

Report on the Testing of the
Barrett Communications Pty.Ltd.
Barrett 4050 HF SDR
4050ip
(Secondary Control Handset)



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

Prepared for: Barrett Communications Pty.Ltd.
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SIGNATURE

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FCC Accreditation Designation Number US1233
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EXECUTIVE SUMMARY

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



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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 – Addressed Typographical errors	08/28/2023
2	Third 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.td.
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	07/17/2023
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

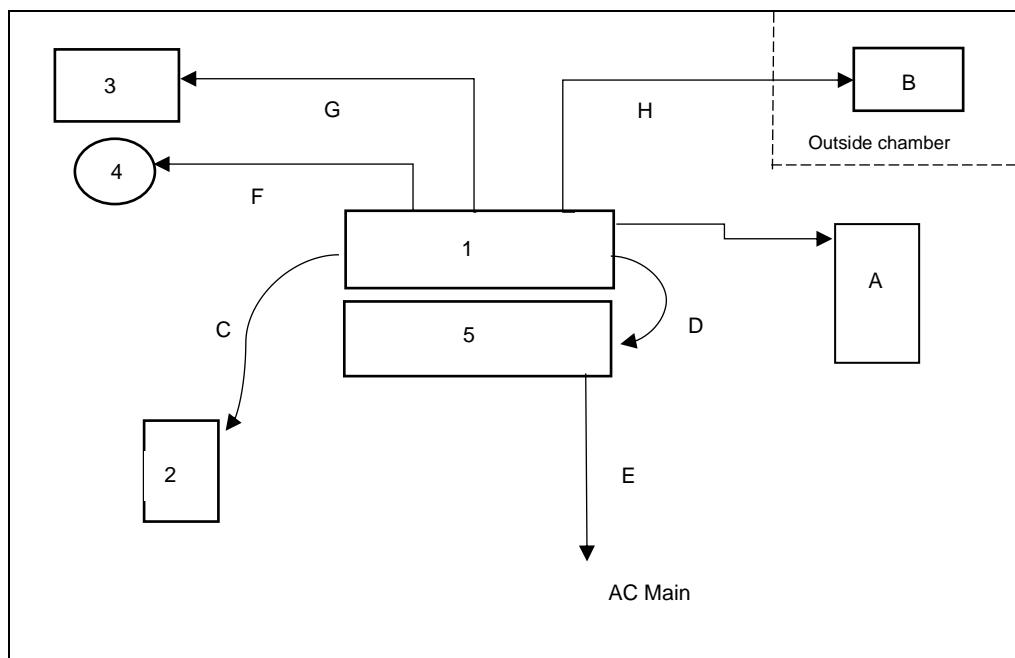


Figure 1.4.1-3 – Test Setup Block Diagram

**Table 1.4.1-1: Primary Equipment Descriptions**

Item	Equipment Type / Description	Manufacturer
1	Barrett 4050 HF SDR Transceiver	Barrett Communications
2	Secondary control Head	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	BCA40005: Remote head interface cable for 4050 - 6m	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

07/17/2023 – 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					
0.04418	68.31	84.4	16.1	Co-Axial	PASS
0.07916	61.02	84.4	23.4	Co-Axial	PASS
0.2515	68.79	84.4	15.6	Co-Axial	PASS
0.5708	60.98	84.4	23.4	Co-Axial	PASS
1.6022	51.12	84.4	33.3	Co-Axial	PASS
250.007	46.2	84.4	38.2	H	PASS
263.988	46	84.4	38.4	H	PASS
350.023	45.8	84.4	38.6	H	PASS
450.014	48.1	84.4	36.3	H	PASS
45.797	39.2	84.4	45.1	V	PASS
250.006	46.7	84.4	37.7	V	PASS
264.013	47.5	84.4	36.9	V	PASS
350.023	46.2	84.4	38.2	V	PASS
450.014	47.3	84.4	37	V	PASS
MCH - 15.8 MHz					
0.04653	67.60	84.4	16.8	Co-Axial	PASS
0.08483	61.36	84.4	23.0	Co-Axial	PASS
0.2499	66.58	84.4	17.8	Co-Axial	PASS
0.5723	60.27	84.4	24.1	Co-Axial	PASS
15.8003	50.33	84.4	34.1	Co-Axial	PASS
47.415	49.9	84.4	34.5	H	PASS
63.207	47.9	84.4	36.5	H	PASS
78.998	42	84.4	42.4	H	PASS
126.397	43.8	84.4	40.5	H	PASS
142.214	53.6	84.4	30.8	H	PASS



47.415	58.9	84.4	25.5	V	PASS
63.207	47.1	84.4	37.2	V	PASS
78.998	45.7	84.4	38.7	V	PASS
126.397	45.9	84.4	38.5	V	PASS
142.213	50.1	84.4	34.3	V	PASS
HCH – 29.8 MHz					
0.04245	66.82	84.4	17.6	Co-Axial	PASS
0.07722	61.71	84.4	22.7	Co-Axial	PASS
0.25149	70.61	84.4	13.8	Co-Axial	PASS
0.57088	60.33	84.4	24.1	Co-Axial	PASS
59.611	47.6	84.4	36.8	H	PASS
89.409	43.4	84.4	41	H	PASS
119.207	45.5	84.4	38.8	H	PASS
149.004	59.4	84.4	25	H	PASS
268.219	52.2	84.4	32.2	H	PASS
45.276	50.1	84.4	34.2	V	PASS
89.408	57	84.4	27.4	V	PASS
119.206	48.6	84.4	35.8	V	PASS
149.004	59.6	84.4	24.8	V	PASS
208.6	47.4	84.4	37	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					
0.04582	68.15	84.4	16.2	Co-Axial	PASS
0.0834	61.06	84.4	23.3	Co-Axial	PASS
0.25149	69.87	84.4	14.5	Co-Axial	PASS
0.57237	58.77	84.4	25.6	Co-Axial	PASS
110.794	38.7	84.4	45.7	H	PASS
250.007	47.7	84.4	36.7	H	PASS
350.023	48.9	84.4	35.5	H	PASS
450.014	42.4	84.4	42	H	PASS
111.594	38.7	84.4	45.7	V	PASS
250.006	45.7	84.4	38.7	V	PASS
312.002	42.9	84.4	41.4	V	PASS
350.023	48.7	84.4	35.7	V	PASS



450.039	44.7	84.4	39.7	V	PASS
MCH – 15.8 MHz					
0.04776	69.20	84.4	15.2	Co-Axial	PASS
0.08907	61.04	84.4	23.3	Co-Axial	PASS
0.2529	69.02	84.4	15.4	Co-Axial	PASS
0.2858	67.87	84.4	16.5	Co-Axial	PASS
0.5708	60.61	84.4	23.8	Co-Axial	PASS
47.415	51.3	84.4	33.1	H	PASS
63.206	49.2	84.4	35.1	H	PASS
78.998	43.2	84.4	41.2	H	PASS
126.397	43.8	84.4	40.5	H	PASS
142.213	54.9	84.4	29.5	H	PASS
47.39	51	84.4	33.3	V	PASS
63.206	49.2	84.4	35.2	V	PASS
78.998	43.1	84.4	41.2	V	PASS
126.397	43.6	84.4	40.8	V	PASS
142.213	54.9	84.4	29.4	V	PASS
HCH – 29.8 MHz					
0.04567	67.42	84.4	17.0	Co-Axial	PASS
0.0819	60.76	84.4	23.6	Co-Axial	PASS
0.2499	62.85	84.4	21.5	Co-Axial	PASS
0.57536	59.49	84.4	24.9	Co-Axial	PASS
59.611	49.3	84.4	35.1	H	PASS
89.409	44.7	84.4	39.7	H	PASS
119.207	49.3	84.4	35.1	H	PASS
149.004	65.3	84.4	19	H	PASS
268.219	52.4	84.4	32	H	PASS
59.611	50.1	84.4	34.3	V	PASS
89.408	59.3	84.4	25.1	V	PASS
119.206	52.4	84.4	32	V	PASS
149.004	64	84.4	20.4	V	PASS
178.802	47.6	84.4	36.8	V	PASS

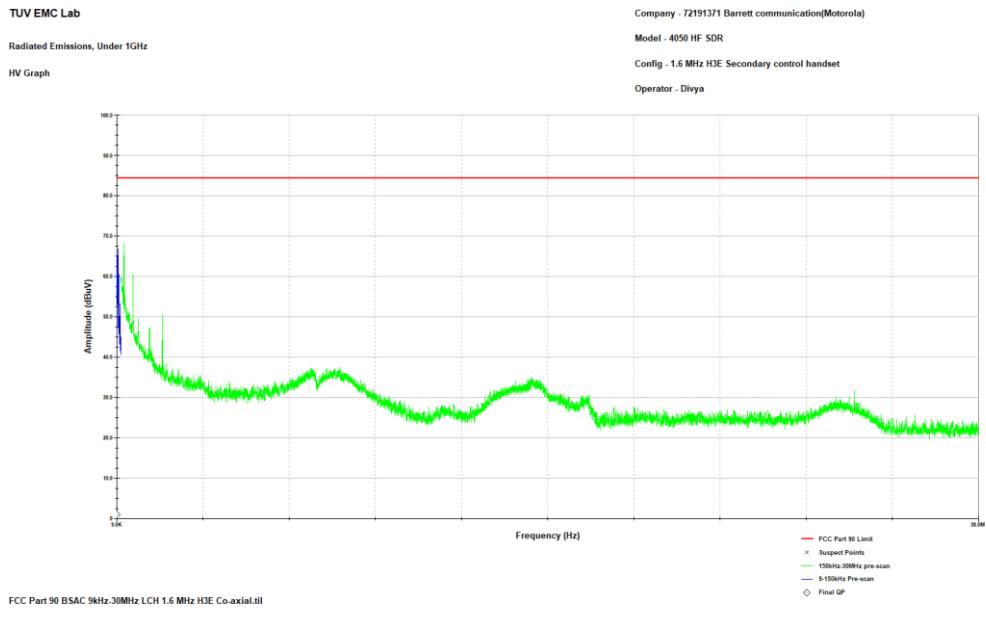


Figure 2.1.6-1: Reference Plot for Field Strength of Spurious Emissions – 9 kHz – 30 MHz –H3E - LCH

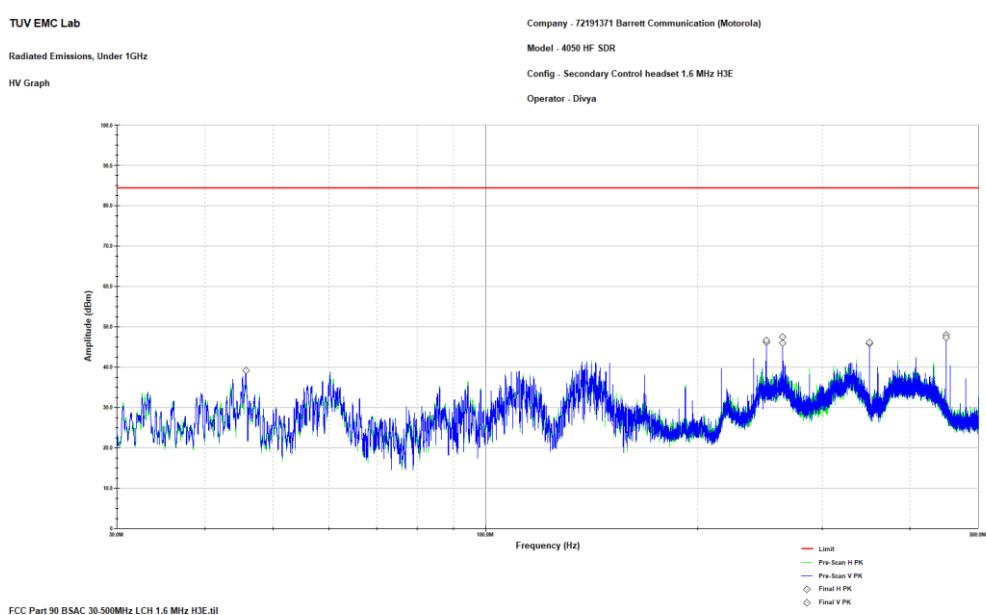


Figure 2.1.6-2: Reference Plot for Field Strength of Spurious Emissions – 30 MHz – 500 MHz – H3E- LCH

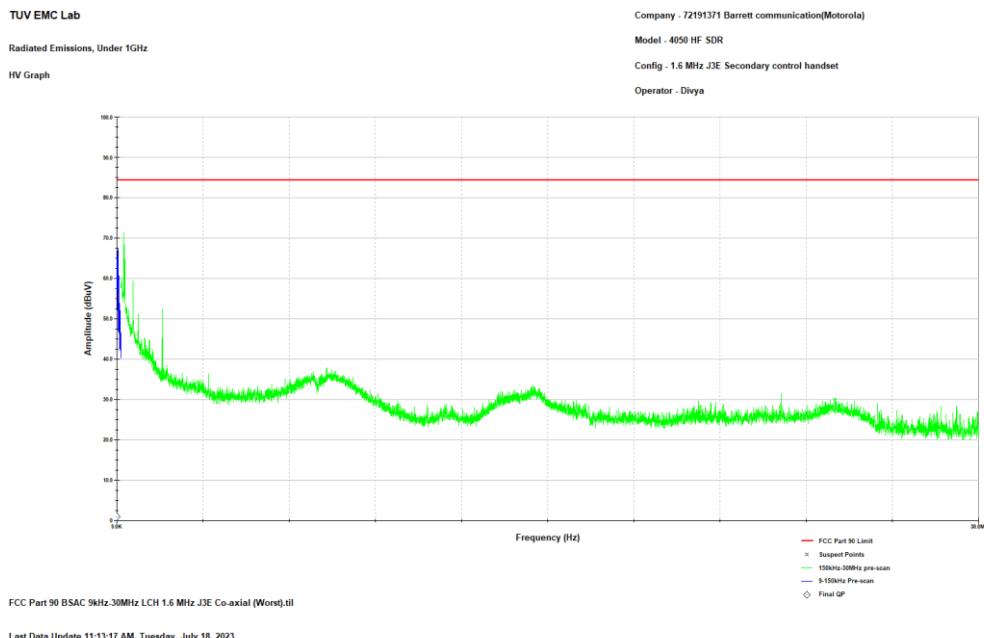


Figure 2.1.6-3: Reference Plot for Field Strength of Spurious Emissions – 9 kHz – 30 MHz – J3E - LCH

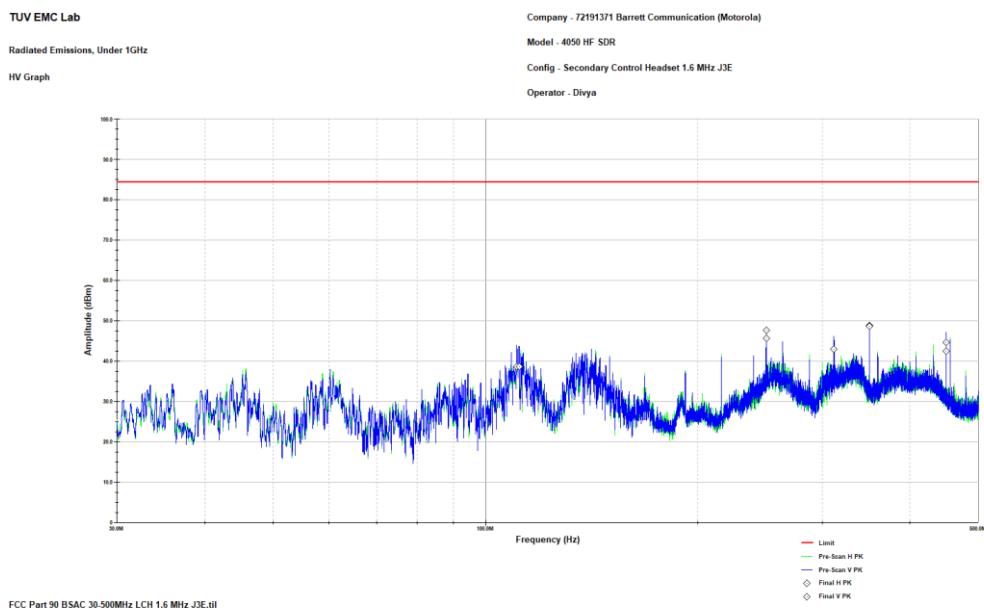


Figure 2.1.6-4: Reference Plot for Field Strength of Spurious Emissions – 30 MHz – 500 MHz – J3E- LCH



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

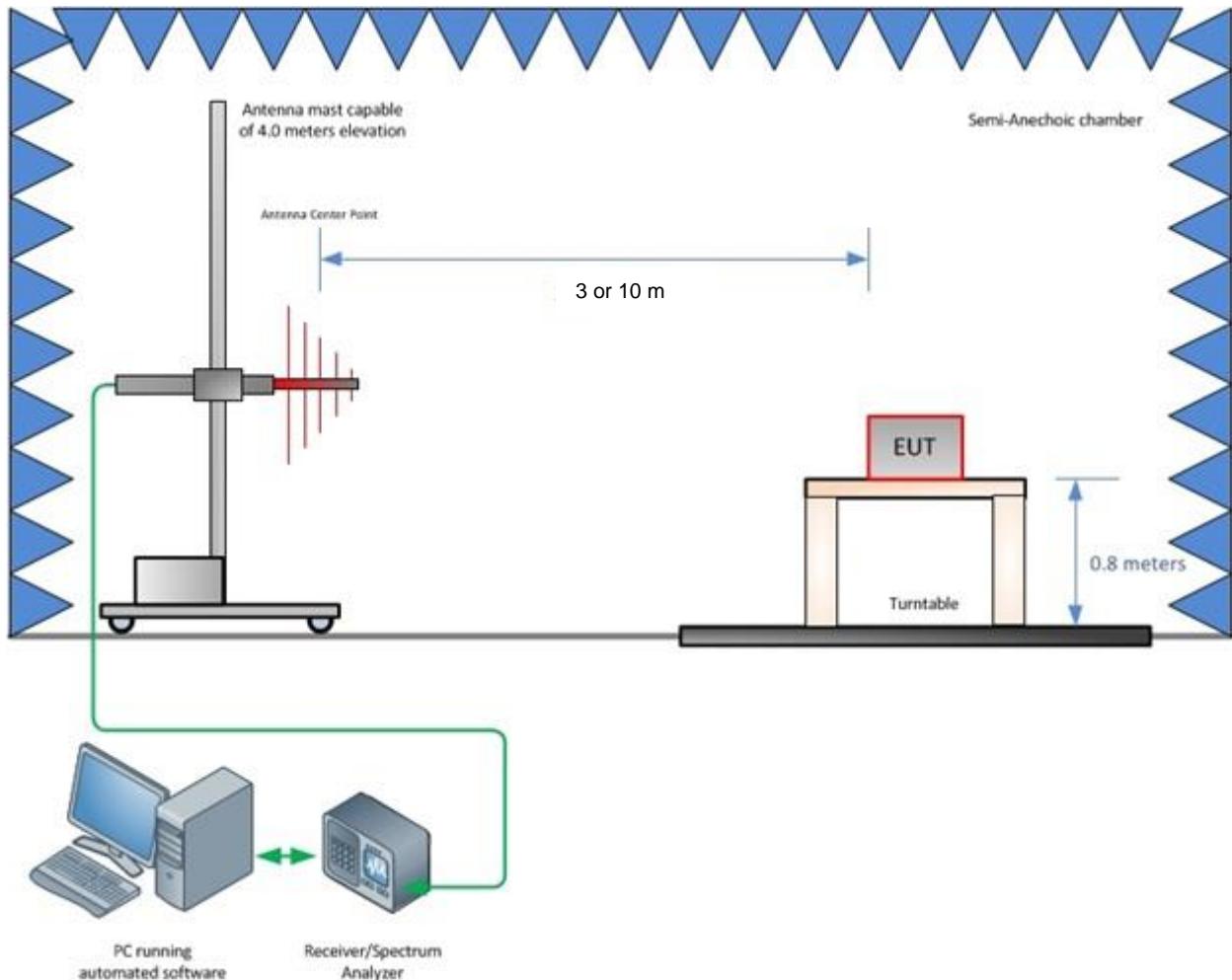


Figure 3-1 – Radiated Emissions Test Setup up to 1 GHz



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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 $\leq 1 \text{ GHz}$	$\pm 5.814 \text{ dB}$
Radiated Emissions $> 1 \text{ GHz}$	$\pm 4.318 \text{ dB}$

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