NASA-TM-89689

NSSDC NATIONAL SPACE SCIENCE DATA CENTER

WORLD DATA CENTER A for ROCKETS AND SATELLITES 86-15

PROMIS SERIES

VOLUME 1

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Orbital Data and Acquisition Times

NASA

National Aeronautics and Space Administration

Goddard Space Flight Center

NSSDC/WDC-A-R&S 86-15

PROMIS SERIES

VOLUME 1

Orbital Data and Acquisition Times

by

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November 1986

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PREFACE

This is the first of a series of volumes to be published by the NSSDC/WDC-A pertaining to the Polar Region Outer Magnetosphere International Study (PROMIS) period March 29-June 16, 1986, i.e., days 88-167 of 1986.

For the data acquisition phase of PROMIS, special time intervals totalling about 1200 hours were preselected on the basis of concurrently favored locations of IMP 8, ISEE 1 and 2, AMPTE/IRM, DE 1, and Viking and were then tracked at the highest possible priority. The data of particular interest from these spacecraft are the solar wind plasma and its embedded magnetic field (IMP 8), plasma, energetic particles, and magnetic field in the magnetotail (ISEE 1 and 2, and IRM) and the images of auroral displays in the southern and northern auroral ovals (DE 1 and Viking, respectively). The scientific rationale for the interest in these regions is to ascertain the details of the complex process in which the solar wind energy is transferred to the magnetosphere, stored in the magnetotail, and then, in part, episodically released to activate the two conjugate auroral ovals.

Some of the energy in the episodic releases is injected directly into the inner magnetosphere rather than into the auroral ovals, generating a current ring of millions of amperes at a distance of a few earth radii. These injections were monitored by a number of geostationary and other spacecraft, notably 1982-019A, 1984-037A, 1984-146A, GOES 5 and 6, SCATHA, and CCE. There was no need to seek high-priority tracking of these spacecraft during the PROMIS period, since they were being tracked all along, nearly 24 hours each day.

Numerous ground-based observatories below the two auroral ovals have obtained continuous data on the magnetic field and its variations. Thanks to the promptness of Dr. M. Sugiura and his colleagues at the Kyoto University, Japan, the magnetic indices of these variations, known as AE, AL, and AU, are now available for the period at NSSDC/WDC-A in hard copies, microfiche, and digital magnetic tapes. The hard copies have been reproduced as volume 2 of this series and will be mailed out by NSSDC to scientists around the world.

Some of the acquired spacecraft data have already started arriving at NSSDC. A few such data sets for the PROMIS period will be plotted and reproduced at NSSDC as volumes 3-5 of this series and will be mailed to space scientists soon. The hope is that these "quick look" data will facilitate selection of periods for detailed analysis and will stimulate the initiation of such analysis. The bulk of the data acquired during the PROMIS period, however, are likely to remain with the Principal Investigators for approximately a year before being deposited at NSSDC for distribution. As always, during that period the Principal Investigators are likely to respond favorably to any reasonable direct request for data from other researchers.

This volume contains some tabulations of essential orbital information and plots of data acquisition intervals for IMP 8, ISEE 1 and 2, IRM, DE 1, and Viking. [Note: Day 1 is 1 January] For DE1 and Viking the plotted intervals pertain to the times when its auroral imaging instrument was operating. (Viking was tracked for many more hours, without the imaging instrument in operational mode.) NSSDC has also generated an orbital parameters data set for the above spacecraft plus SCATHA for the 80 days of the PROMIS period. The data set will be available in microfiche.

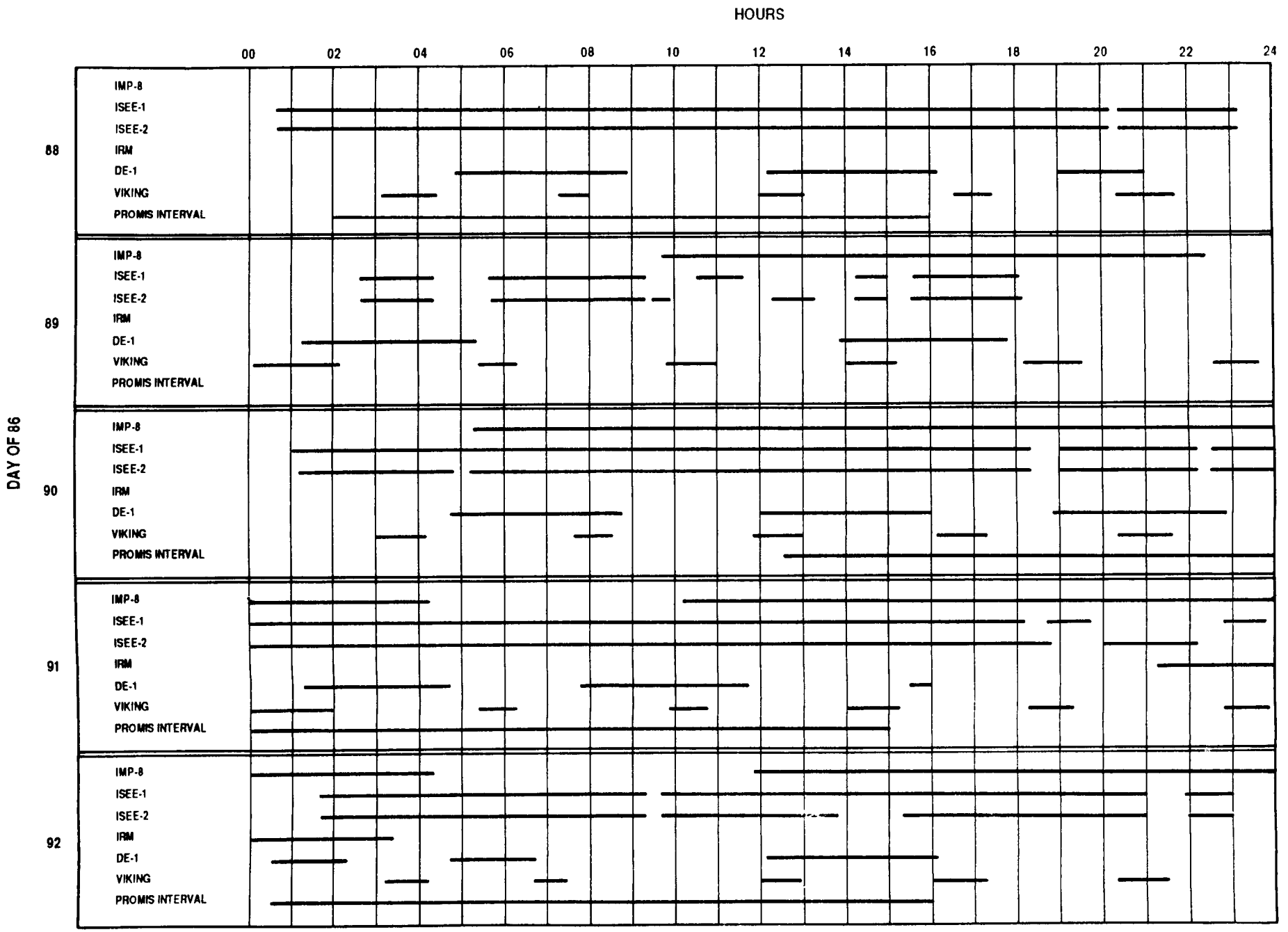
It contains the following plots:

IMP 8:	Trajectory in X-Y (GSE) plane. 1 plot/12 days X, Y, Z (GSM) vs. UT. 1 plot/10 days
ISEE 1, 2:	X, Y, Z, ΔZ (GSM) vs. UT. 1 plot/1 day
IRM:	X, Y, Z, ΔZ (GSM) vs. UT. 1 plot/1 day
SCATHA:	X, Y, Z (GSM) vs. UT. 1 plot/3 days
DE 1:	Radial distance, Invariant latitude, and magnetic local time
VIKING:	Radial distance, Invariant latitude, and magnetic local time

[Note: ΔZ is the distance of the spacecraft above a model Neutral Sheet, based on equations (1) and (2) of D.H. Fairfield, *Journal of Geophysical Research, 85*, pp. 775-780, 1980. It is meaningful only when the spacecraft is in the magnetotail. Samples of these plots are given on pages 20-26 of this report.]

As example of the use of this document, assume that it is of interest to determine the availability of DE 1 auroral imagery for 15:00 on day 139, and to estimate the latitude of DE 1 at that time. Page 14 shows that DE 1 data were acquired at that time. Table 4 (pg. 30) indicates that the first apogee of day 139 occurred at hour 0, minute 37. Using the DE 1 orbital period of 6 hour, 51 minute (given at botton of Table 4), we estimate that the 3rd apogee of day 139 occurred at about hour 14, minute 19. So DE 1 was just 41 minutes past apogee at the time point of interest. From Table 5, we see that the apogee latitude changed form -75° to -50° during PROMIS, so on day 139 (60% through the PROMIS period), the apogee latitude was about -60°.

A table of scientific experiments and names of Principal Investigators is also contained in this volume. Addresses are provided on the pages following the table. Brief details of the experiments may be seen in the NSSDC publication entitled *Report on Active and Planned Spacecraft and Experiments*, NSSDC/WDC-A-R&S 85-01, February 1985.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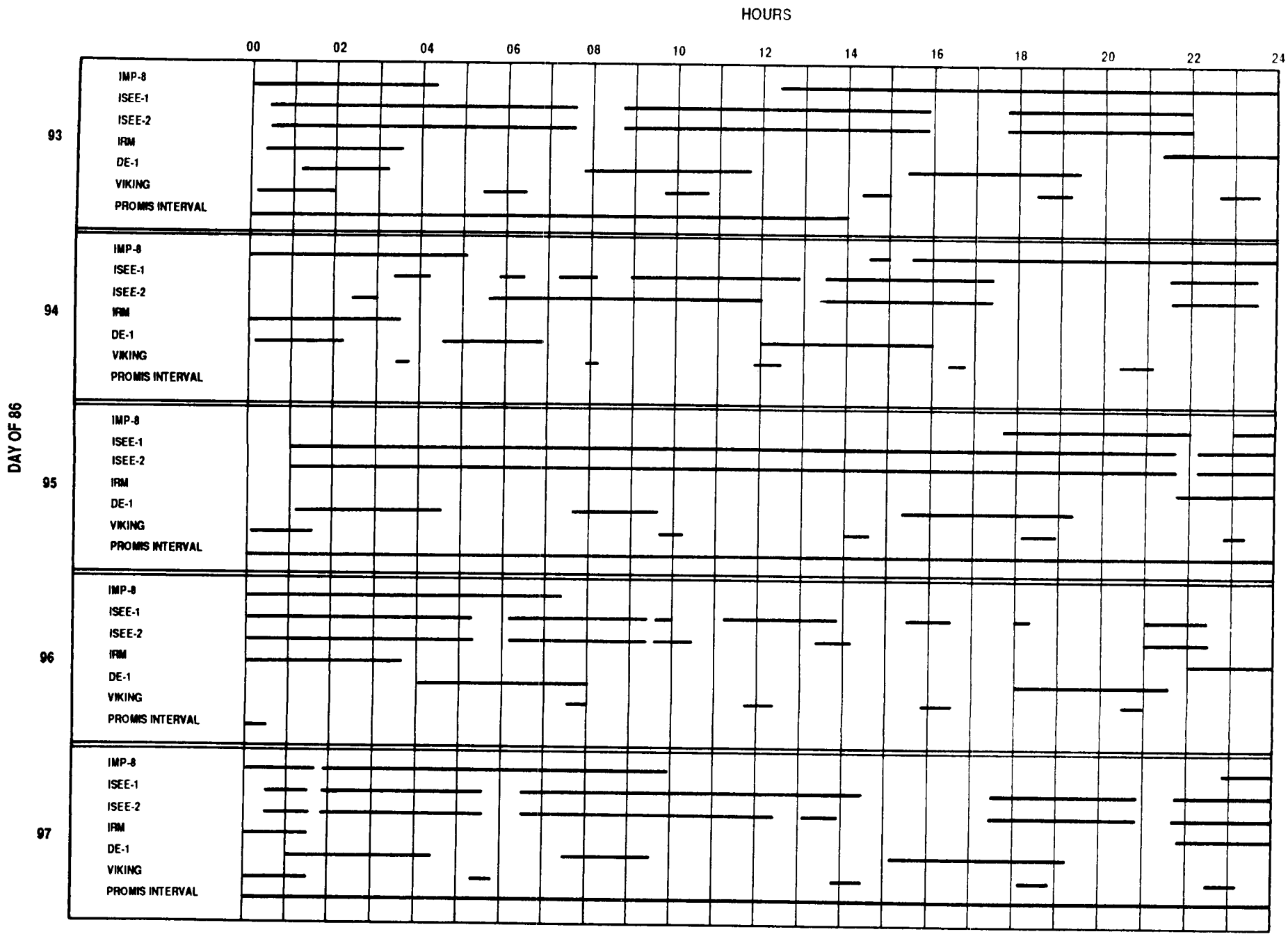
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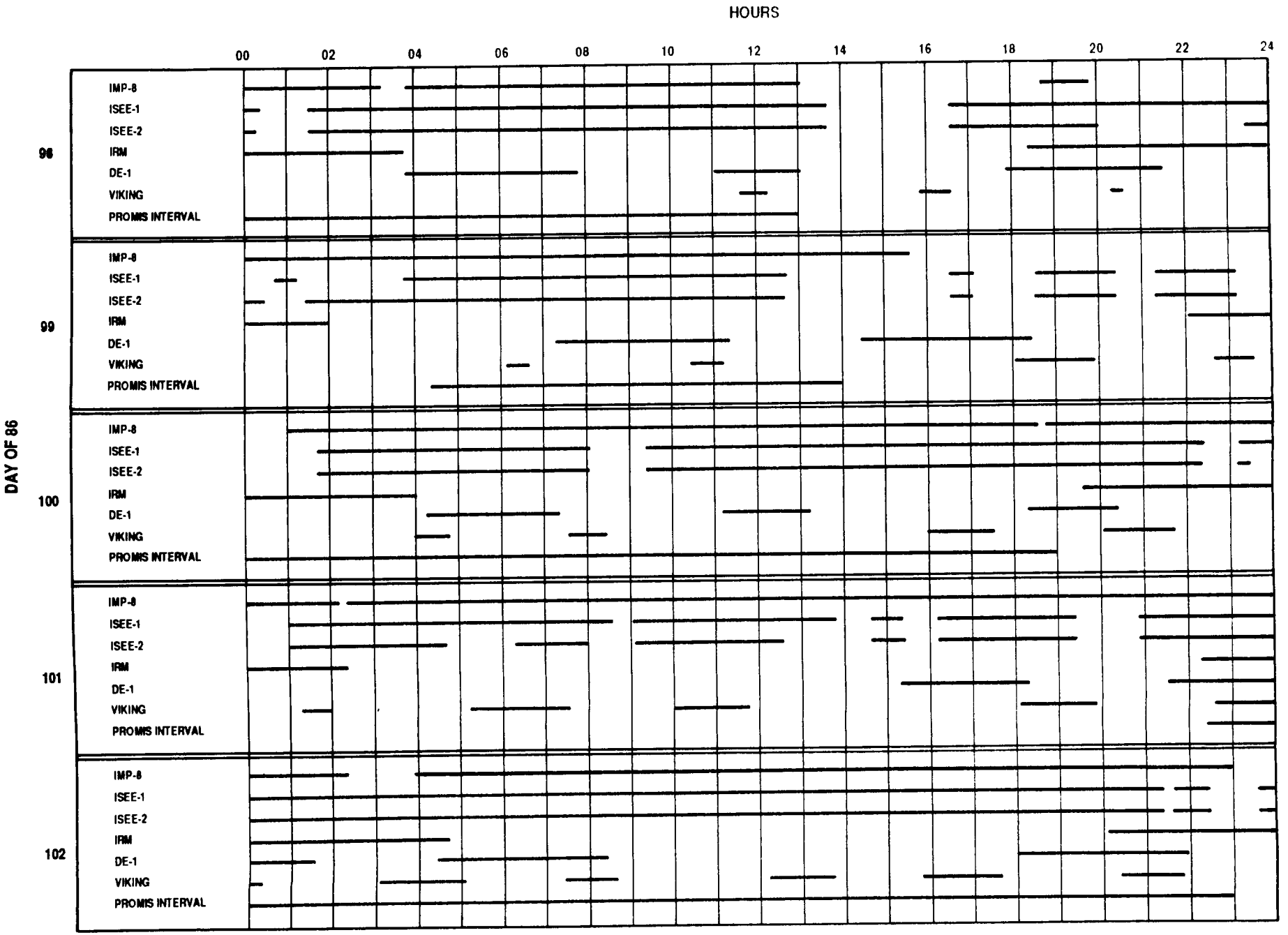
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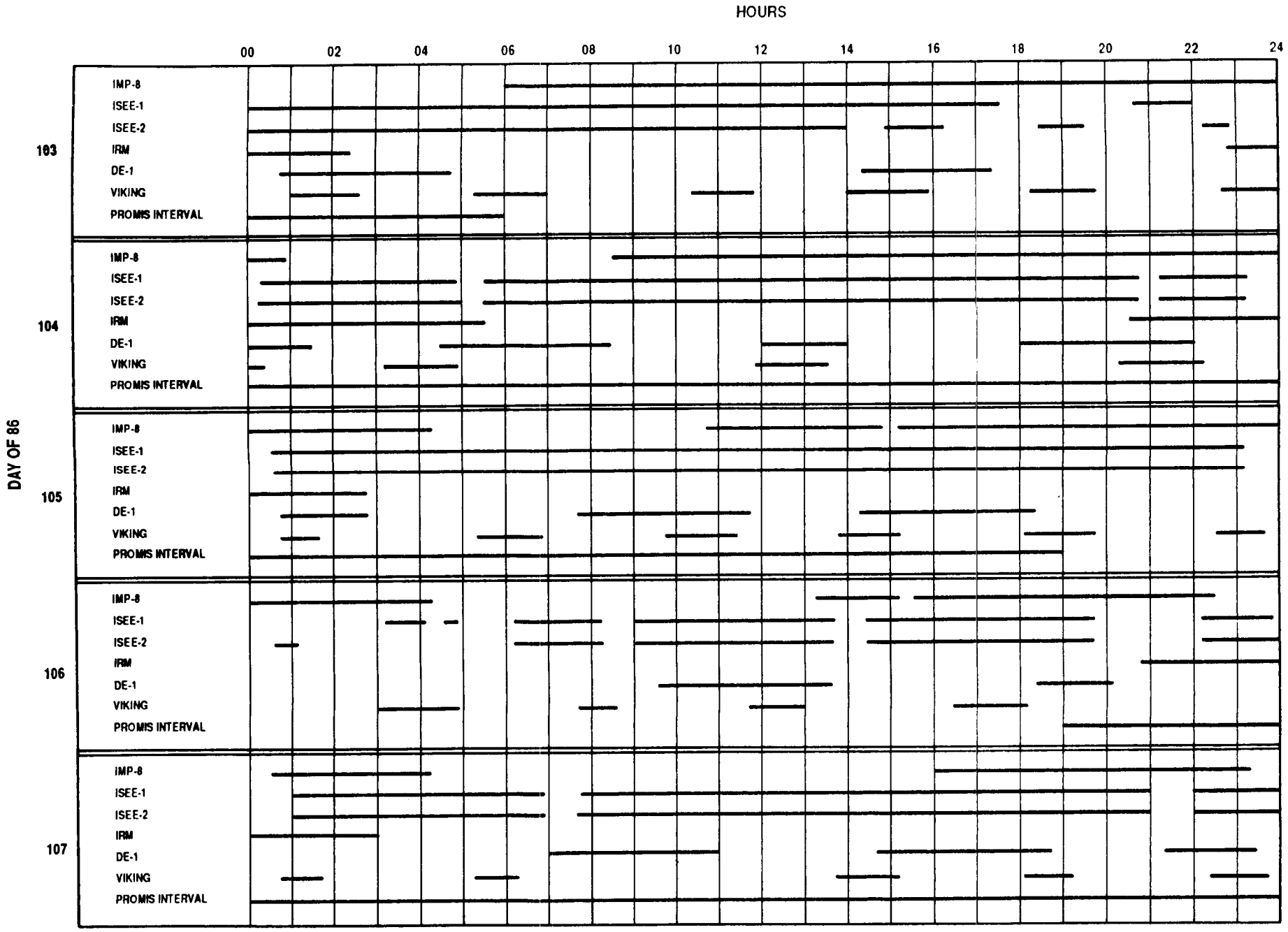
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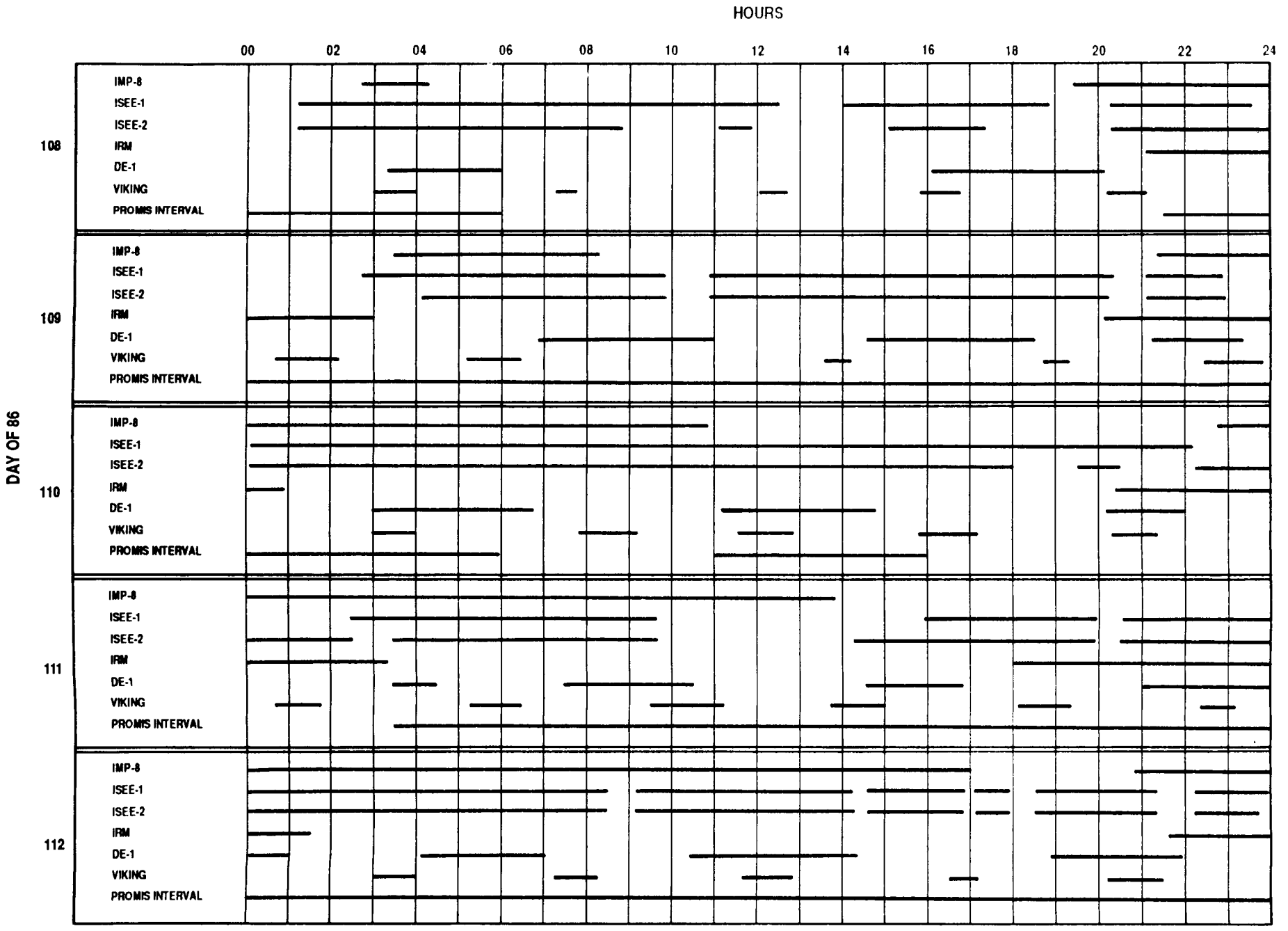
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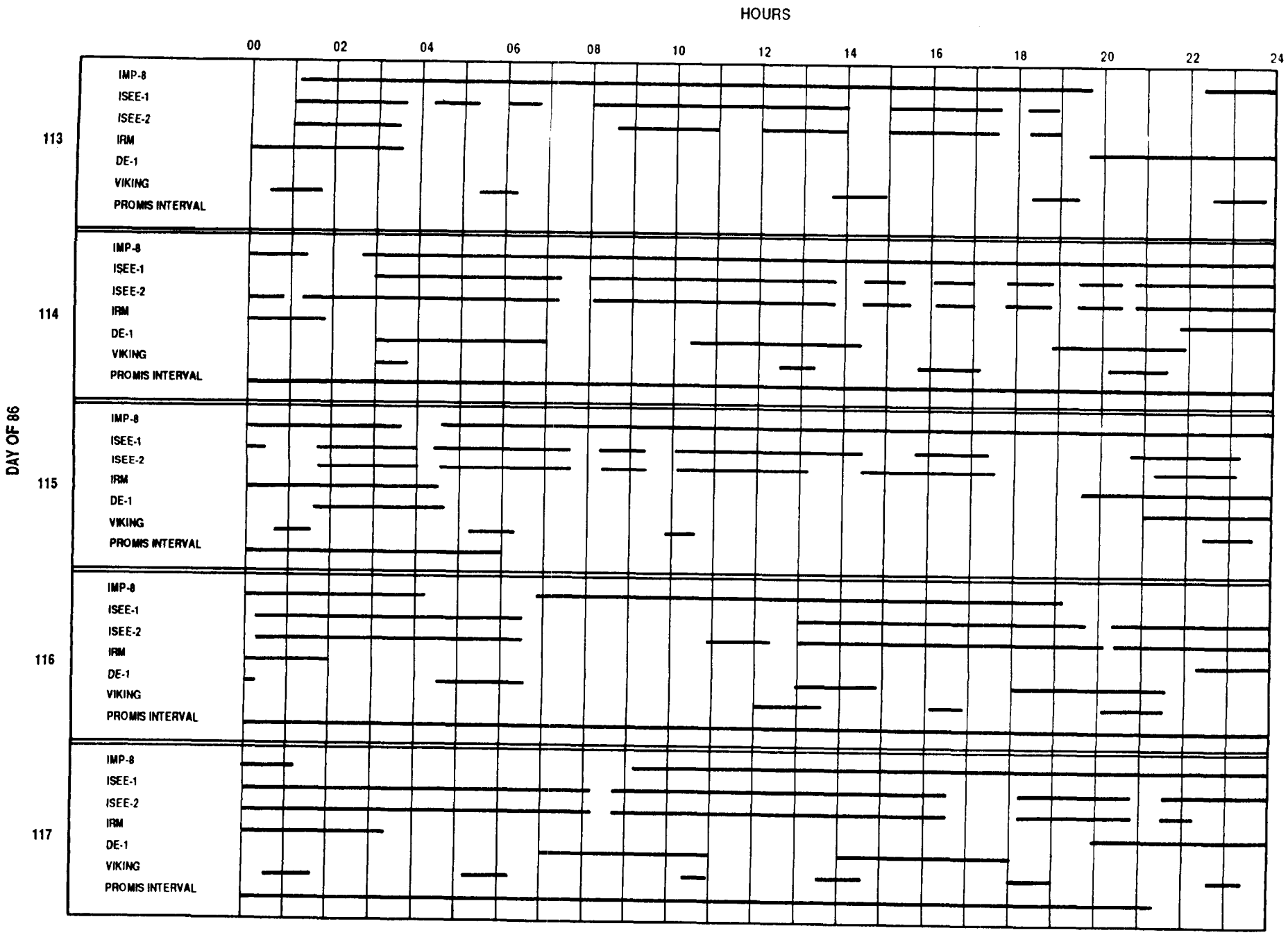
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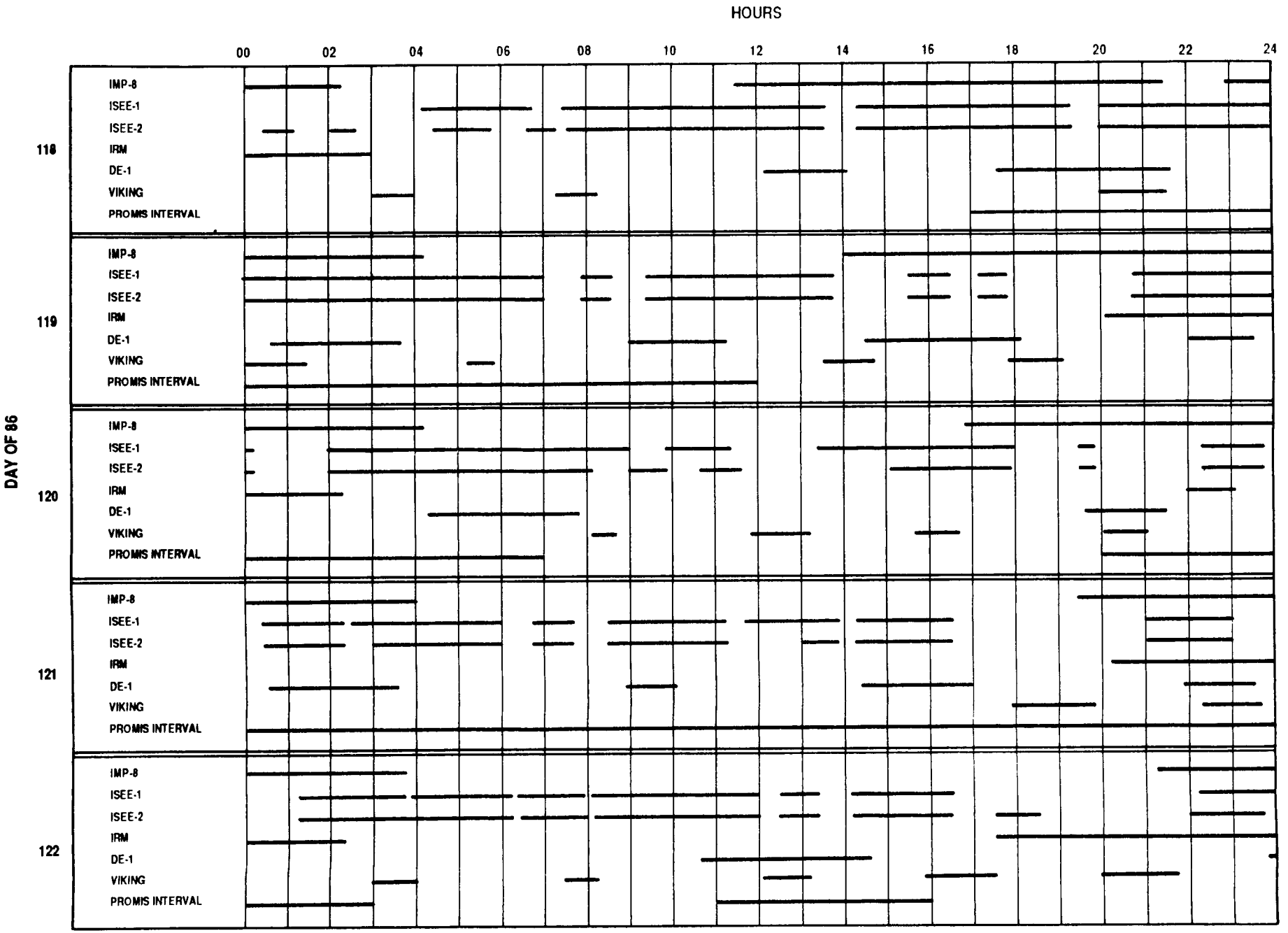
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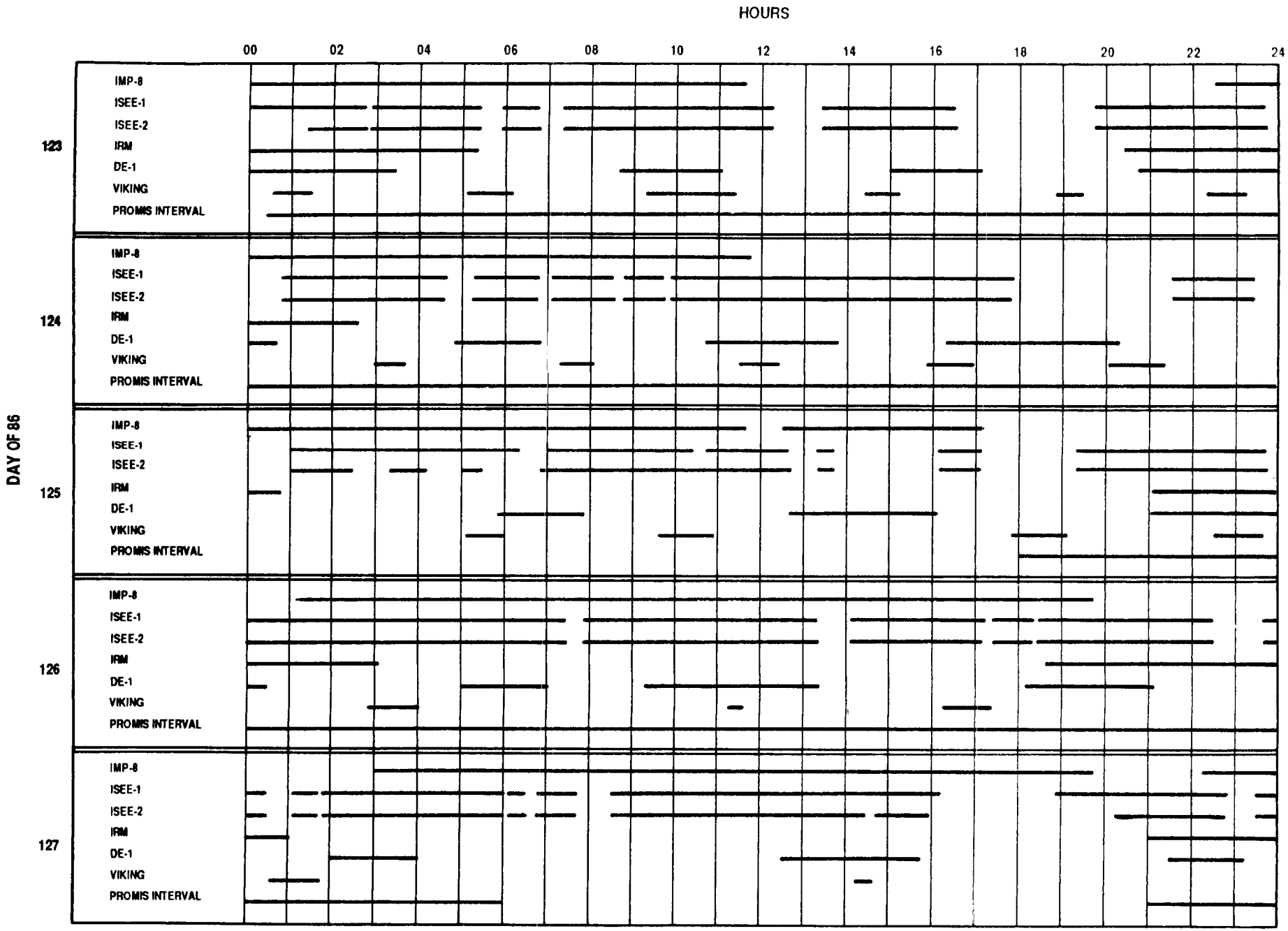
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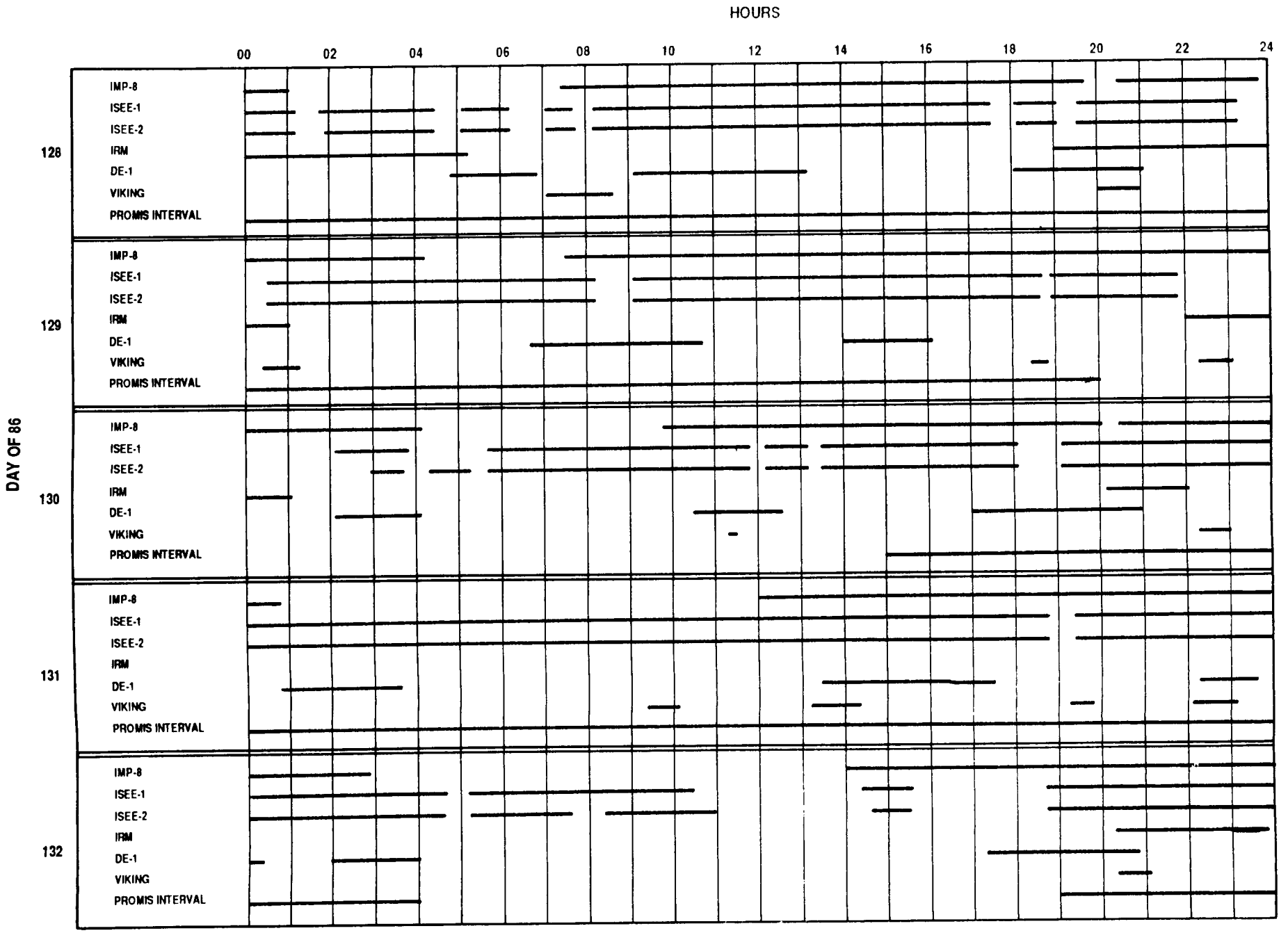
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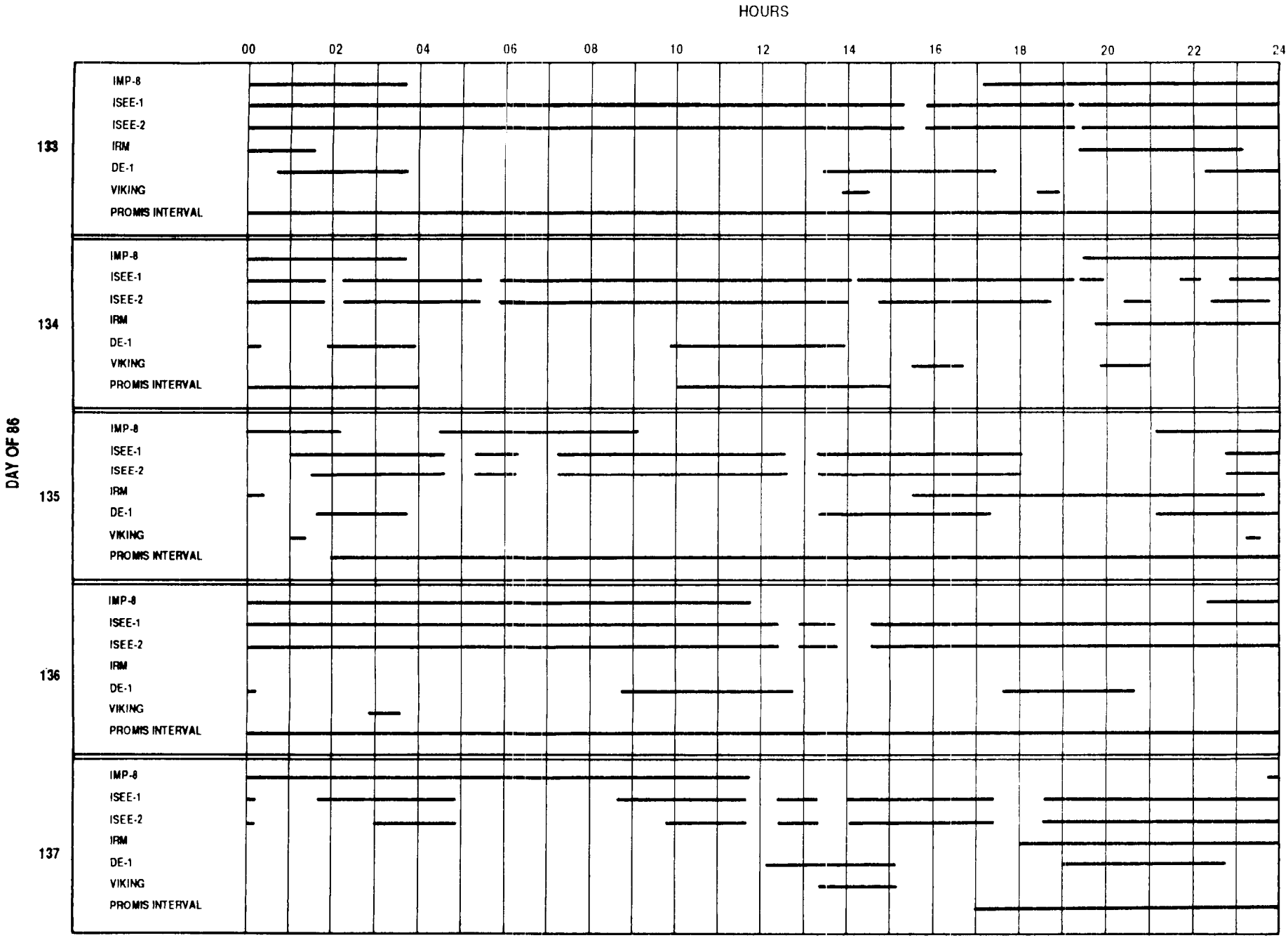
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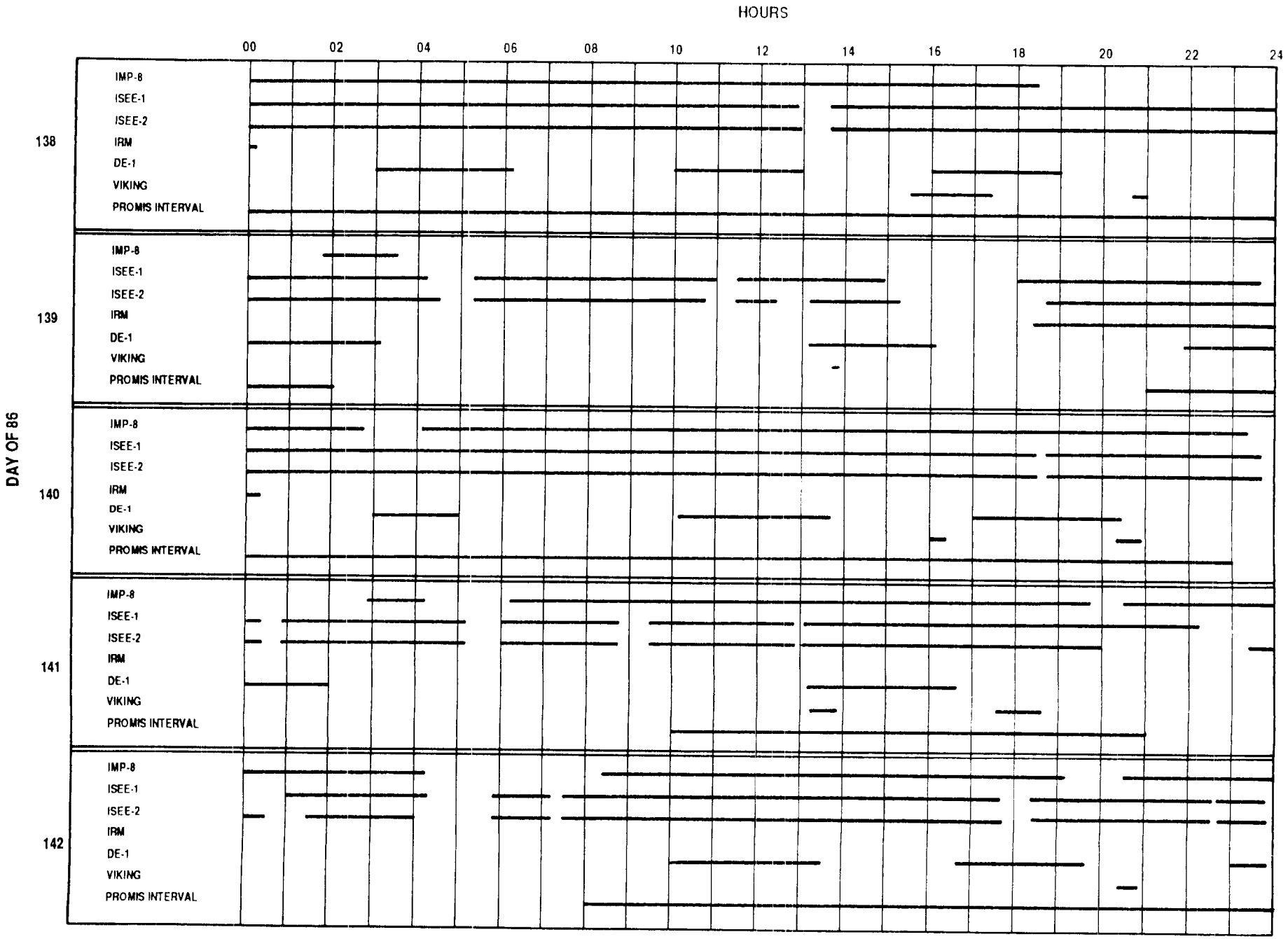
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ISEE-2
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DE-1
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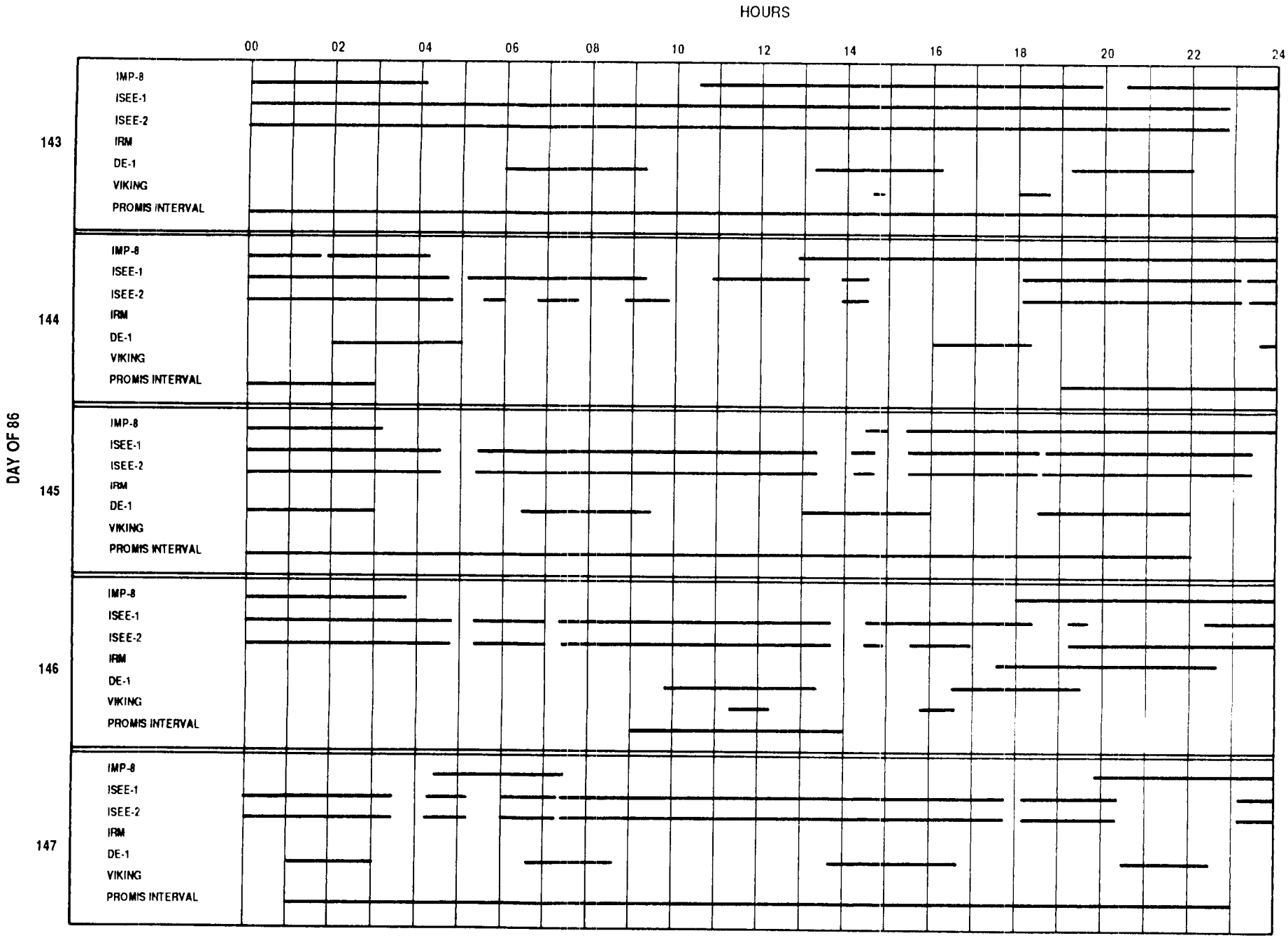
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ISEE-2
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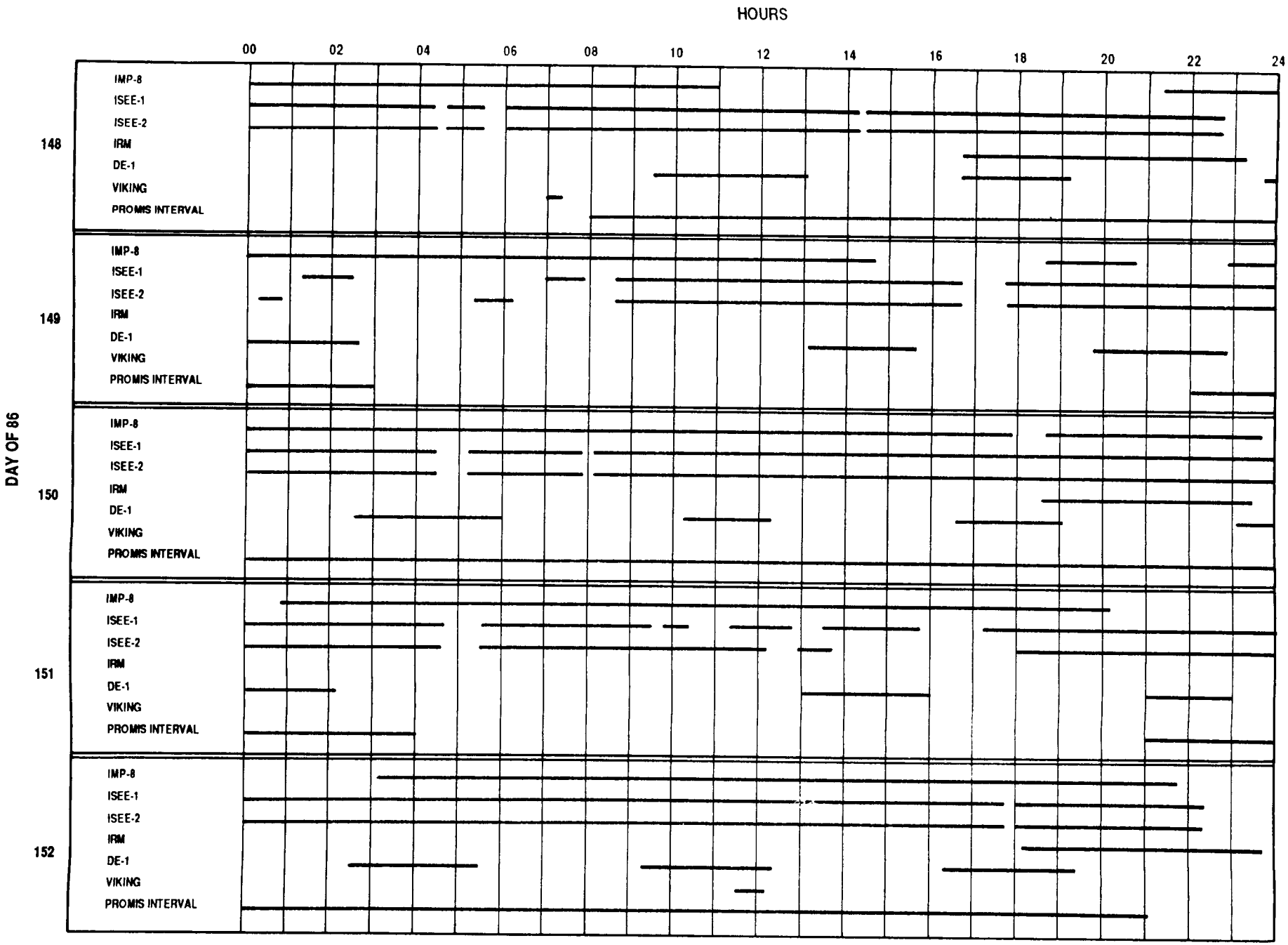
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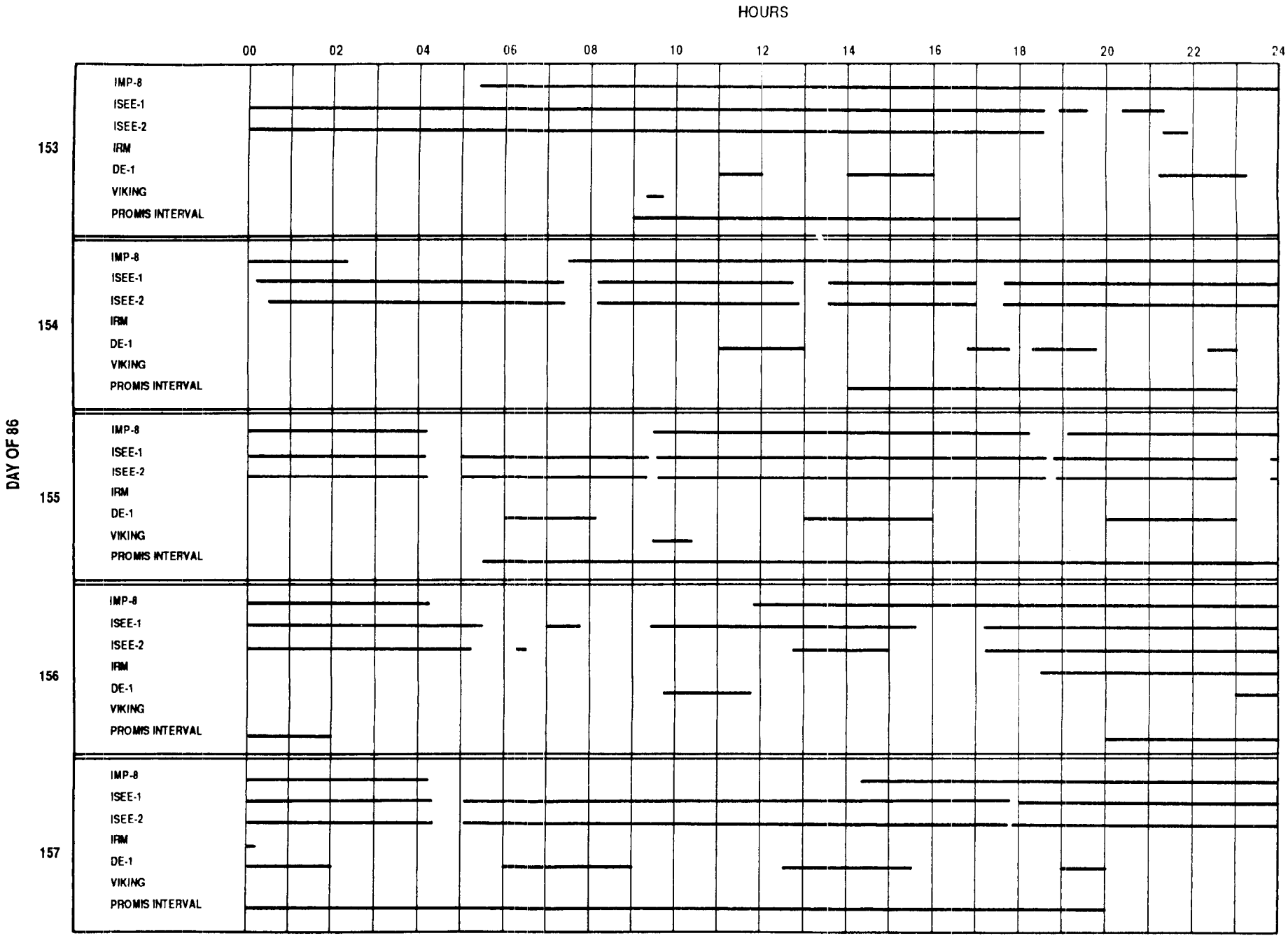
HOURS
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157
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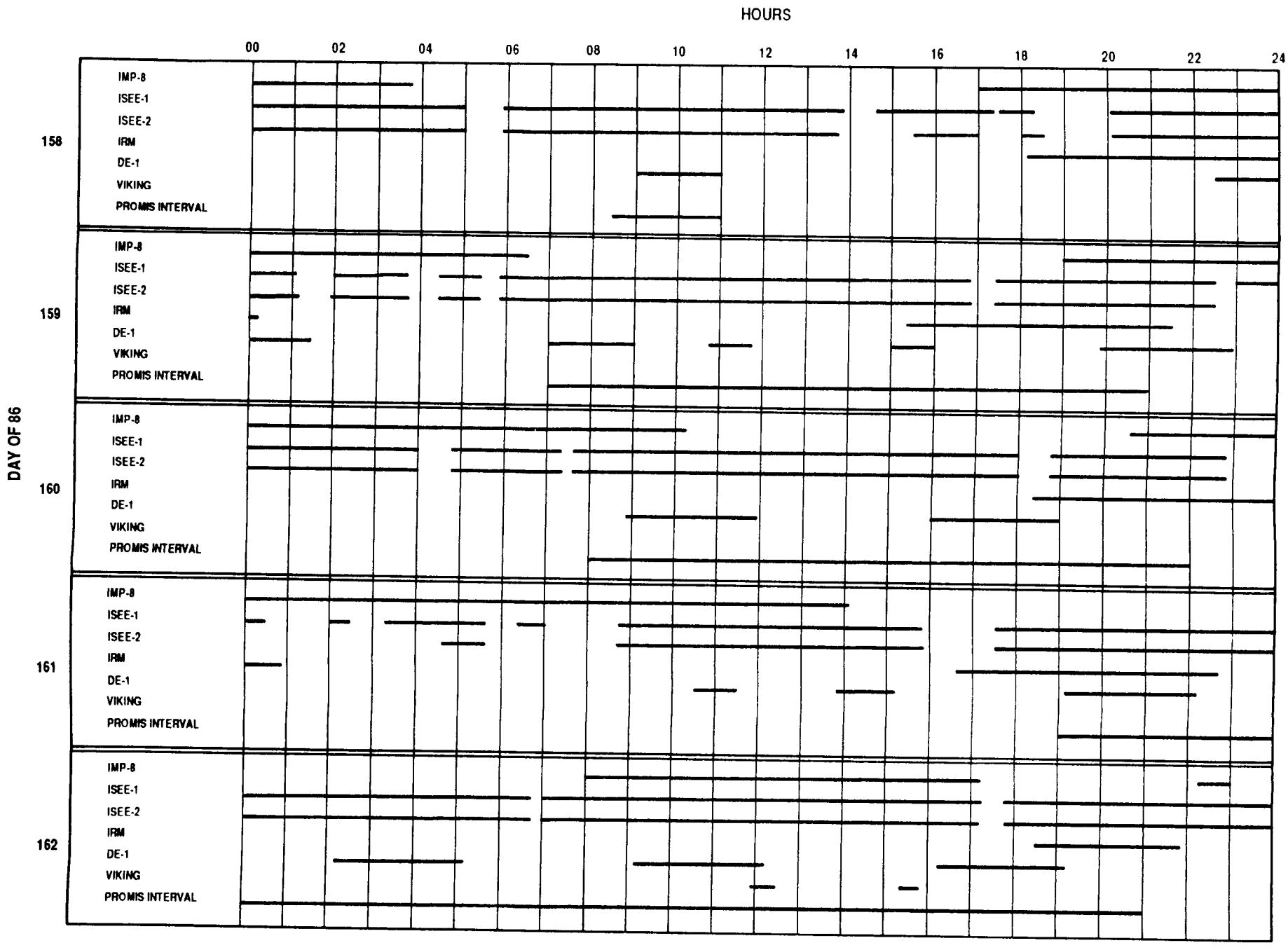
ISEE-1
ISEE-2
IRM
DE-1
VIKING
PROMIS INTERVAL


HOURS
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DAY OF 86
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159
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161
162
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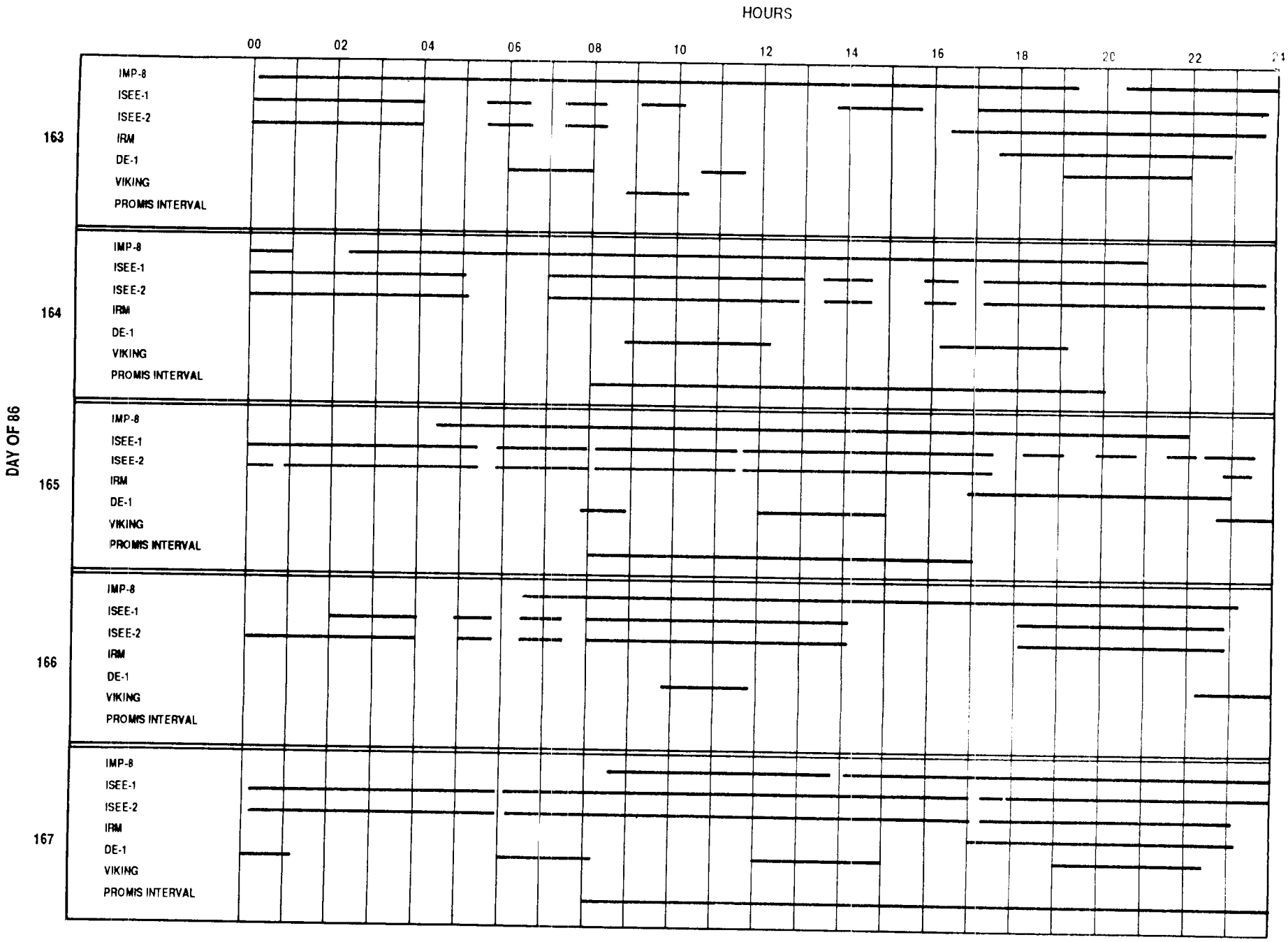
ISEE-2
IRM
DE-1
VIKING
PROMIS INTERVAL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DAY OF 86
163
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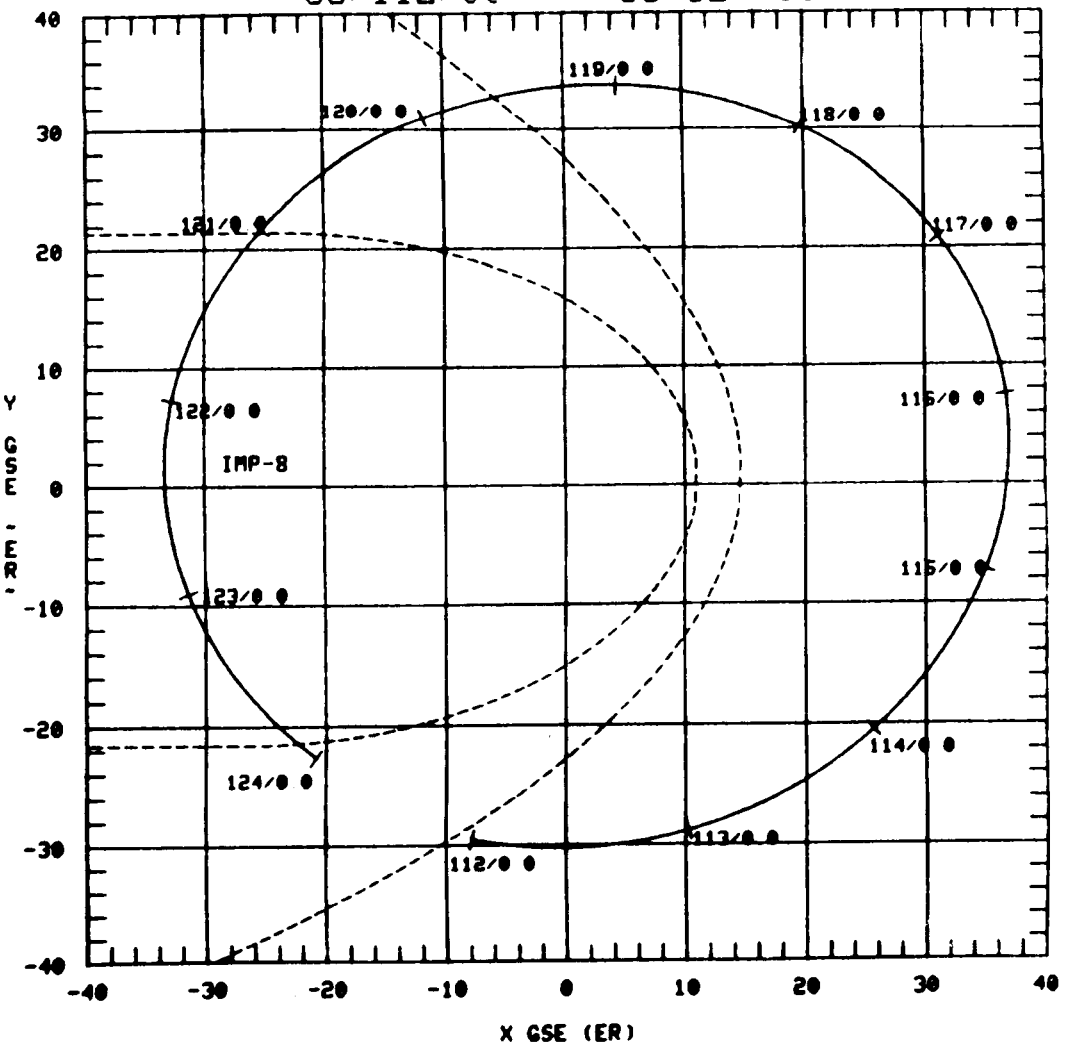
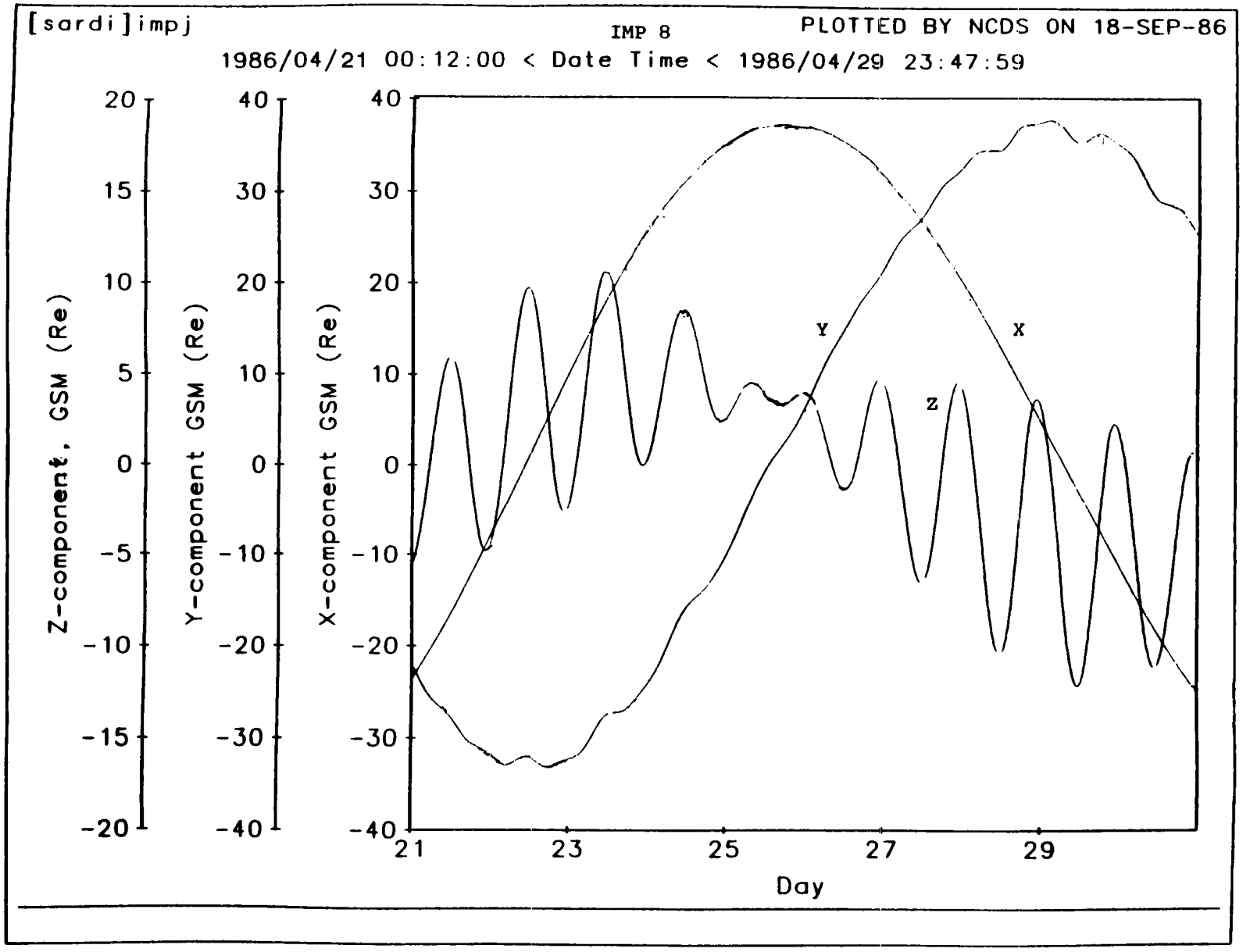
167
IMP-8
ISEE-1
ISEE-2
IRM
DE-1
VIKING
PROMIS INTERVAL

IMP 8

GEOCENTRIC SOLAR ECLIPTIC X-Y TRUE PROJECTION

86/112/00 - 86/124/00

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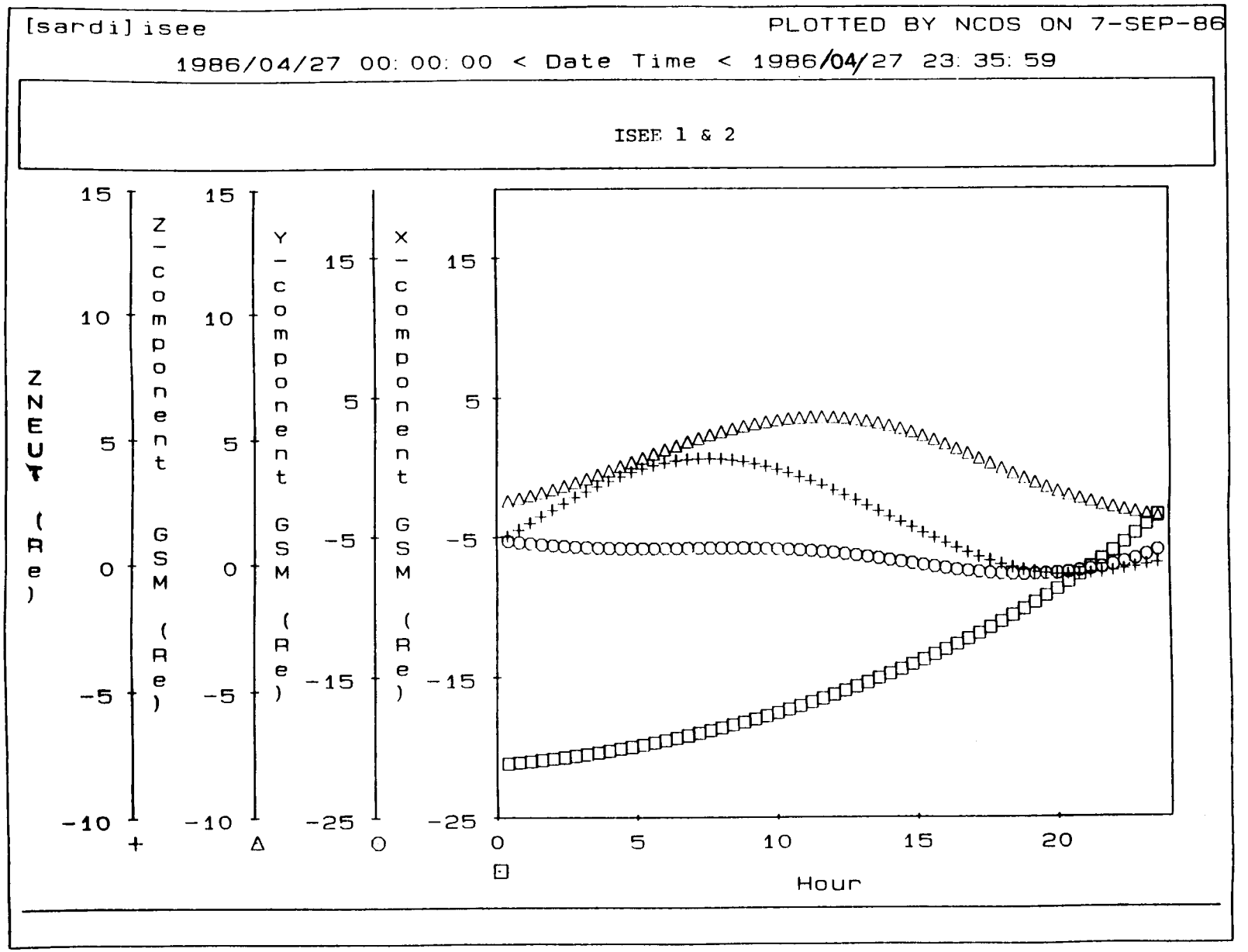
Y-component GSM (Re)
X-component GSM (Re)
Y
X
Z
Day
21
23
25
27
29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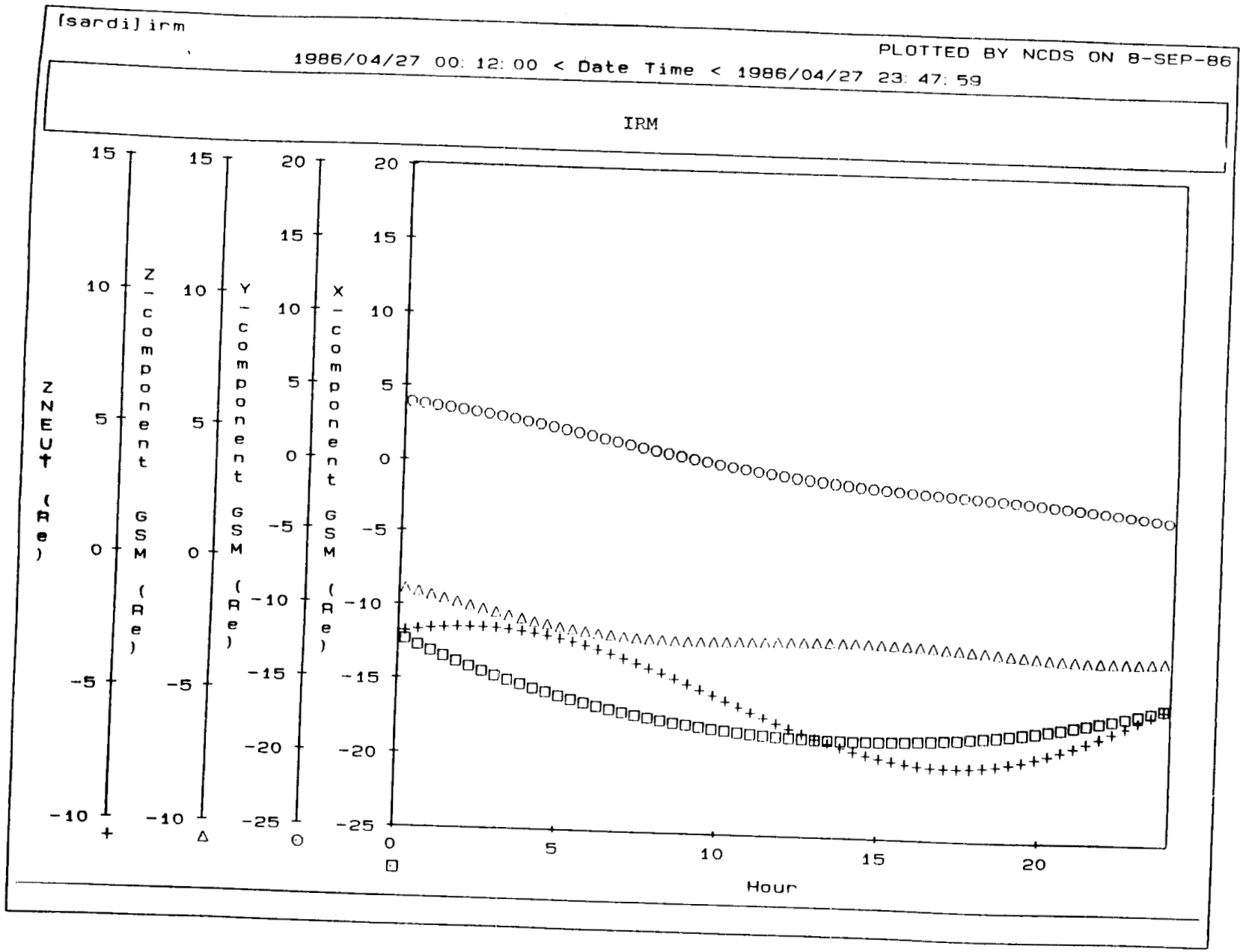
ISEE 1 & 2
ZNEUT (Re)
Z-component GSM (Re)
Y-component GSM (Re)
X-component GSM (Re)
Hour
15
10
5
0
-5
-10
-15
-25
20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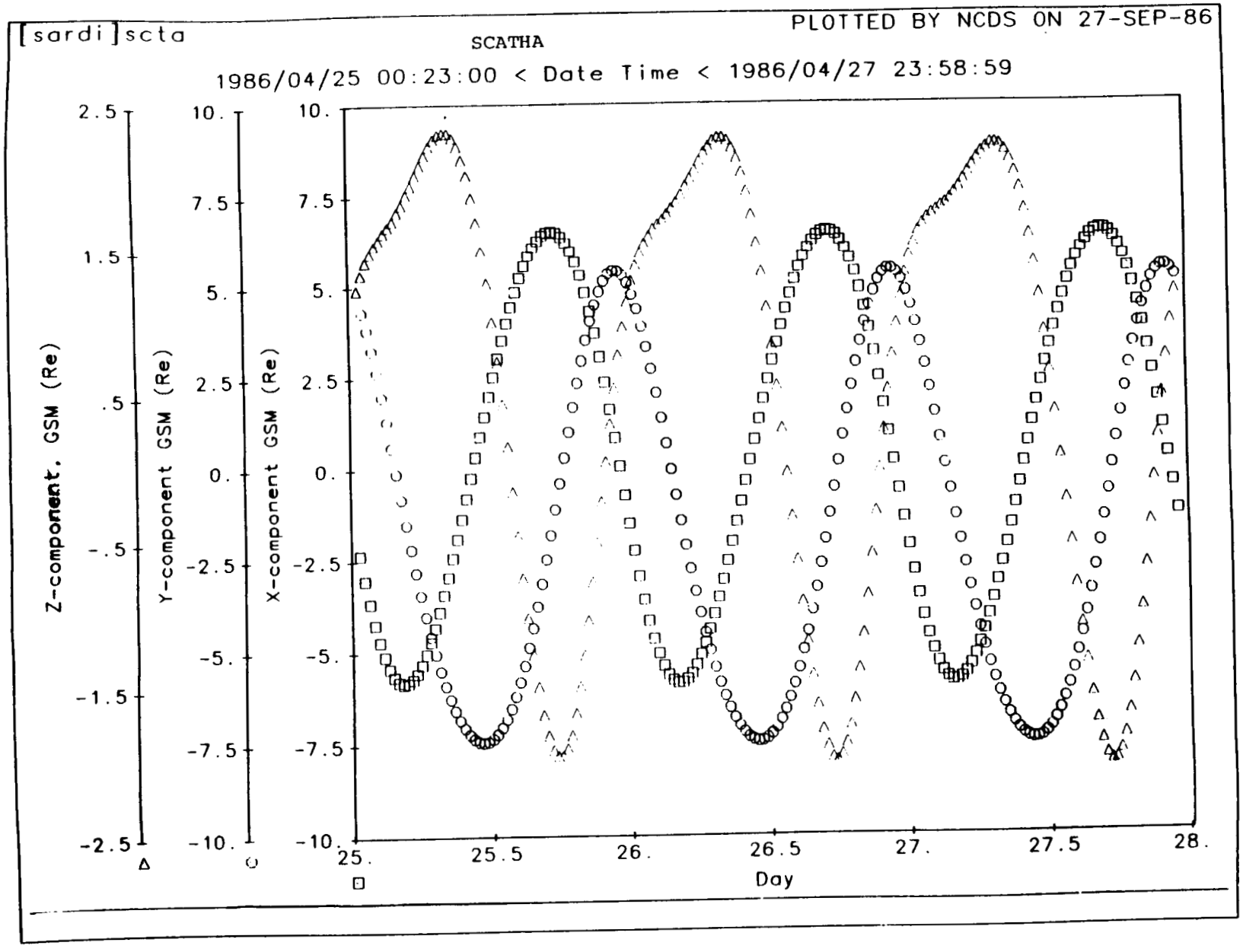
IRM
ZNEUT (Re)
Z-component GSM (Re)
Y-component GSM (Re)
X-component GSM (Re)
Hour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Y-component GSM (Re)
X-component GSM (Re)
2.5
1.5
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-2.5
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7.5
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2.5
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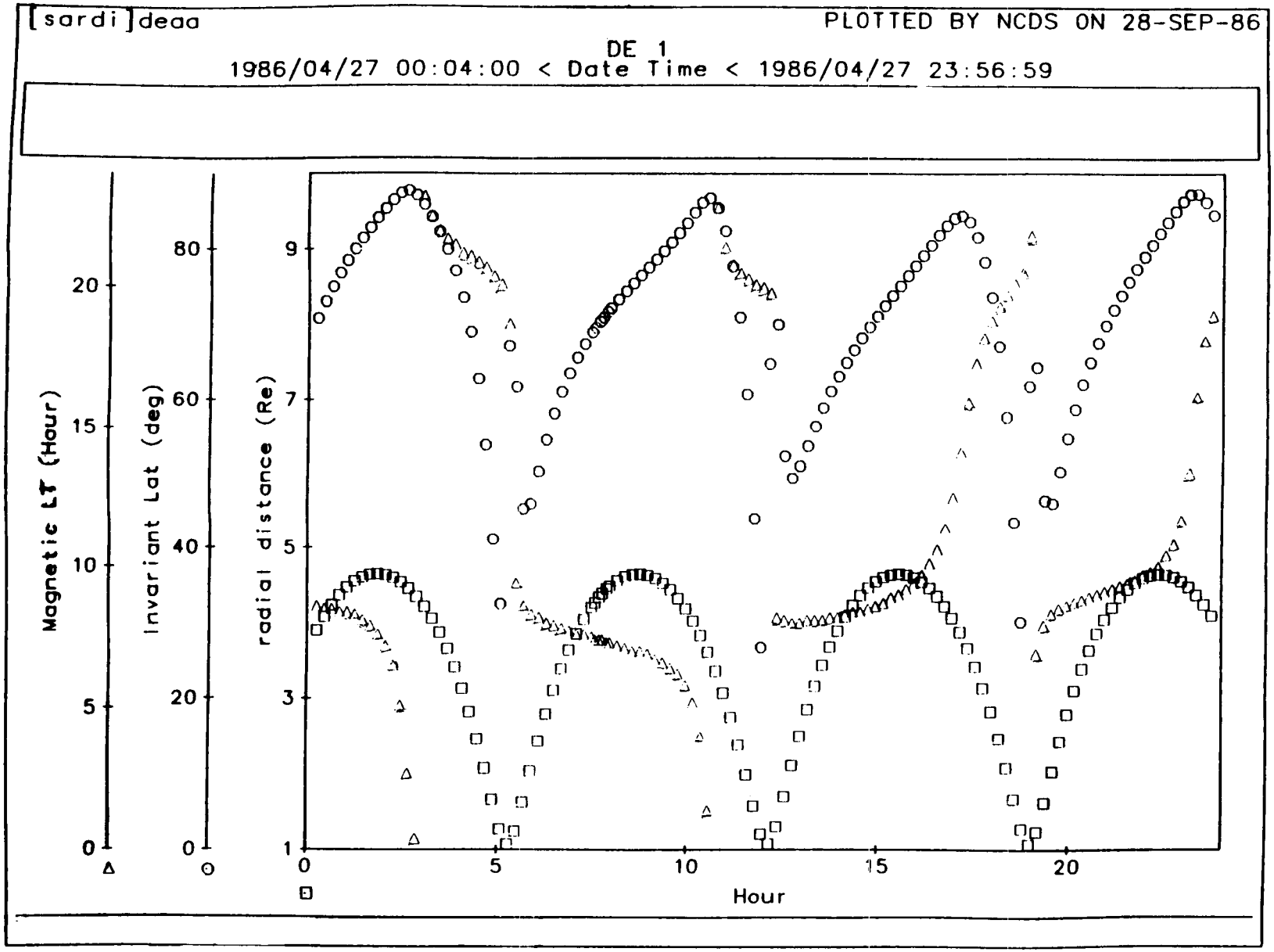
28.
Day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Magnetic LT (Hour)
Invariant Lat (deg)
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Hour
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10
15
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40
60
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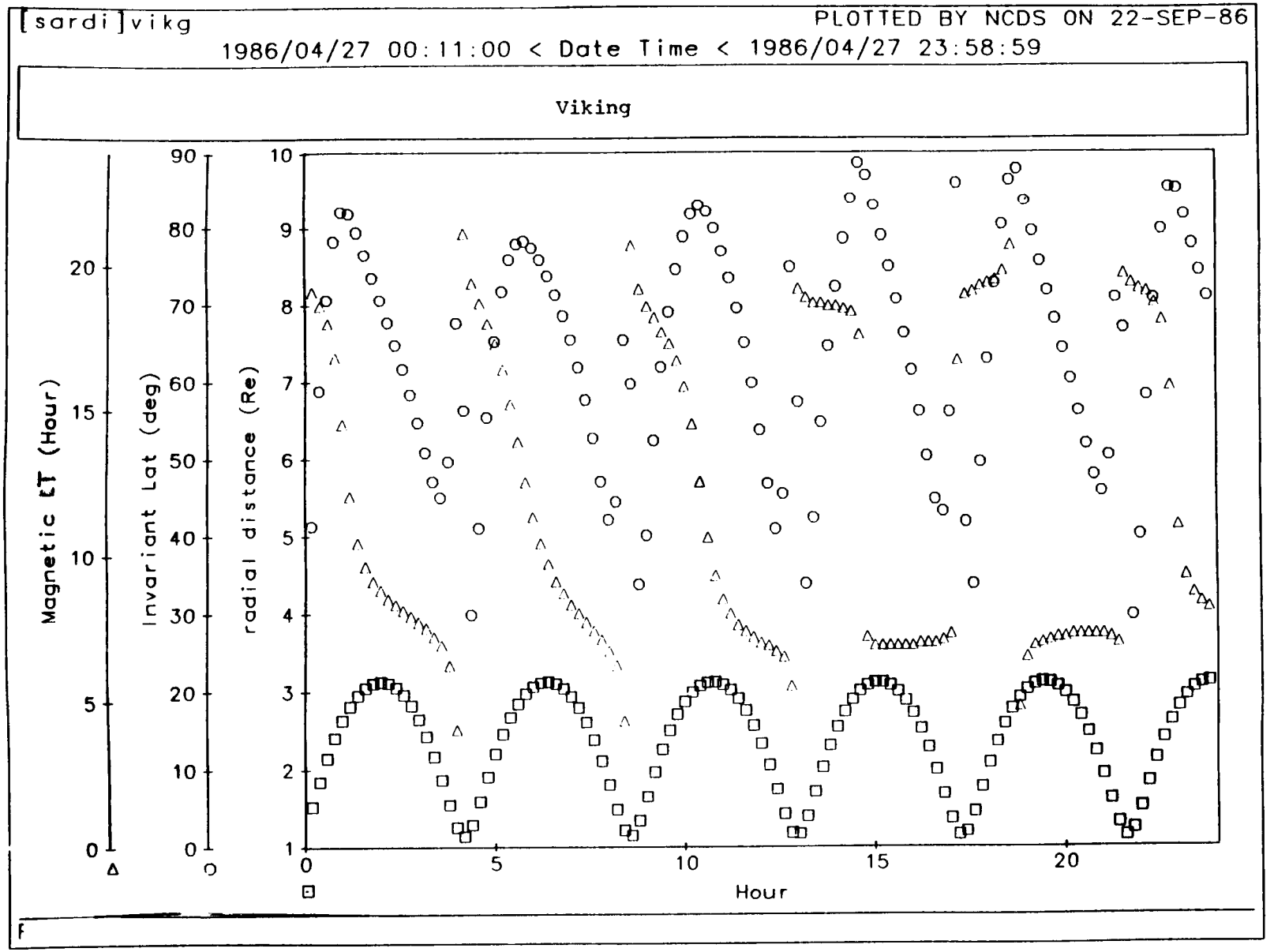
1
3
5
7
9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Viking
Magnetic LT (Hour)
Invariant Lat (deg)
radial distance (Re)
Hour

IMP 8

Launch Date: 26 October, 1973

Mean Period: 298.28 hrs = 12 days, 10.28 hrs.

Apogee: 39.5 RE

	YY/DDD/HH	-	MODEL BOUNDARY LOCATION
27 March, 1986.	86/086/11	-	Bow Shock
	86/094/11	-	Bow Shock
	86/095/19	-	Magnetopause
	86/098/04	-	Magnetopause
	86/099/00	-	Bow Shock
	86/107/01	-	Bow Shock
	86/108/10	-	Magnetopause
	86/110/21	-	Magnetopause
	86/111/18	-	Bow Shock
	86/119/20	-	Bow Shock
	86/121/05	-	Magnetopause
	86/123/17	-	Magnetopause
	86/124/14	-	Bow Shock
	86/132/18	-	Bow Shock
	86/134/02	-	Magnetopause
	86/136/12	-	Magnetopause
	86/137/07	-	Bow Shock
	86/145/11	-	Bow Shock
	86/146/17	-	Magnetopause
	86/149/00	-	Magnetopause
	86/149/17	-	Bow Shock
	86/157/21	-	Bow Shock
	86/159/00	-	Magnetopause
	86/161/04	-	Magnetopause
10 June, 1986.	86/161/21	-	Bow Shock

TABLE 1

ISEE 1, 2

Apogee Times and X, Y, and ΔZ (= Distance From Modeled Neutral Sheet) in GSM Coordinates

Apogee = 22.0 RE

DDD/HHMM	X	Y	ΔZ
088 0525	-17.7	-12.9	-0.3
090 1445	-18.2	-12.3	-1.4
093 0015	-18.6	-11.3	-2.7
095 0945	-19.0	-10.8	1.4
097 1845	-19.5	-10.1	-3.3
100 0415	-19.8	-9.5	0.7
102 1345	-20.1	-8.6	-0.4
104 2315	-20.4	-8.2	-1.5
107 0815	-20.7	-6.8	2.1
109 1745	-20.9	-6.6	-2.0
112 0315	-21.1	-5.8	1.7
114 1215	-21.3	-4.2	0.5
116 2145	-21.4	-4.5	-0.5
119 0725	-21.5	-2.7	2.8
121 1625	-21.6	-2.2	-0.9
124 0145	-21.6	-2.0	2.5
126 1115	-21.6	0.3	1.0
128 2045	-21.5	-0.7	0.7
131 0615	-21.4	1.4	3.4
133 1515	-21.3	2.4	-0.2
136 0045	-21.2	1.9	3.4
138 1015	-21.0	4.7	1.4
140 1945	-20.8	3.5	1.6
143 0445	-20.6	5.6	4.1
145 1415	-20.3	7.0	0.1
147 2345	-20.0	5.8	4.2
150 0915	-19.6	9.0	1.6
152 1815	-19.3	8.3	1.7
155 0345	-18.9	9.5	4.6
157 1315	-18.4	11.3	-0.1
159 2245	-18.0	9.8	4.8
162 0745	-17.5	12.9	1.8
164 1715	-17.0	12.6	1.8
167 0245	-16.5	13.0	5.0

TABLE 2

IRM

X, Y and ΔZ (= Distance From Modeled Neutral Sheet) in GSM Coordinates, at Midpoints of Data Acquisition Intervals That Are Shown in Pages 4-19

Apogee = 18.8 RE

DDD/HHMM	X	Y	ΔZ	DDD/HHMM	X	Y	ΔZ
092 0015	-15.5	-6.9	-7.2	123 2330	-1.9	-3.0	
093 0130	-11.7	0.3	-2.5	124 2130	-18.5	1.9	-5.0
094 0030	-14.0	-7.5	-6.6	125 2400	-5.3	4.8	
096 0045	-11.8	-7.4	-5.9	126 2230	-18.3	0.7	-4.6
097 0030	-16.1	-1.9	-4.9	128 0115	-12.3	5.6	-2.2
098 0100	-8.6	-6.9	-4.8	128 2200	-17.6	0.1	-5.1
098 2300	-16.8	-2.1	-6.3	129 2330	-14.2	5.7	-2.8
100 0100	-3.6	-5.2		130 2115	-16.0	-0.7	-5.2
100 2300	-17.5	-3.1	-6.7	132 2300	-11.7	-2.3	-4.2
102 0130	-5.2	2.9	-0.4	133 2115	-16.9	5.5	-4.1
102 2300	-17.5	-4.0	-6.9	134 2200	-7.9	-2.9	-4.5
104 0200	-11.1	2.2	-2.0	135 1900	-17.3	5.6	-5.5
104 2330	-16.3	-4.9	-6.3	137 2100	-18.2	4.3	-4.6
106 2400	-14.5	-5.4	-5.9	139 2130	-17.5	3.0	-4.1
108 2400	-11.6	-5.5	-5.3	146 2000	-16.4	8.1	-4.3
109 2230	-17.1	0.5	-5.2	148 2000	-17.1	7.6	-4.4
111 0100	-5.7	-4.9		150 2100	-17.0	6.3	-3.8
111 2145	-18.0	-0.1	-6.0	152 2030	-16.9	7.0	-3.7
113 0030	-0.5	2.2		154 2100	-16.0	5.7	-3.8
113 2230	-18.4	-1.3	-5.7	156 2045	-14.3	4.0	-3.9
115 0100	-8.6	4.0	-1.7	158 2100	-11.4	1.8	-4.0
115 2245	-17.8	-2.1	-5.7	159 1815	-13.3	11.4	-5.0
117 0045	-13.0	3.7	-2.6	160 2200	-3.8	-1.6	
117 2330	-15.9	-3.1	-5.0	161 1930	-15.1	11.1	-3.8
119 2300	-14.1	-3.5	-5.3	162 2000	1.1	2.1	
120 2230	-16.8	3.1	-4.2	163 2015	-15.4	10.1	-3.5
121 2315	-9.8	-4.0	-4.4	165 2000	-15.1	9.2	-3.9
122 2200	-17.8	2.7	-4.9	167 2000	-14.0	7.5	-4.0

TABLE 3

1986

First apogee time (+/- 5 min) on each PROMIS day

	Viking		DE			Viking		DE	
Day	Hr	Min	Hr	Min	Day	Hr	Min	Hr	Min
88	00	10	00	10	128	03	58	04	45
89	02	22	03	22	129	01	47	01	08
90	00	10	06	34	130	03	58	04	32
91	02	22	03	10	131	01	47	01	08
92	00	10	06	34	132	03	58	04	32
93	02	22	03	10	133	01	47	01	01
94	00	10	06	22	134	03	58	04	25
95	02	22	02	58	135	01	47	00	50
96	00	10	06	22	136	03	58	04	13
97	02	10	02	58	137	01	47	00	50
98	04	22	06	10	138	03	46	04	13
99	02	10	02	46	139	01	34	00	37
100	04	22	06	10	140	03	46	04	01
101	02	10	02	46	141	01	34	00	37
102	04	22	05	58	142	03	46	04	01
103	02	10	02	34	143	01	34	00	26
104	04	22	05	51	144	03	46	03	49
105	02	10	02	27	145	01	34	00	26
106	04	22	05	51	146	03	46	03	49
107	02	10	02	27	147	01	34	00	18
108	04	22	05	39	148	03	46	03	42
109	02	10	02	15	149	01	34	00	06
110	04	10	05	39	150	03	46	03	30
111	01	58	02	03	151	01	34	00	06
112	04	10	05	27	152	03	46	03	30
113	01	58	02	03	153	01	34	06	54
114	04	10	05	27	154	03	34	03	18
115	01	58	01	51	155	01	22	06	42
116	04	10	05	15	156	03	34	03	18
117	01	58	01	51	157	01	22	06	42
118	04	10	05	08	158	03	34	03	06
119	01	58	01	45	159	01	22	06	30
120	04	10	05	08	160	03	34	03	06
121	01	58	01	45	161	01	22	06	23
122	04	10	04	56	162	03	34	03	00
123	01	58	01	32	163	01	22	06	23
124	03	58	04	56	164	03	34	02	47
125	01	47	02	20	165	01	22	06	11
126	03	58	04	45	166	03	34	02	47
127	01	47	01	20	167	01	17	06	11

Viking Period = 4 hr, 22.0 min.

DE 1 Period = 6 hr, 50.7 min.

TABLE 4

TABLE 5

Miscellaneous Orbital Data Days 88-167/1986

DE 1

Radial distance of apogee: 4.7 RE
Altitude of perigee: 568 km
Period: 6 h, 51 min
Inclination: 89.9°

Geographic latitude of apogee: Changed nearly linearly from about -75° to -50° through the PROMIS period.

Local time of apogee: Changed (decreased) nearly linearly from 10:20 to 05:00 through the PROMIS period.

Viking

Radial distance of apogee: 3.1 RE
Altitude of perigee: 817 km
Period: 4 h, 22 min
Inclination: 98.8°

Geographic latitude of apogee: Changed nearly linearly from about 50° to 80° through the PROMIS period.

Local time of apogee: Decreased nearly linearly from 09:20 on day 88, to 08:20 on day 118; remained constant until day 148; theen increased nearly linearly to 11:30 on day 167.

SCATHA

Radial distance of apogee: 7.7 RE
Radial distance of perigee: 5.4 RE
Period: 23 hr, 55 min
Inclination: 7.7°
UT at midnight meridian passage:

Day 88 - 13:10
Day 167 - 10:50

(Drift rate in UT was 20.0 minutes per day, from 13:10 - 24:00 - 10:50.)

Geographic longitudes of geostationary spacecraft

GOES 5	74° W.
GOES 6	108° W.
1982-019A	37° W.
1984-037A	70° E.
1984-146A	155° W.

TABLE 6

IMP 8

Experiment Name	Principal Investigator/Contact
Electrostatic Fields	T.L. Aggson
Solar Plasma (Electrostatic Analyzer)	S.J. Bame
Solar Plasma (Faraday Cup)	A.J. Lazarus
Low Energy Protons and Electrons	L.A. Frank
Solid State Detectors	G. Gloeckler
Electrostatic Waves and Radio Noise	D.A. Gurnett
Charged Particles Measurements	S.M. Krimigis
Solar and Cosmic Ray Particles	R. McGuire
Magnetic Field	N.F. Ness
Solar Flare High-Z/Low-E and Low-E Isotope	J.A. Simpson
Energetic Electrons and Ion Masses	E.C. Stone
Energetic Electrons and Protons	D.J. Williams

ISEE 1

Electrons and Protons	K.A. Anderson
Fast Plasma and Solar Wind Ions	S.J. Bame
Gamma-Ray Bursts	T.L. Cline
Hot Plasma	L.A. Frank
Plasma Waves	D.A. Gurnett
Plasma Density	C.C. Harvey
VLF Wave Propagation	R.A. Helliwell
DC Electric Field	J.P. Heppner
Low Energy Cosmic Ray	D.K. Hovestadt
Fast Electrons	K.W. Ogilvie
Flux Gate Magnetometer	C.T. Russell

ISEE 2

Electrons and Protons	K.A. Anderson
Hot Plasma	L.A. Frank
Plasma Waves	D.A. Gurnett
Radio Propagation	C.C. Harvey
Flux Gate Magnetometer	C.T. Russell
Energetic Electrons and Protons	D.J. Williams

IRM

Plasma Wave Spectrometer	B. Hausler
Suprathermal Ionic Charge Analyzer	D.K. Hovestadt
Magnetometer	H. Luehr
3-D Plasma Analyzer	G. Paschmann
Mass Separating Ion Sensor	H.R. Rosenbauer

SCATHA (STP-P78-2)

Electric Field Detector	T.L. Aggson
Energetic Proton Detector	J.B. Blake
Spacecraft Sheath Fields Detector	J.F. Fennell
Rapid Scan Particle Detector	D.A. Hardy
Energetic Ion Spectrometer	K.G. Johnson
Charging Electrical Effects Analyzer	H.C. Koons
Magnetic Field Monitor	B.G. Ledley
High Energy Particle Detector	J.B. Reagan

CCE

Charge-Energy-Mass Spectrometer	G. Gloeckler
Medium Energy Particle Analyzer	R.W. McEntire
Magnetometer	T.A. Potemra
Plasma Wave Experiment	F.L. Scarf

1982-019A

Energetic Particle Detector	P.R. Higbie

1984-037A

Energetic Particle Detector	P.R. Higbie

1984-146A

Energetic Particle Detector	P.R. Higbie

GOES 5

Energetic Particle Monitor	H. Leinbach
Magnetic Field Monitor	H. Leinbach

GOES 6

Energetic Particle Monitor	H. Leinbach
Magnetic Field Monitor	H. Leinbach

DE 1

Retarding Ion Mass Spectrometer	C.R. Chappell
Global Auroral Imager	L.A. Frank
Wave Particle Interactions	R.A. Helliwell
Plasma Waves	S.D. Shawhan
Hot Plasma Composition	E.G. Shelley
Magnetic Field	M. Sugiura

Viking

Ultraviolet Auororal Imager	C.D. Anger
High Frequency Wave Experiment	A. Bahnsen
Vector Electric Field	L.P. Block
Low Frequency Waves	G. Gustafsson
Hot Plasma	R. Lundin
Magnetic Field	T.A. Potemra

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