ECL-EMC Test Report No.: 13-276

Equipment under test: **ION-M7P/80-85HP/9 800MHz Path**
FCC ID: **XS5-M7P8085HP9**
IC ID:

Type of test: **FCC 47 CFR Part 90 Subpart S:2013**
Private Land Mobile Repeater
RSS-Gen:2007, RSS-131:2005
Zone Enhancers for the Land Mobile Service

Measurement Procedures: 47 CFR Parts 2:2013 (*Frequency Allocations and Radio Treaty Matters; General Rules and Regulations*),
Part 90:2013 (Private Land Mobile),
ANSI/TIA-603-C (2004), *Land Mobile FM or PM Communications Equipment Measurement and Performance Standards*
IC-RSS-GEN:2007 General Requirements and Information for the Certification of Radiocommunication Equipment

Test result: **Passed**

Date of issue:	05.12.13		Signature:
Issue-No.:	02	Author:	Tom Zahlmann Test engineer Digitally signed by Tom Zahlmann DN: cn=Tom Zahlmann, o=Bureau Veritas CPS, ou=ECL, email=tom.zahlmann@de.bureauveritas.com, c=DE Date: 2013.12.05 10:22:03 +01'00'
Date of delivery:	17.10.13	Checked:	Oliver Wagner Test engineer Digital unterschrieben von Oliver Wagner DN: cn=Oliver Wagner, o=Bureau Veritas CPS Germany GmbH, ou=ECL, email=oli.wagner@de.bureauveritas.com, c=DE Datum: 2013.12.05 11:04:11 +01'00'
Test dates:	07.10. – 17.10.13		
Pages:	50		

Manufacturer: ANDREW Wireless Systems GmbH
Industriering 10

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Test Location: Bureau Veritas Consumer Products Services
Germany GmbH
European Compliance Laboratory (ECL)
Thurn-und-Taxis-Straße 18
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Fax: +49 40 74041-2755

General:
The purpose of this report is to show compliance to the FCC regulations for licensed devices operating under section 90 of the Code of Federal Regulations title 47.
This report informs about the results of the RF tests, it only refers to the equipment under test. No part of this report may be reproduced in any form, without written permission.

Table of contents

1 Test Results Summary

Name of Test	FCC Para. No.	FCC Method	FCC Spec.	Result
RF Power Output	90.635	2.1046	1000 Watts	Complies
Occupied Bandwidth	90.210	2.1049	Input/Output	Complies
Spurious Emissions at Antenna Terminals	90.210	2.1051	-13dBm	Complies
Radiated Spurious emission	90.543	2.1053	-13dBm	Complies
Frequency Stability	90.213	2.1055	1 ppm	NA

Name of Test	IC Para. No.	IC Method	Result
RF Power Output	RSS-131	RSS-GEN 4.8	Complies
Occupied Bandwidth	RSS-131	RSS-GEN 4.6.1	Complies
Spurious Emissions at Antenna Terminals	RSS-131	RSS-GEN 4.9	Complies
Field Strength of Spurious Emissions	RSS-131 6.4	RSS-GEN 4.9	Complies
Frequency Stability	RSS-131	RSS-GEN 4.7	NA

Frequency stability is given by: The system gets an electrical analog signal from the BSS which is converted into an analog optical signal, transmitted by the optical links and then reconverted in the Remote Unit into an analog electrical signal. During this process happens no frequency change/modification, so input and output have same frequency what can be seen under capture “Occupied Bandwith”.

2 Equipment under test (E.U.T.)

2.1 Description

Kind of equipment	ION-M7P/80-85HP/9
Andrew Ident. Number	7672284-0001
Serial no.(SN)	11
Revision	00
Software version and ID	V5.30.0 Id.No. 7158950
Type of modulation and Designator	Analog (F3E (Voice)) ☒ iDEN (W7W) ☒ GSM (GXW) ☒ GSM EDGE (G7W) ☒ CDMA (F9W) ☒ W-CDMA (F9W) ☒
Frequency Translation	F1-F1 ☒ F1-F2 ☐ N/A ☐
Band Selection	Software ☐ Duplexer ☒ Full band ☐

2.1.1 Downlink

Pass band	Path 859 MHz – 869 MHz
Max. composite output power based on one carrier per path (rated)	44.5 dBm = 28.2 W
System Gain*	11.5 dB @ Pout BTS of 33 dBm

*see 2.1.6

2.1.2 Uplink

Pass band	Path 814 MHz – 824 MHz
Maximum rated output power	n. a.
System Gain*	n.a.

*see 2.1.6

Note: The EUT does not transmit over the air in the uplink direction.

2.1.3 Description of EUT

Andrew ION-M7P/80-85HP/9 is a multi-band, multi-operator remote unit with various extension units. It is used in conjunction with a master unit in the ION optical distribution system.

This Test Report describes only the approval of the 700 MHz Path.
The ION-M7P/80-85HP/9 Repeater system consists of one 700 MHz path and one 800 – 850 MHz path with the intended use of simultaneous transmission. The 900 MHz path (935 – 941 MHz) is deactivated by software.

The antenna(s) used with device must be fixed-mounted on permanent structures.

2.1.4 Block diagram of measurement reference points

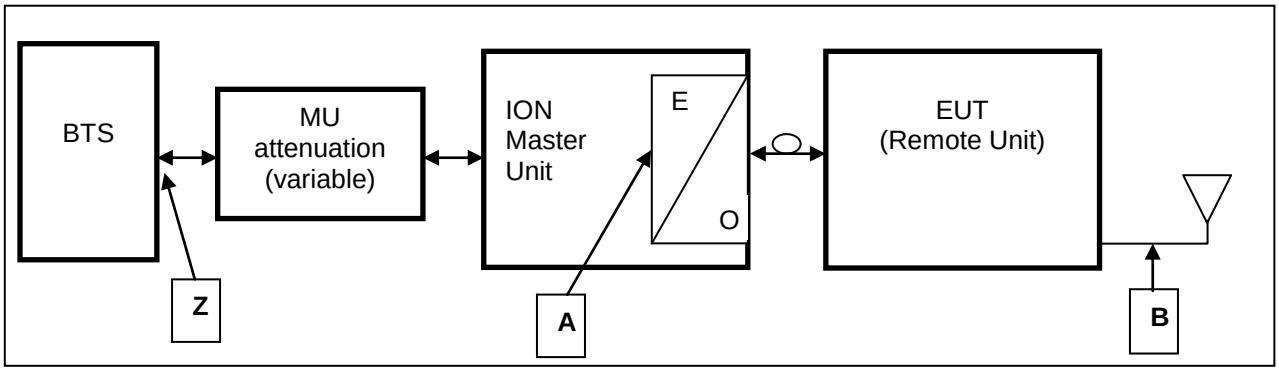


figure 2.1.4-#1 Block diagram of measurement reference points

Remote Unit is the EUT

O/E	Optical / Electrical converter
SRMU	Sub Rack Master Unit

Reference point A	SRMU	UL output,	DL input
Reference point B	Remote Unit	DL output,	UL input
Reference point Z	BTS	DL output,	UL input

Downlink: Measure from reference point A to B

Since a signal generator does not supply a good output signal with +33 or +43dBm, for the downlink measurement the MU Attenuation is not used.
That means for downlink measurements the signal generator is connected to measurement point A at the master optical / electrical converter and the analyzer to the measurement point B at the RU.

2.1.5 Downlink System Gain and Output Power

System optimized for BTS power *(fixed value)* **Z**	MU Attenuation *(manual leveling)*	Maximum rated input power at the MU OTRX *(fixed value)* **A**	RU Gain *(fixed value)* **A to B**	Maximum rated output power at RU Antenna port *(fixed value)* **B**
+33 dBm	**27 dB**	**6 dBm**	**+38.5 dB**	**+44.5 dBm** *@ 1 carrier*
System Gain Z to B	**+11.5 dB**			
+43 dBm	**37 dB**	**6 dBm**	**+38.5 dB**	**+44.5 dBm** *@ 1 carrier*
System Gain Z to B	**+1.5 dB**			

table 2.1.5-#1 Equipment under test (E.U.T.) Description Downlink System Gain and Output Power

3 Test site (Andrew Buchdorf)

3.1 Test environment

All tests were performed under the following environmental conditions:

Condition	Minimum value	Maximum value
Barometric pressure	86 kPa	106 kPa
Temperature	15°C	30°C
Relative Humidity	20 %	75 %
Power supply range	±5% of rated voltages	

3.2 Test equipment

ANDREW Inv. No.	Test equipment	Type	Manufacturer	Serial No.	Calibration
9102	Network Analyzer	ZVB 14	R&S	100118	08/14
9054	Spectrum Analyzer	FSV13	R&S	100859	12/13
9233	Signal Generator	SMBV100A	R&S	257777	06/14
8849	Signal Generator	SMU200A	R&S	101732	04/14
8671	Power Meter	E4418B	Agilent	GB39513094	06/14
8672	Power Sensor	E9300H	Agilent	US41090179	06/14
7336	Power Attenuator	768-20	Narda	04904	CIU
7119	Divider	2way	Mikom	3512	CIU
7408	RF-Cable	2,0m; N-N	Andrew	---	CIU
7409	RF-Cable	2,0m; N-N	Andrew	---	CIU
7410	RF-Cable	1,0m; N-N	Andrew	---	CIU
7411	RF-Cable	2,0m; N-N	Andrew	---	CIU
7373	RF-Cable	Multiflex141	Andrew	---	CIU
7374	RF-Cable	Multiflex141	Andrew	---	CIU
7437	RF-Cable	Multiflex141	Andrew	---	CIU
7438	RF-Cable	Multiflex141	Andrew	---	CIU
7439	RF-Cable	Multiflex141	Andrew	---	CIU
7443	RF-Cable	Multiflex141	Andrew	---	CIU
7444	RF-Cable	Multiflex141	Andrew	---	CIU
7445	RF-Cable	Multiflex141	Andrew	---	CIU
7446	RF-Cable	Multiflex141	Andrew	---	CIU
7447	RF-Cable	Multiflex141	Andrew	---	CIU
7448	RF-Cable	Multiflex141	Andrew	---	CIU
7449	RF-Cable	Multiflex141	Andrew	---	CIU
7450	RF-Cable	Multiflex141	Andrew	---	CIU
7440	RF-Cable	RG-223 0.8m	Andrew	---	CIU
7441	RF-Cable	RG-223 0.8m	Andrew	---	CIU
---	Notch filter	---	Wainwright Instruments	---	CIU

CIU = Calibrate in use

3.3 Input and output losses

All recorded power levels should be referenced to the input and output connectors of the repeater, unless explicitly stated otherwise.
The test equipment used in this test has to be calibrated, so that the functionality is also checked.
All cables, attenuators, splitter, isolator, circulator and combiner etc. must be measured before testing and used for compensation during testing.

3.4 Measurement uncertainty

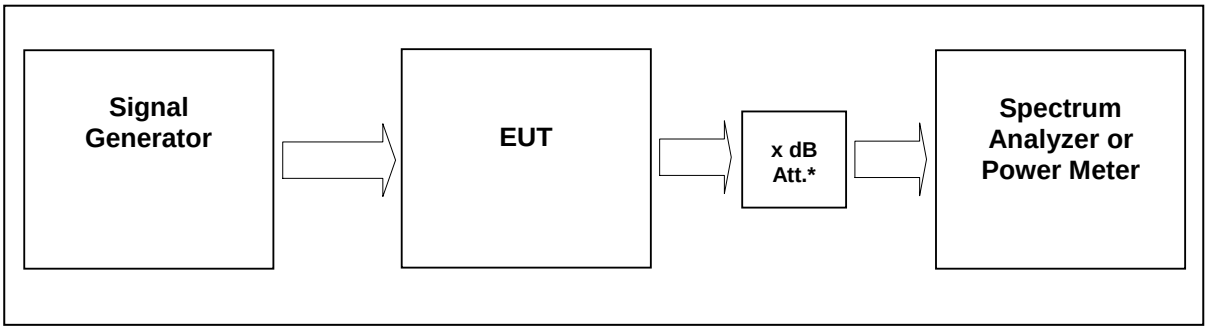
The extended measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor k=2. The true value is located in the corresponding interval with a probability of 95 %.

4 Test site (BUREAU VERITAS CPS Service Plus GmbH)

FCC Test site: **96997**
IC OATS: **IC3475A-1**

See relevant dates under section 8.

5 RF Power Out: §90.635, §2.1046



External Attenuator DL x dB = 20 dB
figure 5-#1 Test setup: RF Power Out: §90.635, §2.1046

Measurement uncertainty	± 0,38 dB
Test equipment used	9054; 9233; 7336; 7408; 7449; 7444; 7374

5.1 Limit

Minimum standard:

§ 90.635 Limitations on power and antenna height.

(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.

5.2 Test method

§ 2.1046 Measurements required: RF power output.

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit circuit elements specified in § 2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

(c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the testconditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations

5.3 Test Results

Detector RMS.

Test signal Analog:
FM signal with 3.0 kHz deviation and 2.5 kHz rate and sine waveform

Test signal iDEN:
Signal waveform according to Motorola iden Technical Overview 68P81095E55-E

Test signal GSM:
Signal waveform with GMSK modulation in all time slots according to 3GPP TS45.004

Test signal GSM EDGE:
Signal waveform with 8-PSK modulation in all time slots according to 3GPP TS45.004

Test signal CDMA
Signal waveform according to table 6.2-1 of standard specification 3GPP2 C.p0051-0 v1.0 16.February 2006 pilot, sync, paging, 37 traffics, which is equal to the table 6.5.2.1 of 3GPP2 C.S0010-C v2.0 24.February 2006.

Test signal WCDMA
Signal waveform according to Test Model 1 of standard specification 3GPP TS25.141. Signal modulated with a combination of PCCPCH, SCCPCH and Dedicated Physical Channels specified as test model 1 64 DPCH.

5.3.1 Downlink

Modulation	Measured at		RBW VBW Span	RF Power [dBm]	RF Power [W]	Plot -
Analog	Middle	864 MHz	0.1MHz 0.3MHz 1.5MHz	44.5	28.2	5.3.1.1 #1
iDEN	Middle	864 MHz	0.1MHz 0.3MHz 1.5MHz	44.5	28.2	5.3.1.2 #1
GSM	Middle	864 MHz	1MHz 3MHz 10MHz	44.5	28.2	5.3.1.3 #1
EDGE	Middle	864 MHz	1MHz 3MHz 10MHz	44.5	28.2	5.3.1.4 #1
CDMA	Middle	864 MHz	3MHz 10MHz 15MHz	44.5	28.2	5.3.1.5 #1
WCDMA	Middle	864 MHz	10MHz 10MHz 50MHz	44.0	25.1	5.3.1.6 #1
Maximum output power = 44.5 dBm = 28.2 W						
Limit Maximum output power = 60 dBm = 1000 W (erp)						

table 5.3.1-#1 RF Power Out: §90.635, §2.1046 Test Results Downlink

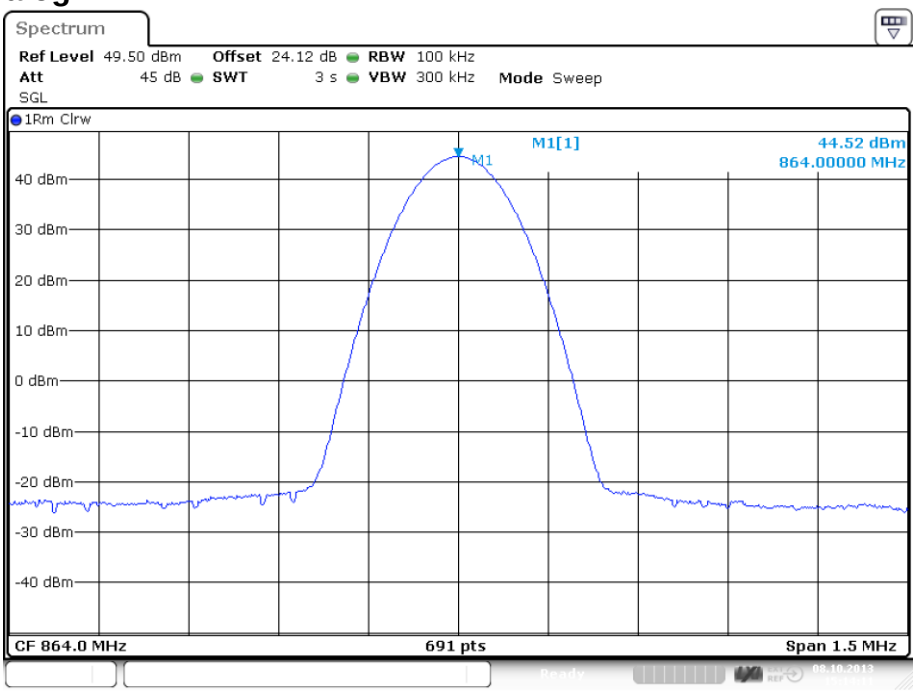
The max RF Power out is 44.5 dBm, so the maximum antenna gain (x) can be calculated as follow:
Limit = 1000W (eirp) = **60 dBm** Info: 1000W (erp) = 1640W (eirp)
60 dBm **>** 44.5 dBm + x
15.5 dBd = 17.65 dBi > x

=> The antenna that will be used for the complete system have to have a gain lower than 17.7 dBi, relative to a dipol.

Modulation	Pin / dBm (Ref. point B)
Analog	6.0
iDEN	6.1
GSM	6.0
EDGE	6.1
CDMA	5.9
WCDMA	5.6

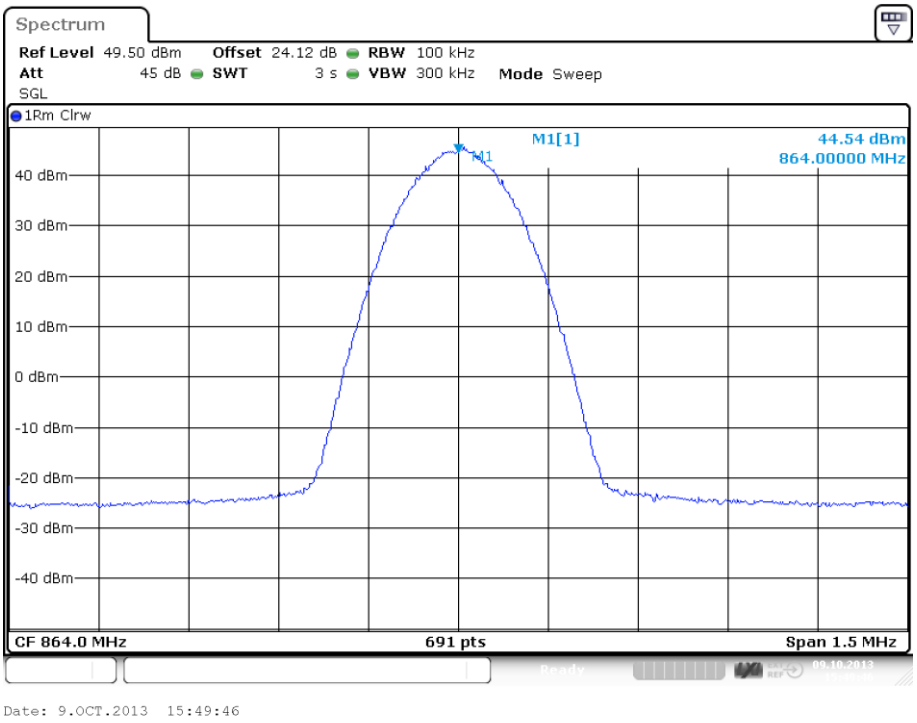
table 5.3.1-#2 RF Power Out: §90.635, §2.1046 Test Results; Downlink; Input power

5.3.1.1 Analog



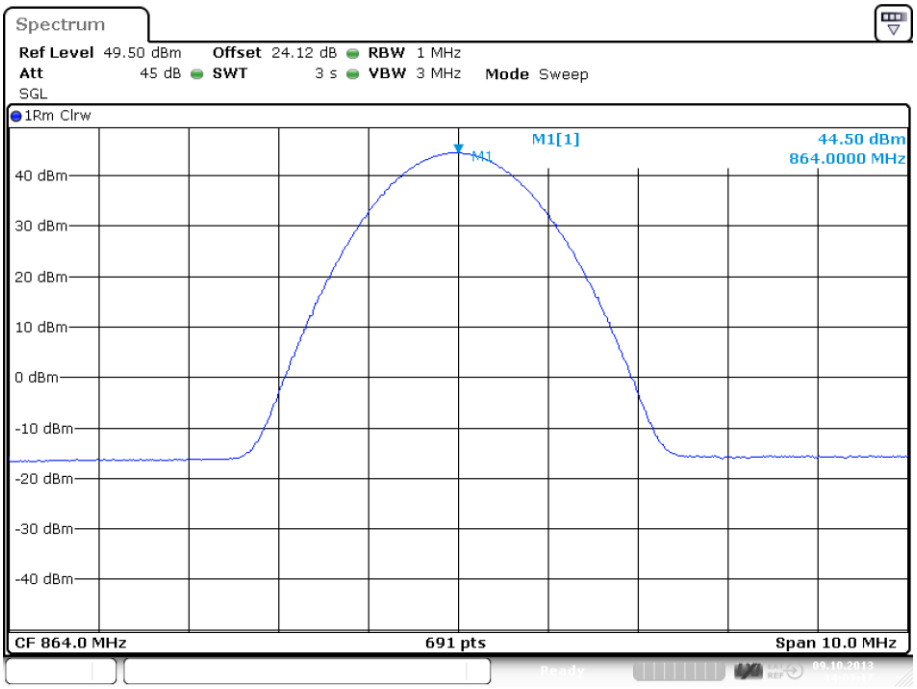
plot 5.3.1.1-#1 RF Power Out: §90.635, §2.1046; Test Results; Downlink; Analog Middle

5.3.1.2 iDEN



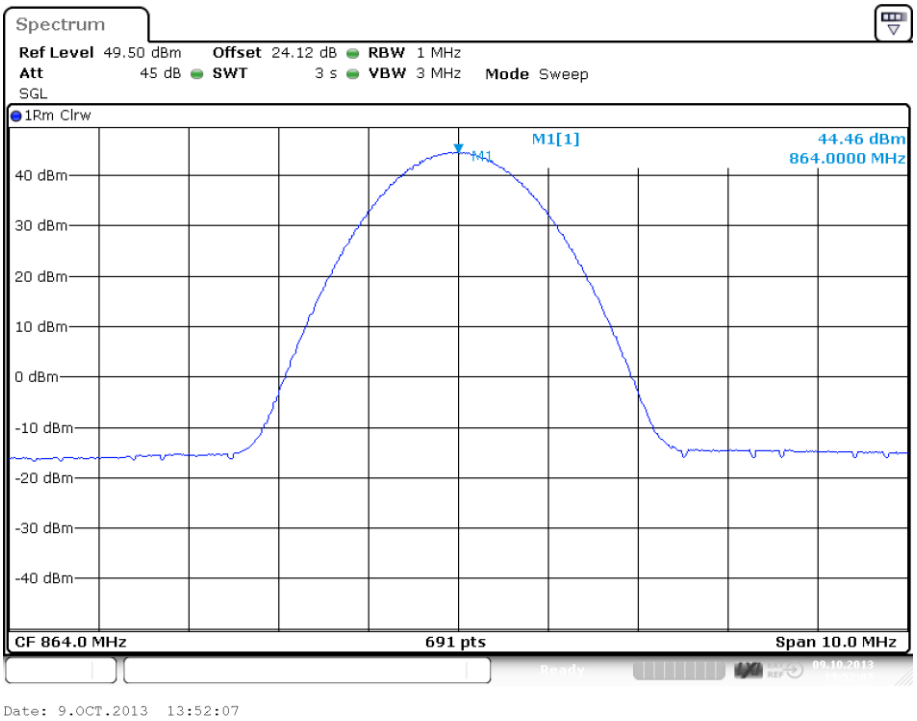
plot 5.3.1.2-#1 RF Power Out: §90.635, §2.1046; Test Results; Downlink; iDEN Middle

5.3.1.3 GSM



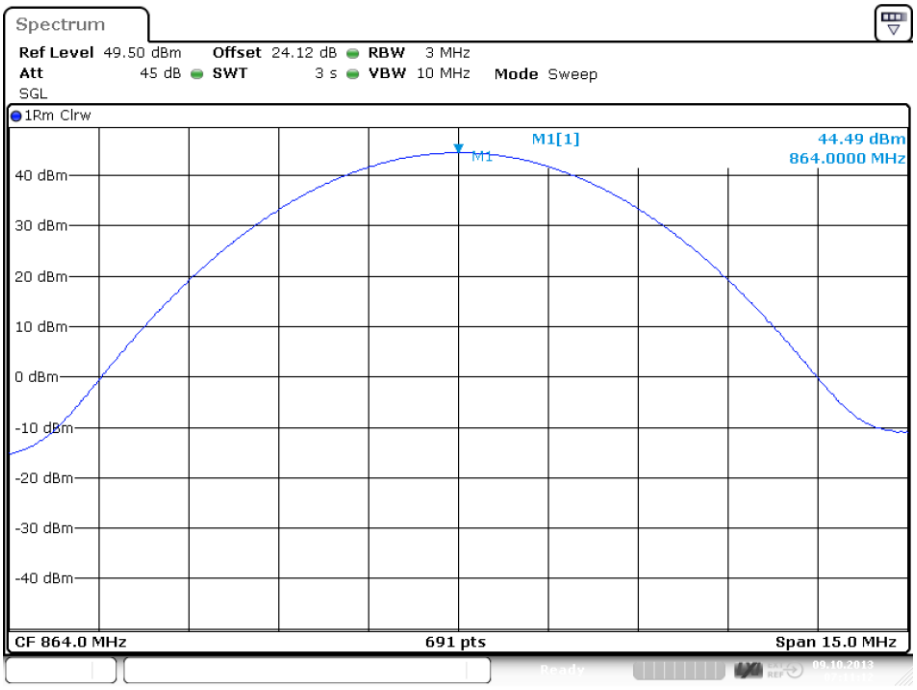
plot 5.3.1.3-#1 RF Power Out: §90.635, §2.1046; Test Results; Downlink; GSM Middle

5.3.1.4 EDGE



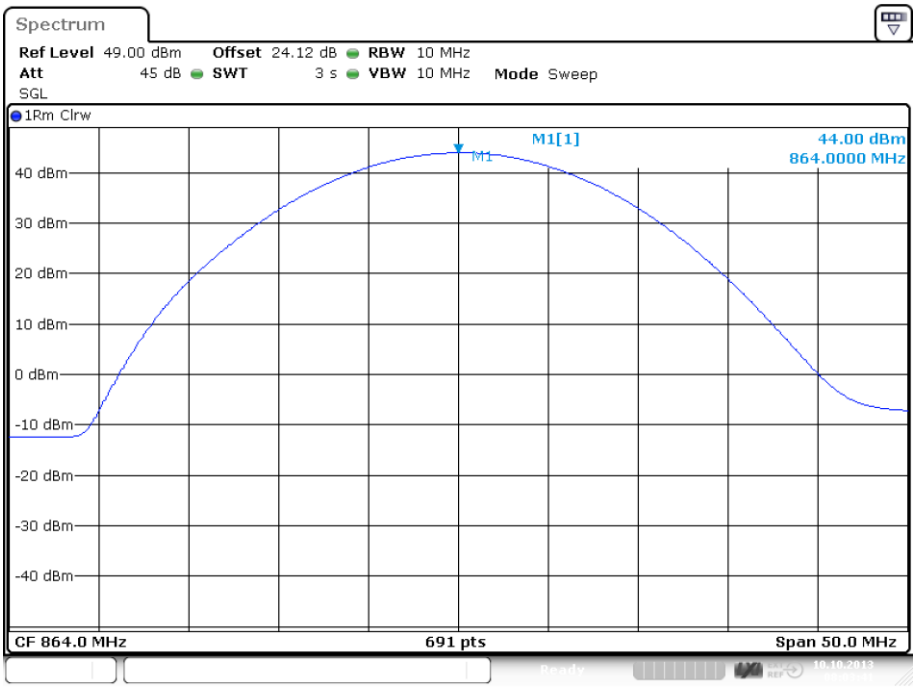
plot 5.3.1.4-#1 RF Power Out: §90.635, §2.1046; Test Results; Downlink; EDGE Middle

5.3.1.5 CDMA



plot 5.3.1.5-#1 RF Power Out: §90.635, §2.1046; Test Results; Downlink; CDMA Middle

5.3.1.6 WCDMA



plot 5.3.1.6-#1 RF Power Out: §90.635, §2.1046; Test Results; Downlink; WCDMA Middle

5.3.2 Uplink

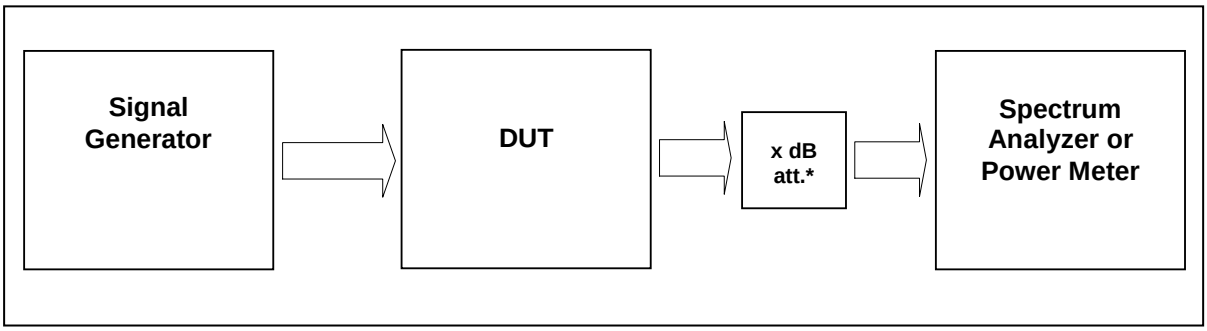
n.a.

Note: The EUT does not transmit over the air in the uplink direction.

5.4 Summary test result

Test result	complies, according the plots above
Tested by:	M. Leinfelder
Date:	10.10.2013

6 Occupied Bandwidth: §90.210, §2.1049



External Attenuator DL x dB = 30 dB

figure 6-#1 Test setup: Occupied Bandwidth: §90.210, §2.1049

Measurement uncertainty	± 0,38 dB
Test equipment used	9054; 9233; 7336; 7408; 7449; 7444; 7374

6.1 Limit

The spectral shape of the output should look similar to input for all modulations.

6.2 Test method

Para. No.2.1049

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 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

6.3 Test results

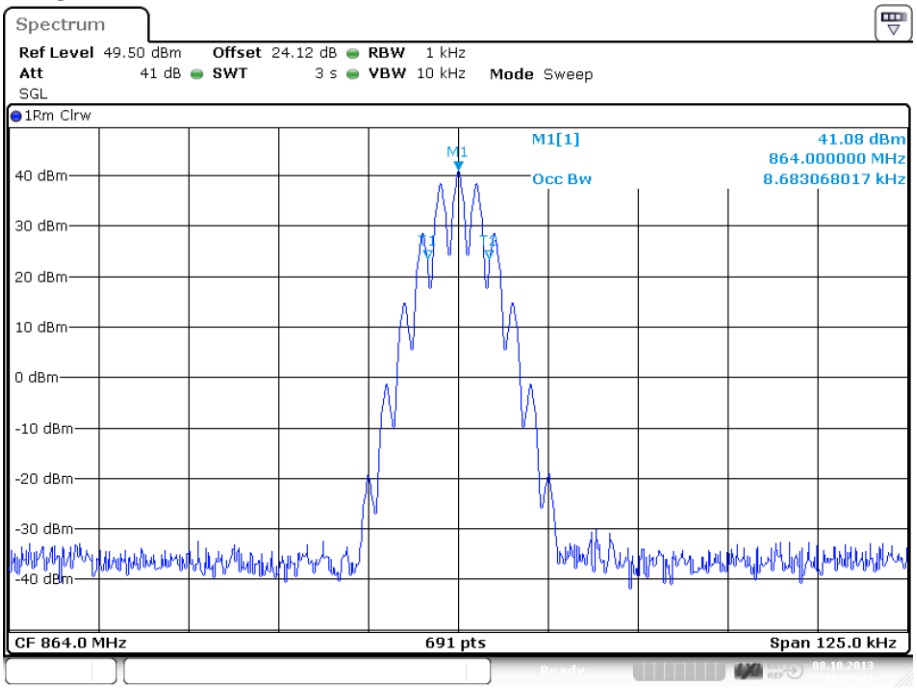
6.3.1 Downlink

Detector RMS.

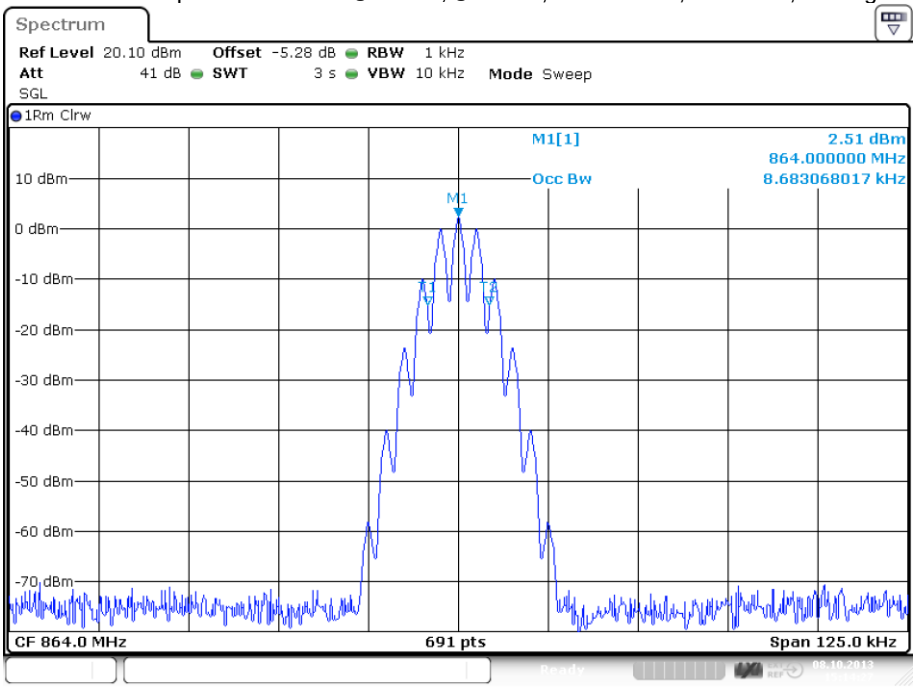
Modulation	Measured at		RBW VBW Span	Occupied Bandwidth	Plot #
Analog	Middle	864 MHz	1 kHz 10 kHz 125 kHz	9 kHz	6.3.1.1 #1, #2
iDEN	Middle	864 MHz	1 kHz 10 kHz 125 kHz	17 kHz	6.3.1.2 #1, #2
GSM	Middle	864 MHz	3 kHz 30 kHz 1 MHz	0.19 MHz	6.3.1.3 #1, #2
EDGE	Middle	864 MHz	3 kHz 30 kHz 1 MHz	0.19 MHz	6.3.1.4 #1, #2
CDMA	Middle	864 MHz	30 kHz 300 kHz 5 MHz	1.17 MHz	6.3.1.5 #1, #2
WCDMA	Middle	864 MHz	100 kHz 1 MHz 10 MHz	3.8 MHz	6.3.1.6 #1, #2

table 6.3-#1 Occupied Bandwidth: §90.210, §2.1049 Test results

6.3.1.1 Analog

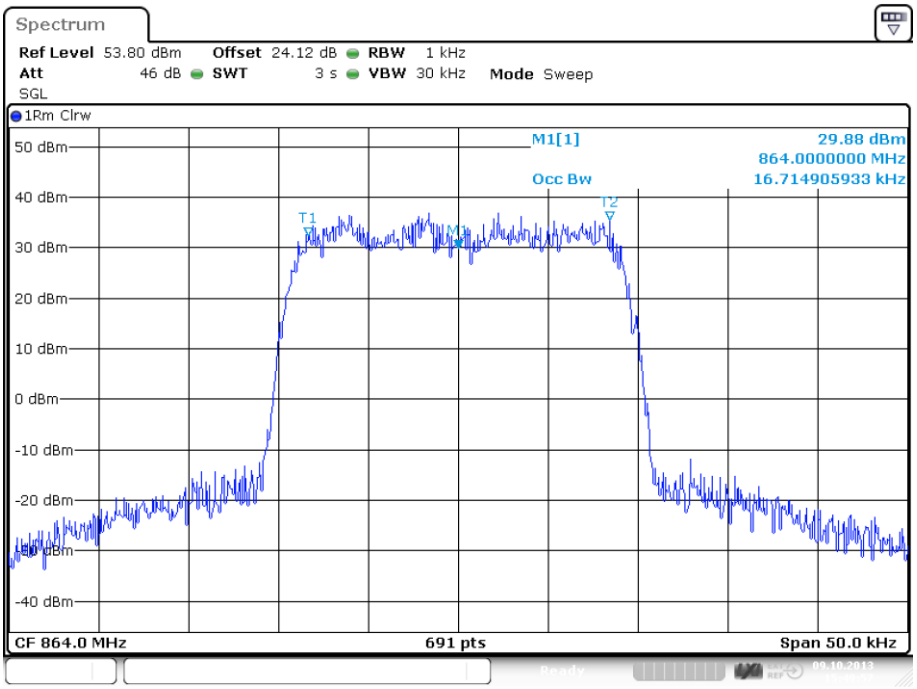


plot 6.3.1.1-#1 Occupied Bandwidth: §90.210, §2.1049; Test results; Downlink; Analog Output

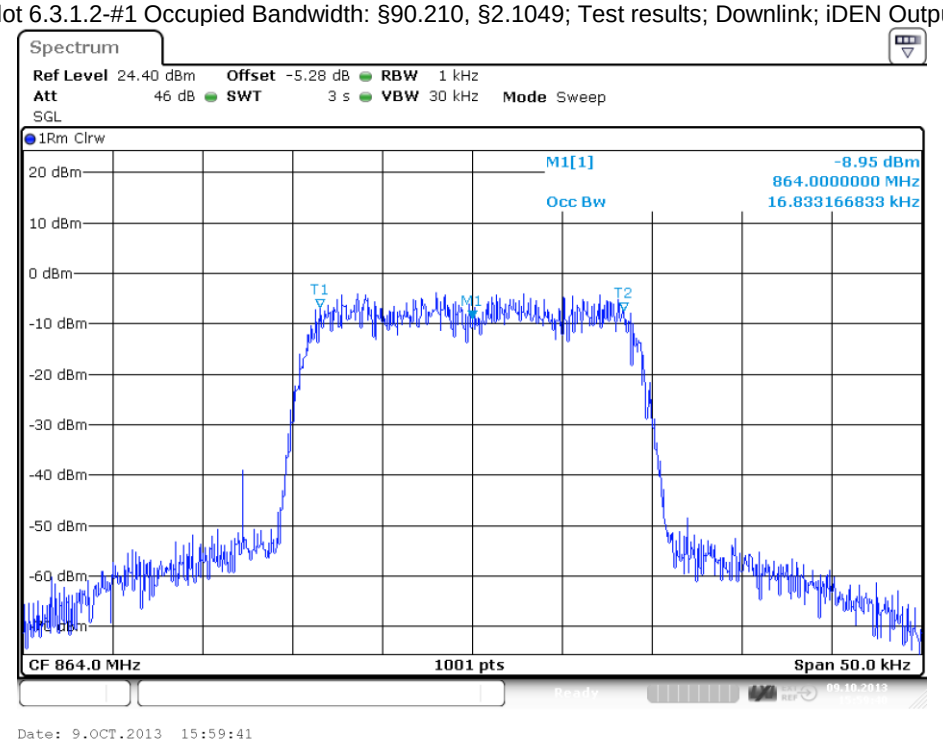


plot 6.3.1.1-#2 Occupied Bandwidth: §90.210, §2.1049; Test results; Downlink; Analog Input

6.3.1.2 iDEN

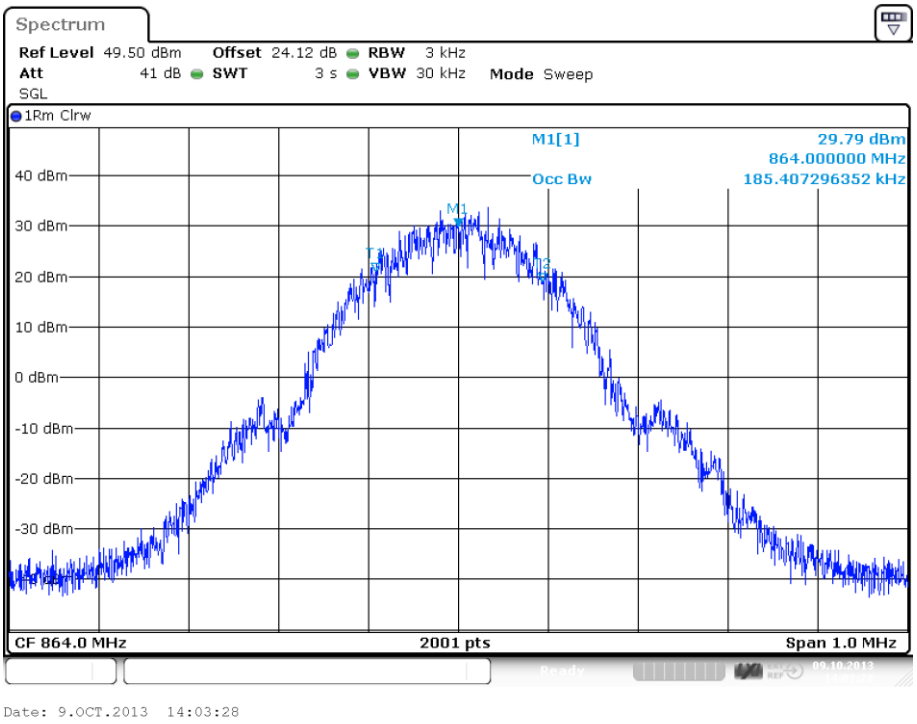


plot 6.3.1.2-#1 Occupied Bandwidth: §90.210, §2.1049; Test results; Downlink; iDEN Output

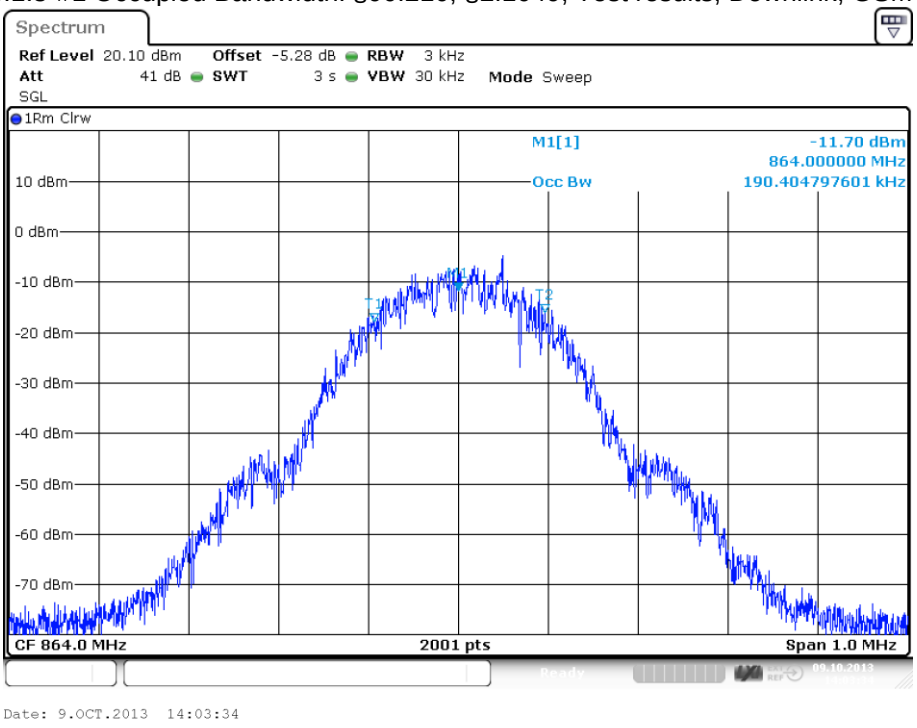


plot 6.3.1.2-#2 Occupied Bandwidth: §90.210, §2.1049; Test results; Downlink; iDEN Input

6.3.1.3 GSM

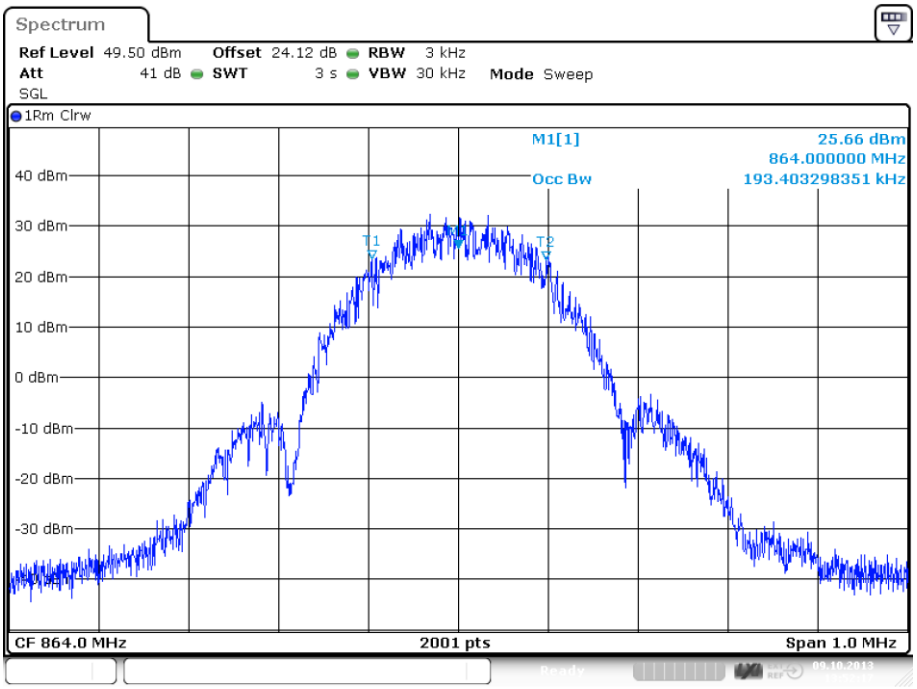


plot 6.3.1.3-#1 Occupied Bandwidth: §90.210, §2.1049; Test results; Downlink; GSM Output

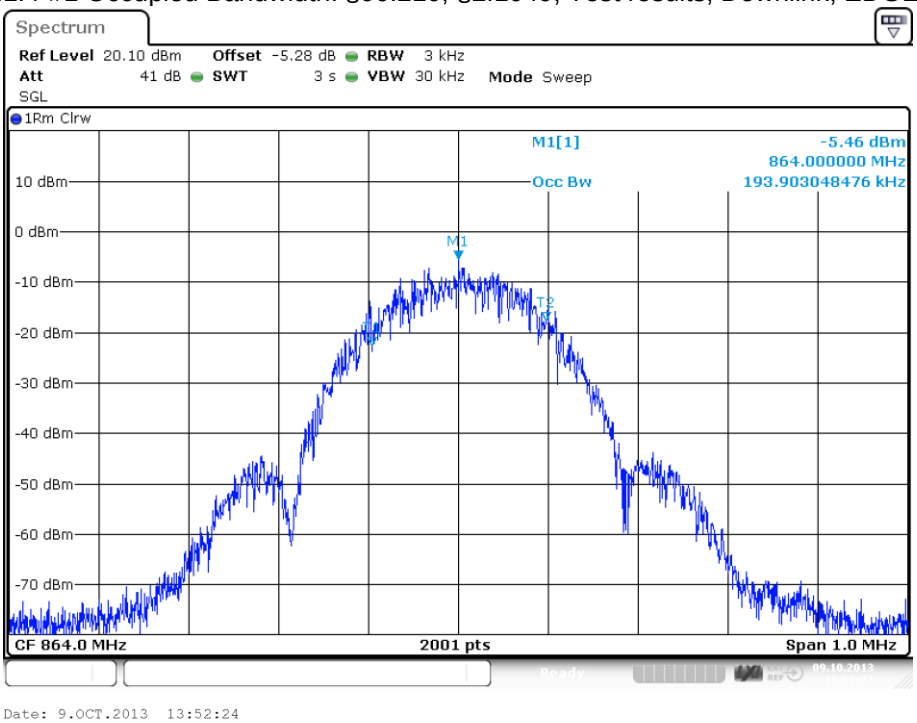


plot 6.3.1.3-#2 Occupied Bandwidth: §90.210, §2.1049; Test results; Downlink; GSM Input

6.3.1.4 EDGE

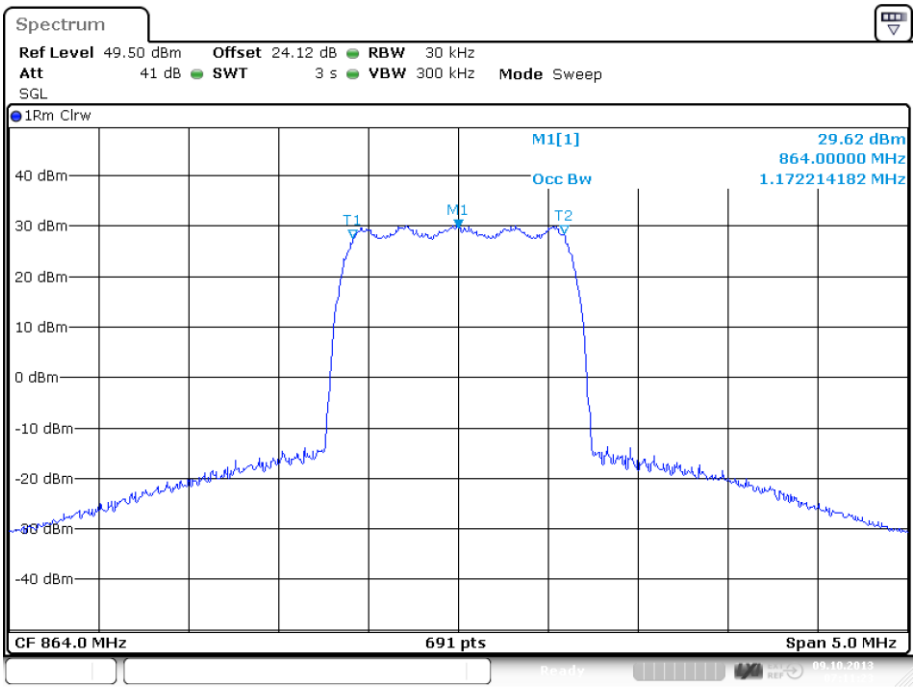


plot 6.3.1.4-#1 Occupied Bandwidth: §90.210, §2.1049; Test results; Downlink; EDGE Output

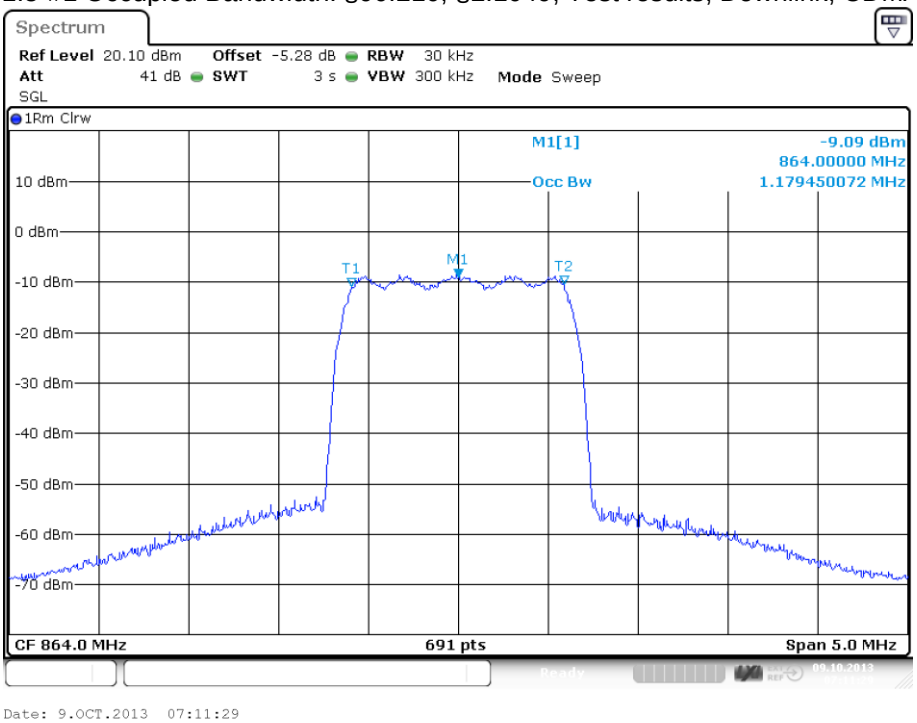


plot 6.3.1.4-#2 Occupied Bandwidth: §90.210, §2.1049; Test results; Downlink; EDGE Input

6.3.1.5 CDMA

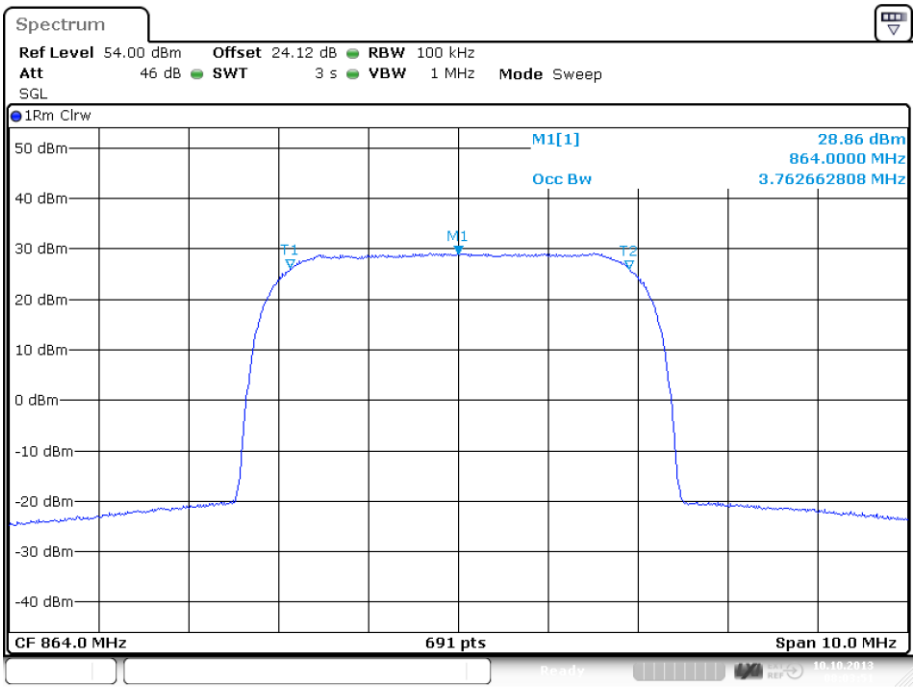


plot 6.3.1.5-#1 Occupied Bandwidth: §90.210, §2.1049; Test results; Downlink; CDMA Output

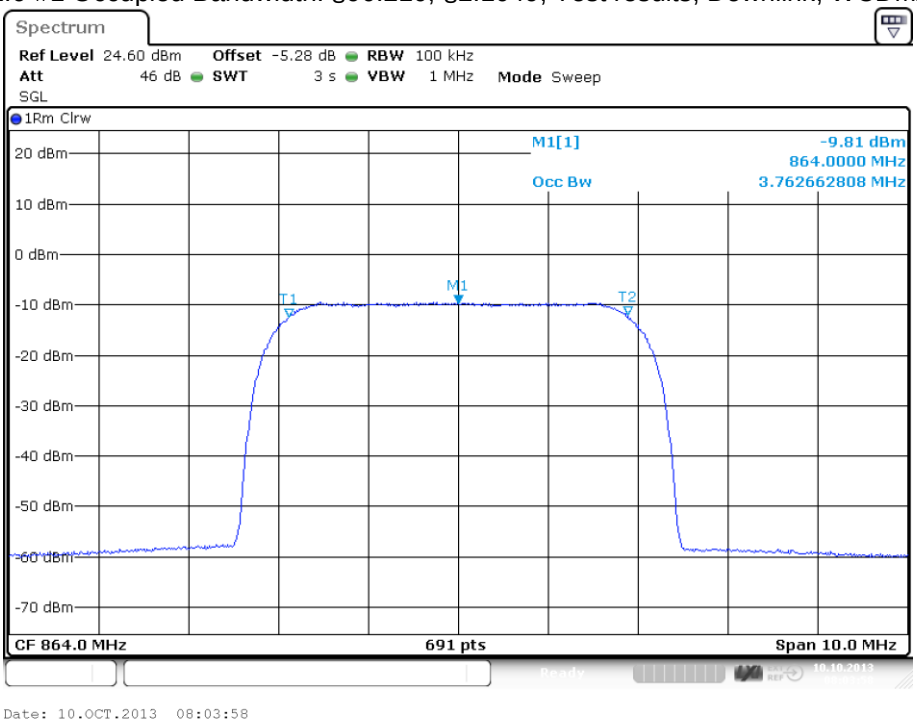


plot 6.3.1.5-#2 Occupied Bandwidth: §90.210, §2.1049; Test results; Downlink; CDMA Input

6.3.1.6 WCDMA



plot 6.3.1.6-#1 Occupied Bandwidth: §90.210, §2.1049; Test results; Downlink; WCDMA Output



plot 6.3.1.6-#2 Occupied Bandwidth: §90.210, §2.1049; Test results; Downlink; WCDMA Input

6.3.2 Uplink

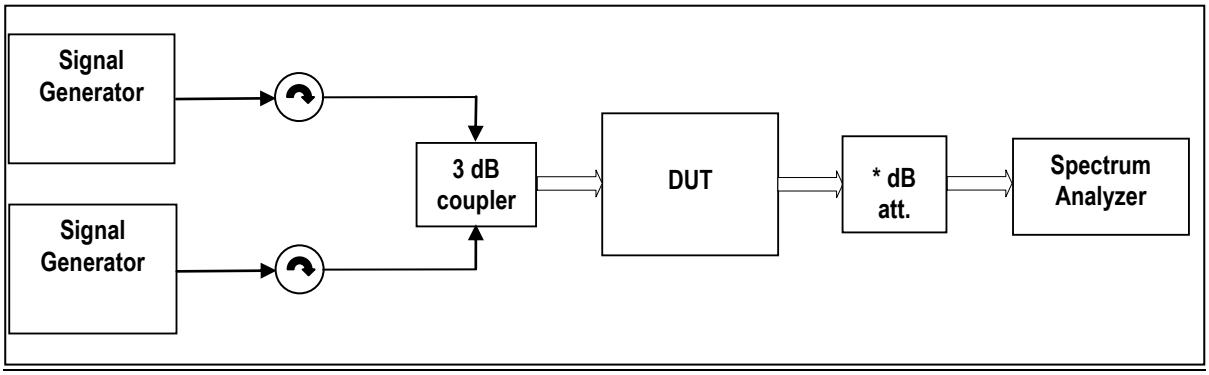
n.a.

Note: The EUT does not transmit over the air in the uplink direction.

6.4 Summary test result

Test result	complies, according the plots above
Tested by:	M. Leinfelder
Date:	10.10.2013

7 Spurious Emissions at Antenna Terminals: §90.210, §2.1051



External Attenuator DL x dB = 30 dB

figure 7-#1 Test setup: Spurious Emissions at Antenna Terminals: §90.210, §2.1051

Measurement uncertainty	± 0,54 dB ± 1,2 dB ± 1,5 dB	9 kHz to 3 GHz 3 GHz to 7 GHz 7 GHz to 26 GHz
Test equipment used	9054; 9233;8849; 7119; 7447; 7448; 7443; 7336; 7408; 7449; 7444; 7374, Notch filter	

7.1 Limit

Minimum standard: §90.210, Table “Application Emission Mask”

Frequency Band (MHz)	Mask for equipment with Audio Low pass filter	Mask for Equipment without audio low pass filter
806–809/851–854	B	H
809–824/854–869 [3]	B	G

[3] Equipment used in this licensed to EA or non-EA systems shall comply with the emission mask provisions of § 90.691.

MASK	Spurious Limit
A,B,C,G,H,I	-13dBm

7.2 Test method

Para. No 2.1051 Measurements required: Spurious emissions at antenna terminals.
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.
[39 FR 5919, Feb. 15, 1974. Redesignated andamended at 63 FR 36599, July 7, 1998]

7.3 Test results

7.3.1 Downlink

<1MHz from Band Edge

Detector: RMS.

Modulation	Measured at Band Edge	Carriers	RBW VBW Span Sweep points	Max. level (dBm)	Plot -
Analog	Lower Edge Upper Edge	859,0125 MHz 859,0375 MHz 868,9625 MHz 868,9875 MHz	0.3kHz 3kHz 1.1MHz	-29.2	7.3.1.1 #1 #2
iDEN	Lower Edge Upper Edge	859,0125 MHz 859,0375 MHz 868,9625 MHz 868,9875 MHz	0.3kHz 3kHz 1.1MHz	-27.7	7.3.1.2 #1 #2
GSM	Lower Edge Upper Edge	859,4 MHz 859,6 MHz 868,4 MHz 868,6 MHz	3kHz 30kHz 2MHz	-33.1	7.3.1.3 #1 #2
EDGE	Lower Edge Upper Edge	859,4 MHz 859,6 MHz 868,4 MHz 868,6 MHz	3kHz 30kHz 2MHz	-33.5	7.3.1.4 #1 #2
CDMA	Lower Edge Upper Edge	859,775 MHz 861,025 MHz 866,975 MHz 868,225 MHz	30kHz 300kHz 6MHz	-16.8	7.3.1.5 #1 #2
WCDMA	Lower Edge Upper Edge	861.6 MHz 866.6 MHz 861.4 MHz 866.4 MHz	100kHz 1MHz 15MHz	-21.7	7.3.1.6 #1 #2

table 7.3-#1 Spurious Emissions at Antenna Terminals: §90.210, §2.1051 Test results <1MHz from Band Edge

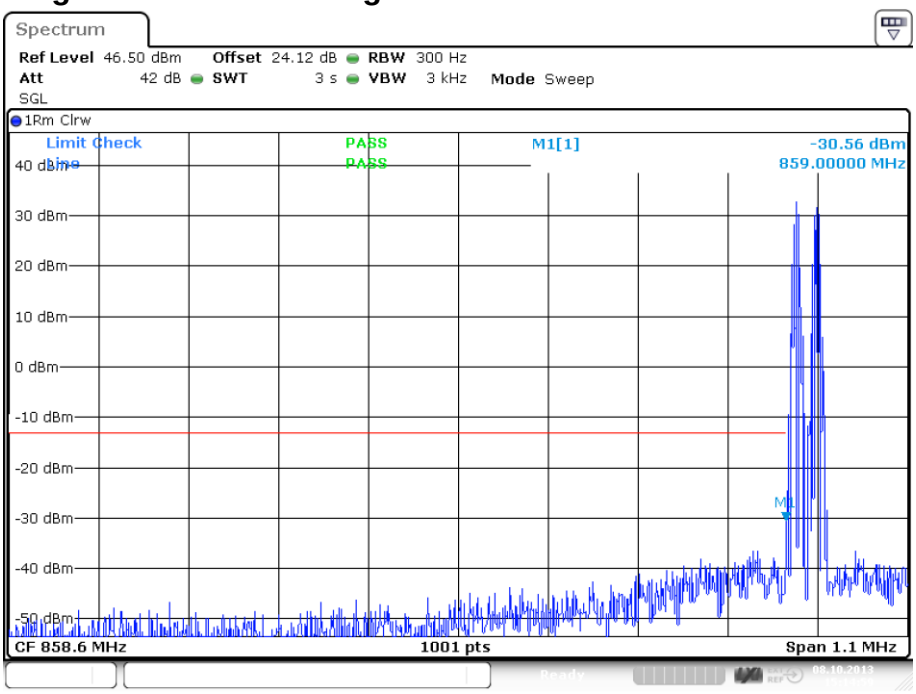
>1MHz from Band Edge

Detector: RMS.

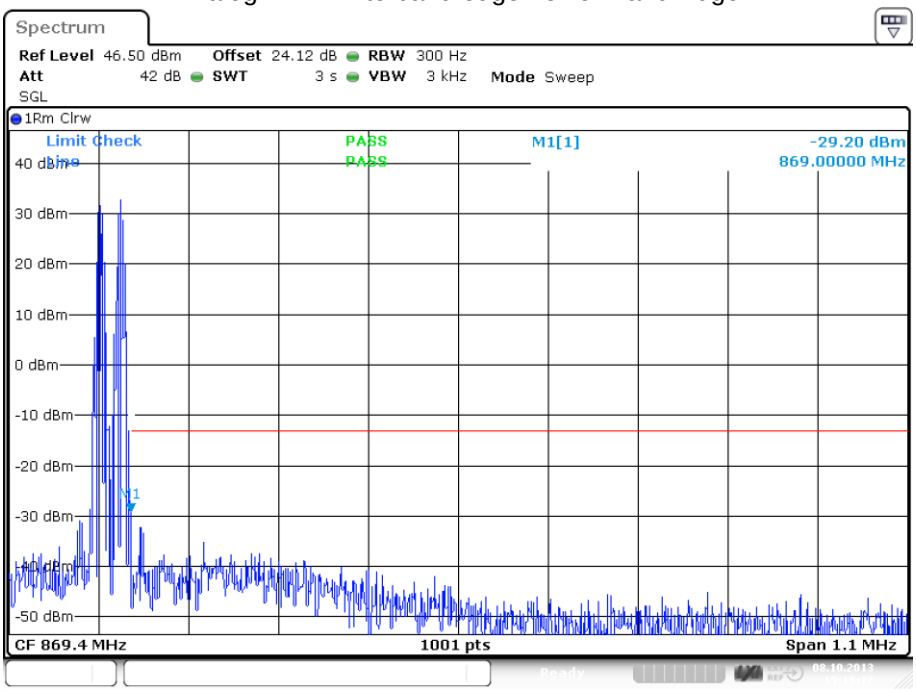
Modulation	Carrier	RBW VBW Span	Max. level (dBm)	Plot -
Analog	881,5 MHz	1MHz 3MHz 30MHz – 10GHz	-17.9	7.3.1.7 #1
iDEN	881,5 MHz	1MHz 3MHz 30MHz – 10GHz	-17.2	7.3.1.8 #1
GSM	881,5 MHz	1MHz 3MHz 30MHz – 10GHz	-17.4	7.3.1.9 #1
EDGE	881,5 MHz	1MHz 3MHz 30MHz – 10GHz	-17	7.3.1.10 #1
CDMA	881,5 MHz	1MHz 3MHz 30MHz – 10GHz	-17.4	7.3.1.11 #1
WCDMA	881,5 MHz	1MHz 3MHz 30MHz – 10GHz	-17.7	7.3.1.12 #1

table 7.3-#2 Spurious Emissions at Antenna Terminals: §90.210, §2.1051 Test results <1MHz from Band Edge

7.3.1.1 Analog < 1MHz to band edge

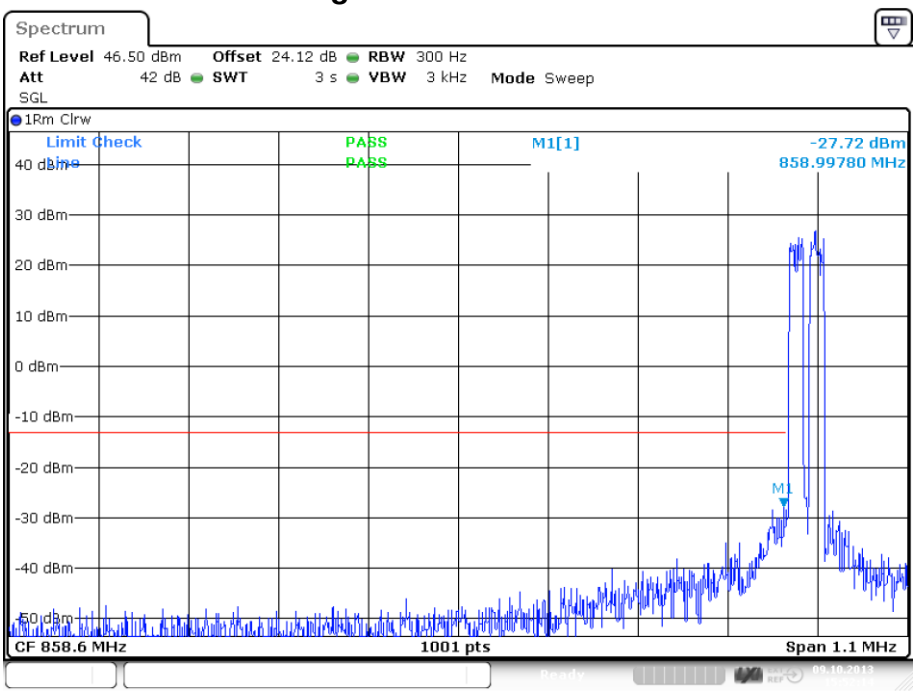


plot 7.3.1.1-#1 Spurious Emissions at Antenna Terminals: §90.210, §2.1051; Test results; Downlink; Analog < 1MHz to band edge Lower Band Edge

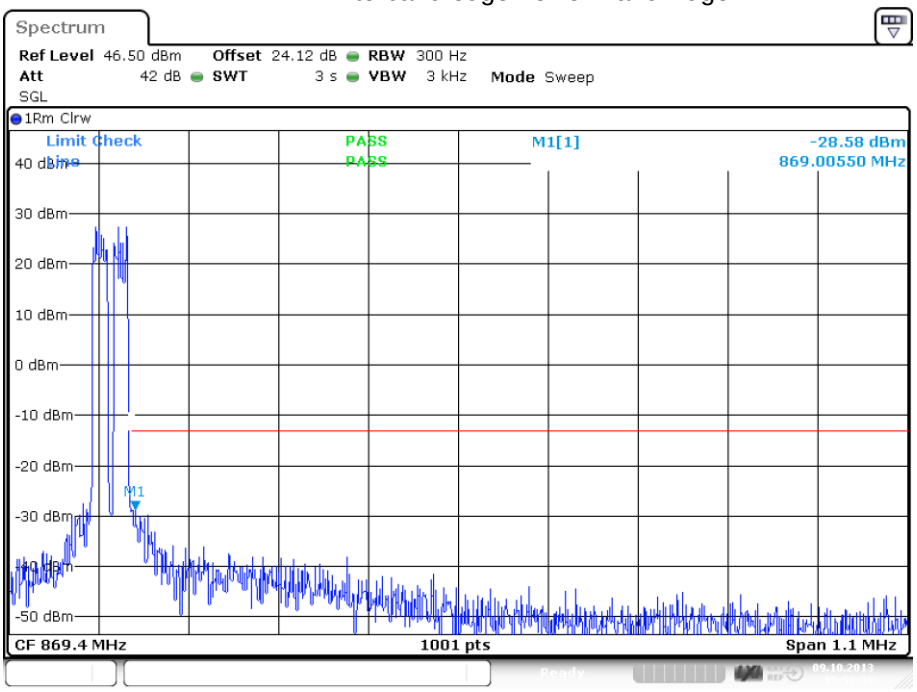


plot 7.3.1.1-#2 Spurious Emissions at Antenna Terminals: §90.210, §2.1051; Test results; Downlink; Analog < 1MHz to band edge Upper Band Edge

7.3.1.2 iDEN < 1MHz to band edge

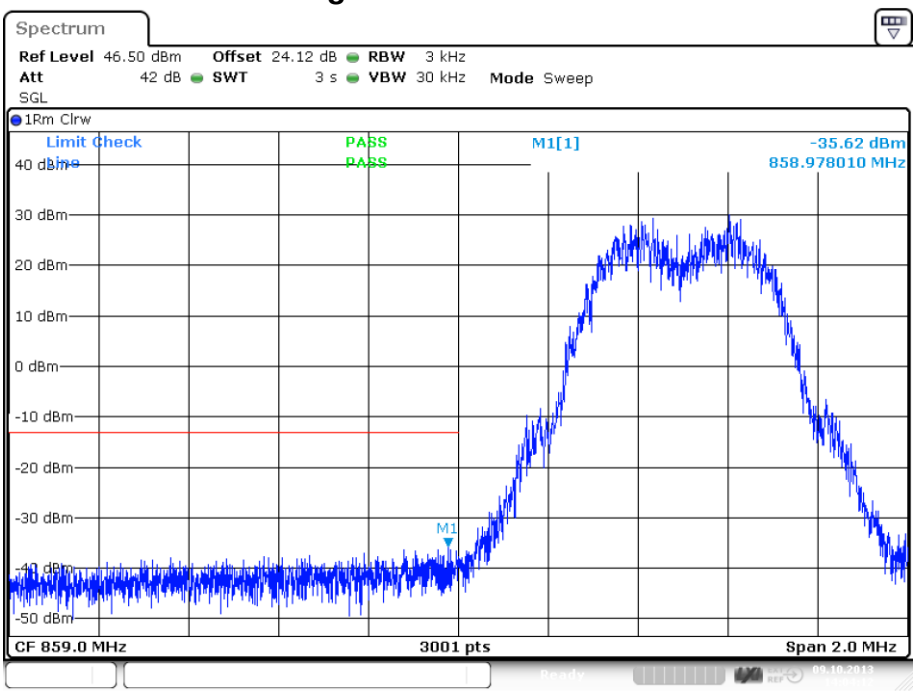


plot 7.3.1.2-#1 Spurious Emissions at Antenna Terminals: §90.210, §2.1051; Test results; Downlink; iDEN < 1MHz to band edge Lower Band Edge

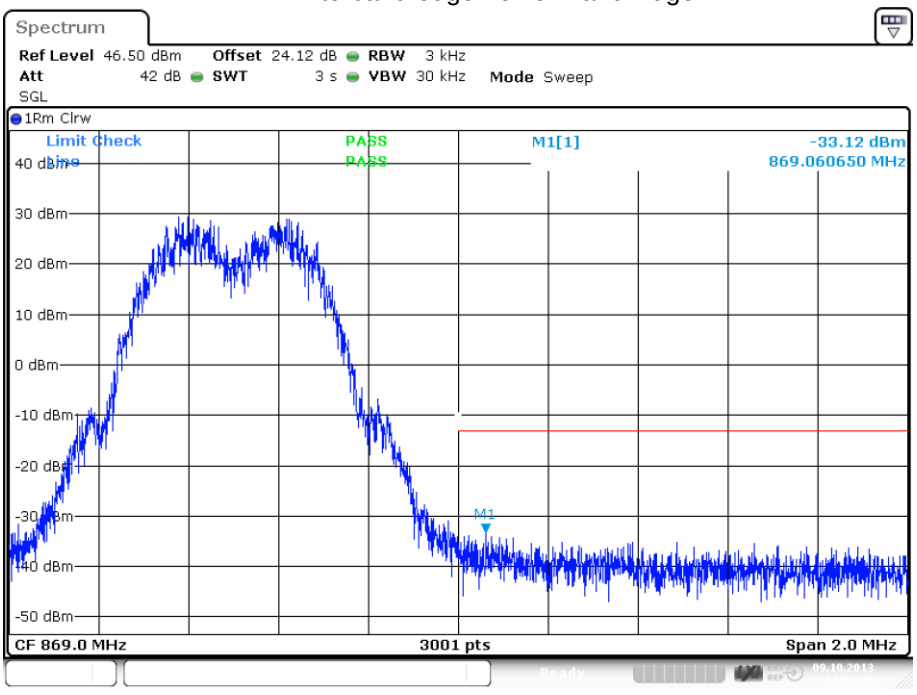


plot 7.3.1.2-#2 Spurious Emissions at Antenna Terminals: §90.210, §2.1051; Test results; Downlink; iDEN < 1MHz to band edge Upper Band Edge

7.3.1.3 GSM < 1MHz to band edge

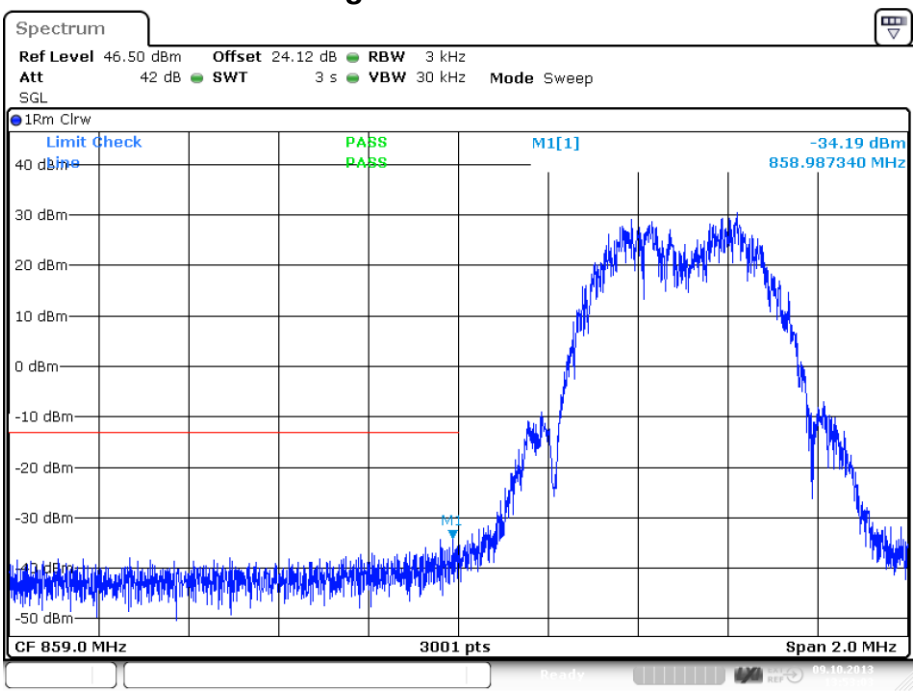


plot 7.3.1.3-#1 Spurious Emissions at Antenna Terminals: §90.210, §2.1051; Test results; Downlink; GSM < 1MHz to band edge Lower Band Edge

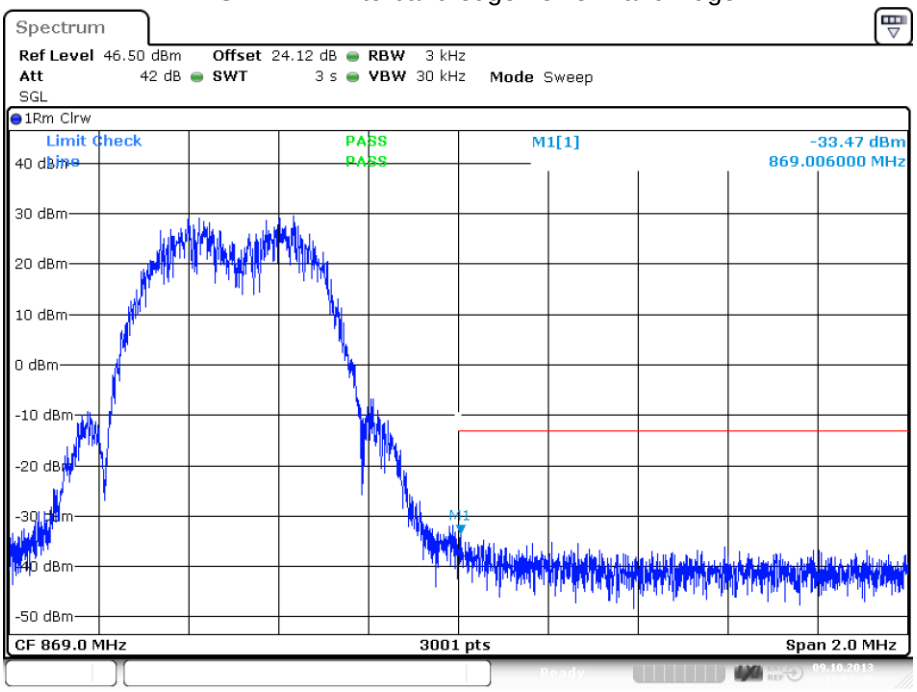


plot 7.3.1.3-#2 Spurious Emissions at Antenna Terminals: §90.210, §2.1051; Test results; Downlink; GSM < 1MHz to band edge Upper Band Edge

7.3.1.4 EDGE < 1MHz to band edge

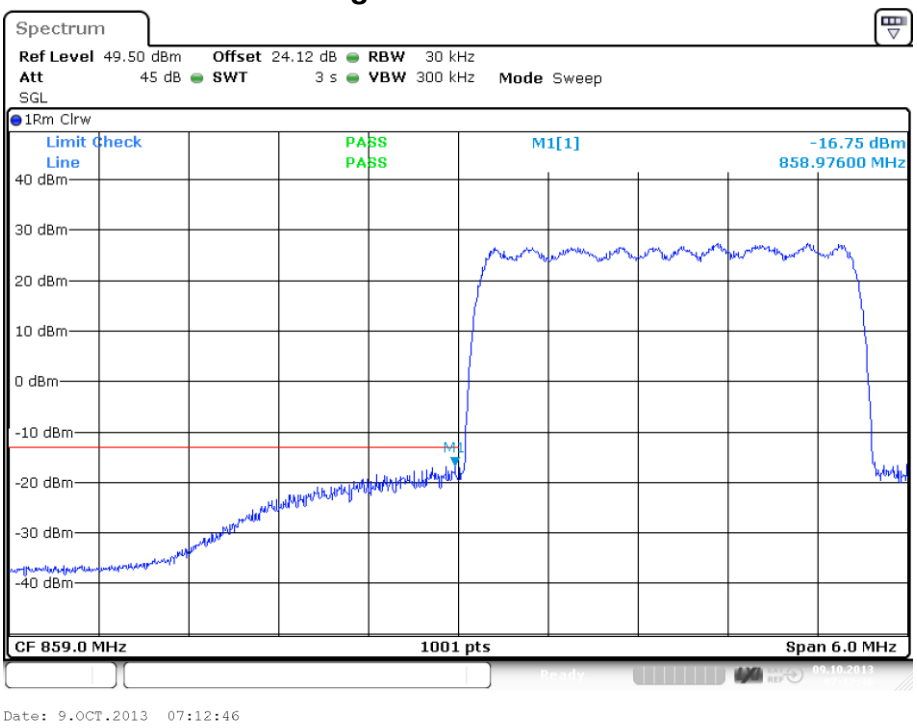


plot 7.3.1.4-#1 Spurious Emissions at Antenna Terminals: §90.210, §2.1051; Test results; Downlink; EDGE < 1MHz to band edge Lower Band Edge

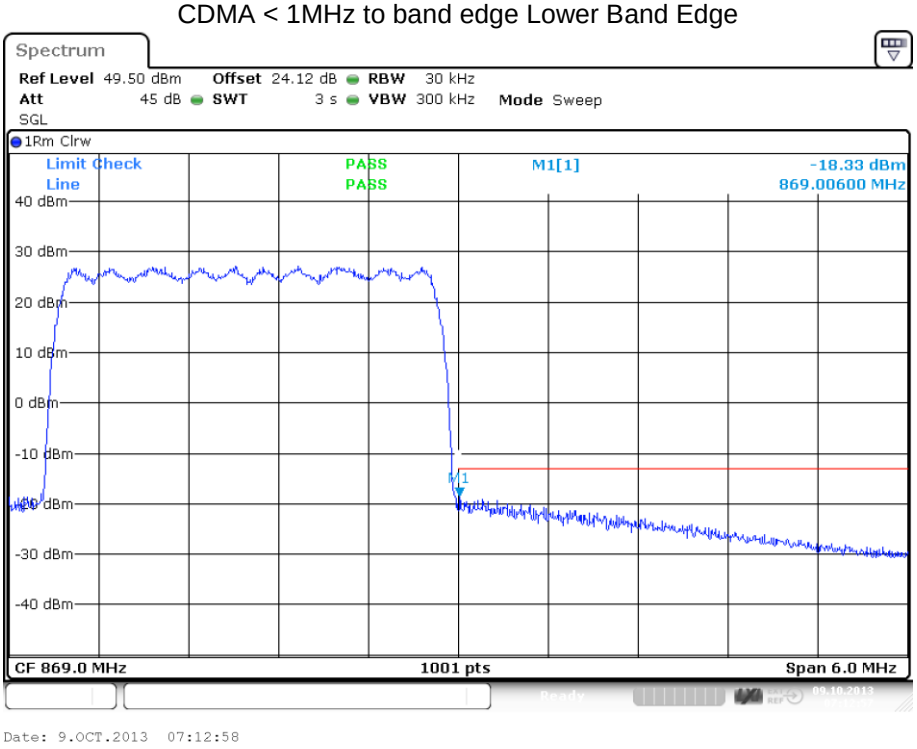


plot 7.3.1.4-#2 Spurious Emissions at Antenna Terminals: §90.210, §2.1051; Test results; Downlink; EDGE < 1MHz to band edge Upper Band Edge

7.3.1.5 CDMA < 1MHz to band edge

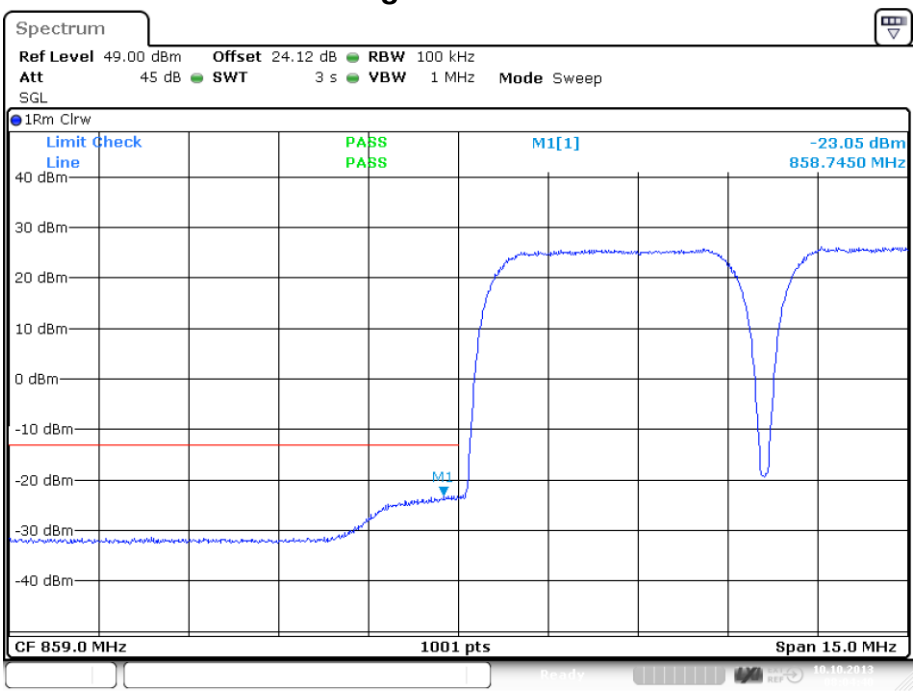


plot 7.3.1.5-#1 Spurious Emissions at Antenna Terminals: §90.210, §2.1051; Test results; Downlink; CDMA < 1MHz to band edge Lower Band Edge

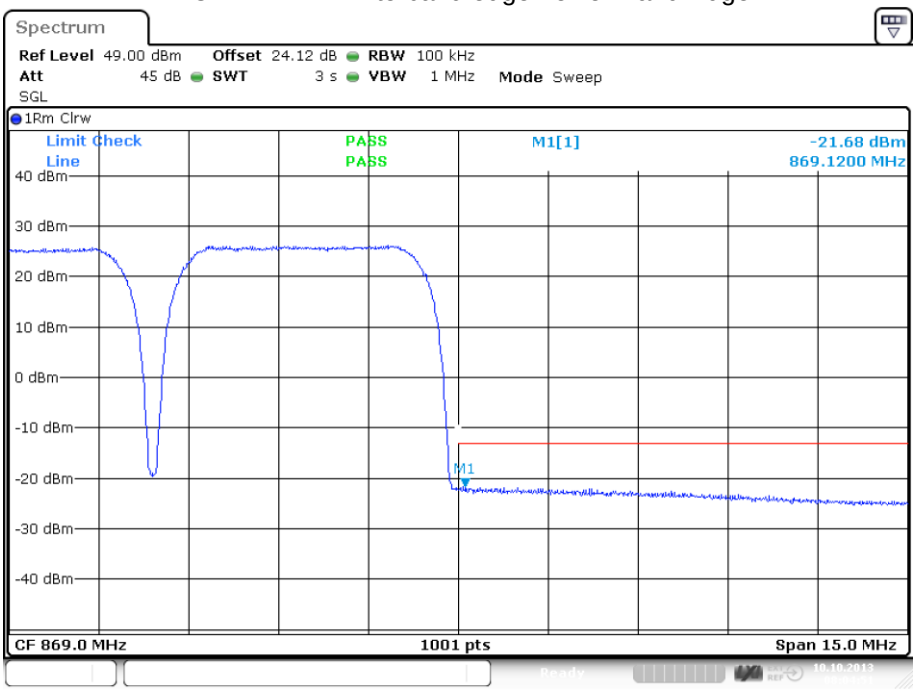


plot 7.3.1.5-#2 Spurious Emissions at Antenna Terminals: §90.210, §2.1051; Test results; Downlink; CDMA < 1MHz to band edge Upper Band Edge

7.3.1.6 WCDMA < 1MHz to band edge

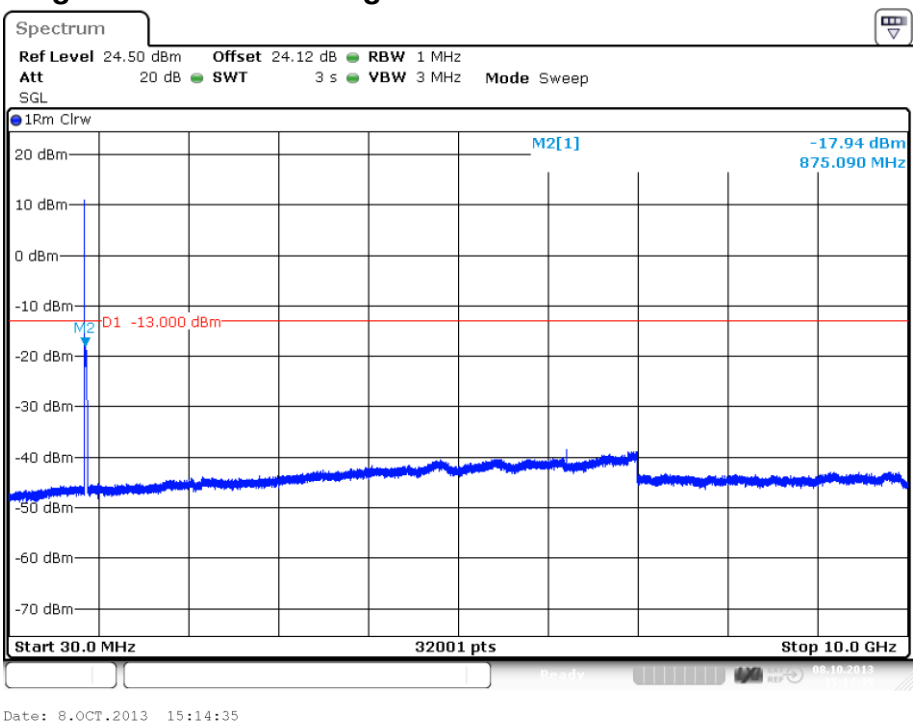


plot 7.3.1.6-#1 Spurious Emissions at Antenna Terminals: §90.210, §2.1051; Test results; Downlink; WCDMA < 1MHz to band edge Lower Band Edge



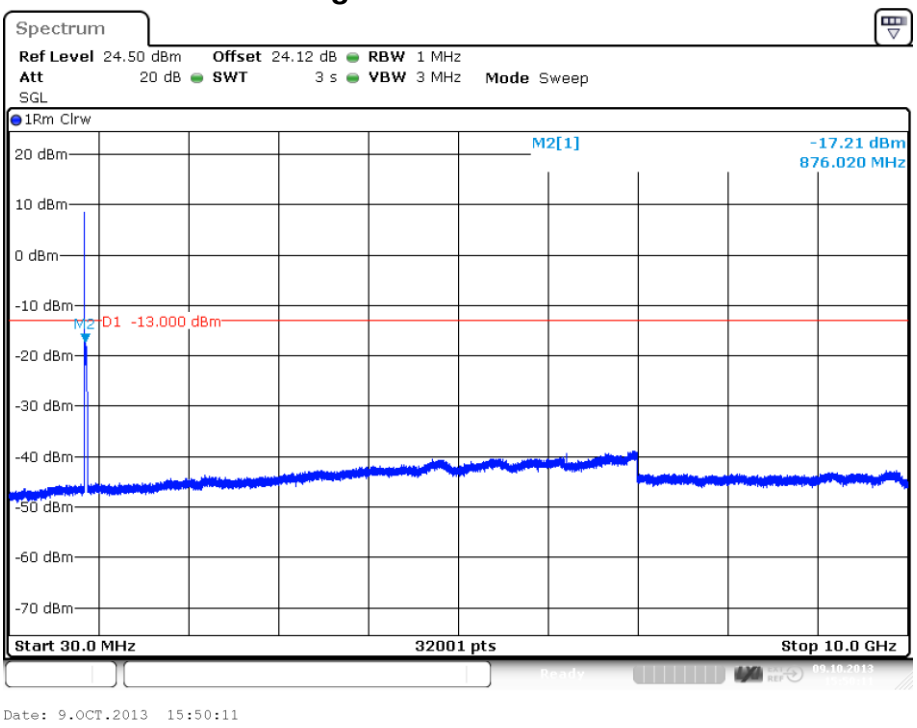
plot 7.3.1.6-#2 Spurious Emissions at Antenna Terminals: §90.210, §2.1051; Test results; Downlink; WCDMA < 1MHz to band edge Upper Band Edge

7.3.1.7 Analog > 1MHz to band edge



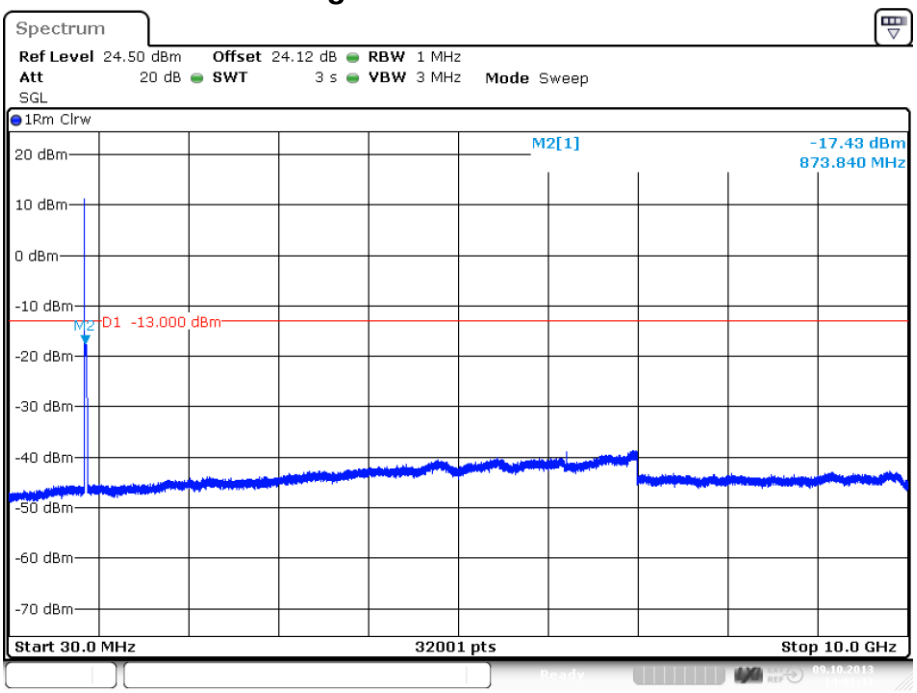
plot 7.3.1.7-#1 Spurious Emissions at Antenna Terminals: §90.210, §2.1051; Test results; Downlink; Analog > 1MHz to band edge; carrier (864MHz) notched

7.3.1.8 iDEN > 1MHz to band edge



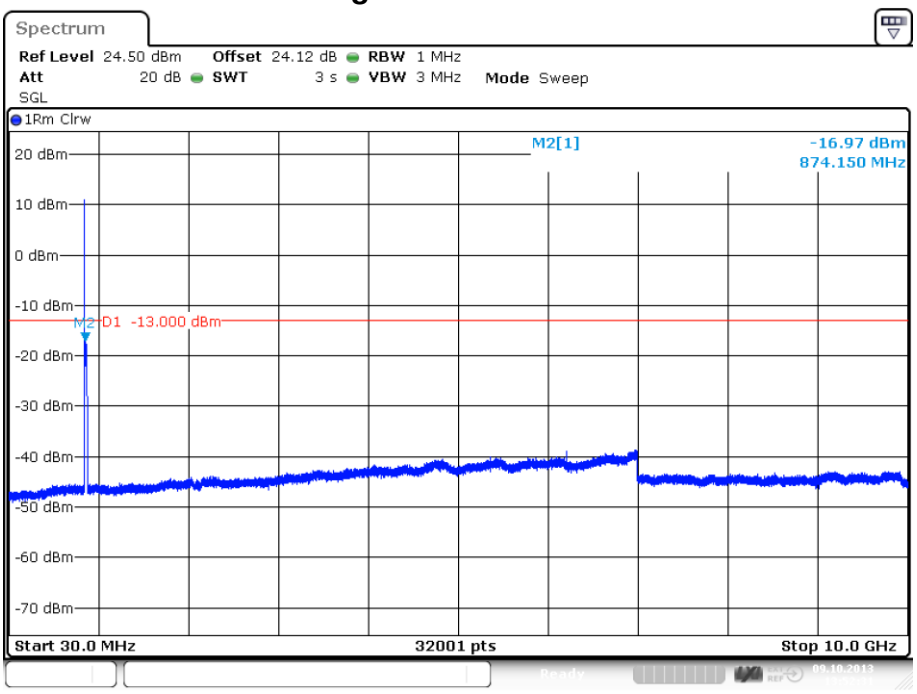
plot 7.3.1.8-#1 Spurious Emissions at Antenna Terminals: §90.210, §2.1051; Test results; Downlink; iDEN > 1MHz to band edge; carrier (864MHz) notched

7.3.1.9 GSM > 1MHz to band edge



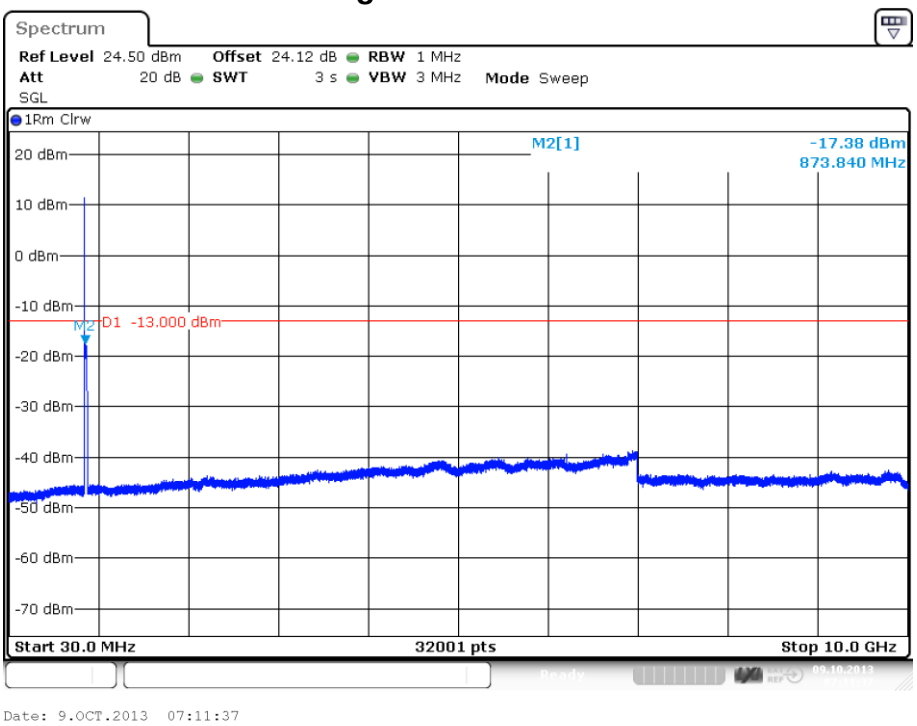
plot 7.3.1.9-#1 Spurious Emissions at Antenna Terminals: §90.210, §2.1051; Test results; Downlink; GSM > 1MHz to band edge; carrier (864MHz) notched

7.3.1.10 EDGE > 1MHz to band edge



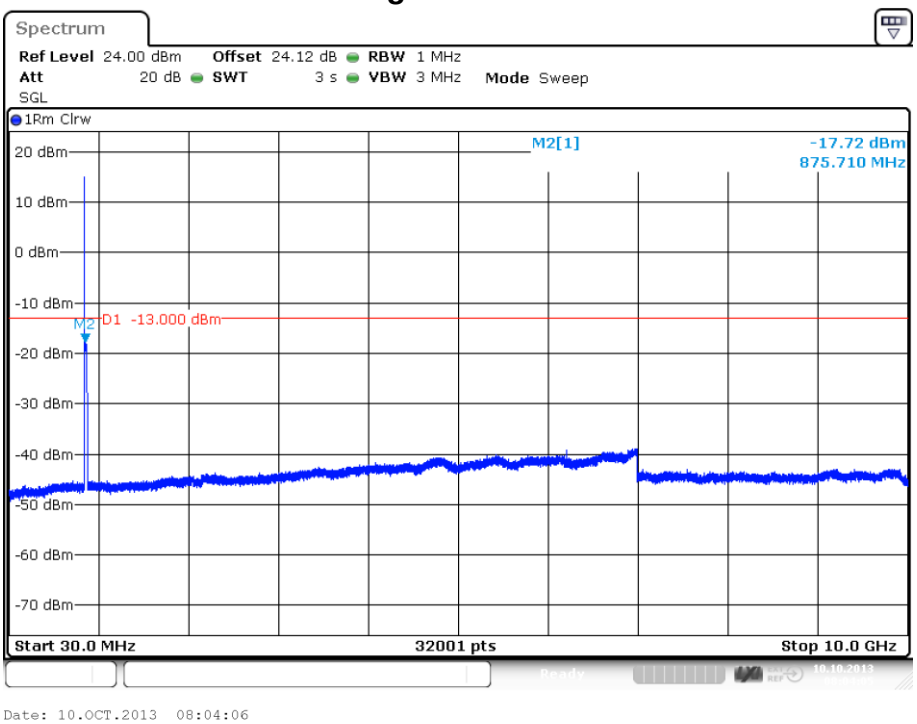
plot 7.3.1.10-#1 Spurious Emissions at Antenna Terminals: §90.210, §2.1051; Test results; Downlink; EDGE > 1MHz to band edge; carrier (864MHz) notched

7.3.1.11 CDMA > 1MHz to band edge



plot 7.3.1.11-#1 Spurious Emissions at Antenna Terminals: §90.210, §2.1051; Test results; Downlink; CDMA > 1MHz to band edge; carrier (864MHz) notched

7.3.1.12 WCDMA > 1MHz to band edge



plot 7.3.1.12-#1 Spurious Emissions at Antenna Terminals: §90.210, §2.1051; Test results; Downlink; WCDMA > 1MHz to band edge; carrier (864MHz) notched

7.3.2 Uplink

n.a.

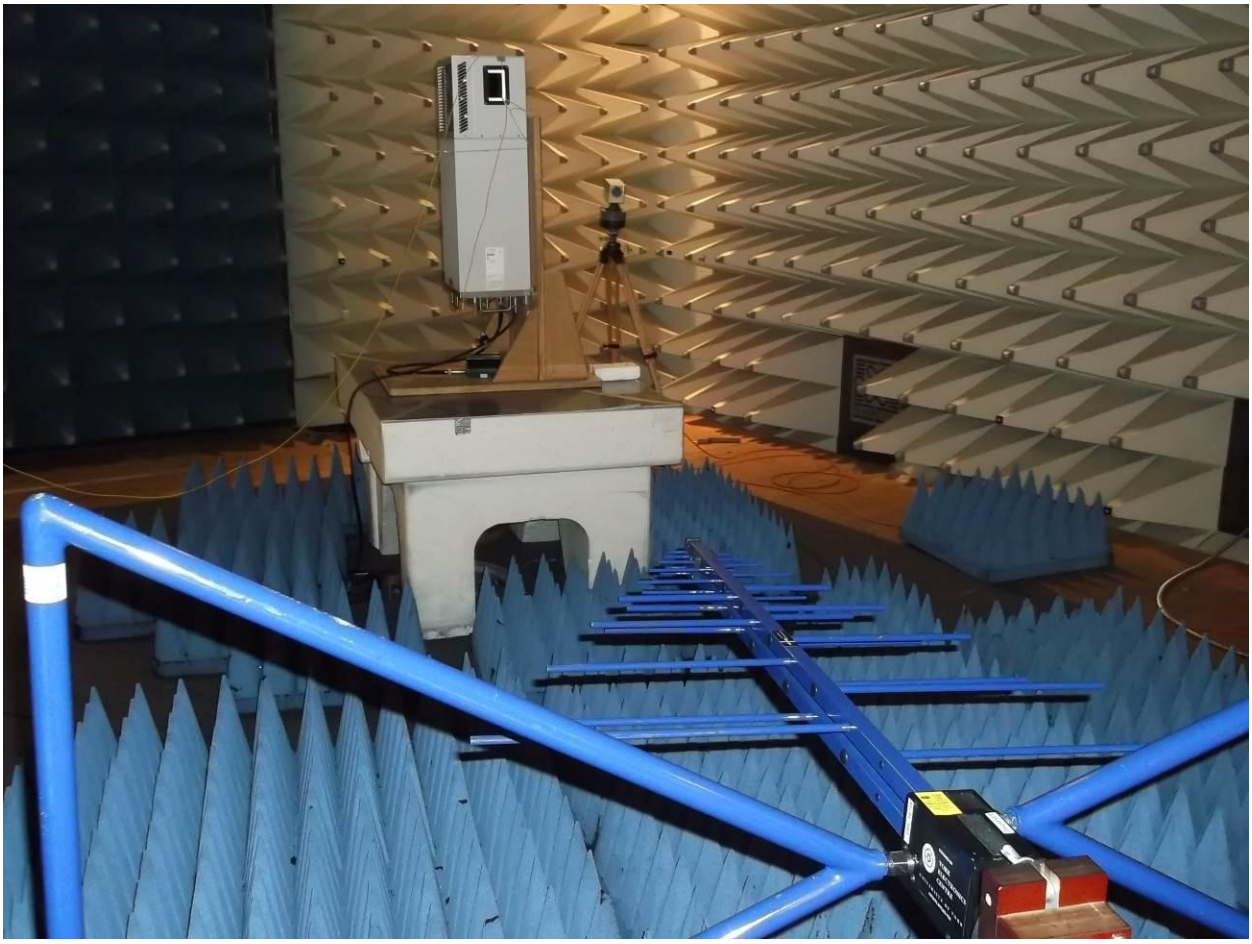
Note: The EUT does not transmit over the air in the uplink direction.

7.4 Summary test result

Test result	complies, according the plots above
Tested by:	M. Leinfelder
Date:	10.10.2013

8 Radiated Spurious Emissions at the ECL (BUREAU VERITAS CPS): §90.210, §2.1053, RSS-Gen, RSS-131

picture 8.1: label



picture 8.2: Test setup: Field Strength Emission <1 GHz @3m in the FAC

picture 8.3: Test setup: Field Strength Emission >1 GHz @3m in the FAC

This clause specifies requirements for the measurement of radiated emission.

Frequency range	Distance: EUT <-> antenna / location	Limit	Test method
30 MHz - 1 GHz	3 metres / FAC	FCC 47 CFR Part 90.543	TIA/EIA-603-C:2004
		IC RSS-131 sec. 6.4	
1 GHz – 10 GHz	3 metres / FAC	FCC 47 CFR Part 90.543	
		IC RSS-131 sec. 6.4	

Test equipment used:

Designation	Type	Manufacturer	Invent.-no.	Cal.-date	due Cal.-date	used
EMI test receiver	ESI40	Rohde & Schwarz	E1687	19.12.2012	19.12.2013	X
Antenna	CBL 6111	Chase	K1149	12.06.2013	12.06.2014	X
RF Cable		Frankonia	K1121 SET	20.02.2013	20.02.2014	X
Antenna	HL 025	R&S	K809	31.07.2013	31.07.2014	X
Preamplifier	AFS4-00102000	Miteq	K817	27.03.2013	27.03.2014	X
RF Cable	Sucoflex 100	Suhner	K1742	27.03.2013	27.03.2014	X

The REMI version 2.135 has been used for max search.

Test set-up:

Test location: FAC
Both, the Fully Anechoic Chamber (FAC) and the Semi Anechoic Chamber (SAC) fulfil the requirements of ANSI C63.4 and CISPR 16-1-4 with regards to NSA and SVSWR.
Test Voltage: 115V / 60 Hz
Type of EUT: Wall mounted

Measurement uncertainty:

Measurement uncertainty expanded (95% or K=2)	± 4,7 dB for ANSI C63.4 measurement ± 0,5 dB for TIA-603 measurement

8.1 Method of Measurement

Measurement procedure. **TIA-603-C**

The antenna substitution method is used to determine the equivalent radiated power at spurious frequencies. The spurious emissions are measured at a distance of 3 meters. The EUT is then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna is fed with a signal at the spurious frequency. The level of the signal is adjusted to repeat the previously measured level. The resulting eirp is the signal level fed to the reference antenna corrected for gain referenced to an isotropic dipole (see Figure 7.2).

From KDB (AMPLIFIER, BOOSTER, AND REPEATER REMINDER SHEET):
Radiated spurs (enclosure) – Use of CW signal (low, mid. and high freq.) is acceptable rather than all modulations.

The maximum RFI field strength was determined during the measurement by rotating the turntable (±180 degrees) and varying the height of the receive antenna (h = 1 ... 4 m) as like defined in ANSI C63.4. A measurement receiver has been used with a RBW 120 kHz up to 1 GHz and 1 MHz above 1 GHz. Steps with during pre measurement was half the RBW.

Both, the Fully Anechoic Chamber (FAC) and the Semi Anechoic Chamber (SAC) fulfil the requirements of ANSI C63.4 and CISPR 16-1-4 with regards to NSA and SVSWR.

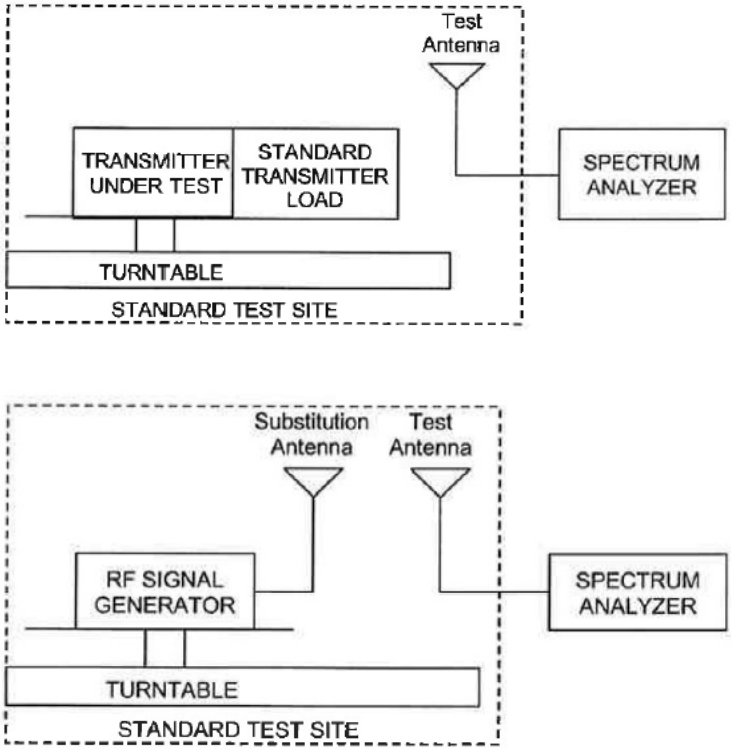


Figure #7.2 Substitution methods TIA/EIA-603-C

8.2 Limit

§90.210 Emission masks / RSS-GEN sec. 4.9; RSS-131 sec. 6.4

Frequency band (MHz)	Mask for equipment with Audio low pass filter	Mask for equipment without audio low pass filter
806–809/851–854	B	H
809–824/854–869	B	G

(g) *Emission Mask G.* For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(2) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

(h) *Emission Mask H.* For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(5) On any frequency removed from the center of the authorized bandwidth by more than 25 kHz: At least 43 + log (P) dB.

The Emission limit is -13dBm

8.3 Climatic values in the lab

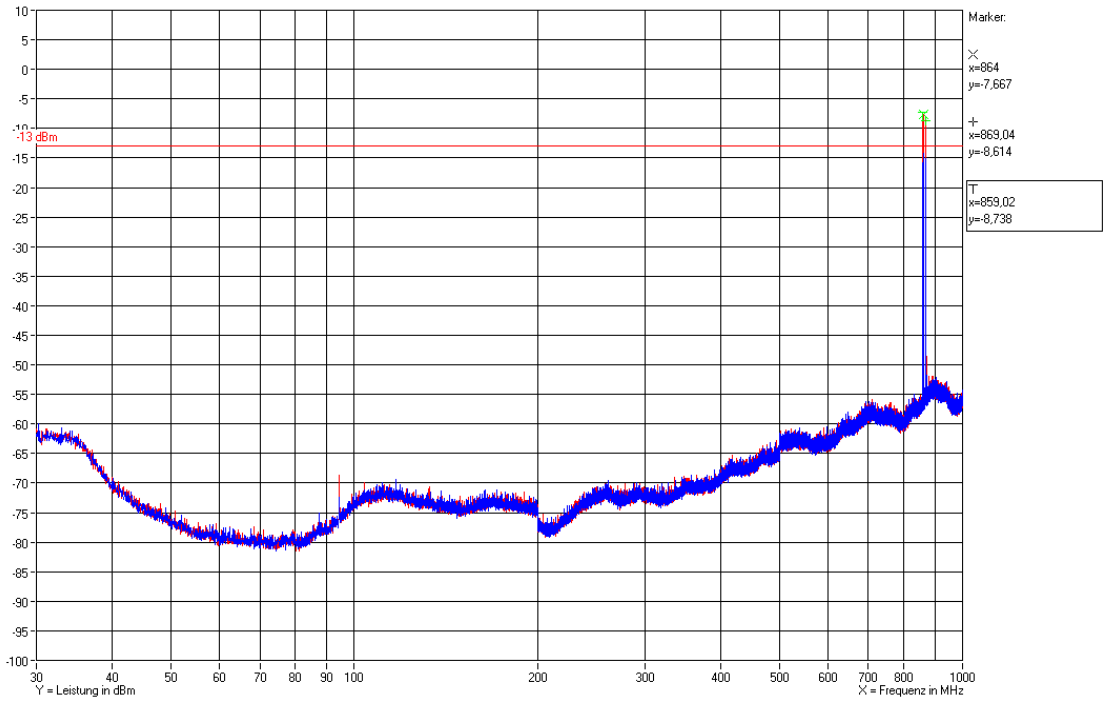
Temperature: 21°
Relative Humidity: 47%
Air-pressure: 998 hPa

8.4 Test results

8.4.1 30 MHz to 1 GHz Downlink (Bottom – Middle – Top)

F1: 859 MHz; F2: 864 MHz; F3 869 MHz

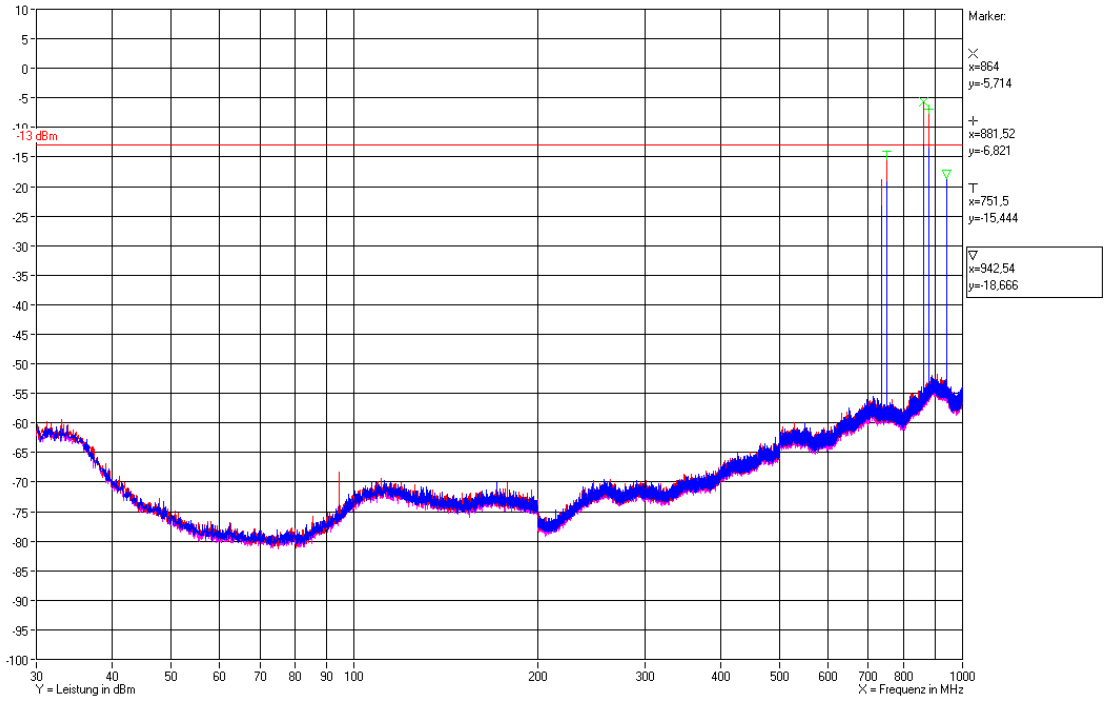
Vertikal / Horizontal



8.4.2 30 MHz to 1 GHz Downlink (middle of all bands)

F1: 737 MHz; F2: 751,5 MHz; F3 864 MHz; F4 881,5 MHz; F3 938 MHz*

Vertikal / Horizontal

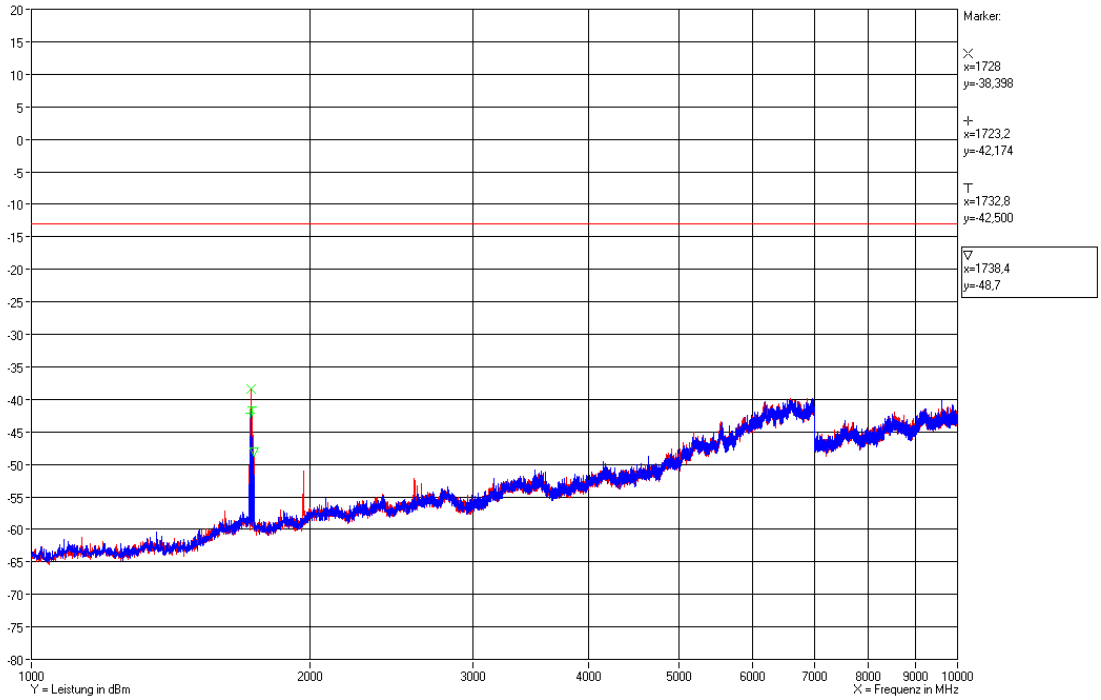


***Remark:** The 900 MHz (935 – 941 MHz) path is deactivated in the final setup by software.

8.4.3 1 GHz to 10 GHz Downlink (Bottom – Middle – Top)

F1: 859 MHz; F2: 864 MHz; F3 869 MHz

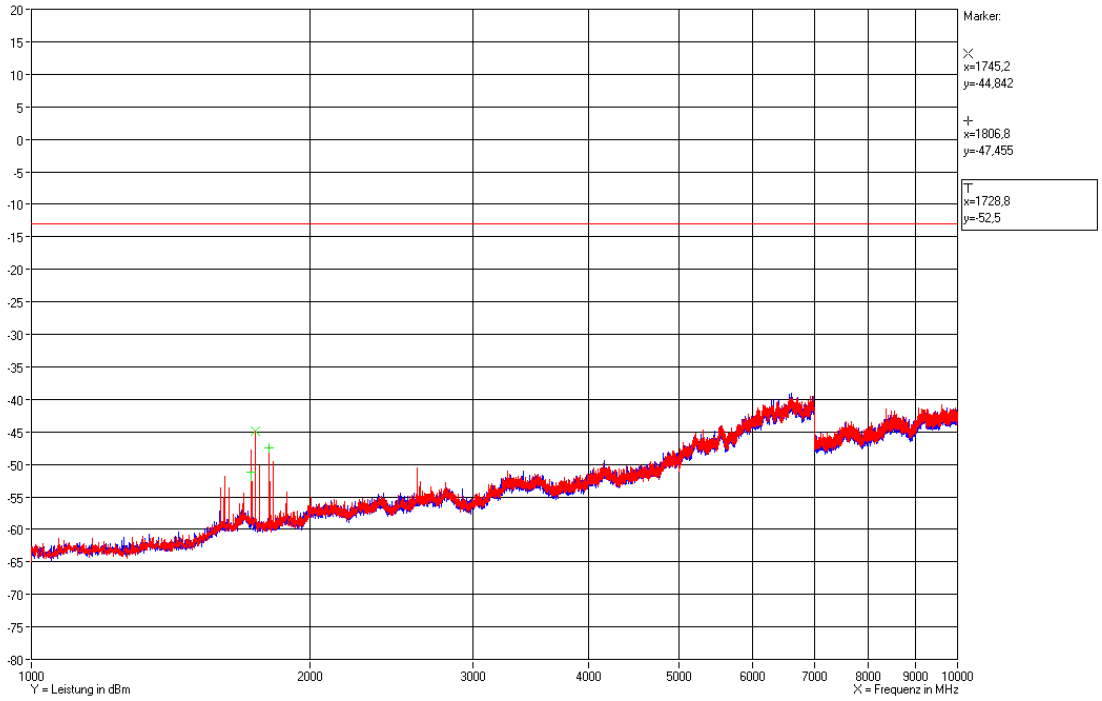
Vertikal / Horizontal



8.4.4 1 GHz to 10 GHz Downlink (middle of all bands)

F1: 737 MHz; F2: 751,5 MHz; F3 864 MHz; F4 881,5 MHz; F3 938 MHz*

Vertikal / Horizontal



***Remark:** The 900 MHz (935 – 941 MHz) path is deactivated in the final setup by software.

The radiated spurious emission measurements have been passed!

9 History

Revision	Modification	Date	Name
V01.00	Initial	13.11.2013	Tom Zahlmann
V02.00	Remark: The 900 MHz (935 – 941 MHz) path is deactivated in the final setup by software.	05.12.2013	Tom Zahlmann

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