

Test report

403481-4R1TRFWL

Date of issue: September 16, 2020

Applicant:

CalAmp

Product:

Asset Tracker

Model:

LMU1300MB

FCC ID: APV-1300MB

IC ID: 5843C-1300MB

Specifications:

- ◆ FCC 47 CFR Part 15, Subpart C – §15.209
- ◆ FCC 47 CFR Part 15, Subpart C – §15.207

Lab and test locations

Company name	Nemko USA Inc.
Address	2210 Faraday Ave, Suite 150
City	Carlsbad
State	California
Postal code	92008
Country	USA
Telephone	+1 760 444 3500
Website	www.nemko.com
FCC Site Number	Test Firm Registration Number: 392943 Designation Number: US5058
ISED Test Site	2040B-3

Tested by	James Cunningham, Wireless Supervisor
Reviewed by	Juan M Gonzalez, EMC & Wireless Divisions Manager
Review date	September 16, 2020
Reviewer signature	

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.
This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko USA's ISO/IEC 17025 accreditation.
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Table of Contents

Table of Contents	4
Section 1 Report summary	5
1.1 Test specifications	5
1.2 Test methods	5
1.3 Exclusions	5
1.4 Statement of compliance	5
1.5 Test report revision history	5
Section 2 Summary of test results	6
2.1 Radiated emissions in simultaneous transmission	6
2.2 Operating modes investigated	6
Section 3 Equipment under test (EUT) details	7
3.1 Applicant	7
3.2 Manufacturer	7
3.3 Sample information	7
3.4 EUT information	7
3.5 EUT exercise and monitoring details	7
3.6 EUT exercise and monitoring details	8
Section 4 Engineering considerations	9
4.1 Modifications incorporated in the EUT	9
4.2 Technical judgment	9
4.3 Deviations from laboratory tests procedures	9
Section 5 Test conditions	10
5.1 Atmospheric conditions	10
5.2 Power supply range	10
Section 6 Measurement uncertainty	11
6.1 Uncertainty of measurement	11
Section 7 Test equipment	12
Section 8 Testing data	13
8.1 Radiated emission limits; intentional radiators	13
8.2 Conducted emission limits; intentional radiators	22
Section 9 Block diagrams of test set-ups	25
9.1 Radiated emissions set-up	25

Section 1 Report summary

1.1 Test specifications

FCC 47 CFR Part 15, Subpart C – §15.209	Radiated emission limits; general requirements.
FCC 47 CFR Part 15, Subpart C – §15.207	Conducted limits

1.2 Test methods

ANSI C63.10-2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
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1.3 Exclusions

None

1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard. Results obtained indicate that the product under test **complies in full** with the requirements tested. The test results relate only to the items tested.

This test report covers Radiated Spurious Emissions to prove:

- a) **Multi Transmissions (transmitting simultaneously) meet the general requirement of FCC 15.207/209 (Bluetooth™ APV-1300MB™ and pre-certified cellular LTE module “XMR201910BG95M3”)**
- b) **That the pre-certified Cellular module “XMR201910BG95M3” meets the RSE limits mounted in a final host (LMIU1300MB).**

See “Summary of test results” for full details.

1.5 Test report revision history

Table 1.5-1: Test report revision history

Revision #	Details of changes made to test report
403481-4TRFWL	Original report issued
403481-4R1TRFWL	Corrected typo in model name

Notes:

Section 2 Summary of test results

2.1 Radiated emissions in simultaneous transmission.

Part	Test description	Verdict
§15.209	Radiated emission Intentional radiators	Pass
§15.207	Conducted limits	Pass

Note: EUT contains 2 transmitters: 1) LTE M1/GPRS module and 2) Bluetooth module. All transmitters were active during testing.

2.2 Operating modes investigated.

The EUT was assessed in the following modes:

1. GSM 850 Band active, Bluetooth (2440 MHz) active
2. GSM 1900 Band active, Bluetooth (2440 MHz) active

GSM/GPRS was chosen as the transmitter power is higher than for LTE M1 and these two modes can be used as representative for all other modes and worst-case scenario.

Section 3 Equipment under test (EUT) details

3.1 Applicant

Company name	CalAmp
Address	2200 Faraday Avenue, Suite 220
City	Carlsbad
Province/State	CA
Postal/Zip code	92008
Country	USA

3.2 Manufacturer

Company name	CalAmp
Address	2200 Faraday Avenue, Suite 220
City	Carlsbad
Province/State	CA
Postal/Zip code	92008
Country	USA

3.3 Sample information

Receipt date	July 27, 2020
Nemko sample ID number	NEx: 403481

3.4 EUT information

Product name	Asset Tracker
Model	LMU1300MB
Serial number	U0H3K2499915C01 (Radiated sample)
Part number	LMU1300MB
Power requirements	12 V DC
Description/theory of operation	Operational, with radios on
Operational frequencies	LTE Bands B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B66/B85 GPRS Bands 850/900/1800/1900
Software details	None
FCC ID:	#1: LTE module: XMR201910BG95M3 #2: Bluetooth radio: APV-1300MB

3.5 EUT exercise and monitoring details

An GPRS connection was established between the EUT and a call box with the EUT commanded to transmit at full power with the maximum uplink timeslots (4). The EUT's Bluetooth transmitter was commanded to operate at 2440 MHz at maximum output power.

3.6 EUT exercise and monitoring details

Table 3.6-1: EUT sub assemblies

Description	Brand name	Model/Part number	Serial number	Rev.
Radiated sample	CalAmp	LMU1300MB	U0H3K2499915C01	N/A

Table 3.6-2: EUT interface ports

Description	Qty.
DC power	1
USB (not used for normal operation)	3

Table 3.6-3: Support equipment

Description	Brand name	Model/Part number	Serial number	Rev.
Laptop	Dell	Inspiron 5548	9K643SS	N/A
DC power supply	BK Precision	1697	260G13306	N/A

Table 3.6-4: Inter-connection cables

Cable description	From	To	Length (ft)
USB	EUT	Laptop	3
USB	EUT	Laptop	3
USB	EUT	Laptop	3
DC power	EUT	DC power supply	3

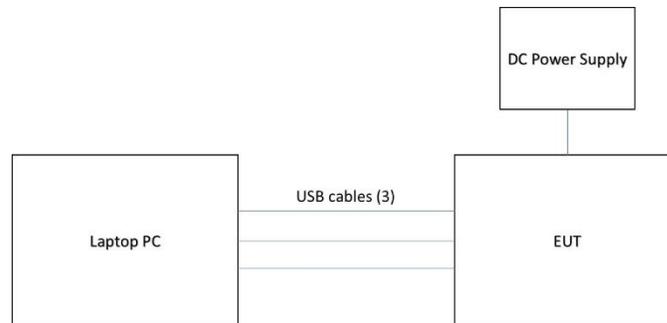


Figure 3.6-1: Test setup

Section 4 Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures

Section 5 Test conditions

5.1 Atmospheric conditions

Temperature	15-30 °C
Relative humidity	20-75 %
Air pressure	86–106 kPa

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages $\pm 5\%$, for which the equipment was designed.

Section 6 Measurement uncertainty

6.1 Uncertainty of measurement

Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of $K = 2$ with 95% certainty.

Test name	Measurement uncertainty, dB
Radiated spurious emissions	3.78
Powerline conducted emissions	1.38

Section 7 Test equipment

Table 7-1: Radiated disturbance equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI Test Receiver	Rohde & Schwarz	ESU40	E1121	1 yr	25 Nov 2020
System Controller	Sunol Sciences	SC104V	E1129	NCR	NCR
Bilog Antenna	Schaffner	CBL6111C	1480	1 yr	18 Oct 2020
DRG Horn	ETS-Lindgren	3117-PA	E1160	1 yr	30 Oct 2020
Pre Amp as part of DRG Horn	ETS-Lindgren	3117-PA	Part of E1160	1 yr	30 Oct 2020
Tunable Notch Filter	K&L	3TNF-500/1000N/N	1060	NCR	NCR
Tunable Notch Filter	K&L	3TNF-1000/2000-N/N	1059	NCR	NCR
High Pass Filter	Wainwright Instruments	WHKX12-900-1000-1500	E1211	NCR	NCR
High Pass Filter	Micro-Tonics	HPM50110-01	E1142	NCR	NCR
Horn Antenna	ETS-Lindgren	3115	752	1 yr	21 Aug 2021
LTE Call Box	Rohde & Schwarz	CMW500	E1161	NCR	NCR

Notes: NCR - no calibration required

Table 7-2: Radiated disturbance test software details

Manufacturer of Software	Details
Rohde & Schwarz	EMC 32 V10.00.00

Notes: None

Table 7-3: Conducted disturbance equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI Test Receiver	Rohde & Schwarz	ESCI 7	E1026	2 years	29 May 2021
Transient Limiter	Hewlett Packard	11947A	E1159	NCR	NCR
Two Line V-Network	Rohde & Schwarz	ENV216	E1019	1 year	4 Aug 2021
LTE Call Box	Rohde & Schwarz	CMW500	E1161	NCR	NCR

Notes: NCR - no calibration required

Table 7-4: Conducted disturbance test software details

Manufacturer of Software	Details
Rohde & Schwarz	EMC 32 V10.20.01

Notes: None

Section 8 Testing data

8.1 Radiated emission limits; intentional radiators.

8.1.1 References

Title 47 → Chapter I → Subchapter A → Part 15 → Subpart C → §15.209 / ANSI C63.4: 2014/ ANSI C63:10: 2013 Clauses 6.3, 6.5 and 6.6

- (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz, however, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

- (b) In the emission table above, the tighter limit applies at the band edges.
- (c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
- (d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
- (e) The provisions in §§15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.
- (f) In accordance with §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in §15.109 that are applicable to the incorporated digital device.

NOTE: For Radiated Emissions the test methods of the ANSI C63.10:2013 Clauses 6.3, 6.5, 6.6 were consulted and used for setup and testing.

8.1.2 Test summary

Verdict	Pass		
Test date	September 9, 2020 September 15, 2020	Temperature	20.9 °C (Sept 9) 23 °C (Sept 15)
Test engineer	James Cunningham	Air pressure	1006 mbar (Sept 9) 1008 mbar (Sept 15)
Test location	3m semi anechoic chamber	Relative humidity	40 % (Sept 9) 58 % (Sept 15)

8.1.3 Notes

Filters were used as appropriate to avoid overloading measurement instruments. See details for below.

8.1.4 Setup details

EUT setup configuration	Tabletop
Test facility	3 m Semi anechoic chamber
Measuring distance	3 m
Antenna height variation	1–4 m
Turn table position	0–360°
Measurement details	A preview measurement was generated with receiver in continuous scan or sweep mode while the EUT was rotated and antenna adjusted to maximize radiated emission. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Receiver/spectrum analyzer settings for frequencies below 1 GHz:

Resolution bandwidth	120 kHz
Video bandwidth	300 kHz
Detector mode	– Peak (Preview measurement) – Quasi-peak (Final measurement)
Trace mode	Max Hold
Measurement time	– 100 ms (Peak preview measurement) – 5000 ms (Quasi-peak final measurement)

Receiver/spectrum analyzer settings for frequencies above 1 GHz:

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	Peak (Preview measurement) Peak and CAverage (Final measurement)
Trace mode	Max Hold
Measurement time	– 100 ms (Peak preview measurement) – 5000 ms (Peak and CAverage final measurement)

8.1.5 Test data radiated emissions 30 MHz to 26 GHz - GSM 850 (837 MHz), Bluetooth (2440 MHz) active

Full Spectrum

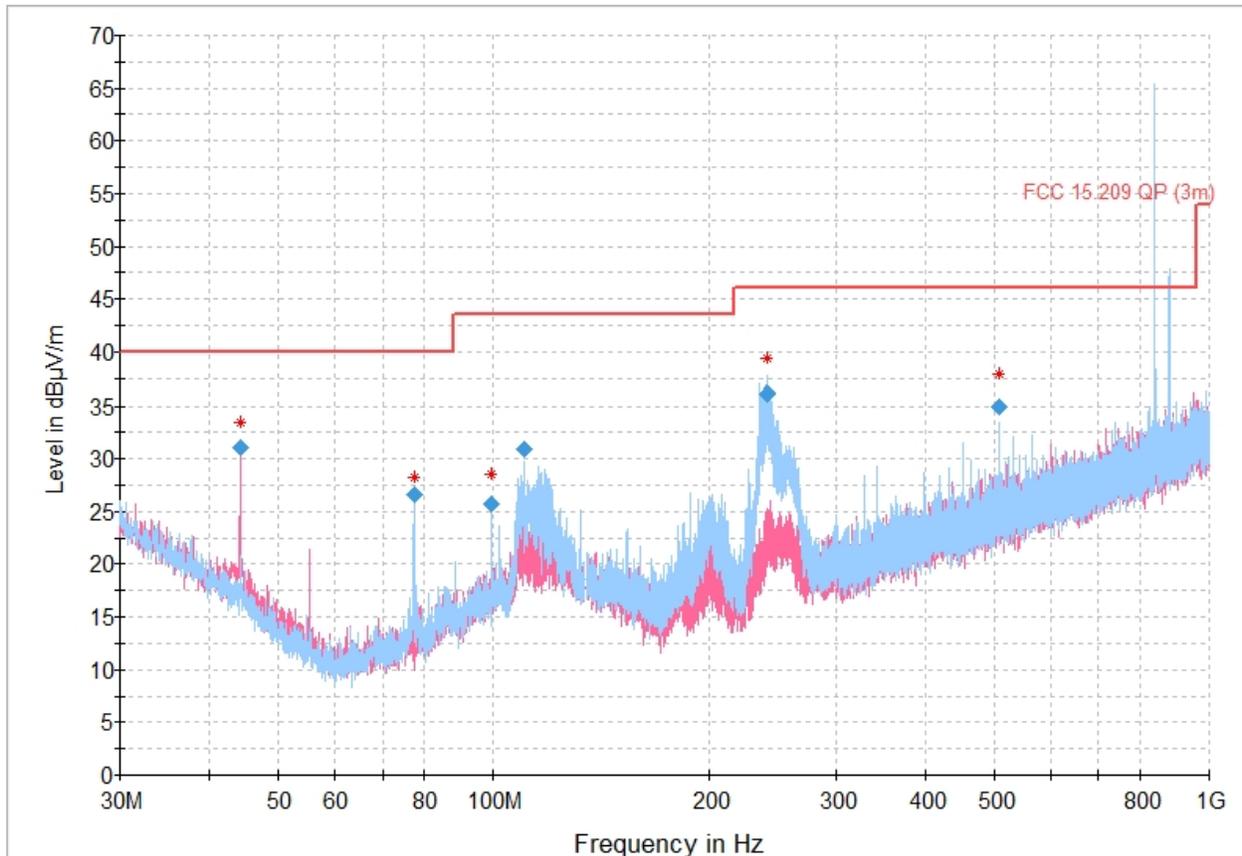


Figure 8.1-1: Radiated Emissions, 30 MHz to 1 GHz - GSM 850 (837 MHz), Bluetooth (2440 MHz) active

Table 8.1-1: Radiated Emissions, 30 MHz to 1 GHz - GSM 850 (837 MHz), Bluetooth (2440 MHz) active

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
44.246667	31.09	40.00	8.91	5000.0	120.000	100.0	V	317.0	18.7
77.420667	26.64	40.00	13.36	5000.0	120.000	227.0	H	181.0	14.5
99.536667	25.72	43.50	17.78	5000.0	120.000	313.0	H	71.0	17.4
110.594667	30.96	43.50	12.54	5000.0	120.000	286.0	H	283.0	18.6
240.417333	36.17	46.00	9.83	5000.0	120.000	104.0	H	234.0	19.6
508.747333	34.96	46.00	11.04	5000.0	120.000	159.0	H	330.0	26.8

Notes: Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
 Correction factors = antenna factor ACF (dB) + cable loss (dB)
 1. A notch filter was used to reduce the level of the wanted GPRS signal at 837 MHz.
 2. The emissions observed at 837 MHz and 882 MHz are attributable to the intentional GSM uplink and downlink signals and are not evaluated against the 15.209 emissions limits.

Full Spectrum

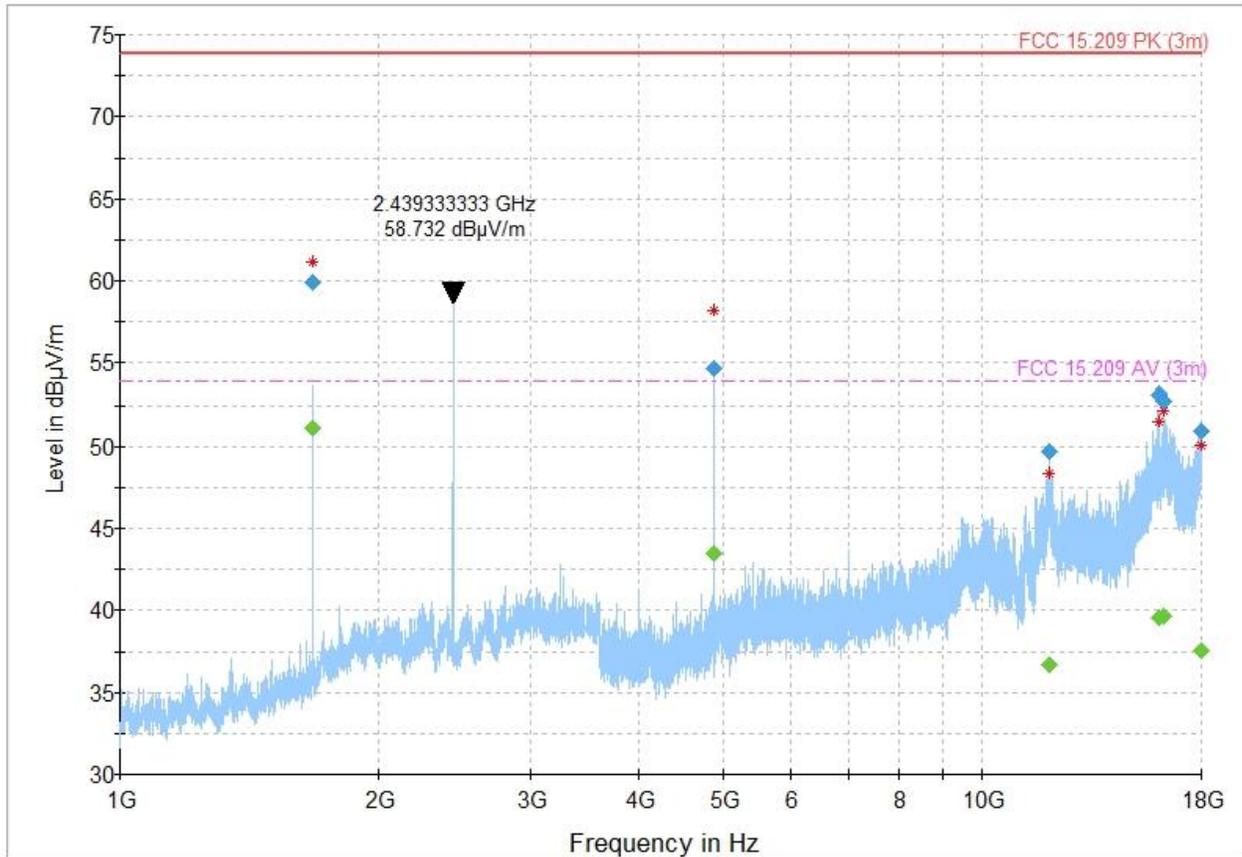


Figure 8.1-2: Radiated Emissions, 1 GHz to 18 GHz - GSM 850 (837 MHz), Bluetooth (2440 MHz) active

Table 8.1-2: Radiated Emissions, 1 GHz to 18 GHz - GSM 850 (837 MHz), Bluetooth (2440 MHz) active

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (sec)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1673.981100	---	51.14	53.90	2.76	5000.0	1000.000	127.0	H	73.0
1673.981100	59.86	---	73.90	14.04	5000.0	1000.000	127.0	H	73.0
4880.013967	54.69	---	73.90	19.21	5000.0	1000.000	110.0	V	28.0
4880.013967	---	43.51	53.90	10.39	5000.0	1000.000	110.0	V	28.0
11974.779900	---	36.64	53.90	17.26	5000.0	1000.000	244.0	V	185.0
11974.779900	49.67	---	73.90	24.23	5000.0	1000.000	244.0	V	185.0
16100.388633	53.13	---	73.90	20.77	5000.0	1000.000	170.0	V	159.0
16100.388633	---	39.59	53.90	14.31	5000.0	1000.000	170.0	V	159.0
16299.511900	---	39.68	53.90	14.22	5000.0	1000.000	241.0	V	0.0
16299.511900	52.75	---	73.90	21.15	5000.0	1000.000	241.0	V	0.0
17989.927800	---	37.54	53.90	16.36	5000.0	1000.000	301.0	V	0.0
17989.927800	50.97	---	73.90	22.93	5000.0	1000.000	301.0	V	0.0

Notes: Field strength (dB μ V/m) = receiver/spectrum analyzer value (dB μ V) + correction factor (dB)
Correction factors = antenna factor ACF (dB) + cable loss (dB)

1. A 1 GHz High Pass Filter was installed to prevent overloading the measurement equipment.
2. A 2.4 GHz notch filter was installed to reduce the Bluetooth transmitter from the EUT
3. The peak at 2440 MHz is the intentional Bluetooth transmitter which was operating at full power during testing and is excluded from evaluation against the 15.209 limits.

No spurious emissions were observed above 12 GHz therefore measurements above 18 GHz are not reported.

8.1.6 Test data radiated emissions 30 MHz to 26 GHz - GSM 1900 (1880 MHz), Bluetooth (2440 MHz) active

Full Spectrum

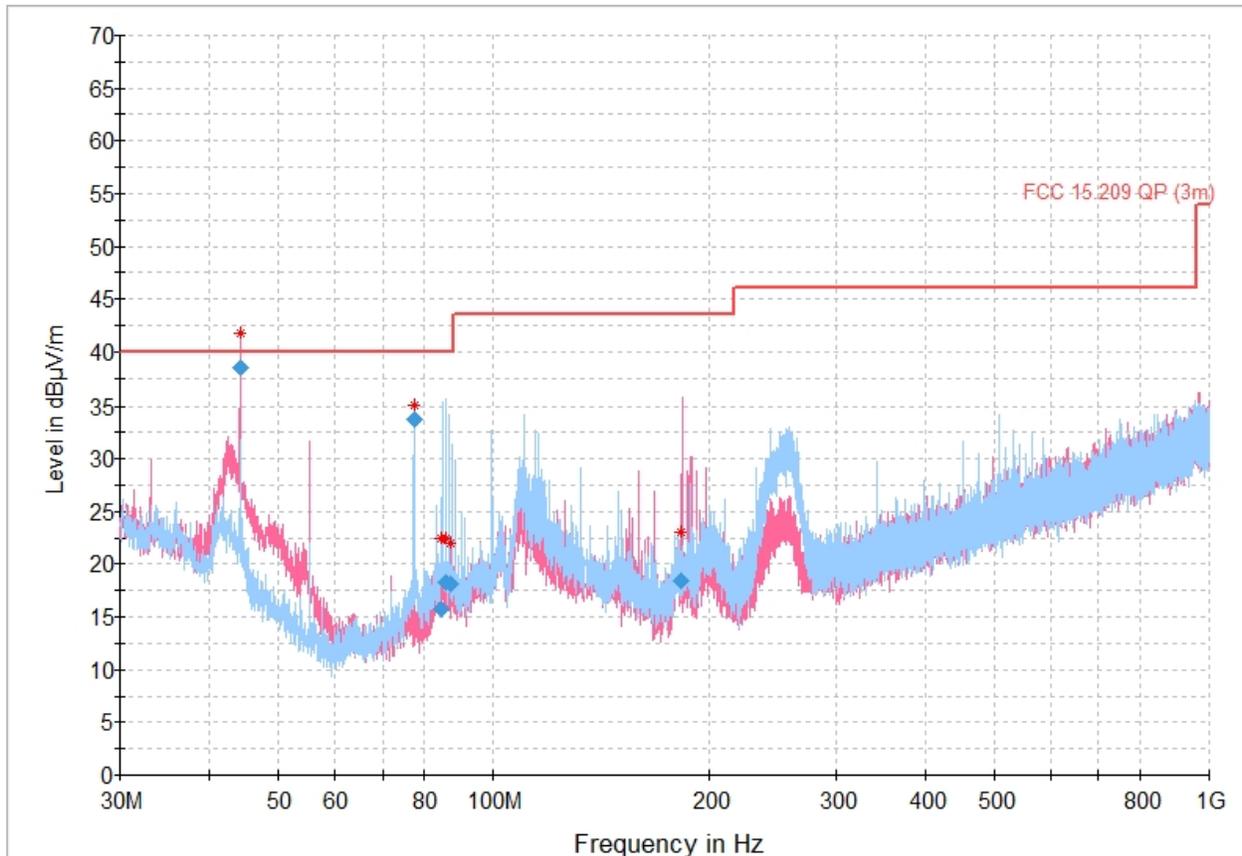


Figure 8.1-3: Radiated Emissions, 30 MHz to 1 GHz - GSM 1900 (1880 MHz), Bluetooth (2440 MHz) active

Table 8.1-3: Radiated Emissions, 30 MHz to 1 GHz - GSM 1900 (1880 MHz), Bluetooth (2440 MHz) active

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
44.246667	38.46	40.00	1.54	5000.0	120.000	100.0	V	0.0	18.7
77.420667	33.74	40.00	6.26	5000.0	120.000	224.0	H	168.0	14.5
84.722000	15.71	40.00	24.29	5000.0	120.000	338.0	H	187.0	15.3
85.835000	18.32	40.00	21.68	5000.0	120.000	189.0	H	234.0	15.4
86.915667	18.20	40.00	21.80	5000.0	120.000	215.0	H	247.0	15.5
182.090333	18.42	43.50	25.08	5000.0	120.000	100.0	V	85.0	16.8

Notes: Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
 Correction factors = antenna factor ACF (dB) + cable loss (dB)

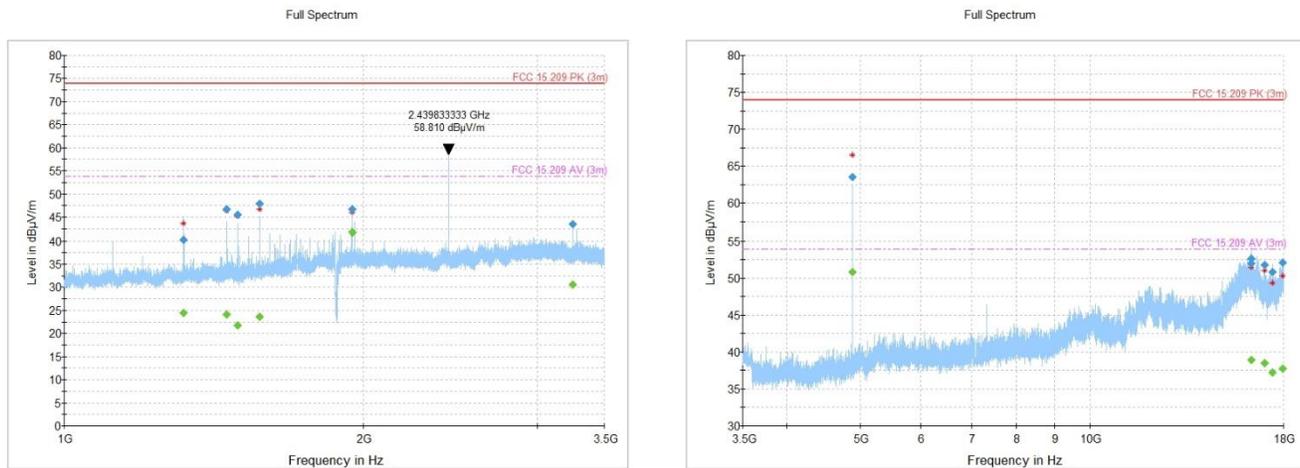


Figure 8.1-4: Radiated Emissions, 1 GHz – 18 GHz - GSM 1900 (1880 MHz), Bluetooth (2440 MHz) active

Table 8.1-4: Radiated Emissions, 1 GHz – 18 GHz - GSM 1900 (1880 MHz), Bluetooth (2440 MHz) active

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1320.208166	40.21	---	73.90	33.69	5000.0	1000.000	129.0	H	119.0	-14.2
1320.208166	---	24.41	53.90	29.49	5000.0	1000.000	129.0	H	119.0	-14.2
1459.041600	46.69	---	73.90	27.21	5000.0	1000.000	159.0	H	11.0	-14.0
1459.041600	---	24.05	53.90	29.85	5000.0	1000.000	159.0	H	11.0	-14.0
1497.520699	45.52	---	73.90	28.38	5000.0	1000.000	141.0	H	91.0	-13.9
1497.520699	---	21.82	53.90	32.08	5000.0	1000.000	141.0	H	91.0	-13.9
1574.315800	47.98	---	73.90	25.92	5000.0	1000.000	129.0	H	23.0	-13.5
1574.315800	---	23.62	53.90	30.28	5000.0	1000.000	129.0	H	23.0	-13.5
1947.715434	46.70	---	73.90	27.20	5000.0	1000.000	158.0	V	24.0	-10.4
1947.715434	---	41.81	53.90	12.09	5000.0	1000.000	158.0	V	24.0	-10.4
3253.204667	43.44	---	73.90	30.46	5000.0	1000.000	110.0	H	11.0	-6.6
3253.204667	---	30.63	53.90	23.27	5000.0	1000.000	110.0	H	11.0	-6.6
4879.995600	---	50.81	53.90	3.09	5000.0	1000.000	100.0	H	38.0	-3.6
4879.995600	63.52	---	73.90	10.38	5000.0	1000.000	100.0	H	38.0	-3.6
16328.946867	---	38.87	53.90	15.03	5000.0	1000.000	179.0	H	235.0	13.2
16328.946867	52.64	---	73.90	21.26	5000.0	1000.000	179.0	H	235.0	13.2
16332.049266	---	38.89	53.90	15.01	5000.0	1000.000	387.0	H	286.0	13.2
16332.049266	51.95	---	73.90	21.95	5000.0	1000.000	387.0	H	286.0	13.2
17017.971834	---	38.50	53.90	15.40	5000.0	1000.000	171.0	H	350.0	11.1
17017.971834	51.74	---	73.90	22.16	5000.0	1000.000	171.0	H	350.0	11.1
17395.566967	50.84	---	73.90	23.06	5000.0	1000.000	189.0	V	208.0	11.5
17395.566967	---	37.25	53.90	16.65	5000.0	1000.000	189.0	V	208.0	11.5
17959.748900	52.13	---	73.90	21.77	5000.0	1000.000	182.0	V	236.0	14.1
17959.748900	---	37.74	53.90	16.16	5000.0	1000.000	182.0	V	236.0	14.1

- Notes:
1. In the range 1 – 3.5 GHz, a notch filter tuned to 2440 MHz was installed to reduce the intentional Bluetooth signal from the EUT.
 2. In the range 1 – 3.5 GHz, a notch filter tuned to 1880 MHz was installed to reduce the intentional GPRS signal from the EUT.
 3. in the range 1 – 3.5 GHz, the high peak observed at 2440 MHz is attributable to the intentional Bluetooth transmitter and is excluded from evaluation against the 15.209 limits.
 4. In the range 3.5 – 18 GHz, a 2.5 GHz high pass filter was installed.
- Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
 Correction factors = antenna factor ACF (dB) + cable loss (dB)

No spurious emissions were observed above 18 GHz therefore measurements above 18 GHz are not reported.

8.1.7 Radiated emissions setup photos



Figure 8.1-5: Radiated emissions 30 MHz-1 GHz Front Picture

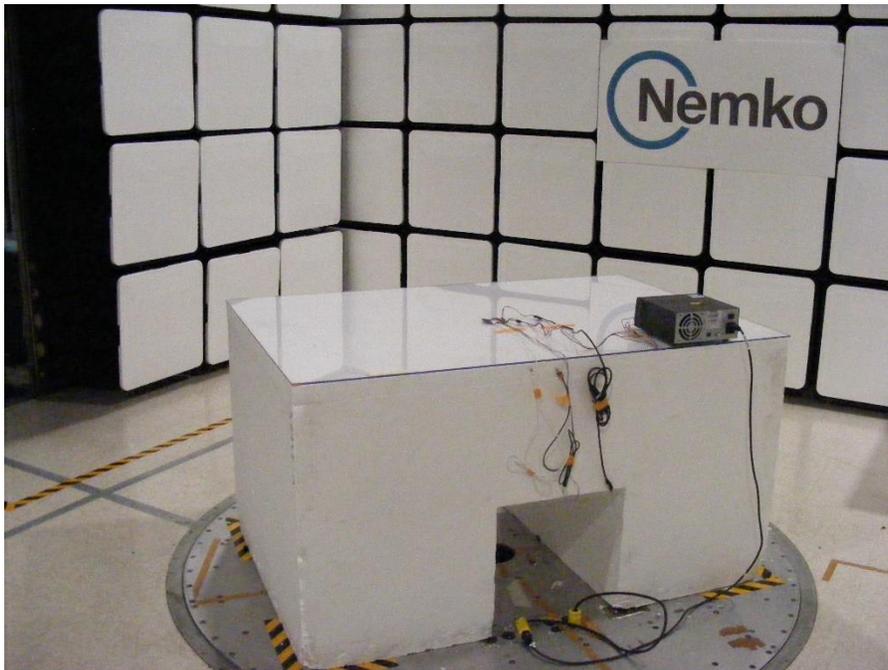


Figure 8.1-6: Radiated emissions 30 MHz-1 GHz Back Picture

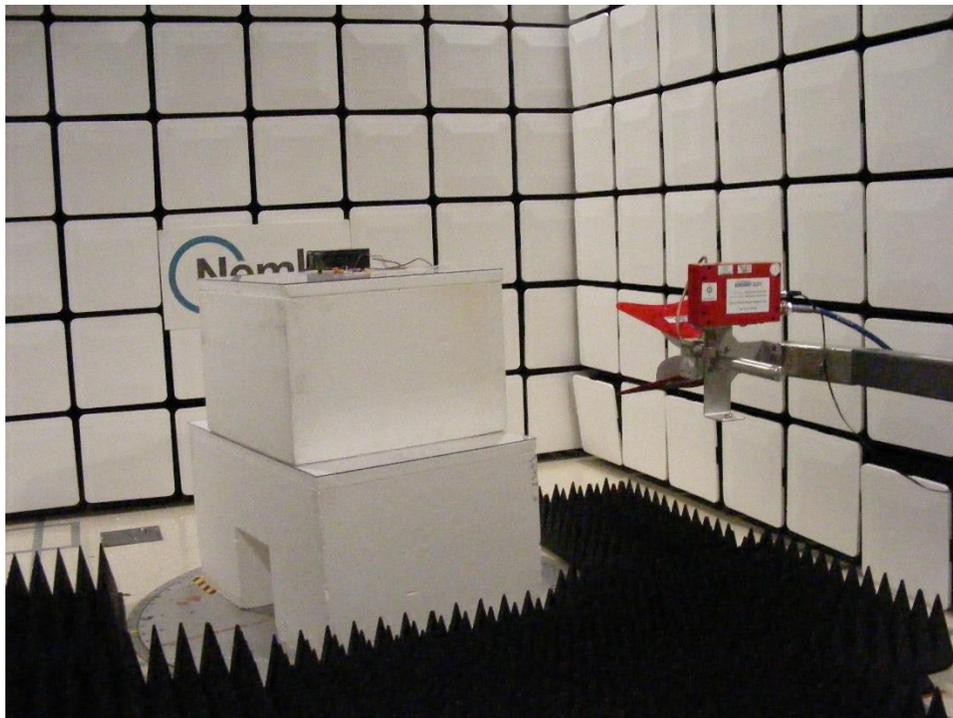


Figure 8.1-7: Radiated emissions 1 GHz-18 GHz - Front



Figure 8.1-8: Radiated emissions 1 GHz-18 GHz - Back

8.2 Conducted emission limits; intentional radiators

8.2.1 References

Title 47 → Chapter I → Subchapter A → Part 15 → Subpart C → §15.207 / ANSI C63.4: 2014 / ANSI C63.10:2013 Clause 6.2

- (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

- (b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:
- (1) For carrier current system containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.
 - (2) For all other carrier current systems: 1000 μ V within the frequency band 535-1705 kHz, as measured using a 50 μ H/50 ohms LISN.
 - (3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in §15.205, §15.209, §15.221, §15.223, or §15.227, as appropriate.
- (c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation, and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

NOTE: For Conducted Emissions the test methods of the ANSI C63.10:2013 Clauses 6.2 were consulted and used for setup and testing.

8.2.2 Test summary

Verdict	Pass		
Test date	July 27, 2020	Temperature	22 °C
Test engineer	Greg Woelke, EMC Test Engineer	Air pressure	1002 mbar
Test location	Ground Plane	Relative humidity	59 %

8.2.3 Notes

Both operational modes (GSM 850 + Bluetooth and GSM 1900 + Bluetooth) were evaluated. Only the worst case (GSM 850 + Bluetooth) is reported here.

8.2.4 Setup Details

Port under test	AC Mains
EUT setup configuration	Tabletop
Measurement details	A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Receiver settings:

Resolution bandwidth	9 kHz
Video bandwidth	30 kHz
Detector mode	– Peak and Average (Preview measurement) – Quasi-peak and CAverage (Final measurement)
Trace mode	Max Hold
Measurement time	– 100 ms (Peak and Average preview measurement) – 5000 ms (Quasi-peak final measurement) – 5000 ms (CAverage final measurement)

8.2.5 Test data conducted emissions 150 kHz – 30 MHz - GSM 850 (837 MHz), Bluetooth (2440 MHz) active

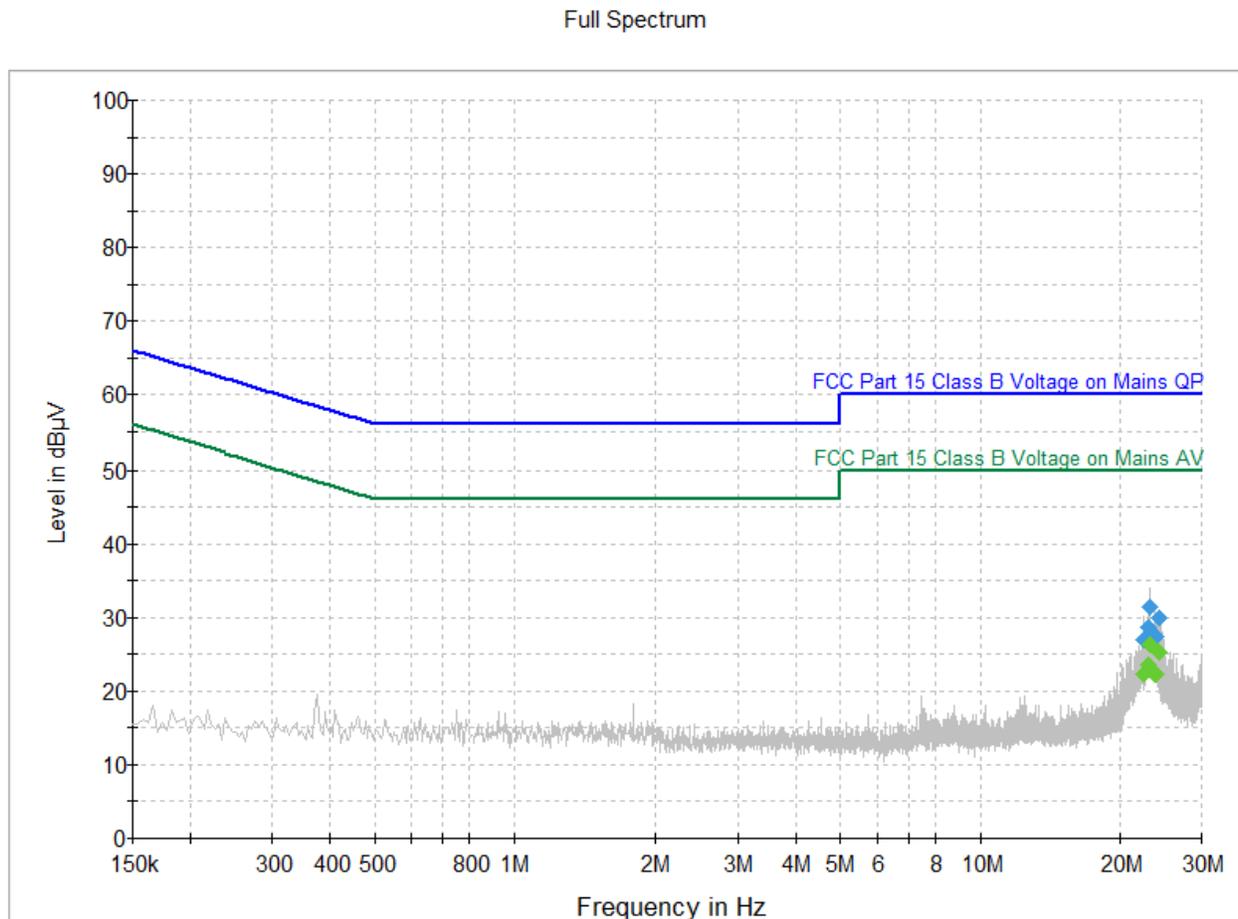


Figure 8.2-1: Conducted Emissions, 9 kHz – 30 MHz- GSM 850 (837 MHz), Bluetooth (2440 MHz) active

Table 8.2-1: Conducted Emissions, 9 kHz – 30 MHz- GSM 850 (837 MHz), Bluetooth (2440 MHz) active

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
22.454000	---	22.35	50.00	27.65	5000.0	9.000	N	ON	20.2
22.454000	26.88	---	60.00	33.12	5000.0	9.000	N	ON	20.2
23.066000	---	23.49	50.00	26.51	5000.0	9.000	N	ON	20.1
23.066000	28.74	---	60.00	31.26	5000.0	9.000	N	ON	20.1
23.130000	---	26.42	50.00	23.58	5000.0	9.000	N	ON	20.1
23.130000	31.49	---	60.00	28.51	5000.0	9.000	N	ON	20.1
23.738000	---	22.25	50.00	27.75	5000.0	9.000	N	ON	20.0
23.738000	27.17	---	60.00	32.83	5000.0	9.000	N	ON	20.0
23.862000	---	22.38	50.00	27.62	5000.0	9.000	N	ON	20.0
23.862000	27.46	---	60.00	32.54	5000.0	9.000	N	ON	20.0
24.350000	---	25.25	50.00	24.75	5000.0	9.000	N	ON	20.0
24.350000	29.91	---	60.00	30.09	5000.0	9.000	N	ON	20.0

Notes: ¹ Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)
³ The maximum measured value observed over a period of 5 seconds was recorded.

8.2.6 Conducted emissions setup photos



Figure 8.2-2: Conducted emissions 9 kHz – 30 MHz Front Picture



Figure 8.2-3: Conducted emissions 9 kHz – 30 MHz Side Picture

Section 9 Block diagrams of test set-ups

9.1 Radiated emissions set-up

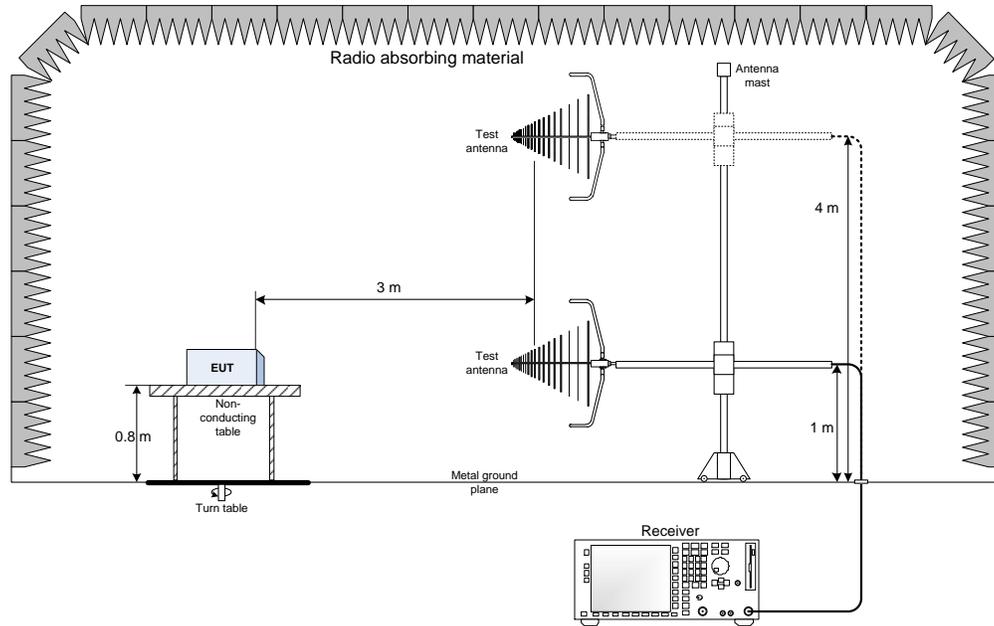


Figure 9.1-1 30 MHz - 1000 MHz Setup

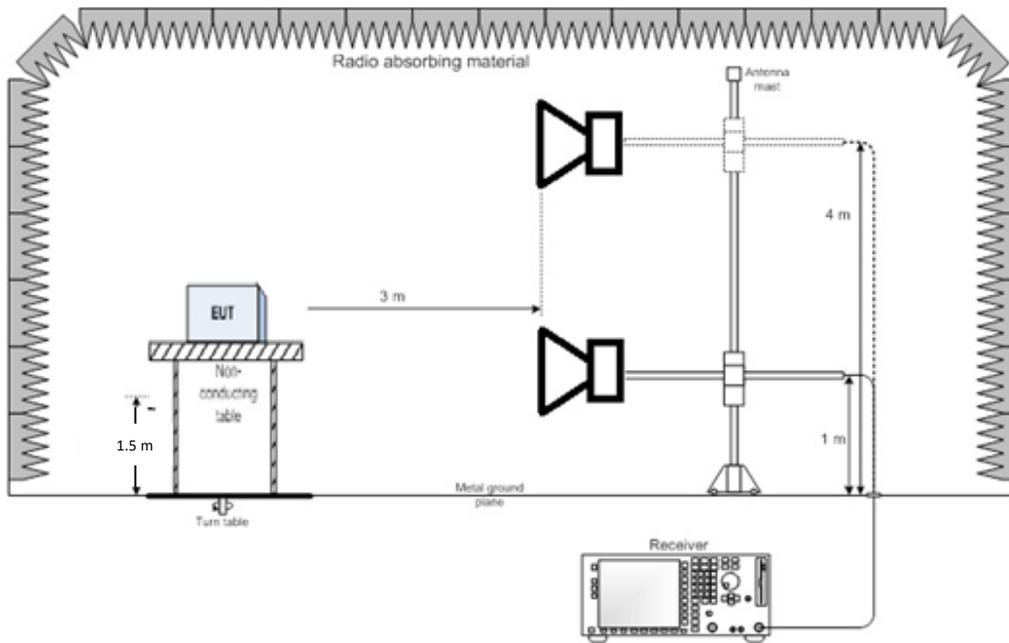


Figure 9.1-2 1 GHz - 26 GHz Setup

Thank you for choosing

