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Record Number: 188

File Name (TITLE): High-Resolution Spectroscopy  
at Juy

Document Number (ID): WT-604 (EX)

DATE: 2/1955

Previous Location (FROM): CIC

AUTHOR: O. A. Beck

Additional Information: \_\_\_\_\_  
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OrMIbox: 12

CyMIbox: 8

0051282

0051282

**WT-604(EX)  
EXTRACTED VERSION**

## **OPERATION IVY—PROJECT 8.4**

**Report to the Scientific Director**

### **HIGH-RESOLUTION SPECTROSCOPY AT IVY COMPARED WITH PREVIOUS TESTS**

**Carl A. Beck**

**Naval Research Laboratory  
Washington, DC**

**February 1955**

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2a. SECURITY CLASSIFICATION AUTHORITY		3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution is unlimited.			
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE					
4. PERFORMING ORGANIZATION REPORT NUMBER(S)		5. MONITORING ORGANIZATION REPORT NUMBER(S) WT-604(EX)			
6a. NAME OF PERFORMING ORGANIZATION Naval Research Laboratory	6b. OFFICE SYMBOL (if applicable)	7a. NAME OF MONITORING ORGANIZATION Naval Research Laboratory			
6c. ADDRESS (City, State, and ZIP Code) Washington, DC		7b. ADDRESS (City, State, and ZIP Code) Washington, DC			
8a. NAME OF FUNDING/SPONSORING ORGANIZATION	8b. OFFICE SYMBOL (if applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER			
8c. ADDRESS (City, State, and ZIP Code)		10. SOURCE OF FUNDING NUMBERS			
		PROGRAM ELEMENT NO	PROJECT NO	TASK NO	WORK UNIT ACCESSION NO
11. TITLE (Include Security Classification) OPERATION IVY - PROJECT 8.4 - HIGH-RESOLUTION SPECTROSCOPY AT IVY COMPARED WITH PREVIOUS TESTS, REPORT TO THE SCIENTIFIC DIRECTOR, EXTRACTED VERSION					
12. PERSONAL AUTHOR(S) Carl A. Beck					
13a. TYPE OF REPORT	13b. TIME COVERED FROM 5211-- TO	14. DATE OF REPORT (Year, Month, Day) 1955, February	15. PAGE COUNT 159		
16. SUPPLEMENTARY NOTATION This report has had sensitive military information removed in order to provide an unclassified version for unlimited distribution. The work was performed by the Defense Nuclear Agency in support of the DoD Nuclear Test Personnel Review Program.					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP			
18	3		Operation Ivy Mike Burst Ultraviolet Radiation		
20	6		Spectroscopy King Burst		
			Ultraviolet Spectra Light Spectra		
19. ABSTRACT (Continue on reverse if necessary and identify by block number)					
The high-resolution ultraviolet and visible spectra of typical test nuclear detonations up to and including Operation Ivy have been analyzed and compared. Topics studied include the types of atomic and molecular material observed (with calculations, in some cases, of the relative quantities involved), the ultraviolet cutoff, and rotational temperatures. Variation of these quantities with the radiochemical yield of the bomb is indicated.					
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED		
22a. NAME OF RESPONSIBLE INDIVIDUAL Betty L. Fox		22b. TELEPHONE (Include Area Code) 202-325-7042	22c. OFFICE SYMBOL STTI		

DD FORM 1473, 84 MAR

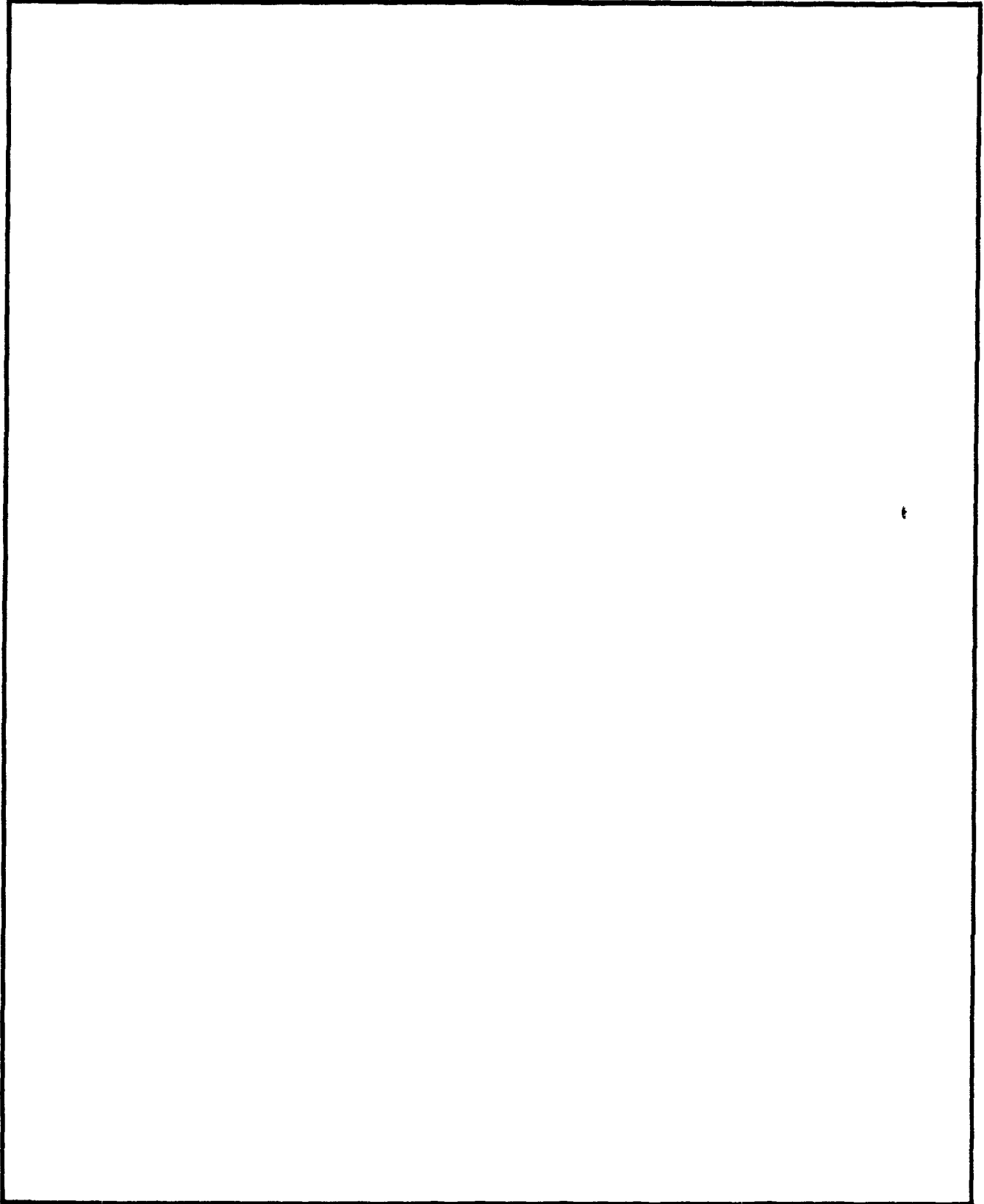
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## FOREWORD

Classified material has been removed in order to make the information available on an unclassified, open publication basis, to any interested parties. The effort to declassify this report has been accomplished specifically to support the Department of Defense Nuclear Test Personnel Review (NTPR) Program. The objective is to facilitate studies of the low levels of radiation received by some individuals during the atmospheric nuclear test program by making as much information as possible available to all interested parties.

The material which has been deleted is either currently classified as Restricted Data or Formerly Restricted Data under the provisions of the Atomic Energy Act of 1954 (as amended), or is National Security Information, or has been determined to be critical military information which could reveal system or equipment vulnerabilities and is, therefore, not appropriate for open publication.

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## ABSTRACT

The high-resolution ultraviolet and visible spectra of typical test nuclear detonations up to and including Operation Ivy have been analyzed and compared. Topics studied include the types of atomic and molecular material observed (with calculations, in some cases, of the relative quantities involved), the ultraviolet cutoff, and rotational temperatures. Variation of these quantities with the radiochemical yield of the bomb is indicated.

## **PREFACE**

This report is concerned with the high-dispersion spectral characteristics of the devices fired at Operation Ivy and the comparison of these characteristics with those of other nuclear explosions recorded in Operations Greenhouse, Buster-Jangle, and Tumbler-Snapper.

All the work reported here was done at the request of the Los Alamos Scientific Laboratory (LASL) and under the supervision of the J-Division of that laboratory. At Greenhouse, the Optics Division participation (which included the spectroscopic work) was part of the Naval Research Laboratory (NRL) program headed by Wayne C. Hall of the Electricity Division. For the remaining operations, spectroscopic work has been part of the Optics Division commitment directly to LASL.

The spectrographic observations were made at Greenhouse and Buster-Jangle by Joseph A. Curcio, who, with Louis F. Drummeter, was also responsible for the original identification of many of the spectral features which are common to nuclear explosions.

The observations and the preliminary data reduction at Tumbler-Snapper and Ivy were made by Carl A. Beck and John H. Campbell.

The data analysis reported here was done in collaboration with Dorothy E. Buttrey, who also aided materially in the assembling of the final text:



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## CHAPTER 1

### INTRODUCTION

#### 1.1 OBJECTIVE

The primary object of this report is to present the results of measurements of high-resolution spectra photographed for the Mike and King shots at Operation Ivy and to compare these results with similar data from previous operations.

#### 1.2 BACKGROUND

Optical spectra at dispersions ranging from 2.5 A/mm to 8.3 A/mm have been photographed for most of the explosions at Operations Greenhouse, Buster-Jangle, Tumbler-Snapper, and Ivy. The wavelength region covered is from about 3000 A, where the spectrum is cut off by some absorbing process, to an instrumental limit near 7800 A. The spectrograms vary in exposure time and wavelength coverage. They also vary in the time during the life of the fireball at which the exposure was made. Table 1.1 gives information pertinent to the shots discussed in this report. It includes for each shot the yield of the weapon in kilotons of TNT, the spectral region photographed, the spectral region measured, the time limits of the exposure, and the prominent atoms and molecules observed in the spectra.

In most of the spectra considered here, the exposure at a particular wavelength is the result of the integration of light on a photographic plate over a relatively long period of time and from a wide region of space. The degree of space and of time integration is determined by the exposure technique used.

The bomb spectra which have been photographed always show a continuous background, as in the case of the photosphere of the sun. This serves as a background for absorption spectra due to excitation of certain atoms and molecules near the surface of the fireball. In some cases the emission spectra of certain atoms and molecules have been obtained.

This report includes a table of the wavelengths and the estimated strengths of the lines and bands observed between 3000 and 5000 A on some of the spectrographic plates obtained at Greenhouse, Buster-Jangle, Tumbler-Snapper, and Ivy (see Appendix A).

Most of the measured wavelengths have been identified as to the atomic or molecular agents responsible. The intensity estimates are included because intensities can give indications of the amount of an agent present and the degree of its excitation.

#### 1.3 THEORY

In general, an electronic molecular spectrum can be either of a broad continuous nature or have structure, i.e., consist of sharp rotational lines, or bands which may or may not show a resolved rotational structure. A spectrum which inherently consists of sharp separated

Table 1.1—COMPILATION OF DATA ON THE COMPARED SHOTS

Shot	Yield, kt	Exposure time	Spectral region photographed, Å	Spectral region measured, Å*	Prominent components observed	Iron appearance	Burst location
Greenhouse Dog		Total	3000-5000	4350-4950	Ba, O <sub>2</sub> , N <sub>2</sub> <sup>+</sup>	Absorption above 4200 Å	Tower
Buster-Jangle Charlie	14.0	0-20 msec	3000-5000	3200-3950	NO <sub>2</sub> , HNO <sub>2</sub> , O <sub>2</sub>	Not present	Air
Baker	3.49	Total	3000-5000	3000-5000	Ba, Al, AlO	Prominent absorption	Air
Tumbler-Snapper 2	1.17	Total	3000-5000	3200-5100	Ba, Al, AlO <sub>2</sub>	Prominent absorption	Air
3	30.7	Total	3000-5000	3150-4670	Ba, Al, AlO(em), N <sub>2</sub> <sup>+</sup> , O <sub>2</sub> , O	Emission above 4000 Å	
4	19.2	0.6-5 sec	4000-6000	4000-5000	Ba(em), Al, AlO(em), N <sub>2</sub> <sup>+</sup> (em), O <sub>2</sub>	Emission	Air
7	14.6	0-100 μsec	3000-5000	3000-5000	NO <sub>2</sub> , HNO <sub>2</sub> , N <sub>2</sub> <sup>+</sup> , O <sub>2</sub>	Not present	Tower
Ivy Mike	10,000	Total	3000-7700	4000-4500	O, N, NO <sub>2</sub> , O <sub>2</sub> N <sub>2</sub> <sup>+</sup> (difficult region to see)	Not observed	Surface
King	540	Total	4000-7800	3950-4020 4060-4700 4900-5100	O, N, NO <sub>2</sub> , N <sub>2</sub> , O <sub>2</sub>	Not observed	Air
		1.0-1.1 sec	3000-5000	3280-4470 4900-5000	N <sub>2</sub> <sup>+</sup> , O <sub>2</sub>	Not observed	
		1st max.	4300-8000	4330-4960	O, N, NO <sub>2</sub> , N <sub>2</sub> <sup>+</sup> , O <sub>2</sub>	Not observed	

\* Please note the spectral regions measured so that, in the use of the table in Appendix A, a blank region will not be misconstrued. In some regions it is difficult to decide between absorption and emission.

lines will appear as such if the spectrograph is of sufficiently high resolving power. Sometimes rotational lines are so close together that they are not inherently resolved because of the finite width of the individual lines involved. As is well known, line broadening can be attributed not only to the nature of the molecule but also to external causes such as temperature, pressure, and external electric or magnetic fields.

The intensity of a spectral line depends on both the population of the initial energy level associated with the optical transition and on the transition probability. This holds for emission and absorption, the initial state being of higher energy in emission and of lower energy in absorption.

In an ideal case, two intensity distributions can be obtained from molecular spectra—that of the intensities of the rotational lines in a v-v, or vibration band, and that of sums of these rotational line intensities taken for many v-v transitions. The first would give an effective rotational temperature and the second an effective vibrational temperature. These temperatures have little meaning if equilibrium conditions do not exist. They also lose significance if the intensities or the sums of intensities represent averages taken over too much time or space. This is the situation in nearly all the experiments described in the present report. Consequently, intensity distributions are given which cannot always be interpreted in terms of temperature.

However, by using intensity distributions of certain oxygen band systems, approximate values of the rotational temperatures were calculated for three of the shots in two ways:

1. In a particular band, the line of maximum intensity was found, and the corresponding total angular momentum of the initial quantum state (J value) was noted. An approximate theoretical expression for line intensity in terms of J and T (temperature) was maximized so that by substitution of the J value of the line of maximum intensity the value of T was found.

2. Temperatures of the same shots were calculated also from the slope of the graph of  $\log_e [I/(2J + 1)]$  vs the rotation energy E, where I is the intensity of the line, (2J + 1) is the degeneracy factor, and E is the rotational energy appropriate to the value of J of the initial or lower level in absorption. The slope of this graph is  $1/KT$ , where K is the Boltzmann factor and T is the temperature.

Spectra at high dispersion are not well suited for measurements of the frequency distribution of a continuous spectrum; hence such distributions are outside the scope of this report. The transmission of the atmosphere is not considered in this report since it does not affect the relative strength of absorption lines or bands, nor does it affect appreciably the relative strengths of observed emission lines.

## CHAPTER 2

# EXPERIMENTAL PROCEDURE

### 2.1 RECORDING OF SPECTRA

The shots at Greenhouse, Buster-Jangle, and Tumbler-Snapper, as well as the King shot (1.0 to 1.1 sec exposure) at Ivy, were studied with a Baird 2-meter, concave grating spectrograph. The first-order spectrum, at a dispersion of 8.3 A/mm, was photographed in each case in the 3000 to 5000 A wavelength region. The slit width was always 0.030 mm, and the average aperture of the spectrograph was  $f/24$ , which in most cases included a large enough solid angle of space to see all of the fireball.

A Jarrell-Ash, 21-ft Wadsworth-mount, grating spectrograph was used for the Mike and King shots at Operation Ivy. This instrument had two gratings, one directly above the other, each having 15,000 lines/in. The grating in the upper deck illuminated one set of plates and was used in the first order to cover wavelengths from about 4000 to 7000 A with a dispersion of 5 A/mm. The second-order spectrum was photographed in the lower deck on a second set of plates so as to cover the 3000 to 4200 A region at a dispersion of 2.5 A/mm. Eastman II-0 spectroscopic plates were used for the second order, and Eastman II-F and I-N plates were used in the first order. Each deck of the spectrograph had an average aperture of about  $f/40$  and was pointed somewhat above shot center in order to include as much of the fireball as possible.

No lens or mirror was used between the slit and the bomb in any of the described cases except in Tumbler-Snapper 6 and 7 and with the Baird spectrograph at King shot. Step wedges were used in all cases except Tumbler-Snapper 6 and 7 in order to obtain proper exposure. These were not always the proper ones to obtain a good plate characteristic curve; therefore an approximate H and D curve was used. This seemed justifiable for comparison of intensities between different plates and also on the same plate.

### 2.2 REDUCTION OF DATA

A Mann comparator was used for measuring wavelengths, and two sets of readings were made on each plate. The wavelength determinations were accurate to about 0.1 A except in the cases of the Mike and the King plates, where a shift of the iron comparison spectrum occurred, and the case of Tumbler-Snapper 7, where the iron calibration lines did not touch the absorption spectrum. In these cases the accuracy was about 0.2 A. Density traces were taken on a JACO recording microphotometer using a slit width of 0.015 mm. This was narrow enough to record all the structure observable on the plates.

The total strength of any spectral line in emission is directly related to the area under the curve in a plot of intensity vs frequency. In absorption the strength, or intensity, is given by measuring the area under the whole absorption peak, provided the optical density due to the

absorbing atom or molecule is plotted against frequency. The absorption intensities in the individual tables were obtained by taking heights off the microphotometer curve recorded on logarithmic paper and correcting these heights with a photographic characteristic curve to give very approximate values of the optical density associated with the absorbing material. These values can be used as an indication of the distribution of intensities in a band. The width and height of the microphotometer slit was kept the same for all traces.



## CHAPTER 3

### RESULTS

Wavelength measurements and microphotometer traces have been made for certain selected spectral regions shown in column 5 of Table 1.1. It was not considered necessary for this report to measure the spectra of all shots already taken up to Ivy. For example, \_\_\_\_\_ are almost exact duplicates, as are Tumbler-Snapper 1 and 3. \_\_\_\_\_ agrees well with Tumbler-Snapper 2 below 4000 A except that it does not have as strong Schumann-Runge bands of oxygen there.

The regions studied for the various plates lie, in general, between 3000 and 5000 A. Measurements were not extended above 5000 A because of the great agreement between absorption structure observed there and the absorption spectrum of the atmosphere. An absorption continuum, possibly due to ozone, blotted out the spectrum below about 3000 A.

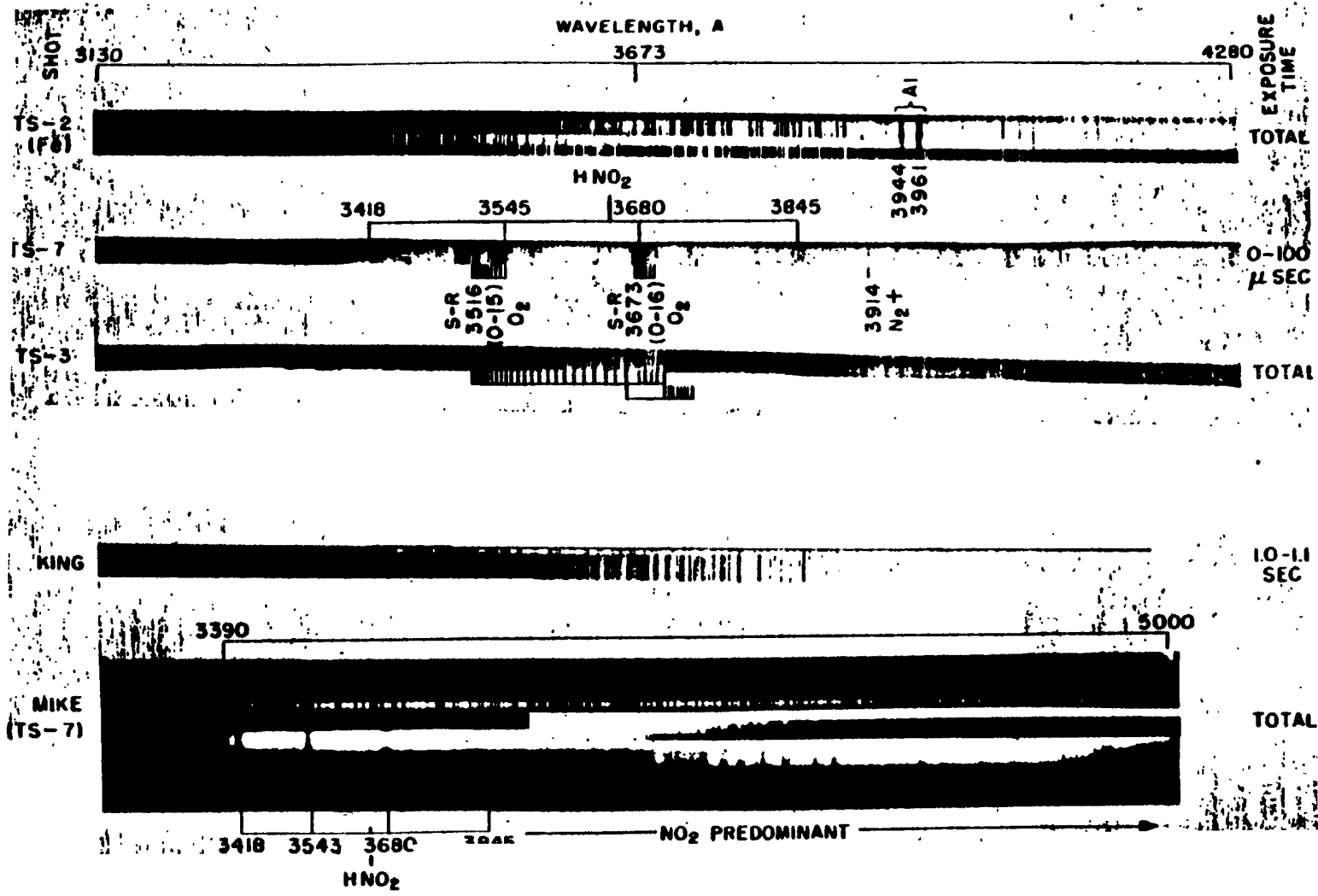
The bulk of the line and band structure appears in absorption (hence nearly all measurements concern absorption), but emission is also present in some cases. For example, the structure of the Tumbler-Snapper 4 spectrum at its long-wavelength end is almost completely in emission. Sometimes it was difficult to distinguish between emission and absorption since both seemed to exist side by side on the plate.

Many wavelengths have been identified, and the materials contributing prominently to the observed structure are listed for the various shots in column 6 of Table 1.1. The main contribution comes from the Schumann-Runge system of oxygen; other more or less prominent molecules observed were  $\text{NO}_2$ ,  $\text{HNO}_2$ ,  $\text{OH}$ , and  $\text{N}_2^+$ . Spectral lines of several atoms were found, iron being the one found most often. Its presence is attributed to the casing of the bomb or to tower materials and is not held to be of first importance in this report. However, column 7 of Table 1.1 gives an indication of the appearance of iron in the spectra for various shots. For example, iron lines are quite prominent in Buster Baker and Tumbler-Snapper 2 and not observed in Mike or King.

Prints of the actual spectra in the 3000 to 4000 A region for several shots are shown in Fig. 3.1. With the exception of Mike, the spectra are positive prints; i.e., an emission line is bright and an absorption line is dark. The reverse is true for Mike. In some cases a comparison spectrum of iron is shown—as for Tumbler-Snapper 2—to show coincidences. The wavelengths of the heads of selected bands are identified in order to facilitate visual comparison of the strengths of the bands in various shots.

Figure 3.1 shows that the S-R 3516 (0-15) band of  $\text{O}_2$  in Tumbler-Snapper 4 has about a dozen lines. In Tumbler-Snapper 3 this band is considerably longer and somewhat stronger, extending as far as the head of the S-R band at 3673 A.

A comparison of Mike and Tumbler-Snapper 7 in the region above 4200 A is also shown in Fig. 3.1. The absorption peaks in Mike are broad and fuzzy compared with the other spectra.



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Fig. 3.1—Typical bomb spectra in the 3000 to 4000 Å region.

This is at least partly due to much stronger absorption by  $O_2$  and probably also by the strength of the  $NO_2$  absorption spectrum. This effect is seen better on the original plates.

Appendix A is a composite tabulation of measured wavelengths for the various shots. The names of the shots head all but the first and the last columns. The first column contains identifications for each Schumann-Runge line. The branch and transition are designated by "P" or "R" followed by the rotational quantum number, J, for the final (lower) state.<sup>1</sup> The true wavelength and the member of the band system are also given. For other molecules and for atoms, the true wavelengths and chemical symbols are given in the first column. Other identifications are made immediately to the left of the measured wavelengths for various shots, and rough visual estimates of the absorption or emission strengths in many cases are given immediately to the right of the measured wavelength. Where there is no intensity number given, it can be taken to mean that the corresponding line is relatively weak. Emission is designated by the letters "em"; all other structure is absorption. For convenience, the last column to the right marked "Fe" gives true wavelengths of iron as taken directly from the MIT Wavelength Tables.

A notation in Appendix A does not necessarily establish a sure identification since there may be superposition of something else, such as unreported lines of  $NO_2$ , at that position. Of the lines not identified, some, no doubt, are lines of S-R  $O_2$  or  $NO_2$  missed in the present study or not reported in the literature. The extremely broad bands around 3500 A attributed to  $HNO_2$  (see Fig. 3.1) are not included in the table. The table can be used profitably in a negative manner to indicate the exclusion of a suspected material.

For completeness Appendix B is given. It is comprised of negative prints of all the original plates exposed at Operation Ivy. However, there is much in the originals that is lost in these prints since all regions on the originals give information except parts in Figs. B.1 and B.4.

The Baird spectrograph was used at Mike to try to record the very early spectrum, but only a meager bit of information in the form of a line showed on the plate. This may be the head of the 4278 A  $N_2^+$  band, but, since it is not certain, it is not indicated in the results.

## CHAPTER 4

### ANALYSIS OF DATA

#### 4.1 GENERAL COMMENTS

There are several points of interest in the following discussion of tables and results. These are ultraviolet cutoff, certain compared strengths of absorption in the spectra, the various atoms and molecules present in the several shots, and the rotational temperatures of the molecules.

#### 4.2 ULTRAVIOLET CUTOFF

All the spectra studied for this report show a fairly abrupt cutoff of ultraviolet radiation centered above 3000 A (Table 4.1). This cutoff cannot be attributed, in any of the cases

Table 4.1—APPROXIMATE ULTRAVIOLET CUTOFF VALUES

Shot	Exposure time	Yield, kt	Cutoff, A
Greenhouse Dog	Total		3600
Buster Baker	Total	3.49	3600
Buster Charlie	0-20 msec	14.0	3450
Tumbler-Snapper 2	Total	1.17	3450
Tumbler-Snapper 3	Total	30.7	3350
Tumbler-Snapper 7	0-100 $\mu$ sec	14.6	3300
Mike	Total	10,000	>3600
King	1.0-1.1 sec (also total)	540.0	>3600

studied, to the normal atmosphere between the bomb and the spectrograph. It must be the result of an attenuating medium surrounding the weapon and created by the explosion; but, from the spectra described in this report, the identity of such an absorber is not apparent.

However, recent observations with low-dispersion spectrographs at Operation Upshot-Knothole appear to have established the existence of ozone in equivalent thicknesses of several centimeters around the bomb during the time up to the minimum. It would be informative to attempt to describe the cutoff in terms of the intensity distribution of the ozone absorption spectrum, but the well-known wavy form of the spectral curve of ozone was not detected. This may be due to the presence of many bands in the cutoff region, such as those of the S-R system.

Table 4.1 gives for the spectra studied the exposure time, the total yield in kilotons, and the wavelength of the cutoff, e.g., the wavelength at which the optical density fell to one-tenth of that at about 4100 Å. A trend in this cutoff toward longer wavelengths with an increase in yield seems to be present over the whole yield range studied, but it is doubtful that a scaling law can be established at present. In the second column of Table 4.1, the exposure times referred to as "total" cover the entire life of the fireball; appropriate designations of times of exposure are made for shots where only a portion of the life of the fireball was observed.

#### 4.3. COMPARISON OF SPECTRAL INTENSITIES FOR O<sub>2</sub>, NO<sub>2</sub>, AND N<sub>2</sub>

The second very prominent feature in the comparison of these spectra is that the larger the effective kilotonnage of the bomb, the stronger are the absorption lines or bands, i.e., for spectra of comparable exposure times. This is very evident in the Schumann-Runge system of oxygen from about 4600 Å to the cutoff. These lines are relatively strong in Mike and King and are considerably weaker for bombs of smaller yield. The lines are close together, with many overlappings at the dispersion used, and, of course, since the intensities of the individual lines are different for the different shots, the appearances of the spectra are not always the same.

In order to show an important difference between total-time shots and those taken at an early interval, Table 4.2 gives intensity values for the Schumann-Runge 0-13 band system in Buster Charlie and also for the same system in Tumbler-Snapper 3; Fig. 4.1 shows the microphotometer traces for this region. [The Buster Charlie trace in Fig. 4.1 is taken from the report by J. Curcio, Atlas of High Dispersion Spectra Recorded at Buster-Jangle, NRL Report 4386 (RD 408), p. 20.] The exposure at Buster Charlie covered the first 20 msec of the explosion, and Tumbler-Snapper 3 was a total-time exposure. The rotational transition number "J" indicated for each wavelength is that of the R-branch. The peak intensity for Buster Charlie occurs around J = 15 and for Tumbler-Snapper 3 at about J = 41. The intensity distribution of this rotational structure in Buster Charlie corresponds to a much lower temperature than it does in the total-time Tumbler-Snapper 3. The effective rotational temperatures range from a few hundred degrees Kelvin in Buster Charlie to several thousand degrees in Tumbler-Snapper 3.

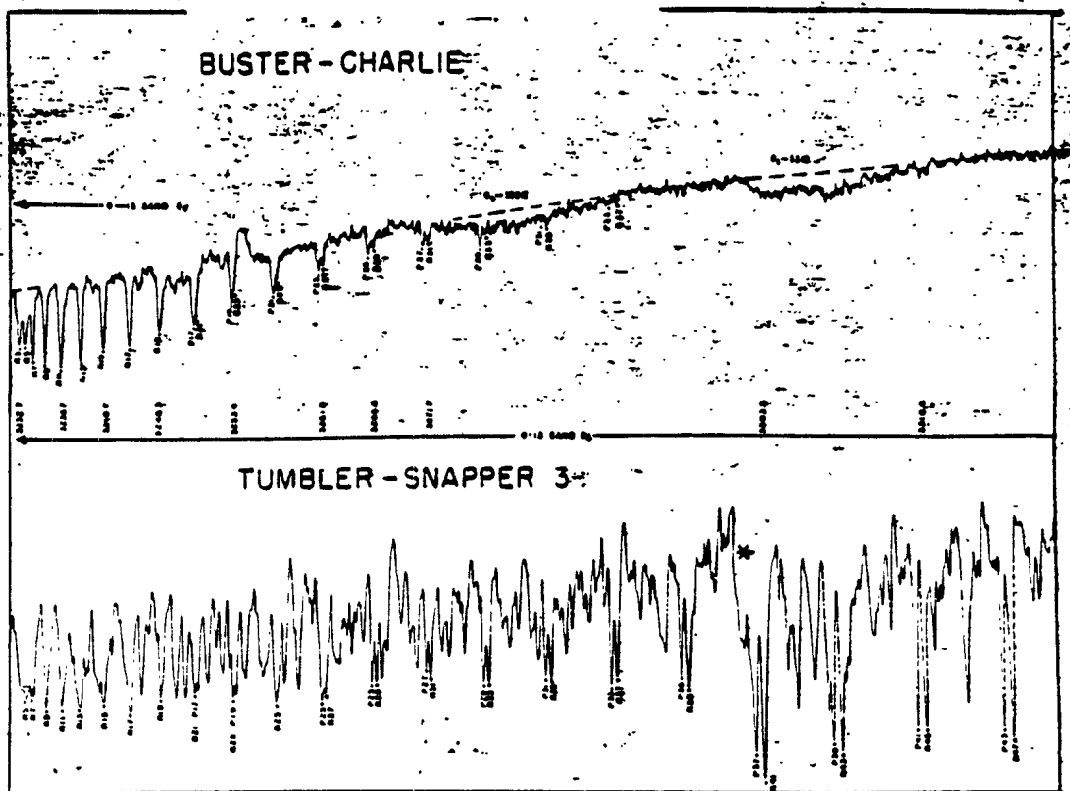
Table 4.3 shows a comparison of intensities of the lines of the S-R 0-15 band (head at 3516 Å) found in Tumbler-Snapper 3 (total), King (1.0 to 1.1 sec), Tumbler-Snapper 7 (0 to 100 μsec), and Buster Charlie (0 to 20 msec). A plot of intensities of the peaks given in this table for King and Tumbler-Snapper 3 is shown in Fig. 4.2. In this plot no distinction is made between P and R branches; however, one can see that all points for King are about twice as high on the intensity scale as are corresponding points for Tumbler-Snapper 3. The irregularities in the intensities for King around 3700 Å are probably due to overlappings by the S-R 0-16 system. Microphotometer traces showing the S-R 0-15 band for the four shots are presented in Fig. 4.3. It is of interest to note that in comparing the two short-time exposures (Buster Charlie and Tumbler-Snapper 7), the very early Tumbler-Snapper 7 exposure shows the band more strongly than does the 20-msec Buster Charlie exposure. This suggests that the band was excited by an early radiation surge. It should be noted, however, that the casing material in Buster Charlie was about  $\frac{1}{2}$  that in Tumbler-Snapper 7. The two large jumps in the Tumbler-Snapper 7 trace are due to HNO<sub>2</sub> absorption. For the most part, everything else seen in these four traces is due to S-R O<sub>2</sub> absorption.

From the Mike plates it was difficult to obtain good intensities for the rotational distribution of any Schumann-Runge v-v transition because of the superposition of the NO<sub>2</sub> spectrum and the great breadth of the lines. The latter fuzziness is probably due to broadening conditions present in the explosion. In order to give some idea, however, of the way Mike compares with King (total), Greenhouse Dog, and Tumbler-Snapper 3, the intensities of two selected spectral ranges have been compared for the four shots in Table 4.4. These intensity values are only approximate, mainly because of the overlappings of other bands. Microphotometer traces of absorption bands around this region (4000 to 4200 Å) are shown in Fig. 4.4 for Mike, King, and Tumbler-Snapper 3.

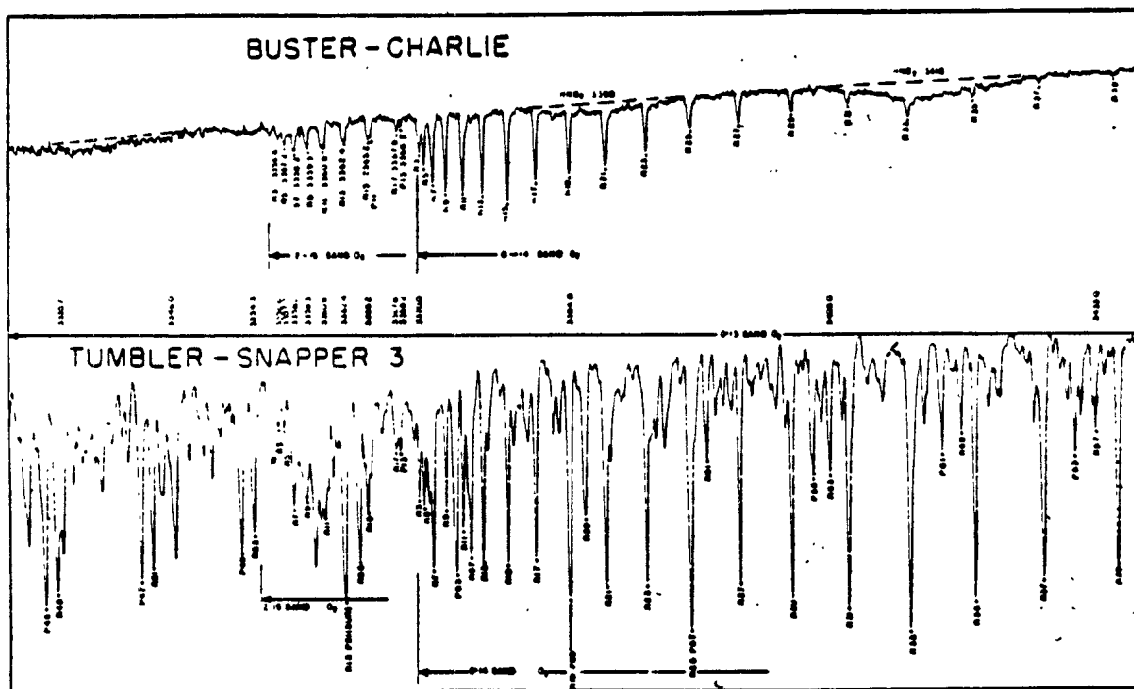
Table 4.2—COMPARISON OF SPECTRAL INTENSITIES FOR THE  
S-R 3233 (0-13) BAND OF BUSTER CHARLIE (14 KT, 0 TO 20 MSEC)  
AND OF TUMBLER-SNAPPER 3 (30.7 KT, TOTAL)

Rotational transition for R-branch, J	S-R 3233 (0-13) band*			
	Buster Charlie		Tumbler-Snapper 3	
	Measured wavelength, A	Intensity (see Sec. 2.2)	Measured wavelength, A	Intensity (see Sec. 2.2)
3	3232.9	0.10	3232.7	0.24
5	33.5	0.12	33.8	0.30
7	34.2	0.13	34.2	0.30
9	35.4	0.15	35.4	0.42
11	36.9	0.16	36.8	0.35
13	38.8	0.18	38.4 38.7	0.43
15	41.1	0.19	40.8	0.36
17	43.7	0.17	42.9 43.5	0.46
19	46.5	0.13	46.4	0.34
21	49.8	0.11	49.3 49.7	0.39
23	53.4	0.09	53.1 53.5	0.38
25	57.0	0.08	57.2 57.5	0.44
27	61.9	0.04	61.5 62.0	0.45
29	66.5	0.05	66.7	0.39
31	71.9		71.9	0.35
33	77.1		77.4	0.41
35			83.2	0.37
	Total 1.70			
37			89.5	0.36
41			3303.3	0.42
43			10.8	0.32
45			18.6	0.33
47			26.9	0.39
			Total 9.04	

\* For all of Buster Charlie and up to R = 27 of Tumbler-Snapper 3, the intensity values include the intensity of superimposed P-branch members.



(a) \* RECORDER SENSITIVITY CHANGE



(b)

Fig. 4.1 — Microphotometer traces of S-R 0-13 band O<sub>2</sub> in Buster Charlie and Tumbler-Snapper 3.

Table 4.3—COMPARISON OF SPECTRAL INTENSITIES FOR THE  
S-R 3516 (0-15) BAND OF BUSTER CHARLIE,  
TUMBLER-SNAPPER 3, TUMBLER-SNAPPER 7, AND KING

Rotational transition for R-branch, J	S-R 3516 (0-15) band					
	Wavelength, <sup>a</sup> Å	Intensity (see Sec. 2.2)				
		Buster Charlie (14 kt, 0-20 msec)	Tumbler-Snapper 3 (30.7 kt, total)	Tumbler-Snapper 7 (14.6 kt, 0-100 μsec)	King (540 kt, 1.0-1.1 sec)	
7	3517.8	0.09	0.31	0.24	0.42	
9	19.0					
11	20.6	0.09	0.17	0.24	0.39	
13	22.6	0.10	0.15	0.24	0.28	
15	25.0	0.06	0.19	0.20	0.35	
17	27.8	0.03	0.19	0.20	0.35	
	31.0	0.12	0.21	0.18	0.35	
	34.6	0.06	0.17	0.15	0.36	
	38.6	0.04	0.17	0.12	0.37	
25	43.0	0.04	0.21	0.08	0.36	
27	48.0	0.07	0.17	0.08	0.38	
	52.5		0.22	0.05	0.41	
	58.9		0.17		0.30	
	65.0		0.22		0.41	
35	70.5		0.22		0.38	
37	78.3		0.48		0.45	
	84.7		0.25		0.50	
	93.2		0.24		0.39	
	3601.3		0.24		0.62	
45	09.8		0.25		0.57	
47	18.8		0.26		0.56	
	28.4		0.20		0.50	
	38.2		0.24		0.61	
	48.7		0.20		0.52	
55	59.6		0.16		0.50	
57	70.9		0.20		0.57	
	82.4		0.26		0.84	
	95.1		0.20		0.40	
	3708.0				0.65	
65	21.4		0.22		0.76	
67	35.2		0.28		0.59	
	49.2		0.20		0.50	
71	64.8		0.20		0.52	
		Total	0.70	6.46	0.78	15.16

<sup>a</sup> These wavelengths are taken from the table of reference 1. These values are given for the R-branch, but actually the intensity values have a contribution from the P-branch because of overlapping.



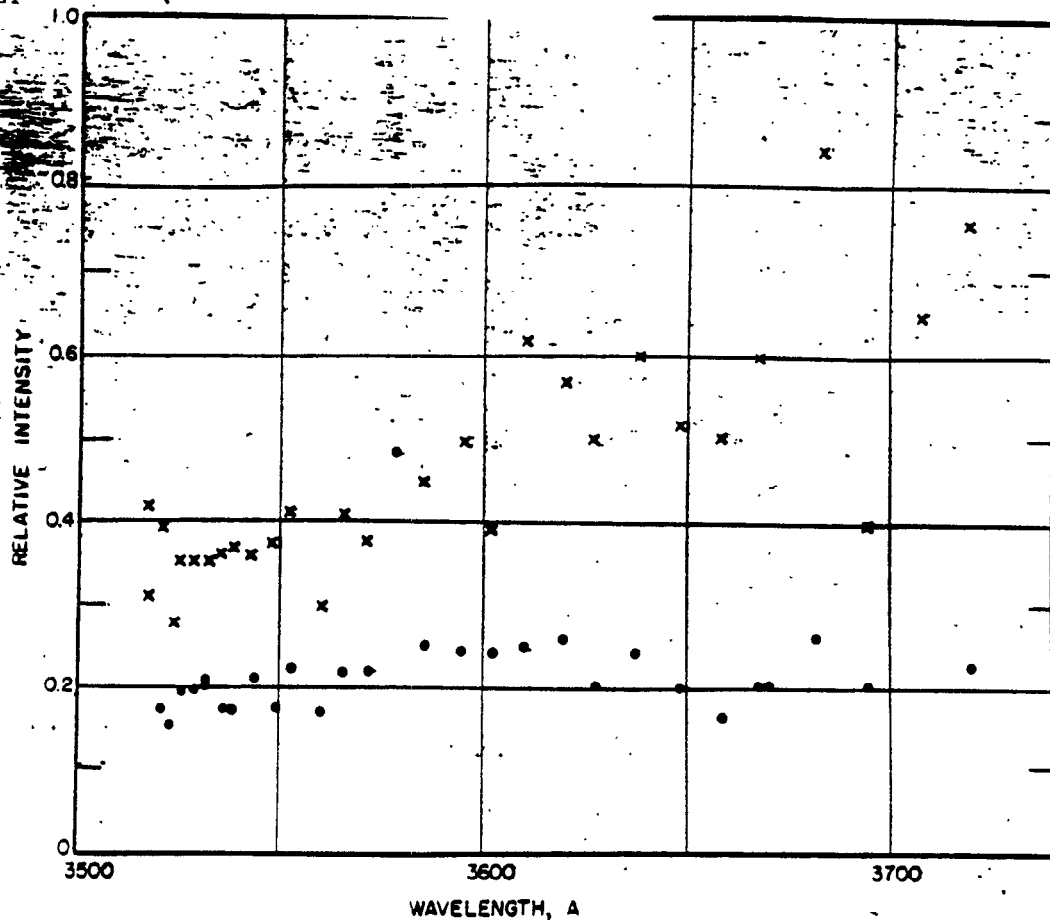


Fig. 4.2 — Relative intensity vs wavelength for the S-R 0-13 band  $O_2$  in Tumbler-Snapper 3 and King (0.1 to 1.1 sec). x, King. o, Tumbler-Snapper 3.

The foregoing comparisons of intensities center for the most part around the Schumann-Runge bands of  $O_2$ . In addition to these, bands of  $N_2^+$ ,  $NO_2$ , and the broad bands of  $HNO_2$  appear in the spectra for the various explosions.

There is an interesting behavior of the  $NO_2$  absorption spectrum. For the total-time shots, it is only in the Mike spectrum that  $NO_2$  appears prominently. King shows it markedly for the first maximum exposure, but the exposure conditions were not favorable to judge its strength in the total-time exposure. The  $NO_2$  bands in the spectra of Mike and King (first maximum) appear to be very roughly of the same strength as in the early-times Tumbler-Snapper 7 spectrum. The lower part of Fig. 3.1 shows the appearance of  $NO_2$  in the spectrum of Tumbler-Snapper 7 and Mike.

The blackening in the King (1.0 to 1.1 sec) exposure was too great to judge the presence of  $NO_2$  effectively.

The behavior of  $N_2^+$  in several shots is described in Table 4.5. The intensity distribution in the 4278 Å band of  $N_2^+$  is shown in Table 4.6 for King (total) and Tumbler-Snapper 3.  $N_2^+$  is not evident in Buster Charlie, but the 3914 Å (0,0) band is present in Tumbler-Snapper 7 (see Fig. 3.1). Identifications were made with the help of a table by Fassbender.<sup>3</sup>

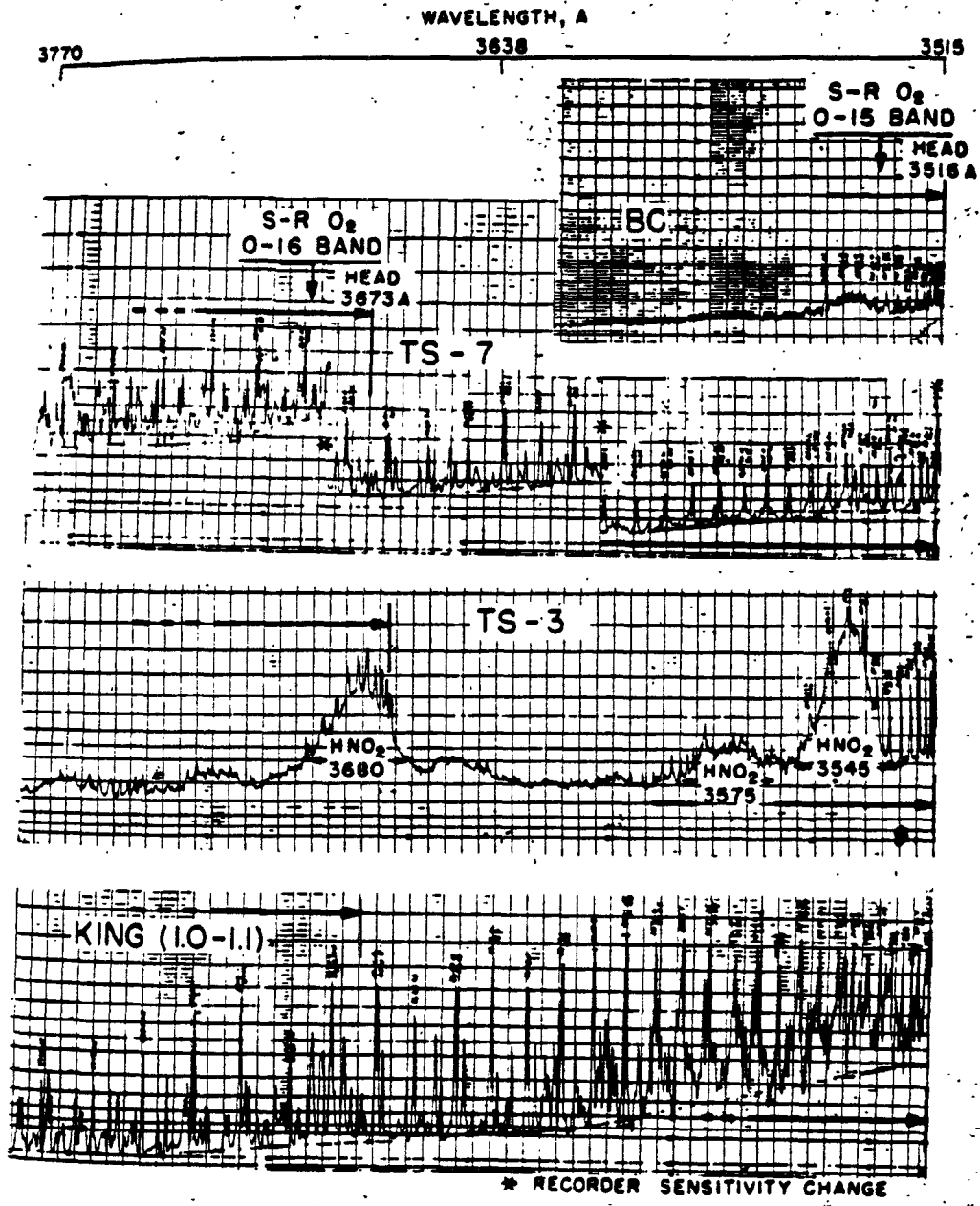


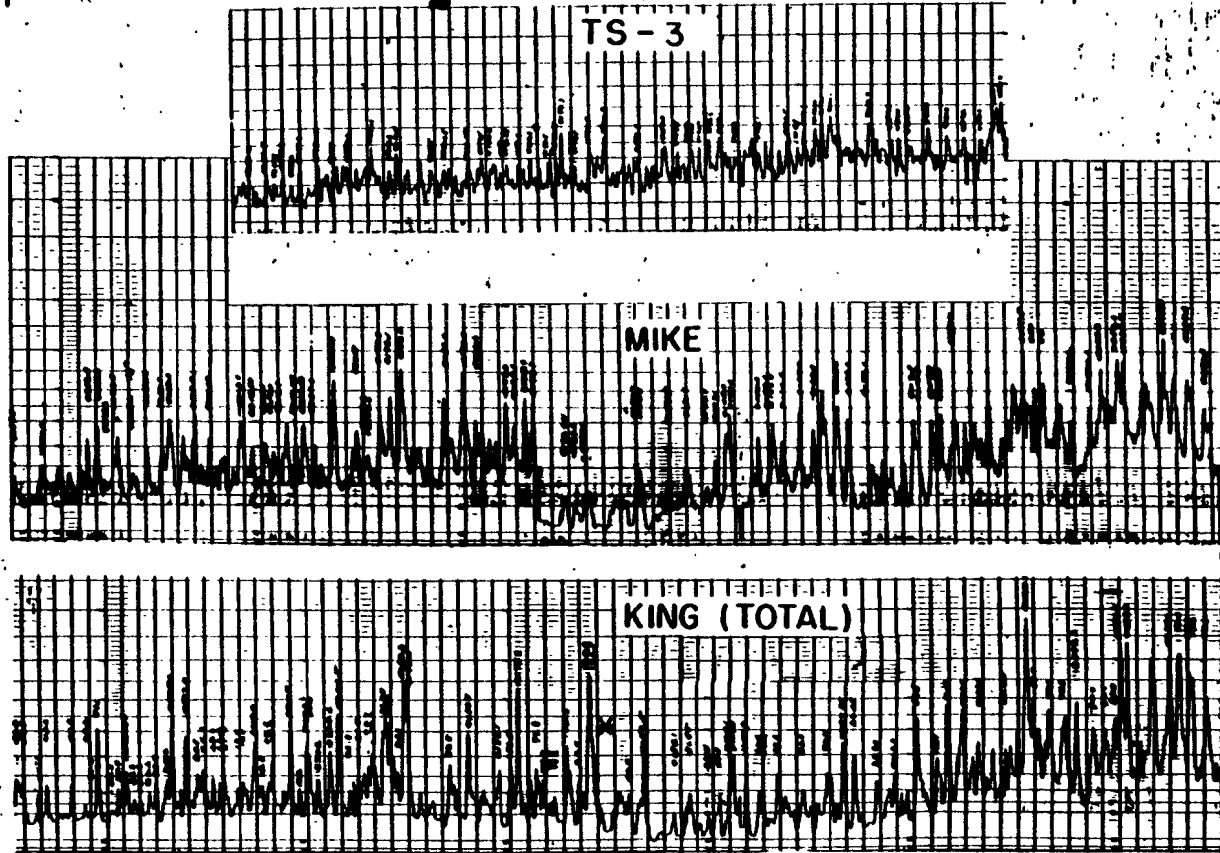
Fig. 4.3—Microphotometer traces of S-R 0-15 band O<sub>2</sub> in Buster Charlie, Tumbler-Snapper 3, Tumbler-Snapper 7, and King (1.0 to 1.1 sec).

4254

WAVELENGTH, A

4160

4070



\* RECORDER SENSITIVITY CHANGE

Fig. 4.4—Microphotometer traces of 4000 to 4200 A region in Tumbler-Snapper 3, Mike, and King (total).

20

Table 4.4—COMPARISON OF SPECTRAL INTENSITIES FOR SELECTED REGIONS IN GREENHOUSE DOG, TUMBLER-SNAPPER 3, MIKE, AND KING

Wavelength at peak, A	Identification	Intensity (see Sec. 2.2)			
		Greenhouse Dog total)	Tumbler-Snapper 3 (30.7 kt, total)	Mike (10 Mt, total)	King (540 kt, total)
4087.9	R55 S-R 0-16		0.05	0.40	
59.2	P93 S-R 0-16		0.05	0.40	
60.9	R53 S-R 1-18		0.04	0.35	
4144.7	R75 S-R 0-17		0.08	0.39	0.43
	R31 S-R 1-19				
45.3	P61 S-R 1-18		0.06	0.35	0.38
47.5	R49 S-R 0-18		0.06	0.28	0.23
48.5	?		0.07	0.14	0.12
50.0	?		0.05	0.09	0.08
52.6	?		0.12	0.35	0.30
54.2	P29 S-R 1-19			0.33	0.19
58.7	R51 S-R 0-17		0.07	0.40	0.35
59.3	R35 S-R 1-19		0.07	0.31	0.17

Table 4.5—COMPARISON OF ABSORPTION BY  $N_2^+$  IN VARIOUS SHOTS

Wavelength of $N_2^+$ bandhead, A	Buster Charlie (14 kt, 0-20 msec)	Tumbler- Snapper 2 (1.17 kt, total)	Tumbler- Snapper 3 (30.7 kt, total)	Tumbler- Snapper 7 (14.8 kt, 0-100 $\mu$ sec)	Mike (10 Mt, total)	King (540 kt, total)	King (540 kt, 1.0-1.1 sec)
4278	Not evident	Negligible	Has many members	Not evident	Negligible	Many rotational lines	Probably strong only at head
3914	Not evident	Negligible	Has many members	Present	Not recorded	Not recorded	Strong only at head

Table 4.6—COMPARISON OF SPECTRAL INTENSITIES FOR THE  
 $\text{N}_2^+$  BAND AT 4278 Å. ON TUMBLER-SNAPPER 3 AND KING.

Half quantum number $R_m$	Wavelength, Å (measured for Tumbler- Snapper 3)	Intensity (see Sec. 2.2)	
		Tumbler-Snapper 3 (30.7 kt. total)	King (540 kt. total)
	4278.1		
8.5	66.4	0.06	0.16
9.5	64.8	0.05	0.13
10.5	63.7	0.07	0.13
11.5	62.3	0.06	0.16
12.5	61.0	0.05	0.10
13.5	59.5	0.06	0.13
(Superposition of bands)	58.0	0.06	0.12
	55.1	0.07	0.16
	53.6	0.05	0.14
18.5	49.2	0.08	0.19
19.5	47.5	0.09	0.15
20.5	45.2	0.08	0.18
21.5	43.2	0.14	0.23
23.5	41.2	0.08	0.25
	Total	1.08	2.27

#### 4.4 DISCUSSION OF OTHER STRUCTURE

##### 4.4.1 General

It is principally absorption due to molecules either produced or excited by the action of the bomb that gives the characteristic features of the spectra. The conspicuous molecules are  $\text{O}_2$ ,  $\text{N}_2^+$ ,  $\text{NO}_2$ , and  $\text{HNO}_2$ . These are products and by-products of the disturbed air close to the fireball. In addition, molecules formed from the combination of atoms of the casing and those of the atmosphere would be expected, especially when case materials are observed. Indeed, aluminum monoxide (AlO) absorption bands are observed very prominently in Tumbler-Snapper 2 and weakly in emission in Tumbler-Snapper 3 and Tumbler-Snapper 4. Cyanogen (CN) appears to be present in Tumbler-Snapper 4, and it may be present in Tumbler-Snapper 3. When atomic lines of barium, aluminum, and iron appear, they may be accounted for by the presence of these materials in the high explosive, the bomb case, or the tower. However, these atomic lines are not always seen though the material may be present.

There are many wavelengths not yet identified, especially at both ends of the table. Some of these lines may be due to molecular transitions not yet recorded in the literature. Because of the choppy nature of the spectra near the ultraviolet cutoff, measurements and identifications were very difficult in this region. There is also considerable structure at long wavelengths: left unidentified at present.

Whether one says the spectra of the various bombs are alike or not depends on the point of view taken. Many of the same wavelengths will appear in different shots under corresponding conditions of space and time. On the other hand, the general appearance can be quite different from shot to shot. Some of this difference can be attributed to overlapping of bands and changes in their intensity. For example, an increase of intensity of absorption in Mike gives a spectrum which looks unusual below 4000 Å, but even here the molecular spectrum agrees roughly in contour with those of total-time bombs of lower yield.

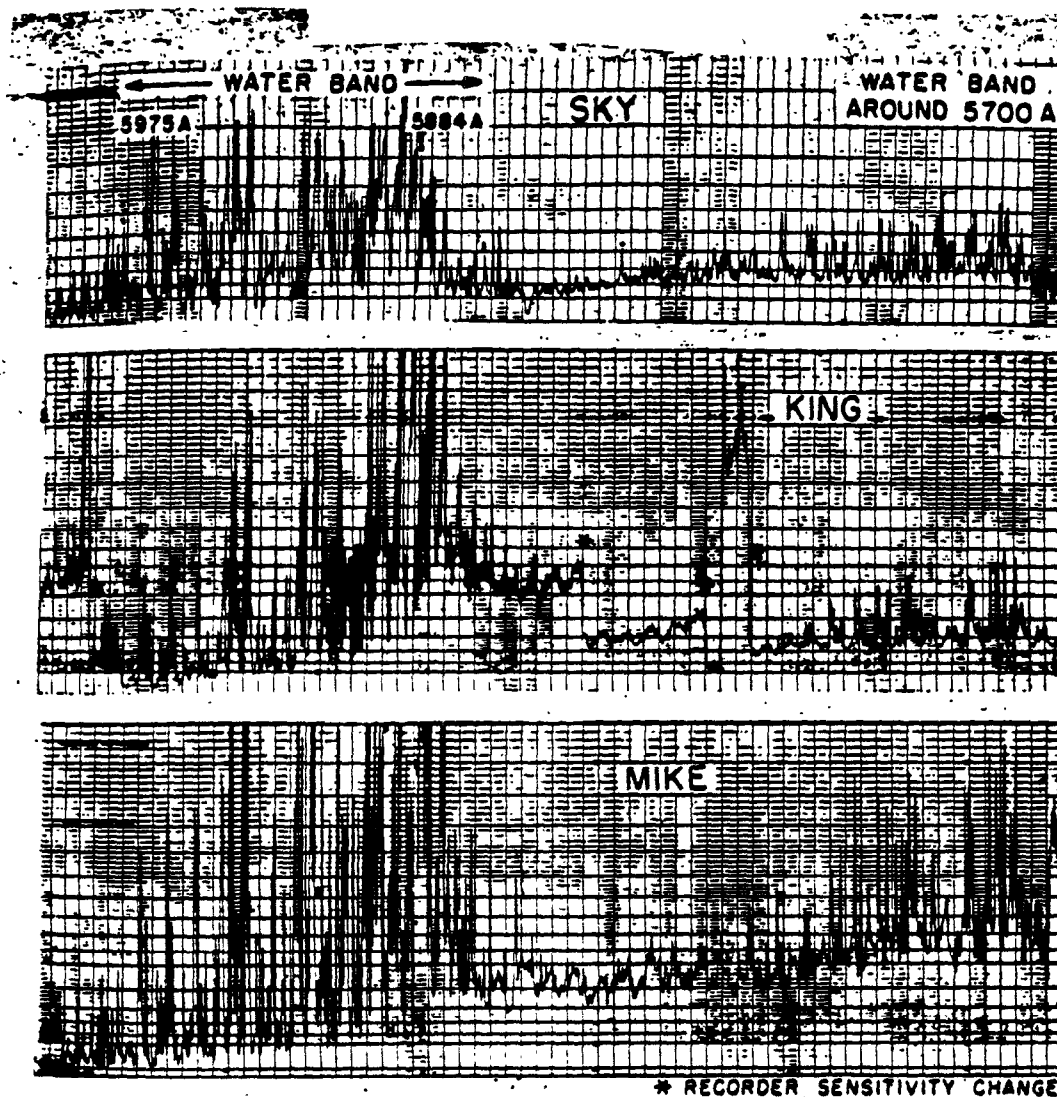


Fig. 4.5—Agreement of Mike and King (total) spectra with sky spectrum in 5925 Å region.

#### 4.4.2 Mike and King

Above about 5200 Å, the observed absorption spectra of bombs can be accounted for almost entirely by the absorption of the normal atmosphere between the explosion and the point of observation. The absorption structure is mainly due to water vapor and oxygen molecules. This is easily seen by examining the plates with an eyepiece; but to make the comparison more quantitative, microphotometer traces of the long-wavelength region (up to about 6500 Å) of a sky spectrum taken during the Ivy tests have been compared with traces of Mike (total) and King (total and first maximum). Figure 4.5 shows how these traces agree in the region of 5925 Å. Except for some oxygen I lines at 5328, 6156, 6155, and 6158, 7771, 7774, and 7775 Å and very probably nitrogen I lines at 5357, 5281, and 5369 Å on the Ivy plates, a comparison of the Ivy and sky plates shows them all to be the same in this region. At about 5450 Å, Mike appears to have an open structure band not found in the sky or King.

There is a group of absorption lines in the neighborhood of 5040 Å which appears in Mike and King but does not appear exactly the same in the spectrum of the sky. It cannot be identi-

fied at present. It may be due to an unreported band of water vapor or NO<sub>2</sub>. It does not, however, have the appearance of a typical NO<sub>2</sub> section of spectrum.

With regard to atomic spectra present in Mike and King, no atomic lines are prominent below 4800 Å. However, since every single line in this region has not yet been identified, some might be present. The three atomic oxygen lines at 7771, 7774, and 7775 Å, observed in the total King and in the King first-maximum spectra, are very broad. A further study of their appearance is suggested. This region in Mike was blackened by accident, and measurements were impossible.

Sodium lines at 5890 and 5896 Å are observed in Mike and King but are of no special interest here.

#### 4.5 ROTATIONAL AND VIBRATIONAL TEMPERATURES

Information on temperature is rather meager, especially for the Ivy shots. It was not possible to obtain any value from the Mike spectra and only one value for King.

Rotational temperatures were calculated by both the maximum method and the slope method using the measured intensities and J values for the R-branch of the S-R 0-13 and S-R 0-15

Table 4.7—APPROXIMATE ROTATIONAL TEMPERATURES

Shot	Yield, kt	Exposure time	S-R O <sub>2</sub> band	J <sub>max.</sub>	Temp. by max. method, °K	Temp. by slope method, °K
Buster Charlie	14.0	0-20 msec	0-13	11	700	600
Tumbler-Snapper 3	30.7	Total	0-13	37	8,000	2,500
Buster Charlie	14.0	0-20 msec	0-15	9	400	
Tumbler-Snapper 3	30.7	Total	0-15	40	10,000	5,000
Tumbler-Snapper 7	14.6	0-100 μsec	0-15	11	700	
King	540.0	1.0-1.1 sec	0-15	40	10,000	10,000

bands as given in Tables 4.2 and 4.3. These temperatures are listed in Table 4.7. The graphs of  $\log_e [I/(2J + 1)]$  vs E from which the "slope" temperatures were determined are shown in Figs. 4.6 and 4.7. In these graphs the rotational energy is that of the lower state and is plotted in wave numbers (cm<sup>-1</sup>). (See Sec. 1.3 for comment on the maximum method.)

Theoretically, the same temperature should be arrived at by both methods for a certain shot; but, as seen in Table 4.7, the 0-13 S-R band of Buster Charlie gave about 600°K by the slope method as compared with 700°K by the maximum method. Similar variations were obtained for the other shots, except in the case of King where both methods gave roughly 10,000°K. The slope method is considered more reliable for obtaining rotational temperatures since more points were used in the determination. Both methods are affected by large error due to overlapping of branches and rotational components themselves.

The vibrational temperature of the early-time spectra is very high in comparison with the rotational temperature, as is evidenced by the existence of transitions from a very high vibrational level (v ranging in O<sub>2</sub> from 21 or so, upward). Calculation of this type of temperature is not possible at present because of lack of good data on transition probabilities, and, also, the experimental data which are measurable do not cover a wide enough energy range of the initial quantum state. Although it is true that thermal excitation does not produce these high vibrational levels at the early stage, it does seem that the levels could be thermally excited in the later stages. Before this can be verified, reliable transition probabilities over a wide range of observed frequencies should be determined.

An electronic temperature for O<sub>2</sub>, for example, cannot be calculated because of lack of observation of different electronic levels from which transitions take place.

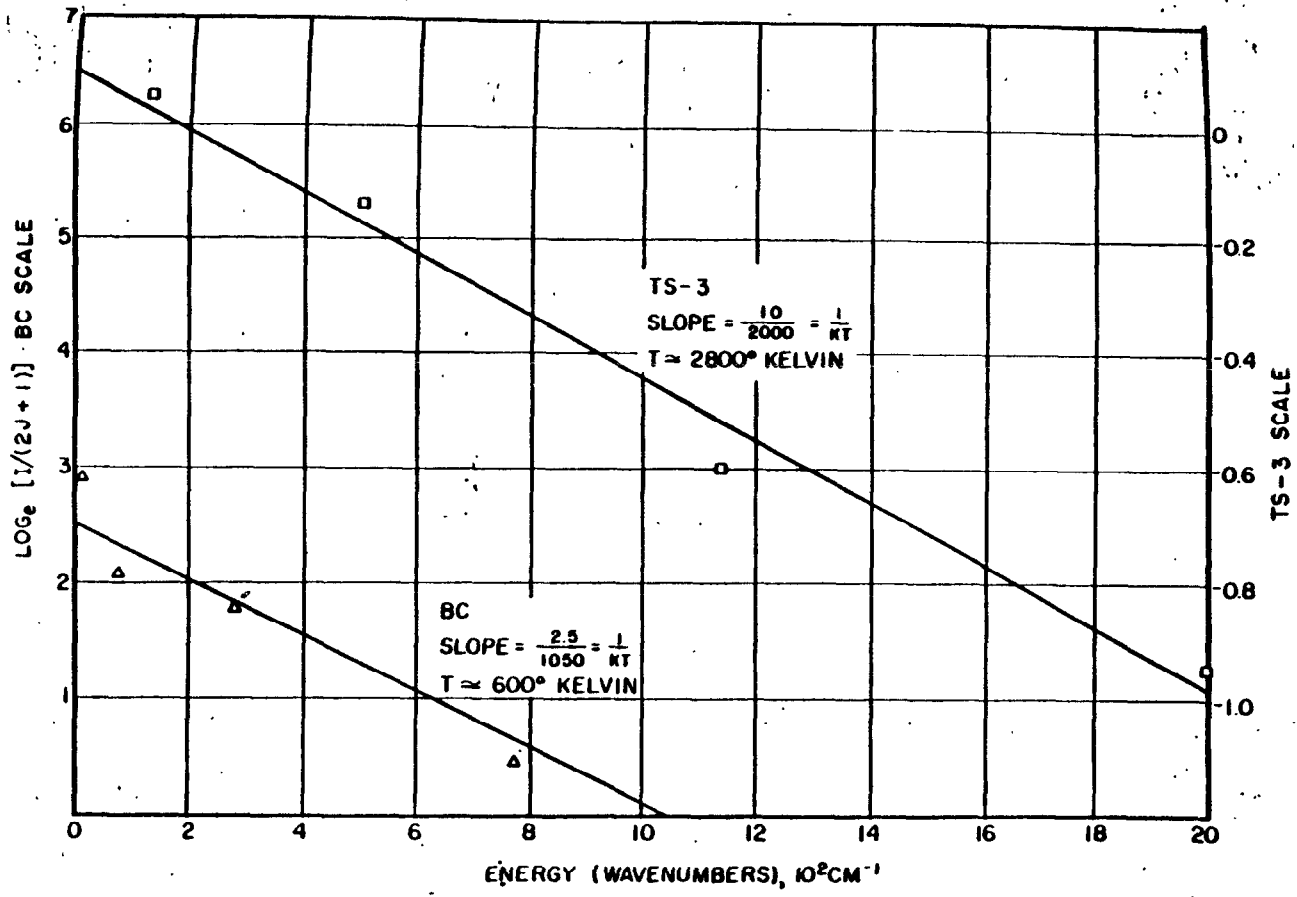


Fig. 4.6— Graph of rotational energy vs  $\log_e [1/(2J + 1)]$  for S-R 0-13 band  $O_2$  of Tumbler-Snapper 3 and Buster Charlie.



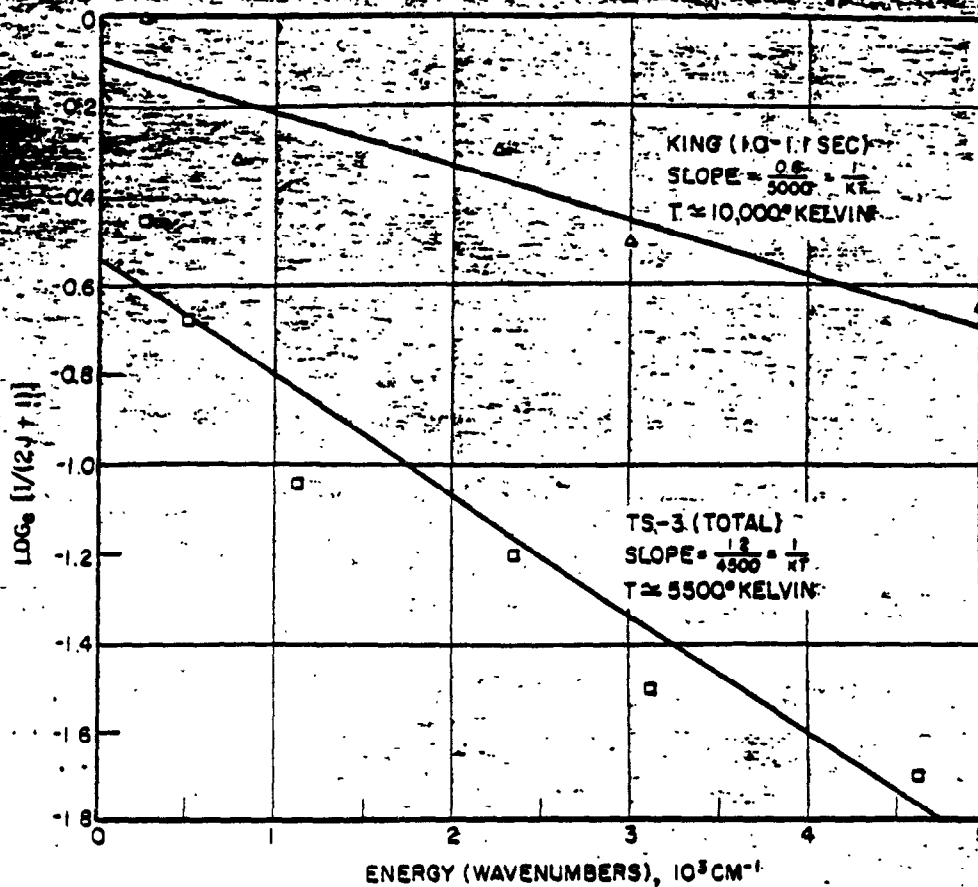


Fig. 4.7—Graph of rotational energy vs  $\log_e [(1/2)J + 1]$  for S-R 0-15 band  $O_2$  of Tumbler-Snapper 3 and King.

The excitation of atomic oxygen to the high electronic level necessary for absorption by the triplet at about 7770 Å is very large and may involve mechanism different from thermal excitation. However, these lines may have a relatively large intrinsic transition probability.

#### 4.6 AMOUNT OF ABSORPTION

As already presented, Tables 4.2, 4.3, 4.4, and 4.6 give comparison of the strengths of absorption for various molecules, and, by totaling the intensities given, it is possible to compare the amounts or yields of absorbing materials excited to the initial vibrational and rotational levels for the various shots.

##### 4.6.1 Oxygen

Table 4.2 shows the much greater yield of absorbing  $O_2$  for a total-time shot like Tumbler-Snapper 3 compared to the early-timed Buster Charlie. Table 4.3 shows that King from 1.0 to 1.1 sec produced more than twice as much absorbing  $O_2$  in the 0-15 band as did Tumbler-Snapper 3 over the life of the fireball. In Table 4.4, if the rough absorption values for three shots are compared for the same J value, it is shown that in Mike the values are greatest whereas in Tumbler-Snapper 3 they are the least.

#### 4.6.2 Nitrogen Dioxide

$\text{NO}_2$  is known to be produced early in the life of an explosion. This is evidenced by its marked presence in the 0 to 20 msec plate from Buster Charlie and by its presence in greater strength in the 0 to 100  $\mu\text{sec}$  plate from Tumbler-Snapper 7. The spectrum of Tumbler-Snapper 7 from about 4000 A higher is essentially that of  $\text{NO}_2$ , and below 4000 A there is a superposition of short S-R bands on the  $\text{NO}_2$  plus broad bands of  $\text{HNO}_2$ .  $\text{NO}_2$  appears fairly prominently in the Mike spectrum. It is interesting to note that  $\text{NO}_2$  does not appear measurable in Tumbler-Snapper 3 or loom prominently in Tumbler-Snapper 3. A value of about 4 mm at STP has been roughly calculated for  $\text{NO}_2$  in Tumbler-Snapper 7, and a value probably not too much in excess of this holds for Mike.

#### 4.6.3 Ionized Nitrogen

At present there is no explanation for the spectral behavior of  $\text{N}_2^+$ . It is not easy to observe its presence in Mike, but in King (total) it is quite evident, as it is in Tumbler-Snapper 3. In the early-time shots, its presence in Tumbler-Snapper 7 and its absence in Buster Charlie are noteworthy. In Tumbler-Snapper 7 it is only the 3914 A band which appears; this is the 0-0 band due to a transition in which the molecule is initially in the vibrationless ground state. This points to a correspondingly low vibrational temperature. The rotational temperature for the same band was roughly calculated to be 4000°K, and in view of this high rotational temperature, it is hard to understand why the 1-0 transition band at 4278 A is not also in Tumbler-Snapper 7. This behavior differs from that of early  $\text{O}_2$  for the same plate. The  $\text{O}_2$  rotational temperature was only about 400°K, and yet so many high vibrational states are present.

Table 4.6 shows for the 4278 A band that there is a greater  $\text{N}_2^+$  production in King (total) than in Tumbler-Snapper 2 (total). The 3914 A band occurs in both of these spectra also, but overlappings prevented intensity measurements of any value. It is difficult to say whether the rotational temperature for the  $\text{N}_2^+$  shown in King (total) is higher than in Tumbler-Snapper 7. It is interesting that in the early first-maximum exposure for King the  $\text{N}_2^+$  does not definitely appear. The foregoing statements give the observations, and, for lack of more detailed data, no explanation can be given here.

#### 4.6.4 Iron

The appearance of iron is noted very briefly in Table 1.1 as well as in the composite wavelength table (Appendix A). Its presence or absence and its approximate cutoff value are given. The cutoff is an interesting and currently inexplicable phenomenon. It may be due to the superposition in time of many spectra to give a cutoff effect.

### 4.7 SUMMARY

There is a marked difference between early or first-maximum exposures and later or total-time exposures. The first-maximum spectrum in the 3000 to 4500 A region is considerably simpler than that of the second maximum since no casing material shows and the S-R bands have fewer rotational lines.

It can be considered in this report that four orders of magnitude of yield are being treated: Tumbler-Snapper 2 (yield 1.17 kt), Tumbler-Snapper 3 (30.7 kt), King (540 kt), and Mike (10,000 kt). The main features are material observed, amounts of absorbing material, the cutoff frequency, and temperatures. The spectra of these four shots plus that of Tumbler-Snapper 4 are summarized here.

#### 4.7.1 Tumbler-Snapper 2 (1.17 kt, Airdrop, Total Time)

It shows aluminum and barium in absorption, also AlO. Iron in absorption is very prominent over the whole range. In fact, the S-R spectrum of  $\text{O}_2$  is masked by the presence of the

iron lines. The spectral cutoff is given as 3450 A. No intensities or temperatures were measured here because of overlapping. (Tumbler-Snapper 1 is essentially the same.)

#### 4.7.2 Tumbler-Snapper 3 (30.7 kt, Airdrop, Total)

AlO appears in emission. Barium and aluminum appear in absorption. One of the barium lines (4934 A) appears to show self-reversal with a broad emission shape. Iron begins at 4000 A and appears above this in emission. Calculations of the quantity of vibrationally excited  $O_2$  and  $N_2^+$  are given in relative terms. From a comparison of this with other shots, there is an indication of the scaling of the quantity of these with variance of yield. Rotational temperatures were calculated, and the best value seems to be about 2500°C.

#### 4.7.3 Tumbler-Snapper 4 (19.2 kt, Airdrop, 0.6 to 5 Sec)

Iron covers the whole 4000 to 6000 A region in emission. Barium appears in emission as does AlO. This was not a good plate for line measurements; thus no temperatures or quantities of absorbers were calculated.  $N_2^+$  and probably  $NO_2$  are seen in absorption.

#### 4.7.4 Mike (10,000 kt, Surface, Total Time)

O(I) and N(I) appear in absorption. No casing material shows.  $N_2^+$  is surprisingly not very evident, but the production of excited  $O_2$  molecules for the S-R absorption is increased beyond that in the lower yield shots.  $NO_2$  appears fairly prominently. The high cutoff value here could not be measured accurately because of plate fogging, but it can be stated that it is at a higher wavelength than for any shot measured up to the present. It seems to lie around 3800 A.

#### 4.7.5 King (540 kt, Airdrop, First Maximum and 0.1 to 1.1 Sec)

Casing material does not show here. O(I) and N(I) appear in absorption. The wavelength of the cutoff in King (1.0 to 1.1 sec) seems higher than in Tumbler-Snapper 3, an exact measurement being impossible. A higher cutoff would be consistent with a greater production of absorbing material. From the data for King (1.0 to 1.1 sec), a rather high rotational temperature of about 9000°C was obtained from an S-R band. This is a very rough value. This temperature seems high for this time which is beyond breakaway. Some calculations of the relative amount of absorbing material were made, and these show the trend of a moderate rise with increase of yield.

## CHAPTER 5

### CONCLUSIONS AND RECOMMENDATIONS

The spectra studied show, in a general way, what pattern of spectrum is to be expected. There is a hope of scaling the detailed spectrum in time and space as a function of the size of bomb. This will require many exposures taken at a great resolution and at relatively short intervals of time. At the same time the whole "volume" of the bomb and its surroundings should be scanned. This was the aim for Castle. From these measurements it would be hoped that quantitative values of the production and excitation of molecules and atoms responsible for absorption could be obtained, and thus the energy changes could be followed in fair detail over the life of the bomb.

## REFERENCES

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2. R. B. King and A. S. King, Relative  $f$ -values for Lines of FeI and TiI, *Astrophys. J.*, 87: 24 (1938).
3. M. Fassbender, Untersuchungen über das Negative Stickstoffbandenspectrum, *Z. Physik*, 30: 73 (1924).

## APPENDIX A

### COMPOSITE TABLE OF WAVELENGTHS MEASURED

This composite wavelength table covers the wavelength region from the ultraviolet cutoff of the spectra in question up to approximately 5000 Å. This limit was set because at the time it was concluded that practically all the characteristic parts of the spectra of atomic explosions were found below this value. Data for all explosions prior to Operation Ivy are not included but only those which were considered to be fairly typical.

The "iron" spectrum is given in detail for the Buster Baker shot. The values for iron are not given in all possible situations. They are not given above about 3500 Å for Tumbler-Snapper 2 except in some cases where the notation "co" for coincidence (with standard iron spectrum) is used. The absence of wavelength values in Tumbler-Snapper 3 above about 4600 Å indicates that only some very weak coincidences with the iron comparison spectrum are detected. (Please refer to the text for the regions which have been measured.)

The presence of an identification does not always mean that it is taken to be certain that the line is due to this material. A line of another material may be superimposed at this point. This may be true of OH, which was identified only by wavelength coincidence.

There are gaps in the identifications due partly to incomplete original research data, e.g., in the case of the S-R O<sub>2</sub> bands and NO<sub>2</sub> bands.

"Em" stands for emission, and "Br" or "Brd" either before or after the number stands for broad. "Dv" and "dr" mean degraded to the violet and red, respectively.

The numbers after the wavelength values are very rough relative estimates of the visual intensity. If no numbers are given, this indicates a rather weak intensity.

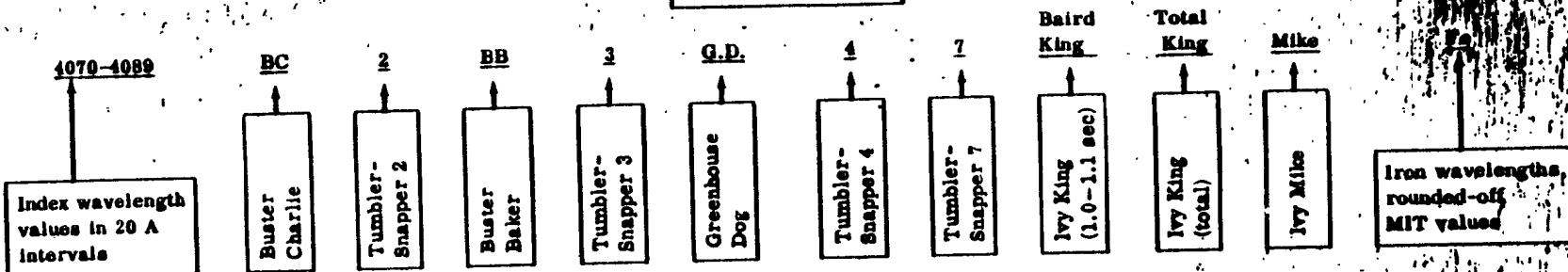
Brackets include a region of broad spectral absorption, or emission if specifically marked "em," and the intensity numbers generally refer to the region as a whole and should not be read separately.

All peaks have not been measured. Some wavelength values of weak lines hence are not given, e.g., in King (Baird) where measurements were not easy. The microphotometer traces of a forthcoming atlas will then be particularly useful.

Some irregularities have crept into the typing.

Guide for the Use of Composite Wavelength Table

Shot Designations



R 55 728 S-R 1-18 ← Branch line identification

J values of P and R branch lines of Schumann-Runge bands of molecular oxygen

Br 730 3  
 Identifications in a single column were made specifically for the spectrum of that shot.

Em 69.3  
 Emission line

P51 75.6 S-R 1-18

Mainly accepted S-R wavelengths for P and R branch lines. These have been identified in at least one shot and are assumed present in any shot where the numerical values of the measured wavelengths for the lines agree. Of course, superpositions of lines are very common; so many measured wavelengths will have more than one identification associated with them. Some OH values are given as being probable. Because of superposition, the bands themselves were not distinctly seen.

Br 75.53 75.85 BR  
 Symbols (along with Brd) used to identify broad spectral lines

77.2 2  
 Intensity of spectral line

Abs 80.1  
 Absorption line

Br 81.4 V  
 Very broad spectral line

NO<sub>2</sub> 83.1  
 Identification of element most probably giving rise to spectral lines

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	BC	2	88	3	G.D.	4	7	Baird King	Total King	Mike	Fe
	3050-3089										
			3051.40								
			56.05								
			Tl	58.05							3057.45
		60.43									
41	3080.82 S-R 0-11		60.45								60.99
	64.96 OH		64.95								65.31
	66.976 OH		66.00 Mn								66.48
	66.114 OH										
	68.80 OH		Fe	68.80 Pb							68.17
	3070-3089										
	70.318 OH		3070.30								
	70.392 OH		71.00								
	70.478 OH										
	71.145 OH		71.45								
	72.009 OH		72.05 Zn								
	72.063 OH										
	72.107 OH										
	73.028 OH										
			73.00 TiII								
			Ce	73.65							
			Fe	74.25							3074.15
				75.10							
39	P46 75.79 S-R 0-11		Fe	75.75							75.72
	P46 75.98 S-R 0-11										
			Fe	76.35							
		77.028 OH		77.00 Ca							77.17
R49	3077.77 S-R 0-11		77.85								77.64
R49	78.373 OH		78.35 NaII								
	79.951 OH		80.00 Fe								80.11
	80.006 OH										
	81.255										
	81.541 OH		81.60 Fe								81.66
	83.278 OH		83.30 CuII								83.03
											83.15
	84.05 OH										
P47	3084.05 S-R 0-11		84.05								
P47	84.23 S-R										83.74
	85.20 OH		85.20								85.20
	86.23 OH										
R51	3086.33 S-R 0-11		86.30								86.56
	87.35 OH		87.35								87.35
	87.45 OH										
											88.35
	89.01 OH		88.70								88.80
	89.75 OH		89.70								89.39
											89.61
											89.74



	BC	2	BB	3	G.D.	4	7	Beird King	Total King	Mile	Fig
3090-3109											
			3090.38								3090.21
											91.19
											91.58
											91.21
											91.37
P49			Al	92.40							92.44
											92.78
			Fe	93.70							93.34
											93.89
											94.22
											94.43
											94.90
											95.27
											95.64
											96.10 Cr
											96.40
			Mg	96.80							96.38
											97.00
											97.81
											98.59
											98.65
											99.58
											99.65
			Fe	3100.35 2							3100.38
P61				00.65 3							00.87
				01.24 OH							00.94
											01.25
											01.65
P61				02.15 OH							02.14
											02.35
											02.36
											02.54
											02.97
											03.28 OH
											03.30
											03.77
B65											04.05 S-R 0-11
											04.20
R3											04.16 S-R 0-12
											04.60
B65											04.27 S-R 0-11
											04.60
B5											04.60 S-R 0-12
											05.35
R7											05.38 S-R 0-12
											05.68 OH
											05.70
											06.05
											06.03 OH
											06.36
P6											06.30 S-R 0-12
											06.60
B9											06.51 S-R 0-12
											07.50 10
											07.46 OH
											07.90 10
R11											07.97 S-R 0-12
											08.85 1
			CuMn								08.85 1
			Ti								09.10 2

	DC	1	2	3	G.D.	4	5	Dated King	Total King	Mths	Pa
<b>3000-3100</b>											
		09.33 OH									
	P9	09.45 S-R 0-12		09.40 5							09.34
	R13	09.77 S-R 0-12		09.80 2							09.68
<b>3110-3120</b>											
		3110.26 OH		3110.26 3							3110.10
			CoTi	10.60 2							10.28
				11.05 3							10.71
11		11.57 S-R 0-12		11.65 5							10.84
											11.58
15		11.92 S-R 0-12		12.15 10							11.82
		13.1 OH		13.15 1							12.08
		13.30 OH									
57		13.37 S-R 0-11		13.45 2							13.37
57		13.60 S-R 0-11									13.59
13		14.01 S-R 0-12		14.00 3							
17		14.4 S-R 0-12		14.35 10							14.29
		14.63 OH		14.60 10							14.68
		14.78 OH									14.78
			TiH	15.10 1							15.36
			CoTi	15.55 1							15.66
41		16.26 OH	Ti	16.25 1							16.26
15		16.78 S-R 0-12		16.80 5							16.59
											16.63
											16.98
		17.20 OH		17.20 5							17.19
10		17.22 S-R 0-12									
		17.89 OH	Ti	17.85 10							17.64
											17.76
											17.89
		19.68 OH	Ti	18.90 5							19.40
											19.67
17		19.91 S-R 0-12		19.80 5							
21		20.41 S-R 0-12		20.50 5							20.23
											20.43
		20.60 OH									20.87
55		20.95 S-R 0-11		21.00 5							
55		21.13 S-R 0-11		21.80 5							21.77
		22.22 OH									22.30
		22.57 OH	Fc	22.45 5							22.55
			Ti	23.05 2							
P19		23.38 S-R 0-12		23.40 3							23.34
											23.55

	BC	2	BW	3	G.D.	4	7	Burd King	Total King	Mike	Fe
3110-3129											
R23		23.81 S-R 0-12		23.94 4							23.86
		24.92 OH		24.95 3							24.88
		25.33 OH		25.35 2							24.89
			Fe	25.65 1							25.27
		26.62 OH		26.55 10							25.66
R59		26.5 S-R 0-11									26.17
P21		27.20 S-R 0-12		27.20 5							26.78
R25		27.7 S-R 0-12									
R25		27.81 S-R 0-12		27.80 6							
		28.10 OH									27.49
		28.29 OH		28.25 5							28.28
		28.62 OH		28.66							28.28
			Fe	28.90 3							28.89
				29.60 1							29.10
3130-3149											
		30.27 OH		3130.30 5							30.37
		30.57 OH		30.60 2							30.58
P23		31.38 S-R 0-12		30.90 1							
		31.46 OH		31.40 10							31.48
R27		31.93 S-R 0-12									31.71
R27		32.06 S-R 0-12	Ca	32.10 10							
			Fe	32.56 2							32.51
		33.22 OH									32.68
			Mi	33.30 2							33.48
R27		34.06 S-R 0-12	Fe	34.10 10							33.23
		34.34 OH	OH	34.35 10							34.11
			Ti	34.65 10							34.49
				35.00 1							34.36
											34.45
P25		35.9 S-R 0-12		35.95 2							35.88
		36.20 OH		36.25 1							36.88
R29		36.5 S-R 0-12									36.88
R29		36.83 S-R 0-12									36.44
			Co	37.00 5							36.88
			BaPb	37.80 10							37.78
			AgFe	38.60 1							38.41

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	BC	S	NO	3	G.D.	4	7	Rated King	Total King	Miba	Fe
<b>3130-3140</b>											
			39.17 OH								39.16
				Co							39.85
											39.86
			40.603 OH								40.30
			40.731 OH								40.33
P27			40.87 S-R 0-12								
P27			40.78 S-R 0-12								
				Ca							
K31			41.44 S-R 0-12								
K31			41.58 S-R 0-12								
			41.909 OH								41.88
				Fe							42.45
											42.88
			43.82 OH								43.24
				Ti							
											43.88
			43.797 OH								
			44.284 OH								
			44.424 OH								44.49
				FeM							44.78
				FeCr							45.05
											45.51
			45.63 OH								
P29			45.91 S-R 0-12								
P29			46.02 S-R 0-12								
			46.80 OH								46.47
K33			46.78 S-R 0-12								46.74
K33			46.9 S-R 0-12								
				Ba							
				FeCr							47.29
			47.27 OH								47.60
			47.45 OH								47.70
				Cr							48.41
			48.44 OH								48.91
				Fe							49.84
			48.95 OH								
				Fe							50.30
											51.00
			51.01 OH								51.35
K1			51.48 S-R 0-12								
K1			51.5 S-R 0-12								
K1			51.81 S-R 0-12								51.86
K1			52.39 S-R 0-12								52.02
K1			52.54 S-R 0-12								53.20
				Fe							53.30
											53.74

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	PC	2	BB	3	G.D.	4	7	Raid King	Total King	Miles	Fe
3150-3169											
			Fe	54.30 1							54.30
	64.50 OH			54.60 10							54.50
			Fe	55.10 1							55.10
											55.20
											55.70
											55.80
			Fe	56.25 5	3156.25 0						56.25
	56.85 OH			56.90 3							56.45
	57.11 OH		Fe	57.15 3	57.10 0						57.04
											57.10
P33	57.63 S-R 0-12										57.60
P33	57.68 S-R 0-12			57.55 10							57.50
			Fe	57.80							57.80
											57.90
P37	58.45 S-R 0-12										58.40
											58.40
P37	58.58 S-R 0-12			58.56 10							58.51
P37	58.507 OH										58.51
			Ca	58.95 1	58.80 0						59.02
				59.16 1							59.16
			Ni	59.55 1	59.50 0						59.55
			Cr	59.84 1							59.84
	60.067 OH		Cu	60.05 3	60.25 0						60.20
											60.24
	60.80 OH			60.85 3							60.40
											60.81
											61.00
	61.89 OH		Fe	61.90 10	61.85 0						61.37
											61.40
											61.94
											62.23
			Tl	62.56 3	62.65 0						62.60
											62.60
	63.22 OH		Fe	63.25 2	63.05 0						63.05
					63.40 0						63.40
R35	63.76 S-R 0-12										63.77
R35	63.91 S-R 0-12		Fe	63.90 3	64.00 0						64.00
	64.85 OH			64.55 10	64.50 0						64.50
R39	64.83 S-R 0-12										64.80
R39	65.0 S-R 0-12			64.95 10							64.94
					65.30 0						65.30
					66.25 3						66.24
	66.34 OH			66.40 10							66.43
					66.70						66.69

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BC	2	BB	3	G.D.	4	7	Saled King	Total King	Miles	Fe
<b>3160-3169</b>										
	67.18 OH		67.20 1							
		Fe	67.26 2							67.26
										67.92
										68.18
	68.868 OH		68.75 1							68.86
			69.10 3							
	68.982 OH									
	69.813 OH	CrCu	69.70 2							69.81
	69.886 OH		69.90 1							
<b>3170-3189</b>										
										3170.15
										70.34
P37	70.45 S-R 0-12		70.60 8							
P37	70.8 S-R 0-12		70.70							
B41	71.59 S-R 0-12	Fe	71.40 1							71.35
B41	71.76 S-R 0-12		71.75 10							71.80
		Fe	72.05 1							72.05
			72.35 1							
	72.99 OH		73.05 2							
	73.21 OH		73.25 2							73.41
	73.816 OH	Fe	73.80 1							73.81
										73.88
	74.38 OH									
	74.49 OH		74.45 10							74.98
		Fe	75.10 7							75.03
										75.08
		Fe	75.40 7							75.44
										75.98
		Fe	76.05 1							76.36
		Fe	76.45 1							
										76.80
P39	77.53 S-R 0-12	Feil	77.45 1							77.50
	77.68 OH									77.63
P39	77.7 S-R 0-12		77.65 5							77.67
		Fe	78.10 2							78.01
										78.05
										78.30
B43	78.77 S-R 0-12									78.54
B43	78.92 S-R 0-12		78.90 2							78.95
										79.10
		Ca	79.35 1							79.40
			79.65 1							
	79.97 OH		80.05 5							80.16
		Fe	80.30 5							80.22
	80.49 OH		80.55 5							80.45

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	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3170-3189											
			Fe	80.70 1							80.75
			Fe	81.55							
	81.645 OH		Ni	81.75 5							81.52
											81.85
											81.90
											82.06
			Sr								82.30
	82.965 OH		Fe	83.05 5							82.97
											83.10
	83.509 OH		Fe	83.50 2							83.57
			Ti	84.00 1							84.10
			Fe	84.80							84.96
P41	85.00 S-R 0-12			85.00 10							
P41	85.14 S-R 0-12										
			FeU	85.20							85.31
	85.795 OH			85.80 1							
	86.11 OH			86.15 10							
R45	86.33 S-R 0-12										
R45	86.5 S-R 0-12			86.45 10							86.74
			Fe	86.85 1							
			Fe	87.15 1							87.16
											87.29
											87.45
				87.80 1							87.80
	88.01 OH			88.15 2							87.68
											88.02
			Fe	88.85 2							88.57
											88.82
											89.00 shp
	89.312 OH			89.35 1							89.35 shp
				89.70 1							89.75 shp
			Fe	89.95 1							
3190-3209											
	90.28 OH			90.25 1							90.01
	90.802 OH		TiU	90.80 1							90.35 brd
											90.65
			FeCo	91.20 1							90.81
	91.784 OH			91.80 2							91.11
				92.20 2							91.65
	92.356 OH		CoU	92.20 2							92.06
			Fe	92.45 2							92.40
											92.50
P43	92.83 S-R 0-12			92.90 10							92.80
											92.92
P43	93.01 S-R 0-12										
	93.05 OH										

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		BC	S	NO	S	G.D.	Dated King	Total King	Mths	Fe
3100-3200										
				Fe	93.40 1					93.23
				Ba	93.90 1	93.90 brd				93.30
										93.80
										93.97
M7	94.25 S-R 0-12			Fe	94.45 3	94.40				94.42
M7	94.43 S-R 0-12									94.50
	94.845 OH				94.95 2	94.95				
				Ba	95.16 2					95.23
					95.35 2	95.30				
	95.554 OH				95.60 2	95.65				95.73
				Fe	96.10 2	96.10				96.07
										96.12
						96.55				
				Fe	97.00 2					96.93
					97.65 1	97.70 shp				96.99
					97.95 1					97.51
						98.10				
					98.55 1	98.50				98.28
										98.48
	99.14 OH				99.10 5	99.15				
				Fe	99.50 5	99.60				99.52
						3200.10				
					00.35					00.47
				Fe	00.55 5	00.60				00.78
	00.96 OH									
M45	01.08 S-R 0-12				01.05					
M45	01.24 S-R 0-12	01.00 <sub>3</sub> ?			01.25 3	01.20 brd				
				Tl	01.65 1	01.80 brd				
					01.95 1					
M49	02.40 S-R 0-12			TlFe	02.40 2	02.30 shp				02.54
	02.79 OH									
M49	02.78 S-R 0-12				02.75 6	02.85 shp				02.85
										02.96
					03.30 1	03.20				
						03.54				
	03.98 OH				03.95 2	04.06 3				
						04.45				
						04.80				
				Fe	05.40 3	05.20				05.40
				Tl	05.75 3	05.75 brd				
					06.30	06.30				
	06.24 OH				06.50 2	06.50				
	06.518 OH				06.75 2	06.85 brd				
	06.76 OH				07.20 1					07.08



	BC	2	BB	3	G.D.	4	7	Seird King	Total King	Mike	Fe
3190-3209											
			Fe	07.70 1		07.66					07.66
				08.15		08.15					
		08.7 OH	TiH	08.60 2		08.60 0					08.67
						08.85 0					
		09.433 OH	Fe	09.25							09.29
	P47	09.71 S-R 0-12		09.45 5		09.55 0					
	P47	09.89 S-R 0-12		09.90 5							
3210-3227											
		10.04 OH				10.10 brd					10.23
		10.60 OH		10.55 5		10.60 brd					10.45
		10.72 OH									10.80
		10.79 OH	Fe	10.80 5		10.85					10.83
	R51	11.32 S-R 0-12									
	R51	11.51 S-R 0-12	Fe	11.50 5		11.55					11.40
											11.50
		11.95 OH									11.90
		12.10 OH	Fe	12.05 5		12.15 brd					12.17
			Ca	12.50 3							
		12.65 OH	Ba	12.70 3		12.65 brd					
		12.83 OH									
		12.83 OH		12.95 3		13.05 brd					
		13.470 OH		13.55 3		13.50 shp					13.31
		13.740 OH		13.85 3		13.80 shp					
		13.99 OH	Fe	14.10 3		14.15 shp					14.04
		14.499 OH		14.50 3		14.60 0					14.30
			Ti	14.90							
		15.099 OH		15.05 3		15.05 wide					15.23
						15.55 0					15.41
		16.09 OH	Fe	15.95 3		16.00 0					15.94
						16.30					
		16.532 OH		16.60 1		16.65 shp					
		17.09 OH		17.10 3		17.15					
			Fe	17.40 3							17.30
		17.83 OH				17.70					
		18.04 OH		18.20 3		18.15					
						18.60					
	P49	18.74 S-R 0-12		18.90 3		19.00					
	P49	18.9 S-R 0-12									
		19.435 OH	Fe	19.55 2		19.50 brd					19.50

	BC	2	BB	3	G.D.	4	7	Said King	Total King	Mike	Fe
<b>3210-3227</b>											
			Fe	19.80							19.81
R53	20.49 S-R 0-12			20.55 5							20.70
R53	20.7 S-R 0-12			20.70 5							
	21.13 OH			21.20 1							21.30 shp
	21.627 OH			21.65 2							21.75 shp
			Fe	22.10 4							22.15 shp
	22.75 OH										22.50
				22.80 2							22.90
	3222.93 0										
	23.37 OH	3223.45		23.40 2							23.45 shp
											23.26
	23.75 OH		Fe	23.80 1							23.45
			Ca	24.25 2							23.84
	24.20	24.40									
	24.88 OH			24.95 1							24.40
	25.09 OH										24.95
	25.16 OH										
	25.25 OH			25.25 4							25.35
				25.55 4							
		25.80	Fe	25.80 4							25.78
				26.05 1							26.25
	26.443 OH		Co	26.50 4							26.55 2
				26.80 2							26.95 2
	26.85 1		Fe	27.10 2							27.10 2
	27.44 OH										27.25 2
	27.2 03										27.60 1
P51	28.18 S-R 0-12	28.09 OH	Fe	27.80							27.95 1
											27.74
											27.80
											27.99
<b>3228-3249</b>											
P51	28.42 S-R 0-12		Fe	28.30 5							28.40
	28.89 OH		Fe	28.75 3							28.80
											28.90
	28.75 0										
			Fe	29.10 3							29.20
											29.70
R55	30.03 S-R 0-12	30.0 OH	Fe	30.15 10							30.10 2
											29.79
											29.87
											29.99
R55	30.26 S-R 0-12										30.21
	30.73 OH			30.80 5							30.45 2
											30.90 brd
											30.96

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	BC	2	BB	3	G.D.	4	7	Said King	Total King	Fe
3228-3249										
	31.20 OH	31.10 0		31.00 3						31.60
	31.47 OH				31.30 2					31.71
					31.50 2					
					31.95 0					
R3	32.74 S-R 0-13	32.70 0		32.85 3	32.55 2					32.78
	32.97 OH									
R5	33.22 S-R 0-13			33.15	33.00 2					33.05
		33.30 1	Fe	33.30 6						
					33.45 2					
	33.65 OH									
	33.75 OH			33.80 4	33.80 2					
	33.96 OH									33.97
R7	34.0 S-R 0-12	33.95	Fe	34.05 4	34.20 2					
				34.50 1						
P6	35.10 S-R 0-13			35.20 6						34.61
P5	35.18 S-R 0-13									
R9	35.20 OH	35.25 1	35.30		35.35 3					
					35.55 1					35.69
			Fe	36.25 1						35.83
P7	36.50 S-R 0-13	36.70 1		36.65 6	36.75 2					36.22
R11	36.73 S-R 0-13									37.22
										37.40
	36.93 OH				37.15 1					37.81
	37.57 OH				37.70 1					
P9	38.41 S-R 0-13	38.55 1		38.50 6	38.45 1					
	38.54 OH									
R13	38.58 S-R 0-13		38.70		38.65 1					
	38.89 OH									
	39.17 OH									
			Fe	39.05 3	39.05 1					39.03
R57	39.99 S-R 0-12			39.35 3	39.35 1					38.43
R57	40.22 S-R 0-13			39.70 3	39.80 1					
	40.57 S-R 0-13	40.65	40.75	40.15 3	40.35 1					40.01
	40.72 S-R 0-13			40.70 6	40.85 3					
	40.74 OH									
	41.45 OH		41.55	41.45 1	41.60 2					41.69
			42.15	42.10 1	42.25 1					42.37
	42.81 OH				42.80 2					
P13	43.18 S-R 0-13		43.30	43.30 10						43.10
P13	43.199 OH	43.45 1			43.50 2					43.49
										43.73

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	BC	B	SP	S	G.D.	4	7	Bird King	Total King	Mike	Fe
<b>3228-3248</b>											
		44.34 OH	44.25	Fe	44.30 8		44.45 shp				
					44.90 1						
		46.06 OH					45.15 1				
							45.75 1				45.88
P15		46.10 S-R 0-13			46.20						
R19		46.27 S-R 0-13									
R19		46.37 S-R 0-13	46.35 1		46.40 10		46.40 3				46.48
							46.95 1/2				46.96
		47.61 OH		Cu	47.55 10		47.50 2				47.17
											47.21
F55		48.32 S-R 0-12									47.27
											47.38
F55		48.54 S-R 0-12					47.80 2				48.20
F17		48.4 S-R 0-13	48.45		48.50 6		48.60 3				48.03
R21		49.45 S-R 0-13			49.40 5		49.30 3				49.19
R21		49.68 S-R 0-13	49.60		49.65 5		49.70 3				49.65
											49.85
<b>3250-3289</b>											
		50.42 S-R 0-12			50.50 4						50.39
R59		50.73 S-R 0-12	50.65		50.70 5		50.70 3				50.82
		51.36 OH	51.25		51.30 4						51.23
		51.60 OH					51.60 3				
			51.75		51.95 4						
							52.10 3				
		52.60 OH	52.50		52.55 4						52.43
P19		52.96 S-R 0-13					52.75 2				52.92
P19		53.04 S-R 0-13			53.00 6		53.10 2				
R23		53.23 S-R 0-13									
R23		53.35 S-R 0-13	53.25 1		53.35 6		53.55 2				
											53.60
		54.08 OH			Fe	53.70 1					53.83
					Fe	53.95 4	54.10 1				53.94
					Fe	54.25 4	54.40 1				54.34
			54.80		54.70 1		54.85 1/2				54.73
		55.49 OH					55.30 1/2				
			55.55		55.70 1		55.85 1				
		55.92 OH	56.10		55.90 3						55.89
							56.45 1				56.89
P21		56.97 S-R 0-13	56.80 1		57.05 4		57.15 2				57.11
P21		57.06 S-R 0-13									
R25		57.26 S-R 0-13		57.45	Fe	57.35 4	57.50 2				57.24
R25		57.41 S-R 0-13									57.59
					NaII	57.90 3	58.15 3				57.89

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	PC	2	BB	3	G.D.	4	T	Baird King	Total King	Miles	Fe
<b>3260-3269</b>											
F67				59.90		59.95 1					59.77
F67		59.25		59.20 4		59.49 3					59.94
				59.97 OH							
		60.10	Fe	60.05 1		60.10 1					60.99
			Fe	60.25 1							60.25
				60.46 OH		60.50 1					
						60.85 1					
M61				61.29 S-R 0-12							
M61		61.35		61.45 15		61.50 2					61.23
F35				61.59 S-R 0-13							
F35	61.65 1			61.80 5							
						62.00 2					62.01
				62.70 OH		62.70 1					62.28
				63.11 OH		63.20 1					
						63.45					63.07
						63.50 1					63.26
				63.83 OH		63.80 1					
				64.18 OH							
				64.30 OH		64.35 1					64.51
			Fe	64.55 1		64.75 0					64.71
			Fe	65.05 1		65.25 0					65.04
		65.10	Fe	65.25 1		65.50 2					65.51
		65.55	Fe	65.80 1							
F25				66.04 S-R 0-13							
F25		66.20		66.10 2		66.20 2					
E20				66.43 S-R 0-13							
E20				66.50 S-R 0-13	66.25 1	66.50 2					66.53
				66.55 OH		66.70					
				67.06 OH							
				67.28 OH	67.10	67.10 2					67.03
					67.70	67.50 1		67.4			67.17
			Fe	68.25		68.20 1					68.23
						68.55					
			Co	69.00 1							69.50
				69.04 OH		69.12 2					
				69.50 OH		69.75 2					69.23
						69.80 2					69.77
											69.55
<b>3270-3280</b>											
F27				70.25 2		70.50 2					
F27		71.20	Fe	71.15 3		71.25 2					71.09
M31				71.50 S-R 0-13	71.05 0	71.20					71.48
M31			Fe	71.55 2		71.65 2					71.60

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	BC	2	SP	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3270-3289											
R31		72.23 OH		72.10 1							72.59
			72.70	72.70 2							72.70
				72.85							
				73.45 2							
		73.74 OH		73.75							73.49
		74.20 OH		74.05 5							
		74.51 OH		74.55 1							
		74.88 OH	74.95	74.90 1							74.45
		75.22 OH									
				75.65 1							
		76.24 OH									
		76.49 OH									
R29		76.82 S-R 0-13	76.75	76.75 5							76.46
											76.60
R33		77.10 S-R 0-13	76.90 0								
R33		77.28 S-R 0-13	77.30	77.25 5							
		77.33 OH									77.34
			77.8	77.70 1							
		78.00 OH									
		78.60 OH		78.50							
		78.80 OH		78.75							
		79.13 OH	79.35	79.20 2							78.73
			79.85	79.80 2							79.14
											79.65
		80.16		80.20 2							79.73
			80.80	80.75 1							80.26
				81.35 3							
				81.90 3							
			82.05								
P31		82.5 S-R 0-13									
P31		82.64 S-R 0-13									
R36		83.02 S-R 0-13	82.60	82.55 4							82.44
R36		83.2 S-R 0-13	83.25	83.05 4							82.89
R36		83.52 OH									83.42
		83.90 OH									83.54
		84.49 OH	84.60	84.55 2							84.58
		85.03 OH									
			85.35	85.20 1							
		86.24 OH									85.20
		86.59 OH									85.41
											86.02
											86.44
				86.75 8							86.75

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	BC	2	BB	3	G.D.	4	7	Beird King	Total King	Mike	Fe
3270-3289											
			87.25 1	87.45 1							87.11
		87.70	87.70 1	87.90 1							87.67
			88.12 OH								
P33		88.25	88.20 1								
P33			88.88 S-R 0-13								88.65
		88.90	88.80 10	88.96 3							88.96
R37			89.32 S-R 0-13								89.34
R37		89.45	89.40 10	89.55 3							89.43
3290-3309											
			90.35	90.55 1				90.10			90.04
				90.85 1							90.71
			91.05								90.98
			91.26 OH	91.30							
			91.51 OH	91.85							
		92.05	Fe 92.10 2	92.25 1							92.02
		92.55	Fe 92.55 2	92.60 1							92.59
				93.10 1							
			93.57 OH	93.50 2							93.14
		94.05	93.95 5	94.10 2							
				94.70 1							
				95.10 1							
P35			95.37 S-R 0-13								
P35		95.45	95.50 5	95.65 2							95.42
		96.05									95.81
			96.62 OH								
R39			96.11 S-R 0-13								
R39		96.20	96.20	96.30 2							
			96.24 OH								
		96.45	96.32 OH	96.55 5							96.48
			96.37 OH								
		96.80	96.80 2	96.75 1 1/2							96.90
			97.10	97.25							
			97.45 1	97.60 1							
		97.90	97.90	97.95 1							97.89
		98.10	98.20 1								98.13
			98.50 1	98.45 1							
			98.75 1	98.90 1							
		99.25	98.75 1	99.45							99.07
			99.39 OH	99.40 1							
				3300.00							
				00.40							
			00.86 OH	00.80 1							

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	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
<b>3290-3309</b>											
		3301.25	01.20 2	01.25 1							01.22
			01.40								01.42
	01.86 OH	01.90	01.90 1								
P37	02.39 S-R 0-13	02.40 Na		02.25							
P37	02.55 S-R 0-13	02.65	02.50 10	02.60 3							02.66
R41	03.11 S-R 0-13										03.47
R41	03.28 S-R 0-13	03.35	03.25 10	03.30 3							03.56
			04.00	04.05 1/2							
			04.30 1	04.45 1/2				3304.30			
	04.74 OH	04.80	04.80 1	04.90 1							
		05.30	05.25 1	05.35 1							05.13
	05.64 OH		05.70 5	05.70 1							
	06.00 OH		Fe 05.95 5	06.00 1							05.97
				06.12 1							
			Fe 06.40 5	06.45 1							06.36
			Fe 06.55 5								
	06.72 OH		06.85	06.75 1							
			07.20 1					07.30			07.01
											07.14
											07.23
		07.70		07.55 0							
	08.0 N <sub>1</sub>										
	08.10 OH		07.95 1	07.90 0							
	08.34 OH	08.40		08.20 2							
				08.60				08.6			
				09.30 0							08.74
P39	09.79 S-R 0-13	09.50	09.45 3	09.60 2							
P39	09.88 S-R 0-13	09.90	09.90 3								
<b>3310-3329</b>											
		10.00		10.00 2							
R43	10.6 S-R 0-13	10.55	Fe 10.60 3								10.34
											10.48
R43	10.76 S-R 0-13	10.75		10.75 2							
R43	11.14 OH	11.20	11.10 1	11.20 1							
		11.50	Fe 11.40 1	11.55 1							11.45
	11.9 OH		11.70 1/2								
	12.05 OH			12.10 0							
		12.35	Ni 12.35 1	12.55				12.75			12.22
											12.70
				13.00 0							
		13.55 Br	13.40	13.60 1							13.72
				14.05 0							
		14.40		14.45 0							



	BC	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3310-3329												
		14.70	Fe	14.65 1								14.07
			Fe	14.75 2	14.95 2							14.44
	15.48 OH	15.60		15.45 1								14.74
	15.50											
	16.4 OH			16.40 1	16.4				16.05			
				16.65 1	16.85 1							
		17.10	Fe	17.10 1								17.12
P41	17.61 S-R 0-13	17.60			17.40 3							
P41	17.79 S-R 0-13	17.80		17.70 3	17.85 3							
		18.00										
	18.37 OH											
R45	18.44 S-R 0-13	18.45										
R45	18.64 S-R 0-13	18.70		18.55 3	18.60 3							
	19.05 OH				19.15 1							
		19.30	Fe	19.30 1	19.45 1							19.24
		19.60		19.55 1	19.65 1							
				19.95 1								
			Ni	20.20 1	20.15 1							
		20.70	MnFe	20.65 1	20.55 0							20.65
				20.95 1	20.75 1							20.77
					21.20 0							
		21.55 4		21.80 1	21.60				21.65			
					22.20 0							
	22.48 OH		Fe	22.50 5	22.50 3							22.47
		22.95 4		22.85 2								
					23.10 1							23.06
		23.75	Fe	23.70 2	23.55 1							23.73
					24.00 1							
		24.55	Fe	24.50 2	24.60 1				24.60 1			24.36
												24.53
				24.90 1	25.00 1							24.78
				25.10 1	25.20 1							
		25.50	Fe	25.45 1	26.60 1							25.46
P43	25.83 S-R 0-13	25.84		25.95 5								
P43	26.03 S-R 0-13	26.05			26.05 3							
R47	26.73 S-R 0-13	26.80		26.80 5								
R47	26.94 S-R 0-13	26.95			26.95 3				27.60			
		27.50	NiFe	27.45 1	27.55 1							27.49
			Fe	28.00	28.00 1							27.96
			Cr	28.30 1	28.45							28.86
		28.85	Fe	28.90 3	29.05 2							29.06
	29.64 OH	29.50 1	NiCo	29.45 2	29.65 2							29.53

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9.5

					G.D.			Beiré King	Total King	Mike	Fe
		3330.00		3330.00	1						30.31
		30.30					30.30				
		30.65		30.65	1		30.60				
				31.10	1		30.95				
							31.30				
		31.70	Fe	31.65	1			31.70			31.61
				31.95	1		31.95				31.77
		32.25									
				32.45	1		32.60				
		32.95		32.85	1		33.05				
		33.60		33.55	1/2						
							33.80				
			Fe	34.20	2		34.20				34.21
P45	34.44 S-R 0-13	34.45		34.50	3						
P45	34.65 S-R 0-13	34.60					34.65				
R49	35.42 S-R 0-13	35.15		35.35	1						
R49	35.65 S-R 0-13	35.65		35.65	3		35.70	35.15			35.61
							36.00				35.76
	36.23 OH	36.30	Fe	36.15	2		36.25				36.25
	36.74 OH	36.70		36.75	1		36.90				
				37.10	1		37.30				
		37.65	Fe	37.65	1		37.65				37.66
	38.00 OH						38.15				
		38.60	Fe	38.55	1		38.50				38.51
							38.90				38.83
		39.15	Fe	39.20	1						39.19
		39.65	Fe	39.60	1		39.55				39.58
			CrCo	39.80	1		39.95				39.89
				40.20			40.25				
			FeTi	40.85	1		41.00				40.56
			Ti	41.80	1		41.85				41.90
			Fe	42.25	1		42.45				42.21
											42.29
								43.00	NH		
P47	43.51 S-R 0-13	43.55		43.60			43.65	43.4			43.24
P47	43.70 S-R 0-13	43.70		43.70	3						43.87
				44.15							
R51	44.54 S-R 0-13	44.60						44.6			
R51	44.77 S-R 0-13	44.75		44.80	3		44.80				
	44.84 OH										
		45.65	Br	45.65	3		45.55				45.68
							45.85				
				46.35	1		46.35	45.8			
	46.6 OH	46.70					46.75	46.7			
		47.00	Fe	46.95	3		47.05				46.93

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	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3330-3349											
		47.90 Fe	47.45 1 47.75 1	47.65			47.8 1	47.60 1			47.50 47.92
			Fe 48.00 2 48.30 2						48.65 1 NH		
	49.62 OH	49.05 49.45	Ti 49.10 3 Ti 49.55 1	48.30 1 49.10 1							49.73
3350-3369											
	51.13 OH	50.30	50.40 1 51.25	50.40 1 51.20 1							50.28
		51.45					51.11				51.52
		Fe 51.65	51.70 1	51.85 1			51.9 0				51.74
			52.30 1	52.25 1							
P49	52.90 S-R 0-13	52.90	53.05 3								52.93
P49	53.10 S-R 0-13	53.20	53.25 3	53.15 3							53.26
			53.55 1 53.80	53.75 1			53.9 3				
R53	54.09 S-R 0-13	Fe 54.05	Fe 54.14 3								54.06
R53	54.32 S-R 0-13	54.35	54.35 3	54.30 3							
		54.65	Ti 54.75 1	54.80 1							
			Fe 55.30 1	54.25 1				55.25 2			55.22
			Fe 55.55 1	55.50			55.4 0				
		Fe 56.40	Fe 56.35 1	56.00 2							56.26 56.40
		Fe 56.45		56.45 2							
	56.82 OH	56.63 0	Fe 56.75 1	56.75 1							56.69
			56.90	56.85 1			56.9 2	57.05			
		57.29 0	57.25 1	57.35 1			57.3				
		58.19 1	57.75 1	57.80 2							57.56
			58.10 2	58.10 2							58.25
				58.60 1							
		59.23 1		58.90 59.30							58.90 59.49
	59.89 OH		59.80 2	59.75			59.6				59.81
	60.07 OH	60.05	60.15 2	60.25 2			60.3				60.10
	60.60 OH		60.65 1	60.70							60.31 60.92
		61.06 1	61.05	61.10 1							
		61.20	61.25 2				61.3				
				61.45 1							
		61.90 0	61.85 1	61.90 1			62.0				61.95

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		BC	2	BB	3	G.D.	4	7	Matrd King	Total King	Misc	Fe
<b>3350-3369</b>												
			62.20 0	62.25 1								62.27
P51	62.84 OH				62.50 1							
P51	62.85 S-R 0-13		62.85 2					63.0 1				
P51	63.06 S-R 0-13	63.00 1	63.05 2	63.00 3	63.05 3							
				63.45 1								
	63.62 OH			63.65	63.65 1/2				63.60			
R55	64.08 S-R 0-13			63.90 1								63.81
R55	64.32 S-R 0-13		64.30 2	64.30 3	64.30 3				64.55			64.27
			64.75	64.75 1	64.80 1							64.40
P11	65.00 S-R 2-15		65.00	65.001	65.05 1							
R15	65.33 S-R 2-15	65.20 1	65.35	65.35 1	65.30			65.2 2				
				65.80 1	65.65				65.90			
			66.15 2	66.30 1	66.20 1							66.78
			66.80 2	Fe 66.85 3	66.65 1							66.88
												66.96
			67.05 00		67.20							67.16
P13	67.71 S-R 2-15		67.65	67.70 2	67.80							
R17	68.11 S-R 2-15	68.05 0	68.05	68.15 2	68.25			68.0				68.16
					68.80			69.4 0				69.14
	69.36 OH		Fe 69.50	69.55 2	69.30			70.0 0				69.34
					69.50 1							69.54
R3	69.92 S-R 0-14		69.85	69.90 2								
<b>3370-3389</b>												
		70.00			70.00 2							
R5	70.4 S-R 0-14	70.35	70.40 2	70.40 2	70.45 2							
					70.70			70.60 0				
P15	70.82 S-R 2-15	70.60		Fe 70.80 2	70.85 2							70.78
R7	71.17 S-R 0-14		71.20	71.30 2	71.35 2			71.2 1				
		71.30	71.40									
			72.00	Fe 72.05 1	72.10 1							72.08
P5	72.40 S-R 0-14		72.35	72.45 2	72.55 2			72.4 2				72.35
P5	72.42 S-R 0-14											
	72.59 OH	72.45 1	72.80 1	72.85 2								72.86
P53	73.18 S-R 0-13		73.20 1	73.20	73.25 3							
P53	73.4 S-R 0-13		73.40 1	73.40 2	73.60 3			73.5 00				73.87
R11, P7	73.97 S-R 0-14		73.95									
				74.00 3	74.15 2			74.0 2				74.22
R57	74.50 S-R 0-13	74.10	74.45 1	74.50 2	74.50 2							74.45

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	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3370-3389											
R57	74.76 S-R 2-15										
	0-13		74.75 1	74.80 2		74.90 2		74.8 00			
R57	75.23 OH					75.20 1		75.4 00	75.26		
R13	75.81 S-R 0-14	76.00 2	75.90	75.95 5		76.00 2		75.8 2			
P9	75.91 S-R 0-14		Br 76.50	76.45 2		76.45 1					76.50
			Br 77.05			76.85 1					
			77.60	77.55 2		77.60					77.20
P19	78.22 S-R 2-15		78.25	78.30 5		78.35 2		77.8 2			
P11	78.25										
	78.26 OH										
R23	78.72 S-R 2-15	78.15 2	78.65								78.68
				78.85 3		78.80					
			78.85			78.95					
				79.40 2							79.02
			80.05 Fe	80.20 5		80.00					80.11
			80.50			80.40					
P13	80.96 S-R 0-14		80.90 2	80.95 5							80.99
						81.00 2		81.0 2			
		81.05 2							81.65		
			81.90			81.80 1/2					
						82.10		82.1 00			81.33
R21	82.51 S-R 2-15		Fe 82.40	82.55 3		82.60 1		82.60 1			82.40
			82.90								
P25	83.11 S-R 2-15			83.05 3		83.15 1					83.69
			83.60			83.75					83.98
P65	83.93 S-R 0-13		Fe 84.00	Fe 84.05 10				84.2 2	84.05 1		
P65	84.10 S-R 0-13	84.15 2									
R19	84.0 S-R 0-14					85.00 0					
R59	85.35 S-R 0-13		85.40					85.45 1			
R69	85.62 S-R 0-13		85.65	85.55 10		85.65 2 1/2					85.44
			85.95								85.55
						86.30					
P23	87.17 S-R 2-15					86.80					
R21, P17	87.35 S-R 0-14		Fe 87.45 2	Fe 87.50 10		87.50 2		87.5 2	87.55 Br		87.41
R21, P17	87.49 S-R 0-14										87.63
R27	87.65 S-R 2-15	87.55 2	87.90 0	87.85 3		87.80 1					
				88.20 1		88.25					
				88.75 1		88.85 1			88.90		88.62
				89.05 1							88.96
				89.30		89.30 1					
				Fe 89.80 1		89.95 1					89.74

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	RC	S	SS	S	G.D.	4	7	Beird King	Total King	Mike	Fe	
<b>3390-3400</b>												
											3390.50 1	90.08
											90.65 0	
F19	91.18 S-R 0-14										3391.25	
F19	91.29 S-R 0-14										3391.30 10	
											91.80 1	
											91.75 1	
P25	92.22 S-R 2-16										92.00	92.01
R29	92.94 S-R 2-16										Fe 92.00 5	92.31
											Fe 92.30 5	
											Fe 92.75 5	92.66
											93.00 5	
											93.00 1	93.38
											93.55 1	
											00	
											94.00 Br	
											94.55 1	94.08
											Fe 94.80 3	94.58
P21, R25	95.38 S-R 0-14										95.45 3	95.32
P21, R25	95.50 S-R 0-14	95.60 1									95.45 10	
R61	96.66 S-R 0-13										96.50 3	
R61	96.95 S-R 0-13										96.00	96.94
											Fe 96.95 1	96.38
											96.75 1	96.97
R61	97.27 S-R 2-16										96.80	97.21
											Fe 97.00 3	97.56
											97.80	97.64
											Fe 97.65 2	
											97.80 1	
											98.15	
											98.55	
R31	98.5 S-R 2-16										99.15	98.22
											Fe 99.35 2	99.23
											Fe 99.30 10	99.33
											99.35	
											99.45	
R23, R27	99.95 S-R 0-13										00.05 2 1/2	
R23, R27	00.09 S-R 0-14	00.20 1									00.05 10	
											00.15 2 1/2	
											00.95 1	
											00.2 2	00.10
											01.20	
											Fe 01.50	01.52
											Fe 02.20 0	02.26
											Fe 02.20 2	
											02.90 1	
											02.90 1/2	
											03.25 00	03.32
P29	03.57 S-R 2-16										Fe 03.35 2	
R33	04.45 S-R 2-16										03.60 2	
											04.35 10	04.30
											04.50 2 1/2	04.35
R29, P25	04.93 S-R 0-14										05.05 3	04.75
R29, P25	05.08 S-R 0-14	05.20 1									05.05	04.75
											Fe 05.60	05.57
											05.70 Br	05.83
											Fe 05.75 2	
											05.75	
											05.85	
											06.10 1	
											06.20	
											Fe 06.40 2	06.44

	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
<b>3390-3409</b>											
P69	06.81 S-R 0-13		Fe 06.85 5	06.90 1							06.80
P69	07.07 S-R 0-13		07.05 4	07.15 1				07.60			
			Fe 07.50 5	07.65 1							07.46
		07.90 Br	07.85 4								
				08.05 1							
R63	08.56 S-R 0-13	08.55 1	08.55 5	08.60 1				08.60			
R63	08.72 S-R 0-13	08.85 1	08.75 5	08.90 1							
			Fe 09.20 2	09.35 1				09.05			
			09.60 1								09.20
P31	09.83 S-R 2-15			09.90 1							
<b>3410-3429</b>											
P27,R31	10.29 S-R 0-14		10.00 1								10.17
P27,R31	10.44 S-R 0-14	Br 10.45 2	10.40	10.55 3			10.4 1	10.45			
R36	10.72 S-R 2-15	10.60 1	10.90 00	10.90							10.90
				11.20 1				11.25			11.13
			Fe 11.40 1								11.35
			11.80								
				12.15				12.00			
			Fe 12.90 2					12.80			12.64
			13.10 10								13.13
			13.40 3	13.45 1				13.55 Br			13.48
			13.70 3								
			14.20 1								
		14.75	14.75 3								
			15.05 1								
			Fe 15.50 2								15.53
R29	16.06 S-R 0-14	16.20 2	16.15 10								16.02
P29	16.15 S-R 0-14										
R33	16.16 S-R 0-14			16.25 3			16.3 1	16.25			
R33	16.27 S-R 0-14	16.25 1	16.55 2								16.29
											16.87
P33	16.51 S-R 2-15		17.60 2	17.50 1				17.60			17.16
											17.28
R37	17.57 S-R 2-15	Fe 17.80	Fe 17.85 3	17.85 1							17.84
		18.20		18.00 1							
			Fe 18.25 1								18.17
			Fe 18.55 2								18.51
P61	18.93 S-R 0-13		18.90 2								18.88
P61	19.2 S-R 0-13	19.00	19.20 2	19.15 2				19.15			19.15
		19.80									19.89
		20.40	20.35 2	20.25 1				20.60 Br			

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	PC	2	3	4	G.D.	7	Beird King	Total King	Mike	Fe
3410-3429										
P65		20.71 S-R 0-13	20.75							
P65		21.0 S-R 0-13								
P31		22.17 S-R 0-14	21.90							22.14
R35, P31		22.21 S-R 0-14	22.30 2							22.49
R36		22.42 S-R 0-14	22.60			22.4 0		22.25		22.66
P36	22.30	23.65 S-R 2-15		NI	23.65 2			23.60		
			24.25 0	Fe	24.25 2					24.28
R39		24.78 S-R 2-15						24.50		
			24.95	Fe	24.85 2					25.01
				Fe	26.40 5					25.58
				Fe	26.65 5	26.65 1				26.32
				Fe	27.10 5		26.95			26.38
										26.63
										27.01
										27.12
		28.1 OH			28.00 5			27.95		
P33		28.70 S-R 0-14	28.25	Fe	28.20 5					28.19
R37, P33		28.94 S-R 0-14	28.95		28.85 10		28.9 0	28.80		28.75
R37		29.0 S-R 0-14			29.60 1					
3430-3449										
			30.45		30.35 1			30.35		
R37		31.15 S-R 2-15	31.05		31.10 1					
P63		31.54 S-R 0-13	31.60		31.60 5			31.35		
P63		31.82 S-R 0-13	31.90	Fe	31.80 5		31.2 00 Br			31.81
		32.38 S-R 2-15	32.50		32.40 1					
					32.80 1			32.70		
R67		33.45 S-R 0-13	33.10	Fe	33.00 1					33.04
R67		33.75 S-R 0-13	33.60		33.55 5		33.4	33.65 1		
					33.75					
			34.20	Fe	34.05 1		34.0			34.02
					34.60 1		34.8	34.55 0		
					35.05					
P35		35.65 S-R 0-14	35.70							
R39, P35		35.81 S-R 0-14	35.90		35.90 10		36.0 0	35.90 4		36.11
R39		35.95 S-R 0-14	36.05 2							
			37.10	Fe	37.10 2			37.10 0		37.05
							37.7 0			
			37.95	Fe	37.90 2					37.95
								38.10 0		
			38.40	Fe	38.30 2					38.30
P39		39.10 S-R 2-15			39.00 2			39.15 0		
				Fe	39.80 2		39.5 0			39.87
								40.25 0		

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	BC	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3430-3440												
				Fe	40.60 15			40.8 0				40.61
				Fe	41.05 10							40.99
				Cr	41.45 2				41.30 1			
				Mall	42.00 2			42.0 0				
				Fe	42.30 2		42.56 1		42.40 0			42.23
												42.36
												42.67
P37	43.16 S-R 0-14				43.25 10		43.40 3		43.3 0	43.25 4		
P37	43.37 S-R 0-14			Fe	43.90 7							43.66
												43.67
					44.40 1							
P65	44.64 S-R 0-13				44.70 3		44.85 1		44.8 00	44.90 VBR		
P65	44.91 S-R 0-13				45.00 3							
		Fe	45.15 1	Fe	45.20 3		45.20 1					45.15
				Fe	45.80 1							45.77
					46.00 1		46.11 1					
				Ni	46.25 1				46.50			
R89	46.66 S-R 0-13				46.75 2		46.85 1					46.79
R89	46.99 S-R 0-13				47.05 2							
				Fe	47.30 2		47.35 1					47.26
P41	47.48 S-R 2-15				47.60 1				47.9 00			
				Cl	47.85 1		47.75 1					
R45	48.92 S-R 2-15			Fe	48.85 2		48.75		48.80			
		Co	49.20				49.05					
			49.50		49.55 1				49.55 00			
							49.80					
3450-3460												
				Fe	50.30 2		50.35		50.30			50.33
P39	50.78 S-R 0-14	50.85										
P39	50.97 S-R 0-14	51.05			51.05 10				51.10 5			
R43	51.19 S-R 0-14	51.25			51.20		51.20 3		51.4 00			51.22
		51.70		Fe	51.60 1							51.61
				Fe	51.95 2		52.15 1/2					51.91
				Fe	52.25 2							52.27
				Ni	52.95 2		53.10 1/2		52.9 Br	52.75 00		
		53.60 2		Co	53.55 2		53.50 1/2					53.02
							54.95			53.80 2		
									55.15 1			
		55.30 0			55.45 2				55.4 VBR			55.23

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		MC	S	SP	S	G.D.	T	Notes King	Total King	Mths	Fe
3480-3489											
			56.35 0 Br	Fe	56.25 2				56.10 1		
				Tl	56.65 1						56.93
			57.15 0	Fe	57.05 2				57.10 2		57.08
			57.70		57.60 2						57.51
									57.90 0		
P67	58.2 S-R 0-13	Fe	58.45	Fe	58.30						58.30
P67	58.5 OH										
P67	58.51 S-R 0-13				58.50 10				58.55 1		
P41	58.98 S-R OH		59.05		59.05 7						
P41	59.18 S-R 0-14		59.30		59.25 10				59.40 1		
R45	59.43 S-R 0-14				59.45						59.42
				Fe	59.90 2						59.74
											59.91
									60.15 1		
R71	60.40 S-R 0-13				60.40 2				60.55 3		
R71	60.74 S-R 0-13		60.80		60.75 2						
				Co	61.10 1						
		Ni	61.65	NITl	61.60 2						
					62.15 1						
				Fe	62.40 1						62.36
				Co	62.90 2				62.95 2		
					63.15 2						63.30
									63.20 shp		
									63.70		
				Fe	64.10 2						
			64.50		64.50 3						64.49
				Fe	65.00 1						64.91
P45	65.56 S-R 2-15				65.55 3				65.55 1		
		Fe	65.85	Fe	65.90 10						65.86
				Fe	66.30 2						66.50
				Fe	66.55 2				66.4 00		66.89
				Fe	66.85 2						
					67.10 1						67.10
					67.35 1						
P43	67.59 S-R 0-14		67.65		67.70 3						
P43,R47	67.80 S-R 0-14				67.90 10				67.8 10		
R47	68.07 S-R 0-14		68.15 2		68.15 3						68.67
				Fe	68.85 2						68.84
											69.01
			69.70	Fe	69.60 2				69.5 1		69.38
											69.40
											69.83

CO

	BC	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3470-3489												
				70.25 1								
				70.55 1	70.50 1							
				71.05 1	71.10 1				70.9 0			
		71.35	Fe	71.35 3								71.27
												71.34
			Fe	71.85 1	71.85							71.91
P69	72.27 S-R 0-13	72.35		72.30 3	72.45 2				72.4 3			72.03
												72.36
P69	72.64 S-R 0-13	72.65		72.60 5	72.75 2							
				72.95 1								
			Fe	73.20 2	73.40 1							73.30
		73.65	Cr	73.60 2					73.6 1			73.60
												73.68
		74.10	Co	74.00 2	73.90 1							
		74.45	Fe	74.45 2	74.55 1							74.40
R73	74.60 S-R 0-13	74.75		74.70 2	74.85 1				74.9 4			
R73	75.01 S-R 0-13			75.05 3	75.15 1							
P47	75.20 S-R 2-13		Fe	75.45 10								75.45
												75.65
		FeBr	75.85		76.00 1							75.88
P45	76.63 S-R 0-14		Fe	76.75 10					76.6 5			76.34
												76.70
					76.90 3							76.95
P45	76.83 S-R 0-14											
R49	77.97 S-R 0-14											77.00
R49	77.19 S-R 0-14	77.25		77.15 7	77.10 3							
				77.50 1	77.40 3				77.6 5			
				77.85 1								77.85
				78.20 1	78.05 1							78.37
			Fe	78.65 1	78.45							78.82
												78.78
				79.15 1	79.05							
			Fe	79.60 1	79.45				79.4 2			79.68
		79.70		79.85								
				80.15 1	79.95 1							80.34
					80.35 1				80.3 00			
		80.55										
				81.00 1	81.05				81.0 1			
				81.90 1	82.05 1				81.9 00			81.56
												81.86
				82.85 2	82.70 1							
		83.05 1			83.10 1				83.00 1			
					83.35							
		83.85		83.90 2								83.01
				84.25 1	84.20				84.1 1			

	BC	S	BB	3	G.D.	4	7	Daired King	Total King	Mile	Fe
<b>3470-3489</b>											
							84.8 Br				84.85
P49	85.45 S-R 2-15		Fe 84.95 2	85.55				85.4			85.34
		86.20	85.35 2	86.25				86.2			
P47	86.33 S-R 0-14	86.40	86.20 4	86.40 4	86.55 2			}			86.55
P51	86.50 S-R 0-14	86.65	86.40 4	86.75 4							
P71	86.75 S-R 0-13	86.90	86.65	86.95 2							
R51	86.75 S-R 0-14	87.25	86.75 4	87.25 4	87.35 2						
		88.75	87.95	87.95				87.6			87.99
			88.65 2	88.60				88.5 2			
			89.10 1								
R75	89.37 S-R 0-13	89.35	89.40								
R75	89.71 S-R 0-13		89.70 2	89.80				89.9 2			89.57
<b>3490-3509</b>											
				90.15							
			Fe 90.55 15	90.65 1							90.57
				91.20 1				91.15 00			
			91.50								
				91.75 1				91.9 1			
		93.05	92.10 1	92.13 1		92.3					
			Ni 93.00 1	93.10 1				93.0 1			
			93.40 1								93.29
			Fe 93.75 1								93.47
			Fe 94.10 1	94.10				94.1			93.69
			Fe 94.65 1	94.50 1							94.17
		Fe 95.30	Fe 95.25 2								94.67
			96.65 1			95.3 0		95.1			95.28
P49	96.00 S-R 0-14		Fe 95.90 1					95.9			95.89
P51	96.05 S-R 2-15		96.10 5	96.10 2				}			
P49	96.24 S-R 0-14	96.30	96.30 5	96.30 2		92.3					
P49, R53	96.44 S-R 0-14	96.45									
R53	96.70 S-R 0-14		96.75 4	96.85 1					96.8		
			Fe 97.15 3								97.10
		97.80	Fe 97.50 1	97.65 1/2							
			Fe 97.85 10					97.9			97.84
			98.20 1	98.10 1/2							98.75
	98.62			98.60							
			99.50 1	99.65		99.3 0		96.6			
			99.85 1			00.0 0					99.87
	00.69		Fe 00.55 1	00.65		00.6 0		00.55 00			00.56
											00.96
	01.12 Ba	01.15 5	Ba 01.10 5	01.10				01.5			
			01.85 1								

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		BC	2	BB	3	G.D.	4	7	Baird King	Total King	Make	Fe
3490-3509												
		01.92			01.80 1			01.9				
P73	02.27 S-R 0-13		02.40	02.25 3	02.36 1				02.4			
				02.75								02.63
				03.05 1								
R11	03.50 S-R 2-18	03.58		03.55 2	03.40			03.5 0	03.6 0			03.47
				03.95 1								
R77	04.69 S-R 0-13			Br 04.85 3	04.75 1				04.8 2			04.85
R77	05.06 S-R 0-13				05.15 1							
		05.62		05.50 1	05.60 1			05.7 0				05.06
				05.75 1								
P61	06.39 S-R 0-14		06.35						06.45			
P51	06.6 S-R 0-14		06.60	Fe 06.50 10	06.60 2				07.1 2			06.49
R55	07.14 S-R 0-14			Fe 07.00 8	07.15 2							07.17
				Fe 07.45 1								07.39
				Ni 07.70 1	07.75 1							
				08.10 1	08.30 1			08.2 0	08.15 1			
				Fe 08.50 1								08.21
												08.48
				Fe 09.00								08.53
			09.20	09.20 1	09.15 1				09.25 1			09.13
				Co 09.80 1								09.86
3510-3529												
			10.40	10.40 1	10.20 1							
		11.04		10.80 1	10.90 1			11.0 00	10.7 1			10.44
				11.70 1	11.60 1							
			12.20	Fe 12.10 1					12.0 0			11.74
												12.08
			Fe 12.70	Co 12.65 1	12.70 1							12.22
				Fe 13.00								
			Fe 13.10		13.25 1				13.1 0			12.95
				Co 13.50								13.06
				Fe 13.85 10								
					14.25 1 1/2			14.2 0	14.1 2			13.82
				Fe 14.70 1/2	14.90							14.62
				Ni 15.10 1								
				15.45 1	16.40							
				15.65 1					15.6 1			
				16.10 1								
R3	16.35 S-R 0-15	16.48		Fe 16.40 4	16.50 1			16.35 1	16.4 0			16.42
												16.65

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	BC	2	20	2	G.D.	4	7	Bed King	Total King	Miles	Fe
3810-3820											
R3	16.57 S-R-15	16.57	16.00	16.55 3	16.55		16.5 1				
R5	16.85 S-R-15				17.00 1						
P63	17.17 S-R-14		17.30	17.30 3	17.30 1			17.2 3			
P63	17.42 S-R-14		17.55	17.50 3	17.50 2						
	17.67 S-R-14										
R7	17.67 S-R-15										
R7	17.85 S-R-15	17.85	17.00	17.80 3	17.80 2		17.8 1				
P57	18.00 S-R-14			18.05 4	18.05 2						
P17	18.23 S-R-16		18.15					18.25 3			
R0, P3	18.95 S-R-15				18.70			18.85 3			
R21	18.95 S-R-16	19.01		Fe 18.95 5	19.10 2		19.0 1				18.80
				18.50 1							18.80
				19.00 1	19.70 1			19.8 1			
				20.10 1	20.15 1						
R11	20.5 S-R-15	20.57	20.50	20.55 5			20.6 2				20.55
P7	20.7 S-R-15				20.80 2			20.9 4			
				Fe 21.25 5	21.35 0						21.30
				Fe 21.85 2	21.80 0			21.9 1			21.84
R13	22.6 S-R-15			Fe 22.30 2	22.30 1						22.27
P9	22.7 S-R-15	22.70	22.70	22.75 5	22.75 2		22.7 2	22.7 1			22.60
				Fe 23.30 2	23.50 1						23.31
				Fe 24.00 2	24.05 1			24.0 1			24.07
				Fe 24.25 2							24.24
				Ni 24.50 2							
R15	25.0 Ba										
R15	25.0 S-R-15	25.10	Ba 25.05 2	25.05 5	25.20 2		25.15 2	25.05 4			
P11	25.2 S-R-15			Fe 25.10 10	25.00 1						25.04
											25.16
				Fe 25.45 3				25.3 3			25.30
											25.45
				Fe 25.70 2	25.65 1						25.67
					27.20 1						
R17	27.8 S-R-15			Fe 27.80 7	27.95 2			27.9 2			27.70
P13	28.0 S-R-15	28.18		28.00 4			28.0 2				
P55	28.23 S-R-14		28.50	28.25 2	28.70 2			28.7 2			
P55	28.45 S-R-14		28.80	28.75 2	28.90						
			29.00	29.10 1							
R19	29.20 S-R-14		29.15		29.30 2						
R50	29.80 S-R-14		29.50	29.45 2				29.4 2			29.43
			29.80	Fe 29.80 2							29.82

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	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3530-3549											
		30.40	Fe 30.40 2	30.40 1							30.38
R19	31.00 S-R 0-15			30.90			31.15 2	30.6 4			
P16	31.25 S-R 0-15	31.21		31.25 2				31.6 4			31.44
			Mn 32.00 1								
			Fe 32.50 1/2	32.60 2				32.6 1			32.67
			Fe 33.10 2								33.01
			Fe 33.25 2								33.20
			33.60	33.55 1/2							
			33.80 1/2	33.85 1				33.8 4			
			34.15 1	34.35 1							
R21	34.60 S-R 0-15		Fe 34.55	Fe 34.50 2			34.75 2				34.62
P17	34.90 S-R 0-15	34.89	Fe 34.85	Fe 34.85 2				34.9 4			34.91
			Ti 35.40 1								
			Fe 35.65 1	35.60 1/2				35.7 00			
				36.15 1/2							
R29	36.72 S-R 2-16		Fe 36.45	36.55 4				36.6 1			36.18
											36.56
				36.85 1							
			Ni 37.25 1	37.05 1				37.1 00			
			Fe 37.50 1	37.45 1							37.49
			Fe 37.75 1	37.75 1/2							37.73
			Fe 37.90 1								37.89
				38.20 1/2							
R23	38.3 N <sub>2</sub>			38.50 3				38.6 4			38.29
	38.6 S-R 0-15										38.56
P19	38.9 S-R 0-15	38.90		38.80 3			38.85 2				38.79
	39.25 CN			39.25 1							39.20
				39.50 1							
P57	40.2 S-R 0-14			40.19 5							40.11
P57	40.4 S-R 0-14			40.55 5				40.45			40.71
R61	40.93 S-R 0-14						40.85 00				
R61			Fe 41.10 10	41.10 2							41.08
R61	41.22 S-R 0-14			41.45 2				41.35 3			
			Fe 42.05 8								42.07
											42.23
				42.70 1				42.3 3			
R25	43.00 S-R 0-15			42.95 5			43.10 2				
P21	43.30 S-R 0-15	43.17		43.25 5				43.4 3			43.39
			Fe 43.70 1								43.67
			Cu 44.05 1								
			Fe 44.65 2					44.4 1			44.63

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	PC	S	BB	3	G.D.	4	7	Ward King	Total King	Milk	Fe
3630-3649											
			Fe	44.65 2				44.4 1			44.63
				45.00 1							
		Fe	45.65	Fe	45.70 3		45.45	45.7			45.64
											45.83
											45.90 1
											46.40 0
											46.10 1
											47.10 1
							47.25				47.05 0
			Mn	47.80 10							47.80 10
			MnFe	48.10 10				47.55 2			47.80 10
											47.96 2
											48.30 2
											48.70 1
	48.9 Ne		Br	48.75 1			48.30	48.6 2			48.75 1
				49.45 1							49.45 1
		49.85	Fe	49.80 1				49.7 1			49.87
3550-3569											
											50.10 1
	50.60 Co		Co	50.55 1							50.80
		50.70						50.9 2			51.00 1
											51.15 1
			Ni	51.50 1							51.60 1
			Fe	52.00 1							52.00 1
	P59 52.44 S-R 0-14		Fe	52.45 1							52.45 1
	P59 52.72 S-R 0-14		Fe	52.85 10							52.85 10
	R63 53.52 S-R 0-14	53.48									53.45 2
	R63 53.11 S-R 0-14		Fe	53.65 5			53.1 1 Hr	53.4 5			53.65 5
	P25 0-15										53.95 3
											54.20 1
		54.10	Fe	54.20 3				54.25 0			54.20 3
			Fe	54.55 2							54.55 2
			Fe	54.95 10							54.95 10
											55.40 2
		55.50									55.15 1
											55.60 1
											56.55 2
			Fe	56.90 5			55.7	56.5 2			56.65 0
	57.37 CN		Cn	57.40 1							56.90 5
	57.88 CN		Cn	57.85 1							57.40 1
	58.08 CN		Fe	58.15 1							57.85 1
	P27 58.35 S-R 0-15							58.1 00			58.15 1
			Fe	58.55 10							58.25 1
											58.55 10
	R31 58.80 S-R 0-15	59.00									58.70 2
	R31 58.90 S-R 0-15										58.95 2
											59.05 2
											59.35 1
											59.00 0
											58.8 5
											59.08

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	BC	2		BB	3	G.D.	4	7	Hard King	Total King	Aluke	Fe
3550-3569												
		59.50	Fe	59.55 1	59.50 1/2							59.50
				60.00 1	60.05 1/2				59.9 00			
			Fe	60.65 2	60.75 1			60.5	60.7 00			60.69
												60.88
	61.28 CN			CN	61.25 1							
		Ma	61.85	Ni	61.80			61.7	61.8 1			61.81
	62.10 Co											
	62.25 S-R 2-16		Fe	61.90	Co	62.05 1		61.9 00				
	62.55											
	62.71 Co			CN	62.60 1				62.5 1			
				Co	62.90 1			62.8 00				
	63.93 Co				63.80 1				63.75 1			
	63.9 Ni			CN	63.95 1			63.9 0				
				I. T.	64.55 10				64.6			64.11
												64.53
	R33 64.85 S-R 0-15				64.80 2							
	R33 65.00 S-R 0-15		65.07		65.05 10			65.0 00				
	P61 65.09 S-R 0-14											
	P61, P29 65.42 S-R 0-15			Fe	65.40 15							65.38
					66.10 1							65.58
	R37 65.67 S-R 2-16				66.35 2				66.35 5			66.14
												66.31
	R65 66.34 S-R 0-14				66.90							66.58
	R65 66.05 S-R 0-14											
				Fe	67.05 1			67.0 00				67.03
				Fe	67.35 1							67.38
					67.80 1			67.8 00				67.72
					68.05 1				68.15 1			
				Fe	68.30 1							68.42
				Fe	68.95 1			69.0 00				68.82
					68.90 1							68.97
				Min	69.50 1				69.3 1			
	P35 69.75 S-R 2-16											
3570-3589												
				Fe	70.15				70.00			70.09
	R39 70.38 S-R 2-16					70.25		70.4 0 Br				70.25
	R35 70.50 S-R 0-15			CN	70.60 15							
	R31 71.2 S-R 0-15			CN	71.05 2	71.15 3			71.1 6			
	R35 72.45 S-R 0-15		71.50 0		71.50 2			71.5 0				71.22
												71.68
	P31 71.85 S-R 0-15			Fe	72.00 2	71.75 3						71.89

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	AC	2	30	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3670-3689											
			Zn	72.65 1			72.3 0 ]				
	70.5		Fe	73.10							
	71.2		Fe	73.40 1							73.40
			Fe	73.90 2							73.63
				74.45 1			74.3 1	74.26 3			73.88
			Fe	75.25 2			75.3				75.11
				76.00 2							75.25
			Fe	76.70							75.37
			Fe	77.15 2			76.8 0	76.55 2			75.98
	77.15 Ca			77.40							76.76
	P37 77.60 S-R 2-16										
	R37 78.06 S-R 0-15										
	M41 78.06 S-R 2-16			77.96			77.6 0 ]	77.6 3 ]			77.75
	P33 78.25 S-R 0-15	78.25		78.35 10							78.38
	R37 78.30 S-R 0-15						78.7 0 ]	78.6 3 ]			
	R63 78.35 S-R 0-14										
	R63, P33 78.65 S-R 0-15			78.70							
	R63 78.68 S-R 0-14	Fe	79.55	79.40 10							79.56
	R67 79.65 S-R 0-14			79.70 3				79.6 3			79.82
							79.90 Br				
			Fe	81.23				80.5 00			
				80.55 1							81.19
			Fe	81.80 1			81.8 1 ]				81.64
			Fe	82.20 1							81.81
	82.1 N <sub>2</sub> <sup>+</sup>		Fe	82.70			82.2 1 ]				82.20
	83.00 S-R 1-16	83.17		83.00				83.05 0			82.68
	R6 83.26 S-R 1-16		Fe	83.35 1			83.3 0				83.34
	83.91 CN										
	R7 84.18 S-R 1-16	85.15	CN	83.90 1			84.1 0	84.9 0			83.69
	84.70 S-R 0-15		Fe	84.70 2							84.66
				84.50 1							84.79
				84.60 1							84.96
	R39 85.30 S-R 0-15		Fe	85.00 2				84.9 6 ]			84.96
	R9 85.30 S-R 1-16										
	P36, R39 85.50 S-R 0-15	85.32	Fe	85.30 10			85.35 1				85.32
	P6 85.50 S-R 1-16										
	85.9 CN										
	P35 85.91 S-R 0-15		Fe	85.70 10							85.70

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	BC	2		BB	3	G.D.	4	7	Reid King	Total King	Mike	Fe
3570-3589												
R45	88.40			Fe 86.15 3								
			Fe 86.75 1		86.35 2				88.3 8			88.11
P7,R11	87.16 S-R 1-16			Fe 87.00 6	87.15 2			87.0 1	87.10 4			88.74
				87.35 1								86.98
				Fe 87.75 1								87.24
			88.20 00									87.42
				Fe 88.60 2	88.45				88.25 00			87.75
		88.94		Fe 89.05 2	89.05							88.87
				Fe 89.55 1					89.0 0			88.81
P9,R13	89.23 S-R 1-16							89.2 1				88.16
	89.99 CN			Mn 89.99	89.85 1							89.45
									89.9 2			89.99
3590-3609												
	90.4 CN				90.30 1				90.4 1			90.88
				Fe 90.75 1								90.59
				Fe 91.00	91.05 1							91.88
P11,R16	91.8	91.44		Fe 91.40 1	91.60 1 1/2			91.7 1				91.34
												91.45
P66	92.03 S-R 0-14			92.10 1								92.26
P66	92.36 S-R 0-14			92.35 1	92.30 2				92.3 1			92.48
			92.80	Cu 92.75 1								92.69
				92.86 1								92.89
R41	92.98 S-R 0-16				93.05 3				93.2 2 Br			
R41	93.25											
P37	93.40 S-R 0-15	94.37		93.40 5	93.55 3							93.33
P37	93.80 S-R 0-15		Fe	94.50	94.55 2				94.4			94.63
M99	93.82 S-R 0-14											
P13,R17	94.8 S-R 2-18							94.6 0	95.1 00			
P13,R17	94.8 S-R 1-16											
				95.25 1	95.35							95.20
					95.80 1							95.85
				Fe 96.10 1	96.30 1			96.20 Br	96.1 1			96.19
				Fe 97.05 1	97.10 1							97.05
P15,R19	97.89 S-R 1-16	97.55		97.70 1	97.85 2			97.9 0	97.7 3			
			98.55	Fe 98.75 1	98.75 1				98.5 2			98.72
												98.98
				Fe 99.15 1								99.14
			99.65	Fe 99.60 1	99.75 1							99.82
												99.97

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	BC	2	BB	3	G.D.	4	7	Beard King	Total King	Mike	Fe
<b>3590-3609</b>											
			00.05 1/2								
			00.30 1/2	00.45 1							
R21, P39	01.5 S-R 0-16										
R43	01.05 S-R 0-16							00.8			
R43	01.30 S-R 0-16										
P17, P39	01.70 S-R 0-16	01.52	01.10	01.20 3	01.25 3		01.6 0				
P17	01.71 S-R 0-16		01.60	01.55 3	01.65 3			01.6			
P17	01.71 S-R 1-16										
	02.07 CO								02.25 00		02.08
			Fe	02.05 2							02.44
			Fe	02.55 2	02.35						02.55
	CNR										
			Fe	03.25 2	02.95						03.20
											03.57
P43	03.74 S-R 1-16			Fe	03.80 1	03.80 2		03.5 1			03.82
R47	04.43 S-R 2-16			Fe	04.40 1	04.55 2		04.5 1			03.94
				Fe	04.75 1						04.27
				Fe	04.75 1						04.38
R23	05.67 S-R 1-16	05.76		Fe	05.50 5		05.7 00	05.5 2			05.21
											05.45
											05.90
P57	06.39 S-R 0-14				06.50 2			06.4 2			
P57	06.70 S-R 0-14			Fe	06.65 5						06.88
P19	06.85 S-R 1-16										
R71	07.61 S-R 0-14			Fe	07.60 1	07.65 2		07.7 2			
R71	07.95 S-R 0-14			Fe	07.90 1	08.00 2					
				Fe	08.30 1						08.15
				Fe	08.90 10	08.65 1		08.6 2			08.86
R46	09.59 S-R 0-15				09.65 1	09.05 1					
R46	09.8 S-R 0-15				09.80 1	09.90 3		09.5 3			
<b>3610-3629</b>											
P41	10.00 S-R 0-15										
R26	10.03 S-R 1-16			Fe	10.20 10	10.25 3	10.3 00	10.1			10.16
P21	10.25 S-R 1-16			Fe	10.75 1						10.70
P41	10.28 S-R 0-15										
		11.00			11.00 1/2	11.10 1					
					11.45 1/2						
					11.80 1/2	11.90 1					
		Fe	12.05	Fe	12.10 1						12.07
											12.50

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	MC	2	BB	3	G.D.	4	7	Maad King	Total King	Makc	Fe
3610-3629											
			Fe 13.00 1	13.15 1							12.94
								13.25			13.14
			Fe 13.50 1								13.45
			Fe 14.10 1	14.00 1							13.60
			Fe 14.65 1					14.25 0			14.11
											14.56
											14.71
			Fe 15.15 1	15.30 2			15.3 00	15.1 2			14.87
			Fe 15.75 1	15.95 1/2							15.20
			16.20 1					16.1 00			15.35
											15.66
			Fe 16.55 1	16.50 1/2							16.14
			Fe 17.30 1					17.45 1			16.32
											16.57
			Fe 17.80 1	17.60 1							17.09
			Fe 18.40 5					18.4 5			17.31
R47	18.57 S-R 0-15										17.78
											18.30
R47	18.8 S-R 0-15		Fe 18.80 10	18.75 3							18.38
P43	19.0 S-R 0-15		19.15 5	19.05 3				19.2 5			18.76
											19.39
											19.77
				19.37 2							
				19.80							
R29	20.47 S-R 1-16		20.30 5					20.4 2			20.22
P25	20.65 S-R 1-16		20.60 2	20.75 2							20.47
											20.78
P69	21.15 S-R 0-14		21.05 2	21.15 2				21.2 2			21.10
P69	21.36 S-R 0-14		21.30								21.27
			Fe 21.45 2	21.45							21.48
											21.71
			Fe 22.00 2								22.00
R73	22.37 S-R 0-14		22.35 1/2								
R73	22.73 S-R 0-14		22.65 1/2	22.65				22.5 2			
			Fe 23.15 2	23.25							23.18
P47	23.46 S-R 2-16		Fe 23.45 2								23.44
R51	23.82 S-R 2-16		MuFe 23.75 2	23.65 1				23.6 2			23.77
			Fe 24.20 1/2								24.05
											24.30
			Fe 24.75 1								24.81
											24.89
			Fe 25.09 0								25.14

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	BC	2		BB	3	G.D.	4	7	Bald King	Total King	Misc	Fe
<b>3610-3629</b>												
R31		26.20 S-R 1-16		Fe	26.20				26.2 2			26.17
P27		26.68 S-R 1-16		Fe	26.65							26.71
					27.06 1							27.04
												27.46
												27.79
									27.3 00			
R49		28.03 S-R 0-15	28.06	Fe	28.10 2							28.09
P45		28.1 S-R 0-15										
R49		28.3 S-R 0-15			28.30 2				28.4 6			
P45		28.4 S-R 0-15			28.50							
					28.75 2							28.81
												29.81
<b>3630-3649</b>												
			Fe	30.25	Fe	30.35 1						30.34
		30.65 Ba		30.60		30.75 1						
						31.20 2						31.08
						31.60 10						31.48
						32.06 1						32.04
R33		32.46 S-R 1-16		Fe	32.50 1				32.45 4			32.54
P29		32.62 S-R 1-16		Fe	33.00 1							32.87
												33.07
					33.45				33.5 00			
					Fe	33.80 1						33.83
					Fe	34.30			34.2 1			34.33
		34.70 CO			34.65 1							34.68
					Fe	35.10 1						35.19
			35.45		Ti	35.40 1			35.4 1			35.18
P71		36.28 S-R 0-14		Fe	36.25 2							36.23
P71		36.8 S-R 0-14		Fe	36.85 2				36.8 1			36.48
												36.66
												36.74
					Fe	37.05 1/2						36.90
R76		37.77 S-R 0-14		Fe	37.90 6							37.25
R76		37.98 S-R 0-14										37.98
R61		37.98 S-R 0-15										
R61		38.2 S-R 0-15			38.25 10				38.2 7			38.29
P47		38.6 S-R 0-15	38.50		38.65 1							
R36		39.10 S-R 1-16			39.00				39.2 2			
P31		39.32 S-R 1-16		Pb	39.50 1							
			Fe	40.35	Fe	40.35 2						40.39
					41.00 1							
					41.35 1				41.3 00			

	BC	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
<b>3830-3849</b>												
				41.75 1					42.3 00			
	41.79 CO		42.70	Tl 42.60 1								42.81
				Fe 43.10 1								43.11
				Fe 43.70 2	Br	43.7 2			43.4 1			43.62
												43.71
												43.81
												44.18
												44.58
												44.79
				Fe 45.00 1								45.08
												45.22
				Fe 45.50 1					45.48 Br			45.49
				Fe 45.80 1								45.82
	R37 46.28 S-R 1-16			46.15 1		46.3 4			46.2 5			
	P33 46.43 S-R 1-16			46.50 1								
									47.4 00			
				Fe 47.85 15								47.42
												47.84
	R53 48.35 S-R 0-15		48.30	48.25 1								
	R53 48.7 S-M 0-15	Br	48.65	48.80 2					48.6 10			
				48.85 1		48.9 2						
	P49 49.00 S-R 0-15		49.00	49.00		49.1 2						49.30
				49.30								49.50
				49.50								
						49.85 1			49.7 00			
<b>3850-3869</b>												
				Fe 50.05								50.03
				Fe 50.30 2								50.28
												50.53
			51.15						51.3 00			
				Fe 51.50 2								51.10
												51.46
	P73 52.08 S-R 0-14			52.00 1								
		Br	52.25			52.3 2			52.2 4			
				52.40 1		52.45 2						52.47
												52.73
			53.50									
	R77 53.71 S-R 0-14			Fe 53.80 2 Br		53.85 2			53.8 5			53.76
												53.97
	R39 54.03 S-R 1-16					54.11						54.06
			54.65									54.09
				Fe 55.55 2 Br	Br	55.6 0			55.5 0			55.48
												55.67

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	AC	2	BB	3	G.D.	4	7	Baird King	Total King	Mlbc	Fe
3660-3669											
			Fe 56.15 1								56.22
	36.56 CaO		Br 57.00 1	Br 57.00 0					56.80		57.13
		57.35									57.43
			58.00 1	58.2 1				58.1 1			57.90
											58.02
R55	59.56 S-R 0-15		Fe 59.55 3	59.60 2				59.6 5			58.55
P51	59.90 S-R 0-15		59.85 3								59.52
				60.00 2							59.75
			Fe 60.35 1								60.33
			Fe 61.35 1								60.80
R41	61.70 S-R 1-16		61.75 1	Br 61.8 2				61.7 2			61.37
P37	61.89 S-R 1-16										
		62.45									
			Fe 62.80 2								62.84
			Fe 63.35 2					63.5 1			63.26
			Fe 63.95 1								63.45
								64.00 1			63.95
		64.55	Fe 64.60 2								64.54
											64.89
			Fe 66.20 2					65.1 0			66.24
											66.78
											66.94
			Fe 67.30 2	Br 67.2 0				67.4 00			67.26
			Fe 68.05 1								67.99
											68.21
P75	68.46 S-R 0-14		68.55 1								
P75	68.65 S-R 0-14		Fe 68.85 1	Br 68.7 2				68.7 4			68.89
			Fe 69.20 2								69.15
			69.80 2								69.52
											69.75
								69.9 10			
3670-3689											
R43	70.22 S-R 1-18		Fe 70.10 4	70.00							70.02
R43	70.58 S-R 1-18										70.07
R79	70.89 S-R 0-14	70.80									
			Fe 70.75 4								70.81

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		BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3670-3689												
R57, P53	70.9 S-R 0-15				71.0				70.1			
P53	71.2 S-R 0-15		71.20	Fe 71.25 2								71.52
				71.60 1								71.70
				72.10 1								
R3	72.99 S-R 0-16	73.05		Fe 72.70 1					72.7 0			72.71
R5	73.44 S-R 0-16	73.62		Fe 73.05 2				73.0 1				73.08
								73.45 0				
				Fe 73.95 2					73.4			73.90
												74.04
R7	74.3 S-R 0-16			Fe 74.40 2				74.4 1		74.4 2		74.41
		74.77		Fe 74.80 2								74.76
R9	75.59 S-R 0-16			75.60 2	Br			75.7 1		75.7 2		
P5	75.83 S-R 0-16	75.85		75.85 2								75.73
				Fe 76.35 2								76.31
				Fe 76.90 1/2								76.87
R11	77.28 S-R 0-16			Fe 77.35 5				77.2 1		77.4 1		77.30
												77.47
P7	77.6 S-R 0-16	77.72		77.60 5				77.7 1				77.63
R45	79.00 S-R 1-16			Fe 78.90 3								78.84
												78.98
												79.00
R13	79.39 S-R 0-16				Br			79.2 2		79.4 1		79.3 6
R13	79.4 S-R 1-16			Fe 79.50 1								
P9	79.77 S-R 0-16	79.79		Fe 79.85 5				79.9 1				79.91
				80.40 1								80.38
				Fe 80.80 2								80.67
												80.79
				Fe 81.25 1								81.22
R15	81.89 S-R 0-16			Fe 81.85 2				81.8 1		80.9 1		81.66
R59, P11	82.4 S-R 0-16			Fe 82.30 5				82.4 1				82.20
R59	82.74 S-R 0-15	82.60		82.80 5						82.7 8		
P55	83.0 S-R 0-15			Fe 83.10 5	Br			83.1				83.05
			83.45	PbFe 83.55 1								83.61
R17	84.41 S-R 0-16			Fe 84.15 2								84.11
			84.10	Fe 84.80 2								
			84.65					84.7 1		84.8 2		
P13	85.35 S-R 0-16	85.29	85.20	TiH 85.20 4				85.3 1				
P77	85.35 S-R 0-14			85.45 4								
				85.85 5						85.6 3		
				Fe 86.10 5						85.6 3		
				Fe 86.25								86.00
R81	87.35 S-R 0-14											86.25
R81	87.78 S-R 0-14		87.70	Fe 87.50 10						87.6 00		87.10
												87.45
												87.66

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	BC	2	BB	3	G.D.	4	7	Balrd King	Total King	Mike	Fe
<b>3670-3689</b>											
R47				88.15 2			88.15 1	88.00 0			
R19		88.45									
R47				88.60 2							88.47
P15	88.64			88.45 2			88.5 1	88.6			88.49
			Fe	88.90 2							88.50
<b>3690-3709</b>											
			Fe	89.45 1				89.30 Br			89.45
				89.75 1							89.73
						91.0 15					
				91.25 1							91.15
R21	91.9 5-R 0-16	91.75		91.90 1			91.9 0	91.7 1			91.33
						91.95 25					
P17	92.17 5-R 0-16	92.10					92.6 0				
	92.48			92.55 1				92.6 1			92.65
				92.00 1							93.03
				93.45 1							
				94.05 10				93.7 00			94.01
R61	96.08 5-R 0-15		Fe	96.10	Br	96.1 1		96.1 10			96.05
P57	96.25 5-R 0-15										96.51
											96.65
R23	96.08 5-R 0-16		Fe	96.05 3		96.05 25	96.1 0	96.1 3			96.02
P19	96.77 5-R 0-16	96.73		96.90 3		96.75 25	96.8 0	96.8 3			
			Fe	97.50 5							97.43
											97.53
			Ti	98.15 2							98.15
P45, R49	98.25 5-R 1-16			98.30 2		98.35 0		98.35 2			
	99.02 CO		Fe	98.85 2							98.80
				98.95 2		98.9 0					
			Fe	99.15 2							99.14
			Br	99.95							
R25	00.66 5-R 0-16	00.65		00.65 10		00.60 35	00.6 0	00.6 2			
			Fe	01.05 10							01.00
P21	01.41 5-R 0-16	01.44		01.40 10		01.40 35	01.5 0	01.45 2			
			Mn	01.80 2							
			Fe	02.05 2							02.03
			Fe	02.50 2							02.49
				02.75 2		02.85 15					
P79	02.93 5-R 0-14			03.00 2							
P79	03.03 5-R 0-14			03.10 2		03.25 15		03.05 1 Br			

	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mibe	Fe
<b>369C-3709</b>											
			Fe 03.70 10								03.66 03.80 03.83 04.02 04.46
			Fe 04.60 4								
R83	05.00 S-R 0-14		05.00 2								
R83	06.48 S-R 0-14		Fe 05.60 15	05.55 25			05.6 0	05.5 2			05.54
R27	05.60 S-R 0-16										
P23	06.48 S-R 0-16		06.45 1	Br 06.50 3		06.8	06.4 0	06.6 2			
			Fe 07.05 2								07.04 07.45 07.56 07.82 07.82
R83	07.93 S-R 0-16		Fe 07.90 10								
P59	08.11 S-R 0-16			Br 08.05 4				08.1 6			
R51	08.12 S-R 0-16										
P47	08.50 S-R 1-16		Fe 08.80 2								08.80 09.24 09.63 09.66
			Fe 09.30 10								
<b>3710-3729</b>											
				10.50 0							
R29	11.09 S-R 0-16		Fe 11.20 5	11.05 15			11.15 0	11.1 2			11.22 11.41
P25	11.97 S-R 0-16	11.90	Fe 11.90 3	11.90 15			12.1 0				
								12.0 2			
			Mn 12.35 1								12.95
			12.65 2								
			13.60								
			13.90 2								
			14.10 2	Br 14.0 0							
			14.40 2					14.50 Br			
			14.70 1								
			14.90 1								
			15.20 1								
	16.00 0	16.84	Fe 15.95 5				15.9				15.91 16.44
			Fe 16.45 5								
R31	16.77 S-R 0-16		16.90 2								
R31	16.96 S-R 0-16		16.90 2	16.90 15				17.0 2			
P27	17.73 S-R 0-16	17.75	17.95 2	17.75 15			17.9				
P27	17.96 S-R 0-16		Fe 18.35 2				Cen. of ext. board reg.	18.0 2			18.40
P49,R53	19.3 S-R 1-16							19.3 2			

	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
<b>3710-3729</b>											
			Fe 19.95 15	19.90 00							19.93
k65	21.44 S-R 0-15		Fe 21.45 10	21.4 6			20.5 VVW	21.4 6			21.19
											21.27
											21.39
											21.61
											21.61
			Fe 21.90 2				21.9 0				21.92
			Fe 22.10 2	22.20 05							
			Fe 22.65 10								22.56
R33	23.01 S-R 0-15										
R33	23.23 S-R 0-15		Bd 23.10 3	Br 23.25			22.9 Br	23.2 2			
			23.85 2				23.9 1				23.88
P29	24.25 S-R 0-15	24.25	Fe 24.40 5	24.2 Br				24.2 2			24.38
			CNNI 24.80 2								
			TI 25.15 2				25.25 0				
		25.79 0	Fe 25.60 24								25.49
			26.20 2	26.10 Br							
			Fe 27.00 10	27.00 Br			27.0 1				26.92
											27.09
		27.76 0	Fe 27.65 10								27.62
											27.81
			28.25 1								
			Fe 28.55 1								
			28.65 1					28.8 0			28.66
			CN 29.10 1								
	29.07 CN										
R35	29.76 S-R 0-15										
R35	29.95 S-R 0-15	29.90 1	29.85 2				29.3 1	29.8 2			
<b>3730-3749</b>											
		30.00				Br 30.0 2					
			Fe 30.40 2								30.39
P31	30.83 S-R 0-15										
P31	31.05 S-R 0-15		Fe 30.95 2	31.0 2V			30.9 0	30.9 2			30.94
			Fe 31.35 2								31.37
							31.9 1				31.91
		32.45 0				Br 32.2 0		32.2 00			
			Fe 32.45 2								32.39
			Fe 33.35 3	Br 33.3			33.4	33.5 0			33.31
P63	34.96 S-R 0-15		Fe 34.90 15				34.9 Br				34.86
						35.0 3					
P67	35.25 S-R 0-15		Fe 35.30 5	35.25 3				35.25 10			35.33
		35.59 0									
R37	36.9 S-R 0-15										
R37	37.11 S-R 0-15		Fe 37.15 15	37.1 25				37.2 2			37.13

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	BC	2	BB	3	G.D.	4	7	Bald King	Total King	Miba	Fe
<b>3730-3740</b>											
P33	38.03	S-R 0-16									
P33	38.2	S-R 0-16									
			Fe	38.16 4							38.30
			Fe	38.30 4				38.5	38.3 2		38.12
			Fe	38.45 3							38.21
P83	39.75	S-R 0-14									38.53
P83	40.17	S-R 0-14									
			Fe	40.25 3							40.06
									40.1 1		40.26
		41.00	Tl	41.05 2							41.40
											41.70
R3	41.95	S-R 1-17						41.95 1			
R3	42.38	S-R 0-14			Br	42.4 0		42.4 1	42.45 10		42.02
R5	42.38	S-R 1-17	42.80 1								42.36
P3	43.38	S-R 1-17	43.37 1						43.55 1		43.48
			Fe	42.85 2							43.76
			Fe	43.40 5							43.48
											43.76
R9	44.52	S-R 1-17									
R39	44.52	S-R 0-16									44.10
R39	44.73	S-R 0-16	44.95			Br	44.7 3		44.90 4		
R5	44.73	S-R 1-17									
P35	45.89	S-R 0-16									45.56
P35	45.88	S-R 0-16				Br	45.9 2		45.9 1		45.90
R11	46.42	S-R 1-17						46.4 1			46.48
		46.83 1	Fe	46.50 2					46.91 Br		46.92
			Fe	46.95 2							46.98
			Fe	48.30 10							48.40
R13	48.6	S-R 1-17	48.91 1					48.5 1	48.70		48.96
R59	49.33	S-R 0-15						49.7 00	49.65 6		49.48
R59	49.69	S-R 0-15									
<b>3750-3760</b>											
R15	51.12	S-R 1-17									51.06
P11	51.57	S-R 1-17	51.80			Br	51.40		51.0 1		51.82
									51.4 1		52.06
											52.42
R41	52.8	S-R 0-16	52.75						52.7 1		53.16
P37	53.79	S-R 0-16									53.81
P37	54.0	S-R 0-16									54.50
R17	54.32	S-R 1-17						54.0 1	54.0 2		
P13	54.52	S-R 1-17	54.74 1					54.7 1			
			CN	54.00 2							54.50
				54.40 2							
				54.95 1	Br	55.00					

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MC	9	10	11	12	13	14	15	16	17	Based King	Total King	Notes	Fe	
3760-3769														
			Co	58.45 1										
			Fe	58.00 1										58.07
	58 CN			58.25 1										
				58.60 1										
				58.90 2										58.94
R19	57.63 S-R 1-17				Br	57.60				57.4 ]	57.5 2			57.45
P13	58.16 S-R 1-17	58.16 1	Fe	58.30 15	Br	58.40				58.1 ]	58.3 0			58.23
P05	59.14 S-R 0-14		Fe	59.15 3										59.18
														59.46
P05	59.57 S-R 0-14				Br	59.50					59.35 2			
			Fe	60.00 3										60.05
			Fe	60.55 3										60.53
R43	61.09 S-R 0-16		Fe	61.05 3										
R43	61.35 S-R 0-16			61.35 4	Br	61.35 3				61.3 0 ]	61.40 2			61.40
R21	61.53 S-R 1-17													
P17	62.04 S-R 1-17			62.00 4						62.0 0 ]				
	62.34 S-R 0-15													
	62.35 S-R 0-14	62.28 1	Fe	62.25 4	Br	62.35					62.35 3			62.20
														62.91
			Fe	63.80 10										63.79
	64.27 S-R		CN	64.25 4										
R71	64.60 S-R 0-15		CN	64.60 4	Br	64.50					64.55 4			
	64.92 CN			64.95 1										
R23	65.80 S-R 1-17		Fe	65.55 5	Br	65.70				65.8 ]	65.75 1			65.63
														65.54
														65.70
	66.33 CN													
	66.46 CN													
P19	66.42 S-R 1-17	66.41 0		66.40 2		66.4 15				66.4 ]	66.55 1			66.08
			Fe	67.25 10	Br	67.3 1					67.35 0			66.66
			Fe	68.05 4										67.19
											68.40			68.02
				68.80 4										
				69.05 4	Br	69.10				69.2 00	69.2 Br			
				69.35 4										
3770-3789														
R45	70.05 S-R 0-16		Fe	70.05 6		70.35 0				70.45	70.40 4			69.99
R45	70.31 S-R 0-16		Fe	70.35 6										70.30
P21	70.33 S-R 1-17													
P4	71.3 S-R 0-16													70.41
P4	71.56 S-R 0-16	71.50	BrFe	71.40 4	Br	71.55 0				71.2 00	71.40 0			71.49

85

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	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
<b>3770-3789</b>											
			72.15 2	Br	72.30						
			72.55 2								
			73.00 2								
			Fe 73.70 3				73.5 Br				73.36
			74.10 2								73.69
			74.70 2								
			Fe 74.90 2								74.82
			75.15 2		75.2 00						
R27	75.78 S-R 1-17				78.8 15			75.90 2			
			76.00				76.0 2 Br				75.86
F19	76.44 S-R 1-17		Fe 76.45 2					76.40 2			76.45
			Fe 77.10 2								77.06
			Fe 77.40 2								77.44
			77.85 2								
			77.85 2								
			Fe 78.51 2		78.0 0			78.0 00			78.32
											78.51
			Fe 78.70 2								78.70
			79.15 2		79.2 05						
			Fe 79.50 3				79.5 Br				79.44
											79.48
		79.70	79.75 3		79.8 2			79.90 10			
			80.10 2	Br	80.0 2						
			80.50 2								
			80.90 2								
			Fe 81.15 2		81.1		81.1 00	81.20 5			81.19
			81.65 2								81.93
			Br 82.20 3		82.30 1		82.0 Br	82.30 2			82.13
											82.45
											82.61
			83.10 1								
			83.50 2					83.40 Br			83.34
		83.85	83.85 2		83.85 1						
			84.40 1								
			85.35 4		85.4 1			85.35 1			
			Fe 85.95 8								85.71
											85.96
			Fe 86.70 5								86.17
											86.67
R31	87.35 S-R 1-17		87.15 5								87.16
											87.42
					87.4 1			87.35 1			

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AC			3	G.D.	4	7	Beird King	Total King	Mike	Fe
	8770-8780	Fe	87.80				87.9 VVBR			87.88
		Fe	88.16 10		88.3 1			88.20 1		88.17
R49	89.58 S-R 0-16	Fe	89.86		89.7 5			89.85 1		89.43
R49	89.67 S-R 0-16	Fe								89.57
	3780-3800	Fe	90.10 4							90.81
										90.88
P45	90.74 S-R 0-16	Fe	90.80 4					90.80 4		90.85
P45	90.97 S-R 0-16	Fe			91.0 1					90.78
		Fe	91.45 2				91.5 VVBR			91.38
			91.80 2		91.85 1					91.58
		Fe	92.15 2							91.73
			92.55 2							92.16
		Fe	92.80 2							92.83
		Fe	93.45 5							93.38
										93.48
R33	93.85 S-R 1-17	Fe	93.80 5	Br	93.9 1			93.95 3		93.87
		Fe	94.40 5				94.4 0			94.34
P29	94.70 S-R 1-17			Br	94.9 0			94.70 3		94.00
		Fe	95.00 10							95.53
R75	95.98 S-R 0-16		95.90 1							96.53
P71,R75	96.25 S-R 0-16		96.20 4		96.00 15			96.05 6		96.00
			96.60 1				96.7 0 BR			
			96.80 2							
		Fe	97.55 5							97.51
		Fe	97.95 2					97.9 00		97.94
					98.00 15					
		Fe	98.55 10				98.3 VVBR	98.7 00		98.51
R51	99.01 S-R 0-16	Fe	99.00 10					99.00 2		99.54
			99.00 2		99.2 VBR			99.05 1		
P47	01.01 S-R 0-16									
P17	01.01 S-R 1-17									
P47	01.38 S-R 0-16		01.40 5	Br	01.40 4					01.33
P31	01.38 S-R 1-17									
P31	01.87 S-R 1-17	Fe	01.85 5				01.84 BR	01.85 5		01.88
										01.88
			02.75 2					02.7 0		01.98
			02.86		02.9 05					02.28
			03.15 2							

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	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Milne	Fe
<b>3790-3809</b>											
			03.55 1								
			Fe 04.05 2	04.2 1				04.0 ]			04.01
			04.65 2								
			Fe 05.30 3								05.34
			05.85 1								
			Fe 06.20 2								06.21
			Fe 06.65 2								06.69
			Ni 07.20 1	Br 07.10							
		07.45	Fe 07.60 2					07.4 00			07.53
			07.95 2								
R37	07.91 S-R 1-17		Fe 08.20 2	Br 08.1				08.15 2			08.28
R37	08.18 S-R 1-17		Fe 08.70 2								08.73
P33	08.88 S-R 1-17		Fe 09.10 2	09.05 1				09.10 2			09.04
P33	09.18 S-R 1-17										09.15
			09.50 2								09.57
			09.75 2								
<b>3810-3829</b>											
			10.05 1	10.1 2			10.0				
R53	10.59 S-R 0-16		10.65 2								
R53	10.87 S-R 0-16		10.95 2	10.8 2				10.90 2			10.76
		11.30	11.35 2								11.89
				11.95 Br 3							
			12.05 3D								
P49	12.03 S-R 0-16		12.60 2					12.40 6			
P73	12.25 S-R 0-16		Fe 12.95 10				13.0 ]				12.96
R77	12.53 S-R 0-16		Fe 13.60 2								13.06
R77	12.90 S-R 0-16										13.63
			Fe 13.95 2				13.9 ]				13.89
			14.50 2	14.40 1 sh							14.52
								14.60 0			14.78
				15.1 06							
			Fe 15.85 15	Br 15.9							15.84
R39	15.77 S-R 1-17		Fe 16.0 2				16.0 0	16.10 2			16.34
R39	16.03 S-R 1-17										
P35	16.77 S-R 1-17			16.85 1				16.85 2			
P35	17.00 S-R 1-17		Fe 17.00 1								
		17.55	Fe 17.70 2	Br 17.6 0			17.6 VVBR				17.65
			18.10 1								
			18.65 1	Br 18.9 3							18.82
								19.10 0			
				19.75 1 sh							

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BC	S	SP	S	C.P.	T	Dist King	Work King	Dist King	Pa
3810-3829									
		Fe	20.40 15		20.4 1 sh				19.80
		Fe	20.85 2						20.42
		Fe	21.20 2						21.17
					21.50 1		21.50 2		
R55	21.95 S-R 0-16	Fe	21.80 2			21.5 VVBR			21.83
R55	22.37 S-R 0-16		22.30 2		22.30 1		22.30 2		
			23.00 1						
P51	23.40 S-R 0-16								
P51	23.65 S-R 0-16		23.55 2D		23.65		23.65 2		
R41	24.36 S-R 1-17	Fe	24.45 10		24.45	24.5	24.40 2		24.07
									24.30
									24.44
P37	25.35 S-R 1-17		25.25 2		25.25		25.45 2		25.40
		Fe	25.80 10						25.88
			26.80 2						26.84
		Fe	27.85 10	Br	27.0 3	27.3 VBR	27.1 BR		27.57
									27.82
			28.20 1						
			28.50 1				28.60		28.50
			28.85 1						
P75	29.4 S-R 0-15		29.40 3						29.12
									29.45
P75	29.71 S-R 0-15		29.70 3	Br	29.8 4	29.7 VBR	29.80 6		29.77
3830-3849									
			30.05 2						
			30.30 2						
			30.70 2						30.76
									30.86
			31.00 2						
			31.75 2						
		Fe	32.35 3		32.25 1 sh		32.40 0		
			32.50			32.5 VBR			
			33.05 2		33.05 1 sh		33.05 1		
R43	33.26 S-R 1-17		33.30 2						33.31
P39	33.84 S-R 1-17								
R57	33.84 S-R 0-16	Fe	33.85 2						
R57	34.18 S-R 0-16	Fe	34.20 15		34.00 1		34.15 5		34.22
P39	34.18 S-R 1-17		34.90 2						
P53	35.26 S-R 0-16		35.20 2		35.2 2				
P53	35.50 S-R 0-16		35.50 2			35.3 VBR	35.45		
		Fe	36.40 2D				36.45		36.33

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		BC	2	MS	3	G.D.	4	7	Beird King	Total King	Mike	Fe
3830-3849												
				Fe	37.05 2							37.14
					37.55 2		37.60 1					
			38.20		37.85 2			37.9 VVBR	37.90 00			38.03
					38.30							
					38.75 2							
				Fe	38.20		38.15 0			38.10 00		38.25
				Fe	38.70 1							38.63
							40.25 2					
R3	40.74 S-R 0-17			Fe	40.50 10			40.8 0				40.43
R3	41.10 S-R 0-17			Fe	41.10 10			41.2 0				41.06
R5	41.23 S-R 0-17	41.24 0			41.45 1		41.3					
					41.70 1							
R45	42.14 S-R 1-17											
R7	42.14 S-R 0-17							42.05 0		42.25 3		
P3	42.46 S-R 0-17	42.31 1			42.45 1	Br	42.6	42.4 0				42.85
				Fe	43.00 2							43.88
												43.97
				Fe	43.30 2			43.3 1				43.25
P41, R9	43.60 S-R 0-17				43.70 2			43.5 0		43.5 4		
P41, R9	43.60 S-R 1-17											
		43.93 1			43.85 1	Br	43.8					
					44.15 1							44.28
R11	45.22 S-R 0-17				45.05 2		45.15 1	45.1 1		45.2 2		45.17
		45.85 1	45.45									
P7	45.73 S-R 0-17			Fe	45.95 1			45.7 0				45.70
P59	46.55 S-R 0-16			Fe	46.45 2					46.60 2		46.00
												46.41
				Fe	46.80 2							46.80
P77	47.03 S-R 0-15											
R81	47.40 S-R 0-15	47.48 1			47.35 2		47.4 2	47.3 1		47.40 3		
R13	47.40 S-R 0-17											
P65	47.63 S-R 0-16											
P9	47.96 S-R 0-17		47.95		47.95 2		47.95 2					
R81	47.97 S-R 0-15											
P65	48.98 S-R 0-16							48.0 0				
		48.24 1								48.00 3		
					48.95 1		48.9 0					48.20
					48.50							
R15	49.98 S-R 0-17	50.00 1		Fe	50.00 10	Br	49.8	49.8 1		49.95 3		49.96
3850-3869												
					50.60 5	Br	50.6					
P11	50.7 S-R 0-17	50.80 1		Fe	50.80 5			50.8 1		50.80 3		50.82
												50.97

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					G.D.		7	Metre King	Total King	Miles	Fe
											51.58
			81.00 1								
			81.70 2			51.60 1					
			82.15 1								
			82.55 2	Fe							52.57
P43	83.02 S-R 1-17										
R17	83.02 S-R 0-17			Br	53.05 2	53.15 1		52.9 0	53.20 4		
P43	83.28 S-R 1-17			Br	83.45 2						53.48
P13	83.87 S-R 0-17	53.64 0			83.85 2			53.9 0	53.90 0		53.82
			84.10 2								
			84.35 2	Fe							
			84.80 2		Br	54.75 2		54.9 00	54.80 1		
	54.7 CN		85.30 2								55.32
			85.70 2			55.55 15					55.86
			86.05 2						55.90 00		
R19	86.40 S-R 0-17			Fe	56.45 15	VBR 54.5		56.7 0	56.50 2		56.37
			87.05 2					56.9 0			
P15	87.46 S-R 0-17	57.32 0			87.35 2			57.5 0	57.45 2		
	87.9 N <sub>2</sub> <sup>+</sup>				87.90 2						
			88.25 2								
			88.65 2								
M51	89.03 S-R 0-16										
M51	89.41 S-R 0-16				89.20 3	59.25		59.1 00	59.35 2		59.21
						59.5					
			89.95 15	Fe							59.91
P57	90.42 S-R 0-16										
R21	90.43 S-R 0-17				90.50 2	60.5		60.2 00			60.97
P57	90.81 S-R 0-16	60.96 0							60.75 4		
R21	91.43 S-R 0-17				91.45 2	61.45		61.3 2	61.50 4		61.34
											61.60
		8a 81.90									
R49	92.44 S-R 1-17				92.40 2	Br 92.5 1			92.50 3		
					92.80 1						
			93.05 1								
P45	93.52 S-R 1-17				93.50 2	63.45 15		63.45 1			63.41
			93.70 2						63.60 2		63.74
			94.05 1	Fe							
			94.40								
R23	94.70 S-R 0-17				94.60 1	64.7 05		64.7 00	64.80 2		64.30
			95.15 1								64.78
P19	95.3 S-R 0-17										
P79	95.3 S-R 0-15			Fe	95.50 10			95.4			
P79	95.80 S-R 0-15				95.95 1	Br 65.9 4		65.9	65.90 5		65.52
			96.15 1								
			96.45 1								
			96.95 2								

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	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3850-3869											
			Fe 67.25 2	67.4 15			67.6 0				67.21
			67.75 2					67.90 0			67.92
			68.05 2								68.24
			68.60 2D	68.55 05							68.62
			69.10 2								
R25	69.26	S-R 0-17									
R25	69.46	S-R 0-17	69.35 1				69.5 1				69.56
			69.60 3	69.55 2							
			70.00 1								
			70.21 1								
P21	70.76	S-R 0-17	70.80 2	70.6			70.8 0	70.80 2			70.81
	71.56	N <sub>2</sub> <sup>+</sup>	71.35 2	Br 71.4				71.40 1			
			71.70 2				71.6 0				71.75
			72.40 2								
R63	72.46	S-R 0-16	Fe 72.55 10								72.50
R63	72.81	S-R 0-16	72.80 2	72.8 15			73.4 0	72.80 2			72.82
R61	73.81	S-R 1-17									
F69	73.9	S-R 0-16	Fe 73.75 2								73.76
											73.94
R27	74.22	S-R 0-17									
F69	74.22	S-R 1-17	Fe 74.10 2	Br 74.1				74.30 2			74.65
F69	74.23	S-R 0-16									
R27	74.68	S-R 0-17	74.80 2	74.8							74.89
			75.05								
			75.40								
			75.44 N <sub>2</sub> <sup>+</sup>	75.35 2	Br 75.5		75.3 00				75.38
			75.65 1								
P23	76.04	S-R 0-17	Fe 76.00 2					76.90 1			76.04
			76.40 2								76.37
			76.55	76.6							76.67
			76.90 2								
			77.40 2	Br 77.2 2			77.3 1	77.35 0			77.51
	77.28	N <sub>2</sub> <sup>+</sup>									
	77.23	N <sub>2</sub> <sup>+</sup>									
			Fe 78.05 10								78.02
			Fe 78.60 10								78.57
											78.67
											78.73
											79.27
			79.08 N <sub>2</sub> <sup>+</sup>	79.20 1	Br 79.0		79.05 0	79.05 0			79.65
			79.03 N <sub>2</sub> <sup>+</sup>								
			79.65 1								
			80.05 1	Br 80.1							
	80.12	S-R 0-17	80.40 1					80.35 2			80.22
	80.40	S-R 0-17	80.40 1								
			80.75 1								
			80.84 N <sub>2</sub> <sup>+</sup>	81.0			80.7 1				80.78
			81.25 1								81.01

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	MC	S	MB	S	G.D.	4	7	Baled King	Total King	Milk	Fe
3870-3880											81.98 82.48
P25	81.78 S-R 0-17							81.86 2 83.20 2			83.28 84.38 84.68
	83.43 CN	Fe	83.40	CN	83.45 1		82.5				
	84.23 N <sub>2</sub>			Fe	84.35 2	Br	84.3		84.1	84.50 2	
P81	84.60 S-R 0-16										85.15
M85	85.13 S-R 1-17			Fe	85.10 1						
M85	85.13 S-R 0-16										
M85	85.48 S-R 1-17			Fe	85.50 2	Br	85.6 1		85.8	86.65 2	86.51
M85	85.47 S-R 0-16				85.95 1						
M31	86.18 S-R 0-17										
M31	86.38 S-R 0-17			Fe	86.35 10						86.28
M55	86.37 S-R 0-16										
M55	86.72 S-R 0-16			Fe	87.05 2				86.60 2		87.05
	87.48 N <sub>2</sub>					Br	87.6		87.4		
P61	87.78 S-R 0-16										
P61	87.78 S-R 0-17										
P27	88.83 S-R 0-17								88.15 2		
P61	88.83 S-R 0-16			Fe	88.55 5						88.51
	88.98 N <sub>2</sub>			Fe	88.90 2						88.82
	89.32 BA	Fe	89.35						88.9	89.05 00	
				TI	89.85 1					89.95 00	89.92
3890-3900											
	90.48 N <sub>2</sub>			Fe	90.45 1				90.60 10		90.23 90.39 90.64
				Fe	90.85 1						
				Ba	91.80 10						
									92.10		
R33	92.72 S-R 0-17										
R33	92.96 S-R 0-17	Fe	92.75	Fe	92.80 2						
	93.33 N <sub>2</sub>			Fe	93.35 2	Br	93.4		93.20 2		93.91 94.01
				Fe	93.95 2						
P29	94.48 S-R 0-17										
P29	94.66 S-R 0-17			Mn	94.70 2				94.75 2		95.14 95.23 95.65
M55	95.82 S-R 1-17			Fe	95.65 10						
M55	96.15 S-R 1-17								96.05 1	96.20 3	

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	BC	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3890-3909												
P51	97.22 S-R 1-17			Fe 97.35 2					97.35 3			97.44
				Fe 97.95 5								97.99
	98.50 N <sub>3</sub> <sup>+</sup>			Ti 98.50 1								98.01
				Fe 98.95 2								99.01
												99.03
R35	99.75 S-R 0-17			Fe 99.75 10								99.70
R35	99.99 S-R 0-17								00.05 25			
				Fe 00.50 1					00.00 1			00.51
R67	00.87 S-R 0-16			00.85 1								
R67	01.26 S-R 0-16			01.10 1	Br		01.00		01.10 1			
P31	01.59 S-R 0-17			01.40 1								
P31	01.78 S-R 0-17											
	01.93 N <sub>3</sub> <sup>+</sup>						01.95					
P63	02.26 S-R 0-16			Fe 02.95 10					02.75 1			02.94
P63	02.60 S-R 0-16											
	02.96 N <sub>3</sub> <sup>+</sup>			Fe 03.95 2			03.15					03.90
	03.98 N <sub>3</sub> <sup>+</sup>											
	04.14 N <sub>3</sub> <sup>+</sup>											
	04.19 N <sub>3</sub> <sup>+</sup>						04.1		04.3			
		04.80		04.90								04.83
	05.05 N <sub>3</sub> <sup>+</sup>											
	05.14 N <sub>3</sub> <sup>+</sup>			Fe 05.25 1			05.05		05.25 Br			
		05.60		05.60 2								
				05.90 1								
	05.99 N <sub>3</sub> <sup>+</sup>											
	06.04 N <sub>3</sub> <sup>+</sup>			06.10			06.00					06.03
				Fe 06.50 5								06.48
	06.89 N <sub>3</sub> <sup>+</sup>											
	06.84 N <sub>3</sub> <sup>+</sup>			Fe 06.75 2			06.8					06.75
	07.24 S-R 0-17											
	07.71 N <sub>3</sub> <sup>+</sup>			Fe 07.55 2			07.65		07.60 1			07.47
												07.87
	07.65 N <sub>3</sub> <sup>+</sup>			Fe 08.00 2								07.93
	08.42 N <sub>3</sub> <sup>+</sup>											
	08.46 N <sub>3</sub> <sup>+</sup>											
	08.47 S-R 1-17			08.40 2			08.45		08.45 1			
	09.19 N <sub>3</sub> <sup>+</sup>											
	09.14 N <sub>3</sub> <sup>+</sup>			09.20 2	Br		09.2					
P53	09.17 S-R 1-17											
P33	09.17 S-R 0-17											

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	BC	S	BB	S	G.D.	4	7	Beard King	Total King	Mike	Fe
<b>3000-3009</b>											
F33	09.30	S-R 0-17						09.45 1			
F63	09.30	S-R 1-17									
	09.00	N <sub>2</sub> <sup>+</sup>	Fe	09.75 5							09.00
											09.63
<b>3010-3020</b>											
	10.44	N <sub>2</sub> <sup>+</sup>		10.25 2							
			Fe	10.05 2							10.84
	11.00	N <sub>2</sub> <sup>+</sup>									
	11.55	N <sub>2</sub> <sup>+</sup>		11.50 2							11.00
											11.60
				11.00 2							
R3	12.5	S-R 1-18		12.45 2							12.05
											12.44
R5	12.0	S-R 1-18	12.00 0	Fe	12.00 2						
					13.20 1						13.21
					13.00 5						13.63
	14.34	N <sub>2</sub> <sup>+</sup> Head	14.30 1	Fe	14.30 5	14.3		14.35 1	14.3 2		14.28
R30	15.00	S-R 0-17									
R0	15.30	S-R 1-18		Fe	15.25 5			15.4 0			
R30	15.32	S-R 0-17	15.57 1	Fe	15.45 1	15.45 15		15.0 0	15.45 1		
R00	15.70	S-R 0-16			15.75 1						
F5	15.70	S-R 1-18									
					15.95 1						
					16.25 1			16.40 00			
F65	17.10	S-R 0-16		Fe	16.75 1			17.2 0			16.73
R11	17.15	S-R 1-18	17.42 1	Fe	17.20 2						17.18
F35	17.20	S-R 0-17									
F7	17.65	S-R 1-18				Dr	17.65 2	17.7 0	17.55 5		
				Fe	18.35 2						18.32
											18.42
F65	18.60	S-R 0-16		Fe	18.60 2						18.64
F7	18.60	S-R 1-18									
				Fe	19.10 2						19.07
R13	19.35	S-R 1-18				19.45 15		19.35 0	19.35 0		
			19.74 1								
F9	20.00	S-R 1-18		Fe	20.25 10			20.00 0			20.26
				Fe	20.90 1						20.84
				Fe	21.30 1						21.18
											21.38
R15	22.05	S-R 1-18	22.37 1	Fe	22.15 1	22.10 15		22.15 0	22.20 2		
F55	22.35	S-R 1-17									
R16	22.75	S-R 1-18		Fe	22.95 10			22.9 0			22.91

95

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	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
<b>3910-3929</b>											
R41	23.60	S-R 0-17									
R41	23.83	S-R 0-17	23.95 1	23.8 p			24.0 00	23.80 2			23.97
R17	25.25	S-R 1-18	Fe 25.20 2	25.35 15			25.3 0				24.17
P37	25.7	S-R 0-17	Fe 25.70 2					25.80 0			25.30
								25.90 3			25.64
P37	25.95	S-R 0-17	25.92 1	Fe 26.00 2	26.0 2		26.1 0				25.94
				Fe 27.95 10							26.83
R19	28.80	S-R 1-18					28.8 0	28.80 0			27.92
				Fe 29.20 1	Br 29.0 1						28.08
											29.12
P15	29.7	S-R 1-18	29.42 1				29.8 0	29.90 00			29.21
				29.9 15							
<b>3930-3949</b>											
				Fe 30.35 10							30.29
				Fe 31.15 1							31.12
					31.80						
R71	31.99	S-R 0-16		32.05 1				32.05 00			32.27
R43	32.48	S-R 0-17		Fe 32.65 2							32.63
P67	32.81	S-R 0-16		Fe 32.90 2	32.95 1		32.7 0	32.80 2			32.92
P17	33.85	S-R 1-18	33.30 0	Ca 33.65 5			33.9 1	33.70 0			33.60
					33.90 1						34.23
P39	34.67	S-R 0-17									
P39	34.67	S-R 1-17						34.80 0			
P39	34.90	S-R 0-17									
	35.79	S-R 1-17		BaFe 35.75 3							36.30
											36.81
											36.95
R23	37.30	S-R 1-18			Br 36.7						
				Fe 37.30 1	37.4		37.3 1	37.3			37.33
			37.23 0	37.85 1							
P19	38.40	S-R 1-18		38.40 1	38.60 15		38.5 1	38.50 0			38.02
											38.96
				Fe 40.85 1							40.64
											40.88
											41.28
				Fe 41.30 1							
R25	42.10	S-R 1-18		42.10 2	42.20 25			42.15 4			42.44
R45	42.12	S-R 0-17		Fe 42.40 2			42.4 00				43.34
											43.59

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	BC	S	BB	3	G.D.	4	7	Baird King	Total King	Mlbc	Fe
<b>3930-3949</b>											
P21		43.45 S-R 1-18						43.40 1			
P41		44.1 S-R 0-17									44.75
		44.03 Al	Al	44.05	Al	44.05 20					44.89
P41		44.35 S-R 0-17						44.40 1			45.12
											47.00
											46.96 1
R73		47.67 S-R 0-16									47.59
R27		47.65 S-R 1-18						47.5 00	47.50 1		47.53
											48.10
R73		48.16 S-R 0-16									48.77
R83		48.28 S-R 1-17									48.77
P69		49.0 S-R 0-16									49.15
P23		49.00 S-R 1-18						48.9 0	49.15 2 Br		49.15
P69		49.0 S-R 1-17									49.15
<b>3950-3969</b>											
											49.96
											51.16
R47		51.98 S-R 0-17						51.90 2			52.00
											52.70
											53.15
											53.40 1
R29		53.45 S-R 1-18						53.40 0			53.86
											54.71
											54.20 1/2
P43		54.05 S-R 0-17									54.40 1
P43		54.32 S-R 0-17									54.4 2
P25		54.85 S-R 1-18						54.8 2 BR			54.9 2
											55.0
											55.00 1
											55.35 1
											56.00 1/2
											56.50 2
											56.75 2
											58.95 1
											58.9
											57.3 5
											58.40
											58.74
											60.28
											60.89
											59.5 1
R31		59.75 S-R 1-18						59.80 2	59.70 0		59.5 1
											60.5 VBR
P27		61.25 S-R 1-18						61.30 2			61.4 4
			Al	61.50	Al	61.55 20				61.40 0	61.14

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	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
<b>3950-3969</b>											
R65	62.04 S-R 1-17										62.36
R49	62.04 S-R 0-17										62.72
R49	62.33 S-R 0-17							62.45 0			
			Fe	83.10 1			63.10 VBR				63.10
	63.61 S-R 1-17			63.60 1					63.75 0		
	64.07 S-R 1-17										
P45	64.51 S-R 0-17		Fe	64.55 1							64.52
P45	64.75 S-R 0-17					64.8 3		64.80 3	64.70 0		
	65.03 CO		Co	65.05 1							
				65.65 1							65.51
R33	66.25 S-R 1-18		Fe	66.05 2					66.25 0		66.06
R33	66.55 S-R 1-18										
	66.68 S-R 0-15		Fe	66.60 2		66.5 1		66.5 Dv	66.50 3		66.51
											66.62
						66.7					
			Fe	67.45 1					67.20 0		67.42
			Fe	67.95 2							67.96
P29	68.15 S-R 1-18				Br	68.2 3		68.2 Dv	68.25 3	68.35 0	
			Ca	68.50 2							68.37
			Fe	69.30 5							69.28
						69.9 5		69.8 Dv			
<b>3970-3989</b>											
			Fe	70.30						70.05 0	69.63
											70.26
											70.39
			Fe	71.30						71.15 0	
											71.32
											71.81
						72.10 0		72.20 VBR		72.10 0	
	73.22 S-R 0-17							73.4 VBR	73.2	73.35 0	
R35	73.80 S-R 1-18		Fe	73.70	Br	73.5			73.9		73.26
											73.65
											74.39
											74.76
	75.34 S-R 0-18										
R31	75.30 S-R 1-18	75.3		75.30			75.2 1			75.30 0	75.21
P47	75.65 S-R 0-17			75.55		75.6 1		75.6 3			75.84
			Fe	76.60						76.55 0	76.39
											76.56
											76.61
											76.66

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BC	S	MP	3	G.D.	4	7	Beard King	Total King	Mike	Fe
<b>3970-3989</b>										
P67	77.65 S-R 1-17	Fe	77.75					77.60 0		77.74
P67	78.1 S-R 1-17									
P63	78.6 S-R 1-17	Fe	78.40		78.60 05		78.8 1	78.40 BR		78.46
		Fe	79.55						79.65 0	79.64
R37	81.26 S-R 1-18							81.35 0	81.20 1	
R37	81.55 S-R 1-18				81.60					
		Fe	81.75							81.10
										81.77
							82.2		82.25 0	
R53	84.2 S-R 0-17	Fe	83.85	Br	83.3			83.35 4	83.25 1	
R53	84.57 S-R 0-17									83.96
	84.6 CN			Br	84.8			84.6 0	84.40 1	84.93
		Fe	85.25							85.38
		Fe	86.15				85.4 0			86.17
	86.85 S-R 2-19									
P49	87.1 S-R 0-17									
R5	87.33 S-R 2-19				87.0 1				86.90 2	
								87.0 2		
						87.3 0				
						88.2 0				
			88.95							89.01
				Br	89.3					89.25
						89.2 0				
R39	89.75 S-R 1-18	Fe	89.75					89.6 2	89.45 2	
P5	89.75 S-R 2-19									89.66
<b>3990-4009</b>										
P35	91.55 S-R 1-18	Fe	90.35			90.2	90.15 0			90.37
				Br	91.50		91.6 0	91.6 2	91.44 2	
						92.2	92.2 0			92.16
	93.40 Ba				93.40				93.15 1	
		Ba	93.40							93.10
										94.12
R13	94.10 S-R 2-19			Br	94.2	94.3	93.9 0	94.2 BR	93.70 1	
P9	94.63 S-R 2-19						94.4 0		94.15 1	
									94.50 1	
						95.2				94.9
		Fe	95.20							95.20
		Fe	95.65							
		Fe	95.90							95.96
R55	96.12 S-R 0-17									
R55	96.45 S-R 0-17									
R15	96.90 S-R 2-19	Fe	96.9	Br	96.3		96.7 0	96.4 BR	96.25 2	
		Fe	97.35						97.30 1	97.39

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	RC	S	NO	S	G.D.	4	7	Baird King	Total King	Mike	Fe
	4010-4029										
			Fe	14.40			Abs 14.00			14.16	14.27
			Fe	16.35				16.3 00	16.40 1	16.05	16.42
R45	16.86 S-R 1-18		Fe	17.05					16.85		17.09
											17.15
R45	17.20 S-R 1-18						17.6 00	17.3 1 BR		17.95	18.27
			Fe	18.10							
P41	19.0 S-R 0-18		Fe	18.95	BR	19.0 V		19.0 3			
P41	19.0 S-R 1-18										
							19.6				
				20.10				18.9 00		19.95	20.48
R3	20.73 S-R 0-18							20.8 00		20.55	
R5	21.3 S-R 0-18				BR	21.5 0		21.3 00	21.5 00		21.61
R59	21.68 S-R 0-17		Fe	21.75							21.87
R7	22.10 S-R 0-18						22.3	22.2 00			22.74
P3	22.59 S-R 0-18		Fe	22.80							
R9	23.45 S-R 0-18										
R11	23.67 S-R 0-18						23.8	23.5 00			
F5	24.09 S-R 0-18		Fe	24.05							24.10
P23	24.4 S-R 2-19		TI	24.55		24.5 00		24.2 00	24.4 00		
P55	24.4 S-R 0-17										
			Fe	24.75			Abs 24.75 CO			24.95	24.73
								25.3 00		25.85	
				25.70							
P7	26.10 S-R 0-18		MnFe	26.35				26.0 00		26.75	
R47	26.98 S-R 1-18						26.6				
R47	27.40 S-R 1-18					27.6 Dv		27.5 00	27.5 Dv		
							27.8			28.05	
								28.5 00			
P43	29.25 S-R 1-18										
R29	29.25 S-R 2-19										
P43	29.5 S-R 1-18		Fe	29.65	VBR	29.7 3		29.45 2			29.77
											29.83
	4030-4049										
										30.15 5	30.19
											30.49

Omitted by  
exp. accident

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	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
4030-4049											
R15	30.50	S-R 0-18	Mn	30.70	EmFe	30.7		30.3 0	30.50 00		
P25	30.50	S-R 2-19									
			Mn	31.75				31.3 0	31.7		31.24
			Fe	32.00							31.96
			Fe	32.60							32.46
R17	33.40	S-R 0-18	Mn	33.10				32.9 00	33.3 00		32.63
								33.4			
										33.95 2	
R61	34.71	S-R 0-18									
	34.70	S-R 2-19	Mn	34.50	EmFe	34.5		34.6			
						34.9					
R61	35.02	S-R 0-17							35.0 0		
P13	35.02	S-R 0-18									
			Mn	35.70							35.65 2
R31	35.7	S-R 2-19									
				36.45							36.25 2
											36.75 2
R19	37.05	S-R 0-18									
P27	37.05	S-R 2-19									
P67	37.57	S-R 0-17									
R49	37.57	S-R 0-18					37.3				37.45 4
P67	38.05	S-R 0-17									
R49	38.05	S-R 0-18							38.1 10	Br	38.05 10
P15	38.75	S-R 0-18	Fe	38.75				NO <sub>2</sub>	38.6 1		38.80
								39.1			
			Fe	39.95							40.09
P45	40.25	S-R 1-18							40.25 3		40.45 4
			Fe	40.65							40.64
R21	41.05	S-R 0-18	Mn	41.30							41.28
											41.55 2
R17	42.65	S-R 0-18									
R33	42.65	S-R 2-19									
					Br	43.00 VV		42.1	Em	42.6 0	42.6 1
											42.7
											43.25 2
											43.90
P29	44.20	S-R 2-19									43.90
			Fe	44.25					44.3		44.61
			Fe	44.60				Em	44.4		44.55 2
											45.20 5
			Fe	45.80					45.3		45.81
											45.81
								Abs	46.9		

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	BC	2	BB	3	G.D.	4	7	Bald King	Total King	Mike	Fe
4030-4049											
P19		47.35 S-R 0-18						47.4 0	47.40		
										47.55 5	
R53		48.77 S-R 0-17	48.76					48.1 2			
R53		48.77 S-R 1-18		48.9		Em 48.9 1					47.31
R53		49.15 S-R 0-17	Fe 49.20	49.3				49.3 2	49.20 4		
						Abs 49.5 1				Br 49.65 5	49.33

	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4050-4069											
R25	50.55	S-R 0-18				50.4 0					49.87
		Fe	50.00								
			50.45		Abs 50.8				50.85		
P47	51.55	S-R 1-18			51.45	51.6 0					
P59	51.58	S-R 0-17									
P59	51.96	S-R 0-17		VV			51.84 4				51.91
P21	52.46	S-R 0-18		Br 52.1 BR							
		Fe	51.80		Abs 52.3	NO <sub>2</sub> 52.3 VBR					
		Fe	52.30			NO <sub>2</sub> 53.2 VBR					
		Fe	53.10		Abs 54.0						
			54.2								
		Fe	54.75			Br 54.7 1					54.83
		Mn	55.35						55.25		55.04
R27	56.0	S-R 0-18		55.5							
R27	55.8	S-R 0-18			Abs 55.8	Br 56.1					
							56.2 00		56.25		
				57.0							
		Br	57.8			57.5 1					57.35
			57.75		Em 57.9						
R85	58.15	S-R 0-16					58.20 0		58.25 3		58.23
P23	58.15	S-R 0-18									
		Fe	58.70		58.4						58.76
P81	59.0	S-R 0-16				Abs 59.0			59.25 1		59.72
		Fe	59.55								
					Em 60.0				60.05		
R53	60.78	S-R 1-18									
R53	60.90	S-R 1-18				60.7	60.85 0				
			60.75 0	60.9 25							
					Abs 61.2 BR	61.0 1			Br 61.25 3		
R29	61.7	S-R 0-18									
R29	61.9	S-R 0-18					61.6 1				61.96
		MnFe	61.70								
		Fe	62.30				62.20		62.25		62.44
				63.1							
R65	63.3	S-R 0-17									
P49	63.3	S-R 1-18				63.6	63.40 3				63.28
R65	63.70	S-R 0-18							Br 63.95 10		
P25	64.1	S-R 0-18									
		Fe	65.25			64.7 1					65.39
		Fe	66.45		65.1	65.0					66.59
P61	66.23	S-R 0-17		66.5			66.6 2	66.40 1			66.98
P61	66.6	S-R 0-17							66.85 5		67.27
		Fe	66.75			66.4					
		Fe	67.05								
					Abs 67.3						67.98
		Fe	67.80								
R31	68.05	S-R 0-18		68.0			68.25 1	68.15 1			

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	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4070-4089											
		Fe	84.60		Fe 84.9 cm	NO <sub>2</sub>					84.50
P31	85.10 S-R 0-18	Fe	85.10			NO <sub>2</sub> 85.4	85.1	85.05 2	85.25 2		85.01
P31	84.99 S-R 0-18										85.32
R57	84.05 S-R 1-18	Fe	85.95	Br 86.0 2			86.1	86.00 2			86.00
R57	85.6 S-R 1-18								86.35 2		
	CO 87.00	Fe	86.90								87.10
						87.1		87.05 1			
								88.06 1			
P63	88.45 S-R 1-18	Fe	88.40		Fe 88.3 cm		88.3 2		88.25 BR		
								88.4 1			88.58
		Fe	89.00					88.85 1			
R37	89.87 S-R 0-18	Fe	89.95		Fe 89.9 cm						89.22
											90.08
4090-4109											
R37	90.2 S-R 0-18										
		Fe	90.70	Br 90.80 VV				90.36 2	90.05 2	90.35	
		Fe	91.35						90.70 1		91.56
	92.40 CO	22.15	Co	92.20							92.20
	92.75 CO		Co	92.70							
P33	92.83 S-R 0-18				93.00 2s		93.0 00	92.90 3		93.15 2	
P33	93.06 S-R 0-18										
R69	93.9 S-R 0-17										
R69	94.54 S-R 0-17		94.50								
				Br 94.8 4				BR 94.8 0	94.80 2	94.75 2BR	
R3	95.15 S-R 1-19		95.20								
R5	95.5 S-R 1-19									95.75	
		Fe	96.00		Abs 95.7 0						95.98
P3	96.0 S-R 1-19	Fe	96.95	96.8						96.75	96.97
	97.10 S-R 0-17										97.12
	97.45 S-R 0-17										
R7	97.80 S-R 1-19										
R39	98.29 S-R 0-18										
R9	98.3 S-R 1-19	Fe	98.20								98.19
P5	98.45 S-R 1-19										
R39	98.45 S-R 0-18										
			98.95								
			99.10								
R11	00.20 S-R 1-19	Fe	00.15								00.17
			00.40								
					00.3 cm		00.3	00.25 3	00.45 1		

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				G.D.			Baird King	Total King	Mike	King 1st max.	Fe
4090-4109											
		Fe	00.75	Abs 00.7					00.75		00.74
P7	00.70 S-R 1-10	Fe	01.25			01.1 0]		01.45 1			01.27
P35	01.25 S-R 0-18	Fe	01.25								
P35	01.45 S-R 0-18		01.60								
P55	01.45 S-R 1-18										
	01.65 S-R 1-18						01.65				
			02.25						02.05		
R13	02.55 S-R 1-10		02.80 7D			NO <sub>2</sub> 02.5 1]		02.65 1	02.85 1		
			03.40								
			03.65 7D		Abs 03.7	NO <sub>2</sub> 03.5 1]			03.75 1		
		Fe	04.15		BR 04.6 abs			04.25 1			04.13
			05.05				05.20				04.95
R15	05.35 S-R 1-10					NO <sub>2</sub> 05.2]		05.30 2	05.45 3		
					BR 05.8 abs						
P11	06.40 S-R 1-10	Fe	06.40			NO <sub>2</sub> 06.5]		06.45			06.27
											06.44
R41	06.95 S-R 0-18								06.65 1		
R41	07.25 S-R 0-18										
		Fe	07.45				07.5	07.60 1	07.55		07.49
R17	08.6 S-R 1-10							08.65 1	08.75 2		
		Fe	09.00		Br 09.1 cm	NO <sub>2</sub> 08.6]					09.07
P13	09.80 S-R 1-10	Fe	09.80			NO <sub>2</sub> 09.8]	09.8	09.9 2			09.81
4110-4129											
P37	10.15 S-R 1-18						10.0 dr				
P37	10.35 S-R 0-18	10.30	10.40					10.30 2	10.50 4		
R71	10.8 S-R 0-17		10.80					10.90 1			
			11.65								
R19	12.30 S-R 1-10	Fe	12.25		12.3	12.2 0	12.2	12.20 4			12.35
		Fe	12.95		12.8				12.55 3		12.97
					13.5 cm			13.65 3			
P15	13.7 S-R 0-17					13.8	13.75		13.95 BR		
P15	13.75 S-R 1-10										
				14.0							
		Fe	14.30								14.45
		Fe	14.80								14.98
		15.05 BR									
R57	15.75 S-R 1-18		15.65		15.8 cm						
R43	16.24 S-R 0-18	16.45	Br 16.35			16.3 0]					
R43	16.5 S-R 0-18										
R21	16.5 S-R 1-10										
					16.7	16.6 0	16.6	16.50 2	16.75 BR		
					Abs 17.1						

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	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4110-4129		Fe	17.66 17.90 18.4		17.7 cm 18.4 cm						17.88
						18.1 0	18.1 0	17.95 1		18.25 1 18.85	18.55 18.90 19.39
F39 19.80 S-R 0-18		Fe	19.15 19.70 20.00				19.8 0	19.85 1	20.05 2		20.21
20.8 Head		Fe	20.55	Br 20.5 3	20.7 cm			20.80 1			
R23 21.15 S-R 1-19			21.00 21.80			21.2 00	21.10	21.25 0			
		Fe	22.00	Br 22.1 3							21.81
		Fe	22.35		22.4 cm			22.35 1			22.51
P19 22.85 S-R 1-19		Fe	22.55			22.8 0	22.8 0	22.80 2			
									23.05 4		
		Fe	23.55					23.75 0			23.75
						24.3 00		24.15 0	24.25 2		
				24.8 25				24.85 1		25.3 1	
		Fe	25.45			25.5 1					25.82
R45 26.01 S-R 0-18		Fe	25.70								25.88
R45 26.25 S-R 0-17		Fe	25.95			26.3 1	26.25 1	26.25 3			26.19
				26.3 15					26.45 BR		26.88
R63 27.70 S-R 1-18	27.54	Fe	27.50					27.85 3			27.61
R63 27.75 S-R 0-15											
				28.1						28.05 3	27.80
P21 28.1 S-R 1-19					28.6	28.3 0		28.80 1			28.73
				29.2						29.05 1S	29.22
P41 29.43 S-R 0-18					29.4						
P41 29.7 S-R 0-18								29.75 2			
4130-4149											
R59 30.25 S-R 1-18						30.3 0	30.0				30.04
		Ba	30.45		30.4			30.35 1	30.35 3		
P69 30.7 S-R 0-17	30.60 5						30.6 1BR				
				Br 30.9 2	Abs 31.0 2	31.8 0					
R27 31.85 S-R 1-19		Fe	31.90				31.85 0BR	31.80 1			32.06
									32.15 3BR		
	32.40 1		32.40								
P23 32.85 S-R 1-19			32.90					32.80 1			
			33.40	33.2							
		Fe	33.80			NO <sub>2</sub> 33.8 2	33.80 2BR	33.90			33.86

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	2	MS	3	G.D.	4	7	King	King	Miba	100 Max.	
4130-4140		Fe 34.80	34.4 3								34.34
		Mn 35.10									35.04
R47 36.2 S-R 0-18			36.2 1					36.25 1			
R47 36.5 S-R 0-17		36.65					36.50 00	36.25 1			
								36.80 1	36.75 2		37.00
R29 37.68 S-R 1-19		Fe 37.90	37.1 1								
R29 37.9 S-R 1-19			Br 37.7			37.7 1	37.90 00	37.75 2			
									38.05 2		
			39.6 0					38.90 1			
								39.40 1			
P43 39.85 S-R 0-18											
P43 40.10 S-R 0-18					40.3 cm	40.6 1BR	40.15 2	40.15 2	40.35 2		39.92
P26 40.10 S-R 1-19											
			40.7 2		40.8 cm			40.90 2			
		41.20									
		41.55									
		Fe 41.90							41.45 1BR		41.87
		42.30									
		Tl 42.55									
M65 42.85 S-R 1-18		42.85	42.7 1		42.5 2 cm	42.5 1	42.70 0	42.65 2	42.75 2		
		Fe 43.80									43.42
		Fe 43.90									43.87
					44.3 cm BR	44.3		44.55 2			
R75 44.94 S-R 0-17		44.75 2	44.7 2								
		Fe 45.15	45.3 2								
P61 45.35 S-R 1-18								45.45 2			
		45.90									
		46.45									
R49 46.8 S-R 0-18		Cr 46.70					46.9	46.90 2			
P27 46.79 S-R 1-19											
R49 47.3 S-R 0-18		47.30	47.5 1						47.05 2		
		Fe 47.65						47.50 1			47.67
		48.25									
P71 48.15 S-R 0-17		48.55	48.5 1					48.40 1	48.55 0		
		48.80	48.8								
		Fe 49.15	49.5		49.6			49.00 0			49.37
								49.70 0	49.85		
4150-4169		Fe 50.10									
		50.40						50.30 0			50.26

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	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4150-4169											
P45	61.05	S-R 0-18						51.10			
R33	61.50	S-R 1-19	51.40				Br 51.55 2	51.55 2			
		Fe	51.95	51.7 3					51.75 2BR		
				52.0 3	52.0	52.4		52.15 1			51.96
											52.17
		Fe	53.75	53.3 0				53.40 0			
				53.8							53.41
P29	64.15	S-R 1-19		54.1				54.15 1			53.91
		Fe	54.5 1								54.11
		Fe	54.6						54.35 3		54.50
				55.0				55.20 0			54.81
					Abs 55.3	55.4 0					
								56.05 1			
		Fe	56.55	56.5				56.40 1			56.68
					Abs 57.0						
		Fe	57.70 0			NO <sub>2</sub> 57.6 00		57.95 1			57.79
R51	58.32	S-R 0-18									
R51	58.6	S-R 0-18	58.55 0	58.3 2				58.50 1			58.80
R87	58.8	S-R 1-18									
R35	59.05	S-R 1-19					Abs 58.9 00		58.85		61.08
									59.25		61.49
				59.4 1			NO <sub>2</sub> 59.2 00		59.35		63.67
								59.60 1			
					Abs 60.1 BR			60.90 1			
F63	61.00	S-R 1-18		60.8 BR							
							61.2		61.25		
P31	61.85	S-R 1-19					NO <sub>2</sub> 61.8 00		61.75	61.85	
P47	62.45	S-R 0-18		62.5 BR							
P47	62.16	S-R 0-18					62.7		62.55 0	62.75	
				63.1			NO <sub>2</sub> 63.0 00				
					63.5				63.40 0	63.85 BR	
								64.40 0			
		Ba	65.85	64.7			NO <sub>2</sub> 65.7 00				65.42
	65.95 3				65.7						
P73	66.33	S-R 0-17						66.55			
								66.90 3			
R37	67.05	S-R 1-19								67.35 4	
					Abs 67.3						67.86
					67.8			67.70 1			67.96
		Fe	68.35	68.1 0				68.50 1			68.94
									68.65 4		68.77

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4180-4189  
P33 69.8 S-R 1-10

Abs 69.8

69.6 DR

Br 69.35 1 69.65 2

4170-4189  
R53 70.09 S-R 0-18  
R53 70.46 S-R 0-18

NO<sub>2</sub> 70.3

Br 70.05 1 70.25 2

Fe 70.65

70.5

70.6

70.65

70.90

71.1 0

Fe 71.90

71.40 0

71.70

Fe 72.35

72.10 0

72.12

R3 72.7 S-R 2-20

Fe 72.55

72.6 0

72.80 0

72.66

R5 73.25 S-R 2-20

Fe 73.20

72.75

73.22

73.47

73.5 1

73.2 0

Fe 73.75

73.70 1

73.92

Fe 74.15

74.2 0

74.5 00

74.35 1

Fe 74.70

74.7 0

74.7 0

74.65 3

74.81

Fe 75.50

75.4 0

75.6 0

75.64

R59 75.6 S-R 1-18

R39 75.6 S-R 1-19

R9 75.6 S-R 2-20

75.7 00

75.70 1

R6 76.29 S-R 2-20

Fe 76.30

76.4 0

76.2 0

76.1 1

76.40 1

76.57

77.25 S-R 1-18

Fe 77.20

77.3 1

77.4

77.30 2

76.85

R11 77.65 S-R 2-20

Fe 77.50

Abs 77.4

77.45 0

77.59

Fe 77.80

78.15 2

78.1

78.2

78.05

P35 78.48 S-R 1-19

P7 78.48 S-R 2-20

78.50

78.45 2

78.86

79.35 2

Fe 79.15

79.0

78.65 00

78.65 2

79.6

R13 80.05 S-R 2-20

80.0 1

77.9 0

80.05 2

80.25 1

P9 80.9 S-R 2-20

Fe 80.75

80.5 1

80.9 0

80.35

80.80 1

81.0 CN

Abs 81.0 2

81.30 1

Fe 81.65

81.75

Fe 82.25

82.35 1

82.38

R55 82.85 S-R 0-18

Fe 82.80

82.8 1

82.8 cm

82.9 0

Br 82.55

82.95 1

82.75 DR

R15 82.85 S-R 2-20

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	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4170-4189											
		83.40									
		83.60	83.7 1								
P11	83.93 S-R 2-20	83.95				83.8 0		83.85 1			
		84.15									
R41	84.28 S-R 1-19	84.30									
R41	84.6 S-R 1-19	85.50									
		Fe 84.75 5	84.90 1				84.80 1	84.80 2			84.89
								85.85 1	85.05 BR		
						86.0 1			86.25		
P51	86.90 S-R 0-18	Fe 86.90						86.95 1			87.04
P51	86.59 S-R 0-18										
P13	87.4 S-R 2-20	Fe 87.60	87.5 1			87.4 1	87.55	87.50			87.58
											87.80
P37	87.6 S-R 1-19								87.95 3BR		
		88.55						88.95 0			
		89.40				Abs 89.3 BR					89.56
			89.5 9					89.60 0			
		89.90									
4190-4209											
							90.10 1				
R19	90.1 S-R 2-20	90.25	90.25 0			90.0 0		90.25 0	90.35 1		
								91.10 0			
P15	91.45 S-R 2-20	Fe 91.35	91.2 1			91.4 00					91.43
											91.68
							91.5 1				92.51
			92.1 2						91.85 0		
						Abs 92.6 BR		92.00 1			
						92.8					
		93.30	93.4 2					92.70	92.85 00		
		94.10						93.45			
R43	94.1 S-R 1-19					94.3 00	94.3 3	94.30 2		94.60 10	
R21	94.45 S-R 2-20		94.4 2								
R57	95.31 S-R 0-18	Fe 95.20	95.2 0					95.30 1			95.33
		95.55									95.62
R57	95.8 S-R 0-18	95.75	95.9 0				95.9 0	95.75 1			
		96.05							96.15 1		
		Fe 96.25	96.4 0			96.1 2		96.40 1			96.21
		96.70									96.53
P39	97.04 S-R 1-19	96.95	96.9 0			97.0 0		96.95 1			
P39	97.3 S-R 1-19		97.5 0				97.6 1	97.50 1	97.55 1		
	97.2 CN										
		Fe 98.20				Abs 97.7 2					98.31

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			2	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
	4190-4209											
		Fe	98.60				99.1 0	99.1 0	98.50 0			98.64
			98.85						99.20 1			
	R23 09.25 S-R 2-20		99.40	99.4 0						99.55 0		99.09
	P53 09.62 S-R 0-18		99.75									
	P53 09.65 S-R 0-18			00.0 0					99.95 1			
			00.50							00.55 0		
	P19 00.9 S-R 2-20	Fe	00.60				00.7 00		00.80			00.92
			00.85	00.7 0						01.30		
			01.15					01.40 0	01.45 1			
		Fe	01.40	01.5						01.75 0		
		Fe	01.90									
			02.10 Fe									
			02.55									02.03
		Fe	02.45									02.75
			02.85									
			03.00	03.0 1					02.90 1			
			03.55	03.8 00					03.65 0			03.57
	R45 03.92 S-R 1-19	Fe	03.90									03.98
	R45 04.25 S-R 1-19		04.20			04.20		04.40 3				
	R25 04.5 S-R 2-20			04.50 1					04.55 2	04.65		
			05.00 0						05.75 2			06.54
	P21 06.30 S-R 2-20	Fe	05.45				06.4					
			06.20	06.05 2								
			06.55				06.3 00		06.40 0			06.70
		Fe	06.95									
	P41 07.23 S-R 1-19	Fe	07.20			07.3		07.50 1	07.40 1			07.13
	P41 07.45 S-R 1-19		07.55									
				07.8 1								
		Fe	08.5			08.3	NO <sub>2</sub> 08.2 1		08.55 0	07.65 2		08.61
	R59 09.2 S-R 0-18		09.05	08.9		09.2		09.25 1	09.10 1	09.35 BR		
	4210-4229											
		Fe	10.25			10.1	10.1 1		10.20 0			10.35
	R27 10.35 S-R 2-20		10.40 0					10.5	11.00 0	10.55 2		
			11.50	11.55 25		11.35						
								11.8 3	11.65 2			
				12.5 0			BR 11.9 0		12.65 0	12.45 2		
									13.35 0			
	P55 13.21 S-R 0-18								13.60 0			13.65
	R3 13.21 S-R 0-19											
	P55 13.55 S-R 0-18	Fe	13.55									
	R5 13.55 S-R 0-19									13.95 0		
						14.1						
	R47 14.5 S-R 1-19							14.7 OBR				
	R47 14.45 S-R 1-19											
	R7 14.45 S-R 0-19								14.35 1			
	R7 14.85 S-R 1-19								14.80 1			

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	2	BB	3	G.D.	4	7	Batrd King	Total King	Mike	King 1st max.	Fe
4210-4220											
	15.60	15.45									15.42
	42.16	16.10			Abs 16.1			15.90 1			15.97
P6, R9 16.62 S-R 0-10							16.9 00BR		16.75 1		16.18
			17.0 BR		17.0 em			17.00 2			
P43 17.89 S-R 1-10		Fe 17.45				NO <sub>2</sub> 17.7 0					17.56
P43 18.30 S-R 1-10					Abs 17.7 1						
							18.4 2	18.30 1			
P7, R11 18.75 S-R 0-10						NO <sub>2</sub> 18.6					
		Fe 19.25	18.9 0		Abs 19.0 0			18.90	18.95 4BR		19.36
								19.60 1			
		Fe 20.20	20.0 0			19.5		20.35			20.34
					Abs 20.5 3			20.6 0BR			
					20.9	21.1 00		21.15 1			
R13 21.09 S-R 0-10					BR 21.4 em						
P9 21.60 S-R 0-10		Fe 22.10						21.60 1	21.75 BR		22.22
								22.30 1	22.45 0		
	23.56 N <sub>2</sub> <sup>+</sup>	23.05 1	23.2 2					23.20 1			
R61 23.3 S-R 0-10						23.8	23.5 0BR		23.55 0		
R15 24.0 S-R 0-10		Fe 24.05						24.20 0			24.17
		24.30									24.51
									24.75 00		
			24.9 2			25.1 00		24.85 1			
P11 25.39 N <sub>2</sub> <sup>+</sup>		Fe 25.35						25.45 1			25.46
R49 25.6 S-R 1-10											
P27 25.6 S-R 2-20		Fe 25.85						25.7 1	25.75 3		26.95
		26.40									26.43
		Ca 26.60			Co 26.5 em			26.65 0			
			26.9 0						26.95		
P57 27.36 S-R 0-10		Fe 27.35				27.5 00	27.4 1BR				27.43
R17 27.36 S-R 0-10											
P57 27.75 S-R 0-10											
	28.30 N <sub>2</sub> <sup>+</sup>				28.3 em			28.40 3		27.80	
	28.59 N <sub>2</sub> <sup>+</sup>							28.50 1			
	29.62 N <sub>2</sub> <sup>+</sup>	Fe 29.50	29.5 0				29.5 2	29.60 3			29.76
	29.76 N <sub>2</sub> <sup>+</sup>				BB 29.9 em				29.85		

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	2	3	G.D.	4	7	Beard King	Total King	Mike	King 1st max.	Fe
4230-4240		30.20								
		30.35					30.55 1			
R19	30.8 N <sub>2</sub> <sup>+</sup> 31.08 S-R 0-19	30.7		30.8 1 31.8 em	NO <sub>2</sub> 30.6 1 VVBR 31.9 1			30.95		31.70
P15	32.90 S-R 0-19	32.80 2BR		32.1 1			32.05 3			32.73
P29	32.90 S-R 2-20 33.20 N <sub>2</sub> <sup>+</sup> 33.89 N <sub>2</sub> <sup>+</sup>		Fe	33.4 em	NO <sub>2</sub> 33.1 1	32.80 1BR	33.20 3 33.95	32.85 2		33.10 33.61
		34.20			34.3 1					
P21	34.53 N <sub>2</sub> <sup>+</sup> 34.89 N <sub>2</sub> <sup>+</sup> 35.25 S-R 0-19	Mn	35.15	34.6 15	34.5		34.60 2	35.20 2		
	35.91 N <sub>2</sub> <sup>+</sup> 36.65 N <sub>2</sub> <sup>+</sup> 36.60 N <sub>2</sub> <sup>+</sup>	Fe	35.90		35.5		35.85 2			35.94
P17	37.43 S-R 0-19			36.80 5	36.6 em		36.65 3			
R51	37.43 S-R 1-19									
R53	37.43 S-R 0-18									
R51	37.75 S-R 1-19				37.6 em		37.60 1			37.16
P63	37.7 S-R 0-18	Fe	37.95		NO <sub>2</sub> 37.7	37.70 3BR	38.30 1	37.85		38.03
	38.45 S-R 2-20									
		FeII	38.80		NO <sub>2</sub> 38.7			38.55 3		38.82
				39.2 0			38.00 2			
R23	39.71 S-R 0-19									
R23	39.90 S-R 0-19	Mn	39.75							39.73 39.84
		Fe	40.30				40.05 0	40.15 0		40.37
P31	40.90 S-R 2-20				N <sub>2</sub> <sup>+</sup> 40.9 2 em					
P47	41.40 S-R 1-19	Fe	41.10	41.2 2		41.15 2	41.10 5	41.25 4		41.11
P19	42.40 S-R 0-18									
P59	42.40 S-R 0-19				42.4 2		42.40 2			
	CH <sub>2</sub> O	Fe	42.55			42.50 1		42.65 1		42.58 43.36
				43.2 2	43.15 2		43.15 2	43.25		
R25	44.78 S-R 0-19					44.95 0BR	44.80 3			
R25	45.15 S-R 0-19			45.15 2	45.2 2					

	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4230-4249		Fe 45.20									45.28
		Fe 46.00							45.45		46.09
46.8 S-R 2-20							46.8 BR	46.30 0	46.95		
		Fe 47.30			47.2 2			47.15 0			47.43
		Fe 48.15	47.5 2			NO <sub>2</sub> 47.7 2					48.22
		49.00	49.15 3		49.05	49.0 00		49.20 4			
49.35 S-R 2-20							49.5 BR		49.45		
4250-4269											
49.85 S-R 1-19		Fe 50.10				49.9 00	50.00	50.00	50.15		50.13
R27 50.39 S-R 0-19					50.4						
R27 50.7 S-R 0-19		Fe 50.75			50.8 Fe		50.85	50.85	50.85		50.79
							NO <sub>2</sub> 51.1 0				53.93
								52.00 0			
52.54 CO			52.5 BR								
52.95 S-R 0-18					52.9 BR			52.90 2			
52.87 S-R 1-19							53.5 OBR				
P23 53.65 S-R 0-19			53.6 BR					53.60 2			
		Cr 54.35			54.3 Co				53.85		54.93
								54.80 2	54.95 5		55.49
			55.1 0					55.60 SR			55.85
											56.22
55.55 S-R 2-20						NO <sub>2</sub> 55.8 0	55.7 OBR		55.85 2		56.15
			56.2 BR		56.2						56.32
R29 56.89 S-R 0-19								56.55 2			56.95
R29 56.82 S-R 0-19											
R29 57.7 S-R 0-18											
					57.9	57.8 BR					
			58.0 BR					58.0 2			
58.25 S-R 2-20							58.25 OBR		58.45		
			59.5		59.4			59.50 2			
P25 59.95 S-R 0-19											
		Fe 60.15					60.0				60.00
		Fe 60.45									60.13
					60.9 00						60.47
			61.0			61.0		61.05 2			
62.2 S-R 1-19		62.35	62.25		62.2 2 em	63.3	62.4 1	62.45 2			
									62.85 2		
R31 63.26 S-R 0-19											
R31 63.50 S-R 0-19			63.7		63.6			63.80 2			

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	2	BB	3	G.D.	4	7	Saird King	Total King	Mike	King 1st max.	Fe
4270-4289											
R35 77.7 S-R 0-19					77.7 1	77.3 0					
P39 77.7 S-R 2-20											
78.1 N <sub>2</sub> Head			78.0								
R35 78.2 S-R 0-19						NO <sub>2</sub> 78.6 1	78.0	78.00 8	78.06 6		
P63 79.62 S-R 1-19					79.7 00						
P63 80.0 S-R 1-19							79.9	79.85 2			
									80.15		
P31 81.95 S-R 0-19					81.7 em						
	82.40 Co	Fe	82.40								82.40
	83.10 SBA	Ca	83.05		83.0						
					83.9						
		Fe	85.45		85.0		85.0 3	85.40	85.45		85.44
	86.0							86.05			
R37 86.3 S-R 0-19									86.25		
		Fe	86.95								
				87.4							
					87.2						
P41 88.2 S-R 2-20											
		Fe	88.10								
P65 89.05 S-R 0-18					88.7						
R59 89.05 S-R 1-19											
		Cr	89.75								
4290-4309											
R59 89.95 S-R 1-19											
P65 89.95 S-R 0-18											
P33 90.3 S-R 0-19	91.1										
R3 91.90 S-R 1-20											
R7 93.44 S-R 1-20											
R7 93.90 S-R 1-19											
P55 93.90 S-R 1-19											
	94.10 Fe	Fe	94.10		93.9			93.95			
									94.25 2		94.12
											94.58
R39 94.9 S-R 0-19											
R9 94.95 S-R 1-20								95.00	95.10 BR		
P5 95.65 S-R 1-20	95.8 BR										

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	2	3	G.D.	4	7	Baird King	Total King	Mibe	King 1st max.	Fe
4290-4309							96.15	96.15		
				96.4 00 cm			96.90	96.95		
R11 96.70 S-R 1-20										
R47 96.10 S-R 2-20										
		Fe	98.05							98.04
P35 99.2 S-R 0-19		Fe	99.30		99.0 Co	99.1				99.24
P43 99.2 S-R 2-20										
R13 99.2 S-R 1-20							99.30	99.45 4		
	00.5 BR									
	01.2 BR				01.6 00					
				01.9		01.9				
R15 02.00 S-R 1-20	02.1 00	Fe	02.20				02.20 BR	02.25 1		02.19
R74 02.03 S-R 0-18	02.5 BR									
		Fe	03.10							
					Abs(?) 03.1					
P11 03.5 S-R 1-20					Abs(?) 03.7	03.6 1	03.7	03.55 2		03.16
R41 03.8 S-R 0-19										
R61 04.1 S-R 1-19										
R61 04.3 S-R 1-19					Abs(?) 04.5	NO <sub>2</sub> 05.1 1		04.35 2	04.45 2	
				04.9						
P17 06.35 S-R 1-20		Fe	06.50				06.30 5	06.55 2		06.45
	05.8 0									
P67 06.6 S-R 0-18						07.0 1	06.85			
P67 07.05 S-R 0-18							07.20 0			
P13 07.05 S-R 1-20										
P57 08.2 S-R 1-19		Fe	07.90							07.90
P37 08.5 S-R 0-19						NO <sub>2</sub> 08.6 1	08.7	08.64 2		
P19 09.2 S-R 1-20		Fe	09.00					09.35 BR		09.03
		Fe	09.40							09.38
4310-4329										
	10.4 05					10.1 0				
P15 10.9 S-R 1-20					10.9 1 cm		10.95 2			
P45 10.9 S-R 2-20								11.25 2		
						13.1 BR	12.65 0			
P43 13.55 S-R 0-19				13.4			13.50 2			
R21 13.55 S-R 1-20								13.75 3		
		Fe	15.10							14.38
						NO <sub>2</sub> 15.6 0	15.65 1			15.08
		Tl	16.76					15.90 1		19.71

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	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
<b>4310-4329</b>											
P39	18.01 S-R 0-19							17.30 1			
P39	18.35 S-R 0-19	18.45				18.4 0		18.20 2			
R23	18.35 S-R 1-20									18.75 1	
R63	19.09 S-R 1-19				19.2 ]			19.40 3			
R51	19.35 S-R 2-20									19.80 2	
R63	19.40 S-R 1-19										20.84
R73	19.85 S-R 0-18	20.70						20.70 2			
P19	20.7 S-R 1-20	20.8 Co				20.6 0			20.95 2		
		Fe	21.85								21.80
					22.6 ]	NO <sub>2</sub> 22.1 1 ]		22.85 3			
P47	23.1 S-R 2-20	23.1 15			23.6 ]						
							23.5	23.60 3			
P45	23.65 S-R 0-19					NO <sub>2</sub> 24.0 1 ]			23.95 2		
R25	23.85 S-R 1-20										
P59	23.85 S-R 1-19										
R69	24.17 S-R 0-18		24.0								
R69	24.75 S-R 0-18				25.6			24.80			
		Fe	25.80								25.76
						NO <sub>2</sub> 26.0 ]		26.15 3			26.76
									26.50 0		27.09
						NO <sub>2</sub> 26.9 ]					
P41	28.75 S-R 0-19							28.60 0			
					Abn 28.9 VBR						
R27	29.5 S-R 1-20				29.0 1BR			29.50 2	29.70 0		
<b>4330-4349</b>											
		30.7						30.00 2			
									30.70 0		30.15
											30.95
			32.0					32.30 4			
P23	32.35 S-R 1-20	32.8 2BR							32.45 3		
							32.7				
P47	34.55 S-R 0-19							34.50 4 ]			
R65	34.57 S-R 1-19								34.75 1		
R65	35.10 S-R 1-19							35.20 4 ]	35.25 1		
							35.6 BR	35.75 2			
R29	35.80 S-R 1-20				36.0				35.95 1		

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	2	NO	3	G.D.	4	7	Baird King	Total King	Mibe	King jet max.	Fe
4330-4349											
		Fe 37.05				NO <sub>2</sub> 37.1		36.60 0			
R75 37.34 S-R 0-18					37.4 16 cm			37.20 0			37.04
R76 37.85 S-R 0-18									37.85	37.80	
								38.10 0			
P61 38.93 S-R 1-18											
P25 38.95 S-R 1-20					38.25 cm		38.7	38.70 2			
						BR		39.55 2	39.05		
P81 39.4 S-R 1-19						NO <sub>2</sub> 39.4 VV		40.30 1	39.65		
P43 39.85 S-R 0-19											
P71 42.82 S-R 0-18											
R31 42.80 S-R 1-20					42.4 cm		42.5	42.45 4			
			42.7 0						42.75 BR		
		Fe 43.35									43.40 43.25
					43.8						43.70
					44.1						
		Cr 44.50									
					45.0						
R49 45.5 S-R 0-19			45.8 0				45.6	45.40 5			
R55 45.5 S-R 2-20											
R49 45.85 S-R 0-19					45.8						
P27 45.90 S-R 1-20									46.05 BR		
		CrFe 46.60									46.55
								47.15 1BR			
		Fe 47.85			47.7	NO <sub>2</sub> 47.4 2					47.85 47.85
		Fe 48.85				NO <sub>2</sub> 48.6 2		48.25 1			
P51 49.1 S-R 2-20								48.95 1			48.83
			49.9								
								49.95 2			
4350-4369											
	50.40	Fe 50.45	50.3			NO <sub>2</sub> 50.0 2			50.35 2BR	50.40	
P45 50.75 S-R 0-19											
R67 51.39 S-R 1-19								51.20	51.40		
R67 51.14 S-R 1-19		Fe 51.65									51.56 51.76
		Fe 52.75				NO <sub>2</sub> 52.9 1					52.50
			53.2 0		53.5	NO <sub>2</sub> 53.5 1		52.40 0			52.73
P29 53.45 S-R 1-20								53.20 3	53.70 4	53.80	

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	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4350-4369											
P63	55.31	S-R 1-19						55.60 VBR	55.40 1		
P63	55.75	S-R 1-19							56.15 1		
R77	56.7	S-R 0-18						56.75	56.85 1		
		Fe	58.50		58.5		57.7				57.57
R51	57.65	S-R 0-19					58.8		57.85 2		58.50
R57	59.35	S-R 2-20						59.10 0	59.45 VBR		
					60.0						
							60.8		60.35		
P31	61.5	S-R 0-18									
P31	61.5	S-R 1-20	61.55	VVBR						61.65 4	
							62.1		61.95		
					62.8				63.00 2	63.15 1	
					63.3 2						
					64.0 00						
		Fe	65.80								
R37	66.1	S-R 1-20			66.1 0				66.00 2	66.15	
		Fe	67.50				66.6		67.15 0		67.58
											67.90
R69	67.71	S-R 1-19			67.8 cm						
R69	68.2	S-R 1-19	68.15 6						68.20 4		
	68.3	Ol								68.40	
		Fe	69.80				69.3		69.95 2		69.77
R53	69.95	S-R 0-19									
P33	69.95	S-R 1-20									
4370-4389											
										70.10 1	
P65	72.14	S-R 1-19			72.4 cm						
P65	72.65	S-R 1-19									
R3,R5	72.85	S-R 2-21							72.70 2	72.85	
		Fe	73.60								
R7	73.6	S-R 2-21			73.5 cm				73.7 1	73.65 1	73.56

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	2	3	G.D.	4	7	Netd King	Total King	Mlbc	King 1st max.	Fe
4370-4389										
P3	74.15 S-R 2-21				74.1 00			73.85		
R39	75.00 S-R 1-20			75.0 cm	75.0 0		75.15 2BR	75.15 2		
R9	75.00 S-R 2-21									
P49	75.6 S-R 0-19									
		Fe 76.96	78.5 Fe	75.0 cm	75.8 0					75.83 76.78
P6	76.85 S-R 2-21									
R11	77.04 S-R 2-21			77.1 cm	77.0 0					
P65	77.4 S-R 2-20						75.35 5BR	77.55 BR		
P7	78.05 S-R 2-21							78.55		
P35	79.15 S-R 1-20			78.7 1	79.5 0		79.10 2BR			
R13	79.64 S-R 2-21							79.55		
P9	80.75 S-R 2-21			80.9 OBR	80.7 0		80.90 OBR			
							81.80 0			
R56	82.45 S-R 0-19				82.45 0		82.65 5			
R15	82.45 S-R 2-21									
		Fe 83.65	83.2		83.5		83.55 5BR			82.77 83.54 84.09 85.38
P11	83.85 S-R 2-21				83.9 0					
R41	84.35 S-R 1-20						84.45 5BR	84.45 1BR		
R71	85.22 S-R 1-19		85.4 VVBR				85.45 1			
							85.90 3			
R71	85.9 S-R 1-19				85.9 1	86.0		86.05 1	86.00	
R17	85.9 S-R 2-21									
				86.3 cm			86.45 0			
P13	87.65 S-R 2-21	Fe 87.90			87.65 1		87.70 BR	87.85 0		87.89
			88.2						88.00	
		Fe 88.40	88.5 BR			88.3 1	88.45 2			88.41 89.24
P51	88.7 S-R 0-19			88.7				88.95 1		
R19	89.91 S-R 1-19									
R19	89.9 S-R 2-20			89.9 00	NO <sub>2</sub> 89.9 2		89.80 2			
4390-4409										
P67	90.3 S-R 1-19		90.3 0		90.5 00		90.15 3	90.05	90.20	
							90.55 2			90.95
				91.9	91.8 0		91.80 2			
P15	91.85 S-R 2-21		92.2 BR			92.1 0		92.05		

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	2	B8	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4390-4409											
P57 92.45 S-R 2-20						93.5 ]		92.65 2BR	92.75	93.45	
R43 94.35 S-R 1-20					94.2 BR	94.5 ]	94.3	94.15 2	94.55		
		Ti 95.10						95.30 1BR			95.28
R57 96.25 S-R 0-19								96.35 2			
R81 96.50 S-R 0-18					96.7	96.5 0	96.5		96.65 2	96.45	
P17 96.50 S-R 2-21								97.00 2			
					97.8			97.85 0			
P39 98.85 S-R 1-20			98.9			NO <sub>2</sub> 99.0 1 ]	98.9	98.75 5 ]		99.15	
R23 99.35 S-R 2-21					99.2			99.50 5 ]	99.65		
								00.40 2BR		00.45	
					00.8 0	NO <sub>2</sub> 00.5 0					00.35
		Fe 01.40									01.45
P77 01.70 S-R 0-18					01.7 0	NO <sub>2</sub> 01.7 1 ]	01.8	01.95 2BR	01.95		
P49 01.70 S-R 2-21											
P53 02.3 S-R 0-19					02.3 0					02.15	
									02.65 1		
		02.60						03.25 2 ]	03.25 2 ]		
						04.0 00					
R45 04.8 S-R 1-20		Fe 04.75					04.8				04.75
						05.1 00		05.13 2 ]			
P21 07.4 S-R 2-21						07.4 1					
								07.05 1 ]			07.71
		Fe 07.70						07.50 1 ]			
								08.10 0			
P59 08.65 S-R 2-20		Fe 08.45						08.60	08.55 BR		08.41
P41 09.5 S-R 1-20											
								09.55 1			
					09.75 0 cm				09.85 0		
4410-4429											
					10.7 0 cm			10.80 1BR			10.71
						10.8 ]			11.15 0		
								11.80 1			
					12.4 00 cm			12.35 1			

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	2	3	G.D.	4	7	Beird King	Total King	Mibe	King 1st max.	Fe
4410-4429				13.5 00 cm	13.5		13.60 5 14.55 0			
				15.0				14.85 1		15.12
	Fe	15.15		15.7						16.81
										19.54
R55 16.55 S-R 0-19					16.5		16.0 5	16.15 1		
				17.3			17.15 4			
					17.6			17.55 2		
							18.15 0			
				19.1			19.0 3			
P25 20.3 S-R 2-21				20.1			19.9 0			
P43 20.7 S-R 1-20							20.35 2	20.45 3		
			21.3			NO <sub>2</sub> 20.7 0				
							21.55 0			
							22.10 1			
	Fe	22.60		22.7 BR		NO <sub>2</sub> 22.3 0				22.57
P79 22.7 S-R 0-18							22.90 1	22.85 2		
R76 22.7 S-R 1-19										
	Fe	23.90								
R31 24.3 S-R 2-20				24.5 BR	24.5 VBR		24.4 2	24.55 1		
							25.25 0			
								25.45 0		
							26.15 5			
						NO <sub>2</sub> 26.7			26.35	26.35
R49 27.3 S-R 1-20	Fe	27.30					27.15	26.35 1		27.31
P27 27.3 S-R 2-21								27.65 2		
		28.20				NO <sub>2</sub> 28.0				
				28.9 00 cm						
								29.85 00	29.75	
4430-4449										
	Fe	30.15								30.20
	Fe	30.62				30.3 VVBR				30.61
33 31.9 S-R 2-21	31.85 3BA	31.90		31.7 0						
45 32.75 S-R 1-20			37.7 0	32.6 0			32.88	32.65 1BR		

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	2	BB	3	G.D.	4	7	Burd King	Total King	Mike	King 1st max.	Fe
4430-4449		Fe 33.25									32.57 33.22 33.78
		Ti 34.00			34.8 1	33.7 0		34.26 0			
		35.15	35.2 0					35.16 10			35.16
P29 35.29 S-R 2-21					35.5 1				35.45 2		36.93 38.35 39.88
								38.50 0			
					37.2 0					38.90	
					38.0 0						
R51 39.65 S-R 1-20	38.25 0							38.80 0			
					39.9 0			39.90 8			
R35 39.95 S-R 2-21									40.05 1		
					42.1 1			41.85 1		42.25 1	
		Fe 42.35									42.34
						42.8 1				42.95	
P31 43.55 S-R 2-21		Fe 43.25						43.8 1		43.20	43.19
									43.85 05		
P47 44.8 S-R 1-20								44.9 2			
					46.3 0			45.8 1			
		Fe 46.85								46.35	46.84
					47.7			46.7 2		47.45 2	47.72
		Fe 47.75								48.20	
R37 48.55 S-R 2-21			48.4								
					48.7			48.1 5		48.85 1 VBR	49.21
	49.15 00	Ti 49.15						49.1 5			49.65
									49.95 1		
4450-4469											
	50.85	Ti 50.40			50.8	49.8				50.95 1BR	50.31
		Mn 51.60									51.54
					52.2						
R53 52.10 S-R 1-20							52.4	51.02			
R53 52.40 S-R 2-21								51.75 0			
								52.30 5	52.55 0BR	52.70	

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	2	SP	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4450-4469	53.15 BR	Mn	53.05			53.2		53.3 0			54.38 55.03 55.25 55.10
	54.2 55.3				54.7			54.5 0			
			55.7 00			55.0 00		55.5 0	55.65 1	55.10 55.60	
						56.5		56.3 1			
					57.6			57.6 3			
							57.9		58.05 2	57.95	
		Fe	59.15		59.3 1	57.6 58.8 59.8		58.8 0 59.55 2 60.3 0 61.15 3			59.12
		Fe	61.35		61.5	NO <sub>2</sub> 61.1 0				61.35	61.22 61.65
		Fe	61.70								
		MnFe	62.00		62.6 1						
						62.5 00		63.0 63.90 0	63.9 1	64.05	
									64.35		
		MnCrFe	64.70			63.7		64.70 0			64.77
					65.15 0			65.50 0 66.40 3	66.05 00		
		Fe	66.55			65.5			66.95 00		66.55 66.94
	67.2				67.3	67.0		67.30 3	67.65 2		
								68.25 1			
	68.4 69.20 4	Fe	69.40 69.65			68.0					69.38
						69.1 00 BR		69.60 2			
4470-4489										70.10	
	70.45				70.80 em			70.50			

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2	BB	3	G.D.	4	7	Sard King	Total King	Mike	King 1st max.	Fe
4470-4489										
						70.6 00BR	71.65 2BR	71.75		
72.70	Fe 72.75								72.80	72.72
						72.7 BR	73.20 2			
						74.6 ]	74.30 2			
	Fe 76.05			75.2 cm		76.0 ]	75.40 0BR			
				76.3			76.40 5		76.05	76.02
				77.6					76.75	
							77.60 1BR	77.85		
								78.25		
	Fe 79.55					NO <sub>2</sub> 78.7 2 ]	79.53 1VBR		79.20	79.82
	Fe 80.15			80.2						80.14
						NO <sub>2</sub> 80.3 1 ]	80.92 1VBR		80.75	
				81.8				81.15		
						81.6 1	82.1 1VBR	82.15	81.95	
	Fe 82.30									82.17
82.6	Fe 82.75							82.65		82.25
				83.4 BR					83.35	82.75
	Fe 84.25					83.1 1		83.85		
						83.9 0 ]				84.22
	Fe 85.70	85.0 BR		85.2 BR		85.1 0 ]	85.2 2		84.90	85.68
							85.9 2BR	85.65		86.13
										88.91
										89.18
										89.74
				88.2		NO <sub>2</sub> 87.3 1 ]	87.33 0			
89.00 BA		88.4 BR					88.35 3	88.55	88.60	
						NO <sub>2</sub> 88.5 1 ]				
4490-4509										
							90.3 1BR		90.50	90.08
										90.78

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	2	80	3	G.D.	4	7	Said King	Total King	Milch	King 1st max.	Fe
4490-4509						89.9 0					91.40
			92.5 BR			91.1 0		91.6 0			
					92.8			92.7 1			
	94.5	Fe	94.60		94.7 1			94.0 1	94.15		
		Fe	95.85			94.8 00		95.5 1			94.50
											95.90
					97.3	96.1 00		96.2 1			
		CrMa	98.75			97.2 0		97.25 2	97.15		
					99.7 2BR			99.1 3			
								99.95 3	00.45 2		
NHr 4502					01.0			00.90 2			
						00.4 00		02.00 1			
					02.3						
						NO <sub>2</sub> 01.7 00		02.70 1			
						NO <sub>2</sub> 03.0 00		03.60 0			
		Fe	04.80		04.5			04.55 5			02.50
						NO <sub>2</sub> 04.1 00					04.84
		BR						05.55 2	06.15 2		
	05.85 10		05.90								
		TiCr	06.85			05.4 00		06.25 2			
								06.95 2			
		Fe	08.05		08.0	06.3 00			07.35		
						07.2 00		08.00 2			08.28
								08.74 0			
			09.35					09.20 2			
4510-4529					09.9			10.10 1			
						08.8 00					
					10.7			10.90 2			
						09.6 00					
					11.8			11.70 2			
						11.5 00					
			13.35					13.45 3			
	14.00 Fe				14.1						
		Fe	14.25			13.0 1		14.45 2			

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	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4510-4529		Fe 15.30			15.3			16.50 0			15.34 17.63
			16.0			15.0 0		16.20 2			
	16.40				16.5			16.90 1 17.80 2 18.80 2			
		Ti 18.75			18.9						
		Cr 19.85					NO <sub>2</sub> 18.3				
		Fe 20.20					NO <sub>2</sub> 21.0	20.0 2 21.50 2 22.55 2 23.25 1		20.15	20.23
	23.0 5BR	Ti 22.70									22.83
		Fe 23.20									
					24.8		NO <sub>2</sub> 23.5	24.15 4BR			
	24.9 BR										25.14
	25.00 Fe	Fe 25.00									26.41
								25.80 1BR			
	25.9									25.95	
	26.5 Fe							26.46 1			
	27.2									27.35	
	27.8							28.15 0 28.60 0 29.20 1			28.61
		Fe 28.65									
		CrTiFe 29.65					NO <sub>2</sub> 28.2				29.58 29.67
4530-4549											
	30.05 1 cm							30.20 0 30.90 1			31.51 31.65 34.18
	31.1 00 cm	Fe 31.20									
	31.6 cm					30.2 00		31.8 4		31.85	
	32.3 3 cm										
		Ti 33.40			33.4			33.50 2		33.45	
	33.6 3										
							NO <sub>2</sub> 33.0 1	34.70 2			34.80

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Massy close lines

	2	SP	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4530-4540											
35.5 N <sub>2</sub>	36.2 2				35.5	NO <sub>2</sub> 34.4		35.95 2			
					36.5 00			36.85 2		36.80	
	37.25 3					NO <sub>2</sub> 35.2 1		37.50			
					37.9 BR			38.35			
								39.00 2		39.50	
								39.90 2			
								40.65 2		41.05	
								41.35 2			
								42.00 2			
	43.0 Abs				43.5 BR	42.0 1		43.70 3			
								44.90 0		45.15	
	45.95				46.5 BR	44.0 0		46.95 4BR		46.90	
	47.65							47.90 3BR		48.10	
						47.7		49.00 1			
						48.4		49.85 1			
4550-4560	50.25 0							50.90 2		50.10 50.95	
											41.52 42.42 47.02 47.85 49.47
	51.5 OBR				51.9	NO <sub>2</sub> 50.7		51.80 2		50.79 52.54 55.09 56.12	

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	2	BN	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4550-4569								53.30 0			
54.04 Ball	53.96 20	Ma 54.10	53.9		53.9			54.45 2BR		54.10	
						52.6					
						53.4		55.50 2			
	56.10 Co							56.45 2			
	Abs 57.65 1					58.5		57.00 2			
										58.60	
							NO <sub>2</sub> 58.0 BR	59.0			
					60.2		NO <sub>2</sub> 59.4 VBR	59.7		60.35	
	61.0 cm							61.2 1			
								62.0 2		62.00	
								62.95 2			
					63.6 cm			63.65 1BR		63.75	
						63.4		64.35 1BR		64.20	
					65.5			65.15 0			
			66.2					65.95 0			
					66.2			66.50			
								67.60 1			
					68.3			68.35 1			
	68.8									69.25	
4570-4589								69.15 2			
	70.2					70.0		70.05 2			
	70.9					71.0		70.85 2		70.70	60.09
											65.32
											65.65
	71.6										66.52
								72.1 0			68.77
	72.7										74.50
											74.72
											74.33

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	2	3	G.D.	4	7	Baird King	Total King	Milke	King 1st max.	Fe
4570-4580	72.9						72.9 2			
	73.8	Ba 73.95		74.0 BR						
74.0 ND 74.3 N2				74.6						
						74.2	75.00 5 76.30 1		74.95	
	76.6						76.95 2			
	77.3						77.90 2 78.60 2			
	79.6	Ba 79.70					79.50 3		78.90	
				80.1		NO <sub>2</sub> 77.8 BR				
							80.35 1		80.20	
	81.4 Fe					NO <sub>2</sub> 79.3 2	81.1 1			
							82.01 BR		82.00	
							82.8 1			
		Fe 83.80		83.5 Fe			83.65 6			80.60 81.62 82.83 83.84 84.82 87.13
									84.80	
						82.6	85.05 1 85.75 2			
	86.35 1			86.0 em			86.65 2			
	89.7 1			89.9			88.40 2BR 89.75 3		88.40 79.85	
590-4609										
	90.6									
	91.6 2					86.4	90.90 3			
							92.00 1BR		91.80	

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	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4590-4609	92.6	Fe	92.70			92.6	NO <sub>2</sub> 90.3 0					92.65
				93.3 0					92.90 2BR			
	94.05 1BR						NO <sub>2</sub> 91.5 1		94.25 0			
				95.6 0		95.5	NO <sub>2</sub> 93.1		95.10 1		94.60	
			95.85						95.75 4			95.36
	96.00											96.06
						96.5			96.60 3		96.40	
	97.5					97.6	94.5		97.30 0		97.45	
		Fe	98.00						97.90 0			
				98.5		98.7	95.8 1 VBR		98.60 5		98.30	98.13
									99.20 2			
99.7 N <sub>1</sub>		BiFe	99.85			99.6	97.8 1		00.05 2			
				01.2		01.3			00.80 0			
											01.30	
						02.6			99.5 0			
		Fe	02.90						01.8 00			02.01
						03.9 BR						02.94
				04.1			NO <sub>2</sub> 03.8 1					
	04.9 1BR								04.30 3VBR		04.45	
				06.8		06.8	06.1					
	07.4 10	Cr	07.40			07.3			06.80 3		06.75	
				09.0			NO <sub>2</sub> 07.4		07.5			07.65
							NO <sub>2</sub> 08.3		08.7 2		08.70	
						09.0						
						09.6			09.50 2			
4610-4639		Fe	11.25									11.28
				11.8					11.72			

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	2	BB	3	G.D.	4	7	Saird King	Total King	Mike	King 1st max.	Fe
4610-4639		Fe 13.15						12.20			
			14.2			11.1 1BR		13.10 3			13.21
	16.2 1				15.4			14.0		14.15	
						13.3 0		14.6 2			
								15.3 2			
	17.3 1				16.9						
			16.7			16.0 00		16.8 5			
								17.95 1			
		Fe 19.35						19.05 3BR			
19.98 Bal	20.0 BR				21.3						18.75
						22.1 00		21.35 2			19.29
	23.2							22.70			
								24.25 1			
	25.10 Fe	Fe 25.10			25.7 BR	25.0 ]					25.05
						26.0 ]		25.55 4			
	26.5 BR							26.51 1		26.30	
								27.70 3			
	28.35 4									28.00	
								28.70 0		28.70	
	29.45	Tl 29.30			29.3			29.50 3			29.32
										29.70	
4630-4649											
						27.5 1					
						NO <sub>2</sub> 28.4 2				30.60	
					31.3	NO <sub>2</sub> 29.4 2		35.3			
					32.7						30.12
		Fe 32.90									32.91
						31.3 ]		33.20 2BR			35.32
											35.85
					34.5					33.65	

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	2	88	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4630-4649								34.80 2			
	35.8 VBR				36.5			36.40 3			
	36.50 VBR										
	37.4 BR	Fe	37.75								37.51
											38.01
	38.0 BR				38.0			38.15 3			
	39.2					37.1		39.35 2			
					39.4						
	40.8 0				40.7			40.55 2			
								42.0 1			
						40.9					
		Fe	43.40								43.47
	43.70										
					46.2			44.8 1			
								46.30 1			
								47.10 1			
		Fe	47.45								47.43
								48.1 1			
	48.2 Al 0	48.25 0	48.40								
						46.7					
4650-4669								50.1 2		50.10	
						48.4					
	51.2	Cr	51.15					51.15 2			
				52.3	52.1			52.05 5			
								54.0 0			
					54.3						
		Fe	54.65								54.50
											54.82
					55.9			56.0 1BR			
								56.95 1			
					57.4						
								59.0 0			

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	2	3	G.D.	4	7	Balrd King	Total King	Mike	King lot max.	Fe
4660-4669				59.3			60.2 3BR		60.40	
		60.3					60.95 3BR			
							61.7 3BR			
		63.1					62.65		62.65	
							63.20		63.65	
				64.5			64.50 2			
				66.9					66.60	61.53
							67.15 head			61.97
	Fe	67.45								67.45
	Fe	68.10				NO <sub>2</sub> 66.2 VVBR	68.15 1			68.14
	Fe	68.95								69.18
							69.90 10		69.45	
4670-4689					68.5				70.45	
							71.05 1BR		71.55	
	72.2 Al 0	72.0 10			70.0					
				72.5 BR em			72.90 2			73.17
		73.4 10								
	Fe	73.15								
							75.30 0		75.20	
							77.25 1		77.60	
							78.70 1		78.85	
	Fe	79.85							79.15	
				79.3 0BR		77.5 1				
	Fe	80.20				NO <sub>2</sub> 79.1 1			80.80	80.30
										83.56
				82.2 0			81.55 2			
							82.35 2		82.30	
						NO <sub>2</sub> 80.6 1				
							83.80 2			
				84.2 0		NO <sub>2</sub> 82.1 1	84.40 2			
				85.8 0			85.65 2			

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	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4670-4689								86.30 2			
						84.6 1		87.8 2VBR			
	88.2					86.2					
4690-4709					90.0						
						88.6		89.95 2VBR		91.15	
	91.4	Fe	91.55								90.14
	91.9 2BR							91.55 1VBR			91.41
	92.35						90.6 VVBR				
	93.30		93.10		93.0 0			93.1 1VBR			
	94.15 00										
	94.85 2	Fe	94.75		94.8			94.75 2			
							93.5 VVBR				
	96.05 1							96.50 2VBR			
										97.15	
						95.7		97.80 1			
	98.65 15							99.05 1			
					99.6 abs-cm						
							97.9 1	00.25 1			
								01.45 1			
								02.55 1			
					03.1 BR-abs		00.7 1			03.55	
								03.65 1			
		Fe	04.90					04.50 1			01.05
											04.96
											05.46
								05.40 1			
					05.8 BR-abs		03.8 BR	06.20 1			
	07.30	Fe	07.25								07.28
											07.48
											08.06

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	2		3	G.D.	4	7	Bald King	Total King	Mike	King 1st max.	Fe
4690-4709 09.2 N <sub>2</sub> <sup>+</sup>		Fe	09.10					09.30 head(r)			09.09
	09.8 cm										
4710-4729	10.1	Fe	10.20								10.28
					11.0 1 abs						14.07
		Fe	11.65								
	13.7 cm										
	14.4 cm										
	15.2					14.7					
	16.2 2BR										
	18.1 1BR										
	18.2										
								17.8 0VBR			
	22.0		22.05							22.20	
	23.0										
	24.7 1BR				24.4 cm	21.7					
					25.4 abs						
	26.3	Ba	26.35								27.40
		Fe	27.35								28.55
										27.60	29.69
										29.45	
4730-4749	30.25 1BR										
								26.5 VVBR			
		Fe	31.40								31.49
Al H					31.9 abs						
	32.1									32.40	
	32.6										33.59
	33.6	Fe	33.45		33.9						
						31.3 1					
			34.75		34.9 cm					34.05	
	35.0				35.2 abs						

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	1	2	3	G.D.	4	7	Bald King	Total King	Mike	King 1st max.	Fe
<b>4750-4769</b>	59.0										59.10
	60.4										61.30
	61.5	Mn	61.60								
	62.50	1Fe	Mn	62.45	62.0 em						
	65.2	00BR									65.40
	66.7	Mn	66.40		66.4 em						66.55
	68.3		Fe	68.45							68.50
	69.7	BR			69.4						68.34
	71.5		Fe	71.65							68.39
	73.50		Fe	72.75							72.81
	76.2	0BR	Fe	76.00	73.0						75.50
	78.1	0BR			73.5 abs						77.65
	79.9	0			76.5 abs						79.25
	82.0	1			77.7 2 em						80.1 em
											80.5 abs
											83.35
			Mn	83.40							

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4770-4789

	2	BB	3	G.D.	4	7	Baird King	Total King	Mihc	King 1st max.	Fe
4770-4789	84.3 1									84.95	
					85.3 0 cm					86.30	86.81
	86.8 0 Fe	Ni	86.55							88.65	
	88.0										
	88.85 Co										88.75
	89.85 1	Fe	89.60								89.65
4790-4809	91.0 1										
	92.6 1	TiCr	92.40			92.2 BR					91.24
	94.6 1									93.70	
										95.10	
	96.4				96.0 BR-cm					96.00	
						96.2 BR					
						97.1 BR					
		Fe	98.20		98.0 cm					97.75	
	98.45				Abs(r)					98.90	
		Fe	00.70								00.65
		Fe	02.95							02.55	02.88
										03.70	
	05.5 BR				04.7 cm					05.05	
					06.1 cm						
	07.9 VBR									08.10	

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	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4810-4820											
	10.46 1	10.56			09.1 10.3						
	11.9	Fe 11.96									
					12.4 abs					12.30 13.35 15.00 16.15 18.70 20.85	
											21.04
		Mn 23.50									23.90
	26.4 0										26.30
					29.10 BR-cm(7)						
	29.5 0										29.45
143 4830-4840											31.75
	32.1 0										
	34.4 BR										
	35.9 BR	Fe 35.80									38.86
	37.3 0										
	38.6 BR	Fe 38.55									39.54
	40.4										
	42.1 Al 0										
		Fe 42.65									43.16
											44.01
	43.00 0 Al										45.65
		Ca 47.50									

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	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4830-4849										31.75	
	32.1 0										
					33.9 em						
	34.4 BR										
	35.9 BR	Fe	35.80								35.86
						36.1					
	37.3 0										
	38.6 BR	Fe	38.55								39.54
	40.4										
					42.0						
42.1 Al 0	42.3	Fe	42.65								43.16
											44.01
	43.00 Al										45.86
		Ca	47.50								
		Fe	48.15								
144, 4850-4869										50.71	
										55.80	
										59.50	55.88
		Be	59.75							59.74	
	60.3										
		Fe	61.10								
			61.95								
		Fe	62.55								
		Fe	63.80								
			64.60								
		Ti	65.40								
Al 0	66.4 2	Ni	66.45		68.5		66.8			63.36	63.65
	67.25 1										

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	2	BP	3	G.D.	4	7	Sold King	Total King	Mibe	King 1st max.	Fe
4860-4869	68.2	Tl	68.30		68.3		68.4			69.10	
			69.30								
4870-4889		Tl	70.25								71.32
		Fe	71.35								72.14
		Fe	72.30		73.4		74.4			76.10	
		CaFe	78.20		79.2 abs					81.30	78.21
						82	81.7				81.72
		Fe	82.30		82.9						83.30
			83.60								
							84.4 BR			84.45	
										86.10	
						85.5					
					87.2						
					87.4 head(r)		87.4 BR			87.95	
					87.8	87				89.10	
					88.5 BR						85.43
	89.1 BR	Fe	88.90								86.34
											88.66
											89.00
4890-4909										90.10	
		Fe	90.95								90.76

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	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4890-4909		Fe 91.50			91.6					91.45	91.49
					92.5		92.0 5			92.20	
						92.9				92.70	
							94.1 2			94.25	
	95.1 1						95.7			95.70	
	96.2 1				96.0 0						
					96.8 0		96.6			96.80	
	97.2 1										
	98.0 1										
	99.3 1						98.4			99.45	
4899.97 Ba					99.8 2 Ba						
	00.3	00.20					00.5				
										01.25	
										02.25	
										03.15	
	03.3 3	Fe 03.40									03.31
	04.8 2						05.0				05.18
	06.3 2VBR										
	06.5				06.5	06.4					
	07.6						07.6				07.74
	08.0 2	Fe 08.00									09.39
	08.9										
	09.6 2										
4910-4929											10.02
											10.32
	10.7 1VBR						10.6				10.57
							11.3				11.80
	11.9										
	12.8									12.95	
					13.5 BR						
							14.0			14.05	
	14.4 1										
	15.8				15.7		15.8				15.80
					17.0						
	17.4						17.6				
	18.4										

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	$\lambda$		$\lambda$	$\lambda$	$\lambda$	$\lambda$	Obs'd Wing	Comp'd Wing	Wing 1st obs.	Fe
4910-4929	18.8						18.9			17.26
	18.1	Fe	18.00							18.99
									18.75	20.80
		Fe	20.45							
22.29 CN	20.8	Cn	22.30							
	22.6				22.4					
	24.5									
	26.1									
	27.9	Fe	27.70							23.72
										23.91
										24.77
										25.29
										27.44
										27.87
							28.6			
	29.6		29.50							
4930-4949	30.4									
	31.3						32.2			
									33.25	30.33
34.10 BaII	34.10	Ba	34.00		33.9 6 cm					33.34
										33.62
										34.02
							34.8	35.0 2		
									35.85	
									36.65	
	37.10 0							37.1		37.60
							37.7			
					38.0 abs					38.18
		Fe	38.75							38.81
										39.24
										39.69
					40.5		40.4			

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	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4930-4949		42.20									
	42.6 1									42.90	
										43.66	
					44.2 head(r)		43.9				
	44.4										
	45.3						45.3			45.65	
	46.2 ]	Fe	46.35							46.40	46.63
										46.75	
	47.5 ]							46.8			
	48.4 1				48.3 cm		48.4			47.85	
										49.85	
4950-4960											50.10
	50.3 1	Fe	50.10		50.2 s						
							51.3 ]				
	52.5 1	Fe	52.25							52.45	52.64
							53.2 ]			53.95	
	54.3 BR										
		Fe	54.55								
	55.7 BR						55.1 ]				
							56.4 ]			56.65	
					57.3 Co					57.65	57.30
		Fe	57.45							57.60	
										58.45	
							59.1			59.75	
					60.3						
	60.7 0										
	61.0						60.9			62.00	61.91
			62.25							62.56	
	62.6 3				62.8 cm					63.30	

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BH1

	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4960-4969										64.35	
	64.7 2				64.6 cm						
	66.1	Fe	66.10		65.3 abs						66.09
	V edge							66.5			
	68.6	Fe	68.00		67.1 abs		68.0 head(r)				68.70
											69.92
4970-4989											
	70.1 0	Fe	70.05								70.49
	73.2 0	Fe	73.10								73.10
	75.8 0VBR						74.5 cm(r)				
					76.7			77.2 cm(r)			
		Fe	77.75								
	78.3 0BR	NaFe	78.55		79.0 1 cm						78.60
	80.2 0				80.4 0		80.4 cm(r)				
	82.5 0	Ti	81.80								82.50
		Fe	82.45				82.9 cm				83.25
		Fe	83.85								83.85
								82.9			
	85.5 0	Fe	85.35								85.28
							86.9 cm(r)				85.55
	87.6 BR										
		Fe	88.95								88.96
	89.3 BR										
4990-5009											
	91.3	TiFe	91.25				90.0 cm(r)				90.46
											91.27
		Fe	93.85		92.8						94.13
											95.62
	94.2 0						94.0 cm(r)				97.80
			96.20								

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	2	BB	3	G.D.	4	7	Burd King	Total King	Mike	King 1st max.	Fe
4990-5009	97.0 0										
	97.9										
		Tl	99.25								99.11
	99.5 IRR										
	01.9 1	Fe	01.80		01.2					01.3(r)	01.87
											02.80
	04.1 BR						02.2(r)	02.3			
		Fe	05.80								04.79
											04.99
	06.2 Co	Fe	06.20				06.4(r)				05.72
	07.6		07.65								06.13
	08.9										07.28
5010-5029							10.0				10.2
											10.85
	12.2 Co	Fe	12.00								11.31
											12.07
							12.3				
	14.4										
	15.1	Fe	14.95							15.15	14.95
	17.0										
		Fe	18.50								18.44
							19.1				
	19.9 BR				19.7 VBR-abs					19.4 1	
	22.2										
							24.4	24.4 2			
							25.9	26.2 IRR			
	27.1 4										
	28.2 00										
										28.7 3	
	29.7 00										
5030-5090											
		Fe	12.10								11.31
											12.07
		Fe	15.00								14.95
		Fe	18.40								18.44

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	2	DB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
5030-5090		Fe	21.75								
		Fe	22.35								22.25
		Fe	27.00								23.47
		Fe	27.35								27.13
		Fe	28.05								27.21
		Fe	28.75								28.13
		Fe	29.55					29.5			30.78
							30.1				
							31.2	31.25 0			
							33.0	33.05 0			
					34.3		34.5	34.54 2			
								35.8 2			
							36.2				
	36.5 BR							36.4 0			
								37.3 4			
		Ti	38.40					37.8 4			
		Fe	38.25					38.4 0			
								38.9 1			39.26
								39.7 1			
	41.1	Fe	41.00					40.40 1			41.08
		Fe	41.80					41.30 1			41.78
	42.10							42.85 6			
								44.0 3			
	44.3 1	Fe	44.20								44.22
								44.7			
		Fe	48.45					45.70 BR			
	48.8 0							46.5 0			48.45
		Fe	49.80					47.60 VBR			
								48.50 VBR			49.82
	50.0 1										
	51.8 1	Fe	51.65					52.3 3			51.83
			53.50			54.4		53.8 0			
		Fe	54.80								54.84
	55.1 2							55.3 0			
								55.8			
								58.4			
	60.3 00							60.1			
								62.0			
	65.1 0BR	Fe	64.95					60.02			60.07
								61.1 2			65.01
											65.20
	67.2 2Co	Fe	67.20					65.4 0			
								67.9			
	68.7 2Co	Fe	68.85					68.9			70.95
	72.4 BR					68.7					
						BR-em region		68.9 4			

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	2	BB	3	G.D.	4	7	Bald King	Total King	Mike	King 1st max.	Fe
5030-5090											
	74.7 BR										
	76.4										
	79.6						75.2				
					81.5						
	83.5						82.1				
	90.8						89.0				
					96.2 BR-abs						
					99.4 BR-abs						
					01.2 BR-abs						
					05.5 edge(r)						
					12.2 BR-abs(r)						
					23.4 edge(r)						
								70.15 0			
								71.15 2			
								72.20 0			
								72.90 3			
								75.8 1			
								76.4 5			
								77.4 1			
								78.45 0			
								79.25 3 AI 0			
								81.70(r)			
								84.0			
								86.45 2VBR			
								87.7(r)			
								92.4 2VBR			
								94.1 3VBR			
								96.0 2VBR			
								02.5 AI 0			

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## APPENDIX B

### NEGATIVE PRINTS OF ALL PLATES EXPOSED AT OPERATION IVY

Following are negative prints of all plates exposed at Operation Ivy. On each print, the following information is given as a legend:

Shot viewed  
Instrument used  
Position of plate (JACO spectrograph)  
Wavelength range  
Exposure type of plate

As an aid to the location of any particular print, the following list indicates the figure numbers for all plates used in the JACO spectrograph in the two shots.

- Mike: B.1 (upper deck, high wavelength region)  
B.2 (upper deck, middle wavelength region)  
B.3 (upper deck, low wavelength region)  
B.4 (lower deck, high wavelength region)  
B.5 (lower deck, middle wavelength region)  
B.6 (lower deck, low wavelength region)
- King: B.8 (upper deck, high wavelength region)  
B.9 (upper deck, middle wavelength region)  
B.10 (upper deck, low wavelength region)  
B.11 (lower deck, high wavelength region)  
B.12 (lower deck, middle wavelength region)  
B.13 (lower deck, low wavelength region)



7785 A

6490 A

Fig. B.1—Mike, JACO spectrograph, 21 ft, upper deck, high wavelength region  
(6490 to 7785 A; total, I N).

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6490 A

5195 A

Fig. B.2—Mike, JACO spectrograph, 21 ft, upper deck, middle wavelength region  
(5195 to 6490 A; total, II F).



5195 A

Fig. B.3—Mike, JACO spectrograph, 21 ft, upper deck, low wavelength region  
(3900 to 5195 A; total, II F).

3900 A

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4120 A

Fig. B.4—Mike, JACO spectrograph, 21 ft, lower deck, high wavelength region  
(3485 to 4120 A; second order; total, II O).

3485 A



3485 A

Fig. B.5—Mike, JACO spectrograph, 21 ft, lower deck, middle wavelength region (2795 to 3485 A; second order; total, H O).

2795 A

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5595 A

Fig. B.6—Mike, JACO spectrograph, 21 ft, lower deck, low wavelength region (4315 to 5595 A; first order; total, H O).

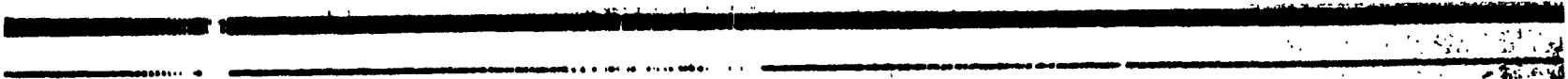
4315 A



5000 A

Fig. B.7—King, Baird, 2 meter (3000 to 5000 A, 1.0 to 1.1 sec; H O). Black part has been measured.

3000 A



7785 A

Fig. B.8—King, JACO spectrograph, 21 ft, upper deck, high wavelength region  
(6490 to 7785 A; total, I N).

6490 A

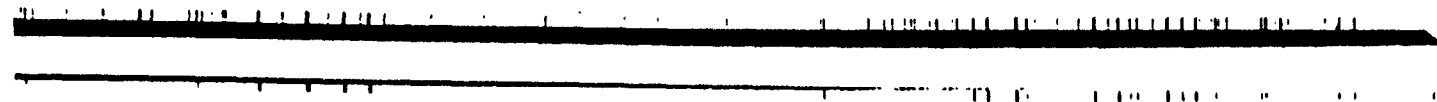


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6490 A

Fig. B.9—King, JACO spectrograph, 21 ft, upper deck, middle wavelength region  
(5195 to 6490 A; total, II F).

5195 A

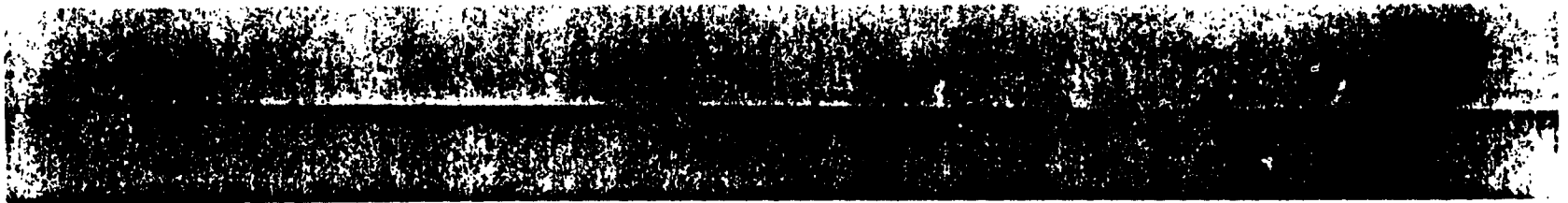


5195 A

Fig. B.10—King, JACO spectrograph, 21 ft, upper deck, low wavelength region  
(3900 to 5195 A; total, II F).

3900 A

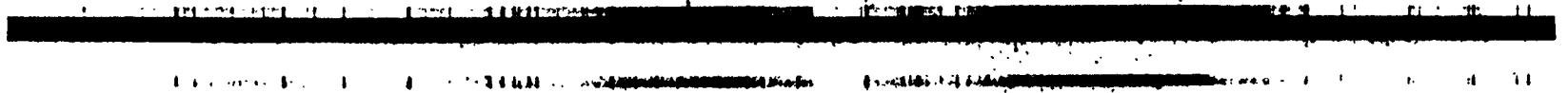
151



8245 A

Fig. B.11—King, JACO spectrograph, 21 ft, lower deck, high wavelength region  
(6970 to 8245 A; first maximum, I N).

6970 A



970 A

Fig. B.12—King, JACO spectrograph, 21 ft, lower deck, middle wavelength  
region (5595 to 6970 A; first maximum, II F).

5595 A



595 A

Fig. B.13—King, JACO spectrograph, 21 ft, lower deck, low wavelength region  
(4315 to 5595 A; first maximum, II F).

4315 A

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Fig 159 deleted.

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