EMC Test Report
2024-0451-EMC-TR-25-0069-V01

Designation:	UAP-XR [WCS 2300]
Manufacturer:	CommScope
Serial No(s):	SZBEBF2452A0003
ID No.	7862380-00 Rev: 00
FCC ID	XS5-IONEUAPR
ISED ID	2237E-IONEUAPR
Test Specifications:	ANSI 63-26:2015 FCC Rules and Regulations as listed in 47 CFR, Part 20 and Part 27 RSS-195 Issue 2 with RSS-GEN Issue 5, RSS-131 Issue 4 and SRSP-516 Issue 1
Test Plan:	"BU-PC-2336-58" from customer
Test Result:	**Passed**

Date of issue:	12.06.2025		Signature:
Version:	01	Technical Reviewer:	Thomas Gerngroß Test Engineer Digitally signed by Thomas Gerngroß DN: cn=Thomas Gerngroß, o=Bureau Veritas CPS Germany GmbH, ou=ECL, email=thomas.gerngross@bureauveritas.com, c=DE Date: 2025.06.12 14:16:10 +02'00'
Date of receipt EUT:	26.02.2025		
Performance date:	14.03.2025 - 30..03.2025	Report Reviewer:	Thomas Hufnagel Test Engineer Digitally signed by Thomas Hufnagel Date: 2025.06.12 14:12:37 +02'00'

Bundesnetzagentur

BNetzA-CAB-19/21-20

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Laboratory accreditation no:	DAkkS D-PL-12024-06-04 BNETZA-CAB-19/21-20
FCC Designation Number:	DE0023
FCC Test Firm Registration:	366481
ISED CAB Identifier	DE0016
ISED Company Number	

Versions management:

V 01.00	Initial release

Table of Contents

1 APPLIED STANDARDS AND TEST SUMMARY

1.1 CFR APPLIED STANDARDS

Type of Authorization
Certification for an Industrial Signal Booster.

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Chapter 1 Parts 2 and 20 and 27. The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 20, Commercial Mobiles Services

§ 20.21 Signal Boosters

Part 27; Miscellaneous Wireless Communications Services
Subpart C – Technical standards

§ 27.50 – Power and duty cycle limits
§ 27.54 – Frequency stability
§ 27.53 – Emission limits

The tests were selected and performed with reference to:

- FCC Public Notice 935210 applying "Signal Boosters Basic Certification Requirements" 935210 D02, 2024-11-20.
- FCC Public Notice 935210 applying "Measurement guidance for industrial and non-consumer signal booster, repeater and amplifier devices"
- 935210 D05, 2020-04-03.
- FCC Public Notice 971168 applying "Measurement guidance for certification of licensed digital transmitters" 971168 D01, 2018-04-09.

- ANSI C63.26: 2015 "American National Standard for Compliance Testing of Transmitters Used in Licensec Radio Services"
- RSS-195 Issue 2 "Wireless Communication Service (WCS) Equipment Operating in the Bands 2305-2320 MHz and 2345-2360 MHz"
- SRSP-516 Issue 1 "Technical Requirements for Wireless Communication Service (WCS) Operating in the Bands 2305-2320 MHz and 2345-2360 MHz"
- RSS-GEN Issue 5 "General Requirements for Compliance of Radio Apparatus"
- RSS-131 Issue 4 "Zone Enhancers"

1.2 FCC-ISED CORRELATION TABLE

Correlation of measurement requirements for Industrial signal booster from FCC and ISED Canada

Measurement	FCC reference	ISED reference
Effective radiated power, mean output power and zone enhancer gain	§ 27.50 KDB 935210 D05 v01r04: 3.5	RSS-GEN Issue 5, 6.12 RSS-195 Issue 2, 5.5 SRSP-516, Issue 1, 5.1.1
Peak to Average Ratio	§ 27.50	RSS-195 Issue 2, 5.5.1
Occupied bandwidth Input-versus-output spectrum	§ 2.1049 KDB 935210 D05 v01r04: 3.4	RSS-GEN Issue 5, 6.7 RSS-131 Issue 4: 9.2
Conducted spurious emission at antenna terminal	§ 2.1051 § 27.53 KDB 935210 D05 v01r04: 3.6	RSS-GEN Issue 5, 6.13 RSS-195 Issue 2, 5.6
Out-of-band emissions limits	§ 2.1051 § 27.53 KDB 935210 D05 v01r04: 3.6	RSS-GEN Issue 5, 6.13 RSS-195 Issue 2, 5.6
Frequency stability	§ 2.1055 § 27.54	RSS-GEN Issue 5, 6.11 RSS-131 Issue 4: 9.4 RSS-195 Issue 2, 5.4
Out-of-band rejection	KDB 935210 D05 v01r04: 3.3	RSS-131 Issue 4: 9.1
Field strength of spurious radiation	§ 2.1053 § 27.53	RSS-GEN Issue 5, 6.13 RSS-131 Issue 4, 10.5
All measurements	ANSI 63.26	ANSI 63.26

The test case frequency stability was not performed since the EUT is not equipped with signal processing capabilities. According KDB 935210 D05 in this case a measurement is not required.

1.3 MEASUREMENT SUMMARY/SIGNATURES

47 CFR CHAPTER I FCC PART 27 Subpart C [Base Stations/Repeater] **§ 27.50**

Effective Radiated Power, mean output power and zone enhancer gain
The measurement was performed according to ANSI C63.26, KDB 935210 D05 v01r04: 3.5 **Final Result**

OP-Mode	**FCC**	**ISED**
Frequency Band, Direction, Input Power, Signal Type		
WCS 2300, RF downlink, 0.3 dB < AGC, Wideband	Passed	Passed
WCS 2300, RF downlink, 3 dB > AGC, Wideband	Passed	Passed
WCS 2300, RF downlink, 0.3 dB < AGC, Narrowband	Passed	Passed
WCS 2300, RF downlink, 3 dB > AGC, Narrowband	Passed	Passed
WCS 2300, RF downlink, 0.3 dB < AGC, Wideband 5G	Passed	Passed
WCS 2300, RF downlink, 3 dB > AGC, Wideband 5G	Passed	Passed

47 CFR CHAPTER I FCC PART 27 Subpart C [Base Stations/Repeater] **§ 27.50**

Peak to Average Ratio
The measurement was performed according to ANSI C63.26 **Final Result**

	FCC	**ISED**
WCS 2300, RF downlink, 0.3 dB < AGC, Wideband	Passed	Passed
WCS 2300, RF downlink, 3 dB > AGC, Wideband	Passed	Passed
WCS 2300, RF downlink, 0.3 dB < AGC, Narrowband	Passed	Passed
WCS 2300, RF downlink, 3 dB > AGC, Narrowband	Passed	Passed
WCS 2300, RF downlink, 0.3 dB < AGC, Wideband 5G	Passed	Passed
WCS 2300, RF downlink, 3 dB > AGC, Wideband 5G	Passed	Passed

47 CFR CHAPTER I FCC PART 2 **§ 2.1049**

Occupied Bandwidth/Input-versus-output Spectrum
The measurement was performed according to ANSI C63.26, KDB 935210 D05 v01r04: 3.4 **Final Result**

OP-Mode	**FCC**	**ISED**
Frequency Band, Direction, Input Power, Signal Type		
WCS 2300, RF downlink, 0.3 dB < AGC, Wideband	Passed	Passed
WCS 2300, RF downlink, 3 dB > AGC, Wideband	Passed	Passed
WCS 2300, RF downlink, 0.3 dB < AGC, Narrowband	Passed	Passed
WCS 2300, RF downlink, 3 dB > AGC, Narrowband	Passed	Passed
WCS 2300, RF downlink, 0.3 dB < AGC, Wideband 5G	Passed	Passed
WCS 2300, RF downlink, 3 dB > AGC, Wideband 5G	Passed	Passed

47 CFR CHAPTER I FCC PART 27 Subpart C [Base Stations/Repeater] § 2.1051, § 27.53

Conducted spurious emissions at antenna terminals
The measurement was performed according to ANSI C63.26

OP-Mode Frequency Band, Direction, Input Power, Signal Type	Final Result FCC	ISED
WCS 2300, low, RF downlink, Wideband	Passed	Passed
WCS 2300, mid, RF downlink, Wideband	Passed	Passed
WCS 2300, high, RF downlink, Wideband	Passed	Passed
WCS 2300low, RF downlink, Narrowband	Passed	Passed
WCS 2300, mid, RF downlink, Narrowband	Passed	Passed
WCS 2300, high, RF downlink, Narrowband	Passed	Passed
WCS 2300, low, RF downlink, Wideband 5G	Passed	Passed
WCS 2300, mid, RF downlink, Wideband 5G	Passed	Passed
WCS 2300, high, RF downlink, Wideband 5G	Passed	Passed

47 CFR CHAPTER I FCC PART 27 Subpart C [Base Stations/Repeater] §2.1051, § 27.53

Out-of-band emission limits
The measurement was performed according to ANSI C63.26, KDB 935210 D05 v01r04: 3.6

OP-Mode Band Edge, Frequency Band, Number of signals, Direction, Input Power, Signal Type	FCC	ISED
Upper, Band 30 WCS 2300, 1, RF downlink, 0.3 dB < AGC, Wideband	Passed	Passed
Upper, Band 30 WCS 2300, 1, RF downlink, 3 dB > AGC, Wideband	Passed	Passed
Upper, Band 30 WCS 2300, 1, RF downlink, 0.3 dB < AGC, Wideband 5G	Passed	Passed
Upper, Band 30 WCS 2300, 1, RF downlink, 3 dB > AGC, Wideband 5G	Passed	Passed
Upper, Band 30 WCS 2300, 1, RF downlink, 0.3 dB < AGC, Narrowband	Passed	Passed
Upper, Band 30 WCS 2300, 1, RF downlink, 3 dB > AGC, Narrowband	Passed	Passed
Lower, Band 30 WCS 2300, 1, RF downlink, 0.3 dB < AGC, Wideband	Passed	Passed
Lower, Band 30 WCS 2300, 1, RF downlink, 3 dB > AGC, Wideband	Passed	Passed
Lower, Band 30 WCS 2300, 1, RF downlink, 0.3 dB < AGC, Wideband 5G	Passed	Passed
Lower, Band 30 WCS 2300, 1, RF downlink, 3 dB > AGC, Wideband 5G	Passed	Passed
Lower, Band 30 WCS 2300, 1, RF downlink, 0.3 dB < AGC, Narrowband	Passed	Passed
Lower, Band 30 WCS 2300, 1, RF downlink, 3 dB > AGC, Narrowband	Passed	Passed
Upper, Band 30 WCS 2300, 2, RF downlink, 0.3 dB < AGC, Wideband	Passed	Passed
Upper, Band 30 WCS 2300, 2, RF downlink, 3 dB > AGC, Wideband	Passed	Passed
Upper, Band 30 WCS 2300, 2, RF downlink, 0.3 dB < AGC, Narrowband	Passed	Passed
Upper, Band 30 WCS 2300, 2, RF downlink, 3 dB > AGC, Narrowband	Passed	Passed
Lower, Band 30 WCS 2300, 2, RF downlink, 0.3 dB < AGC, Wideband	Passed	Passed
Lower, Band 30 WCS 2300, 2, RF downlink, 3 dB > AGC, Wideband	Passed	Passed
Lower, Band 30 WCS 2300, 2, RF downlink, 0.3 dB < AGC, Narrowband	Passed	Passed
Lower, Band 30 WCS 2300, 2, RF downlink, 3 dB > AGC, Narrowband	Passed	Passed

47 CFR CHAPTER I FCC PART 27 Subpart C [Base Stations/Repeater]	**KDB 935210 D05 v01r04: 3.3**		
Out-of-band rejection The measurement was performed according to ANSI C63.26; KDB 935210 D05 v01r04: 3.3		**Final Result**	
OP-Mode Frequency Band, Direction	**Setup**	**FCC**	**ISED**
Band 30 WCS 2300, RF downlink		Passed	Passed

47 CFR CHAPTER I FCC PART 27 Subpart C [Base stations/Repeater]	**§ 2.1053, § 27.53**		
Field strength of spurious radiation The measurement was performed according to ANSI C63.26		**Final Result**	
OP-Mode Frequency Band, Direction			
WCS 2300, RF downlink		Passed	Passed

The test case frequency stability was not performed, since the EUT is not equipped with signal processing capabilities.

2 ADMINISTRATIVE DATA

2.1 TESTING LABORATORY

Bureau Veritas Consumer Products Services
Germany GmbH
Thurn-und-Taxis-Straße 18
D-90411 Nürnberg
Tel.: +49 40 74041 0
Fax: +49 40 74041-2755

2.2 APPLICANT DATA

Company Name:	CommScope Andrew Wireless Systems GmbH
Address:	Industriering 10 86675 Buchdorf Germany
Contact Person:	Mr. Jiri Čečka

2.3 MANUFACTURER DATA

Company Name:	Please see applicant data.
Address:	

3 TEST OBJECT DATA

3.1 GENERAL EUT DESCRIPTION

Kind of Device product description	Cellular repeater
Product name	Cellular repeater
Type	UAP-XR
Declared EUT data by the supplier	
General Product Description	The EUT is an industrial signal booster supporting the following: Band 30/WCS 2300: 2350 – 2360 MHz Band 41 (BRS 2500), Broadband Radio Service: ● Lower Band Segment (LBS): 2496- 2568 MHz (Range for FCC) ● Lower Band Segment (LBS): 2500- 2568 MHz (Range for ISED) ● Middle Band Segment (MBS): 2572- 2614 MHz ● Upper Band Segment (UBS): 2618 – 2690 MHz Band 25/PCS 1900 Band 66/AWS 1700 A RF operation is only supported for the downlink.
Booster Type	Industrial signal booster
Voltage Type	DC, supply about PoE
Voltage Level	-60 V - -36 V, -57 V nominal
Maximum Output Donor Port [Uplink]	-
Maximum Output Server Port [Downlink]	18 dBm in all bands
Maximum Gain [Uplink]	-
Maximum Gain [Downlink]	20 dB in all bands

The main components of the EUT are listed and described in chapter 3.2 EUT Main components.

3.2 EUT MAIN COMPONENTS

Sample Parameter	Value
Serial Number	SZBEBF2452A0003
HW Version	7862380-00 Rev: 00
SW Version	01.03.0012
Comment	-----

NOTE: The short description is used to simplify the identification of the EUT in this test report.

3.3 ANCILLARY EQUIPMENT

For the purposes of this test report, ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Ancillary Equipment can influence the test results.

Device	**Details (manufacturer, type model, OUT code)**	**Description**
-	-	-

3.4 AUXILIARY EQUIPMENT

For the purposes of this test report, auxiliary equipment is defined as equipment which is used temporarily to enable operational and control features especially used for the tests of the EUT which is not used during normal operation or equipment that is used during the tests in combination with the EUT but is not subject of this test report. It is necessary to configure the system in a typical fashion, as a customer would normally use it.
But nevertheless Auxiliary Equipment can influence the test results.

Device	**Details (manufacturer, type, S/N)**	**Description**
AUX1	CommScope; ION-E PSU Shelf AC; HD20882	Power supply rack
AUX1	CommScope; ION-E WCS-2; SZAEAJ1952A0032	Power supply rack
AUX3	GE Power Electronics Inc.; CAR1212FPBC-Z; FK69111	Power module
AUX4	GE Energy; CP2000AC54TEP-CM; LBLNPW13KZ07004506	Power module
AUX5	CommScope; ION E SUI; (e1)MA34	Ethernet module
AUX6	CommScope; ION E CAT; SZBEAE1810A0009	PoE module
AUX8	CommScope, ION E RFD, SZBEAG1825A0004	RF card plug-in module
AUX8	CommScope, ION E RFD, SZBEA G1849A0043	RF card plug-in module

3.5 EUT SETUPS

This chapter describes the combination of EUTs and equipment used for testing. The rationale for selecting the EUTs, ancillary and auxiliary equipment and interconnecting cables, is to test a representative configuration meeting the requirements of the referenced standards.

Setup	**Combination of EUTs**	**Description and rationale**
	,	Setup for all tests

3.6 OPERATING MODES

This chapter describes the operating modes of the EUT used for testing.

3.6.1 TEST CHANNELS

Band	Direction	Lower Frequency Band Edge [MHz]	Upper Frequency Band Edge [MHz]	Center Frequency [MHz]	Port
30, WCS 2300	Downlink	2350.0	2360.0	2355.0	Donor

3.6.2 DEFINITION OF USED FREQUENCY BANDS

Narrowband: representation by a GSM signal
Wideband : representation by an AWGN signal with 4.1 MHz
Wideband 5G: representation by an AWGN signal with 9.4 MHz

3.6.3 AUTOMATIC GAIN CONTROL LEVELS

AGC Levels							
Band	**Direction**	**Signal Type**	**AGC Start Pin [dBm]**	**AGC Start Pin -0.3 dB [dBm]**	**AGC Start Pin +3 dB [dBm]**	**Frequency [MHz]**	**Frequency**
30	Downlink	Narrowband	-0.5	-0.8	2.5	2355.0	Mid
30	Downlink	Wideband	-1.2	-1.5	1.8	2355.0	
30	Downlink	Wideband 5G	--0.2	-0.5	2.8	2355.0	
30	Downlink	Narrowband	--0.2	-0.5	2.8	2350.2	Low
30	Downlink	Wideband	-0.4	-0.7	2.6	2352.5	
30	Downlink	Wideband 5G	-0.2	-0.5	2.8	2355.0	
30	Downlink	Narrowband	-0.9	-1.3	2.0	2359.8	High
30	Downlink	Wideband	-0.8	-1.1	2.2	2357.5	
30	Downlink	Wideband 5G	--0.2	-0.5	2.8	2355.0	
30	Downlink	Narrowband	-0.7	-1.0	2.3	2357.8	Max.Power
30	Downlink	Wideband	-0.8	-1.1	2.2	2357.5	
30	Downlink	Wideband 5G	--0.2	-0.5	2.8	2355.0	

Remark:

If the measured frequency f_0 for the max power has a too low distance to the band edges, because in the tests modulated signals must be used: The next possible frequency to the according band edge was used.
For example for minimum distances to the band edges:

GSM signal (narrowband): 0.2 MHz
AWGN signal (wideband): 2.5 MHz
AWGN signal (wideband 5G): Here only measurements at the mid frequency were performed, because of the signal width.

3.7 PRODUCT LABELLING

3.7.1 FCC ID LABEL

Please refer to the documentation of the applicant.

3.7.2 LOCATION OF THE LABEL ON THE EUT

Please refer to the documentation of the applicant.

4 DESCRIPTION OF EMC TEST CENTRE

4.1 CLIMATIC CONDITIONS DURING MEASUREMENTS

The climatic conditions were within the following ranges.
For ESD testing, the conditions during the test were denoted in the corresponding chapter.

Ambient temperature:	25 ± 10 °C
Relative humidity:	20 – 60 %
Air pressure:	860 - 1060 hPa

4.2 CONFORMITY STATEMENT/DECISION RULE

4.2.1 EMISSION

If the standard or the customer defines no decision rule, the laboratory applies a decision rule following the "Binary Statement for Simple Acceptance Rule (w=0)" (chapter 4.2.1) of ILAC Guidelines on Decision Rules and Statements of Conformity (ILAC-G8:09/2019). If the measured value is at the limit value, it is evaluated as PASS. The client has agreed with application of the decision rule prior testing and demanded a statement of conformity by the test laboratory.

4.3 MEASUREMENT UNCERTAINTIES

KDB 935210 D05	**Test laboratory**
Power measurement	0,68 dB
Measuring AGC threshold level	0,90 dB
Out of band rejection	0,90 dB
Input-versus-output signal comparison	0,91 dB
Mean power output	0,90 dB
Measuring out-of-band/out-of-block (including intermodulation) emissions and spurious emissions	0,90 dB
Out-of-band/out-of-block emissions conducted measurements	0,90 dB
Spurious emissions conducted	2,18 dB
Spurious emissions radiated mesurements	5,38 dB
Total frequency uncertainty	2×10^{-7}

Reference : ECL-MU5.4.6.3-EMC-14-001-V03.00 MU Wireless.xlsx

5 TEST RESULTS

5.1 EFFECTIVE RADIATED POWER, MEAN OUTPUT POWER AND ZONE ENHANCER GAIN

Standard FCC Part 27, §27.50

The test was performed according to:
ANSI C63.26, KDB 935210 D05 v01r04: 3.5

Test date: 2025-03-18 – 2025-03-19; 2025-04-07

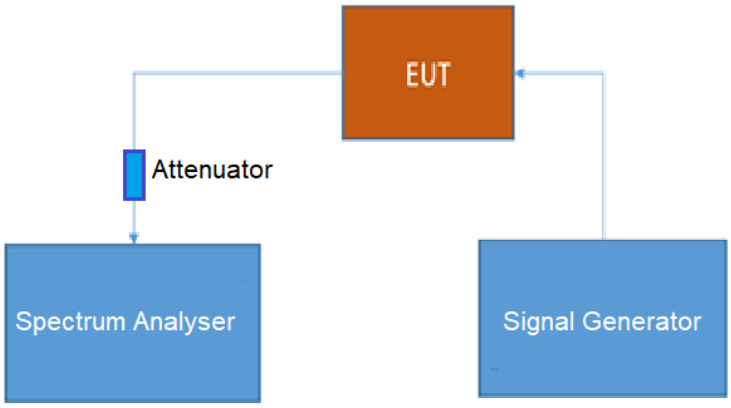
Environmental conditions: 23.5 °C; 23 % r. H./22.9 °C; 22 % r. H./23.7 °C; 23 % r. F.

Test engineer: Thomas Hufnagel; Thomas Gerngroß

5.1.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the signal booster power and gain limits and requirements for industrial signal boosters.

The EUT was connected to the test setup according to the following diagram:



The attenuation of the measuring and stimulus path are known for each measured frequency and are considered.

The Spectrum Analyzer settings can be directly found in the measurement diagrams.

5.1.2 TEST REQUIREMENTS/LIMITS

Part 27; Miscellaneous Wireless Communication Services

Subpart C – Technical standards

§ 27.50

Abstract § 27.50 from FCC:

(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.

Abstract RSS-195 from ISED:

5.5 Transmitter Output Power and Equivalent Isotropically Radiated Power

The equivalent isotropically radiated power (e.i.r.p.) of base and fixed station equipment shall comply with the e.i.r.p. limit in SRSP-516.

Abstract SRSP-516 from ISED:

5.1 Radiated Power Limits

5.1.1 Base and Fixed Stations

5.1.1.1 The equivalent isotropically radiated power (e.i.r.p.) of the base and fixed stations3 (with the exception of fixed subscriber stations) operating in the band 2305-2315 MHz or in the band 2350-2360 MHz shall not exceed 400 watts within any 1 MHz band; and shall not exceed 2000 W within any 5 MHz of bandwidth. The peak-to-average power ratio (PAPR) of these transmissions shall comply with the limits specified in RSS-195.

5.1.3 TEST PROTOCOL

FCC table

Band 30 WCS 2300, downlink							
Signal type	**Input power**	**Frequency [MHz]**	**Input power [dBm]**	**Maximum average output power [dBm]**	**Limit average output power [dBm] EIRP**	**Margin to iimit [dB]**	**Gain [dB]**
Wideband	0.3 dB < AGC	2357.5	-1.6	18.7	63.0	44.3	-1.6
Wideband	3 dB > AGC	2357.5	1.8	18.2	63.0	44.8	1.8
Narrowband	0.3 dB < AGC	2357.8	-1.5	18.5	56.0	37.5	-1.5
Narrowband	3 dB > AGC	2357.8	1.8	18.1	56.0	37.9	1.8
Wideband 5G	0.3 dB < AGC	2355.0	-1.1	19.0	53.0	34.1	-1.1
Wideband 5G	3 dB > AGC	2355.0	2.2	18.5	53.0	34.5	2.2

ISED table

Band 30 WCS 2300, downlink							
Signal type	**Input power**	**Frequency [MHz]**	**Input power [µW; dBm]**	**Maximum average output power [mW;/dBm]**	**Limit average output power [W; dBm] EIRP**	**Margin to limit [dB]**	**Gain [dB]**
Wideband	0.3 dB < AGC	2357.5	701,3/-1.5	73.5/18.7	2000/63.0	44.3	20.2
Wideband	3 dB > AGC	2357.5	1510/1.8	66.3/18.2	2000/63.0	44.8	16.4
Narrowband	0.3 dB < AGC	2357.8	709/-1.5	70.8/18.5	400/56.0	37.5	20.0
Narrowband	3 dB > AGC	2357.8	1510/1.8	66.2/18.2	400/56.0	37.8	16.4
Wideband 5G	0.3 dB < AGC	2355.0	770/-1.1	78.3/18.9	2000/63.0	44.1	20.1
Wideband 5G	3 dB > AGC	2355.0	1650/2.2	71.1/18.5	2000/63.0	44.5	16.3

Remark: Please see next sub-clause for the measurement plot.

5.1.4 SAMPLE CALCULATION OF OUTPUT POWER

FCC calculation:

Maximum output power (EIRP) in consideration together with the send antenna

The highest power level in the table inconsideration together with the lowest margin above is $p_{highest}$ = 18.9 dBm at the narrowband signal.

Hereby at an antenna gain of G_{dBi} = 13.0 dB the highest effecitve radiated output power EIRP $p_{EIRP\ 1CH}$ of one channel is:

$p_{EIRP\ 1CH} = p_{highest} + G_{dBi}$

This results in:

$p_{EIRP\ 1CH}$ = 18.9 dBm + 13.0 dB = 31.9 dBm

The eqivalent power P is according the given formula:

$P_{EIRP\ 1CH}$ =

$$P\ EIRP\ 1CH\ [W] = 10EXP\quad \left(p\ EIRP\ 1CH\ [dBm]\quad /\quad 10\right) * 0.001\ [W]$$

This results in:

$$P\ EIRP\ 1CH\ [W] = 10EXP\quad \left(31.9\ [dBm]\quad /\quad 10\right) * 0.001\ [W] = 1.55\ \text{W}$$

Because only one conducted antenna port is available no calculation for MIMO operation must be done.

Final result of this consideration:

$p_{EIRP\ all\ channels}$ = 1.55 W < 400 W/MHz, hereby 400 W/MHz is the highest allowed limit in this band which equates 56.0 dBm/MHz.

The DUT doesn't exceed the limit.

ISED calculation:

Maximum output power (EIRP) in consideration together with the send antenna

The highest power level in consideration together with the lowest margin in the table above is $p_{highest}$ = 18.2 dBm at the narrowband signal.

Hereby at an antenna gain of G_{dBi} = 13.0 dB the highest effecitve radiated output power EIRP $p_{EIRP\ 1CH}$ of one channel is:

$p_{EIRP\ 1CH} = p_{highest} + G_{dBi}$

This results in:

$p_{EIRP\ 1CH}$ = 18.2 dBm + 13.0 dB = 31.2 dBm

The eqivalent power P is according the given formula:

$P_{EIRP\ 1CH}$ =

$$P\ EIRP\ 1CH\ [W] = 10EXP\quad \left(p\ EIRP\ 1CH\ [dBm]\quad /\quad 10\right) * 0.001\ [W]$$

This results in:

$$P\ EIRP\ 1CH\ [W] = 10EXP\quad \left(31.2\ [dBm]\quad /\quad 10\right) * 0.001\ [W] = 1.32\ \text{W}$$

Because only one conducted antenna port is available no calculation for MIMO operation must be done.

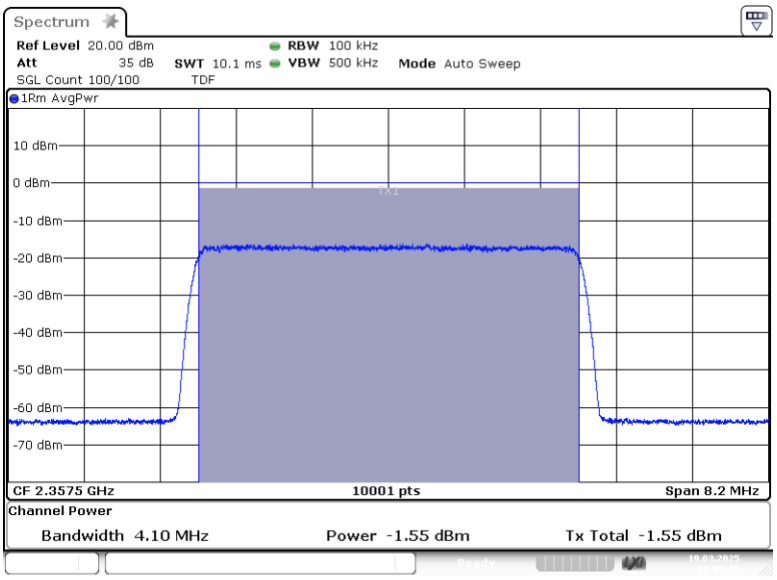
Final result of this consideration:

$p_{EIRP\ all\ channels}$ = 1.32 W < 400 W/MHz, hereby 400 W/MHz is the highest allowed limit in this band which equates 56.0 dBm/MHz.

5.1.5 MEASUREMENT PLOT

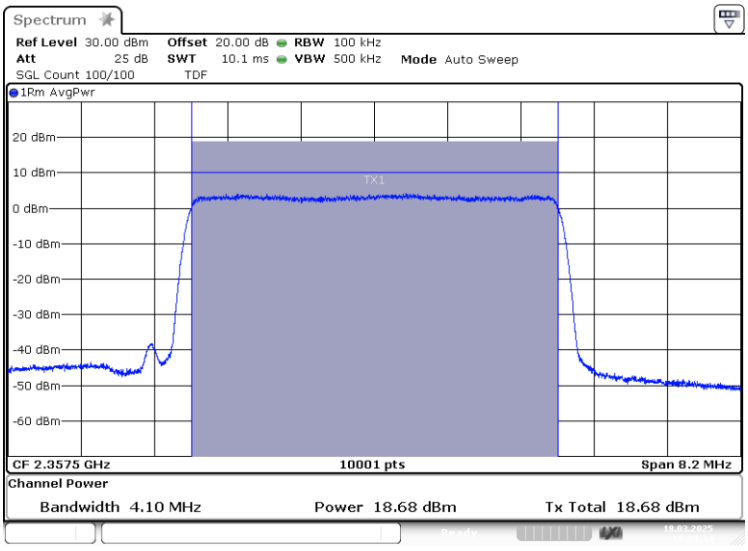
FCC plots

Band: WCS 2300; Frequency: 2.3575 GHz; Band edge: f0; Mod: AWGN;
Input power 0.3 dB < AGC



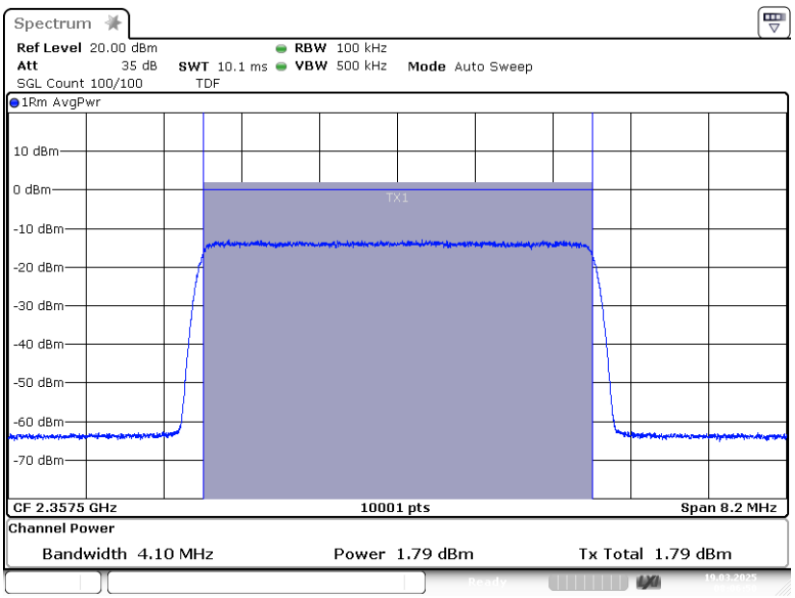
3.5.3 Power AWGN In-0.3 2.35750G

Band: WCS 2300; Frequency: 2.3575 GHz; Band edge: f0; Mod: AWGN;
Output power 0.3 dB < AGC



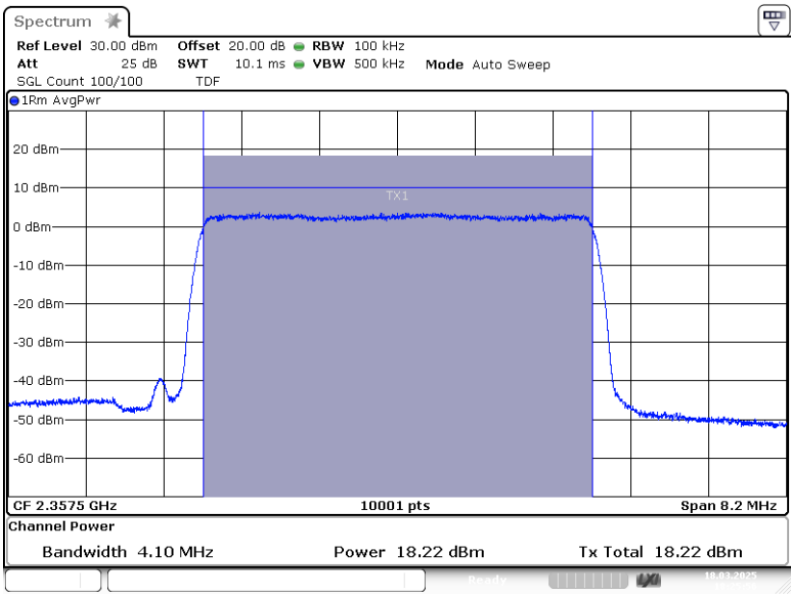
3.5.3 Power AWGN Out -0.3 2.35750G

Band: WCS 2300; Frequency: 2.3575 GHz; Band edge: f0; Mod: AWGN;
Input power 3 dB > AGC



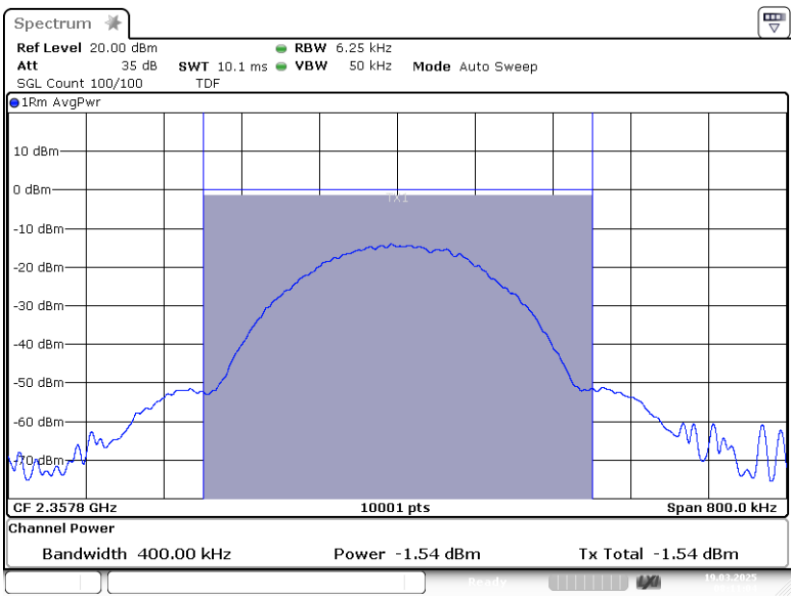
3.5.3 Power AWGN In+3 2.35750G

Band: WCS 2300; Frequency: 2.3575 GHz; Band edge: f0; Mod: AWGN;
Output power 3 dB > AGC



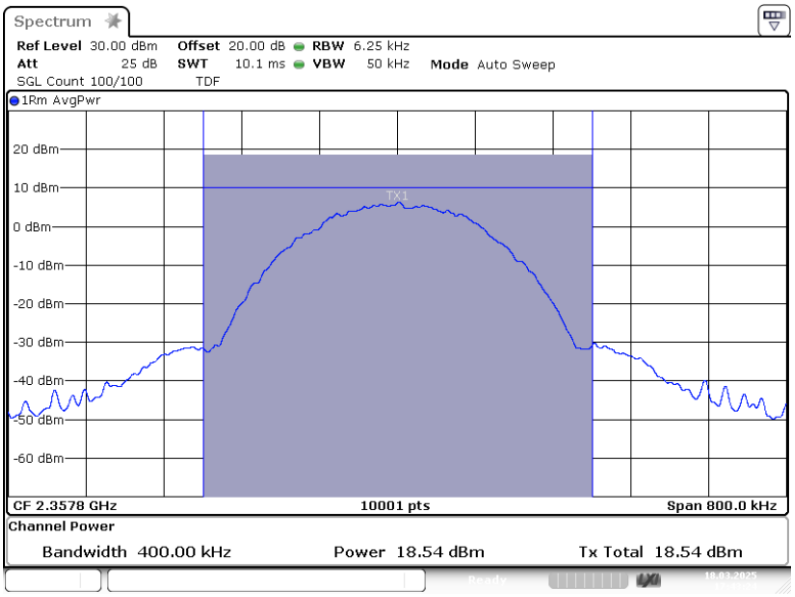
3.5.3 Power AWGN Out +3 2.35750G

Band: WCS 2300; Frequency: 2.3578 GHz; Band edge: f0; Mod: GSM;
Input power 0.3 dB < AGC



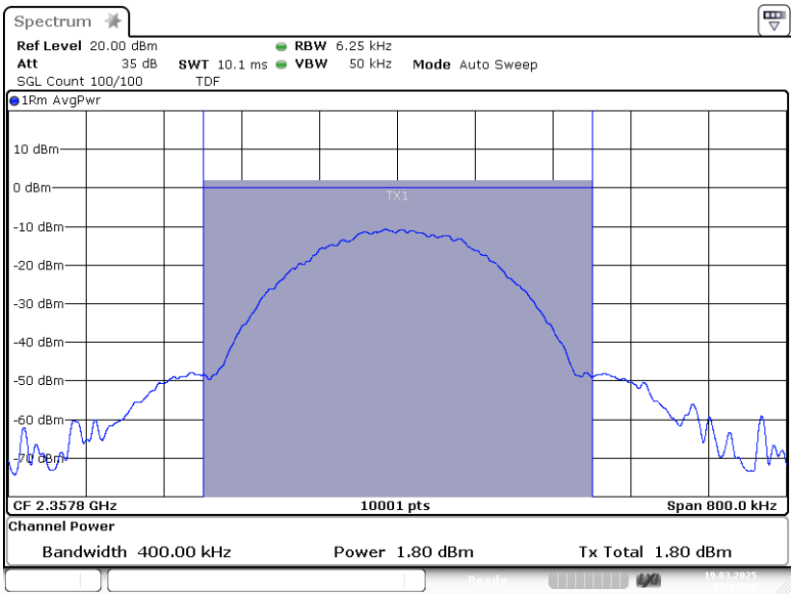
3.5.3 Power GSM In-0.3 2.35780G

Band: WCS 2300; Frequency: 2.3578 GHz; Band edge: f0; Mod: GSM;
Output power 0.3 dB < AGC



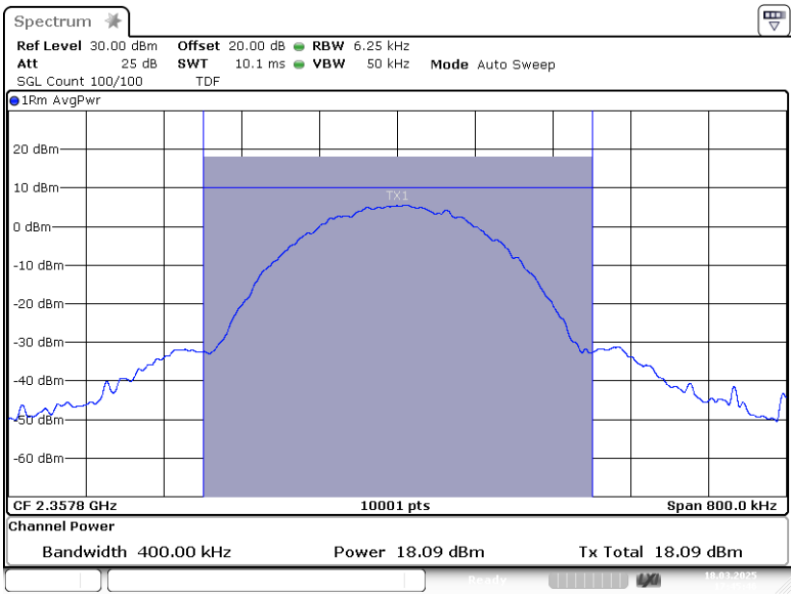
3.5.3 Power GSM Out -0.3 2.35780G

Band: WCS 2300; Frequency: 2.3578 GHz; Band edge: f0; Mod: GSM;
Input power 3 dB > AGC



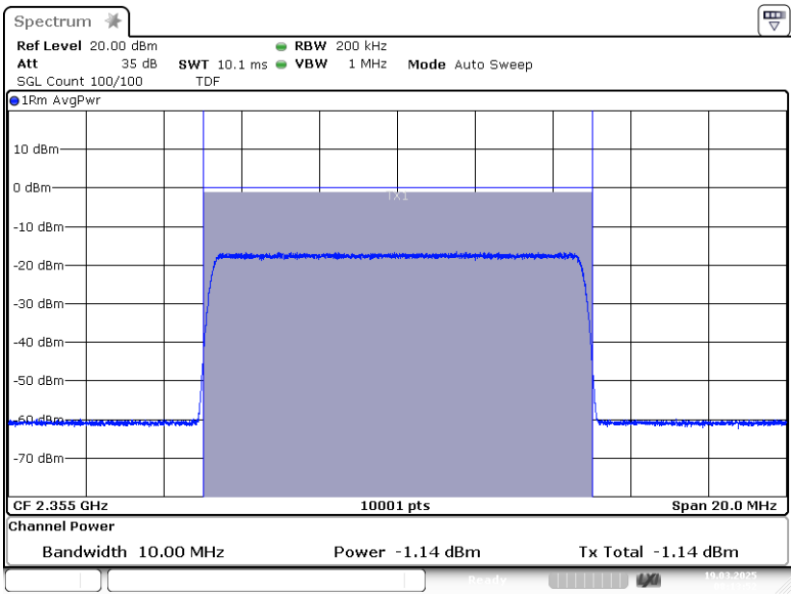
3.5.3 Power GSM In+3 2.35780G

Band: WCS 2300; Frequency: 2.3578 GHz; Band edge: f0; Mod: GSM;
Output power 3 dB > AGC



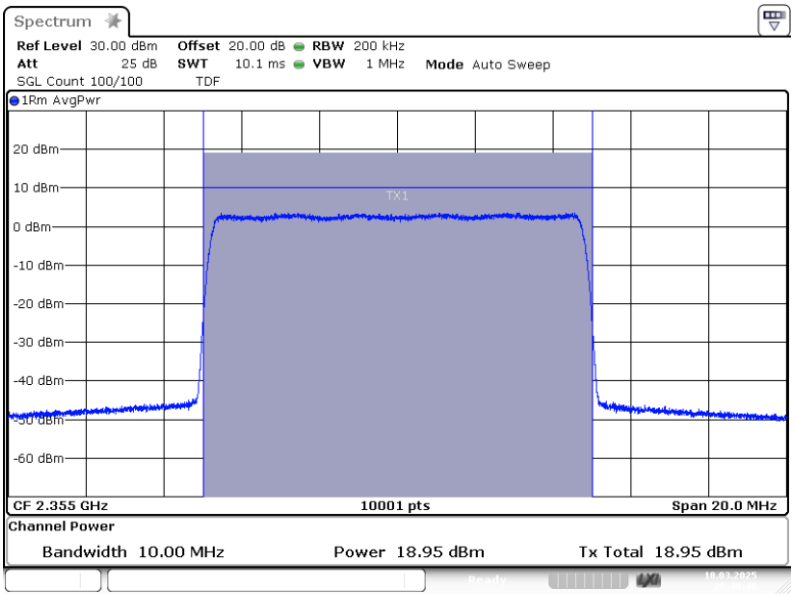
3.5.3 Power GSM Out +3 2.35780G

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: AWGN 10M;
Input power 0.3 dB < AGC



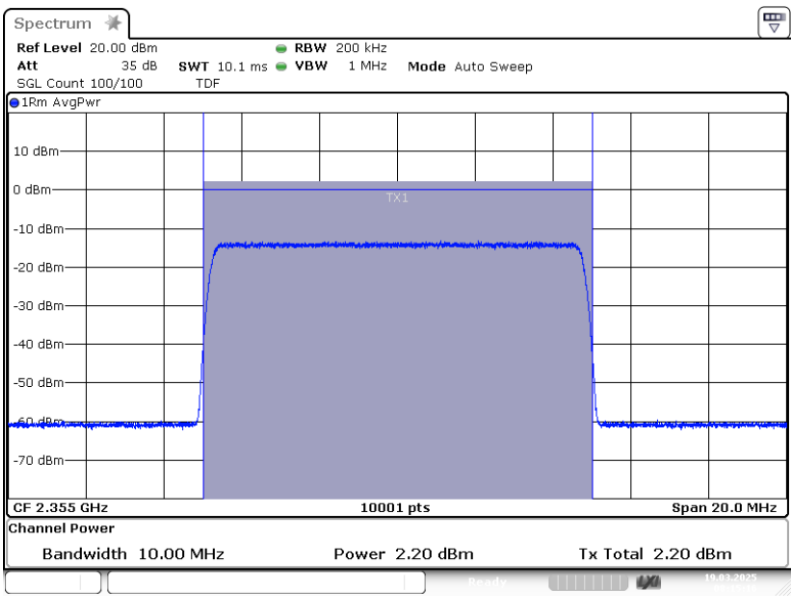
3.5.3 Power AWGN 10M In-0.3 2.35500G

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: AWGN 10M;
Output power 0.3 dB < AGC



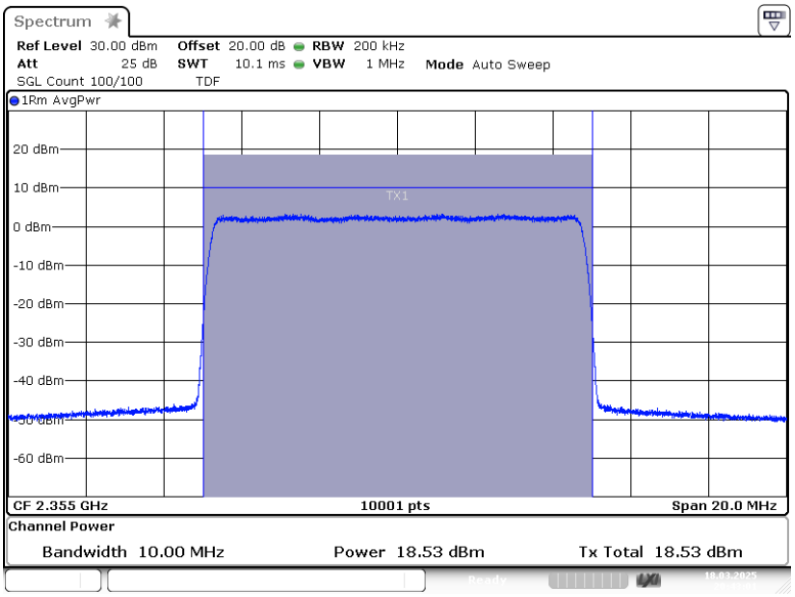
3.5.3 Power AWGN 10M Out -0.3 2.35500G

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: AWGN 10M;
Input power 3 dB > AGC



3.5.3 Power AWGN 10M In+3 2.35500G

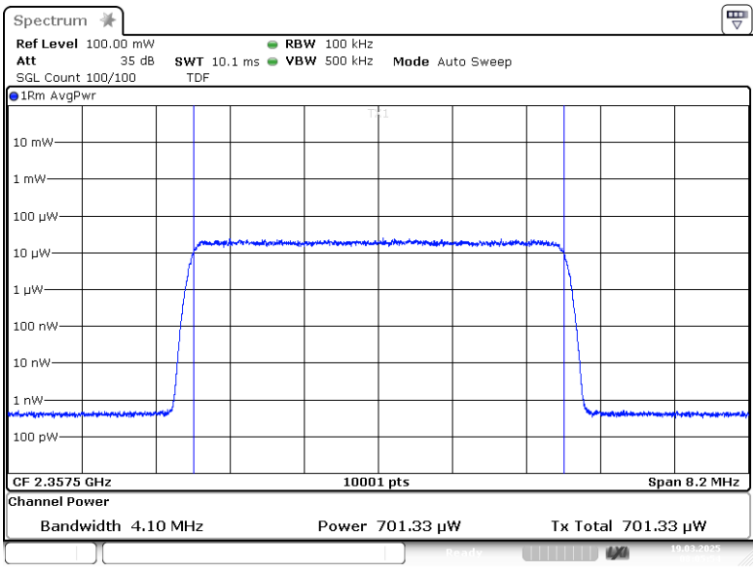
Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: AWGN 10M;
Output power 3 dB > AGC



3.5.3 Power AWGN 10M Out +3 2.35500G

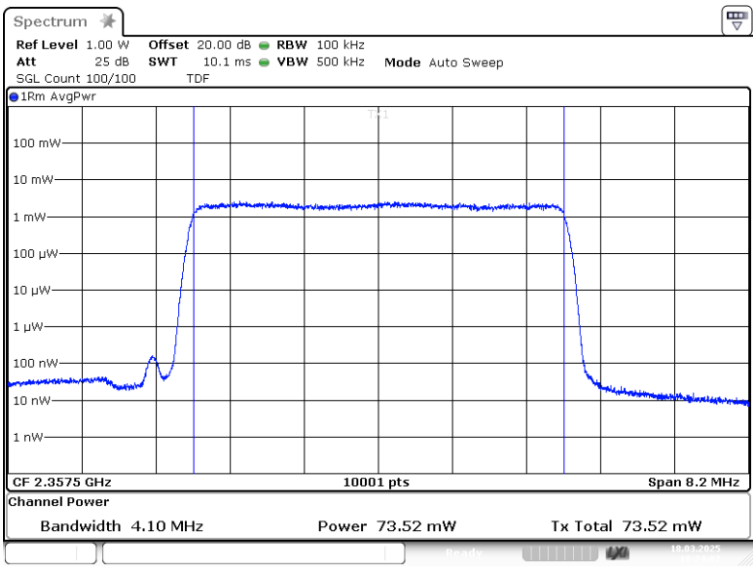
ISED plots

Band: WCS 2300; Frequency: 2.3575 GHz; Band edge: f0; Mod: AWGN;
Input power 0.3 dB < AGC



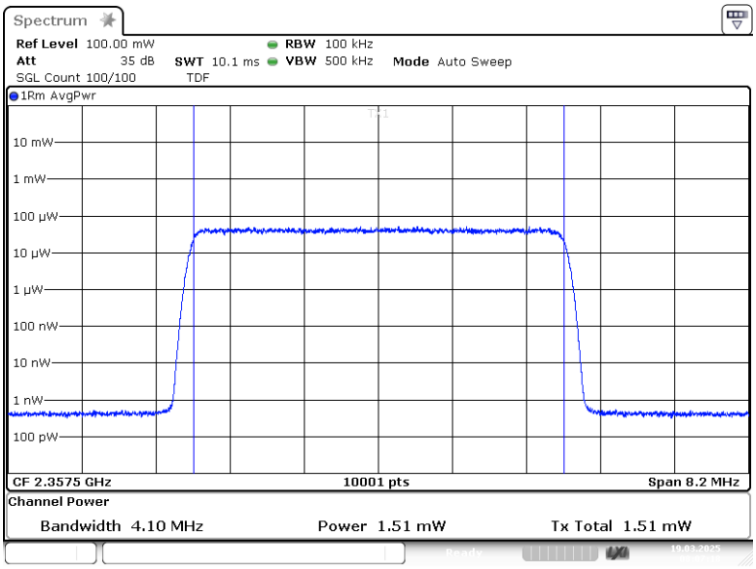
3.5.3 Power_W AWGN In-0.3 2.35750G

Band: WCS 2300; Frequency: 2.3575 GHz; Band edge: f0; Mod: AWGN;
Output power 0.3 dB < AGC



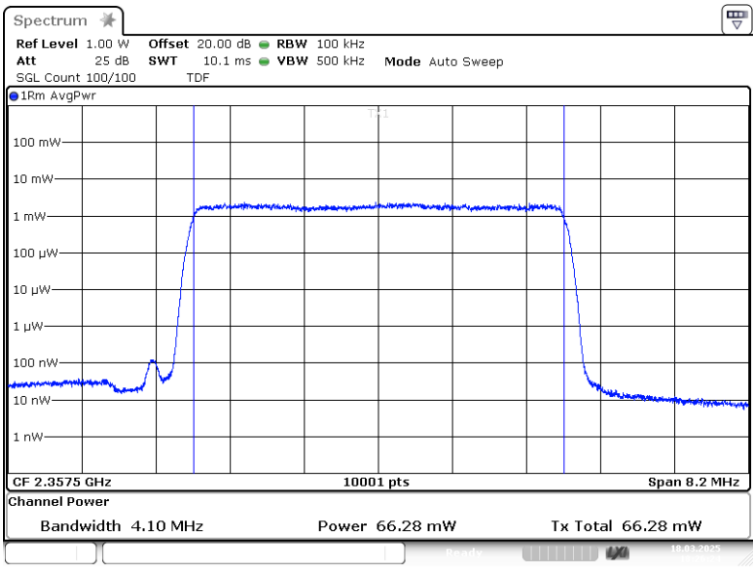
3.5.3 Power_W AWGN Out -0.3 2.35750G

Band: WCS 2300; Frequency: 2.3575 GHz; Band edge: f0; Mod: AWGN;
Input power 3 dB > AGC



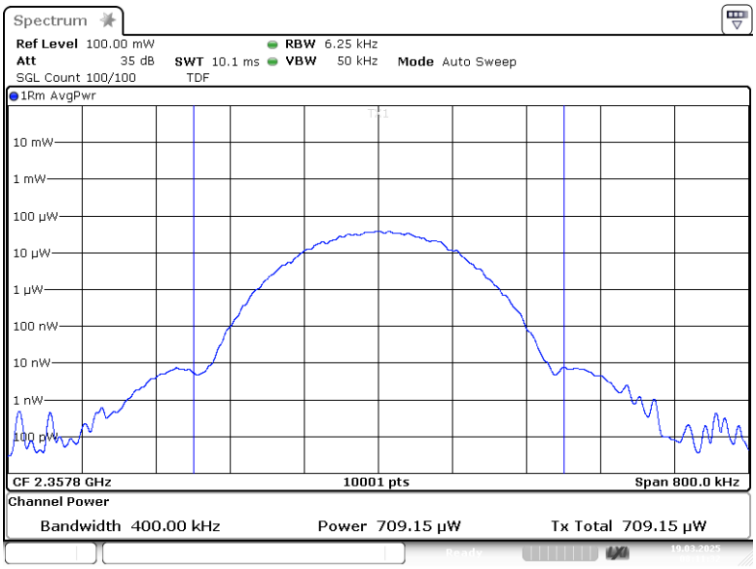
3.5.3 Power_W AWGN In+3 2.35750G

Band: WCS 2300; Frequency: 2.3575 GHz; Band edge: f0; Mod: AWGN;
Output power 3 dB > AGC



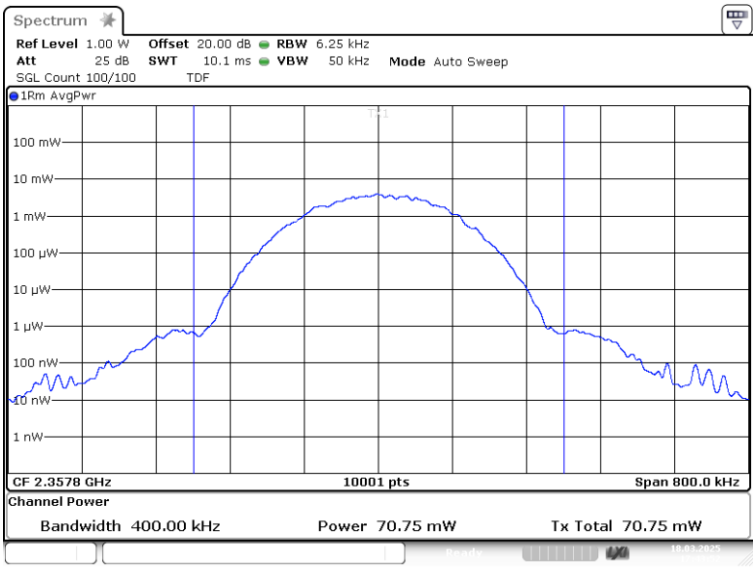
3.5.3 Power_W AWGN Out +3 2.35750G

Band: WCS 2300; Frequency: 2.3578 GHz; Band edge: f0; Mod: GSM;
Input power 0.3 dB < AGC



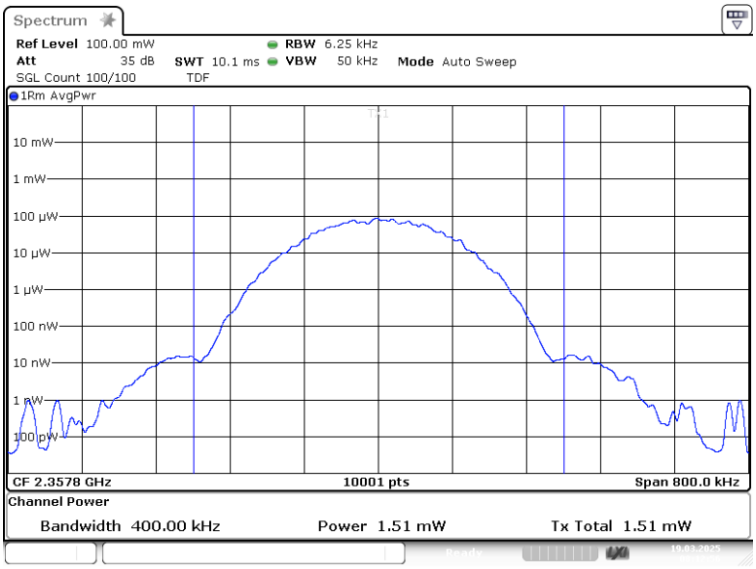
3.5.3 Power_W GSM In-0.3 2.35780G

Band: WCS 2300; Frequency: 2.3578 GHz; Band edge: f0; Mod: GSM;
Output power 0.3 dB < AGC



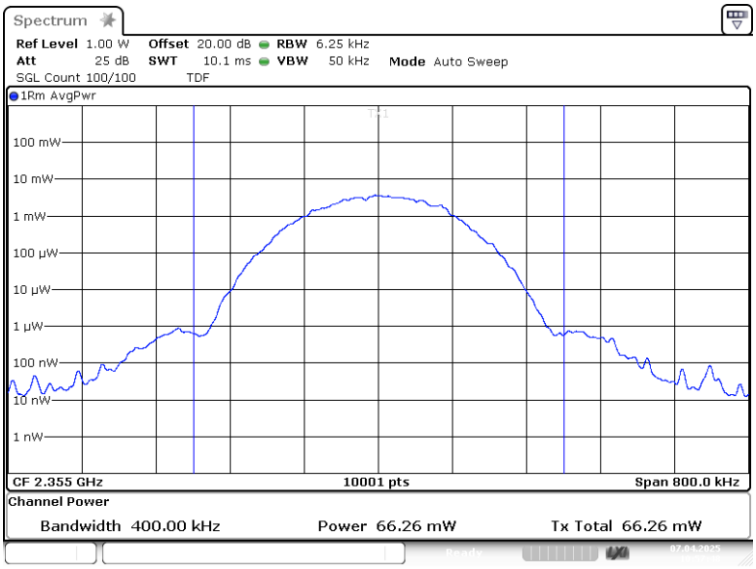
3.5.3 Power_W GSM Out -0.3 2.35780G

Band: WCS 2300; Frequency: 2.3578 GHz; Band edge: f0; Mod: GSM;
Input power 3 dB > AGC



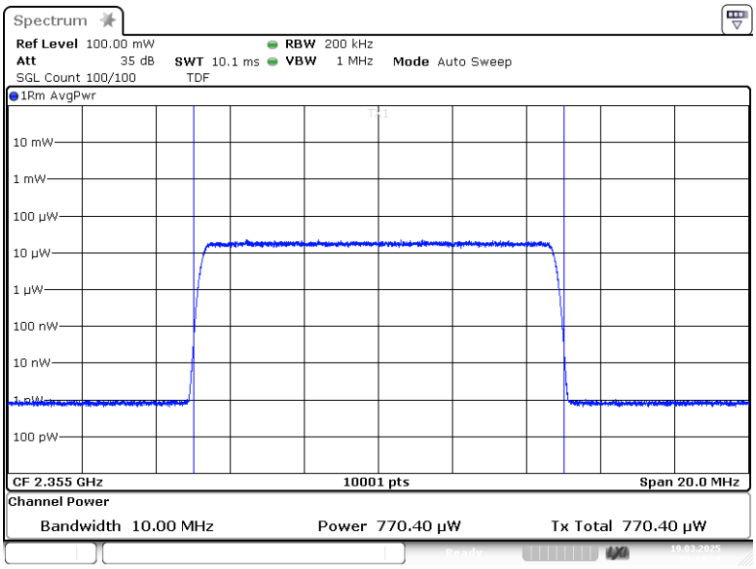
3.5.3 Power_W GSM In+3 2.35780G

Band: WCS 2300; Frequency: 2.3578 GHz; Band edge: f0; Mod: GSM;
Output power 3 dB > AGC



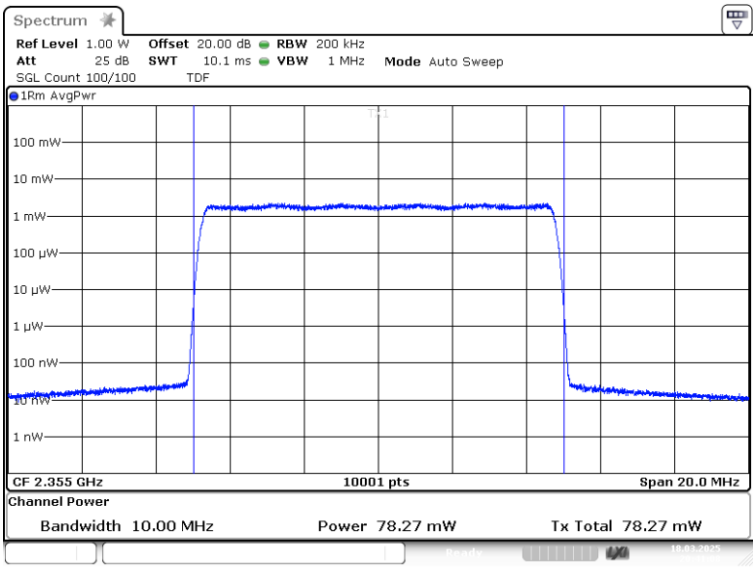
3.5.3 Power_W GSM Out +3 2.35500G

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: AWGN 10M;
Input power 0.3 dB < AGC



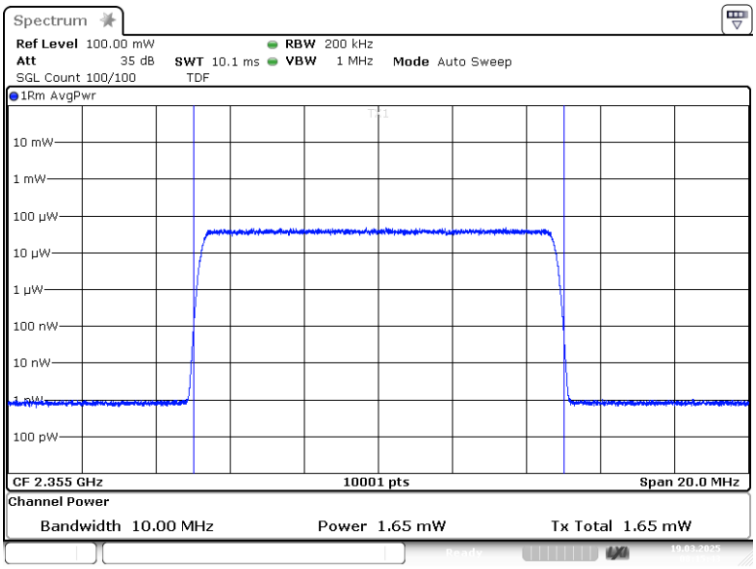
3.5.3 Power_W AWGN 10M In-0.3 2.35500G

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: AWGN 10M;
Output power 0.3 dB < AGC



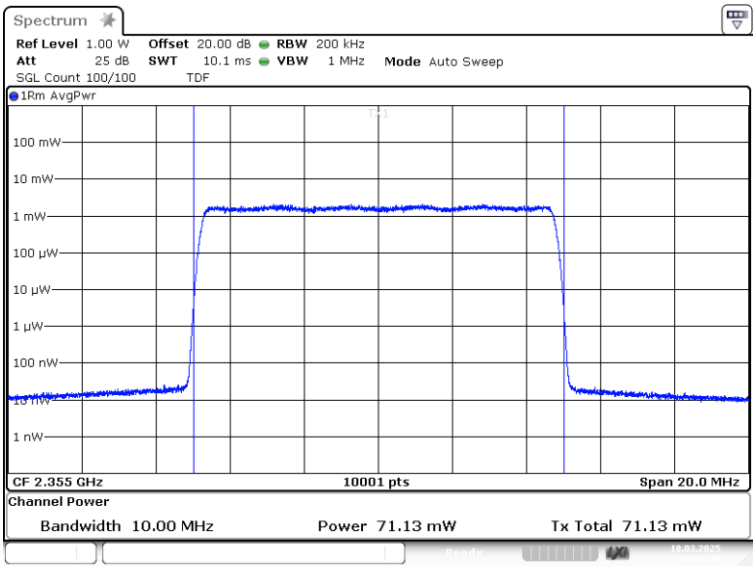
3.5.3 Power_W AWGN 10M Out -0.3 2.35500G

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: AWGN 10M;
Input power 3 dB > AGC



3.5.3 Power_W AWGN 10M In+3 2.35500G

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: AWGN 10M;
Output power 3 dB > AGC



3.5.3 Power_W AWGN 10M Out +3 2.35500G

5.1.6 TEST EQUIPMENT USED

- Conducted

5.2 PEAK TO AVERAGE RATIO

Standard FCC Part 27, §27.50

The test was performed according to:
ANSI C63.26

Test date: 2025-03-18 – 2025-03-19

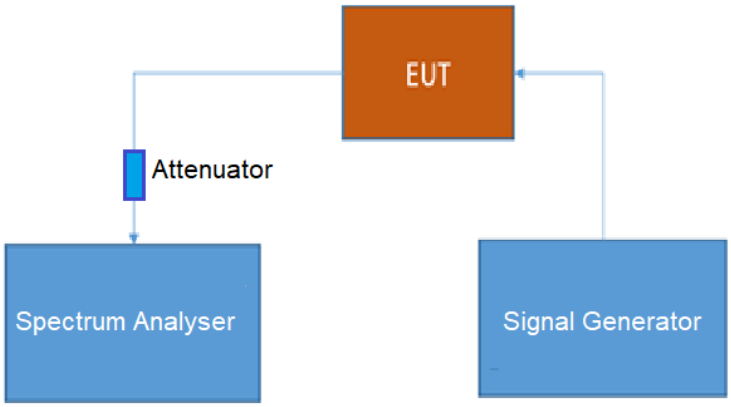
Environmental conditions: 23.5 °C; 23 % r. H./22.9 °C; 22 % r. H.

Test engineer: Thomas Hufnagel

5.2.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the occupied bandwith in comparison between the input and output signal of a bosster.

The EUT was connected to the test setup according to the following diagram:



The attenuation of the measuring and stimulus path are known for each measured frequency and are considered.

The Spectrum Analyzer settings can be directly found in the measurement diagrams.

5.2.2 TEST REQUIREMENTS/LIMITS

Subpart C – Technical standards

§ 27.50

Abstract § 27.50 from FCC:

(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) ……

(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.

Abstract RSS-195 from ISED:

5.5.1 Peak to Average Power Ratio (PAPR) for Base and Fixed Station Equipment in the Frequency Ranges 2305-2315 MHz and 2350-2360 MHz

The PAPR of the transmitter output power of base and fixed station equipment shall not exceed 13 dB for more than 0.1% of the time, using a signal that corresponds to the highest PAPR during periods of continuous transmission.

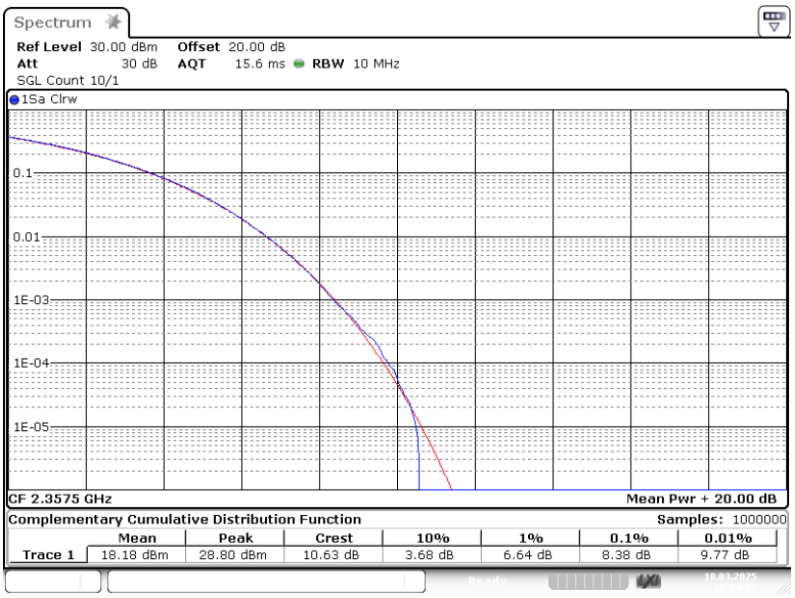
5.2.3 TEST PROTOCOL

Band 30 WCS 2300, downlink						
Signal type	**Input power**	**Frequency [MHz]**	**Input power [dBm]**	**PAPR [dB]**	**Limit PAPR [dB]**	**Margin to limit [dB]**
Wideband	0.3 dB < AGC	2357.5	-1.1	8.4	13.0	4.6
Wideband	3 dB > AGC	2357.5	2.2	8.4	13.0	4.6
Narrowband	0.3 dB < AGC	2357.8	-1.0	0.1	13.0	12.9
Narrowband	3 dB > AGC	2357.8	2.3	0.1	13.0	12.9
Wideband 5G	0.3 dB < AGC	2355.0	-0.5	8.5	13.0	4.5
Wideband 5G	3 dB > AGC	2355.0	2.8	8.4	13.0	4.6

Remark: Please see next sub-clause for the measurement plot.

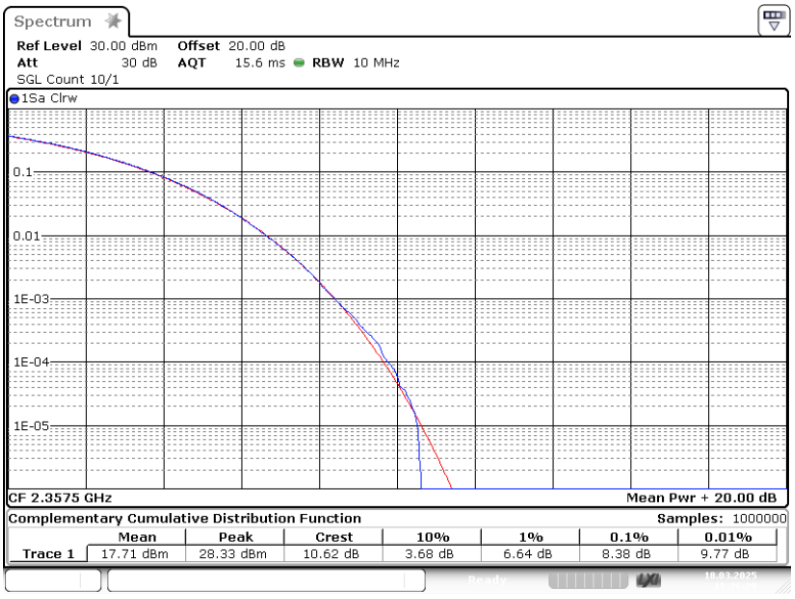
5.2.4 MEASUREMENT PLOT

Band: WCS 2300; Frequency: 2.3575 GHz; Band edge: f0; Mod: AWGN; PAPR 0.3 dB < AGC



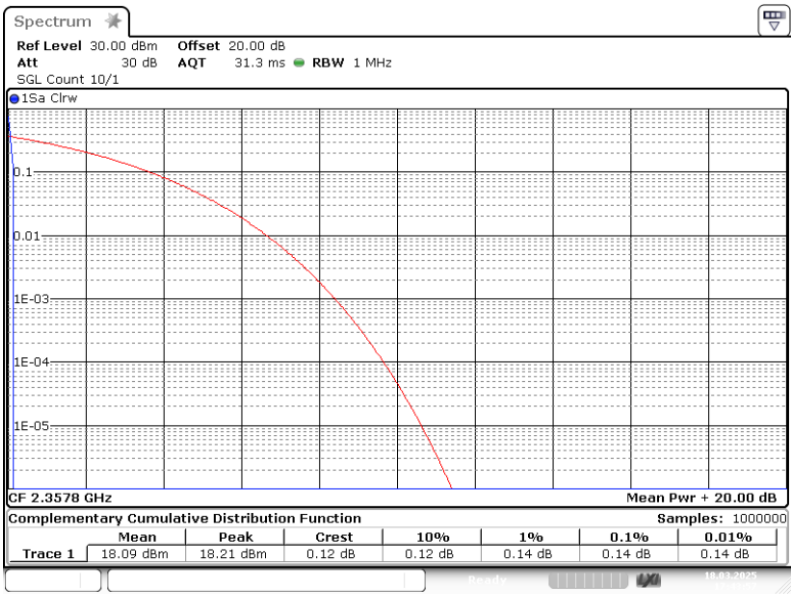
4.0 PAPR AWGN Out -0.3 2.358G

Band: WCS 2300; Frequency: 2.3575 GHz; Band edge: f0; Mod: AWGN; PAPR 3 dB > AGC



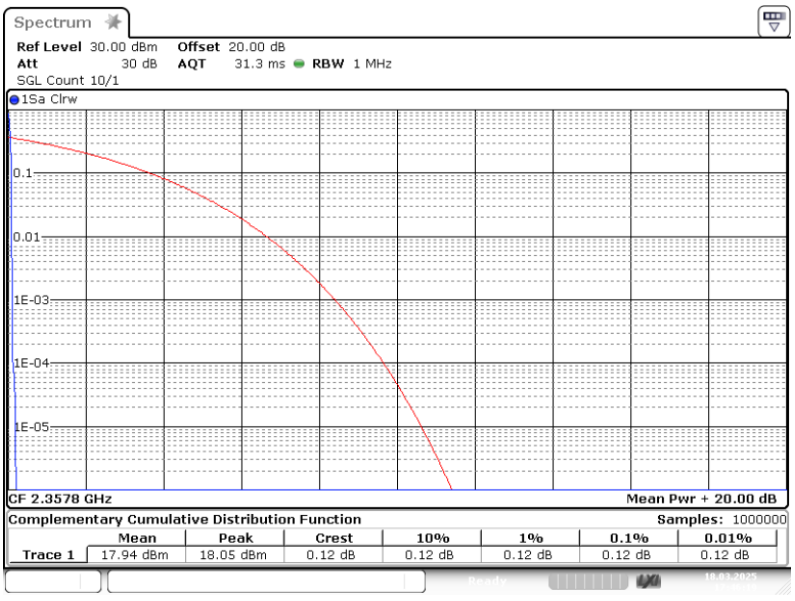
4.0 PAPR AWGN Out +3 2.358G

Band: WCS 2300; Frequency: 2.3578 GHz; Band edge: f0; Mod: GSM; PAPR 0.3 dB < AGC



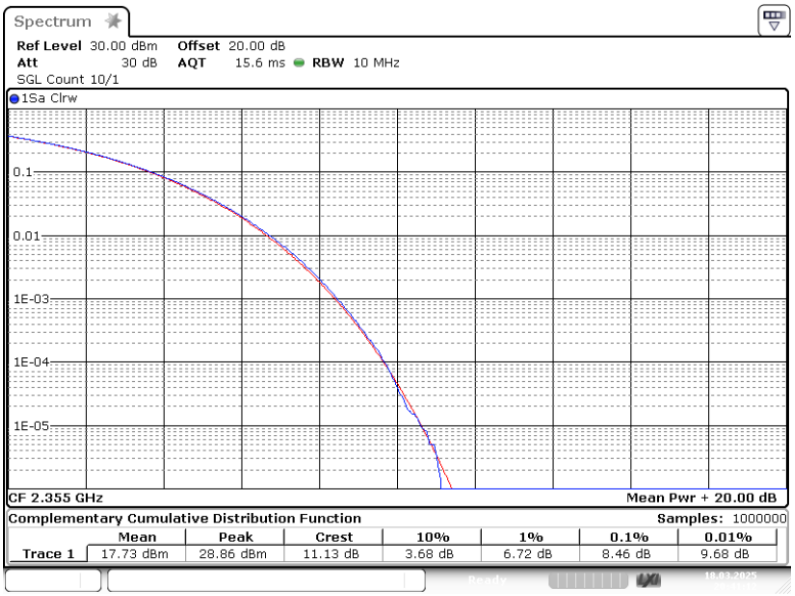
4.0 PAPR GSM Out -0.3 2.358G

Band: WCS 2300; Frequency: 2.3578 GHz; Band edge: f0; Mod: GSM; PAPR 3 dB > AGC



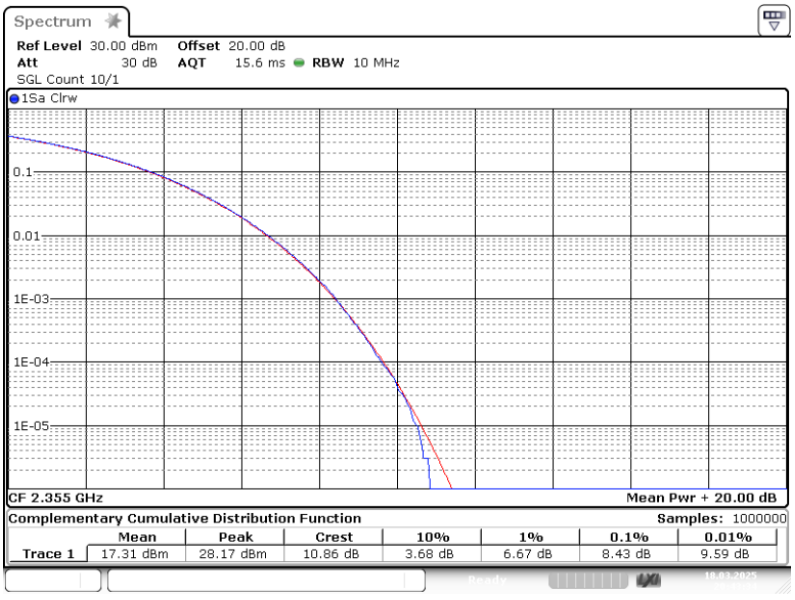
4.0 PAPR GSM Out +3 2.358G

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: AWGN 10M; PAPR 0.3 dB < AGC



4.0 PAPR AWGN 10M Out -0.3 2.355G

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: AWGN 10M; PAPR 3 dB > AGC



4.0 PAPR AWGN 10M Out +3 2.355G

5.2.5 TEST EQUIPMENT USED

- Conducted

5.3 OCCUPIED BANDWIDTH/INPUT-VERSUS-OUTPUT SPECTRUM

Standard FCC Part 2.1049; Occupied bandwidth

The test was performed according to:
ANSI C63.26, KDB 935210 D05 v01r04: 3.4

Test date: 2025-03-18 – 2025-03-19

Environmental conditions: 23.5 °C; 23 % r. H./22.9 °C; 22 % r. H.

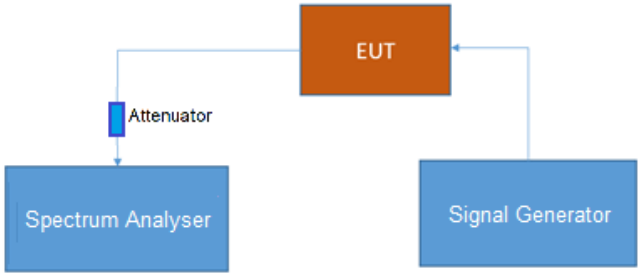
Test engineer: Thomas Hufnagel

5.3.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the applicable conducted spurious emission limits per FCC §2.1049, RSS-GEN 6.4 and RSS-131-5.2.2

The EUT was connected to the test setups according to the following diagram:

Test Setup step 1: Measuring characteristics of test signals



Test Setup step 2; Occupied Bandwidth/Input-versus-output spectrum

The attenuation of the measuring and stimulus path are known for each measured frequency and are considered.

The Spectrum Analyzer settings can be directly found in the measurement diagrams.

5.3.2 TEST REQUIREMENTS/LIMITS

Abstract § 2.1049 from FCC:

FCC Part 2.1049; Occupied Bandwidth:

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.3 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

(h) Transmitters employing digital modulation techniques—when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the user.

(i) Transmitters designed for other types of modulation—when modulated by an appropriate signal of sufficient amplitude to be representative of the type of service in which used. A description of the input signal should be supplied.

Abstract RSS-GEN from ISED:

RSS-GEN; 6.7 Occupied Bandwidth

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

In some cases, the "x dB bandwidth" is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated x dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.

- The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.

- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

Abstract RSS-131 from ISED:

RSS-131; 9.2 Input-versus-output spectrum

The spectral growth of the 26 dB bandwidth or occupied bandwidth of the output signal shall be less than 5% of the input signal spectrum.

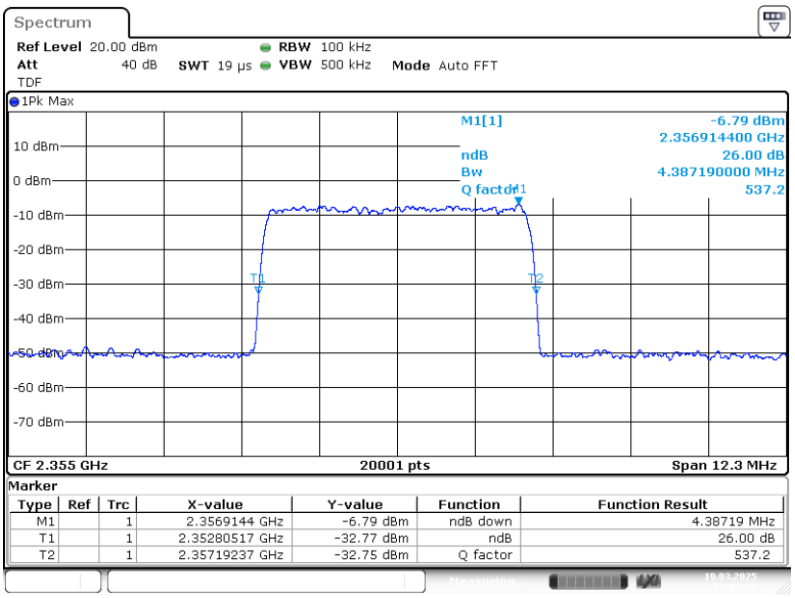
5.3.3 TEST PROTOCOL

Band 66 AWS 1700, downlink							
Signal type	**Input power**	**Signal frequency [MHz]**	**Occupied bandwidth SG [kHz]**	**Occupied bandwidth booster [kHz]**	**Delta occupied bandwidth [kHz]**	**Limit delta occupied bandwidth [kHz]**	**Margin to limit [kHz]**
Wideband	0.3 dB < AGC	2355.0	4387.2	4387.8	0.6	205.0	204.4
Wideband	3 dB > AGC	2355.0	4386.6	4388.4	1.8	205.0	203.2
Narrowband	0.3 dB < AGC	2356.0	316.0	312.9	3.1	10.0	6.9
Narrowband	3 dB > AGC	2356.0	317.9	319.7	1.9	10.0	8.1
Wideband 5G	0.3 dB < AGC	2355.0	9932.5	9935.5	3.0	470.0	467.0
Wideband 5G	3 dB > AGC	2355.0	9946.0	9928.0	18.0	470.0	452.0

Remark: Please see next sub-clause for the measurement plot.

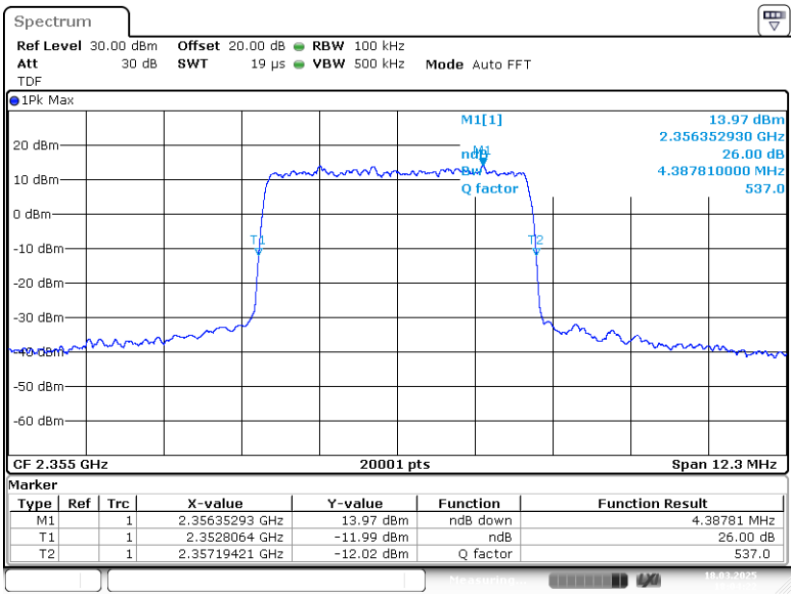
5.3.4 MEASUREMENT PLOT

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: AWGN;
Input OCBw 0.3 dB < AGC



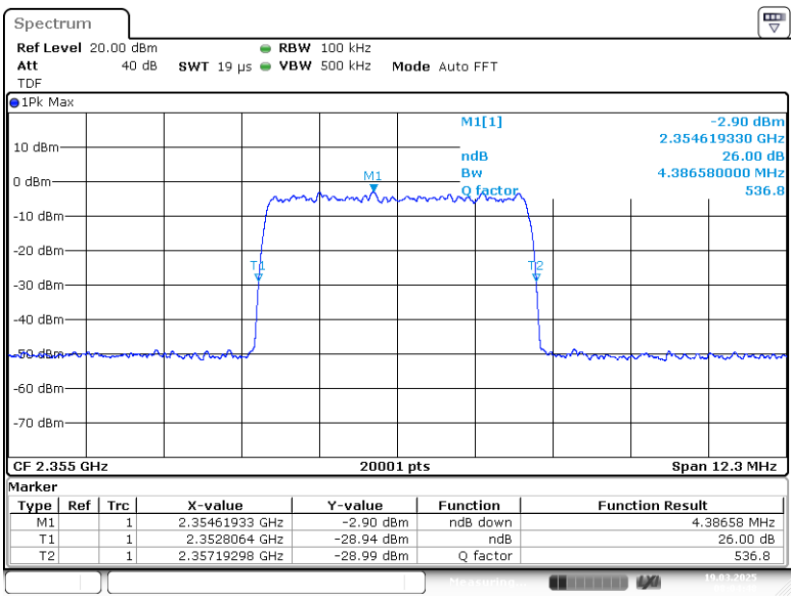
3.4 OCBw AWGN In-0.3 2.3550G _26dB

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: AWGN;
Output OCBw 0.3 dB < AGC



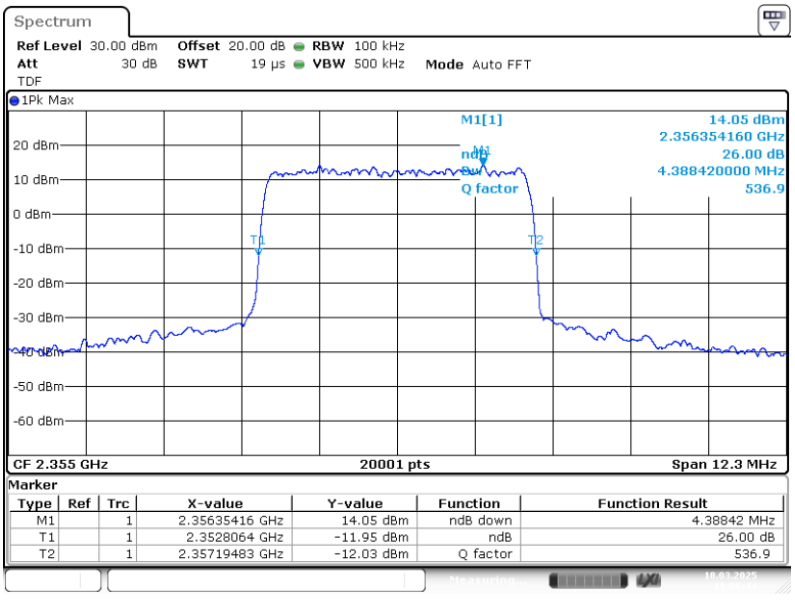
3.4 OCBw AWGN Out -0.3 2.3550G _26dB

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: AWGN;
Input OCBw 3 dB > AGC



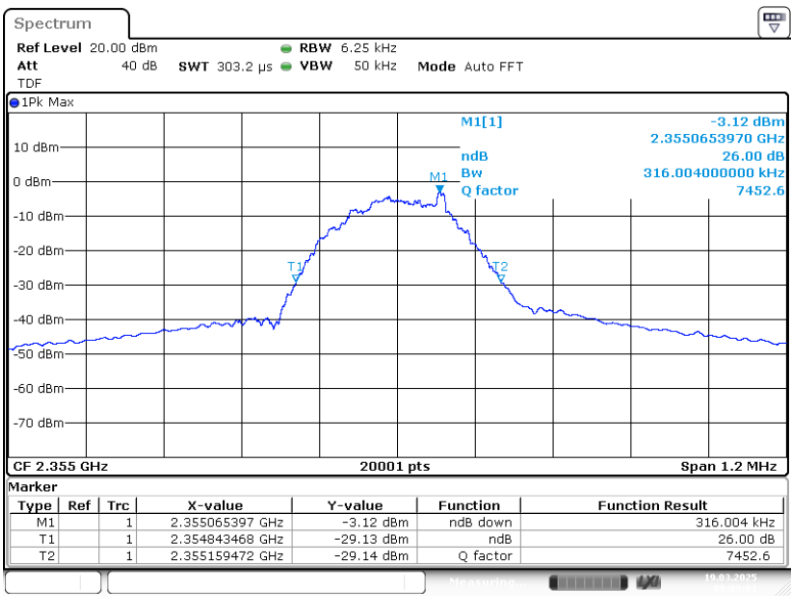
3.4 OCBw AWGN In+3 2.3550G _26dB

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: AWGN;
Output OCBw 3 dB > AGC



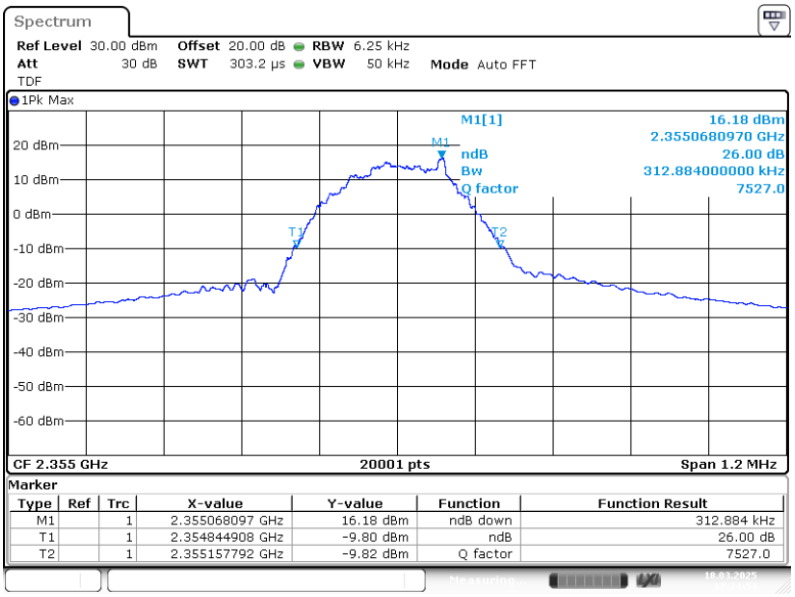
3.4 OCBw AWGN Out +3 2.3550G _26dB

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: GSM;
Input OCBw 0.3 dB < AGC



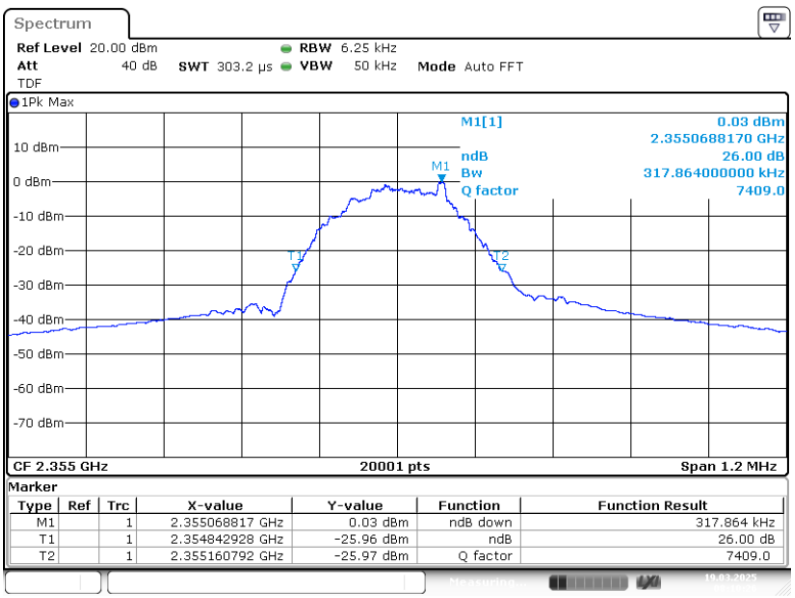
3.4 OCBw GSM In-0.3 2.3550G _26dB

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: GSM;
Output OCBw 0.3 dB < AGC



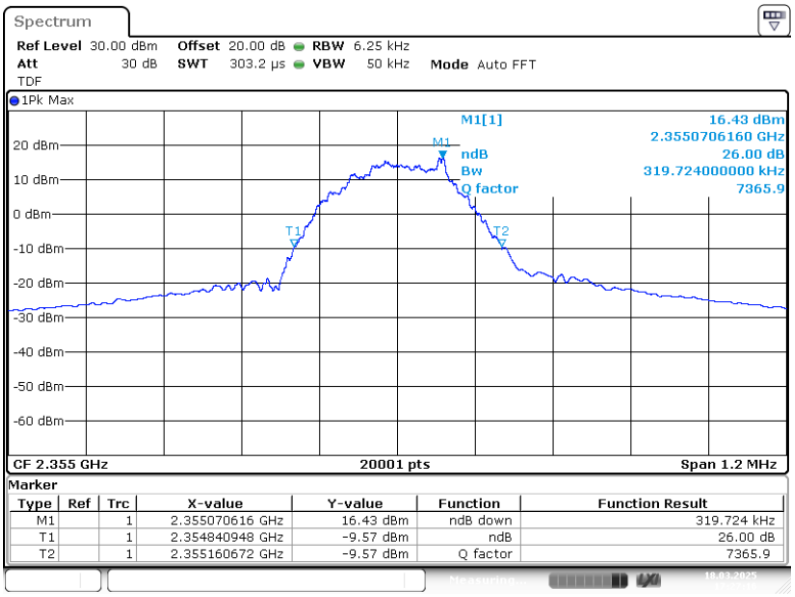
3.4 OCBw GSM Out -0.3 2.3550G _26dB

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: GSM;
Input OCBw 3 dB > AGC



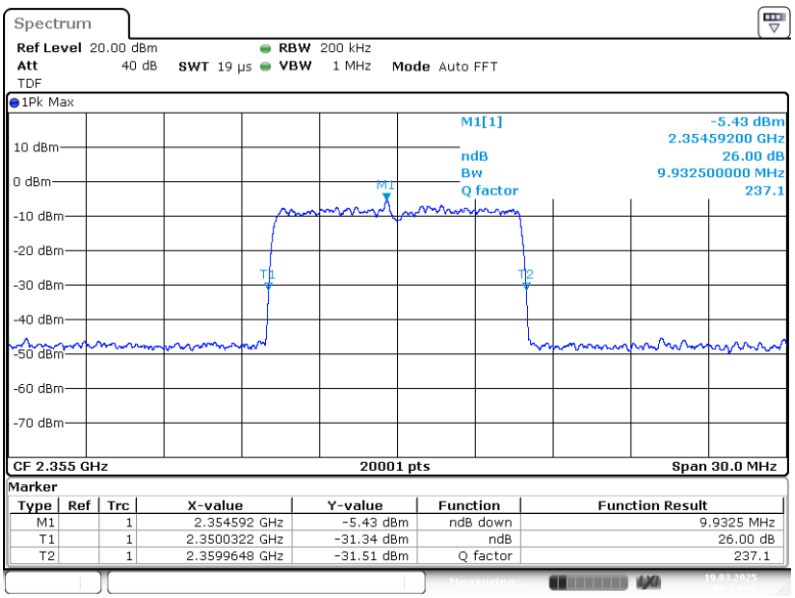
3.4 OCBw GSM In+3 2.3550G _26dB

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: GSM;
Output OCBw 3 dB > AGC



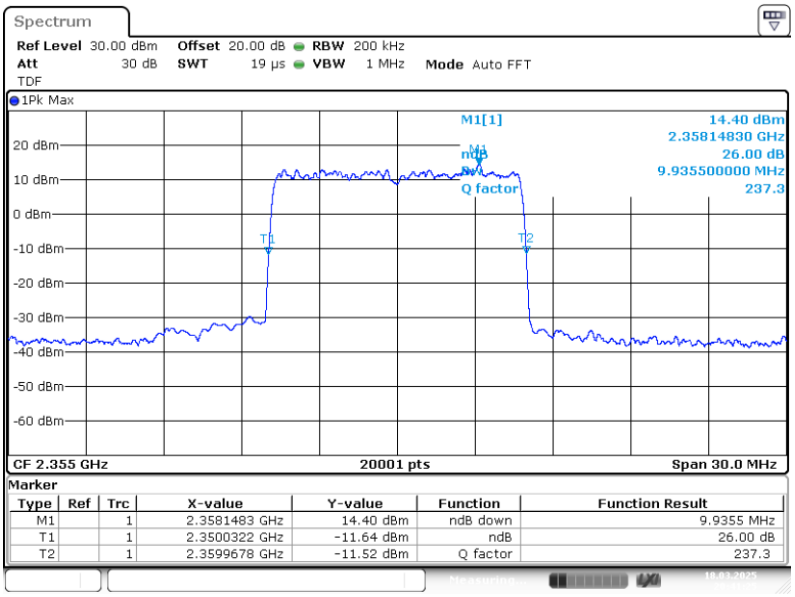
3.4 OCBw GSM Out +3 2.3550G _26dB

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: AWGN 10M;
Input OCBw 0.3 dB < AGC



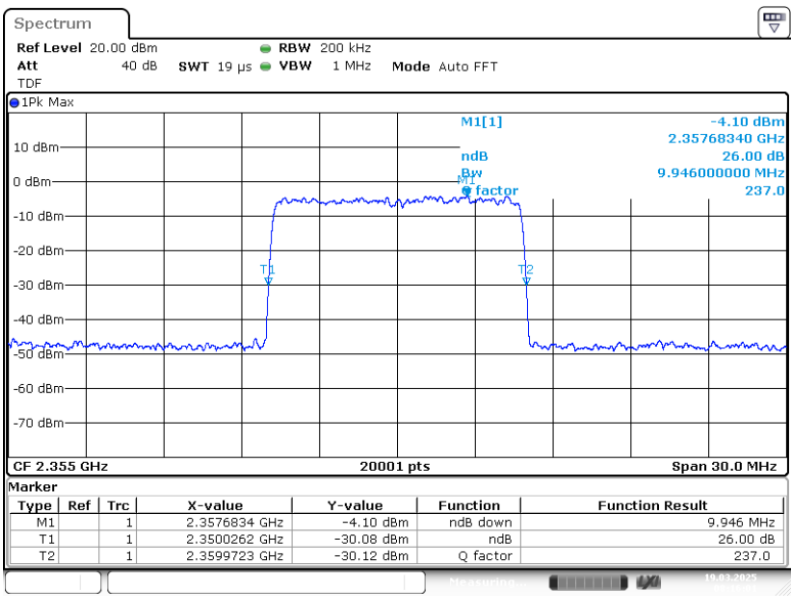
3.4 OCBw AWGN 10M In-0.3 2.3550G _26dB

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: AWGN 10M;
Output OCBw 0.3 dB < AGC



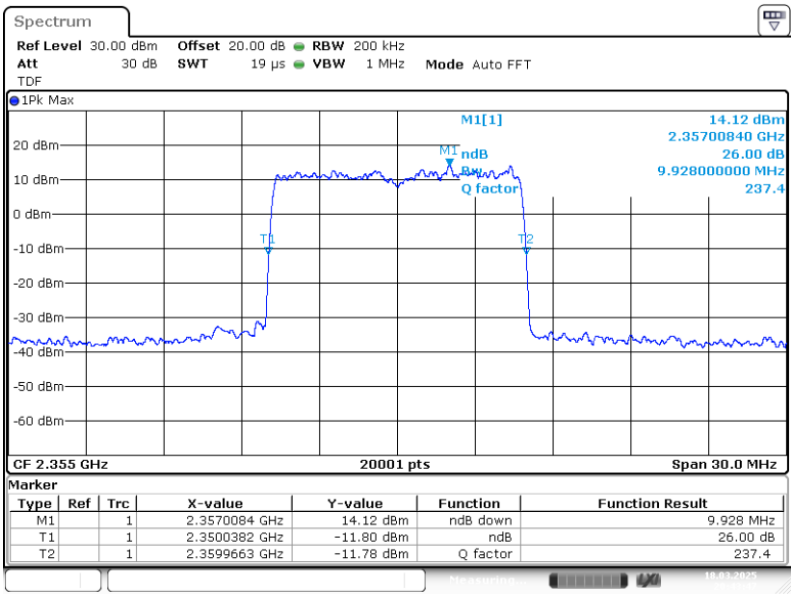
3.4 OCBw AWGN 10M Out -0.3 2.3550G _26dB

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: AWGN 10M;
Input OCBw 3 dB > AGC



3.4 OCBw AWGN 10M In+3 2.3550G _26dB

Band: WCS 2300; Frequency: 2.3550 GHz; Band edge: mid; Mod: AWGN 10M;
Output OCBw 3 dB > AGC



3.4 OCBw AWGN 10M Out +3 2.3550G _26dB

5.3.5 TEST EQUIPMENT USED

- Conducted

5.4 CONDUCTED SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Standard FCC Part §2.1051, §27.53

The test was performed according to:
ANSI C63.26

Test date: 2025-03-18 – 2025-03-19

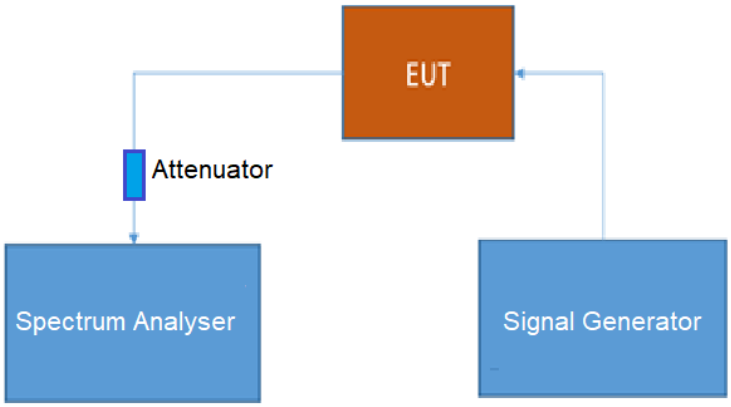
Environmental conditions: 23.5 °C; 23 % r. H./22.9 °C; 22 % r. H.

Test engineer: Thomas Hufnagel

5.4.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the signal booster power and gain limits and requirements for industrial signal boosters.

The EUT was connected to the test setup according to the following diagram:



The attenuation of the measuring and stimulus path are known for each measured frequency and are considered.

The Spectrum Analyzer settings can be directly found in the measurement diagrams.

5.4.2 TEST REQUIREMENTS/LIMITS

Abstract § 2.1051 from FCC:

FCC Part 2.1051; Measurement required: Spurious emissions at antenna terminal:

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

Part 27; Miscellaneous Wireless Communication Services

Subpart C – Technical standards

§27.53 – Emission limits

Abstract § 27.53 FCC:

(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.

(2) For fixed customer premises equipment (CPE) stations operating in the 2305-2320 MHz band and the 2345-2360 MHz band transmitting with more than 2 watts per 5 megahertz average EIRP:

(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.

(3) For fixed CPE stations operating in the 2305-2320 MHz and 2345-2360 MHz bands transmitting with 2 watts per 5 megahertz average EIRP or less:

(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, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324 MHz and between 2341 and 2345 MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328 MHz and between 2337 and 2341 MHz, and not less than 67 + 10 log (P) dB on all frequencies between 2328 and 2337 MHz;

(ii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 55 + 10 log (P) dB on all frequencies between 2296 and 2300 MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296 MHz, 67 + 10 log (P) dB on all frequencies between 2288 and 2292 MHz, and 70 + 10 log (P) dB below 2288 MHz;

(iii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365 MHz, and not less than 70 + 10 log (P) dB above 2365 MHz.

Abstract RSS-195 from ISED

5.6 Transmitter Unwanted Emissions

The transmitter unwanted emissions shall be measured with a resolution bandwidth of 1 MHz. A smaller resolution bandwidth is permitted provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz. However, in the 1 MHz bands immediately adjacent to the edges of the frequency range(s) in which the equipment is allowed to operate, a resolution bandwidth of as close as possible to, without being less than 1% of the occupied bandwidth, shall be employed provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz#

5.6.1 Base Station, Fixed Station and High-Power Fixed Subscriber Equipment

The power of any emission outside the frequency range(s) in which the equipment operates shall be attenuated below the transmitter power, P(dBW), by the amount indicated in Table 1 and graphically represented in Figure 1, where p is the transmitter output power measured in watts.

Table 1 — Unwanted Emissions for Base Station, Fixed Station and High-Power Fixed Subscriber Equipment

Frequency (MHz)	Attenuation (dB)
<2200	$43 + 10 \log_{10}(p)$
2200 - 2285	$75 + 10 \log_{10}(p)$
2285 - 2287.5	$72 + 10 \log_{10}(p)$
2287.5 - 2300	$70 + 10 \log_{10}(p)$
2300 - 2305	$43 + 10 \log_{10}(p)$
2305 - 2320	$43 + 10 \log_{10}(p)$ Note
2320 - 2345	$75 + 10 \log_{10}(p)$
2345 - 2360	$43 + 10 \log_{10}(p)$ Note
2360 - 2362.5	$43 + 10 \log_{10}(p)$
2362.5 - 2365	$55 + 10 \log_{10}(p)$
2365 - 2367.5	$70 + 10 \log_{10}(p)$
2367.5 - 2370	$72 + 10 \log_{10}(p)$
2370 - 2395	$75 + 10 \log_{10}(p)$
>2395	$43 + 10 \log_{10}(p)$

Note: Measured at the edges of the highest and lowest frequency range(s) in which the equipment is designed to operate. See Section 5.2 for the permitted frequency ranges for the various equipment types.

5.4.3 TEST PROTOCOL

General considerations concerning the limits:

The measuring bandwidth of 1 MHz was chosen according the test requirements exept at the band edges: At the band edges reducing of measurement bandwidth was necessary to prevent overlaying the RF-signal over the spurious emissions.
Also outside the downlink frequency band at lower frequencies the measurement bandwidths were reduced to have the possibility to record the spurious emissions at these lower frequencies.

At frequencies were measuring bandwidths were reduced also the limit lines were reduced according the given formula:

$$p\ RBWreduced\ [dBm] = 10 * \log\left(RBWreduced\ [kHz] \quad / \quad 1000\ kHz\right) + pRBW\ 1000\ kHz[dBm]$$

Hereby "p" are the limit lines' values.

Band 30, WCS 2300, downlink							
Test Frequency	**Signal Type**	**Spurious Freq. [MHz]**	**Spurious Level [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
low	Wideband	0.01259	-89.0	RMS	1	-75.0	14.0
low	Wideband	0.15749	-75.8	RMS	10	-65.0	10.8
low	Wideband	949.5	-63.5	RMS	100	-55.0	8.5
low	Wideband	2106.3	-47.3	RMS	1000	-45.0	2.3
low	Wideband	2285.9	-47.9	RMS	1000	-42.0	5.9
low	Wideband	2288.8	-55.2	RMS	100	-50.0	5.2
low	Wideband	2303.1	-37.8	RMS	100	-23.0	14.8
low	Wideband	2316.3	-36.5	RMS	100	-23.0	13.5
low	Wideband	2320.5	-56.6	RMS	100	-45.0	11.6
low	Wideband	2320.5	-56.6	RMS	100	-45.0	11.6
low	Wideband	2345.3	-38.4	RMS	100	-23.0	15.4
low	Wideband	2361.1	-38.4	RMS	100	-23.0	15.4
low	Wideband	2364.7	-37.6	RMS	100	-35.0	2.6
low	Wideband	2366.5	-56.9	RMS	100	-50.0	6.9
low	Wideband	2365.4	-57.7	RMS	100	-50.0	7.7
low	Wideband	2375.9	-56.5	RMS	100	-55.0	1.5
low	Wideband	2627.7	-45.2	RMS	1000	-45.0	0.2
low	Wideband	6831.0	-51.0	RMS	1000	-45.0	6.0
low	Wideband	19524.3	-51.1	RMS	1000	-45.0	6.1
low	Wideband	20322.2	-50.8	RMS	1000	-45.0	5.8
mid	Wideband	0.00941	-89.3	RMS	1	-75.0	14.3
mid	Wideband	0.15249	-76.0	RMS	10	-65.0	11.0
mid	Wideband	951.2	-64.0	RMS	100	-55.0	9.0
mid	Wideband	1811.4	-46.8	RMS	1000	-45.0	1.8
mid	Wideband	2285.1	-47.7	RMS	1000	-42.0	5.7
mid	Wideband	2290.2	-54.5	RMS	100	-50.0	4.5
mid	Wideband	2303.5	-37.3	RMS	100	-23.0	14.3
mid	Wideband	2307.8	-36.5	RMS	100	-23.0	13.5
mid	Wideband	2329.1	-56.8	RMS	100	-45.0	11.8
mid	Wideband	2320.0	-57.4	RMS	100	-45.0	12.4
mid	Wideband	2346.9	-37.5	RMS	100	-23.0	14.5
mid	Wideband	2361.1	-37.0	RMS	100	-23.0	14.0
mid	Wideband	2361.0	-37.8	RMS	100	-23.0	14.8
mid	Wideband	2366.3	-57.2	RMS	100	-50.0	7.2
mid	Wideband	2366.3	-57.4	RMS	100	-50.0	7.4
mid	Wideband	2366.3	-57.4	RMS	100	-50.0	7.4
mid	Wideband	2627.7	-47.7	RMS	1000	-45.0	2.7
mid	Wideband	6884.0	-50.8	RMS	1000	-45.0	5.8
mid	Wideband	19944.8	-51.2	RMS	1000	-45.0	6.2
mid	Wideband	20299.2	-50.5	RMS	1000	-45.0	5.5

Band 30, WCS 2300, downlink							
Test Frequency	**Signal Type**	**Spurious Freq. [MHz]**	**Spurious Level [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
high	Wideband	0.01105	-90.2	RMS	1	-75.0	15.2
high	Wideband	0.15249	-75.7	RMS	10	-65.0	10.7
high	Wideband	949.2	-64.4	RMS	100	-55.0	9.4
high	Wideband	1825.4	-46.9	RMS	1000	-45.0	1.9
high	Wideband	2280.8	-48.8	RMS	1000	-45.0	3.8
high	Wideband	2290.0	-54.8	RMS	100	-50.0	4.8
high	Wideband	2301.5	-37.8	RMS	100	-23.0	14.8
high	Wideband	2305.0	-36.8	RMS	100	-23.0	13.8
high	Wideband	2320.2	-57.1	RMS	100	-45.0	12.1
high	Wideband	2338.2	-56.4	RMS	100	-55.0	1.4
high	Wideband	2348.5	-37.6	RMS	100	-23.0	14.6
high	Wideband	2362.5	-38.6	RMS	100	-23.0	15.6
high	Wideband	2361.8	-38.9	RMS	100	-23.0	15.9
high	Wideband	2365.3	-57.7	RMS	100	-50.0	7.7
high	Wideband	2369.6	-57.5	RMS	100	-52.0	5.5
high	Wideband	2372.8	-57.2	RMS	100	-55.0	2.2
high	Wideband	2627.7	-47.0	RMS	1000	-45.0	2.0
high	Wideband	6826.0	-50.8	RMS	1000	-45.0	5.8
high	Wideband	19979.3	-51.1	RMS	1000	-45.0	6.1
high	Wideband	20294.7	-50.7	RMS	1000	-45.0	5.7

Band 30, WCS 2300, downlink							
Test Frequency	**Signal Type**	**Spurious Freq. [MHz]**	**Spurious Level [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
low	Narrowband	0.02177	-90.1	RMS	1	-75.0	15.1
low	Narrowband	0.14749	-74.2	RMS	10	-65.0	9.2
low	Narrowband	950.8	-64.2	RMS	100	-55.0	9.2
low	Narrowband	1747.5	-47.3	RMS	1000	-45.0	2.3
low	Narrowband	2285.1	-50.2	RMS	1000	-42.0	8.2
low	Narrowband	2289.5	-55.0	RMS	100	-50.0	5.0
low	Narrowband	2304.8	-37.6	RMS	100	-23.0	14.6
low	Narrowband	2305.5	-36.8	RMS	100	-23.0	13.8
low	Narrowband	2326.6	-57.1	RMS	100	-45.0	12.1
low	Narrowband	2326.6	-57.1	RMS	100	-45.0	12.1
low	Narrowband	2346.2	-37.3	RMS	100	-23.0	14.3
low	Narrowband	2361.6	-38.1	RMS	100	-23.0	15.1
low	Narrowband	2361.6	-38.1	RMS	100	-23.0	15.1
low	Narrowband	2365.2	-58.0	RMS	100	-50.0	8.0
low	Narrowband	2365.1	-58.5	RMS	100	-50.0	8.5
low	Narrowband	2372.0	-57.4	RMS	100	-55.0	2.4
low	Narrowband	2627.7	-48.5	RMS	1000	-45.0	3.5
low	Narrowband	6960.0	-50.6	RMS	1000	-45.0	5.6
low	Narrowband	19971.8	-51.1	RMS	1000	-45.0	6.1
low	Narrowband	20280.2	-50.8	RMS	1000	-45.0	5.8
mid	Narrowband	0.00905	-89.5	RMS	1	-75.0	14.5
mid	Narrowband	0.15749	-75.7	RMS	10	-65.0	10.7
mid	Narrowband	813.6	-64.2	RMS	100	-55.0	9.2
mid	Narrowband	2193.8	-47.1	RMS	1000	-45.0	2.1
mid	Narrowband	2285.1	-47.3	RMS	1000	-42.0	5.3
mid	Narrowband	2289.5	-54.8	RMS	100	-50.0	4.8
mid	Narrowband	2303.6	-36.7	RMS	100	-23.0	13.7
mid	Narrowband	2303.6	-36.7	RMS	100	-23.0	13.7
mid	Narrowband	2326.6	-56.6	RMS	100	-45.0	11.6
mid	Narrowband	2321.9	-57.2	RMS	100	-45.0	12.2
mid	Narrowband	2347.2	-37.6	RMS	100	-23.0	14.6
mid	Narrowband	2361.1	-38.6	RMS	100	-23.0	15.6
mid	Narrowband	2364.2	-38.1	RMS	100	-35.0	3.1
mid	Narrowband	2365.6	-57.4	RMS	100	-50.0	7.4
mid	Narrowband	2365.6	-57.4	RMS	100	-50.0	7.4
mid	Narrowband	2372.0	-56.4	RMS	100	-55.0	1.4
mid	Narrowband	2627.7	-47.1	RMS	1000	-45.0	2.1
mid	Narrowband	6944.5	-50.8	RMS	1000	-45.0	5.8
mid	Narrowband	19547.3	-51.2	RMS	1000	-45.0	6.2
mid	Narrowband	20305.7	-50.6	RMS	1000	-45.0	5.6

Band 30, WCS 2300, downlink							
Test Frequency	**Signal Type**	**Spurious Freq. [MHz]**	**Spurious Level [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
high	Narrowband	0.00905	-89.5	RMS	1	-75.0	14.5
high	Narrowband	0.14249	-74.8	RMS	10	-65.0	9.8
high	Narrowband	950.4	-63.9	RMS	100	-55.0	8.9
high	Narrowband	2159.8	-47.3	RMS	1000	-45.0	2.3
high	Narrowband	2286.0	-47.4	RMS	1000	-42.0	5.4
high	Narrowband	2292.0	-54.5	RMS	100	-50.0	4.5
high	Narrowband	2304.5	-36.7	RMS	100	-23.0	13.7
high	Narrowband	2304.5	-36.7	RMS	100	-23.0	13.7
high	Narrowband	2326.4	-57.2	RMS	100	-45.0	12.2
high	Narrowband	2326.4	-57.4	RMS	100	-45.0	12.4
high	Narrowband	2345.9	-37.5	RMS	100	-23.0	14.5
high	Narrowband	2361.9	-37.0	RMS	100	-23.0	14.0
high	Narrowband	2361.9	-37.3	RMS	100	-23.0	14.3
high	Narrowband	2365.9	-57.4	RMS	100	-50.0	7.4
high	Narrowband	2365.9	-57.7	RMS	100	-50.0	7.7
high	Narrowband	2373.8	-56.9	RMS	100	-55.0	1.9
high	Narrowband	2627.7	-48.0	RMS	1000	-45.0	3.0
high	Narrowband	6892.0	-51.1	RMS	1000	-45.0	6.1
high	Narrowband	19984.3	-51.1	RMS	1000	-45.0	6.1
high	Narrowband	20291.7	-50.7	RMS	1000	-45.0	5.7

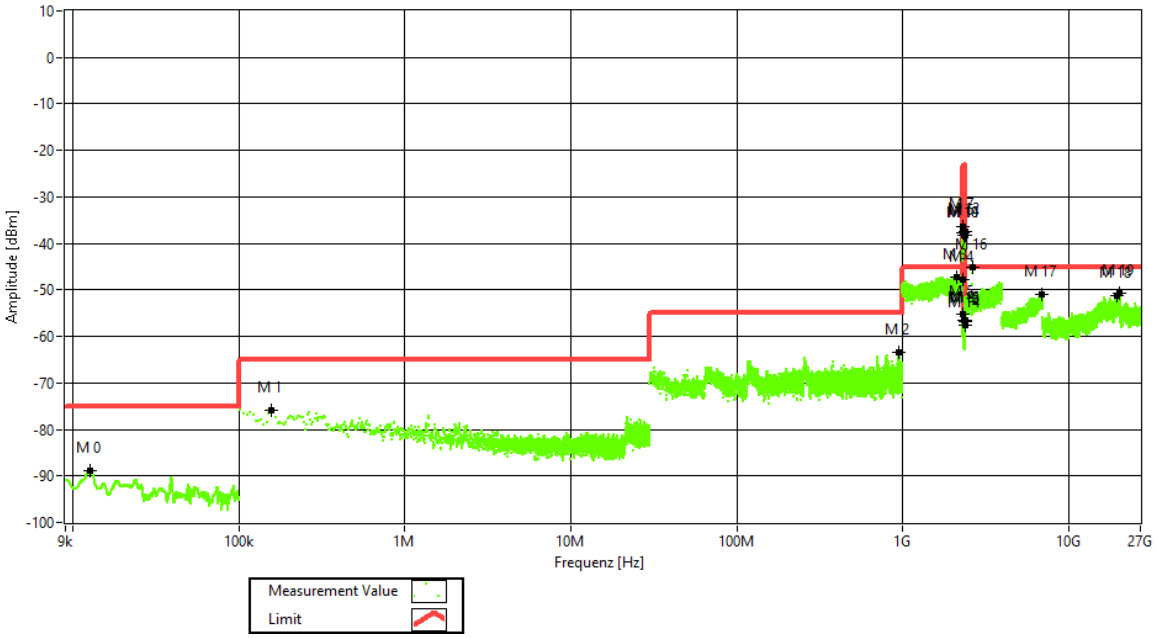
Band 30, WCS 2300, downlink							
Test Frequency	**Signal Type**	**Spurious Freq. [MHz]**	**Spurious Level [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
low	Wideband 5G	0.01105	-89.2	RMS	1	-75.0	14.2
low	Wideband 5G	0.15249	-75.6	RMS	10	-65.0	10.6
low	Wideband 5G	810.0	-63.7	RMS	100	-55.0	8.7
low	Wideband 5G	2130.3	-46.7	RMS	1000	-45.0	1.7
low	Wideband 5G	2282.3	-49.2	RMS	1000	-45.0	4.2
low	Wideband 5G	2290.9	-55.3	RMS	100	-50.0	5.3
low	Wideband 5G	2300.0	-37.3	RMS	100	-23.0	14.3
low	Wideband 5G	2306.2	-36.7	RMS	100	-23.0	13.7
low	Wideband 5G	2326.7	-57.2	RMS	100	-45.0	12.2
low	Wideband 5G	2334.4	-56.9	RMS	100	-55.0	1.9
low	Wideband 5G	2346.9	-37.8	RMS	100	-23.0	14.8
low	Wideband 5G	2361.0	-37.8	RMS	100	-23.0	14.8
low	Wideband 5G	2363.3	-37.3	RMS	100	-35.0	2.3
low	Wideband 5G	2365.2	-57.2	RMS	100	-50.0	7.2
low	Wideband 5G	2365.0	-57.9	RMS	100	-50.0	7.9
low	Wideband 5G	2365.2	-57.4	RMS	100	-50.0	7.4
low	Wideband 5G	3770.8	-48.3	RMS	1000	-45.0	3.3
low	Wideband 5G	6885.5	-50.2	RMS	1000	-45.0	5.2
low	Wideband 5G	19951.8	-51.3	RMS	1000	-45.0	6.3
low	Wideband 5G	20299.7	-50.7	RMS	1000	-45.0	5.7
mid	Wideband 5G	0.00941	-89.1	RMS	1	-75.0	14.1
mid	Wideband 5G	0.10250	-74.5	RMS	10	-65.0	9.5
mid	Wideband 5G	949.6	-64.0	RMS	100	-55.0	9.0
mid	Wideband 5G	2125.8	-46.6	RMS	1000	-45.0	1.6
mid	Wideband 5G	2283.8	-48.6	RMS	1000	-45.0	3.6
mid	Wideband 5G	2290.6	-54.8	RMS	100	-50.0	4.8
mid	Wideband 5G	2301.4	-36.2	RMS	100	-23.0	13.2
mid	Wideband 5G	2301.4	-37.2	RMS	100	-23.0	14.2
mid	Wideband 5G	2320.5	-57.4	RMS	100	-45.0	12.4
mid	Wideband 5G	2339.9	-57.2	RMS	100	-55.0	2.2
mid	Wideband 5G	2348.5	-36.8	RMS	100	-23.0	13.8
mid	Wideband 5G	2362.2	-38.6	RMS	100	-23.0	15.6
mid	Wideband 5G	2363.2	-38.1	RMS	100	-35.0	3.1
mid	Wideband 5G	2366.0	-57.2	RMS	100	-50.0	7.2
mid	Wideband 5G	2365.0	-57.5	RMS	100	-50.0	7.5
mid	Wideband 5G	2365.0	-57.7	RMS	100	-50.0	7.7
mid	Wideband 5G	2627.7	-47.6	RMS	1000	-45.0	2.6
mid	Wideband 5G	6925.5	-50.7	RMS	1000	-45.0	5.7
mid	Wideband 5G	19533.8	-51.3	RMS	1000	-45.0	6.3
mid	Wideband 5G	20305.7	-50.7	RMS	1000	-45.0	5.7

Band 30, WCS 2300, downlink							
Test Frequency	**Signal Type**	**Spurious Freq. [MHz]**	**Spurious Level [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
high	Wideband 5G	0.01395	-90.0	RMS	1	-75.0	15.0
high	Wideband 5G	0.15249	-75.6	RMS	10	-65.0	10.6
high	Wideband 5G	810.4	-63.3	RMS	100	-55.0	8.3
high	Wideband 5G	1710.0	-46.9	RMS	1000	-45.0	1.9
high	Wideband 5G	2287.4	-48.4	RMS	1000	-42.0	6.4
high	Wideband 5G	2290.8	-54.5	RMS	100	-50.0	4.5
high	Wideband 5G	2302.6	-36.5	RMS	100	-23.0	13.5
high	Wideband 5G	2302.6	-36.9	RMS	100	-23.0	13.9
high	Wideband 5G	2326.0	-56.5	RMS	100	-45.0	11.5
high	Wideband 5G	2326.0	-56.5	RMS	100	-45.0	11.5
high	Wideband 5G	2345.9	-37.6	RMS	100	-23.0	14.6
high	Wideband 5G	2361.0	-38.9	RMS	100	-23.0	15.9
high	Wideband 5G	2363.3	-38.3	RMS	100	-35.0	3.3
high	Wideband 5G	2366.2	-58.0	RMS	100	-50.0	8.0
high	Wideband 5G	2369.1	-56.9	RMS	100	-52.0	4.9
high	Wideband 5G	2369.1	-56.9	RMS	100	-52.0	4.9
high	Wideband 5G	2627.7	-47.2	RMS	1000	-45.0	2.2
high	Wideband 5G	6994.5	-50.7	RMS	1000	-45.0	5.7
high	Wideband 5G	19993.7	-51.2	RMS	1000	-45.0	6.2
high	Wideband 5G	20320.7	-50.4	RMS	1000	-45.0	5.4

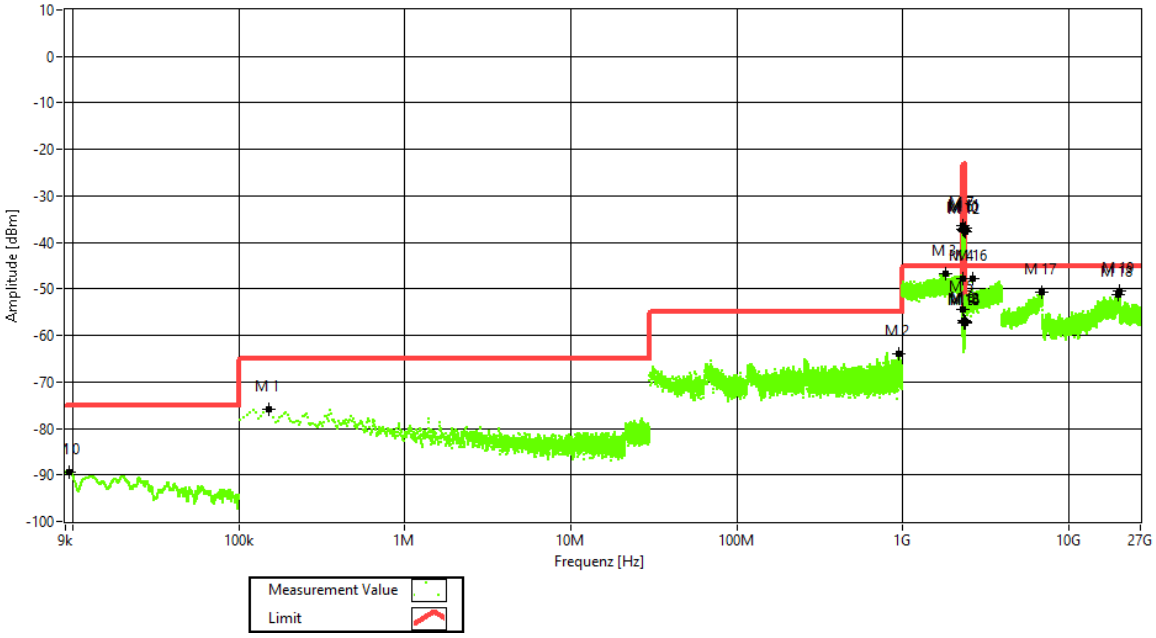
Remark: Please see next sub-clause for the measurement plot.

5.4.4 MEASUREMENT PLOT

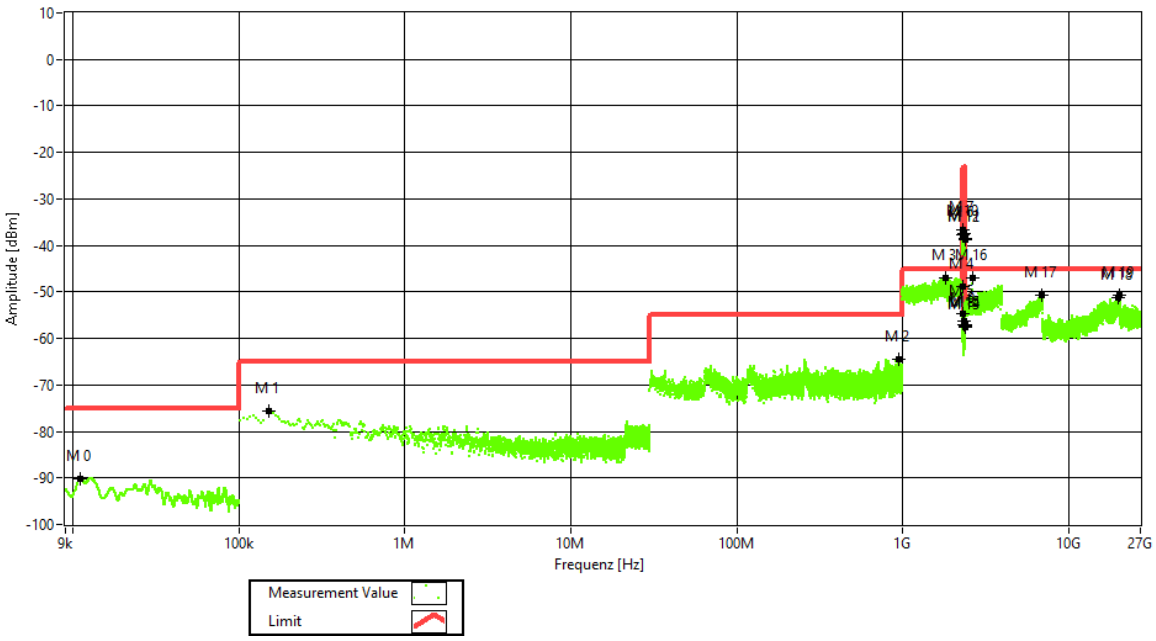
Frequency Band = WCS 2300; Test frequency = low; Direction = RF downlink;
Signal type = Wideband



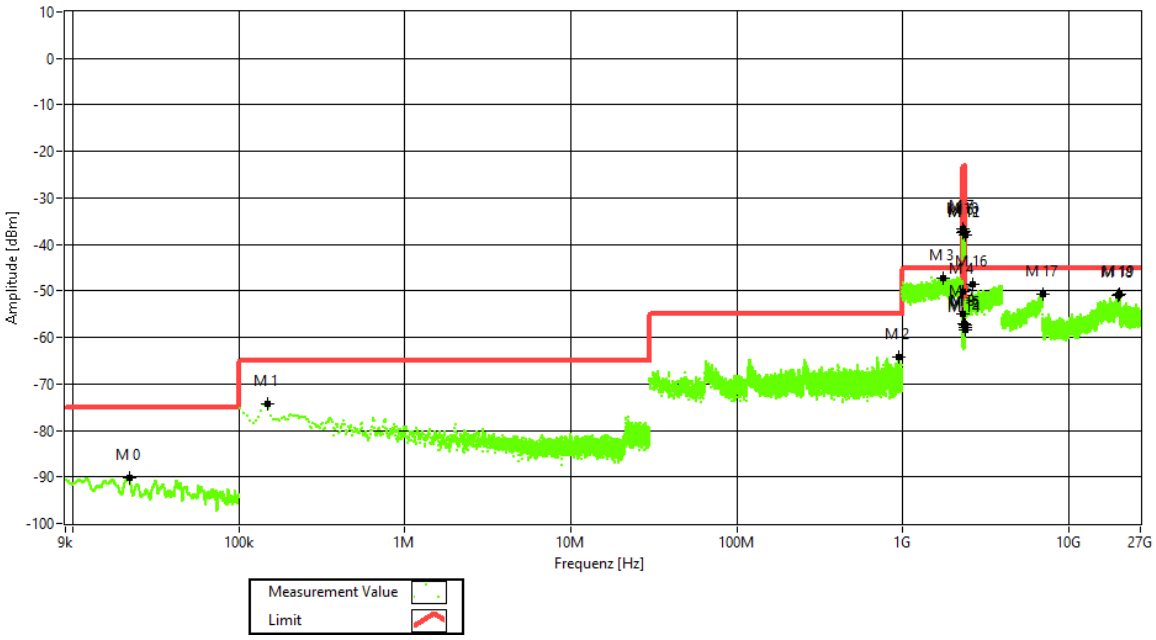
Frequency Band = WCS 2300; Test frequency = mid; Direction = RF downlink;
Signal type = Wideband



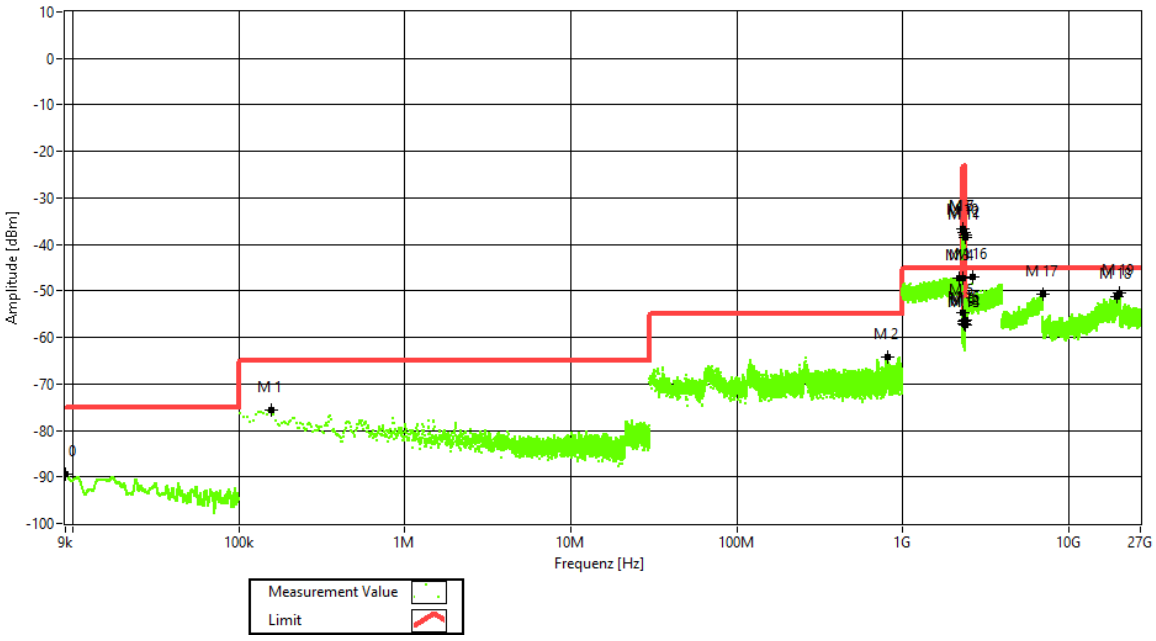
Frequency Band = WCS 2300; Test frequency = high; Direction = RF downlink;
Signal type = Wideband



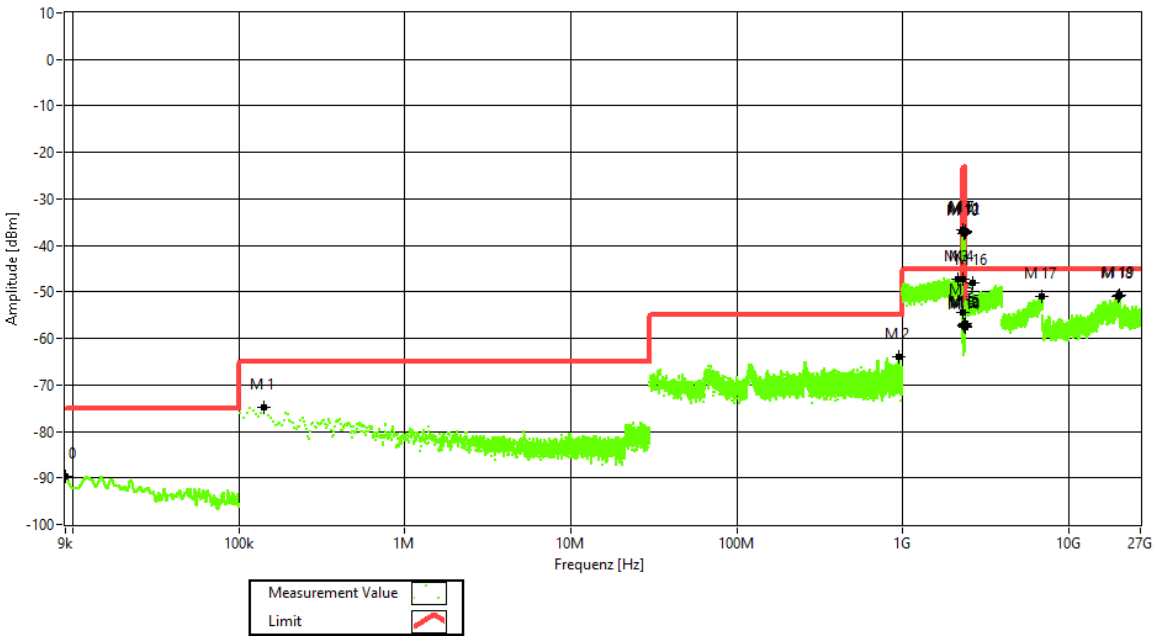
Frequency Band = WCS 2300; Test frequency = low; Direction = RF downlink;
Signal type = Narrowband



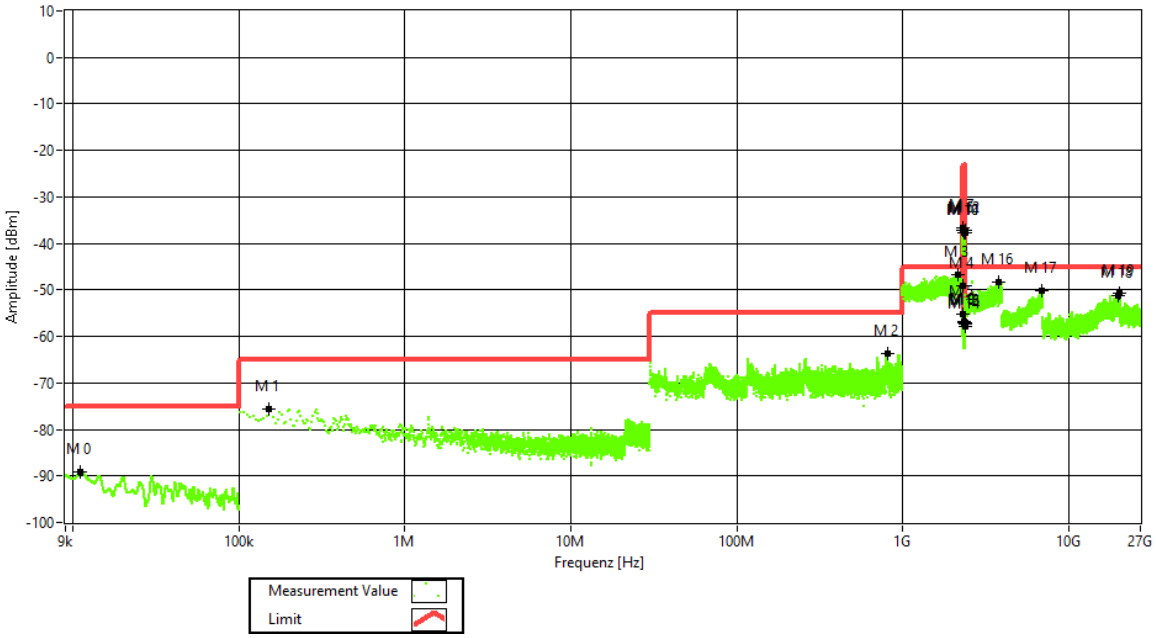
Frequency Band = WCS 2300; Test frequency = mid; Direction = RF downlink;
Signal type = Narrowband



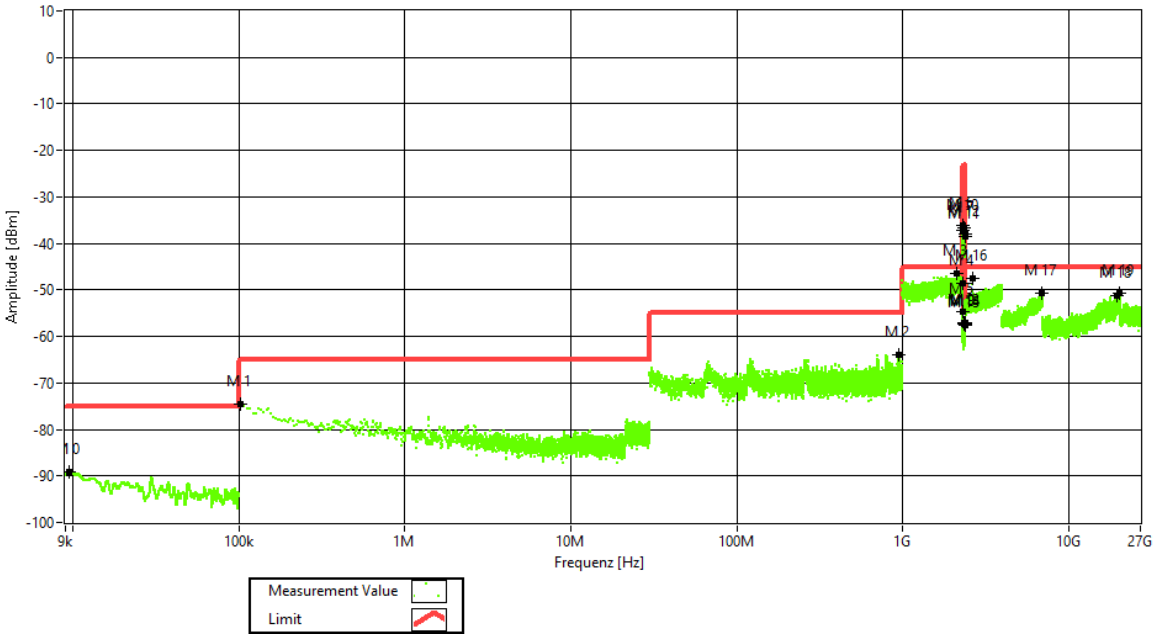
Frequency Band = WCS 2300; Test frequency = high; Direction = RF downlink;
Signal type = Narrowband



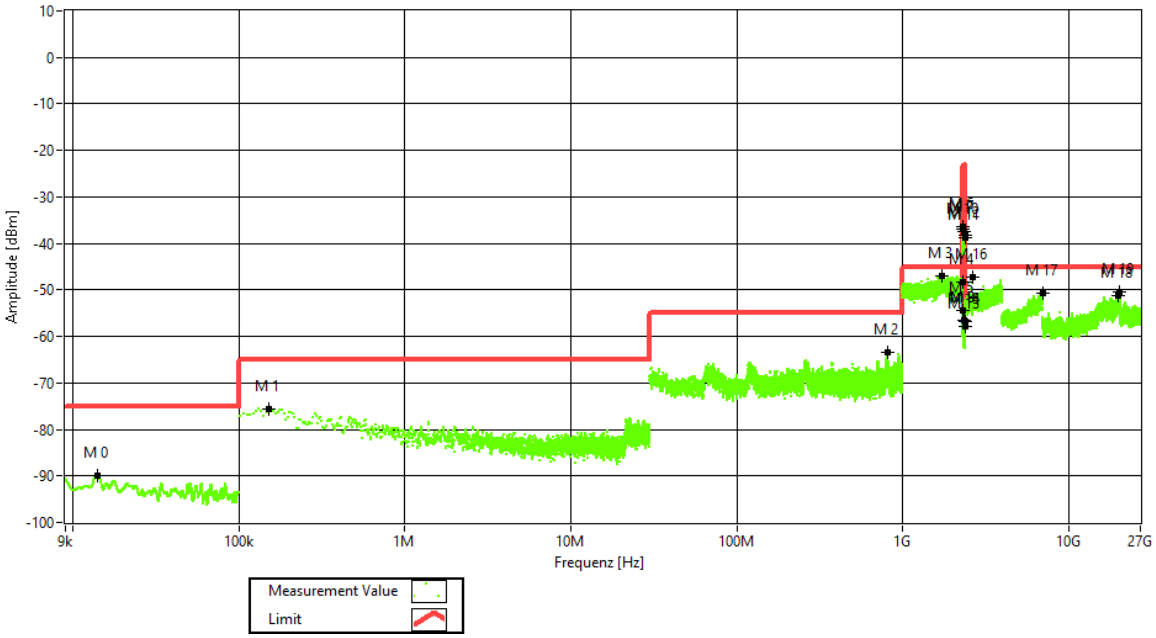
Frequency Band = WCS 2300; Test frequency = low; Direction = RF downlink;
Signal type = Wideband 5G



Frequency Band = WCS 2300; Test frequency = mid; Direction = RF downlink;
Signal type = Wideband 5G



Frequency Band = WCS 2300; Test frequency = high; Direction = RF downlink;
Signal type = Wideband 5G



5.4.5 TEST EQUIPMENT USED

- Conducted

5.5 OUT-OF-BAND EMISSION LIMITS

Standard FCC Part §2.1051, §27.53

The test was performed according to:
ANSI C63.26, KDB 935210 D05 v01r04: 3.6

Test date: 2025-03-18; 2025-04-03

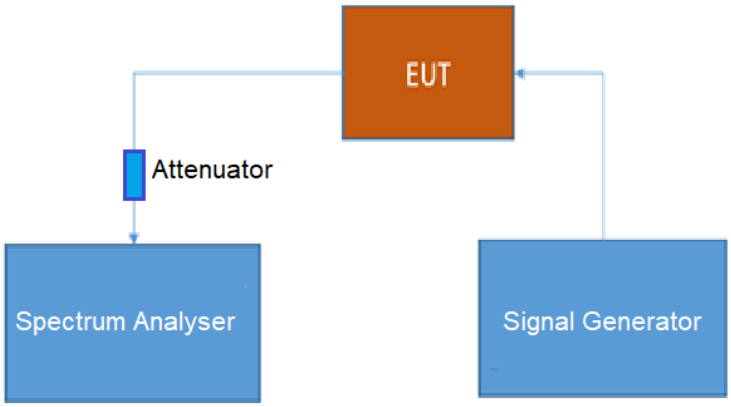
Environmental conditions: 23.5 °C; 24.1 °C; 28 % r. H./

Test engineer: Thomas Hufnagel

5.5.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the out-of-band emission limit for industrial signal boosters. The limits itself come from the applicable rule part for each operating band.

The EUT was connected to the test setup according to the following diagram:



The attenuation of the measuring and stimulus path are known for each measured frequency and are considered.

The Spectrum Analyzer settings can be directly found in the measurement diagrams.

5.5.2 TEST REQUIREMENTS/LIMITS

Abstract § 2.1051 from FCC:

FCC Part 2.1051; Measurement required: Spurious emissions at antenna terminal:

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

Part 27; Miscellaneous Wireless Communication Services

Subpart C – Technical standards

§27.53 – Emission limits

Abstract § 27.53 FCC:

(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.

(2) For fixed customer premises equipment (CPE) stations operating in the 2305-2320 MHz band and the 2345-2360 MHz band transmitting with more than 2 watts per 5 megahertz average EIRP:

(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.

(3) For fixed CPE stations operating in the 2305-2320 MHz and 2345-2360 MHz bands transmitting with 2 watts per 5 megahertz average EIRP or less:

(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, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324 MHz and between 2341 and 2345 MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328 MHz and between 2337 and 2341 MHz, and not less than 67 + 10 log (P) dB on all frequencies between 2328 and 2337 MHz;

(ii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 55 + 10 log (P) dB on all frequencies between 2296 and 2300 MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296 MHz, 67 + 10 log (P) dB on all frequencies between 2288 and 2292 MHz, and 70 + 10 log (P) dB below 2288 MHz;

(iii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365 MHz, and not less than 70 + 10 log (P) dB above 2365 MHz.

Abstract RSS-195 from ISED

5.6 Transmitter Unwanted Emissions

The transmitter unwanted emissions shall be measured with a resolution bandwidth of 1 MHz. A smaller resolution bandwidth is permitted provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz. However, in the 1 MHz bands immediately adjacent to the edges of the frequency range(s) in which the equipment is allowed to operate, a resolution bandwidth of as close as possible to, without being less than 1% of the occupied bandwidth, shall be employed provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz#

5.6.1 Base Station, Fixed Station and High-Power Fixed Subscriber Equipment

The power of any emission outside the frequency range(s) in which the equipment operates shall be attenuated below the transmitter power, P(dBW), by the amount indicated in Table 1 and graphically represented in Figure 1, where p is the transmitter output power measured in watts.

Table 1 — Unwanted Emissions for Base Station, Fixed Station and High-Power Fixed Subscriber Equipment

Frequency (MHz)	Attenuation (dB)
<2200	$43 + 10 \log_{10}(p)$
2200 - 2285	$75 + 10 \log_{10}(p)$
2285 - 2287.5	$72 + 10 \log_{10}(p)$
2287.5 - 2300	$70 + 10 \log_{10}(p)$
2300 - 2305	$43 + 10 \log_{10}(p)$
2305 - 2320	$43 + 10 \log_{10}(p)$ Note
2320 - 2345	$75 + 10 \log_{10}(p)$
2345 - 2360	$43 + 10 \log_{10}(p)$ Note
2360 - 2362.5	$43 + 10 \log_{10}(p)$
2362.5 - 2365	$55 + 10 \log_{10}(p)$
2365 - 2367.5	$70 + 10 \log_{10}(p)$
2367.5 - 2370	$72 + 10 \log_{10}(p)$
2370 - 2395	$75 + 10 \log_{10}(p)$
>2395	$43 + 10 \log_{10}(p)$

Note: Measured at the edges of the highest and lowest frequency range(s) in which the equipment is designed to operate. See Section 5.2 for the permitted frequency ranges for the various equipment types.

5.5.3 TEST PROTOCOL

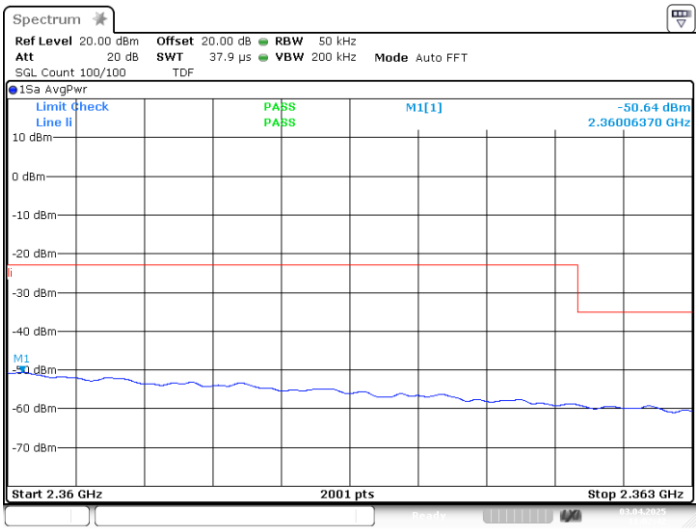
Band 30 WCS 2300, downlink, Number of input signals = 1							
Signal type	**Input power**	**Band edge**	**Signal frequency [MHz]**	**Input power [dBm]**	**Maximum out-of-band power [dBm]**	**Limit out-of-band power [dBm]**	**Margin to limit [dB]**
Wideband	0.3 dB < AGC	upper	2357.50	-0.9	-50.6	-23.0	27.6
Wideband	3 dB > AGC	upper	2357.50	2.4	-52.0	-23.0	29.0
Wideband 5G	0.3 dB < AGC	upper	2355.00	-1.2	-47.4	-23.0	24.4
Wideband 5G	3 dB > AGC	upper	2355.00	1.8	-47.3	-23.0	24.3
Narrowband	0.3 dB < AGC	upper	2359.80	-1.3	-41.2	-23.0	18.2
Narrowband	3 dB > AGC	upper	2359.80	2.0	-41.2	-23.0	18.2
Wideband	0.3 dB < AGC	lower	2352.50	-0.7	-49.9	-23.0	26.9
Wideband	3 dB > AGC	lower	2352.50	2.6	-51.7	-23.0	28.7
Wideband 5G	0.3 dB < AGC	lower	2355.00	-1.0	-46.4	-23.0	23.4
Wideband 5G	3 dB > AGC	lower	2355.00	2.0	-45.8	-23.0	22.8
Narrowband	0.3 dB < AGC	lower	2350.20	-0.5	-37.7	-23.0	14.7
Narrowband	3 dB > AGC	lower	2350.20	2.8	-38.6	-23.0	15.6

Band 30 WCS 2300, downlink, Number of input signals = 2								
Signal type	**Input power**	**Band edge**	**Signal frequency f1 [MHz]**	**Signal frequency f2 [MHz]**	**Input power [dBm]**	**Maximum out-of-band power [dBm]**	**Limit out-of-band power [dBm]**	**Margin to limit [dB]**
Wideband	0.3 dB < AGC	upper	2357.5	2355.0	-0.9	-53.2	-23.0	30.2
Wideband	3 dB > AGC	upper	2357.5	2355.0	2.4	-54.4	-23.0	31.4
Narrowband	0.3 dB < AGC	upper	2359.8	2359.6	-1.3	-42.1	-23.0	19.1
Narrowband	3 dB > AGC	upper	2359.8	2359.6	2	-42.2	-23.0	19.2
Wideband	0.3 dB < AGC	lower	2352.5	2355.0	-0.7	-52.2	-23.0	29.2
Wideband	3 dB > AGC	lower	2352.5	2355.0	2.6	-52.3	-23.0	29.3
Narrowband	0.3 dB < AGC	lower	2350.2	2350.4	-0.9	-40.6	-23.0	17.6
Narrowband	3 dB > AGC	lower	2350.2	2350.4	2.4	-41.6	-23.0	18.6

Remark: Please see next sub-clause for the measurement plot.

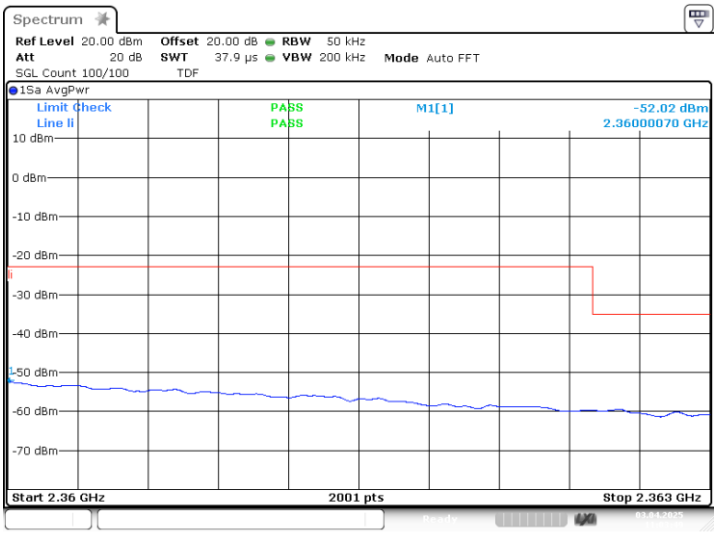
5.5.4 MEASUREMENT PLOT

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: upper; Mod: AWGN; Input power = 0,3 dB < AGC; Number of signals 1



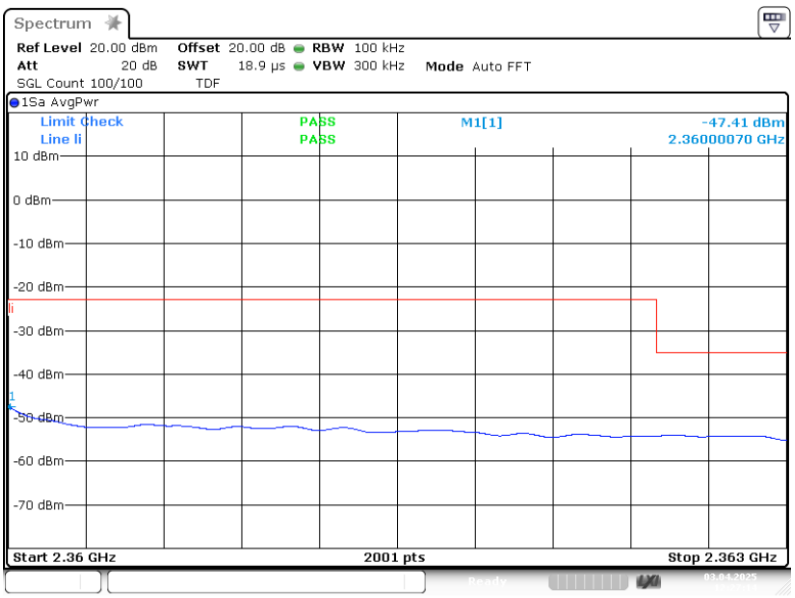
3.6.2 out of band emi WCS 2300 AWGN upper 1carrier -0.3 dB 2
.360G 2.363G

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: upper; Mod: AWGN; Input power = 3 dB > AGC; Number of signals 1



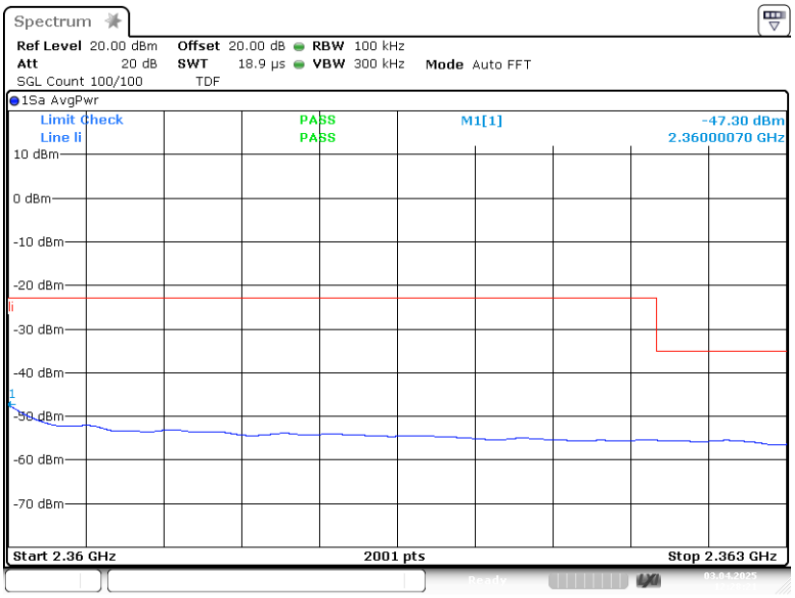
3.6.2 out of band emi WCS 2300 AWGN upper 1carrier +3.0 dB 2
.360G 2.363G

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: upper; Mod: AWGN 10M; Input power = 0,3 dB < AGC; Number of signals 1



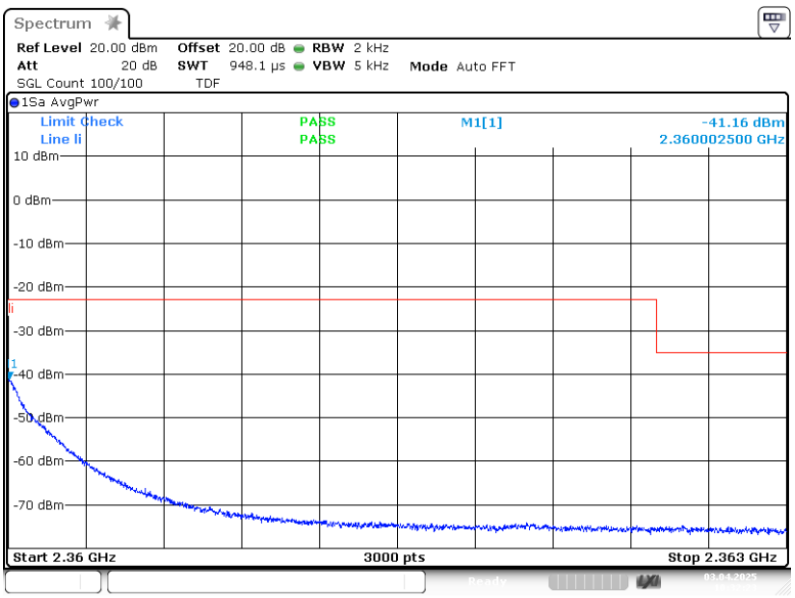
3.6.2 out of band emi WCS 2300 AWGN 10M upper 1carrier -0.3 dB 2.360G 2.363G

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: upper; Mod: AWGN 10M; Input power = 3 dB > AGC; Number of signals 1



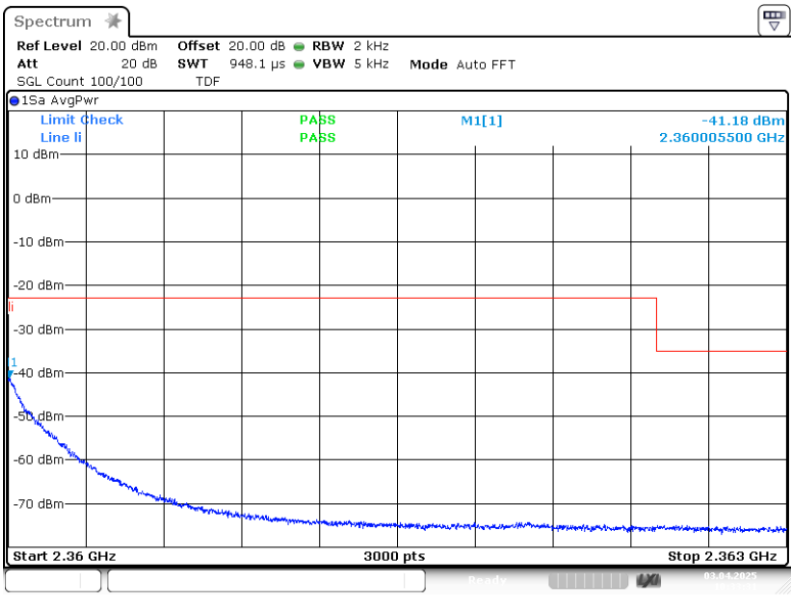
3.6.2 out of band emi WCS 2300 AWGN 10M upper 1carrier +3.0 dB 2.360G 2.363G

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: upper; Mod: GSM; Input power = 0,3 dB < AGC; Number of signals 1



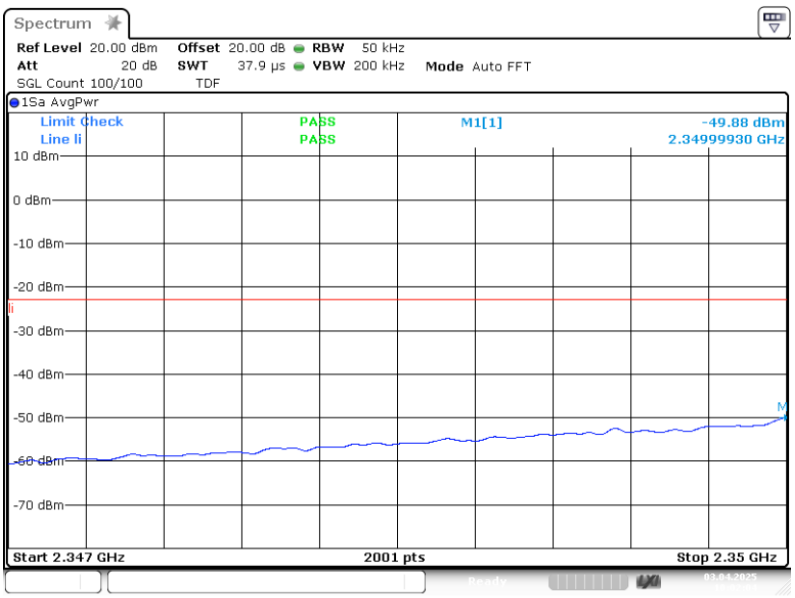
3.6.2 out of band emi WCS 2300 GSM upper 1carrier -0.3 dB 2.
360G 2.363G

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: upper; Mod: GSM; Input power = 3 dB > AGC; Number of signals 1



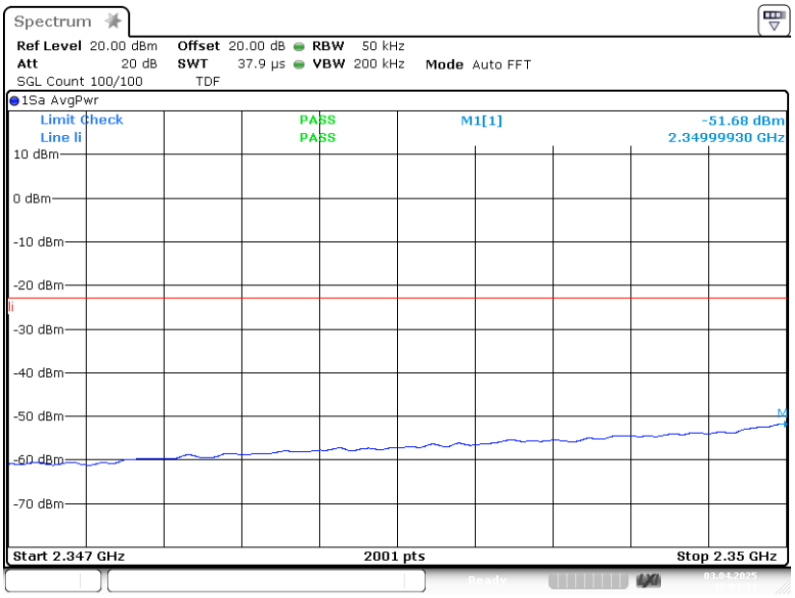
3.6.2 out of band emi WCS 2300 GSM upper 1carrier +3.0 dB 2.
360G 2.363G

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: lower; Mod: AWGN; Input power = 0,3 dB < AGC; Number of signals 1



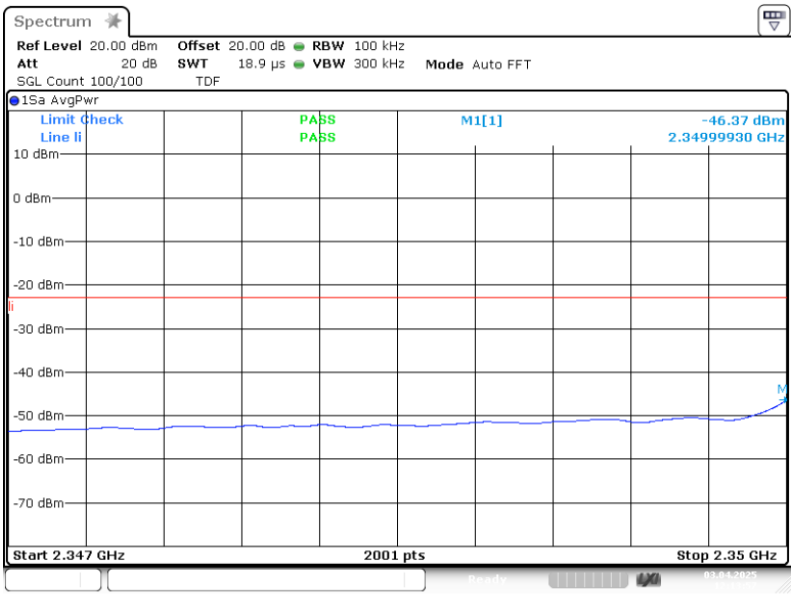
3.6.2 out of band emi WCS 2300 AWGN lower 1carrier -0.3 dB 2
.347G 2.350G

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: lower; Mod: AWGN; Input power = 3 dB > AGC; Number of signals 1



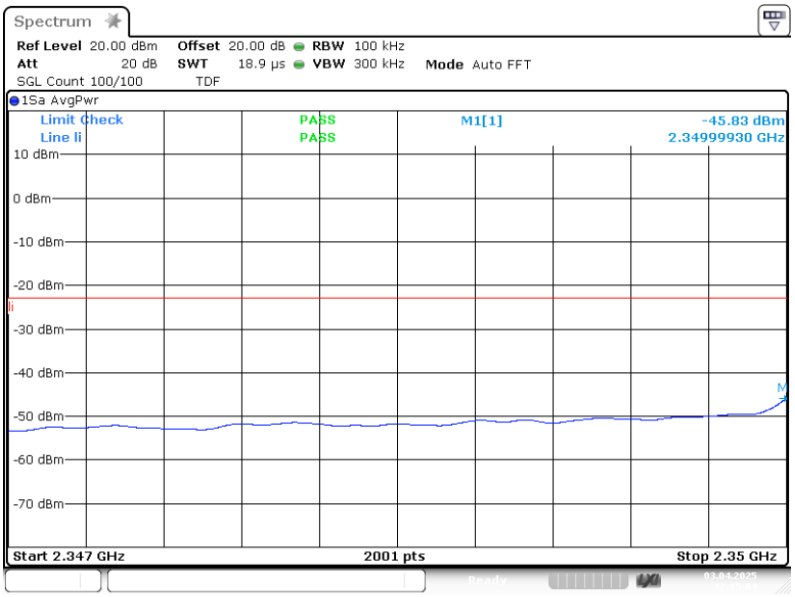
3.6.2 out of band emi WCS 2300 AWGN lower 1carrier +3.0 dB 2
.347G 2.350G

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: lower; Mod: AWGN 10M; Input power = 0,3 dB < AGC; Number of signals 1



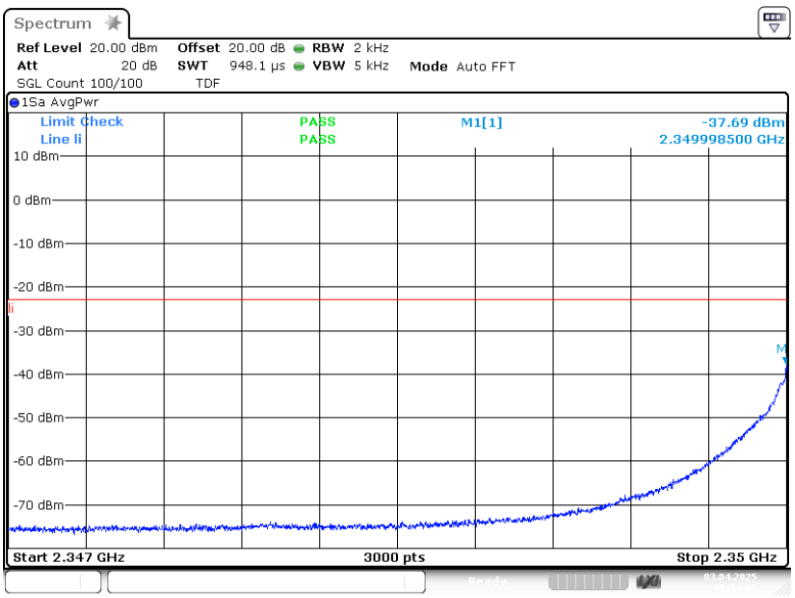
3.6.2 out of band emi WCS 2300 AWGN 10M lower 1carrier -0.3 dB 2.347G 2.350G

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: lower; Mod: AWGN 10M; Input power = 3 dB > AGC; Number of signals 1



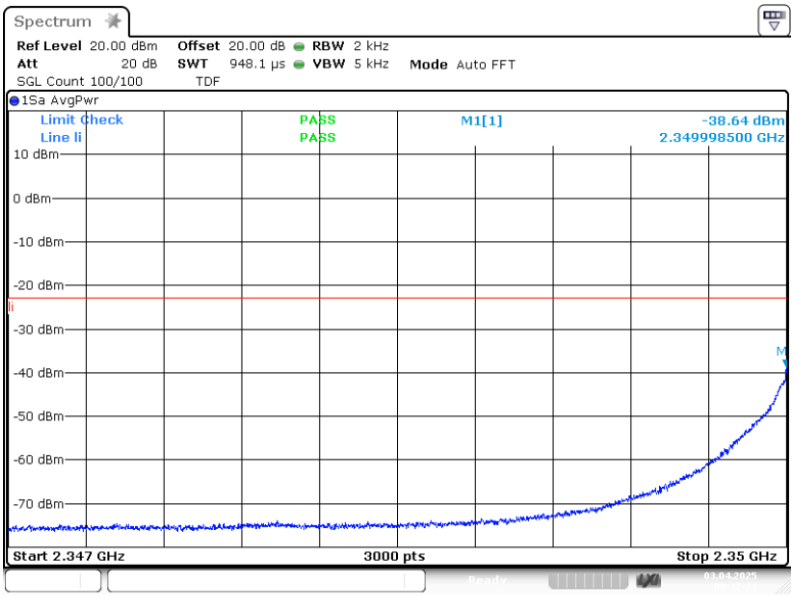
3.6.2 out of band emi WCS 2300 AWGN 10M lower 1carrier +3.0 dB 2.347G 2.350G

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: lower; Mod: GSM; Input power = 0,3 dB < AGC; Number of signals 1



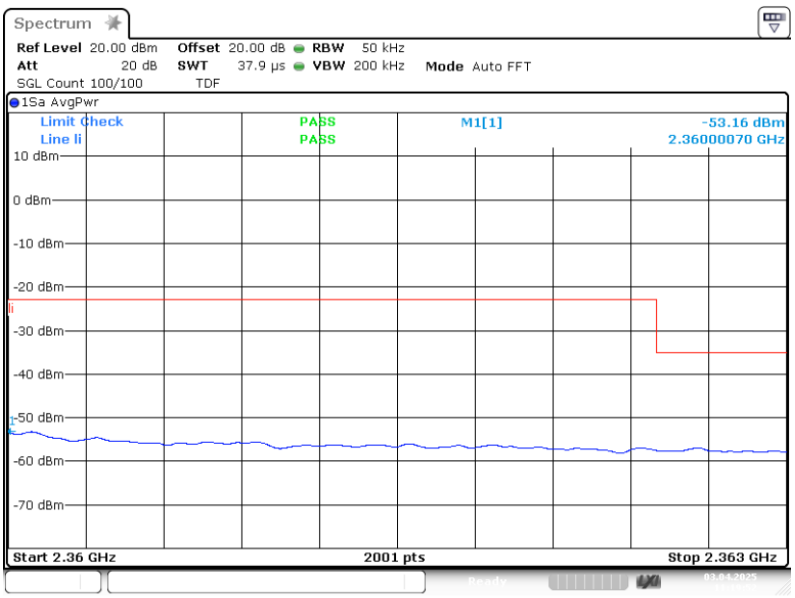
3.6.2 out of band emi WCS 2300 GSM lower 1carrier -0.3 dB 2.
347G 2.350G

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: lower; Mod: GSM; Input power = 3 dB > AGC; Number of signals 1



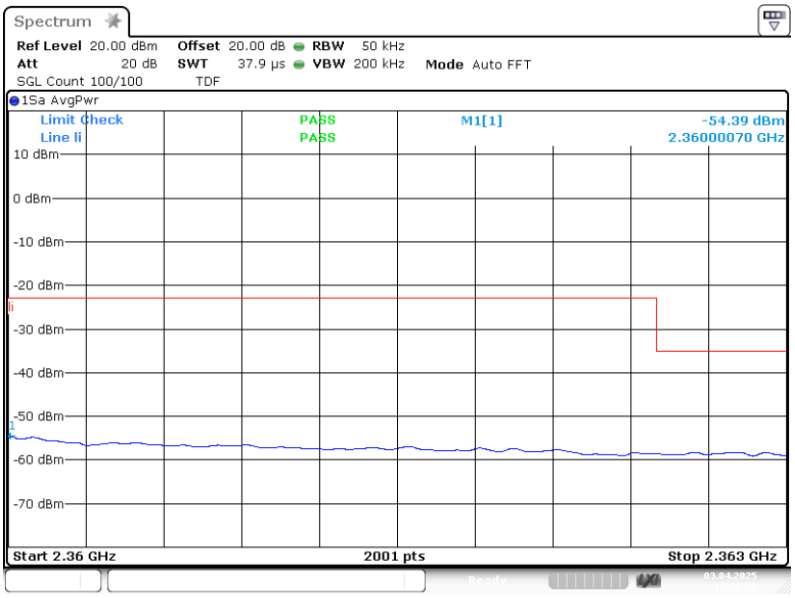
3.6.2 out of band emi WCS 2300 GSM lower 1carrier +3.0 dB 2.
347G 2.350G

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: upper; Mod: AWGN; Input power = 0,3 dB < AGC; Number of signals 2



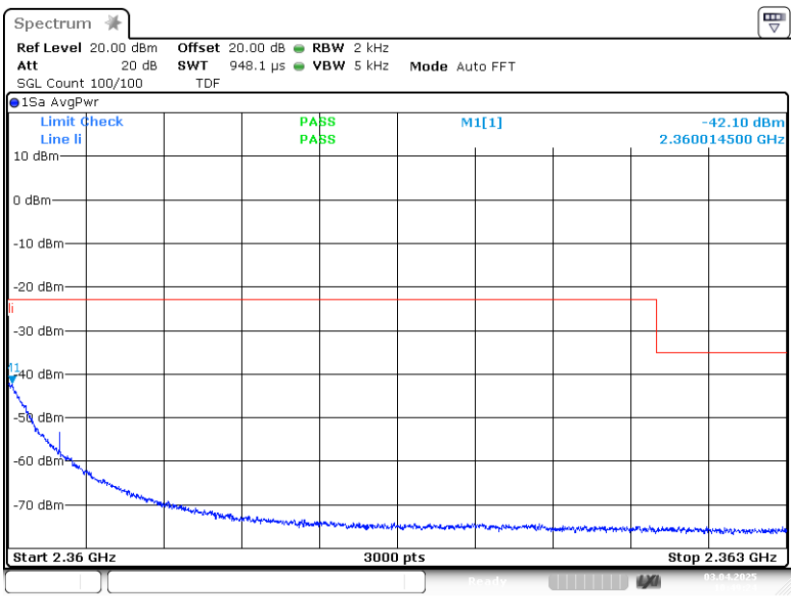
3.6.2 out of band emi WCS 2300 AWGN upper 2carriers -0.3 dB
2.360G 2.363G

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: upper; Mod: AWGN; Input power = 3 dB > AGC; Number of signals 2



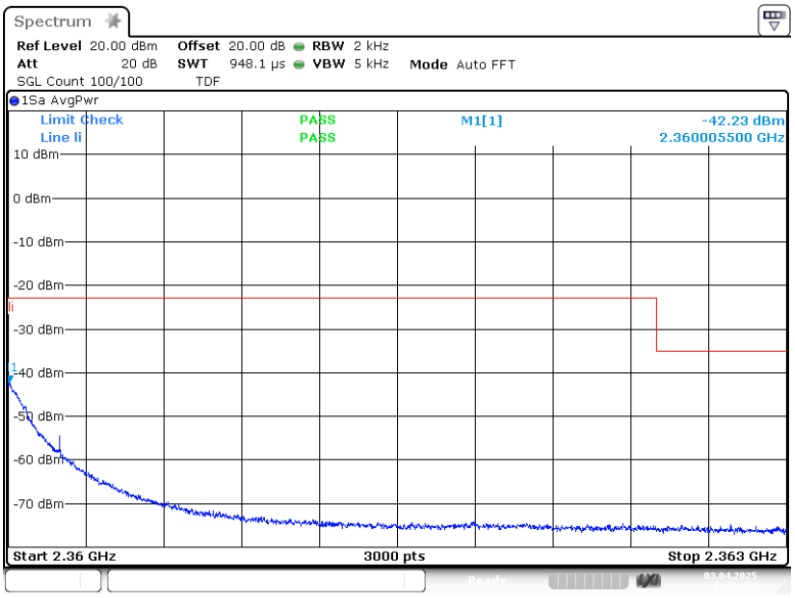
3.6.2 out of band emi WCS 2300 AWGN upper 2carriers +3.0 dB
2.360G 2.363G

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: upper; Mod: GSM; Input power = 0,3 dB < AGC; Number of signals 2



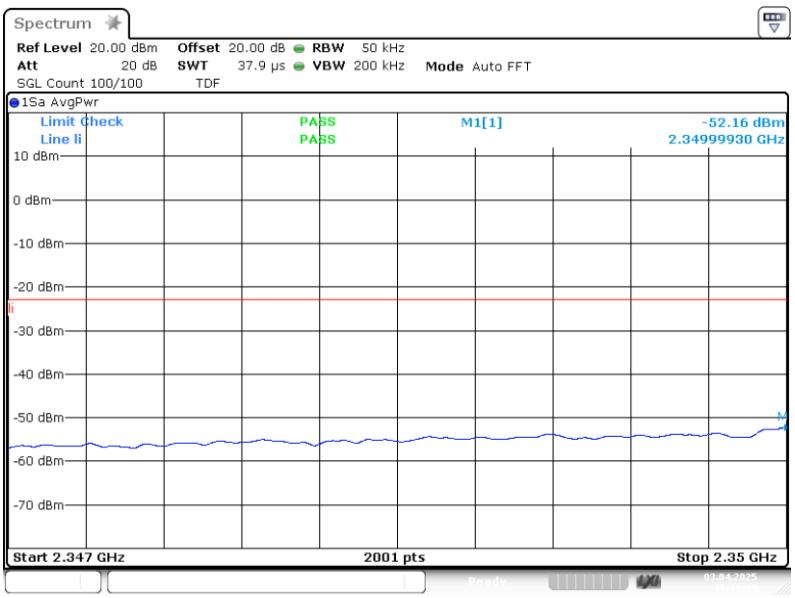
3.6.2 out of band emi WCS 2300 GSM upper 2carriers -0.3 dB 2
.360G 2.363G

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: upper; Mod: GSM; Input power = 3 dB > AGC; Number of signals 2



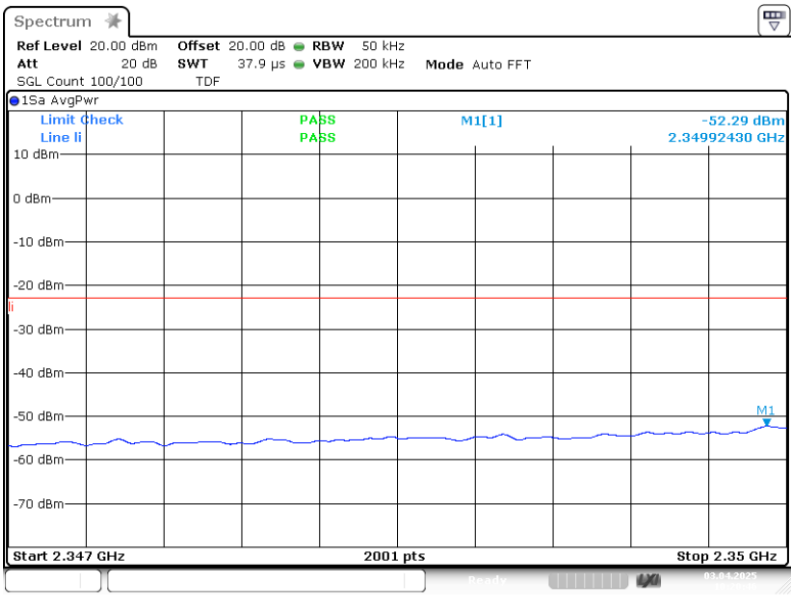
3.6.2 out of band emi WCS 2300 GSM upper 2carriers +3.0 dB 2
.360G 2.363G

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: lower; Mod: AWGN; Input power = 0,3 dB < AGC; Number of signals 2



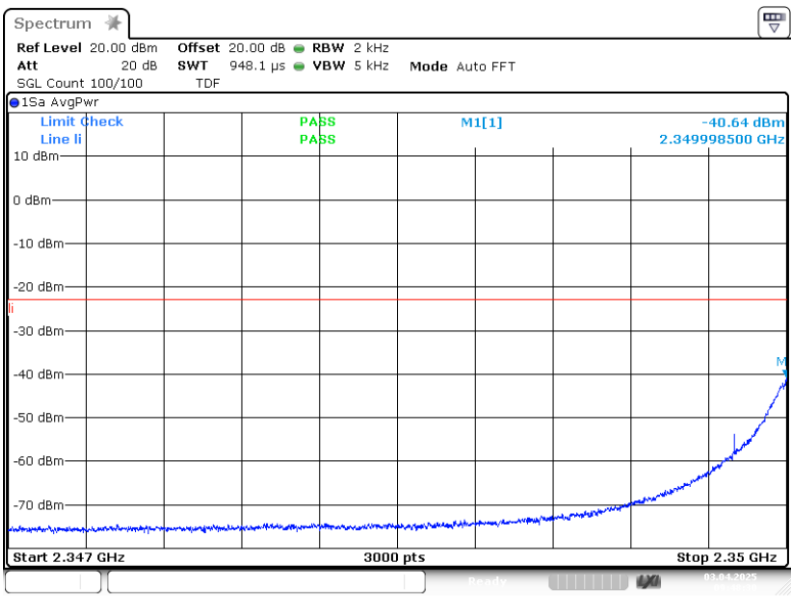
3.6.2 out of band emi WCS 2300 AWGN lower 2carriers -0.3 dB
2.347G 2.350G

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: lower; Mod: AWGN; Input power = 3 dB > AGC; Number of signals 2



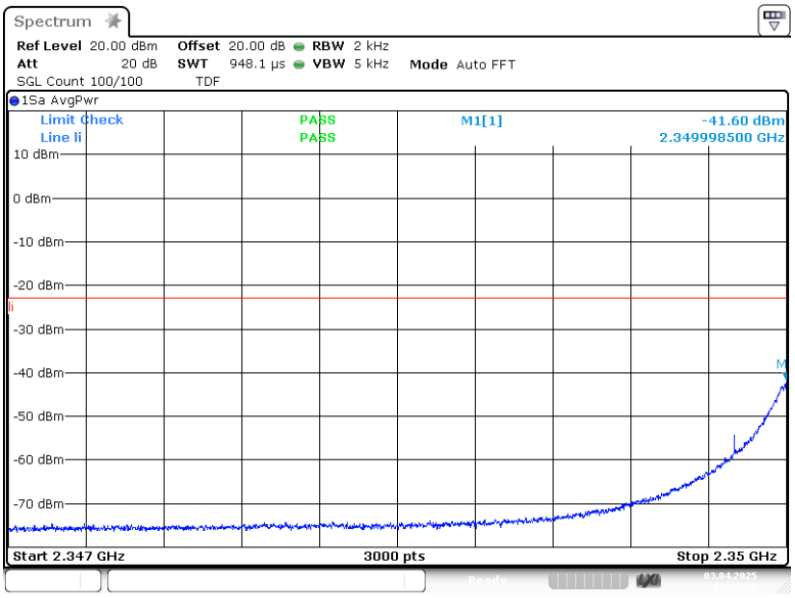
3.6.2 out of band emi WCS 2300 AWGN lower 2carriers +3.0 dB
2.347G 2.350G

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: lower; Mod: GSM; Input power = 0,3 dB < AGC; Number of signals 2



3.6.2 out of band emi WCS 2300 GSM lower 2carriers -0.3 dB 2
.347G 2.350G

Band: WCS 2300; Frequency: 2,3500 GHz to 2,3600 GHz; Band edge: lower; Mod: GSM; Input power = 3 dB > AGC; Number of signals 2



3.6.2 out of band emi WCS 2300 GSM lower 2carriers +3.0 dB 2
.347G 2.350G

5.5.5 TEST EQUIPMENT USED

- Conducted

5.6 OUT-OF-BAND REJECTION

Standard FCC Part 27

The test was performed according to:
ANSI C63.26

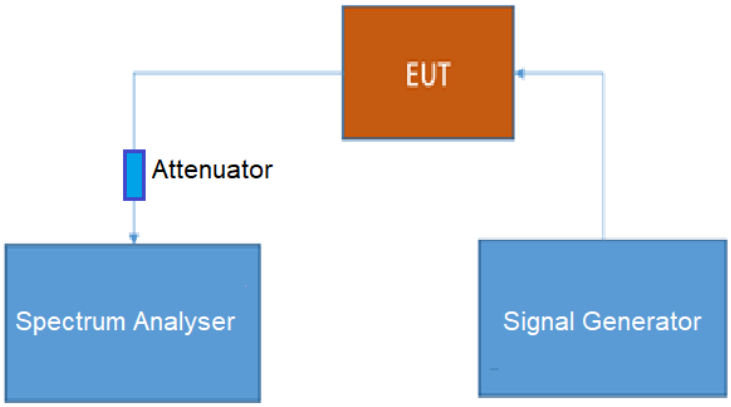
Test date: 2025-03-18

Environmental conditions: 23.5 °C; 23 % r. H.

Test engineer: Thomas Hufnagel

5.6.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the out-of-band rejection test case for industrial signal boosters.
The EUT was connected to the test setup according to the following diagram:



The attenuation of the measuring and stimulus path are known for each measured frequency and are considered.

The Spectrum Analyzer settings can be directly found in the measurement diagrams.

TEST REQUIREMENTS/LIMITS

Abstract RSS-131 from ISED:

9.1 Out-of-band rejection

The gain-versus-frequency response and the 20 dB passband bandwidth of the zone enhancer shall be reported. The zone enhancer shall reject amplification of other signals outside the passband of the zone enhancer.

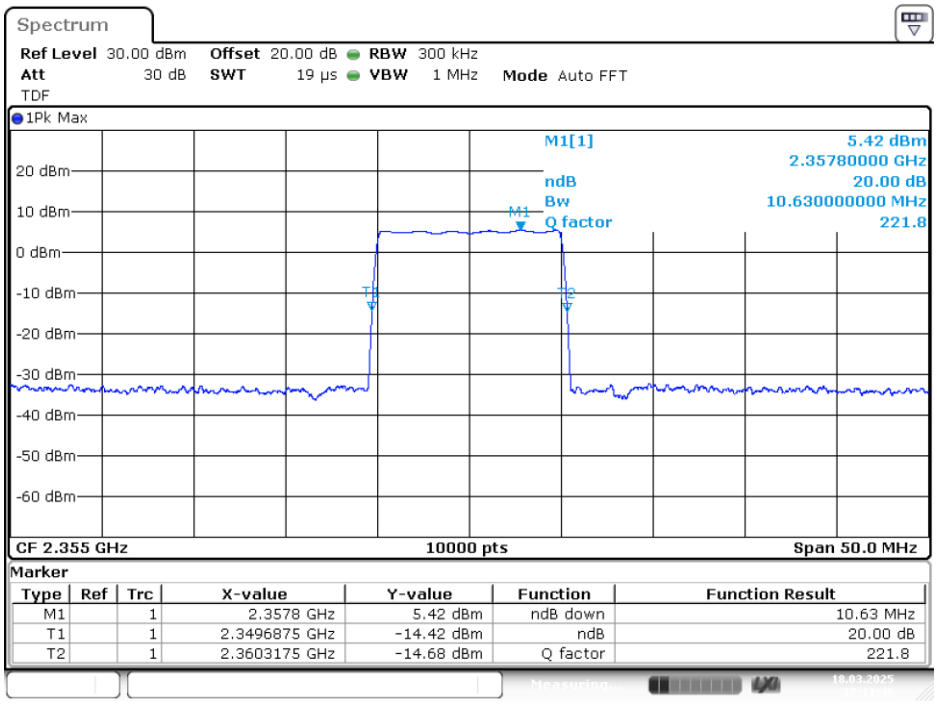
5.6.2 TEST PROTOCOL

Band 66 AWS 1700, downlink				
Highest power frequency [MHz]	**Output power [dBm]**	**Lower highest power -20 dB frequency [MHz]**	**Upper highest power -20 dB frequency [MHz]**	**20 dB bandwidth [MHz]**
2357.8	5.42	2349.6875	2360.3175	10.6300

Remark: Please see next sub-clause for the measurement plot.

5.6.3 MEASUREMENT PLOT

Frequency Band = WCS 2300, Direction = RF downlink



3.3 Out of band rejection WCS 2300 2.35500G

_20dB

5.6.4 TEST EQUIPMENT USED

- Conducted

5.7 FREQUENCY STABILITY

The frequency stability test case was not carried out, as any frequency errors are eliminated by the given system architecture. This is achieved by generating the LOs in the head-end station and the LOs in the remote unit with a common reference clock. This reference clock is transmitted from the head-end station to the remote unit and regenerated there. This means that the same reference frequency is used for all signal conversions (up- and down-conversion as well as analog-to-digital and digital-to-analog conversion) and any frequency error in the reference clock is compensated therefore. This is already clear from the measurement markings for the occupied bandwidth (26dB bandwidth). It can be seen that the DUT has no influence on the frequency (comparison between input and output signal). In addition, it is operationally necessary for the frequency deviation to be significantly smaller than the spectral distance between the transmission bandwidth edge and the channel bandwidth edge in order to meet the signal quality requirement (signal purity) and such ensure that the fundamental emissions remain within the authorized bands of operation.

5.8 FIELD STRENGTH OF SPURIOUS RADIATION

Standard FCC Part 27, §24.53

The test was performed according to:
ANSI C63.26

Test date: 2025-03-30

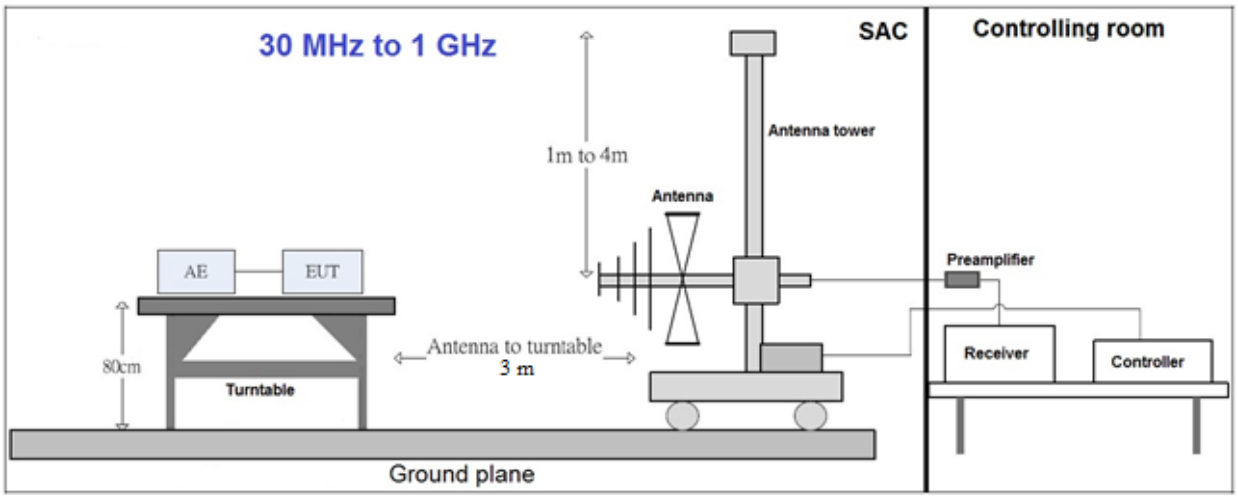
Environmental conditions: 23.5 °C; 28 % r. H.

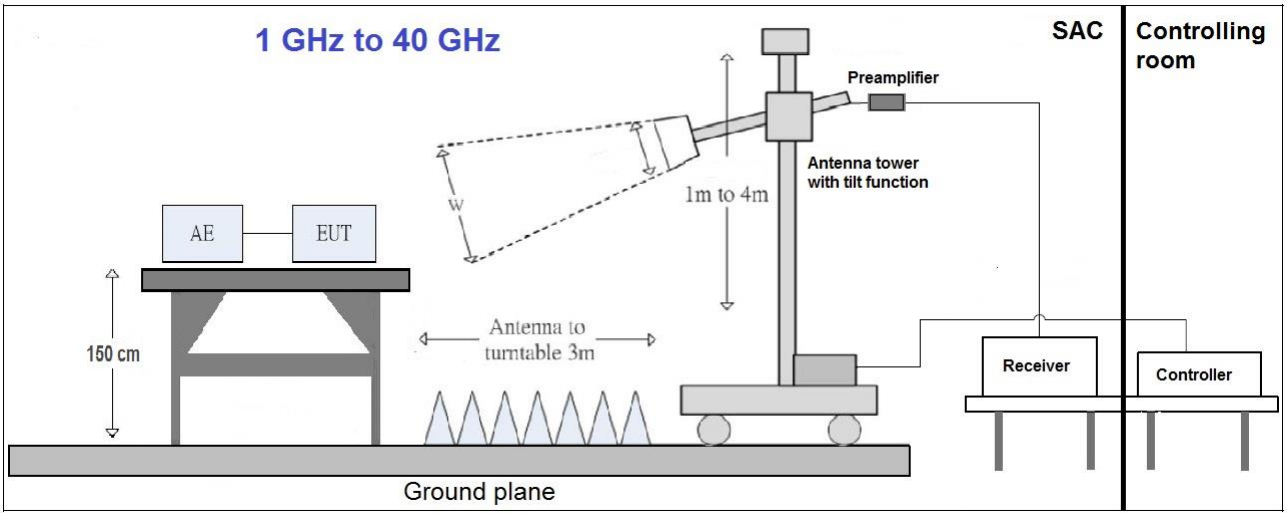
Test engineer: Thomas Hufnagel

5.8.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the applicable radiated spurious emission measurements per § 2.1053

The EUT was connected to the test setup according to the following diagram:





The test set-up was made in accordance to the general provisions of ANSI C63.4 in a typical installation configuration. The Equipment Under Test (EUT) was set up on a non-conductive table 1.5 x 1.5 m² in the semi-anechoic chamber. 0.8 meters above the ground or floor-standing arrangement shall be placed on the horizontal ground reference plane. The influence of the EUT support table that is used between 30–1000 MHz was evaluated. For the initial measurements. the receiving antenna is varied from 1-4 meters height and is changed in the vertical plane from vertical to horizontal polarization at each frequency. The highest emissions between 30 MHz to 1000 MHz were analyzed in details by operating the spectrum analyzer and/or EMI receiver in quasi-peak mode to determine the precise amplitude of the emissions.

The measurement procedure is implemented into the EMI test software BAT EMC from NEXIO. Exploratory tests are performed at 3 orthogonal axes to determine the worst-case orientation of a body-worn or handheld EUT. The final test on all kind of EUTs is also performed at 3 axes. A pre-check is performed while the EUT is powered by a DC power source.

1. Measurement above 30 MHz and up to 1 GHz

Step 1: Preliminary scan
This is a preliminary test to identify the highest amplitudes relative to the limit.
Settings for step 1:
- Antenna distance: 3 m
- Detector: PEAK
- Frequency range: 30 – 1000 MHz
- Frequency steps: 30 kHz
- IF–Bandwidth: 100 kHz
- Turntable angle range: –180° to 180°
- Turntable step size: 15°
- Height variation range: 1 – 4 m
- Height variation step size: 1 m
- Polarisation: Horizontal + Vertical

Intention of this step is. to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

Step 2: Adjustment measurement
In this step the accuracy of the turntable azimuth and antenna height will be improved. This is necessary to find out the maximum value of every frequency.
For each frequency. which was determined the turntable azimuth and antenna height will be adjusted. The turntable azimuth will slowly vary by ±15° around this value. During this action. the value of emission is continuously measured. The turntable azimuth at the highest emission will be recorded and adjusted. In this position. the antenna height will also slowly vary by ± 100 cm around the antenna height determined. During this action. the value of emission is also continuously measured. The antenna height of the highest emission will also be recorded and adjusted.
- Detector: PEAK
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 100 kHz
- Turntable angle range: ±15 ° around the determined value
- Antenna Polarisation: max. value determined in step 1

Step 3: Final measurement with RMS detector
With the settings determined in step 2. the final measurement will be performed:
EMI receiver settings for step 3:
- Detector: RMS (< 1 GHz)
- Measured frequencies: in step 1 and step 2 determined frequencies
- IF – Bandwidth: 100 kHz

After the measurement a plot will be generated which contains a diagram with the results of the preliminary scan and a chart with the frequencies and values of the results of the final measurement.

3. Measurement above 1 GHz

The following modifications apply to the measurement procedure for the frequency range above 1 GHz:

Step 1:

The Equipment Under Test (EUT) was set up on a non-conductive support at 1.5 m height in the semi-anechoic chamber. Absorbers are placed around and between the turn table and the antenna tower.
All steps were performed with one height (1.5 m) of the receiving antenna only.
The EUT is turned during the preliminary measurement across the elevation axis. with a step size of 15 °.
The turn table step size (azimuth angle) for the preliminary measurement is 15 °.

Step 2:

The maximum RFI field strength was determined during the measurement by rotating the turntable (±180 degrees) and varying the height of the receive antenna (h = 1 ... 4 m) with a additional tilt function of the antenna.The turn table azimuth will slowly vary by ±15°.
EMI receiver settings (for all steps):
- Detector: PEAK
- IF Bandwidth = 1 MHz

Step 3:

Final measurement with RMS detector
Spectrum analyser settings for step 3:
- Detector: RMS
- Measured frequencies: in step 2 determined frequencies
- IF – Bandwidth: 1 MHz

5.8.2 TEST REQUIREMENTS/LIMITS

Abstract from FCC Part 2:

FCC Part 2.1053; Measurement required: Field strength of spurious radiation:

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet. control circuits. power leads. or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test. single sideband. independent sideband. and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049. as appropriate.

Part 27; Miscellaneous Wireless Communication Services

Subpart C – Technical standards

§27.53 – Emission limits

Abstract § 27.53 FCC:

(h) AWS emission limits—(1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.

Abstract RSS-131 from ISED:

RSS-131; 10.5 Spurious emissions

The spurious emissions of a zone enhancer shall not exceed −13 dBm in any 100 kHz measurement bandwidth.

5.8.3 TEST PROTOCOL

General considerations concerning the limits:

The measuring bandwidth of 1 MHz was chosen according the test requirements exept at the bands from 30 MHz to 1 GHz: At these bands reducing of measurement bandwidth was done. Also outside the downlink frequency band at lower frequencies the measurement bandwidths were reduced to have the possibility to record the spurious emissions at these lower frequencies.

At frequencies were measuring bandwidths were reduced also the limit lines were reduced acoording the given formula:

$$p\ RBWreduced\ [dBm] = 10 * \log\left(RBWreduced\ [kHz] \quad / \quad 1000\ kHz\right) + pRBW\ 1000\ kHz[dBm]$$

Hereby "p" are the limit lines' values.

Considerations to MIMO operation:

Because only one antenna port is available not MIMO operation mode was tested.

Measurement tables with one antenna

30 MHz to 1 GHz:

Band 30, 2350 MHz – 2360 MHz, downlink;						
Spurious Freq. [MHz]	**Spurious Level [dBm]**	**Pin (Sum Level) [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
98.0/hor..	-81.0	-0.8	RMS	100	-23.0	58.0
158.8/hor..	-93.9	-0.8	RMS	100	-23.0	70.9
359.1/hor..	-79.7	-0.8	RMS	100	-23.0	56.7
66.0/vert.t.	-90.8	-0.8	RMS	100	-23.0	67.8
98.4/vert.t.	-78.7	-0.8	RMS	100	-23.0	55.7
359.2/vert.t.	-74.9	-0.8	RMS	100	-23.0	51.9

Above 1 GHz to 18 GHz:

Band 30, 2350 MHz – 2360 MHz, downlink;						
Spurious Freq. [MHz]	**Spurious Level [dBm]**	**Pin (Sum Level) [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
1599.8/hor.	-59.6	-0.8	RMS	1000	-13.0	46.6
2359.8/hor.	-39.6	-0.8	RMS	1000	-13.0	26.6
3200.2/hor.	-51.2	-0.8	RMS	1000	-13.0	38.2
4135.4/hor.	-58.3	-0.8	RMS	1000	-13.0	45.3
1875.0/vert.t.	-57.9	-0.8	RMS	1000	-13.0	44.9
2350.2/vert.t.	-43.9	-0.8	RMS	1000	-13.0	30.9
3200.2/vert.t.	-57.0	-0.8	RMS	1000	-13.0	44.0

Above 18 GHz to 27 GHz:

Band 30, 2350 MHz – 2360 MHz, downlink;						
Spurious Freq. [MHz]	**Spurious Level [dBm]**	**Pin (Sum Level) [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
20625.0/hor.	-55.6	-0.8	RMS	1000	-13.0	42.6
23285.1/hor.	-68.2	-0.8	RMS	1000	-13.0	55.2
25059.9/hor.	-67.0	-0.8	RMS	1000	-13.0	54.0
20625.0/vert.t.	-59.7	-0.8	RMS	1000	-13.0	46.7
22760.1/vert.t.	-68.3	-0.8	RMS	1000	-13.0	55.3
25044.6/vert.t.	-67.7	-0.8	RMS	1000	-13.0	54.7

Abbreviations:

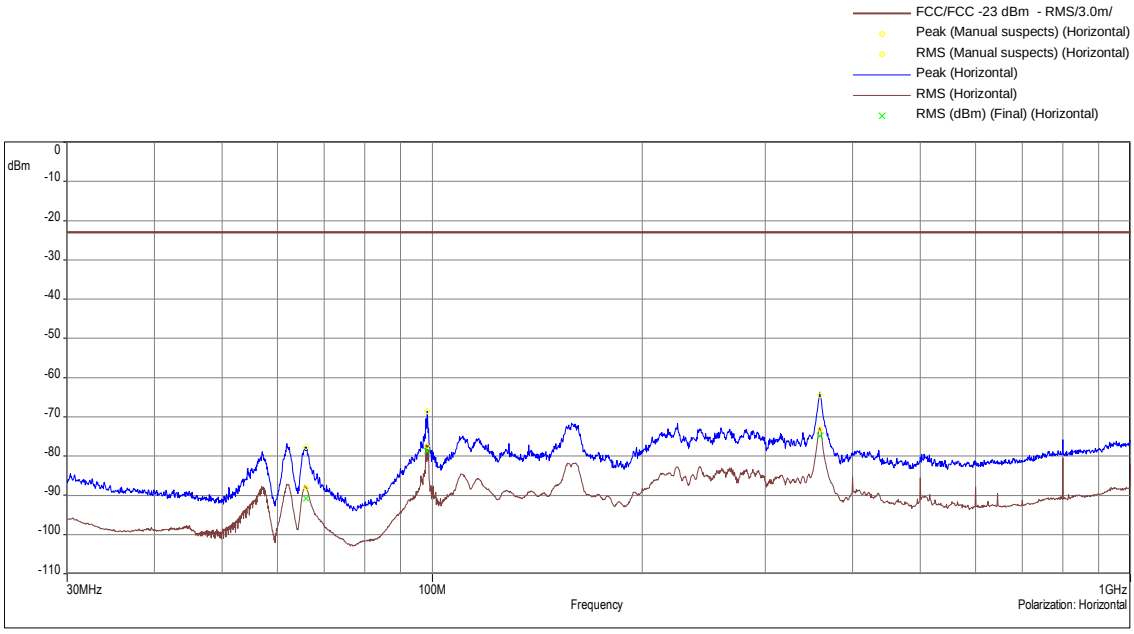
"hor.": horizontal position
"vert.": vertical position

Remarks: Please see next sub-clause for the measurement plot.

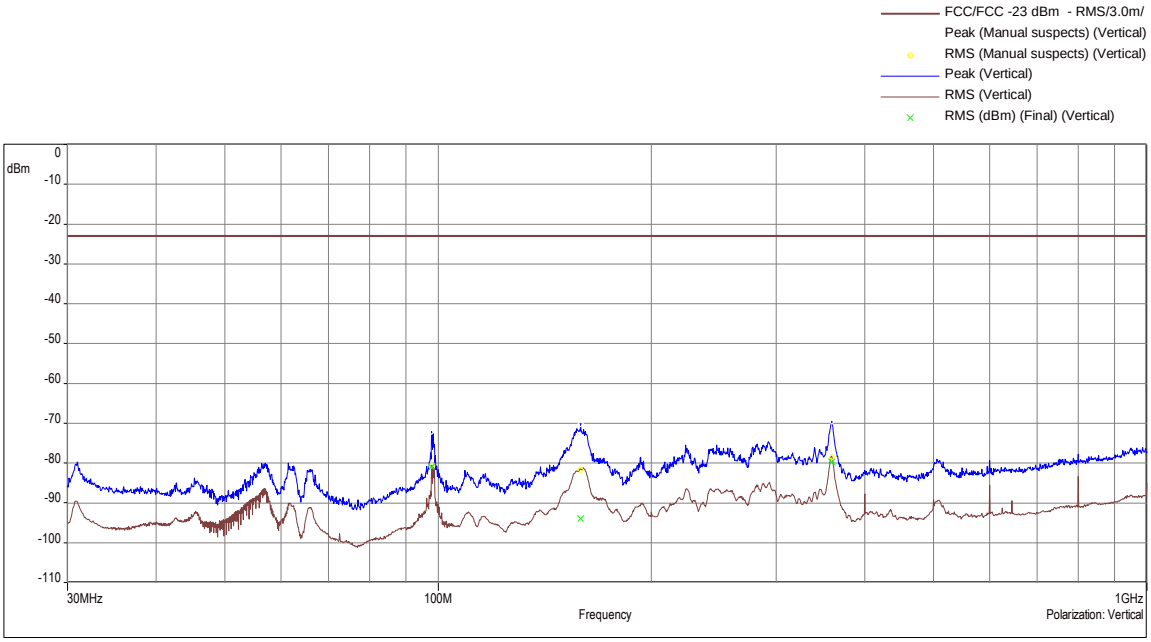
5.8.4 MEASUREMENT PLOT WITH ONE ANTENNA

5.8.4.1 Frequency band = WCS 2300; Direction = RF downlink

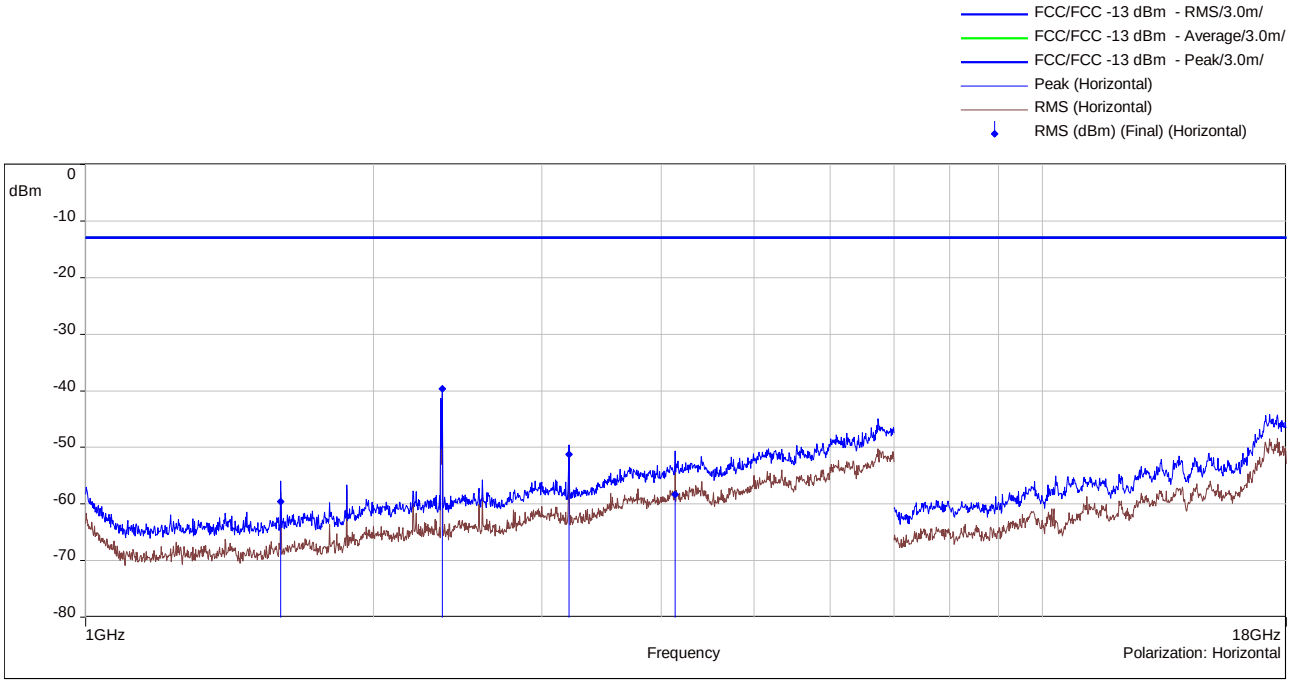
30 MHz - 1 GHz. horizontal



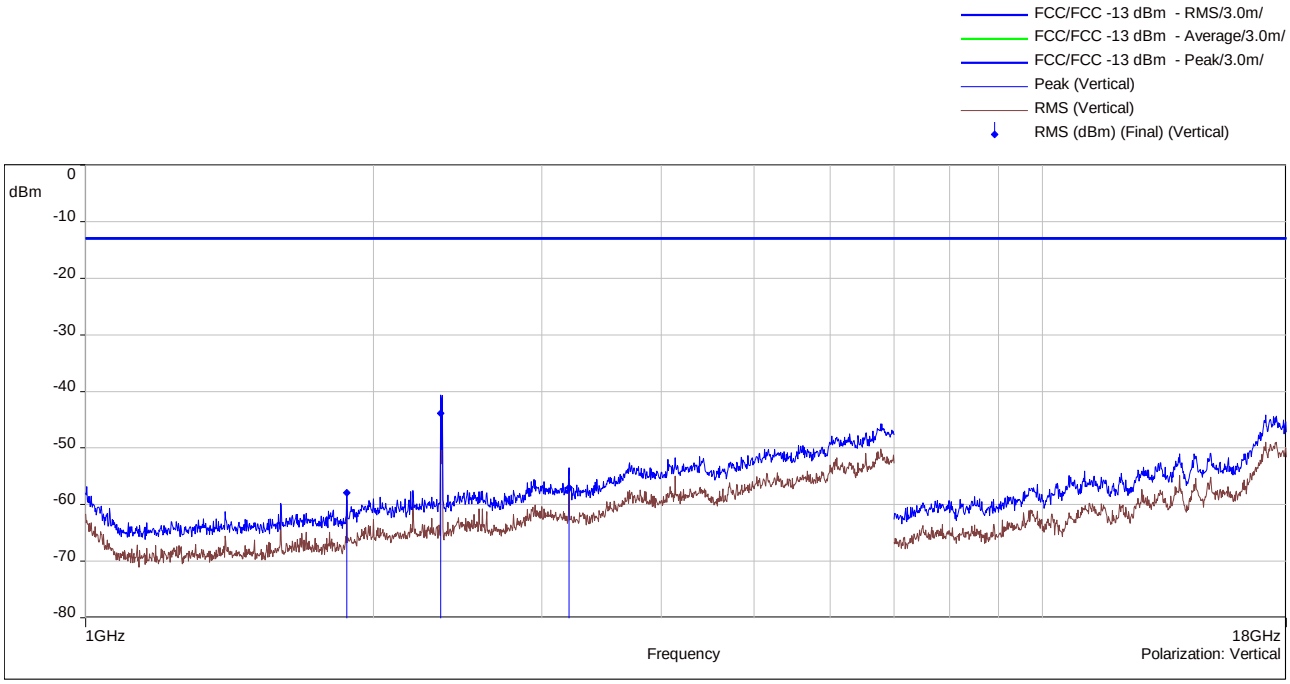
30 MHz - 1 GHz. vertical



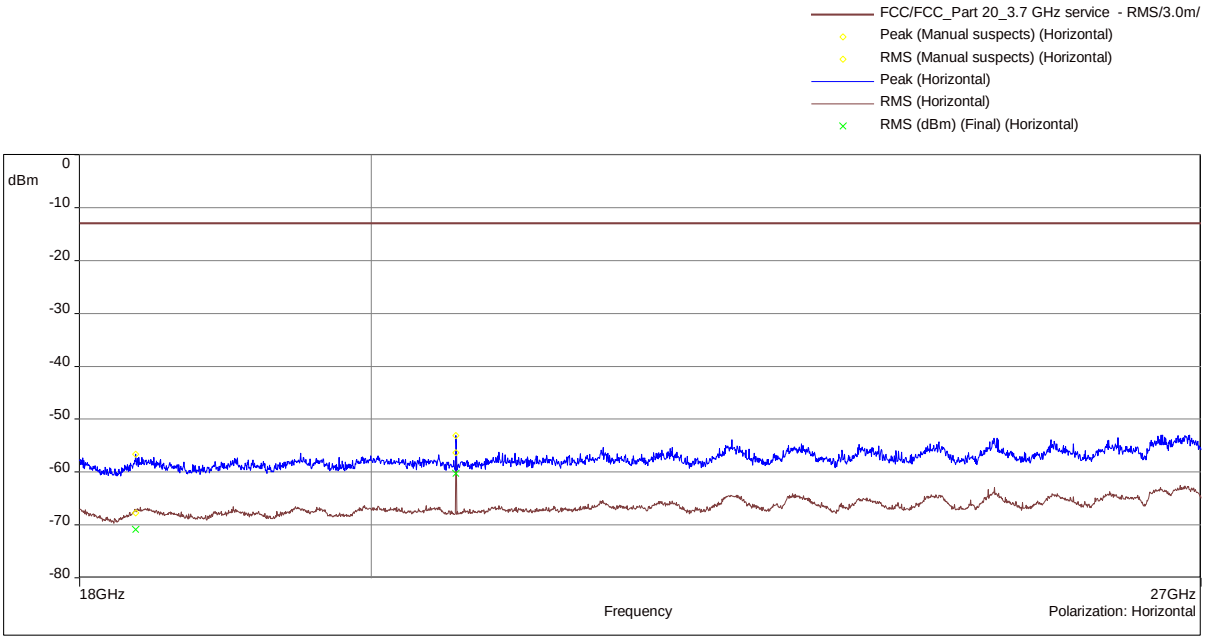
1 GHz - 18 GHz. horizontal



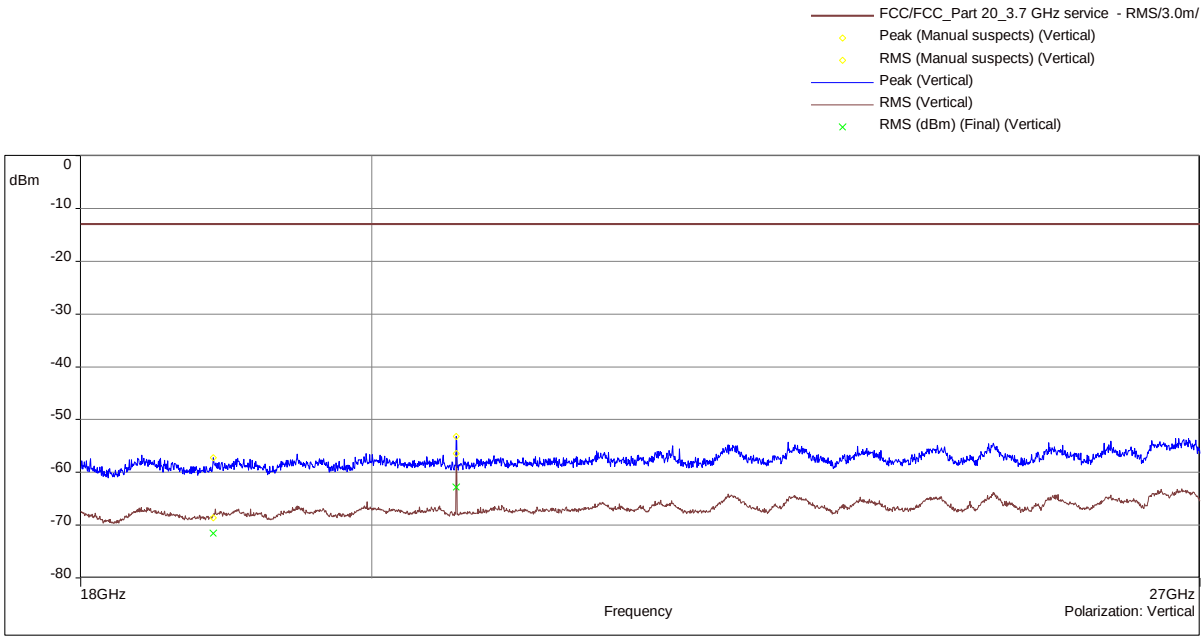
1 GHz - 18 GHz. vertical



18 GHz – 27 GHz. horizontal



18 GHz - 27 GHz. vertical



5.8.5 FIELD STRENGTH CALCULATIONS

FS = SA + AF + CL + PA

Where as:

FS = Field strength
SA = EMC test receiver reading
AF = Antenna factor
CL = Cable loss
PA = Preamplifier

5.8.6 TEST EQUIPMENT USED

- Radiated Emissions

6 TEST EQUIPMENT

6.1 CONDUCTED EMISSIONS

Ref.No.	Type	Description	Manufacturer	Inventory no.	Last calibration	Calibration due
1.1	FSV40	Signal Analyzer 10 Hz - 40 GHz	Rohde & Schwarz	E-003138	2023-10	2025-10
1.2	SMBV100A	Vector Signal Generator 9 kHz - 6 GHz	Rohde & Schwarz	E-003206	2023-01	2026-01
1.3	CA-2.9MF-20-40-10W-RDC	Attenuator 20 dB	Tactron	E-004057	2024-10	2026-10
1.4	testo 175 H1	Thermo-Hygrometer	Testo	E-003922	2024-12	2025-12
1.5	Auto Messung 1 Channel V8.1	Software	Bureau Veritas	Software V8.1	---	---

The calibration interval is the time interval between "Last Calibration" and "Calibration Due".

6.2 RADIATED EMISSIONS

Ref.No.	Type	Description	Manufacturer	Inventory no.	Last calibration	Calibration due
1.6	ESU40	EMI test receiver 10 Hz - 40 GHz	Rohde & Schwarz	E-003138	2024-10	2025-10
1.7	CBL 6111C	Antenna 30 MHz – 1 GHz	Chase	E-003226	2024-02	2026-02
1.8	LB-8180-SF	Antenna 0.8 GHz - 18 GHz	A-Info Inc.	E-004052	2024-08	2025-08
1.9	MWH-1826/B	Antenna 18 GHz – 26.5 GHz	ARA Inc.	E-004044	2024-08	2025-08
1.10	AM1431	Pre amplifier 10 kHz – 1 GHz	Miteq	E-003365	2024-10	2025-10
1.11	ZX60-06183LN+	Pre amplifier 6 GHz – 18 GHz	Miteq	E-003952	2024-10	2025-10
1.12	AMP-18000-40000-60-18-2.9-F	Preaamplifier 18 GHz - 40 GHz	Miteq	E-004003	2024-10	2025-10
1.13	CO3000	Controller SAC	Innco systems GmbH	E-003052 with Software 1.02.62	---	---
1.14	testo 176 P1	Thermo-Hygrometer	Testo	E-003918	2024-07	2025-07
1.15	BAT-EMC	Software	Nexio	V 2024.0.12.0	---	---

The calibration interval is the time interval between "Last Calibration" and "Calibration Due".

6.3 ANTENNA FACTORS. CABLE LOSS AND SAMPLE CALCULATION

The used factors for antennas, cables etc. are deposited in the used test systems (LabView program and BAT EMC programm). They are actualised by the returing calibration control.

Sample calculation

E (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (dB)
U = Receiver reading
AF = Antenna factor
Corr. = sum of single correction factors of used cables. switch unit. distance correction. amplifier (if applicable)
Linear interpolation will be used for frequencies in between the values in the table.
distance correction = -20 * LOG (d_{Limit}/ d_{used})
Linear interpolation will be used for frequencies in between the values in the table.
Table shows an extract of values.

7 PHOTO REPORT

Please see separate photo report.

Annex A: Accreditation certificate (for information)

The accreditation relates to competences stated on the accreditation certificate. The current certificate is available on the homepage of the DAkkS and can be downloaded under accredited bodies with the processing number:

https://www.dakks.de/en

Annex B: Additional information provided by client

None.

****** End of test report *****