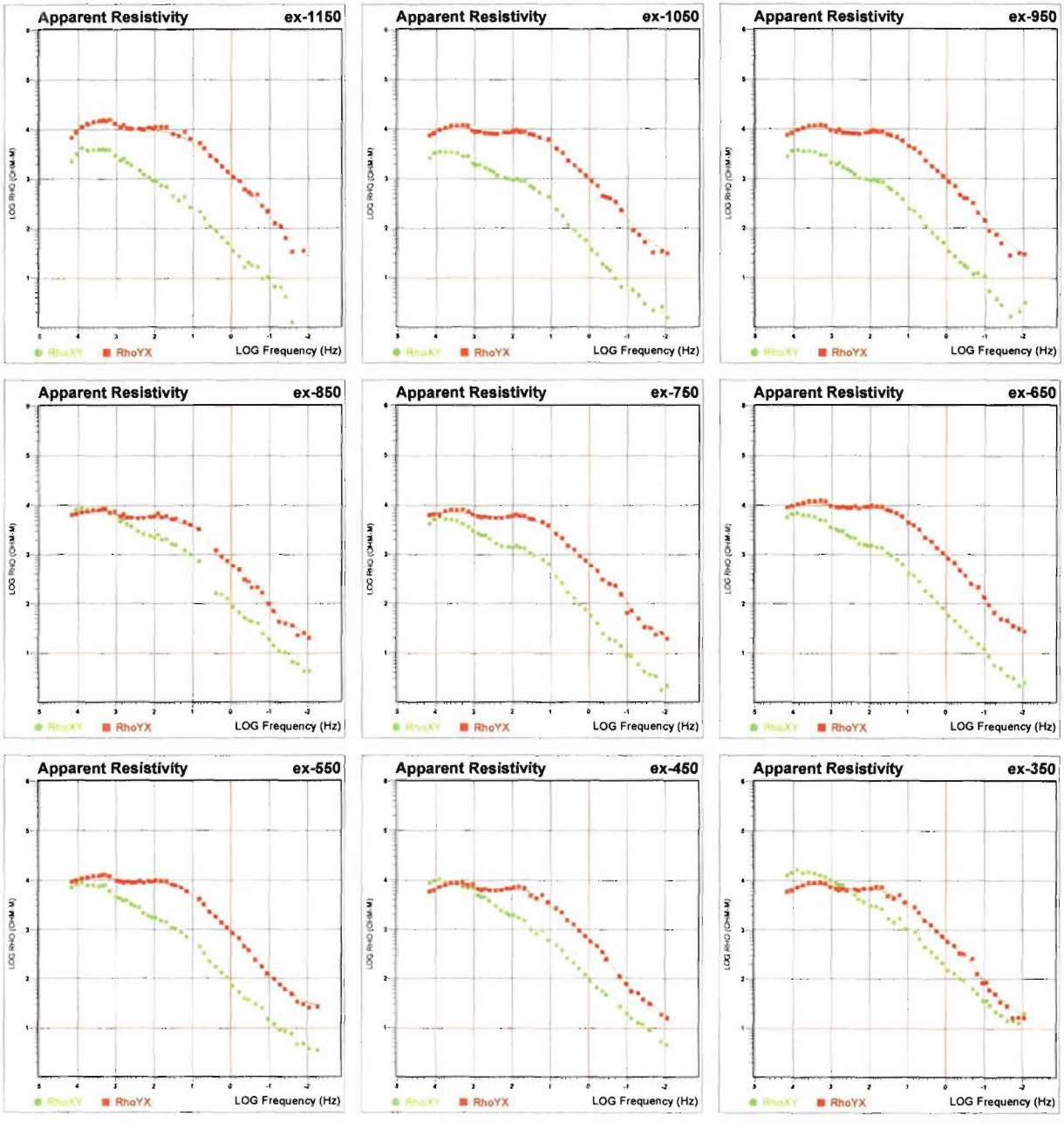
APPENDIX D: MT APPARENT RESISTIVITY AND PHASE SOUNDING CURVES

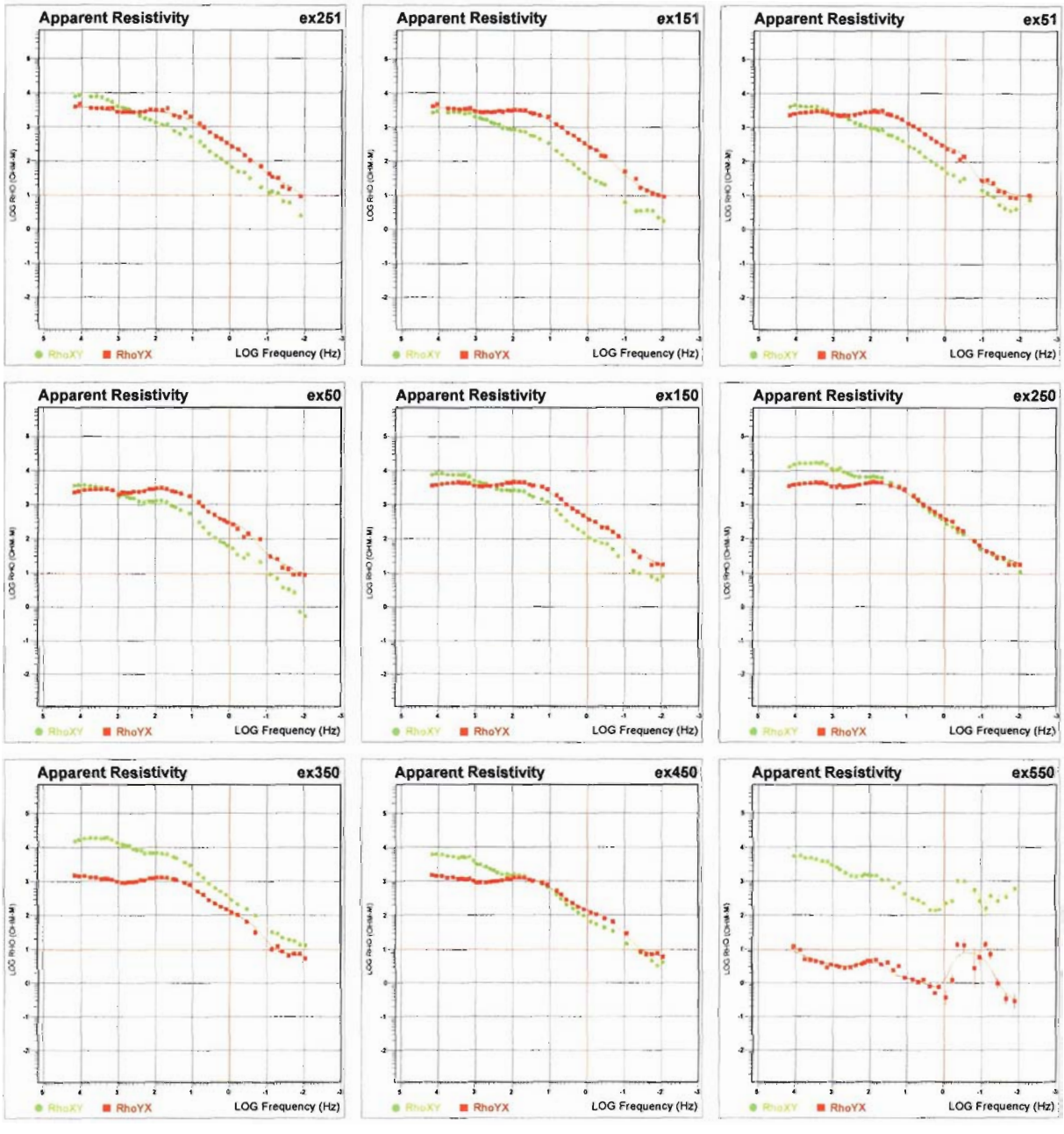
Note: **XY denotes in-line electrical (E) field and orthogonal magnetic (H) field (Ex/Hy).**
YX denotes in-line H field and orthogonal E-field (Ey/Hx).

LINE 0N SUDNIP GRID: APPARENT RESISTIVITY VS. FREQUENCY



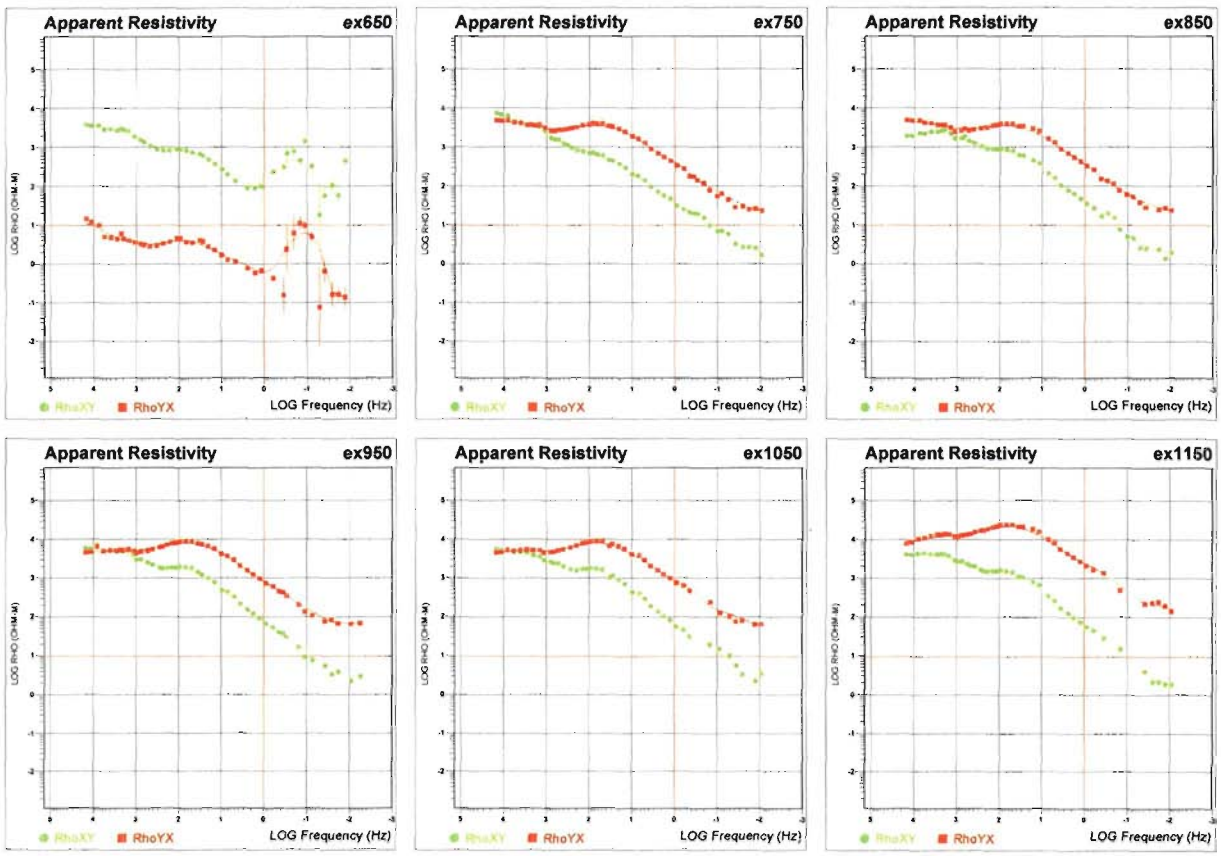
Rho xy ------ green
Rho yx ------ orange

LINE 0N: APPARENT RESISTIVITY VS. FREQUENCY



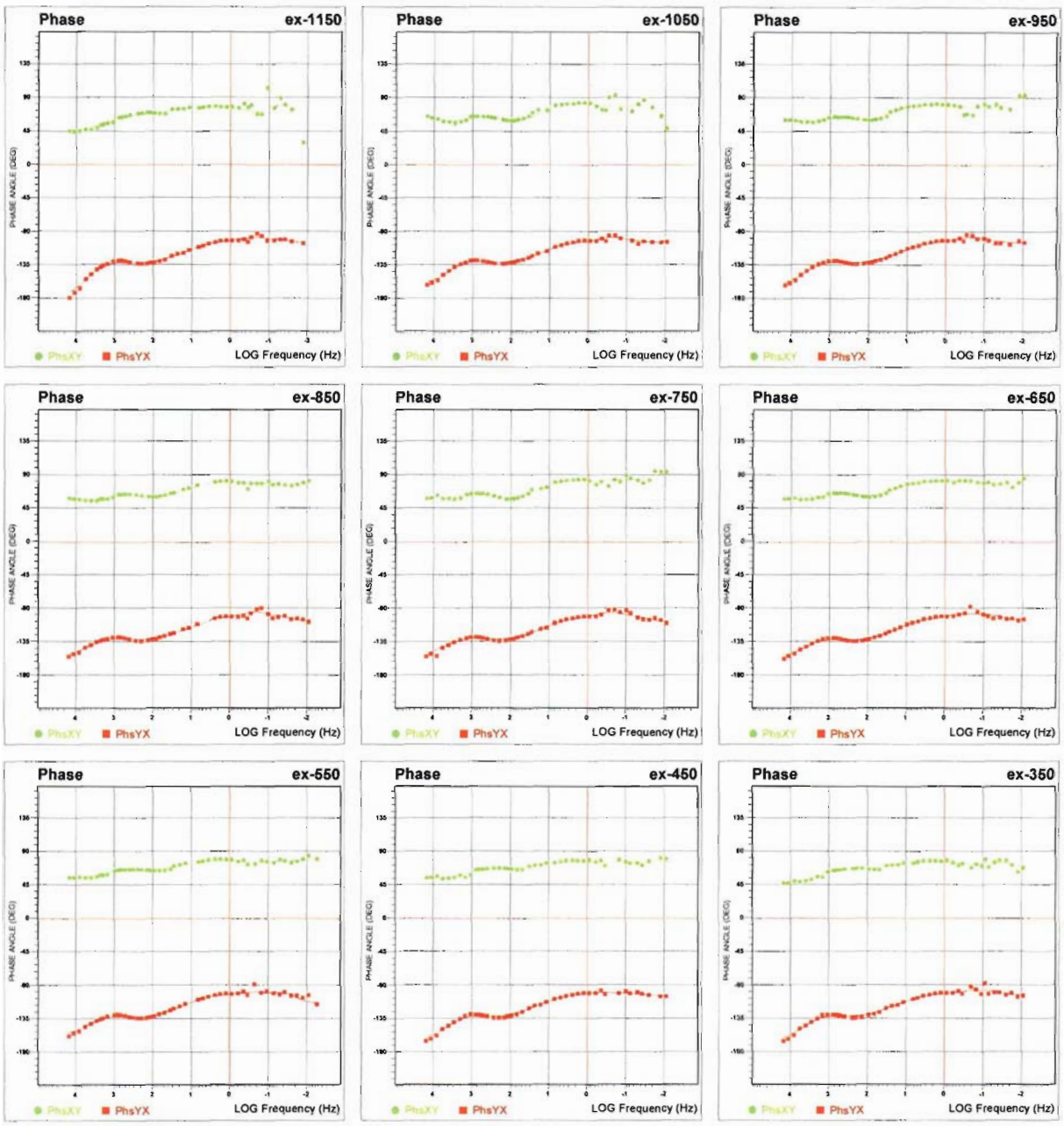
Rho xy ------ **green**
Rho yx ------ **orange**

LINE 0N: APPARENT RESISTIVITY VS. FREQUENCY



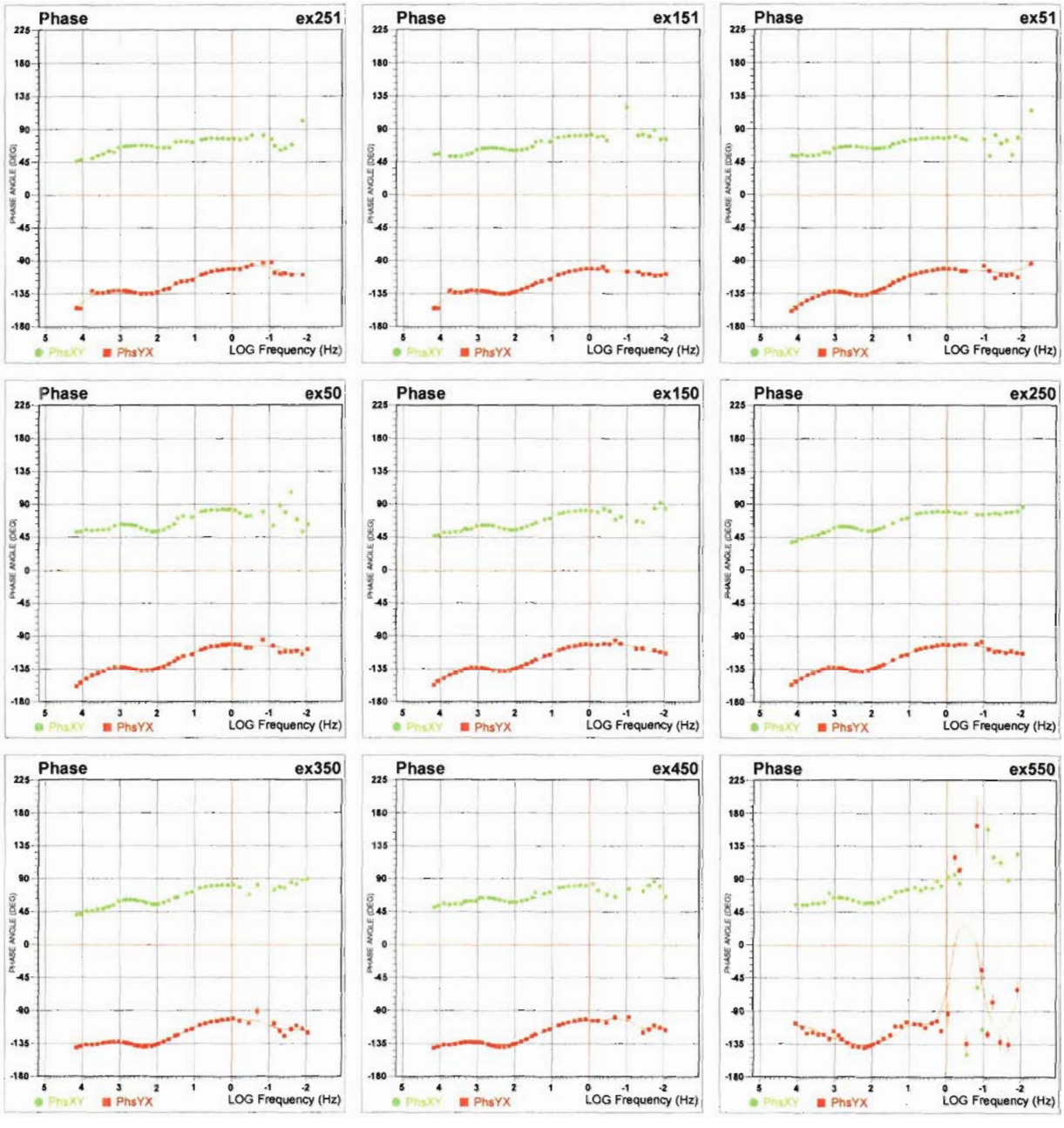
Rho xy ------ green
Rho yx ------ orange

LINE 0N: PHASE



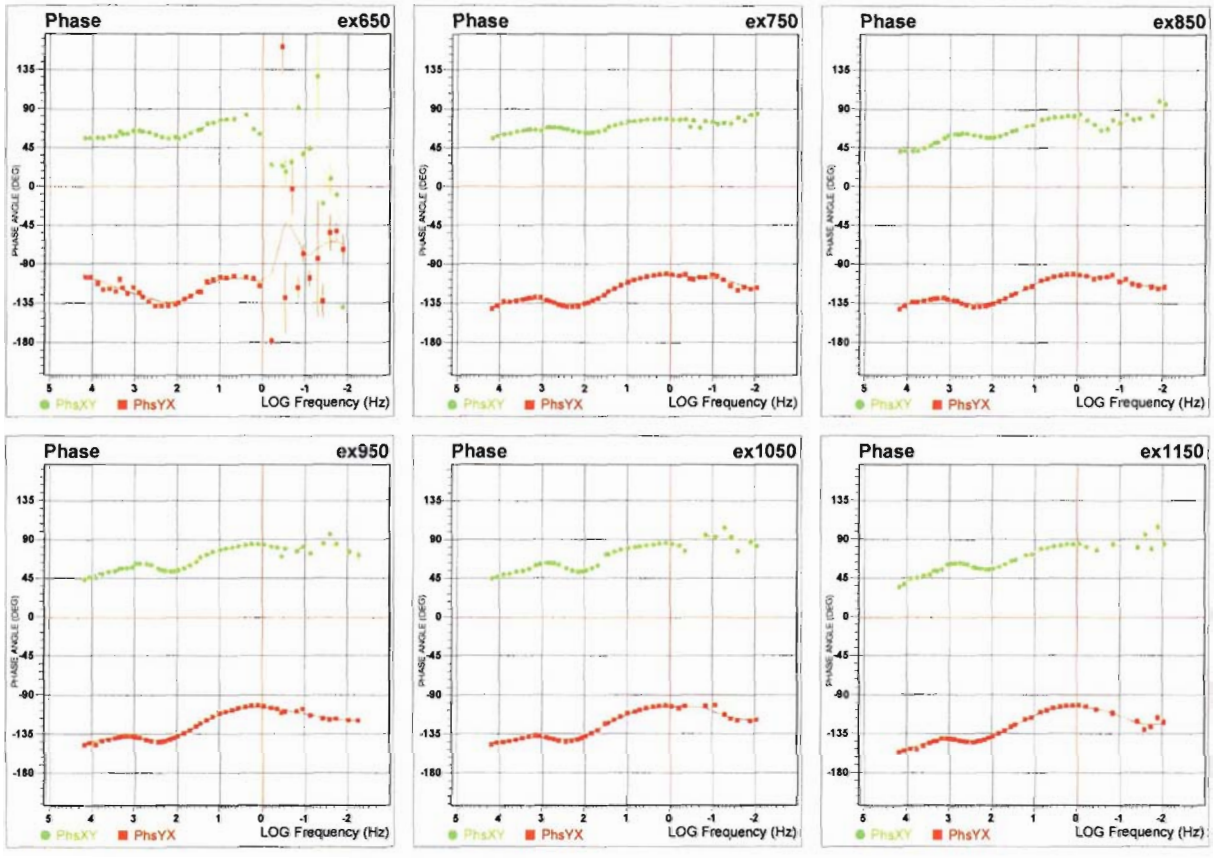
Phs xy ------ green
Phs yx ------ orange

LINE 0N: PHASE



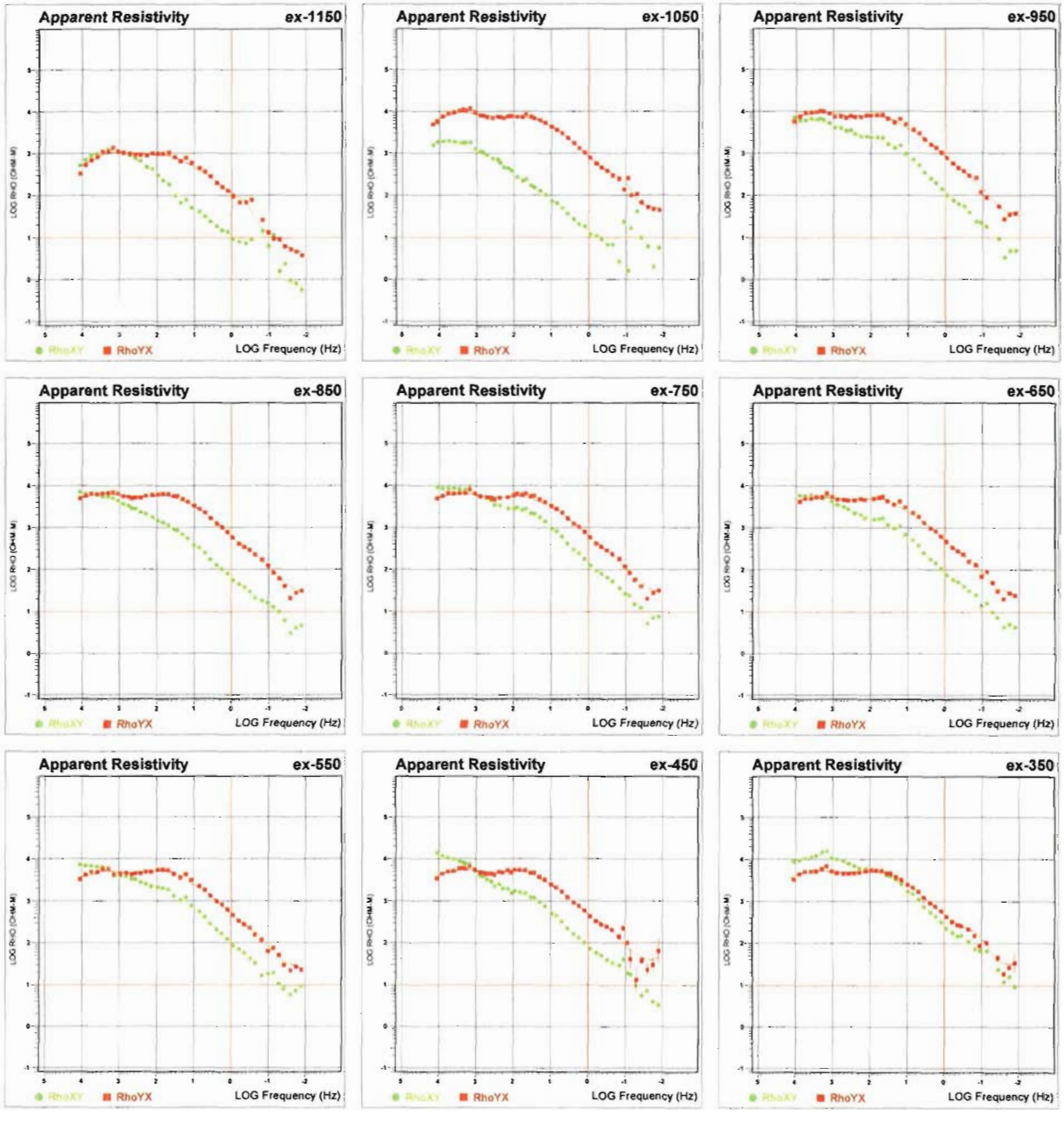
Phs xy ------ green
Phs yx ------ orange

LINE 0N: PHASE



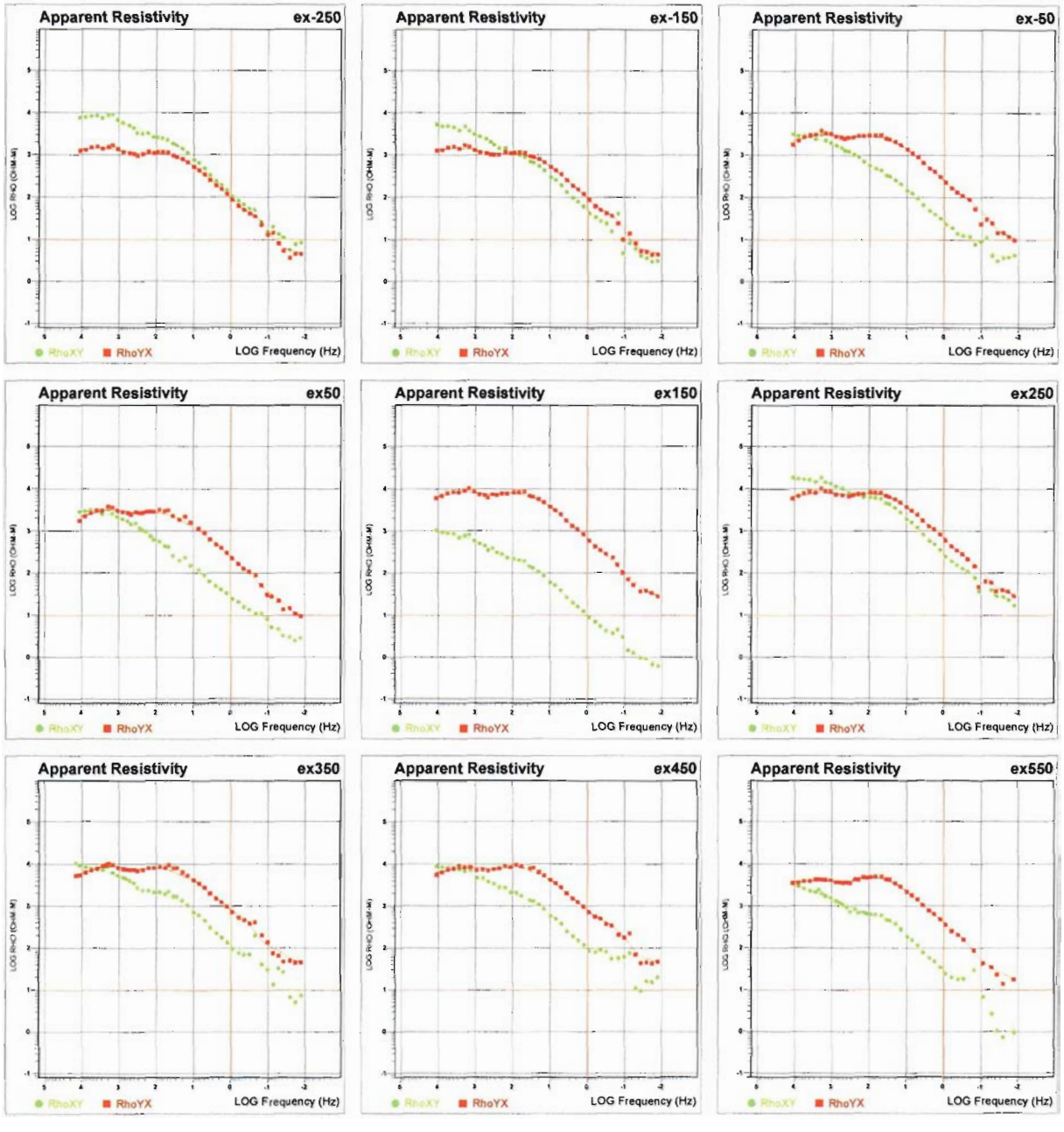
Phs xy ------ green
Phs yx ------ orange

LINE 4N SUDNIP GRID: APPARENT RESISTIVITY VS. FREQUENCY



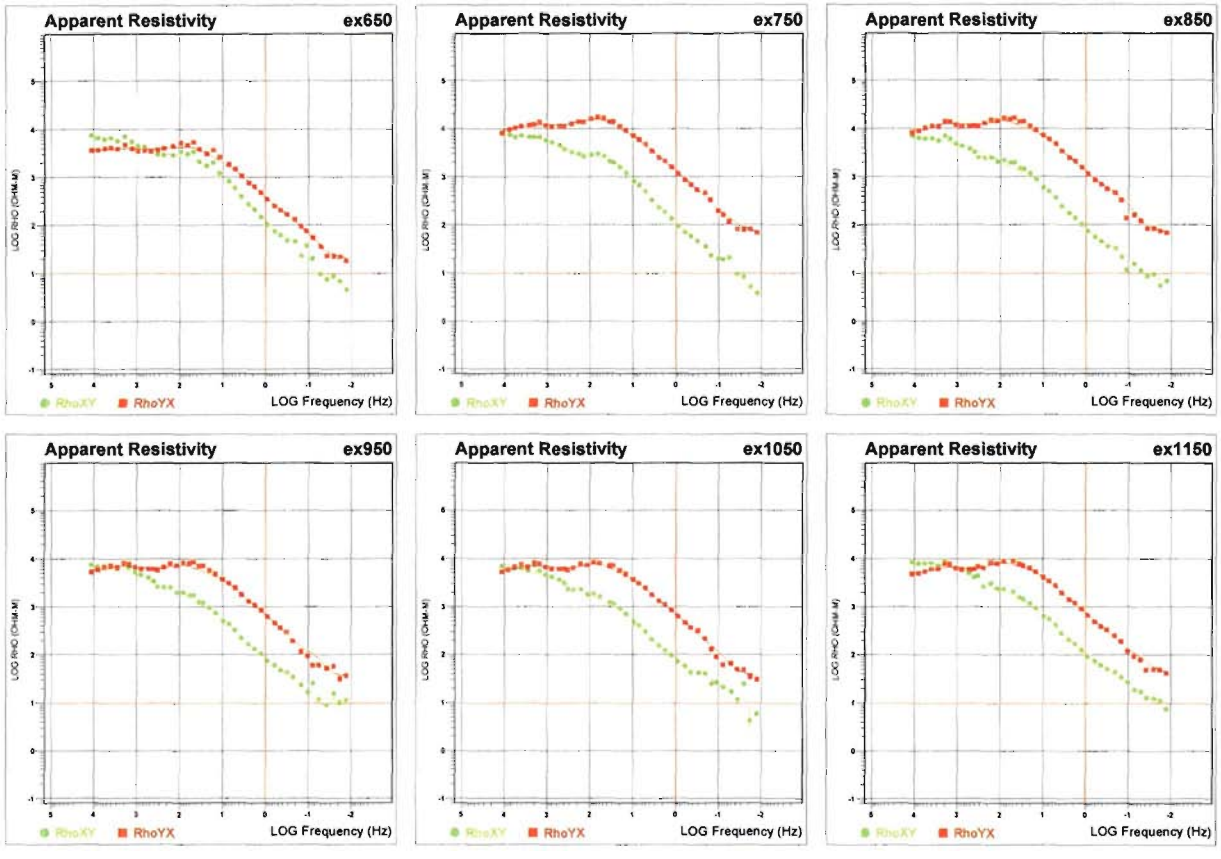
Rho xy ------ green
Rho yx ------ orange

LINE 4N: APPARENT RESISTIVITY VS FREQUENCY



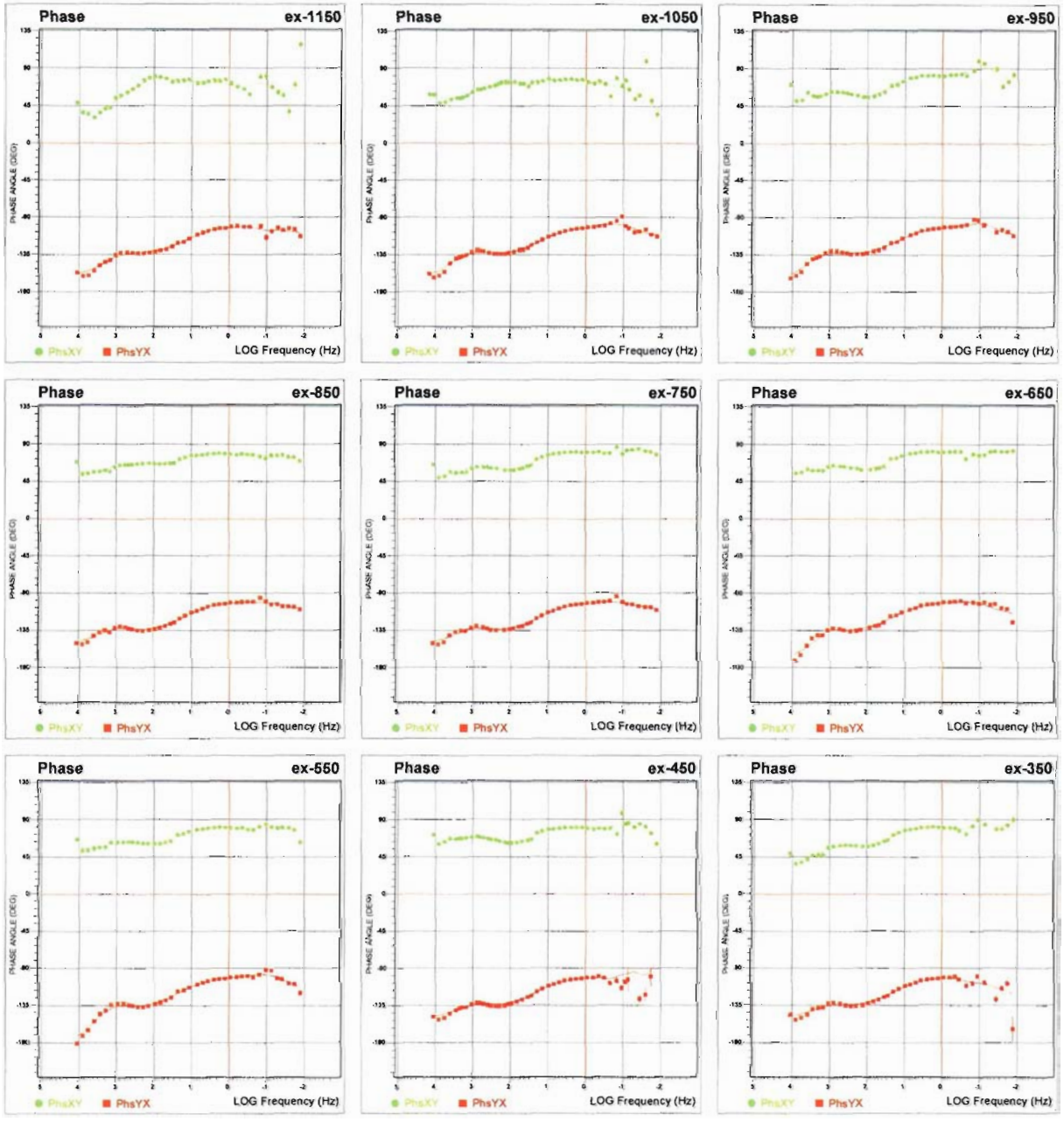
Rho xy ------ green
Rho yx ------ orange

LINE 4N: APPARENT RESISTIVITY VS FREQUENCY



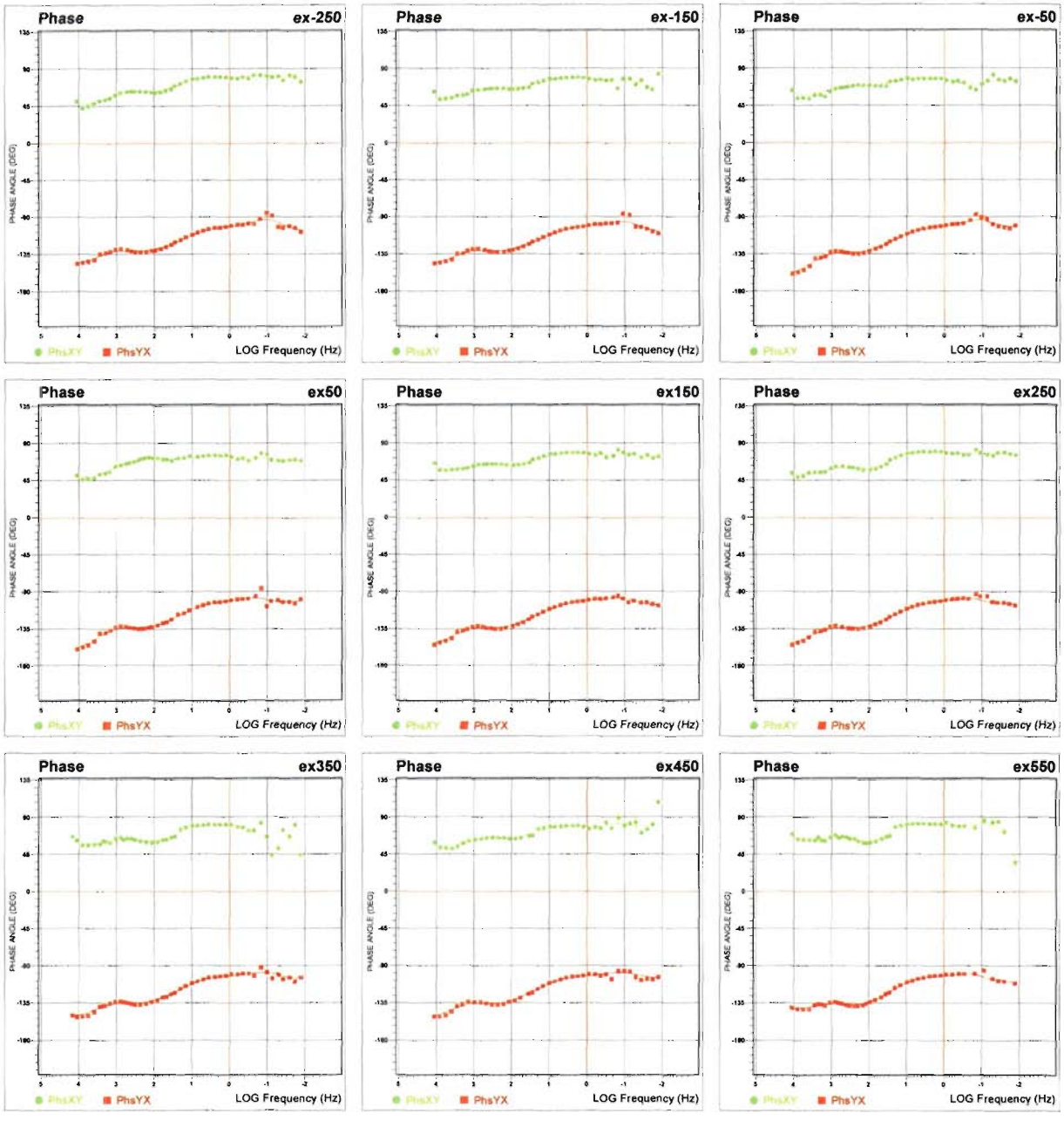
Rho xy ------ green
Rho yx ------ orange

LINE 4N: PHASE



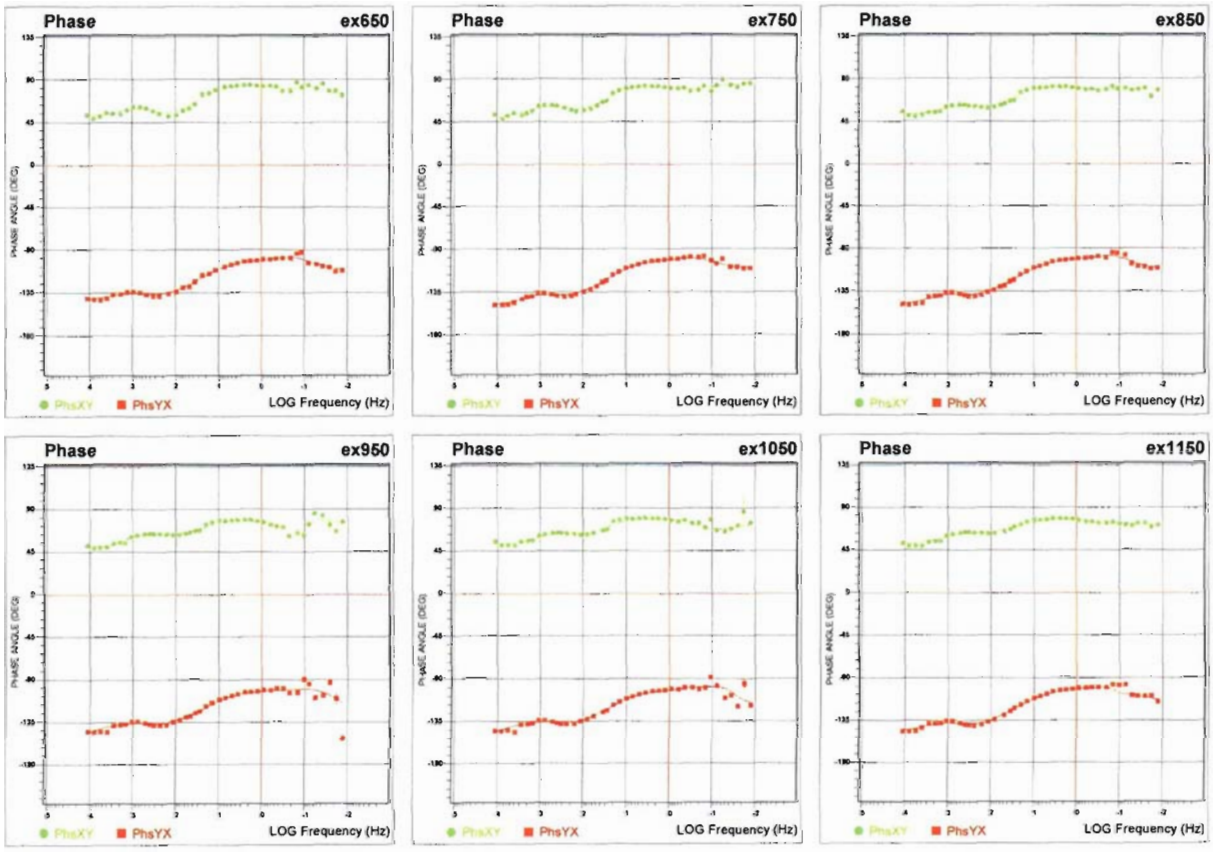
Phs xy ------ green
Phs yx ------ orange

LINE 4N: PHASE



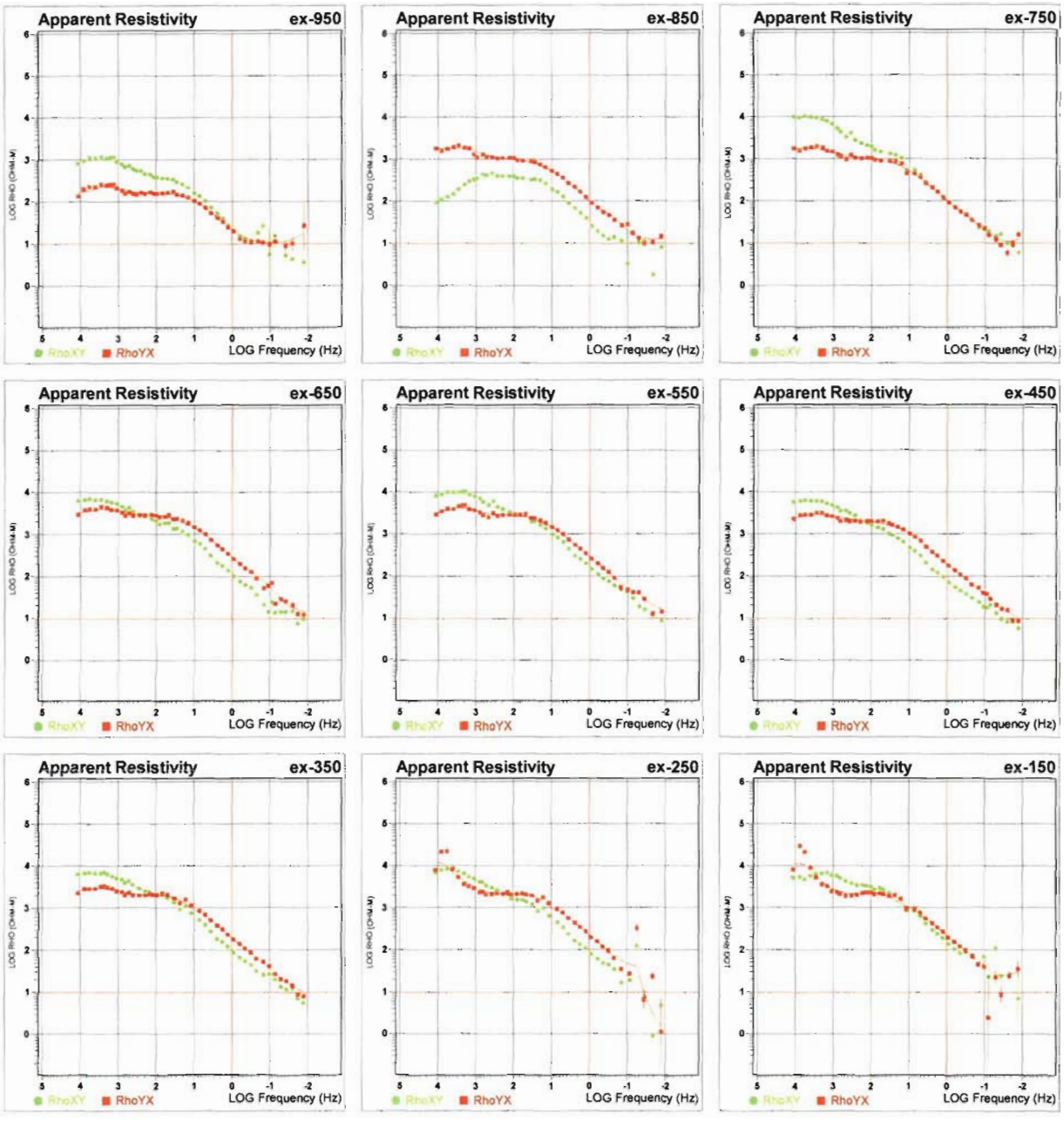
Phs xy ------ green
Phs yx ------ orange

LINE 4N: PHASE



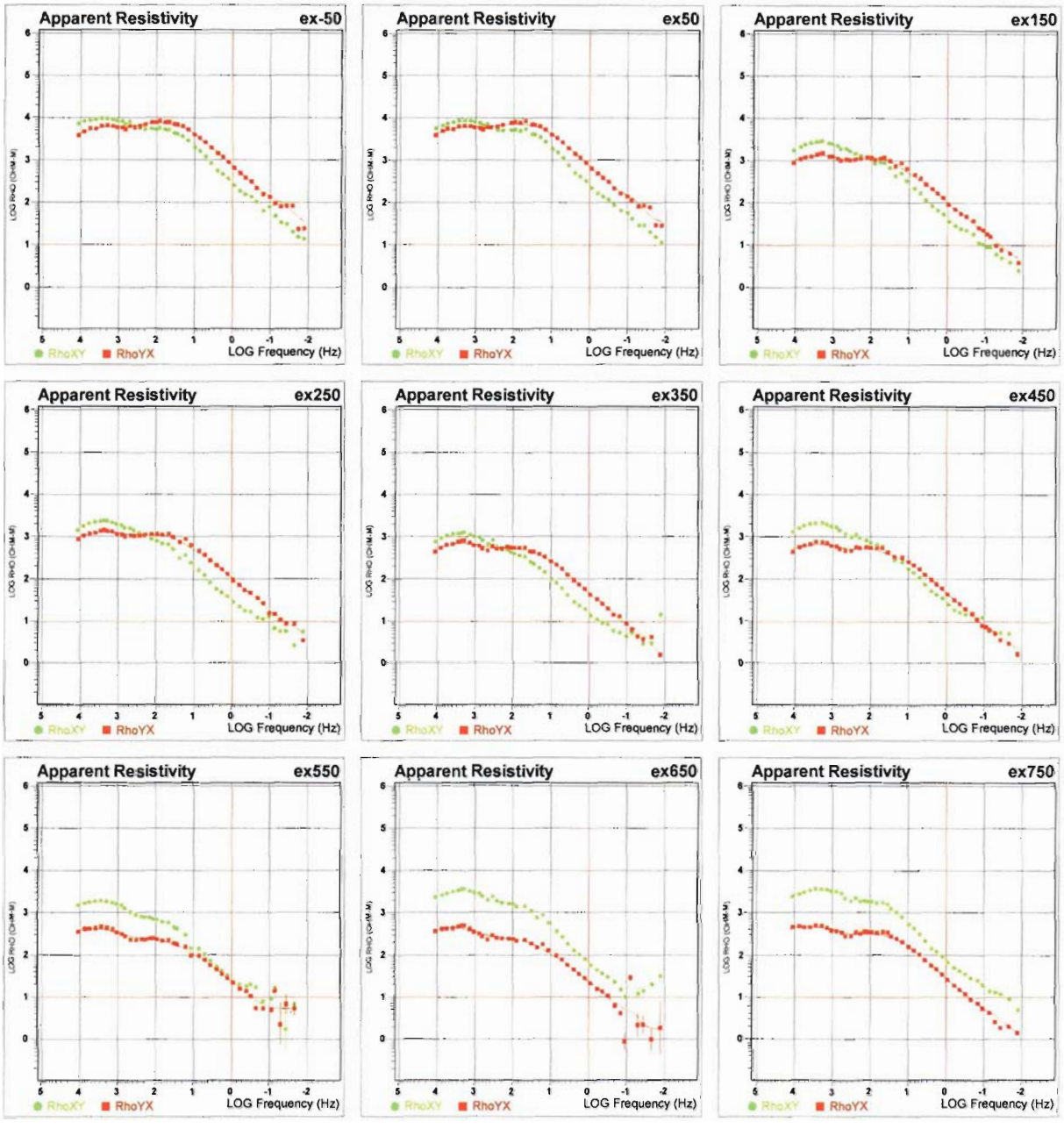
Phs xy ------ green
Phs yx ------ orange

LINE 8N SUDNIP GRID: APPARENT RESISTIVITY VS. FREQUENCY



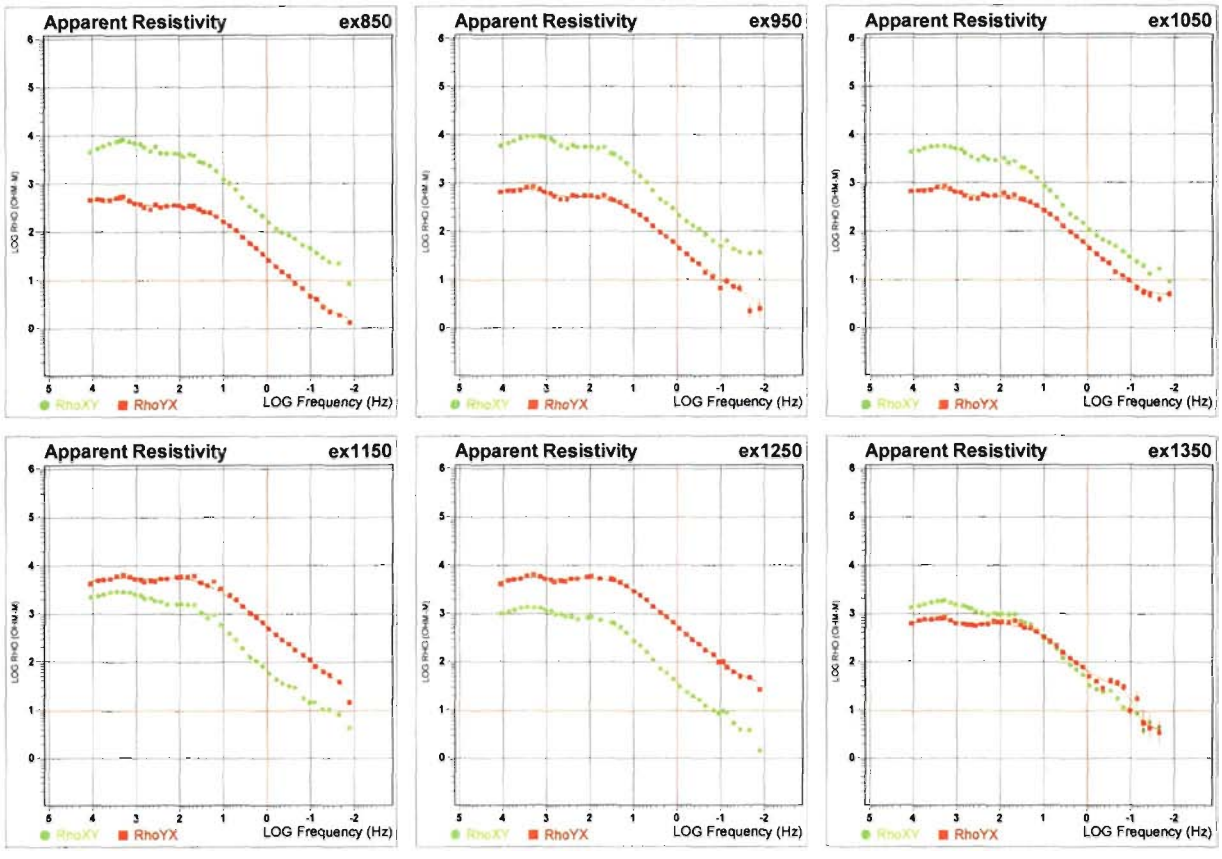
Rho xy ------ green
Rho yx ------ orange

LINE 8N: APPARENT RESISTIVITY VS. FREQUENCY



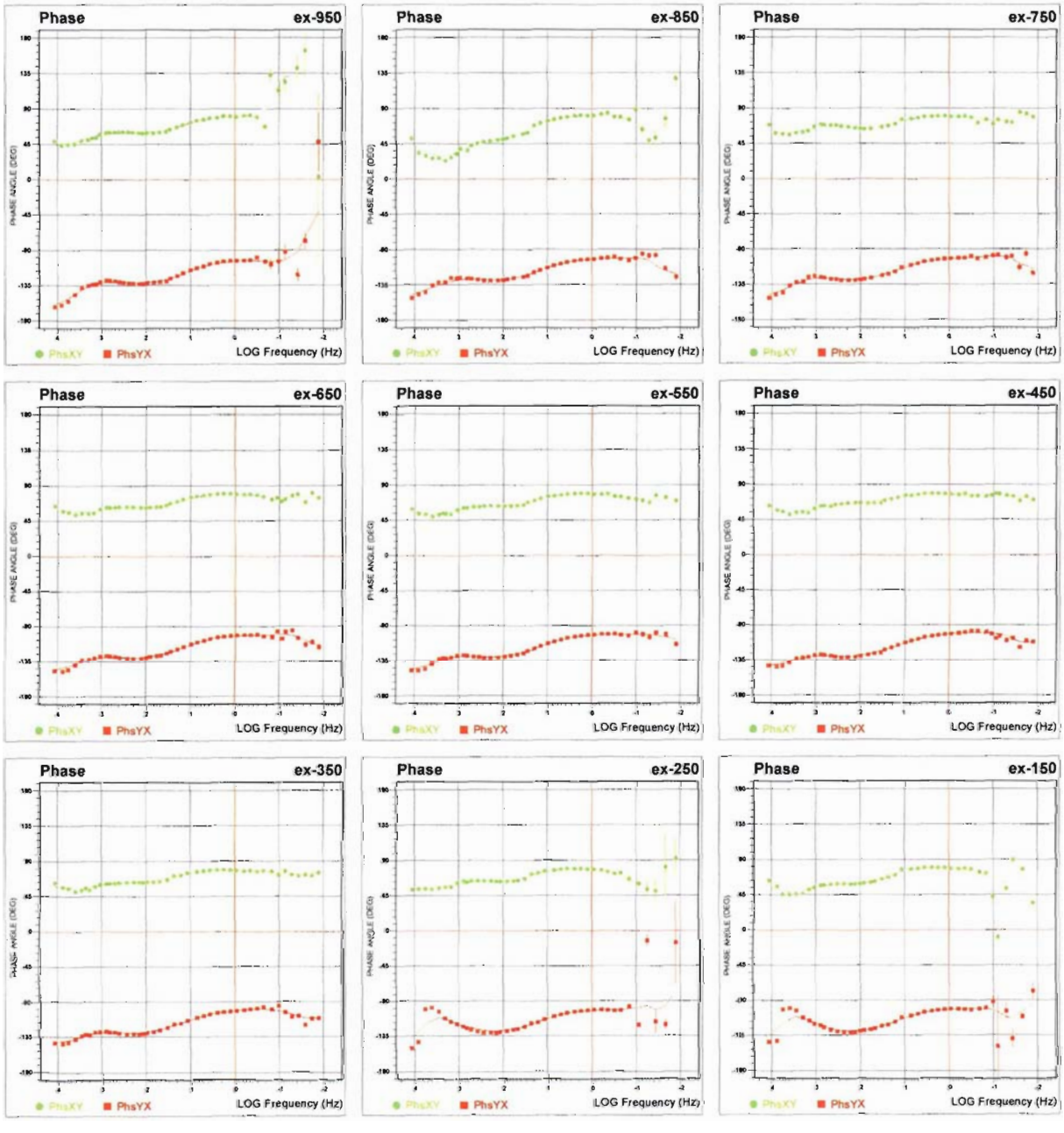
Rho xy ------ green
Rho yx ------ orange

LINE 8N: APPARENT RESISTIVITY VS. FREQUENCY



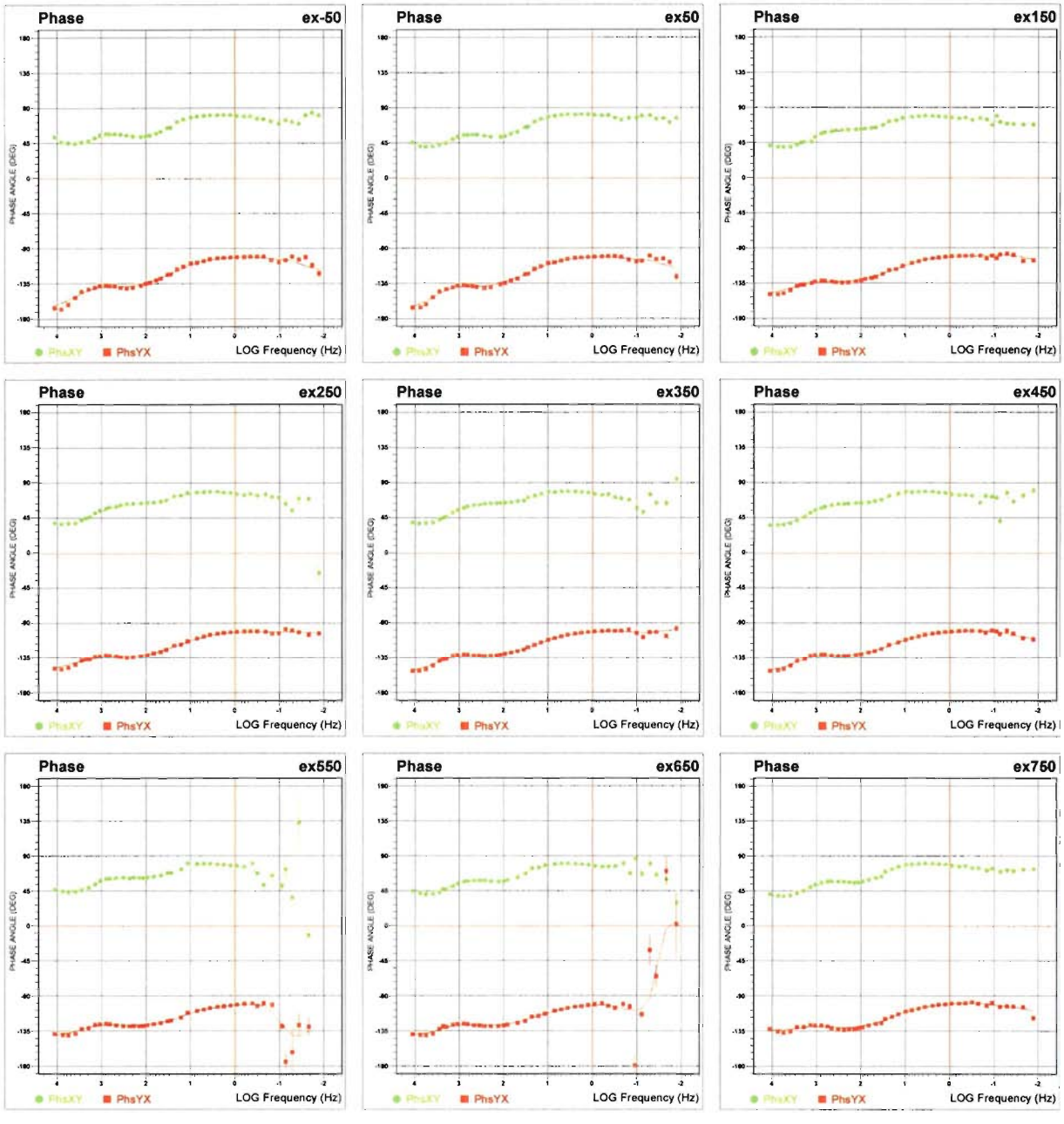
Rho xy ------ green
Rho yx ------ orange

LINE 8N: PHASE



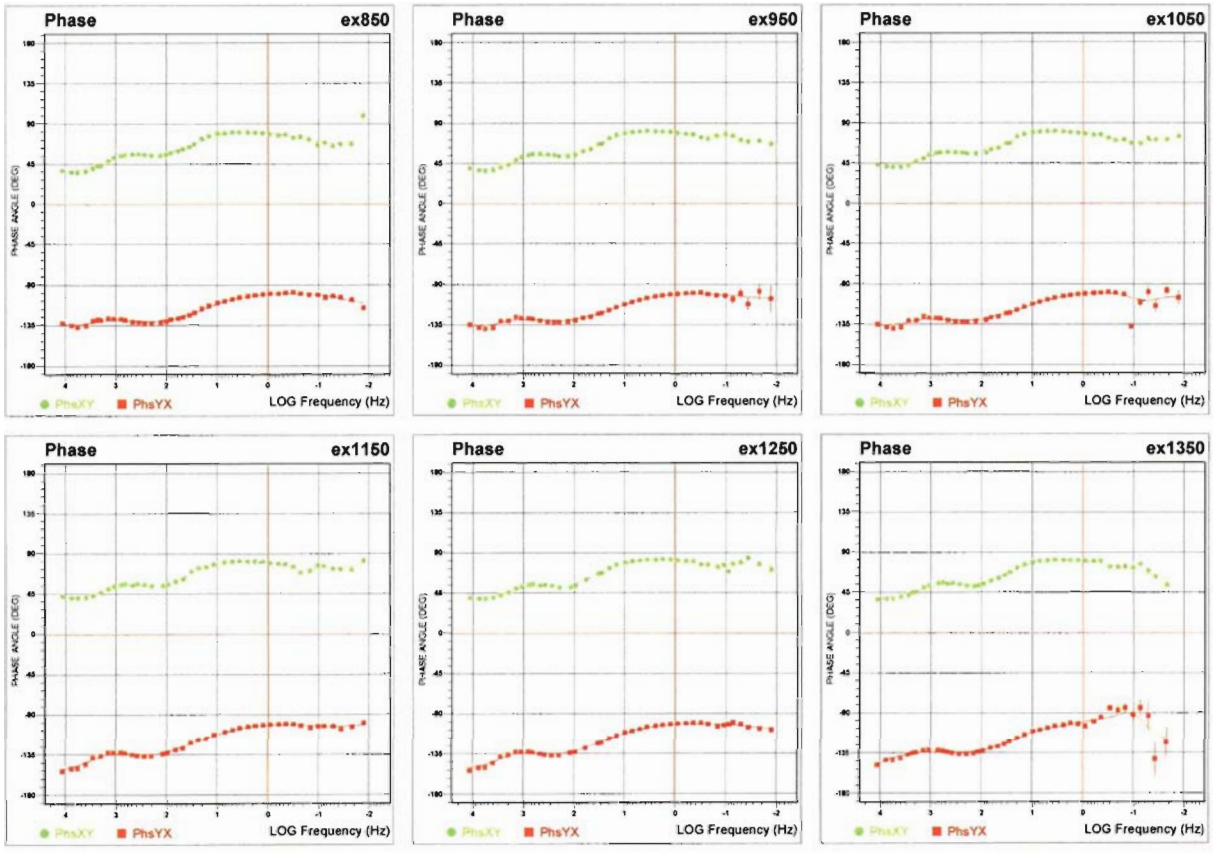
Phs xy ------ green
Phs yx ------ orange

LINE 8N: PHASE



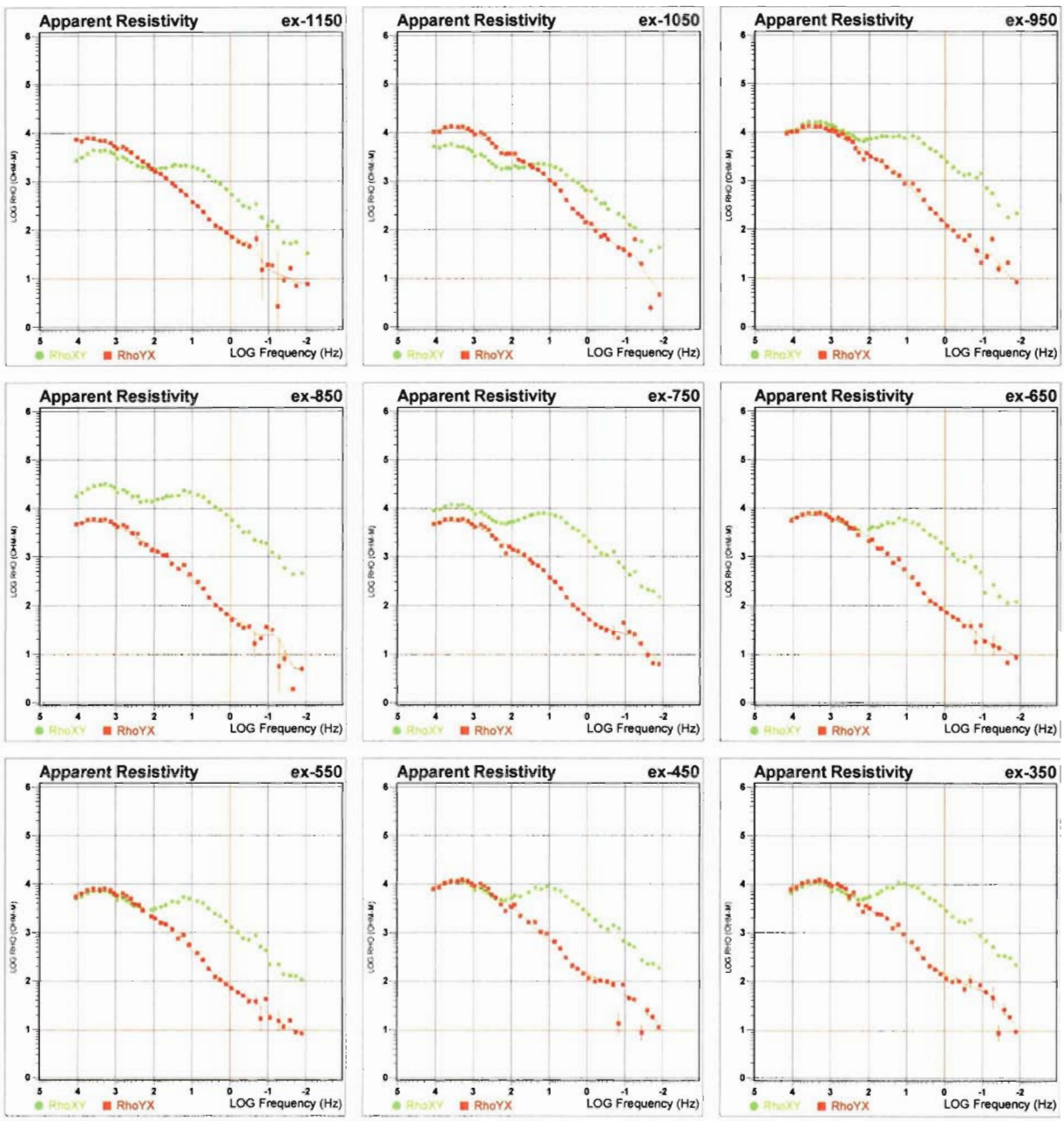
Phs xy ------ green
Phs yx ------ orange

LINE 8N: PHASE



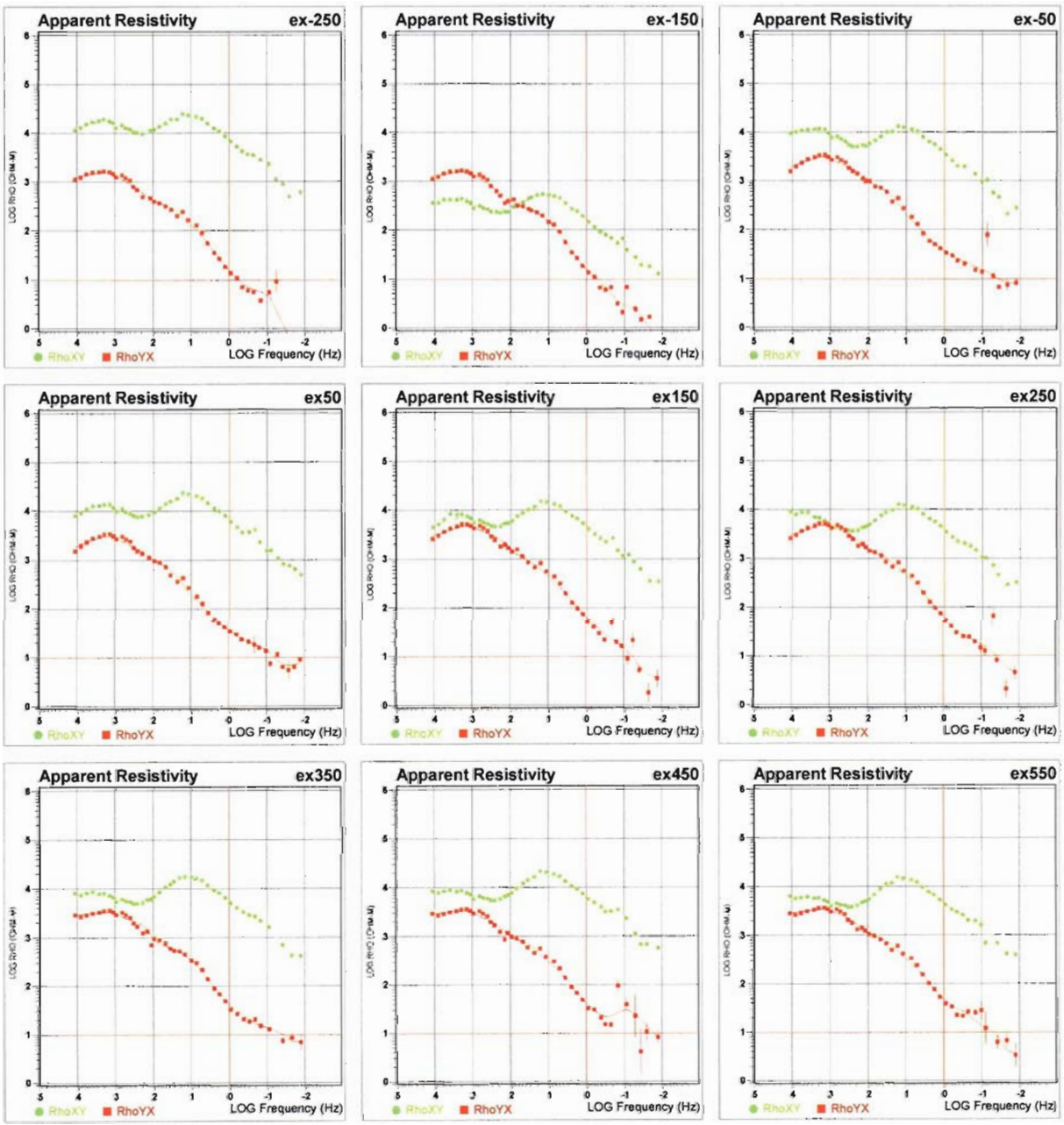
Phs xy ------ green
Phs yx ------ orange

LINE 0E PATRICK GRID: APPARENT RESISTIVITY VS. FREQUENCY



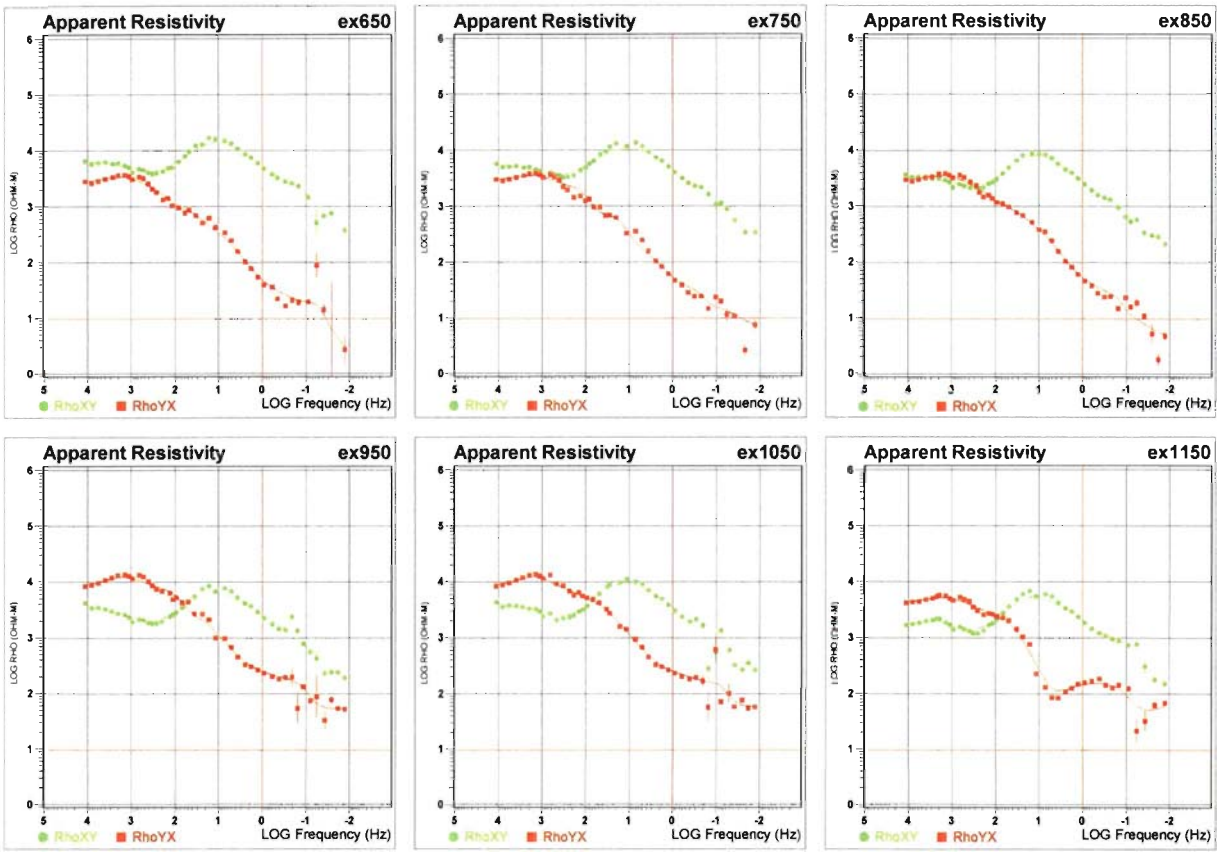
Rho xy ------ green
Rho yx ------- orange

LINE 0E: APPARENT RESISTIVITY VS. FREQUENCY



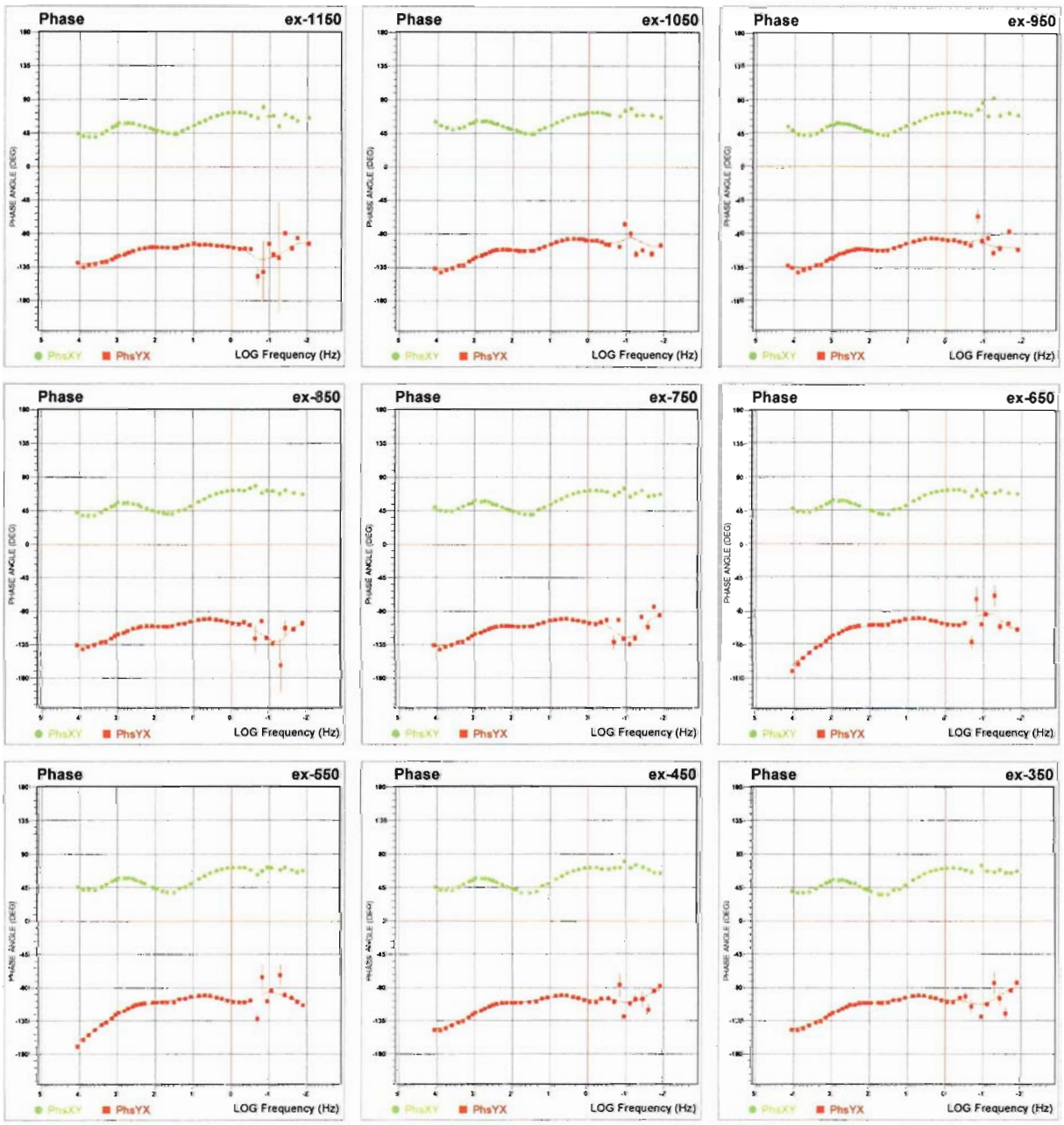
Rho xy ------ green
Rho yx ------ orange

LINE 0E: APPARENT RESISTIVITY VS. FREQUENCY



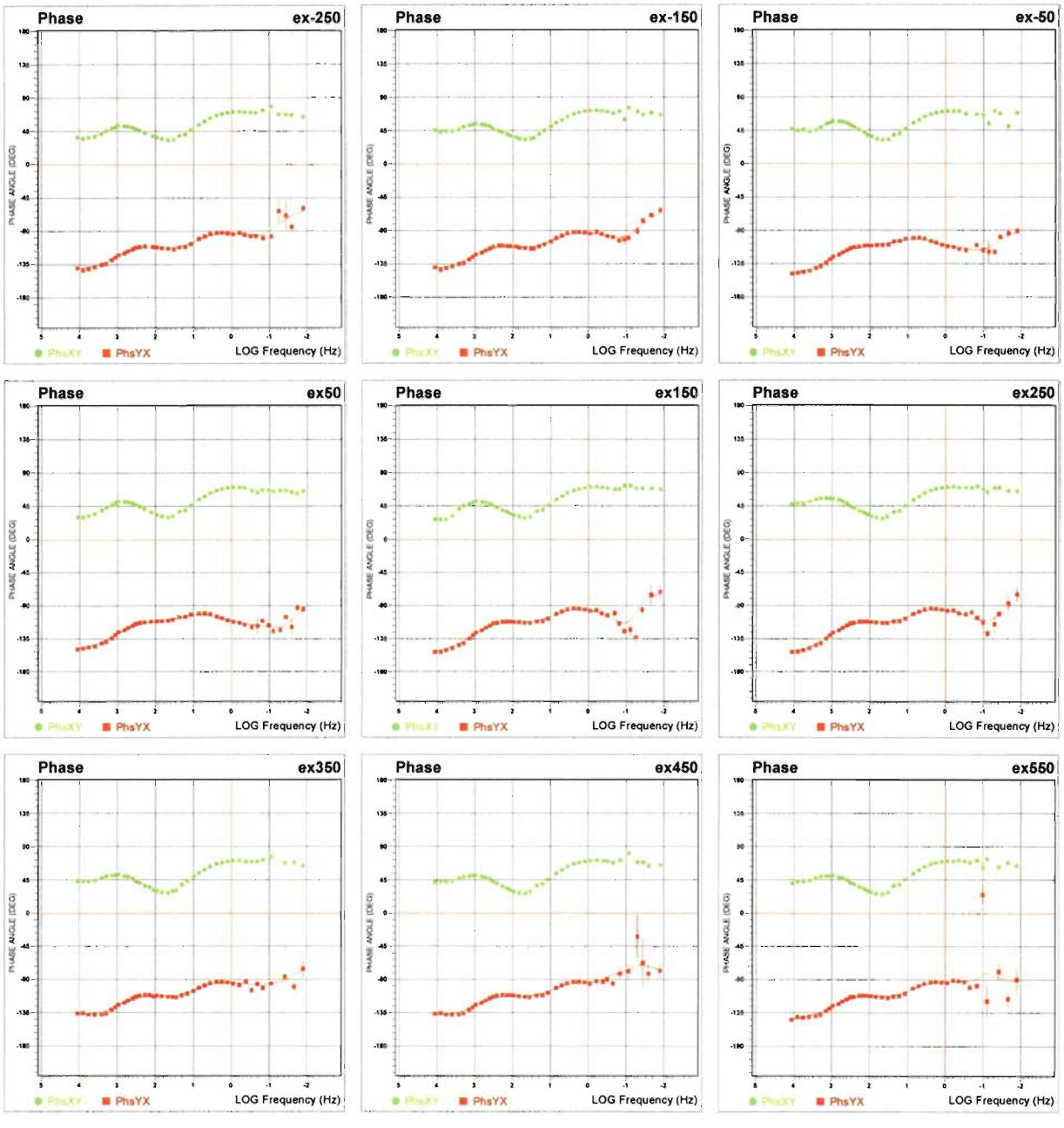
Rho xy ------ green
Rho yx ------ orange

LINE 0E: PHASE



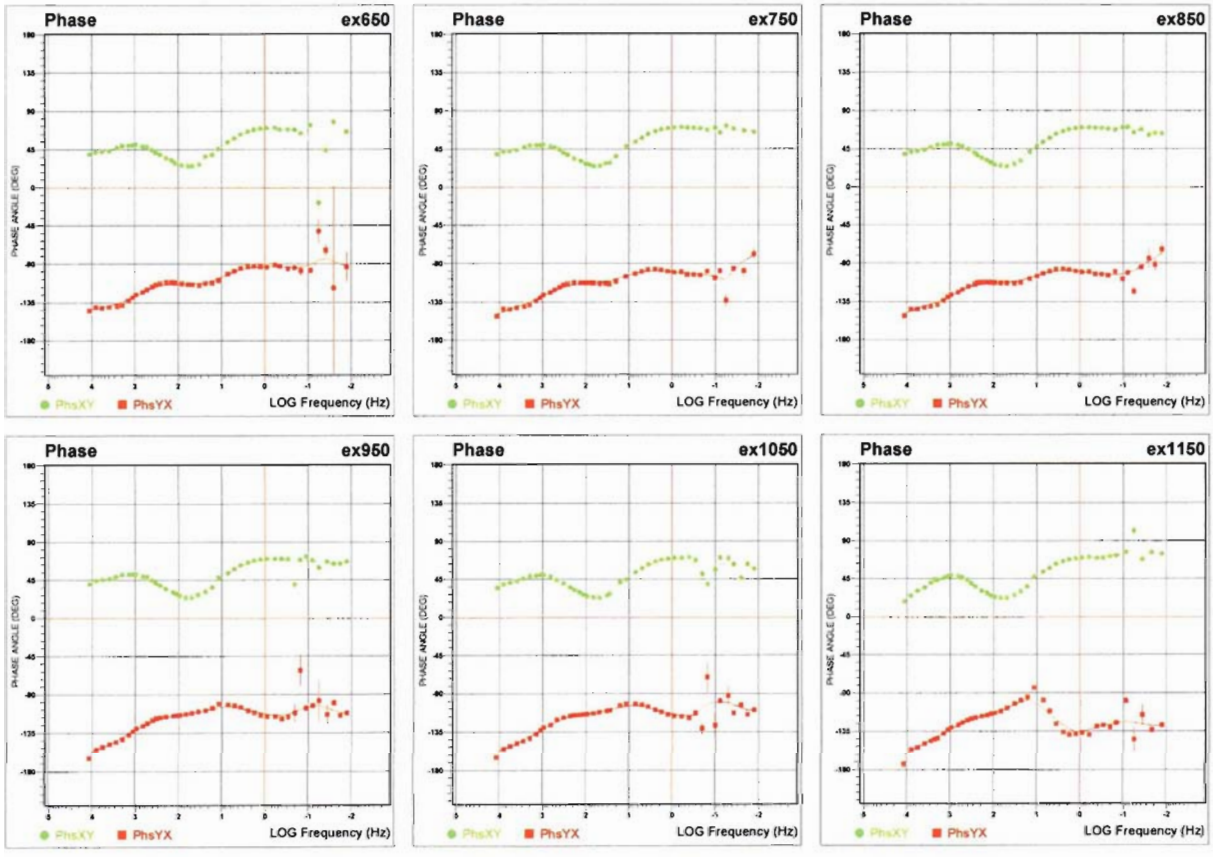
Phs xy ------green
Phs yx ------orange

LINE 0E: PHASE



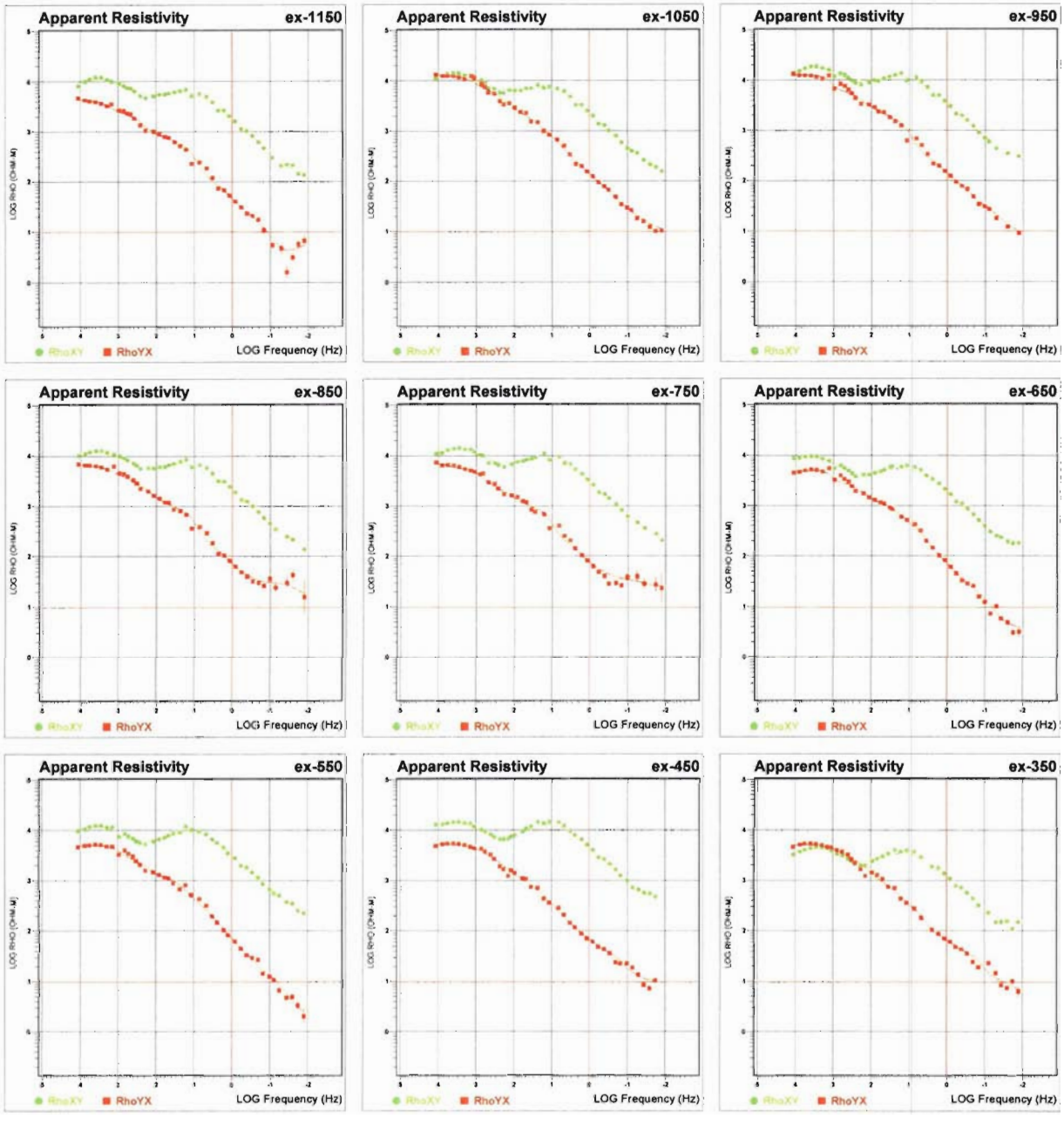
Phs xy ------ green
Phs yx ------ orange

LINE 0E: PHASE



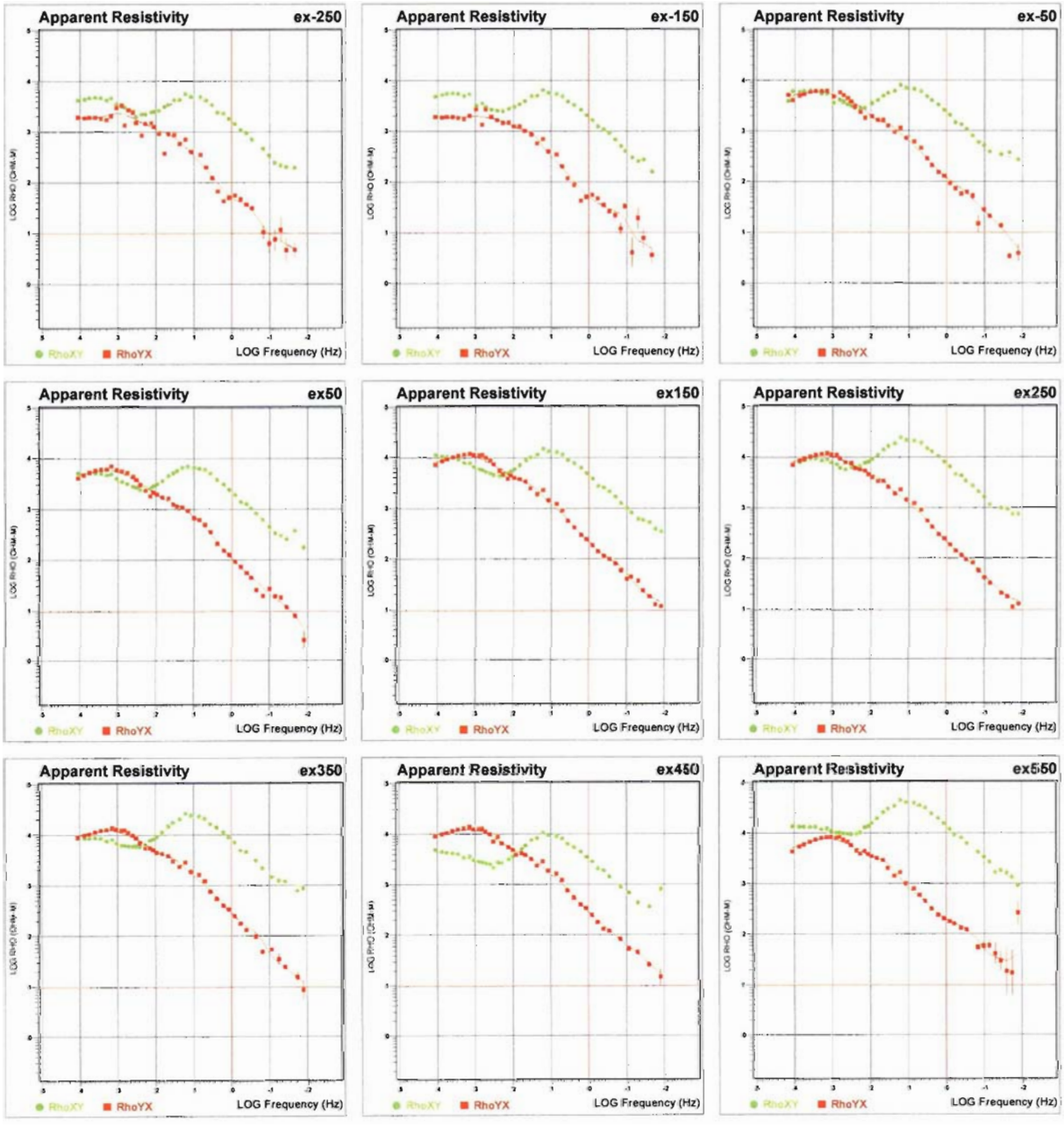
Phs xy ------ green
Phs yx ------ orange

LINE 4E PATRICK GRID: APPARENT RESISTIVITY VS. FREQUENCY



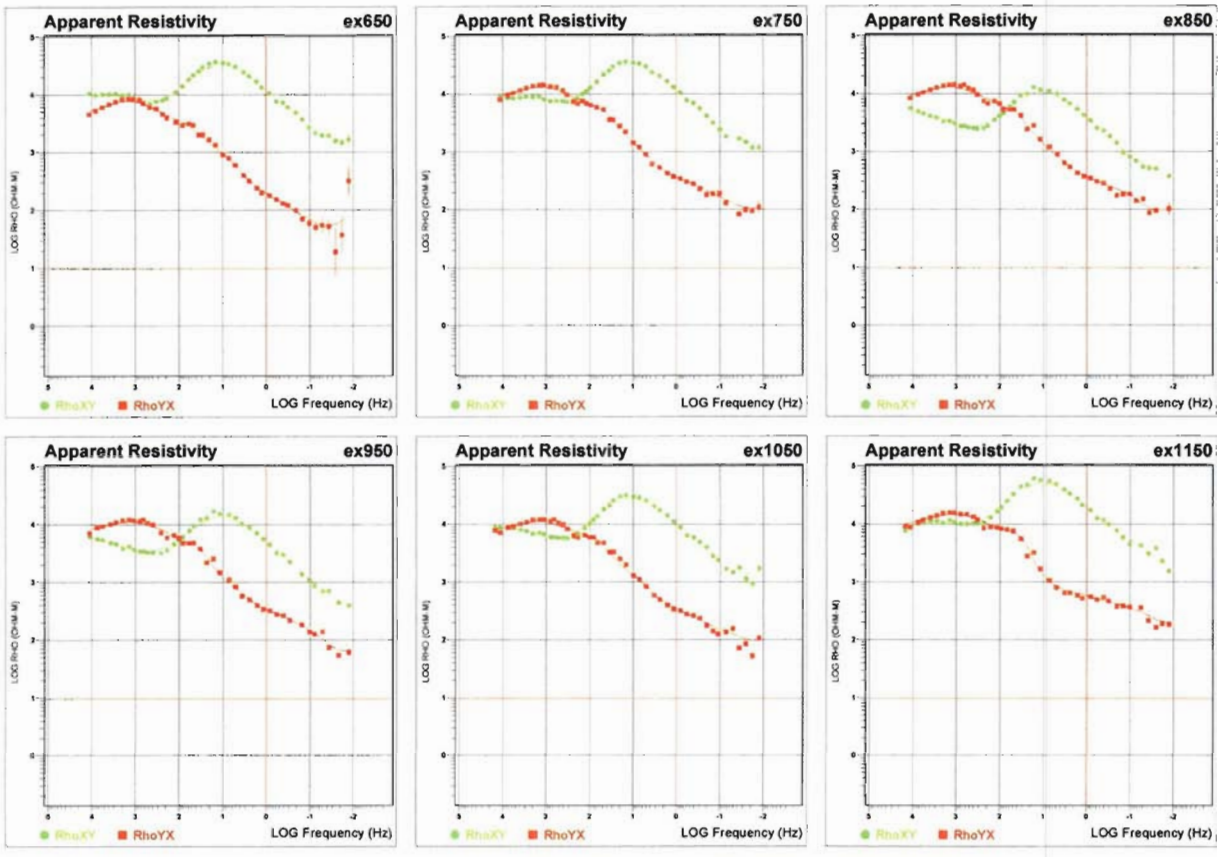
Rho xy ------ green
Rho yx ------ orange

LINE 4E: APPARENT RESISTIVITY VS. FREQUENCY



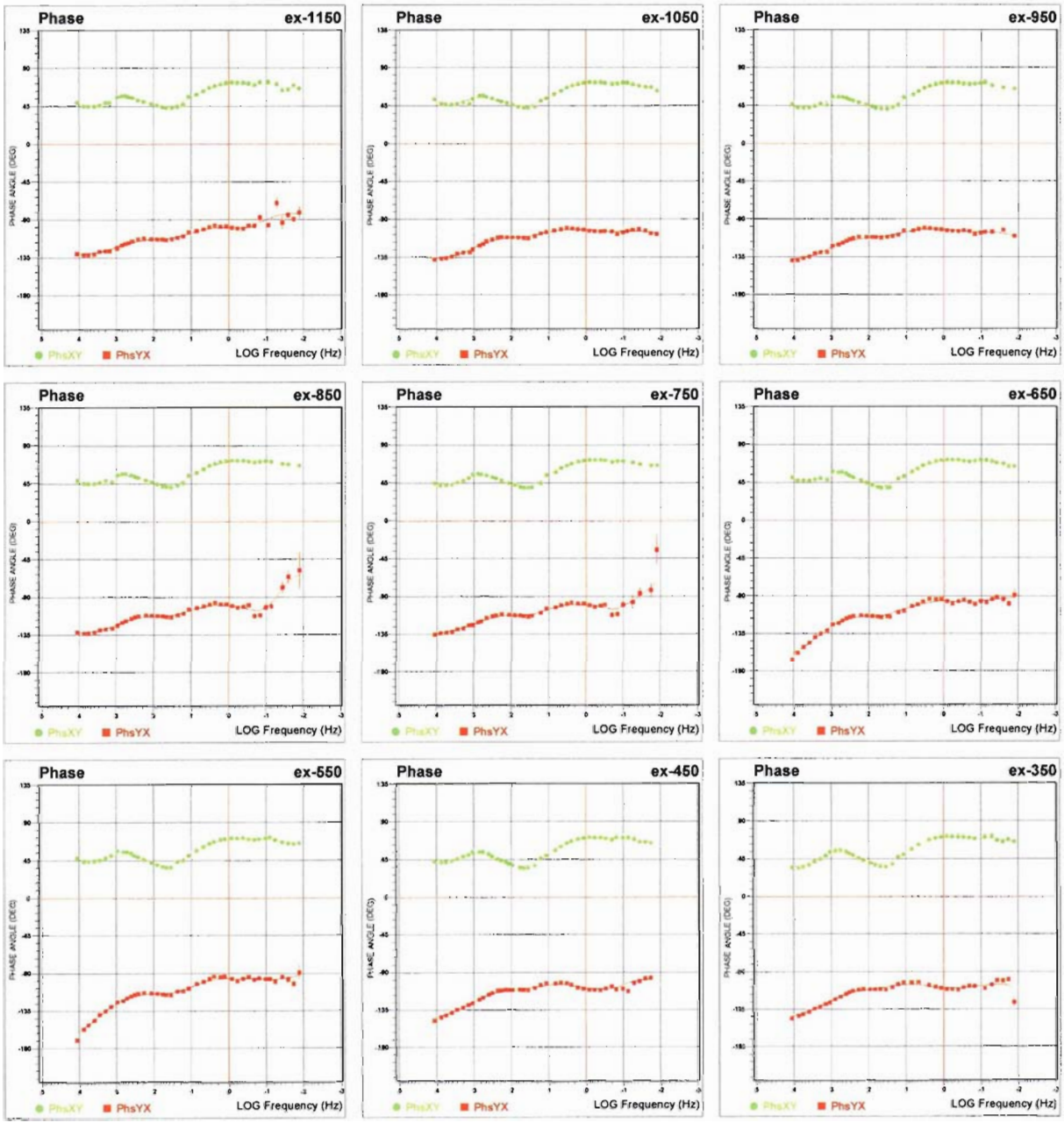
Rho xy ------ green
Rho yx ------ orange

LINE 4E: APPARENT RESISTIVITY VS. FREQUENCY



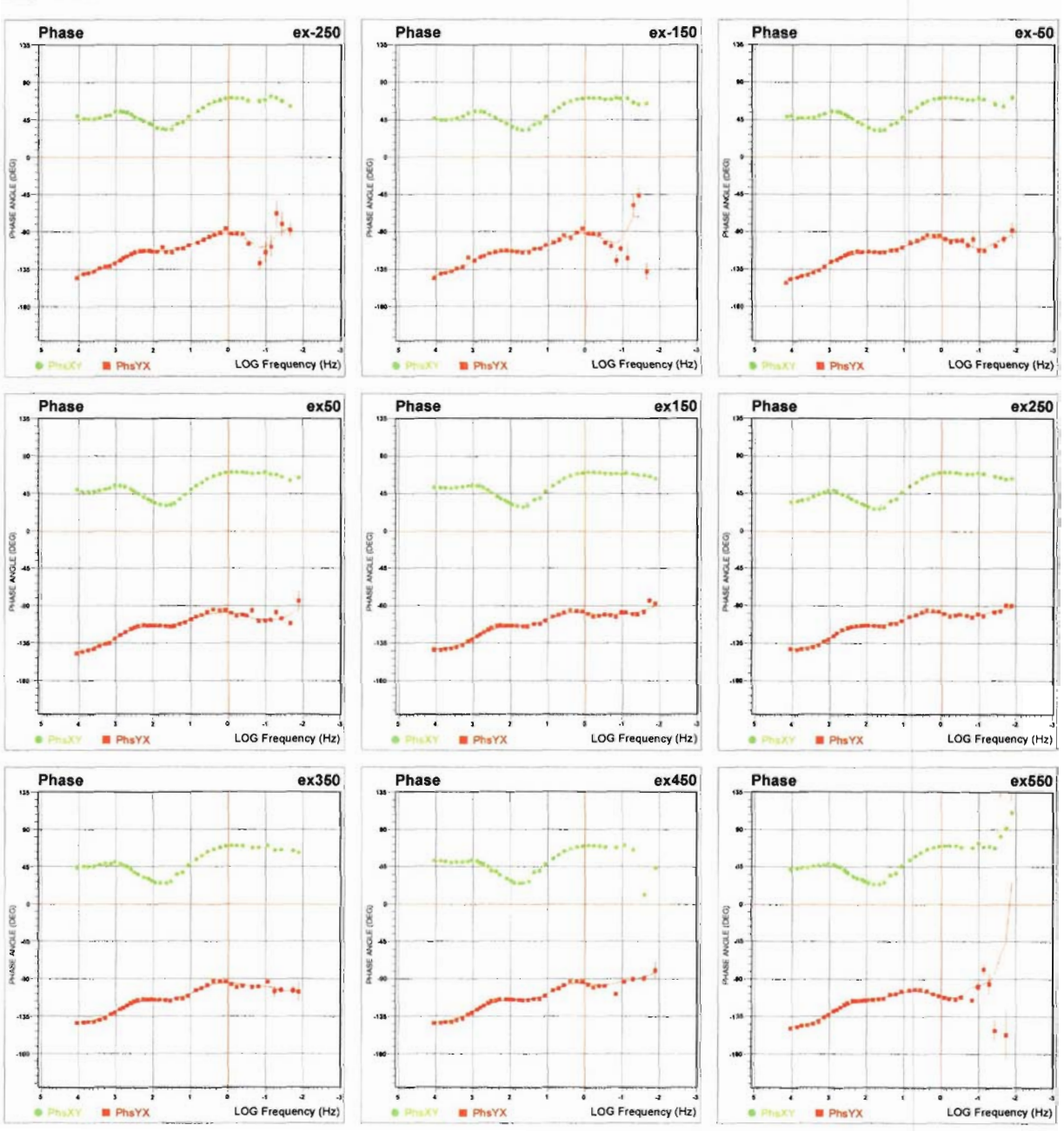
Rho xy ------ green
Rho yx ------ orange

LINE 4E: PHASE



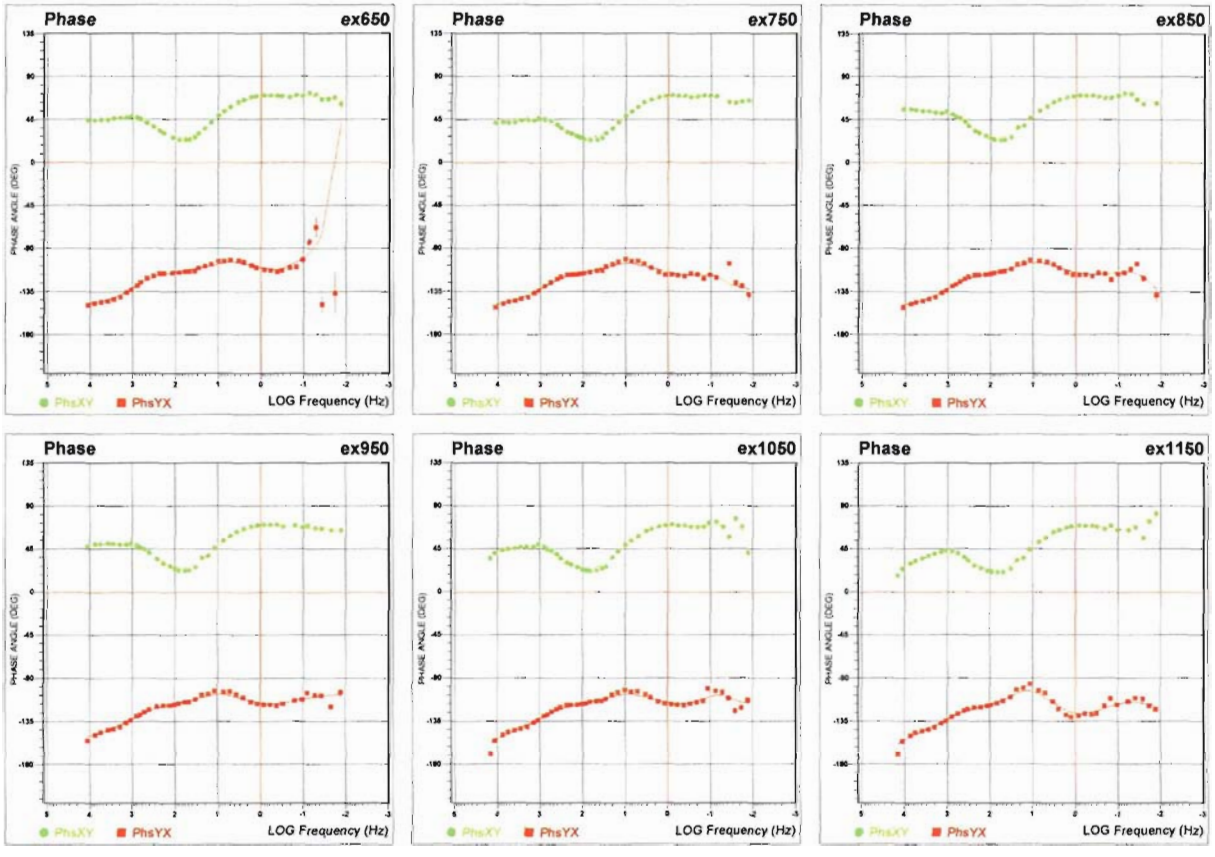
Phs xy ------ green
Phs yx ------ orange

LINE 4E: PHASE



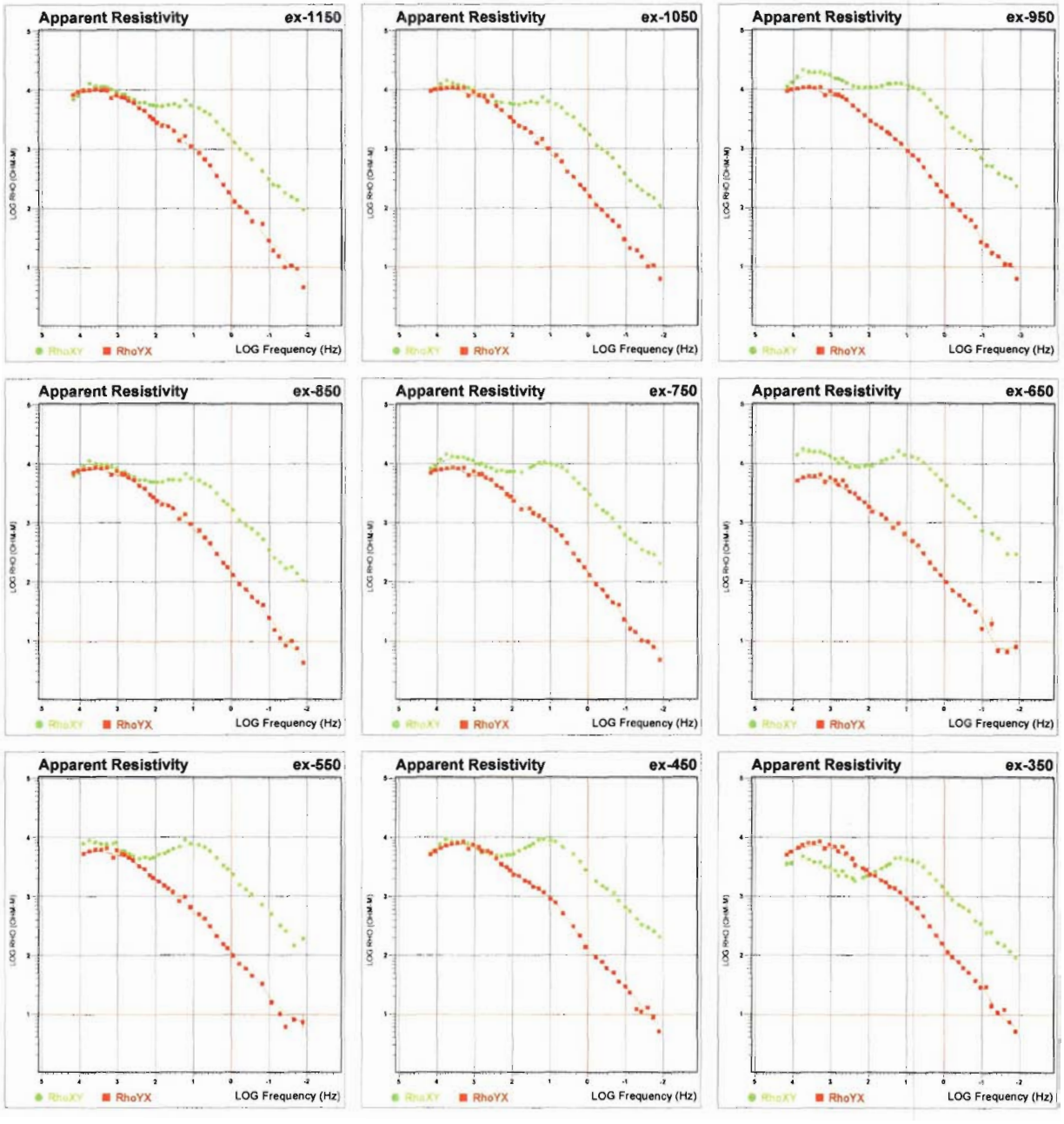
Phs xy ------ green
Phs yx ------ orange

LINE 4E: PHASE



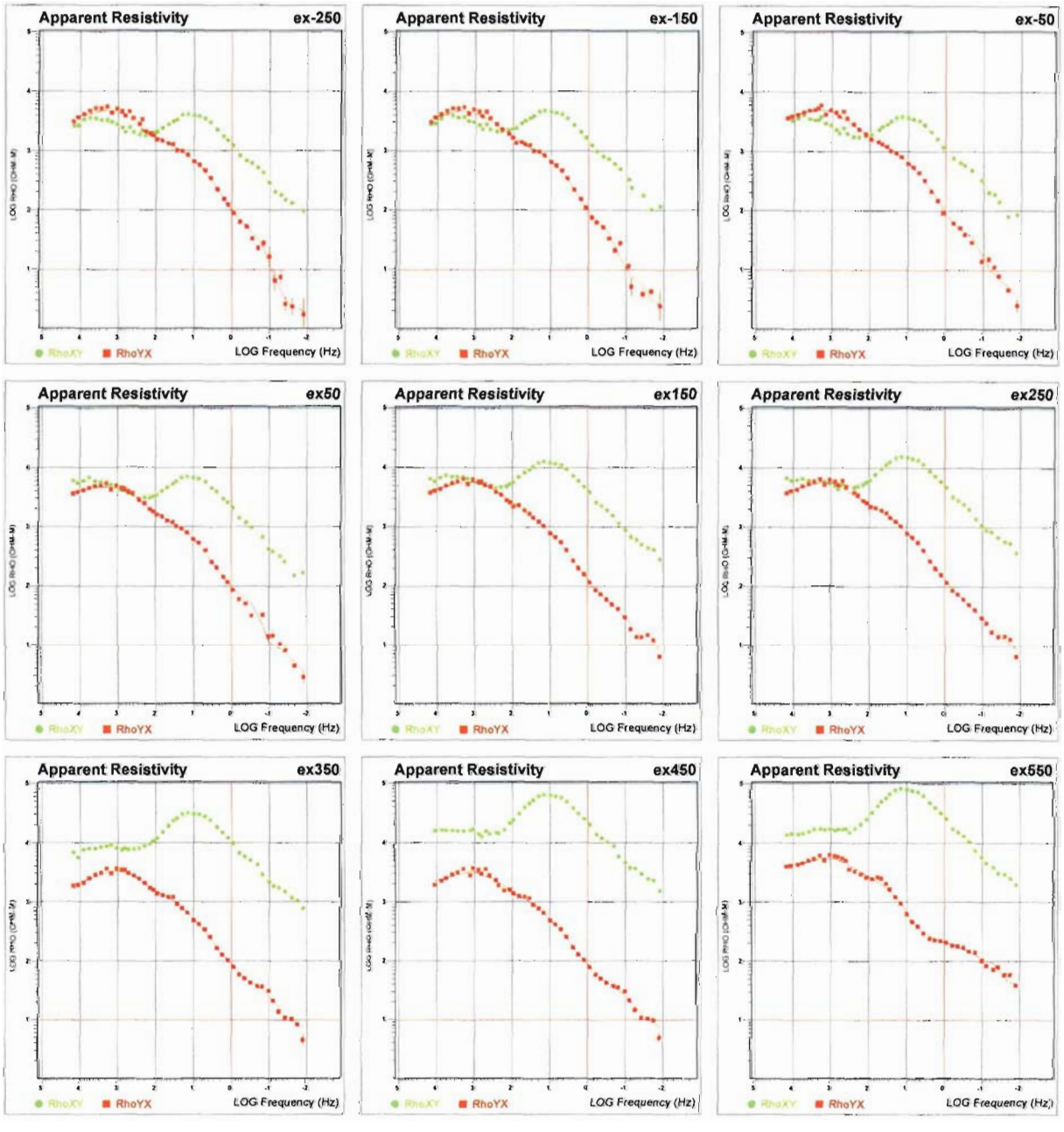
Phs xy ------ green
Phs yx ------ orange

LINE 8E PATRICK GRID: APPARENT RESISTIVITY VS. FREQUENCY



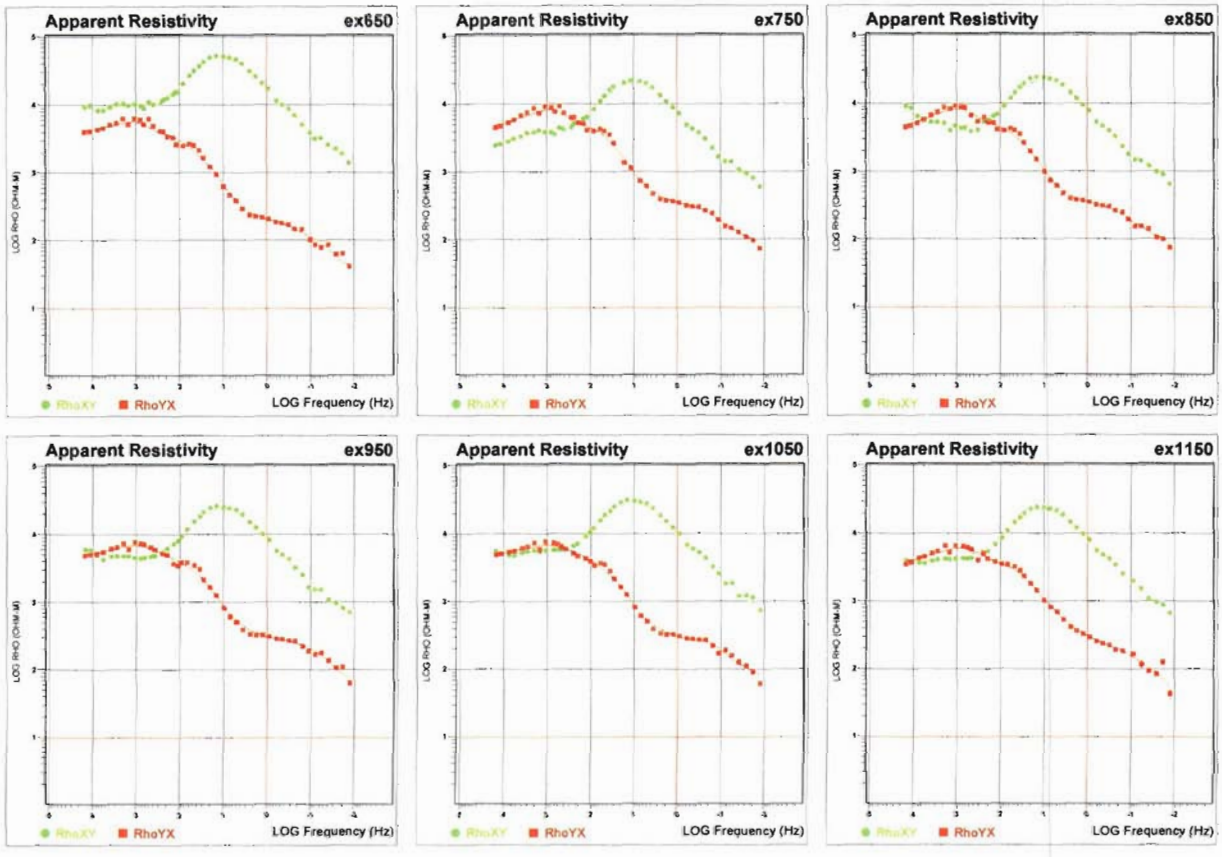
Rho xy ------ green
Rho yx ------ orange

LINE 8E: APPARENT RESISTIVITY VS. FREQUENCY



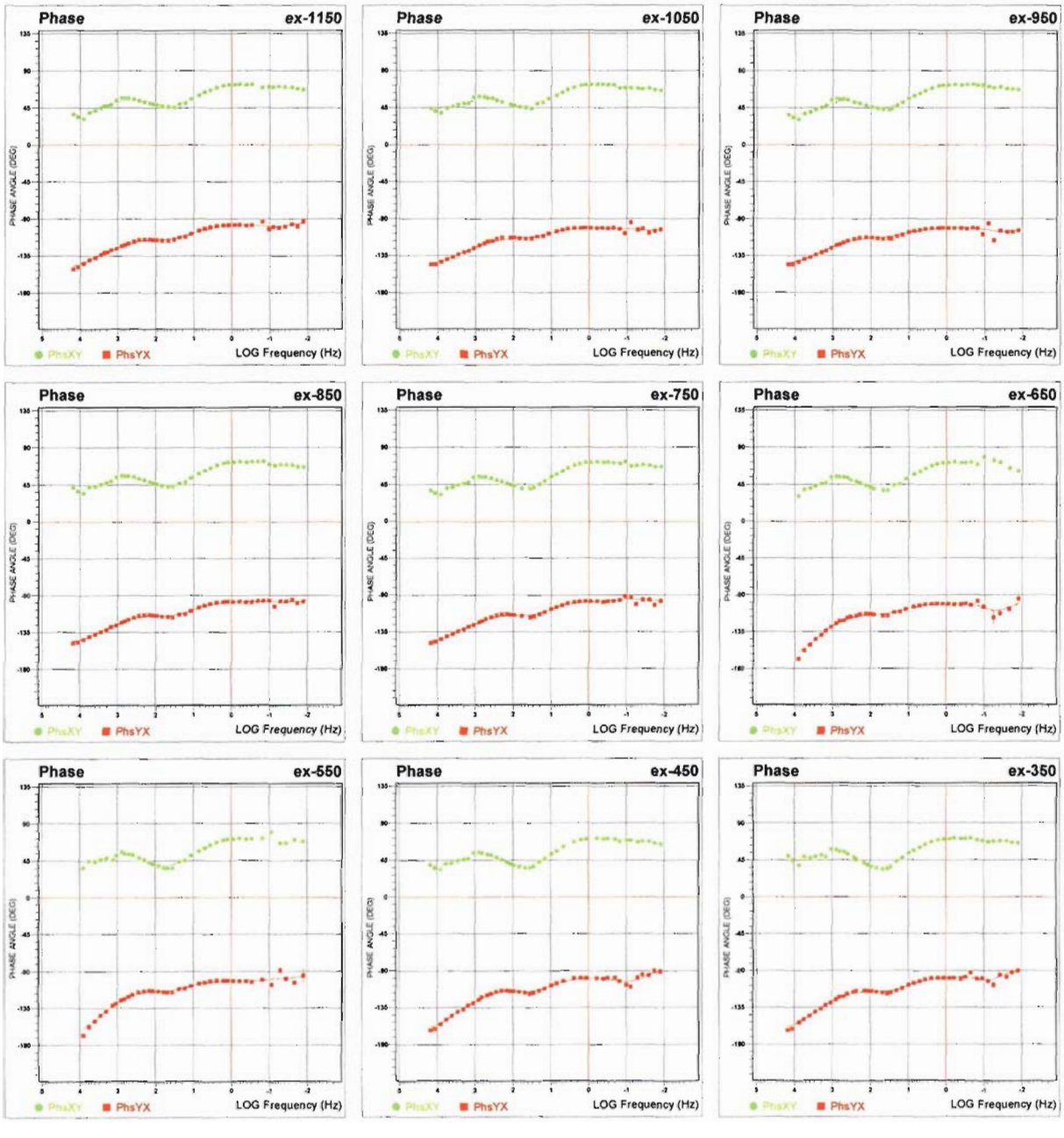
Rho xy ------ green
Rho yx ------ orange

LINE 8E: APPARENT RESISTIVITY VS. FREQUENCY



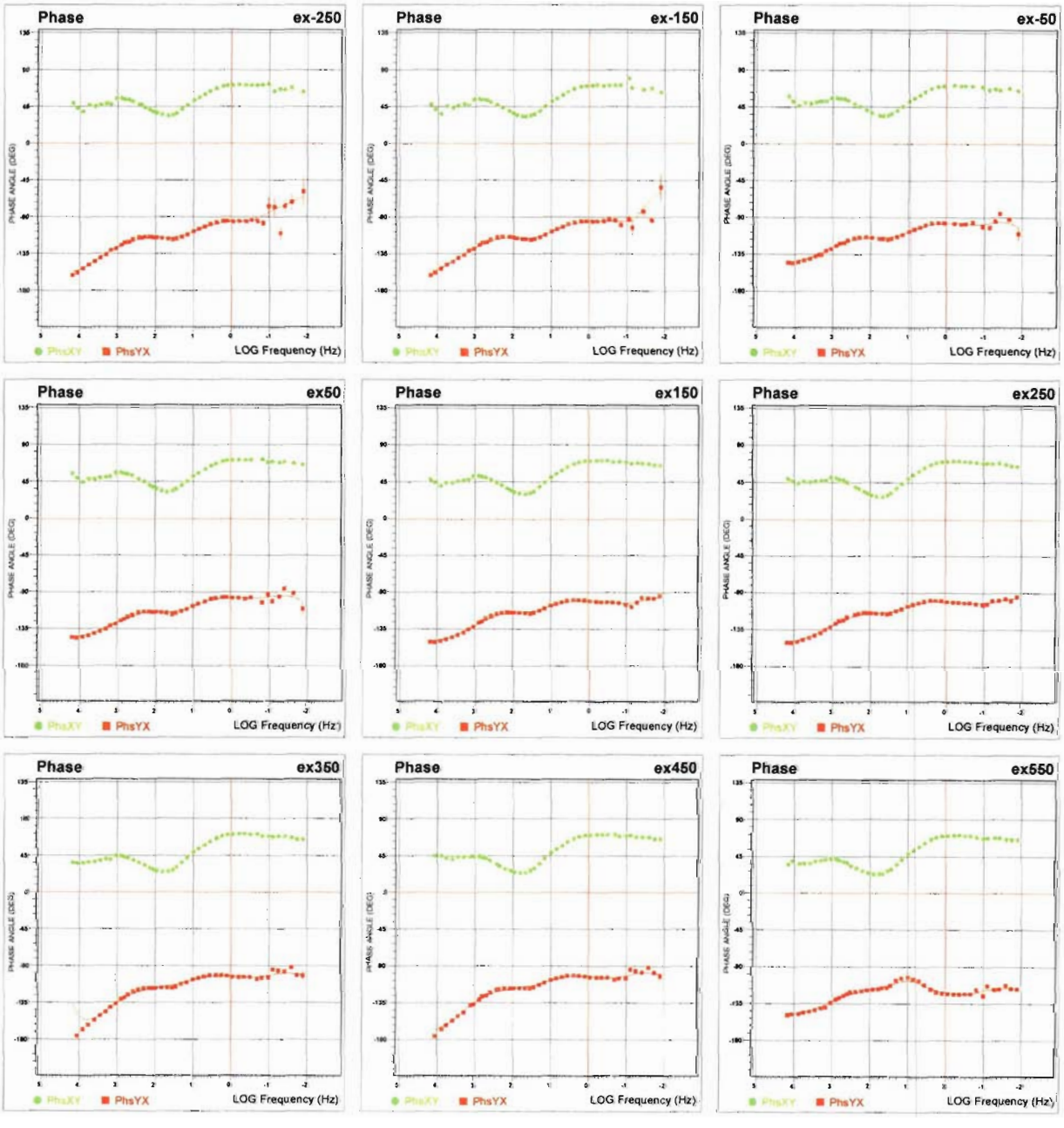
Rho xy ------ green
Rho yx ------ orange

LINE 8E: PHASE



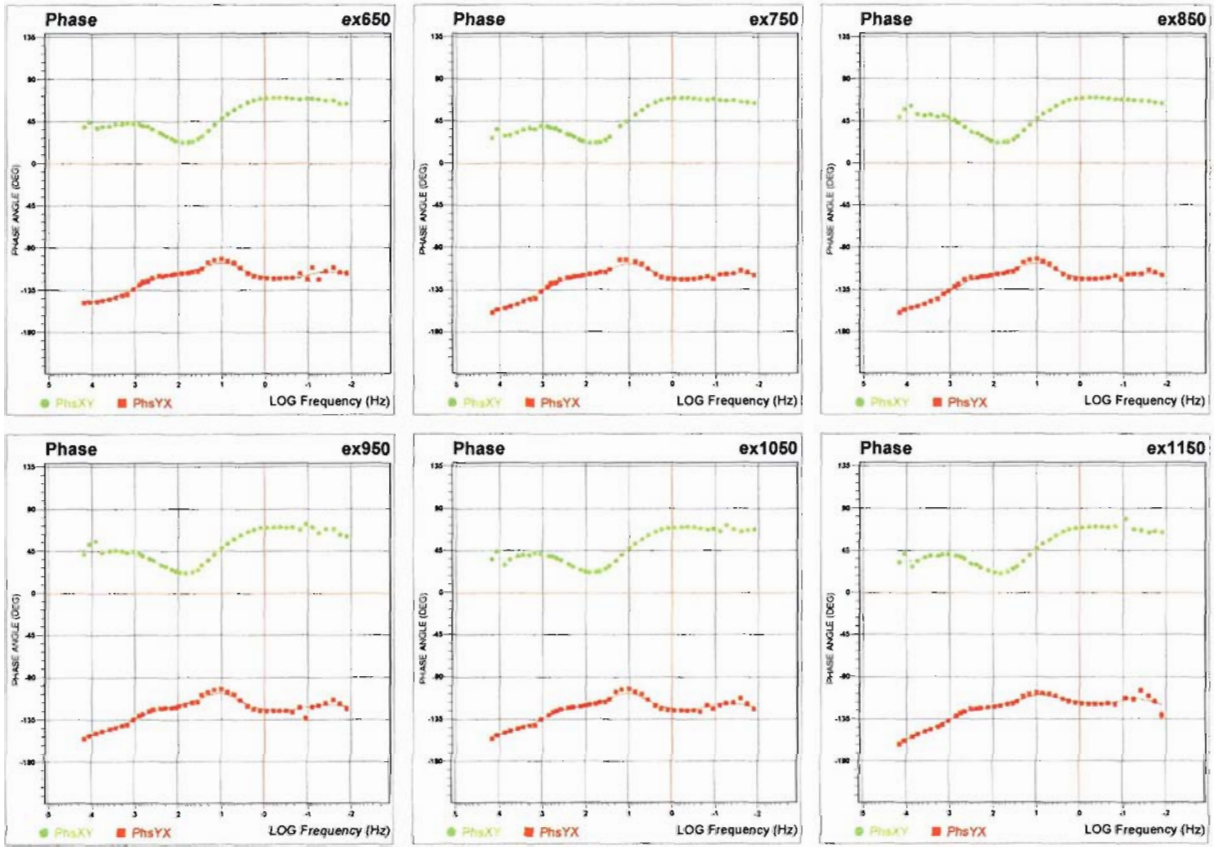
Phs xy ------ green
Phs yx ------ orange

LINE8E: PHASE



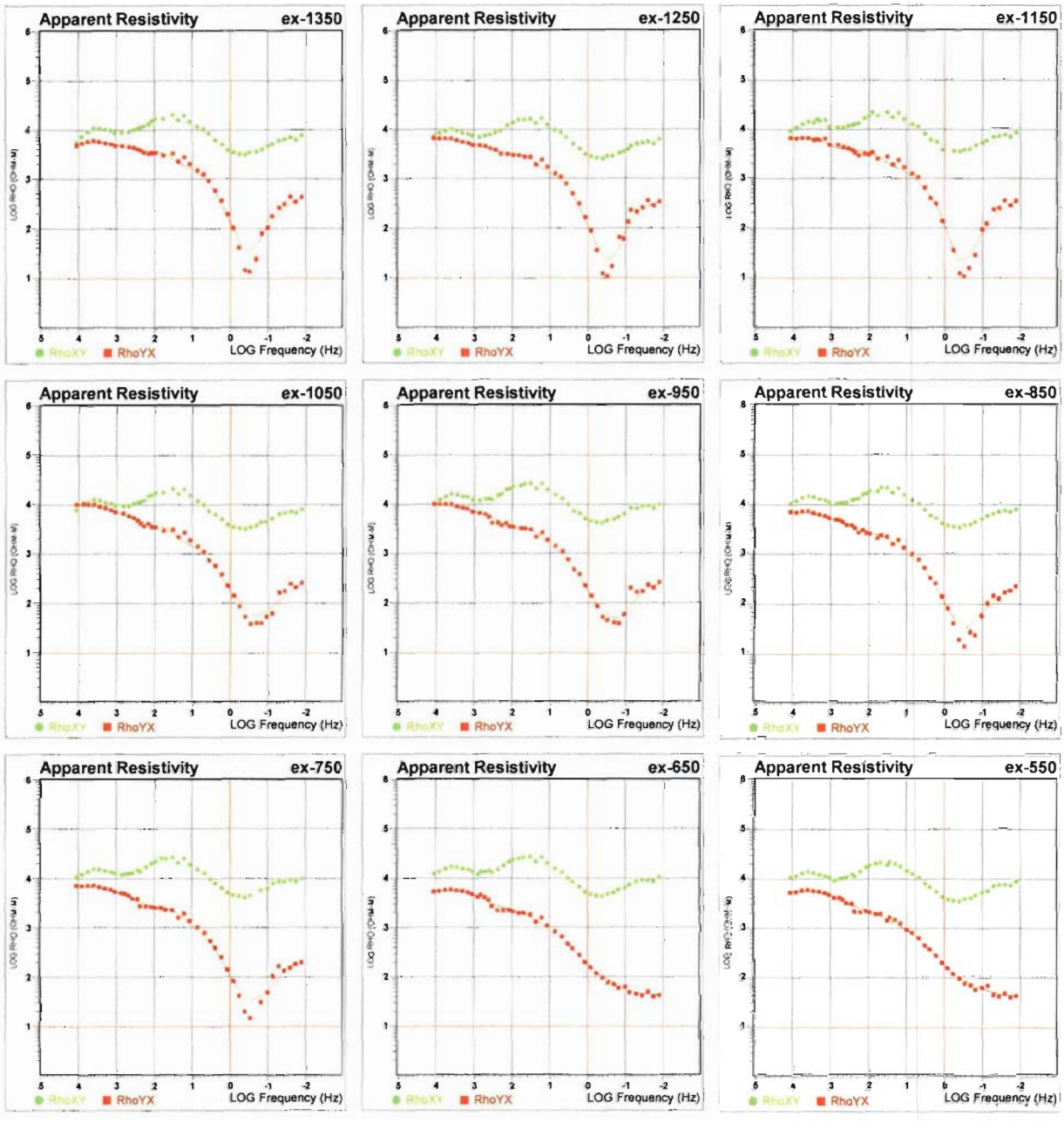
Phs xy ------ green
Phs yx ------ orange

LINE 8E: PHASE



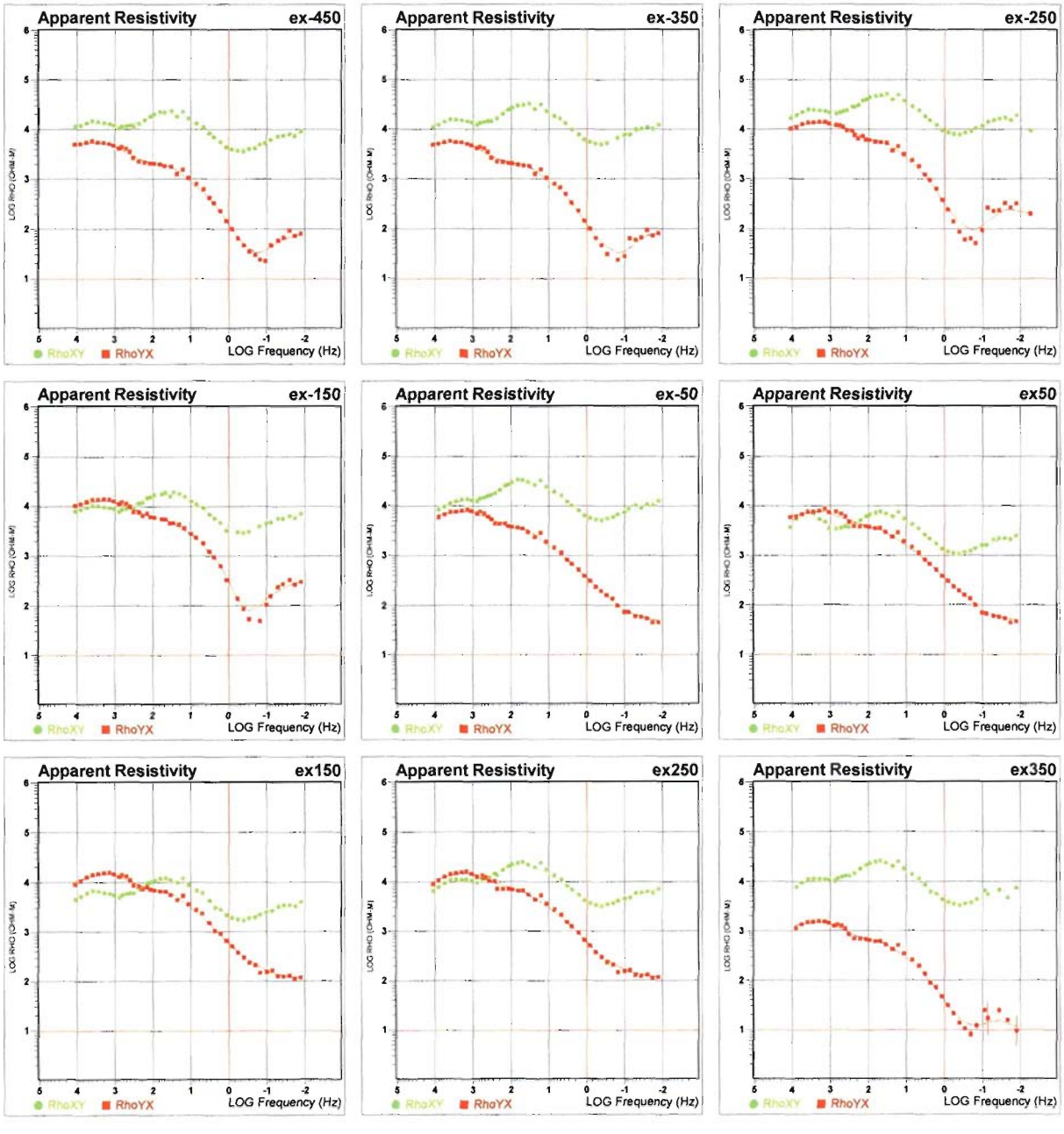
Phs xy ------ green
Phs yx ------ orange

LINE 0E ML GRID: APPARENT RESISTIVITY VS. FREQUENCY



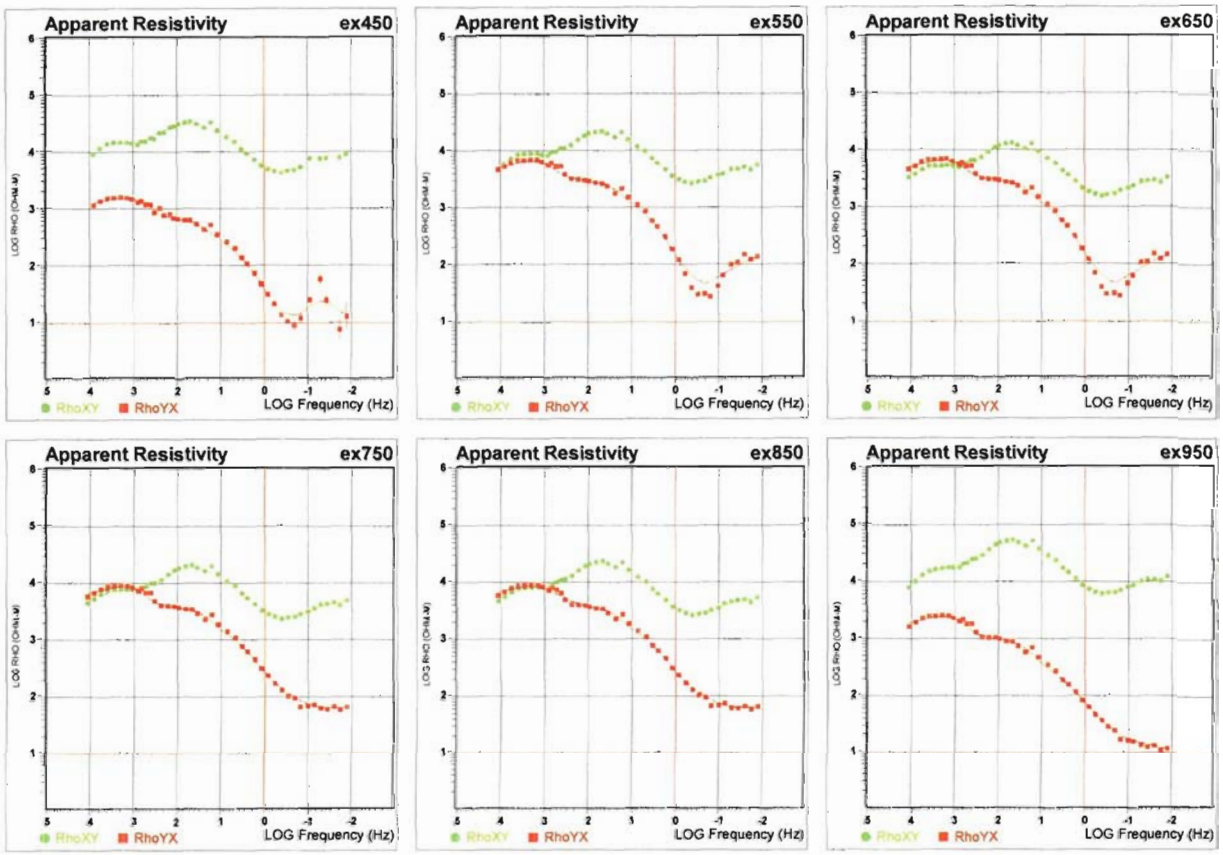
Rho xy ------ green
Rho yx ------ orange

LINE 0E: APPARENT RESISTIVITY VS. FREQUENCY



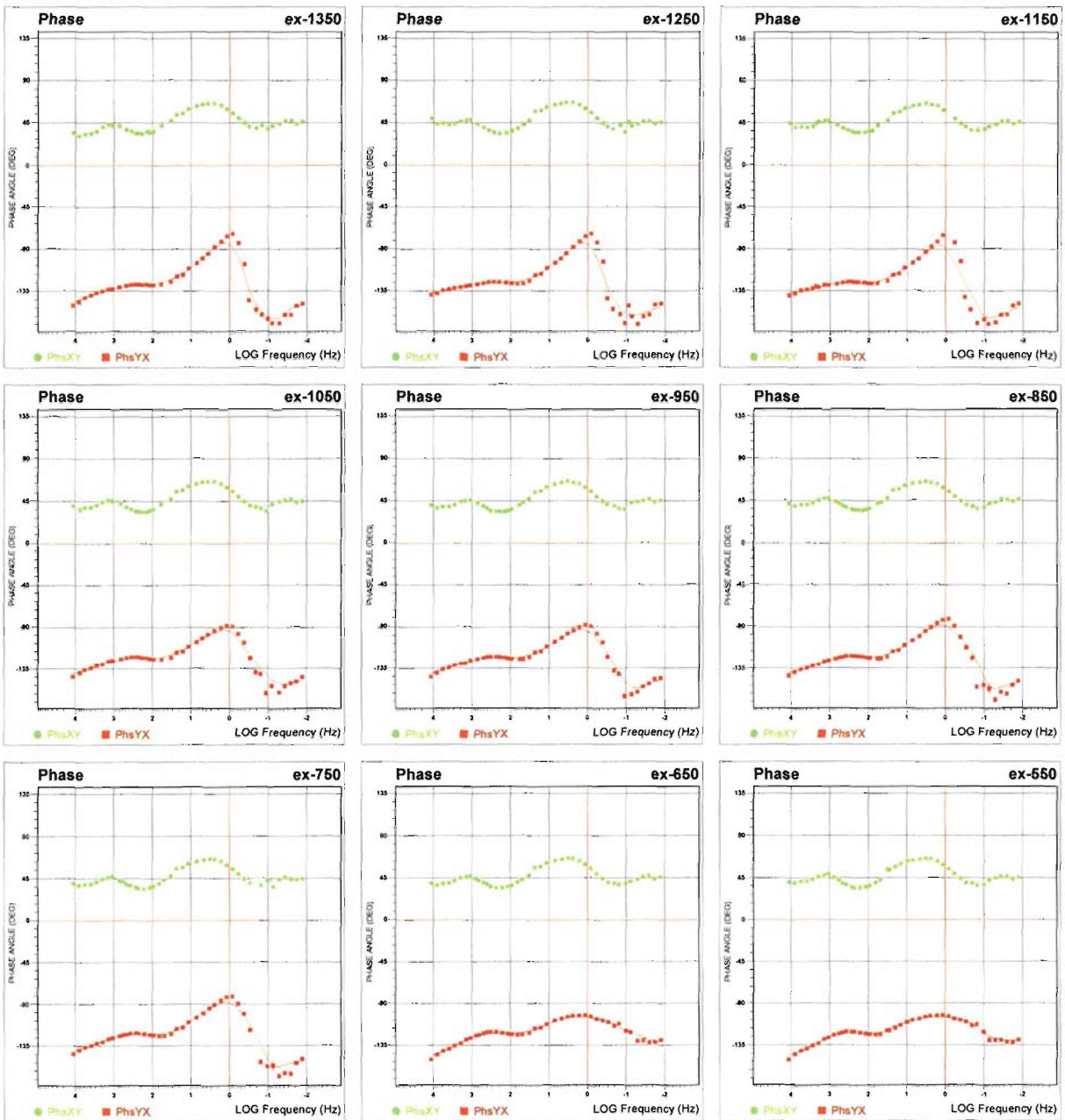
Rho xy ------ green
Rho yx ------ orange

LINE 0E: APPARENT RESISTIVITY VS. FREQUENCY



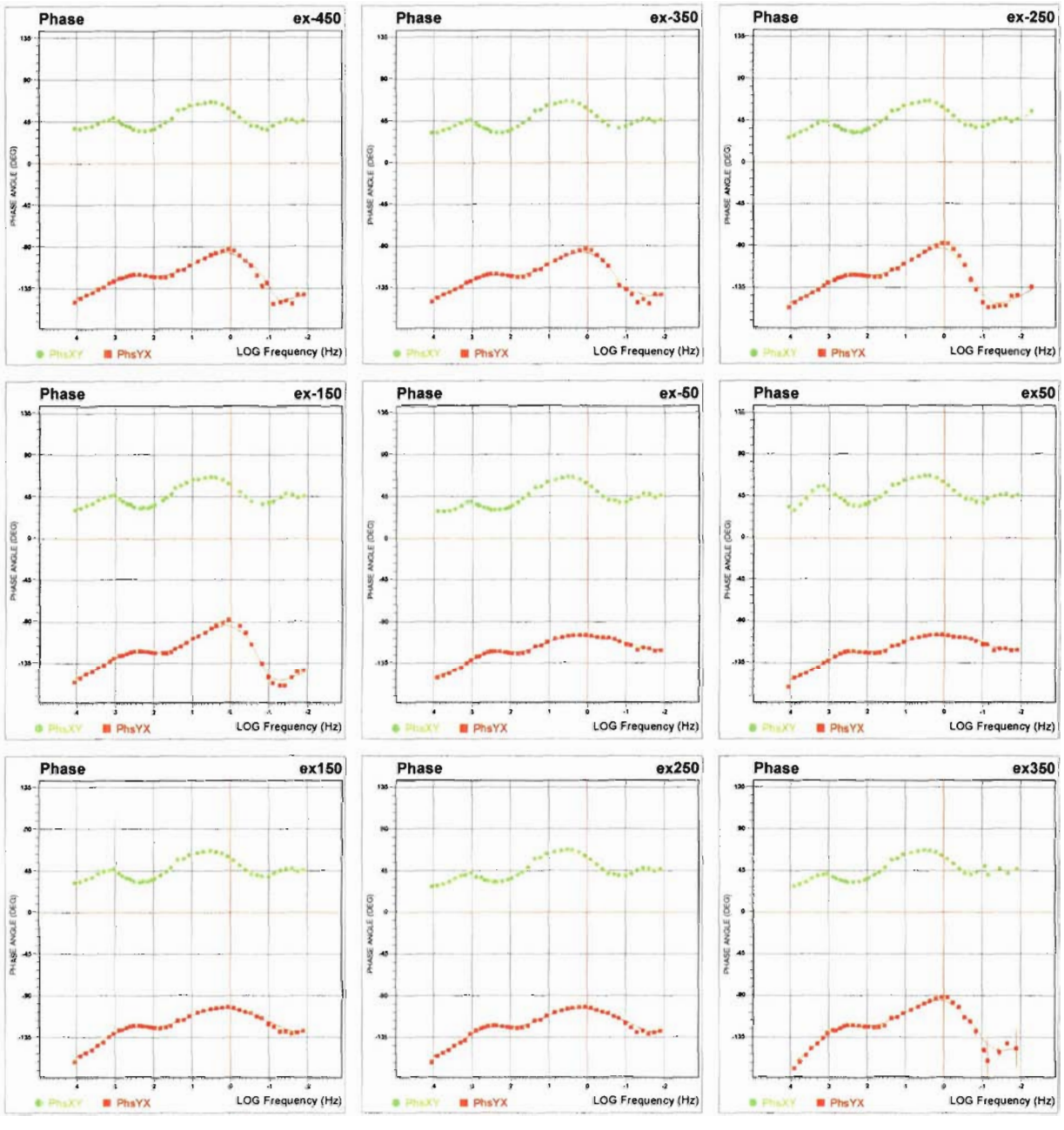
Rho xy ------ green
Rho yx ------ orange

LINE 0E: PHASE



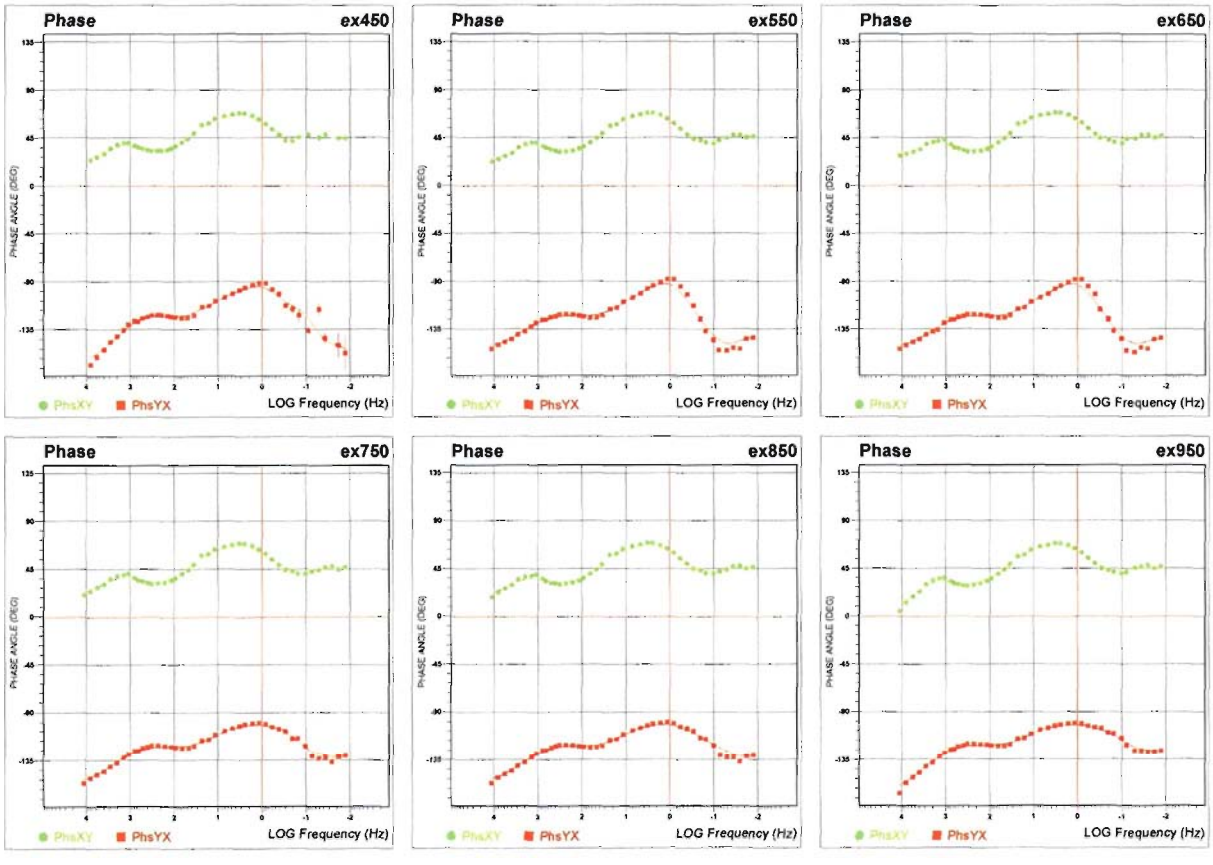
Phs xy ------ green
Phs yx ------ orange

LINE 0E: PHASE



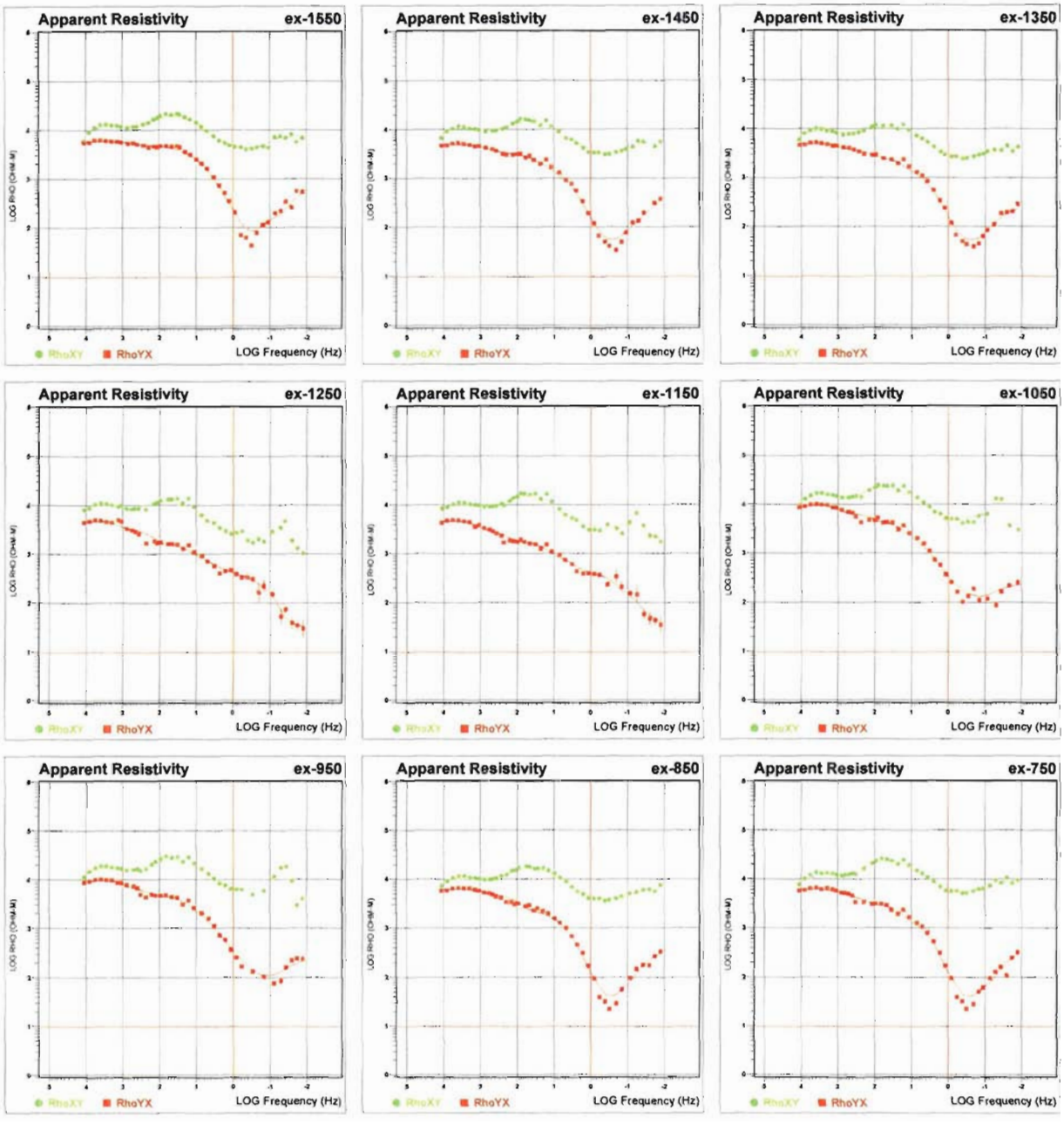
Phs xy ------ green
Phs yx ------ orange

LINE 0E: PHASE



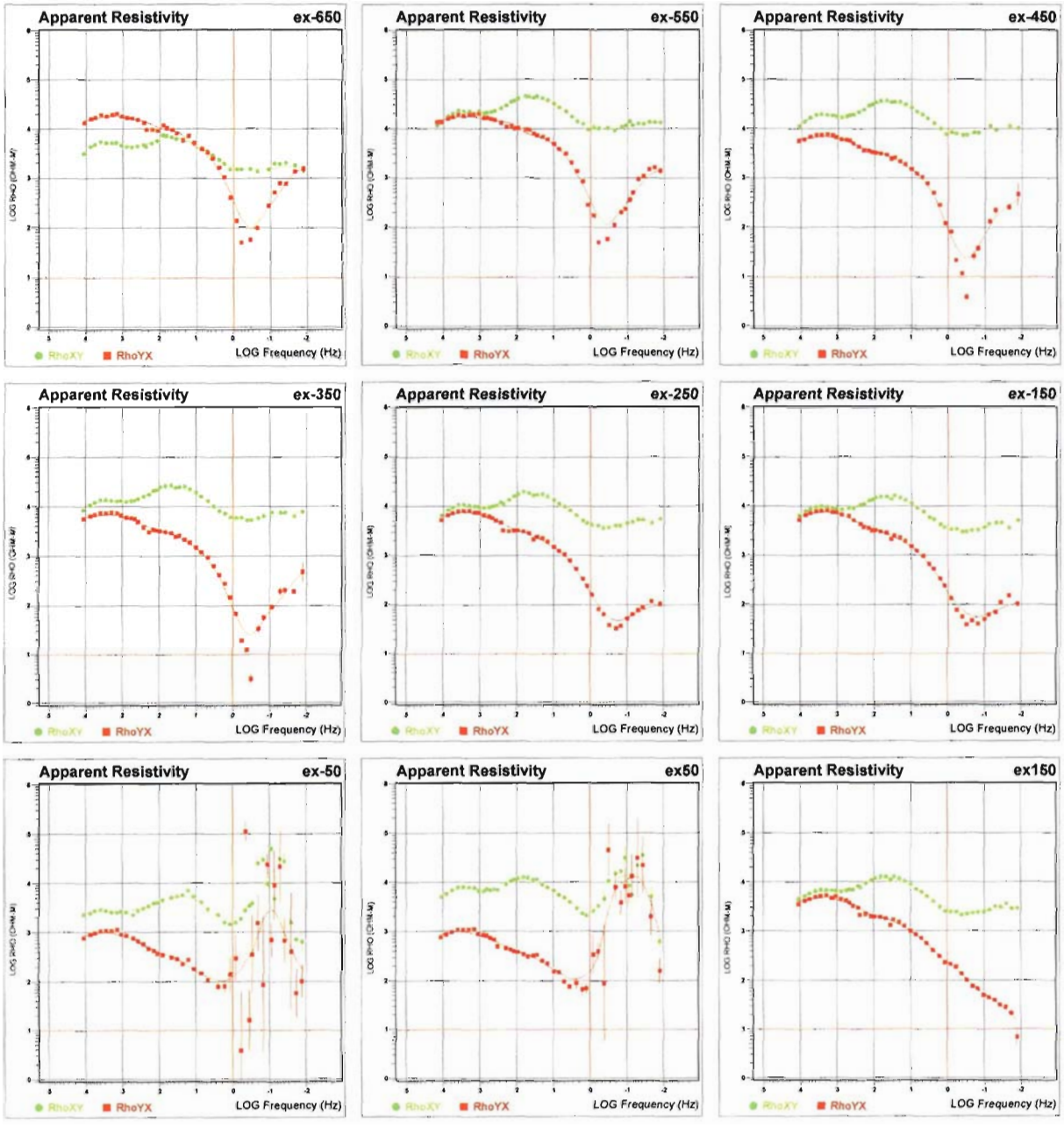
Phs xy ------ green
Phs yx ------ orange

LINE 4E ML GRID : APPARENT RESISTIVITY VS. FREQUENCY



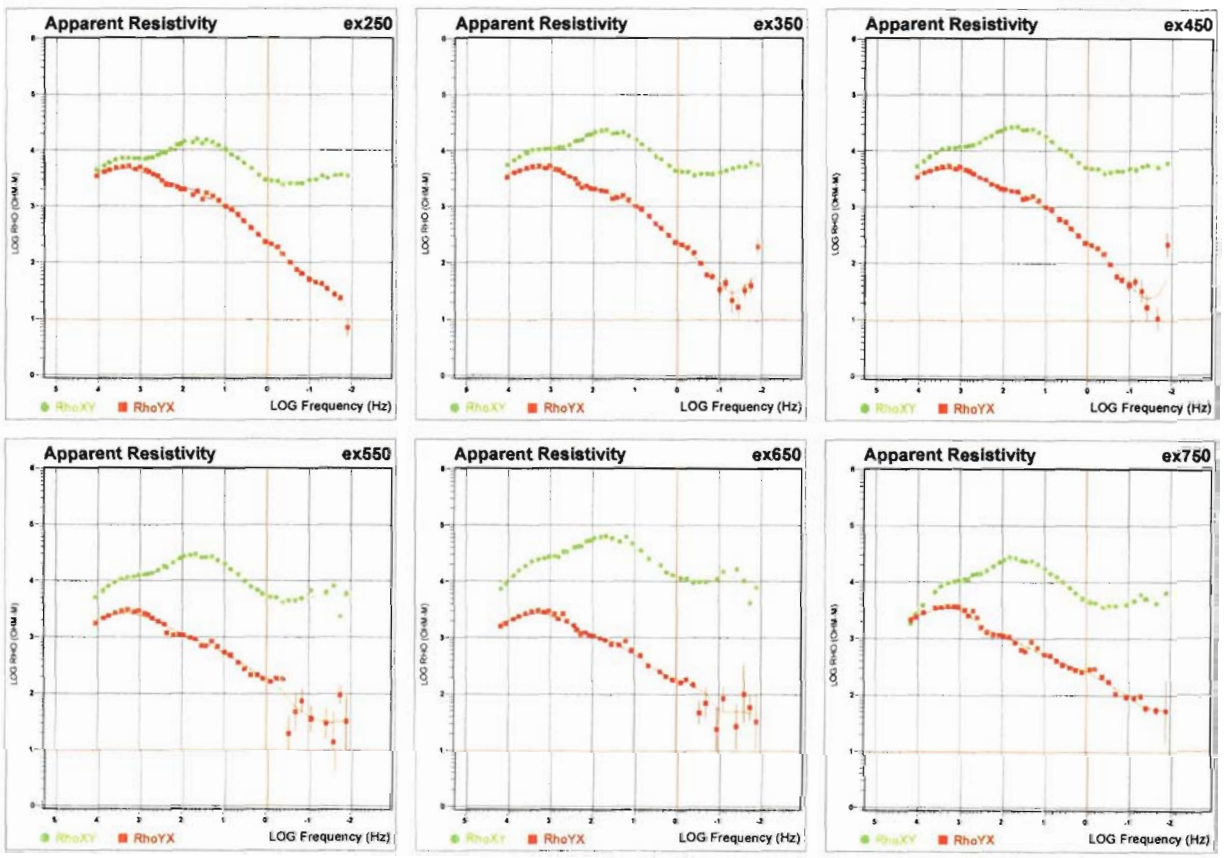
Rho xy ------ green
Rho yx ------ orange

LINE 4E: APPARENT RESISTIVITY VS. FREQUENCY



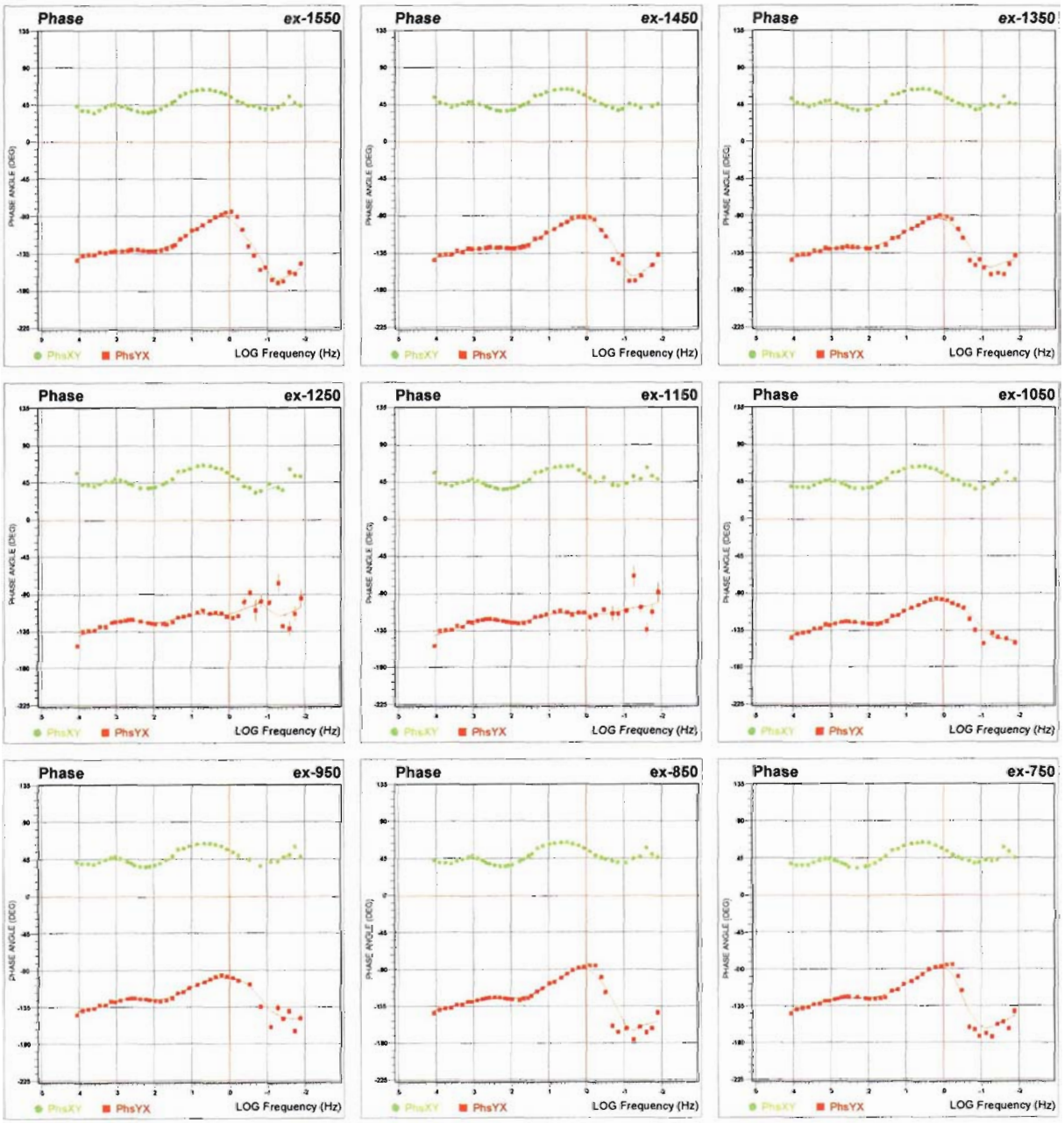
Rho xy ------ green
Rho yx ------ orange

LINE 4E: APPARENT RESISTIVITY VS. FREQUENCY



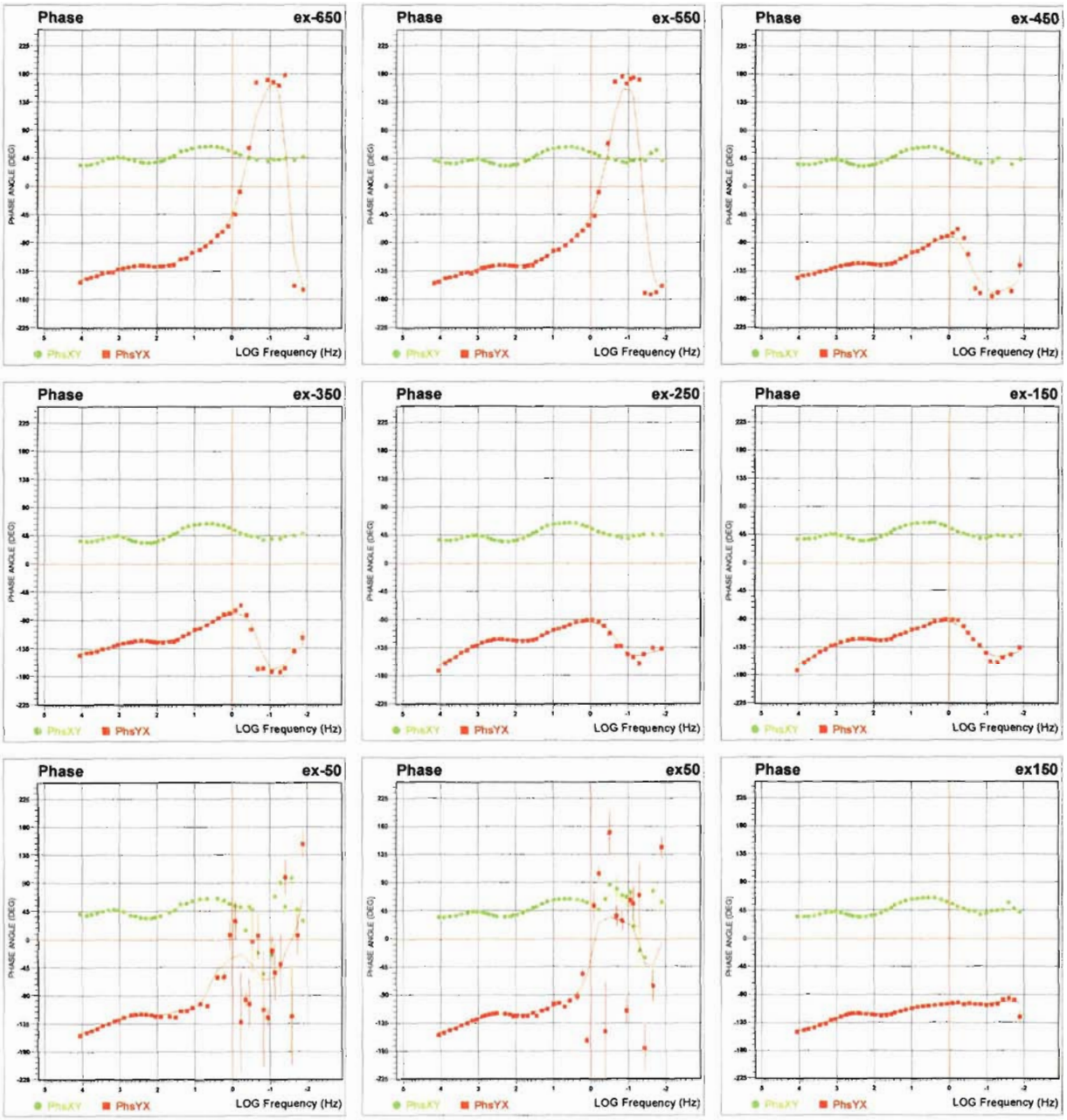
Rho xy ------ green
Rho yx ------ orange

LINE 4E: PHASE



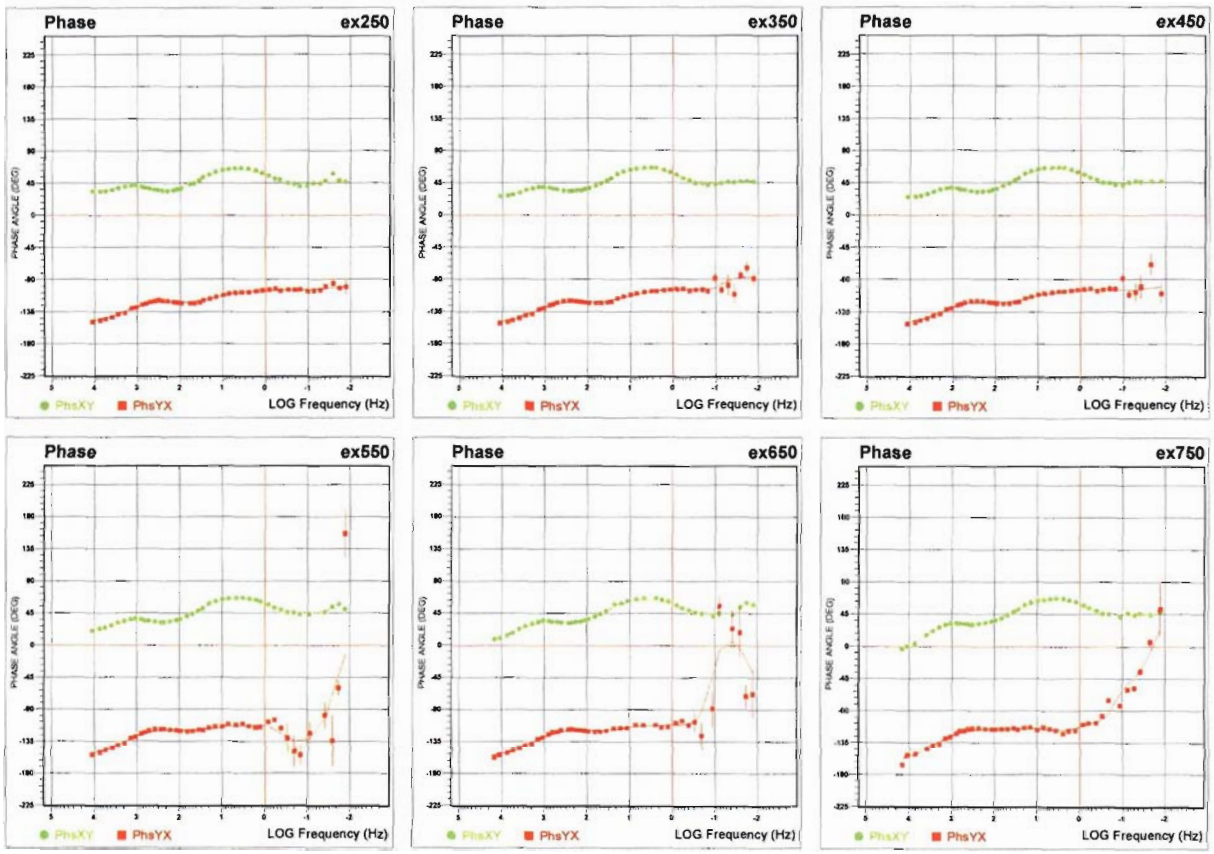
Phs xy ------ green
Phs yx ------ orange

LINE 4E: PHASE



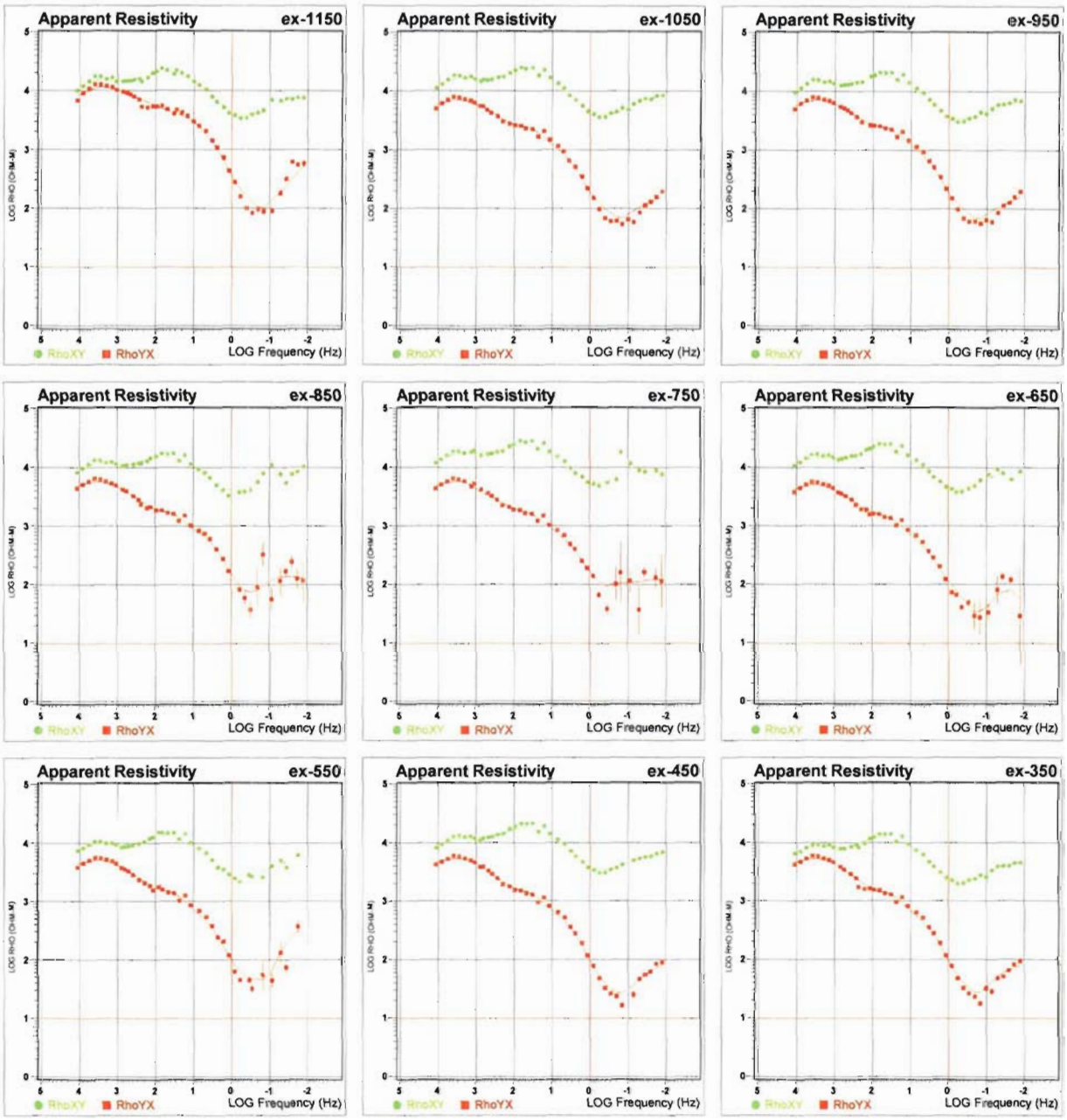
Phs xy ------ green
Phs yx ------ orange

LINE 4E: PHASE



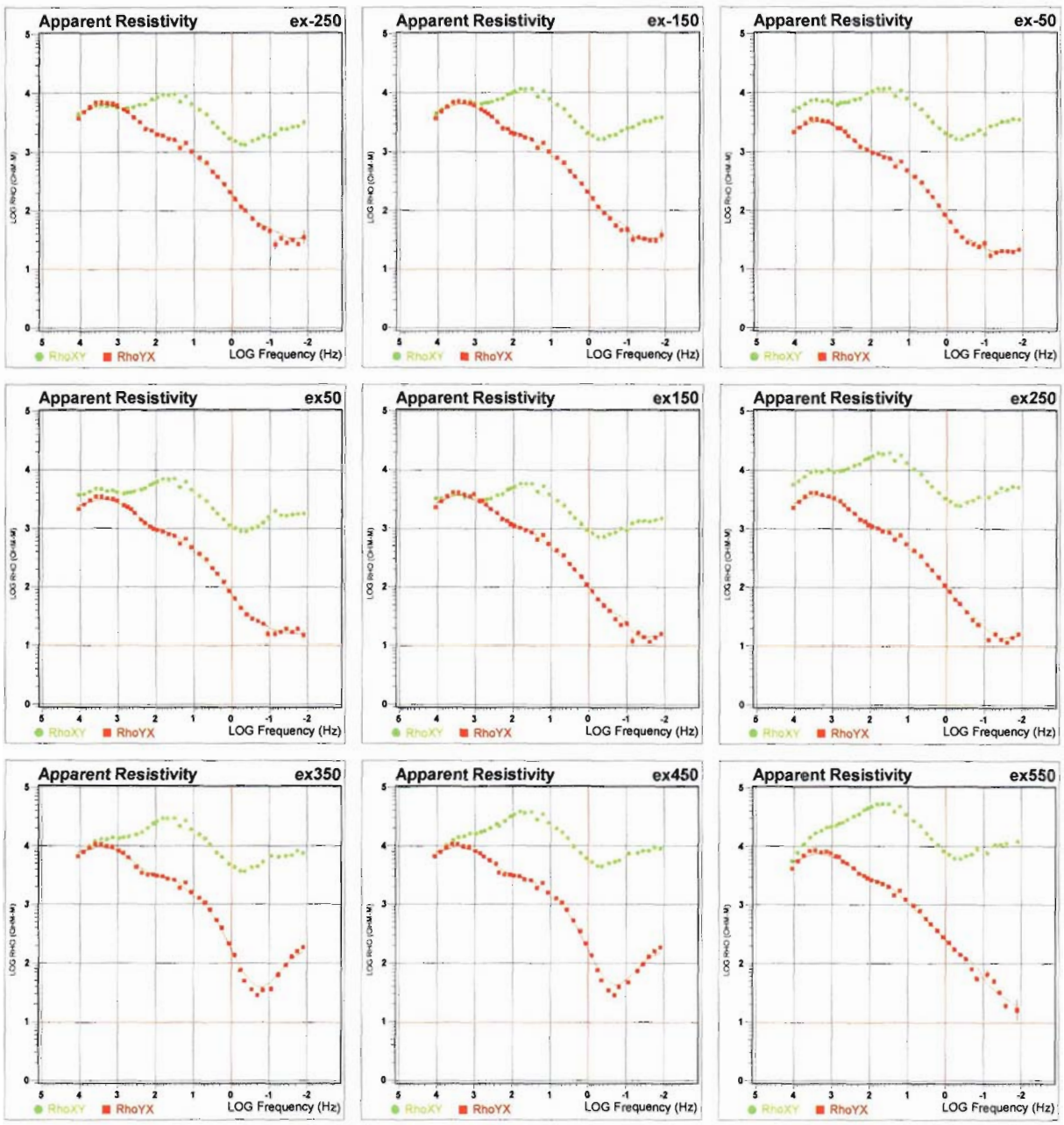
Phs xy ------ green
Phs yx ------ orange

LINE 8E ML GRID: APPARENT RESISTIVITY VS. FREQUENCY



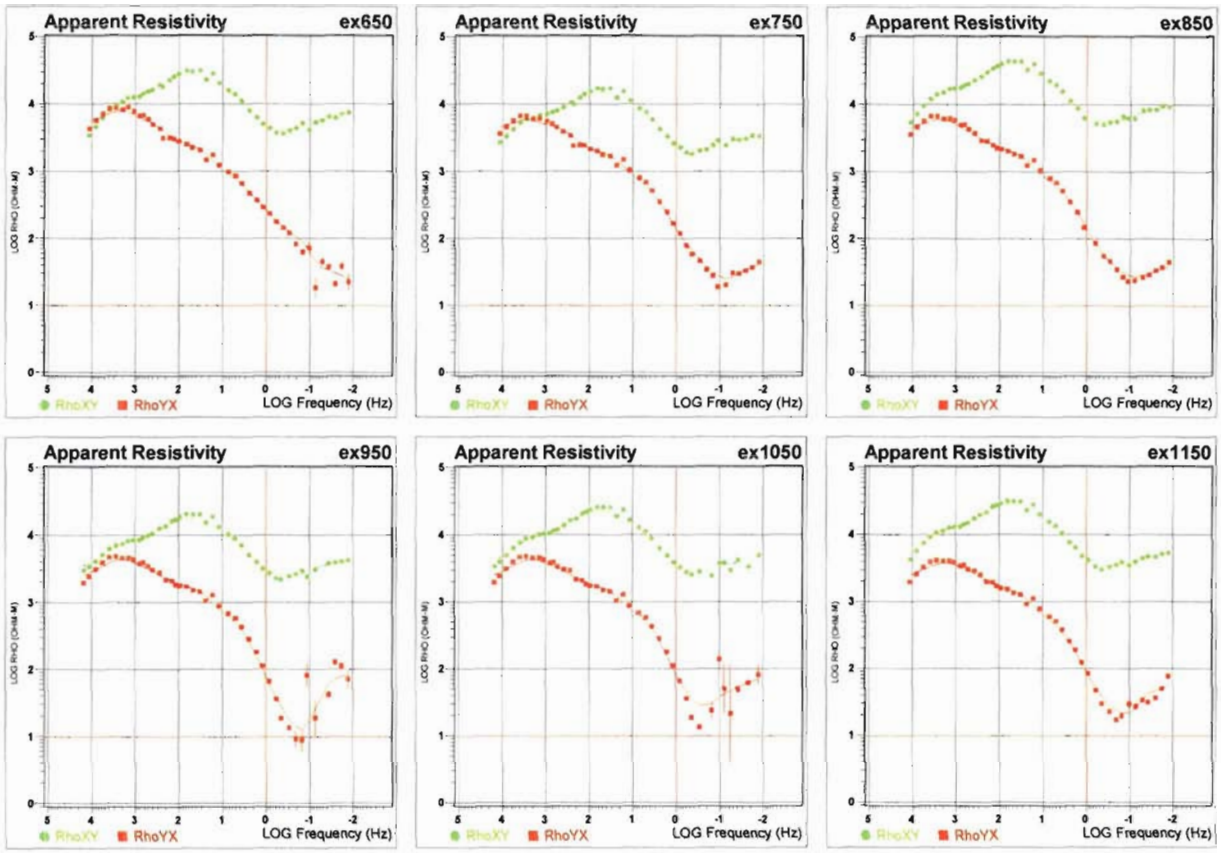
Rho xy ------ green
Rho yx ------ orange

LINE 8E: APPARENT RESISTIVITY VS. FREQUENCY



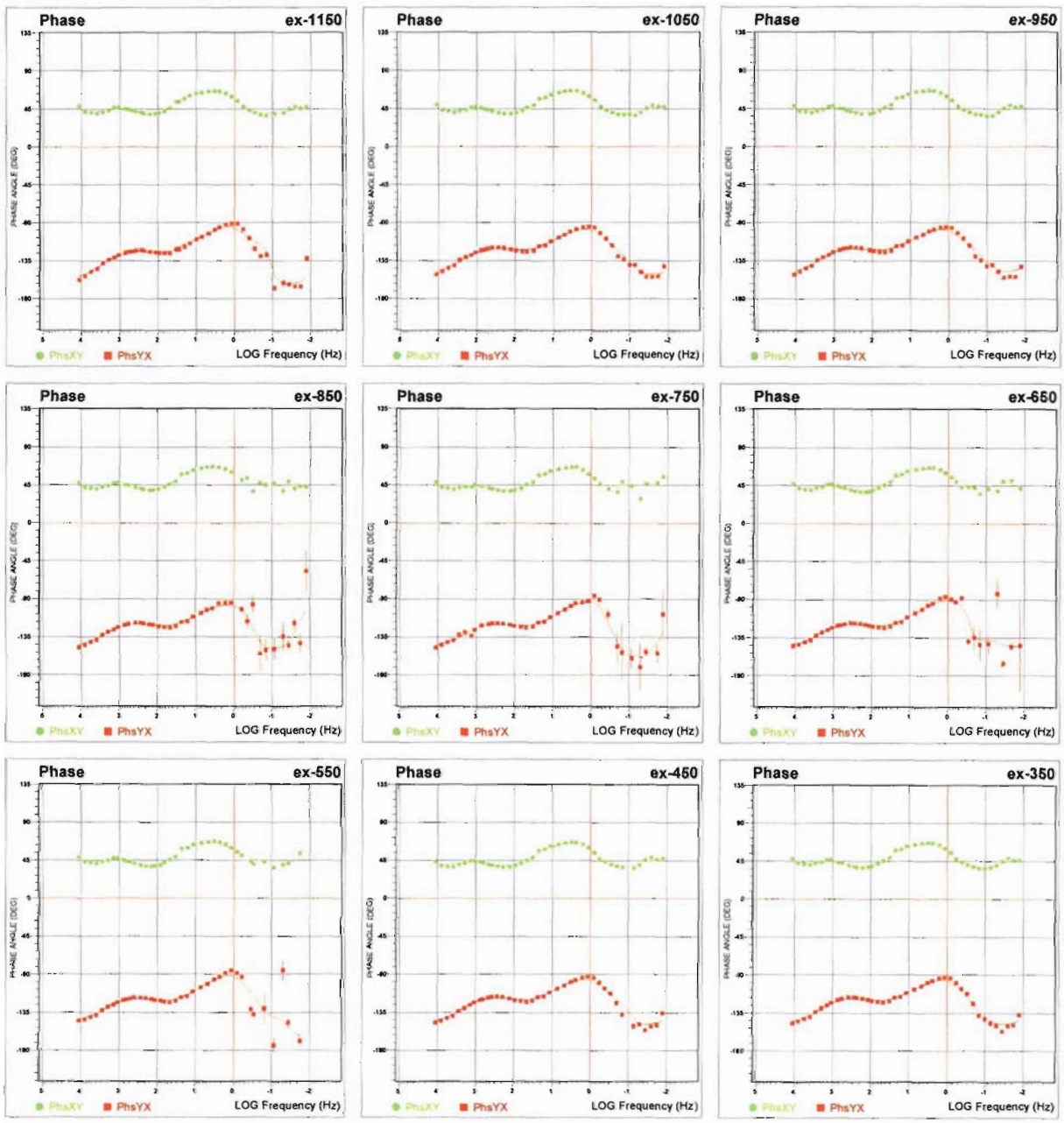
Rho xy ------ green
Rho yx ------ orange

LINE 8E: APPARENT RESISTIVITY VS. FREQUENCY



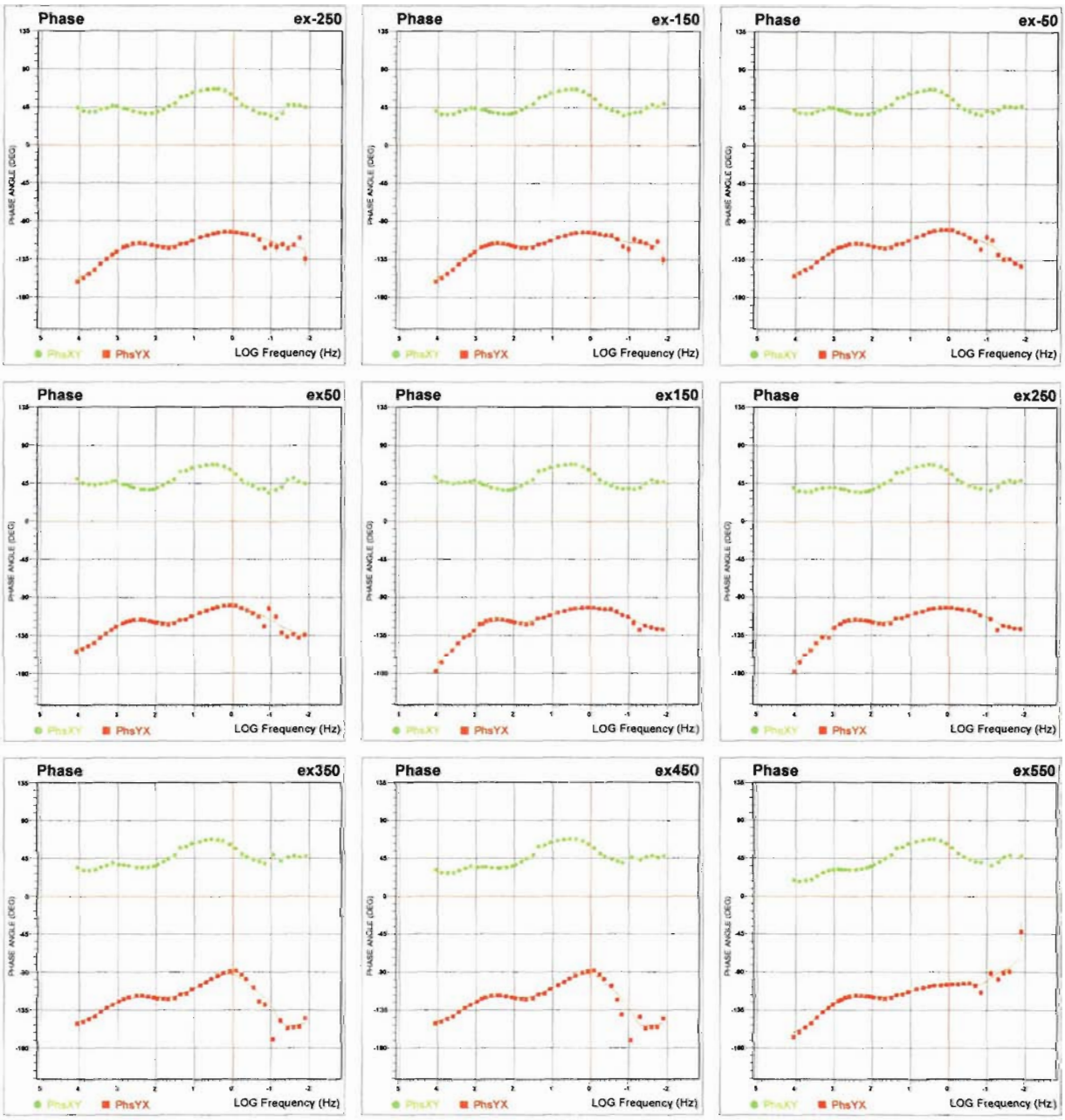
Rho xy ------ green
Rho yx ------ orange

LINE 8E: PHASE



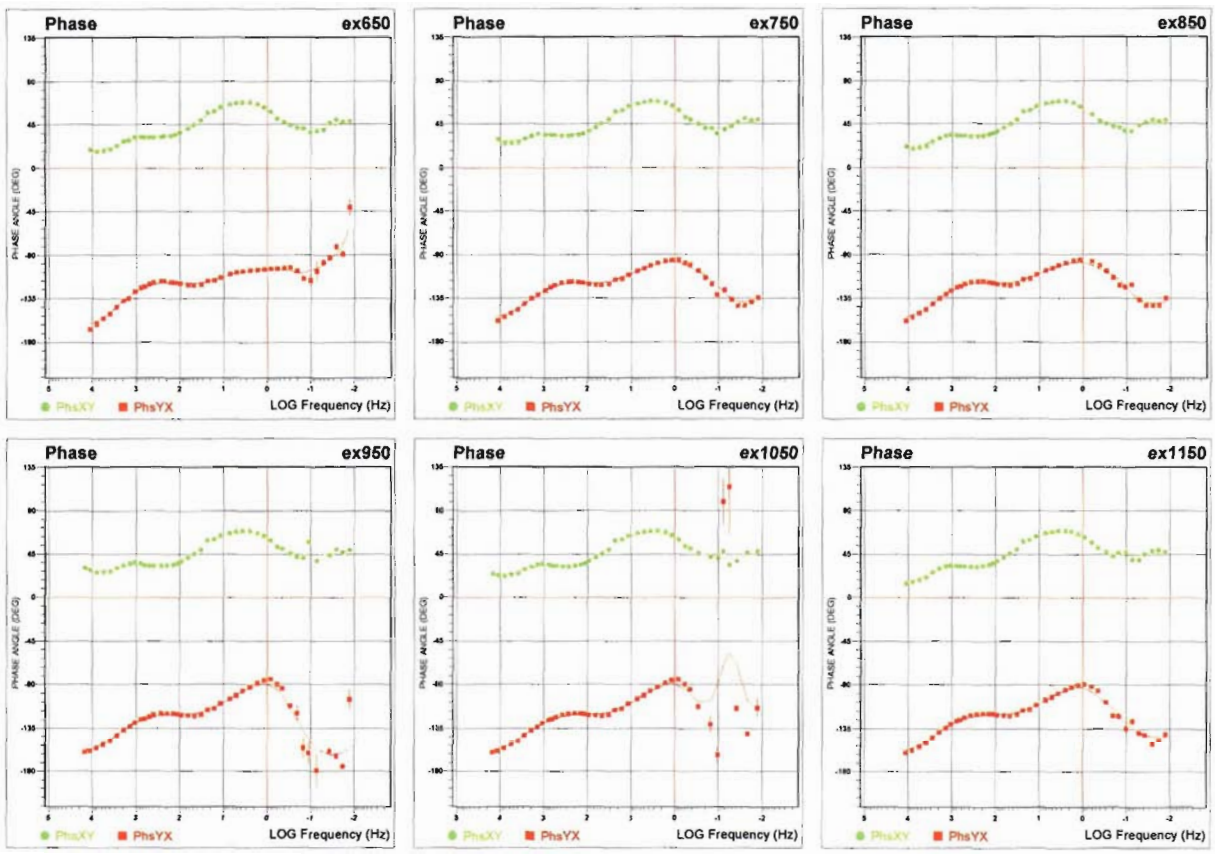
Phs xy ------ green
Phs yx ------ orange

LINE 8E: PHASE



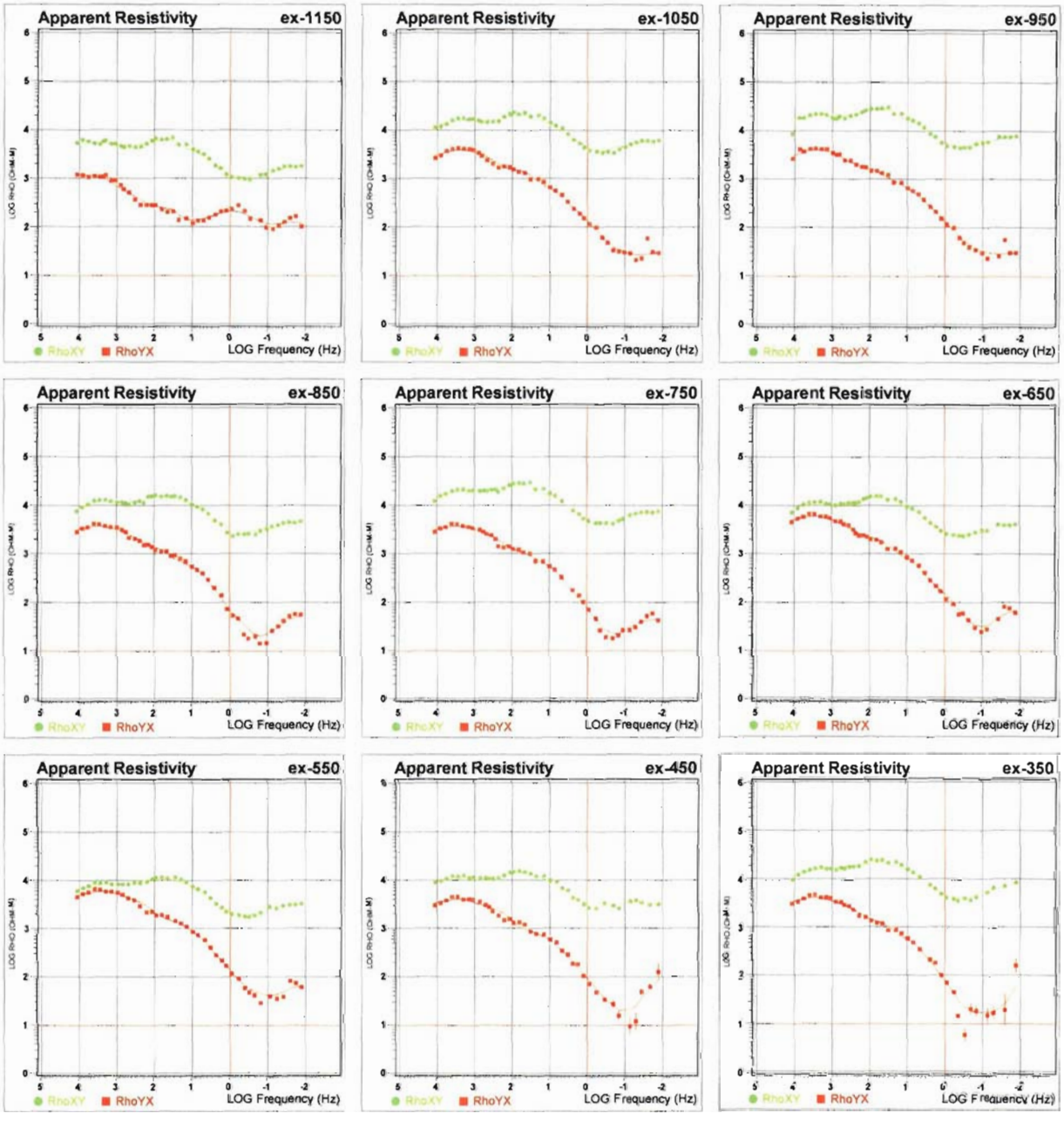
Phs xy ------ **green**
Phs yx ------ **orange**

LINE 8E: PHASE



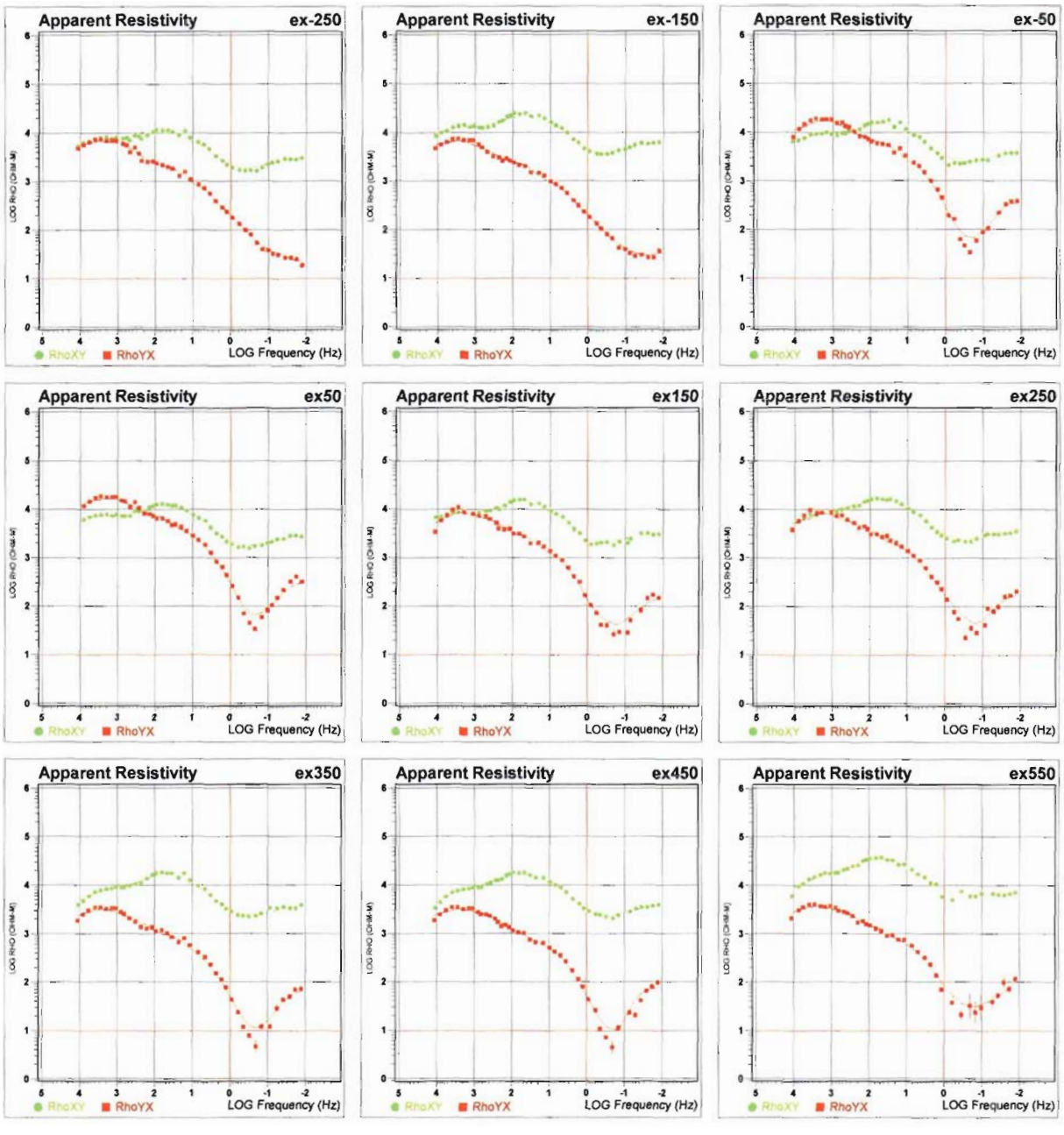
Phs xy ------ green
Phs yx ------ orange

LINE 12E ML GRID: APPARENT RESISTIVITY VS. FREQUENCY



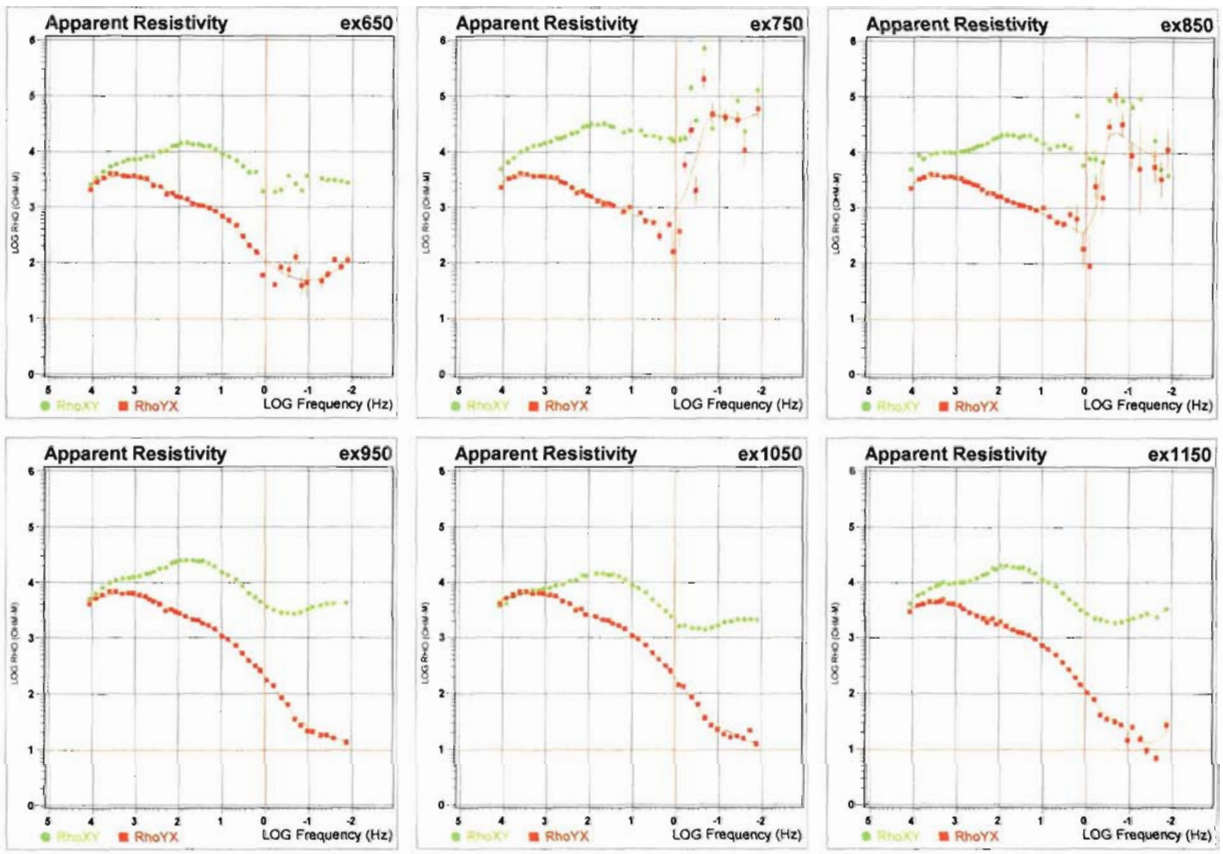
Rho xy ------ green
Rho yx ------ orange

LINE 12E: APPARENT RESISTIVITY VS. FREQUENCY



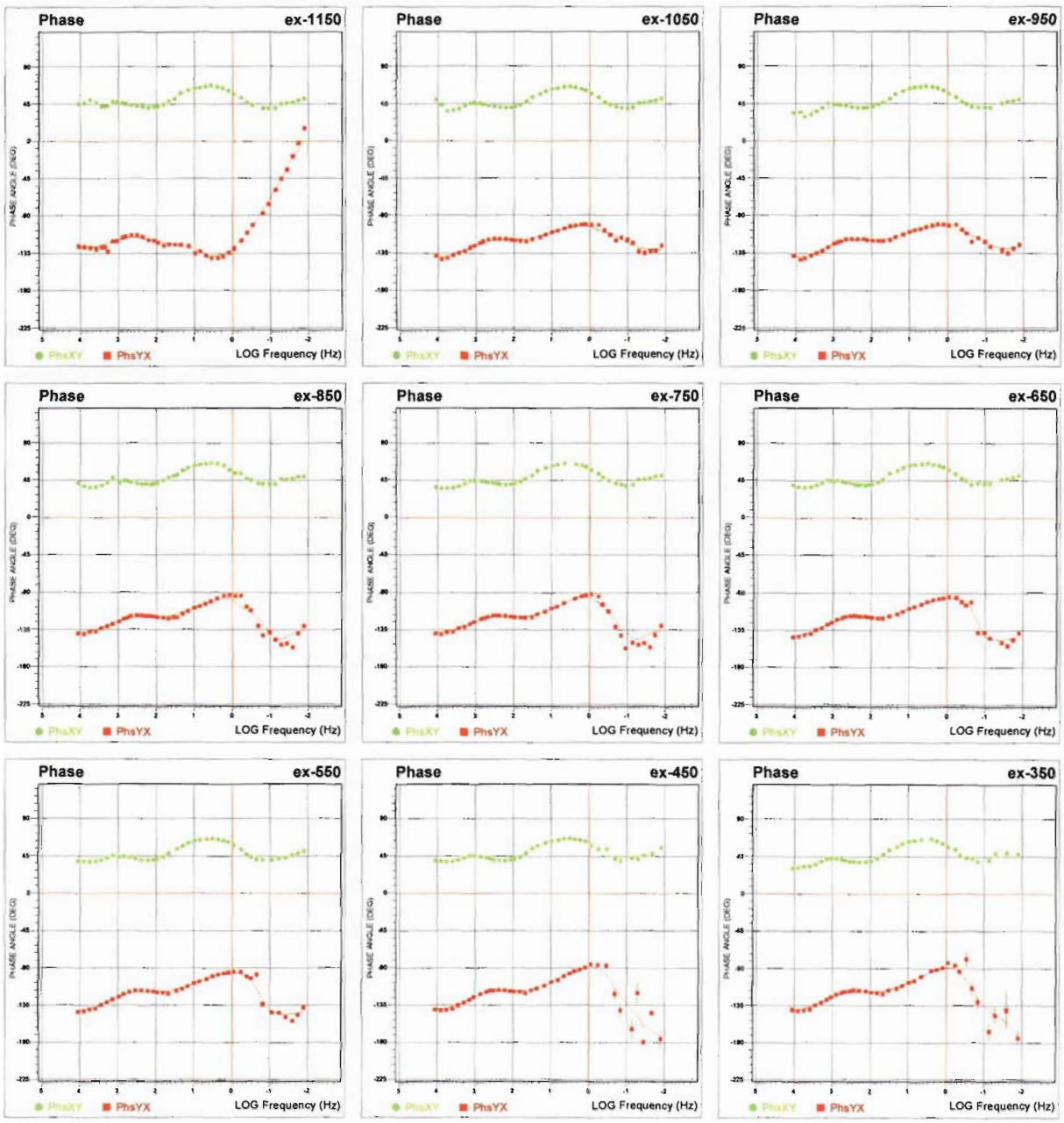
Rho xy ------ green
Rho yx ------ orange

LINE 12E: APPARENT RESISTIVITY VS. FREQUENCY



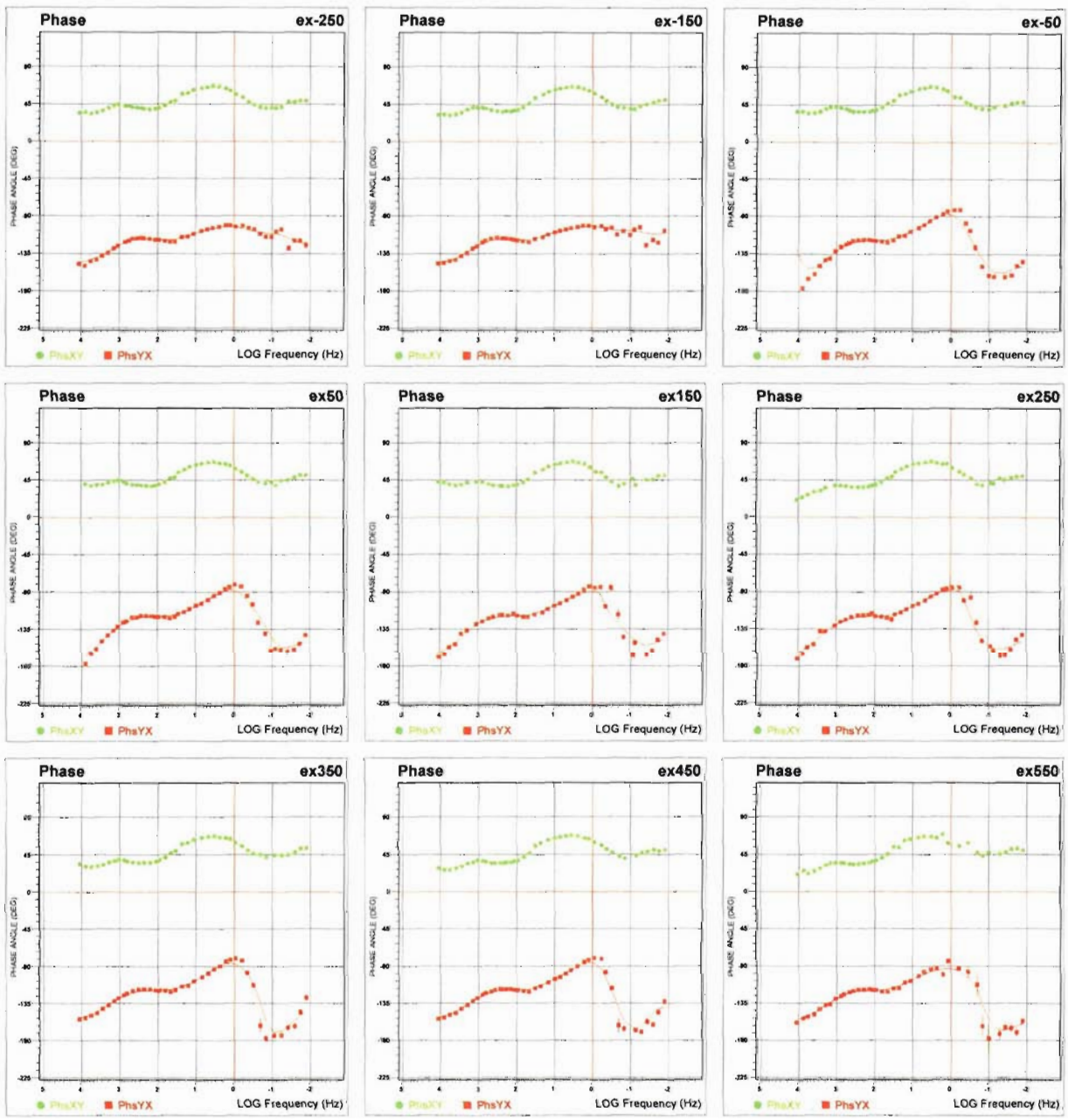
Rho xy ------ green
Rho yx ------ orange

LINE 12E: PHASE



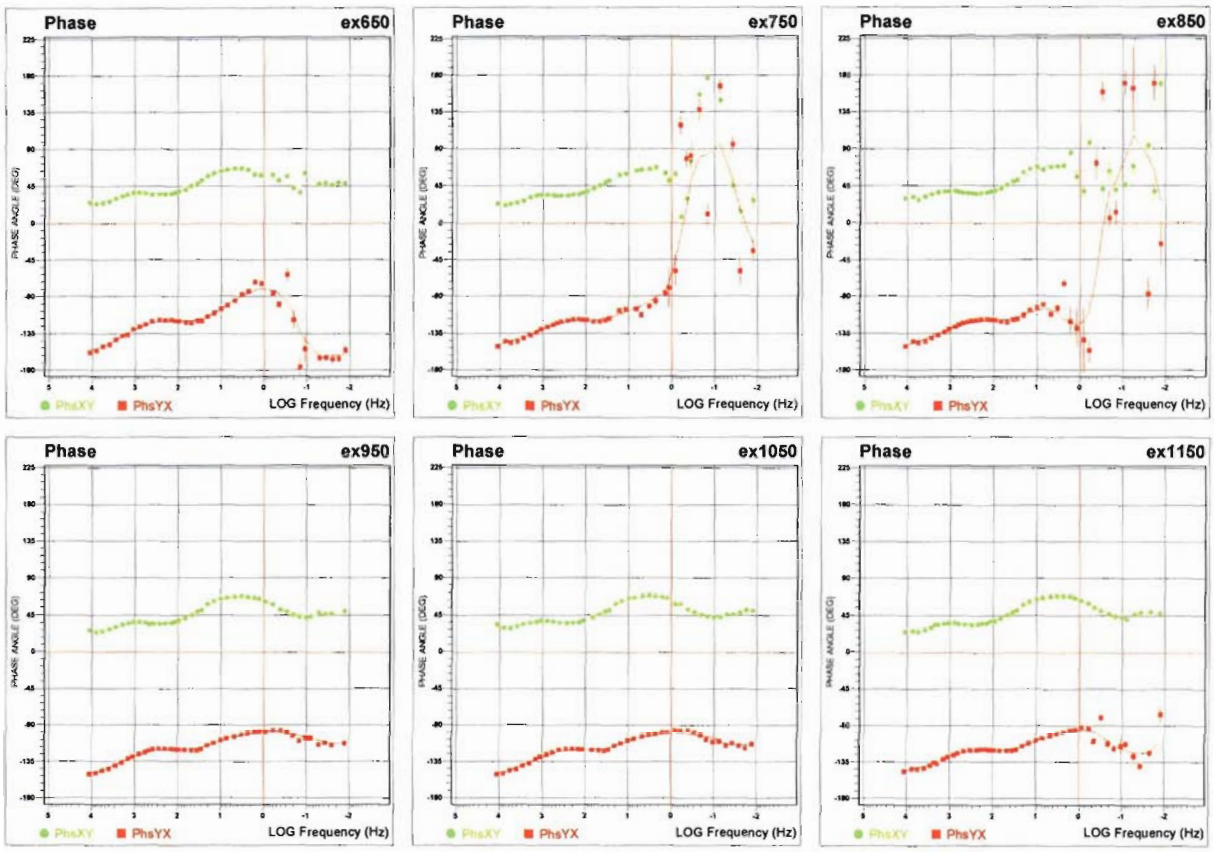
Phs xy ------ green
Phs yx ------ orange

LINE 12E: PHASE



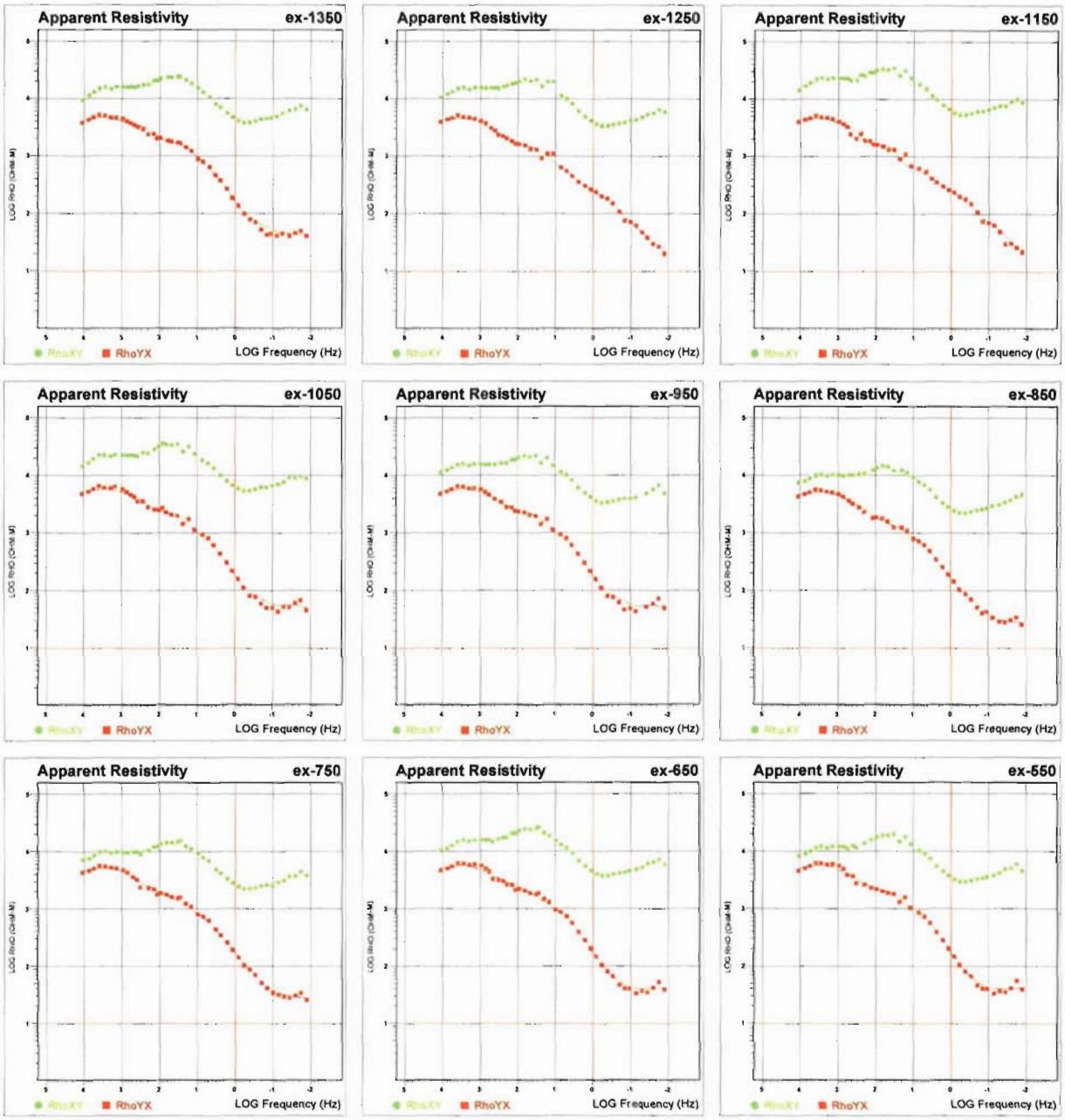
Phs xy ------ green
Phs yx ------ orange

LINE 12E: PHASE



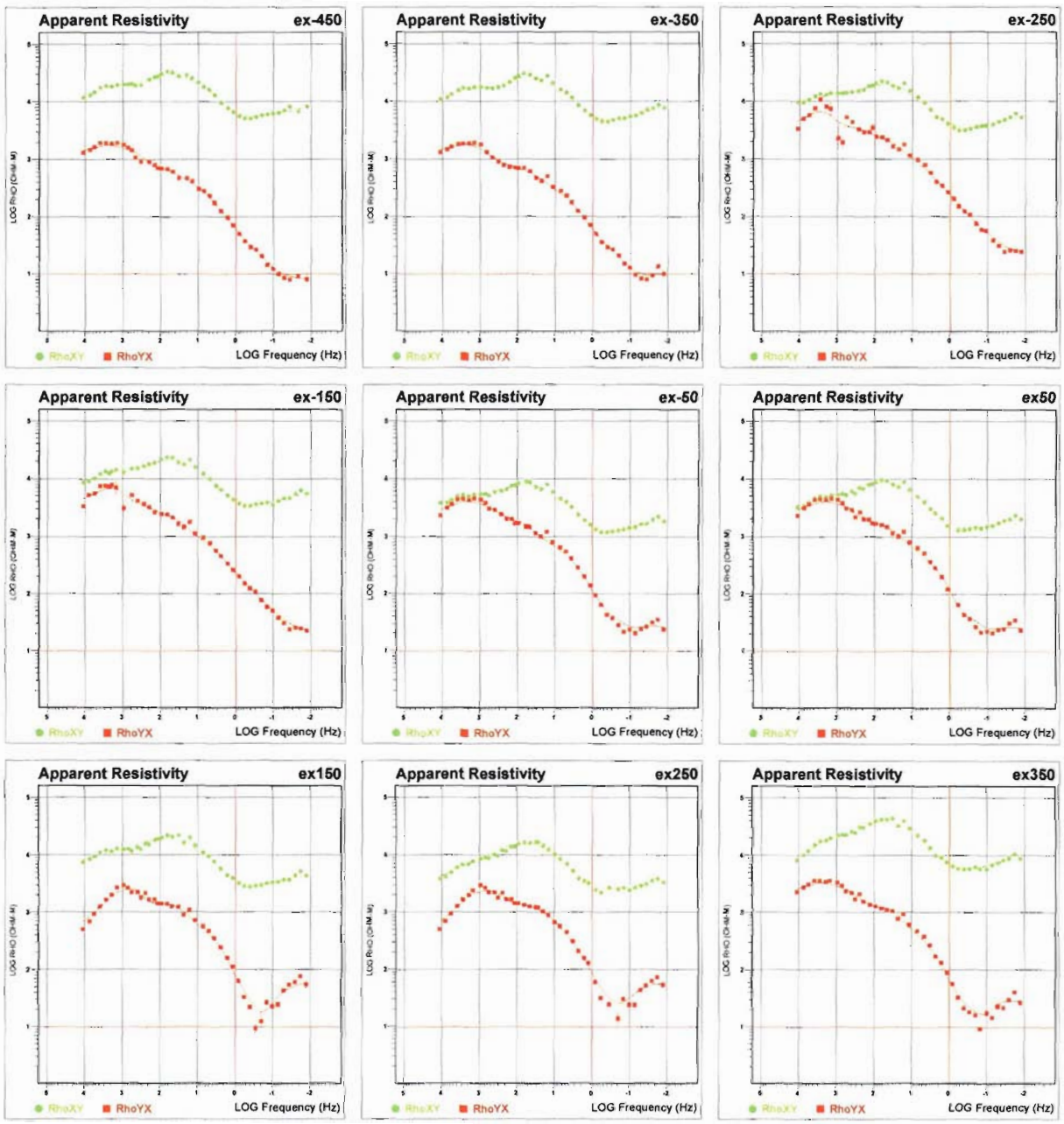
Phs xy ------- green
Phs yx ------- orange

LINE 16E ML GRID: APPARENT RESISTIVITY VS. FREQUENCY



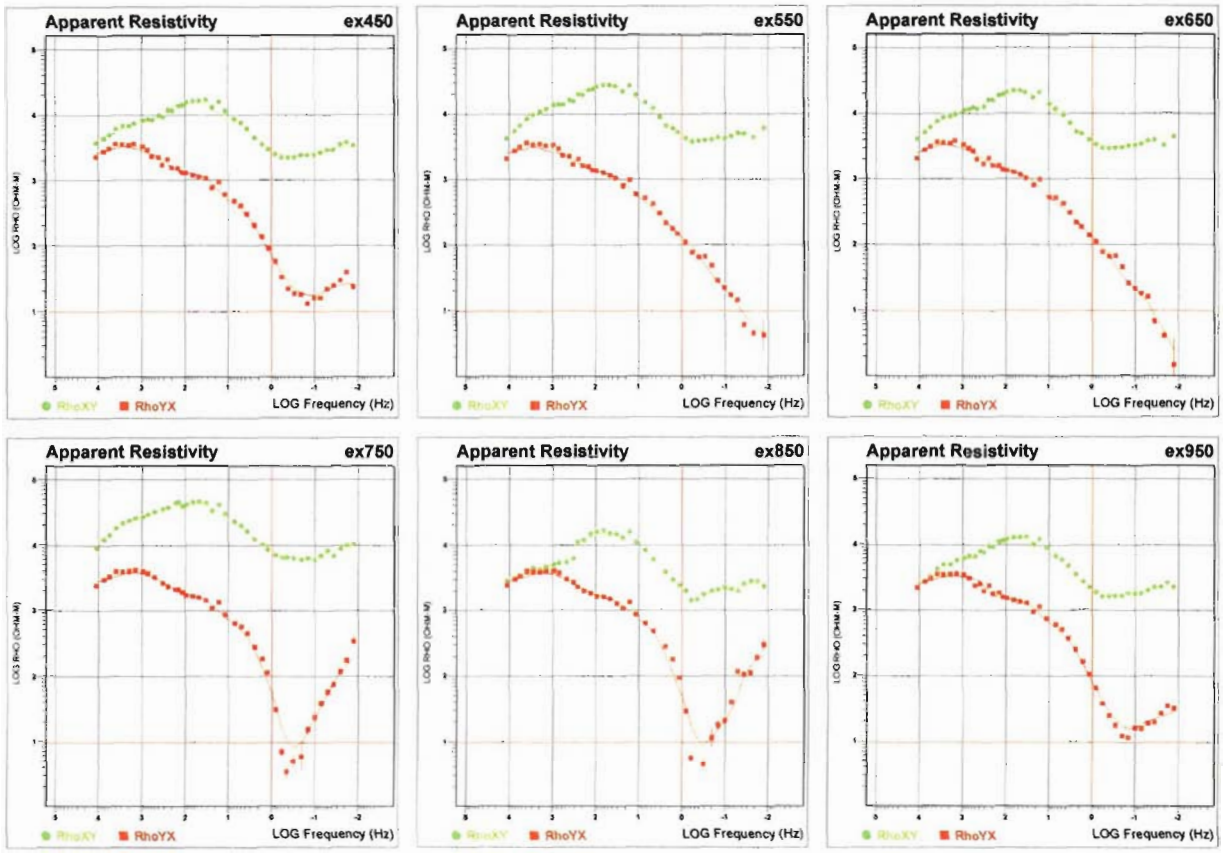
Rho xy ------ green
Rho yx ------ orange

LINE 16E: APPARENT RESISTIVITY VS. FREQUENCY



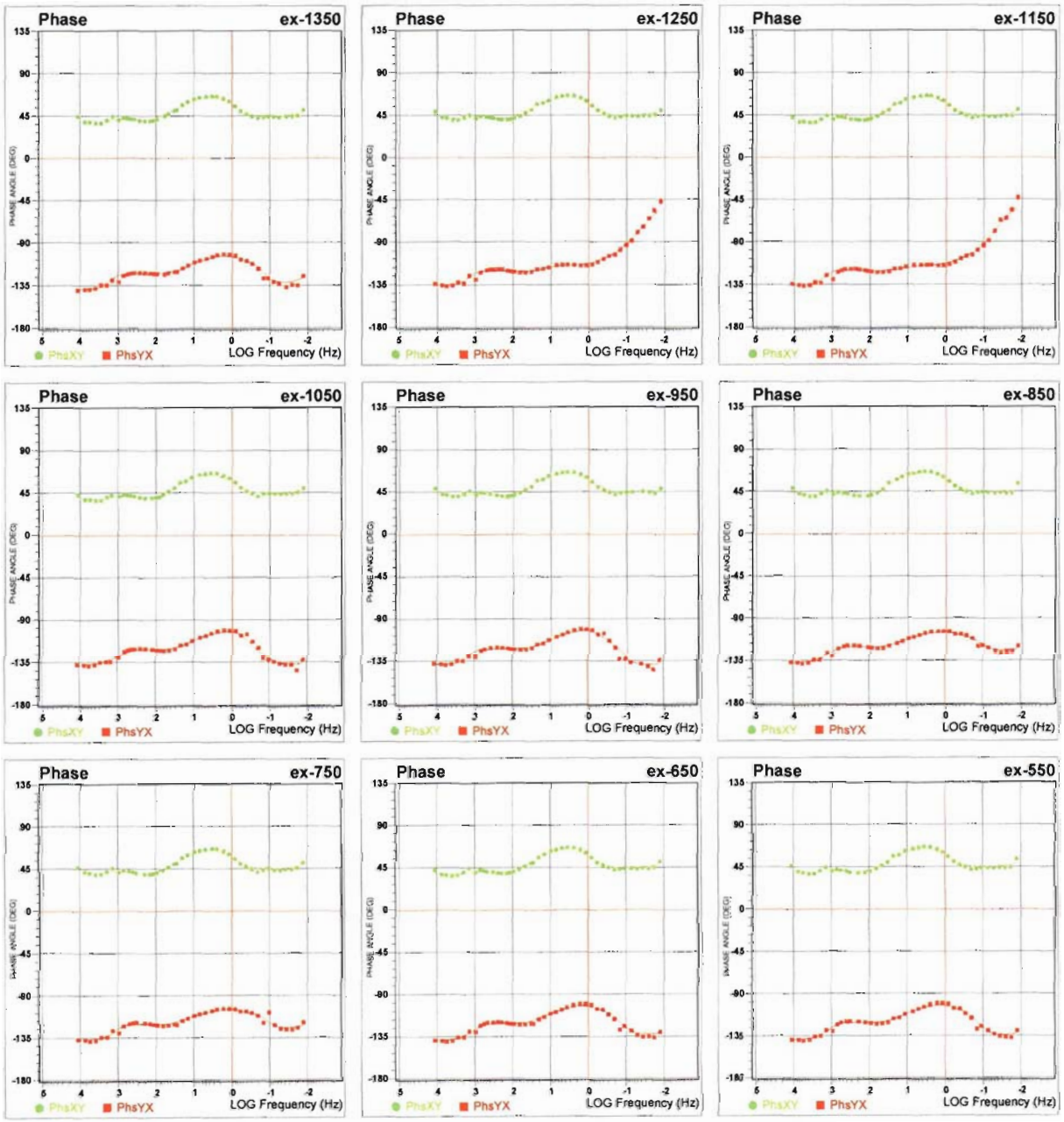
Rho xy ------ green
Rho yx ------ orange

LINE 16E: APPARENT RESISTIVITY VS. FREQUENCY



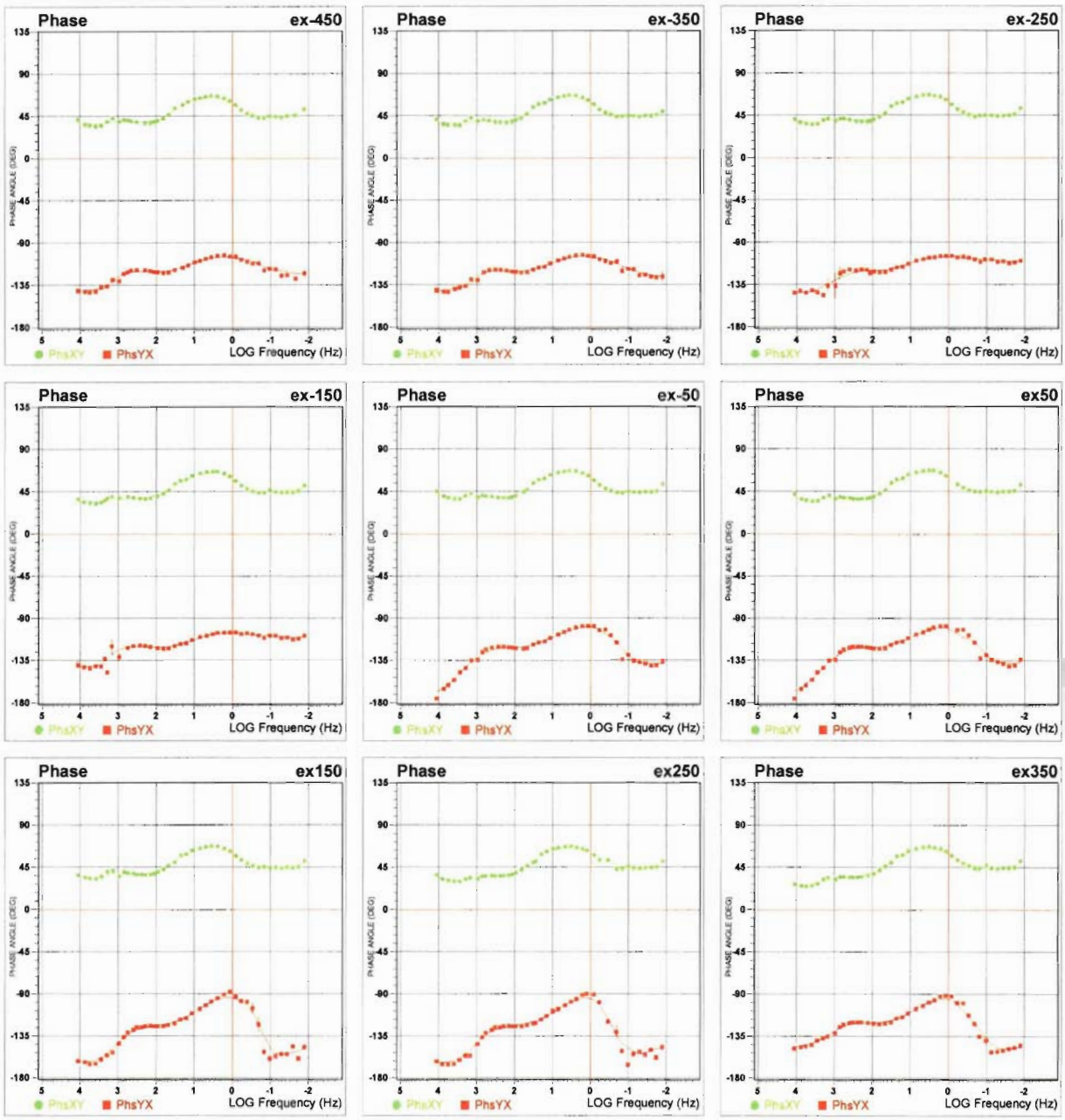
Rho xy ------ green
Rho yx ------ orange

LINE 16E: PHASE



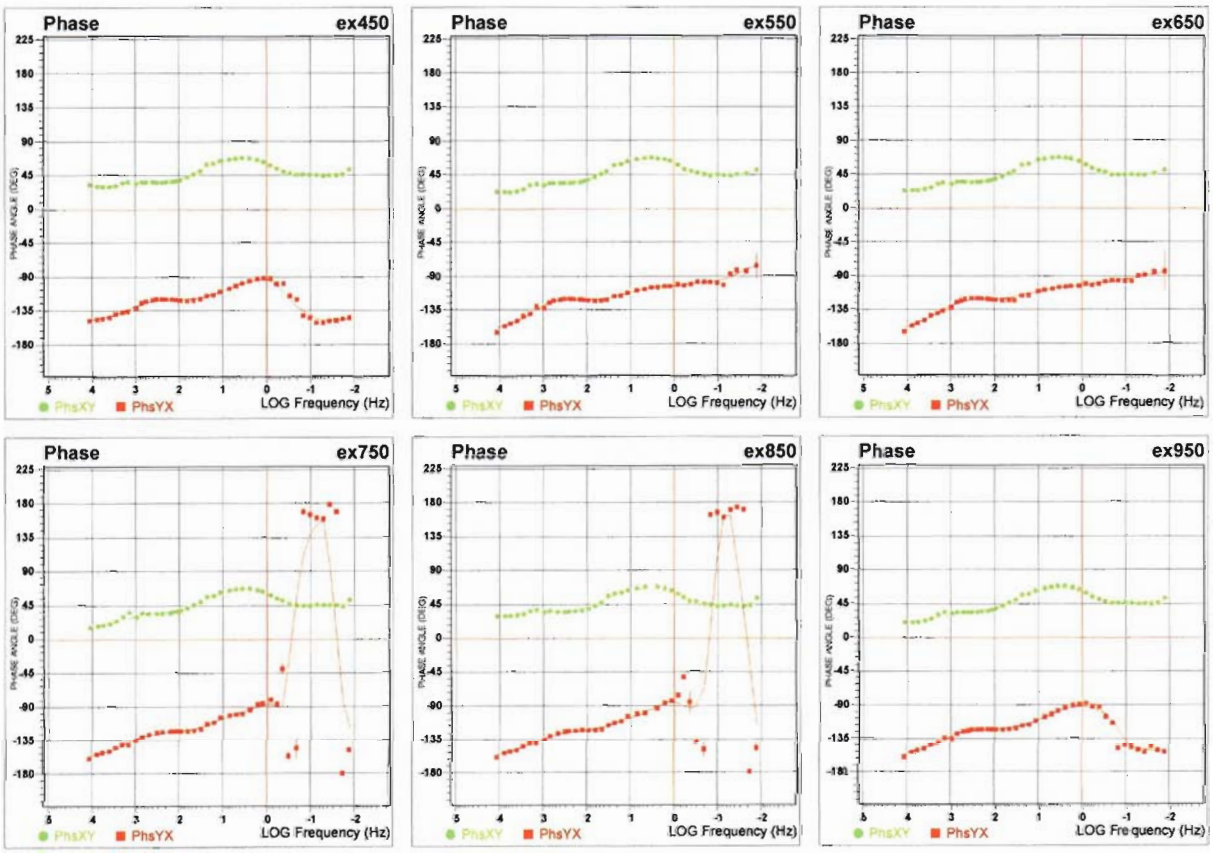
Phs xy ------ green
Phs yx ------ orange

LINE 16E: PHASE



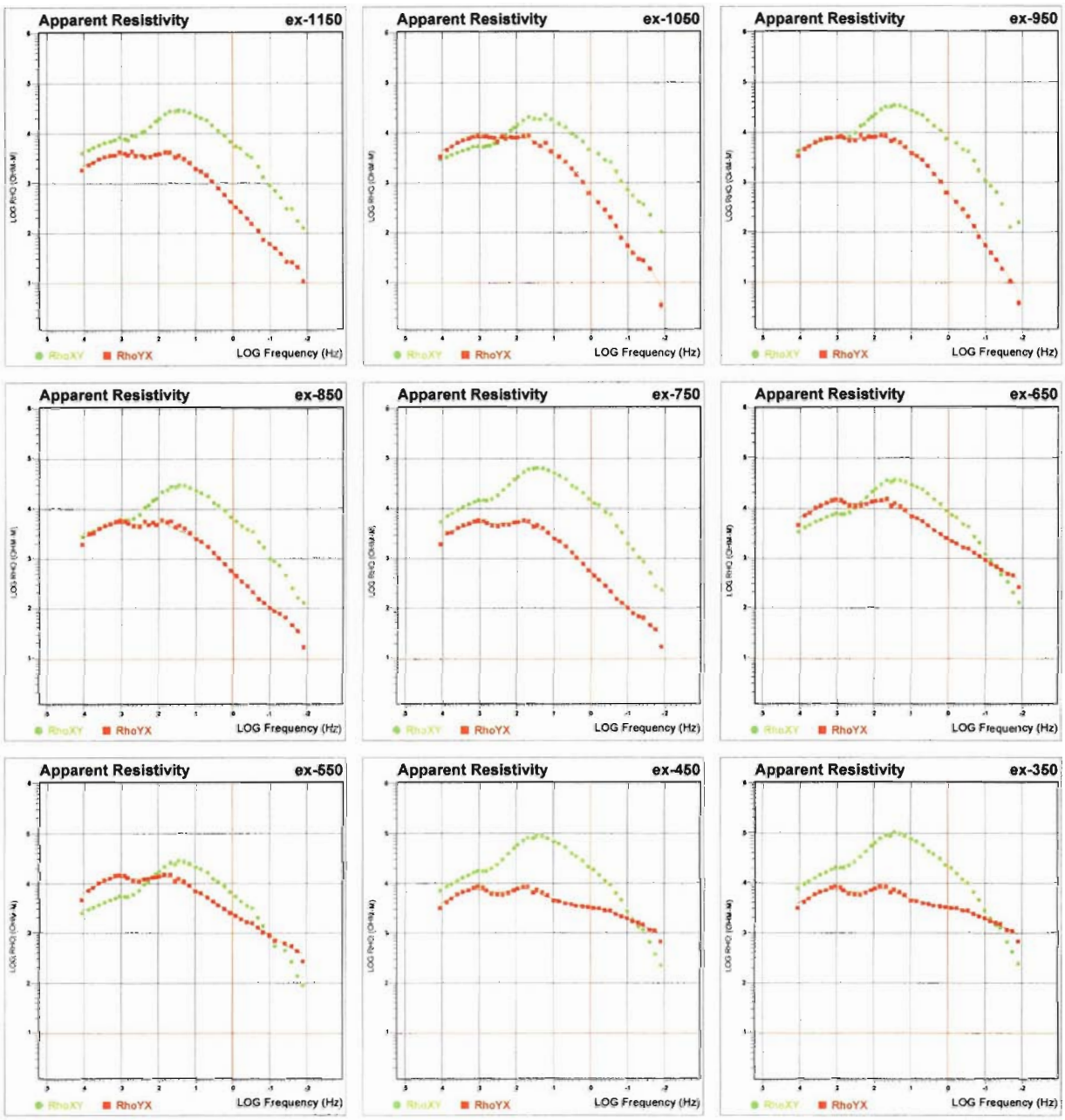
Phs xy ------ green
Phs yx ------ orange

LINE 16E: PHASE



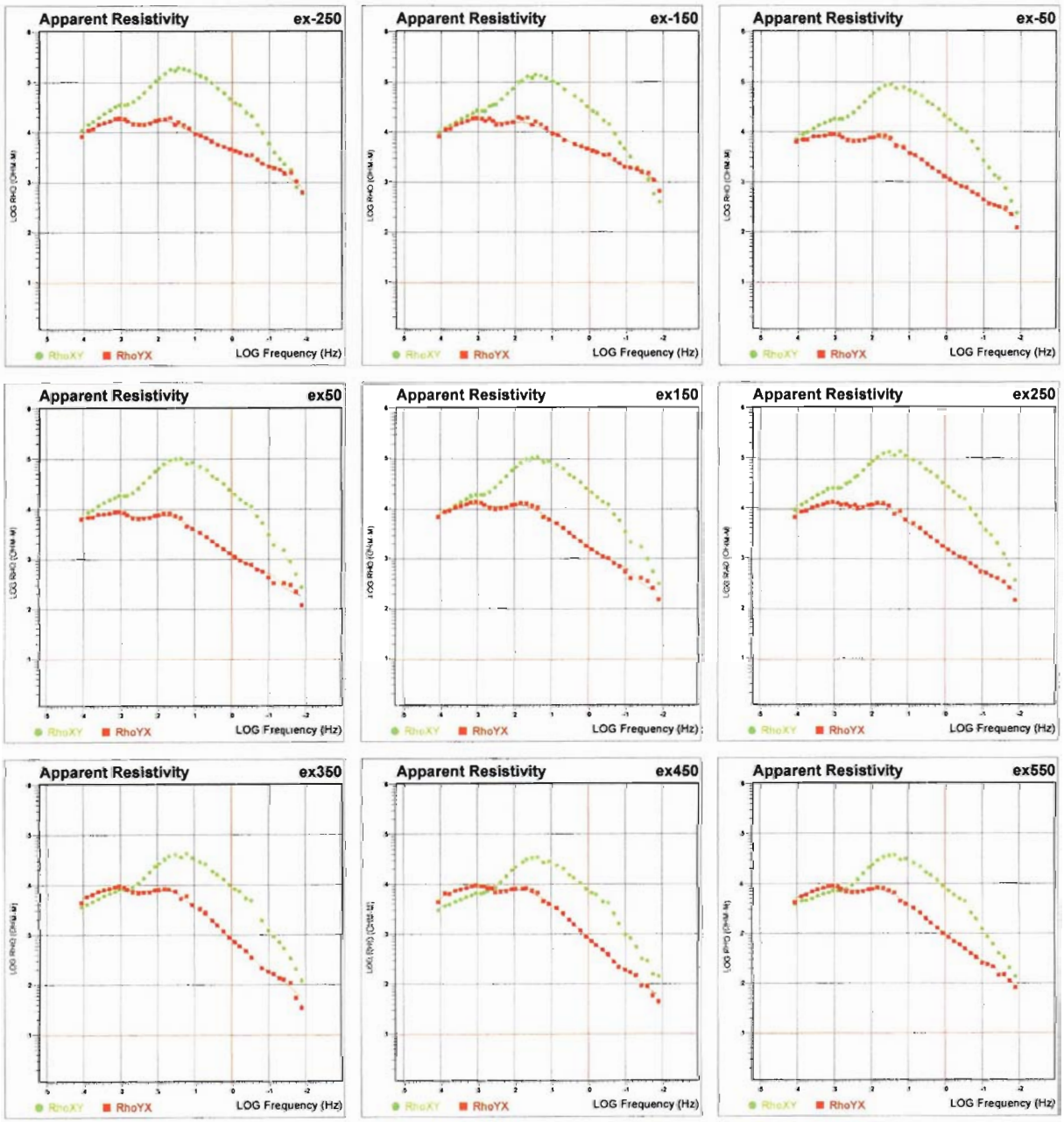
Phs xy ------ green
Phs yx ------ orange

LINE 0E DUCK GRID: APPARENT RESISTIVITY VS. FREQUENCY



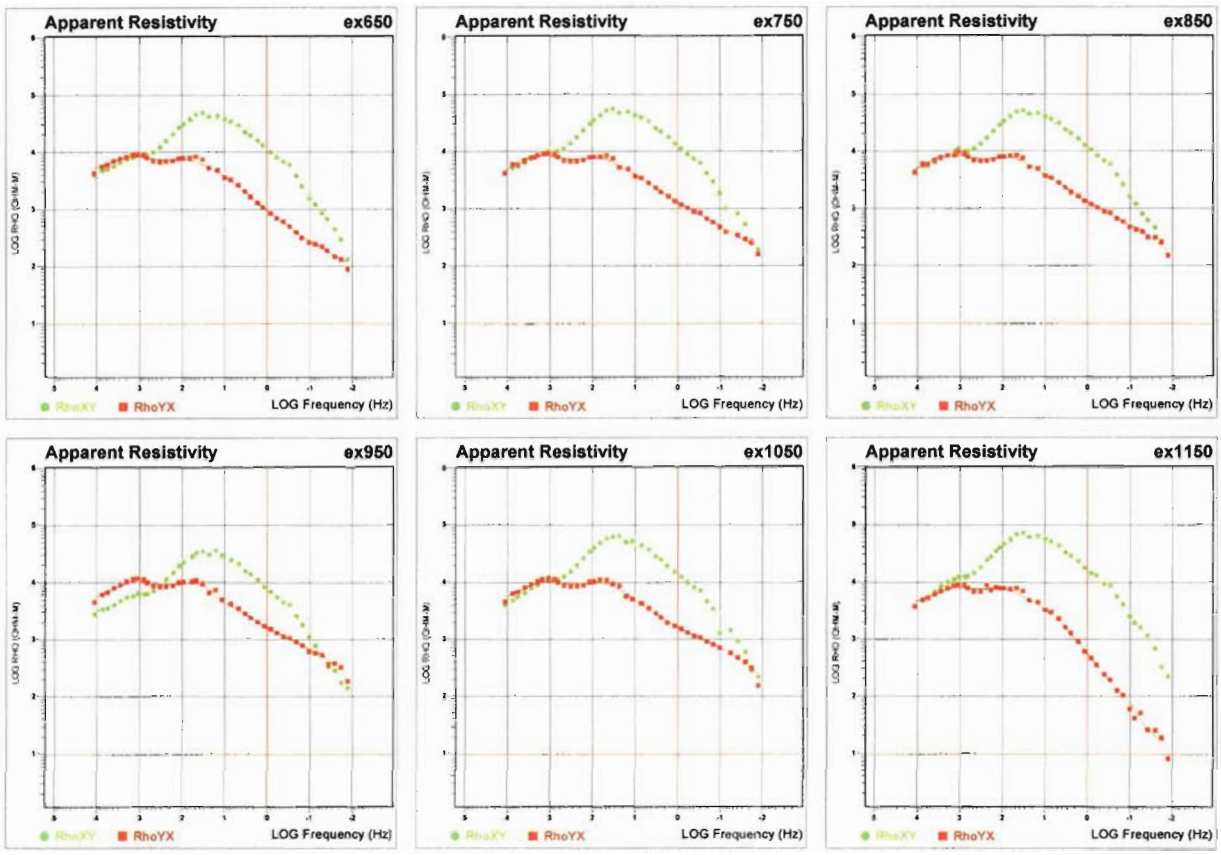
Rho xy ------ green
Rho yx ------ orange

LINE 0E: APPARENT RESISTIVITY VS. FREQUENCY



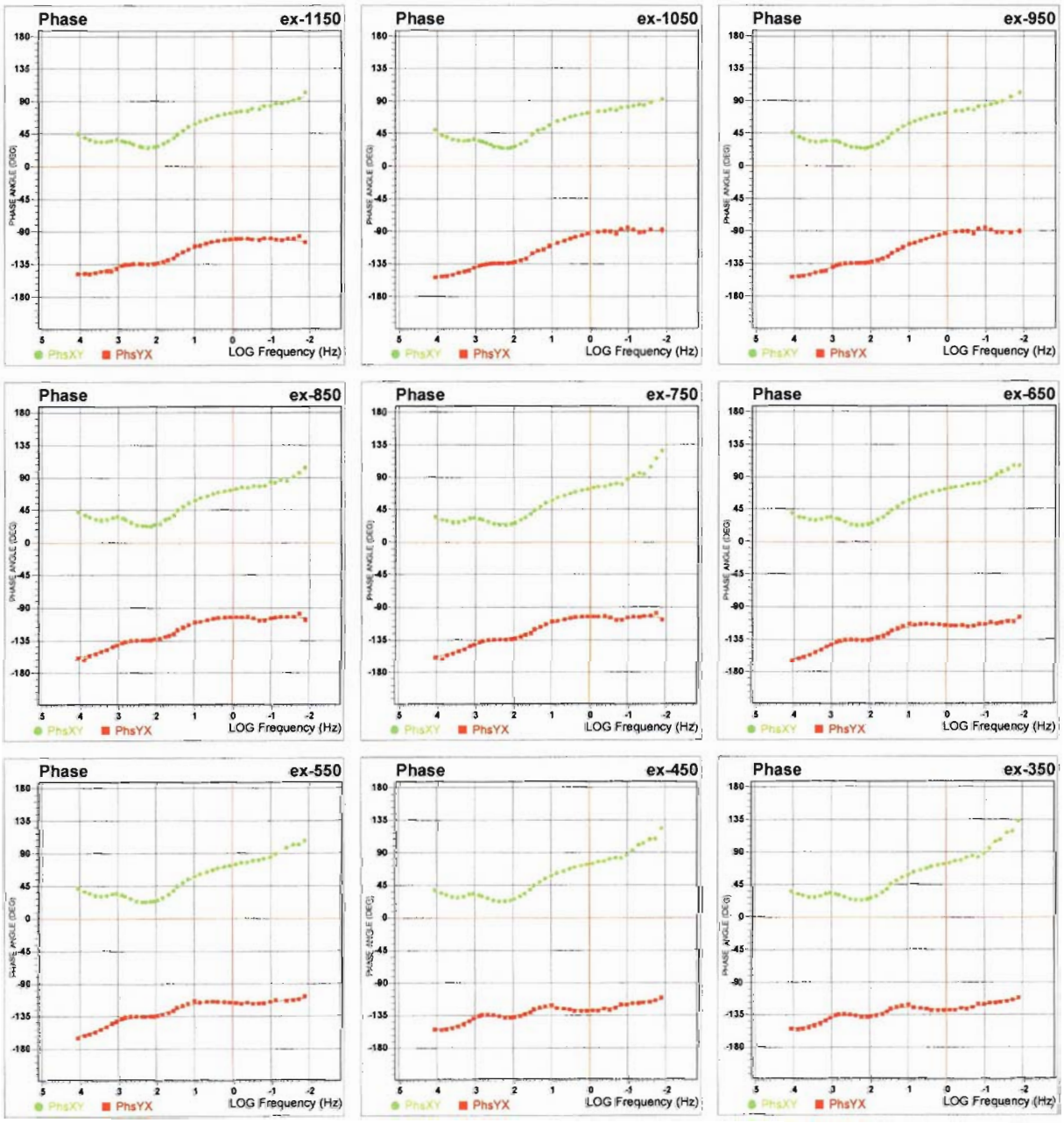
Rho xy ------ green
Rho yx ------ orange

LINE 0E: APPARENT RESISTIVITY VS. FREQUENCY



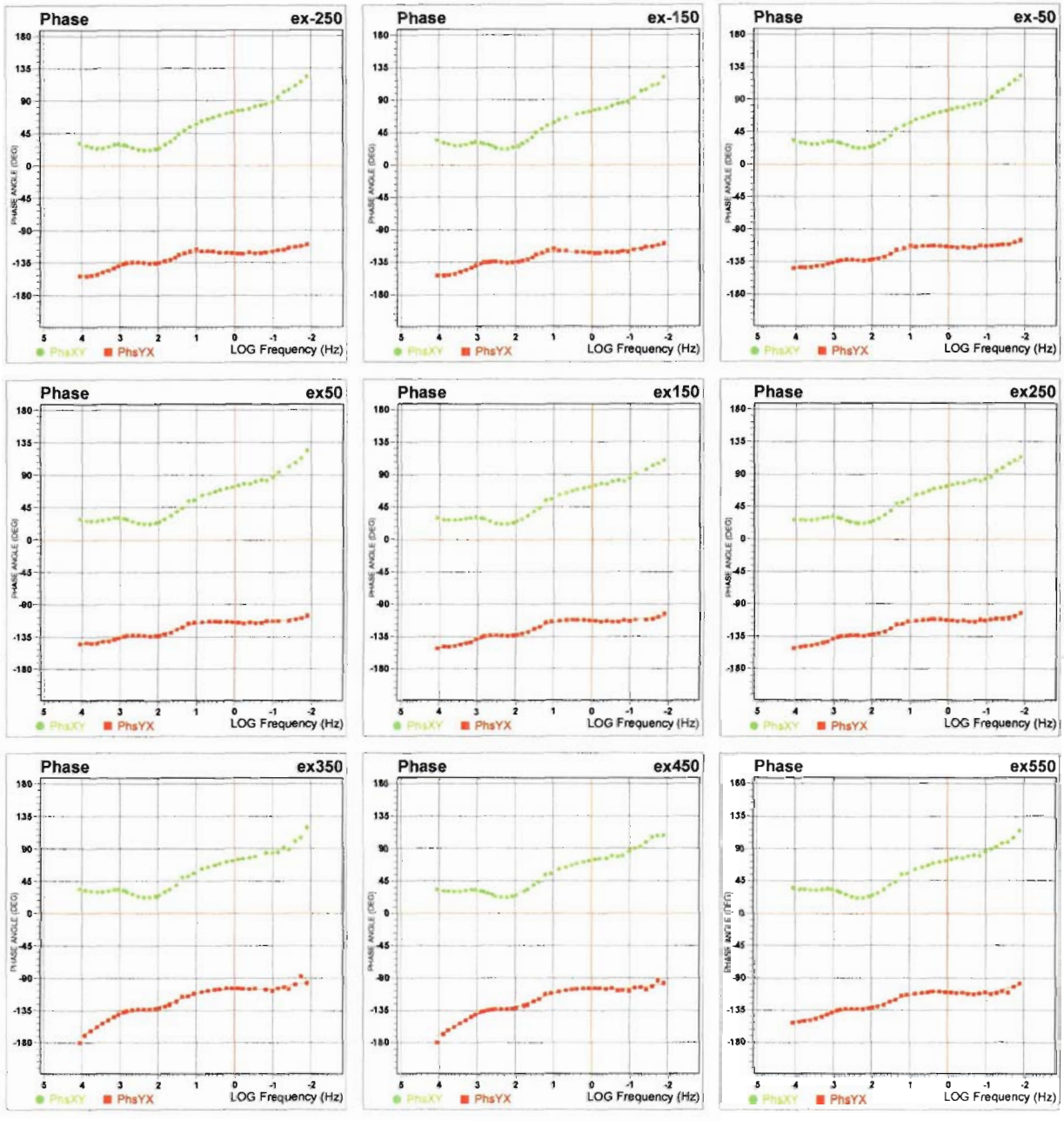
Rho xy ------ green
Rho yx ------ orange

LINE 0E: PHASE



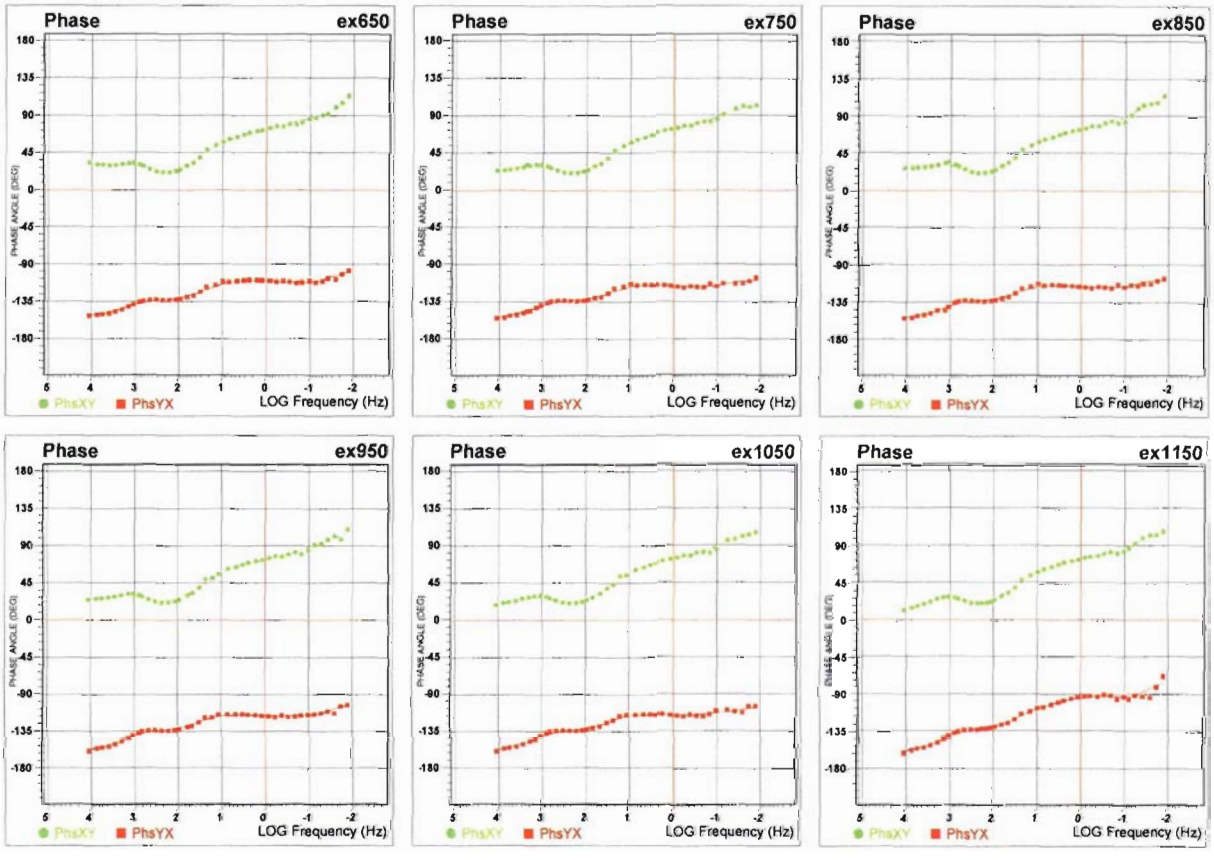
Phs xy ------ green
Phs yx ------ orange

LINE 0E: PHASE



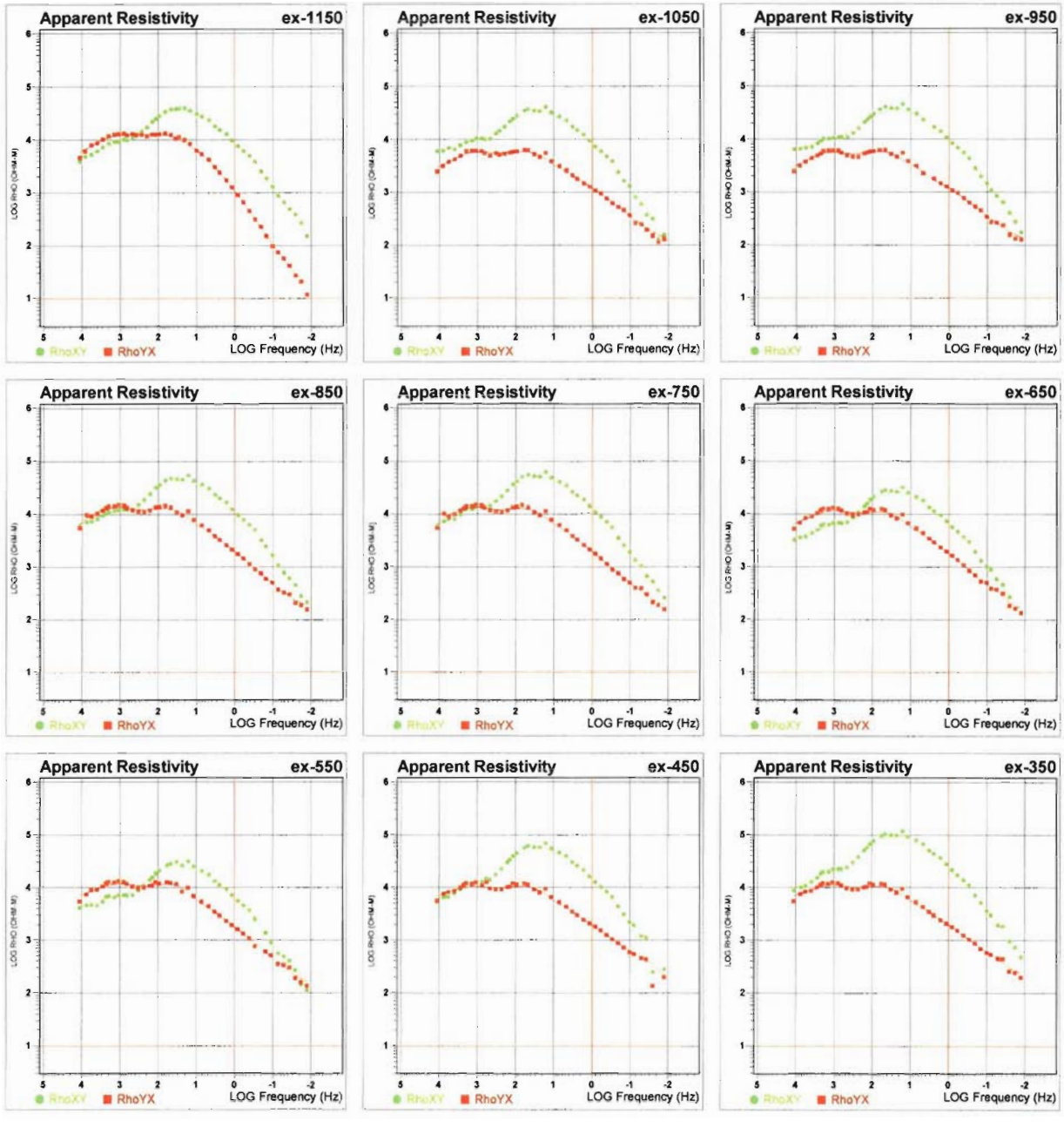
Phs xy ------ green
Phs yx ------ orange

LINE 0E: PHASE



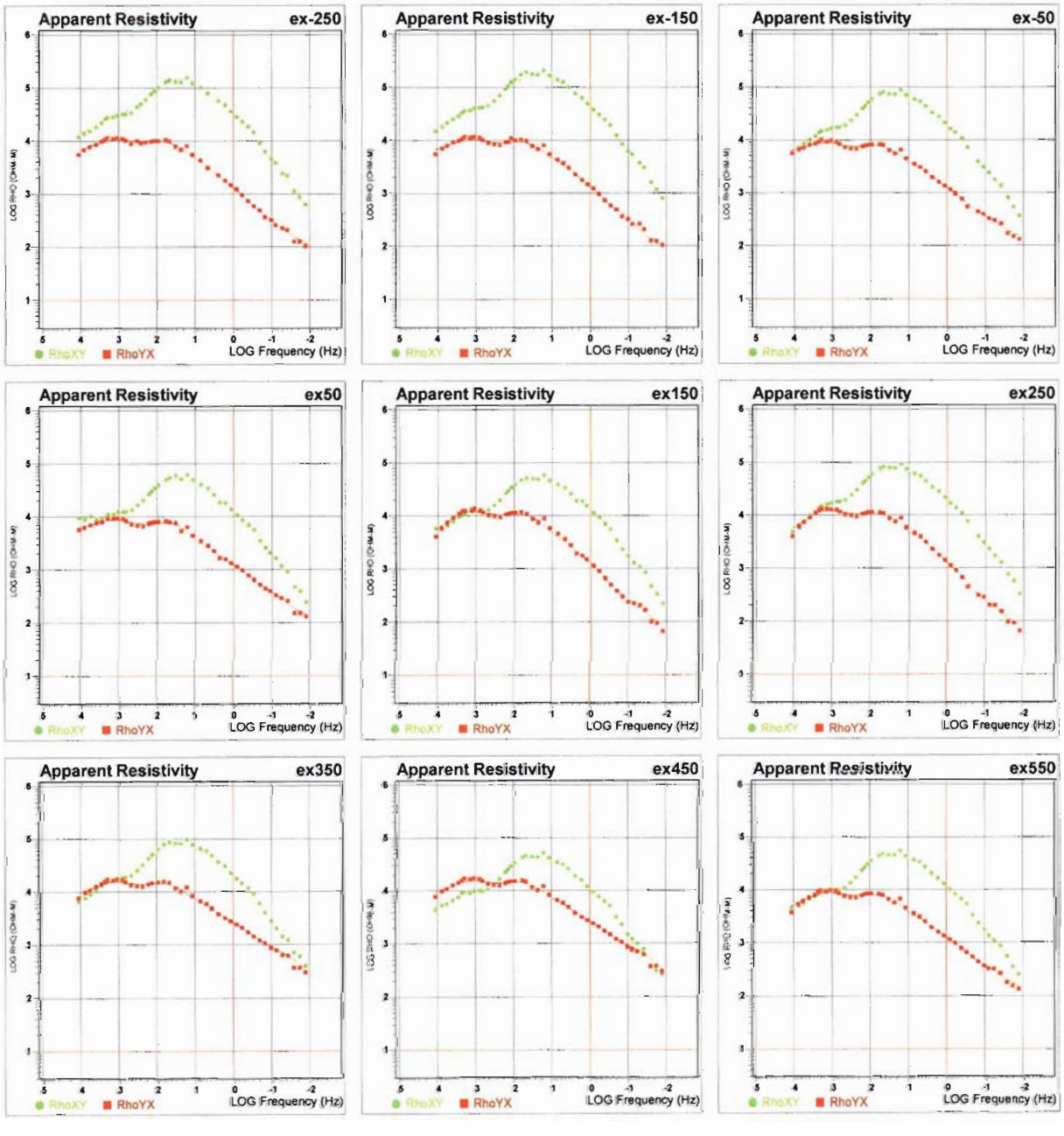
Phs xy ------ green
Phs yx ------ orange

LINE 4E DUCK GRID: APPARENT RESISTIVITY VS. FREQUENCY



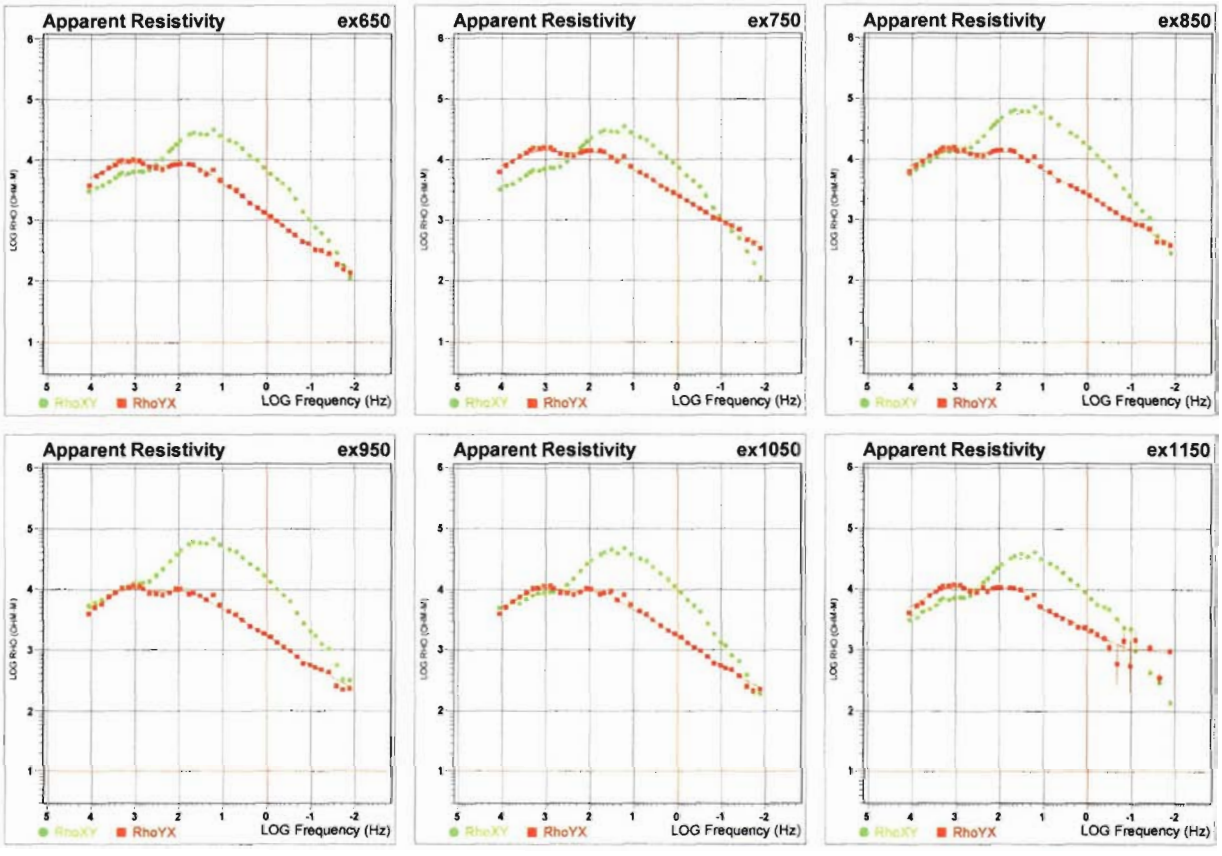
Rho xy ------ green
Rho yx ------ orange

LINE 4E: APPARENT RESISTIVITY VS. FREQUENCY



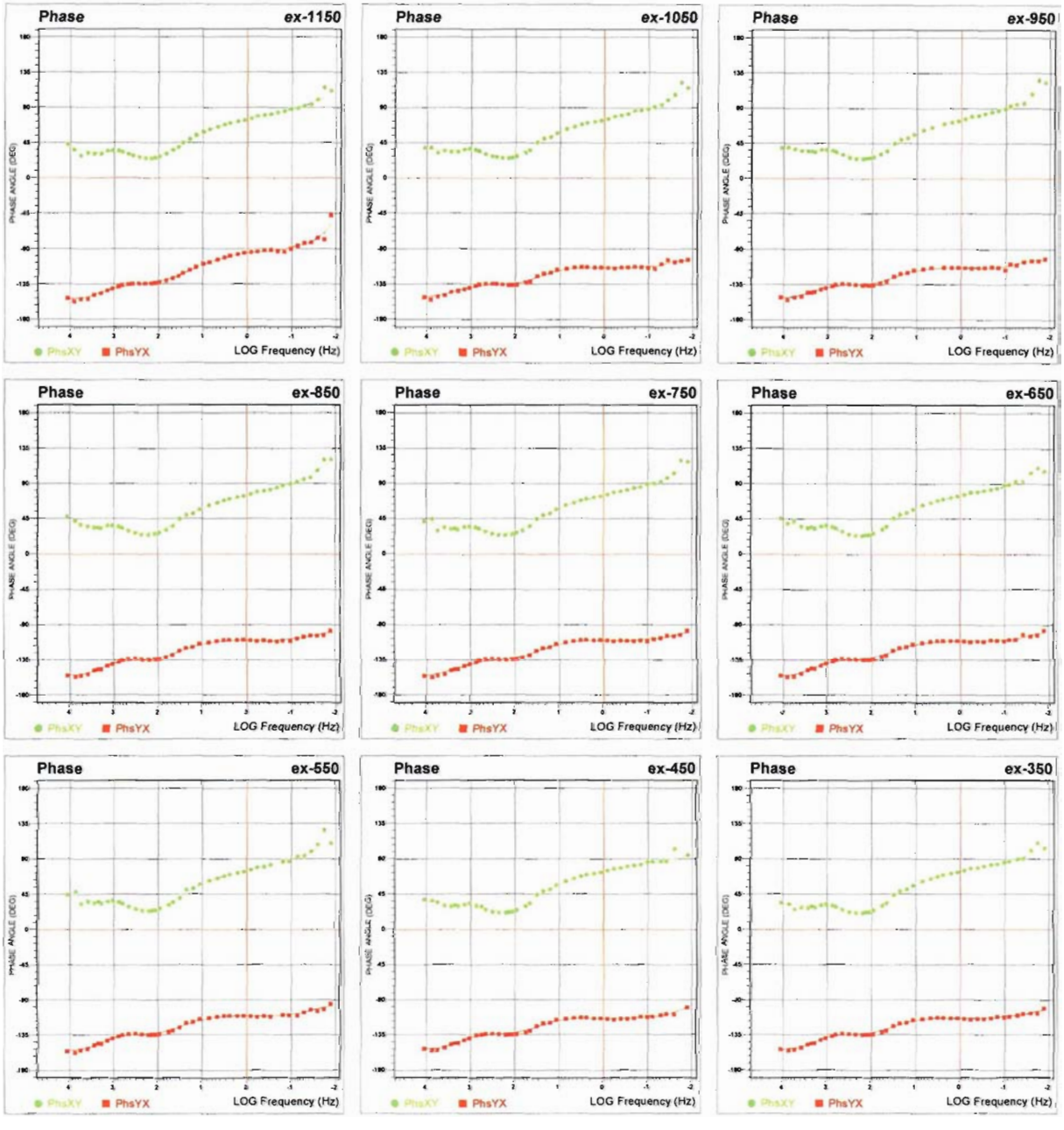
Rho xy ------ green
Rho yx ------ orange

LINE 4E: APPARENT RESISTIVITY VS. FREQUENCY



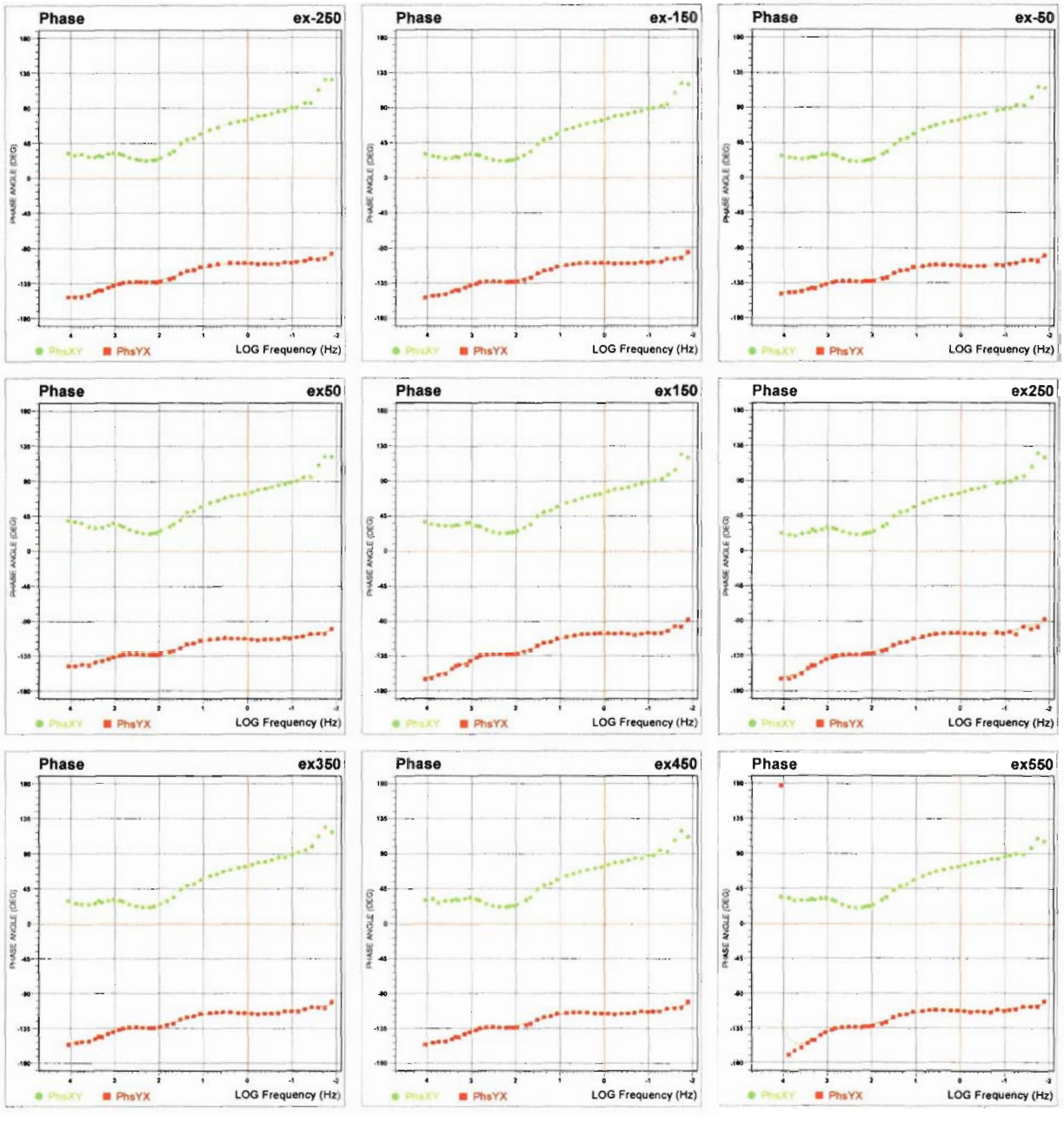
Rho xy ------ green
Rho yx ------ orange

LINE 4E: PHASE



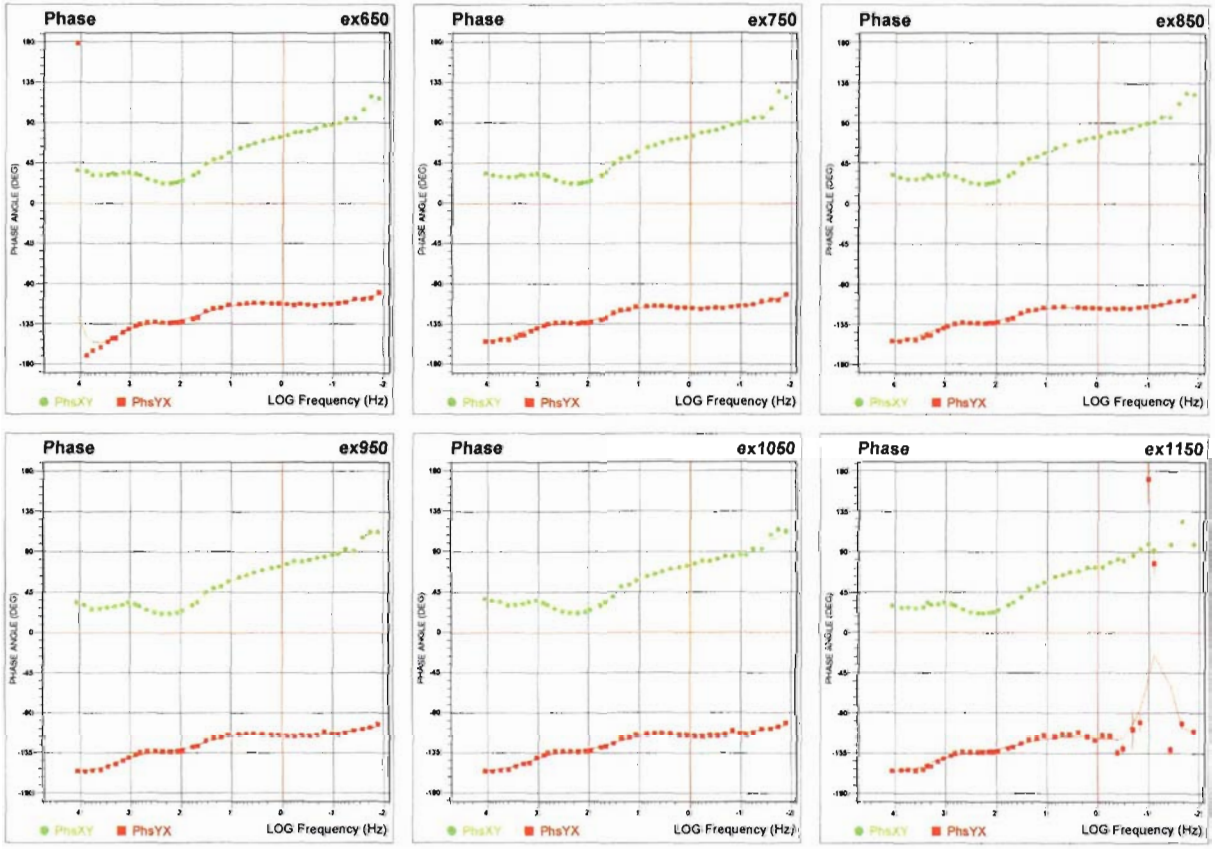
Phs xy ------ green
Phs yx ------ orange

LINE 4E: PHASE



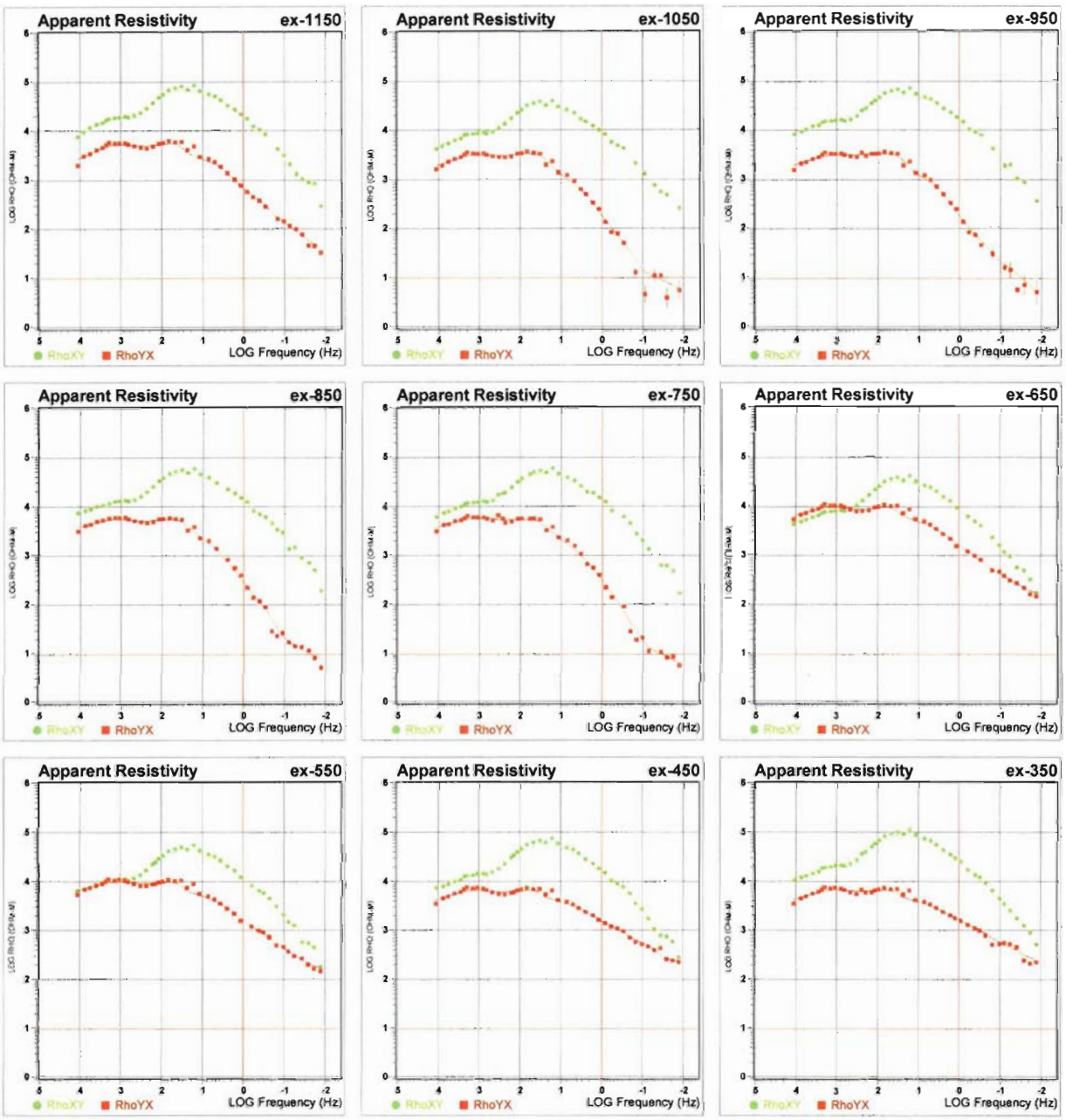
Phs xy ------ green
Phs yx ------ orange

LINE 4E: PHASE



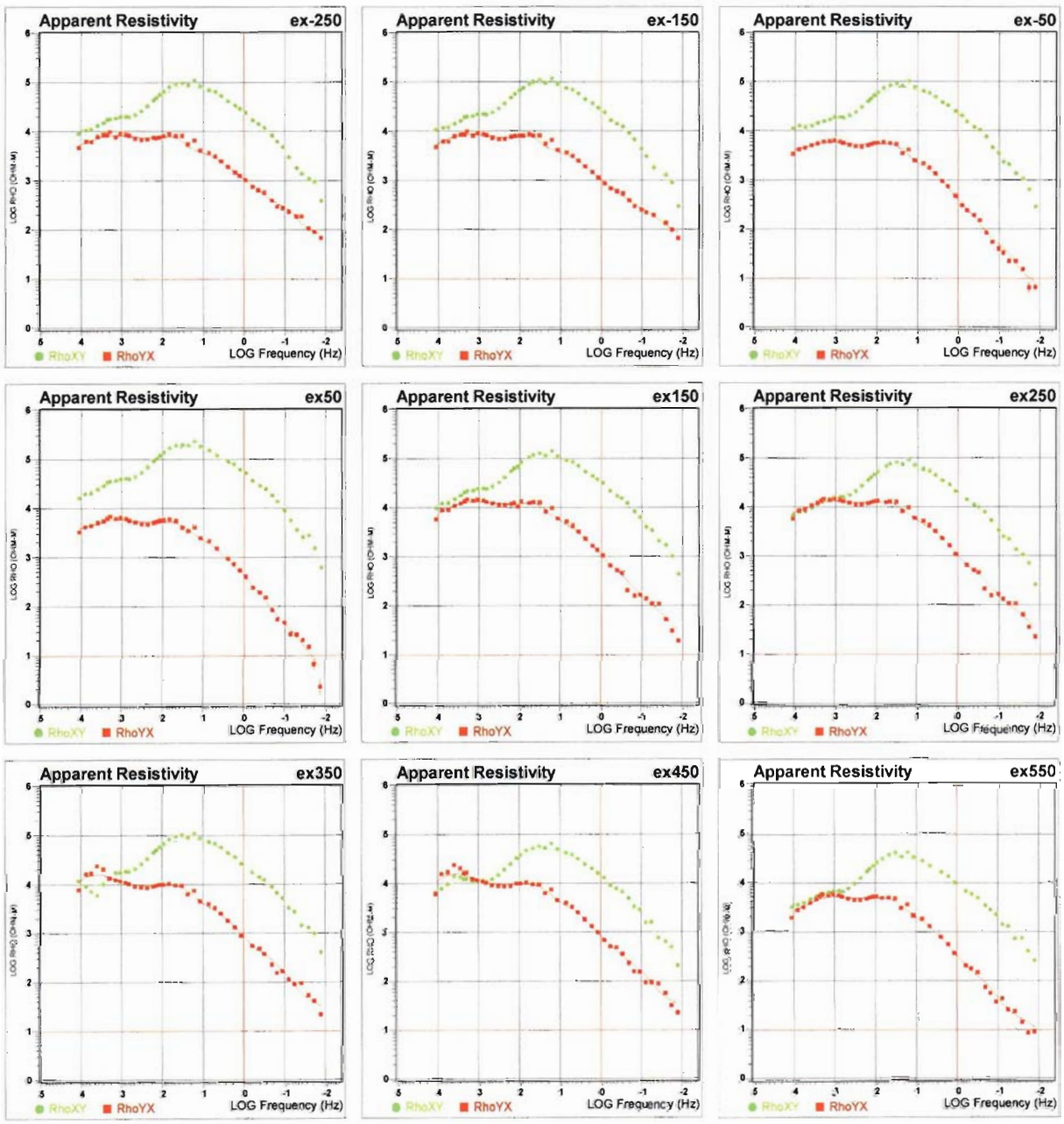
Phs xy ------ green
Phs yx ------ orange

LINE 8E DUCK GRID: APPARENT RESISTIVITY VS. FREQUENCY



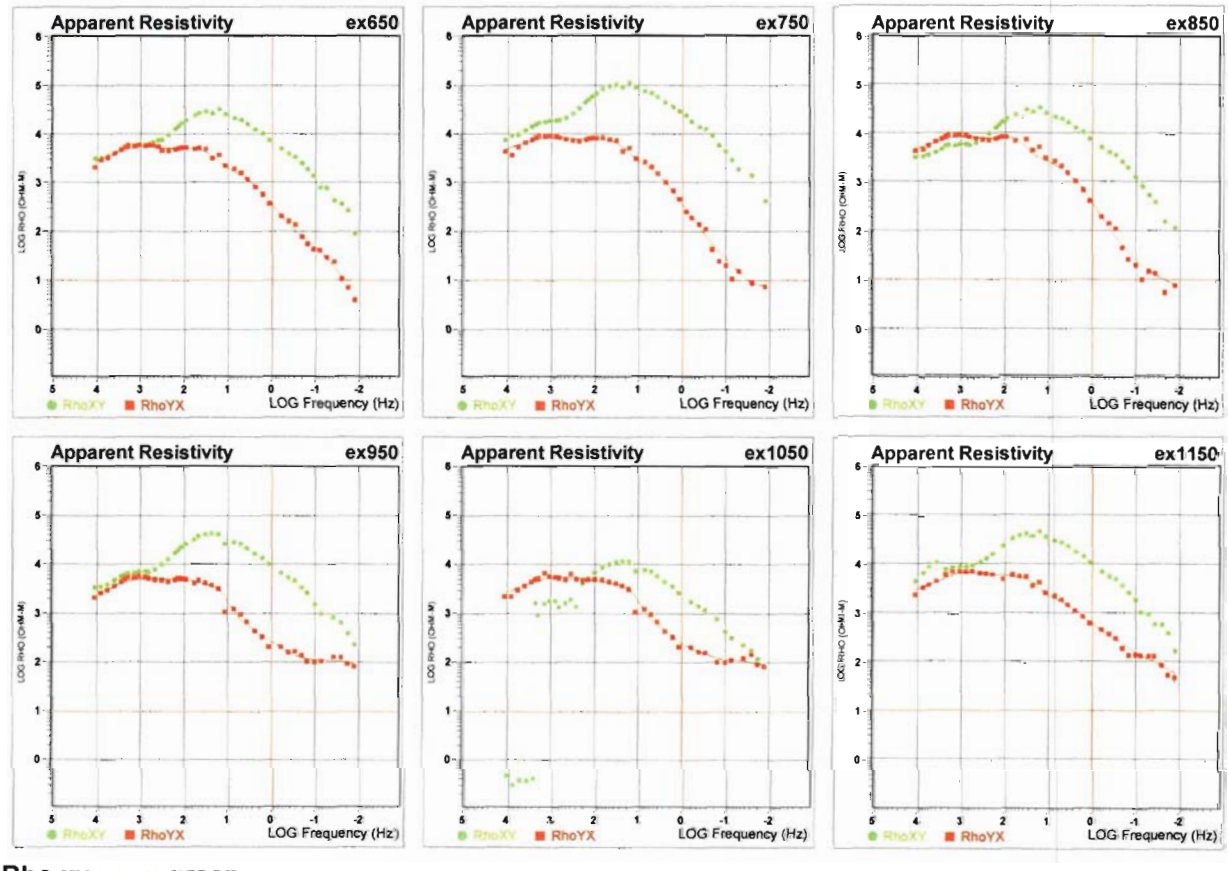
Rho xy ------ green
Rho yx ------ orange

LINE 8E: APPARENT RESISTIVITY VS. FREQUENCY



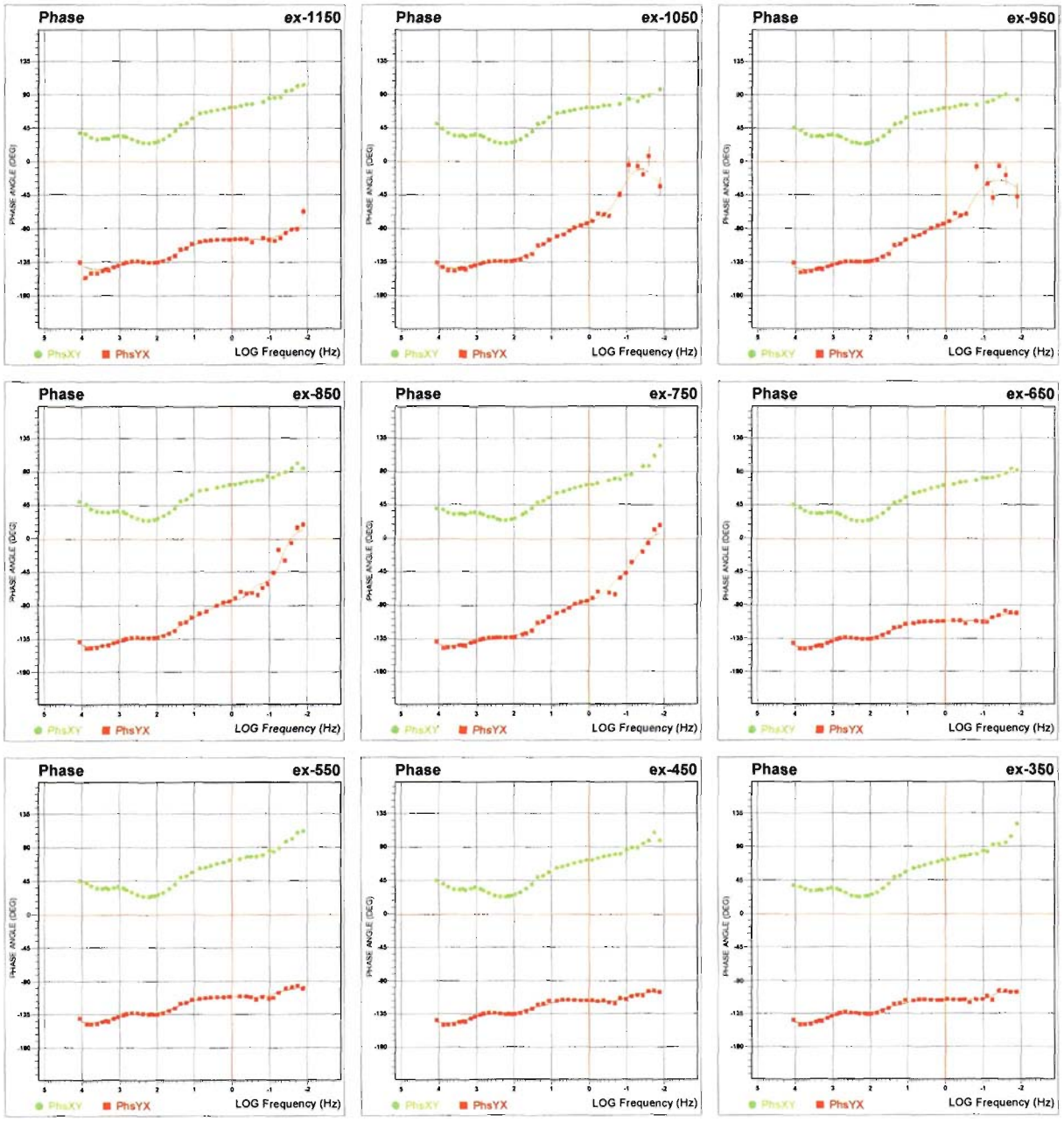
Rho xy ------ green
Rho yx ------ orange

LINE 8E: APPARENT RESISTIVITY VS. FREQUENCY



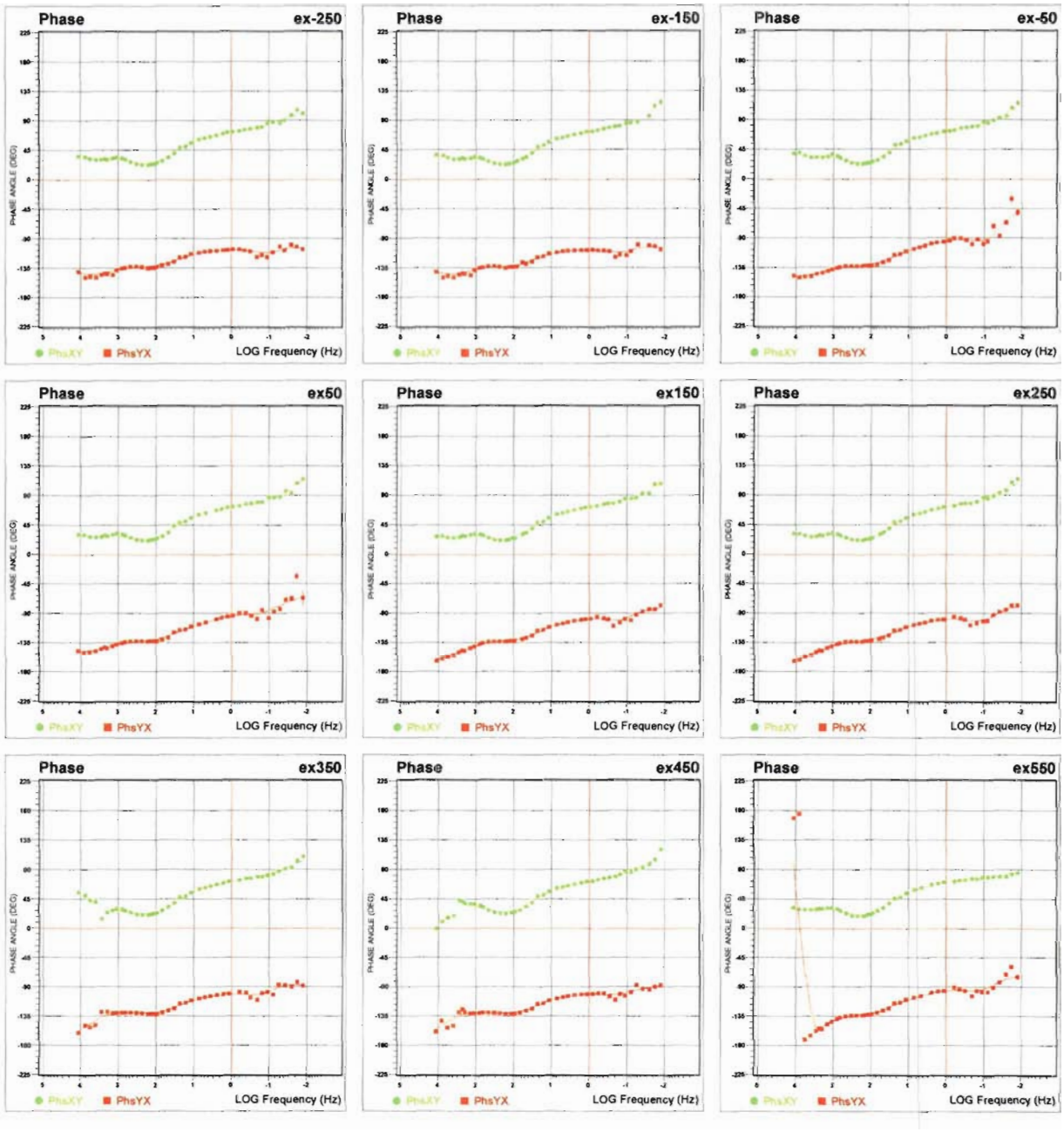
Rho xy ------ green
Rho yx ------ orange

LINE 8E: PHASE



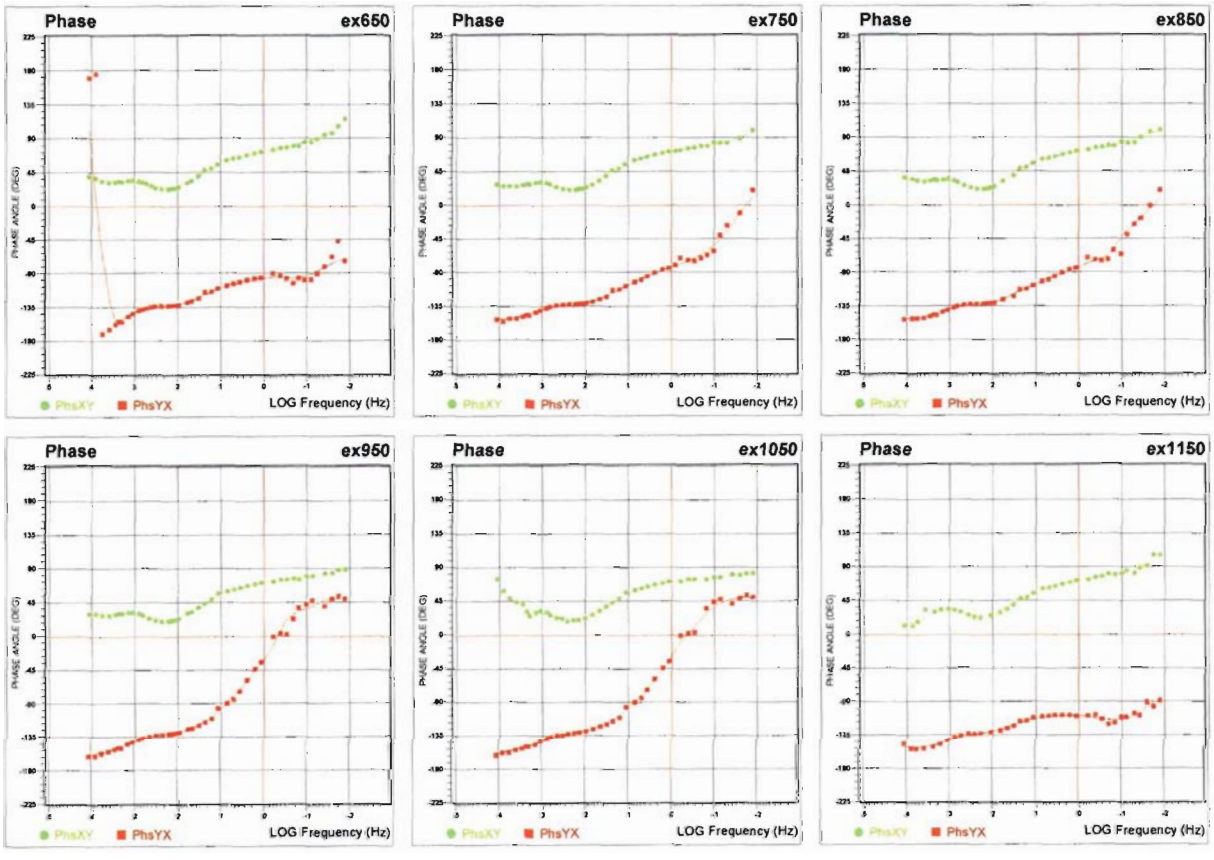
Phs xy ------ green
Phs yx ------ orange

LINE 8E: PHASE



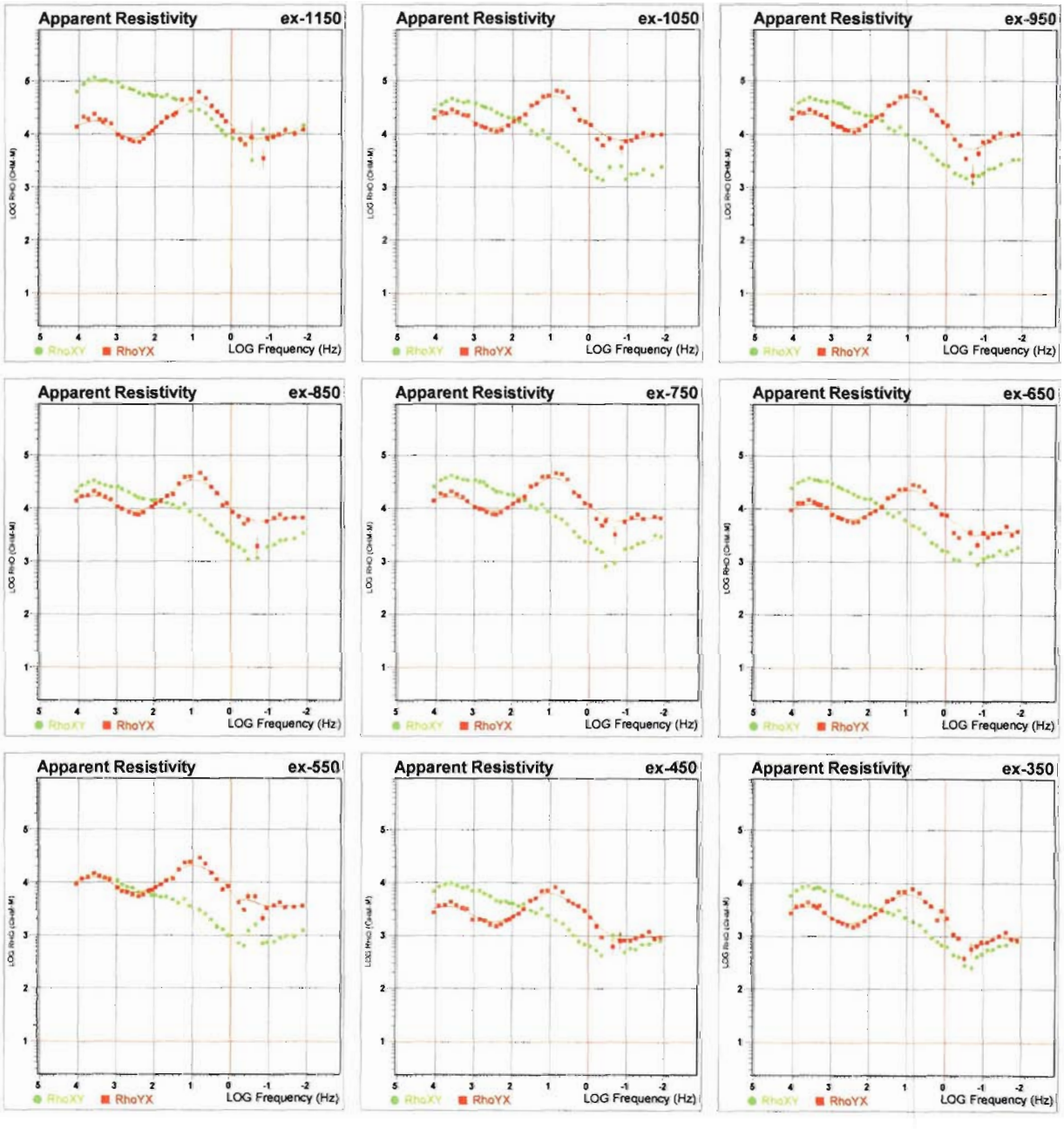
Phs xy ------ green
Phs yx ------ orange

LINE 8E: PHASE



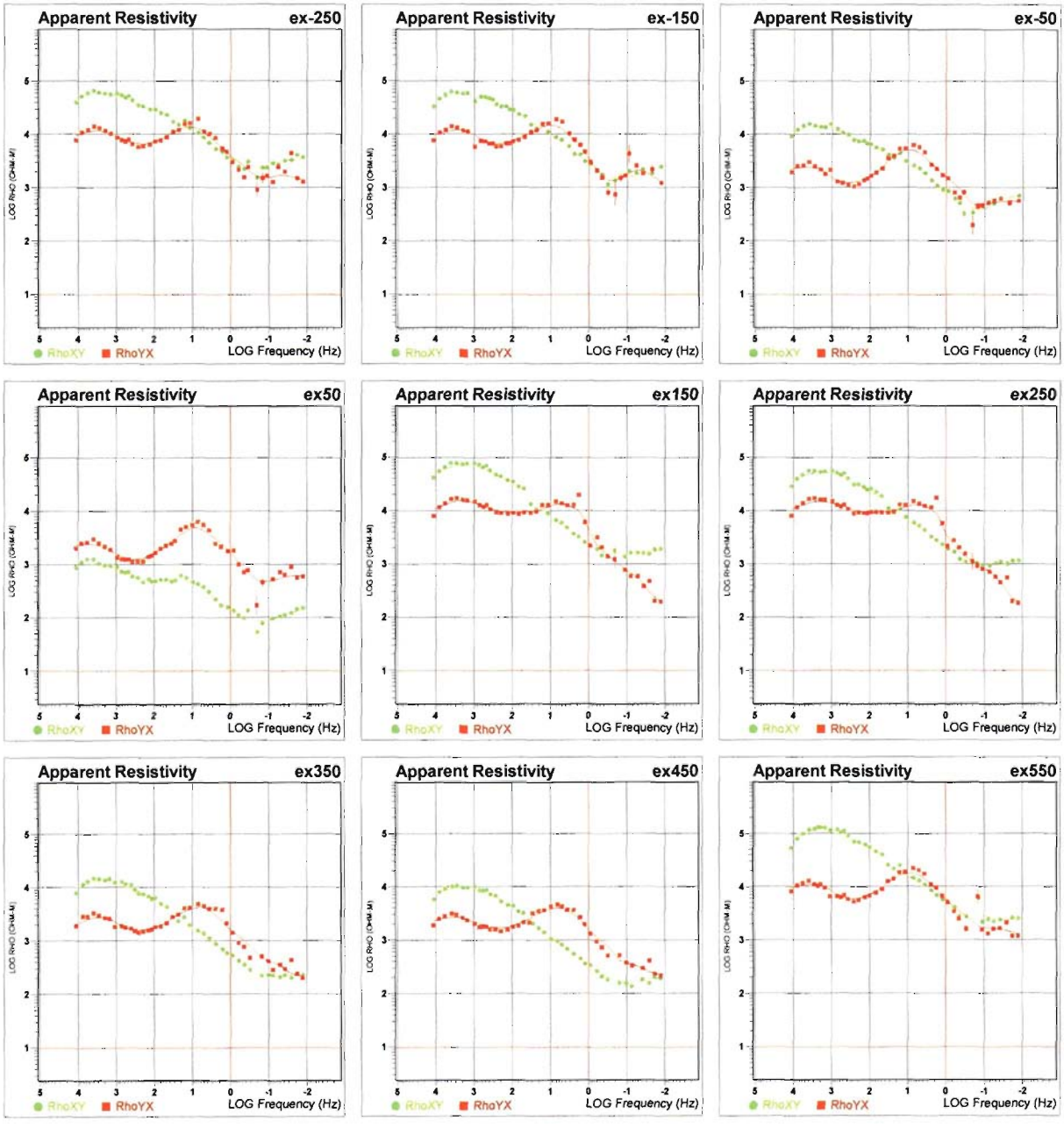
Phs xy ------ green
Phs yx ------ orange

LINE 0N FISHHOOK GRID: APPARENT RESISTIVITY VS. FREQUENCY



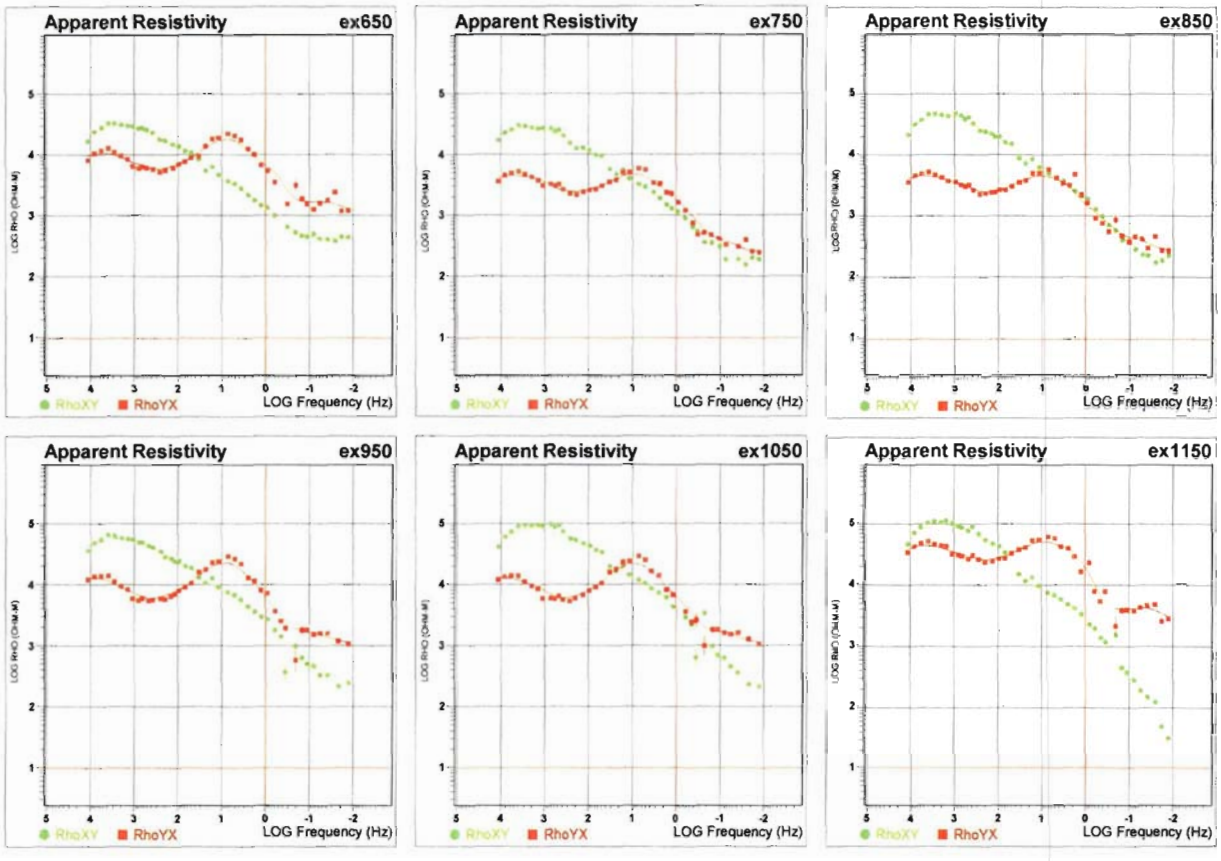
Rho xy ------ green
Rho yx ------ orange

LINE 0N: APPARENT RESISTIVITY VS. FREQUENCY



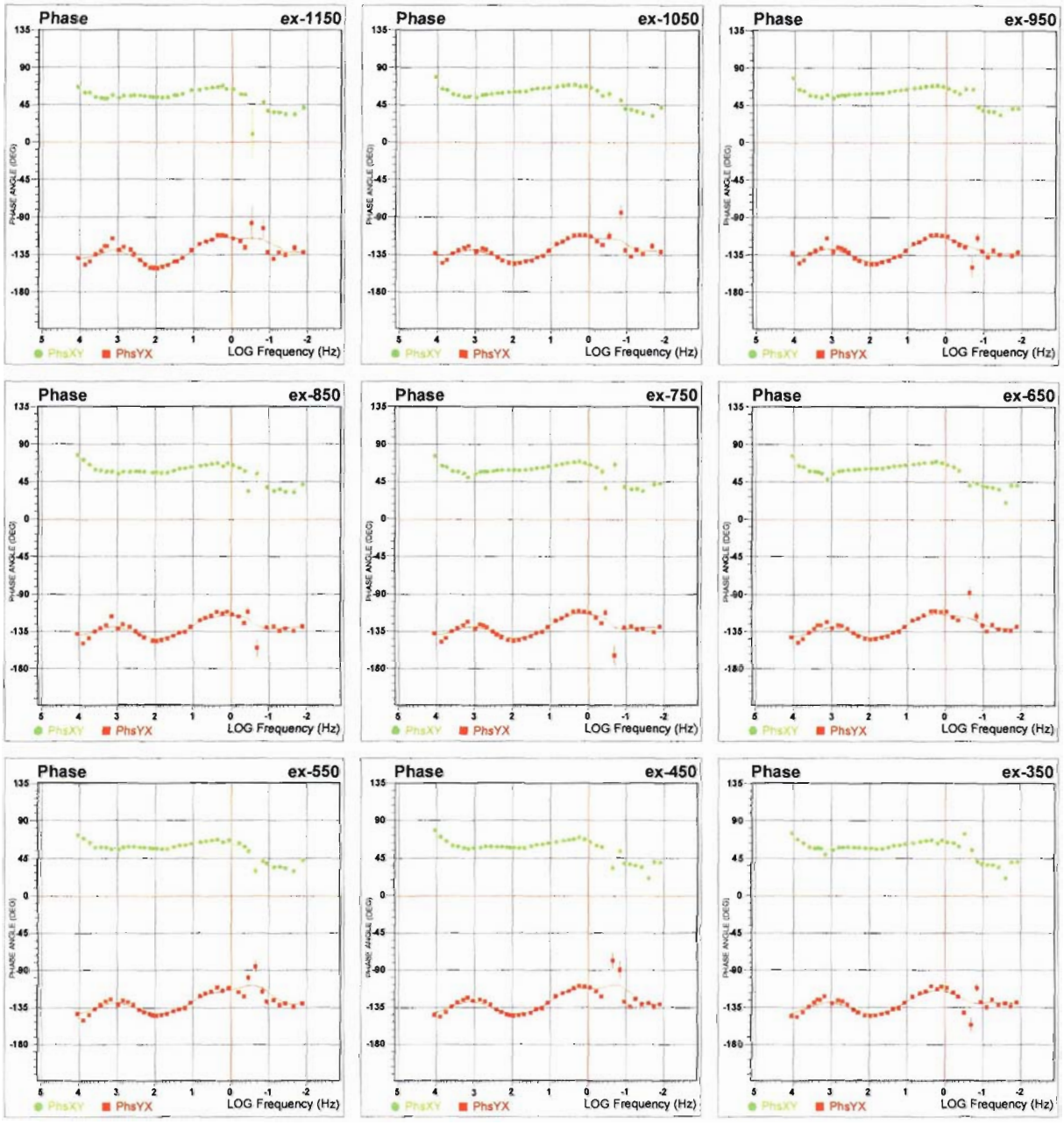
Rho xy ------ green
Rho yx ------ orange

LINE 0N: APPARENT RESISTIVITY VS. FREQUENCY



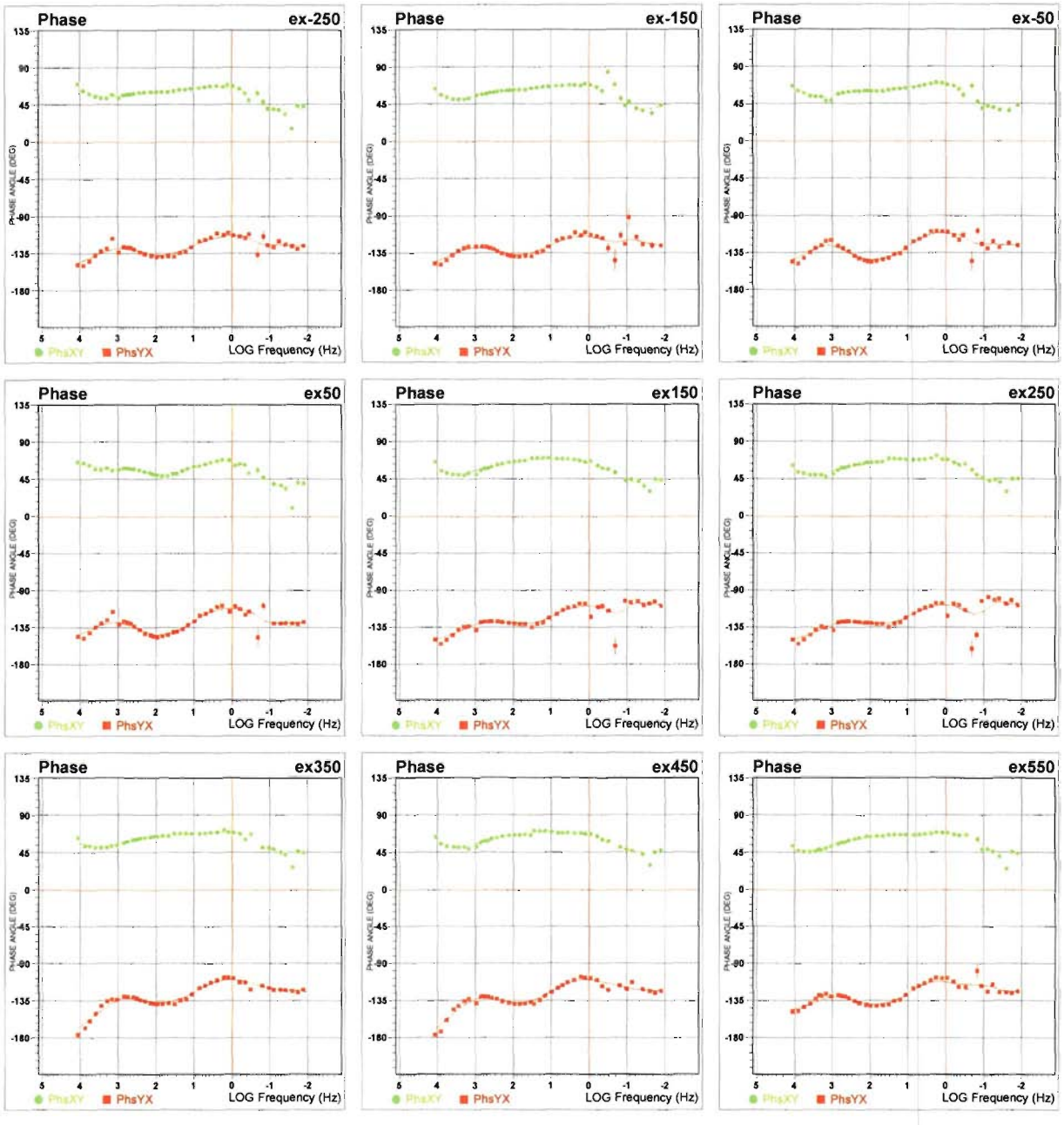
Rho xy ------ green
Rho yx ------ orange

LINE 0N: PHASE



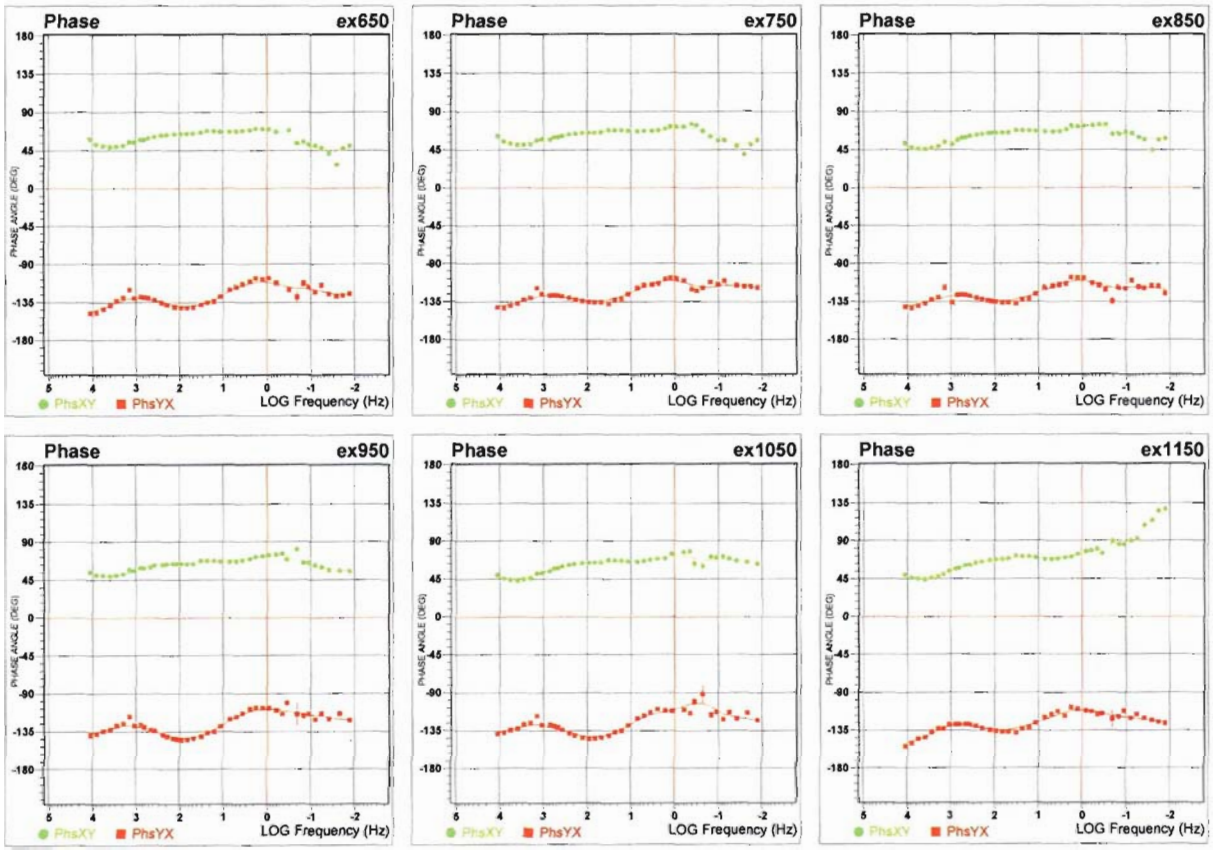
Phs xy ------ green
Phs yx ------ orange

LINE 0N: PHASE



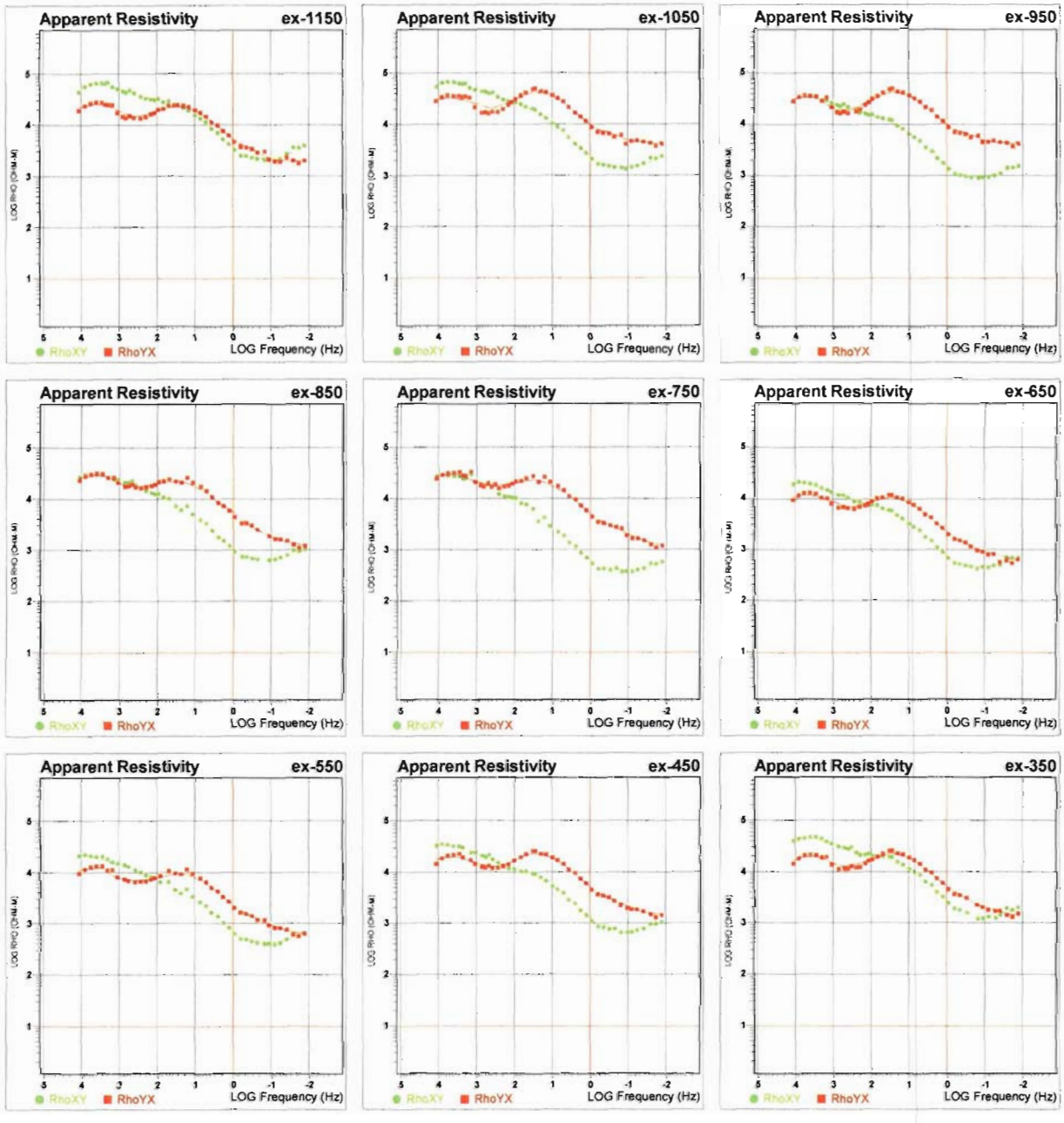
Phs xy ------ green
Phs yx ------ orange

LINE 0N: PHASE



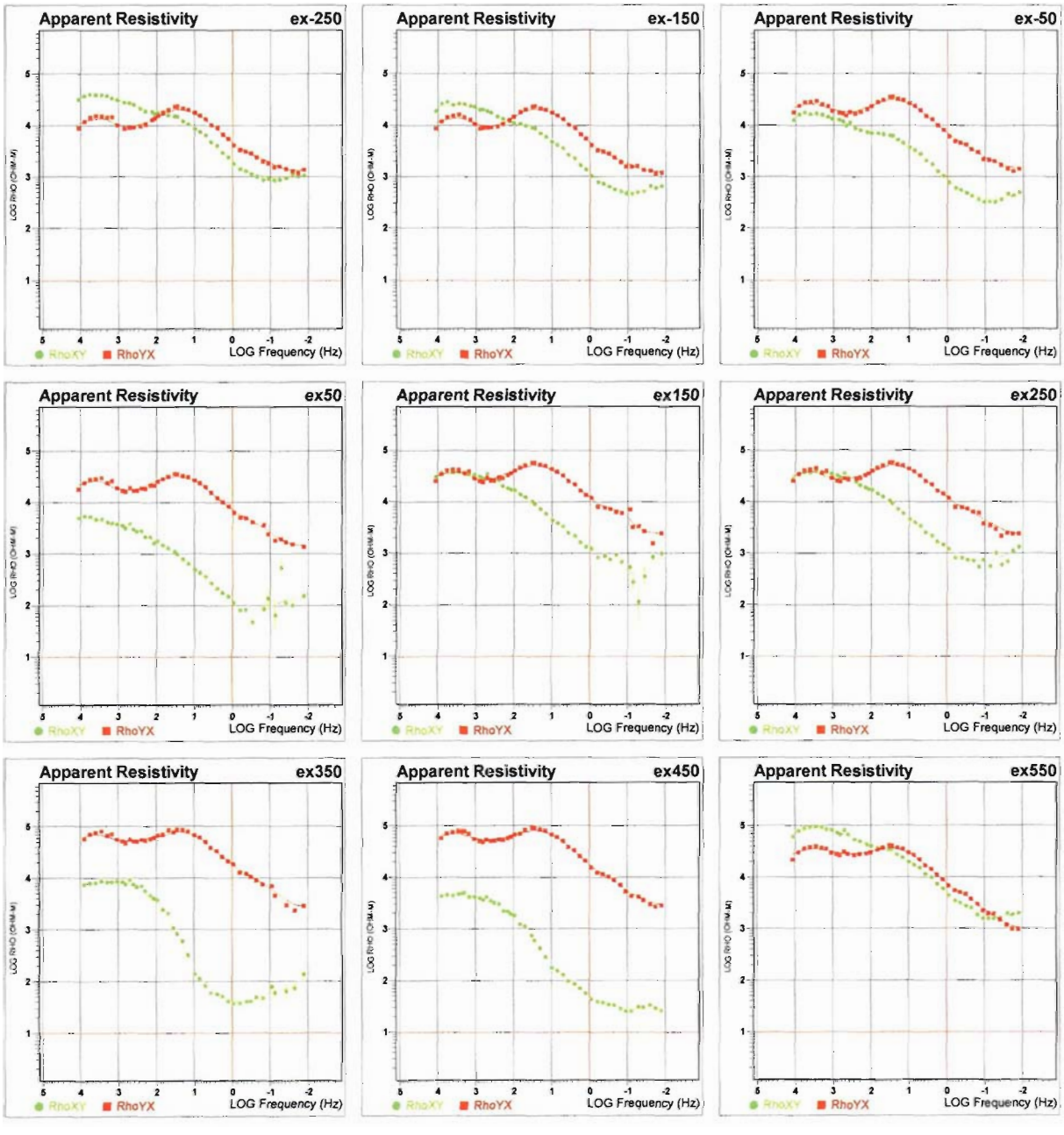
Phs xy ------ green
Phs yx ------ orange

LINE 4N FISHHOOK GRID: APPARENT RESISTIVITY VS. FREQUENCY



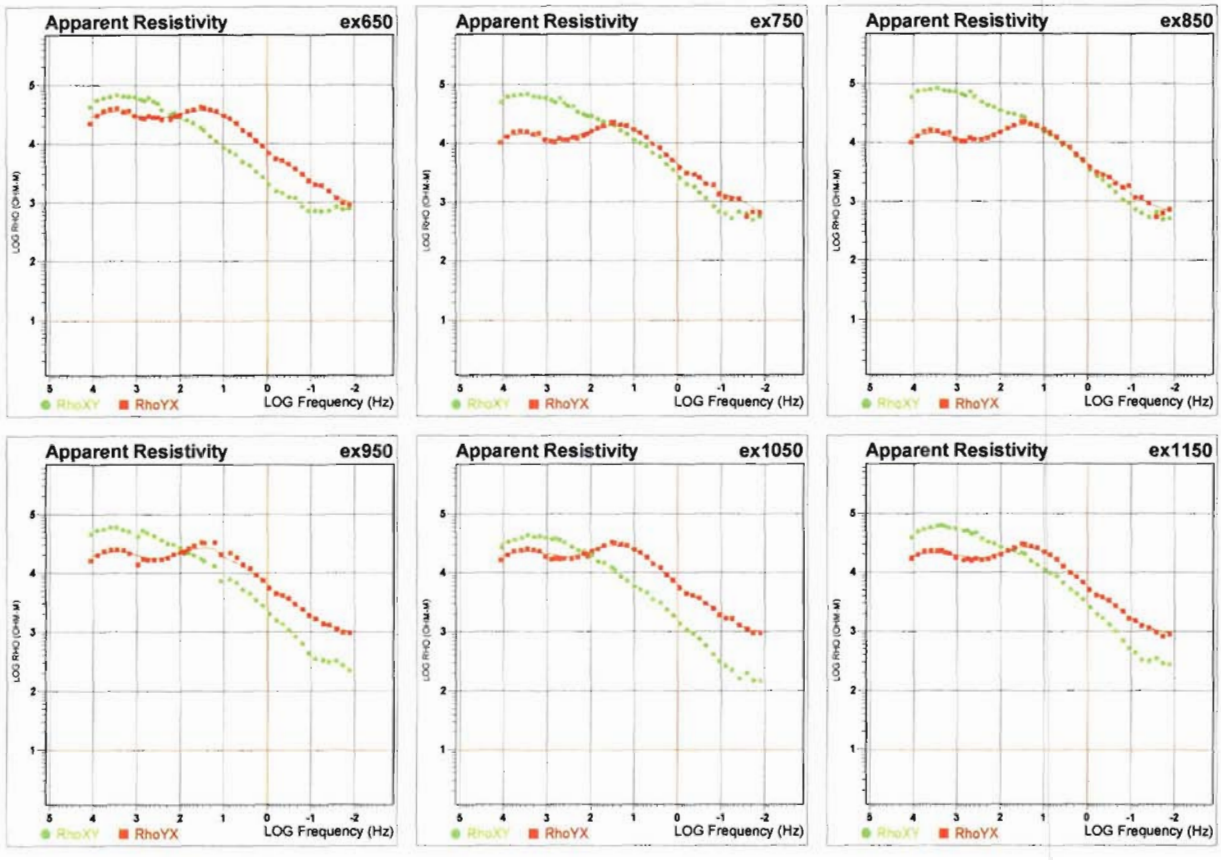
Rho xy ------ green
Rho yx ------ orange

LINE 4N: APPARENT RESISTIVITY VS. FREQUENCY



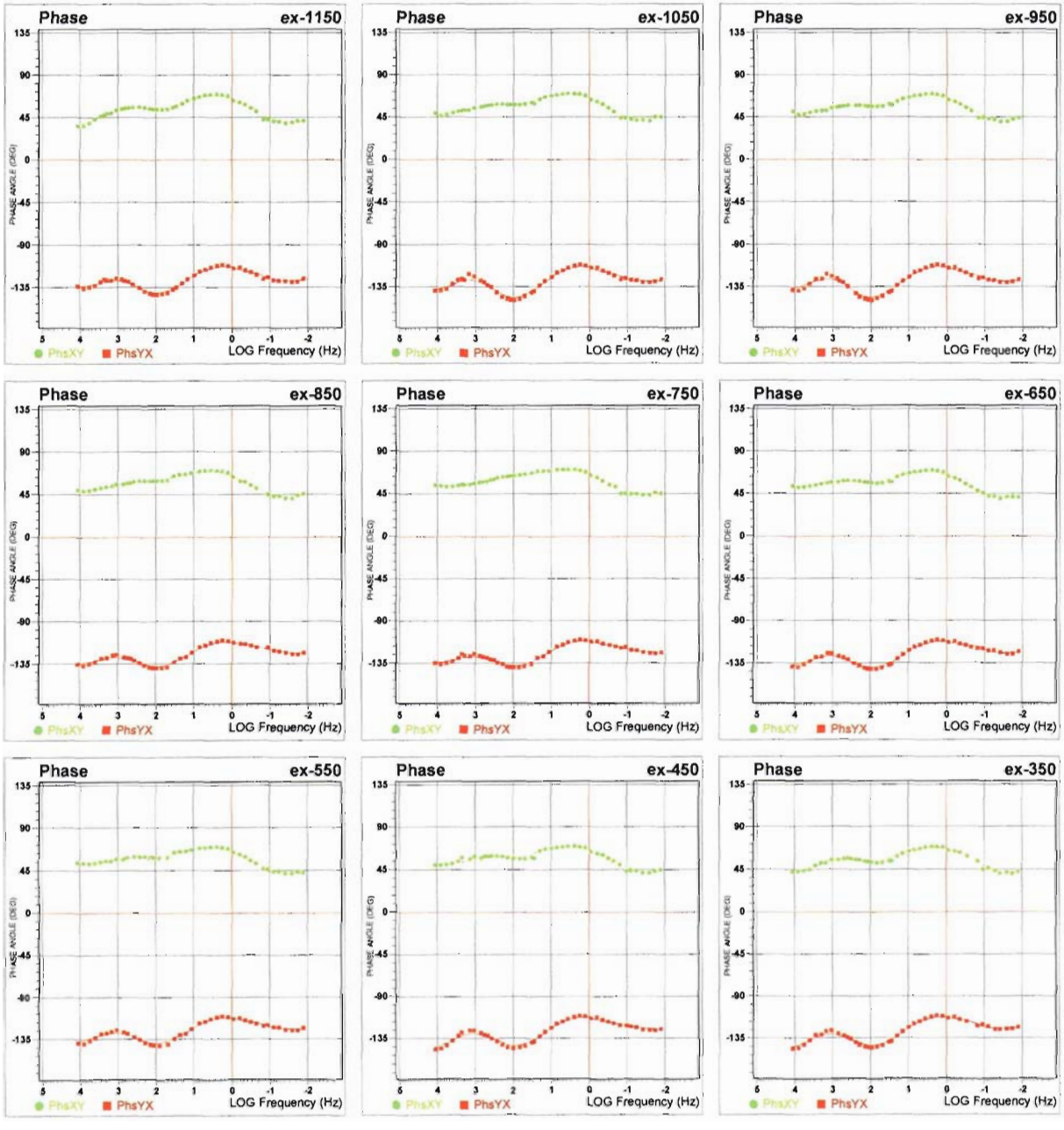
Rho xy ------ green
Rho yx ------ orange

LINE 4N: APPARENT RESISTIVITY VS. FREQUENCY



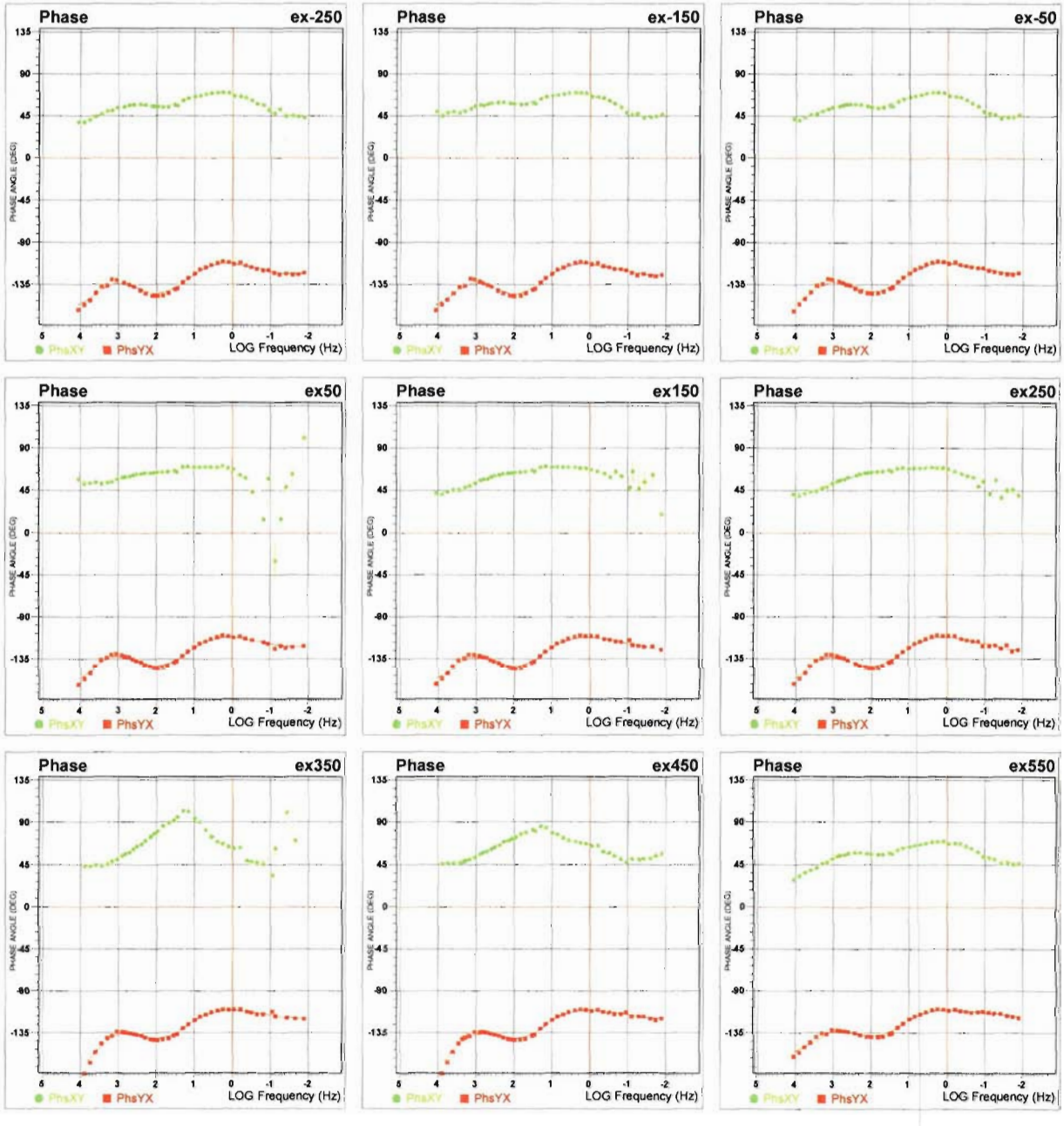
Rho xy ------ green
Rho yx ------ orange

LINE 4N: PHASE



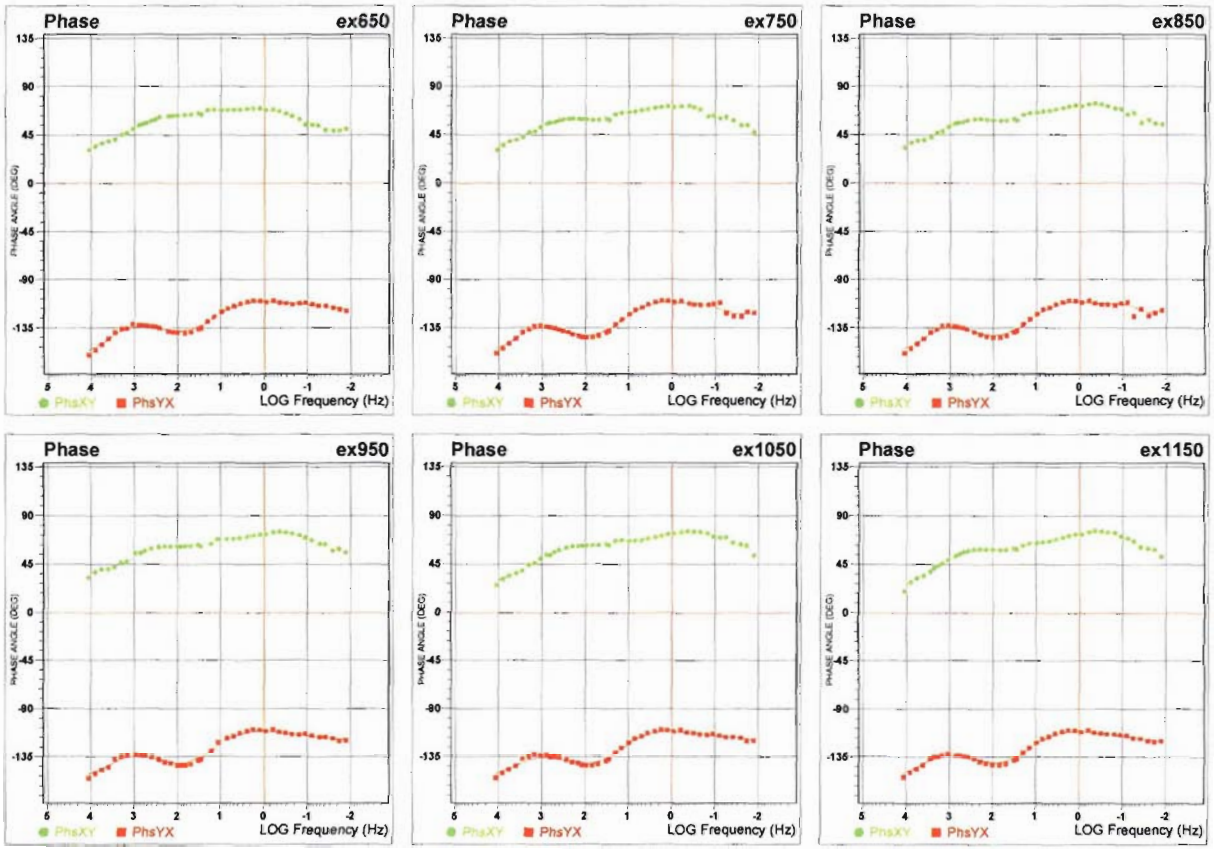
Phs xy ------ green
Phs yx ------ orange

LINE 4N: PHASE



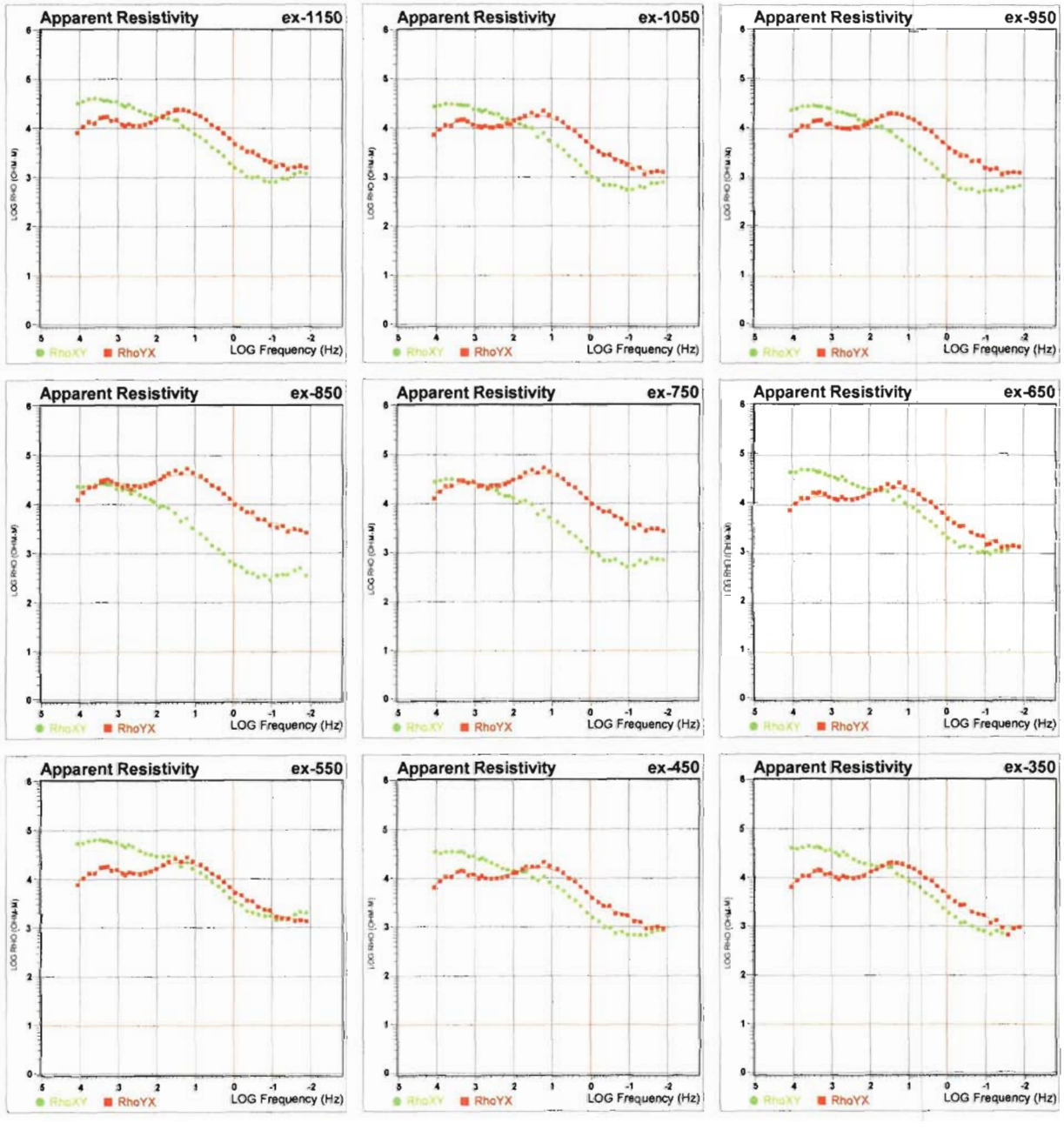
Phs xy ------ green
Phs yx ------ orange

LINE 4N: PHASE



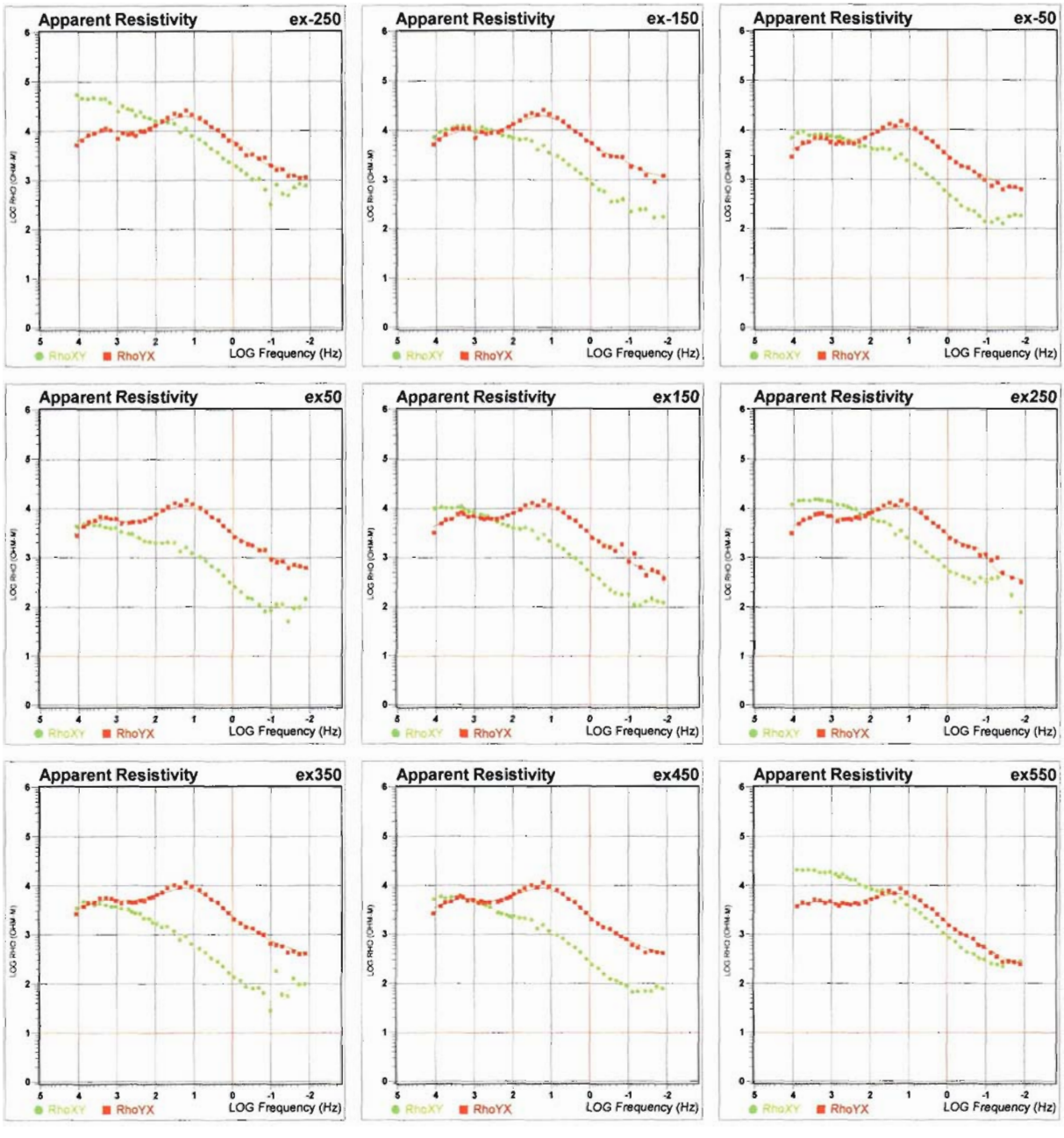
Phs xy ------ green
Phs yx ------- orange

LINE 8N FISHHOOK GRID: APPARENT RESISTIVITY VS. FREQUENCY



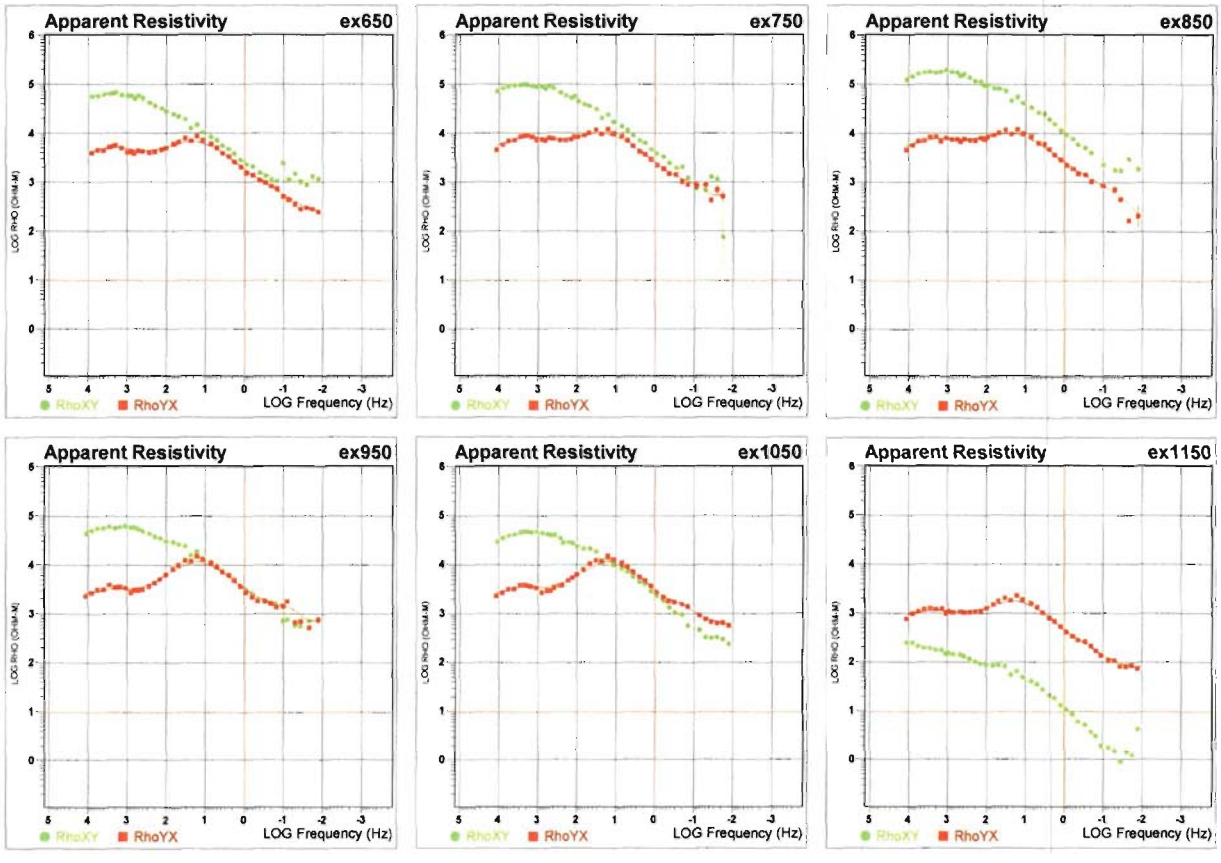
Rho xy ------ green
Rho yx ------ orange

LINE 8N: APPARENT RESISTIVITY VS. FREQUENCY



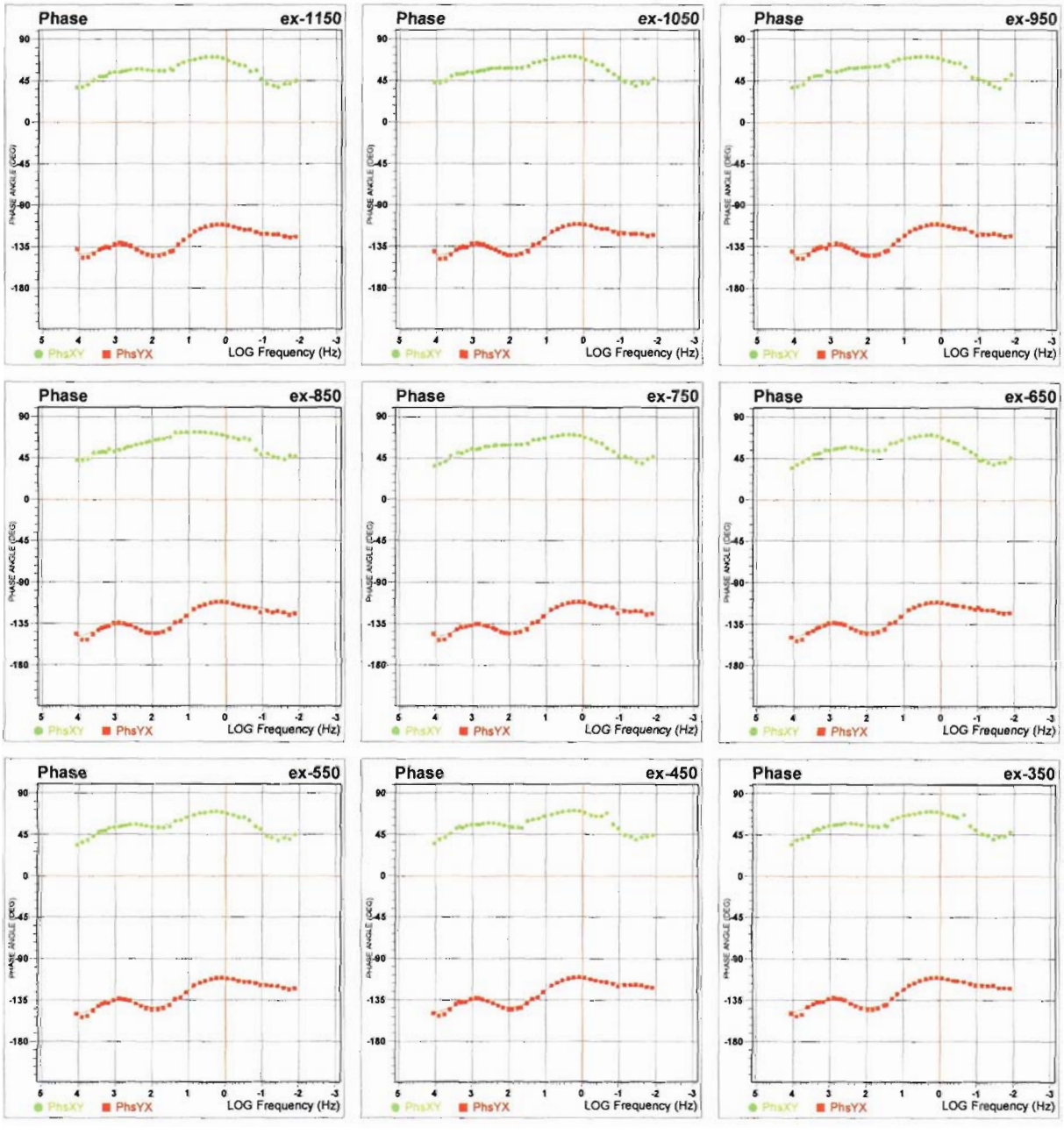
Rho xy ------ green
Rho yx ------ orange

LINE 8N: APPARENT RESISTIVITY VS. FREQUENCY



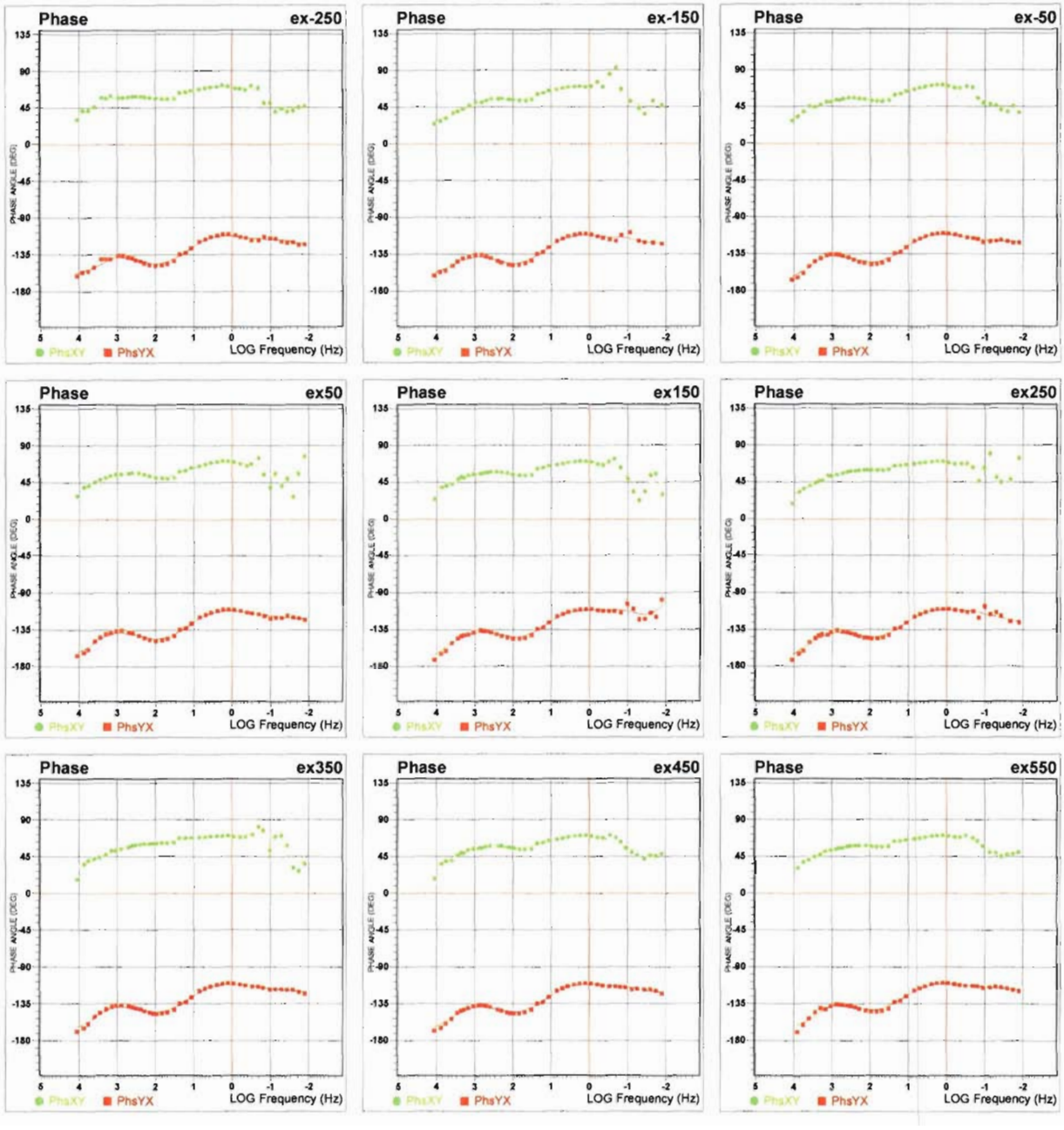
Rho xy ------ green
Rho yx ------ orange

LINE 8N: PHASE



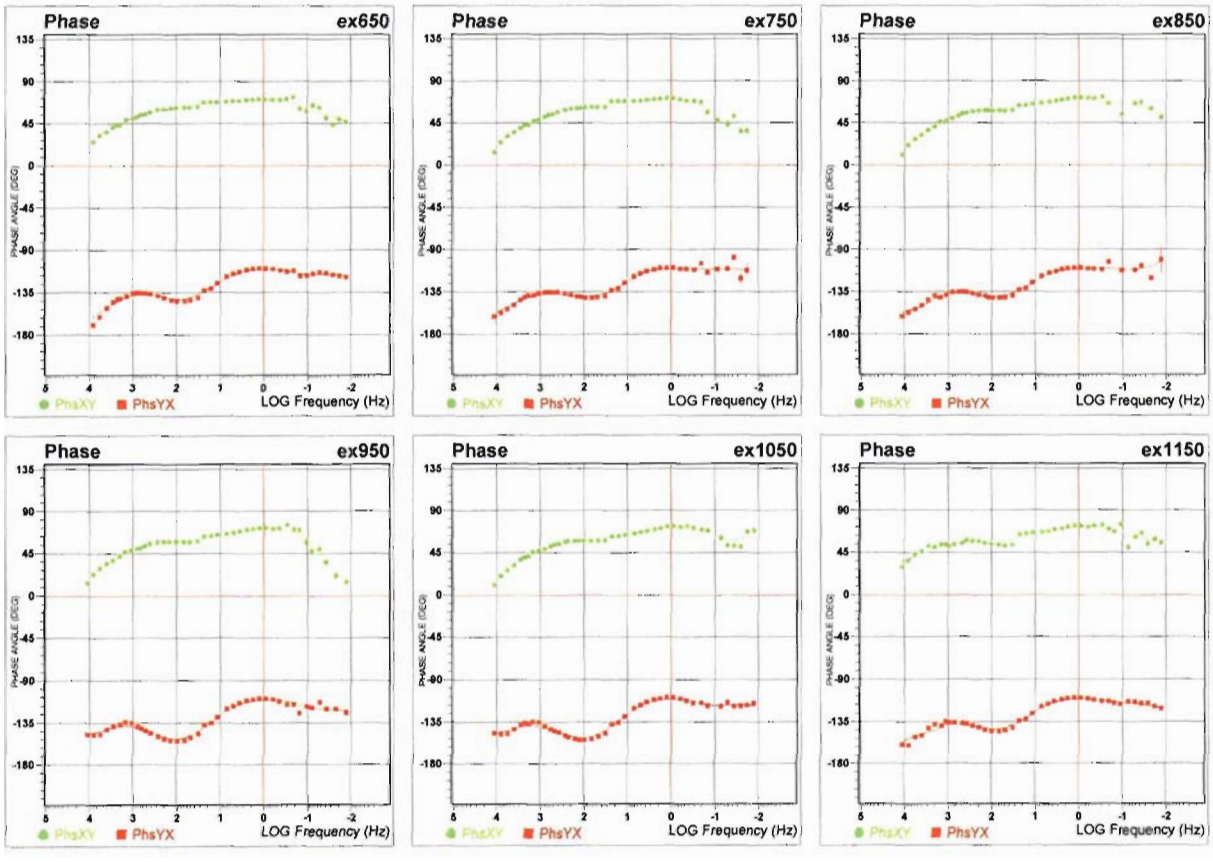
Phs xy ------ green
Phs yx ------ orange

LINE 8N: PHASE



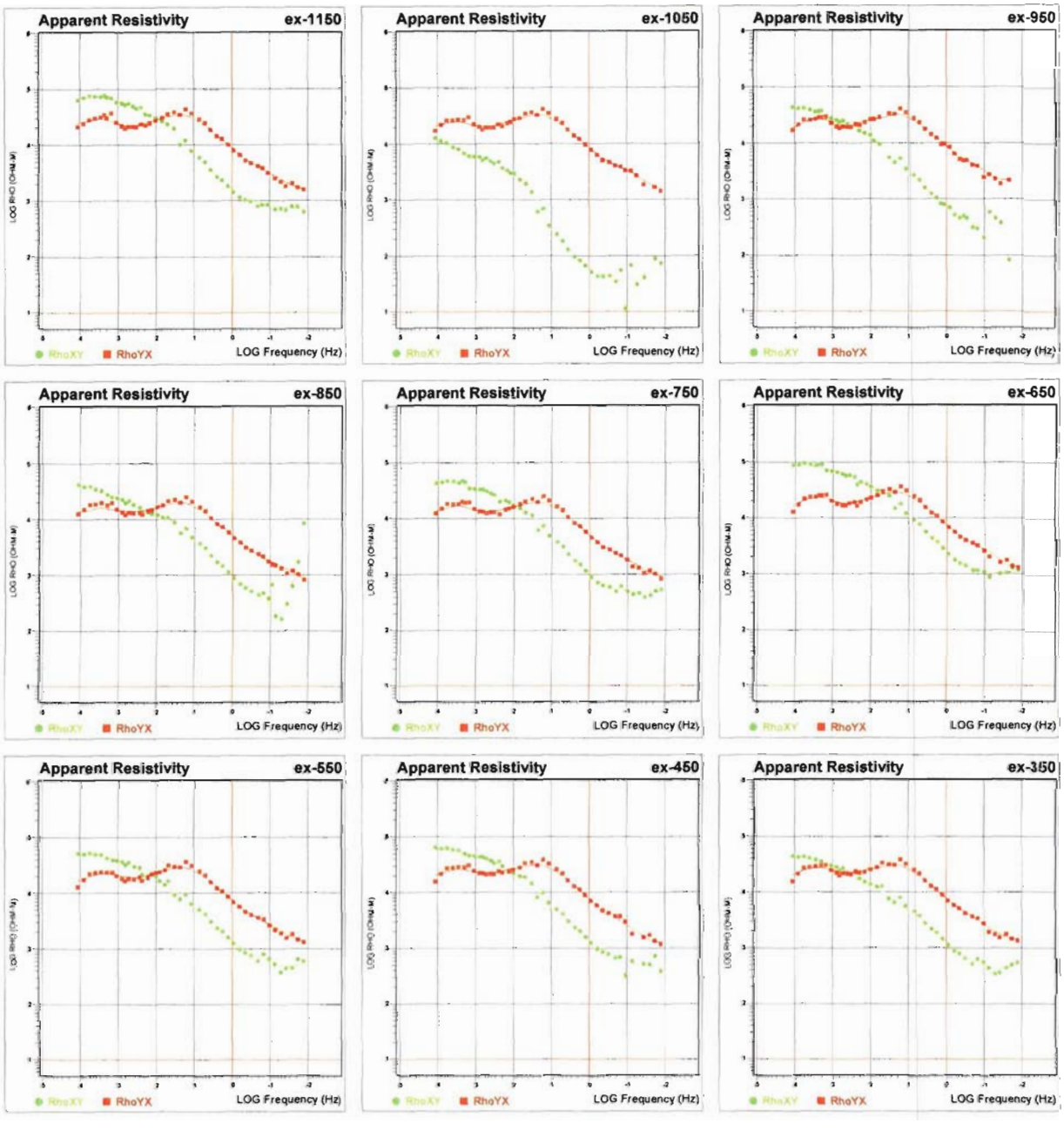
Phs xy ------ green
Phs yx ------ orange

LINE 8N: PHASE



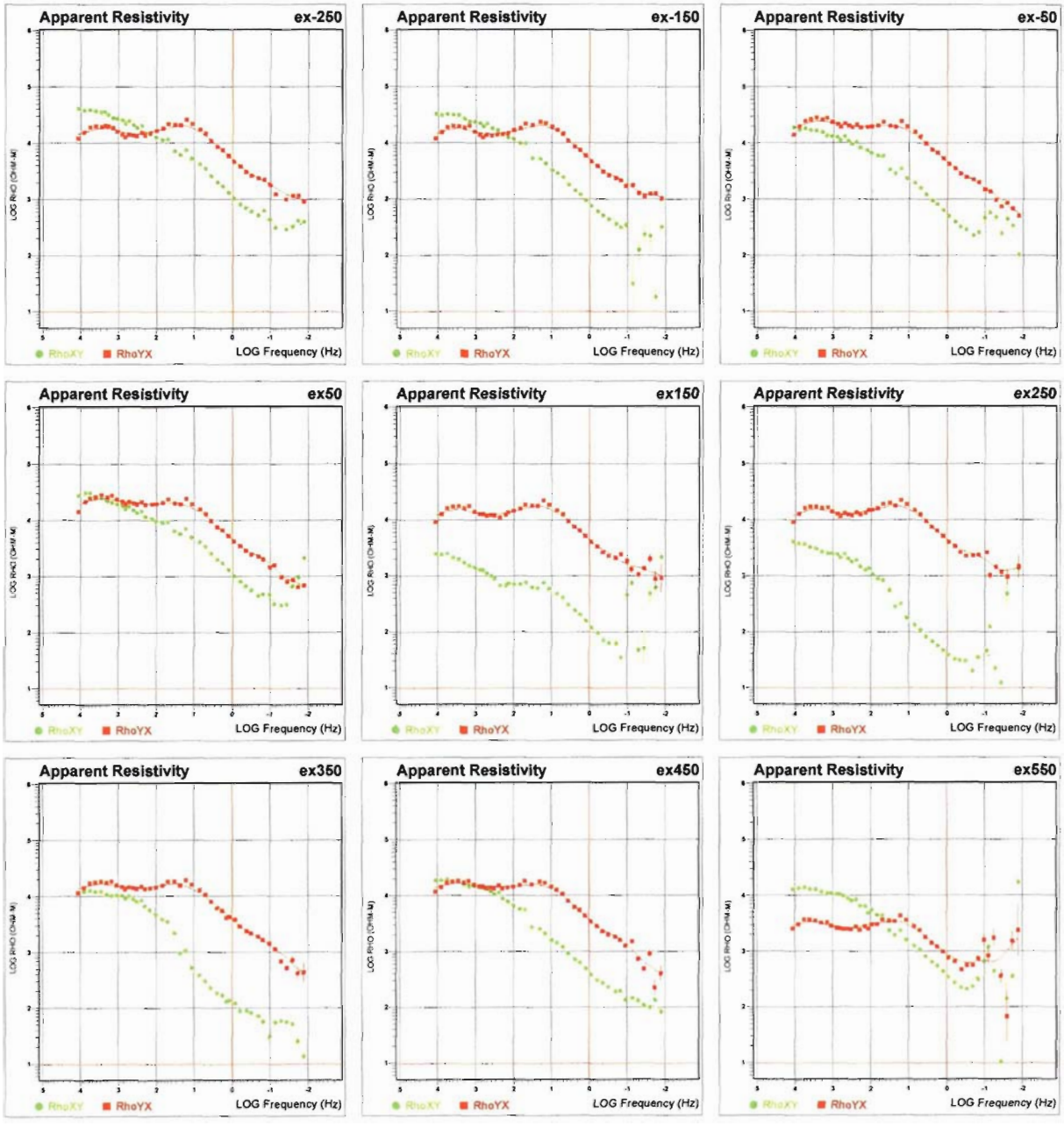
Phs xy ------ green
Phs yx ------ orange

LINE 12N FISHHOOK GRID: APPARENT RESISTIVITY VS. FREQUENCY



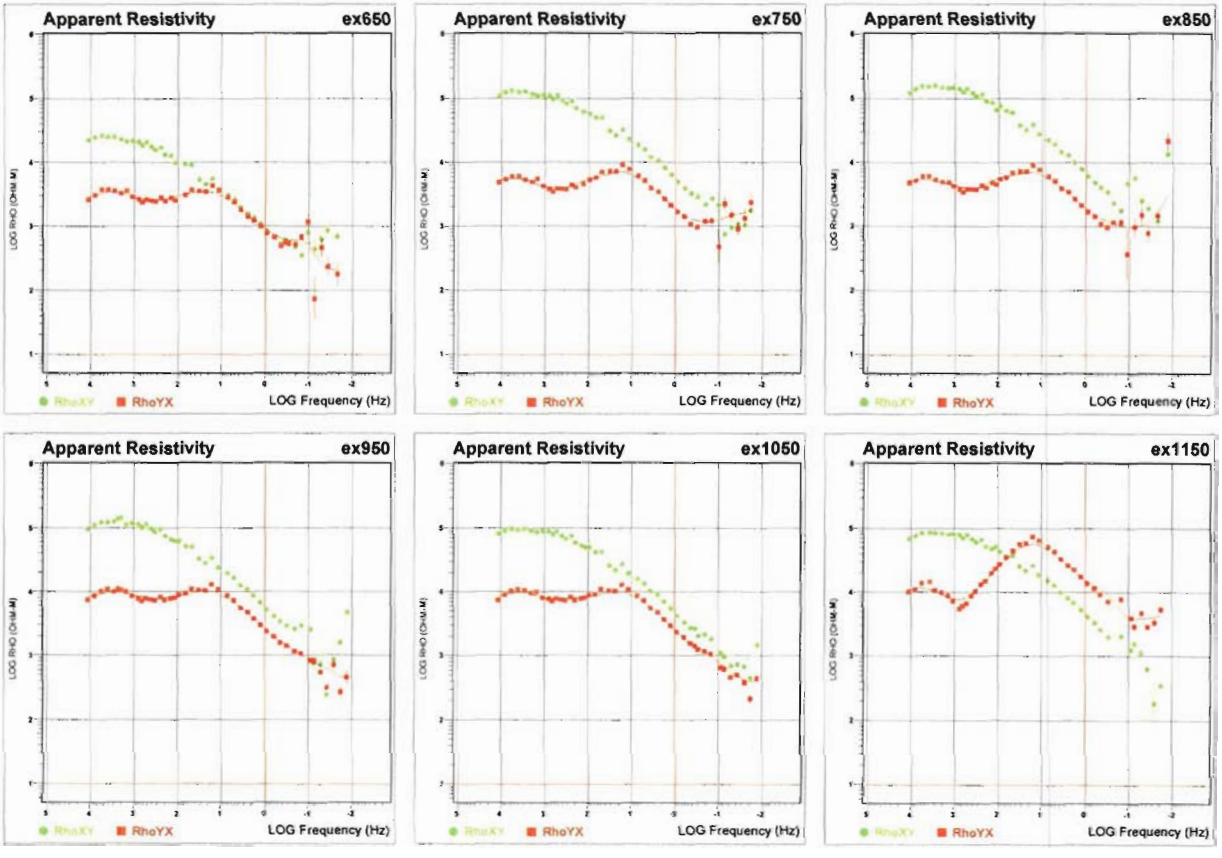
Rho xy ------ green
Rho yx ------ orange

LINE 12N: APPARENT RESISTIVITY VS. FREQUENCY



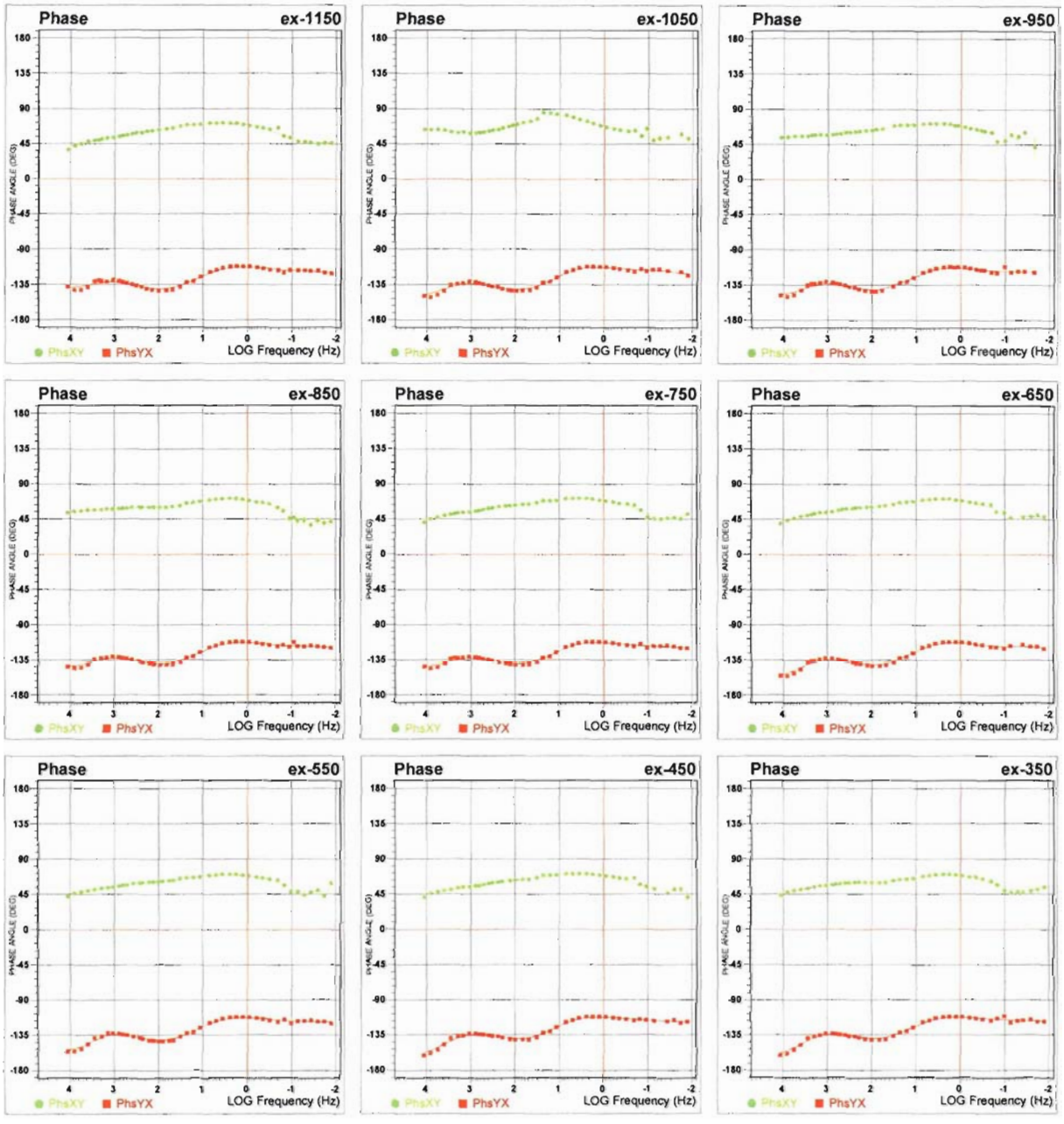
Rho xy ------ **green**
Rho yx ------- **orange**

LINE 12N: APPARENT RESISTIVITY VS. FREQUENCY



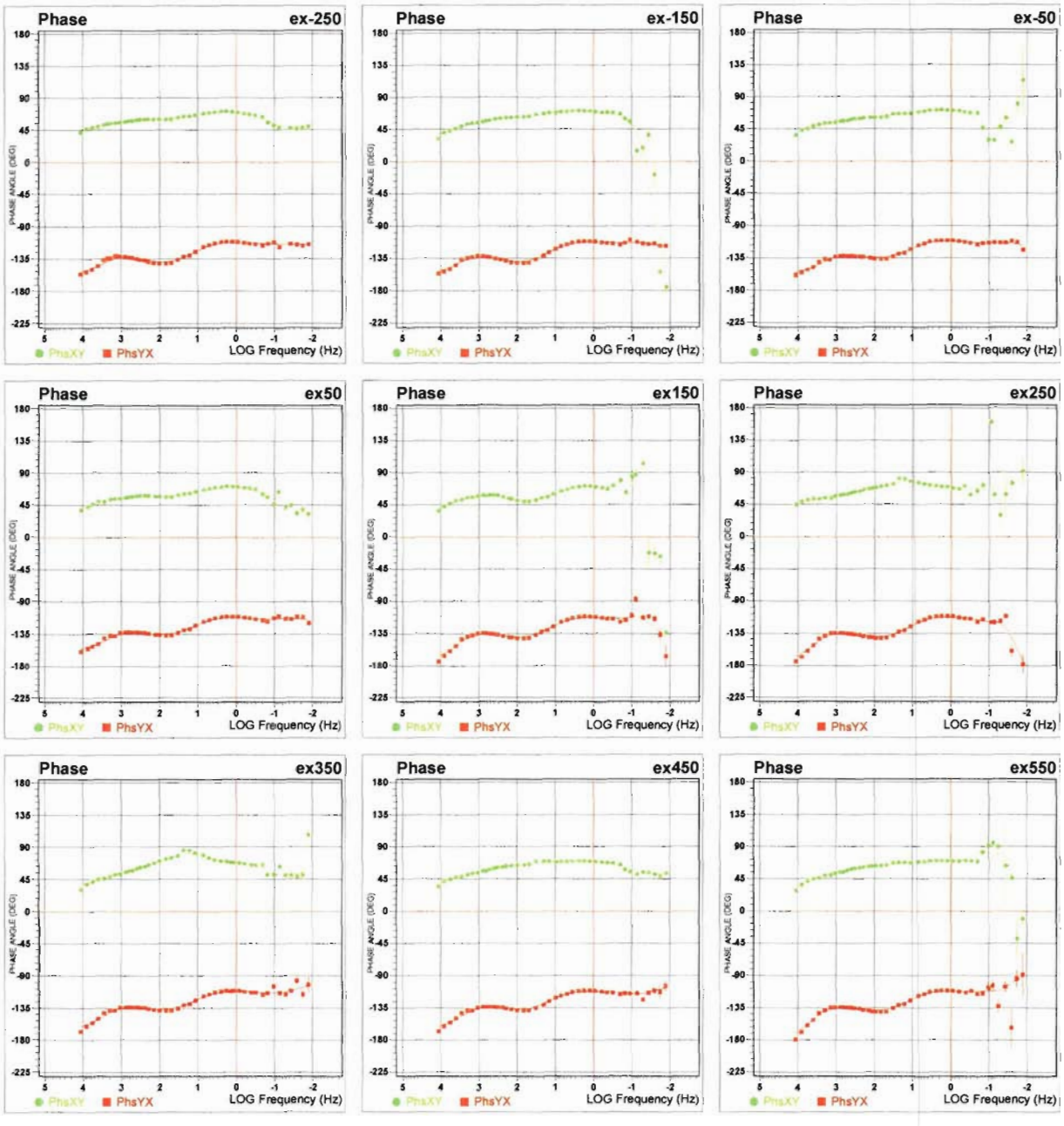
Rho xy ------ green
Rho yx ------ orange

LINE 12N: PHASE



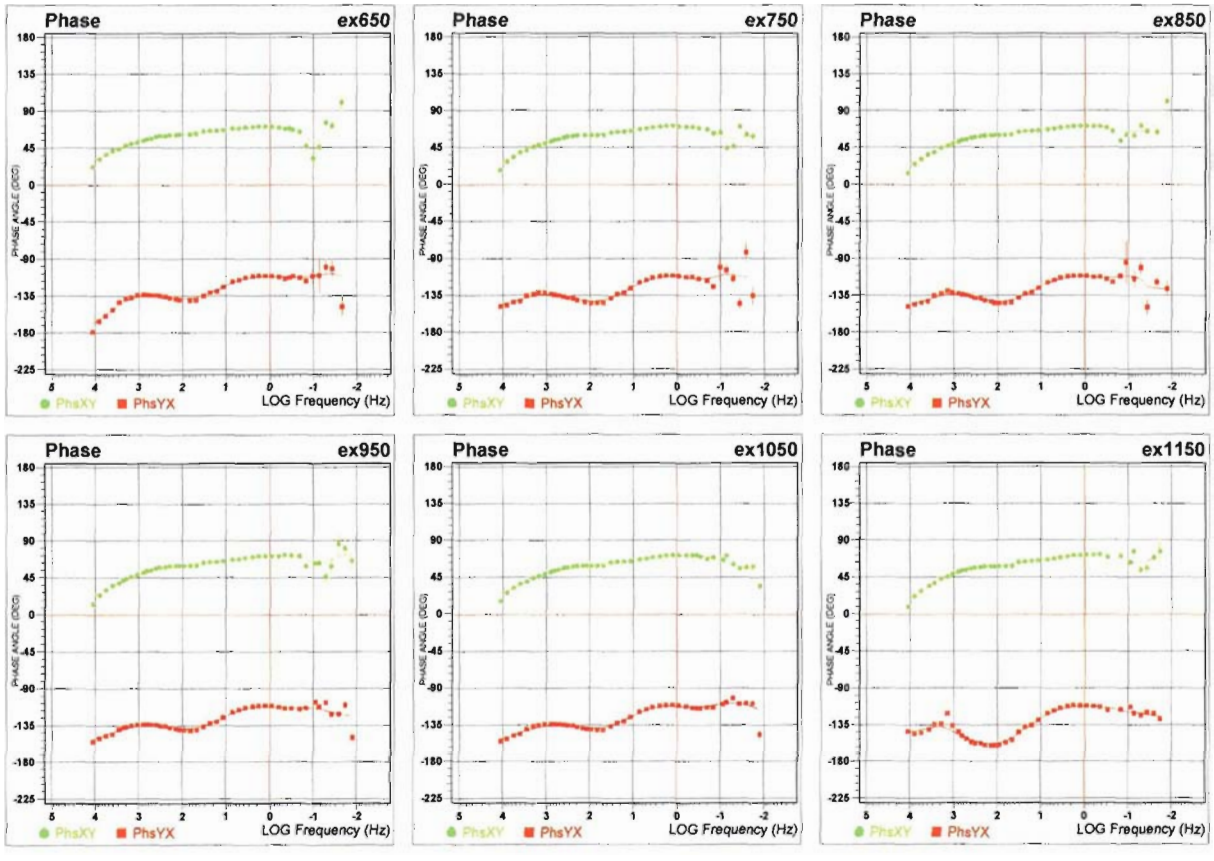
Phs xy ------ green
Phs yx ------ orange

LINE 12N: PHASE



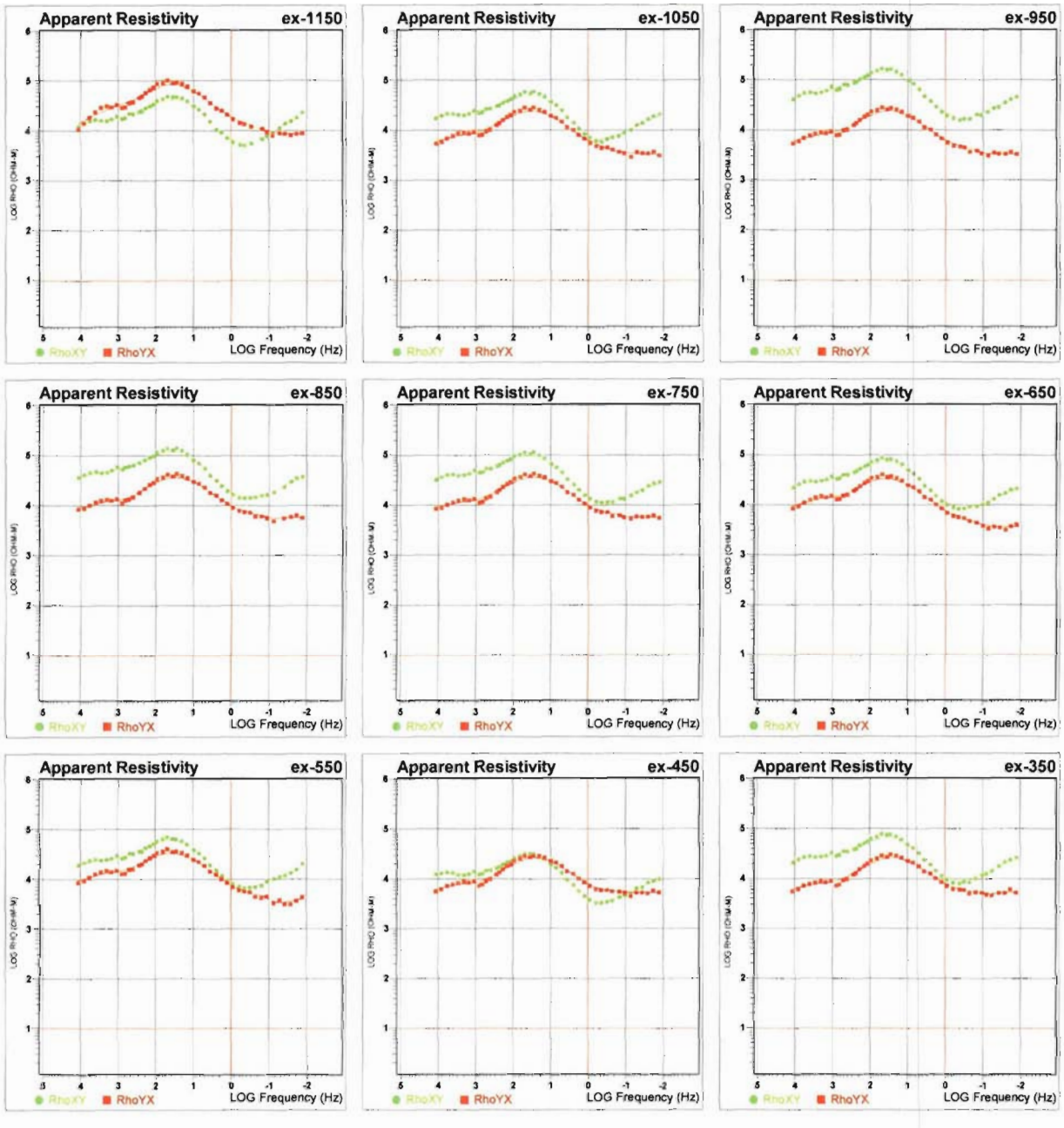
Phs xy ------ green
Phs yx ------ orange

LINE 12N: PHASE



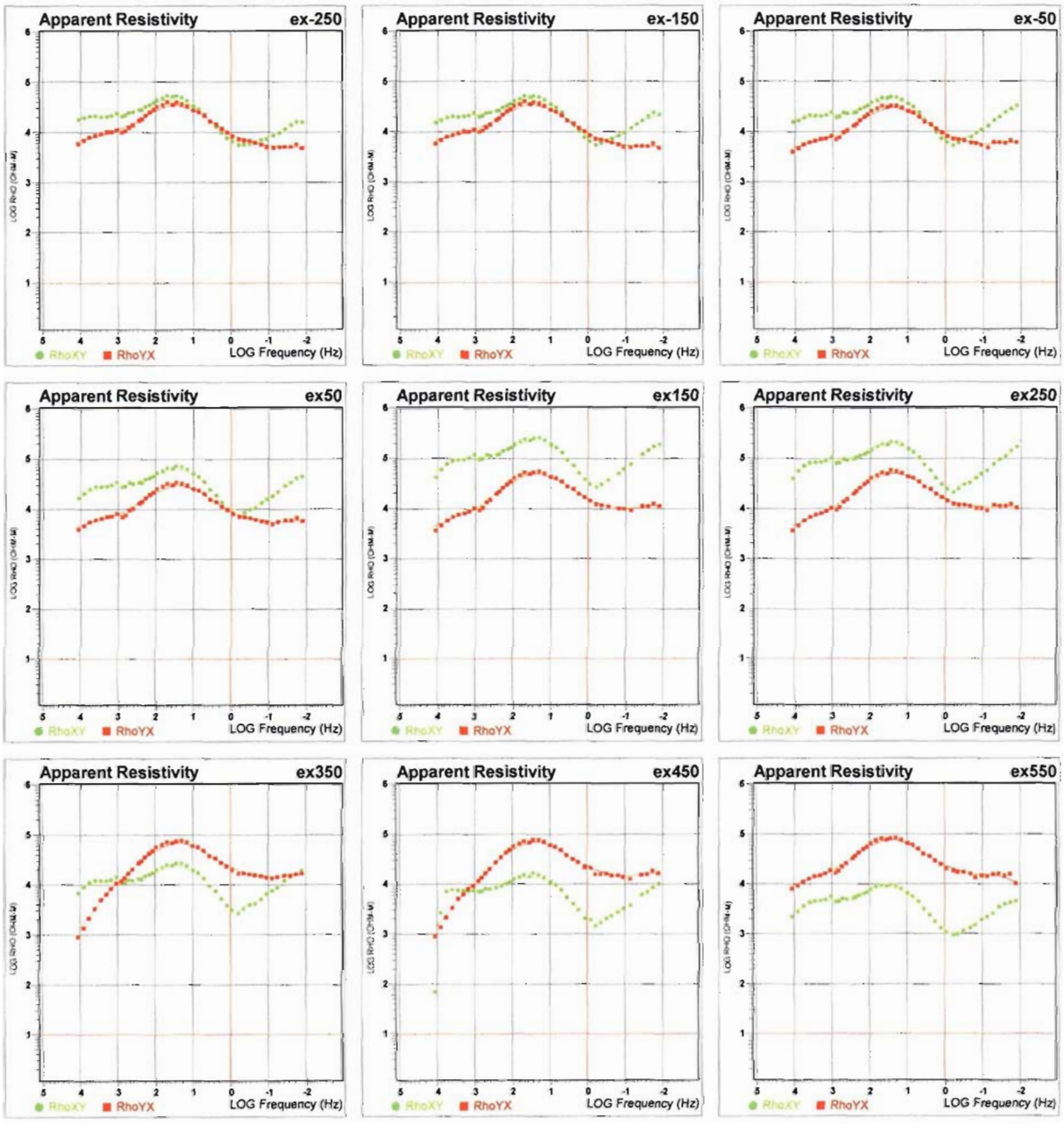
Phs xy ------ green
Phs yx ------ orange

LINE 0E ZIT GRID: APPARENT RESISTIVITY VS. FREQUENCY



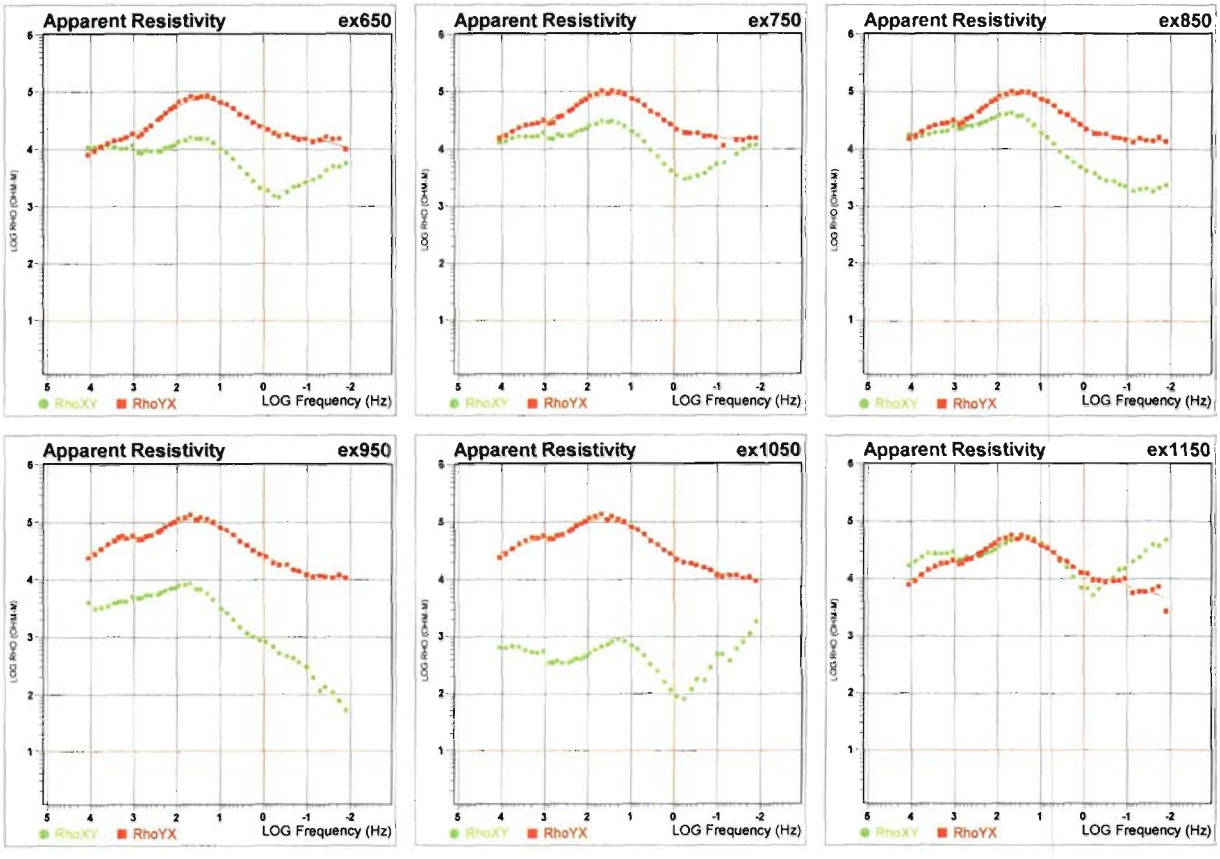
Rho xy ------ green
Rho yx ------ orange

LINE 0E: APPARENT RESISTIVITY VS. FREQUENCY



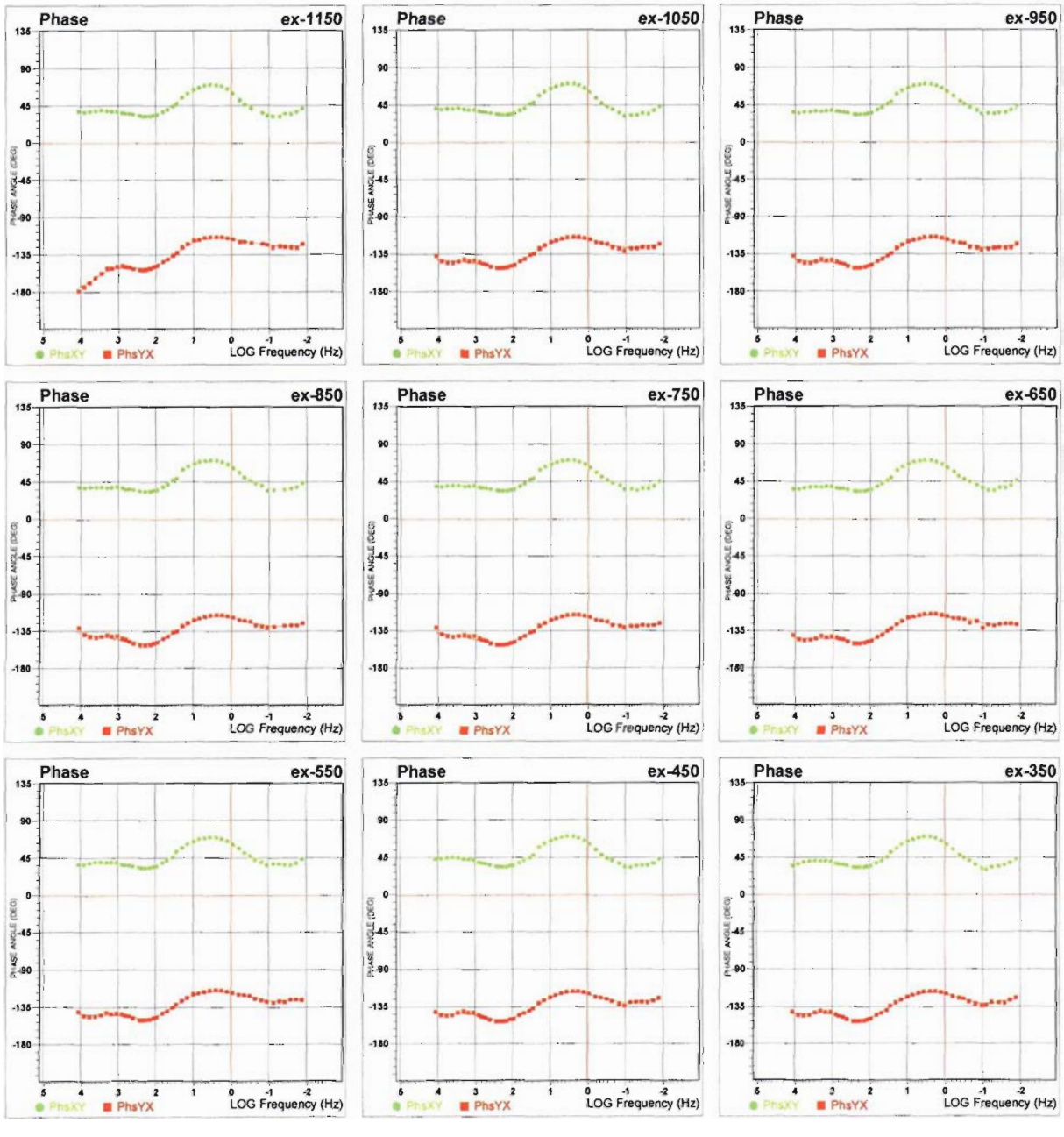
Rho xy ------ **green**
Rho yx ------ **orange**

LINE 0E: APPARENT RESISTIVITY VS. FREQUENCY



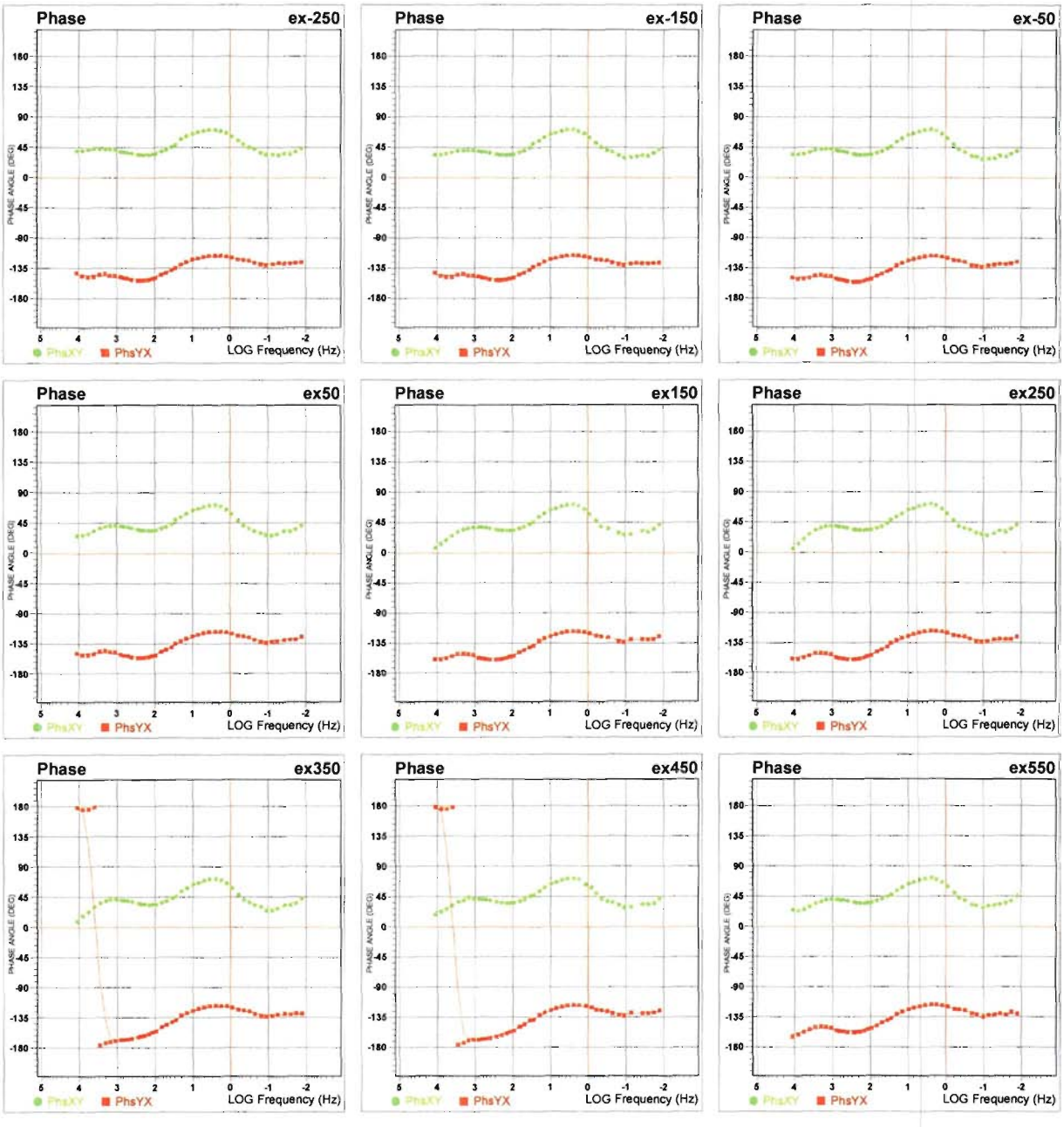
Rho xy ------ green
Rho yx ------ orange

LINE 0E: PHASE



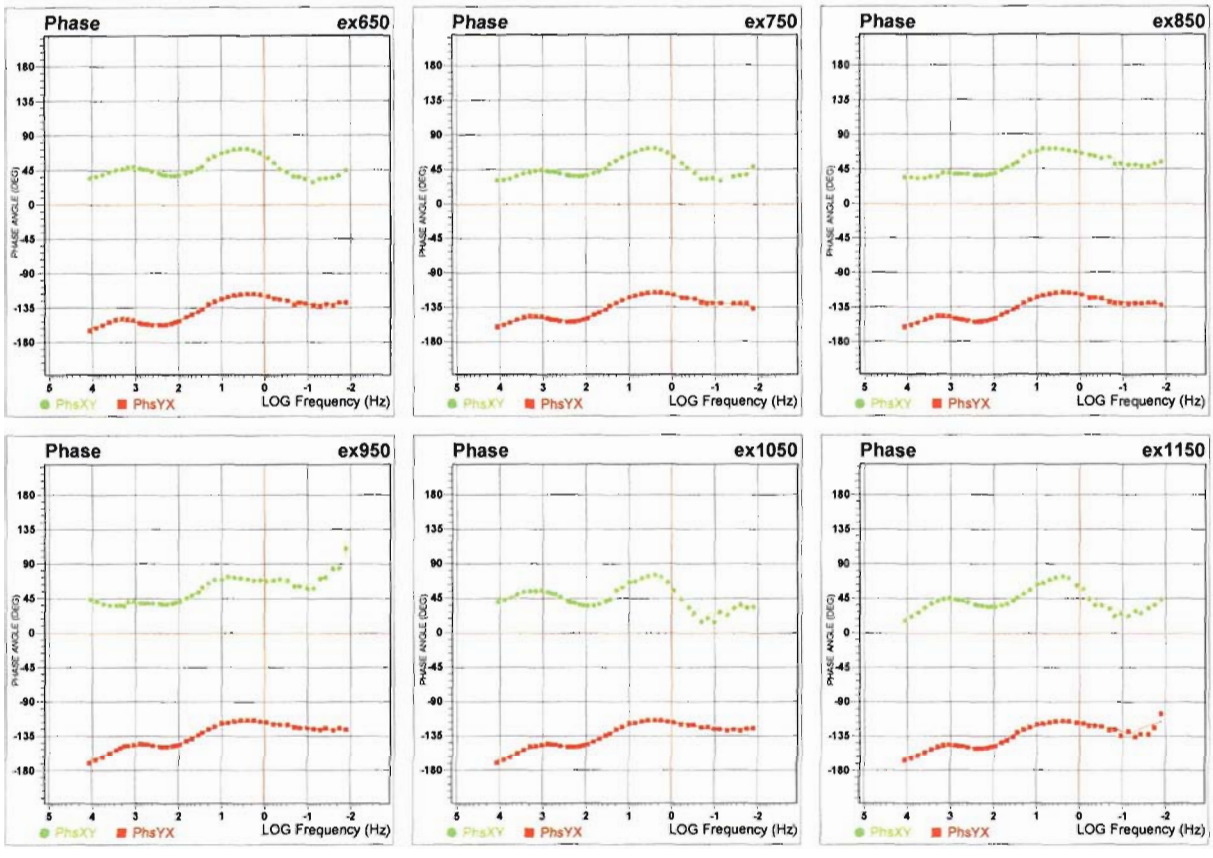
Phs xy ------ green
Phs yx ------ orange

LINE 0E: PHASE



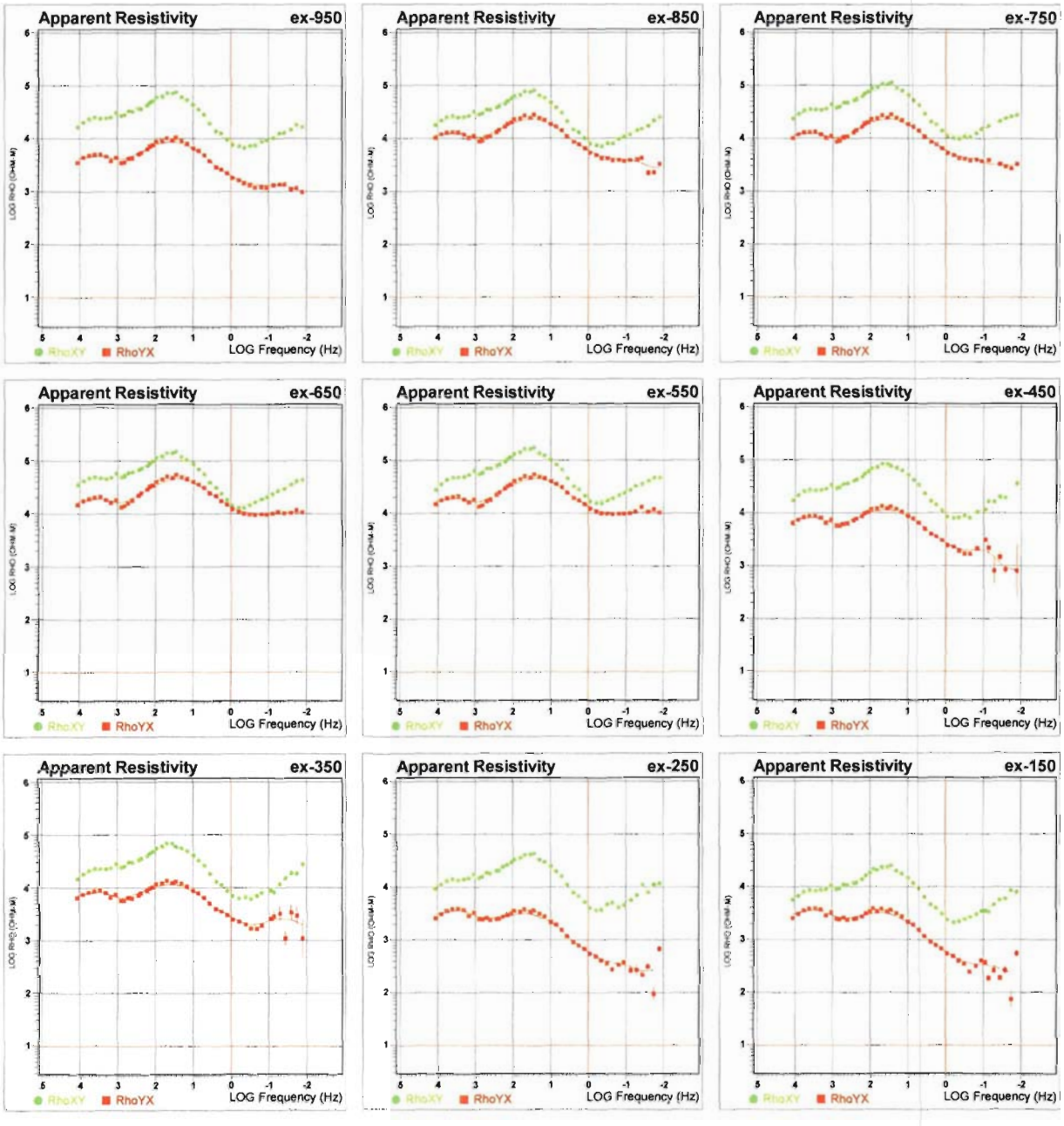
Phs xy ------ green
Phs yx ------ orange

LINE 0E: PHASE



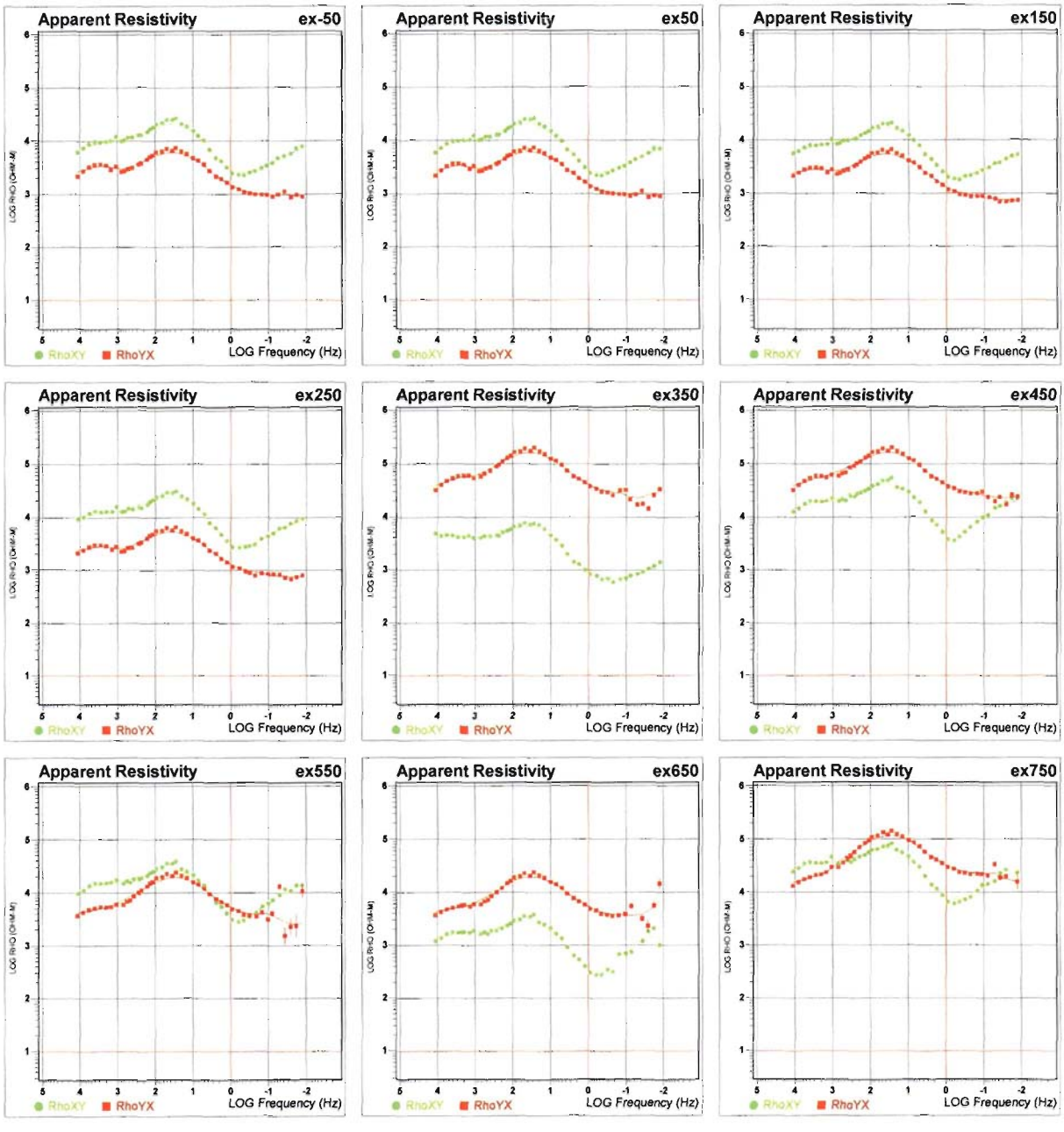
Phs xy ------ green
Phs yx ------ orange

LINE 375E ZIT GRID: APPARENT RESISTIVITY VS. FREQUENCY



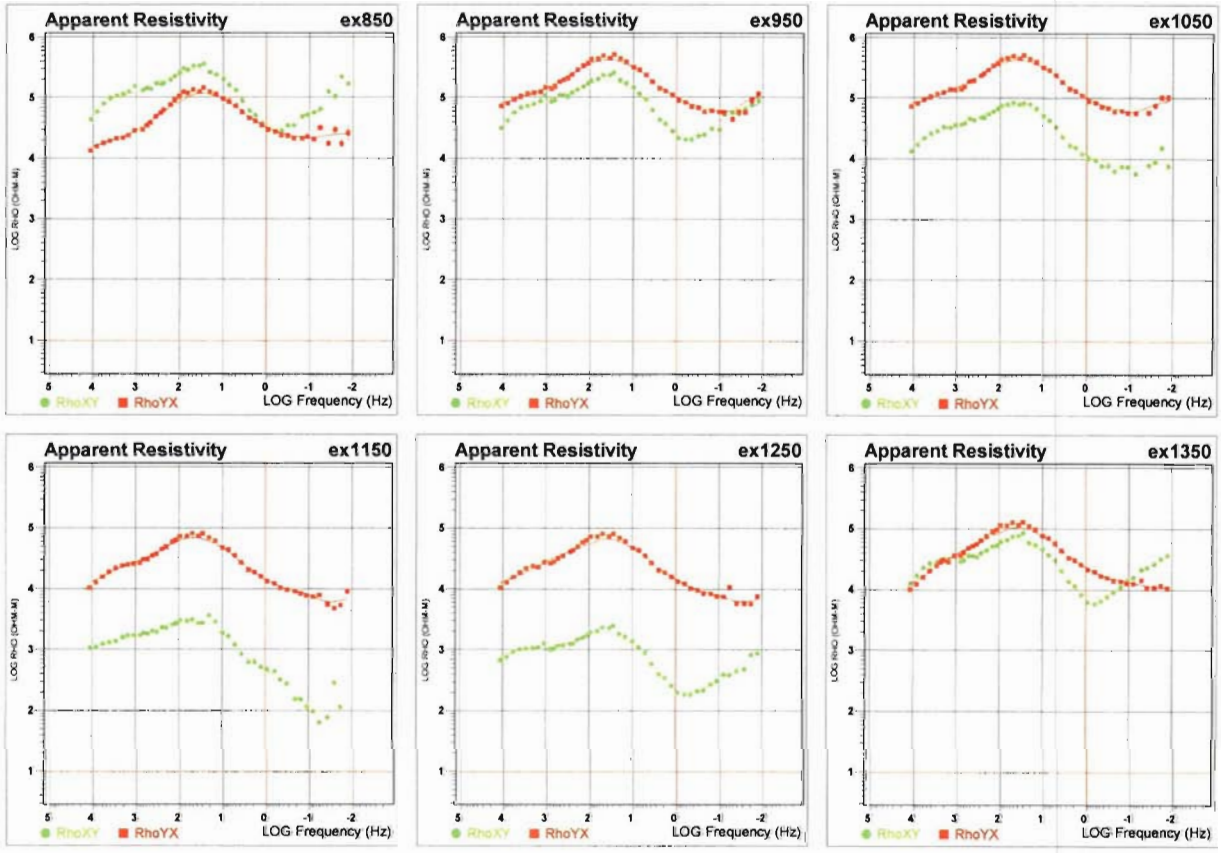
Rho xy ------ green
Rho yx ------ orange

LINE 375E: APPARENT RESISTIVITY VS. FREQUENCY



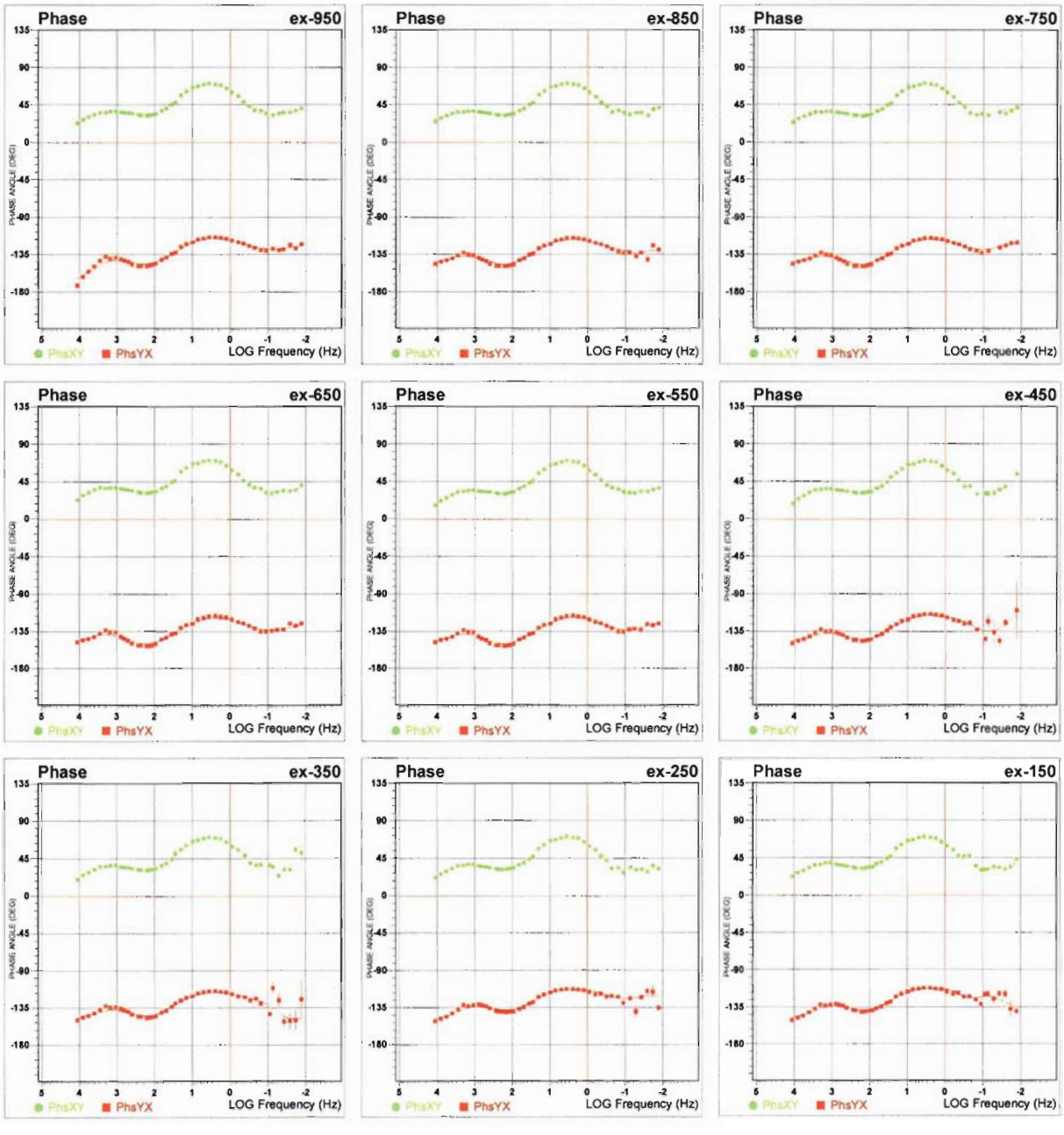
Rho xy ------ green
Rho yx ------ orange

LINE 375E: APPARENT RESISTIVITY VS. FREQUENCY



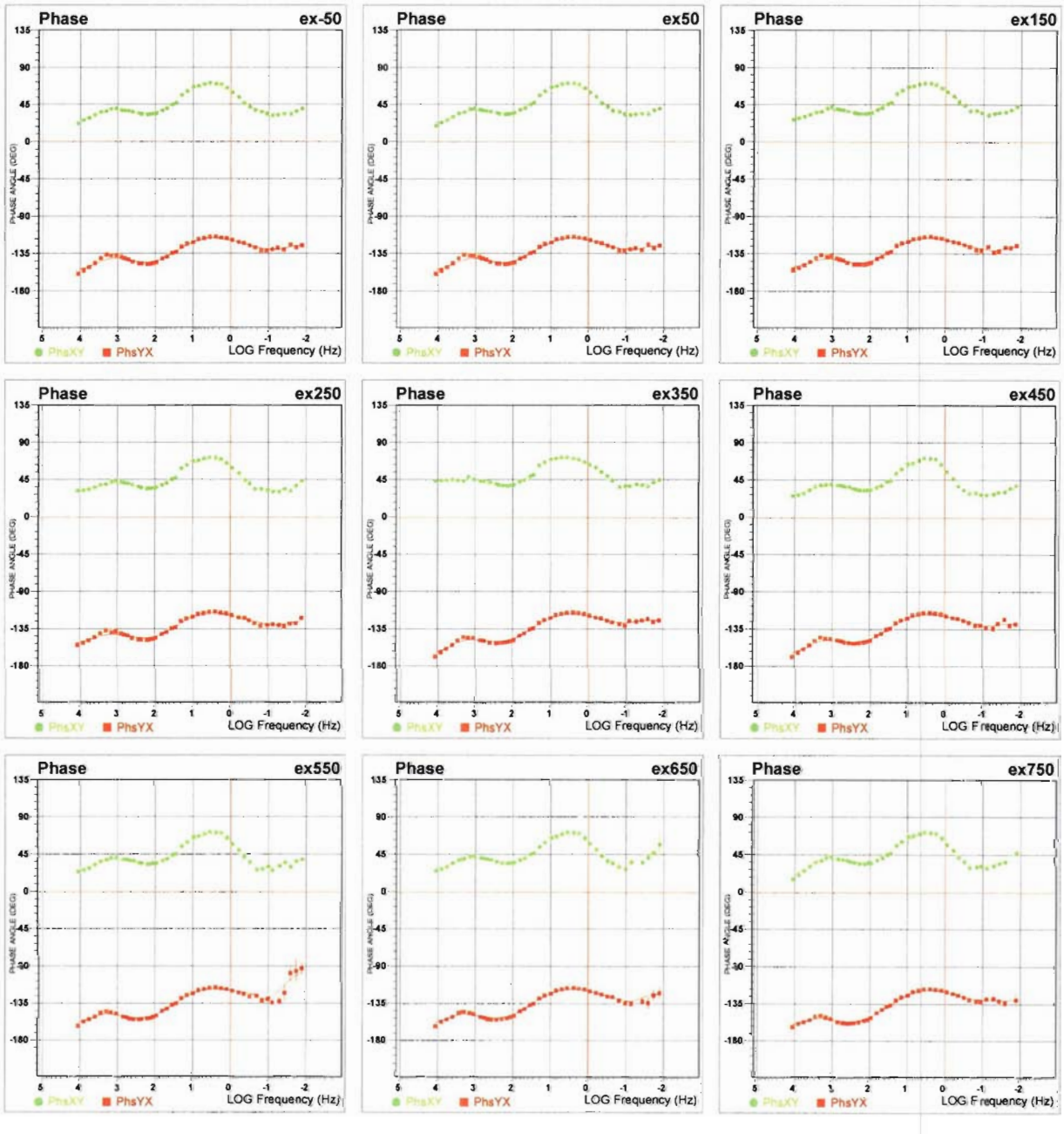
Rho xy ------ green
Rho yx ------ orange

LINE 375E: PHASE



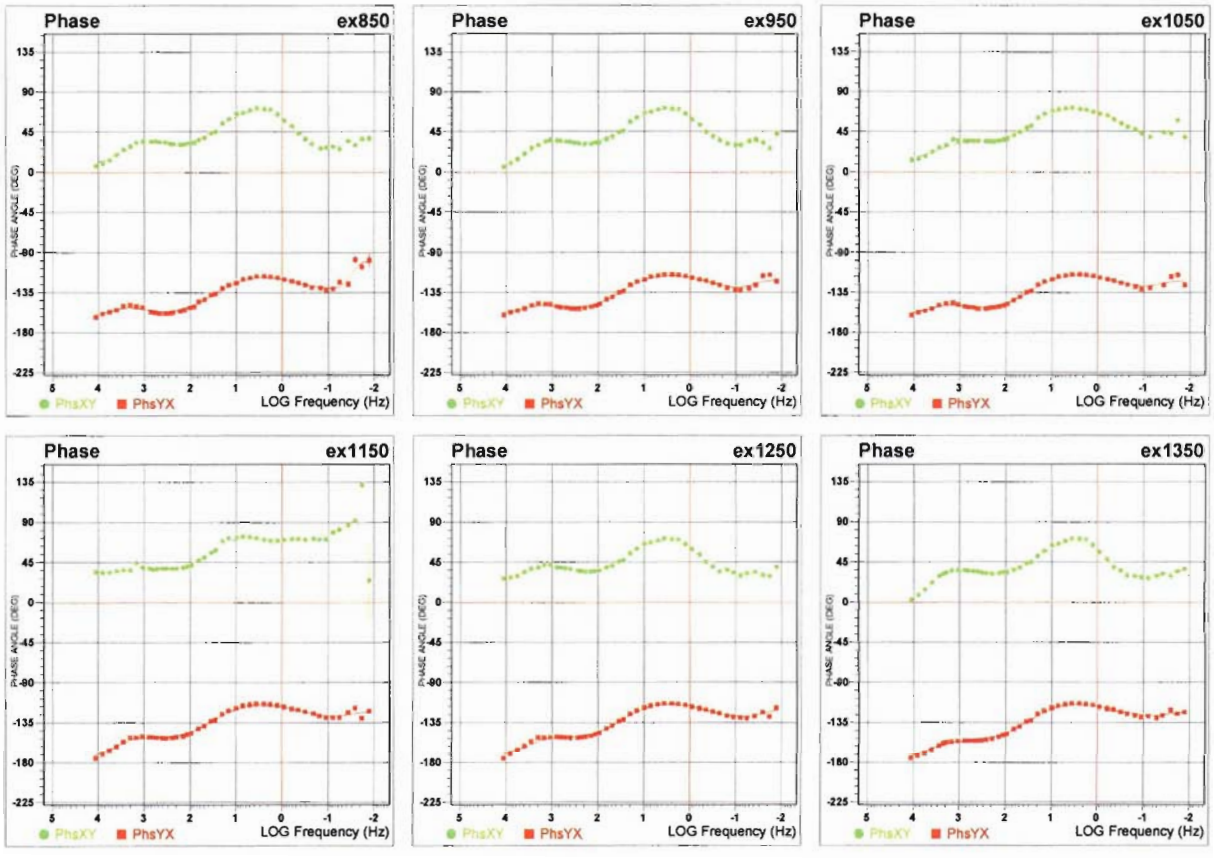
Phs xy ------ green
Phs yx ------ orange

LINE 375E: PHASE



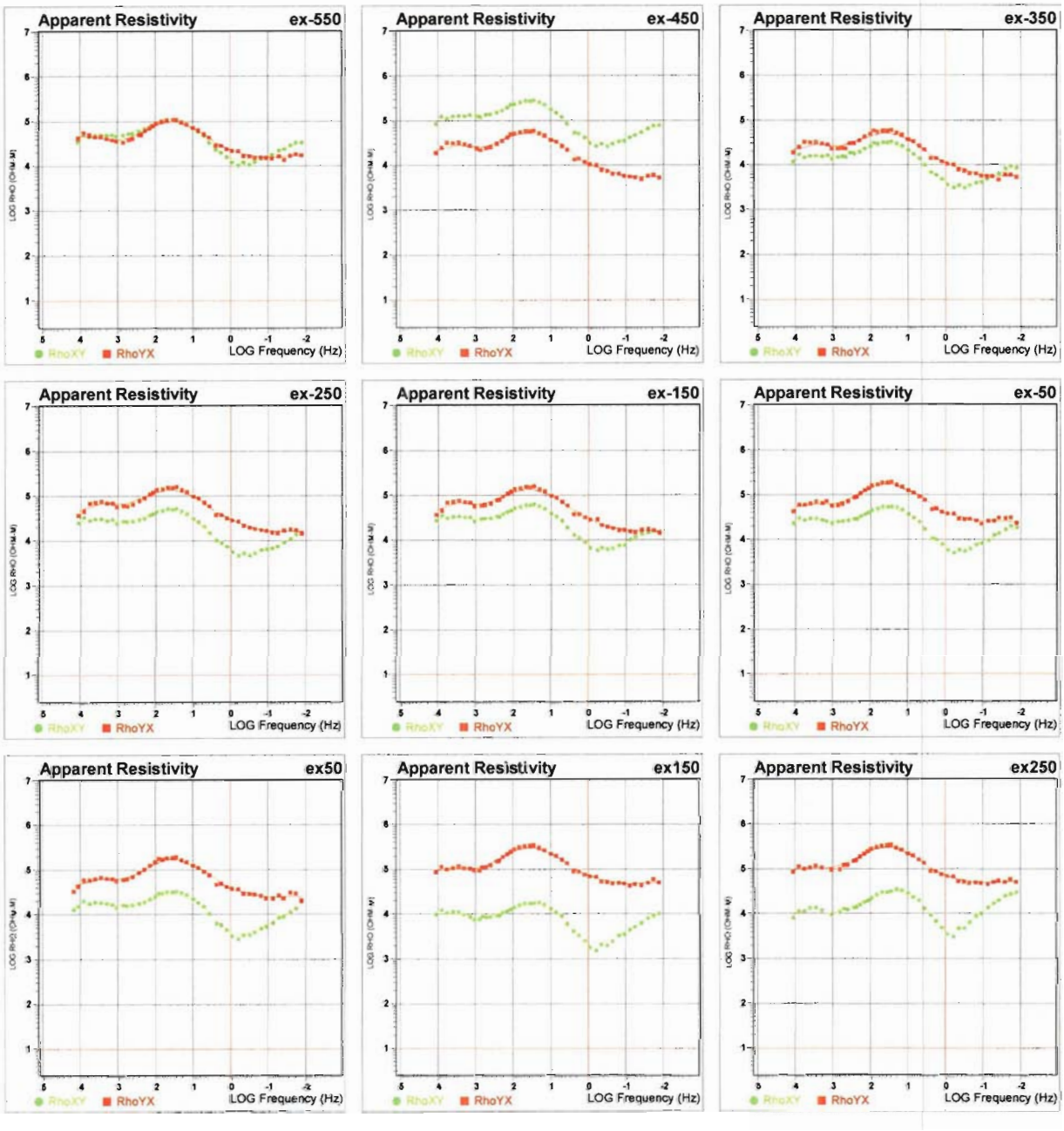
Phs xy ------ **green**
Phs yx ------ **orange**

LINE 375E: PHASE



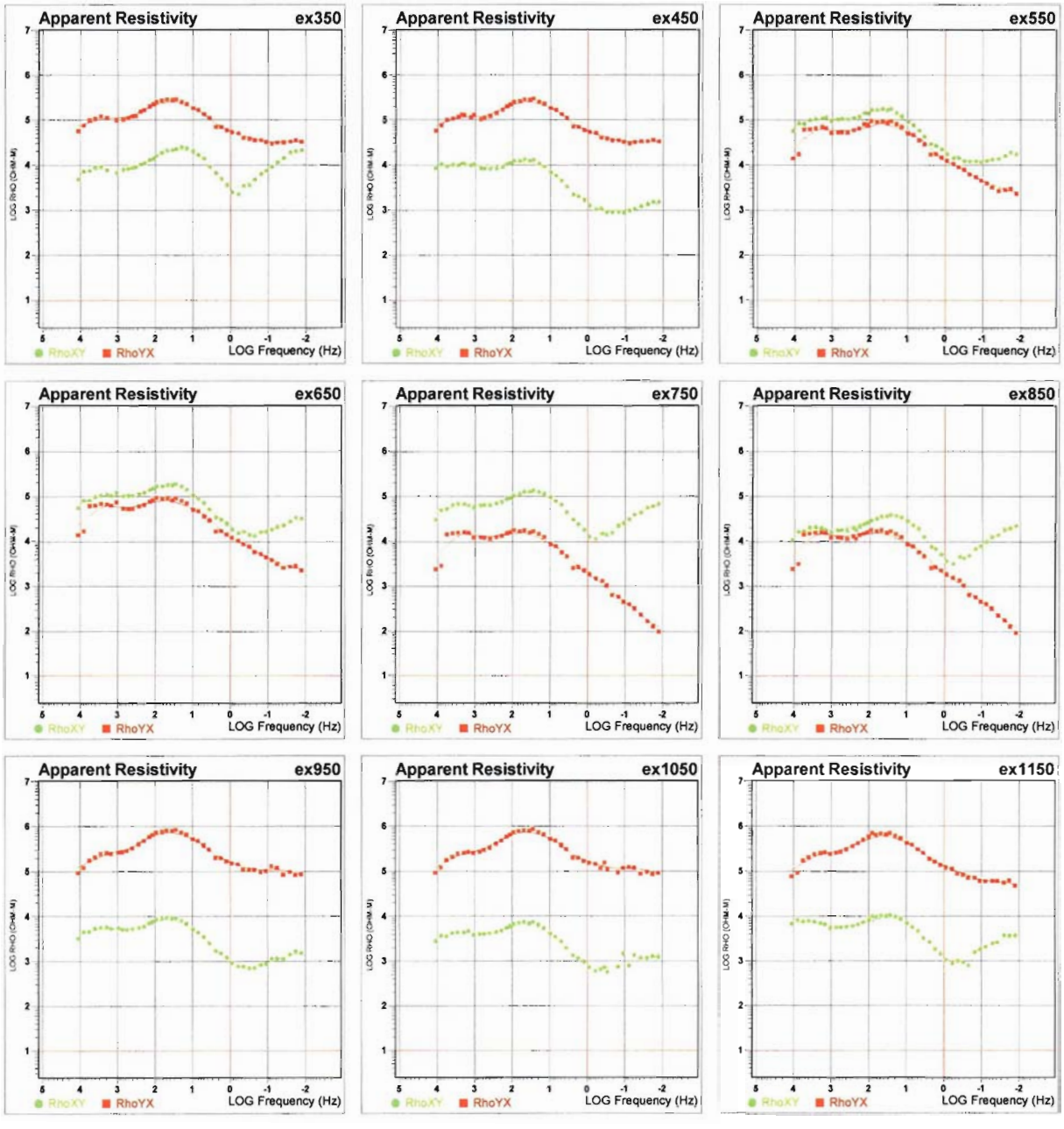
Phs xy ------ green
Phs yx ------ orange

LINE 925E ZIT GRID: APPARENT RESISTIVITY VS. FREQUENCY



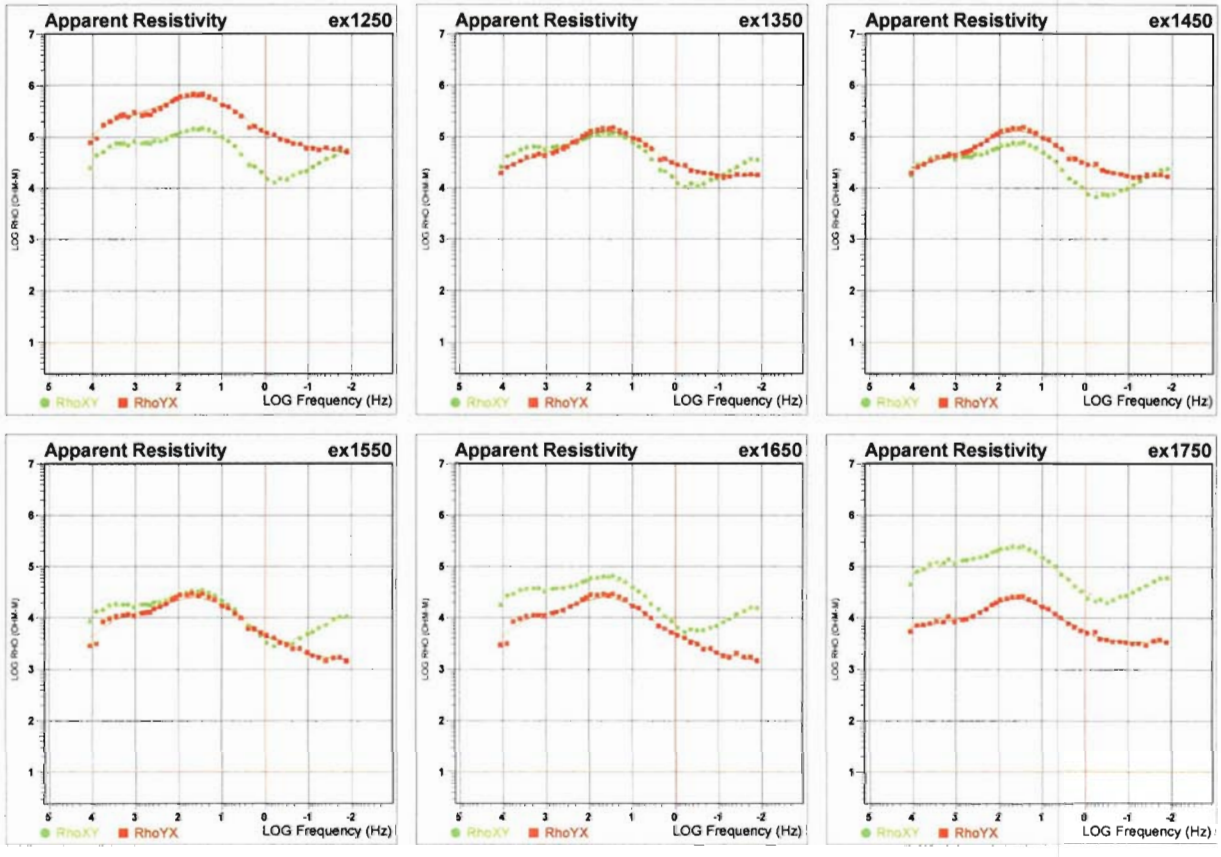
Rho xy ------ green
Rho yx ------ orange

LINE 925E: APPARENT RESISTIVITY VS. FREQUENCY



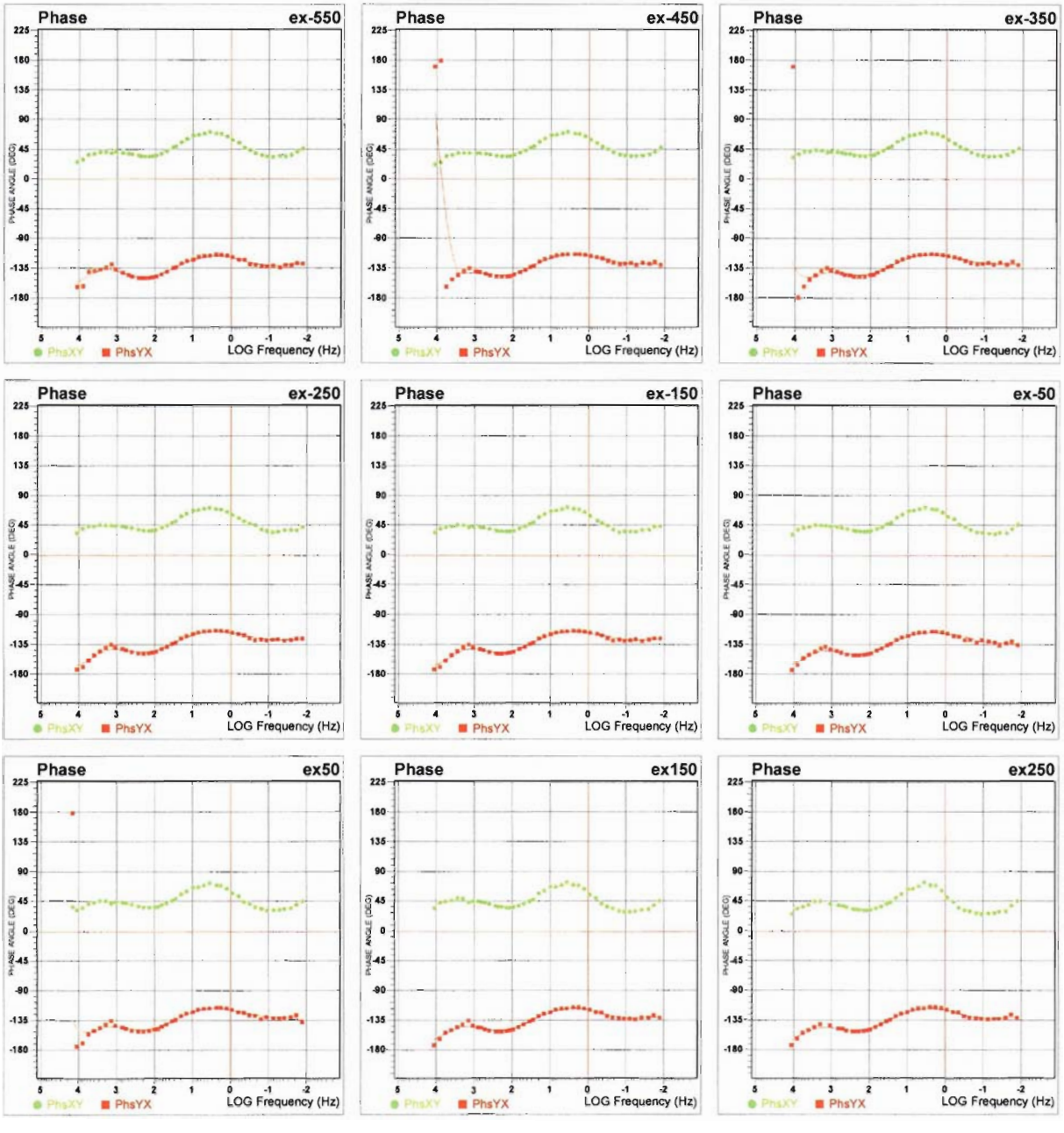
Rho xy ------ **green**
Rho yx ------ **orange**

LINE 925E: APPARENT RESISTIVITY VS. FREQUENCY



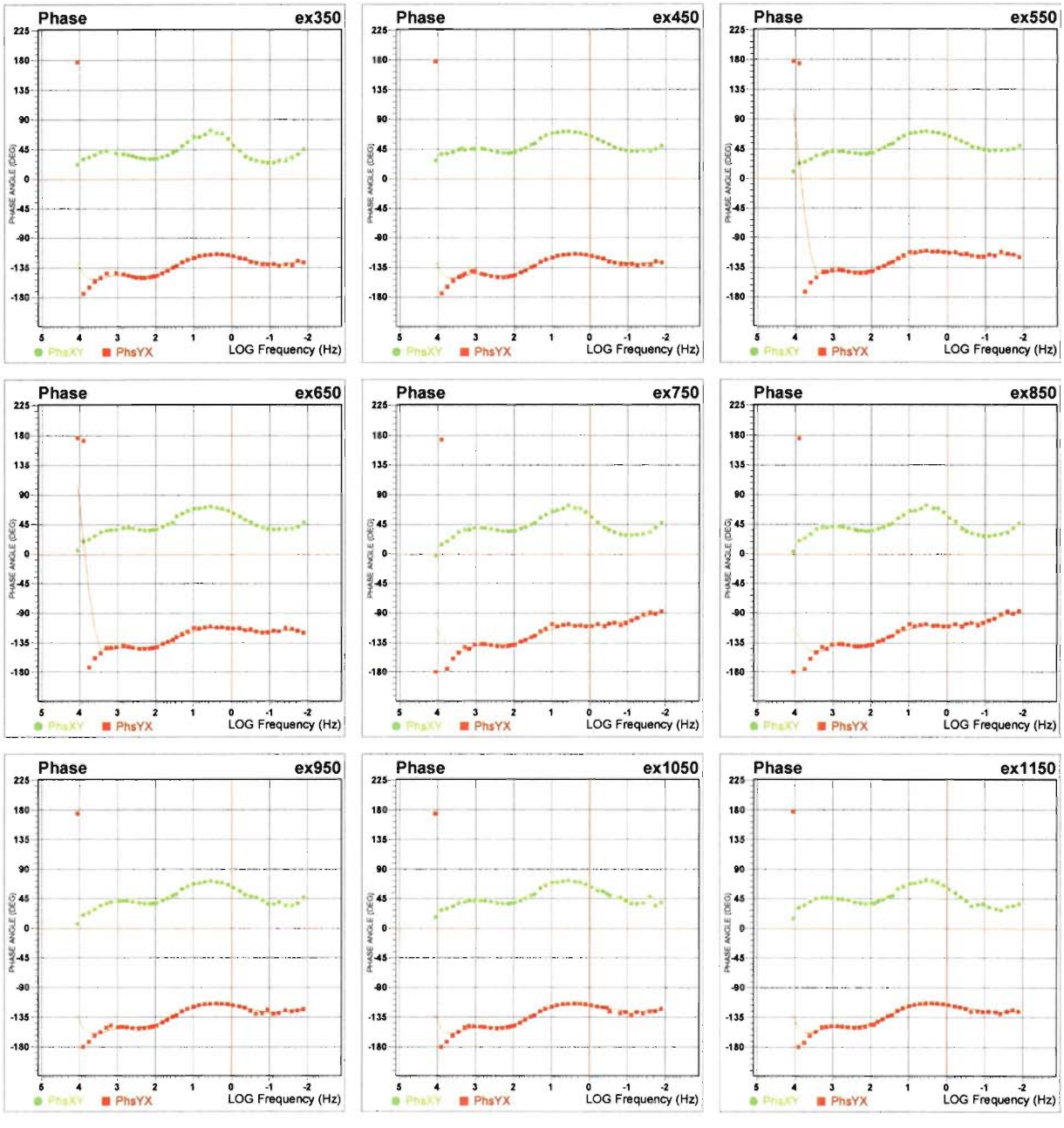
Rho xy ------ green
Rho yx ------ orange

LINE 925E: PHASE



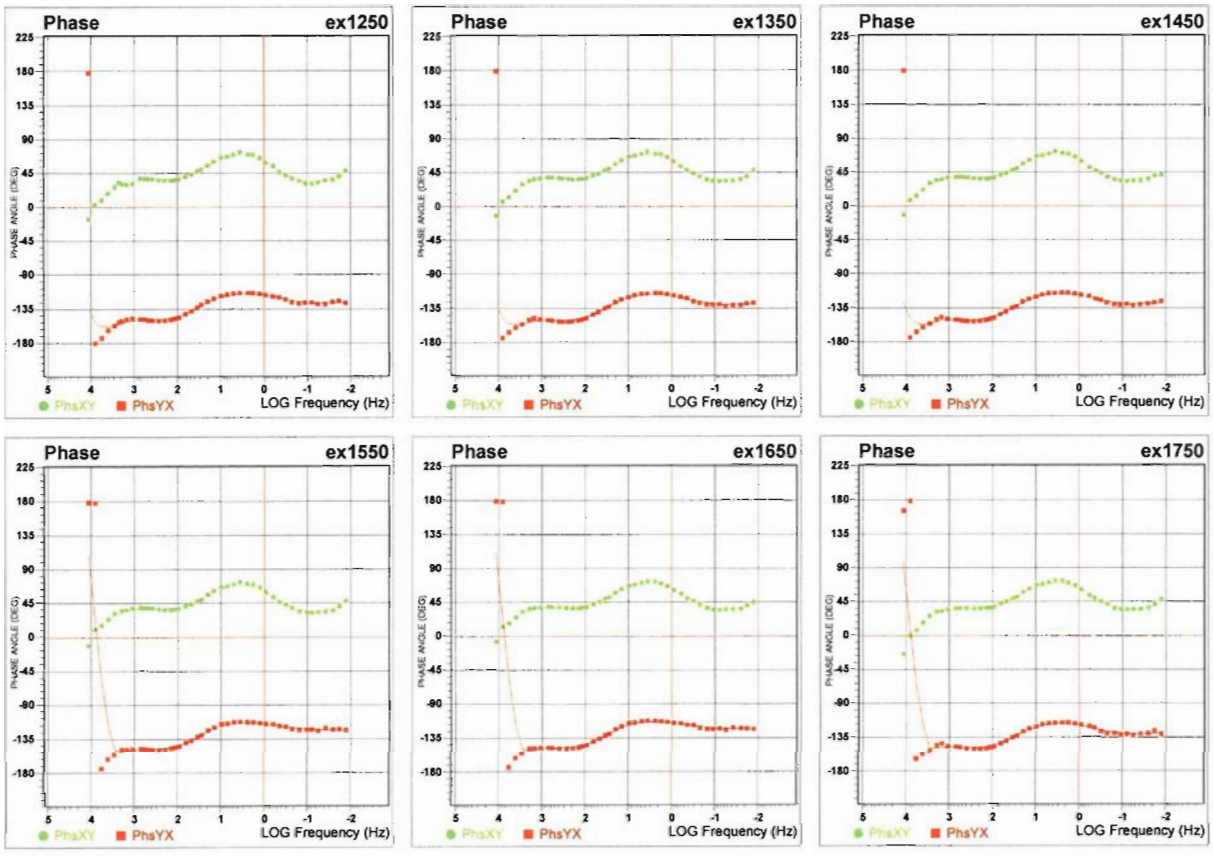
Phs xy ------ green
Phs yx ------ orange

LINE 925E: PHASE



Phs xy ------ green
Phs yx ------ orange

LINE 925E: PHASE

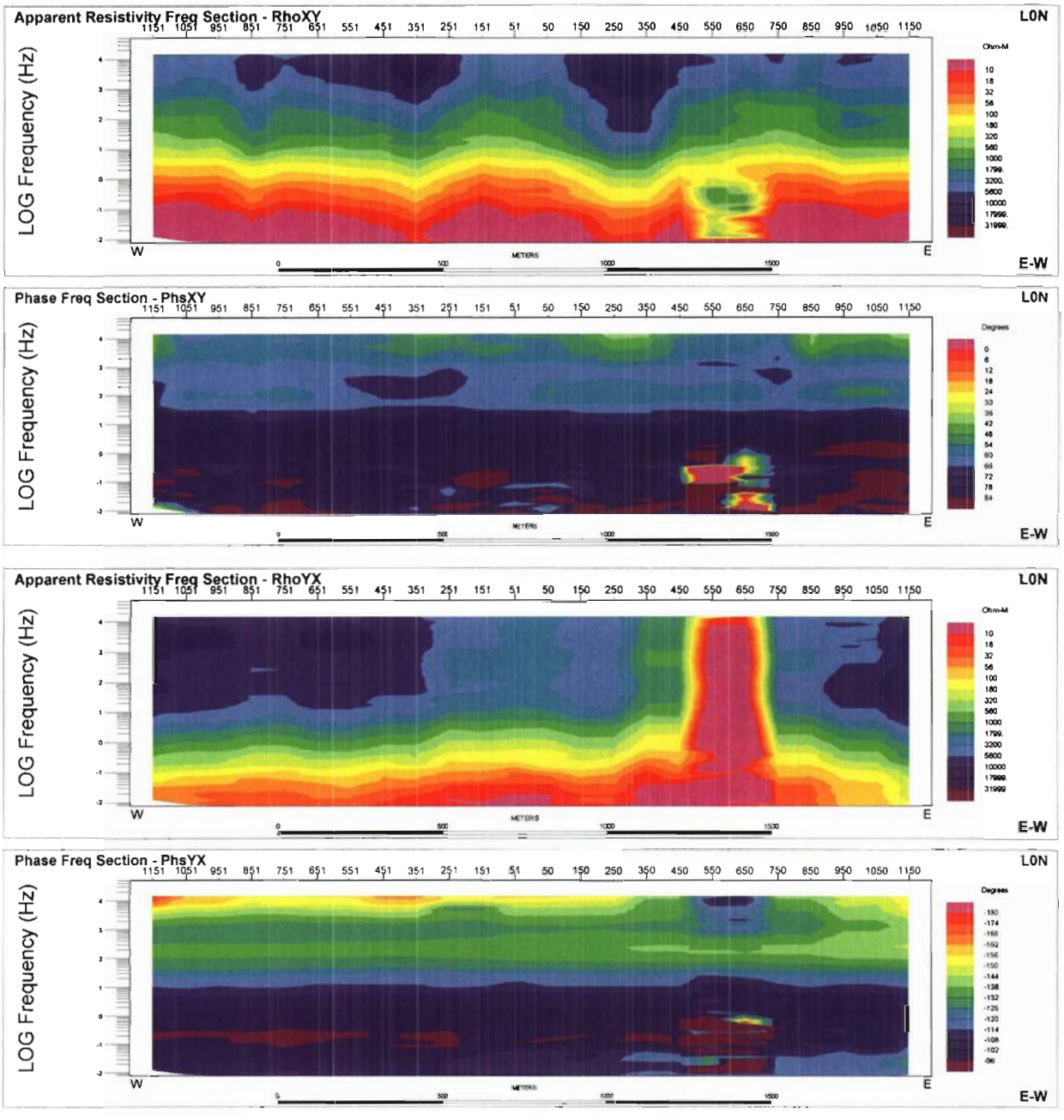


Phs xy ------ green
Phs yx ------ orange

APPENDIX E: MT APPARENT RESISTIVITY AND PHASE PSEUDO-SECTIONS

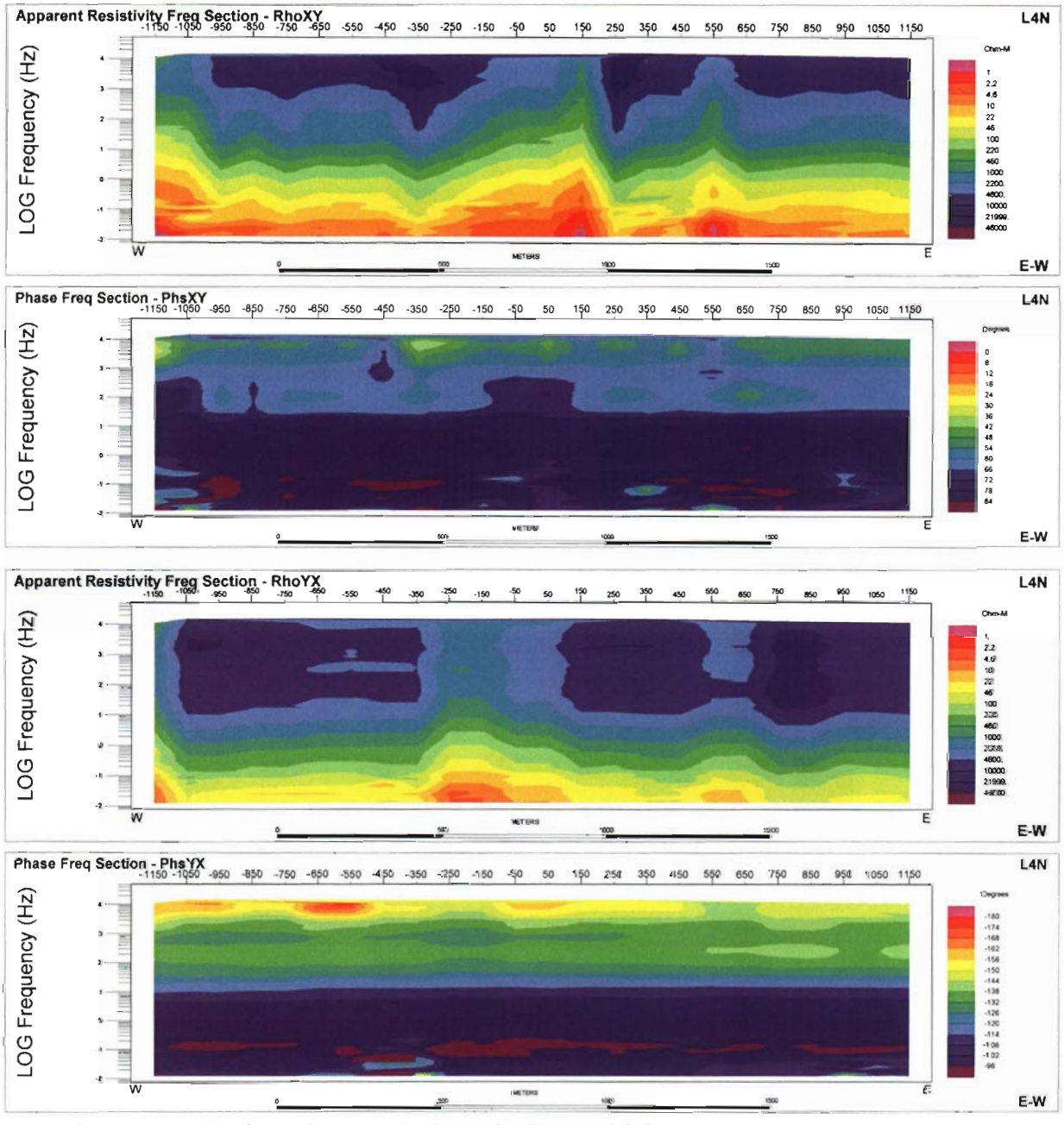
Note: XY denotes in-line electrical (E) field and orthogonal magnetic (H) field (Ex/Hy).
YX denotes in-line H field and orthogonal E-field (Ey/Hx).

LINE 0N SUDNIP GRID –APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



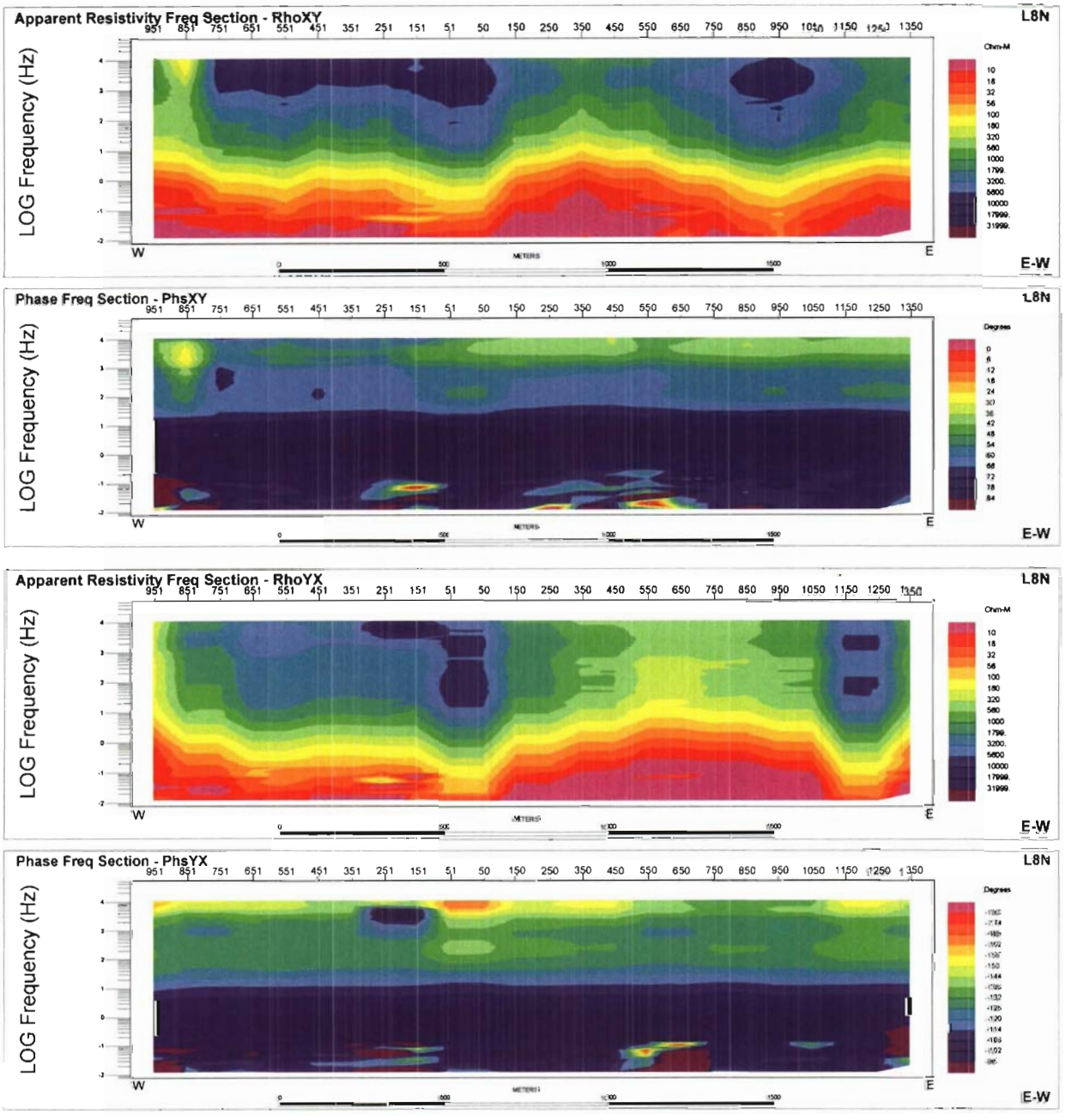
STRIP 1 (TOP) – RHO XY, STRIP 2 – RHO YX, STRIP 3 – PHASE XY, STRIP 4 (BOTTOM) – PHASE YX

LINE 4N SUDNIP GRID–APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



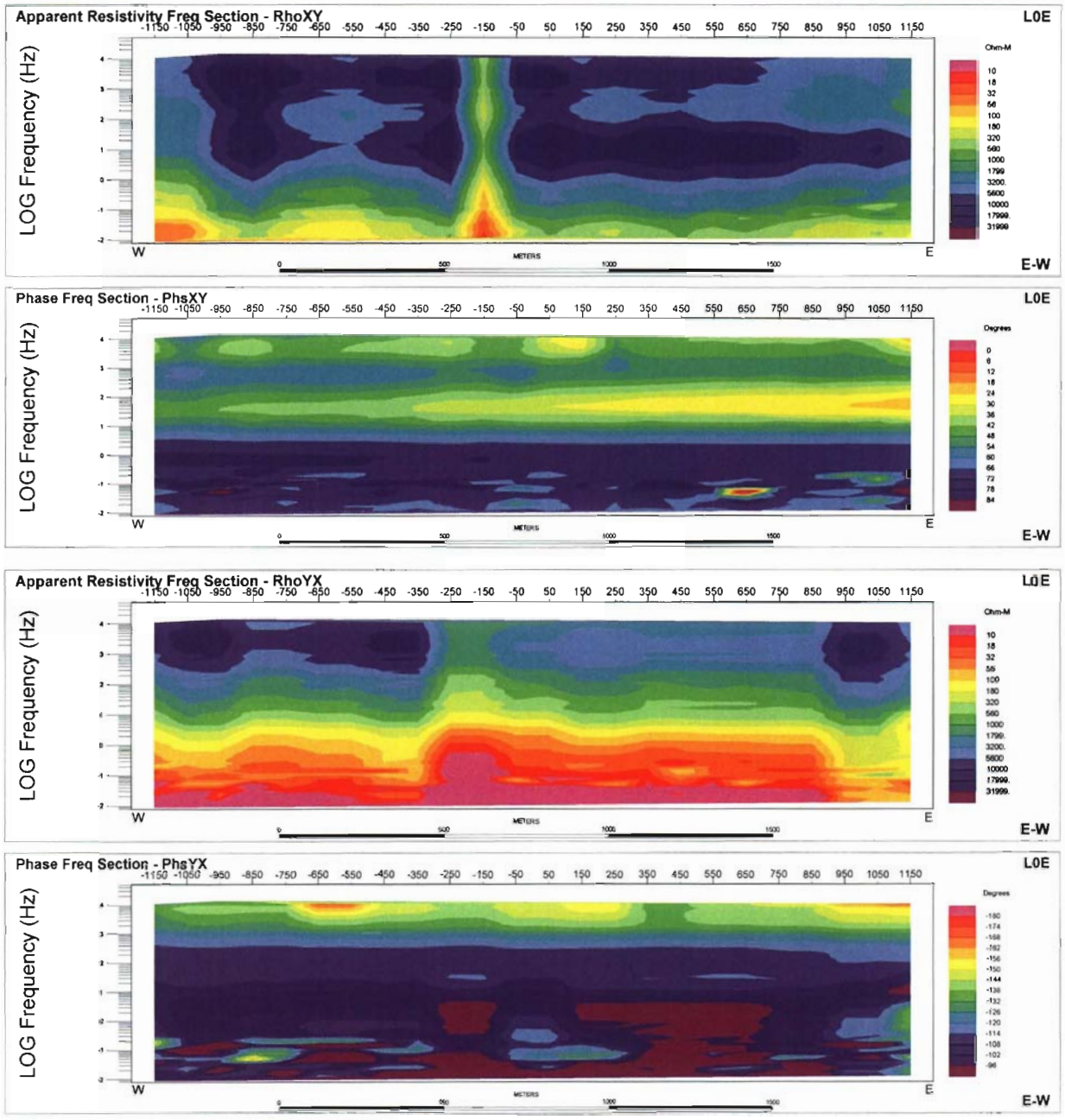
STRIP 1 (TOP) – RHO XY, STRIP 2 – RHO YX, STRIP 3 – PHASE XY, STRIP 4 (BOTTOM) – PHASE YX

LINE 8N SUDNIP GRID–APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



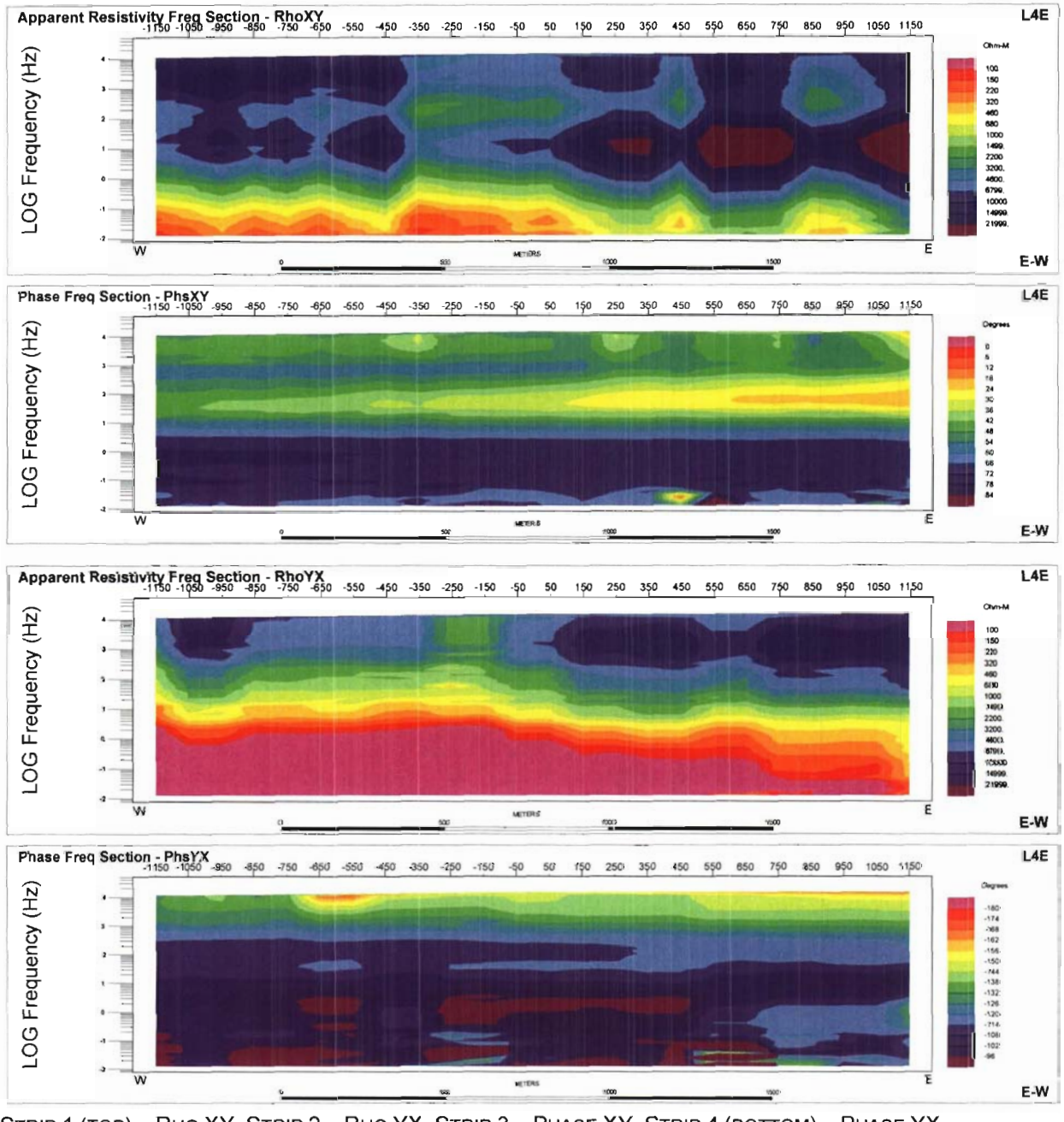
STRIP 1 (TOP) – RHO XY, STRIP 2 – RHO YX, STRIP 3 – PHASE XY, STRIP 4 (BOTTOM) – PHASE YX

LINE 0E PATRICK GRID–APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



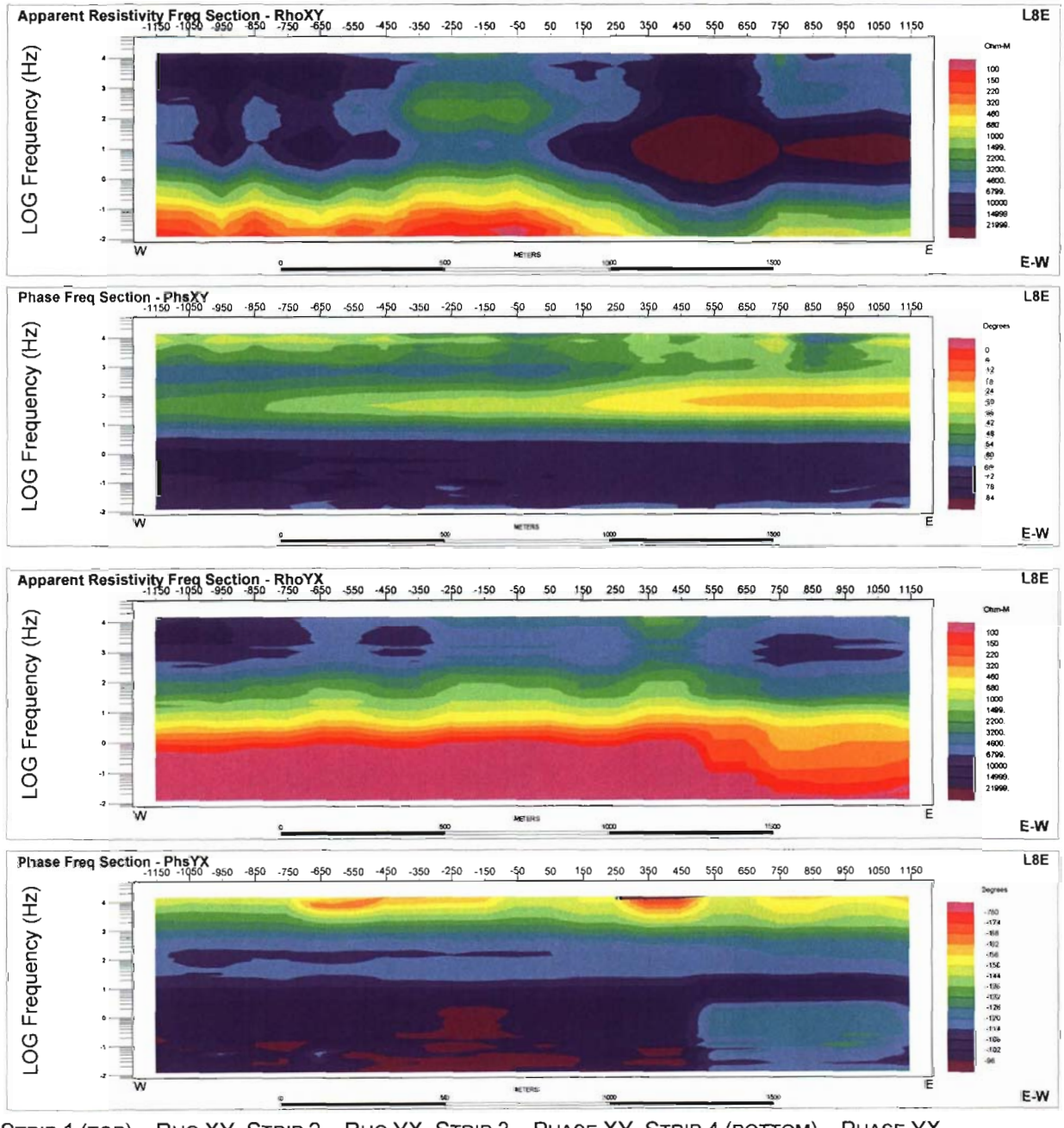
STRIP 1 (TOP) – RHO XY, STRIP 2 – RHO YX, STRIP 3 – PHASE XY, STRIP 4 (BOTTOM) – PHASE YX

LINE 4E PATRICK GRID–APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



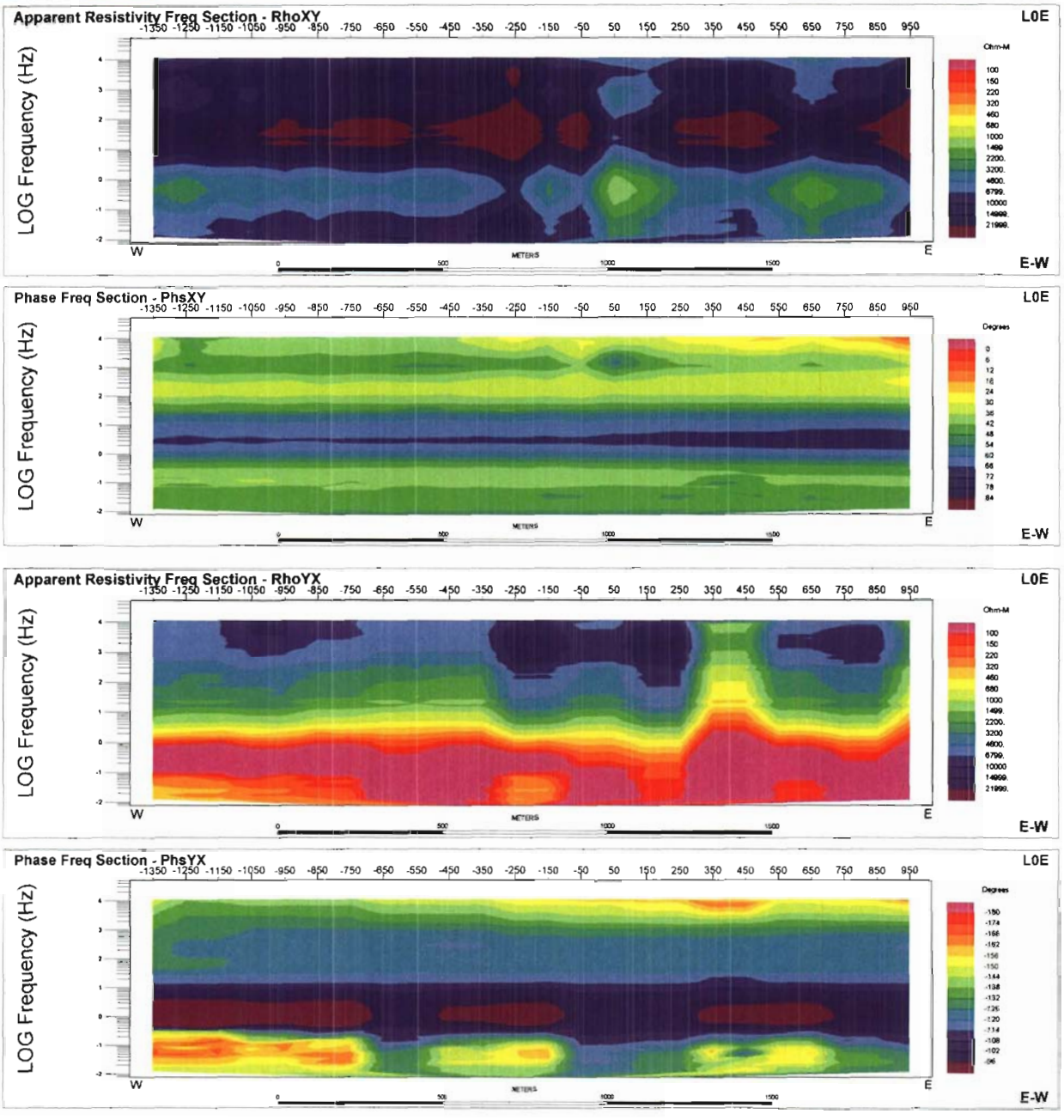
STRIP 1 (TOP) – RHO XY, STRIP 2 – RHO YX, STRIP 3 – PHASE XY, STRIP 4 (BOTTOM) – PHASE YX

LINE 8E PATRICK GRID–APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



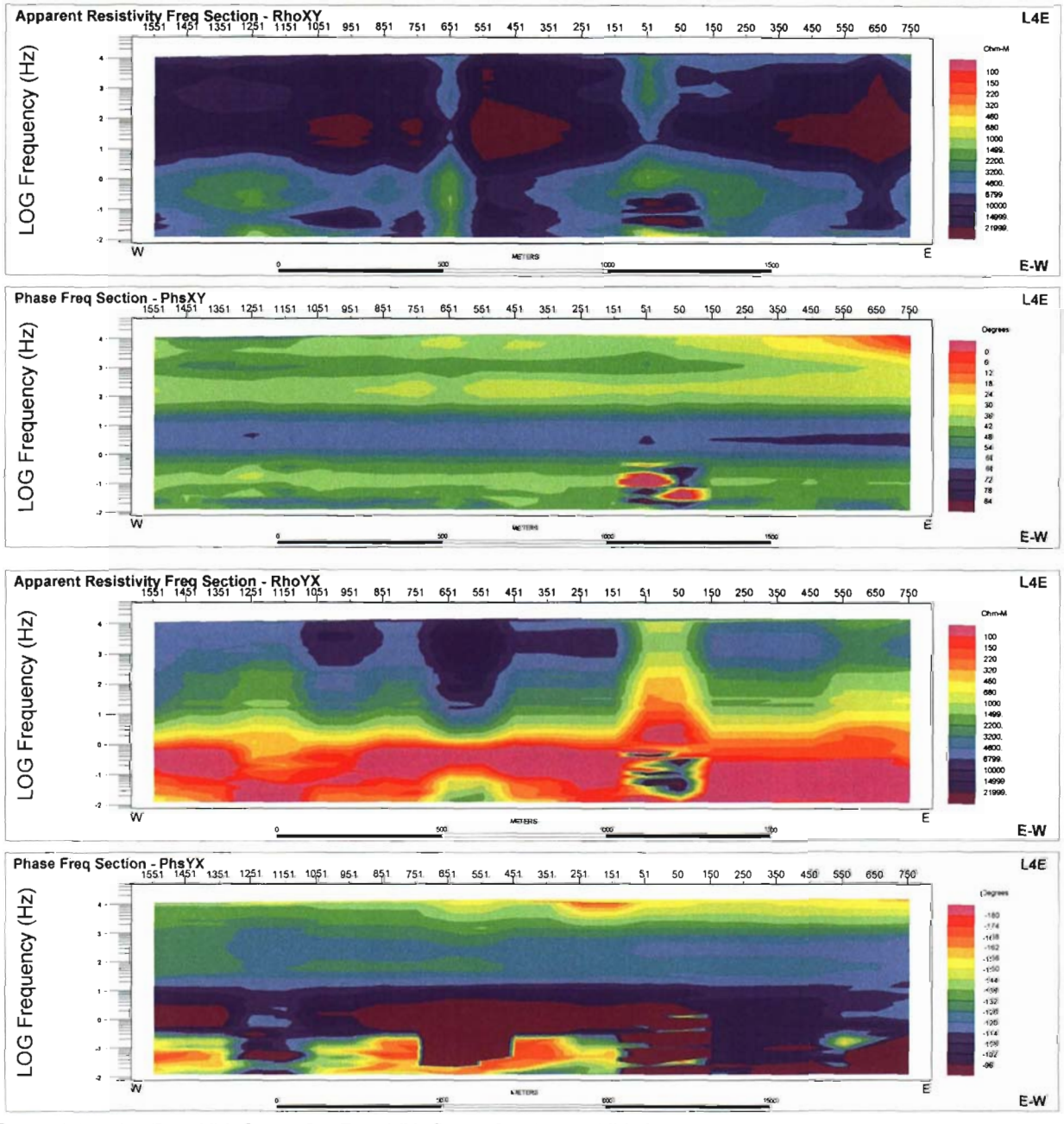
STRIP 1 (TOP) – RHO XY, STRIP 2 – RHO YX, STRIP 3 – PHASE XY, STRIP 4 (BOTTOM) – PHASE YX

LINE 0E ML GRID–APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



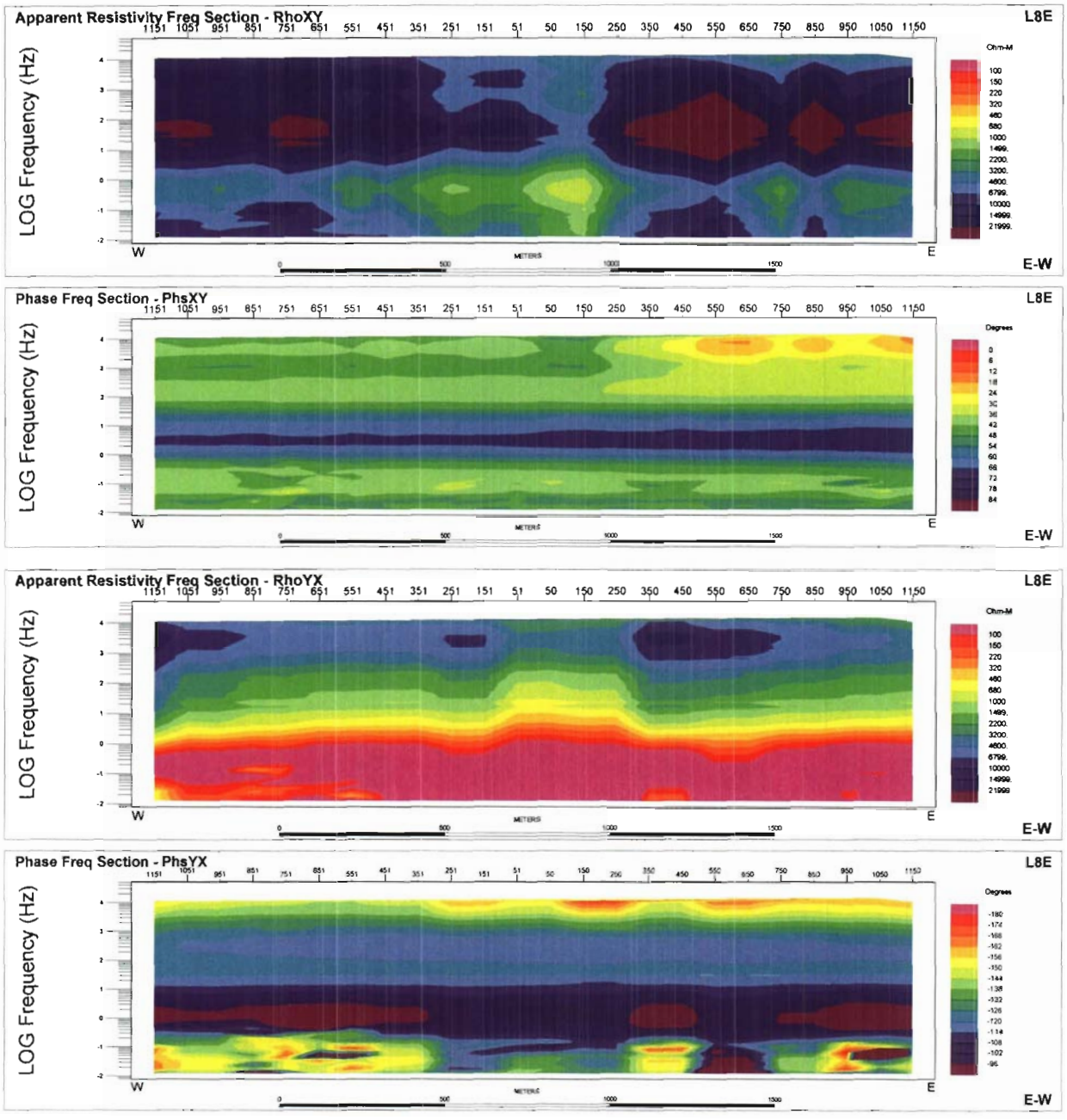
STRIP 1 (TOP) – RHO XY, STRIP 2 – RHO YX, STRIP 3 – PHASE XY, STRIP 4 (BOTTOM) – PHASE YX

LINE 4E ML GRID–APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



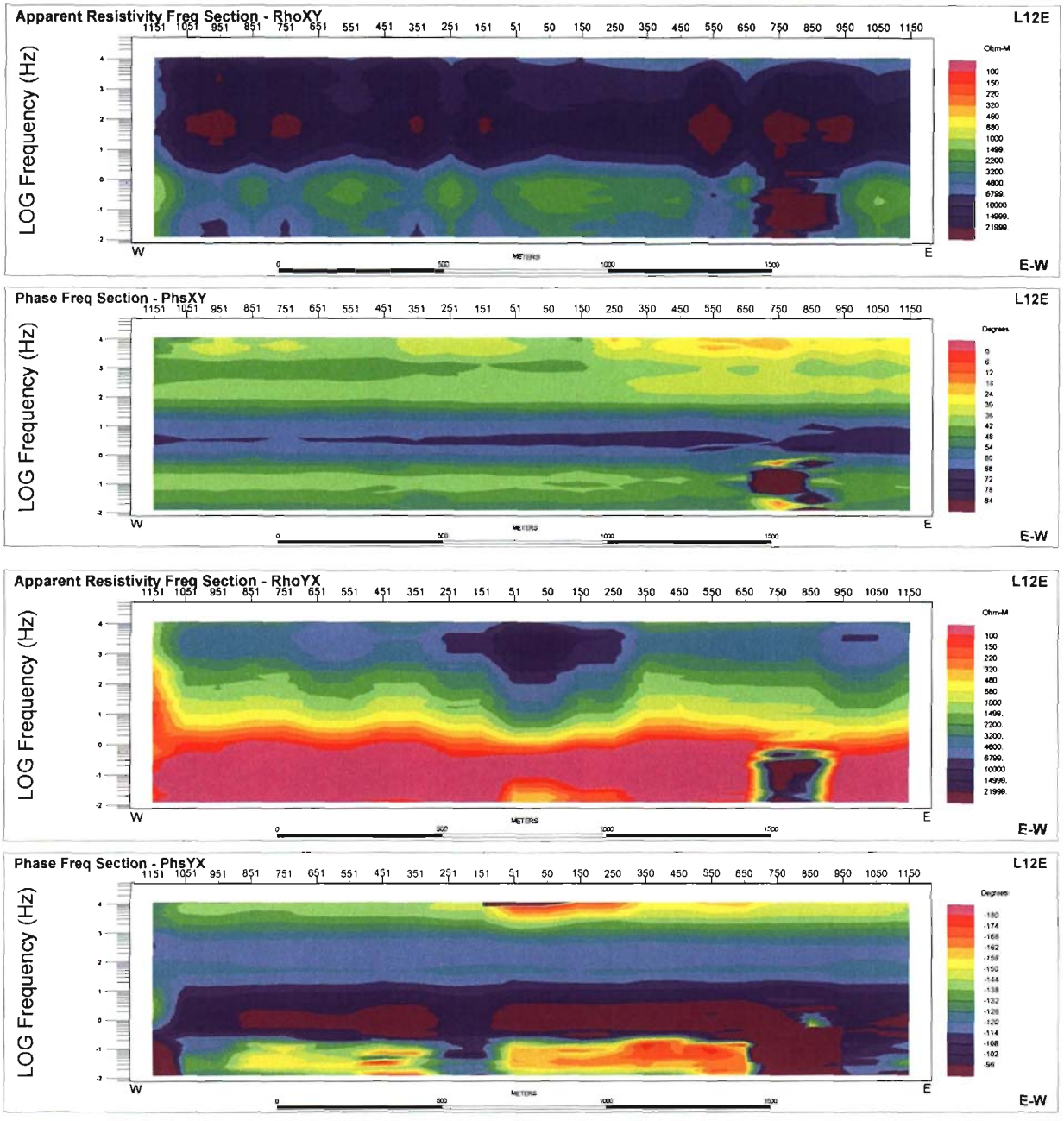
STRIP 1 (TOP) – RHO XY, STRIP 2 – RHO YX, STRIP 3 – PHASE XY, STRIP 4 (BOTTOM) – PHASE YX

LINE 8E ML GRID–APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



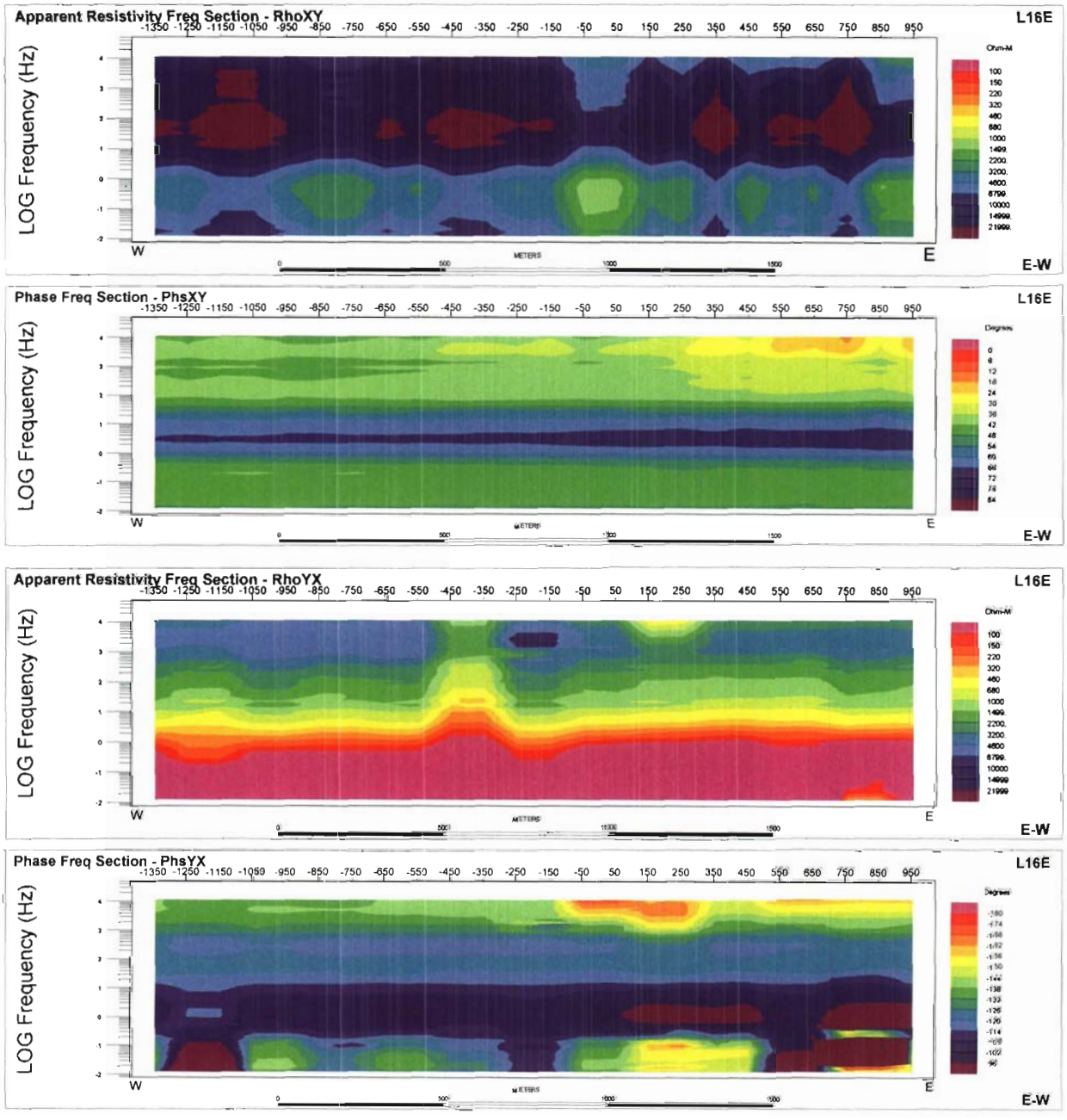
STRIP 1 (TOP) – RHO XY, STRIP 2 – RHO YX, STRIP 3 – PHASE XY, STRIP 4 (BOTTOM) – PHASE YX

LINE 12E ML GRID–APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



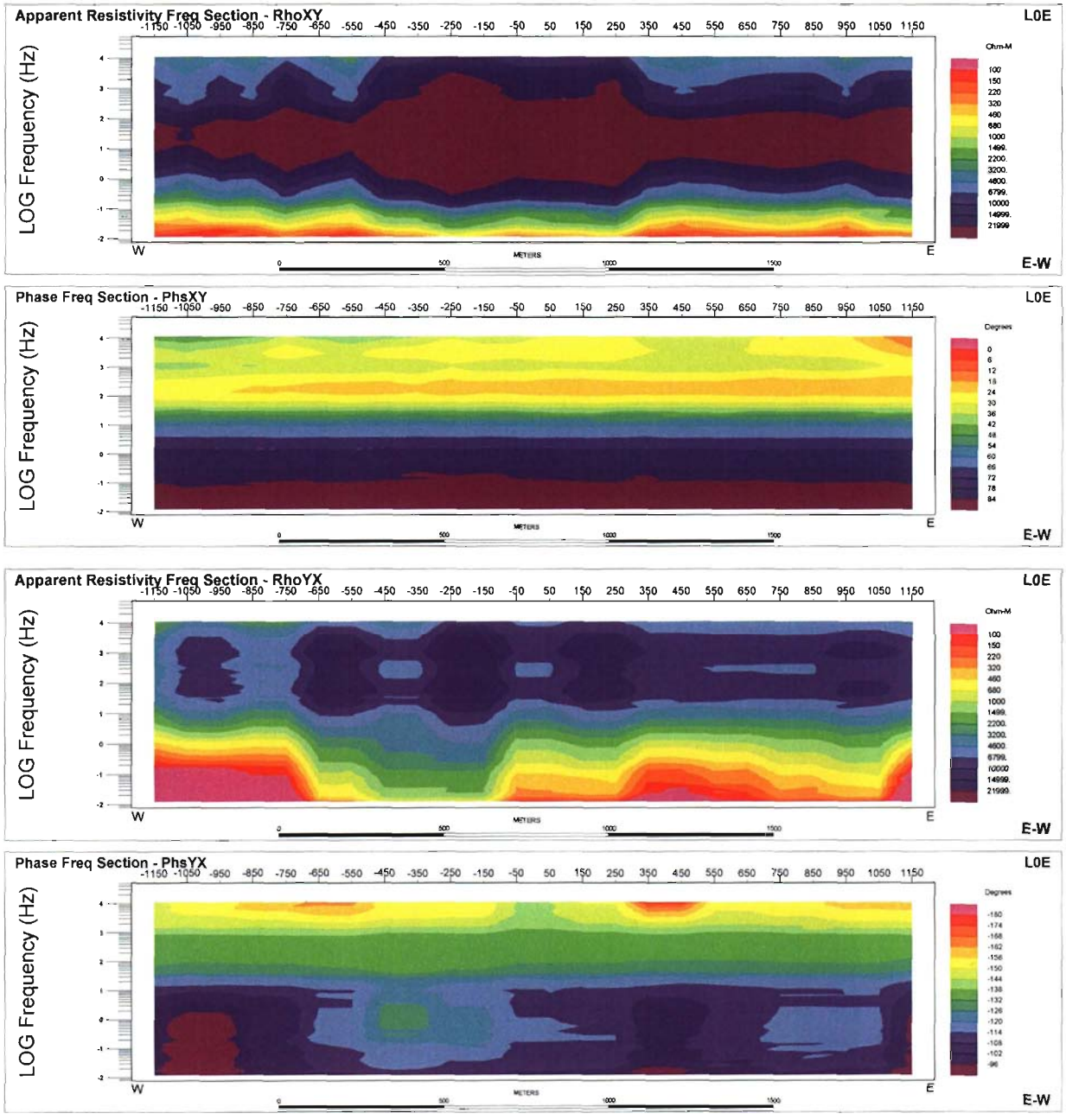
STRIP 1 (TOP) – RHO XY, STRIP 2 – RHO YX, STRIP 3 – PHASE XY, STRIP 4 (BOTTOM) – PHASE YX

LINE 16E ML GRID–APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



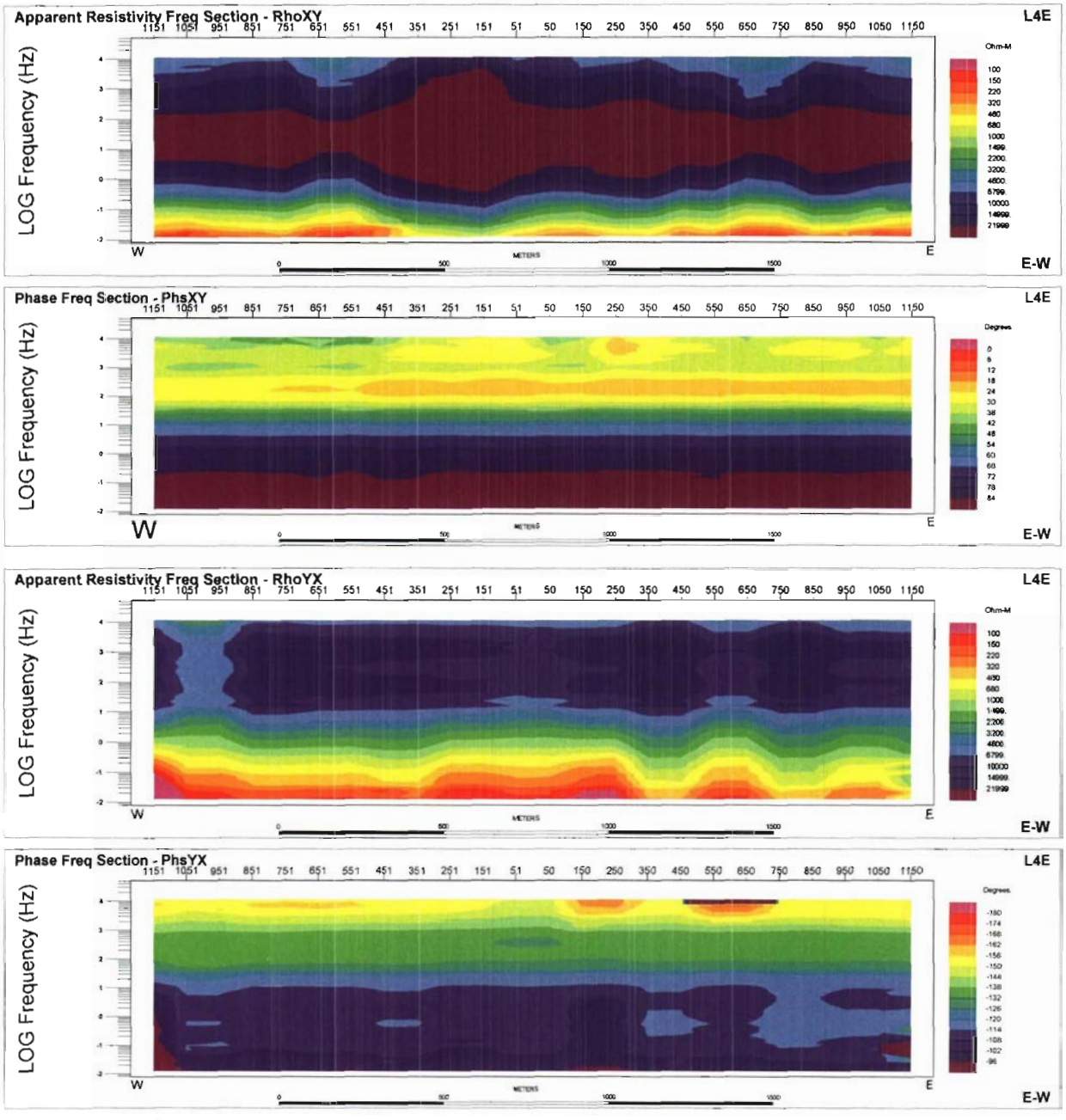
STRIP 1 (TOP) – RHO XY, STRIP 2 – RHO YX, STRIP 3 – PHASE XY, STRIP 4 (BOTTOM) – PHASE YX

LINE 0E DUCK GRID–APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



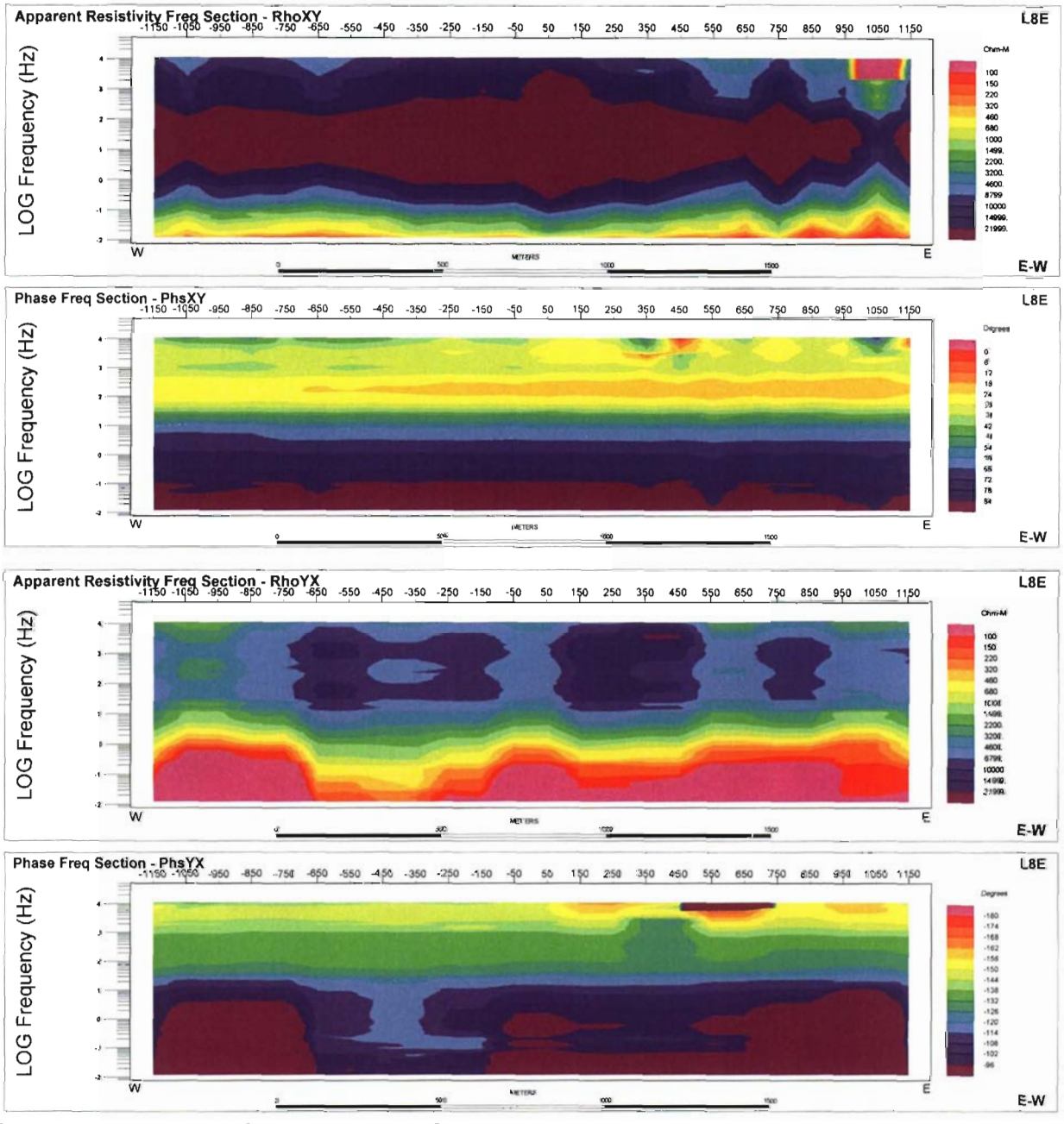
STRIP 1 (TOP) – RHO XY, STRIP 2 – RHO YX, STRIP 3 – PHASE XY, STRIP 4 (BOTTOM) – PHASE YX

LINE 4E DUCK GRID–APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



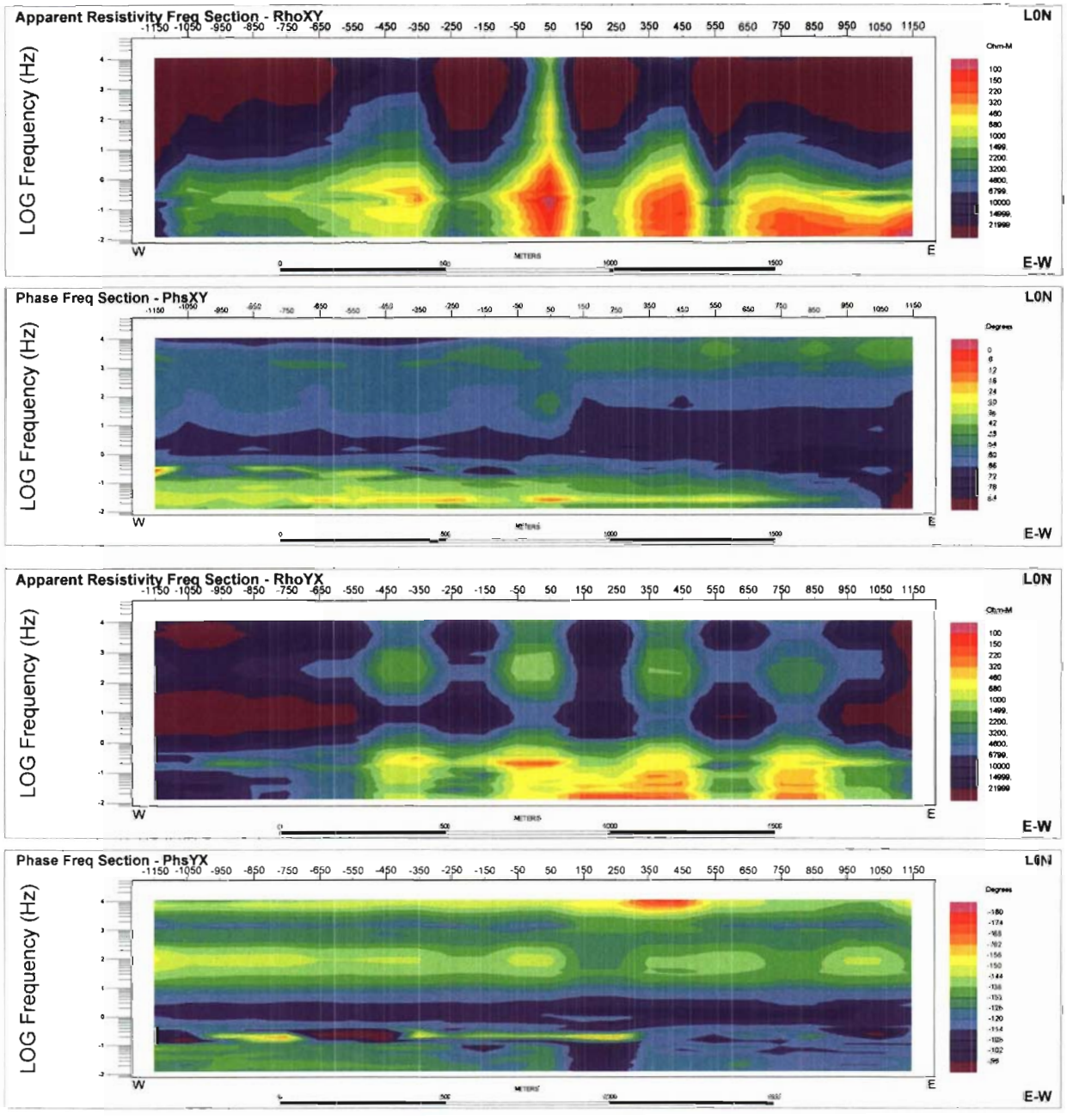
STRIP 1 (TOP) – RHO XY, STRIP 2 – RHO YX, STRIP 3 – PHASE XY, STRIP 4 (BOTTOM) – PHASE YX

LINE 8E DUCK GRID–APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



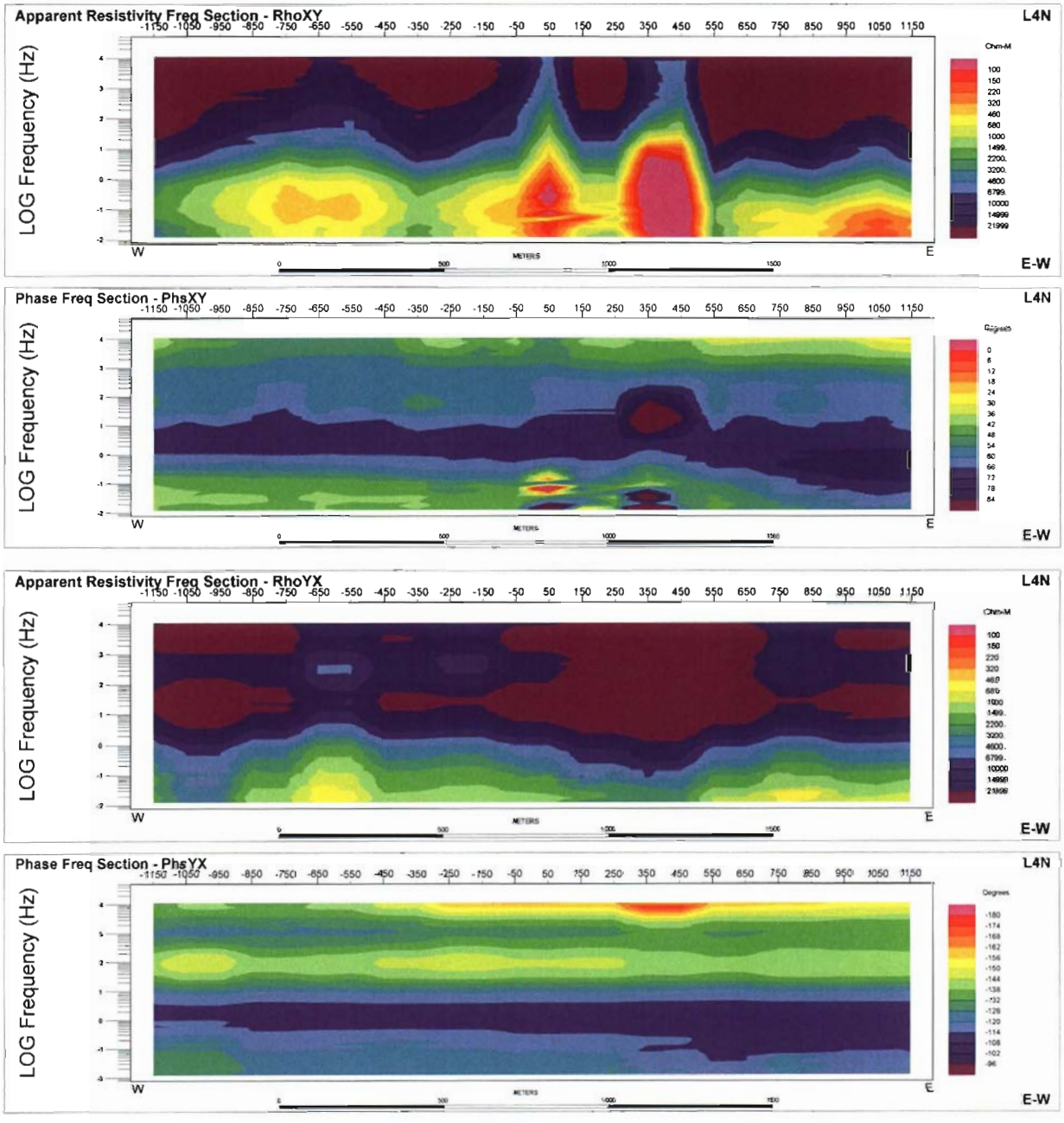
STRIP 1 (TOP) – RHO XY, STRIP 2 – RHO YX, STRIP 3 – PHASE XY, STRIP 4 (BOTTOM) – PHASE YX

LINE 0N FISHHOOK GRID –APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



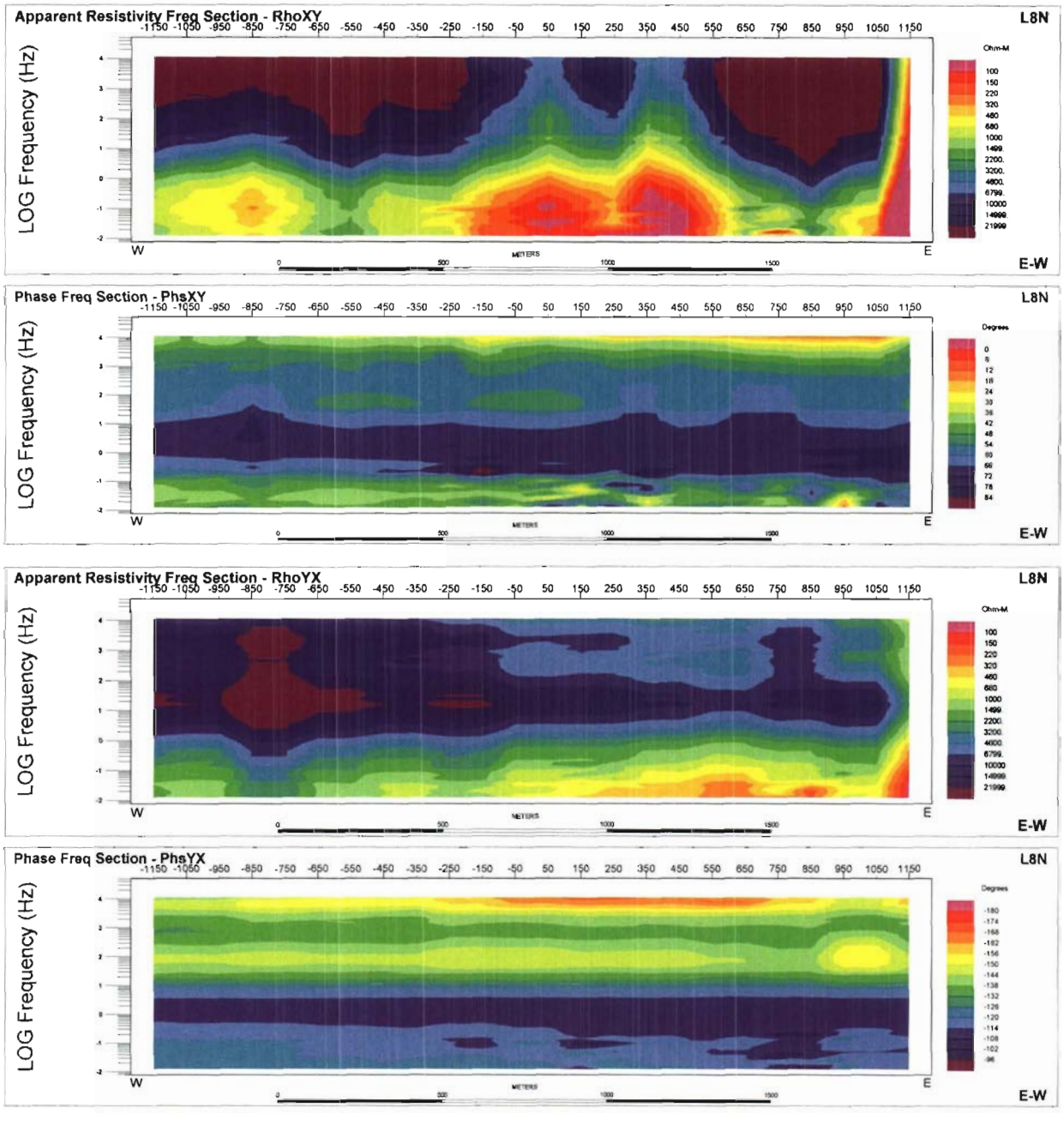
Strip 1 (top) – Rho XY, Strip 2 – Rho YX, Strip 3 – Phase XY, Strip 4 (bottom) – Phase YX

LINE 4N FISHHOOK GRID –APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



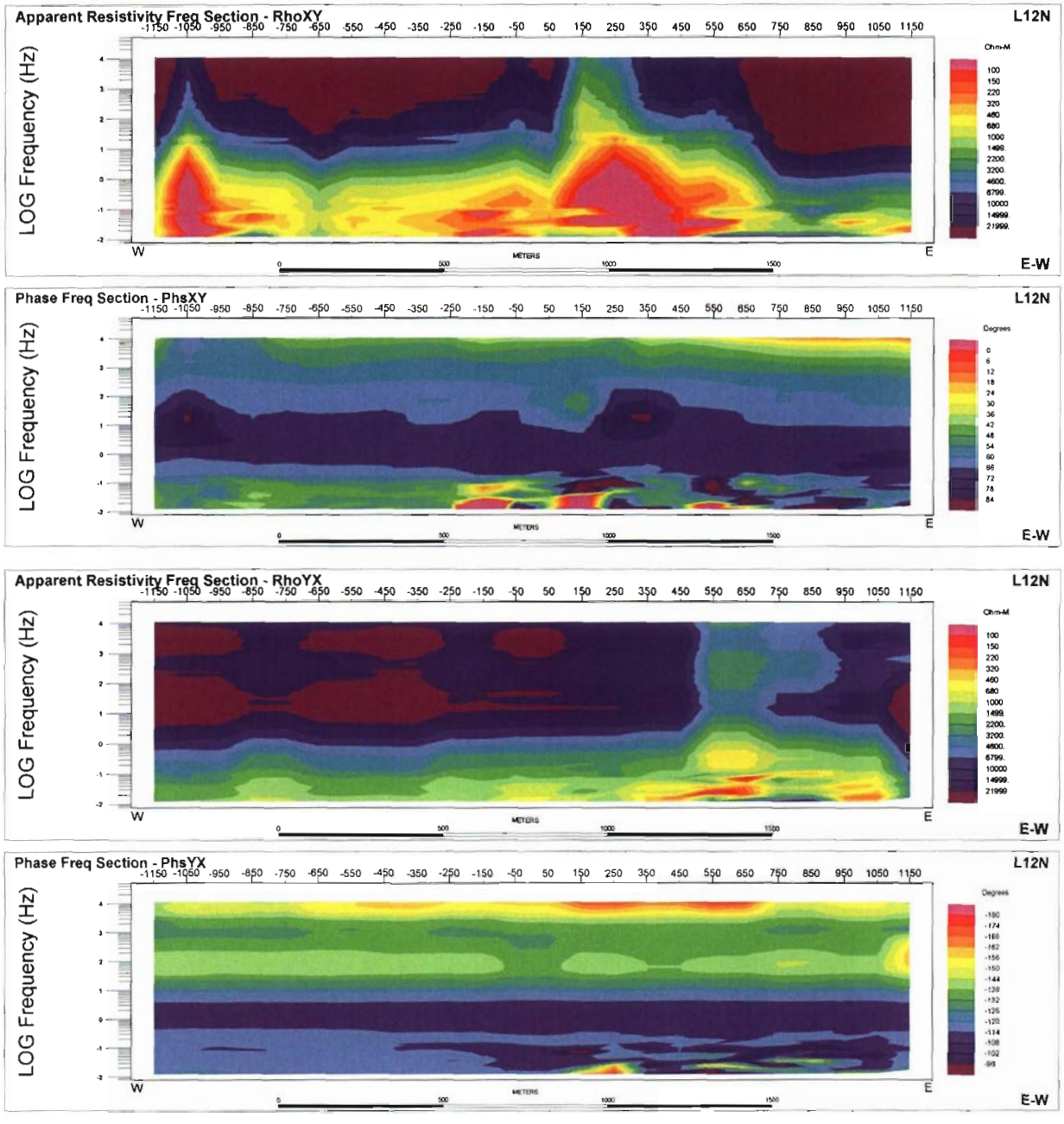
Strip 1 (top) – Rho XY, Strip 2 – Rho YX, Strip 3 – Phase XY, Strip 4 (bottom) – Phase YX

LINE 8N FISHHOOK GRID –APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



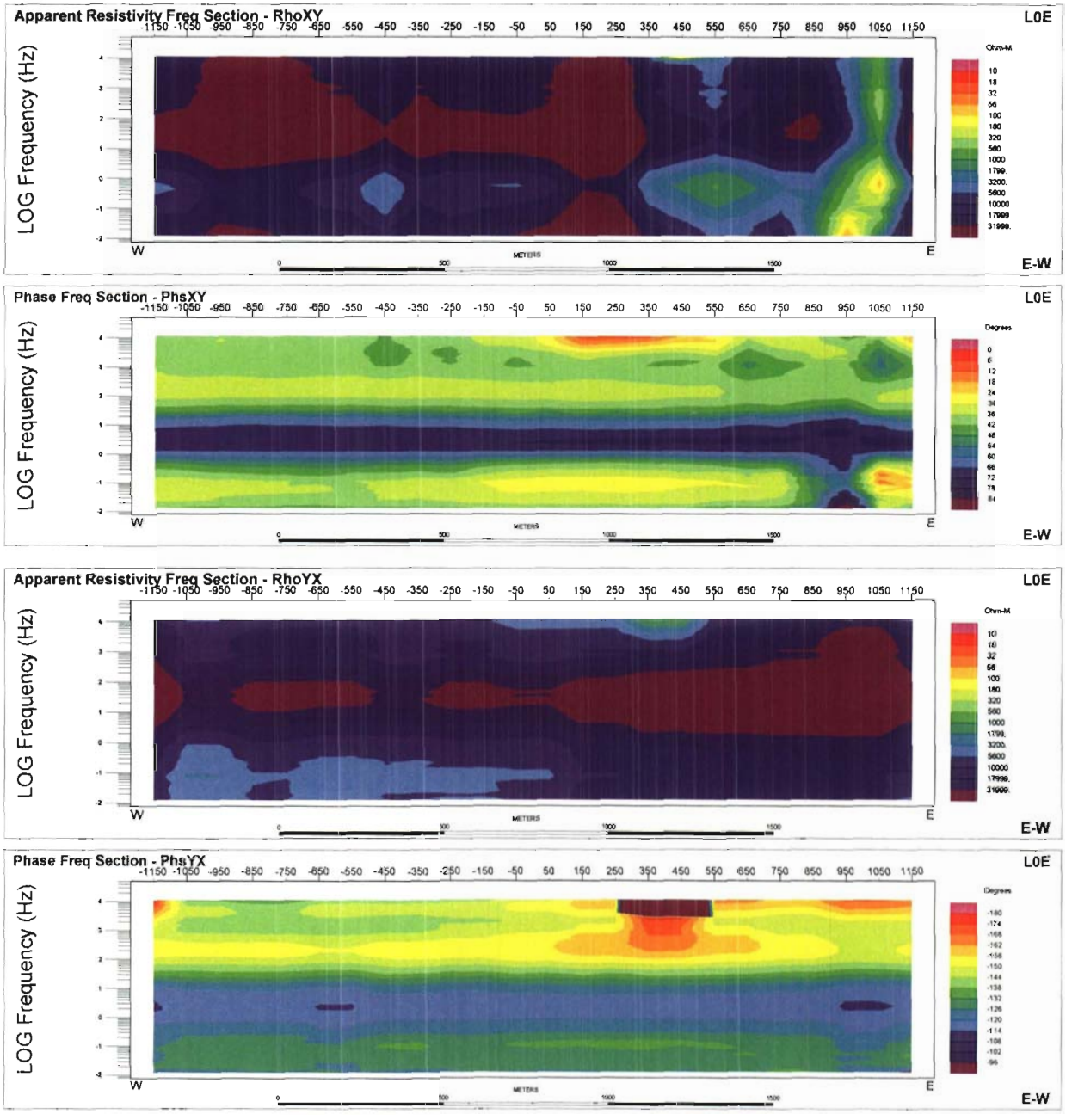
Strip 1 (top) – Rho XY, Strip 2 – Rho YX, Strip 3 – Phase XY, Strip 4 (bottom) – Phase YX

LINE 12N FISHHOOK GRID –APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



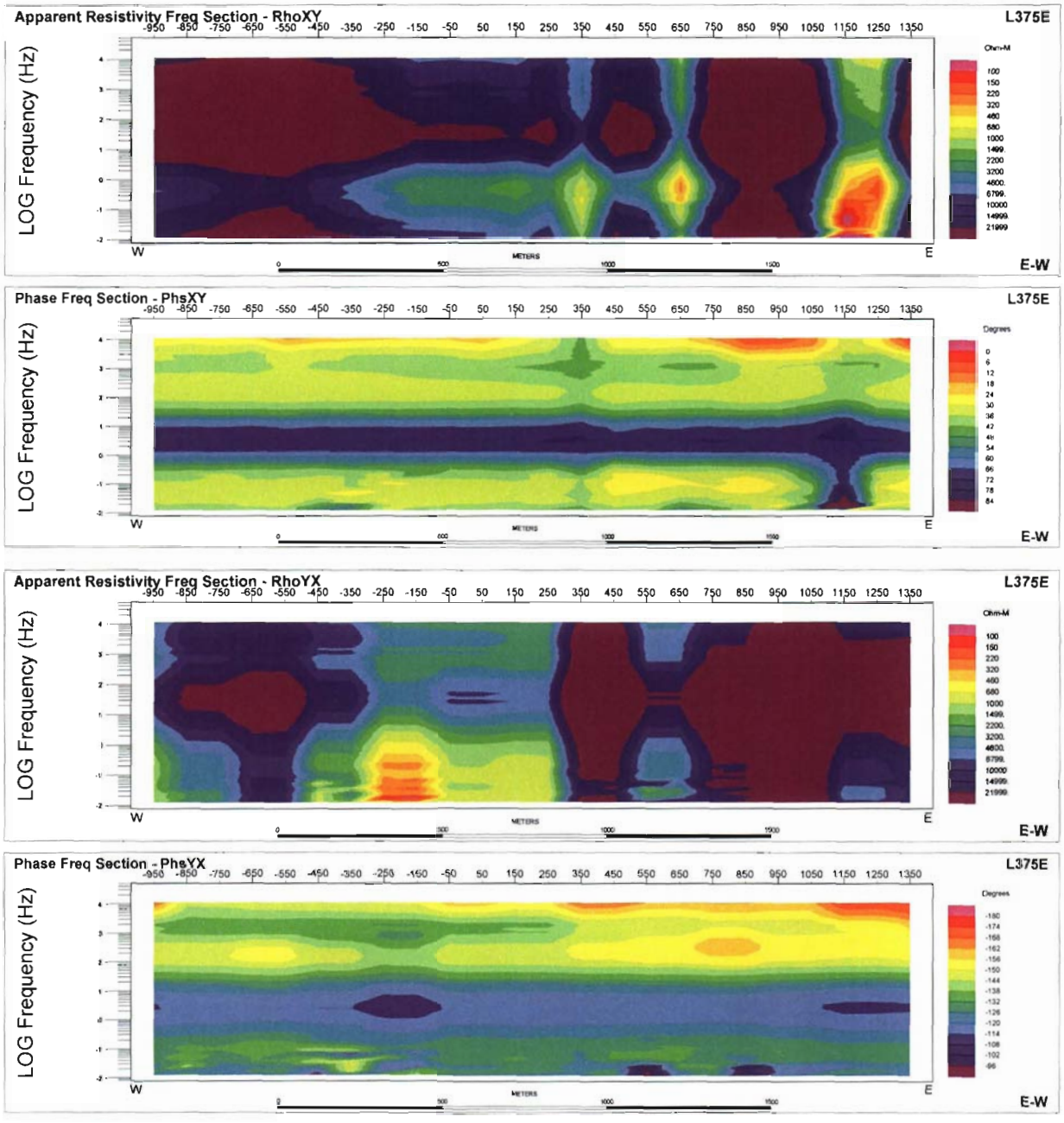
Strip 1 (top) – Rho XY, Strip 2 – Rho YX, Strip 3 – Phase XY, Strip 4 (bottom) – Phase YX

LINE 0E ZIT GRID –APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



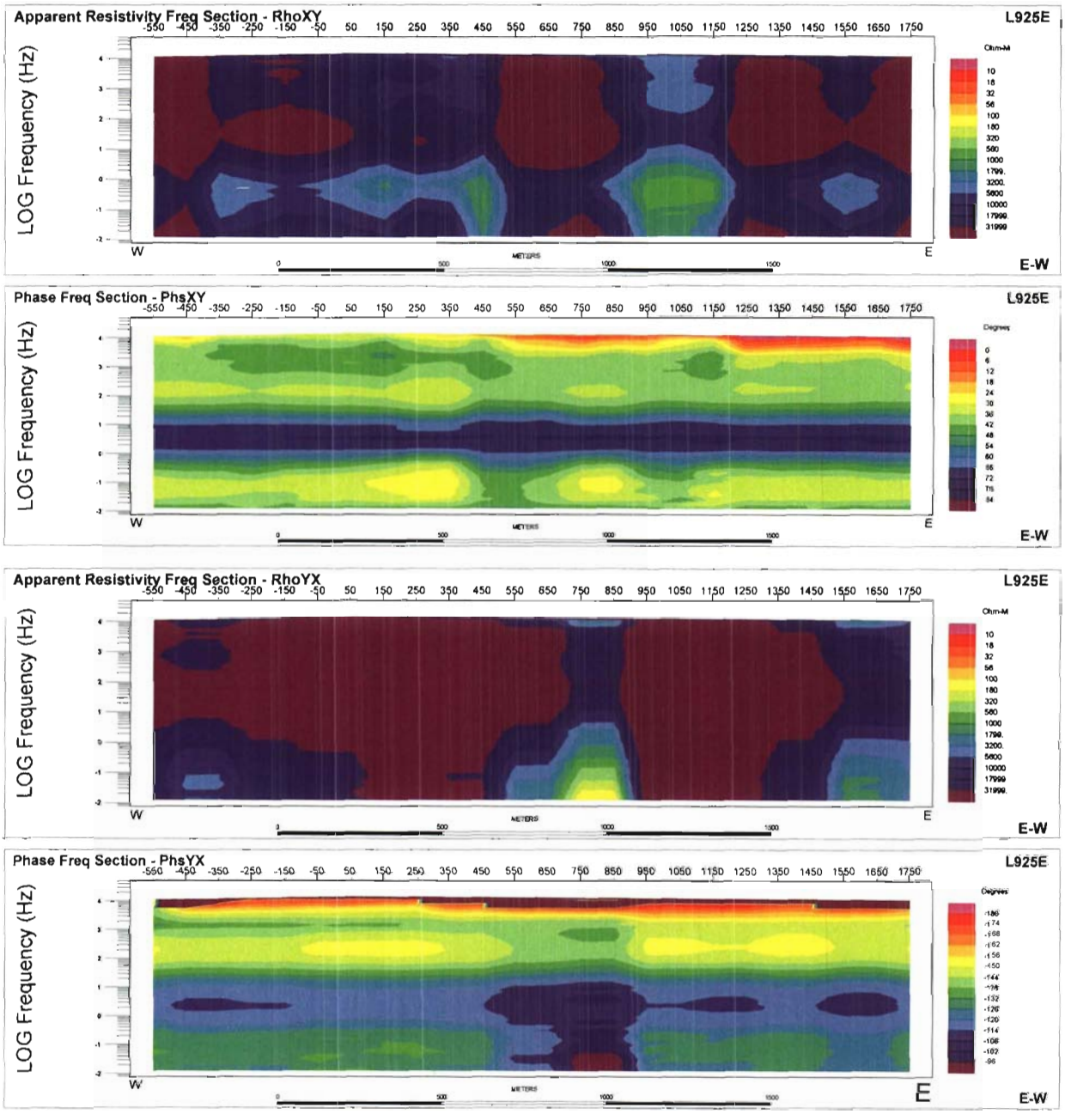
STRIP 1 (TOP) – RHO XY, STRIP 2 – RHO YX, STRIP 3 – PHASE XY, STRIP 4 (BOTTOM) – PHASE YX

LINE 375E ZIT GRID –APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



Strip 1 (top) – Rho XY, Strip 2 – Rho YX, Strip 3 – Phase XY, Strip 4 (bottom) – Phase YX

LINE 925E ZIT GRID –APPARENT RESISTIVITY AND PHASE (XY & YX) PSEUDOSECTIONS



Strip 1 (top) – Rho XY, Strip 2 – Rho YX, Strip 3 – Phase XY, Strip 4 (bottom) – Phase YX

APPENDIX F: INSTRUMENT SPECIFICATIONS

REF TEK – 120 DATA ACQUISITION SYSTEM

REFRACTION TECHNOLCGY INC. – PLANO, TEXAS
(WWW.REFTEK.COM)

SPECIFICATIONS:

Specification	Description
Physical	
Size:	267 x 248 x 184 mm 10.5 x 9.75 x 7.25 in.
Weight:	3.7kg 305 g 8 lbs (2-Channels maximum weight))
Temperature:	-40°C to 60°C operating range.
Environmental:	Operates in 1m of water without leaking for 48 hours. Airtight to 1.0 psi.
Shock:	Remains operational after 1m drop (any corner) onto cement floor.
Connectors	
Line A & Line B:	A pair of identical 10 pin U77/U style connectors. Each connector provides 3 pairs of lines (+): • A (+)/B (-) Receive telemetry data and/or commands • C (+)/D (-) Transmit telemetry data and/or commands • E (+)/F (-) Sync
Power:	PTO7A12-8S style connector. Provides input +12 VDC supplied from battery.
Sensor:	PU283/U style connector. Provides for a direct connection from the AM to the sensor.
Power Requirements	
Battery:	Two 12 volt lead acid battery (7 Ah).
Signal Input	
Input Impedance:	10 megohms, 330pF, differential
Broadband Dynamic Range:	130dB (noise power ratio test @ 125 sample per second [sps])
ADC Type:	Delta-sigma modulation
Sample Rage:	Multiple 50 to 48,000
Gain Settings:	Four – programmable for 1, 4, 16 and 64.

Sensor Input Signal Range:

Gain	24-Bit High Speed A/D		24-Bit Low Speed A/D	
	Actual	Reported	Actual	Reported
1	1.192μV	78.12mV	1.907μV	125.0mV
4	298.0nV	19.53mV	476.8nV	31.25mV
16	74.51nV	4.883mV	119.2nV	7.812mV
64	18.63nV	1.221mV	29.80nV	1.953mV

Data Storage	
Data Size:	32-bit two's compliment.
Base Memory:	128K EPROM 6.5Mb SRAM
Base Capacity:	Better than 1.5 million samples or approximately 3 hours 10 minutes continuous data @ 125 sps.

Specification	Description
AM Telemetry	
Protocol:	Full duplex synchronous data link control (SDLC).
Error Correction:	Packet acknowledge with modulo 8 sliding window.
Speed	3.072Mb/second
Encoding:	Bi-phase pulse = 1, missing pulse = 0
Line Impedance:	100 Ohm
Synchronization	
Timing:	Each AM on-line is timed and synchronized for simultaneous sampling within + 1.50 μsecond.
Protection	
Electrical Protection:	Line A and Line B signals circuits are protect by: • A surge arrestor located on the RT514 board (SS1-14). • A line isolation transformer located on the RT514 board (T1-6) with over-voltage diodes (D1-4) on both sides of each secondary windings.
State-of-Health	
Information Provided:	The AM reports information on battery status, clock setting, gain setting, calibration mode and the communications link.

ACQUISITION PARAMETERS

Acquisition parameters include the sample rate, transmitter frequency and number of samples desired. The operator can also determine whether the AMs calibration signal is activated during data collection. In typical use, the acquisition parameters are set according to the specific application configuration and event type. For each event type, several recording sessions are made, each at a different transmitter frequency and sample rate. The recording period is set based on event type and transmitter frequency. The listing below shows several examples of event type, typical transmitter frequency (Hz), sample rates (with applicable ADC resolution) and the corresponding number of samples (record period).

Event Type	Transmit Frequency	Sample Rate	ADC Resolution	Number of Sample
Geophysical Response	375 Hz	48,000	24	124,032
Gain Test	375	48,000	24	65,536
Geophysical Response	75	9,600	24	130,176
Gain Test	75	9,600	24	65,536
Geophysical Response	25/8	3,200	24	139,264
Gain Test	25/8	3,200	24	32,768
Sensor Impedance	N/A	1,600	24	8,704
Ambient Noise	N/A	1,600	24	8,192
Geophysical Response	25/128	800	24	147,456
Gain Test	25/128	800	24	16,384
Geophysical Response	25/2048	100	24	212,992
Gain Test	25/256	100	24	4,096
Gain Test	N/A	50	24	4,096
Geophysical Response	N/A	50	24	65,536

SENSOR CALIBRATION

The AM can source a 12.5Hz, 50μA signal to the sensor input for measuring the source impedance of the attached sensor. The user can also specify frequency in amplitude of calibration signal.

TELEMETRY CABLE

The telemetry cable is a *Category V* specification cable and is supplied by the customer.

SAMPLE RATES

The following table shows all available sample rates, based on a 12.288 Mhz oscillator. A 24-bit resolution ADC is used for sample rates 48000 through 4800 and a 24-bit resolution ADC is used for sample rates 3200 and below. The correct ADC is selected automatically by the AM, based on the sample rate.

Typically, different sample rates and transmitter frequencies are used in 50 Hz and 60 Hz power environments to minimize AC power effects on the data. In the table, the shaded areas indicate the sample rates typically used in a 60 Hz power environment. A few rates are typically used in both environments.

Sample Rate	Power Line
48000	50 & 60
24000	50 & 60
19200	60
16000	50
12000	50 & 60
9600	50 & 60
6400	50
4800	60
3200	50
1920	60
1600	50
960	60
800	50
480	60
400	50
240	60
200	50
120	60
100	50
60	60
50	50
60/2	60
50/2	50
60/4	60
50/4	50
60/8	60
50/8	50
60/16	60
50/16	50
60/32	60
50/32	50

APPENDIX F: INSTRUMENT SPECIFICATIONS

EMI – ELECTROMAGNETIC INSTRUMENTS INC

NOW EMI TECHNOLOGY CENTER – SCHLUMBERGER – BERKELEY, CA –
(WWW.EMIINC.COM)

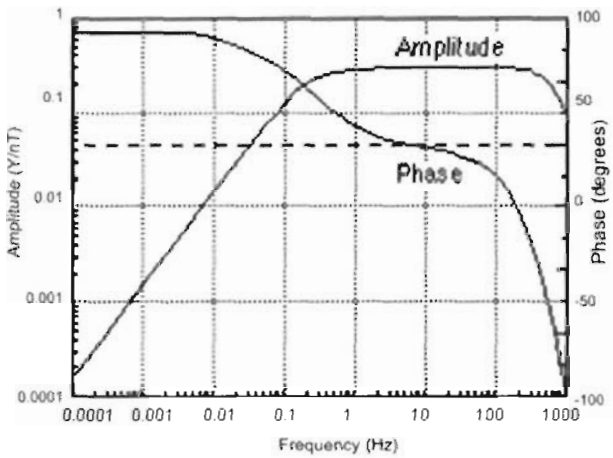
BF-4 Series Magnetic Sensors

SPECIFICATIONS:

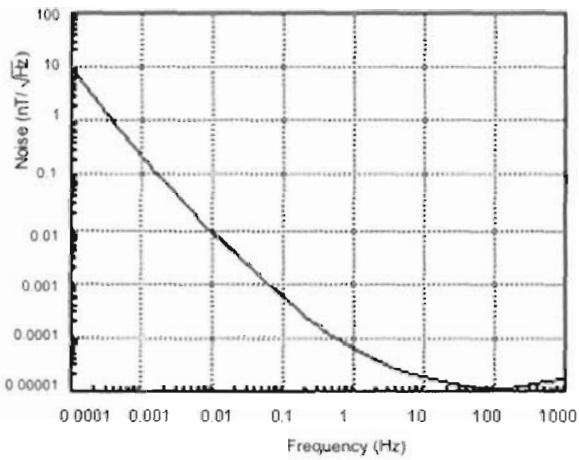
BF-4 Magnetic Field Induction Sensor

The BF-4 sensor utilizes a magnetic feedback design to provide a stable flat response over several decades of frequency. The sensors respond as a B field detector over the flat band regions. Both the amplitude and phase responses are highly stable with variations of less than 0.1dB in amplitude and +/- one degree in phase between sensors. For the frequencies below the flat response region, the sensor response is proportional to signal frequency so that the sensor acts as a dB/dt detector. The coil is potted with epoxy and housed inside a rugged impact-resistant Nema G-10 fiberglass tube. A matched low noise preamplifier is connected to the coil in a waterproof case and powered by an external +/- 12V power supply.

BF-4 Frequency Response



BF-4 Sensor Noise



Features

- High sensitivity
- Very low noise
- Magnetic feedback design
- Chopper stabilized amplifier for best low frequency performance
- Ruggedized and waterproof
- Light weight and compact
- Low power consumption
- Stable phase response

Applications

- Magnetotellurics
- Audiomagnetotellurics
- Controlled-source electromagnetics
- Magnetometric resistivity

Technical Specifications

Performance

- Frequency Range: 0.0001 to 1000 Hz
- 3 dB frequency corners: 0.2 Hz, 500 kHz
- Sensitivity (flat region): 0.3 V/nT (standard)
- Power consumption: 12mA at +/-12V

Physical

- Housing: Nema G-10 straight tube
- Length: 142 cm (56 inches)
- Diameter: 6 cm (2.4 inches)
- Weight: 7 kg (15 lbs)
- Connector: 8-pin Tajimi

APPENDIX F: INSTRUMENT SPECIFICATIONS

EMI – ELECTROMAGNETIC INSTRUMENTS INC

NOW EMI TECHNOLOGY CENTER – SCHLUMBERGER – BERKELEY, CA –
(WWW.EMIINC.COM)

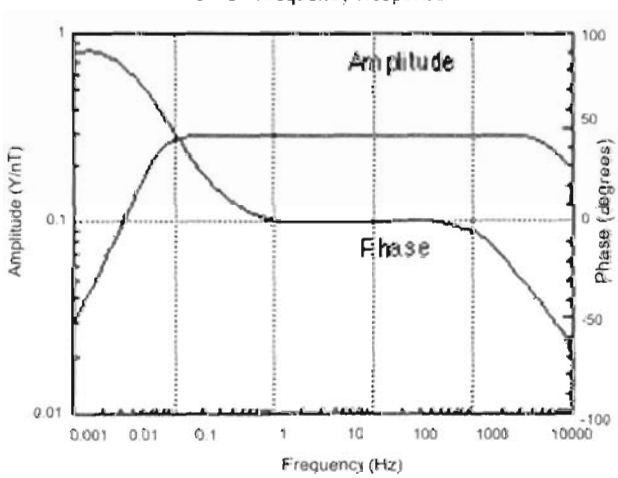
BF-6 Series Magnetic Sensors

SPECIFICATIONS:

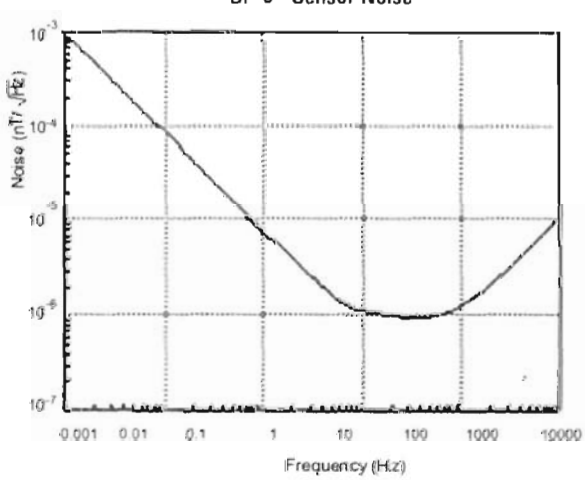
BF-6 Magnetic Field Induction Sensor

The BF-6 sensor utilizes a magnetic feedback design to provide a stable flat response over several decades of frequency. The sensors respond as a B field detector over the flat band regions. Both the amplitude and phase responses are highly stable with variations of less than 0.1dB in amplitude and +/- one degree in phase between sensors. For the frequencies below the flat response region, the sensor response is proportional to signal frequency so that the sensor acts as a dB/dt detector. The coil is potted with epoxy and housed inside a rugged impact-resistant ABS tube. A matched low noise preamplifier is connected to the coil in a waterproof case and powered by an external +/- 12V power supply.

BF-6 Frequency Response



BF-6 Sensor Noise



Features

- High sensitivity
- Very low noise
- Magnetic feedback design
- Ruggedized and waterproof
- Light weight and compact
- Low power consumption (210 mW)
- Stable phase response

Applications

- Magnetotellurics
- Audiomagnetotellurics
- Controlled-source electromagnetics
- Magnetometric resistivity
- Time domain electromagnetics

Technical Specifications

Performance

- Frequency Range: 1 Hz to -100 kHz or 1 Hz to 25 kHz
- 3 dB frequency corners: 10 Hz, 25 kHz or 10 Hz, 100 kHz
- Sensitivity (flat region): 0.3 V/nT (standard)
- Power consumption: 9mA at +/-12V

Physical

- Housing: High Impact ABS Straight Tube
- Length: 73 cm (29 inches)
- Diameter: 5 cm (2 inches)
- Weight: 1.7 kg (3.7 lbs)
- Connector: 8-pin Tajimi

APPENDIX F: INSTRUMENT SPECIFICATIONS

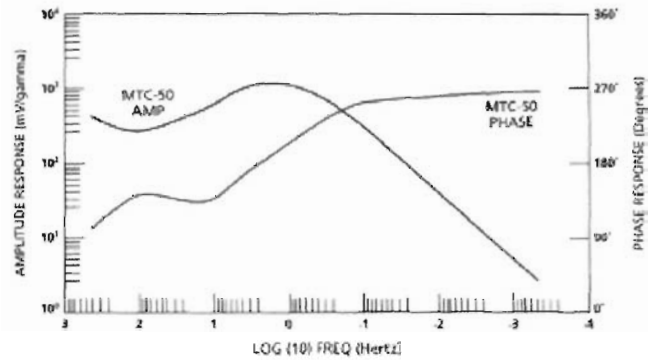
PHOENIX GEOPHYSICS LTD
(WWW.PHOENIX-GEOPHYSICS.COM)

MTC 50 (P50) Serie Magnetic Sensors

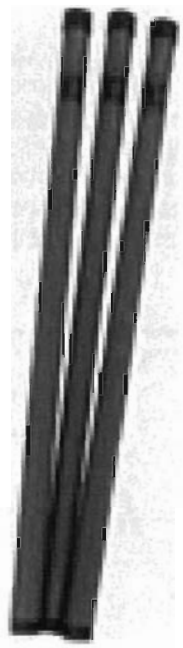
SPECIFICATIONS:

MTC-50 magnetic sensor coils weigh just over 10 kg, and measure only 141 cm. They provide magnetotelluric data at frequencies between 400 Hz to 0.0002 Hz.

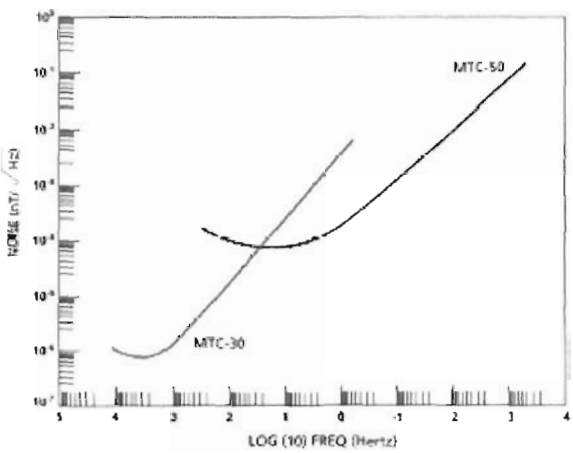
AMPLITUDE AND PHASE RESPONSE MTC-50 SENSOR



Coil model MTC-50	
Overall Length	141 cm
Outside Diameter	6.0 cm
Weight	10.5 kg
Frequency Range (for MT)	400 Hz to 0.00002 Hz



TYPICAL SPECTRAL PLOT OF SENSOR NOISE



Technical Specifications

- Overall Length : 141 cm
- Outside Diameter : 6.0 cm
- Weight : 10.5 kg
- Frequency Range (for MT) : 400 Hz to 0.00002 Hz

APPENDIX G: PARALLEL SENSOR TEST

Date: Aug 17, 2008

Report: Danny Chan

Staff: Badden Luszler
Nick Knotchuk
Joey Plouffe

1. Introduction

Location:

	Location: UTM NAD83 / Zone 17T	
	Easting	**Northing**
Remote site	0553420	5179267

Coil Azimuth: 110° true

Results:

P50-2387 – Coil not coherent with other coils, marked as bad and will not be used.

P50-2392 – Coherency and Amplitude deficiency, task as spare coil.

P50-2388 – Slight coherency deficiency, task to remote site as crossline coil.

BF6-0303 – Slight amplitude deficiency, task as spare coil.

BF6-0316 – Coherency and Amplitude deficiency, task as spare coil.

2. Low Frequency Coils

Available Coils:

TS Strip	Manufacturer	Serial #	Tasked To
1	Phoenix	P50-2387	BAD – Will not be used
2	Phoenix	P50-2388	Remote – Hy
3	Phoenix	P50-2389	Remote – Hx
4	Phoenix	P50-2390	Line – Hx
5	Phoenix	P50-2391	Line – Hy
6	Phoenix	P50-2392	Spare

Processing Parameters:

Parameter	Value
QuickLay Version	2.30.14
PSD Method	Welch
Window	Hanning
Window length	2048
Segment Overlap	50%

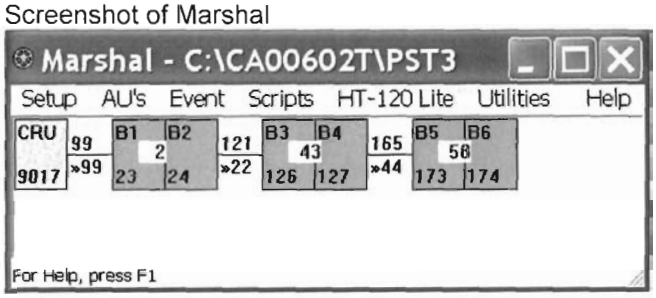
Results:

P50-2387- In the coherency plot (Figure 2-3) P50-2387 clearly shows a significant low coherency with other 5 coils. Multiply short test events were taken to verify P50-2387 coherency. Result were all the same, P50-2387 is not coherent with the other 5 coils, hence, P50-2387 is marked as bad and will not be used.

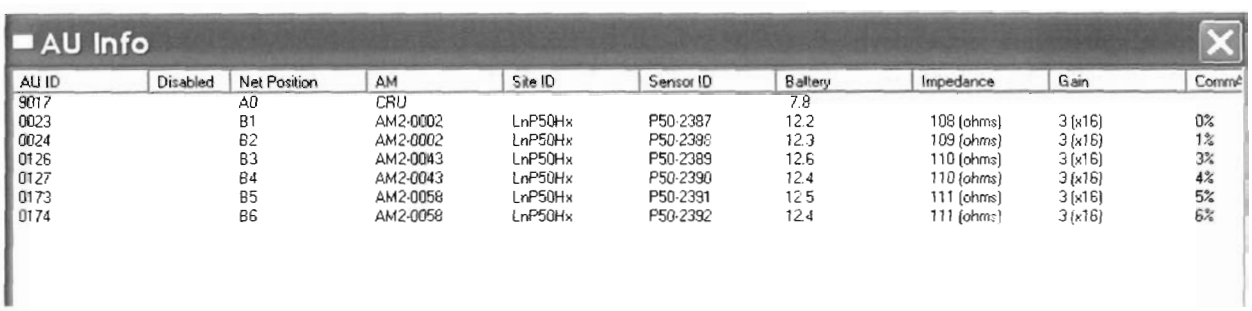
P50-2392 – Overall this coil tracks well, however, at frequency range of 45 – 50 Hz, P50-2392 coherency slightly decreased (Figure 2-3). Furthermore, P50-2392 has the lower amplitude time series in the PSD plot (Figure 2-3). Hence, this coil is task as spare coil.

P50-2388 – A slight decrease in coherency in the range of 15 – 25 Hz (Figure 2-3), therefore this coil is task to remote site as crossline coil.

Screenshot of Marshal



Screenshot of AUs



2.1 Test Results: 120sps

Titan NetEvent: 17
Sample Rate: 120sps
TS Length: 250,000 samples (~35min)

Time Series

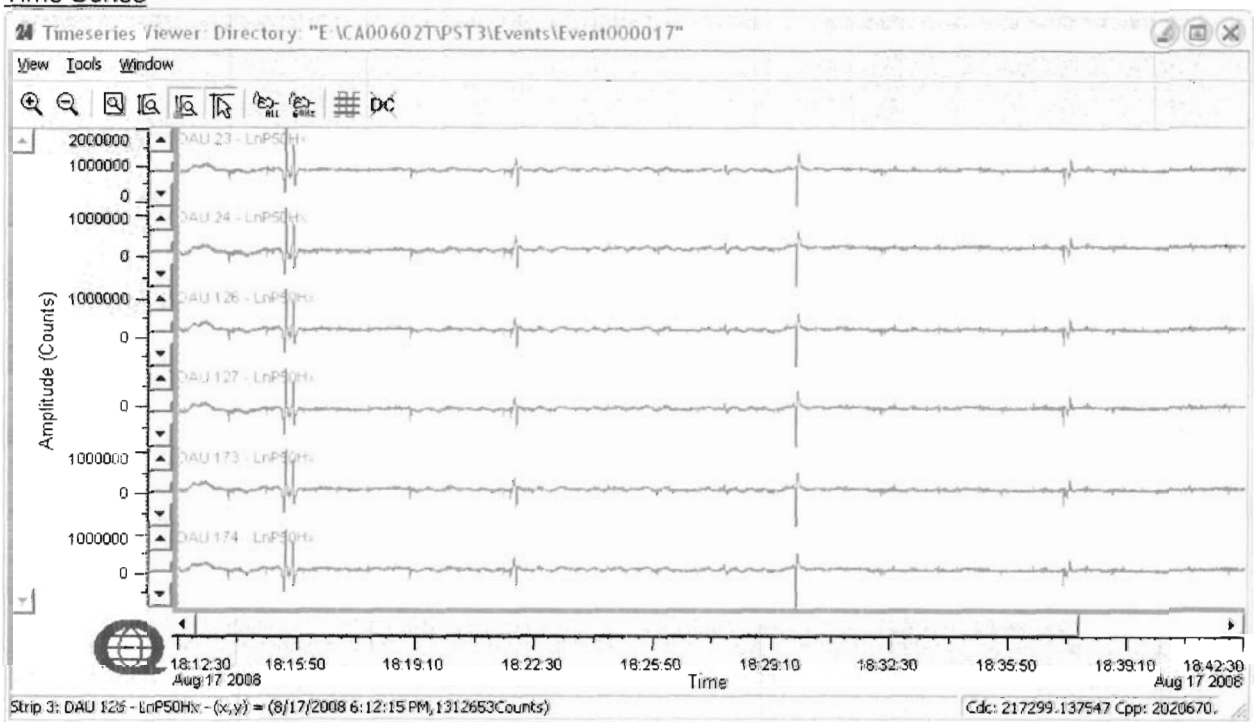


Figure 2-1: Complete time series at 120sps

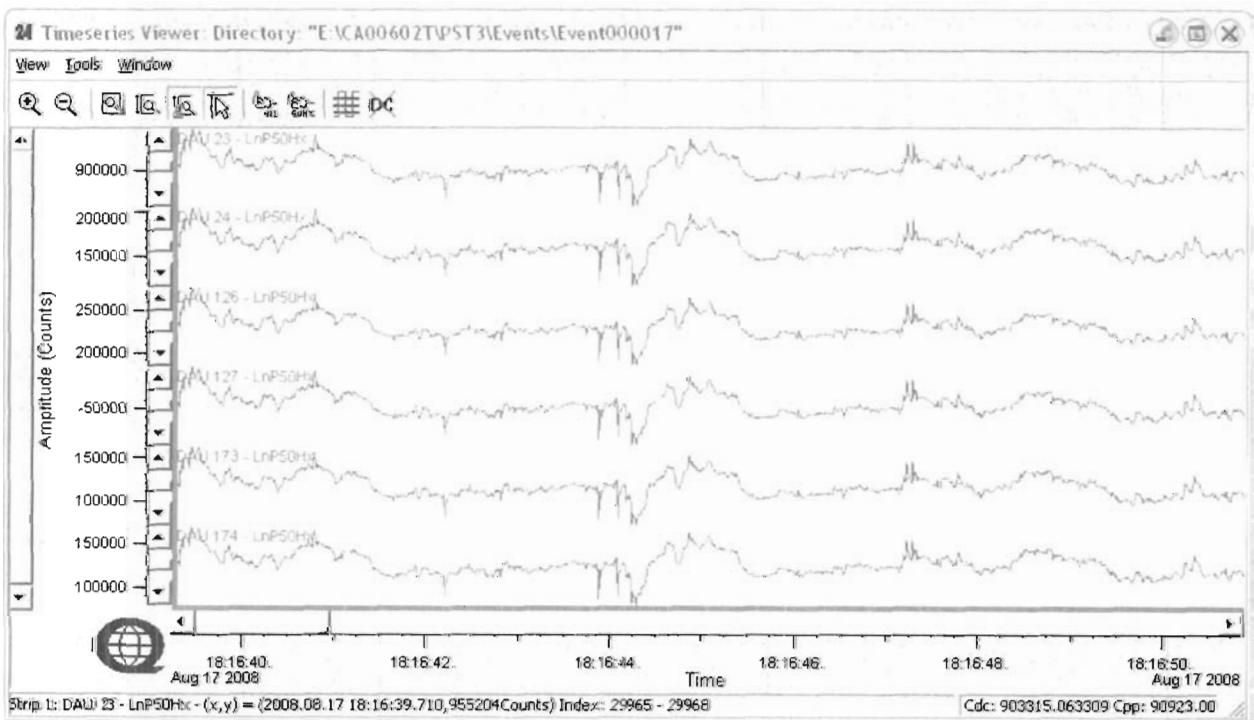


Figure 2-2: Time series focused in on ~10s at 120sps

Low Frequency Coil Results: 120sps
Coherency to P50-2391

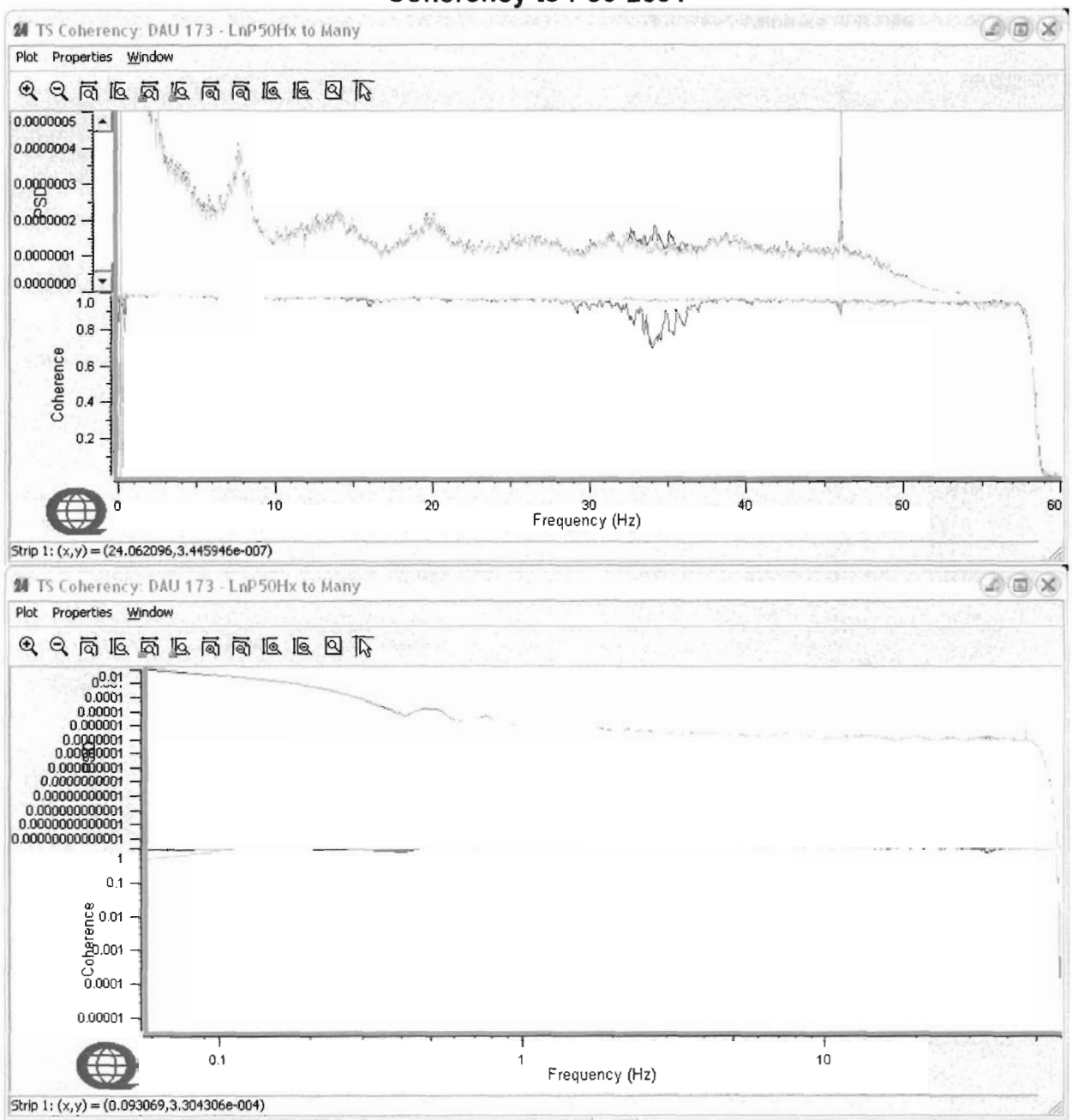


Figure 2-3: Coherencies are referenced to P50-2391 (Magenta) Upper linear, lower logarithmic frequency scales.

Colour	Channel
Blue	P50-2387
Green	P50-2388
Red	P50-2389
Cyan	P50-2390
Magenta	P50-2391
Yellow	P50-2392

3. High Frequency Coils

Available Coils:

TS Strip	Manufacturer	Serial #	Tasked To
1	EMI	BF6-0302	Line – Hy
2	EMI	BF6-0303	Spare
3	EMI	BF6-0304	Line – Hx
4	EMI	BF6-0305	Remote – Hy
5	EMI	BF6-0306	Remote – Hx
6	EMI	BF6-0316	Spare

Processing Parameters:

Parameter	Value
QuickLay Version	2.30.14
PSD Method	Welch
Window	Hanning
Window length	8192
Segment Overlap	50%

Results:

BF6-0316 – In the 48ksps and 9600sps Coherency plot (Figure 2-5 and 2-8), BF6-0316 seem to yield a less coherency time series. Furthermore, its amplitude in the PSD plot also shows a lower signal. Hence, this coil is task as spare coil.

BF6-0303 – Overall this coil tracks well and also display a good coherency time series. However, in the 48ksps PSD plot (Figure 2-5), it shows a significant decrease of amplitude. This may possibly be due to calibration error. Hence, this coil is task as spare coil.

3.1 Test Results: 48ksps

Titan NetEvent: 14.
Sample Rate: 48ksps
TS Length: 1,000,000 samples (~30s)

Time Series

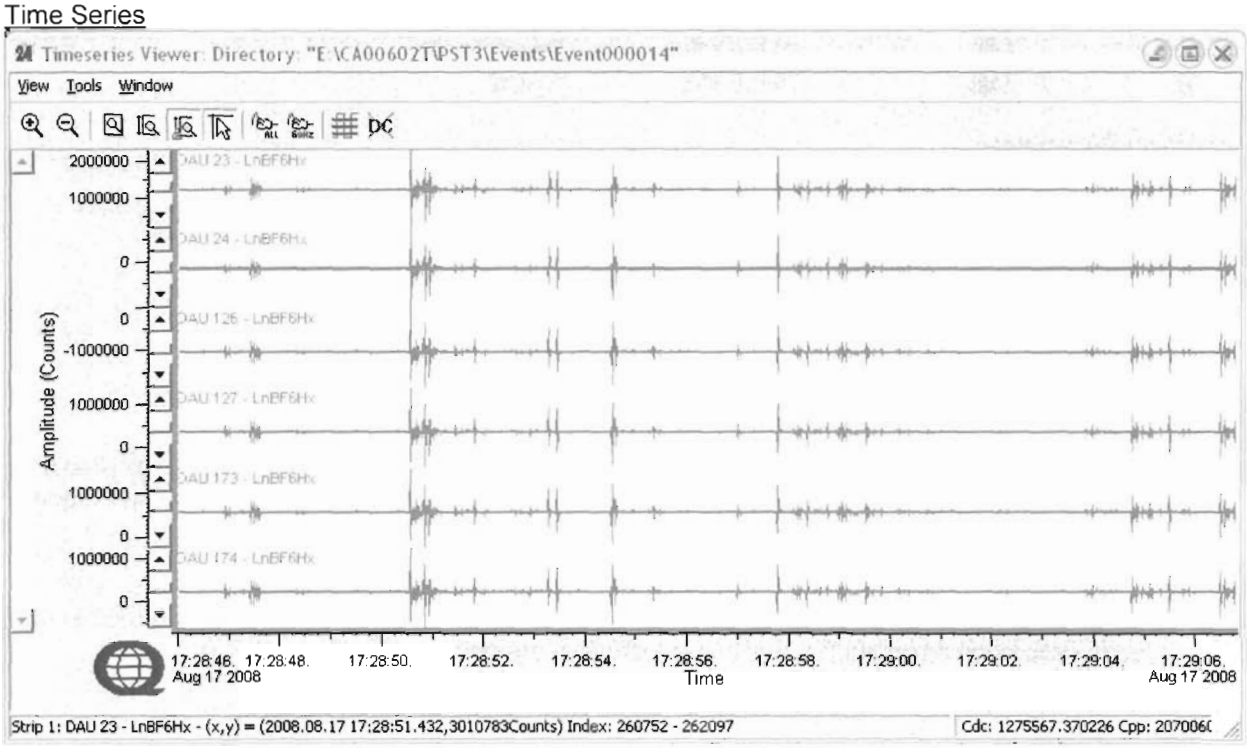


Figure 3-1: Complete time series at 48ksps

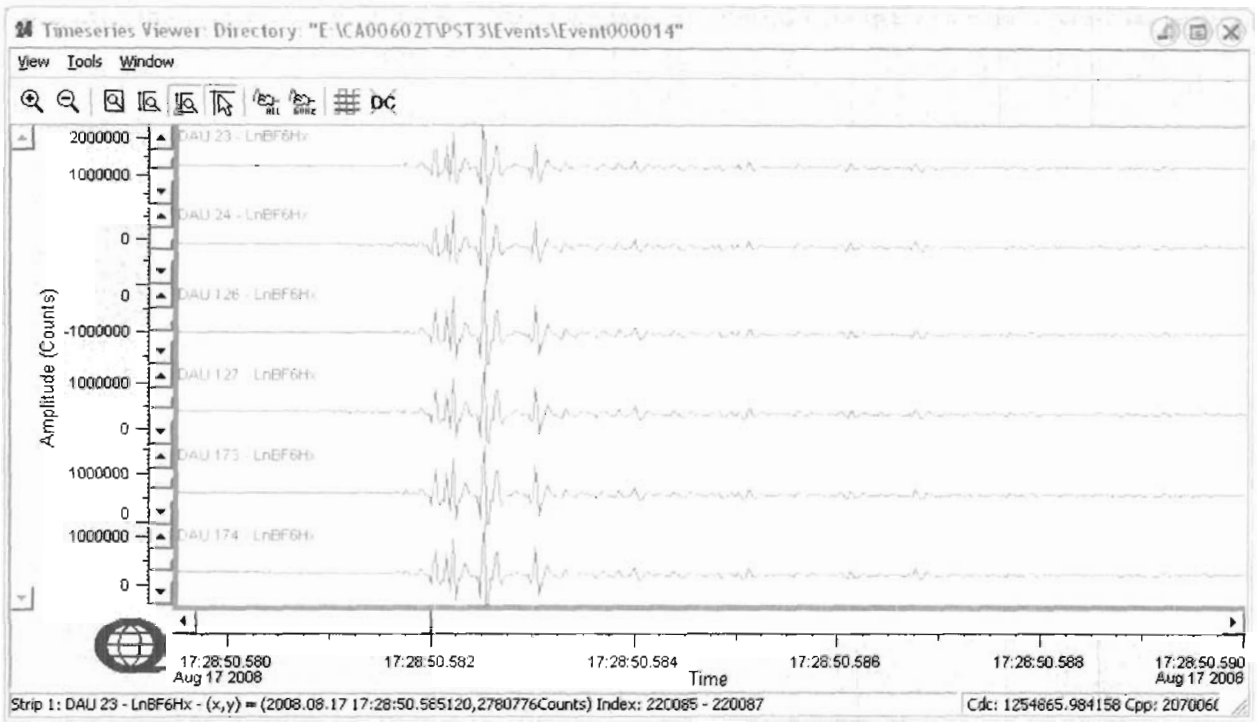


Figure 3-2: Time series focused in on ~0.01ms at 48ksps

High Frequency Coil Results: 48ksps
Coherency to BF6-0302

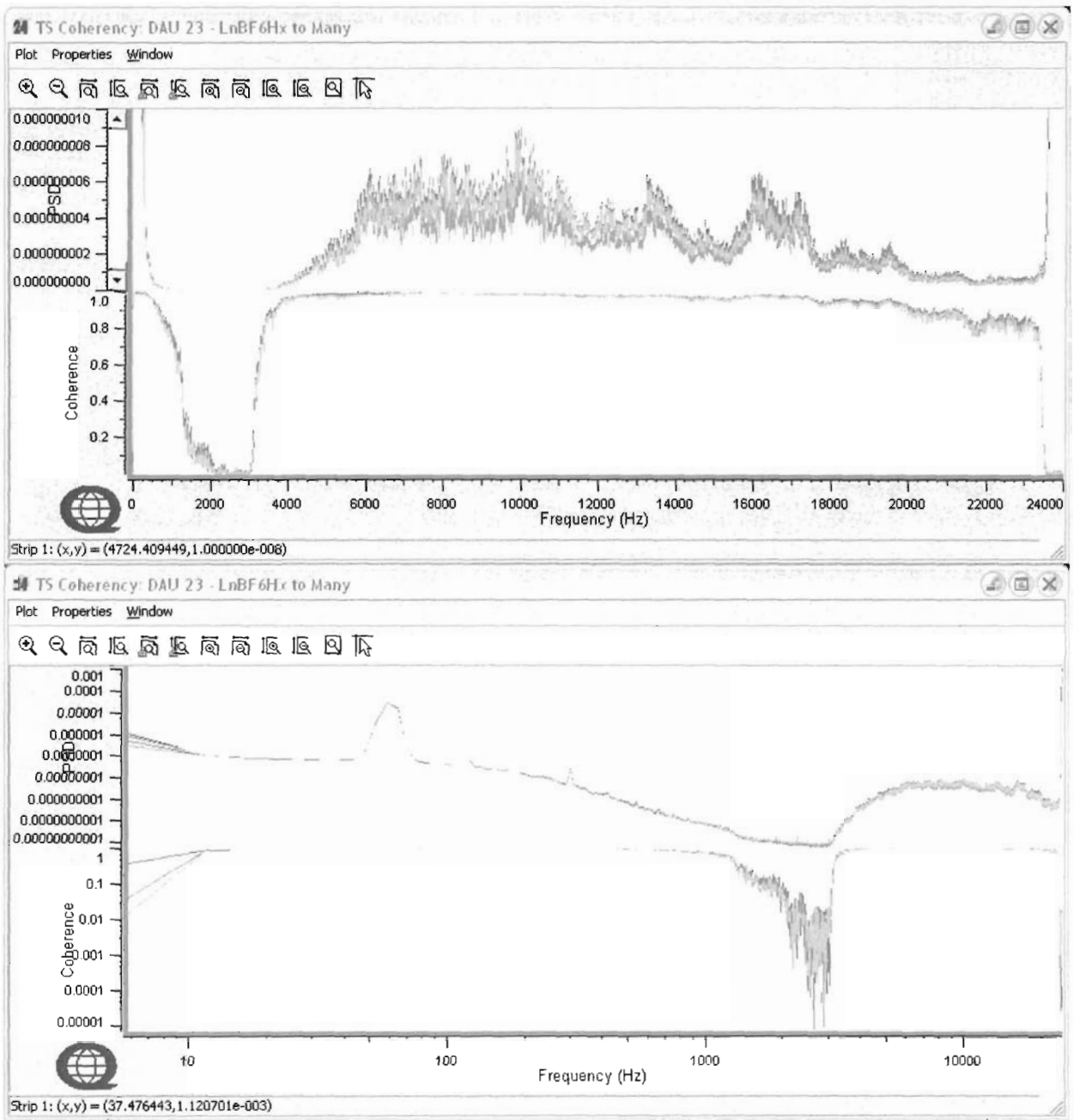


Figure 3-3: Coherencies are referenced to BF6-0302 (Blue). Upper linear, lower logarithmic frequency scales.

Colour	Channel
Blue	BF6-0302
Green	BF6-0303
Red	BF6-0304
Cyan	BF6-0305
Magenta	BF6-0306
Yellow	BF6-0316

3.2 Test Results: 9600sps

Titan NetEvent: 12
Sample Rate. 9600sps
TS Length: 1,000,000 samples (~2min)

Time Series

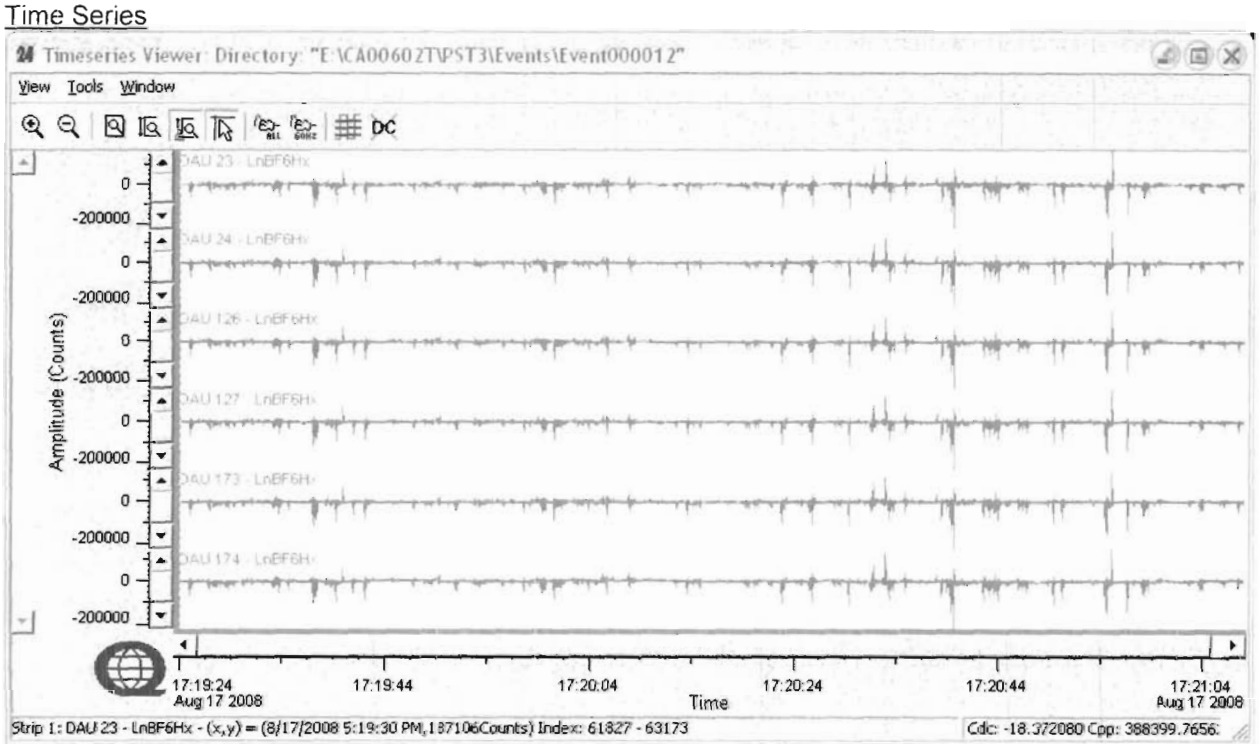


Figure 3-4: Complete time series @9600sps (60Hz scrub all channels applied)

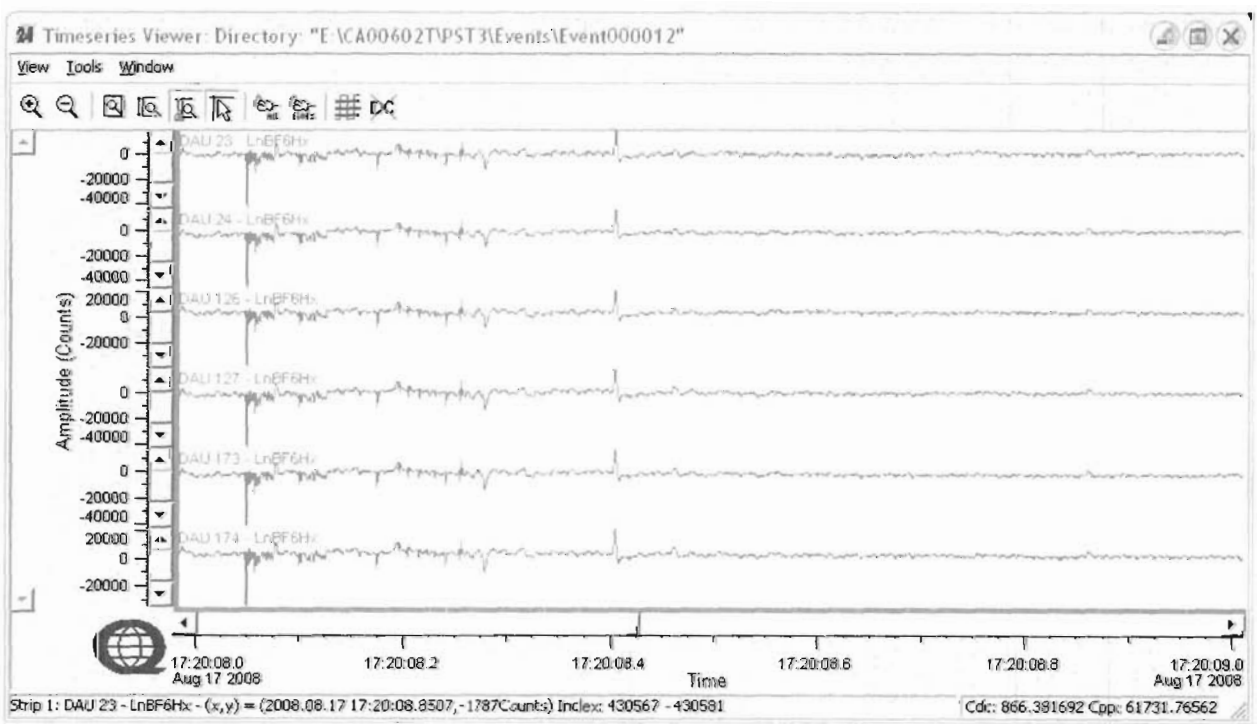


Figure 3-5: Focus on ~0.01s of the time series @9600sps (60Hz scrub all channels applied)

Time Series

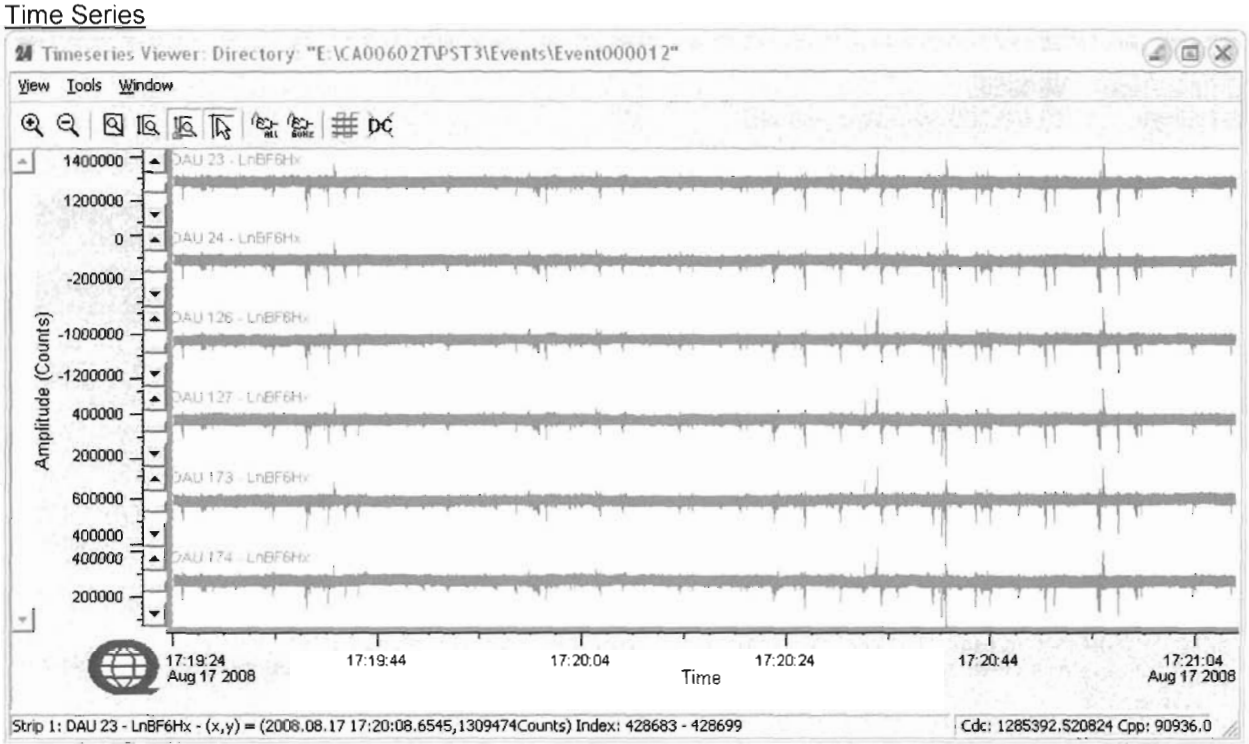


Figure 3-6: Complete time series @9600sps

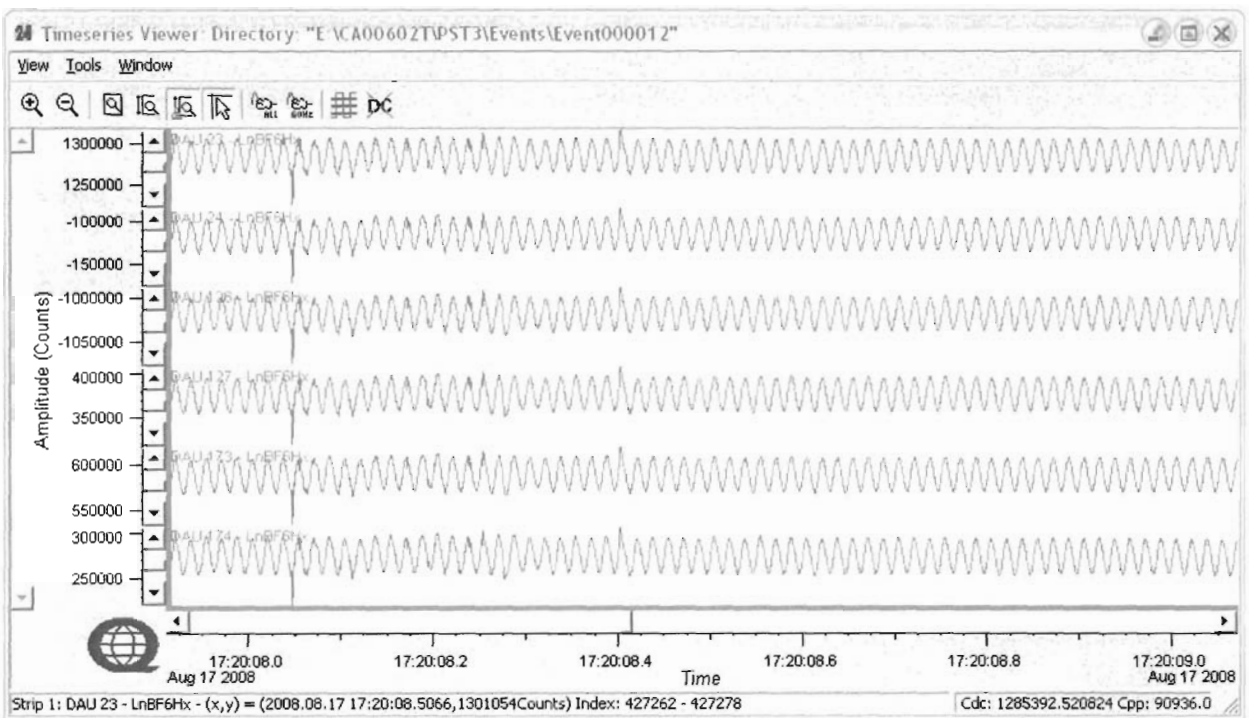


Figure 3-7: Focus on ~0.01s of the time series @9600sps

High Frequency Coil Results: 9600sps
Coherency to BF6-0302

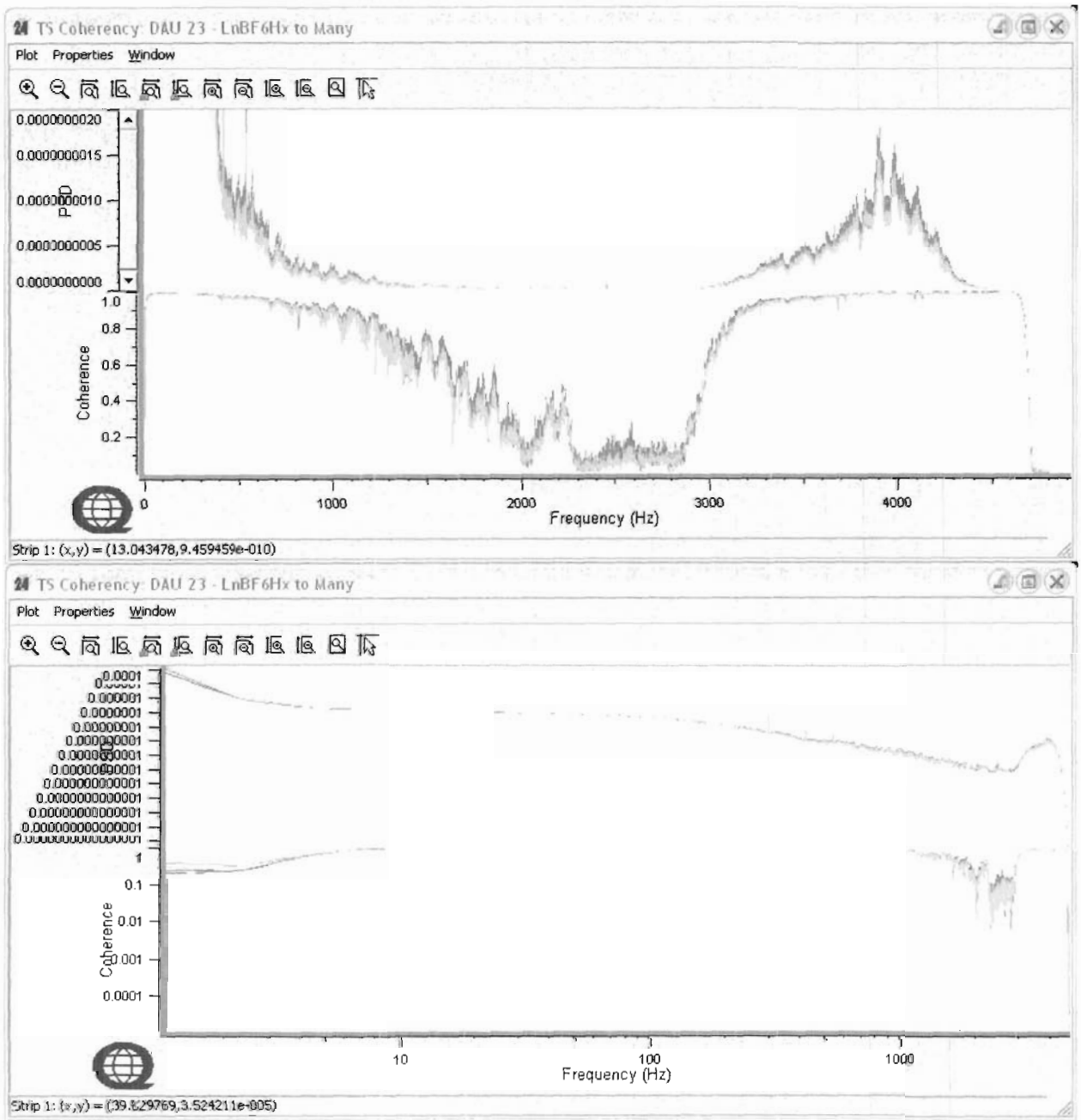


Figure 3-8: Coherencies are referenced to BF6-0302 (blue). Upper linear, lower logarithmic frequency scales.

Colour	Channel
Blue	BF6-0302
Green	BF6-0303
Red	BF6-0304
Cyan	BF6-0305
Magenta	BF6-0306
Yellow	BF6-0316