Report on the Testing of the

Barrett Communications Pty. Ltd.

Barrett 4050 HF SDR

4050ip
(Control Handset)

America

Add value.
Inspire trust.

In accordance with:
FCC Part 90 Subpart I and Part 87 Subpart D

Prepared for: Barrett Communications Pty. Ltd.
47 Discovery Drive
Bibra Lake, Western Australia 6163 Australia

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Document Number: AT72191371.2C1

SIGNATURE			
			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Jean-Charles, Thierry	**Team Lead** **TUV SUD America Inc.**	**Authorized Signatory**	09/01/2023

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD America, Inc. document control rules.

FCC Accreditation Designation Number US1233
FCC Test Site Registration Number 967699
Innovation, Science, and Economic Development Canada Lab Code 23932

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with the standards listed above.

A2LA Cert. No. 2955.09

DISCLAIMER AND COPYRIGHT

ACCREDITATION

Our A2LA Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our A2LA Accreditation.

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Contents

1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Table 1.1-1 – Modification Record

Issue	Description of Change	Date of Issue
0	First Issue	08/24/2023
1	Second Issue – Updated Model Number and Client Email Id	09/01/2023

1.2 Introduction

The purpose of this report is to verify the compliance of the Barrett Communications model Barrett 4050 HF SDR, with Part 87 Subpart D and 90 Subpart I of the FCC's Code of Federal Regulations Radio Standards Specification for the tests documented herein.

Applicant	Barrett Communications Pty. Ltd.
Manufacturer	Barrett Communications Pty.Ltd.
Applicant's Email Address	dave.archer@motorolasolutions.com
Model Number	4050ip and 4050se
Serial Number	405013689
FCC ID	OW4-4050IP
Hardware Version(s)	Micro – A9, PA – A11, Rear Interface – A11, Control Head – A15
Software Version(s)	1.9.5
Number of Samples Tested	1
Test Specification/Issue/Date	US Code of Federal Regulation (CFR): Title 47, Part 90:Private Land Mobile Services - 2023 US Code of Federal Regulation (CFR): Title 47, Part 87:Aviation Services - 2023
Order Number	72191371
Date of Receipt of EUT	06/30/2023
Start of Test	07/14/2023
Finish of Test	08/08/2023
Related Document(s)	ANSI C63.26: American National Standard of Compliance Testing of Transmitters Used in Licensed Radio Services - December 2015 US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures - 2023

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC Part 87 Subpart D and 90 Subpart I is shown below.

Table 1.3-1: Test Result Summary

Test Parameter	Test Plan (Yes/No)	Test Result	FCC Rule Part	Test Report Page No
Radiated Spurious Emissions	Yes	Pass	2.1053, 90.210, 87.139	8

1.4 Product Information

1.4.1 Technical Description

The equipment under test was the Barrett 4050 Transceiver is an SDR based HF SSB transceiver with a frequency range of 1.5 to 30 MHz in transmit and 250kHz – 30 MHz in receive. Designed to operate in the most arduous environments, as encountered in portable, off-road vehicles, vessels, and aircraft environments. It has two variants 4050ip which has an ethernet port and 4050se without an ethernet port.

Note: Testing was performed on the 4050ip model to show compliance of both variants.

A full description and detailed product specification details are available from the manufacturer.

Figure 1.4.1-1 –Front view of the EUT

Figure 1.4.1-2 – Test setup of EUT with ancillaries

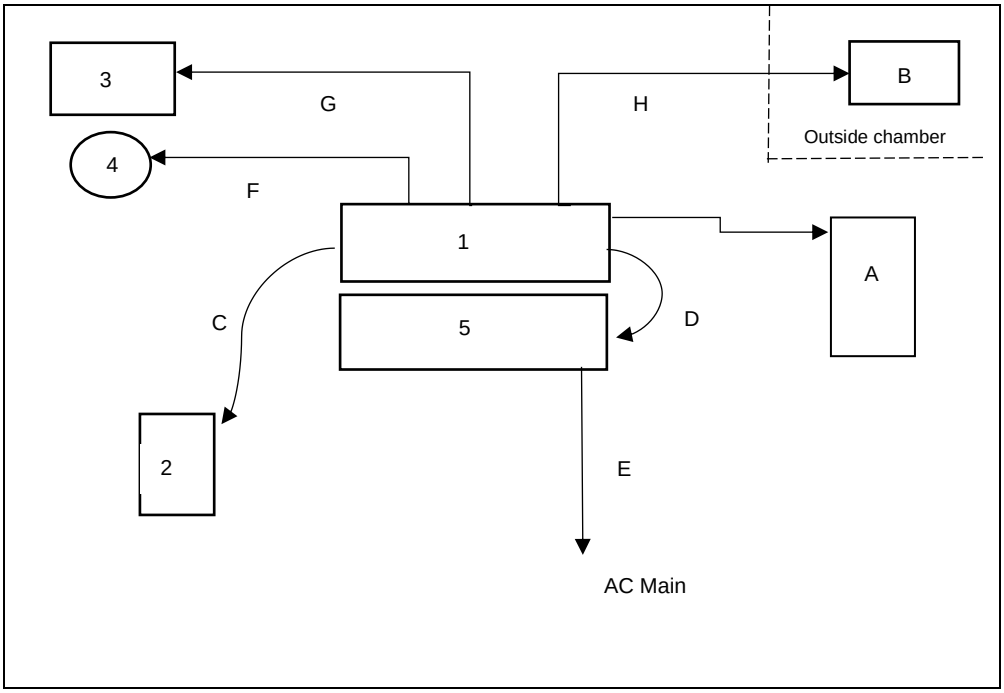

Figure 1.4.1-3 – Test Setup Block Diagram

Table 1.4.1-1: Primary Equipment Descriptions

Item	Equipment Type / Description	Manufacturer
1	Barrett 4050 HF SDR Transceiver	Barrett Communications
2	BCA40500: 4050 Control handset	Barrett Communications
3	BCA40015: Barrett Loudspeaker	Barrett Communications
4	BCA40009: GPS/ESU Receiver	Barrett Communications
5	BCA402201: 4022 Mains power supply 24V for 4050	Barrett Communications

Table 1.4.1-2: Support Equipment and cable Descriptions

Item	Equipment Type / Description	Manufacturer
A	AX-500-30; 50 ohm load termination	Electro Impulse Laboratory, Inc
B	Laptop for modulation configuration	Lenovo
C	BCA40511: 4050 control handset Interface cable 0.85m	Barrett Communications
D	SA-42020: 4050 transceivers to 4022 power supply cable	Barrett Communications
E	SA-00020 IEC Mains Cord	Barrett Communications
F	Antenna cable	Barrett Communications
G	Speaker cable	Barrett Communications
H	25 pin auxiliary connector to RS-232 cable	Barrett Communications

1.4.2 Modes of Operation

The tested mode of operation and configuration during the assessment is listed below.

CFR Title 47 Rule Part	Configuration	Frequency Band of Operation (MHz)	Test Frequency (MHz)	Power (W)	Mode
87 & 90	Remote Front Panel	1.5 – 30	Low: 1.6 Middle: 15.8 High: 29.8	150	H3E(AM) & J3E(USB)

Note: Testing was performed on three (Low, Mid & High) frequencies as declared by the manufacturer.

Power Setting used: 150W.

1.4.3 Monitoring of Performance

The following performance attributes were monitored:

Radiated Spurious Emissions of the Transmitter

1.5 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.6 EUT Modification Record

The table below details modifications made to the EUT during the test program. The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	Initial State		

The equipment was tested as provided without any modifications.

1.7 Test Location

TÜV SÜD conducted the following tests at our Alpharetta, GA test laboratory.

Test Name	Name of Engineer(s)	Accreditation
Operating Voltage 24VDC		
Radiated Spurious Emissions	Bhagyashree Chaudhary	A2LA

Office address:
TÜV SÜD America
5945 Cabot Parkway, Suite 100
Alpharetta, GA 30005, USA

2 Test Details

2.1 Radiated Spurious Emissions

2.1.1 Specification Reference

FCC Sections: 90.210(a)(b) & 87.139(c)

2.1.2 Equipment Under Test and Modification State

No modifications were needed to comply to the test requirements.

2.1.3 Date of Test

07/14/2023 – 08/08/2023

2.1.4 Test Method

The equipment under test is placed in the Semi- Anechoic Chamber on a RF transparent table at the turntable center. For each spurious emission, the antenna mast is raised and lowered from 1 to 4 meters and the turntable is rotated 360° and the maximum reading on the spectrum analyzer is recorded. This was repeated for both horizontal and vertical polarizations of the receive antenna.

For frequencies below 150 kHz, peak measurements were made using a resolution bandwidth RBW of 300 Hz and a video bandwidth VBW of 1 kHz and frequencies between 150 kHz and 30MHz, peak measurements were made using a resolution bandwidth RBW of 10 kHz and a video bandwidth VBW of 30 kHz. For frequencies between 30 MHz and 1000 MHz, peak measurements were made using a resolution bandwidth RBW of 100 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000 MHz, peak measurements were made with RBW of 1 MHz and VBW of 3 MHz

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB. Which is equivalent to -13 dBm. So, each identified emission was measured and compared to the ERP licensed limit of -13 dBm which calculates to 84.4 dBuV/m at a 3-meter test distance.

Measurements up to 500 MHz were done using Tile7 (Version 7.7.2.4) automated software. Reported level is the actual level with all the correction factors factored in.

2.1.5 Environmental Conditions

The EUT was evaluated within the temperature, humidity and pressure range of the EUT as specified by the standard. The laboratory shall have an ambient temperature range of 15°C to 35°C and relative humidity range of 30% to 60%.

Ambient Temperature	22.3 °C
Relative Humidity	53.8 %

2.1.6 Test Results

Test Summary: EUT was set to transmit mode.

Test Results: Pass

See data below for detailed results.

Table 2.1.6-1: Field Strength of Spurious Emissions - H3E (AM)

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polarity (H/V)	Results (Pass/FAIL)
LCH - 1.6 MHz					
0.04402	68.48	84.4	15.9	Co-Axial	PASS
0.08241	61.85	84.4	22.5	Co-Axial	PASS
0.2888	59.64	84.4	24.7	Co-Axial	PASS
0.5768	59.54	84.4	24.8	Co-Axial	PASS
3.2	34.94	84.4	49.4	Co-Axial	PASS
199.999	52	84.4	32.4	H	PASS
264.013	46.5	84.4	37.9	H	PASS
39.495	45.8	84.4	38.6	V	PASS
47.789	47.3	84.4	37.1	V	PASS
96.011	44	84.4	40.4	V	PASS
120.005	46.9	84.4	37.5	V	PASS
199.999	47.4	84.4	37	V	PASS
MCH – 15.8 MHz					
0.04795	69.44	84.4	14.9	Co-Axial	PASS
0.08822	61.07	84.4	23.3	Co-Axial	PASS
0.28581	61.50	84.4	22.9	Co-Axial	PASS
0.57536	60.43	84.4	24.0	Co-Axial	PASS
47.39	49.9	84.4	34.5	H	PASS
63.206	34.1	84.4	50.3	H	PASS
78.998	40	84.4	44.3	H	PASS
110.605	43.6	84.4	40.8	H	PASS
142.213	55.8	84.4	28.6	H	PASS
47.39	62.5	84.4	21.9	V	PASS
63.207	45.9	84.4	38.5	V	PASS
78.998	42.4	84.4	42	V	PASS

96.013	40.7	84.4	43.7	V	PASS
142.213	50.4	84.4	33.9	V	PASS
HCH – 29.8 MHz					
0.04402	68.19	84.4	16.2	Co-Axial	PASS
0.0796	64.89	84.4	19.5	Co-Axial	PASS
0.2902	63.27	84.4	21.1	Co-Axial	PASS
0.5768	61.12	84.4	23.3	Co-Axial	PASS
89.408	52.1	84.4	32.3	H	PASS
119.206	51.8	84.4	32.6	H	PASS
149.004	58.9	84.4	25.4	H	PASS
208.6	57.7	84.4	26.7	H	PASS
268.221	50.5	84.4	33.9	H	PASS
89.408	53.5	84.4	30.8	V	PASS
119.206	47.6	84.4	36.8	V	PASS
149.004	60.5	84.4	23.9	V	PASS
208.6	49.9	84.4	34.5	V	PASS
268.219	48	84.4	36.4	V	PASS

Table 2.1.6-2: Field Strength of Spurious Emissions - J3E (USB)

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polarity (H/V)	Results (Pass/FAIL)
LCH - 1.6 MHz					
0.04435	67.47	84.4	16.9	Co-Axial	PASS
0.08252	61.53	84.4	22.9	Co-Axial	PASS
0.2888	65.51	84.4	18.9	Co-Axial	PASS
0.57336	59.99	84.4	24.4	Co-Axial	PASS
199.999	52.3	84.4	32.1	H	PASS
264.013	47	84.4	37.4	H	PASS
30.613	46.8	84.4	37.6	V	PASS
38.905	46.3	84.4	38	V	PASS
47.815	46.9	84.4	37.4	V	PASS
120.005	47.1	84.4	37.2	V	PASS
200.023	47.1	84.4	37.2	V	PASS
MCH – 15.8 MHz					
0.0475	69.48	84.4	14.9	Co-Axial	PASS
0.0887	61.08	84.4	23.3	Co-Axial	PASS
0.2888	70.31	84.4	14.1	Co-Axial	PASS
0.5783	60.52	84.4	23.9	Co-Axial	PASS

47.415	50.4	84.4	34	H	PASS
63.207	35.1	84.4	49.3	H	PASS
78.998	40.2	84.4	44.1	H	PASS
110.632	46.2	84.4	38.2	H	PASS
142.213	56.5	84.4	27.9	H	PASS
47.415	63.2	84.4	21.2	V	PASS
63.206	46.2	84.4	38.2	V	PASS
78.998	42.9	84.4	41.5	V	PASS
110.606	44.2	84.4	40.2	V	PASS
142.213	50.3	84.4	34.1	V	PASS
HCH – 29.8 MHz					
0.0445	69.21	84.4	15.2	Co-Axial	PASS
0.08255	63.74	84.4	20.6	Co-Axial	PASS
0.2888	67.73	84.4	16.7	Co-Axial	PASS
0.57685	60.94	84.4	23.4	Co-Axial	PASS
89.408	53	84.4	31.4	H	PASS
119.206	54	84.4	30.4	H	PASS
149.004	61.5	84.4	22.8	H	PASS
208.6	58	84.4	26.4	H	PASS
268.219	50.9	84.4	33.5	H	PASS
89.408	54.6	84.4	29.8	V	PASS
119.206	49.3	84.4	35	V	PASS
149.004	64.1	84.4	20.3	V	PASS
208.6	50.1	84.4	34.3	V	PASS
268.221	48	84.4	36.4	V	PASS

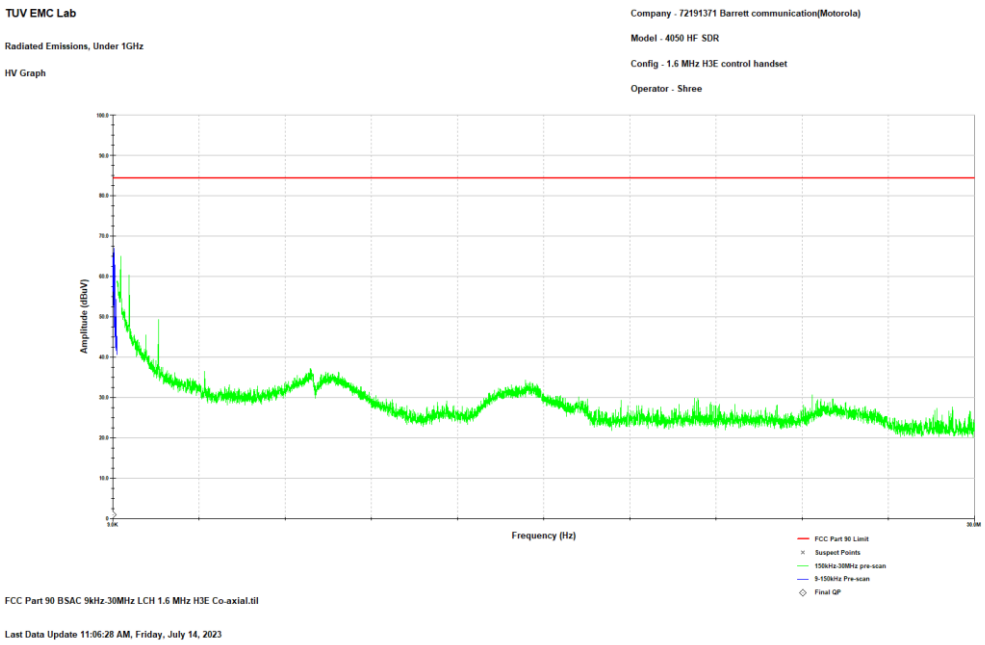

Figure 2.1.6-1: Reference Plot for Field Strength of Spurious Emissions – 9 kHz – 30 MHz –H3E - LCH

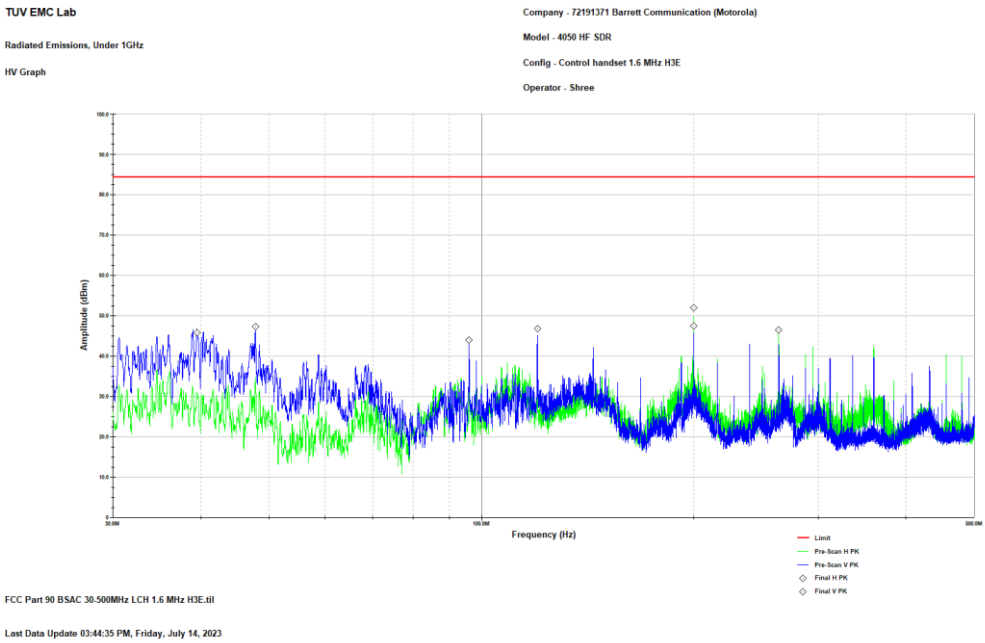

Figure 2.1.6-2: Reference Plot for Field Strength of Spurious Emissions – 30 MHz – 500 MHz – H3E-LCH

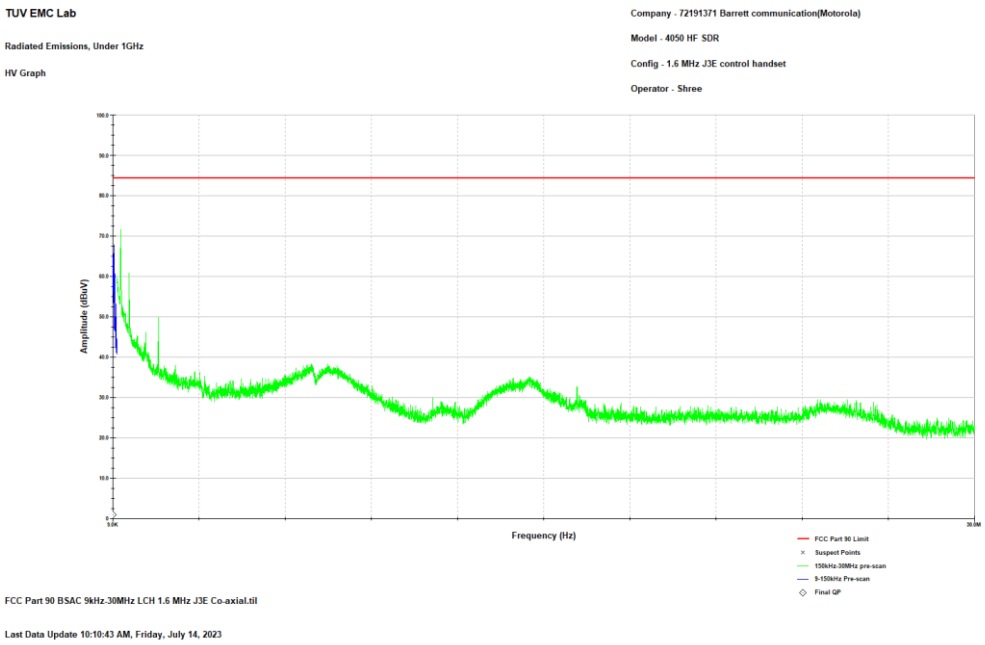

Figure 2.1.6-3: Reference Plot for Field Strength of Spurious Emissions – 9 kHz – 30 MHz – J3E - LCH

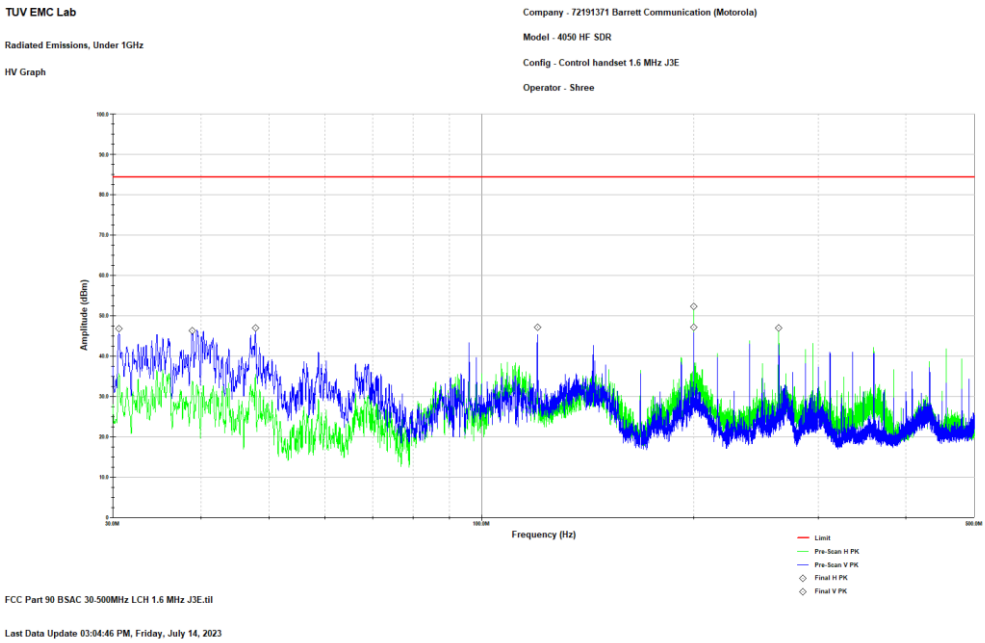

Figure 2.1.6-4: Reference Plot for Field Strength of Spurious Emissions – 30 MHz – 500 MHz – J3E-LCH

2.2 Test Equipment Used

Table 2.2-1 –Equipment List

Asset ID	Manufacturer	Model	Equipment Type	Serial Number	Last Calibration Date	Calibration Due Date
628	EMCO	6502	Active Loop Antenna 10kHz-30MHz	9407-2877	06/20/2023	06/20/2024
852	Teseq	CBL6112D	BiLog Antenna	51617	11/01/2022	11/01/2024
889	Com Power	PAM 103	Pre-amplifier	18020215	09/27/2022	09/27/2023
22	Teledyne Storm Microwave	90-195-456	BSAC Cable	N/A	10/07/2022	10/07/2023
20	Teledyne Storm Microwave	R-90-195-036	BSAC Cable	N/A	07/13/2023	07/13/2024
21	Teledyne Storm Microwave	R-90-195-072	BSAC Cable	N/A	07/13/2023	07/13/2024
882	Rohde & Schwarz	ESW44	ESW44 EMI TEST RECEIVER	101961	06/21/2023	06/21/2024

N/A – Not Applicable

3 Diagram of Test Set-ups

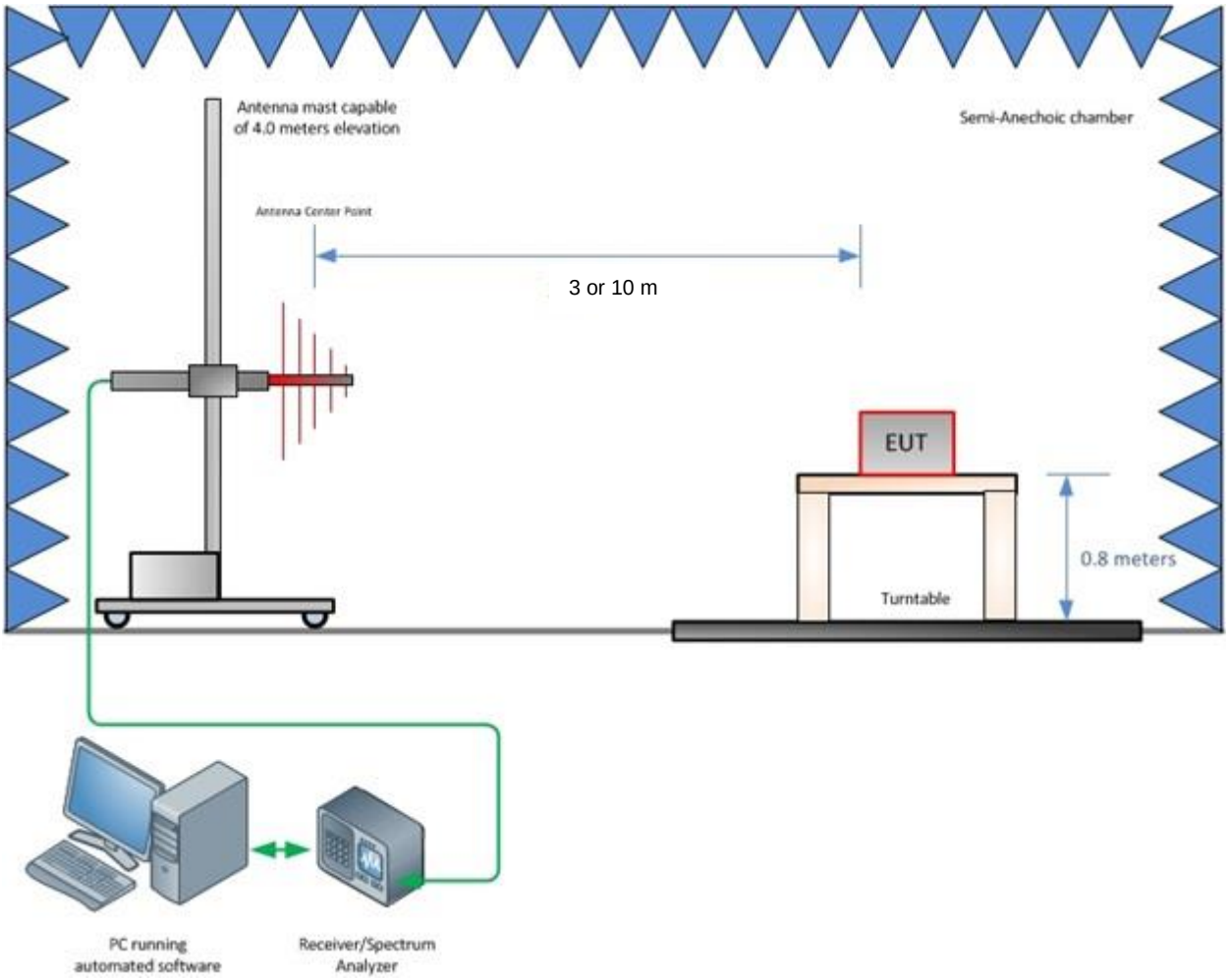

Figure 3-1 – Radiated Emissions Test Setup up to 1 GHz

4 Accreditation, Disclaimers and Copyright

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STATEMENT OF MEASUREMENT UNCERTAINTY – Emissions

The expanded laboratory measurement uncertainty figures (U_{Lab}) provided below correspond to an expansion factor (coverage factor) k = 1.96 which provide confidence levels of 95%.

Table 4-1: Estimation of Measurement Uncertainty

Parameter	U_{lab}
Radiated Emissions ≤ 1 GHz	± 5.814 dB
Radiated Emissions > 1 GHz	± 4.318 dB

TEST EQUIPMENT

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated to meet test method standard requirements and/or manufacturer's specifications.

END REPORT