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Wireless Test report- 408608-1TRFWL

408608-1TRFWL

Date of issue: December 24, 2020

Applicant:

Blinq Wireless, Inc

Product:

Base station

Model:

FW6-B41-00-WW

FCC ID:

ROR0009

Specifications:

- FCC 47 CFR Part 27

  Miscellaneous Wireless Communications Services

Test location

Company name	Nemko Canada Inc.	
Facilities	Cambridge site: 1-130 Saltsman Drive Cambridge, Ontario Canada N3E 0B2 Tel: +1 519 650 4811	
Test site registration	**Organization**	**Recognition numbers and location**
	FCC/ISED	**CA0101 (Cambridge)**
Website	www.nemko.com	

Tested by	Fahar A Sukkoor, Wireless/EMC Specialist
Reviewed by	Tarek Elkholy, EMC/RF Specialist
Review date	December 24, 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 Canada's ISO/IEC 17025 accreditation.

Copyright notification

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Section 1. Report summary

1.1 Applicant and manufacturer

Company name	Blinq Wireless, Inc.
Address	140 Renfrew Drive Suite 200
City	Markham
Province/State	ON
Postal/Zip code	L3R 6B3
Country	Canada

1.2 Test specifications

FCC 47 CFR Part 27	Miscellaneous Wireless Communications Services

1.3 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was completed 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.

1.4 Exclusions

None

1.5 Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued

Section 2. Summary of test results

2.1 FCC Part 27 test results

Part	Test description	Verdict
§27.50(h)	Peak output power at RF antenna connector	Pass
§27.53(m)	Emission limits	Pass
§27.54	Frequency stability	Pass
§2.1049	Occupied bandwidth	Pass

Notes: None

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	November 26, 2020
Nemko sample ID number	1

3.2 EUT information

Product name	Base station
Model	FW6-B41-00-WW
Serial number	6010102-20370009
Software version	Version 2.1.3_42384

3.3 Technical information

Frequency band	2496-2690 MHz
Frequency Min (MHz)	2501 (10 MHz) & 2506 (20 MHz)
Frequency Max (MHz)	2685 (10MHz) & 2680 (20 MHz)
RF power Min (W /EIRP)	426.58 (10 MHz), 693.43 (20 MHz)
RF power Max (W), /EIRP)	1000 (10 MHz), 1025.65 (20 MHz)
Field strength, Units @ distance	N/A
Measured BW (MHz) (26 dB)	9.80 (10 MHz), 19.57 (20 MHz)
Type of modulation	OFDM using QPSK and 64 QAM modulations
Emission classification (F1D, G1D, D1D)	W7D
Power requirements	48 V_{DC} via 120Vac power adaptor
MIMO type	2 × 2 with completely uncorrelated type of signal
Antenna information	1)21.9dBi / 10.5deg Azimuth BW (MBA6F-V2A from CCI Products) 2)21.5dBi / 12.8deg Azimuth BW (MBA3F-E3A from CCI Products) 3) Common Sectorial Antennae (MTI-344075-ND, MT-344036/NV from MTI Wireless Edge Limited) • Antenna gain 15dBi/16dBi/17dBi • Azimuth BW: 60Deg/65Deg/90Deg All antenna referred above are sufficiently uncorrelated. The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator.

3.4 Product description and theory of operation

The BLiNQ FW-600 system is a tri-sector and tri-carrier Long-Term Evolution (LTE) Evolved Node B (eNB) with the capability to operate in the following bands:41, 42, 43, 46 and 48. With a distinctive feature set and integration level, the FW-600 brings an ideal solution to an “install anywhere” micro-base transceiver station (micro-BTS) that fully serves private networks, fixed wireless access and mobility use cases

3.5 EUT exercise details

The EUT was controlled from laptop via Ethernet using Tera term. Link
Power settings table:

BW(MHz)	10	20
FW600- Sector 0 Power	39dBm	39dBm
FW600- Sector 1 Power	39dBm	39dBm
FW600- Sector 2 Power	39dBm	39dBm

"Note: 1. With 10MHz bandwidth carrier, power setting is limited to 36dBm if the carrier is occupying 5MHz from low and high band edges 2496MHz and 2690MHz, respectively. With 20MHz bandwidth carrier power setting is limited to 38dBm if the carrier is occupying 5MHz from low and and band edges 2496MHz and 2690MHz respectively.

3.6 EUT setup diagram

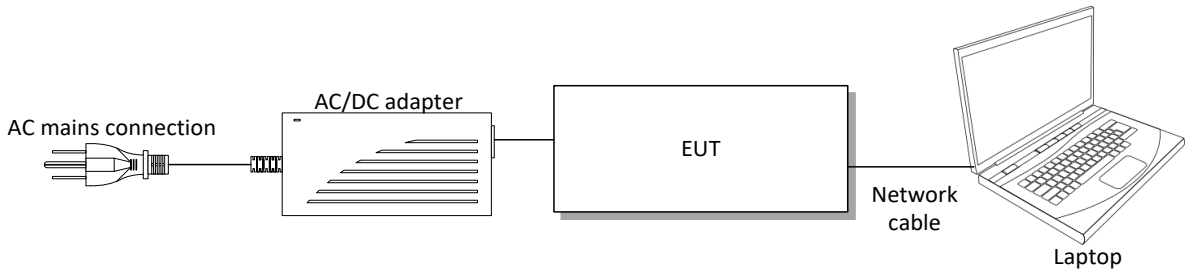


Figure 3.6-1: *Setup diagram*

Table 3.6-1: *EUT support equipment*

Description	Brand name	Model/Part number	Serial number
Power adaptor	Mean Well	HLG-600H-48	RB99055873
laptop	Dell Latitude	E6440	FA002914

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

Measurements results are provided for one sector. All three sectors of EUT have identical emission and power output characteristics as declared by manufacturer.

All measurements are shown in QPSK modulation as it is considered worst case scenario. 64QAM modulation is checked for emission and spurious characteristics

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	860–1060 mbar

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 ±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
All antenna port measurements	0.55
Conducted spurious emissions	1.13
Radiated spurious emissions	3.78
AC power line conducted emissions	3.55

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: *Equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA003012	1 year	Oct 10/21
Flush mount turntable	SUNAR	FM2022	FA003006	—	NCR
Controller	SUNAR	SC110V	FA002976	—	NCR
Antenna mast	SUNAR	TLT2	FA003007	—	NCR
Receiver/spectrum analyzer	Rohde & Schwarz	ESR26	FA002969	1 year	Nov 12/21
Spectrum analyzer	Rohde & Schwarz	FSW43	FA002971	1 year	Nov 13/21
Temperature chamber	Espec	EPX-4H	FA003033	1 year	VOU
Radiated Emissions cable set	Huber + Suhner Inc	—	FA003047	—	NCR
Radiated Emissions cable set	Huber + Suhner Inc	—	FA003044	—	NCR
Preamp (1–18 GHz)	ETS-Lindgren	124334	FA002956	1 year	Mar 18/21
Bilog antenna (20–2000 MHz)	Sun AR	JB1	FA003009	1 year	Sep 17/21
Horn antenna (1–18 GHz)	Electro-Metrics	3115	FA000649	1 year	Sep 11/21
Horn Antenna (18 -40 GHz)	ETS-Lindgren	3116B	FA002948	1 year	Mar 07/21

Note: NCR - no calibration required, VOU - verify on use

Section 8. Testing data

8.1 FCC 27.50(h) Peak output power

8.1.1 Definitions and limits

(1) Main, booster and base stations.

(i) The maximum EIRP of a main, booster or base station shall not exceed 33 dBW + 10log(X/Y) dBW, where X is the actual channel width in MHz and Y is either 6 MHz if prior to transition or the station is in the MBS following transition or 5.5 MHz if the station is in the LBS and UBS following transition, except as provided in paragraph (h)(1)(ii) of this section.

(ii) If a main or booster station sectorizes or otherwise uses one or more transmitting antennas with a non-omnidirectional horizontal plane radiation pattern, the maximum EIRP in dBW in a given direction shall be determined by the following formula: EIRP = 33 dBW + 10 log(X/Y) dBW + 10 log(360/beamwidth) dBW, where X is the actual channel width in MHz, Y is either (i) 6 MHz if prior to transition or the station is in the MBS following transition or (ii) 5.5 MHz if the station is in the LBS and UBS following transition, and beamwidth is the total horizontal plane beamwidth of the individual transmitting antenna for the station or any sector measured at the half-power points.

(2) Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

(3) For television transmission, the peak power of the accompanying aural signal must not exceed 10 percent of the peak visual power of the transmitter. The Commission may order a reduction in aural signal power to diminish the potential for harmful interference.

(4) For main, booster and response stations utilizing digital emissions with non-uniform power spectral density (e.g. unfiltered QPSK), the power measured within any 100 kHz resolution bandwidth within the 6 MHz channel occupied by the non-uniform emission cannot exceed the power permitted within any 100 kHz resolution bandwidth within the 6 MHz channel if it were occupied by an emission with uniform power spectral density, i.e., if the maximum permissible power of a station utilizing a perfectly uniform power spectral density across a 6 MHz channel were 2000 watts EIRP, this would result in a maximum permissible power flux density for the station of 2000/60 = 33.3 watts EIRP per 100 kHz bandwidth. If a non-uniform emission were substituted at the station, station power would still be limited to a maximum of 33.3 watts EIRP within any 100 kHz segment of the 6 MHz channel, irrespective of the fact that this would result in a total 6 MHz channel power of less than 2000 watts EIRP.

(i) Peak transmit power shall be measured over any interval of continuous transmission using instrumentation calibrated in terms of rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

8.1.2 Test summary

Test date	December 7, 2020
Test engineer	Fahar A Sukkoor
Verdict	Pass

8.1.3 Observations, settings and special notes

Test results are taken with QPSK modulation as considering worst case scenario.
Spectrum analyzer settings were:

Resolution bandwidth	500 – 1000 kHz
Video bandwidth	1 –3 MHz
Detector mode	RMS
Trace mode	Power averaging over channel bandwidth

8.1.4 Test data

EIRP limit line calculations.

For 21.9dBi / 10.5deg Azimuth BW (MBA6F-V2A from CCI Products)

$EIRP_{10\ MHz} = 63 + 10 \times Log_{10}(10 / 5.5) + 10 \times Log_{10}(360 / 10.5) = 80.95$ dBm

$EIRP_{20\ MHz} = 63 + 10 \times Log_{10}(20 / 5.5) + 10 \times Log_{10}(360 / 10.5) = 83.96$ dBm

$EIRP_{10\ MHz} = 63 + 10 \times Log_{10}(10 / 6) + 10 \times Log_{10}(360 / 10.5) = 80.57$ dBm

$EIRP_{20\ MHz} = 63 + 10 \times Log_{10}(20 / 6) + 10 \times Log_{10}(360 / 10.5) = 83.58$ dBm

For 21.5dBi / 12.8deg Azimuth BW (MBA3F-E3A from CCI Products):

$EIRP_{10\ MHz} = 63 + 10 \times Log_{10}(10 / 5.5) + 10 \times Log_{10}(360 / 12.8) = 80.09$ dBm

$EIRP_{20\ MHz} = 63 + 10 \times Log_{10}(20/ 5.5) + 10 \times Log_{10}(360 / 12.8) = 83.10$ dBm

$EIRP_{10\ MHz} = 63 + 10 \times Log_{10}(10 / 6) + 10 \times Log_{10}(360 / 12.8) = 79.71$ dBm

$EIRP_{20\ MHz} = 63 + 10 \times Log_{10}(20 / 6) + 10 \times Log_{10}(360 / 12.8) = 82.72$ dBm

Since EUT is used as a base station, EIRP limits are applicable.

As per manufacturer declaration base station is utilizing digital emissions with uniform power spectral density, hence power spectral density requirement is not applicable.

As per manufacturer declaration, for all other antennae listed in section 3.3 shall be used with same maximum power settings as antenna MBA6F-V2A.

8.1.1 Test data

Table 8.1-1: *EIRP measurements results for 10 MHz channel bandwidth with 21.9dBi / 10.5deg MBA6F-V2A from CCI Products antenna*

Frequency, MHz	Bandwidth, MHz	Ch 1/2	Output power, dBm	Antenna gain, dBi	EIRP, dBm	Limit, , dBm	Margin, dB
2501	10(low)	1	36.72	20.9	57.62	80.95	23.33
		2	36.95	20.9	57.85	80.95	23.10
2593	10(mid)	1	39.00	20.9	59.90	80.57	20.67
		2	39.10	20.9	60.00	80.57	20.57
2685	10(high)	1	35.80	20.9	56.70	80.95	24.25
		2	36.99	20.9	57.89	80.95	23.06
2506	10(low)	1	39.04	20.9	59.94	80.95	21.01
		2	38.88	20.9	59.78	80.95	21.17
2680	10(high)	1	38.99	20.9	59.89	80.95	21.06
		2	39.04	20.9	59.94	80.95	21.01

Note: 1 dB cable loss to EIRP is added to antenna gain.

Table 8.1-2: *EIRP measurements results for 20 MHz channel bandwidth with 21.9dBi / 10.5deg MBA6F-V2A from CCI Products antenna*

Frequency, MHz	Bandwidth, MHz	Ch 1/2	Output power, dBm	Antenna gain, dBi	EIRP, dBm	Limit, , dBm	Margin, dB
2506	20(low)	1	38.17	20.9	59.07	83.96	24.89
		2	37.91	20.9	58.81	83.96	25.15
2593	20(mid)	1	39.21	20.9	60.11	83.58	23.47
		2	39.05	20.9	59.95	83.58	23.63
2680	20(high)	1	37.95	20.9	58.85	83.96	25.11
		2	38.73	20.9	59.63	83.96	24.33
2511	20(low)	1	38.99	20.9	59.89	83.96	24.07
		2	38.74	20.9	59.64	83.96	24.32
2675	20(high)	1	38.90	20.9	59.80	83.96	24.16
		2	39.03	20.9	59.93	83.96	24.03

Note: 1 dB cable loss to EIRP is added to antenna gain.

Table 8.1-3: *EIRP measurements results for 10 MHz channel bandwidth with 21.5dBi / 12.8deg MBA3F-E3A from CCI Products antenna*

Frequency, MHz	Bandwidth, MHz	Ch 1/2	Output power, dBm	Antenna gain, dBi	EIRP, dBm	Limit, , dBm	Margin, dB
2501	10(low)	1	36.72	20.5	57.22	80.09	22.87
		2	36.95	20.5	57.45	80.09	22.64
2593	10(mid)	1	39.00	20.5	59.50	79.71	20.21
		2	39.10	20.5	59.60	79.71	20.11
2685	10(high)	1	35.80	20.5	56.30	80.09	23.79
		2	36.99	20.5	57.49	80.09	22.60
2506	10(low)	1	39.04	20.5	59.54	80.09	20.55
		2	38.88	20.5	59.38	80.09	20.71
2680	10(high)	1	38.99	20.5	59.49	80.09	20.60
		2	39.04	20.5	59.54	80.09	20.55

Note: 1 dB cable loss to EIRP is added to antenna gain.

Table 8.1-4: *EIRP measurements results for 20 MHz channel bandwidth with 21.5dBi / 12.8deg MBA3F-E3A from CCI Products :antenna*

Frequency, MHz	Bandwidth, MHz	Ch 1/2	Output power, dBm	Antenna gain, dBi	EIRP, dBm	Limit, , dBm	Margin, dB
2506	20(low)	1	38.17	20.5	58.67	83.10	24.43
		2	37.91	20.5	58.41	83.10	24.69
2593	20(mid)	1	39.21	20.5	59.71	82.72	23.01
		2	39.05	20.5	59.55	82.72	23.17
2680	20(high)	1	37.95	20.5	58.45	83.10	24.65
		2	38.73	20.5	59.23	83.10	23.87
2511	20(low)	1	38.99	20.5	59.49	83.10	23.61
		2	38.74	20.5	59.24	83.10	23.86
2675	20(high)	1	38.90	20.5	59.40	83.10	23.70
		2	39.03	20.5	59.53	83.10	23.57

Note: 1 dB cable loss to EIRP is added to antenna gain.

8.1.1 Test data

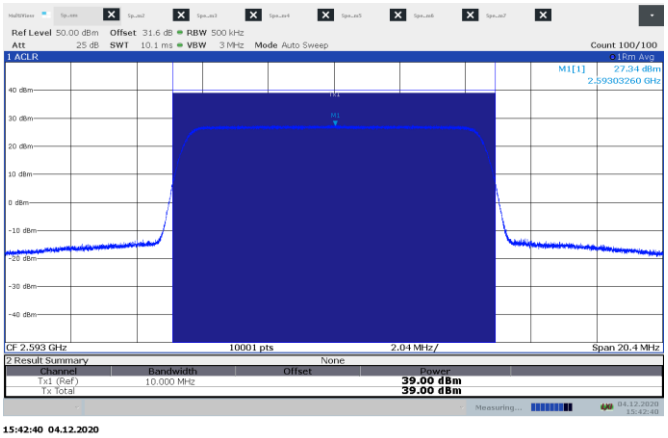


Figure 8.1-1: *Output power for 10 MHz channel BW, sample plot*

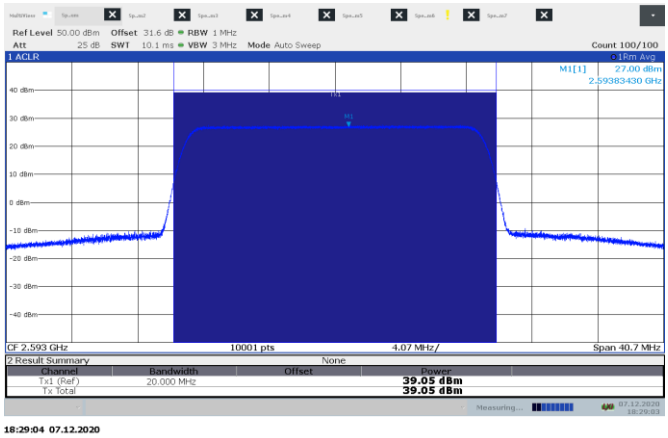


Figure 8.1-2: *Output power for 20 MHz channel BW, sample plot*

8.2 FCC 27.53(m) Emission limits

8.2.1 Definitions and limits

For BRS and EBS stations, the power of any emissions outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts in accordance with the standards below. If a licensee has multiple contiguous channels, out-of-band emissions shall be measured from the upper and lower edges of the contiguous channels.
(1) Prior to the transition, and thereafter, solely within the MBS, for analog operations with an EIRP in excess of −9 dBW, the signal shall be attenuated at the channel edges by at least 38 dB relative to the peak visual carrier, then linearly sloping from that level to at least 60 dB of attenuation at 1 MHz below the lower band edge and 0.5 MHz above the upper band edge, and attenuated at least 60 dB at all other frequencies.
(2) For digital base stations, the attenuation shall be not less than 43 + 10 log (P) dB, unless a documented interference complaint is received from an adjacent channel licensee with an overlapping Geographic Service Area. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS No. 1 on the same terms and conditions as adjacent channel BRS or EBS licensees. Provided that a documented interference complaint cannot be mutually resolved between the parties prior to the applicable deadline, then the following additional attenuation requirements shall apply:

(i) If a pre-existing base station suffers harmful interference from emissions caused by a new or modified base station located 1.5 km or more away, within 24 hours of the receipt of a documented interference complaint the licensee of the new or modified base station must attenuate its emissions by at least 67 + 10 log (P) dB measured at 3 megahertz, above or below, from the channel edge of its frequency block and shall immediately notify the complaining licensee upon implementation of the additional attenuation. No later than 60 days after the implementation of such additional attenuation, the licensee of the complaining base station must attenuate its base station emissions by at least 67 + 10 log (P) dB measured at 3 megahertz, above or below, from the channel edge of its frequency block of the new or modified base station.

(ii) If a pre-existing base station suffers harmful interference from emissions caused by a new or modified base station located less than 1.5 km away, within 24 hours of receipt of a documented interference complaint the licensee of the new or modified base station must attenuate its emissions by at least 67 + 10 log (P)−20 log (Dkm/1.5) dB measured at 3 megahertz, above or below, from the channel edge of its frequency block of the complaining licensee, or if both base stations are co-located, limit its undesired signal level at the pre-existing base station receiver(s) to no more than −107 dBm measured in a 5.5 megahertz bandwidth and shall immediately notify the complaining licensee upon such reduction in the undesired signal level. No later than 60 days after such reduction in the undesired signal level, the complaining licensee must attenuate its base station emissions by at least 67 + 10 log (P) dB measured at 3 megahertz, above or below, from the channel edge of its frequency block of the new or modified base station.

(iii) If a new or modified base station suffers harmful interference from emissions caused by a pre-existing base station located 1.5 km or more away, within 60 days of receipt of a documented interference complaint the licensee of each base station must attenuate its base station emissions by at least 67 + 10 log (P) dB measured at 3 megahertz, above or below, from the channel edge of its frequency block of the other licensee.

(iv) If a new or modified base station suffers harmful interference from emissions caused by a pre-existing base station located less than 1.5 km away, within 60 days of receipt of a documented interference complaint: (a) The licensee of the new or modified base station must attenuate its OOBE by at least 67 + 10 log (P)−20 log (Dkm/1.5) measured 3 megahertz above or below, from the channel edge of its frequency block of the other licensee, or if the base stations are co-located, limit its undesired signal level at the other base station receiver(s) to no more than −107 dBm measured in a 5.5-megahertz bandwidth; and (b) the licensee causing the interference must attenuate its emissions by at least 67 + 10 log (P) dB measured at 3 megahertz, above or below, from the channel edge of its frequency block of the new or modified base station.

(v) For all fixed digital user stations, the attenuation factor shall be not less than 43 + 10 log (P) dB at the channel edge.

(3) Prior to transition and thereafter solely within the MBS, and notwithstanding paragraph (l)(2) of this section, the maximum out-of-band power of a digital transmitter operating on a single 6 MHz channel with an EIRP in excess of −9 dBW employing digital modulation for the primary purpose of transmitting video programming shall be attenuated at the 6 MHz channel edges at least 25 dB relative to the licensed average 6 MHz channel power level, then attenuated along a linear slope to at least 40 dB at 250 kHz beyond the nearest channel edge, then attenuated along a linear slope from that level to at least 60 dB at 3 MHz above the upper and below the lower licensed channel edges, and attenuated at least 60 dB at all other frequencies.
(4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

8.2.2 Test summary

Test date	December 7, 2020
Test engineer	Fahar A Sukkoor
Verdict	Pass

8.2.3 Observations, settings and special notes

The testing was performed conducted on each antenna port as well as radiated with both ports operating simultaneously in MIMO mode and terminated with 50 Ohm loads. Spurious emissions were tested from 30 MHz to the 10th harmonic. Only critical plots provided in test data below. Spectrum analyzer settings:

Resolution bandwidth	100 kHz (below 1 GHz) 1 MHz (conducted)
Video bandwidth	3 × RBW
Detector and trace mode	RMS Power averaging (conducted), Peak Max-hold (radiated)

Spectrum analyser settings for band edge emissions (within 1 MHz right outside 2496–2690 MHz band)

Resolution bandwidth	100 kHz
Video bandwidth	300kHz
Detector mode	RMS
Trace mode	Power Average

8.2.4 Test data

Table 8.2-1: *Band edge emission measurements at 2496 and 2690 MHz QPSK modulation results*

Antenna port	Channel BW, MHz	Frequency of max emission, MHz	Emission level, dBm/MHz	Limit, dBm/MHz	Margin, dB
1	10(low)	2496	-13.10	-13	0.10
2	10(low)	2496	-14.15	-13	1.15
1	10(high)	2690	-13.05	-13	0.05
2	10(high)	2690	-13.46	-13	0.46
1	10(low 2506 MHz))	2496	-14.34	-13	1.34
2	10(low 2506 MHz))	2496	-13.19	-13	0.19
1	10(high 2680 MHz)	2690	-15.19	-13	2.19
2	10(high 2680 MHz)	2690	-15.00	-13	2.00
1	20(low)	2496	-13.67	-13	0.67
2	20(low)	2496	-13.80	-13	0.80
1	20(high)	2690	-13.62	-13	0.62
2	20(high)	2690	-13.93	-13	0.93
1	20(low 2511 MHz))	2496	-13.97	-13	0.97
2	20(low 2511 MHz))	2496	-13.03	-13	0.03
1	20(high 2675 MHz)	2690	-14.82	-13	1.82
2	20(high 2675 MHz)	2690	-14.59	-13	1.59

8.2.1 Test data

Table 8.2-2: *Band edge emission measurements at 2496 and 2690 MHz 64 QAM modulation results*

Antenna port	Channel BW, MHz	Frequency of max emission, MHz	Emission level, dBm/MHz	Limit, dBm/MHz	Margin, dB
1	10(low)	2496	-13.41	-13	0.41
2	10(low)	2496	-14.54	-13	1.54
1	10(high)	2690	-13.22	-13	0.22
2	10(high)	2690	-13.62	-13	0.62
1	10(low 2506 MHz))	2496	-14.04	-13	1.04
2	10(low 2506 MHz))	2496	-13.13	-13	0.13
1	10(high 2680 MHz)	2690	-14.65	-13	1.65
2	10(high 2680 MHz)	2690	-14.68	-13	1.68
1	20(low)	2496	-13.42	-13	0.42
2	20(low)	2496	-13.43	-13	0.43
1	20(high)	2690	-13.11	-13	0.11
2	20(high)	2690	-14.06	-13	1.06
1	20(low 2511 MHz))	2496	-13.10	-13	0.10
2	20(low 2511 MHz))	2496	-13.50	-13	0.50
1	20(high 2675 MHz)	2690	-14.34	-13	1.34
2	20(high 2675 MHz)	2690	-14.65	-13	1.65

Table 8.2-3: *Conducted spurious emission measurement results QPSK modulation results*

Antenna port	Channel BW, MHz	Frequency of max emission, MHz	Emission level, dBm/MHz	Limit, dBm/MHz	Margin, dB
1	10(low)	5003	-38.26	-13.00	25.26
1	10(mid)	5185	-33.72	-13.00	20.72
2	10(low 2506 MHz)	5009	-36.44	-13.00	23.44
1	20(low)	25797	-30.23	-13.00	17.23

.

. Table 8.2-4: *Conducted spurious emission measurement results 64 QAM modulation results*

Antenna port	Channel BW, MHz	Frequency of max emission, MHz	Emission level, dBm/MHz	Limit, dBm/MHz	Margin, dB
1	10(low)	5000	-38.79	-13.00	25.79
1	10(low 2506 MHz)	5009	-35.69	-13.00	22.69
1	10(high 2680 MHz))	5359	-43.43	-13.00	30.43
2	20(high)	25784	-29.78	-13.00	16.78

8.2.2 Test data

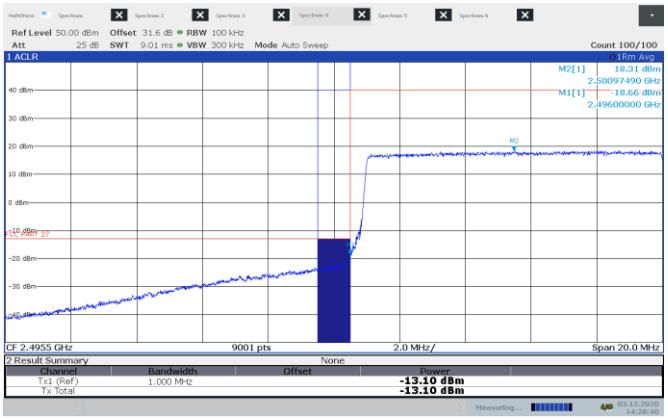


Figure 8.2-1: *Band edge measurement 10 MHz low channel ,sample plot*

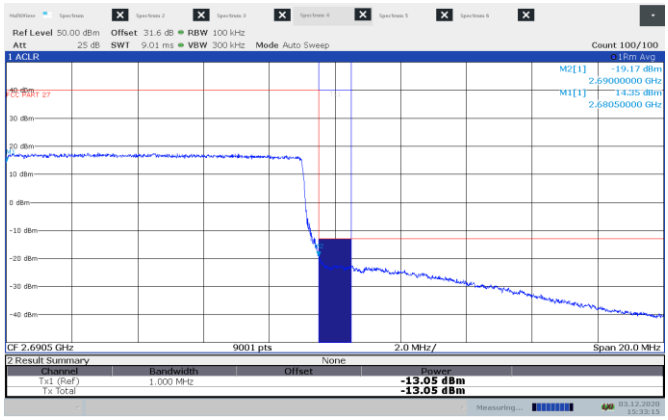


Figure 8.2-2: *Band edge measurement 10 MHz high channel ,sample plot*

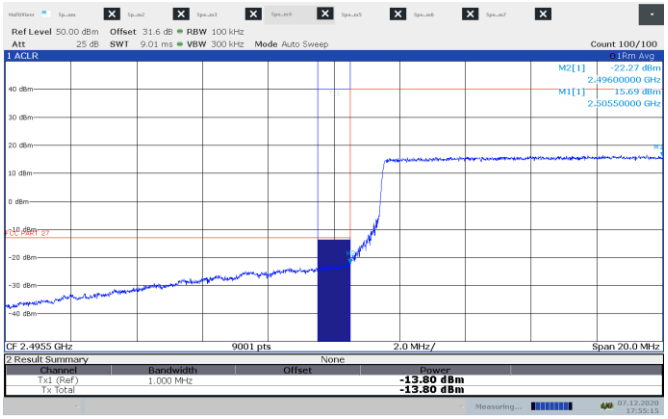


Figure 8.2-3 *Band edge measurement 20 MHz low channel ,sample plot*

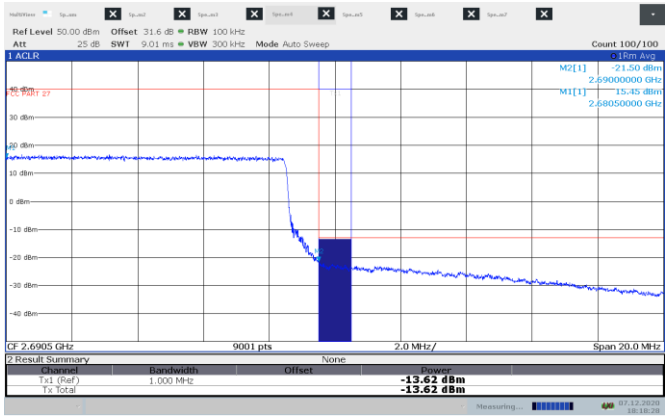


Figure 8.2-4: *Band edge measurement 20 MHz high channel ,sample plot*

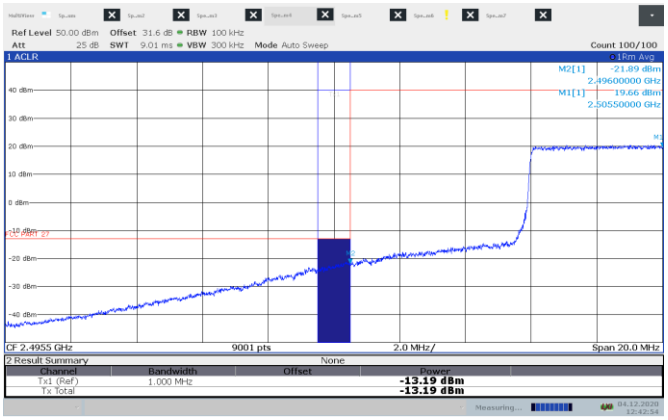


Figure 8.2-5 *Band edge measurement 10 MHz low channel 2506 MHz, sample plot*

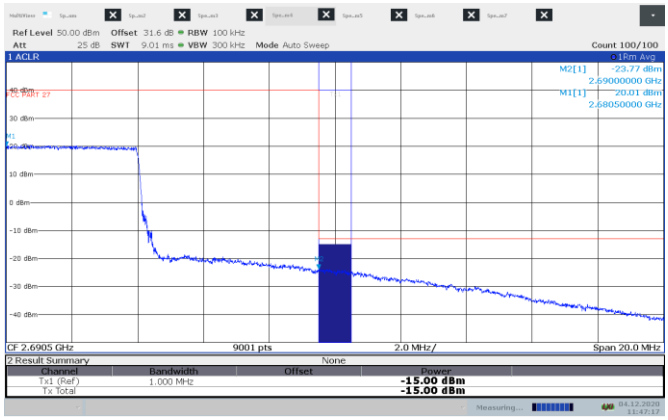


Figure 8.2-6: *Band edge measurement 10 MHz high channel 2680 MHz, sample plot*

8.2.3 Test data

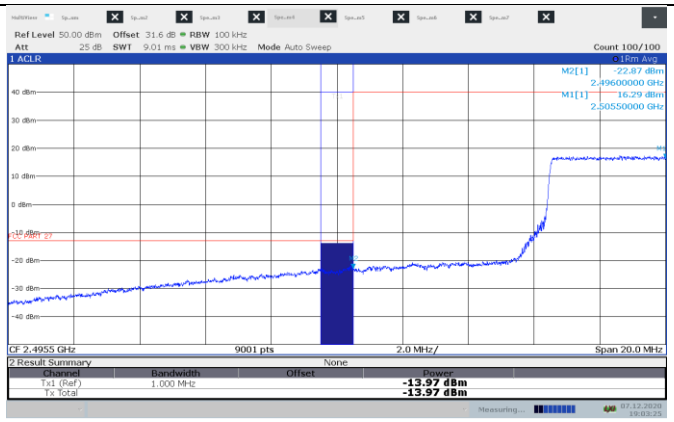


Figure 8.2-7: *Band edge measurement 20 MHz low channel 2511 MHz ,sample plot*

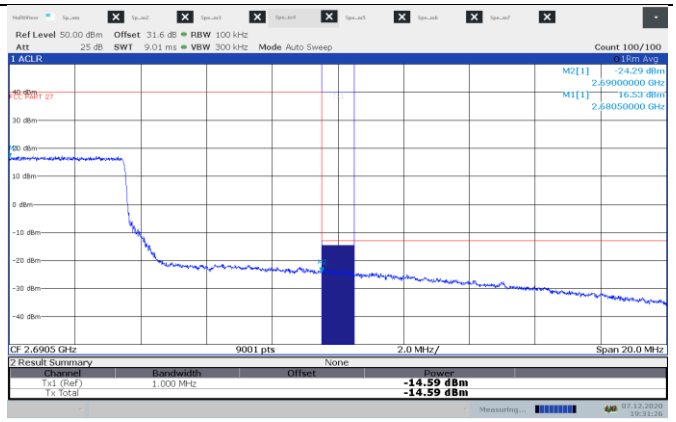


Figure 8.2-8: *Band edge measurement 20 MHz high channel 2675 MHz ,sample plot*

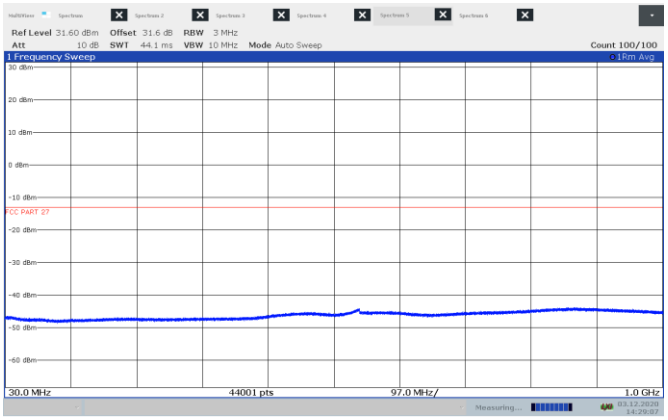


Figure 8.2-9 *Conducted spurious emissions 30 MHz -1 GHz at 10 MHz low channel ,sample plot*

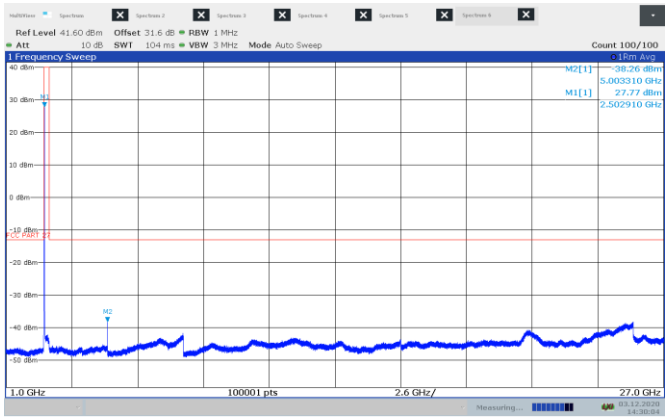


Figure 8.2-10: *Conducted spurious emissions 1 – 27 GHz at 10 MHz low channel ,sample plot*

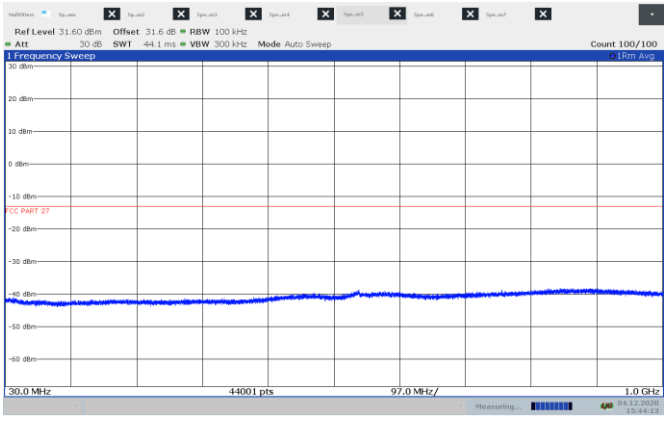


Figure 8.2-11 *Conducted spurious emissions 30 MHz -1 GHz at 10 MHz mid channel ,sample plot*

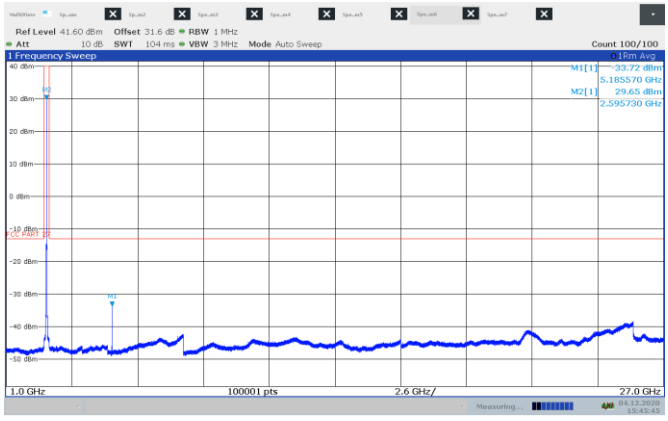


Figure 8.2-12: *Conducted spurious emissions 30 MHz -1 GHz at 10 MHz mid channel ,sample plot*

8.2.4 Test data

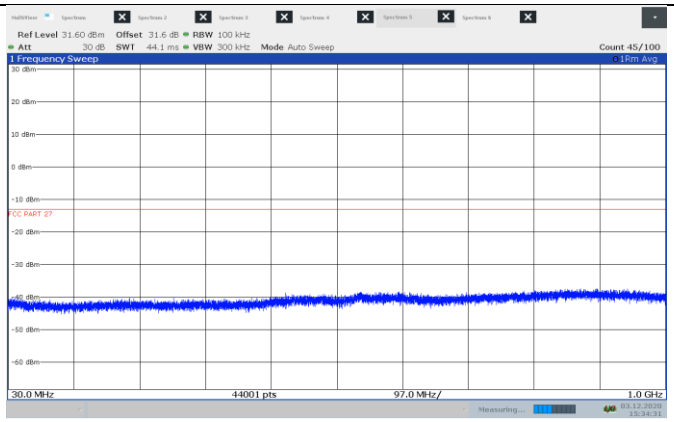


Figure 8.2-13: *Conducted spurious emissions 30 MHz -1 GHz at 10 MHz high channel ,sample plot*

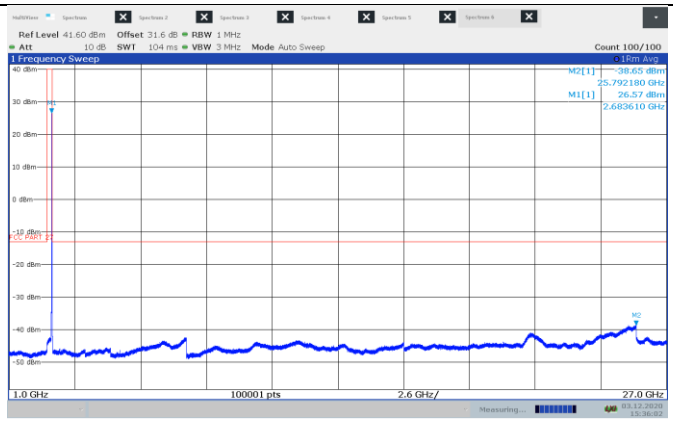


Figure 8.2-14: *Conducted spurious emissions 1 – 27 GHz at 10 MHz high channel ,sample plot*

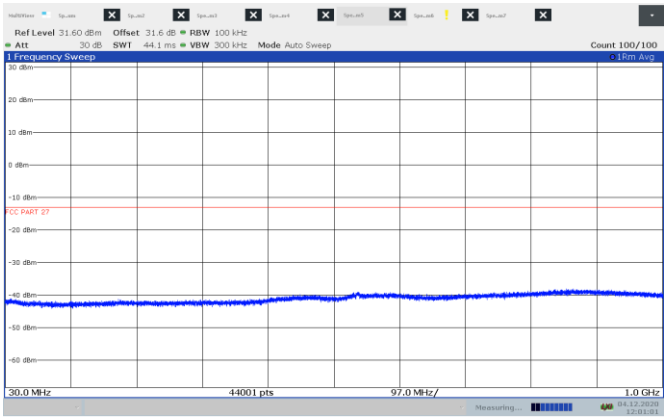


Figure 8.2-15 *Conducted spurious emissions 30 MHz -1 GHz at 10 MHz low 2506 MHz channel ,sample plot*

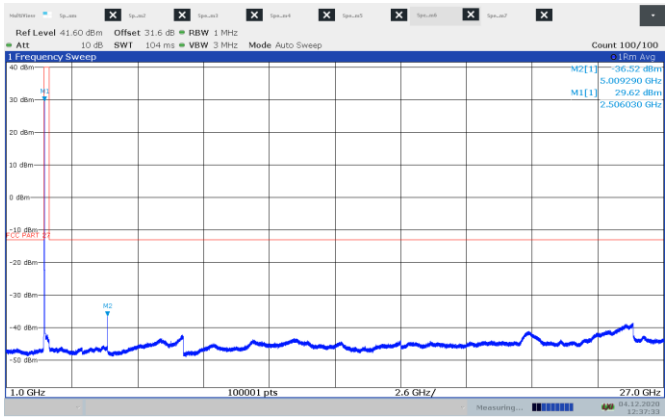


Figure 8.2-16: *Conducted spurious emissions 1 – 27 GHz at 10 MHz low 2506 MHz channel ,sample plot*

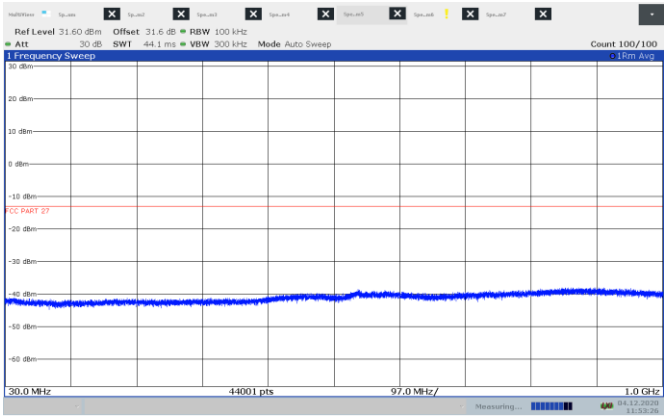


Figure 8.2-17 *Conducted spurious emissions 30 MHz -1 GHz at 10 MHz high 2680 MHz channel ,sample plot*

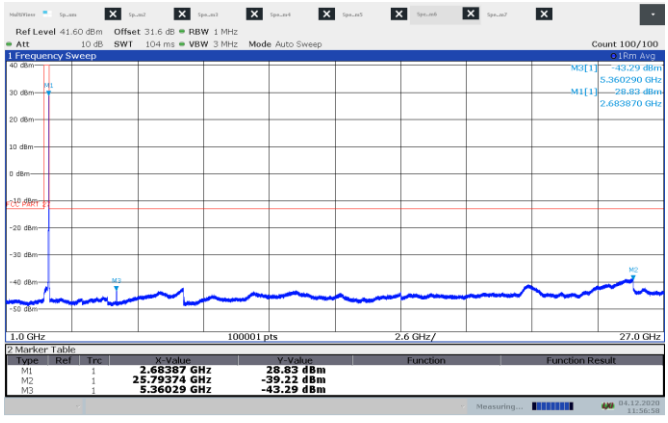


Figure 8.2-18: *Conducted spurious emissions 1 – 27 GHz at 10 MHz high 2680 MHz channel ,sample plot*

8.2.5 Test data

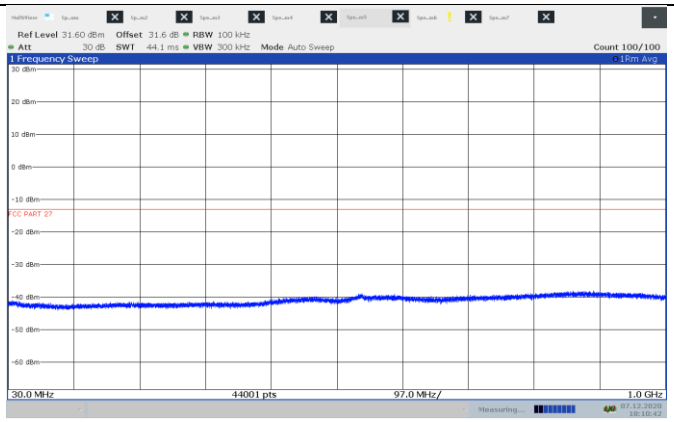


Figure 8.2-19: *Conducted spurious emissions 30 MHz -1 GHz at 20 MHz low channel ,sample plot*

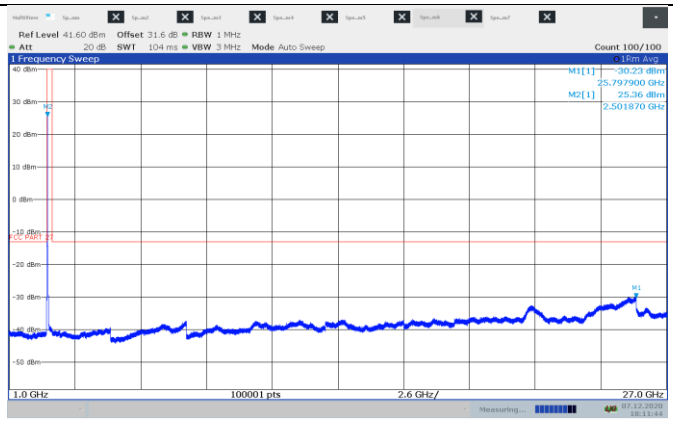


Figure 8.2-20: *Conducted spurious emissions 1 – 27 GHz at 20 MHz low channel ,sample plot*

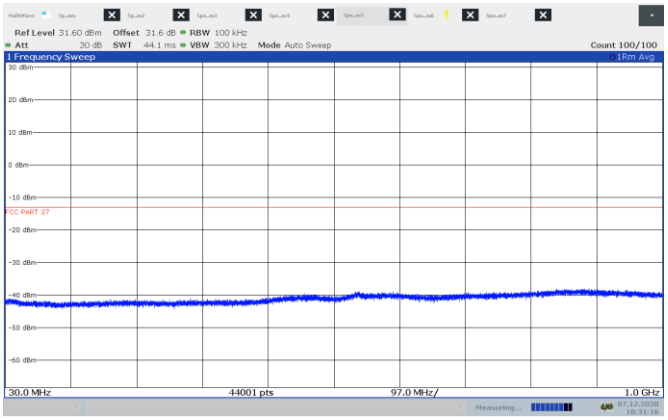


Figure 8.2-21 *Conducted spurious emissions 30 MHz -1 GHz at 20 MHz mid channel ,sample plot*

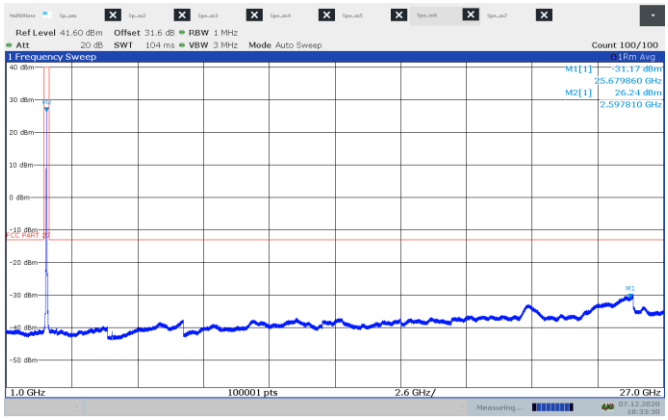


Figure 8.2-22: *Conducted spurious emissions 1 – 27 GHz at 20 MHz mid channel ,sample plot*

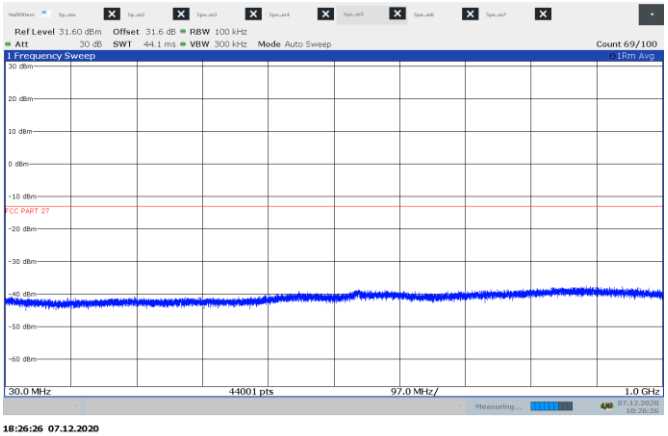


Figure 8.2-23 *Conducted spurious emissions 30 MHz -1 GHz at 20 MHz high channel ,sample plot*

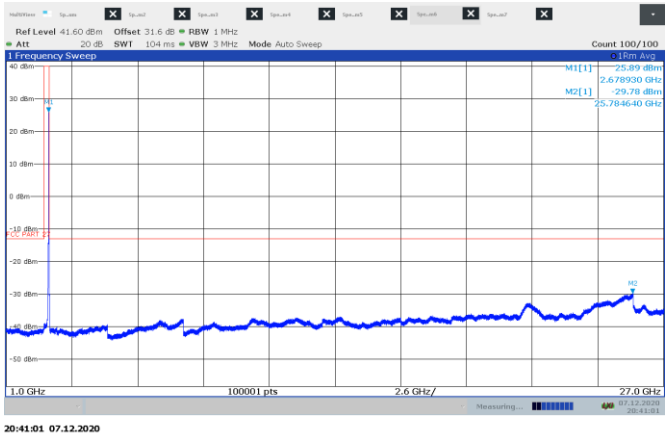


Figure 8.2-24: *Conducted spurious emissions 1 -27 GHz at 20 MHz high channel ,sample plot*

8.2.6 Test data

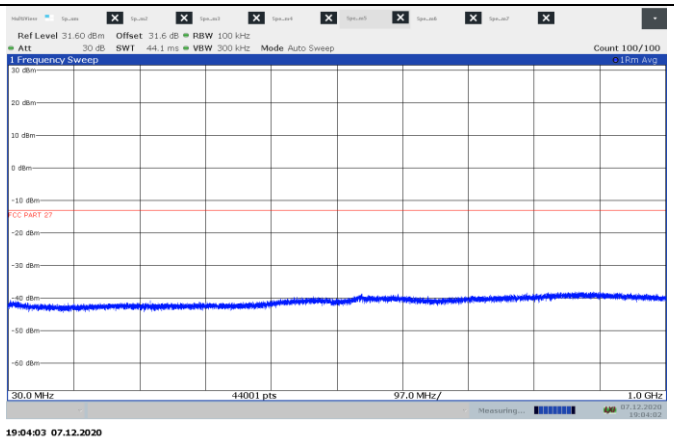


Figure 8.2-25: *Conducted spurious emissions 30 MHz -1 GHz at 20 MHz low 2511 MHz channel ,sample plot*

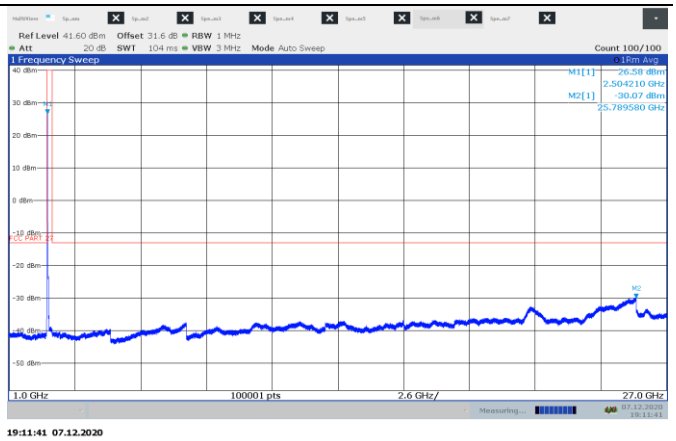


Figure 8.2-26: *Conducted spurious emissions 1 – 27 GHz at 20 MHz low 2511 MHz channel ,sample plot*

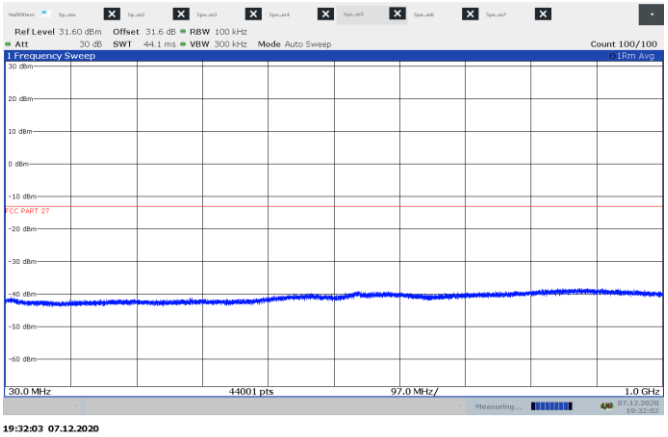


Figure 8.2-27 *Conducted spurious emissions 30 MHz -1 GHz at 20 MHz high 2675 MHz channel ,sample plot*

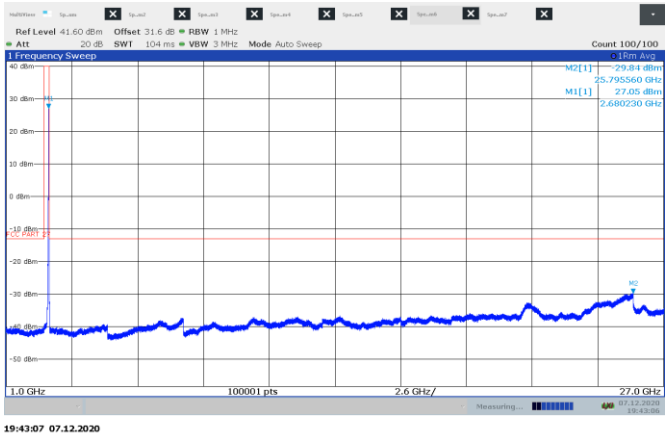


Figure 8.2-28: *Conducted spurious emissions 1 – 27 GHz at 20 MHz high 2675 MHz channel ,sample plot*

8.2.7 Test data

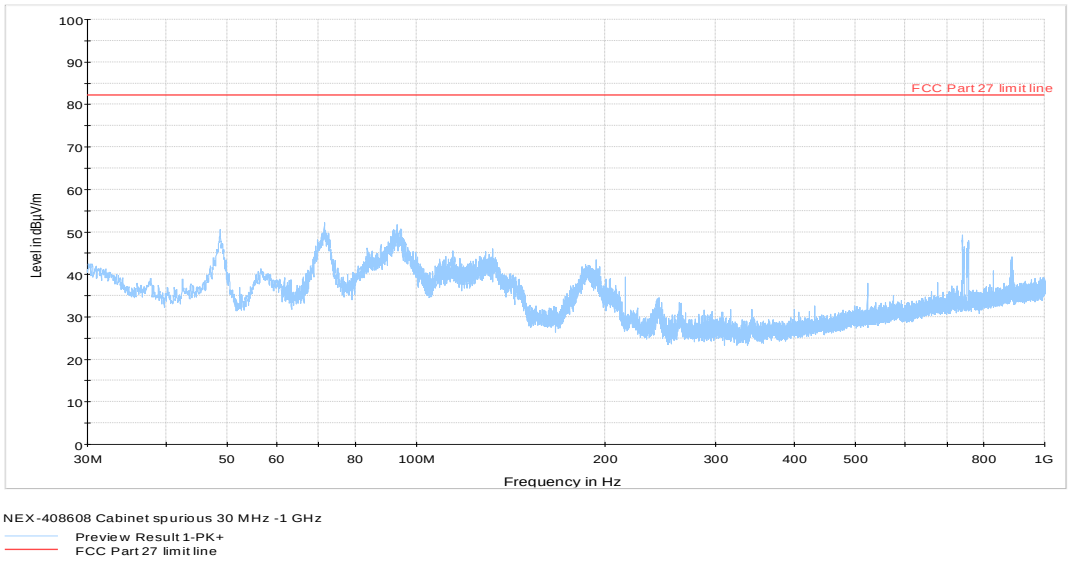


Figure 8.2-29: *Cabinet spurious emissions 30 MHz – 1000 MHz*

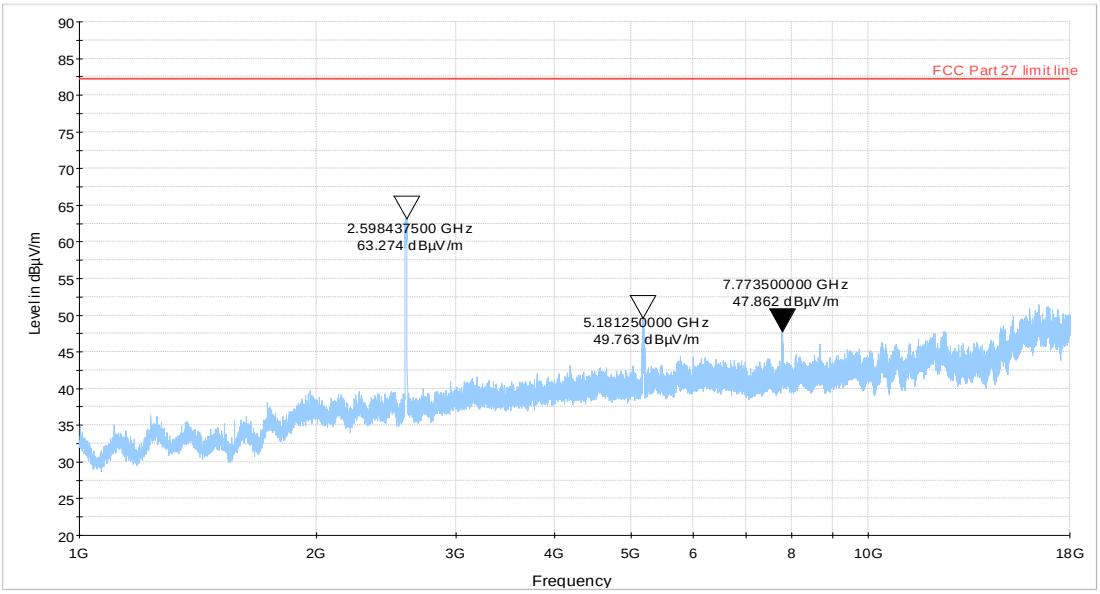


Figure 8.2-30: *Cabinet spurious emissions 1 – 18 GHz*

8.2.8 Test data

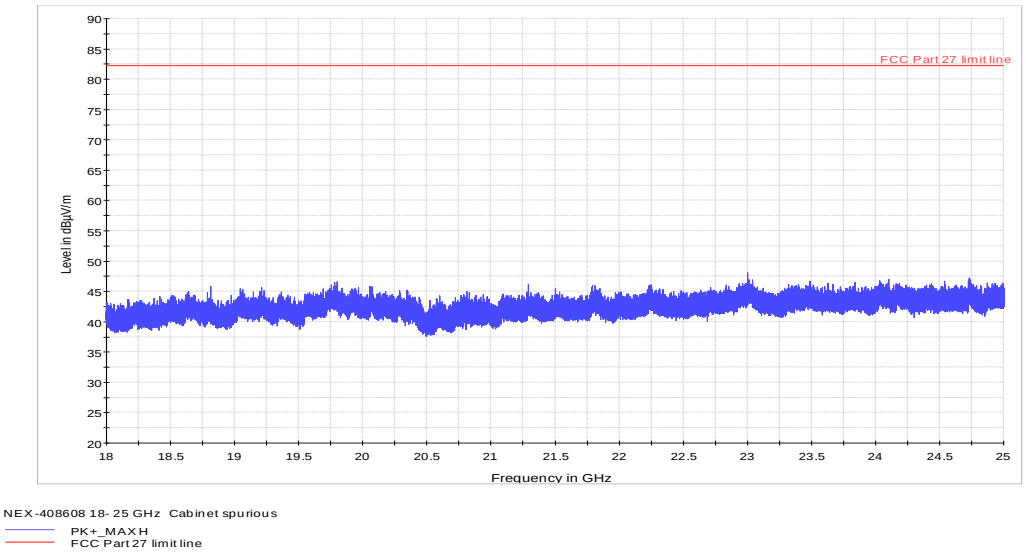


Figure 8.2-31: *Cabinet spurious emissions 18-25 GHz*

8.3 FCC 27.54 Frequency stability

8.3.1 Definitions and limits

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

8.3.2 Test summary

Test date	December 7, 2020
Test engineer	Fahar A Sukkoor
Verdict	Pass

8.3.3 Observations, settings, and special notes

Resolution bandwidth	≥ 1 % of emission bandwidth
Video bandwidth	≥ 3 × RBW
Frequency span	Wider than emission bandwidth
Detector mode	Peak

8.3.4 Test data

Table 8.3-1: *Frequency tolerance measurements*

Test conditions	Frequency, Hz	Offset, Hz
+60 °C, Nominal	2593002659	-661
+50 °C, Nominal	2593002929	-391
+40 °C, Nominal	2593003408	88
+30 °C, Nominal	2593003038	-282
+20 °C, +15 %	2593003093	-227
+20 °C, Nominal	2593003320	reference
+20 °C, -15 %	2593002760	-560
+10 °C, Nominal	2593003190	-130
0 °C, Nominal	2593003096	-224
-10 °C, Nominal	2593003049	-271
-20 °C, Nominal	2593003388	68
-30 °C, Nominal	2593003342	22
-40 °C, Nominal	2593003007	-313

Note: Measurement results show tolerance range is well below to stay with operating band.

8.4 FCC 2.1049 Emission bandwidth

8.4.1 Definitions and limits

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

8.4.2 Test summary

Test date	December 3, 2020
Test engineer	Fahar A Sukkoor
Verdict	Pass

8.4.3 Observations, settings and special notes

Resolution bandwidth:	100 – 200 kHz
Video bandwidth:	300 – 500 kHz
Detector mode:	Peak
Trace mode:	Max Hold

8.4.4 Test data

Table 8.4-1: *26 dB BW results*

Bandwidth, MHz	Frequency, MHz	Antenna port	26 dB BW, MHz
10(low)	2501	1	9.77
		2	9.64
10(mid)	2593	1	9.74
		2	9.76
10(high)	2685	1	9.76
		2	9.75
10(low)	2506	1	9.70
		2	9.76
10(high)	2680	1	9.80
		2	9.75
20(low)	2506	1	19.32
		2	19.28
20(mid)	2593	1	19.38
		2	19.57
20(high)	2680	1	19.43
		2	19.38
20(low)	2511	1	19.28
		2	19.38
20(high)	2675	1	19.42
		2	19.53

8.4.5 Test data

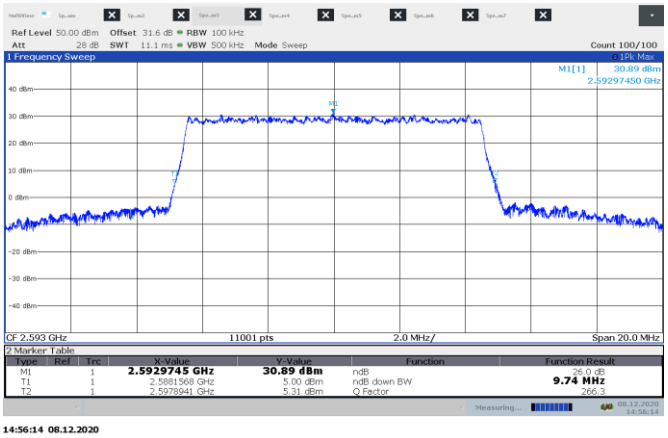


Figure 8.4-1: *26 dB sample plot for 10 MHz channel*

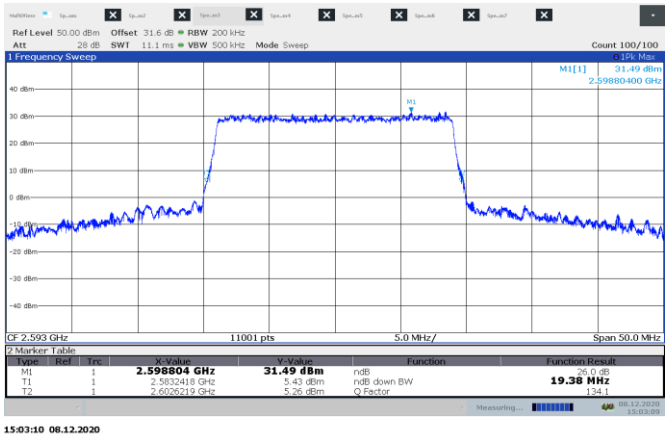
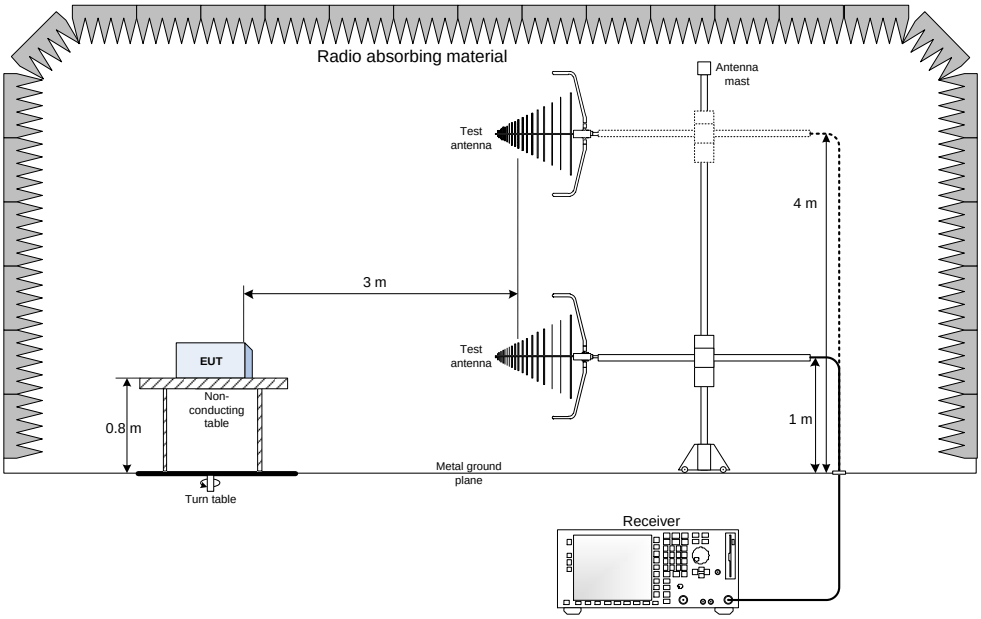


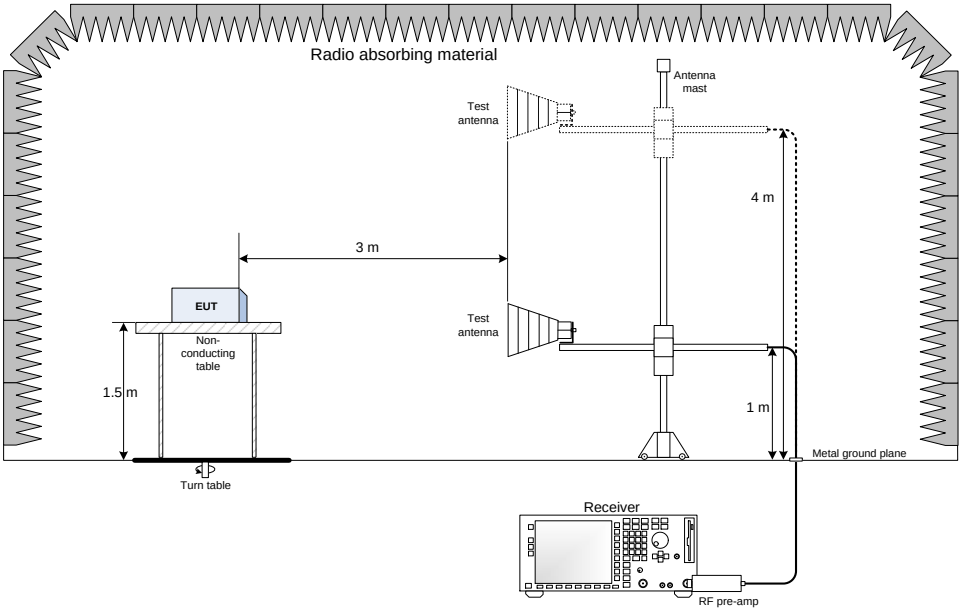
Figure 8.4-2: *26 dB sample plot for 20 MHz channel*

Section 9. Block diagrams of test set-ups

9.1 Radiated emissions set-up for frequencies below 1 GHz



9.2 Radiated emissions set-up for frequencies above 1 GHz



9.3 Conducted emissions set-up