DATA SET CATALOG # 100

DUAL-FREQUENCY EXPERIMENTS

Mariner 5	67-060A-02A	1 tape
Pioneer 6	65-105A-04A	
Pioneer 7	66-075A-04A	
Pioneer 8	67-123A-03A	
Pioneer 9	68-100A-03A	

DUAL FREQUENCY EXPERIMENTS

SATELLITE	NSSDC-ID	FILE	START-TIME	STOP-TIME	
MARINER 5	67-060A-02A	File 1	June 14, 1967	Nov. 21, 1967	
PIONEER 6	65-105A-04A	File 2	Dec. 16, 1965	July 11, 1966	
PIONEER 7	66-075A-04A	File 3	Aug. 18, 1966	Nov. 29, 1967	104
PIONEER 8	67-123A-03A	File 4	Dec. 14, 1967	Aug. 25, 1969	653
PIONEER 9	68-100A-03A	File 5	Nov. 08, 1968	July 16, 1969	251

Cards were loaded on tape D-05914 (C-04731) with data above

Tape is 556, BCD 7-track, with 5 files

STANFORD ELECTRONICS LABORATORIES

RADIOSCIENCE LABORATORY
STANFORD, CALIFORNIA

20 December 1968

Mr. Leo Dubach
NSSDC (Code 601)
NASA Goddard Space Flight Center
Greenbelt, MD 20771

Dear Mr. Dubach:

Following our telephone conversation today, I am enclosing a summary of hourly electron-content measures obtained by our dual-frequency experiments aboard Pioneers 6, 7, and 8. Initial submissions of similar data for Pioneer 9 will become available next month. The data submitted herewith are in three forms:

(1) Punched cards, with roughly one card per day of data

(2) Printed version of the card data, for your convenience in microfilming

(3) Plotted version of the same data, which I understand you will microfilm.

Although we may choose to send different forms of data later when we become familiar with your operation, I anticipate that you can make use of these forms of data in two ways:

(a) You can put the digital data from the cards onto a tape, if you so desire.

(b) You can microfilm the printed and plotted forms, since they complement one another.

Periodically, I will revise all these data, deleting errors and making small corrections to the numbers. Anyone who uses this particular set should be warned that it does indeed contain errors, since it was originally generated with another purpose in mind and for that other purpose the errors were immaterial. This is particularly true of the Pioneer 7 data. I anticipate that in January 1969 I will send you a complete replacement, but this set will serve to get us started and let us become familiar with each other's mode of operation.

Pioneer 5 67-[illegible]
Pioneer 6 65-[illegible]
7 66-[illegible]
8 67-[illegible]A

For the guidance of those who may use these data, I have written a brief explanation of the data format and the meaning of the plots. This should probably be microfilmed together with data forms 2 and 3 and you might also incorporate the text into the tape. Perhaps when we advance further, you might wish to have us supply such explanations on punched cards, since this would make your digital taping easier. If you see such things that we can do for you, please let us know and we'll attempt to help whenever it's practical.

Sincerely yours,

Thomas A. Croft

Thomas A. Croft
Research Engineer
Stanford Center for
Radar Astronomy

TAC:sb

Enclosures: M-P cards, mixed series "C" and "D" for Pioneers 6, 7, and 8
M-P card printout
M-P plots
Explanatory text

STANFORD CENTER FOR RADAR ASTRONOMY

S T A N F O R D U N I V E R S I T Y

Stanford, California 94305

20 December 1968

EXPLANATION OF THE FORMAT OF HP CARDS AND PLOTS

These data provide an hourly estimate of the integrated electron content between the earth-based transmitter and the Pioneer spacecraft, as measured by the Stanford dual-frequency experiment. The numerical data were obtained manually from analog plots of the real time data, and are designed to serve only as a first estimate. The final data reduction yields much more highly-resolved data which is free of many sources of error that may affect these "HP" data. Nevertheless, it is felt that the HP estimates will be of value to others who can use them to find gross trends and indications of isolated large events.

Card Format

```
                1         2         3         4         5         6         7         8
Column:  12345678901234567890123456789012345678901234567890123456789012345678901234567890
Data:    HPD  66 245 23  123 122 113 108 098 096 094 067 056 045 044 067 078 098 124 137 1
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First Item: "HPD" means the data is "HP" data of series D. Each time the data are corrected in any way, the series letter will be advanced.

Second Item: "66" means the year in which the first electron content value occurred was in 1966. This first value is the sixth item on the card.

Third Item: "245" means the first value occurred on day 245 of the year.

Fourth Item: "23" means the first value was measured at 2300 hours UT on that day.

Card Format (continued)

Fifth Item: "1123" identifies the particular Stanford transmission. The first digit is the Pioneer number, so this is Pioneer 1. The next three digits correspond to the DSN "pass number", except that for the Australian receivers, the pass number is 1 digit higher. In this example, the data would be combined from pass 123 of South Africa, Spain, and California and from pass 124 of Australia.

Sixth Item, and all subsequent 3-digit numbers: These are hourly measures of the integrated density in units of 10^{10} electrons per square meter, measured from the Stanford transmitting antenna to the spacecraft. The marked diurnal change is caused by our varying look angle through the earth's ionosphere.

Last Item: A single digit. If this is non-zero, the card is the last one in a deck.

Plot Format

The plots were designed to supplement the cards and cannot be understood without reference to the cards. There is one plot for each card, and the plots appear in groups of seven which were originally designed to fit a standard page. Each plot shows the electron content vs. time of day, and each has an individual baseline which is drawn along the time axis at a scale of 10 hours per inch. Each baseline is 24 hours long, with a 0.25 inch vertical tick at its center which is at either 1200 hours or 2400 hours UT. The baseline slips right or left in 12-hour increments in such a manner that the corresponding plot always lies over its own baseline, and there are no 24-hour horizontal slips. In order to find the date and time, it is usually necessary to refer to the HP cards.

The ordinate is the electron content, drawn at a scale of 1 inch = 10^{15} electrons per square meter. Thus a card entry of 100 leads to a plot 1 inch high.

The spacing between cards is only 1.4 inches, so many content plots overlap the baseline above. This is seldom troublesome and can always be resolved by using the clue provided by the break between groups of seven plots.

A small label lying just above each baseline identifies the card from which the plot was derived. This label consists of a series of letters which occur sporadically, followed by a series of 4 numbers which always appear. The 4 numbers are the transmission number, which was explained above. The letters are intended to help us find faults in the HP cards, and they should be ignored.