Test report

362154 - 2TRFWL

Date of issue: November 26, 2018

Applicant:

Casa Systems

Product:

Apex Strand Small Cell

Model:

LTE4001-41

Part number:

KRC 161 752/1

Specifications:

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

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	Martha Espinoza, Wireless Engineer
Tester signature	
Reviewed by	Juan Manuel Gonzalez, EMC & Wireless Business Development Manager
Review date	November 26, 2018
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.

Copyright notification

Table of Contents

Report summary

Test specifications

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

Test methods

ANSI C64.10-2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

Exclusions

None

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.

See "Summary of test results" for full details.

Test report revision history

Table 1.5-1: *Test report revision history*

Revision #	Details of changes made to test report
362154-2TRFWL	Original report issued

Notes:

Summary of test results

Radiated Emissions in simultaneous transmission.

Table 2.1-1: *FCC 47 CFR Part 15, Subpart C §15.207 & §15.209*

Test description	Verdict
FCC 15.209 - Radiated disturbance	Pass
FCC 15.109 - Conducted disturbance	Pass

Notes:

Equipment under test (EUT) details

Applicant

Company name	Casa Systems
Address	100 Old River Road # 100
City	Andover
Province/State	MA
Postal/Zip code	10810
Country	U.S.A.

Manufacturer

Company name	Casa Systems
Address	100 Old River Road # 100
City	Andover
Province/State	MA
Postal/Zip code	10810
Country	U.S.A.

Sample information

Receipt date	September 11, 2018
Nemko sample ID number	362154

EUT information

Product name	Apex Strand Small Cell
Model	LTE4001-41
Model variant	N/A
Serial number	ENG. Sample
Power requirements	*–40 to -90 V_{AC}, 45Watts*
Description/theory of operation	The Apex Strand Small Cell is a medium-power RF emitting eNodeB for LTE RAN. This node is capable of emitting up to 2W RF power per sector. Each Unit supports two sectors with radio access capabilities (4G) that is responsible for radio transmission (4 antennas) and reception from UEs in a LTE network. The Apex Strand Small Cell provides radio coverage for LTE enabled devices and or handsets within a home residential or enterprise coverage area. The Apex Strand Small Cell incorporates all the capabilities and functions of a standard eNode B. Model LTE4001-41 operates in Band 41. The device includes a pre-certified Wifi radio for management functions only, accessed by service personnel. The Apex Strand Small Cell is mountable from an available aerial strand. The main advantage of the Apex Strand Small Cell include: · Ease of installation: No dedicated LTE Backhaul needed. Can use available Cable, Gigabit Ethernet or Gigabit optical network for EPC backhaul. · Increased subscriber density: The AeMS should manage up to 1M HeNBs.· Easy integration: Uses X.509 digital certificates to authenticate with the service provider's back-end management systems.· Cost effectiveness: Supports Plug-and-Play provisioning, does not require a dedicated installation, and uses existing infrastructure with minimal intervention.
Operational frequencies	2496 – 2690 MHz (LTE Band 41) ; 2.4 GHz (Wi-Fi Band)
Software details	Qualcomm Default production V1.0

EUT exercise and monitoring details

A software was used for emulating the adequate signal into Pico cell model while it was monitored through the same program. For this specific case, the device was tested in active mode and the LTE and Wi-Fi signals were turned on (multi-transmitter mode).

EUT setup details

Table 3.6-1: *EUT sub assemblies*

Description	Brand name	Model/Part number	Serial number
N/A	N/A	N/A	N/A

Table 3.6-2: *EUT interface ports*

Description	Qty.
SMA Port	3
Coaxial Port	1

Table 3.6-3: *Support equipment*

Description	Brand name	Model/Part number	Serial number	Rev.
Laptop Computer	Dell	Inspiron 15	1G1RYN2	N/A
AC Adapter	Dell	HA45NM140	DP/N 00285K	N/A
Power supply	Lectro	Minimite, 4A, 60VAC	1610F0400213	N/A

Table 3.6-4: *Inter-connection cables*

Cable description	From	To	Length (m)
DC Cable	EUT	Power supply	1

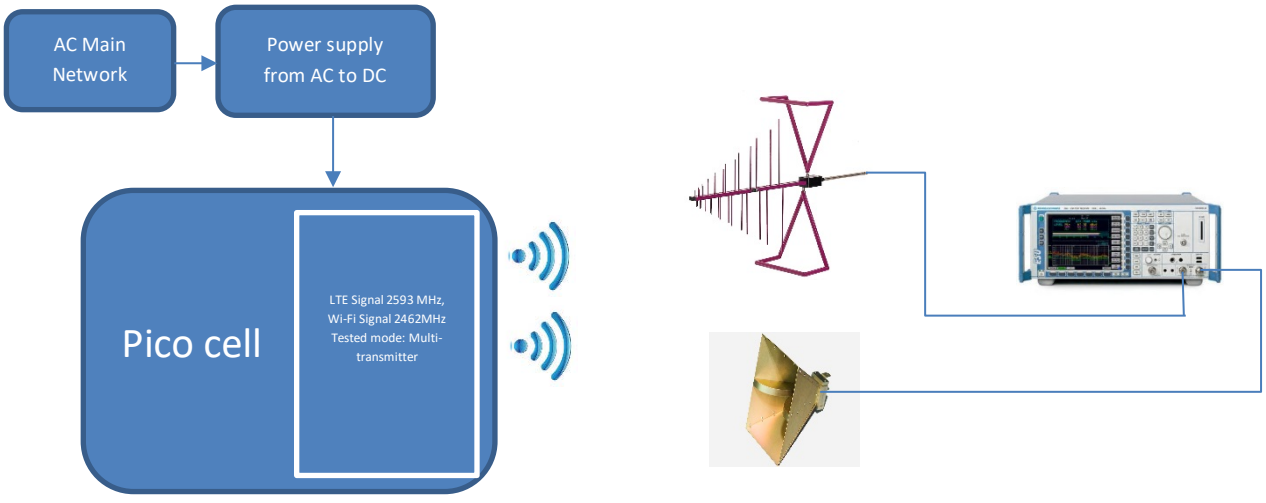


Figure 3.6-1: *Setup diagram*

Engineering considerations

Modifications incorporated in the EUT

None

Technical judgment

None

Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Test conditions

Atmospheric conditions

Temperature	21.4 °C
Relative humidity	55.7 %
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.

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 ±5 %, for which the equipment was designed.

Measurement uncertainty

Uncertainty of measurement

Nemko USA Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 "Uncertainty in EMC measurements." Measurement uncertainty was calculated using the methods described in CISPR 16-4 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC measurements; as well as described in UKAS LAB34: The expression of Uncertainty in EMC Testing. Measurement uncertainty calculations assume a coverage factor of K=2 with 95% certainty.

Test name	Measurement uncertainty
Conducted spurious emissions	1.13 dB
Radiated spurious emissions	3.78 dB
Temperature	1 °C
Humidity	5 %

Table 6.1-1: *Uncertainty of measurement*

Terms and definitions

Equipment type

Multimedia Equipment (MME)	Equipment that is information technology equipment, audio equipment, video equipment, broadcast receiver equipment, entertainment lighting control equipment or combinations of these.
Information technology equipment [ITE]	Equipment having a primary function of either (or a combination of) entry, storage, display, retrieval, transmission, processing, switching, or control of data and/or telecommunication messages and which may be equipped with one or more ports typically for information transfer. - Examples include data processing equipment, office machines, electronic business equipment and telecommunication equipment.
Audio equipment	Equipment which has a primary function of either (or a combination of) generation, input, storage, play, retrieval, transmission, reception, amplification, processing, switching or control of audio signals
Video equipment	Equipment which has a primary function of either (or a combination of) generation, input, storage, display, play, retrieval, transmission, reception, amplification, processing, switching, or control of video signals.
Broadcast receiver equipment	Equipment containing a tuner that is intended for the reception of broadcast services - These broadcast services are typically television and radio services, including terrestrial broadcast, satellite broadcast and/or cable transmission.
Entertainment lighting control equipment	Equipment generating or processing electrical signals for controlling the intensity, color, nature or direction of the light from a luminaire, where the intention is to create artistic effects in theatrical, televisual or musical productions and visual presentations.

7.2 General definitions, continued

Port type

AC mains power port	Port used to connect to the mains supply network - Equipment with a DC power port which is powered by a dedicated AC/DC power converter is defined as AC mains powered equipment
Antenna port	Port, other than a broadcast receiver tuner port (3.1.8), for connection of an antenna used for intentional transmission and/or reception of radiated RF energy.
Broadcast receiver tuner port	Port intended for the reception of a modulated RF signal carrying terrestrial, satellite and/or cable transmissions of audio and/or video broadcast and similar services - This port may be connected to an antenna, a cable distribution system, a VCR or similar device.
DC network power port	Port, not powered by a dedicated AC/DC power converter and not supporting communication, that connects to a DC supply network. - Equipment with a DC power port which is powered by a dedicated AC/DC power converter is considered to be AC mains powered equipment. - DC power ports supporting communications are considered to be wired networks ports, for example Ethernet ports which include Power Over Ethernet (POE).
Enclosure port	Physical boundary of the EUT through which electromagnetic fields may radiate.
Optical fiber port	Port at which an optical fiber is connected to an equipment.
RF modulator output port	Port intended to be connected to a broadcast receiver tuner port to transmit a signal to the broadcast receiver.
Signal/control port	Port intended for the interconnection of components of an equipment under test, or between an equipment under test and local associated equipment and used in accordance with relevant functional specifications (for example for the maximum length of cable connected to it) - Examples include RS-232, Universal Serial Bus (USB), High-Definition Multimedia Interface (HDMI), IEEE Standard 1394 (“Fire Wire”)
Wired network port	Point of connection for voice, data and signaling transfers intended to interconnect widely-dispersed systems by direct connection to a single-user of multi-user communication network (for example CATV, PSTN, ISDN, xDSL, LAN and similar networks) - These ports may support screened or unscreened cables and may also carry AC or DC power where this is an integral part of the telecommunication specification.

Testing data

Radiated emission limits; Intentional Radiators.

References

Title 47 → Chapter I → Subchapter A → Part 15 → Subpart C → §15.209 / ANSI C63.4: 2014

(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.

Test summary

Verdict	Pass		
Test date	October 23, 2018	Temperature	23°C
Test engineer	Martha Espinoza, Wireless Engineer	Air pressure	1000 mbar
Test location	10m semi anechoic chamber	Relative humidity	54 %

Notes: LTE B41 TX @ Low CH 2593 at 33dBm QPSK modulation in All Antennas + Wi-Fi at CH 11

Setup details

EUT setup configuration	Table top
Test facility	10 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) – 1000 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) – 100 ms (Peak and CAverage final measurement)

1.1.4 Setup details, continued

Table 8.1-1: *Radiated disturbance equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMC Test Receiver	Rohde & Schwarz	ESU 40	E1121	1 Year	04/28/2019
Antenna, Bilog	Schaffner-Chase	CBL6111C	E1763	2 Years	11/28/2018
Antenna, Horn	ETS	3117-PA	E1139	2 Years	01/26/2020
Antenna, Horn	Sage	SAR-2309-42-S2	E1143	2 Years	03/05/2020
Low Noise Amplifier	Sage	SBL-183403430-KFKF-S1	E1785	1 Year	01/10/2019
Notch Filter	Micro-Tronics	BRM50702-02	E1142	VOU	VOU

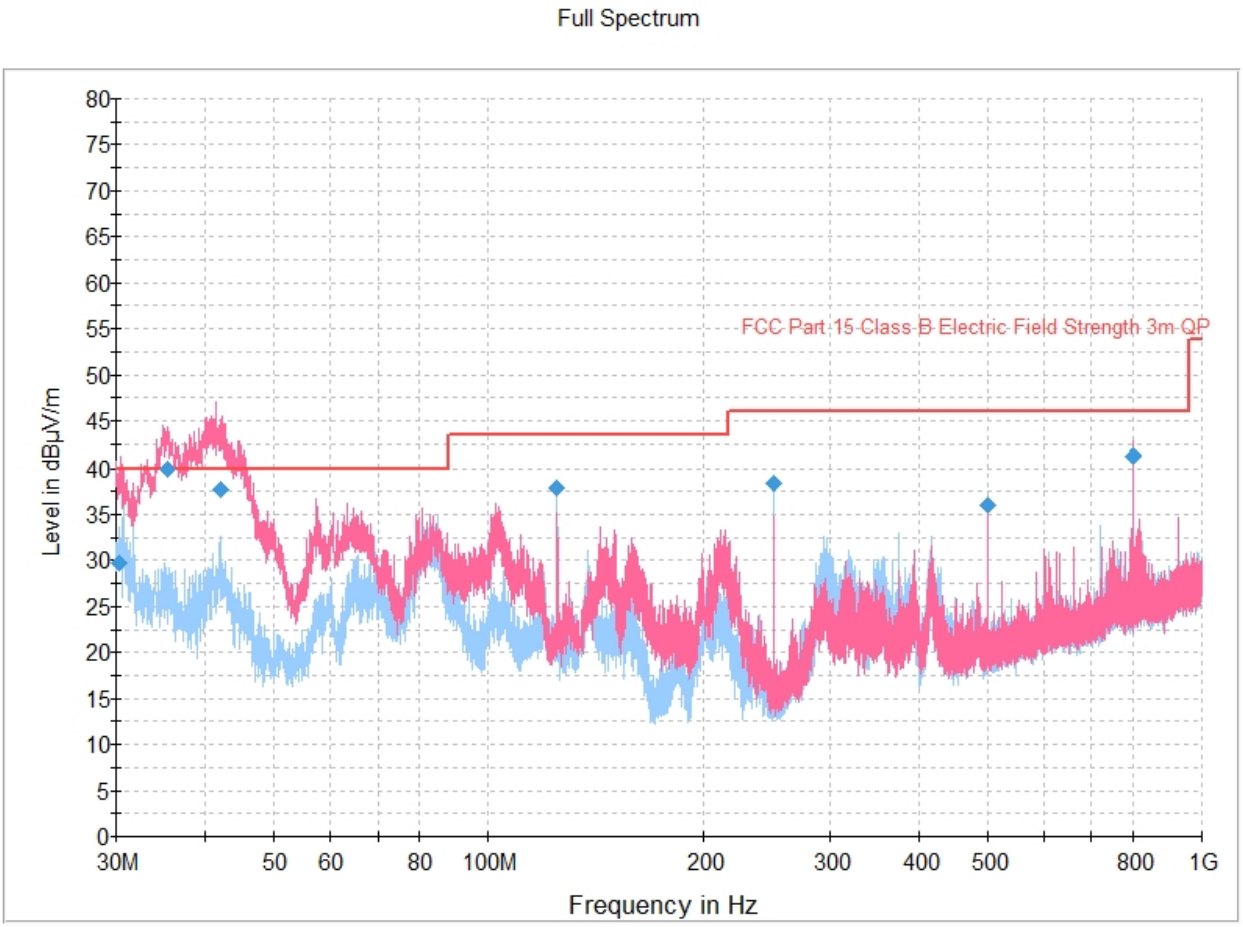
Notes: VOU – Verified on Use

Table 8.1-2: *Radiated disturbance test software details*

Manufacturer of Software	Details
R&S	EMC32 V10.00.00

Notes: None

1.1.5 Test data Radiated Disturbance (Multi-transmitter mode: LTE & Wi-Fi Signal)



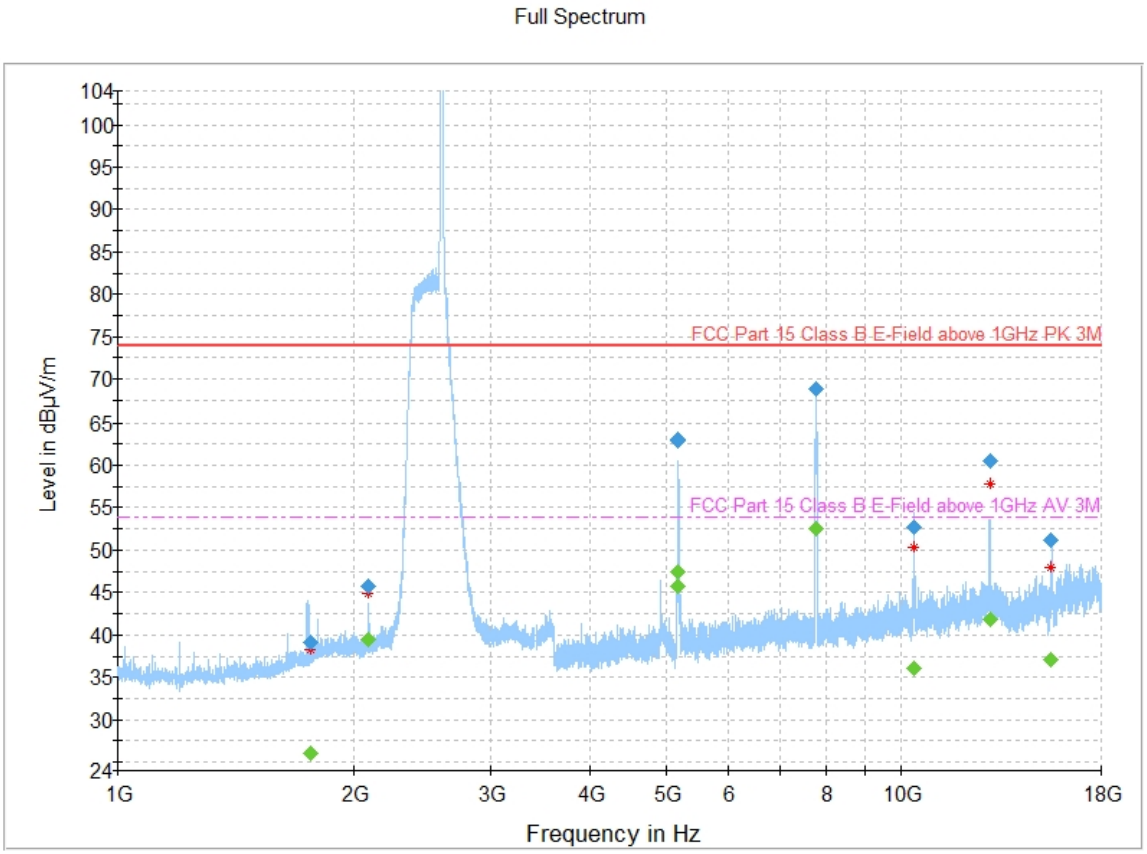
The spectral plot is a summation of a vertical and horizontal scan. The spectral scan has been corrected with the associated transducer factors (i.e. antenna factors, cable loss, amplifier gains, and attenuators.

Figure 8.1-1: *Radiated field strength plot (From 30 to 1000 MHz). Multi-transmitter mode.*

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.320000	29.75	40.00	10.25	1000.0	120.000	104.0	V	10.0	20.5
35.356333	39.89	40.00	0.11	1000.0	120.000	144.0	V	164.0	17.6
41.981333	37.67	40.00	2.33	1000.0	120.000	98.0	V	330.0	14.0
124.995333	37.88	43.50	5.62	1000.0	120.000	217.0	H	248.0	13.6
250.003667	38.40	46.00	7.60	1000.0	120.000	104.0	H	247.0	15.0
500.005000	36.03	46.00	9.97	1000.0	120.000	118.0	V	146.0	21.1
800.026000	41.23	46.00	4.77	1000.0	120.000	207.0	V	112.0	25.7

Table 8.1-3: *Radiated field strength measurement results*

Notes: [1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factors = antenna factor ACF (dB) + cable loss (dB)
3 The maximum measured value observed over a period of 15 seconds was recorded.



The spectral plot is a summation of a vertical and horizontal scan. The spectral scan has been corrected with the associated transducer factors (i.e. antenna factors, cable loss, amplifier gains, and attenuators. A 2.4 GHz notch filter was used!

Figure 8.1-2: *Radiated field strength plot (From 1 to 18 GHz). Multi-transmitter mode.*

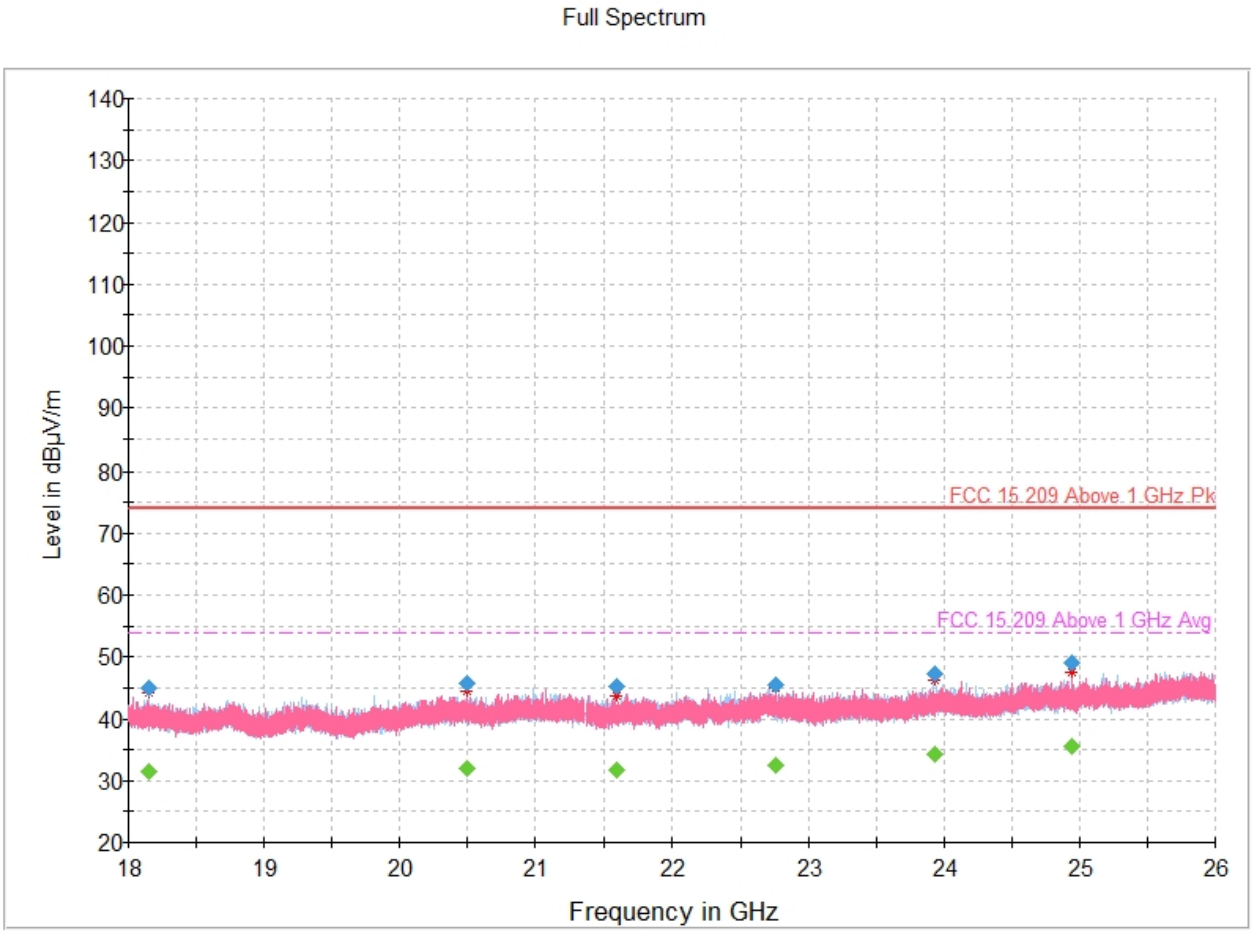
Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1767.066667	---	26.00	53.90	27.90	5000.0	1000.000	250.0	H	-11.0	-10.9
1767.066667	39.08	---	73.90	34.82	5000.0	1000.000	250.0	H	-11.0	-10.9
2089.166667	---	39.43	53.90	14.47	5000.0	1000.000	119.0	V	38.0	-8.9
2089.166667	45.74	---	73.90	28.16	5000.0	1000.000	119.0	V	38.0	-8.9
5178.033333	---	45.68	53.90	8.22	5000.0	1000.000	98.0	H	69.0	-3.0
5178.033333	62.86	---	73.90	11.04	5000.0	1000.000	98.0	H	69.0	-3.0
5184.033333	---	47.52	53.90	6.38	5000.0	1000.000	102.0	H	69.0	-3.0
5184.033333	63.10	---	73.90	10.80	5000.0	1000.000	102.0	H	69.0	-3.0
7774.766667	---	52.54	73.90	1.36	5000.0	1000.000	142.0	V	91.0	0.4
7774.766667	68.77	---	53.90	5.13	5000.0	1000.000	142.0	V	91.0	0.4
10365.533333	52.69	---	73.90	21.21	5000.0	1000.000	180.0	V	120.0	3.4
10365.533333	---	35.99	53.90	17.91	5000.0	1000.000	180.0	V	120.0	3.4
12961.300000	---	41.75	53.90	12.15	5000.0	1000.000	141.0	H	57.0	7.4
12961.300000	60.44	---	73.90	13.46	5000.0	1000.000	141.0	H	57.0	7.4
15549.200000	---	37.11	53.90	16.79	5000.0	1000.000	99.0	H	139.0	9.9
15549.200000	51.23	---	73.90	22.67	5000.0	1000.000	99.0	H	139.0	9.9

Table 8.1-4: *Radiated field strength measurement results*

Notes: [1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

[2] Correction factors = antenna factor ACF (dB) + cable loss (dB) – amplifier gain (dB)

3 The maximum measured value observed over a period of 15 seconds was recorded.



The spectral plot is a summation of a vertical and horizontal scan. The spectral scan has been corrected with the associated transducer factors (i.e. antenna factors, cable loss, amplifier gains, and attenuators.

Figure 8.1-3: *Radiated field strength plot (From 18 to 26 GHz)*

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/m)
18150.733333	45.06	---	73.90	28.84	5000.0	1000.000	175.0	H	131.0	13.3
18150.733333	---	31.59	53.90	22.31	5000.0	1000.000	175.0	H	131.0	13.3
20495.800000	---	31.96	53.90	21.94	5000.0	1000.000	197.0	V	20.0	15.5
20495.800000	45.70	---	73.90	28.20	5000.0	1000.000	197.0	V	20.0	15.5
21591.666667	---	31.84	53.90	22.06	5000.0	1000.000	154.0	V	4.0	15.6
21591.666667	45.15	---	73.90	28.75	5000.0	1000.000	154.0	V	4.0	15.6
22760.866667	45.56	---	73.90	28.34	5000.0	1000.000	149.0	V	139.0	16.7
22760.866667	---	32.51	53.90	21.39	5000.0	1000.000	149.0	V	139.0	16.7
23933.000000	47.17	---	73.90	26.73	5000.0	1000.000	179.0	H	20.0	17.8
23933.000000	---	34.22	53.90	19.68	5000.0	1000.000	179.0	H	20.0	17.8
24942.333333	48.93	---	73.90	24.97	5000.0	1000.000	108.0	V	0.0	19.4
24942.333333	---	35.59	53.90	18.31	5000.0	1000.000	108.0	V	0.0	19.4

Table 8.1-5: *Radiated field strength measurement results*

Notes: [1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factors = antenna factor ACF (dB) + cable loss (dB) − amplifier gain (dB)
[3] The maximum measured value observed over a period of 15 seconds was recorded.

1.1.6 Setup photos

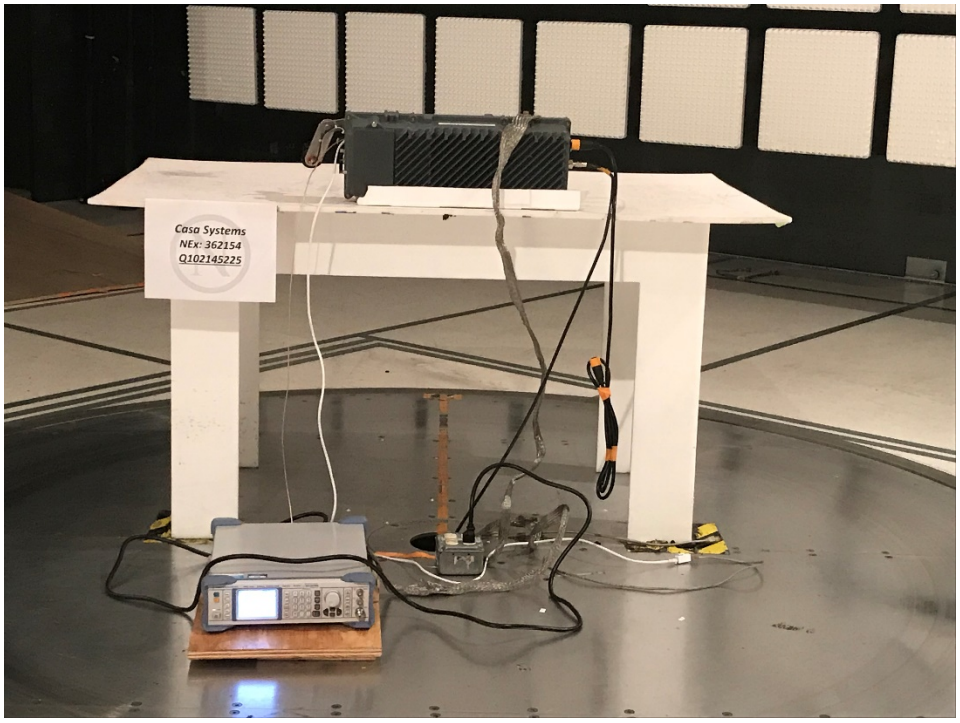


Figure 8.1-4: *Radiated emission setup*

Figure 8.1-5: *Radiated emission setup (from 30 to 1000 MHz)*

8.1.6 Setup photos, continued

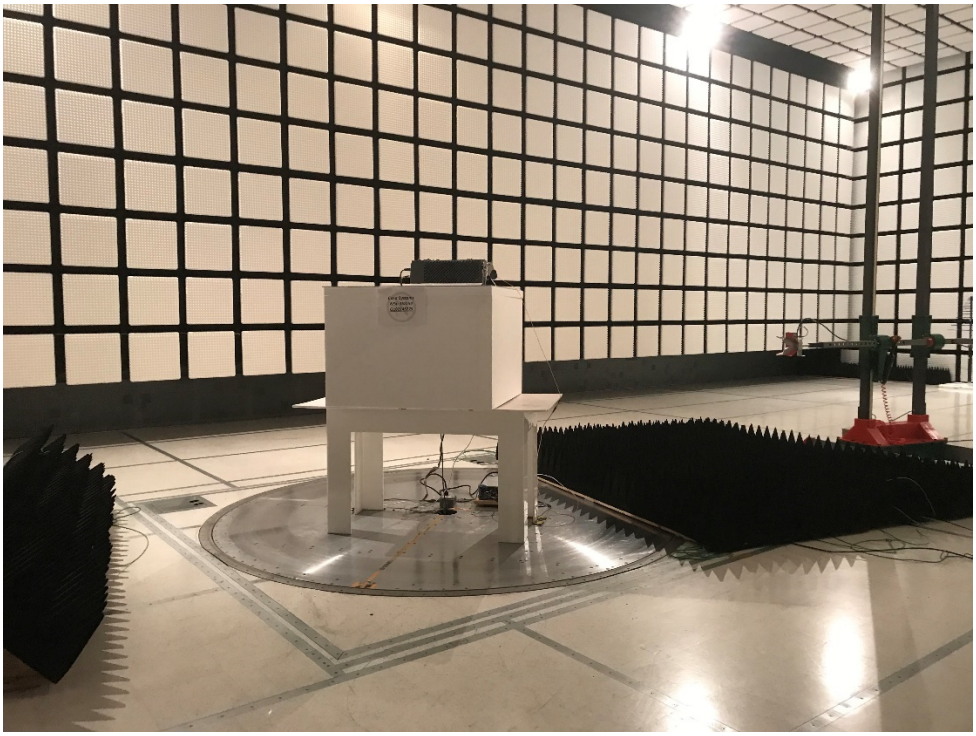


Figure 8.1-6: *Radiated emission setup (from 1 to 18 GHz)*

Figure 8.1-7: *Radiated emission setup (from 18 to 26 GHz)*

Conducted emission limits; Intentional Radiators.

References

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

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

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

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 µV within the frequency band 535-1705 kHz, as measured using a 50 µH/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.

Conducted Emissions Test summary

Verdict	Pass		
Test date	October 17, 2018	Temperature	23 °C
Test engineer	Martha Espinoza, Wireless Engineer	Air pressure	1007 mbar
Test location	Ground Plane	Relative humidity	28%

Notes: LTE B41 TX @ Low CH 2593 at 33dBm QPSK modulation in All Antennas + Wi-Fi at CH 11

Setup details

Port under test	AC Mains Input
EUT setup configuration	Table top
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) – 1000 ms (Quasi-peak final measurement) – 160 ms (CAverage final measurement)

Table -8.2-1: *Conducted disturbance at mains port equipment list*

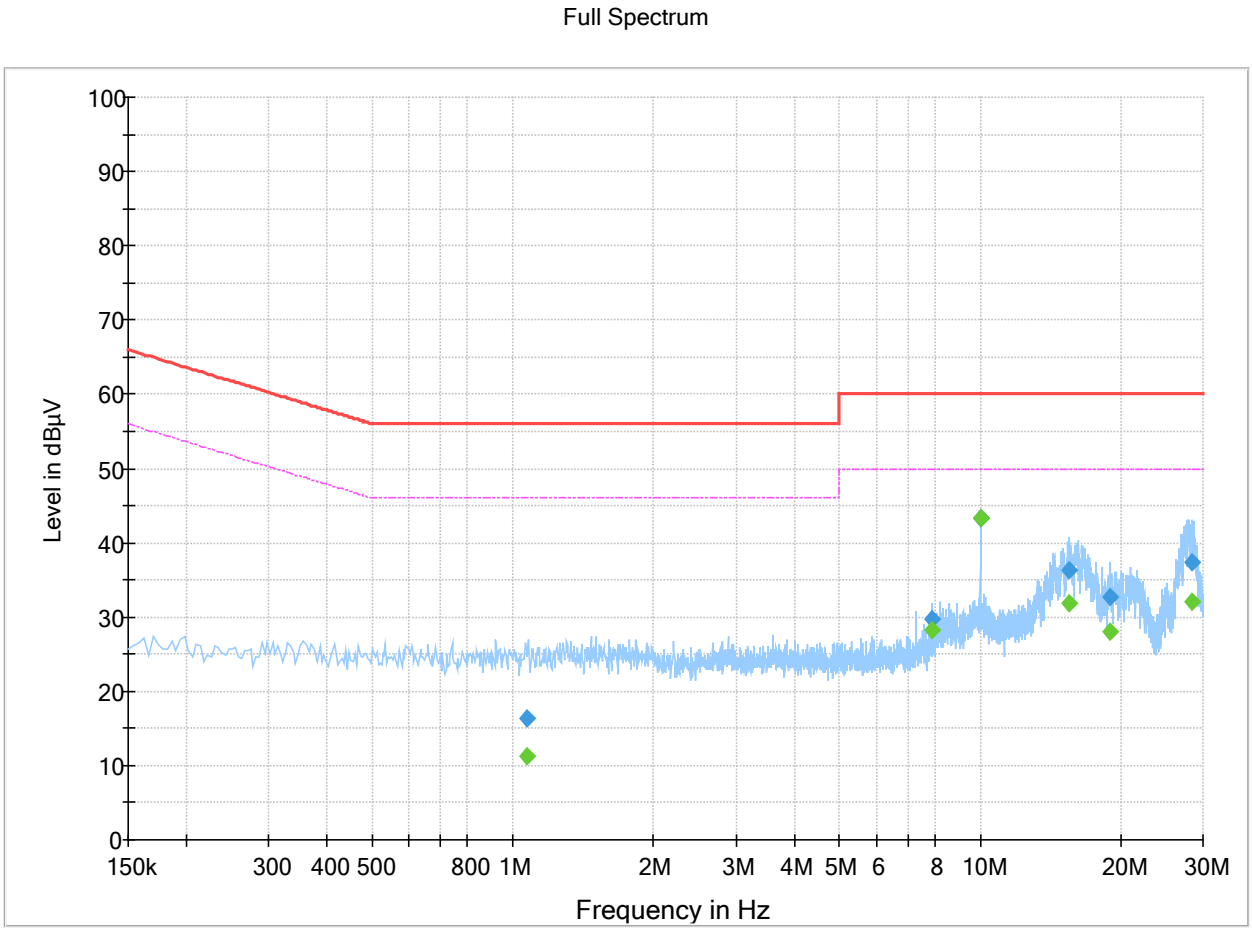
Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI Test Receiver 9kHz to 7GHz	Rohde & Schwarz	ESCI 7	E1767	1 Year	02/21/2019
Two Line V-Network	Rohde & Schwarz	ENV216	E1019	1 Year	07/24/2019

Notes: None

Table 8.2-2: *Conducted disturbance at mains port test software details*

Manufacturer of Software	Details
Rohde-Schwarz	EMC 32 V10.0

Notes: None



The spectral plot has been corrected with transducer factors. (i.e. cable loss, LISN factors, and attenuators)

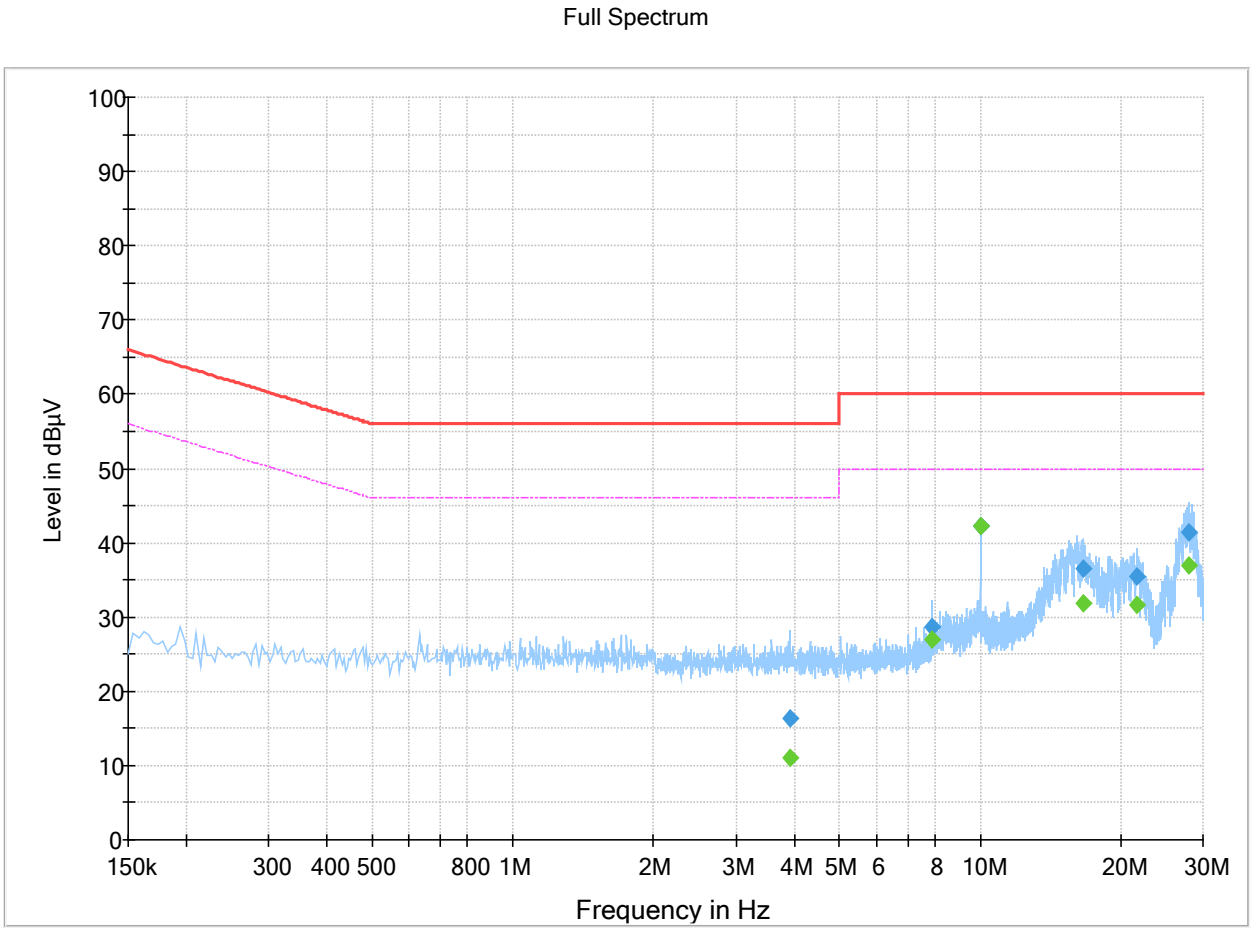
Figure 8.2-1: *Conducted disturbance at mains port spectral plot. LISN/Line, 120 V and 60 Hz*

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
1.072500	---	11.15	46.00	34.85	5000.0	9.000	L1	ON	19.5
1.072500	16.36	---	56.00	39.64	5000.0	9.000	L1	ON	19.5
7.888500	---	28.18	50.00	21.82	5000.0	9.000	L1	ON	19.6
7.888500	29.68	---	60.00	30.32	5000.0	9.000	L1	ON	19.6
10.000500	---	43.30	50.00	6.70	5000.0	9.000	L1	ON	19.6
10.000500	43.35	---	60.00	16.65	5000.0	9.000	L1	ON	19.6
15.548500	---	31.89	50.00	18.11	5000.0	9.000	L1	ON	19.7
15.548500	36.37	---	60.00	23.63	5000.0	9.000	L1	ON	19.7
19.036500	---	28.10	50.00	21.90	5000.0	9.000	L1	ON	19.8
19.036500	32.65	---	60.00	27.35	5000.0	9.000	L1	ON	19.8
28.320500	---	32.07	50.00	17.93	5000.0	9.000	L1	ON	20.1
28.320500	37.47	---	60.00	22.53	5000.0	9.000	L1	ON	20.1

Table 8.2-3: *Conducted disturbance – from AC main power (Quasi-peak and Average) results*

Notes:
[1] Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + attenuator (dB)
[3] The maximum measured value observed over a period of 15 seconds was recorded.

Sample calculation: 63.5 dBµV (result) = 44 dBµV (receiver reading) + 19.5 dB (Correction factor)



The spectral plot has been corrected with transducer factors. (i.e. cable loss, LISN factors, and attenuators)

Figure 8.2-2: *Conducted emissions at main port plot. LISN/Neutral, 120 V and 60 Hz*

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
3.904500	---	11.13	46.00	34.87	5000.0	9.000	N	ON	19.5
3.904500	16.42	---	56.00	39.58	5000.0	9.000	N	ON	19.5
7.888500	---	27.05	50.00	22.95	5000.0	9.000	N	ON	19.6
7.888500	28.67	---	60.00	31.33	5000.0	9.000	N	ON	19.6
10.000500	---	42.20	50.00	7.80	5000.0	9.000	N	ON	19.6
10.000500	42.27	---	60.00	17.73	5000.0	9.000	N	ON	19.6
16.600500	---	31.94	50.00	18.06	5000.0	9.000	N	ON	19.7
16.600500	36.61	---	60.00	23.39	5000.0	9.000	N	ON	19.7
21.724500	---	31.53	50.00	18.47	5000.0	9.000	N	ON	19.9
21.724500	35.42	---	60.00	24.58	5000.0	9.000	N	ON	19.9
27.952500	---	36.99	50.00	13.01	5000.0	9.000	N	ON	20.1
27.952500	41.44	---	60.00	18.56	5000.0	9.000	N	ON	20.1

Table 8.2-4: *Conducted emissions at main port (Quasi-peak and Average) results for AC Main*

Notes:
[1] Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + attenuator (dB)
[3] The maximum measured value observed over a period of 15 seconds was recorded.

Sample calculation: 63.5 dBµV (result) = 44 dBµV (receiver reading) + 19.5 dB (Correction factor)

1.1.6 Setup photos

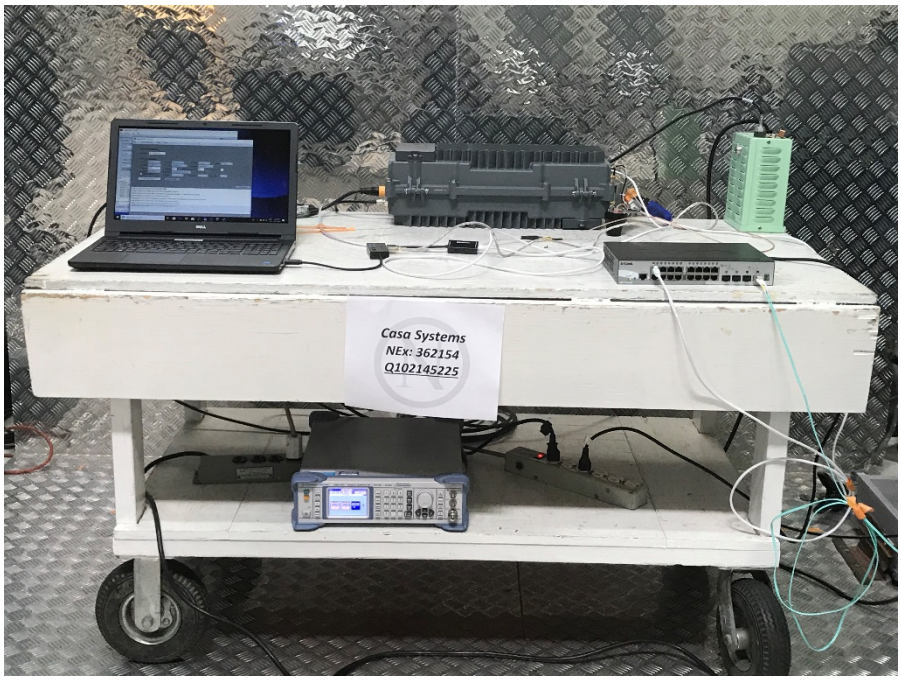


Figure 8.2-3: *Conducted disturbance at mains port setup photo*

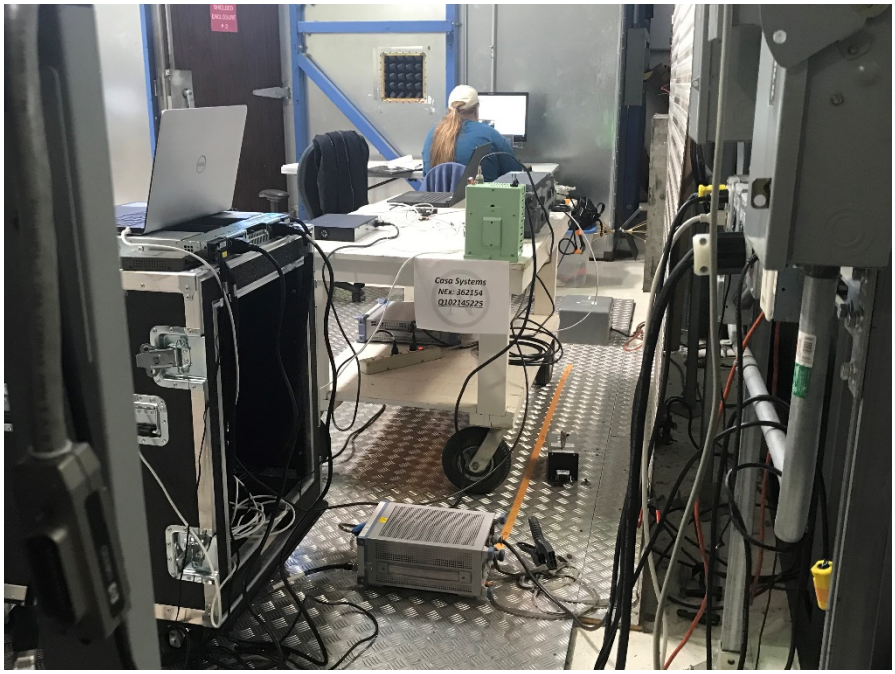


Figure 8.2-4: *Conducted disturbance at mains port setup photo*

Figure 8.2-5: *Conducted disturbance at mains port setup photo*

Section 9 EUT photos

9.1 External photos

Figure 9.1-1: *Front view photo*

Figure 9.1-2: *Side view photo*

Figure 9.1-3: *Side view photo*

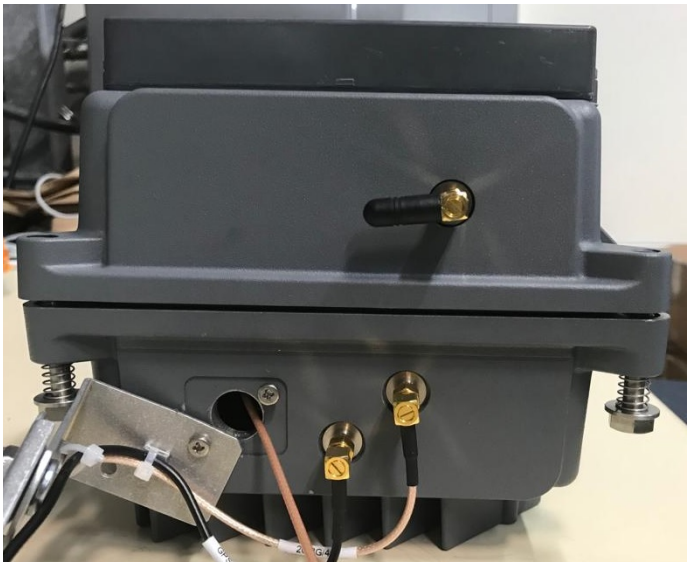
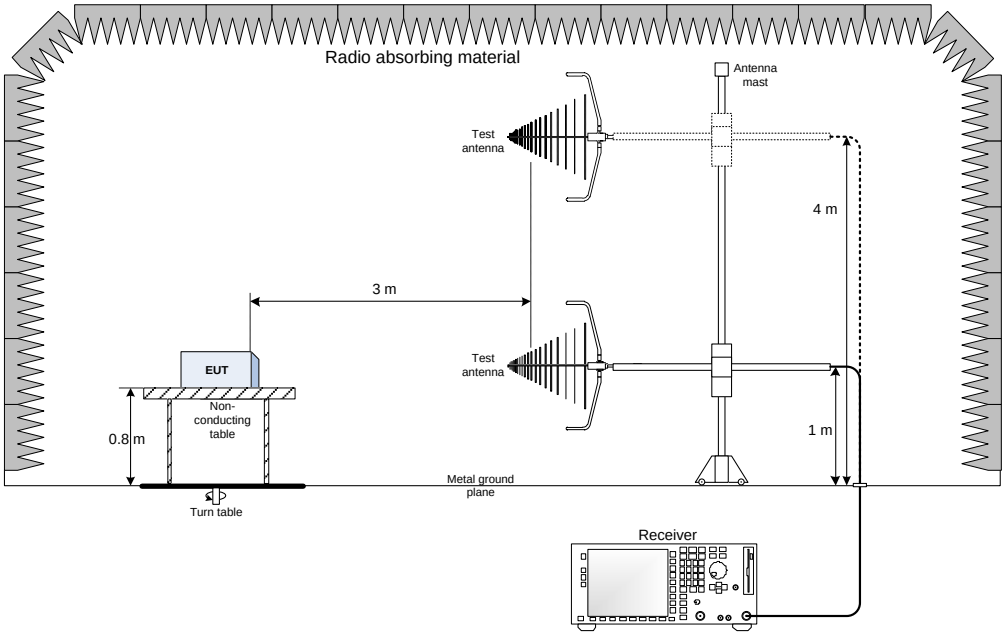
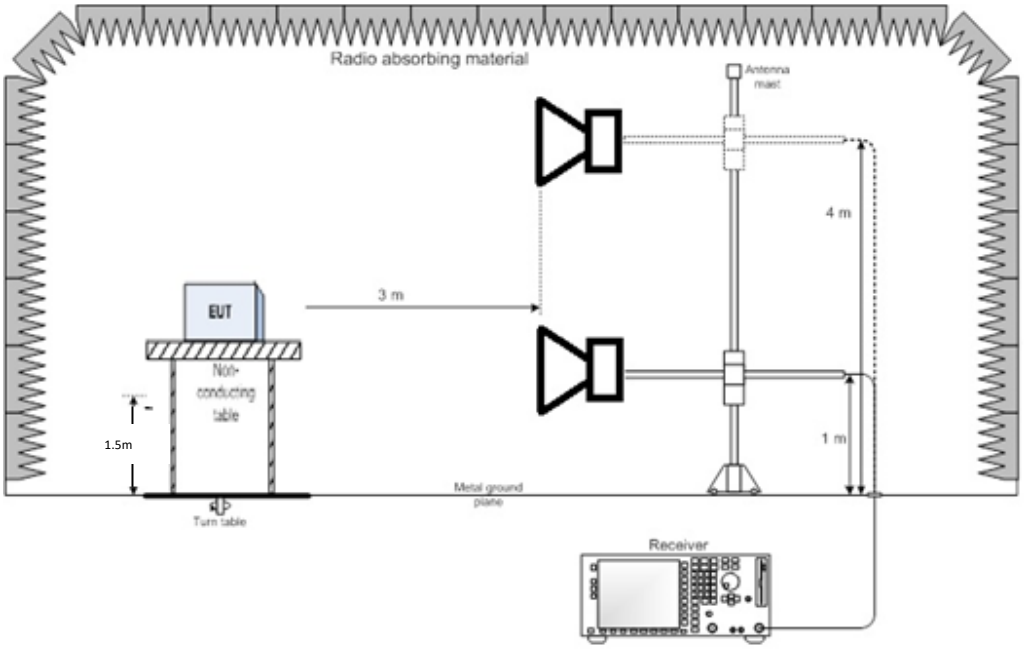


Figure 9.1-4: *Side view photo*

Block diagrams of test set-ups



30-1000MHz Setup



Above 1GHz Setup

Thank you for choosing