



## ECL-TA Test Report No.: 20-018

Designation:	PSR 7/8 A, ESMR Band
Manufacturer:	Andrew
Serial No(s):	8
ID No.	7830127-0001, Rev.: 00
Test Specification(s):	ANSI 63.26:2015 FCC Rules and Regulations as listed in 47 CFR, Part 20:2019-10-01
Test Plan:	Measurement of Band ESMR, downlink and uplink.
<b>Test Result:</b>	<b>Passed</b>

Date of issue:	2020-12-18		Signature:
Version:	01	Technical Reviewer:	
Date of delivery:	2020-11		
Performance date:	2020-11-21. – 2020-12-12	Report Reviewer:	



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TA tests on Andrew PSR 7/8 A, ESMR Band

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Commscope

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**Versions management:**

V01.00

Initial release



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### 1 APPLIED STANDARDS AND TEST SUMMARY

#### 1.1 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 Ch.1 Parts 2, 20 and 90. 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 90; Private Land Mobile Radio Services

Subpart S – Regulations Governing Licensing and Use fo Frequencies in the 806 – 824,  
851 – 869, 896 – 901 and 935 – 940 MHz Bands

§ 90.635 – Limitations on power and antenna height

§ 90.691 – Emission mask requirements for EA-based systems

The tests were selected and performed with reference to:

- FCC Public Notice 935210 applying "Signal Boosters Basic Certification Requirements" 935210 D02, 2019-15-04.
- FCC Public Notice 935210 applying "Measurement guidance for industrial and non-consumer signal booster, repeater and amplifier devices" 935210 D05, 2019-04-03.
- FCC Public Notice 971168 applying "Measurement guidance for certification of licensed digital transmitters" 971168 D01, 2019-04-09.
- ANSI C63.26: 2015



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TA tests on Andrew PSR 7/8 A, ESMR Band

**Summary Test Results:**

**The EUT complies with all performed tests as listed in chapter 1.3 Measurement Summary/Signatures.**

1.2 TABLE OF MEASUREMENT'S FCC REFERENCE

**Measurement requirements for Industrial Signal Booster from FCC**

<b>Measurement</b>	<b>FCC reference</b>
Effective radiated power, mean output power and zone enhancer gain	§ 2.1046 § 90.635 KDB 935210 D05 v01r04: 3.5
Peak to Average Ratio	---
Occupied bandwidth	§ 2.1049
Input-versus-output spectrum	KDB 935210 D05 v01r04: 3.4
Conducted spurious Emission at Antenna Terminal	§ 2.1051 § 90.691 KDB 935210 D05 v01r04: 3.6
Out-of-band emissions limits	§ 2.1051 § 90.691 KDB 935210 D05 v01r04: 3.6
Frequency stability	§ 2.1055 KDB 935210 D05 v01r04: 3.7
Field strength of spurious radiation	§ 2.1053 § 90.691
Out-of-band rejection	KDB 935210 D05 v01r04: 3.3
All measurements	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.

Also the test case noise and noise figure was not performed since in this test the booster performs commercial radio services: According KDB 935210 D05 in this case the measuring of noise and noise figure is not required.



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TA tests on Andrew PSR 7/8 A, ESMR Band

1.3 MEASUREMENT SUMMARY/SIGNATURES

Downlink frequencies: 862 MHz to 869 MHz: uplink frequencies: 817 MHz to 824 MHz

47 CFR CHAPTER I FCC PART 90 Subpart S [Base Stations/Repeater]

§ 2.1046, § 90.635 (a),

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

- Frequency Band, Direction, Input Power, Signal Type
ESMR, RF downlink, 0.3 dB < AGC, Narrowband
ESMR, RF downlink, 0.3 dB < AGC, Wideband
ESMR, RF downlink, 3 dB > AGC, Narrowband
ESMR, RF downlink, 3 dB > AGC, Wideband
ESMR, RF uplink, 0.3 dB < AGC, Narrowband
ESMR, RF uplink, 0.3 dB < AGC, Wideband
ESMR, RF uplink, 3 dB > AGC, Narrowband
ESMR, RF uplink, 3 dB > AGC, Wideband

- Passed
Passed
Passed
Passed
Passed
Passed
Passed
Passed

47 CFR CHAPTER I FCC [Base Stations/Repeater]

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

Final Result

OP-Mode

FCC

- Frequency Band, Direction, Input Power, Signal Type
ESMR, RF downlink, 0.3 dB < AGC, Narrowband
ESMR, RF downlink, 0.3 dB < AGC, Wideband
ESMR, RF downlink, 3 dB > AGC, Narrowband
ESMR, RF downlink, 3 dB > AGC, Wideband
ESMR, RF uplink, 0.3 dB < AGC, Narrowband
ESMR, RF uplink, 0.3 dB < AGC, Wideband
ESMR, RF uplink, 3 dB > AGC, Narrowband
ESMR, RF uplink, 3 dB > AGC, Wideband

- Passed
Passed
Passed
Passed
Passed
Passed
Passed
Passed



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TA tests on Andrew PSR 7/8 A, ESMR Band

**47 CFR CHAPTER I FCC  
[Base Stations/Repeater]**

**§ 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**

Frequency Band, Direction, Input Power, Signal Type

ESMR, RF downlink, 0.3 dB < AGC, Narrowband

Passed

ESMR, RF downlink, 0.3 dB < AGC, Wideband

Passed

ESMR, RF downlink, 3 dB > AGC, Narrowband

Passed

ESMR, RF downlink, 3 dB > AGC, Wideband

Passed

ESMR, RF uplink, 0.3 dB < AGC, Narrowband

Passed

ESMR, RF uplink, 0.3 dB < AGC, Wideband

Passed

ESMR, RF uplink, 3 dB > AGC, Narrowband

Passed

ESMR, RF uplink, 3 dB > AGC, Wideband

Passed

**47 CFR CHAPTER I FCC PART 90 Subpart S  
[Base Stations/Repeater]**

**§ 2.1051, § 90.691 (a)(2)**

Conducted spurious emissions at antenna terminals

The measurement was performed according to ANSI C63.26

**Final Result**

**OP-Mode**

**FCC**

Frequency Band, Direction, Input Power, Signal Type

ESMR, RF downlink, 0.3 dB < AGC, Narrowband

Passed

ESMR, RF downlink, 0.3 dB < AGC, Wideband

Passed

ESMR, RF downlink, 3 dB > AGC, Narrowband

Passed

ESMR, RF downlink, 3 dB > AGC, Wideband

Passed

ESMR, RF uplink, 0.3 dB < AGC, Narrowband

Passed

ESMR, RF uplink, 0.3 dB < AGC, Wideband

Passed

ESMR, RF uplink, 3 dB > AGC, Narrowband

Passed

ESMR, RF uplink, 3 dB > AGC, Wideband

Passed



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**47 CFR CHAPTER I FCC PART 90 Subpart S  
[Base Stations/Repeater]**

**§ 2.1053, § 90.691 (a)(2)**

Out-of-band emission limits

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

**Final Result**

**OP-Mode**

**FCC**

Band Edge, Frequency Band, Number of signals, Direction, Input Power, Signal Type

Lower, ESMR, 1, RF downlink, 0.3 dB < AGC, Narrowband	Passed
Lower, ESMR, 1, RF downlink, 0.3 dB < AGC, Wideband	Passed
Lower, ESMR, 1, RF downlink, 3 dB > AGC, Narrowband	Passed
Lower, ESMR, 1, RF downlink, 3 dB > AGC, Wideband	Passed
Lower, ESMR, 2, RF downlink, 0.3 dB < AGC, Narrowband	Passed
Lower, ESMR, 2, RF downlink, 0.3 dB < AGC, Wideband	Passed
Lower, ESMR, 2, RF downlink, 3 dB > AGC, Narrowband	Passed
Lower, ESMR, 2, RF downlink, 3 dB > AGC, Wideband	Passed
Lower, ESMR, 1, RF uplink, 0.3 dB < AGC, Narrowband	Passed
Lower, ESMR, 1, RF uplink, 0.3 dB < AGC, Wideband	Passed
Lower, ESMR, 1, RF uplink, 3 dB > AGC, Narrowband	Passed
Lower, ESMR, 1, RF uplink, 3 dB > AGC, Wideband	Passed
Lower, ESMR, 2, RF uplink, 0.3 dB < AGC, Narrowband	Passed
Lower, ESMR, 2, RF uplink, 0.3 dB < AGC, Wideband	Passed
Lower, ESMR, 2, RF uplink, 3 dB > AGC, Narrowband	Passed
Lower, ESMR, 2, RF uplink, 3 dB > AGC, Wideband	Passed





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TA tests on Andrew PSR 7/8 A, ESMR Band

**47 CFR CHAPTER I FCC PART 90 Subpart S  
[Base Stations/Repeater]**

**§ 2.1053, § 90.691 (a)(2)**

Out-of-band emission limits

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

**Final Result**

**OP-Mode**

**FCC**

Band Edge, Frequency Band, Number of signals, Direction, Input Power, Signal Type

Upper, ESMR, 1, RF downlink, 0.3 dB < AGC, Narrowband	Passed
Upper, ESMR, 1, RF downlink, 0.3 dB < AGC, Wideband	Passed
Upper, ESMR, 1, RF downlink, 3 dB > AGC, Narrowband	Passed
Upper, ESMR, 1, RF downlink, 3 dB > AGC, Wideband	Passed
Upper, ESMR, 2, RF downlink, 0.3 dB < AGC, Narrowband	Passed
Upper, ESMR, 2, RF downlink, 0.3 dB < AGC, Wideband	Passed
Upper, ESMR, 2, RF downlink, 3 dB > AGC, Narrowband	Passed
Upper, ESMR, 2, RF downlink, 3 dB > AGC, Wideband	Passed
Upper, ESMR, 1, RF uplink, 0.3 dB < AGC, Narrowband	Passed
Upper, ESMR, 1, RF uplink, 0.3 dB < AGC, Wideband	Passed
Upper, ESMR, 1, RF uplink, 3 dB > AGC, Narrowband	Passed
Upper, ESMR, 1, RF uplink, 3 dB > AGC, Wideband	Passed
Upper, ESMR, 2, RF uplink, 0.3 dB < AGC, Narrowband	Passed
Upper, ESMR, 2, RF uplink, 0.3 dB < AGC, Wideband	Passed
Upper, ESMR, 2, RF uplink, 3 dB > AGC, Narrowband	Passed
Upper, ESMR, 2, RF uplink, 3 dB > AGC, Wideband	Passed

**47 CFR CHAPTER I FCC PART 90 Subpart S  
[Base Stations/Repeater]**

Out-of-band rejection

The measurement was performed according to ANSI C63.26, 935210  
D05 v01r04: 3.3

**Final Result**

**OP-Mode**

**Setup**

**FCC**

Frequency Band, Direction

ESMR, RF downlink	Passed
ESMR, RF uplink	Passed



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TA tests on Andrew PSR 7/8 A, ESMR Band

**47 CFR CHAPTER I FCC PART 90 Subpart S  
[Base Stations/Repeater]**

**§ 2.1053, § 90.691 (a)(2)**

Field strength of spurious radiation

The measurement was performed according to ANSI C63.26

**Final Result**

**OP-Mode**

Frequency Band, Test Frequency, Direction

ESMR, high, RF downlink

ESMR, low, RF downlink

ESMR, mid, RF downlink

ESMR, high, RF uplink

ESMR, low, RF uplink

ESMR, mid, RF uplink

**FCC**

Passed

Passed

Passed

Passed

Passed

Passed



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## **ECL-TA-20-018-V01.00**

TA tests on Andrew PSR 7/8 A, ESMR Band

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### 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. Frank Futter

#### 2.3 MANUFACTURER DATA

Company Name: Please see applicant data.

Address:



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TA tests on Andrew PSR 7/8 A, ESMR Band

### 3 TEST OBJECT DATA

#### 3.1 GENERAL EUT DESCRIPTION

Kind of Device product description	Cellular Repeater
Product name	Cellular Repeater
Type	
<b>Declared EUT data by the supplier</b>	
General Product Description	The EUT is an industrial signal booster supporting the following: Band ESMR: downlink: 862 MHz - 869 MHz; uplink: 817 MHz to 824 MHz  A RF operation is supported for downlink and uplink.
Booster Type	Industrial Signal Booster
Voltage Type	AC/50 Hz – 60 Hz
Voltage Level	100 V - 240 V
Nominal Output Donor Port [Uplink]	27 dBm
Nominal Output Server Port [Downlink]	33 dBm
Nominal Gain [Uplink]	90 dB
Nominal Gain [Downlink]	90 dB

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



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TA tests on Andrew PSR 7/8 A, ESMR Band

### 3.2 EUT MAIN COMPONENTS

Sample Name	FCC-ID	
	XS5-PSR78A	
Sample Parameter	Value	
Serial Number	190805AA0006	
HW Version	7831758-0001	
SW Version	SW 01.00.02.06	
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
-	-	-



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TA tests on Andrew PSR 7/8 A, ESMR Band

### 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.

<b>Setup</b>	<b>Combination of EUTs</b>	<b>Description and Rationale</b>
		Setup for all tests

#### OPERATING MODES

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

##### 3.5.1 TEST CHANNELS

<b>Band [MHz]</b>	<b>Direction</b>	<b>Lower Frequency Band Edge [MHz]</b>	<b>Upper Frequency Band Edge [MHz]</b>	<b>Center Frequency [MHz]</b>	<b>Port</b>
862 – 869	downlink	862.0000	869.0000	865.5000	Donor
817 – 824	uplink	817.0000	824.0000	820.5000	ANT



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TA tests on Andrew PSR 7/8 A, ESMR Band

3.5.2 AUTOMATIC GAIN CONTROL LEVELS

AGC Levels							
Band [MHz]	Direction	Signal Type	AGC Start Pin [dBm]	AGC Start Pin -0.3 dB [dBm]	AGC Start Pin +3 dB [dBm]	Frequency [MHz]	Frequency
862 – 869	Downlink	Narrowband	-55.3	-55.6	-52.3	865.5000	Mid
862 – 869	Downlink	Wideband	-55.1	-55.4	-52.1	865.5000	
862 – 869	Downlink	Narrowband	-55.3	-55.6	-52.3	862.2000	Low
862 – 869	Downlink	Wideband	-55.3	-55.6	-52.3	864.5000	
862 – 869	Downlink	Narrowband	-53.9	-54.2	-50.9	868.8000	High
862 – 869	Downlink	Wideband	-54.9	-55.2	-51.9	866.5000	
862 – 869	Downlink	Narrowband	-55.7	-56.0	-52.7	863,1955	Max.Power
862 – 869	Downlink	Wideband	-55.3	-55.6	-52.3	864,5000	
817 – 824	Uplink	Narrowband	-63.1	-63.4	-60.1	820.5000	Mid
817 – 824	Uplink	Wideband	-62.9	-63.2	-59.9	820.5000	
817 – 824	Uplink	Narrowband	-62.3	-62.6	-59.3	817.2000	Low
817 – 824	Uplink	Wideband	-63.1	-63.4	-60.1	819.5000	
817 – 824	Uplink	Narrowband	-62.5	-62.8	-59.5	823.8000	High
817 – 824	Uplink	Wideband	-63.3	-63.6	-60.3	821.5000	
817 – 824	Uplink	Narrowband	-64.1	-64.4	-61.1	822.5200	Max.Power
817 – 824	Uplink	Wideband	-63.3	-63.6	-60.3	821.5000	

Remark:

If the measured frequency f0 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 is used.

For example for minimum distances to the band edges:

GSM-Signal (narrowband): 0.2 MHz

AWGN-signal (wideband): 2.5 MHz

3.6 PRODUCT LABELLING

3.6.1 FCC ID LABEL

Please refer to the documentation of the applicant.

3.6.2 LOCATION OF THE LABEL ON THE EUT

Please refer to the documentation of the applicant.

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### 4 TEST RESULTS

#### 4.1 EFFECTIVE RADIATED POWER, MEAN OUTPUT POWER AND ZONE ENHANCER GAIN

Standard FCC Part 90, § 90.635

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

**Test date:** 2020-11-27; 2020-11-30

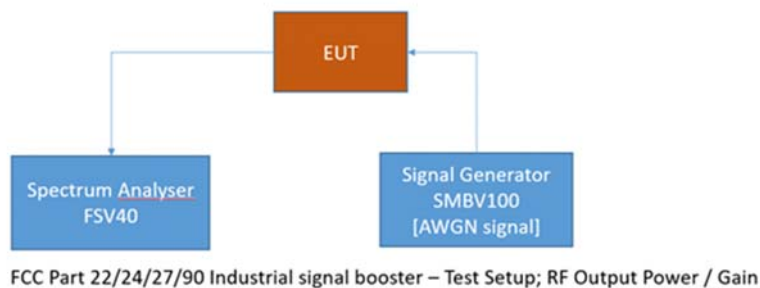
**Environmental conditions:** 22 ° C; 25 % r. F.

**Test engineer:** Thomas Gerngroß

##### 4.1.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the signal booster power and gain limits and requirements for industrial signal boosters per FCC § 90.635.

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 Analyser settings can be directly found in the measurement diagrams.





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4.1.2 TEST REQUIREMENTS/LIMITS: ABSTRACTS FROM STANDARDS

**Part 90;**

**Subpart S—Regulations Governing Licensing and Use of Frequencies in the 806-824, 851-869, 896-901, and 935-940 MHz Bands**

**§ 90.635**

Abstract § 90.635 from FCC:

**Band 862 MHz – 869 MHz**

**§ 90.635**

(a) The effective radiated power and antenna height for base stations may not exceed 1 kilowatt (30 dBw) and 304 m. (1,000 ft.) above average terrain (AAT), respectively, or the equivalent thereof as determined from the Table. These are maximum values, and applicants will be required to justify power levels and antenna heights requested.

(a) The effective radiated power and antenna height for base stations may not exceed 1 kilowatt (30 dBw) and 304 m. (1,000 ft.) above average terrain (AAT), respectively, or the equivalent thereof as determined from the Table. These are maximum values, and applicants will be required to justify power levels and antenna heights requested.

(b) The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw).



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**Table—Equivalent Power and Antenna Heights for Base Stations in the 851-869 MHz and 935-940 MHz Bands Which Have a Requirement for a 32 km (20 mi) Service Area Radius**

<b>Antenna height (ATT) meters (feet)</b>	<b>Effective radiated power (watts)<sup>1 2 4</sup></b>
Above 1,372 (4,500)	65
Above 1,220 (4,000) to 1,372 (4,500)	70
Above 1,067 (3,500) to 1,220 (4,000)	75
Above 915 (3,000) to 1,067 (3,500)	100
Above 763 (2,500) to 915 (3,000)	140
Above 610 (2,000) to 763 (2,500)	200
Above 458 (1,500) to 610 (2,000)	350
Above 305 (1,000) to 458 (1,500)	600
Up to 305 (1,000)	<sup>3</sup> 1,000

<sup>1</sup>Power is given in terms of effective radiated power (ERP).

<sup>2</sup>Applicants in the Los Angeles, CA, area who demonstrate a need to serve both the downtown and fringe areas will be permitted to utilize an ERP of 1 kw at the following mountaintop sites: Santiago Park, Sierra Peak, Mount Lukens, and Mount Wilson.

<sup>3</sup>Stations with antennas below 305 m (1,000 ft) (AAT) will be restricted to a maximum power of 1 kw (ERP).

<sup>4</sup>Licensees in San Diego, CA, will be permitted to utilize an ERP of 500 watts at the following mountaintop sites: Palomar, Otay, Woodson and Miguel.



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4.1.3 TEST PROTOCOL

<b>Band ESMR, 862 MHz – 869 MHz, downlink</b>							
<b>Signal Type</b>	<b>Input Power</b>	<b>Frequency [MHz]</b>	<b>Input Power [dBm]</b>	<b>Maximum Average Output Power [dBm]</b>	<b>Limit Average Output Power [dBm]</b>	<b>Margin to Limit [dB]</b>	<b>Gain [dB]</b>
Wideband	0.3 dB < AGC	864.5000	-55.6	34.2	48.1	13.9	89.8
Wideband	3 dB > AGC	864.5000	-52.3	34.5	48.1	13.7	86.8
Narrowband	0.3 dB < AGC	863.1955	-56.0	34.3	48.1	13.8	90.3
Narrowband	3 dB > AGC	863.1955	-52.7	34.5	48.1	13.6	87.2

<b>Band ESMR, 817 MHz – 824 MHz, uplink</b>							
<b>Signal Type</b>	<b>Input Power</b>	<b>Frequency [MHz]</b>	<b>Input Power [dBm]</b>	<b>Maximum Average Output Power [dBm]</b>	<b>Limit Average Output Power [dBm]</b>	<b>Margin to Limit [dB]</b>	<b>Gain [dB]</b>
Wideband	0.3 dB < AGC	821.5000	-63.6	27.2	48.1	20.9	90.8
Wideband	3 dB > AGC	821.5000	-60.3	27.2	48.1	20.9	87.5
Narrowband	0.3 dB < AGC	822.5200	-64.4	27.2	48.1	20.9	91.6
Narrowband	3 dB > AGC	822.5200	-61.1	27.2	48.1	20.9	88.3

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

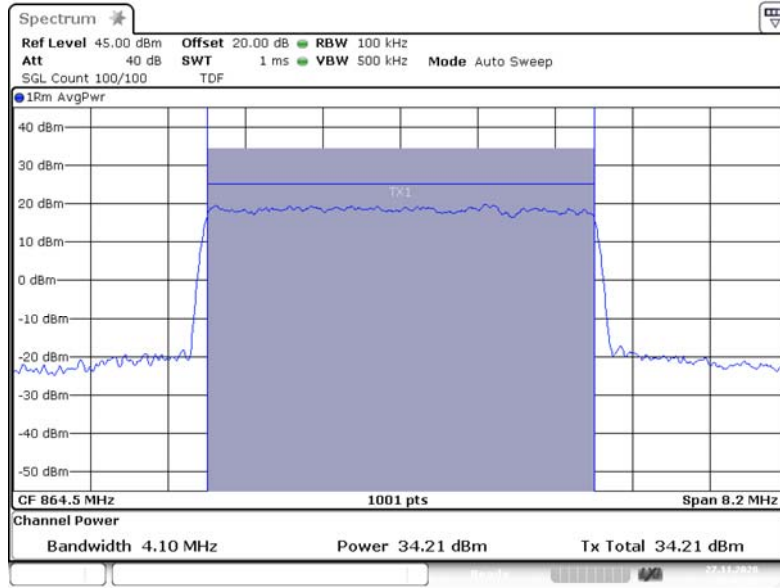


### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

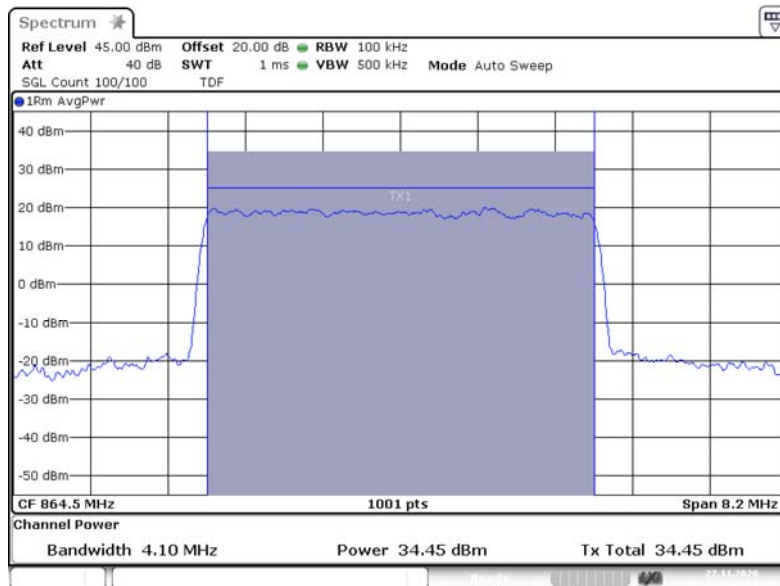
#### 4.1.4 MEASUREMENT PLOT

Downlink, Band ESMR, 862 MHz - 869 MHz; Frequency: 864.5000 MHz; Band Edge: f<sub>0</sub>; Mod: AWGN; Output Power 0.3 dB < AGC



3.5.3 Power AWGN Out -0.3 864.50000M

Downlink, Band ESMR, 862 MHz - 869 MHz; Frequency: 864.5000 MHz; Band Edge: f<sub>0</sub>; Mod: AWGN; Output Power 3 dB > AGC



3.5.3 Power AWGN Out +3 864.50000M

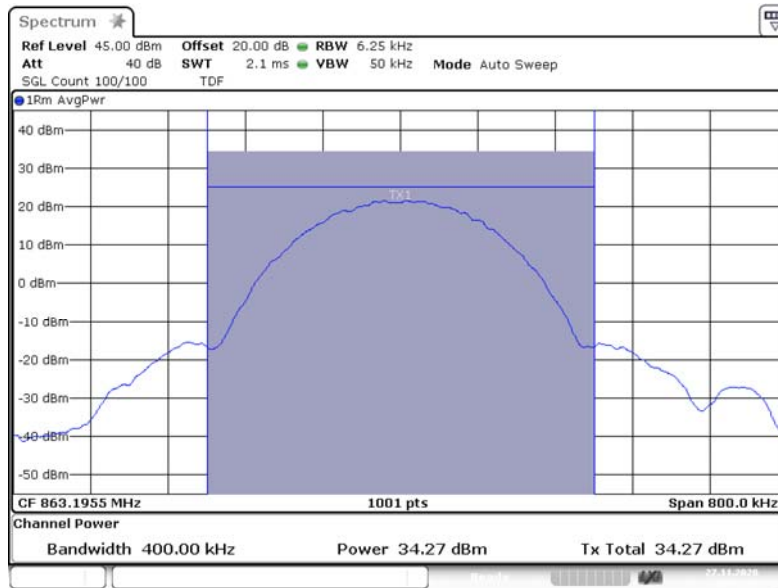


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### ECL-TA-20-018-V01.00

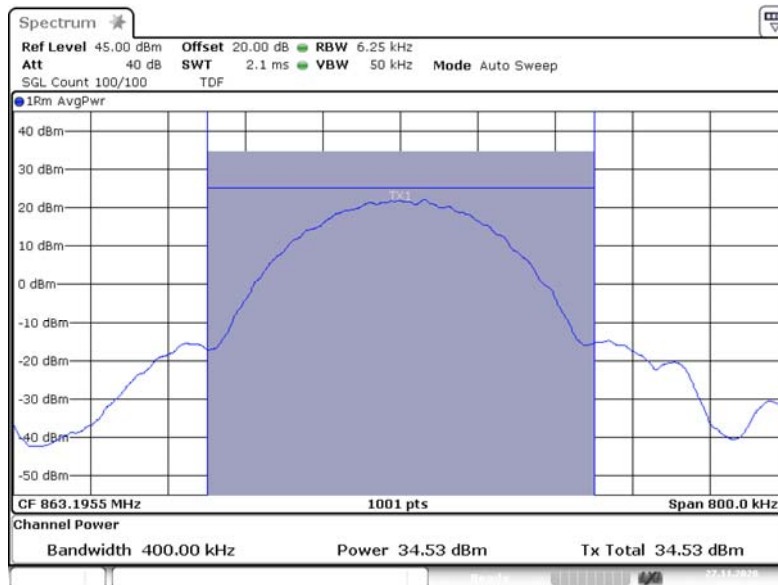
TA tests on Andrew PSR 7/8 A, ESMR Band

Downlink, Band ESMR, 862 MHz - 869 MHz; Frequency: 863.1955 MHz; Band Edge: f0; Mod: GSM;  
Input Power 0.3 dB < AGC



3.5.3 Power GSM Out -0.3 863.19550M

Downlink, Band ESMR, 862 MHz - 869 MHz; 863.1955 MHz; Band Edge: f0; Mod: GSM; Output  
Power 3 dB > AGC



3.5.3 Power GSM Out +3 863.19550M

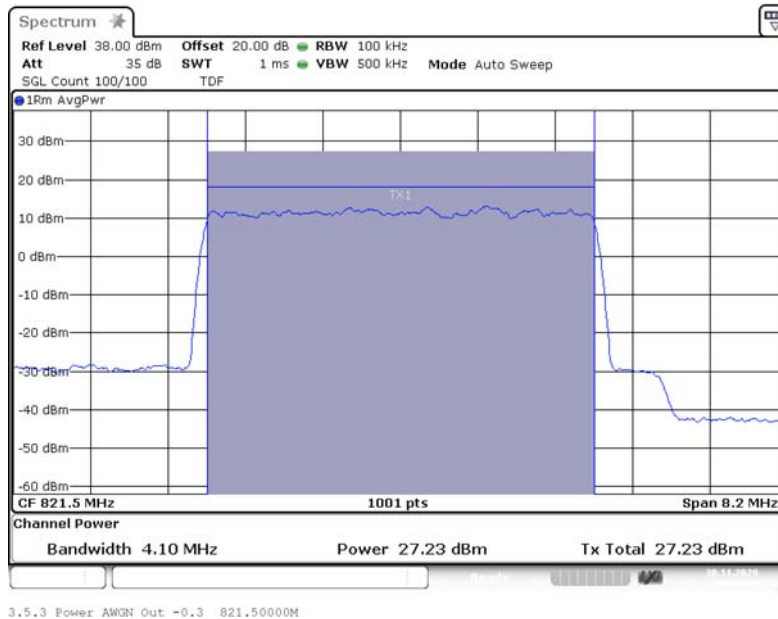


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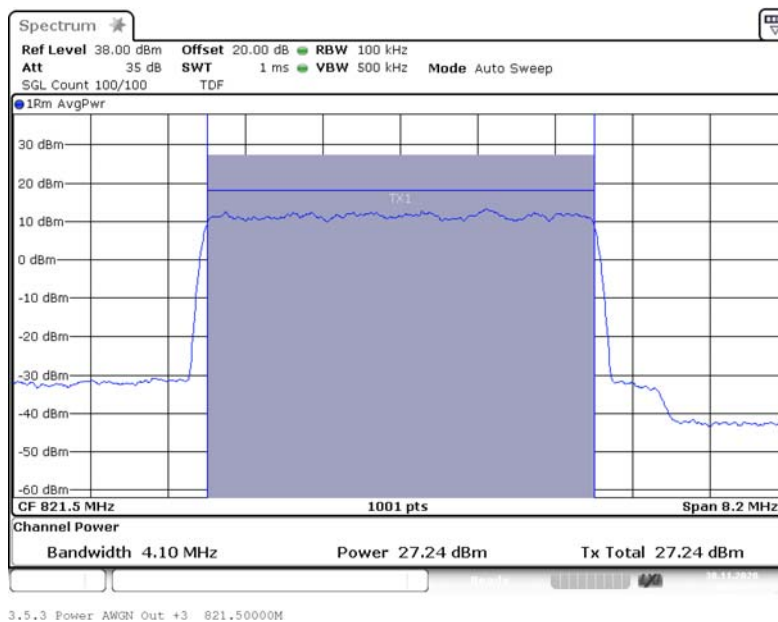
### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Uplink, Band ESMR, 817 MHz - 824 MHz; Frequency: 821.5000 MHz; Band Edge: f<sub>0</sub>; Mod: AWGN;  
Output Power 0.3 dB < AGC



Uplink, Band ESMR, 817 MHz - 824 MHz; Frequency: 821.5000 MHz; Band Edge: f<sub>0</sub>; Mod: AWGN;  
Output Power 3 dB > AGC





### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Uplink, Band ESMR, 817 MHz - 824 MHz; Frequency: 822.5200 MHz; Band Edge: f0; Mod: GSM;  
Input Power 0.3 dB < AGC



Uplink, Band ESMR, 817 MHz - 824 MHz; 822.5200 MHz; Band Edge: f0; Mod: GSM; Output Power  
3 dB > AGC



#### 4.1.5 TEST EQUIPMENT USED

- Conducted

## ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

### 4.2 PEAK TO AVERAGE RATIO

Standard -----

**The test was performed according to:**  
ANSI C63.26

**Test date:** 2020-11-27; 2020-11-30

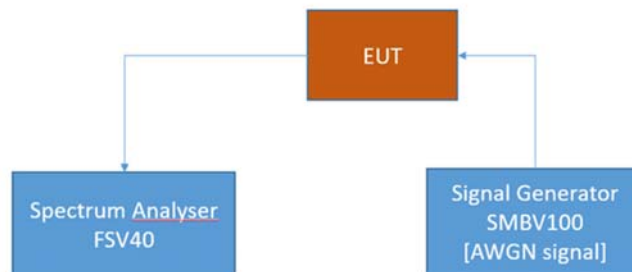
**Environmental conditions:** 22 ° C; 25 % r. F.

**Test engineer:** Thomas Gerngroß

#### 4.2.1 TEST DESCRIPTION

This test case is intended to measure the peak to average ratio.

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



FCC Part 22/24/27/90 Industrial signal booster – Test Setup; RF Output Power / Gain

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.





## ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

### 4.2.2 TEST REQUIREMENTS/LIMITS

There is no requirement for the Peak-to-Average value in the applicable rule parts, therefore a fictive limit of 13 dB is set.

### 4.2.3 TEST PROTOCOL

<b>Band ESMR, 862 MHz - 869 MHz, downlink</b>						
<b>Signal Type</b>	<b>Input Power</b>	<b>Frequency [MHz]</b>	<b>Input Power [dBm]</b>	<b>PAPR [dB]</b>	<b>Fictive Limit PAPR [dB]</b>	<b>Margin to fictive Limit [dB]</b>
Wideband	0.3 dB < AGC	864,5000	-55.6	8.49	13.00	4.51
Wideband	3 dB > AGC	865,5000	-52.1	8.38	13.00	4.62
Narrowband	0.3 dB < AGC	865,5000	-55.6	0.17	13.00	12.83
Narrowband	3 dB > AGC	865,5000	-52.3	0.17	13.00	12.83

<b>Band ESMR, 817 MHz - 824 MHz, uplink</b>						
<b>Signal Type</b>	<b>Input Power</b>	<b>Frequency [MHz]</b>	<b>Input Power [dBm]</b>	<b>PAPR [dB]</b>	<b>Fictive Limit PAPR [dB]</b>	<b>Margin to fictive Limit [dB]</b>
Wideband	0.3 dB < AGC	820,50	-63.2	8.99	13.00	4.01
Wideband	3 dB > AGC	821,50	-60.3	8.93	13.00	4.07
Narrowband	0.3 dB < AGC	820,50	-63.4	0.35	13.00	12.65
Narrowband	3 dB > AGC	820,50	-59.9	0.32	13.00	12.68

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

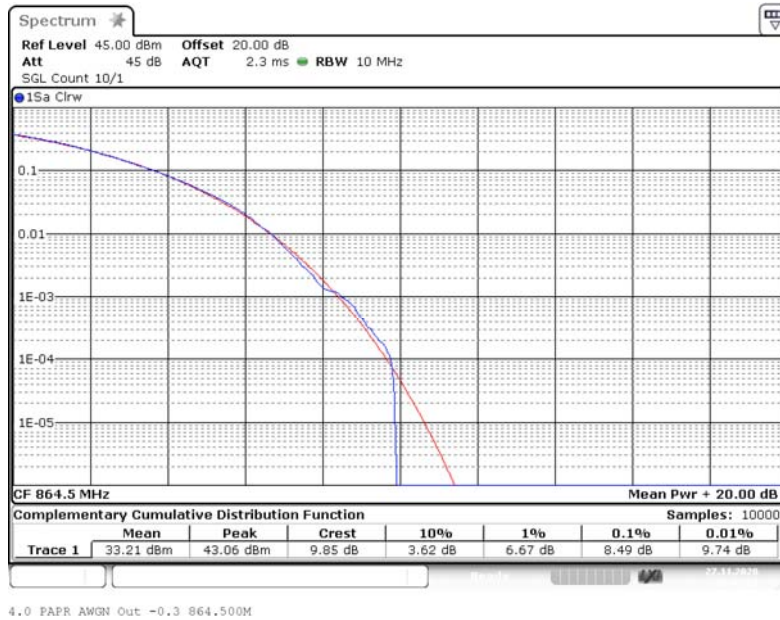


ECL-TA-20-018-V01.00

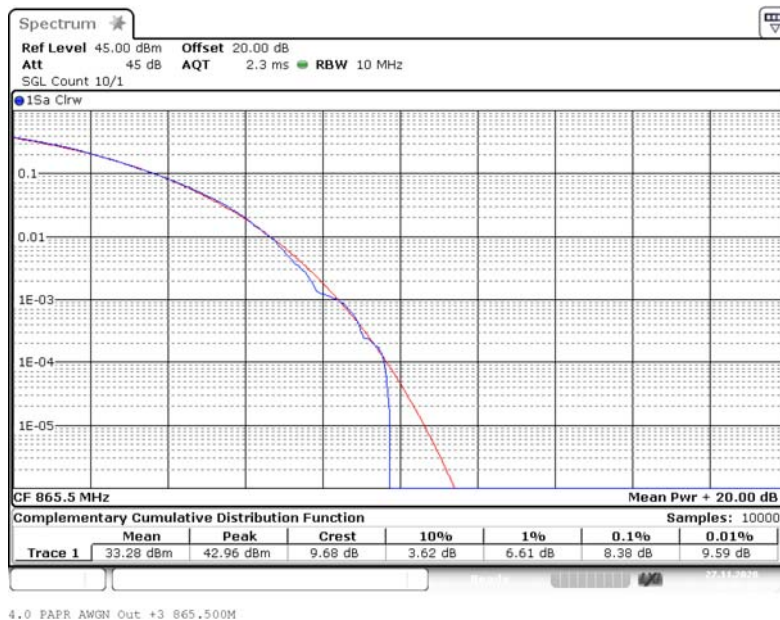
TA tests on Andrew PSR 7/8 A, ESMR Band

4.2.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, "WORST CASE")

Downlink, Band ESMR, 862 MHz - 869 MHz; Frequency: 864.5000 MHz; Band Edge: mid; Mod: AWGN; PAPR 0.3 dB < AGC



Downlink, Band ESMR, 862 MHz - 869 MHz; Frequency: 865.5000 MHz; Band Edge: mid; Mod: AWGN; PAPR 3 dB > AGC





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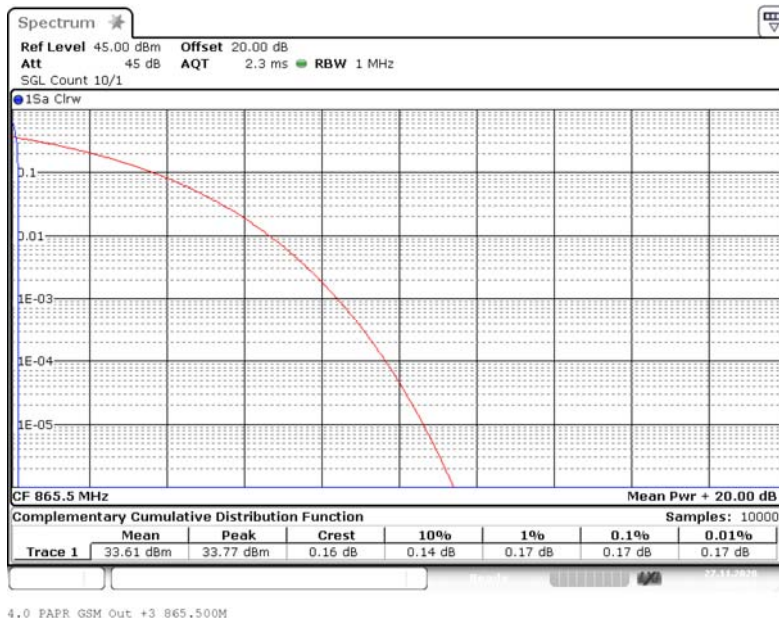
**ECL-TA-20-018-V01.00**

TA tests on Andrew PSR 7/8 A, ESMR Band

Downlink, Band ESMR, 862 MHz - 869 MHz; Frequency: 865.5000 MHz; Band Edge: mid; Mod: GSM; PAPR 0.3 dB < AGC



Downlink, Band ESMR, 862 MHz - 869 MHz; Frequency: 865.5000 MHz; Band Edge: mid; Mod: GSM; PAPR 3 dB > AGC



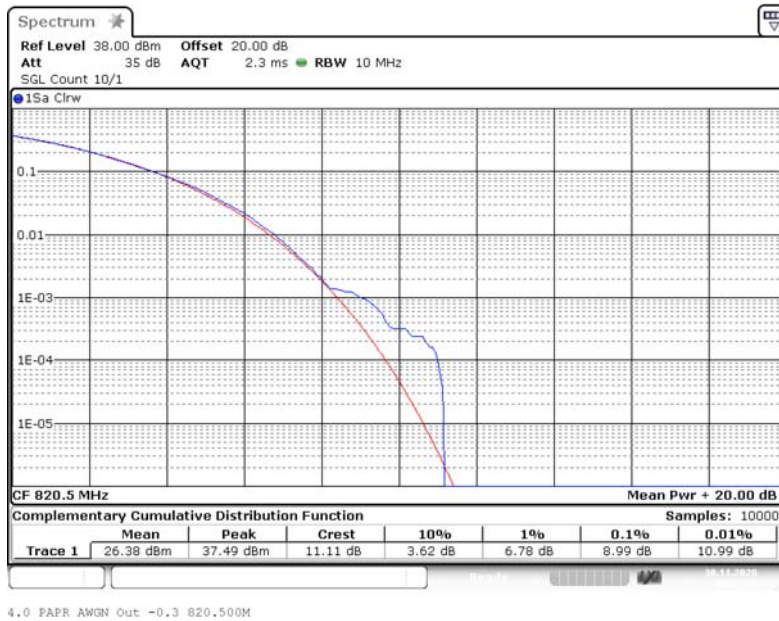


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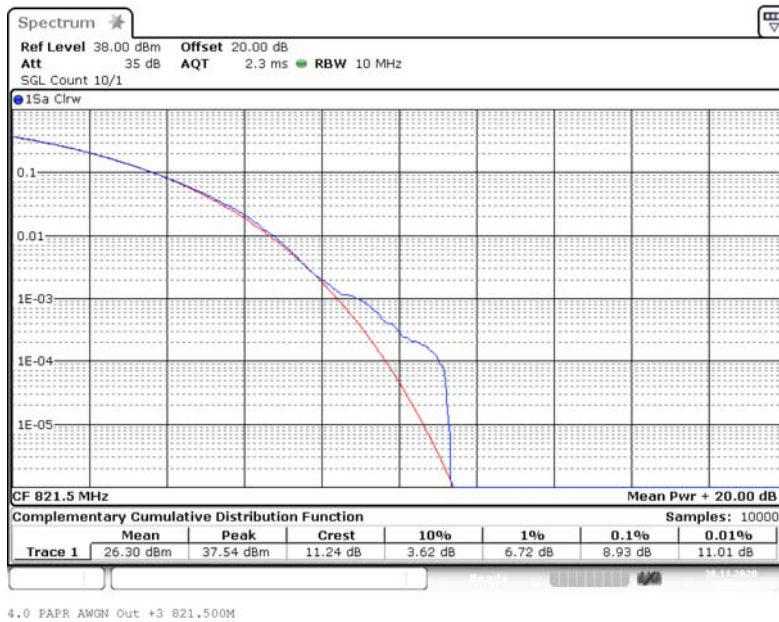
### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Uplink, Band ESMR, 817 MHz – 824 MHz; Frequency: 864.5000 MHz; Band Edge: mid; Mod: AWGN; PAPR 0.3 dB < AGC



Uplink, Band ESMR, 817 MHz - 824 MHz; Frequency: 865.5000 MHz; Band Edge: mid; Mod: AWGN; PAPR 3 dB > AGC



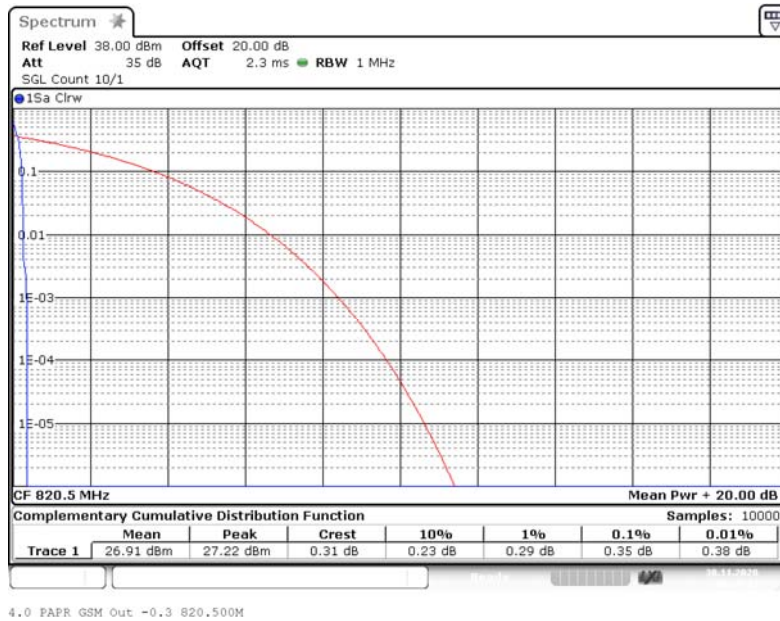




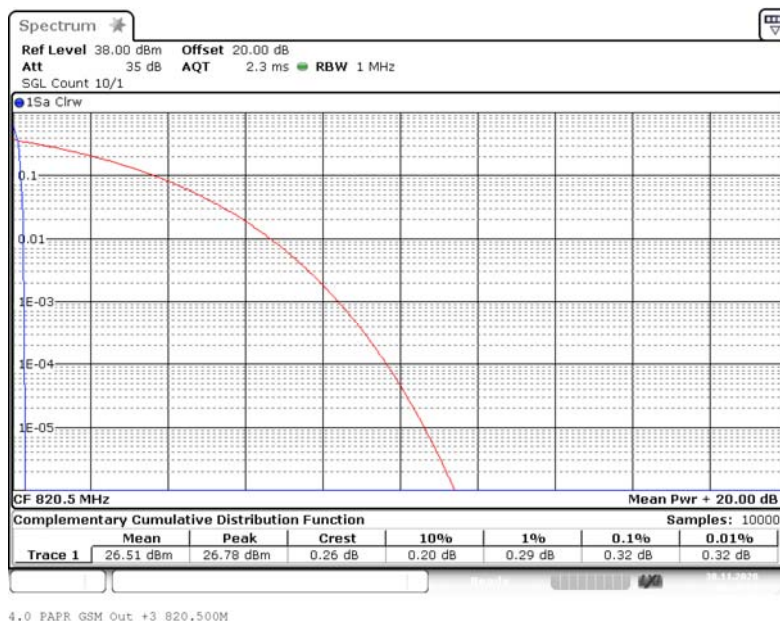
### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Uplink, Band ESMR, 817 MHz - 824 MHz; Frequency: 865.5000 MHz; Band Edge: mid; Mod: GSM;  
PAPR 0.3 dB < AGC



Uplink, Band ESMR, 817 MHz - 824 MHz; Frequency: 865.5000 MHz; Band Edge: mid; Mod: GSM;  
PAPR 3 dB > AGC



#### 4.2.5 TEST EQUIPMENT USED

- Conducted



**ECL-TA-20-018-V01.00**

TA tests on Andrew PSR 7/8 A, ESMR Band

4.3 OCCUPIED BANDWIDTH/INPUT-VERSUS-OUTPUT SPECTRUM

Standard FCC Part 2.1049

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

**Test date:** 2020-11-27; 2020-11-30

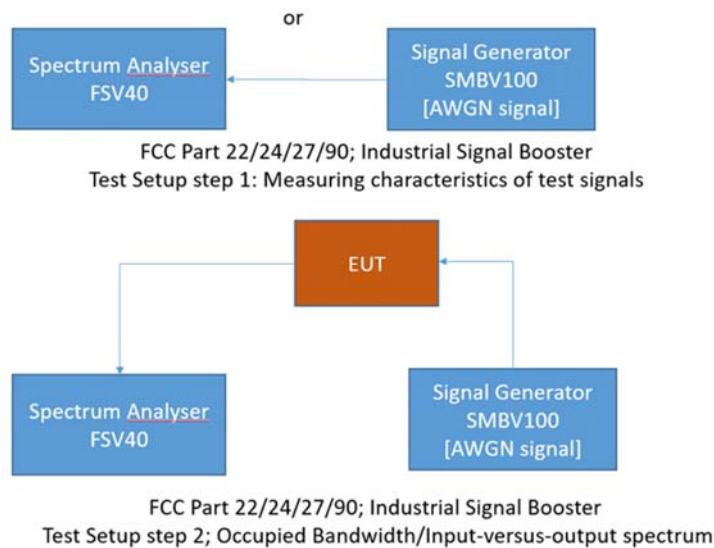
**Environmental conditions:** 22 ° C; 25 % r. F.

**Test engineer:** Thomas Gerngroß

4.3.1 TEST DESCRIPTION

This test case is intended to measure the deviation of the signal bandwidth at the transmission.

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



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

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



## ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

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### 4.3.2 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.



**ECL-TA-20-018-V01.00**

TA tests on Andrew PSR 7/8 A, ESMR Band

4.3.3 TEST PROTOCOL

<b>Band ESMR, 862 MHz - 869 MHz, downlink</b>							
<b>Signal Type</b>	<b>Input Power</b>	<b>Signal Frequency [MHz]</b>	<b>Occupied Bandwidth SG [kHz]</b>	<b>Occupied Bandwidth Booster [kHz]</b>	<b>Delta Occupied Bandwidth [kHz]</b>	<b>Limit Delta Occupied Bandwidth [kHz]</b>	<b>Margin to Limit [kHz]</b>
Wideband	0.3 dB < AGC	865.5000	4371.0	4335.3	35.7	205.0	169.3
Wideband	3 dB > AGC	865.5000	4355.0	4335.3	19.7	205.0	185.3
Narrowband	0.3 dB < AGC	865.5000	321.7	318.2	3.5	10.0	6.5
Narrowband	3 dB > AGC	865.5000	319.3	318.5	0.8	10.0	9.2

<b>Band ESMR, 817 MHz - 824 MHz, uplink</b>							
<b>Signal Type</b>	<b>Input Power</b>	<b>Signal Frequency [MHz]</b>	<b>Occupied Bandwidth SG [kHz]</b>	<b>Occupied Bandwidth Booster [kHz]</b>	<b>Delta Occupied Bandwidth [kHz]</b>	<b>Limit Delta Occupied Bandwidth [kHz]</b>	<b>Margin to Limit [kHz]</b>
Wideband	0.3 dB < AGC	820.5000	4343.9	4336.5	7.4	205.0	197.6
Wideband	3 dB > AGC	820.5000	4340.2	4335.3	4.9	205.0	200.1
Narrowband	0.3 dB < AGC	820.5000	320.5	319.4	1.1	10.0	8.9
Narrowband	3 dB > AGC	820.5000	315.8	320.4	4.6	10.0	5.4

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



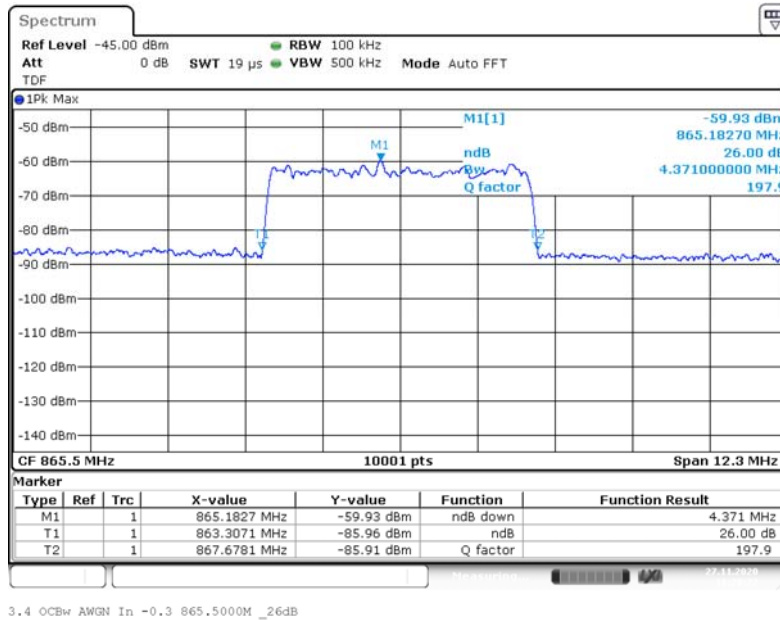


### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

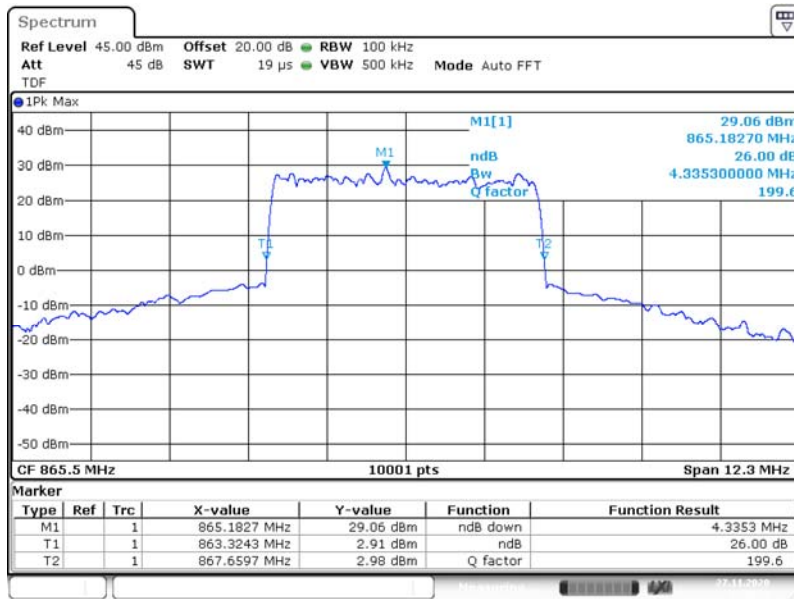
#### 4.3.4 MEASUREMENT PLOT

Downlink, Band ESMR, 862 MHz - 869 MHz; Frequency: 865.5000 MHz; Band Edge: mid; Mod: AWGN; Input OCBw 0.3 dB < AGC



3.4 OCBw AWGN In -0.3 865.5000M \_26dB

Input Signal



3.4 OCBw AWGN Out -0.3 865.5000M \_26dB

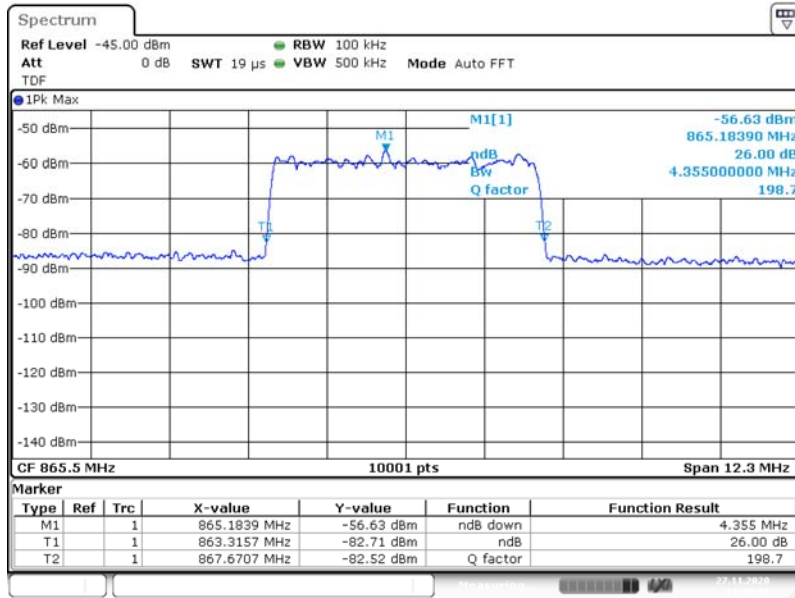
Output Signal



### ECL-TA-20-018-V01.00

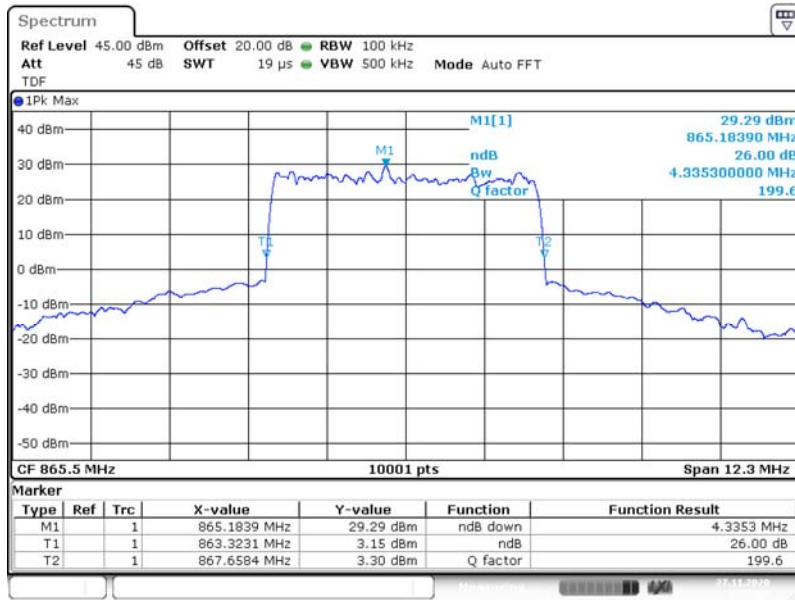
TA tests on Andrew PSR 7/8 A, ESMR Band

Downlink, Band ESMR, 862 MHz - 869 MHz; Frequency: 865.5000 MHz; Band Edge: mid; Mod: AWGN; Input OCBw 3 dB > AGC



3.4 OCBw AWGN In +3 865.5000M \_26dB

Input Signal



3.4 OCBw AWGN Out +3 865.5000M \_26dB

Output Signal

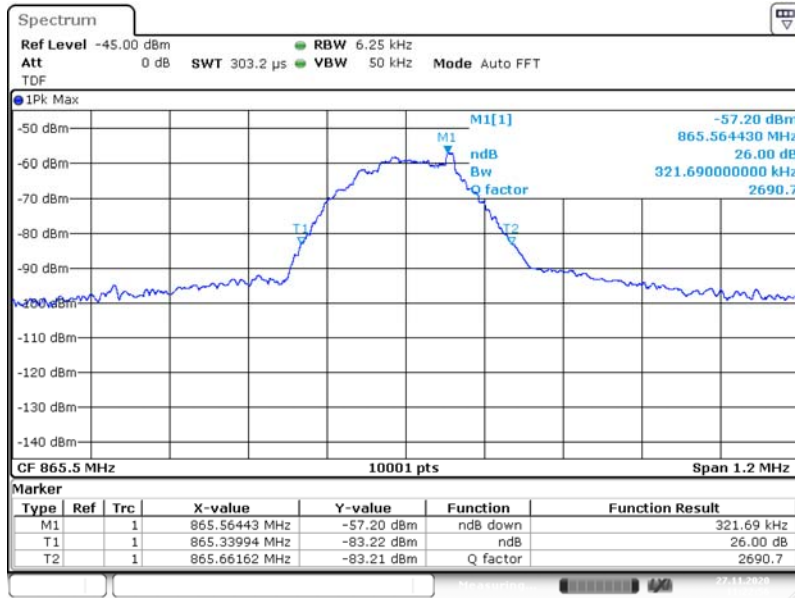


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### ECL-TA-20-018-V01.00

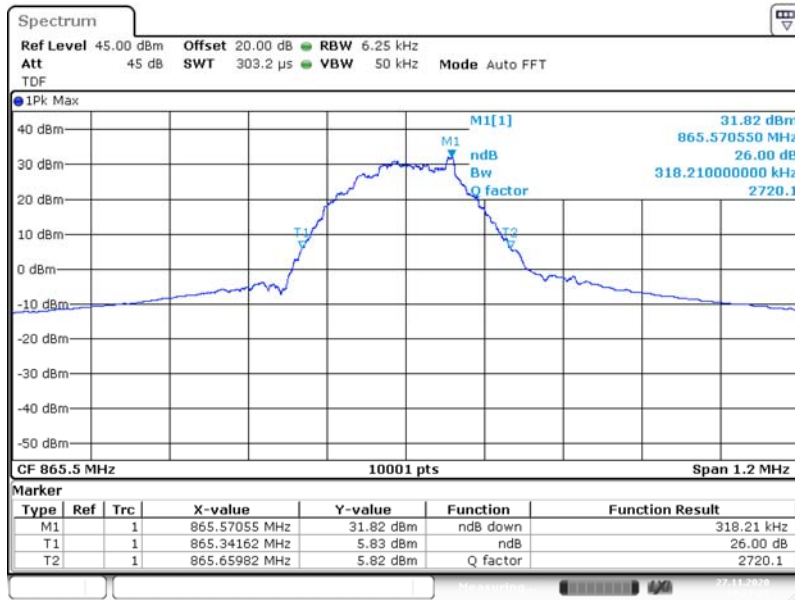
TA tests on Andrew PSR 7/8 A, ESMR Band

Downlink, Band ESMR, 862 MHz - 869 MHz; Frequency: 865.5000 MHz; Band Edge: mid; Mod: GSM; Input OCBw 0.3 dB < AGC



3.4 OCBw GSM In -0.3 865.5000M \_26dB

### Input Signal



3.4 OCBw GSM Out -0.3 865.5000M \_26dB

### Output Signal

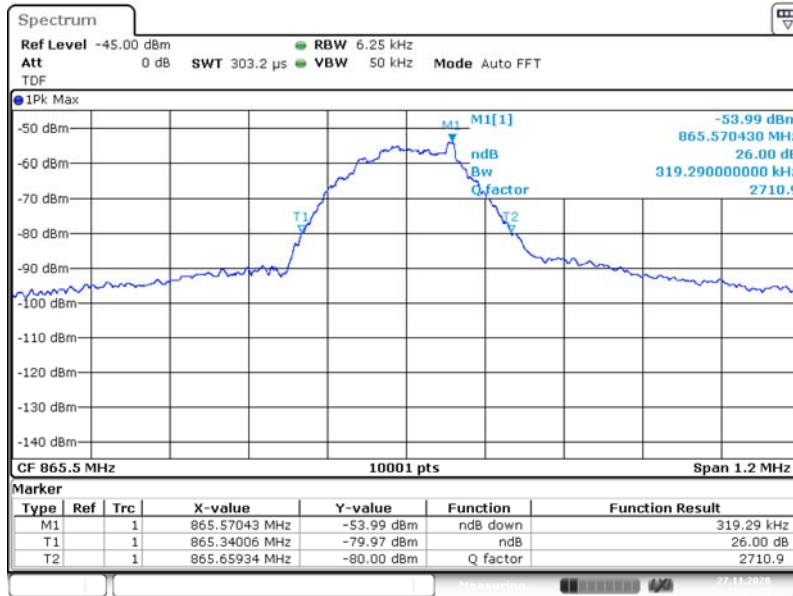


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### ECL-TA-20-018-V01.00

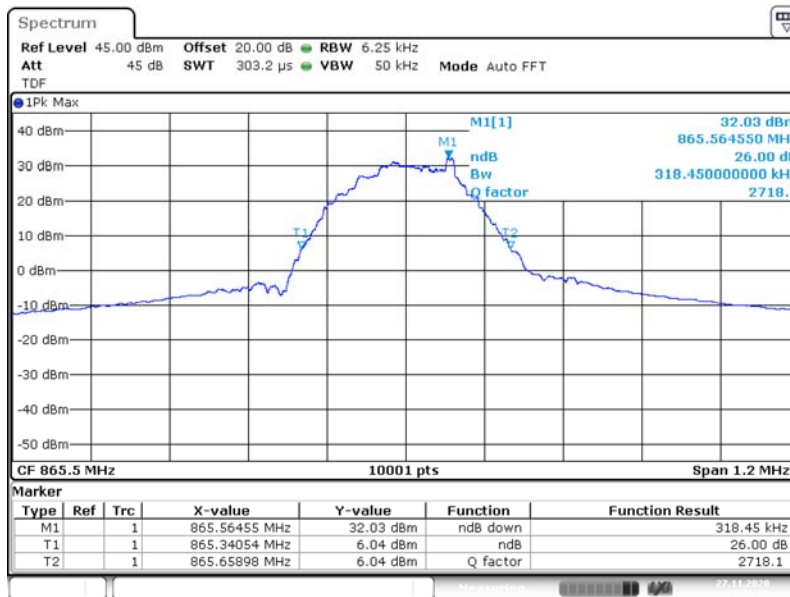
TA tests on Andrew PSR 7/8 A, ESMR Band

Downlink, Band ESMR, 862 MHz - 869 MHz; Frequency: 865.5000 MHz; Band Edge: mid; Mod: GSM; Input OCBw 3 dB > AGC



3.4 OCBw GSM In +3 865.5000M \_26dB

Input Signal



3.4 OCBw GSM Out +3 865.5000M \_26dB

Output Signal

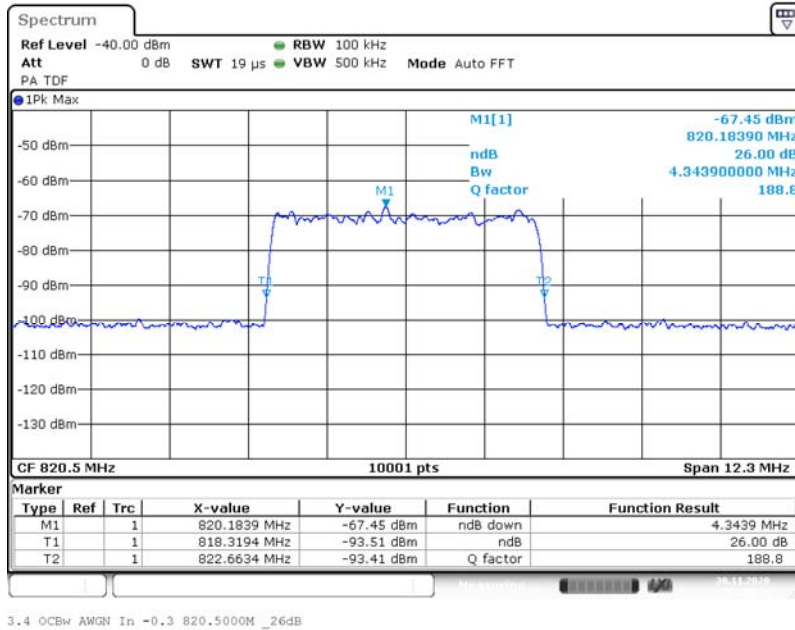


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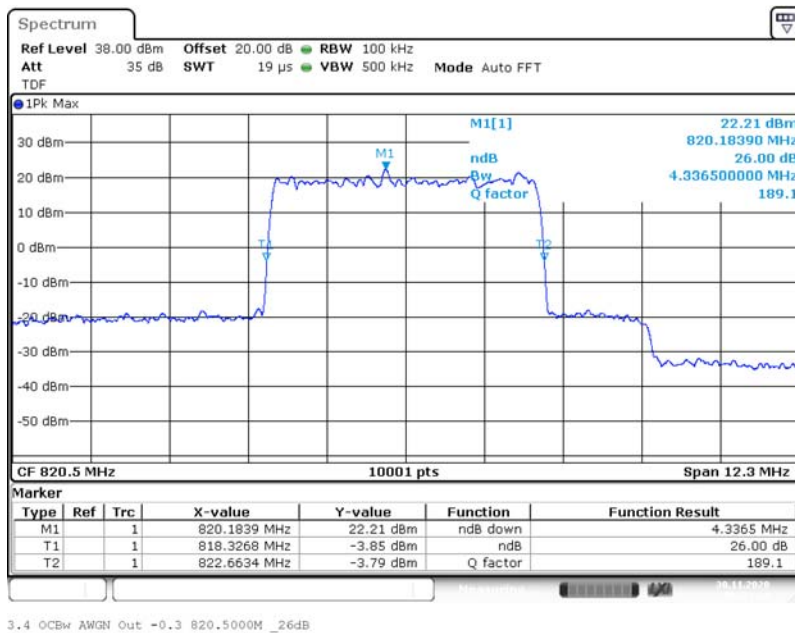
### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Uplink, Band ESMR, 817 MHz - 824 MHz; Frequency: 820.5000 MHz; Band Edge: mid; Mod: AWGN; Input OCBw 0.3 dB < AGC



Input Signal



Output Signal

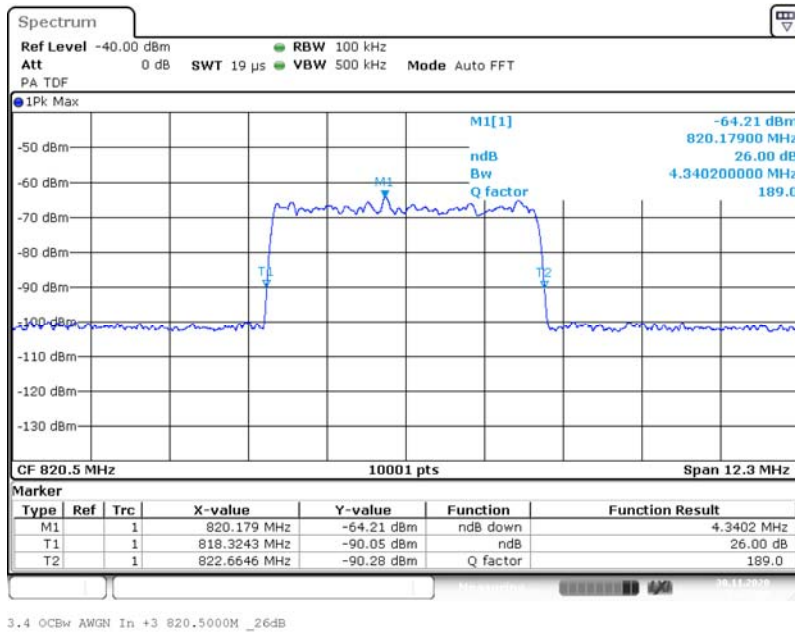


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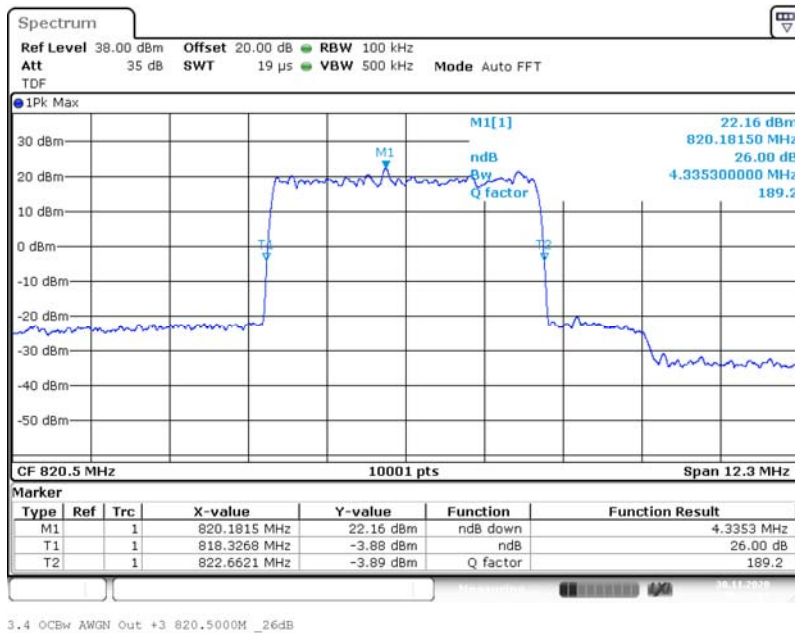
### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Uplink, Band ESMR, 817 MHz - 824 MHz; Frequency: 820.5000 MHz; Band Edge: mid; Mod: AWGN;  
Input OCBw 3 dB > AGC



Input Signal



Output Signal

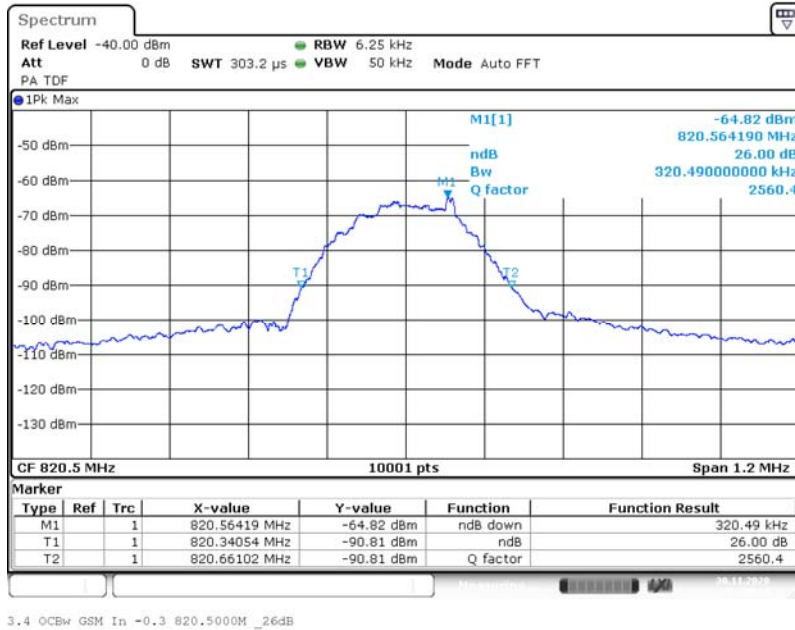


BUREAU VERITAS

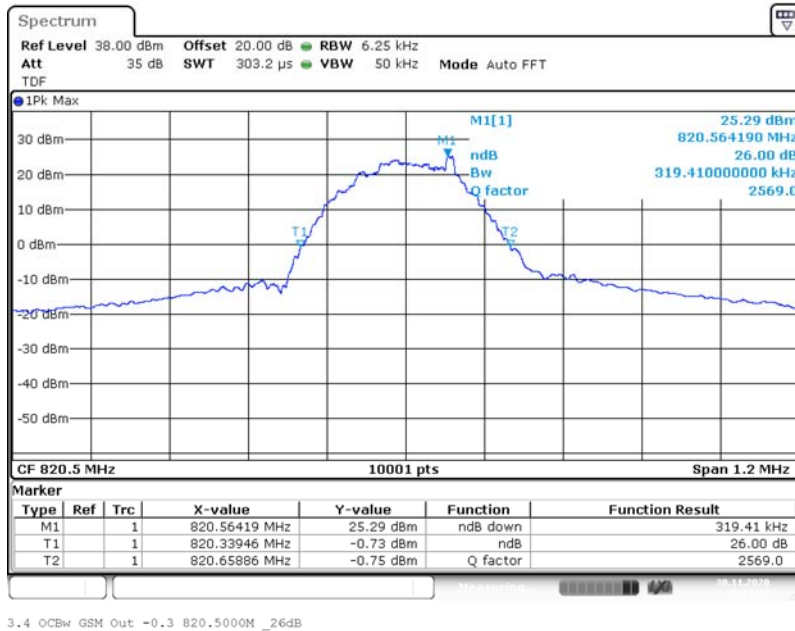
### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Uplink, Band ESMR, 817 MHz - 824 MHz; Frequency: 820.5000 MHz; Band Edge: mid; Mod: GSM;  
Input OCBw 0.3 dB < AGC



Input Signal



Output Signal

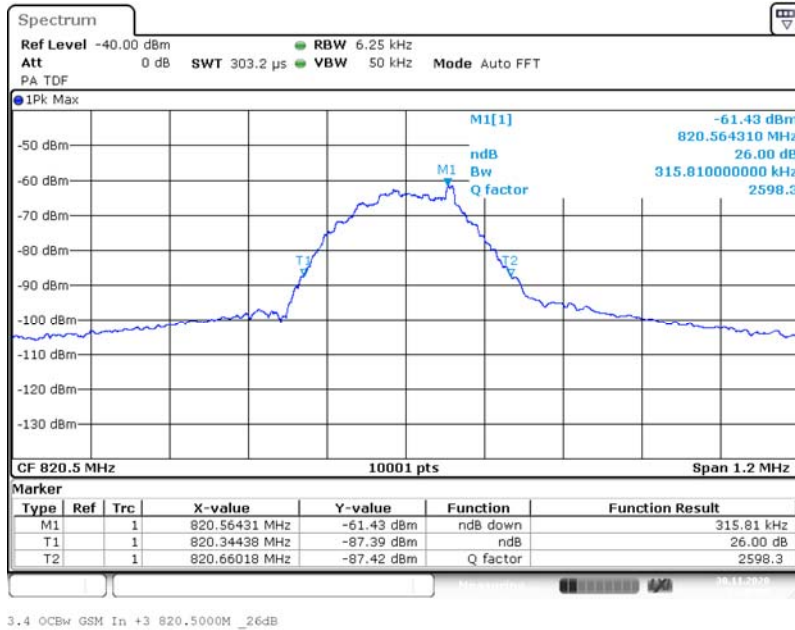




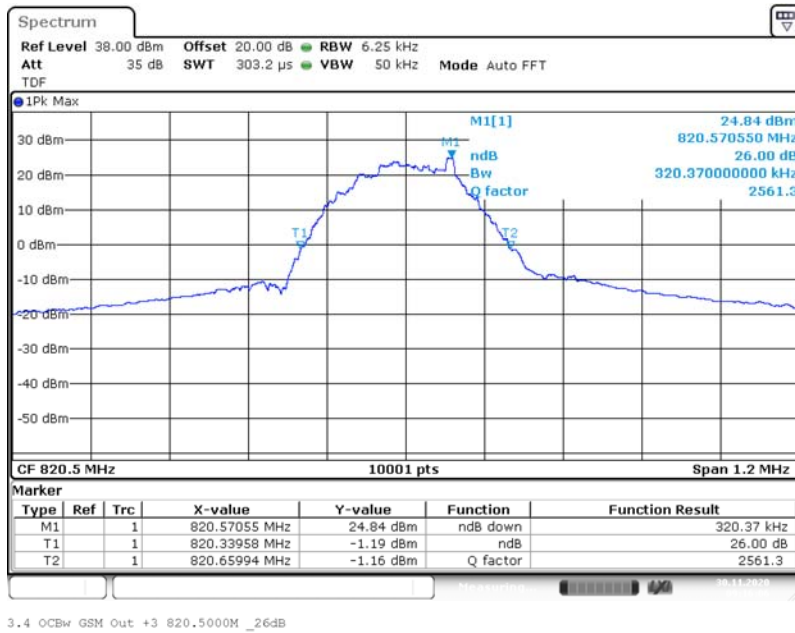
### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Uplink, Band ESMR, 817 MHz - 824 MHz; Frequency: 820.5000 MHz; Band Edge: mid; Mod: GSM;  
Input OCBw 3 dB > AGC



Input Signal



Output Signal

#### 4.3.5 TEST EQUIPMENT USED

- Conducted





## ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

### 4.4 CONDUCTED SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Standard FCC Part § 2.1051, § 90.691

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

**Test date:** 2020-11-27; 2020-11-30

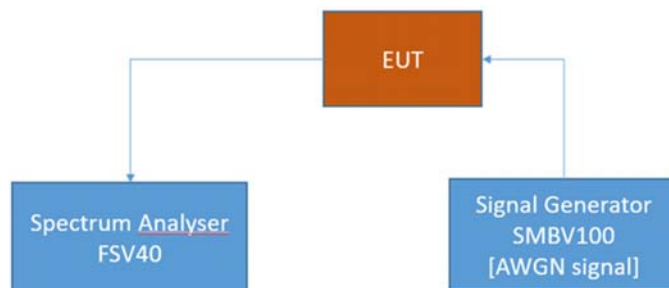
**Environmental conditions:** 22 ° C; 25 % r. F.

**Test engineer:** Thomas Gerngroß

#### 4.4.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the signal booster power and gain limits and requirements for industrial signal boosters per FCC § 2.1051 and FCC § 90.691.

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



FCC Part 22/24/27/90 Industrial signal booster – Test Setup; RF Output Power / Gain

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.



## ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

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### 4.4.2 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.

Abstract § 90.691 FCC:

#### **§ 90.691 Emission mask requirements for EA-based systems.**

(a) Out-of-band emission requirement shall apply only to the "outer" channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10\text{Log}_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.



**ECL-TA-20-018-V01.00**

TA tests on Andrew PSR 7/8 A, ESMR Band

4.4.3 TEST PROTOCOL

<b>Band ESMR, 862 MHz - 869 MHz, downlink</b>							
<b>Test Frequency</b>	<b>Signal Type</b>	<b>Spurious Freq. [MHz]</b>	<b>Spurious Level [dBm]</b>	<b>Detector</b>	<b>RBW [kHz]</b>	<b>Limit [dBm]</b>	<b>Margin to Limit [dB]</b>
low	Wideband	0.0487508	-55.8	RMS	1	-33	22.8
low	Wideband	0.4074403	-49.8	RMS	10	-23	26.8
low	Wideband	120.0654	-45.3	RMS	100	-13	32.3
low	Wideband	852.5251	-27.4	RMS	100	-13	14.4
low	Wideband	852.4751	-28.7	RMS	10	-23	5.7
low	Wideband	869.2	-33.9	RMS	10	-23	10.9
low	Wideband	953.9	-43.2	RMS	100	-13	30.2
low	Wideband	1728.7	-30.1	RMS	1000	-13	17.1
mid	Wideband	0.0487098	-56.0	RMS	1	-33	23.0
mid	Wideband	0.0874937	-49.6	RMS	10	-23	26.6
mid	Wideband	118.2656	-44.7	RMS	100	-13	31.7
mid	Wideband	852.3751	-28.8	RMS	100	-13	15.8
mid	Wideband	861.9	-30.9	RMS	10	-23	7.9
mid	Wideband	869.1	-31.4	RMS	10	-23	8.4
mid	Wideband	955.6	-43.5	RMS	100	-13	30.5
mid	Wideband	1730.7	-30.3	RMS	1000	-13	17.3
high	Wideband	0.0487508	-56.8	RMS	1	-33	23.8
high	Wideband	0.8323694	-49.5	RMS	10	-23	26.5
high	Wideband	118.7156	-45.4	RMS	100	-13	32.4
high	Wideband	851.8252	-29.2	RMS	100	-13	16.2
high	Wideband	861.8675	-33.8	RMS	10	-23	10.8
high	Wideband	869.3	-28.6	RMS	10	-23	5.6
high	Wideband	954.5	-43.3	RMS	100	-13	30.3
high	Wideband	1733.2	-30.8	RMS	1000	-13	17.8



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TA tests on Andrew PSR 7/8 A, ESMR Band

<b>Band ESMR, 862 MHz - 869 MHz, downlink</b>							
<b>Test Frequency</b>	<b>Signal Type</b>	<b>Spurious Freq. [MHz]</b>	<b>Spurious Level [dBm]</b>	<b>Detector</b>	<b>RBW [kHz]</b>	<b>Limit [dBm]</b>	<b>Margin to Limit [dB]</b>
low	Narrowband	0.0202842	-61.0	RMS	1	-33	28.0
low	Narrowband	0.1524829	-55.0	RMS	10	-23	32.0
low	Narrowband	67.321	-45.6	RMS	100	-13	32.6
low	Narrowband	852.775	-29.8	RMS	100	-13	16.8
low	Narrowband	852.1	-30.2	RMS	10	-23	7.2
low	Narrowband	869.1	-41.2	RMS	10	-23	18.2
low	Narrowband	949.8	-43.8	RMS	100	-13	30.8
low	Narrowband	1724.7	-26.0	RMS	1000	-13	13.0
mid	Narrowband	0.0106588	-60.9	RMS	1	-33	27.9
mid	Narrowband	0.0974921	-54.6	RMS	10	-23	31.6
mid	Narrowband	123.1651	-45.4	RMS	100	-13	32.4
mid	Narrowband	851.6252	-29.4	RMS	100	-13	16.4
mid	Narrowband	850.6753	-37.8	RMS	10	-23	14.8
mid	Narrowband	869.1	-41.8	RMS	10	-23	18.8
mid	Narrowband	949.0459	-43.5	RMS	100	-13	30.5
mid	Narrowband	1731.2	-27.8	RMS	1000	-13	14.8
high	Narrowband	0.0101673	-60.1	RMS	1	-33	27.1
high	Narrowband	0.0524996	-54.8	RMS	10	-23	31.8
high	Narrowband	119.5155	-45.2	RMS	100	-13	32.2
high	Narrowband	852.4751	-28.4	RMS	100	-13	15.4
high	Narrowband	853.9	-37.1	RMS	10	-23	14.1
high	Narrowband	869.1	-31.2	RMS	10	-23	8.2
high	Narrowband	950.2	-43.7	RMS	100	-13	30.7
high	Narrowband	1737.7	-27.9	RMS	1000	-13	14.9



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TA tests on Andrew PSR 7/8 A, ESMR Band

<b>Band ESMR, 817 MHz - 824 MHz, uplink</b>							
<b>Test Frequency</b>	<b>Signal Type</b>	<b>Spurious Freq. [MHz]</b>	<b>Spurious Level [dBm]</b>	<b>Detector</b>	<b>RBW [kHz]</b>	<b>Limit [dBm]</b>	<b>Margin to Limit [dB]</b>
low	Wideband	0.0091024	-60.8	RMS	1	-33	27.8
low	Wideband	0.0574988	-54.3	RMS	10	-23	31.3
low	Wideband	117.6157	-45.6	RMS	100	-13	32.6
low	Wideband	806.6252	-27.6	RMS	100	-13	14.6
low	Wideband	810.5011	-36.4	RMS	10	-23	13.4
low	Wideband	824.1275	-39.4	RMS	10	-23	16.4
low	Wideband	951.8894	-43.4	RMS	100	-13	30.4
low	Wideband	6864.4	-30.8	RMS	1000	-13	17.8
mid	Wideband	0.0096758	-60.6	RMS	1	-33	27.6
mid	Wideband	0.0624979	-54.2	RMS	10	-23	31.2
mid	Wideband	66.3211	-45.4	RMS	100	-13	32.4
mid	Wideband	806.9252	-27.3	RMS	100	-13	14.3
mid	Wideband	810.5011	-37.2	RMS	10	-23	14.2
mid	Wideband	824.1574	-39.9	RMS	10	-23	16.9
mid	Wideband	951.9894	-43.8	RMS	100	-13	30.8
mid	Wideband	6850.9	-30.9	RMS	1000	-13	17.9
high	Wideband	0.0150824	-61.1	RMS	1	-33	28.1
high	Wideband	0.0774954	-55.0	RMS	10	-23	32.0
high	Wideband	66.4711	-45.5	RMS	100	-13	32.5
high	Wideband	807.0751	-28.4	RMS	100	-13	15.4
high	Wideband	810.5011	-35.9	RMS	10	-23	12.9
high	Wideband	824.1675	-38.9	RMS	10	-23	15.9
high	Wideband	951.4895	-43.5	RMS	100	-13	30.5
high	Wideband	6786.4	-30.9	RMS	1000	-13	17.9



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TA tests on Andrew PSR 7/8 A, ESMR Band

<b>Band ESMR, 817 MHz - 824 MHz, uplink</b>							
<b>Test Frequency</b>	<b>Signal Type</b>	<b>Spurious Freq. [MHz]</b>	<b>Spurious Level [dBm]</b>	<b>Detector</b>	<b>RBW [kHz]</b>	<b>Limit [dBm]</b>	<b>Margin to Limit [dB]</b>
low	Narrowband	0.0094301	-62.4	RMS	1	-33	29.4
low	Narrowband	0.0524996	-55.3	RMS	10	-23	32.3
low	Narrowband	69.8208	-45.5	RMS	100	-13	32.5
low	Narrowband	806.6252	-28.1	RMS	100	-13	15.1
low	Narrowband	816.8975	-35.6	RMS	10	-23	12.6
low	Narrowband	824.1225	-39.6	RMS	10	-23	16.6
low	Narrowband	951.8394	-44.0	RMS	100	-13	31.0
low	Narrowband	6858.9	-31.3	RMS	1000	-13	18.3
mid	Narrowband	0.0118876	-61.9	RMS	1	-33	28.9
mid	Narrowband	0.0624979	-55.6	RMS	10	-23	32.6
mid	Narrowband	119.6655	-45.7	RMS	100	-13	32.7
mid	Narrowband	807.0252	-28.4	RMS	100	-13	15.4
mid	Narrowband	810.5011	-35.7	RMS	10	-23	12.7
mid	Narrowband	824.1825	-40.5	RMS	10	-23	17.5
mid	Narrowband	952.4892	-44.3	RMS	100	-13	31.3
mid	Narrowband	6905.9	-31.1	RMS	1000	-13	18.1
high	Narrowband	0.0102083	-61.2	RMS	1	-33	28.2
high	Narrowband	0.1574821	-54.4	RMS	10	-23	31.4
high	Narrowband	69.4708	-45.5	RMS	100	-13	32.5
high	Narrowband	807.0751	-28.9	RMS	100	-13	15.9
high	Narrowband	810.5011	-36.2	RMS	10	-23	13.2
high	Narrowband	824.1025	-36.5	RMS	10	-23	13.5
high	Narrowband	954.4886	-43.5	RMS	100	-13	30.5
high	Narrowband	6889.9	-31.1	RMS	1000	-13	18.1

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



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TA tests on Andrew PSR 7/8 A, ESMR Band

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General considerations concerning the measurement plots:

The measuring bandwidth of 100 kHz was chosen according the test requirements except 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 where measuring bandwidths were reduced also the border lines were reduced according the given formula:

$$p_{RBWreduced} [dBm] = 10 * \log \left( RBWreduced [kHz] - 100 kHz \right) + p_{RBW 100 kHz} [dBm]$$

Hereby "p" are the border lines' values.

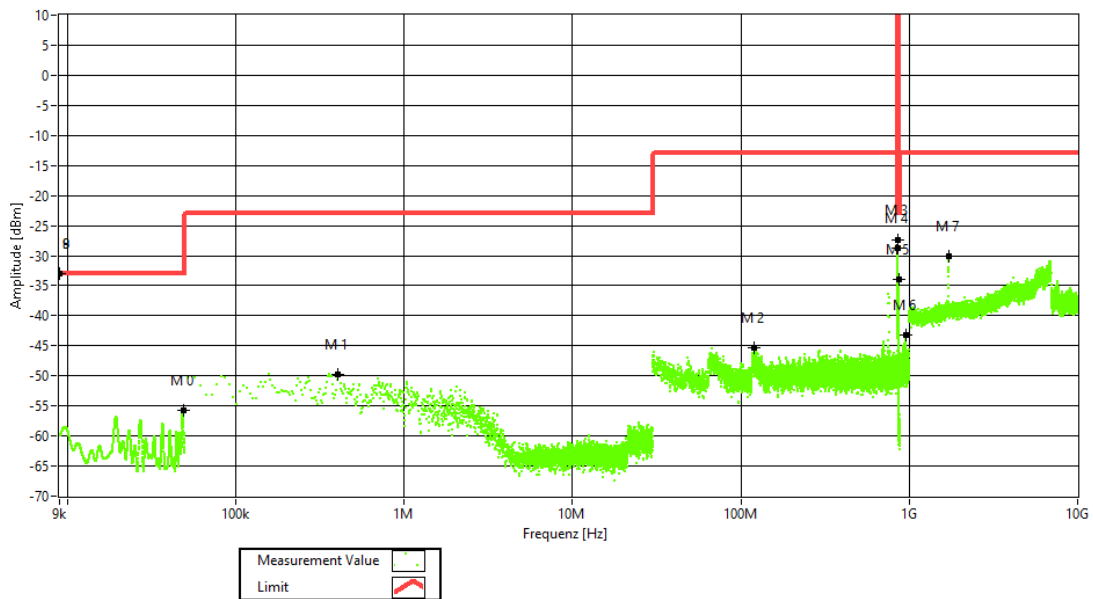


### ECL-TA-20-018-V01.00

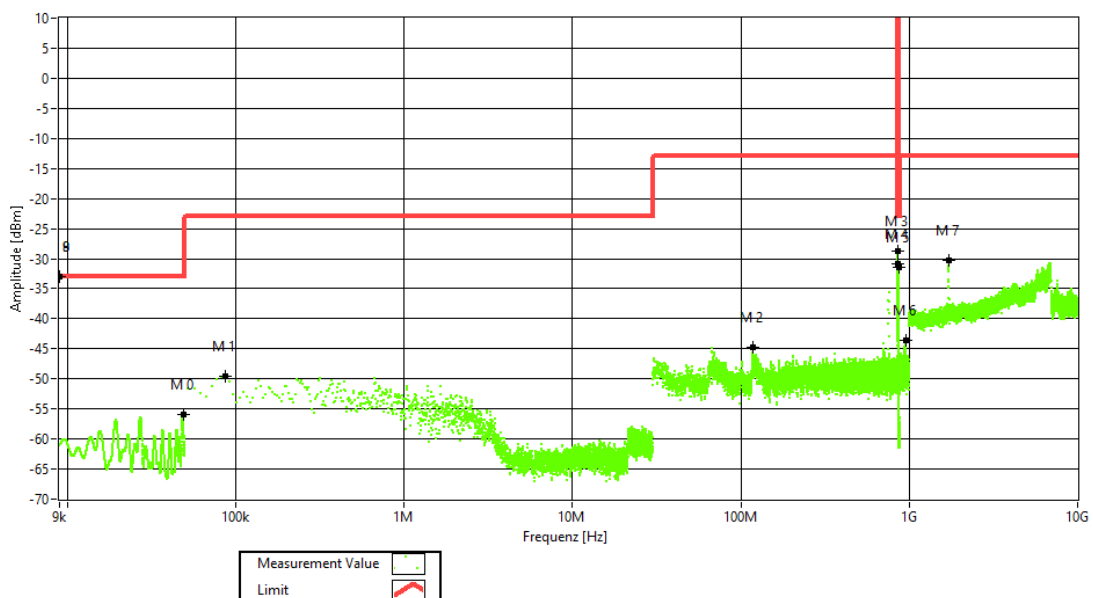
TA tests on Andrew PSR 7/8 A, ESMR Band

#### 4.4.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, "WORST CASE")

Frequency Band = Band ESMR, 862 MHz - 869 MHz, Test Frequency = low, Direction = RF downlink, Signal Type = AWGN



Frequency Band = Band ESMR, 862 MHz - 869 MHz, Test Frequency = mid, Direction = RF downlink, Signal Type = AWGN



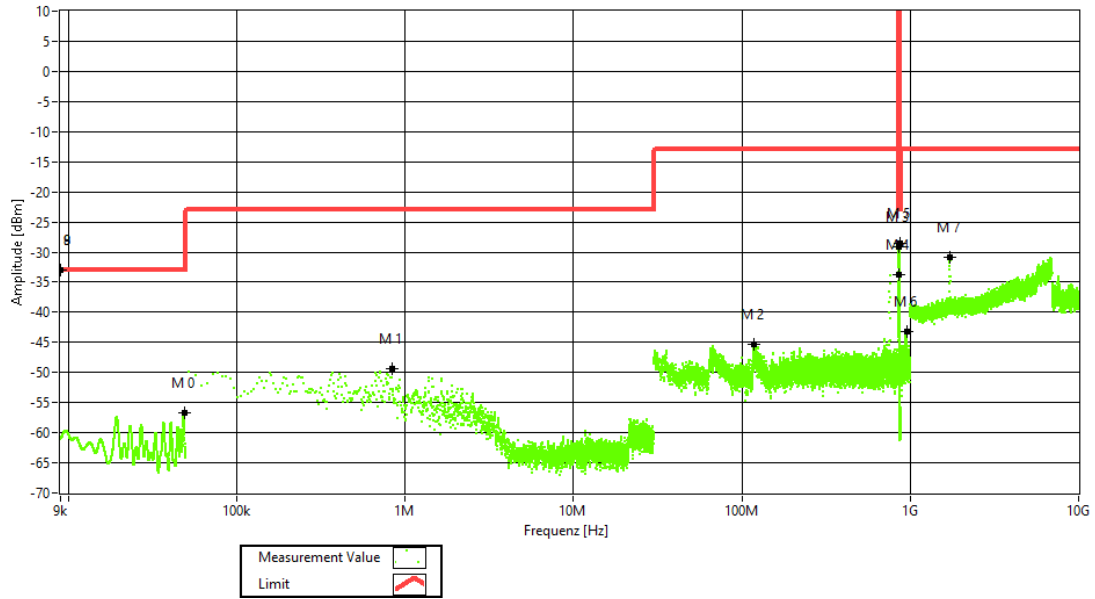




### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Frequency Band = Band ESMR, 862 MHz - 869 MHz, Test Frequency = high, Direction = RF downlink, Signal Type = AWGN

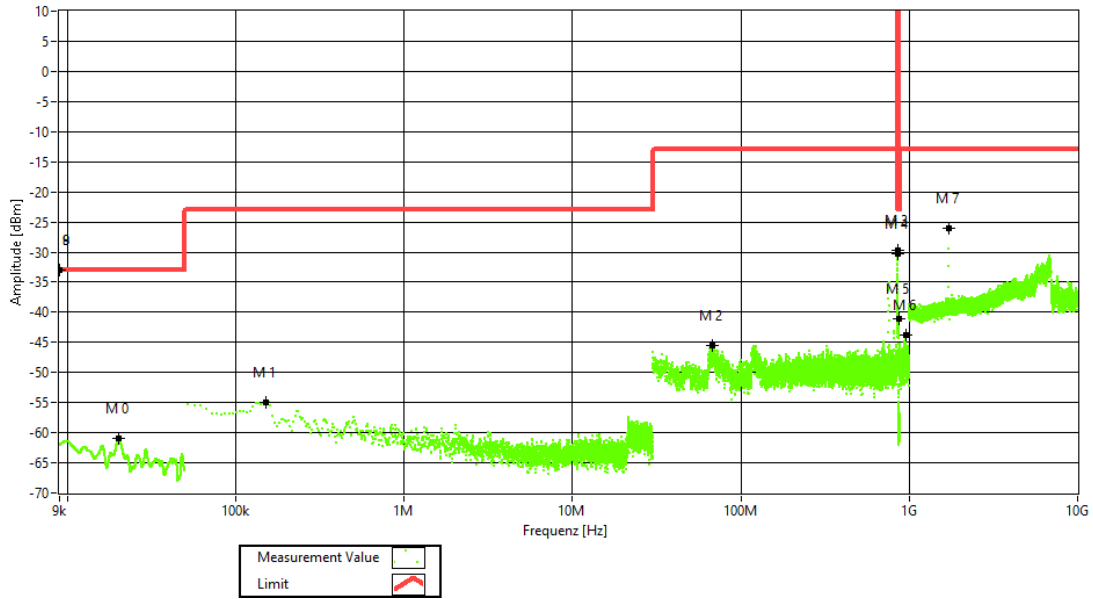




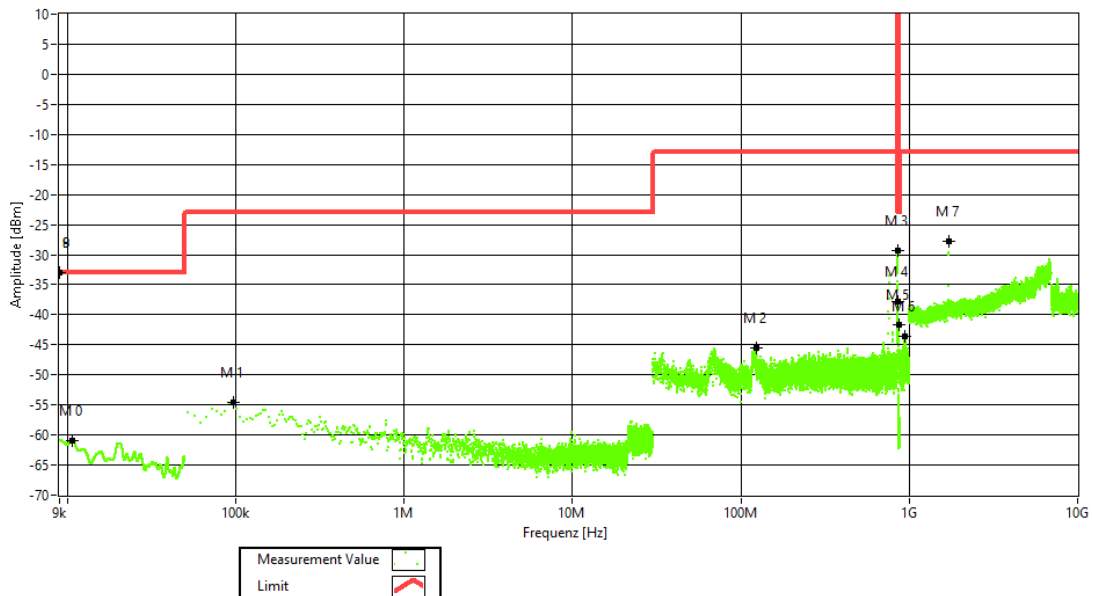
### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Frequency Band = Band ESMR, 862 MHz - 869 MHz, Test Frequency = low, Direction = RF downlink, Signal Type = GSM



Frequency Band = Band ESMR, 862MHz - 869 MHz, Test Frequency = mid, Direction = RF downlink, Signal Type = GSM

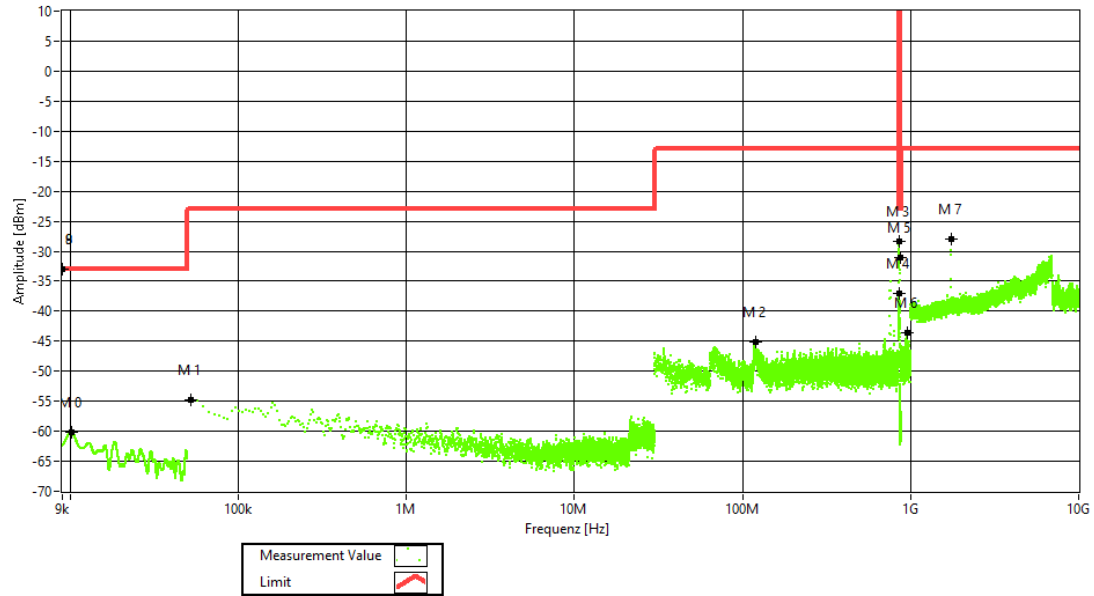




### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Frequency Band = Band ESMR, 862 MHz - 869 MHz, Test Frequency = high, Direction = RF downlink, Signal Type = GSM

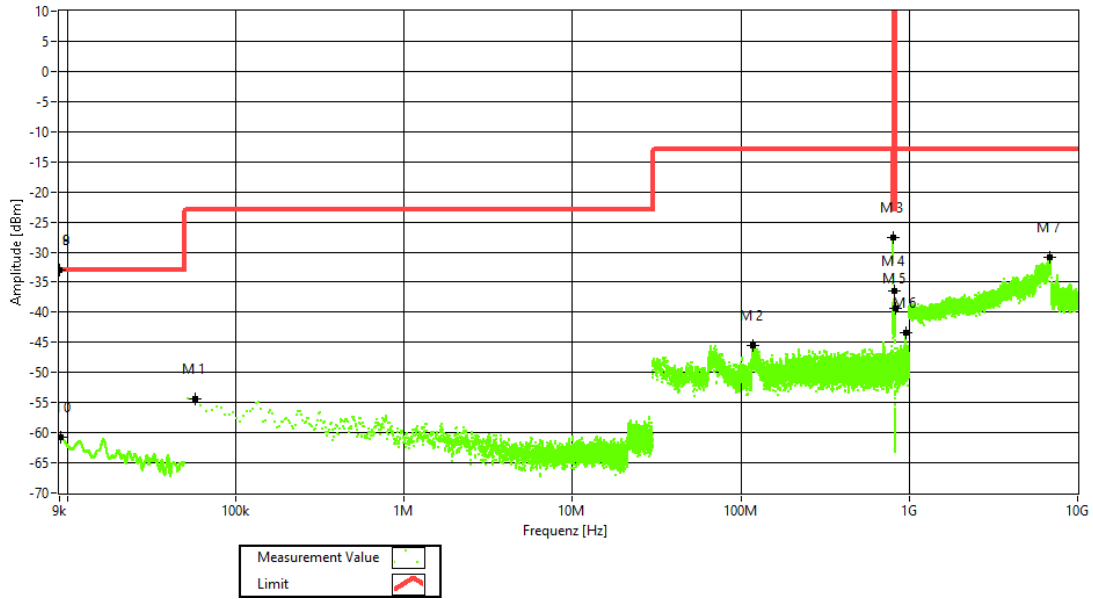




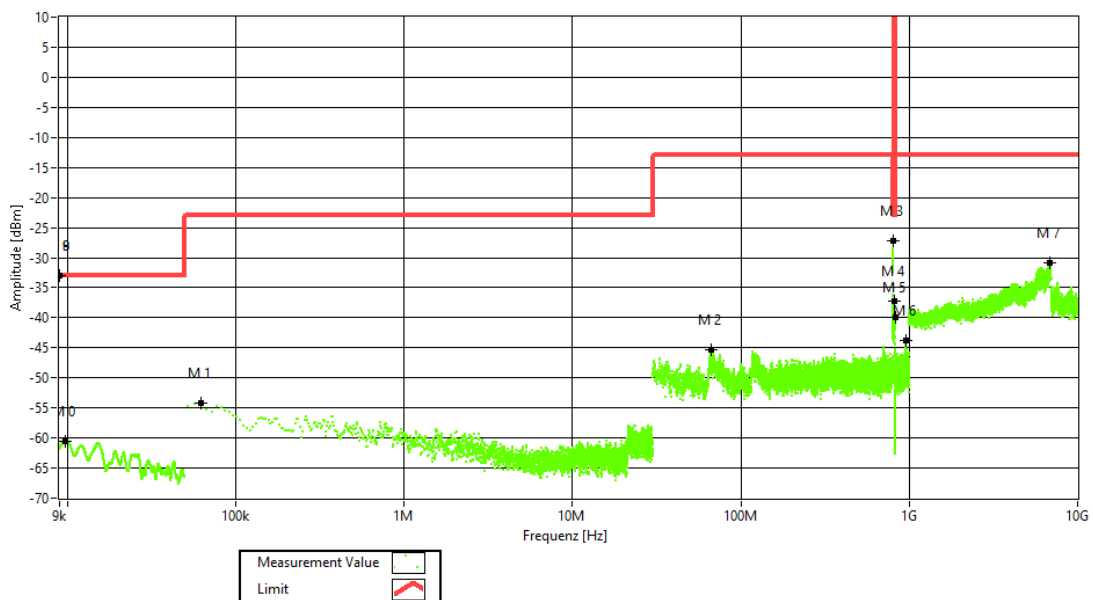
### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Frequency Band = Band ESMR, 817 MHz - 824 MHz, Test Frequency = low, Direction = RF uplink, Signal Type = AWGN



Frequency Band = Band ESMR, 817 MHz - 824 MHz, Test Frequency = mid, Direction = RF uplink, Signal Type = AWGN



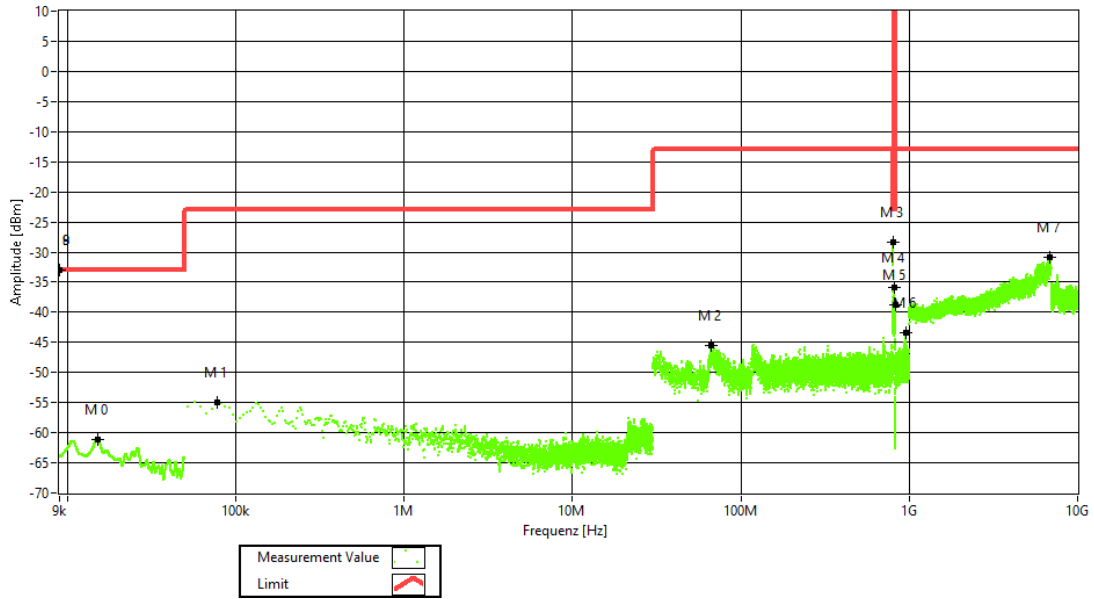


BUREAU  
VERITAS

### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Frequency Band = Band ESMR, 817 MHz - 824 MHz, Test Frequency = high, Direction = RF uplink, Signal Type = AWGN

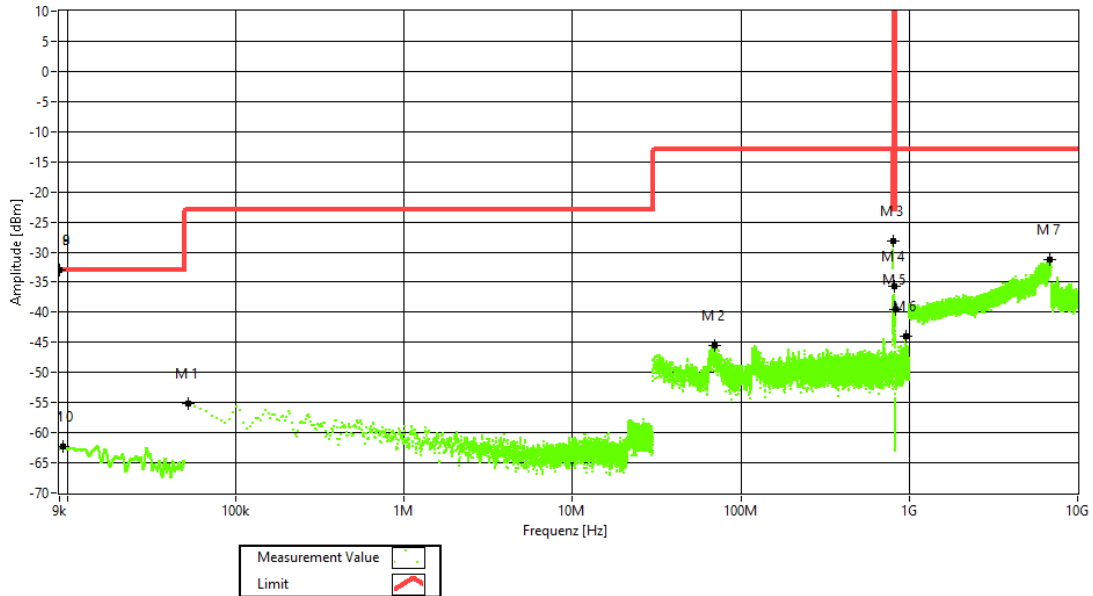




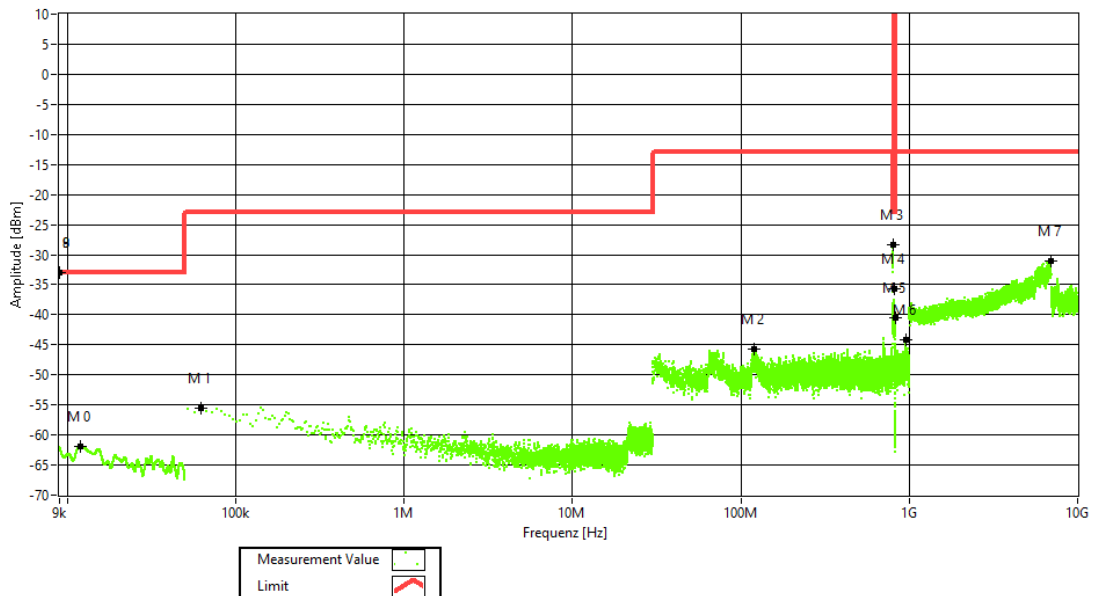
### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Frequency Band = Band ESMR, 817 MHz - 824 MHz, Test Frequency = low, Direction = RF uplink, Signal Type = GSM



Frequency Band = Band ESMR, 817MHz - 824 MHz, Test Frequency = mid, Direction = RF uplink, Signal Type = GSM

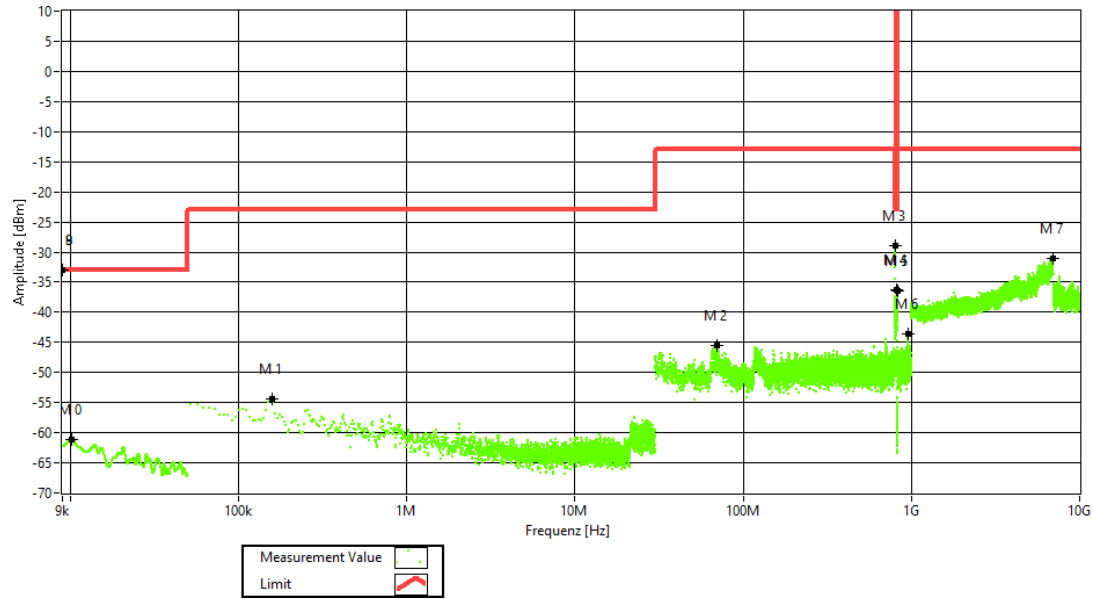




### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Frequency Band = Band ESMR, 817 MHz - 824 MHz, Test Frequency = high, Direction = RF uplink, Signal Type = GSM



#### 4.4.5 TEST EQUIPMENT USED

- Conducted



## ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

### 4.5 OUT-OF-BAND EMISSION LIMITS

Standard FCC Part § 2.1051, § 90.691

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

**Test date:** 2020-11-27; 2020-11-30

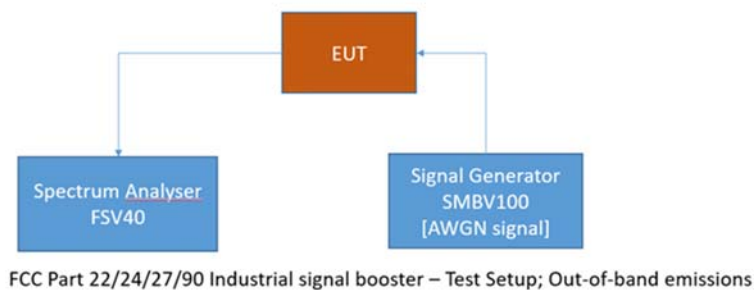
**Environmental conditions:** 22 ° C; 25 % r. F.

**Test engineer:** Thomas Gerngroß

#### 4.5.1 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 per FCC § 2.1051 and FCC § 90.691.

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.





## ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

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### 4.5.2 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.

Abstract § 90.691 FCC:

#### **§ 90.691 Emission mask requirements for EA-based systems.**

(a) Out-of-band emission requirement shall apply only to the "outer" channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10\text{Log}_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.



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TA tests on Andrew PSR 7/8 A, ESMR Band

4.5.3 TEST PROTOCOL

<b>Band ESMR, 862 MHz - 869 MHz, downlink, Number of input signals = 1</b>							
<b>Signal Type</b>	<b>Input Power</b>	<b>Band Edge</b>	<b>Signal Frequency [MHz]</b>	<b>Input Power [dBm]</b>	<b>Maximum Out-of-band Power [dBm]</b>	<b>Limit Out-of-band Power [dBm]</b>	<b>Margin to Limit [dB]</b>
Wideband	-0.3 dB < AGC	upper	866.5000	-55.2	-22.0	-13.0	9.0
Wideband	3 dB > AGC	upper	866.5000	-51.9	-21.9	-13.0	8.9
Narrowband	-0.3 dB < AGC	upper	868.8000	-54.2	-20.7	-13.0	7.7
Narrowband	3 dB > AGC	upper	868.8000	-50.9	-20.8	-13.0	7.8
Wideband	-0.3 dB < AGC	lower	864.5000	-55.6	-22.2	-13.0	9.2
Wideband	3 dB > AGC	lower	864.5000	-52.3	-21.2	-13.0	8.2
Narrowband	-0.3 dB < AGC	lower	862.2000	-55.6	-20.2	-13.0	7.2
Narrowband	3 dB > AGC	lower	862.2000	-52.3	-19.8	-13.0	6.8

<b>Band ESMR, 862 MHz - 869 MHz, downlink, Number of input signals = 2</b>								
<b>Signal Type</b>	<b>Input Power</b>	<b>Band Edge</b>	<b>Signal Frequency f1 [MHz]</b>	<b>Signal Frequency f2 [MHz]</b>	<b>Input Power [dBm]</b>	<b>Maximum Out-of-band Power [dBm]</b>	<b>Limit Out-of-band Power [dBm]</b>	<b>Margin to Limit [dB]</b>
WB	-0.3 dB < AGC	upper	866.5000	864.0000	-55.2	-25.3	-13.0	12.3
WB	3 dB > AGC	upper	866.5000	864.0000	-51.9	-24.4	-13.0	11.4
NB	-0.3 dB < AGC	upper	868.8000	868.6000	-54.2	-22.1	-13.0	9.1
NB	3 dB > AGC	upper	868.8000	868.6000	-50.9	-21.9	-13.0	8.9
WB	-0.3 dB < AGC	lower	864.5000	867.0000	-55.6	-23.9	-13.0	10.9
WB	3 dB > AGC	lower	864.5000	867.0000	-52.3	-23.7	-13.0	10.7
NB	-0.3 dB < AGC	lower	862.2000	862.4000	-55.6	-22.5	-13.0	9.5
NB	3 dB > AGC	lower	862.2000	862.4000	-52.3	-21.7	-13.0	8.7



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TA tests on Andrew PSR 7/8 A, ESMR Band

<b>Band ESMR, 817 MHz - 824 MHz, uplink, Number of input signals = 1</b>							
<b>Signal Type</b>	<b>Input Power</b>	<b>Band Edge</b>	<b>Signal Frequency [MHz]</b>	<b>Input Power [dBm]</b>	<b>Maximum Out-of-band Power [dBm]</b>	<b>Limit Out-of-band Power [dBm]</b>	<b>Margin to Limit [dB]</b>
Wideband	-0.3 dB < AGC	upper	866.5000	-63.6	-33.1	-13.0	20.1
Wideband	3 dB > AGC	upper	866.5000	-60.3	-35.8	-13.0	22.8
Narrowband	-0.3 dB < AGC	upper	868.8000	-62.8	-27.9	-13.0	14.9
Narrowband	3 dB > AGC	upper	868.8000	.59.5	-27.7	-13.0	14.7
Wideband	-0.3 dB < AGC	lower	864.5000	-63.4	-32.4	-13.0	19.4
Wideband	3 dB > AGC	lower	864.5000	.60.1	-35.1	-13.0	22.1
Narrowband	-0.3 dB < AGC	lower	862.2000	-62.6	-26.7	-13.0	13.7
Narrowband	3 dB > AGC	lower	862.2000	-59.3	-26.7	-13.0	13.7

<b>Band ESMR, 817 MHz - 824 MHz, uplink, Number of input signals = 2</b>								
<b>Signal Type</b>	<b>Input Power</b>	<b>Band Edge</b>	<b>Signal Frequency f1 [MHz]</b>	<b>Signal Frequency f2 [MHz]</b>	<b>Input Power [dBm]</b>	<b>Maximum Out-of-band Power [dBm]</b>	<b>Limit Out-of-band Power [dBm]</b>	<b>Margin to Limit [dB]</b>
WB	-0.3 dB < AGC	upper	821.5000	819.0000	-63.6	-32.8	-13.0	19.8
WB	3 dB > AGC	upper	821.5000	819.0000	-60.3	-36.4	-13.0	23.4
NB	-0.3 dB < AGC	upper	823.8000	823.6000	-62.8	-31.0	-13.0	18.0
NB	3 dB > AGC	upper	823.8000	823.6000	.59.5	-30.8	-13.0	17.8
WB	-0.3 dB < AGC	lower	819.5000	822.0000	-63.4	-32.0	-13.0	19.0
WB	3 dB > AGC	lower	819.5000	822.0000	.60.1	-35.0	-13.0	22.0
NB	-0.3 dB < AGC	lower	817.2000	817.4000	-62.6	-29.7	-13.0	16.7
NB	3 dB > AGC	lower	817.2000	817.4000	-59.3	-29.7	-13.0	16.7

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

Explanations concerning table with two input signals:

“WB” means Wideband.

“NB” means Narrowband.

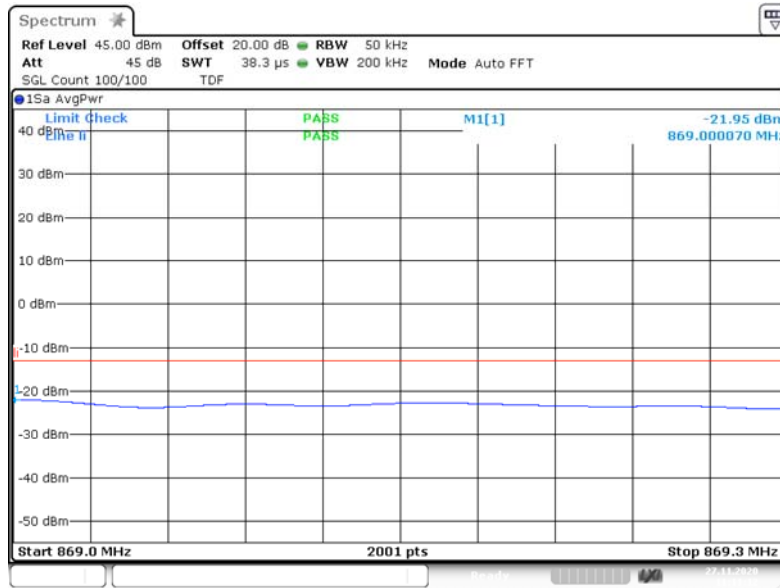


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TA tests on Andrew PSR 7/8 A, ESMR Band

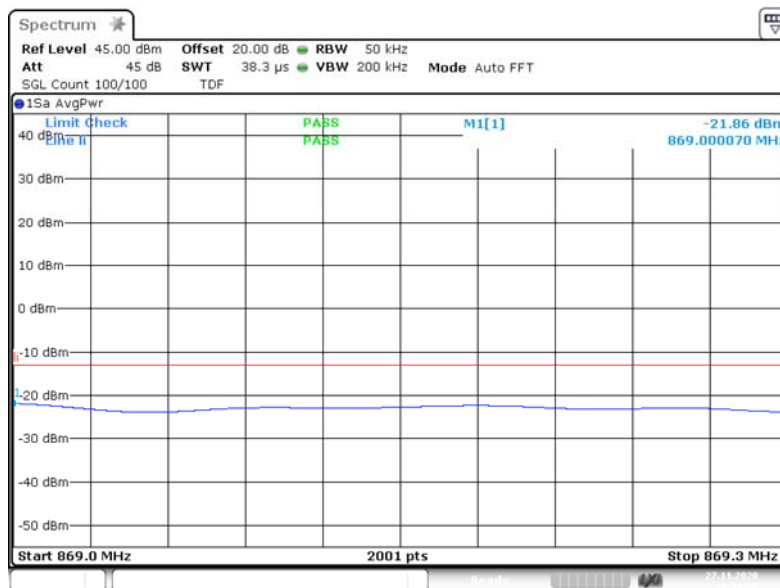
#### 4.5.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, "WORST CASE")

Downlink, Band: ESMR; Frequency: 862.0000 MHz to 869.0000 MHz; Downlink, Band Edge: upper;  
Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 1



3.6.2 out of band emi ESMR AWGN upper lcarrier -0.3 dB 869.0  
00M 869.300M

Downlink, Band: ESMR; Frequency: 862.0000 MHz to 869.0000 MHz; Downlink, Band Edge: upper;  
Mod: AWGN; Input Power = 3.0 dB > AGC; Number of signals 1



3.6.2 out of band emi ESMR AWGN upper lcarrier +3.0 dB 869.0  
00M 869.300M



### ECL-TA-20-018-V01.00

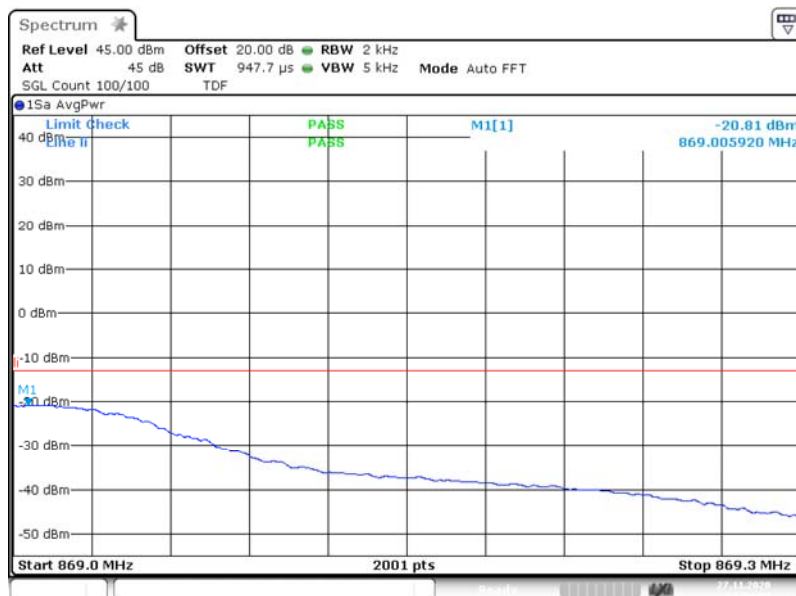
TA tests on Andrew PSR 7/8 A, ESMR Band

Downlink, Band: ESMR; Frequency: 862.0000 MHz to 869.0000 MHz; Downlink, Band Edge: upper;  
Mod: GSM; Input Power = 0.3 dB < AGC; Number of signals 1



3.6.2 out of band emi ESMR GSM upper lcarrier -0.3 dB 869.00  
OM 869.300M

Downlink, Band: ESMR; Frequency: 862.0000 MHz to 869.0000 MHz; Downlink, Band Edge: upper;  
Mod: GSM; Input Power = 3 dB > AGC; Number of signals 1



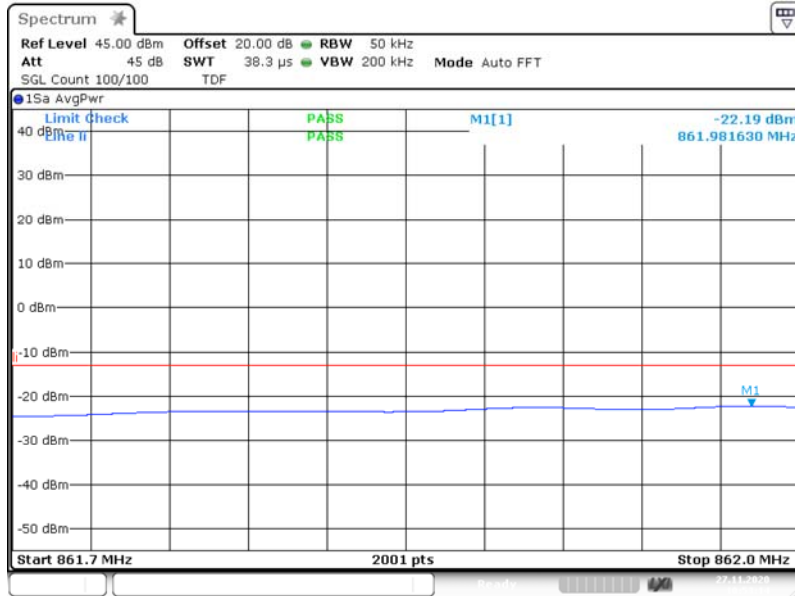
3.6.2 out of band emi ESMR GSM upper lcarrier +3.0 dB 869.00  
OM 869.300M



### ECL-TA-20-018-V01.00

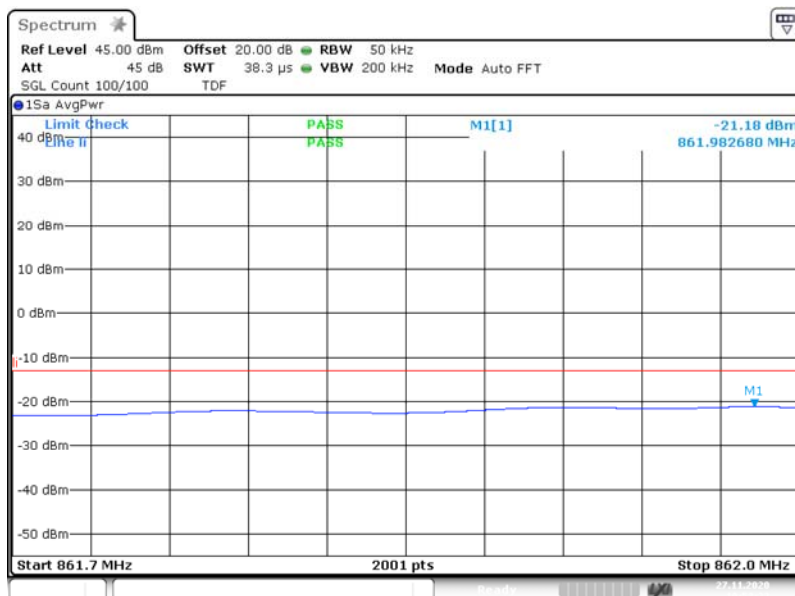
TA tests on Andrew PSR 7/8 A, ESMR Band

Downlink, Band: ESMR; Frequency: 862.0000 MHz to 869.0000 MHz; Downlink, Band Edge: lower; Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 1



3.6.2 out of band emi ESMR AWGN lower lo carrier -0.3 dB 861.7  
00M 862.000M

Downlink, Band: ESMR; Frequency: 862.0000 MHz to 869.0000 MHz; Downlink, Band Edge: lower; Mod: AWGN; Input Power = 3 dB > AGC; Number of signals 1



3.6.2 out of band emi ESMR AWGN lower lo carrier +3.0 dB 861.7  
00M 862.000M



### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Downlink, Band: ESMR; Frequency: 862.0000 MHz to 869.0000 MHz; Downlink, Band Edge: lower;  
Mod: GSM; Input Power = 0.3 dB < AGC; Number of signals 1



3.6.2 out of band emi ESMR GSM lower lcarrier -0.3 dB 861.70  
OM 862.000M

Downlink, Band: ESMR; Frequency: 862.0000 MHz to 869.0000 MHz; Downlink, Band Edge: lower;  
Mod: GSM; Input Power = 3 dB > AGC; Number of signals 1



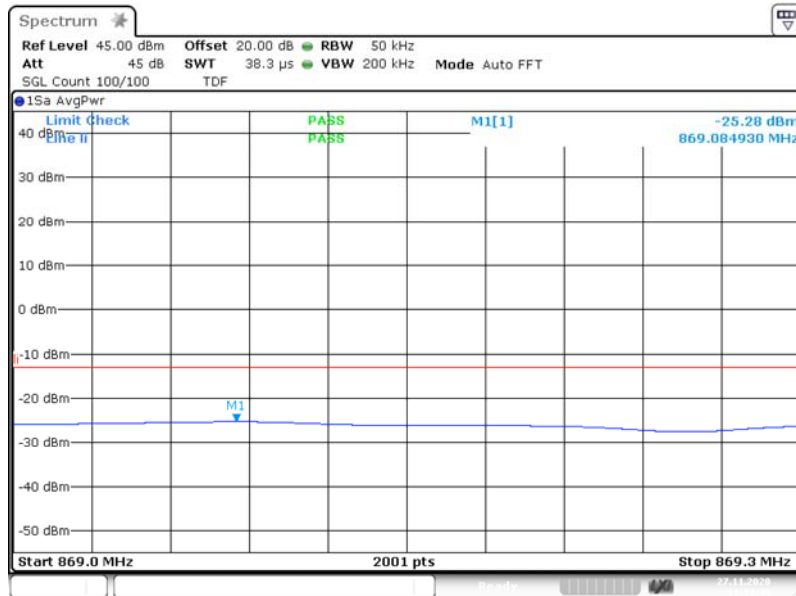
3.6.2 out of band emi ESMR GSM lower lcarrier +3.0 dB 861.70  
OM 862.000M



### ECL-TA-20-018-V01.00

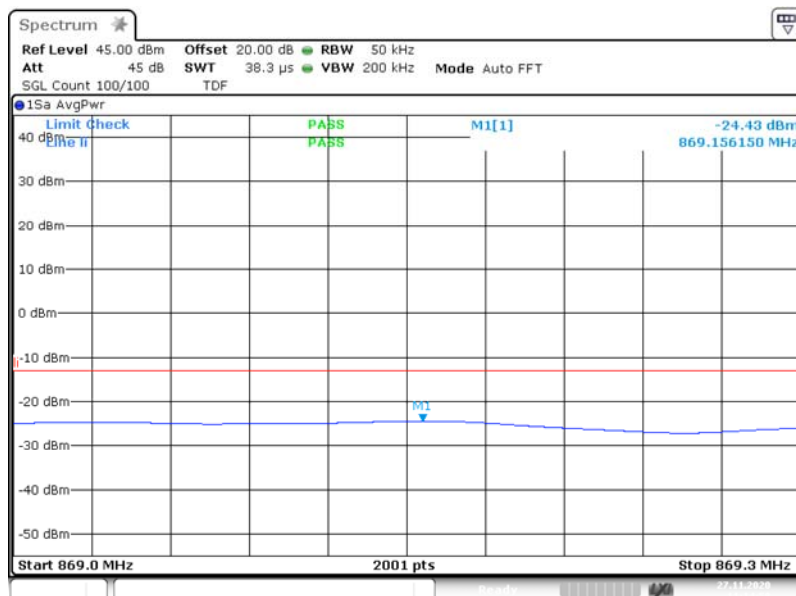
TA tests on Andrew PSR 7/8 A, ESMR Band

Downlink, Band: ESMR; Frequency: 862.0000 MHz to 869.0000 MHz; Downlink, Band Edge: upper;  
Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 2



3.6.2 out of band emi ESMR AWGN upper 2carriers -0.3 dB 869.  
000M 869.300M

Downlink, Band: ESMR; Frequency: 862.0000 MHz to 869.0000 MHz; Downlink, Band Edge: upper;  
Mod: AWGN; Input Power = 3 dB > AGC; Number of signals 2



3.6.2 out of band emi ESMR AWGN upper 2carriers +3.0 dB 869.  
000M 869.300M



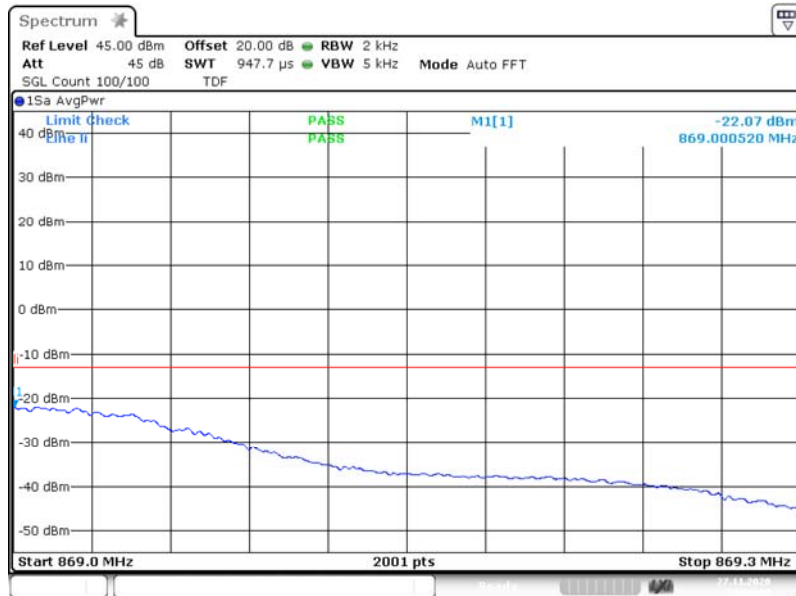


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### ECL-TA-20-018-V01.00

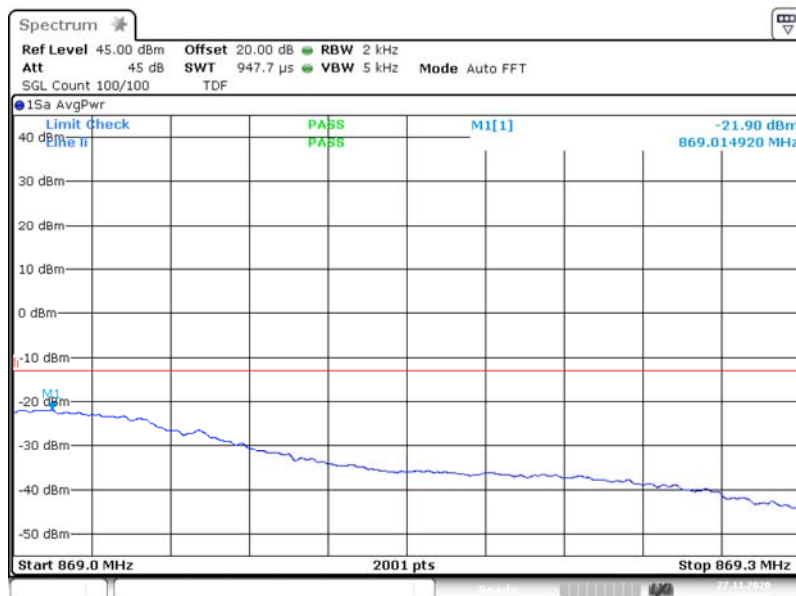
TA tests on Andrew PSR 7/8 A, ESMR Band

Downlink, Band: ESMR; Frequency: 862.0000 MHz to 869.0000 MHz; Downlink, Band Edge: upper;  
Mod: GSM; Input Power = 0.3 dB < AGC; Number of signals 2



3.6.2 out of band emi ESMR GSM upper 2carriers -0.3 dB 869.0  
00M 869.300M

Downlink, Band: ESMR; Frequency: 862.0000 MHz to 869.0000 MHz; Downlink, Band Edge: upper;  
Mod: GSM; Input Power = 3 dB > AGC; Number of signals 2



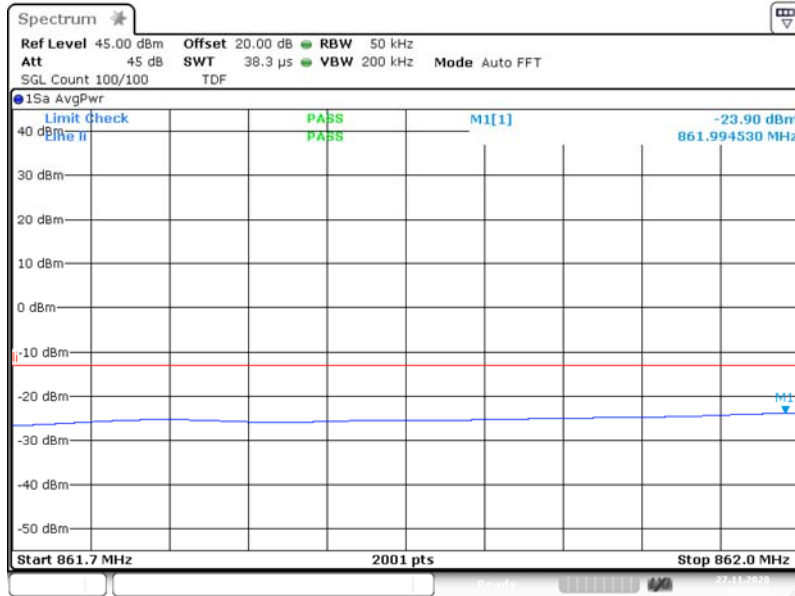
3.6.2 out of band emi ESMR GSM upper 2carriers +3.0 dB 869.0  
00M 869.300M



### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Downlink, Band: ESMR; Frequency: 862.0000 MHz to 869.0000 MHz; Downlink, Band Edge: lower;  
Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 2



3.6.2 out of band emi ESMR AWGN lower 2carriers -0.3 dB 861.  
700M 862.000M

Downlink, Band: ESMR; Frequency: 862.0000 MHz to 869.0000 MHz; Downlink, Band Edge: lower;  
Mod: AWGN; Input Power = 3 dB > AGC; Number of signals 2



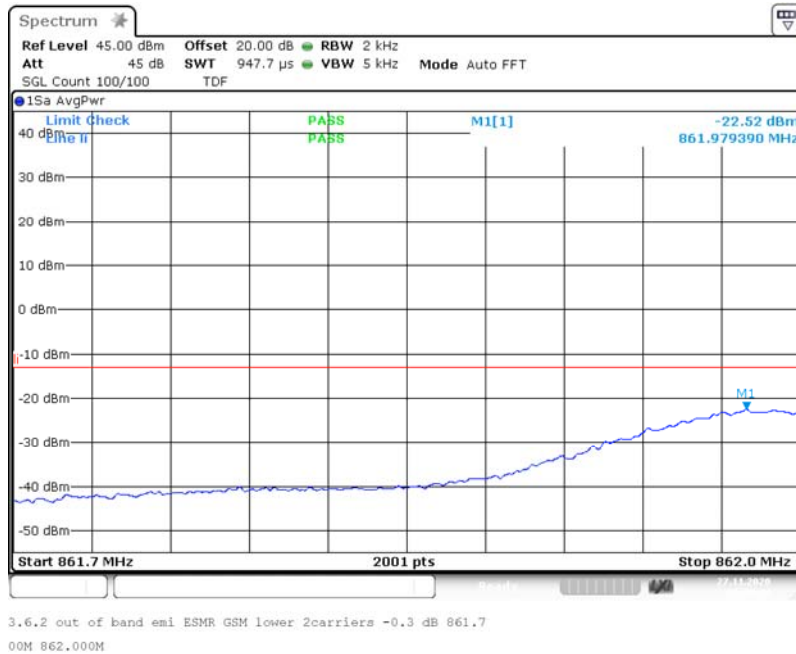
3.6.2 out of band emi ESMR AWGN lower 2carriers +3.0 dB 861.  
700M 862.000M



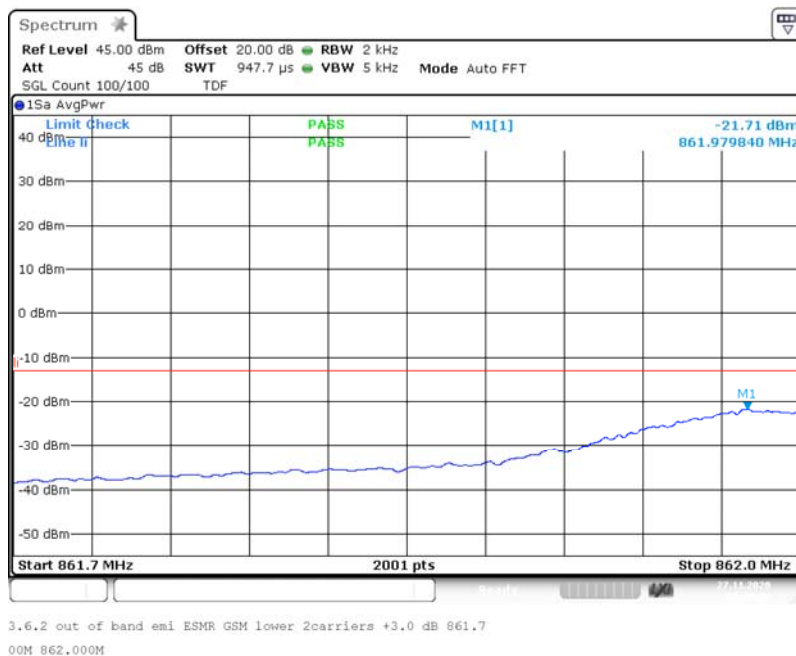
### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Downlink, Band: ESMR; Frequency: 862.0000 MHz to 869.0000 MHz; Downlink, Band Edge: lower;  
Mod: GSM; Input Power = 0.3 dB < AGC; Number of signals 2



Downlink, Band: ESMR; Frequency: 862.0000 MHz to 869.0000 MHz; Downlink, Band Edge: lower;  
Mod: GSM; Input Power = 3 dB > AGC; Number of signals 2



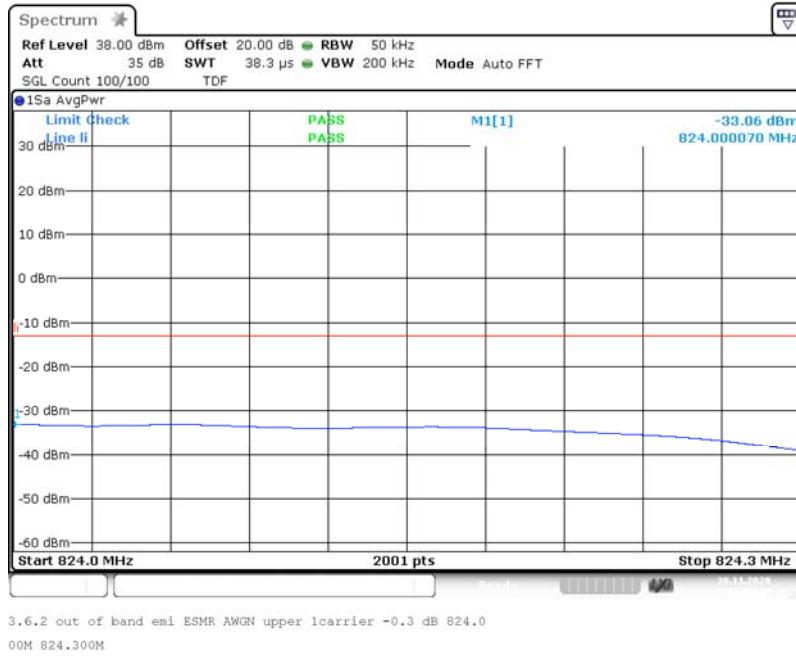


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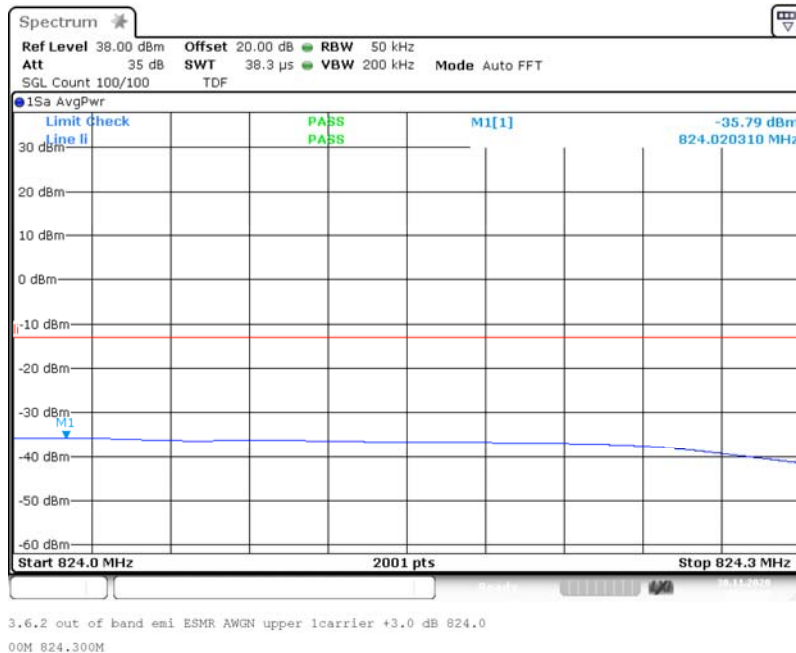
### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Uplink, Band: ESMR; Frequency: 817.0000 MHz to 824.0000 MHz; Uplink, Band Edge: upper; Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 1



Uplink, Band: ESMR; Frequency: 817.0000 MHz to 824.0000 MHz; Uplink, Band Edge: upper; Mod: AWGN; Input Power = 3 dB > AGC; Number of signals 1



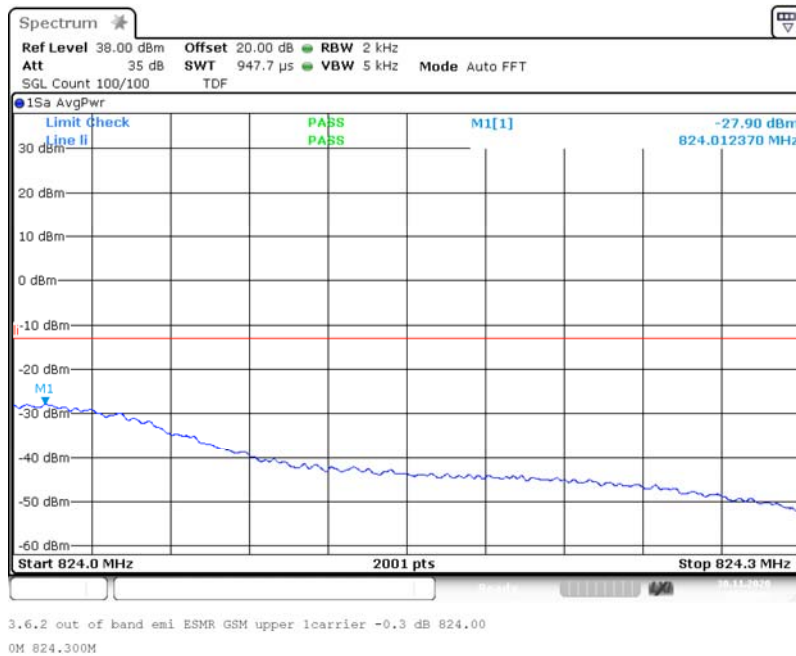


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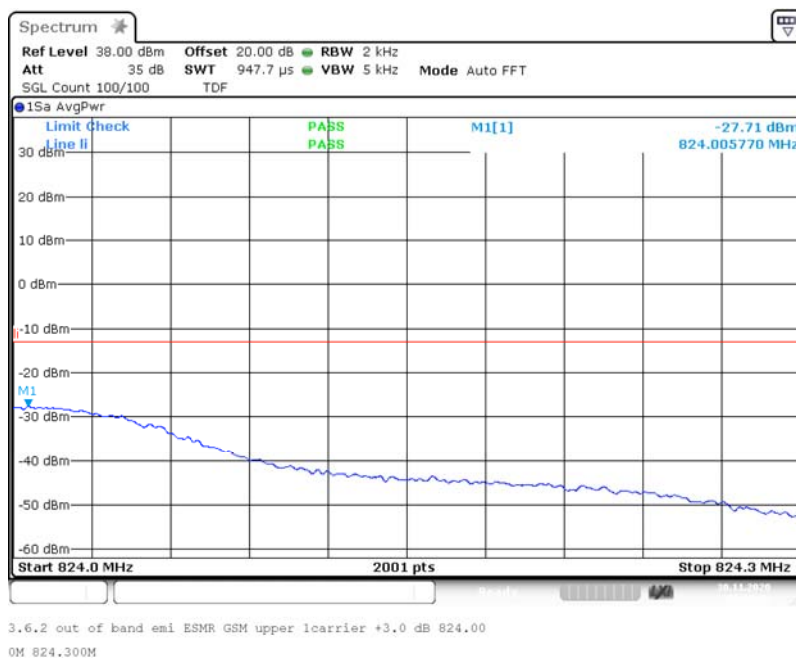
### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Uplink, Band: ESMR; Frequency: 817.0000 MHz to 824.0000 MHz; Uplink, Band Edge: upper; Mod: GSM; Input Power = 0.3 dB < AGC; Number of signals 1



Uplink, Band: ESMR; Frequency: 817.0000 MHz to 824.0000 MHz; Uplink, Band Edge: upper; Mod: GSM; Input Power = 3 dB > AGC; Number of signals 1

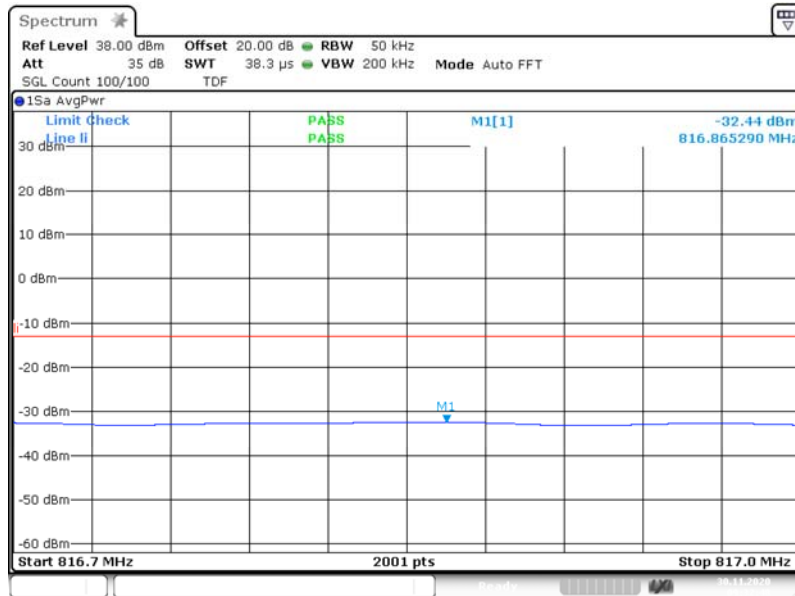




### ECL-TA-20-018-V01.00

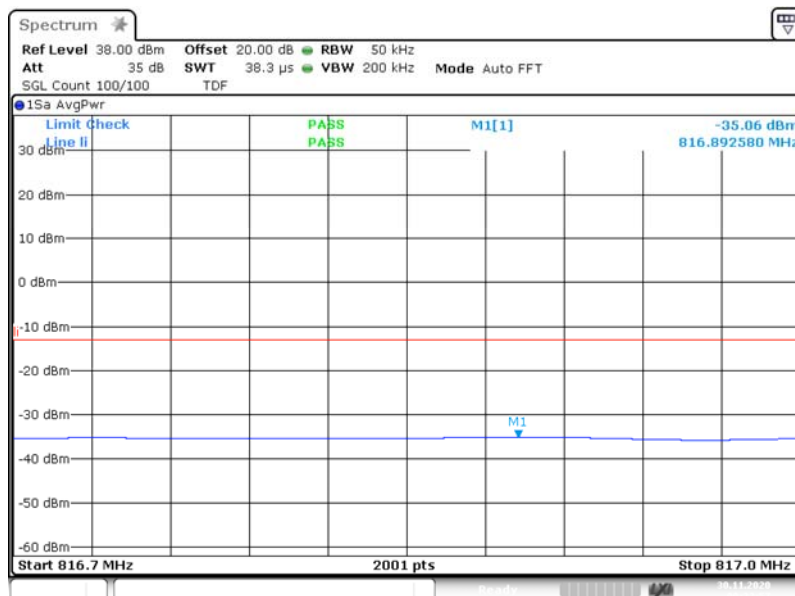
TA tests on Andrew PSR 7/8 A, ESMR Band

Uplink, Band: ESMR; Frequency: 817.0000 MHz to 824.0000 MHz; Uplink, Band Edge: lower; Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 1



3.6.2 out of band emi ESMR AWGN lower lcarrier -0.3 dB 816.7  
00M 817.000M

Uplink, Band: ESMR; Frequency: 817.0000 MHz to 824.0000 MHz; Uplink, Band Edge: lower; Mod: AWGN; Input Power = 3 dB > AGC; Number of signals 1



3.6.2 out of band emi ESMR AWGN lower lcarrier +3.0 dB 816.7  
00M 817.000M

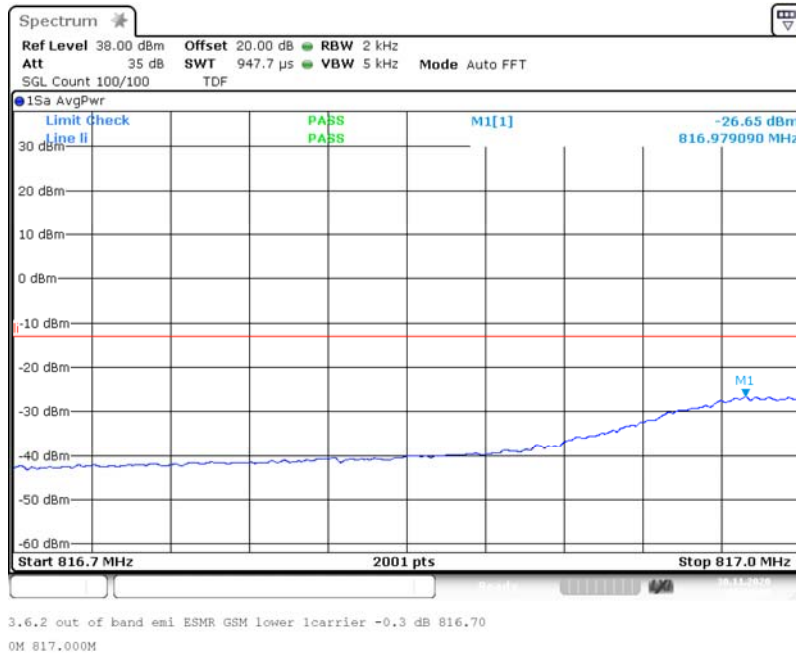


BUREAU  
VERITAS

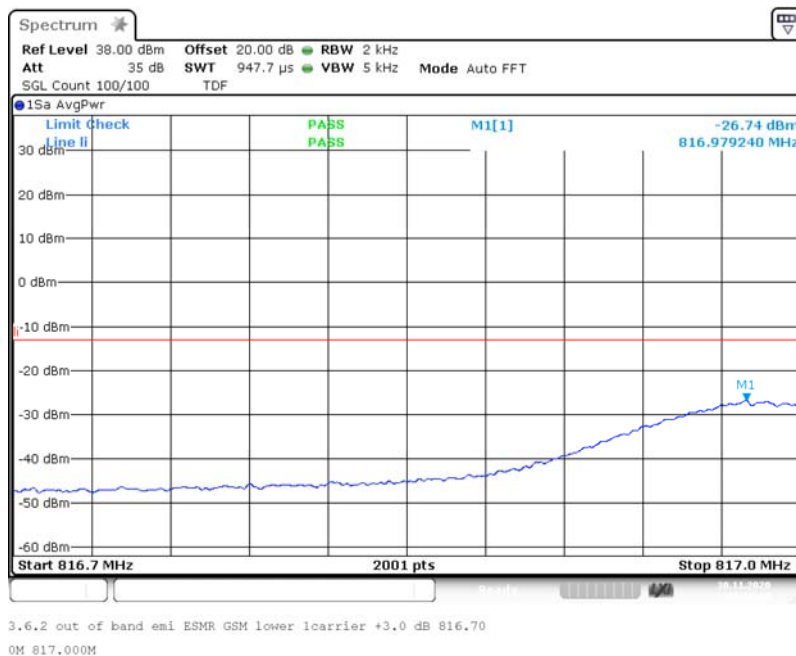
### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Uplink, Band: ESMR; Frequency: 817.0000 MHz to 824.0000 MHz; Uplink, Band Edge: lower; Mod: GSM; Input Power = 0.3 dB < AGC; Number of signals 1



Uplink, Band: ESMR; Frequency: 817.0000 MHz to 824.0000 MHz; Uplink, Band Edge: lower; Mod: GSM; Input Power = 3 dB > AGC; Number of signals 1





### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Uplink, Band: ESMR; Frequency: 817.0000 MHz to 824.0000 MHz; Uplink, Band Edge: upper; Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 2



3.6.2 out of band emi ESMR AWGN upper 2carriers -0.3 dB 824.000M 824.300M

Uplink, Band: ESMR; Frequency: 817.0000 MHz to 824.0000 MHz; Uplink, Band Edge: upper; Mod: AWGN; Input Power = 3 dB > AGC; Number of signals 2



3.6.2 out of band emi ESMR AWGN upper 2carriers +3.0 dB 824.000M 824.300M



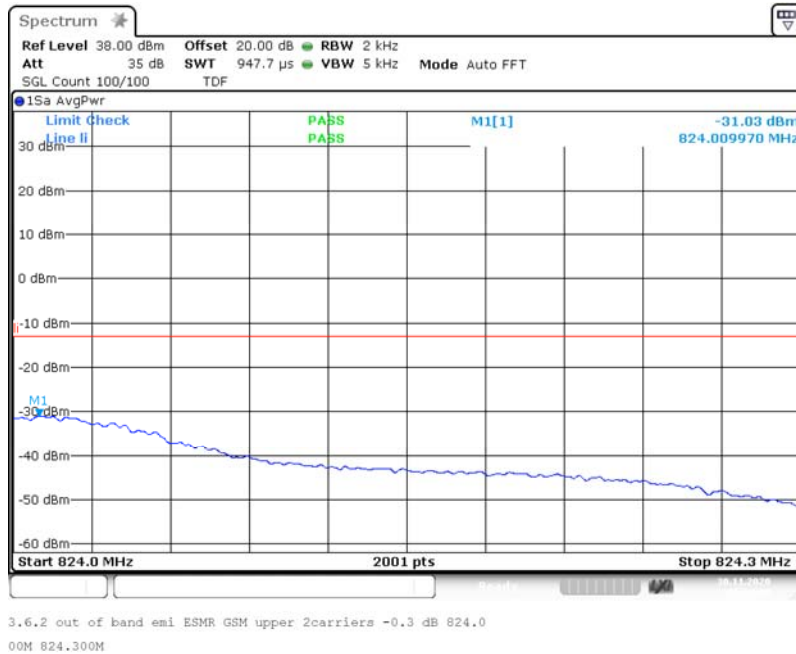


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VERITAS**

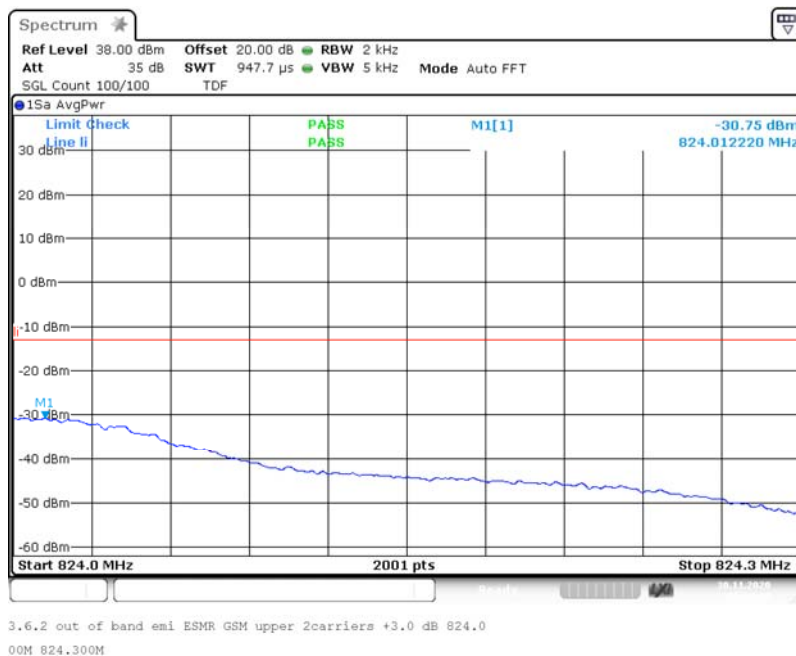
### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Uplink, Band: ESMR; Frequency: 817.0000 MHz to 824.0000 MHz; Uplink, Band Edge: upper; Mod: GSM; Input Power = 0.3 dB < AGC; Number of signals 2



Uplink, Band: ESMR; Frequency: 817.0000 MHz to 824.0000 MHz; Uplink, Band Edge: upper; Mod: GSM; Input Power = 3 dB > AGC; Number of signals 2

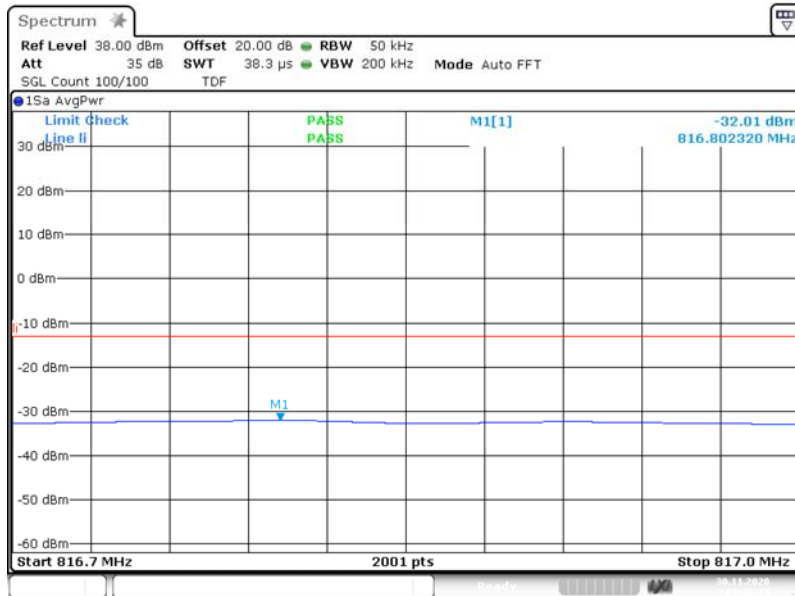




### ECL-TA-20-018-V01.00

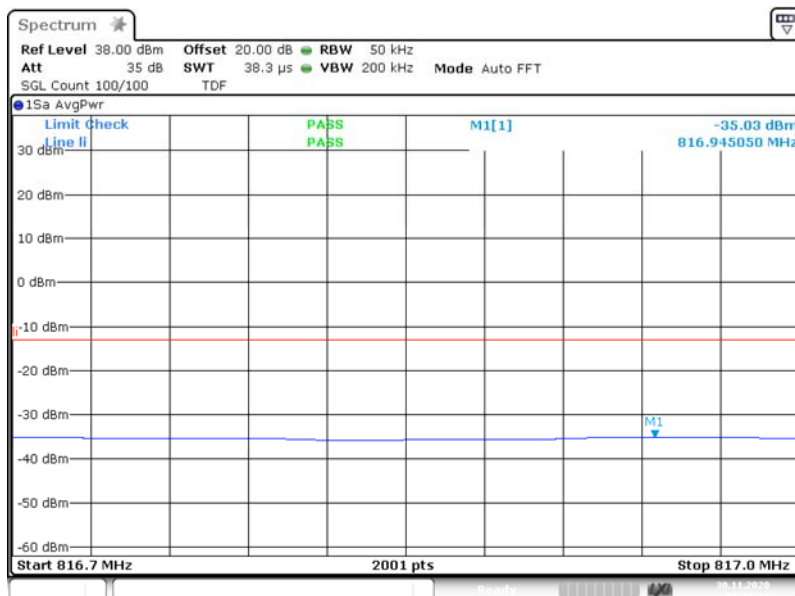
TA tests on Andrew PSR 7/8 A, ESMR Band

Uplink, Band: ESMR; Frequency: 817.0000 MHz to 824.0000 MHz; Uplink, Band Edge: lower; Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 2



3.6.2 out of band emi ESMR AWGN lower 2carriers -0.3 dB 816.  
700M 817.000M

Uplink, Band: ESMR; Frequency: 817.0000 MHz to 824.0000 MHz; Uplink, Band Edge: lower; Mod: AWGN; Input Power = 3 dB > AGC; Number of signals 2



3.6.2 out of band emi ESMR AWGN lower 2carriers +3.0 dB 816.  
700M 817.000M

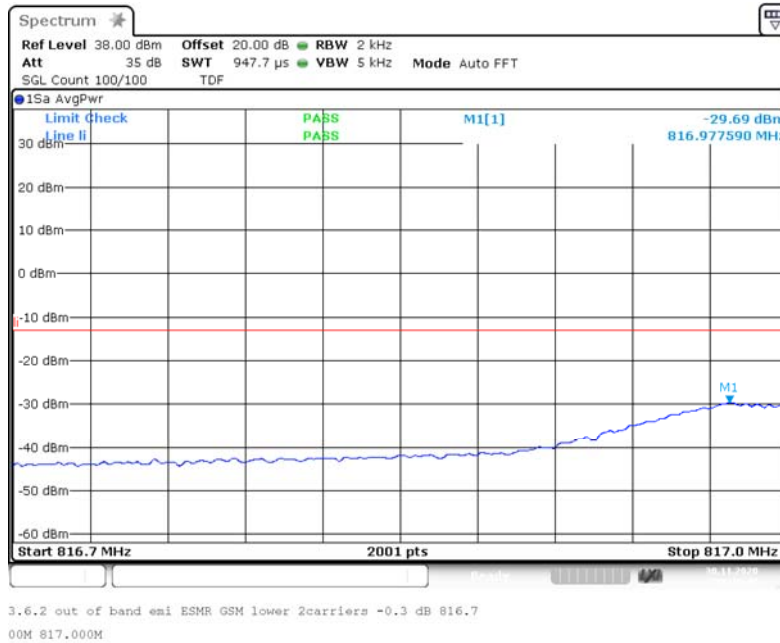


BUREAU  
VERITAS

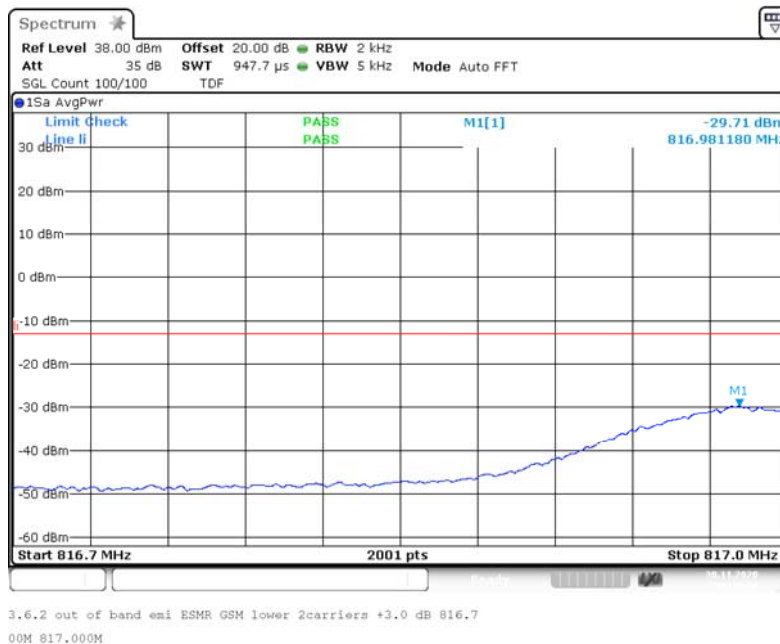
### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

Uplink, Band: ESMR; Frequency: 817.0000 MHz to 824.0000 MHz; Uplink, Band Edge: lower; Mod: GSM; Input Power = 0.3 dB < AGC; Number of signals 2



Uplink, Band: ESMR; Frequency: 817.0000 MHz to 824.0000 MHz; Uplink, Band Edge: lower; Mod: GSM; Input Power = 3 dB > AGC; Number of signals 2



### TEST EQUIPMENT USED

- Conducted

## ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

### 4.6 OUT-OF-BAND REJECTION

Standard KDB 935210 D05

**The test was performed according to:**

ANSI C63.26; KDB 935210 D05

**Test date:** 2020-11-27; 2020-11-30

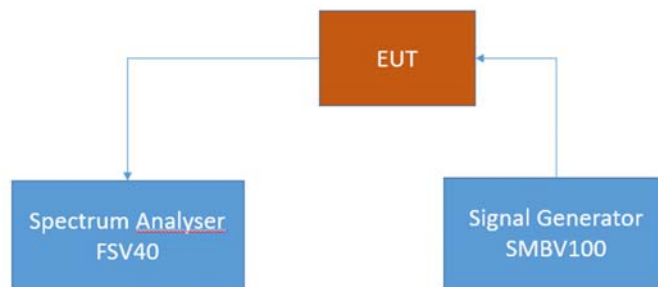
**Environmental conditions:** 22 ° C; 25 % r. F.

**Test engineer:** Thomas Gerngroß

#### 4.6.1 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:



FCC Part 22/24/27/90 Industrial signal booster – Test Setup; Out-of-band rejection

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.

#### 4.6.2 TEST REQUIREMENTS/LIMITS

For this test case exists no applicable limit



**ECL-TA-20-018-V01.00**

TA tests on Andrew PSR 7/8 A, ESMR Band

4.6.3 TEST PROTOCOL

<b>Band ESMR, 862 MHz - 869 MHz, downlink</b>				
<b>Highest Power Frequency [MHz]</b>	<b>Output Power [dBm]</b>	<b>Lower Highest Power -20 dB Frequency [MHz]</b>	<b>Upper Highest Power -20 dB Frequency [MHz]</b>	<b>20 dB Bandwidth [MHz]</b>
863.1955	32.01	850.5218	869.4848	18.9630

<b>Band ESMR, 817 MHz - 824 MHz, uplink</b>				
<b>Highest Power Frequency [MHz]</b>	<b>Output Power [dBm]</b>	<b>Lower Highest Power -20 dB Frequency [MHz]</b>	<b>Upper Highest Power -20 dB Frequency [MHz]</b>	<b>20 dB Bandwidth [MHz]</b>
822.5200	25.72	805.5148	824.4848	18.9700

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

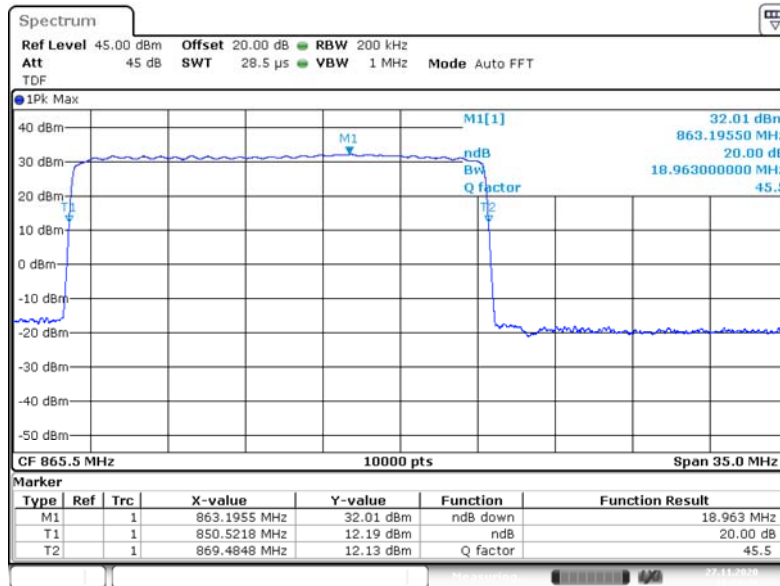


### ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

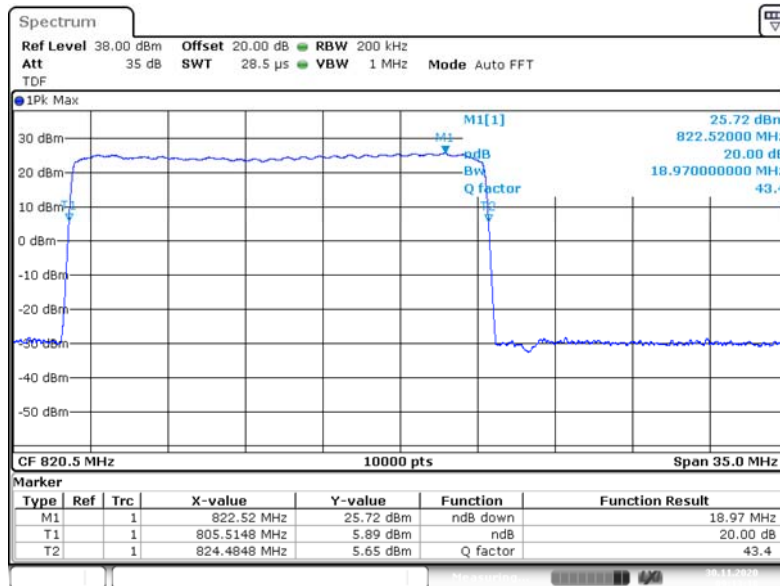
#### 4.6.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, "WORST CASE")

Frequency Band = Band ESMR, 862 MHz - 869 MHz, Direction = RF downlink



3.3 Out of band rejection ESMR 865.50000M  
\_20dB

Frequency Band = Band ESMR, 817 MHz - 824 MHz, Direction = RF uplink



3.3 Out of band rejection ESMR 820.50000M  
\_20dB

#### 4.6.5 TEST EQUIPMENT USED

- Conducted

## ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

### 4.8 FIELD STRENGTH OF SPURIOUS RADIATION

Standard FCC Part90, § 90.691

**The test was performed according to:**  
ANSI C63.26

**Test date:** 2020-12-11 to 2020-12-12

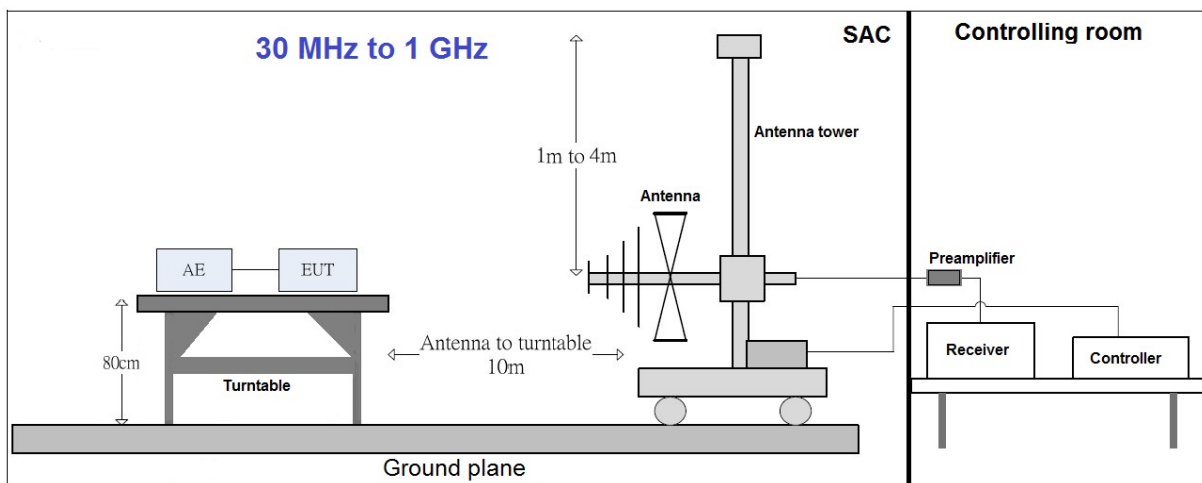
**Environmental conditions:** 23 ° C; 46 % r. F.

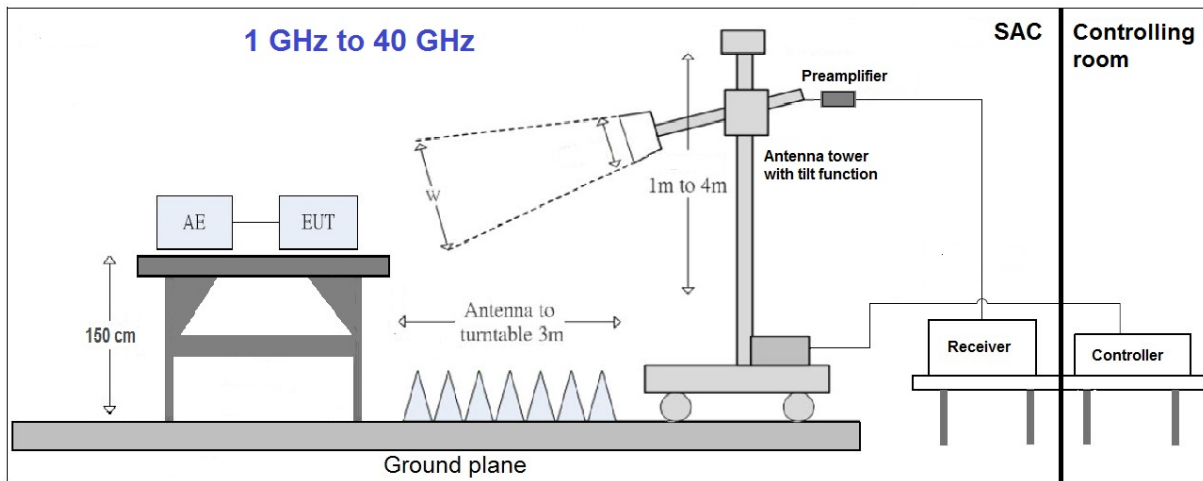
**Test engineer:** Thomas Hufnagel

#### 4.8.1 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 m<sup>2</sup> in the semi-anechoic chamber, 0.8 meter 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 meter 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: 10 m
- Detector: Peak-Maxhold/RMS (FFT-based)
- Frequency range: 30 – 1000 MHz
- Frequency steps: 30 kHz
- IF-Bandwidth: 120 kHz
- Measuring time/Frequency step: 5 ms
- Turntable angle range: –180° to 180°
- Turntable step size: 30°
- 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.





## ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

### 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  $\pm 45^\circ$  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  $\pm 100$  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 – Maxhold; RMS
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range:  $\pm 30^\circ$  around the determined value
- Antenna Polarisation: max. value determined in step 1

### Step 3: Final measurement with QP detector

With the settings determined in step 3, the final measurement will be performed:

EMI receiver settings for step 4:

- Detector: Quasi-Peak (< 1 GHz); RMS; Peak
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

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  $30^\circ$ .

The turn table step size (azimuth angle) for the preliminary measurement is  $15^\circ$ .

### Step 2:

The maximum RFI field strength was determined during the measurement by rotating the turntable ( $\pm 180$  degrees) and varying the height of the receive antenna ( $h = 1 \dots 4$  m) with a additional tilt function of the antenna. The turn table azimuth will slowly vary by  $\pm 15^\circ$ .

EMI receiver settings (for all steps):

- Detector: Peak, Average
- IF Bandwidth = 1 MHz



## ECL-TA-20-018-V01.00

TA tests on Andrew PSR 7/8 A, ESMR Band

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### Step 3:

Spectrum analyser settings for step 3:

- Detector: Peak/Average
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 1 MHz
- Measuring time: 1 s

### 4.8.2 TEST REQUIREMENTS/LIMITS

Abstract from FCC Part § 2.1053:

#### **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.

Abstract § 90.691 FCC:

#### **§ 90.691 Emission mask requirements for EA-based systems.**

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(2) For any frequency removed from the EA licensee’s frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10\text{Log}_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.



**ECL-TA-20-018-V01.00**

TA tests on Andrew PSR 7/8 A, ESMR Band

4.8.3 TEST PROTOCOL

30 MHz to 1 GHz:

<b>Band ESMR, 862 MHz - 869 MHz, downlink;</b>						
<b>Spurious Freq. [MHz]</b>	<b>Spurious Level [dBm]</b>	<b>Pin (Sum Level) [dBm]</b>	<b>Detector</b>	<b>RBW [kHz]</b>	<b>Limit [dBm]</b>	<b>Margin to Limit [dB]</b>
162.3	-55.6	-54.8	PEAK	120	-13.0	42.6
720.0	-58.2	-54.8	PEAK	120	-13.0	45.2
865.5	-49.3	-54.8	PEAK	120	-13.0	36.3
169.0	-62.1	-54.8	PEAK	120	-13.0	49.1
720.0	-60.4	-54.8	PEAK	120	-13.0	47.4
862.2	-54.2	-54.8	PEAK	120	-13.0	41.2

Above 1 GHz:

<b>Band ESMR, 862 MHz - 869 MHz, downlink;</b>						
<b>Spurious Freq. [MHz]</b>	<b>Spurious Level [dBm]</b>	<b>Pin (Sum Level) [dBm]</b>	<b>Detector</b>	<b>RBW [kHz]</b>	<b>Limit [dBm]</b>	<b>Margin to Limit [dB]</b>
3539.2	-41.5	-54.8	PEAK	1000	-13.0	28.5
8491.3	-29.1	-54.8	PEAK	1000	-13.0	16.1
10168.1	-27.6	-54.8	PEAK	1000	-13.0	14.6
1119.6	-54.8	-54.8	PEAK	1000	-13.0	41.8
3571.0	-41.9	-54.8	PEAK	1000	-13.0	28.9
10901.4	-26.0	-54.8	PEAK	1000	-13.0	13.0



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30 MHz to 1 GHz:

Band ESMR, 817 MHz - 824 MHz, uplink;						
Spurious Freq. [MHz]	Spurious Level [dBm]	Pin (Sum Level) [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
132.4	-58.4	-62.7	PEAK	120	-13.0	45.4
720.0	-57.7	-62.7	PEAK	120	-13.0	44.7
820.5	-57.5	-62.7	PEAK	120	-13.0	44.5
880.0	-57.3	-62.7	PEAK	120	-13.0	44.3
162.5	-59.5	-62.7	PEAK	120	-13.0	46.5
720.0	-60.1	-62.7	PEAK	120	-13.0	47.1

Above 1 GHz:

Band ESMR, 817 MHz - 824 MHz, uplink;						
Spurious Freq. [MHz]	Spurious Level [dBm]	Pin (Sum Level) [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
2466.5	-44.7	-62.7	PEAK	1000	-13.0	31.7
7002.1	-32.5	-62.7	PEAK	1000	-13.0	19.5
8422.2	-30.0	-62.7	PEAK	1000	-13.0	17.0
1119.6	-54.3	-62.7	PEAK	1000	-13.0	41.3
3542.1	-40.7	-62.7	PEAK	1000	-13.0	27.7
10106.9	-26.5	-62.7	PEAK	1000	-13.0	13.5

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

Although ususally a RMS detector is used for measruements in this cases a PEAK detector was used.

The limits are values for use of a RMS detector, but it is so, that the use of a PEAK detector results in readings with higher measured levels. Because the levels with the higher values with PEAK detector are in tolerance, the limits with a RMS detector are definately also in tolerance.



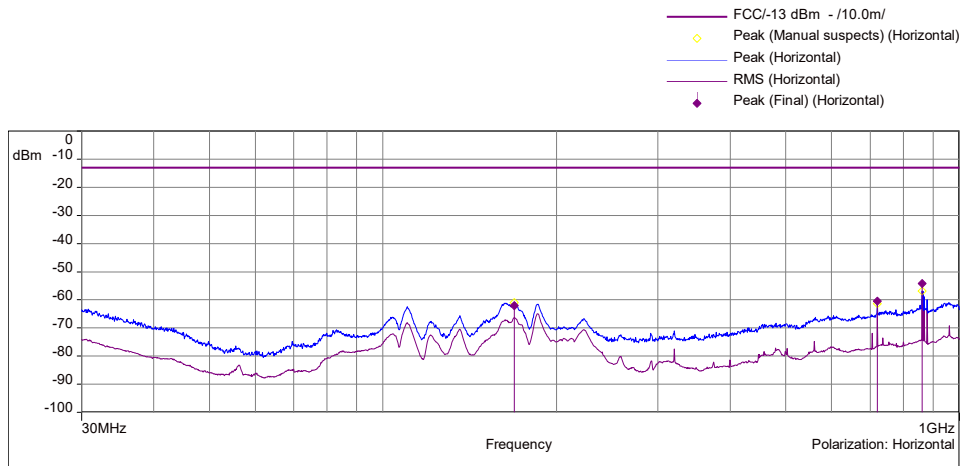
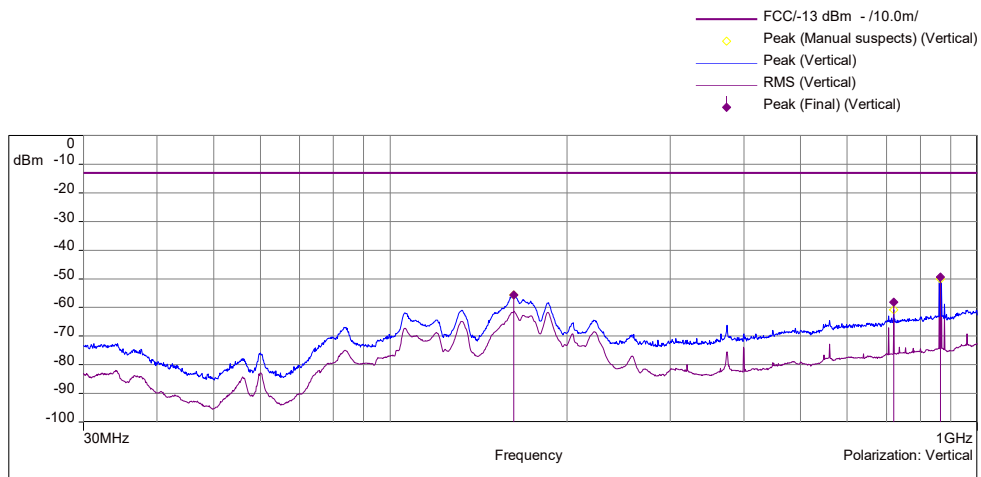
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**4.8.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, "WORST CASE")**

Frequency Band = Band ESMR, 862 MHz - 869 MHz, Test Frequency = low, Direction = RF downlink

30 MHz - 1 GHz



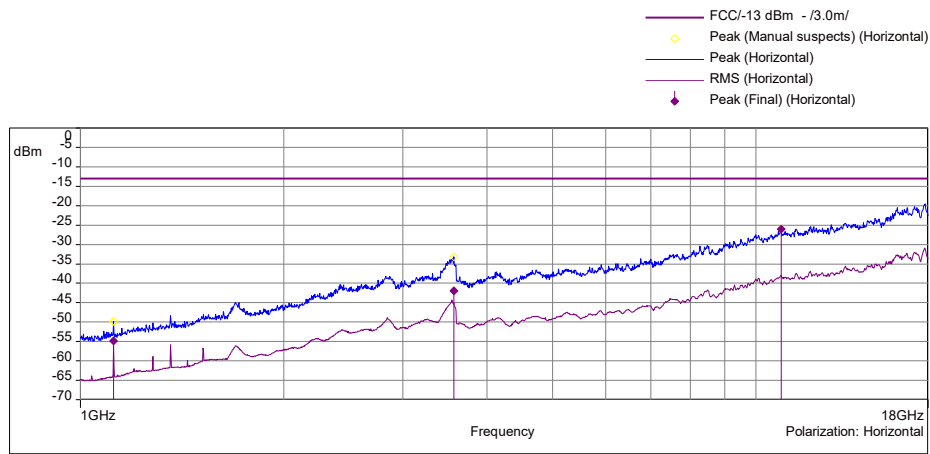
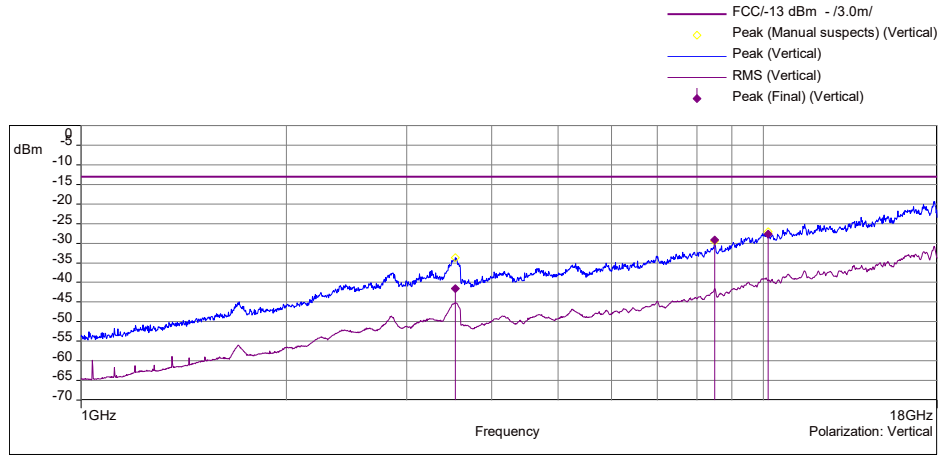


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## 1 GHz - 18 GHz



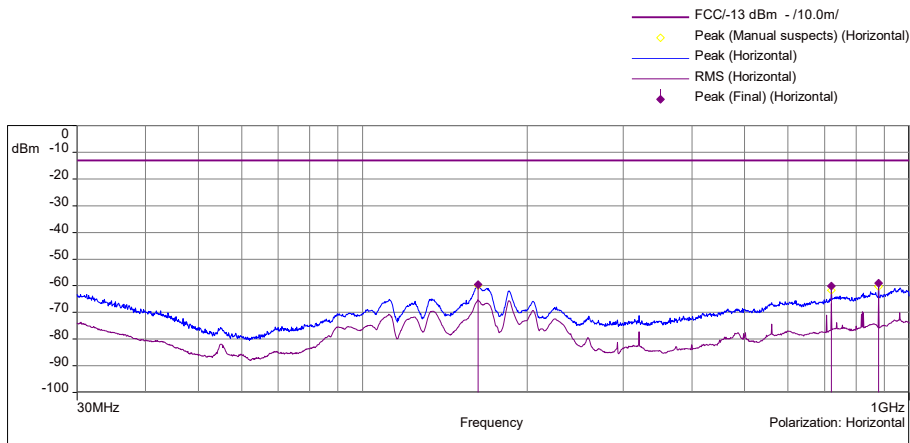
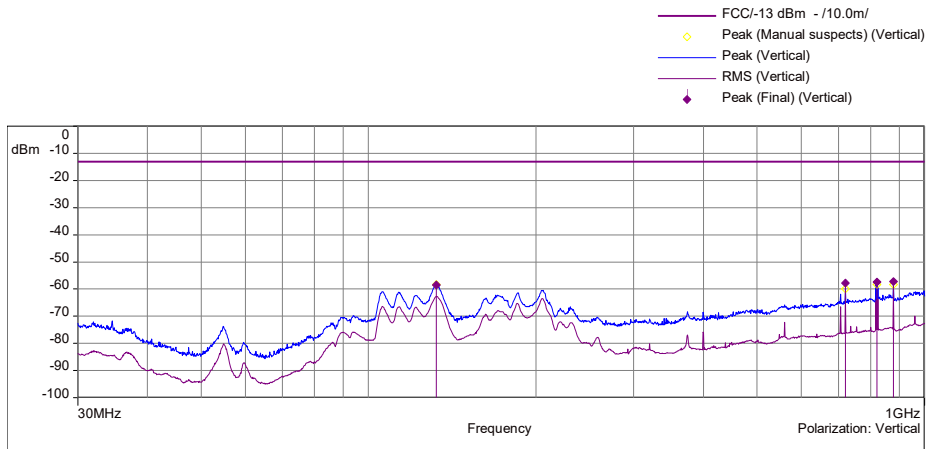


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Frequency Band = Band ESMR, 817 MHz - 824 MHz, Test Frequency = low, Direction = RF uplink

30 MHz - 1 GHz



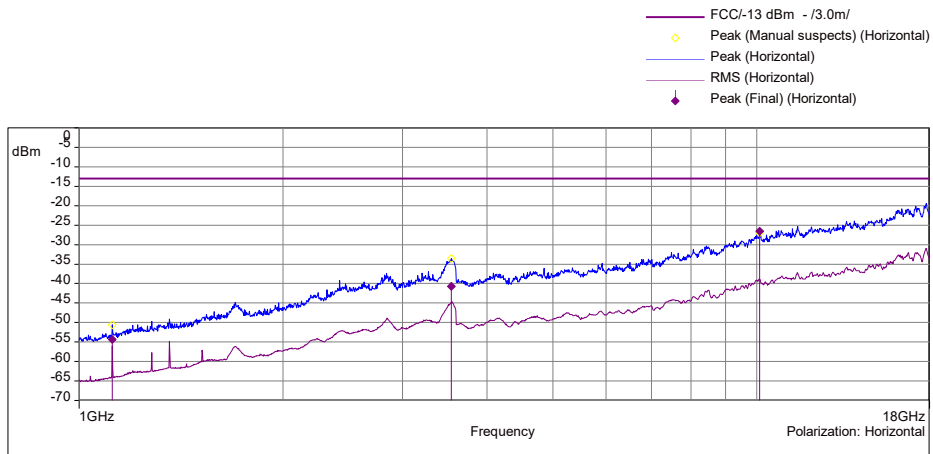
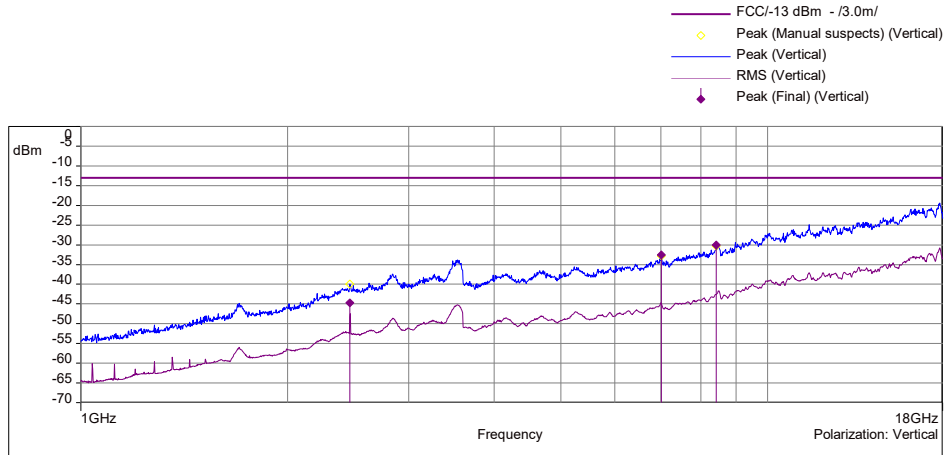


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## 1 GHz - 18 GHz







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TA tests on Andrew PSR 7/8 A, ESMR Band

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### 4.8.5 FIELD STRENGTH CALCULATIONS

$$\mathbf{FS} = \mathbf{SA} + \mathbf{AF} + \mathbf{CL} + \mathbf{PA}$$

Where as:

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

### 4.8.6 TEST EQUIPMENT USED

- Radiated Emissions



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TA tests on Andrew PSR 7/8 A, ESMR Band

### 5 TEST EQUIPMENT

#### 1 Conducted

Ref.No.	Type	Description	Manufacturer	Inventory no.	Last Calibration	Calibration Due
1.1	FSV40	Signal Analyzer 10 Hz - 40 GHz	Rohde & Schwarz	E2050	2019-10	2021-01
1.2	SMBV100A	Vector Signal Generator 9 kHz - 6 GHz	Rohde & Schwarz	G2089	2020-08	2022-08
1.3	KlimaLogg Pro	Thermo-Hygrometer	TFA	X546	2020-05	2021-05

#### 2 Radiated Emissions

Ref.No.	Type	Description	Manufacturer	Inventory no.	Last Calibration	Calibration Due
2.1	ESU40	EMI test receiver 10 Hz - 40 GHz	Rohde & Schwarz	E2025	2018-10	2021-01
2.2	SMBV100A	Vector Signal Generator 9 kHz - 6 GHz	Rohde & Schwarz	G2089	2020-08	2022-08
2.3	CBL 6111C	Antenna 30 MHz – 1 GHz	Chase	K1026	2020-01	2021-01
2.4	HL 025	Antenna 1 GHz - 18 GHz	Rohde & Schwarz	K1114	2019-06	2021-06
2.5	AM1431	Pre amplifier 10 kHz – 1 GHz	Miteq	K1721	2019-10	2021-01
2.6	AFS4-00102000	Preamplifier 100 MHz - 20 GHz	Miteq	K838	2019-10	2021-01
2.7	30.3015	ThermoHygro Datalogger	TFA	X 507	2018-08	2021-08
2.8	BAT-EMC	Software	Nexio	V3.20.0.10	---	---



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**6 ANTENNA FACTORS, CABLE LOSS AND SAMPLE CALCULATIONS**

This chapter contains the antenna factors with their corresponding path loss of the used measurement path for all antennas.

**6.1 ANTENNA CHASE CBL 6111C (30 MHZ – 1 GHZ)**

(d = 10 m)

Frequency	AF Horizontal R&S CBL 6111C	AF Vertikal R&S CBL 6111C	Corr.
30	47.9	38.1	-38.1
50	34.4	26.4	-38.0
100	31.6	32.8	-38.0
150	33.7	33.9	-37.9
200	30.3	32.8	-37.7
250	33.6	36.5	-37.5
300	34.5	36.8	-37.1
350	36.3	37.2	-37.0
400	36.9	38.3	-36.8
450	38.0	39.6	-36.5
500	39.2	40.4	-36.0
550	41.2	42.1	-35.9
600	41.6	41.7	-35.7
650	41.9	42.9	-35.9
700	42.3	43.4	-35.6
750	43.5	43.9	-35.7
800	43.6	44.6	-36.0
850	45.0	45.1	-36.1
900	45.2	45.1	-36.6
950	46.4	46.4	-36.4
1000	45.8	47.0	-36.0

cable loss (antenna - pre-amp)	pre-amp	cable loss (inside chamber)	cable loss (to receiver)
-0,01	-38.3	0.0	0.1
0,28	-38.4	0.3	0.1
0,52	-38.7	0.5	0.2
0,73	-38.8	0.7	0.2
0,95	-38.9	1.0	0.3
1,10	-38.9	1.1	0.3
1,20	-38.6	1.2	0.3
1,29	-38.6	1.3	0.3
1,36	-38.5	1.4	0.3
1,42	-38.2	1.4	0.4
1,48	-37.9	1.5	0.4
1,54	-37.8	1.5	0.4
1,60	-37.7	1.6	0.4
1,64	-38.0	1.6	0.5
1,71	-37.8	1.7	0.5
1,76	-38.0	1.8	0.5
1,80	-38.3	1.8	0.5
1,84	-38.4	1.8	0.5
1,91	-39.0	1.9	0.5
1,93	-38.9	1.9	0.6
1,99	-38.6	2.0	0.6

**Sample calculation**

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



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6.2 ANTENNA ROHDE & SCHWARZ HL 025 (1 GHZ – 18 GHZ)

Frequency	AF R&S HL 025	Corr.
MHz	dB (1/m)	dB
1000	33.2	-18.9
2000	39.4	-17.8
3000	42.8	-17.0
4000	45.1	-16.6
5000	46.8	-16.6
6000	48.5	-16.7
7000	50.2	-16.2
8000	50.4	-15.3
9000	51.9	-14.4
10000	53.8	-14.0
11000	54.5	-14.1
12000	55.3	-14.4
13000	55.7	-14.7
14000	56.5	-14.8
15000	56.4	-14.7
16000	57.2	-14.3
17000	57.6	-14.5
18000	57.6	-14.6

pre-amp	cable loss (to receiver)
dB	dB
-20.92	2.01
-20.60	2.78
-20.44	3.42
-20.58	3.99
-21.08	4.46
-21.53	4.87
-21.53	5.35
-20.97	5.66
-20.44	6.05
-20.43	6.45
-20.84	6.69
-21.41	7.04
-22.09	7.36
-22.48	7.66
-22.56	7.90
-22.49	8.20
-22.90	8.45
-23.27	8.71

Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$   
 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.  
 Tables show an extract of values.



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TA tests on Andrew PSR 7/8 A, ESMR Band

### 7 MEASUREMENT UNCERTAINTIES

<b>KDB 935210 D05</b>	<b>ECL</b>
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 measurements	5,38 dB
Total frequency uncertainty	$2 \times 10^{-7}$

Reference :

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

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TA tests on Andrew PSR 7/8 A, ESMR Band

## 8 Photo Report

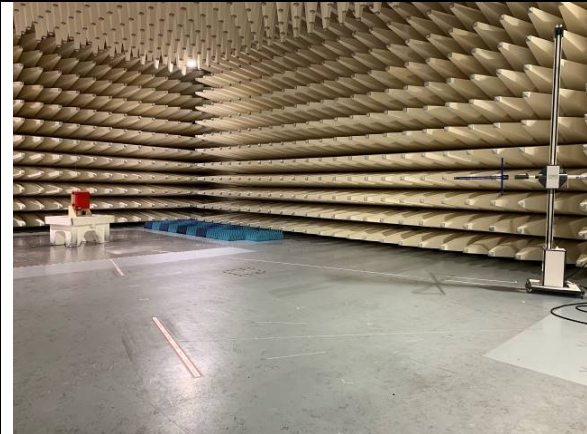
Conducted Mesaruements



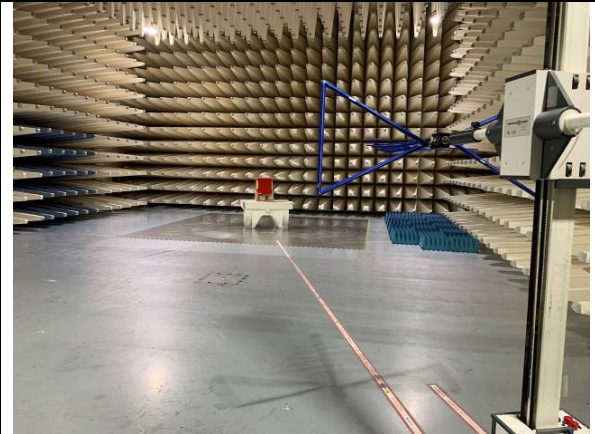
Conducted Mesurements



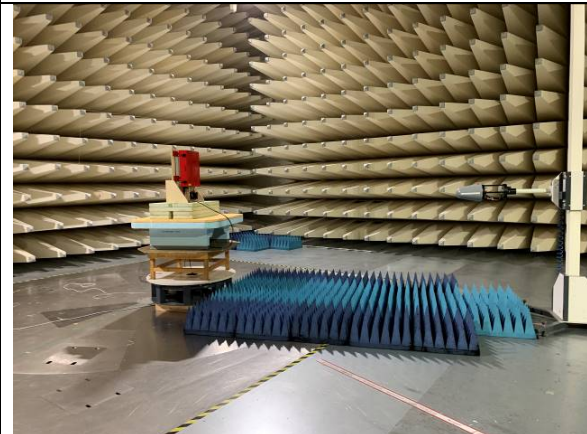
Radiated Mesaruements 30 MHz up to 1 GHz



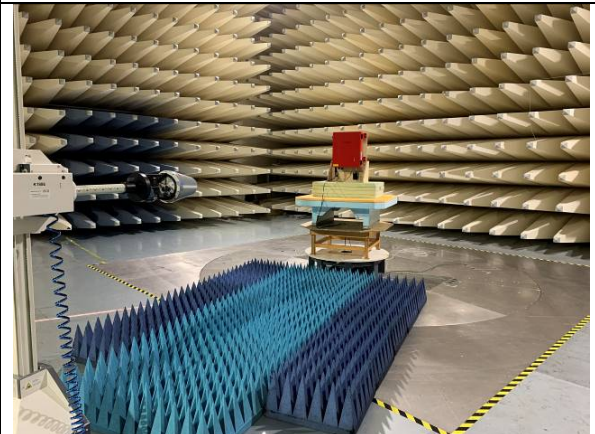
Radiated Mesaruements 30 MHz up to 1 GHz



Radiated Mesaruements over 1 GHz



Radiated Mesaruements over 1 GHz





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## **ECL-TA-20-018-V01.00**

TA tests on Andrew PSR 7/8 A, ESMR Band

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### 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>



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TA tests on Andrew PSR 7/8 A, ESMR Band

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Annex B: Additional information provided by client

None.

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