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Magnetotelluric Data, Northern Yucca Flat, Nevada Test Site, Nevada

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Introduction

Nuclear weapons are integral to the defense of the United States. The U.S. Department of Energy, as the steward of these devices, must continue to gauge the efficacy of the individual weapons. This could be accomplished by occasional testing at the Nevada Test Site (NTS) in Nevada, northwest of Las Vegas. Yucca Flat Basin is one of the testing areas at the NTS. One issue of concern is the nature of the somewhat poorly constrained pre-Tertiary geology and its effects on ground-water flow in the area subsequent to a nuclear test. Ground-water modelers would like to know more about the hydrostratigraphy and geologic structure to support a hydrostratigraphic framework model that is under development for the Yucca Flat Corrective Action Unit (CAU).

During 2003, the U.S. Geological Survey (USGS) collected and processed Magnetotelluric (MT) and Audio-magnetotelluric (AMT) data at the Nevada Test Site in and near Yucca Flat to help characterize this pre-Tertiary geology. That work will help to define the character, thickness, and lateral extent of pre-Tertiary confining units. In particular, a major goal has been to define the upper clastic confining unit (UCCU) in the Yucca Flat area. Interpretation will include a three-dimensional (3-D) character analysis and two-dimensional (2-D) resistivity model. The purpose of this report is to release the MT sounding data for Profile 2, (**fig. 1**), located in the northern Yucca Flat area. No interpretation of the data is included here.

Magnetotelluric Method

The MT method is a passive surface geophysical technique that uses the Earth's natural electromagnetic fields to investigate the electrical resistivity structure of the subsurface. The resistivity of geologic units is largely dependent upon their fluid content, porosity, degree of fracturing, temperature, and conductive mineral content (Keller, 1989). Saline fluids within pore spaces and fracture openings can reduce the resistivity of a resistive rock matrix. Resistivity also can be lowered by the presence of conductive clay minerals, carbon, and metallic mineralization. It is common for altered volcanic rocks to contain authigenic minerals that have resistivities of one tenth of those of the surrounding rocks (Nelson and Anderson, 1992). Increased temperatures cause higher ionic mobility and mineral activation energy, reducing rock resistivities significantly. Unaltered, unfractured igneous rocks are moderately to highly resistive (hundreds to thousands of ohm-m), whereas fault zones will show low resistivity (less than 100 ohm-m) when they are composed of rocks that are fractured enough to have hosted fluid transport and consequent mineralogical alteration (Eberhart-Phillips and others, 1995).

Carbonate rocks are moderately to highly resistive (hundreds to thousands of ohm-m) depending upon their fluid content, porosity, fracturing, and impurities. Marine shales, mudstones, and clay-rich alluvium normally are conductive (a few ohm-m to tens of ohm-m). Unaltered metamorphic rocks (non-graphitic) are moderately to highly resistive (hundreds to thousands of ohm-m). Tables of electrical resistivity for a variety of rocks, minerals, and geological environments are included in Keller (1987) and Palacky (1987).

The MT method can be used to probe the Earth's crust from depths of tens of meters to depths of tens of kilometers (Vozoff, 1991). Natural variations of the Earth's magnetic and electric field are measured and recorded at each MT station. The primary frequency bands used by the MT method are 10,000 to 1 hertz (Hz) from worldwide lightning activity and 1 to 0.0001 Hz from geomagnetic micro-pulsations. The natural electromagnetic waves propagate vertically in the Earth because the large resistivity contrast between the air and the Earth causes a vertical refraction of the electromagnetic wave transmitted into the Earth (Vozoff, 1972).

The natural electric and magnetic fields are recorded in two orthogonal, horizontal directions. The vertical magnetic field ("tipper") also is recorded. The resulting time-series signals are used to derive the tensor apparent resistivities and phases. First, the signals are converted to complex cross-spectra using Fast-Fourier-Transform (FFT) techniques. Then, least-squares, cross-spectral analysis (Bendat and Piersol, 1971) is used to solve for a transfer function that relates the observed electric fields to the magnetic fields with the assumption that the Earth consists of a two-input, two-output linear system. Prior to conversion to apparent resistivity and phase, the tensor normally is rotated. This rotation could be into principal directions that correspond to the direction of maximum and minimum apparent resistivity, or it may be made perpendicular to the survey traverses. For a two-dimensional (2-D) Earth, the MT fields then can be decoupled into a transverse electric (TE) mode (which uses the electric field perpendicular to the survey direction and the magnetic field parallel to the survey direction) and a transverse magnetic (TM) mode (which uses the electrical field parallel to the survey direction and the magnetic field perpendicular to the survey direction). Two-dimensional modeling generally is done to fit both modes. When the geology satisfies the 2-D assumption and the MT survey is perpendicular to the geologic strike, the MT data for the TE mode represent the electric field parallel to geologic strike, and the data for the TM mode represent the electric field across strike, along the survey direction. The MT method is well suited for studying complicated geological environments because the electric and magnetic relations are sensitive to vertical and horizontal variations in resistivity. The MT method is capable of establishing whether the

electromagnetic fields are responding to subsurface terranes of effectively one, two, or three dimensions. An introduction to the MT method and references for a more advanced understanding are in Dobrin and Savit (1988) and Vozoff (1991).

Magnetotelluric Survey

From October to December of 2003, data were collected at 51 stations across the Yucca Flat Basin. The station locations were chosen to constrain the geologic/hydrostratigraphic interpretation, for proximity to roads, and to avoid, where possible, electrical noise from power lines and vehicles. The low frequency data (0.0002 to 200 Hz) were collected with an Electromagnetic Instruments, Inc., (EMI) MT24/LF 24-bit system (EMI, 2002), and the high-frequency data (4 Hz to 23,000 Hz) were collected with a portable EMI MT-1 system (EMI, 1996). For the low frequency, horizontal electric fields were measured using three copper-copper sulfate porous pot electrodes placed in an L-shaped array with dipole lengths of 30 meters (m). Titanium electrodes were used in a similar array for the high-frequency data acquisition. The orthogonal, horizontal magnetic fields in the direction of the electric-field measurement array were sensed using EMI's high magnetic permeability, mu-metal-cored induction coils. For the low frequency data, two single-station recordings of the orthogonal, horizontal components of the electric and magnetic fields and the vertical magnetic field were acquired at Global Positioning System (GPS) referenced times and were used as remote references for each other. The high frequency data were recorded as non-remote referenced single stations.

The following table lists the 51 MT station locations as recorded using a GPS during field acquisition. Coordinates are referenced to the 1866 Clarke spheroid and North American 1983 Western United States datum. Longitude and latitude format is degrees, minutes, seconds. Universal Transverse Mercator (UTM) Zone 11 South and East units are in meters. Station elevation is given in meters. The accuracy of the *x*, *y*, *z* component is ±5 m.

Table 1. Station Locations

Stations	Latitude	Longitude	Elevation	UTM 11S North	UTM 11S East	Remote
1	36,53'51.5	116,11'50.3	1456	4083613	571518	34
2	36,54'37.5	116,10'21.7	1373	4085052	573699	None
3	36,54'23.0	116,08'57.9	1304	4084623	575799	None
4	36,54'04.6	116,07'37.5	1254	4084071	577772	16
5	36,53'27.0	116,03'46.3	1149	4082968	583504	None
6	36,53'36.9	116,02'23.8	1101	4083296	585543	36
7	36,53'52.5	116,00'47.0	1100	4083795	587935	30
8	36,54'18.2	115,59'08.6	1229	4084622	590362	None
9	36,57'36.4	116,12'18.9	1536	4090540	570753	46
10	36,58'01.6	116,11'05.3	1437	4091331	572566	47
11	36,58'44.4	116,09'53.3	1445	4092663	574335	50

12	36,59'36.6	116,08'07.0	1463	4094297	576949	49
13	36,59'25.0	116,06'52.1	1335	4093950	578802	48
14	36,59'27.5	116,05'36.6	1243	4094053	580670	48a
15	36,57'34.8	116,04'48.9	1299	4090592	581884	51
16	36,57'38.3	116,04'02.2	1236	4090710	583035	4
17	36,57'26.7	116,02'16.2	1182	4090375	585659	29
18	36,57'26.5	116,00'34.3	1186	4090400	588182	None
19	36,57'22.4	115,59'29.2	1199	4090289	589792	35
20	37,04'01.5	116,12'12.2	1528	4102410	570816	45
21	37,03'20.9	116,11'12.8	1490	4101166	572297	44
22	37,04'02.3	116,10'01.1	1438	4102458	574055	43
23	37,03'23.6	116,08'16.2	1347	4101290	576659	37
24	37,03'06.3	116,06'52.0	1306	4100781	578746	38
25	37,02'54.4	116,05'09.4	1261	4100434	581280	39
26	37,02'14.0	116,04'05.3	1240	4099202	582876	40
27	37,01'07.0	116,02'00.7	1209	4097167	585977	41
28	37,01'06.3	115,59'45.8	1210	4097185	589311	42
29	37,05'38.3	116,09'55.2	1501	4105419	574177	17
30	37,04'54.5	116,08'10.0	1367	4104092	576786	7
31	37,05'42.2	116,06'51.2	1334	4105583	578716	None
32	37,05'41.0	116,04'57.9	1270	4105571	581515	None
33	37,04'56.9	116,02'58.0	1240	4104238	584489	None
34	37,04'07.5	116,01'20.1	1241	4102745	586922	1
35	37,04'04.8	115,59'59.5	1265	4102681	588914	19
36	37,04'19.6	115,58'36.3	1327	4103157	590961	6
37m	**37,08'26.4**	**116,08'34.4**	**1489**	**4110620**	**576125**	**23**
38m	**37,08'16.7**	**116,06'16.5**	**1331**	**4110353**	**579528**	**24**
39m	**37,07'46.8**	**116,04'18.5**	**1292**	**4109457**	**582448**	**25**
40m	**37,07'23.2**	**116,02'24.8**	**1275**	**4108755**	**585262**	**26**
41m	**37,07'06.8**	**116,01'19.1**	**1317**	**4108275**	**586891**	**27**
42m	**37,06'45.2**	**115,59'55.7**	**1373**	**4107623**	**588955**	**28**
43	37,10'03.5	116,08'33.9	1531	4113609	576110	22
44	37,10'07.6	116,08'00.0	1486	4113742	576943	21
45	37,13'13.1	116,08'41.3	1612	4119451	575875	20
46	37,12'25.4	116,07'13.2	1564	4118000	578059	9
47	37,13'35.5	116,04'19.3	1575	4120201	582325	10
48	37,13'50.6	116,03'39.5	1560	4120677	583300	13
49	37,13'54.7	116,02'25.7	1486	4120819	585119	12
50	37,13'12.2	116,03'52.7	1536	4119490	582990	11
51	37,11'50.5	116,02'44.8	1356	4116992	584688	15

Magnetotelluric Data

The recorded time-series data were transformed to the frequency domain and processed to determine a 2-D apparent resistivity and phase tensor at each site. Rotation of the impedance tensor allows for decoupling into the TE and TM modes. During the analysis and interpretation process, each station is

rotated to a fixed angle determined by the given nominal profile orientation. The data provided here have not been rotated from the original north-south, east-west acquisition orientation. Low frequency time series data were edited, and cross-power files were created with Egbert's (1997) multiple-station, magnetotelluric data-processing algorithms using remote references. Cross-power files were sorted to select optimal signal-to-noise time-series data sets (see Appendix at the back of this report).

The effects of near-surface resistivity anomalies can cause what are known as "static shifts" in the data (Sternberg and others, 1988). There were no significant static shifts in these data. Cultural features also can affect the measured magnetotelluric responses. These include fences, pipelines, communication lines, railways, and other manmade conductors.

The figures in the Appendix represent the field-processed MT data for each station (shown in **boldface** type in the table above) after the time-series data were converted to the frequency domain, and the tensor-transfer function was developed.

For each station, nine separate plots are given:

1. Apparent Resistivity(x and y symbols are xy and yx components)
2. Impedance Phase (x and y symbols are xy and yx components)
3. Rotation Angle
4. Impedance Skew
5. Multiple Coherency(x and y symbols are xy and yx components)
6. Impedance Polar Plots
7. Tipper Magnitude
8. Tipper Strike
9. HzHx (x symbol) and HzHy (o symbol) Coherency

Error bars (],[) on the Apparent Resistivity, Impedance Phase, Skew, Tipper Magnitude, and Tipper Strike plots represent probable errors within one standard deviation of the sample variance (Gamble and others, 1979).

Apparent resistivity is the approximate ratio of the electric-field strength to the magnetic-field strength at a given frequency. The impedance phase is proportional to the slope of the apparent resistivity curve on a log-log plot, but from baselines at ±45 degrees (Vozoff, 1991). A measure of the dimensionality for MT data is provided by the impedance skew of the impedance tensor (Vozoff, 1972). If the effective measured resistivity response to the geology beneath a MT station truly is one or two dimensional, then the skew will be zero. Instrument and environmental sources of electrical noise can cause non-zero skew values. Skew values typically are small (about 0.1) for relatively low-noise recordings. Higher skews (above 0.2) are an indication of either the resistivity response to 3-D geology or higher levels of noise. Manmade electrical noise, such as power lines, power generators,and moving vehicles and trains, can have

a negative effect on MT data quality. All of these local disturbances can produce incoherent noise that mainly affects frequencies above 1 Hz. Other manmade electrical noise, such as direct current electric trains and active cathodic protection of pipelines, produces coherent electromagnetic signals that mainly affect frequencies below 1 Hz.

In the survey area, noise from a number of small power lines and small moving vehicles was negligible at distances greater than 0.4 km from the noise source. Power-line signal levels were measured at each site and typically were less than 20 percent of the maximum recordable signals. Noise from larger power lines, power generators, pipelines, and trains was negligible at distances greater than 5 km. Local lightning, wind, and rainstorms also can degrade data quality. Burying the magnetic induction coils and the electric dipole wires minimized wind noise.

Predicted values of the electric field can be computed from the measured values of the magnetic field (Vozoff, 1991). The coherence of the predicted electric field with the measured electric field is a measure of the signal-to-noise ratio provided in the multiple coherency plots. Values are normalized between 0 and 1; values at 0.5 signify signal levels equal to noise levels. For this data set, coherencies generally were at an acceptable level, except at times in the frequency ranges of 0.01 to 5Hz (often referred to as the "dead band").

The field-processed MT data include some scatter and poor signal-to-noise ratios. Spectral results were inspected visually for noisy data, and the best signal-to-noise field data were combined into the final plots.

The magnetotelluric impedance polar plots provide a measure of MT data dimensionality (Reddy and others, 1977). For 1-D resistivity structures, the principal impedance polar diagram (dashed line) is a circle. For 2-D or 3-D resistivity structures, the principal impedance polar diagram (dashed line) elongates either parallel or perpendicular to strike direction. Over resistors, the principal impedance polar diagram elongates perpendicular to strike direction, and over conductors, it elongates parallel to strike direction. For 2-D resistivity structures, the additional impedance polar diagram (solid line) attains the shape of a symmetric clover leaf. For 3-D resistivity structures, the additional impedance polar diagram (solid line) elongates in one direction, and its amplitude is comparable to that of the principal impedance polar diagram (dashed line).

The magnetotelluric "tipper" is calculated from the vertical component of the magnetic field. The tipper magnitude is a measure of the "tipping" of the magnetic field out of the horizontal plane (Vozoff, 1991). It will be equal to zero for the 1-D case. It typically increases to values between 0.1 to 0.5 and seldom approaches 1, as it responds primarily to vertical

and subvertical structures. The tipper magnitude of the stations discussed in this report ranged from 0.1 to 0.6 over the lower frequencies, indicating some vertical structure at depth. The tipper strike is used to help resolve the 90-degree ambiguity in the impedance rotation angle. The HzHx and HzHy coherency is a measure of the signal-to-noise ratio of the vertical magnetic field with respect to each of the orthogonal, horizontal magnetic-field directions. Values are normalized between 0 and 1; values at 0.5 signify signal levels equal to noise levels. These three-component magnetic-field coherencies provide a check on the signal-to-noise ratio of the measured values in the tipper magnitude and tipper strike plots.

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Appendix
Magnetotelluric Data Plots

There are nine separate plots for each station:

1. Apparent Resistivity for the rotated maximum (x symbol) and minimum (o symbol) modes
2. Impedance Phase for the rotated maximum (x symbol) and minimum (o symbol) modes
3. Rotation Angle for the impedance tensor (corresponds to the direction of maximum apparent resistivity)
4. Impedance Skew for the impedance tensor
5. Multiple Coherency for the rotated maximum (x symbol) and minimum (o symbol) modes of the electric field
6. Impedance Polar Plots (at 12 selected frequencies)
7. Tipper Magnitude for the vertical magnetic field
8. Tipper Strike for the vertical magnetic field
9. HzHx (x symbol) and HzHy (o symbol) Coherency

Refer to the "Magnetotelluric Data" section in this report for an explanation of these plots. The "priorities" listed on the plots were determined prior to data acquisition. During post-processing the priority ranking was changed.

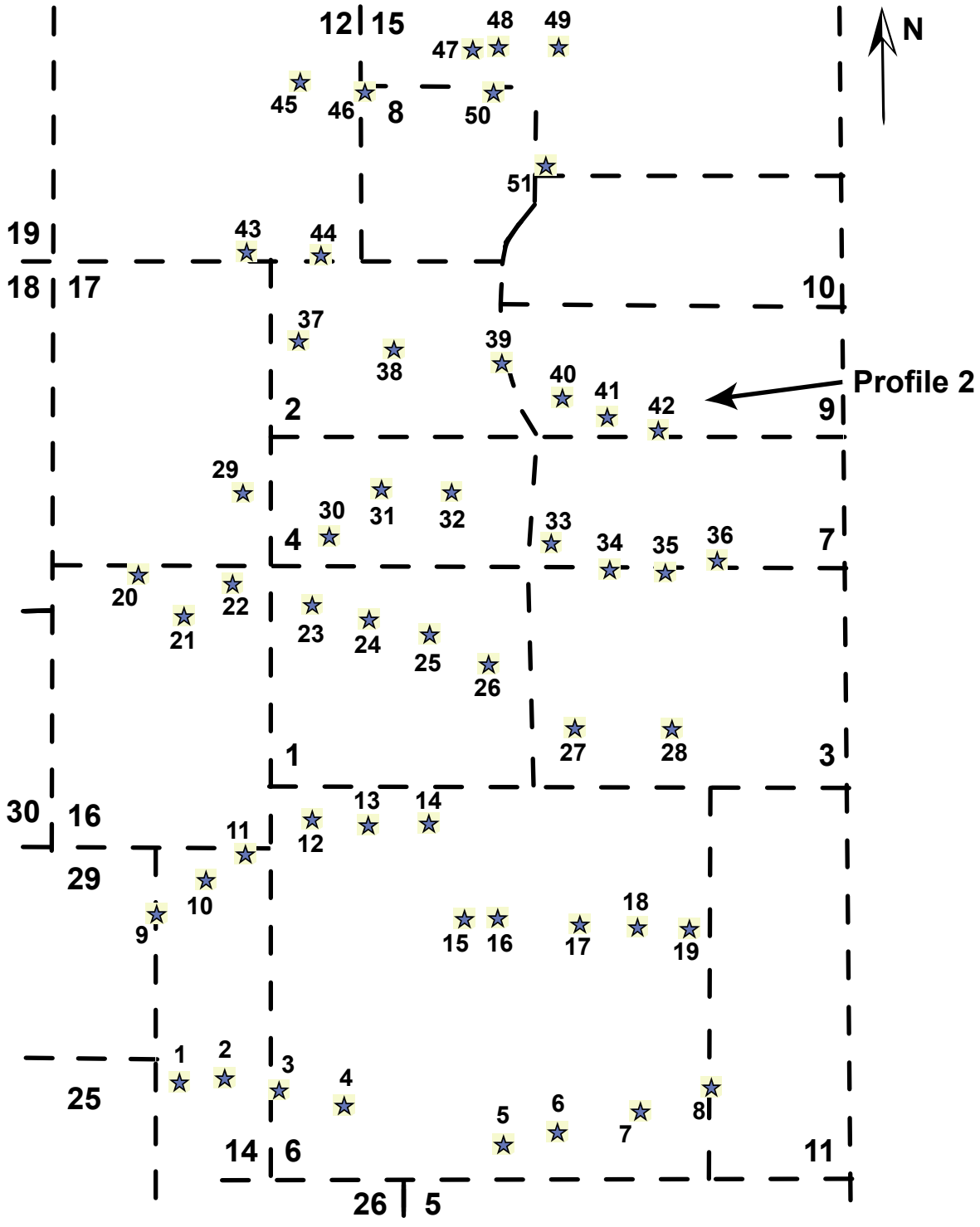
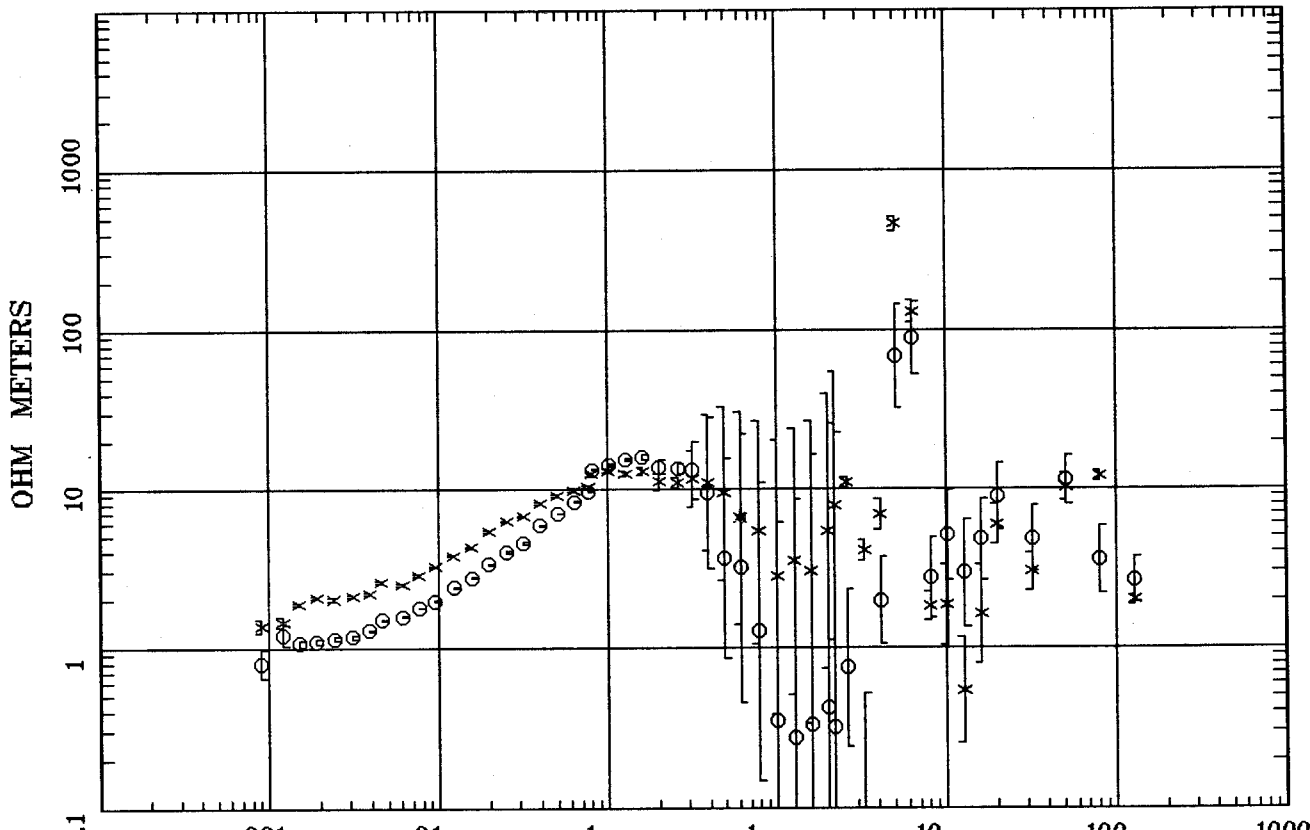


Figure 1. Index map showing magnetotelluric (MT) stations in and near Yucca Flat, Nevada. MT stations acquired in 2003 are numbered stars 1-51. Dashed lines are Nevada Test Site Areas 1-30.

APPARENT RESISTIVITY



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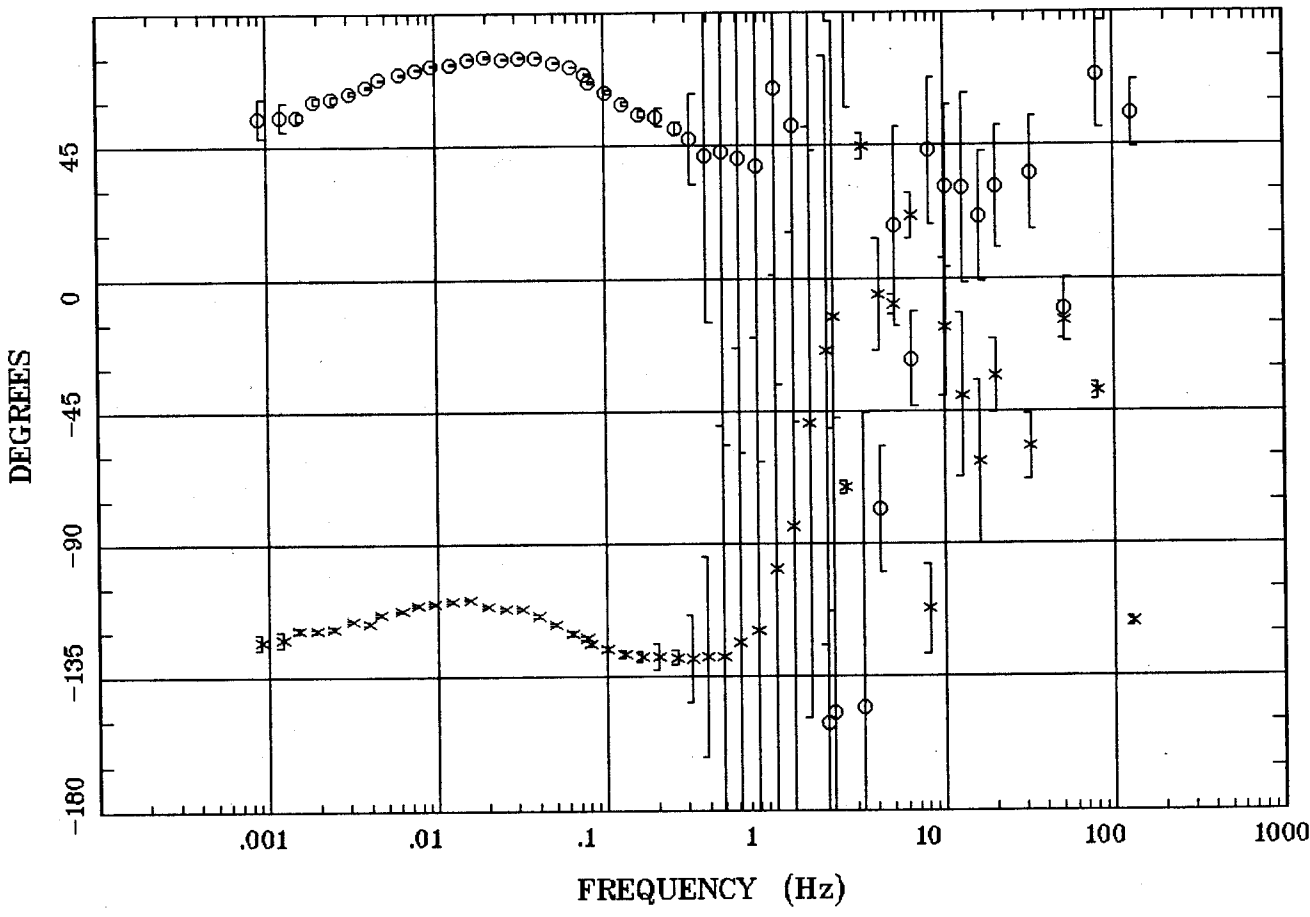

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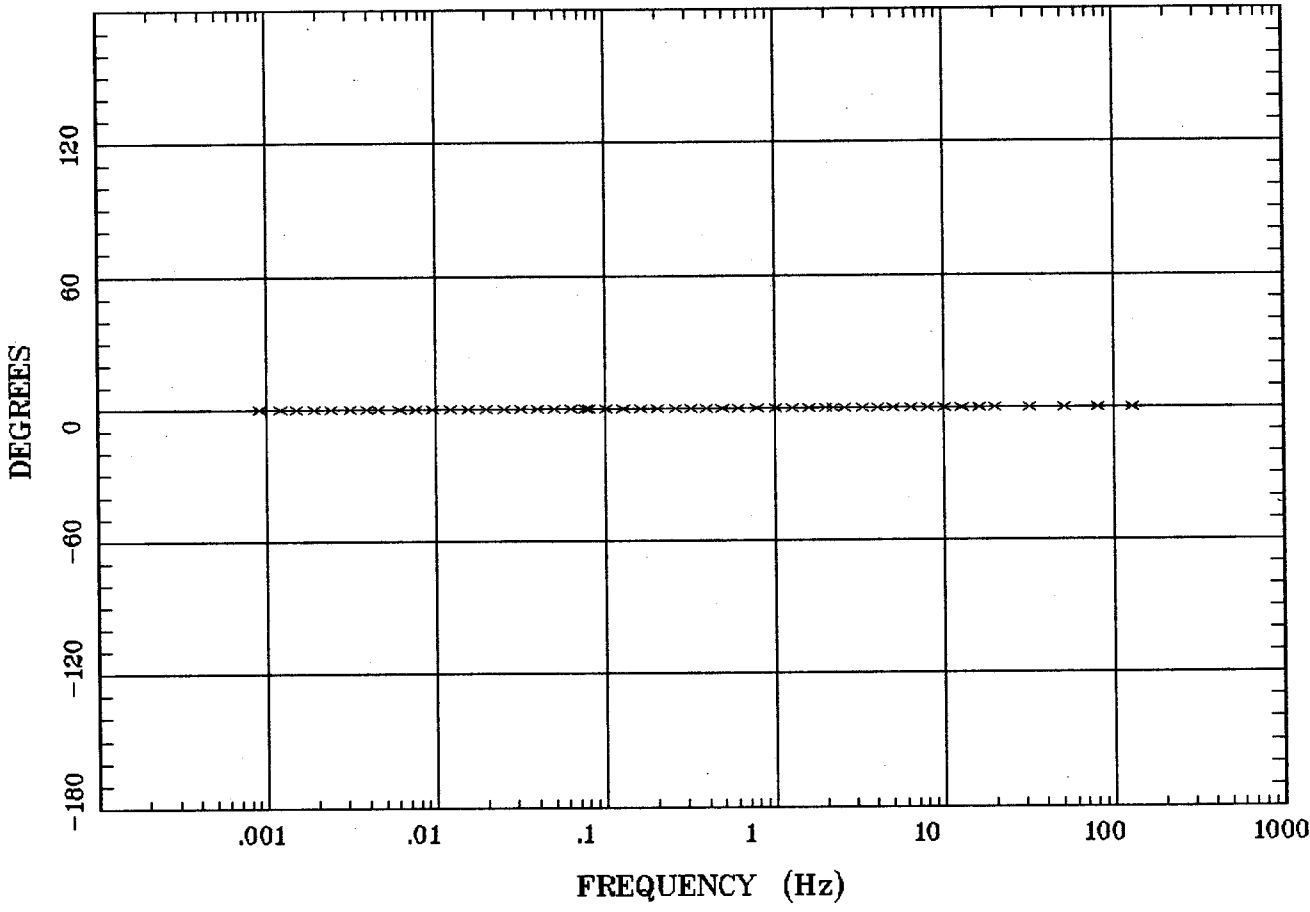

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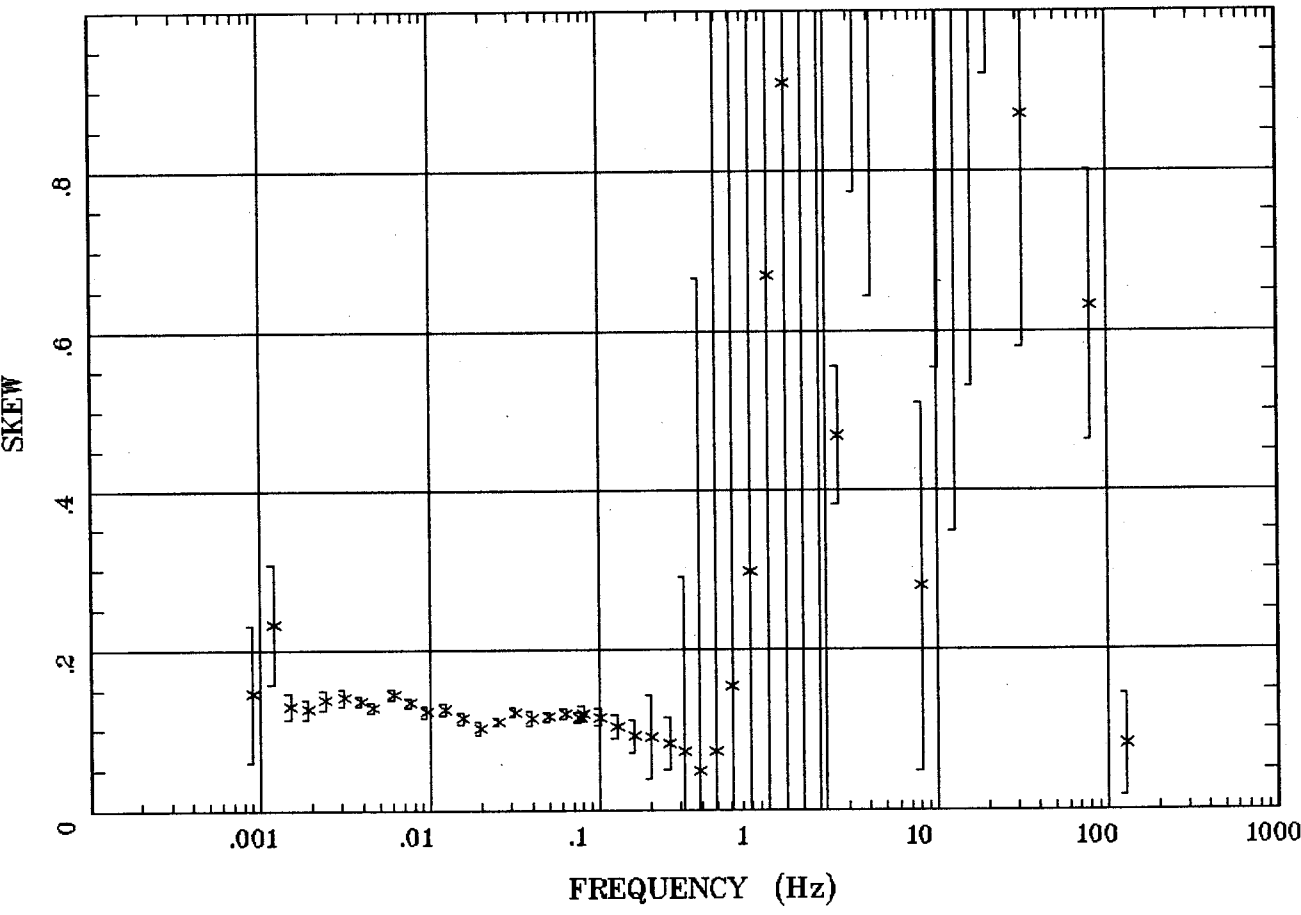
IMPEDANCE SKEW

Station 37



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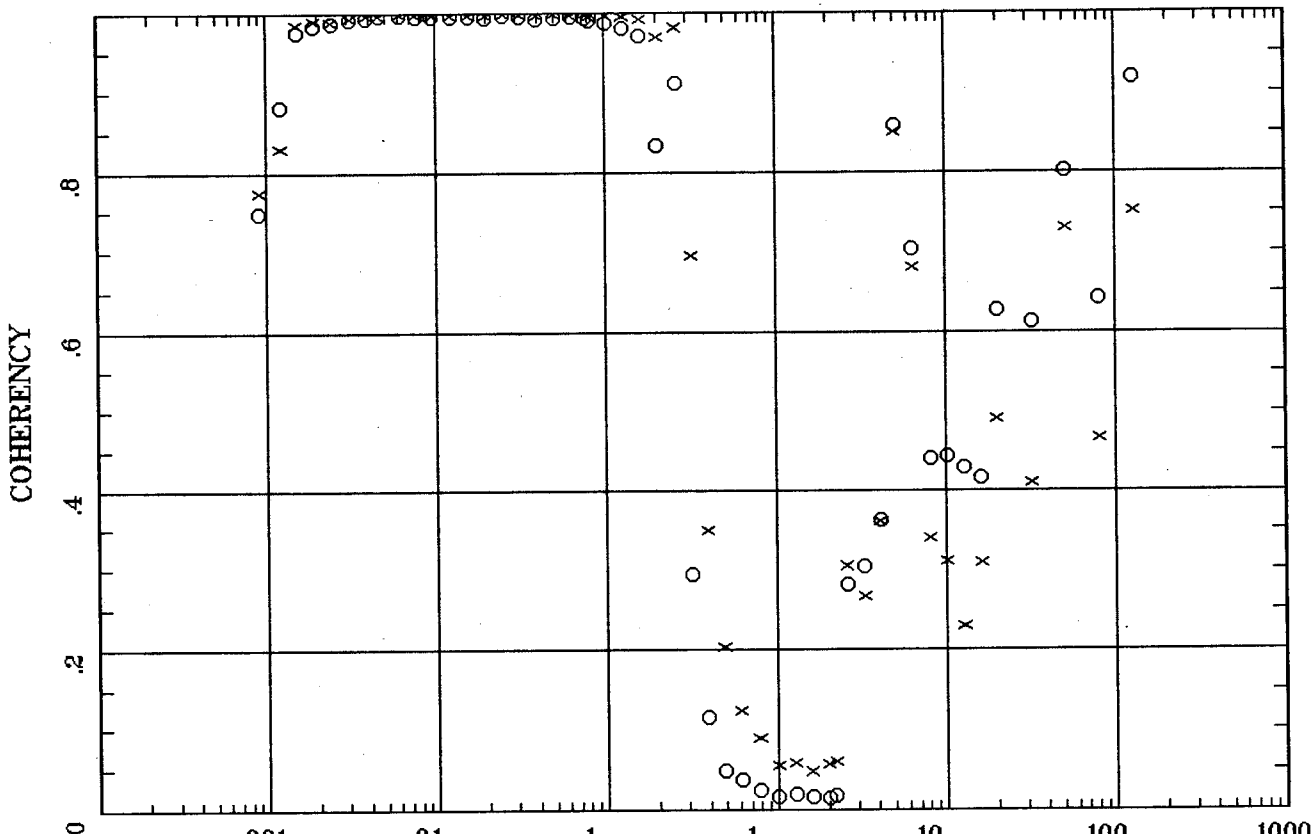
E MULT Coh.



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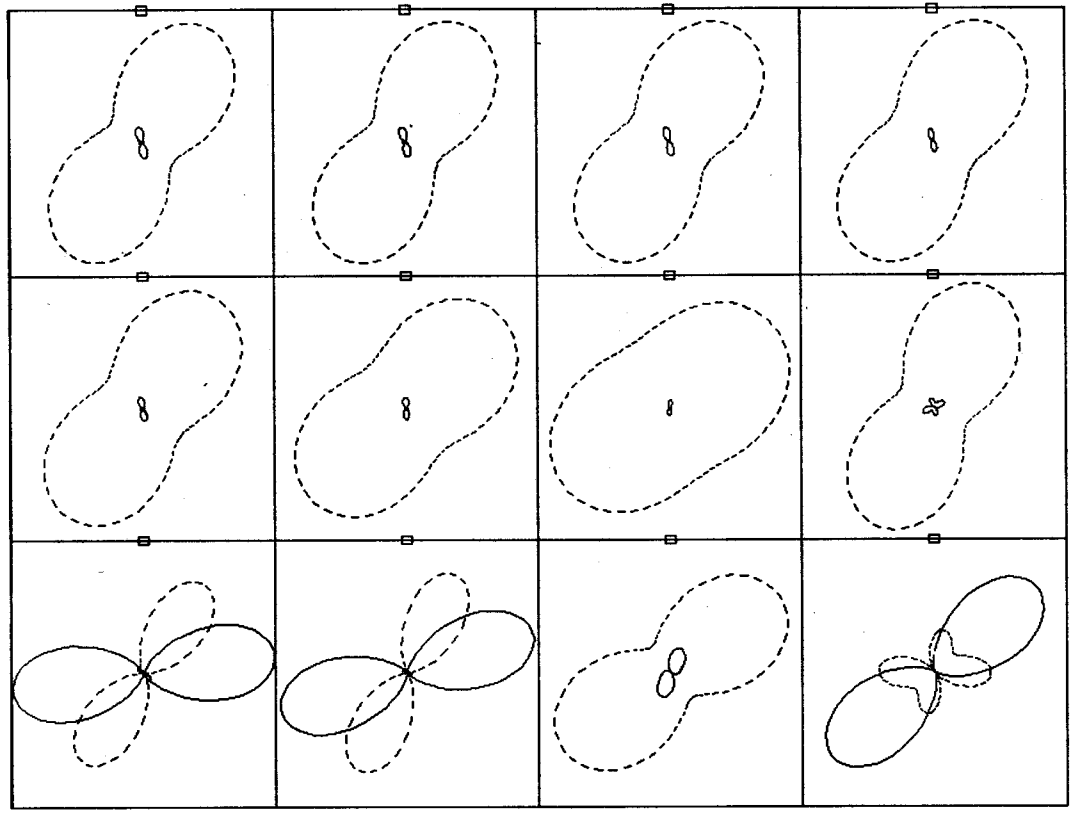
POLAR PLOTS



.0009 Hz	.0024 Hz	.0061 Hz	.0156 Hz
.0397 Hz	.0802 Hz	.202 Hz	.610 Hz
1.587 Hz	3.296 Hz	8.057 Hz	20.020 Hz

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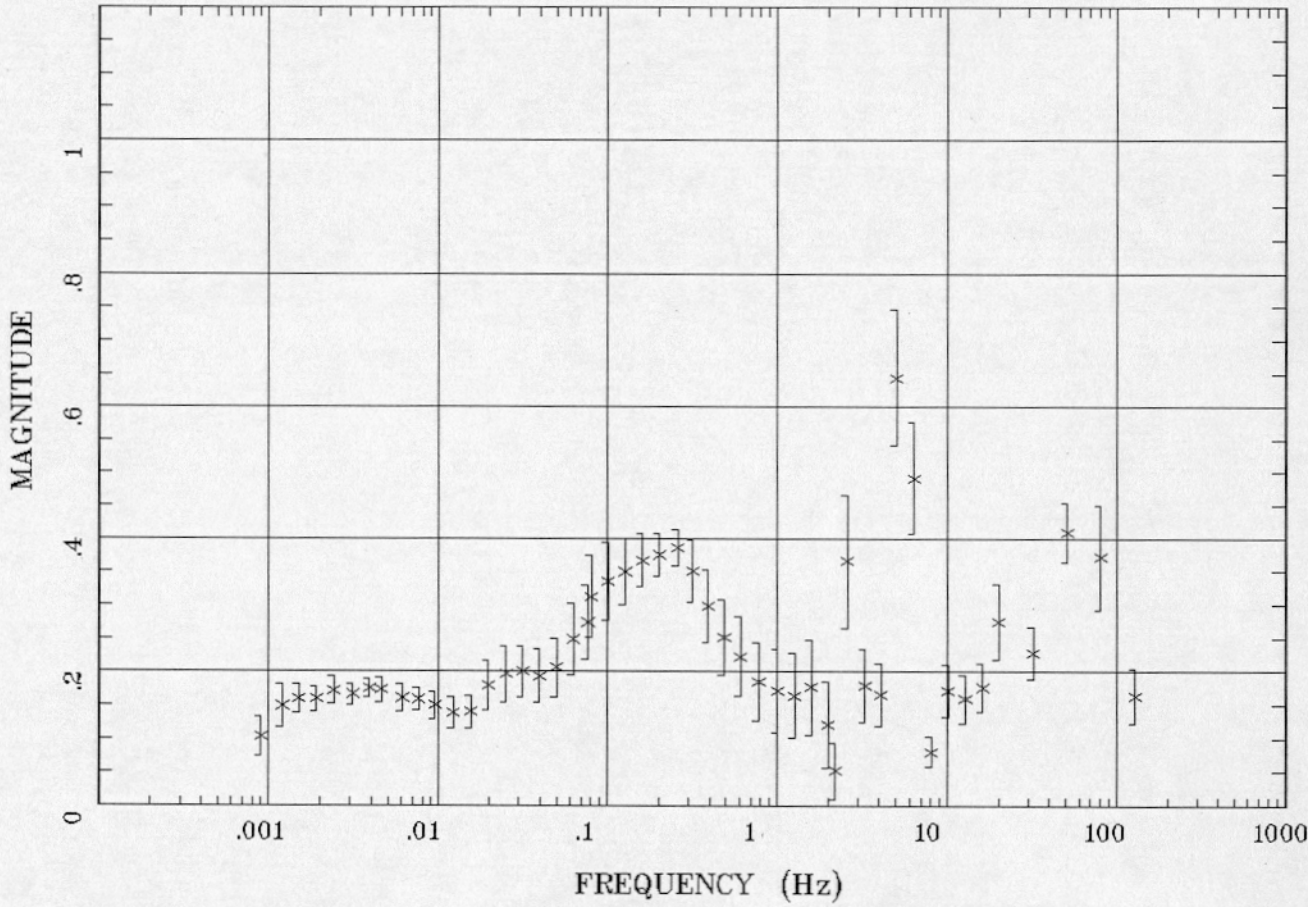
TIPPER MAGNITUDE

Station 37



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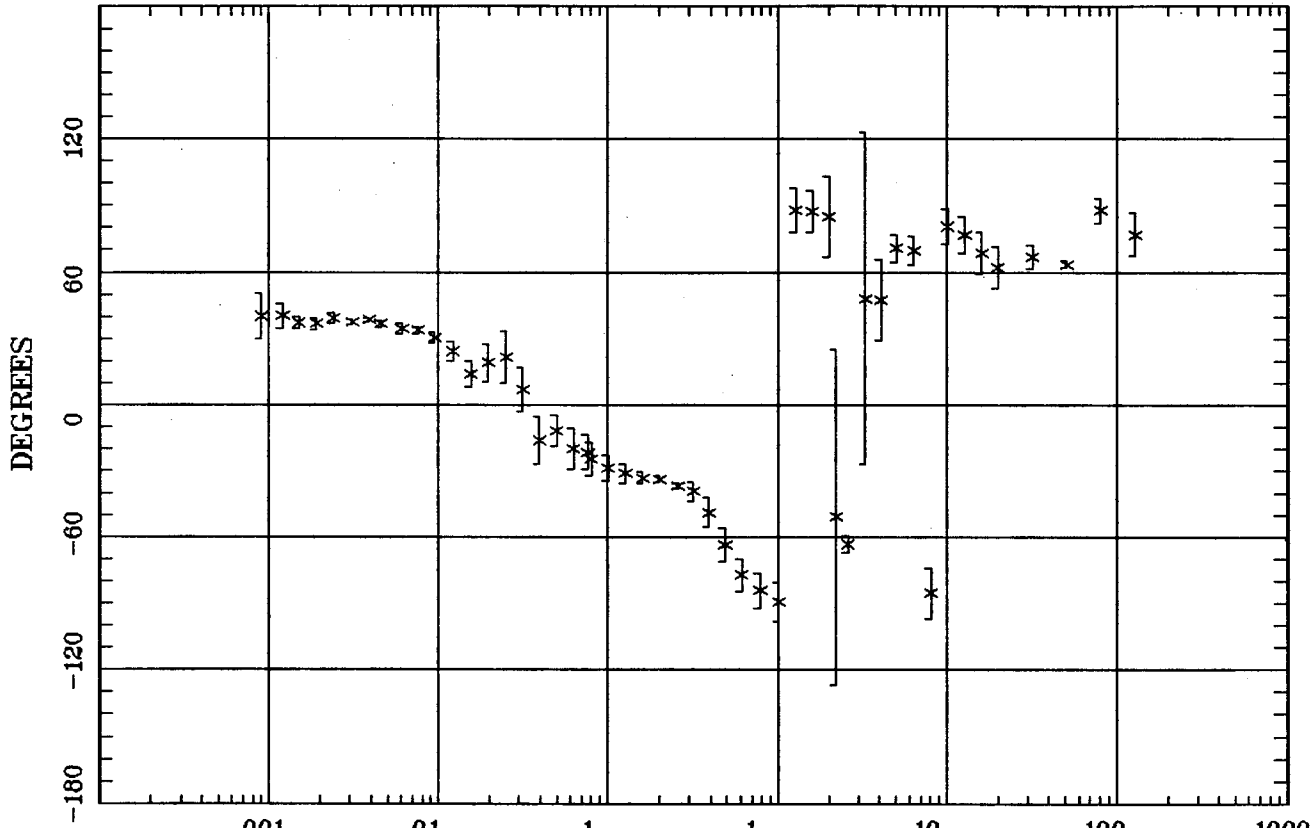
TIPPER STRIKE



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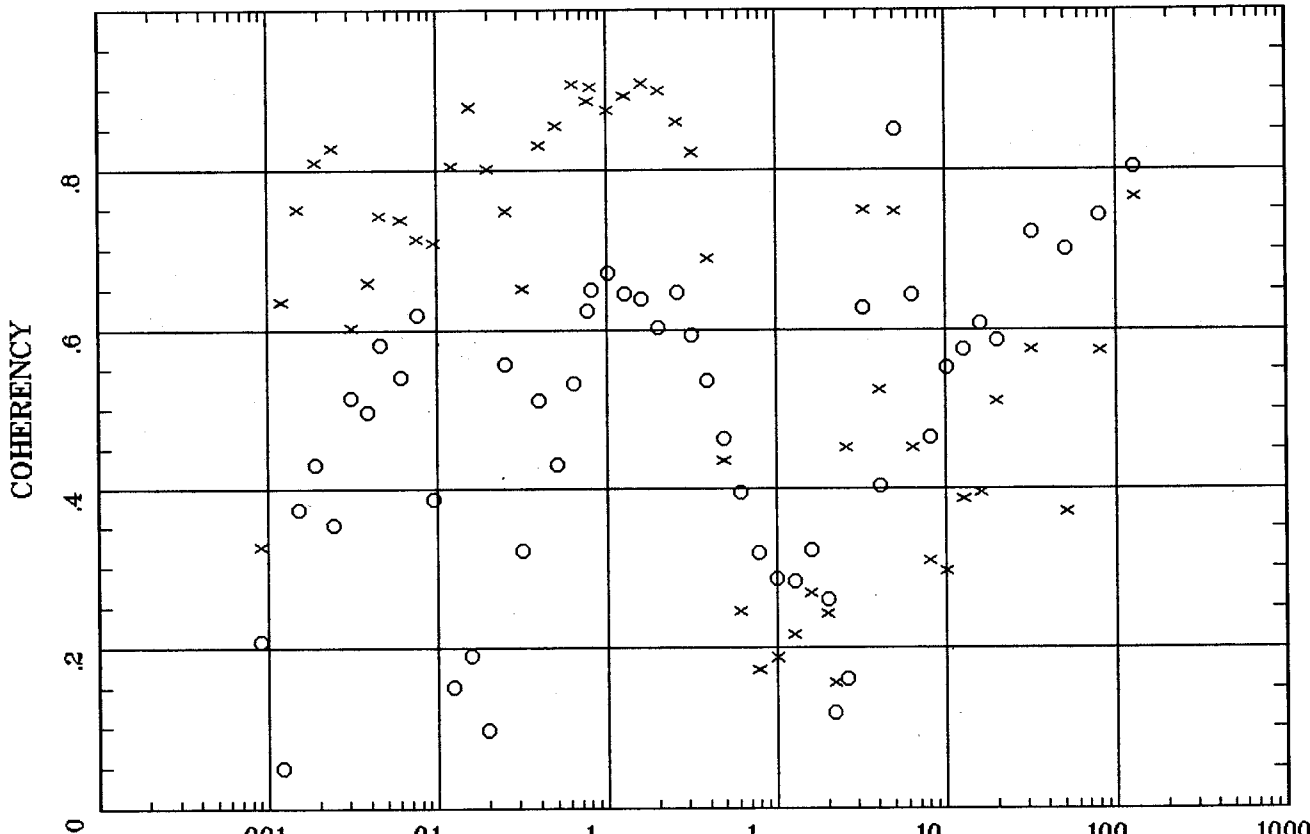
< EMI - ElectroMagnetic Instruments >

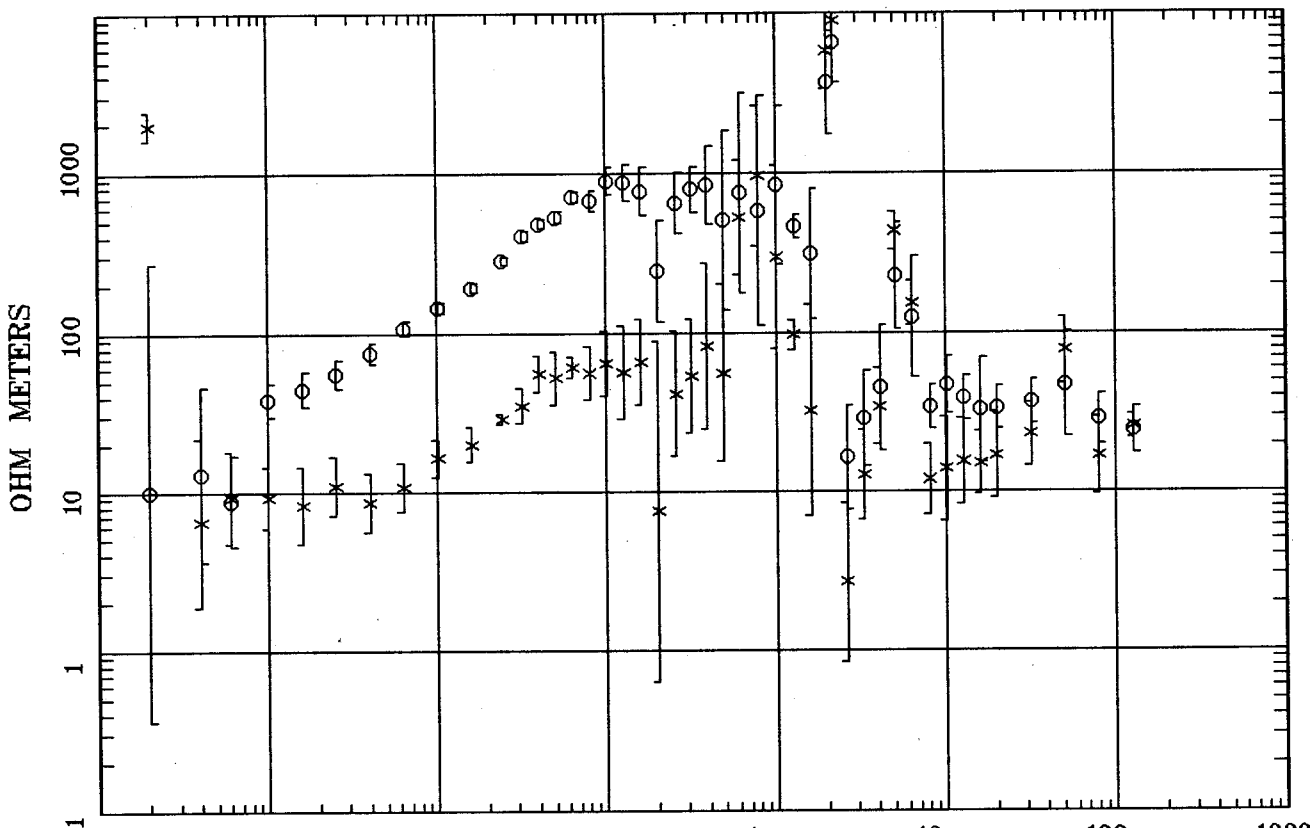
HzHx.x Coh HzHy.o



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s37r23.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 14:47 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

APPARENT RESISTIVITY

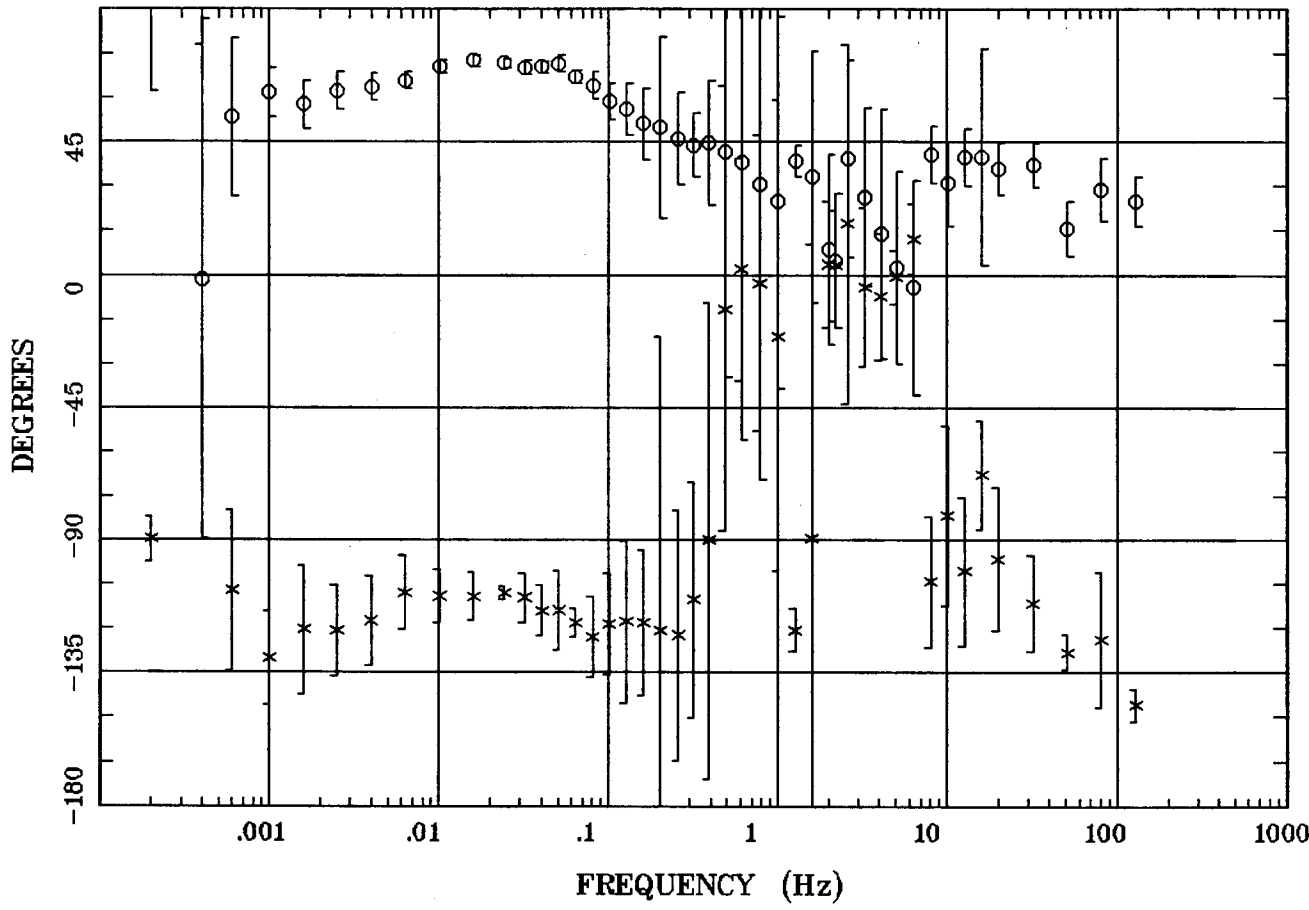


Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s38r24.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:05 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

IMPEDANCE PHASE

Station 38

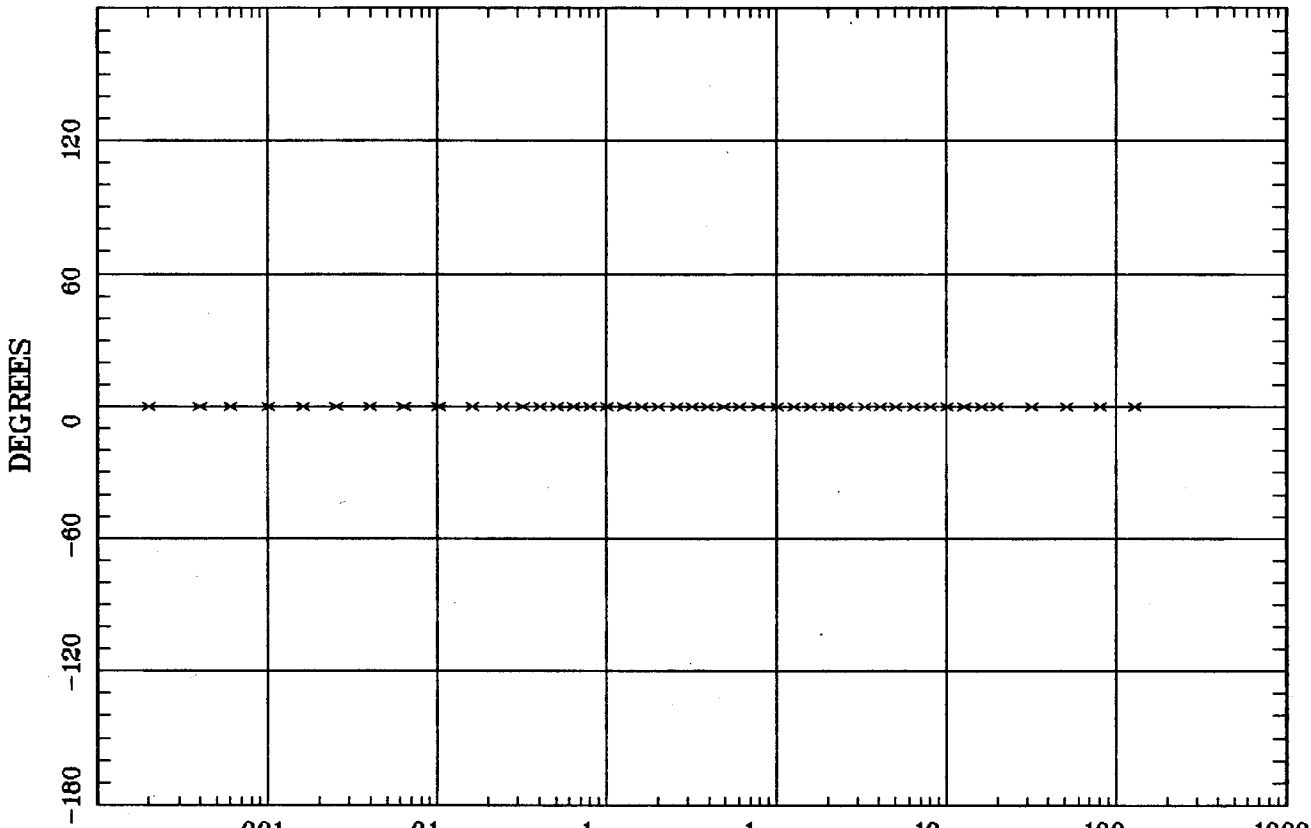


Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s36r24.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:05 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

ROTATION ANGLE

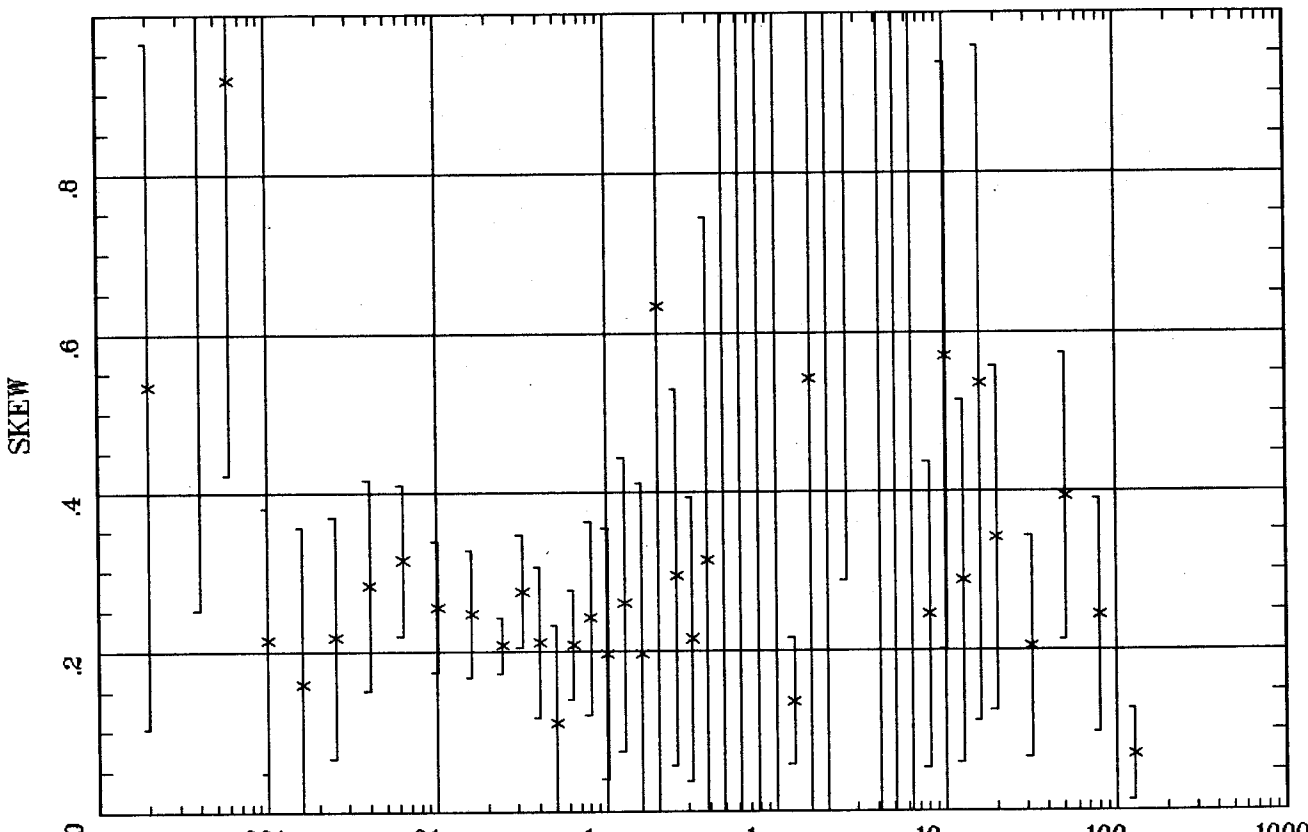
Station 38



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s38r24.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:05 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

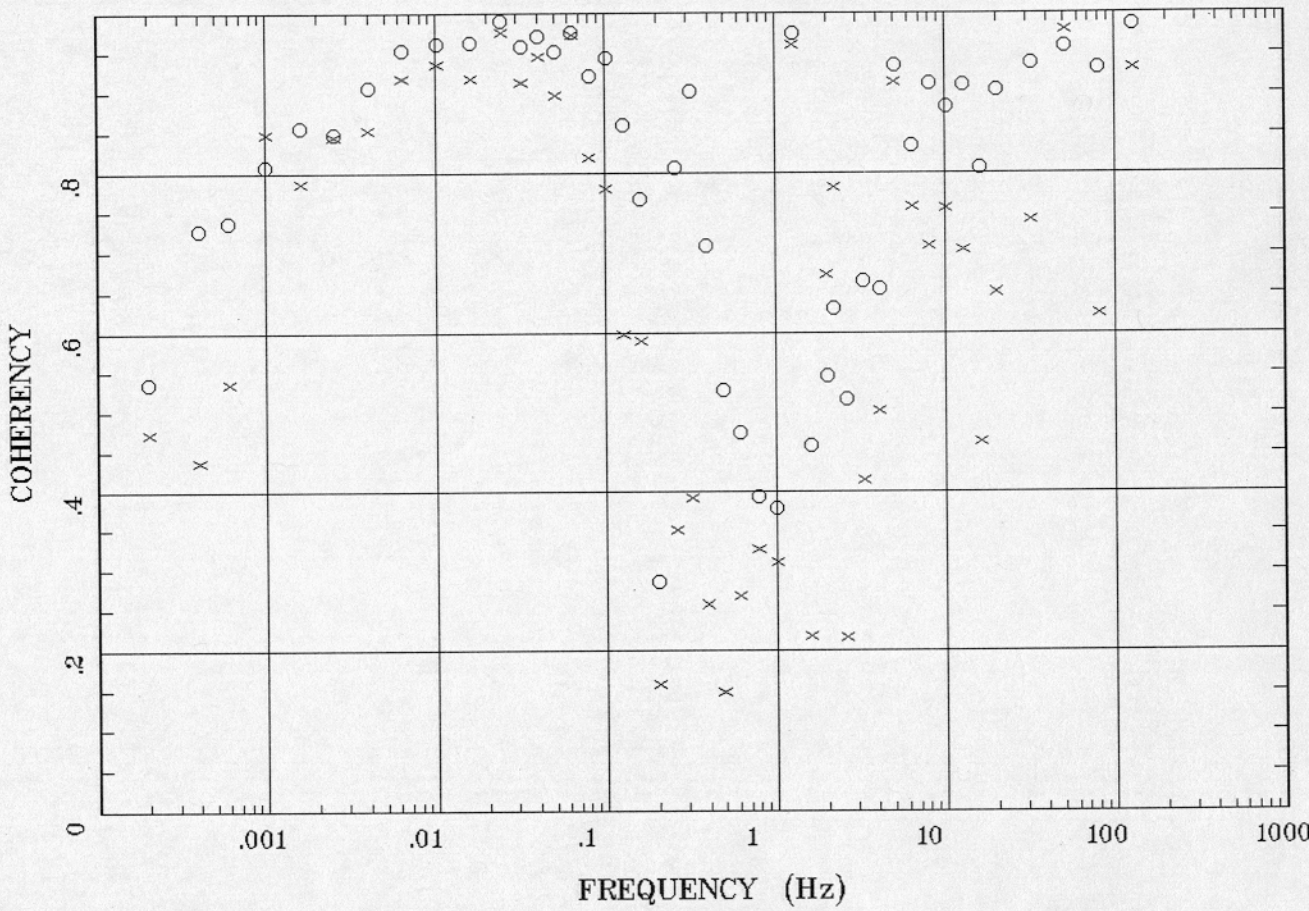
IMPEDANCE SKEW



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s38r24.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:05 Dec 01, 2004
< EMI – ElectroMagnetic Instruments >

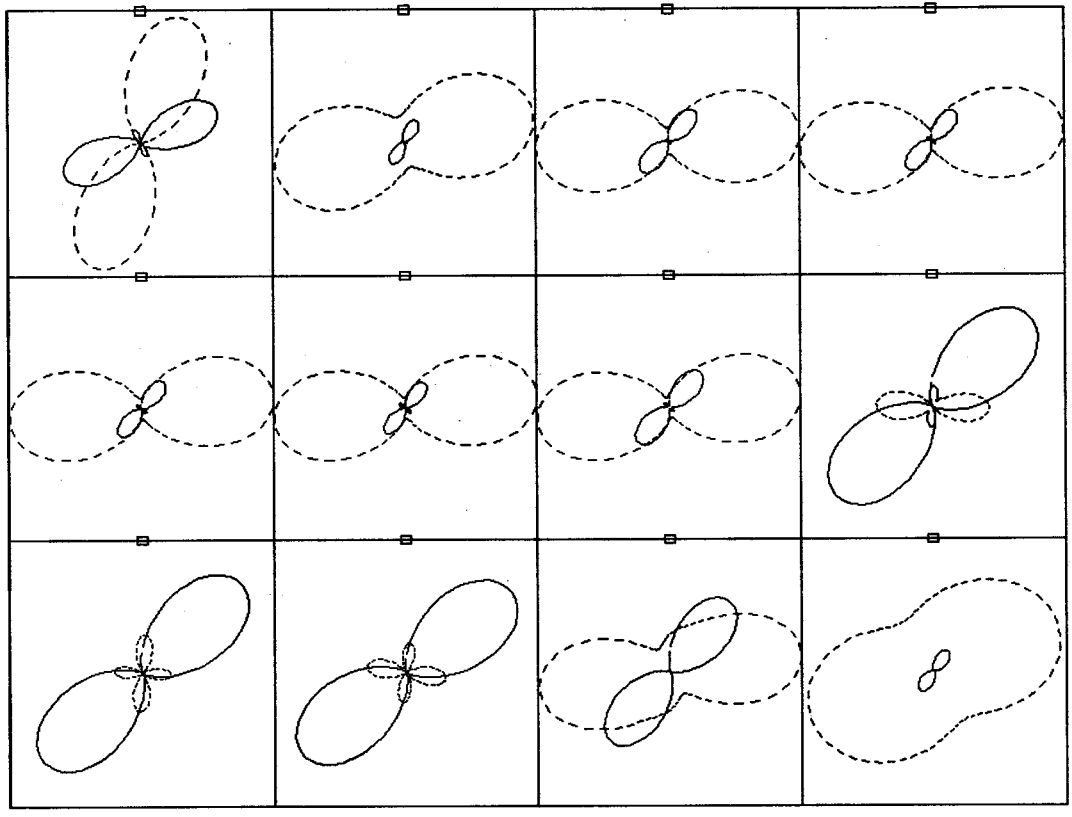
E MULT Coh.



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s38r24.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:05 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

POLAR PLOTS

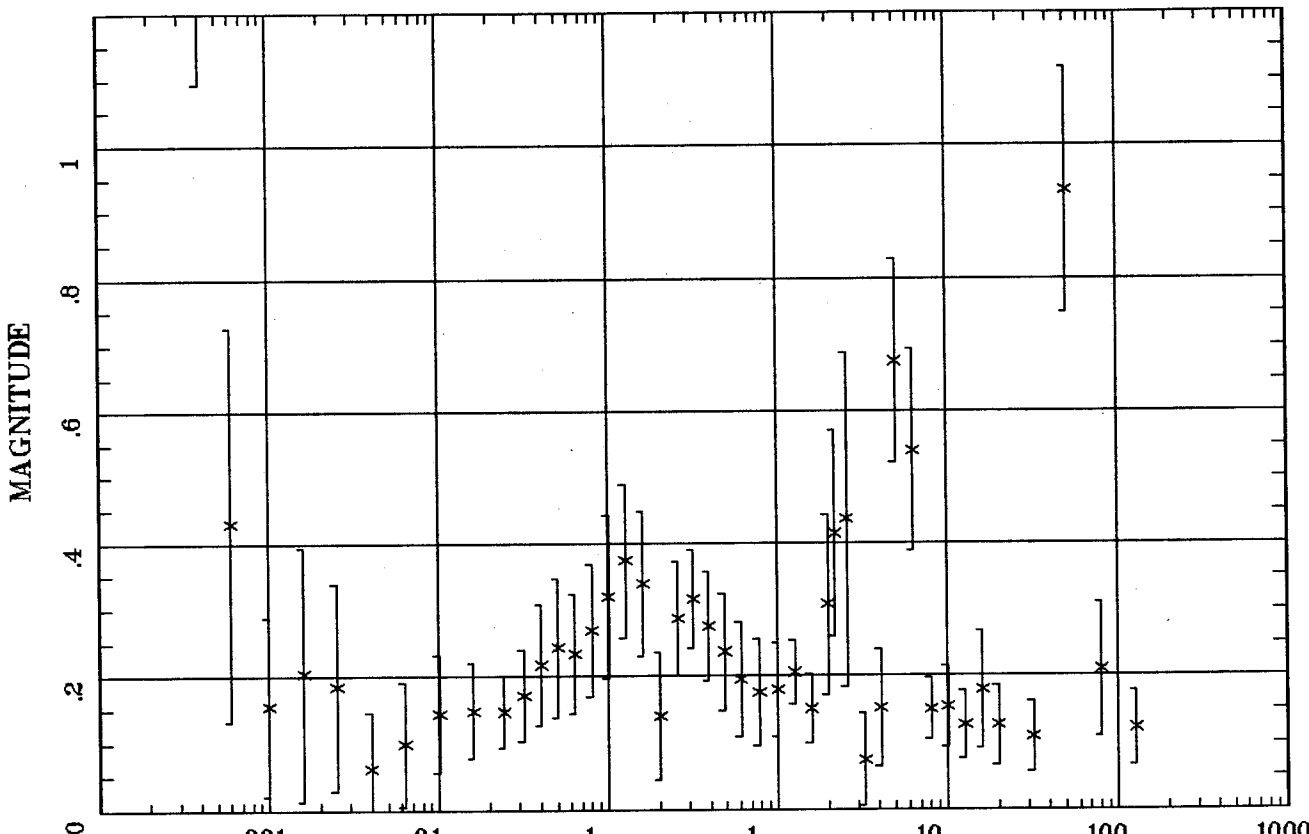


.0002 Hz	.0010 Hz	.0063 Hz	.0320 Hz
.0803 Hz	.160 Hz	.391 Hz	1.001 Hz
2.197 Hz	4.077 Hz	10.132 Hz	31.982 Hz

Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s38r24.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:05 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

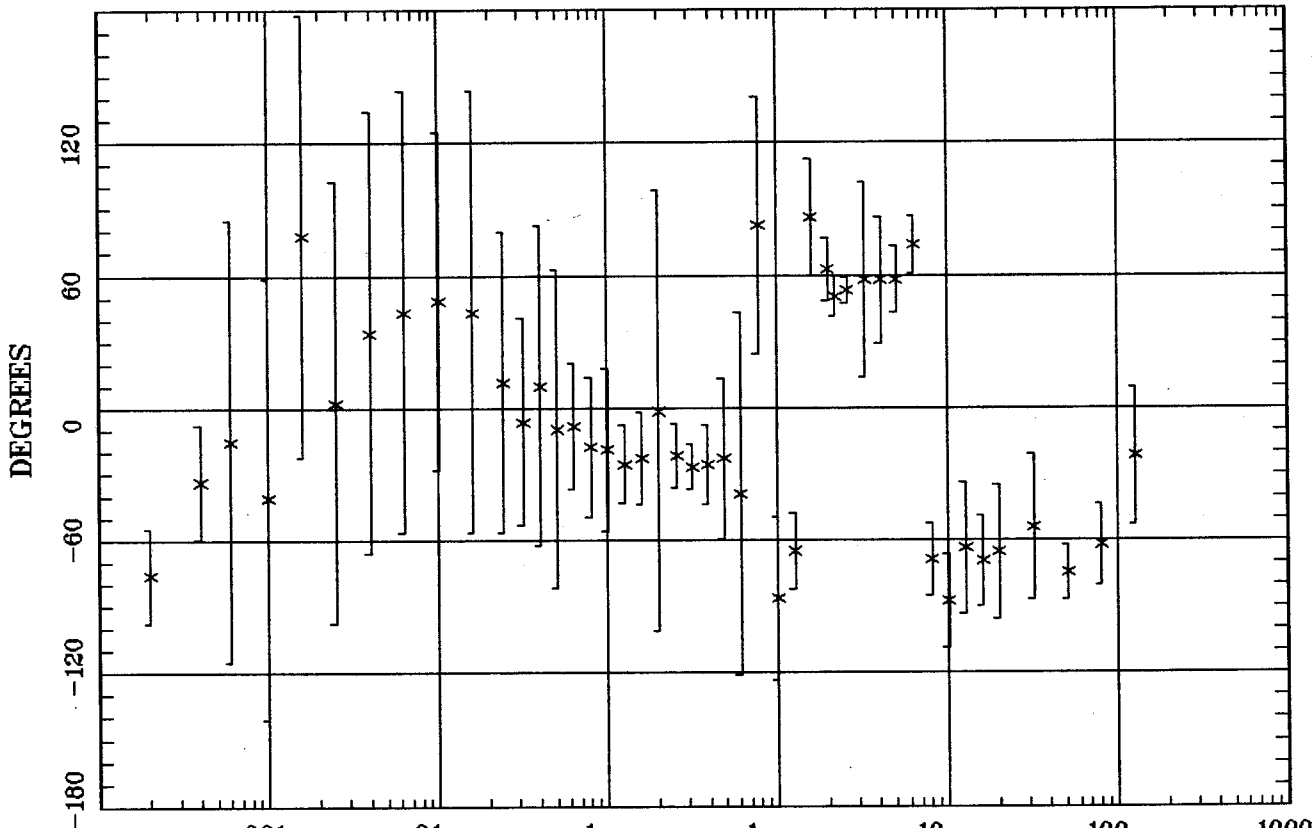
TIPPER MAGNITUDE



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

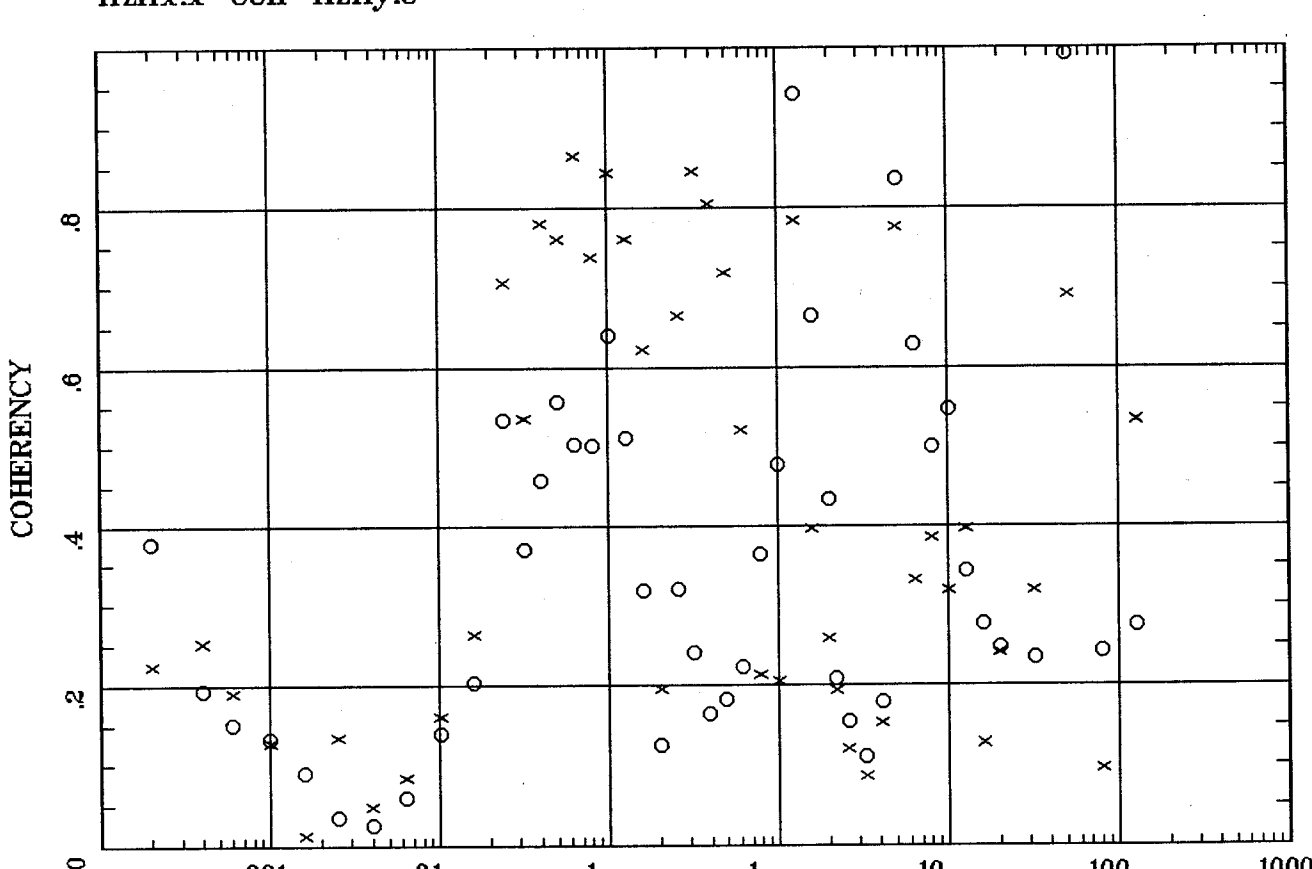
Rotation:
Filename: s38r24.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:05 Dec 01, 2004
< EMI – ElectroMagnetic Instruments >

TIPPER STRIKE



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

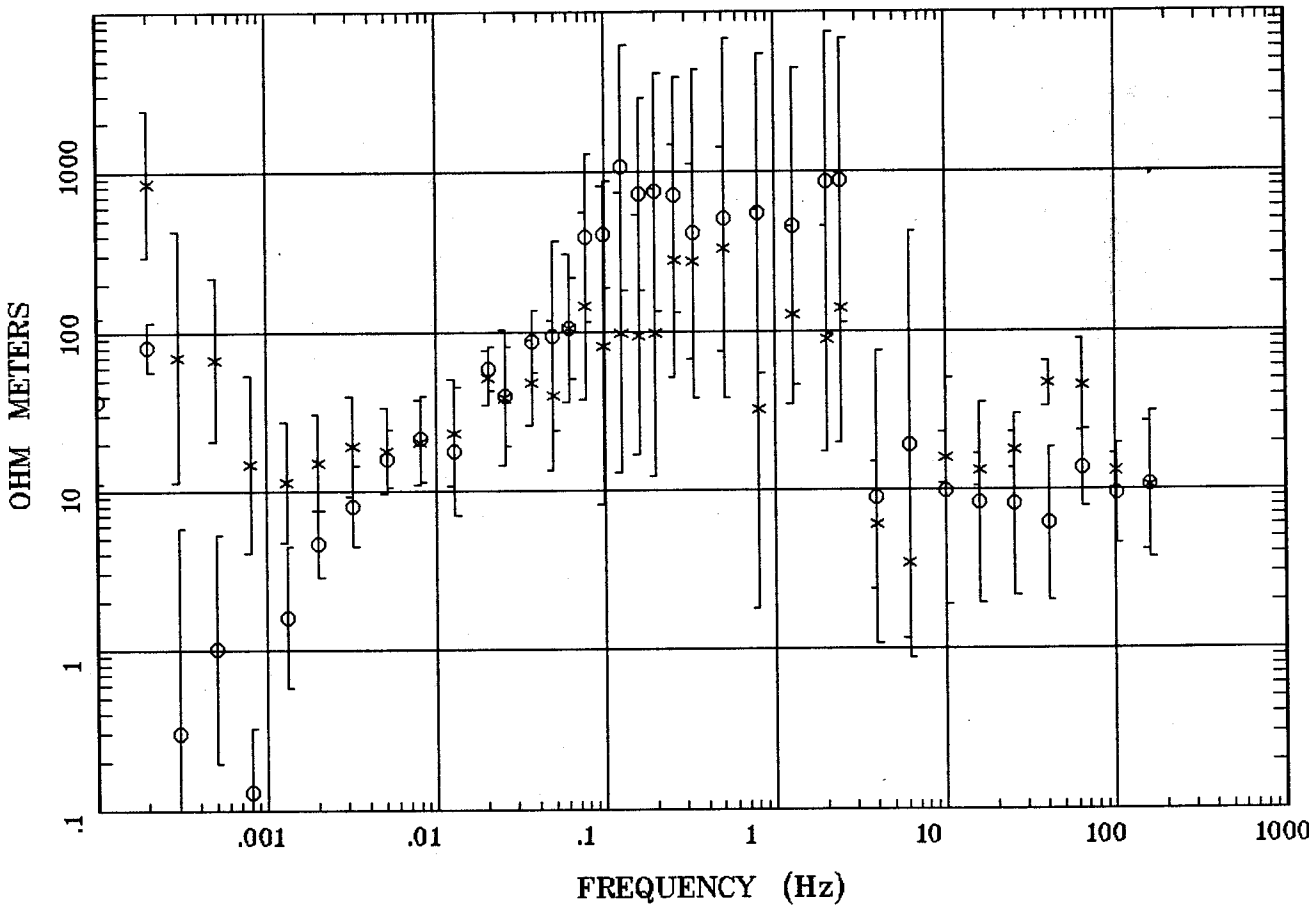
Rotation:
Filename: s38r24.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:05 Dec 01, 2004
< EMI – ElectroMagnetic Instruments >



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s38r24.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:05 Dec 01, 2004
< EMI – ElectroMagnetic Instruments >

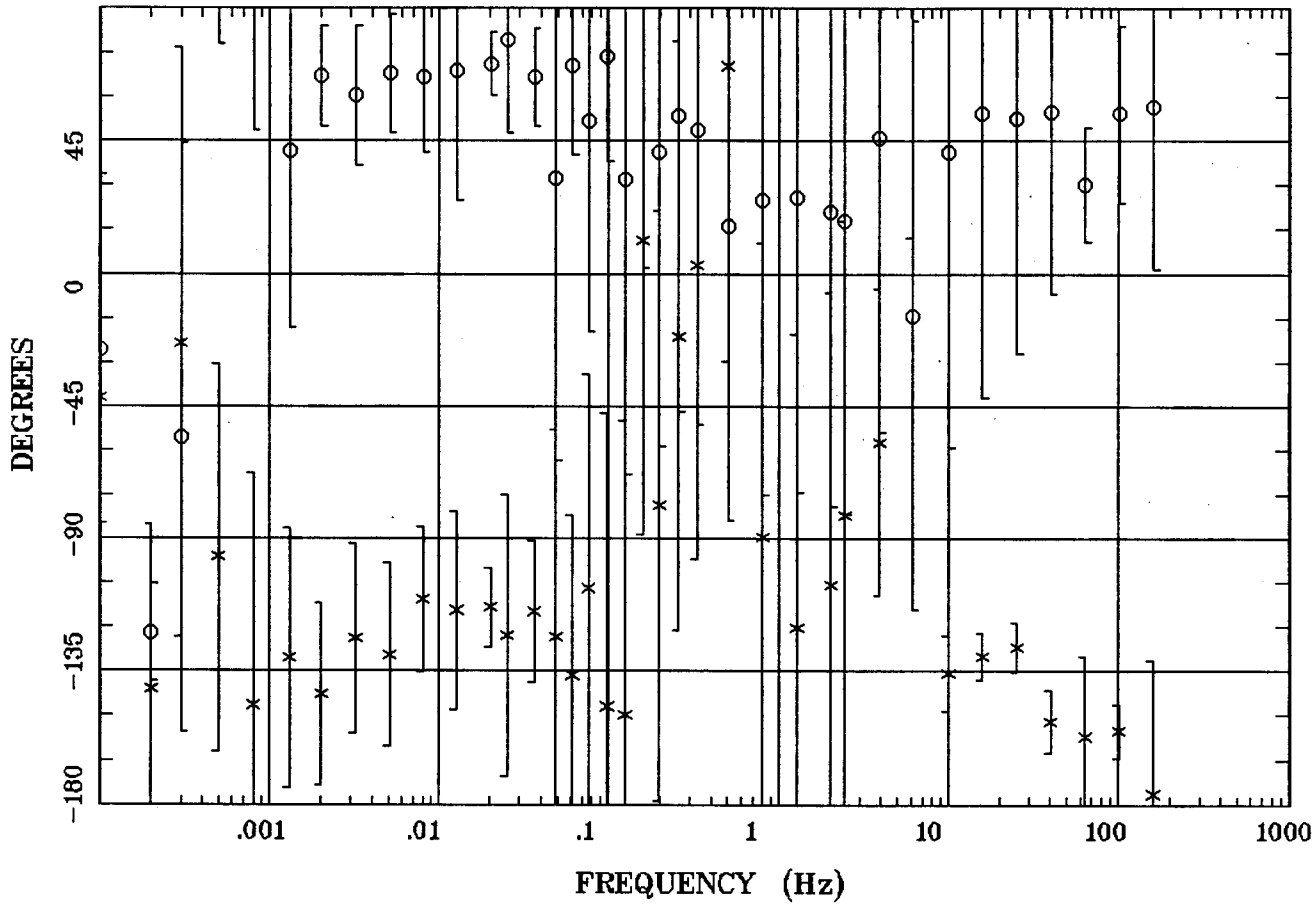
APPARENT RESISTIVITY



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s39r25.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:05 Dec 01, 2004
< EMI – ElectroMagnetic Instruments >

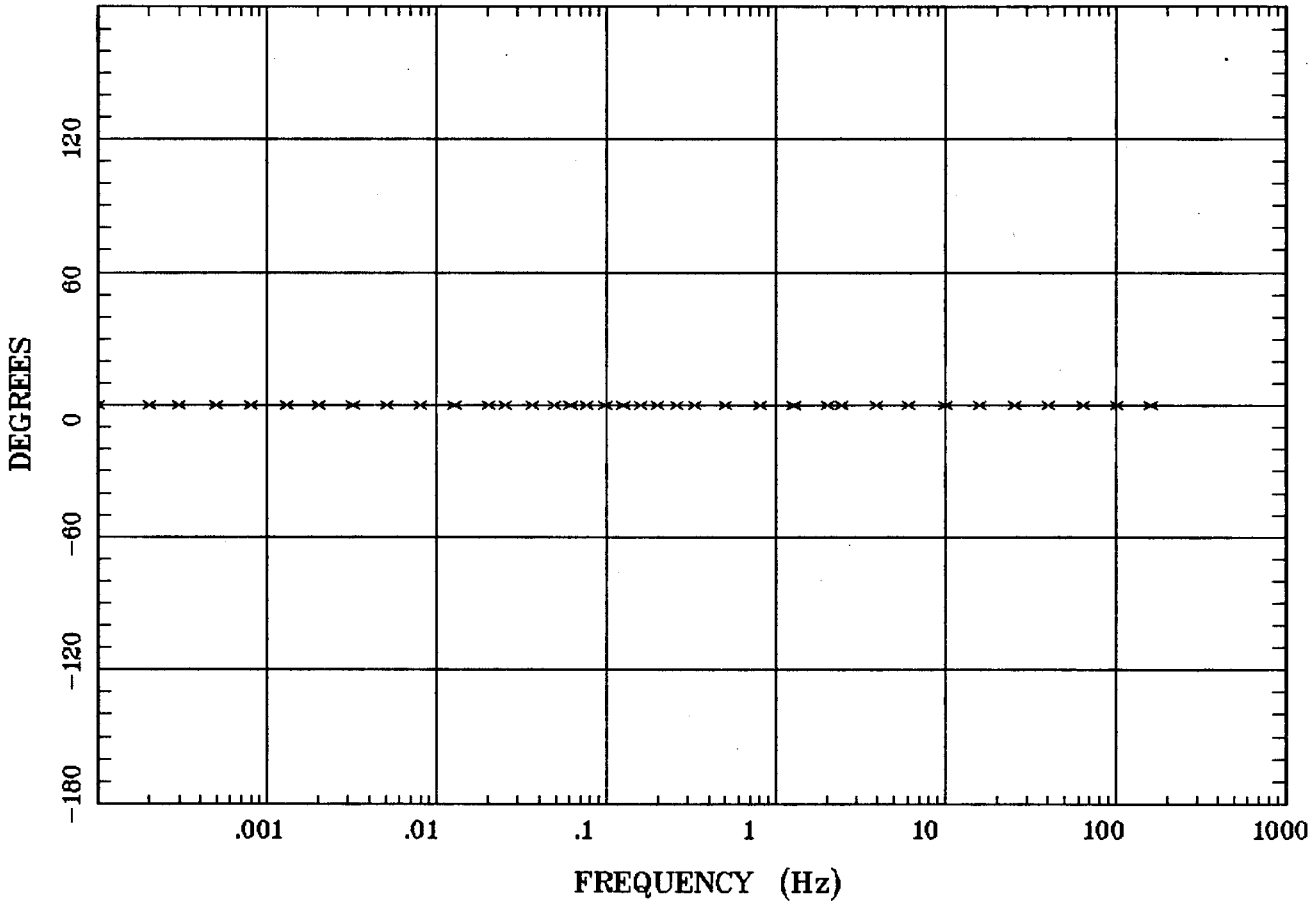
IMPEDANCE PHASE



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s39r25.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:06 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

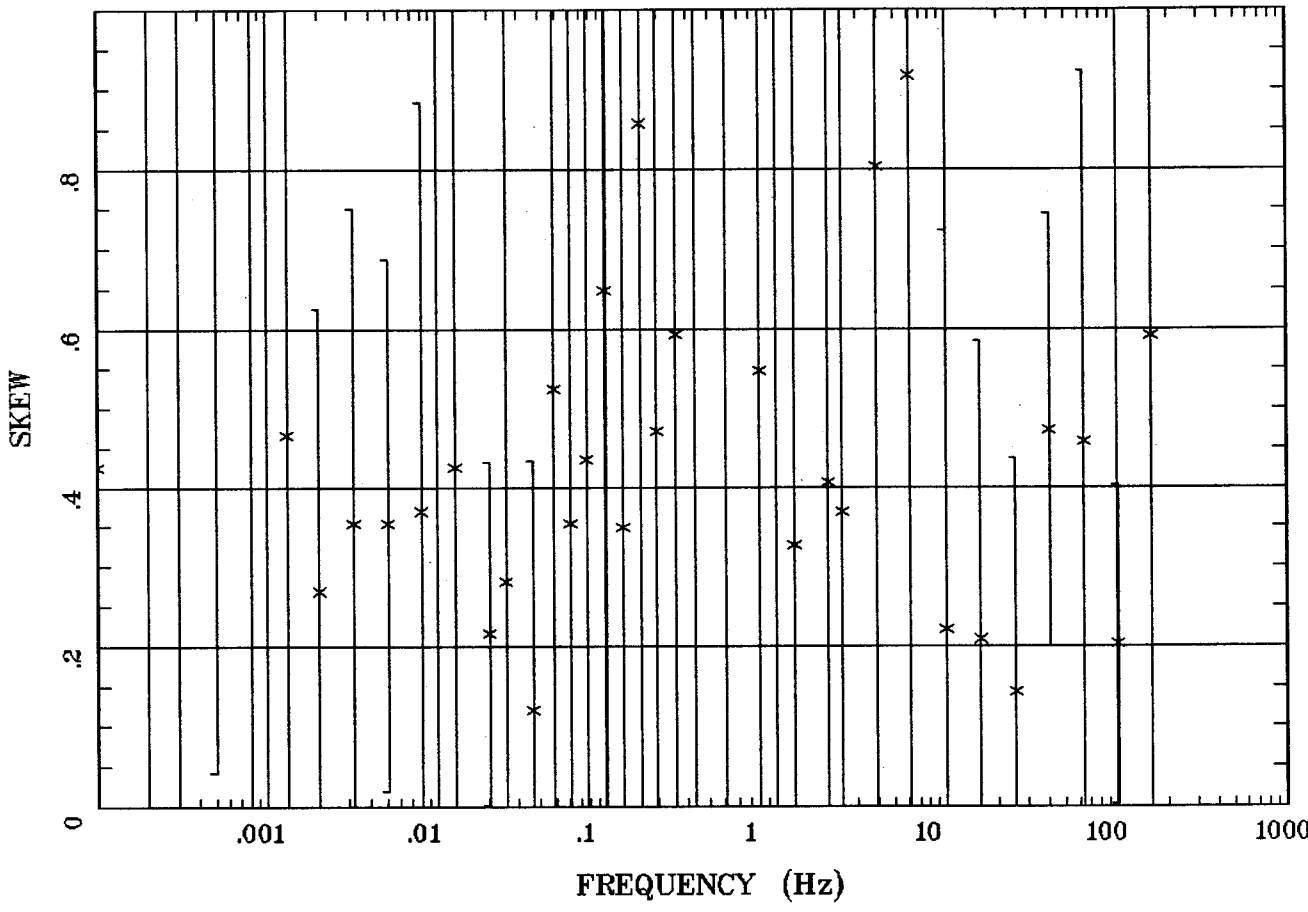
ROTATION ANGLE



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s39r25.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:06 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

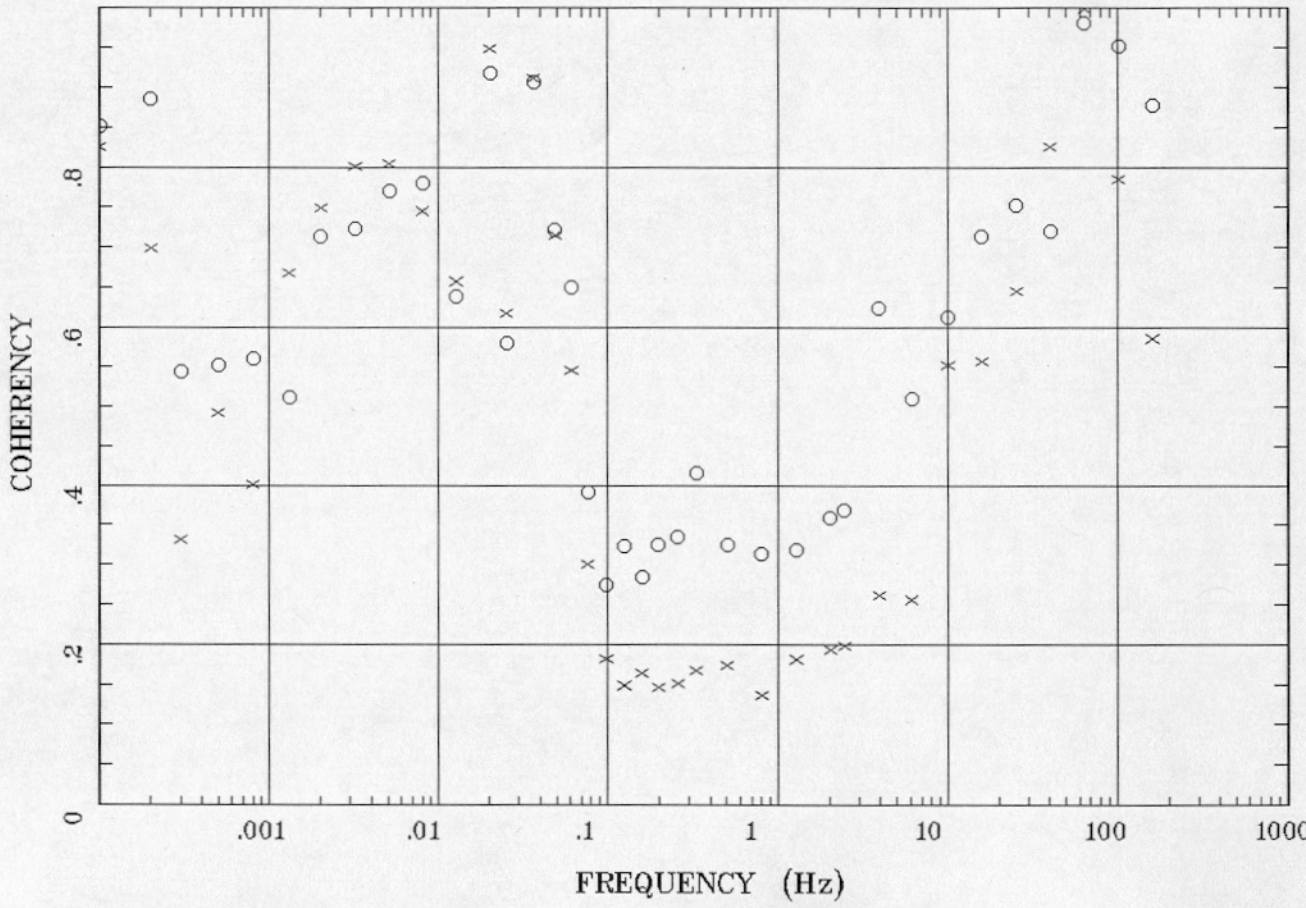
IMPEDANCE SKEW



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s39r25.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:06 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

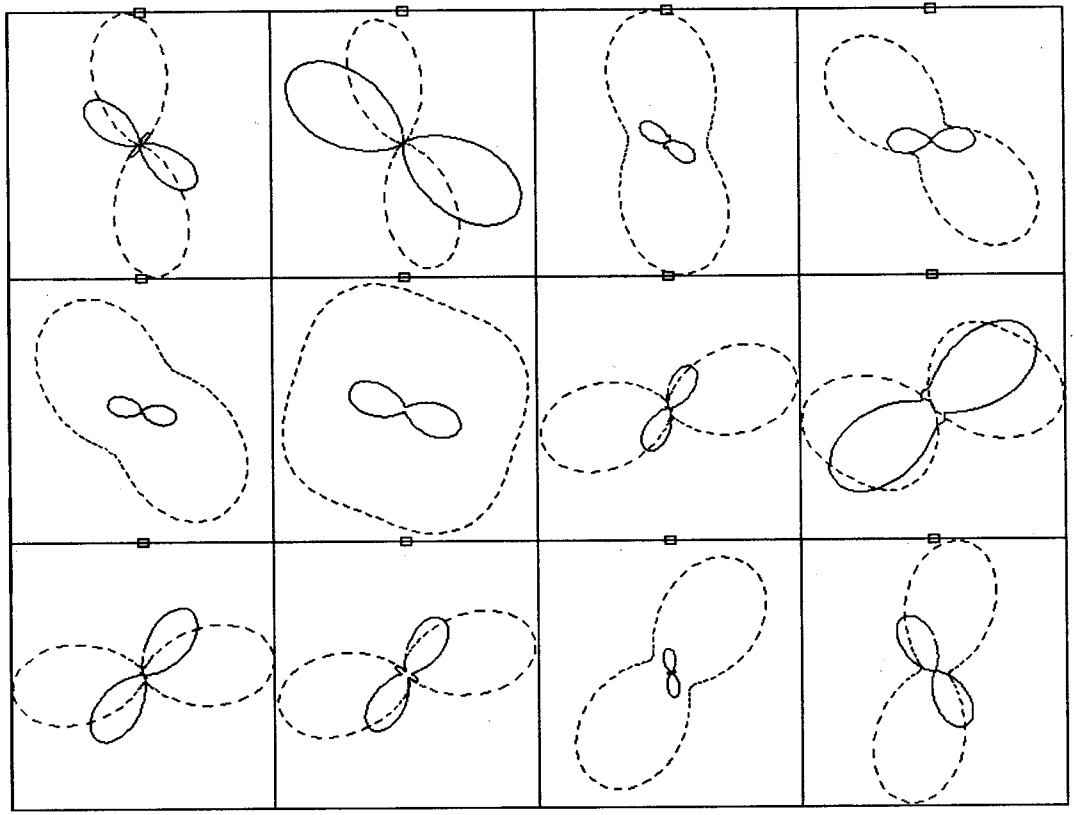
E MULT Coh.



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s39r25.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:06 Dec 01, 2004
< EMI – ElectroMagnetic Instruments >

POLAR PLOTS

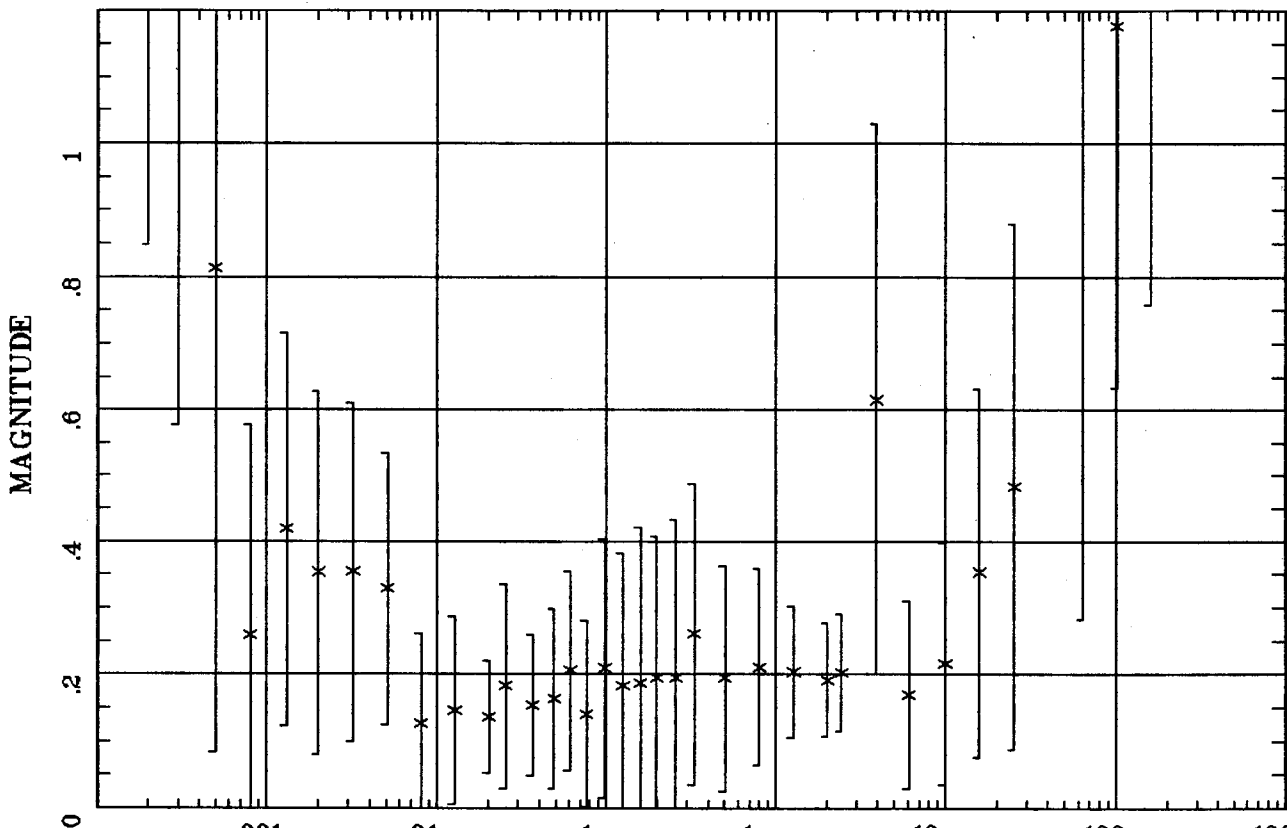


.0001 Hz	.0005 Hz	.0020 Hz	.0080 Hz
.0254 Hz	.0610 Hz	.125 Hz	.256 Hz
.800 Hz	2.451 Hz	10.010 Hz	40.283 Hz

Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s39r25.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:06 Dec 01, 2004
< EMI – ElectroMagnetic Instruments >

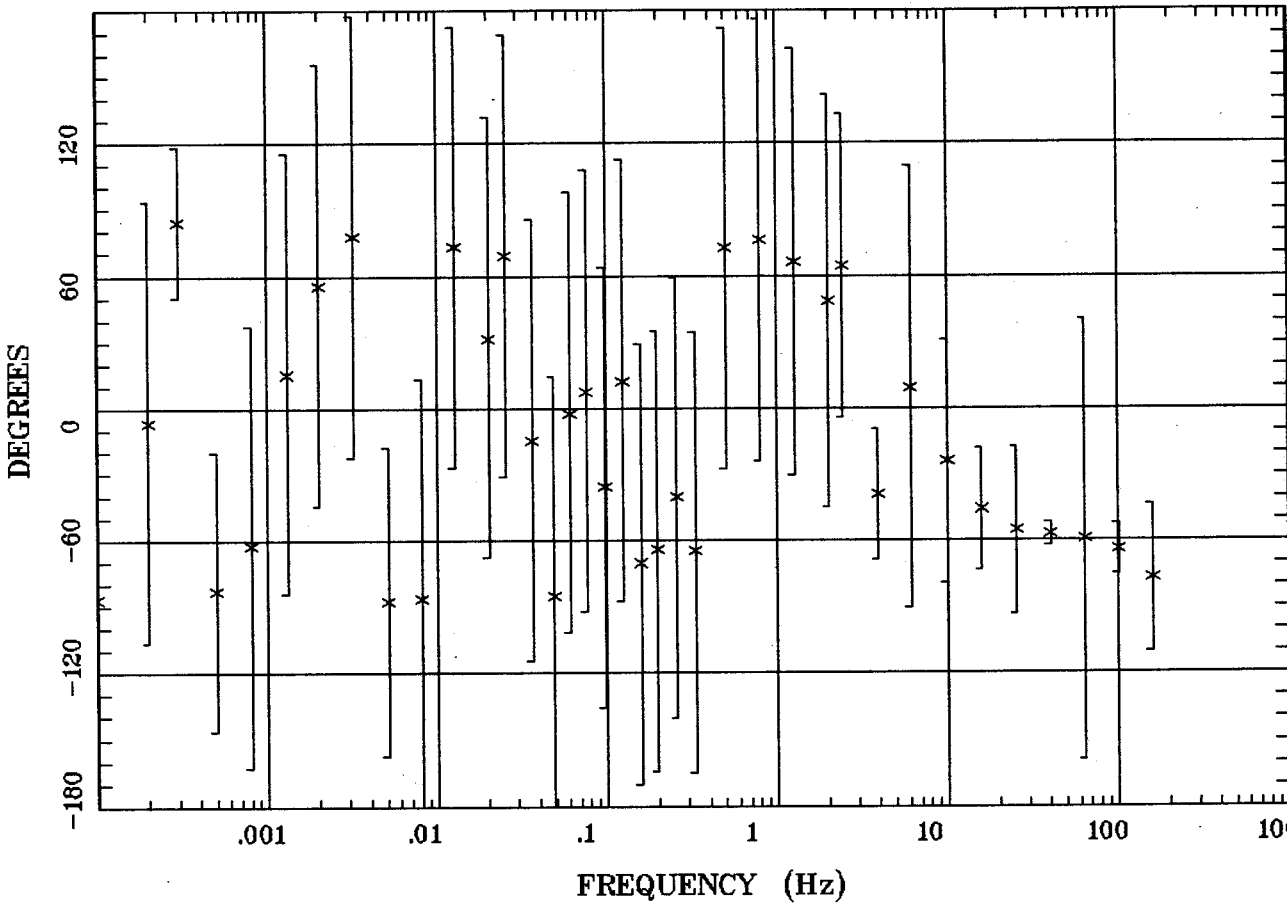
TIPPER MAGNITUDE



Client:
Remote:
Acquired: 19:5 Mar 06, 1998
Survey Co:

Rotation:
Filename: s39r25.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:06 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

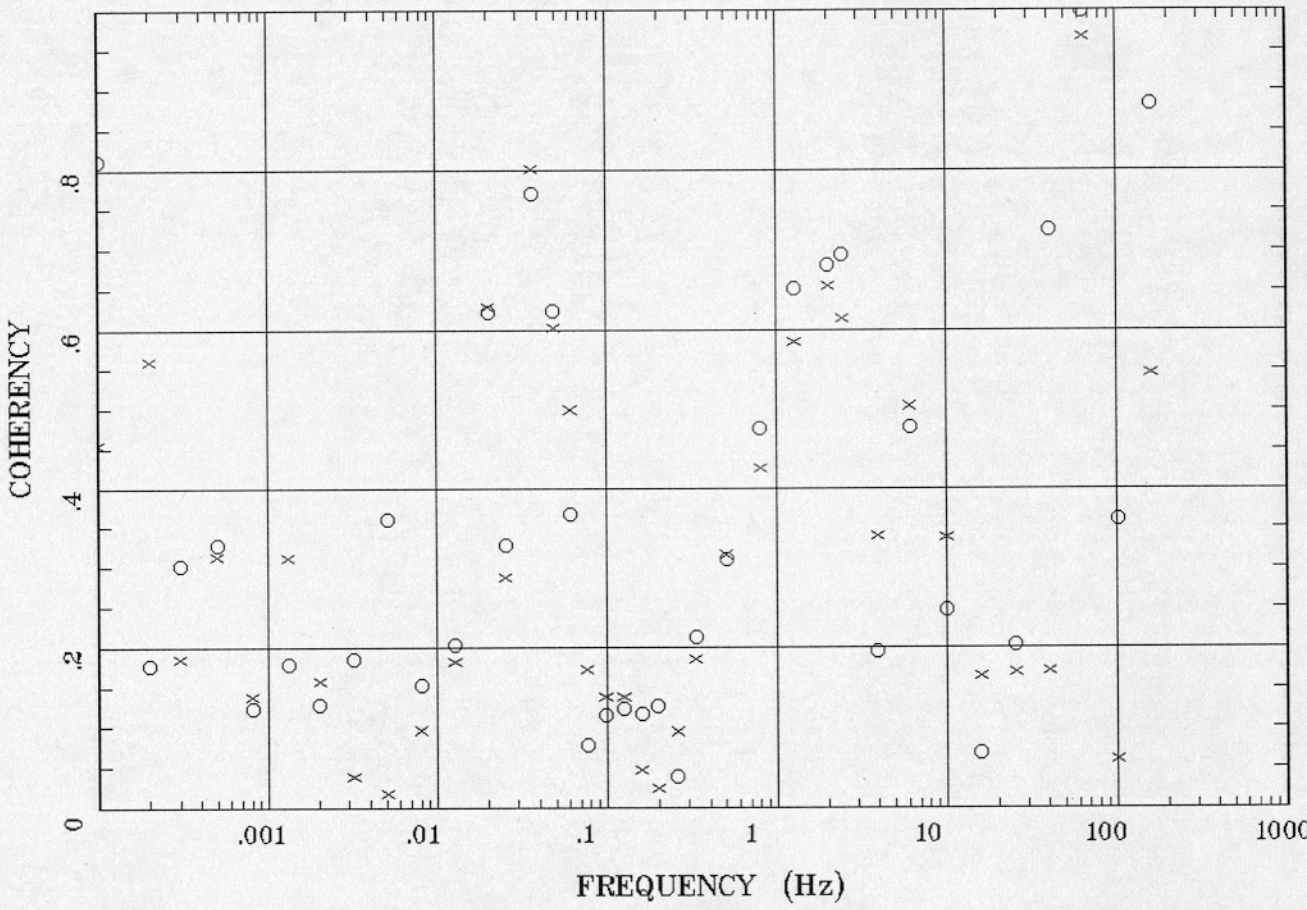
TIPPER STRIKE



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s39r25.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:06 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

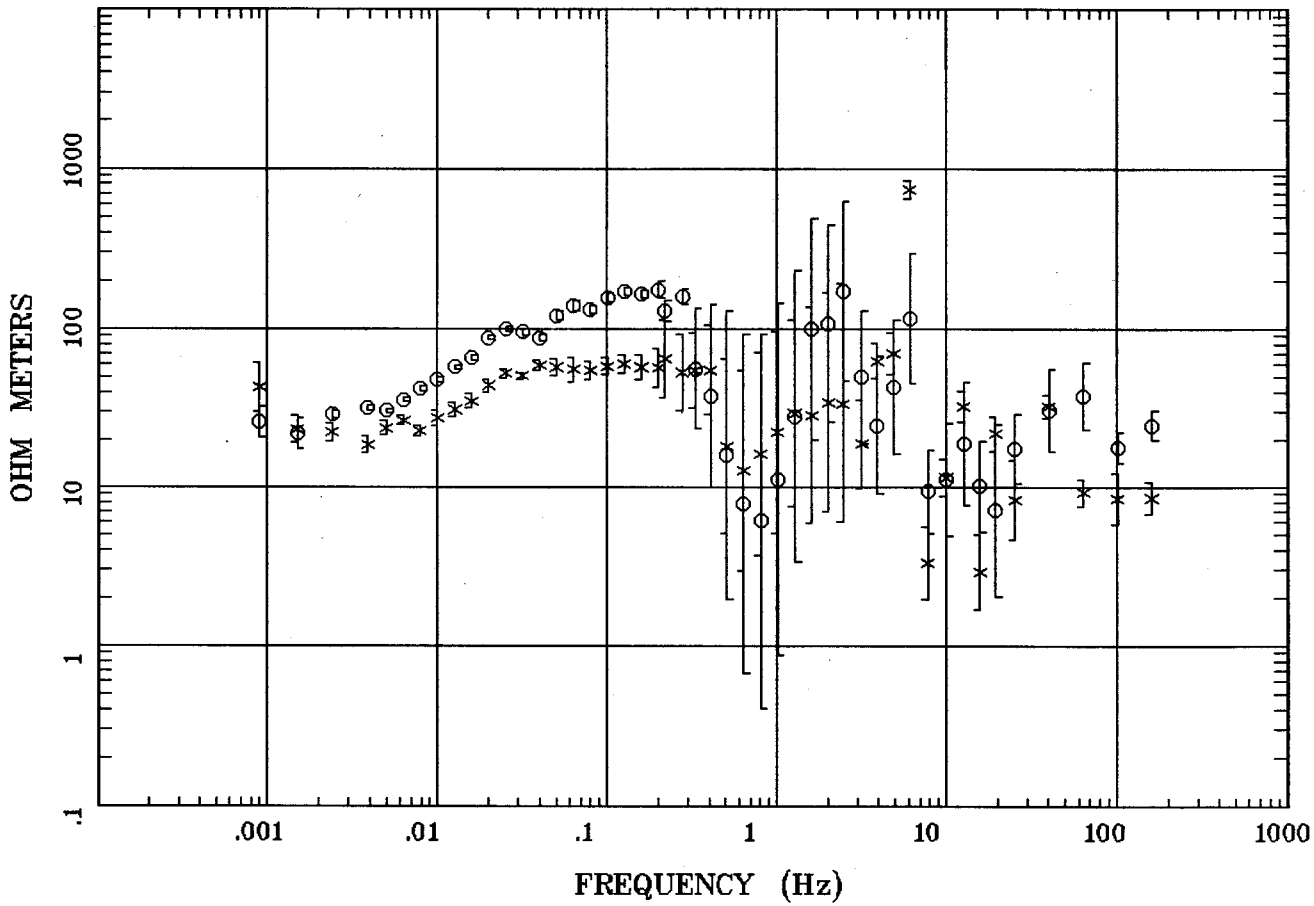
HzHx.x Coh HzHy.o



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s39r25.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:06 Dec 01, 2004
< EMI – ElectroMagnetic Instruments >

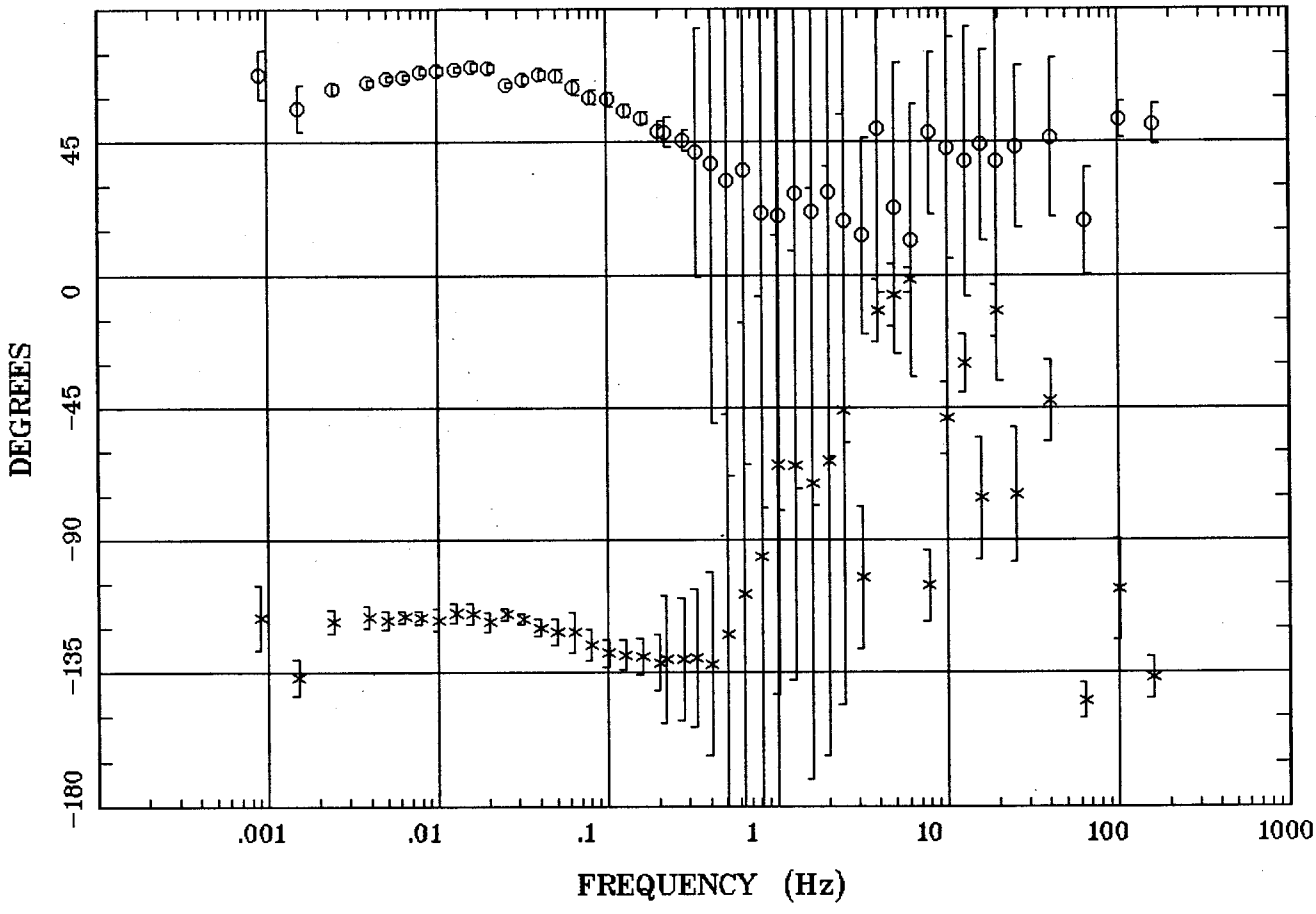
APPARENT RESISTIVITY



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s40r26.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:06 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

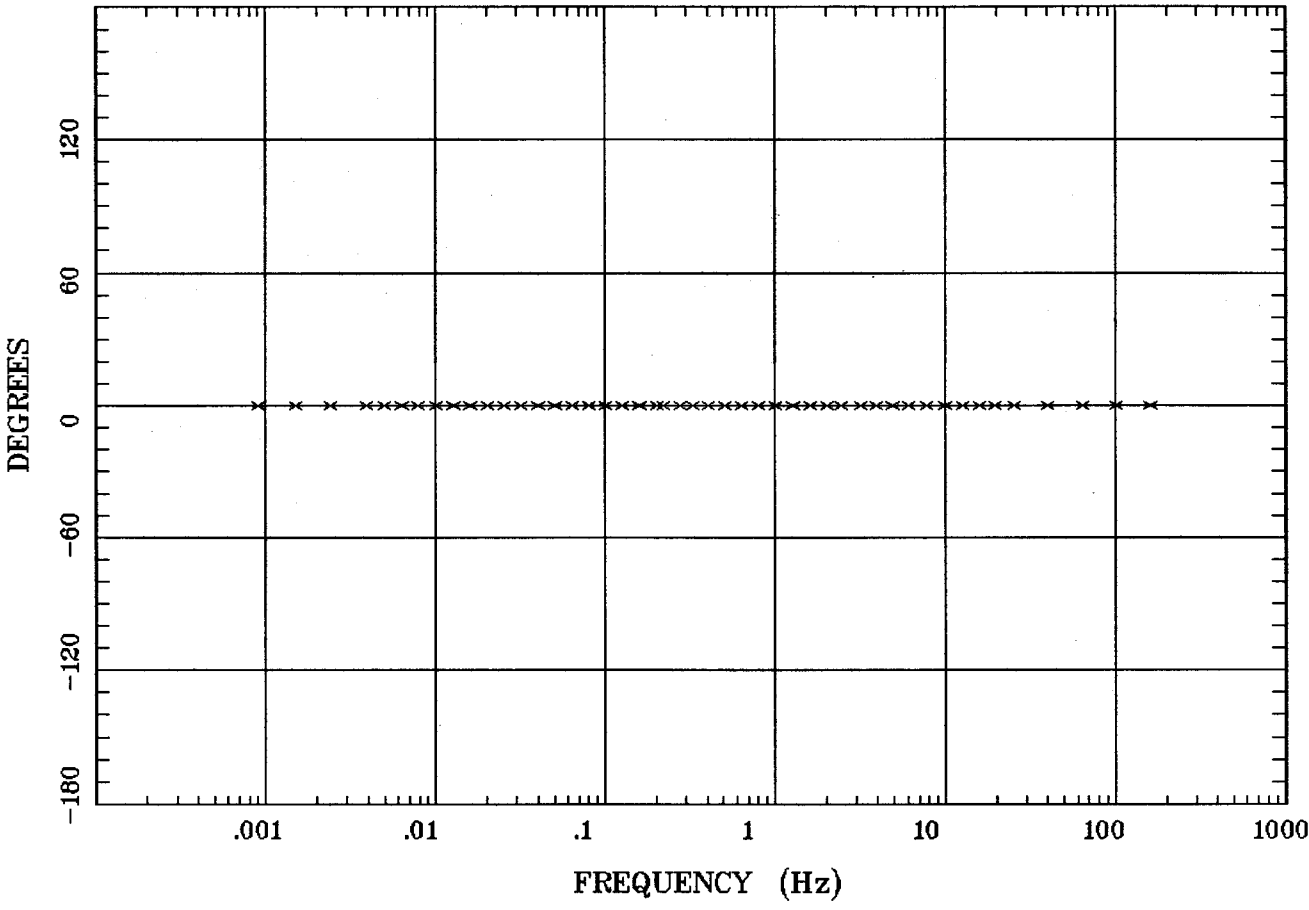
IMPEDANCE PHASE



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s40r26.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:06 Dec 01, 2004
< EMI – ElectroMagnetic Instruments >

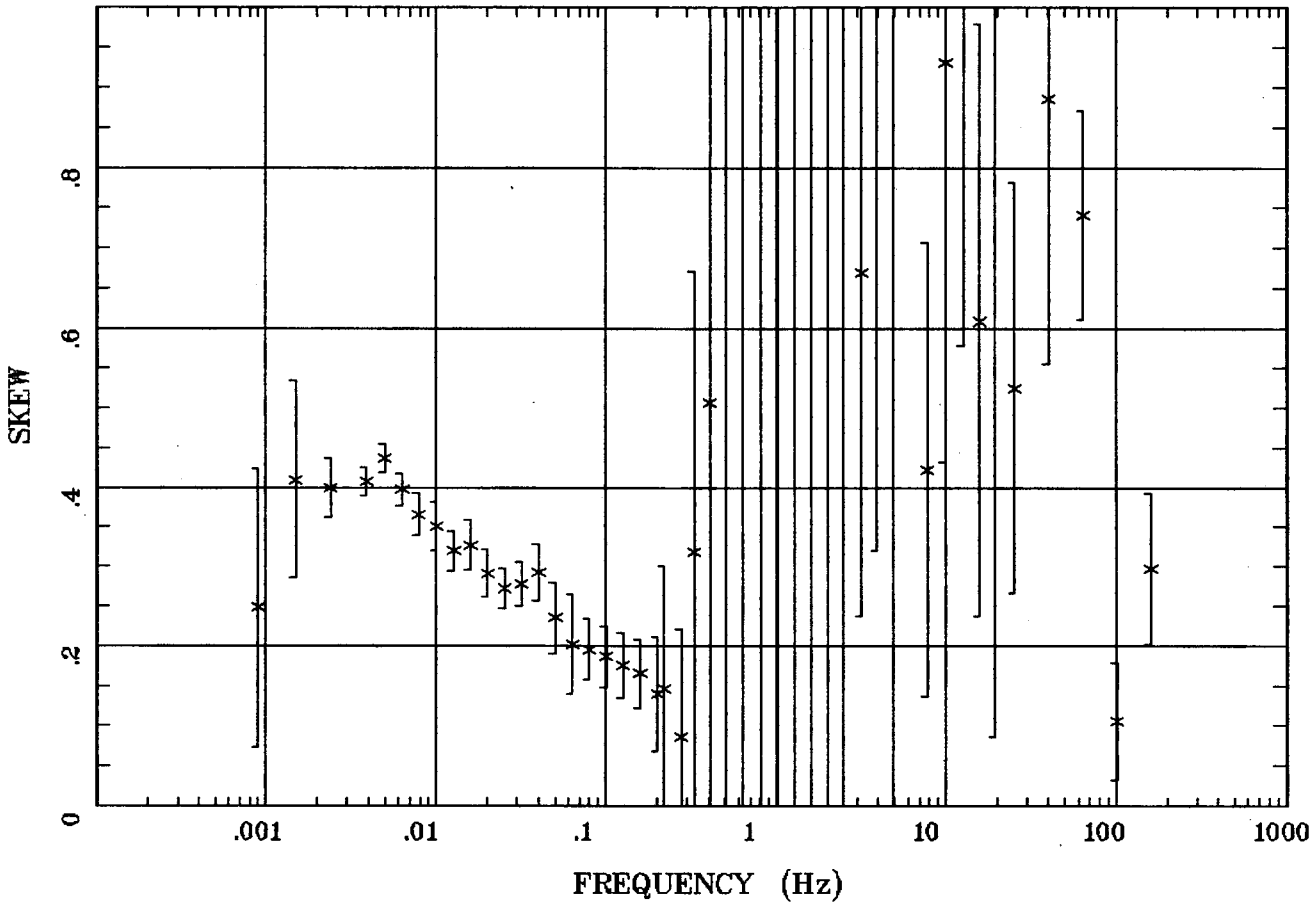
ROTATION ANGLE



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s40r26.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:06 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

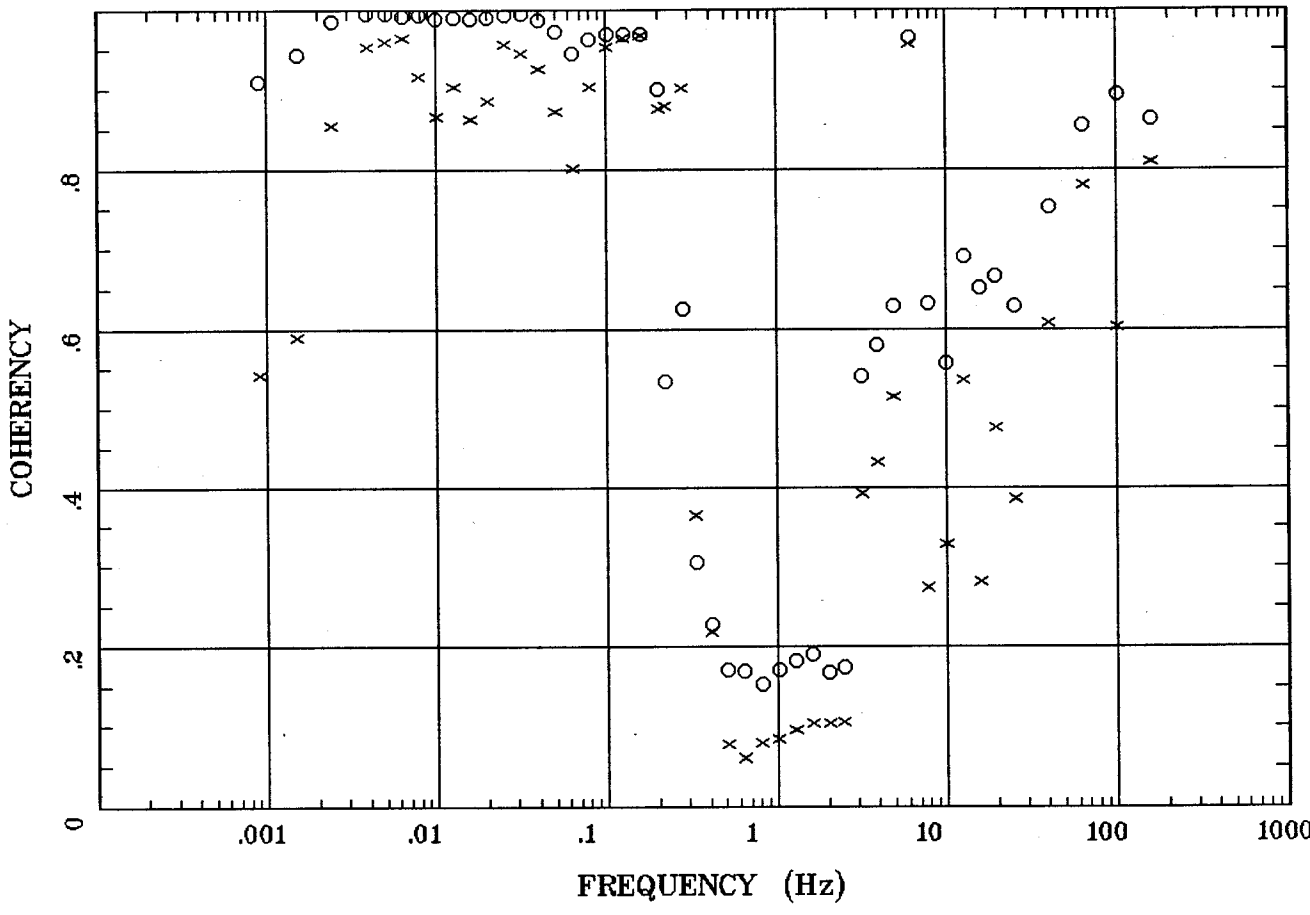
IMPEDANCE SKEW



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s40r26.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:06 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

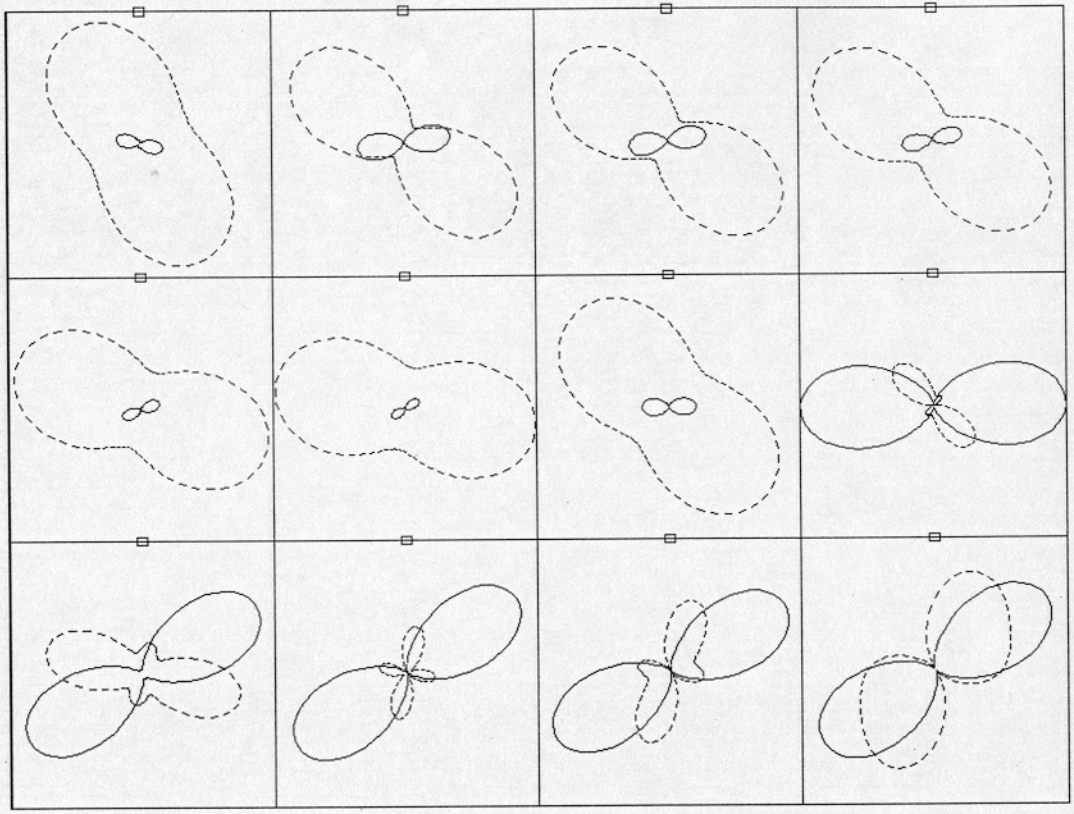
E MULT Coh.



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s40r26.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:06 Dec 01, 2004
< EMI – ElectroMagnetic Instruments >

POLAR PLOTS

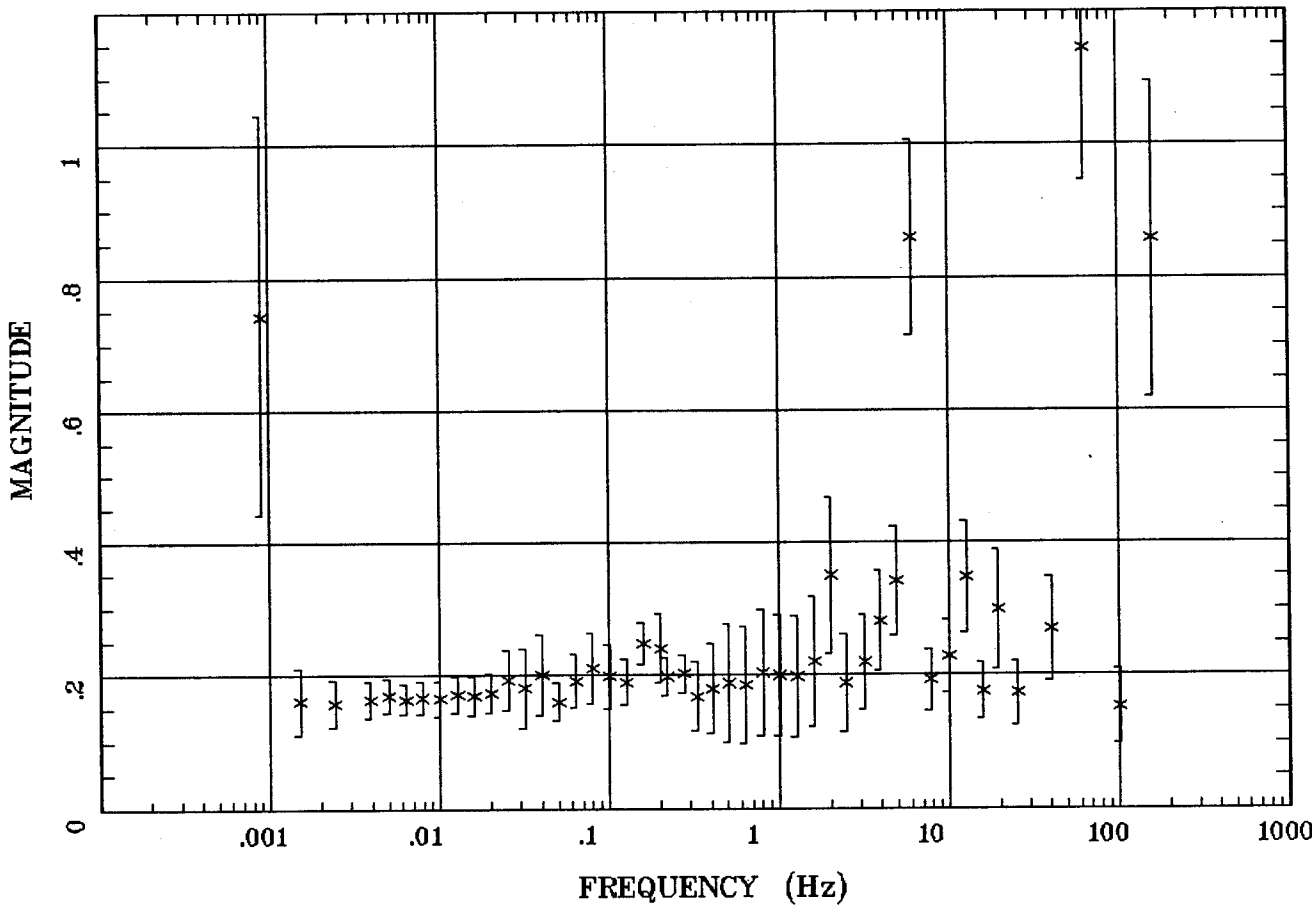


.0009 Hz	.0039 Hz	.0100 Hz	.0254 Hz
.0635 Hz	.160 Hz	.330 Hz	.804 Hz
2.024 Hz	4.883 Hz	12.695 Hz	40.283 Hz

Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s40r26.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:06 Dec 01, 2004
< EMI – ElectroMagnetic Instruments >

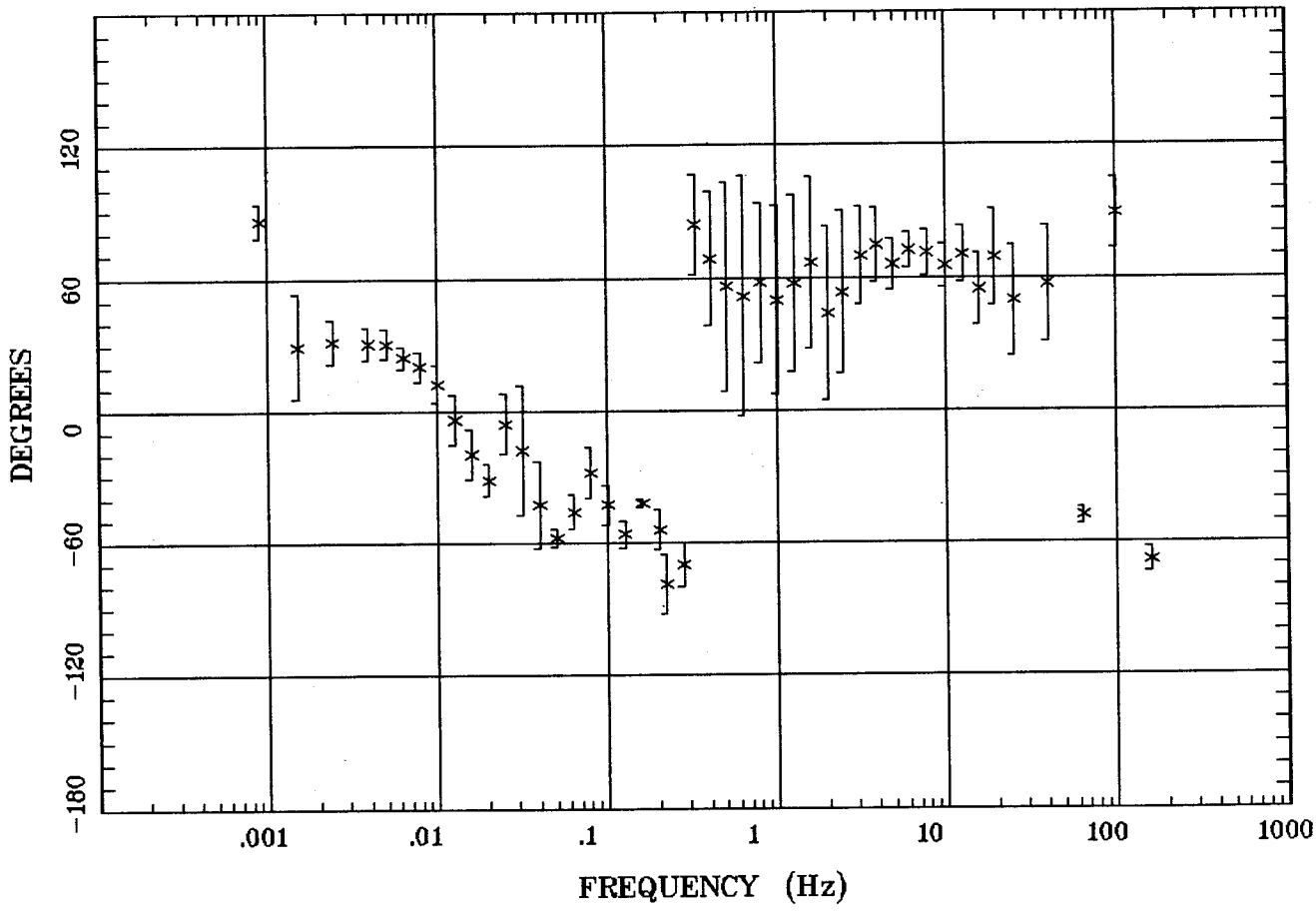
TIPPER MAGNITUDE



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s40r26.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:06 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

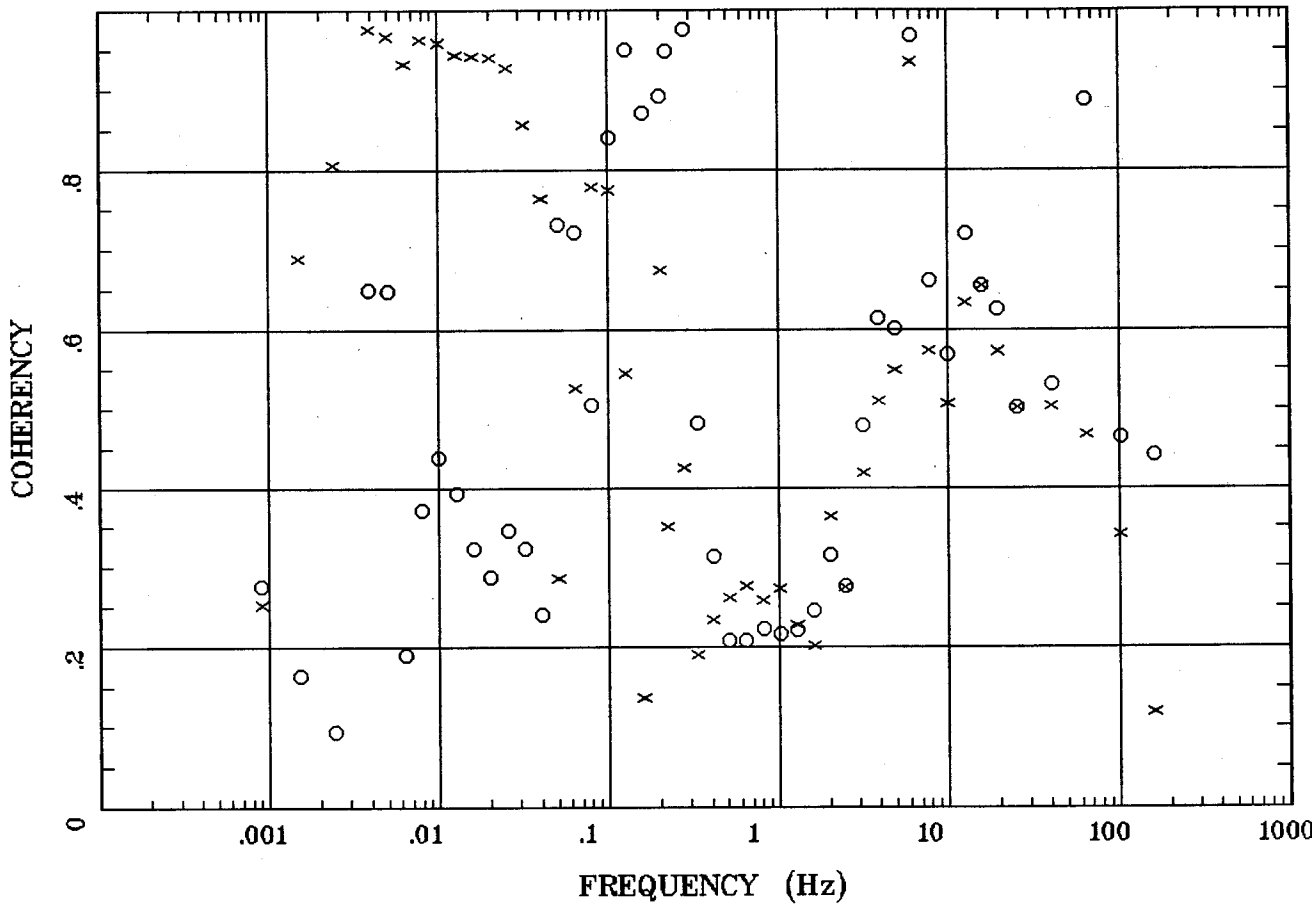
TIPPER STRIKE



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s40r26.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:06 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

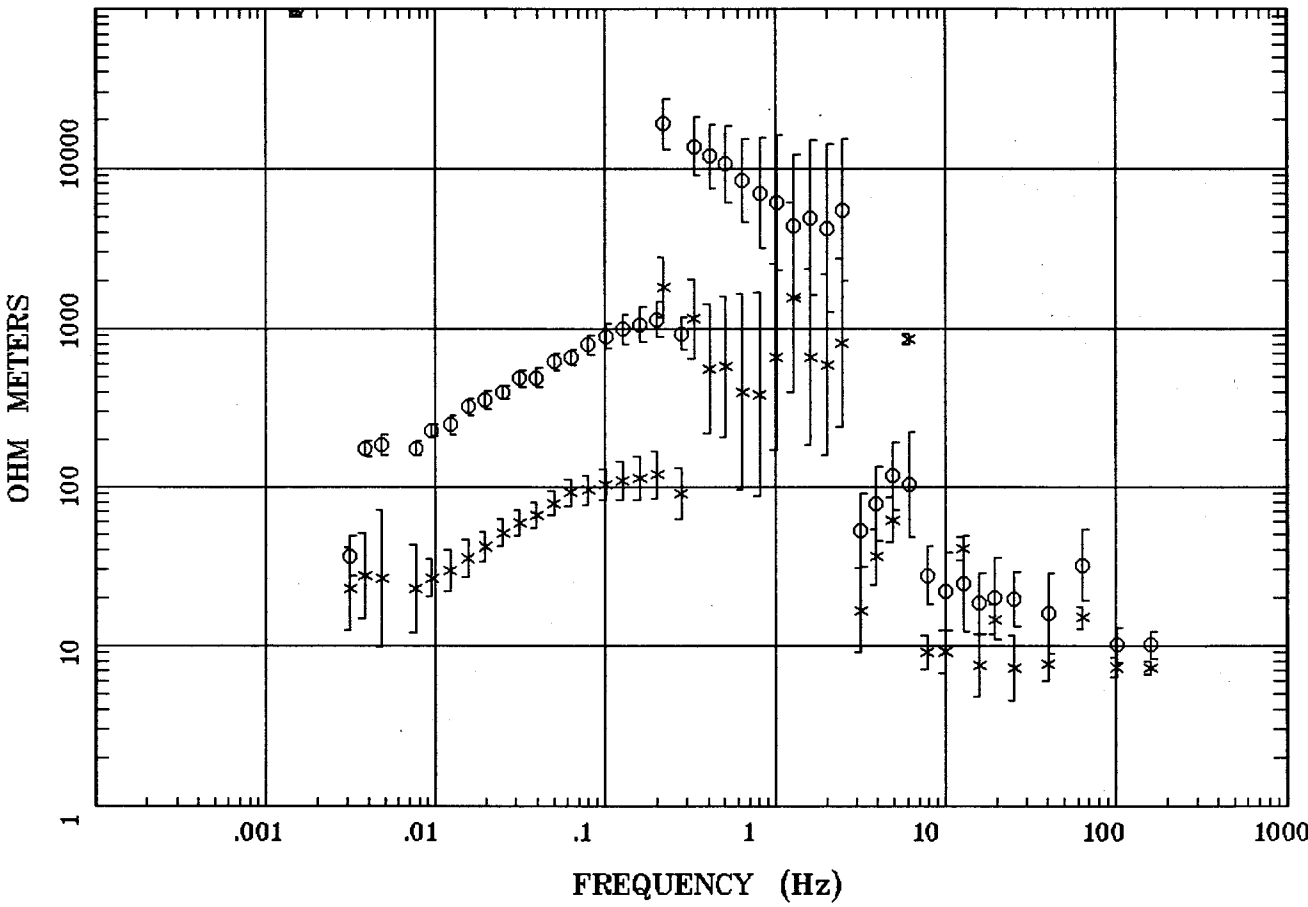
HzHx.x Coh HzHy.o



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s40r26.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:06 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

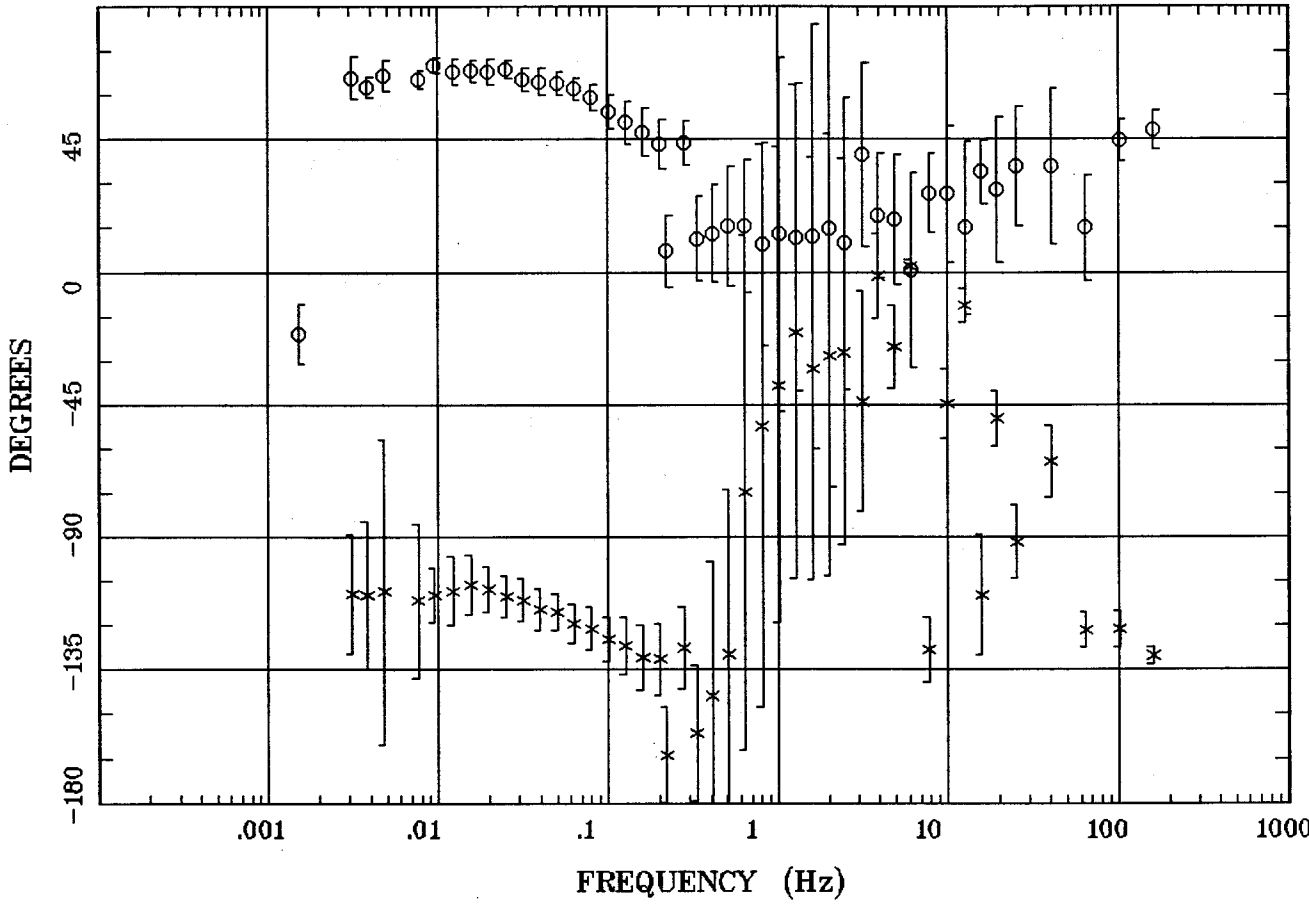
APPARENT RESISTIVITY



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s41r27.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:08 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

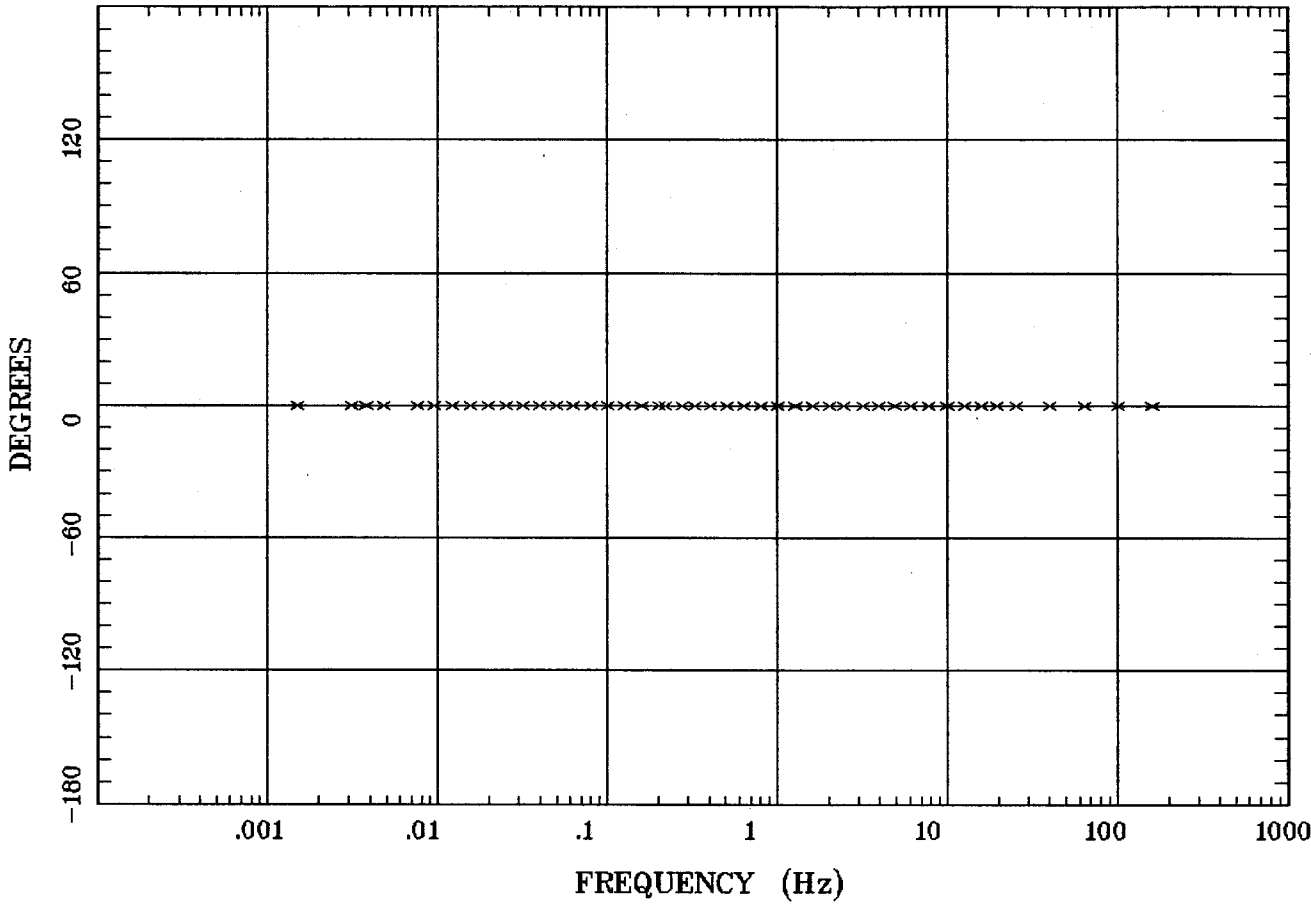
IMPEDANCE PHASE



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s41r27.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:08 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

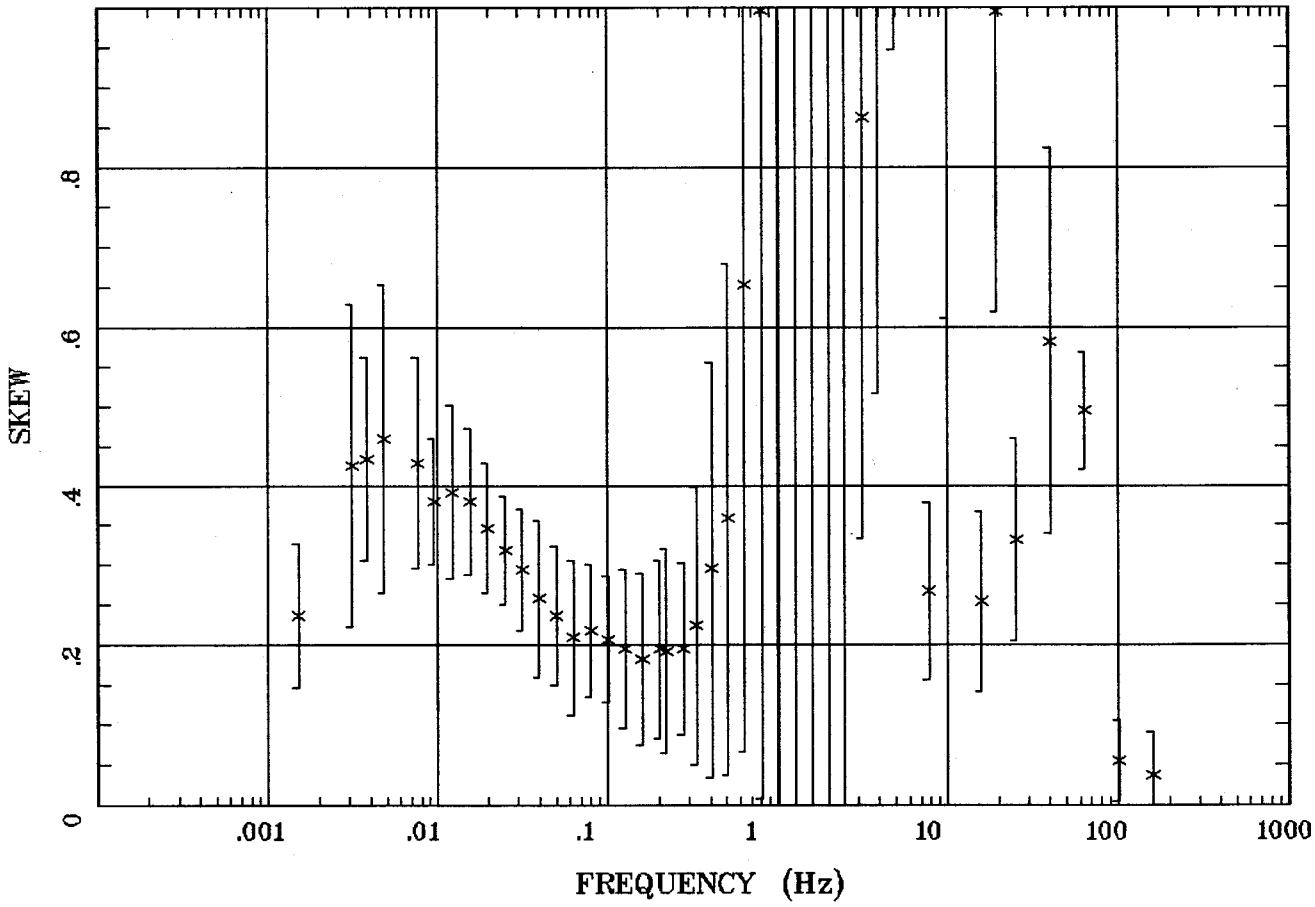
ROTATION ANGLE



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s41r27.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:08 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

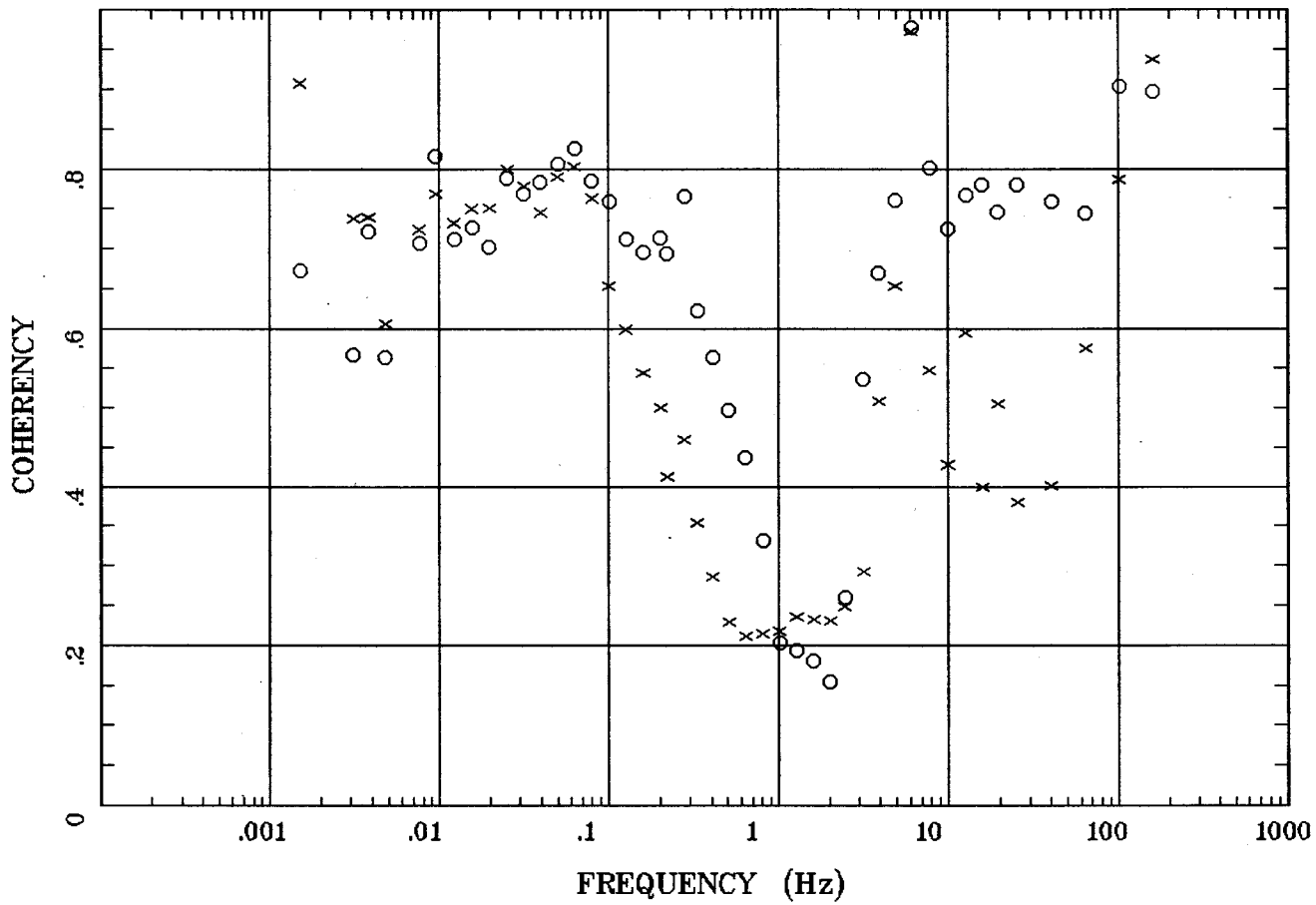
IMPEDANCE SKEW



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s41r27.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:08 Dec 01, 2004
< EMI – ElectroMagnetic Instruments >

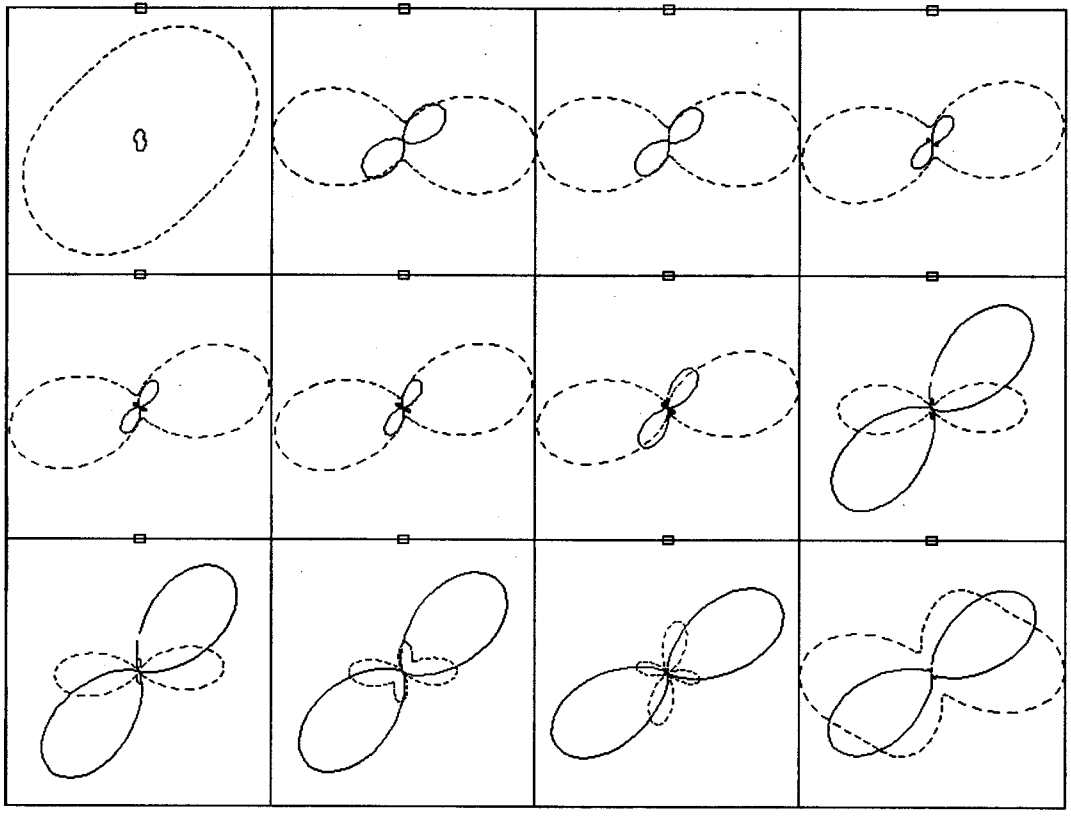
E MULT Coh.



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s41r27.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:08 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

POLAR PLOTS

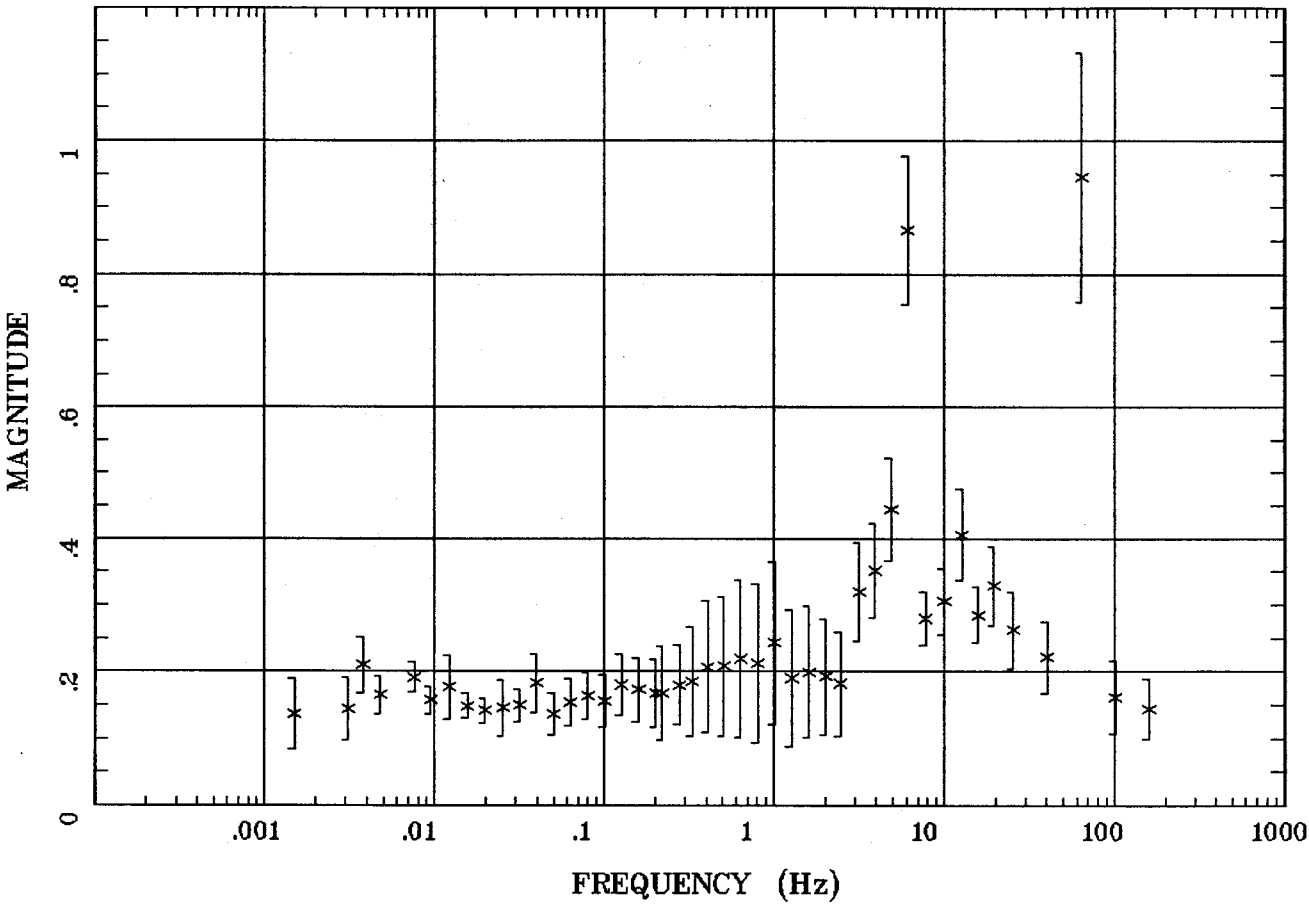


.0015 Hz	.0048 Hz	.0156 Hz	.0397 Hz
.101 Hz	.201 Hz	.408 Hz	1.013 Hz
2.456 Hz	4.883 Hz	12.695 Hz	40.263 Hz

Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s41r27.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:08 Dec 01, 2004
< EMI – ElectroMagnetic Instruments >

TIPPER MAGNITUDE

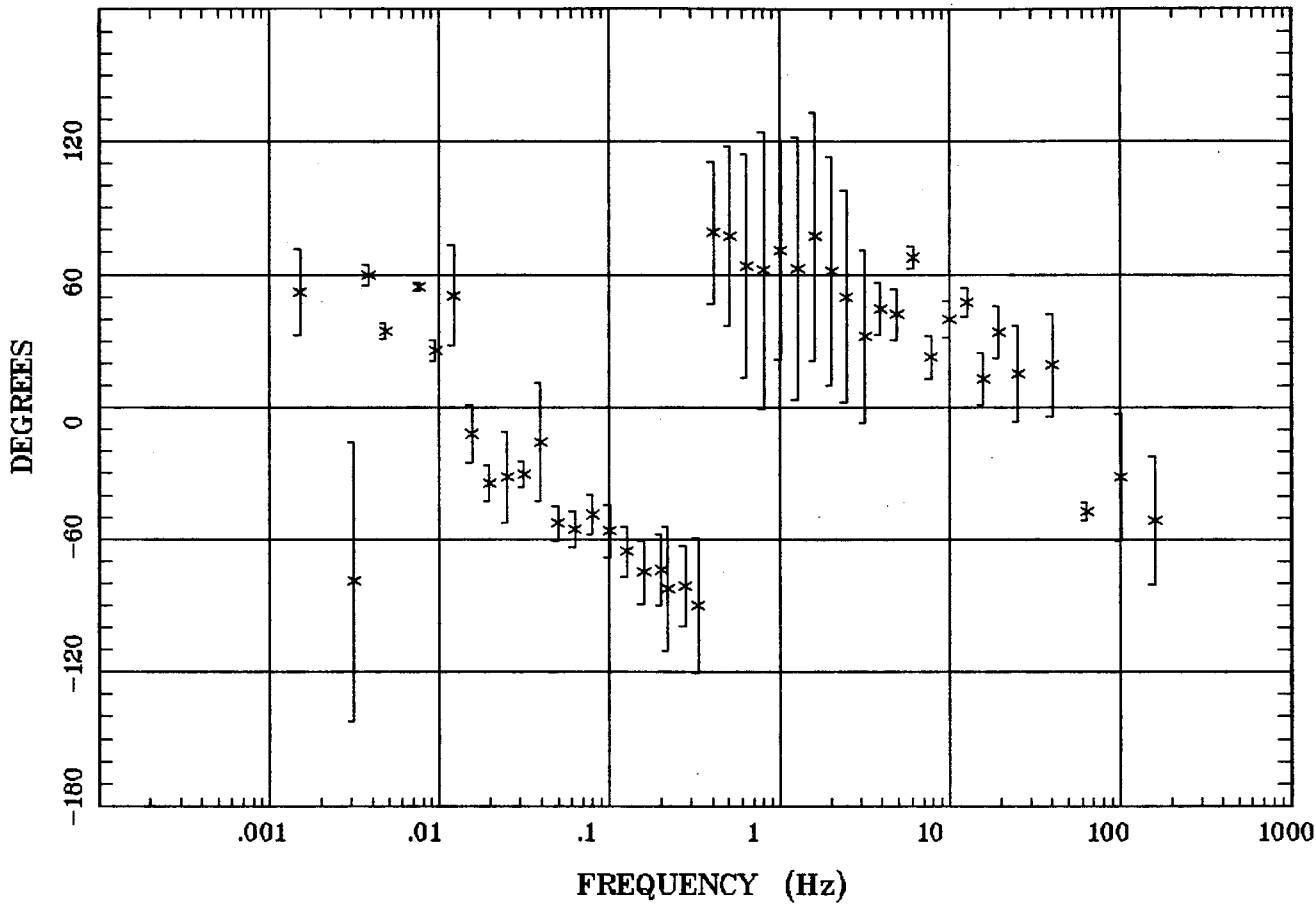


Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s41r27.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:08 Dec 01, 2004
< EMI – ElectroMagnetic Instruments >

SS

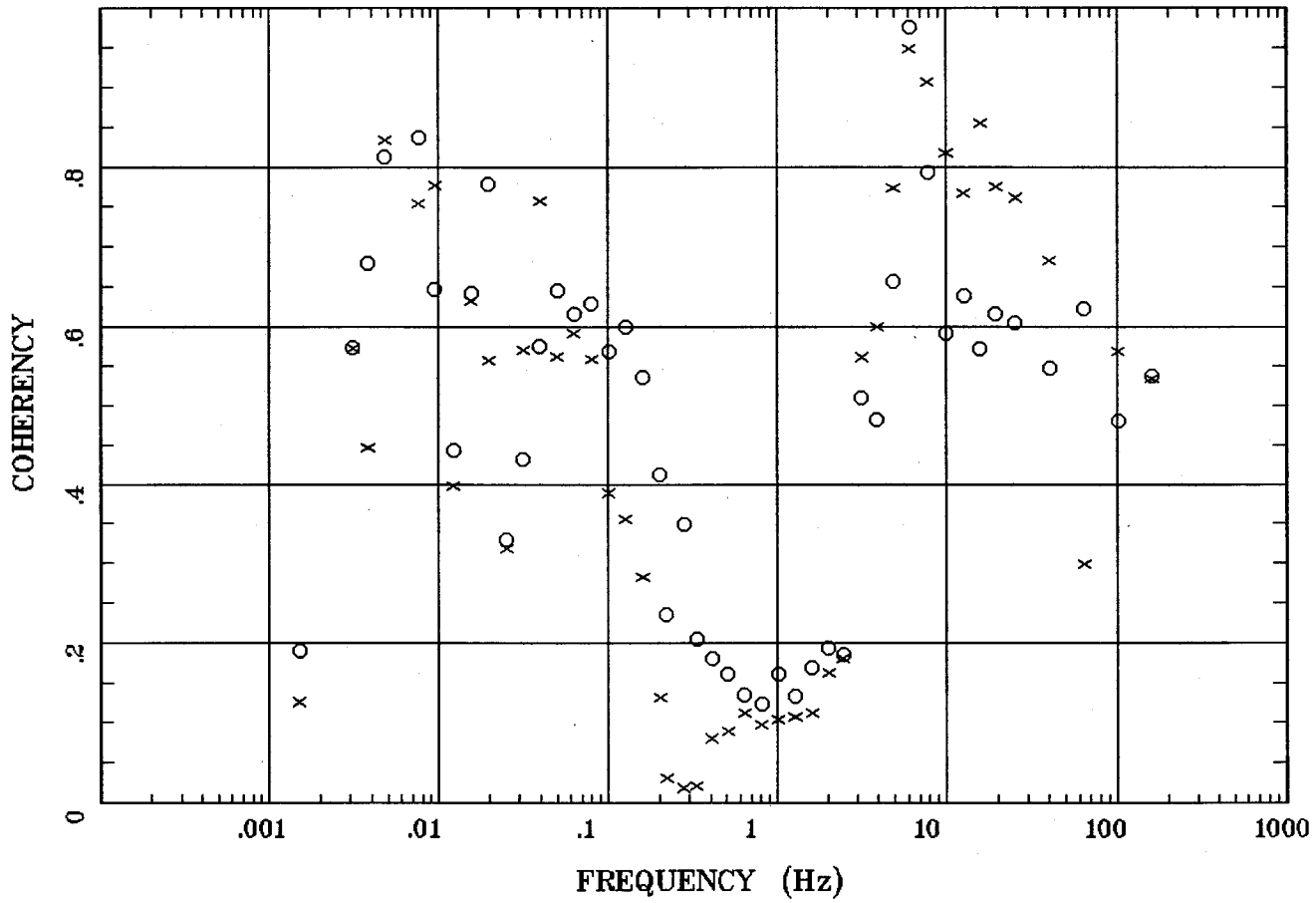
TIPPER STRIKE



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s41r27.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:08 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

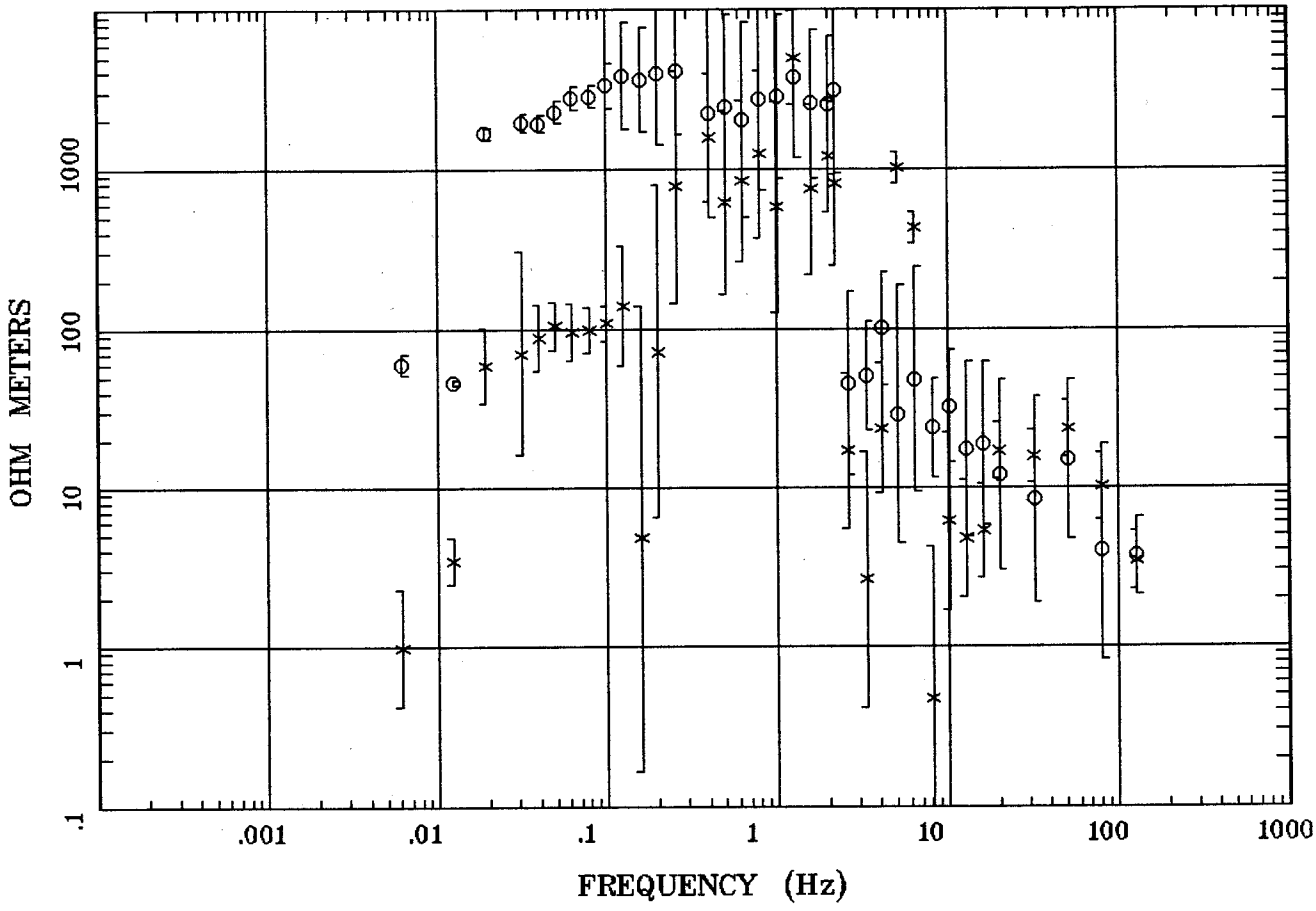
HzHx.x Coh HzHy.o



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s41r27.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:08 Dec 01, 2004
< EMI – ElectroMagnetic Instruments >

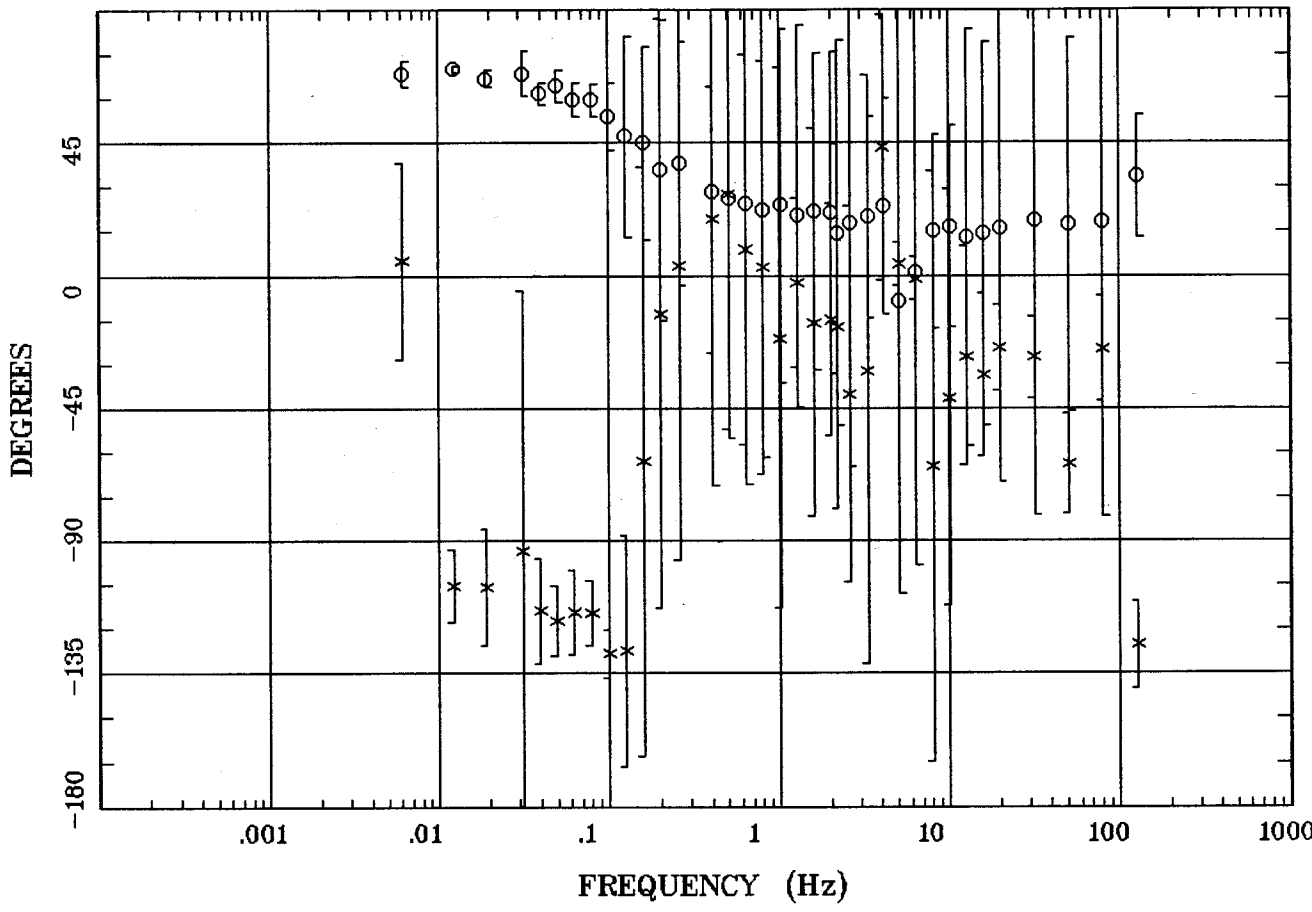
APPARENT RESISTIVITY



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s42r28.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:09 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

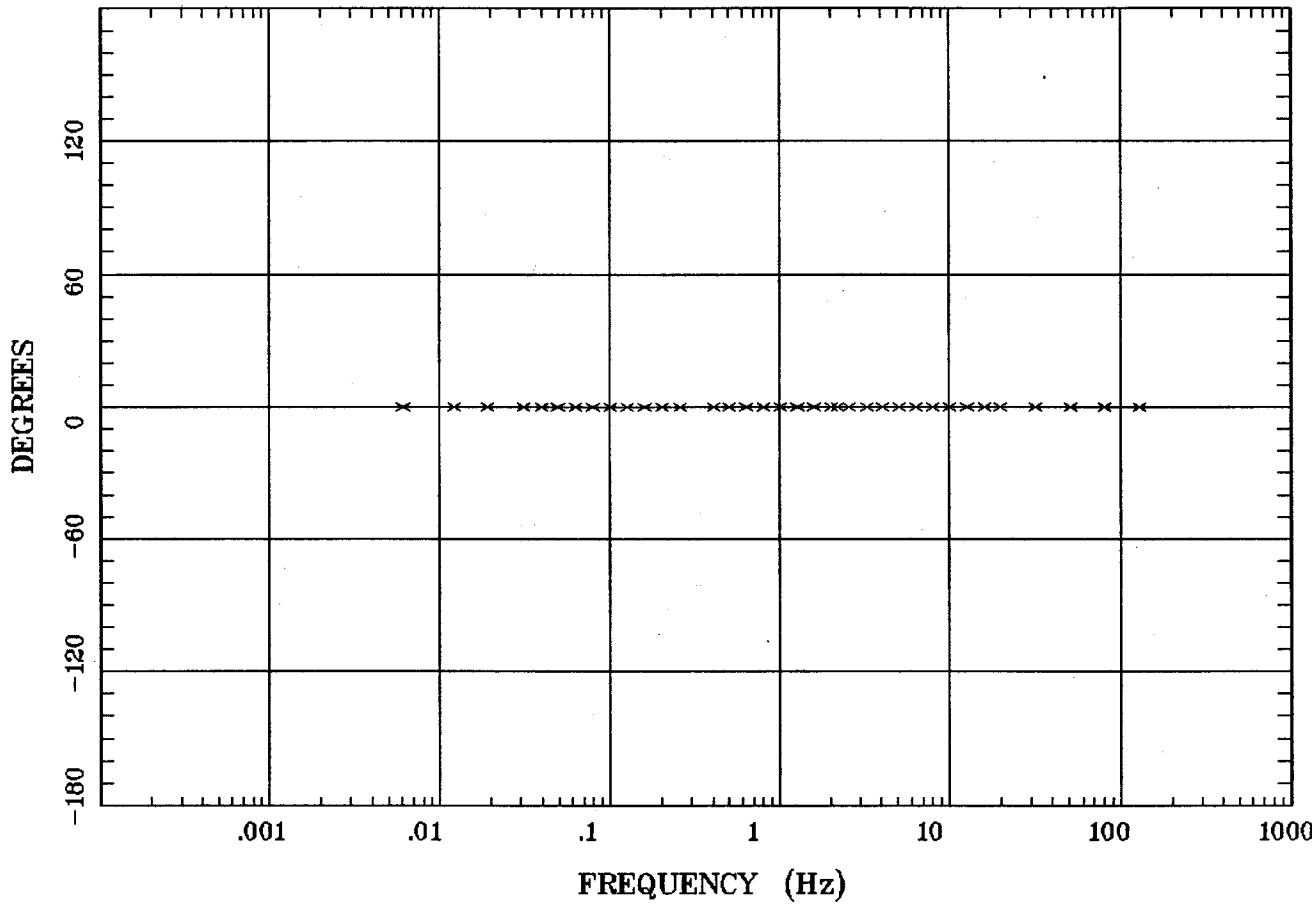
IMPEDANCE PHASE



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s42r28.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:09 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

ROTATION ANGLE

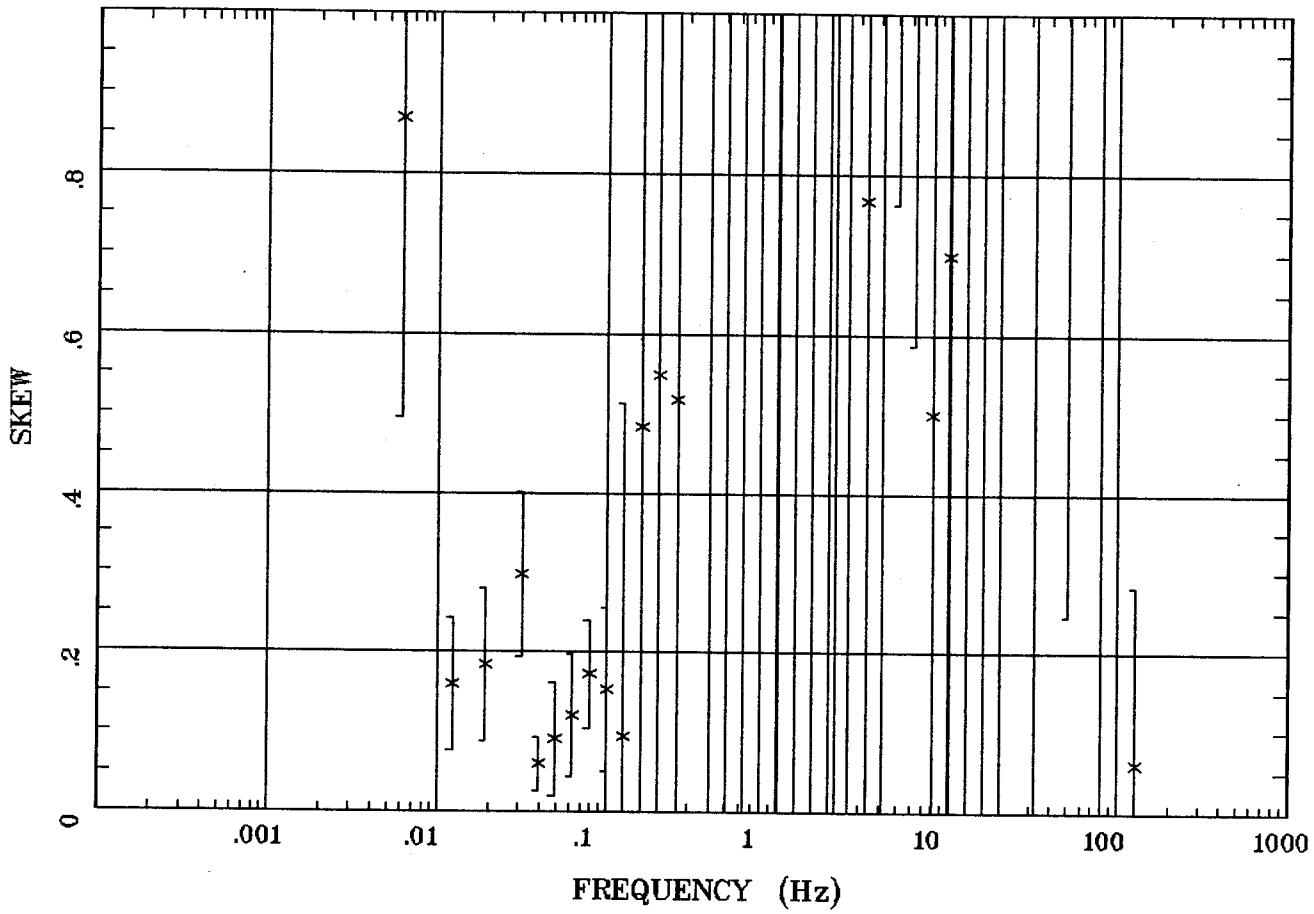


Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s42r28.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:09 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

09

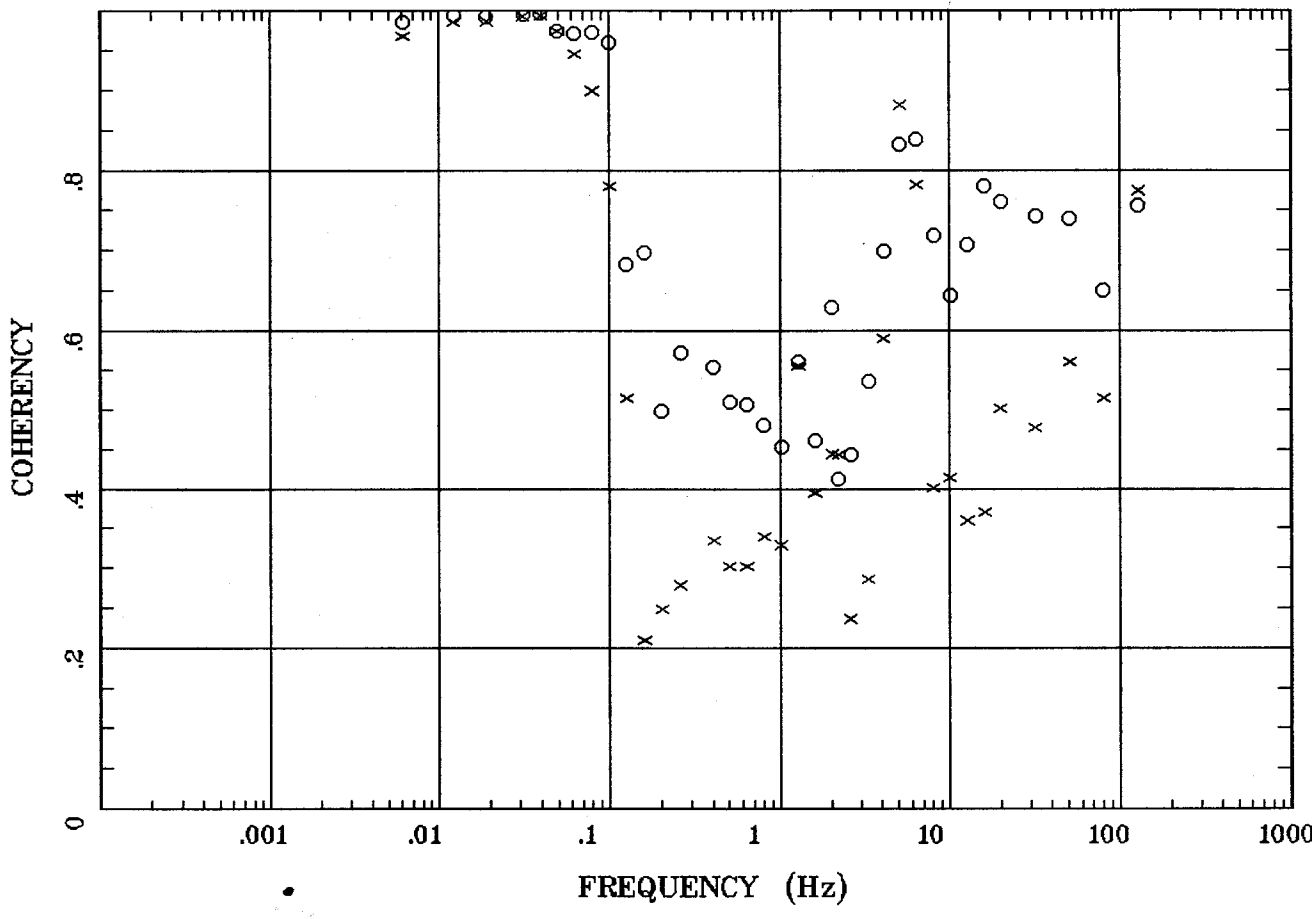
IMPEDANCE SKEW



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s42r28.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:09 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

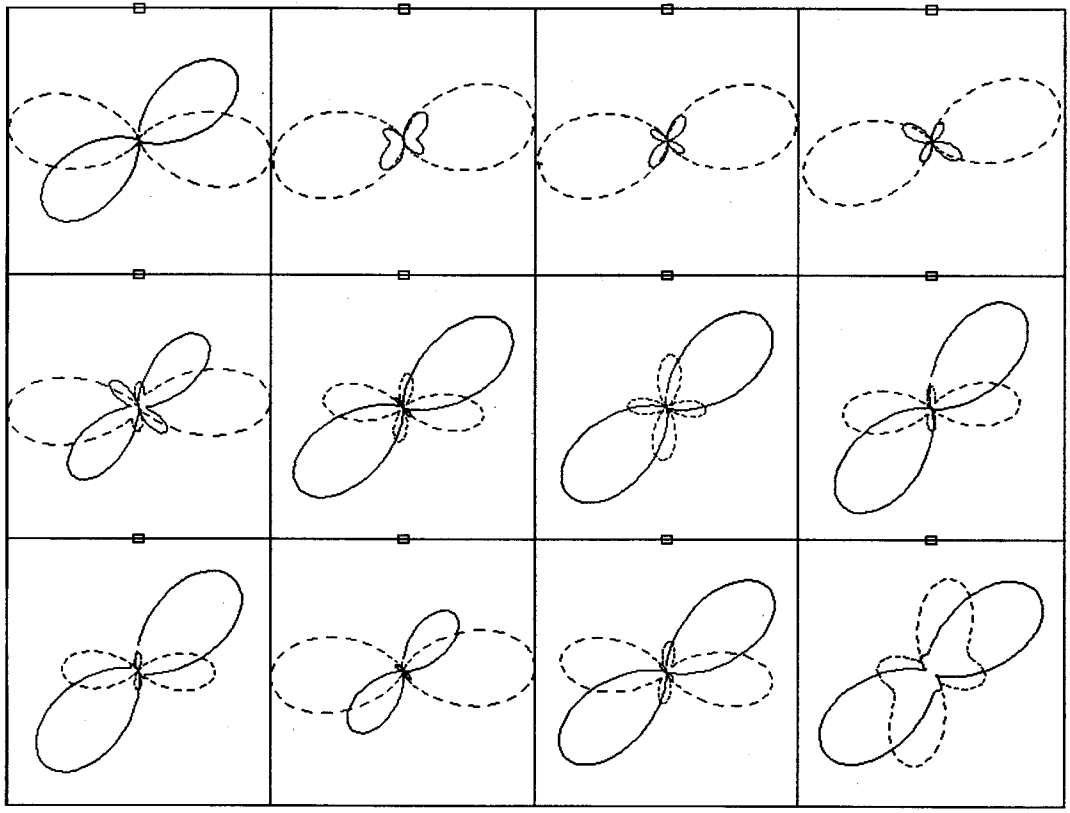
E MULT Coh.



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s42r28.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:09 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

POLAR PLOTS

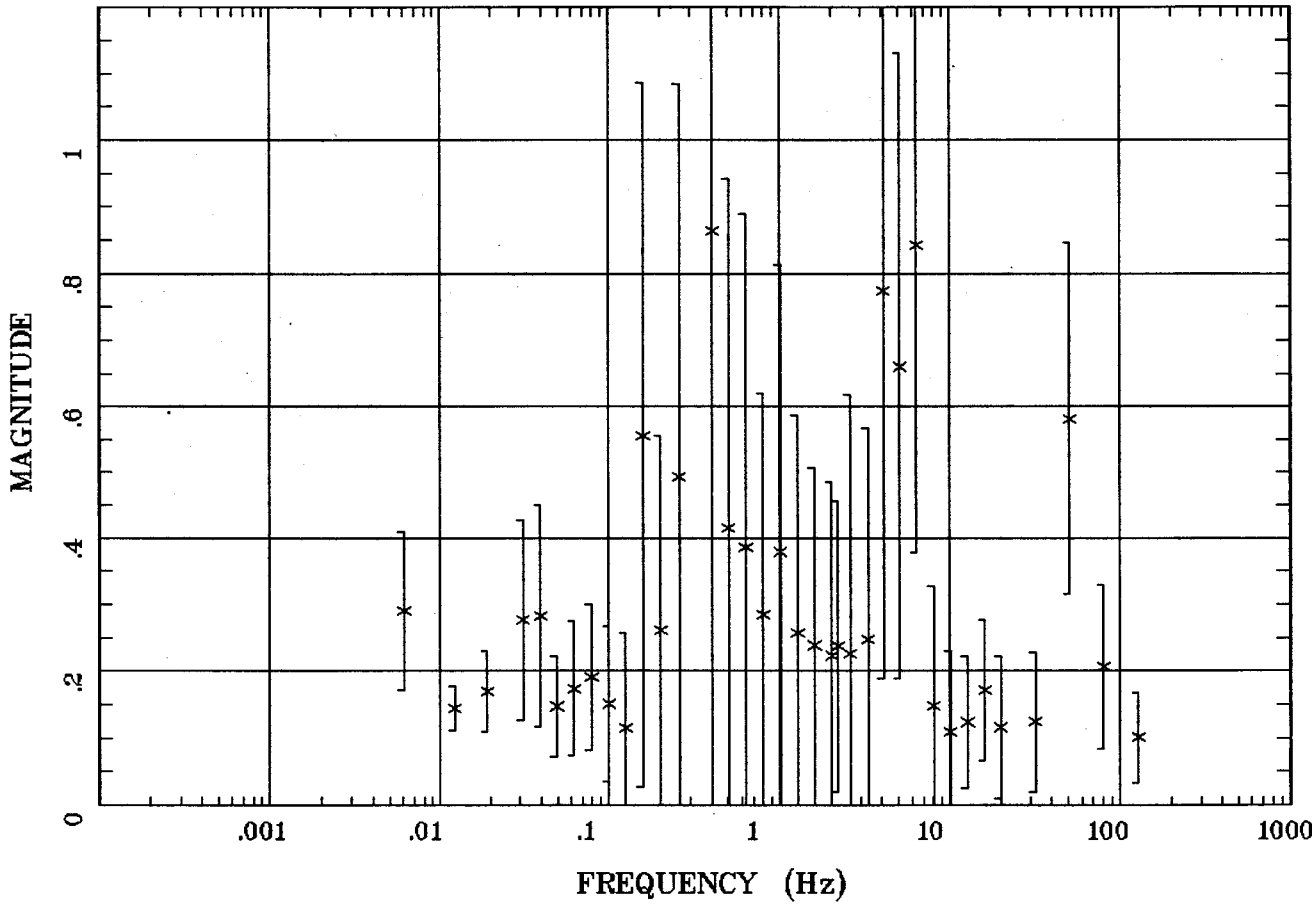


.0061 Hz	.0313 Hz	.0626 Hz	.126 Hz
.259 Hz	.635 Hz	1.273 Hz	2.197 Hz
4.093 Hz	8.076 Hz	16.135 Hz	51.025 Hz

Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s42r28.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:10 Dec 01, 2004
< EMI – ElectroMagnetic Instruments >

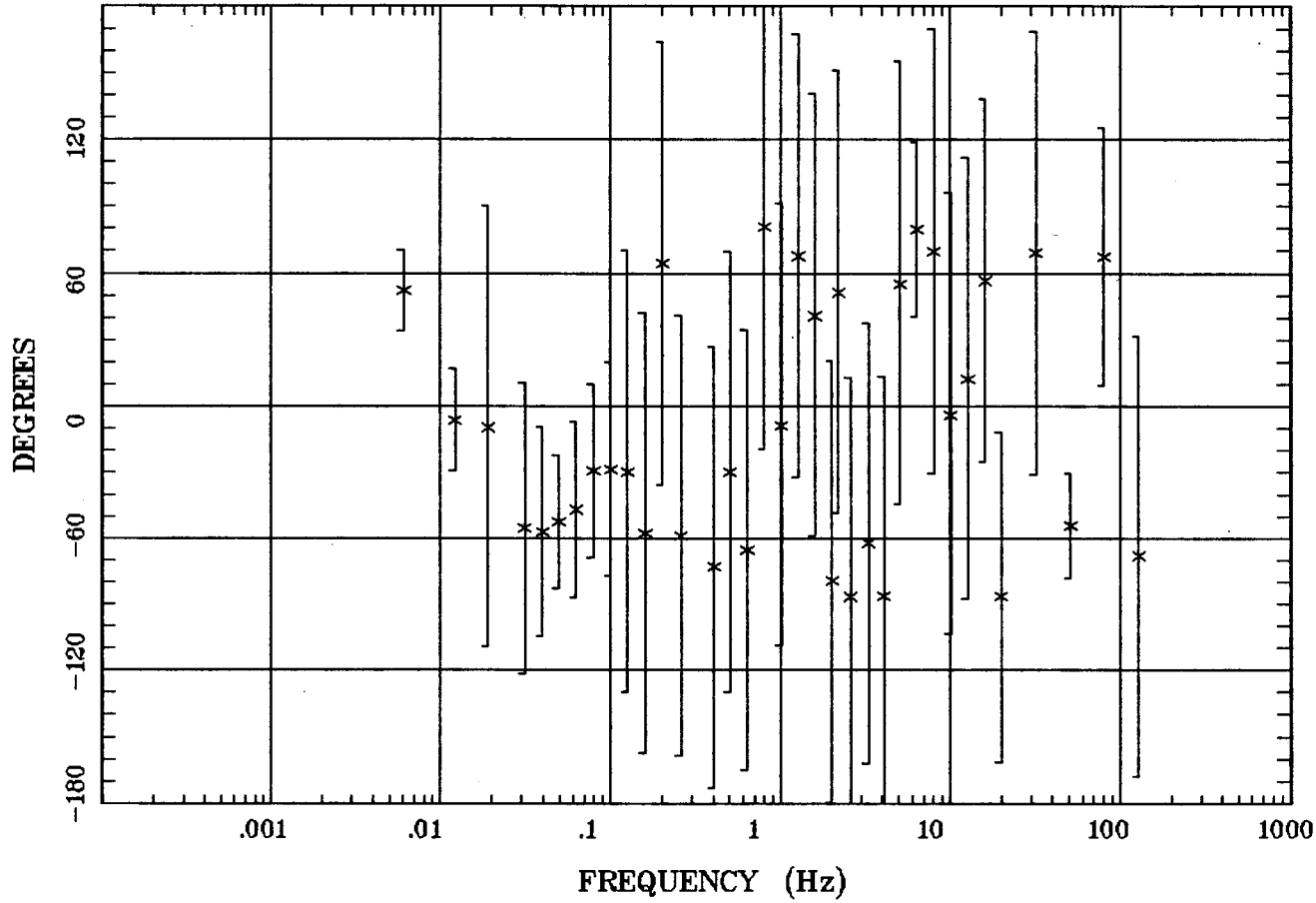
TIPPER MAGNITUDE



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s42r28.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:10 Dec 01, 2004
< EMI – ElectroMagnetic Instruments >

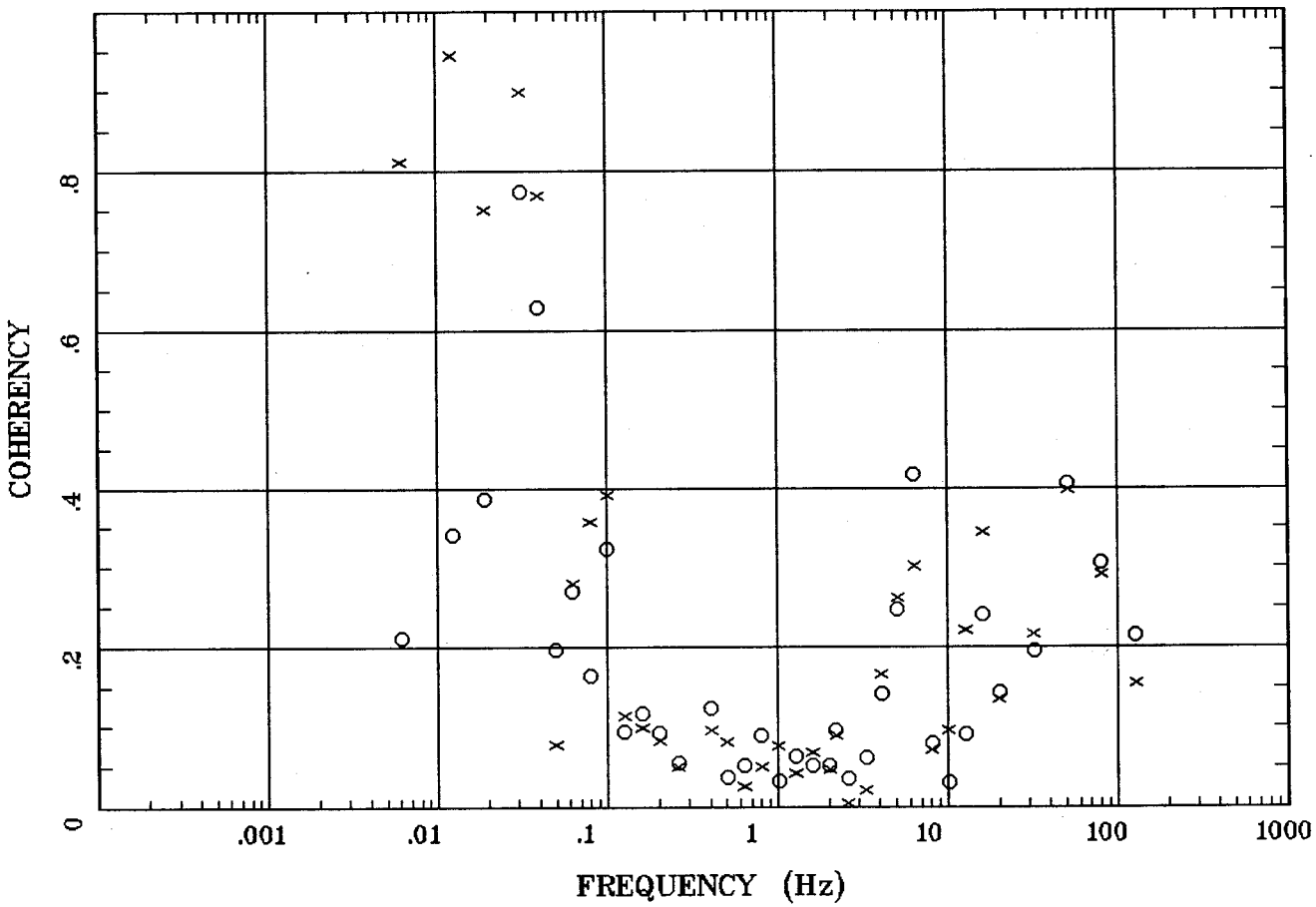
TIPPER STRIKE



Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s42r28.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:10 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

HzHx.x Coh HzHy.o

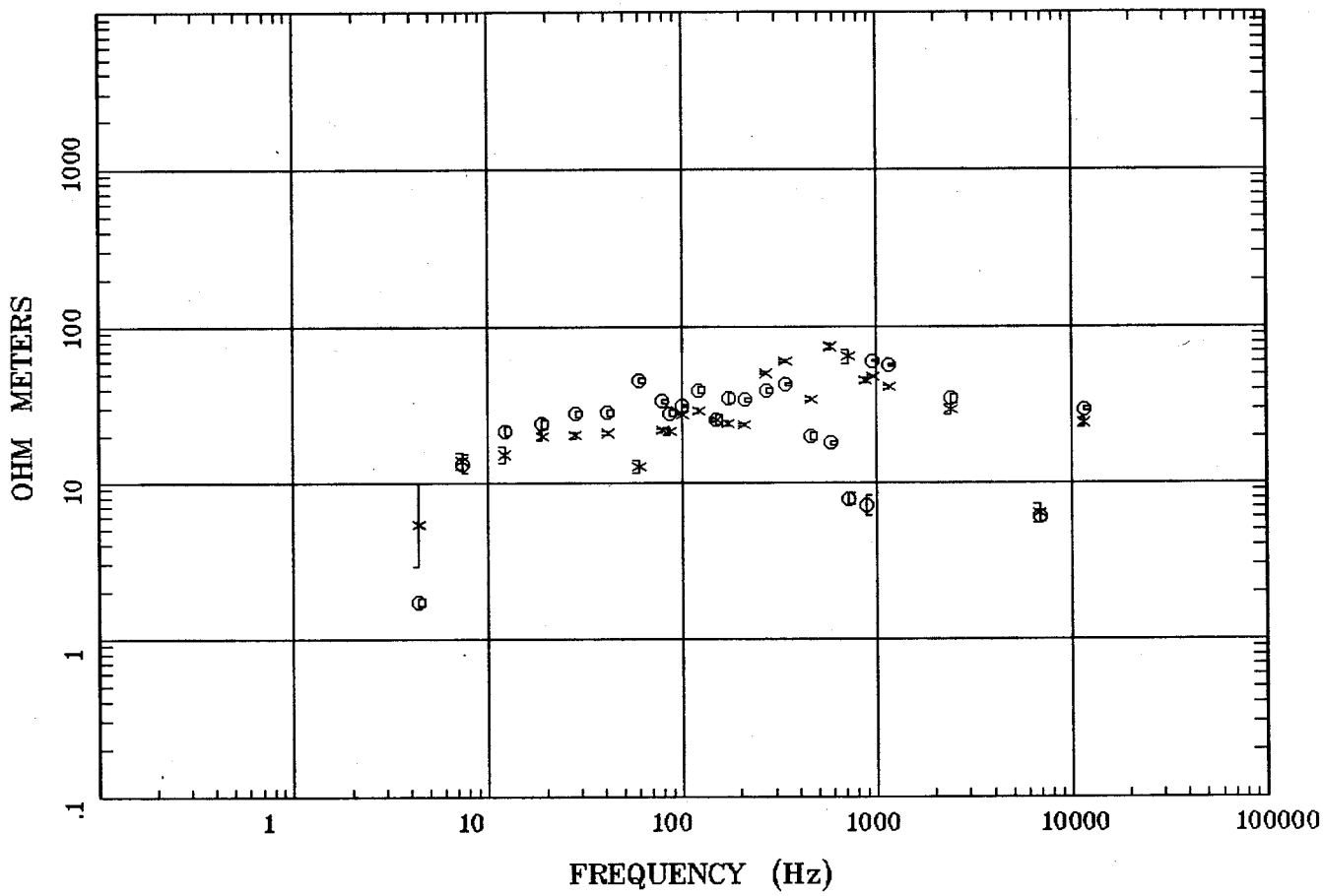


Client:
Remote:
Acquired: 19:5 Mar 08, 1998
Survey Co:

Rotation:
Filename: s42r28.a02
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 15:10 Dec 01, 2004
< EMI - ElectroMagnetic Instruments >

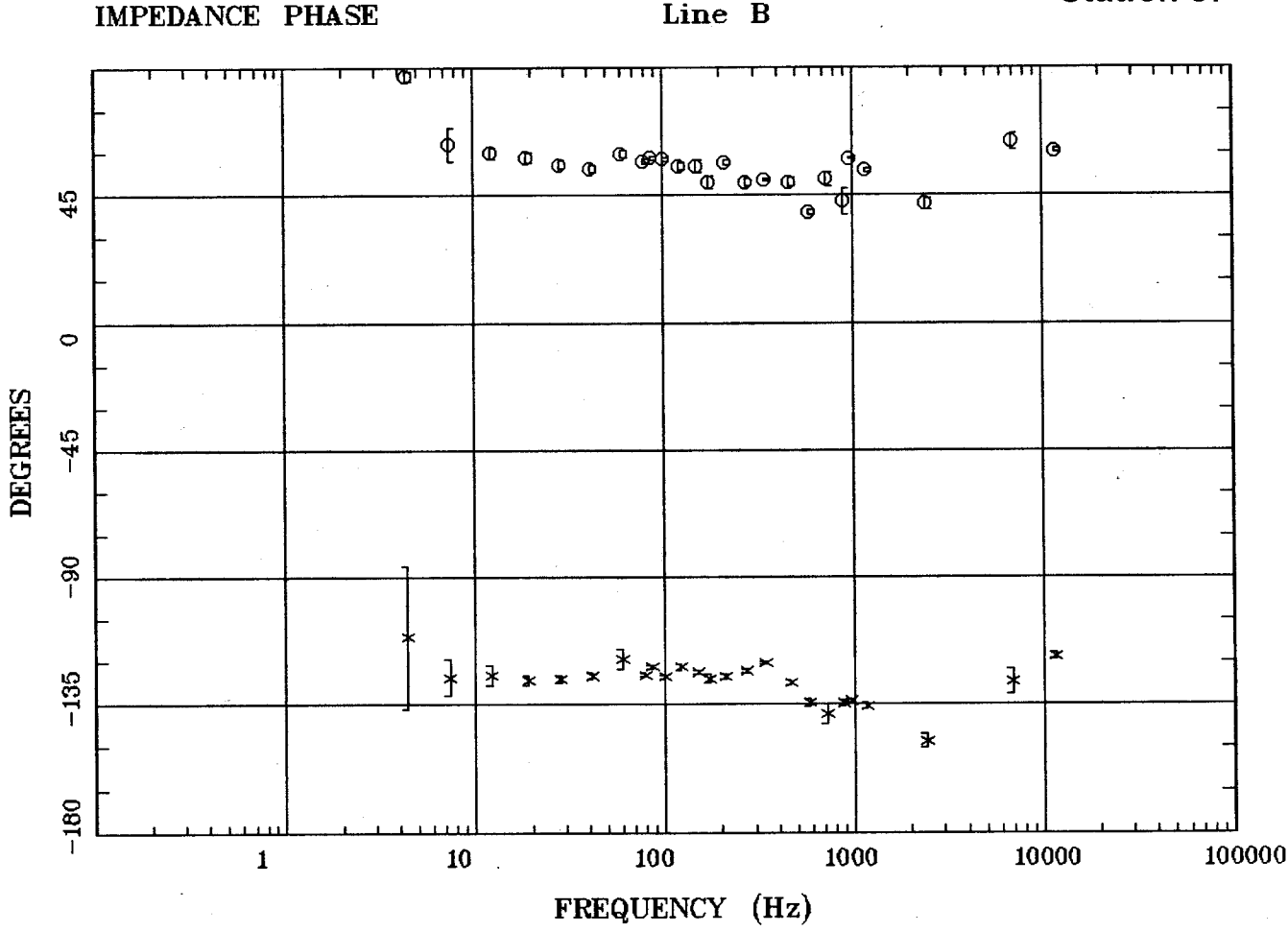
Station 37

APPARENT RESISTIVITY Line B



Client: Water Resources
Remote: none
Acquired: 16:3 Oct 30, 2003
Survey Co:USGS

Rotation:
Filename: nts37.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 09:54 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

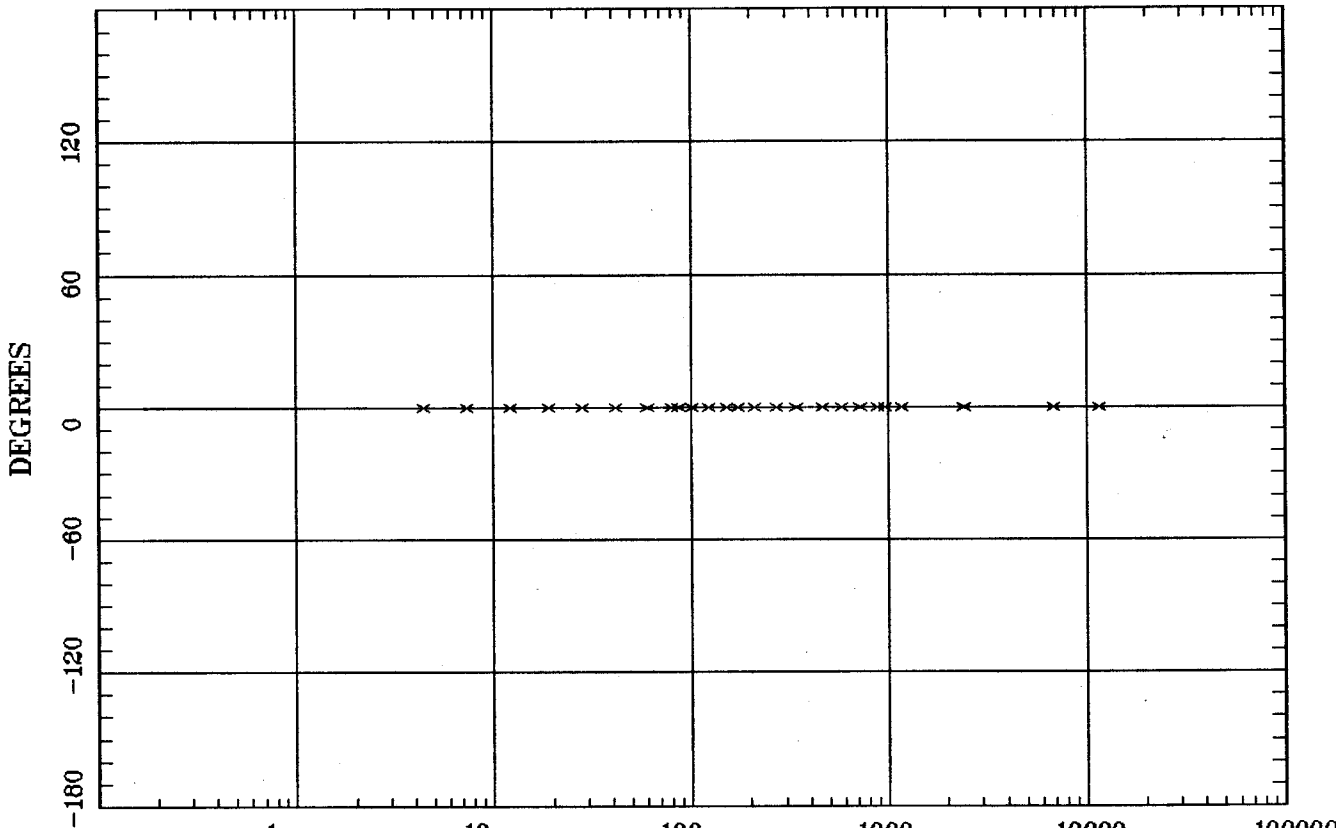


Client: Water Resources
Remote: none
Acquired: 16:3 Oct 30, 2003
Survey Co:USGS

Rotation:
Filename: nts37.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 09:54 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

Station 37

ROTATION ANGLE Line B



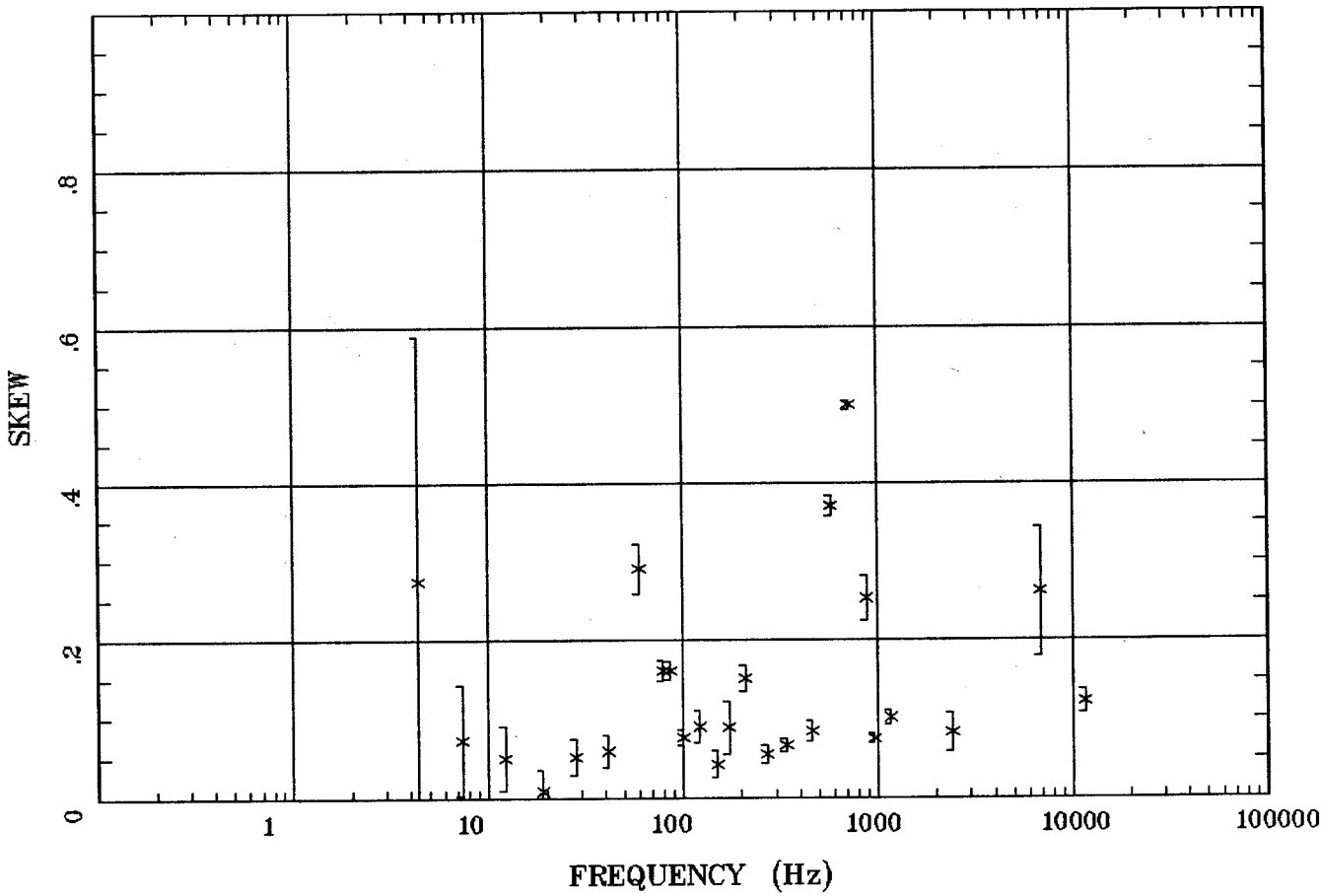
Client: Water Resources
Remote: none
Acquired: 16:3 Oct 30, 2003
Survey Co:USGS

Rotation:
Filename: nts37.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 09:54 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

Station 37

IMPEDANCE SKEW

Line B

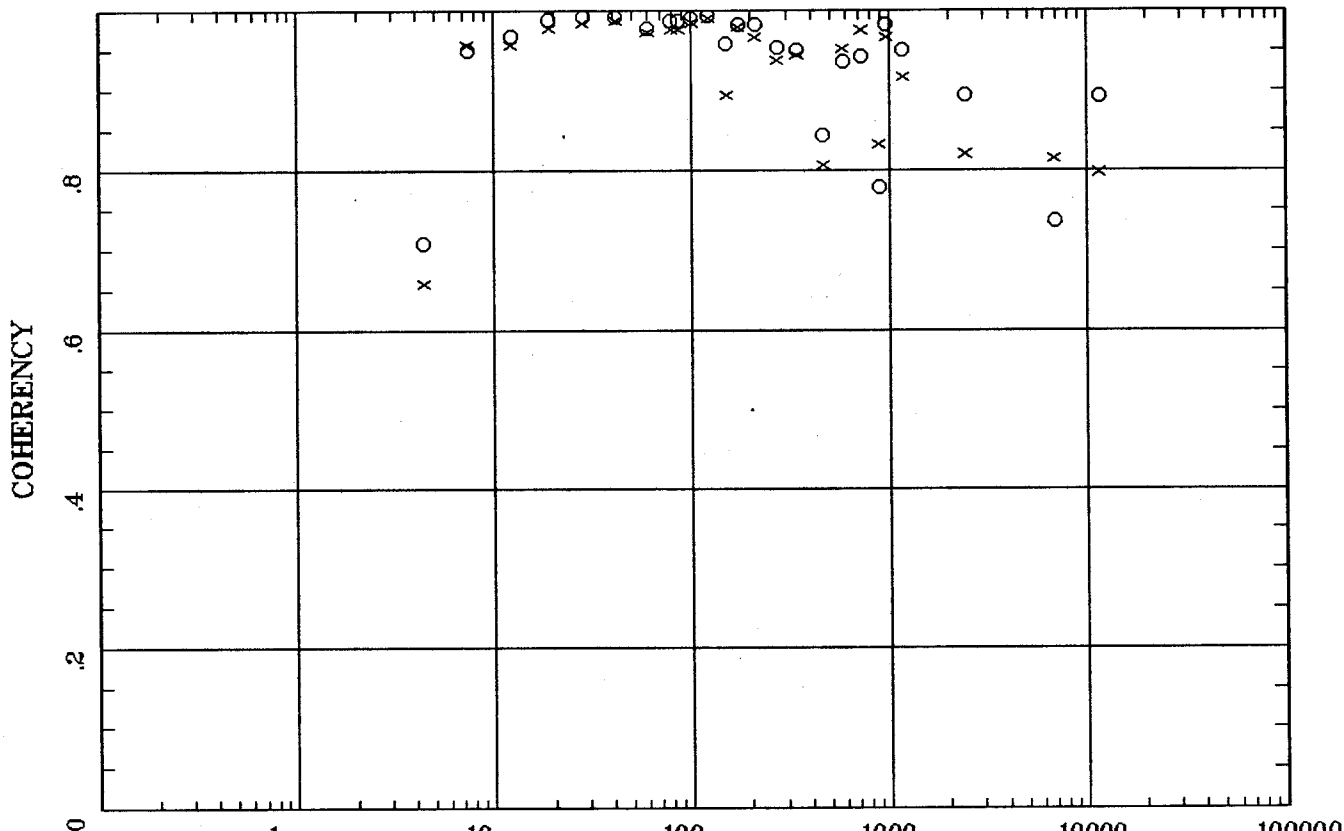


Client: Water Resources
Remote: none
Acquired: 16:3 Oct 30, 2003
Survey Co:USGS

Rotation:
Filename: nts37.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 09:54 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

E MULT Coh.

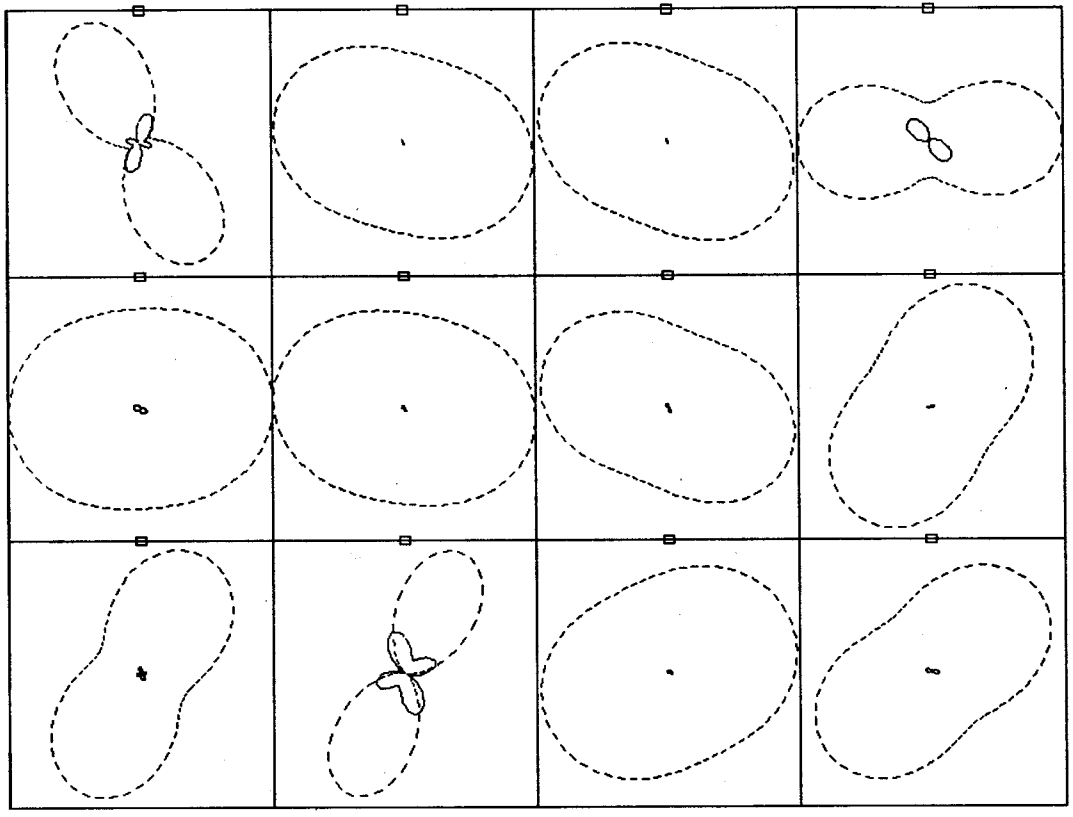
Line B



Client: Water Resources
Remote: none
Acquired: 16:3 Oct 30, 2003
Survey Co:USGS

Rotation:
Filename: nts37.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 09:54 Nov 29, 2004
< EMI – ElectroMagnetic Instruments >

POLAR PLOTS Line B

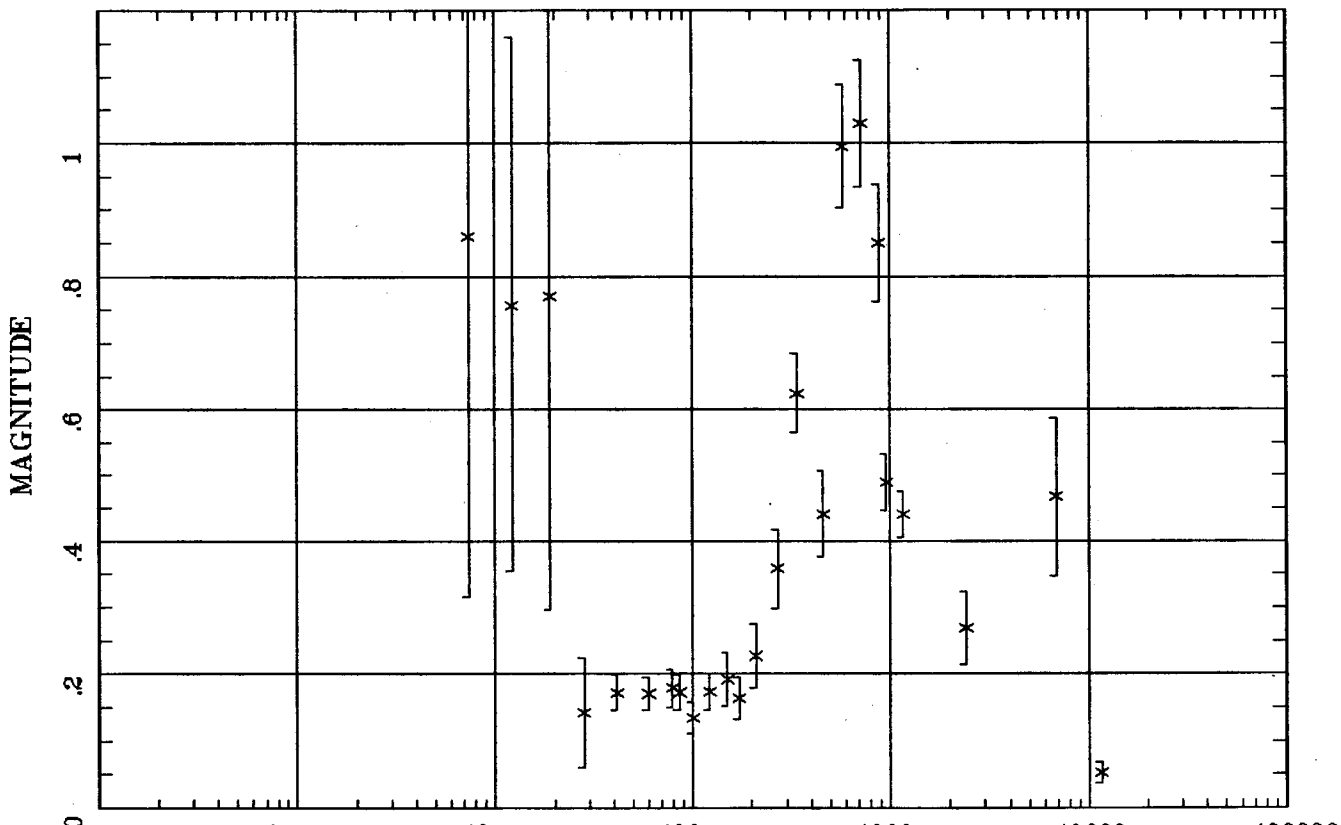


4.394 Hz	12.207 Hz	28.320 Hz	60.059 Hz
85.938 Hz	122 Hz	172 Hz	270 Hz
460 Hz	720 Hz	960 Hz	2420 Hz

Client: Water Resources
Remote: none
Acquired: 16:3 Oct 30, 2003
Survey Co:USGS

Rotation:
Filename: nts37.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 09:54 Nov 29, 2004
< EMI – ElectroMagnetic Instruments >

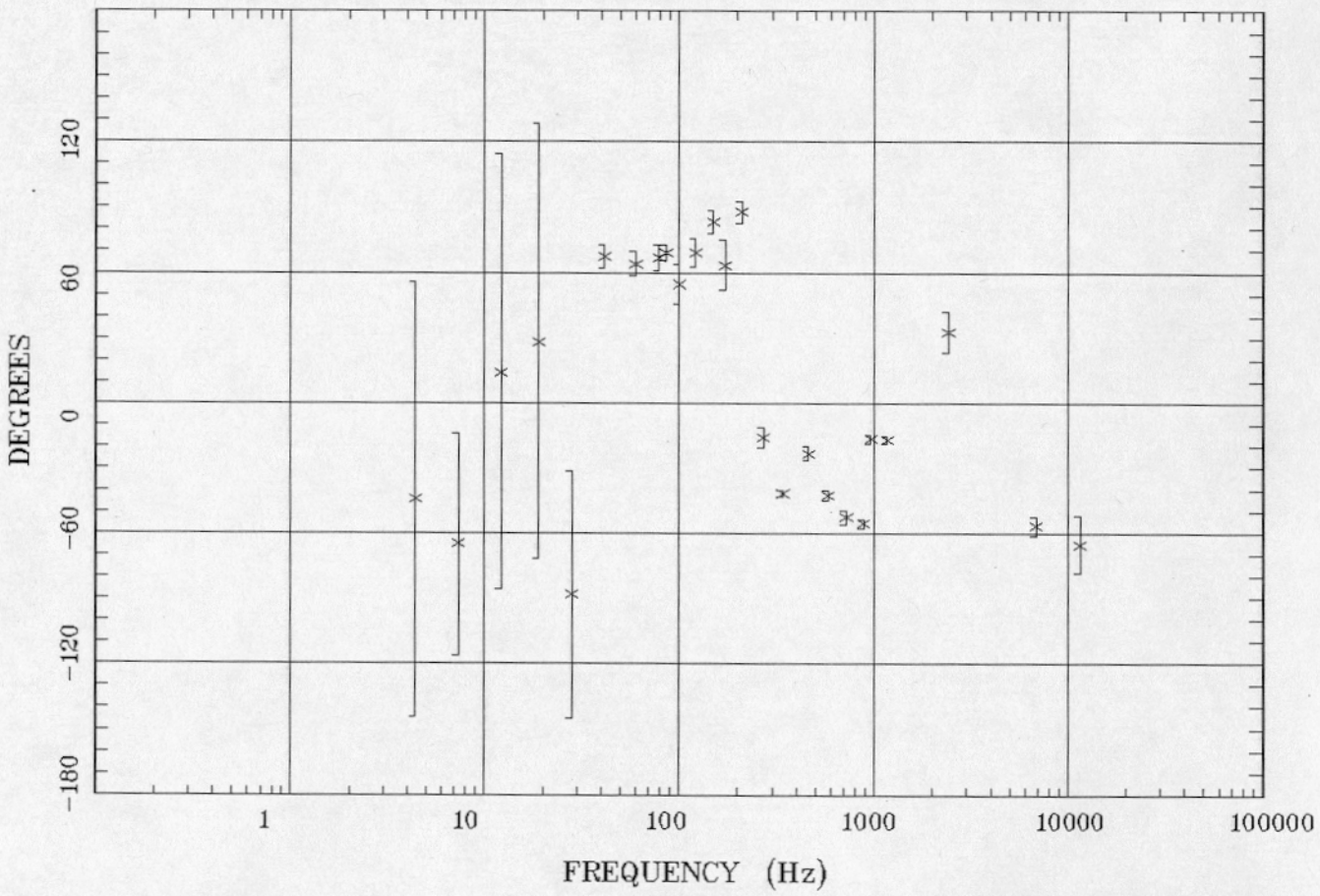
TIPPER MAGNITUDE Line B **Station 37**



Client: Water Resources
Remote: none
Acquired: 16:3 Oct 30, 2003
Survey Co:USGS

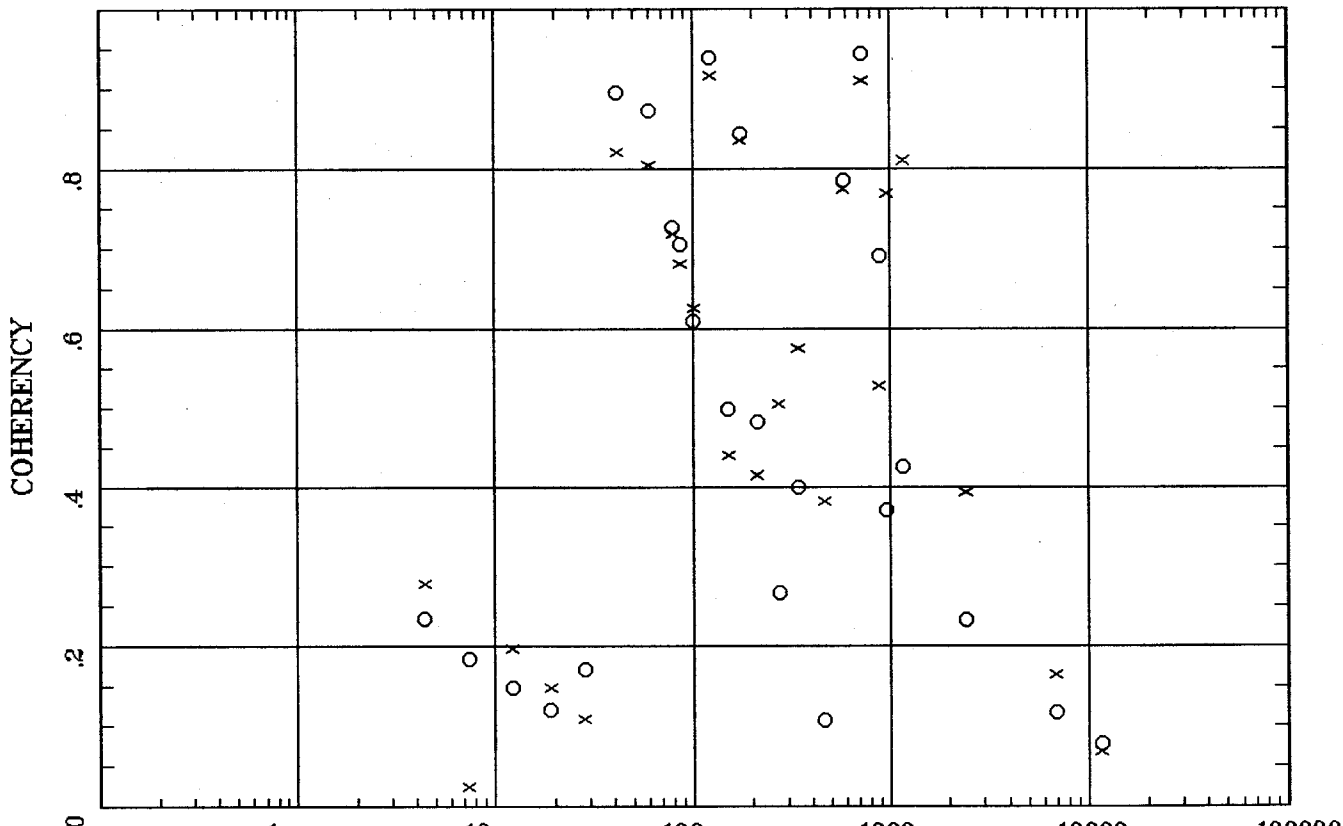
Rotation:
Filename: nts37.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 09:54 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

TIPPER STRIKE Line B **Station 37**



Client: Water Resources
Remote: none
Acquired: 16:3 Oct 30, 2003
Survey Co:USGS

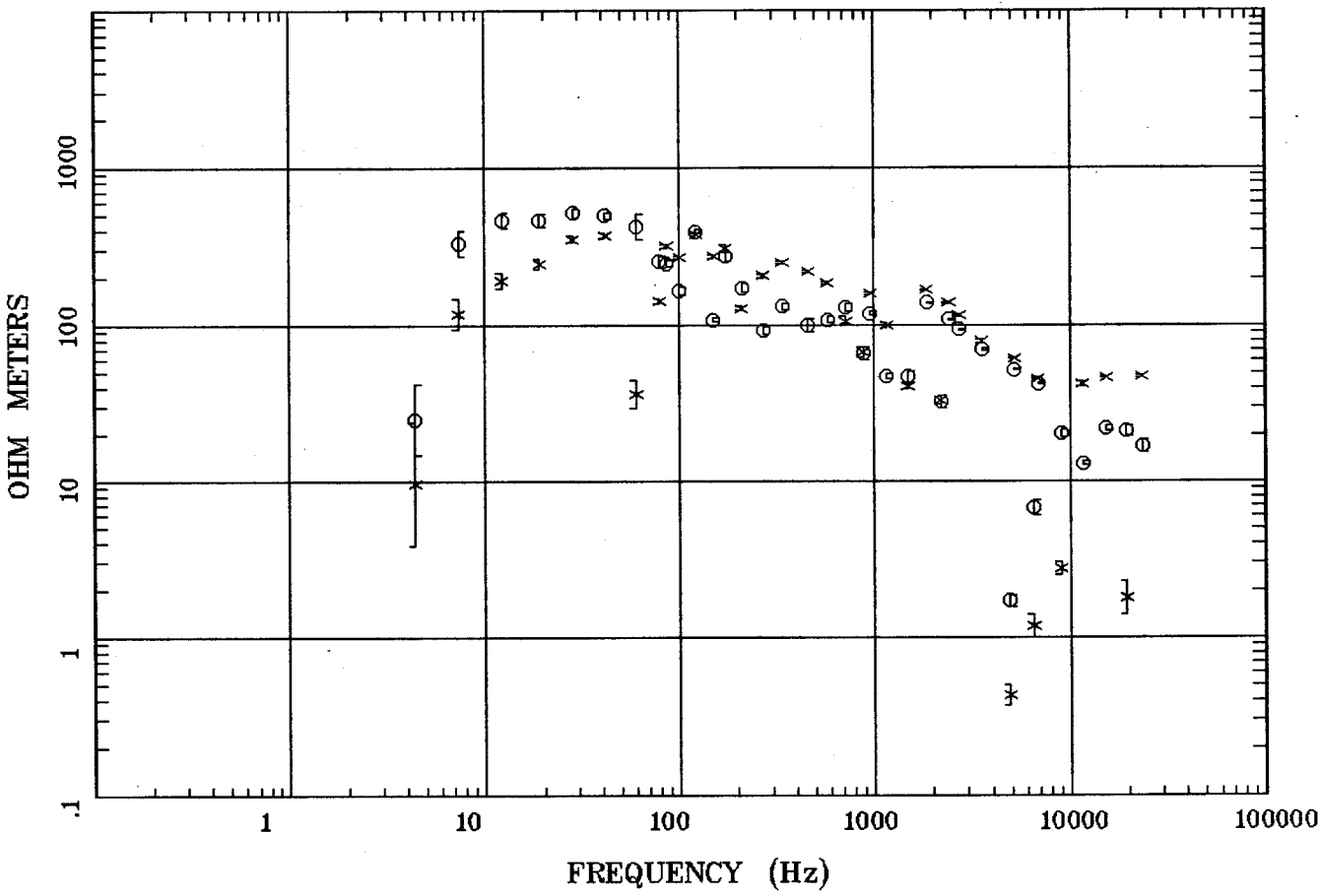
Rotation:
Filename: nts37.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 09:54 Nov 29, 2004
< EMI – ElectroMagnetic Instruments >



Client: Water Resources
Remote: none
Acquired: 16:3 Oct 30, 2003
Survey Co:USGS

Rotation:
Filename: nts37.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 09:54 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

APPARENT RESISTIVITY Line B

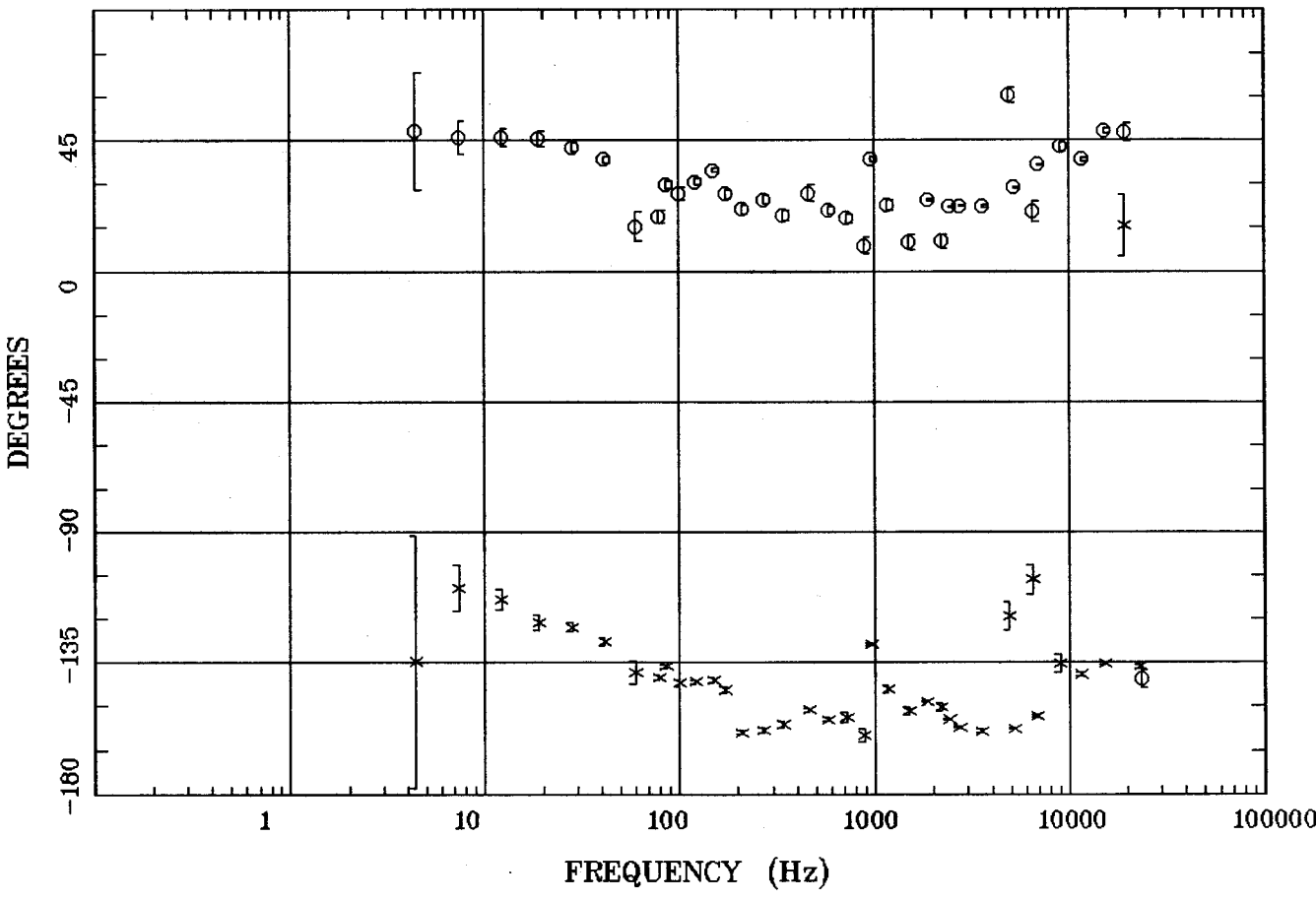


Client: Water Resources
Remote: none
Acquired: 15:4 Oct 28, 2003
Survey Co:USGS

Rotation:
Filename: nts38a.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 09:55 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

Station 38

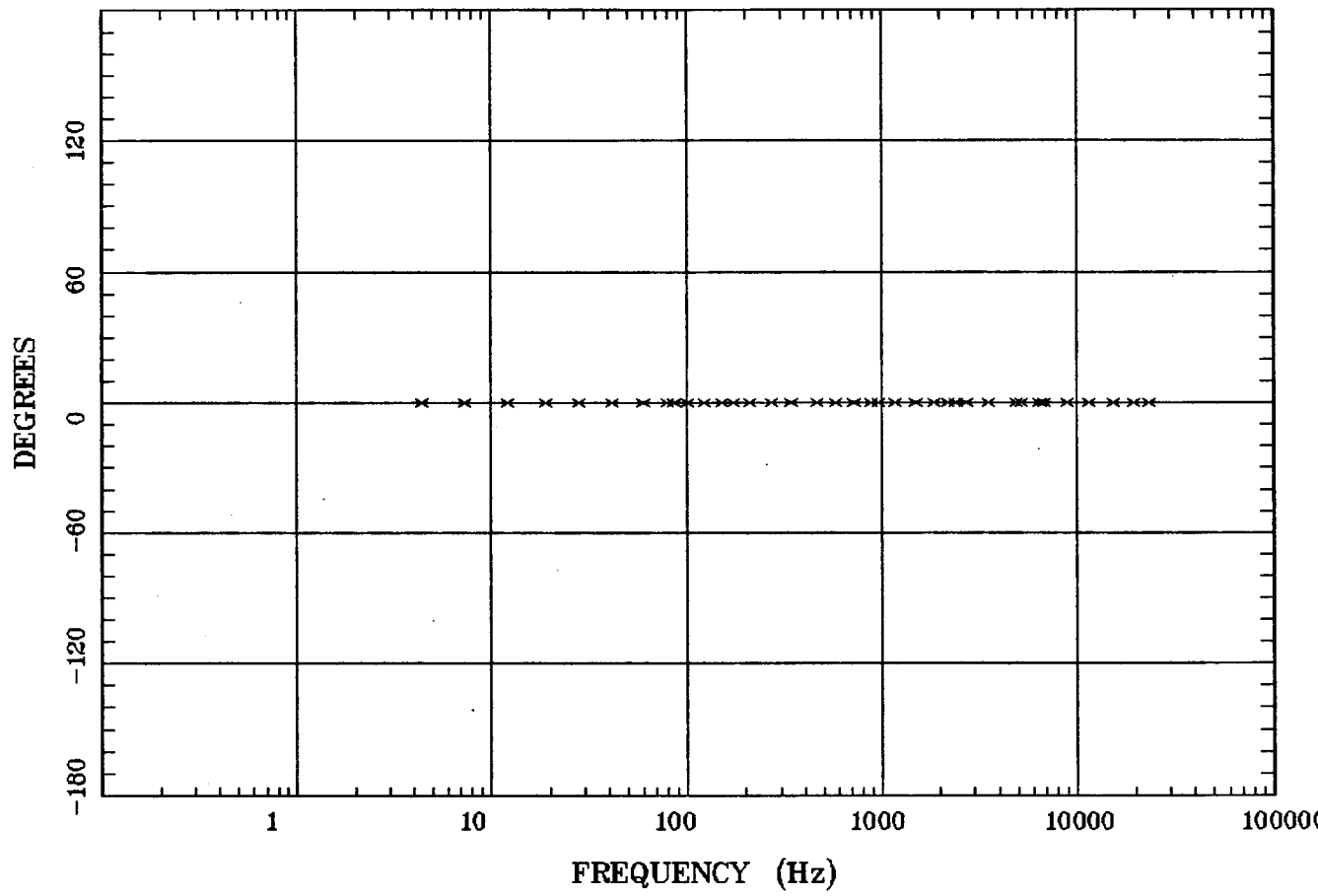
IMPEDANCE PHASE Line B



Client: Water Resources
Remote: none
Acquired: 15:4 Oct 28, 2003
Survey Co:USGS

Rotation:
Filename: nts38a.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 09:56 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

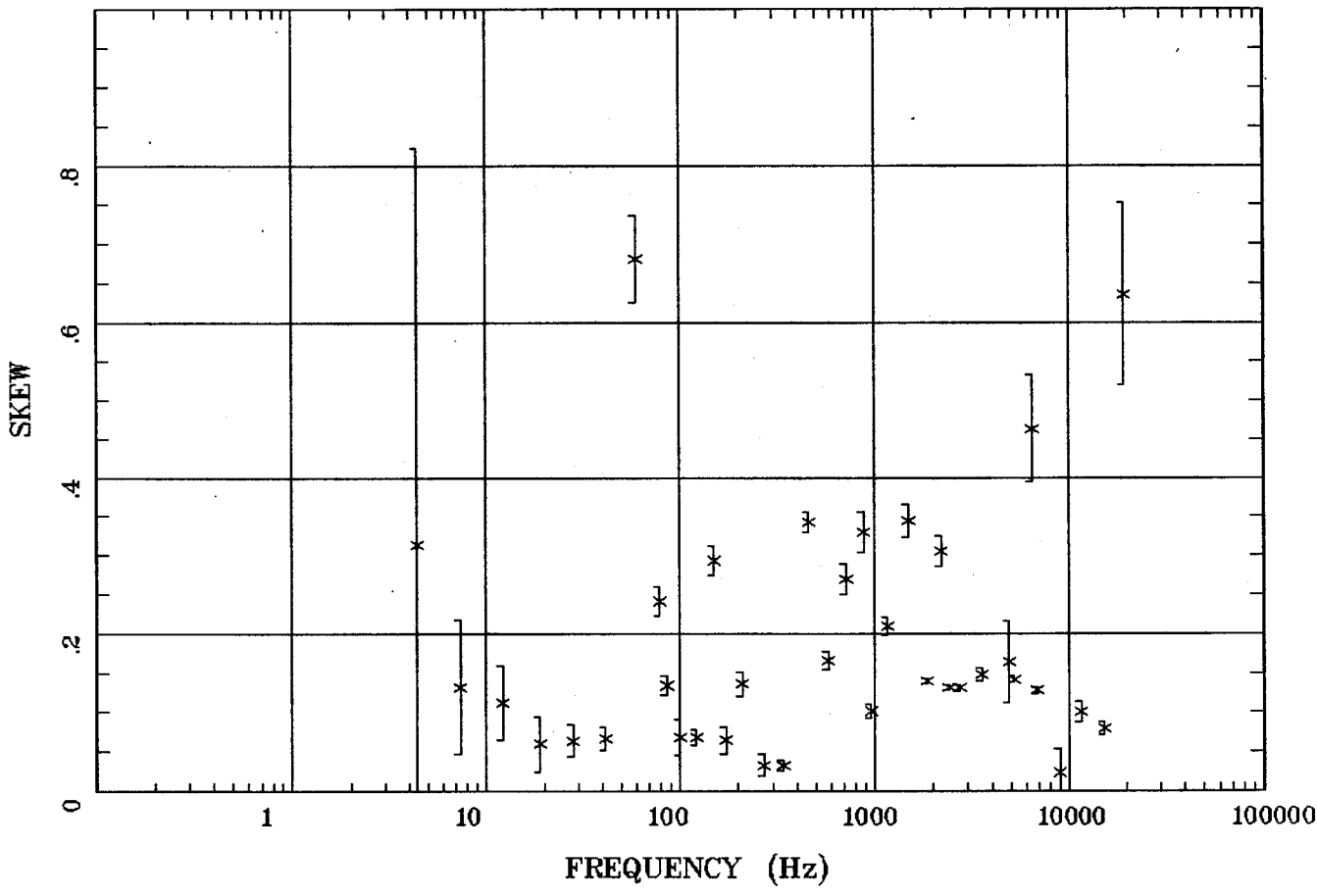
ROTATION ANGLE Line B



Client: Water Resources
Remote: none
Acquired: 15:4 Oct 28, 2003
Survey Co:USGS

Rotation:
Filename: nts38a.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 09:56 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

IMPEDANCE SKEW Line B

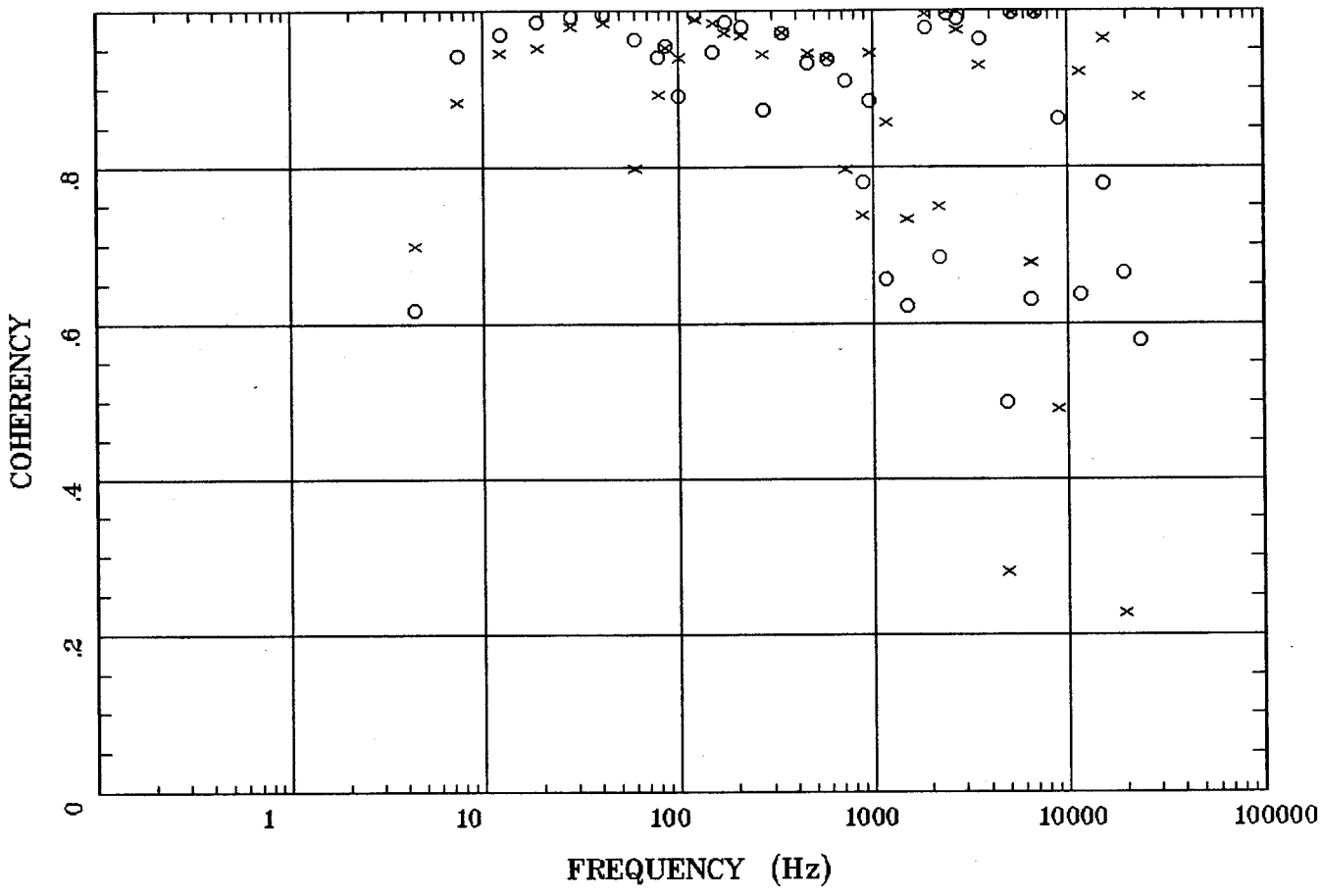


Client: Water Resources
Remote: none
Acquired: 15:4 Oct 28, 2003
Survey Co:USGS

Rotation:
Filename: nts38a.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 09:56 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

E MULT Coh.

Line B

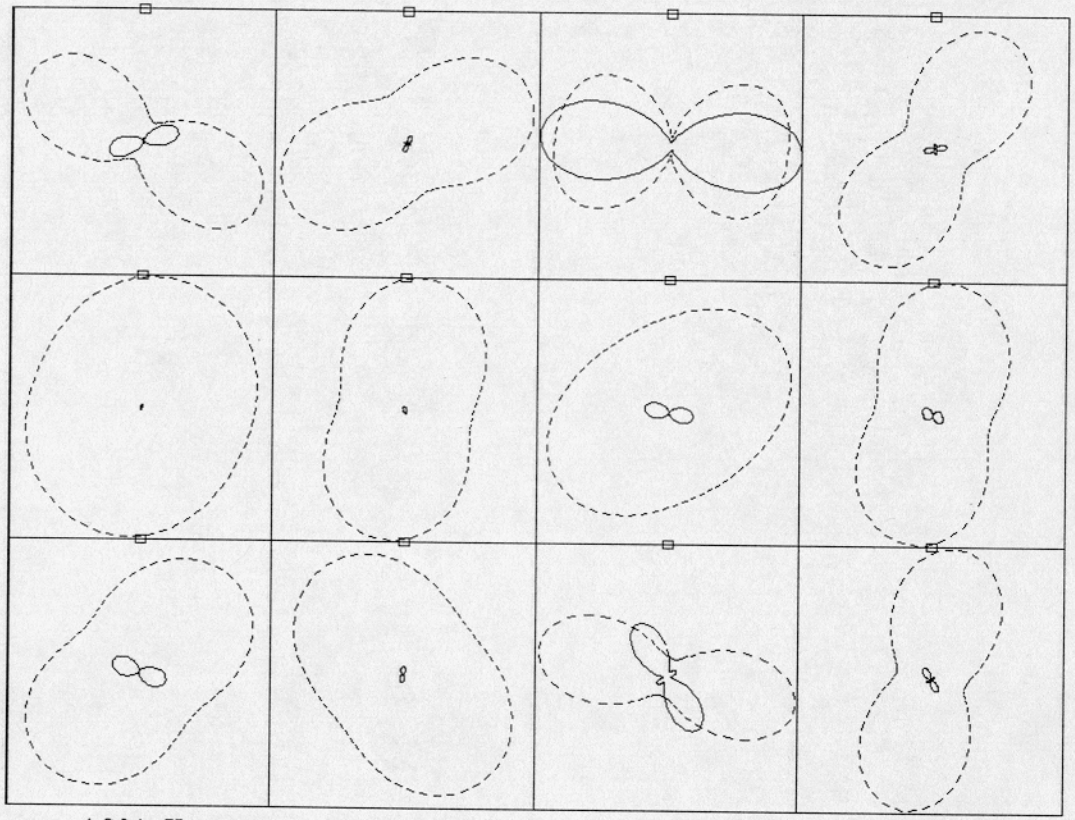


Client: Water Resources
Remote: none
Acquired: 15:4 Oct 28, 2003
Survey Co:USGS

Rotation:
Filename: nts38a.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 09:56 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

POLAR PLOTS

Line B



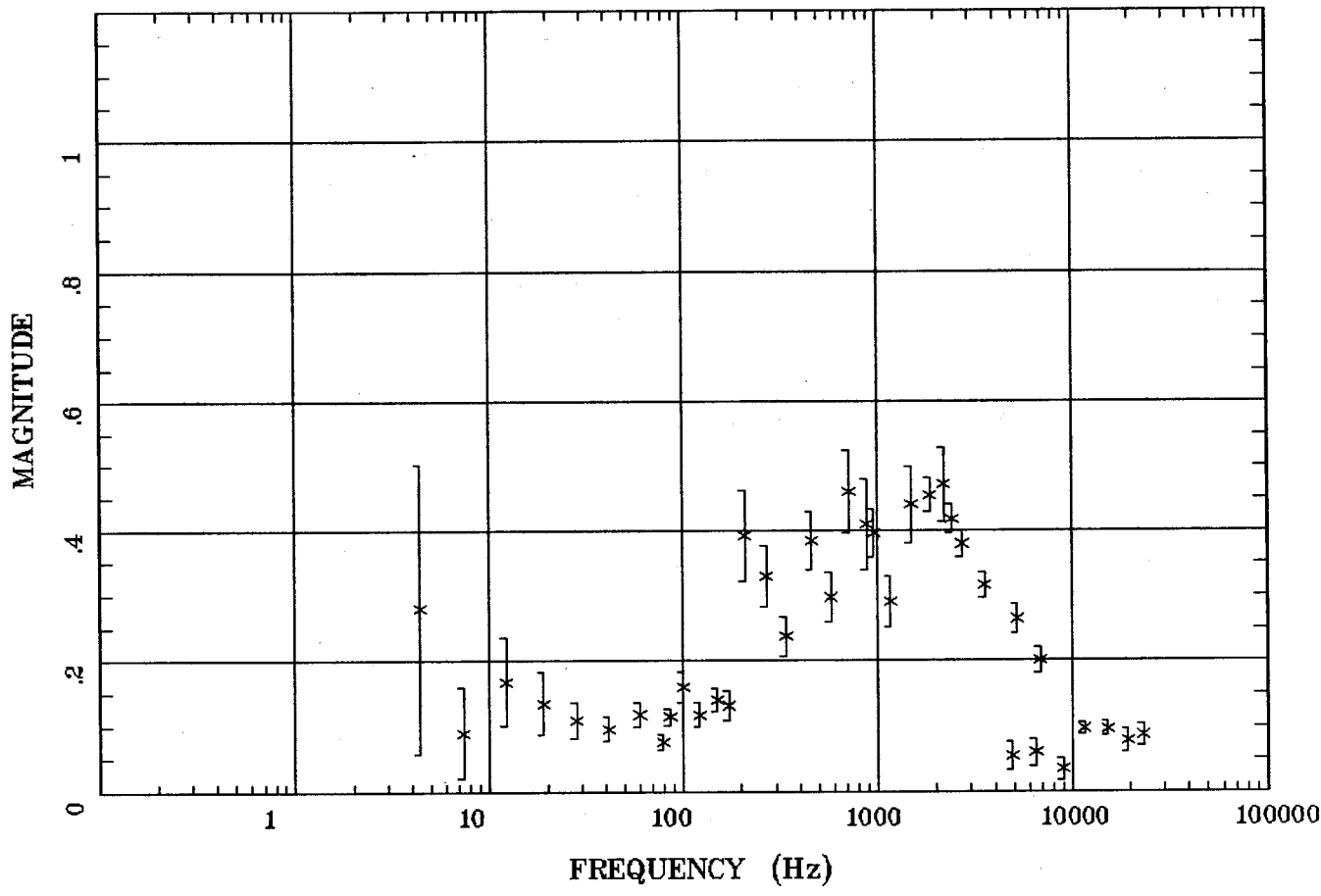
4.394 Hz	19.043 Hz	60.059 Hz	****** Hz
172 Hz	340 Hz	720 Hz	1170 Hz
2200 Hz	3550 Hz	6500 Hz	11590 Hz

Client: Water Resources
Remote: none
Acquired: 15:4 Oct 28, 2003
Survey Co:USGS

Rotation:
Filename: nts38a.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 09:56 Nov 29, 2004
< EMI – ElectroMagnetic Instruments >

TIPPER MAGNITUDE

Line B

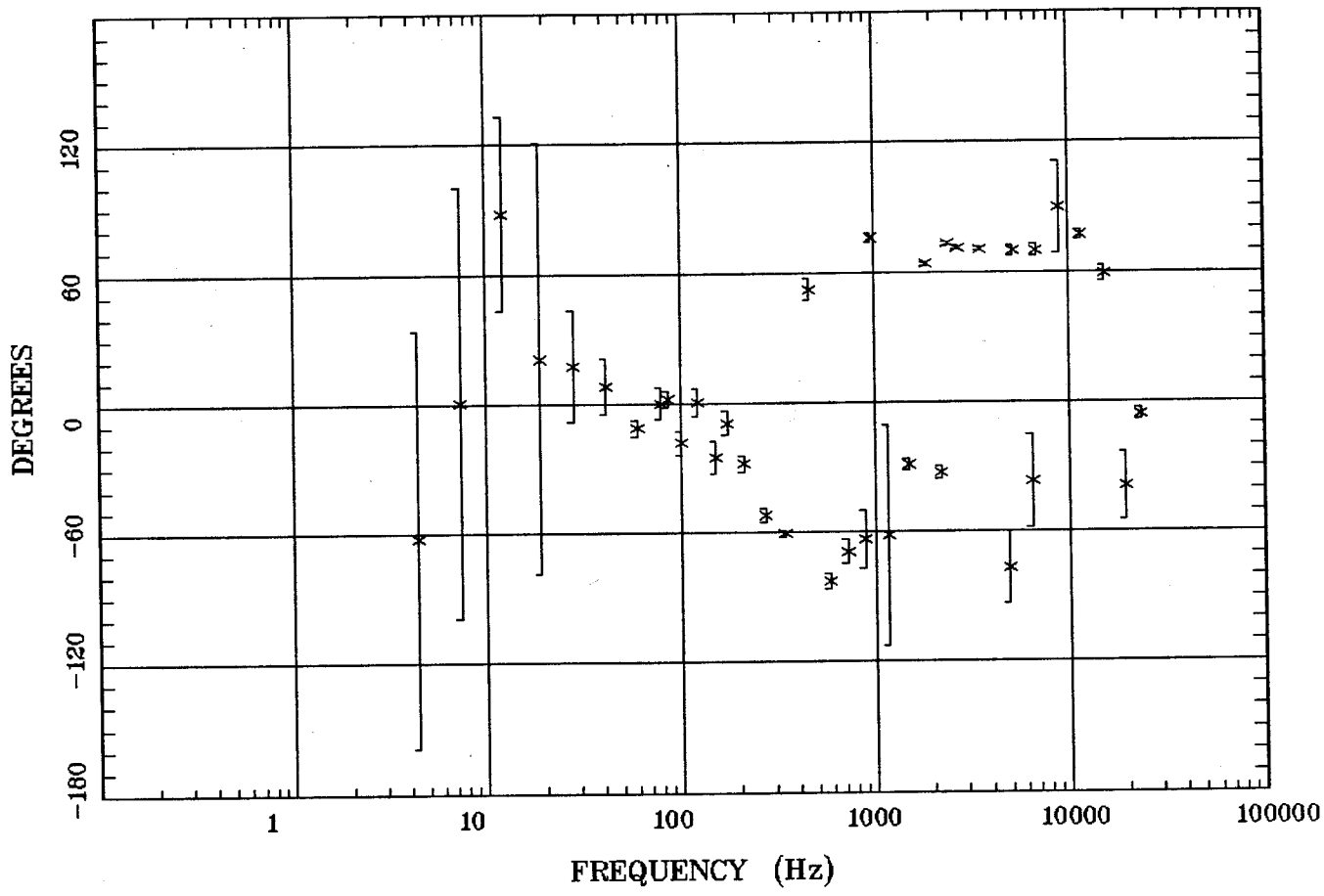


Client: Water Resources
Remote: none
Acquired: 15:4 Oct 28, 2003
Survey Co:USGS

Rotation:
Filename: nts38a.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 09:56 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

TIPPER STRIKE

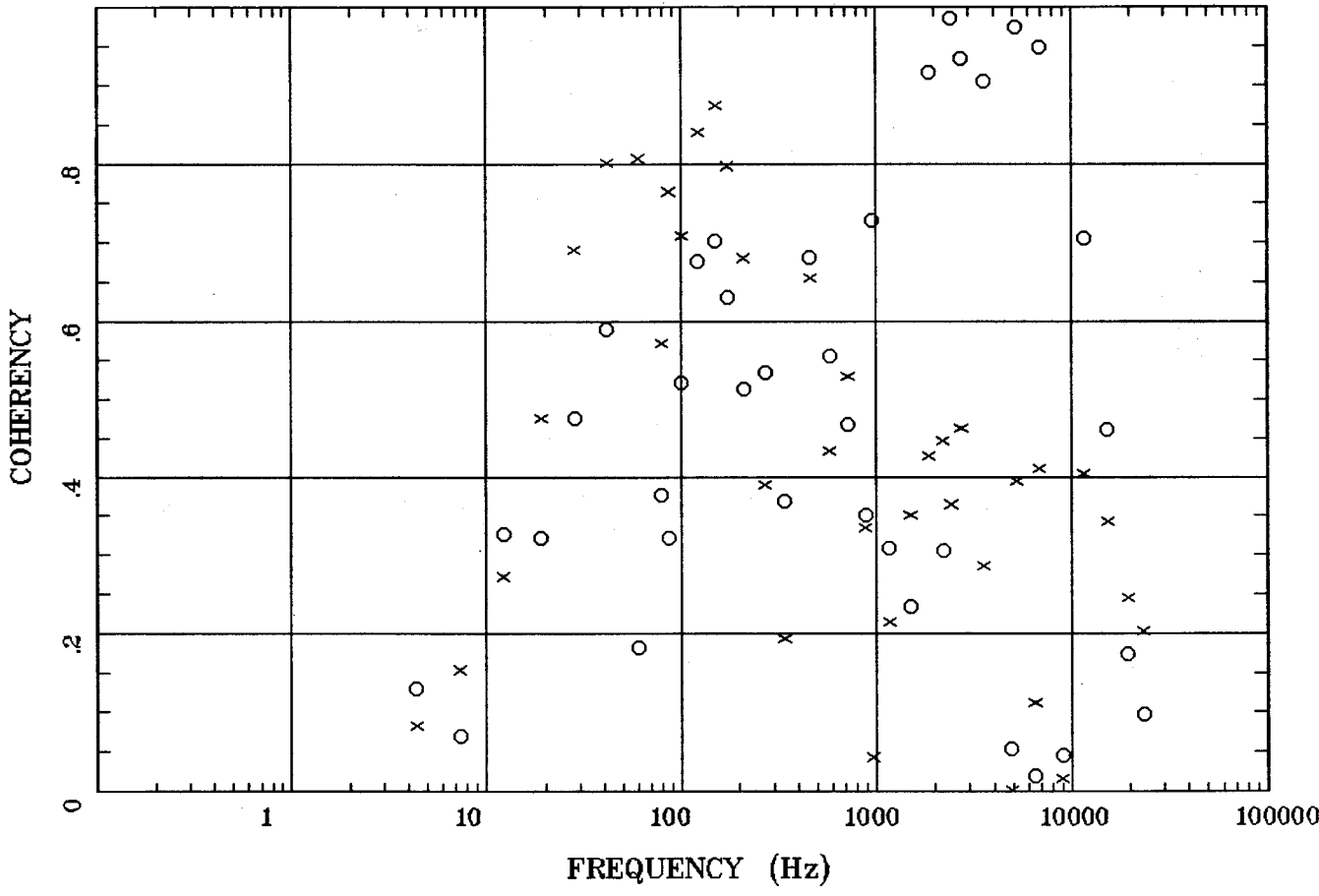
Line B



Client: Water Resources
Remote: none
Acquired: 15:4 Oct 28, 2003
Survey Co:USGS

Rotation:
Filename: nts38a.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 09:56 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

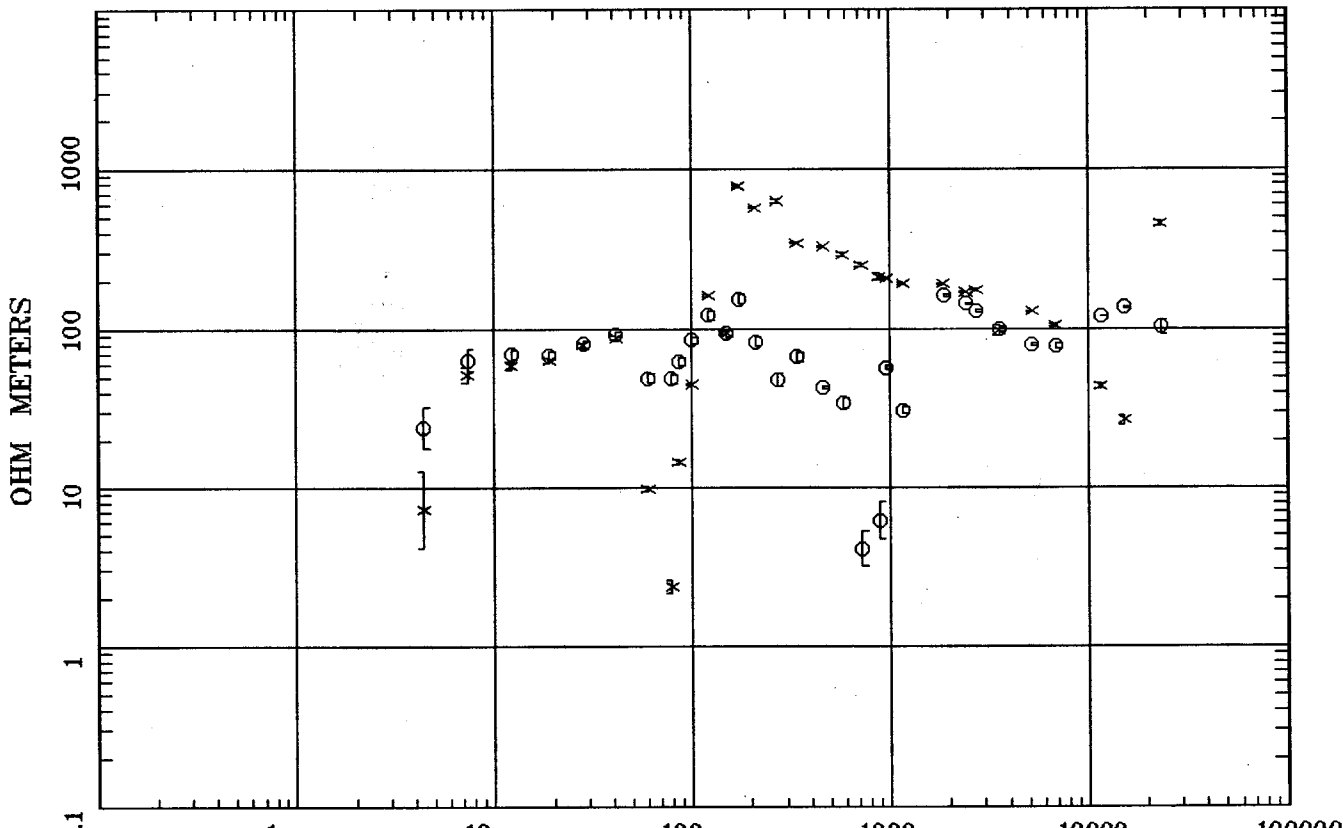
HzHx.x Coh HzHy.o Line B



Client: Water Resources
Remote: none
Acquired: 15:4 Oct 28, 2003
Survey Co:USGS

Rotation:
Filename: nts38a.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 09:56 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

APPARENT RESISTIVITY Line B

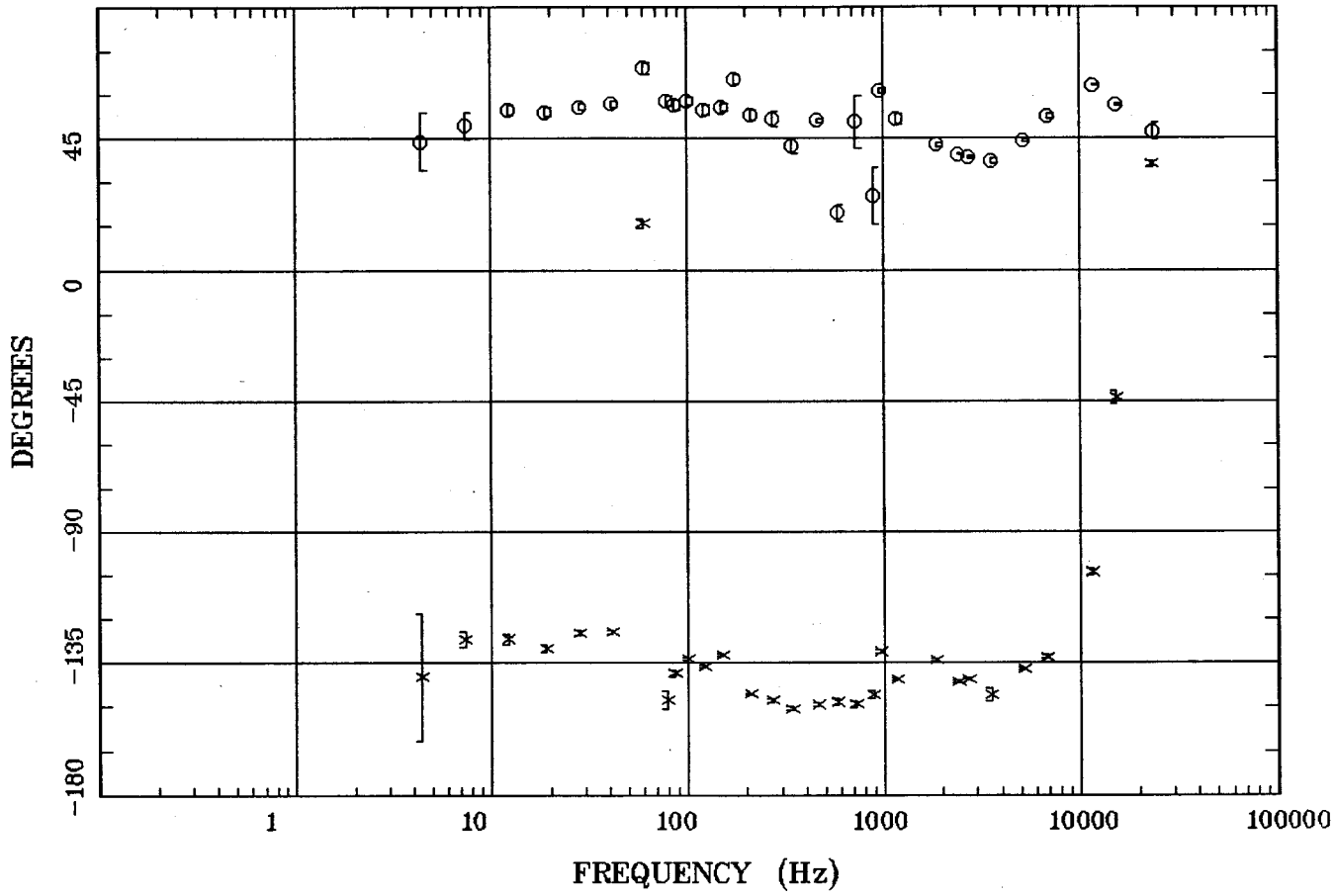


Client: Water Resources
Remote: none
Acquired: 12:4 Oct 27, 2003
Survey Co:USGS

Rotation:
Filename: nts39.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 10:02 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

Station 39

IMPEDANCE PHASE Line B

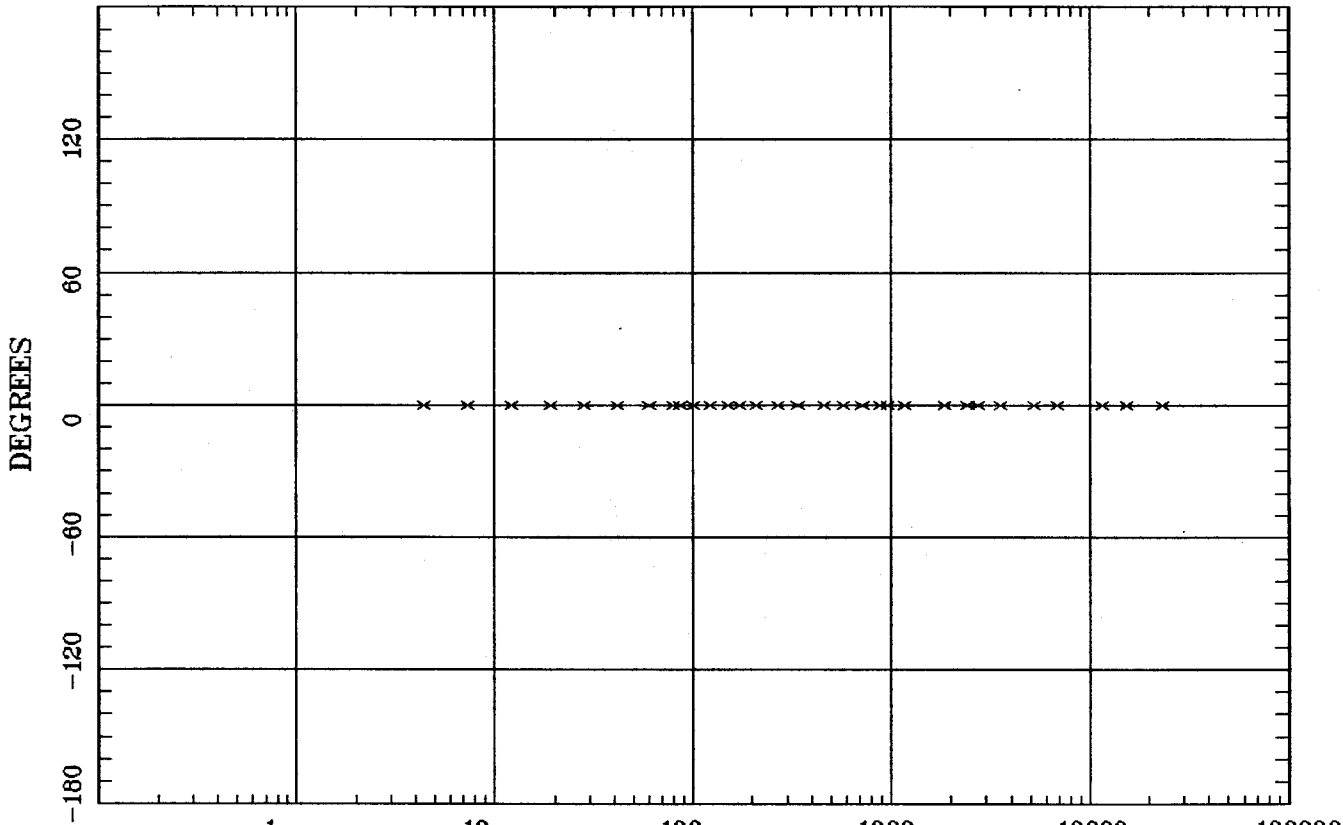


Client: Water Resources
Remote: none
Acquired: 12:4 Oct 27, 2003
Survey Co:USGS

Rotation:
Filename: nts39.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 10:02 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

Station 39

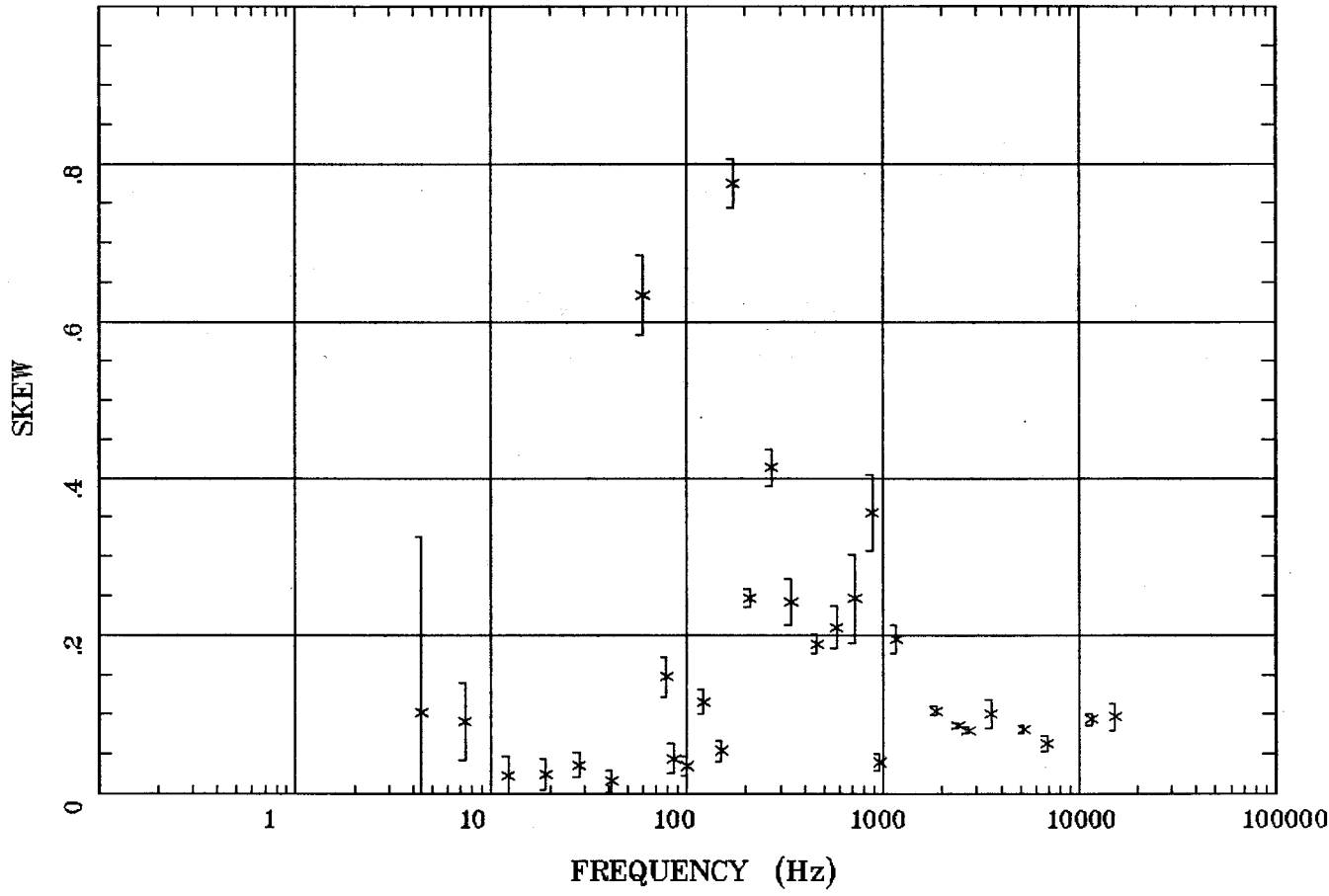
ROTATION ANGLE Line B



Client: Water Resources
Remote: none
Acquired: 12:4 Oct 27, 2003
Survey Co:USGS

Rotation:
Filename: nts39.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 10:02 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

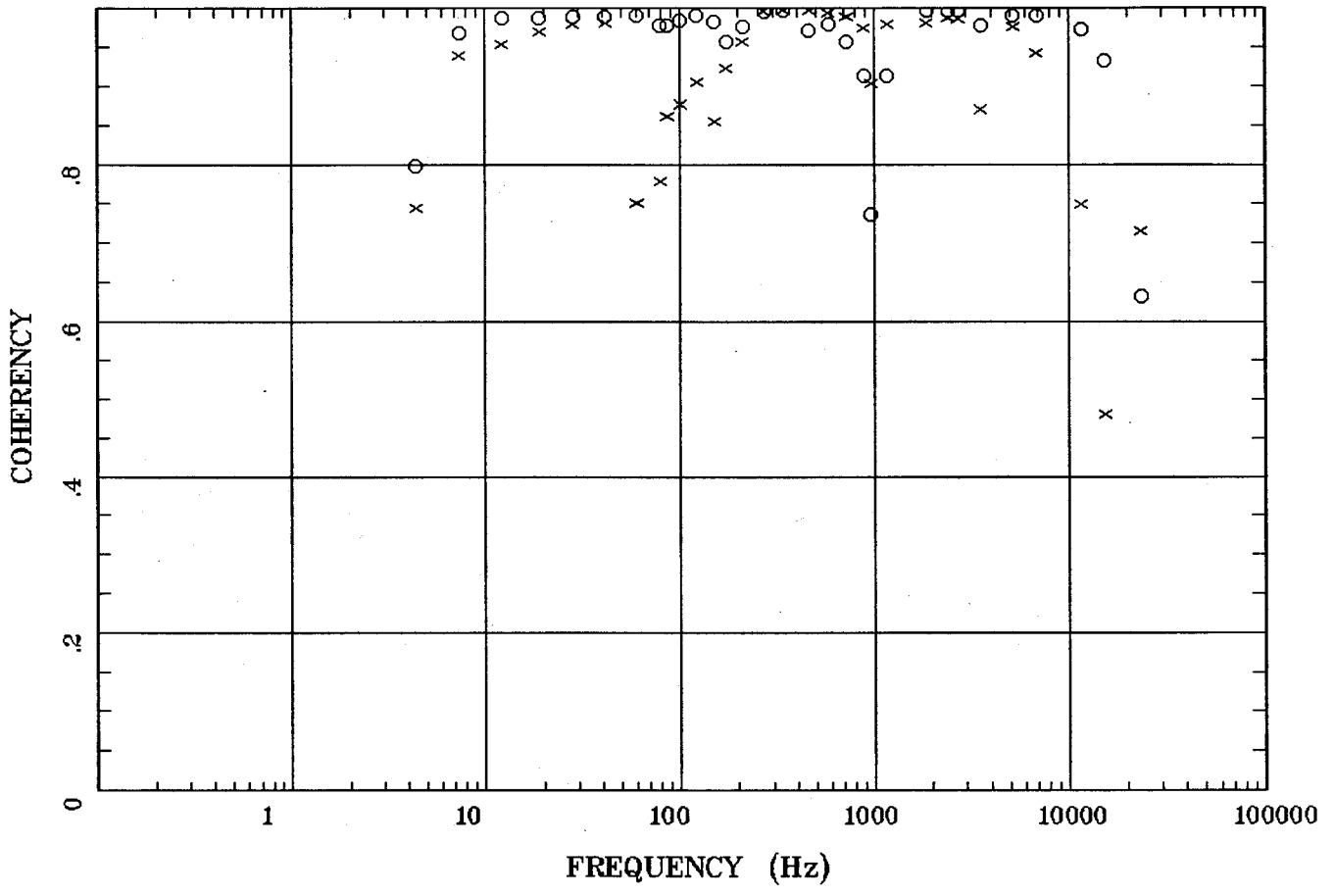
IMPEDANCE SKEW Line B



Client: Water Resources
Remote: none
Acquired: 12:4 Oct 27, 2003
Survey Co:USGS

Rotation:
Filename: nts39.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 10:02 Nov 29, 2004
< EMI – ElectroMagnetic Instruments >

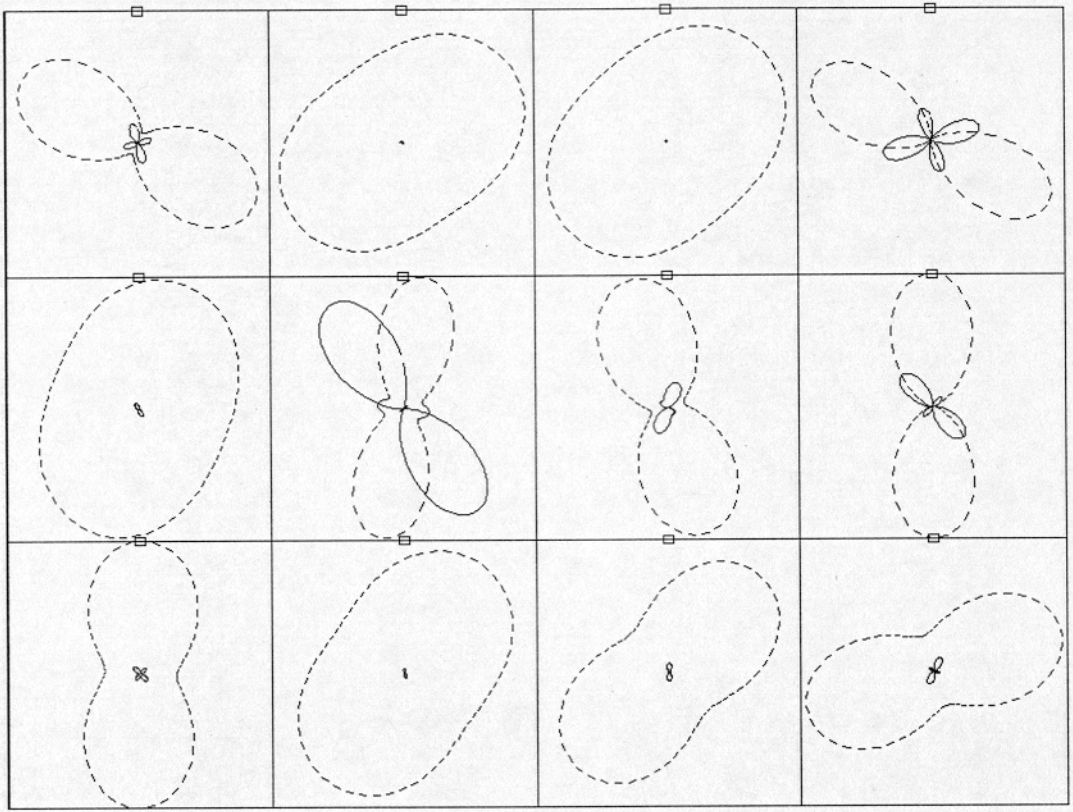
E MULT Coh. Line B



Client: Water Resources
Remote: none
Acquired: 12:4 Oct 27, 2003
Survey Co:USGS

Rotation:
Filename: nts39.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 10:02 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

POLAR PLOTS Line B

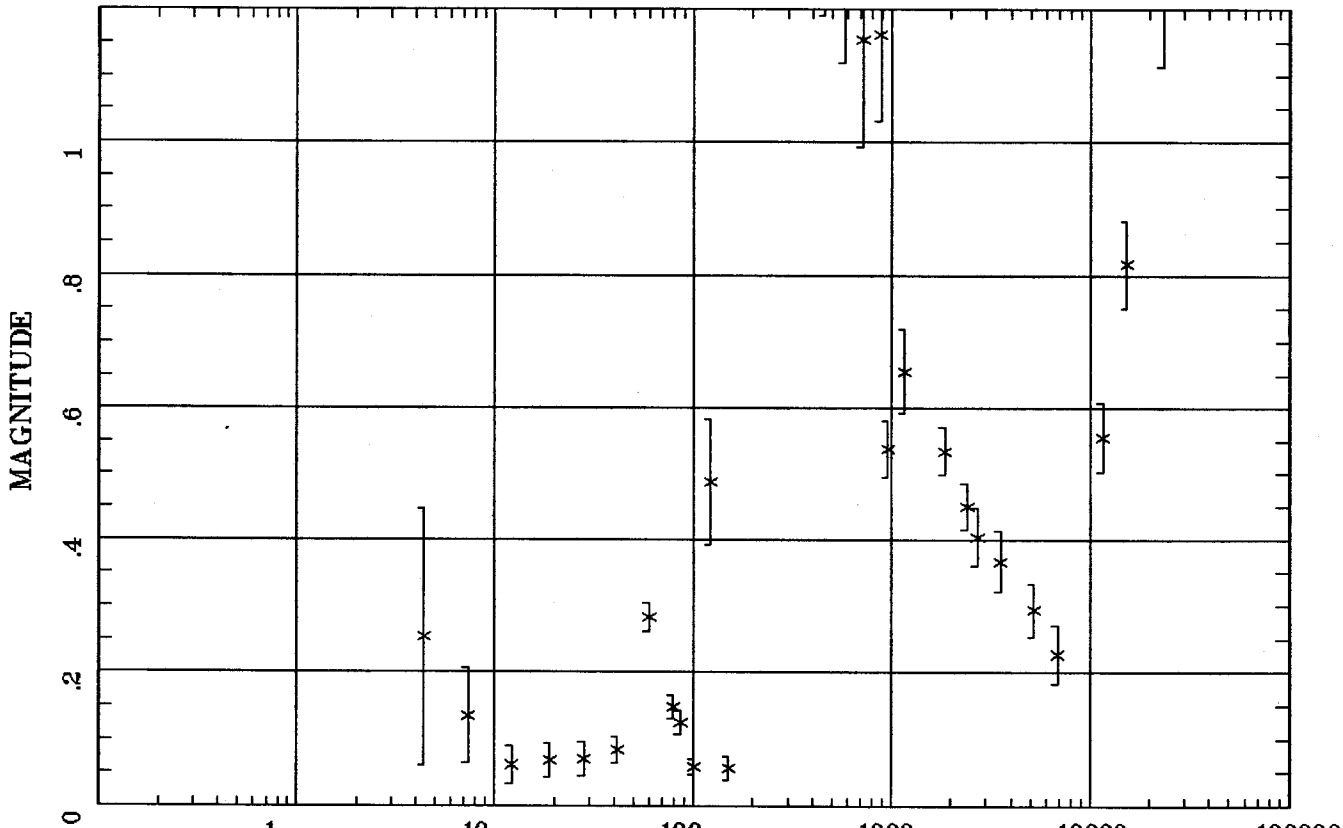


4.394 Hz	12.207 Hz	41.504 Hz	79.000 Hz
122 Hz	172 Hz	340 Hz	720 Hz
960 Hz	2420 Hz	3550 Hz	11590 Hz

Client: Water Resources
Remote: none
Acquired: 12:4 Oct 27, 2003
Survey Co:USGS

Rotation:
Filename: nts39.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 10:02 Nov 29, 2004
< EMI – ElectroMagnetic Instruments >

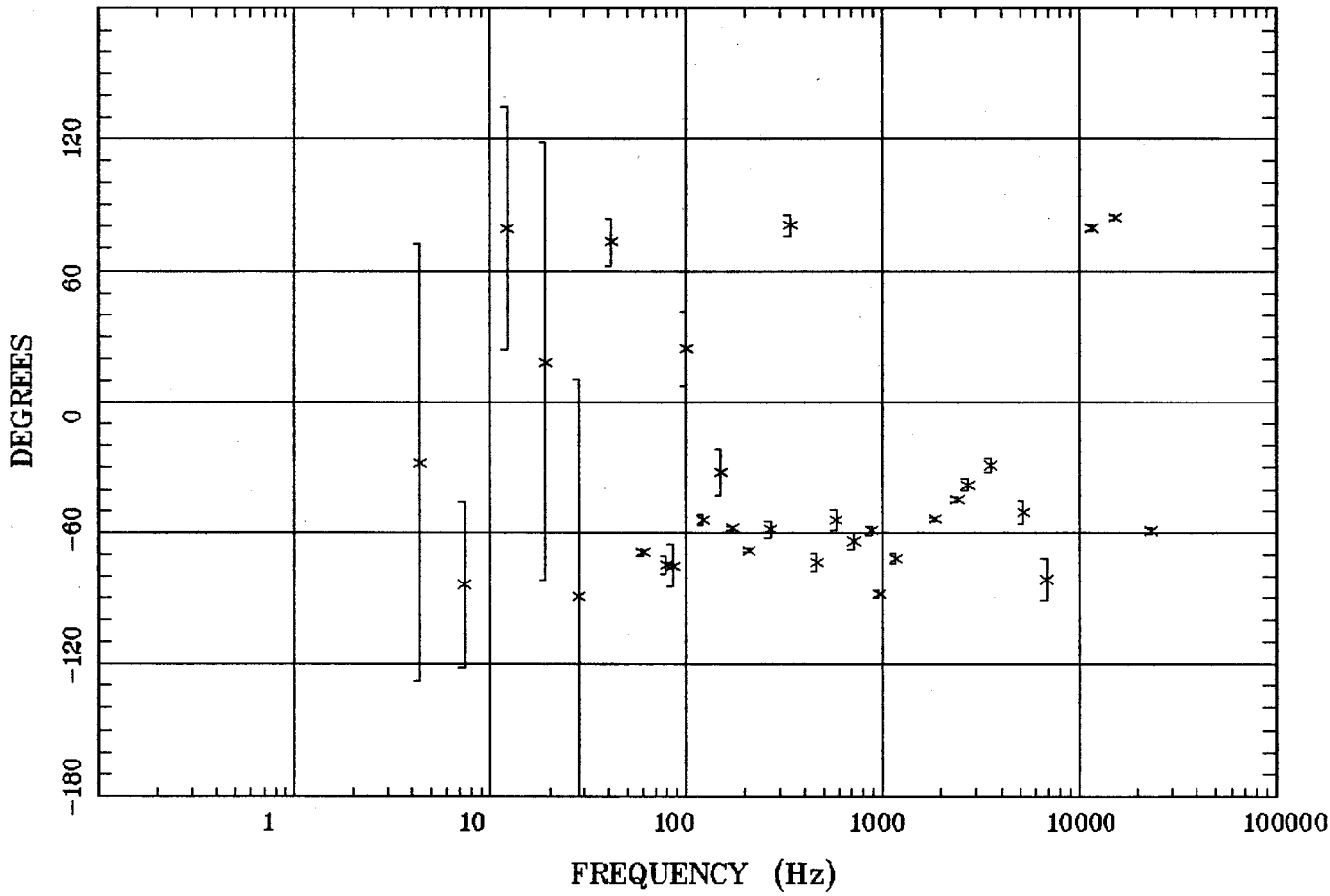
TIPPER MAGNITUDE Line B



Client: Water Resources
Remote: none
Acquired: 12:4 Oct 27, 2003
Survey Co:USGS

Rotation:
Filename: nts39.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 10:02 Nov 29, 2004
< EMI – ElectroMagnetic Instruments >

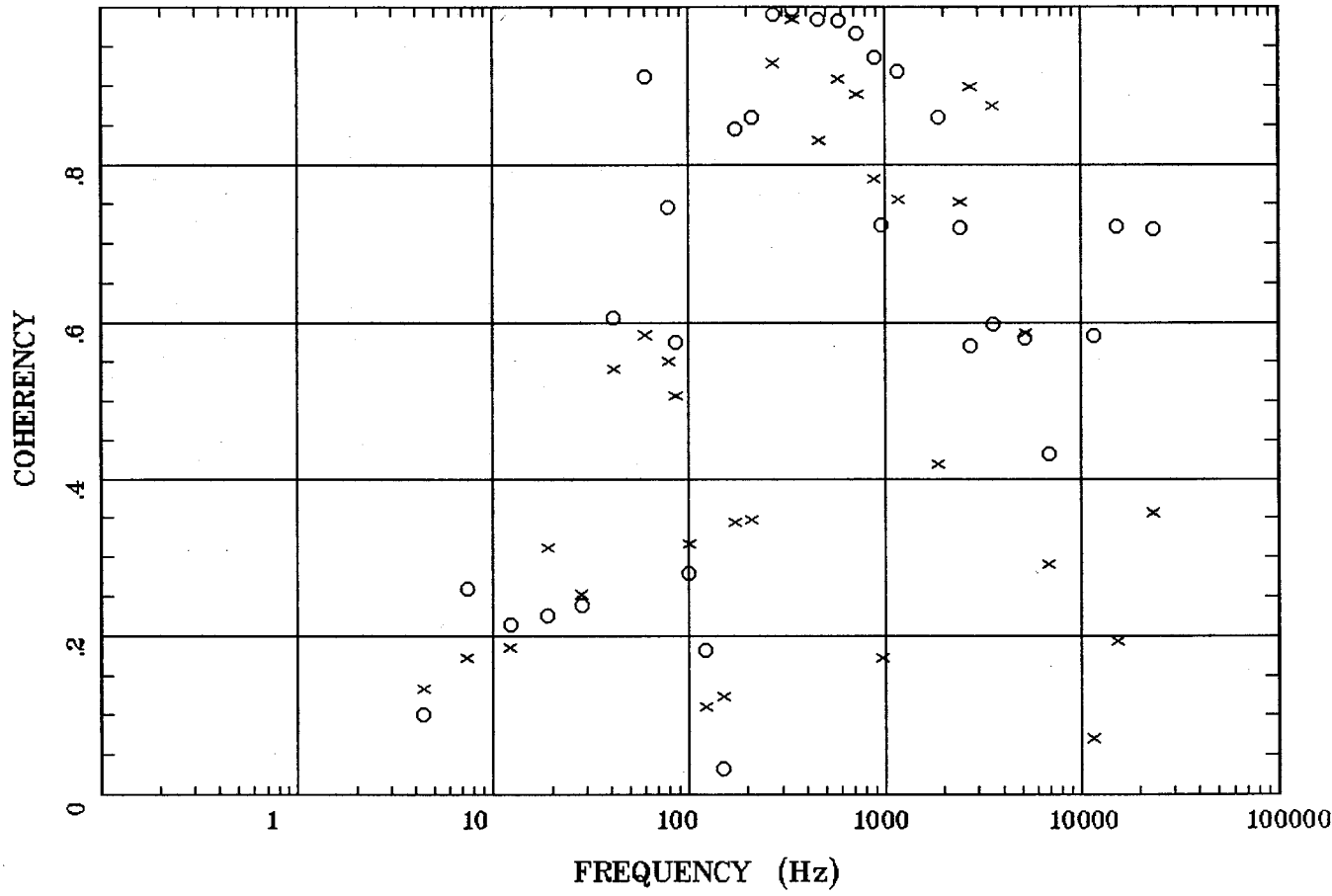
TIPPER STRIKE Line B



Client: Water Resources
Remote: none
Acquired: 12:4 Oct 27, 2003
Survey Co:USGS

Rotation:
Filename: nts39.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 10:02 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

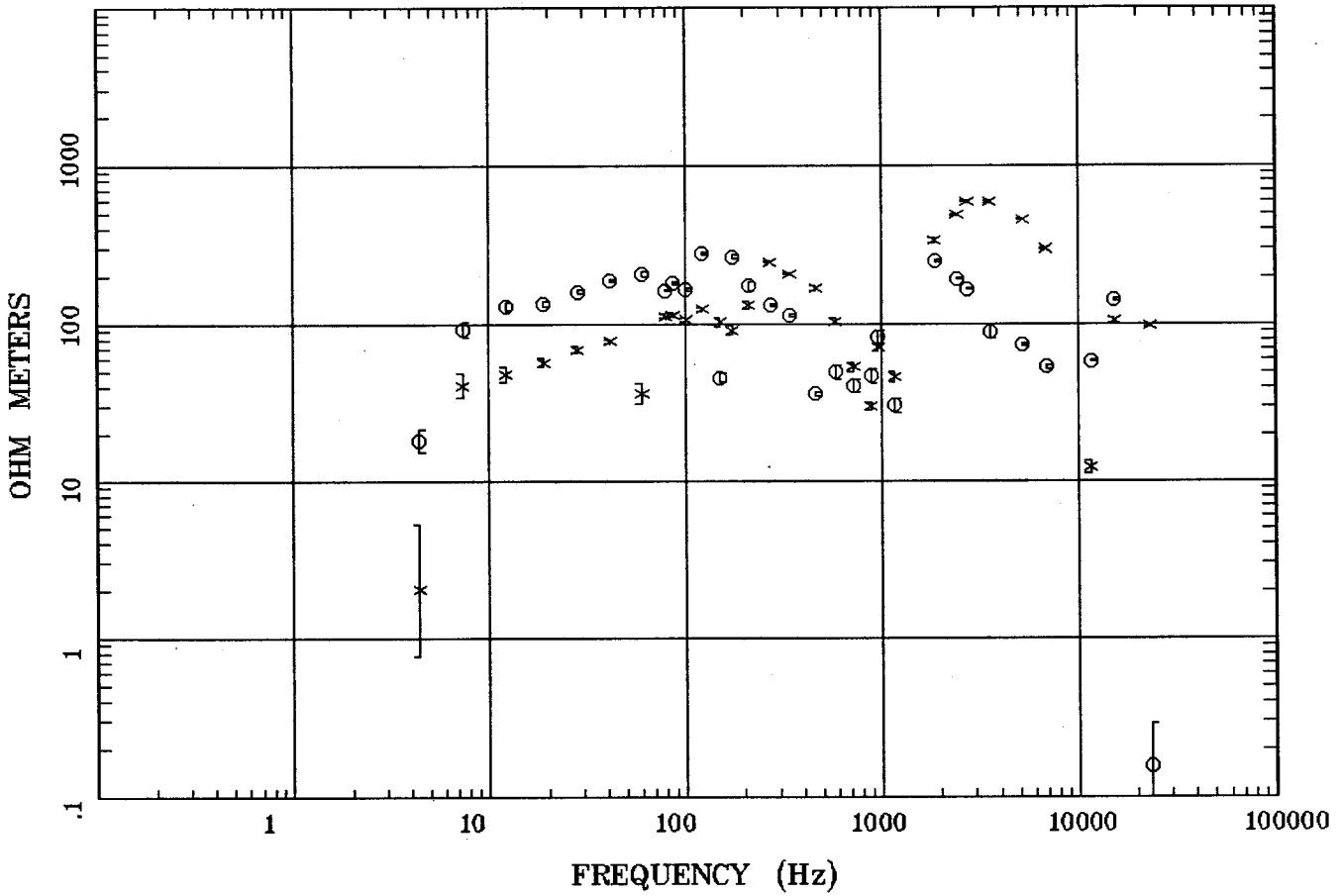
HzHx.x Coh HzHy.o Line B



Client: Water Resources
Remote: none
Acquired: 12:4 Oct 27, 2003
Survey Co:USGS

Rotation:
Filename: nts39.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 10:02 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

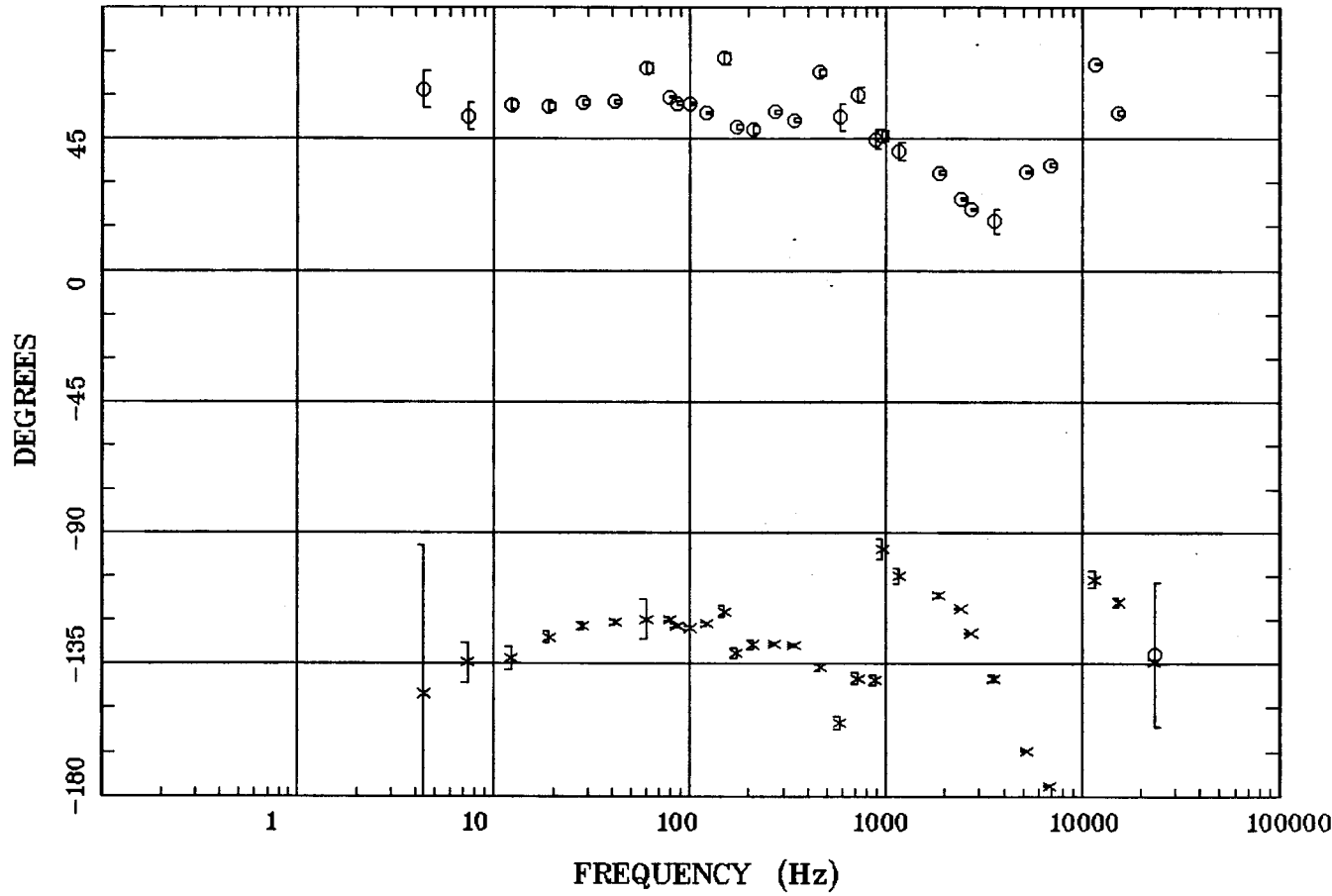
APPARENT RESISTIVITY Line B



Client: Water Resources
Remote: none
Acquired: 16:2 Oct 26, 2003
Survey Co:USGS

Rotation:
Filename: nts40.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 16:37 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

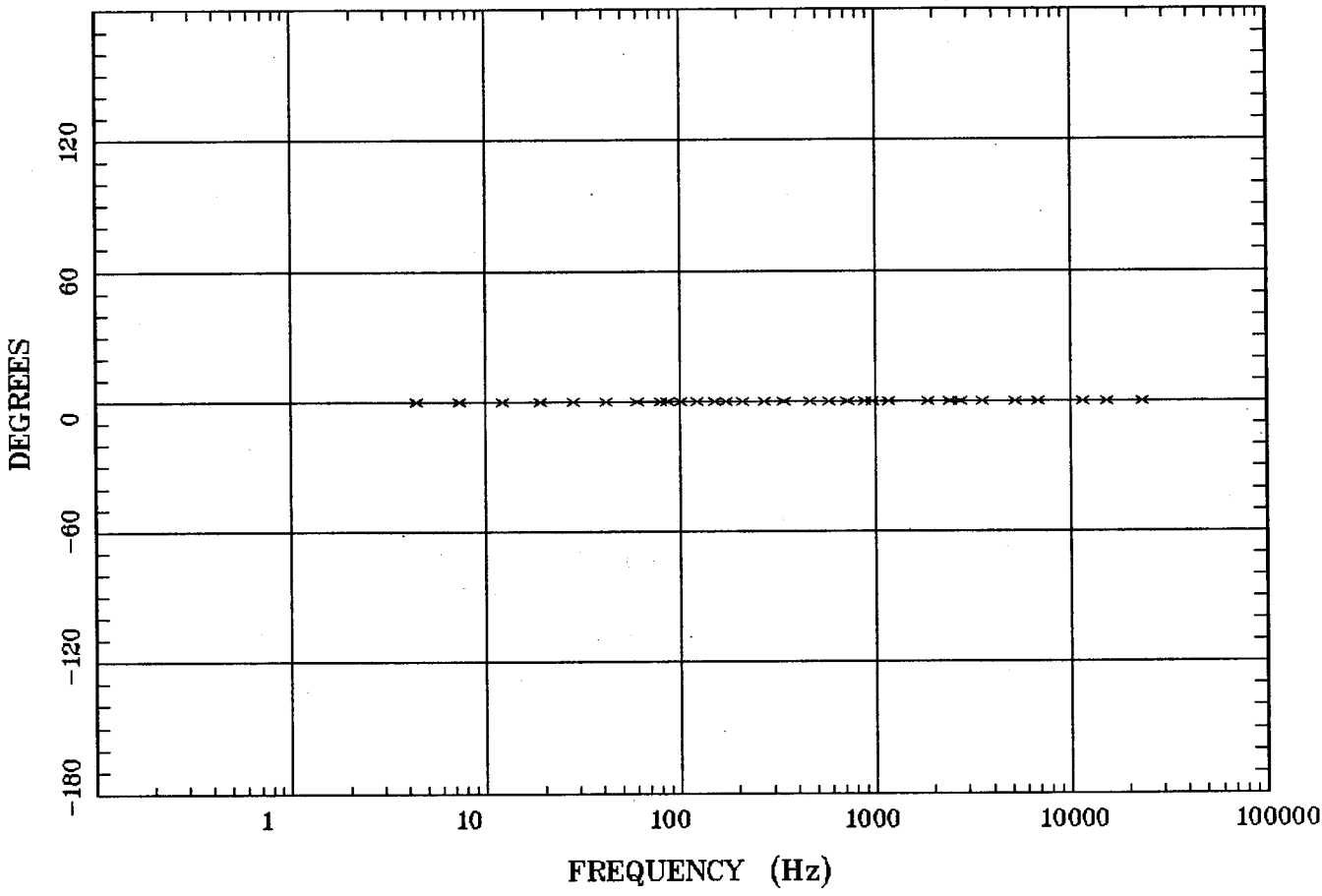
IMPEDANCE PHASE Line B



Client: Water Resources
Remote: none
Acquired: 16:2 Oct 26, 2003
Survey Co:USGS

Rotation:
Filename: nts40.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 16:37 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

ROTATION ANGLE Line B

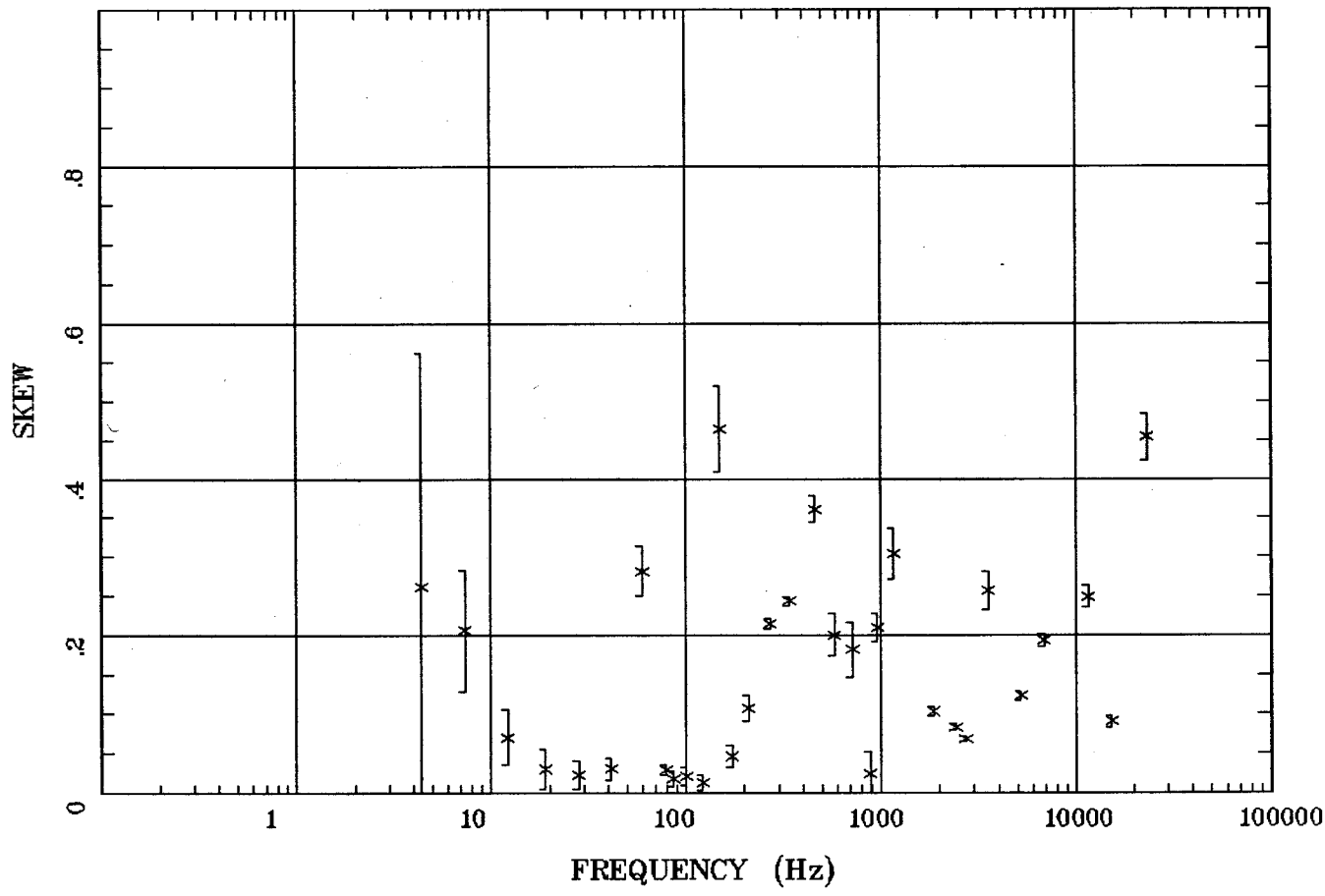


Client: Water Resources
Remote: none
Acquired: 16:2 Oct 26, 2003
Survey Co:USGS

Rotation:
Filename: nts40.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 16:37 Nov 29, 2004
< EMI – ElectroMagnetic Instruments >

IMPEDANCE SKEW

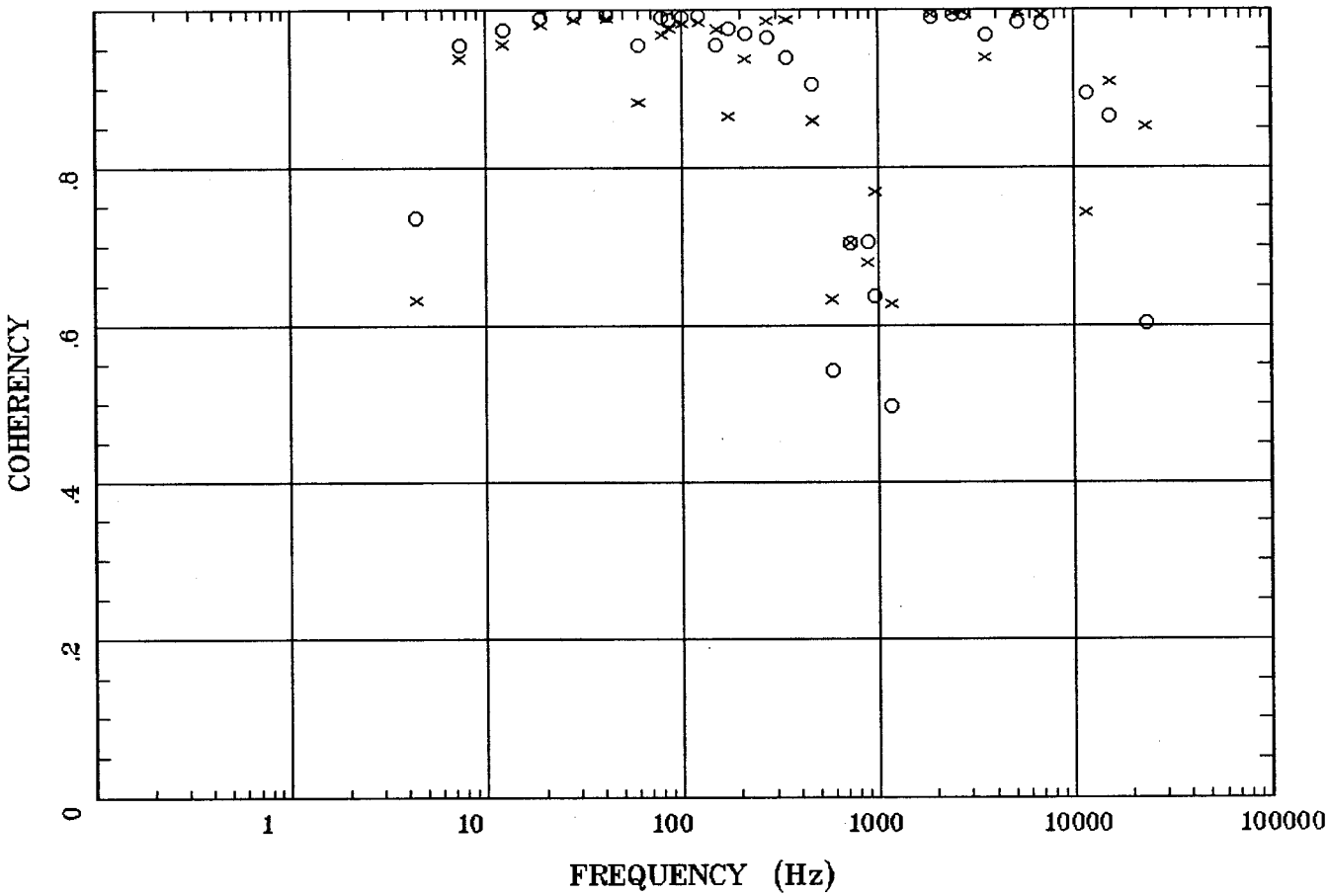
Line B



Client: Water Resources
Remote: none
Acquired: 16:2 Oct 26, 2003
Survey Co:USGS

Rotation:
Filename: nts40.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 16:37 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

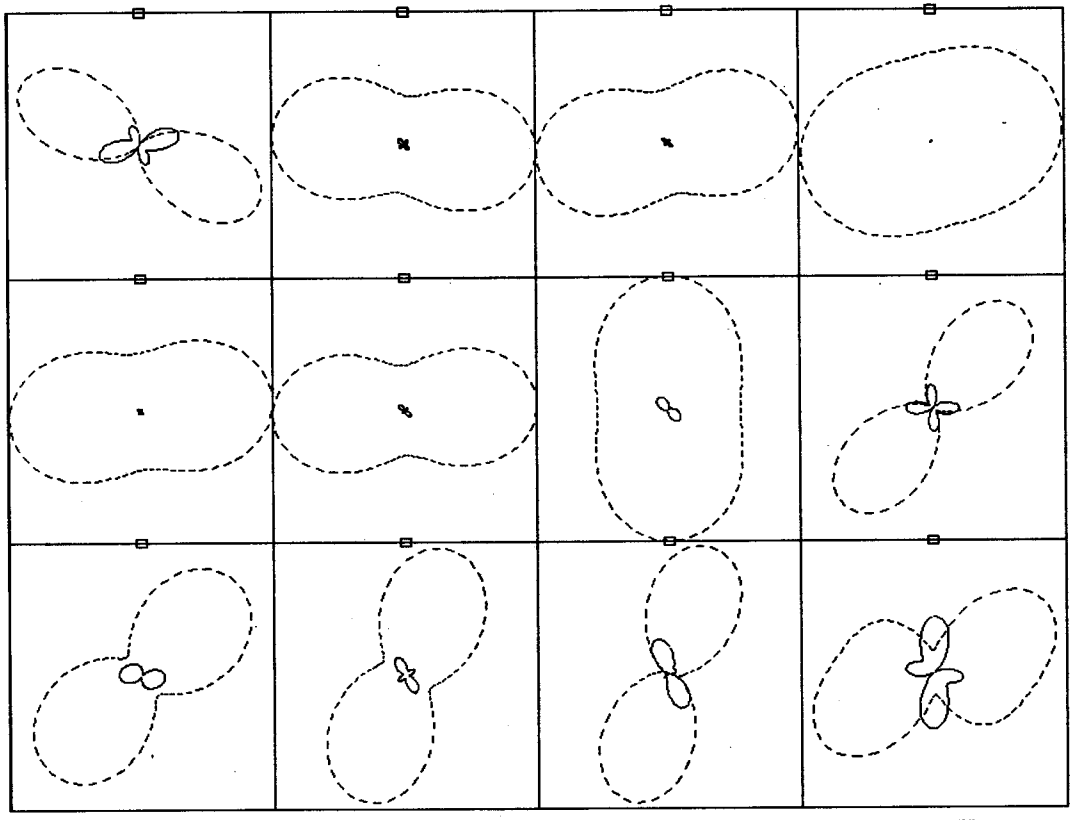
E MULT Coh. Line B



Client: Water Resources
Remote: none
Acquired: 16:2 Oct 26, 2003
Survey Co:USGS

Rotation:
Filename: nts40.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 16:37 Nov 29, 2004
< EMI – ElectroMagnetic Instruments >

POLAR PLOTS Line B



4.394 Hz	12.207 Hz	41.504 Hz	79.000 Hz
122 Hz	172 Hz	340 Hz	720 Hz
960 Hz	2420 Hz	3550 Hz	11590 Hz

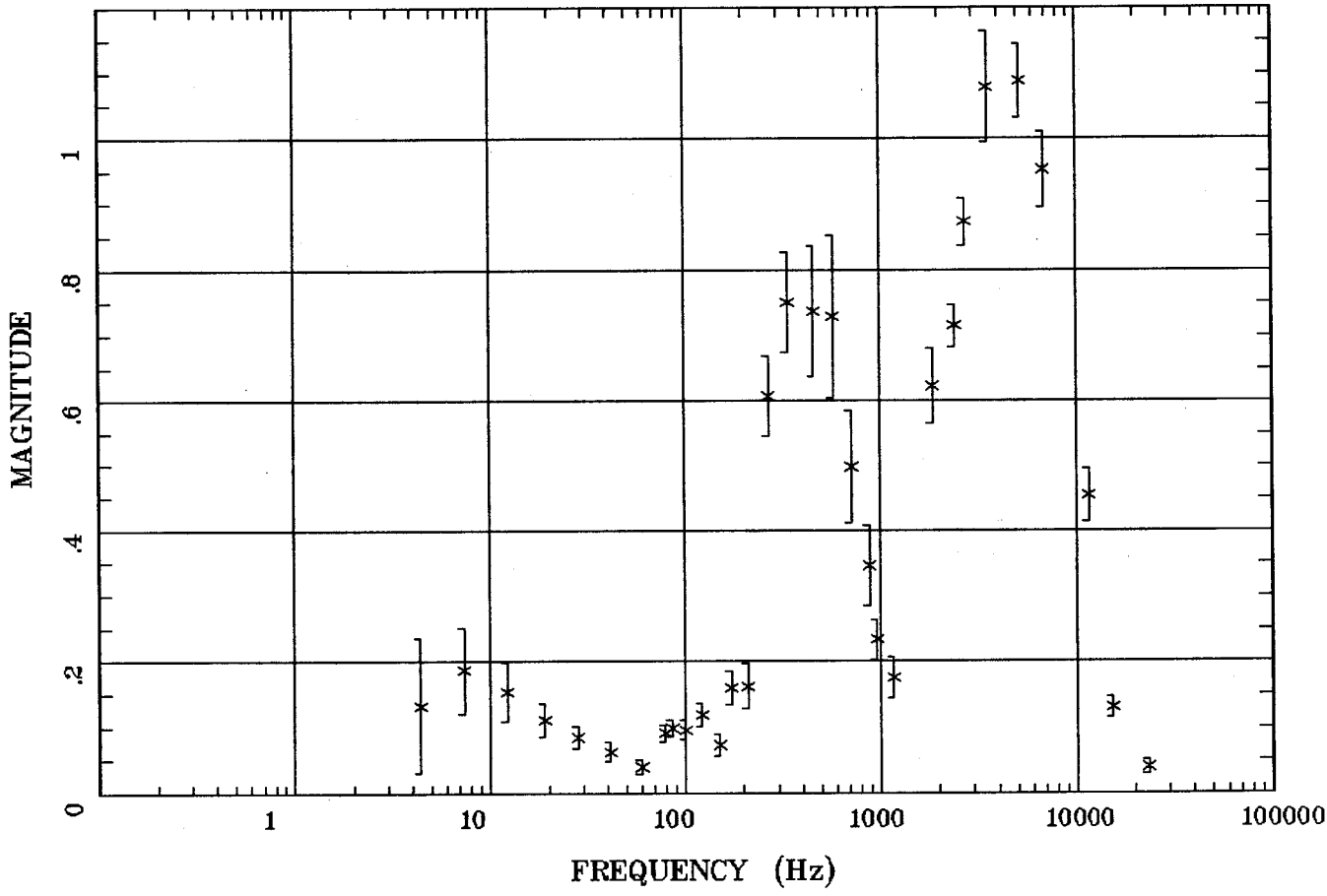
Client: Water Resources
Remote: none
Acquired: 16:2 Oct 26, 2003
Survey Co:USGS

Rotation:
Filename: nts40.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 16:37 Nov 29, 2004
< EMI – ElectroMagnetic Instruments >

Station 40

TIPPER MAGNITUDE

Line B

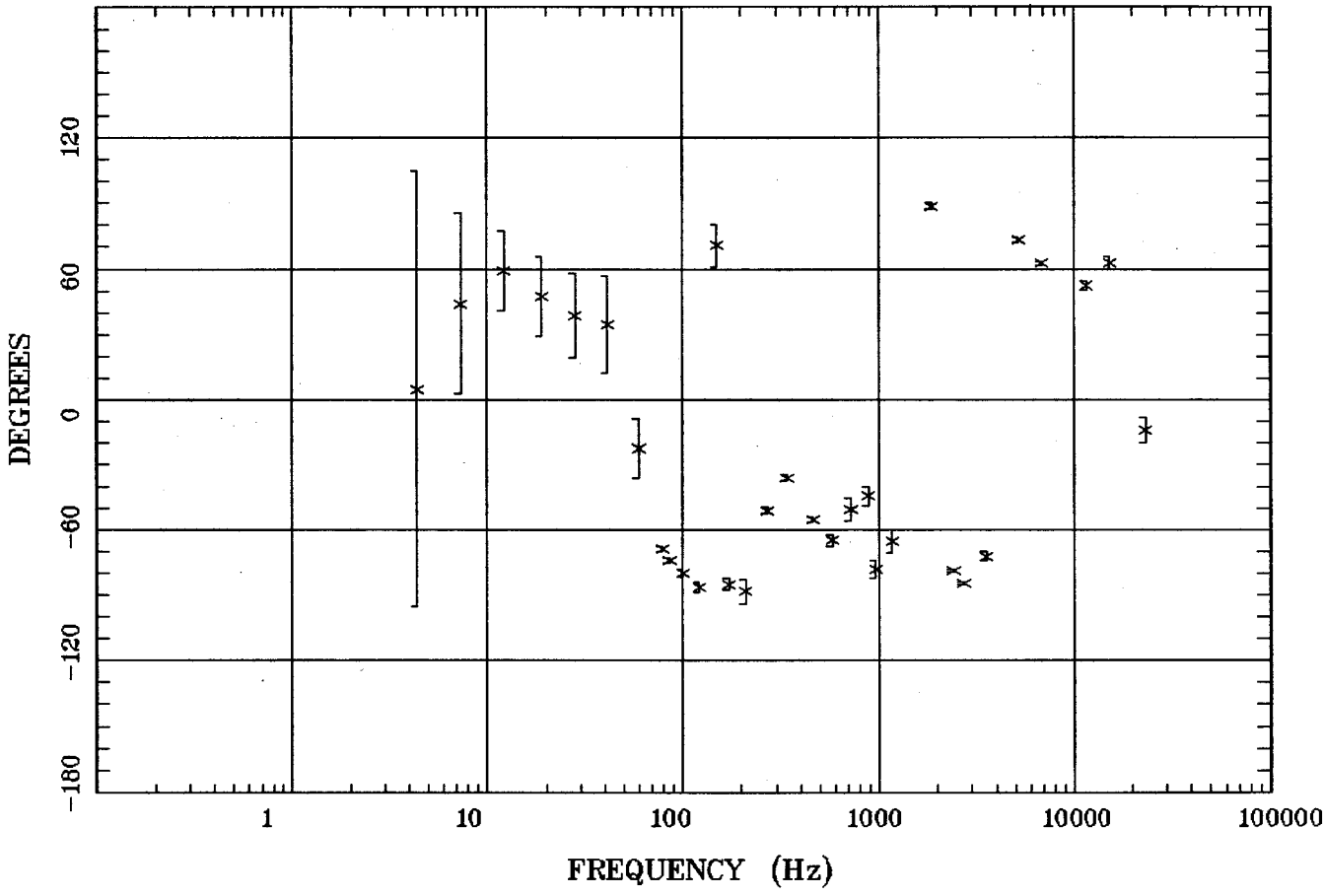


Client: Water Resources
Remote: none
Acquired: 16:2 Oct 26, 2003
Survey Co:USGS

Rotation:
Filename: nts40.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 16:37 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

TIPPER STRIKE

Line B

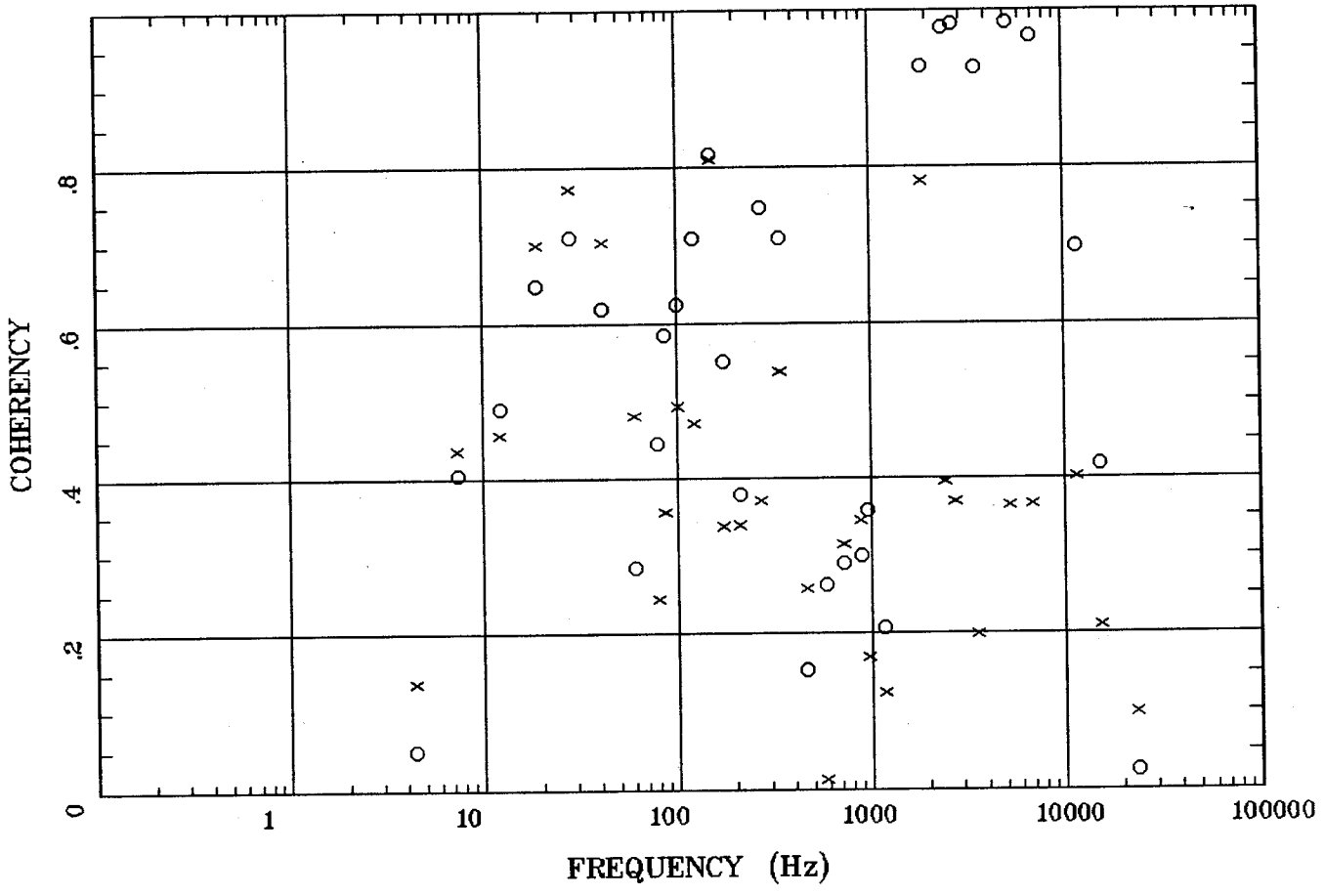


Client: Water Resources
Remote: none
Acquired: 16:2 Oct 26, 2003
Survey Co:USGS

Rotation:
Filename: nts40.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 16:37 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

HzHx.x Coh HzHy.o

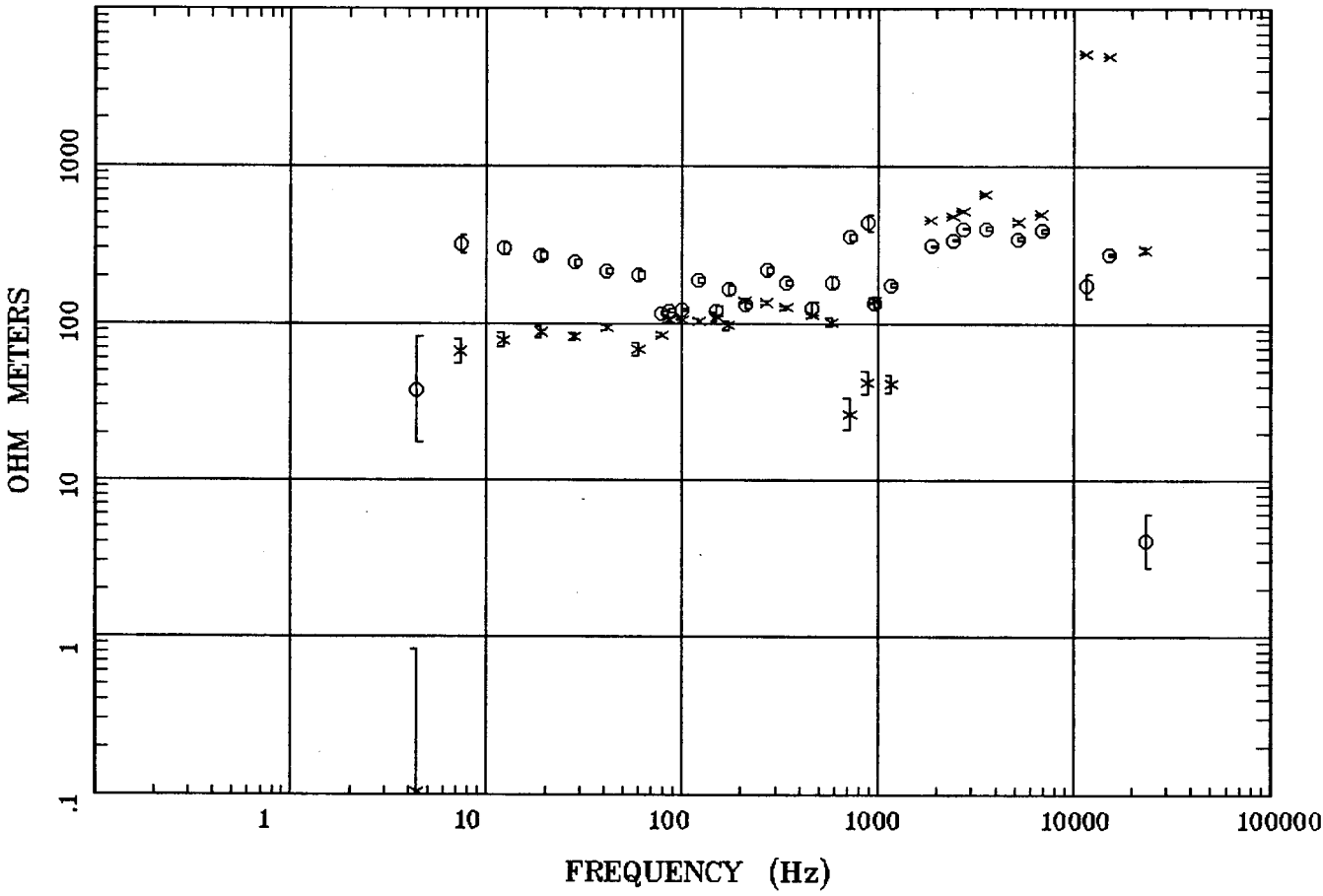
Line B



Client: Water Resources
Remote: none
Acquired: 16:2 Oct 26, 2003
Survey Co:USGS

Rotation:
Filename: nts40.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 16:37 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

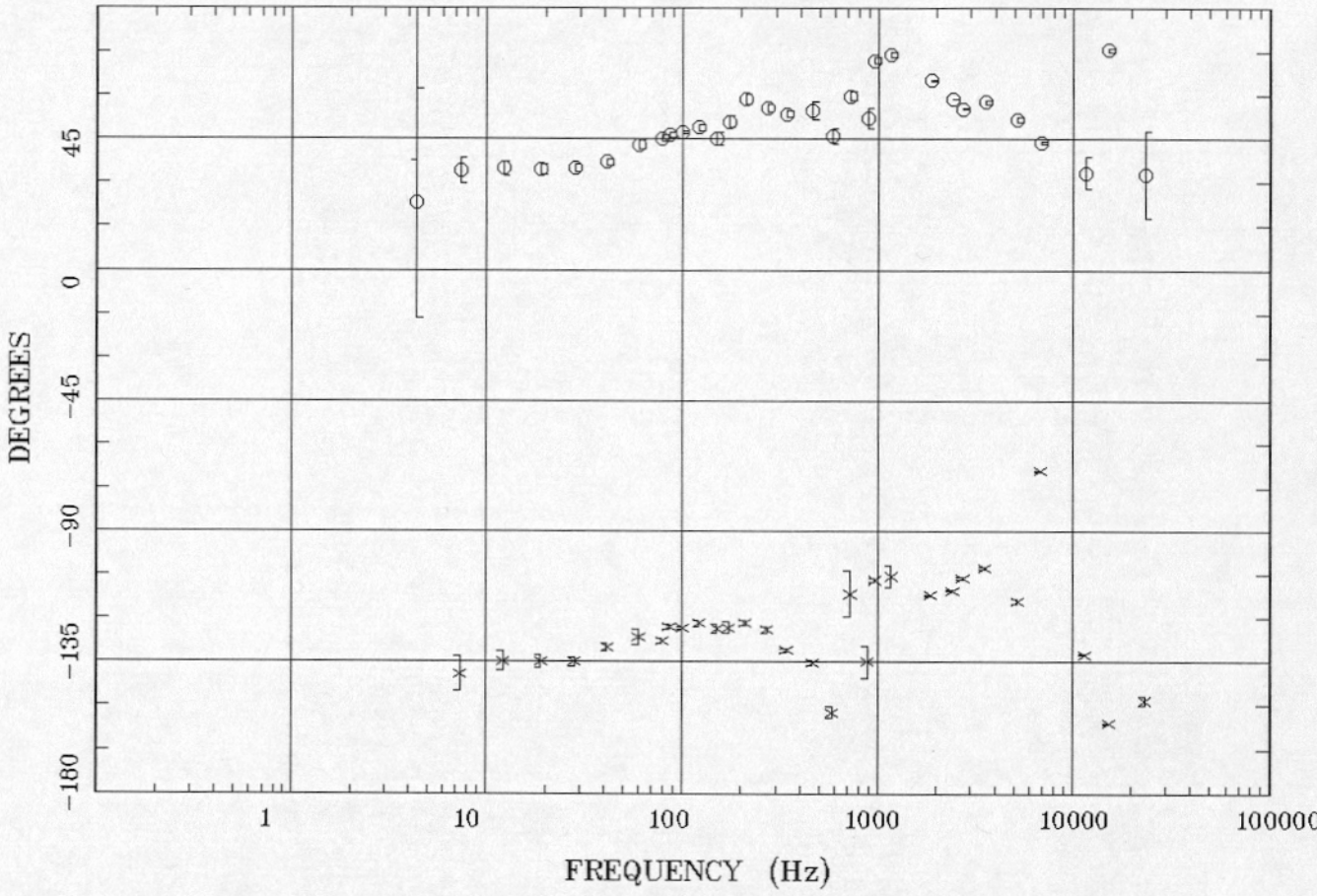
APPARENT RESISTIVITY Line B



Client: Water Resources
Remote: none
Acquired: 15:5 Oct 24, 2003
Survey Co:USGS

Rotation:
Filename: nts41.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 16:38 Nov 29, 2004
< EMI – ElectroMagnetic Instruments >

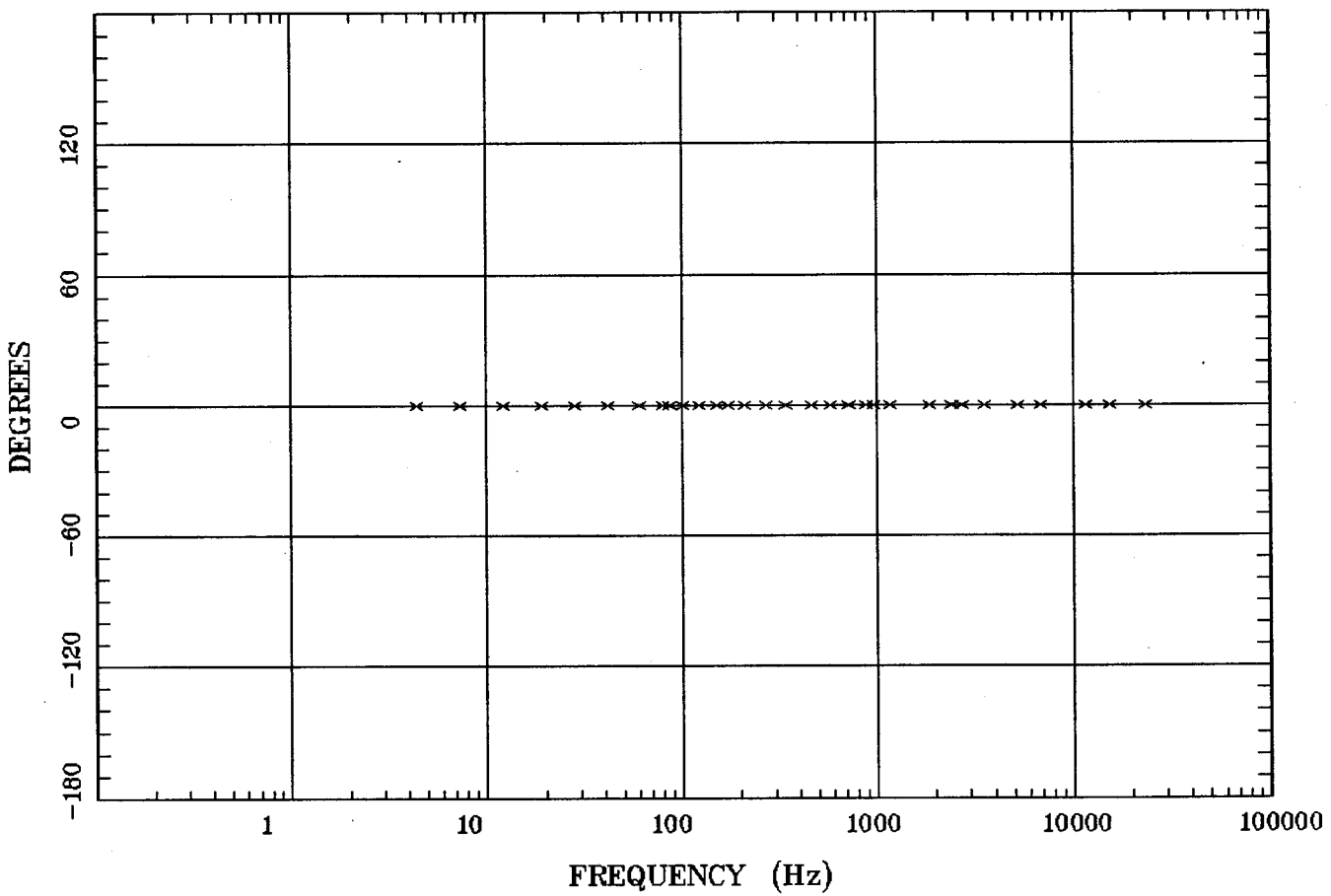
IMPEDANCE PHASE Line B



Client: Water Resources
Remote: none
Acquired: 15:5 Oct 24, 2003
Survey Co:USGS

Rotation:
Filename: nts41.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 16:38 Nov 29, 2004
< EMI – ElectroMagnetic Instruments >

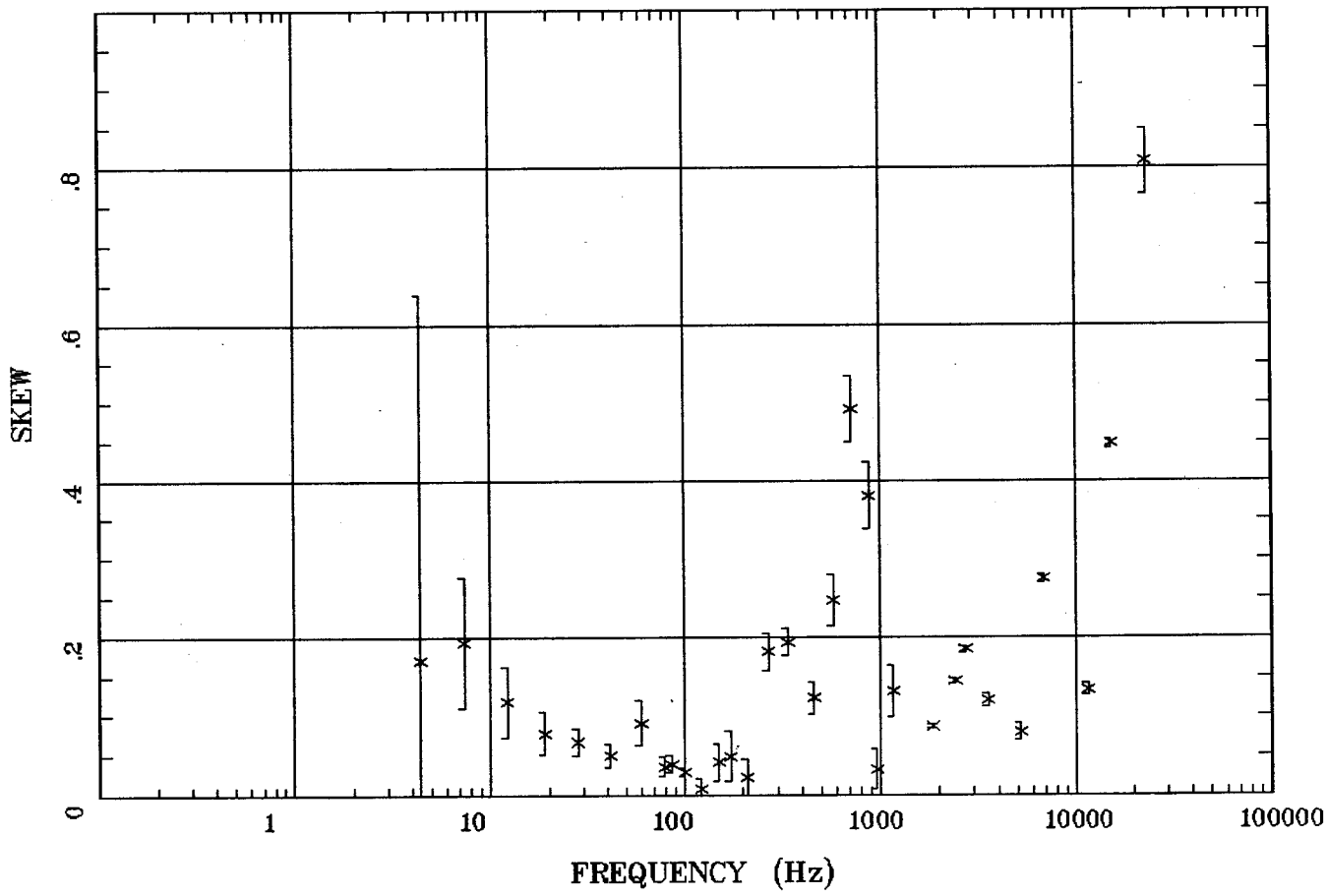
ROTATION ANGLE Line B



Client: Water Resources
Remote: none
Acquired: 15:5 Oct 24, 2003
Survey Co:USGS

Rotation:
Filename: nts41.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 16:38 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

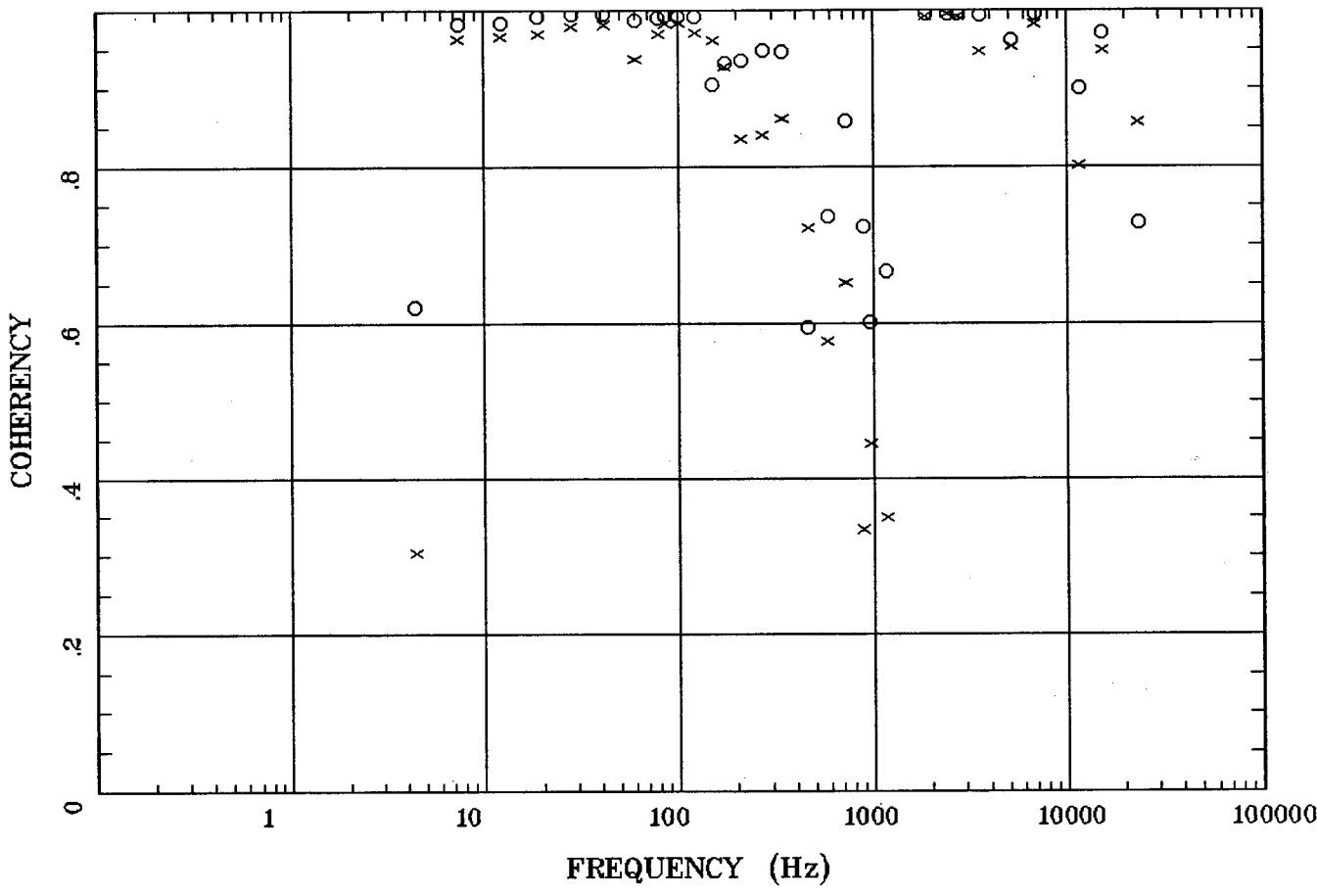
IMPEDANCE SKEW Line B



Client: Water Resources
Remote: none
Acquired: 15:5 Oct 24, 2003
Survey Co:USGS

Rotation:
Filename: nts41.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 16:38 Nov 29, 2004
< EMI – ElectroMagnetic Instruments >

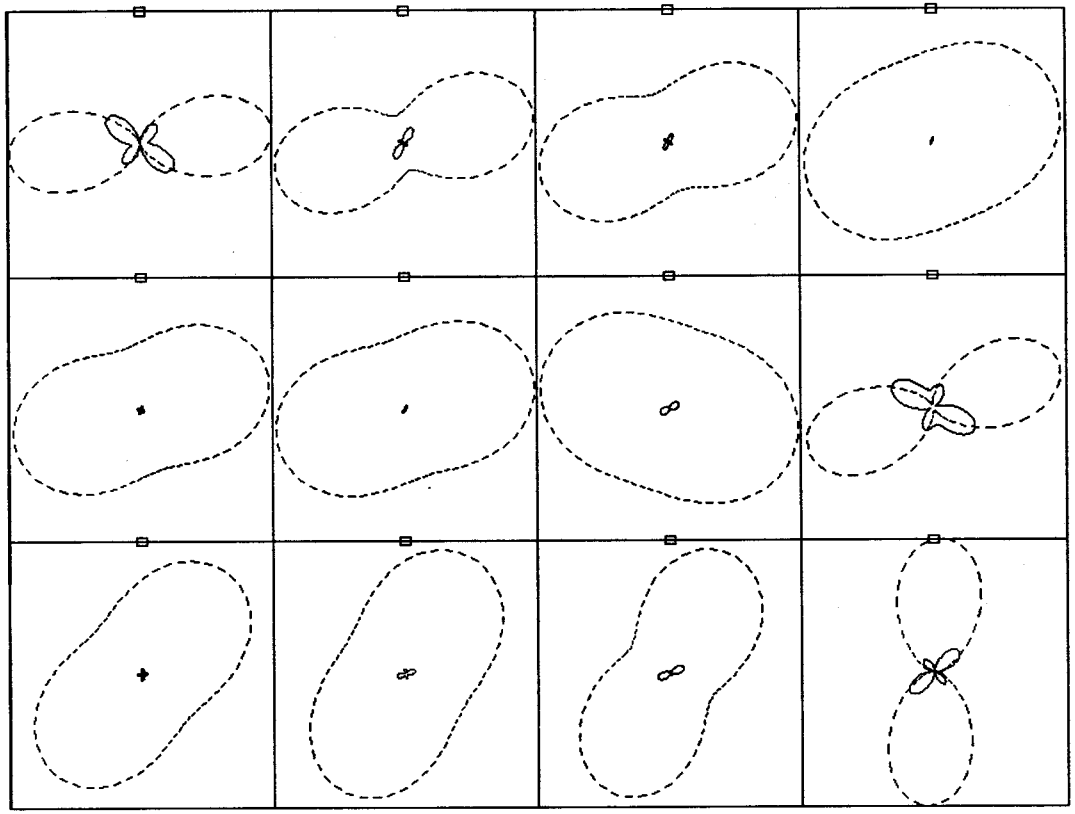
E MULT Coh. Line B



Client: Water Resources
Remote: none
Acquired: 15:5 Oct 24, 2003
Survey Co:USGS

Rotation:
Filename: nts41.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 16:38 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

POLAR PLOTS Line B



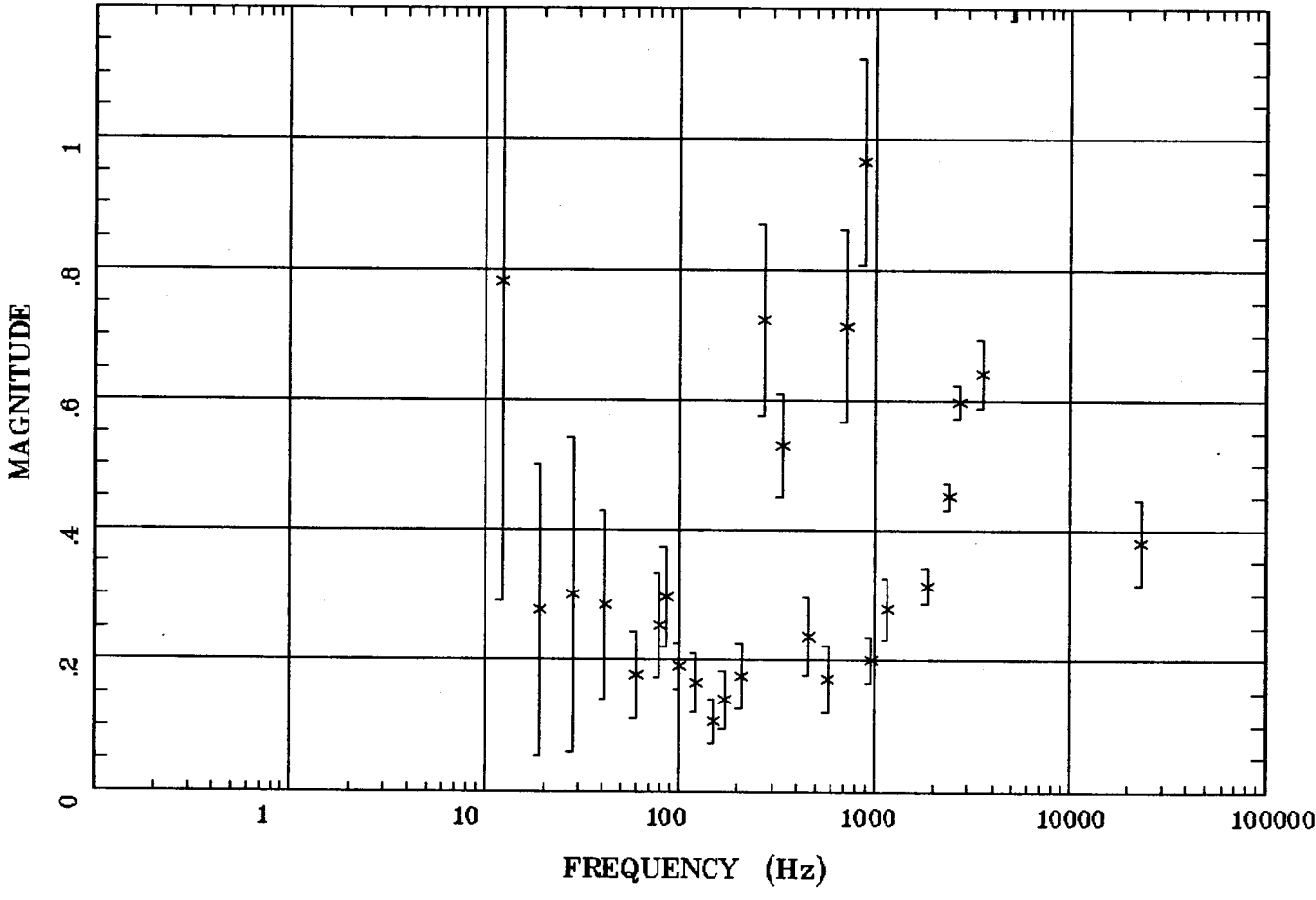
4.394 Hz	12.207 Hz	41.504 Hz	79.000 Hz
122 Hz	172 Hz	340 Hz	720 Hz
960 Hz	2420 Hz	3550 Hz	11590 Hz

Client: Water Resources
Remote: none
Acquired: 15:5 Oct 24, 2003
Survey Co:USGS

Rotation:
Filename: nts41.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 16:38 Nov 29, 2004
< EMI – ElectroMagnetic Instruments >

TIPPER MAGNITUDE

Line B

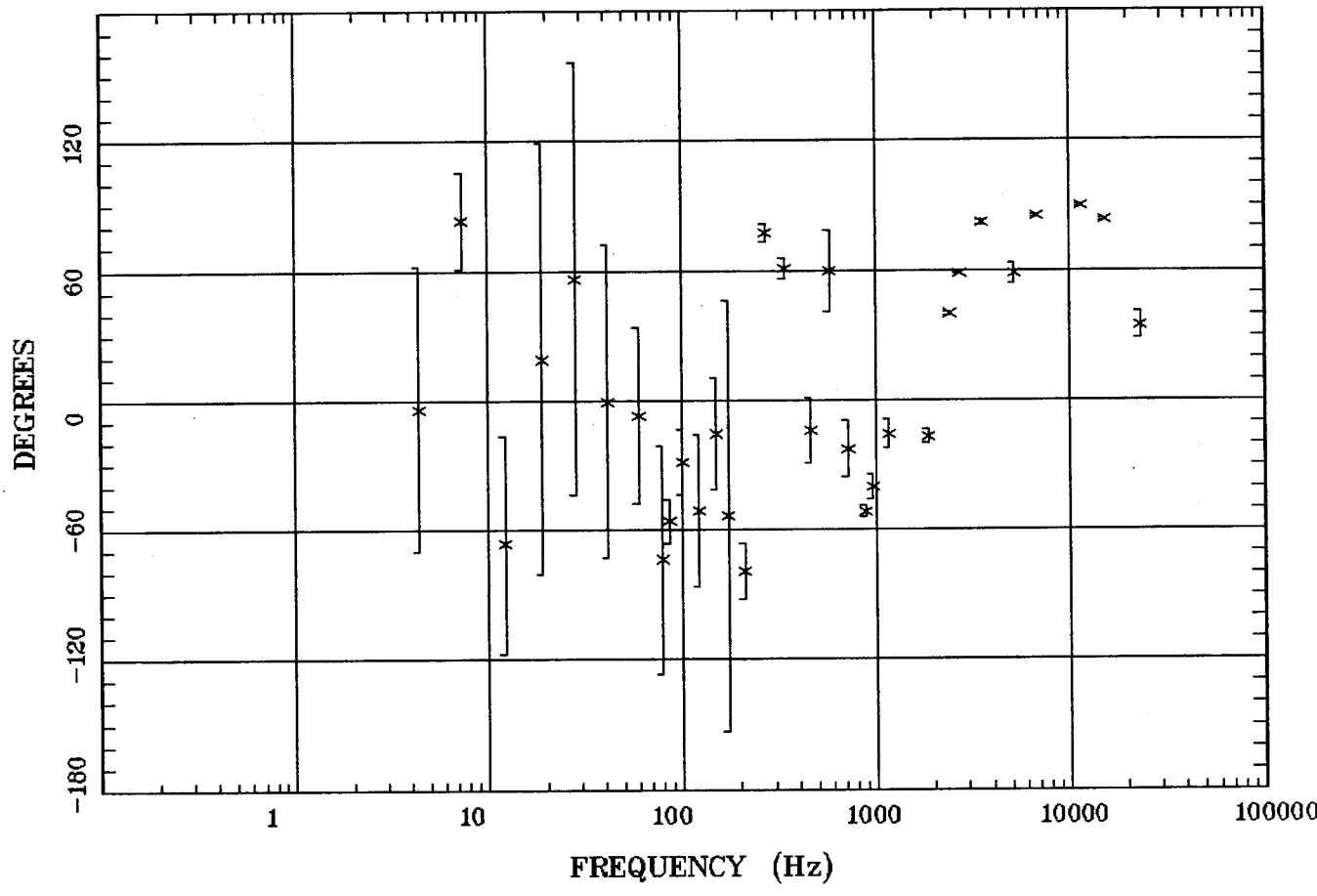


Client: Water Resources
Remote: none
Acquired: 15:5 Oct 24, 2003
Survey Co:USGS

Rotation:
Filename: nts41.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 16:38 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

TIPPER STRIKE

Line B

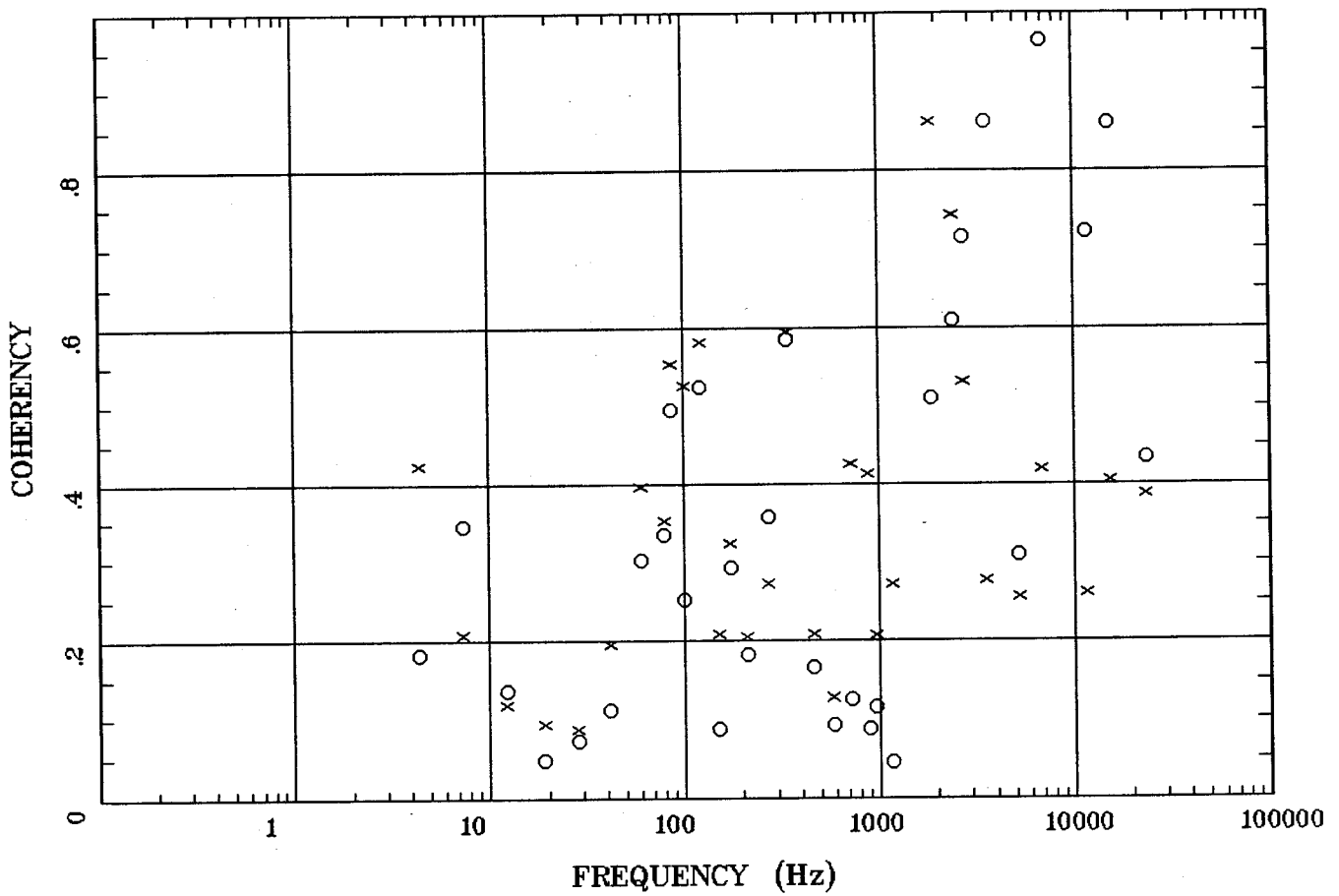


Client: Water Resources
Remote: none
Acquired: 15:5 Oct 24, 2003
Survey Co:USGS

Rotation:
Filename: nts41.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 16:38 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

HzHx.x Coh HzHy.o

Line B

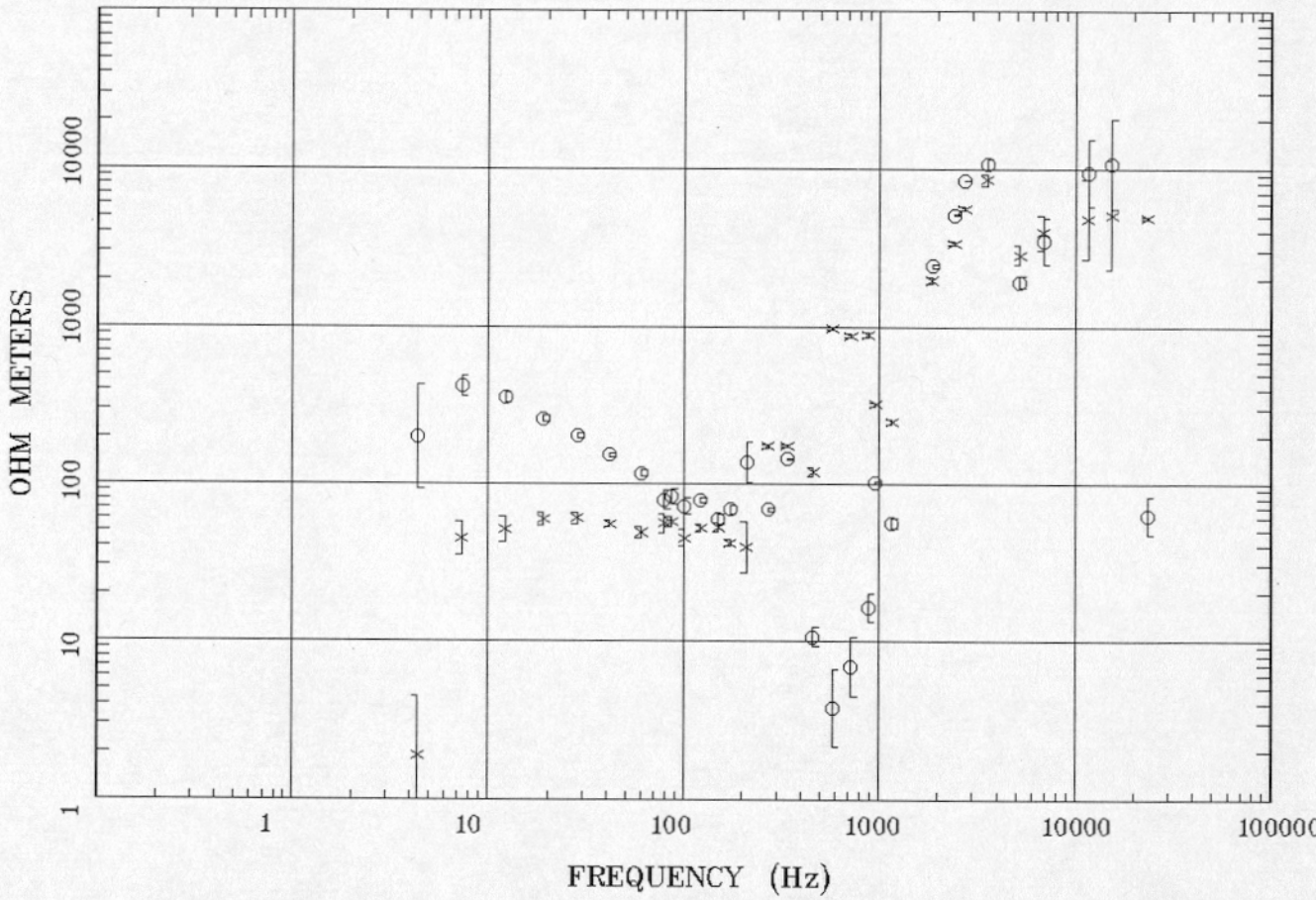


Client: Water Resources
Remote: none
Acquired: 15:5 Oct 24, 2003
Survey Co:USGS

Rotation:
Filename: nts41.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 16:38 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

APPARENT RESISTIVITY Line B

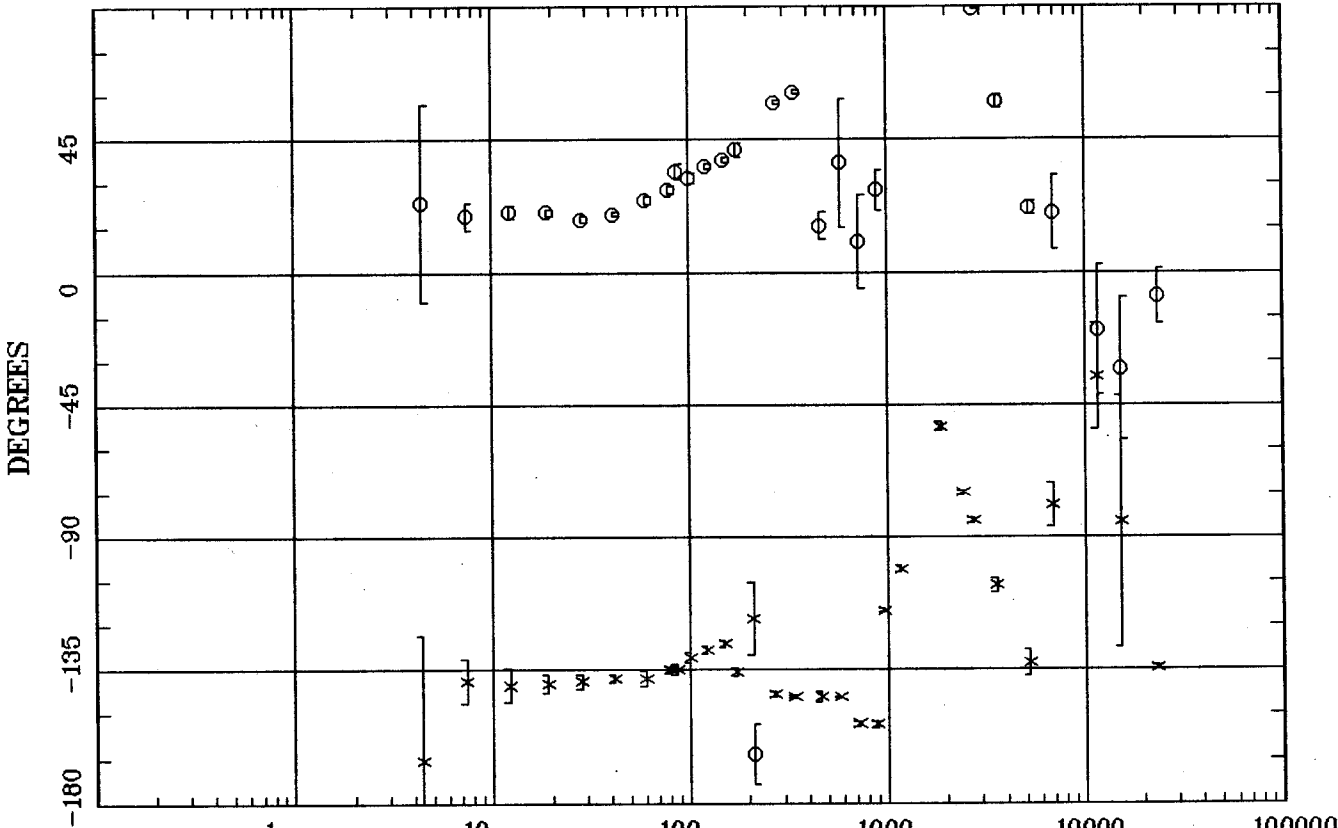
Station 42



Client: Water Resources
Remote: none
Acquired: 17:2 Oct 23, 2003
Survey Co:USGS

Rotation:
Filename: nts42.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 10:26 Nov 29, 2004
< EMI – ElectroMagnetic Instruments >

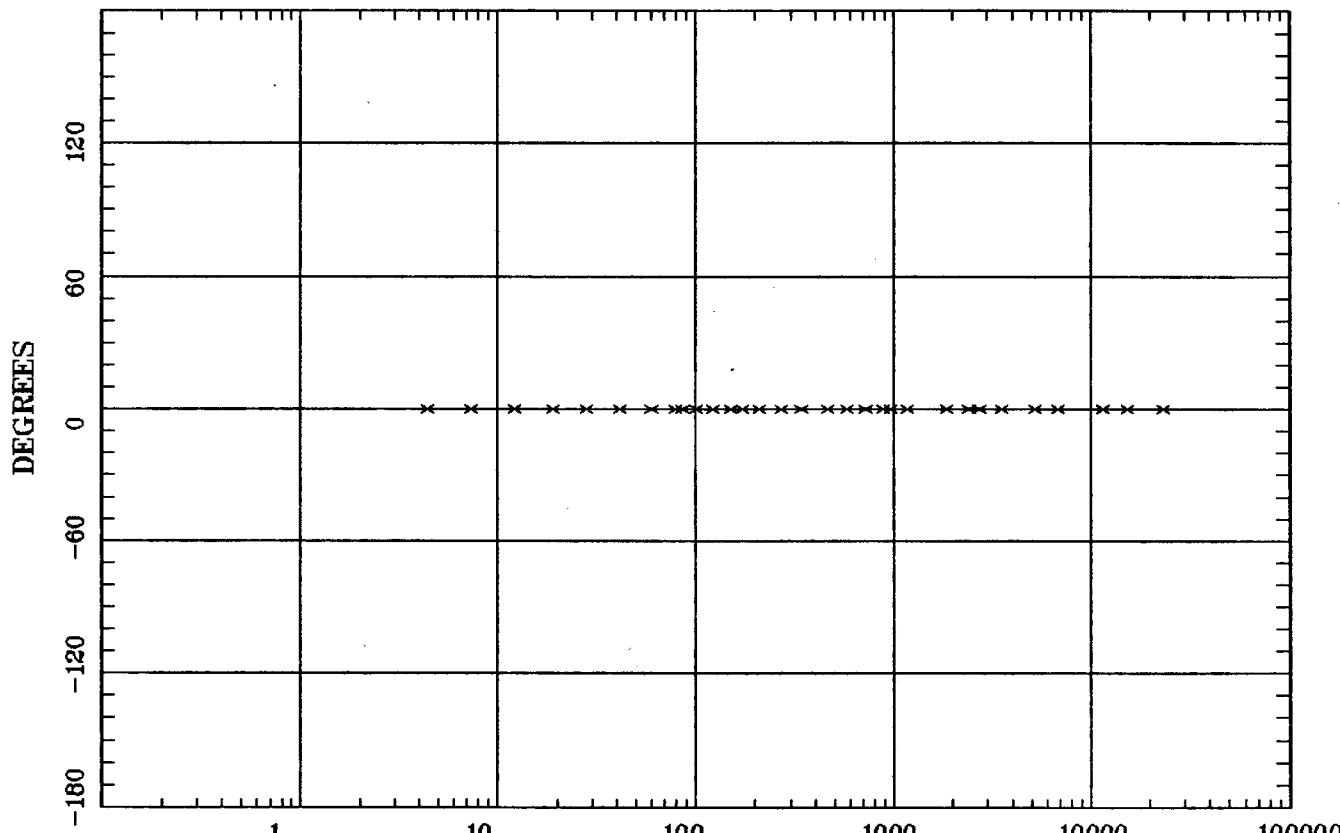
IMPEDANCE PHASE Line B



Client: Water Resources
Remote: none
Acquired: 17:2 Oct 23, 2003
Survey Co:USGS

Rotation:
Filename: nts42.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 10:26 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

ROTATION ANGLE Line B **Station 42**

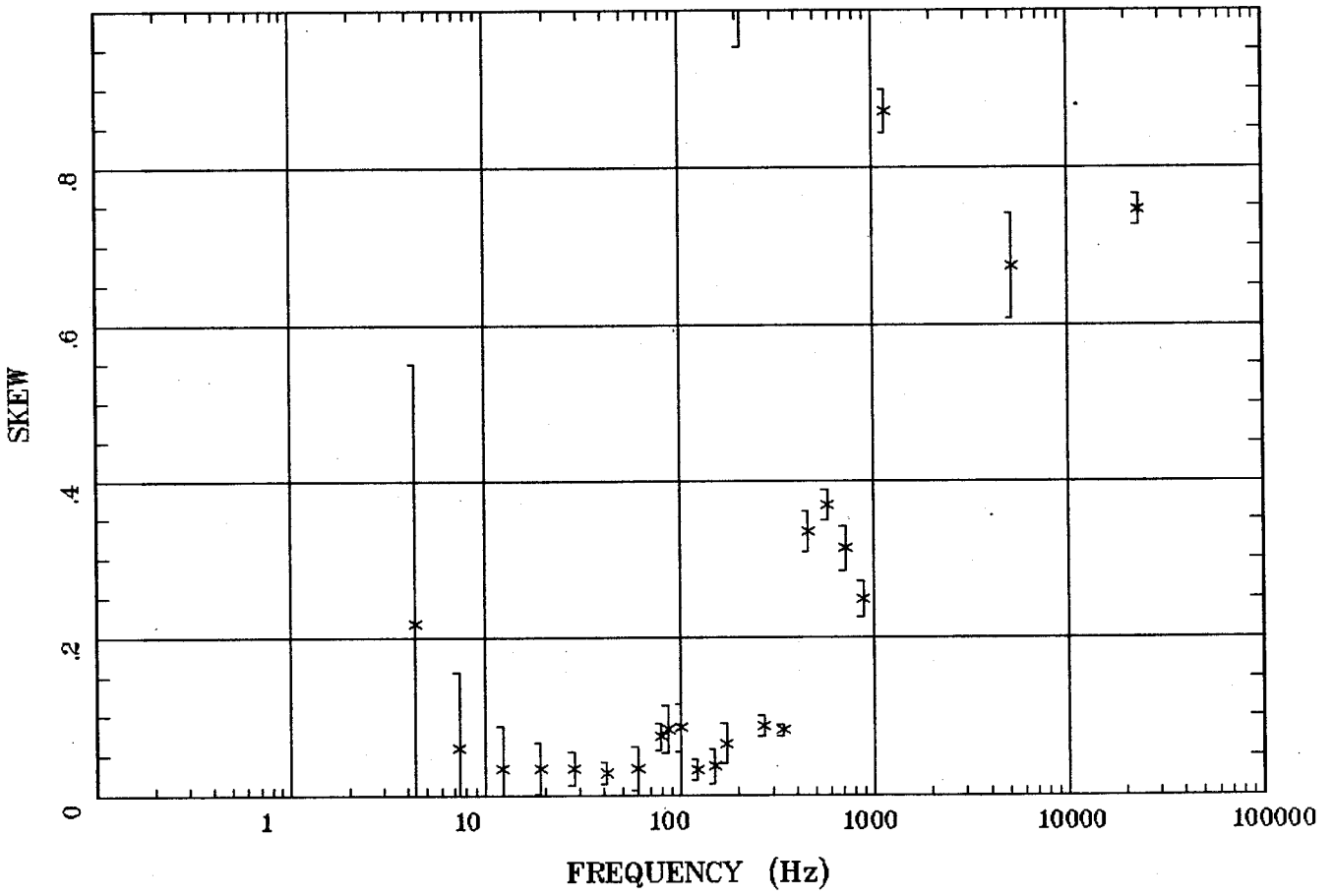


Client: Water Resources
Remote: none
Acquired: 17:2 Oct 23, 2003
Survey Co:USGS

Rotation:
Filename: nts42.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 10:26 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

Station 42

IMPEDANCE SKEW Line B

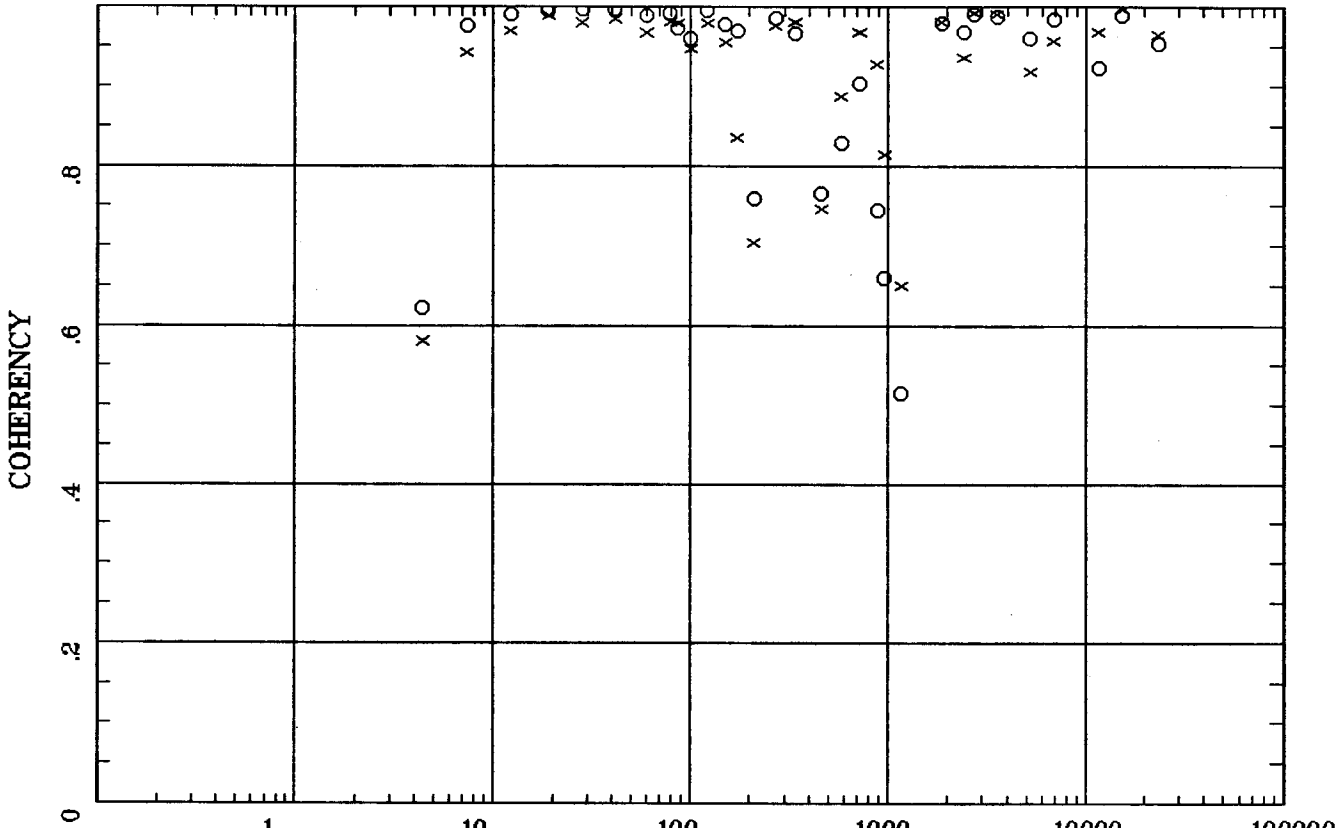


Client: Water Resources
Remote: none
Acquired: 17:2 Oct 23, 2003
Survey Co:USGS

Rotation:
Filename: nts42.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 10:26 Nov 29, 2004
< EMI – ElectroMagnetic Instruments >

Station 42

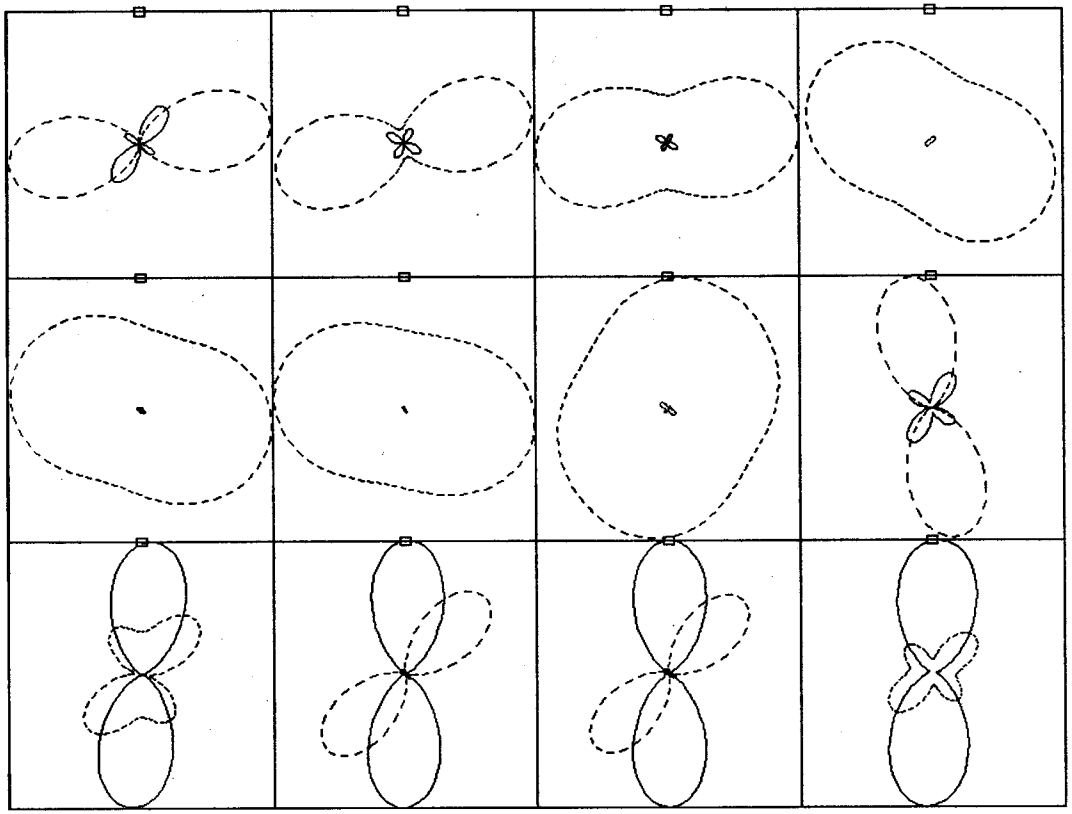
E MULT Coh. Line B



Client: Water Resources
Remote: none
Acquired: 17:2 Oct 23, 2003
Survey Co:USGS

Rotation:
Filename: nts42.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 10:26 Nov 29, 2004
< EMI – ElectroMagnetic Instruments >

POLAR PLOTS Line B



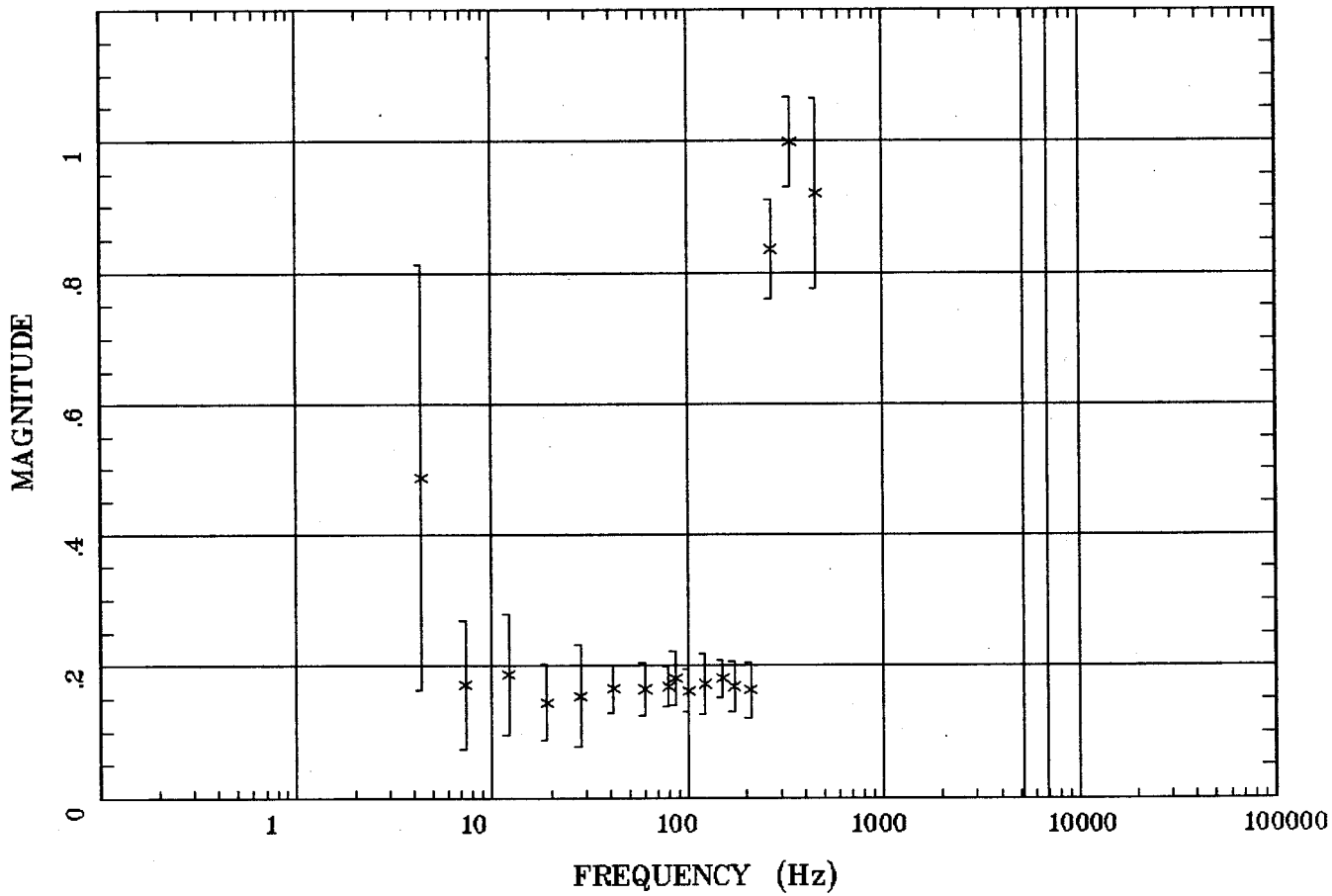
4.394 Hz	12.207 Hz	41.504 Hz	79.000 Hz
122 Hz	172 Hz	340 Hz	720 Hz
960 Hz	2420 Hz	3550 Hz	11590 Hz

Client: Water Resources
Remote: none
Acquired: 17:2 Oct 23, 2003
Survey Co:USGS

Rotation:
Filename: nts42.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 10:26 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

Station 42

TIPPER MAGNITUDE Line B

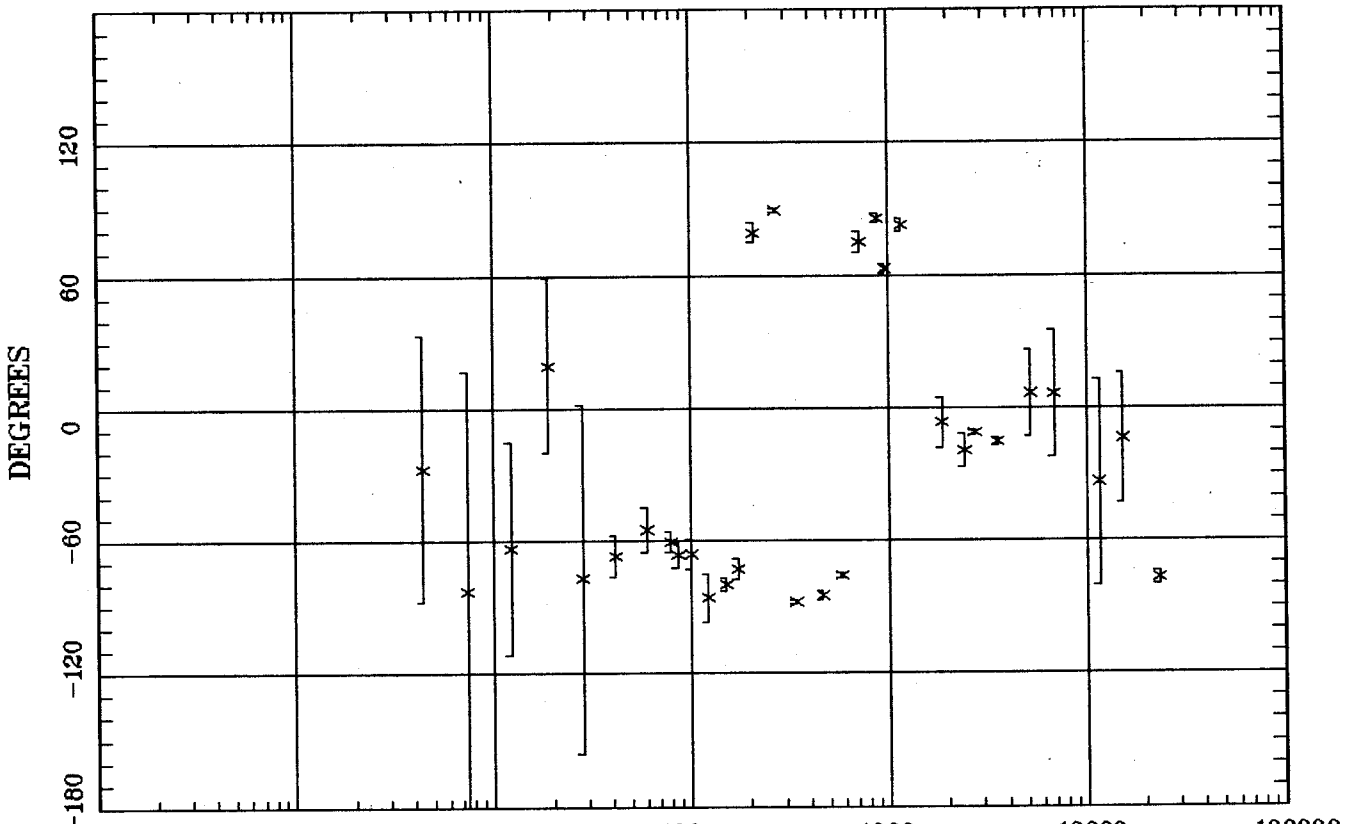


Client: Water Resources
Remote: none
Acquired: 17:2 Oct 23, 2003
Survey Co:USGS

Rotation:
Filename: nts42.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 10:26 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

TIPPER STRIKE

Line B

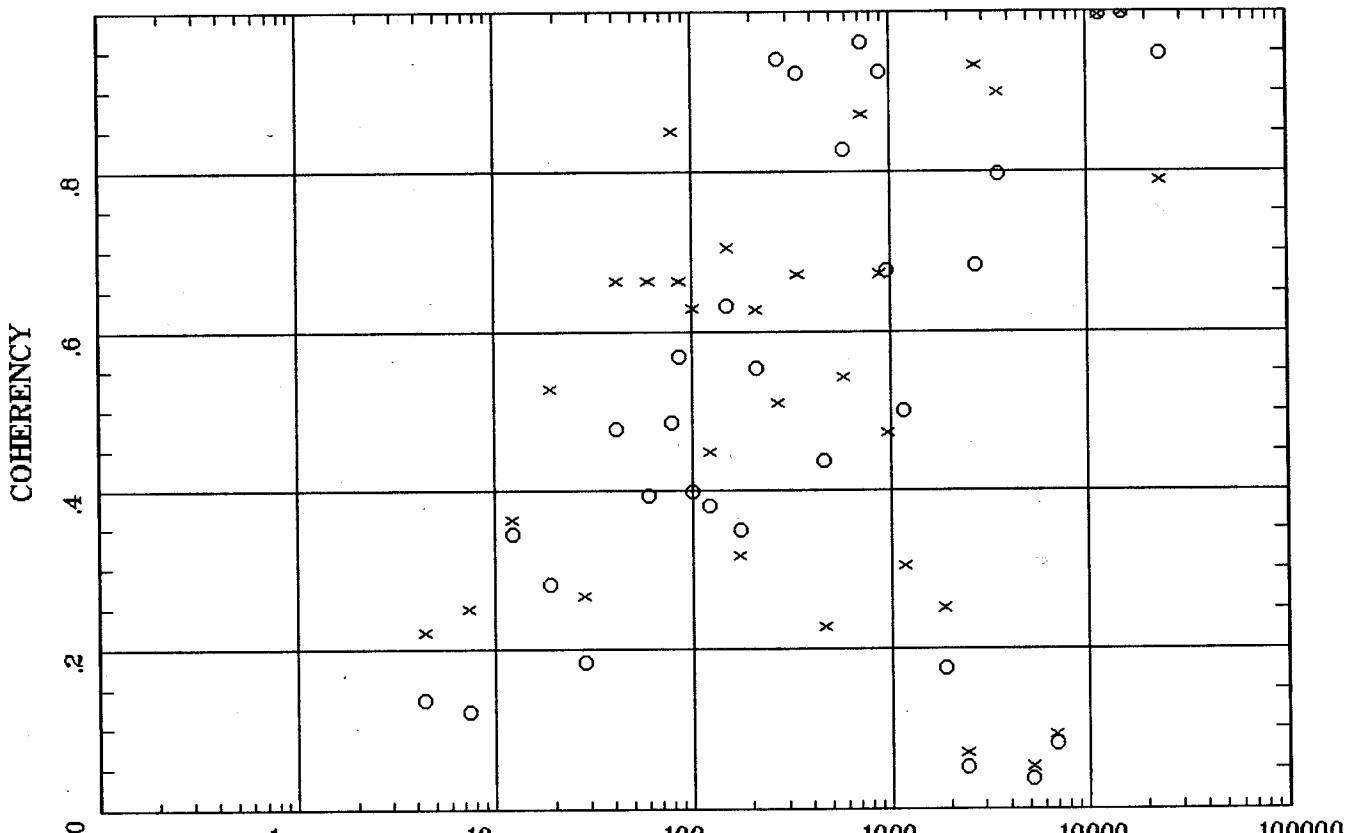


Client: Water Resources
Remote: none
Acquired: 17:2 Oct 23, 2003
Survey Co:USGS

Rotation:
Filename: nts42.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 10:26 Nov 29, 2004
< EMI - ElectroMagnetic Instruments >

HzHx.x Coh HzHy.o

Line B



Client: Water Resources
Remote: none
Acquired: 17:2 Oct 23, 2003
Survey Co:USGS

Rotation:
Filename: nts42.avg
Channels: Ch1 Ch2 Ch3 Ch4 Ch5 Ch3 Ch4
Plotted: 10:26 Nov 29, 2004
< EMI – ElectroMagnetic Instruments >