

RADIO OBSERVATION DATA
AT SYOWA STATION, ANTARCTICA DURING 1999

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1. Introduction

Communications Research Laboratory has been observing the absorption of cosmic radio noise with a standard riometer (relative ionospheric opacity meter) at 30 MHz at Syowa Station, Antarctica since February 1966. This report presents the data observed in January 1 through December 31, 1999. The combined data plots also contain geomagnetic field, and HF signal intensity of Japanese Standard Radio Signal for reference (JJY). The data of geomagnetic field is provided by National Institute of Polar Research.

Copies of these data in digital form are available on request.

Requests should be addressed to:

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2. Location

Syowa Station			
Geographic		Geomagnetic	
Latitude (Deg.)	Longitude (Deg.)	Latitude (Deg.)	Longitude (Deg.)
69.00 S	39.58 E	-70.0	80.2

3. Observer

Hiroshi NAKAMOTO (Communications Research Laboratory)

4. Instrumentation

The riometer receiver has a center frequency of 30 MHz and a band width of 7.5 kHz; it is connected to a vertically directed five-element Yagi antenna whose elements are oriented in the east-west direction. The antenna is designed to match the 50-ohm coaxial cable (8D-2V), which is 80 m long. Noise from a reference noise diode, with power levels of 20000 K, 16000 K, 12000 K, 8000 K, and 4000 K, is inserted each day

at 0800 of 45° EMT (Eastern Meridian Time: UT + 3 hours). The data are recorded on magnetic tapes in digital form.

The cosmic noise power level shows a remarkable sidereal diurnal variation caused by the passage of the cosmic radio source across the zenith. Due to the earth's revolution, the time of the zenith passage of a particular cosmic radio source shifts by about four minutes earlier each day and returns to its initial time after one year. This diurnal variation of the cosmic noise power is deduced from the record on the quiet days.

The ionospheric absorption in dB is obtained as follows:

- 1) The reference sidereal diurnal variation of the cosmic noise power in K, T_0 , is determined from the diurnal variations on several selected quiet days each month.
- 2) Actual received power, T_1 , is read in K.
- 3) Ionospheric absorption A, in dB, is calculated with the following conversion equation:

$$A = -10 \times \log \left(\frac{T_1}{T_0} \right)$$

The combined data plots also include the variation of H-component of the geomagnetic field, and HF field strength, at Syowa Station.

5. Remarks

Because of troubles in the data acquisition system, any plots during periods shown in Table 1 do not appear in the combined data plots.

Variations of the cosmic noise power during periods in Table 2 are not shown because of troubles in the observation system.

If there is any unclear points you would raise or if you have any questions, do not hesitate to write to us at the address in the introduction.

Table 1

From	to
1999. Jan. 18, 00:00	1999. Jan. 18, 24:00
1999. Feb. 2, 00:00	1999. Feb. 10, 24:00

Table 2

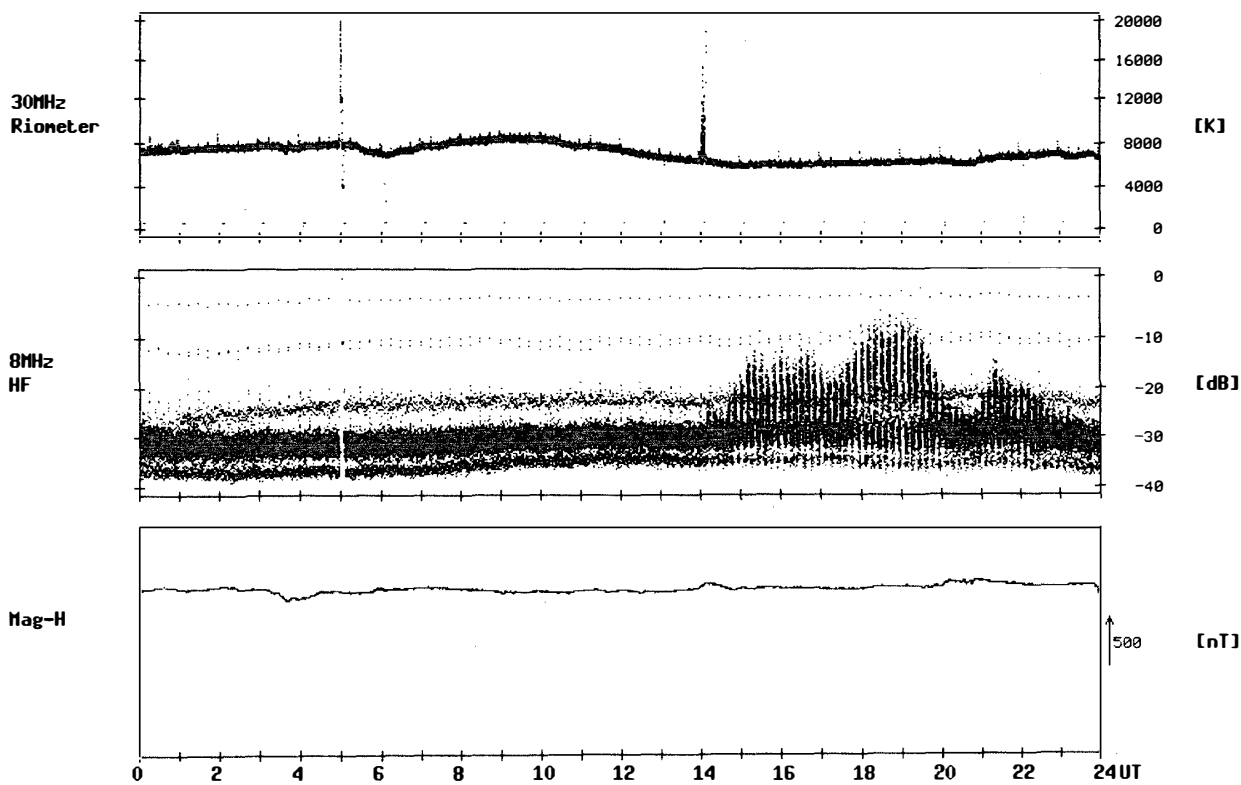
From	to
1999. Jan. 11, 05:20	1999. Feb. 1, 24:00
1999. Feb. 11, 00:00	1999. Feb. 17, 10:00
1999. May 31, 08:30	1999. May 31, 14:50
1999. Dec 29, 08:00	1999. Dec 29, 09:00

Bibliography relevant to RADIO OBSERVATION DATA AT SYOWA STATION, ANTARCTICA
(RIOMETER RECORDS OF 30 MHz COSMIC NOISE AT SYOWA STATION, ANTARCTICA)

Observing Period	Observers	Literature		
		JARE Data Reports		
		Volume	Pages	Year
Feb.1967 - Feb.1968	Ose, M. Nishimuta, I.	2(Ionosphere 1)	62	1968
Feb.1968 - Jan.1969	Ishizawa, K.	7(Ionosphere 3)	65	1970
1969	Ota, Y.	8(Ionosphere 4)	74	1970
1970	Shiro, I. Sakamoto, T.	14(Ionosphere 5)	62	1971
1971	Ogata, T. Ose, M.	18(Ionosphere 7)	62	1971
1972	Isozaki, S. Miyazaki, S.	20(Ionosphere 8)	76	1973
1973	Nishimuta, I. Yabuuma, H.	24(Ionosphere 11)	74	1974
1974	Yamazaki, I. Shiro, I.	29(Ionosphere 13)	84	1975
1975	Sugiuchi, H. Komiya, N.	35(Ionosphere 15)	84	1976
1976	Yamakoshi, A. Sasaki, T.	41(Ionosphere 17)	87	1977
1977	Nishiyama, N. Sakamoto, J.	46(Ionosphere 19)	82	1978
1978	Igarashi, K. Tsuzurahara, S.	51(Ionosphere 20)	86	1979
1979	Ojima, S. Komiya, N.	56(Ionosphere 22)	84	1980
1980	Nozaki, K.	70(Ionosphere 26)	97	1982
1981	Kurihara, N.	80(Ionosphere 27)	94	1983
1982	Kuratani, Y. Igarashi, K.	87(Ionosphere 29)	86	1984
1983	Yamazaki, I. Tanaka, T.	99(Ionosphere 31)	93	1985
1984	Yamamoto, S.	112(Ionosphere 33)	95	1986
1985	Maeno, H.	122(Ionosphere 35)	94	1987
1986	Suzuki, A.	133(Ionosphere 37)	96	1988
1987	Inamori, K.	141(Ionosphere 39)	99	1989
1988	Ohtsuka, A.	155(Ionosphere 42)	98	1990
1989	Yamamoto, S.	168(Ionosphere 44)	184	1991
1990	Ohtaka, K.	176(Ionosphere 47)	204	1992
1991	Nozaki, K.	189(Ionosphere 49)	184	1993
1992	Kamata, M.	196(Ionosphere 52)	202	1994
1993	Yamaguchi, T.	206(Ionosphere 54)	190	1995
1994	Iwasaki, K.	212(Ionosphere 55)	197	1996
1995	Inamori, K.	226(Ionosphere 58)	181	1997
1996	Yumisashi, I.	231(Ionosphere 59)	182	1998
1997	Ozeki, J.	240(Ionosphere 63)	178	1999

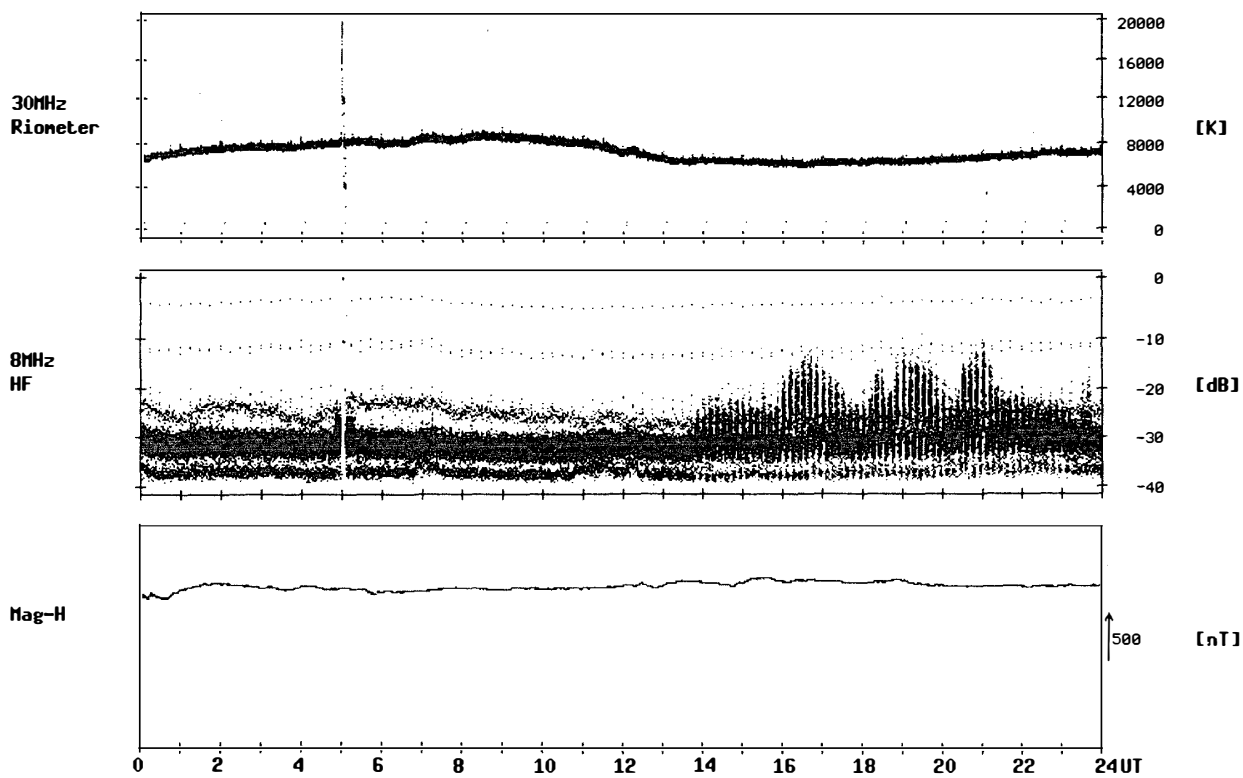
Syowa Station

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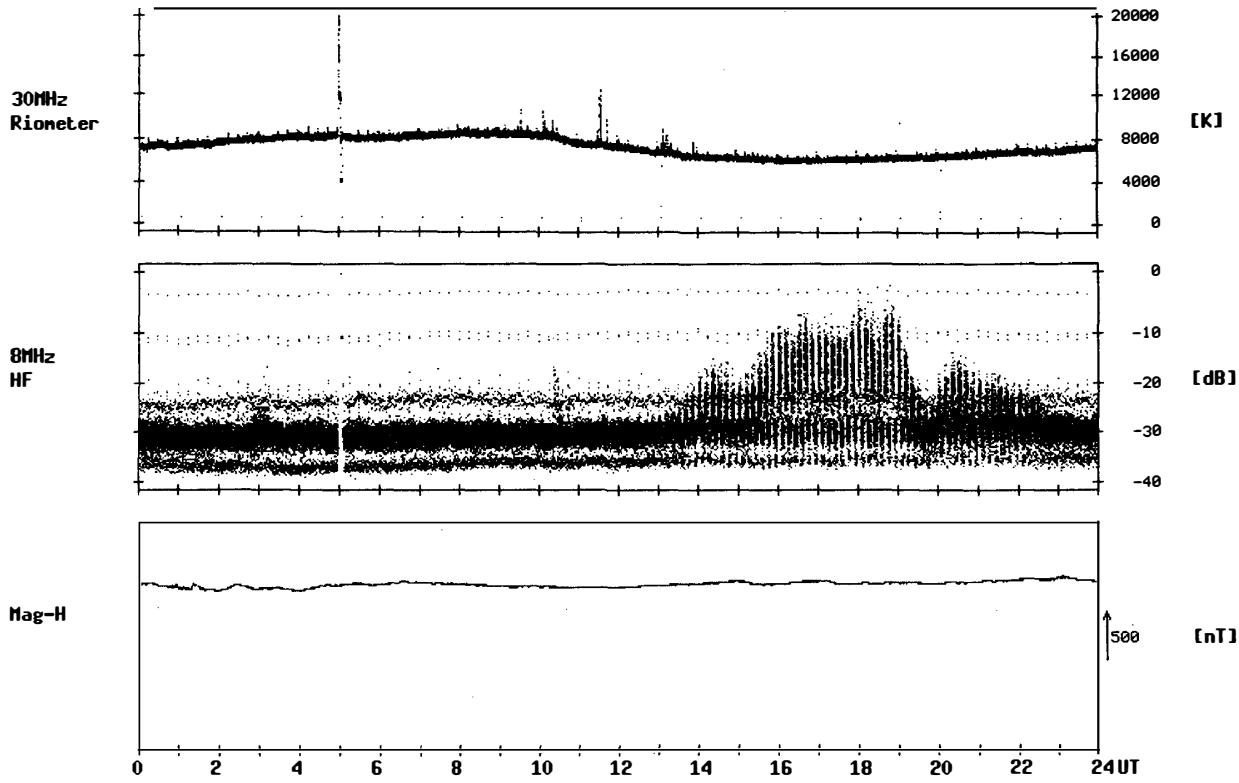
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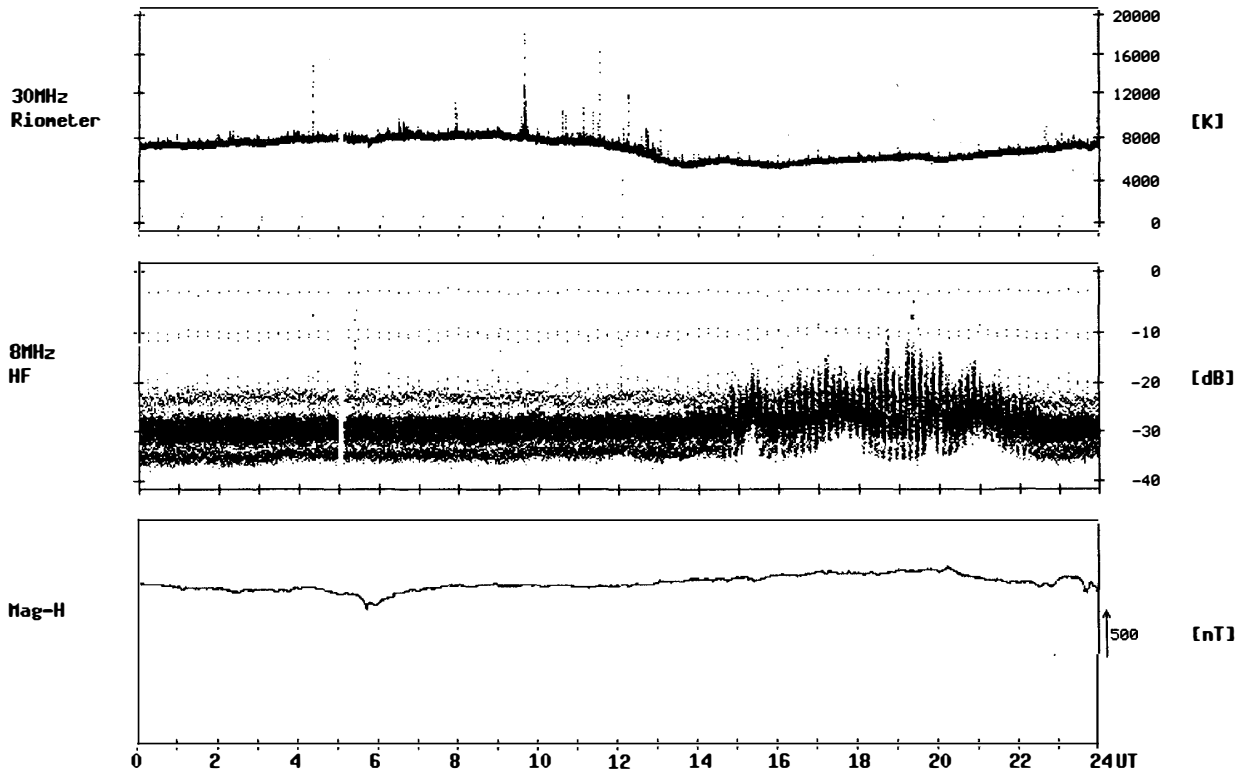
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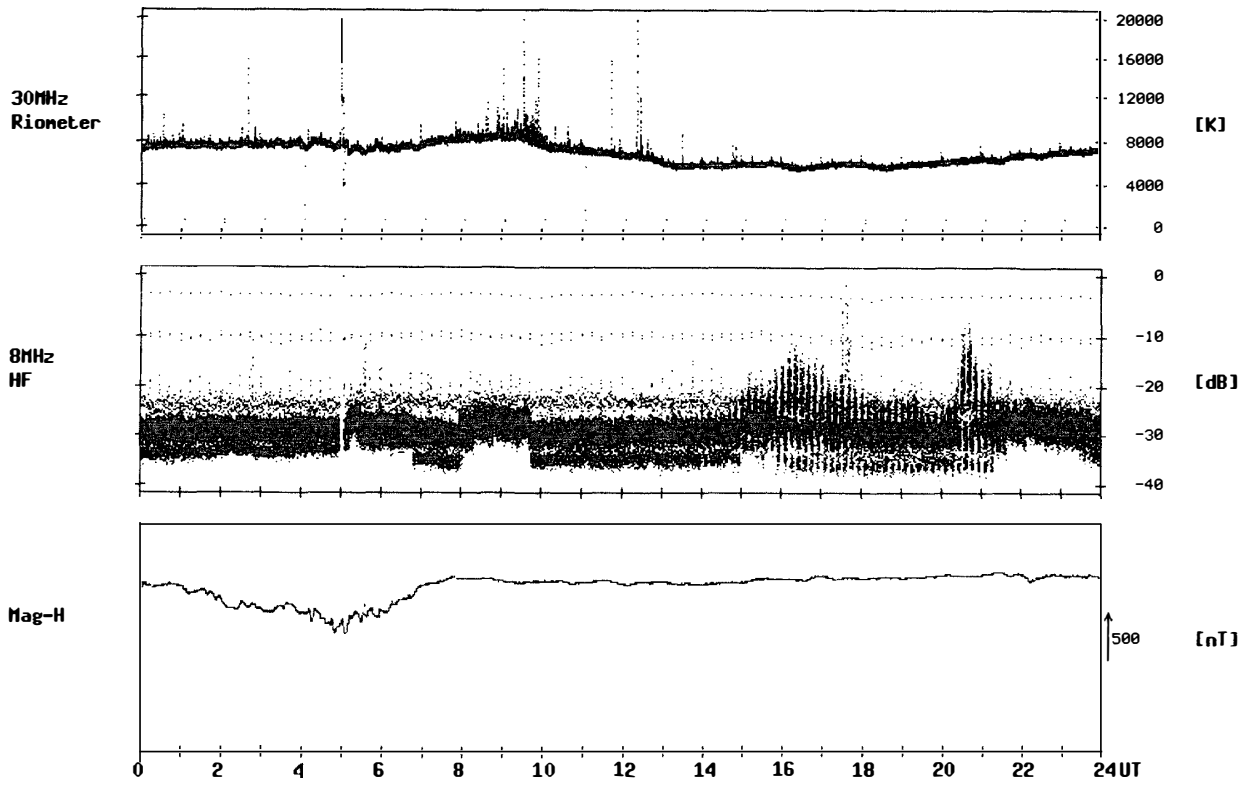
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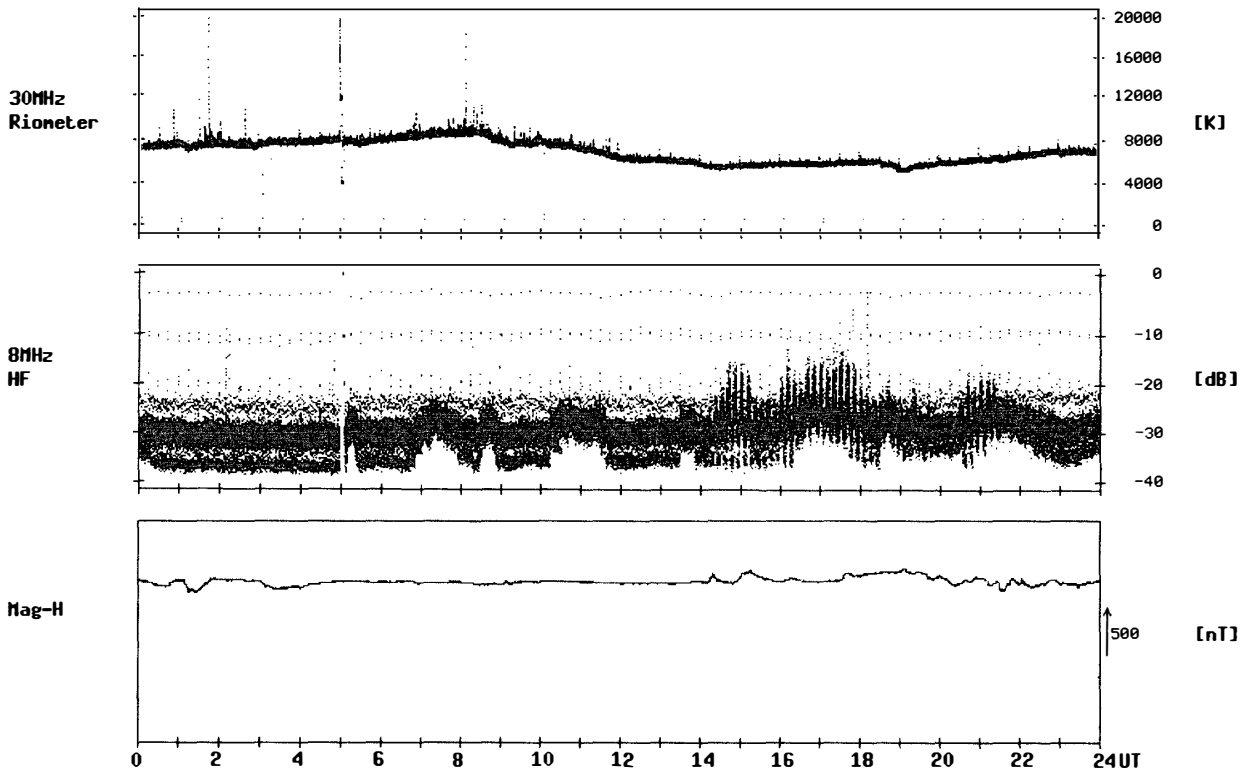
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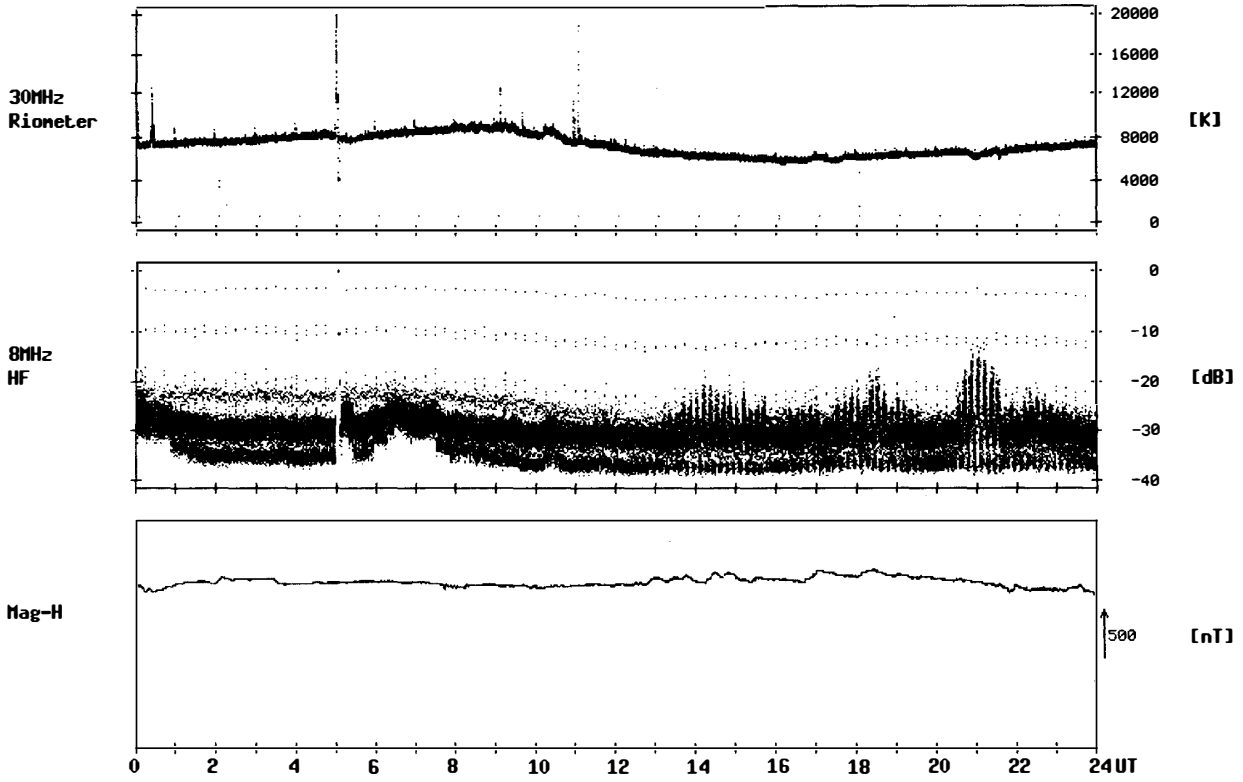
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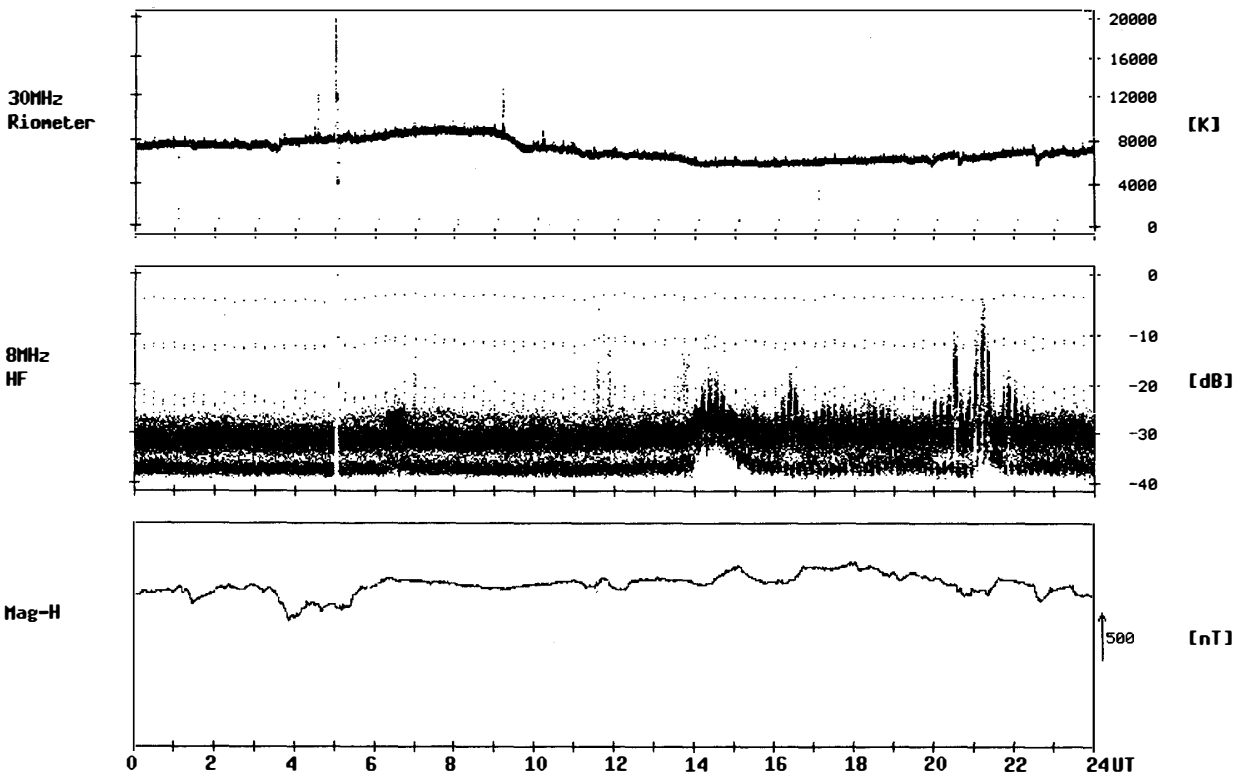
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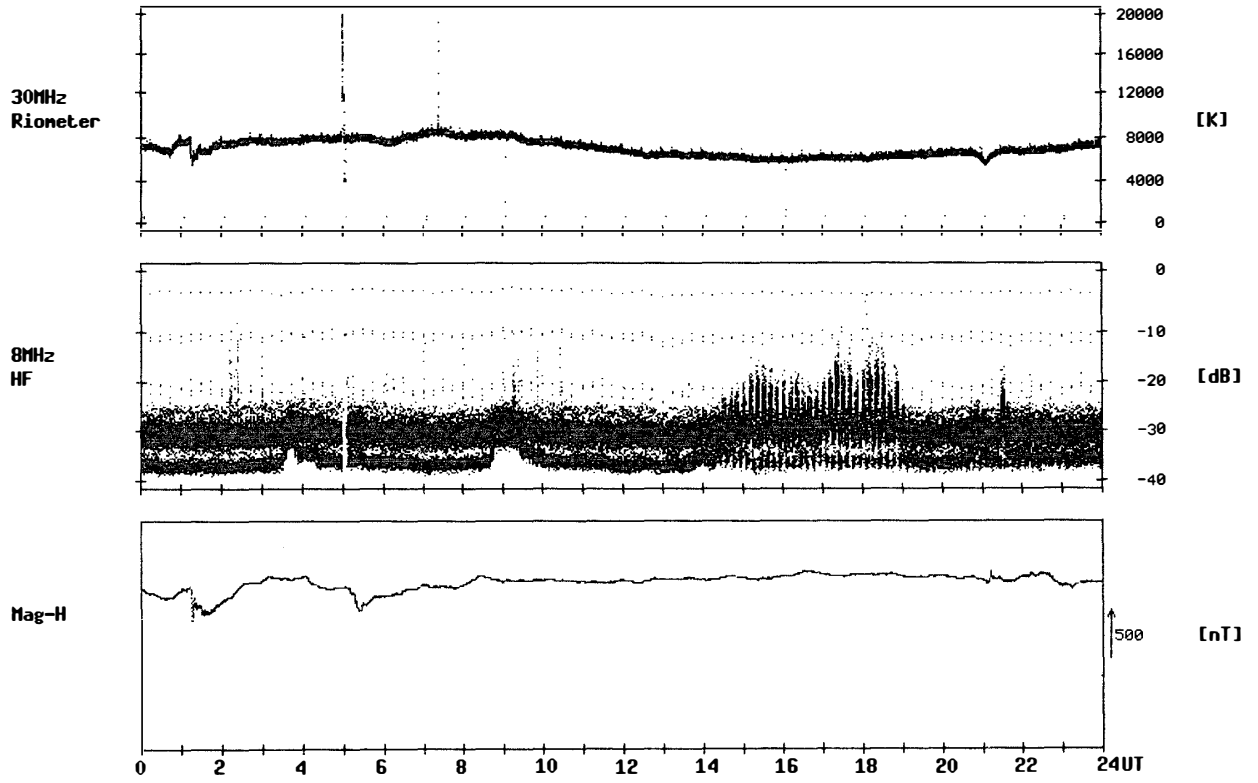
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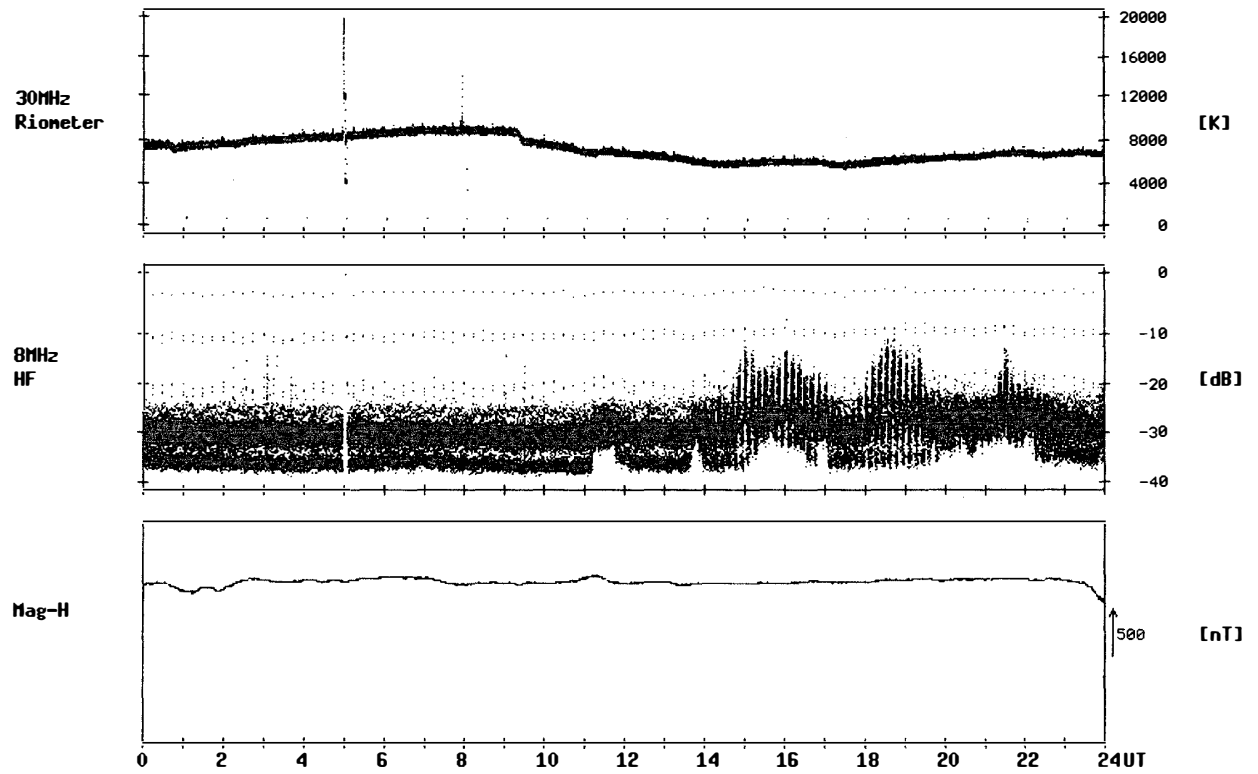
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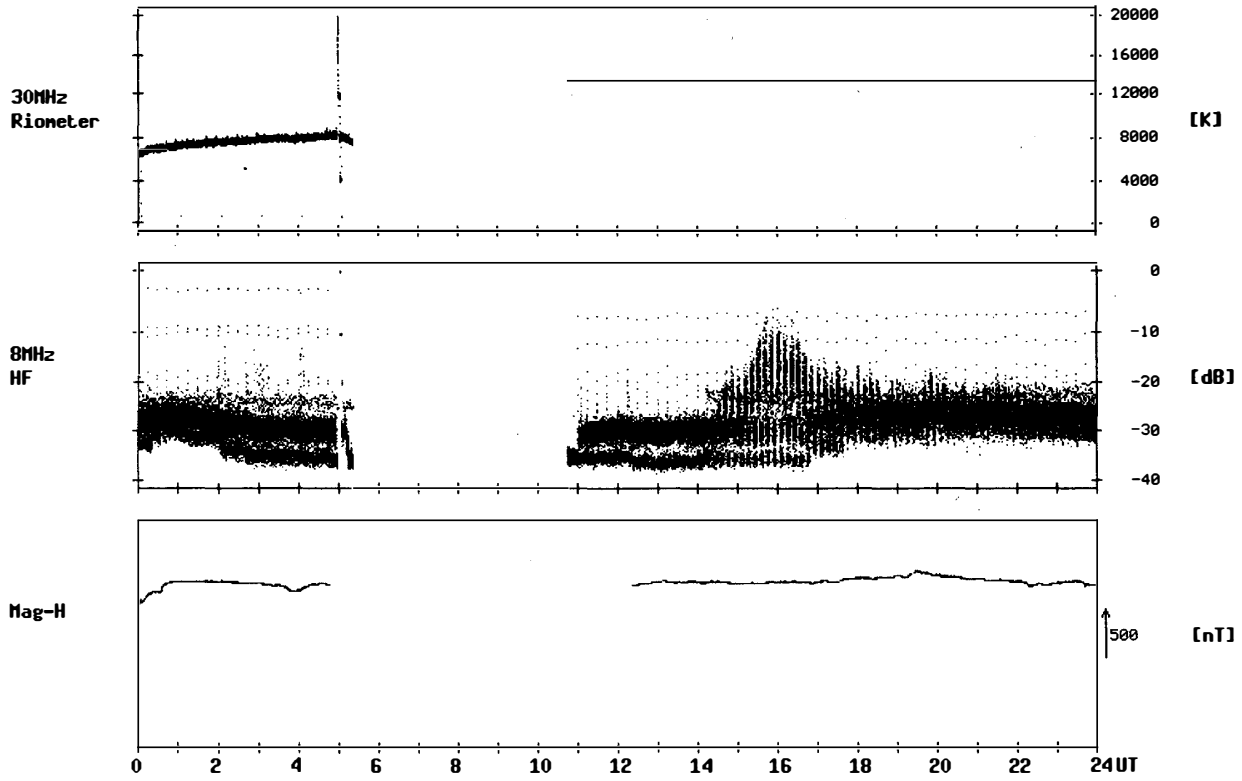
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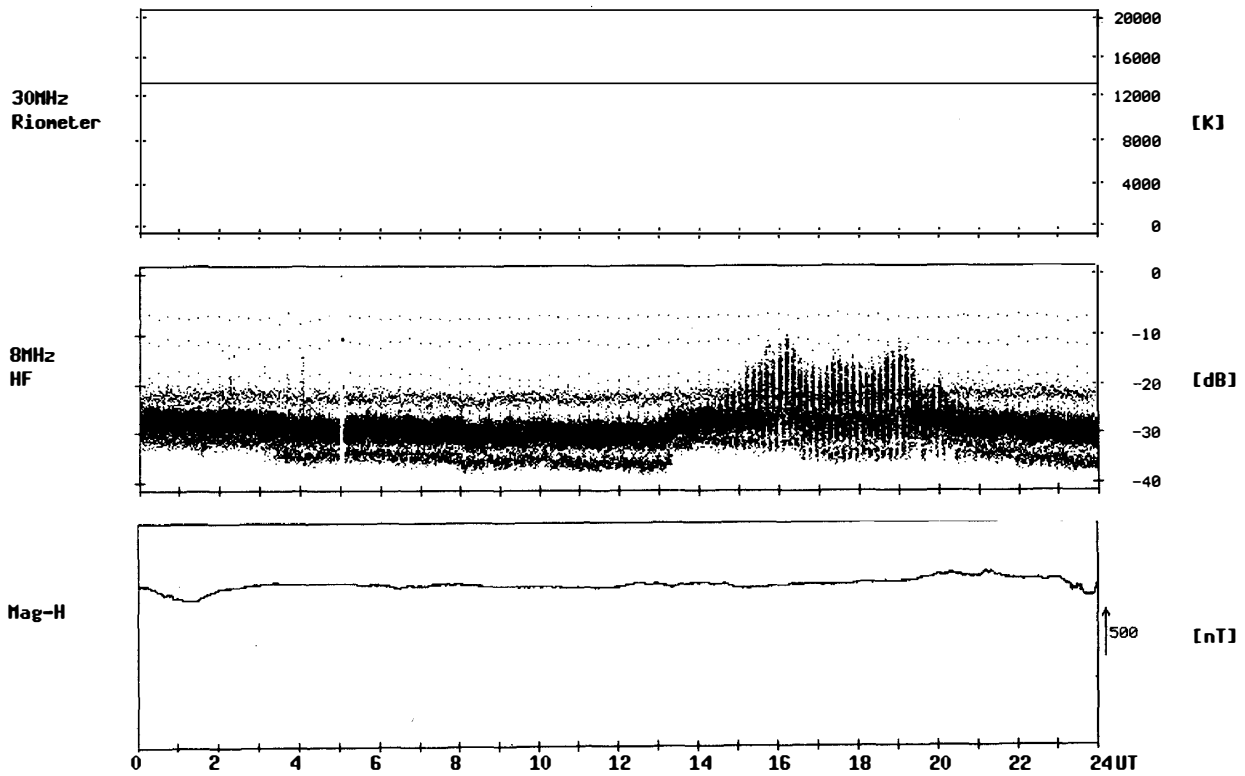
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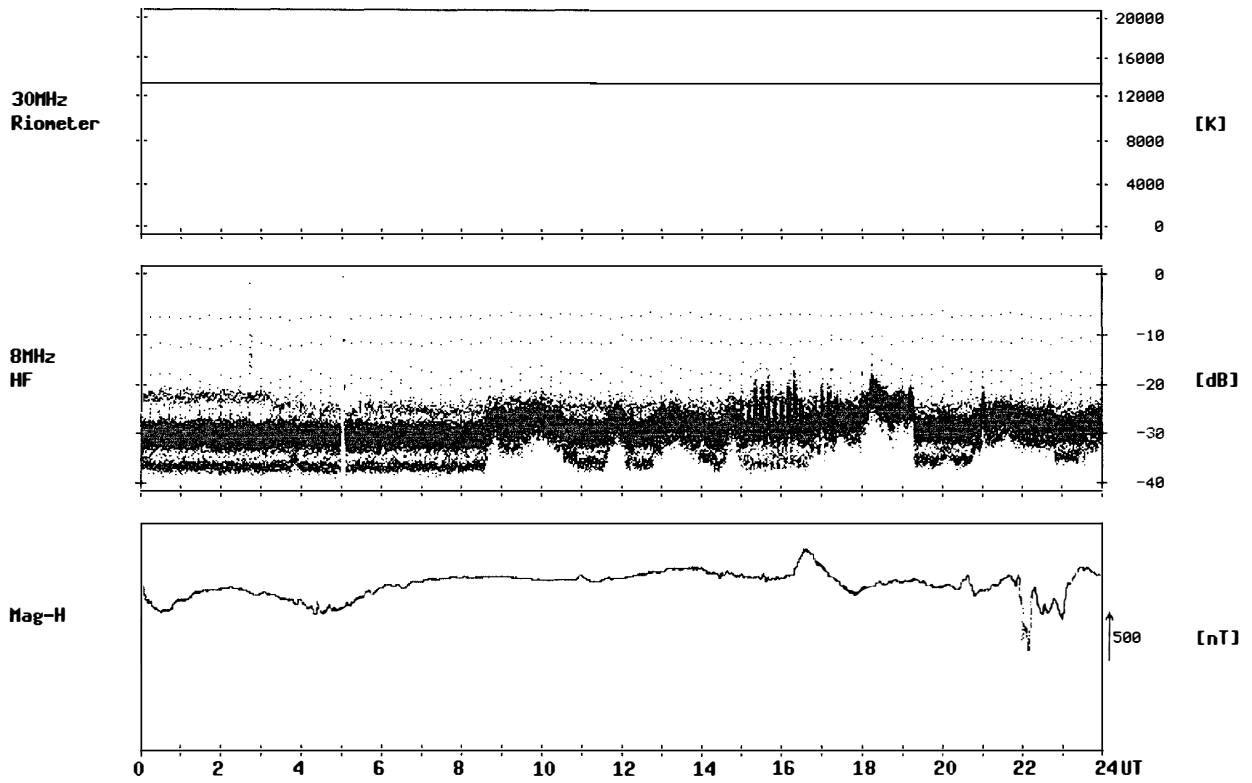
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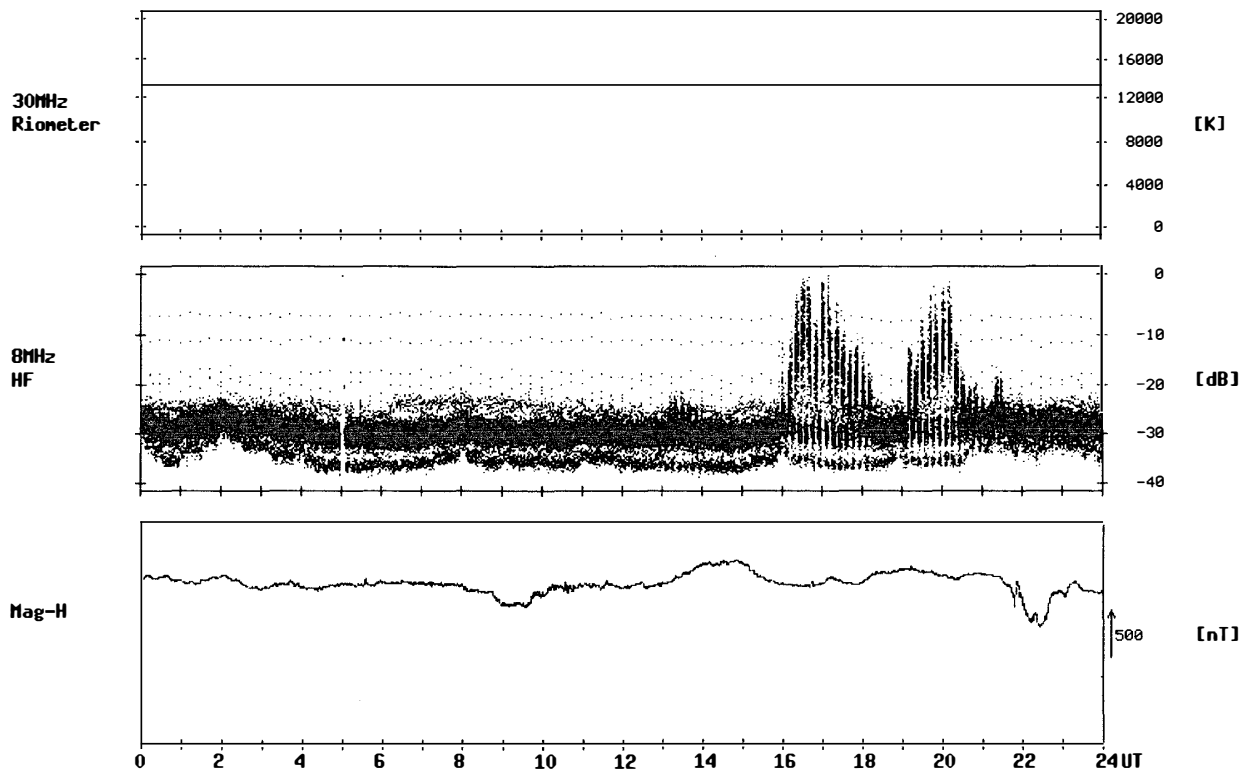
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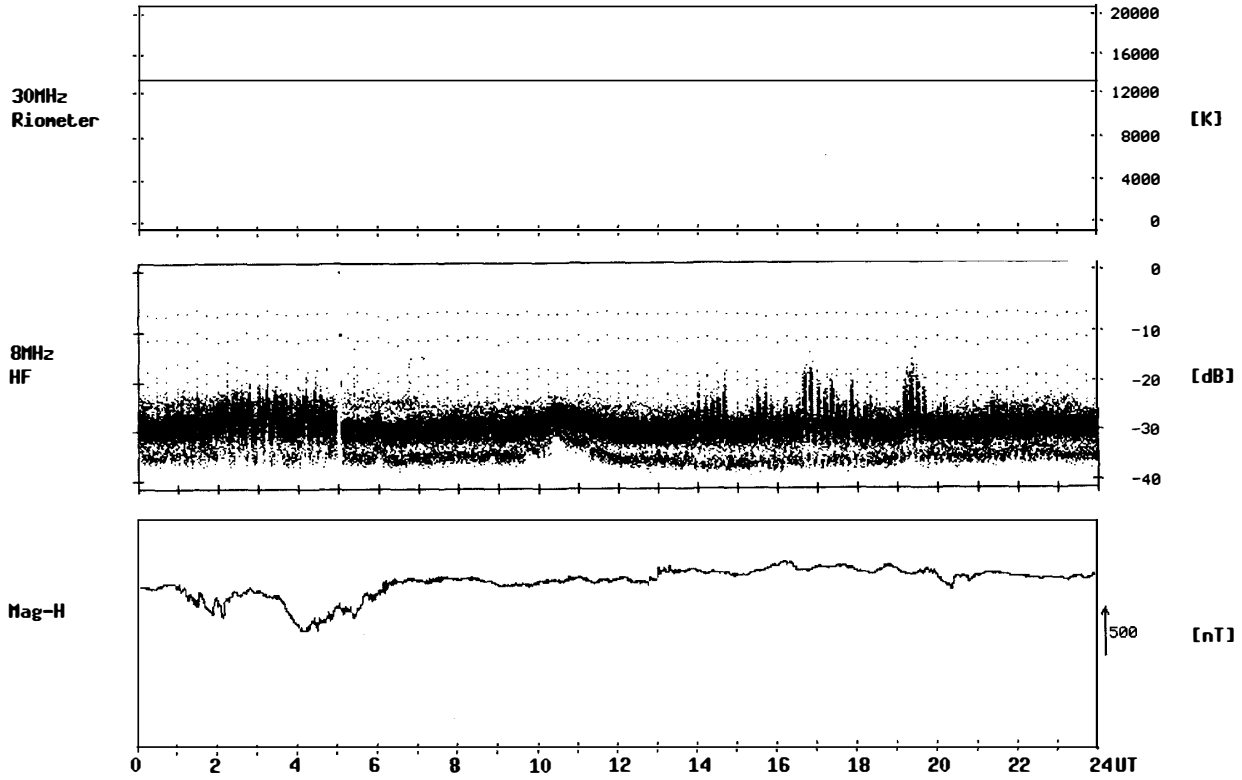
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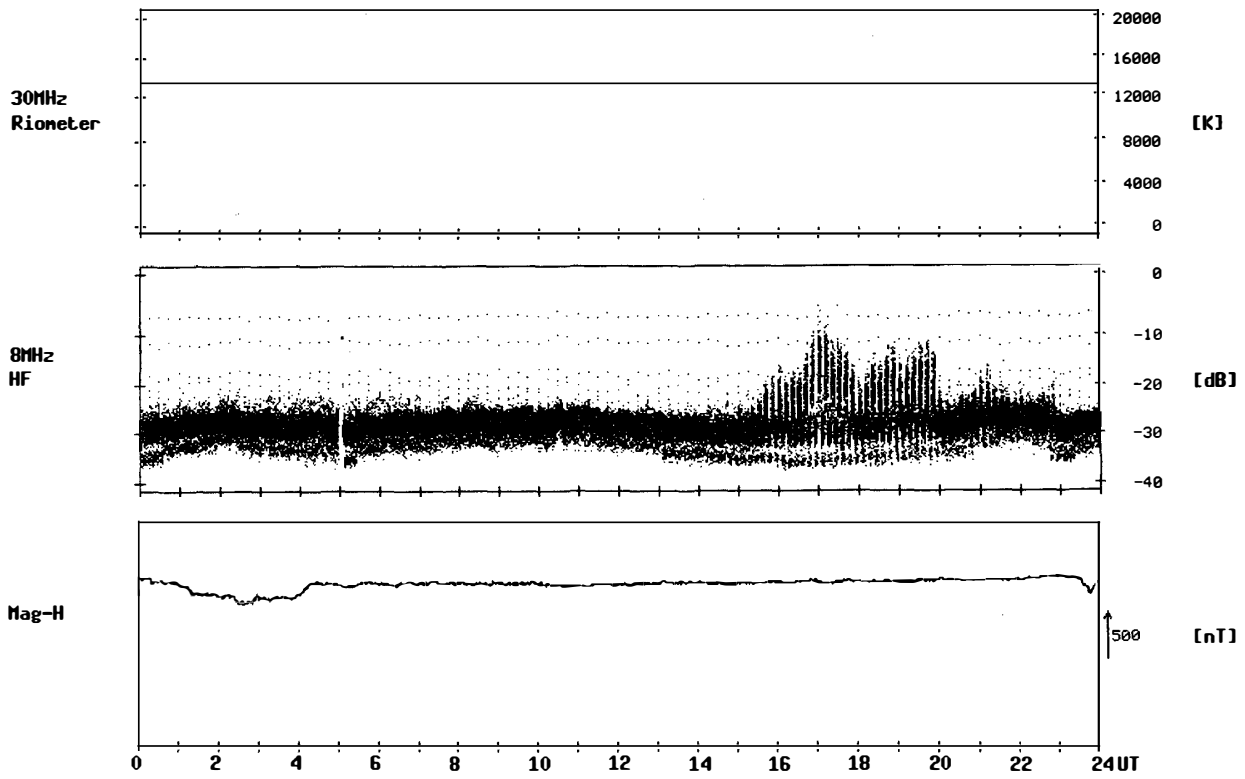
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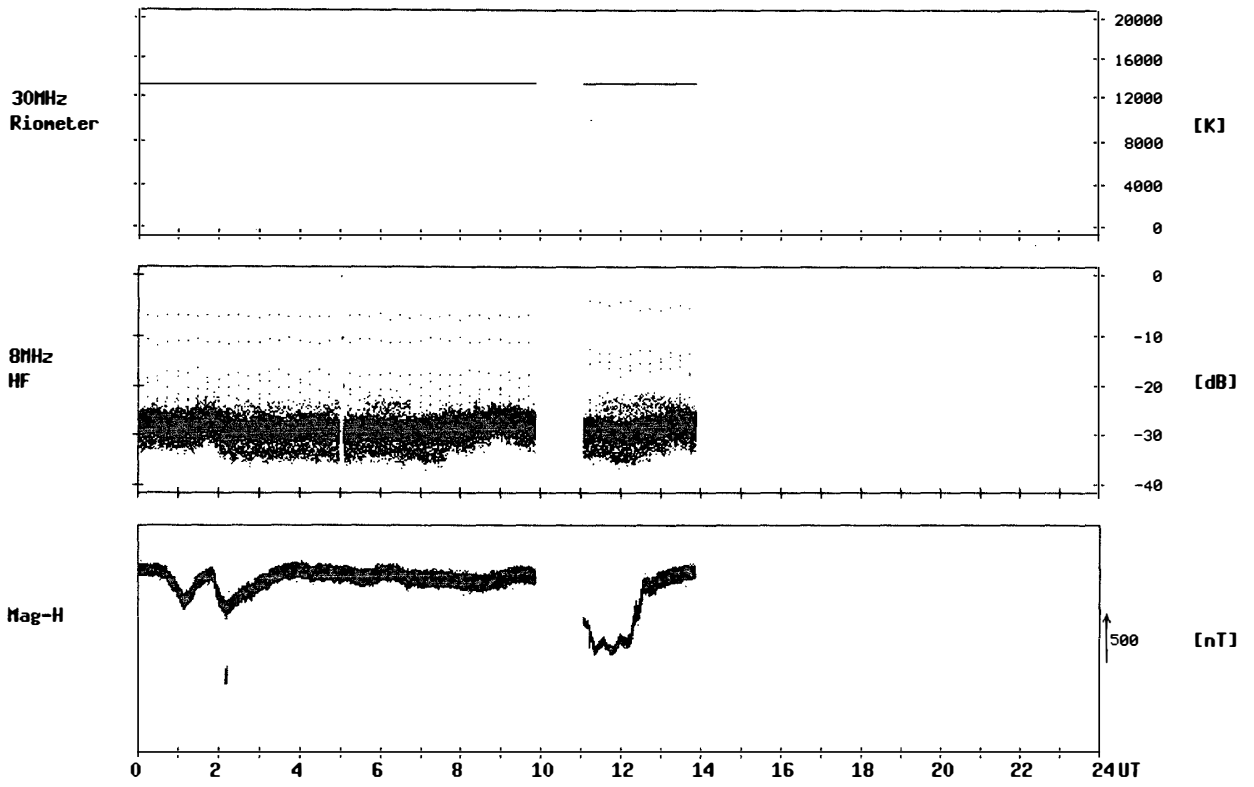
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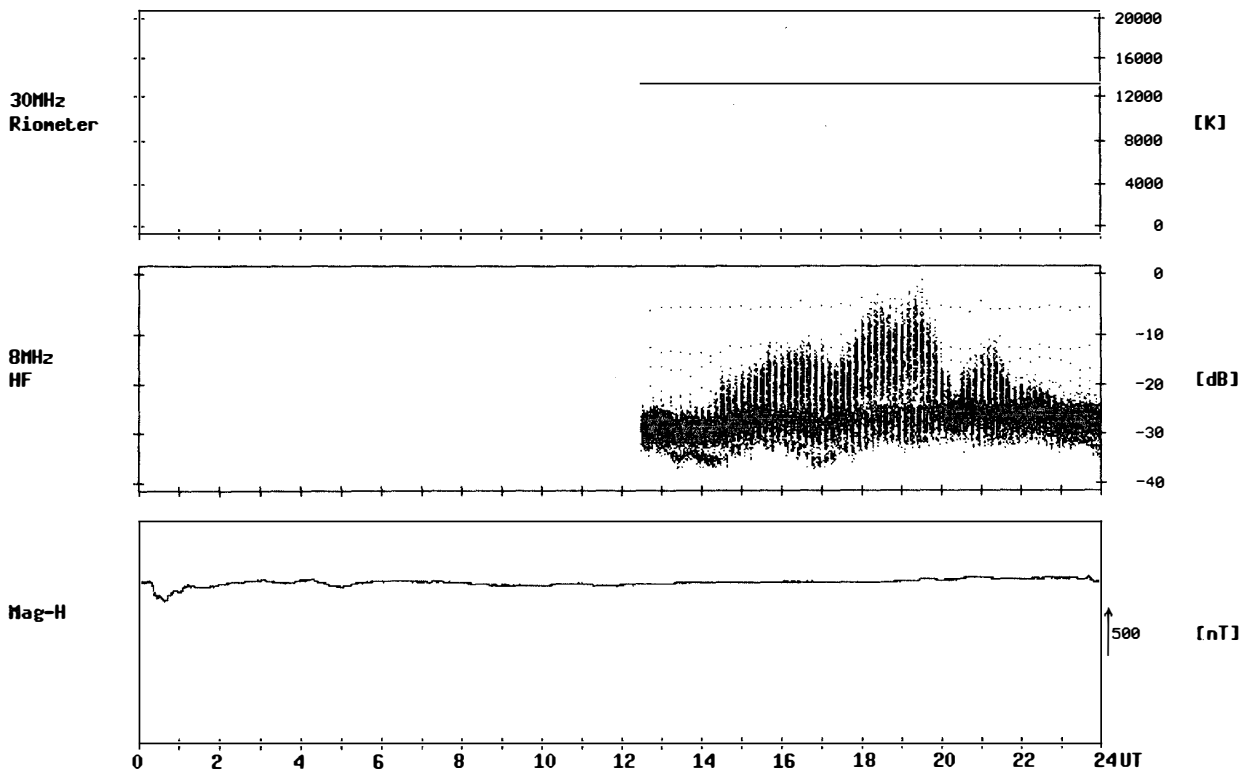
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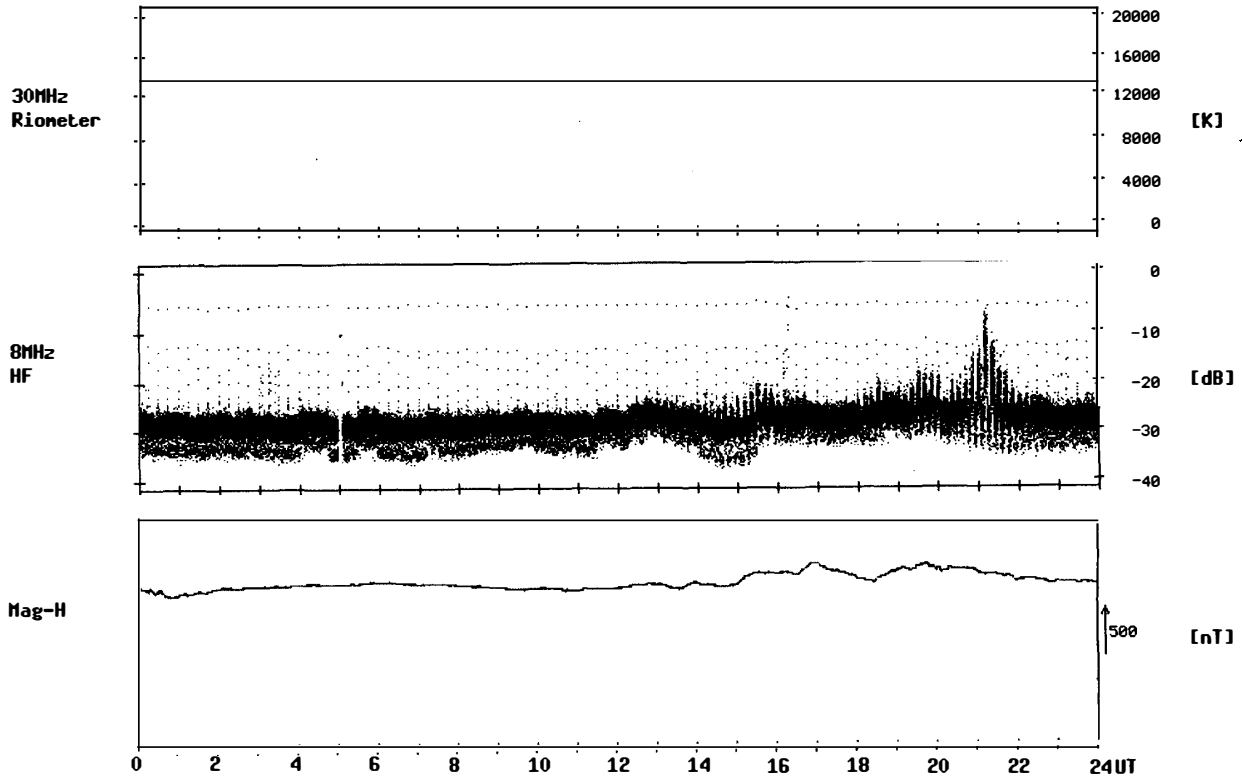
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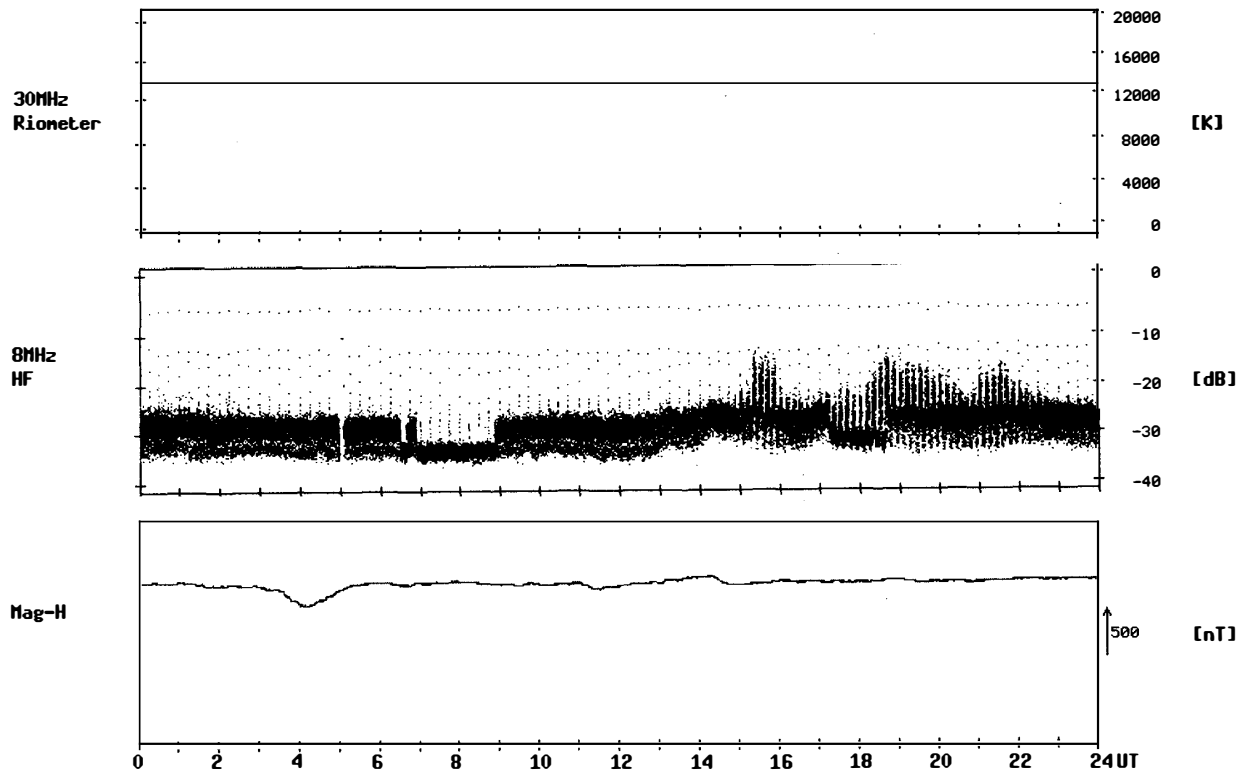
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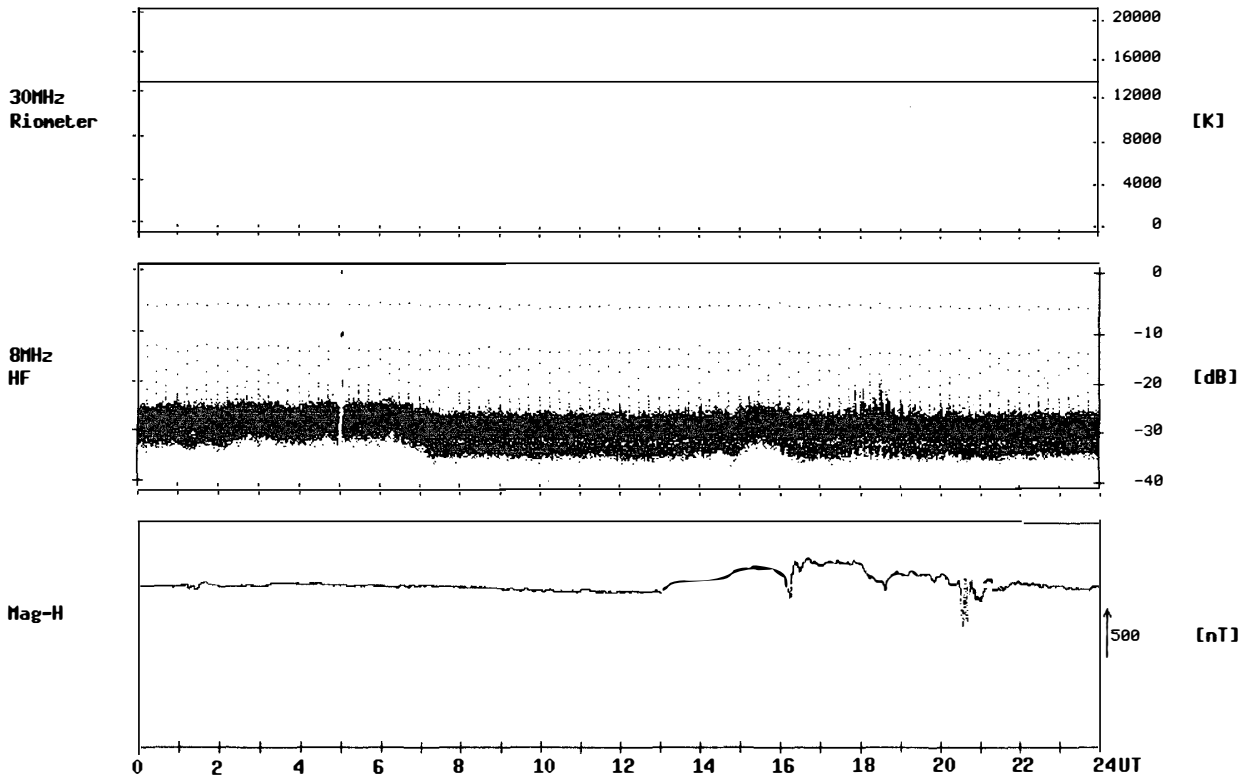
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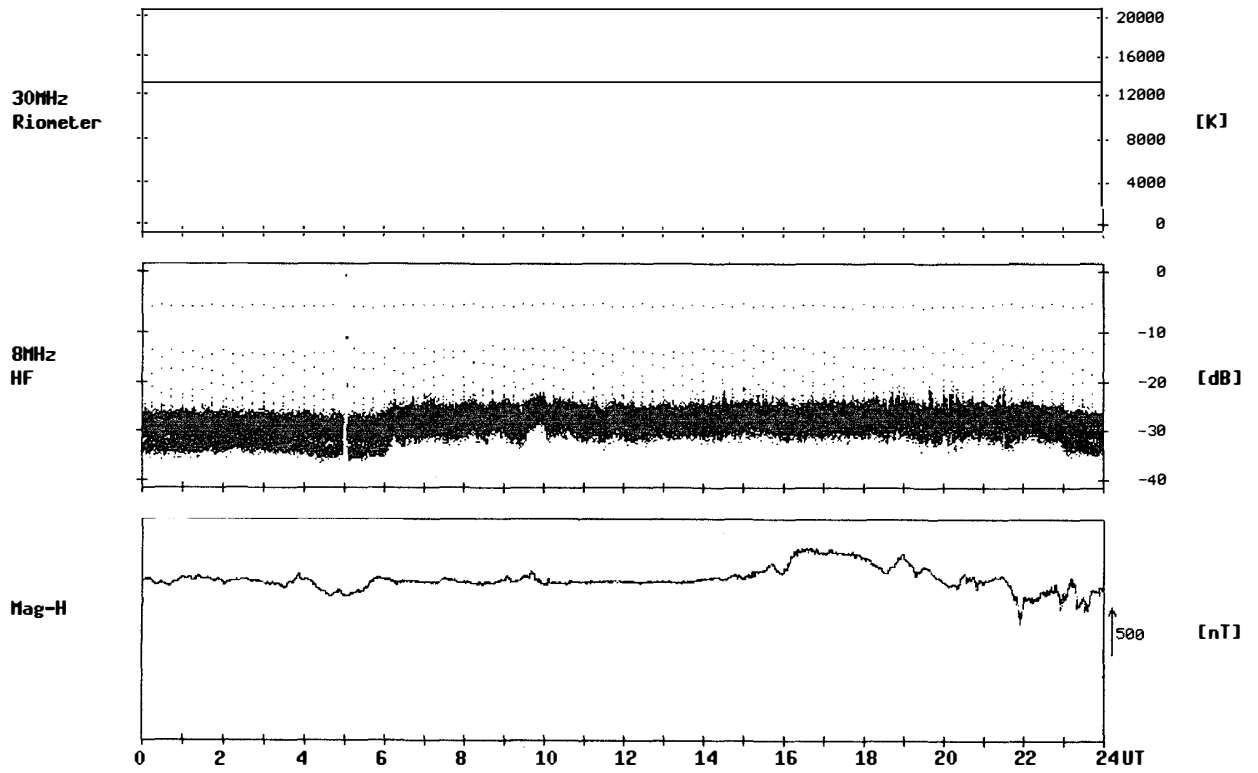
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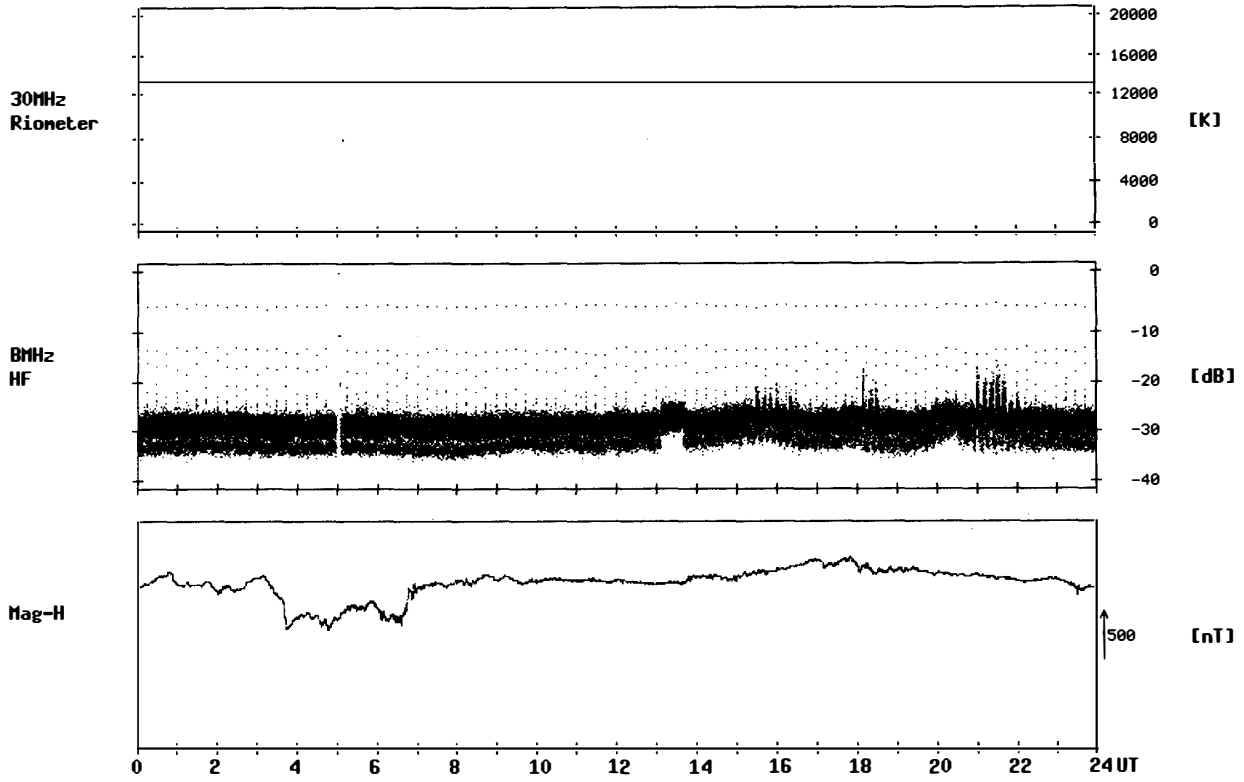
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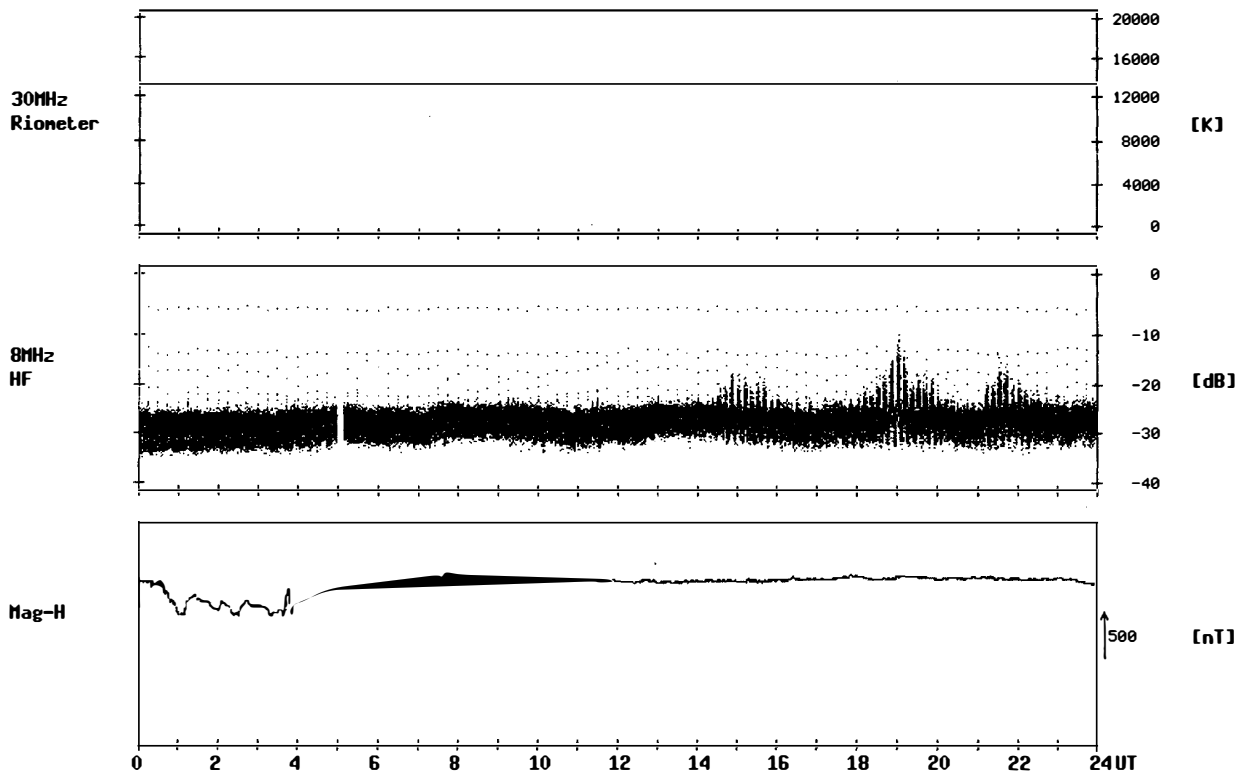
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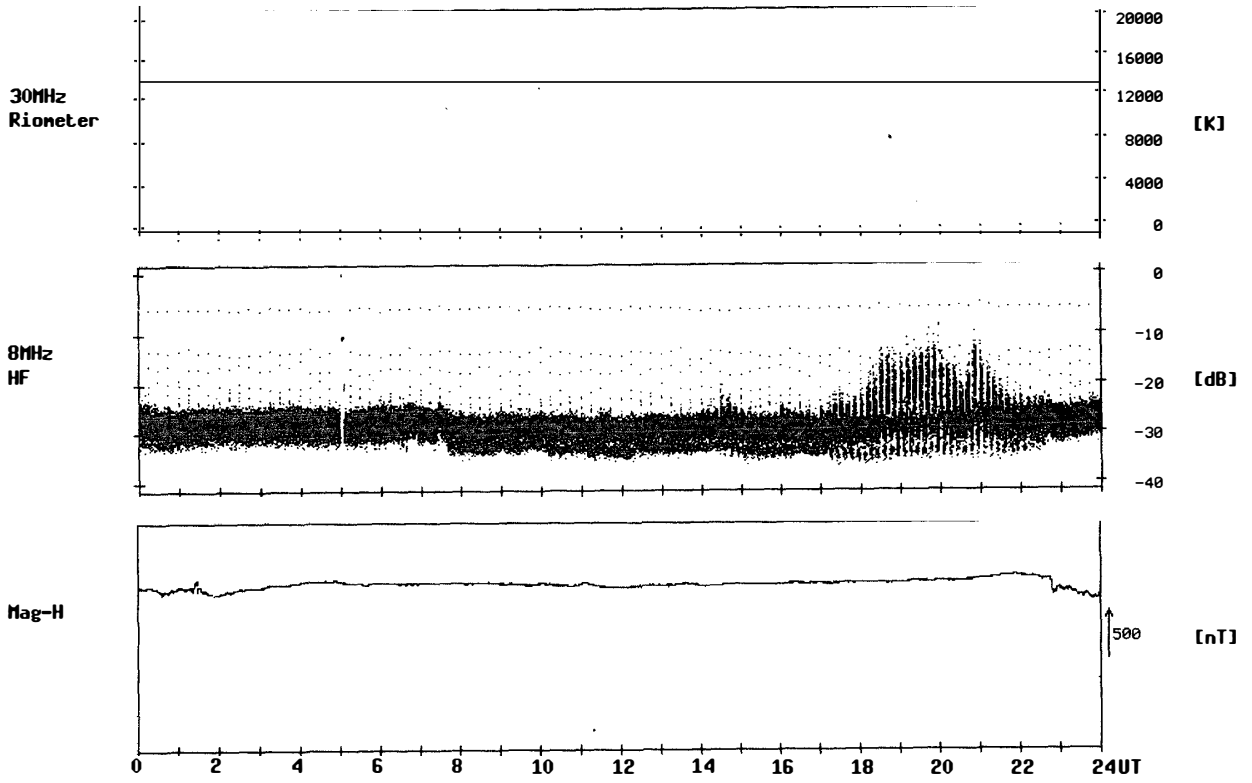
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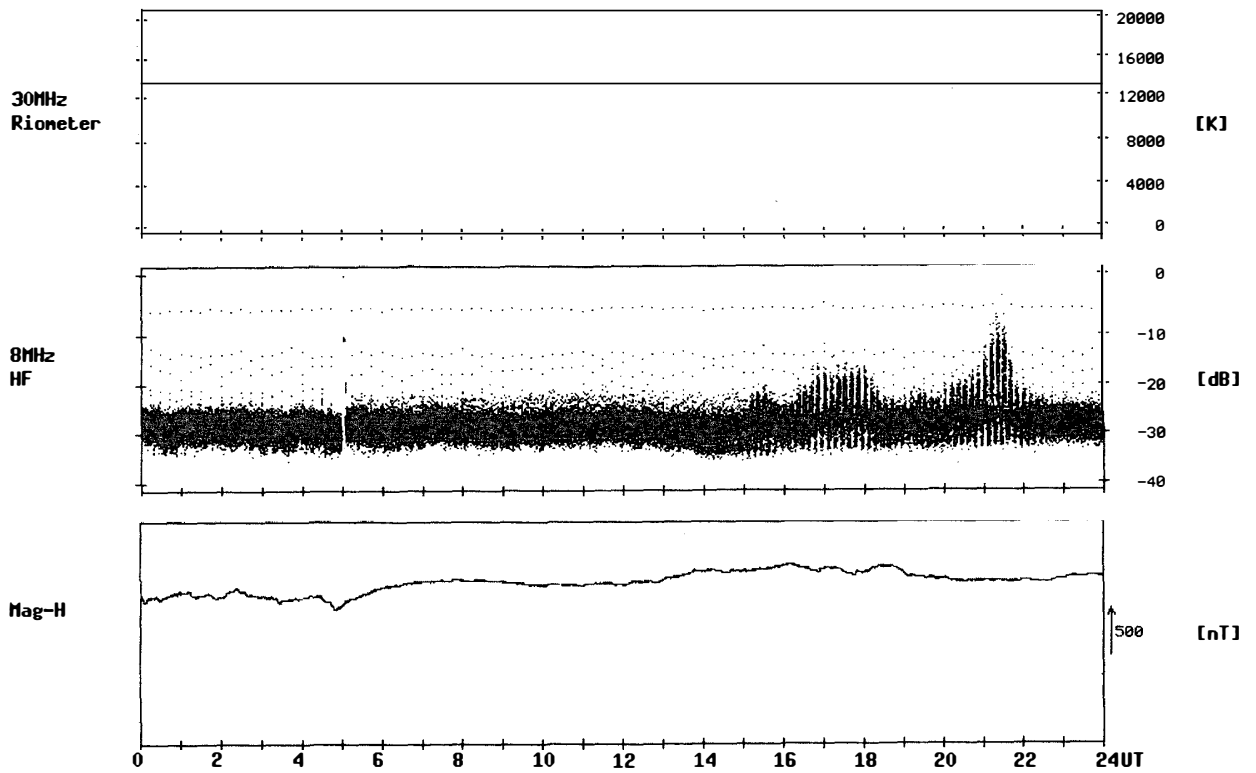
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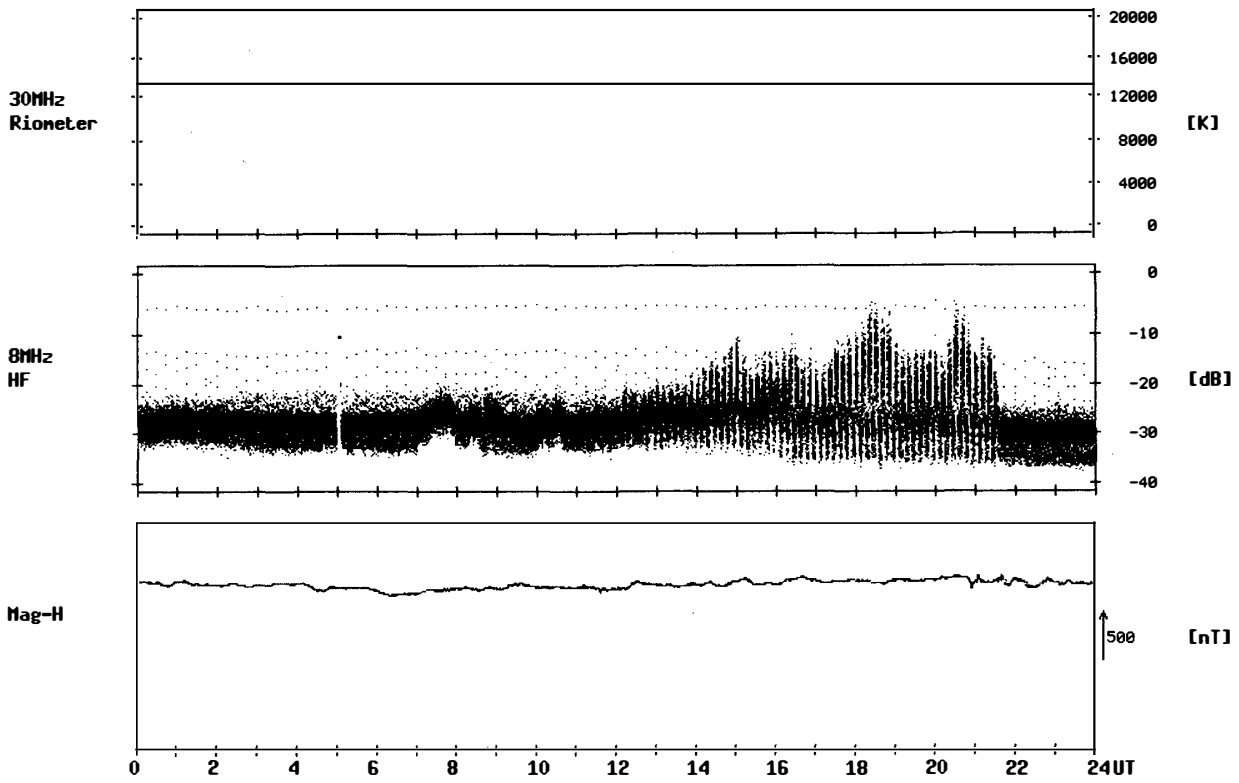
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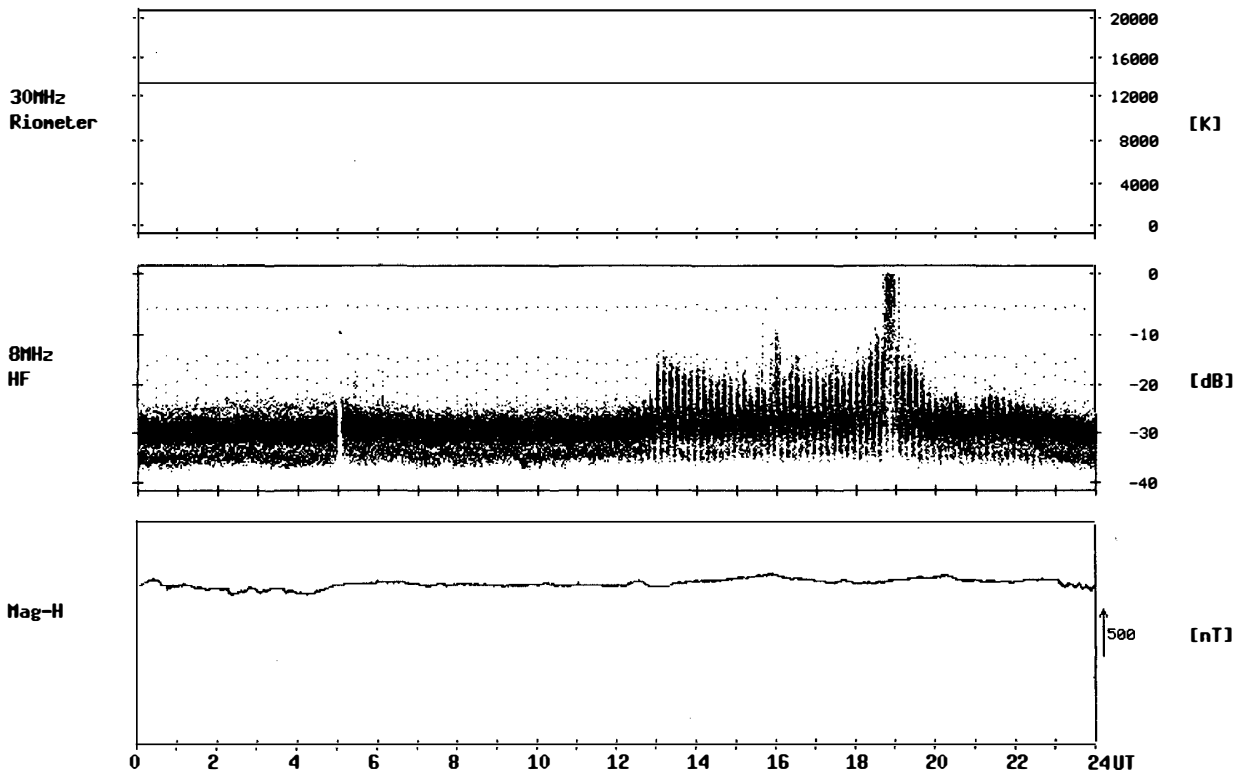
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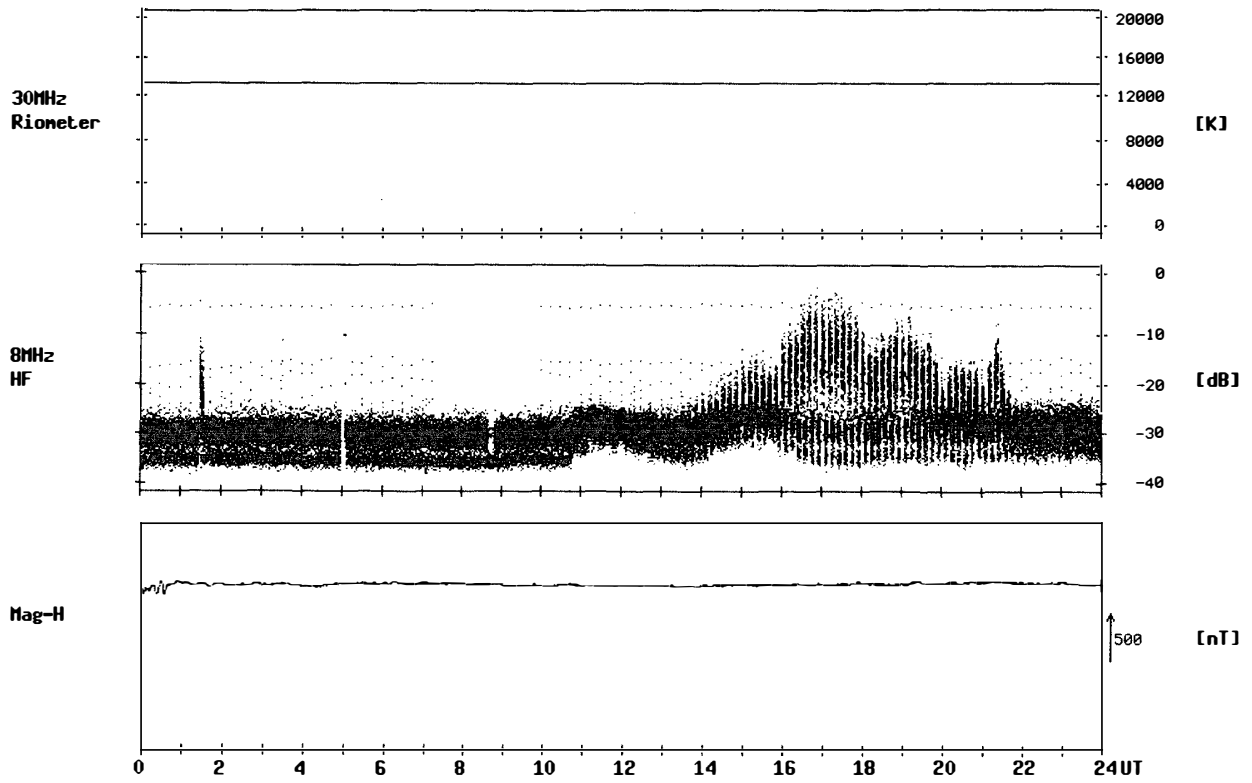
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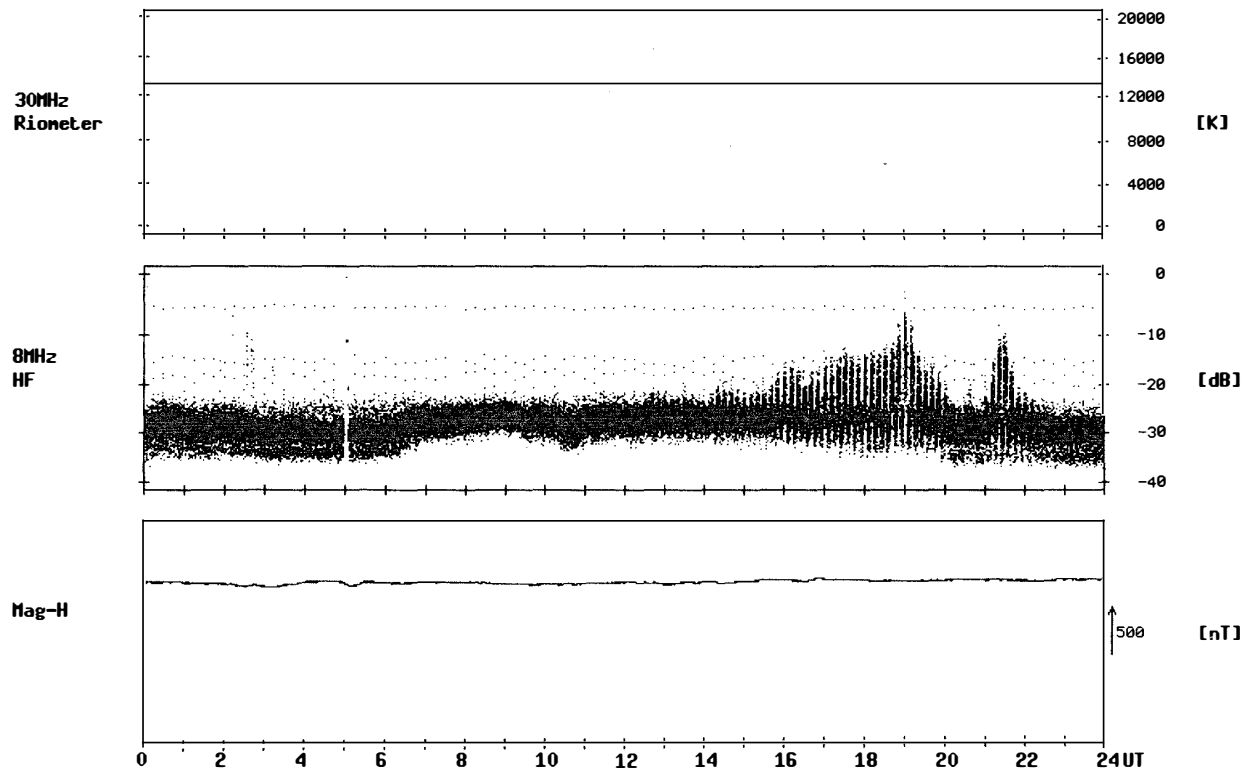
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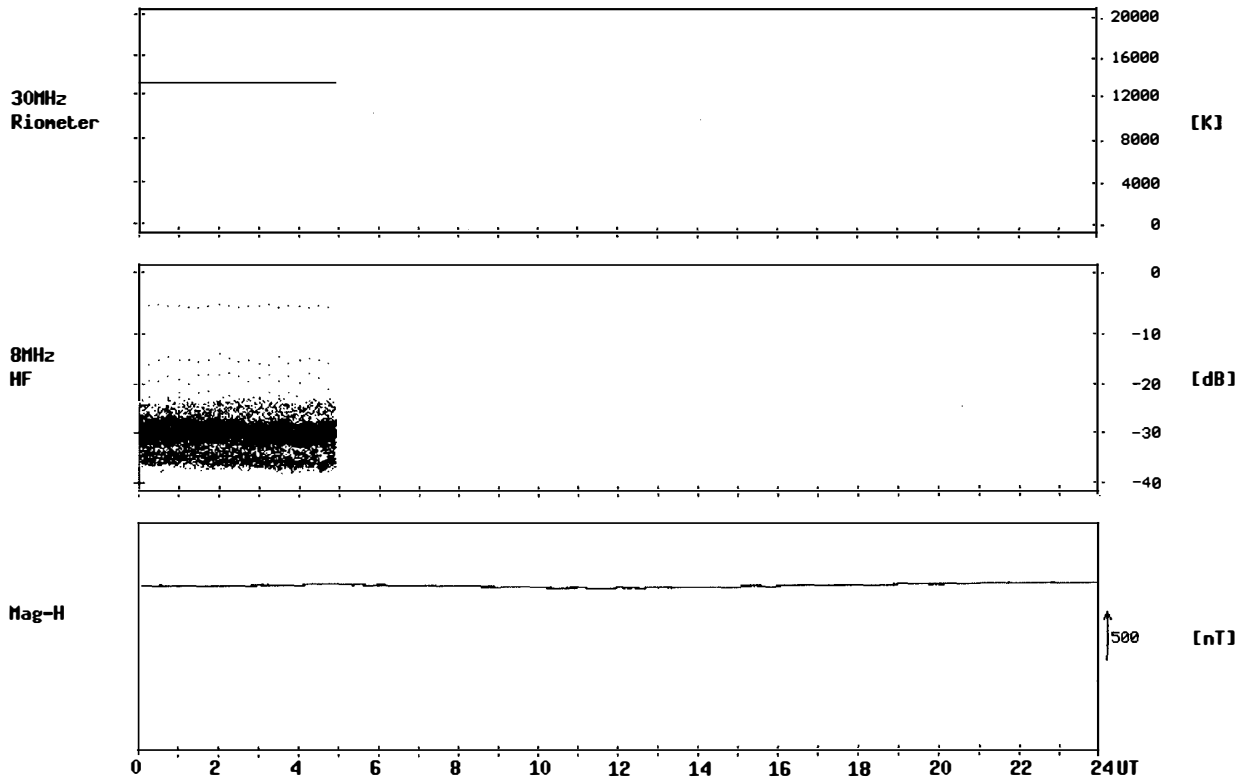
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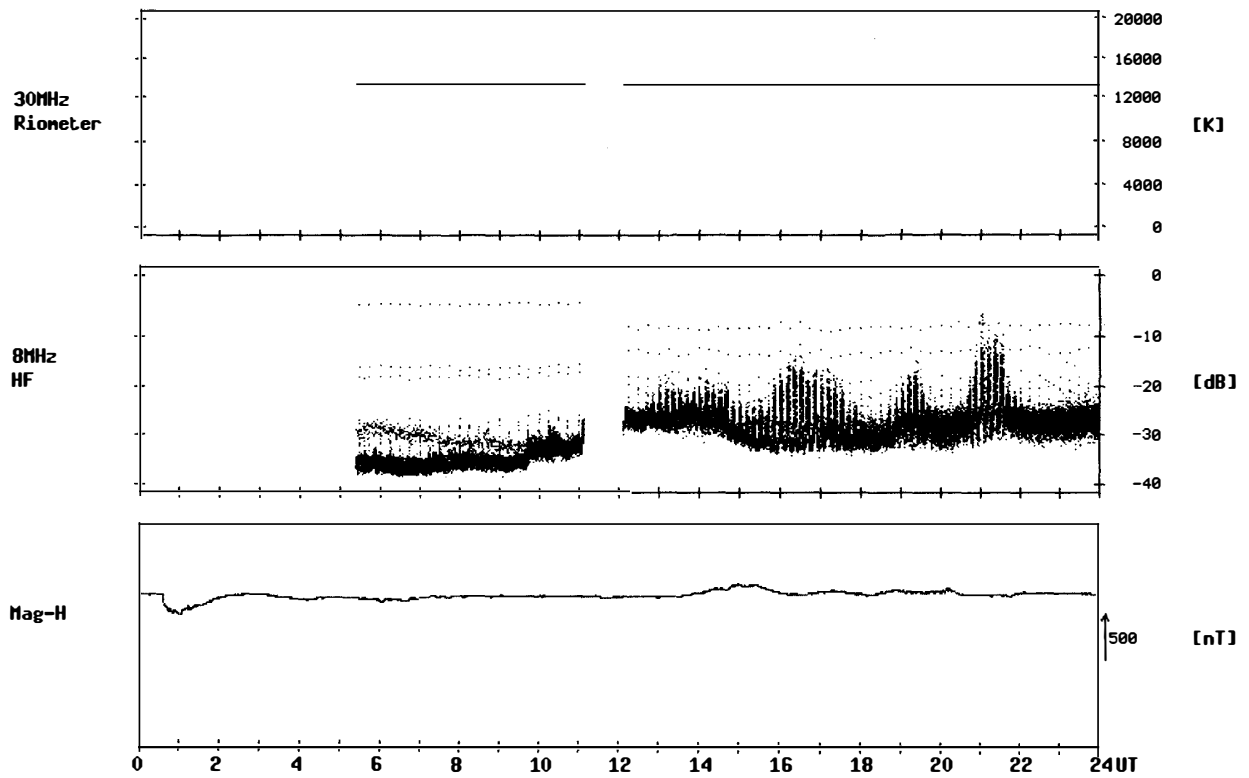
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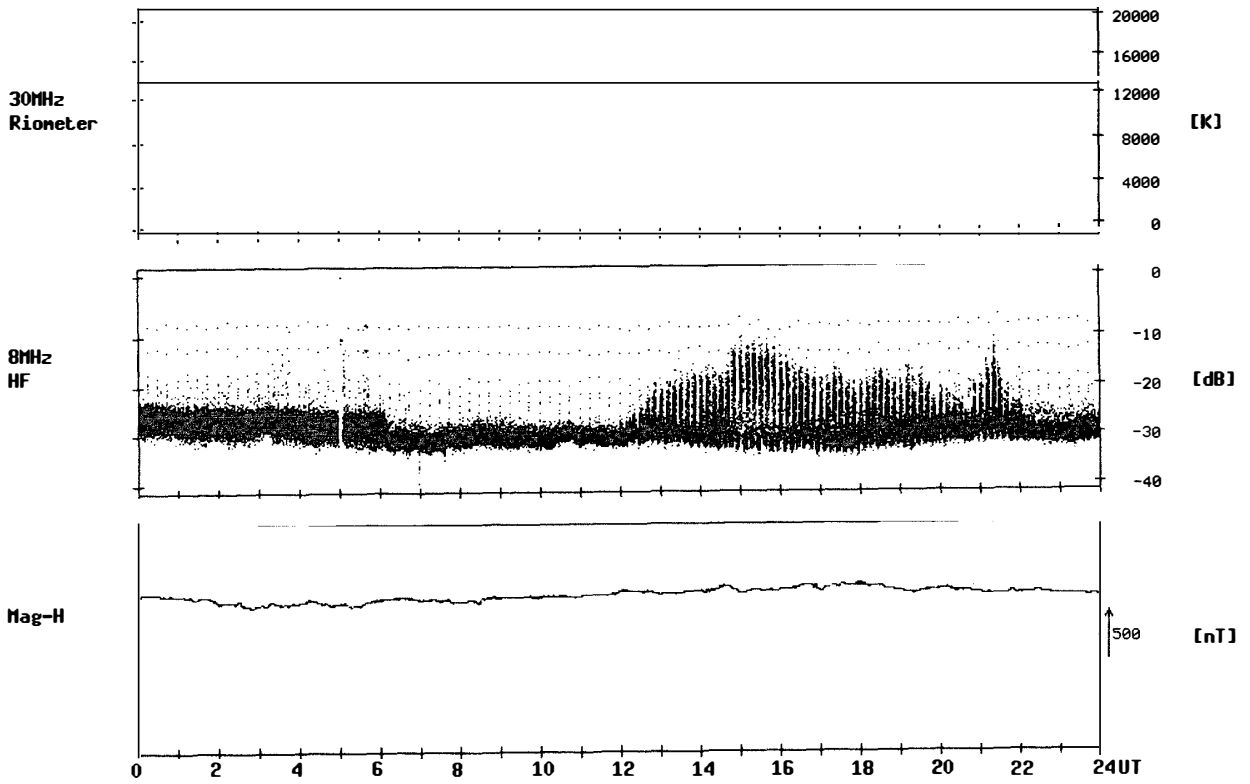
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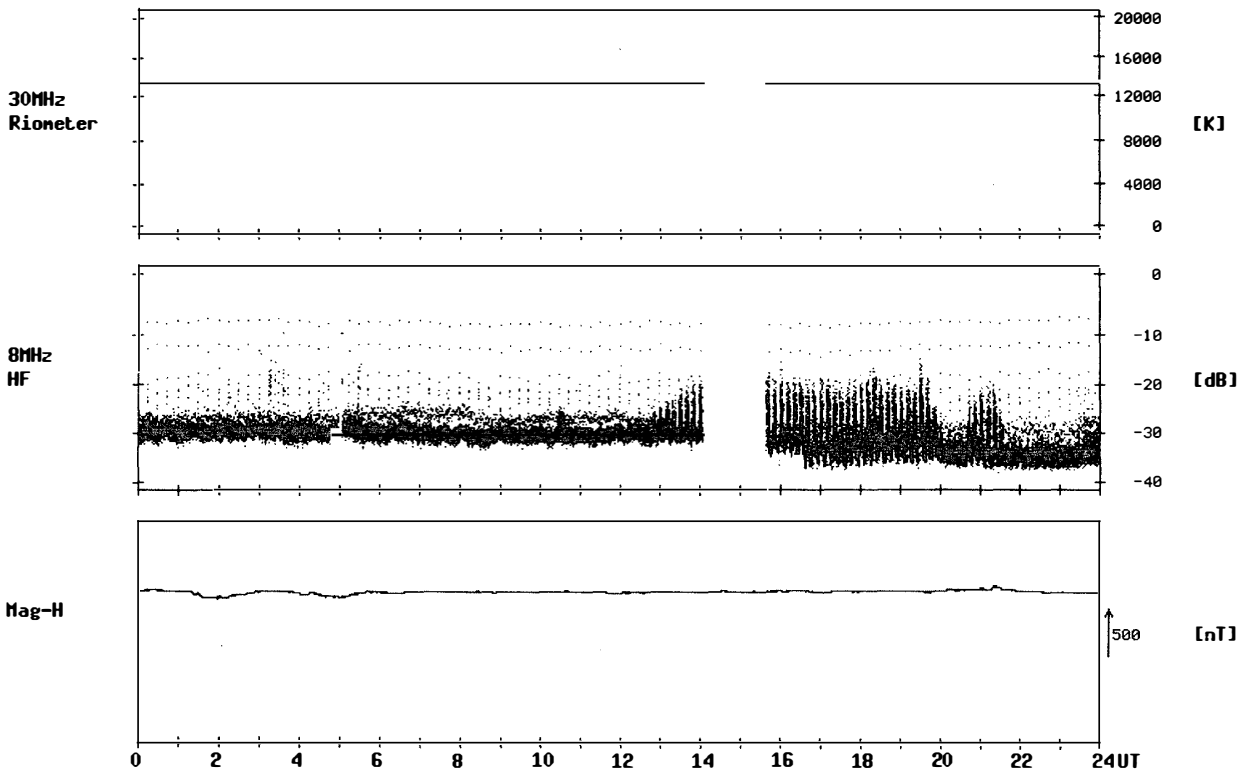
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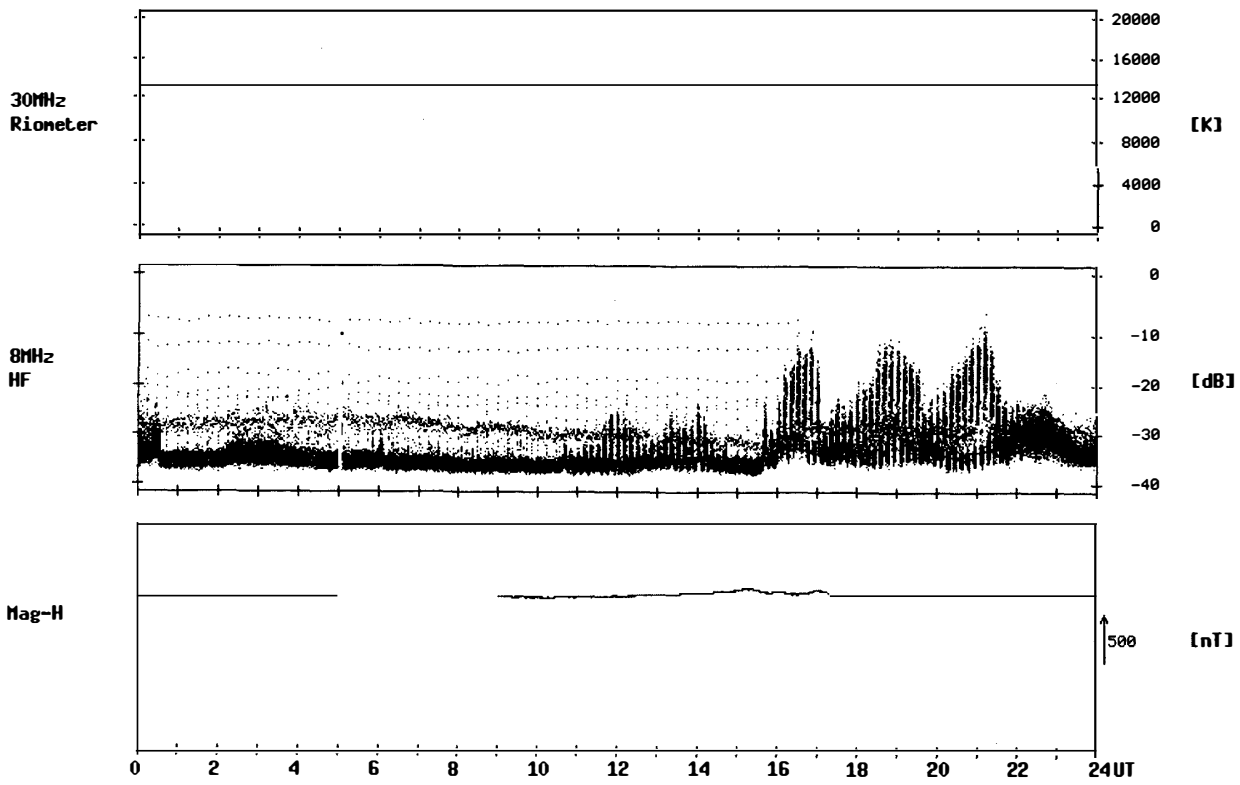
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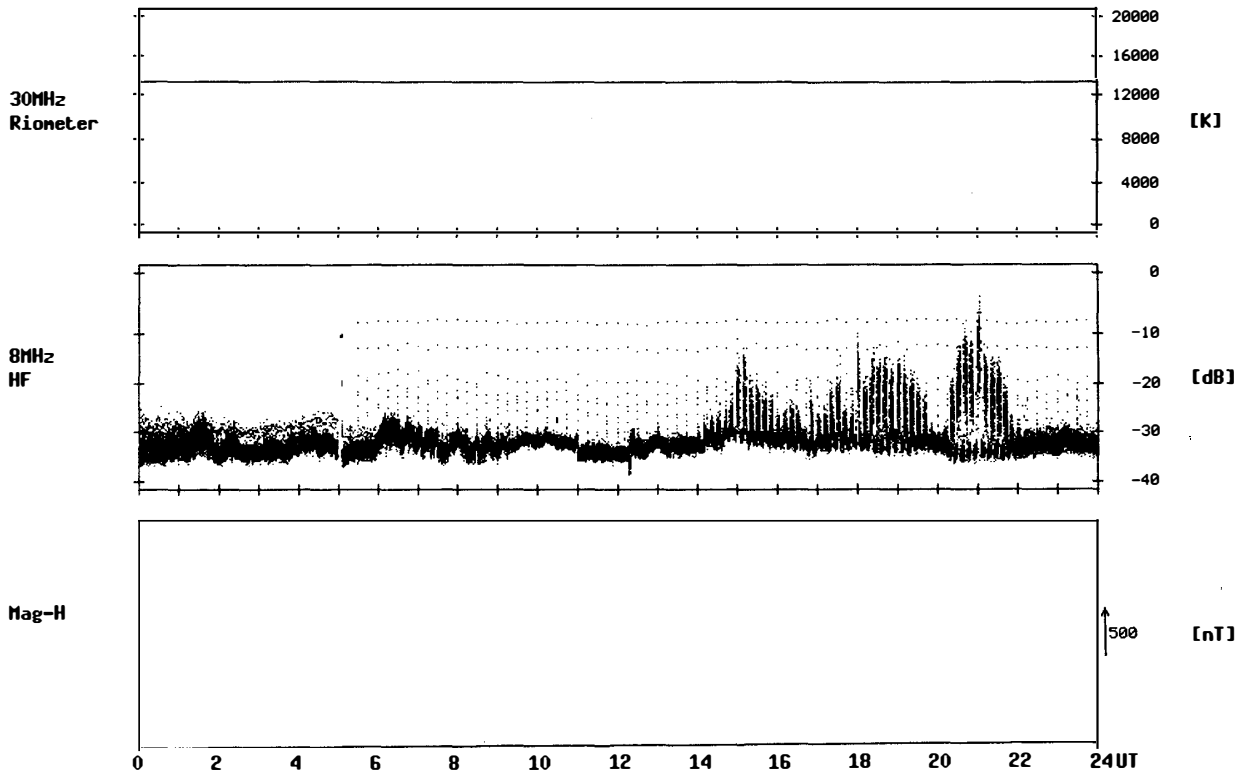
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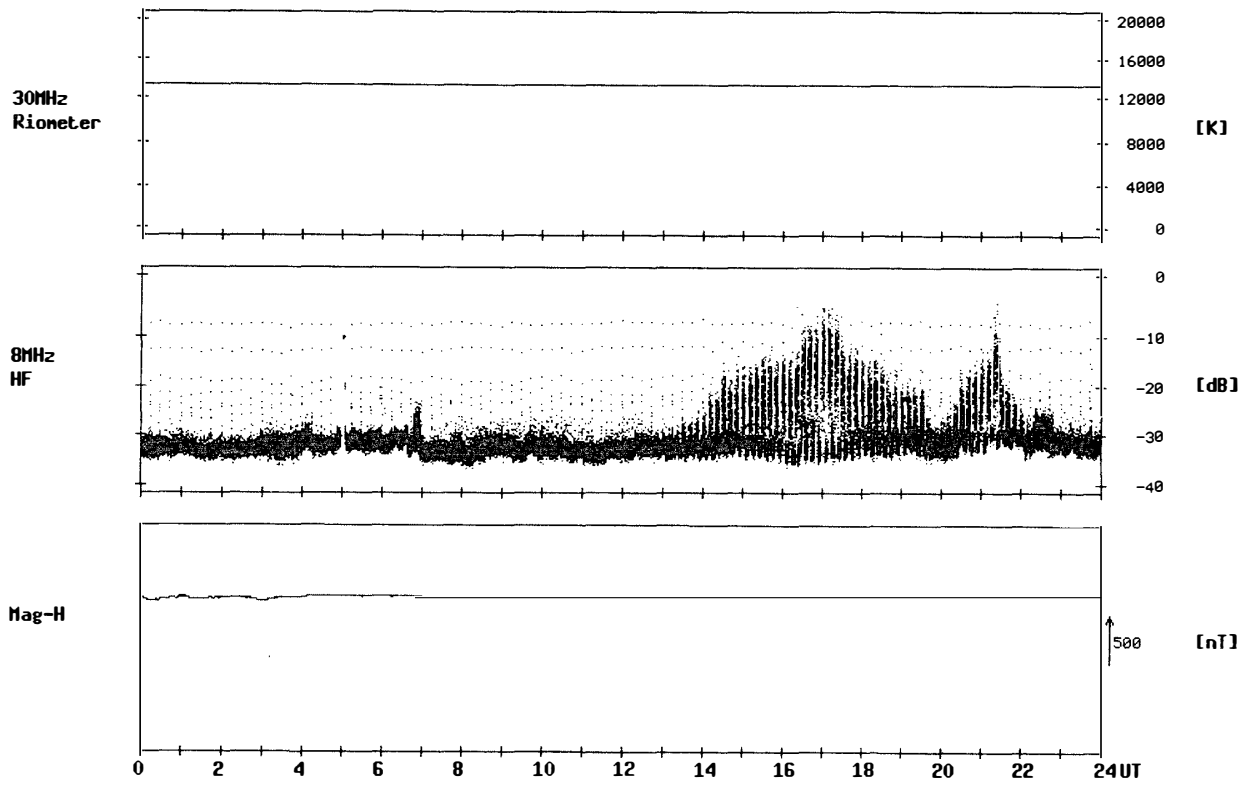
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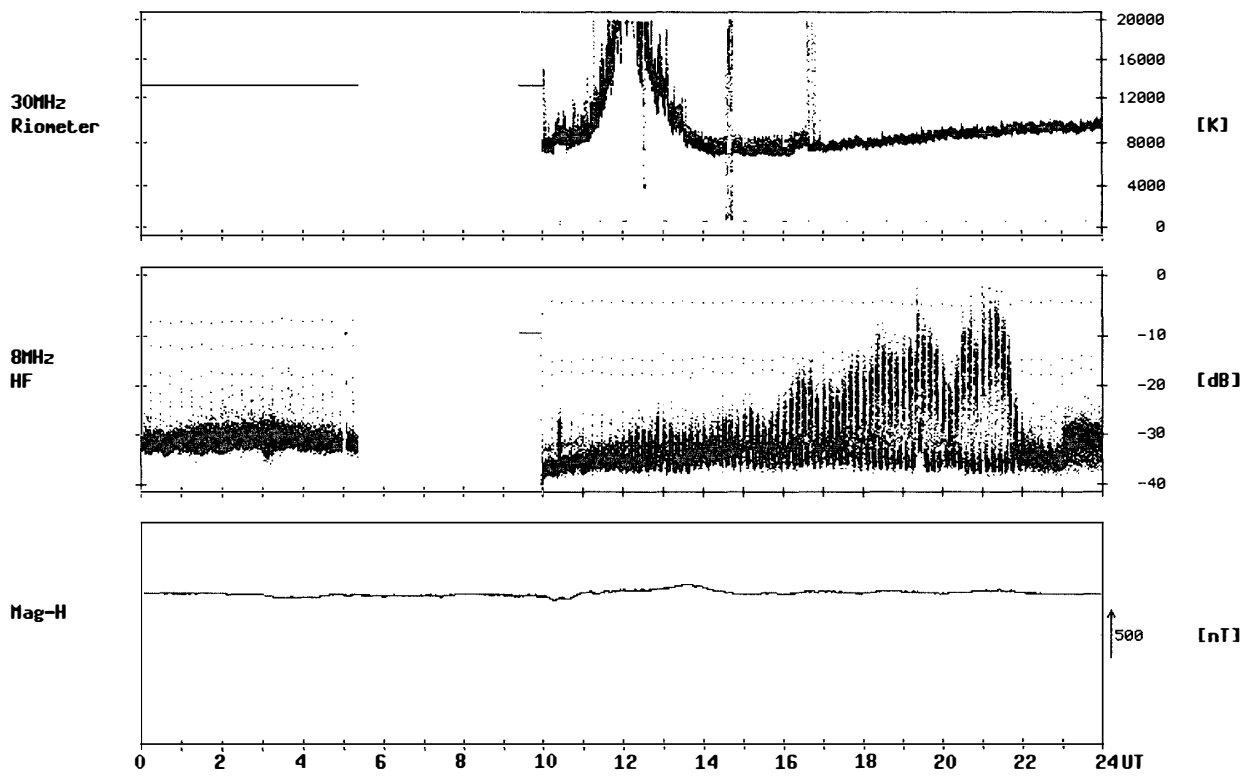
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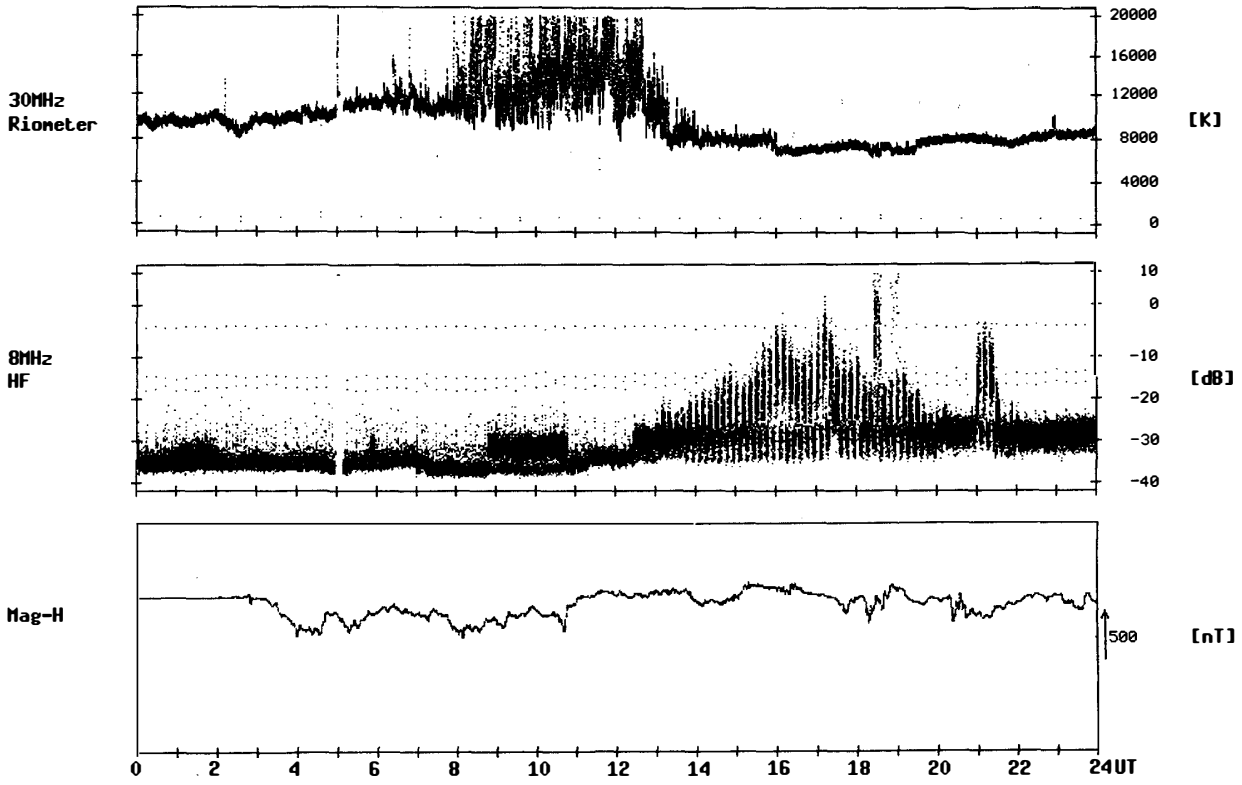
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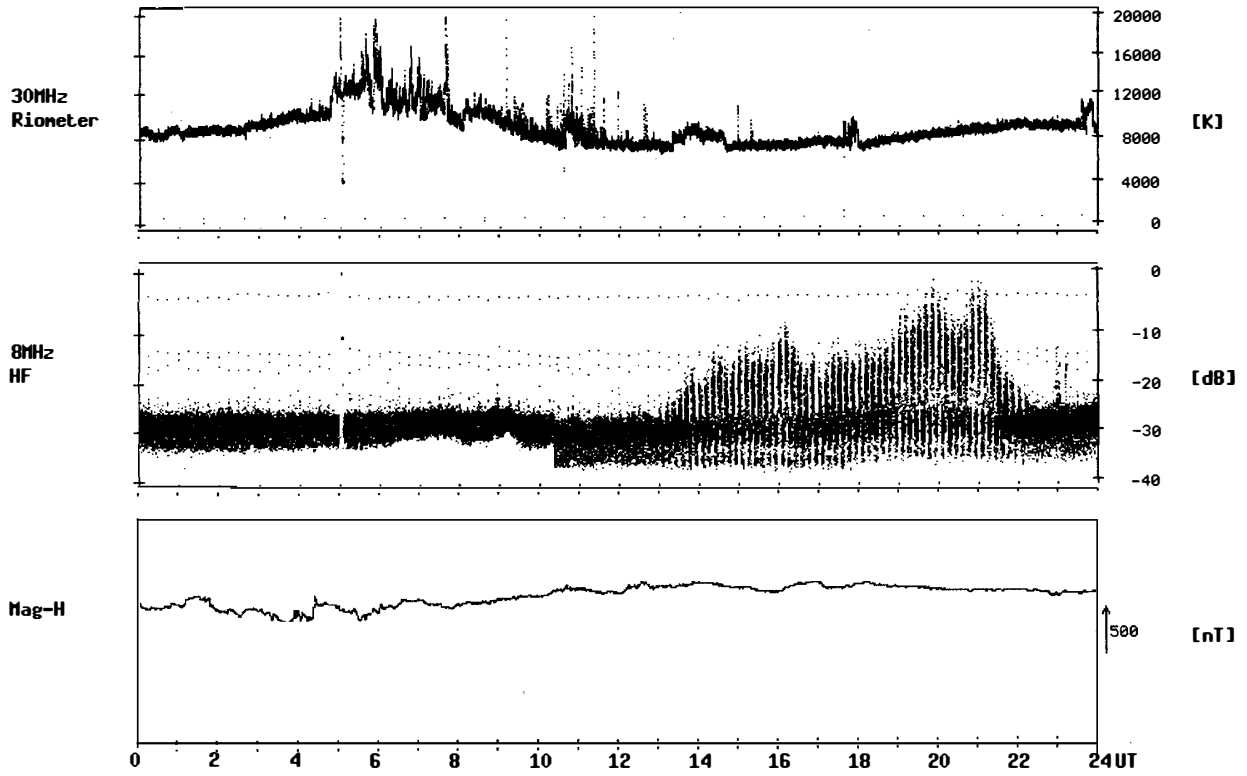
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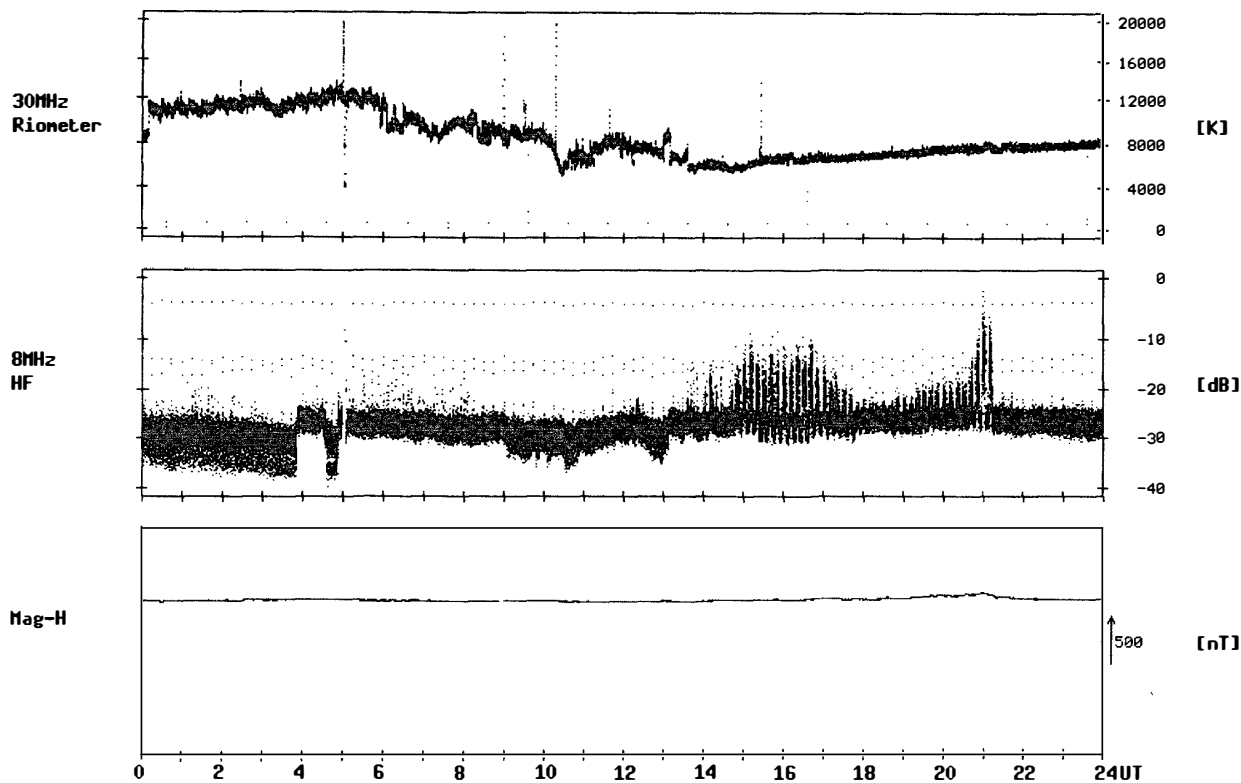
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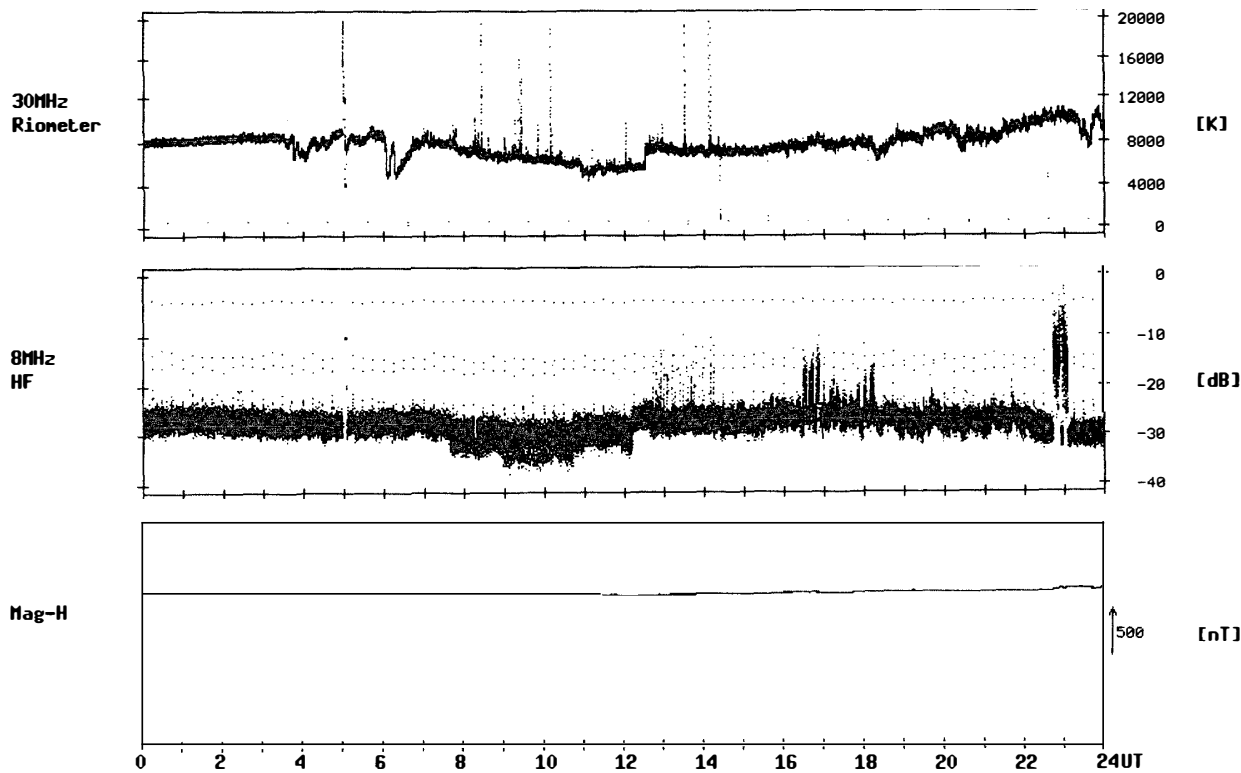
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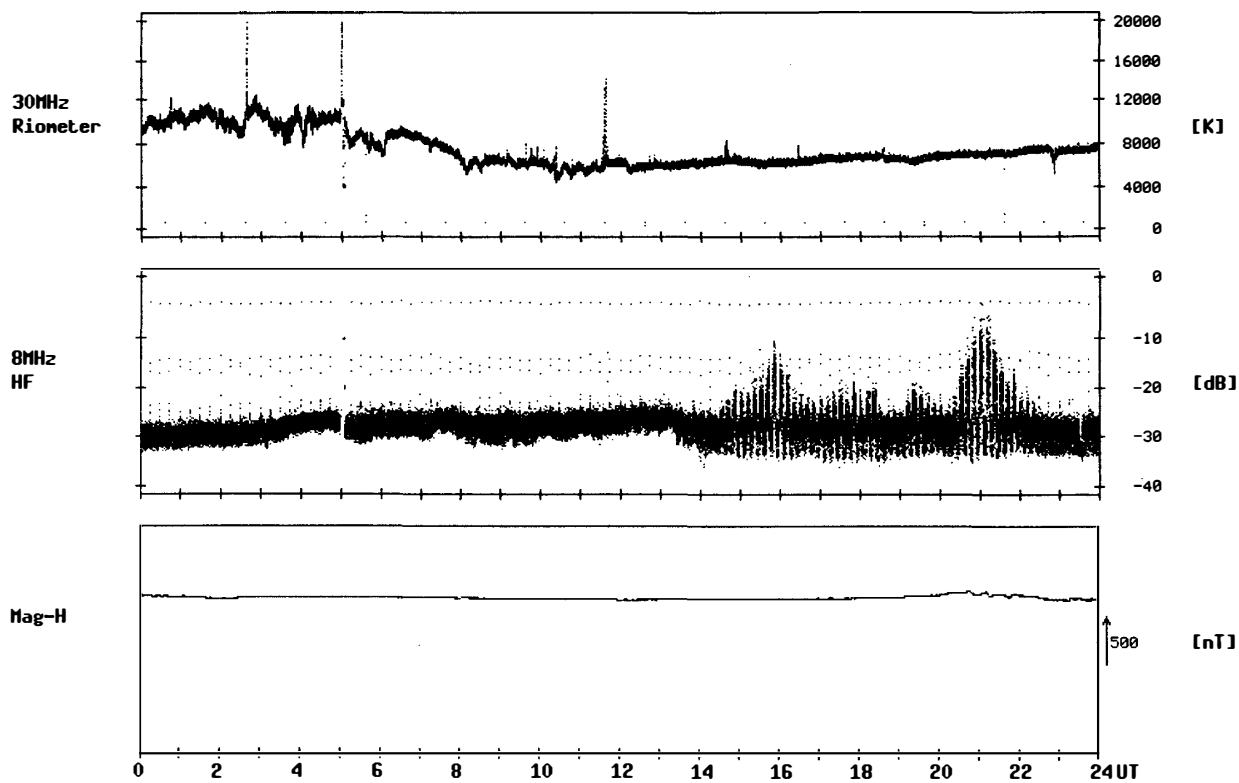
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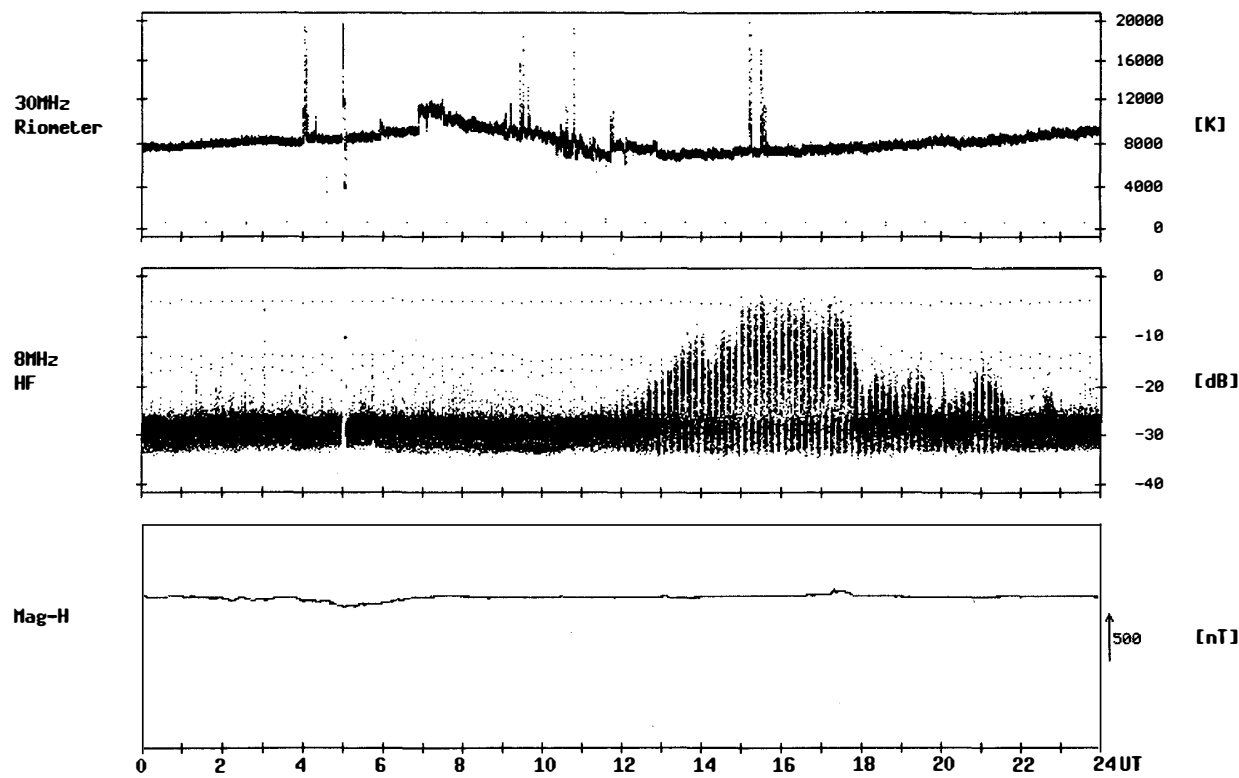
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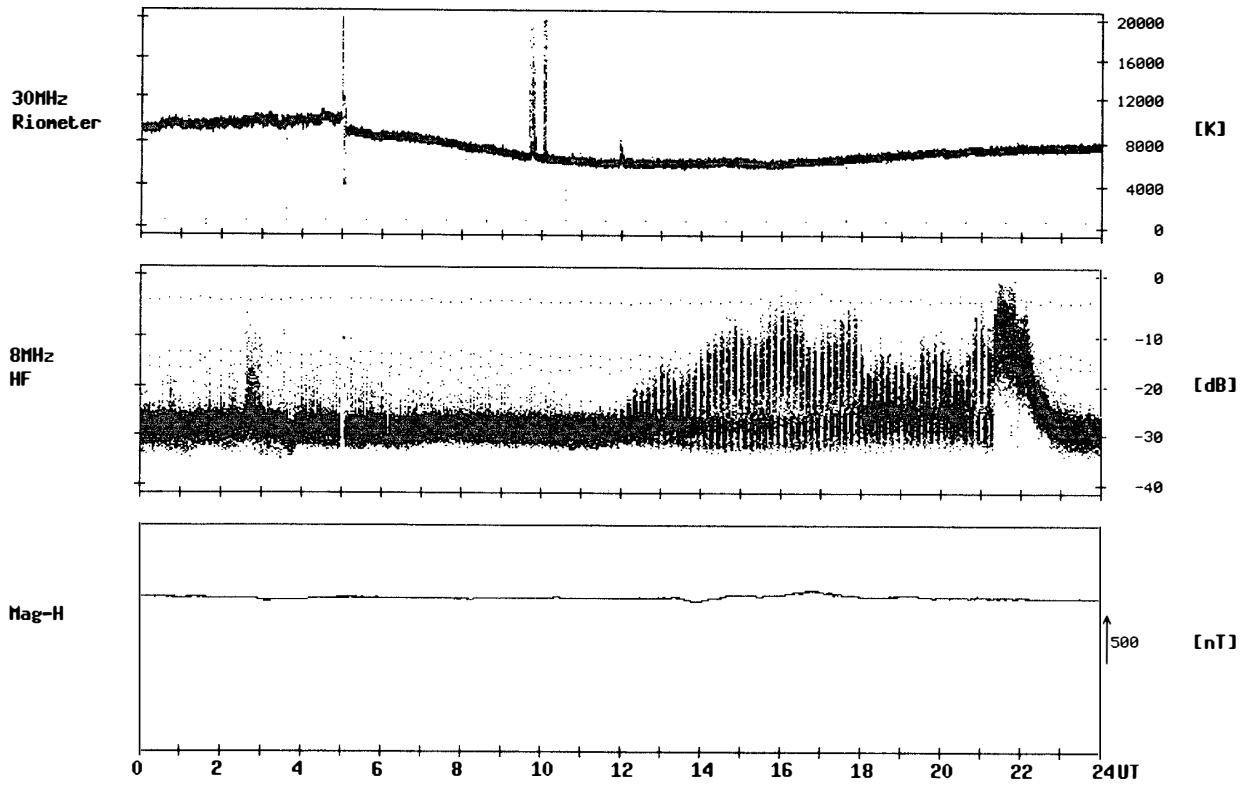
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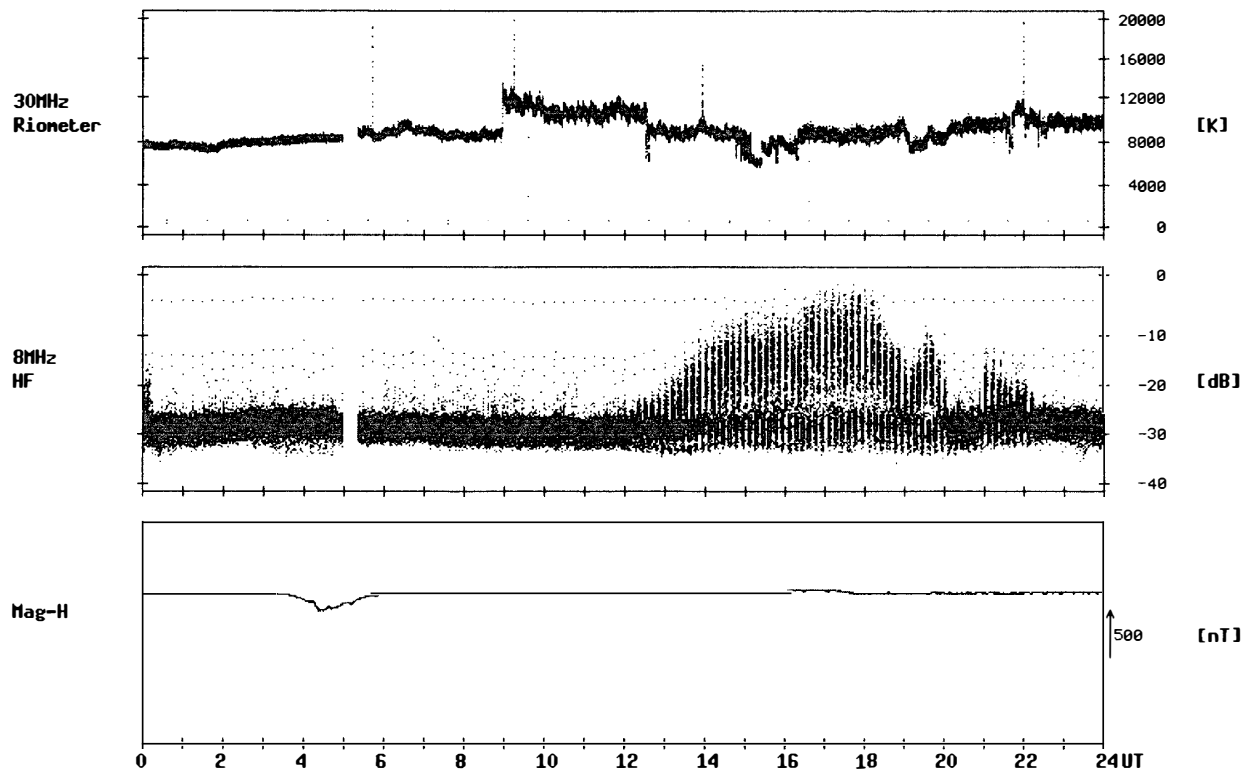
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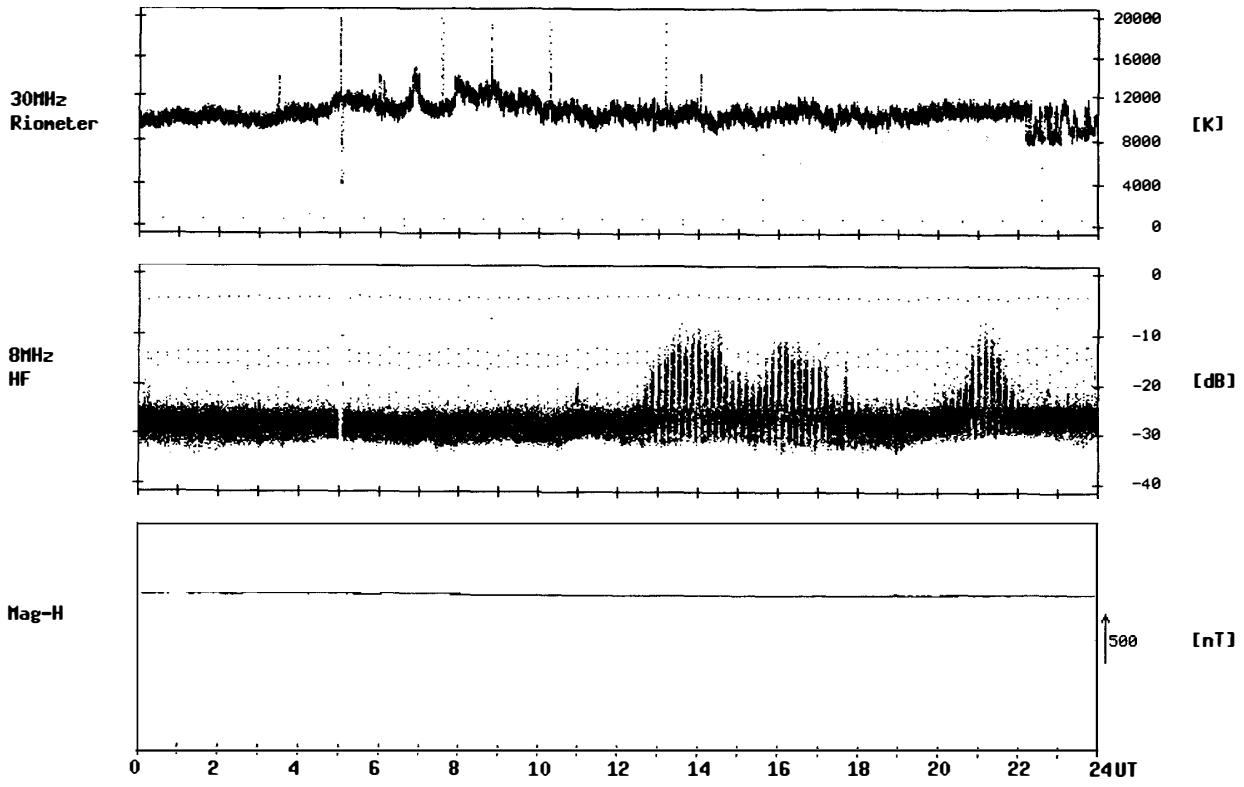
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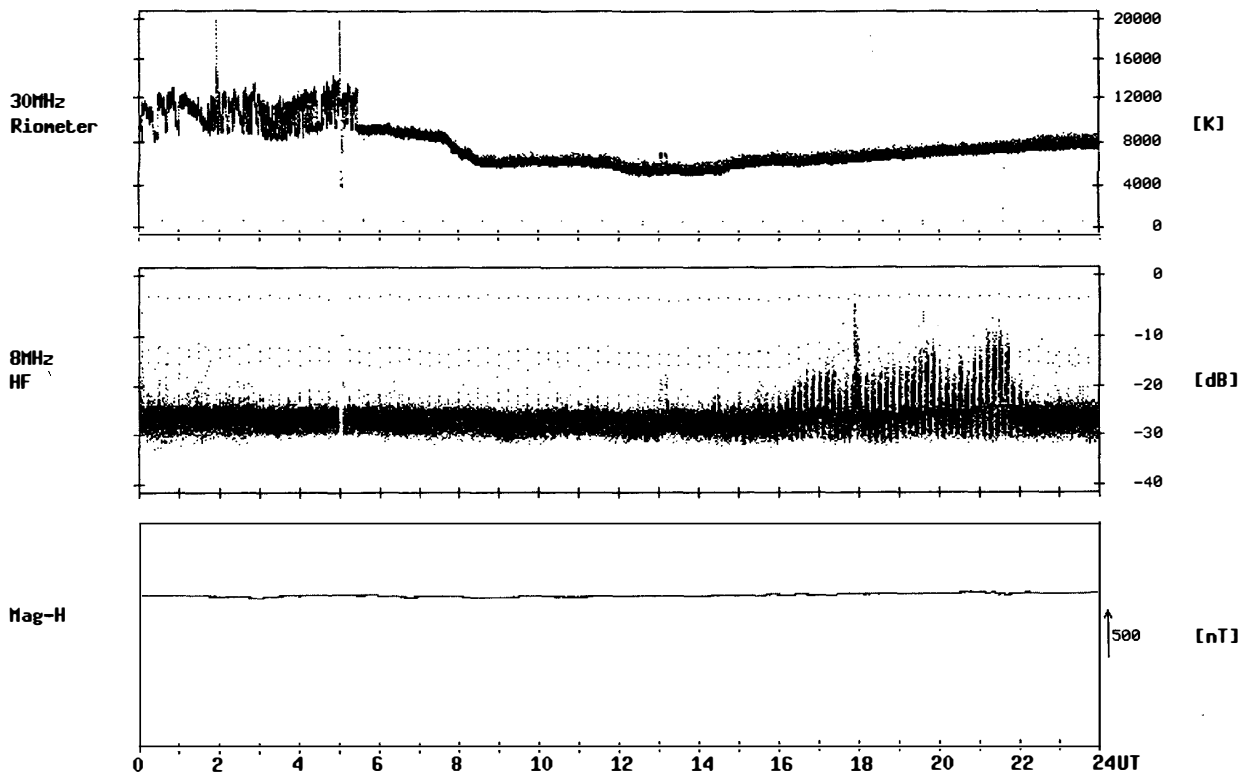
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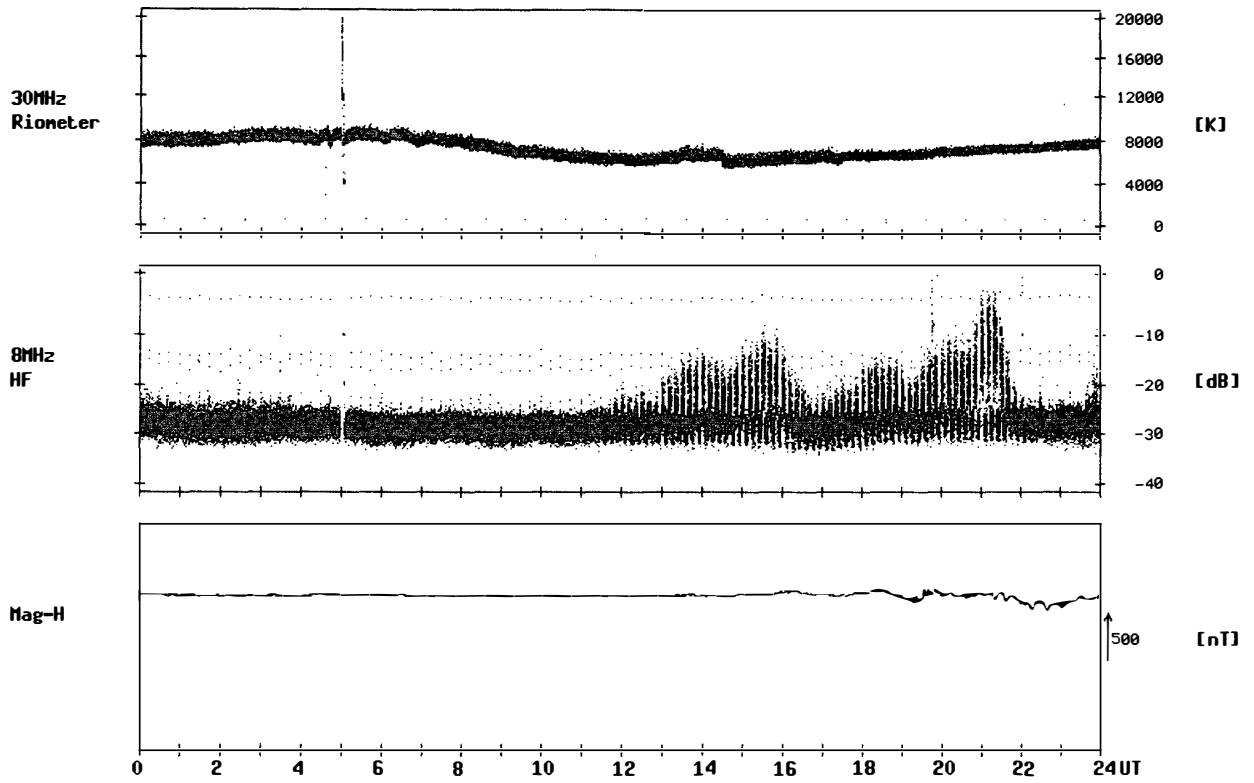
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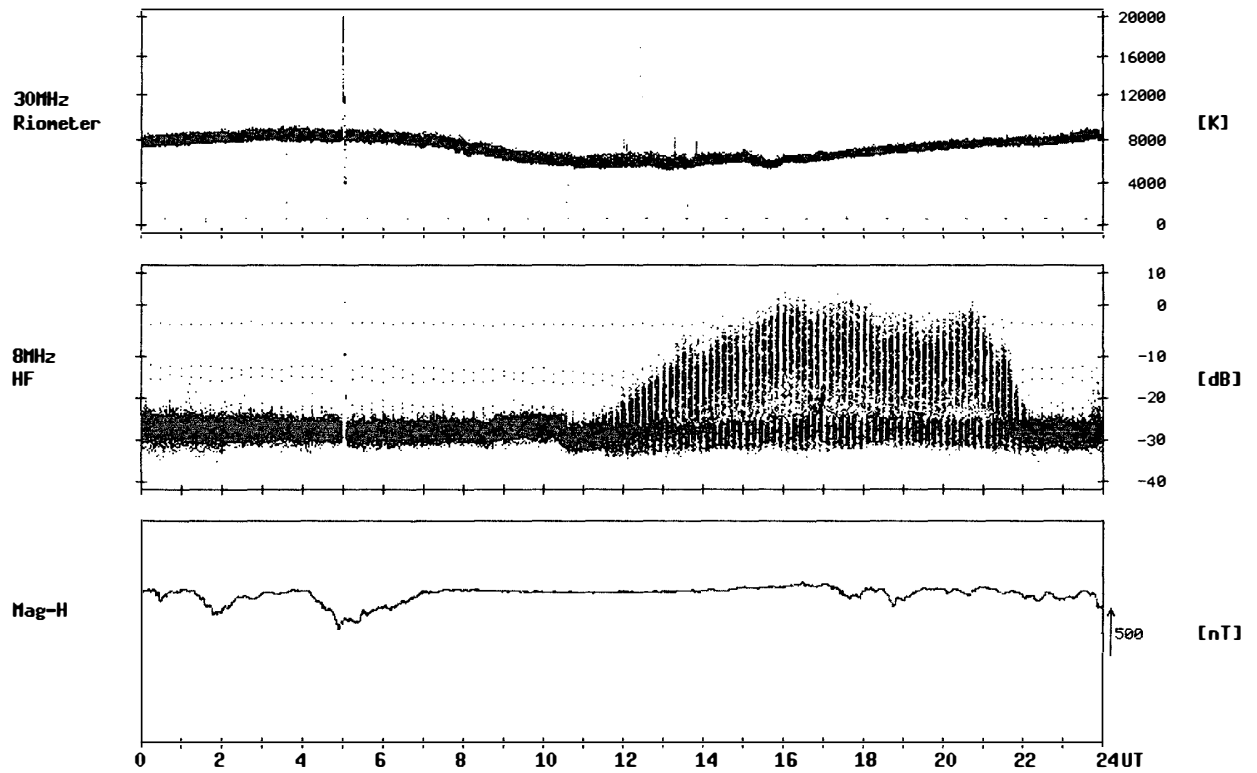
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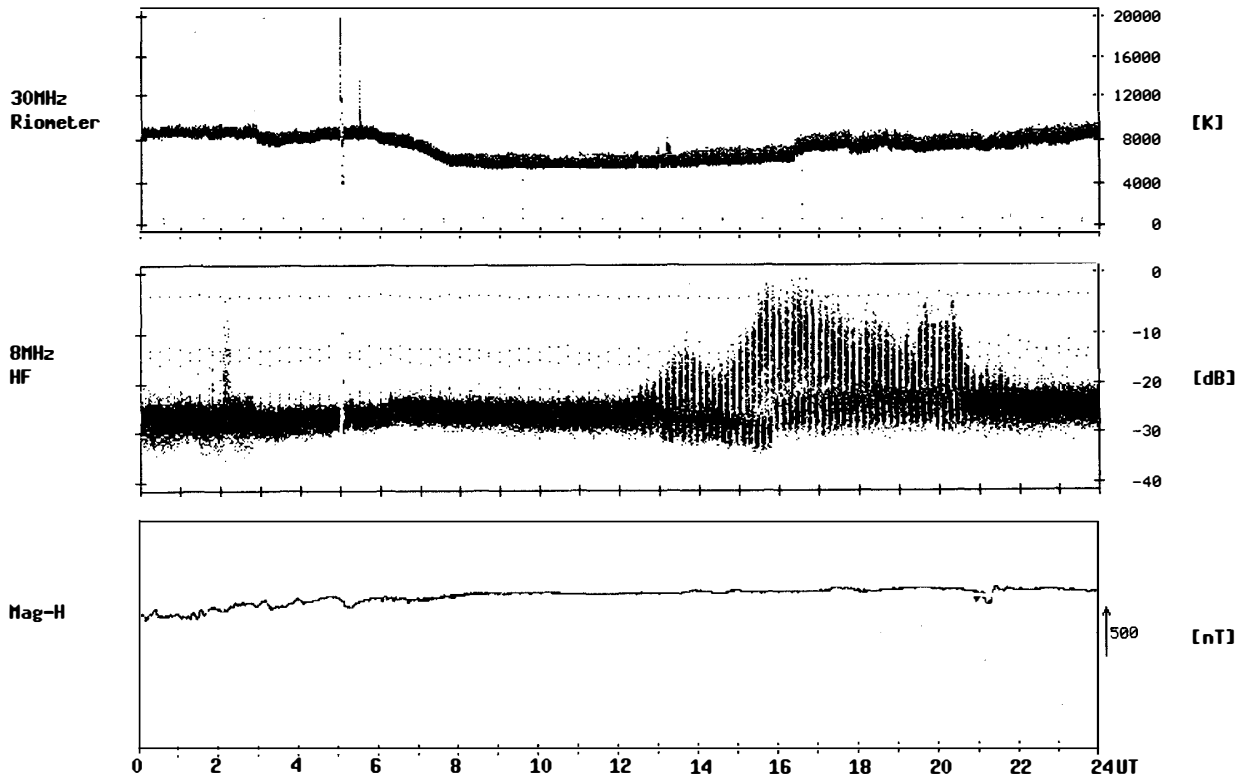
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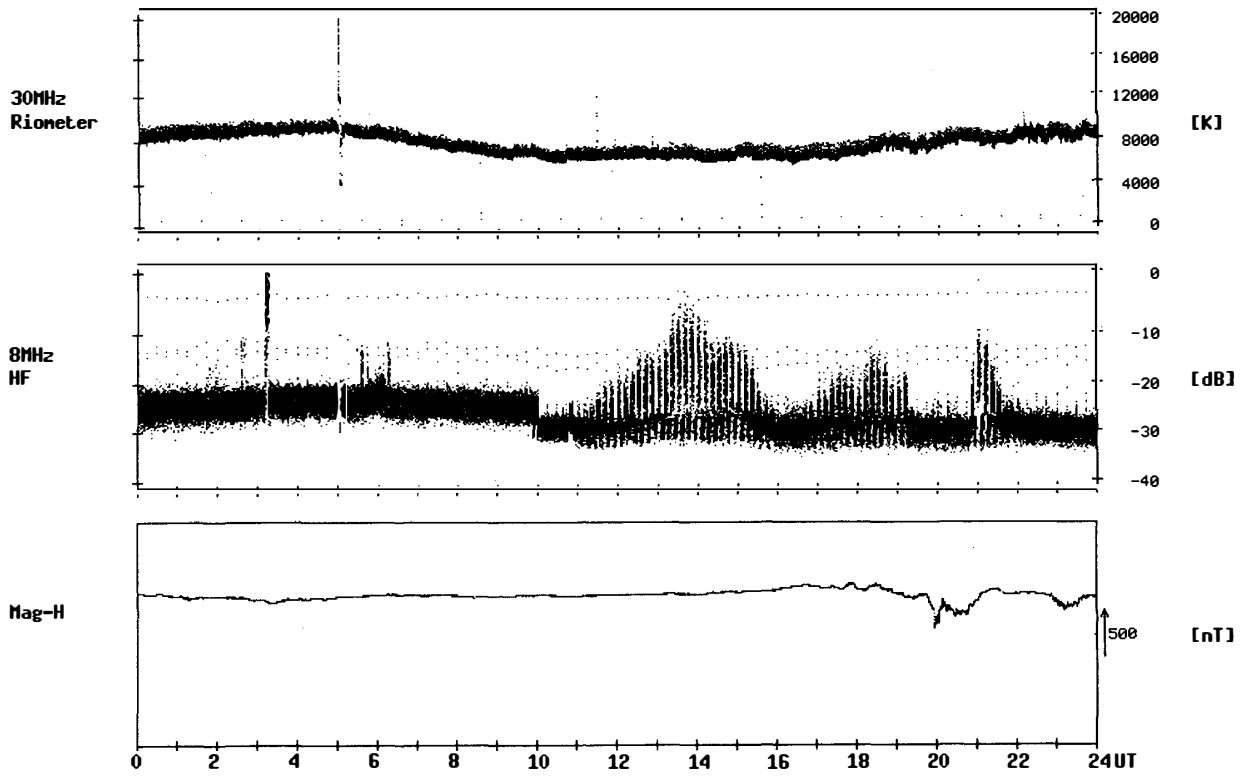
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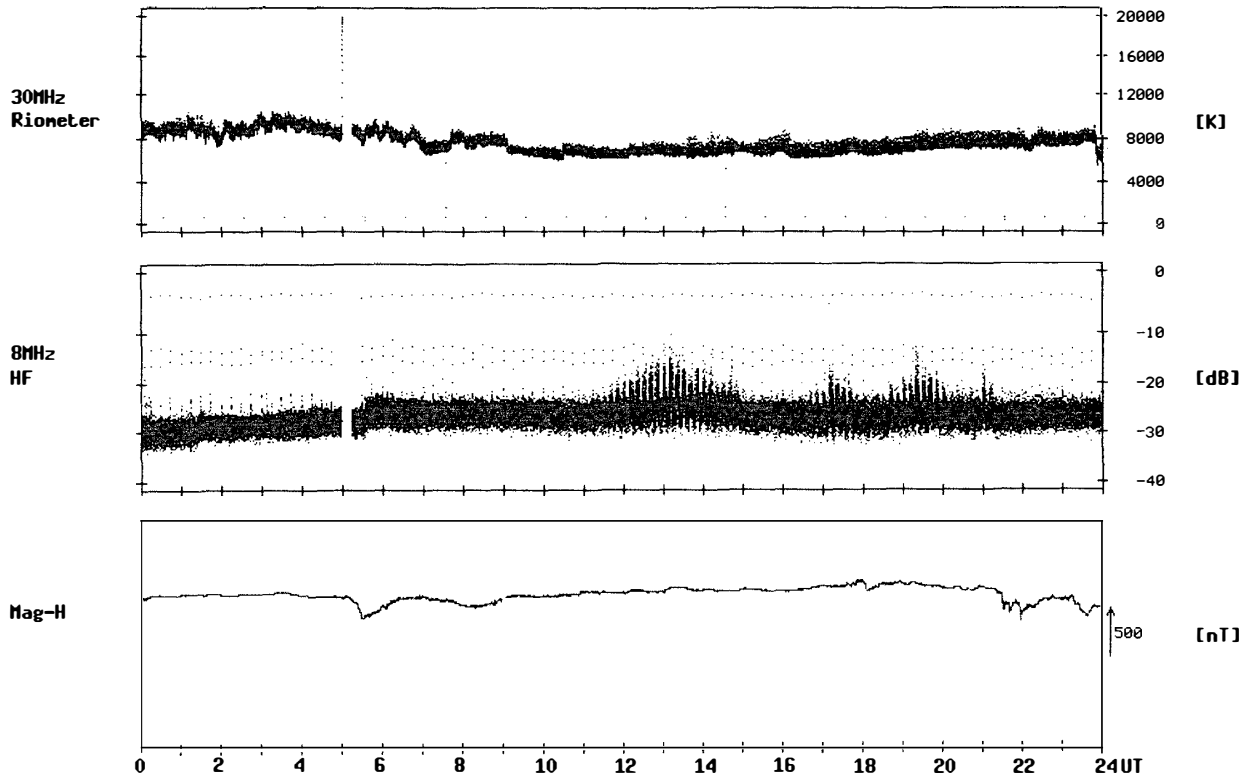
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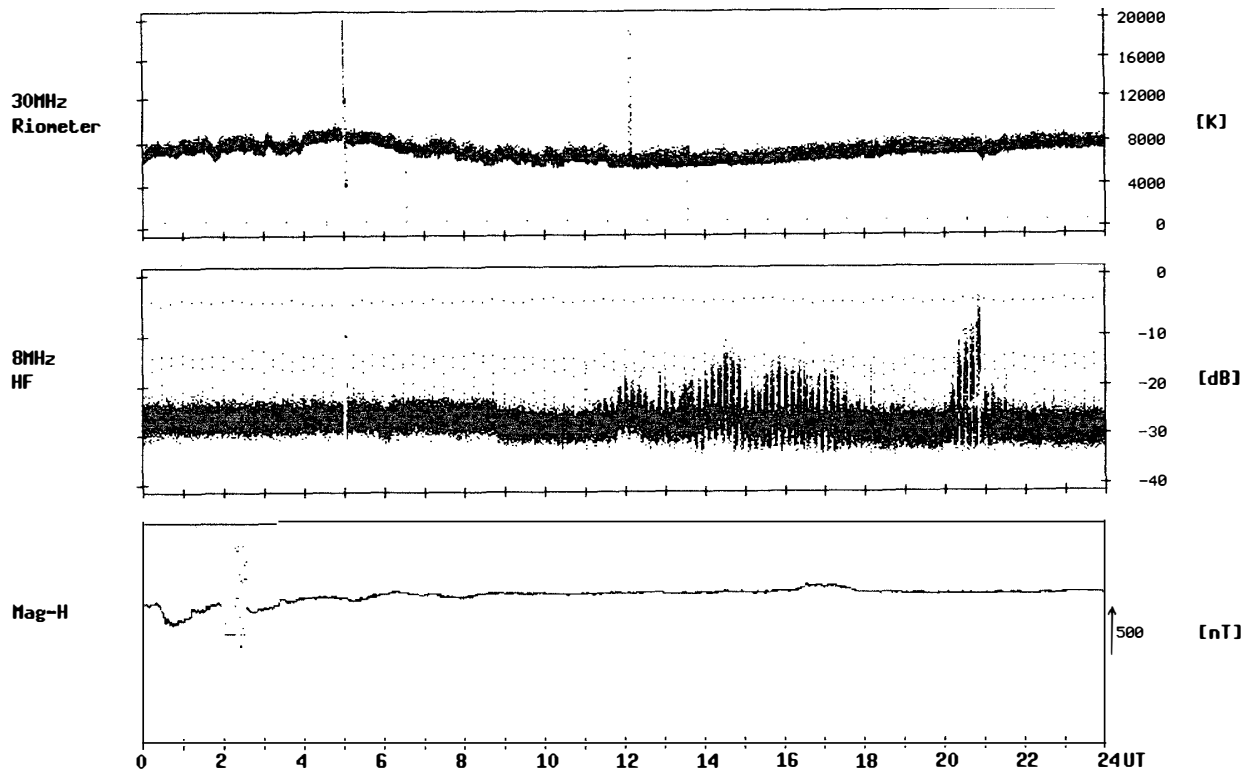
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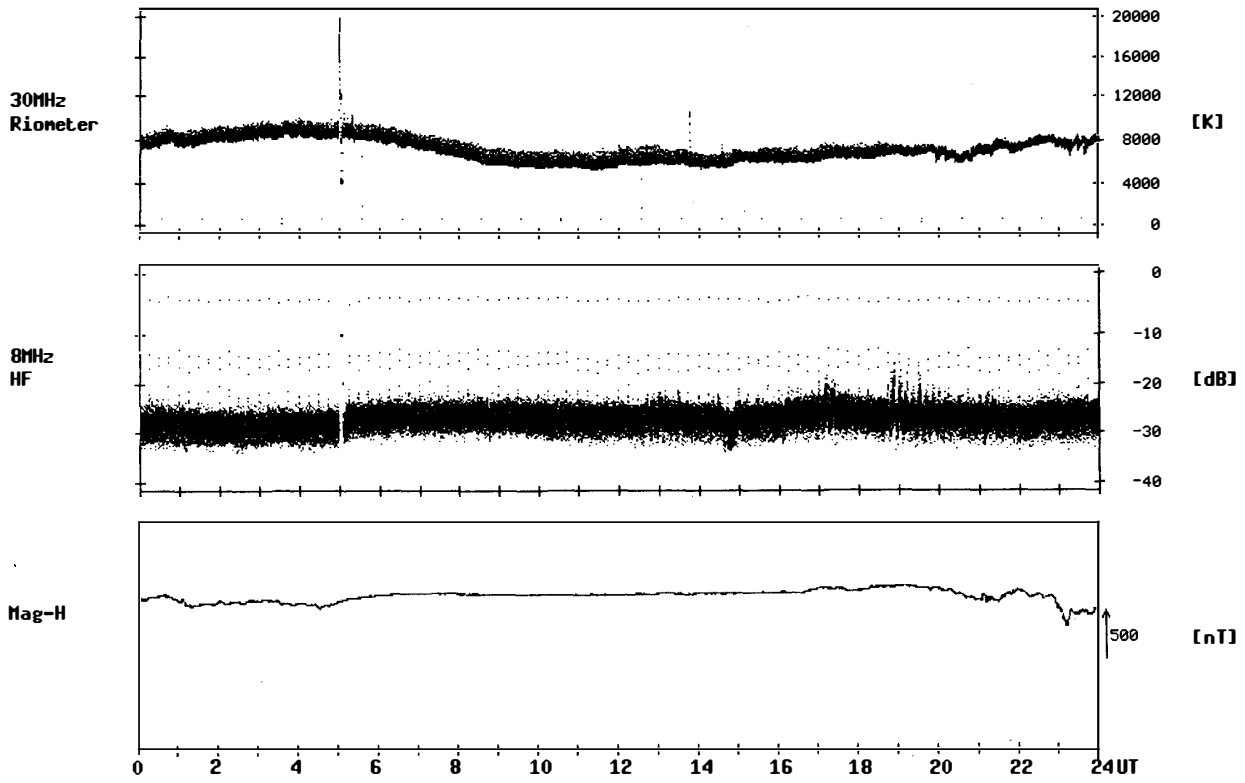
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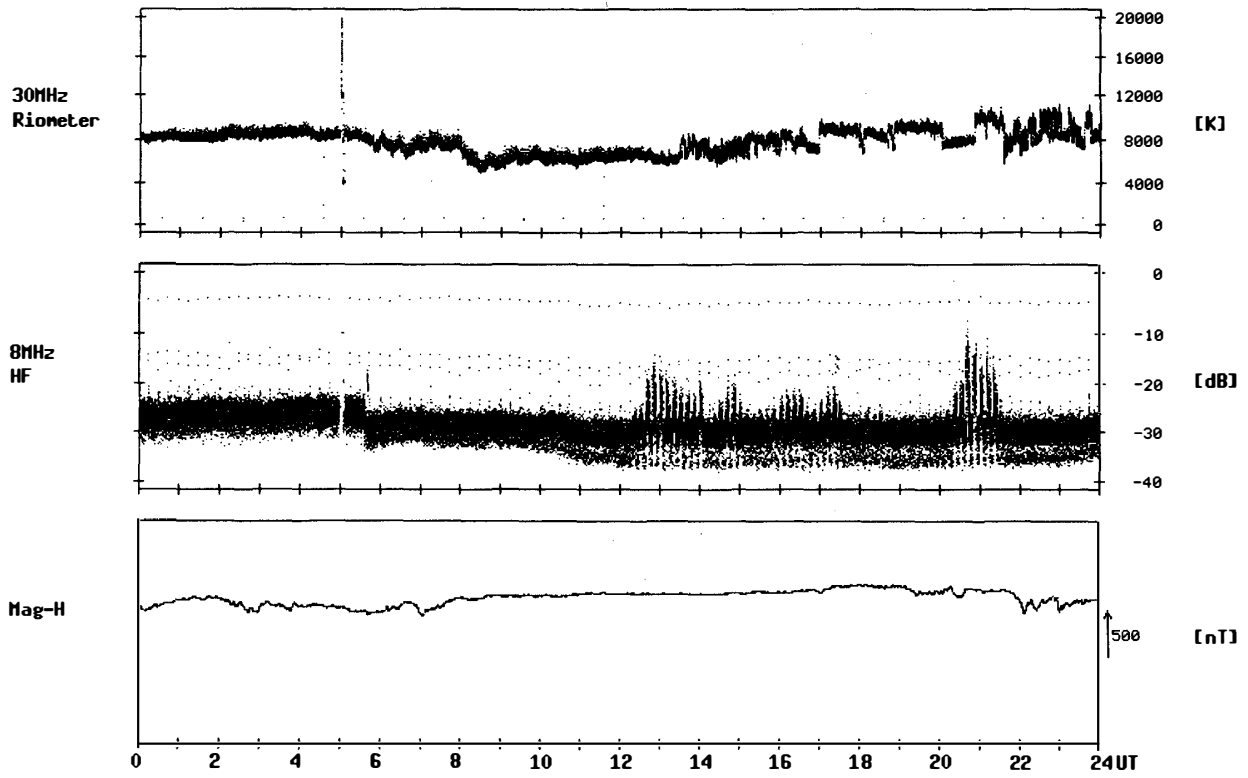
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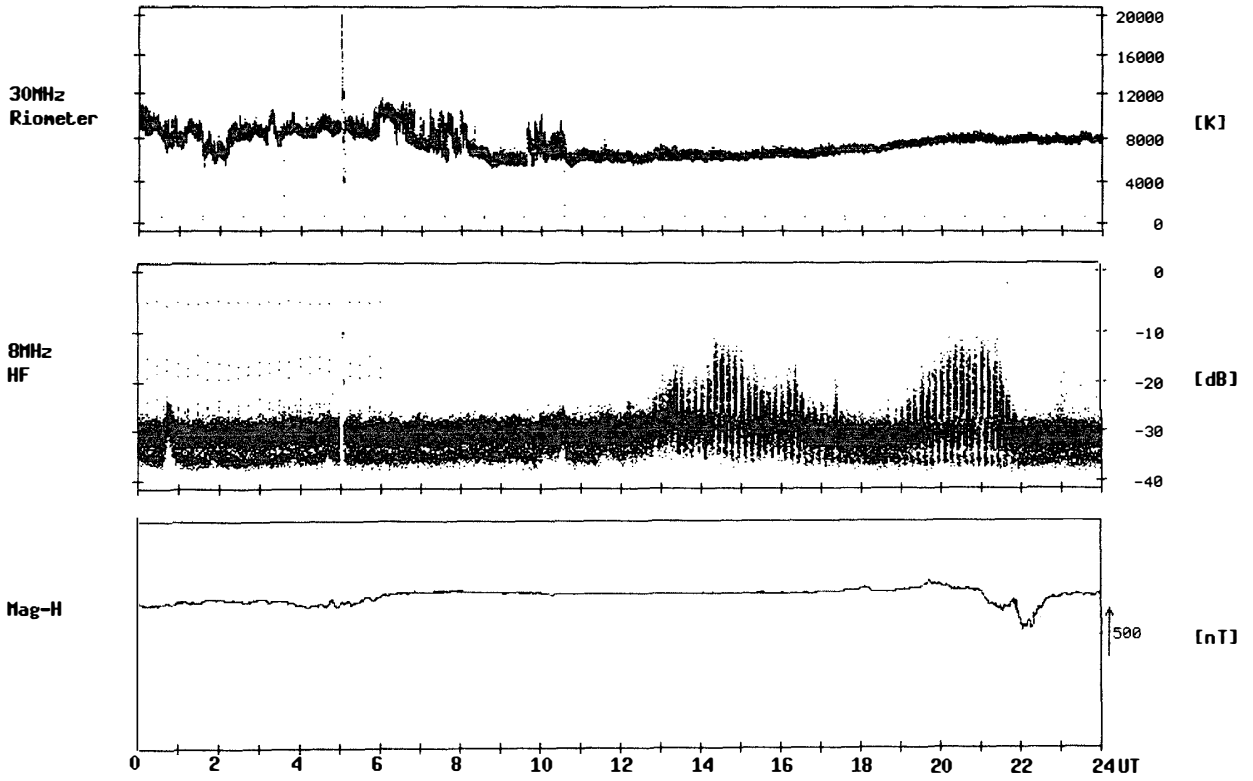
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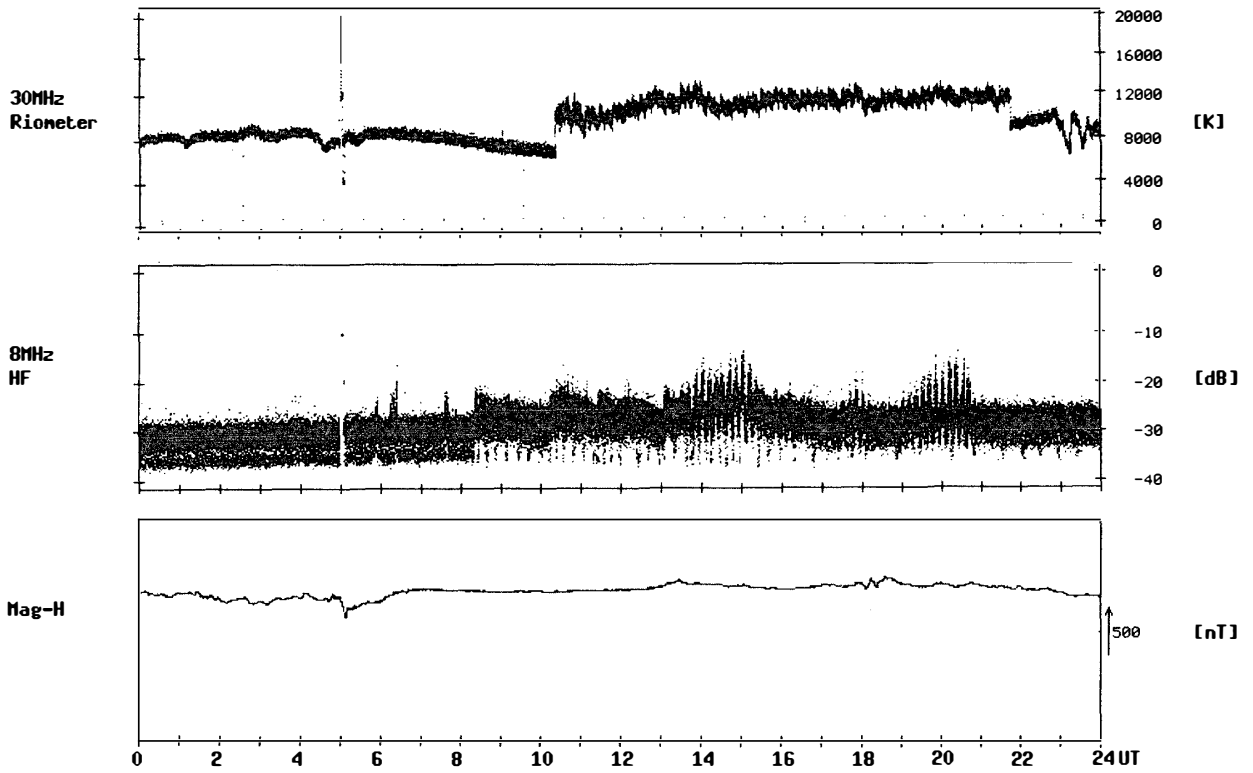
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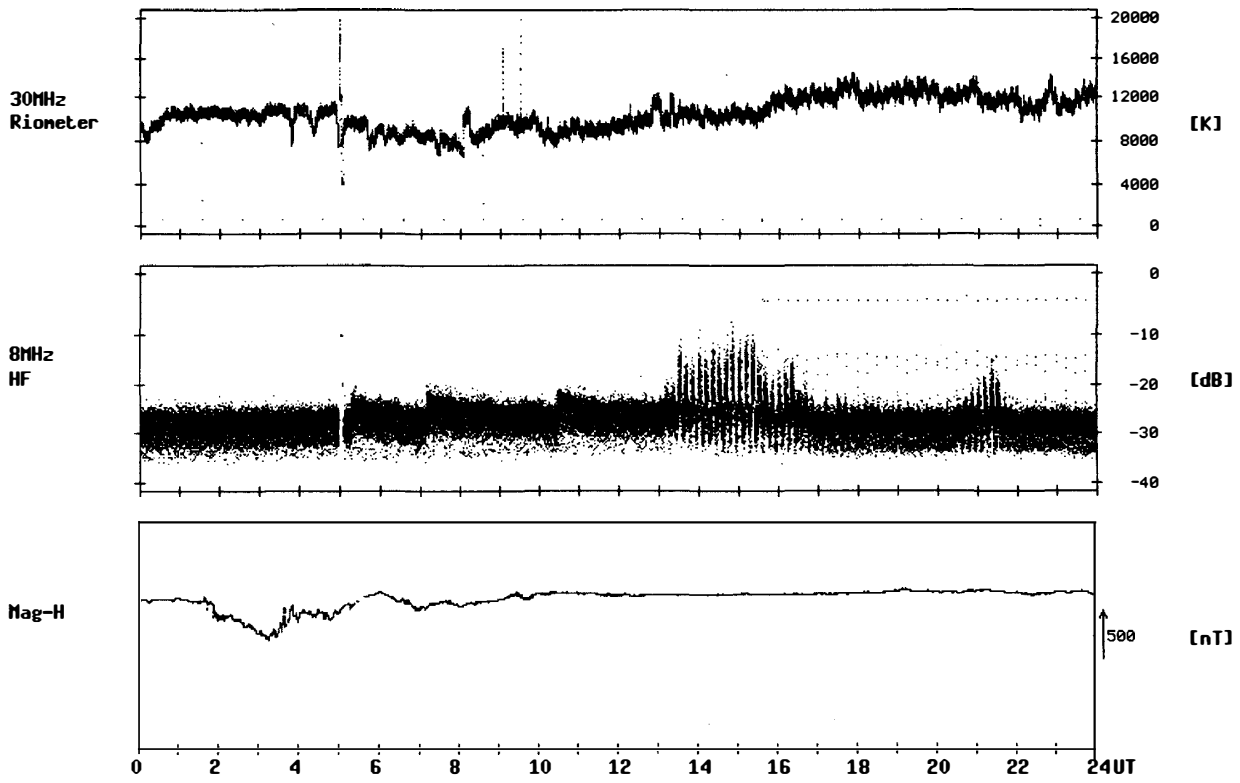
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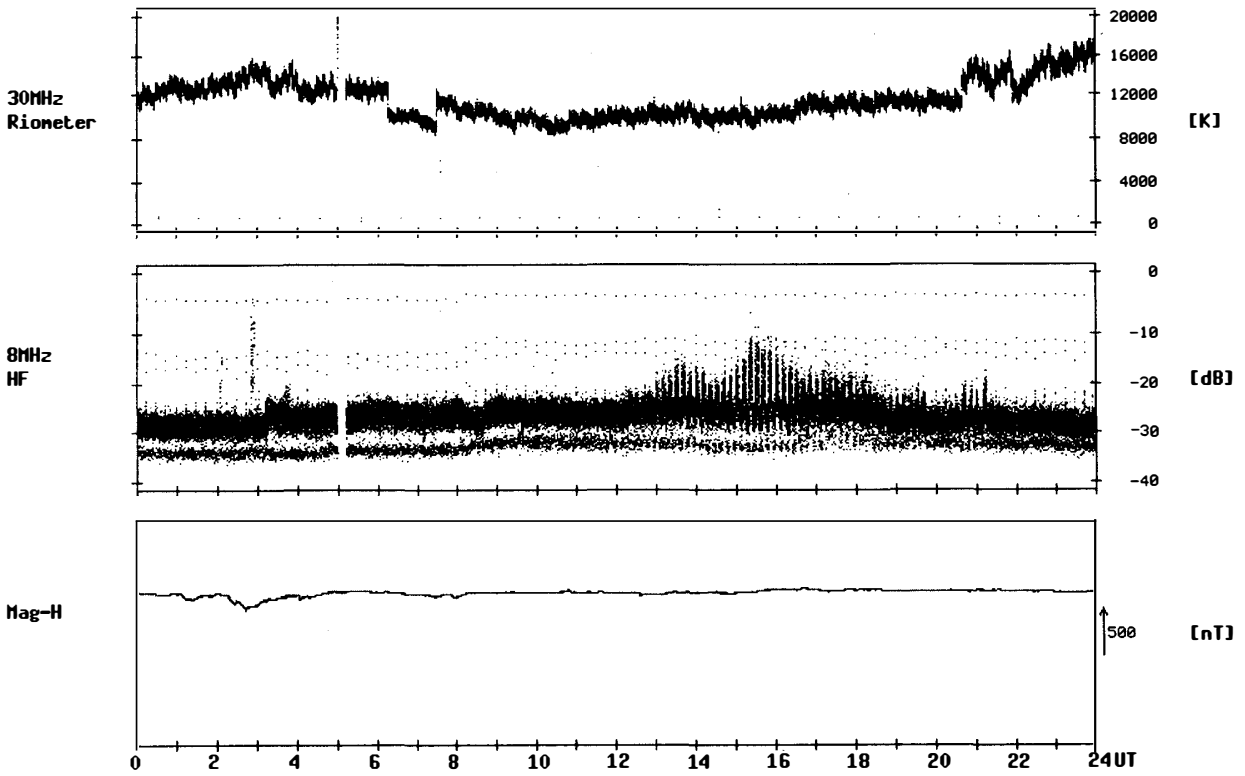
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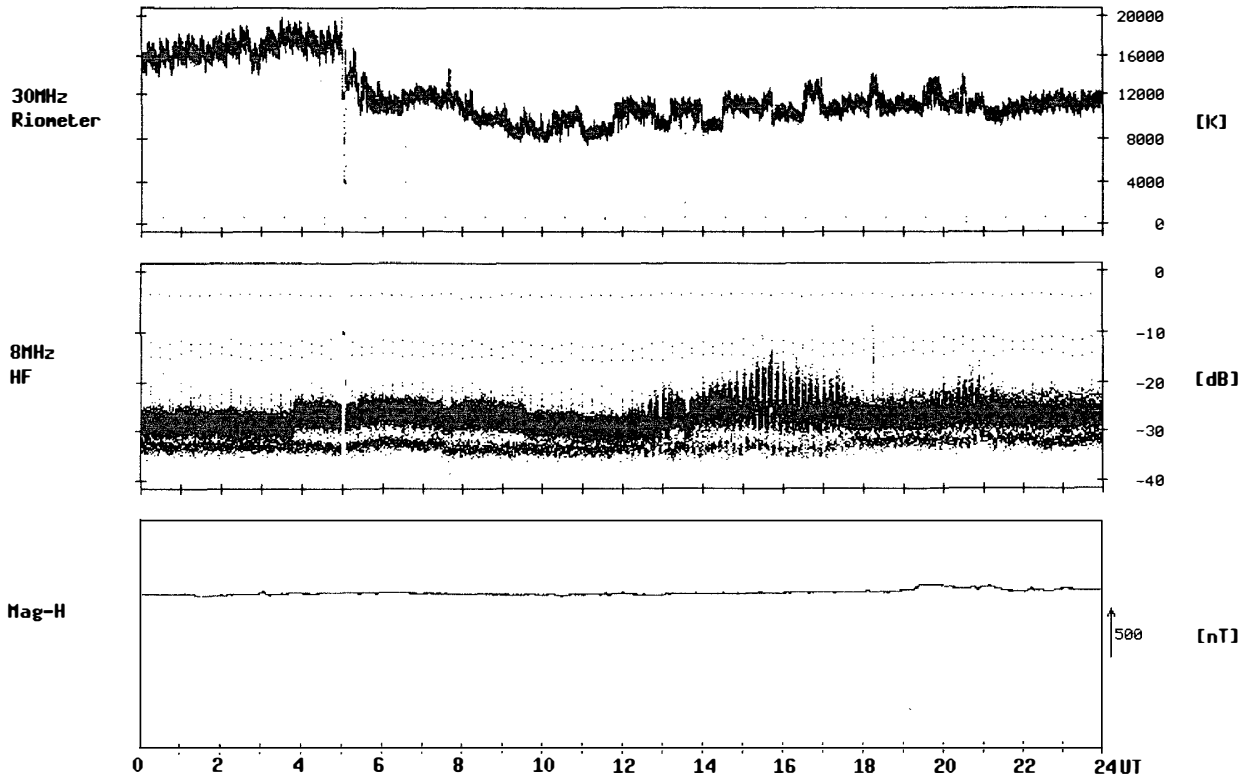
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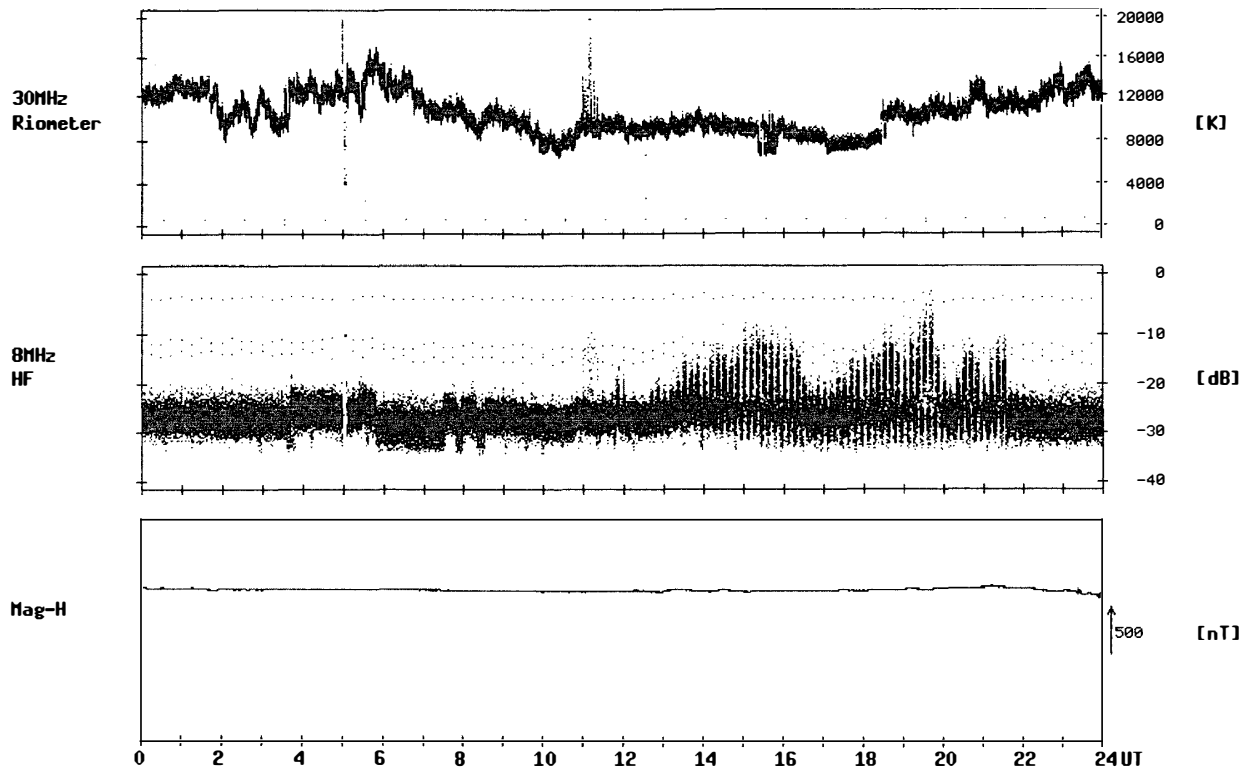
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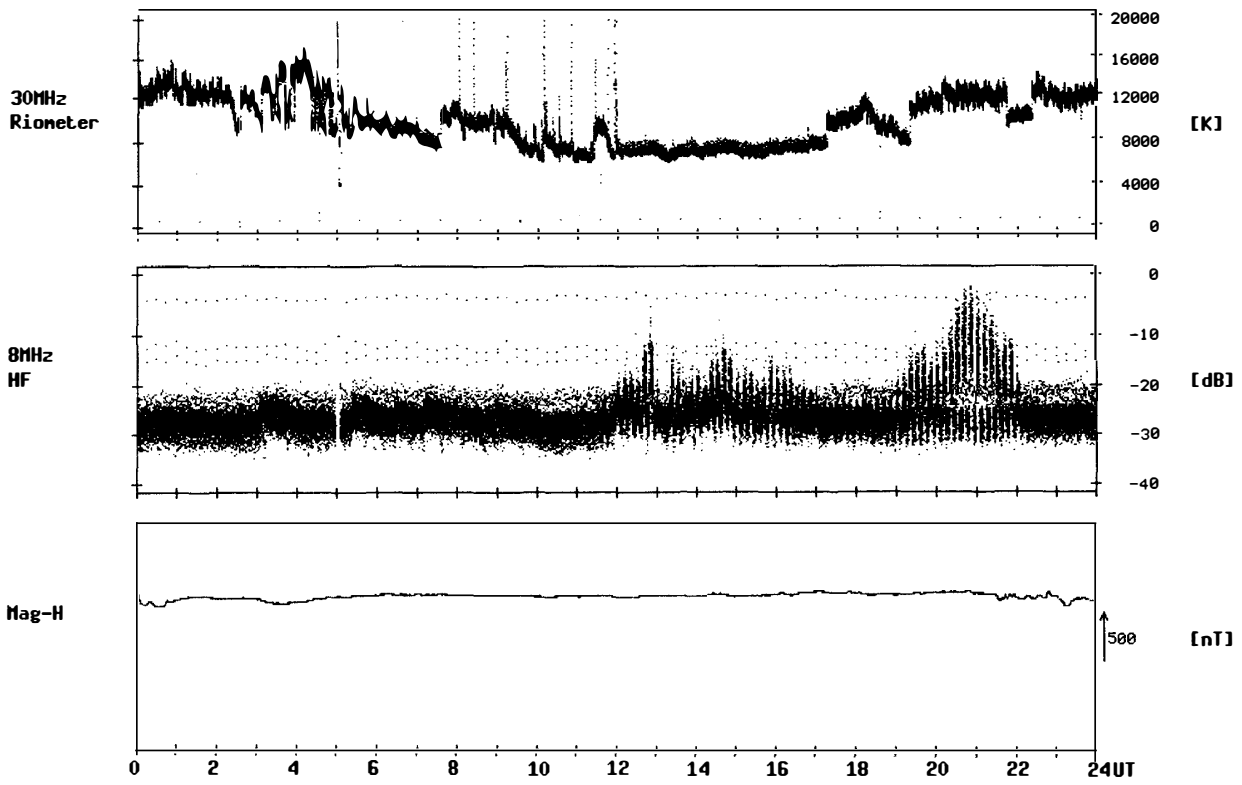
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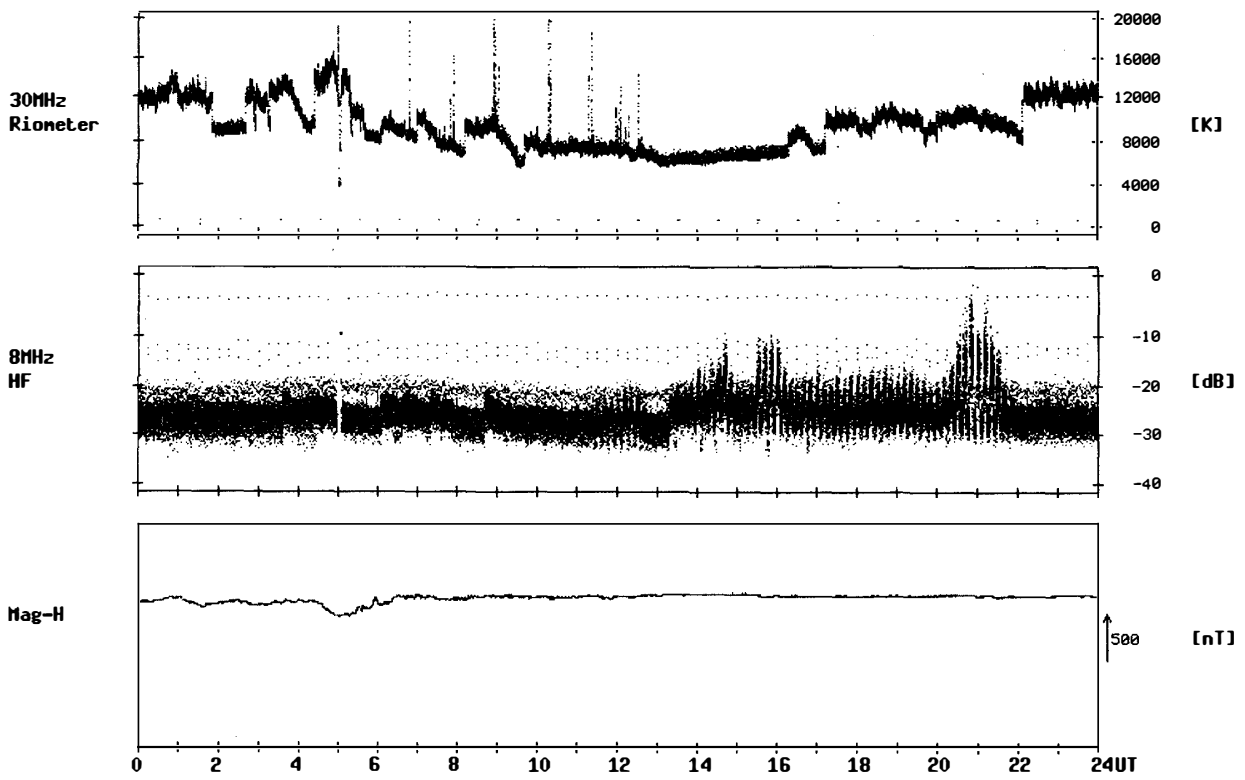
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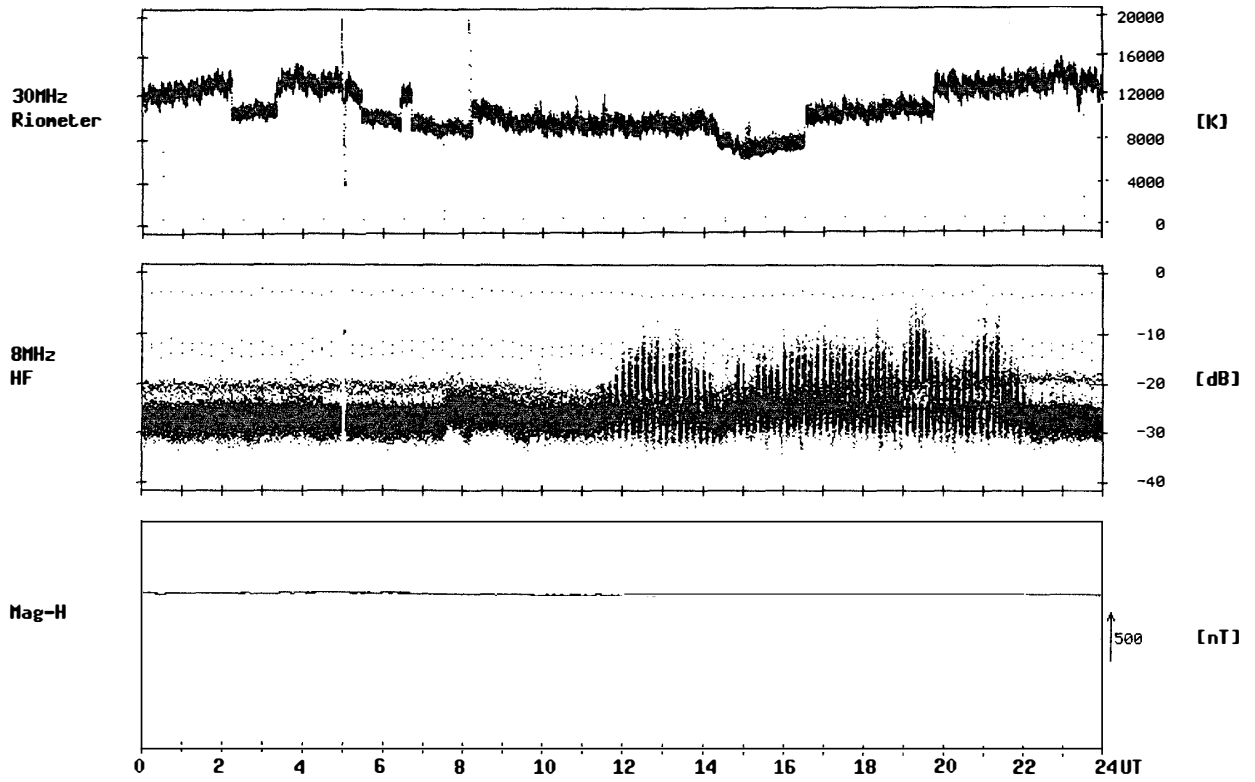
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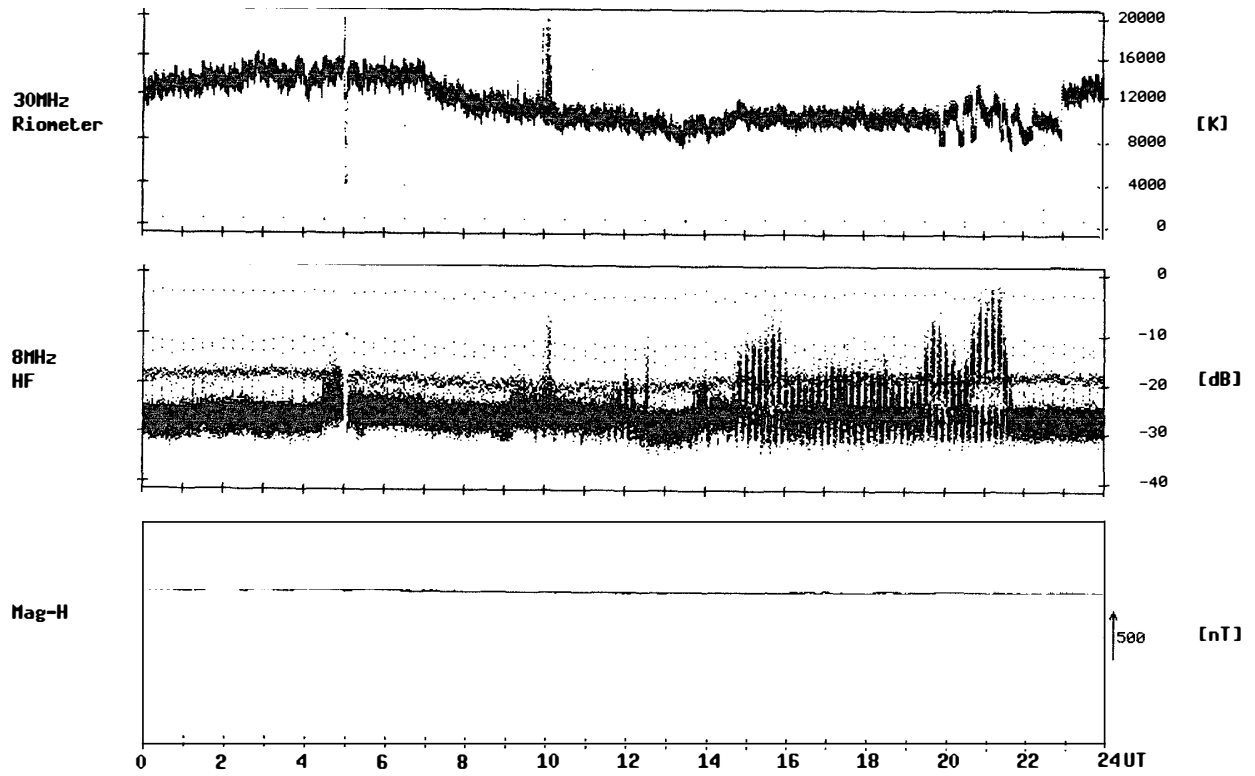
Syowa Station

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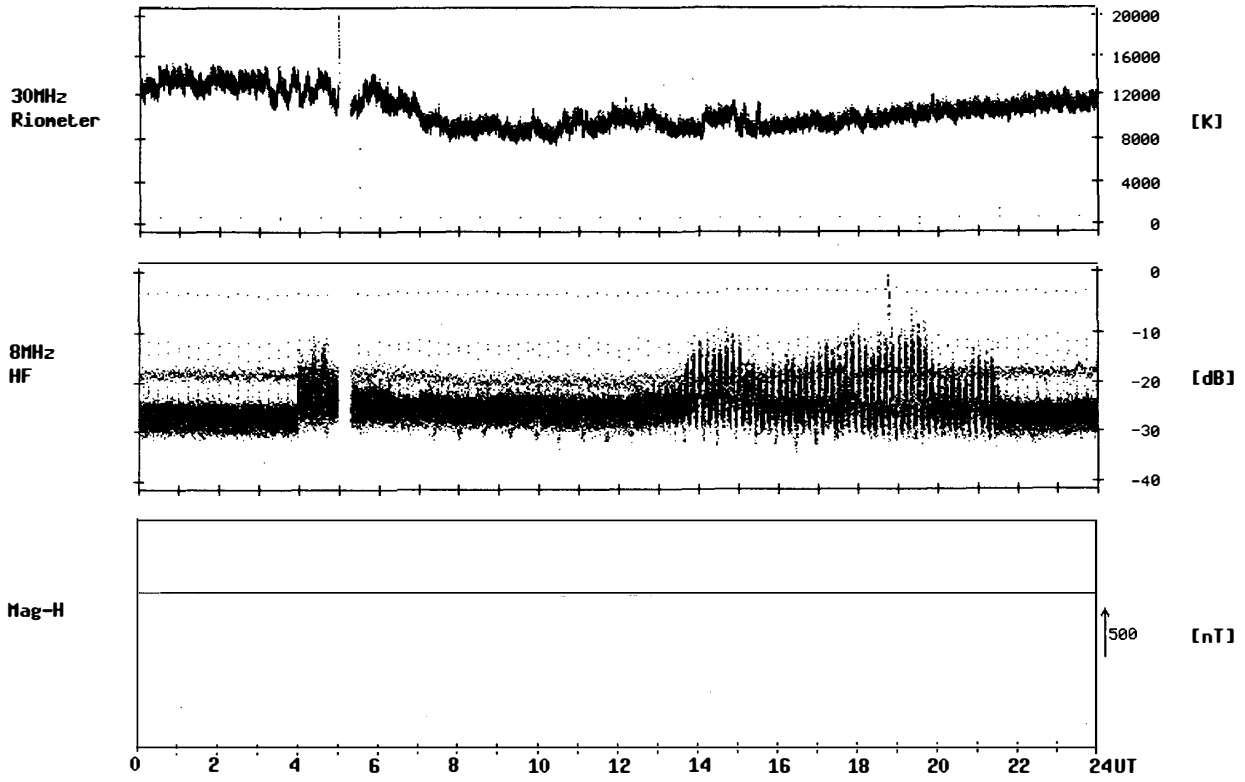
Syowa Station

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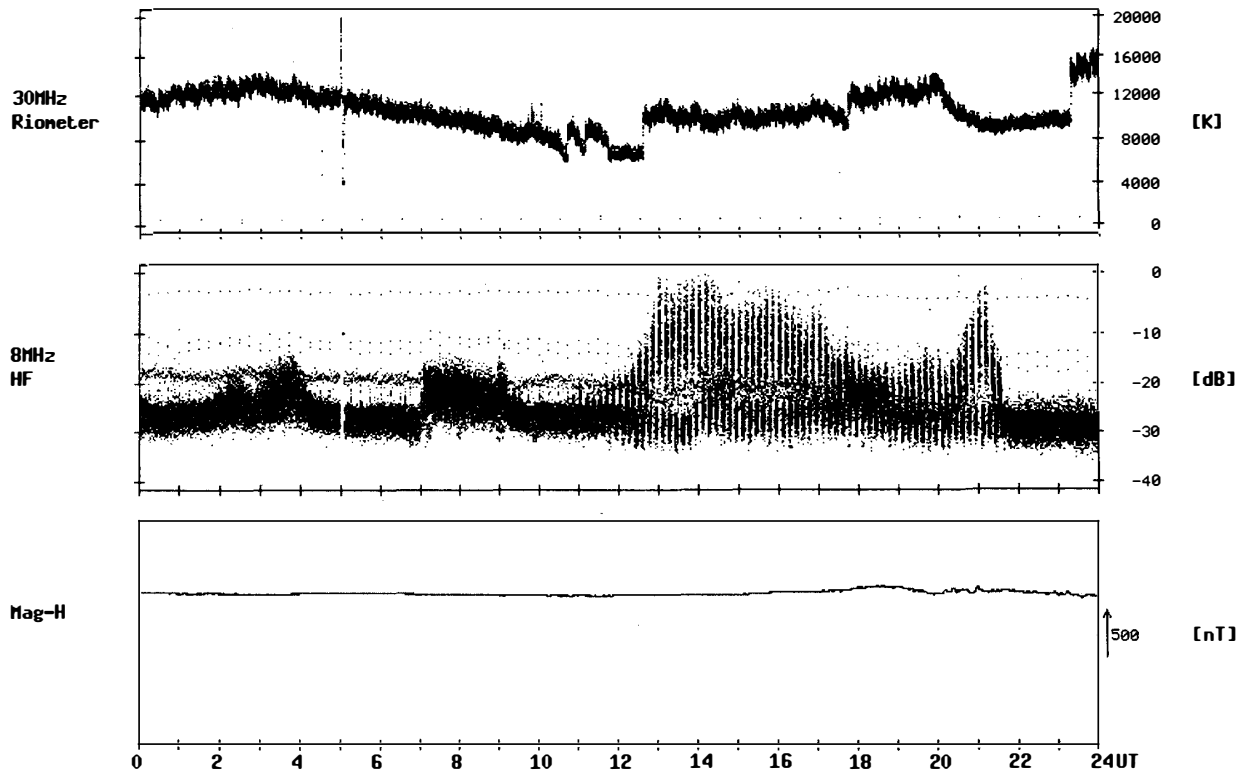
Syowa Station

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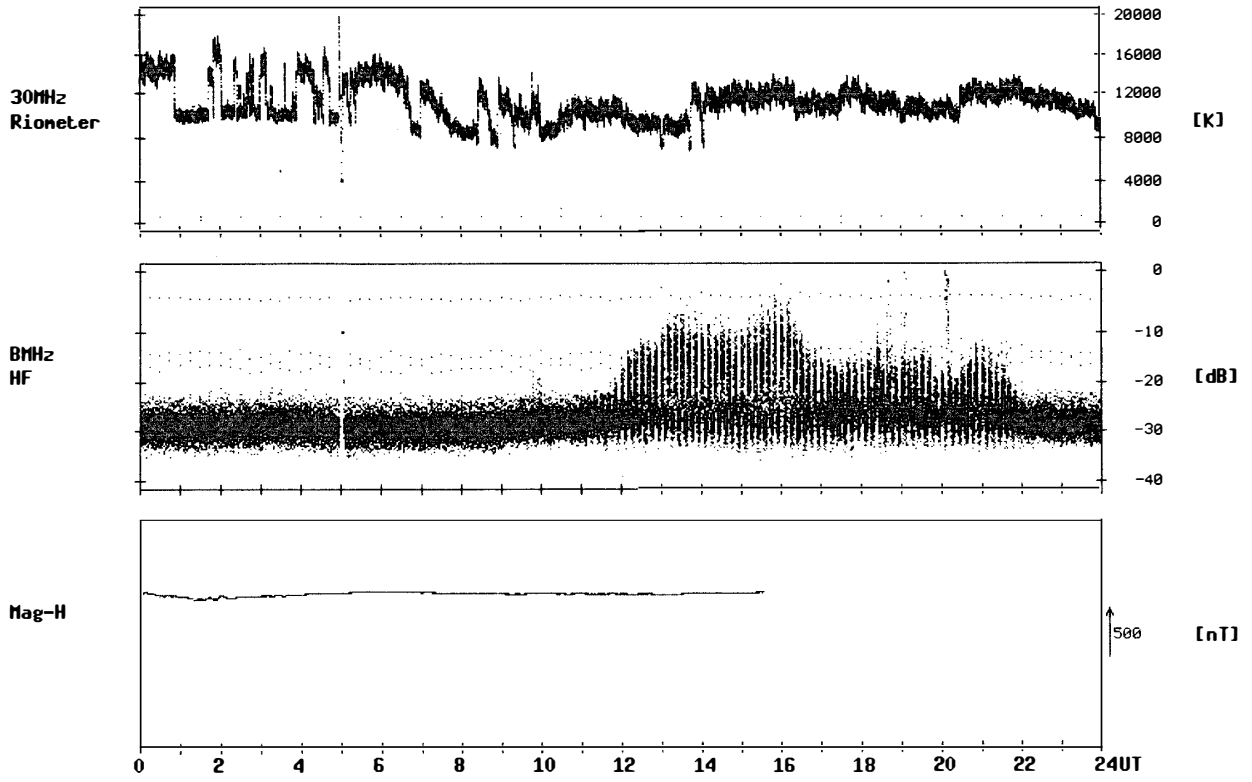
Syowa Station

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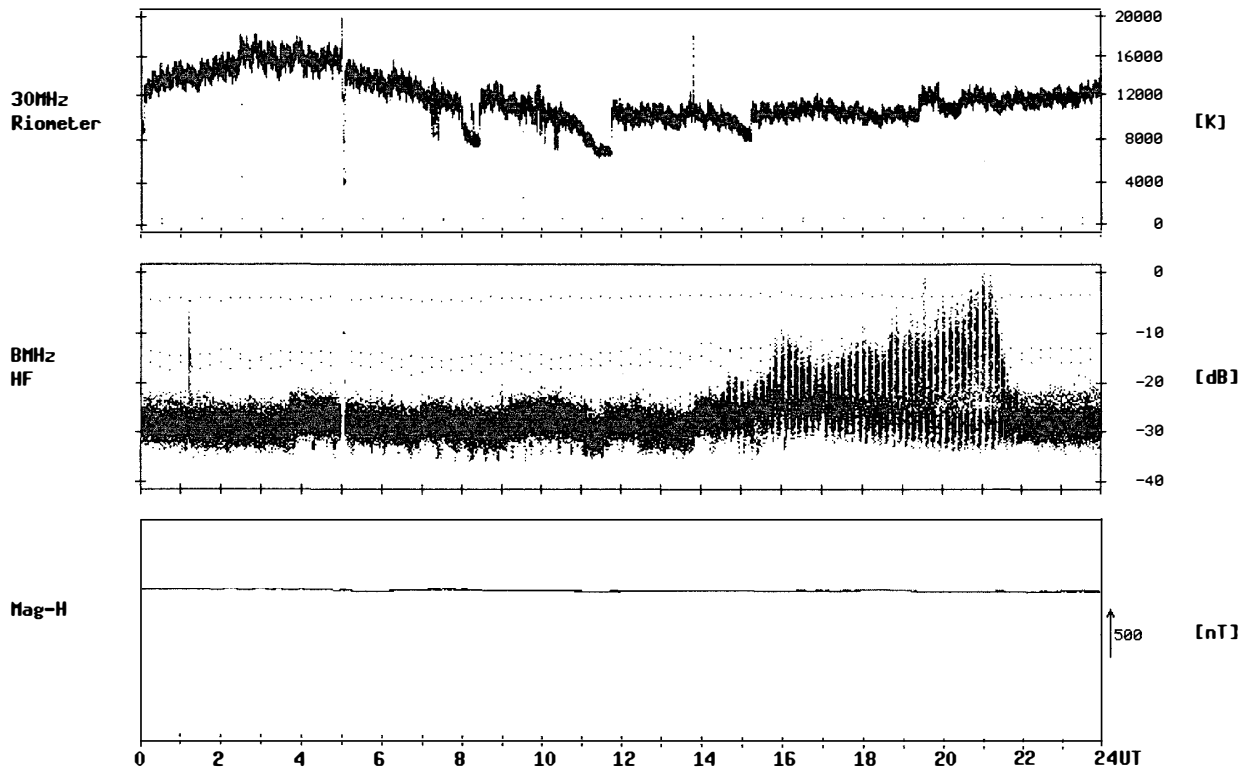
Syowa Station

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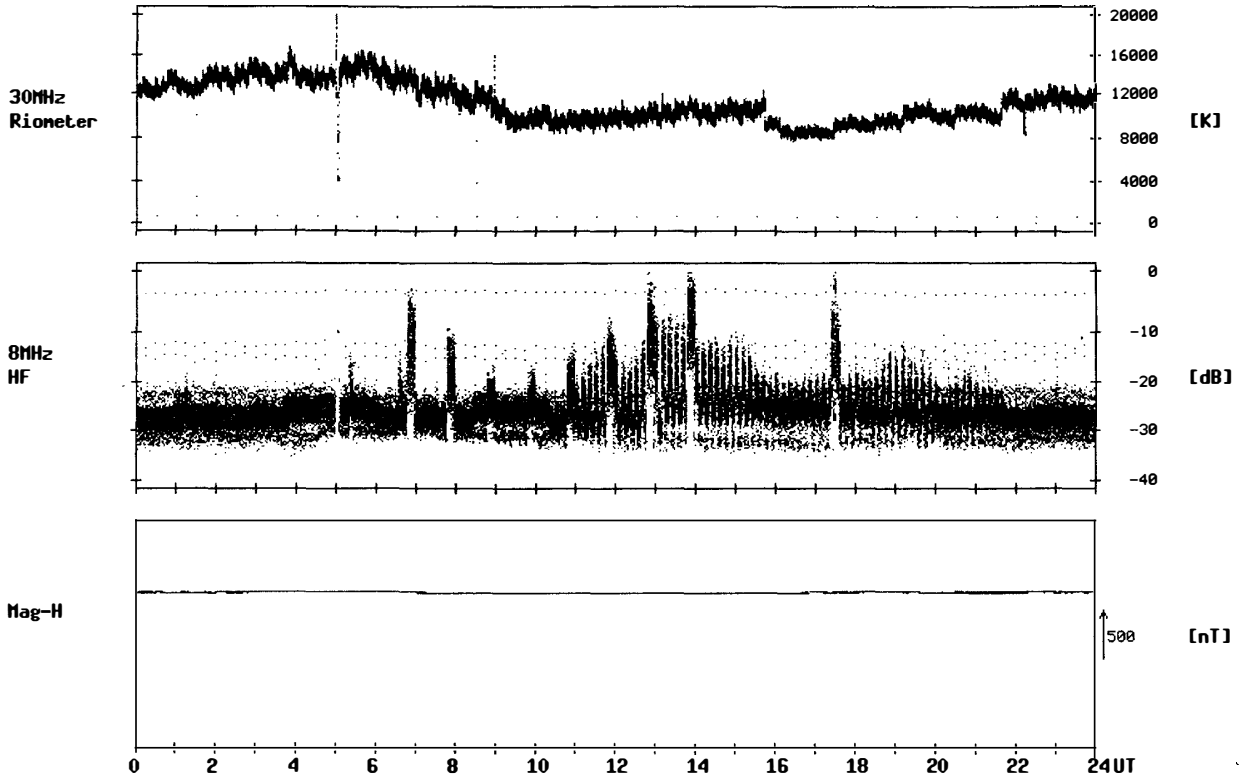
Syowa Station

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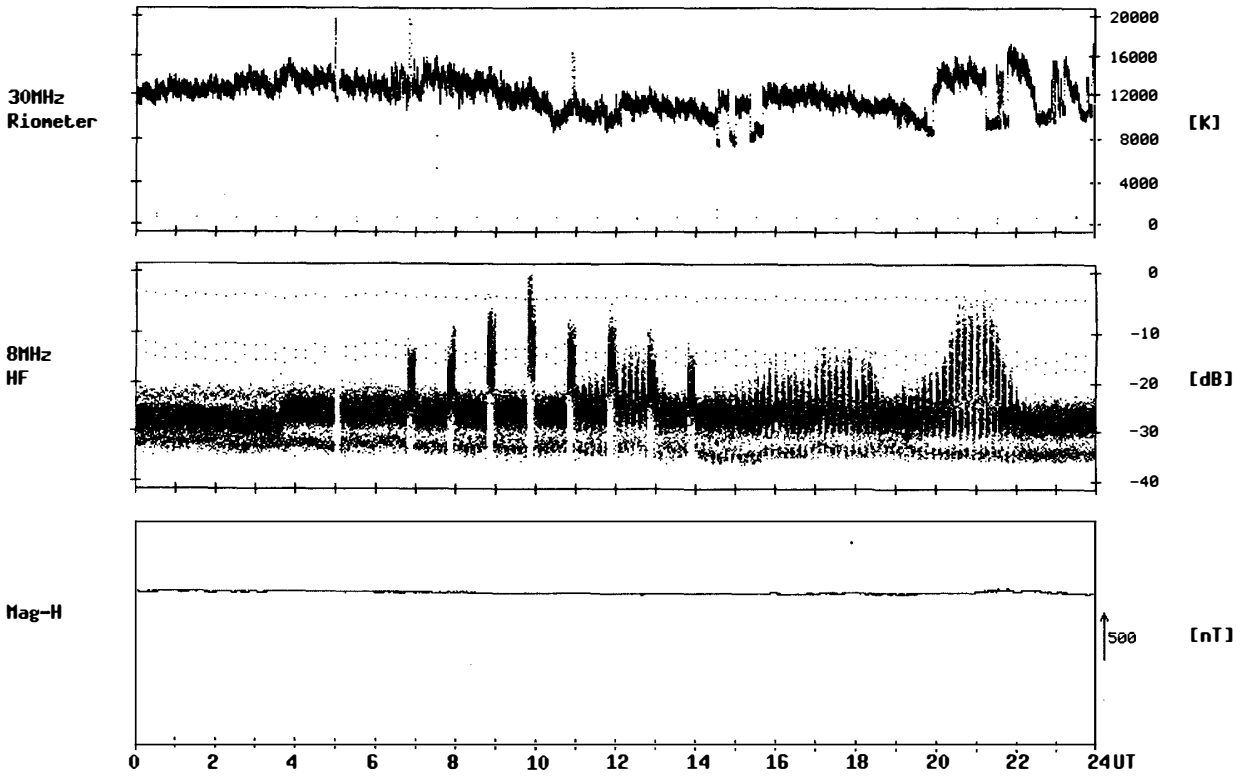
Syowa Station

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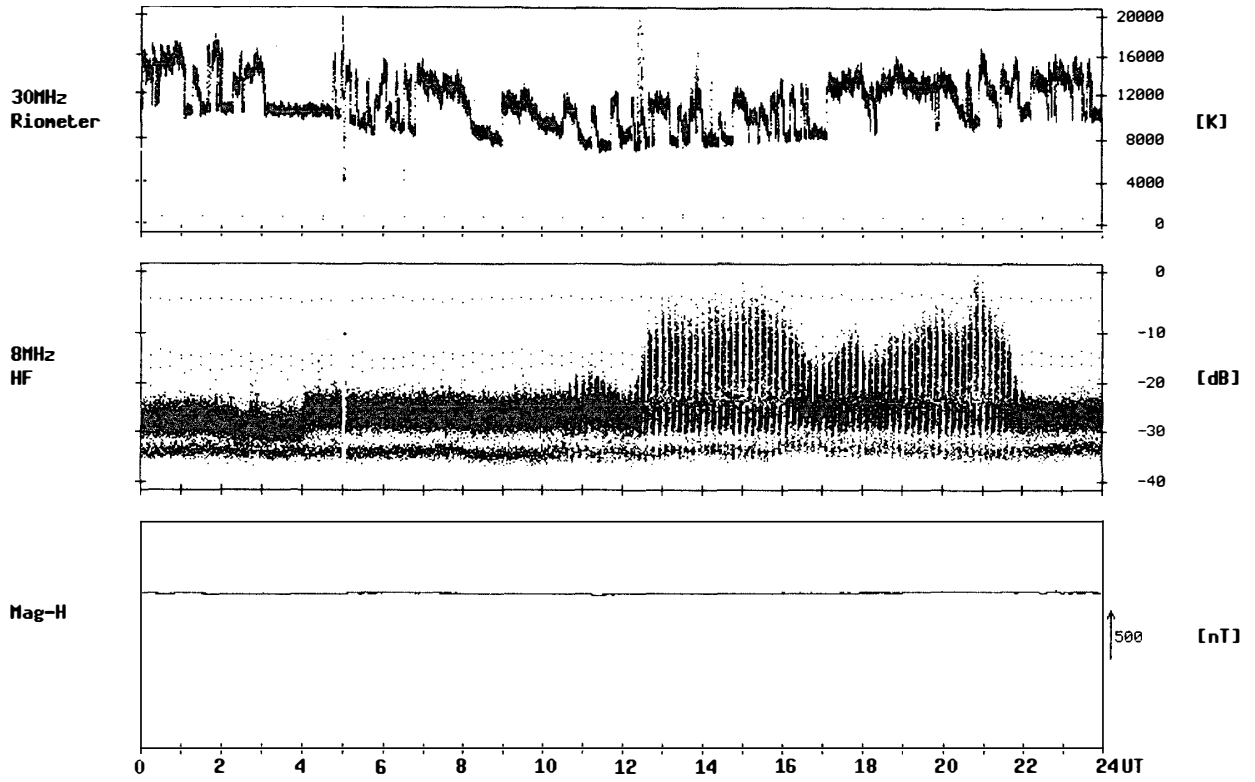
Syowa Station

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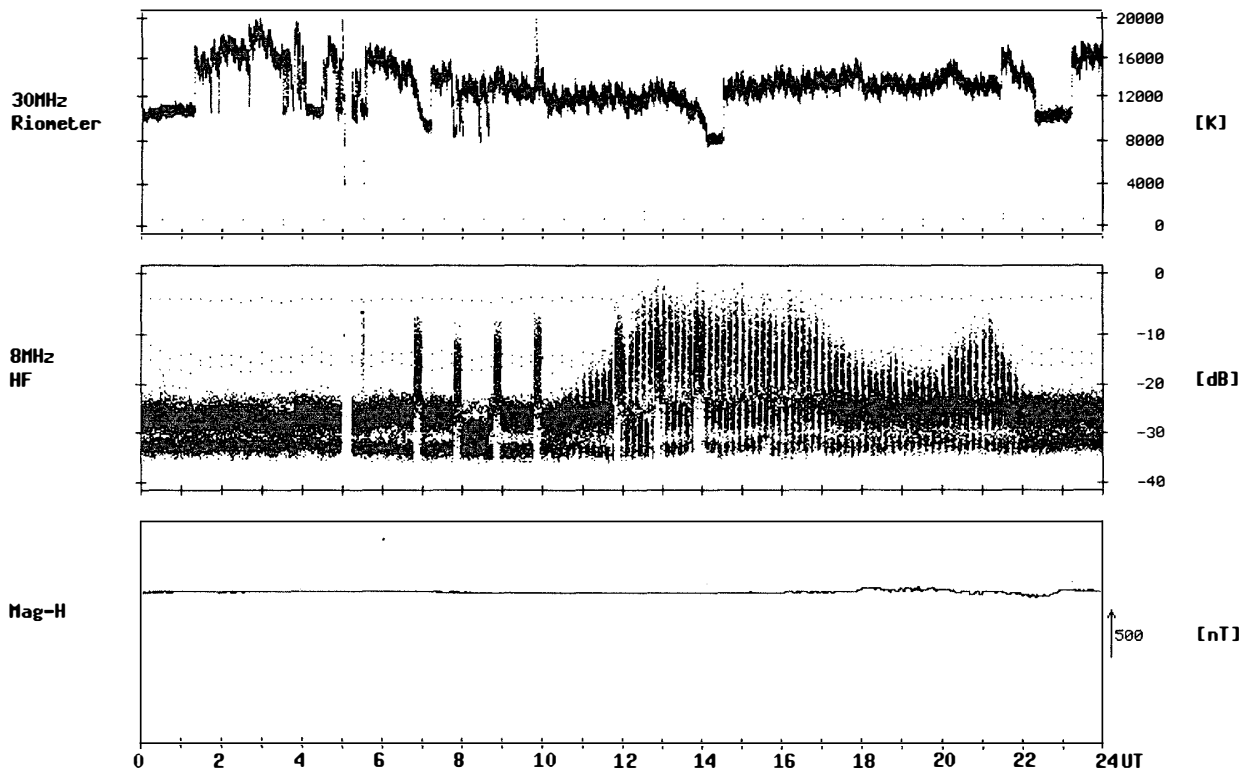
Syowa Station

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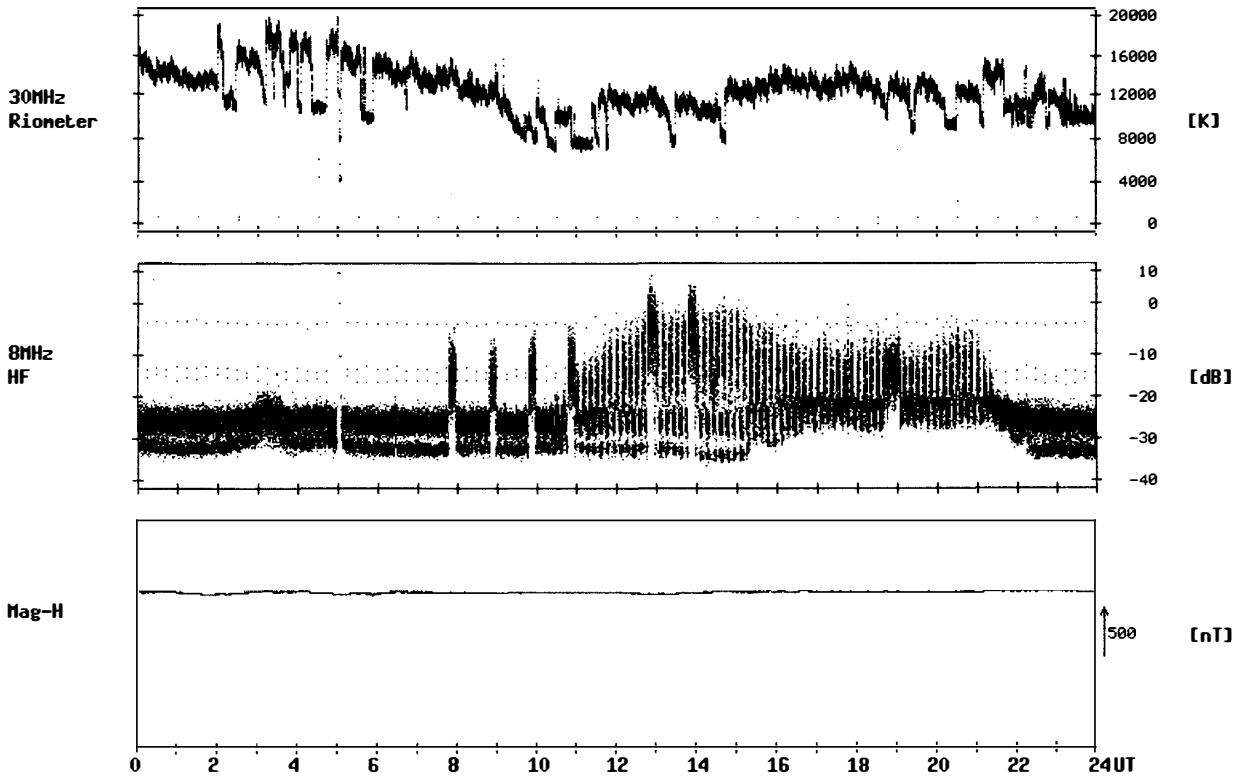
Syowa Station

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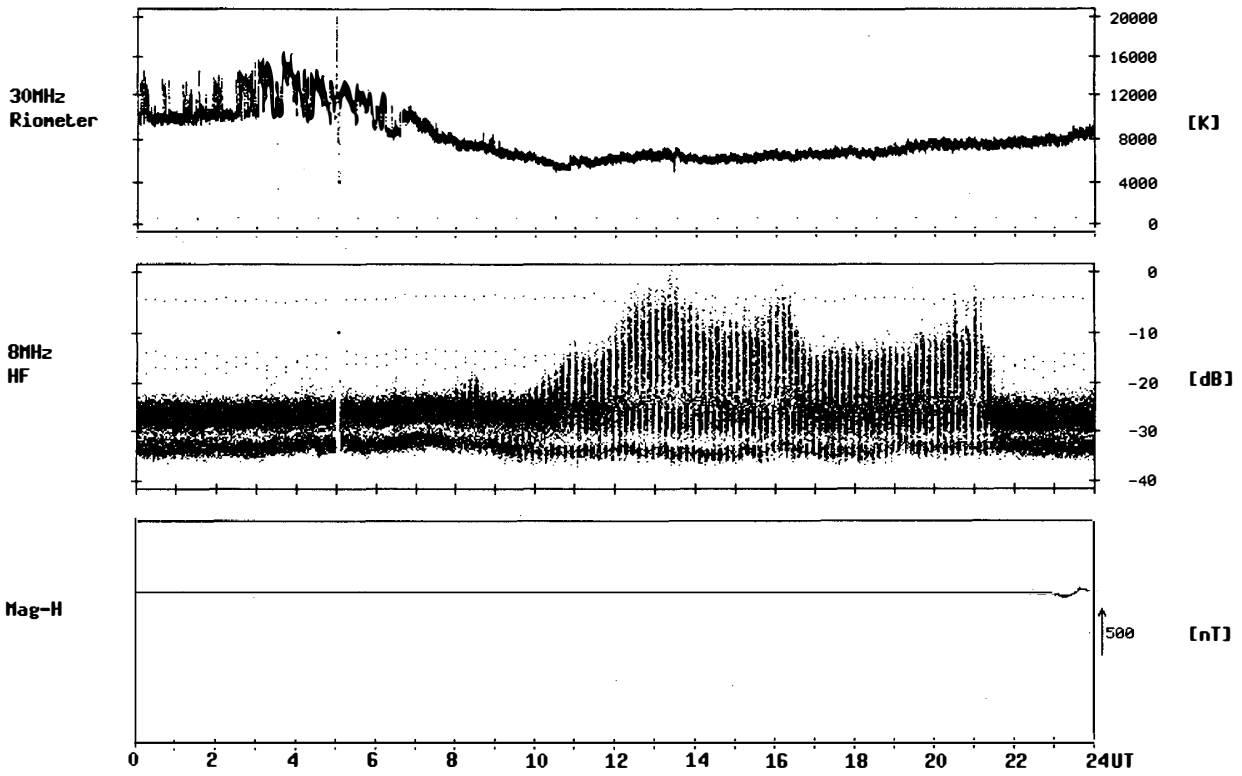
Syowa Station

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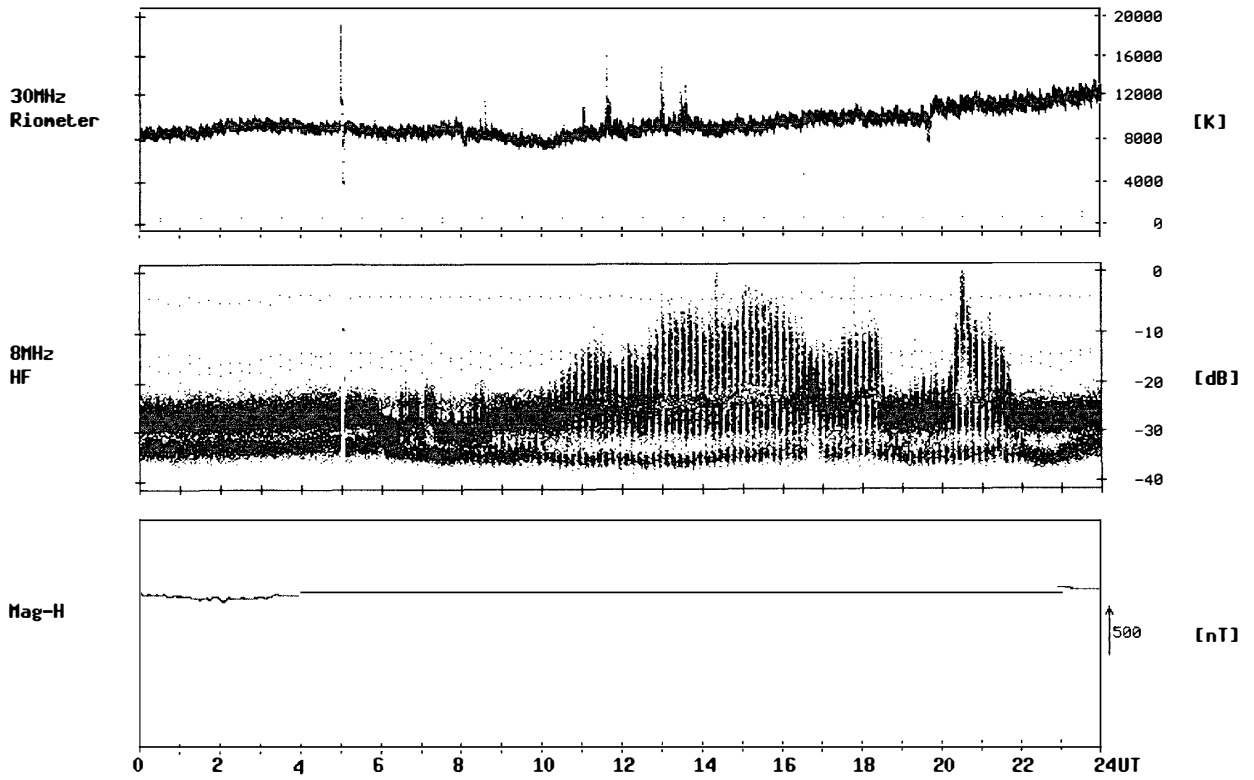
Syowa Station

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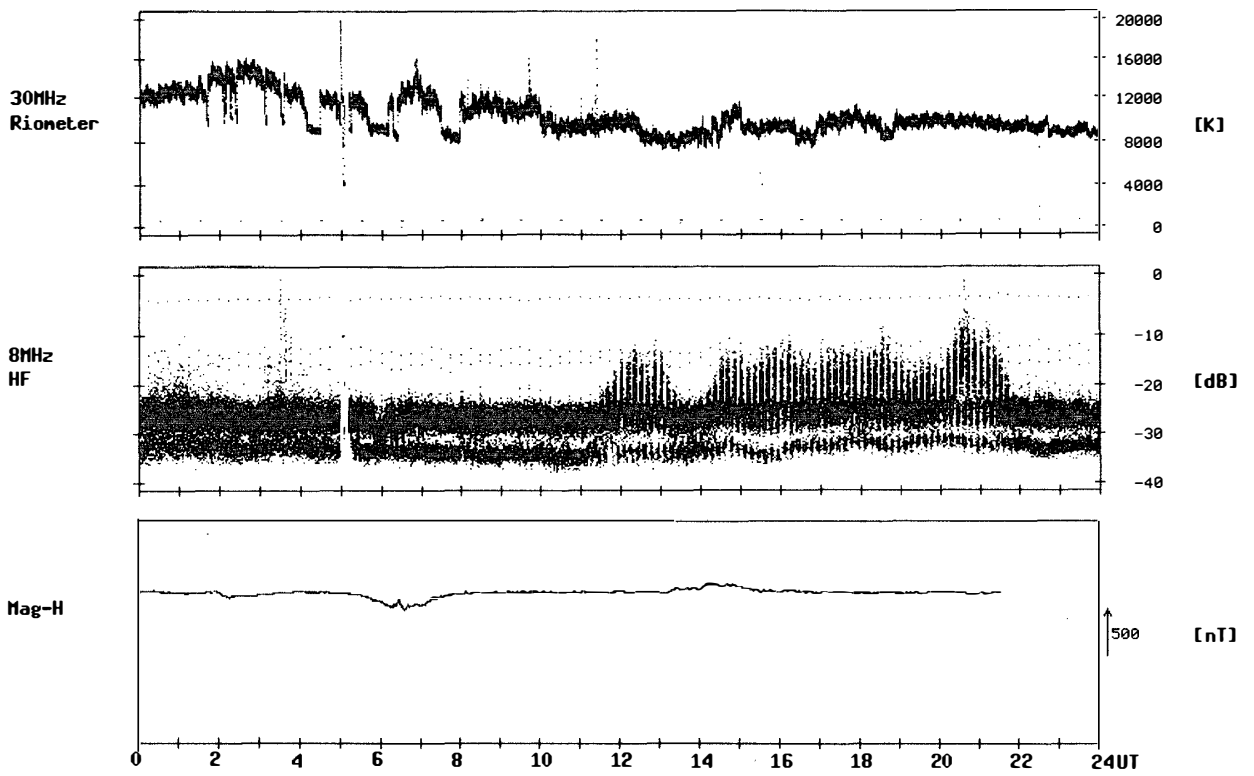
Syowa Station

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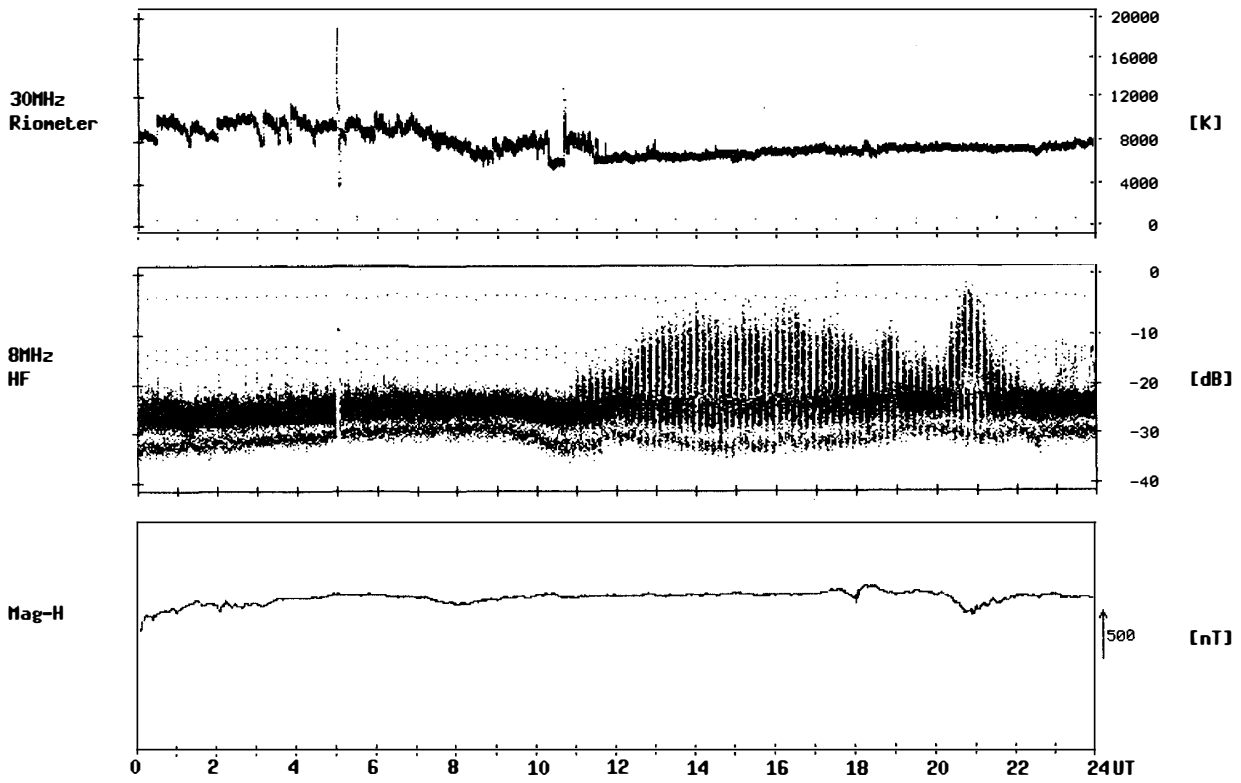
Syowa Station

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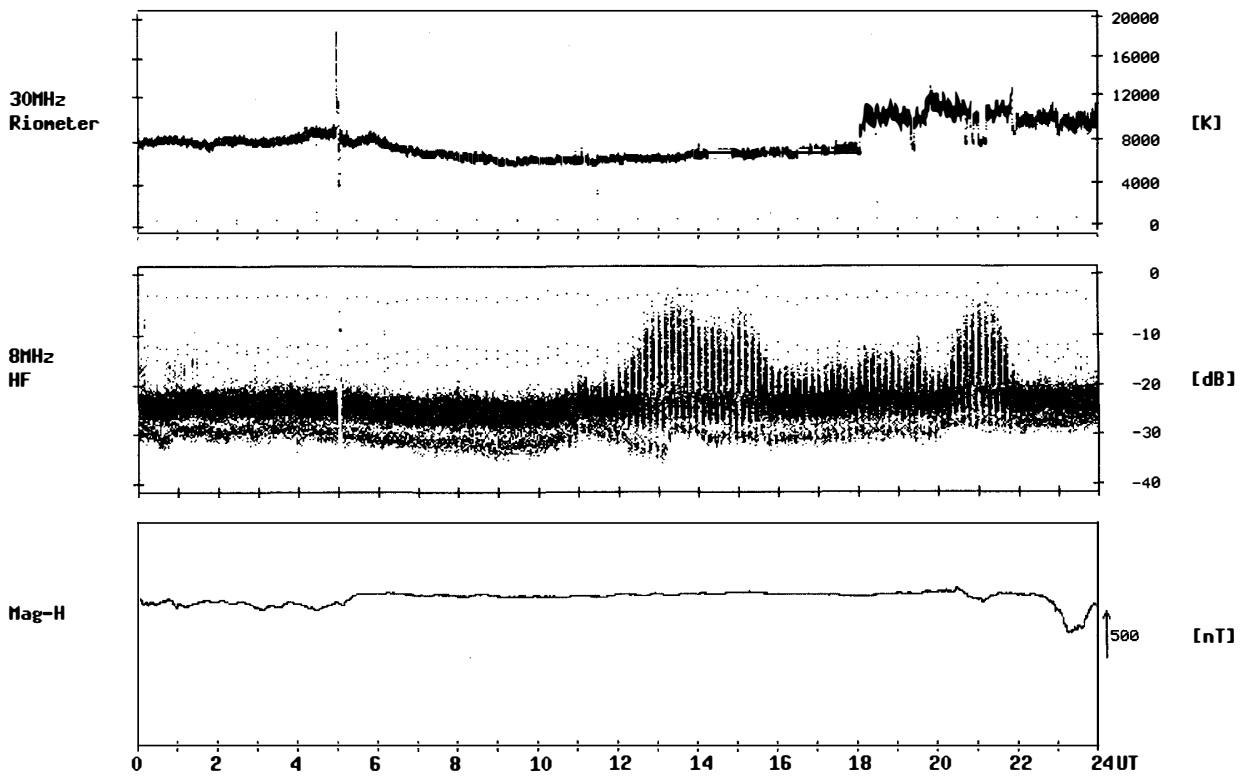
Syowa Station

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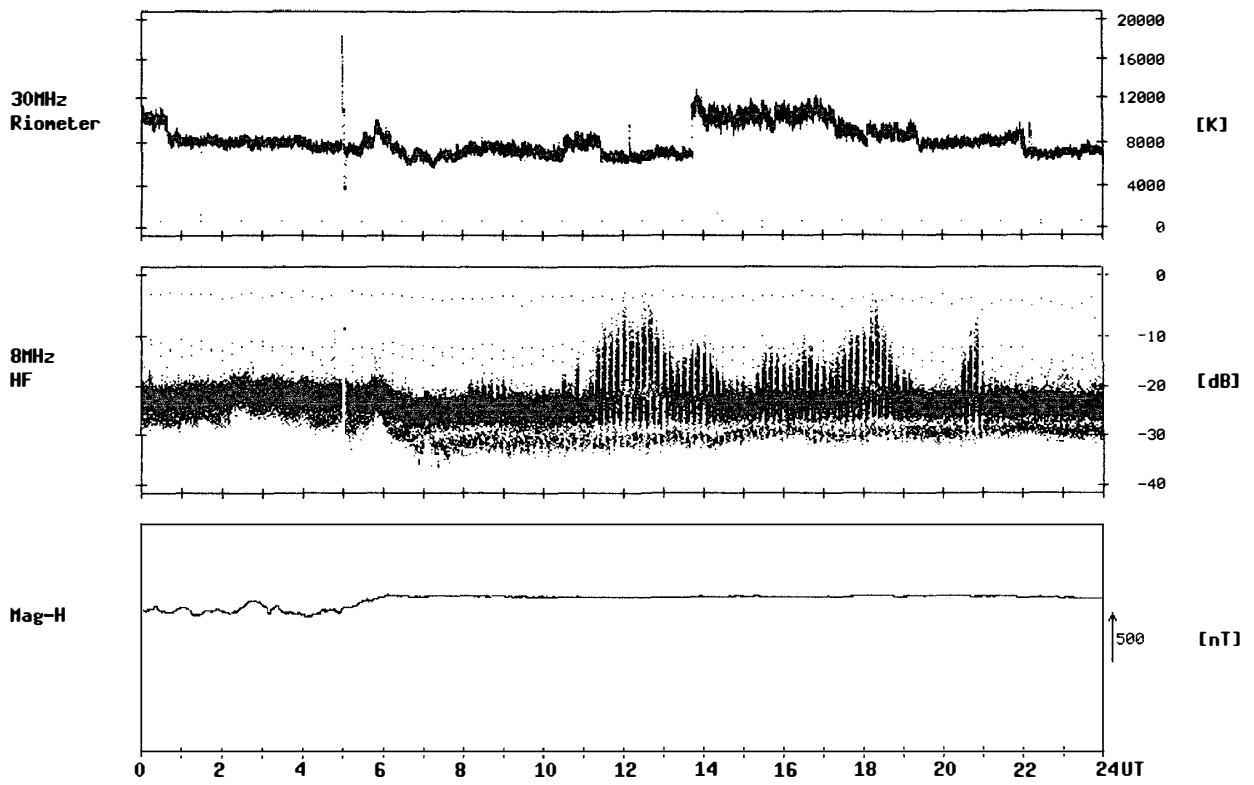
Syowa Station

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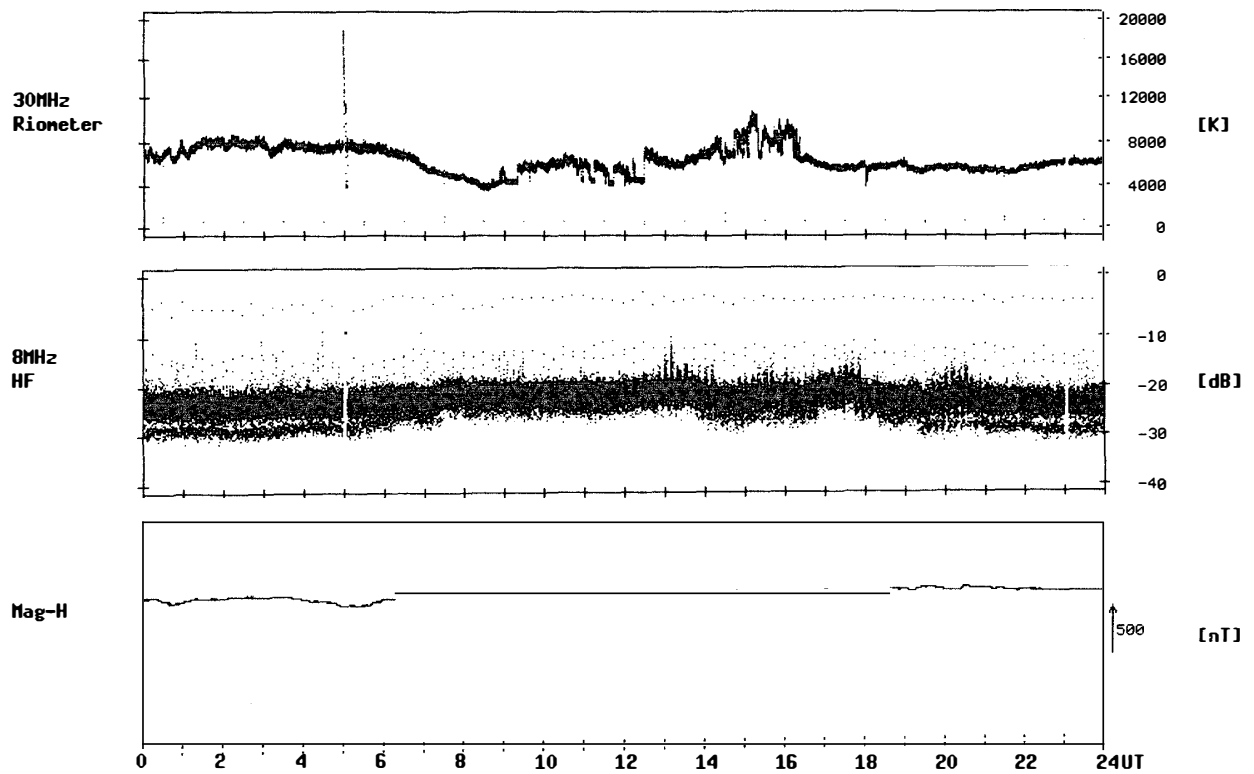
Syowa Station

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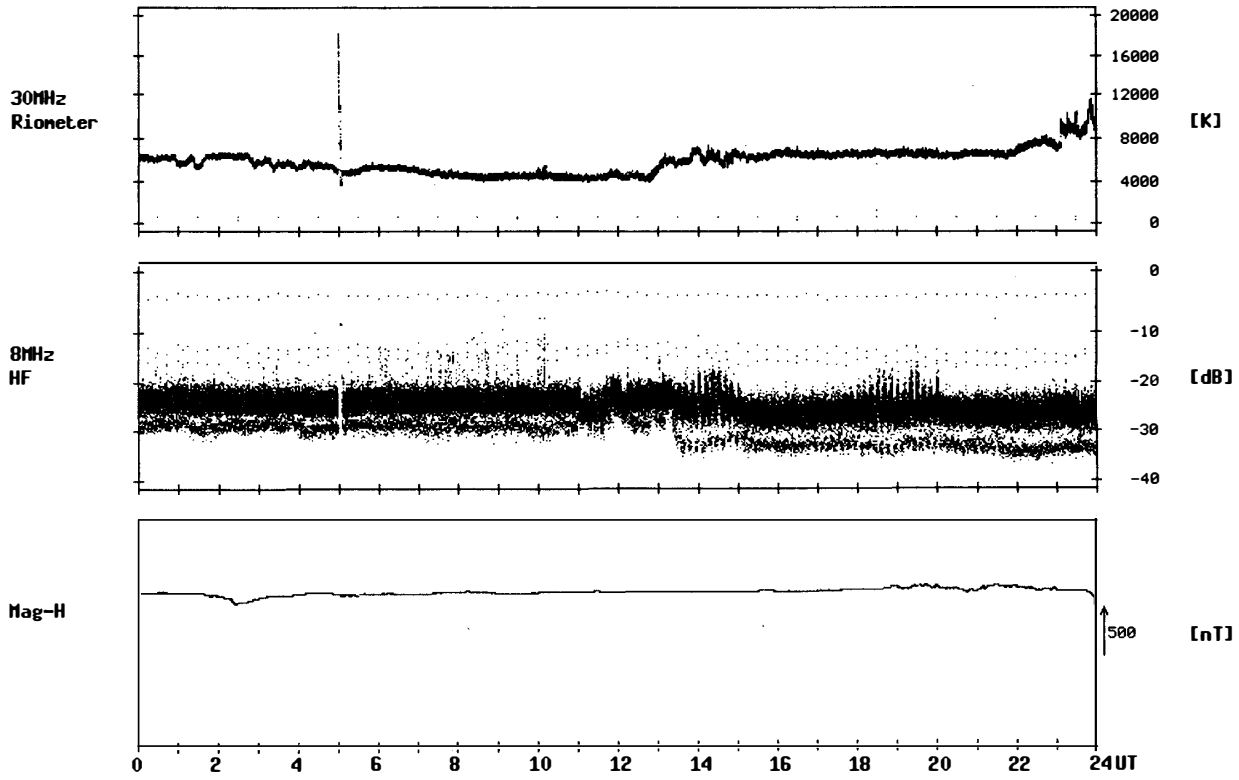
Syowa Station

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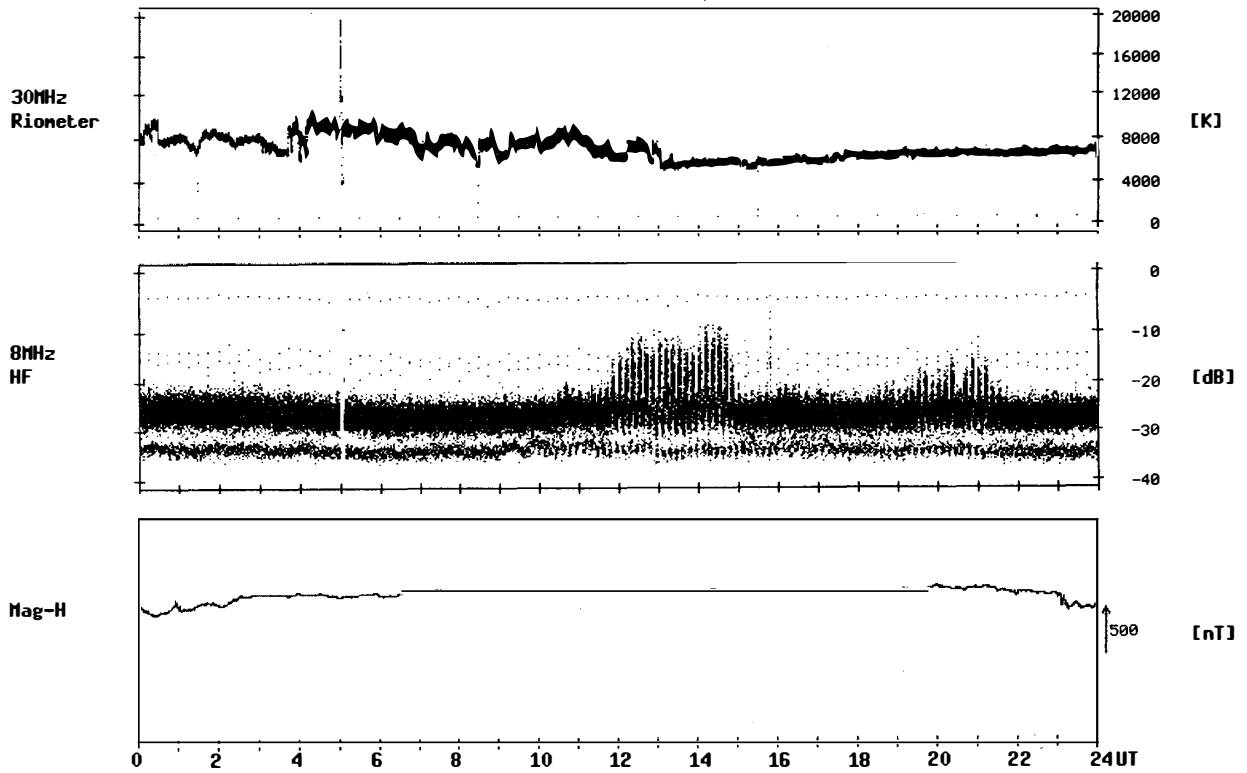
Syowa Station

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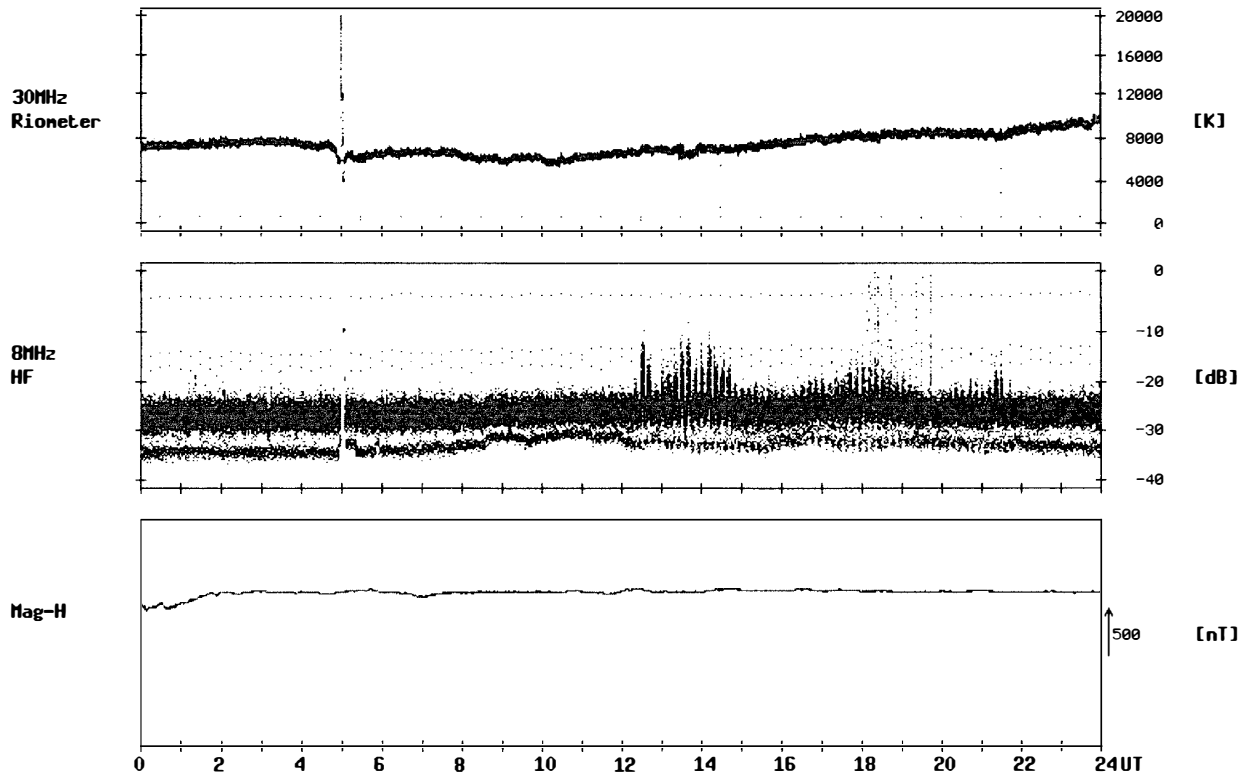
Syowa Station

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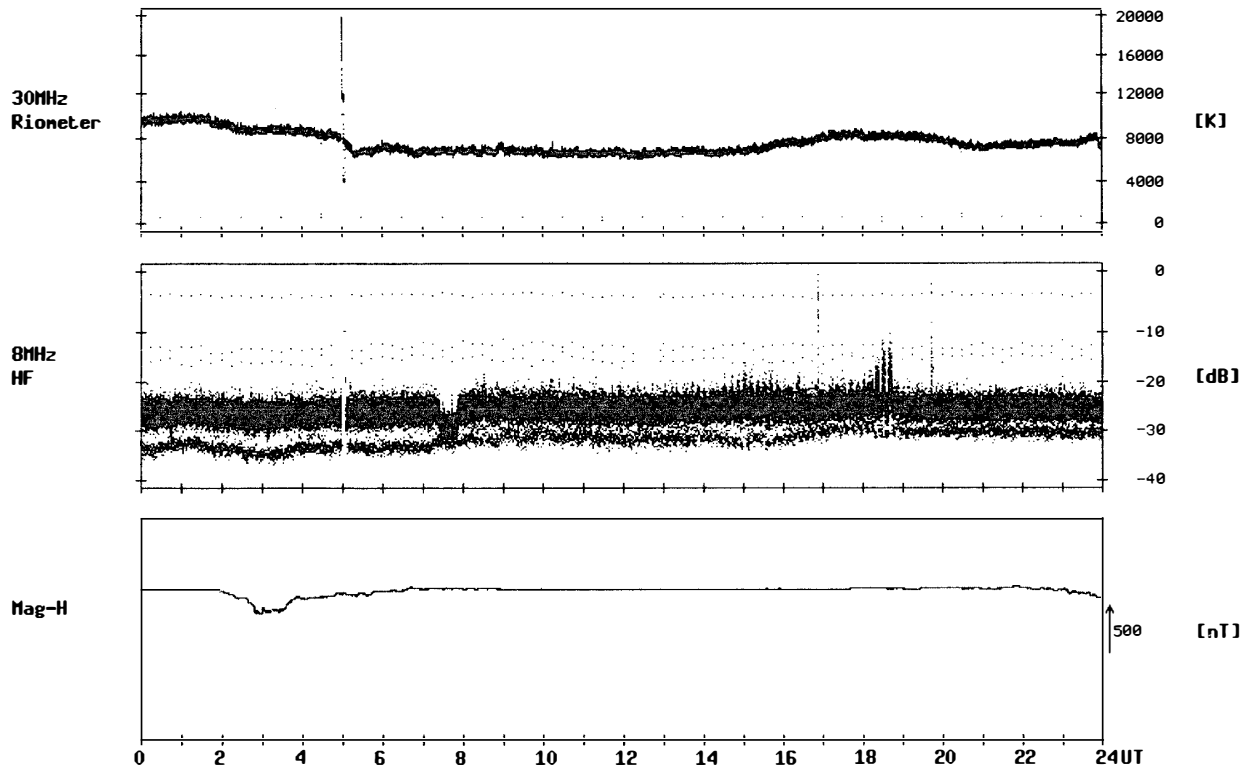
Syowa Station

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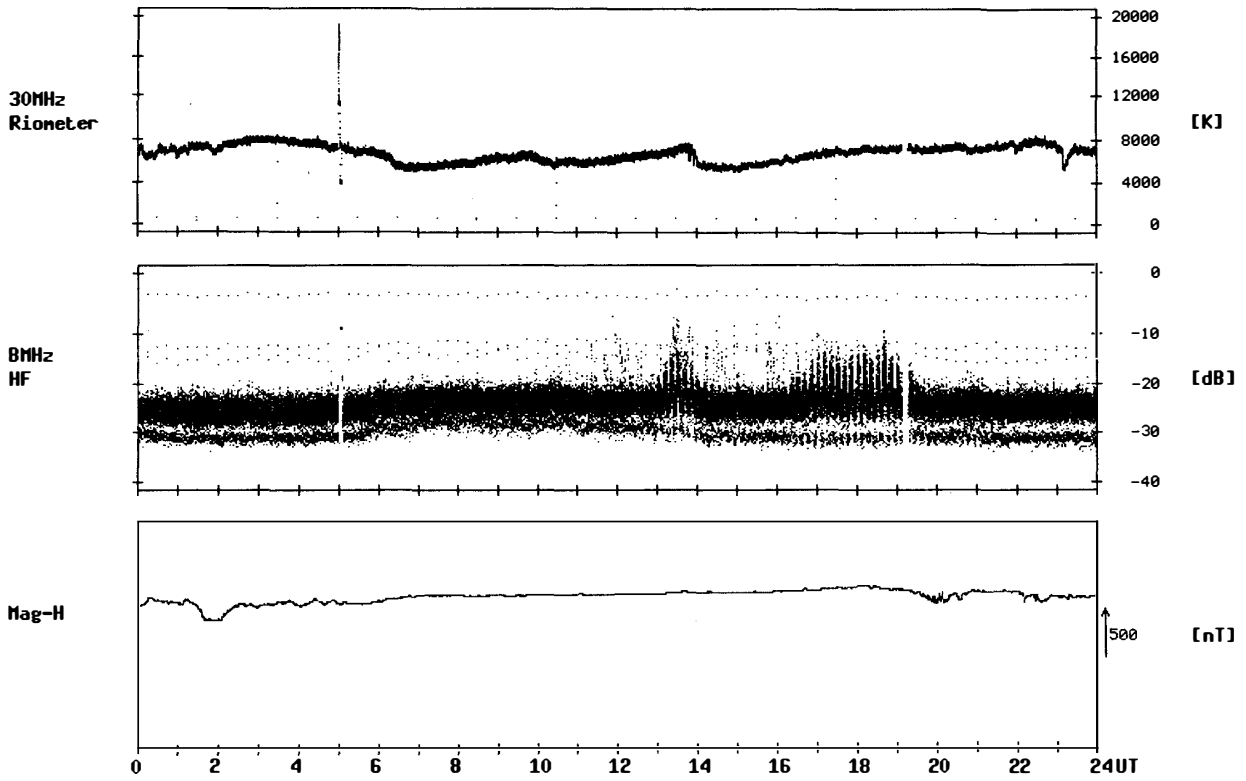
Syowa Station

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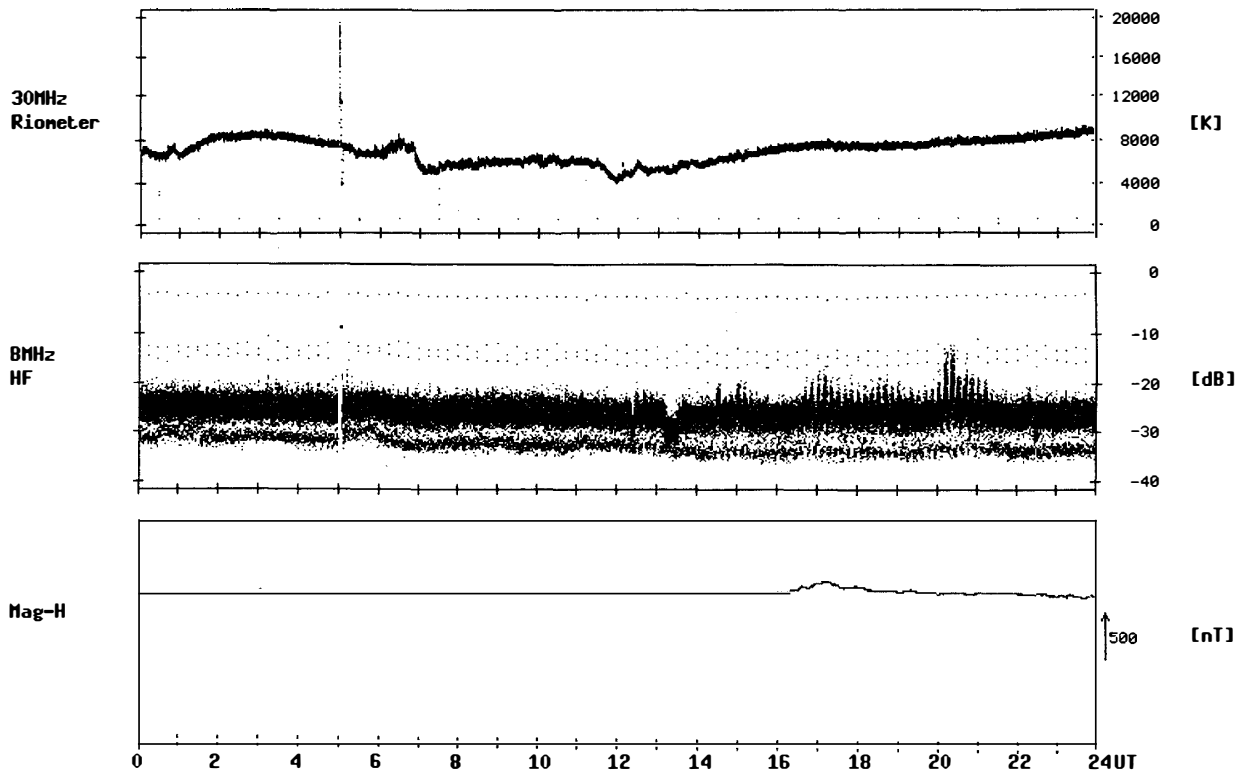
Syowa Station

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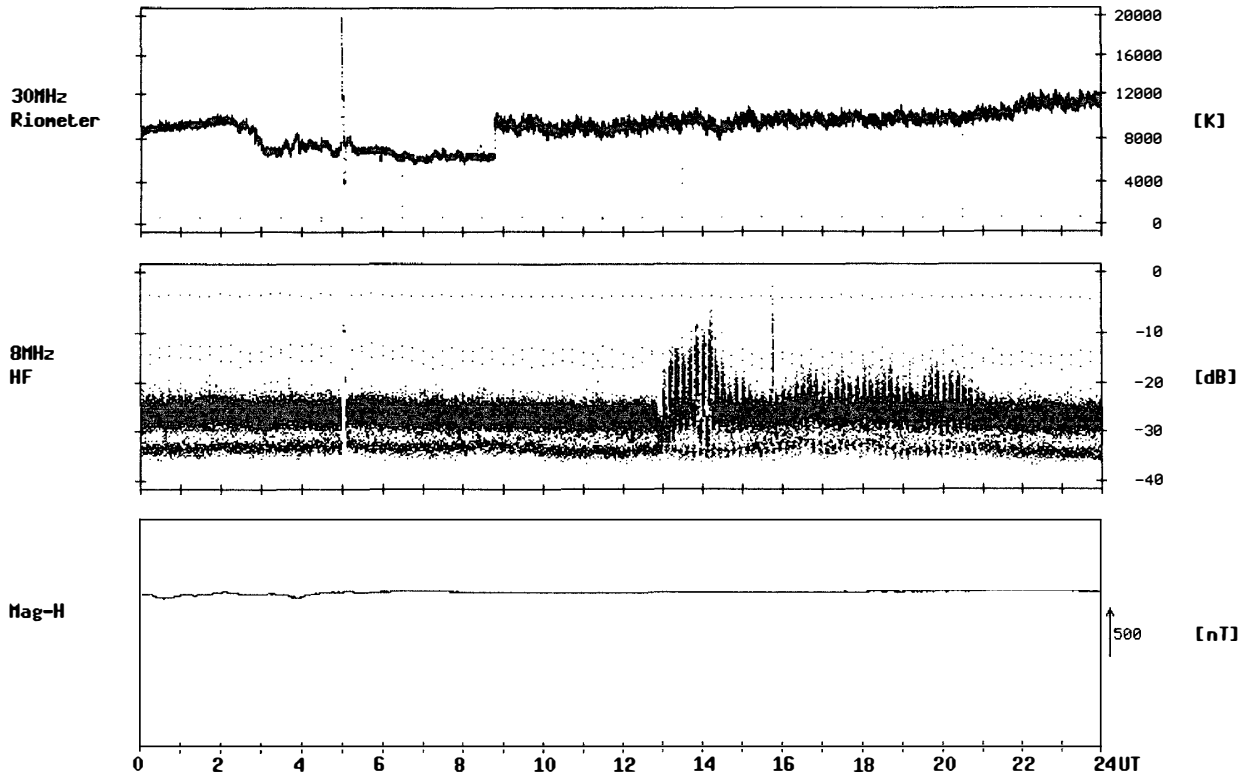
Syowa Station

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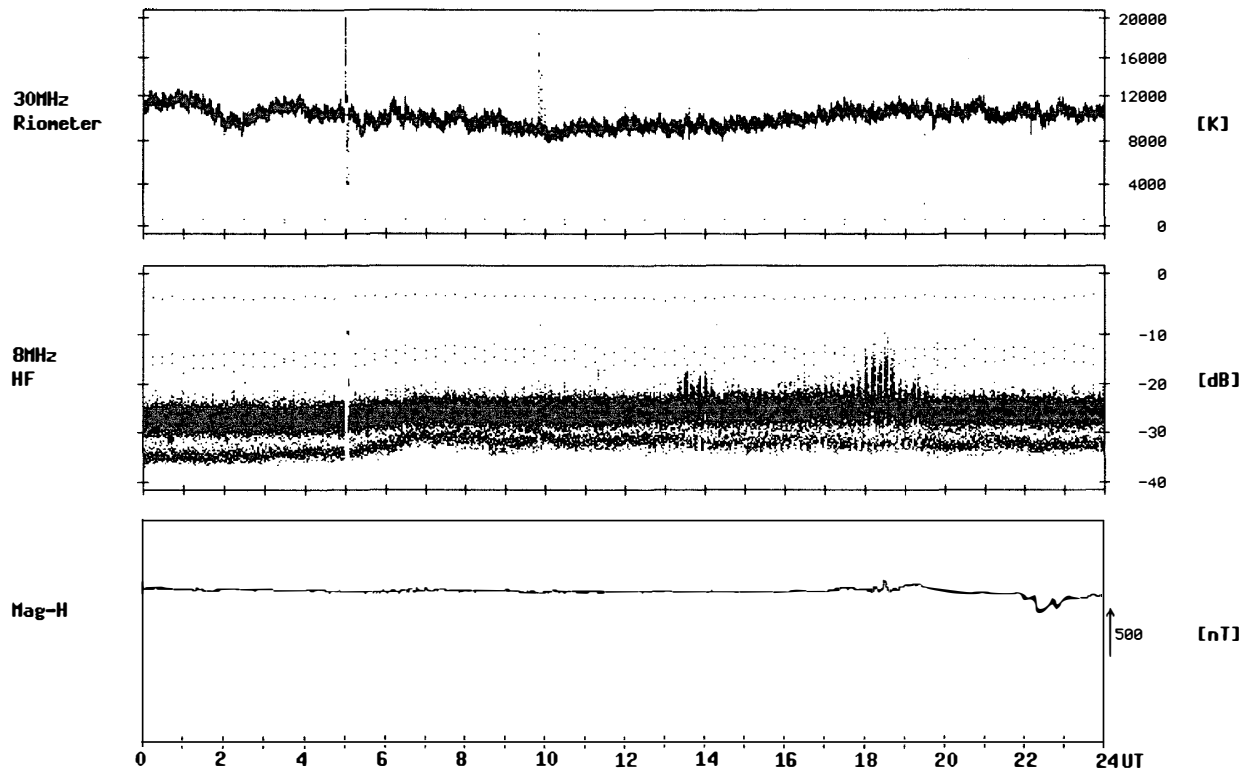
Syowa Station

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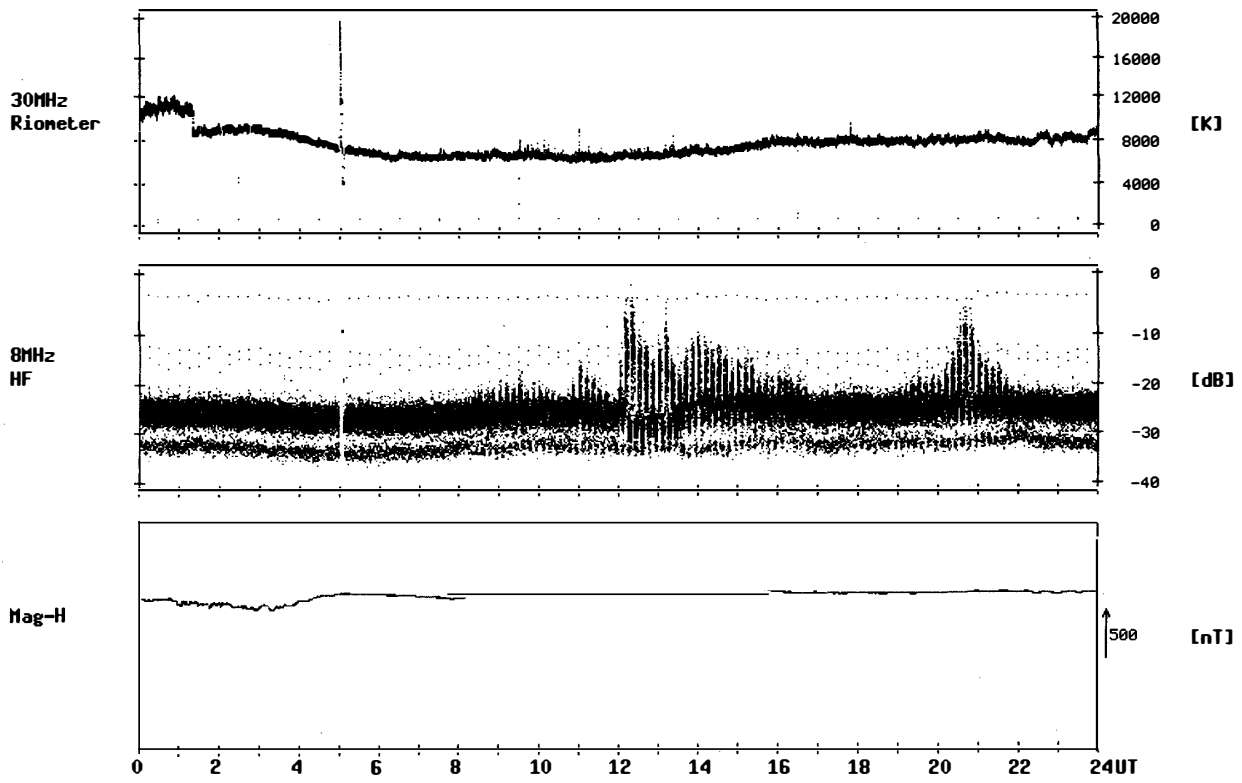
Syowa Station

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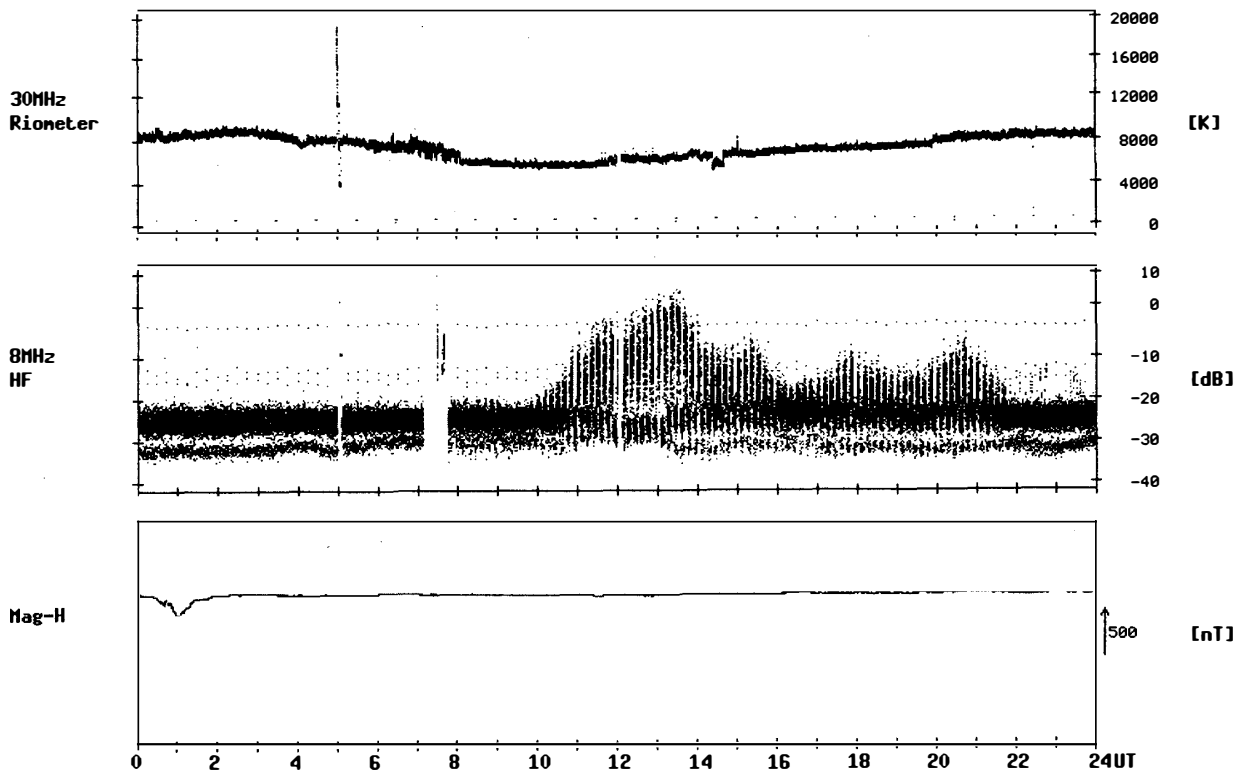
Syowa Station

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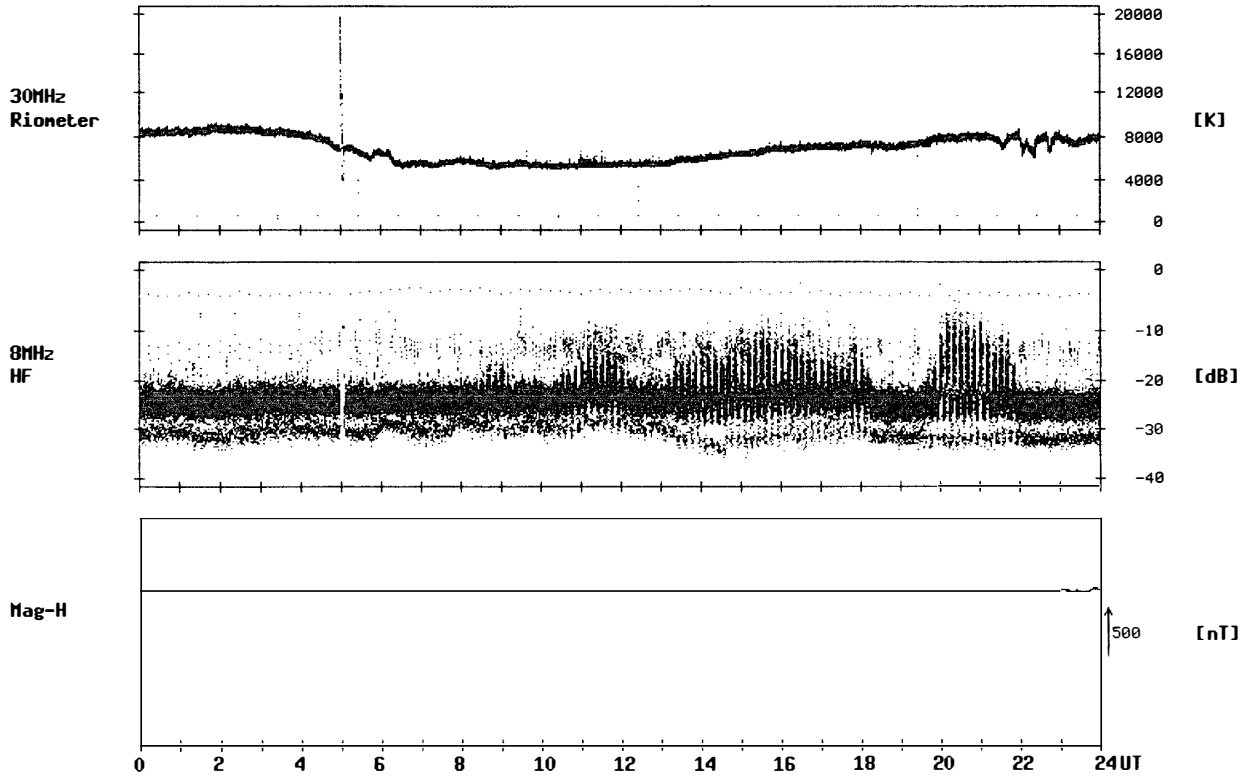
Syowa Station

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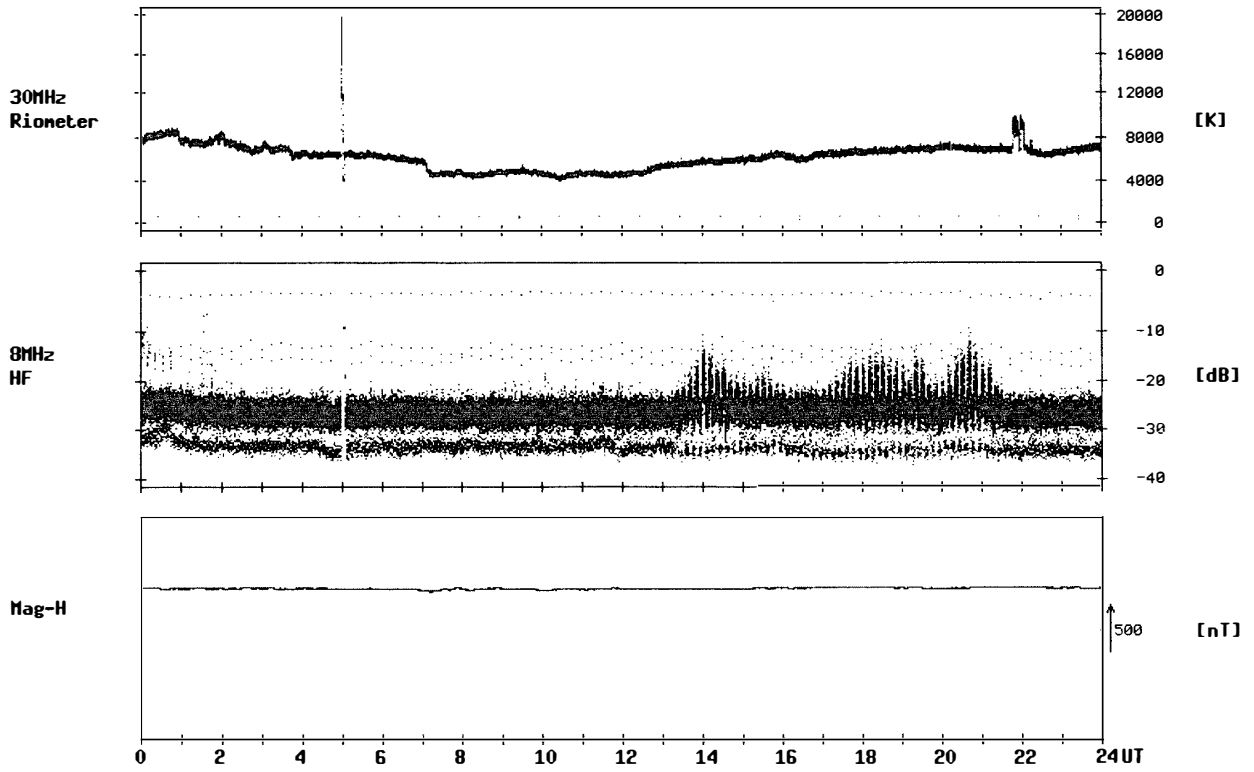
Syowa Station

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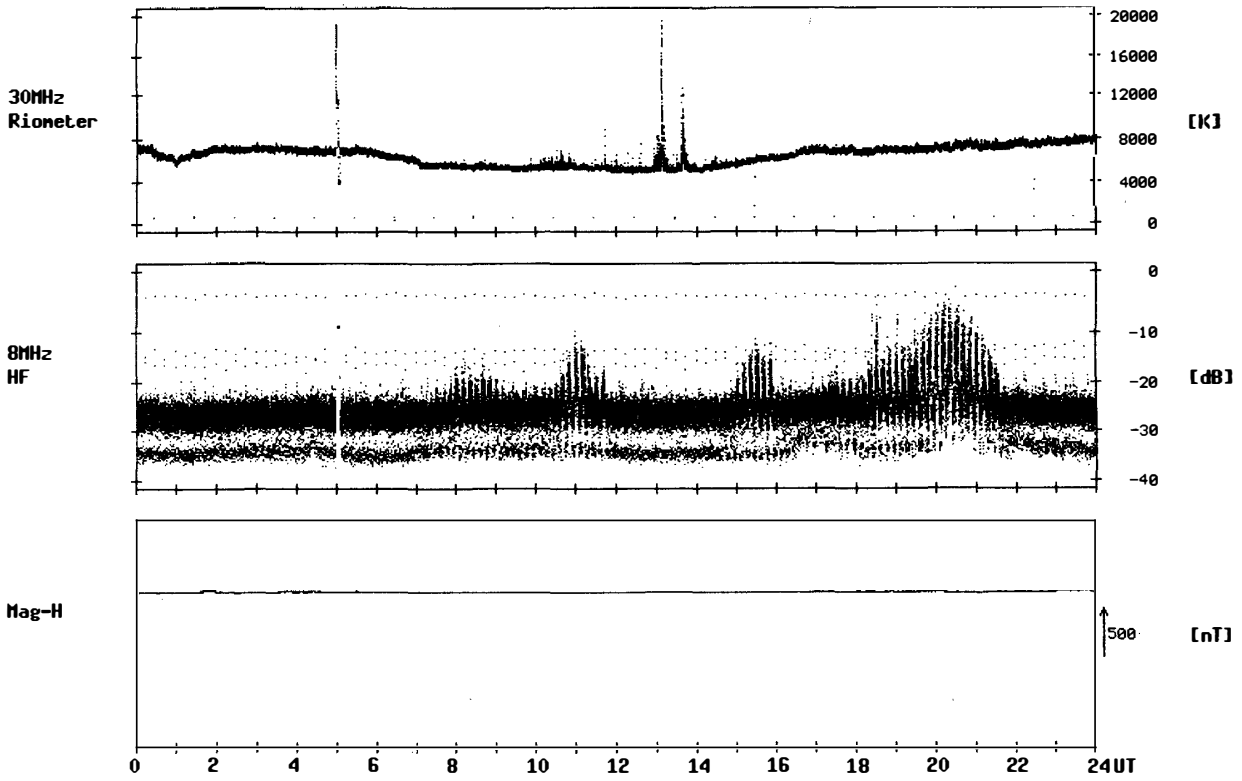
Syowa Station

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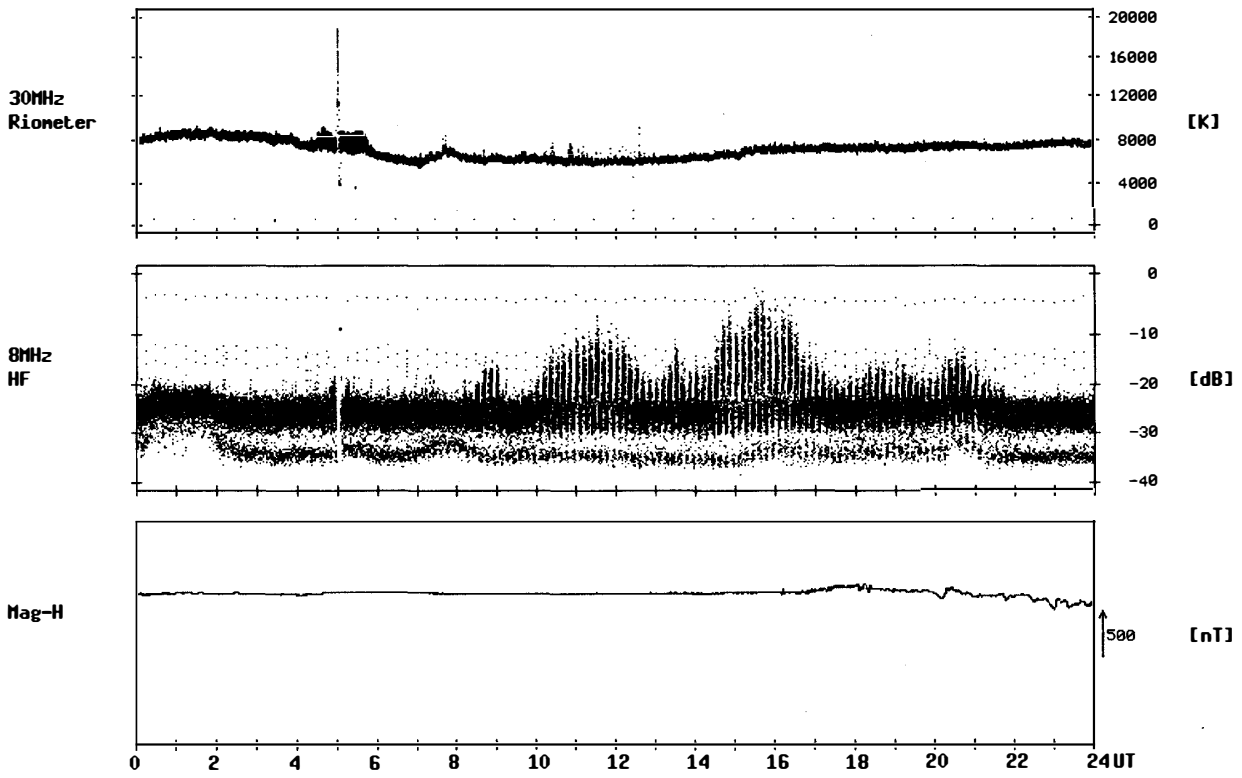
Syowa Station

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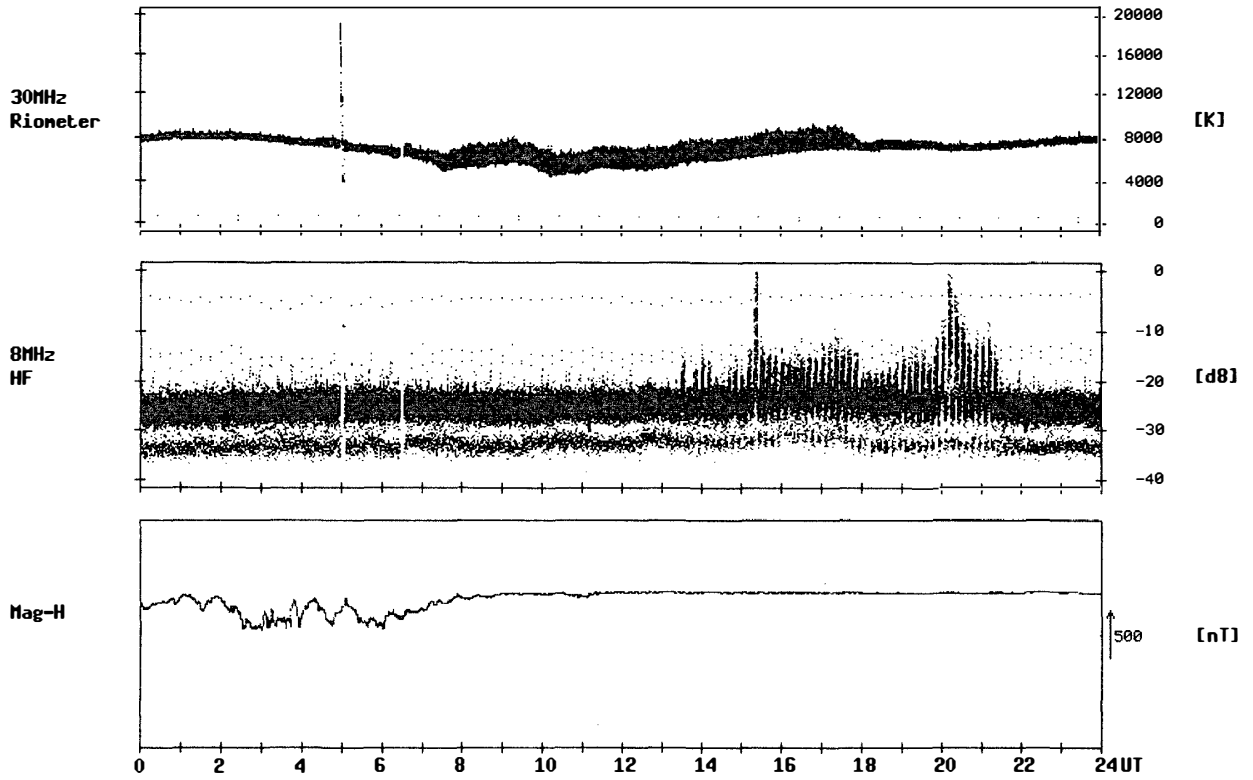
Syowa Station

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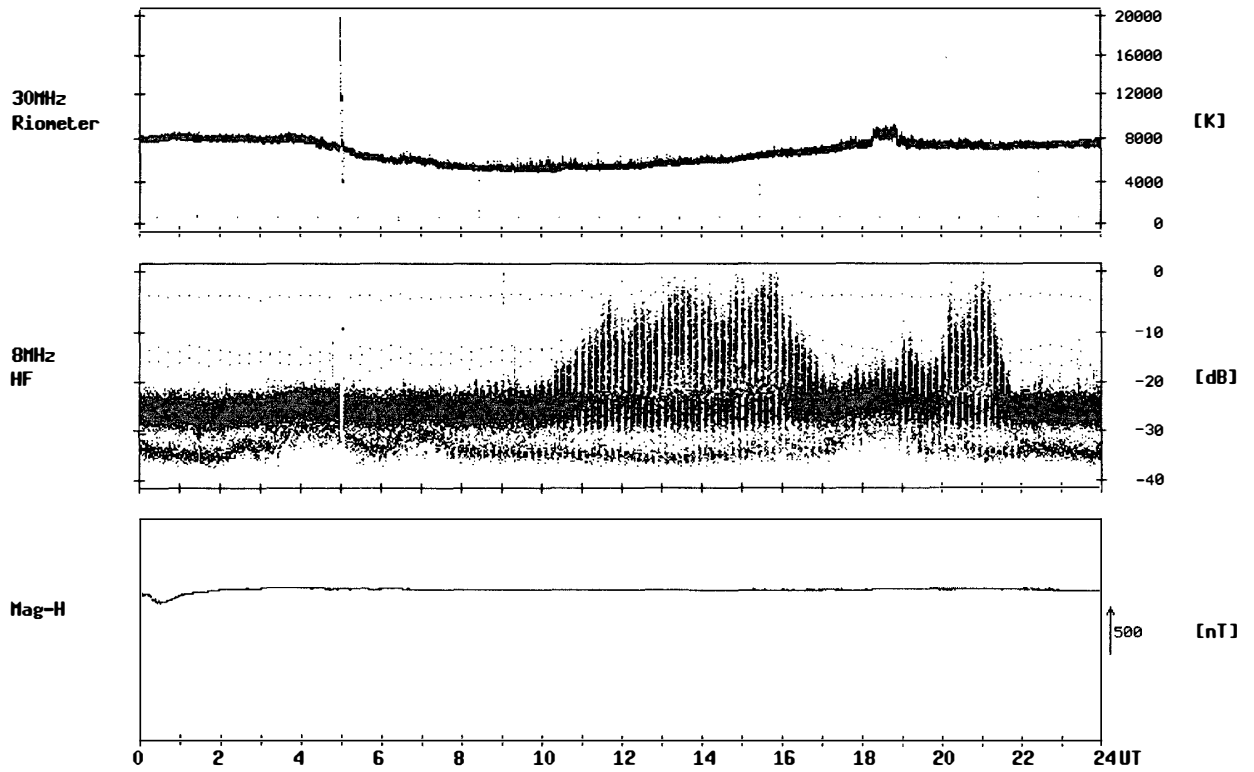
Syowa Station

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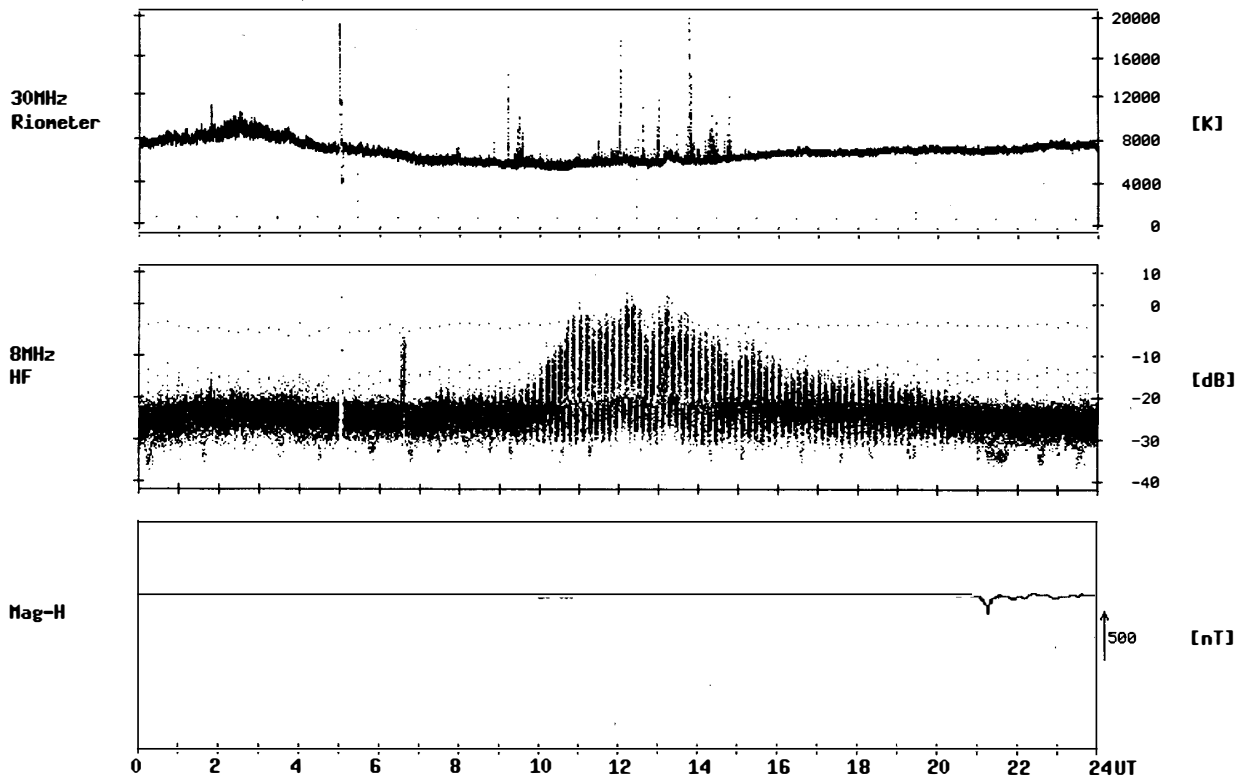
Syowa Station

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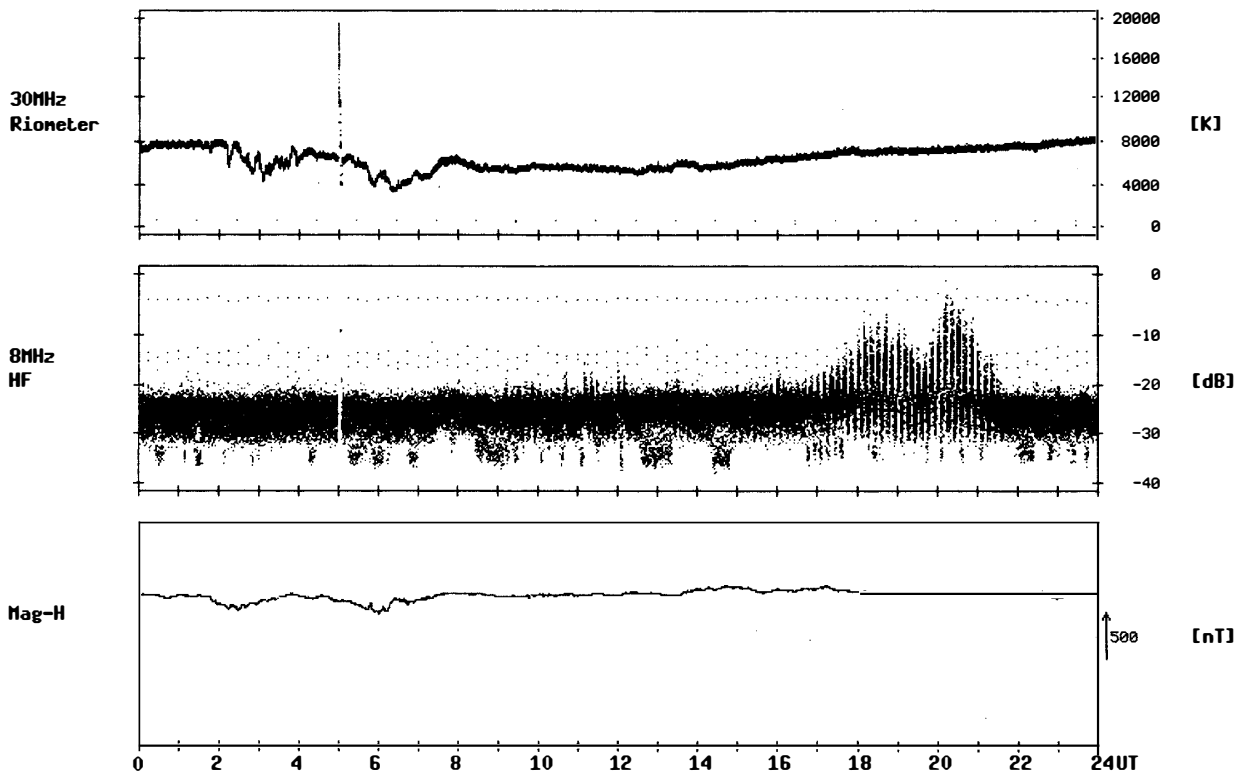
Syowa Station

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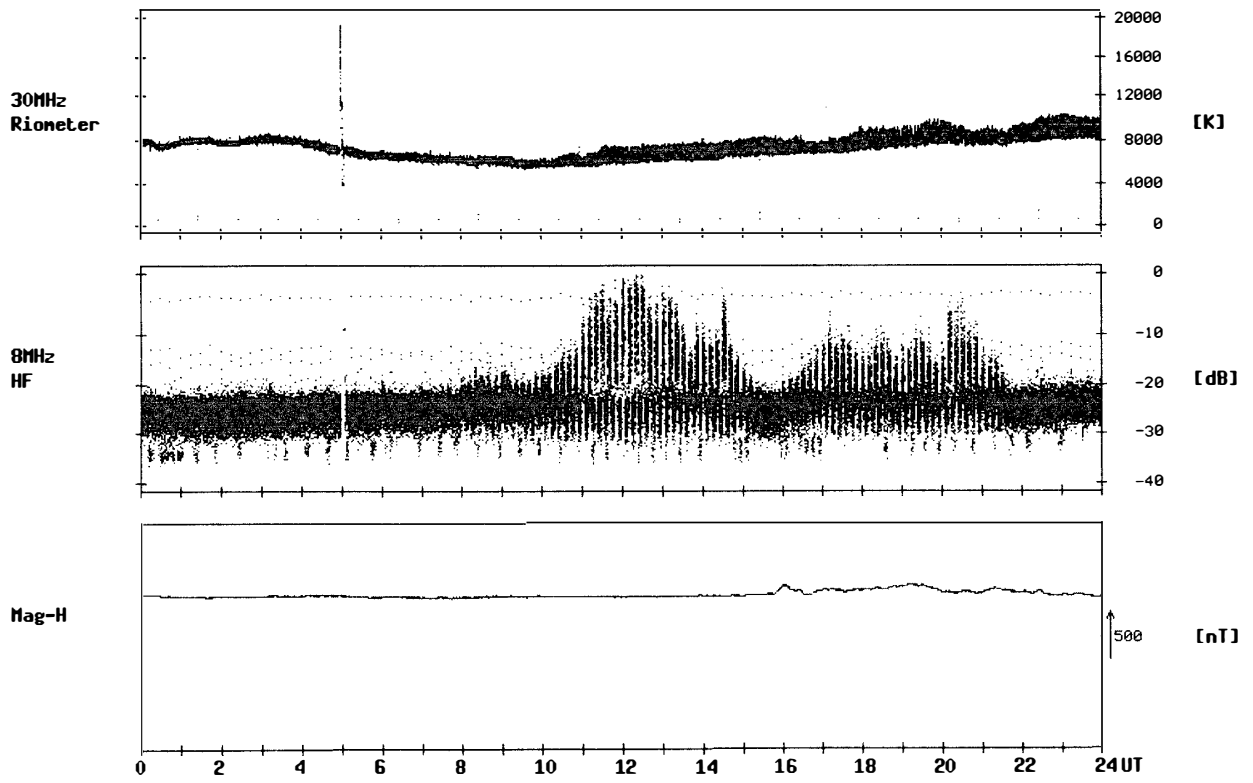
Syowa Station

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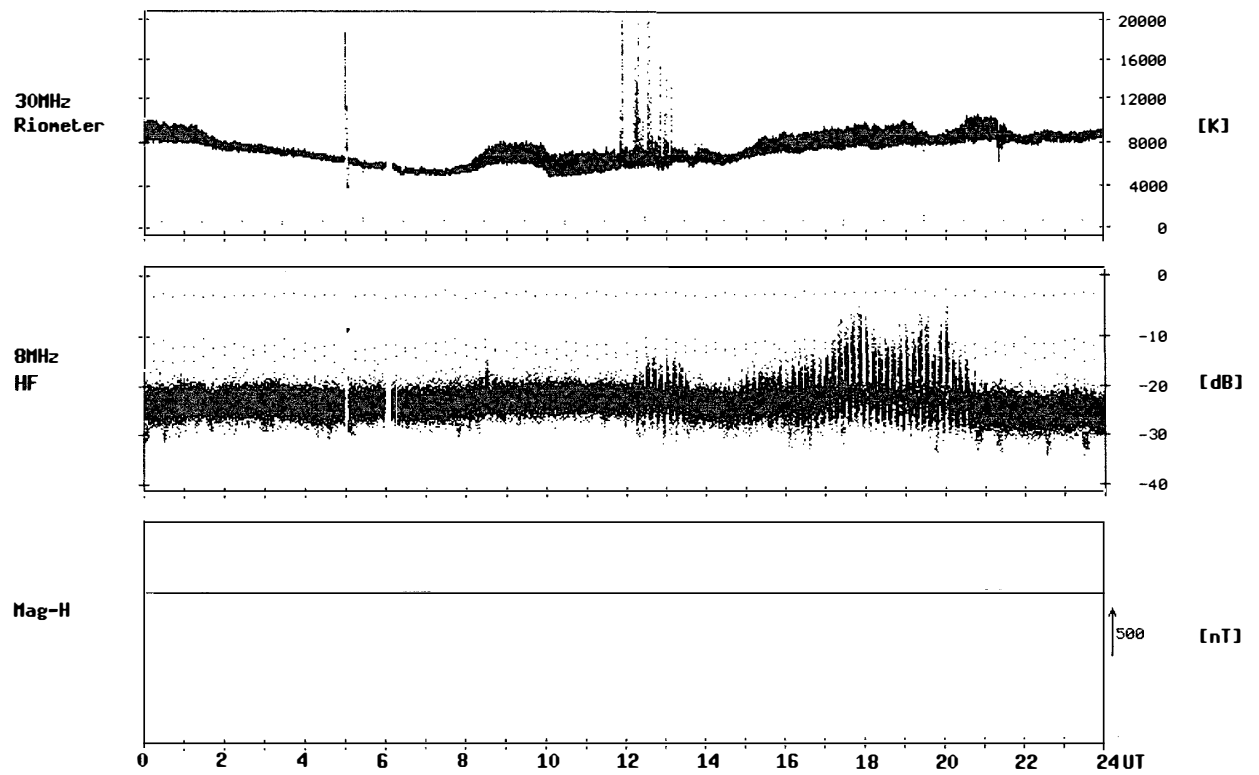
Syowa Station

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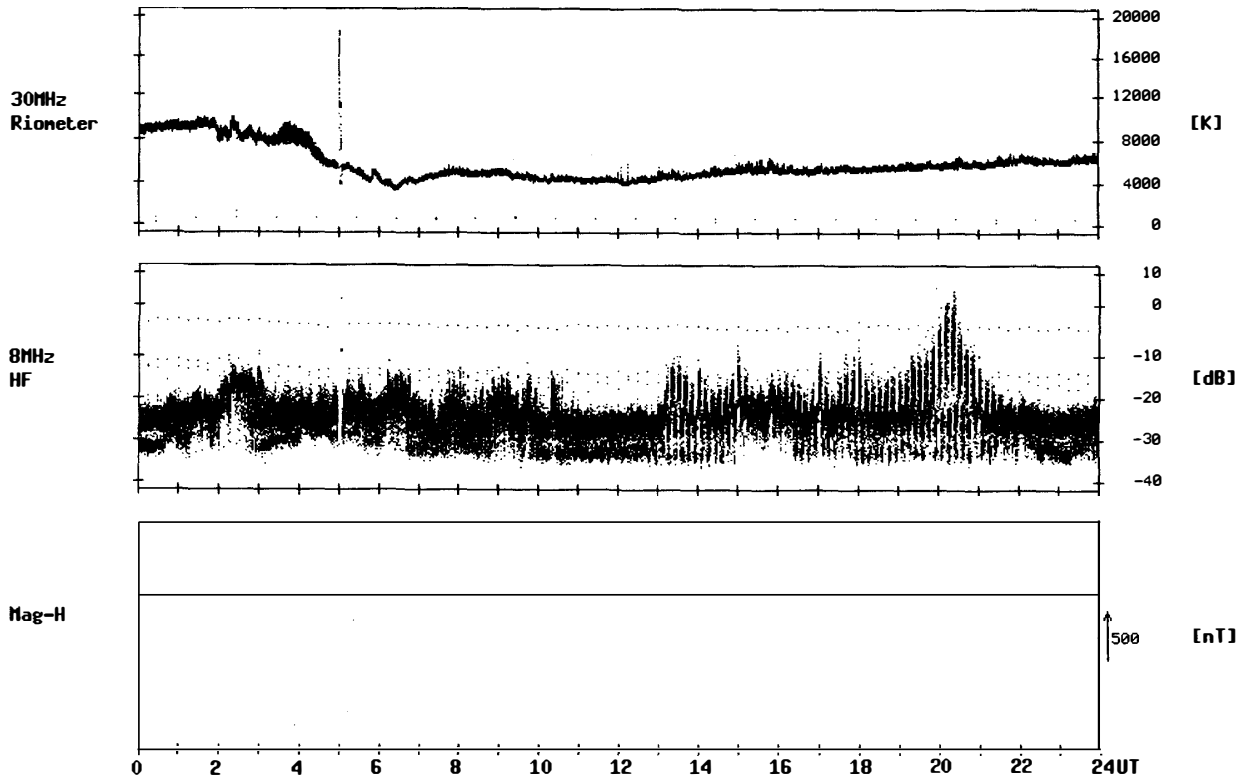
Syowa Station

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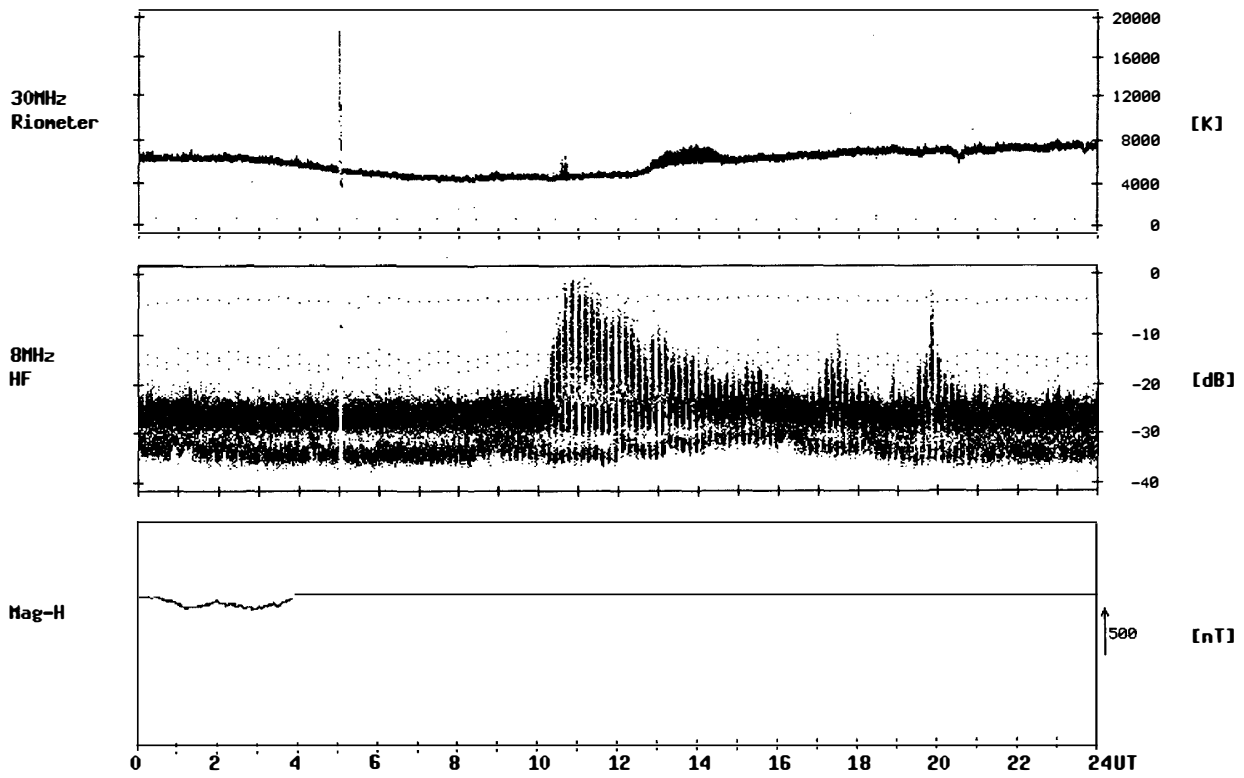
Syowa Station

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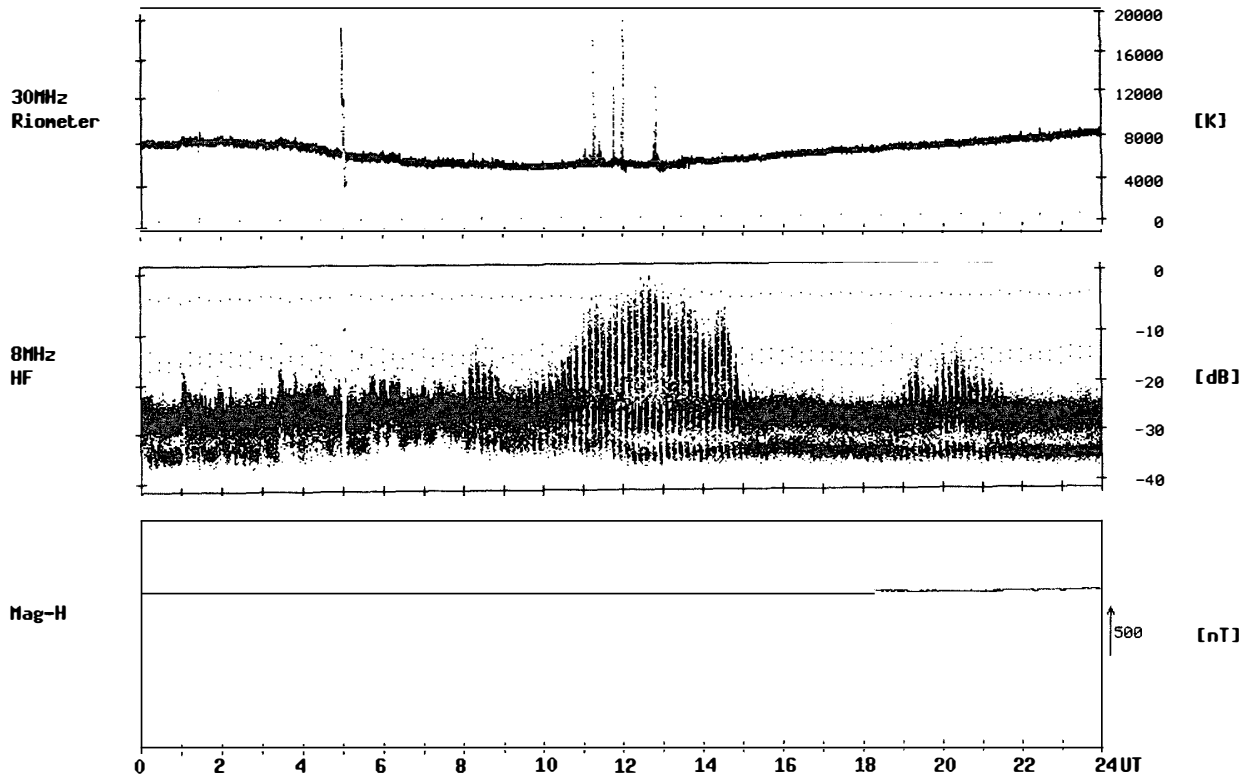
Syowa Station

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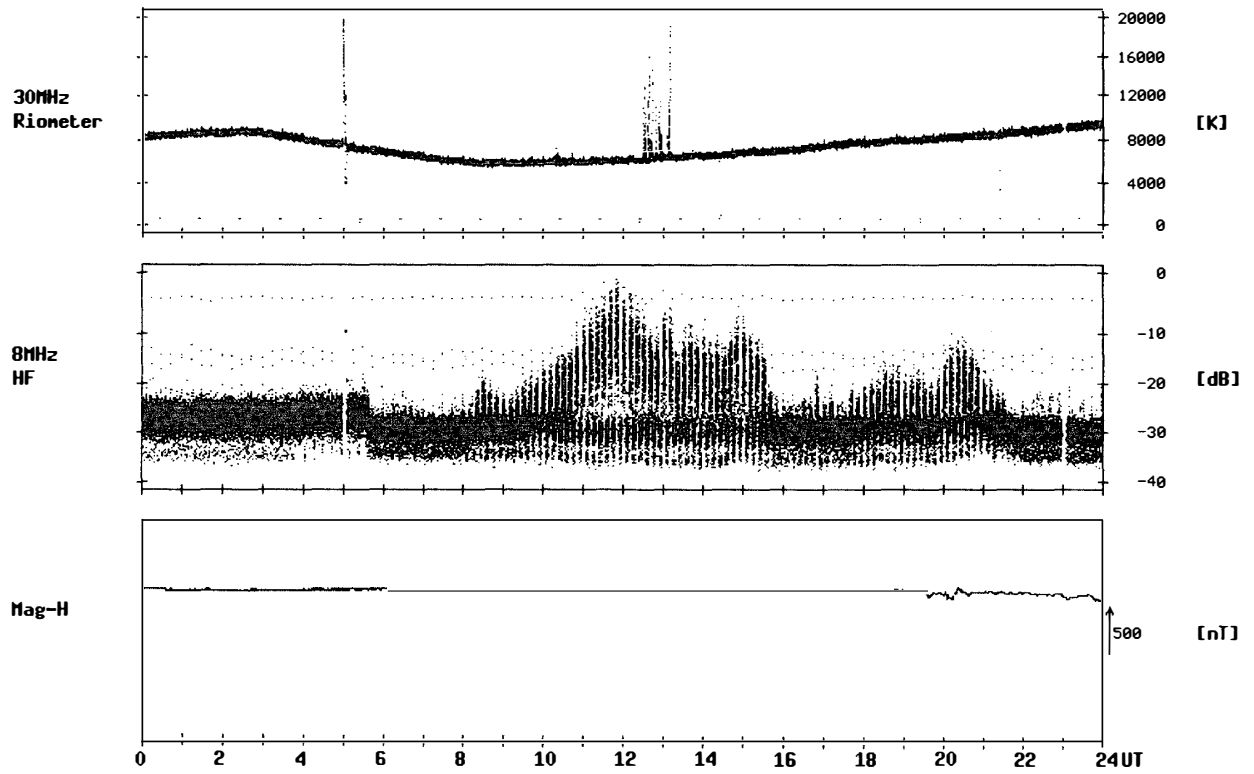
Syowa Station

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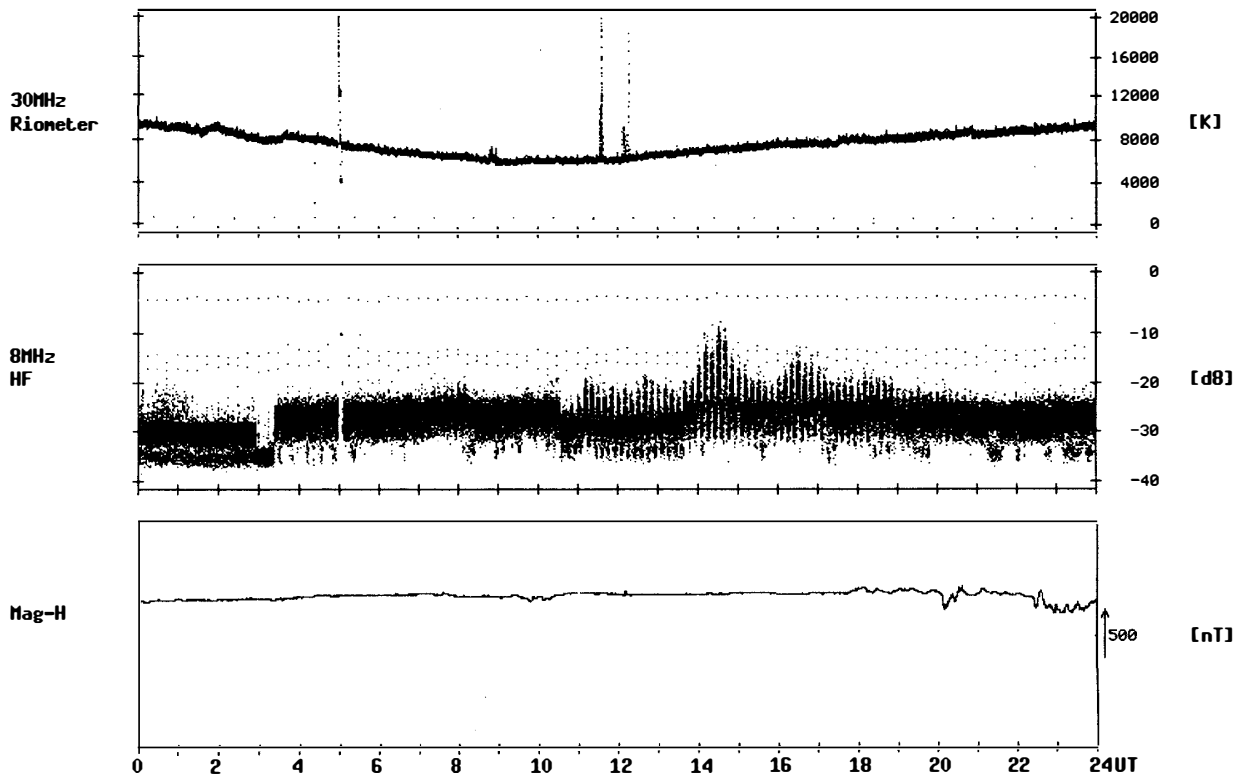
Syowa Station

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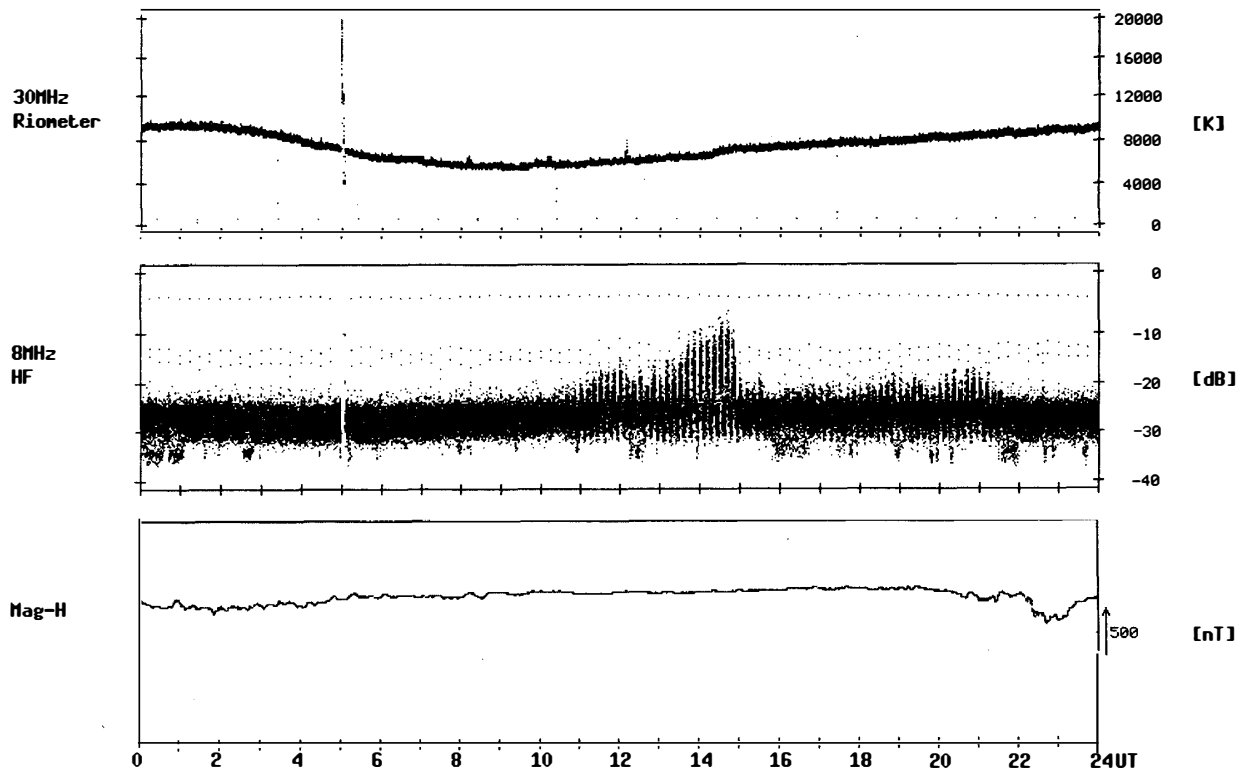
Syowa Station

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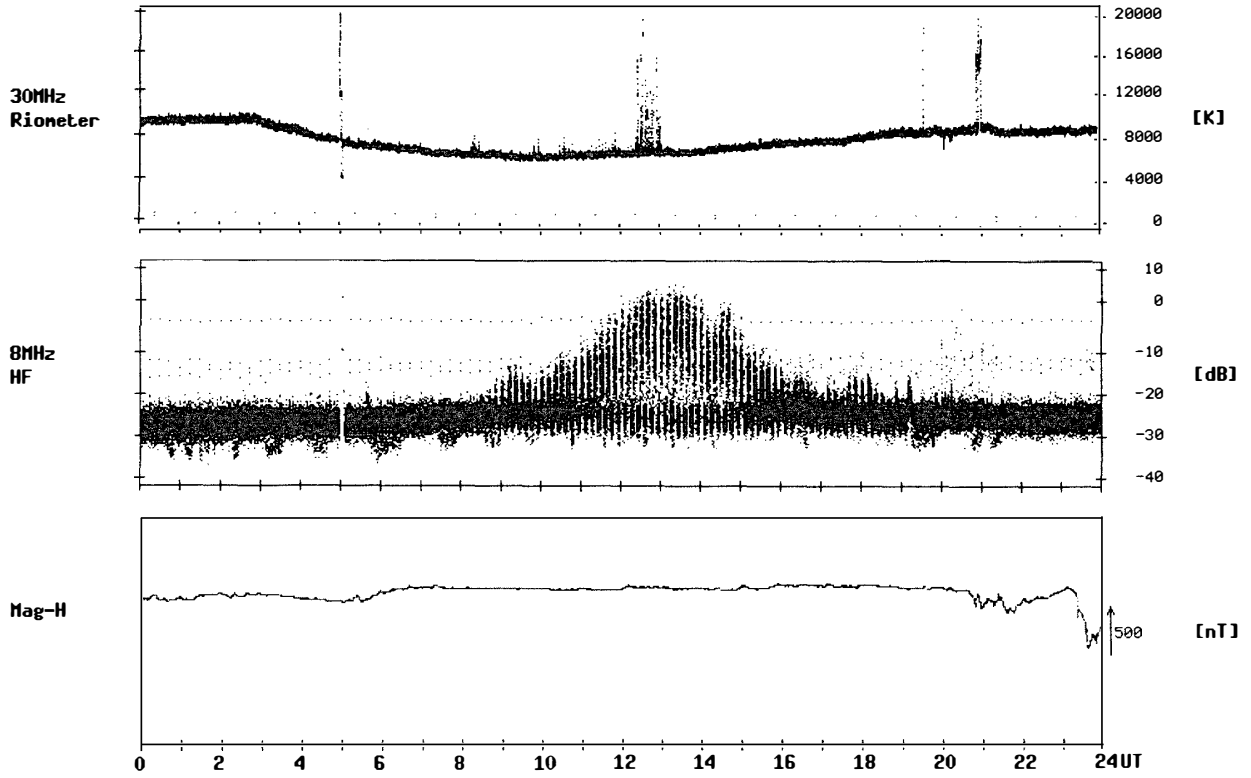
Syowa Station

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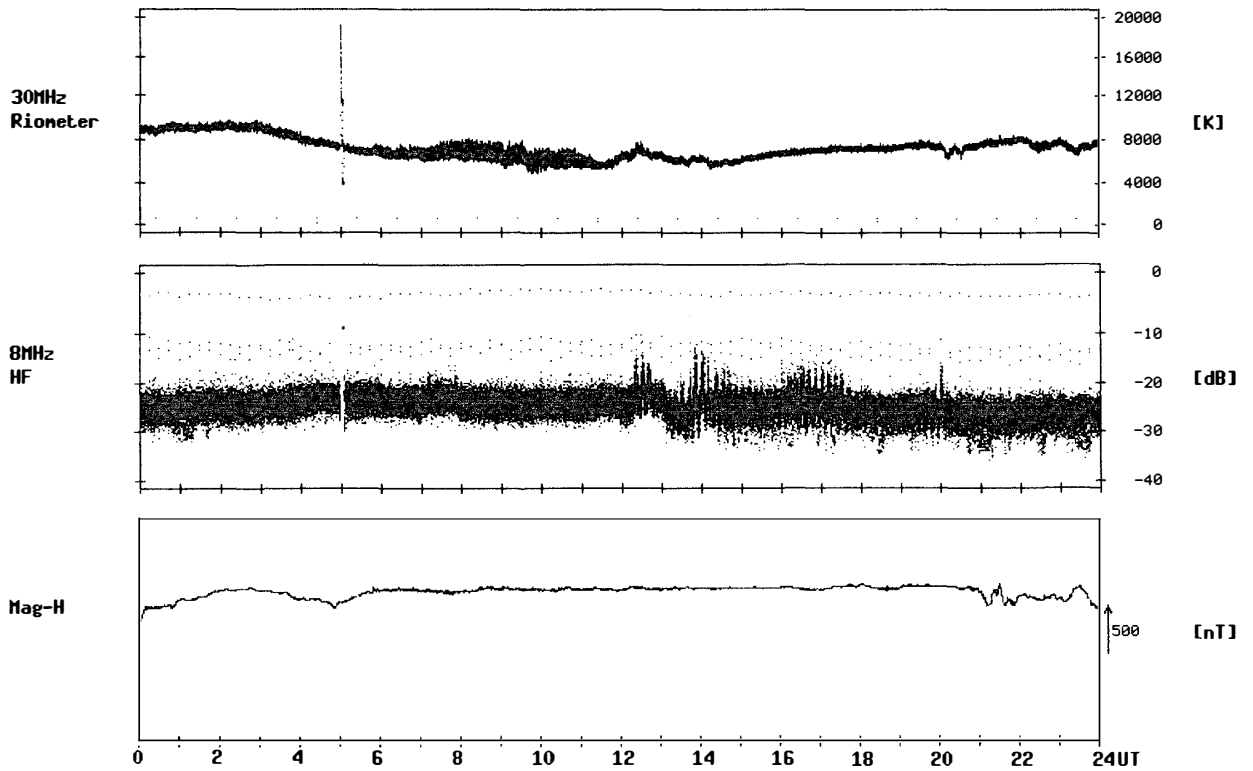
Syowa Station

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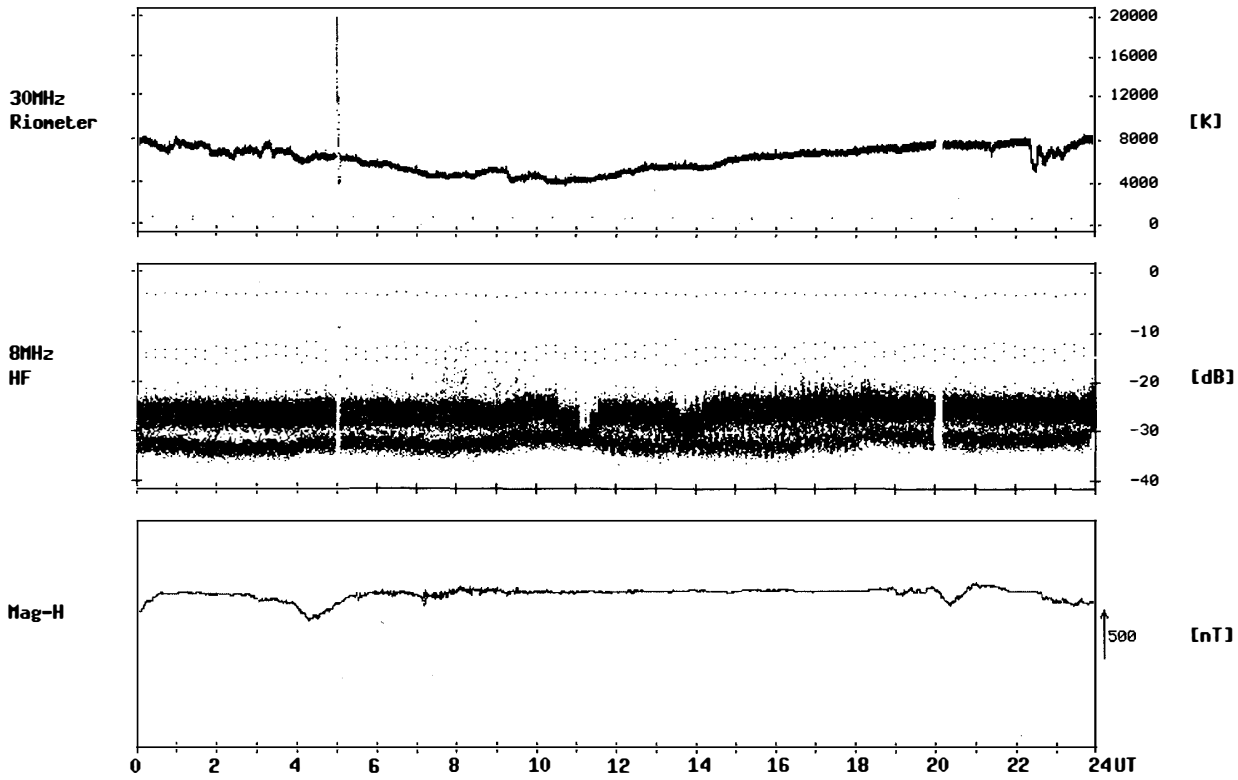
Syowa Station

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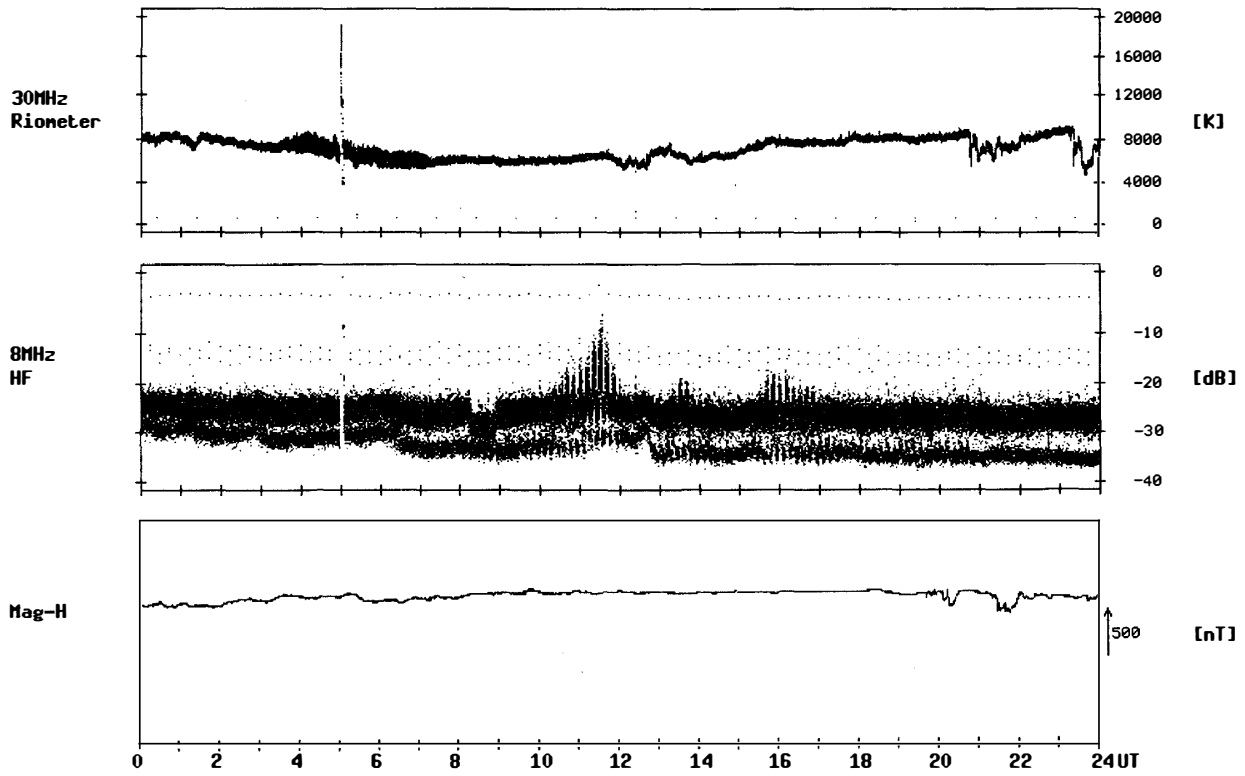
Syowa Station

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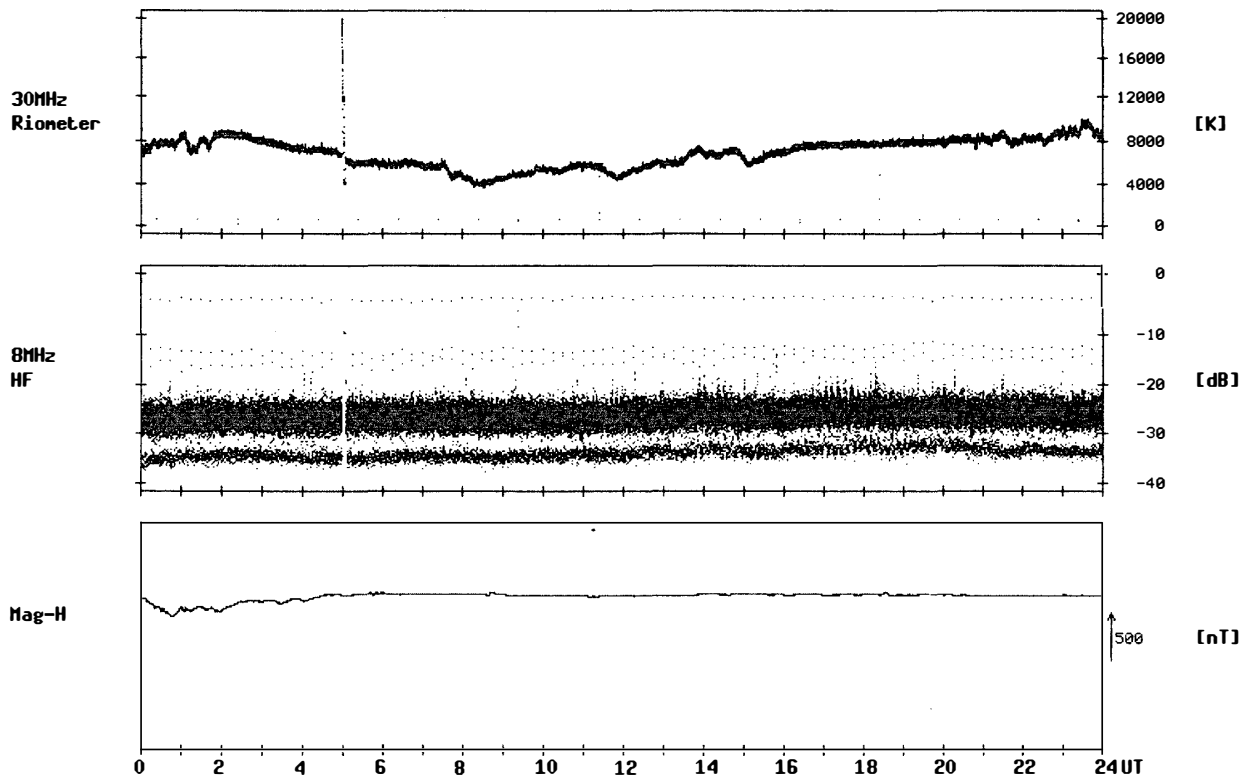
Syowa Station

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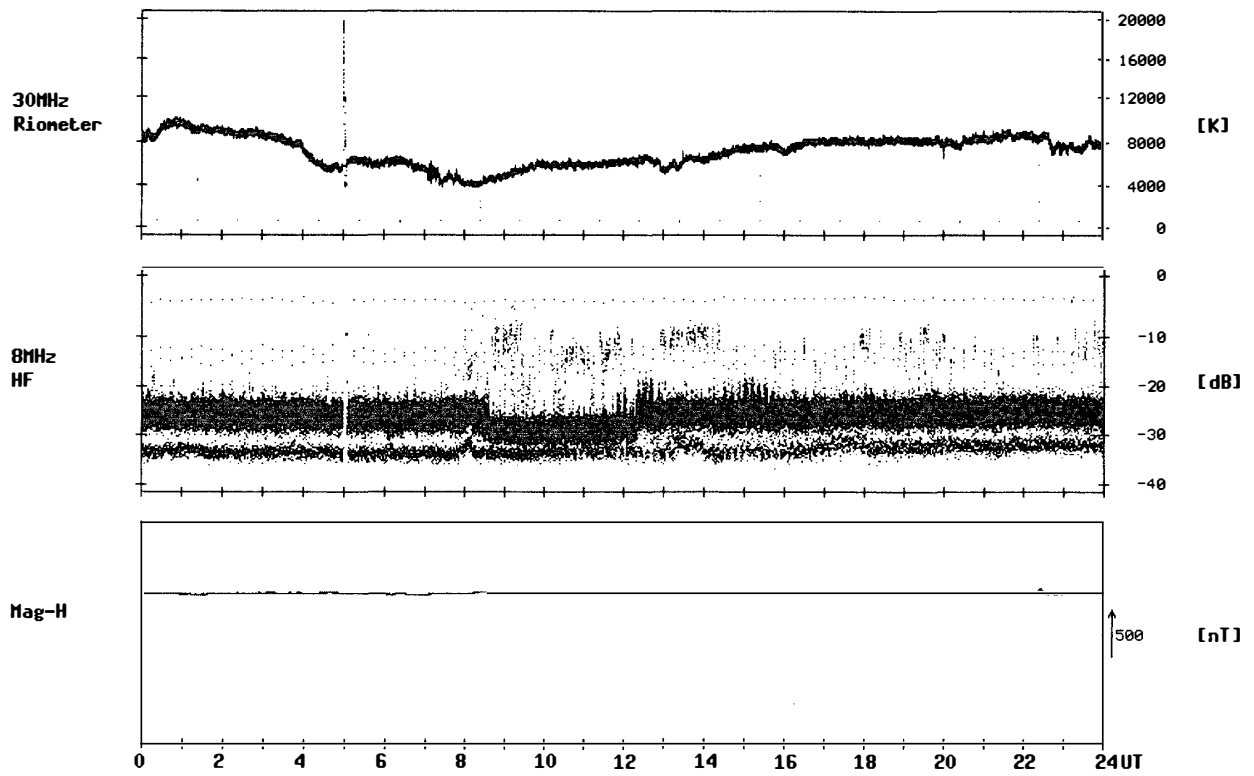
Syowa Station

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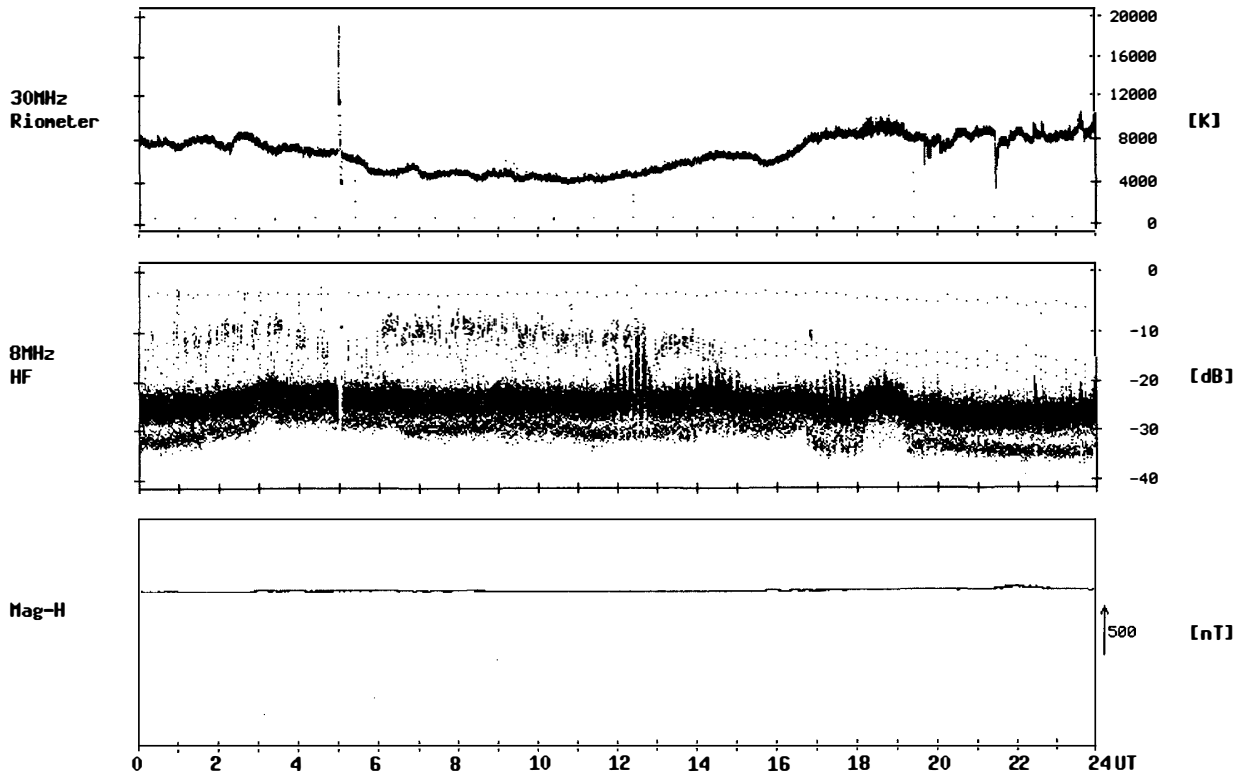
Syowa Station

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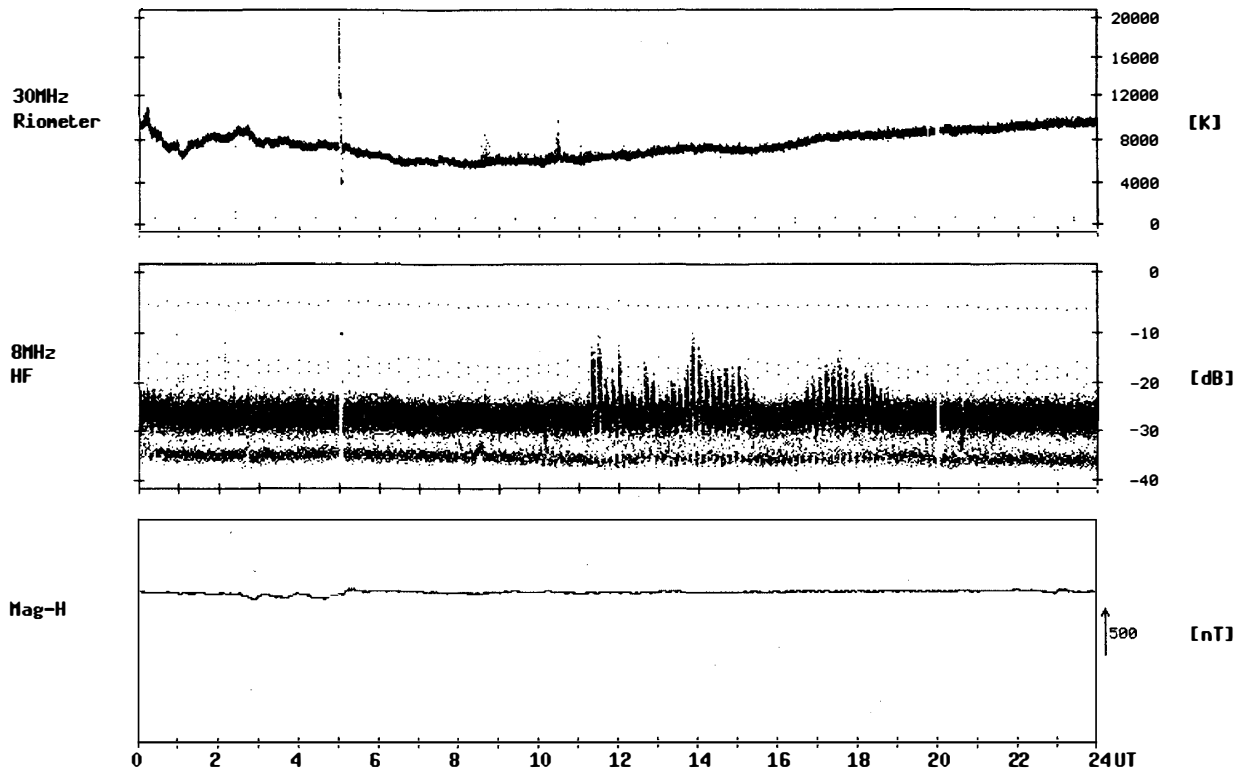
Syowa Station

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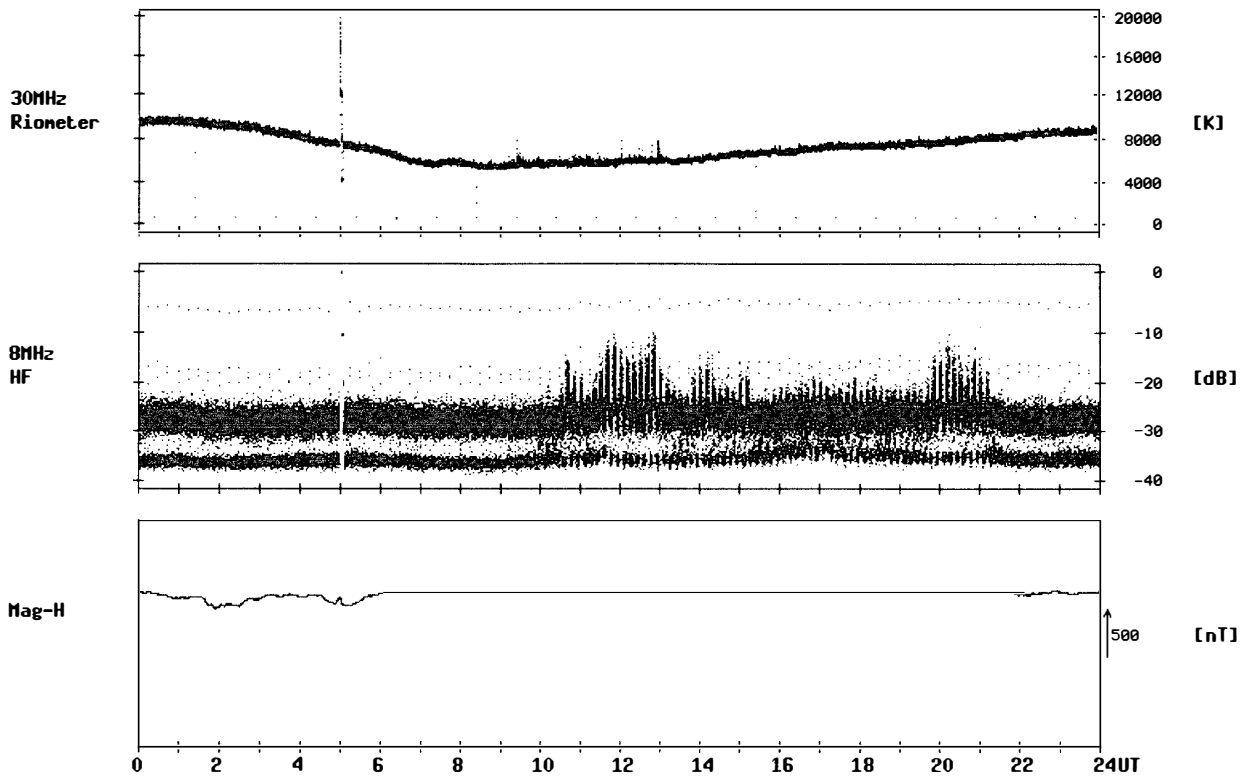
Syowa Station

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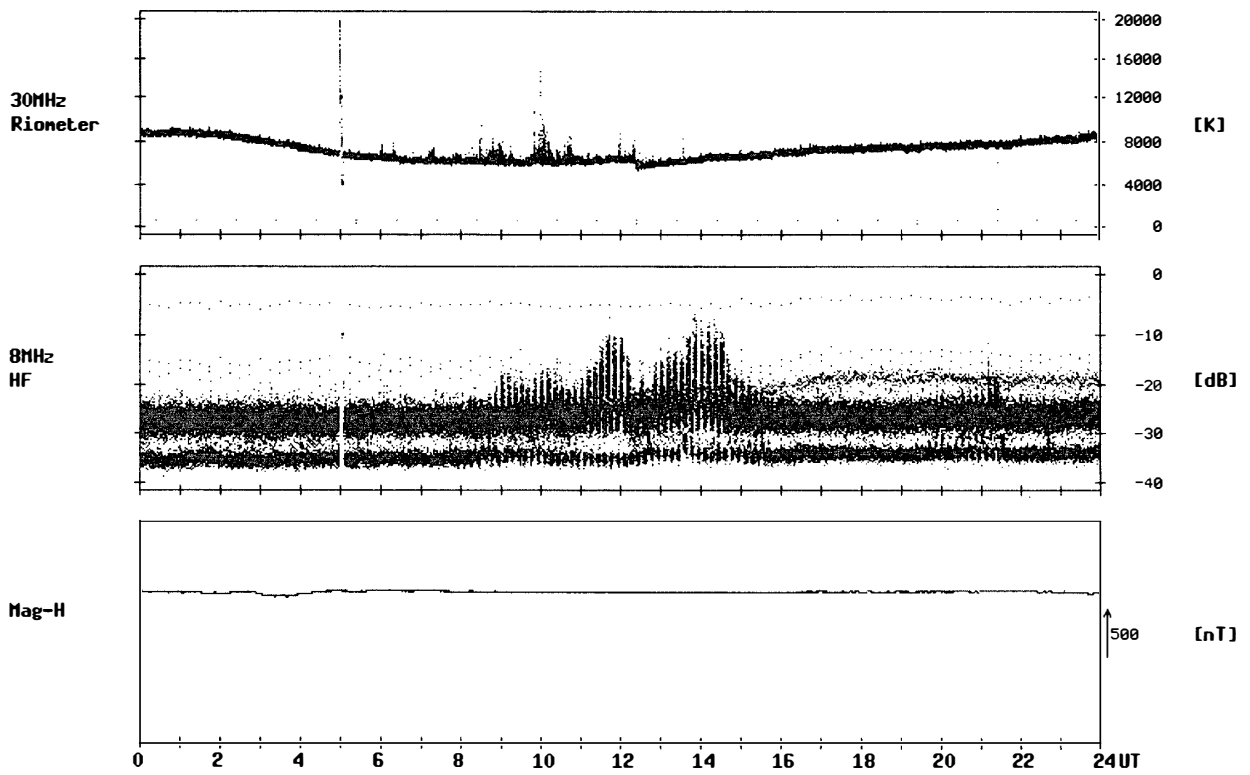
Syowa Station

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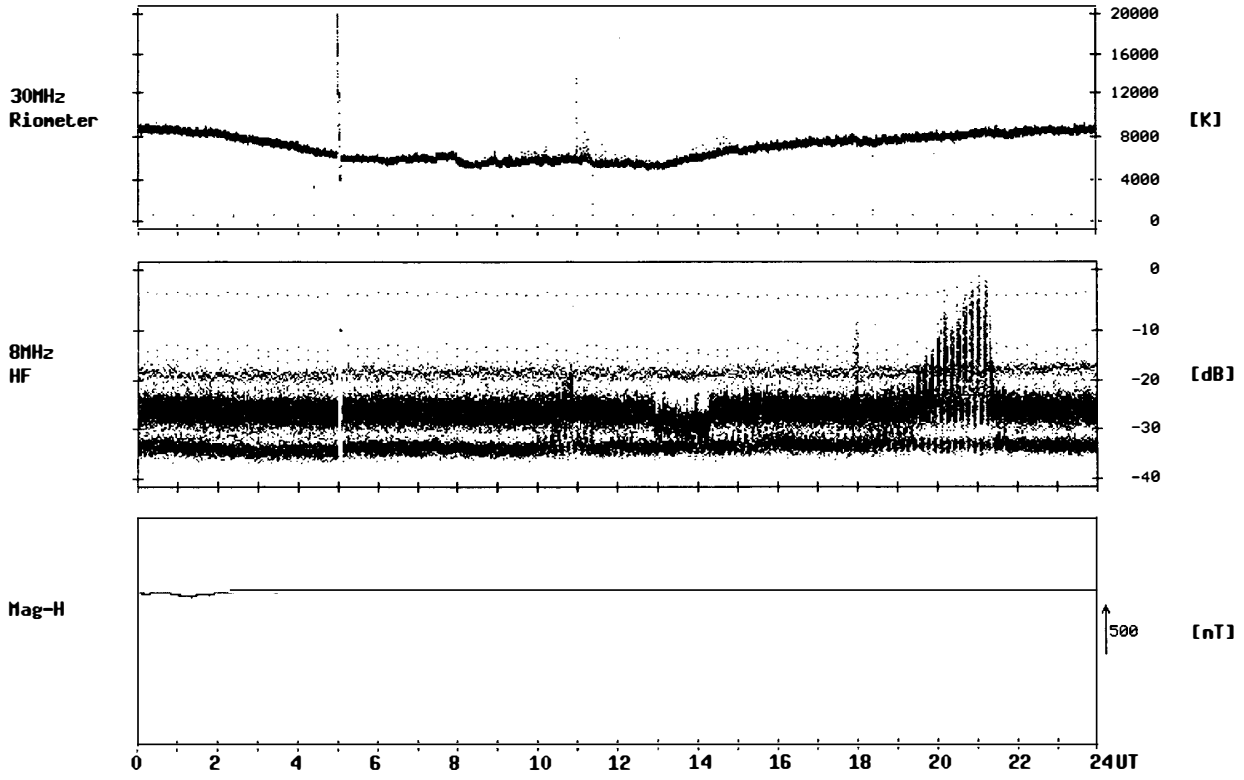
Syowa Station

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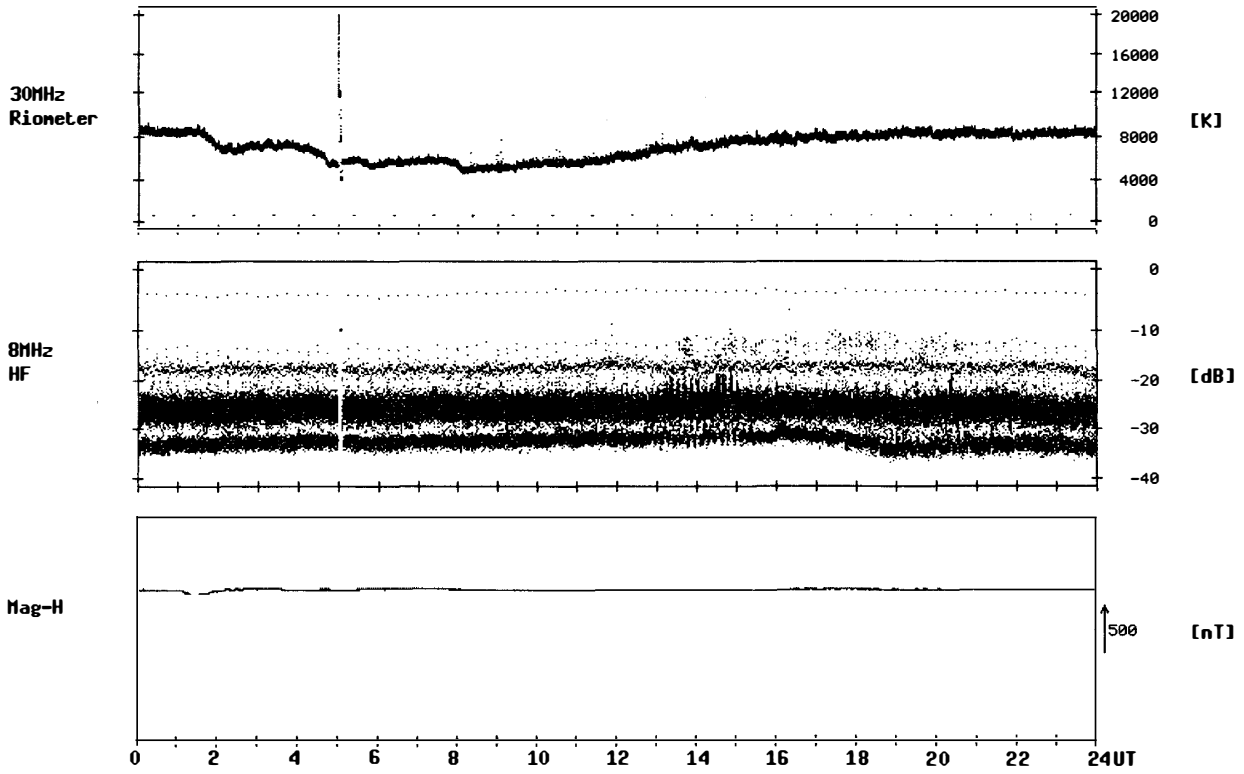
Syowa Station

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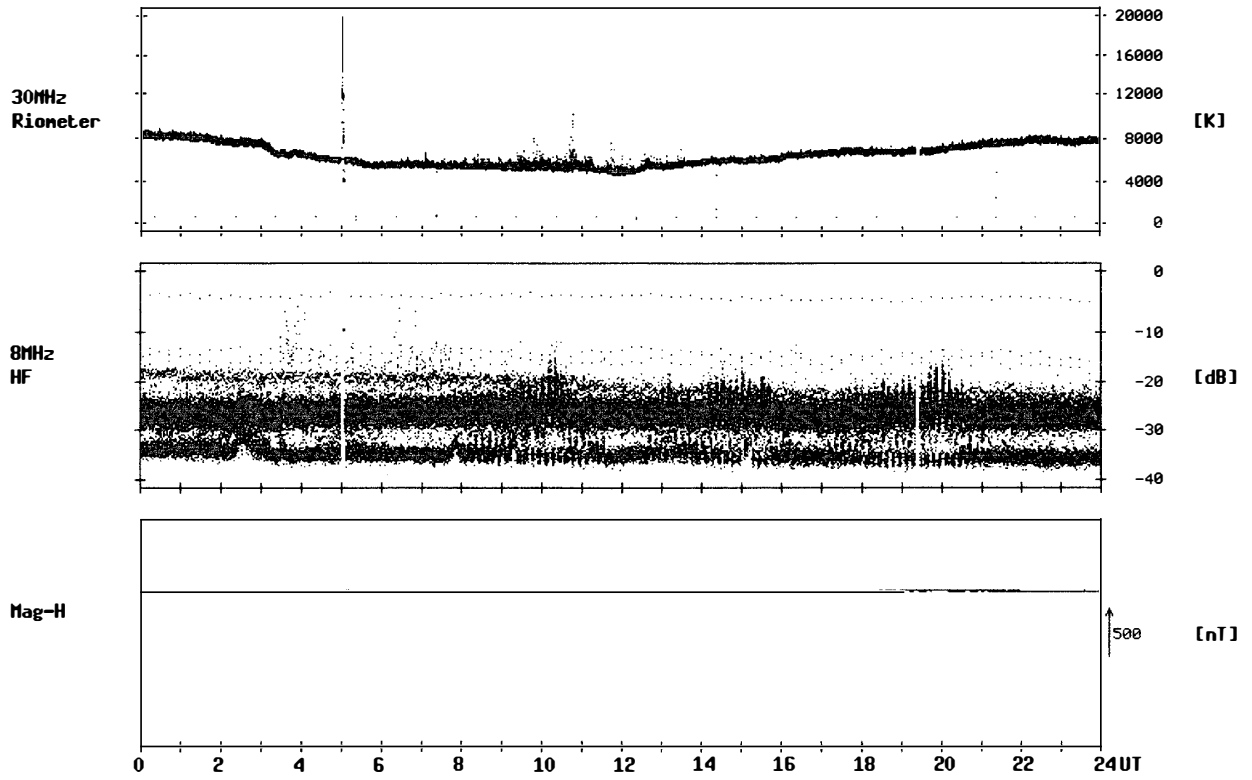
Syowa Station

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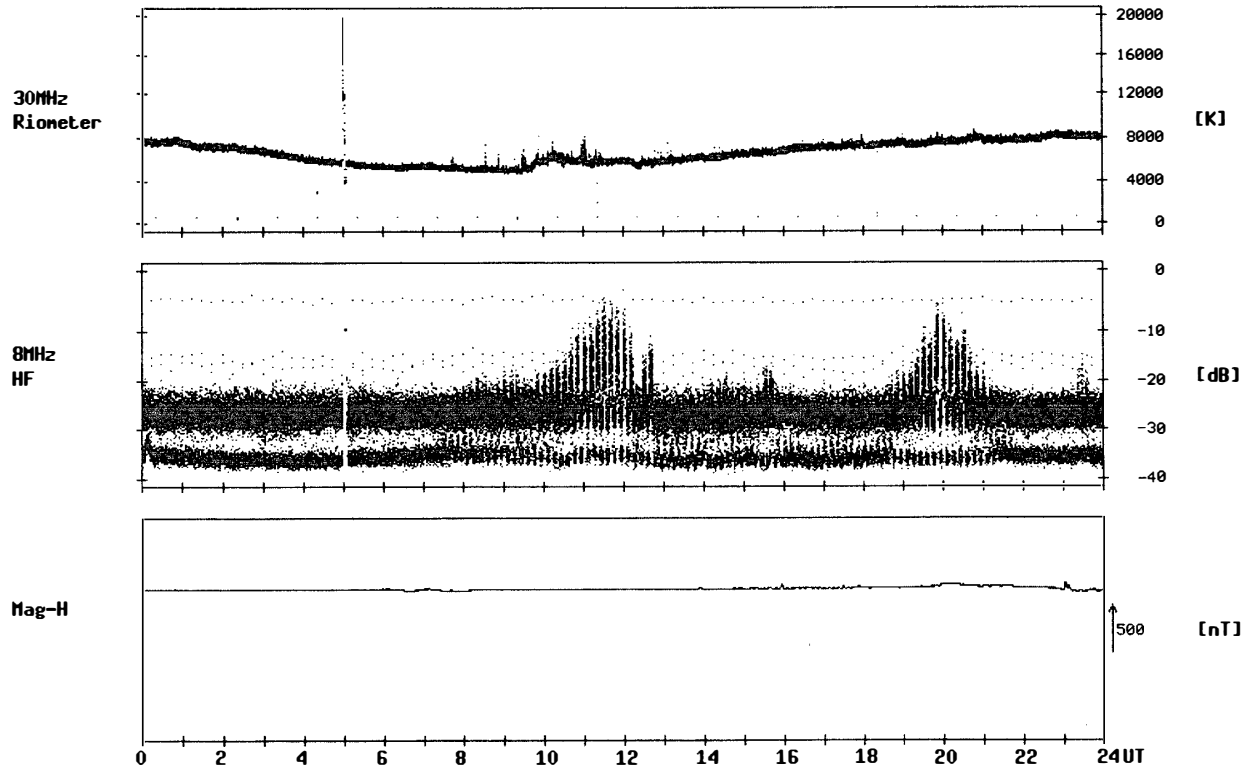
Syowa Station

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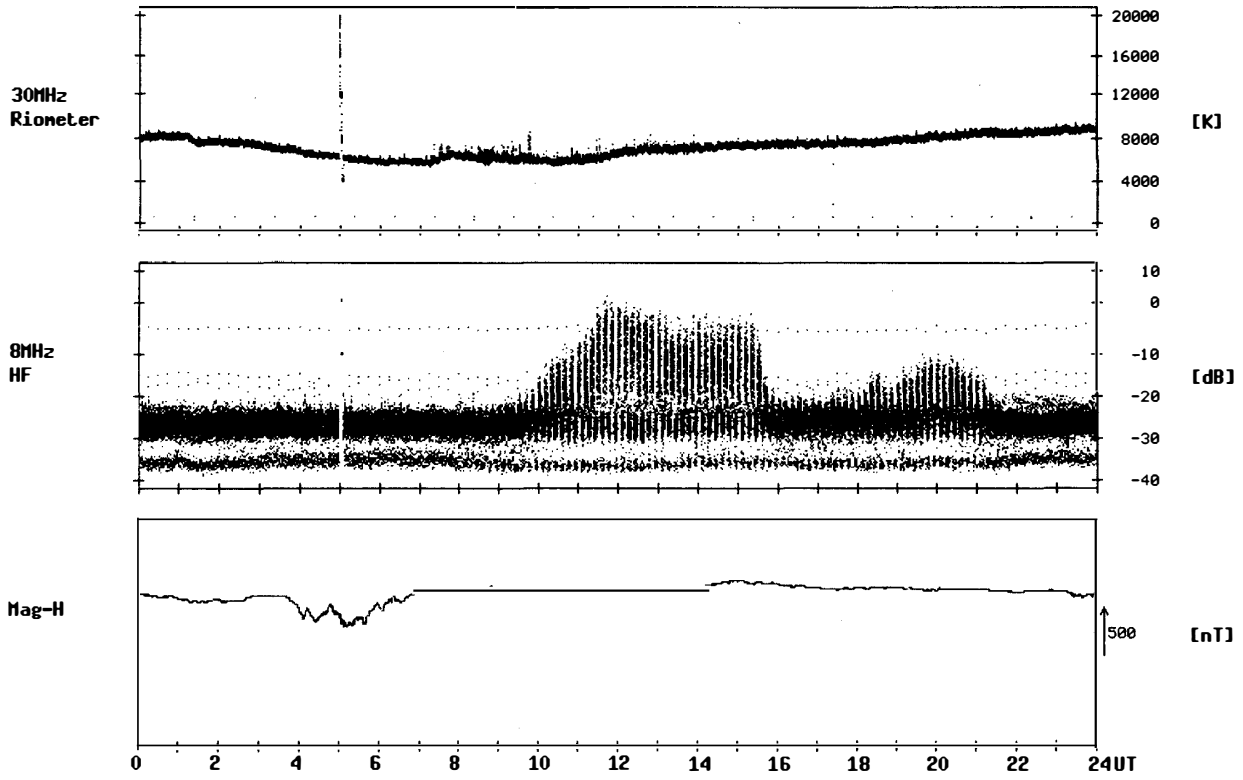
Syowa Station

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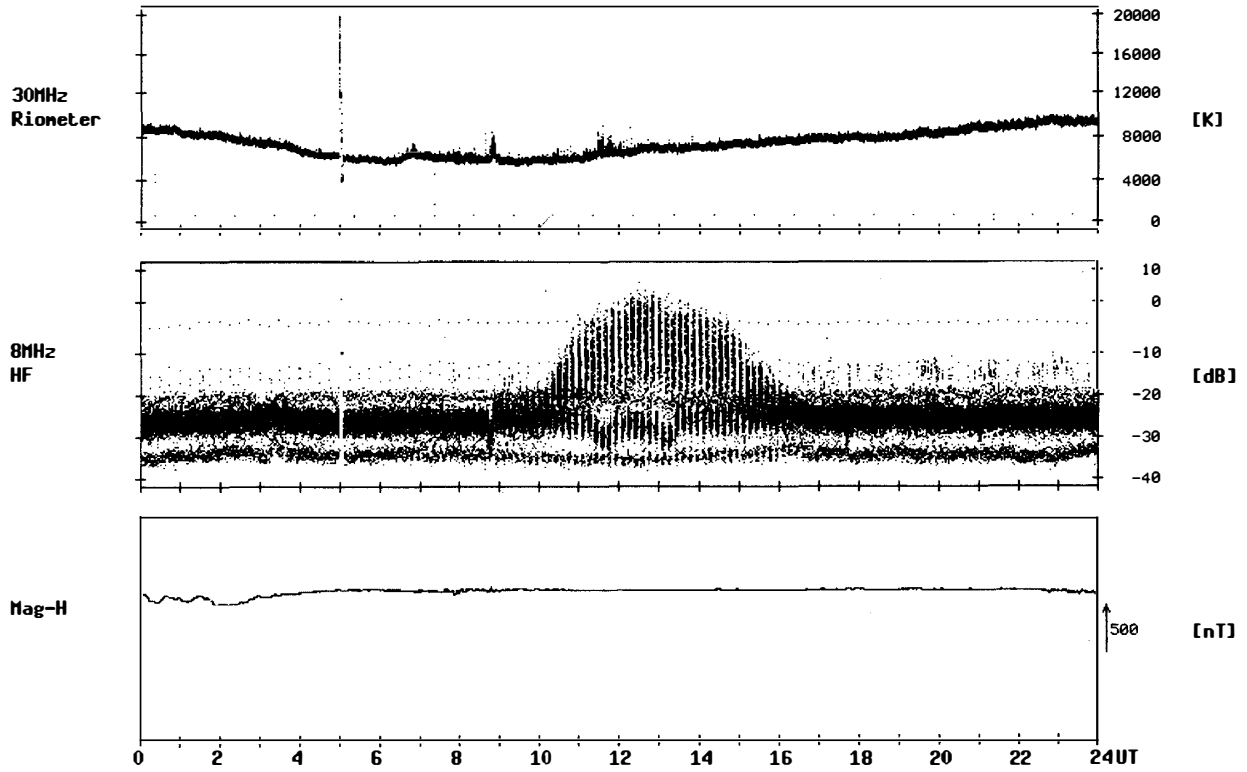
Syowa Station

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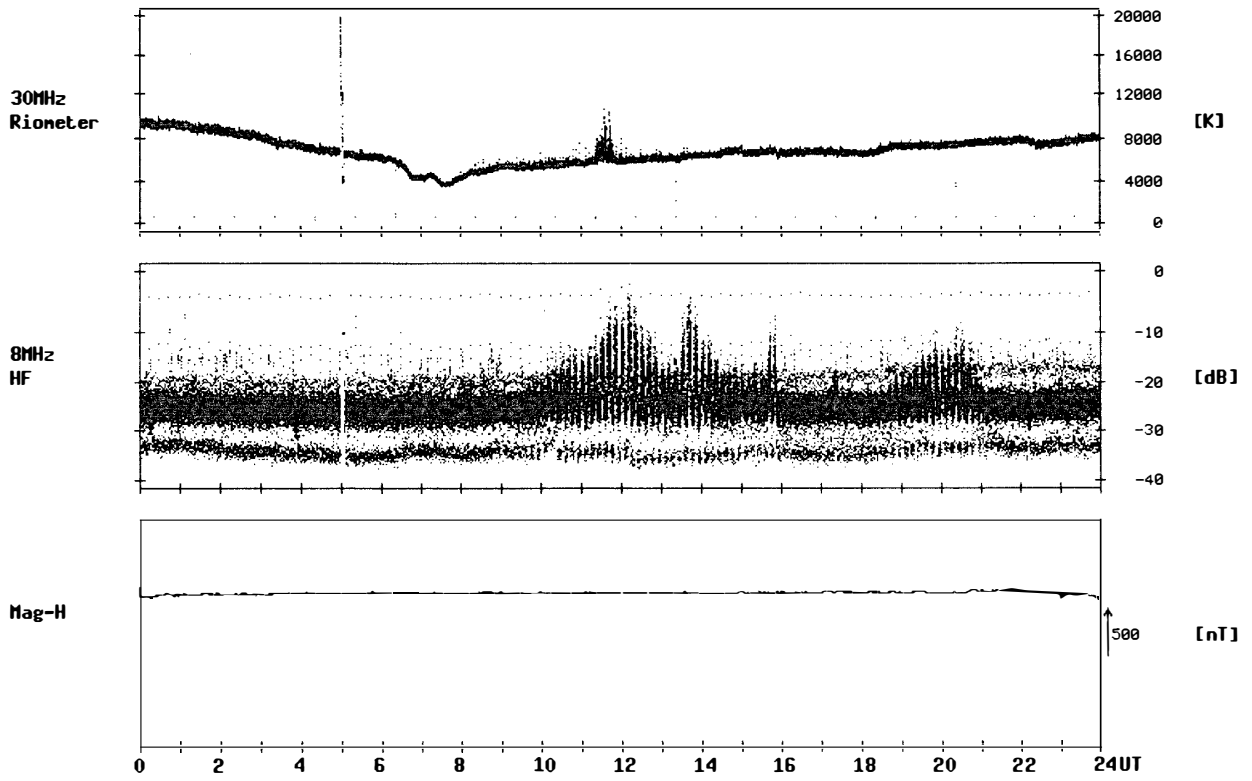
Syowa Station

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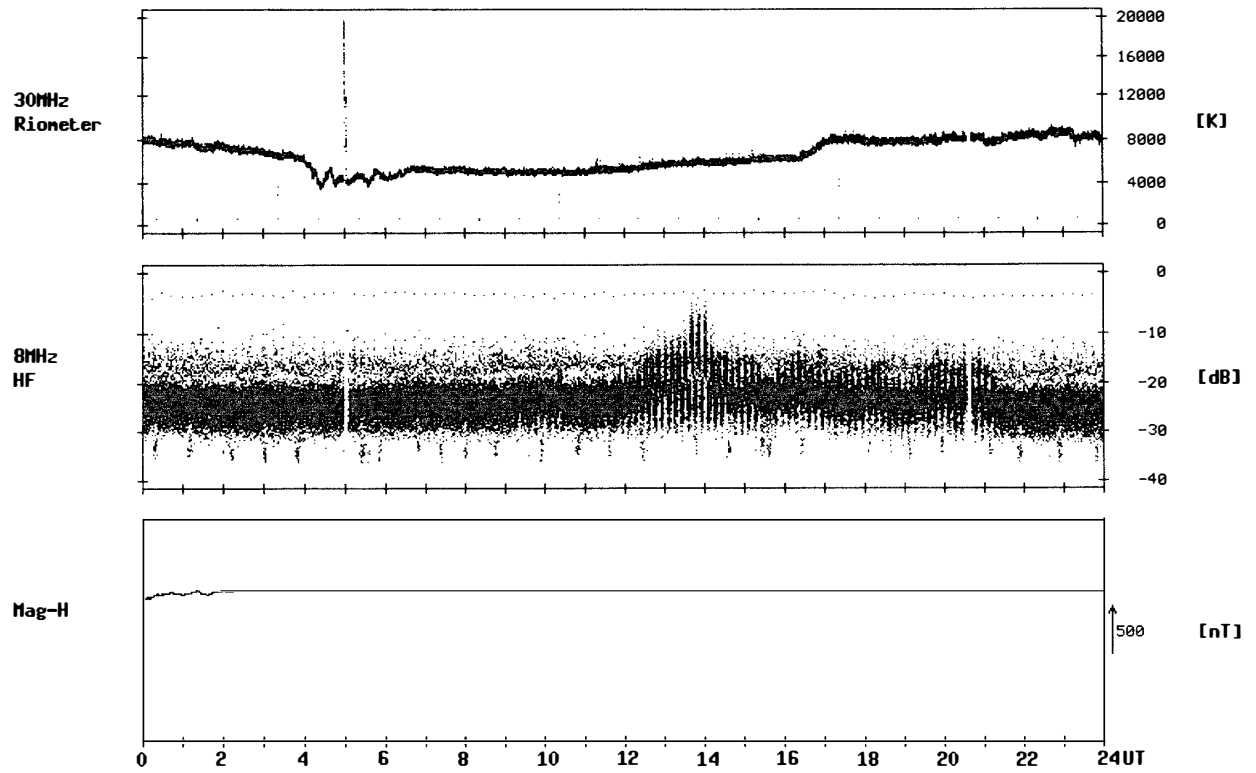
Syowa Station

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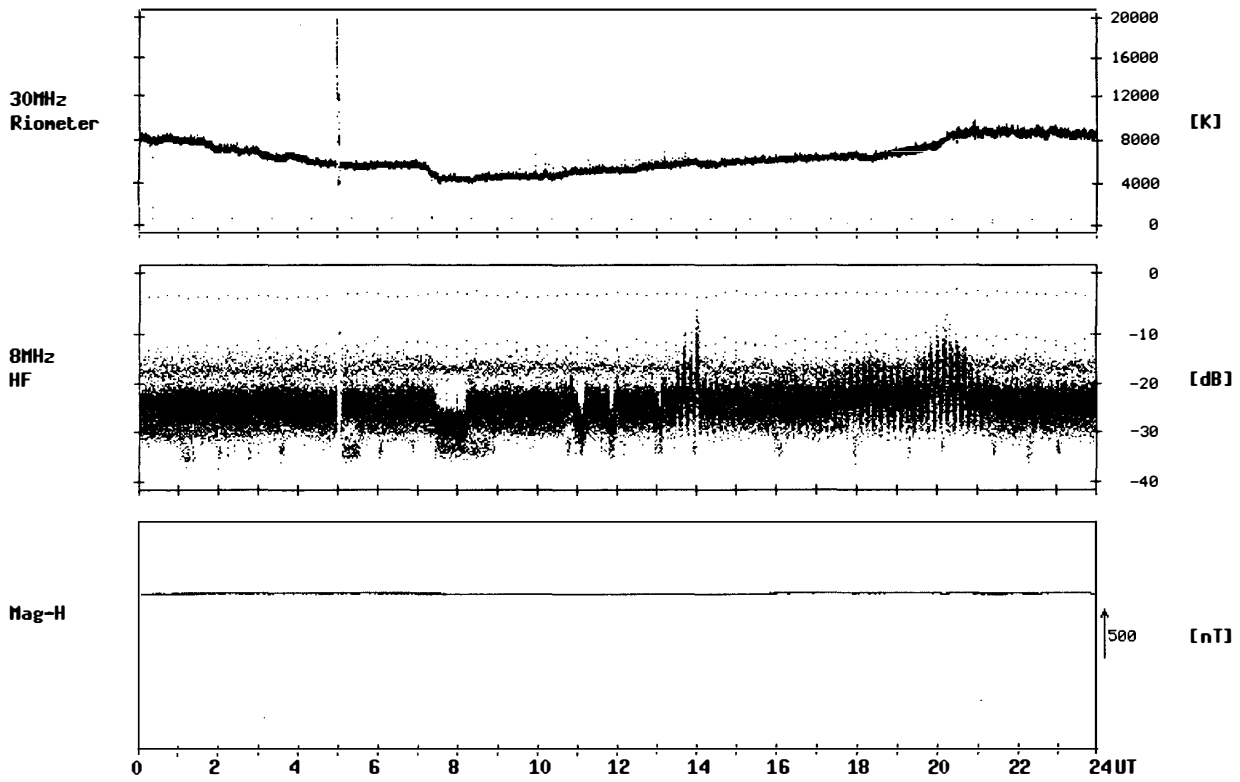
Syowa Station

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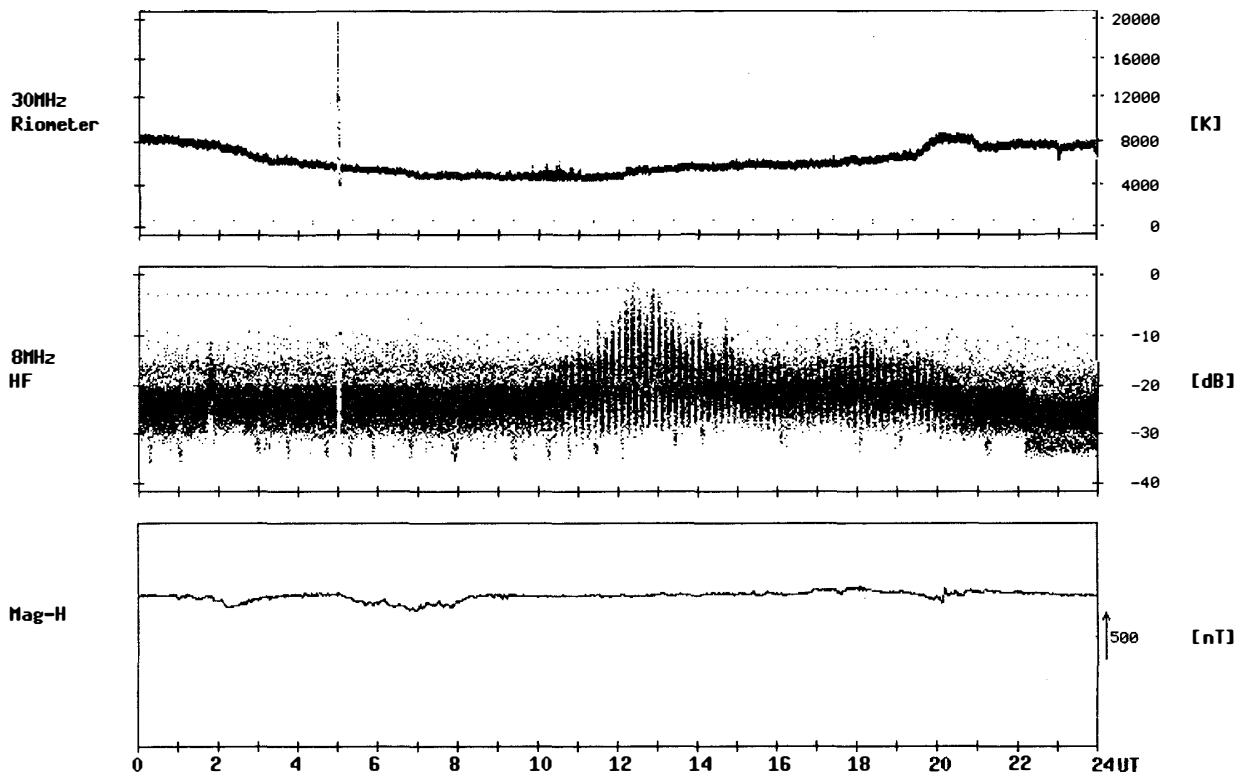
Syowa Station

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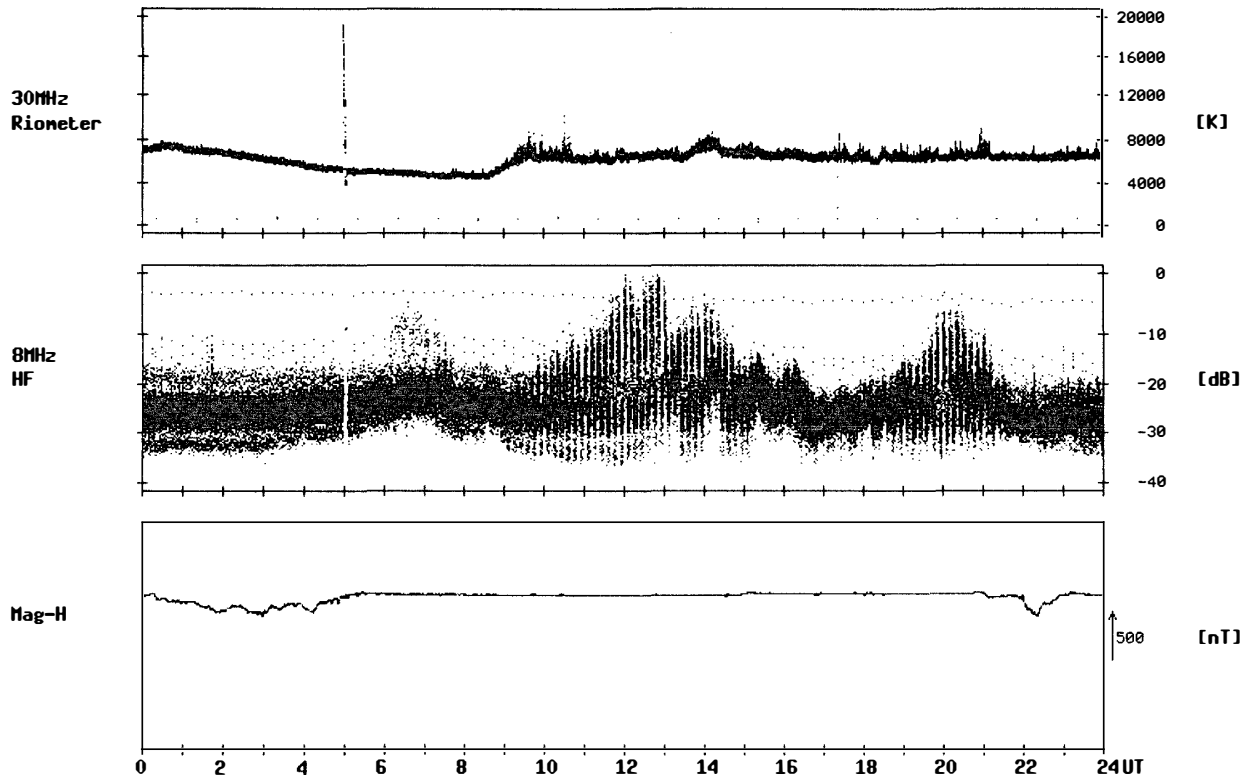
Syowa Station

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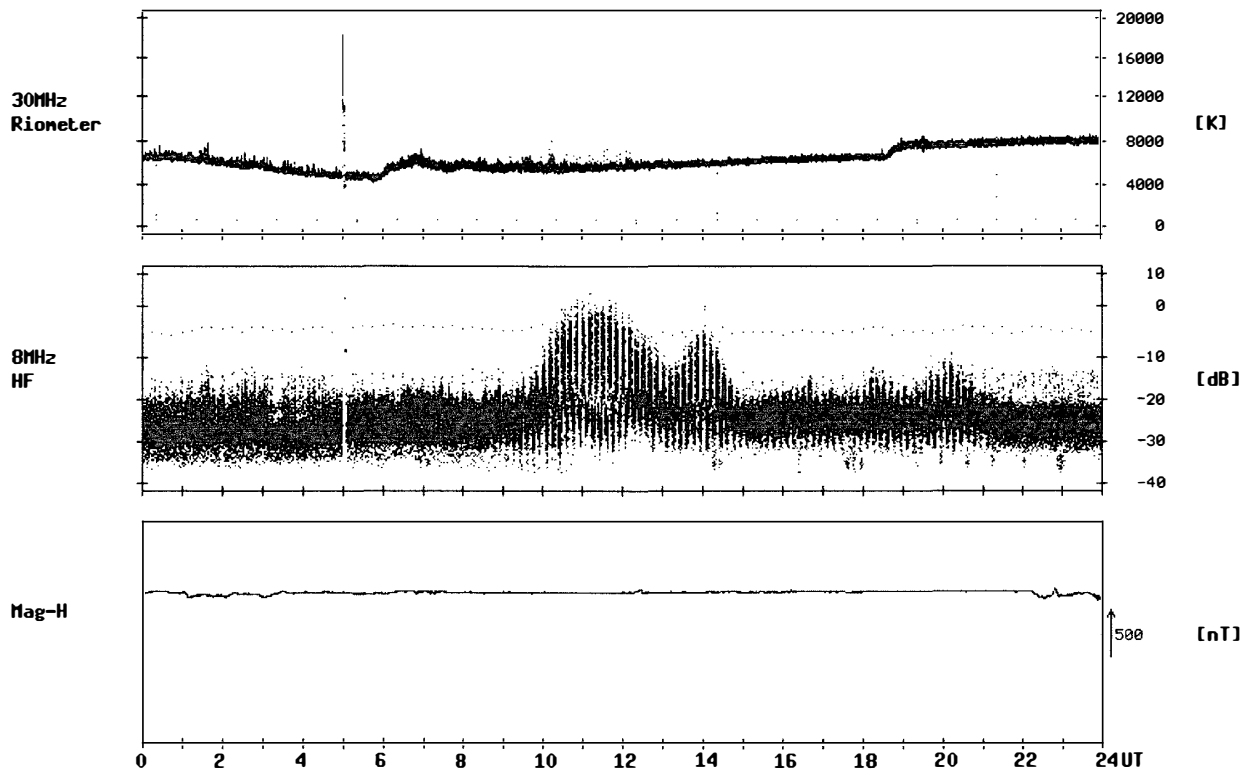
Syowa Station

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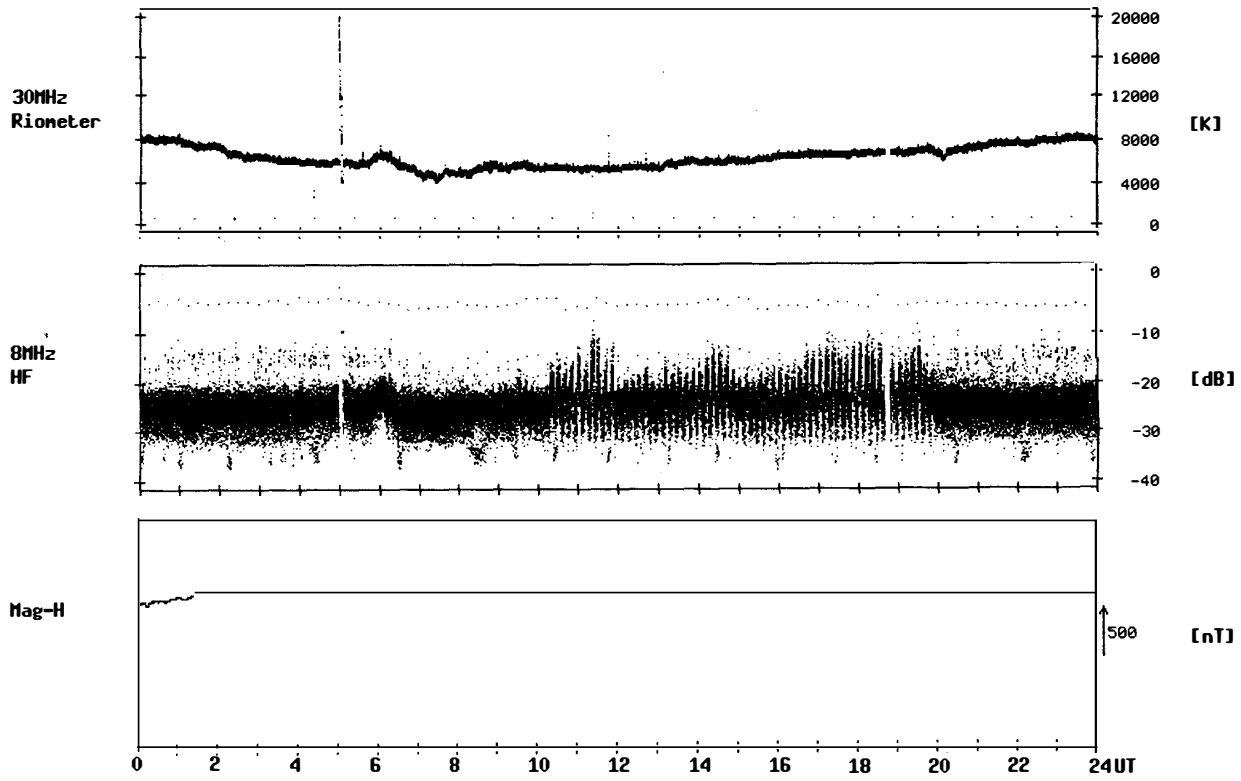
Syowa Station

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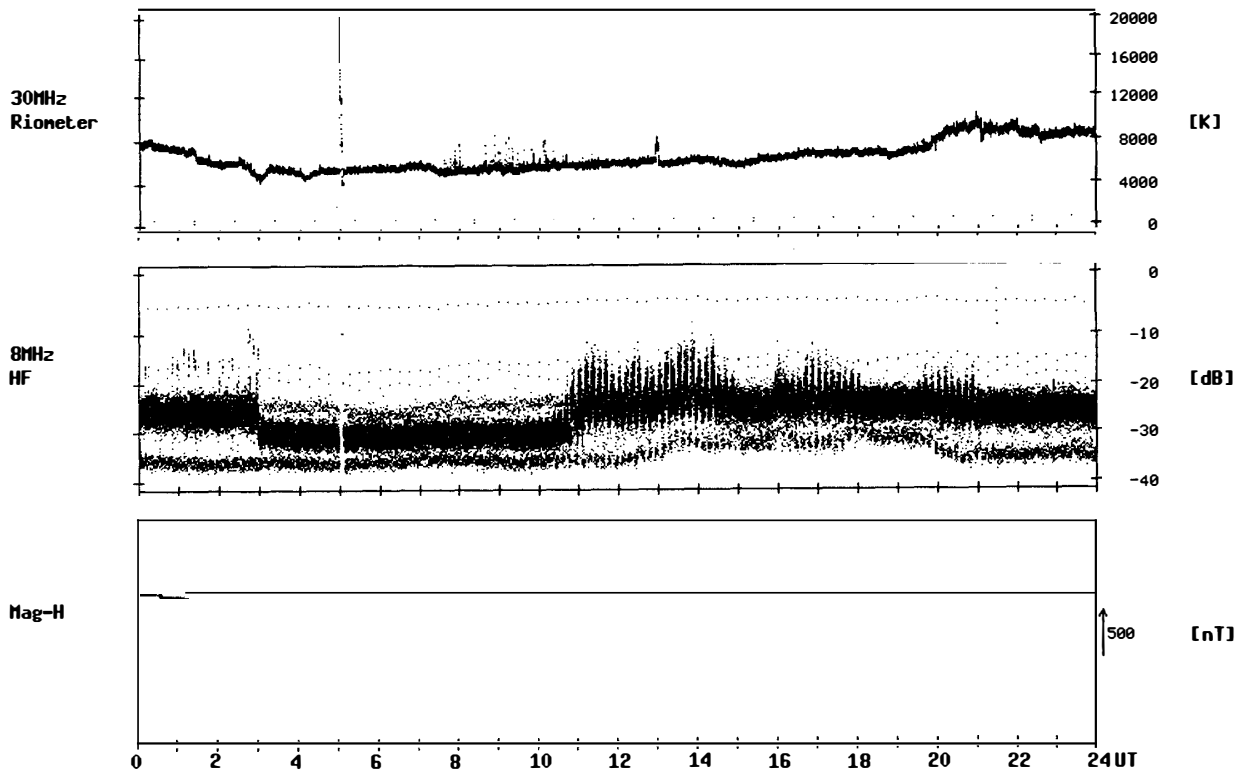
Syowa Station

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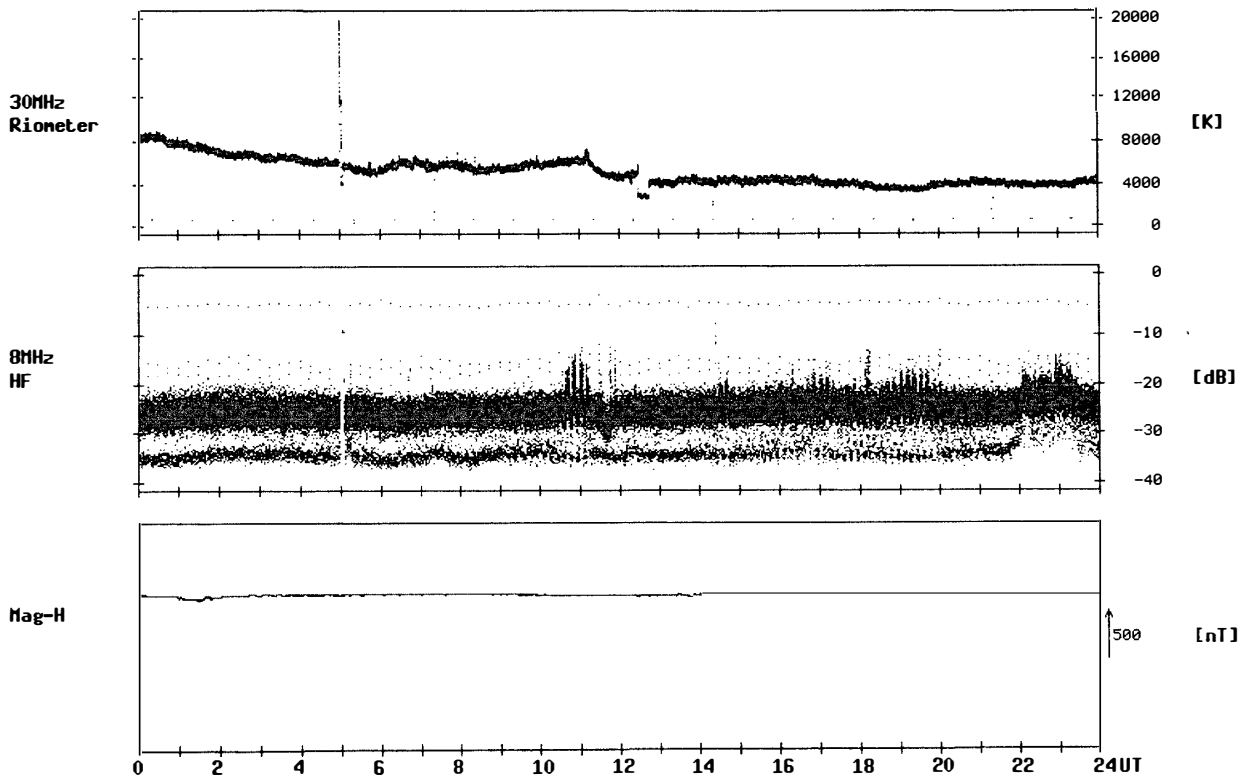
Syowa Station

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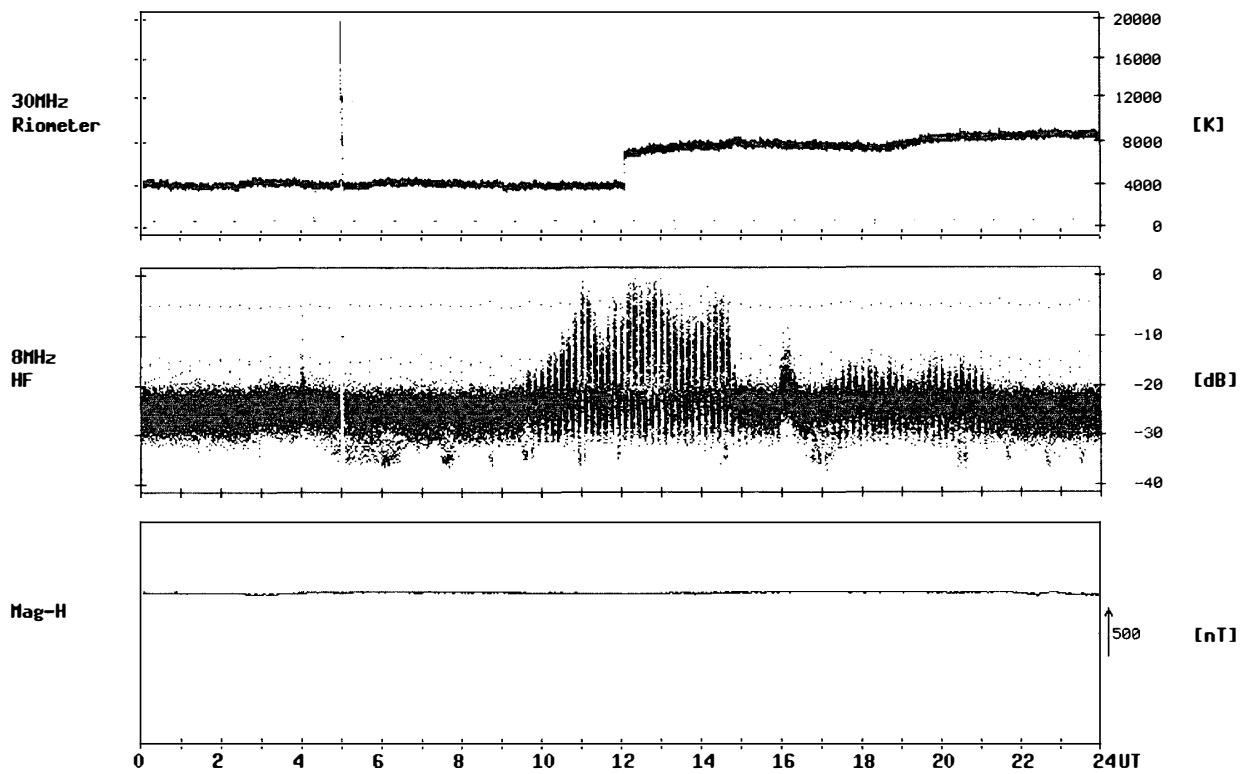
Syowa Station

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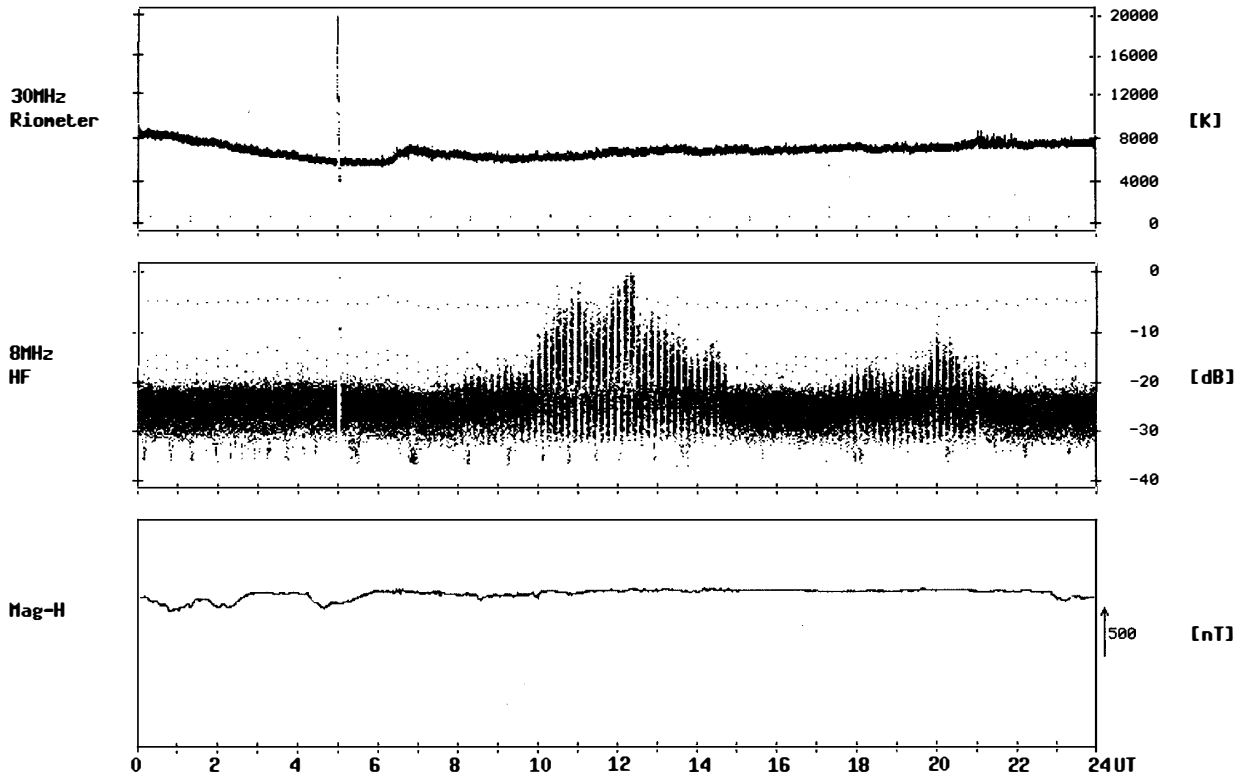
Syowa Station

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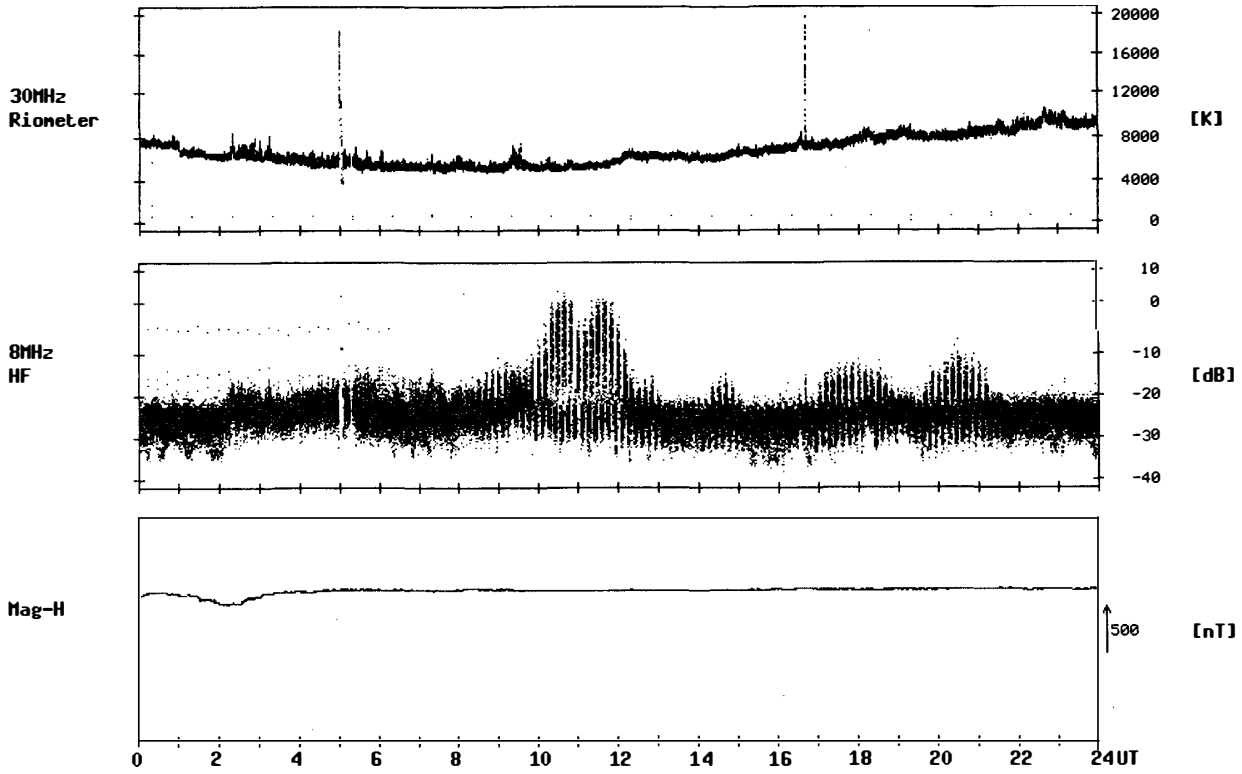
Syowa Station

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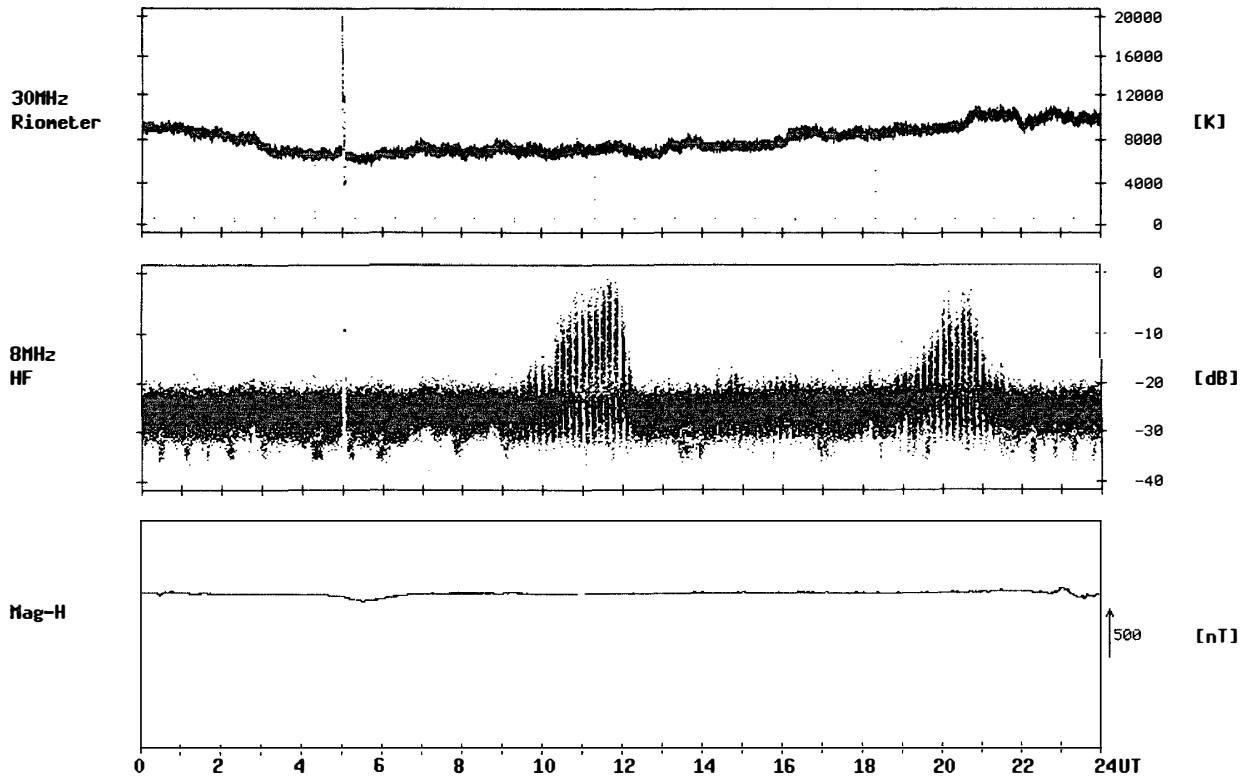
Syowa Station

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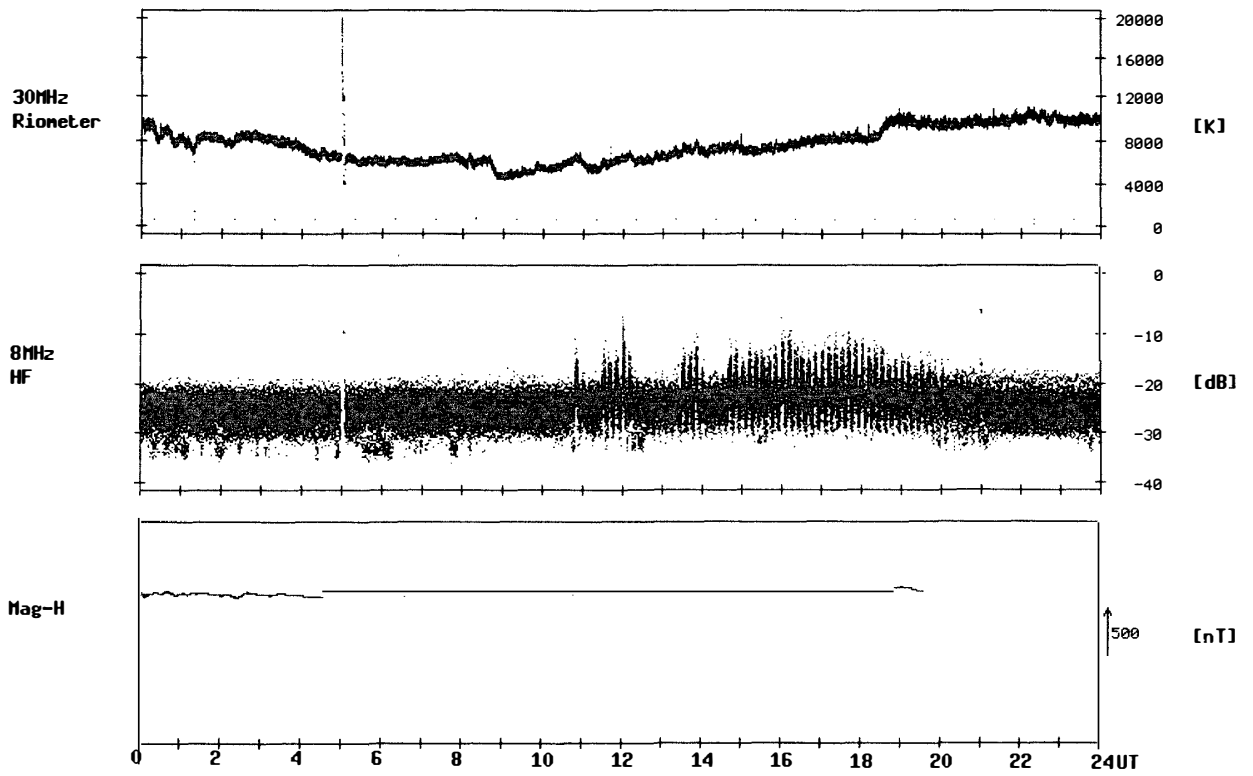
Syowa Station

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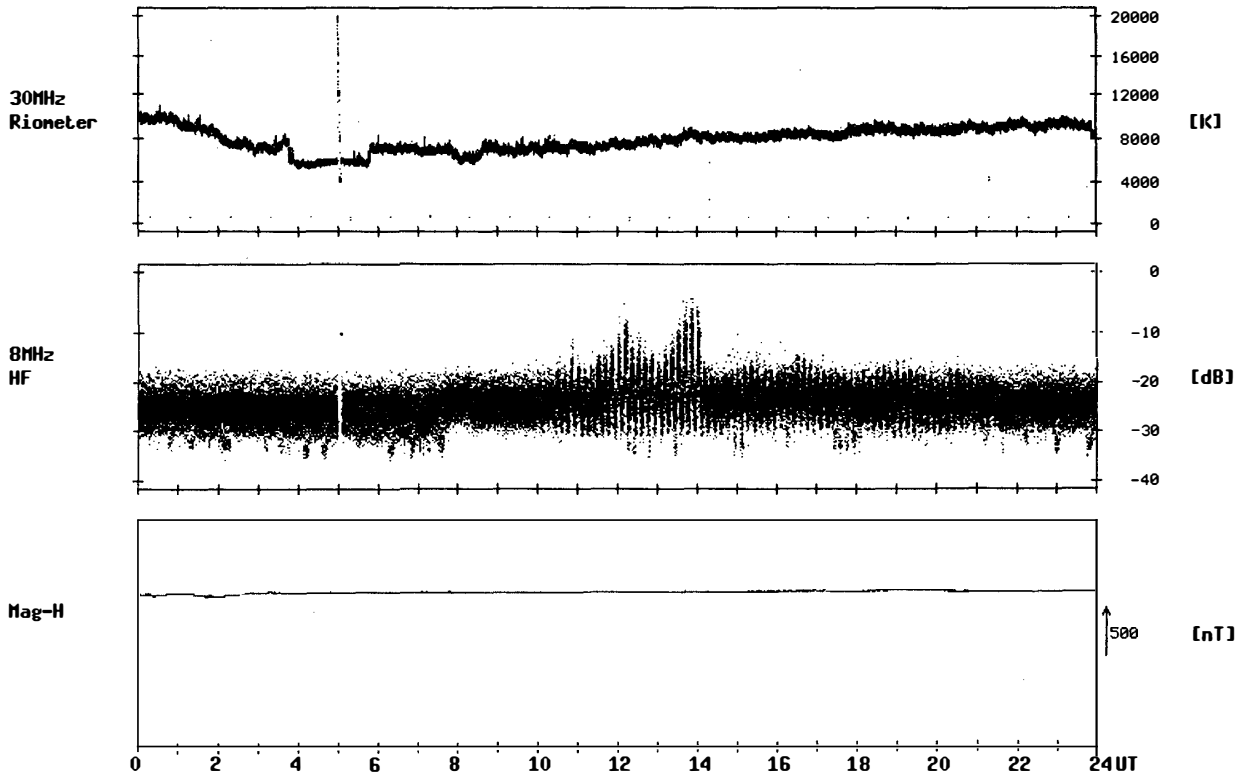
Syowa Station

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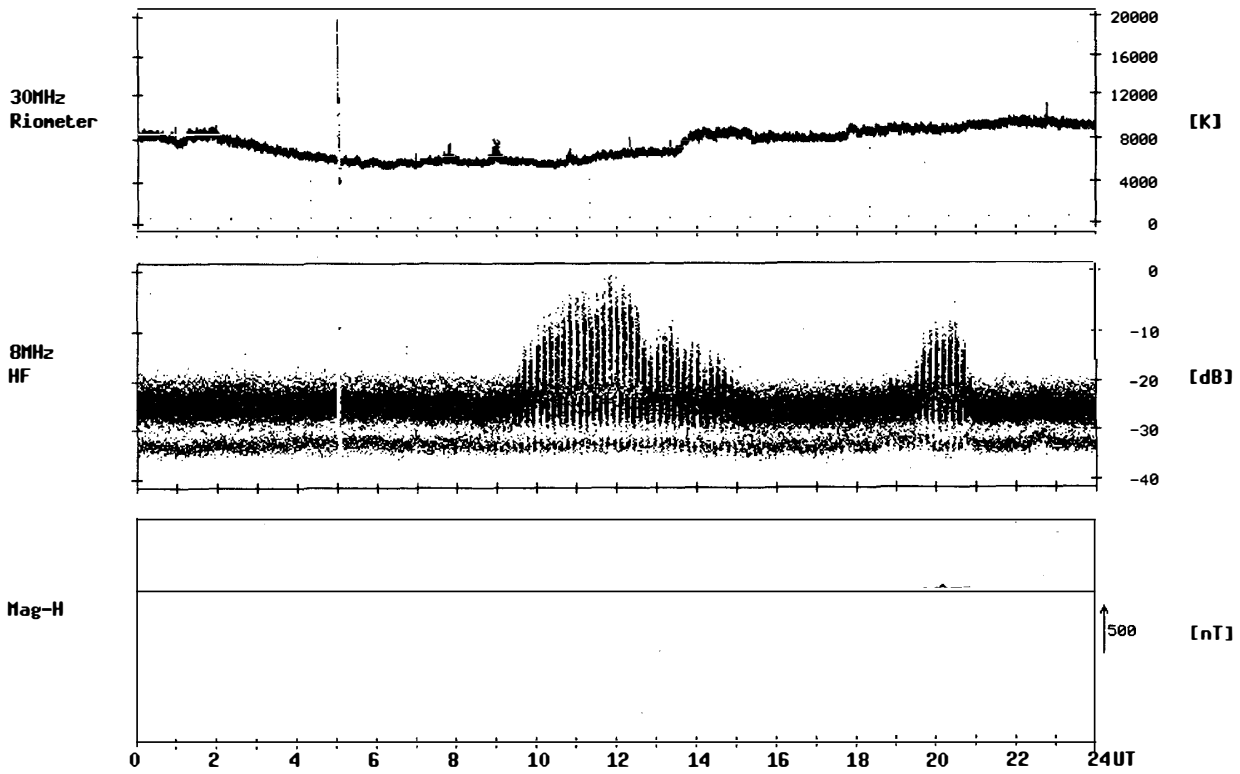
Syowa Station

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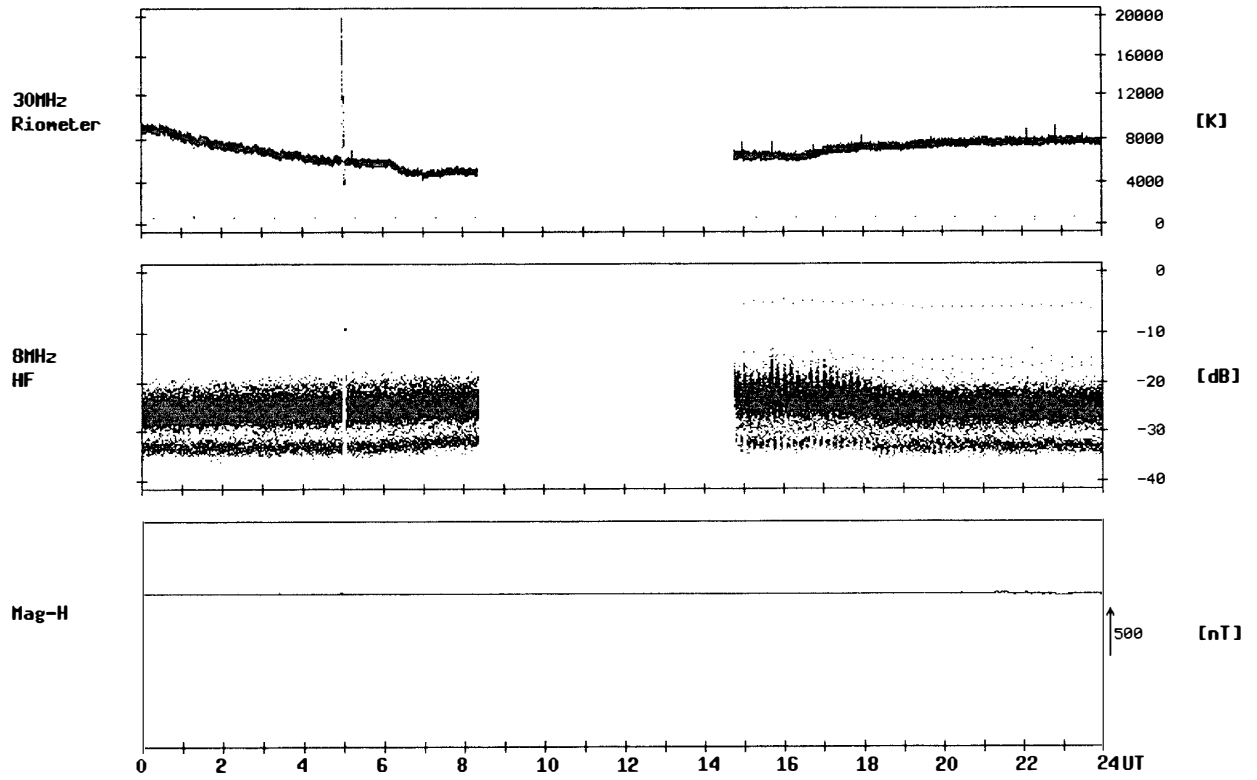
Syowa Station

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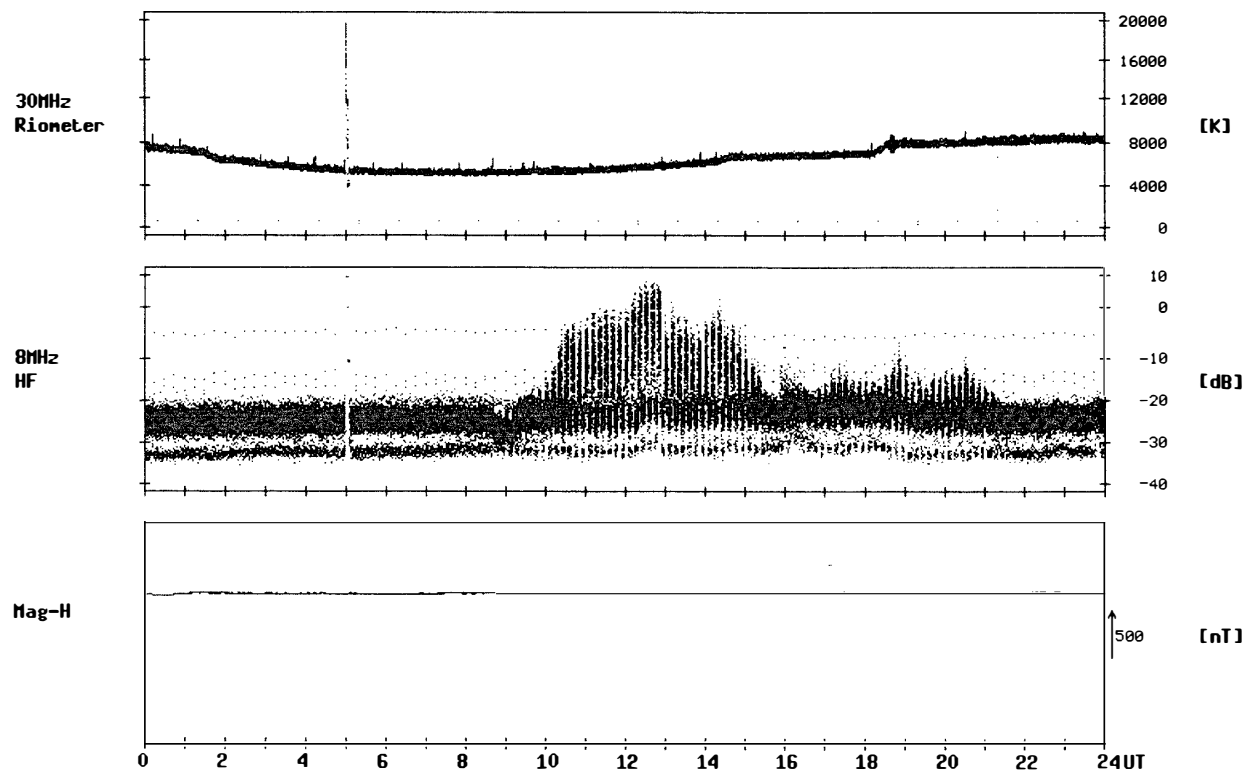
Syowa Station

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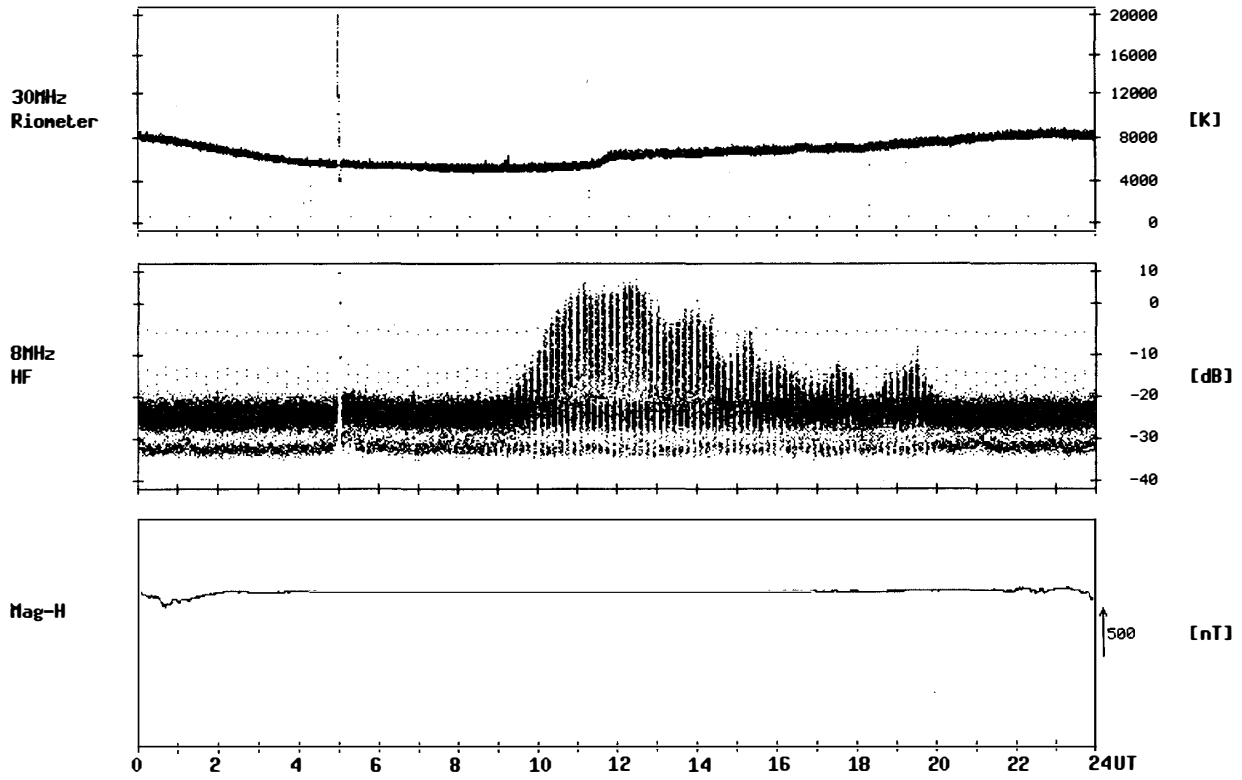
Syowa Station

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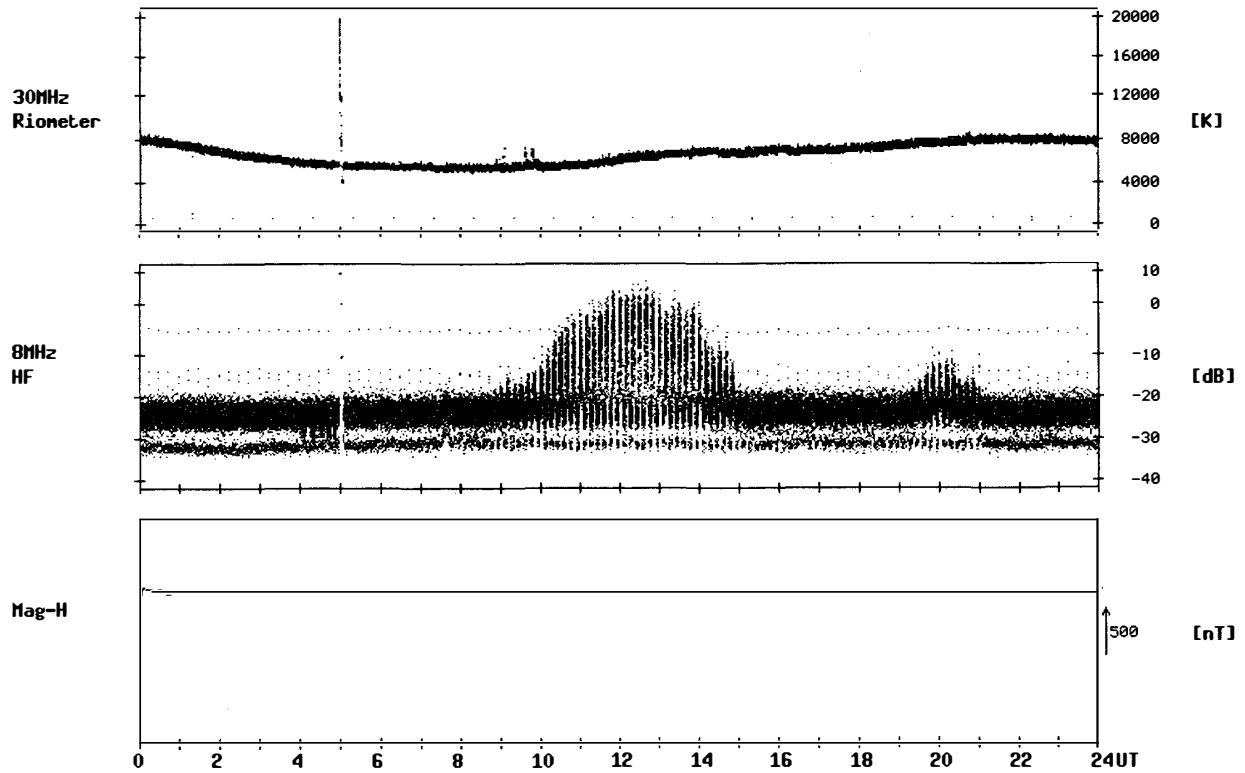
Syowa Station

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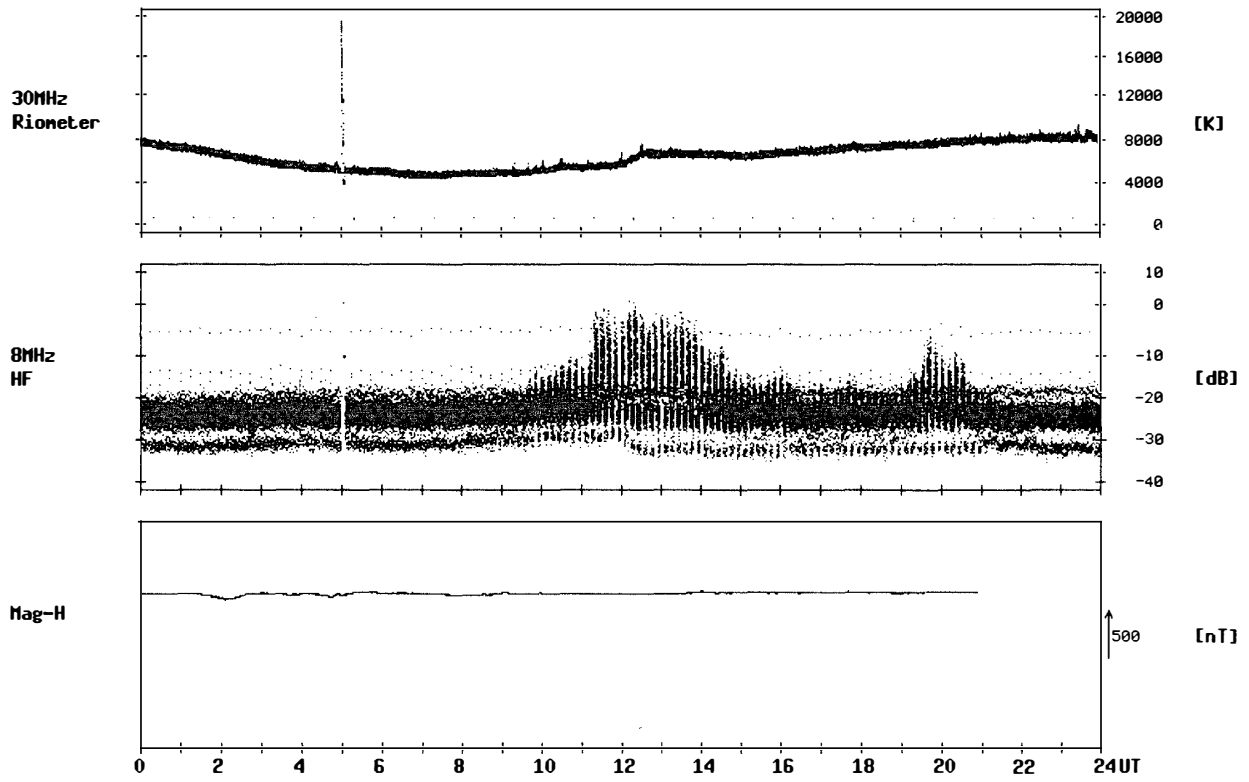
Syowa Station

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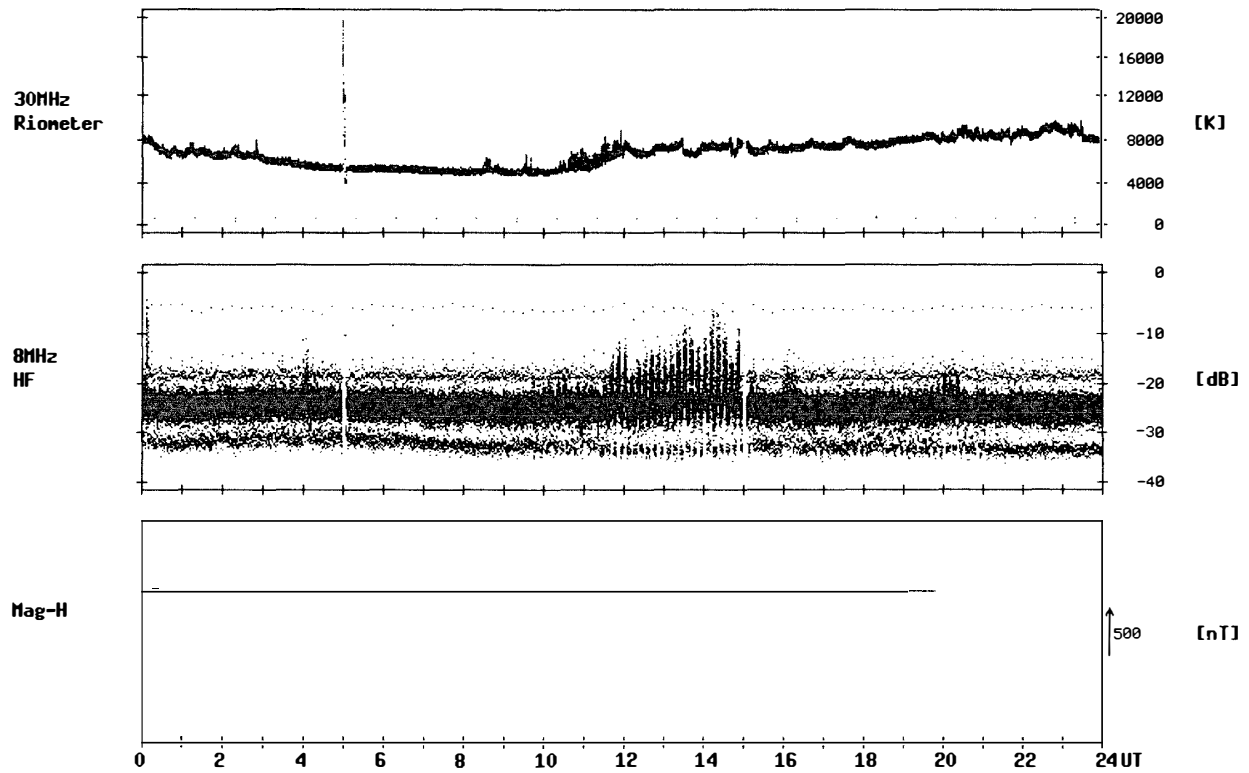
Syowa Station

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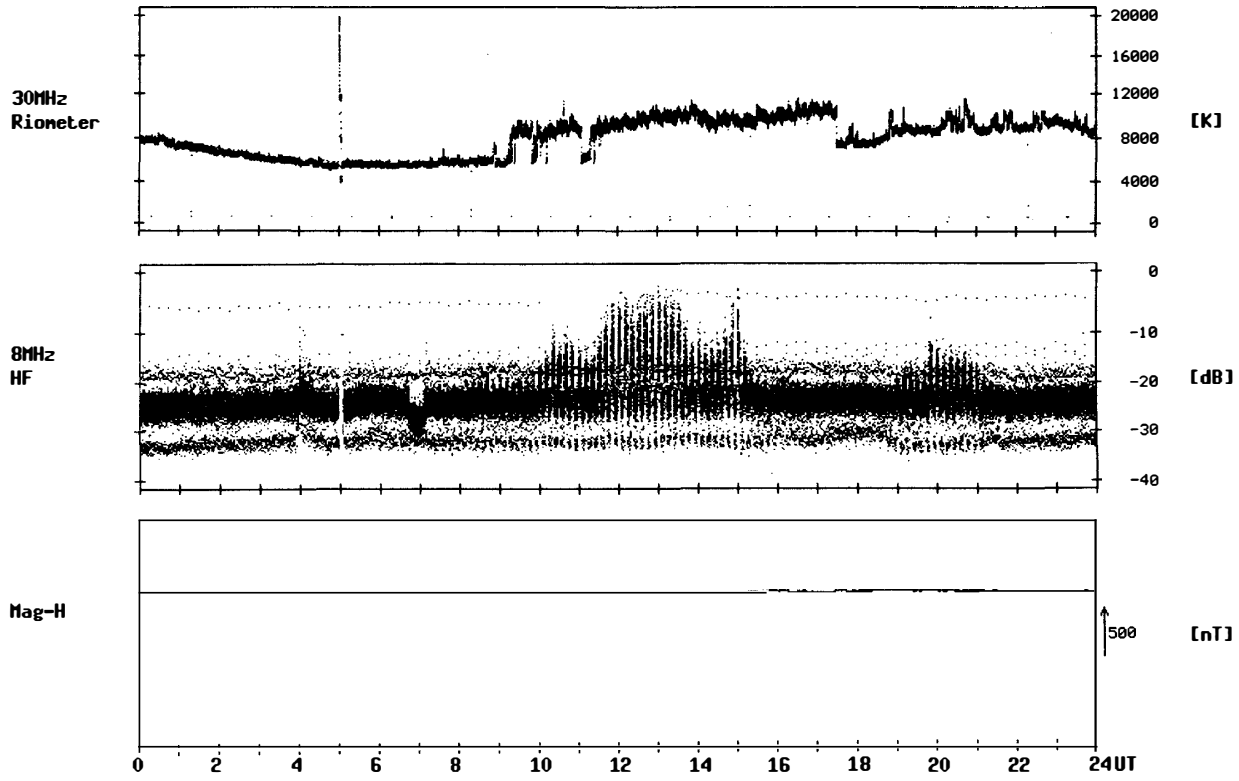
Syowa Station

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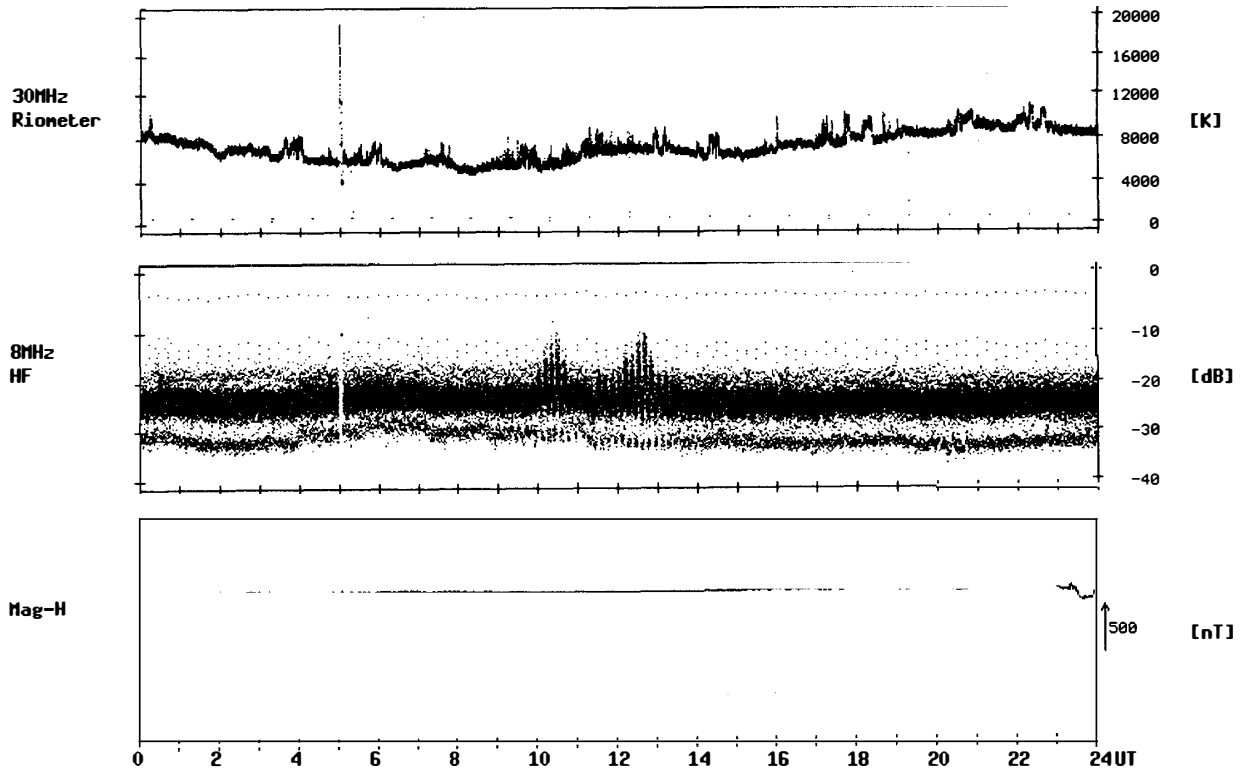
Syowa Station

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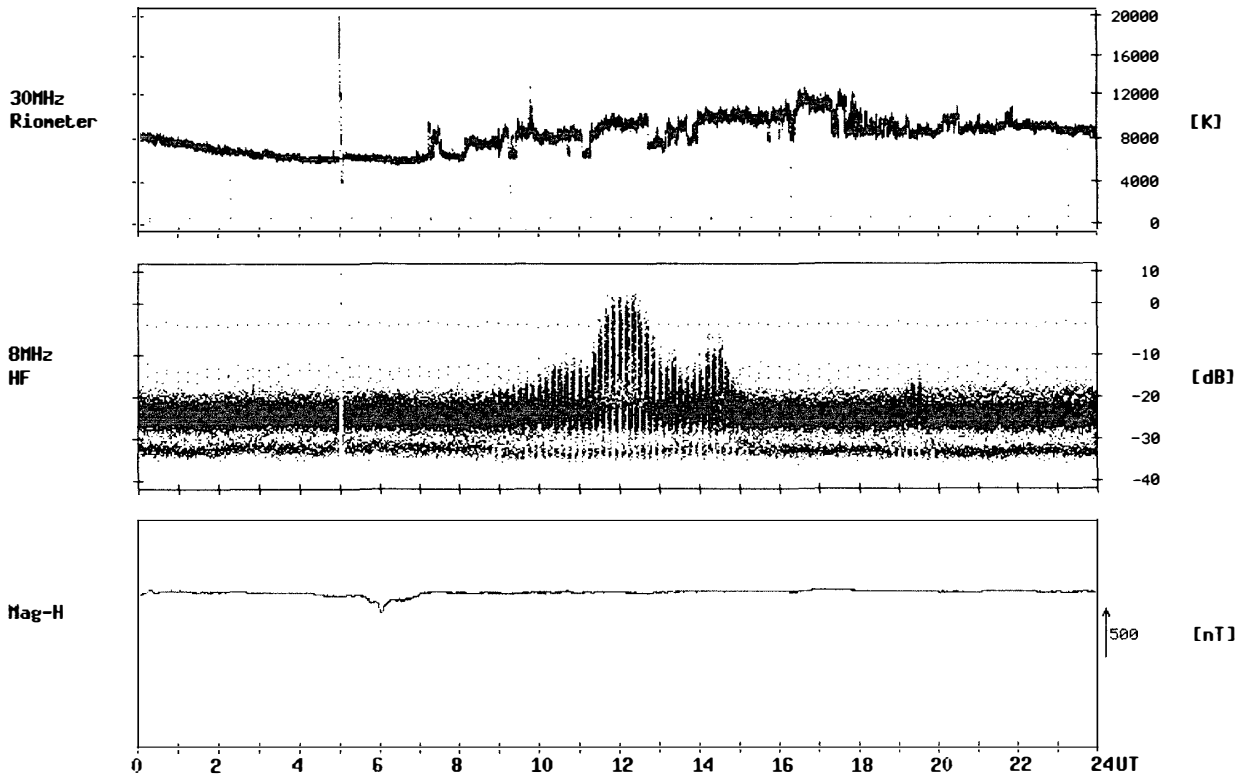
Syowa Station

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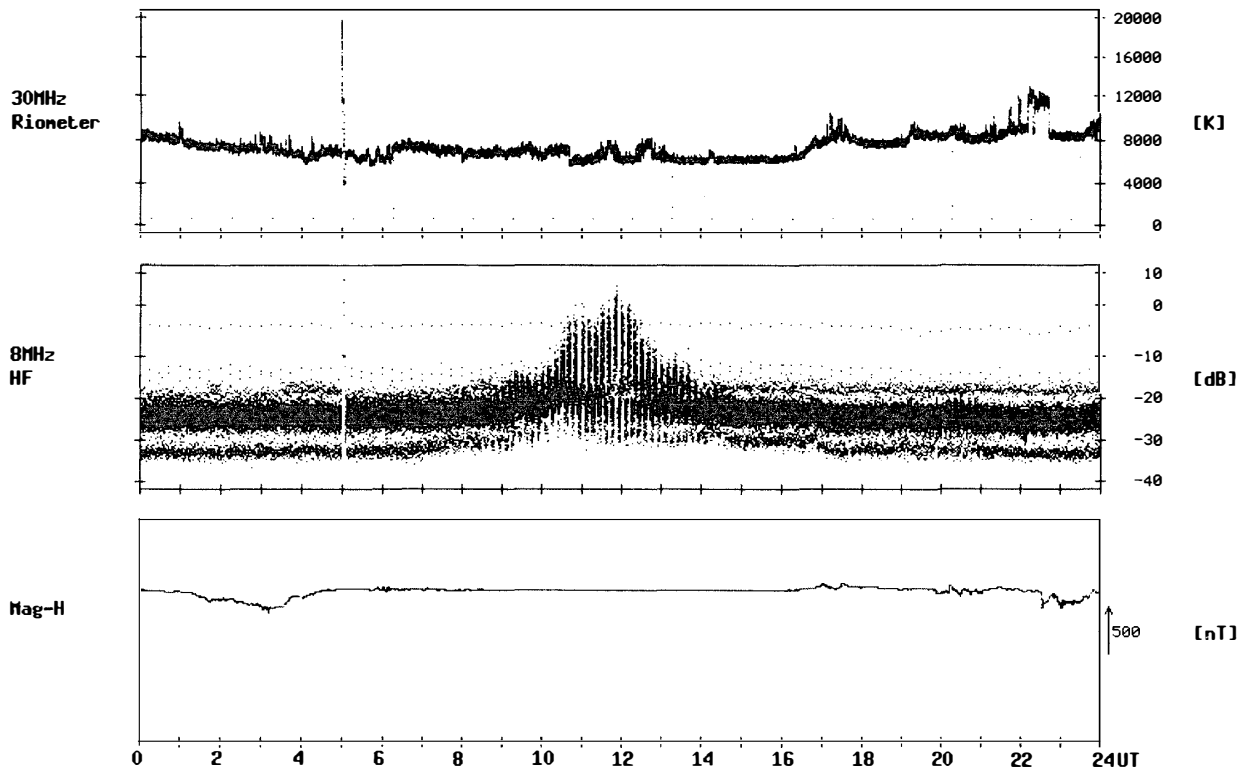
Syowa Station

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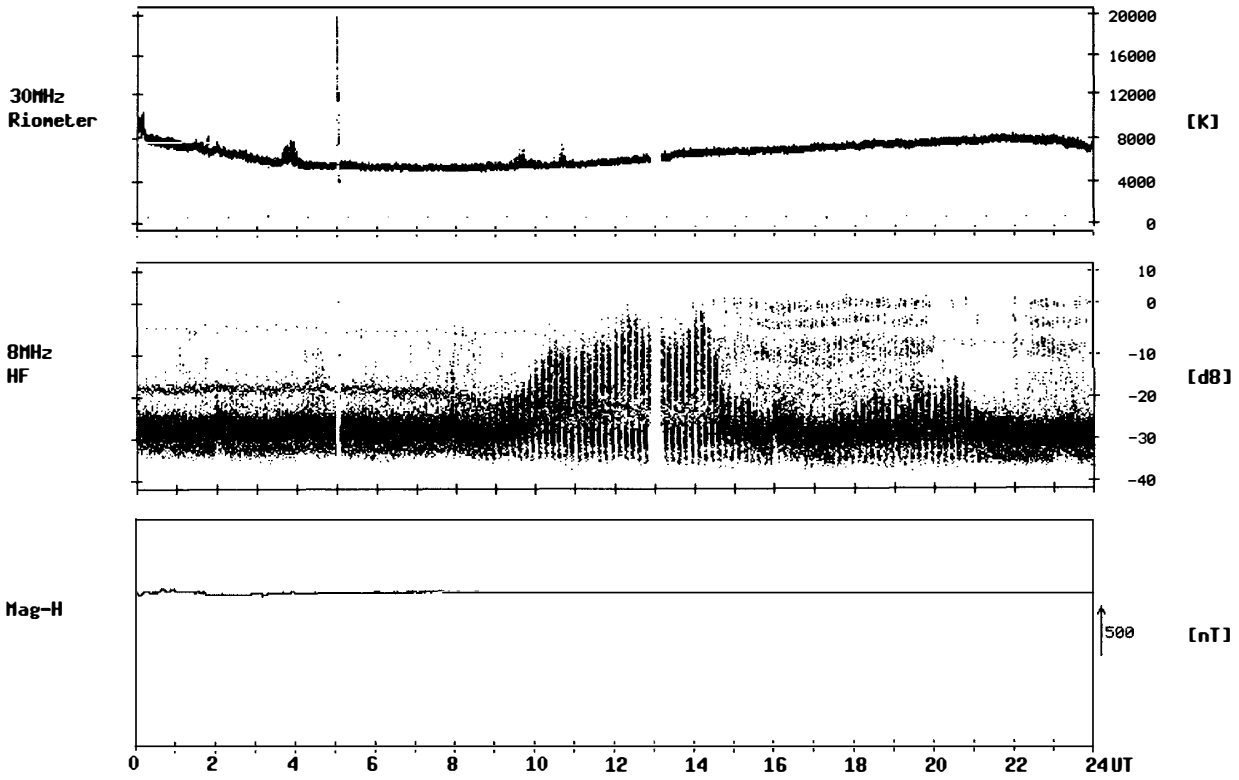
Syowa Station

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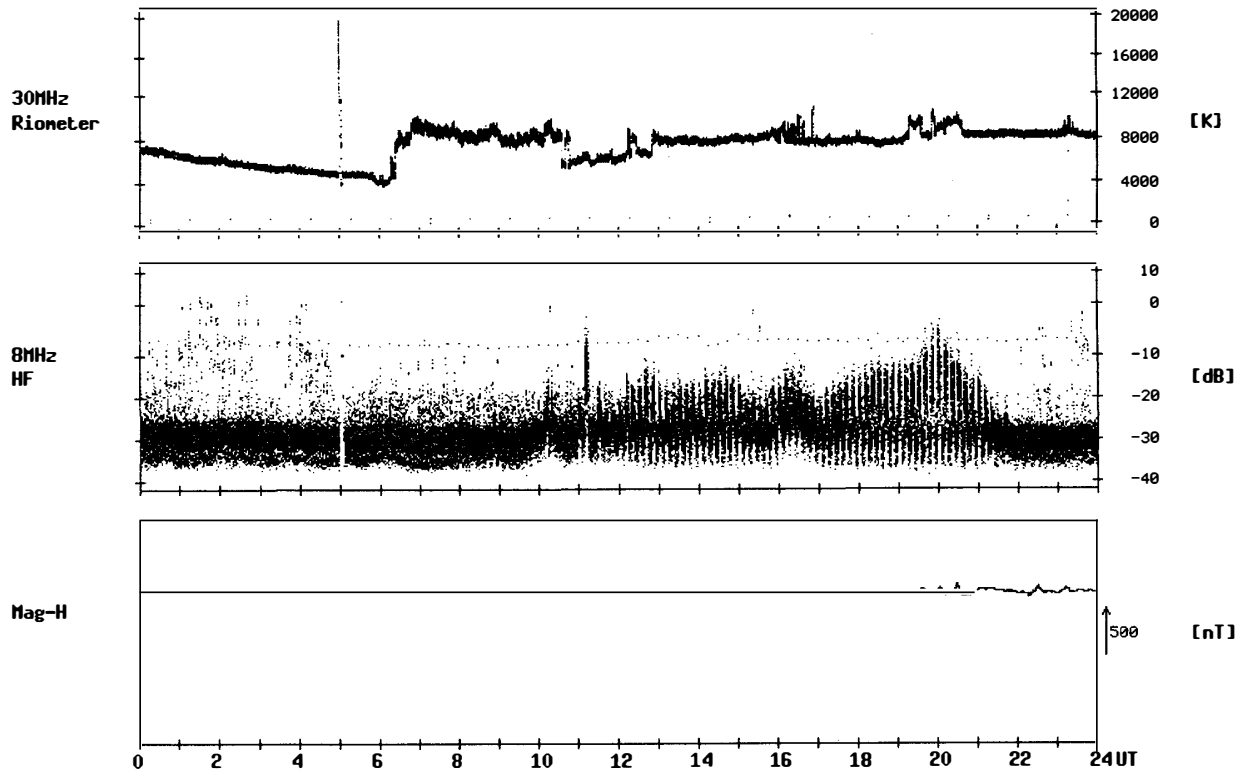
Syowa Station

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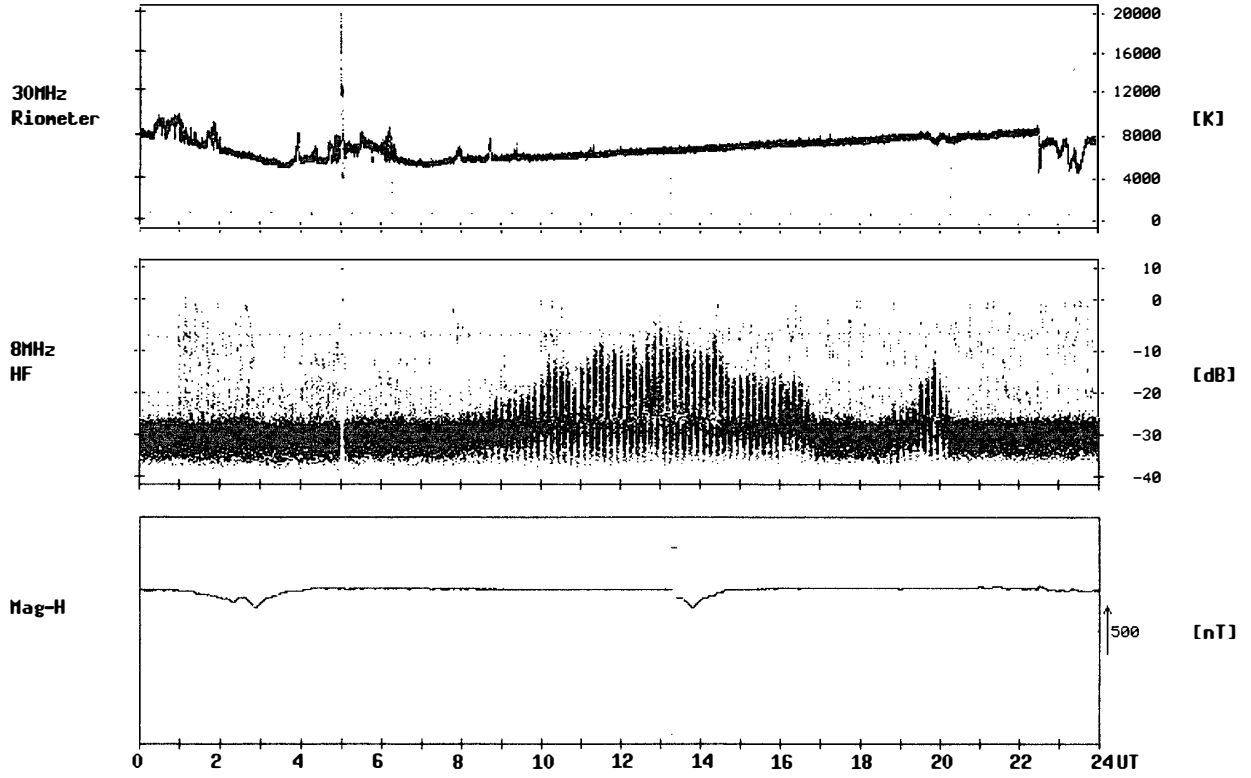
Syowa Station

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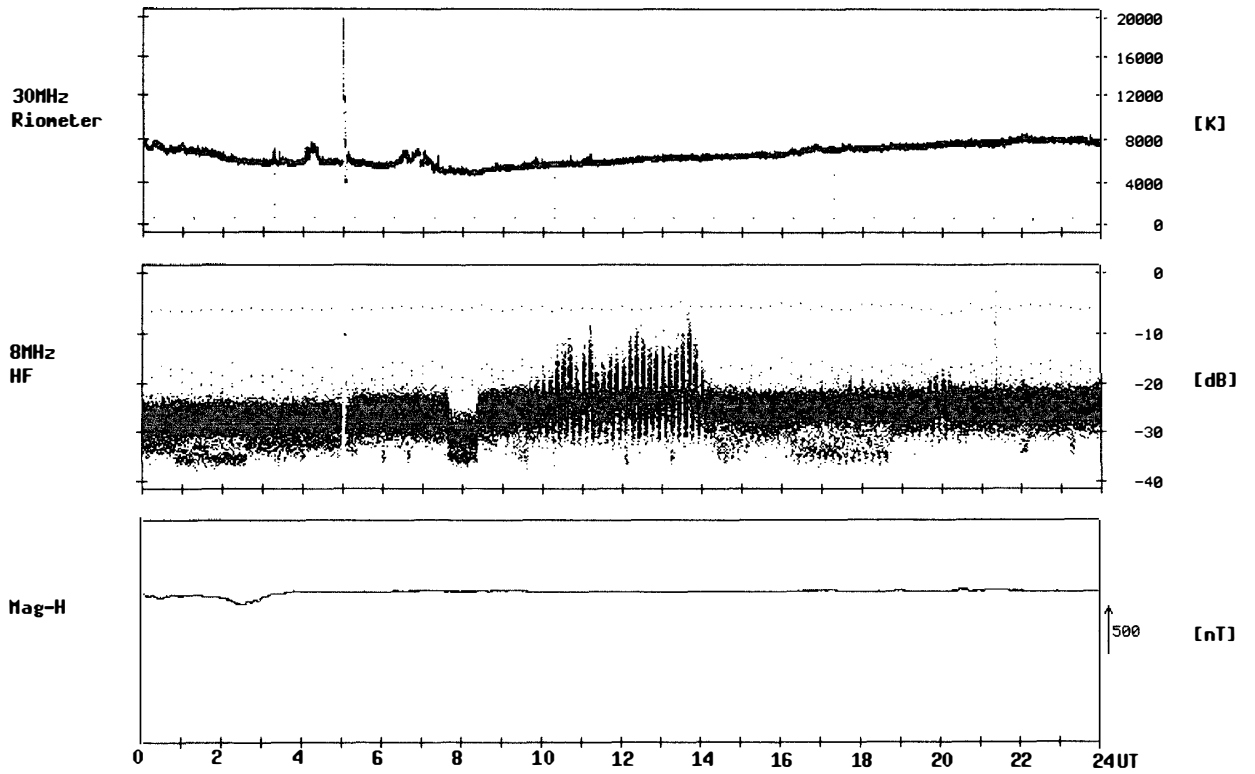
Syowa Station

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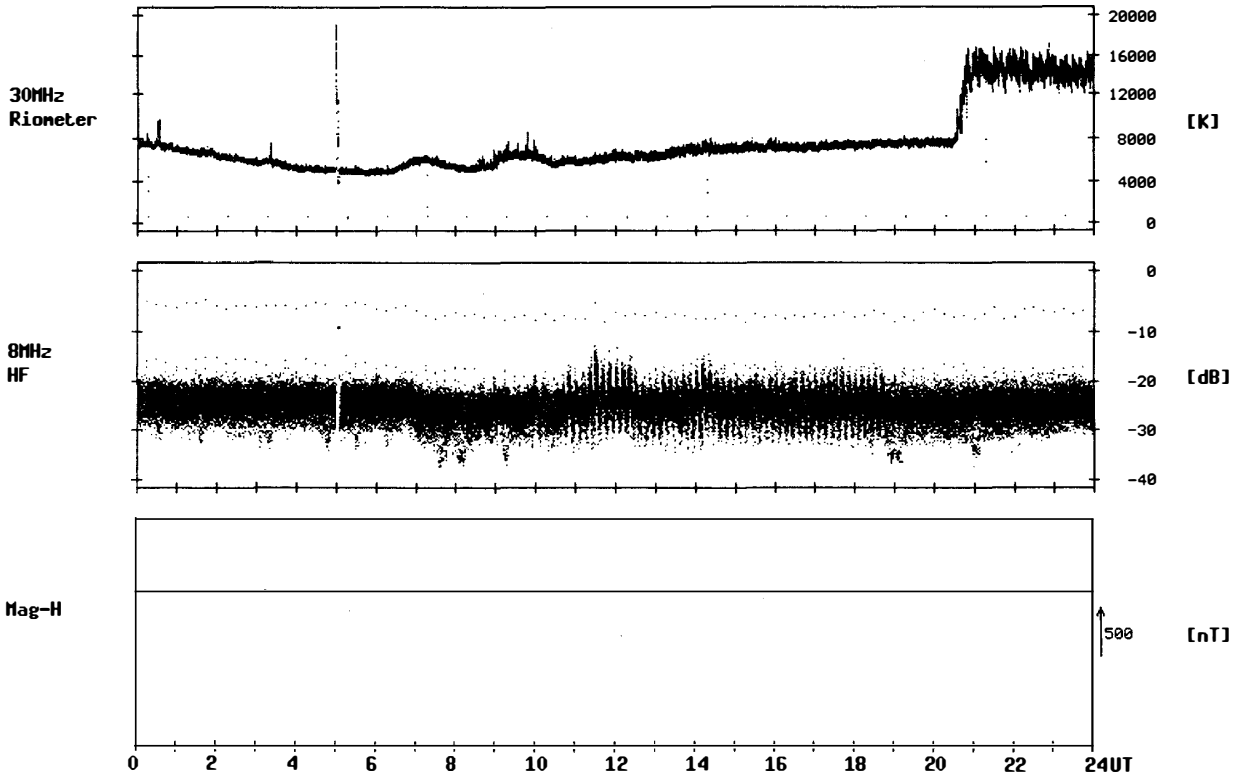
Syowa Station

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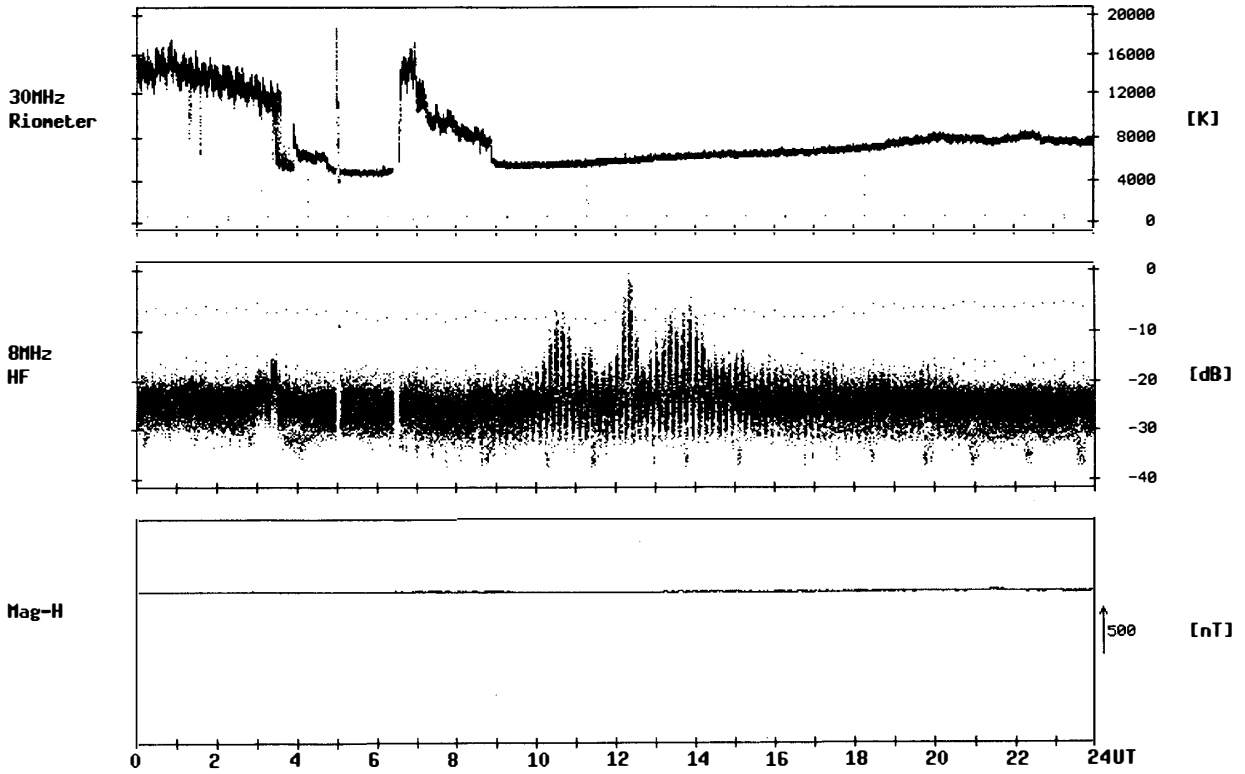
Syowa Station

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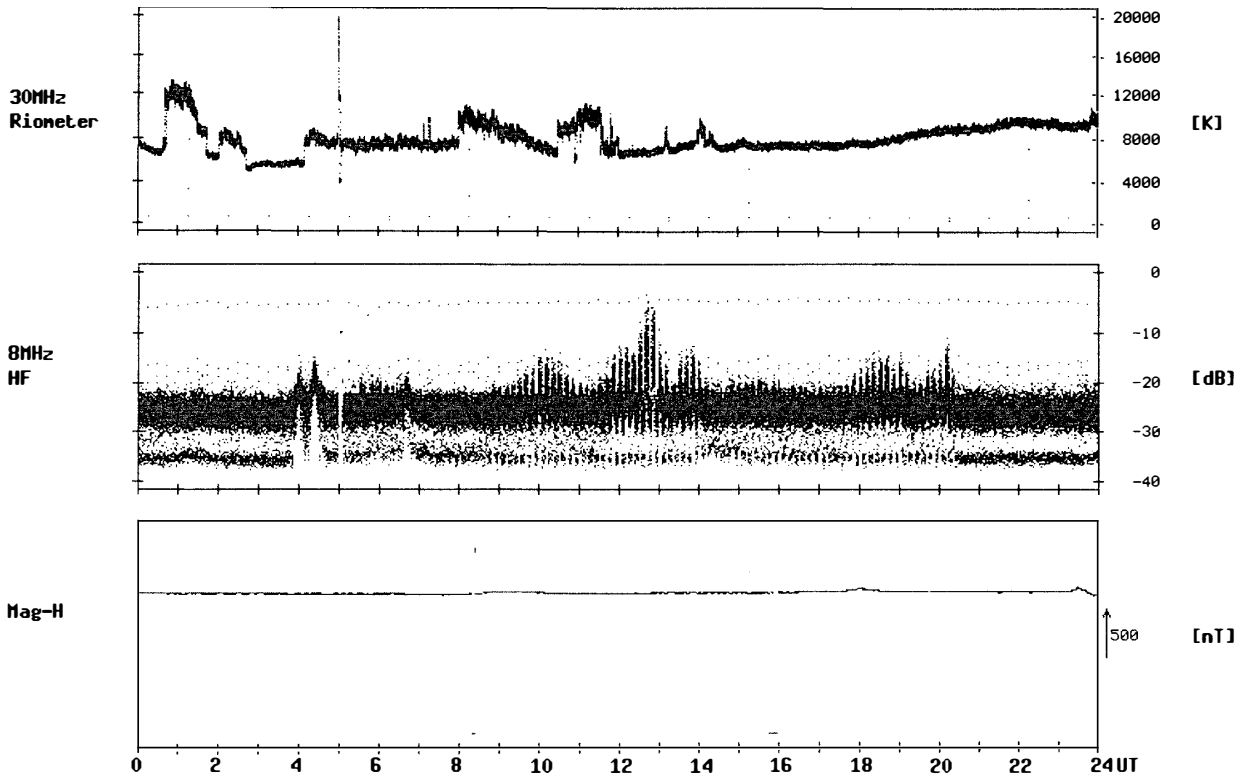
Syowa Station

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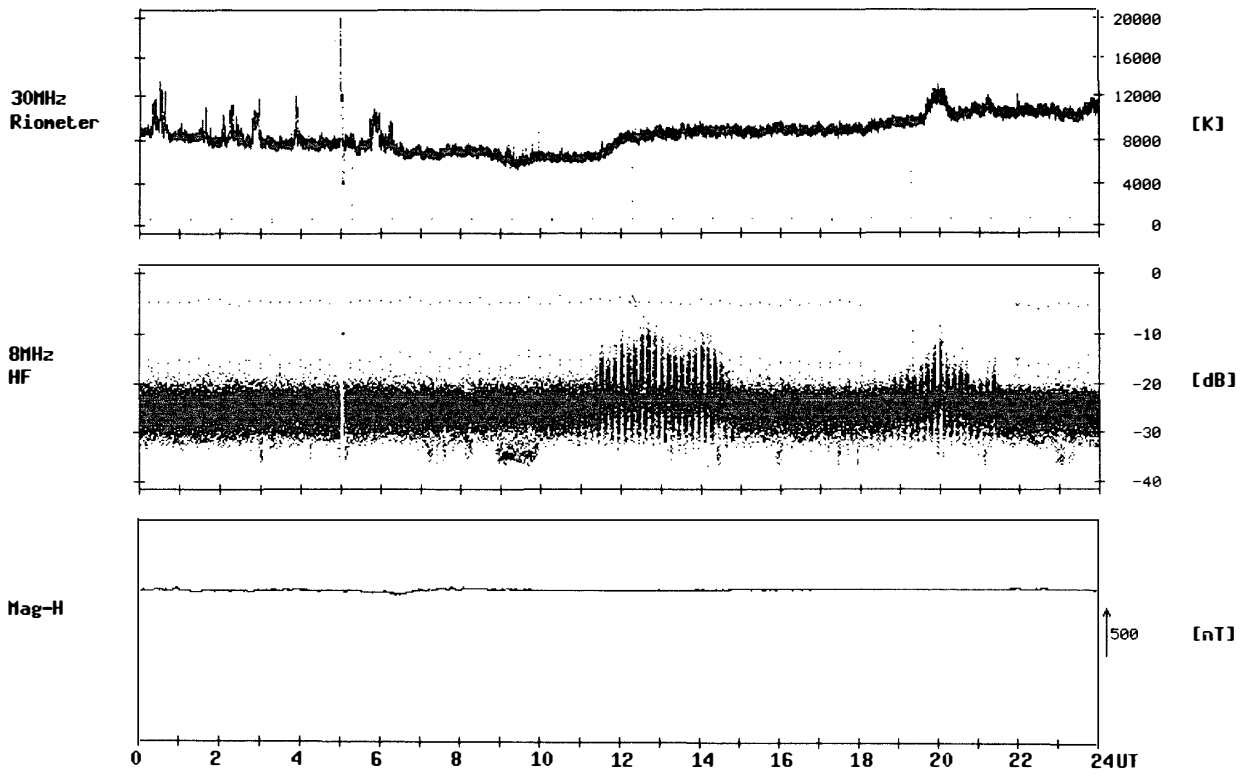
Syowa Station

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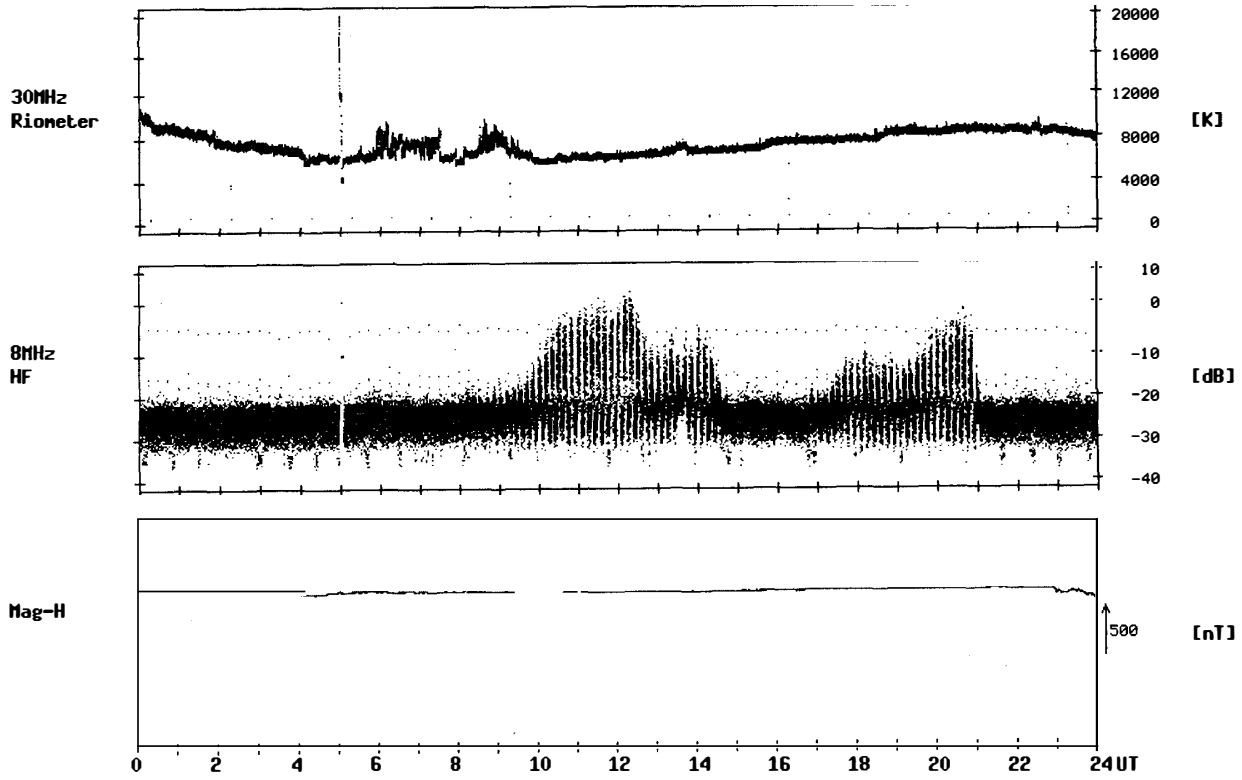
Syowa Station

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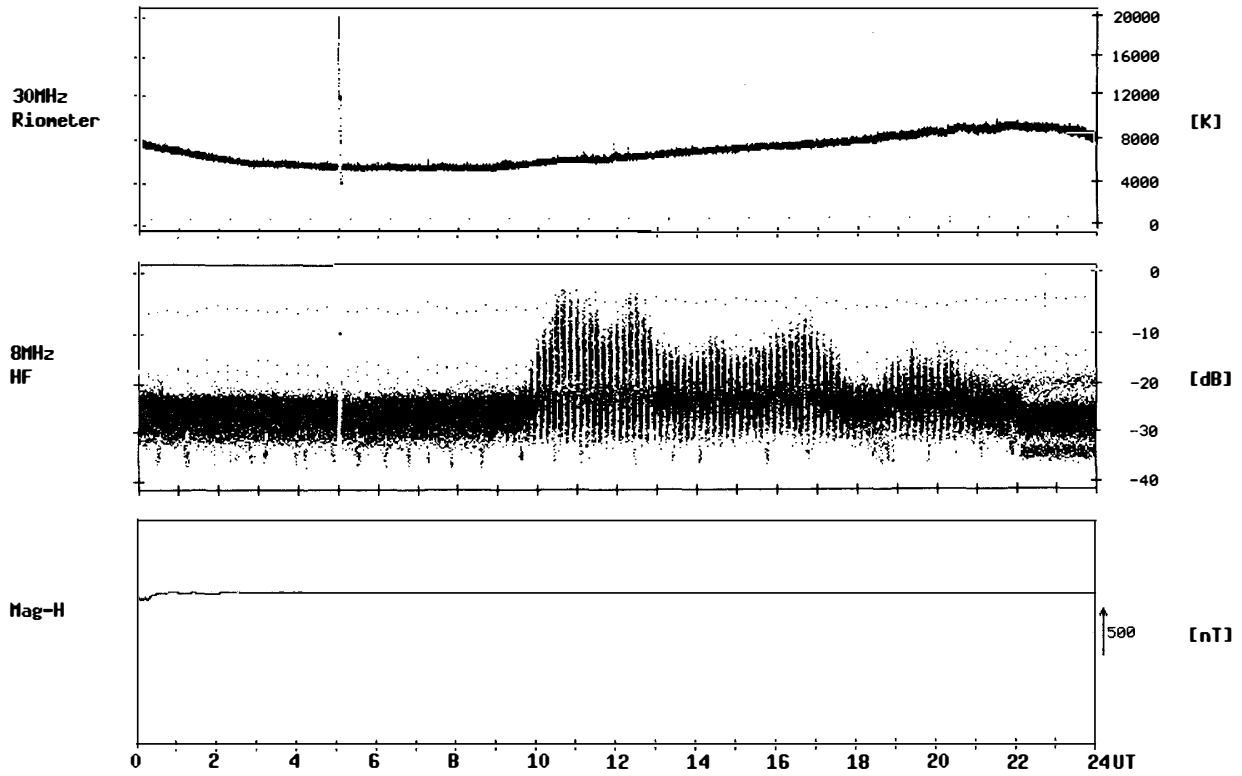
Syowa Station

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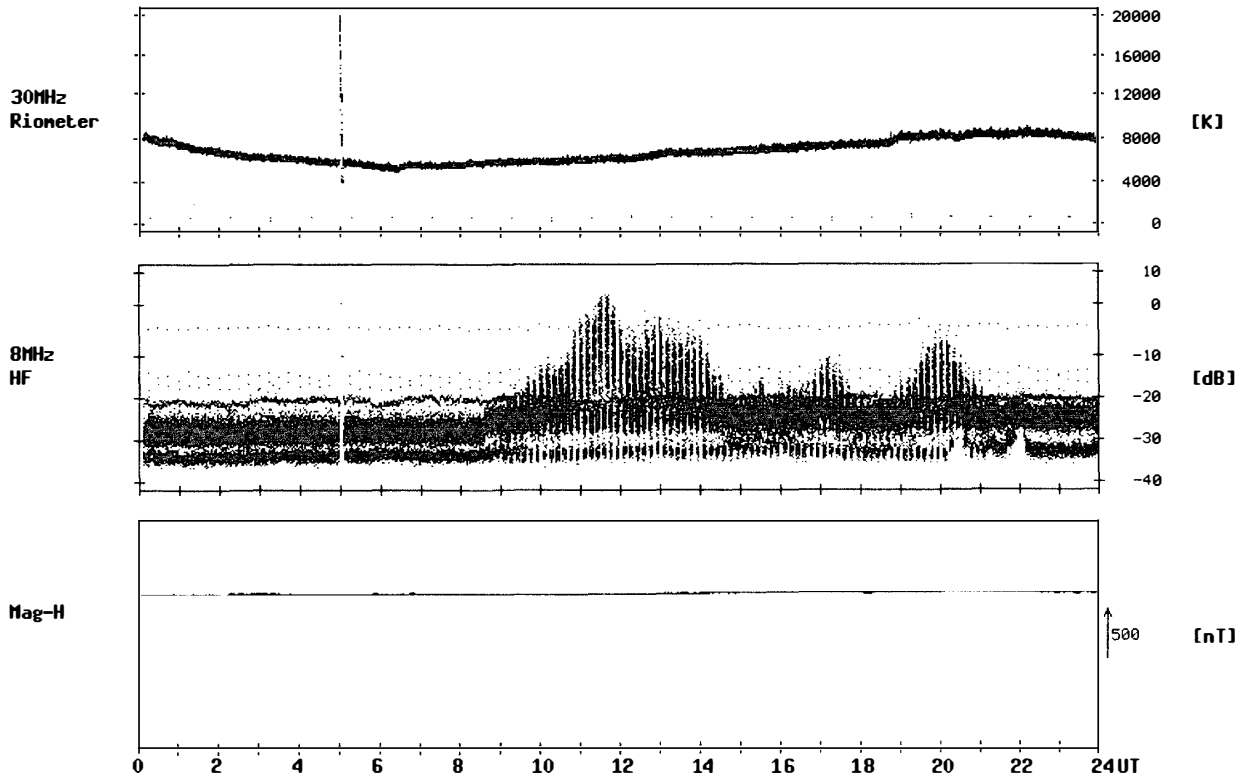
Syowa Station

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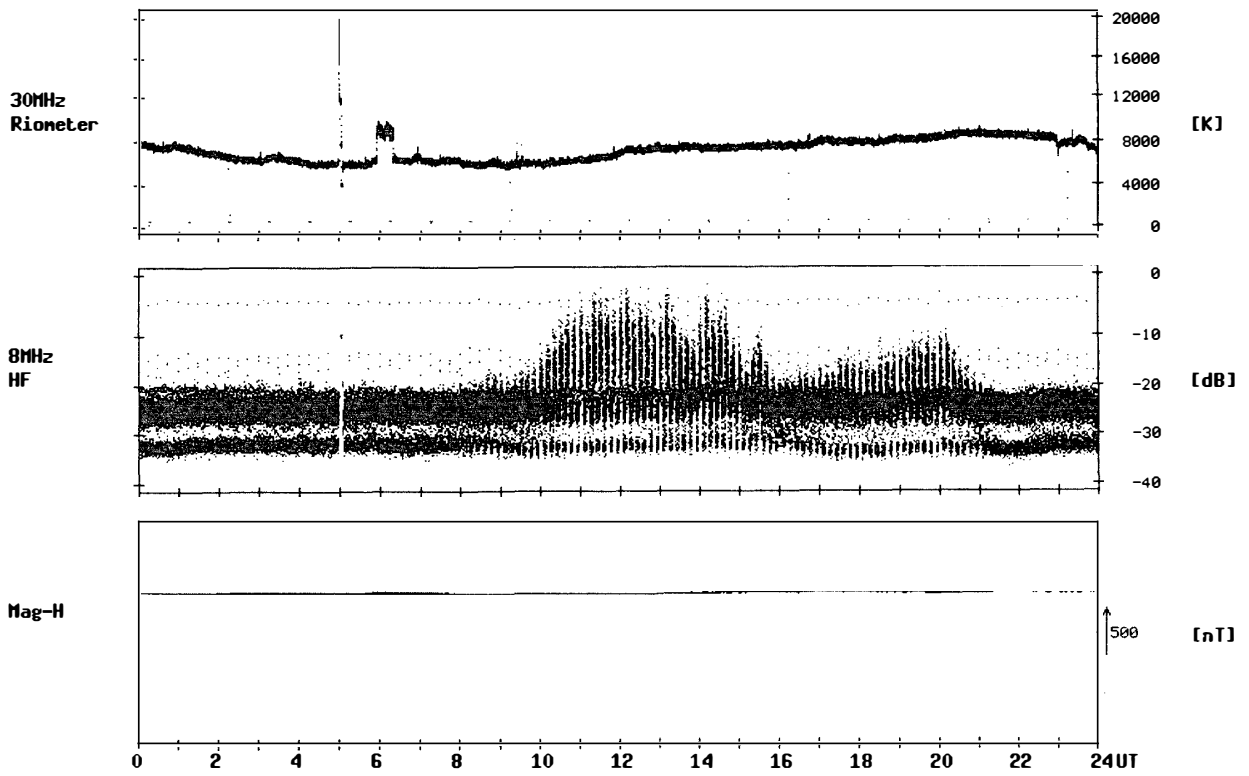
Syowa Station

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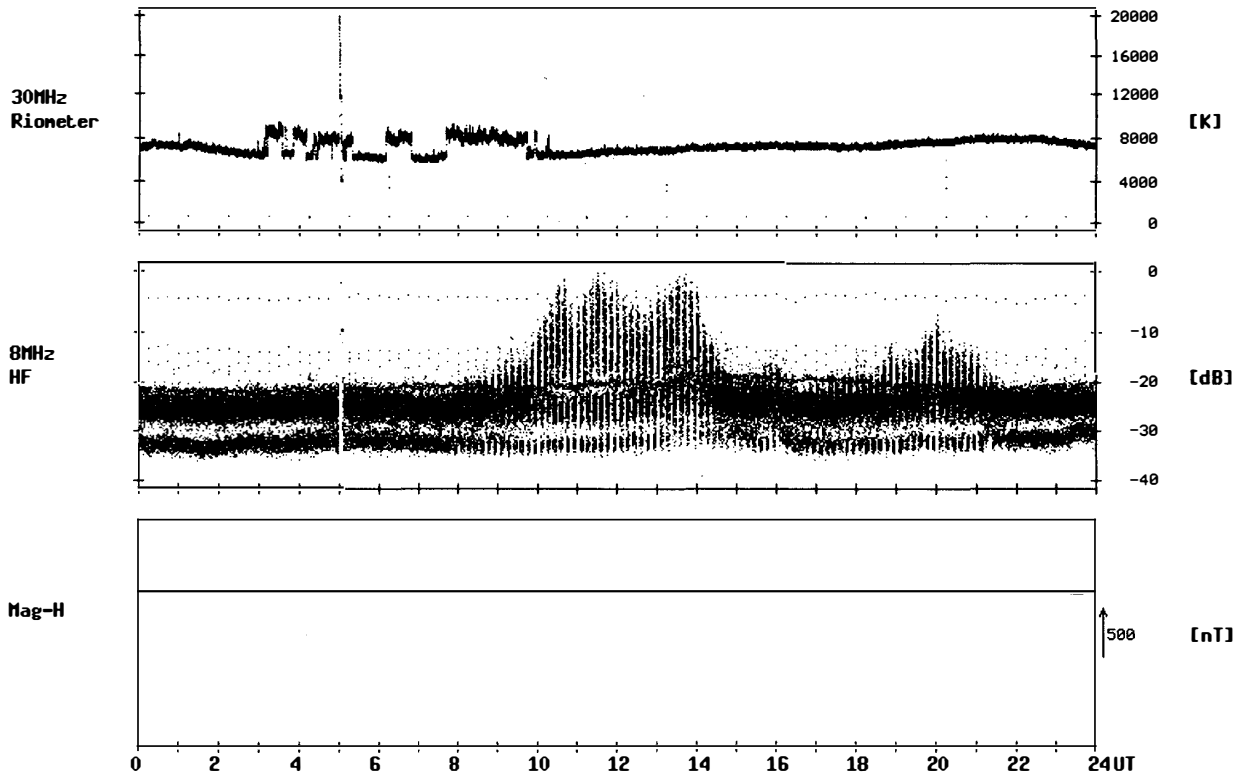
Syowa Station

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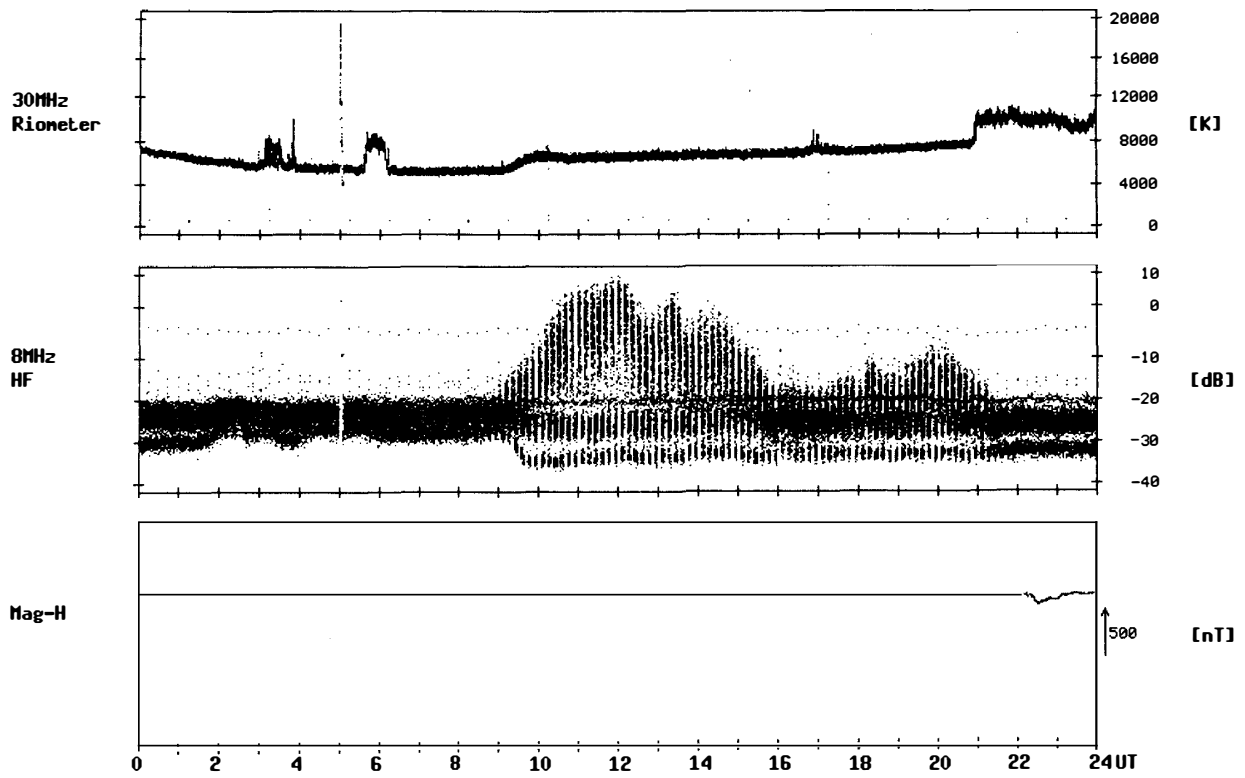
Syowa Station

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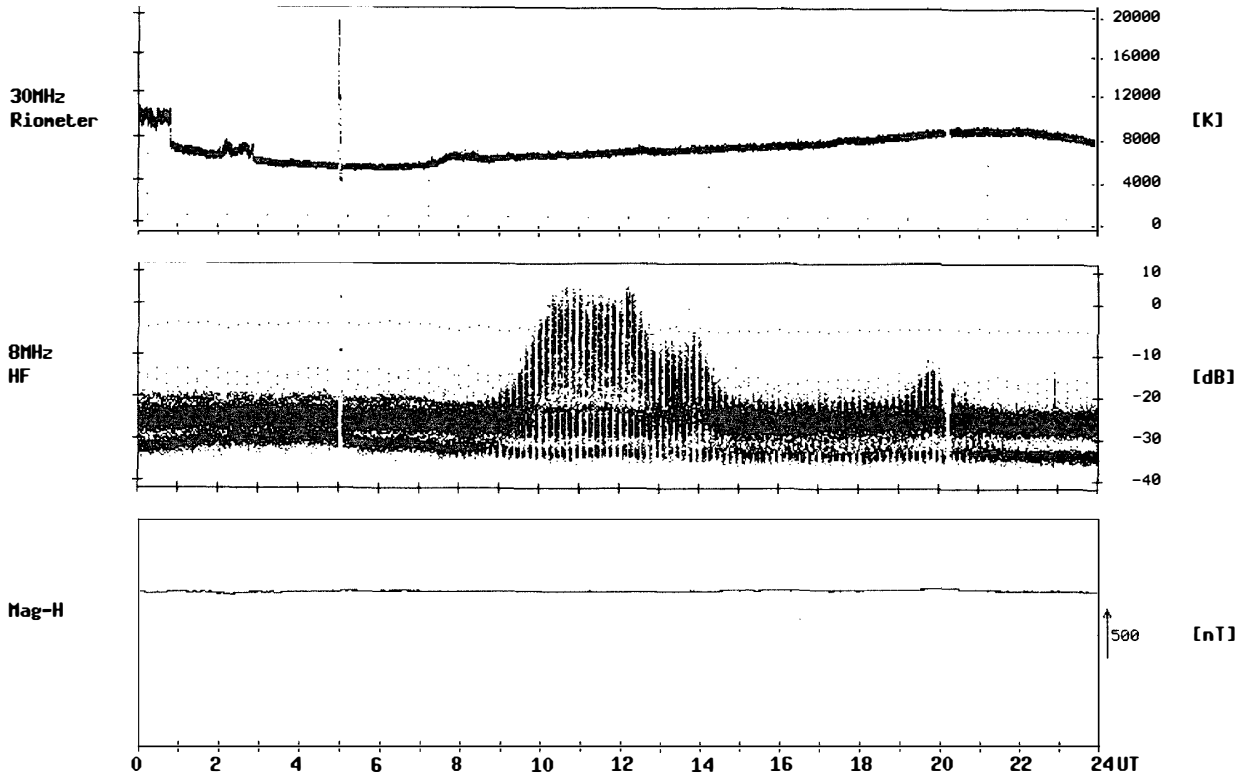
Syowa Station

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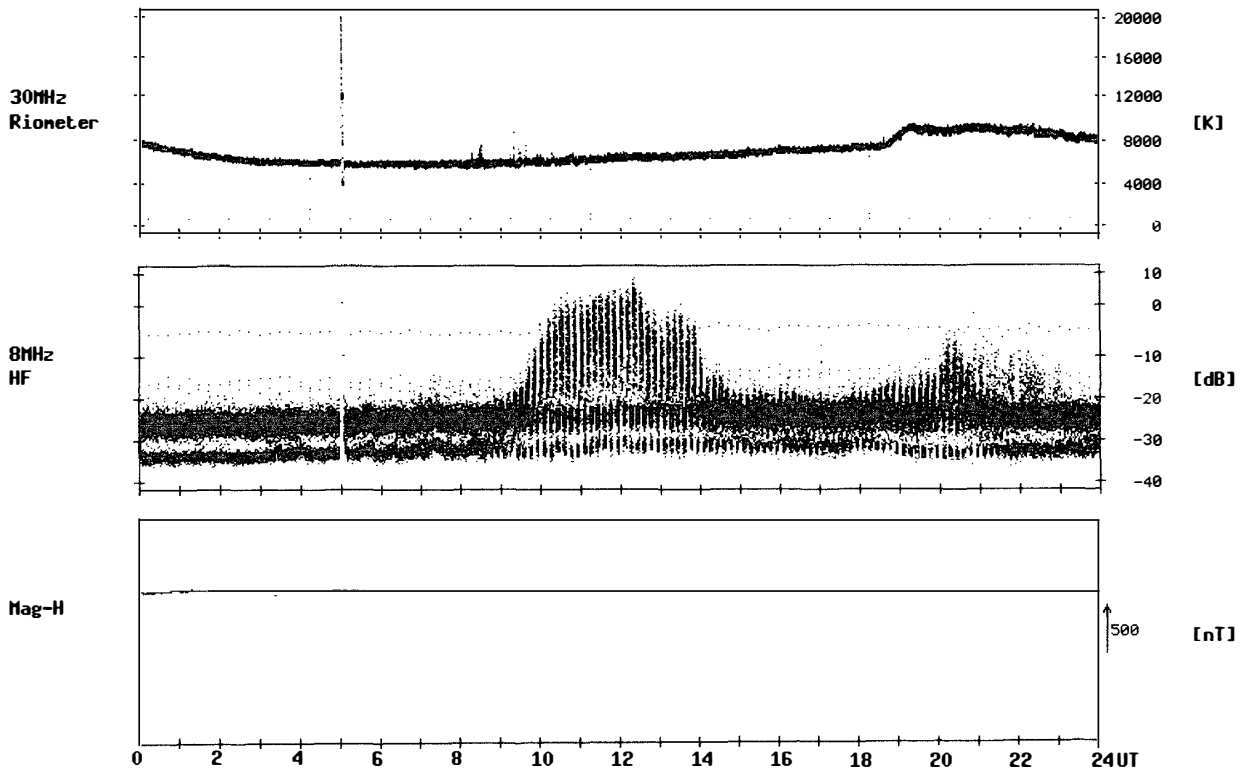
Syowa Station

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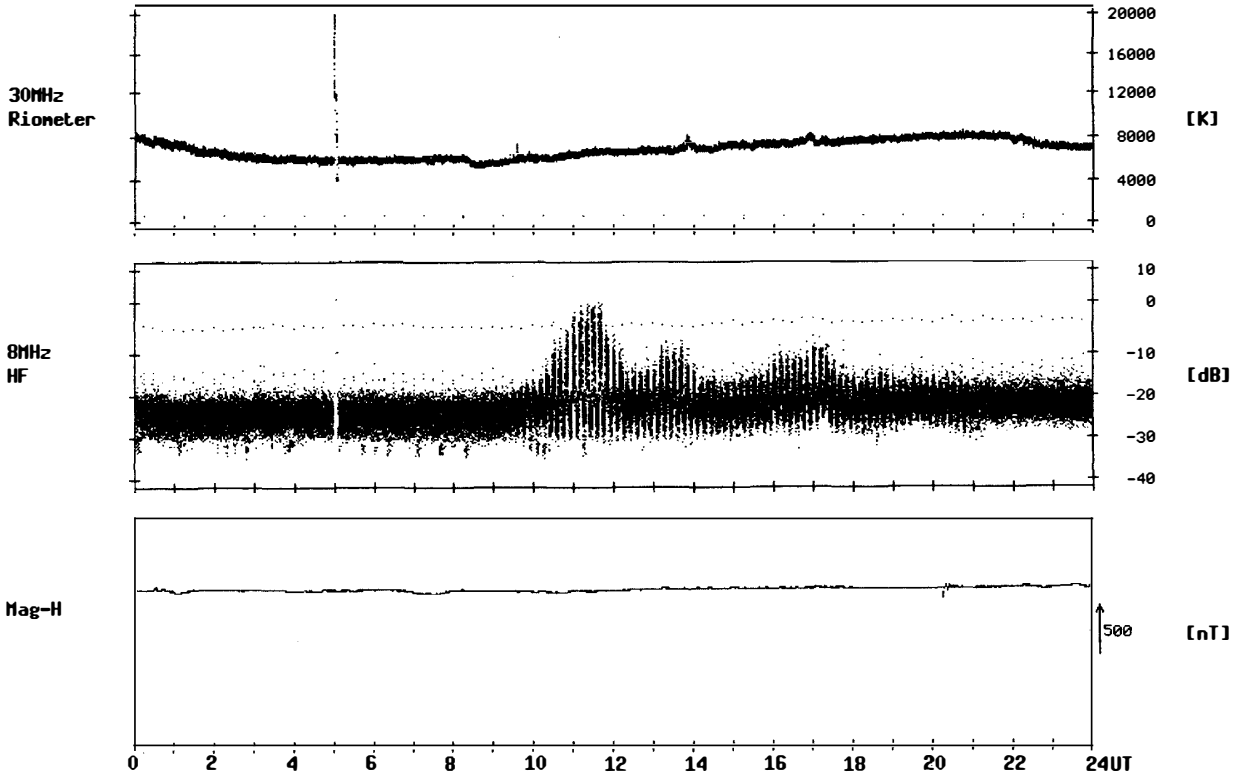
Syowa Station

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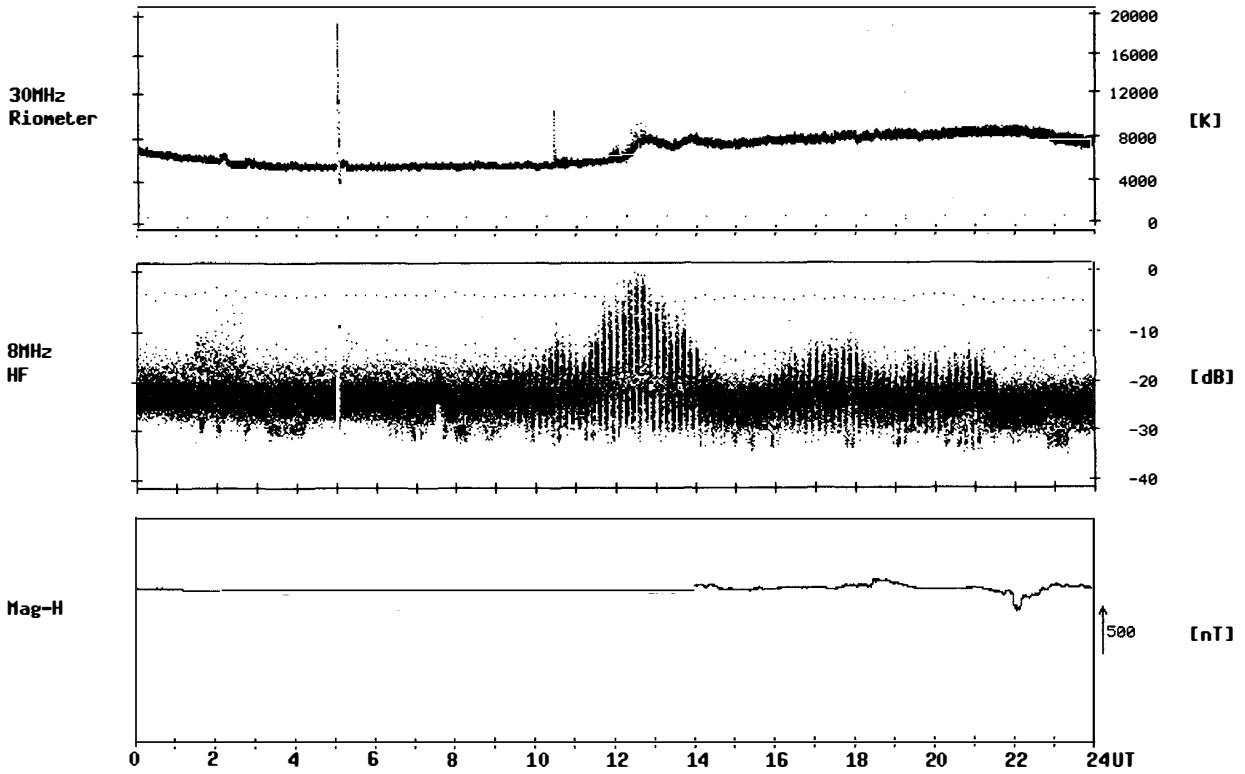
Syowa Station

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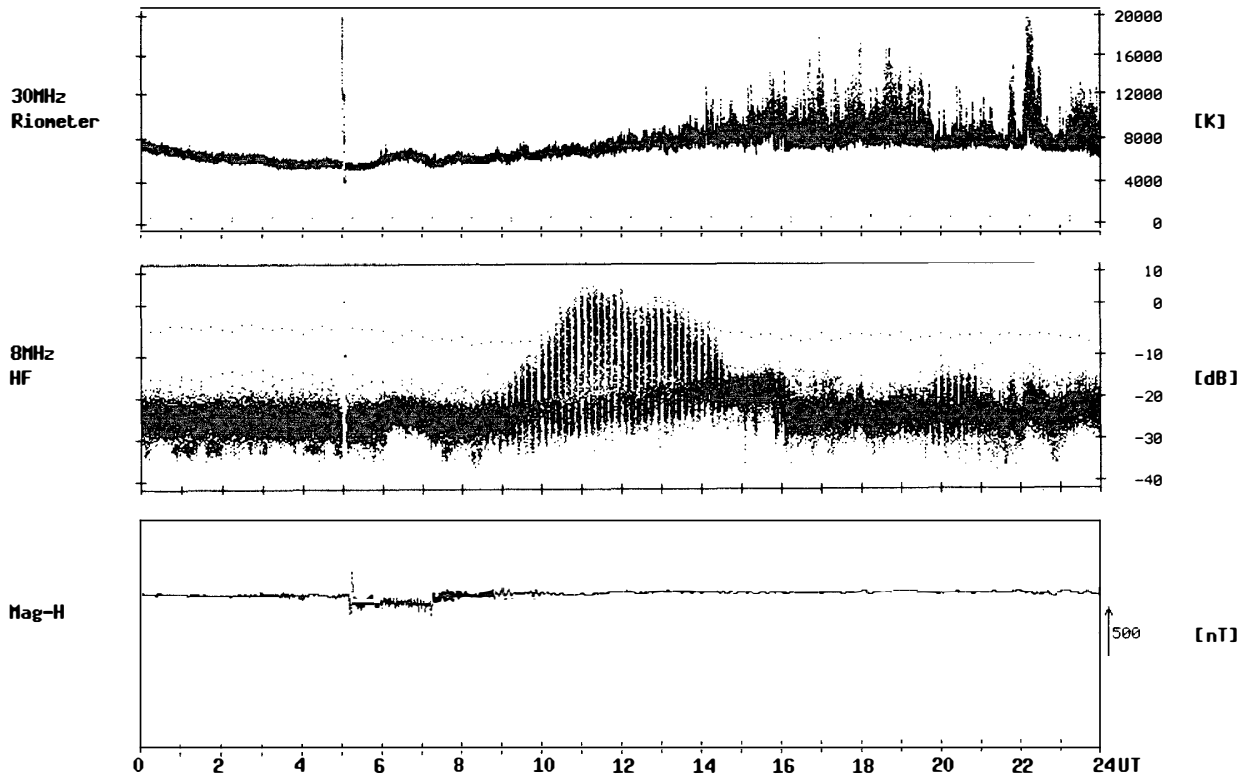
Syowa Station

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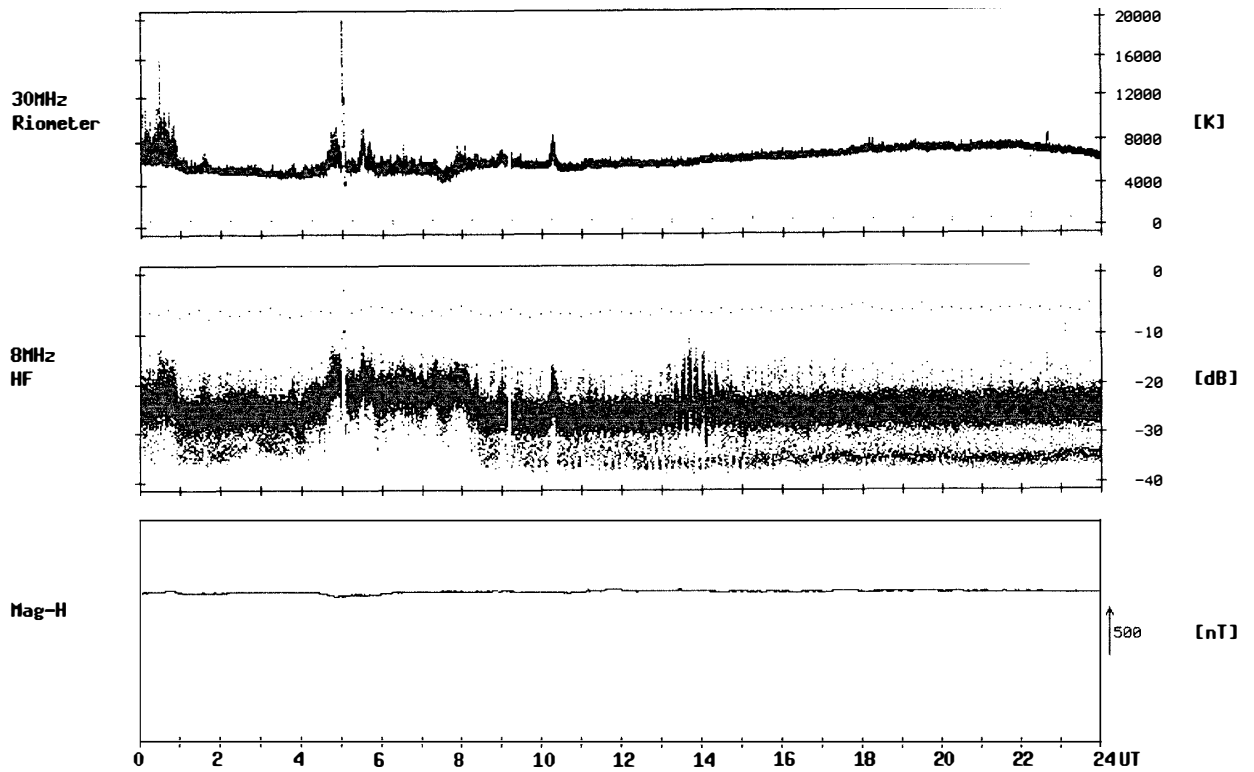
Syowa Station

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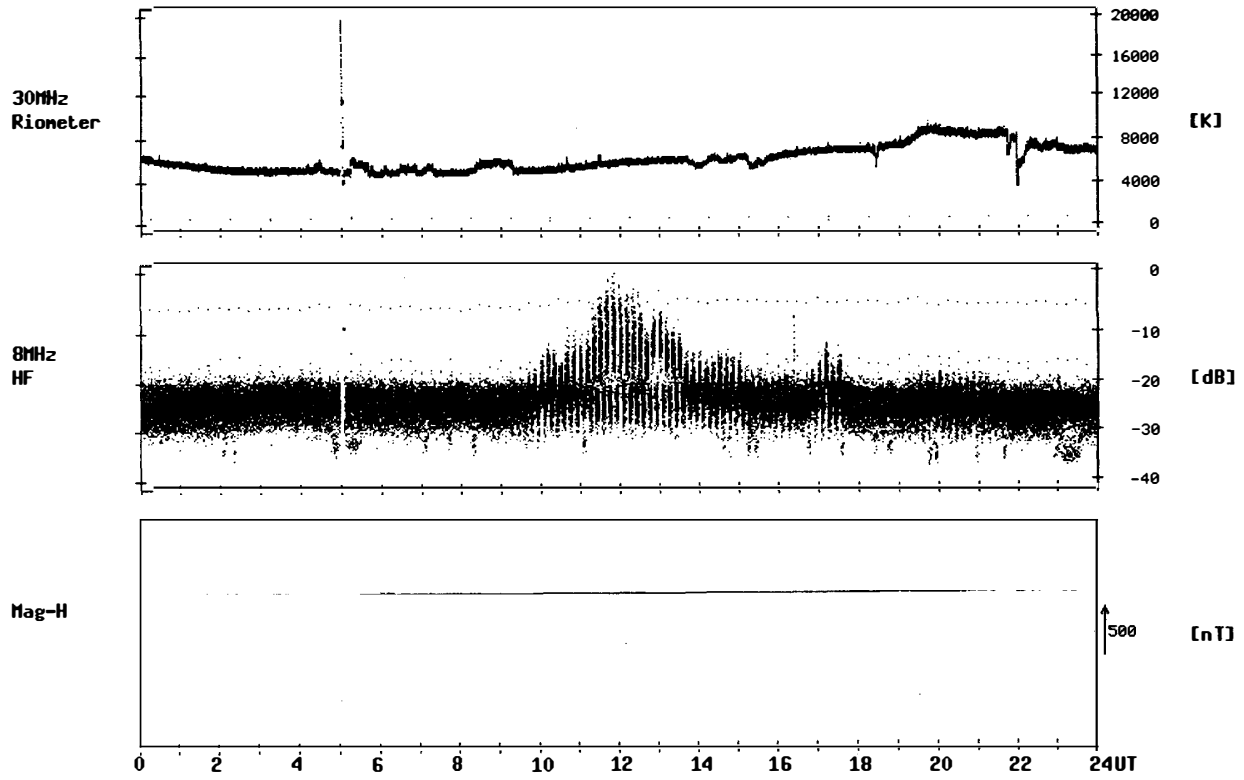
Syowa Station

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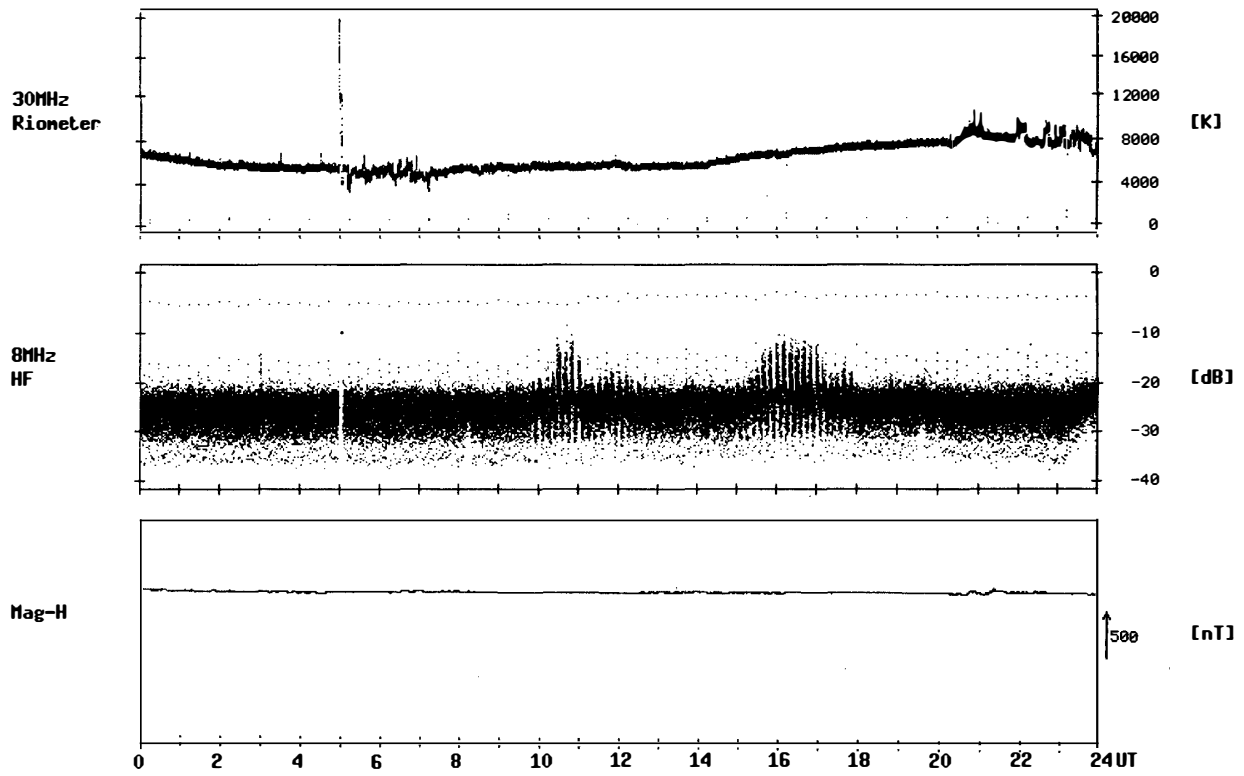
Syowa Station

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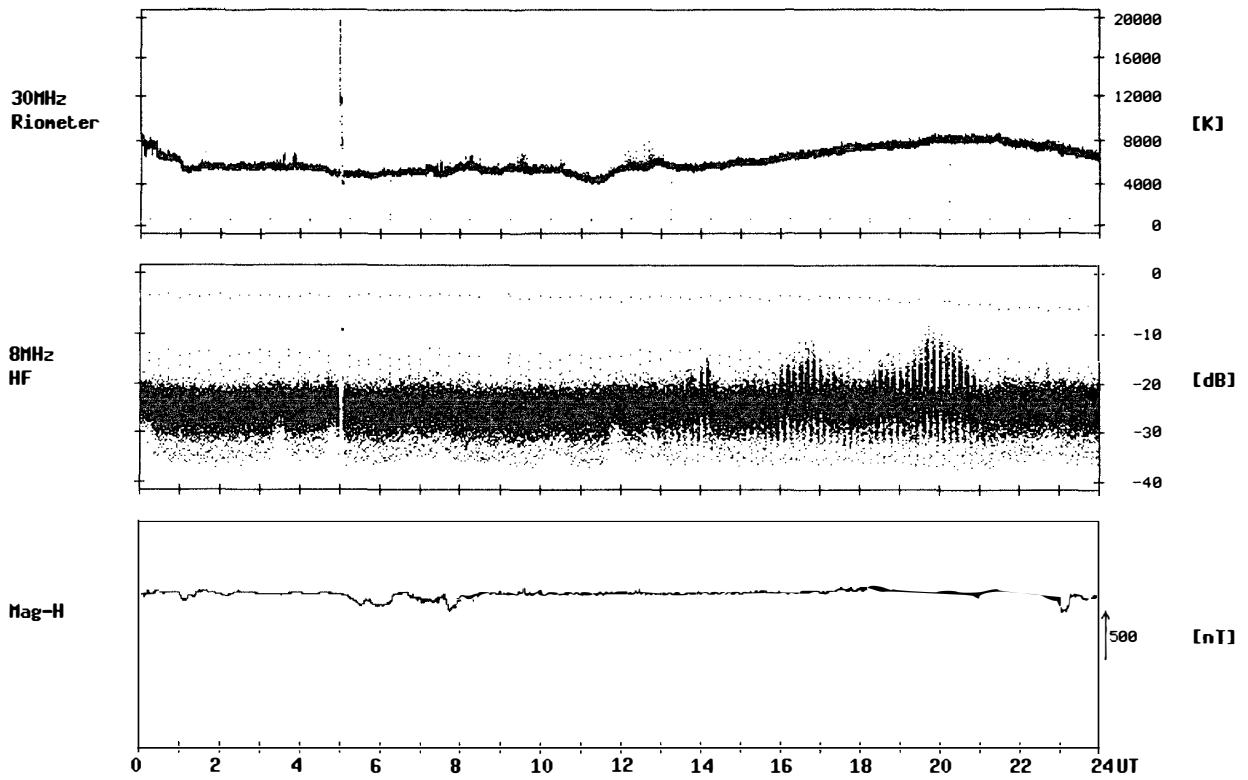
Syowa Station

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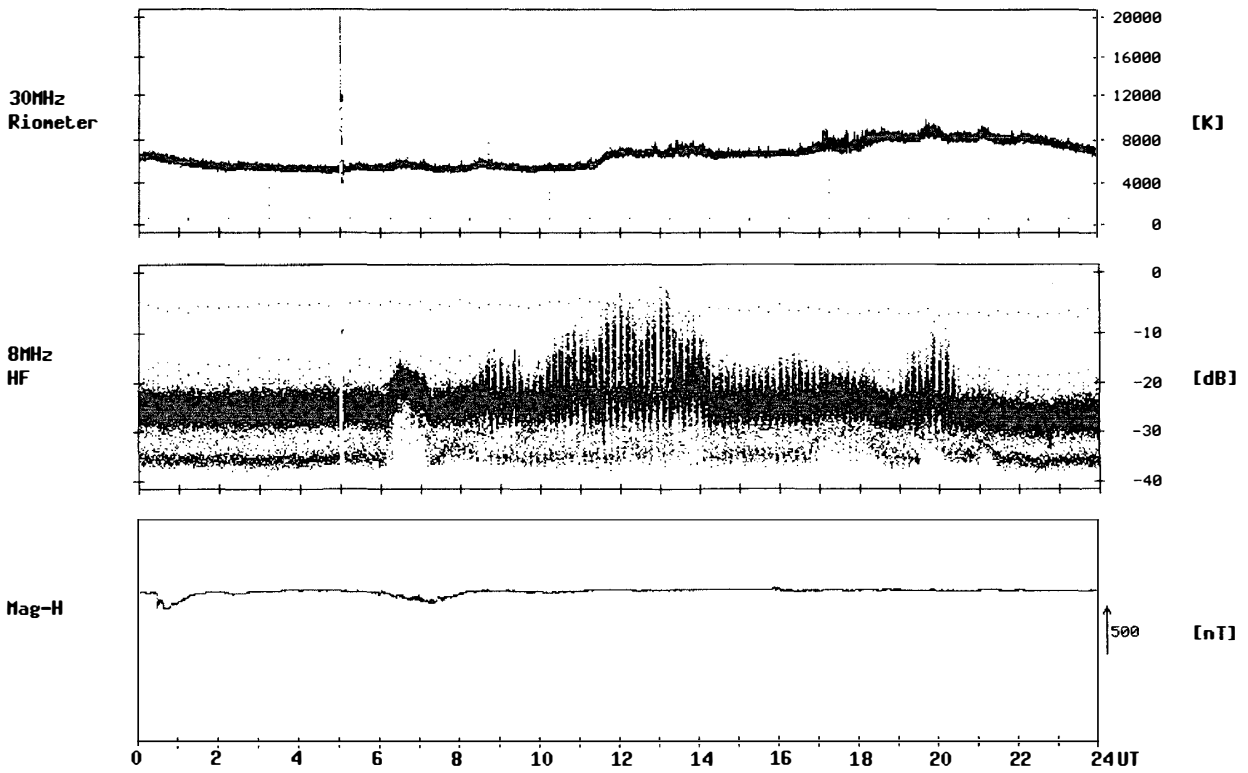
Syowa Station

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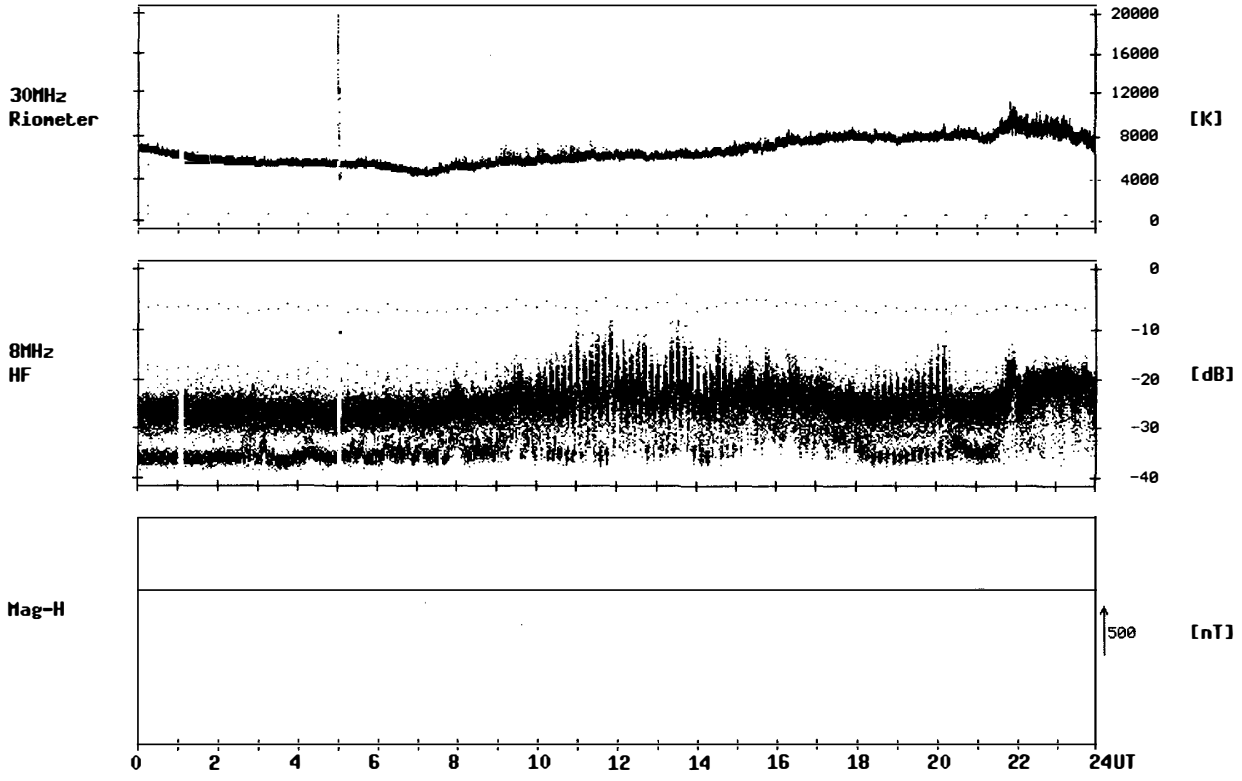
Syowa Station

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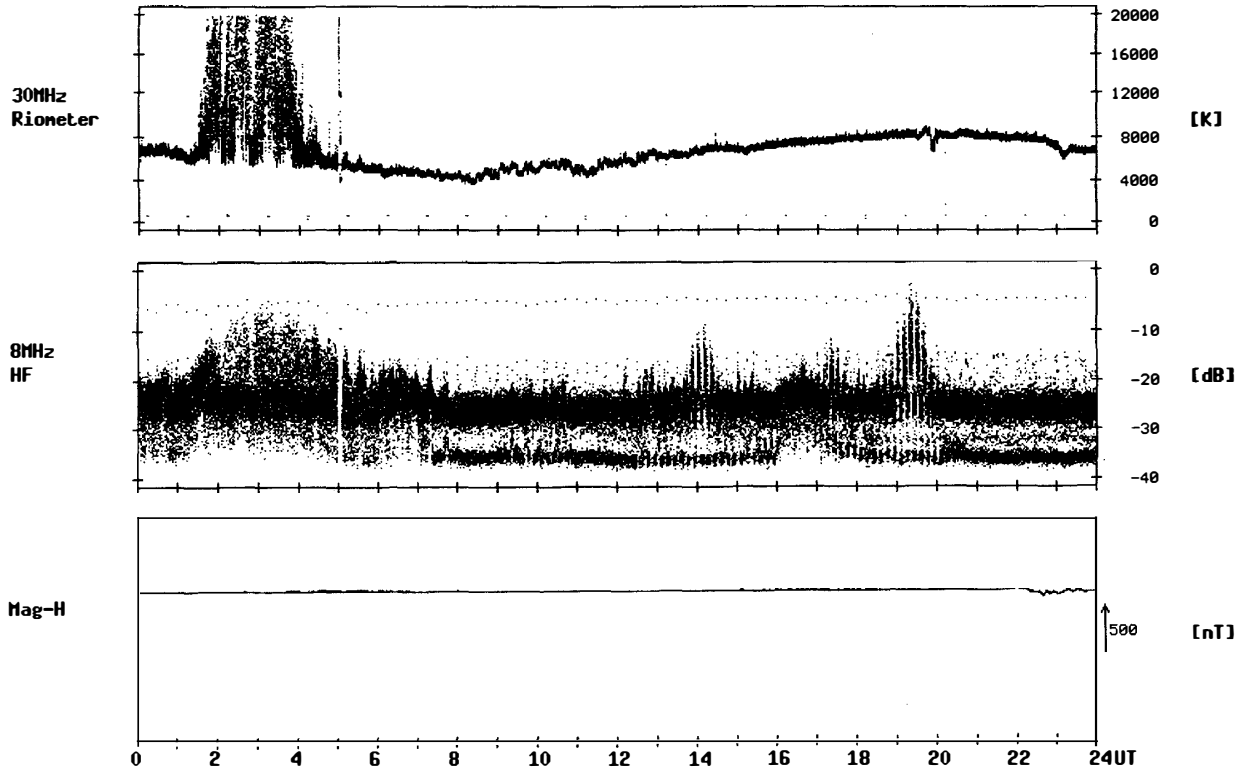
Syowa Station

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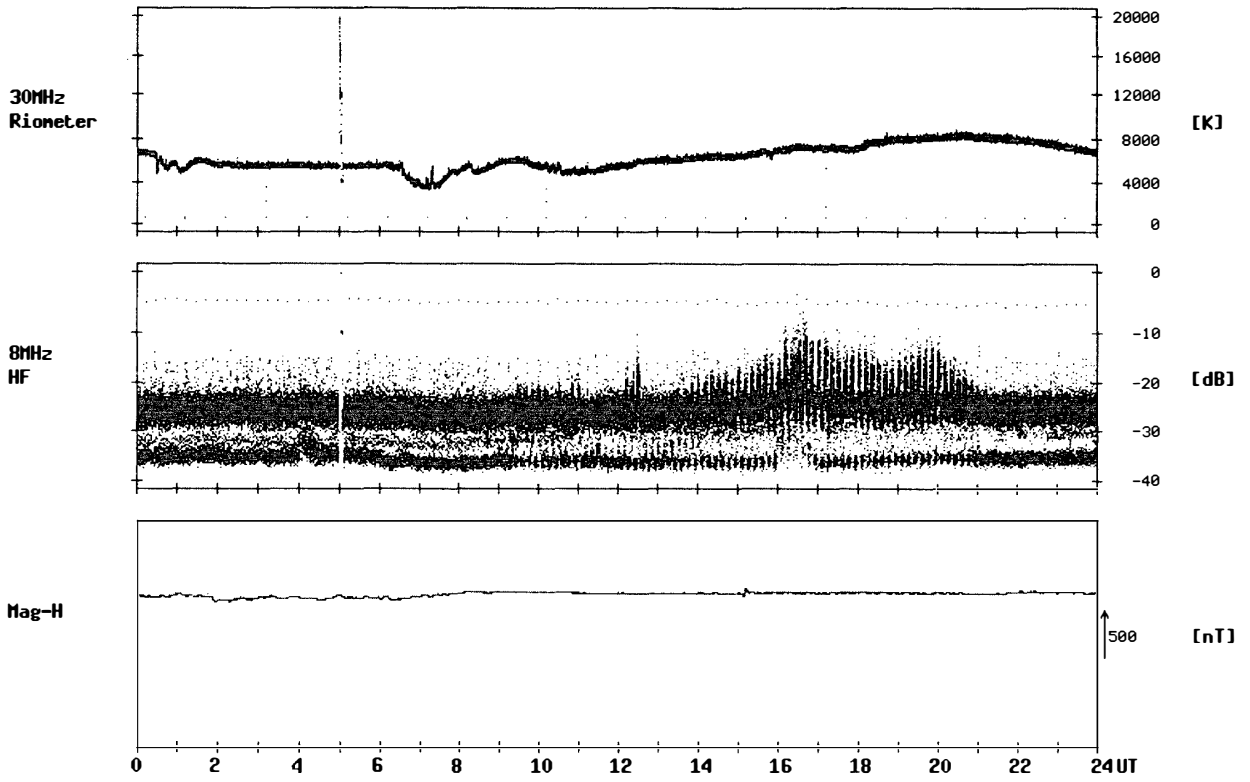
Syowa Station

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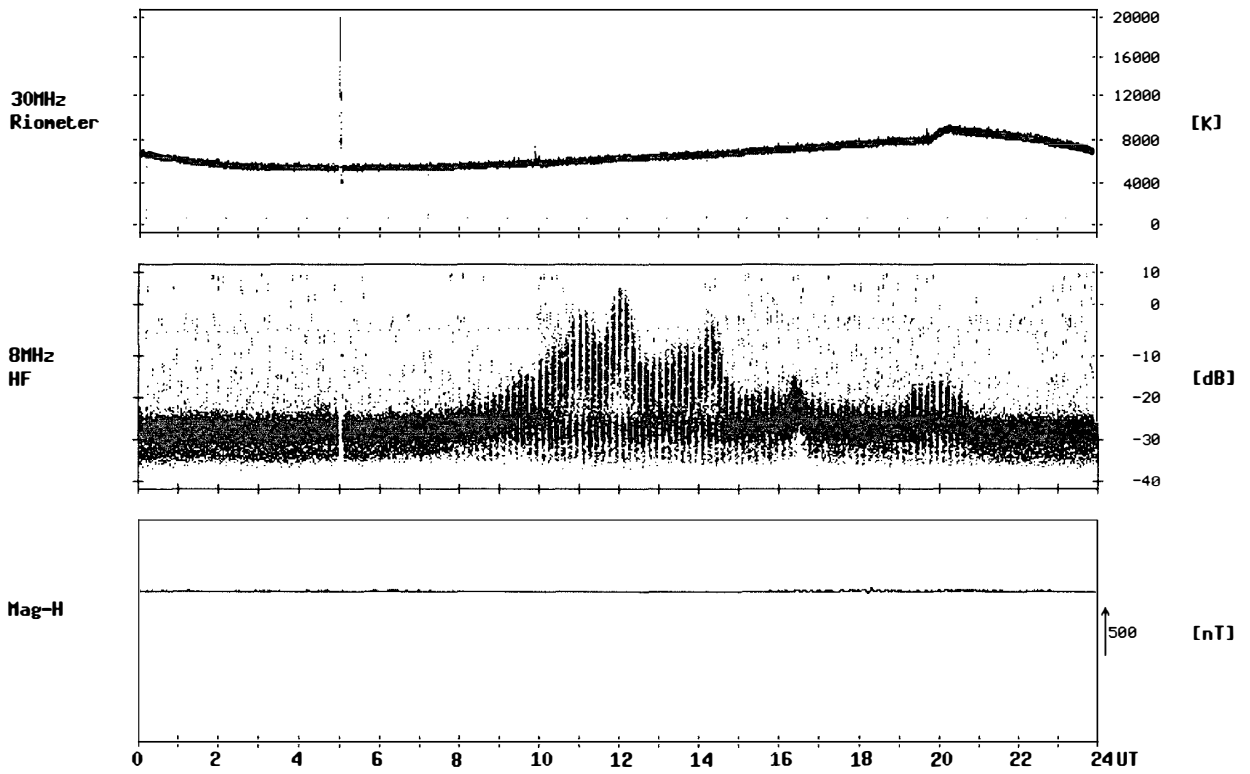
Syowa Station

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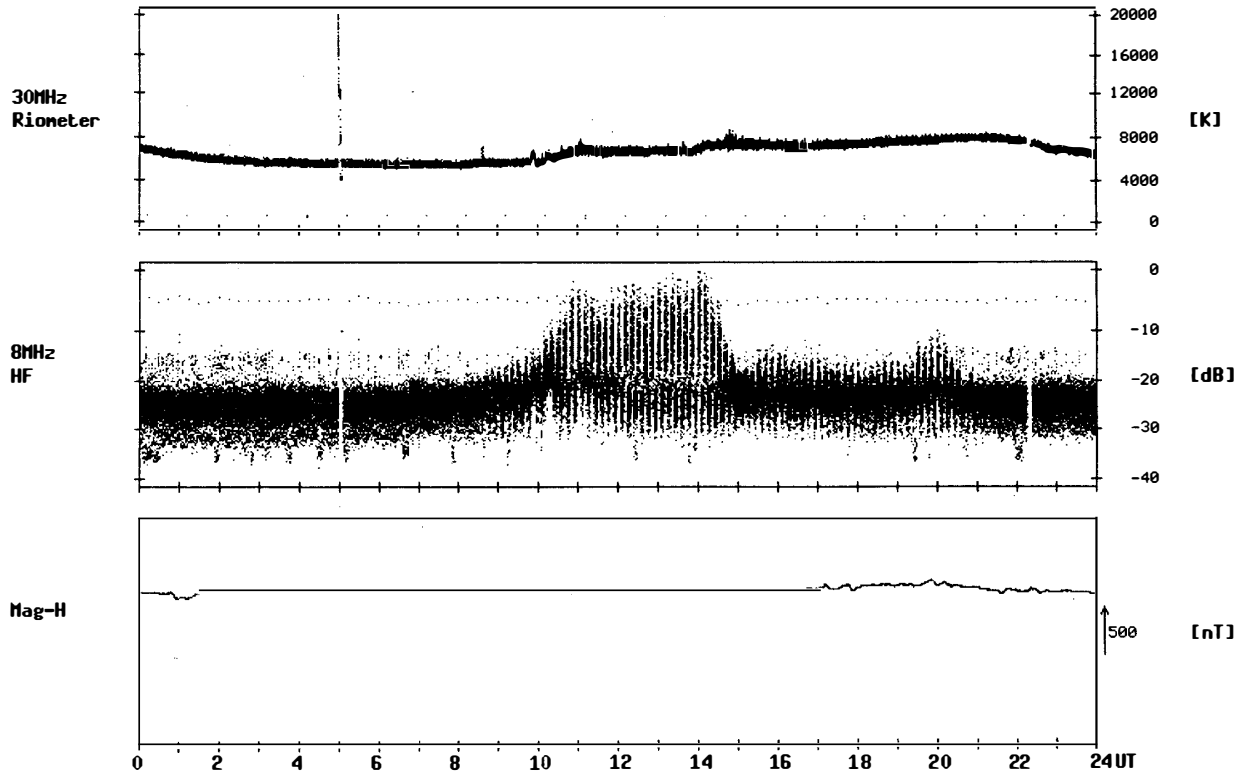
Syowa Station

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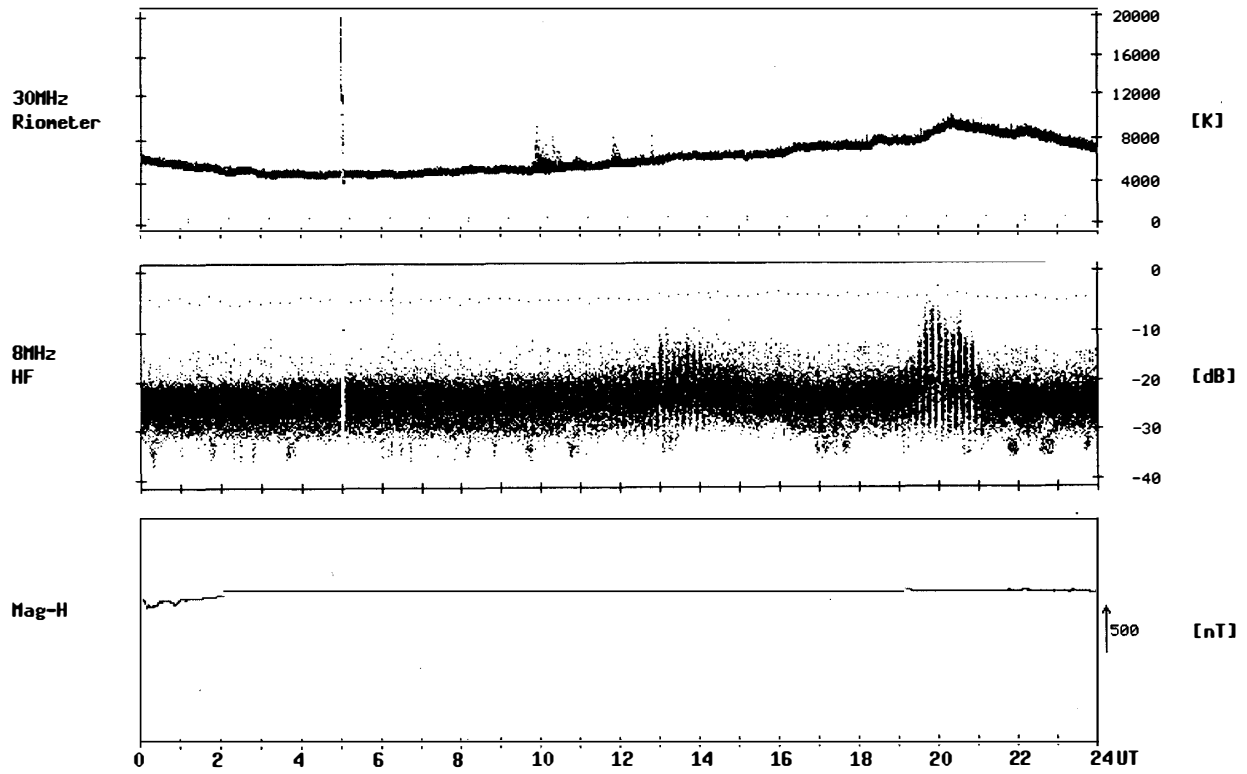
Syowa Station

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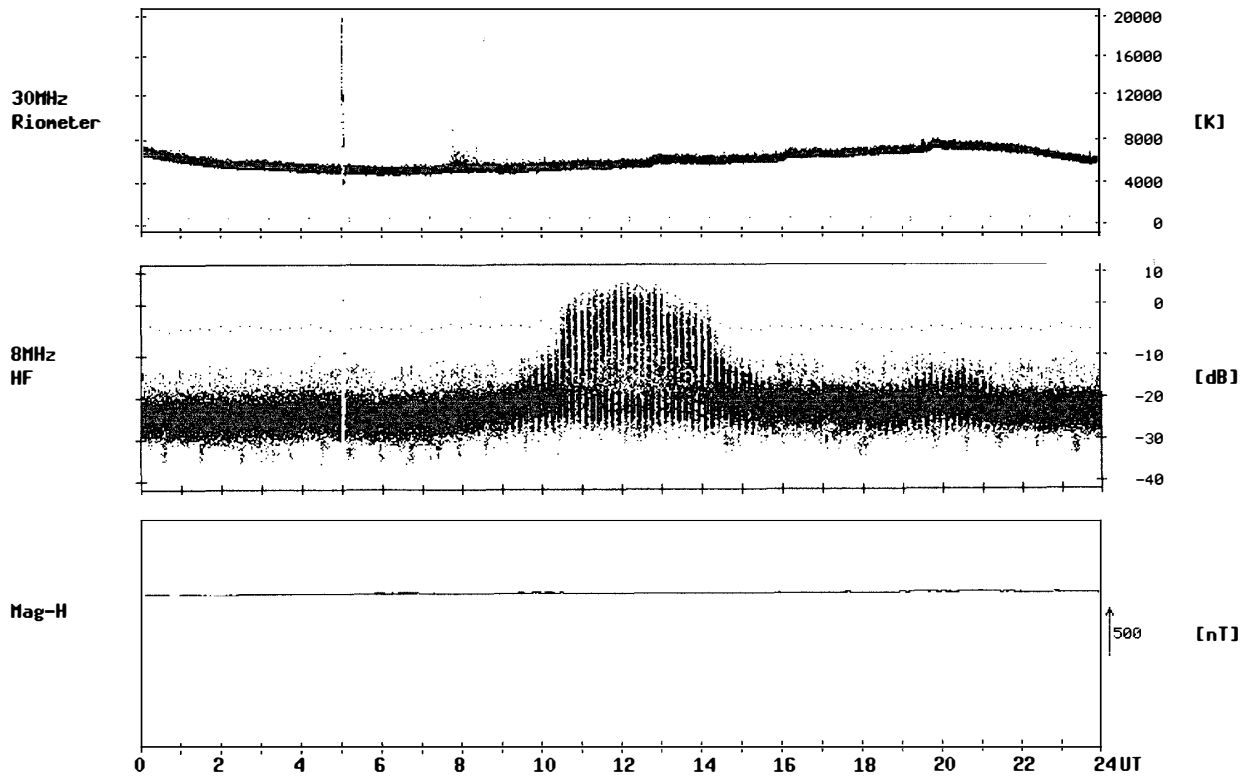
Syowa Station

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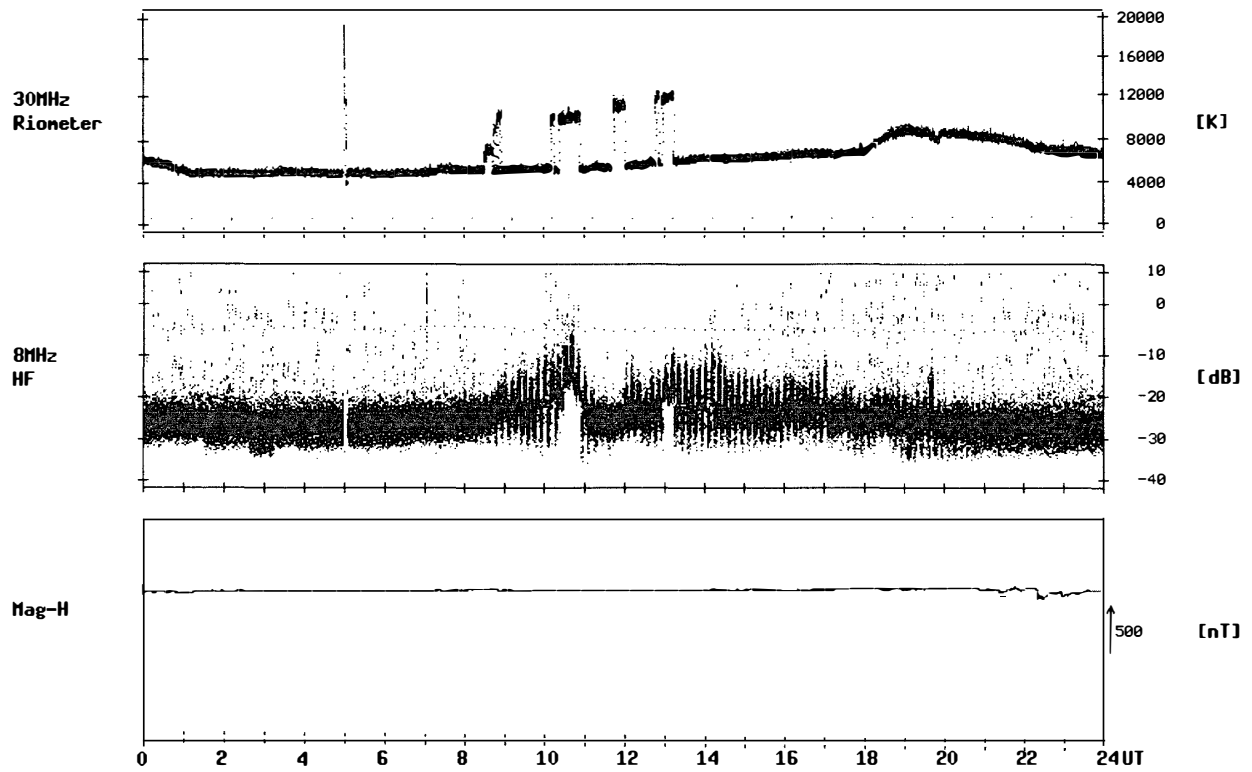
Syowa Station

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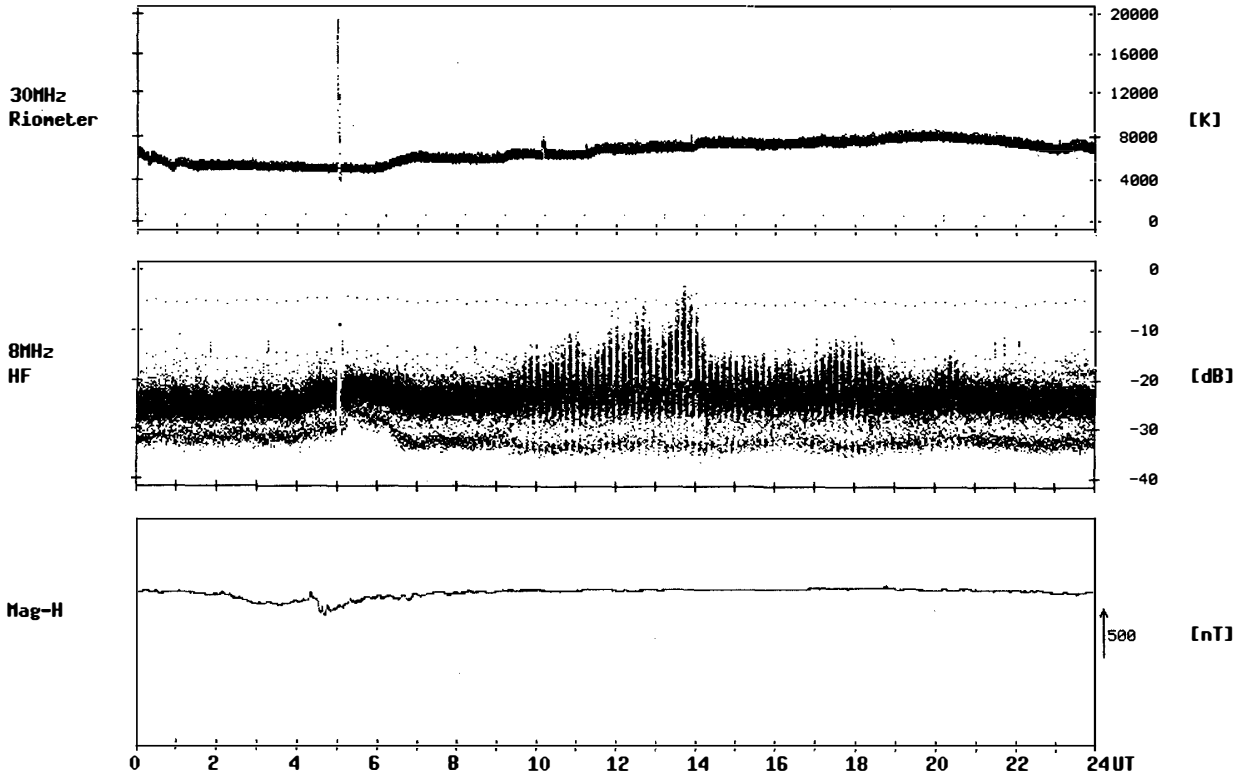
Syowa Station

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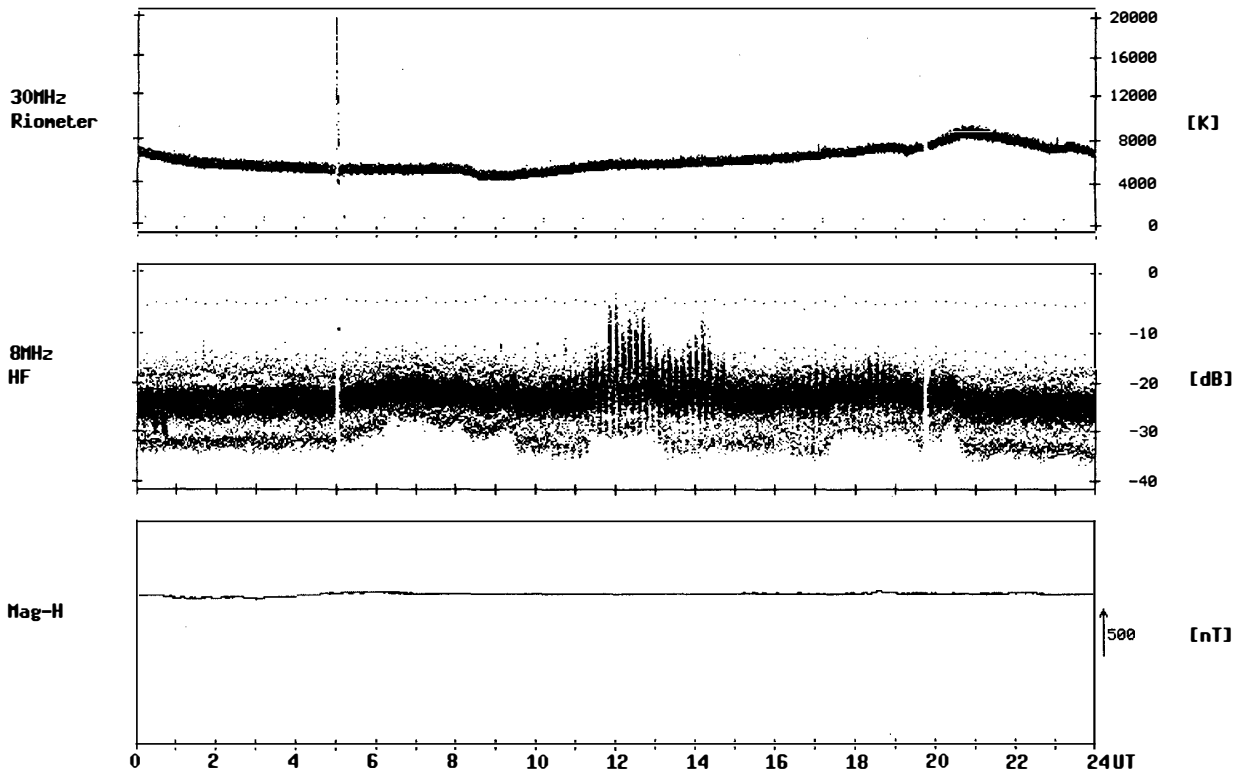
Syowa Station

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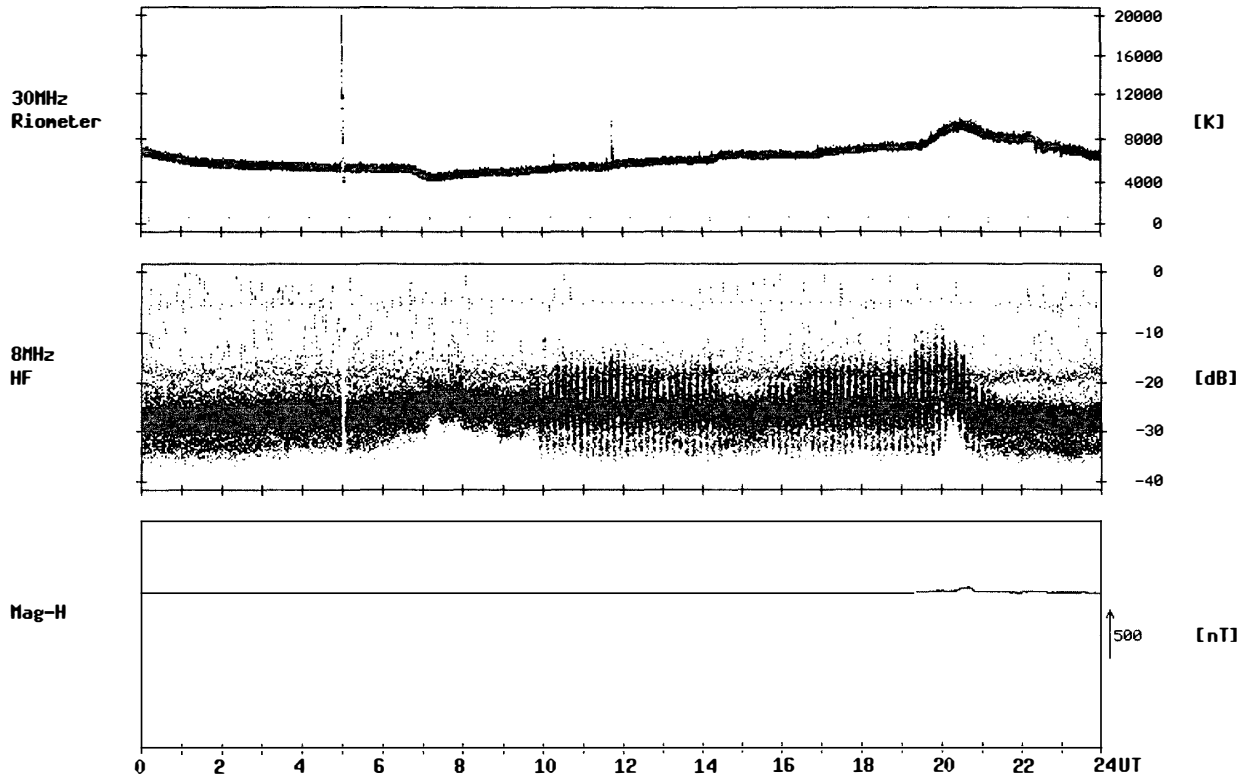
Syowa Station

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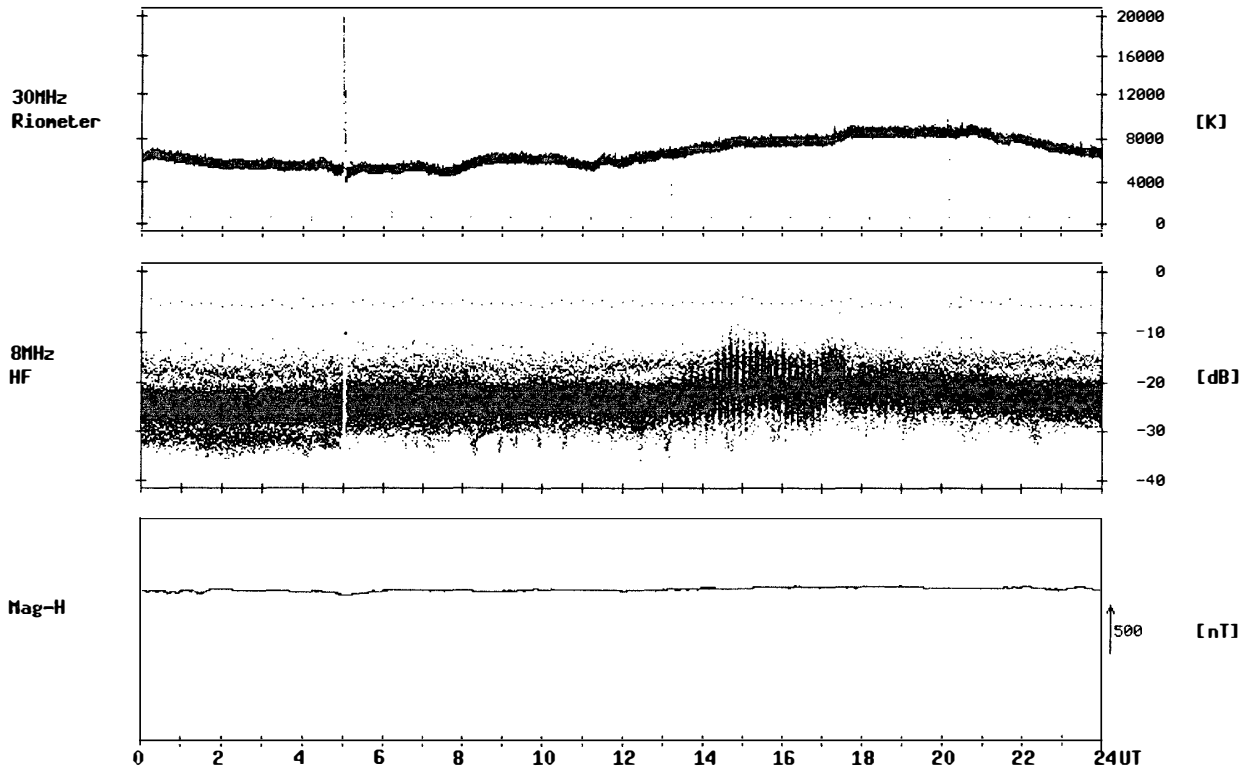
Syowa Station

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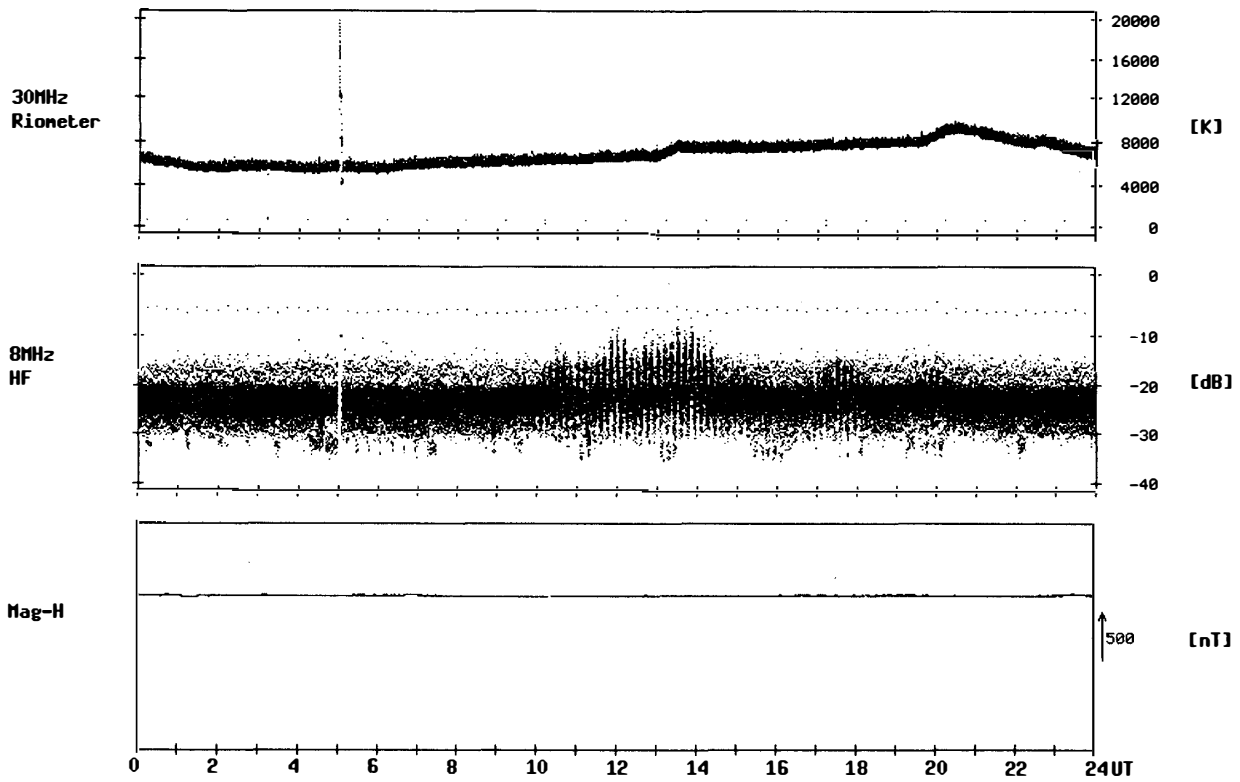
Syowa Station

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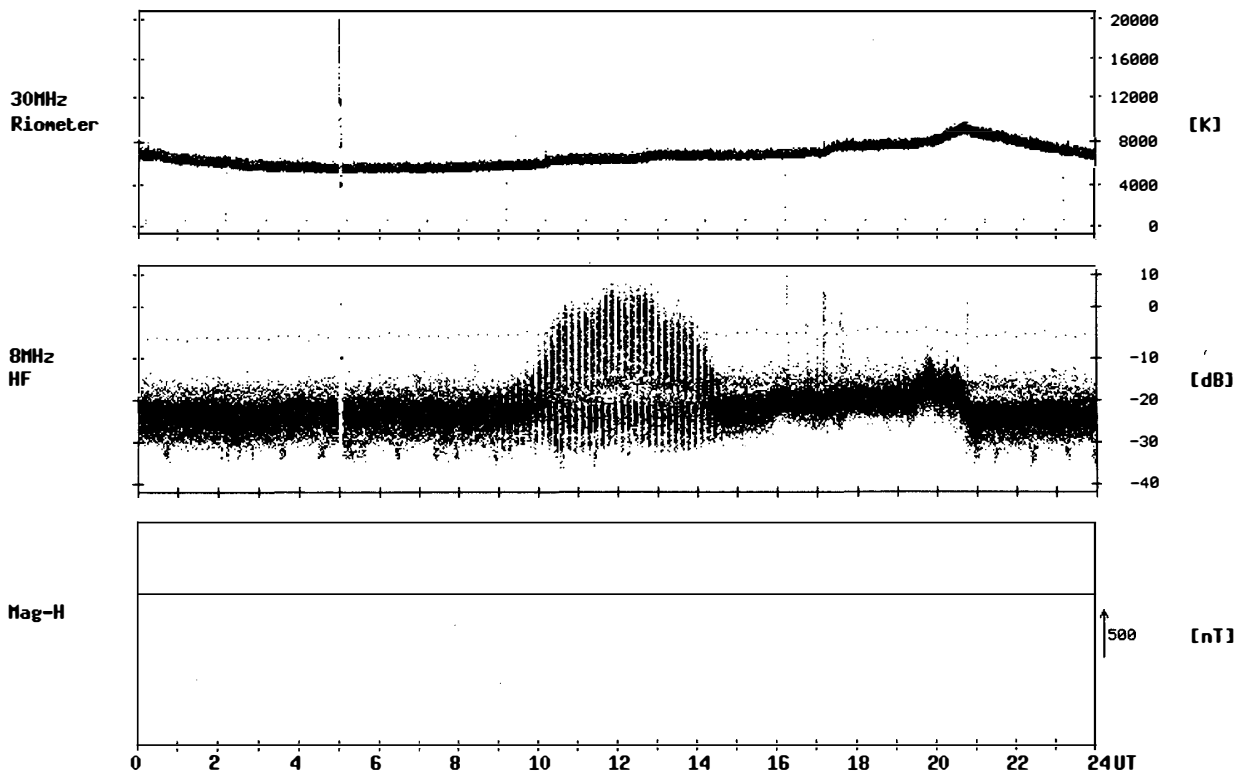
Syowa Station

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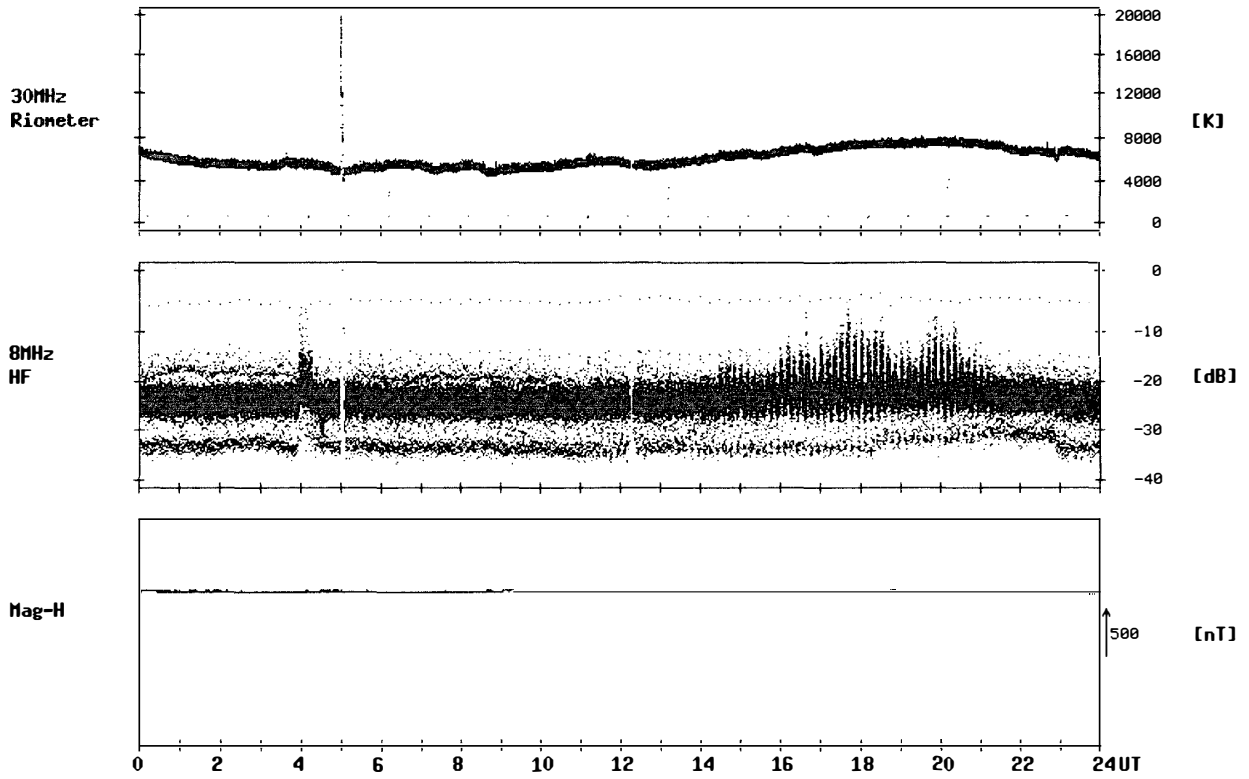
Syowa Station

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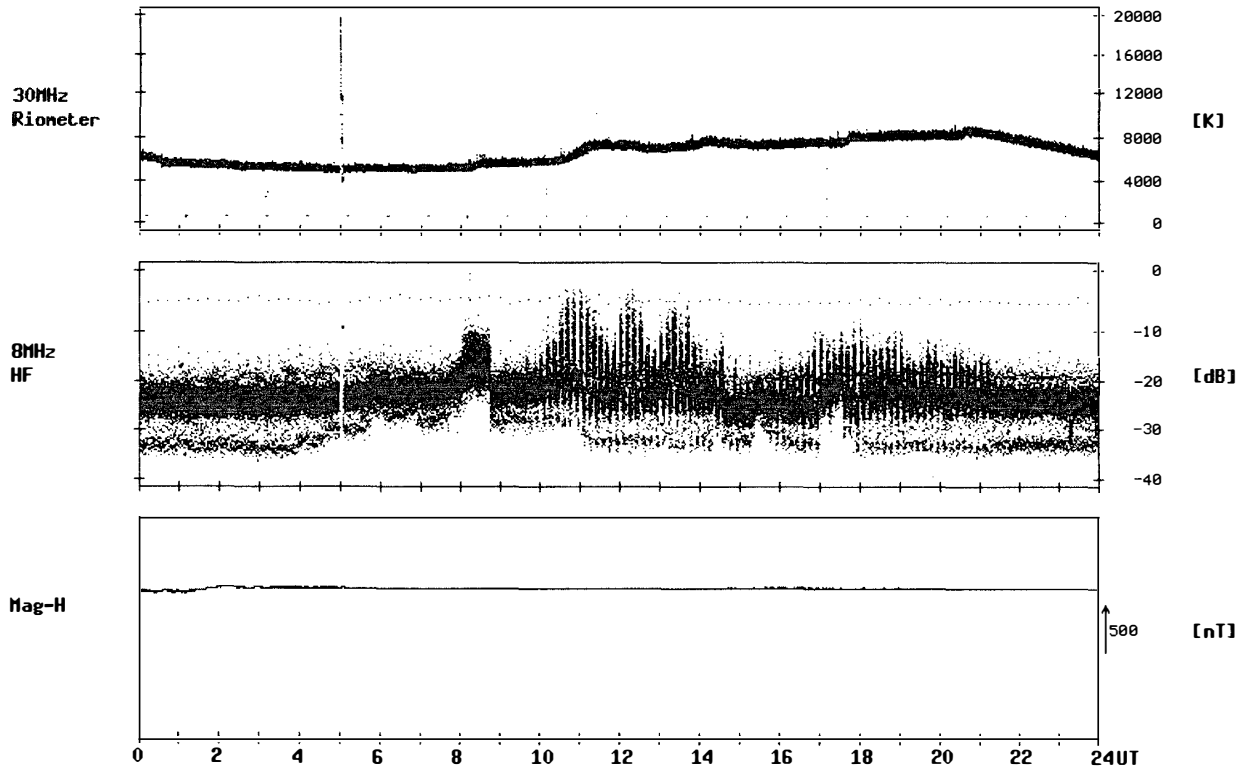
Syowa Station

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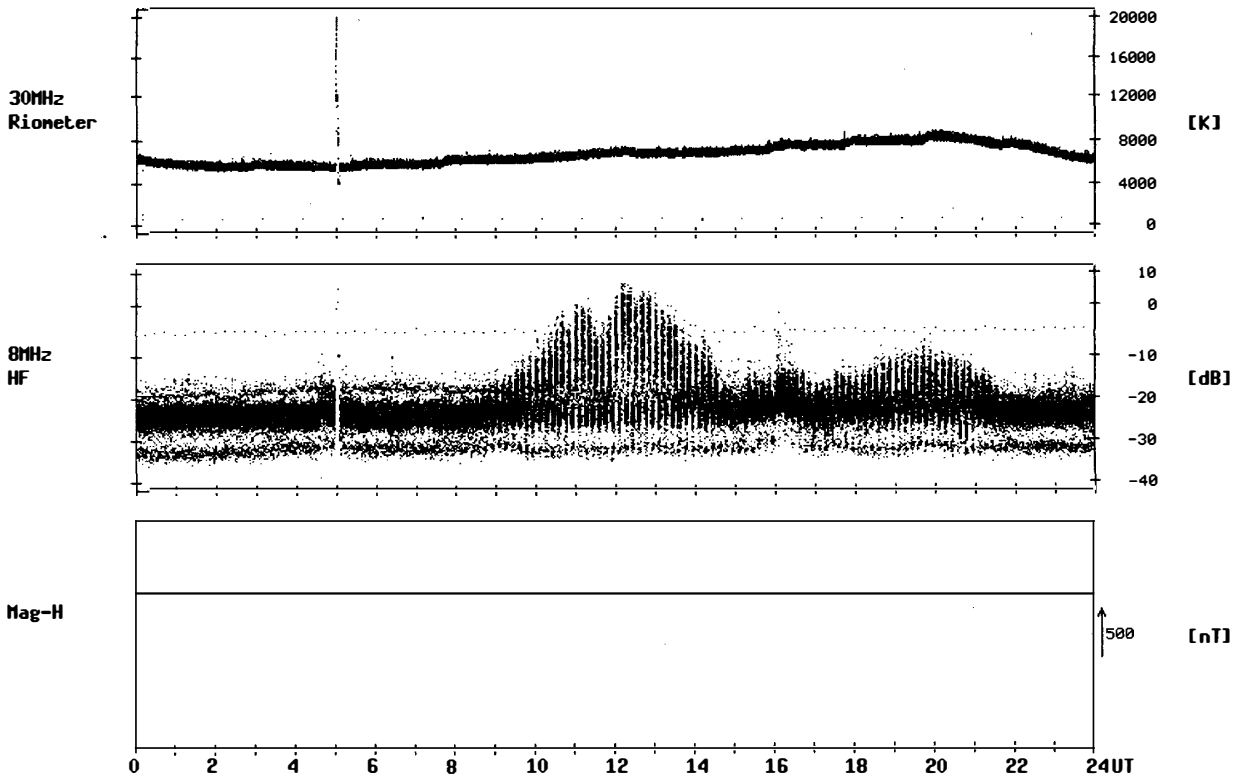
Syowa Station

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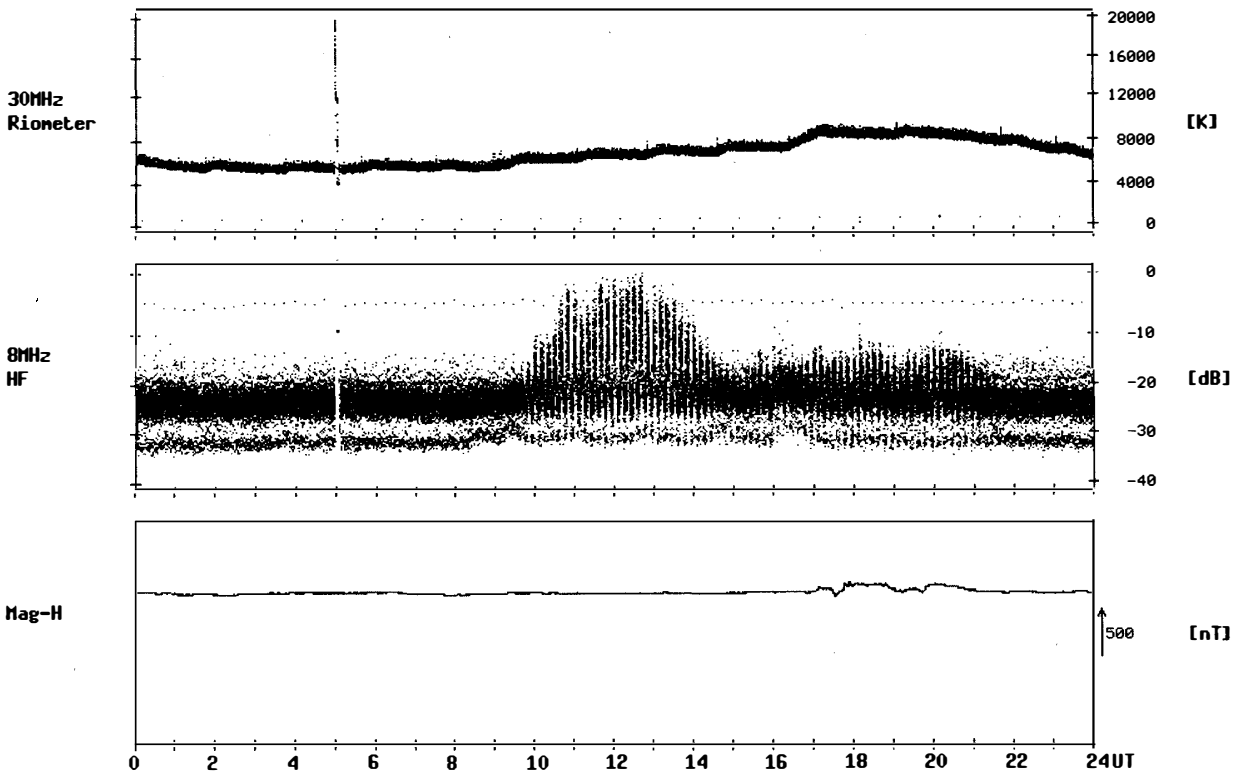
Syowa Station

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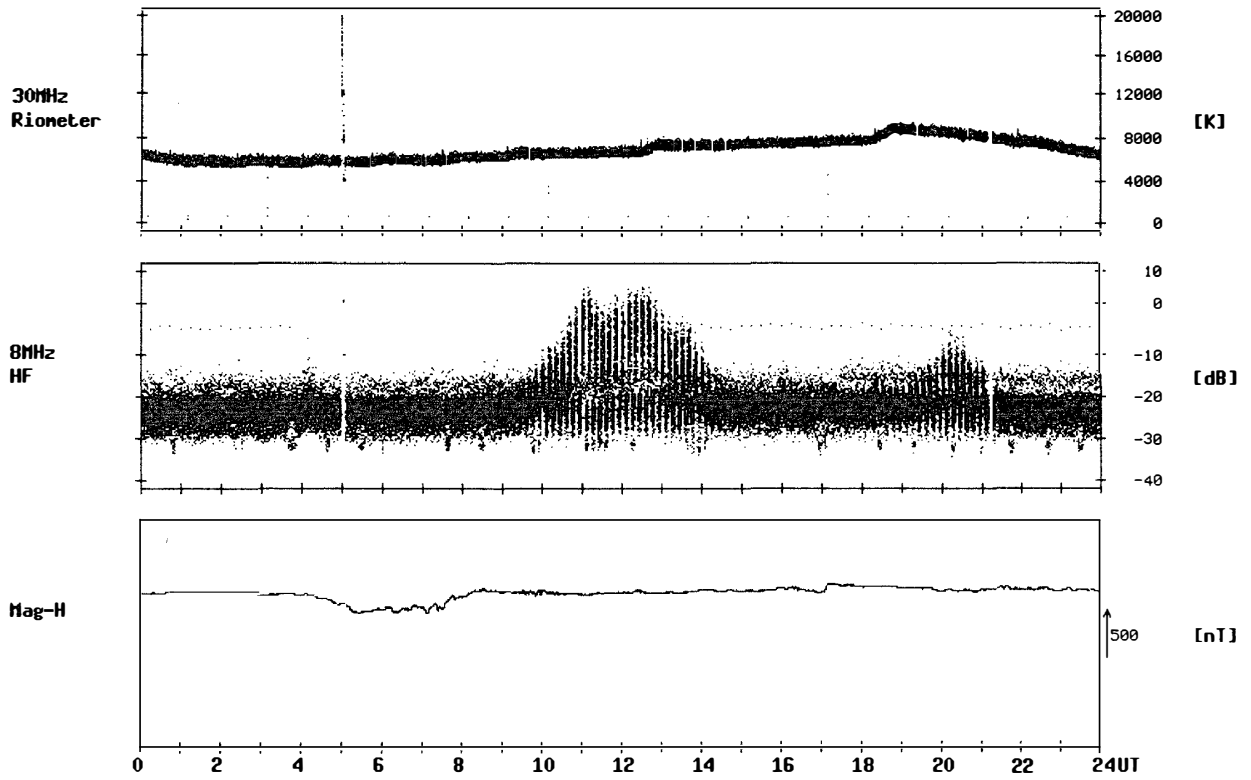
Syowa Station

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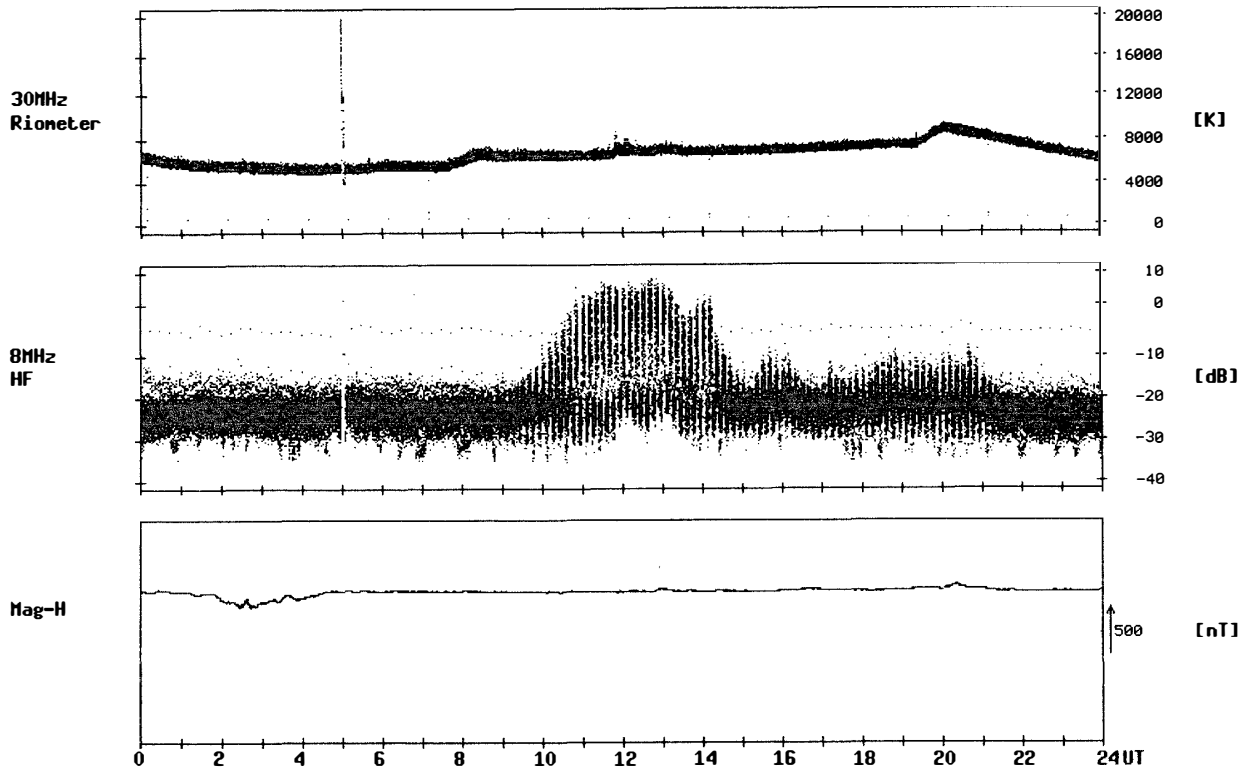
Syowa Station

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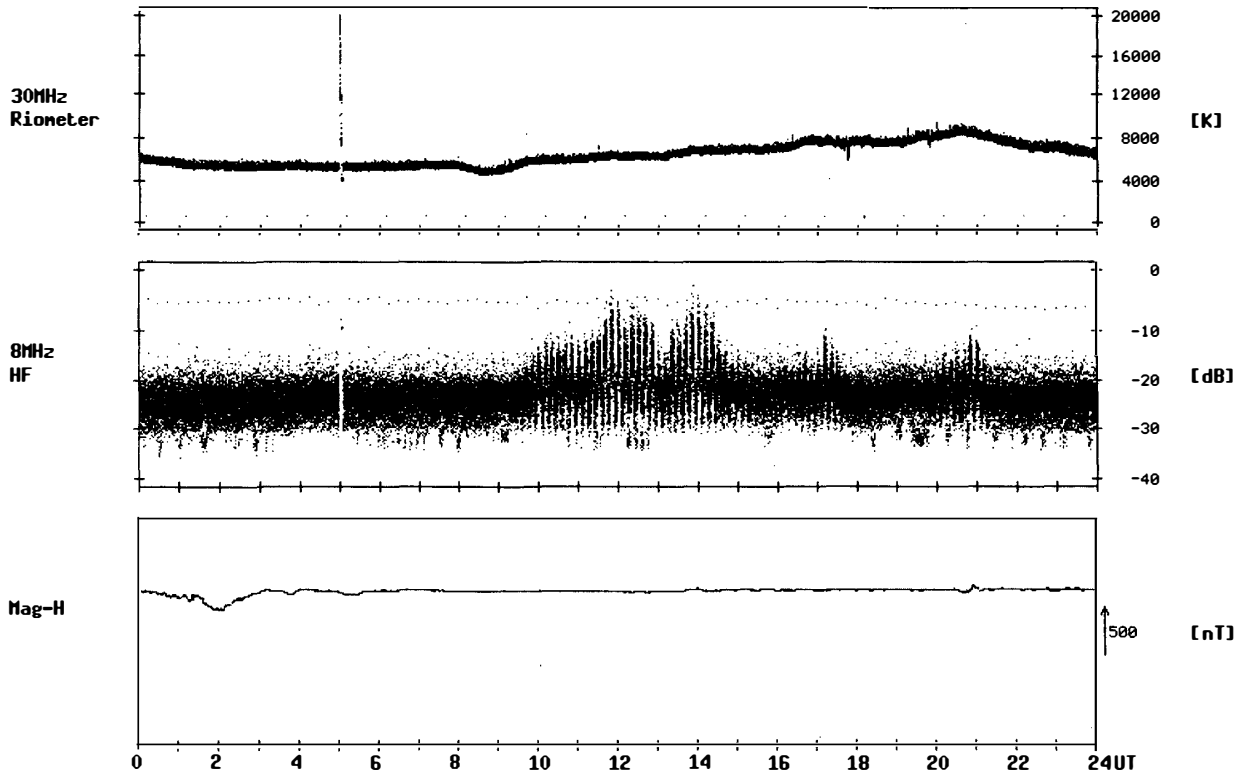
Syowa Station

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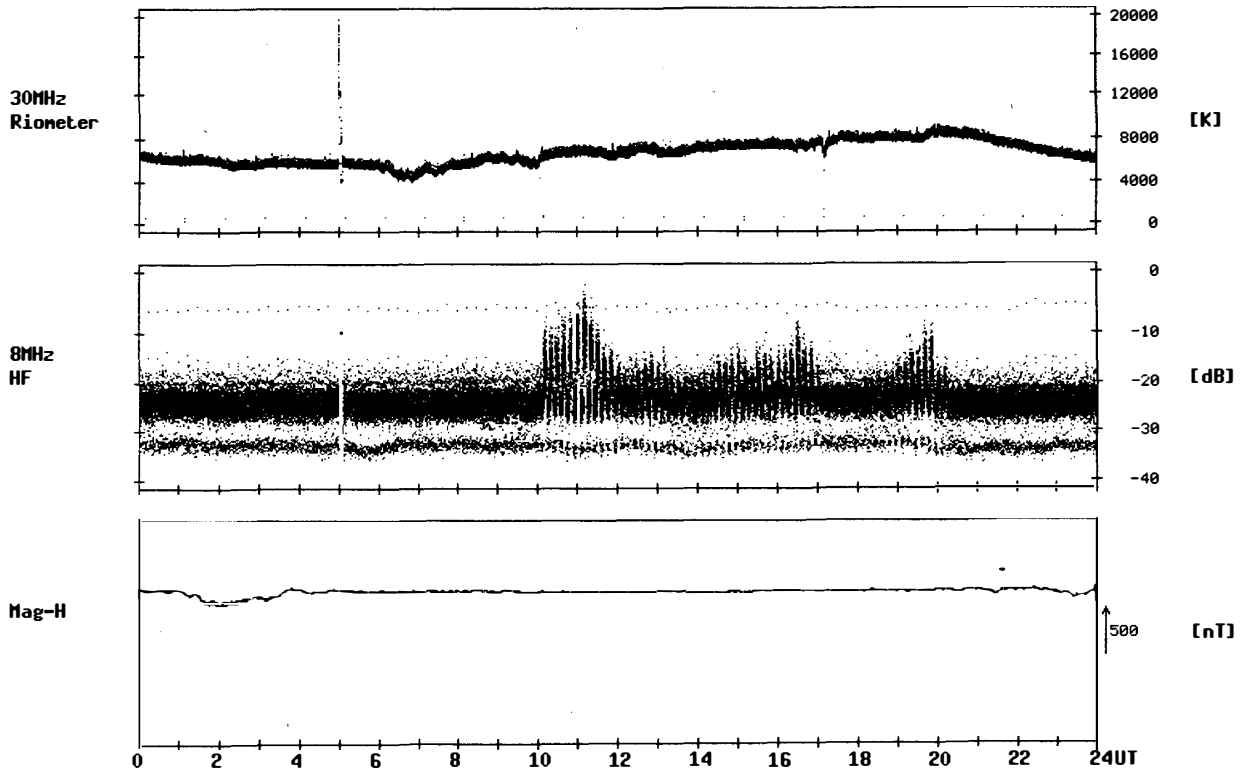
Syowa Station

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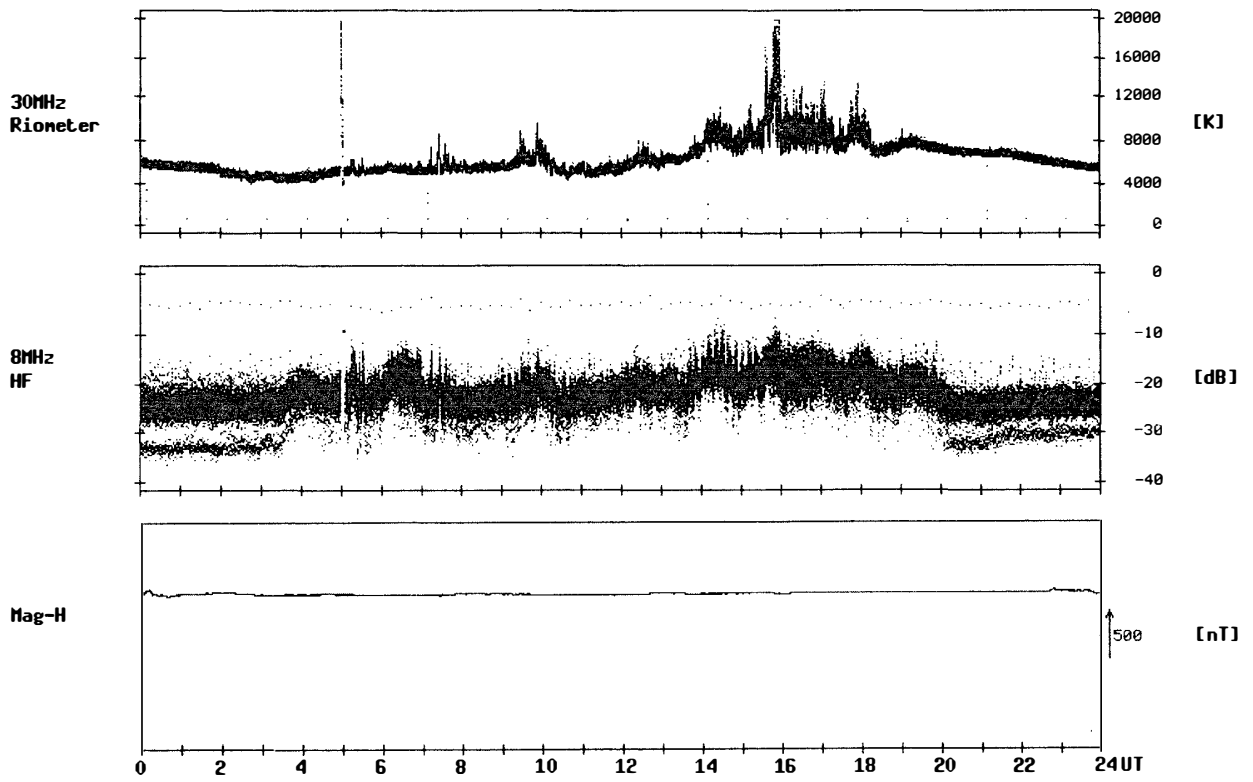
Syowa Station

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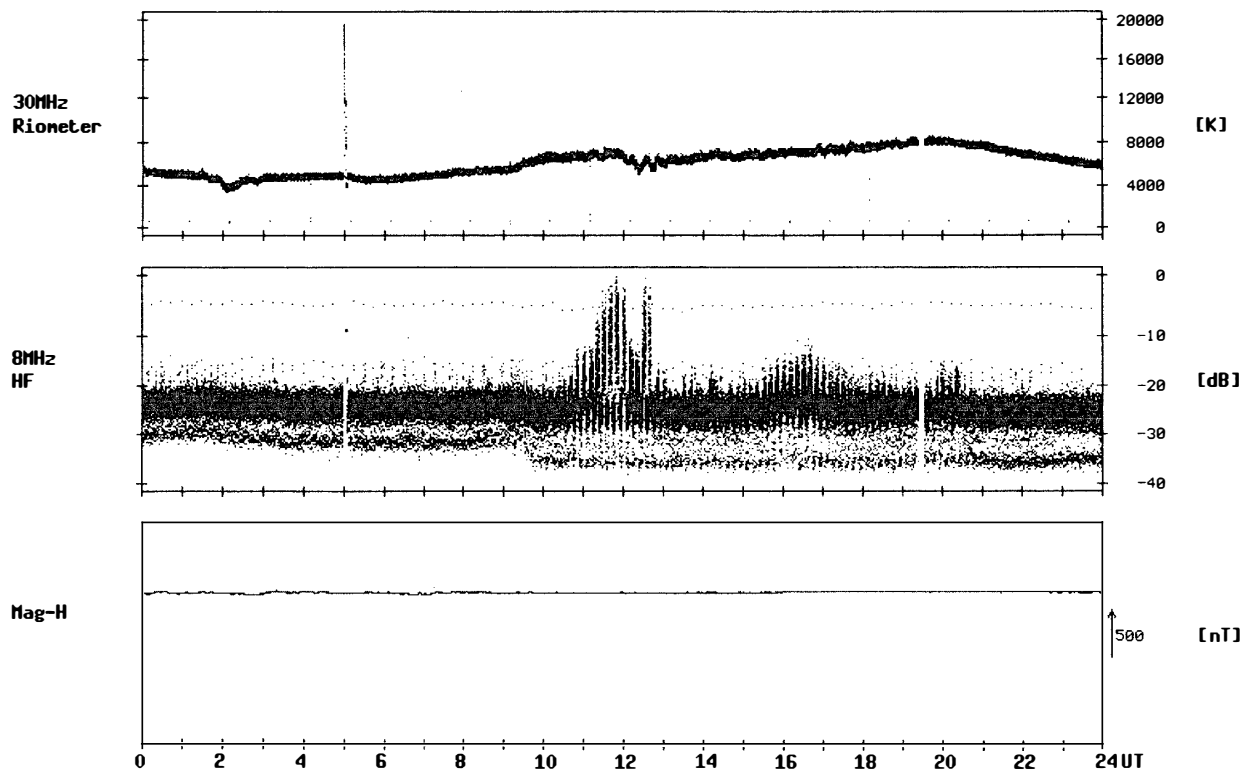
Syowa Station

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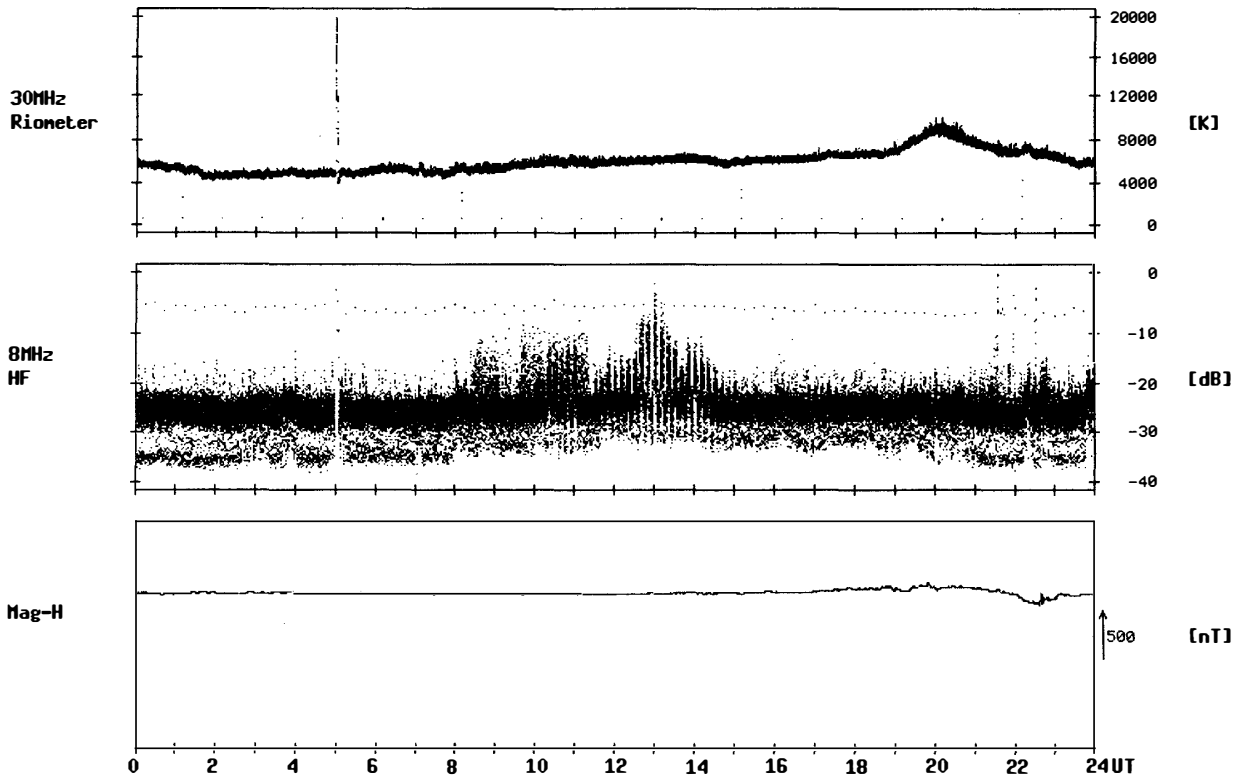
Syowa Station

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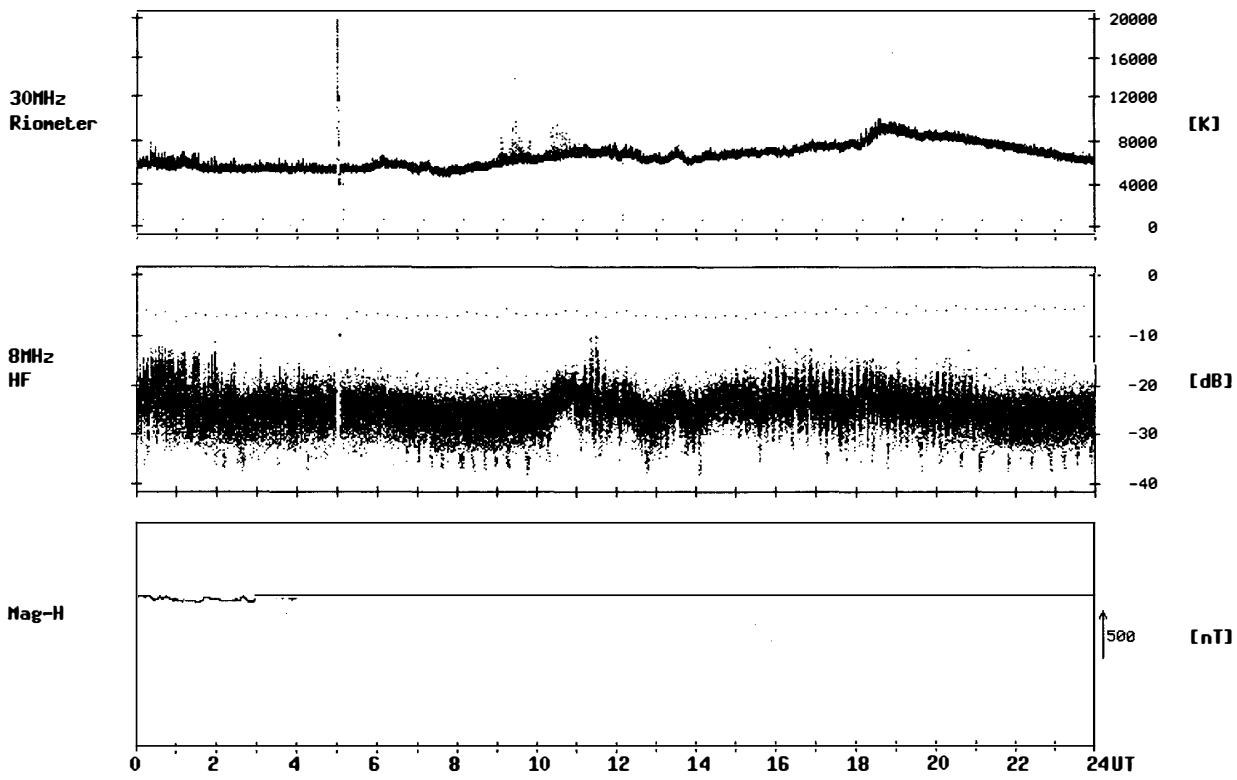
Syowa Station

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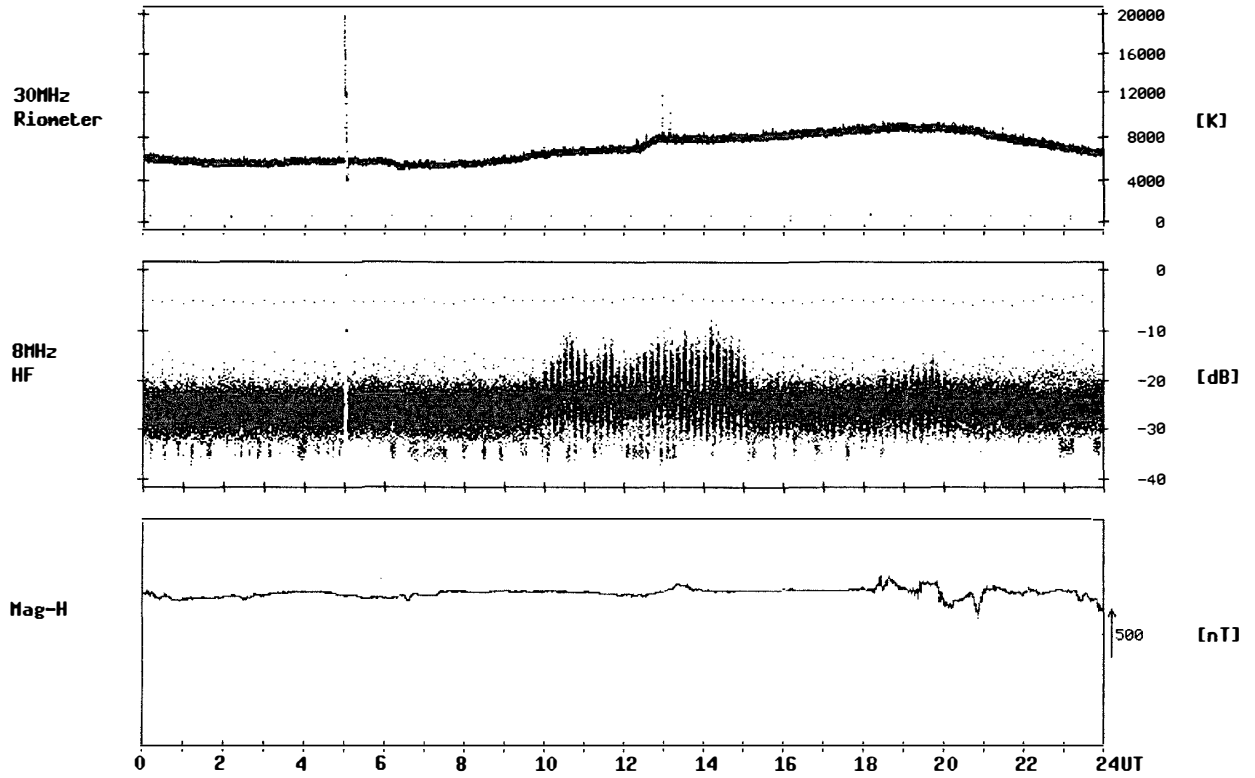
Syowa Station

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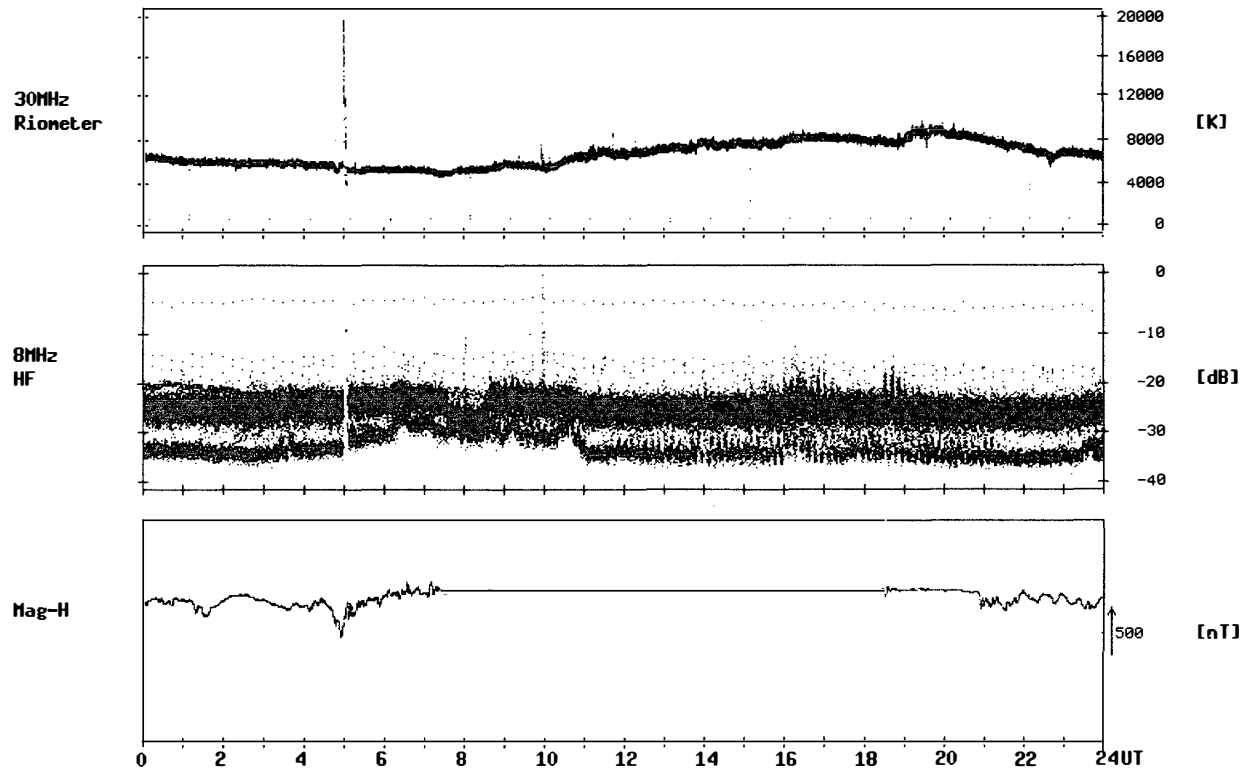
Syowa Station

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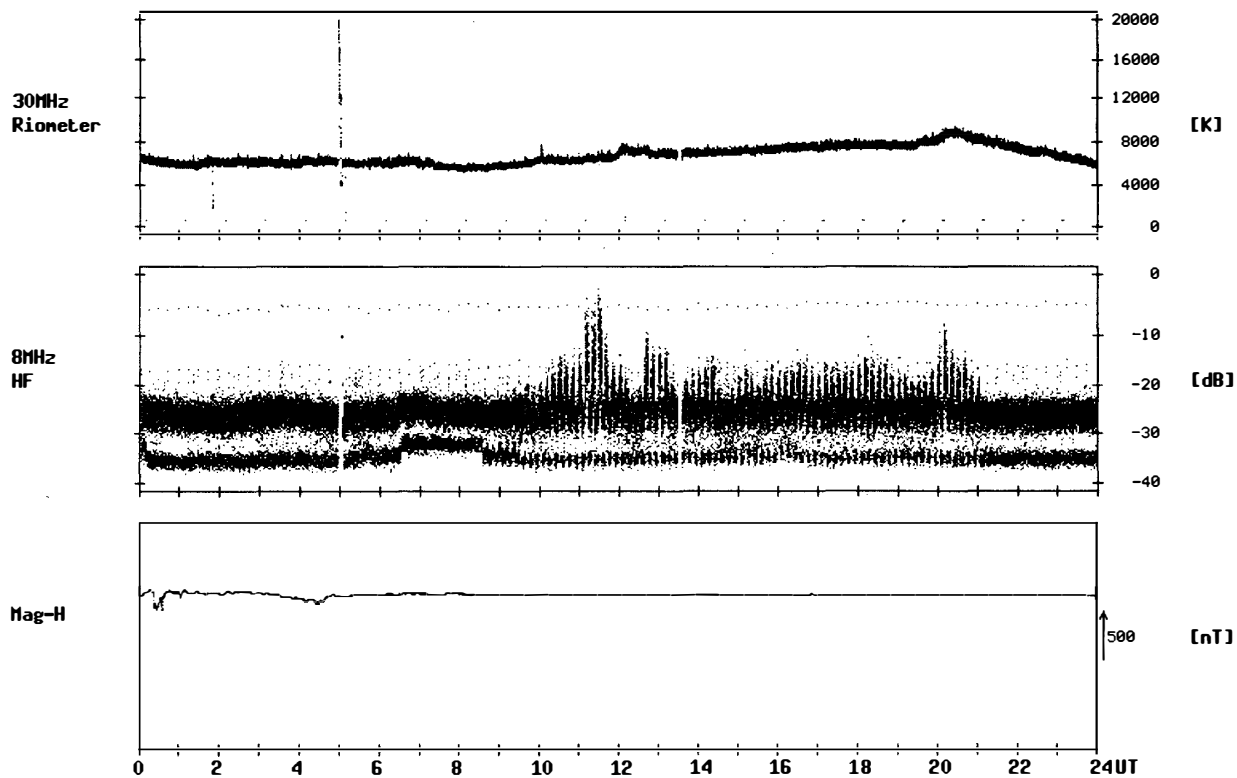
Syowa Station

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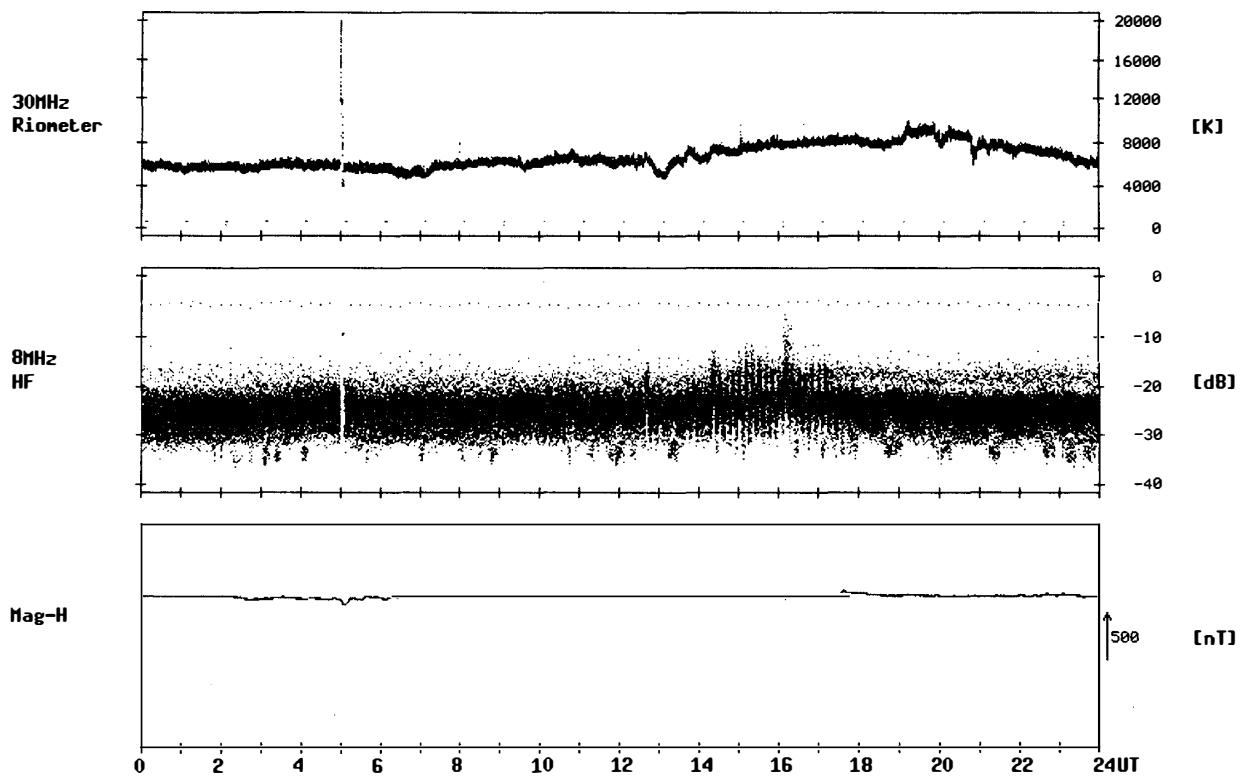
Syowa Station

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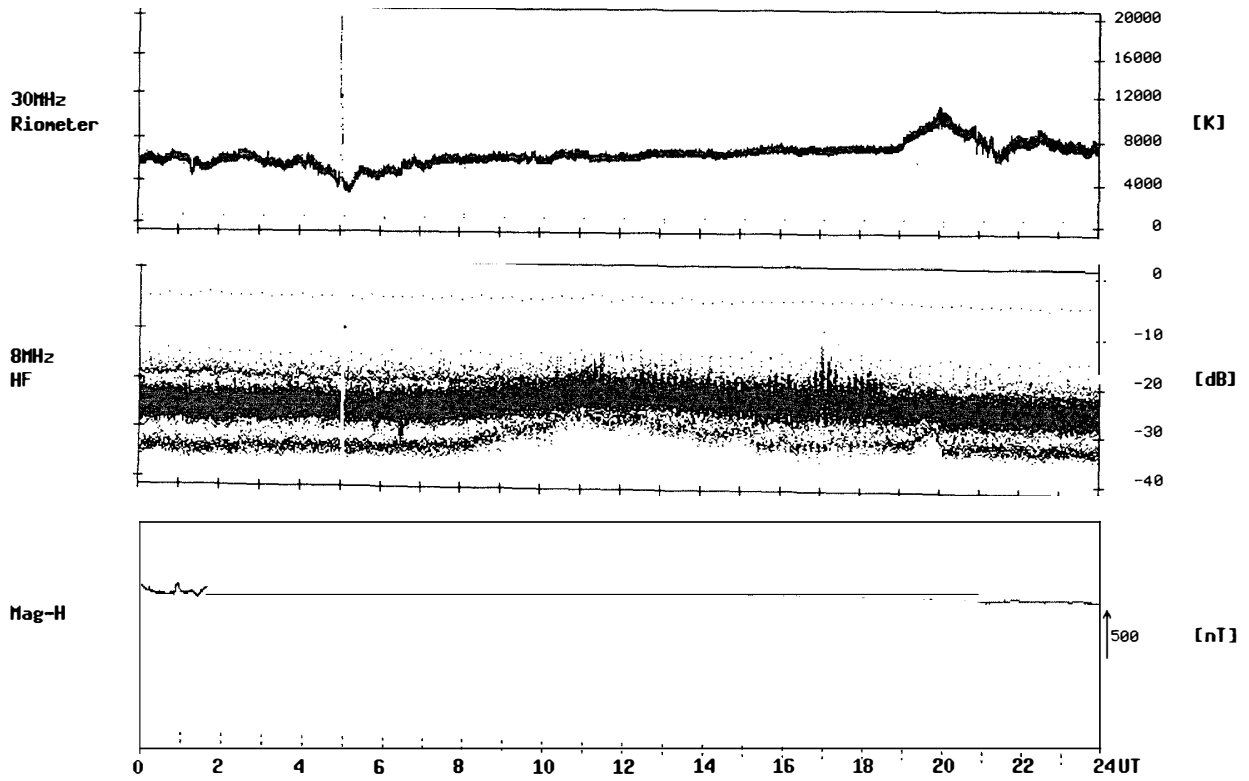
Syowa Station

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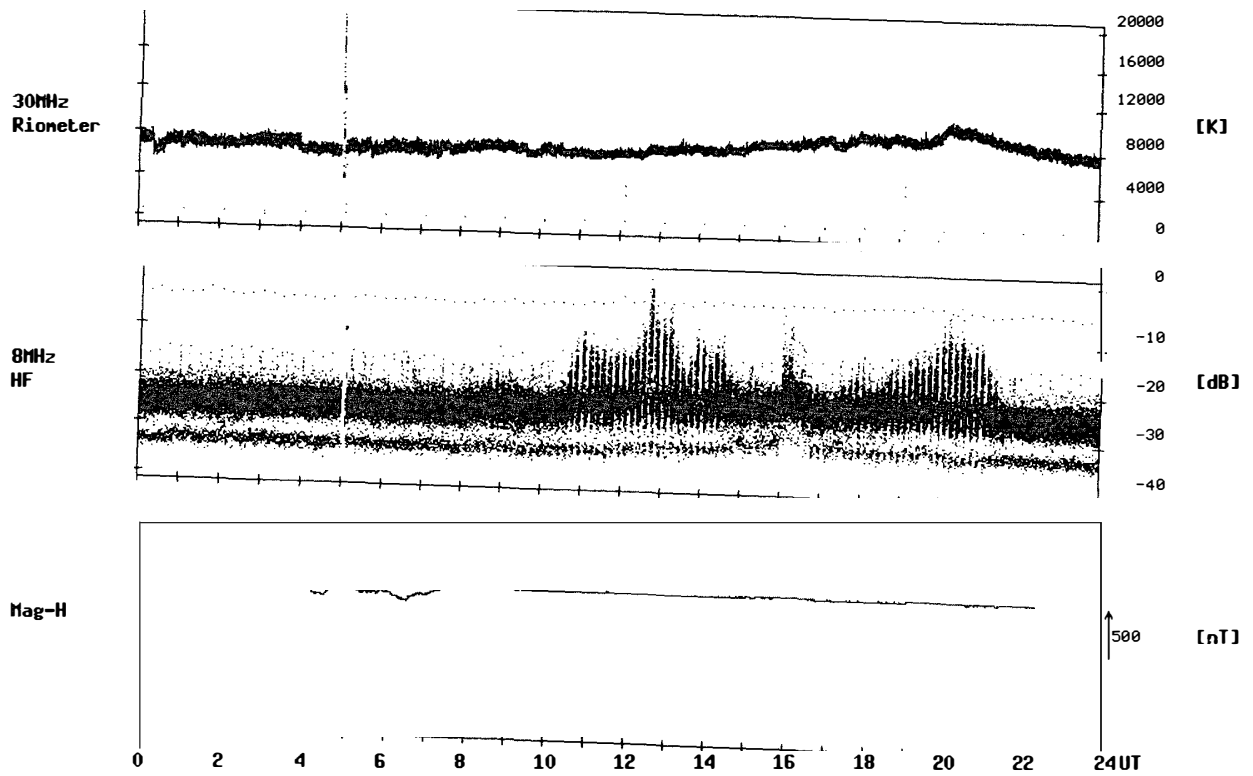
Syowa Station

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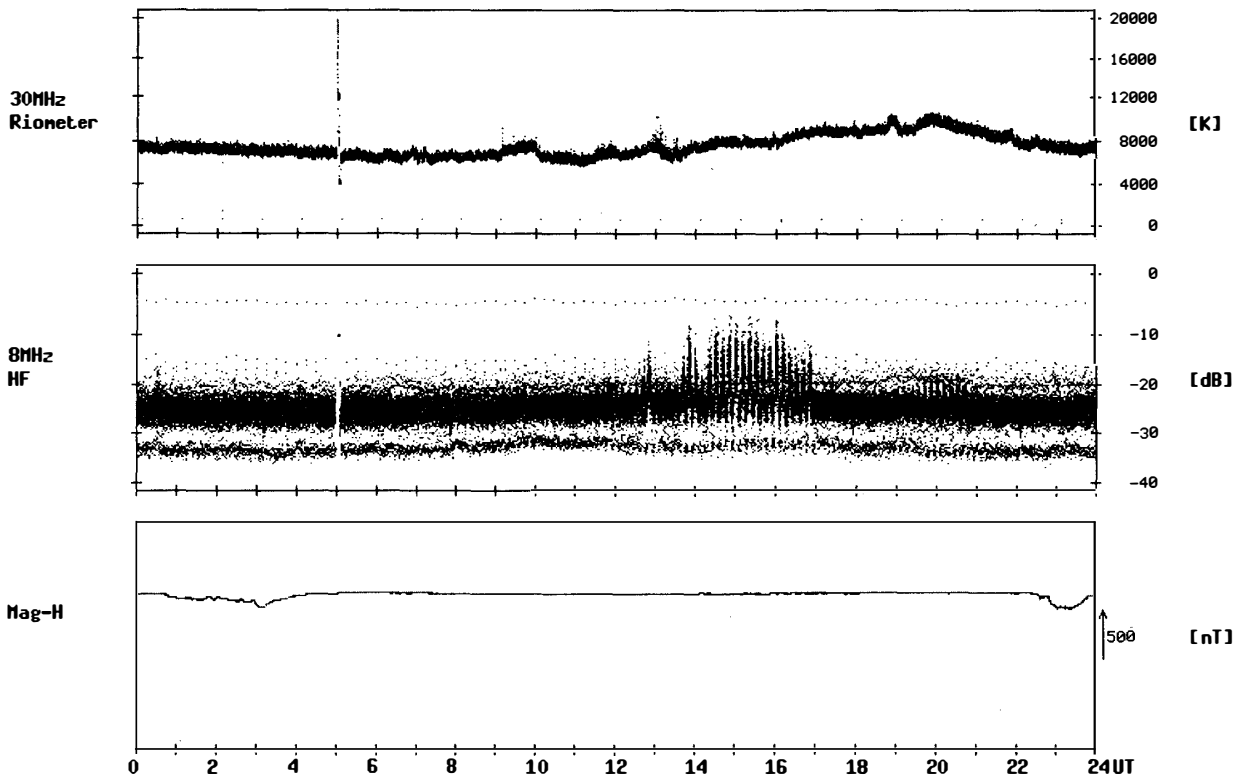
Syowa Station

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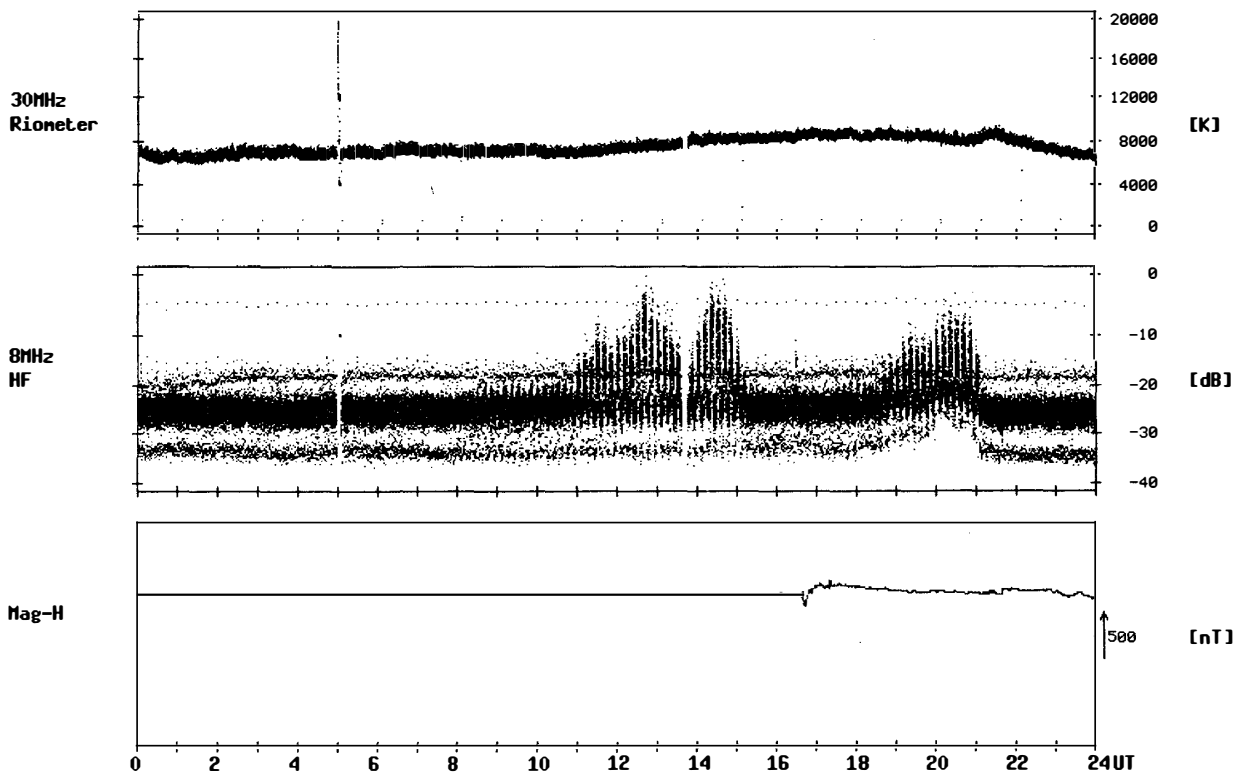
Syowa Station

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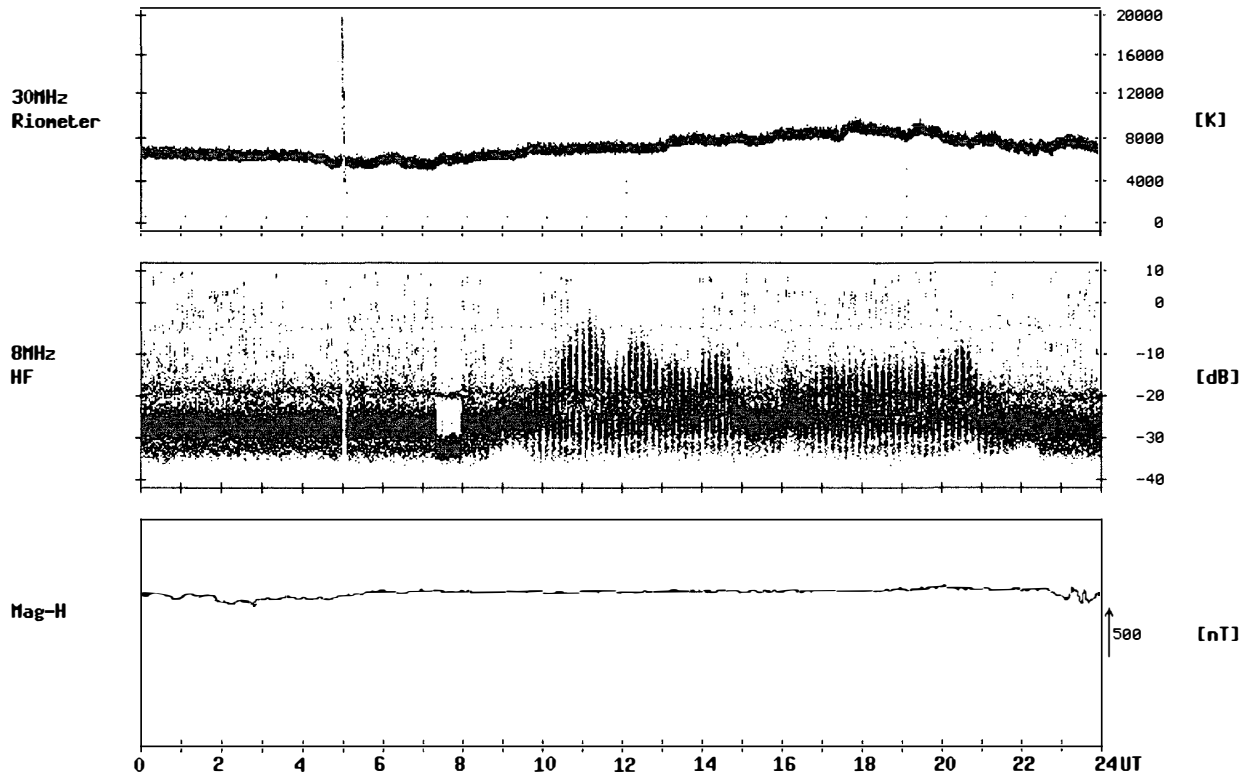
Syowa Station

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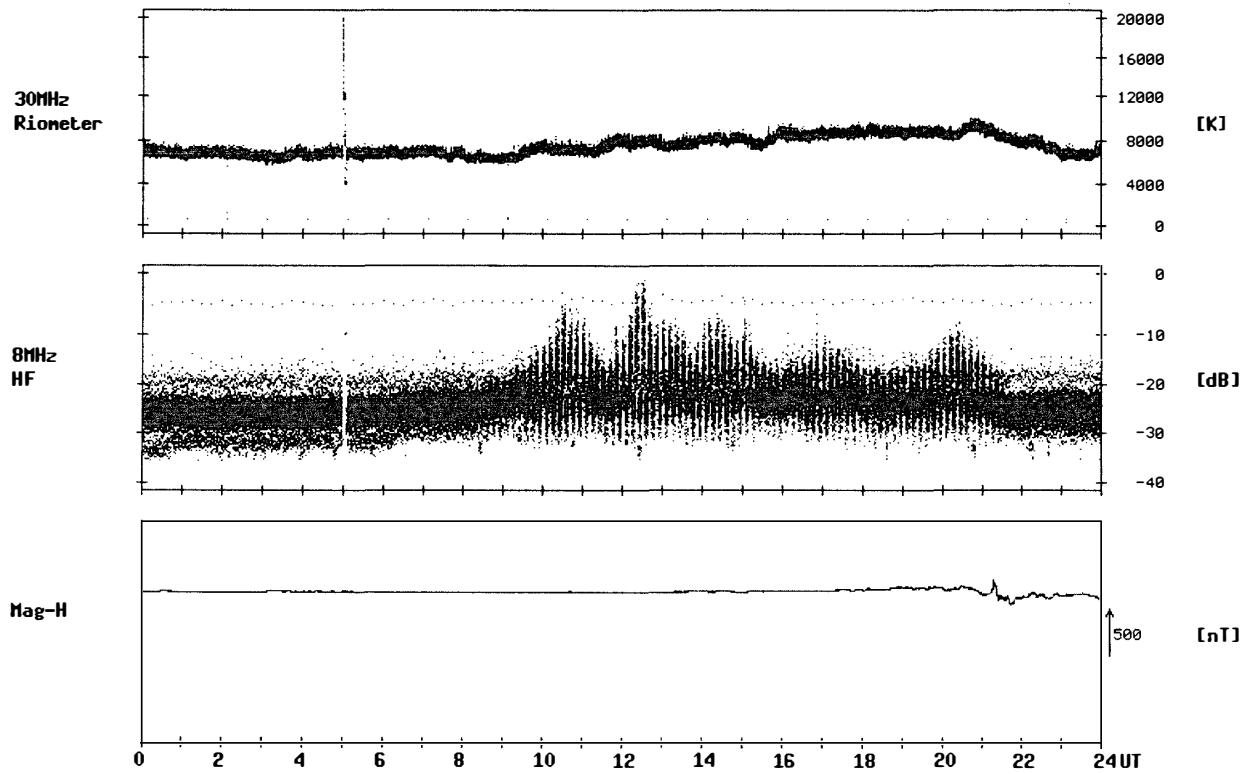
Syowa Station

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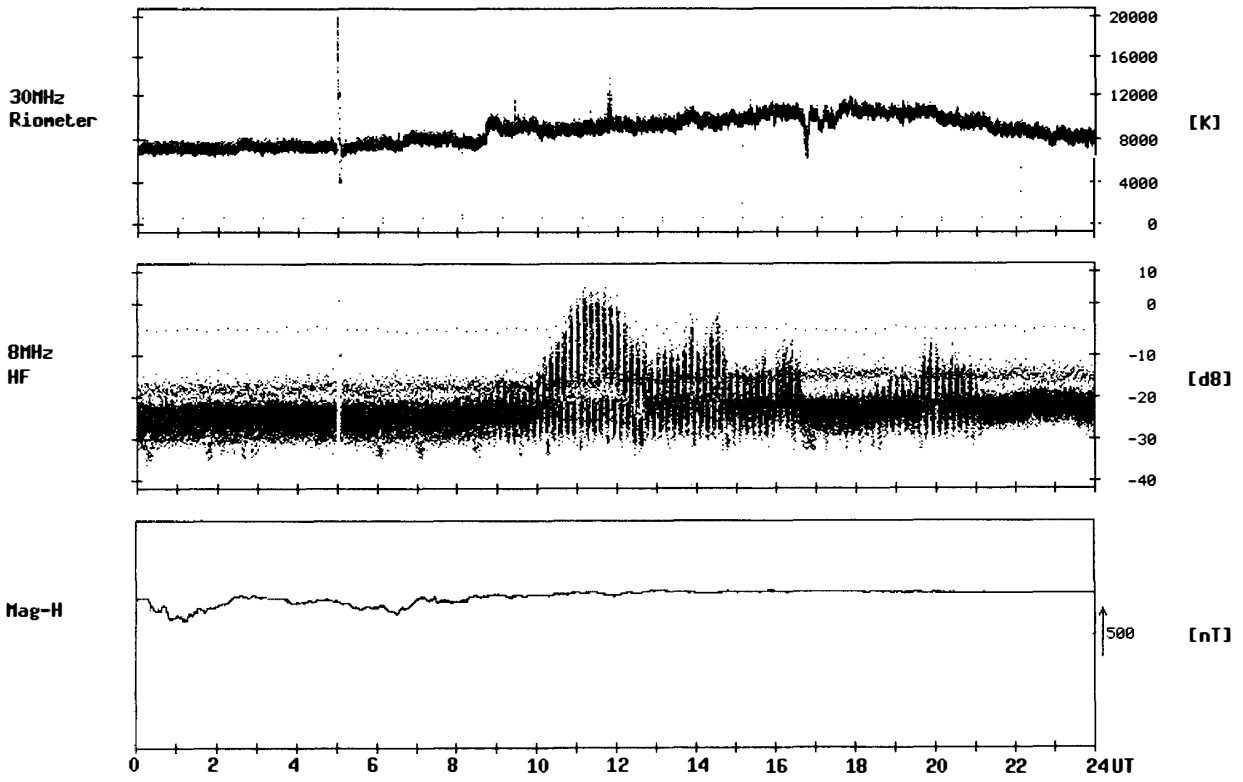
Syowa Station

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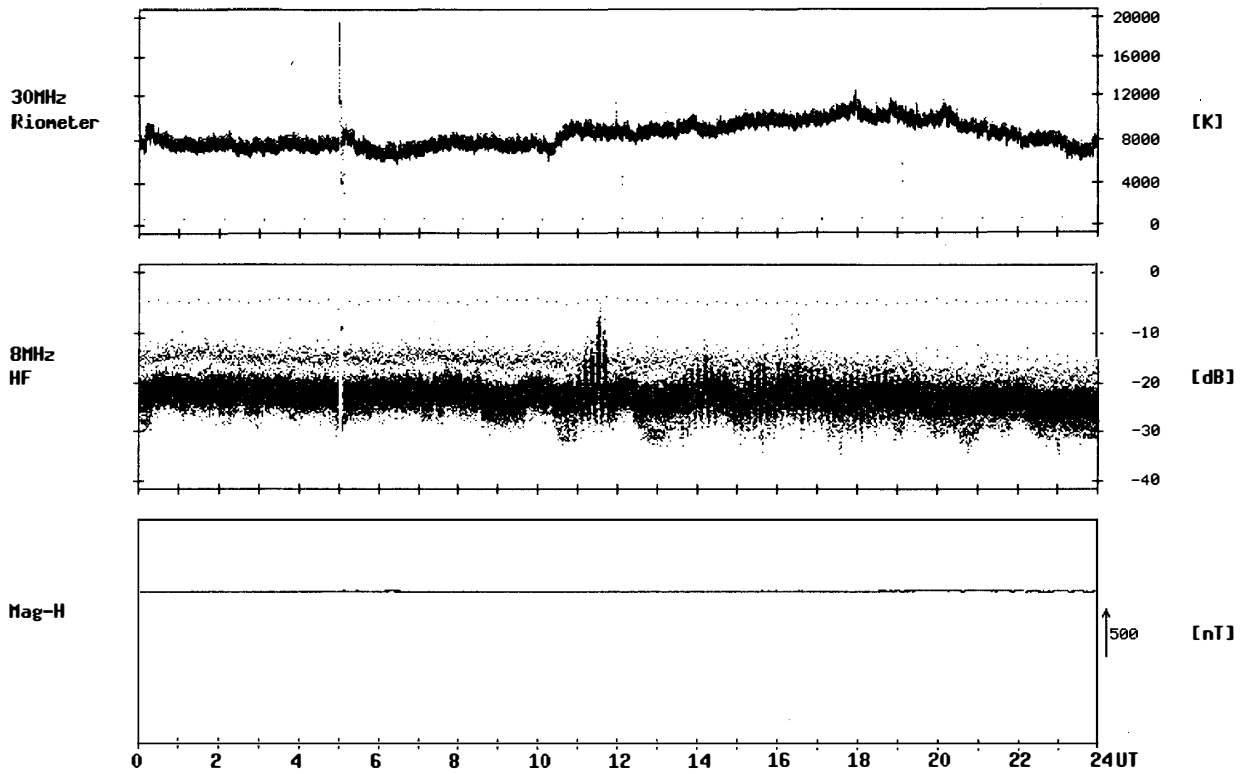
Syowa Station

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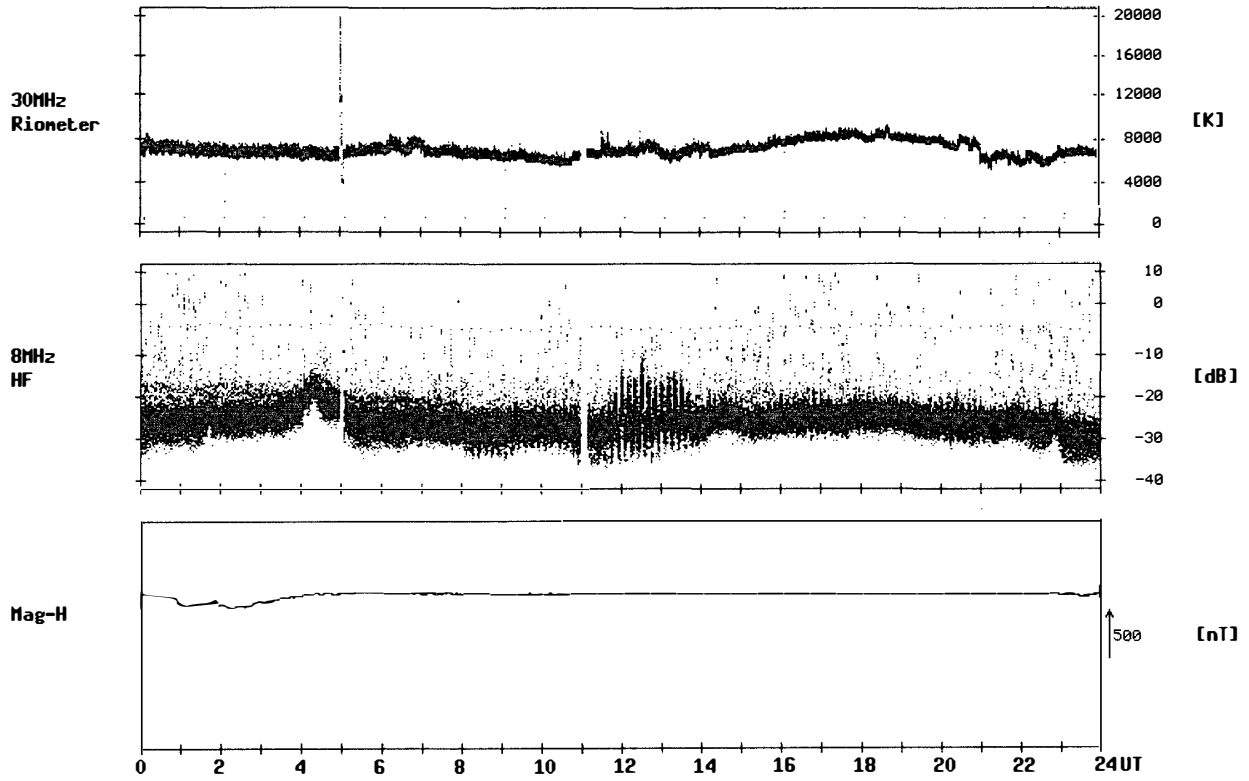
Syowa Station

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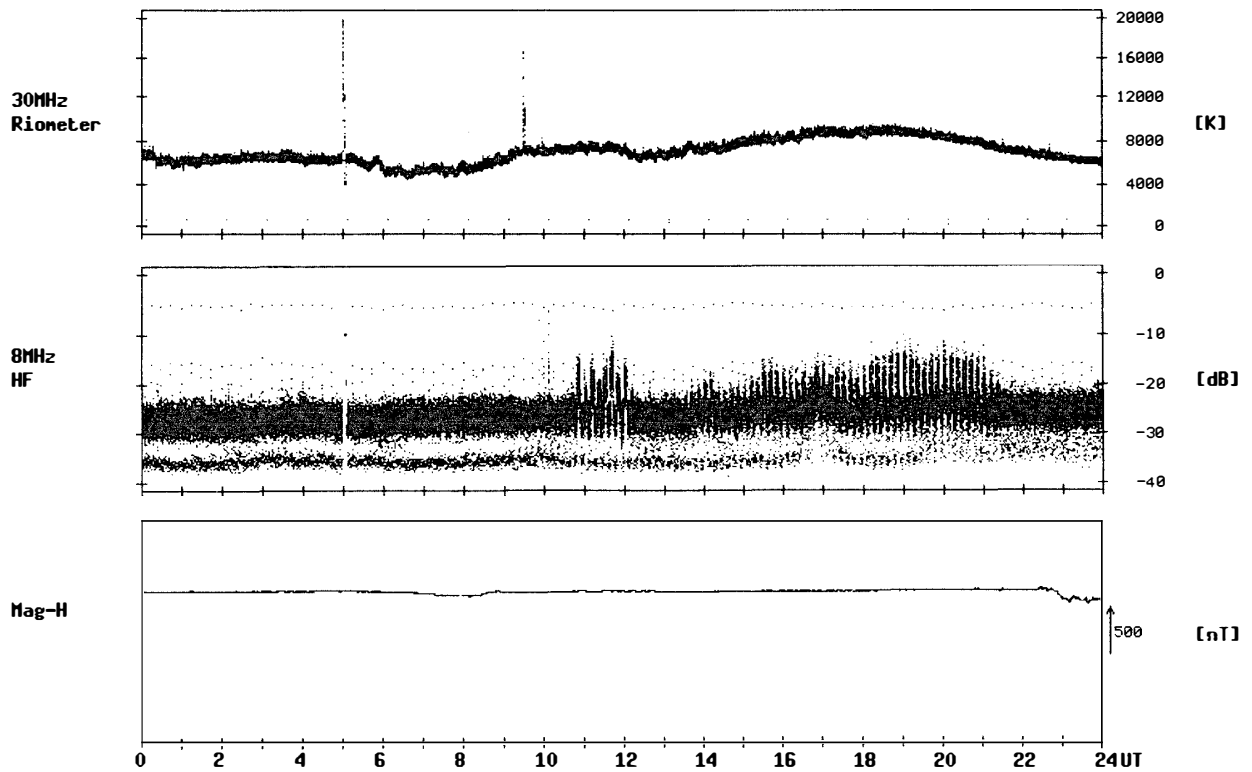
Syowa Station

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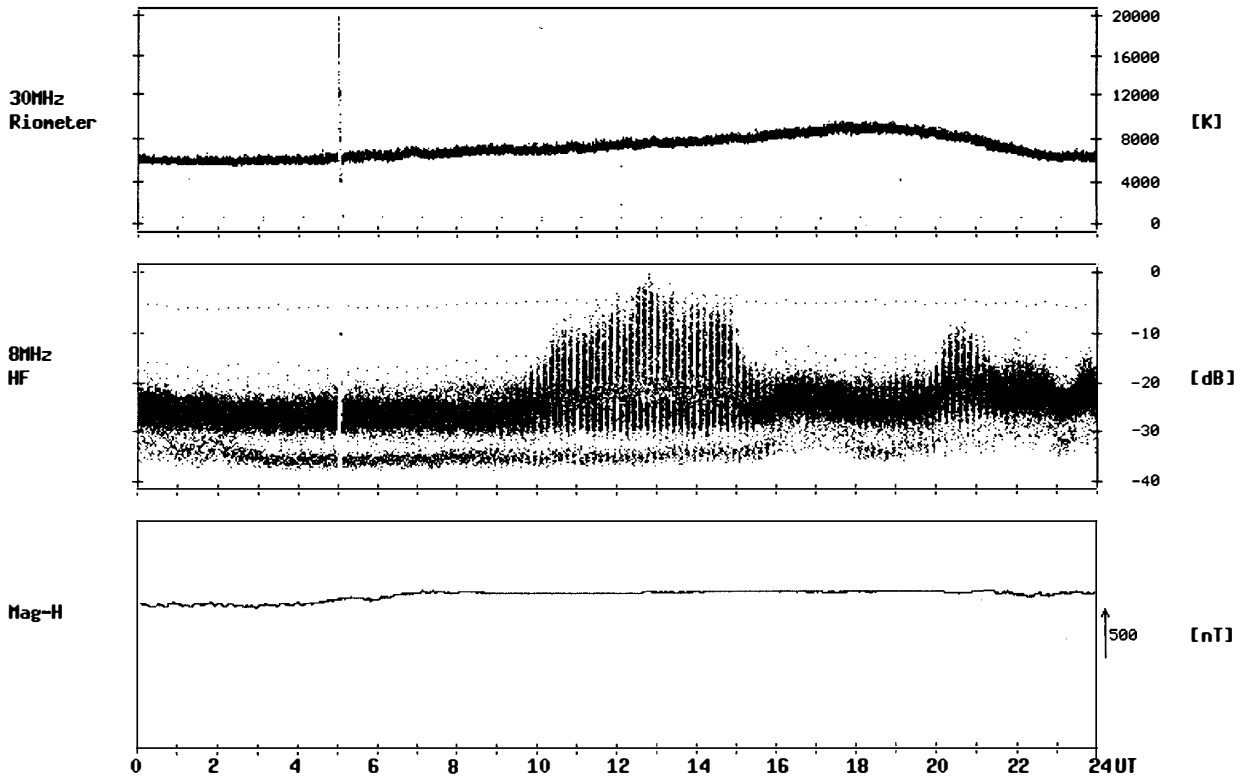
Syowa Station

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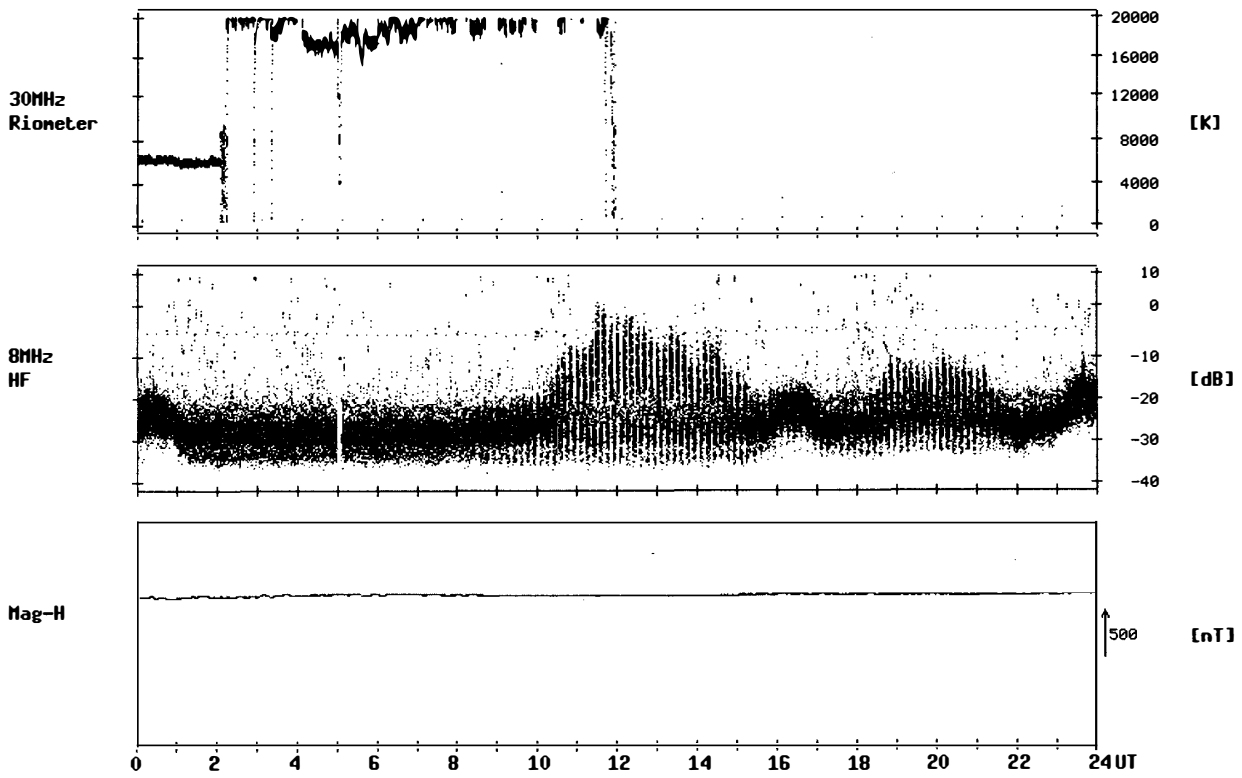
Syowa Station

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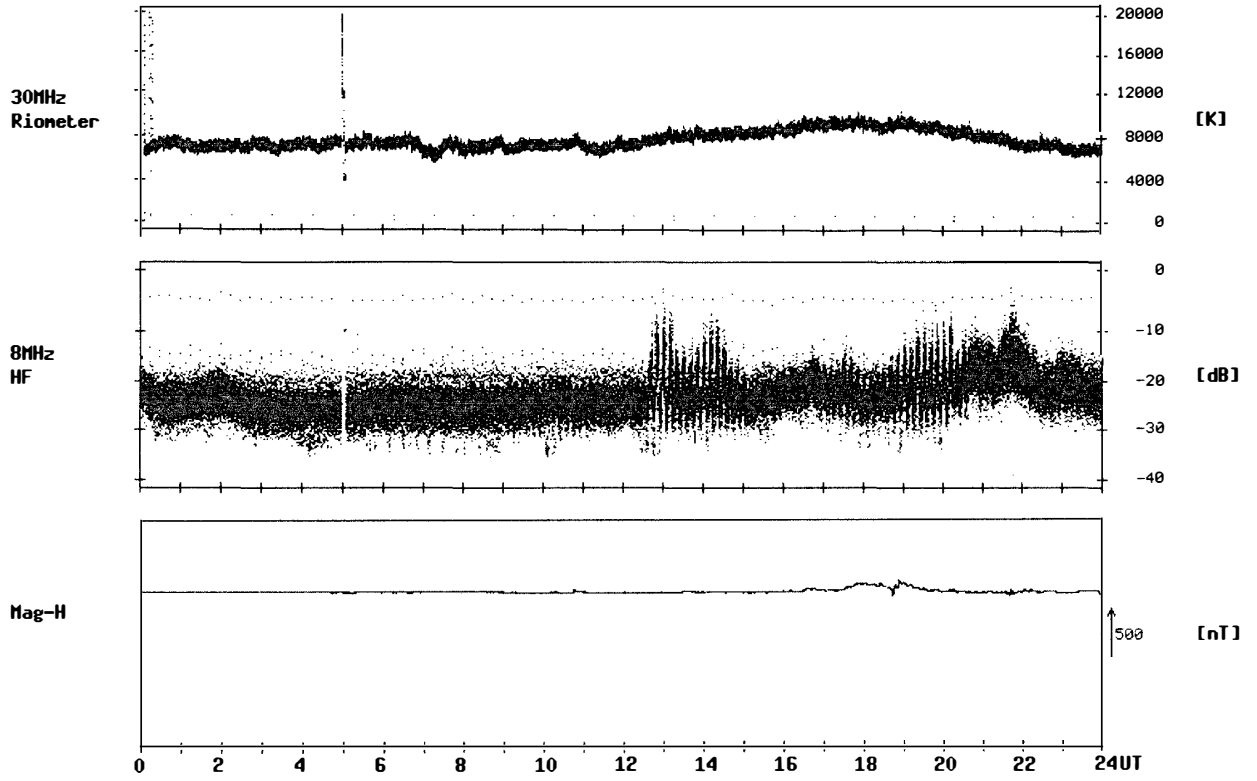
Syowa Station

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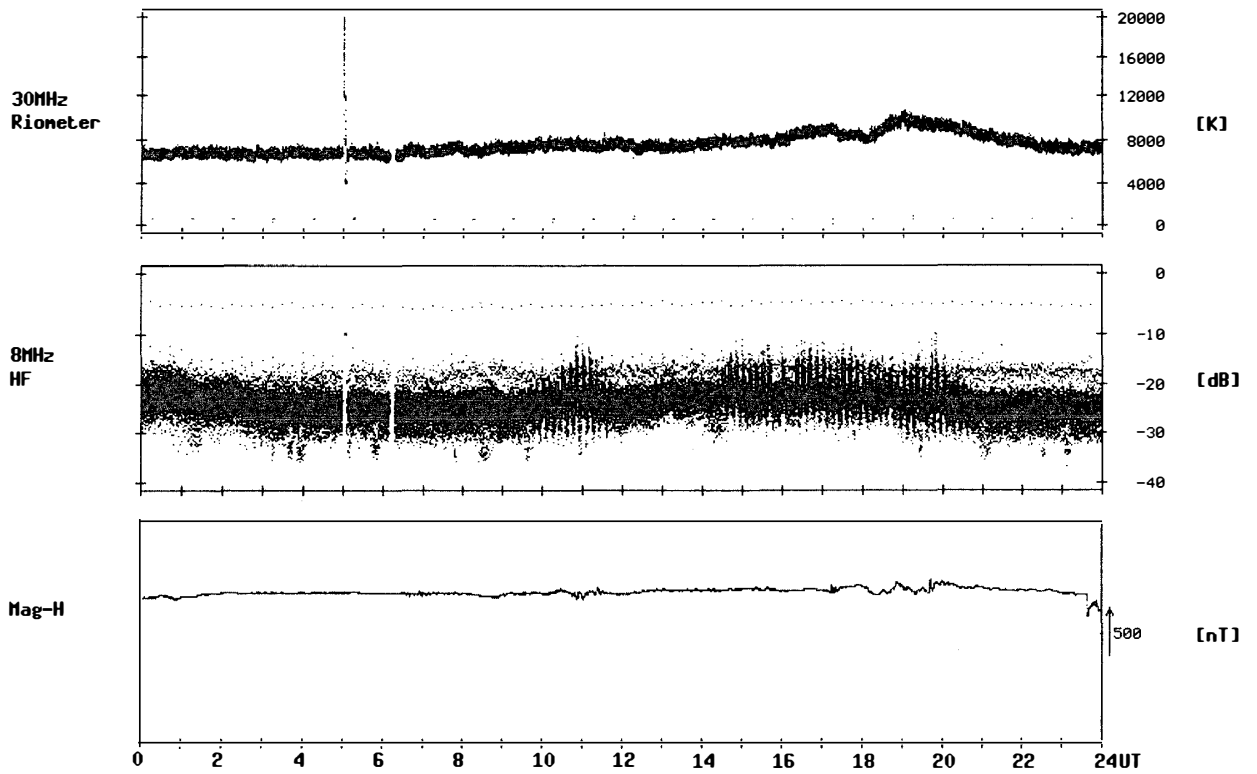
Syowa Station

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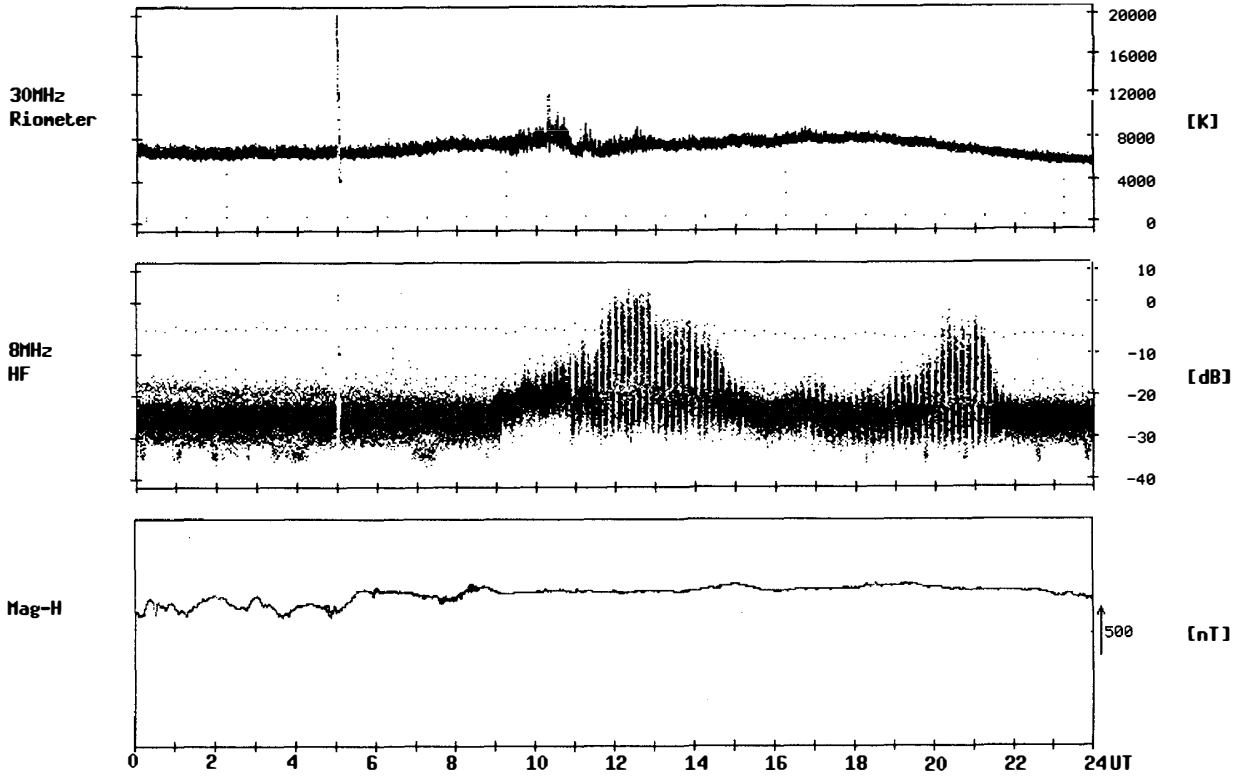
Syowa Station

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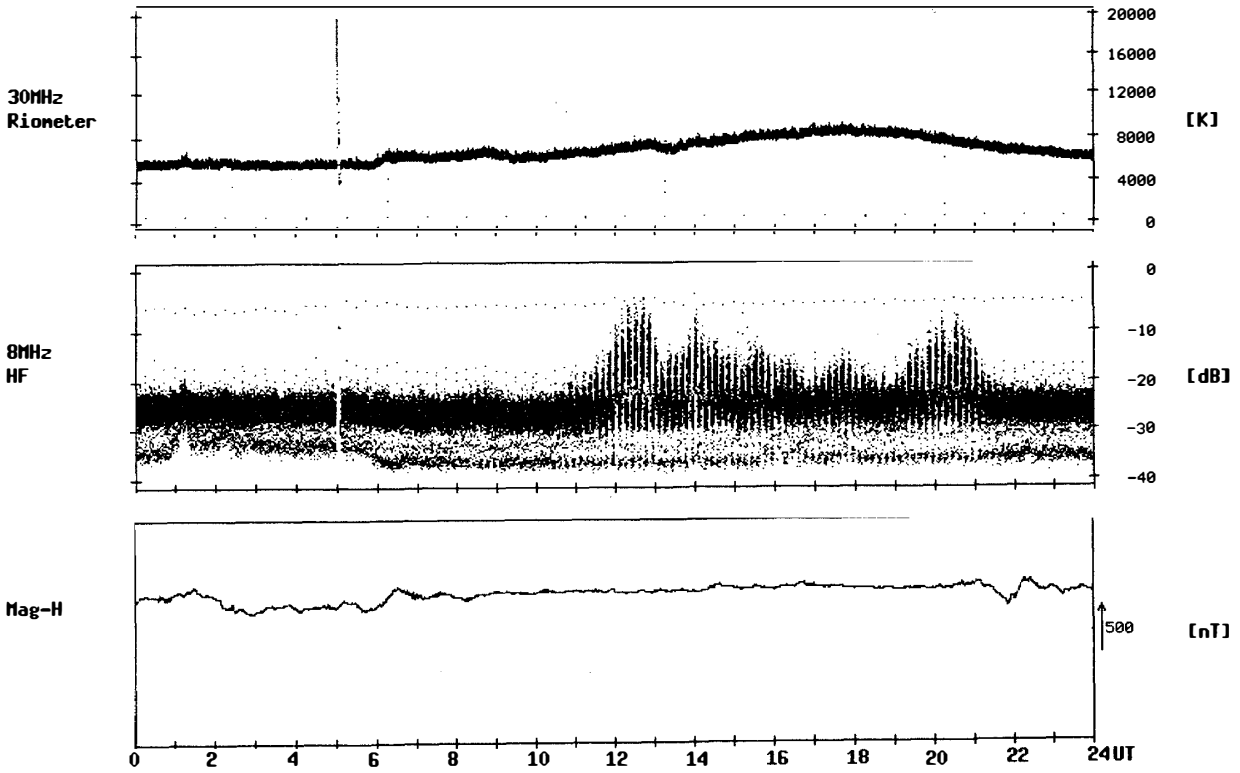
Syowa Station

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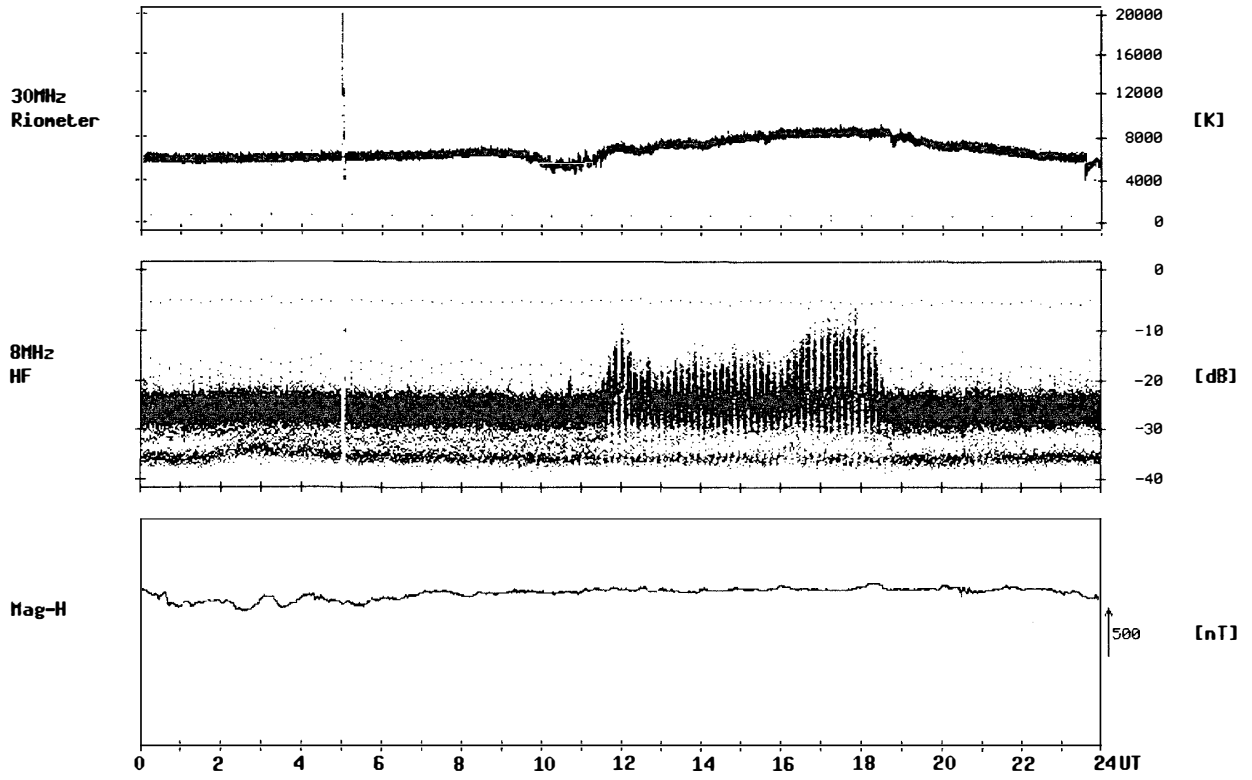
Syowa Station

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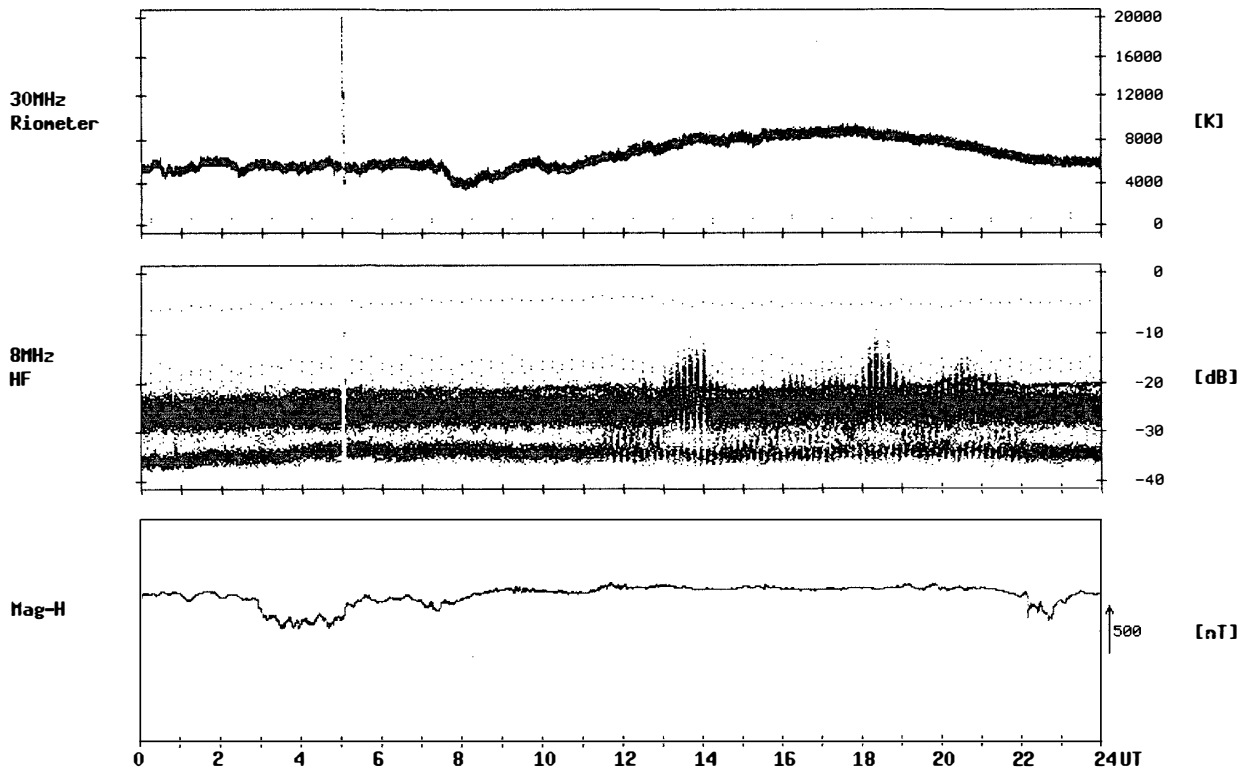
Syowa Station

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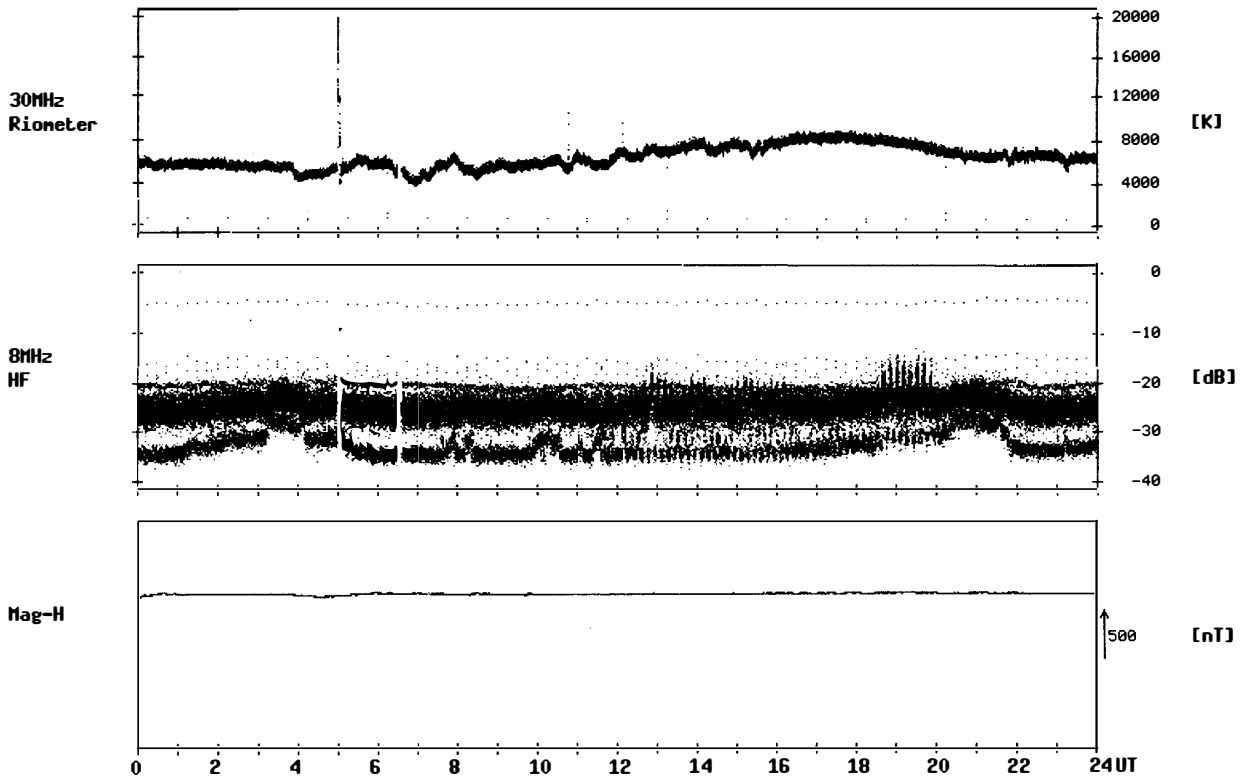
Syowa Station

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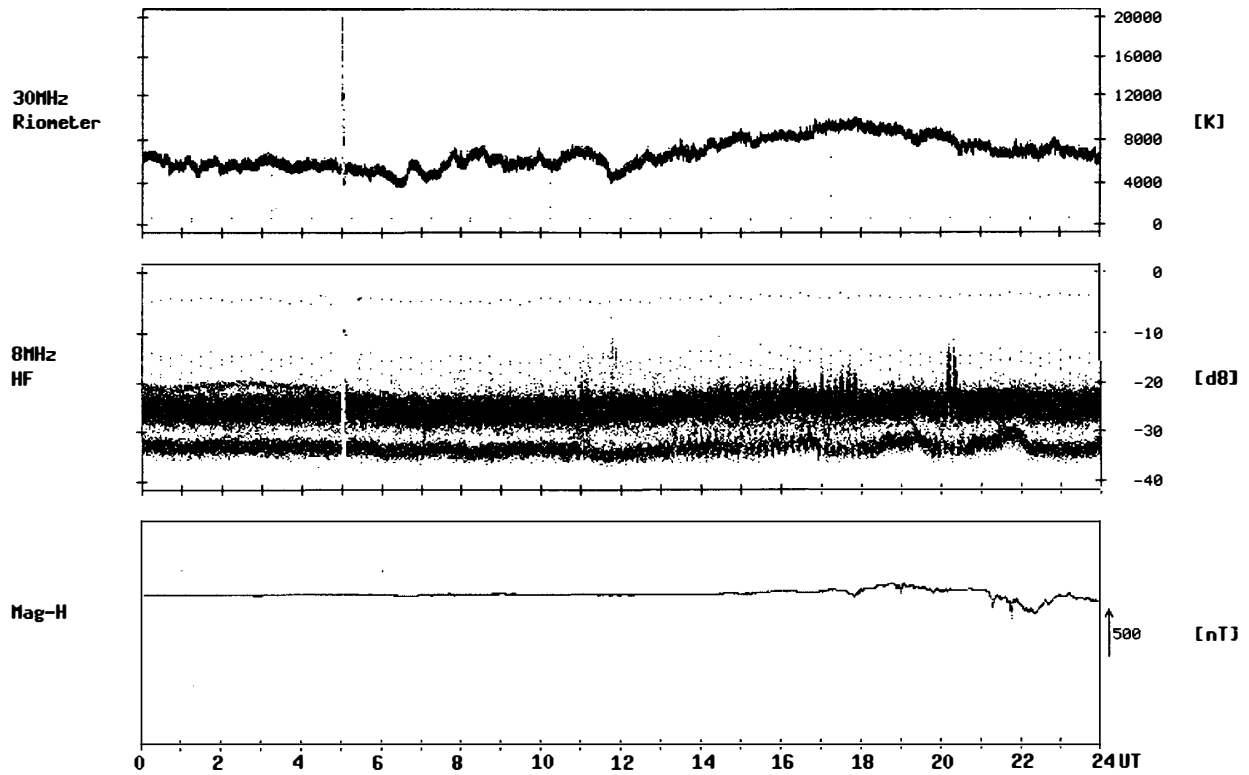
Syowa Station

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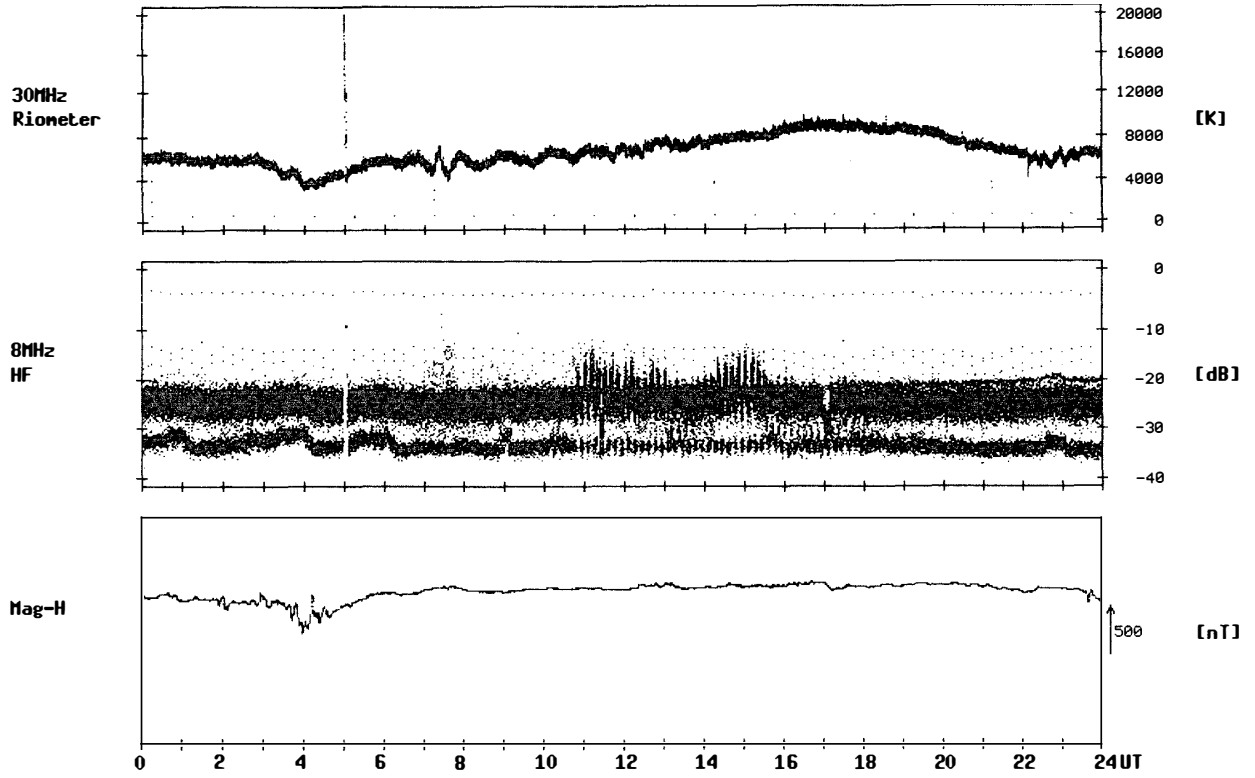
Syowa Station

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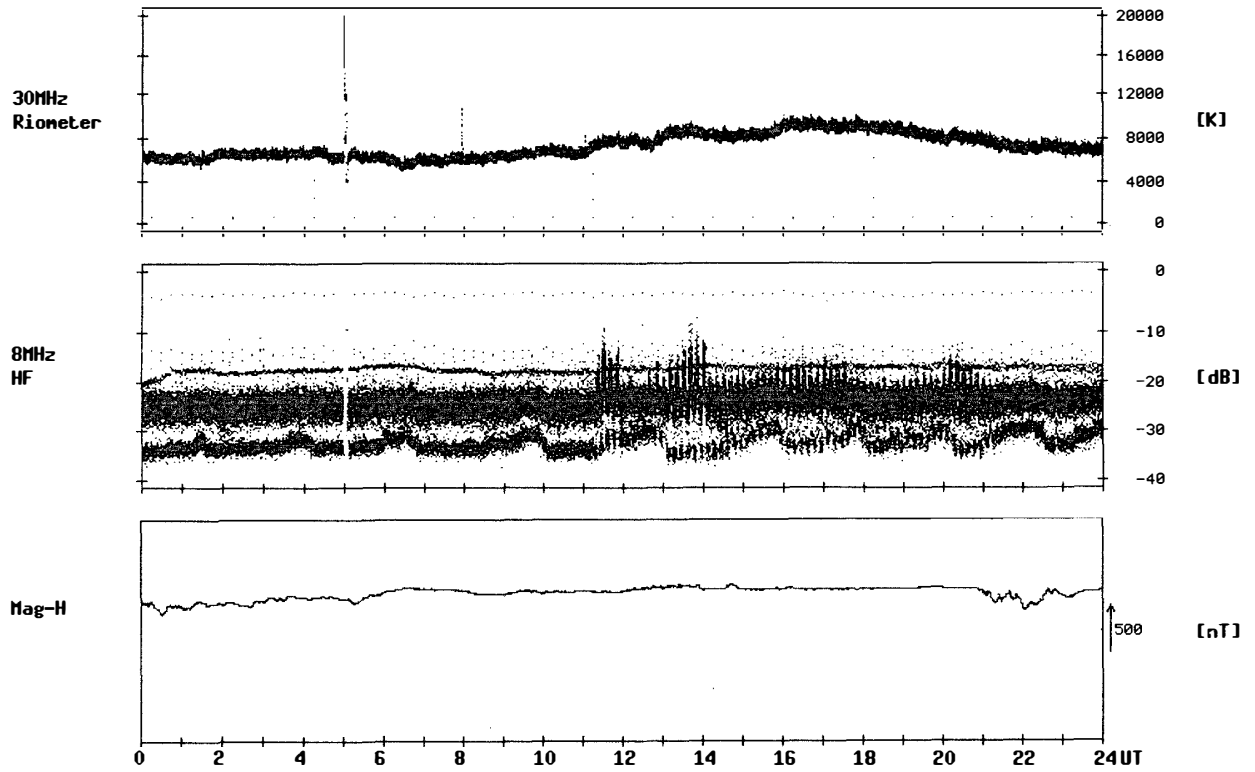
Syowa Station

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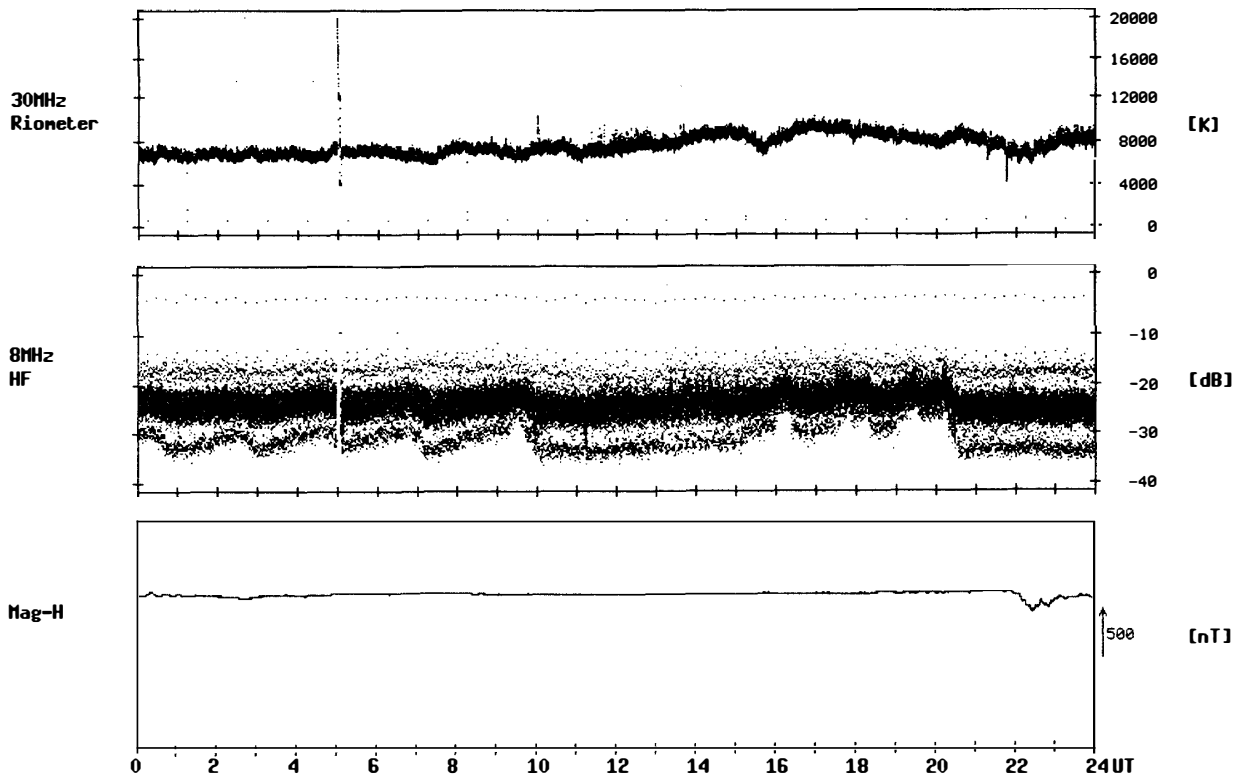
Syowa Station

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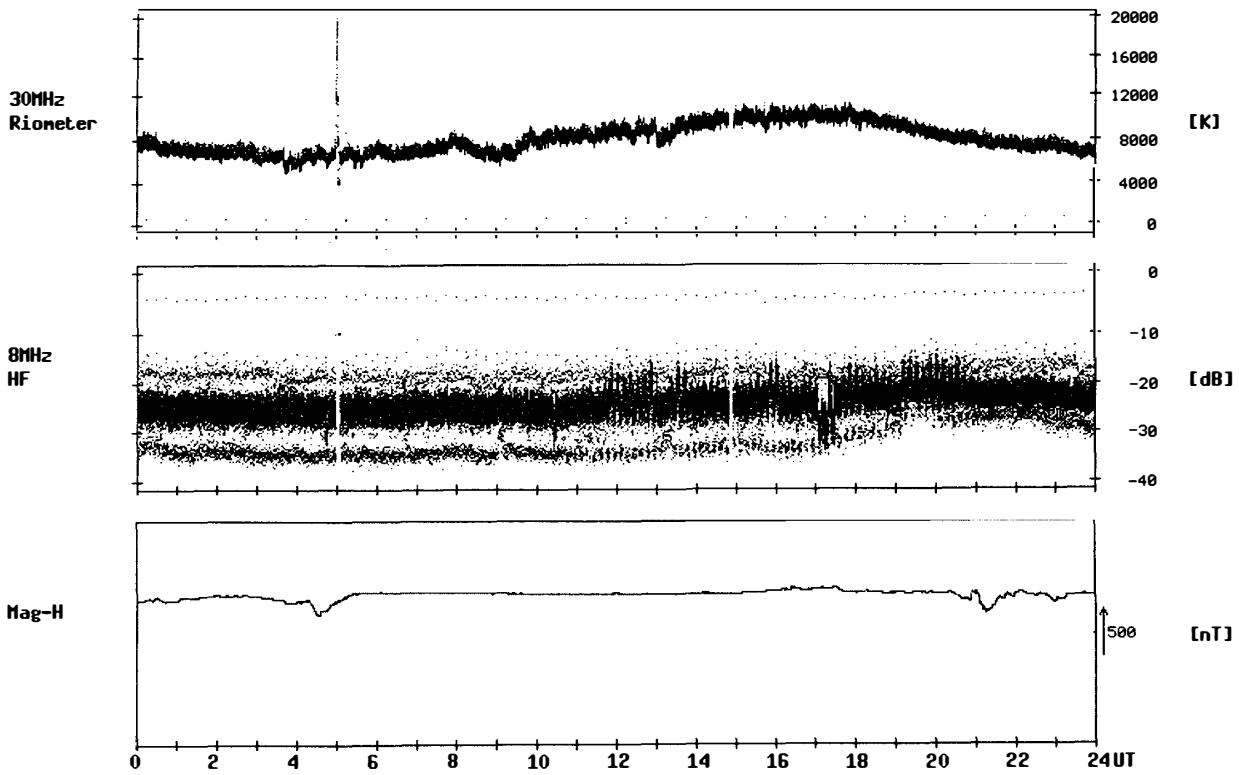
Syowa Station

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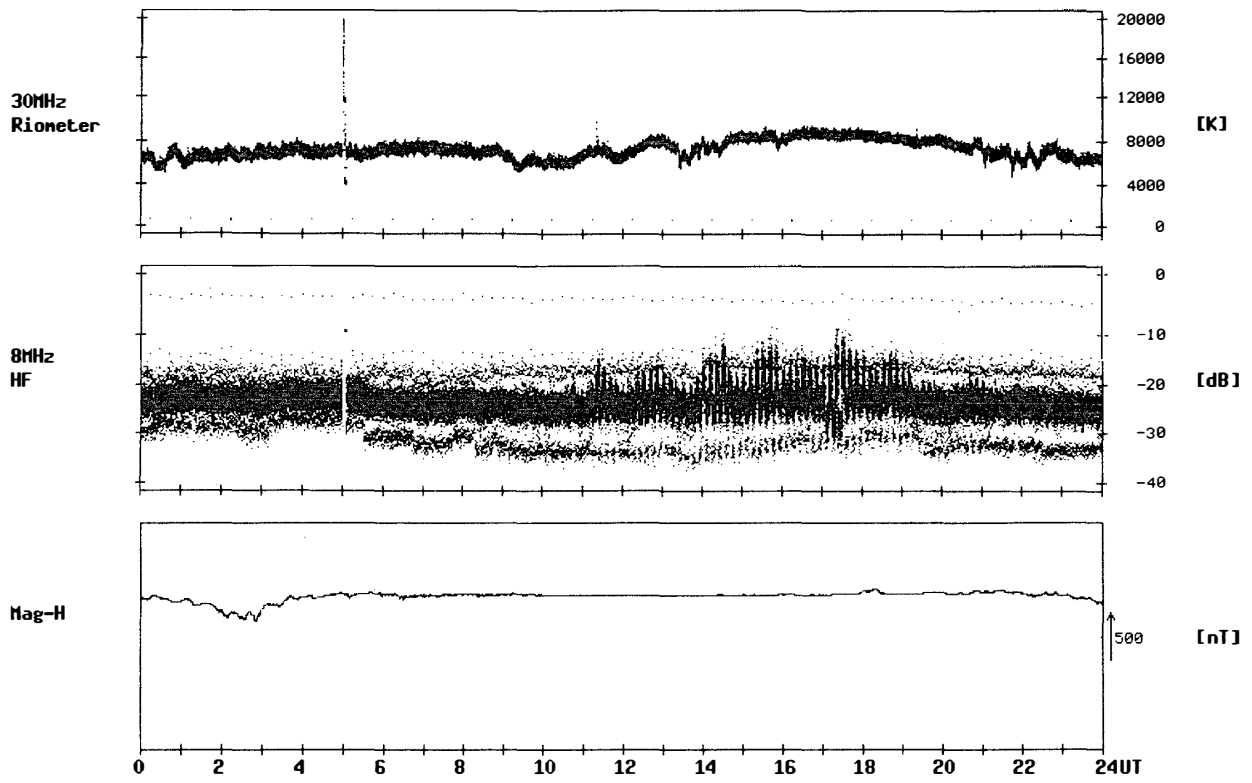
Syowa Station

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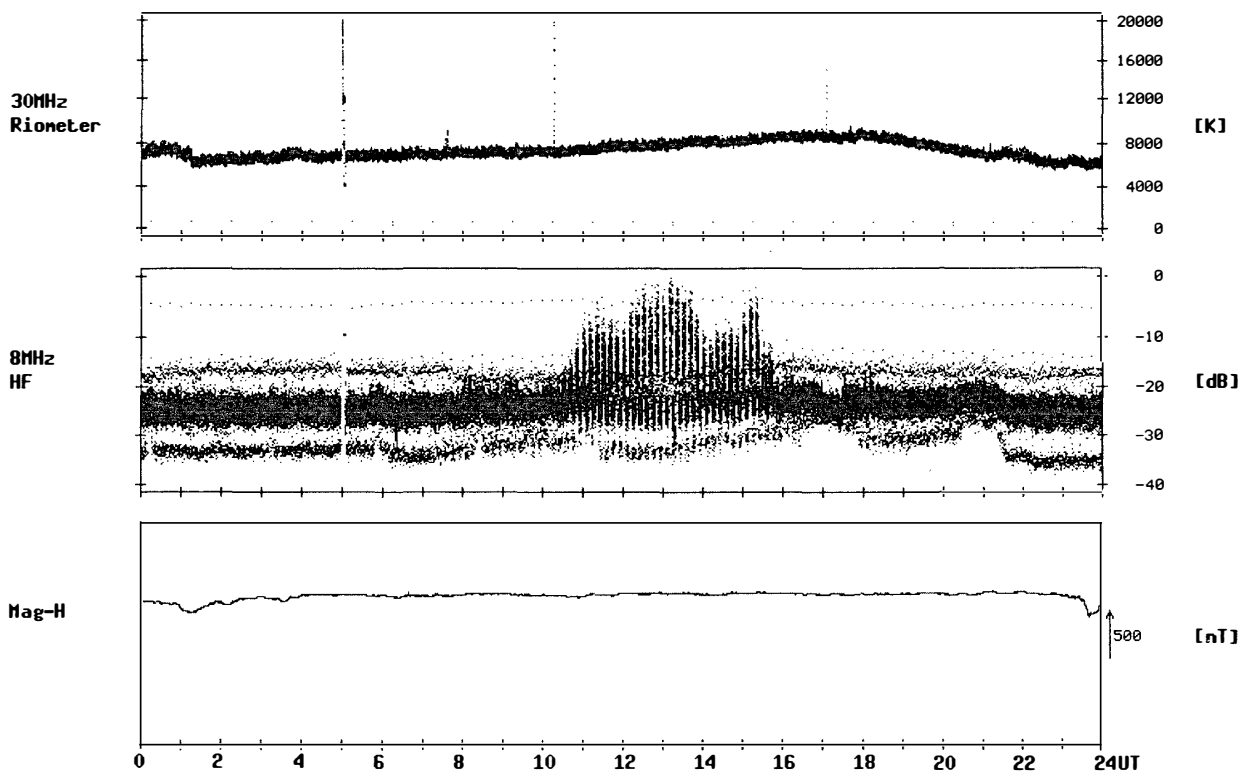
Syowa Station

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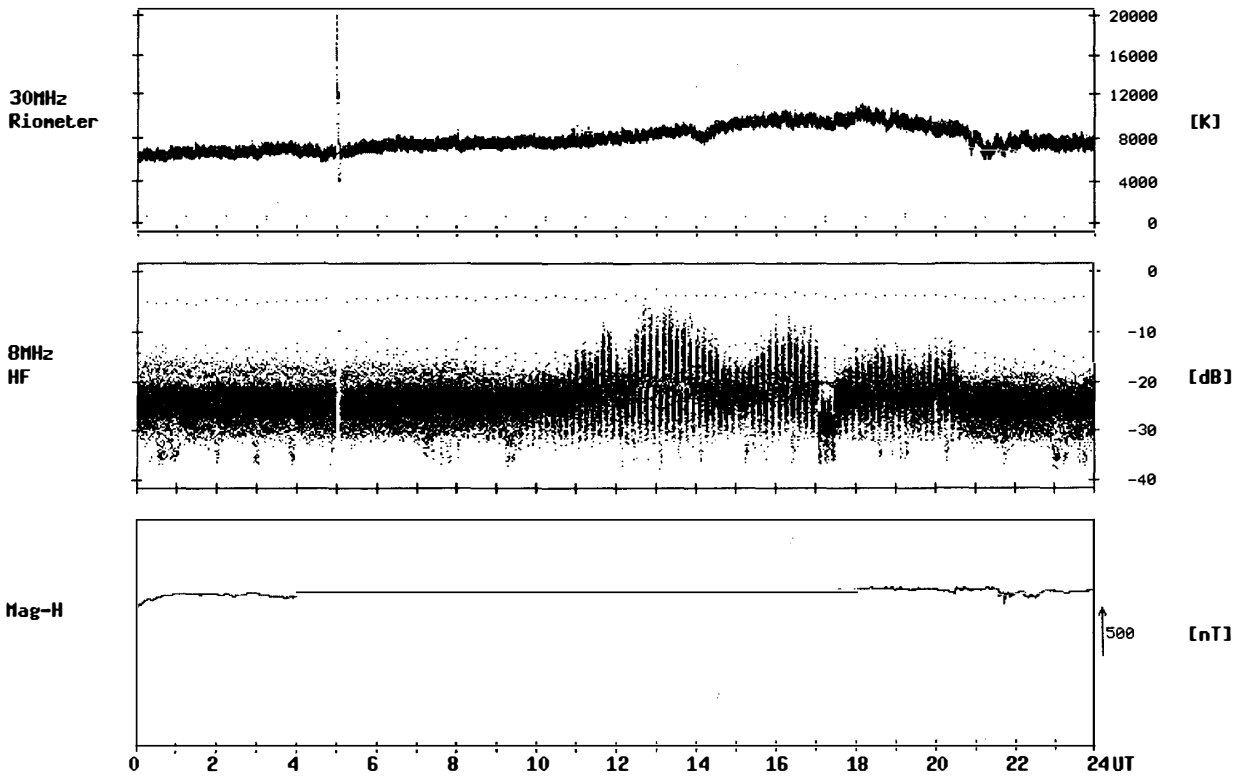
Syowa Station

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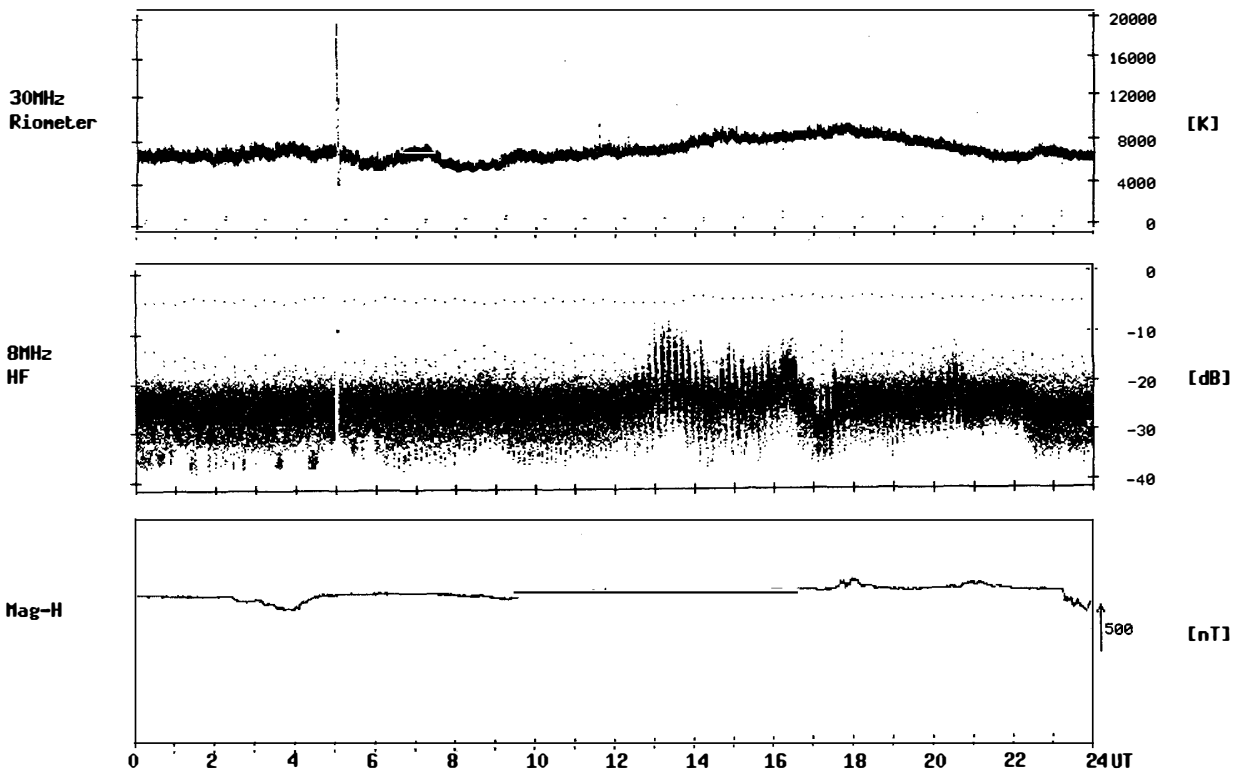
Syowa Station

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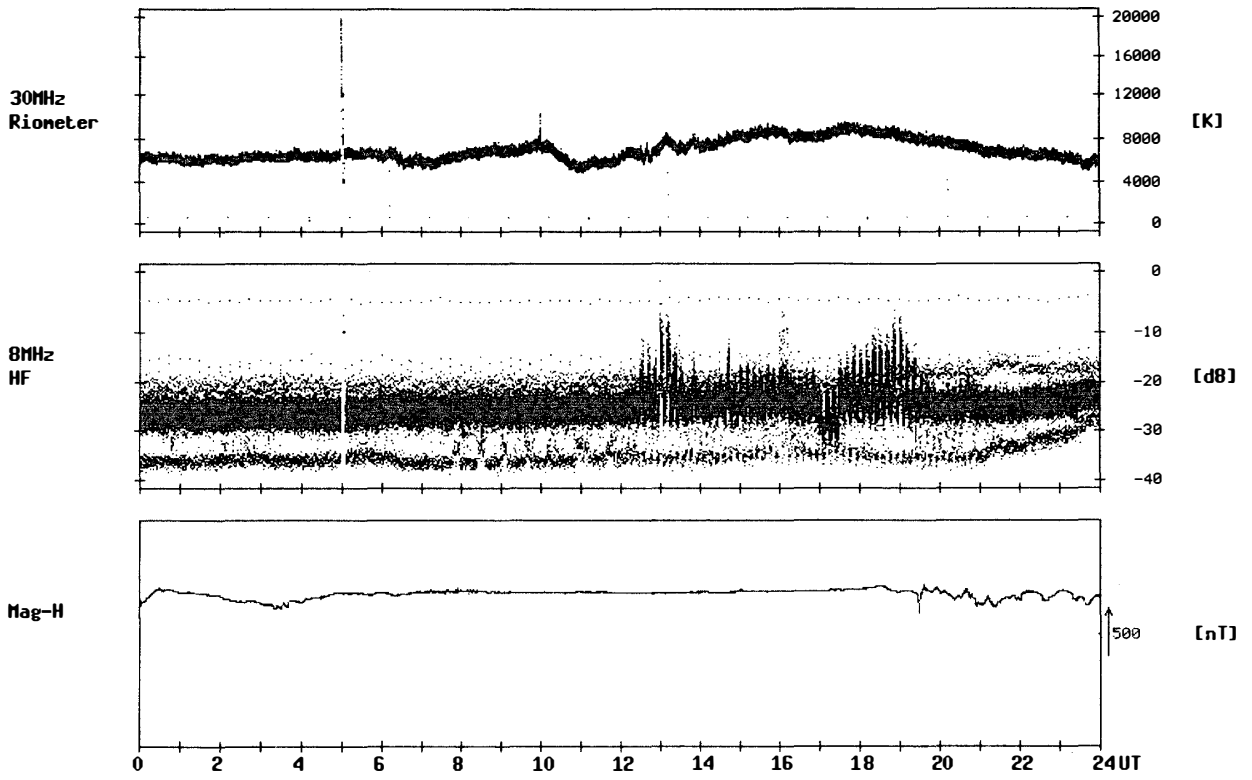
Syowa Station

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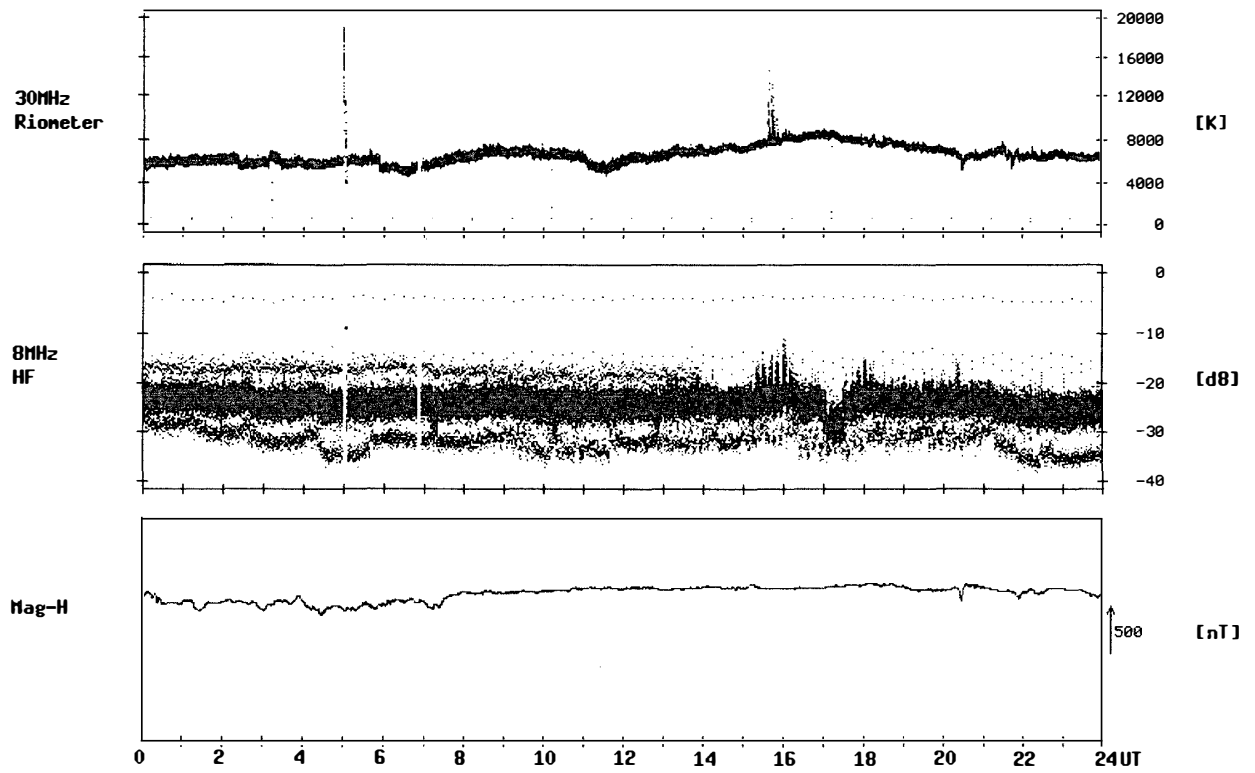
Syowa Station

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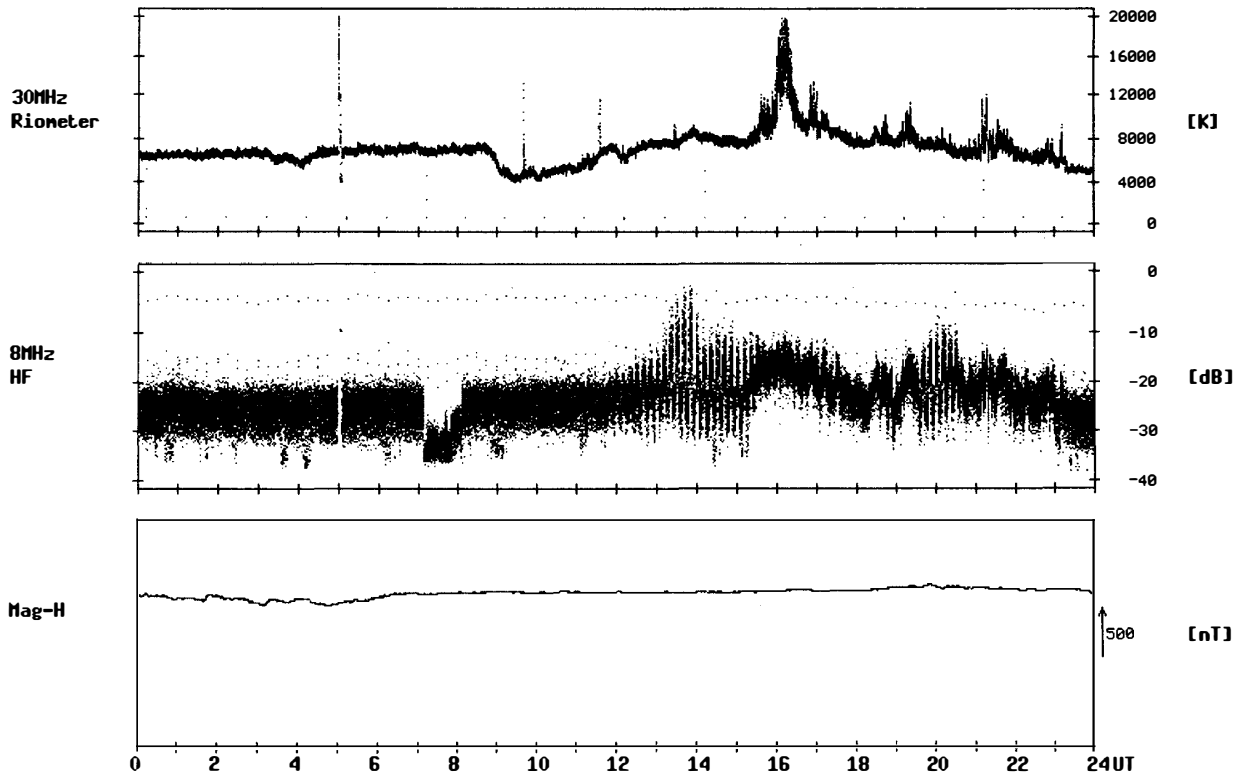
Syowa Station

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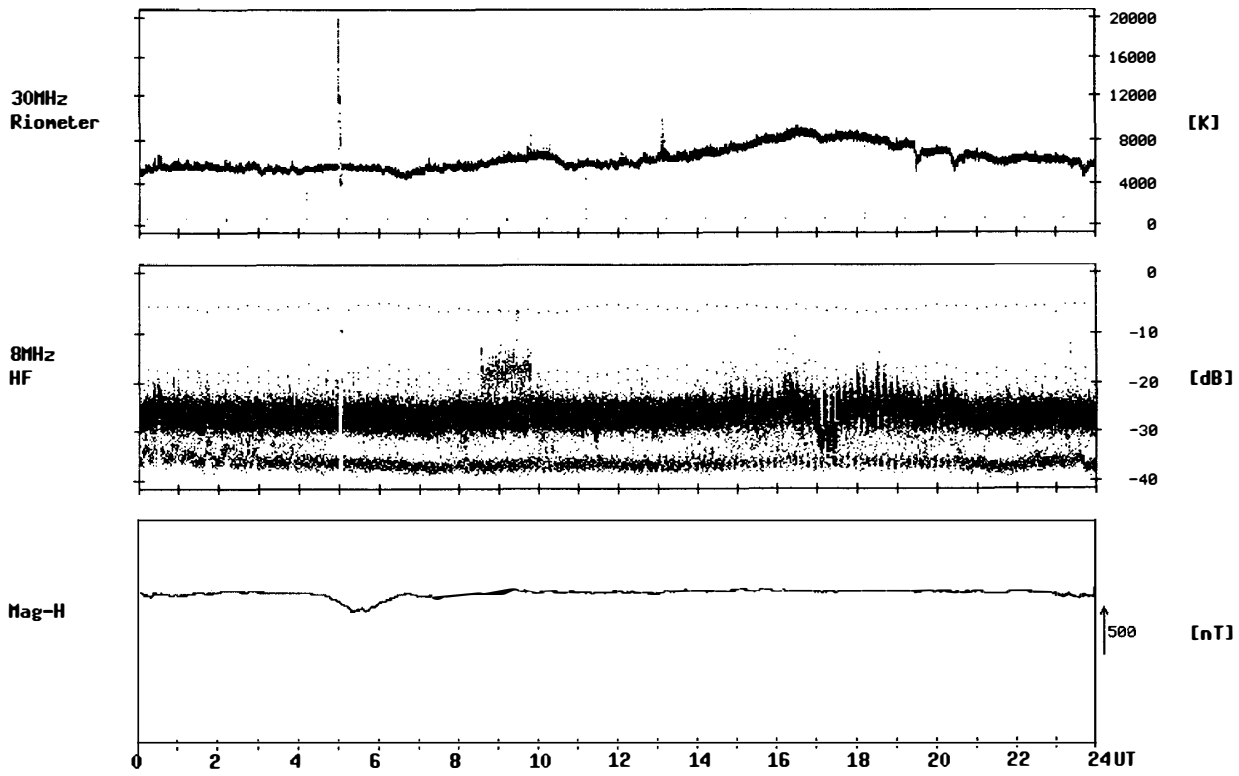
Syowa Station

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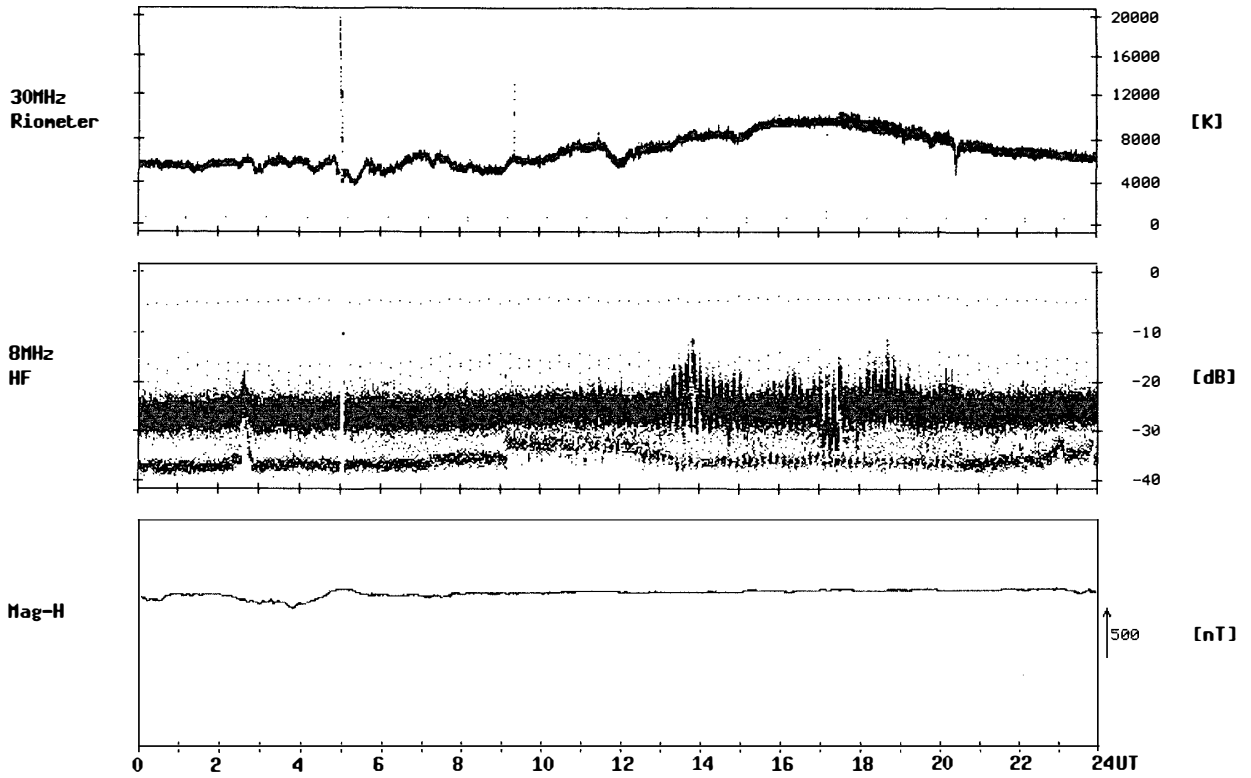
Syowa Station

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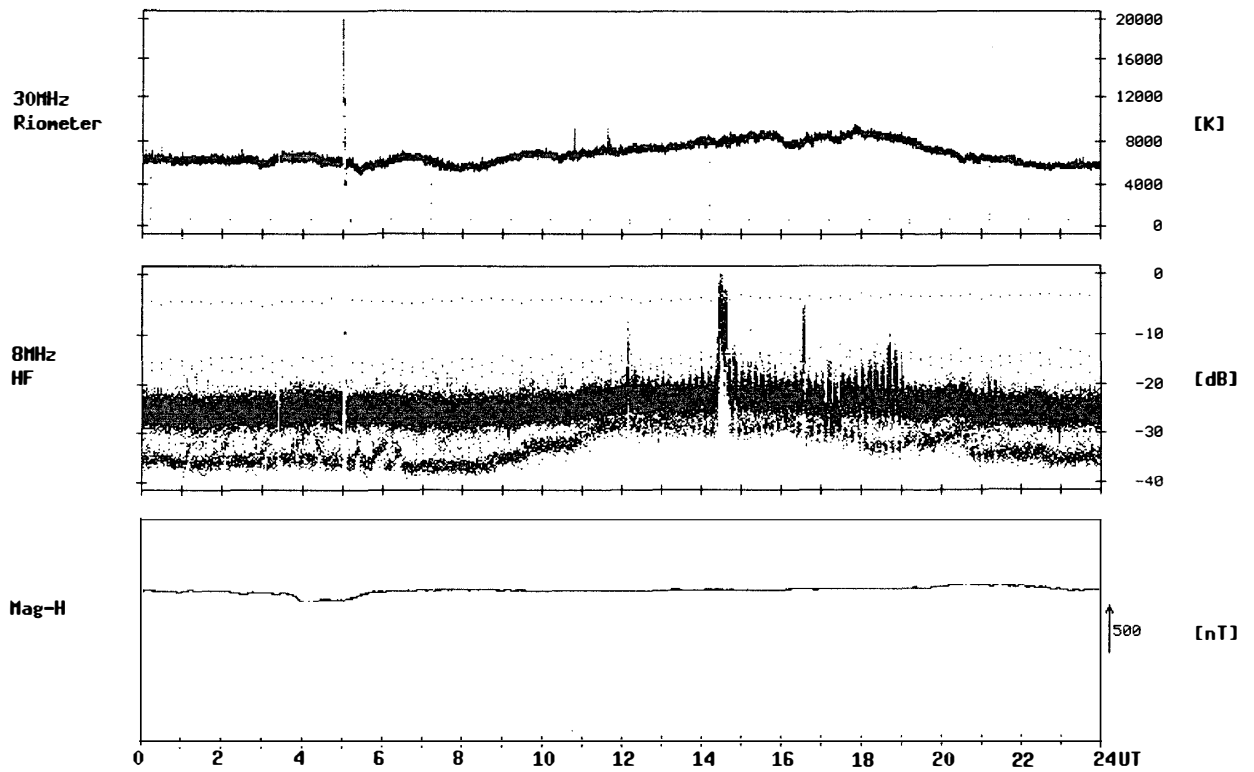
Syowa Station

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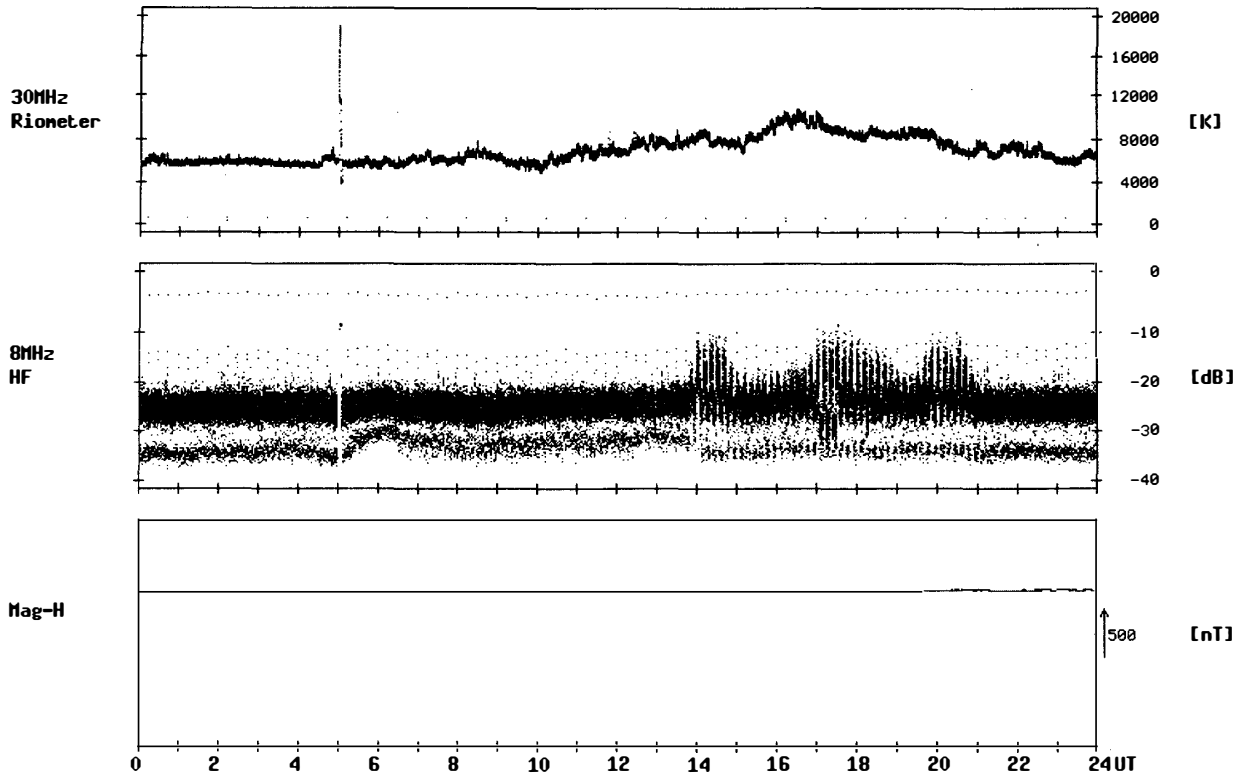
Syowa Station

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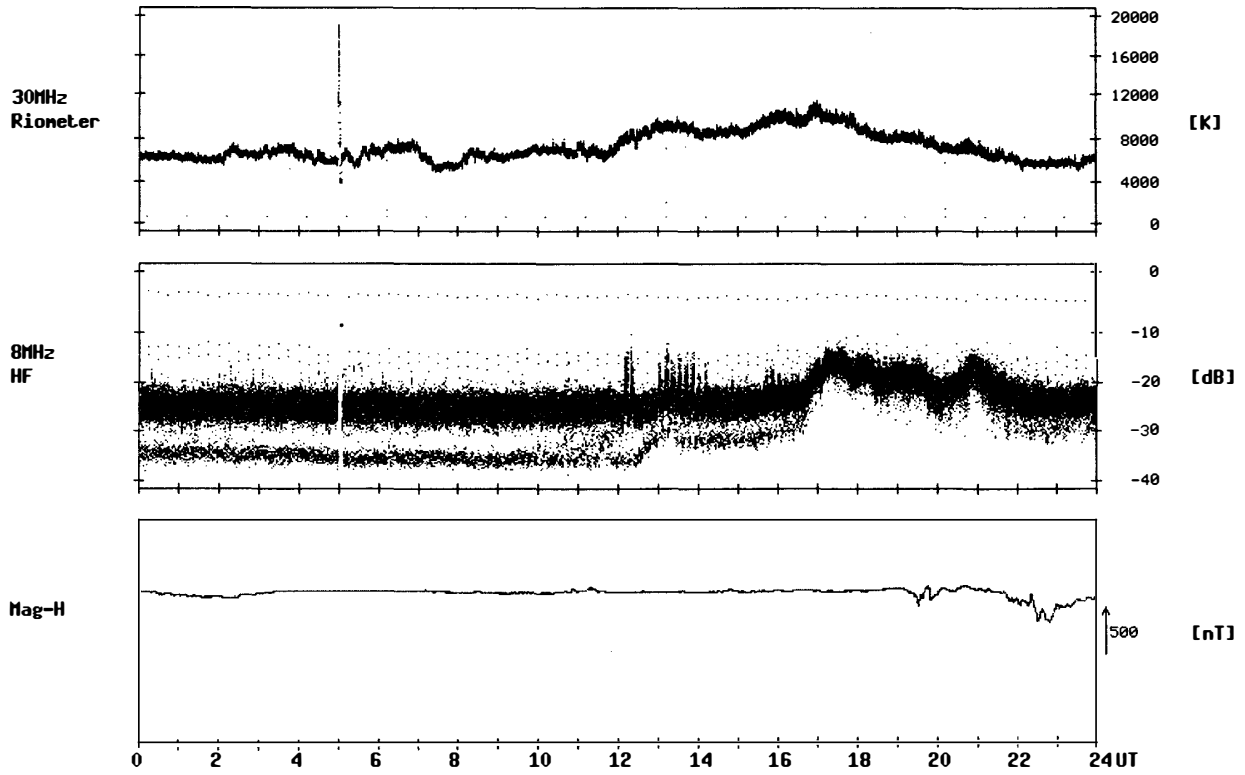
Syowa Station

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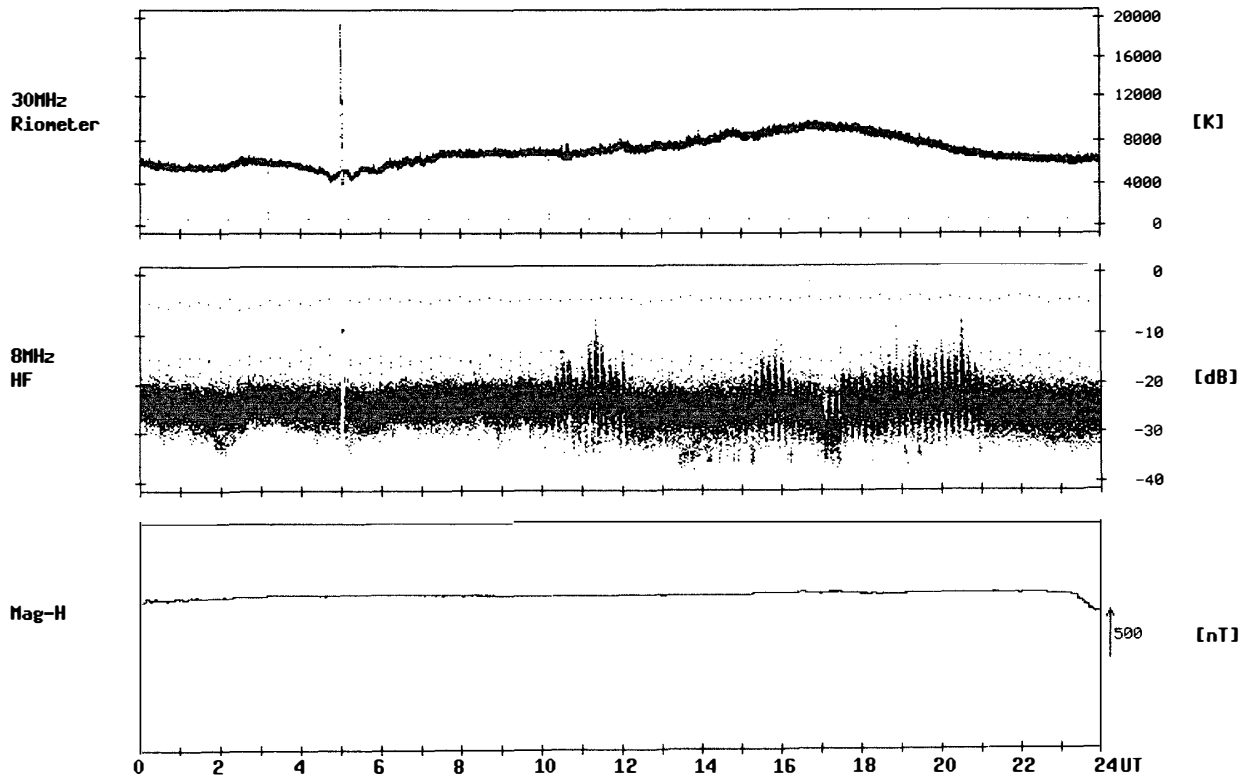
Syowa Station

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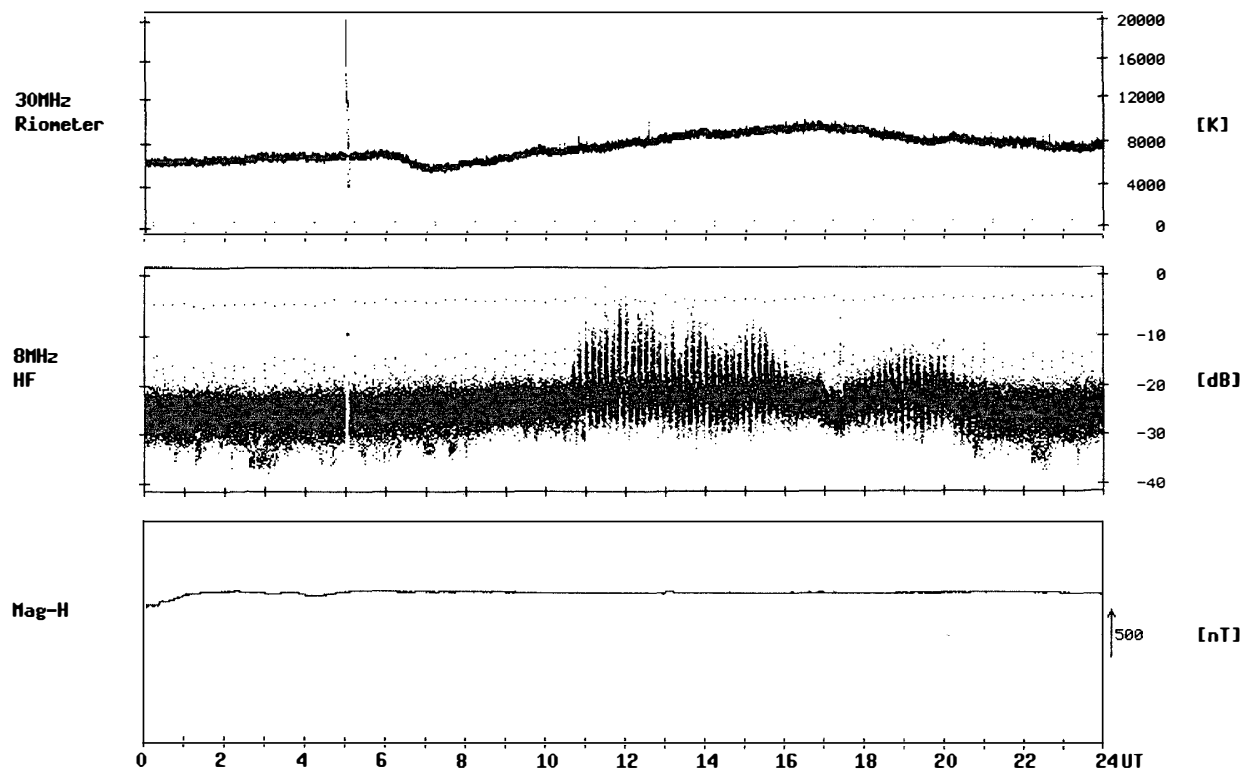
Syowa Station

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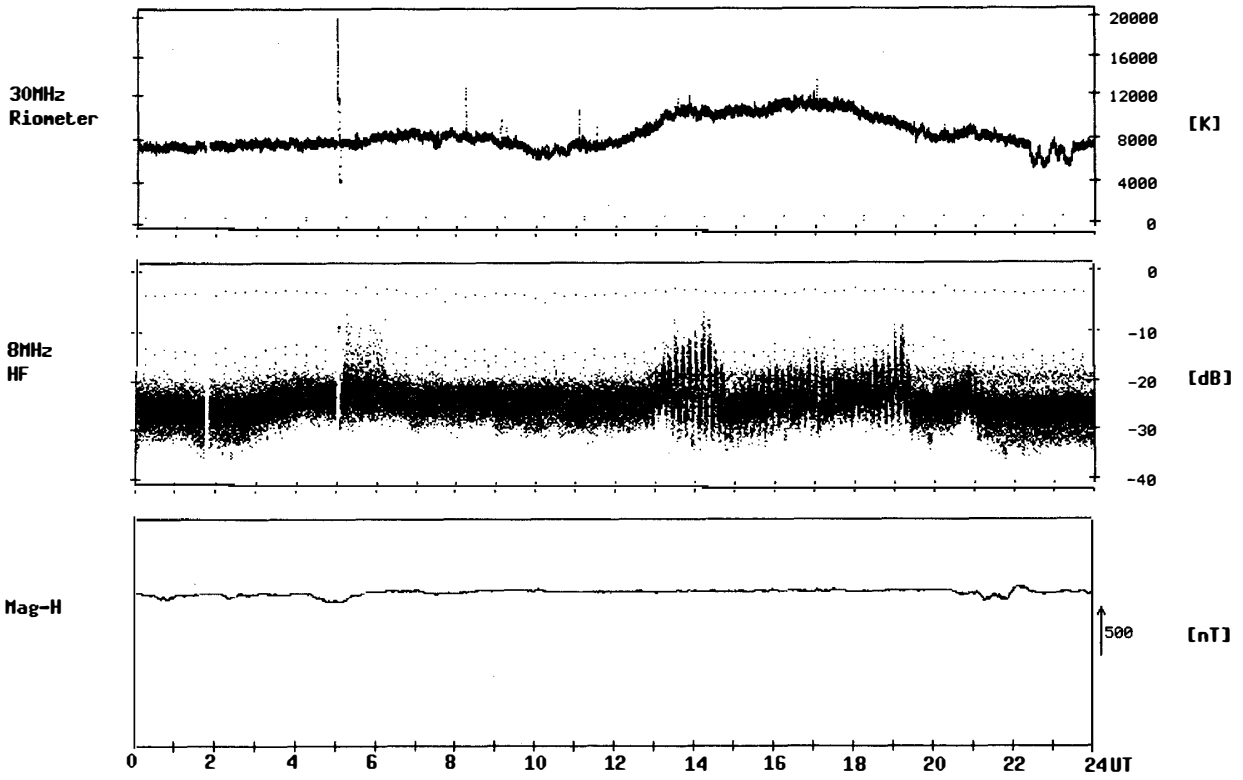
Syowa Station

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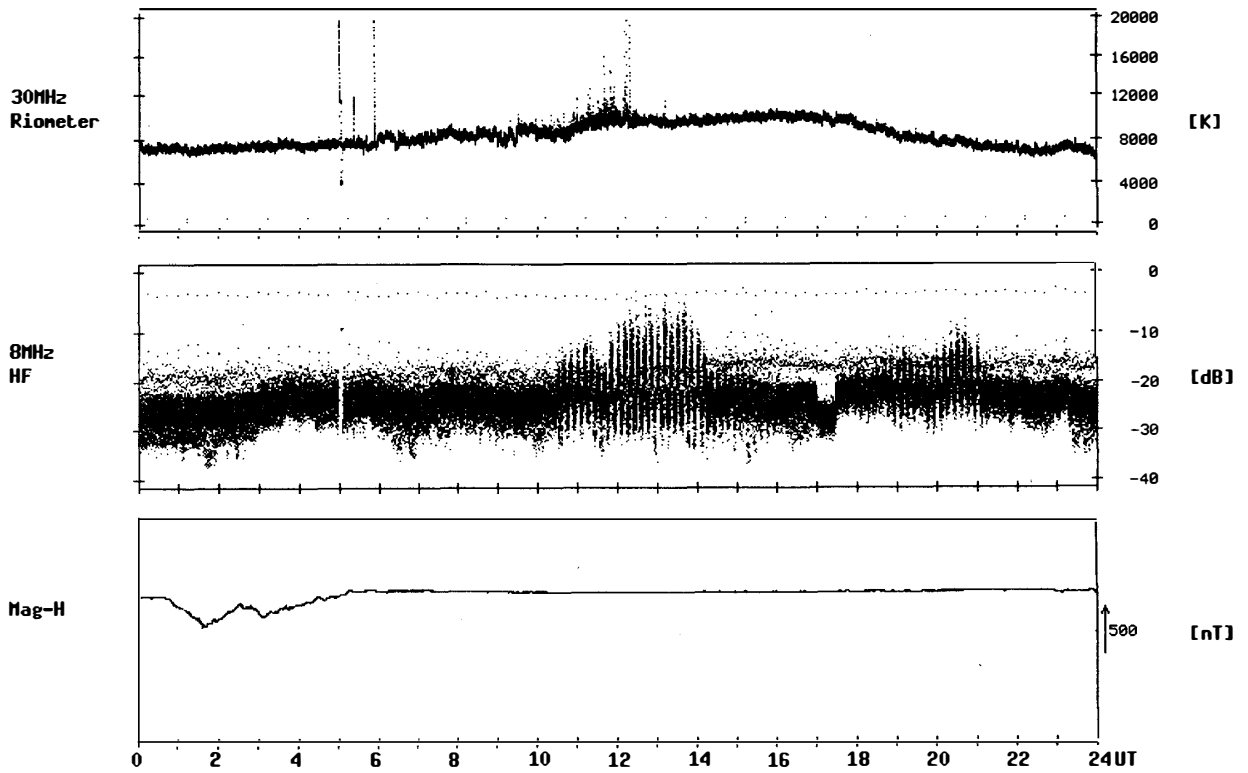
Syowa Station

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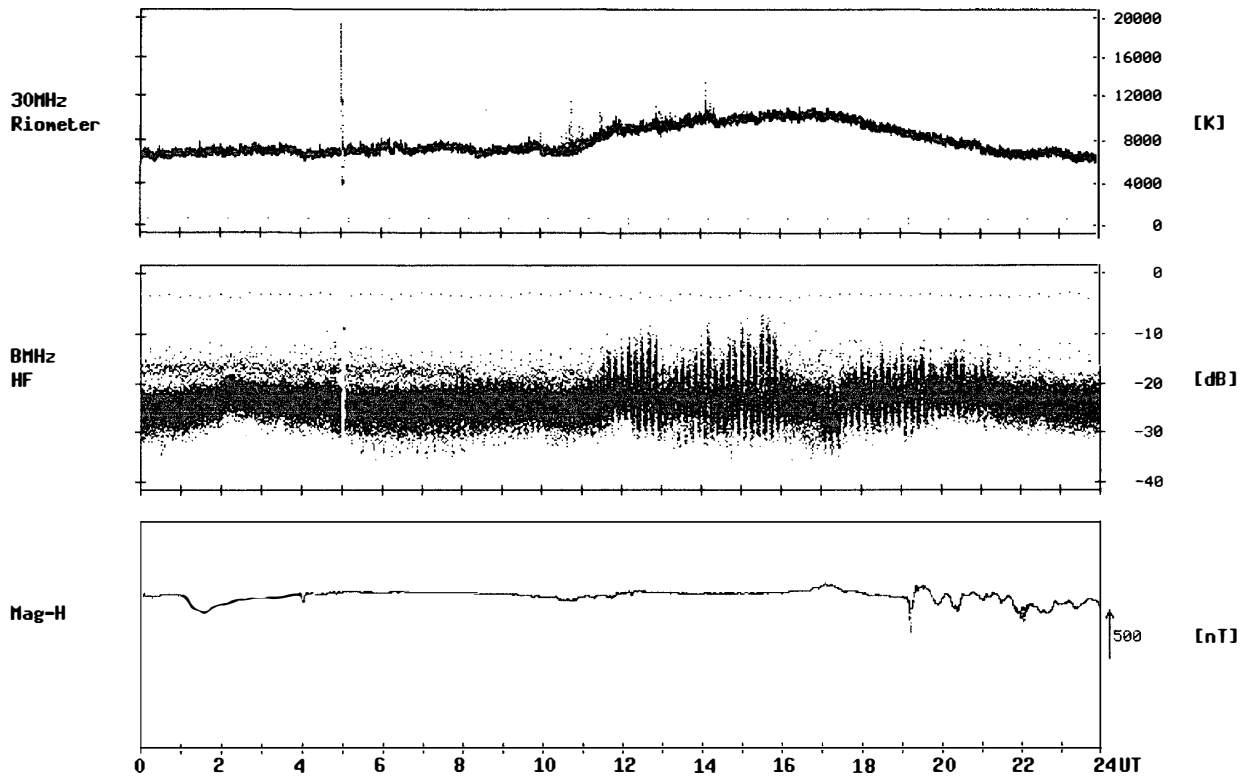
Syowa Station

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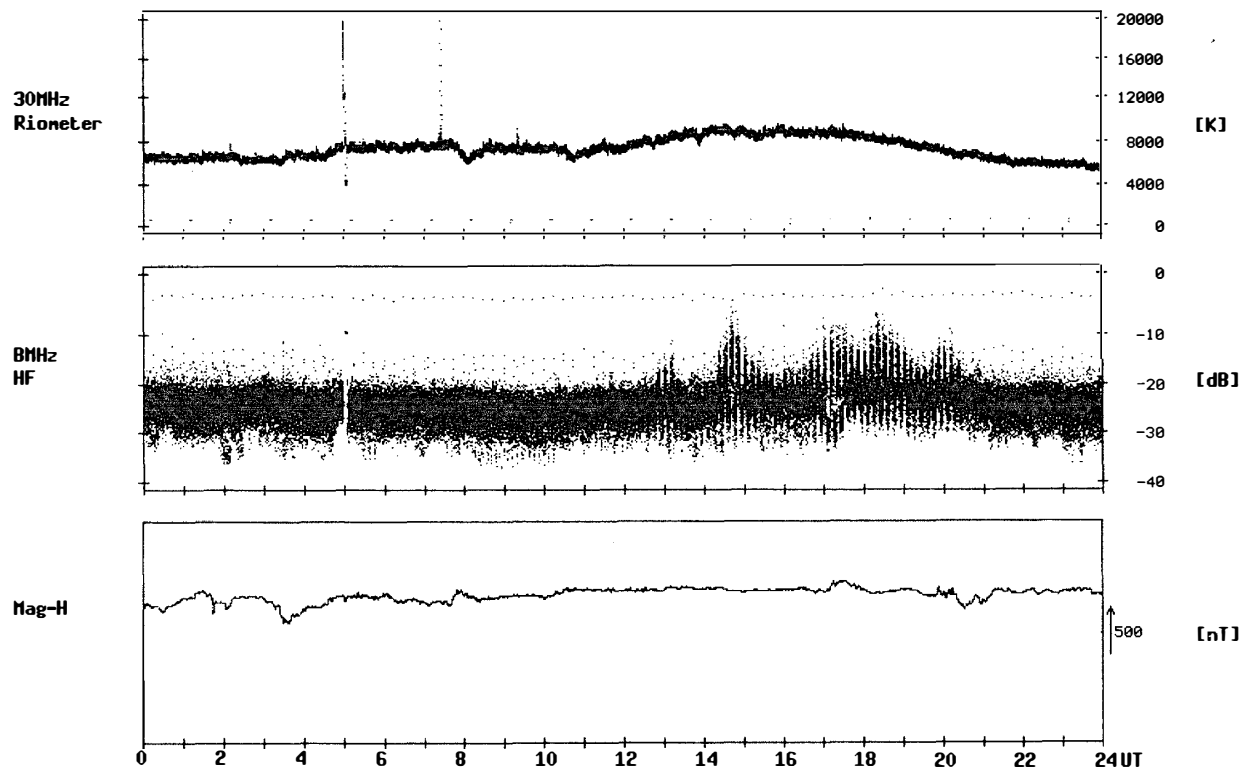
Syowa Station

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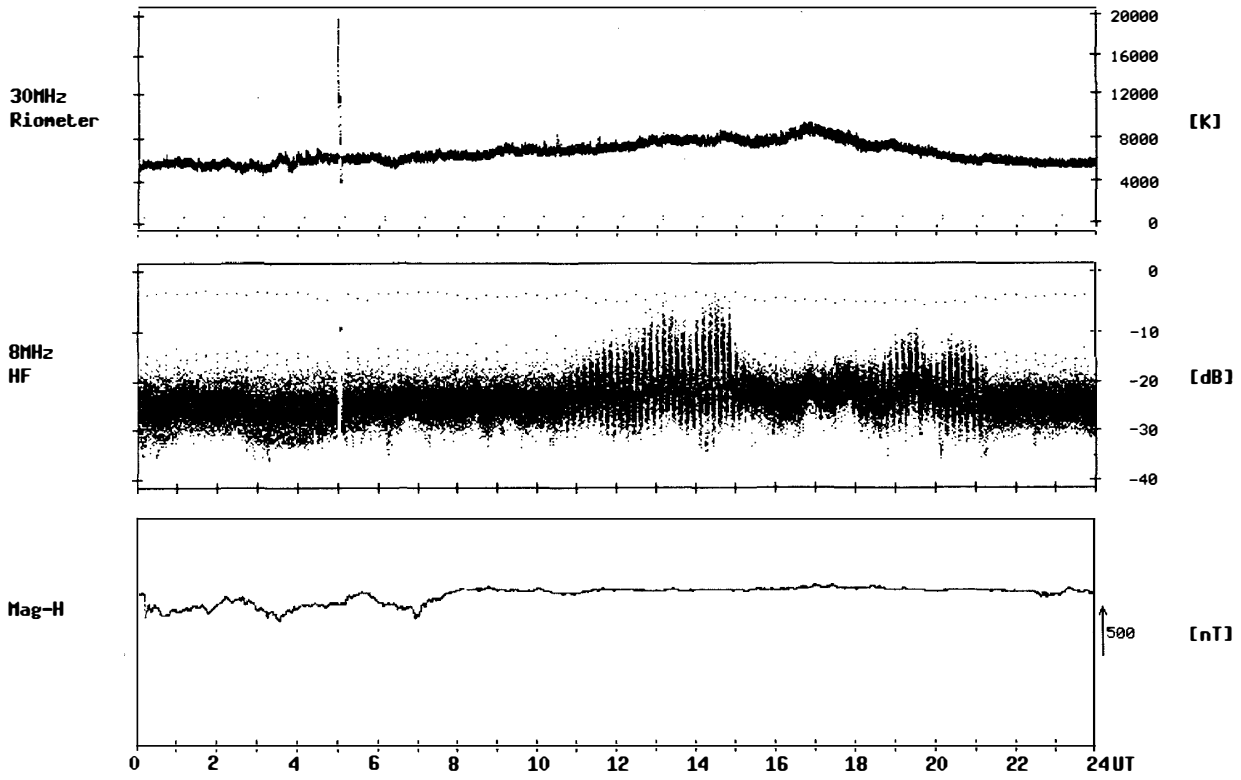
Syowa Station

1999/ 9/13



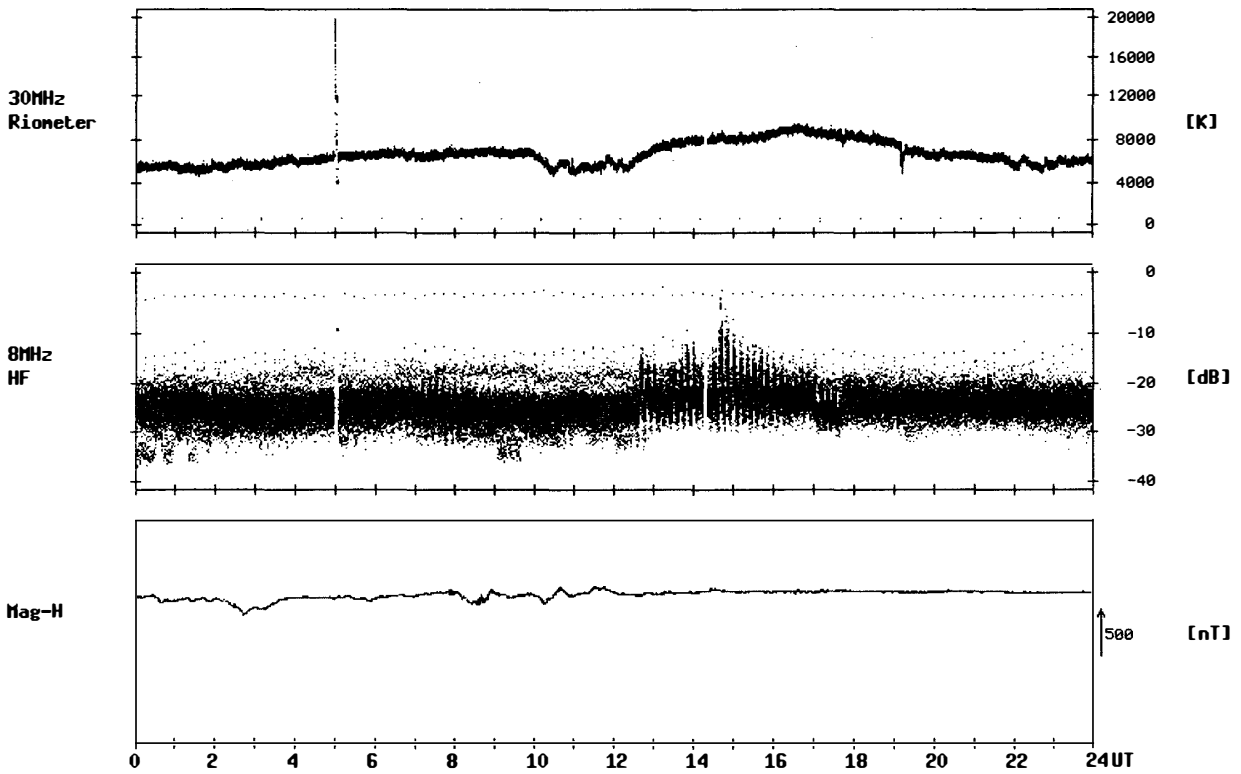
Syowa Station

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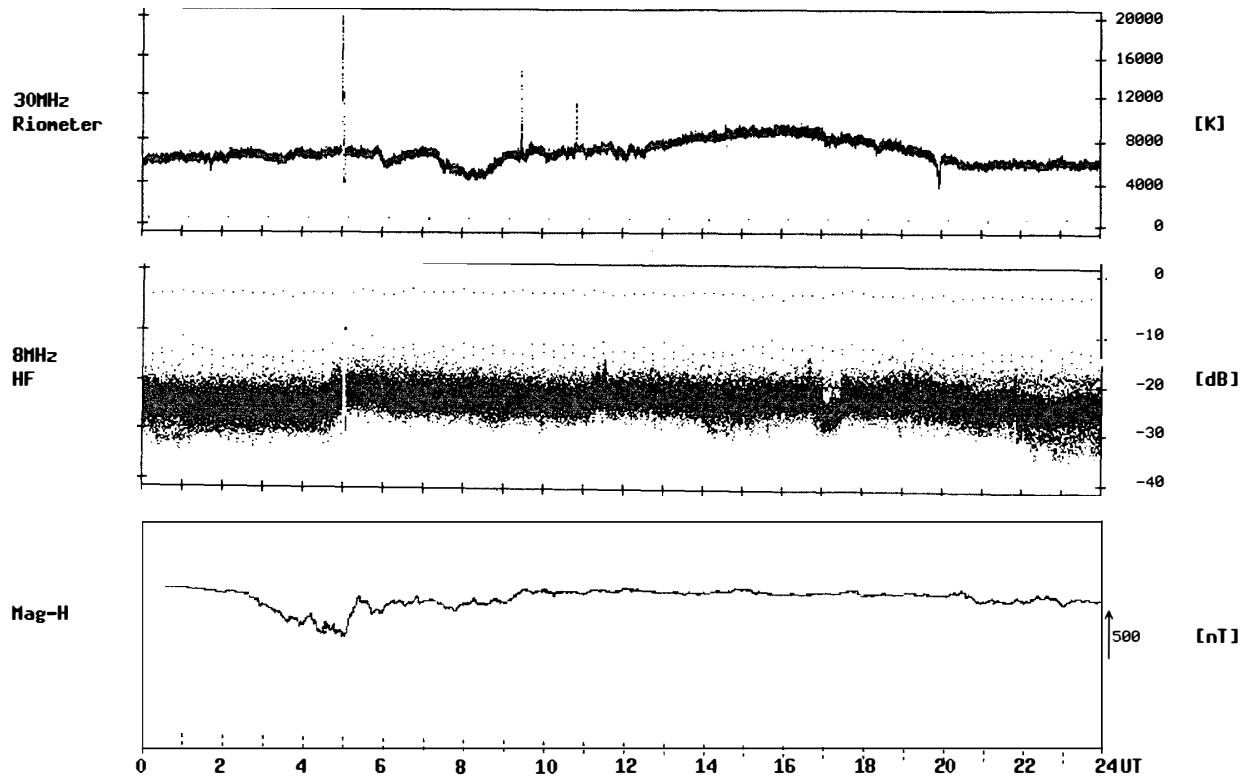
Syowa Station

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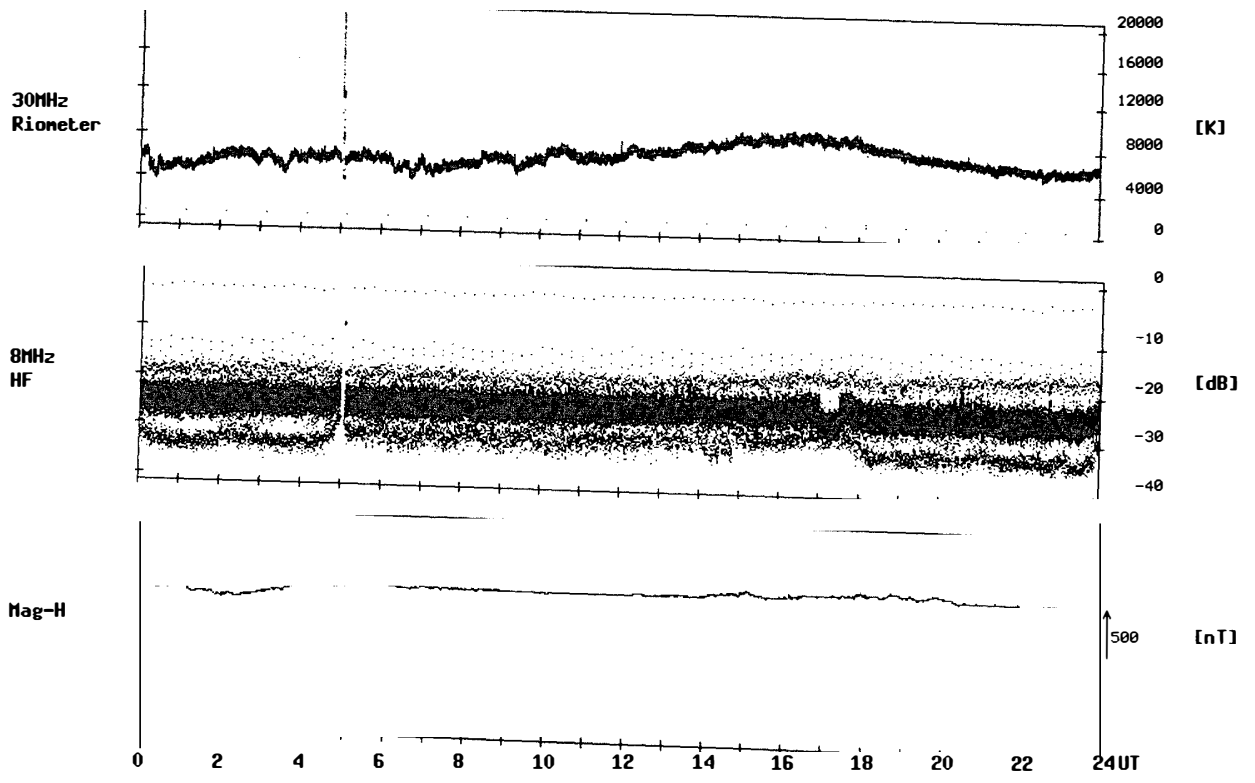
Syowa Station

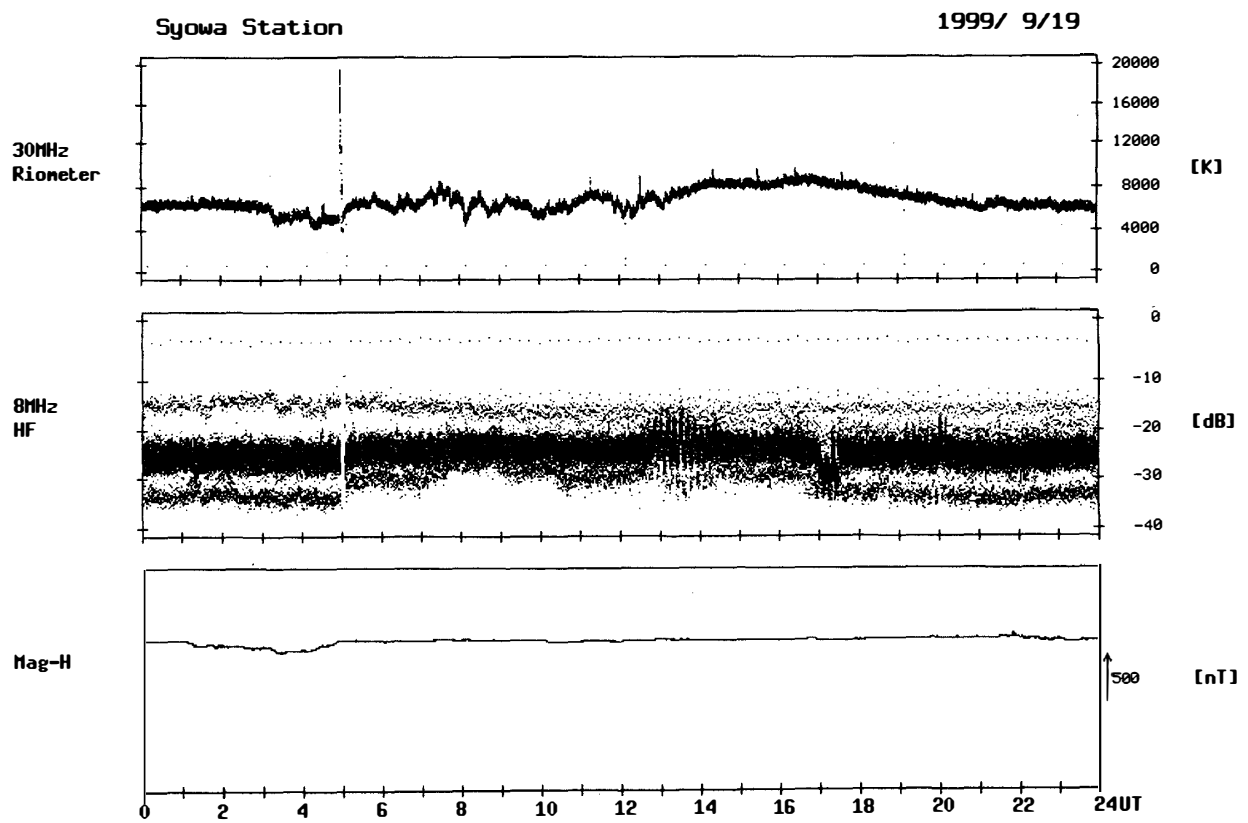
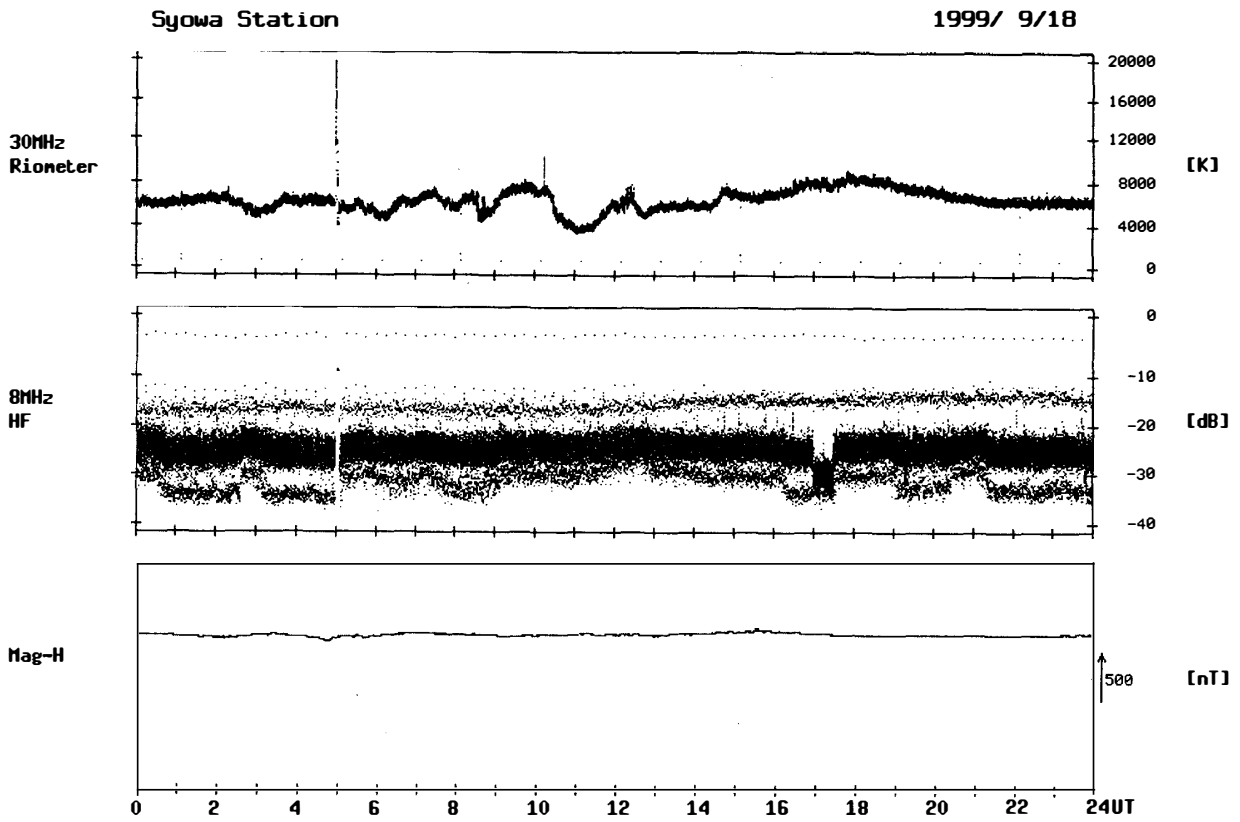
1999/ 9/16



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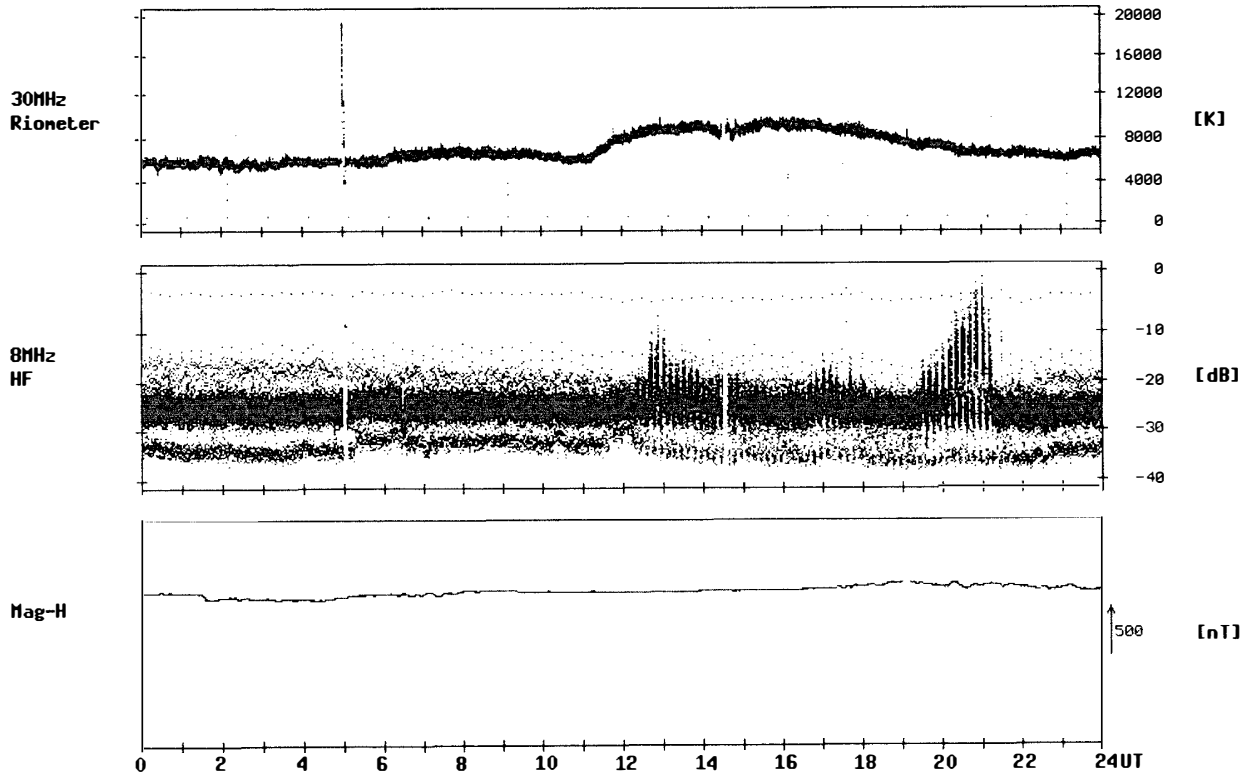
1999/ 9/17





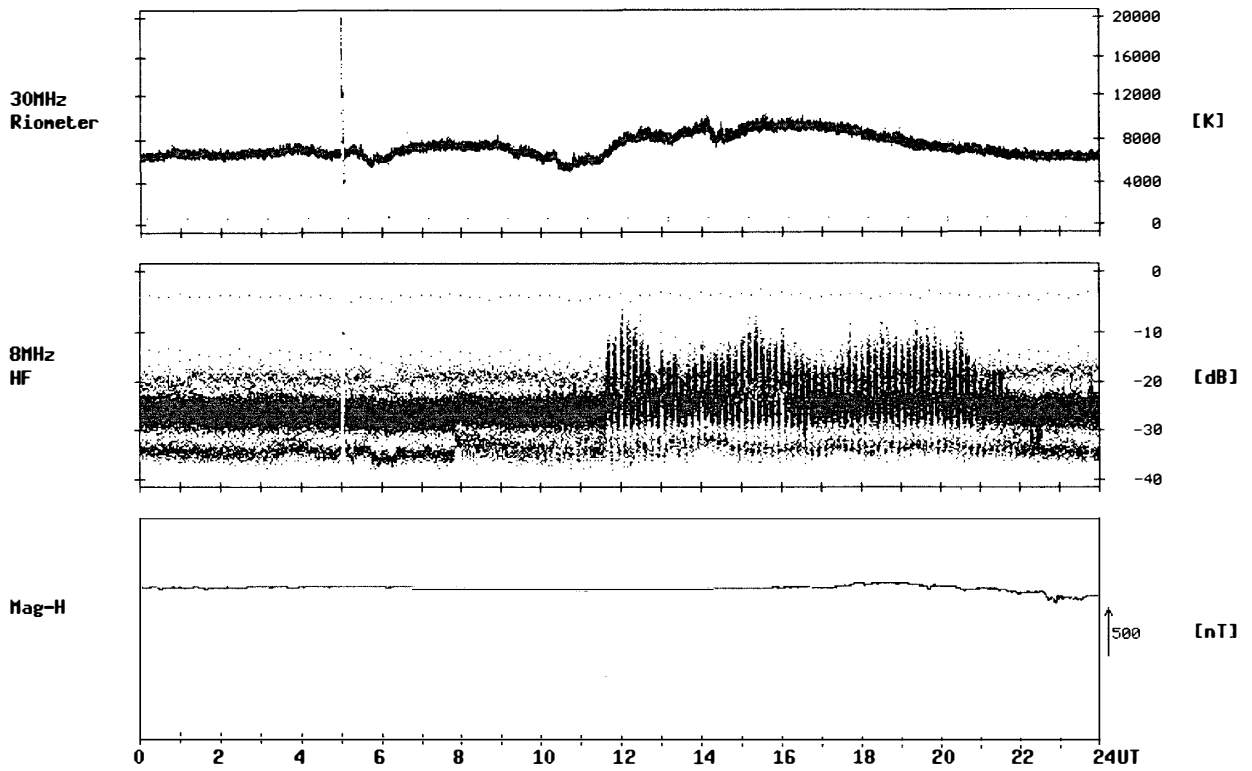
Syowa Station

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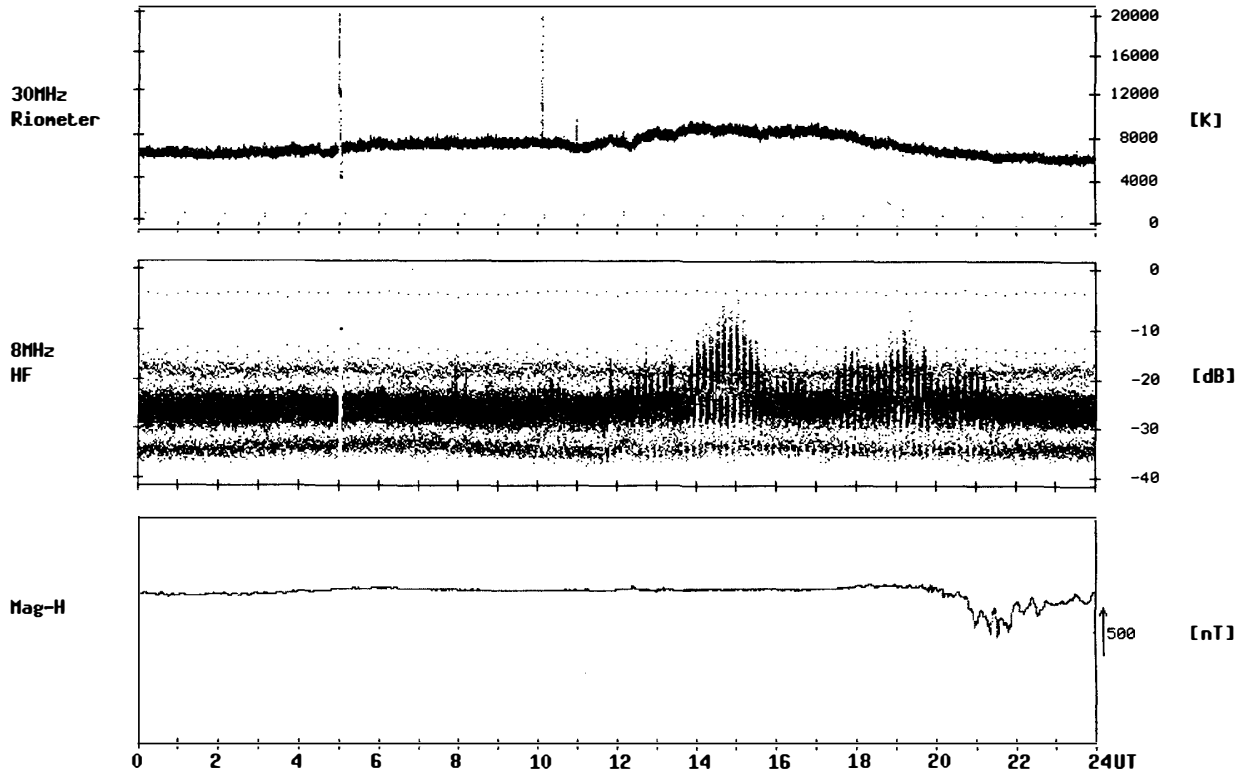
Syowa Station

1999/ 9/21



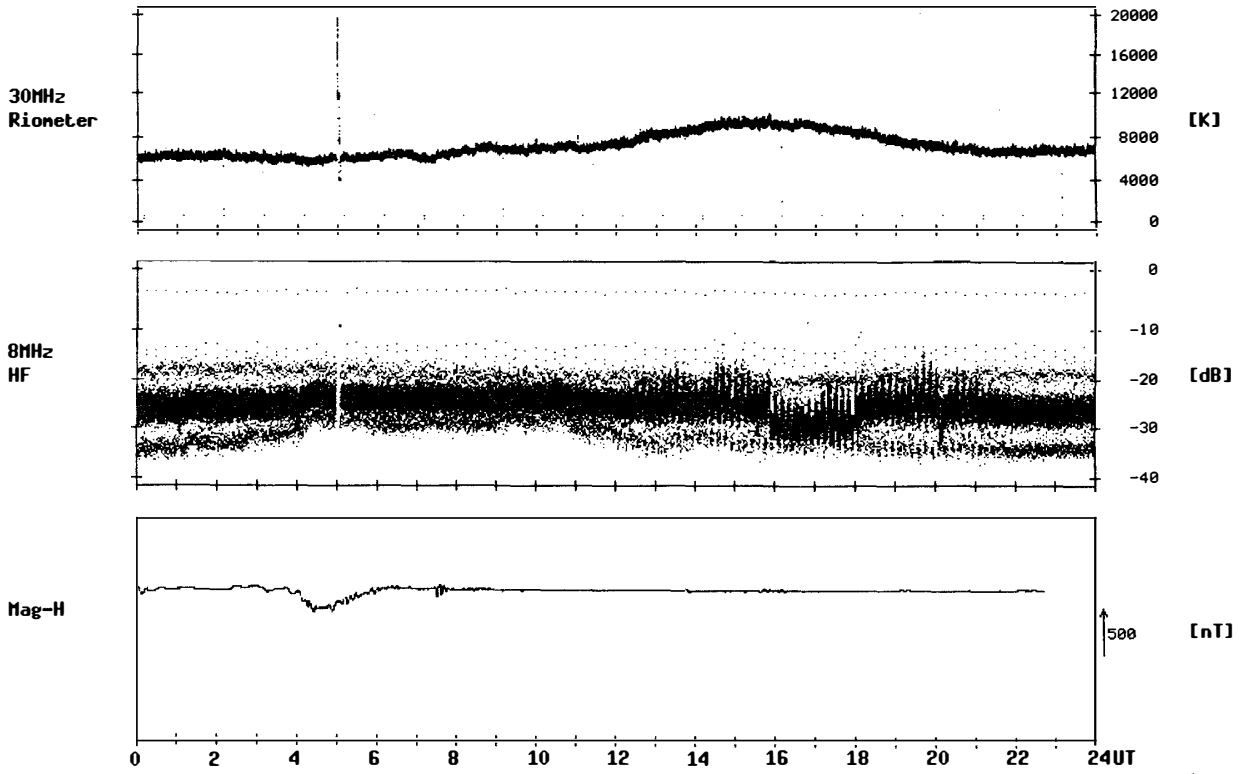
Syowa Station

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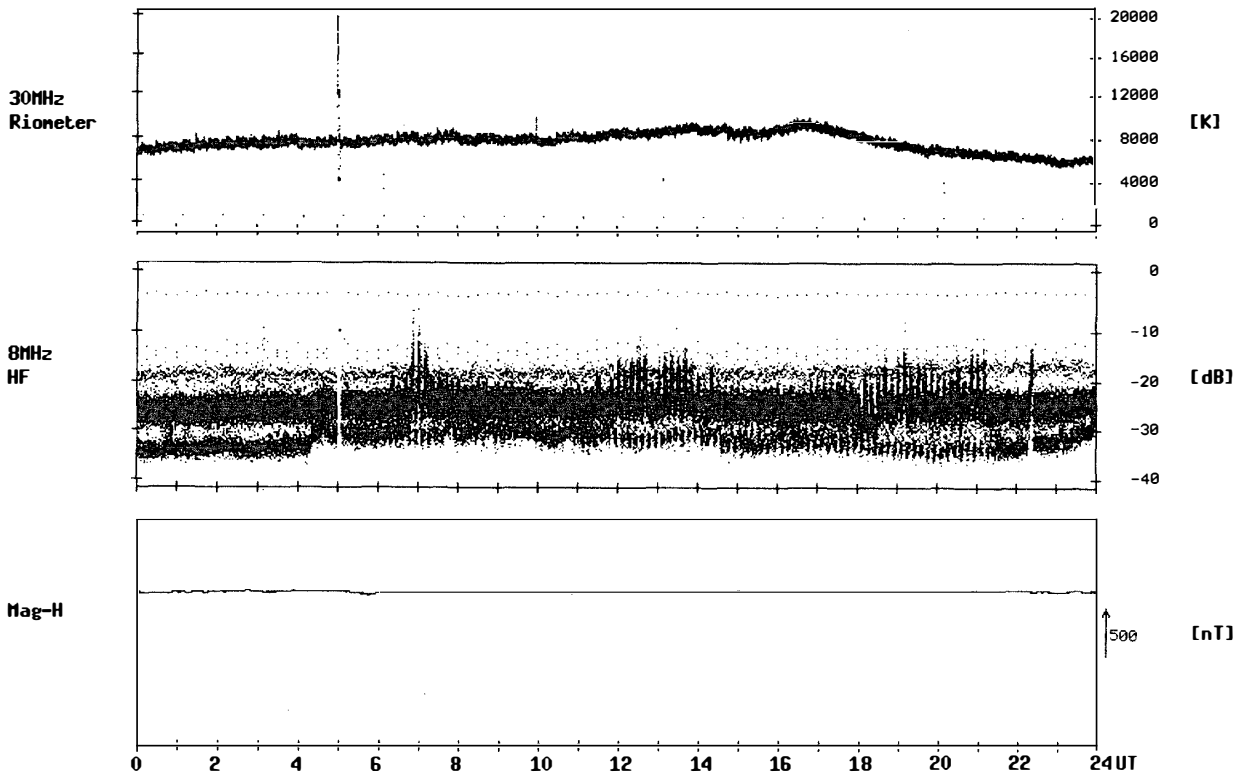
Syowa Station

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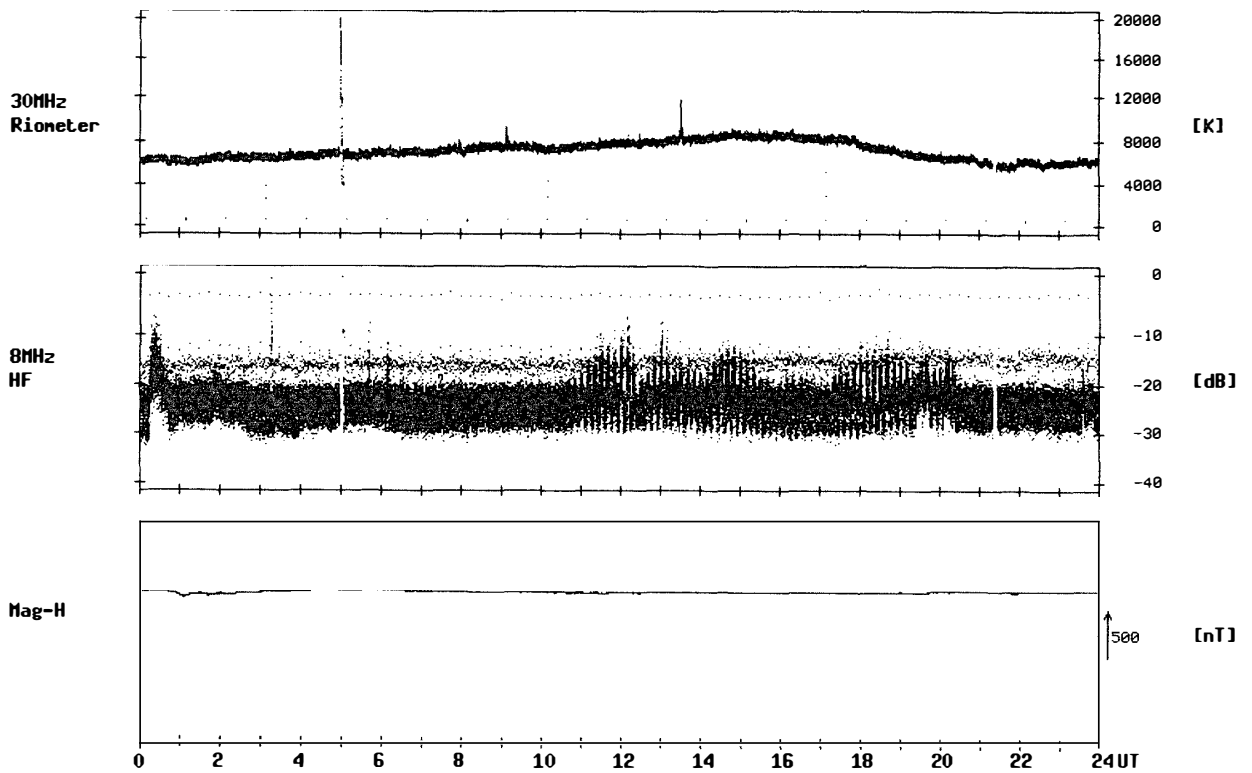
Syowa Station

1999/ 9/24



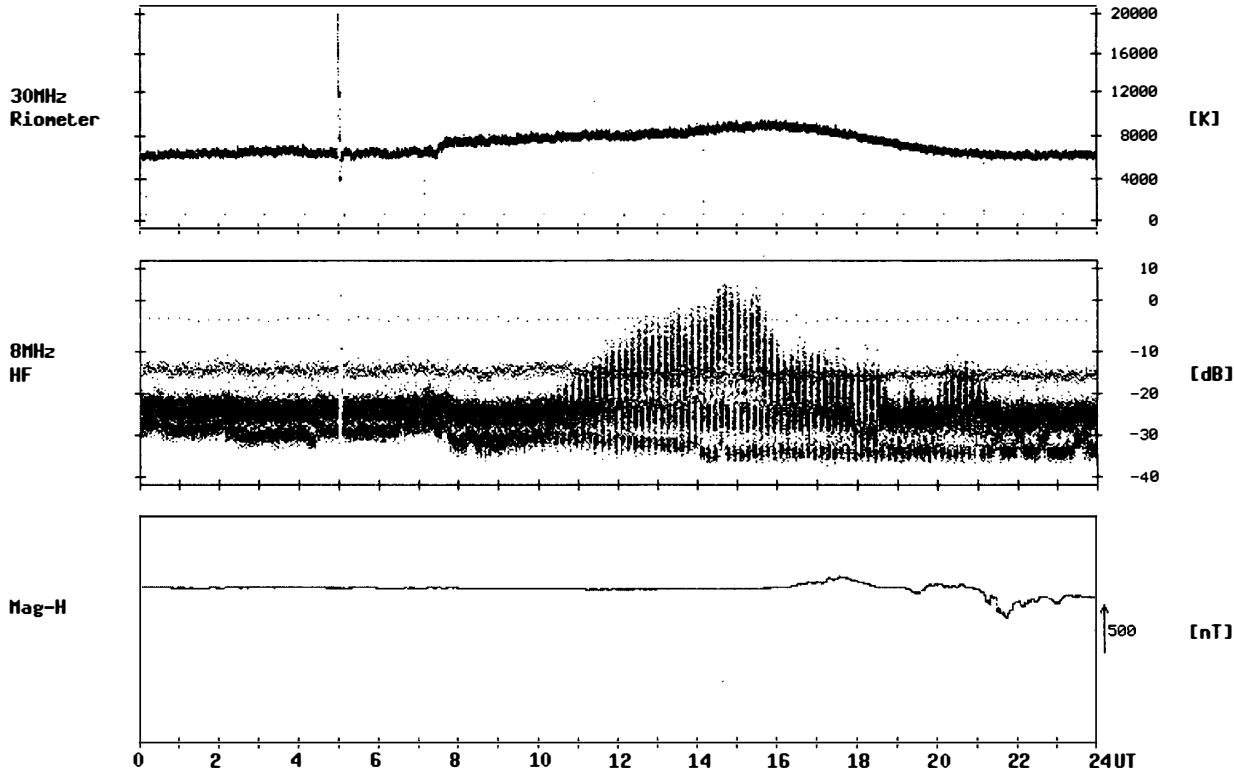
Syowa Station

1999/ 9/25



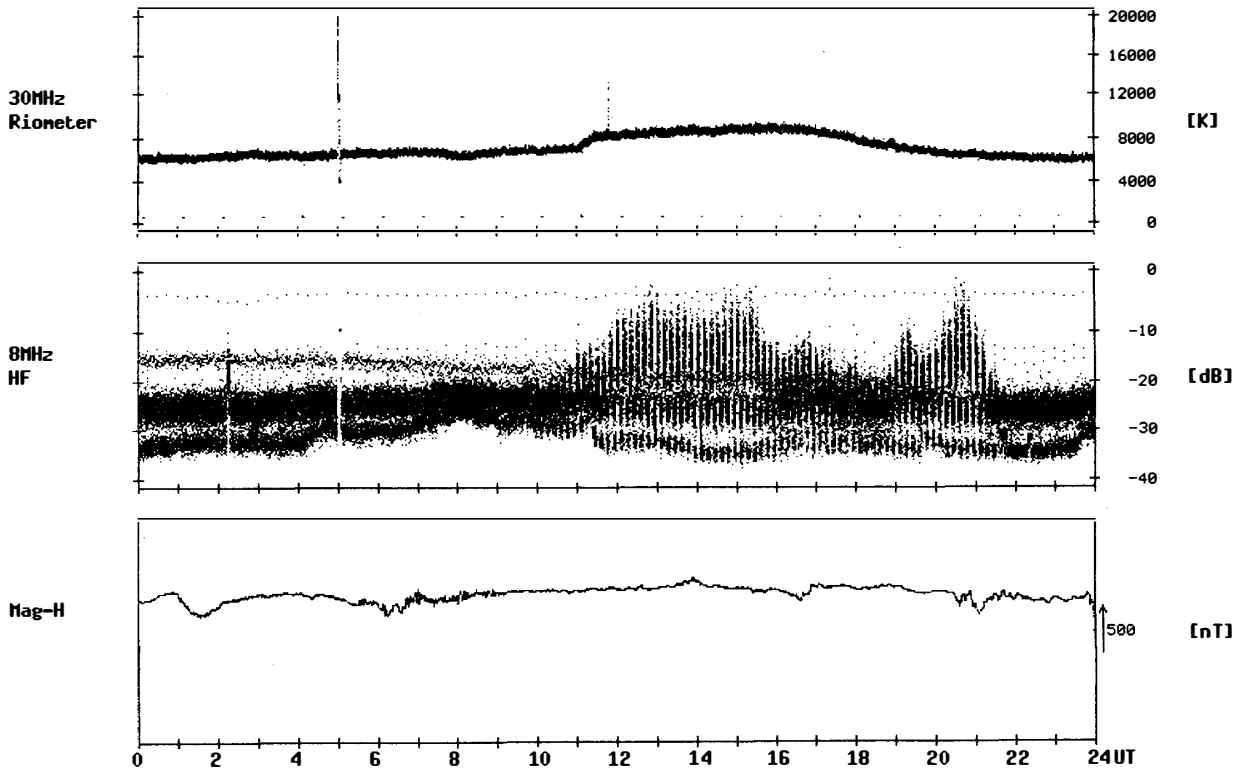
Syowa Station

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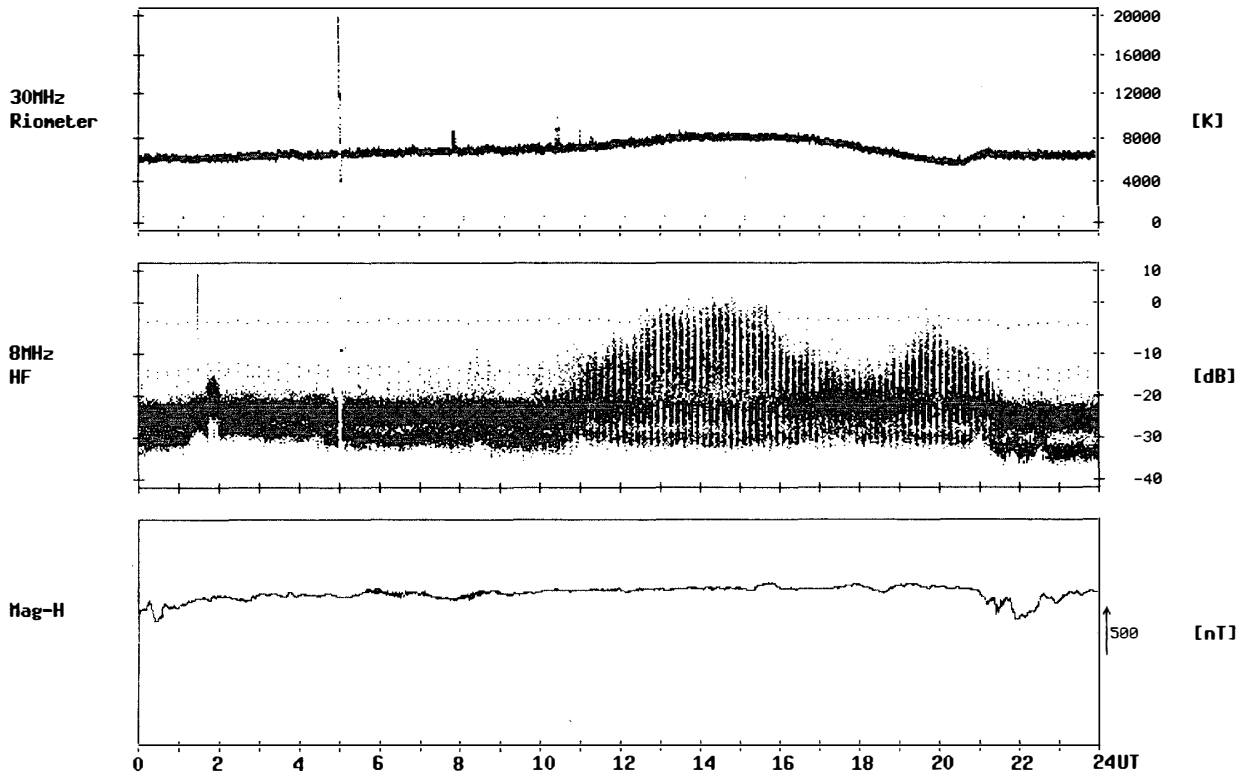
Syowa Station

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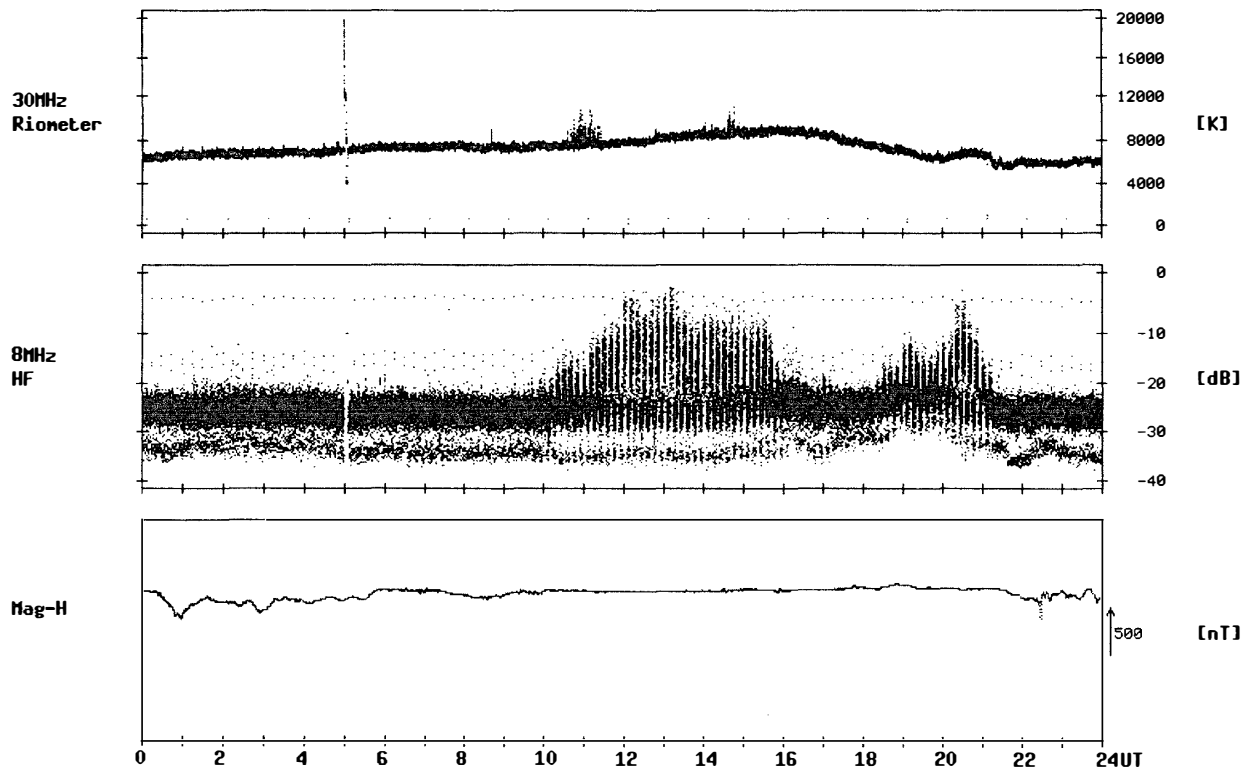
Syowa Station

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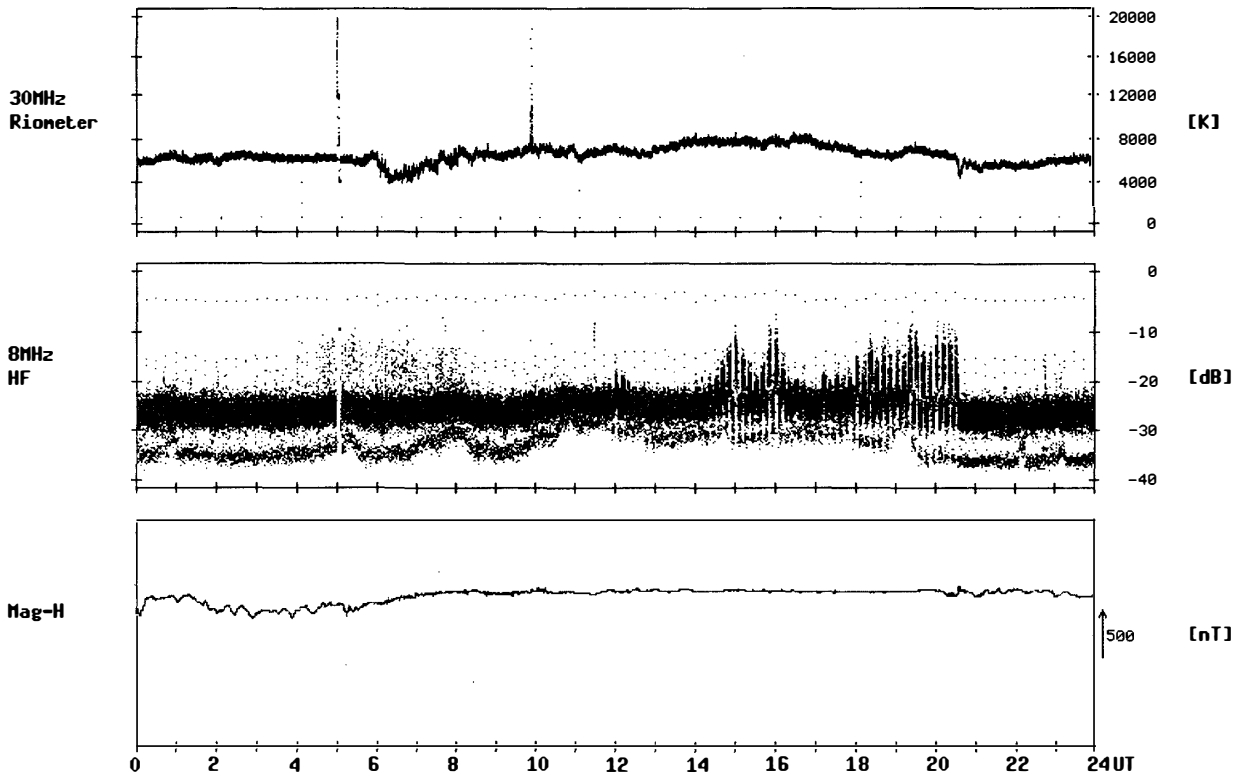
Syowa Station

1999/ 9/29



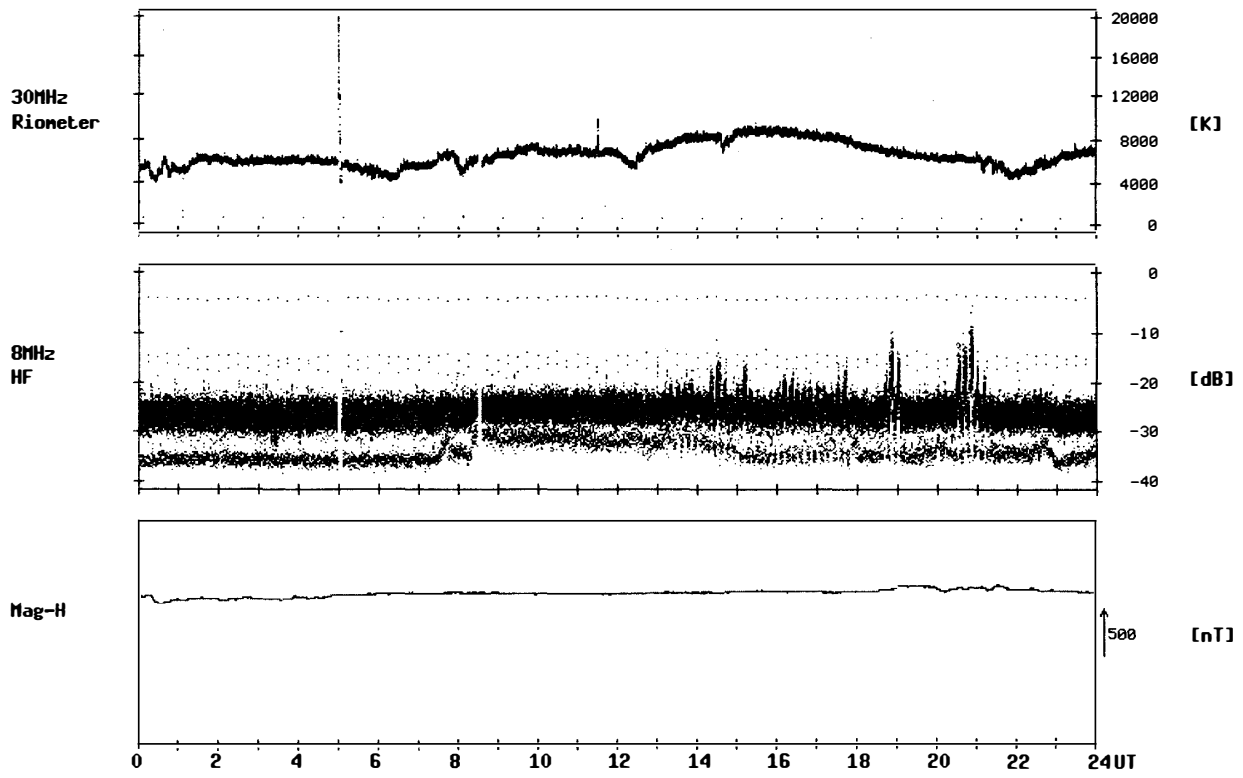
Syowa Station

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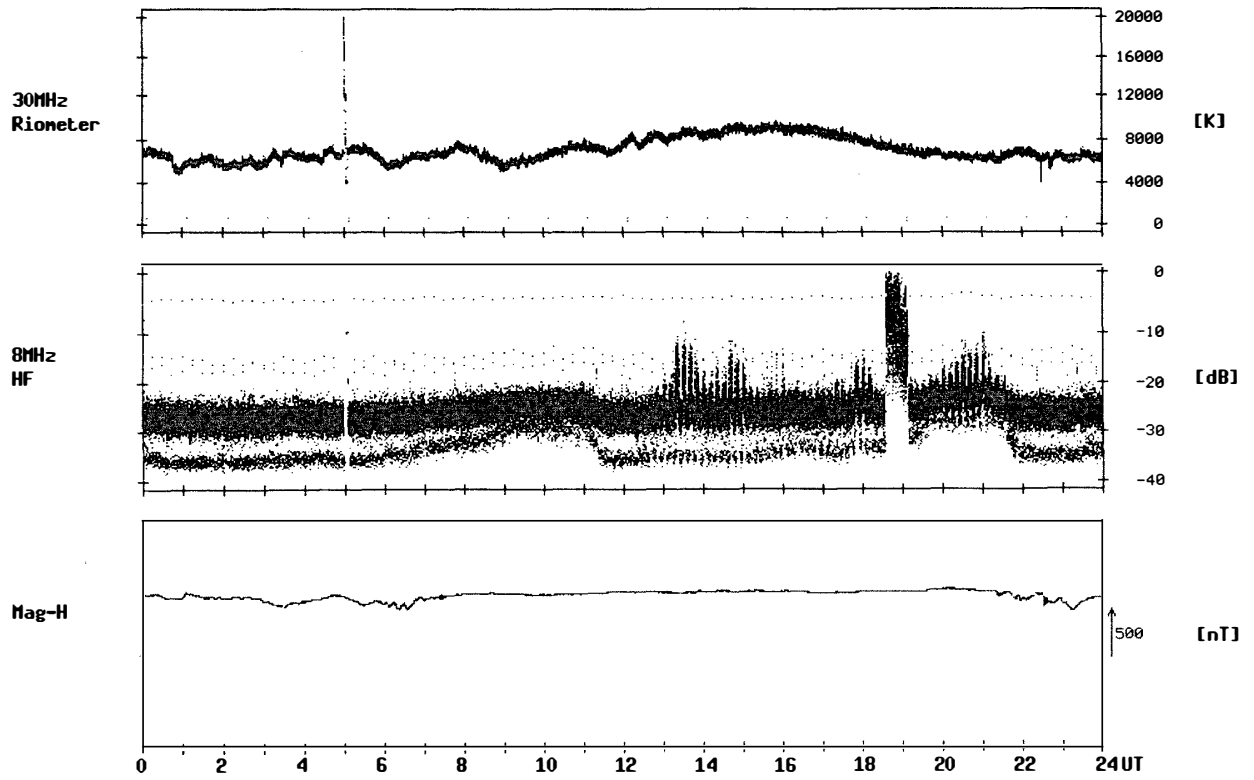
Syowa Station

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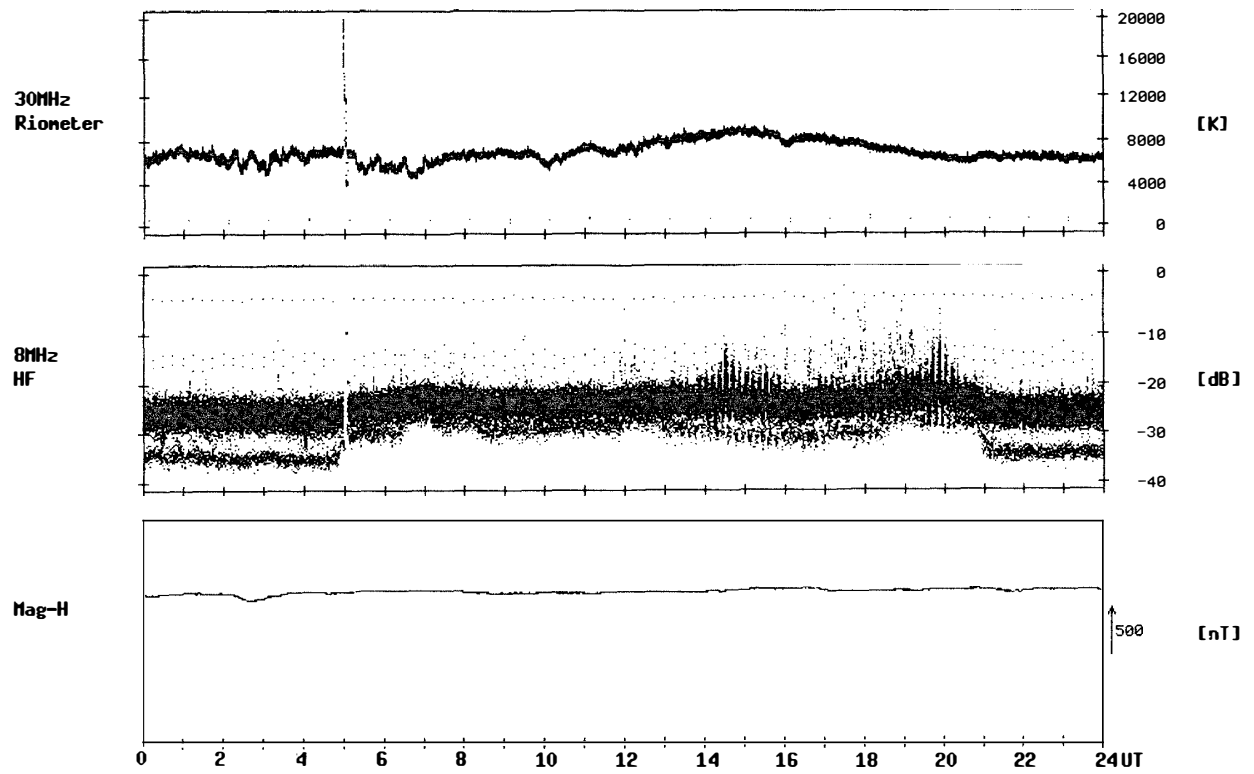
Syowa Station

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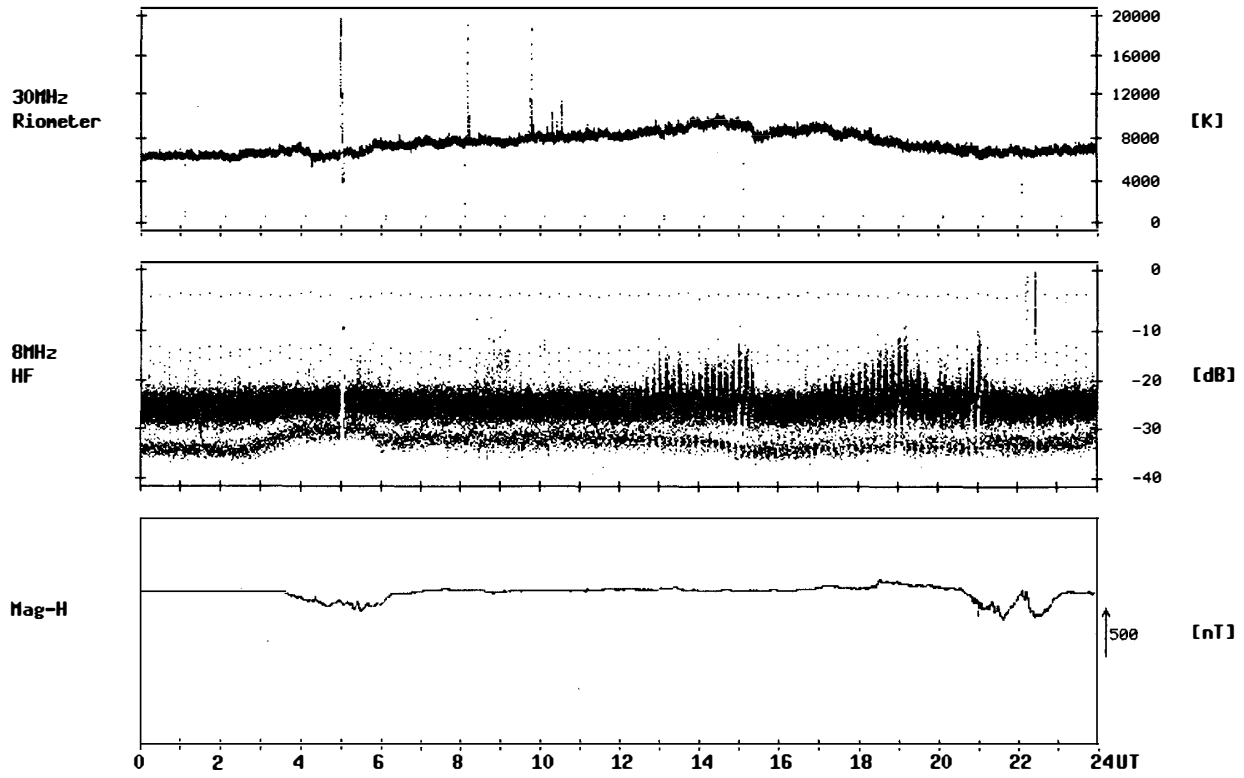
Syowa Station

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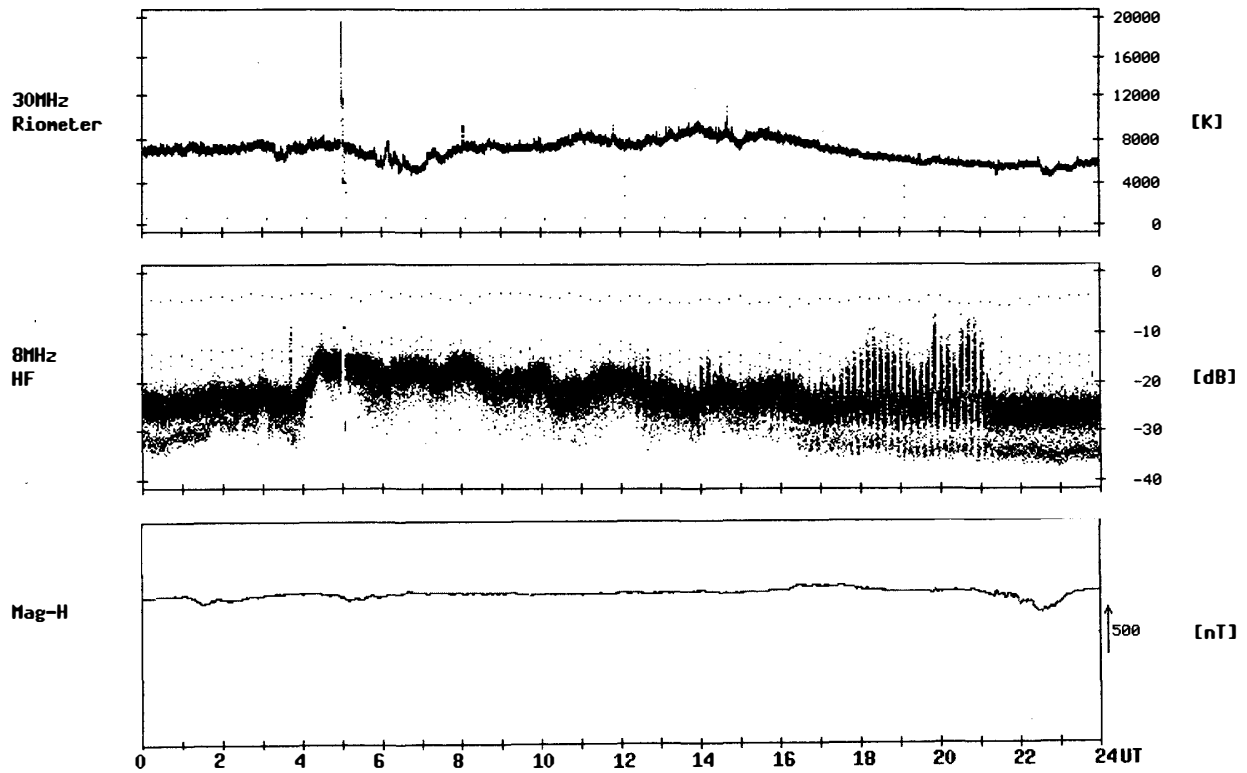
Syowa Station

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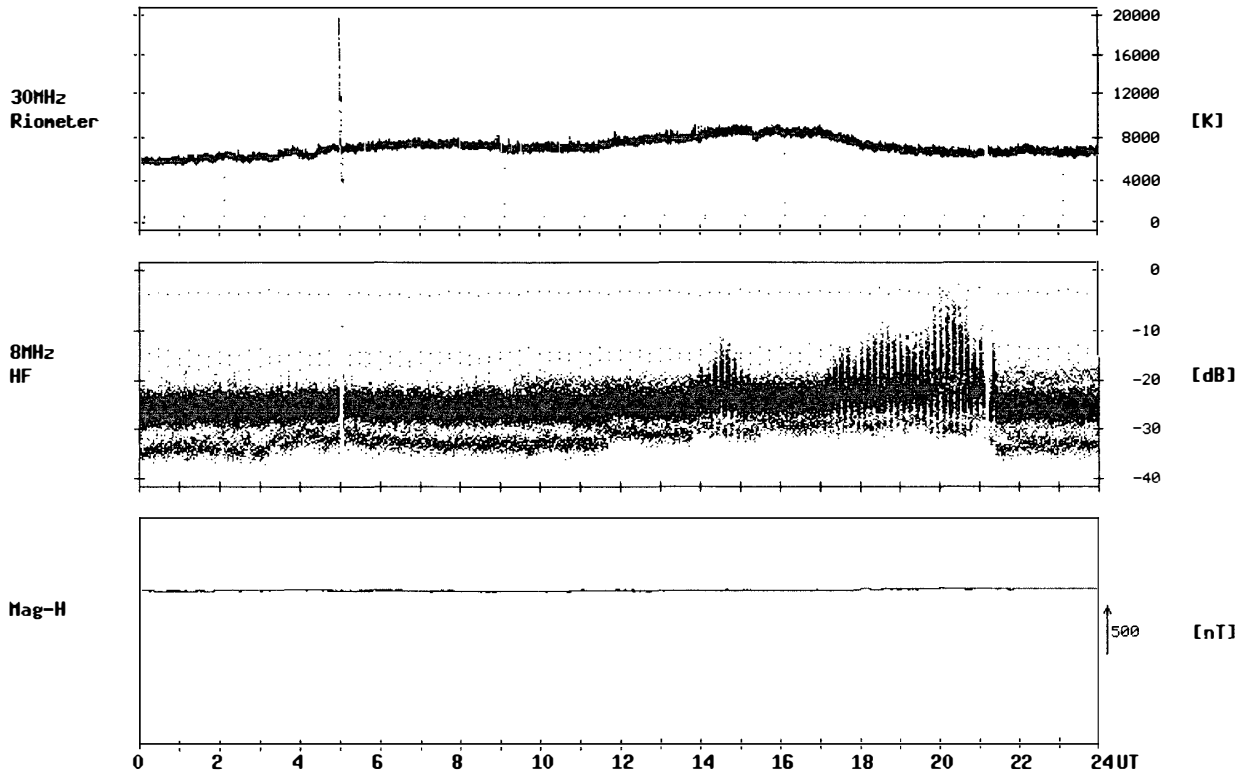
Syowa Station

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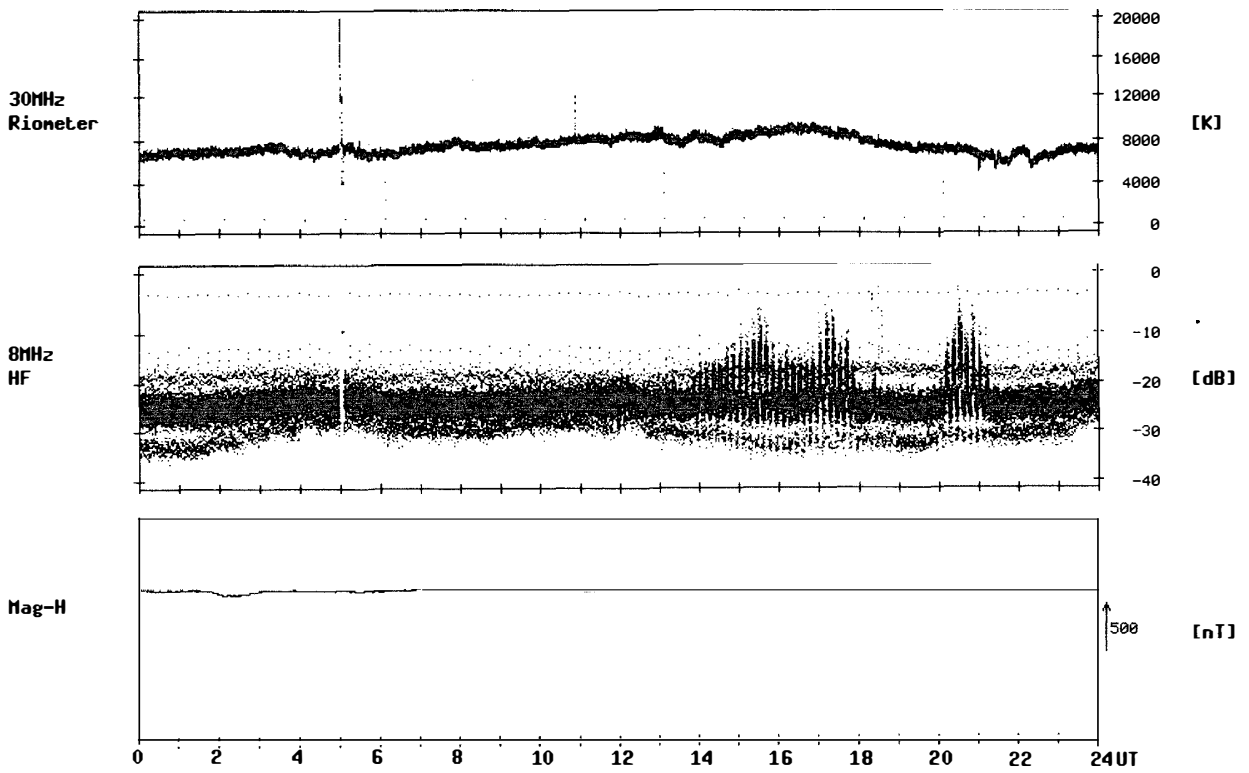
Syowa Station

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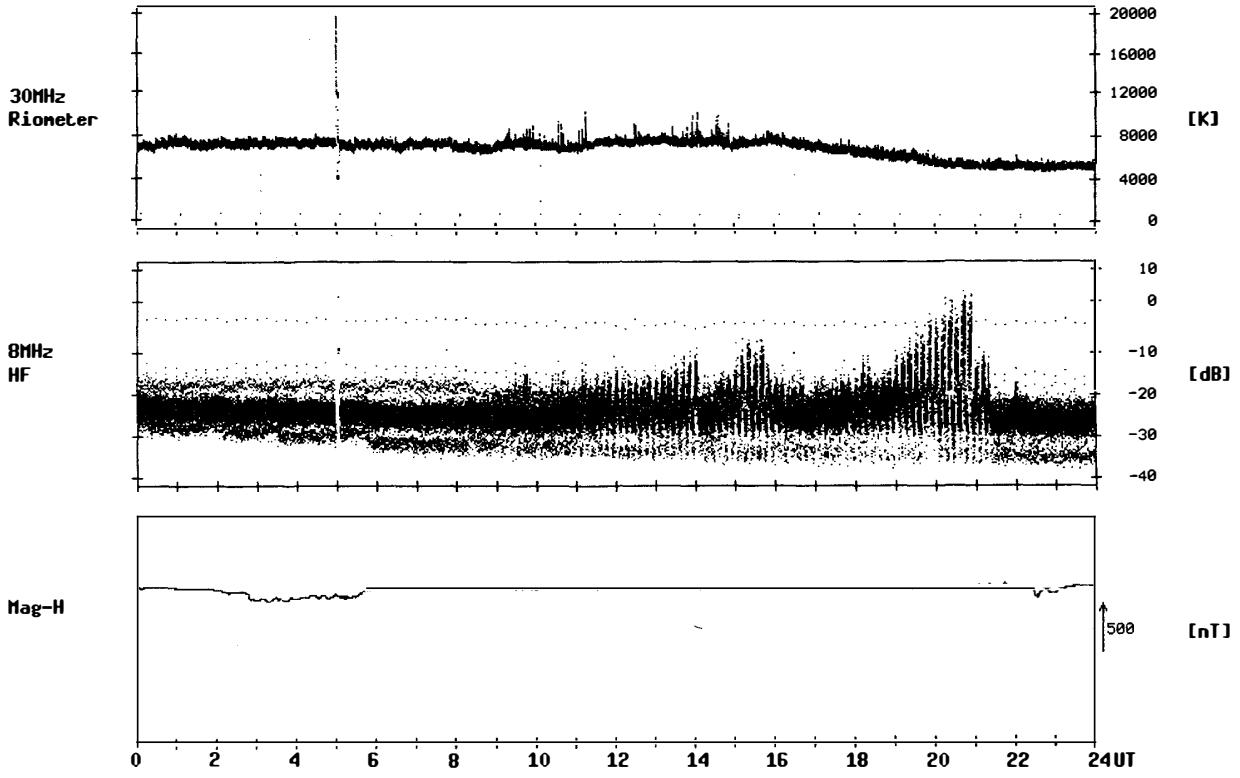
Syowa Station

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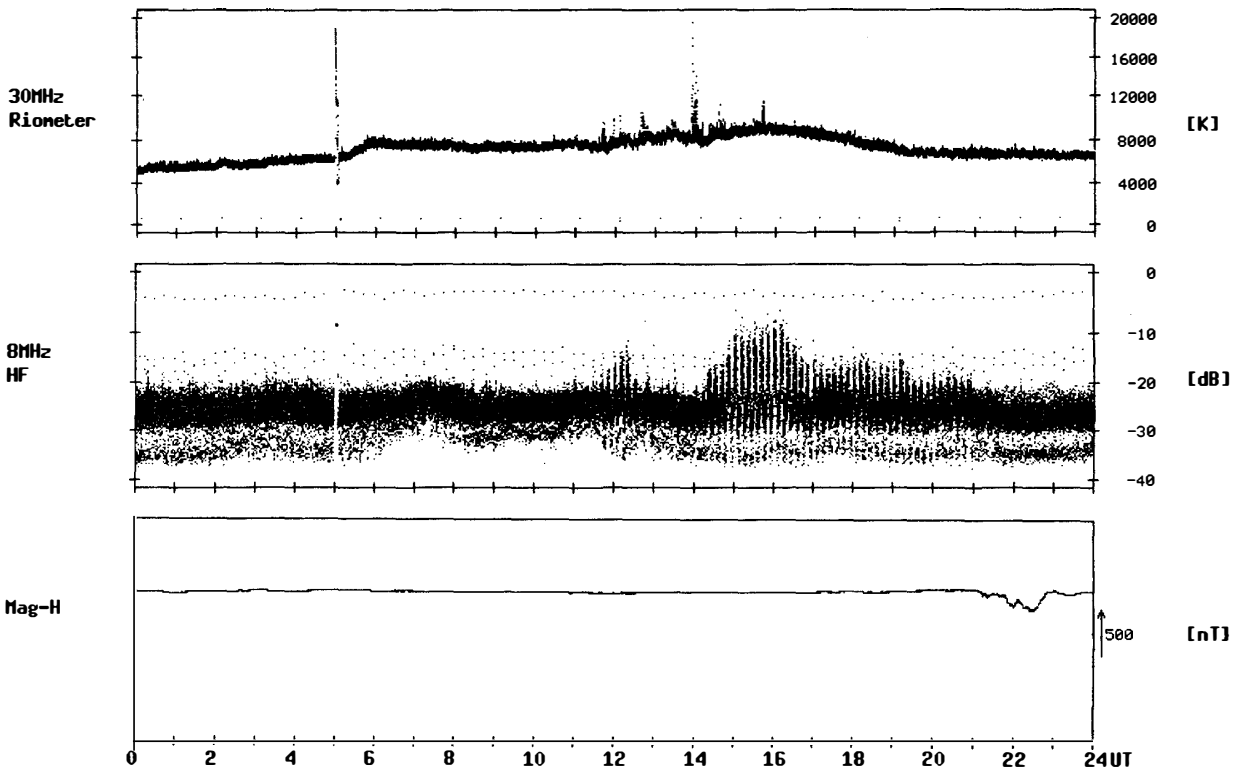
Syowa Station

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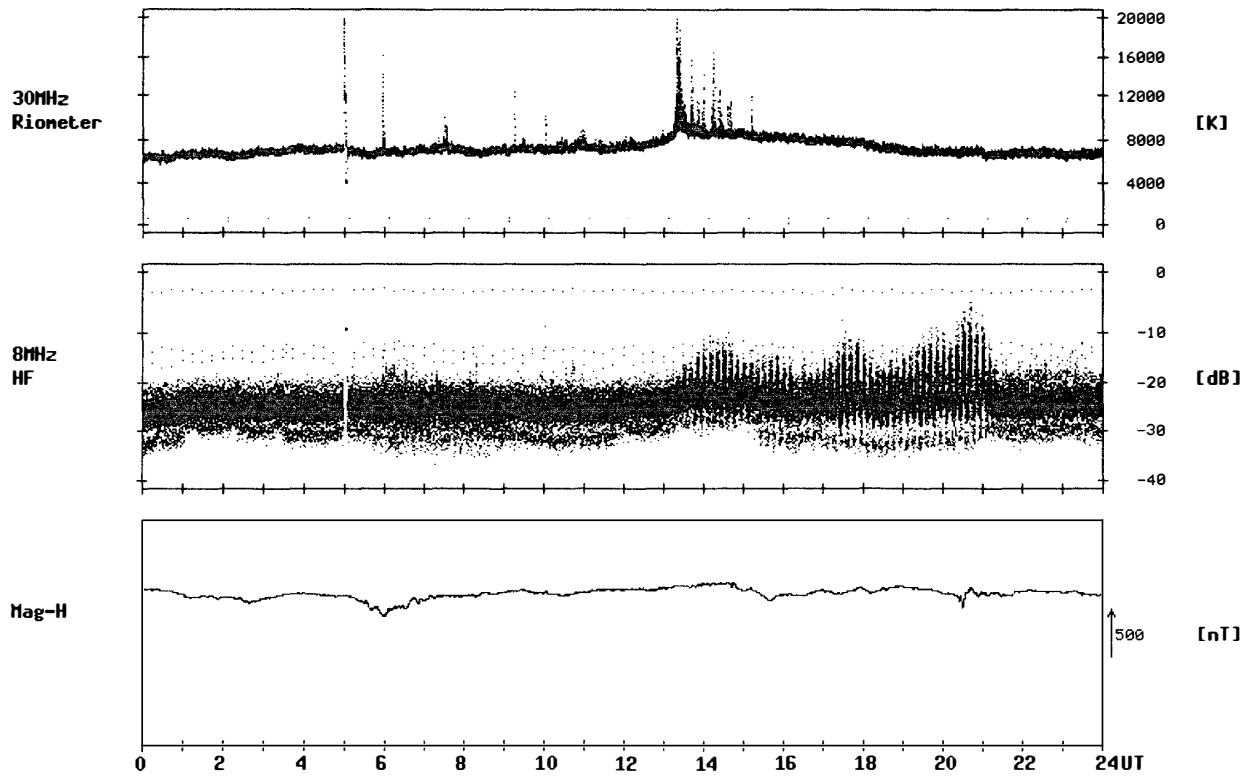
Syowa Station

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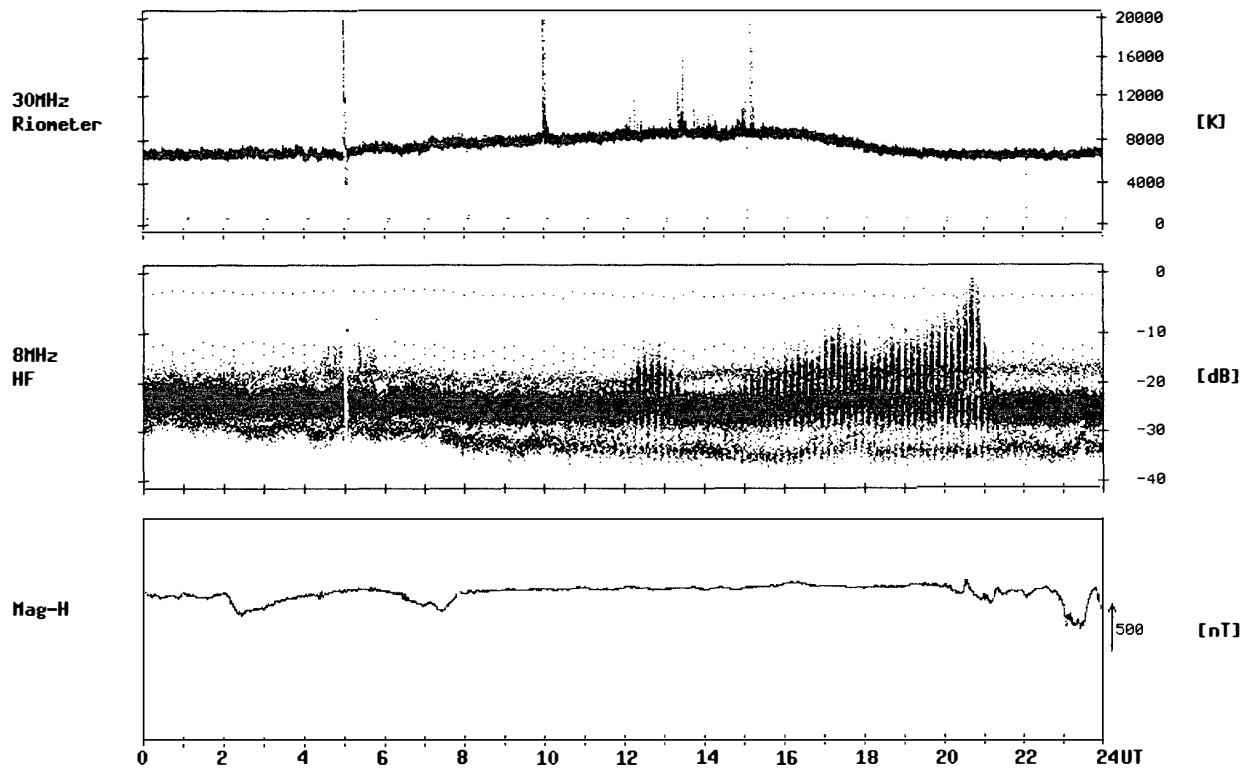
Syowa Station

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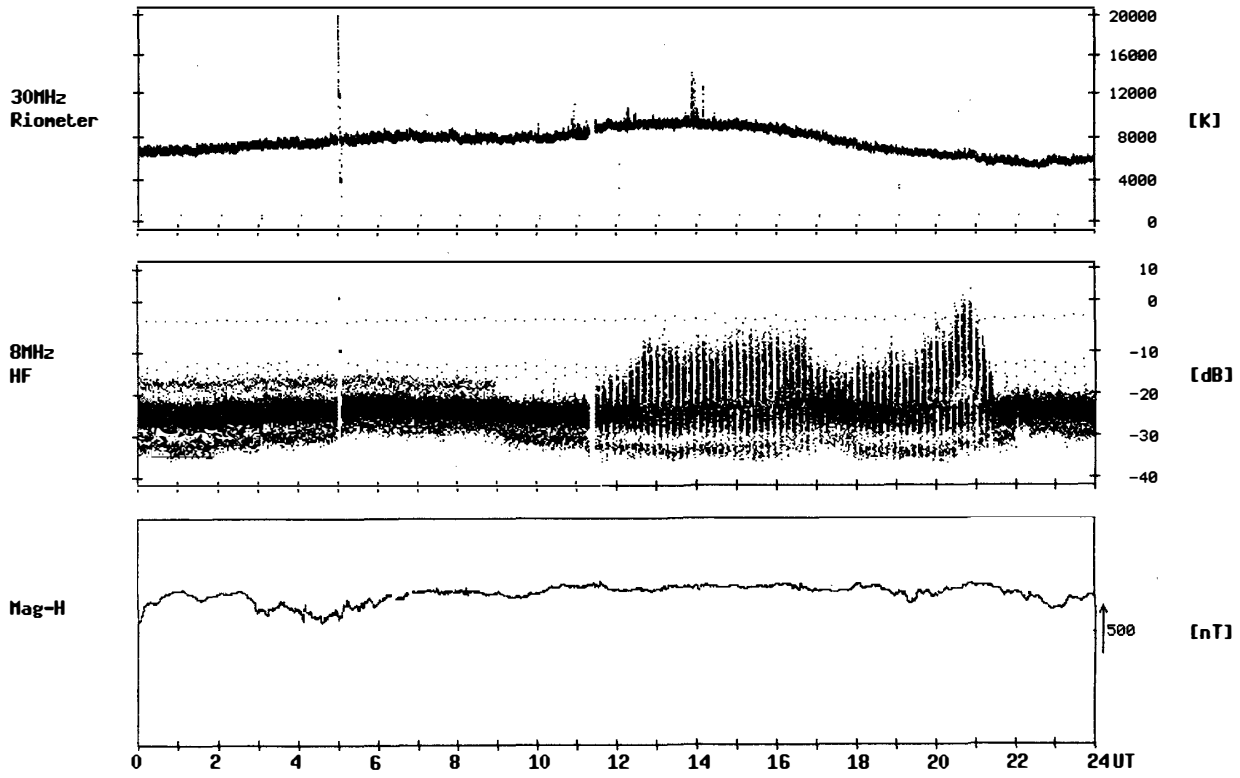
Syowa Station

1999/10/11



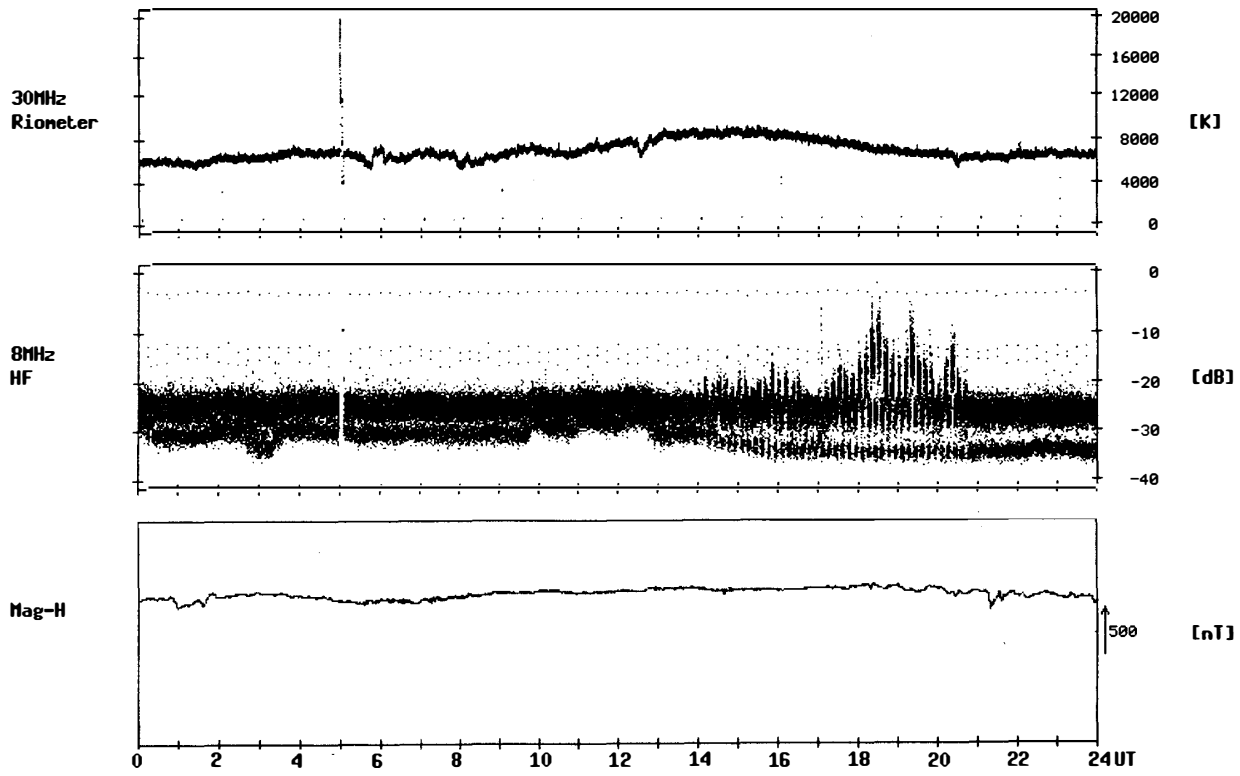
Syowa Station

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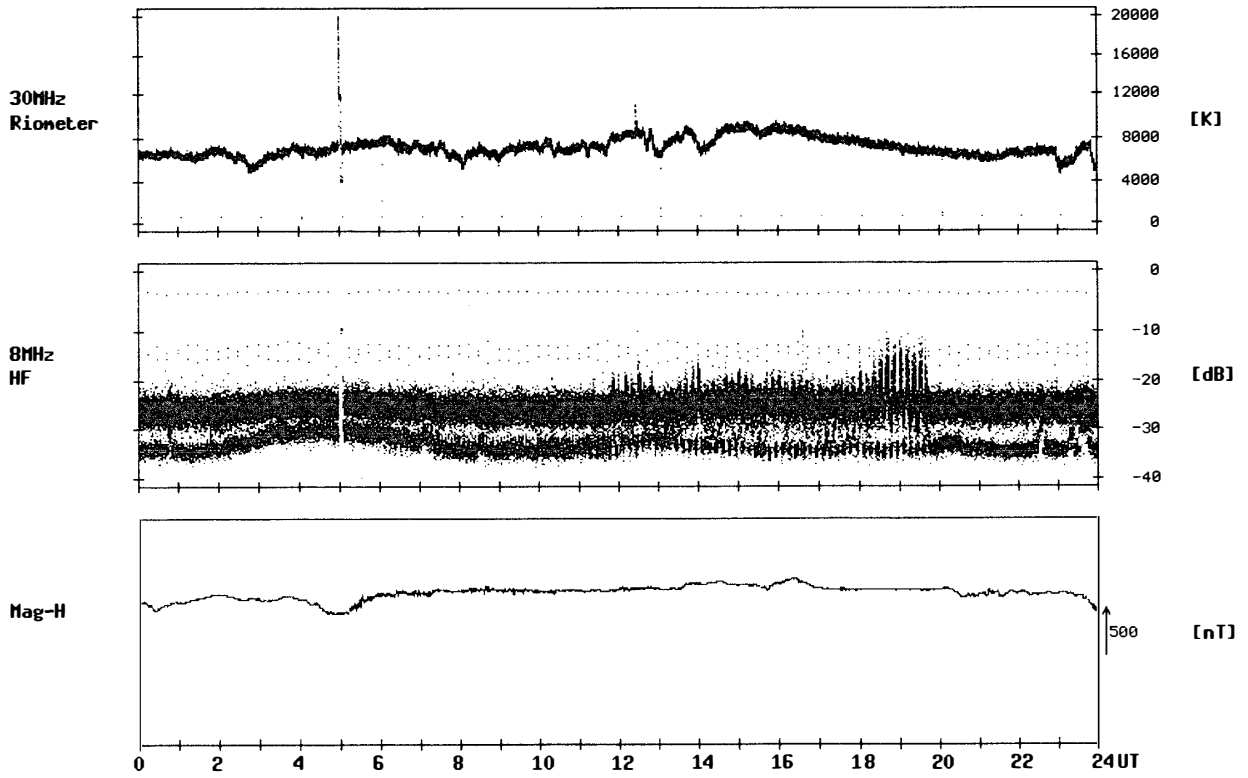
Syowa Station

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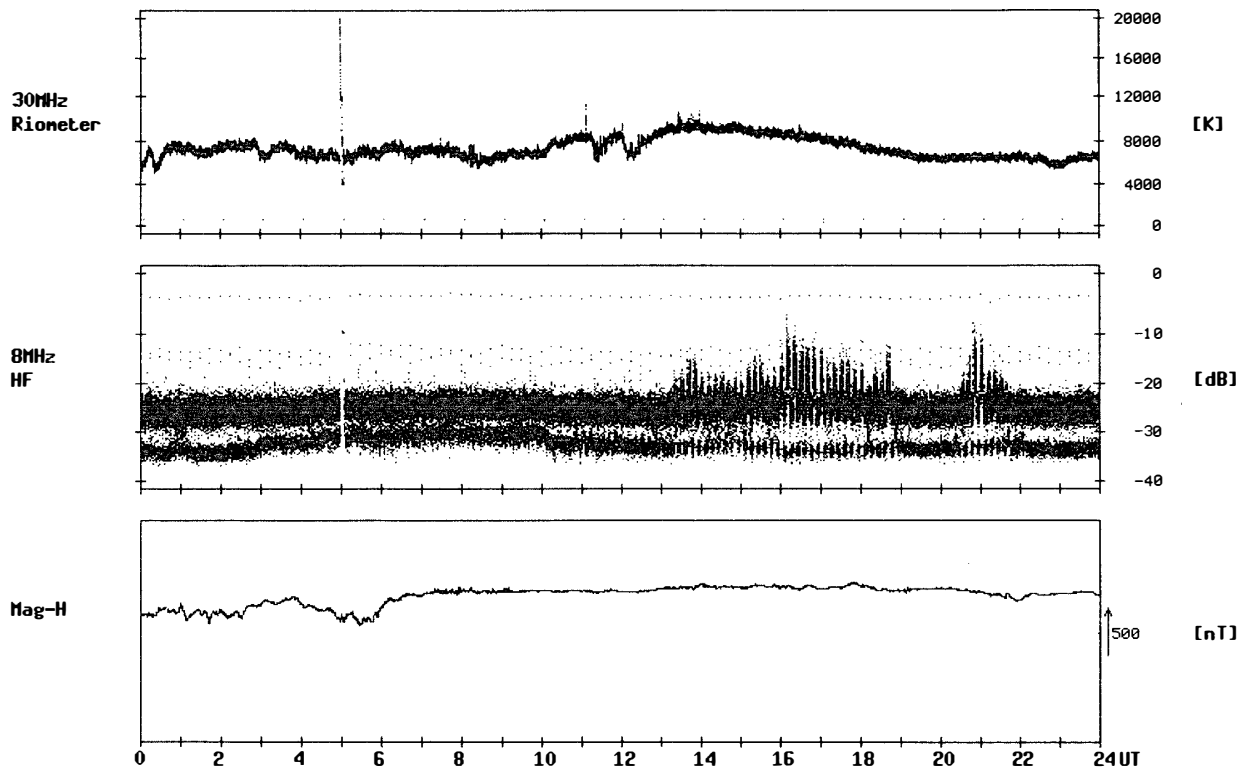
Syowa Station

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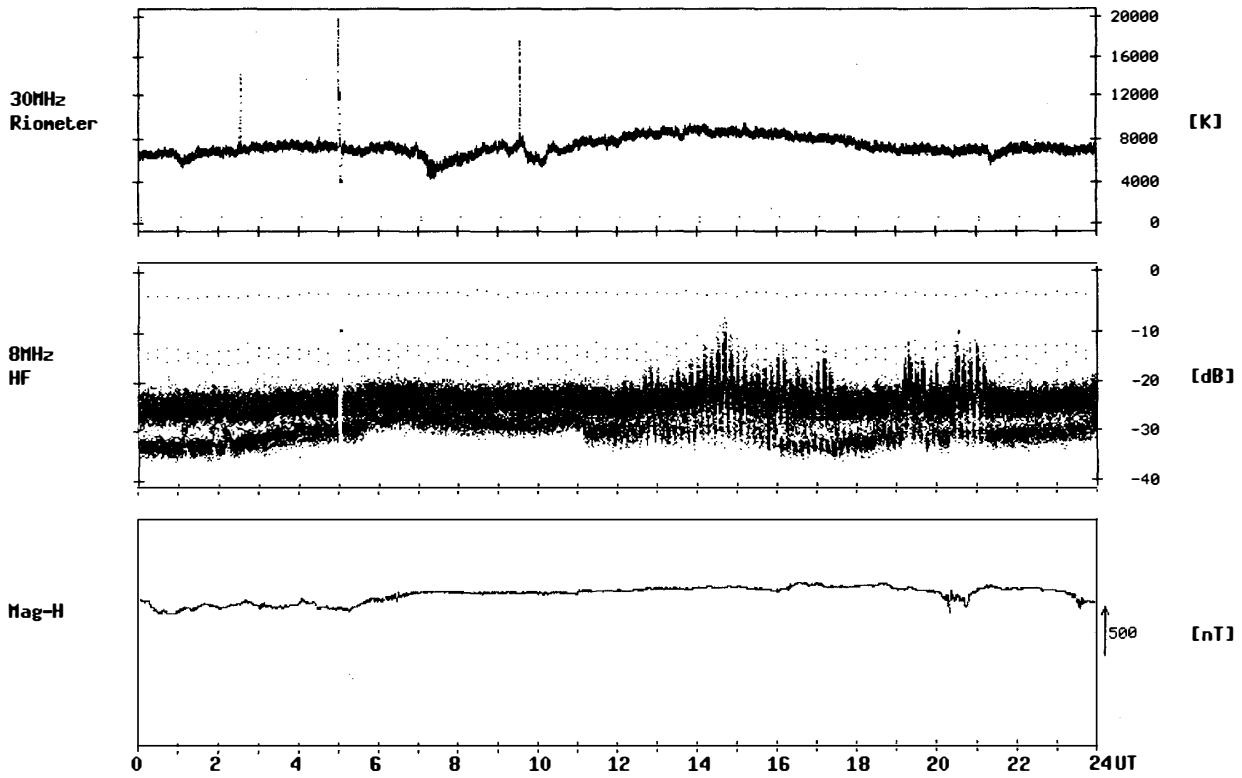
Syowa Station

1999/10/15



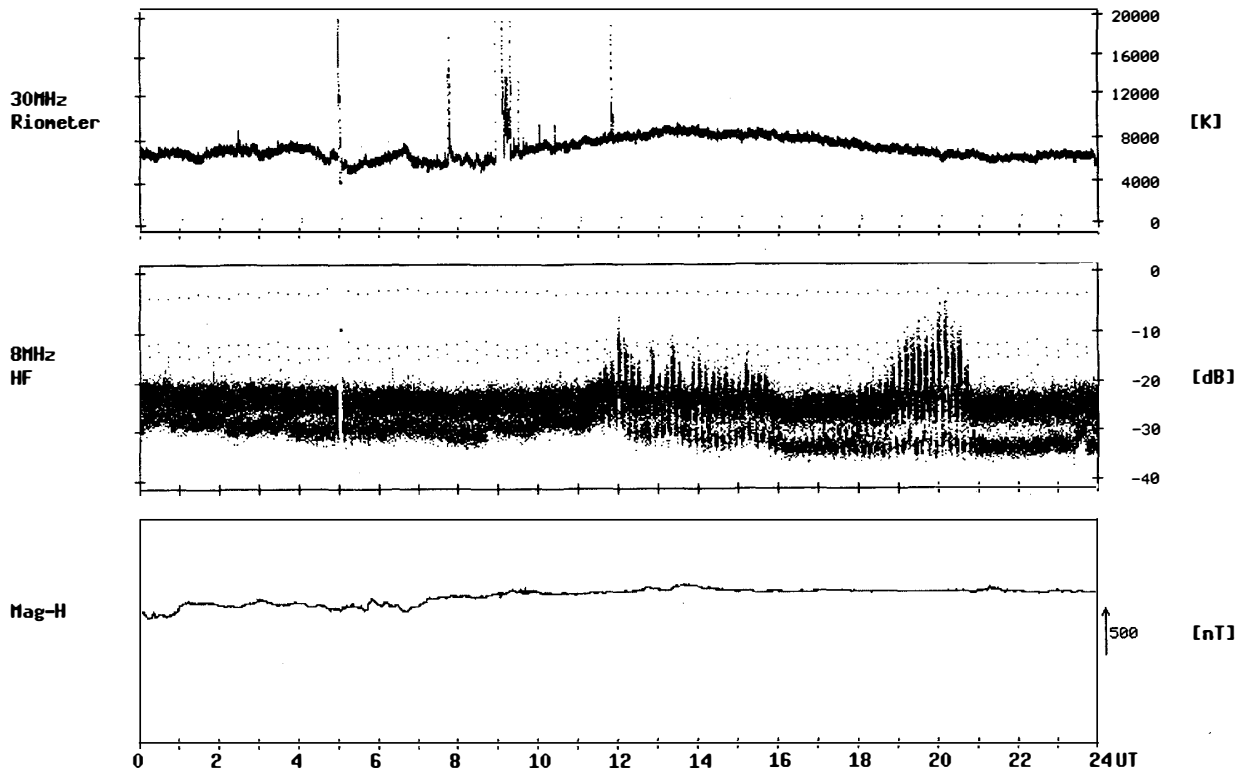
Syowa Station

1999/10/16



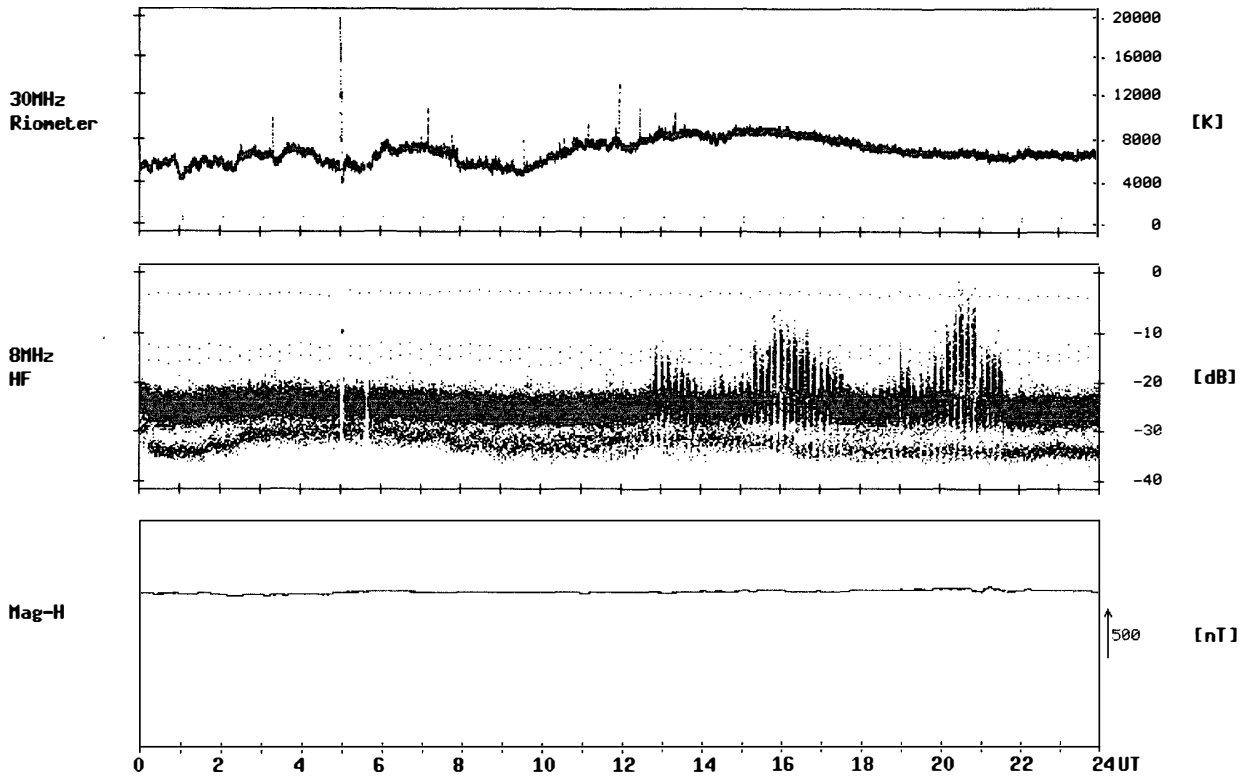
Syowa Station

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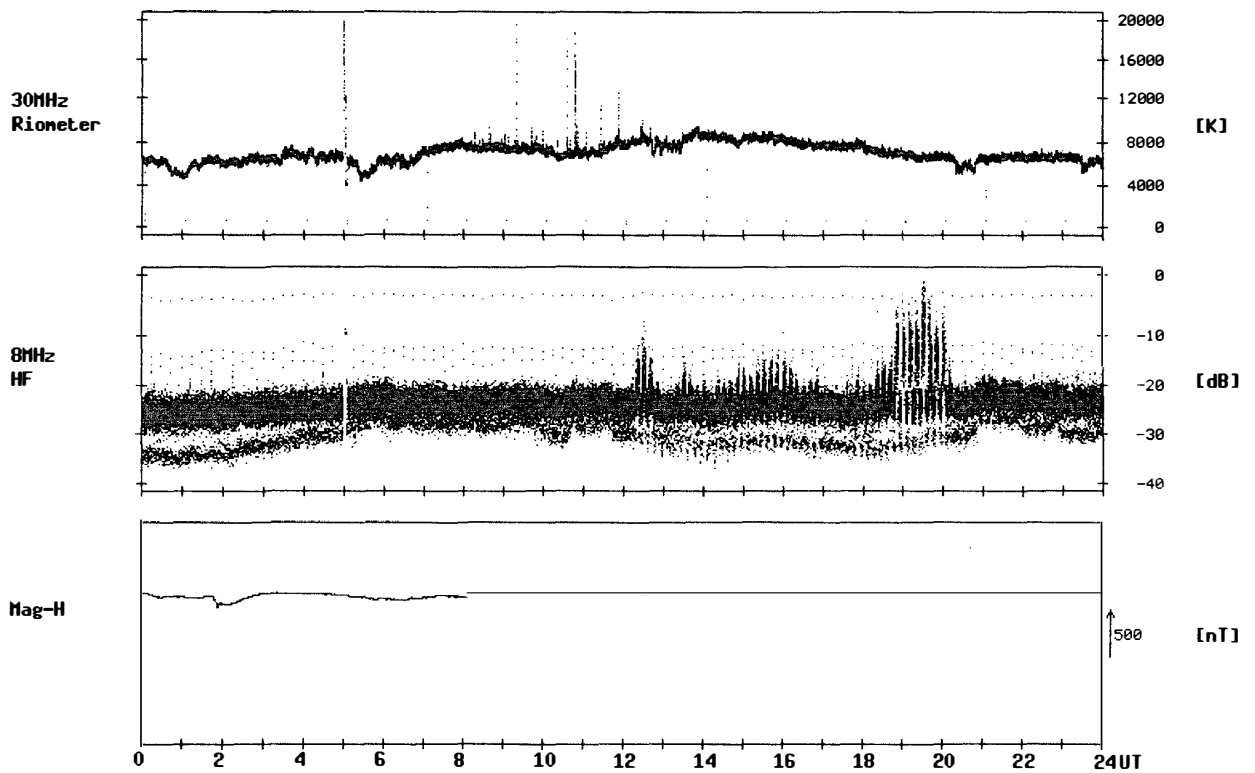
Syowa Station

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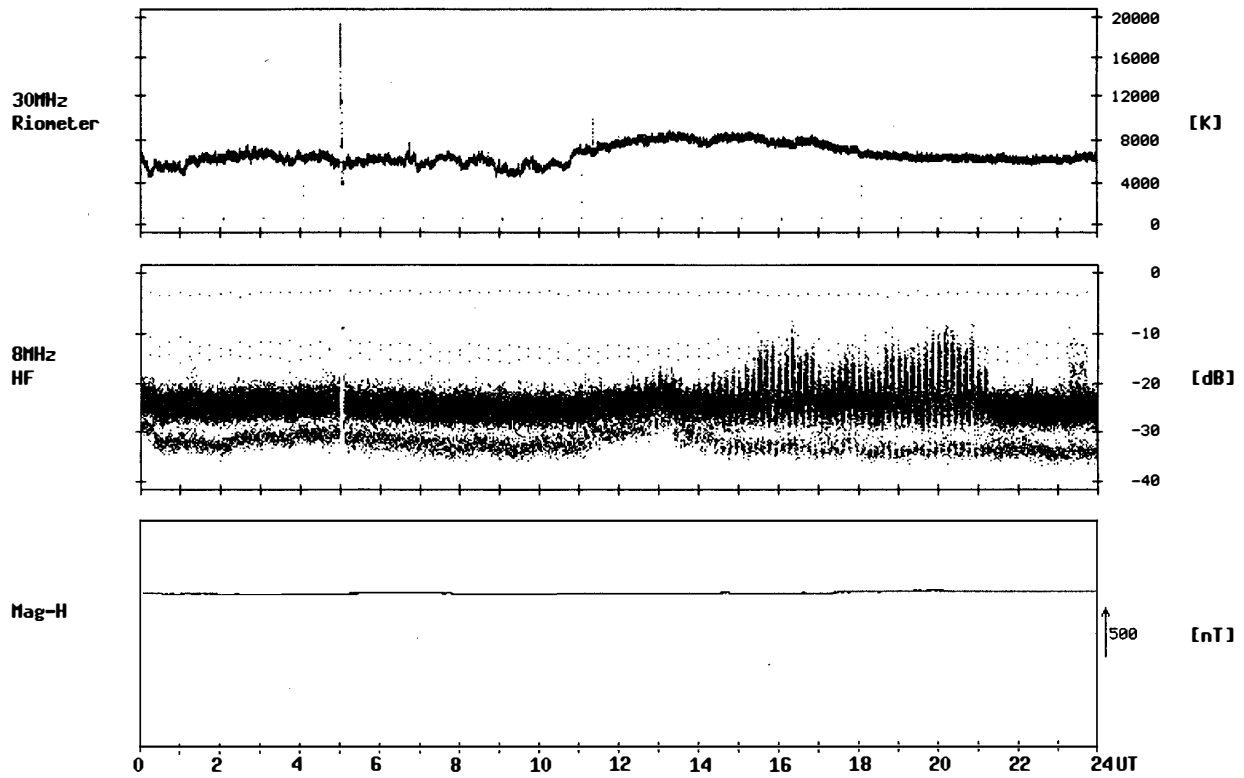
Syowa Station

1999/10/19



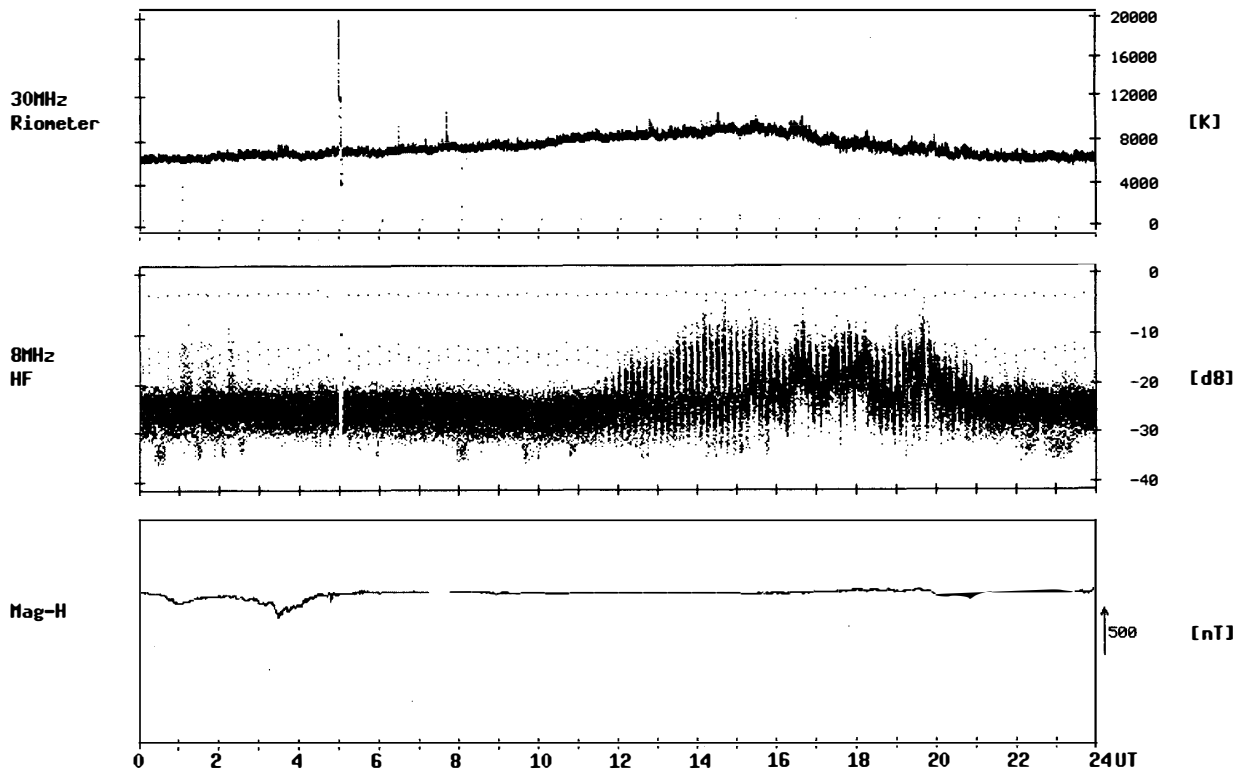
Syowa Station

1999/10/20



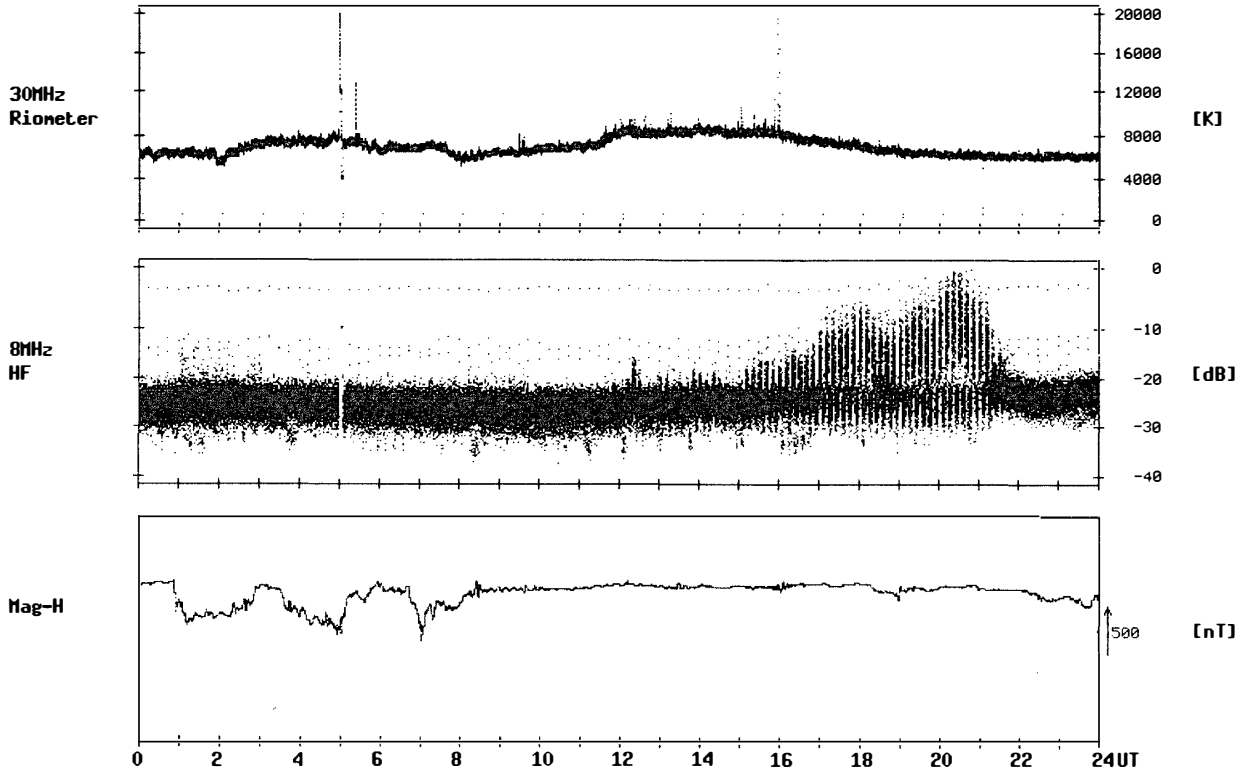
Syowa Station

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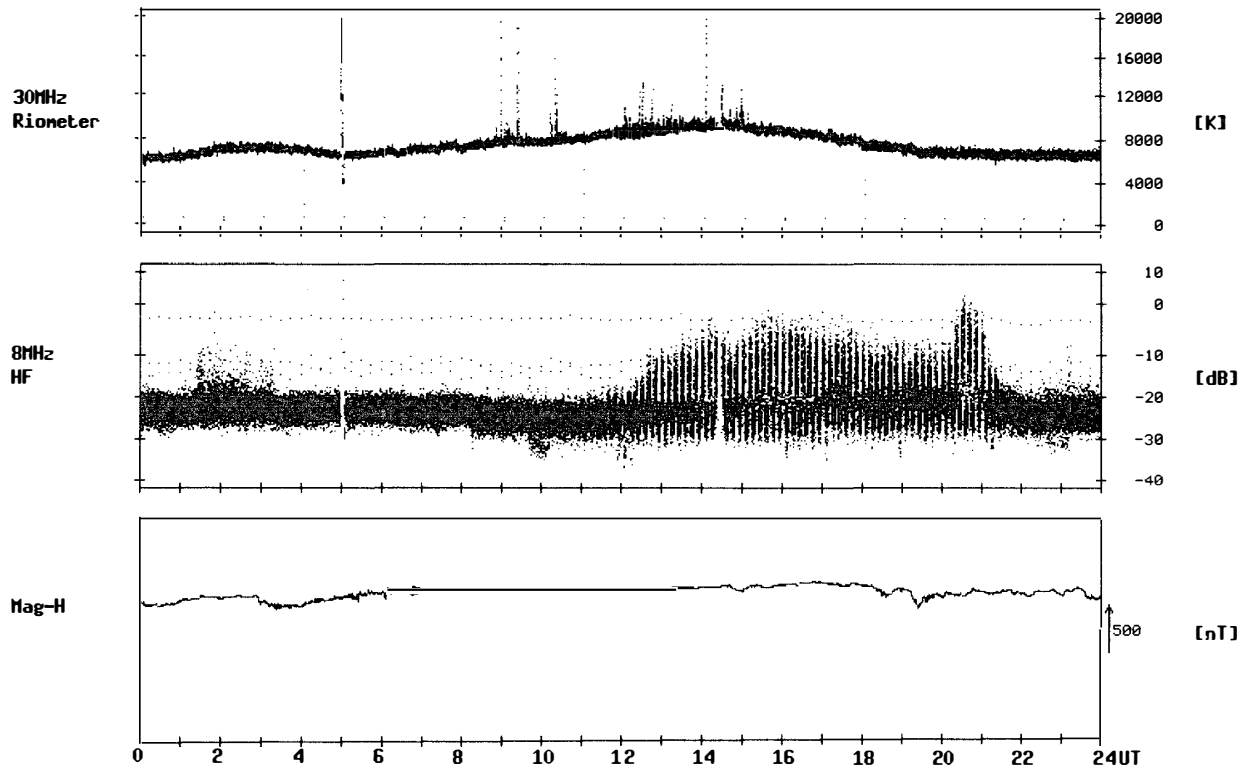
Syowa Station

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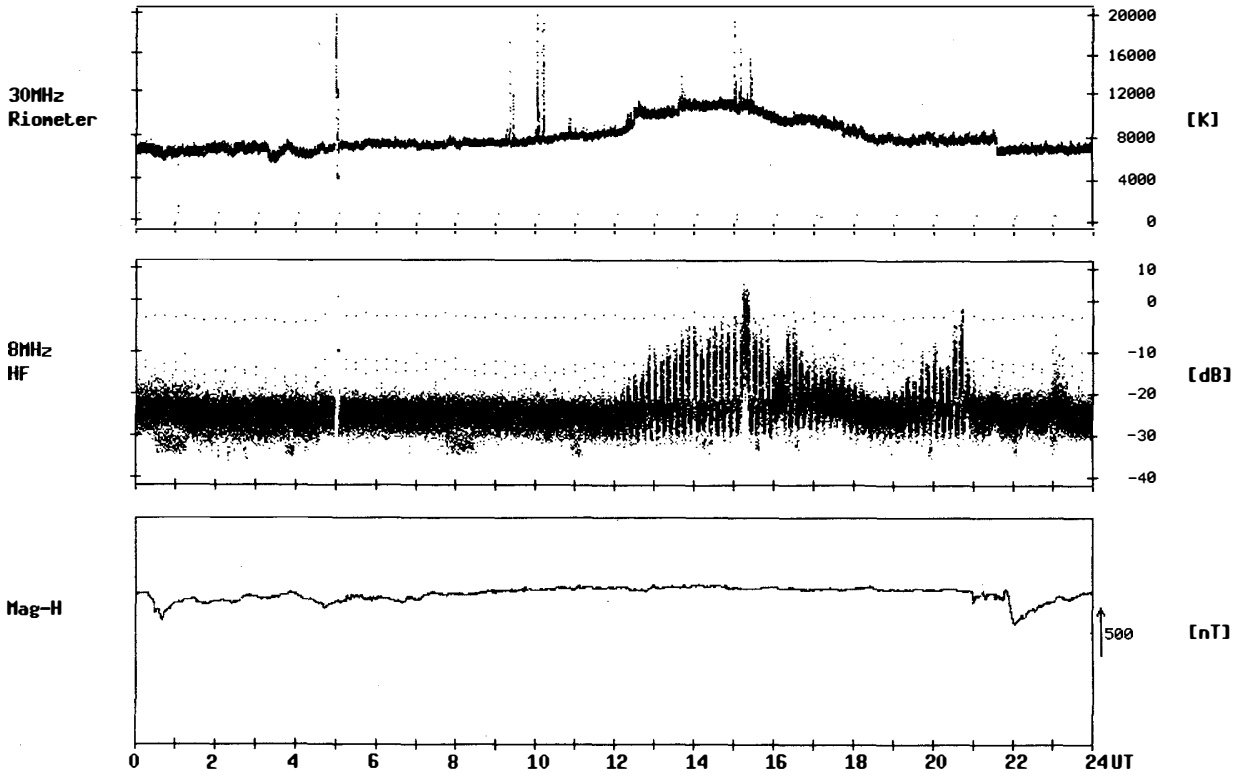
Syowa Station

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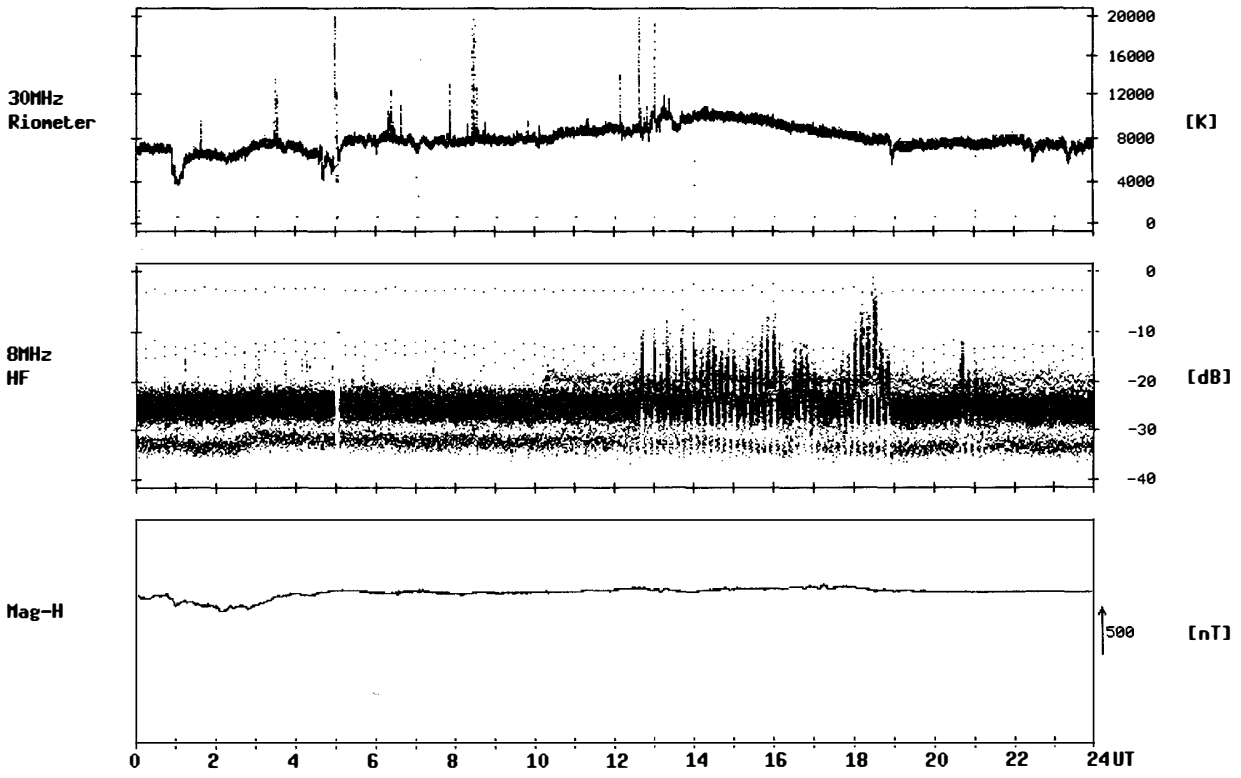
Syowa Station

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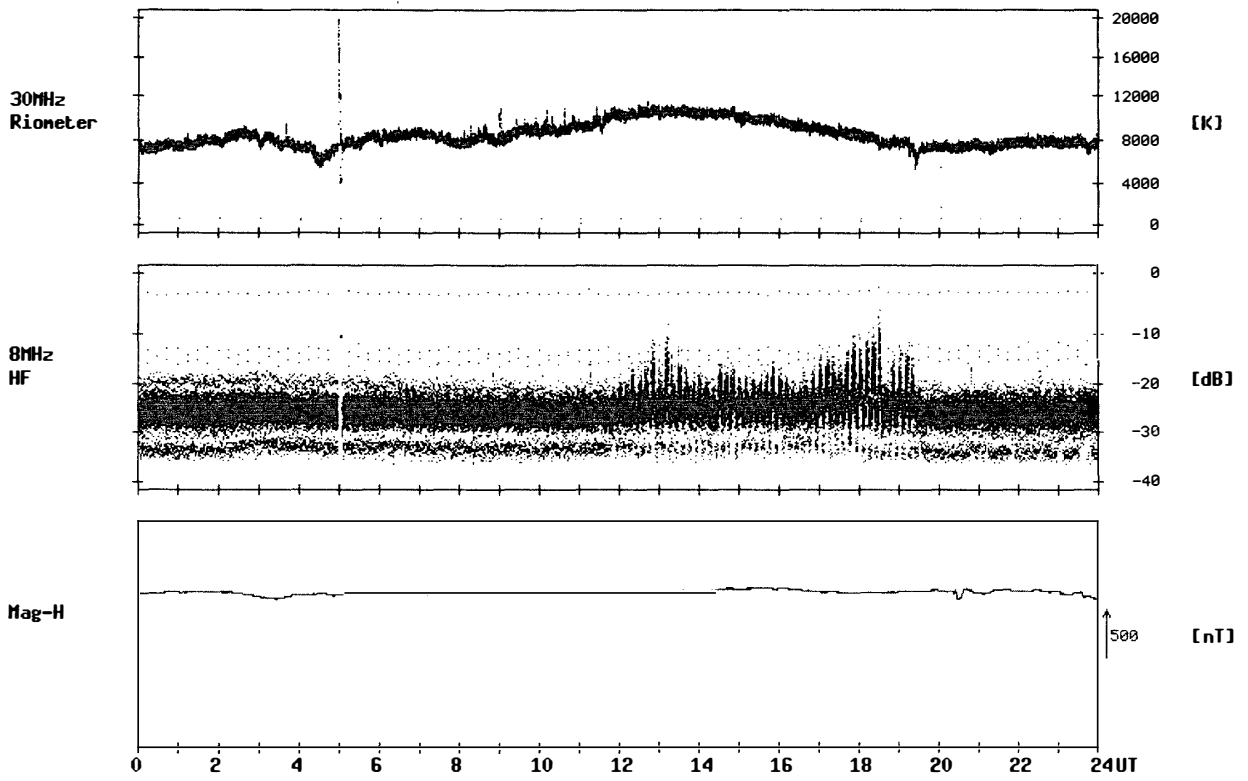
Syowa Station

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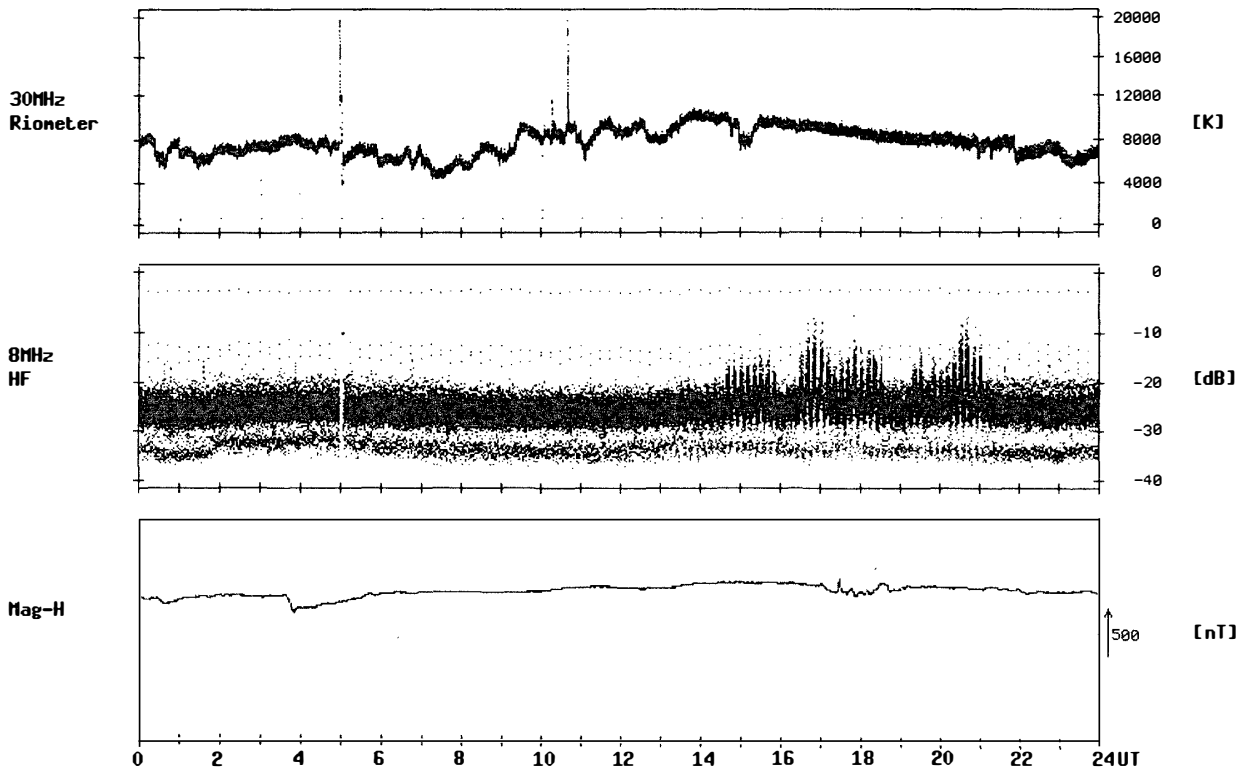
Syowa Station

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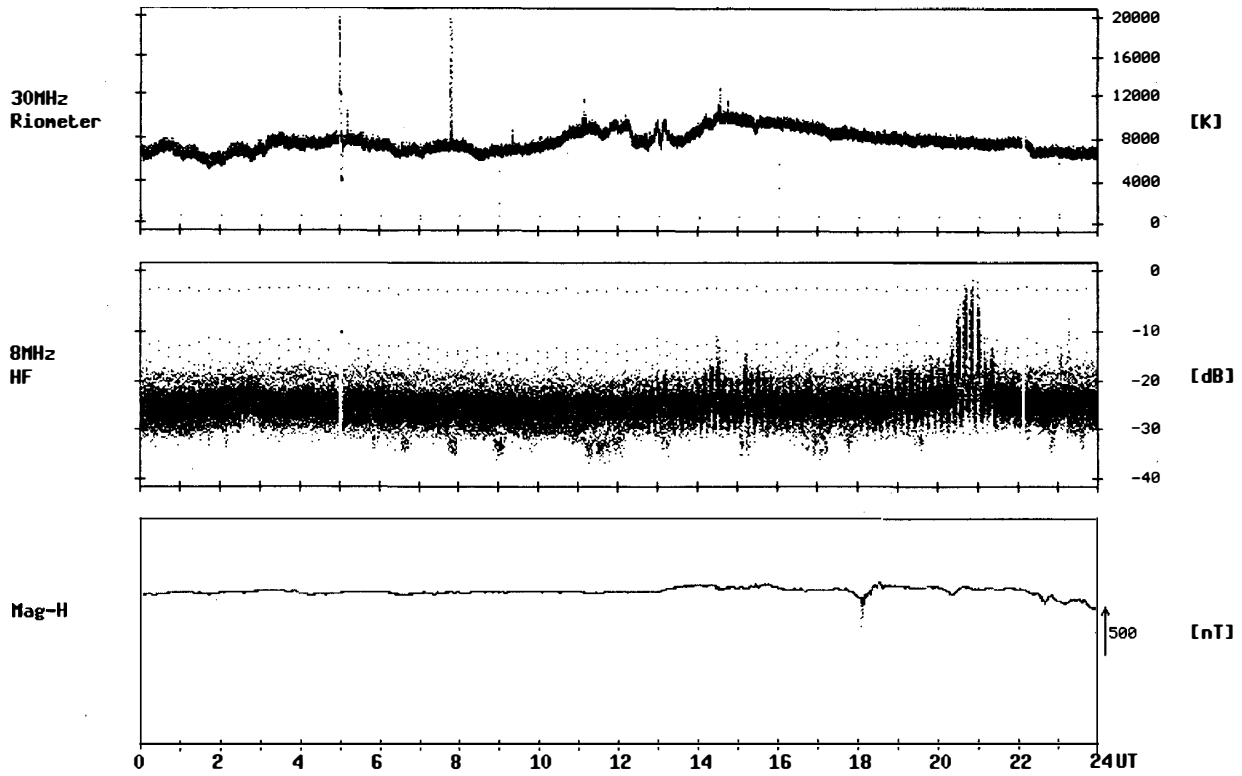
Syowa Station

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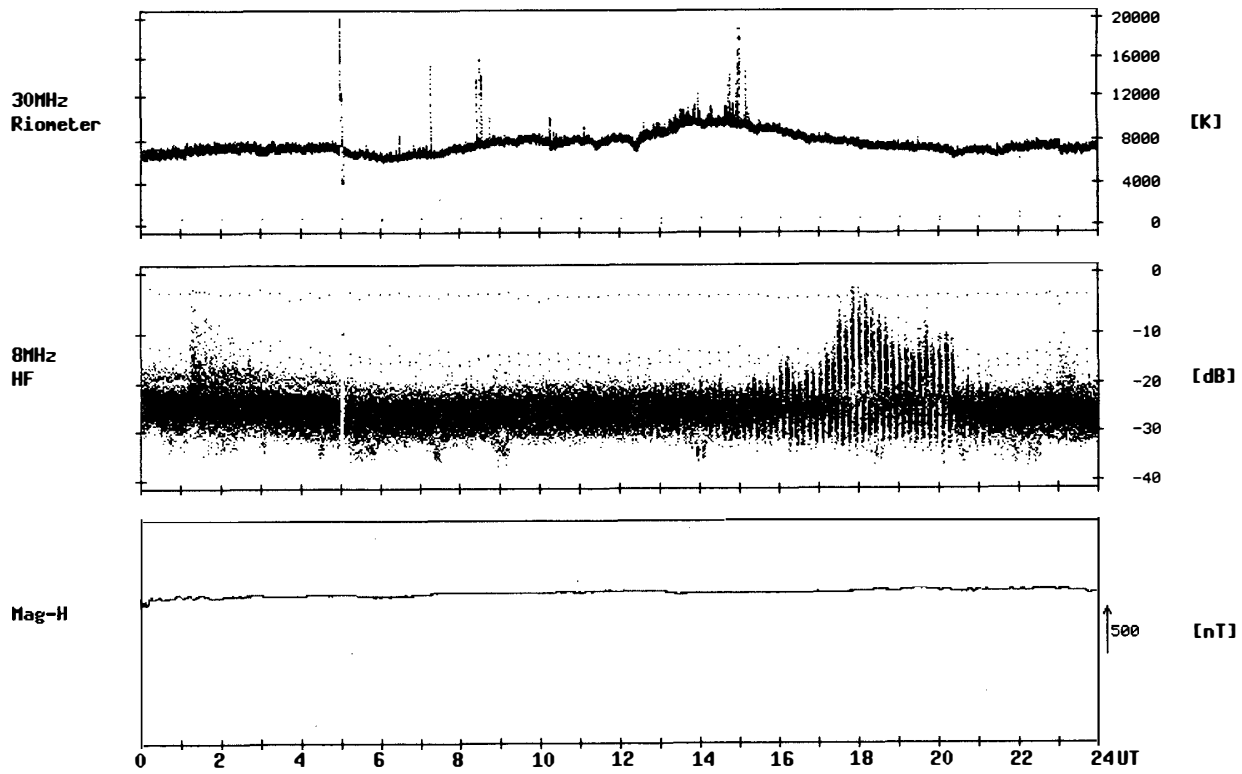
Syowa Station

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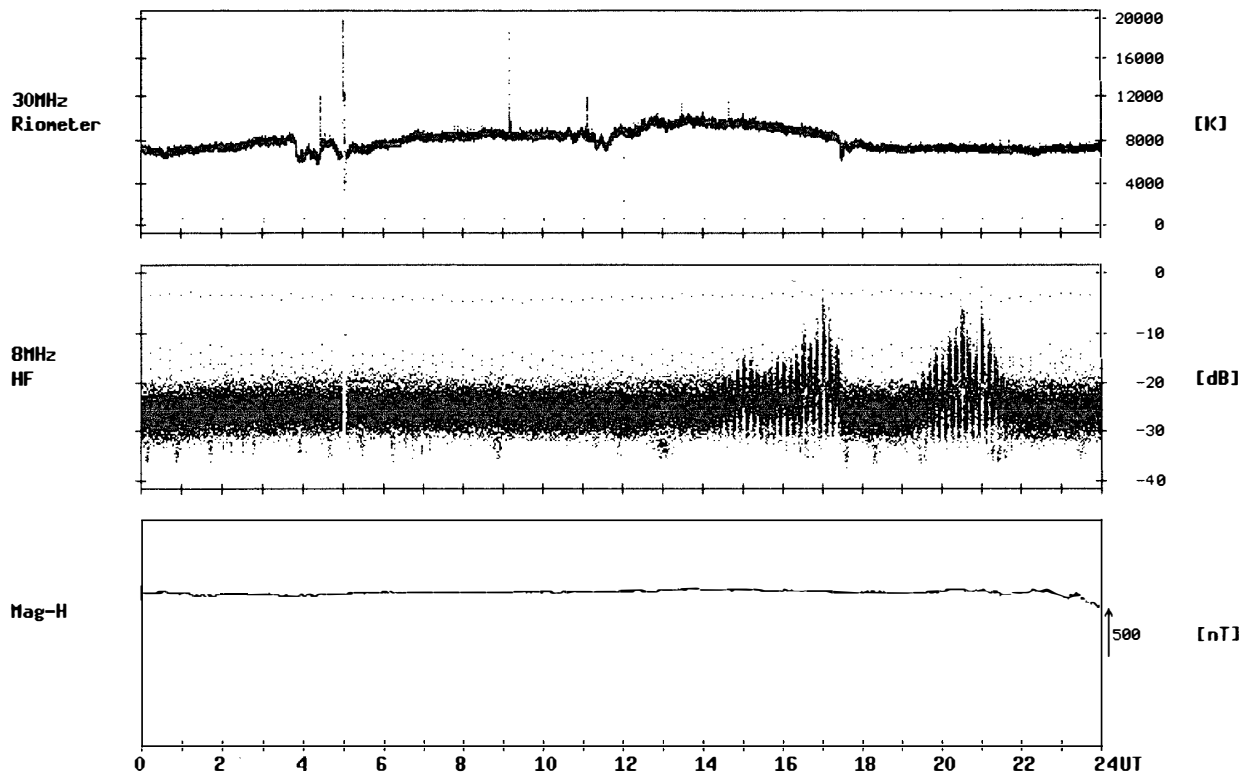
Syowa Station

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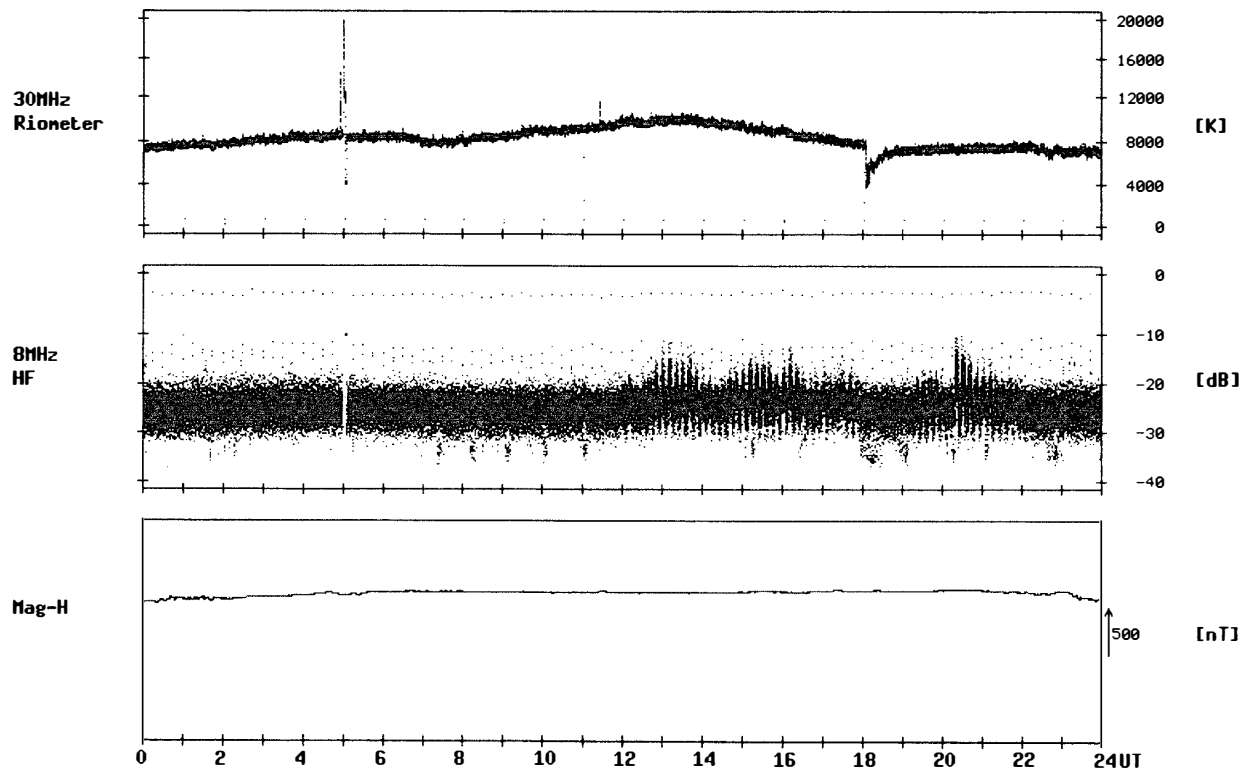
Syowa Station

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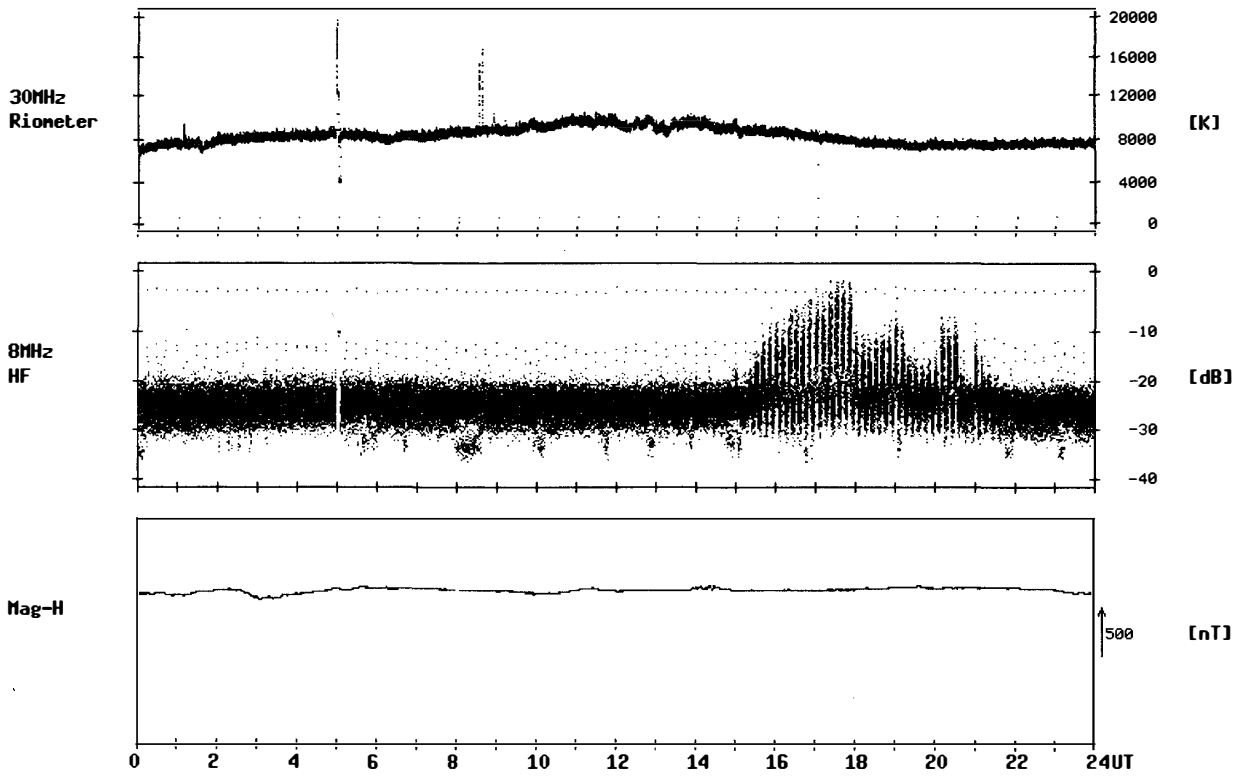
Syowa Station

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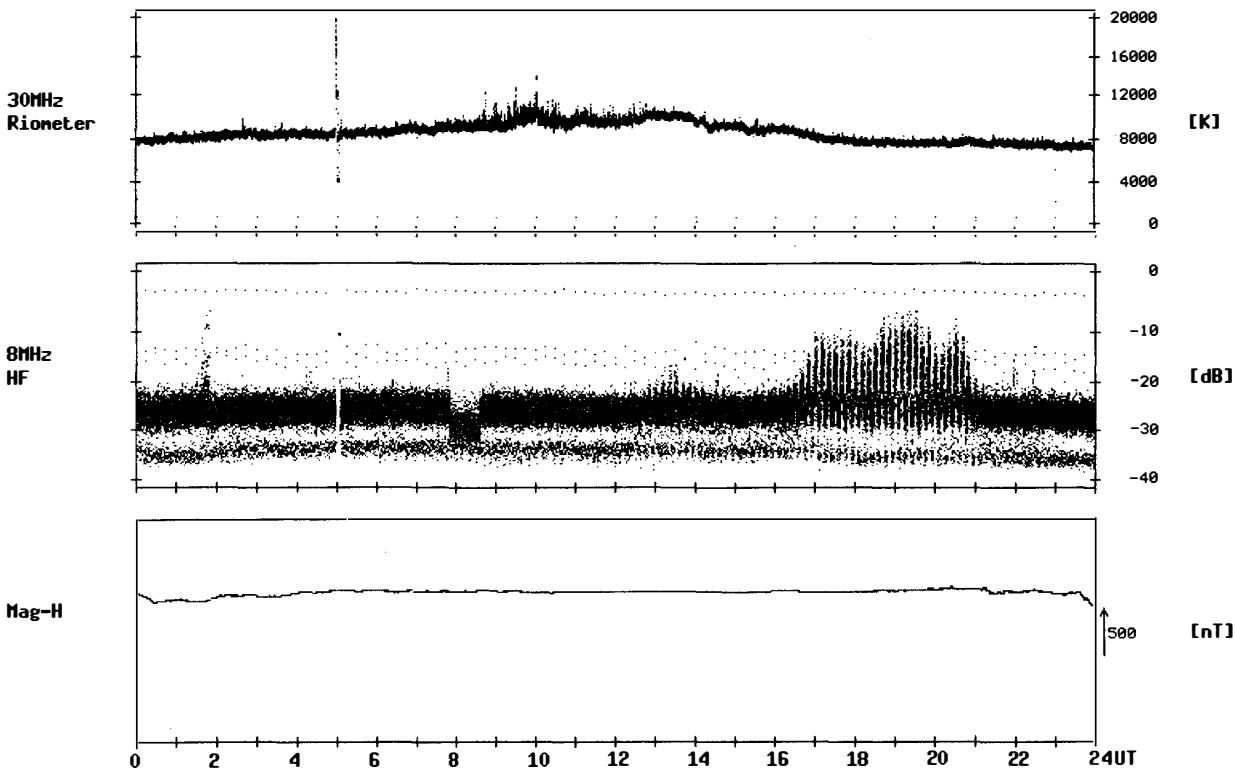
Syowa Station

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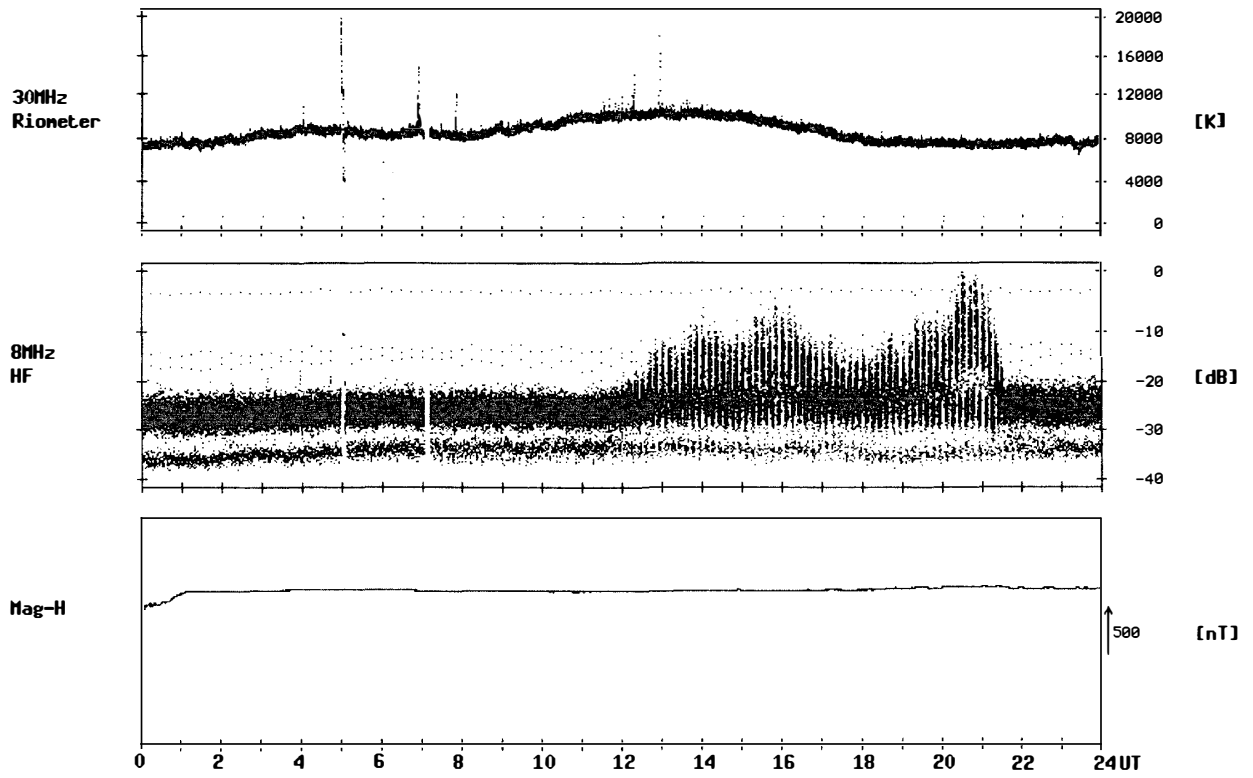
Syowa Station

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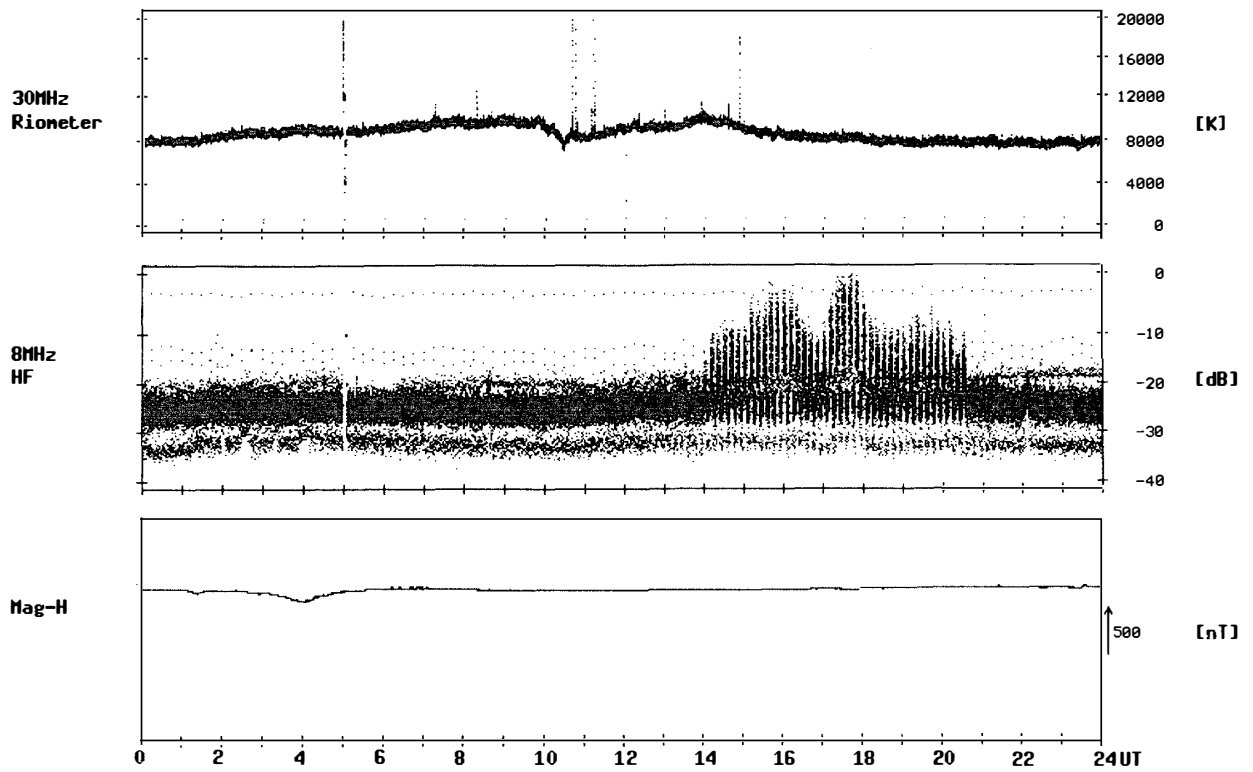
Syowa Station

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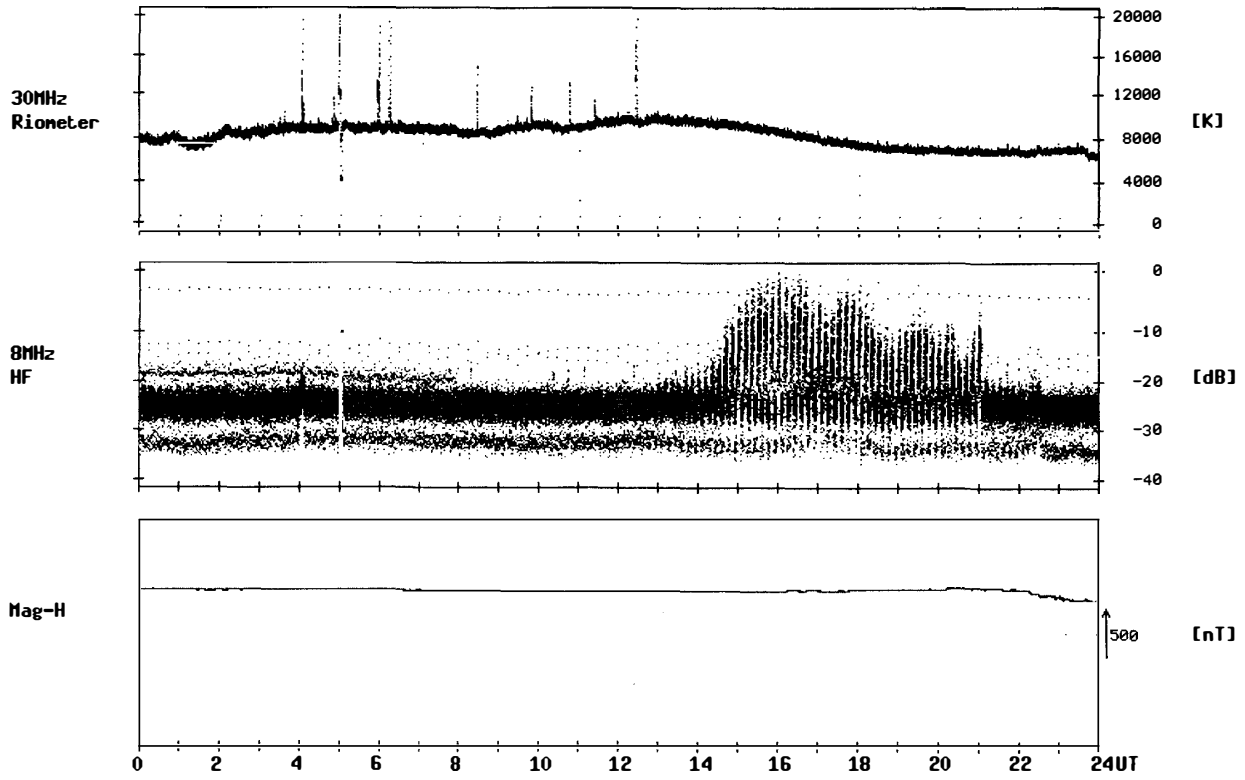
Syowa Station

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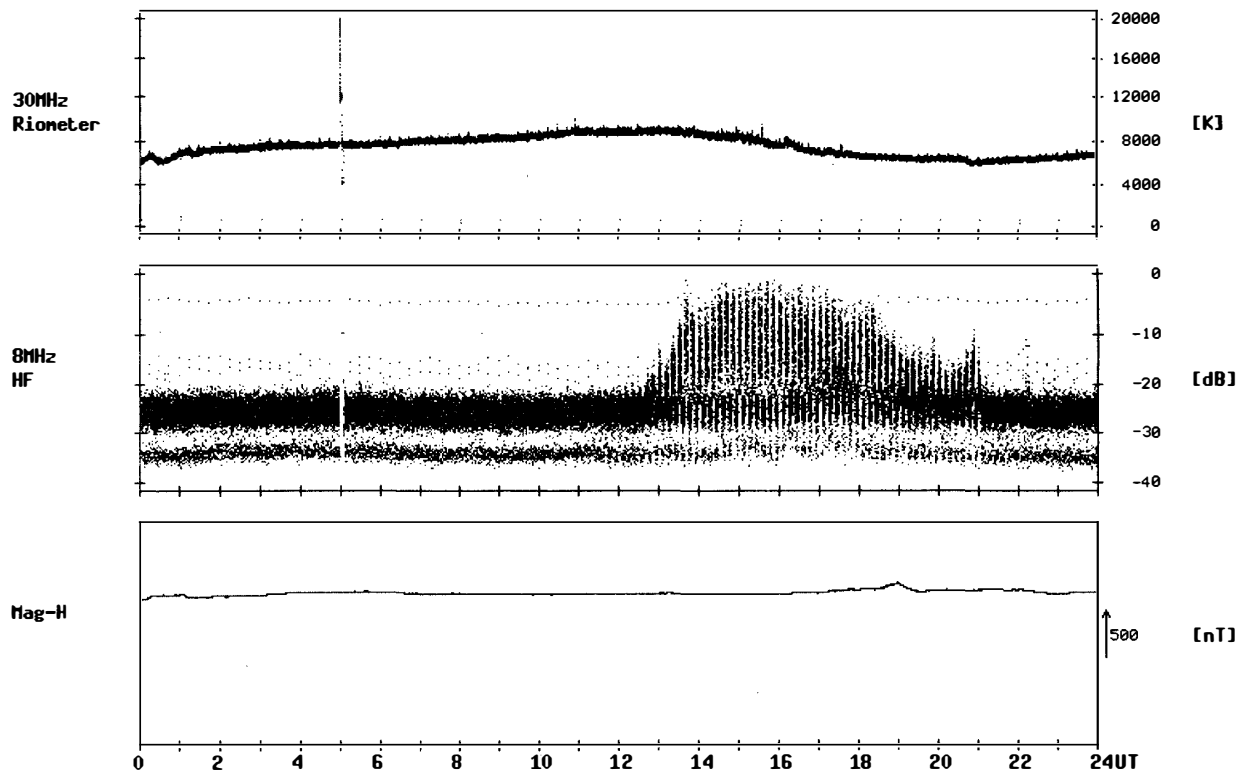
Syowa Station

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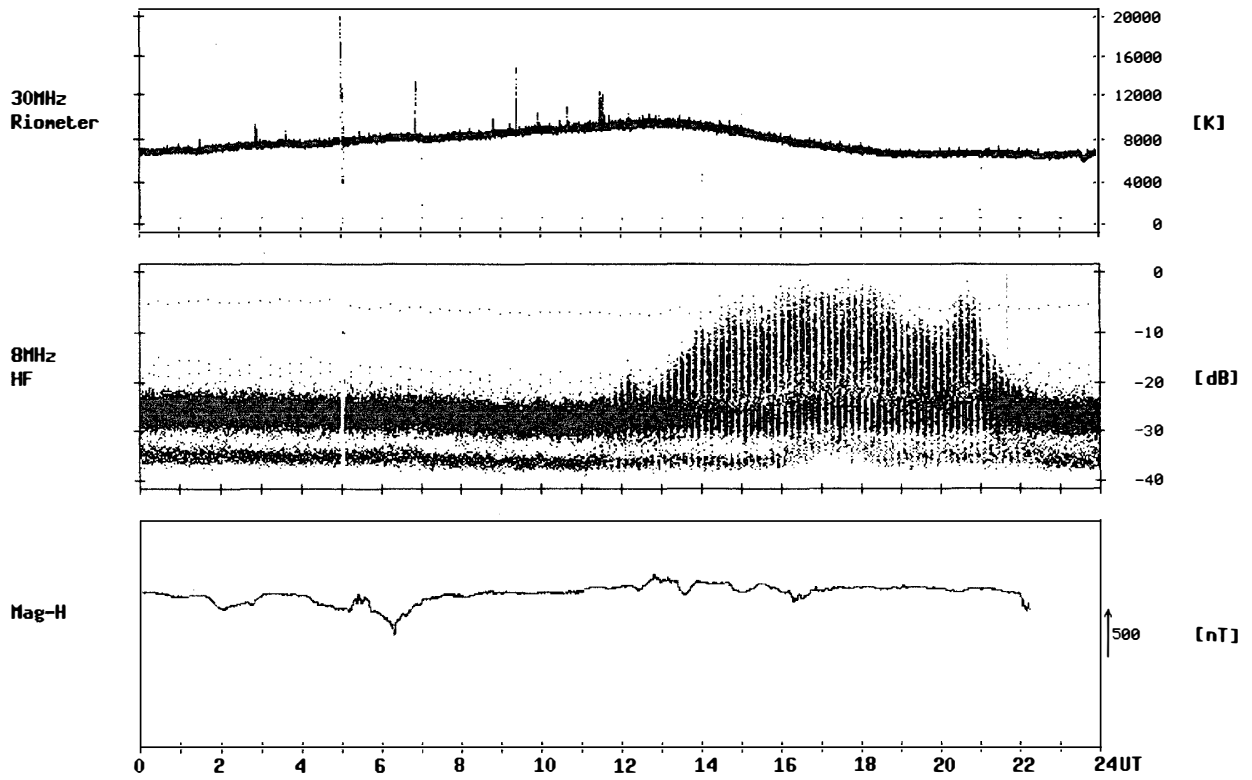
Syowa Station

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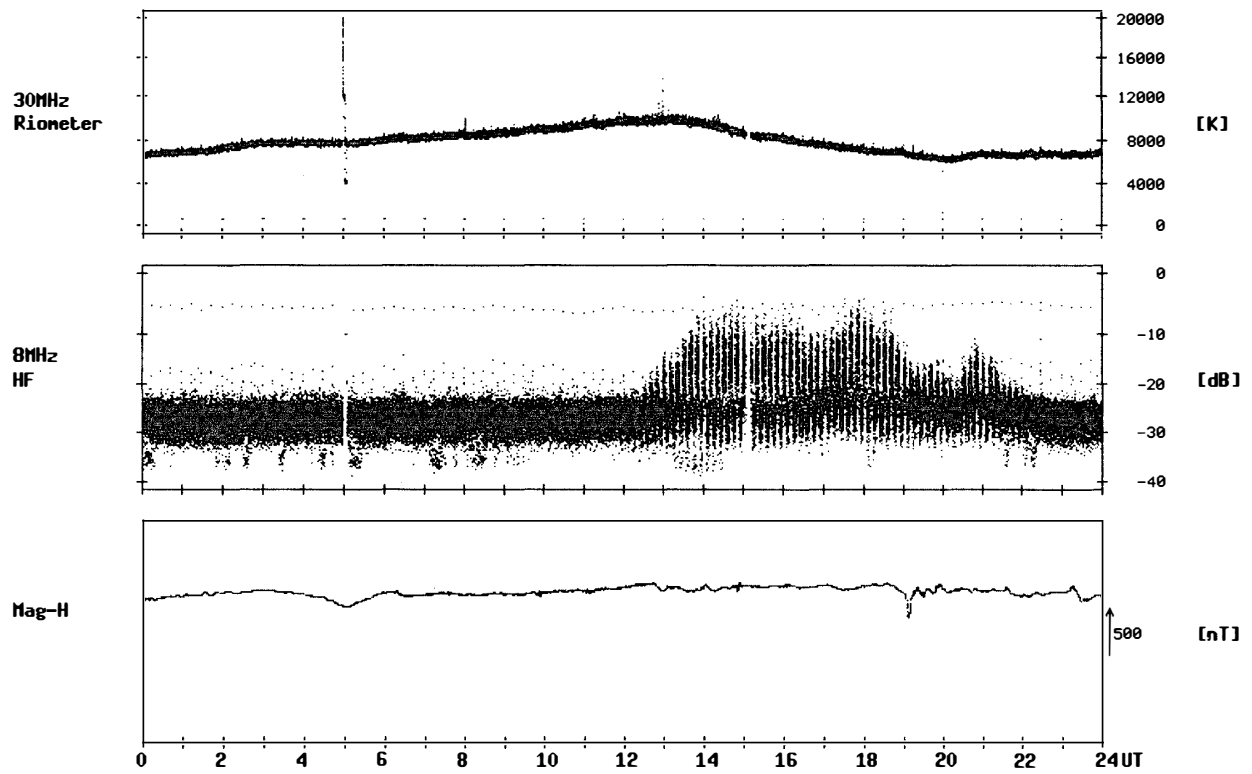
Syowa Station

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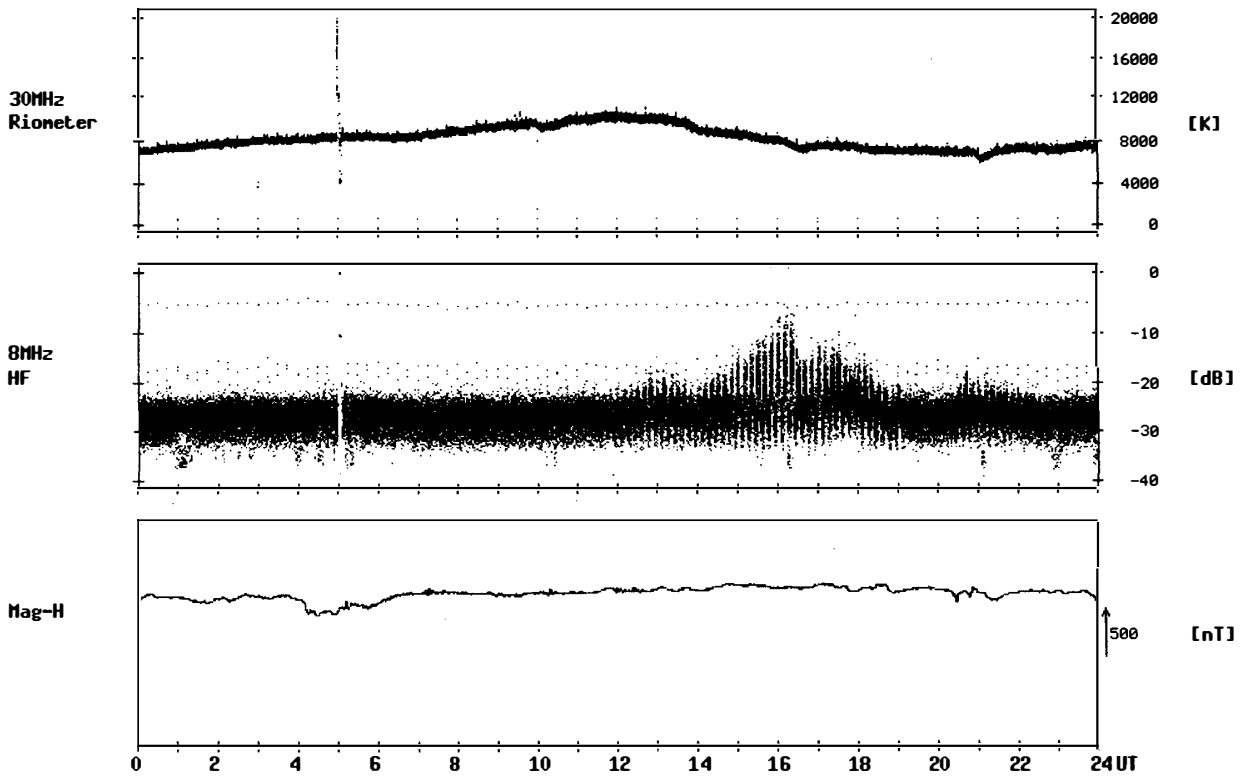
Syowa Station

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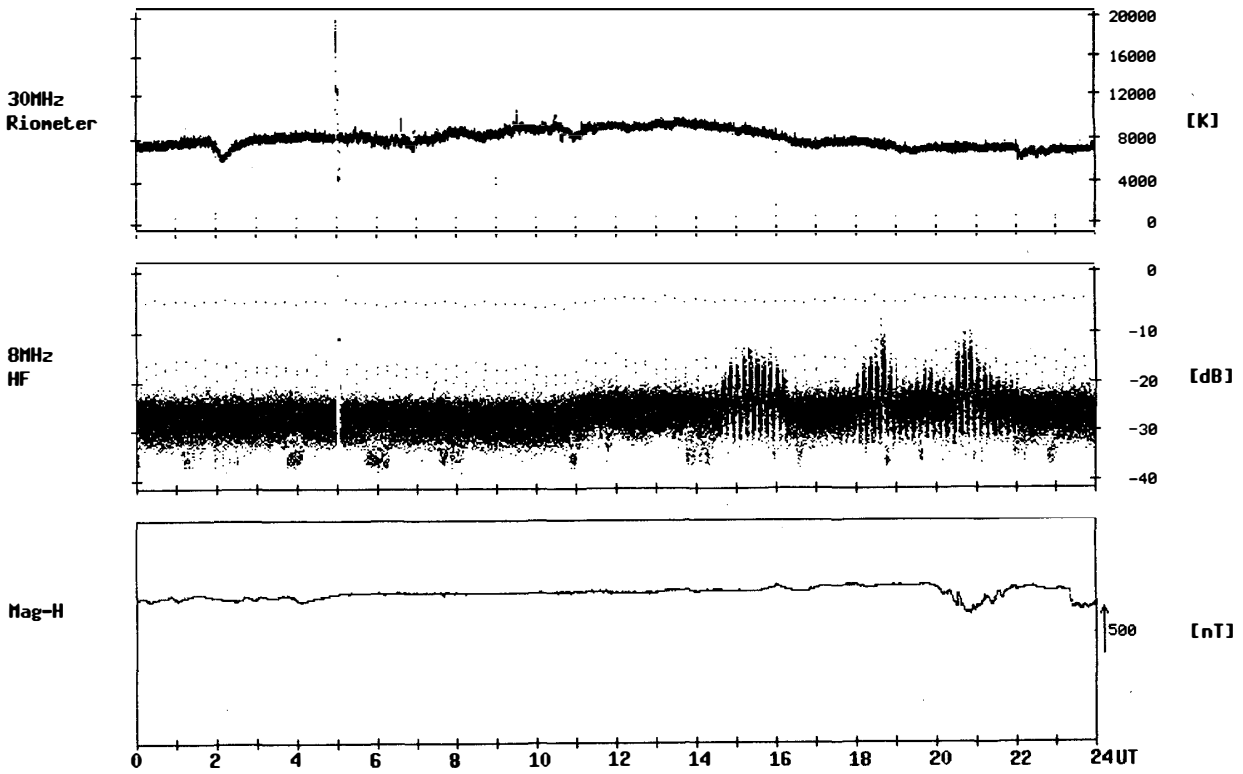
Syowa Station

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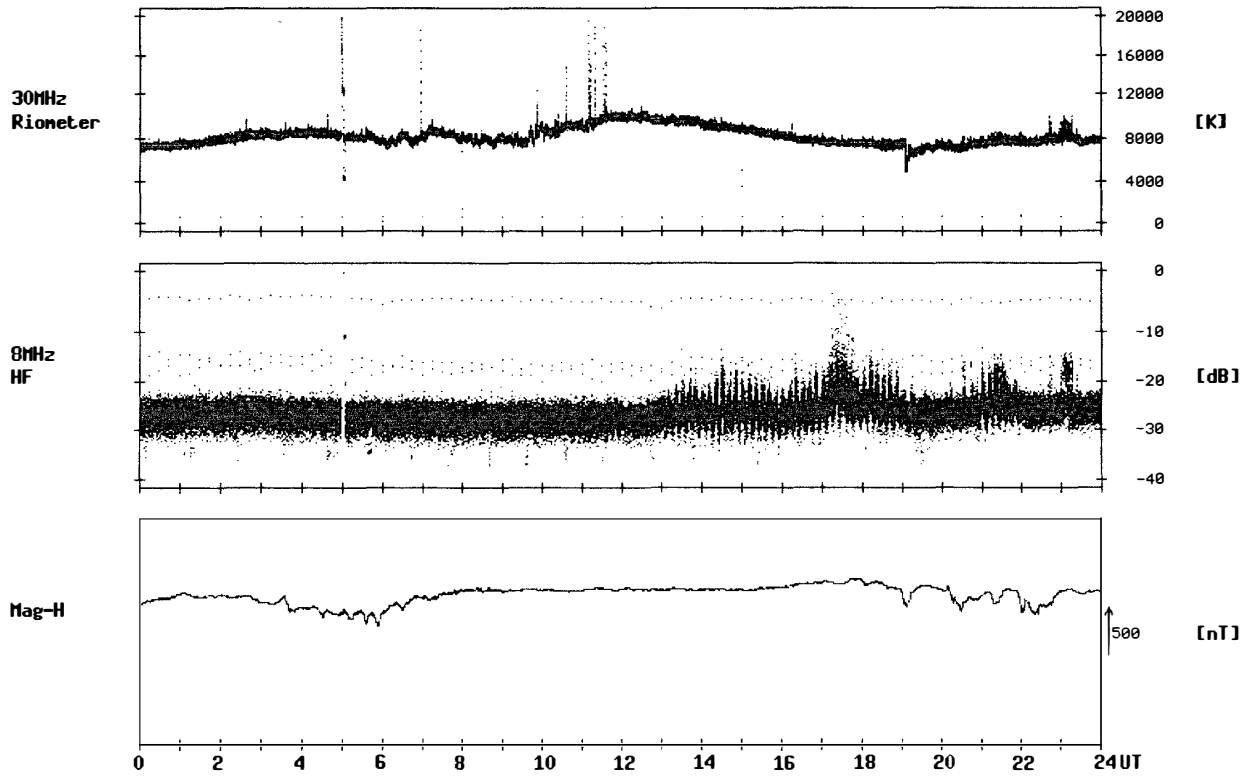
Syowa Station

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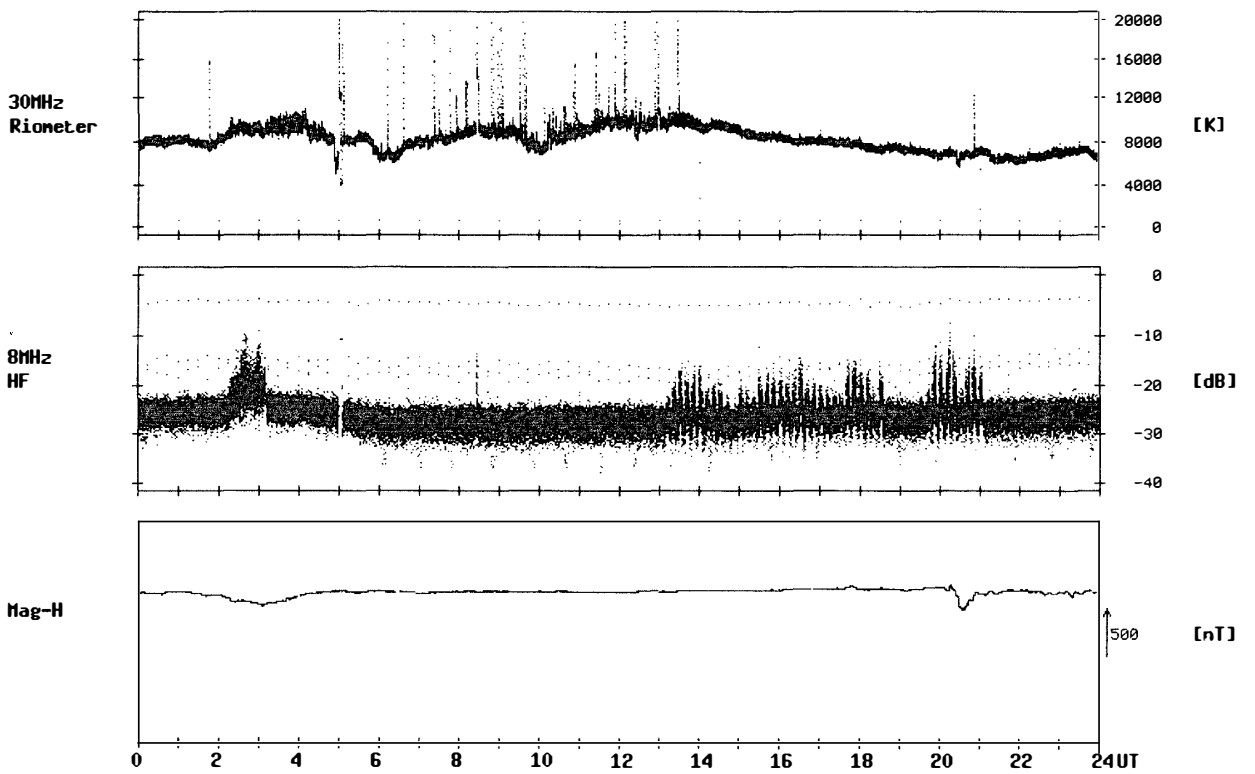
Syowa Station

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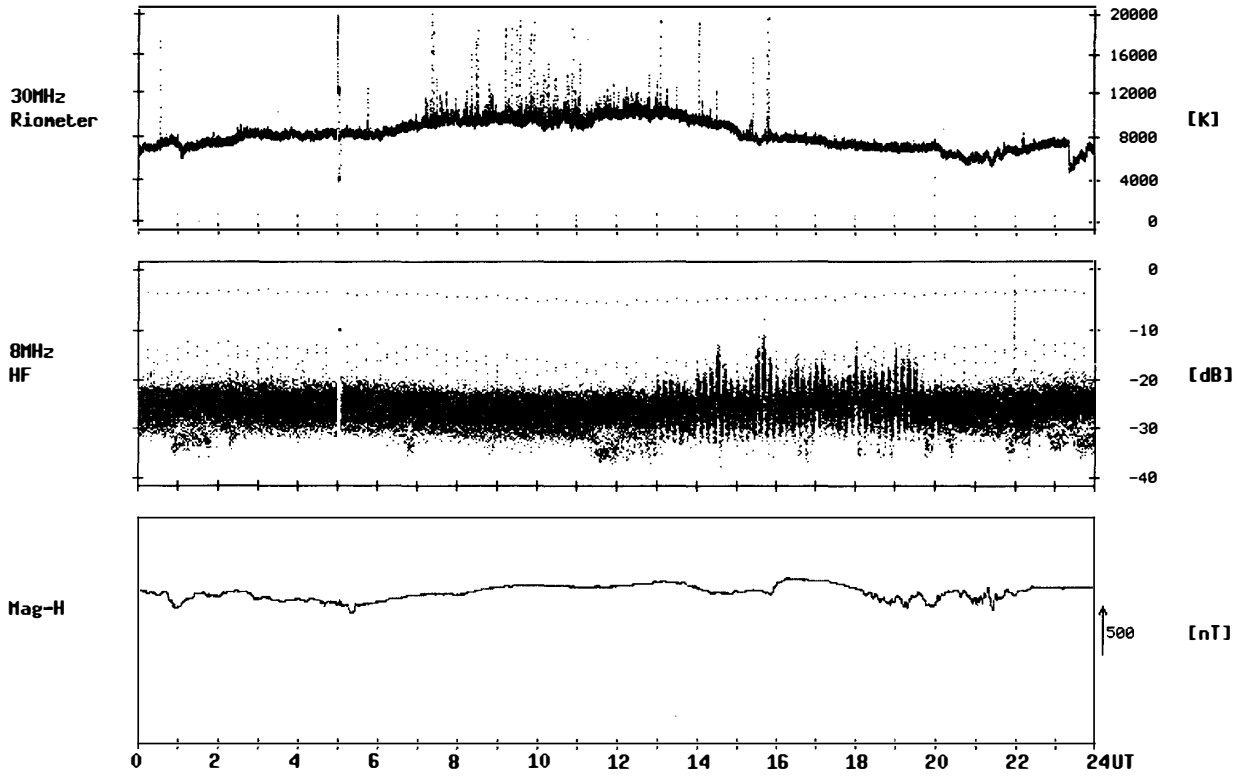
Syowa Station

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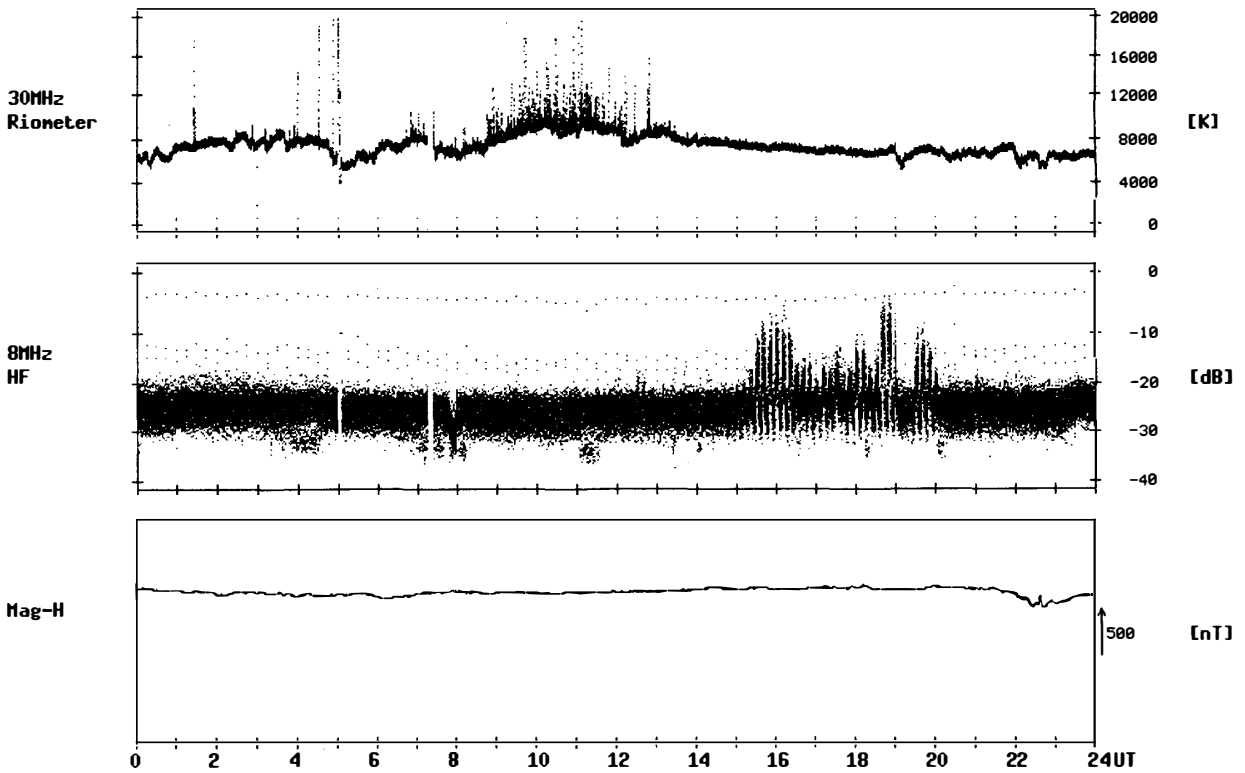
Syowa Station

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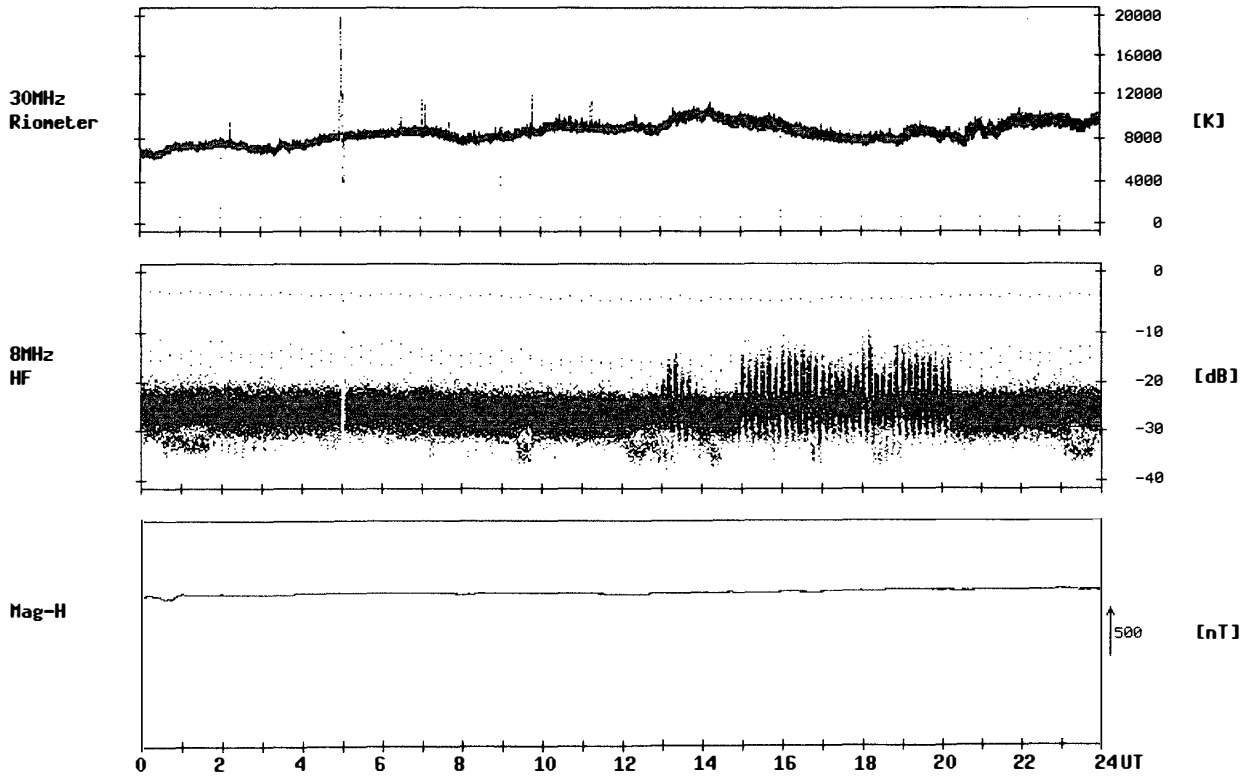
Syowa Station

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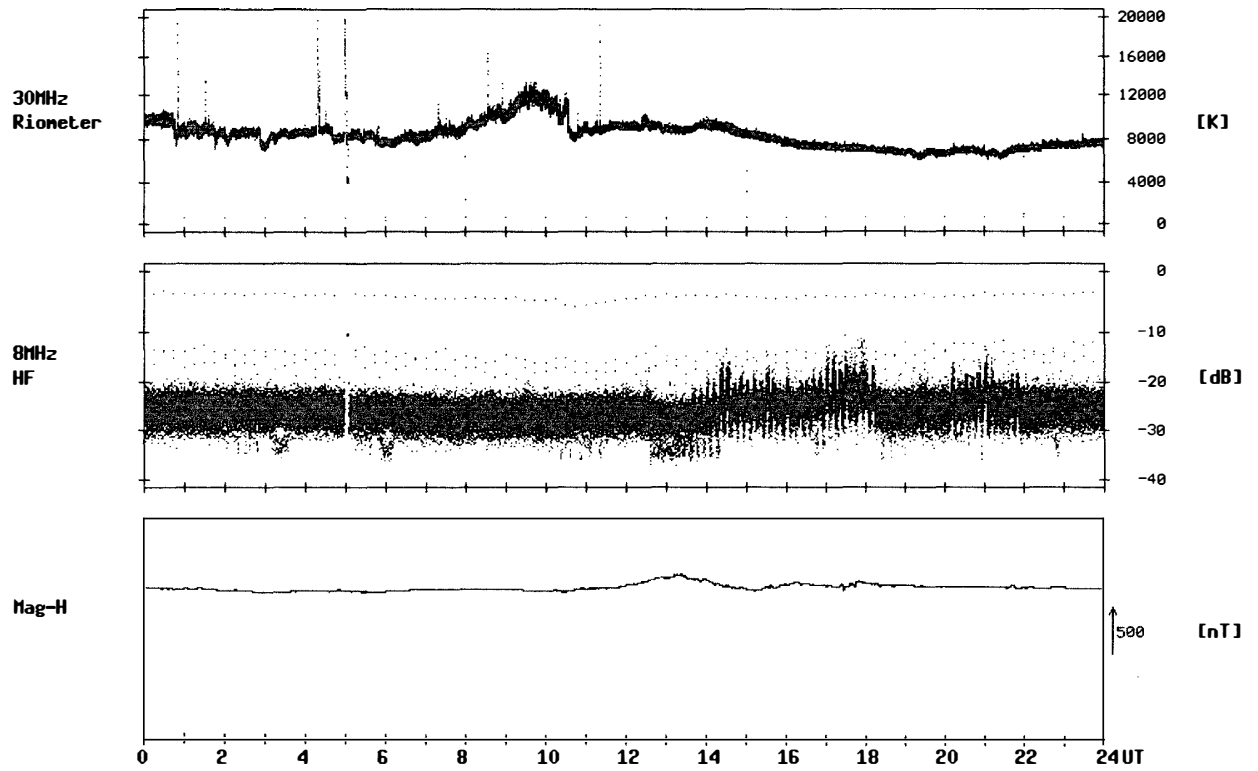
Syowa Station

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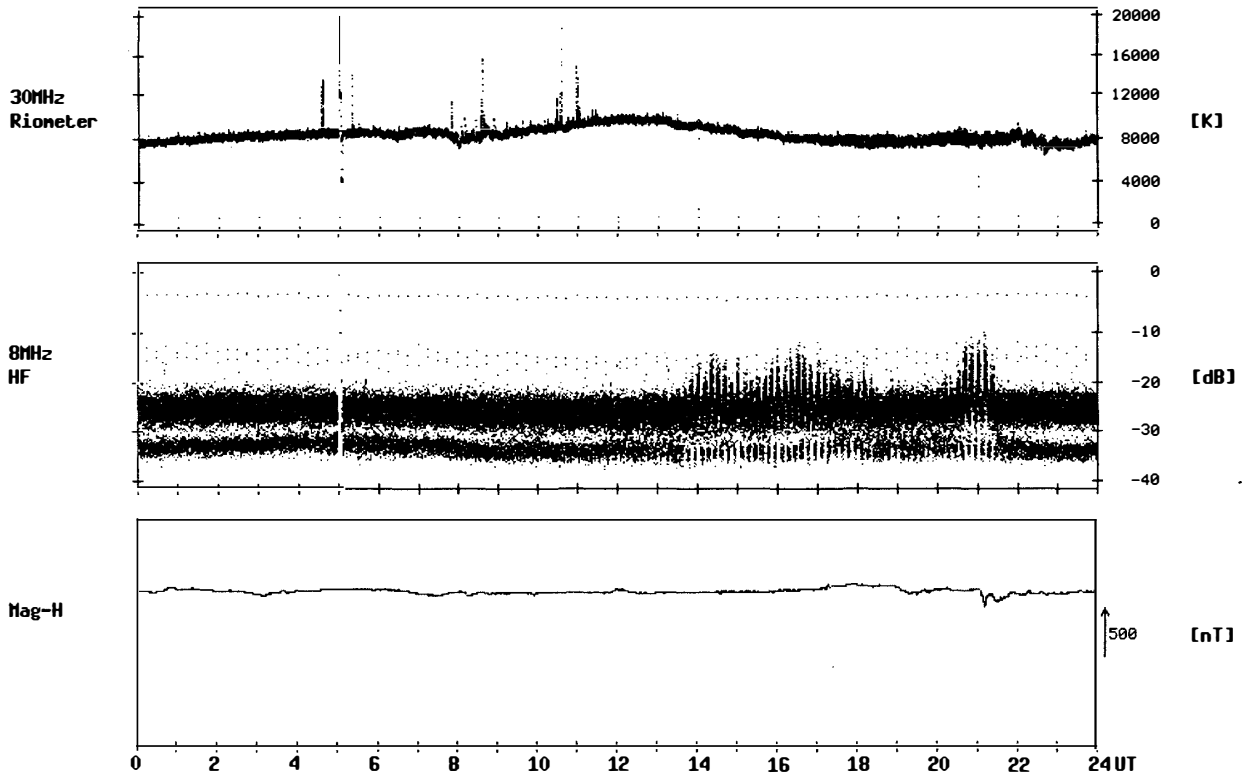
Syowa Station

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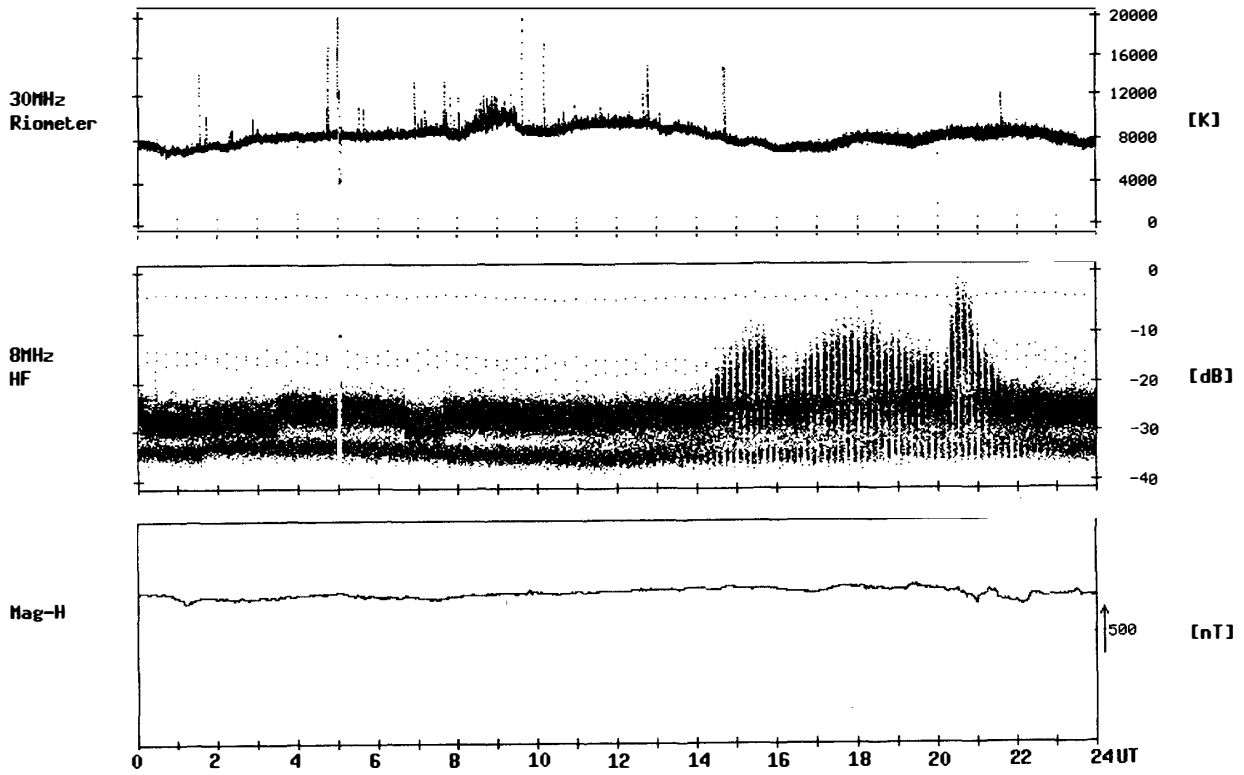
Syowa Station

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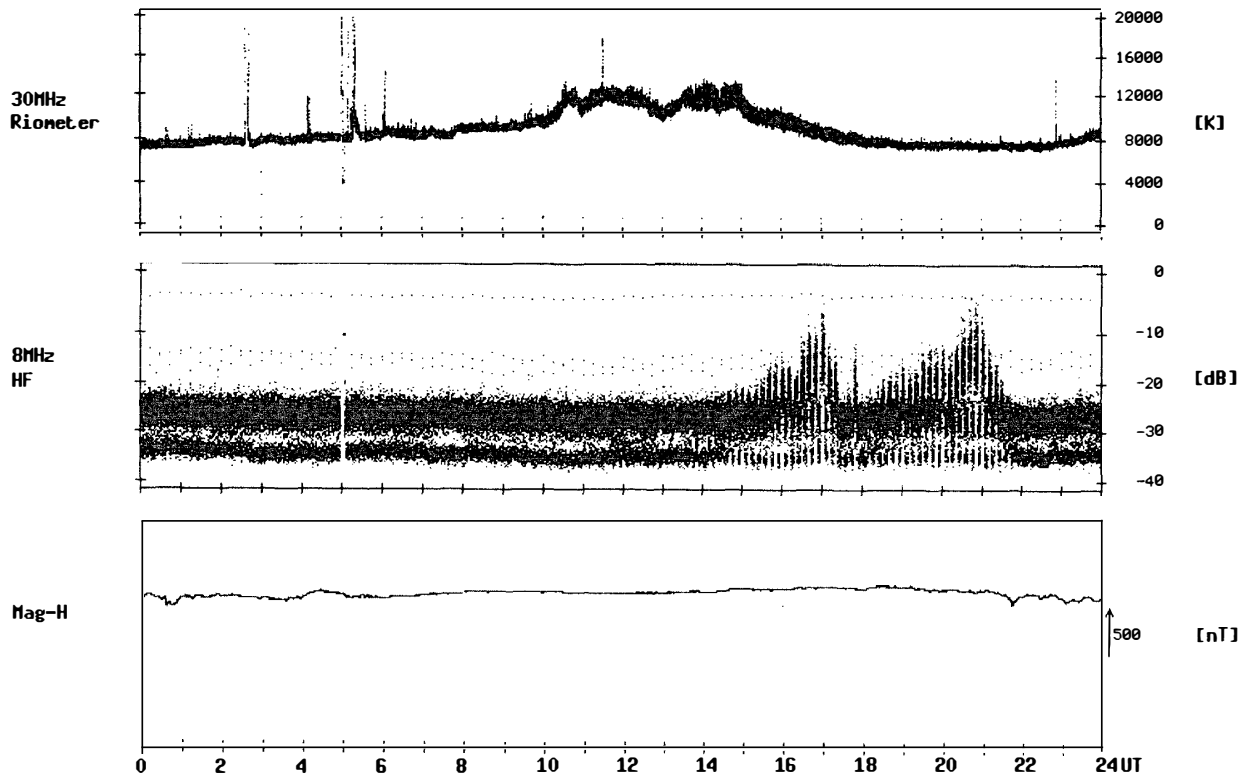
Syowa Station

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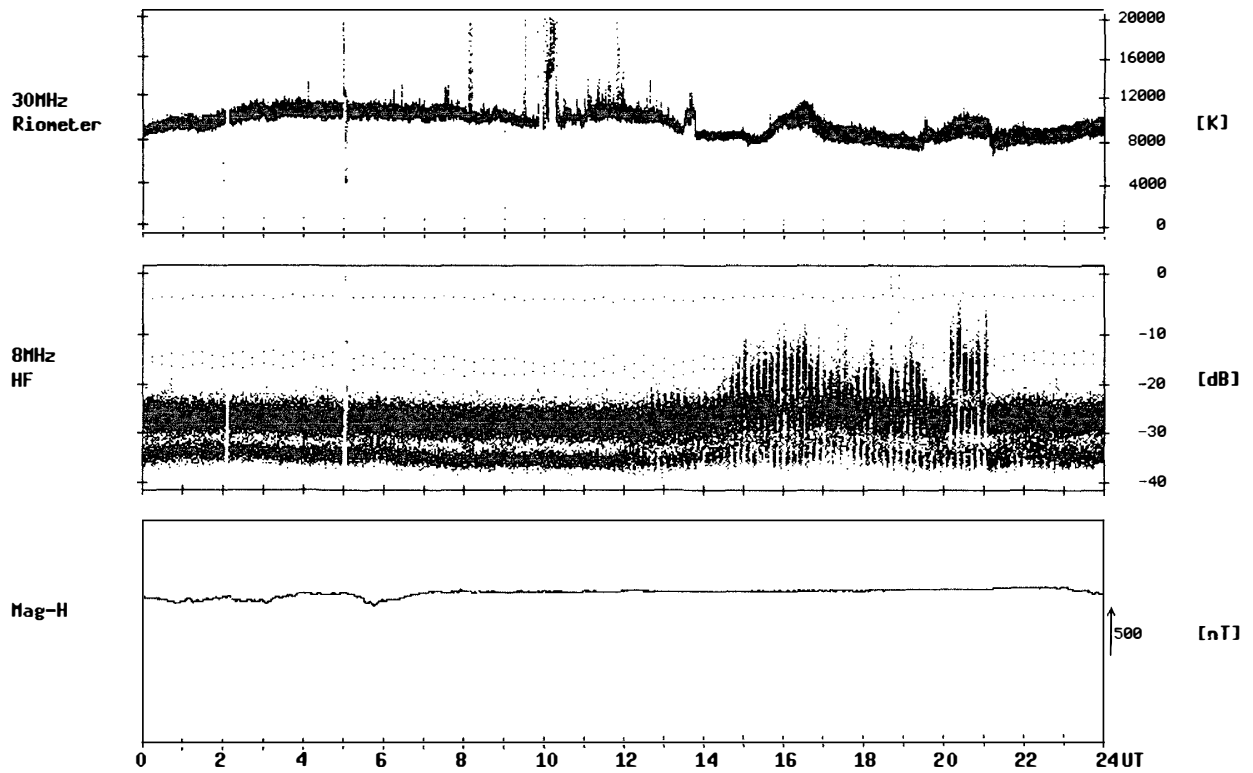
Syowa Station

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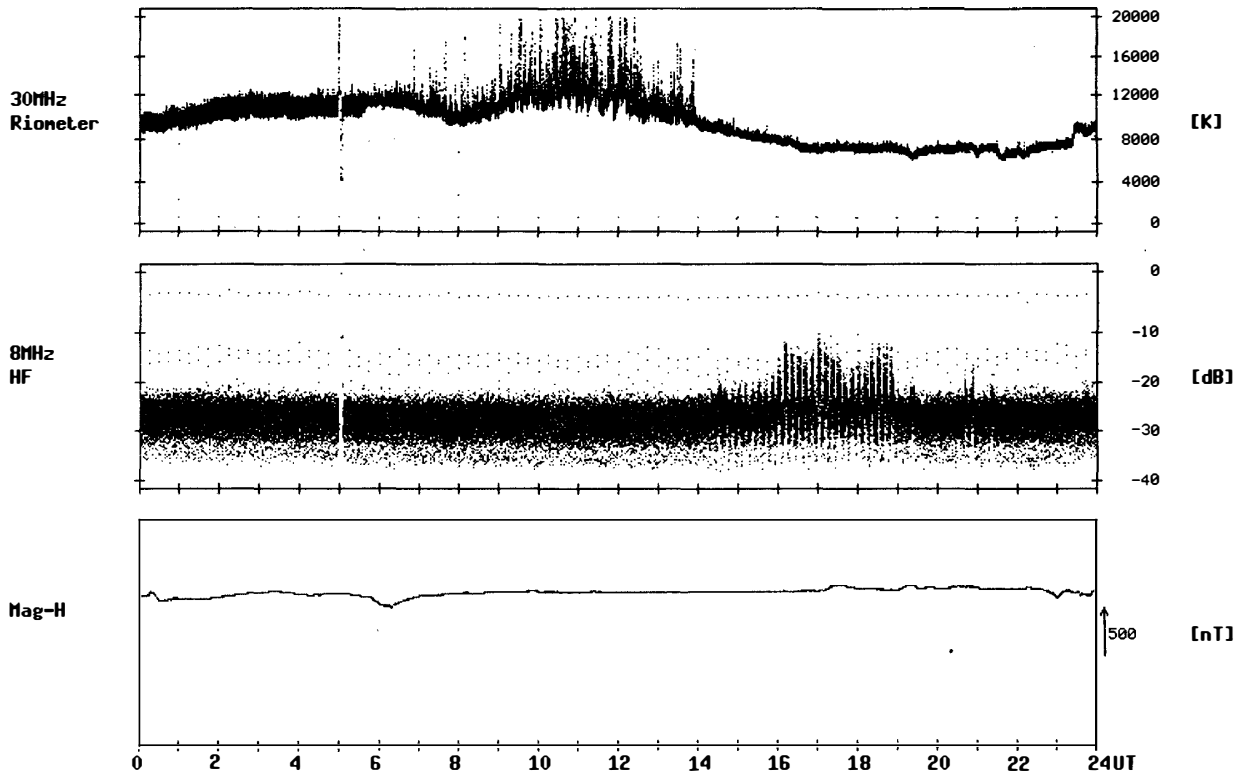
Syowa Station

1999/11/20



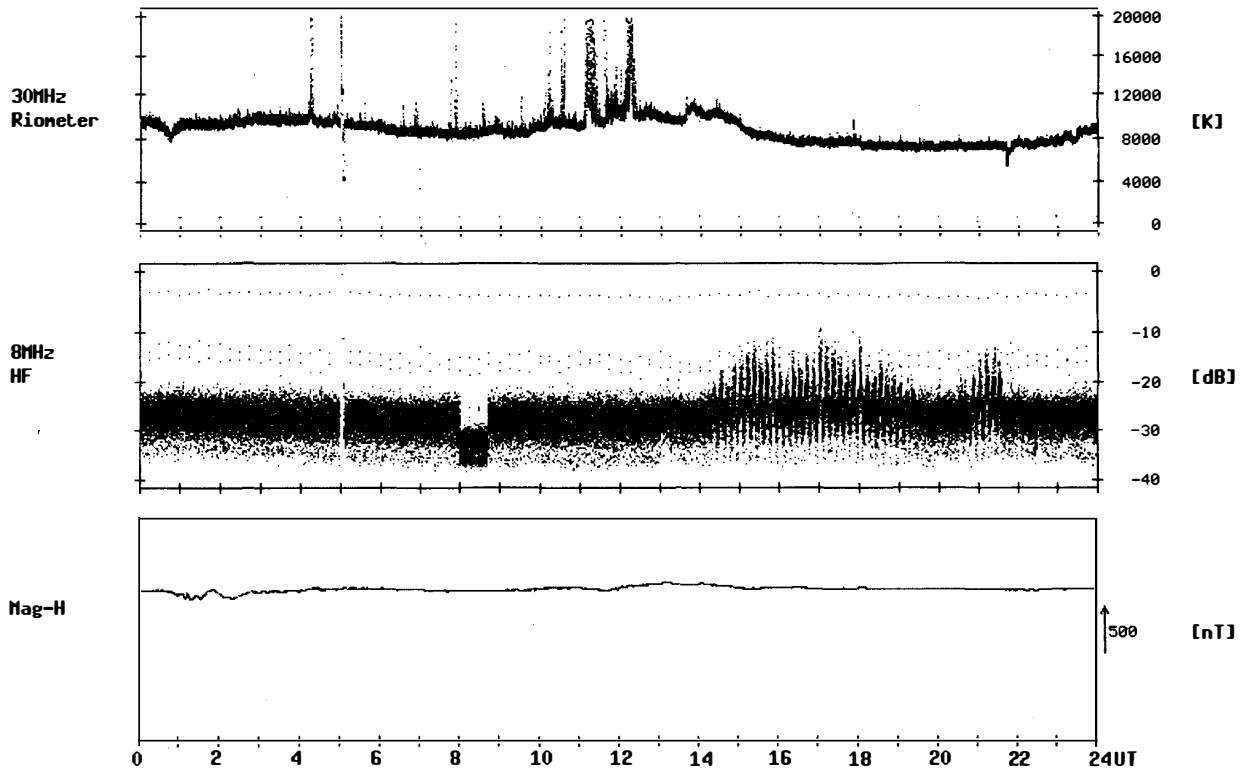
Syowa Station

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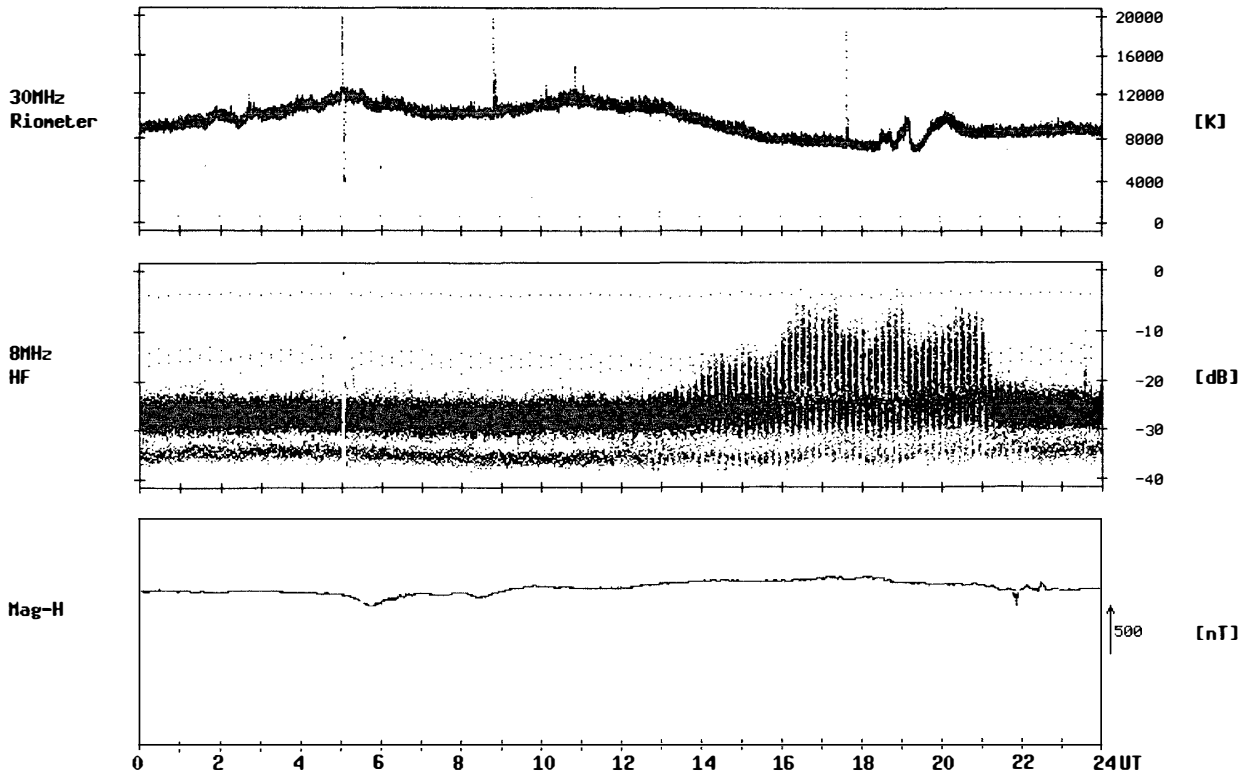
Syowa Station

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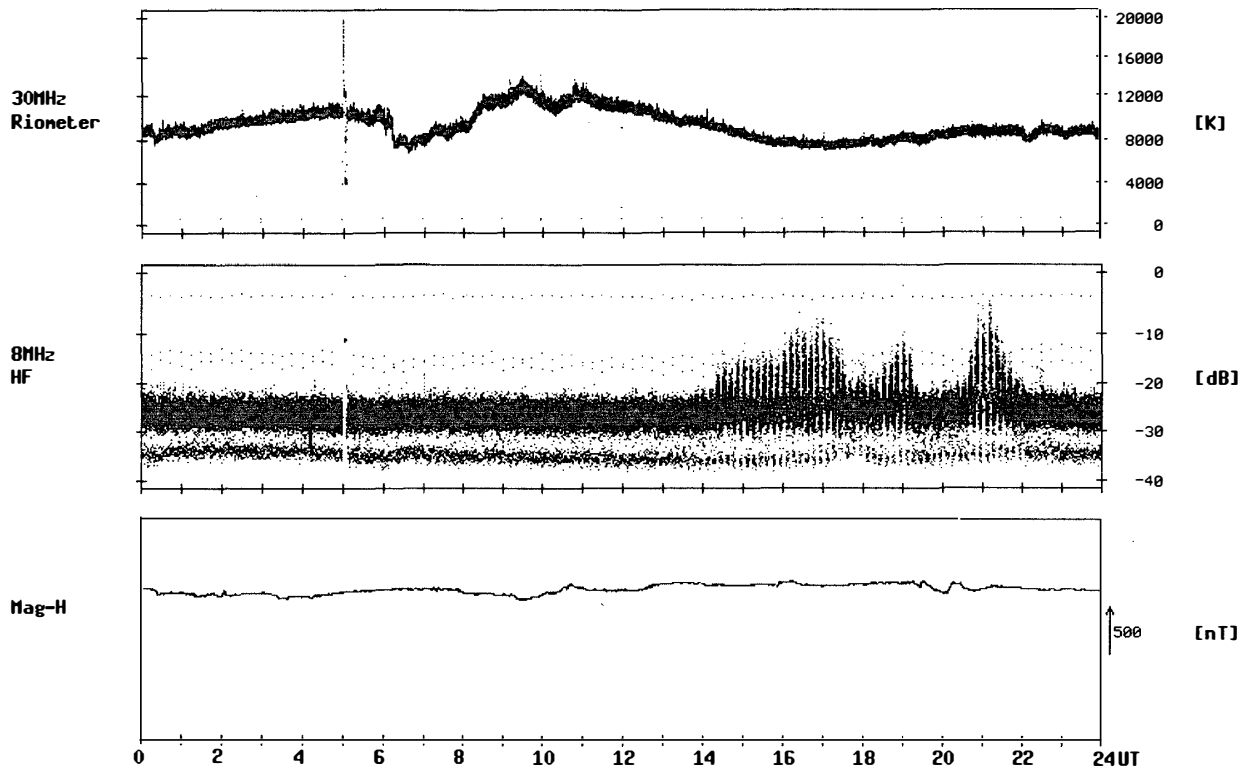
Syowa Station

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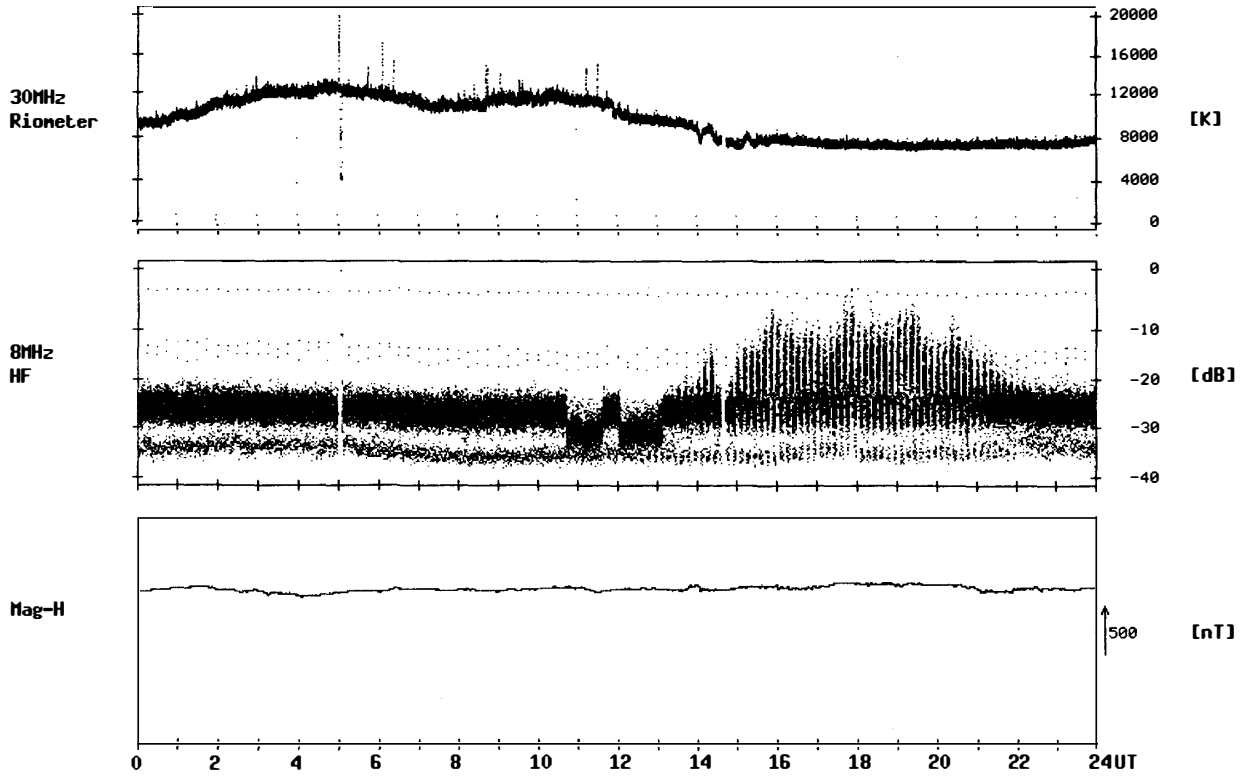
Syowa Station

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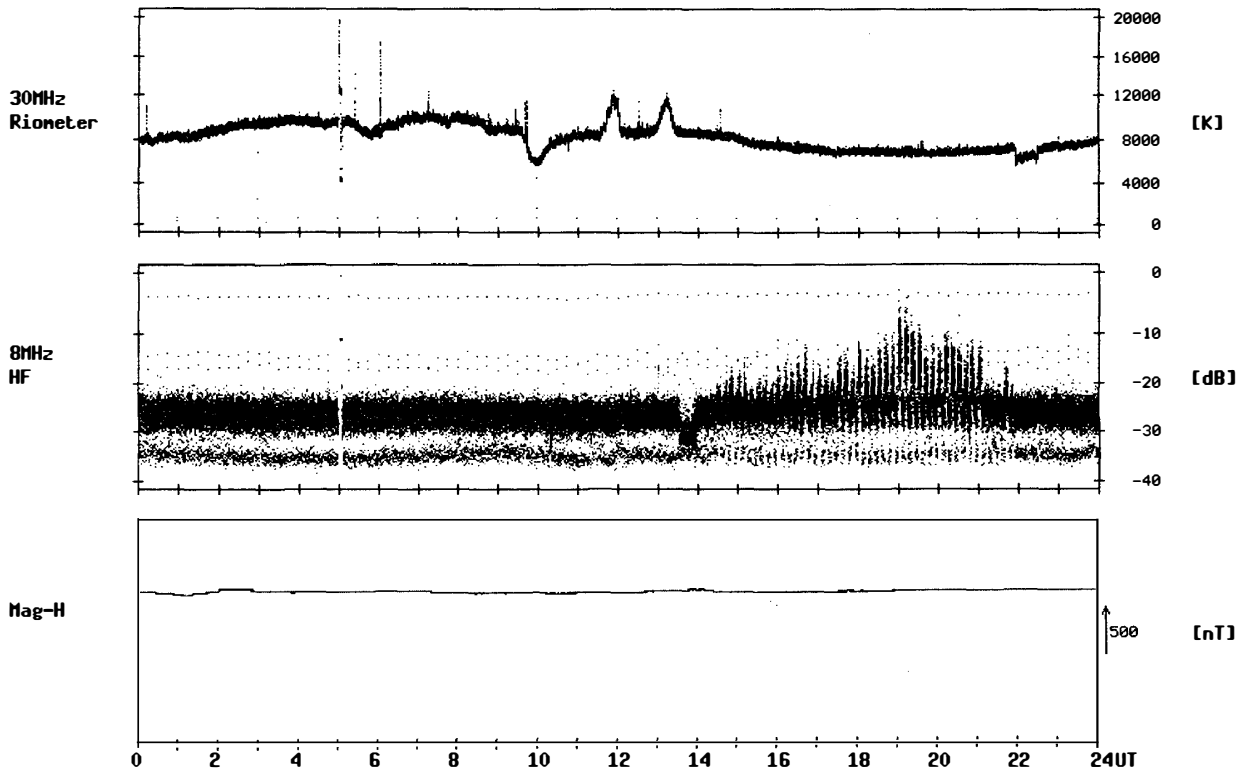
Syowa Station

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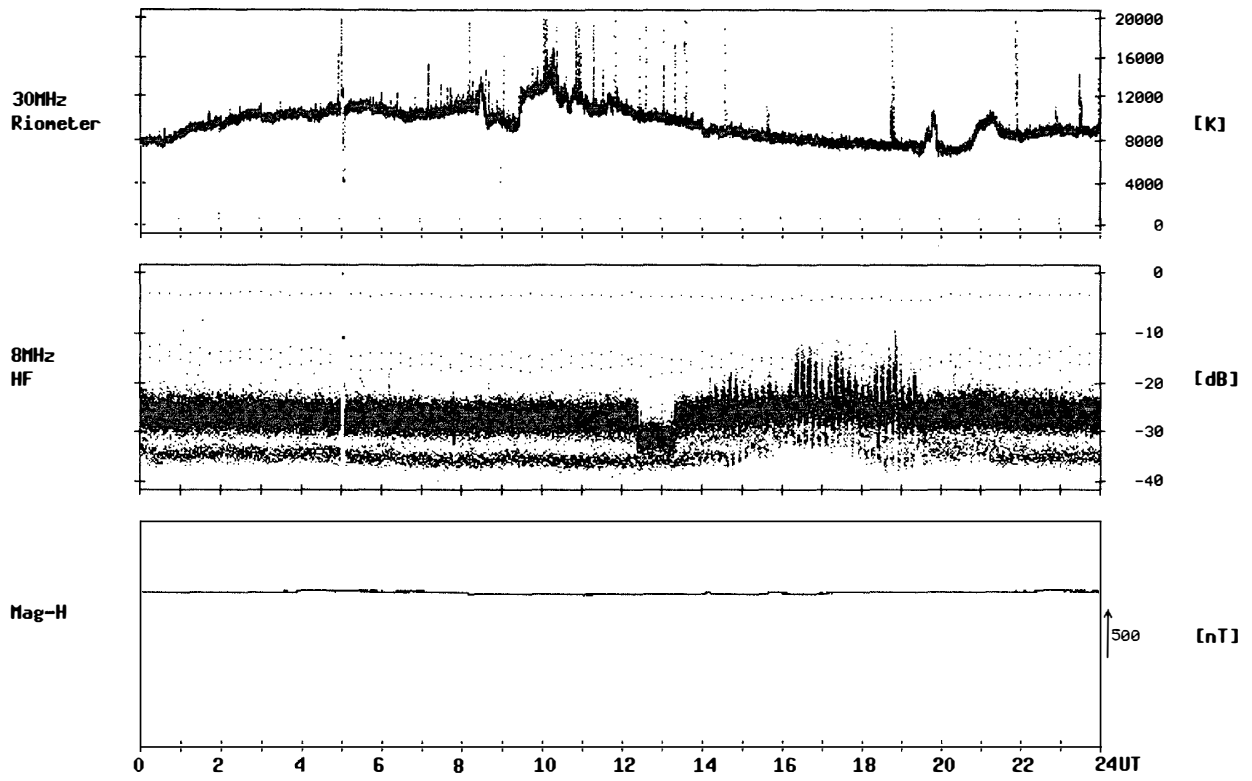
Syowa Station

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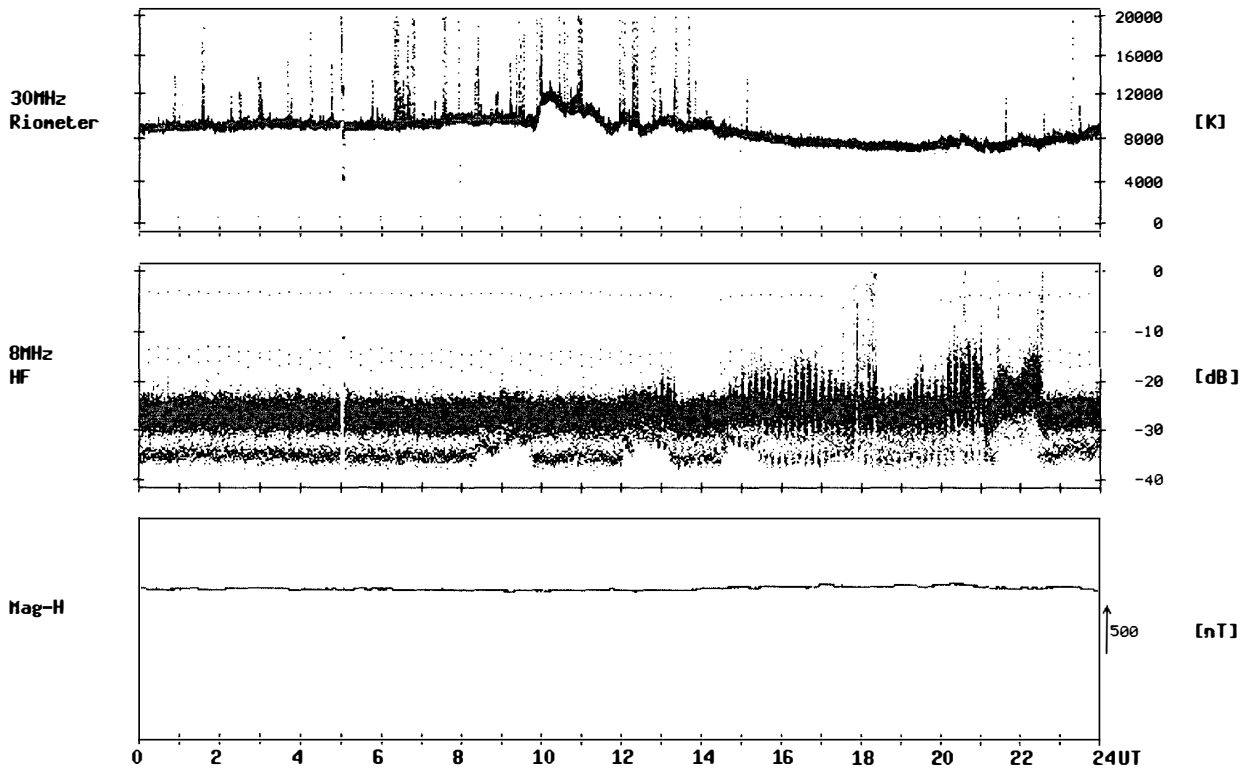
Syowa Station

1999/11/27



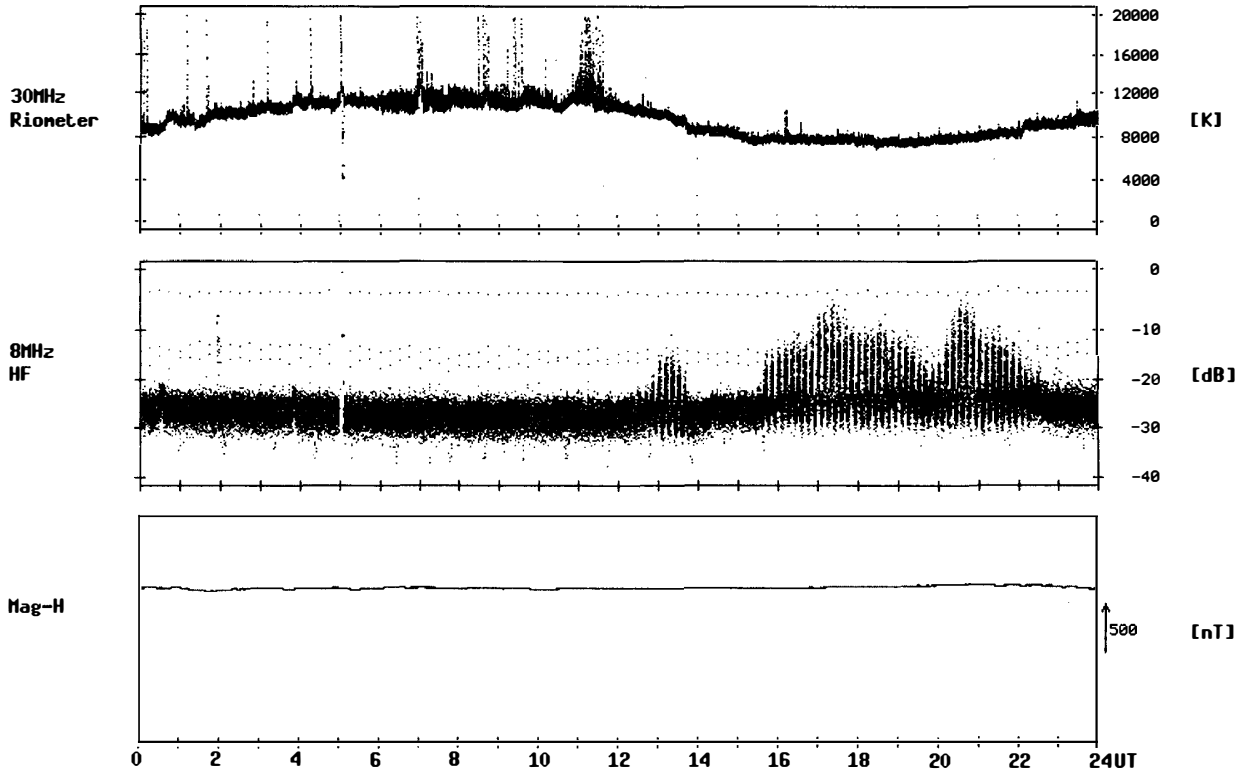
Syowa Station

1999/11/28



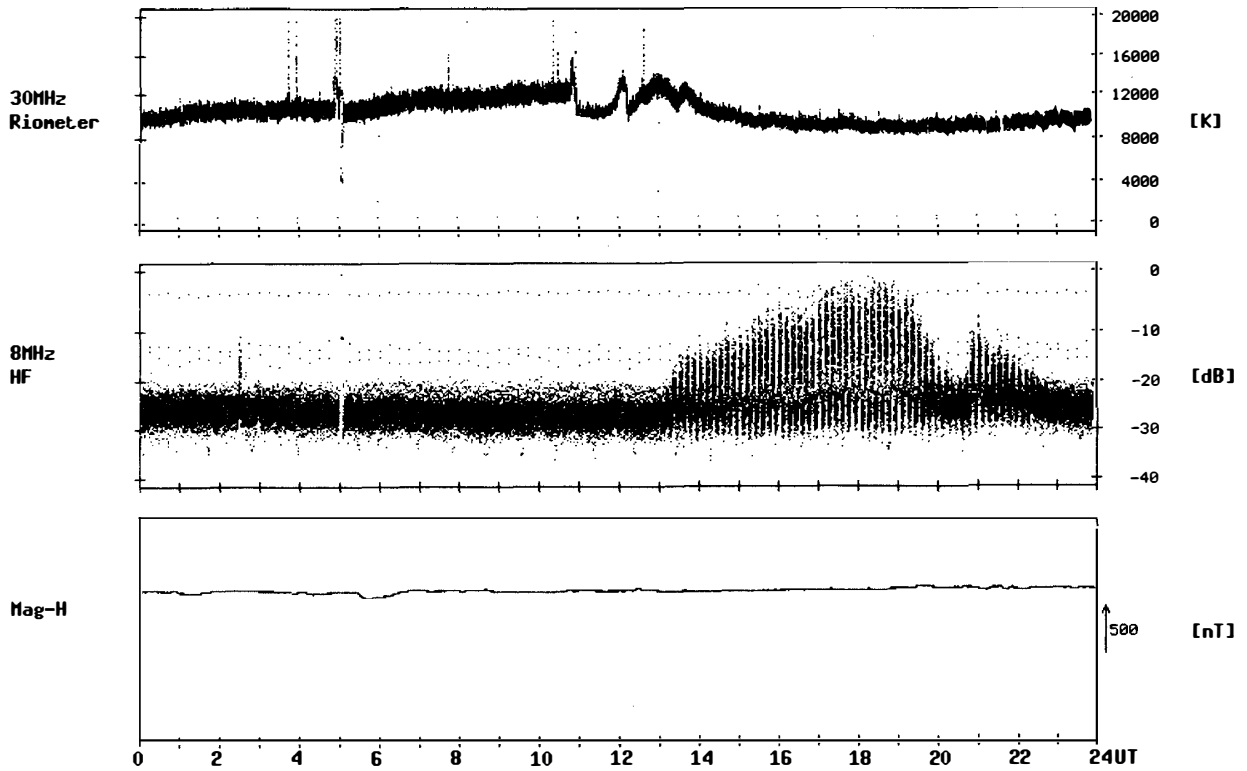
Syowa Station

1999/11/29



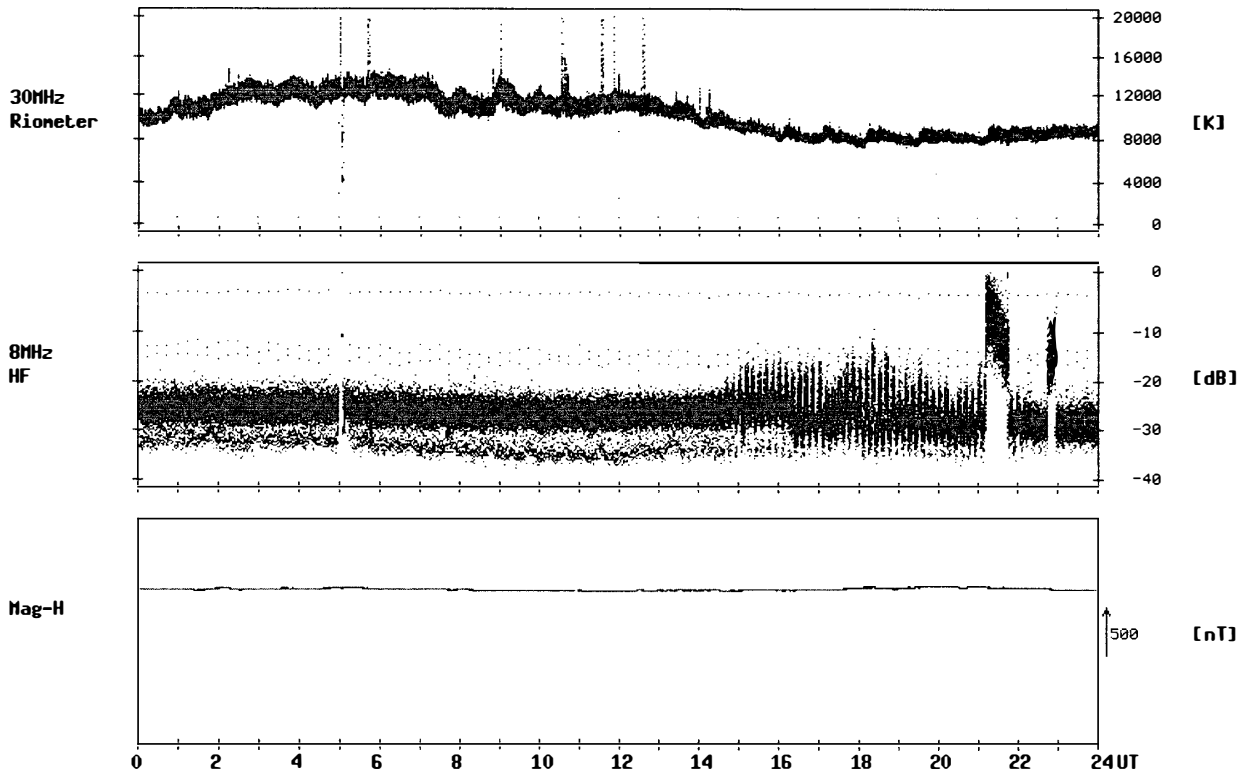
Syowa Station

1999/11/30



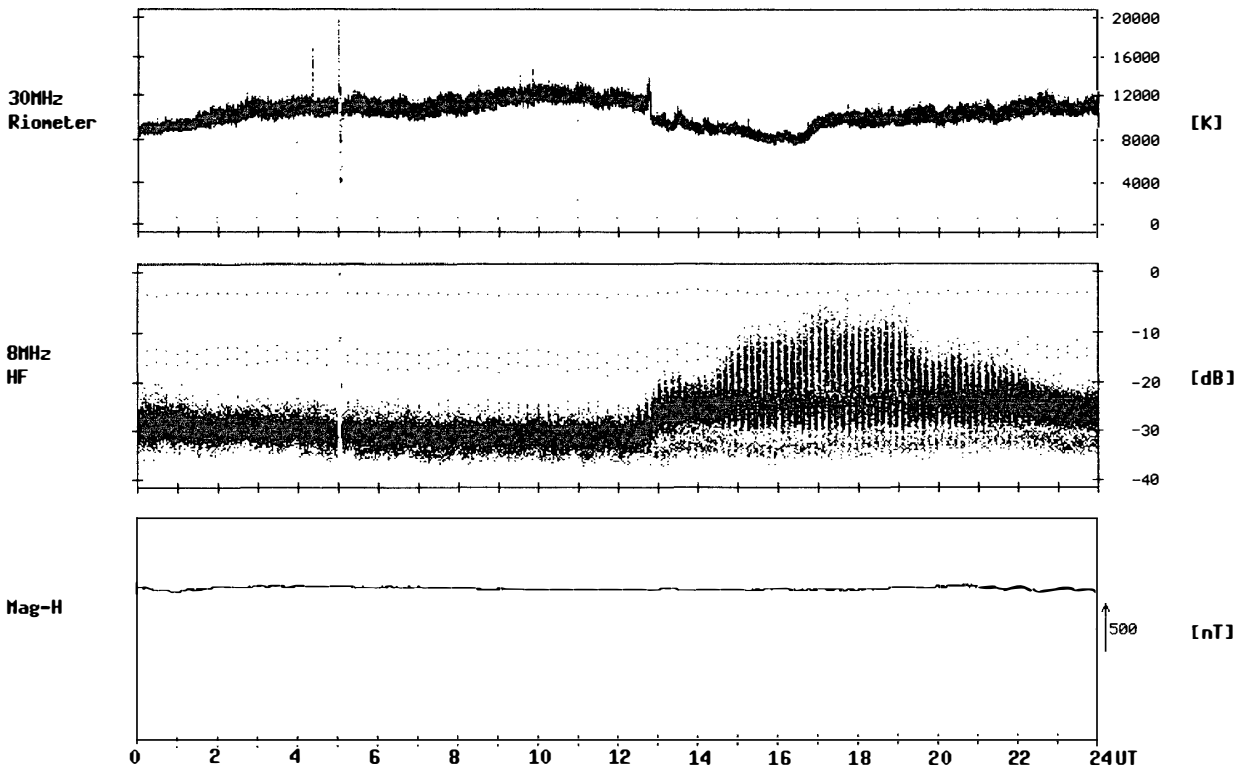
Syowa Station

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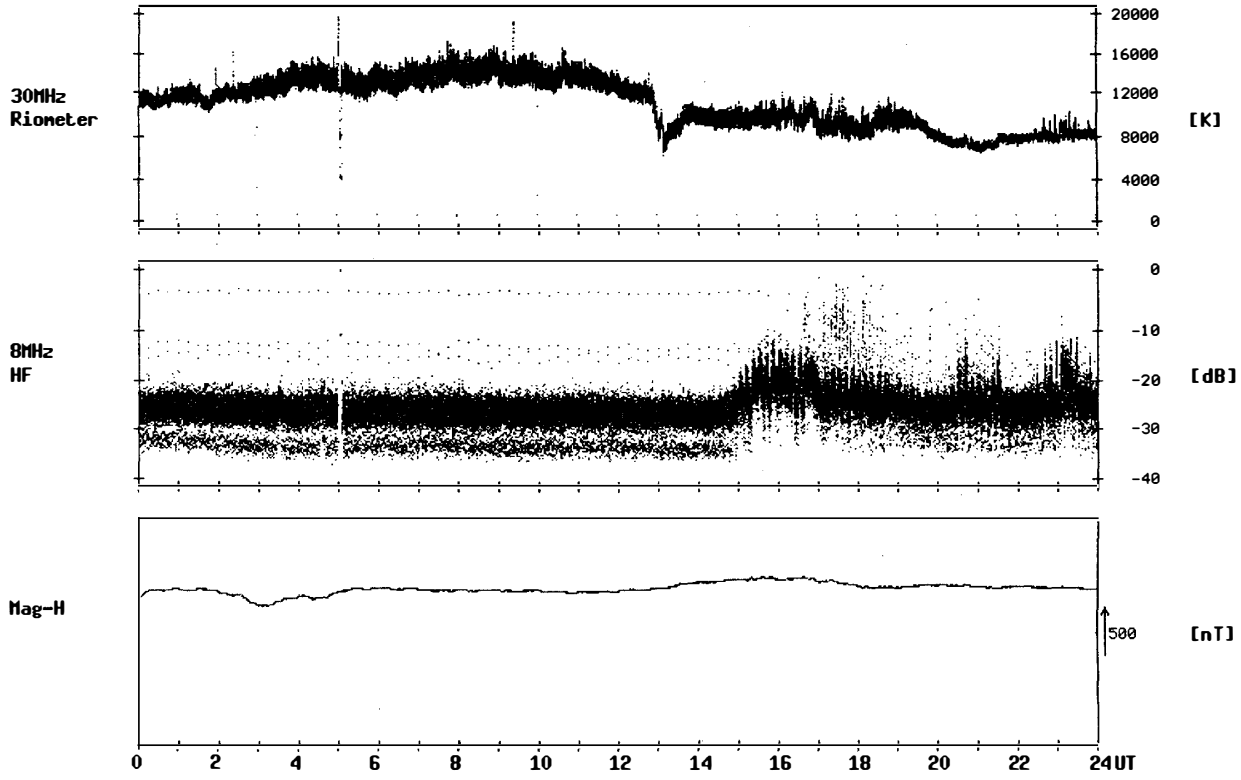
Syowa Station

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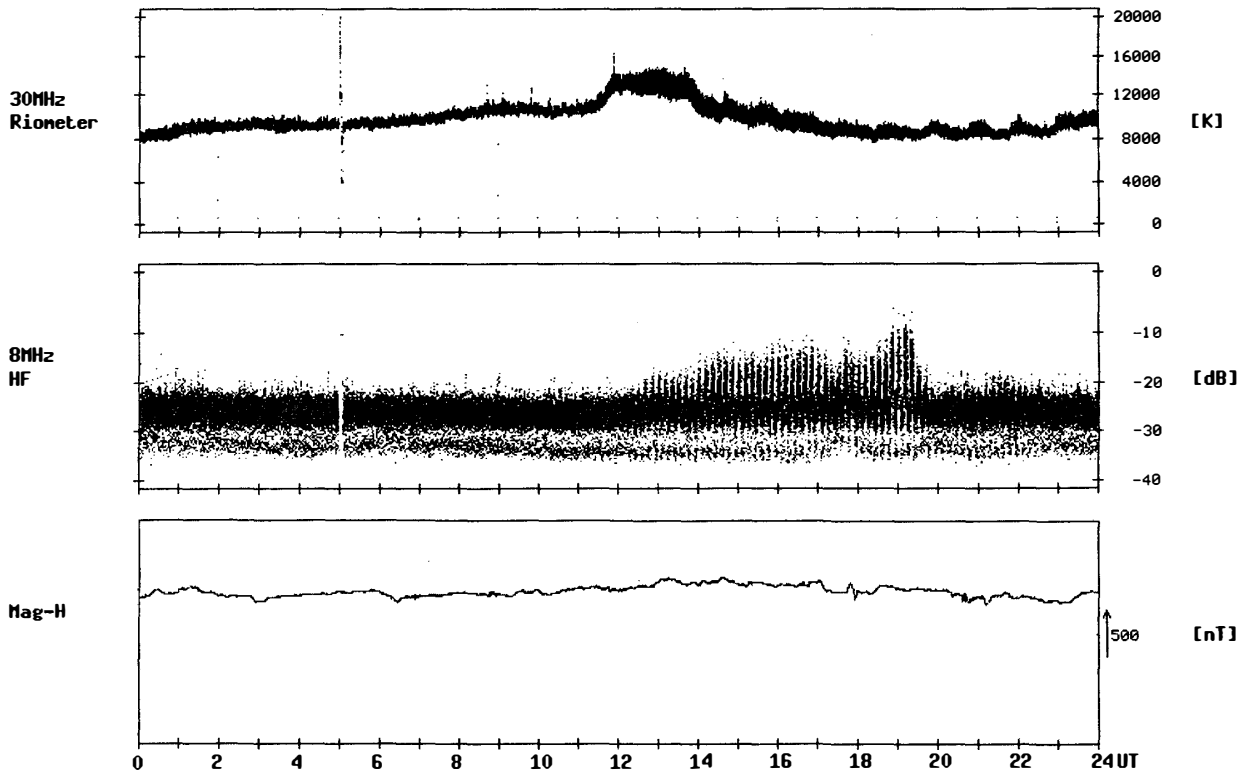
Syowa Station

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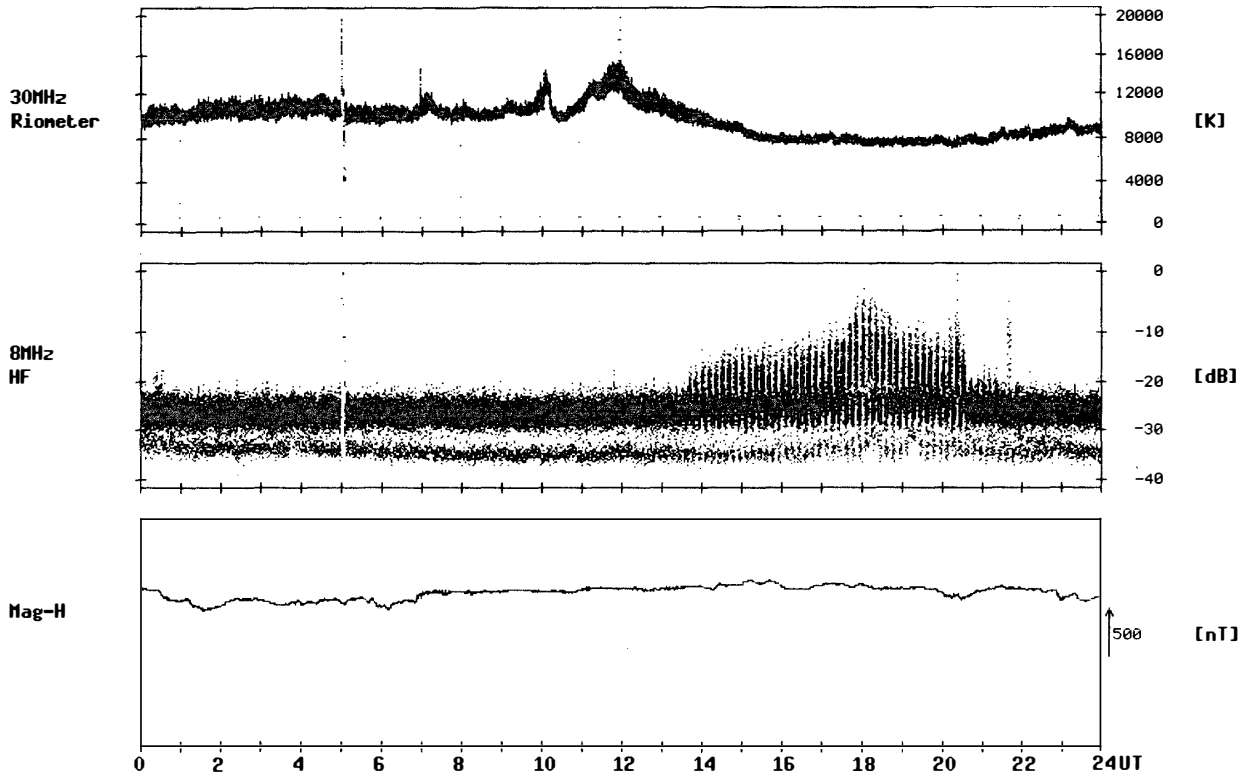
Syowa Station

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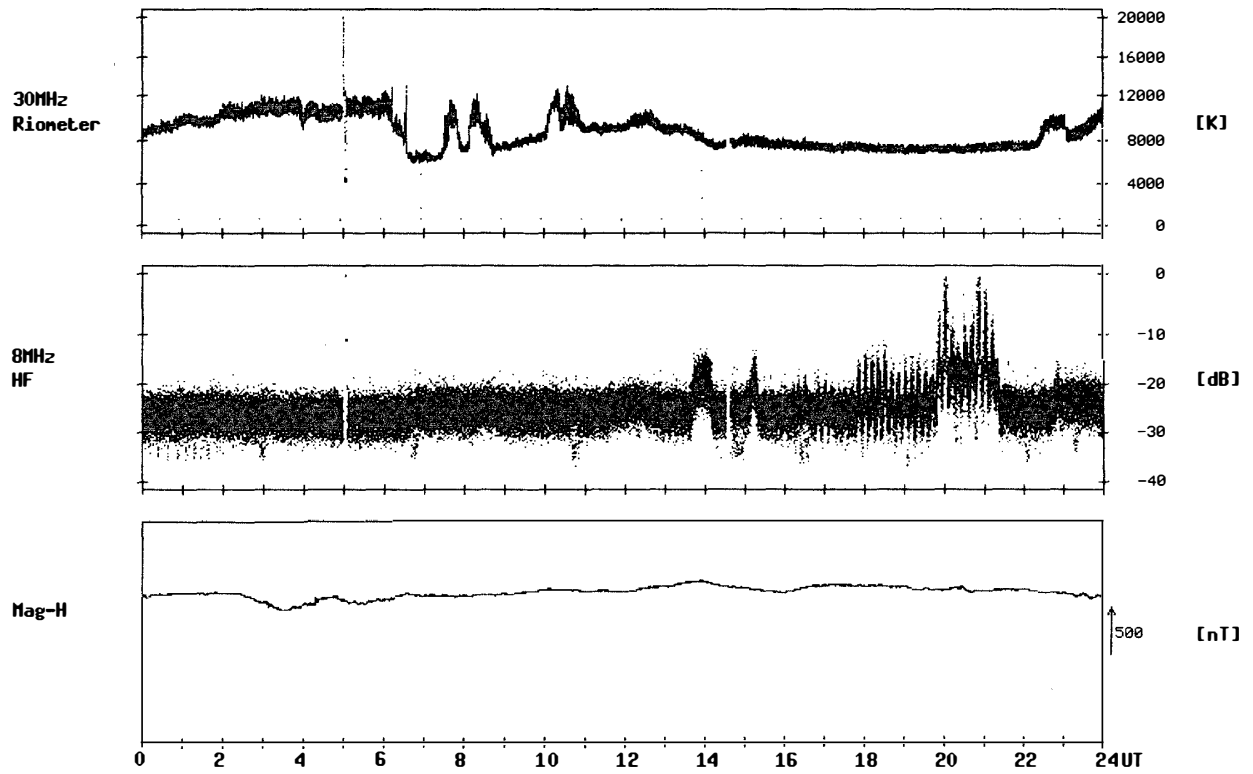
Syowa Station

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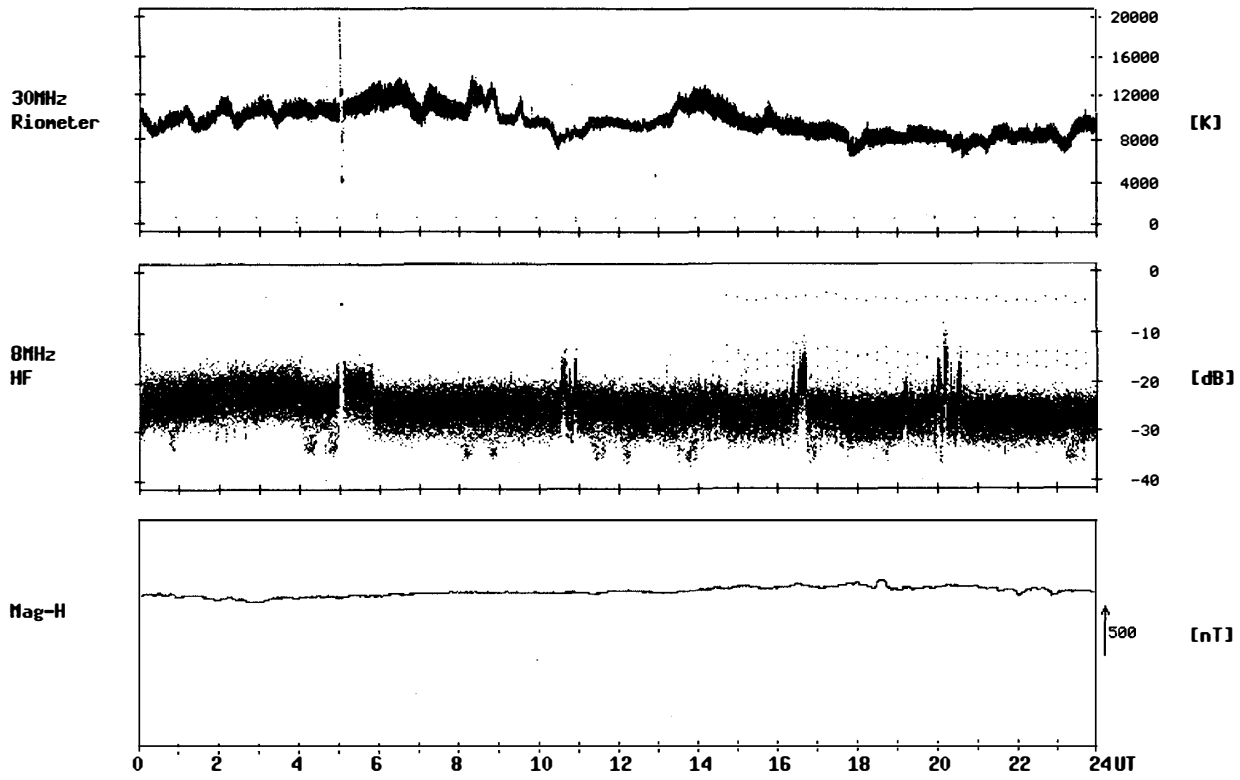
Syowa Station

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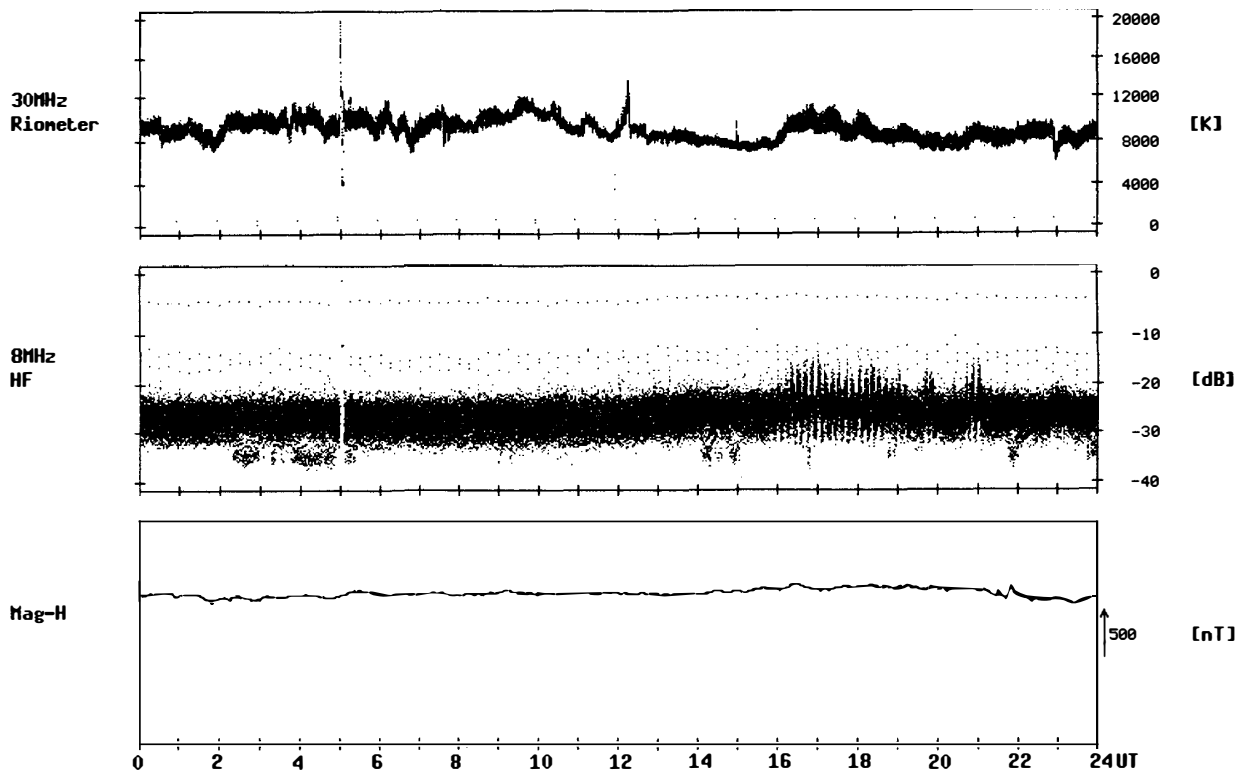
Syowa Station

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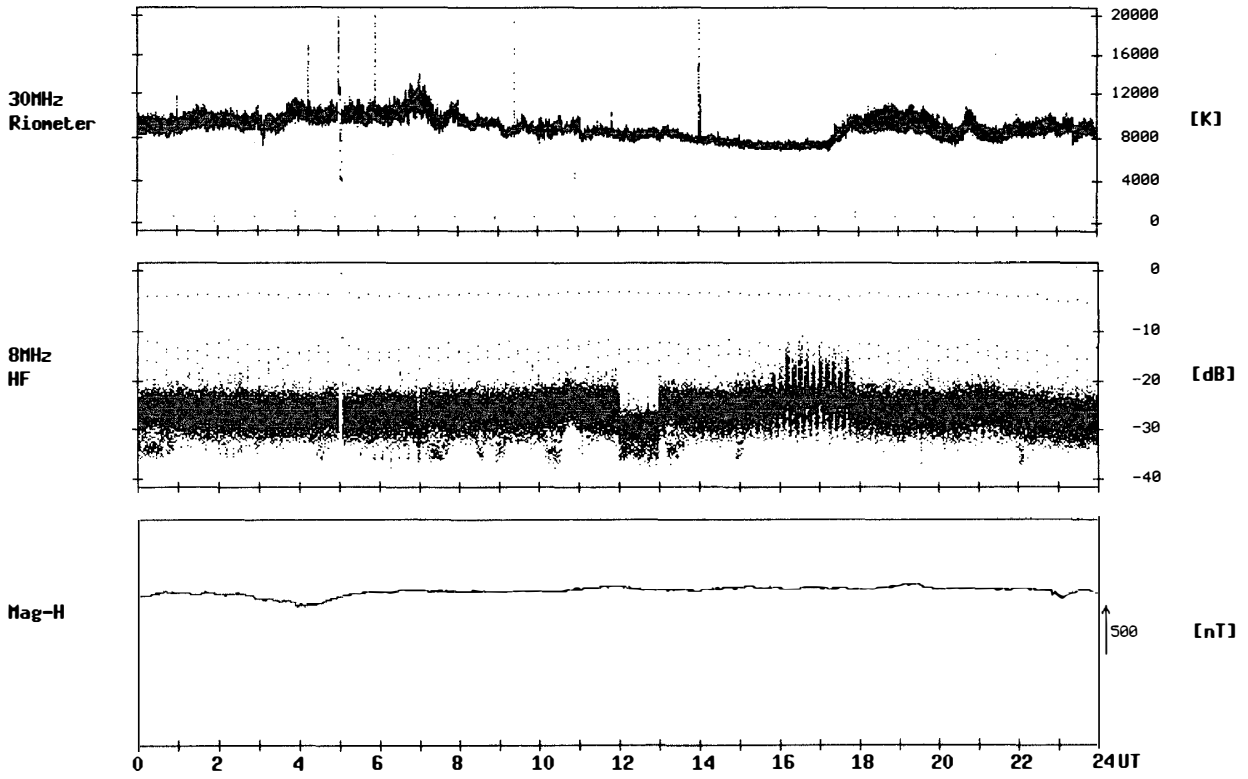
Syowa Station

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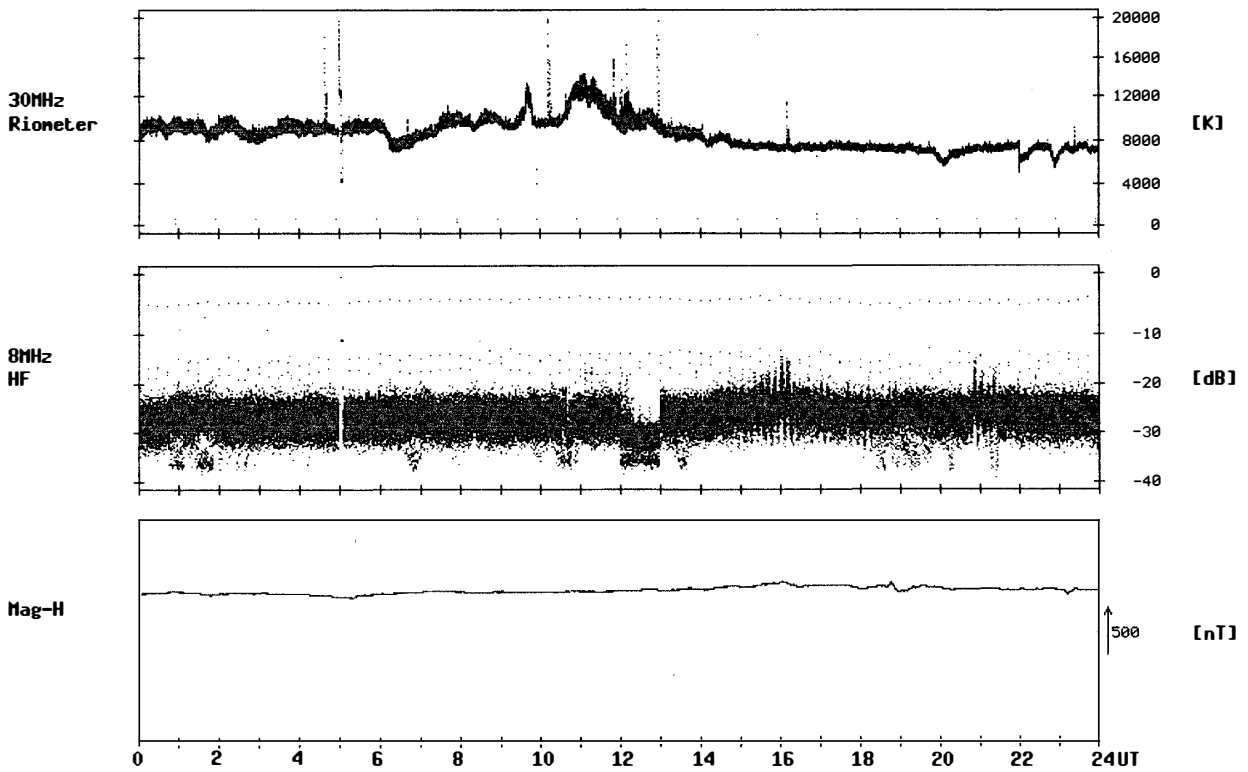
Syowa Station

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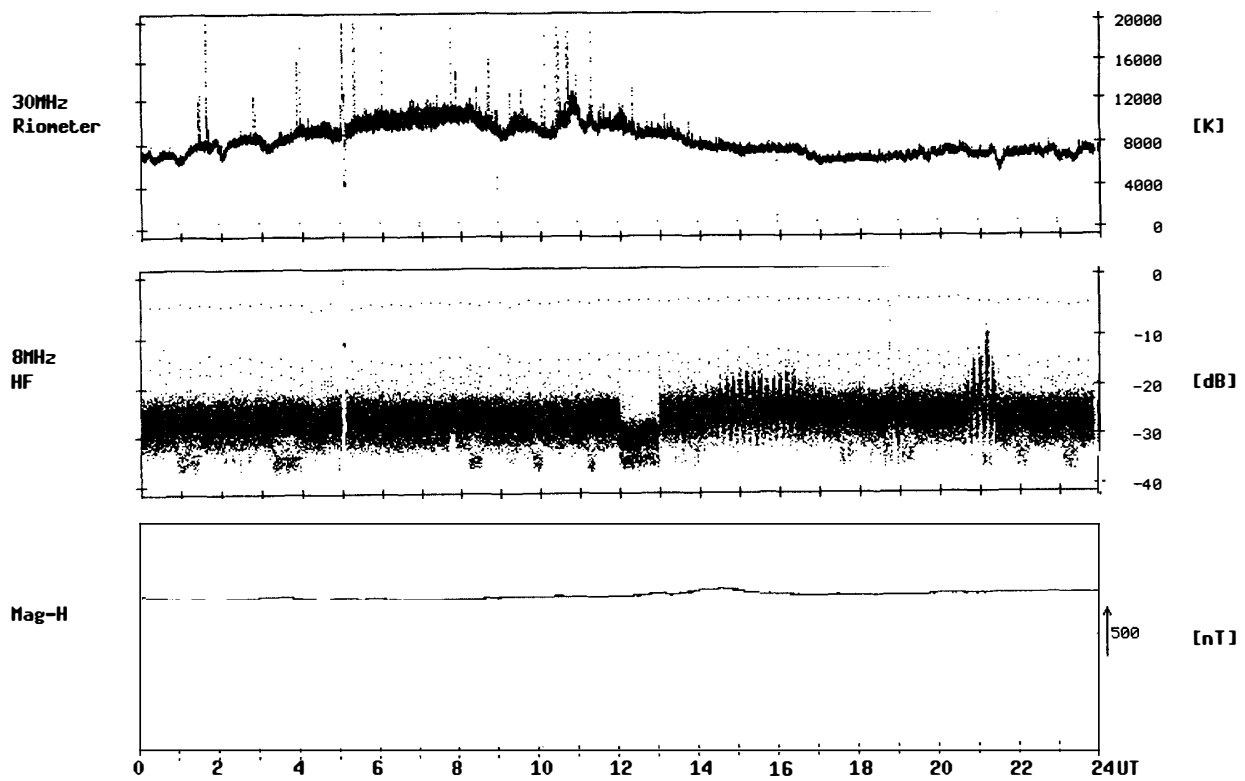
Syowa Station

1999/12/10



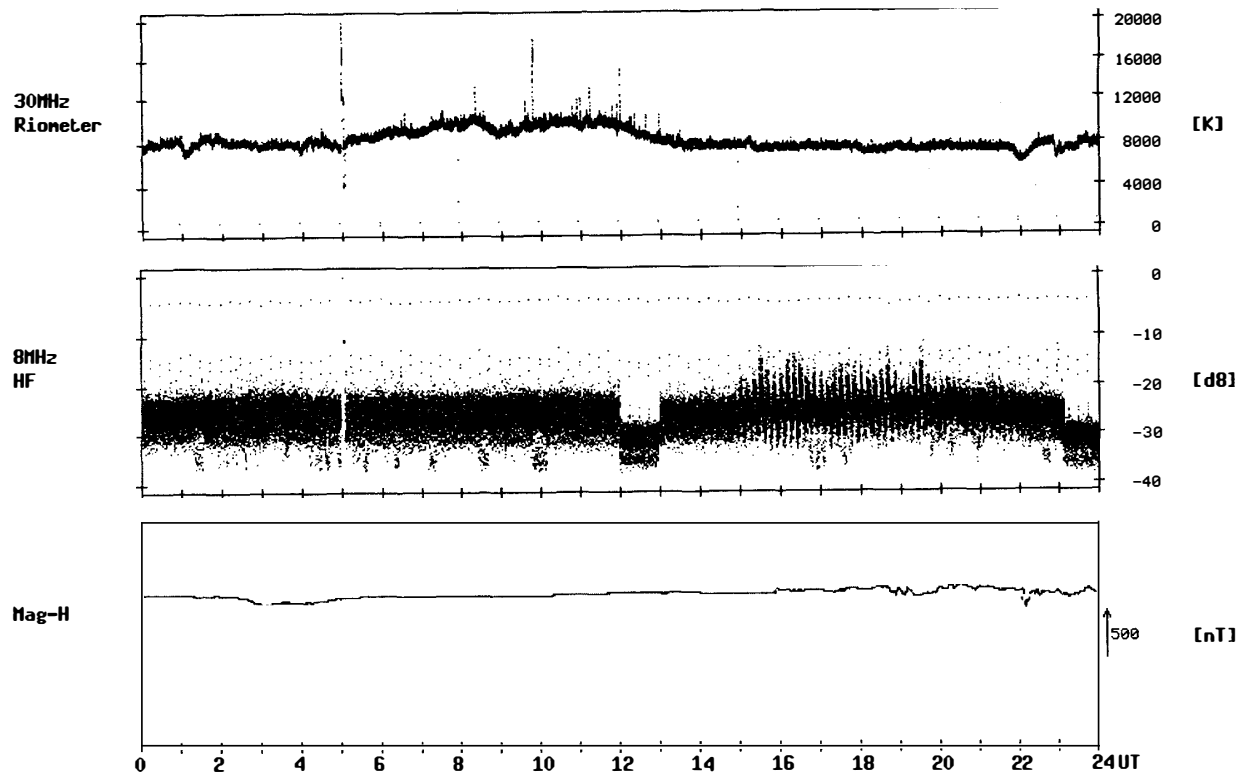
Syowa Station

1999/12/11



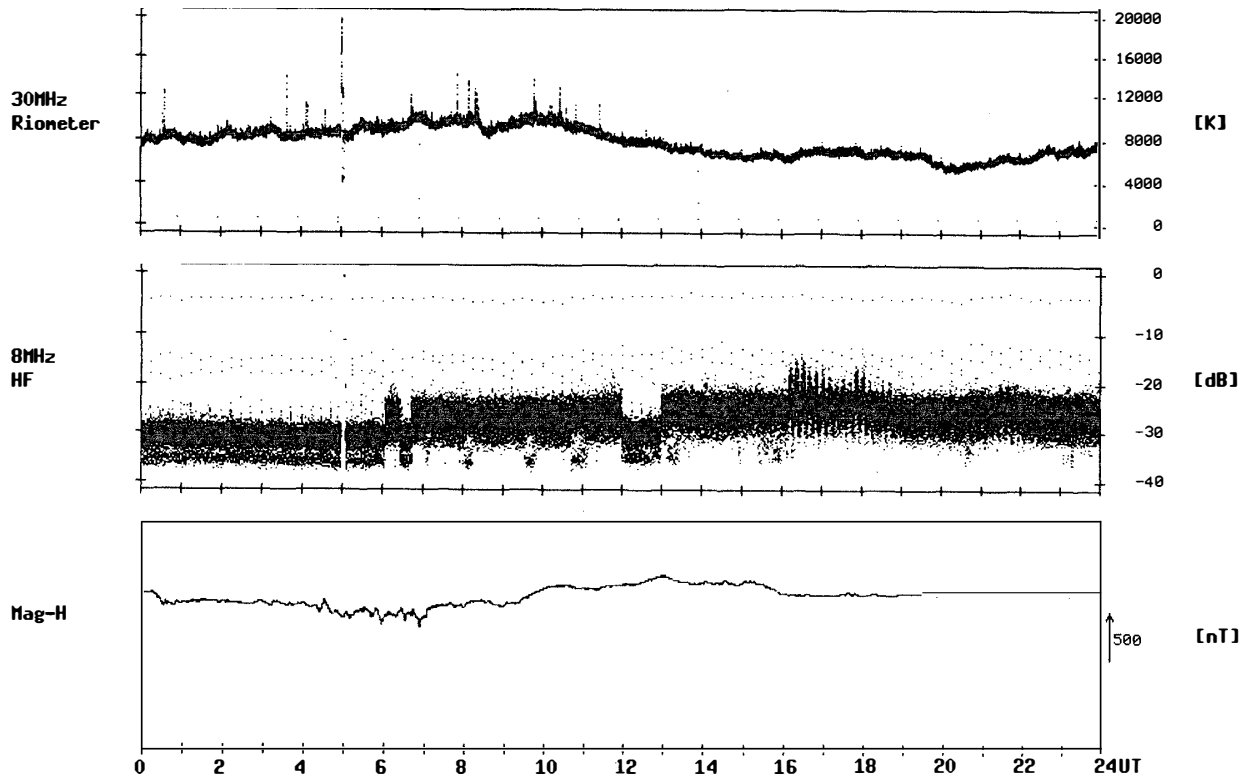
Syowa Station

1999/12/12



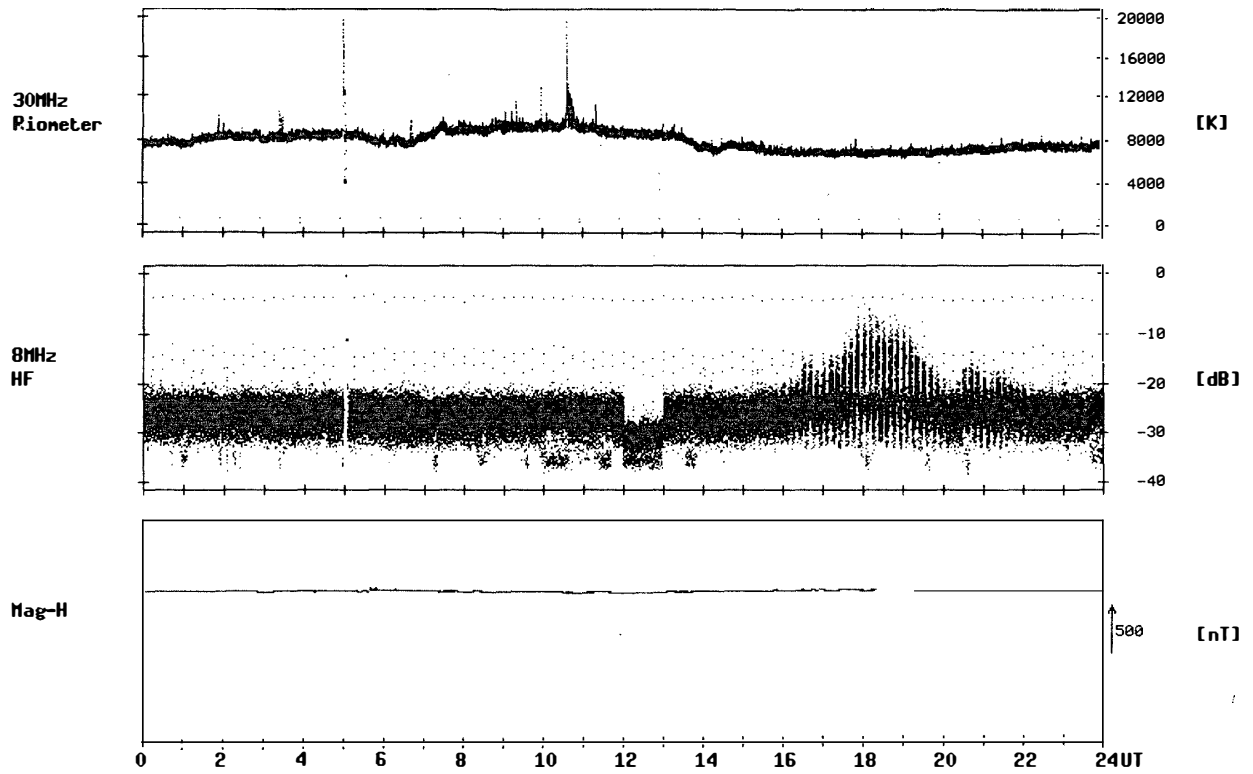
Syowa Station

1999/12/13



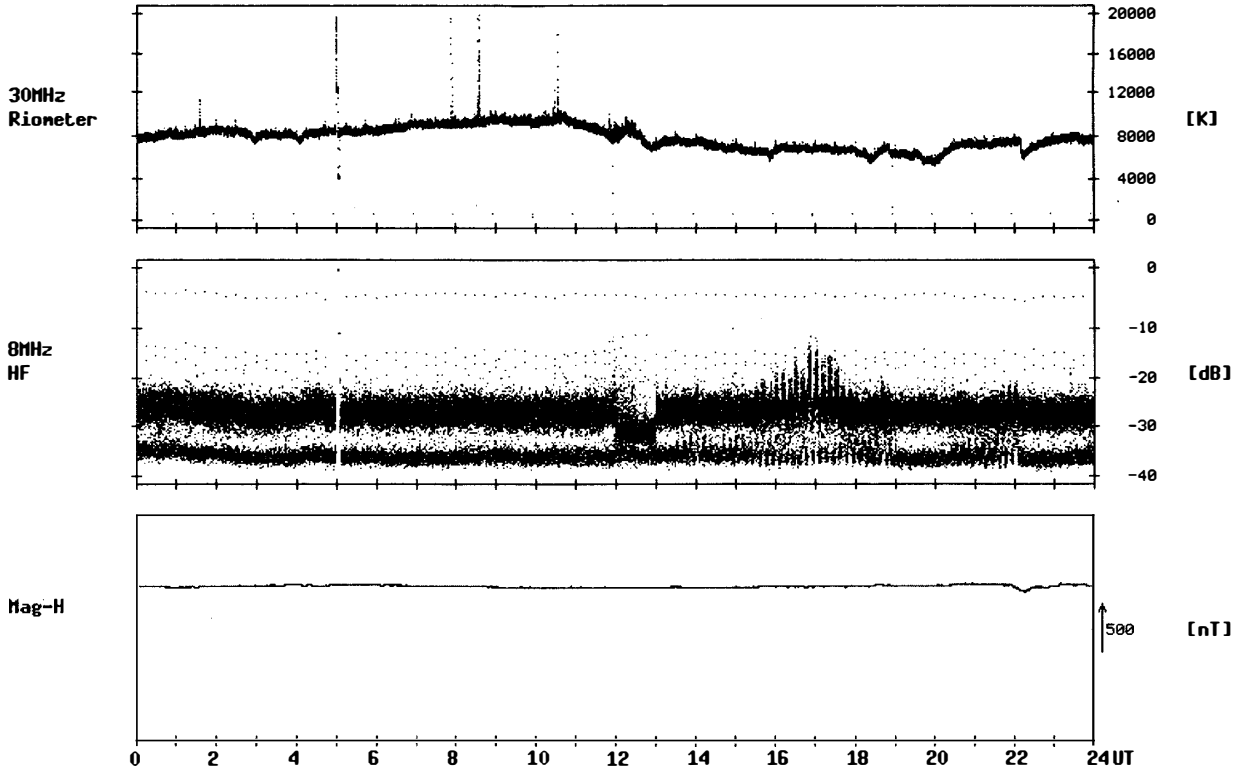
Syowa Station

1999/12/14



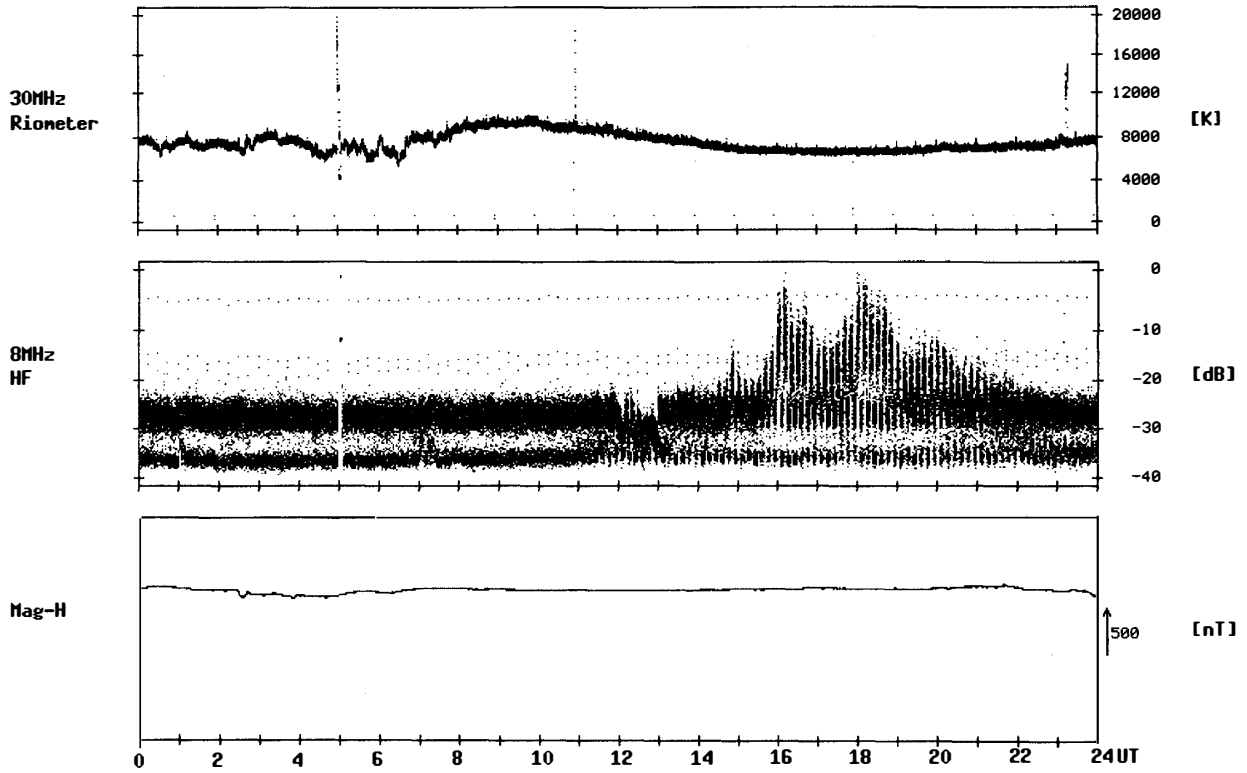
Syowa Station

1999/12/15



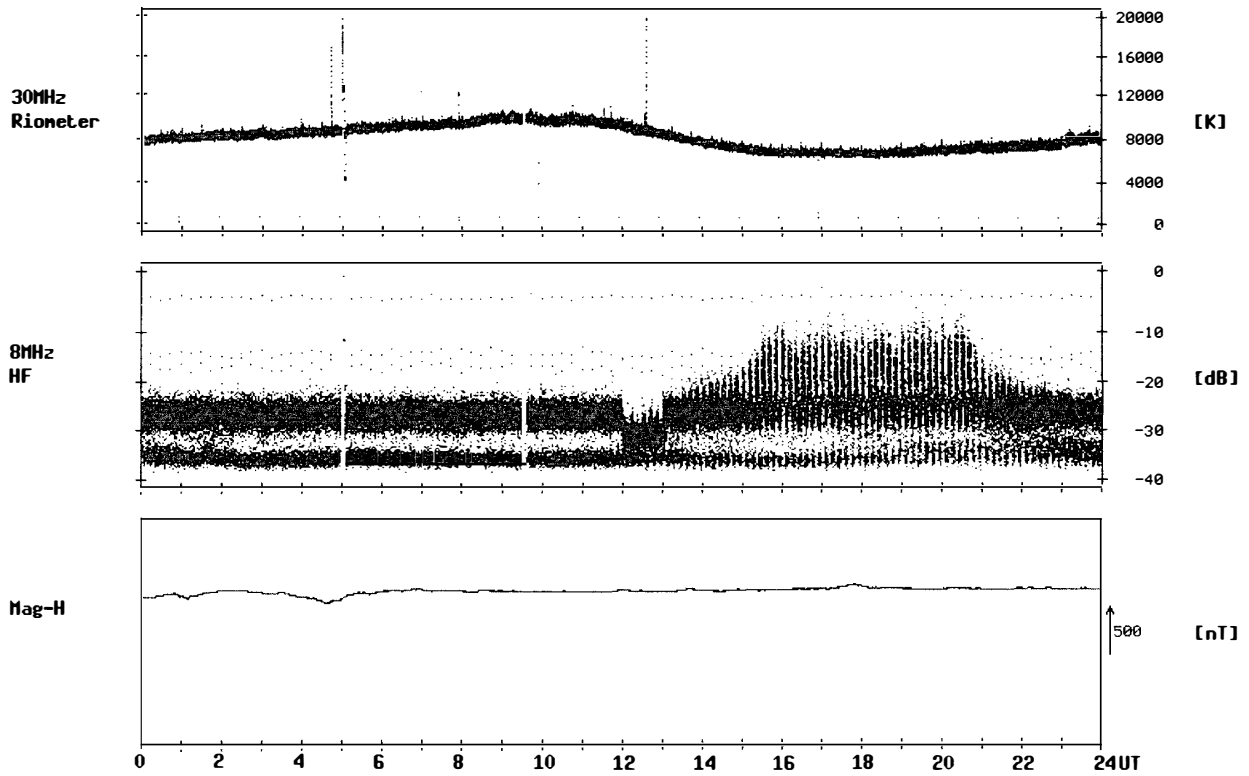
Syowa Station

1999/12/16



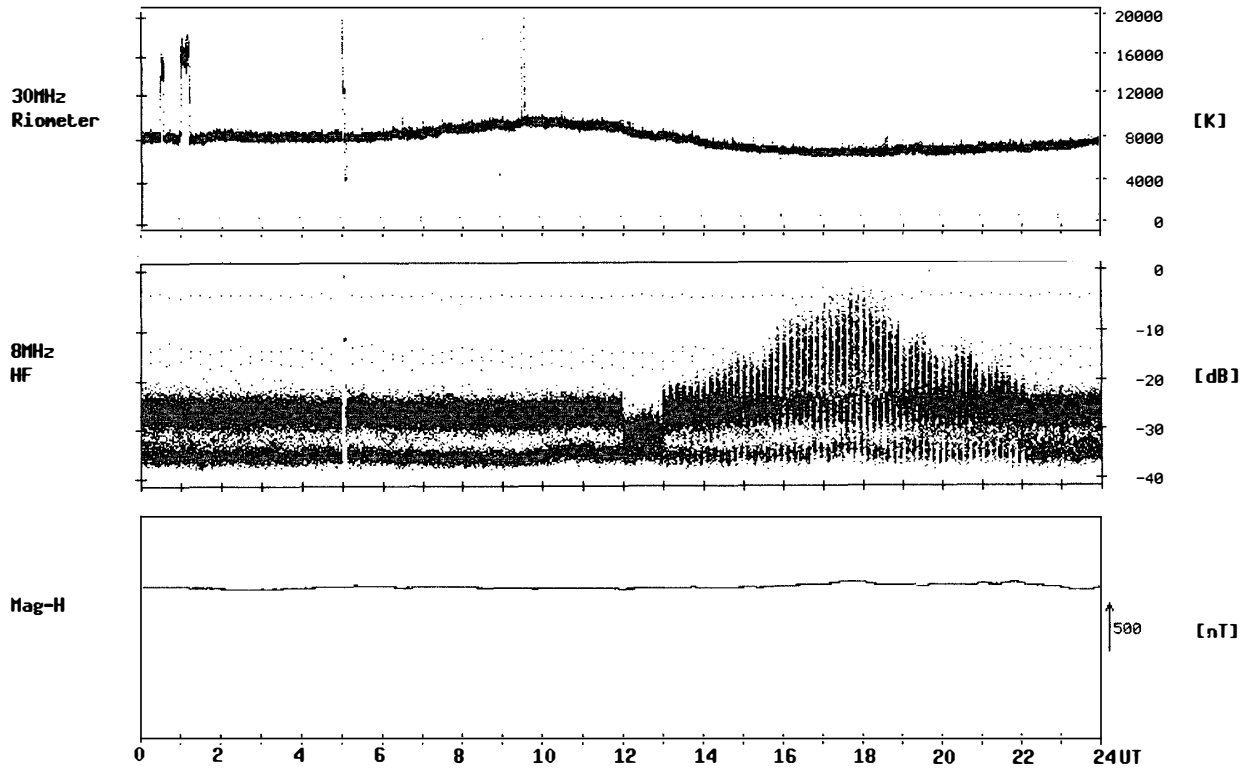
Syowa Station

1999/12/17



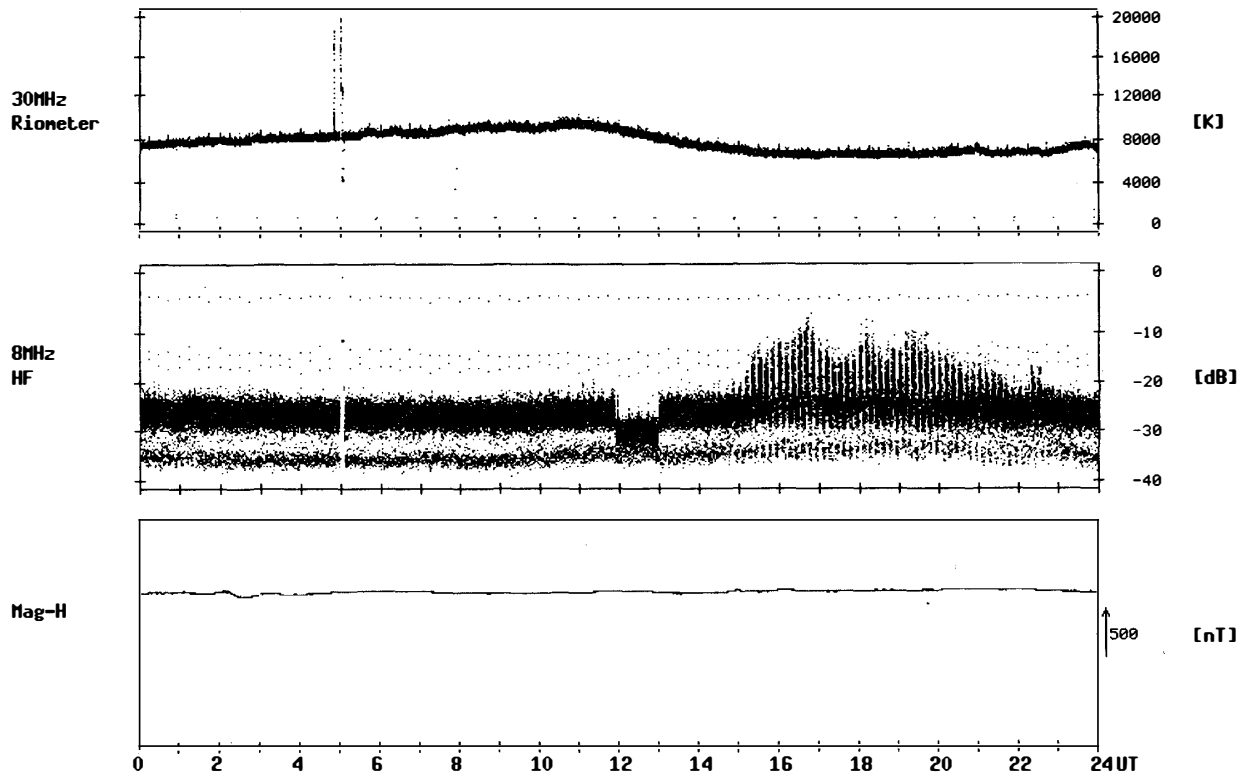
Syowa Station

1999/12/18



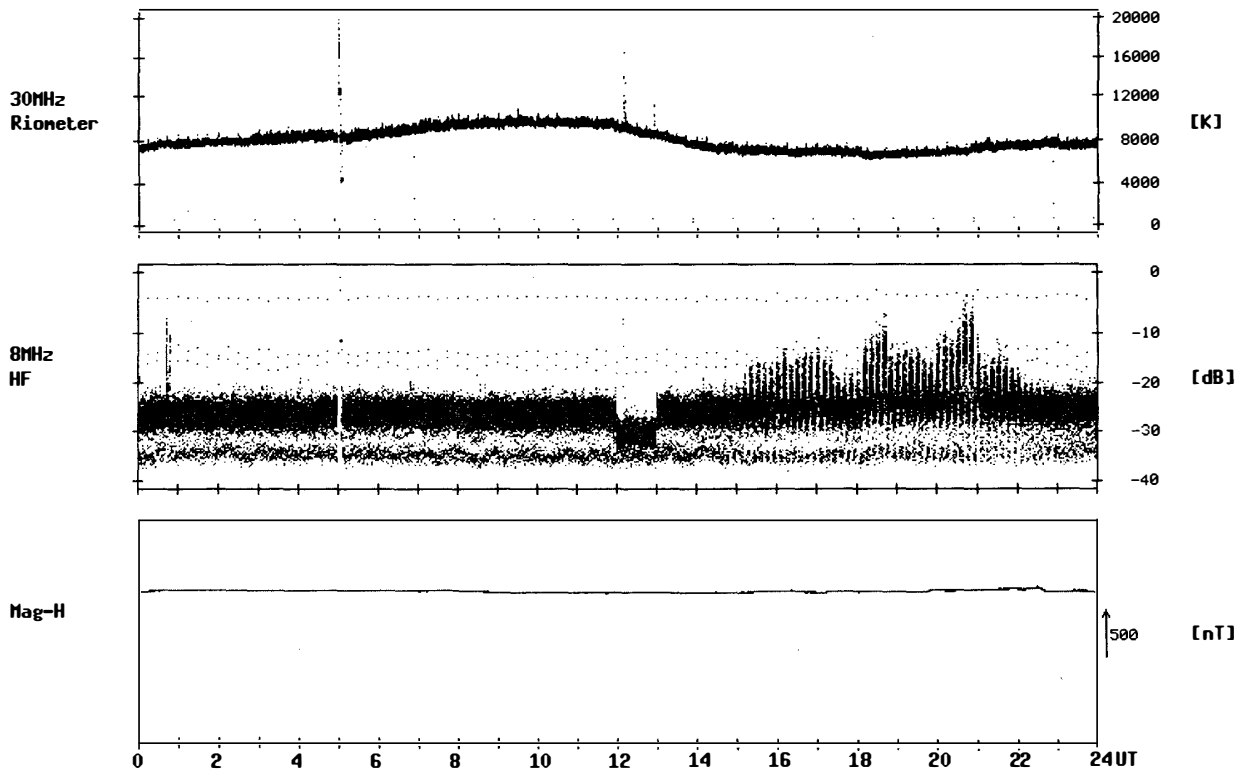
Syowa Station

1999/12/19



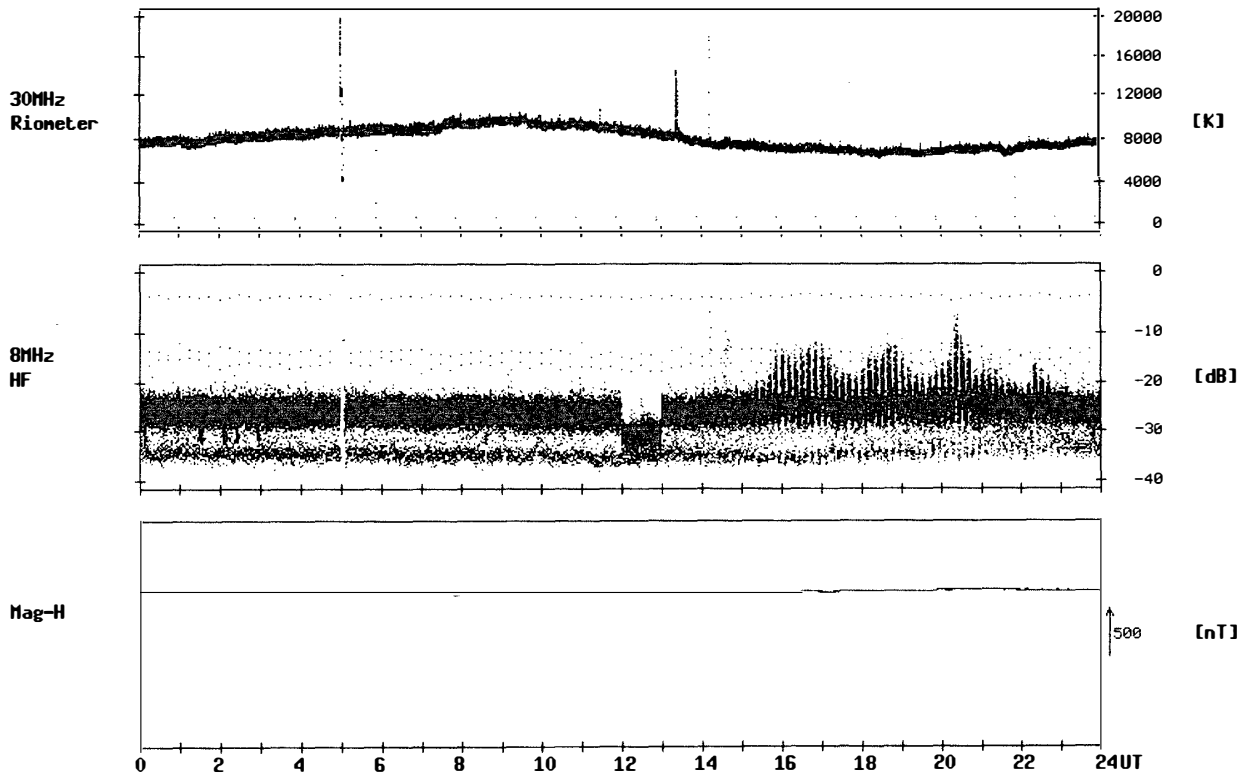
Syowa Station

1999/12/20



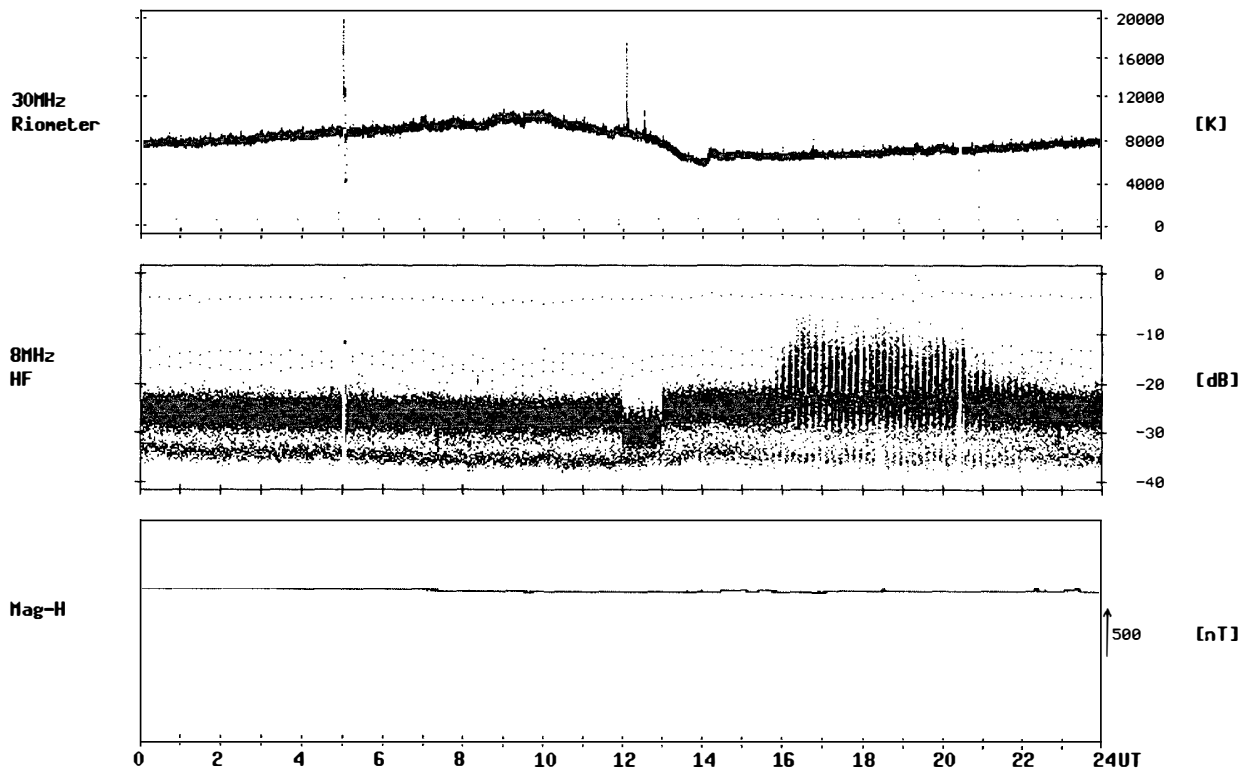
Syowa Station

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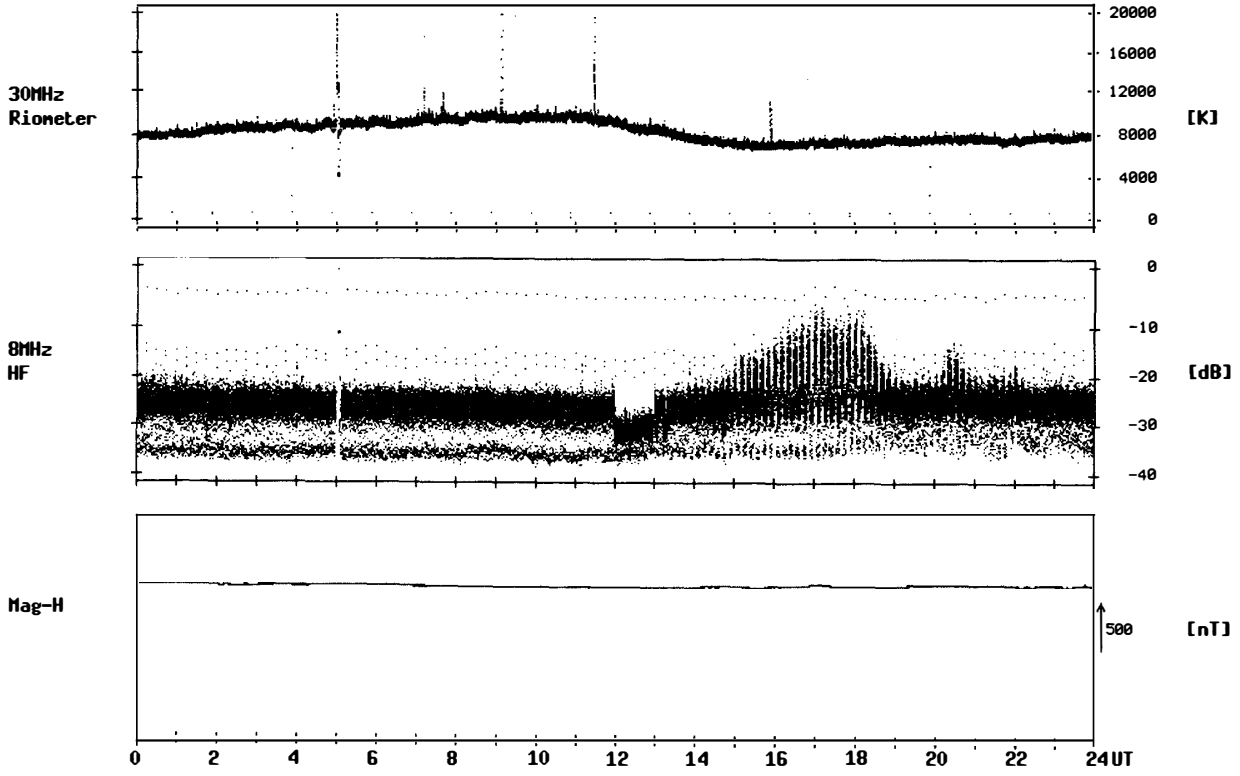
Syowa Station

1999/12/22



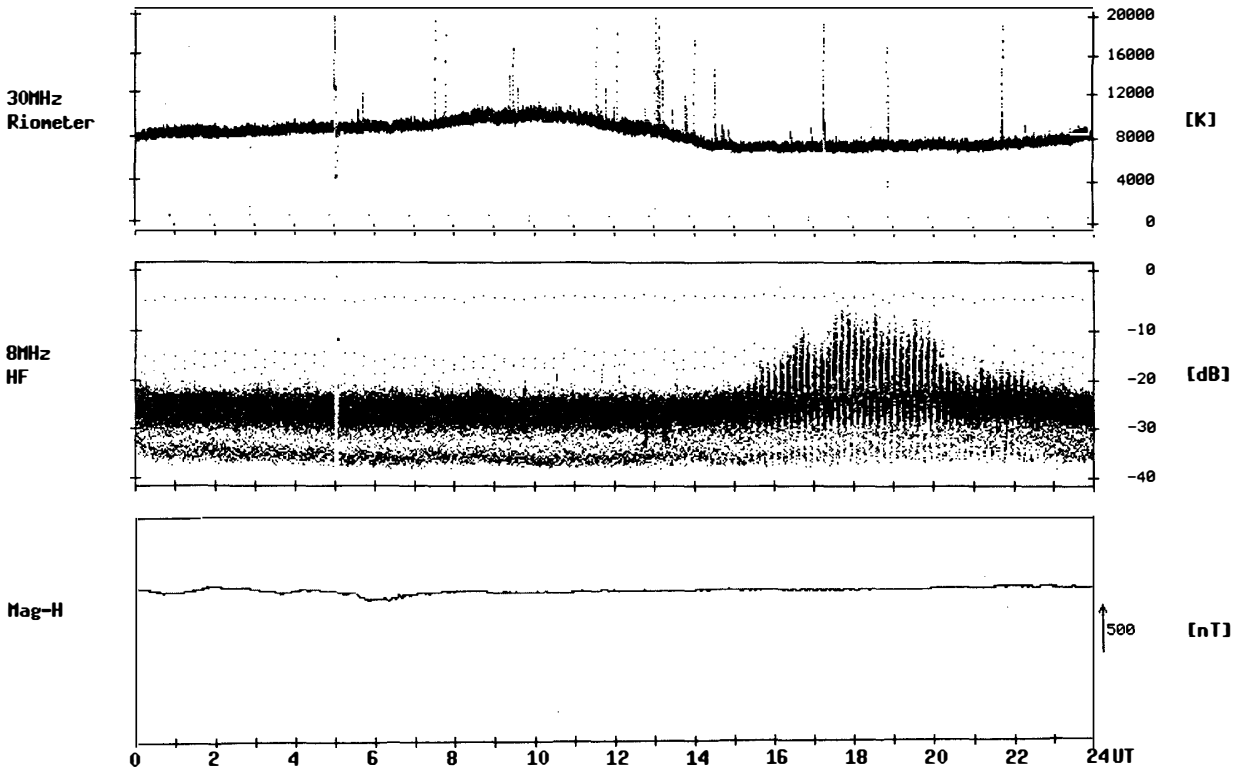
Syowa Station

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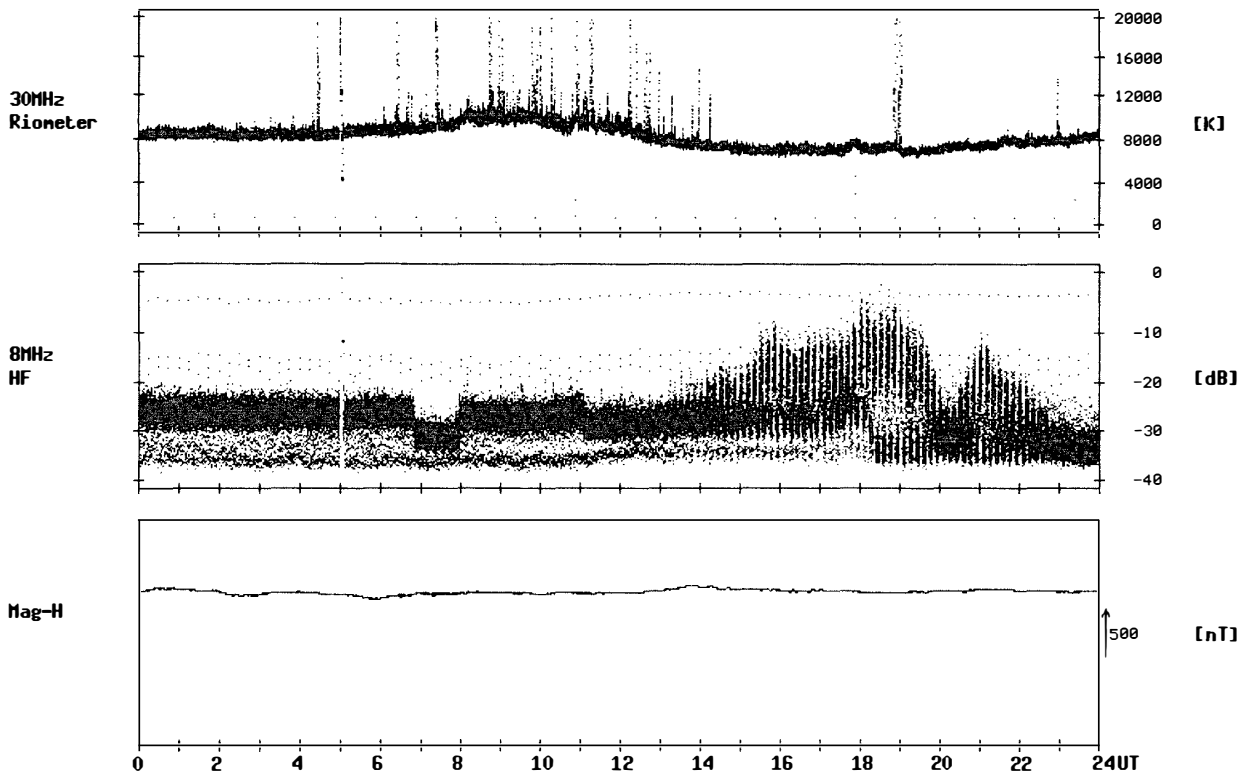
Syowa Station

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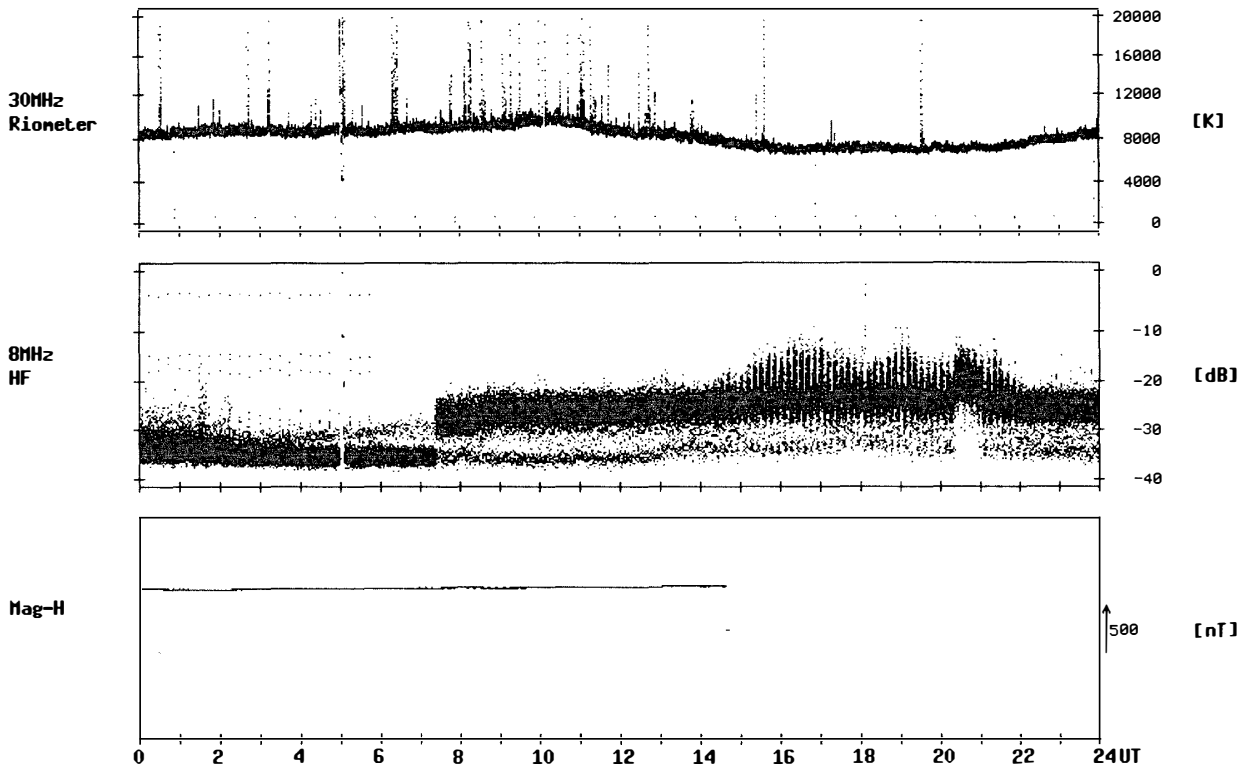
Syowa Station

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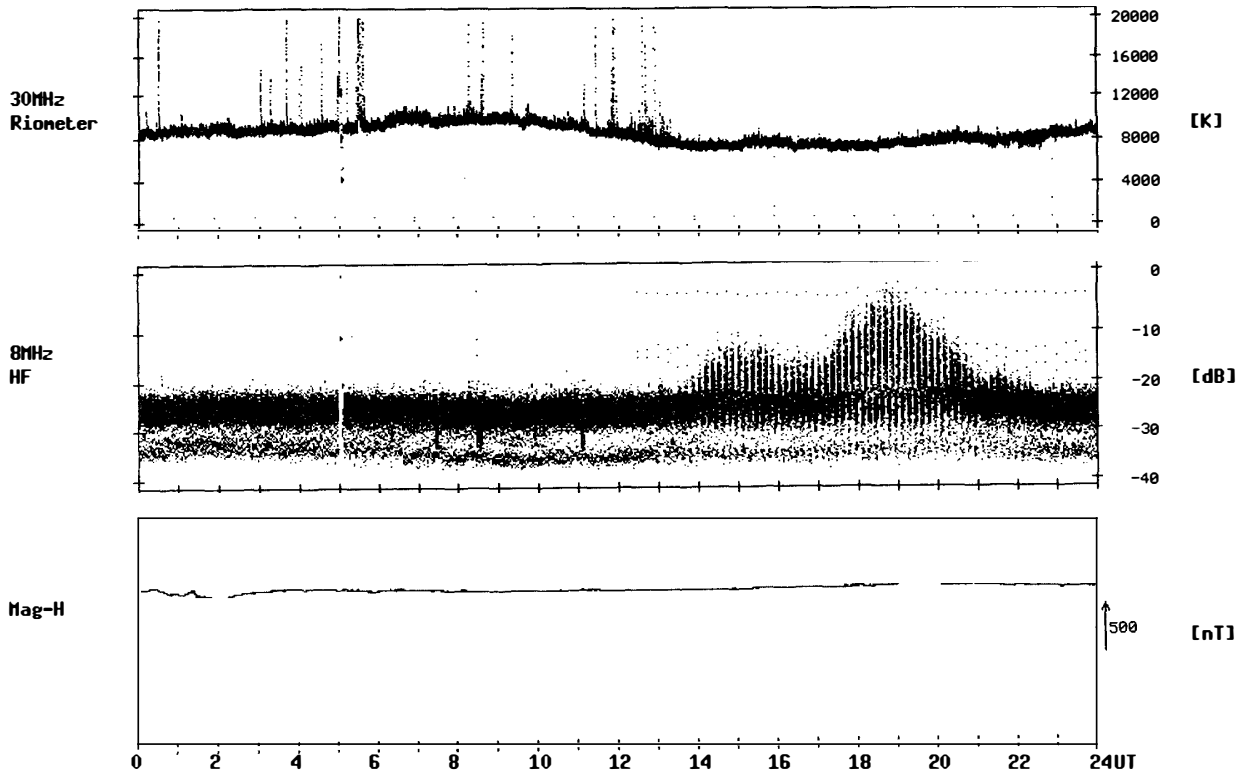
Syowa Station

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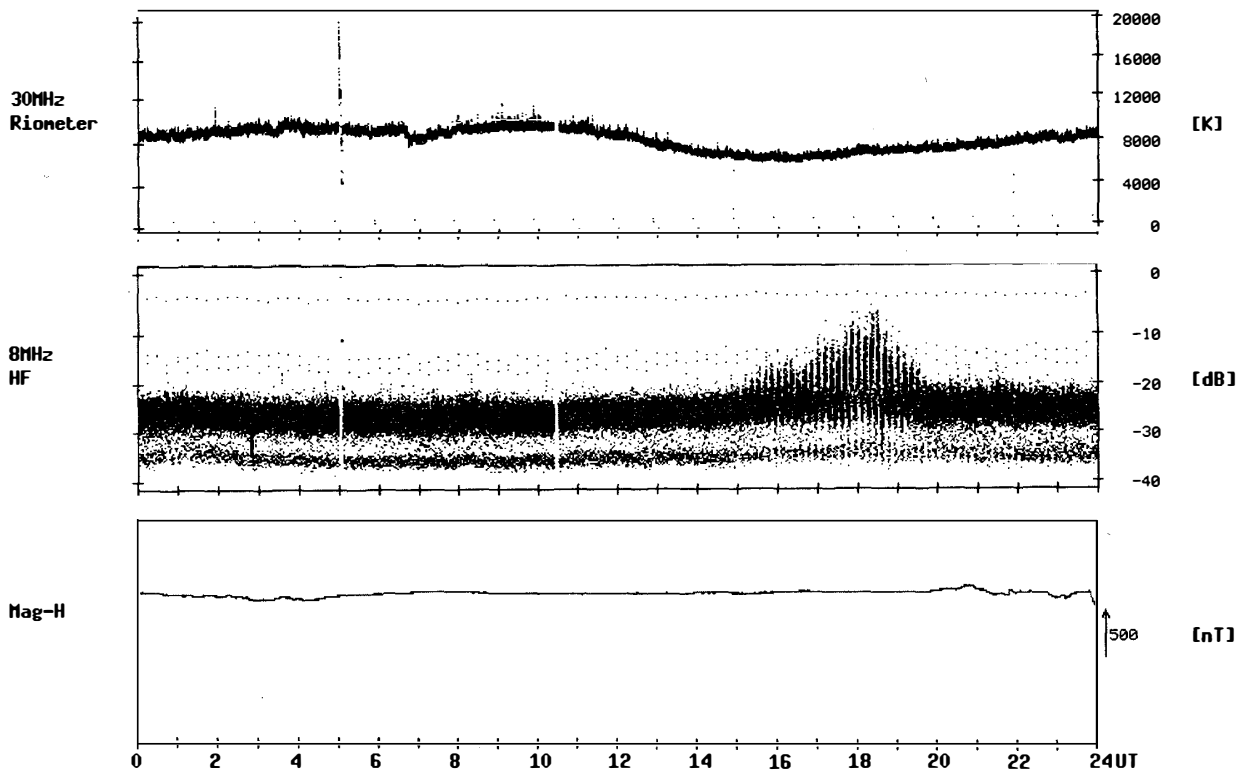
Syowa Station

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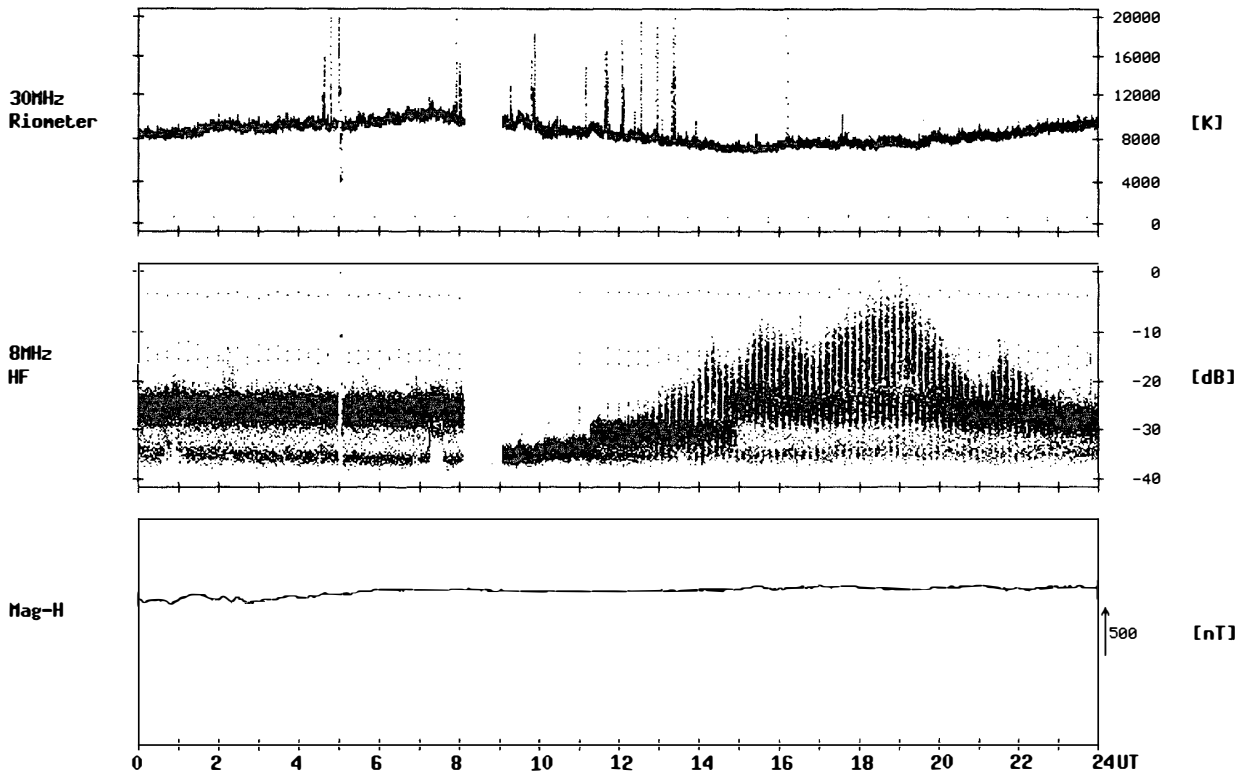
Syowa Station

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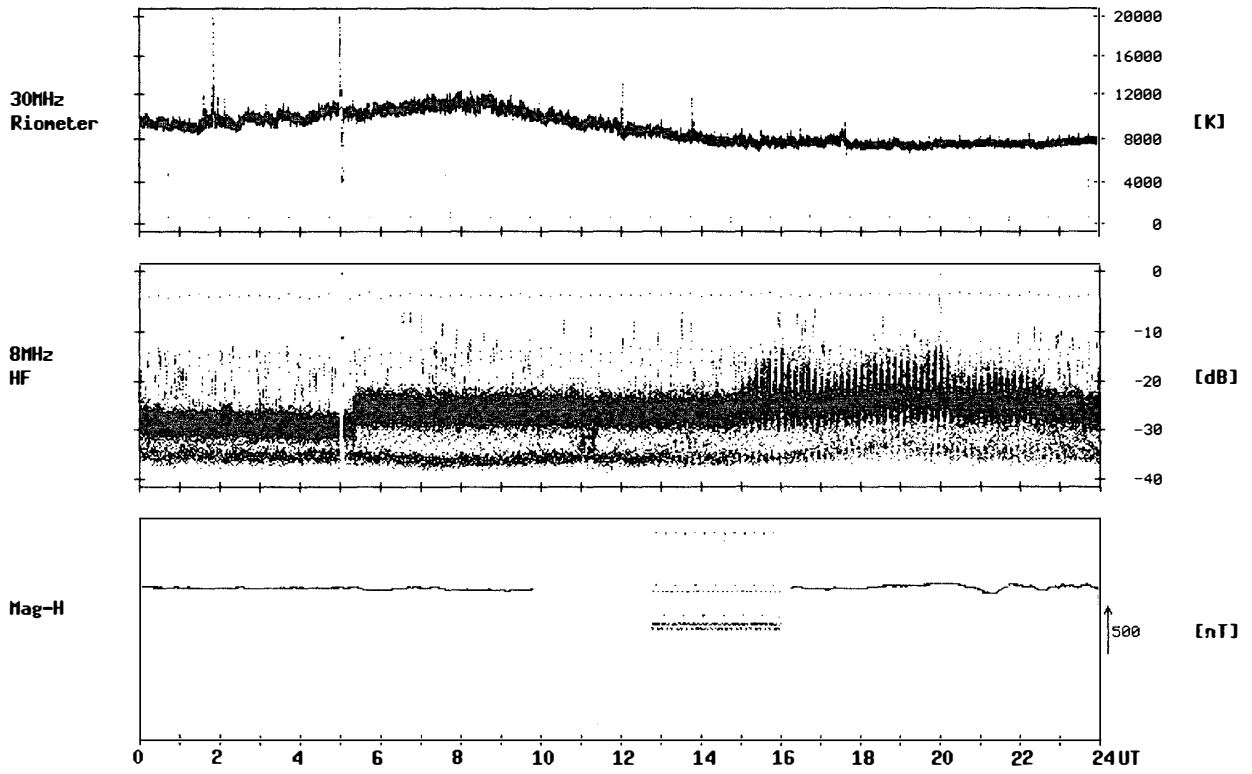
Syowa Station

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