

Report Reference ID:	400107-4TRFWL
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Test specification:	Title 47 – Telecommunication Chapter I – Federal Communications Commission Subchapter B – Common carrier services Part 27 – Miscellaneous wireless communications services
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Applicant:	TEKO Telecom Srl. Via Meucci, 24/a I-40024 Castel S. Pietro Terme (BO) (Italy)
Apparatus:	Very High Power Module Amplifier
Model:	MVHPA2001LTE2G3-D2
FCC ID:	XM2-VHPA23N

Testing laboratory:	Nemko Italy Spa Via del Carroccio, 4 20853 Biassono (MB) – Italy Telephone: +39 039 2201201 Facsimile: +39 039 2201221
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	Name and title	Date
Tested by: (name, function and signature)	 P. Barbieri (project handler)	2020-07-22
Reviewed by: (name, function and signature)	 R. Giampaglia (verifier)	2020-07-22

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Section 1: Report summary

1.1 Test specification

Specifications	Part 27 – Miscellaneous wireless communications services
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1.2 Statement of compliance

Compliance	In the configuration tested the EUT was found compliant Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Test method: ANSI C63.26-2015, 662911 D01 Multiple Transmitter Output v02r01, 662911 D02 MIMO with Cross-Polarized Antennas v01
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1.3 Exclusions

Exclusions	None
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1.4 Registration number

Test site FCC ID number	682159
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1.5 Test report revision history

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

1.6 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.

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Section 2: Summary of test results

2.1 FCC Part 27, test results

Part	Methods	Test description	Verdict
	§ 935210 D05v01r04 (3.2)	AGC threshold	Pass
	§ 935210 D05v01r04 (3.3)	Out of band rejection	Pass
§27.53(a)(5)	§ 935210 D05v01r04 (3.4)	Occupied bandwidth	Pass
§27.50(a)	§ 935210 D05v01r04 (3.5)	Peak output power at RF antenna connector	Pass
§27.53(a)	§ 935210 D05v01r04 (3.6)	Spurious emissions at RF antenna connector	Pass
§27.53(a)	§ 935210 D05v01r04 (3.8)	Radiated spurious emissions	Pass
§27.54	§ 935210 D05v01r04 (3.7)	Frequency stability	N/A a)

Notes:

- NOT APPLICABLE: Modulation/frequency conversion circuitry not in use. No frequency change in EUT (input and output have same frequency)



Section 3: Equipment under test (EUT) and application details

3.1 Applicant details

Applicant complete business name	Name:	Teko Telecom Srl
	Federal Registration Number (FRN):	0018963462
	Grantee code	XM2
Mailing address	Address: City: Province/State: Post code: Country:	Via Meucci, 24/a Castel S. Pietro Terme Bologna 40024 Italy

3.2 Modular equipment

a) Single modular approval	Single modular approval Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
b) Limited single modular approval	Limited single modular approval Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	

3.3 Product details

FCC ID	Grantee code:	XM2
	Product code:	-VHPA23N
Equipment class	B2I	
Description of product as it is marketed	Booster	
	Model name/number:	MVHPA2001LTE2G3-D2
	Serial number:	1021043002

3.4 Application purpose

Type of application	<input checked="" type="checkbox"/>	Original certification
	<input type="checkbox"/>	Change in identification of presently authorized equipment
	Original FCC ID:	Grant date:
	<input type="checkbox"/>	Class II permissive change or modification of presently authorized equipment



Section 3: Equipment under test

3.5 Composite/related equipment

a) Composite equipment	The EUT is a composite device subject to an additional equipment authorization Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
b) Related equipment	The EUT is part of a system that operates with, or is marketed with, another device that requires an equipment authorization Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
c) Related FCC ID	If either of the above is "yes": <input type="checkbox"/> has been granted under the FCC ID(s) listed below: <input type="checkbox"/> is in the process of being filled under the FCC ID(s) listed below: <input type="checkbox"/> is pending with the FCC ID(s) listed below: <input type="checkbox"/> has a mix of pending and granted statuses under the FCC ID(s) listed below: i FCC ID: ii FCC ID:

3.6 Sample information

Receipt date:	2020-05-18
Nemko sample ID number:	400107

3.7 EUT technical specifications

Operating band:	Down Link: 2350–2360 MHz, Up Link: 2305-2315 MHz
Operating frequency:	Wideband
Modulation type:	LTE (QAM and QPSK)
Occupied bandwidth:	LTE: 5 MHz, 10 MHz
Channel spacing:	standard
Emission designator:	LTE: D7W
RF Output	Down Link: 43dBm (20W) Up Link: N.A. (The EUT does not transmit over the air in the up-link direction)
Gain	Down Link: 48dB Up Link: N.A. (The EUT does not transmit over the air in the up-link direction)
Antenna type:	External Antenna is not provided, equipment that has an external 50 Ω RF connector
Power source:	28-30 Vdc



Section 3: Equipment under test

3.8 Accessories and support equipment

The following information identifies accessories used to exercise the EUT during testing:

Item # 1

Type of equipment:	Power Supply
Brand name:	EA-PS
Model name or number:	8080-60
Serial number:	1421120002
Nemko sample number:	-----
Connection port:	To supply amplifier
Cable length and type:	-----

Item # 2

Type of equipment:	Power supply
Brand name:	GWINSTEK
Model name or number:	GPS4303
Serial number:	GER846883
Nemko sample number:	-----
Connection port:	To supply cooling fan of heatsink
Cable length and type:	-----

Item # 3

Type of equipment:	Management Module
Brand name:	Teko Telecom
Model name or number:	MSPVRUV0001
Serial number:	100739447
Nemko sample number:	-----
Connection port:	LAN Port, To manage amplifier module
Cable length and type:	-----

Item # 4

Type of equipment:	
Brand name:	
Model name or number:	
Serial number:	
Nemko sample number:	
Connection port:	
Cable length and type:	

3.9 Operation of the EUT during testing

Details:	In down-link direction, normal working at max gain with max RF power output.
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3.10 EUT setup diagram

In this system, Very High Power Amplifier is the EUT and it is intended for mounting in Remote Unit and Digital Service Front-End (optical system with Master Unit that includes only management module and optical module, to convert RF signal in optical signal in down link direction and viceversa optical signal in RF signal in up link direction). As described in "Operational description", master unit is connected directly to base station, so the system doesn't use another equipment (under another FCC ID) to exercise the EUT. Signal generator is linked directly to the RF input connector.

Test setup for output power, occupied bandwidth, spurious emissions:



Procedure

Connect the signal modulated generator to the input of the EUT, so that the EUT works at the max gain. Raise the input level to the EUT until reach the maximum output power. Connect the spectrum analyzer to the RF output connector of the EUT.



Section 4: Engineering considerations

4.1 Modifications incorporated in the EUT

Modifications	Modifications performed to the EUT during this assessment None <input checked="" type="checkbox"/> Yes <input type="checkbox"/> , performed by Client <input type="checkbox"/> or Nemko <input type="checkbox"/> Details:
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4.2 Deviations from laboratory tests procedures

Deviations	Deviations from laboratory test procedures None <input checked="" type="checkbox"/> Yes <input type="checkbox"/> - details are listed below:
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4.3 Technical judgment

Judgment	None
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Section 5: Test conditions

5.1 Deviations from laboratory tests procedures

No deviations were made from laboratory test procedures.

5.2 Test conditions, power source and ambient temperatures

Normal temperature, humidity and air pressure test 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.
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.

5.3 Measurement uncertainty

The measurement uncertainty was calculated for each test and quantity listed in this test report, according to CISPR 16-4-2 and other specific test standard and is documented in Nemko Spa working manual WML1002.

The assessment of conformity for each test performed on the equipment is performed not taking into account the measurement uncertainty. The two following possible verdicts are stated in the report:

P (Pass) - The measured values of the equipment respect the specification limit at the points tested. The specific risk of false accept is up to 50% when the measured result is close to the limit.

F (Fail) - One or more measured values of the equipment do not respect the specification limit at the points tested. The specific risk of false reject is up to 50% when the measured result is close to the limit.

Hereafter Nemko's measurement uncertainties are reported:

Section 5: Test conditions, continued

EUT	Type	Test	Range	Measurement Uncertainty	Notes
Transmitter	Conducted	Frequency error	0.001 MHz ÷ 40 GHz	0.08 ppm	(1)
		Carrier power	0.009 MHz ÷ 30 MHz	1.1 dB	(1)
		RF Output Power	30 MHz ÷ 18 GHz	1.5 dB	(1)
			18 MHz ÷ 40 GHz	3.0 dB	(1)
			40 MHz ÷ 140 GHz	5.0 dB	(1)
		Adjacent channel power	1 MHz ÷ 18 GHz	1.4 dB	(1)
		Conducted spurious emissions	0.009 MHz ÷ 18 GHz	3.0 dB	(1)
			18 GHz ÷ 40 GHz	4.2 dB	(1)
			40 GHz ÷ 220 GHz	6.0 dB	(1)
		Intermodulation attenuation	1 MHz ÷ 18 GHz	2.2 dB	(1)
		Attack time – frequency behaviour	1 MHz ÷ 18 GHz	2.0 ms	(1)
		Attack time – power behaviour	1 MHz ÷ 18 GHz	2.5 ms	(1)
		Release time – frequency behaviour	1 MHz ÷ 18 GHz	2.0 ms	(1)
		Release time – power behaviour	1 MHz ÷ 18 GHz	2.5 ms	(1)
		Transient behaviour of the transmitter– Transient frequency behaviour	1 MHz ÷ 18 GHz	0.2 kHz	(1)
		Transient behaviour of the transmitter – Power level slope	1 MHz ÷ 18 GHz	9%	(1)
		Frequency deviation - Maximum permissible frequency deviation	0.001 MHz ÷ 18 GHz	1.3%	(1)
		Frequency deviation - Response of the transmitter to modulation frequencies above 3 kHz	0.001 MHz ÷ 18 GHz	0.5 dB	(1)
	Radiated	Dwell time	-	3%	(1)
		Hopping Frequency Separation	0.01 MHz ÷ 18 GHz	1%	(1)
		Occupied Channel Bandwidth	0.01 MHz ÷ 18 GHz	2%	(1)
		Modulation Bandwidth	0.01 MHz ÷ 18 GHz	2%	(1)
		Radiated spurious emissions	0.009 MHz ÷ 26.5 GHz	6.0 dB	(1)
			26.5 GHz ÷ 66 GHz	8.0 dB	(1)
Receiver	Radiated		66 GHz ÷ 220 GHz	10 dB	(1)
			10 kHz ÷ 26.5 GHz	6.0 dB	(1)
		Effective radiated power transmitter	26.5 GHz ÷ 66 GHz	8.0 dB	(1)
			66 GHz ÷ 220 GHz	10 dB	(1)
		Radiated spurious emissions	0.009 MHz ÷ 26.5 GHz	6.0 dB	(1)
			26.5 GHz ÷ 66 GHz	8.0 dB	(1)
			66 GHz ÷ 220 GHz	10 dB	(1)
	Conducted	Sensitivity measurement	1 MHz ÷ 18 GHz	6.0 dB	(1)
		Conducted spurious emissions	0.009 MHz ÷ 18 GHz	3.0 dB	(1)
			18 GHz ÷ 40 GHz	4.2 dB	(1)
			40 GHz ÷ 220 GHz	6.0 dB	(1)

NOTES:

(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95 %



Section 5: Test conditions, continued

5.4 Test equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next cal.
Vector Signal Generator	Keysight	N5172B EXG	MY53051238	2021-05
Vector Signal Generator	Keysight	N5172B EXG	MY56200267	2022-12
Spectrum Analyzer	Agilent	N9030A PXA	MY53120882	2020-12
Trilog Antenna (25 ÷ 8000 MHz)	Schwarzbeck Mess-Elektronik	VULB9162	9162-025	2021-07
Antenna (1 ÷ 18 GHz)	Schwarzbeck Mess-Elektronik	STLP9148	STLP 9148-152	2021-09
Double ridge horn antenna (4 ÷ 40 GHz)	RFSpin	DRH40	061106A40	2023-04
Broadband Amplifier (18 ÷ 40 GHz)	Sage	STB-1834034030-KFKF-L1	18490-01	2021-03
Broadband preamplifier (1 ÷ 18 GHz)	Schwarzbeck	BBV 9718	9718-137	2021-07
EMI receiver (2 Hz ÷ 44 GHz)	R&S	ESW44	101620	2020-08
Controller	Maturo	FCU3.0	10041	NCR
Tilt antenna mast	Maturo	TAM4.0-E	10042	NCR
Turntable	Maturo	TT4.0-5T	2.527	NCR
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530	2021-09
Shielded room	Siemens	10m control room	1947	NCR

Note: N/A = Not Applicable, NCR = No Cal Required, COU = CAL On Use

Appendix A: Test results

Clause 935210 D05v01 (3.2) AGC threshold

Measure of EUT AGC Threshold

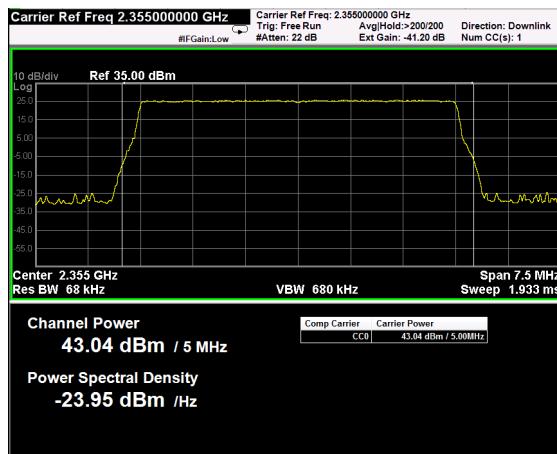
Test date: 2020-05-18 to 2020-06-05

Test results: Pass

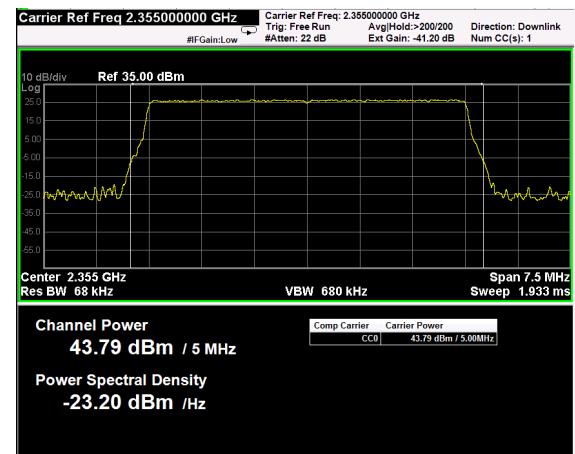
Special notes

- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel)

Test data



AWGN Signal, Nominal Input Signal



AWGN Signal, Nominal Input Signal +1dB

Clause 935210 D05v01 (3.3) Out of band rejection

Out of Band Rejection – Test for rejection of out of band signals.

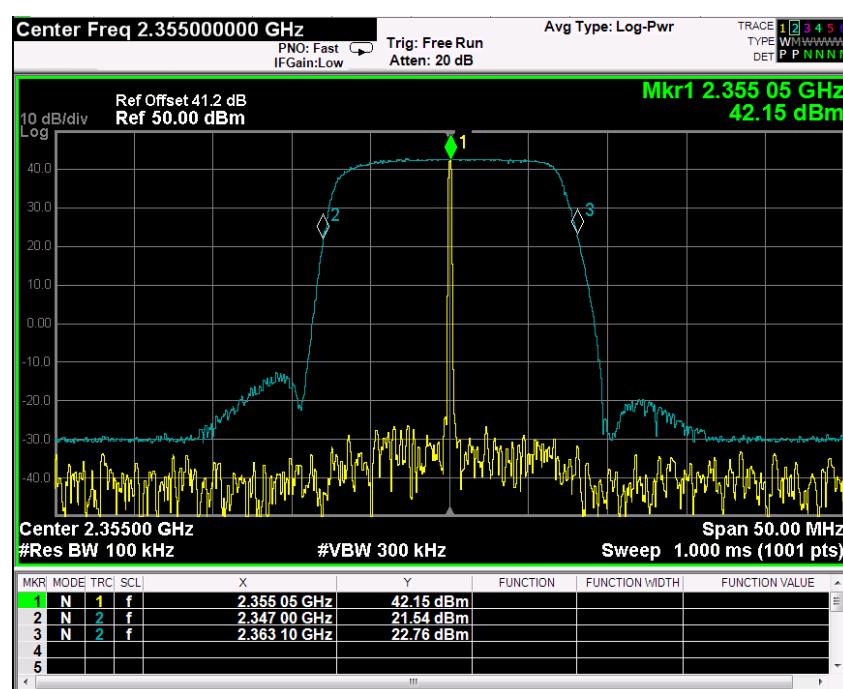
Test date: 2020-05-18 to 2020-06-05

Test results: Pass

Special notes

—

Test data



Clause 27.53(a)(5) Occupied bandwidth

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.

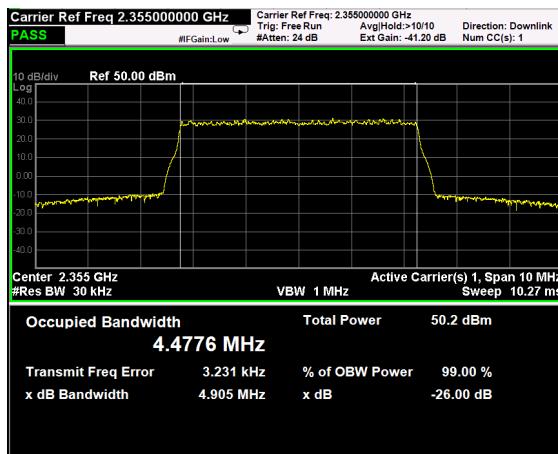
Test date: 2020-05-18 to 2020-06-05

Test results: Pass

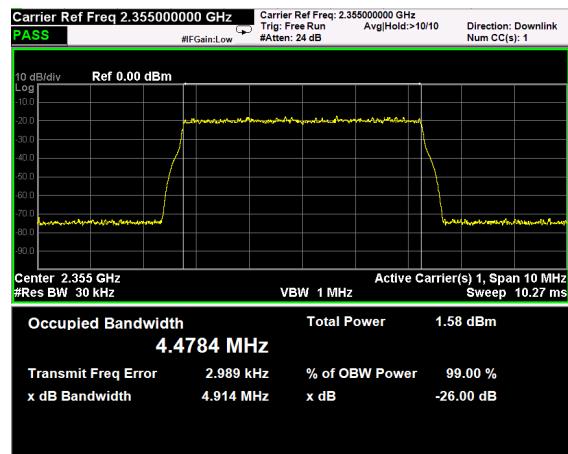
Special notes

- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel)

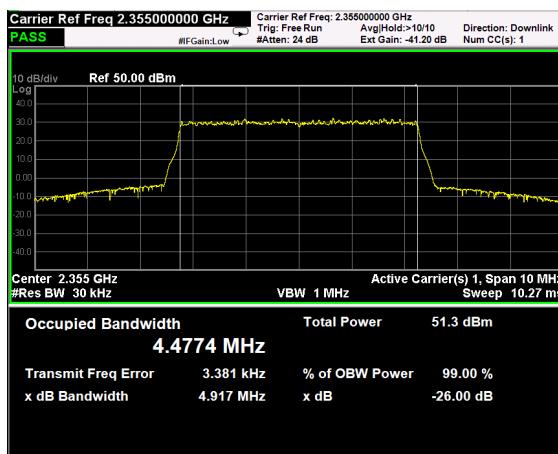
Test data



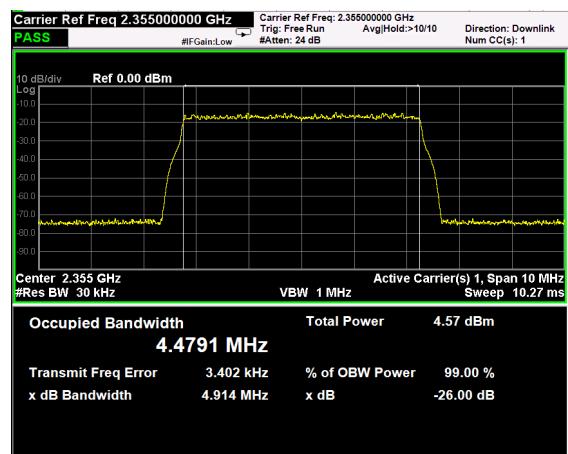
AWGN Signal, Nominal Input Signal,
Output



AWGN Signal, Nominal Input Signal,
Input



AWGN Signal, Nominal Input Signal +3dB,
Output



AWGN Signal, Nominal Input Signal +3dB,
Input

Clause 27.50(a) Peak output power at RF antenna connector

§ 27.50(a) The following power limits and related requirements apply to stations transmitting in the 2305-2320 MHz band or the 2345-2360 MHz band:

(1) Base and fixed stations.

(i) For base and fixed stations transmitting in the 2305-2315 MHz band or the 2350-2360 MHz band:

(A) The average equivalent isotropically radiated power (EIRP) must not exceed 2,000 watts within any 5 megahertz of authorized bandwidth and must not exceed 400 watts within any 1 megahertz of authorized bandwidth.

(B) The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB. The PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities to determine that PAPR will not exceed 13 dB for more than 0.1 percent of the time or other Commission approved procedure. The measurement must be performed using a signal corresponding to the highest PAPR expected during periods of continuous transmission.

Test date: 2020-05-18 to 2020-06-05

Test results: Pass

Special notes

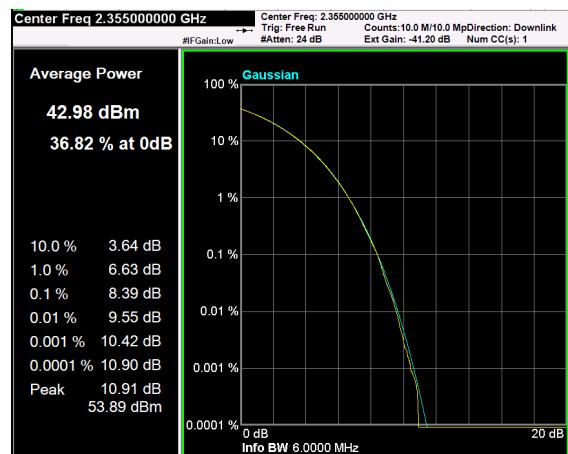
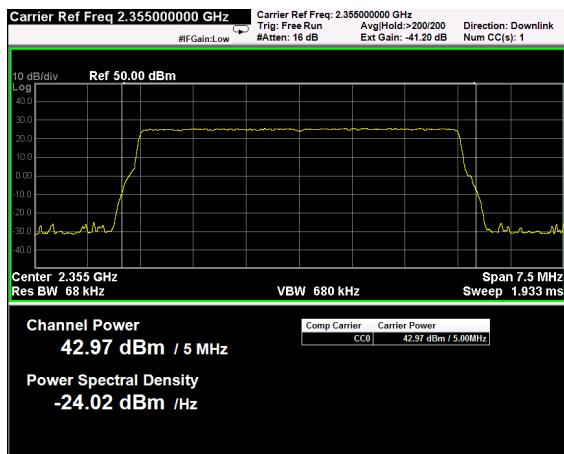
- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel)

Test data

AWGN signal, nominal input signal

Test data

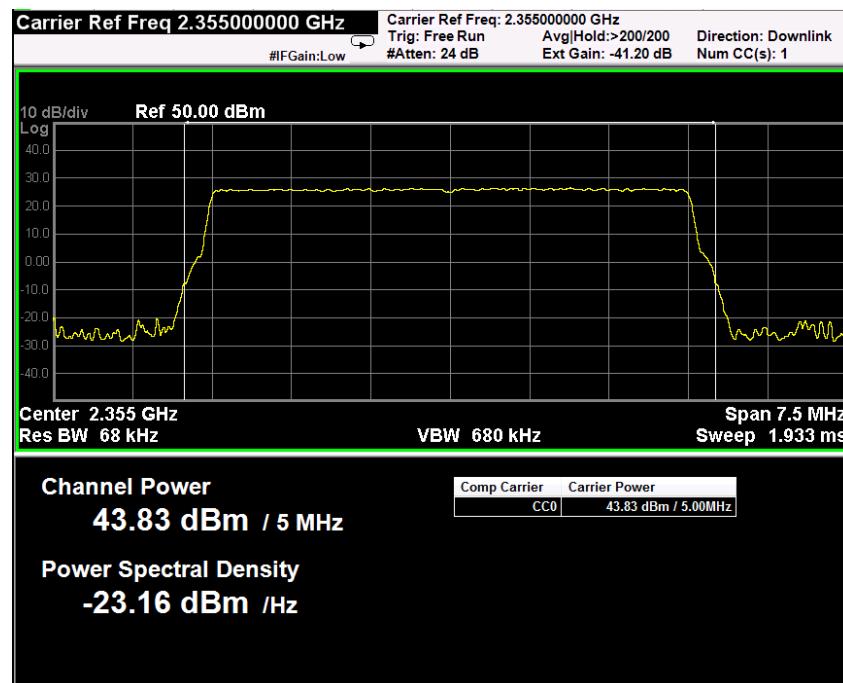
Direction	Modulation	Frequency (MHz)	RF output Power (dBm)	RF output channel Power (W)	RF output Power (W/MHz)	PAR (dB)
Down-link	AWGN (LTE, 5MHz)	2355.0	43.0	20.0	4.0	10.9



PAR measure is performed by the "CCDF" function installed on Spectrum analyzer that provides average power (the same measured with "Channel power" function), peak power and PAR.

AWGN signal, nominal input signal + 3dB

Test data					
Direction	Modulation	Frequency (MHz)	RF output Power (dBm)	RF output channel Power (W)	RF output Power (W/MHz)
Down-link	AWGN (LTE, 5MHz)	2355.0	43.8	24.2	4.8



Clause 27.53(a) Spurious emissions at RF antenna connector

(a) For operations in the 2305-2320 MHz band and the 2345-2360 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power P (with averaging performed only during periods of transmission) within the licensed band(s) of operation, in watts, by the following amounts:

(1) For base and fixed stations' operations in the 2305-2320 MHz band and the 2345-2360 MHz band:

- (i) By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, and not less than $75 + 10 \log (P)$ dB on all frequencies between 2320 and 2345 MHz;
- (ii) By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2300 and 2305 MHz, $70 + 10 \log (P)$ dB on all frequencies between 2287.5 and 2300 MHz, $72 + 10 \log (P)$ dB on all frequencies between 2285 and 2287.5 MHz, and $75 + 10 \log (P)$ dB below 2285 MHz;
- (iii) By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2360 and 2362.5 MHz, $55 + 10 \log (P)$ dB on all frequencies between 2362.5 and 2365 MHz, $70 + 10 \log (P)$ dB on all frequencies between 2365 and 2367.5 MHz, $72 + 10 \log (P)$ dB on all frequencies between 2367.5 and 2370 MHz, and $75 + 10 \log (P)$ dB above 2370 MHz.

(5) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the channel blocks at 2305, 2310, 2315, 2320, 2345, 2350, 2355, and 2360 MHz, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e., 1 MHz). 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.

(7) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power;

Test date: 2020-05-18 to 2020-06-05

Test results: Pass

Special notes

- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel)

**Test data****See Plots below****Spurious emissions measurement results:**

Frequency (MHz)	Spurious emission (dBm)	Limit (dBm)	Margin (dB)
First channel	Negligible	-45	
Mid channel	Negligible	-45	
Last channel	Negligible	-45	

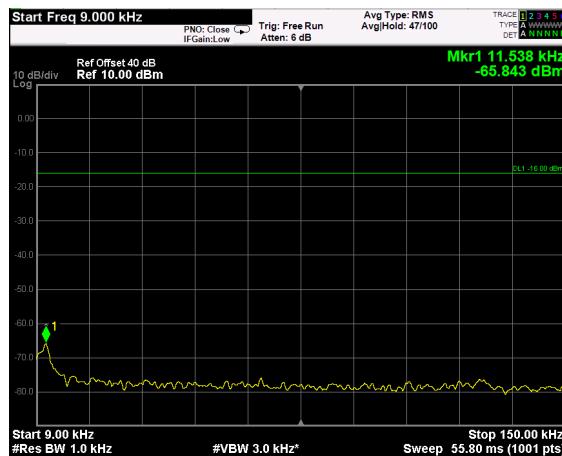
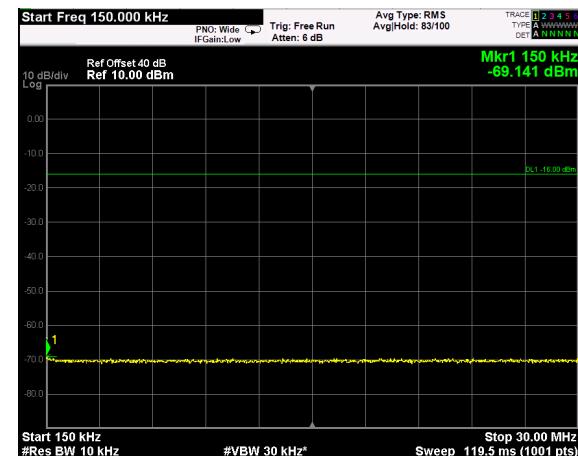
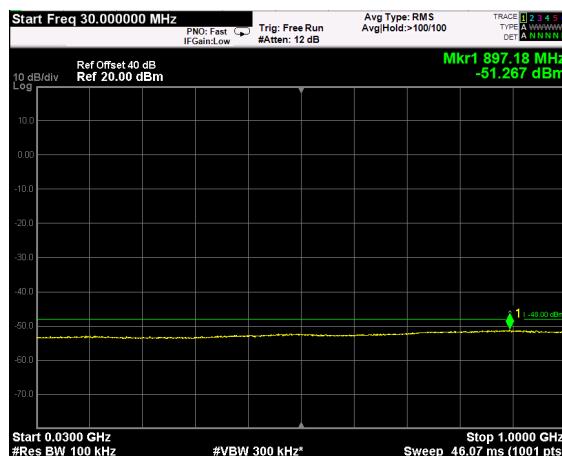
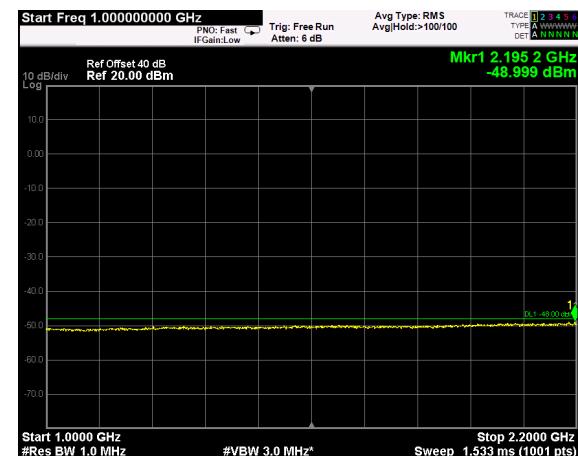
MIMO consideration

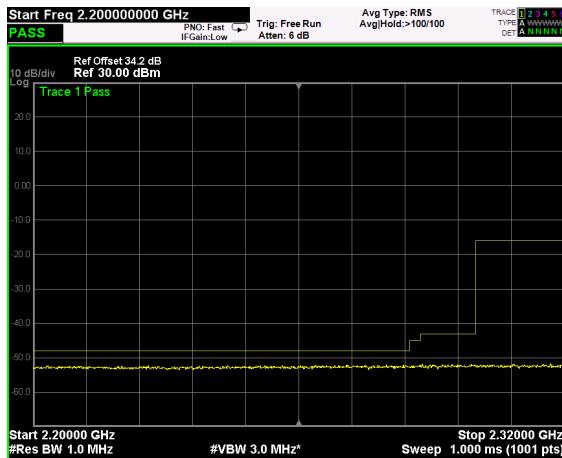
In the final Remote Unit, the EUT could be used in MIMO configuration according to KDB 662911-D01 v02r01 and 662911-D02 v01 with signals completely uncorrelated. So, the maximum emission is calculated as follows:

- MIMO Maximum Emission = Emission at each path + $10\log(N_{\text{ant}})$ dB =
= Emission at each path + $10\log(2)$ = Emission at each path + 3dB
- Spurious emission limit is -48dBm.

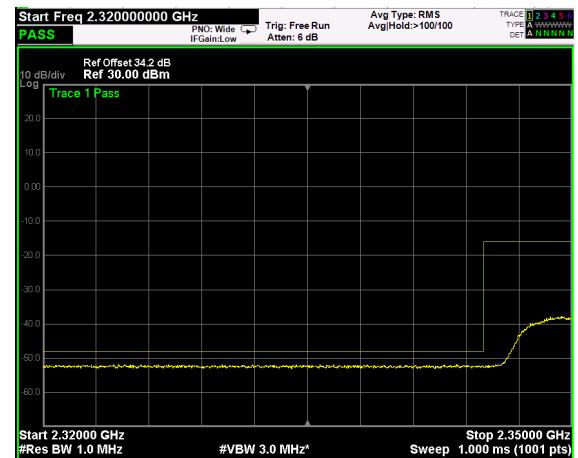
Test data: spurious emissions at antenna terminal
AWGN signal

(Plots are referred to modulated carrier at the Middle Channel)


AWGN SIGNAL, 9kHz-150kHz

AWGN SIGNAL, 150kHz-30MHz

AWGN SIGNAL, 30MHz-1GHz

AWGN SIGNAL, 1GHz-2.2GHz



AWGN SIGNAL, 2.2GHz-2.32GHz
with notched carrier



AWGN SIGNAL, 2.32GHz-2.35GHz
with notched carrier



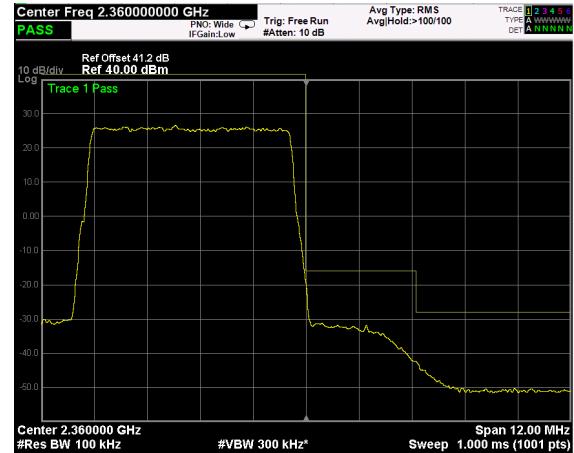
AWGN SIGNAL, 2.36GHz-2.40GHz
with notched carrier



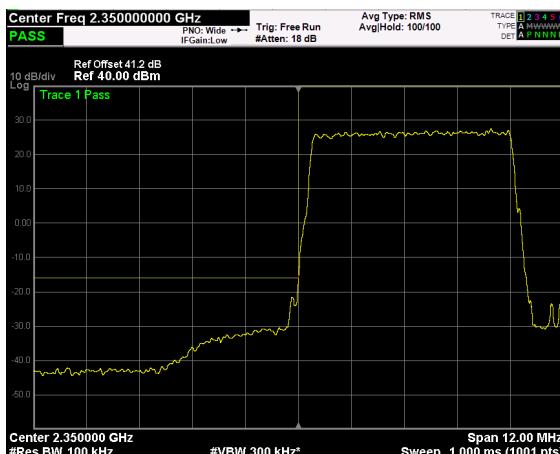
AWGN SIGNAL, 2.40GHz-23.60GHz
with notched carrier

Test data, continued: band edges Inter modulation


AWGN Signal, Nominal Input Signal,
 Low Band Edge, 1 Carrier



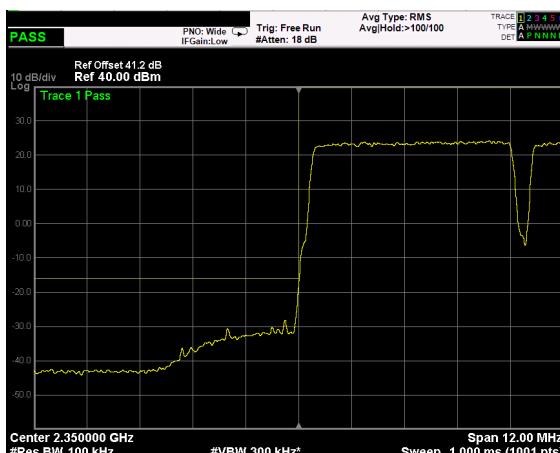
AWGN Signal, Nominal Input Signal,
 High Band Edge, 1 Carrier



AWGN Signal, Nominal Input Signal +3dB,
 Low Band Edge, 1 Carrier



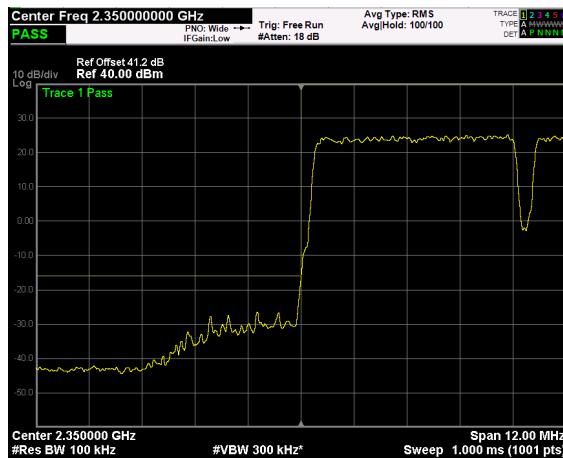
AWGN Signal, Nominal Input Signal +3dB,
 High Band Edge, 1 Carrier



AWGN Signal, Nominal Input Signal,
 Low Band Edge, 2 Carrier



AWGN Signal, Nominal Input Signal,
 High Band Edge, 2 Carrier



AWGN Signal, Nominal Input Signal +3dB,
Low Band Edge, 2 Carrier



AWGN Signal, Nominal Input Signal +3dB,
High Band Edge, 2 Carrier

Clause 27.53(a) Radiated Spurious emissions

(a) For operations in the 2305-2320 MHz band and the 2345-2360 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power P (with averaging performed only during periods of transmission) within the licensed band(s) of operation, in watts, by the following amounts:

(1) For base and fixed stations' operations in the 2305-2320 MHz band and the 2345-2360 MHz band:

- (i) By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, and not less than $75 + 10 \log (P)$ dB on all frequencies between 2320 and 2345 MHz;
- (ii) By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2300 and 2305 MHz, $70 + 10 \log (P)$ dB on all frequencies between 2287.5 and 2300 MHz, $72 + 10 \log (P)$ dB on all frequencies between 2285 and 2287.5 MHz, and $75 + 10 \log (P)$ dB below 2285 MHz;
- (iii) By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2360 and 2362.5 MHz, $55 + 10 \log (P)$ dB on all frequencies between 2362.5 and 2365 MHz, $70 + 10 \log (P)$ dB on all frequencies between 2365 and 2367.5 MHz, $72 + 10 \log (P)$ dB on all frequencies between 2367.5 and 2370 MHz, and $75 + 10 \log (P)$ dB above 2370 MHz.

(5) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the channel blocks at 2305, 2310, 2315, 2320, 2345, 2350, 2355, and 2360 MHz, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e., 1 MHz). 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.

(7) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power;

Test date: 2020-07-21

Test results: Pass

Special notes

-

Test data

The D.U.T. was positioned according to the radiated emissions set-up

The D.U.T. antenna connector was terminated by a 50Ω shielded dummy load.

The spectrum was searched from 30 MHz to 1 GHz (RBW 100 kHz) & 1 GHz (RBW 1 MHz) to the tenth harmonic of the carrier.

There were no emissions detected above the noise floor which was at least 20 dB below the specification limit.

Spurious emissions measurement results:

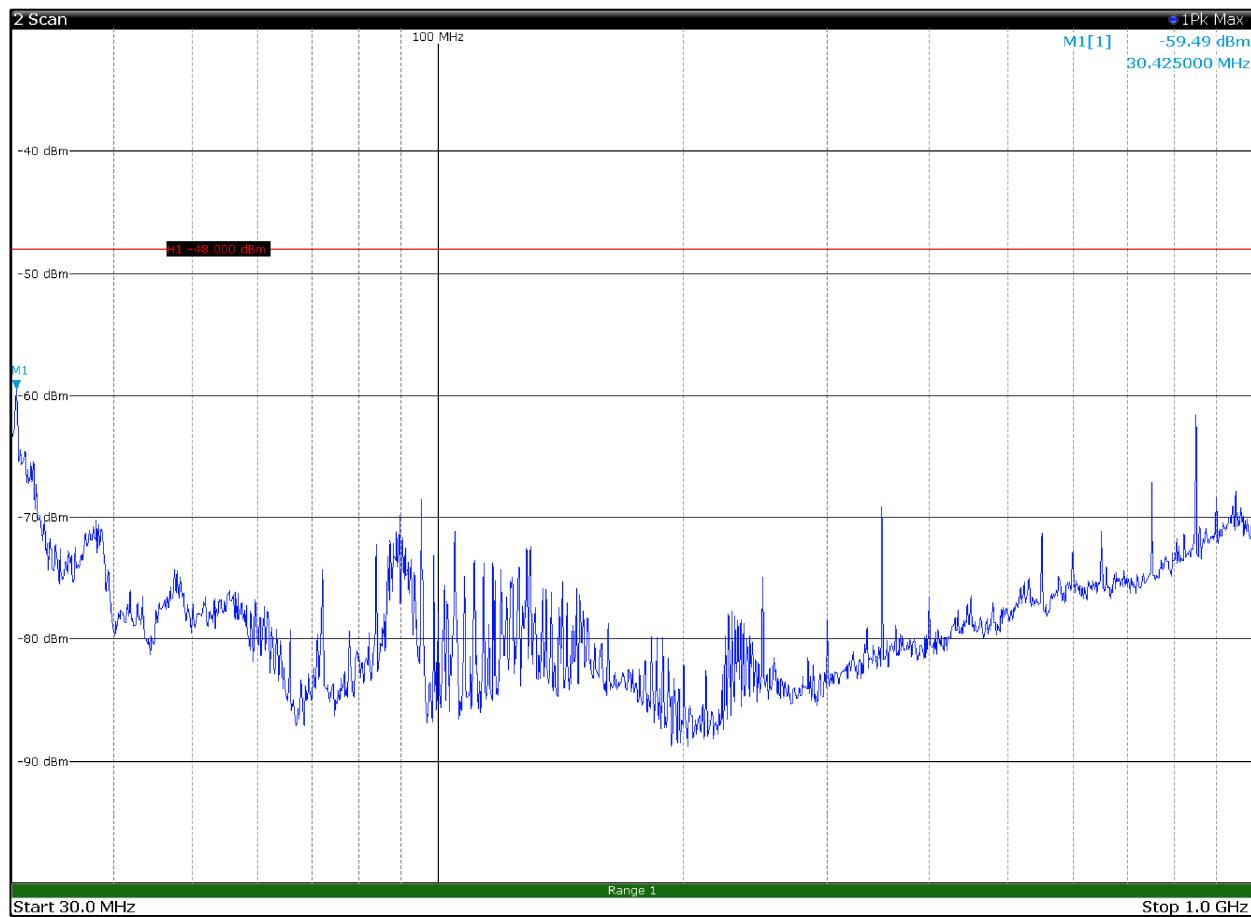
Frequency (MHz)	Polarization. V/H	Field strength (dBm)	Limit (dBm)	Margin (dB)
First Channel	V/H	Negligible	-45	
Mid channel	V/H	Negligible	-45	
Last Channel	V/H	Negligible	-45	

Note: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

MIMO consideration

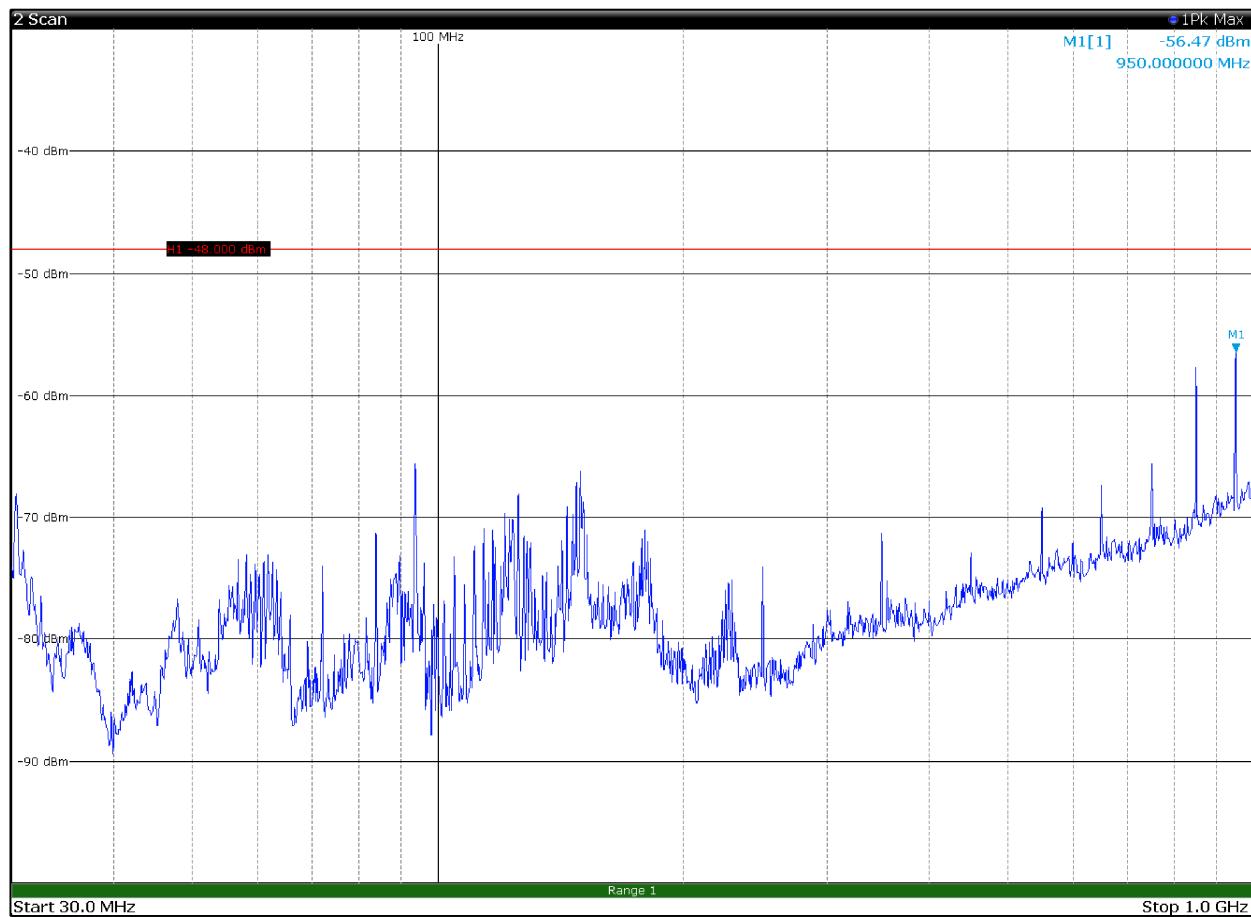
In the final Remote Unit, the EUT could be used in MIMO configuration according to KDB 662911-D01 v02r01 and 662911-D02 v01 with signals completely uncorrelated. So, the maximum emission is calculated as follows:

- MIMO Maximum Emission = Emission at each path + $10\log(N_{\text{ant}})$ dB =
= Emission at each path + $10\log(2)$ = Emission at each path + 3dB
- Spurious emission limit is -48dBm.



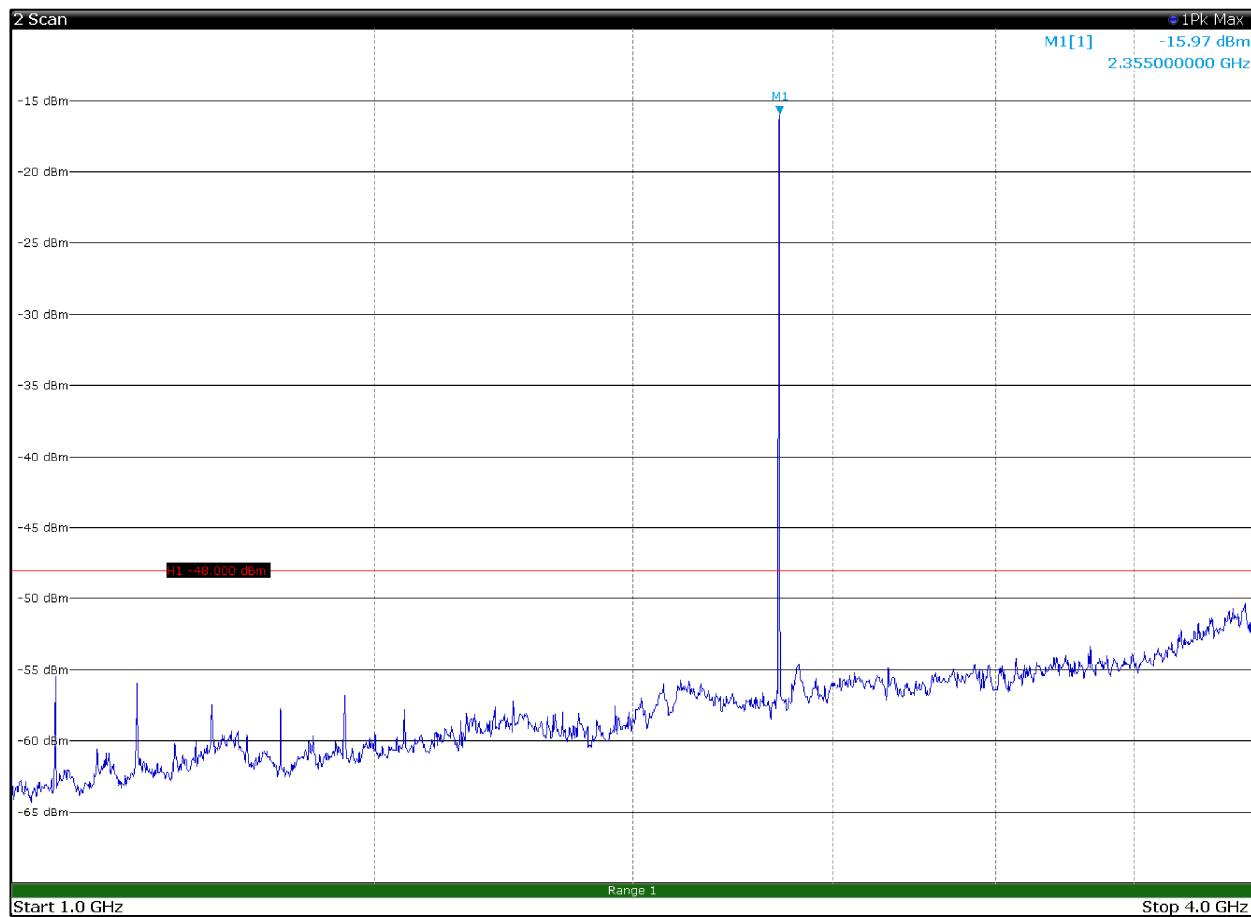
30 MHz – 1 GHz – H Pol

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
30.4250	-59.5	-48.0	-11.5
89.7250	-69.9	-48.0	-21.9
95.3750	-68.6	-48.0	-20.6
350.0000	-69.2	-48.0	-21.2
750.0000	-67.2	-48.0	-19.2
850.0000	-61.6	-48.0	-13.6
900.0000	-68.5	-48.0	-20.5
942.4750	-69.1	-48.0	-21.1
949.9750	-67.9	-48.0	-19.9
963.9000	-69.3	-48.0	-21.3



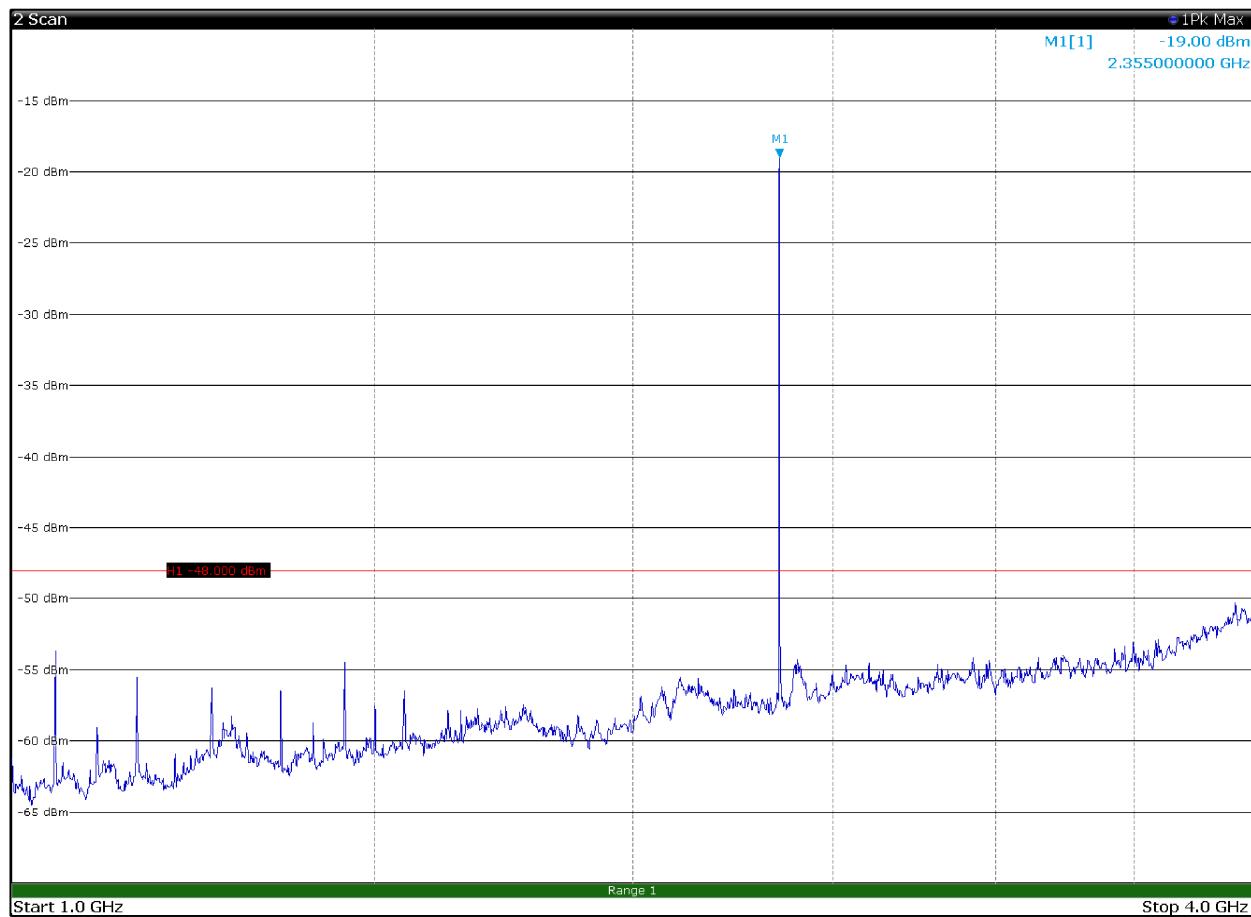
30 MHz – 1 GHz – V Pol

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
93.7250	-65.6	-48.0	-17.6
125.3500	-68.1	-48.0	-20.1
147.6500	-67.2	-48.0	-19.2
149.2750	-66.3	-48.0	-18.3
650.0000	-67.4	-48.0	-19.4
750.0000	-65.7	-48.0	-17.7
850.0000	-57.8	-48.0	-9.8
950.0000	-56.5	-48.0	-8.5
986.3250	-67.1	-48.0	-19.1
1000.0000	-66.6	-48.0	-18.6


1 GHz – 4 GHz – H Pol

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1050.0000	-55.5	-48.0	-7.5
1150.0000	-55.9	-48.0	-7.9
2355.0000	-16.0	--	--
3962.5000	-50.4	-48.0	-2.4

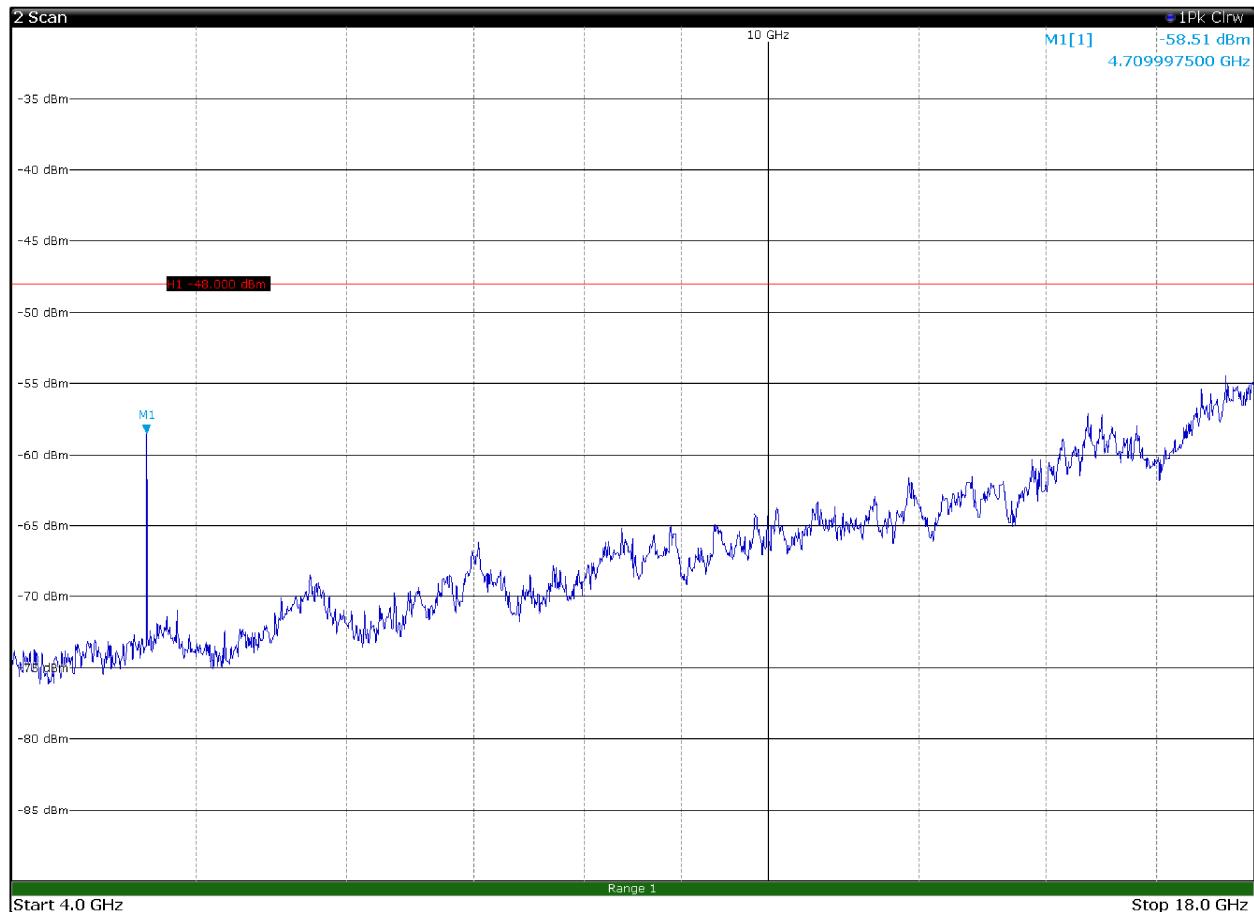
Limit exceeded by the carrier



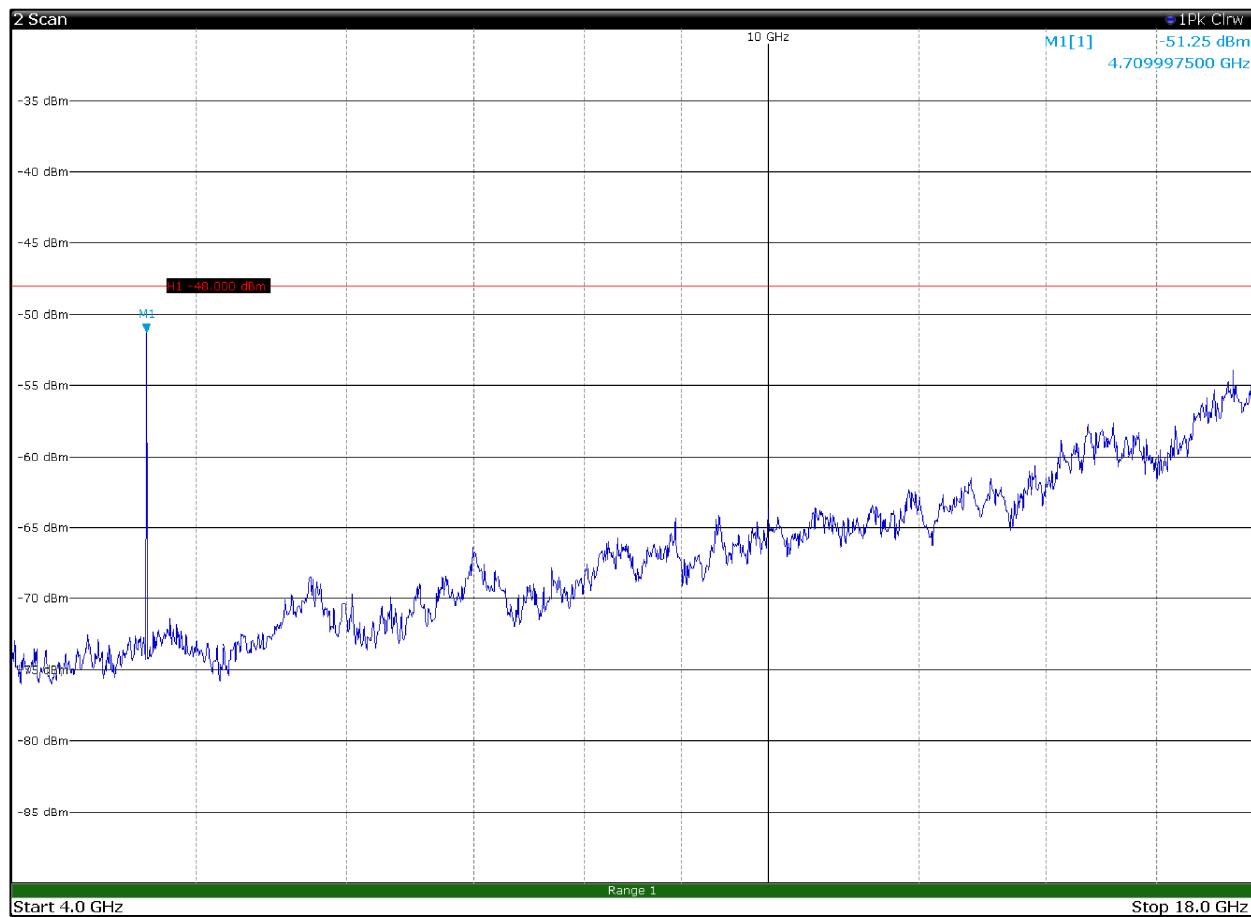
1 GHz – 4 GHz – V Pol

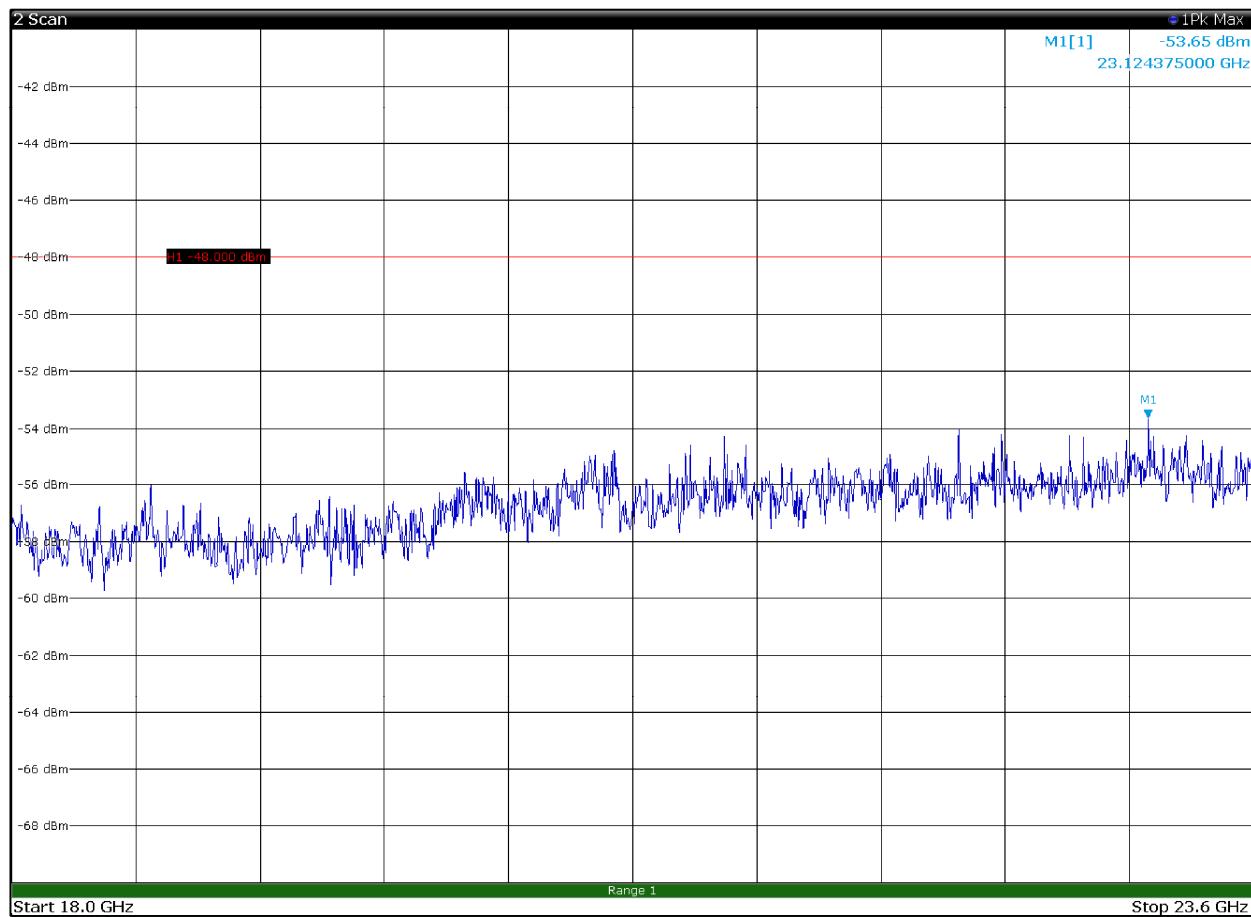
Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1050.0000	-53.8	-48.0	-5.8
1150.0000	-55.6	-48.0	-7.6
1250.0000	-56.3	-48.0	-8.3
1350.0000	-56.5	-48.0	-8.5
1450.0000	-54.5	-48.0	-6.5
2355.0000	-19.0	-48.0	29.0
3918.7500	-50.4	-48.0	-2.4

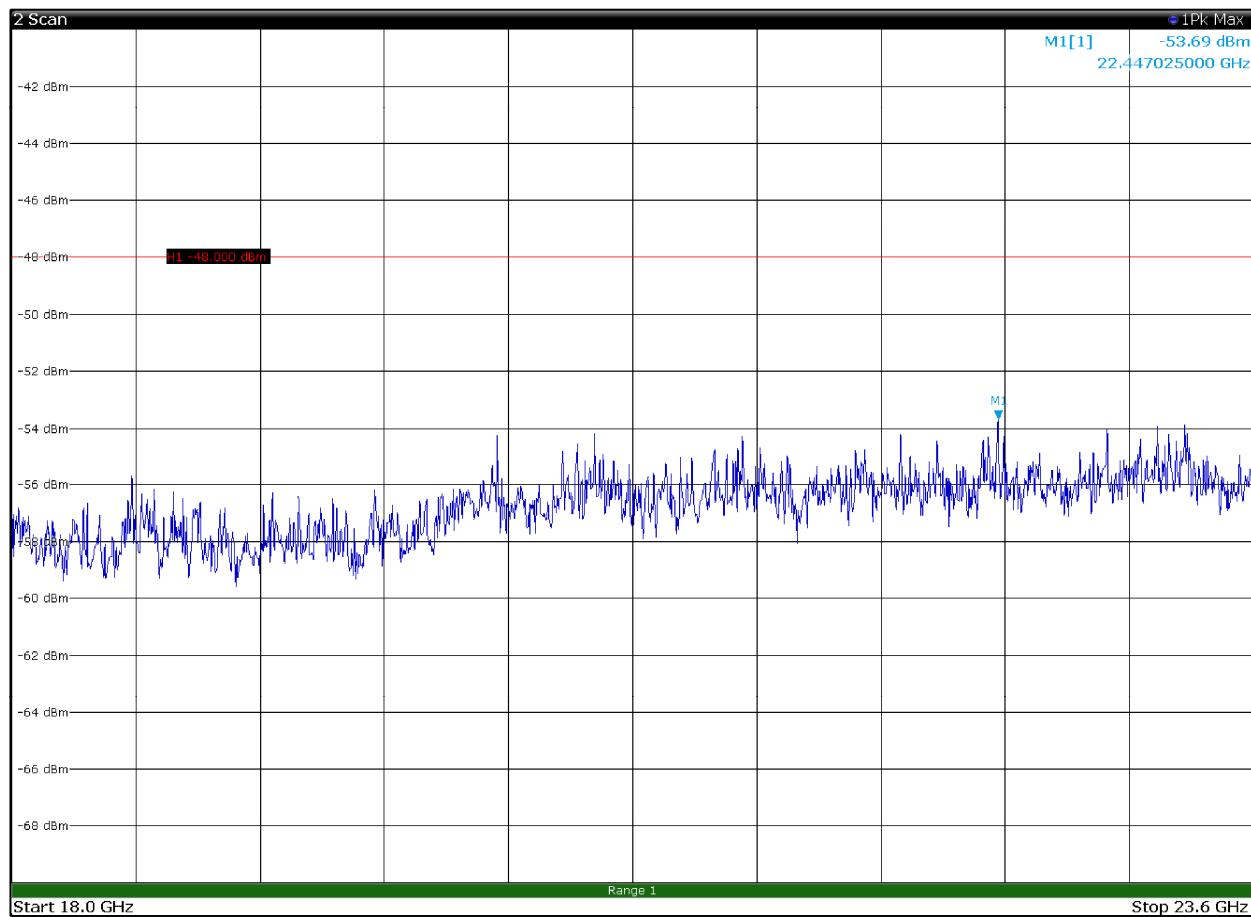
Limit exceeded by the carrier



4 GHz – 18 GHz – H Pol

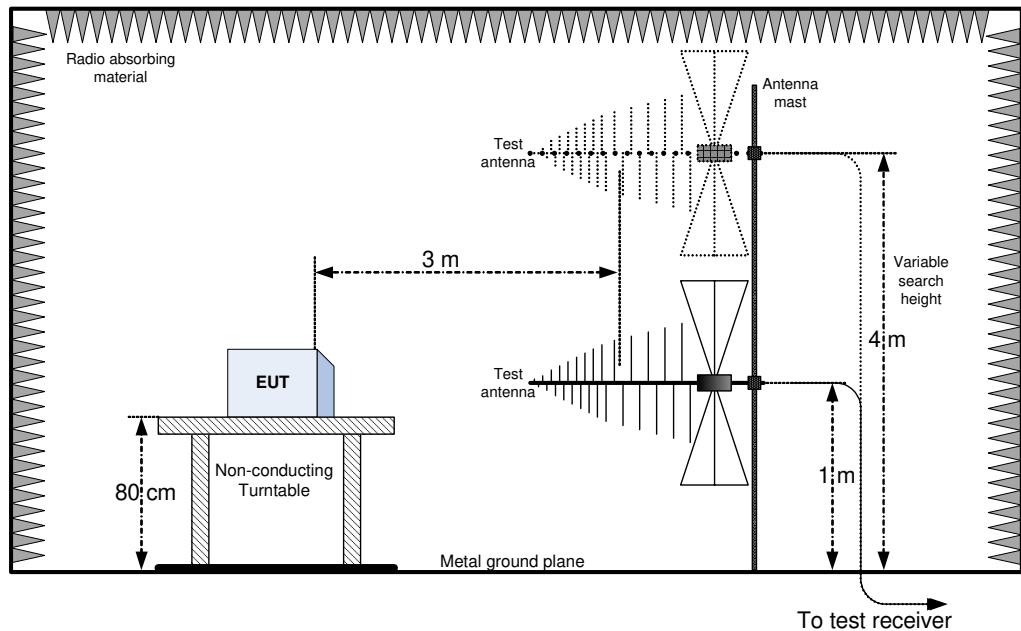
**4 GHz – 18 GHz – V Pol**


18 GHz – 24 GHz – H Pol

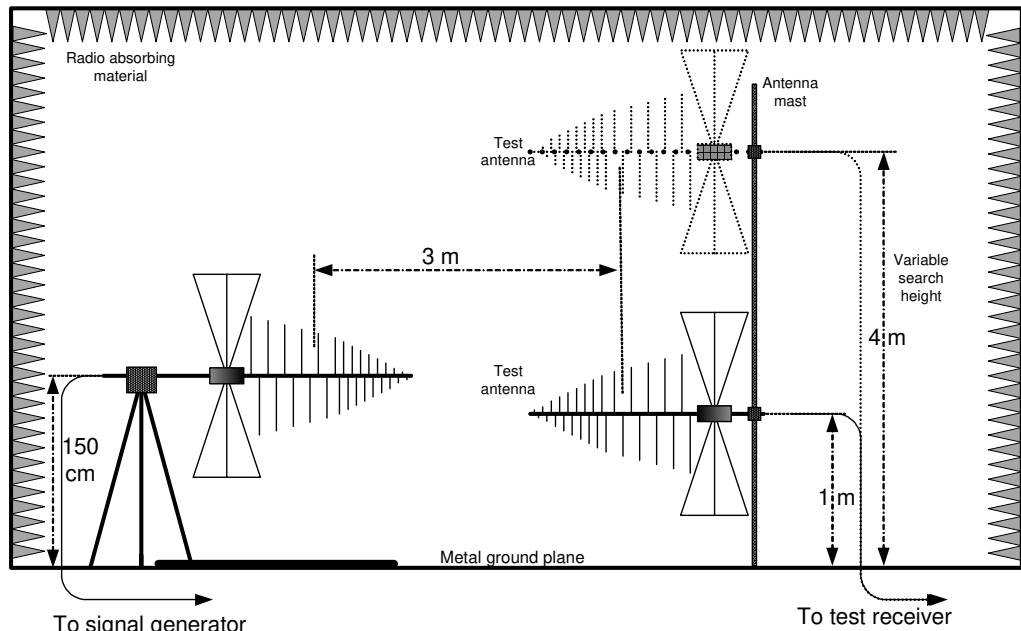

18 GHz – 24 GHz – V Pol

Appendix B: Block diagrams of test set-ups

Radiated emissions set-up



Substitution method set-up



Appendix C: EUT Photos

Photo Set up

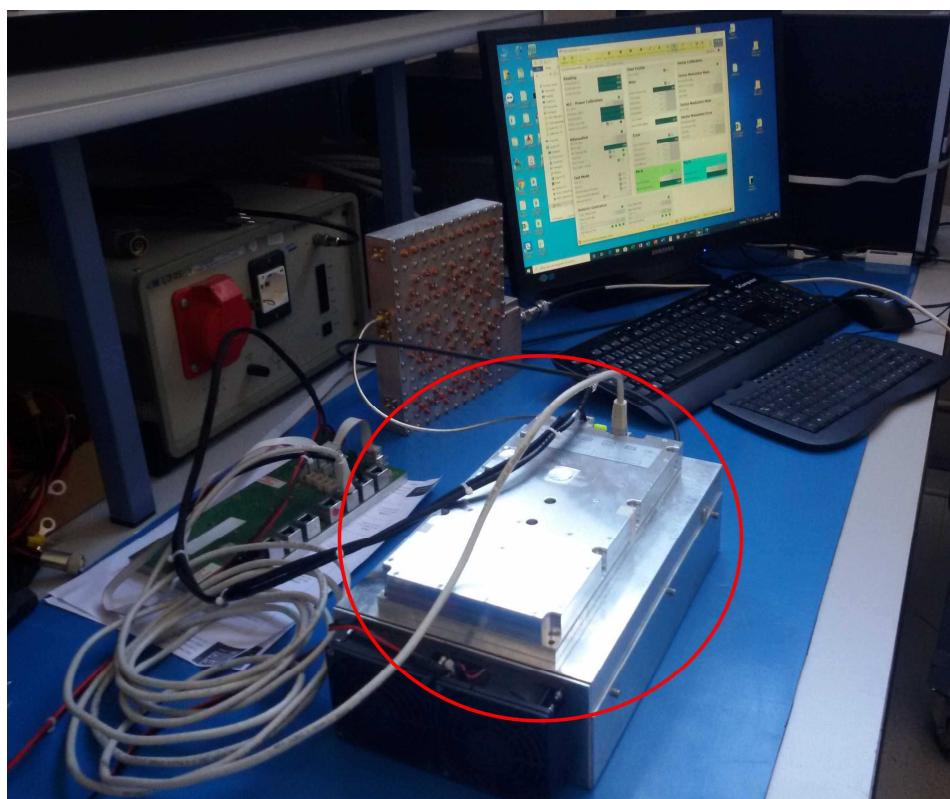




Photo EUT



END OF REPORT