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# LOGISTICS REPORT FOR A

## SPARTAN MT SURVEY

OVER THE

## TITAN PROPERTY

(ONTARIO, CANADA)

ON BEHALF OF

**IMPALA CANADA LTD.**



September 9, 2021

CA01284S

Quantec Geoscience Ltd.

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**QUANTEC**  
Geoscience

Report Disclaimer:

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Statements made in this report represent opinions that consider information available at the time of writing. Although every effort has been made to ensure the accuracy of the material contained in this report, complete certainty cannot be guaranteed due to the interpretive nature of the work which may include mathematically derived solutions that are inherently non-unique. Therefore, the estimated physical parameters of the subsurface may have no direct relation to the real geology and possible economic value of any mineralization.

There is no guarantee or representation to the user as to the level of accuracy, currency, suitability, completeness, usefulness, or reliability of this information for any purpose. Therefore, decisions made based on this work are solely the responsibility of the end user. It is incumbent upon the end user to examine the data and results delivered and make Quantec aware of any perceived deficiencies.

## EXECUTIVE SUMMARY

This report presents the logistics of the SPARTAN MT survey completed from August 7 to 12, 2021 over the Titan Property by Quantec Geoscience Ltd. on behalf of Impala Canada Ltd.

The report describes the instrumentation, data acquisition and processing procedures, final data formats and contents of the digital archives. The final processed data are also presented as Magnetotelluric (MT) sounding curves of apparent resistivity and phase.

A total of 11 MT sites were surveyed. Data were processed and inspected for quality assurance on site and reviewed daily by the geophysicist in charge of the project.

The final processed survey results delivered with the report include:

- GPS Data
  - Single site-site ASCII survey files
    - Each file includes location (Latitude/Longitude, projected UTM and local GRID coordinates) and elevation details of MT sites of the survey.
- Magnetotelluric (MT) Data
  - Single site data in the Electrical Data Interchange (EDI) format containing the MT spectra at each frequency.

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## 1. INTRODUCTION

This report presents the logistics of the SPARTAN MT survey completed from August 7 to 12, 2021 over the Titan Property by Quantec Geoscience Ltd. on behalf of Impala Canada Ltd..

### 1.1. CLIENT INFORMATION

Name:	Impala Canada Ltd.
Address:	1136 Alloy Drive, Suite 100 Thunder Bay, ON Ontario Canada
Representative:	Lionel Djon Phone: (807) 623-8005 Email: ldjon@impalacanada.com

### 1.2. GENERAL PROJECT INFORMATION

Quantec Project Manager:	Mark Morrison
Quantec Project Number:	CA01284S
Report Prepared by:	Ryan Fearon
Project Name:	Titan Property
Survey Type:	SPARTAN MT
General Location:	Approximately 140 km NNW of Thunder Bay (see Figure 1-1). Lat /Long: 49°38'18"N, 89°52'9"E UTM: 292848 E, 5502390 N Datum: WGS84, UTM Zone 16N
Survey Period:	From August 7 to 12, 2021





Figure 1-1: General location map.

## 2. SURVEY LOGISTICS

### 2.1. ACCESS

Base of Operations:	Titan Exploration Camp
Mode of Access:	Truck

### 2.2. GRID AREA

Established by:	Client
Grid Coordinate Reference System:	Grid referenced to UTM coordinates
Datum and Projection:	WGS 84, UTM Zone 16N
Grid Azimuth:	Grid N is 00° True
Magnetic Declination:	04°W
Site Location:	Handheld GPS

### 2.3. PRODUCTION SUMMARY

Details of Survey Production:	See APPENDIX A
Survey Period (Total):	August 7 to 12, 2021 6 days
Survey Days (Read Time):	6 days
Standby:	0 days
Weather Days:	0 days

### 2.4. SURVEY COVERAGE SUMMARY

Details of Survey Coverage:	see APPENDIX B
-----------------------------	----------------

#### MT Survey:

Sites Acquired:	11 sites 11 EDI files delivered (one per site)
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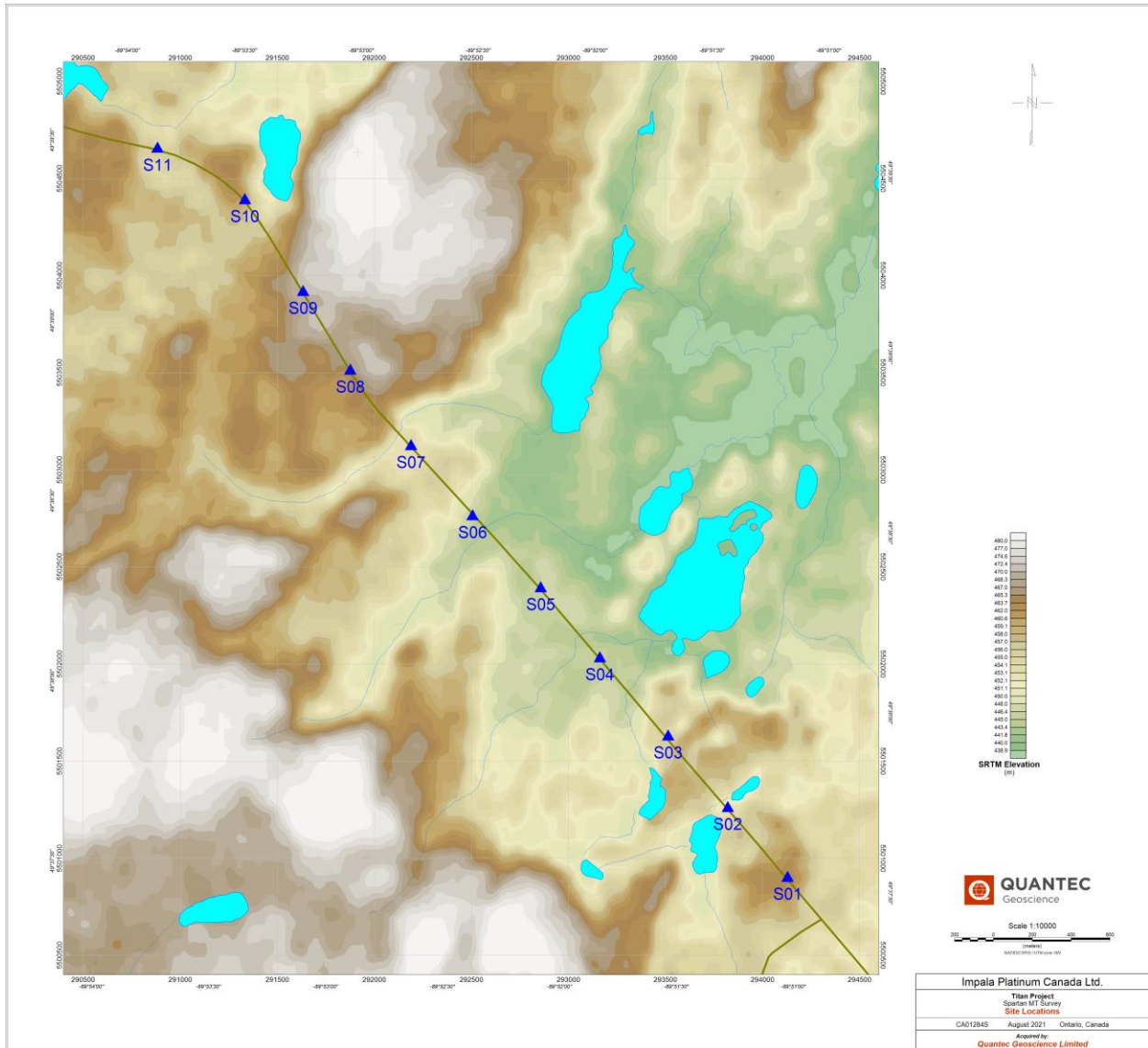


Figure 2-1: MT survey coverage map.

**2.5. QUANTEC PERSONNEL**

Project Manager:	Mark Morrison
Field Operations Manager:	Ryan Fearon
Project Geophysicist:	Darcy McGill
Field HSE Coordinator:	Don McLaren

## **2.6. HEALTH, SAFETY, AND ENVIRONMENT (HSE)**

Quantec Geoscience is committed to conducting its activities in a manner that will safeguard and protect the health and safety of all Quantec personnel, clients, the public and the environment.

### **2.6.1. Hazard Assessment and Control**

Prior to mobilization, Quantec HSE compiled a hazard inventory for the project and risk assessments were completed for the tasks involved in conducting the work. On the basis of the risk assessments, corresponding Job Safety Analyses (JSA) were prepared defining safe work procedures.

### **2.6.2. Systems and Procedures**

All personnel were equipped with any personal protective equipment (PPE) required for the work.

One Quantec crew member was assigned as an HSE coordinator to assist the Field Manager with implementation of HSE procedures and reporting.

Daily safety meetings of Quantec personnel were conducted each morning prior to commencement of work to review safe work procedures and discuss any prior incidents, daily plans and potential hazards.

Vehicle circle checks were completed by drivers before departure.

### **2.6.3. Reporting**

Daily reports were sent by email to both Quantec and the client representative, including:

- Daily operations plan for each acquisition team.
- Minutes of Quantec crew daily Safety meetings.
- Incident Reports if required.

### 3. SURVEY SPECIFICATIONS

#### 3.1. INSTRUMENTATION

Receiver System:	RT160Q Quantec data logger
Synchronisation:	GPS clock (10 ns precision)
Receiver Electrodes:	Ground contacts using steel plates

#### MT Specific

Magnetic Sensors [BB]:	Phoenix MTC150 magnetic field sensors Phoenix MTC180 magnetic field sensors
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See APPENDIX F for more detailed information.

#### 3.2. SURVEY LAYOUT

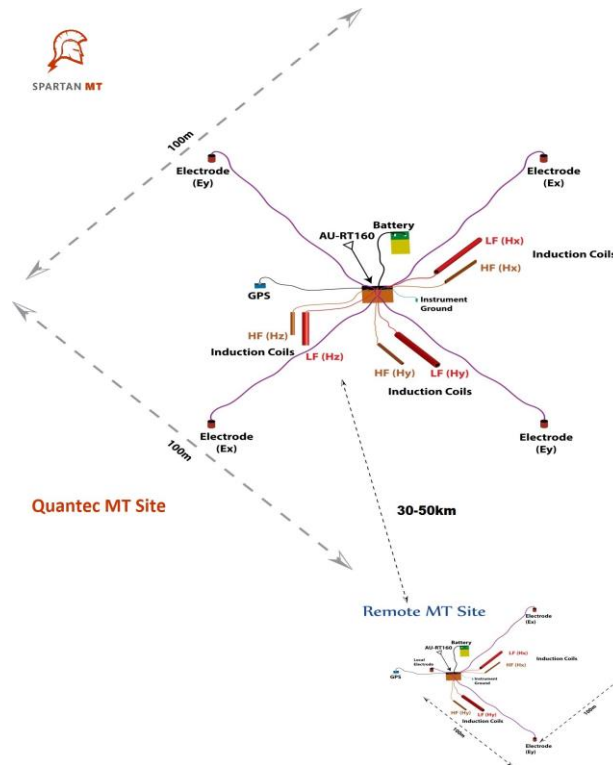


Figure 3-1: Survey acquisition layout.

### 3.3. MAGNETOTELLURIC SURVEY PARAMETERS

#### 3.3.1. Geometry

Technique:	Tensor magnetotelluric soundings processed with remote reference.
Site Configuration:	Cross-shaped E-field with HF and LF magnetic sensors located at each site.
E-field Dipole Lengths:	Ex: 100 m Ey: 100 m
Site Orientation:	Acquisition layout with X pointing to 0° True.
Remote Site Configuration:	Cross-shaped E-fields with HF and LF magnetic sensors located at the site. The sensors are oriented in the same direction as the local sites.
Remote Reference Position:	304699E / 5493200N (WGS84, UTM Zone 16N)
Synchronization to Remote:	GPS clock (10 ns precision)

#### 3.3.2. Acquisition and Processing Parameters

Data Acquisition:	Time series recording.
Time Series Sampling:	HF1: 48,000 samples/s HF2: 12,000 samples/s LF1: 1,000 samples/s LF2: 40 samples/s (resampled from LF1)
Time Series Recording Time:	HF1: minimum 3 events @ 30 s per event HF2: minimum 6 events @ 4 minutes per event LF1: Continuous  HF: minimum of 1 hour to maximum of storage capacity or until pick up LF: minimum of 14 hours to maximum of storage capacity or until pick up HF and LF recording schedule is fixed and defined as follows:

Band	Sampling	Start	Duration
HF1	48 kHz	16, 36, 56 minutes after the hour	30 s for each run
HF2	12 kHz	0, 8, 20, 28, 40, 48 minutes after the hour	4 minutes for each run
LF	1000 Hz	At logger deployment	Continuous until pickup

Frequency Bandwidth: 10 kHz to 0.001 Hz

Calibration Version: ver.2.311 (released: 2021/07/21)

Processing: Quantec proprietary QuickLay software (**ver.5.7.7.15**) coupled with Egbert MT processing code (Egbert, 1997):

- 1) Coherent noise rejection using remote reference
- 2) Proprietary digital filtering (scrubbing)
- 3) Coherency sorting
- 4) Impedance estimate stacking

Processing configuration set to 12 frequencies per decade

Data processed to output X at **0° True**

Data Conventions:

Right-hand positive down coordinate system.

Time dependence:  $e^{+j\omega t}$

Processed Data: Auto- and cross-power spectral estimates for individual stations and sampling band archived as Spectral Density Matrix (SDM) files (Egbert output)

Results are band-merged, edited, and saved as SEG-EDI<sup>1</sup> (Electronic Data Interchange) files.

EDI Format:

Single site format = one site per EDI file

Multi-site format = all sites along a profile per EDI file

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<sup>1</sup> EDI is a format conforming to SEG standard for the storage of magnetotelluric (MT) data (Wight, 1987).



### 3.3.3. Field Quality Control Tests

**Parallel Sensor Test:** A parallel sensor test was completed at the beginning of the survey to verify proper operation of the equipment. The test results are presented in APPENDIX D.

**Remote Test:** MT data was collected at the remote site prior to the survey to evaluate suitability of the site location. The test results are presented in APPENDIX E.

### 3.3.4. Data Presentation

**Sounding Curves:** Observed XY and YX apparent resistivity and phase  
Observed Tzx and Tzy Tipper  
Coherencies between local magnetic and electric fields  
Coherencies between local and remote magnetic fields  
(see APPENDIX C for sounding curves)

**Pseudo-Section Plots:** Observed XY and YX apparent resistivity and phase  
(see APPENDIX C for MT pseudo-sections)

### 3.3.5. Ap Index

The magnetic signal strength as reported by the  $A_p^2$  index varies from 3 to a maximum of 6, with an average near 4 during the project.

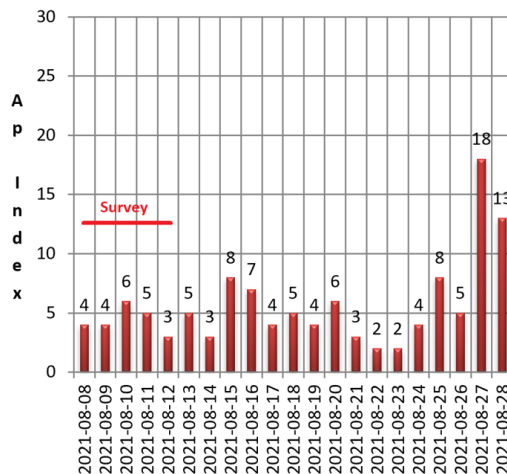


Figure 3-2: Magnetic signal strength ( $A_p$  index) during the project.

<sup>2</sup>  $A_p$  Index reported on the processing notes were uploaded from the Helmholtz Centre Potsdam – GFZ German Research Centre for Geosciences (<https://www.gfz-potsdam.de/en/kp-index/>).

#### **4. COMMENTS ON MEASURED DATA**

MT sites were planned along Highway 811, a gravel road. Sites were installed just off to the side of the road with very good burial conditions. All dipole wire was laid along the ground to minimize wind noise.

Due to the limited amount of travel and culture in the area, the MT data are of very good quality.

An Impala site visit was completed on August 4, 2021, by client representative Jami Brown and his visitors, this was completed at site S09. The minimal ground disturbance required for site installation was highlighted.

## 5. DELIVERABLES

The final deliverables include the following:

### 5.1. DIGITAL DATA ARCHIVE

Table 5-1: Contents of the digital archive.

Directory	Contents
\Report	Logistics report (.PDF)
\Data\EDI	Final processed MT data (.EDI)
\Data\Remote	Final processed MT data (.EDI) from the remote site, each day processed referenced.
\Data\GPS	Compilation of survey files.

### 5.2. FIELD DATA ARCHIVE (HARD DRIVE)

The raw field data are delivered on a hard disk drive and comprise the following:

Time Series:	Raw event files (e.g., Eventxxx.dat), provided with log files having information on the location and time of the event (QuickLay digital format).
Processed MT Data:	Daily processing runs in QuickLay digital format saved as '.MT' files linked with SDM files containing auto- and cross-power spectral estimates for each sampling band and site; Spectra are in right-hand positive down coordinate system. Processed SDM formatted data are band-merged into geo-referenced EDI files containing auto- and cross-power spectral estimates for individual stations;

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Respectfully submitted by:

Ryan Fearon

September 9, 2021

Quantec Geoscience Limited

## APPENDIX A. PRODUCTION SUMMARY

### A.1. DAILY PRODUCTION SUMMARY

QUANTEC GEOSCIENCE LTD.						
Survey Specifications			Project Information			
Survey: Spartan BB MT			Client: Impala Platinum Canada Ltd.			
Specs: Hx/Hy/Hz			Project Name: Titan			
24Hr ACQ			Project Number: CA012845			
** dipoles			Total Sites: 11			
Production Summary						
Task	Crew Size	Date	Sites Deployed	Sites Approved	Profile # and Sites Deployed	Daily Field Activity
Survey	3	2021-08-07				Crew completed site orientation, mobilized to camp and completed the PST.
Survey	3	2021-08-08	3	3	S01, S02, S03	Overnight PST was reviewed, remote site was installed. Crew deployed 3 MT Sites.
Survey	3	2021-08-09	3	3	S04, S05, S06	Continued with MT setup
Survey	3	2021-08-10	3	3	S07, S08, S09	Continued with MT setup
Survey	3	2021-08-11	2	2	S10, S11	Continued with MT setup
Survey	3	2021-08-12				Remove all gear from field - pickup and pack truck. Clean camp behind us and demob to Thunder Bay

### A.2. DAILY ACTIVITY SUMMARY

PROCESS / PICKUP DAY	LAYOUT DAY	TEAM	SITE	ACTIVITY / Process Result	Repeat Log	Comments on Data Results [FM/Geo]	Cultures Notes from Field Notes
							Refresh All Queries
2021-08-07	2021-08-07	ALL		PST/RM DAY		Setup PST for overnight run	
2021-08-08	2021-08-08	ALL		ACQ-SETUP DAY			Good Hz burial, site along road. Camp is ~350m away
2021-08-09	2021-08-08	T01		S01 final			Small lake to the North and South.
2021-08-09	2021-08-08	T01		S02 final			Swamp to the East
2021-08-09	2021-08-08	T01		S03 final			
2021-08-09		ALL		ACQ DAY			
2021-08-10	2021-08-09	T01		S04 final			No visible culture noted
2021-08-10	2021-08-09	T01		S05 final			Swamp to the South
2021-08-10	2021-08-09	T01		S06 final			Swamp to the Southwest
2021-08-10		ALL		ACQ DAY			
2021-08-11	2021-08-10	T01		S07 final			Lake to the East of site
2021-08-11	2021-08-10	T01		S08 final			No visible culture noted
2021-08-11	2021-08-10	T01		S09 final			Rocky coil installation
2021-08-11		ALL		ACQ DAY			
2021-08-12	2021-08-11	T01		S10 review proc			No visible culture noted
2021-08-12	2021-08-11	T01		S11 review proc			Small running creek ~1m from +Ey electrode
2021-08-12		ALL		ACQ-PACK DAY			

## APPENDIX B. SURVEY COVERAGE

### B.1. MT SITES

#### B.1.1. MT Site Locations (Surveyed)

Site ID (EDI)	UTM (WGS84, Zone 16N)		Longitude (dd:mm:ss.ssE)	Latitude (dd:mm:ss.ssN)	Elevation
	Easting	Northing			
S01	294129	5500899	89:51:2.558	49:37:31.878	465
S02	293821	5501258	89:51:18.570	49:37:43.110	455
S03	293514	5501626	89:51:34.552	49:37:54.633	456
S04	293162	5502029	89:51:52.843	49:38:7.233	447
S05	292857	5502389	89:52:8.715	49:38:18.499	448
S06	292506	5502760	89:52:26.900	49:38:30.063	451
S07	292189	5503121	89:52:43.376	49:38:41.345	456
S08	291876	5503510	89:52:59.708	49:38:53.537	466
S09	291633	5503915	89:53:12.586	49:39:6.333	472
S10	291333	5504387	89:53:28.433	49:39:21.224	461
S11	290883	5504652	89:53:51.359	49:39:29.233	458

## APPENDIX C. MEASURED MT DATA

This section presents the final processed MT data on a site by site basis as:

### Sounding curves

- a. Observed XY and YX Apparent Resistivity ( $\Omega \cdot m$ )
- b. Observed XY and YX Phase
- c. Observed Tzx and Tzy Tipper

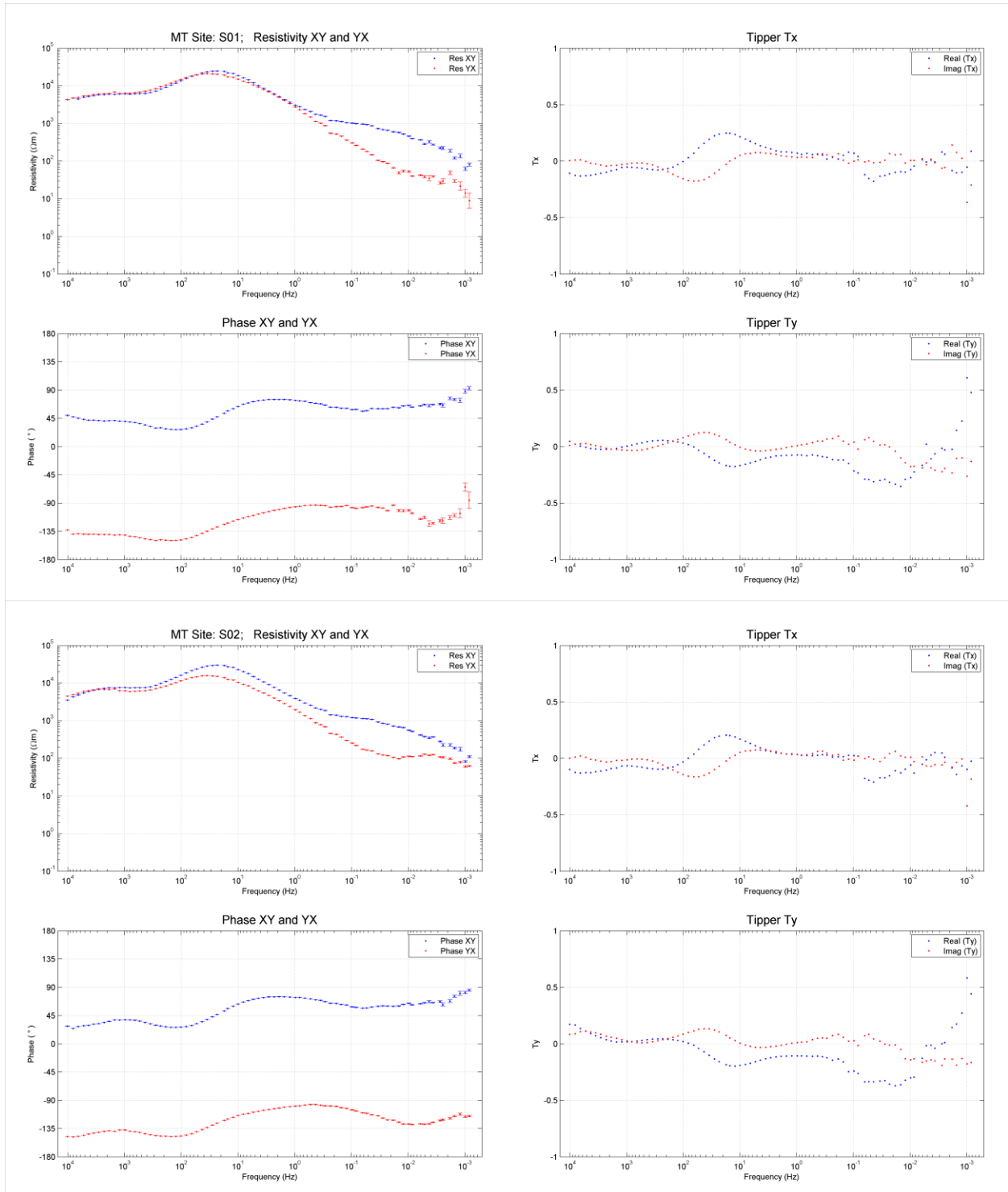
### Notice:

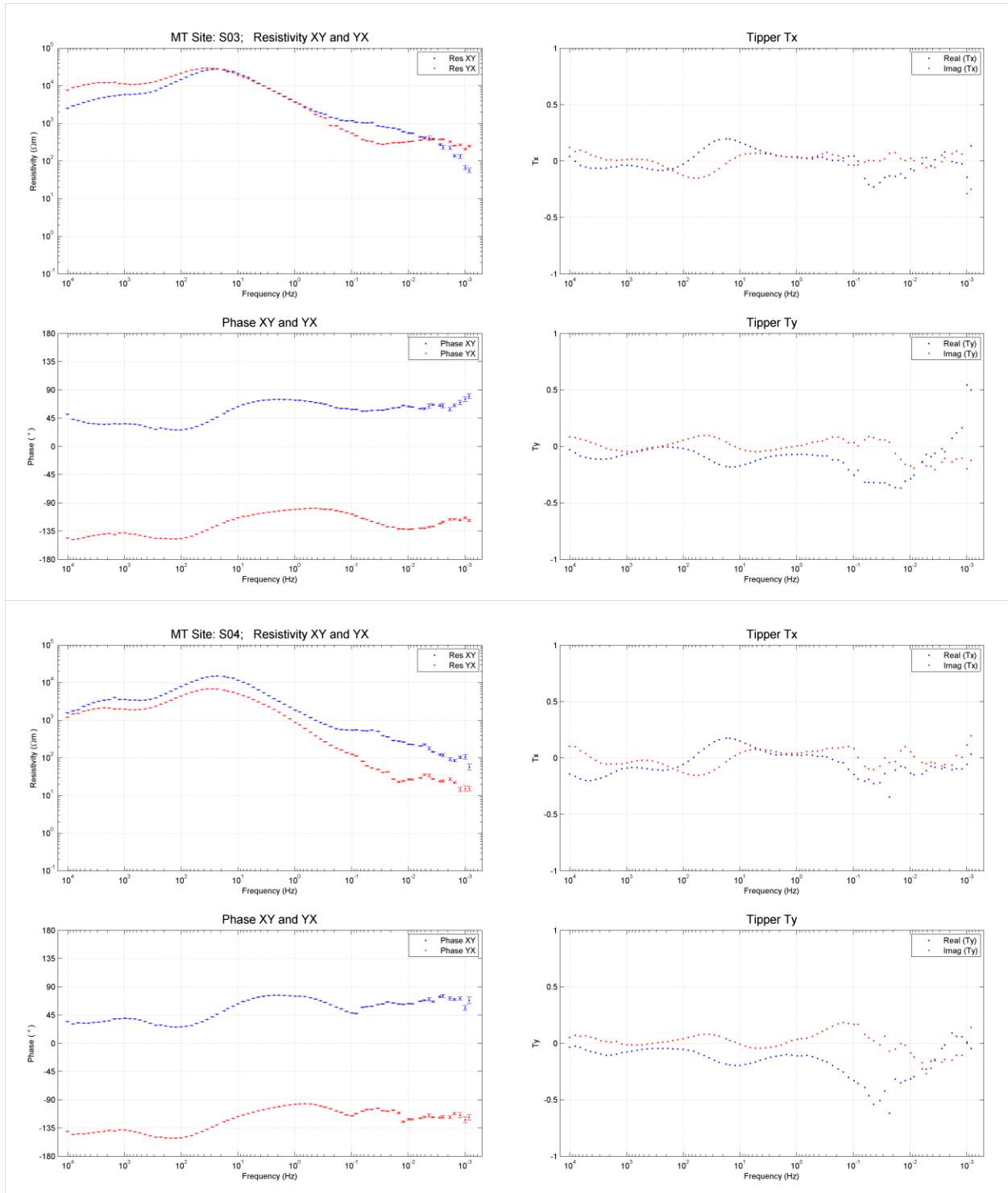
Mode **XY** is defined by Electrical (**Ex**) field and orthogonal magnetic (**Hy**) field (=Ex/Hy);

Mode **YX** is defined by Electrical (**Ey**) field and orthogonal Magnetic (**Hx**) field (=Ey/Hx);

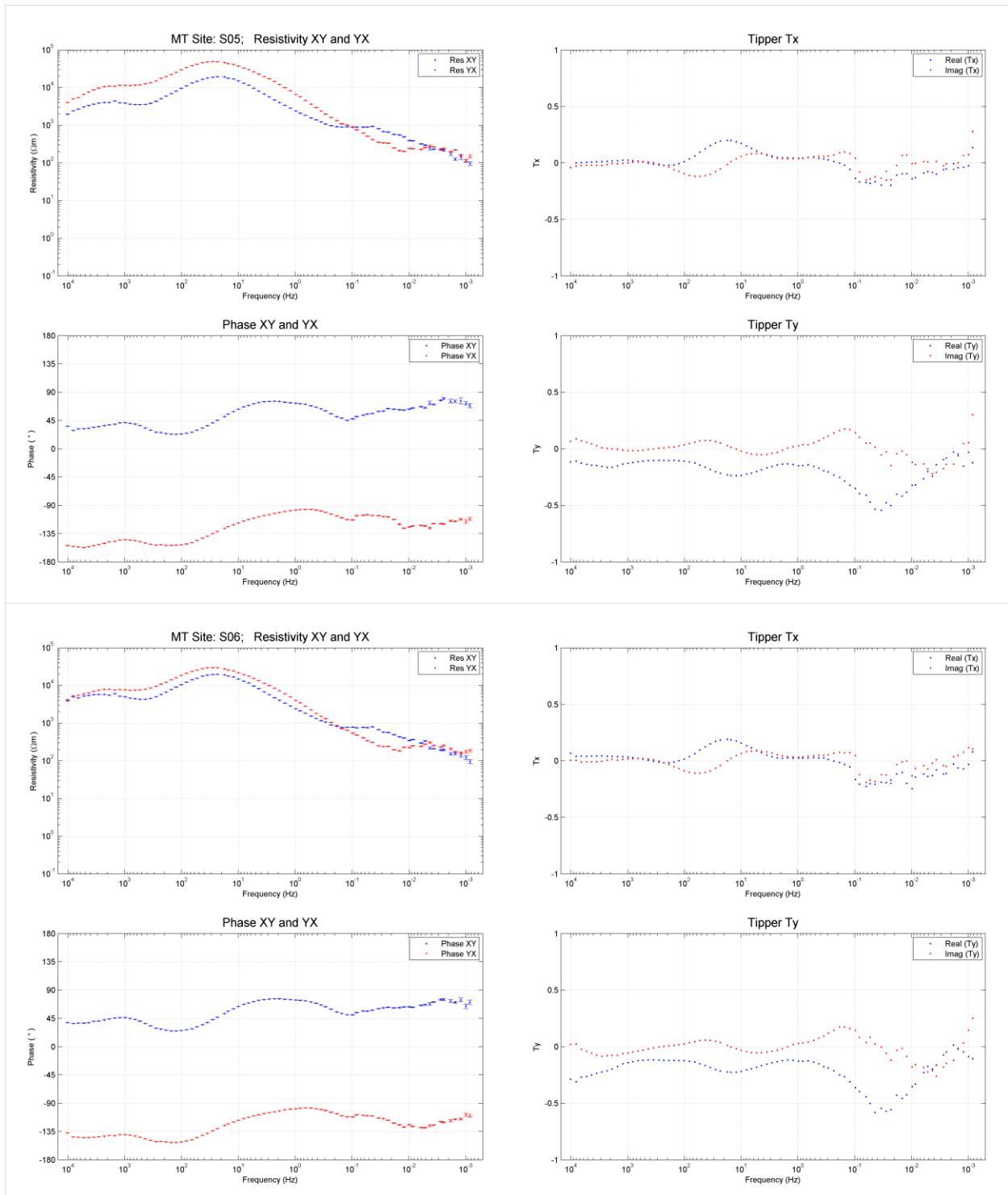
Tipper **Tzx** and **Tzy** represent the ratio of the Vertical Magnetic (**H<sub>z</sub>**) field and the Horizontal X (**H<sub>x</sub>**) and Y Magnetic (**H<sub>y</sub>**) fields respectively;

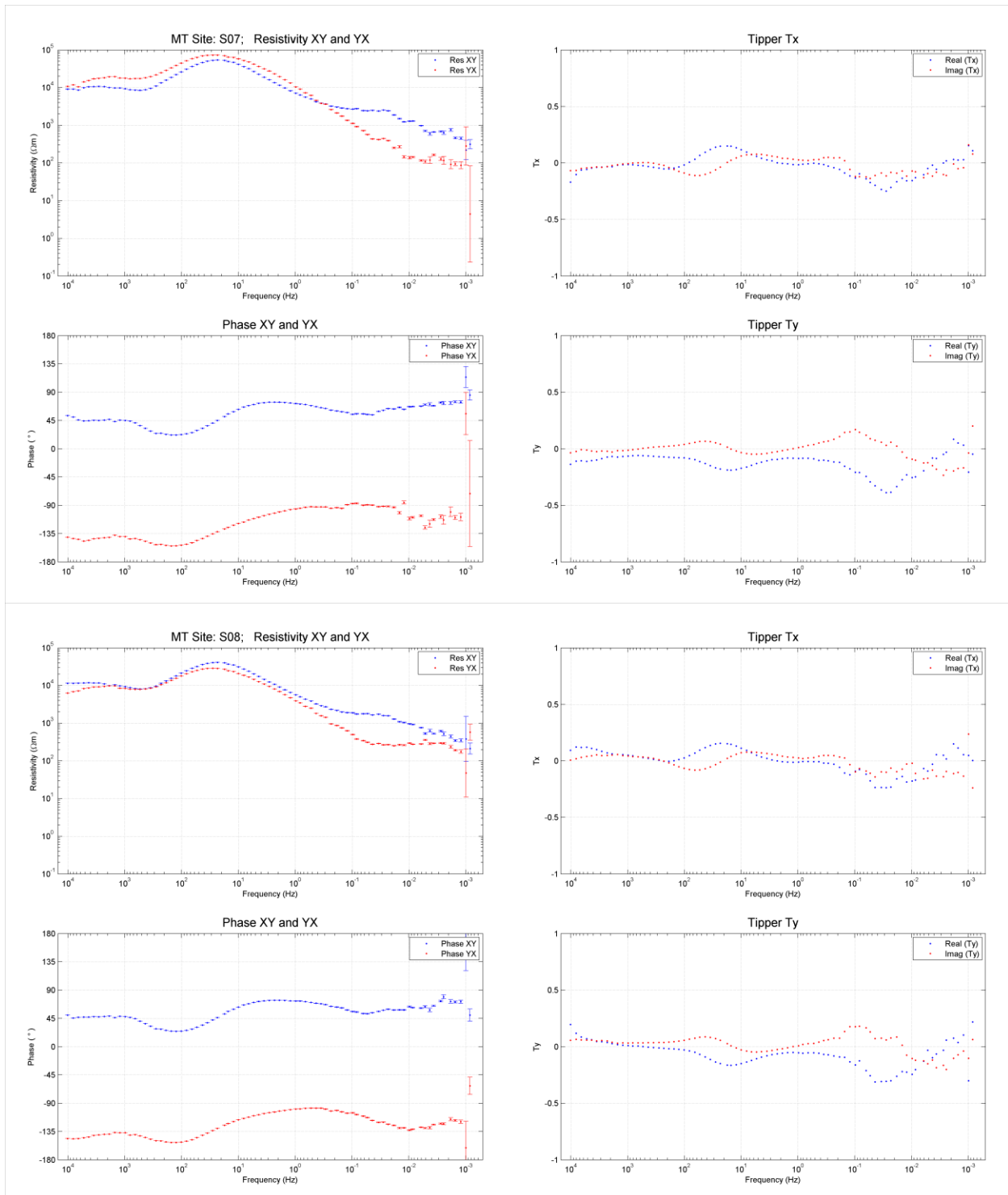
X-axis pointing to **0° True** and Y is perpendicular to X  
(right hand positive down coordinate system)

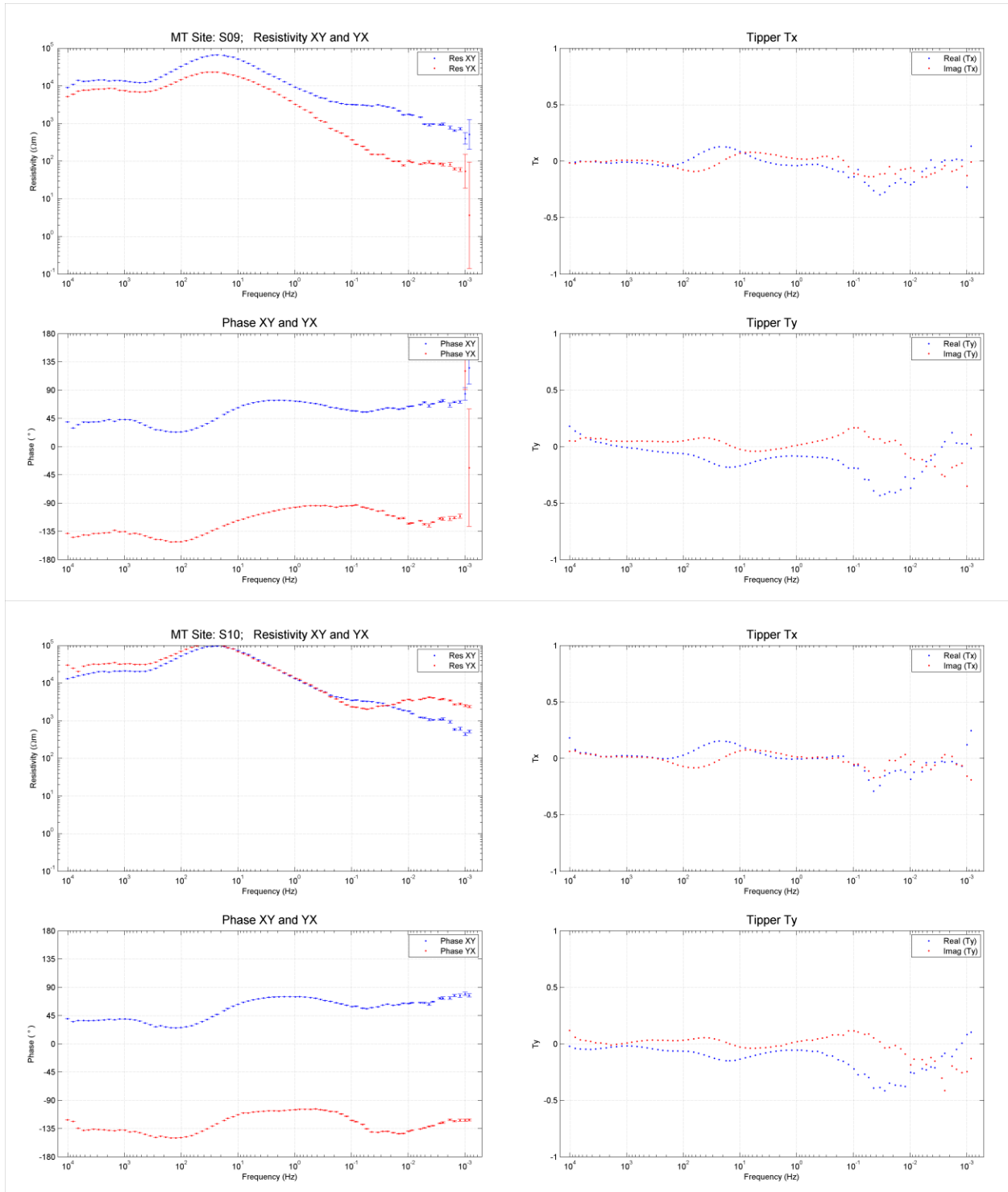


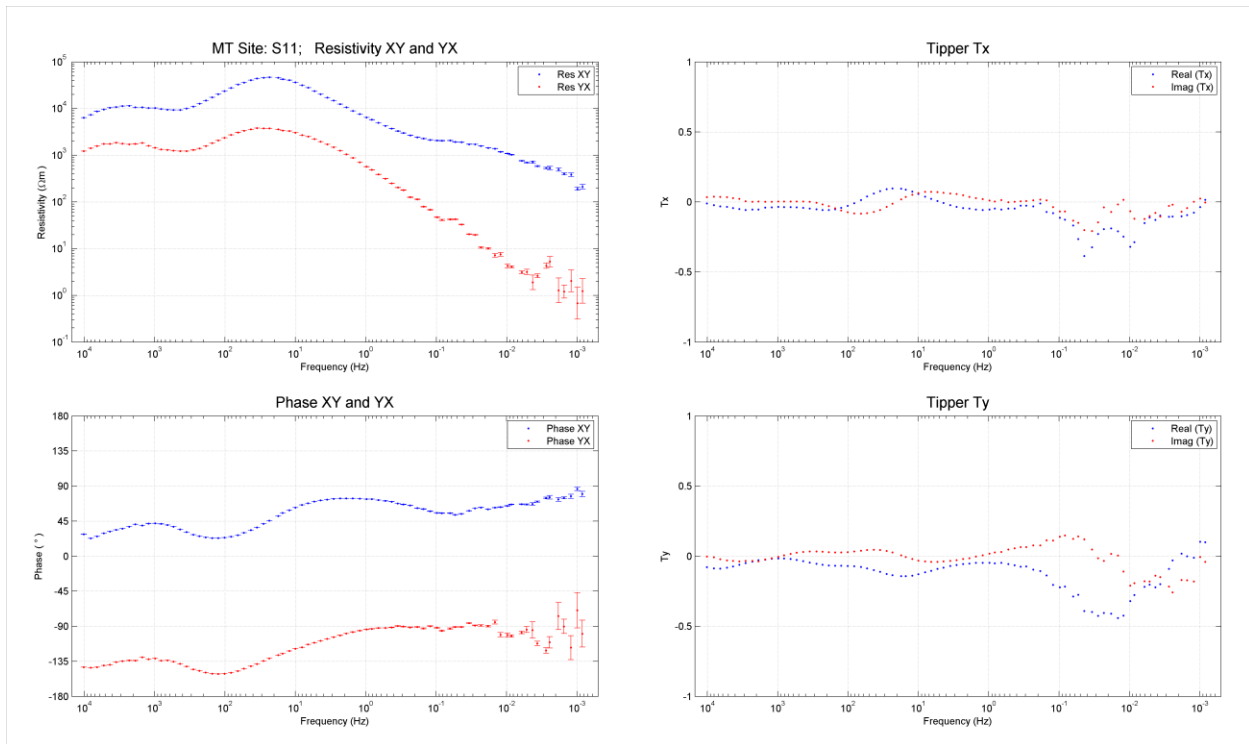














## APPENDIX D. PARALLEL SENSOR TEST

### D.1. GENERAL INFORMATION

<b>Project:</b>	CA01284S
<b>Date:</b>	2021-08-07 and 2021-08-08
<b>Prepared by:</b>	Ryan Fearon
<b>Field Staff:</b>	Don McLaren
<b>QuickLay version:</b>	ver.5.7.7.15
<b>Common folder:</b>	ver.2.311 (released: 2021/07/21)
<b>Datum and Projection:</b>	WGS 84 / UTM Zone 16 North
<b>Site Location (UTM):</b>	304699E / 5493200N
<b>Coil Orientation:</b>	00° True
<b>Magnetic Declination:</b>	04°W

**D.2. SUMMARY OF COILS TESTED AND RESULTS**

Serial ID	Test Passed (ID)	Notes
51-54388	Test 1	
51-54821	Test 1	
51-54824	Test 1	
51-54838	Test 1	
51-54871	Test 1	
51-54884	Test 1	
51-54676	Test 1	
81-53192	Test 5	
81-53207	Test 5	
81-53214	Test 5	
81-53249	Test 5	
81-53250	Test 5	Passed on Test 1. Presented in Test 5 as a control.

D.2.1. Photo of the PST layout



D.2.2. PST conditions (culture, noise, etc.)

No visible culture.

The chosen location was in a sand pit, crew were able to bury the coils deep.

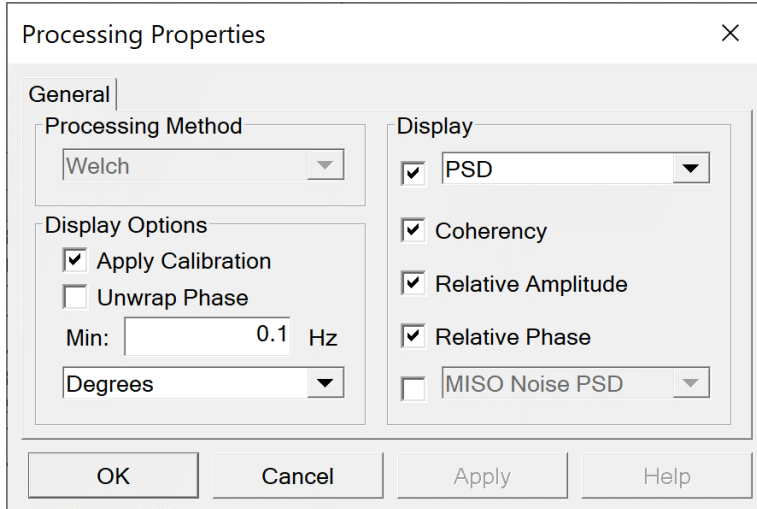
D.2.3. Comment on test results

Test ID	Notes
Test.LF.1	This was run overnight, ~17 Hrs of recorded timeseries
Test.LF.5	This test was run during the day for ~3.5 Hrs of recorded timeseries.
Test.HF.1	48K used from HF sweet spot – 0556 GMT.
Test.HF.5	48K used from day acquisition – 1856 GMT.



### D.3. PST PROCESSING PARAMETERS

For Low Frequency (LF)



Processing Properties

General

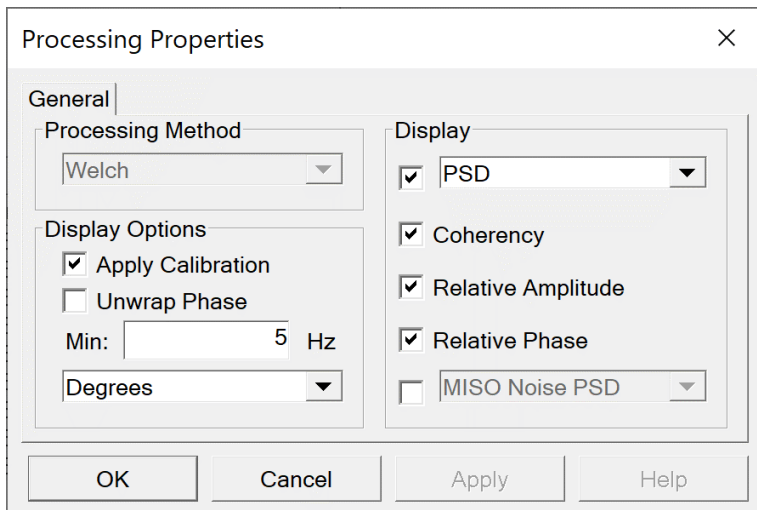
Processing Method  
Welch

Display Options  
 Apply Calibration  
 Unwrap Phase  
 Min: 0.1 Hz  
 Degrees

Display  
 PSD  
 Coherency  
 Relative Amplitude  
 Relative Phase  
 MISO Noise PSD

OK Cancel Apply Help

For High Frequency (HF)



Processing Properties

General

Processing Method  
Welch

Display Options  
 Apply Calibration  
 Unwrap Phase  
 Min: 5 Hz  
 Degrees

Display  
 PSD  
 Coherency  
 Relative Amplitude  
 Relative Phase  
 MISO Noise PSD

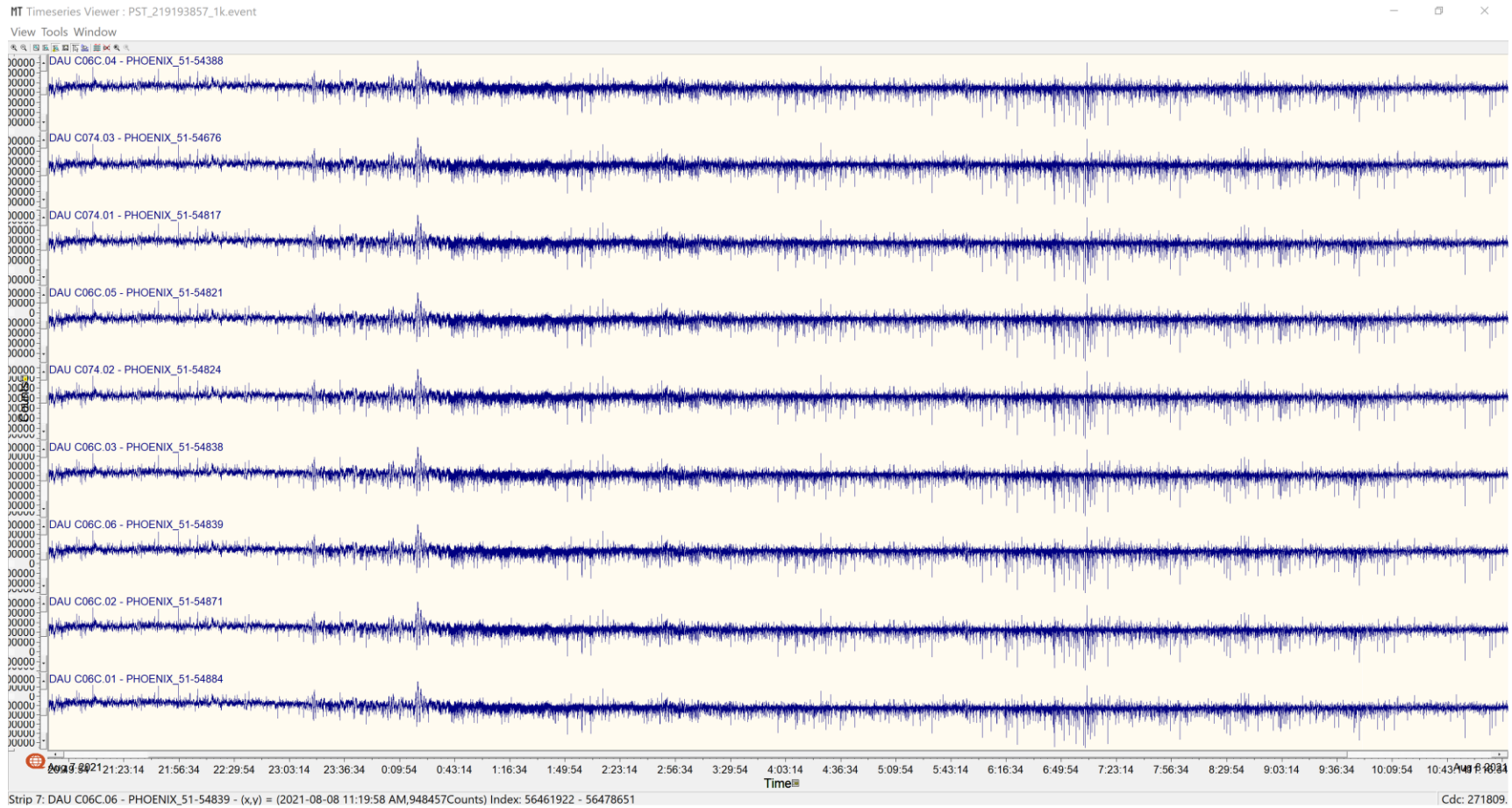
OK Cancel Apply Help

### D.4. TEST LF 1 RESULTS

Event	Components	Channels (9)	Processor View	PST View								
Event: PST_219193857_1k Info Name: PST_219193857_1k Event: Intersecting Survey: MagnetoTelluric Sample Rate: 1000 Duration: 17h21m01.0660s Components (3)	Channels	Sensor: Name	Instrument: ...	Sensor: Type	Sens...	Sens...	Sensor: Im...	Sens...				
	DAU C06C.04 - PHOENIX_51-54388	PHOENIX_51-54388	51-54388	Magnetometer	Inline	0	110	Positive				
	DAU C074.03 - PHOENIX_51-54676	PHOENIX_51-54676	51-54676	Magnetometer	Inline	0	110	Positive				
	DAU C074.01 - PHOENIX_51-54817	PHOENIX_51-54817	51-54817	Magnetometer	Inline	0	110	Positive				
	DAU C06C.05 - PHOENIX_51-54821	PHOENIX_51-54821	51-54821	Magnetometer	Inline	0	110	Positive				
	DAU C074.02 - PHOENIX_51-54824	PHOENIX_51-54824	51-54824	Magnetometer	Inline	0	110	Positive				
	DAU C06C.03 - PHOENIX_51-54838	PHOENIX_51-54838	51-54838	Magnetometer	Inline	0	110	Positive				
	DAU C06C.06 - PHOENIX_51-54839	PHOENIX_51-54839	51-54839	Magnetometer	Inline	0	110	Positive				
	DAU C06C.02 - PHOENIX_51-54871	PHOENIX_51-54871	51-54871	Magnetometer	Inline	0	110	Positive				
	DAU C06C.01 - PHOENIX_51-54884	PHOENIX_51-54884	51-54884	Magnetometer	Inline	0	110	Positive				

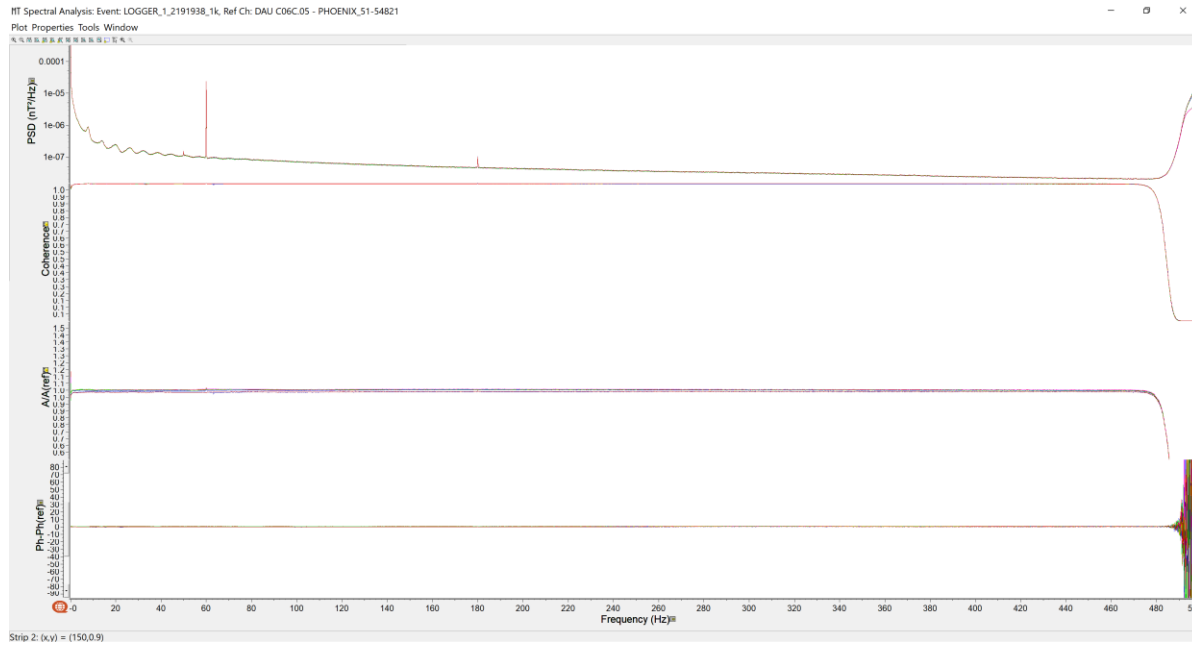
Notes: all is OK

### Time Series @1000 samples per second



**Power Spectral Density (PSD) of channels (strip 1); Coherency (strip 2) and Response Function (strips 3 and 4; Amplitude and Phase)**  
– *Linear frequency scale* –

**Test LF 1**  
**Sampling @ 1000 samples/s**



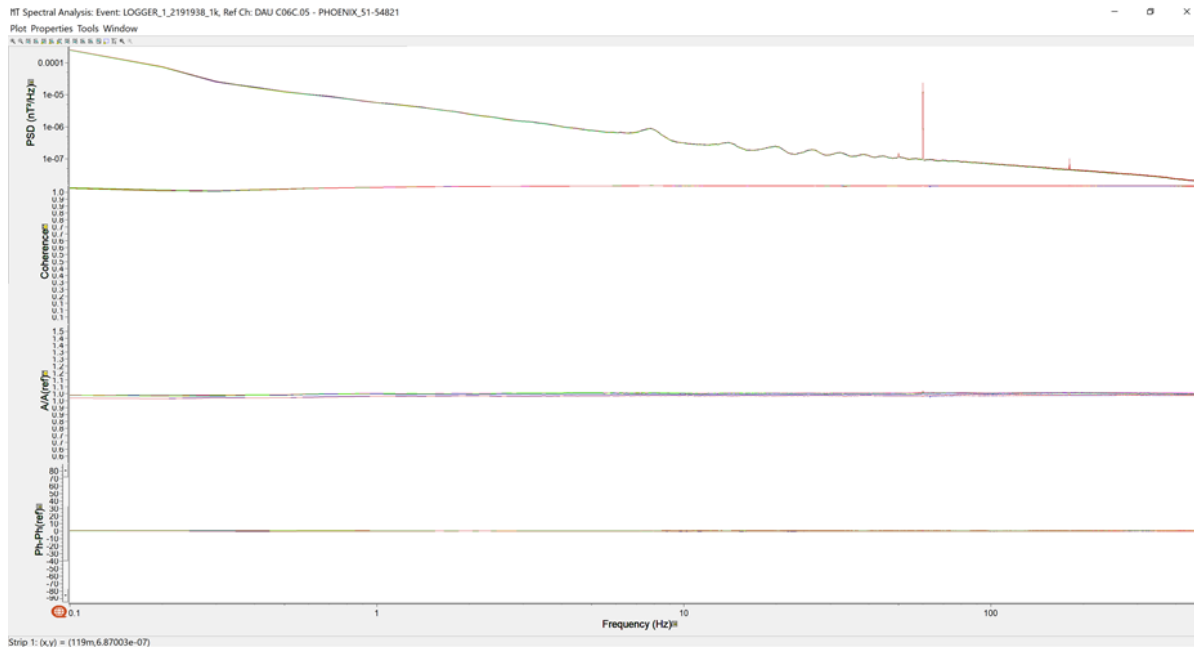
MT Legend

D...Name	Pen	COH Matc...
<input checked="" type="checkbox"/> DAU C06C.04 - PHOENIX_51-54388	<span style="color: blue;">—</span>	99.6
<input checked="" type="checkbox"/> DAU C074.03 - PHOENIX_51-54676	<span style="color: green;">—</span>	99.7
<input checked="" type="checkbox"/> DAU C074.01 - PHOENIX_51-54817	<span style="color: red;">—</span>	99.4
<input checked="" type="checkbox"/> DAU C06C.05 - PHOENIX_51-54821	<span style="color: cyan;">—</span>	
<input checked="" type="checkbox"/> DAU C074.02 - PHOENIX_51-54824	<span style="color: magenta;">—</span>	99.6
<input checked="" type="checkbox"/> DAU C06C.03 - PHOENIX_51-54838	<span style="color: yellow;">—</span>	99.5
<input checked="" type="checkbox"/> DAU C06C.06 - PHOENIX_51-54839	<span style="color: blue;">—</span>	99.6
<input checked="" type="checkbox"/> DAU C06C.02 - PHOENIX_51-54871	<span style="color: green;">—</span>	99.6
<input checked="" type="checkbox"/> DAU C06C.01 - PHOENIX_51-54884	<span style="color: red;">—</span>	99.6

Active Template: <None>

**Power Spectral Density (PSD) of channels (strip 1); Coherency (strip 2) and Response Function (strips 3 and 4; Amplitude and Phase)**  
– *Logarithmic frequency scale* –

**Test LF 1**  
**Sampling @ 1000 samples/s**



MT Legend

D...Name	Pen	COH Matc...
<input checked="" type="checkbox"/> DAU C06C.04 - PHOENIX_51-54388		99.6
<input checked="" type="checkbox"/> DAU C074.03 - PHOENIX_51-54676		99.7
<input checked="" type="checkbox"/> DAU C074.01 - PHOENIX_51-54817		99.4
<input checked="" type="checkbox"/> DAU C06C.05 - PHOENIX_51-54821		
<input checked="" type="checkbox"/> DAU C074.02 - PHOENIX_51-54824		99.6
<input checked="" type="checkbox"/> DAU C06C.03 - PHOENIX_51-54838		99.5
<input checked="" type="checkbox"/> DAU C06C.06 - PHOENIX_51-54839		99.6
<input checked="" type="checkbox"/> DAU C06C.02 - PHOENIX_51-54871		99.6
<input checked="" type="checkbox"/> DAU C06C.01 - PHOENIX_51-54884		99.6

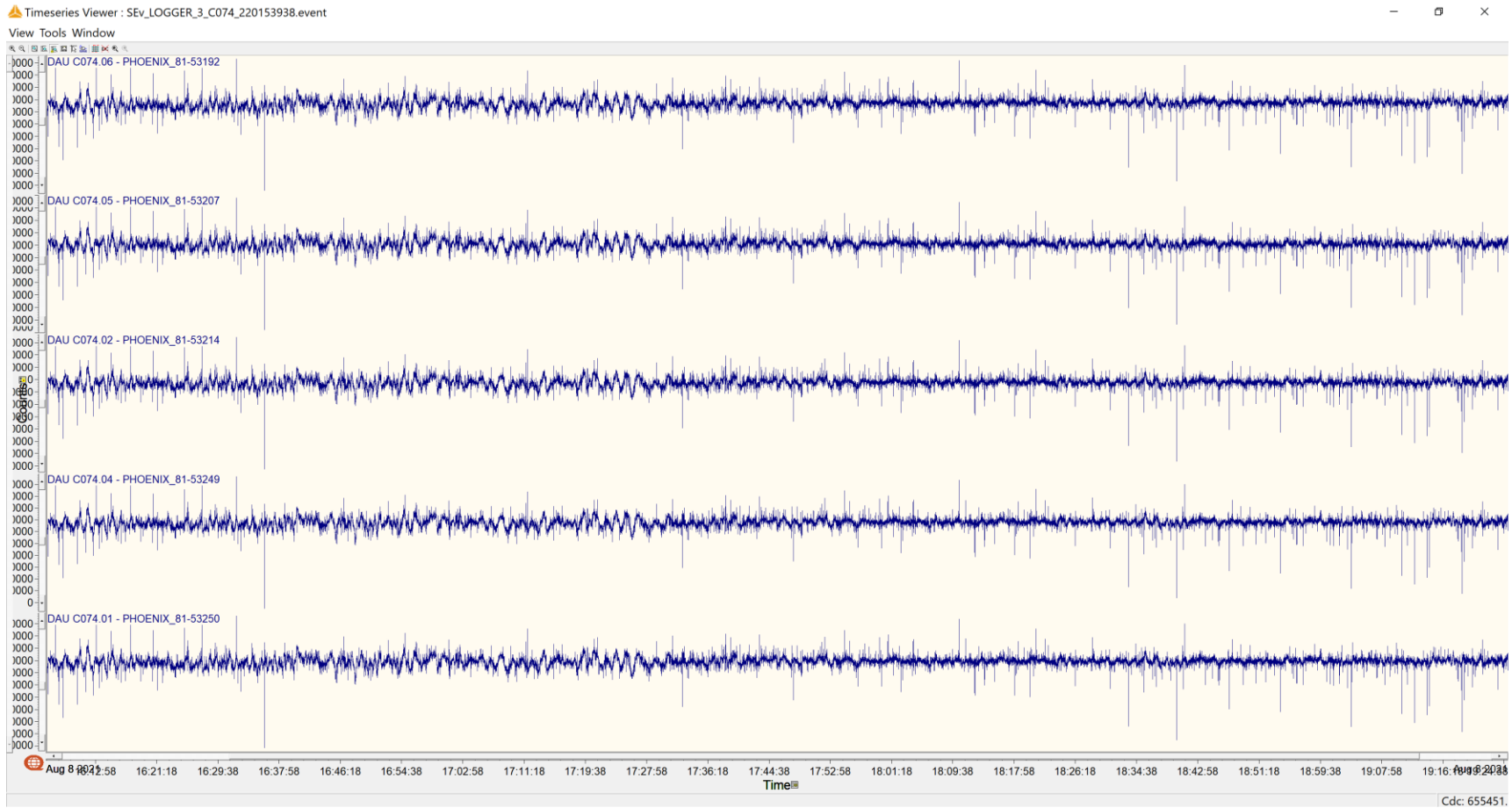
Active Template: <None>

### D.5. TEST LF 5 RESULTS

Channels	Sensor: Name	Instrument: ...	Sensor: Type	Sen...	Sens...	Sensor: Im...	Sensor: Pol...
DAU C074.06 - PHOENIX_81-53192	PHOENIX_81-53192	81-53192	Magnetometer	Inline	0	110	Positive
DAU C074.05 - PHOENIX_81-53207	PHOENIX_81-53207	81-53207	Magnetometer	Inline	0	110	Positive
DAU C074.02 - PHOENIX_81-53214	PHOENIX_81-53214	81-53214	Magnetometer	Inline	0	110	Positive
DAU C074.04 - PHOENIX_81-53249	PHOENIX_81-53249	81-53249	Magnetometer	Inline	0	110	Positive
DAU C074.01 - PHOENIX_81-53250	PHOENIX_81-53250	81-53250	Magnetometer	Inline	0	110	Positive

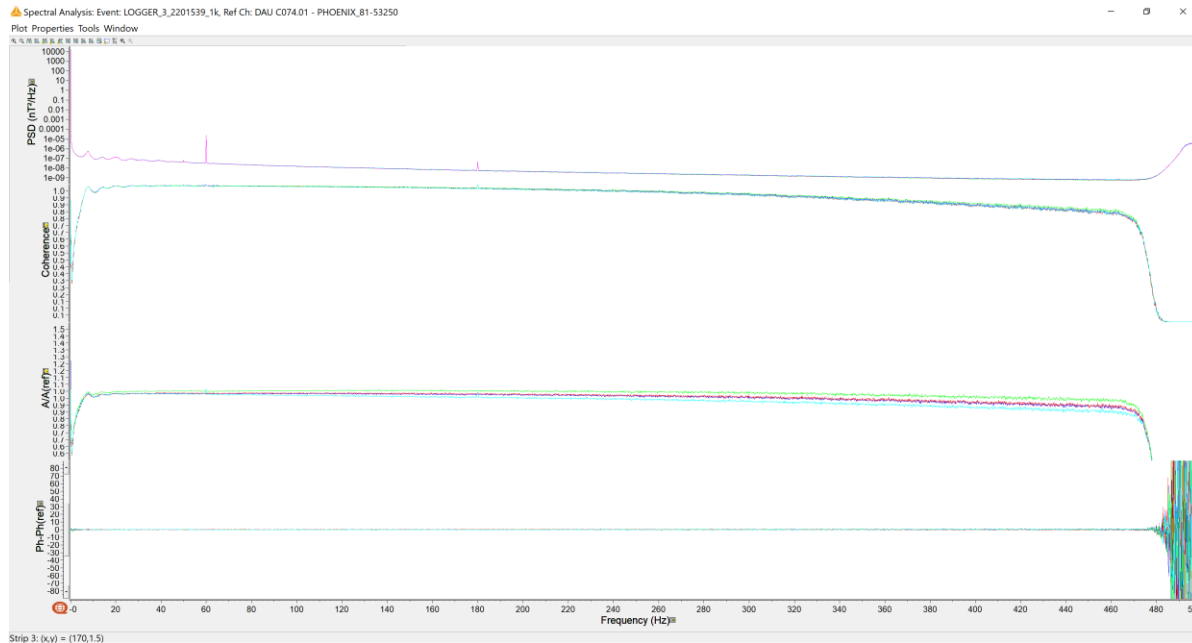
Notes: all is OK

### Time Series @1000 samples per second



**Power Spectral Density (PSD) of channels (strip 1); Coherency (strip 2) and Response Function (strips 3 and 4; Amplitude and Phase)**  
– *Linear frequency scale* –

**Test LF 5**  
**Sampling @ 1000 samples/s**



Legend

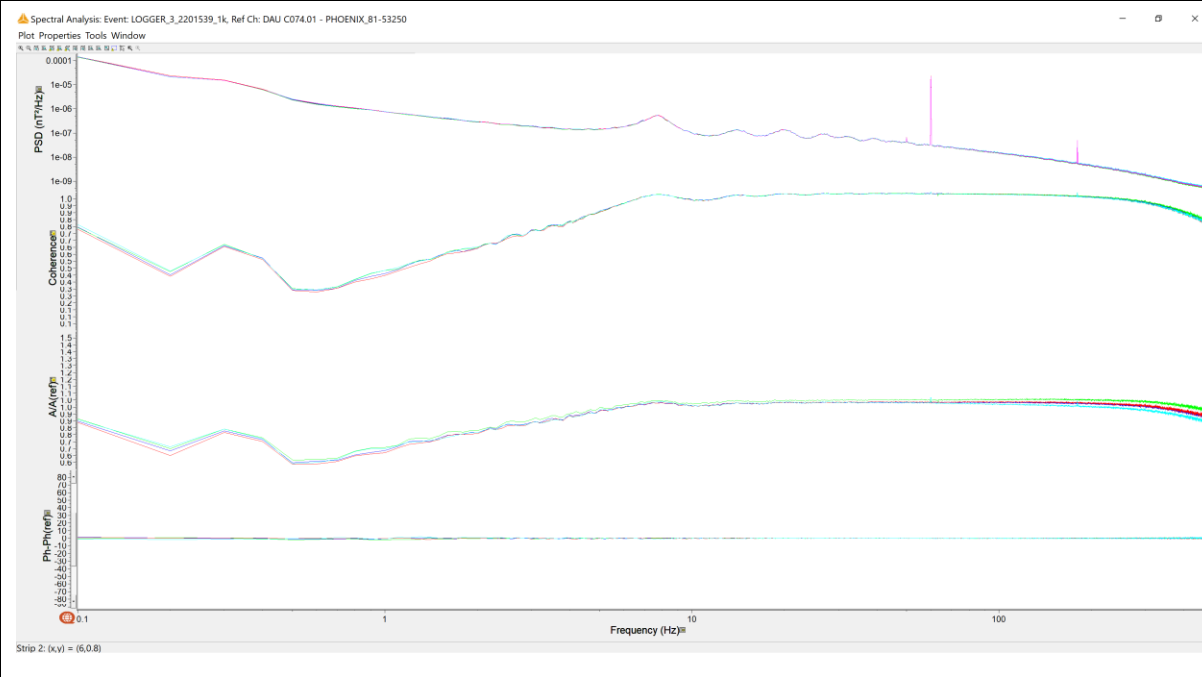
D...Name	Pen	COH Matc...
<input checked="" type="checkbox"/> DAU C074.06 - PHOENIX_81-53192	<span style="color: blue;">—</span>	93.6
<input checked="" type="checkbox"/> DAU C074.05 - PHOENIX_81-53207	<span style="color: green;">—</span>	93.9
<input checked="" type="checkbox"/> DAU C074.02 - PHOENIX_81-53214	<span style="color: red;">—</span>	93.1
<input checked="" type="checkbox"/> DAU C074.04 - PHOENIX_81-53249	<span style="color: cyan;">—</span>	93.1
<input checked="" type="checkbox"/> DAU C074.01 - PHOENIX_81-53250	<span style="color: magenta;">—</span>	

Active Template: <None>



**Power Spectral Density (PSD) of channels (strip 1); Coherency (strip 2) and Response Function (strips 3 and 4; Amplitude and Phase)**  
– *Logarithmic frequency scale* –

**Test LF 5**  
**Sampling @ 1000 samples/s**



Legend

D...Name	Pen	COH Matc...
<input checked="" type="checkbox"/> DAU C074.06 - PHOENIX_81-53192	<span style="color:blue">—</span>	93.6
<input checked="" type="checkbox"/> DAU C074.05 - PHOENIX_81-53207	<span style="color:green">—</span>	93.9
<input checked="" type="checkbox"/> DAU C074.02 - PHOENIX_81-53214	<span style="color:red">—</span>	93.1
<input checked="" type="checkbox"/> DAU C074.04 - PHOENIX_81-53249	<span style="color:cyan">—</span>	93.1
<input checked="" type="checkbox"/> DAU C074.01 - PHOENIX_81-53250	<span style="color:magenta">—</span>	

Active Template: <None>

### D.6. TEST HF 1 RESULTS

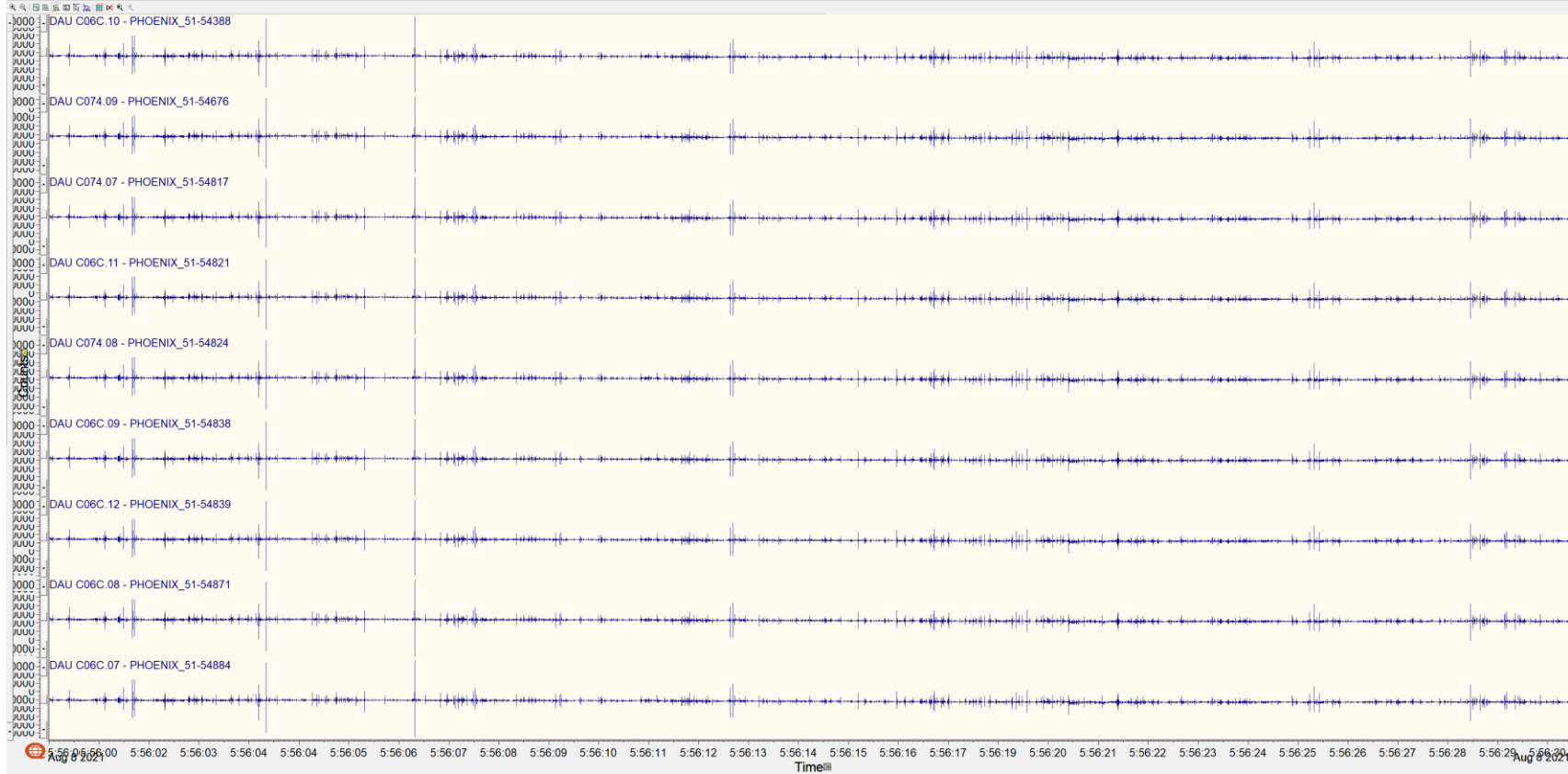
Channels	Sensor: Name	Instrument: ...	Sensor: Type	Sen...	Sens...	Sensor: Im...	Sensor: Pol...
DAU C06C.10 - PHOENIX_51-54388	PHOENIX_51-54388	51-54388	Magnetometer	Inline	0	110	Positive
DAU C074.09 - PHOENIX_51-54676	PHOENIX_51-54676	51-54676	Magnetometer	Inline	0	110	Positive
DAU C074.07 - PHOENIX_51-54817	PHOENIX_51-54817	51-54817	Magnetometer	Inline	0	110	Positive
DAU C06C.11 - PHOENIX_51-54821	PHOENIX_51-54821	51-54821	Magnetometer	Inline	0	110	Positive
DAU C074.08 - PHOENIX_51-54824	PHOENIX_51-54824	51-54824	Magnetometer	Inline	0	110	Positive
DAU C06C.09 - PHOENIX_51-54838	PHOENIX_51-54838	51-54838	Magnetometer	Inline	0	110	Positive
DAU C06C.12 - PHOENIX_51-54839	PHOENIX_51-54839	51-54839	Magnetometer	Inline	0	110	Positive
DAU C06C.08 - PHOENIX_51-54871	PHOENIX_51-54871	51-54871	Magnetometer	Inline	0	110	Positive
DAU C06C.07 - PHOENIX_51-54884	PHOENIX_51-54884	51-54884	Magnetometer	Inline	0	110	Positive

Notes: all is OK /

### Time Series @48k samples per second

MT Timeseries Viewer : PST\_220055600\_48k.event

View Tools Window

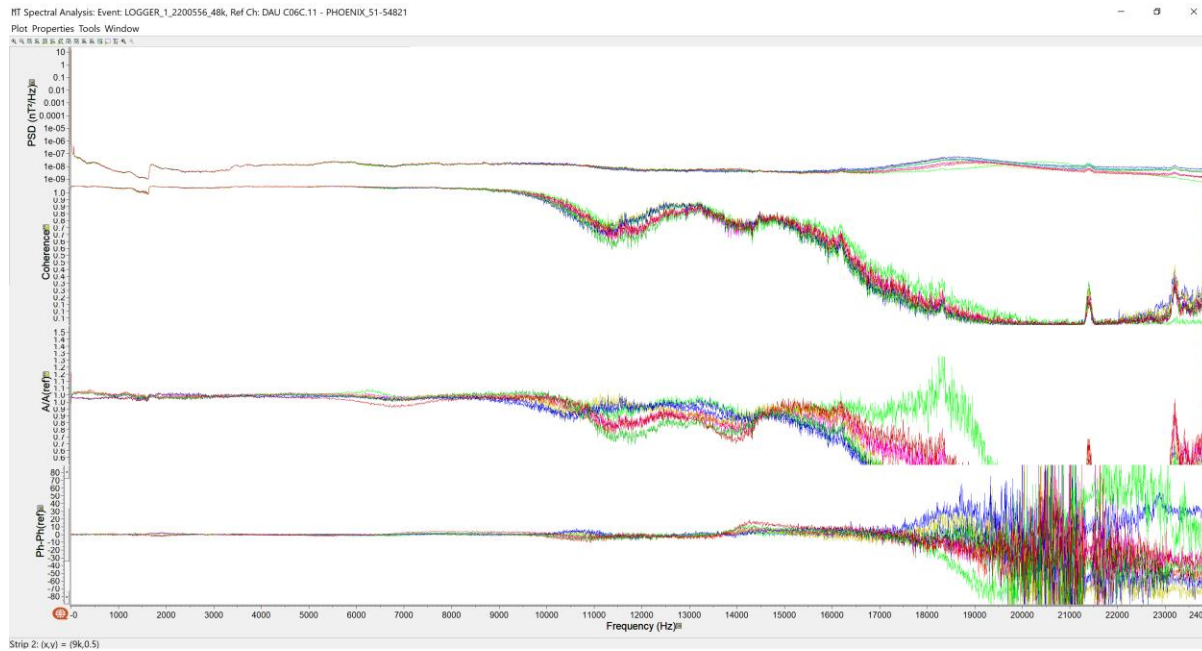


Strip 4: DAU C06C.11 - PHOENIX\_51-54821 - (x,y) = (2021.08.08 05:56:14.6868,245949Counts) Index: 704965 - 705357

Cdc: -110612

**Power Spectral Density (PSD) of channels (strip 1); Coherency (strip 2) and Response Function (strips 3 and 4; Amplitude and Phase)**  
– *Linear frequency scale* –

**Test HF 1**  
**Sampling @ 48k samples/s**



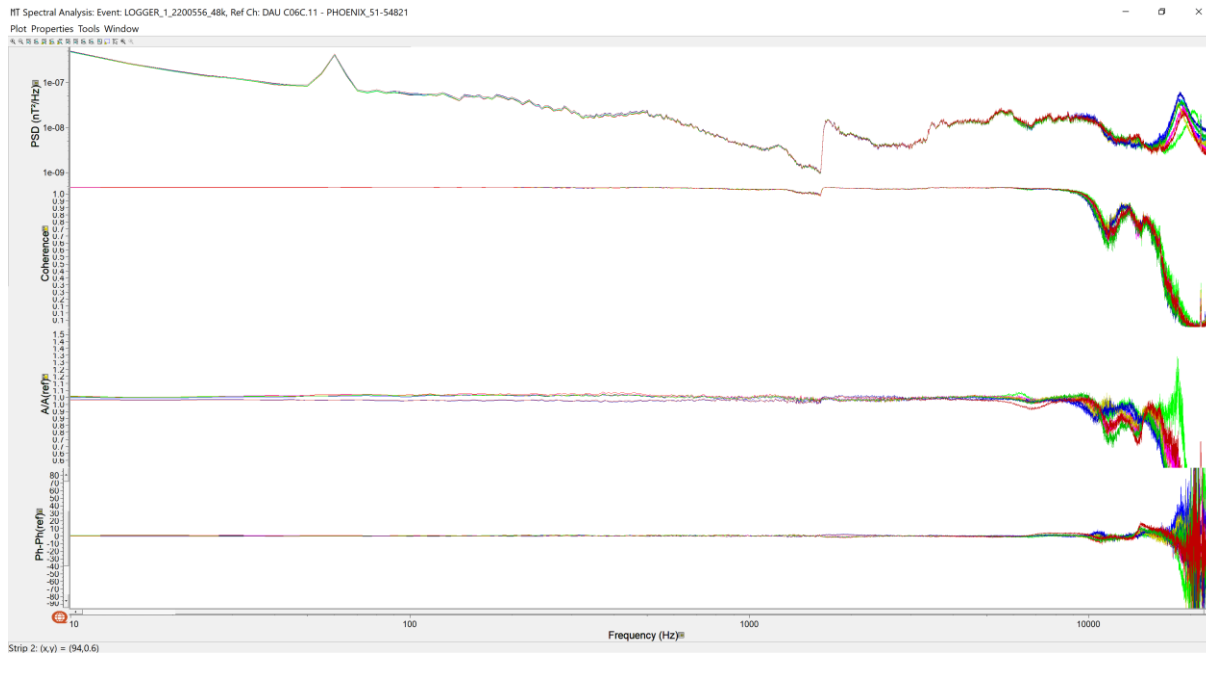
MT Legend

D...Name	Pen	COH Matc...	Ar
DAU C06C.10 - PHOENIX_51-54388	Blue	72.1	
DAU C074.09 - PHOENIX_51-54676	Green	74.7	
DAU C074.07 - PHOENIX_51-54817	Red	71.9	
DAU C06C.11 - PHOENIX_51-54821	Cyan		
DAU C074.08 - PHOENIX_51-54824	Magenta	71.9	
DAU C06C.09 - PHOENIX_51-54838	Yellow	72.1	
DAU C06C.12 - PHOENIX_51-54839	Purple	71.4	
DAU C06C.08 - PHOENIX_51-54871	Light Green	70.3	
DAU C06C.07 - PHOENIX_51-54884	Dark Red	72.7	

Active Template: <None>

**Power Spectral Density (PSD) of channels (strip 1); Coherency (strip 2) and Response Function (strips 3 and 4; Amplitude and Phase)**  
– *Logarithmic frequency scale* –

**Test HF 1**  
**Sampling @ 48k samples/s**



MT Legend

D...Name	Pen	COH Matc...	Ar
<input checked="" type="checkbox"/> DAU C06C.10 - PHOENIX_51-54388	<span style="color:blue">—</span>	72.1	
<input checked="" type="checkbox"/> DAU C074.09 - PHOENIX_51-54676	<span style="color:green">—</span>	74.7	
<input checked="" type="checkbox"/> DAU C074.07 - PHOENIX_51-54817	<span style="color:red">—</span>	71.9	
<input checked="" type="checkbox"/> DAU C06C.11 - PHOENIX_51-54821	<span style="color:cyan">—</span>		
<input checked="" type="checkbox"/> DAU C074.08 - PHOENIX_51-54824	<span style="color:magenta">—</span>	71.9	
<input checked="" type="checkbox"/> DAU C06C.09 - PHOENIX_51-54838	<span style="color:yellow">—</span>	72.1	
<input checked="" type="checkbox"/> DAU C06C.12 - PHOENIX_51-54839	<span style="color:purple">—</span>	71.4	
<input checked="" type="checkbox"/> DAU C06C.08 - PHOENIX_51-54871	<span style="color:orange">—</span>	70.3	
<input checked="" type="checkbox"/> DAU C06C.07 - PHOENIX_51-54884	<span style="color:darkred">—</span>	72.7	

Active Template: <None>

### D.7. TEST HF 5 RESULTS

Channels	Sensor Name	Instrument	S	Sensor Type	Sen...	Sens...	Sensor Im...	Sensor Pol...
DAU C074.12 - PHOENIX_81-53192	PHOENIX_81-53192	81-53192		Magnetometer	Inline	0	110	Positive
DAU C074.11 - PHOENIX_81-53207	PHOENIX_81-53207	81-53207		Magnetometer	Inline	0	110	Positive
DAU C074.08 - PHOENIX_81-53214	PHOENIX_81-53214	81-53214		Magnetometer	Inline	0	110	Positive
DAU C074.10 - PHOENIX_81-53249	PHOENIX_81-53249	81-53249		Magnetometer	Inline	0	110	Positive
DAU C074.07 - PHOENIX_81-53250	PHOENIX_81-53250	81-53250		Magnetometer	Inline	0	110	Positive

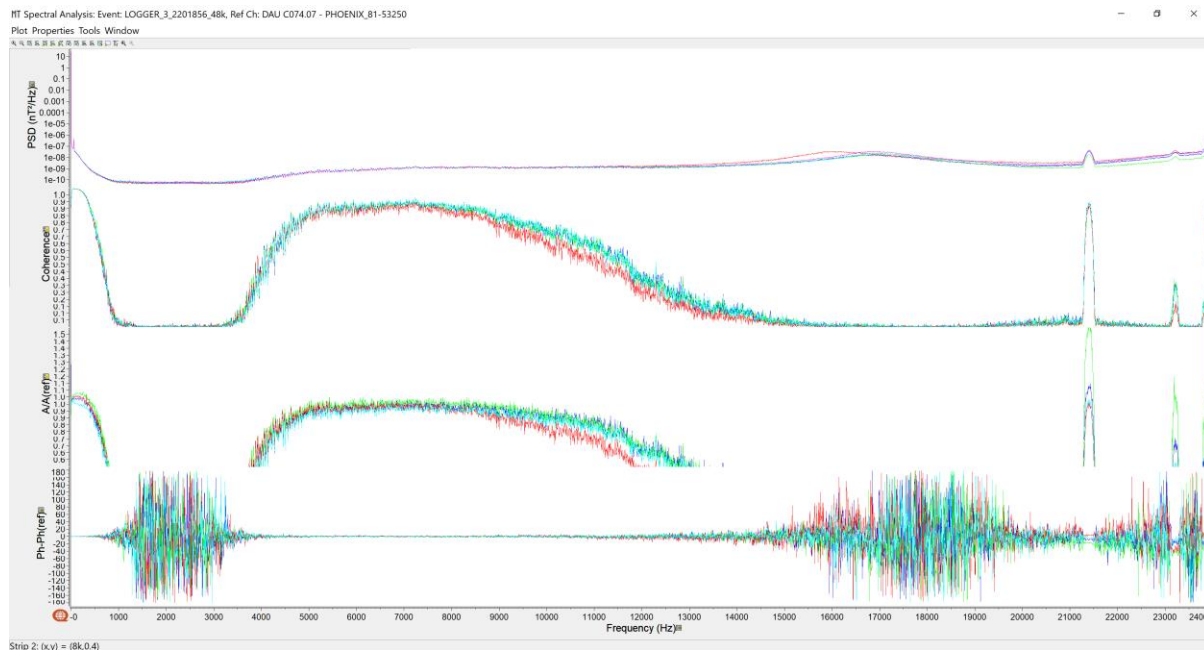
Notes: all is OK

### Time Series @48k samples per second



**Power Spectral Density (PSD) of channels (strip 1); Coherency (strip 2) and Response Function (strips 3 and 4; Amplitude and Phase)**  
– *Linear frequency scale* –

**Test HF 5**  
**Sampling @ 48k samples/s**



MT Legend

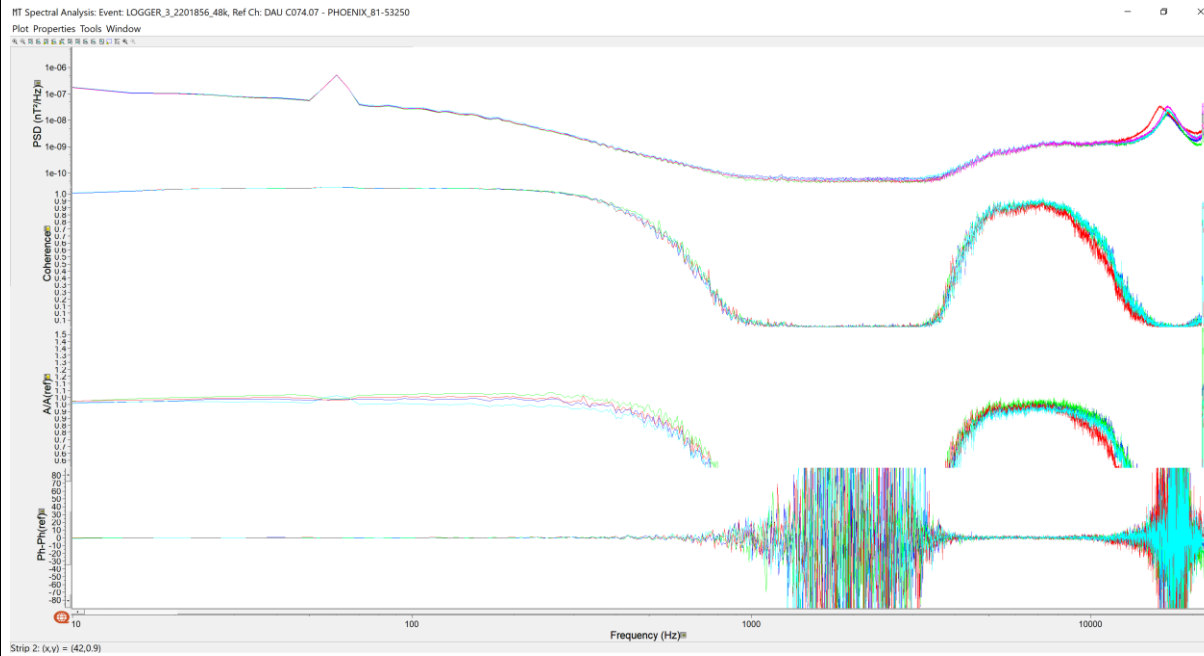
D...Name	Pen	COH Matc...	Ar
<input checked="" type="checkbox"/> DAU C074.12 - PHOENIX_81-53192	Blue	34.6	
<input checked="" type="checkbox"/> DAU C074.11 - PHOENIX_81-53207	Green	34.7	
<input checked="" type="checkbox"/> DAU C074.08 - PHOENIX_81-53214	Red	31.9	
<input checked="" type="checkbox"/> DAU C074.10 - PHOENIX_81-53249	Cyan	34.7	
<input checked="" type="checkbox"/> DAU C074.07 - PHOENIX_81-53250	Magenta		

Active Template: <None>



**Power Spectral Density (PSD) of channels (strip 1); Coherency (strip 2) and Response Function (strips 3 and 4; Amplitude and Phase)**  
– *Logarithmic frequency scale* –

**Test HF 5**  
**Sampling @ 48k samples/s**



MT Legend

D...Name	Pen	COH Matc...	Ar
<input checked="" type="checkbox"/> DAU C074.12 - PHOENIX_81-53192	<span style="color:blue">—</span>	34.6	
<input checked="" type="checkbox"/> DAU C074.11 - PHOENIX_81-53207	<span style="color:green">—</span>	34.7	
<input checked="" type="checkbox"/> DAU C074.08 - PHOENIX_81-53214	<span style="color:red">—</span>	31.9	
<input checked="" type="checkbox"/> DAU C074.10 - PHOENIX_81-53249	<span style="color:cyan">—</span>	34.7	
<input checked="" type="checkbox"/> DAU C074.07 - PHOENIX_81-53250	<span style="color:magenta">—</span>		

Active Template: <None>

## APPENDIX E. MT REMOTE TEST

### E.1. GENERAL INFORMATION

<b>Project:</b>	CA01284S
<b>Date:</b>	2021-08-08
<b>Prepared by:</b>	Ryan Fearon
<b>QuickLay version:</b>	ver.5.7.7.15
<b>Common folder:</b>	ver.2.311 (released: 2021/07/21)
<b>Datum and Projection:</b>	WGS 84 / UTM Zone 16 North
<b>Site Location (UTM):</b>	304699E / 5493200N
<b>Magnetic Declination:</b>	04°W
<b>Sensor Information:</b>	see table below.

Channel	Azimuth	Length	Channel	Azimuth
Ex	00° North	100 m	Hx	00° North
Ey	90° East	100 m	Hy	90° East

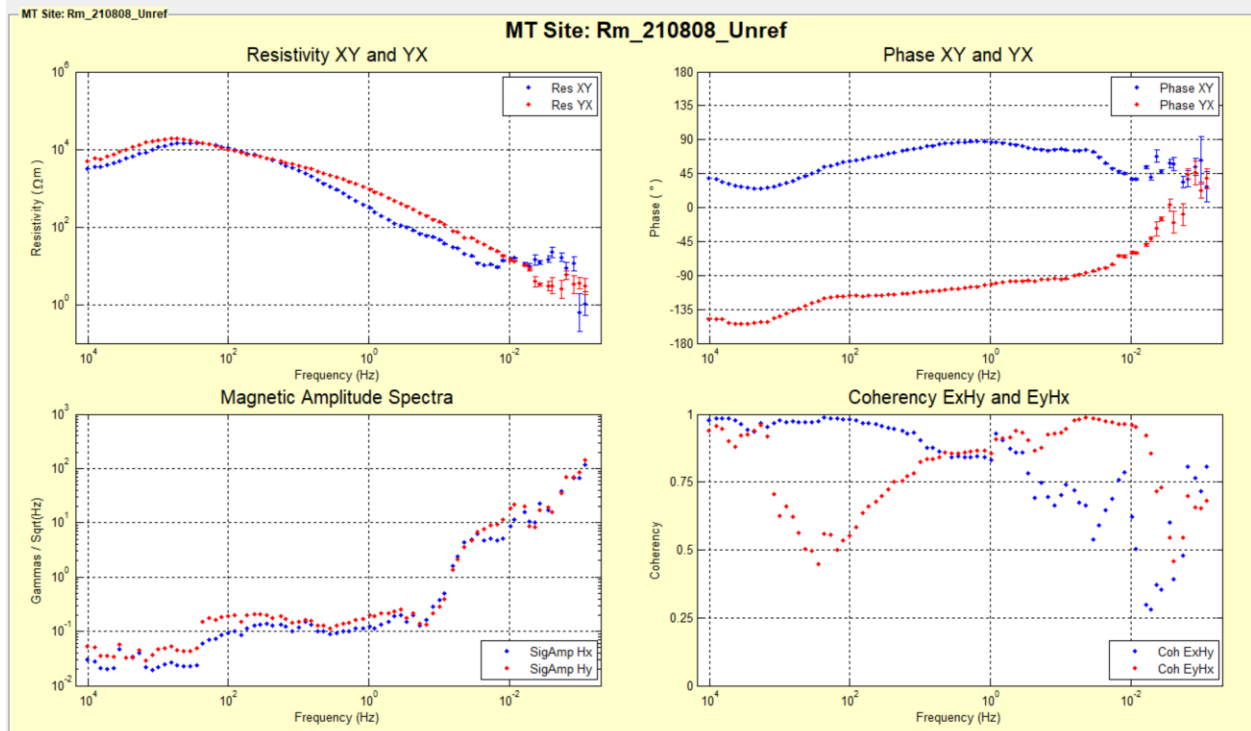
Channels	Sensor: Name	Sensor: C...	Sensor: Type	Instrument: ...	S. Sens...	Sensor: Im..
DAU C06C.01 - RM_Hx	RM_Hx	Inline	Magnetometer	51-54676	0	111
DAU C06C.02 - RM_Hy	RM_Hy	Crossline	Magnetometer	51-54824	90	111
DAU C06C.04 - RM_Ex	RM_Ex	Inline	Dipole	GL	0	8801
DAU C06C.05 - RM_Ey	RM_Ey	Crossline	Dipole	GL	90	9001

**Test conditions:** No visible culture – the PST was also completed at this site.  
 The chosen location was in a sand pit, crew were able to bury the coils deep.

**E.2. SOUNDING CURVES**

Apparent resistivity, phase, magnetic signal amplitude and off-diagonal coherences of the MT remote, data processed unreferenced.

**Comments:** all is ok



### E.3. EVENTS ACQUIRED AND USED IN PROCESSING

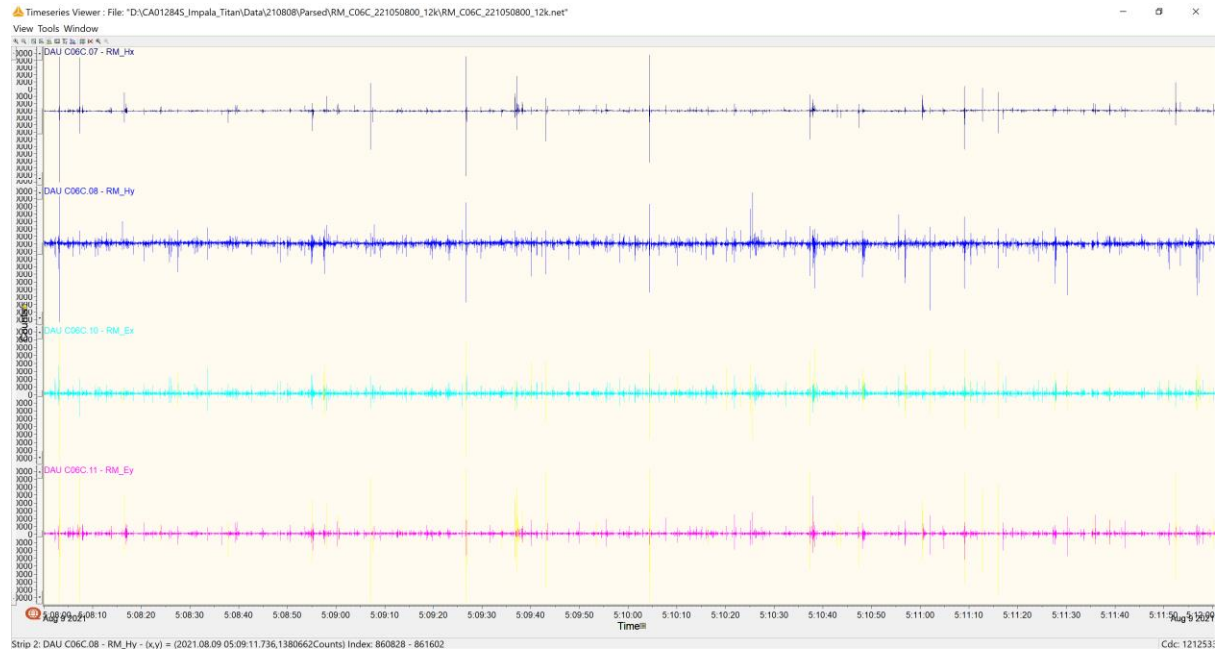
Sample rate	Net Events	TS Length	Observation
48,000 sps	RM_2210416_48k To RM_2210756_48k	30s	
12,000 sps	RM_2210400_12k To RM_2210748_12k	4m	
1,000 sps		4hr	
40 sps		17hrs	

### E.4. SCREEN CAPTURE OF TIME SERIES

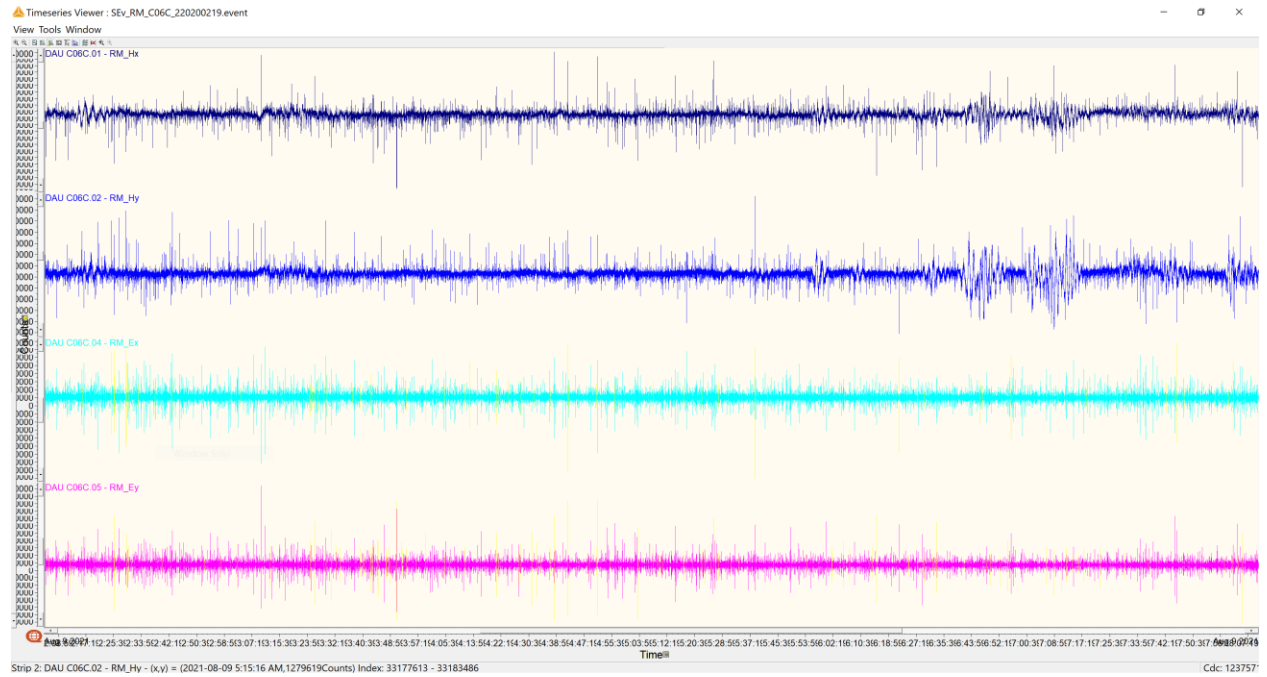
Time Series: @48,000 samples per second



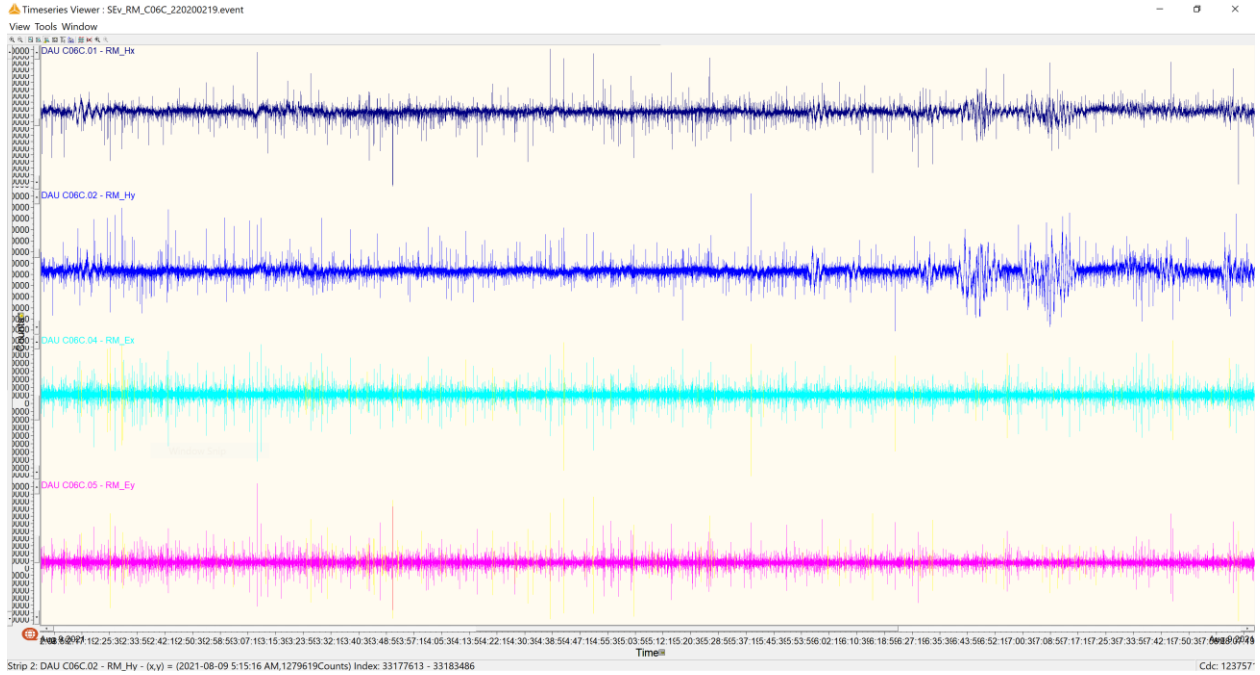
Time Series: @ 12,000 samples per second



Time Series: @1,000 samples per second



Time Series: @40 samples per second





## APPENDIX F. INSTRUMENT SPECIFICATIONS

### F.1. REF TEK – 160 QUANTEC DATA ACQUISITION SYSTEM

Refraction Technology Inc. – Plano, Texas

#### Specifications:

Specification	Description			
<b>Mechanical – DAS</b>				
Size:	130mm high x 240mm wide x 400mm long			
Weight:	16 lbs			
Shock:	Survives a 1 meter drop on any axis			
Operating Temperature:	-20°C to +60°C			
<b>Connectors</b>				
Channel Input:	PTO7A14-19S (2 each for 6-Channel DAS)			
Power:	PTO7A12-4S			
GPS Antenna:	standard			
<b>Power</b>				
Input Voltage:	10 to 15 VDC			
Average Power:	~6 W (5-6 channel)			
	~8 W (10-12 channel)			
<b>A/D Converter</b>				
Type:	$\Delta$ - $\Sigma$ modulation, 256 KHz base rate, 24-bit output resolution			
Channels:	12 (6 @ LS and 6 @ HS)			
Input Impedance:	100 Mohm			
Sensor Input Signal Range:	<b>Gain</b>	<b>Input Full Scale (volts)</b>	<b>Bit Weight</b>	
			<b>Actual</b>	<b>Reported</b>
	1	$\pm 32$ V	3.81 $\mu$ V	
	2	$\pm 16$ V		
	4	$\pm 8$ V	954 nV	
	8	$\pm 4$ V		
	16	$\pm 2$ V	238 nV	
	32	$\pm 1$ V		
	64	$\pm 500$ mV	59.6 nV	
128	$\pm 250$ mV			



Specification	Description		
	256	$\pm 125$ mV	14.9 nV
Sample Rates HS:	48000, 12000, 9600, 8000 sps		
Sample Rates LS:	4000, 2000, 1600, 1000, 960, 800, 500, 480, 400, 250, 240, 200, 125, 120, 100, 60, 50 sps		
<b>Time Base</b>			
Type:	GPS Receiver/Clock plus a disciplined oscillator		
Accuracy with GPS:	+/- 100 $\mu$ sec after validated 3-D fix and locked		
Free-Running Accuracy:	0.1 ppm over the temperature range of 0°C to 40°C, and 0.2 ppm from -20°C to 0°C		
<b>Recording Modes</b>			
Continuous:	All LS modes		
HS Mode 0	8000 sps for 360 s; once		
HS Mode 1	8000 sps for 360 s; every 10 minutes on the 0, 10, 20, 30, 40, 50 minute marks		
HS Mode 2	12000 sps for 240 s; every 10 minutes on the 0, 10, 20, 30, 40, 50 minute marks		
HS Mode 3	48000 sps for 60 s; every 10 minutes on the 0, 10, 20, 30, 40, 50 minute marks		
HS Mode 4	2 @ 12 ksp/s for 240 s and 1 @ 48 ksp/s for 30 s; repeated 20 minutes ( 12 ksp/s on 0, 8, 20, 28, 40, 48 minute marks and 48 ksp/s on 16, 36, and 56 minute marks)		
<b>Recording Capacity</b>			
Battery Backed SRAM:	64 Mbytes		
Removable Storage:	3 @ 8 GB industrial USB 2 sticks		
<b>Recording Format</b>			
Format:	SEED and miniSEED Recording Formats		

**A.1 MTC 150 (P150) SERIES MAGNETIC SENSORS**

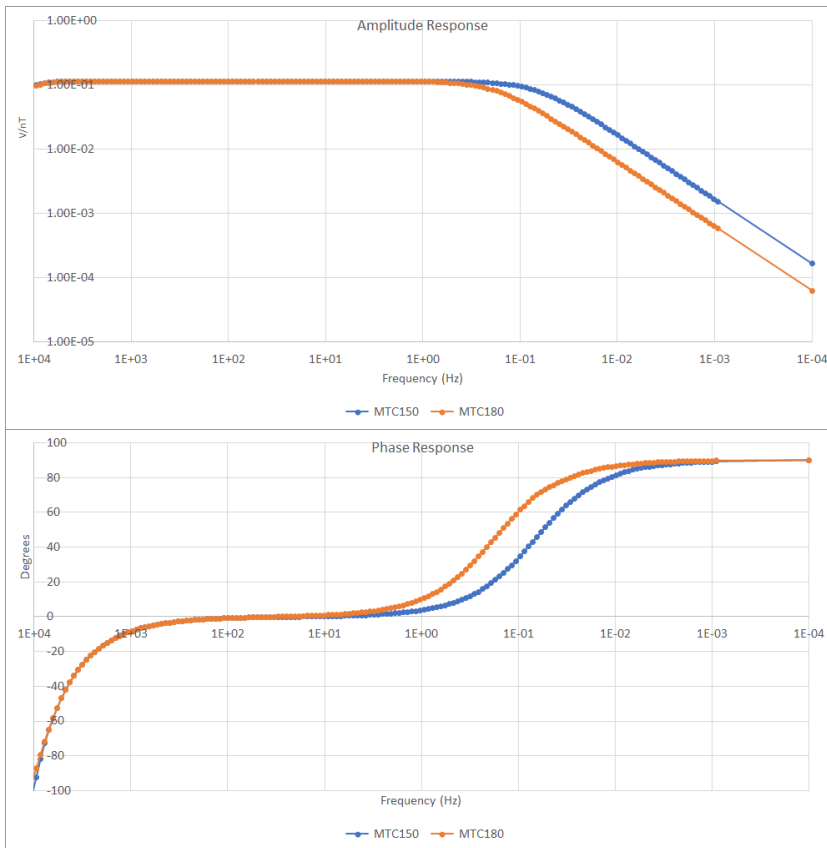
Phoenix Geophysics Ltd

MTC-150 magnetic sensor coils weigh 6.4 kg, and measure 142 cm. They provide magnetotelluric data at frequencies between 10 kHz to 10 000 s.



**Technical Specifications**

Overall Length: 142 cm  
Outside Diameter: 6.3 cm  
Weight: 6.4 kg  
Frequency Range (for MT):  
10 kHz to 10 000 seconds



**A.1 MTC 180 (P180) SERIES MAGNETIC SENSORS**

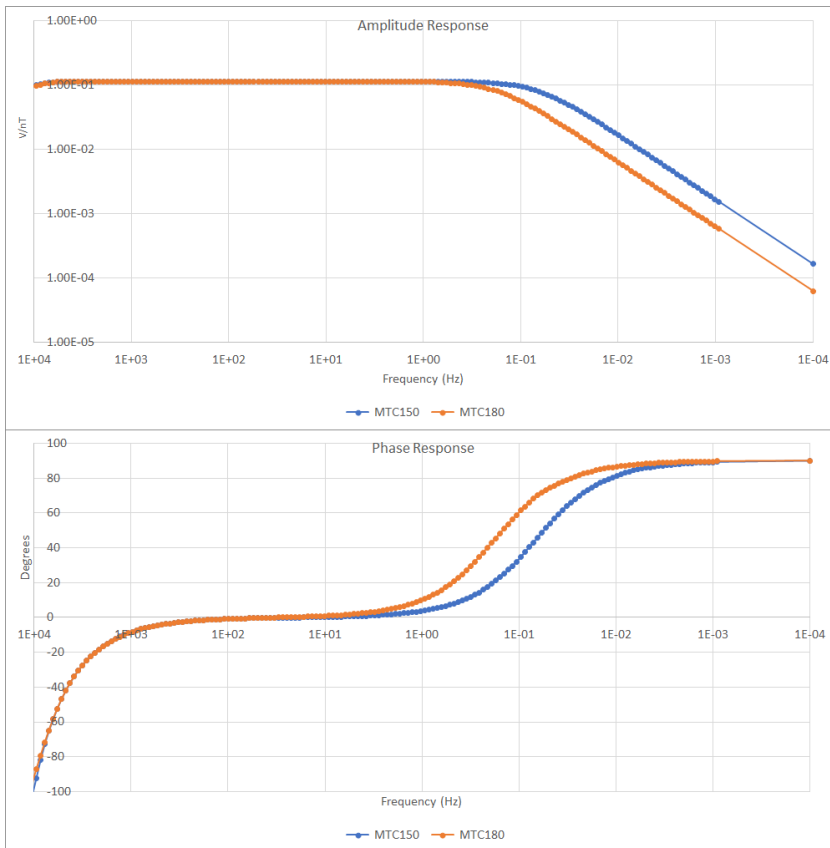
Phoenix Geophysics Ltd

MTC-180 magnetic sensor coils are intended for use in MT surveys to moderate depth, they weigh about 4.5 kg (half the weight of the MTC-50H) and measure 91 cm in length (70% of the length of an MTC-50). The MTC-180 provides good data from 10 kHz down to 10 000 seconds, depending on signal strength and local conditions.



**Technical Specifications**

Overall Length: 91 cm  
Outside Diameter: 6.3 cm  
Weight: 4.5 kg  
Frequency Range (for MT):  
10 kHz to 10 000 seconds



## **APPENDIX G. REFERENCES**

Telford., W.M., Geldart, L., Sheriff, R., and Keys, D., 1976. Applied Geophysics: Cambridge University Press, New York, NY.

### **G.1. MAGNETOTELLURIC**

Egbert, G.D., 1997. Robust multiple station magnetotelluric data processing. Geophys. J. Int., 130, 475-496.

Wight, D.E., 1987. MT/EMAP Data Interchange Standard. The Society of Exploration Geophysicists Document.



## SUMMARY INFORMATION

QUANTEC OFFICE INFORMATION	
Office:	Quantec Geoscience Ltd.
Address:	146 Sparks Ave., Toronto, ON, M2H 2S4, Canada
Phone:	+1-416-306-1941
Web:	<a href="http://quantecgeo.com">quantecgeo.com</a>
Email:	<a href="mailto:info@quantecgeoscience.com">info@quantecgeoscience.com</a>
PROJECT INFORMATION	
Client Name:	Impala Canada Ltd.
Project Name:	Titan Property
Project Location:	Ontario, Canada
Project Type:	SPARTAN MT
Project Number:	CA01284S
Project Manager:	Mark Morrison
Project Period:	August 7 to 12, 2021
Report Type:	Logistics Report
Report Author(s):	Ryan Fearon
Report date:	September 9, 2021
Reference	<i>Logistics Report for a SPARTAN MT survey over Titan Property (Ontario, Canada) by Quantec Geoscience Ltd. on behalf of Impala Canada Ltd.</i>
Template version	Version 2021.05.05