

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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Bibra Lake, Western Australia 6163 Australia

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SIGNATURE

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

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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

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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

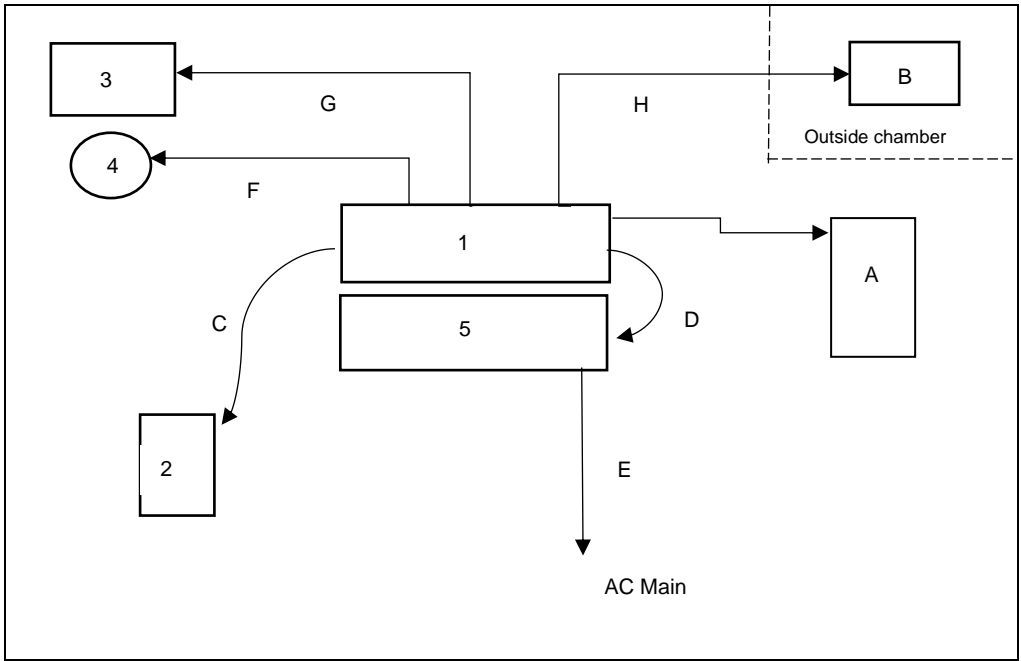


Figure 1.4.1-3 – Test Setup Block Diagram

**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 |

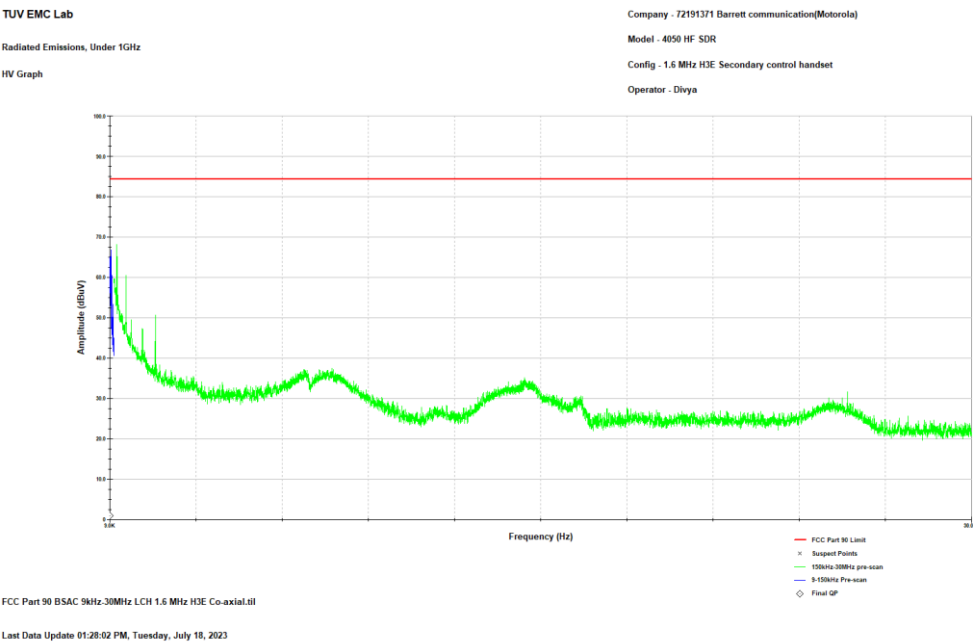


Figure 2.1.6-1: Reference Plot for Field Strength of Spurious Emissions – 9 kHz – 30 MHz –H3E - LCH

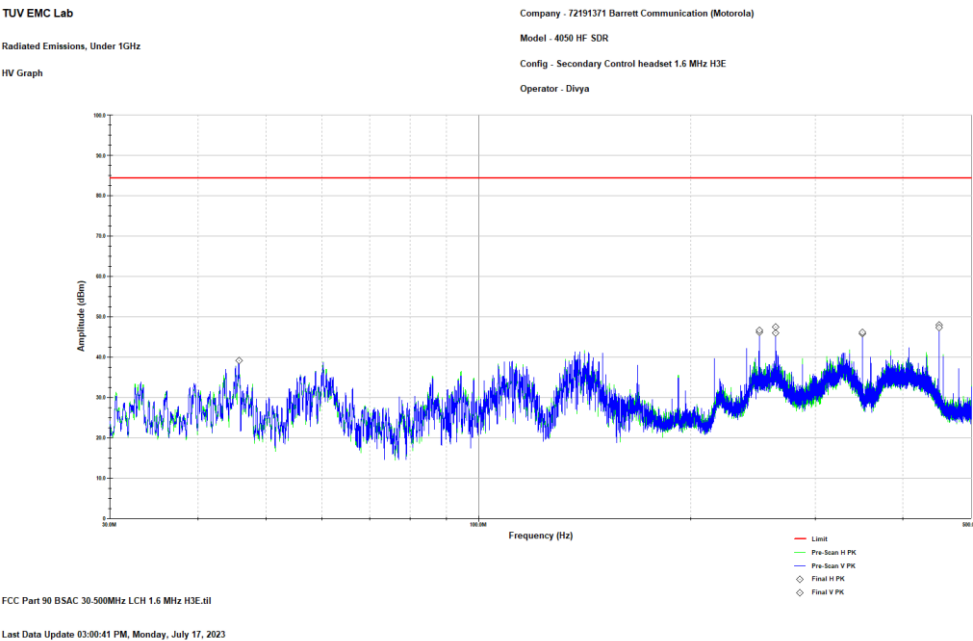


Figure 2.1.6-2: Reference Plot for Field Strength of Spurious Emissions – 30 MHz – 500 MHz – H3E- LCH

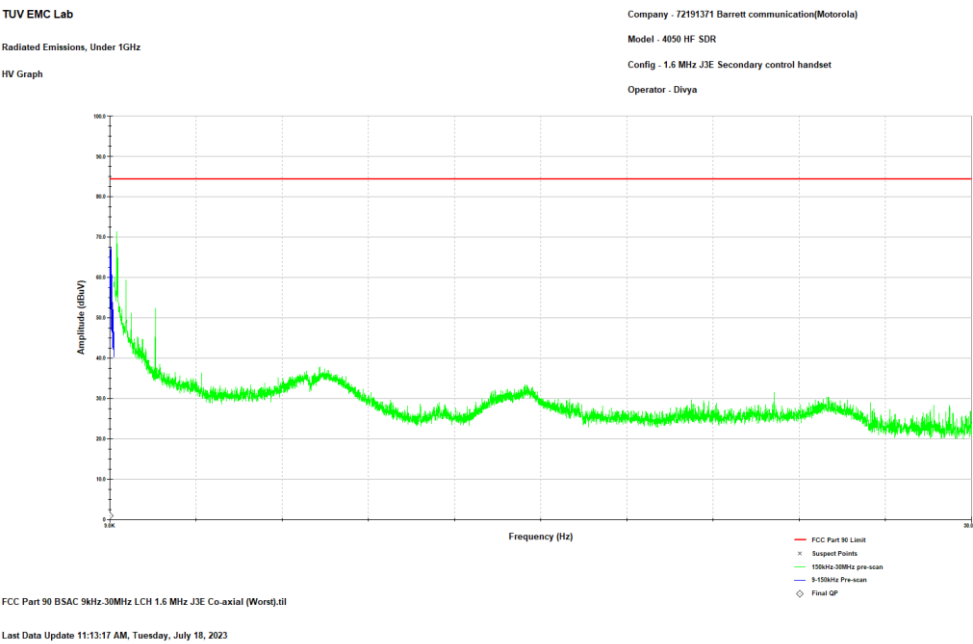


Figure 2.1.6-3: Reference Plot for Field Strength of Spurious Emissions – 9 kHz – 30 MHz – J3E - LCH

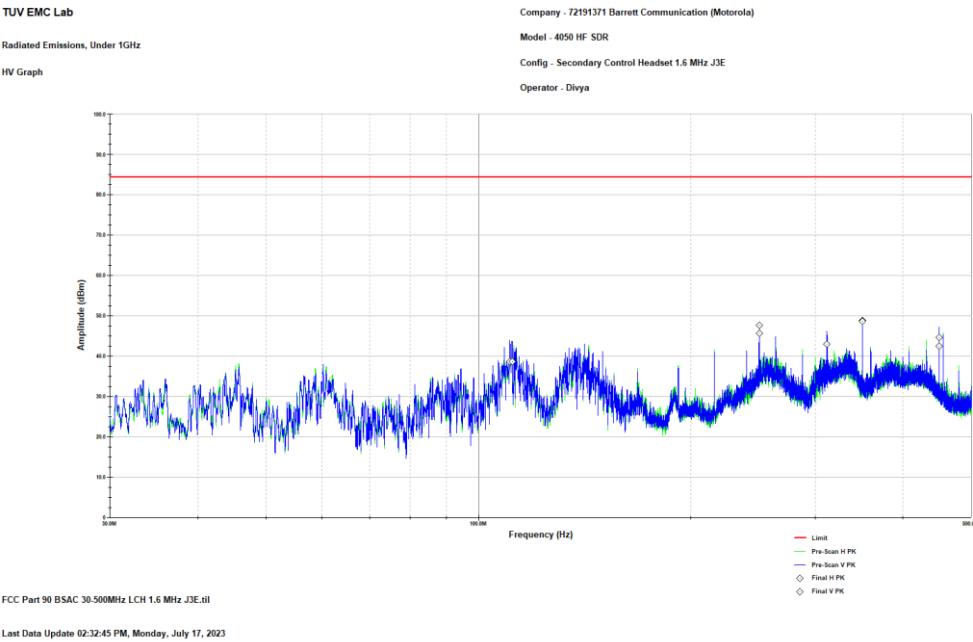


Figure 2.1.6-4: Reference Plot for Field Strength of Spurious Emissions – 30 MHz – 500 MHz – J3E- LCH



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**

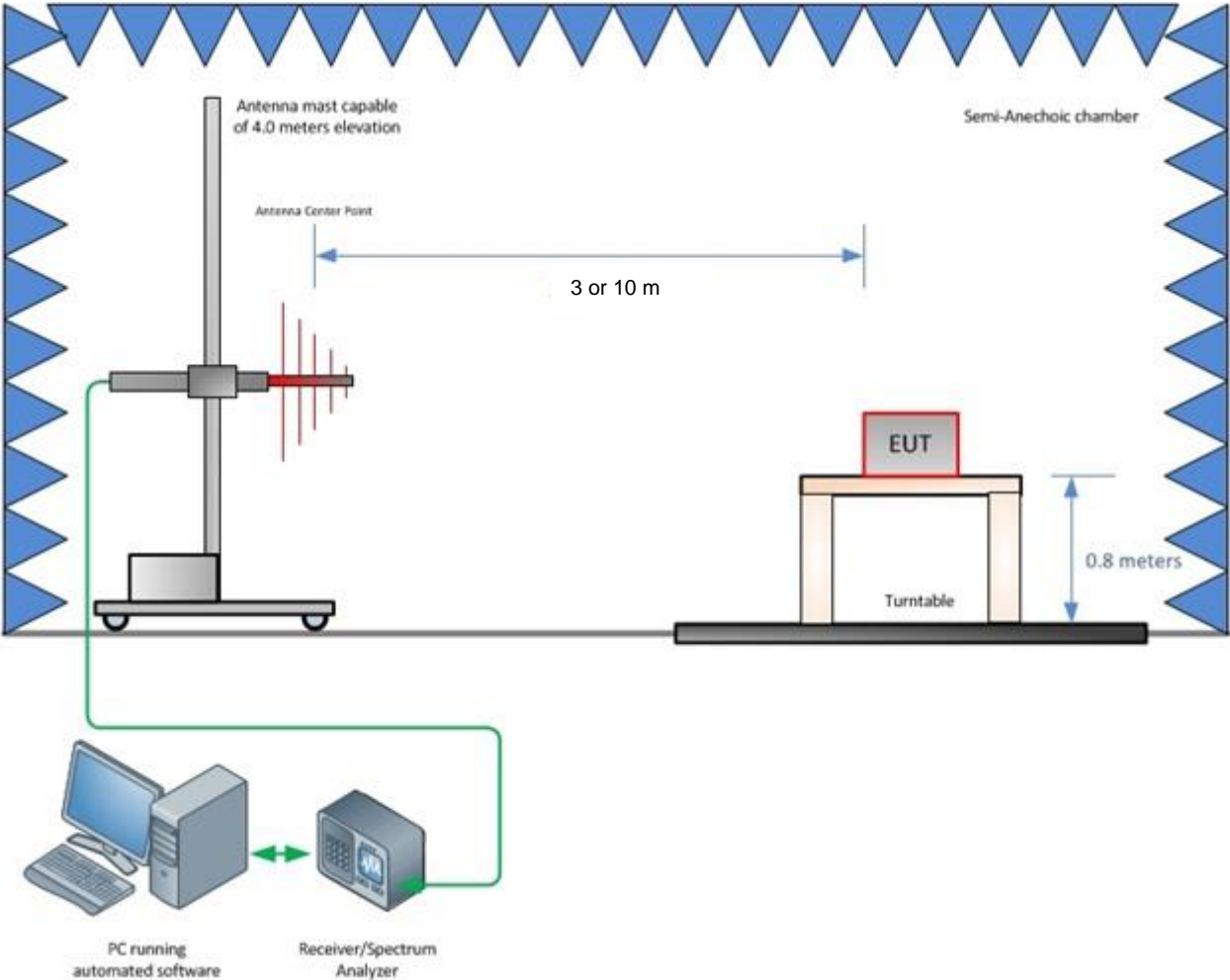


Figure 3-1 – Radiated Emissions Test Setup up to 1 GHz



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