RADIO TEST REPORT

No. 1707651STO-001 Ed. 2

RF performance

EQUIPMENT UNDER TEST

Equipment :	DAS Remote
Type / model :	DDH-AWS3
Manufacturer :	Deltanode AB
Tested by request of :	Deltanode AB

SUMMARY

Referring to the emission limits and the operating mode during the tests specified in this report the equipment complies with the requirements according to

47 CFR Part 2, subpart J, 47 CFR Part 27 Subpart C

RSS-131 Issue 3, RSS-139 Issue 3

Date of issue: 2017-07-03

Tested by: Matti Virkki Approved by: Stefan Andersson

Revision History

Edition	Date	Description
1	2017-04-20	First release
2	2017-07-03	Change of model name

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address

CONTENTS

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address

1 CLIENT INFORMATION

The EUT has been tested by request of

Company:	Deltanode AB Hammarby fabriksväg 61 6tr 120 33 Stockholm Sweden
Name of contact:	Daniel Kerek

2 EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT according to the manufacturer/client declaration

Equipment:	DAS remote	
Tested Model:	DDH-AWS3	
Brand name:	Deltanode	
Serial number:	99992	
Manufacturer:	Deltanode AB	
Transmitter frequency range:	2110 – 2180MHz	
Receiver frequency range:	1710 – 1780 MHz	
Frequency agile or hopping:	☐ Yes	☒ No
Antenna:	☐ Internal antenna	☒ External antenna
Antenna connector:	☐ None, internal antenna	☒ Yes, type N
Rating RF output power:	+43 dBm rms	
Rated gain	+60 dB	
Type of modulation:	Tested with GMSK, QPSK	
Temperature range:	☐ Category I (General): -20°C to +55°C ☐ Category II (Portable equipment): -10°C to +55°C ☐ Category III (Equipment for normal indoor use): +5°C to +35°C ☒ Other: -30°C to +55°C	
Power rating:	120 V 60 Hz	
Transmitter standby mode supported:	☒ Yes	☐ No

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address

2.2 Additional hardware information about the EUT

The EUT consists of the following units:

Remote unit type
DDH 193/1-C:w ver 0.0.1 Ser:99992 Week:2017W08
FOR type
FOR 101 Rev:1.2.1 Week:2016w20 Ser:3945
RF Lineup 1

Item	Information
HPA HW-version	HPT2100 Rev:0.0.1 2016W44
MPI Type	12:36 CDMA 2000/IS-95 Downlink MPI AWS 2100/1700 band ver. 0.0 prod. 2016W13 SN:0002-00368
MPI HW-version	KS45.8 R1A 2016W13 DH00368
LPA HW-version	ADL1-2100-030-070 SN:SMD086-001
VGA Type	82:36 CDMA 2000/IS-95 VGA2 AWS 2100/1700 band ver. 0.0 prod. 2016W36 SN:0004-00111
VGA HW-version	KS55.11 P1A 2016W36 BH00111

2.3 Peripheral equipment

Peripheral equipment is defined as equipment needed for correct operation of the EUT during the tests, but not included as a part of the testing and evaluation of the EUT.

Equipment	Manufacturer / Type
Fiber optical interface	Deltanode AB / DOI 302 Rev:1.3.1 Week:2017w09 Ser:10471
Laptop PC	Dell
Ethernet hub	Deltanode AB

2.4 Test signals

Continuous transmission on full power
As requested in KDB 935210 D05 V01r01

Narrow band signal: GSM with GMSK modulation
Wide band signals : AWGN 4.11 MHz 99% OBW

2.5 Modification during the tests

No modifications were made during the testing.

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address

3 TEST SPECIFICATIONS

3.1 Standards

47 CFR Part 2 subpart J , Part 27 subpart C
RSS-131 Issue 3, RSS-139 Issue3

Test methods in:

KDB 935210 D05 Industrial booster Basic measurement
ANSI C63.26-2015 American National Standard for Compliance Testing of Transmitters Used in License Radio Services

3.2 Additions, deviations and exclusions from standards and accreditation

No additions, deviations or exclusions from standards or accreditation were made

3.3 Test site

Measurements were performed at:

Intertek Semko AB.
Torshamnsgatan 43,
P.O. Box 1103
SE-164 22 Kista

Intertek Semko AB is a FCC listed test site with site registration number 90913
Intertek Semko AB is a Industry Canada listed test facility with IC assigned code 2042G

Measurement chambers

Measurement Chamber	Type of chamber	IC Site filing #
BJÖRKHALLEN	Semi-anechoic 3 m	2042G-1

3.4 Test conditions

If not additionally specified, the tests were performed under the following environmental conditions:

Parameter	Normal	Extreme
Supplying voltage, V	120	85 -273
Air temperature, ^{o}C	20-24	-30 - +50

4 TEST SUMMARY

The results in this report apply only to the tested sample:

Requirement	Description	Result	Section in report	Note
§2.1046 §27.50 RSS-GEN 6.12 RSS-131 5.2.3 RSS-139	RF output power, AGC threshold, linearity and amplifier gain	Pass	5	
§2.1047 RSS-131 5.2.2 RSS-139 6.2	Modulation characteristics input versus output signal comparison	Pass	6	
§2.1049 RSS-GEN 6.6 RSS-131 5.2.1	Occupied bandwidth	Pass	7	
§2.1051 §27.53 RSS-GEN 6.13 RSS-139 6.6	Spurious emissions, Intermodulation and band edge measurements at antenna terminals	Pass	8 - 9	
§2.1053 §27.53 RSS-GEN 6.13 RSS-139 6.6	Field strength of spurious radiation	Pass	10	
§2.1055 §27.54 RSS-GEN 6.11 RSS-131 5.2.4 RSS-139 6.4	Frequency stability	Pass	11	

NT = Not Tested, by request of the Client
NA = Not Applicable

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address

5 AGC TRESHOLD, RF OUTPUT POWER AND LINEARITY

Date of test:	2017-03-13	Test location:	EMC Center
EUT Serial:	99992	Ambient temp. ˚C	21
Tested by:	MTV	Relative humidity %	36
Test result:	Pass	Margin:	4.0 dB

5.1 Requirement

Reference: CFR 47 §2.1049, §27.50(d), KDB 935210 D05 clauses 3.2 and 3.5
RSS-131 Clauses 5.2.3 and 6.2, RSS-139 clause 6.5

5.2 Test set-up

Signal generator was connected to the FOI unit which converted rf signal to optical signal. The optical signal was then fed via fibre to the EUT.
The EUT's output port was connected to signal analyser via rf cables and 30 dB attenuator.
A PC was connected to FOI via Ethernet hub. The PC was then used to control the EUT.

The output power was measured with EUT amplification set to 60 dB and input signal was increased until Automatic Gain Control threshold was reached but did not affect the gain. The EUT output response was monitored when input signal level was increased and the response is linear until AGC threshold is reached.

The test was then repeated with 3 dB higher input signal level so that AGC limited the gain.

The peak power was measured using signal analyser's CCDF measurement function. The value that is exceeded less than 0.1% time is reported.

5.3 Test data

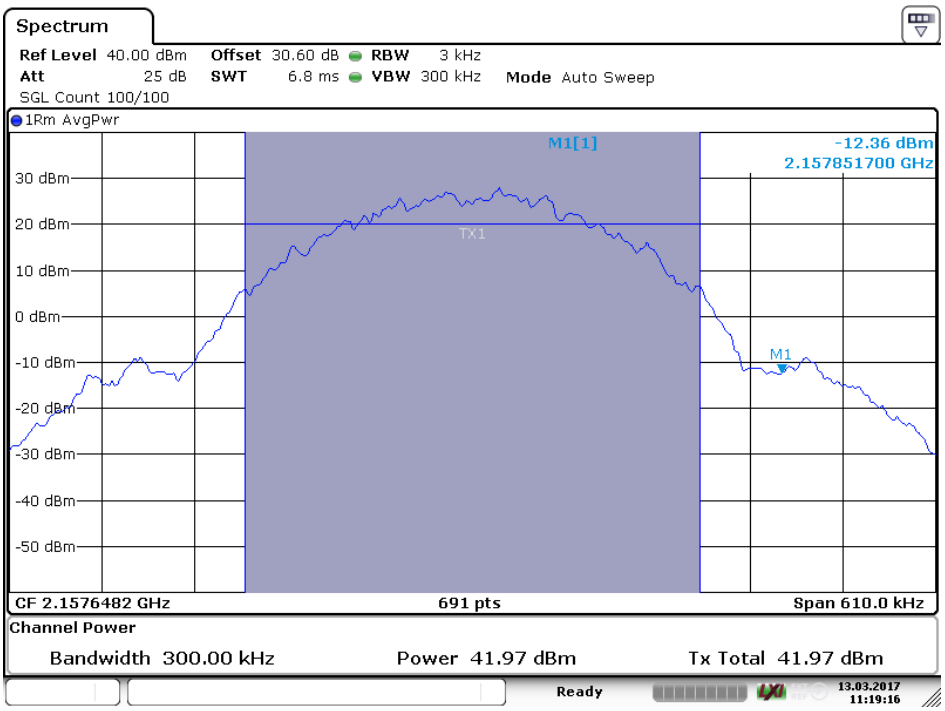
AWS GSM

Frequency MHz	Automatic level control	Average power dBm	Limit EIRP dBm	Peak to avg ratio dB	Peak to avg ratio limit dB
2157.65	Off	41.97	62.15	0.12	13
2157.65	On	41.95	62.15	0.12	13

AWS WCDMA

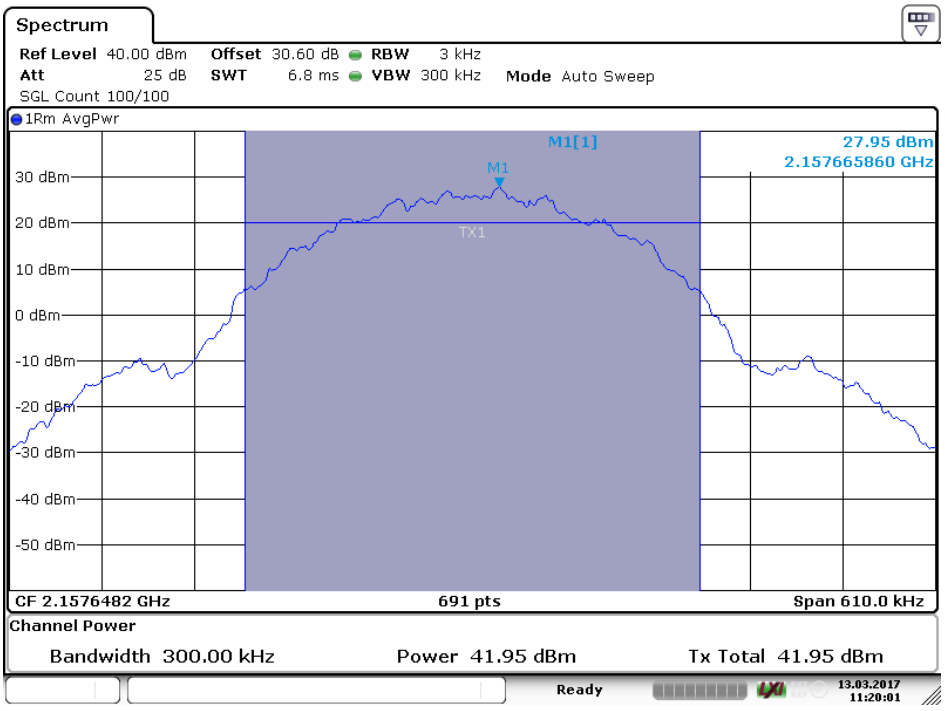
Frequency MHz	Automatic level control	Average power dBm	Limit EIRP dBm	Peak to avg ratio	Peak to avg ratio limit
2157.65	Off	41.68	62.15	8.93	13
2157.65	On	41.73	62.15	8.93	13

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 13.MAR.2017 11:19:17

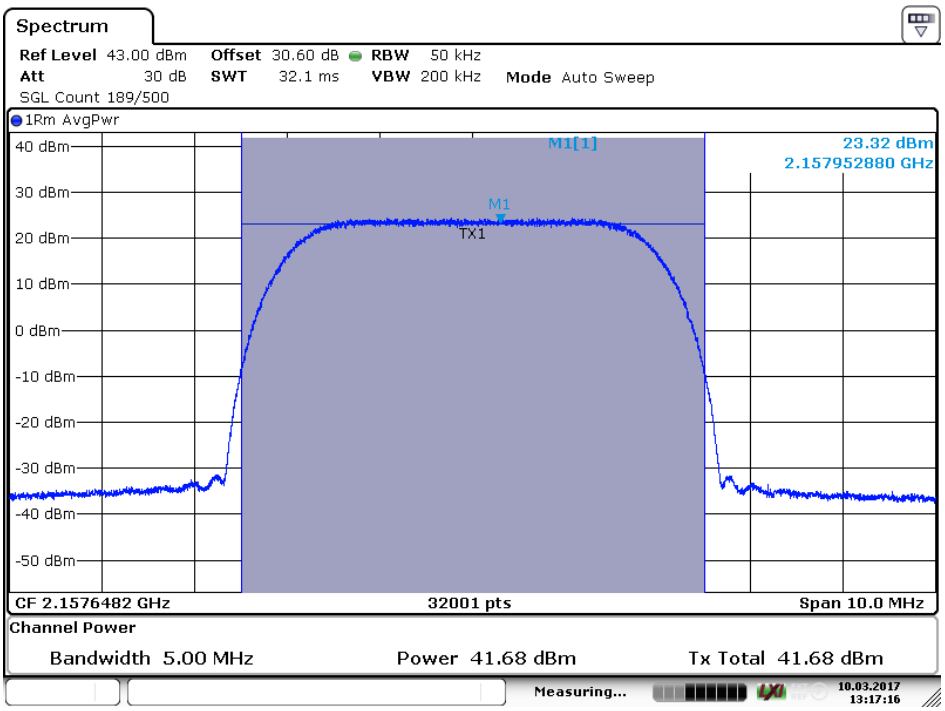
GSM AGC off



Date: 13.MAR.2017 11:20:01

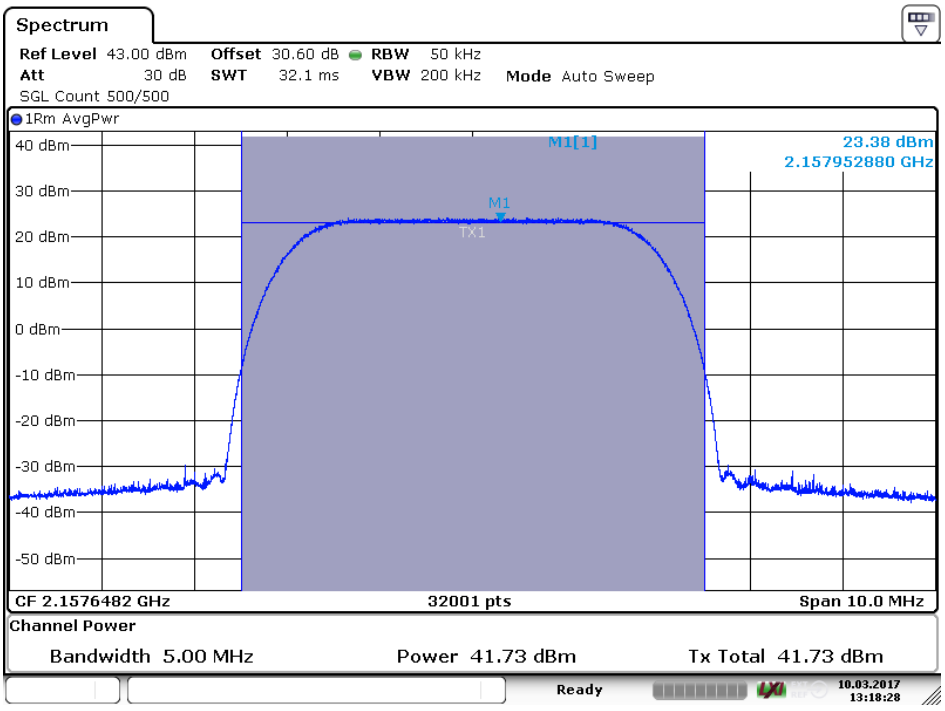
GSM AGC on

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 10.MAR.2017 13:17:16

AWGN AGC off



Date: 10.MAR.2017 13:18:29

AWGN AGC on

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address

Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Spectrum analyser	Rohde & Schwarz	FSV	32594	7/2017
Rf-attenuator	Narda	776B-10	8337	7/2017
Rf-attenuator	Huber Suhner	5920_N-50-010/199_N	32697	7/2017
Rf cable	Huber Suhner	Sucoflex 104PE	39076	7/2017
Rf cable	Huber Suhner	Sucoflex 104PE	39077	7/2017
Rf cable	Huber Suhner	Sucoflex 104PE	39079	7/2017
Signal generator	Rohde & Schwarz	SMIQ03B	12792	7/2017
Signal generator	Rohde & Schwarz	SMBV100	32593	7/2017

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address

6 OCCUPIED BANDWIDTH INPUT VS OUTPUT COMPARISON

Date of test:	2017-03-13	Test location:	EMC Center
EUT Serial:	99992	Ambient temp. ˚C	21
Tested by:	MTV	Relative humidity %	36
Test result:	Pass	Margin:	3.62 % points

6.1 Requirement

KDB 935219 D05:
The spectral shape of the rf-output shall look similar to input for all modulations.

RSS-131 5.2.2:
The spectral growth of the 26 dB bandwidth of the output signal shall be less than 5% of the input signal spectrum.

6.2 Test set-up

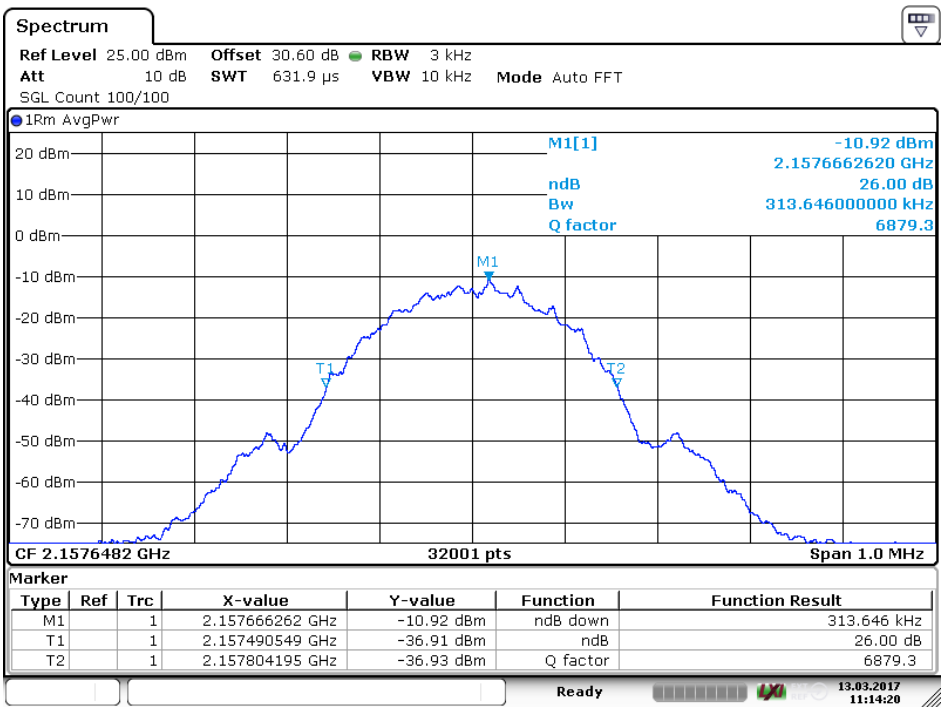
Signal generator was connected to the FOI unit which converted rf signal to optical signal. The optical signal was then fed via fibre to the EUT.
The EUT's output port was connected to spectrum analyser via rf cables and 30 dB attenuator.
A PC was connected to FOI via Ethernet hub. The PC was then used to control the EUT.

The 26 dB occupied bandwidth was measured using spectrum analyser's occupied bandwidth function.
The EUT was set to use 60 dB gain and input signal was adjusted so that Automatic Gain Control did not yet limit the output power.
The test was then repeated with higher input signal level so that AGC limited the output power.
Finally occupied bandwidth of signal generator was measured and input signal output was compared to EUT outputs.

6.3 Test data

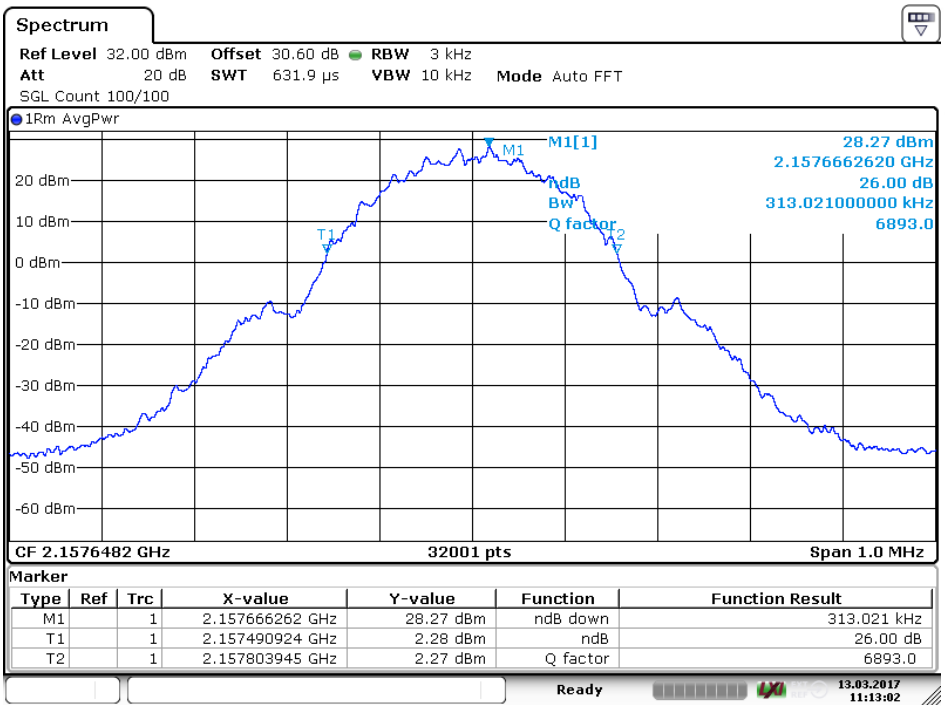
Frequency MHz	Signal type	26 dB Occupied band width Input (kHz)	26 dB Occupied band width output (kHz)	26 dB Occupied band width output with AGC (kHz)	Difference %
2157.648	GSM	313.646	313.021	316.303	0.85
2157.648	AWGN	4802.97	4868.91	4820,00	1.38

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 13.MAR.2017 11:14:20

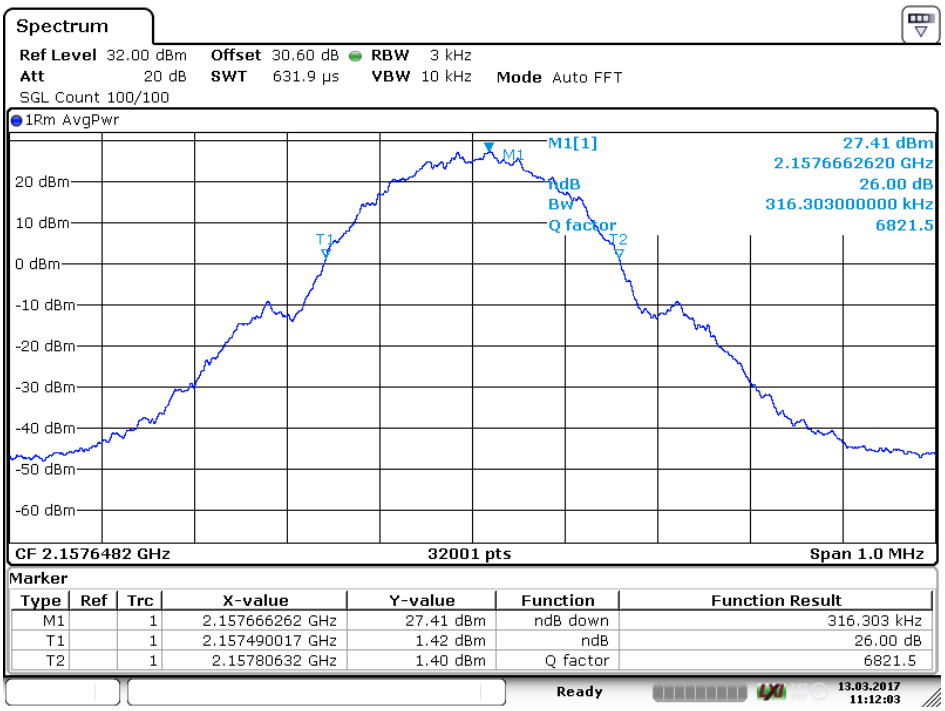
AWS Occupied bandwidth GSM input



Date: 13.MAR.2017 11:13:02

AWS Occupied bandwidth GSM agc off

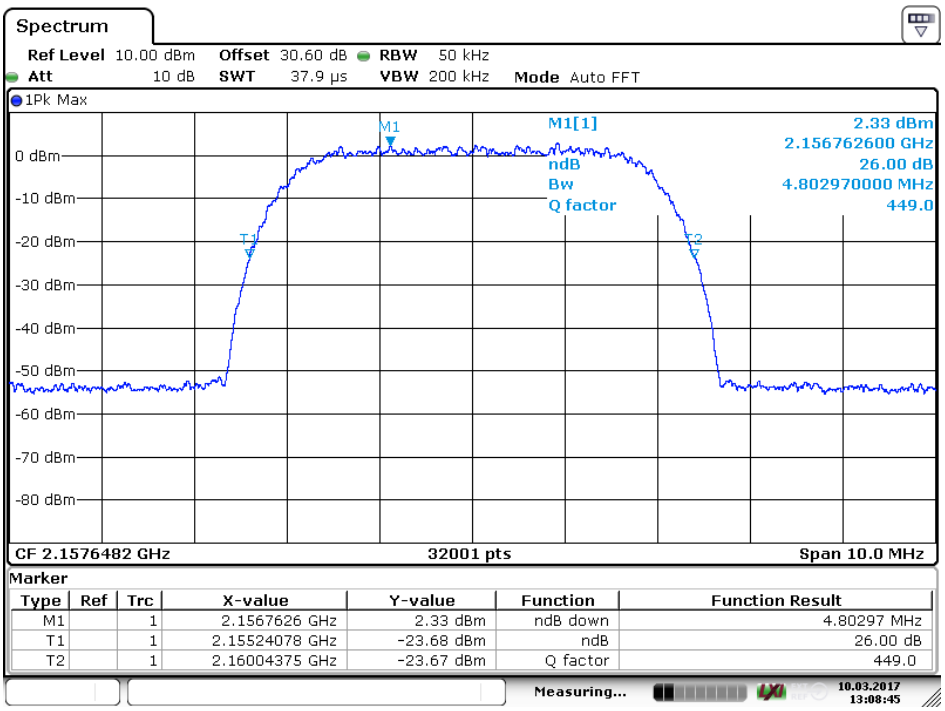
Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 13.MAR.2017 11:12:03

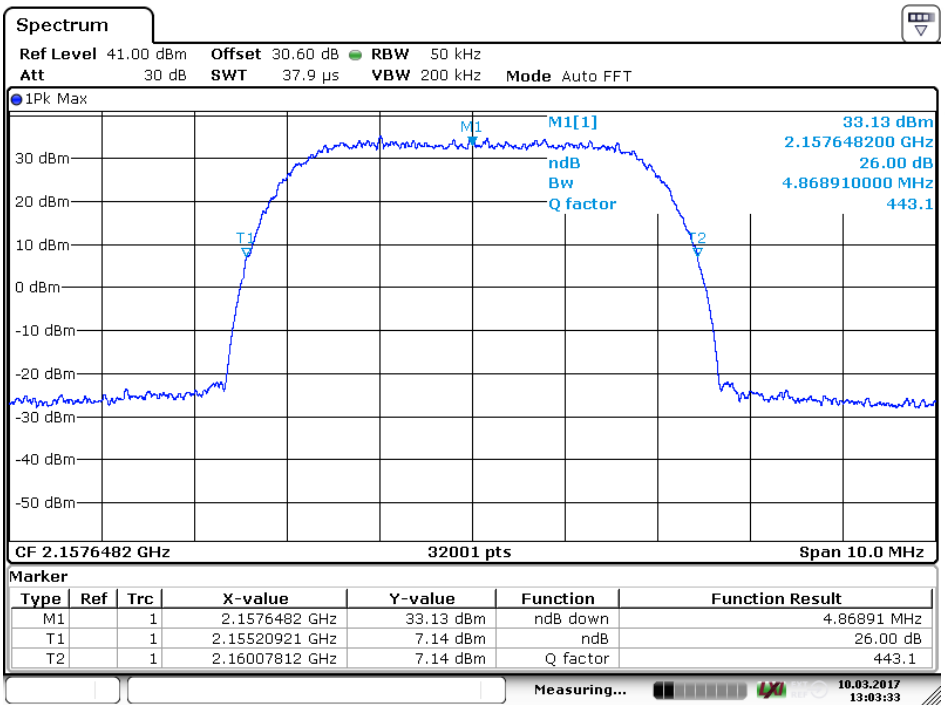
AWS Occupied bandwidth GSM agc on

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 10.MAR.2017 13:08:45

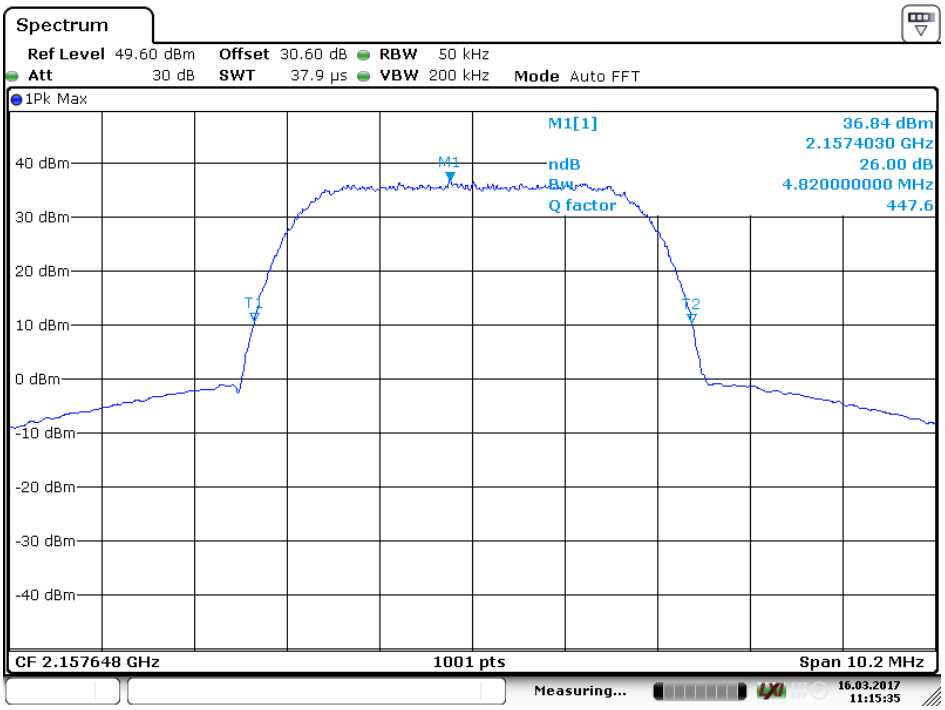
AWS Occupied bandwidth WCDMA input



Date: 10.MAR.2017 13:03:33

AWS Occupied bandwidth WCDMA agc off

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 16.MAR.2017 11:15:36

AWS Occupied bandwidth WCDMA agc on

6.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Spectrum analyser	Rohde & Schwarz	FSV	32594	7/2017
Rf-attenuator	Narda	776B-10	8337	7/2017
Rf-attenuator	Huber Suhner	5920_N-50-010/199_N	32697	7/2017
Rf cable	Huber Suhner	Sucoflex 104PE	39076	7/2017
Rf cable	Huber Suhner	Sucoflex 104PE	39077	7/2017
Rf cable	Huber Suhner	Sucoflex 104PE	39079	7/2017
Signal generator	Rohde & Schwarz	SMIQ03B	12792	7/2017
Signal generator	Rohde & Schwarz	SMBV100	32593	7/2017

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address

7 PASSBAND GAIN, BANDWIDTH AND OUT OF BAND REJECTION

Date of test:	2017-03-10	Test location:	EMC Center
EUT Serial:	99992	Ambient temp. ˚C	21
Tested by:	MTV	Relative humidity %	33
Test result:	Pass	Margin:	N/A

7.1 Requirement

RSS-131 clauses 5.2.1 and 5.2.3

The passband gain shall not exceed the nominal gain by more than 1.0 dB. The 20 dB bandwidth shall not exceed the nominal bandwidth that is stated by the manufacturer. Outside of the 20 dB bandwidth, the gain shall not exceed the gain at the 20 dB point.

7.2 Test set-up

Signal generator was connected to the FOI unit which converted rf signal to optical signal. The optical signal was then fed via fibre to the EUT.
The EUT's output port was connected to spectrum analyser via rf cables and 30 dB attenuator.
A PC was connected to FOI via Ethernet hub. The PC was then used to control the EUT.

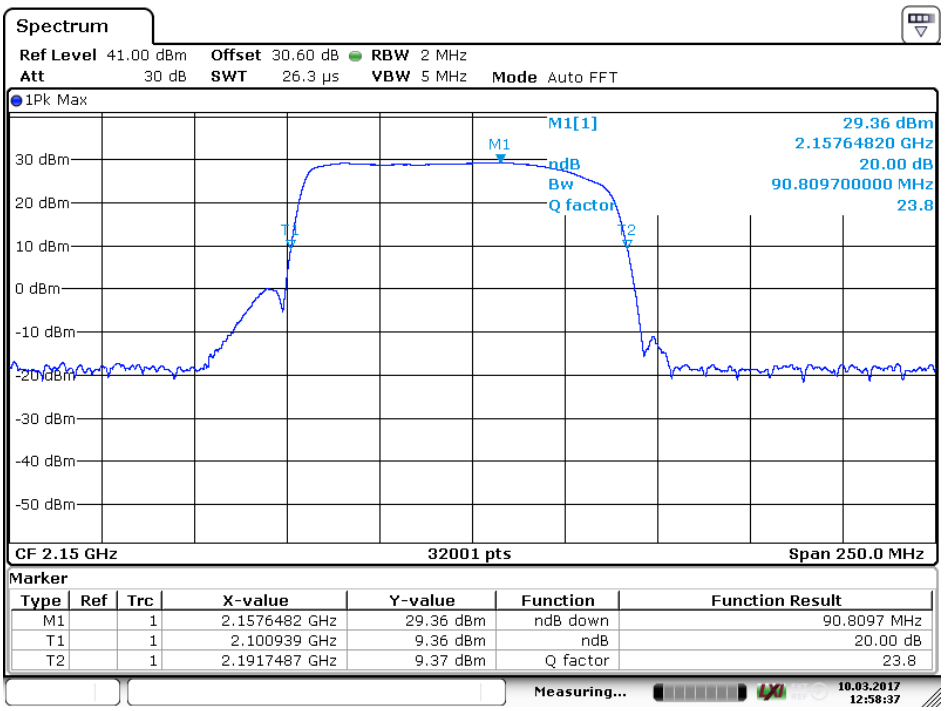
7.3 Test data

Frequency MHz	Signal type	Occupied 20 dB band width (MHz
2100	CW	90.8097

The pass band maximum gain is measured from FOI unit's rf input to EUT output.
This is not same as EUT's amplifier gain. EUT gain was set to 60 dB

Frequency MHz	Gen. out (dBm)	Pathloss (dB)	Measured output (dBm)	Gain dB
2157.65	-26.8	0.6	+41.97	+69,4

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 10.MAR.2017 12:58:37

AWS band passband bandwidth

7.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Spectrum analyser	Rohde & Schwarz	FSV	32594	7/2017
Rf-attenuator	Narda	776B-10	8337	7/2017
Rf-attenuator	Huber Suhner	5920_N-50-010/199_N	32697	7/2017
Rf cable	Huber Suhner	Sucoflex 104PE	39077	7/2017
Rf cable	Huber Suhner	Sucoflex 104PE	39079	7/2017
Signal generator	Rohde & Schwarz	SMBV100	32593	7/2017

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address

8 BAND EDGE EMISSION AND INTERMODULATION

Date of test:	2017-03-13/ 2017-04-05	Test location:	EMC Center
EUT Serial:	99992	Ambient temp. ˚C	21
Tested by:	MTV	Relative humidity %	36
Test result:	Pass	Margin:	0.02 dB

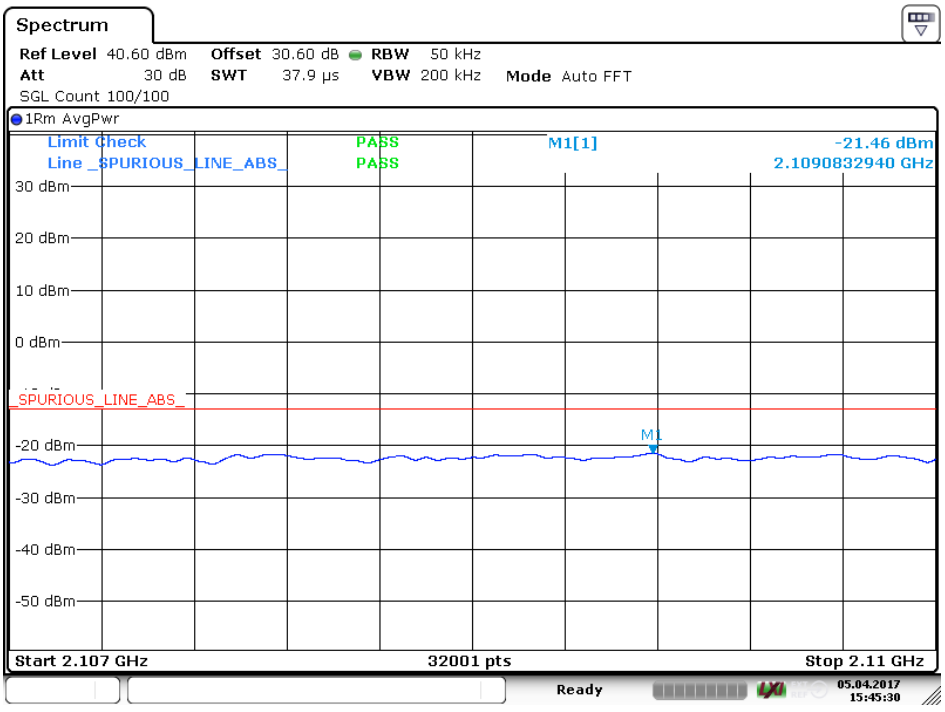
8.1 Requirement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

8.2 Test set-up

2 Signal generators were connected to power combiner who was then connected to the FOI unit.
Signals were placed on two lowest adjacent channels of the band.
The test was repeated on 2 highest channels.

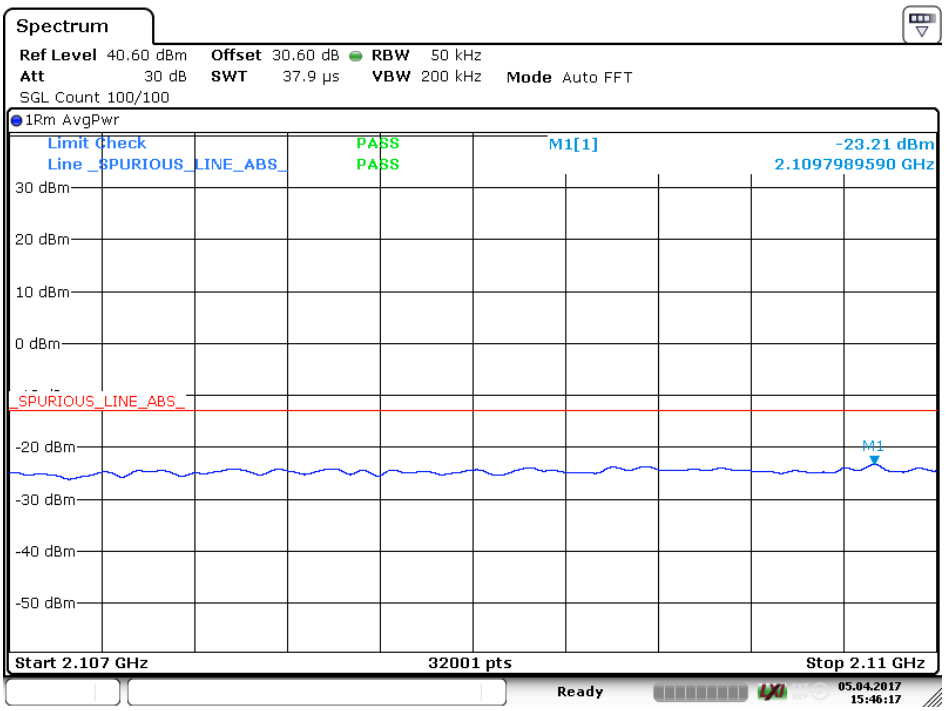
8.3 Test data



Date: 5.APR.2017 15:45:29

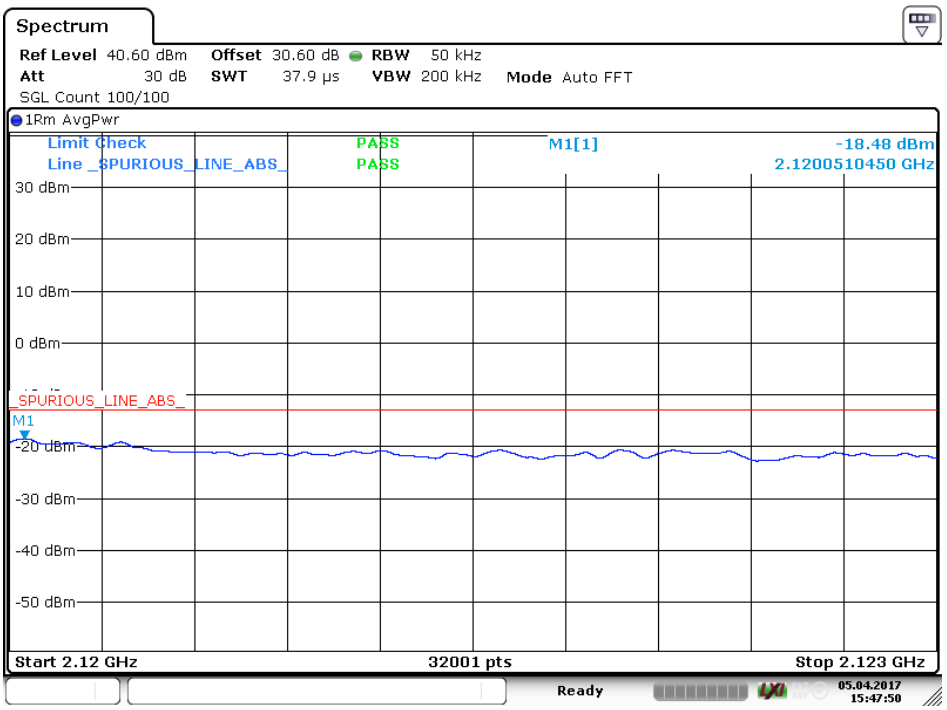
2 AWGN signals lower band edge AGC off

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 5.APR.2017 15:46:18

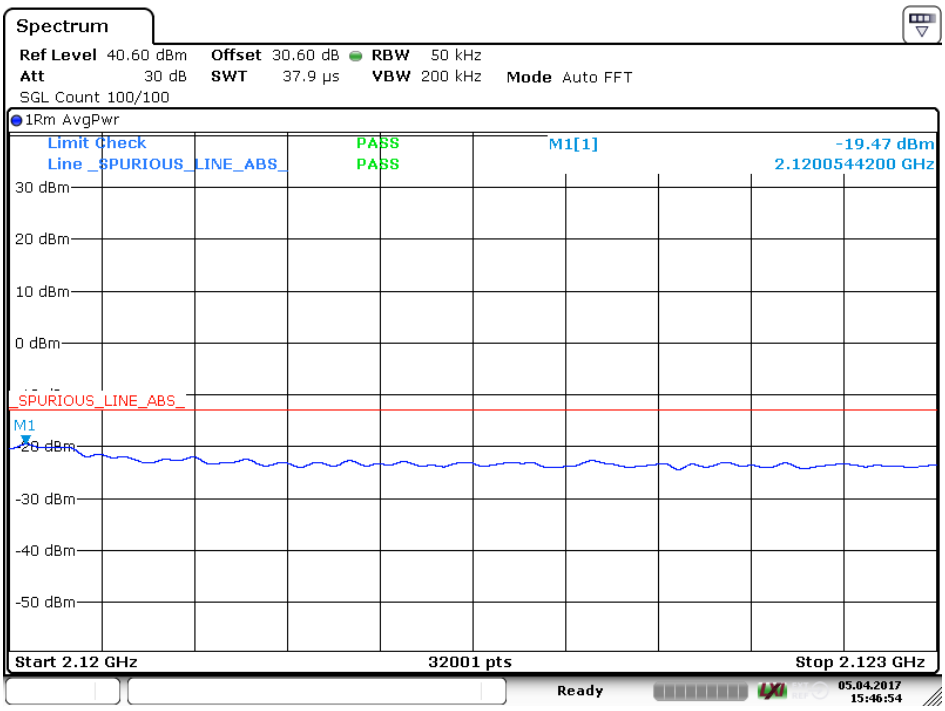
2 AWGN signals lower band edge AGC on



Date: 5.APR.2017 15:47:50

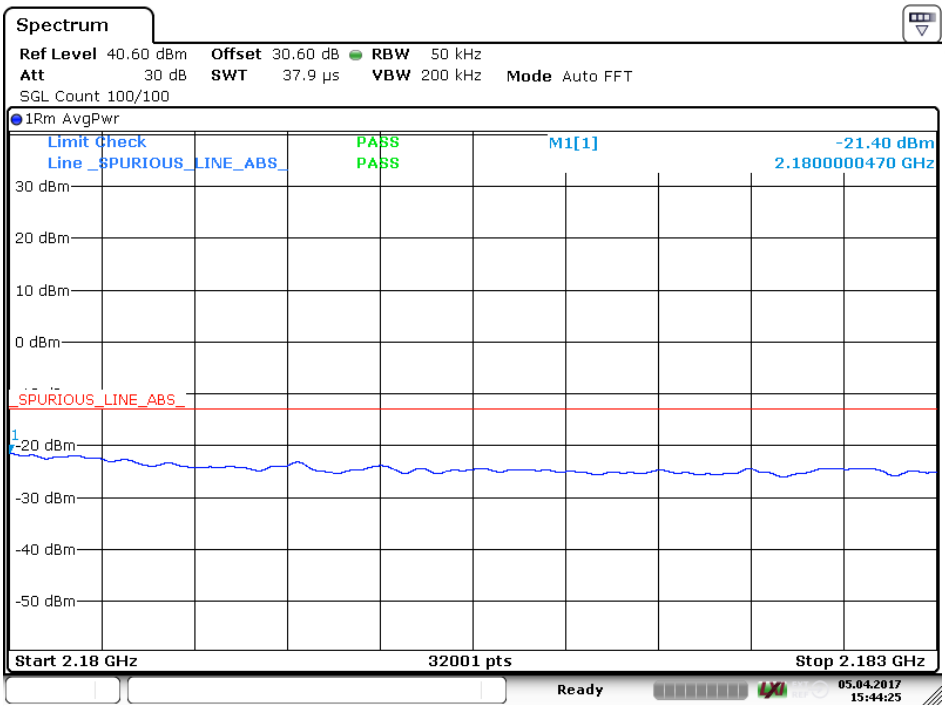
2 AWGN signals lower band edge AGC off in band

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 5.APR.2017 15:46:54

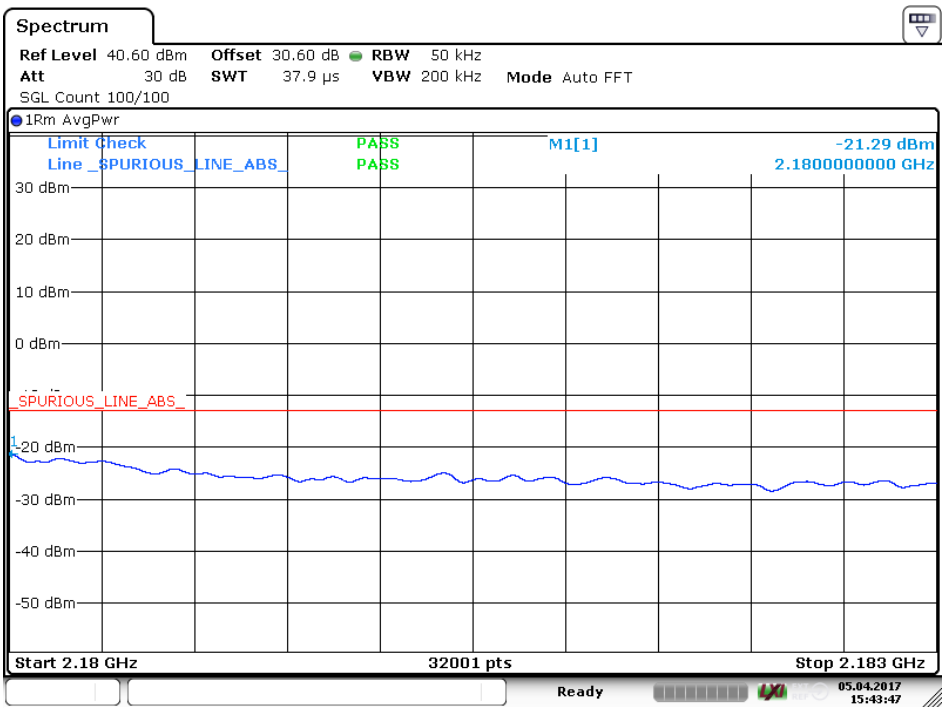
2 AWGN signals lower band edge AGC on in band



Date: 5.APR.2017 15:44:25

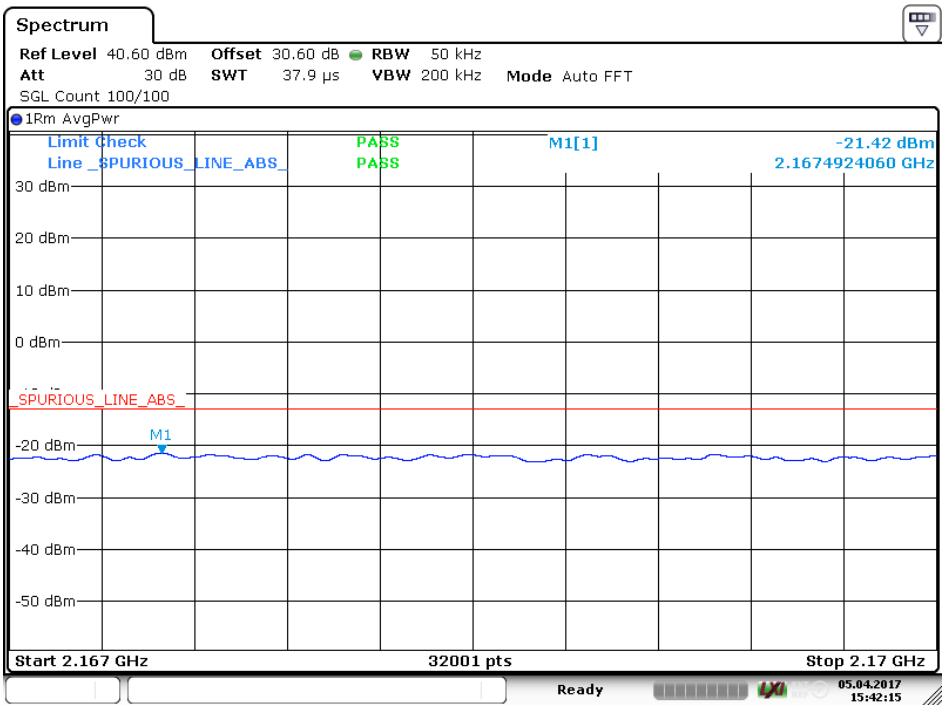
2 AWGN signals upper band edge AGC off

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 5.APR.2017 15:43:47

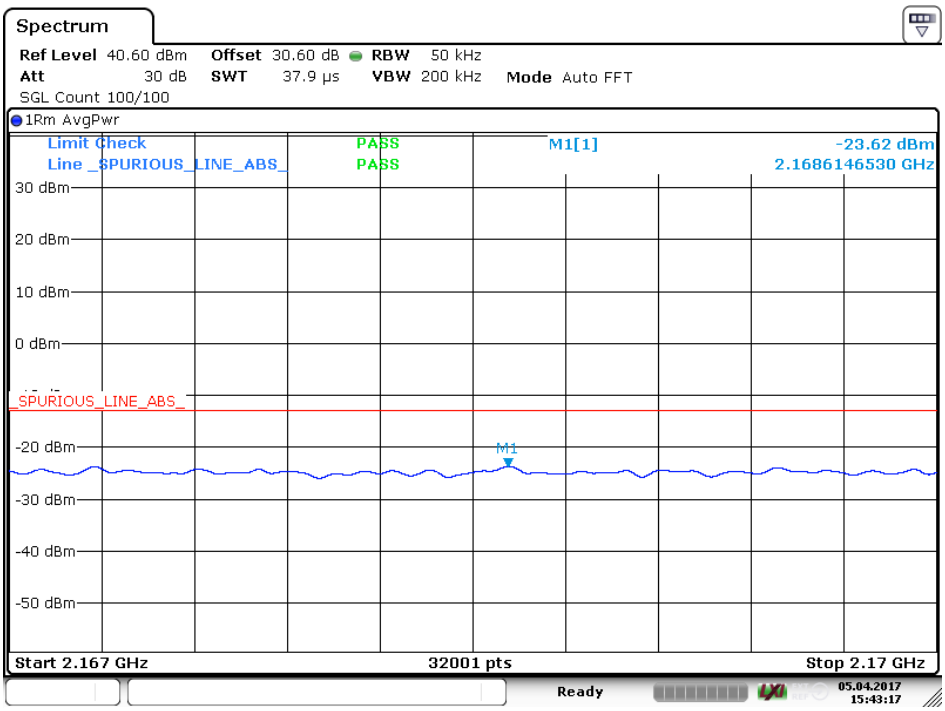
2 AWGN signals upper band edge AGC on



Date: 5.APR.2017 15:42:16

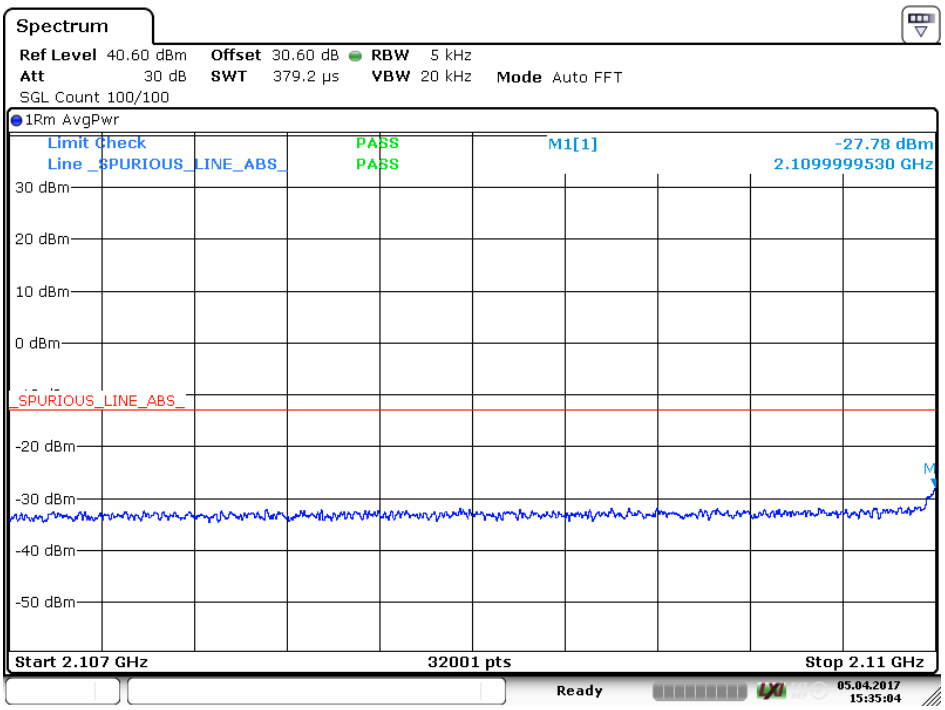
2 AWGN signals upper band edge AGC off in band

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 5.APR.2017 15:43:17

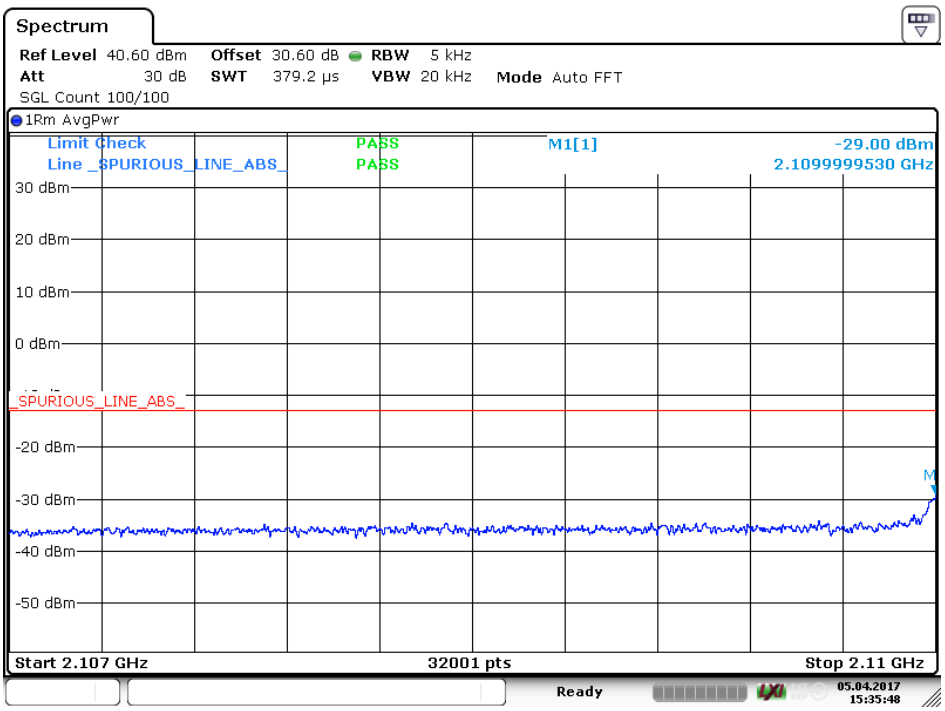
2 AWGN signals upper band edge AGC off in band



Date: 5.APR.2017 15:35:04

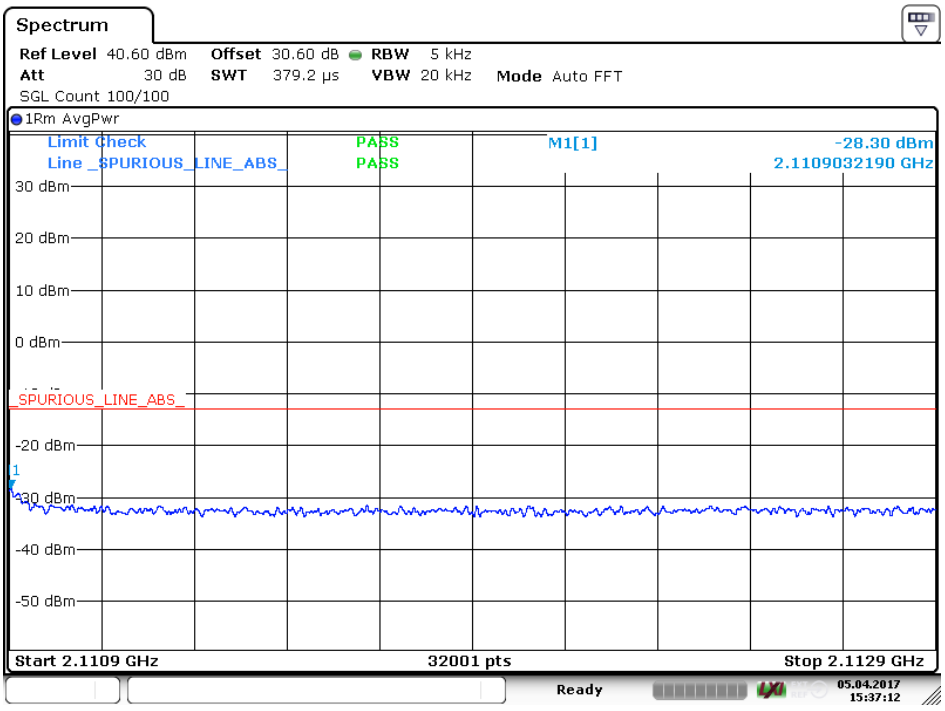
2 GSM signal on lower band edge AGC off

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 5.APR.2017 15:35:48

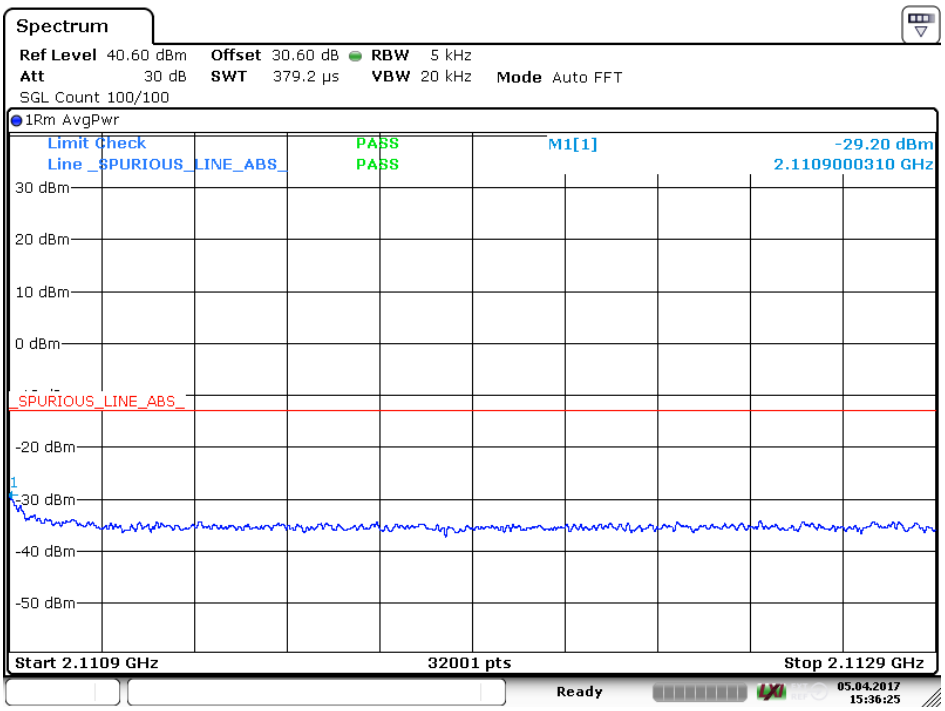
2 GSM signal on lower band edge AGC on



Date: 5.APR.2017 15:37:12

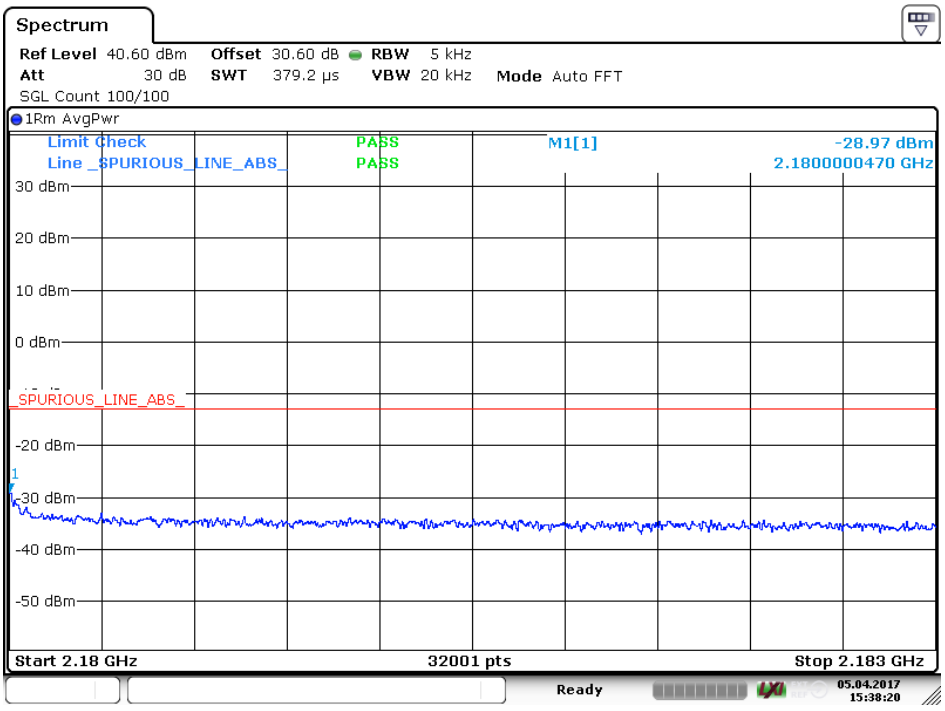
2 GSM signal on lower band edge AGC off in band

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 5.APR.2017 15:36:25

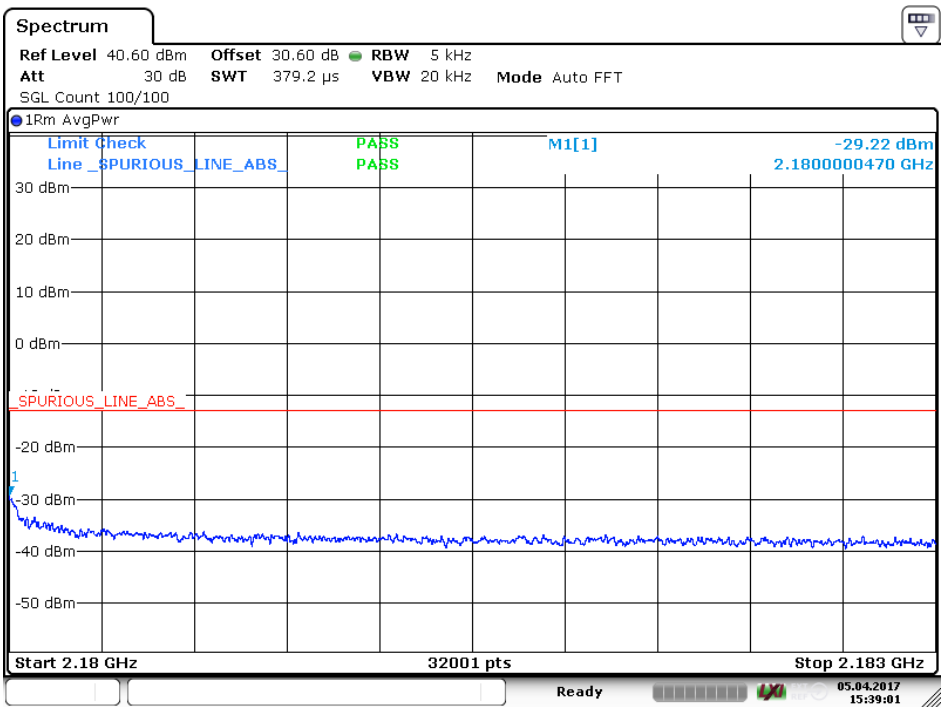
2 GSM signal on lower band edge AGC on in band



Date: 5.APR.2017 15:38:20

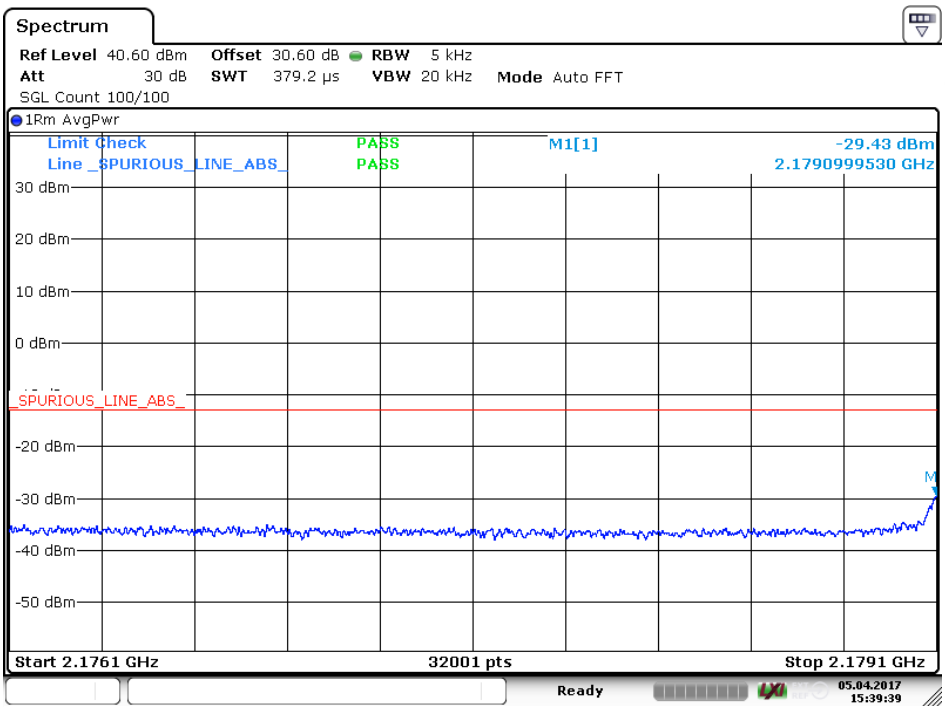
2 GSM signal on upper band edge AGC off

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 5.APR.2017 15:39:01

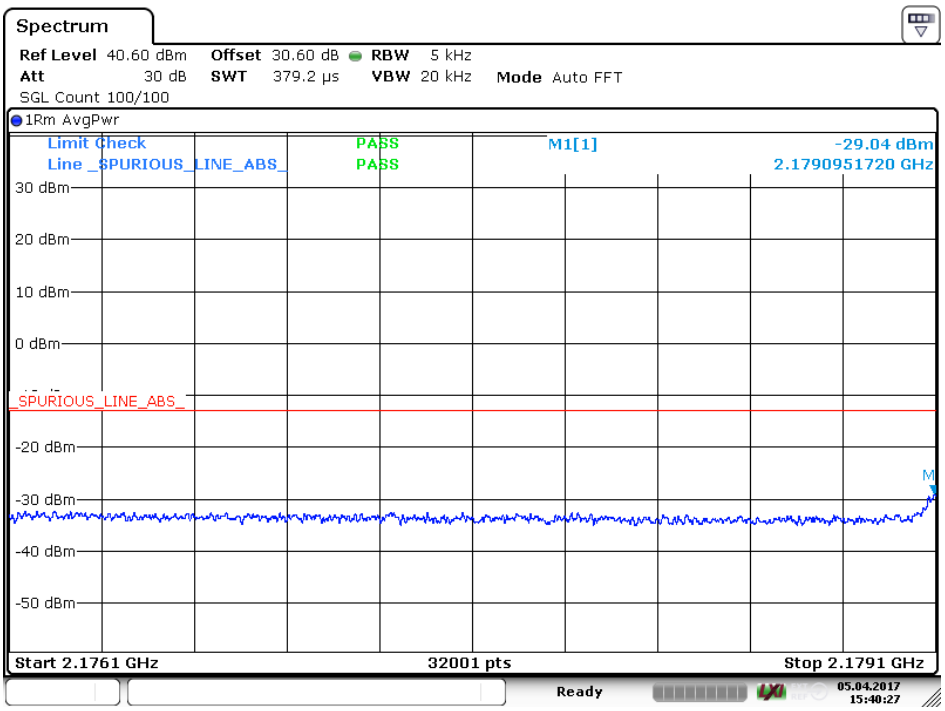
2 GSM signal on upper band edge AGC on



Date: 5.APR.2017 15:39:40

2 GSM signal on upper band edge AGC off in band

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 5.APR.2017 15:40:27

2 GSM signal on upper band edge AGC on in band

8.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Spectrum analyser	Rohde & Schwarz	FSV	32594	7/2017
Rf-attenuator	Narda	776B-10	8337	7/2017
Rf-attenuator	Huber Suhner	5920_N-50-010/199_N	32697	7/2017
Rf cable	Huber Suhner	Sucoflex 104PE	39076	7/2017
Rf cable	Huber Suhner	Sucoflex 104PE	39077	7/2017
Rf cable	Huber Suhner	Sucoflex 104PE	39079	7/2017
Signal generator	Rohde & Schwarz	SMIQ03B	12792	7/2017
Signal generator	Rohde & Schwarz	SMBV100	32593	7/2017

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address

9 CONDUCTED SPURIOUS EMISSION FROM ANTENNA PORT

Date of test:	2017-03-13	Test location:	EMC Center
EUT Serial:	99992	Ambient temp. ˚C	21
Tested by:	MTV	Relative humidity %	36
Test result:	Pass	Margin:	9.35 dB

9.1 Requirement

§ 27.53(h) RSS-139 clause 6.6

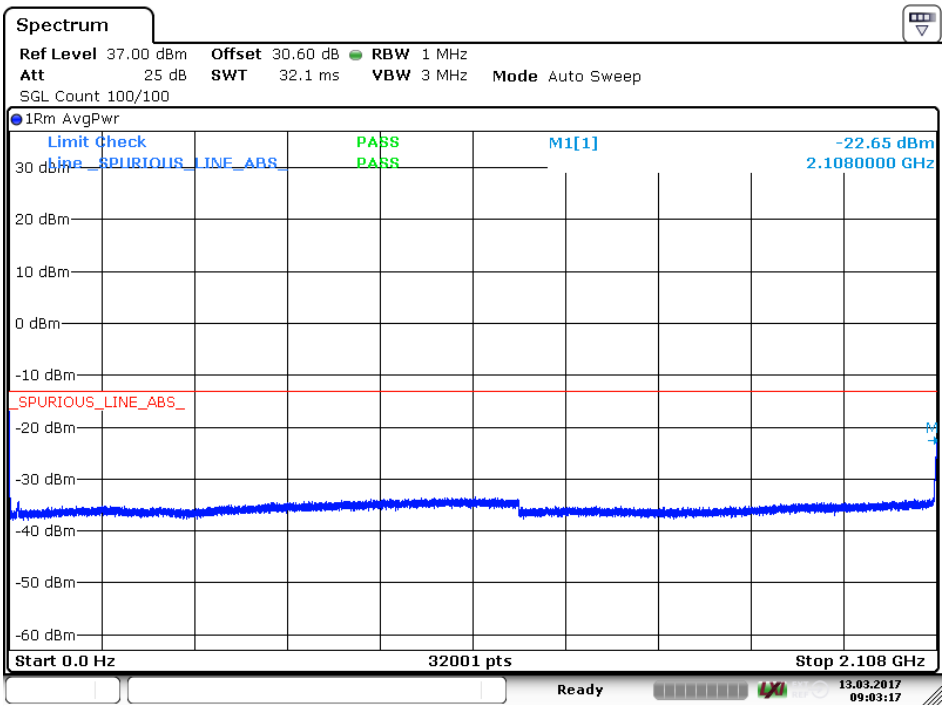
In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 $\log_{10}$ p (watts) dB.
After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 $\log_{10}$ p (watts) dB.

9.2 Test set-up

Signal generator was connected to the FOI unit which converted rf signal to optical signal. The optical signal was then fed via fibre to the EUT.
The EUT's output port was connected to spectrum analyser via rf cables and 30 dB attenuator.
A PC was connected to FOI via Ethernet hub. The PC was then used to control the EUT.

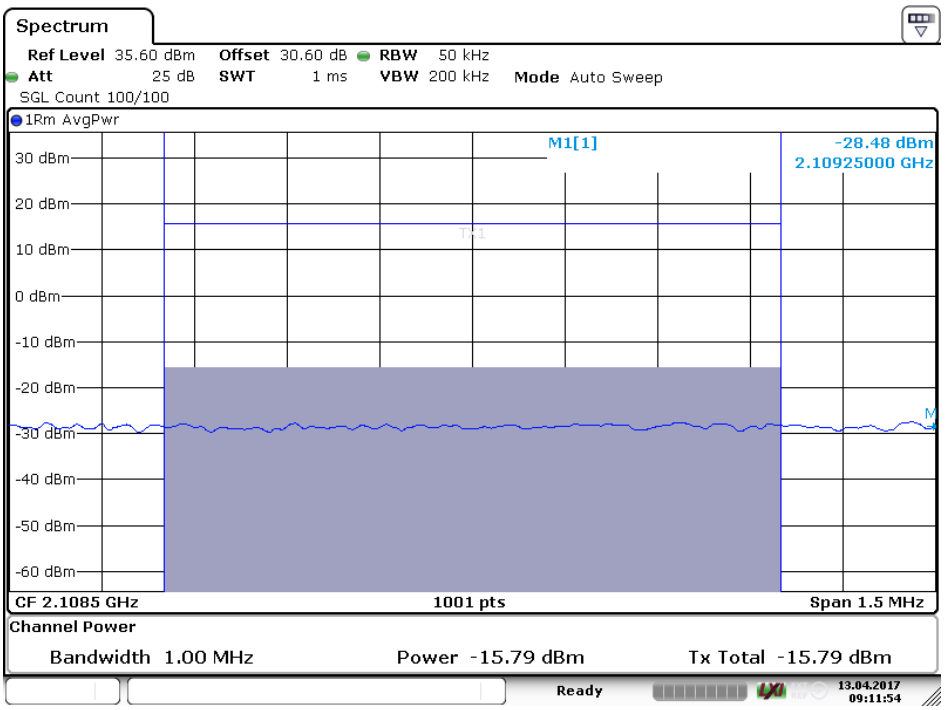
Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address

9.3 Test data



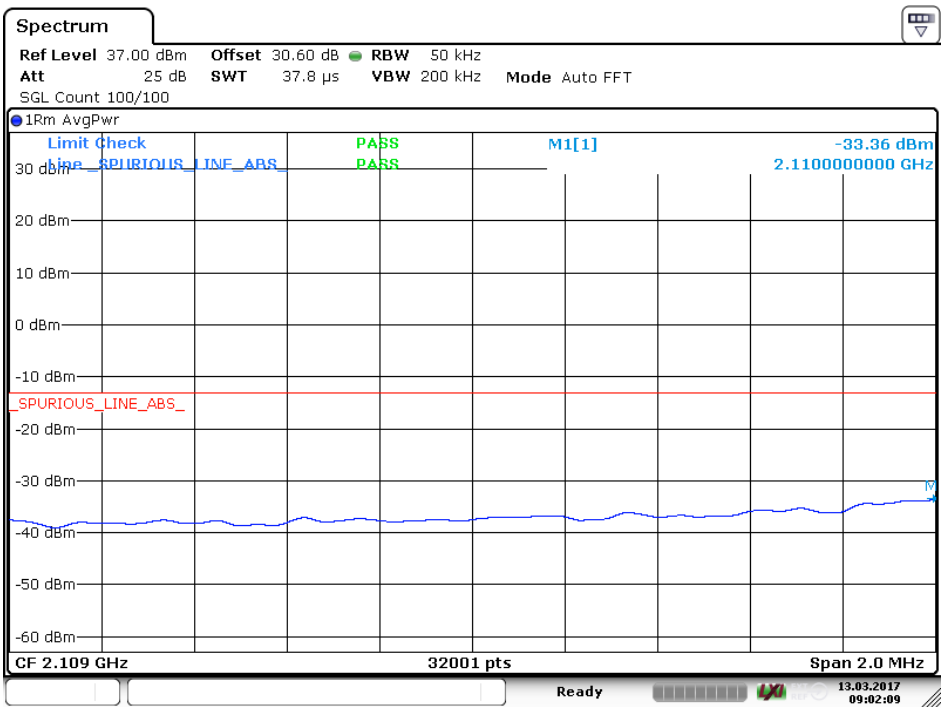
Date: 13.MAR.2017 09:03:18

GSM low ch



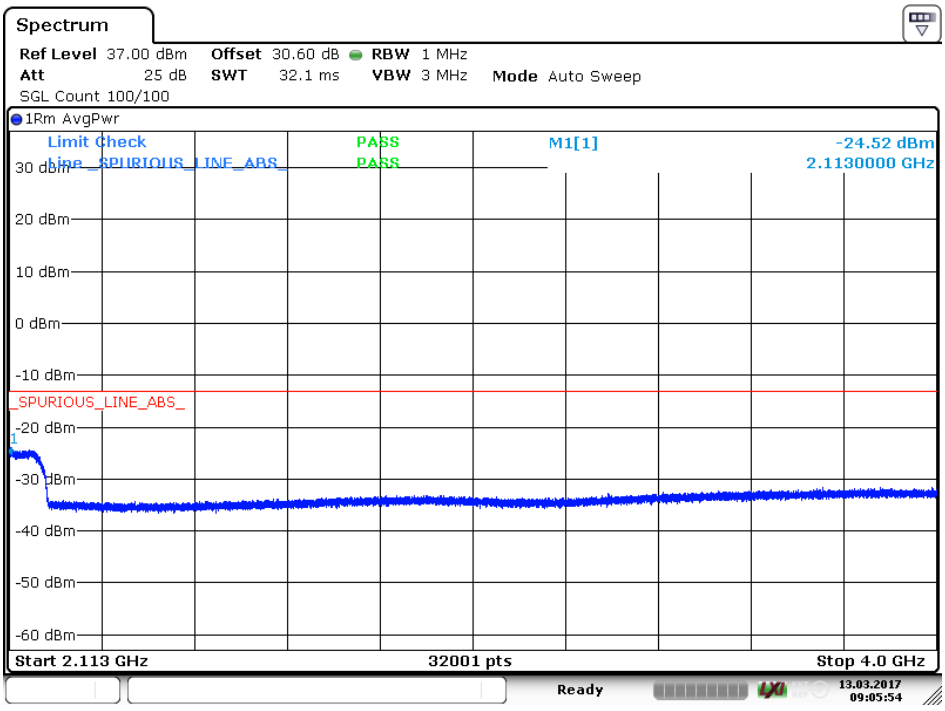
Date: 13.APR.2017 09:11:55

GSM low ch



Date: 13.MAR.2017 09:02:09

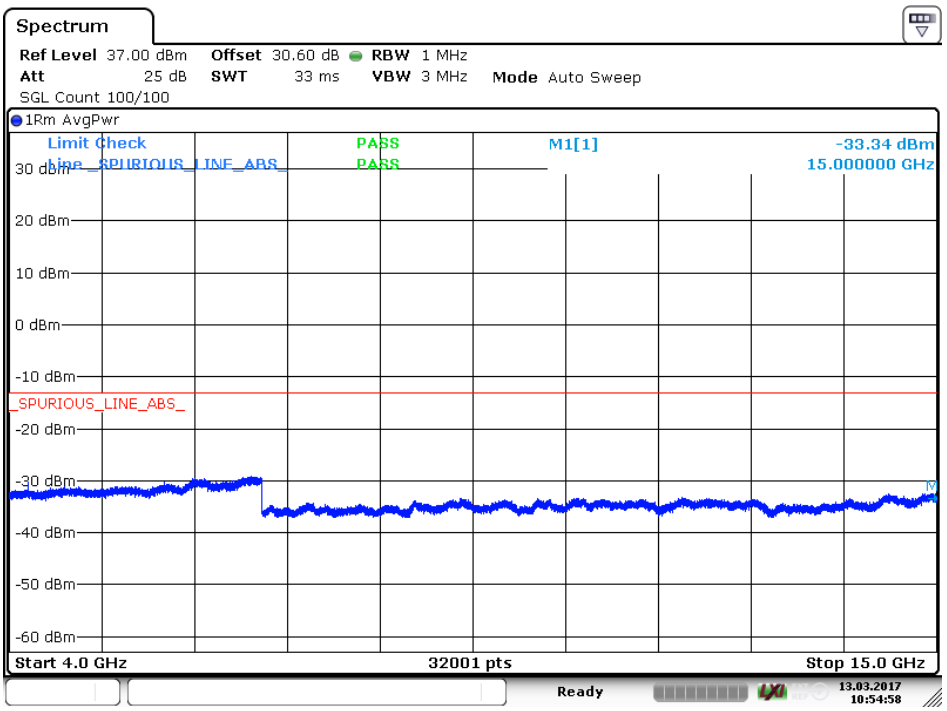
GSM low ch



Date: 13.MAR.2017 09:05:53

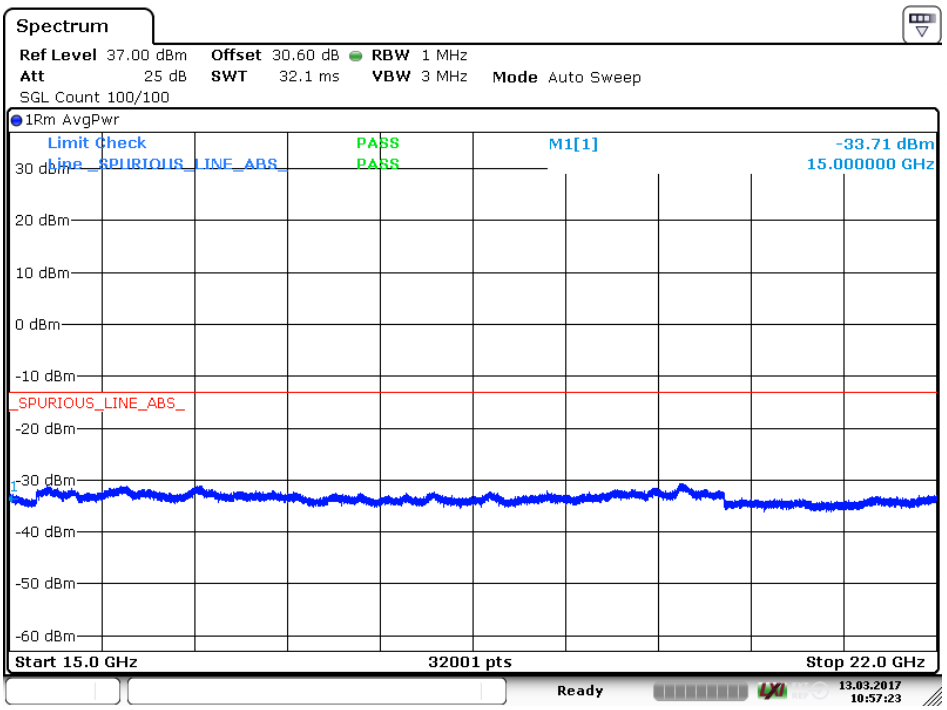
GSM low ch

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 13.MAR.2017 10:54:58

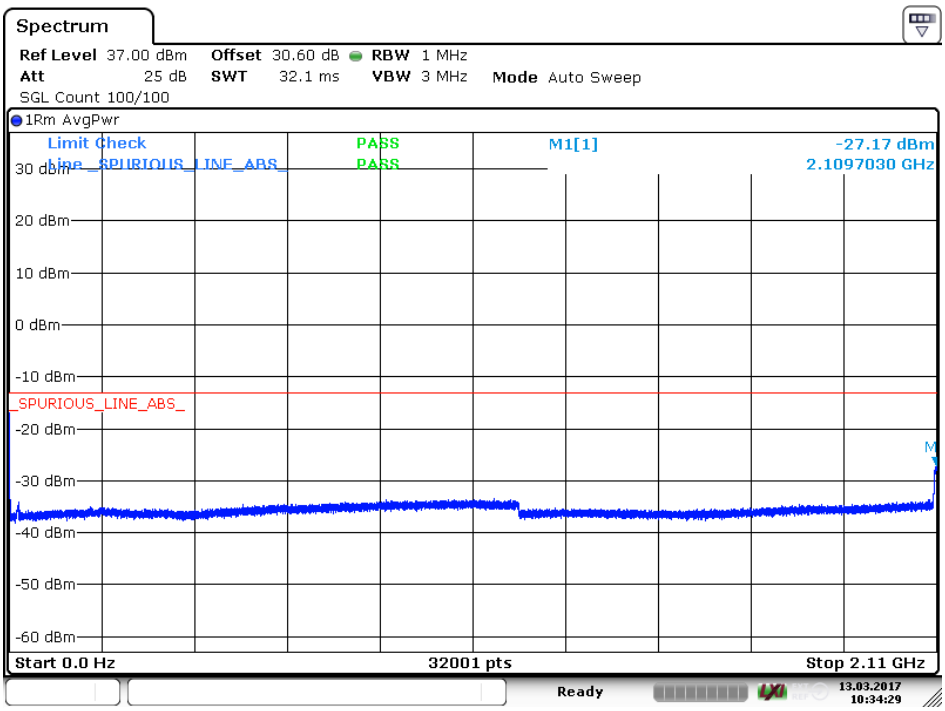
GSM low ch



Date: 13.MAR.2017 10:57:23

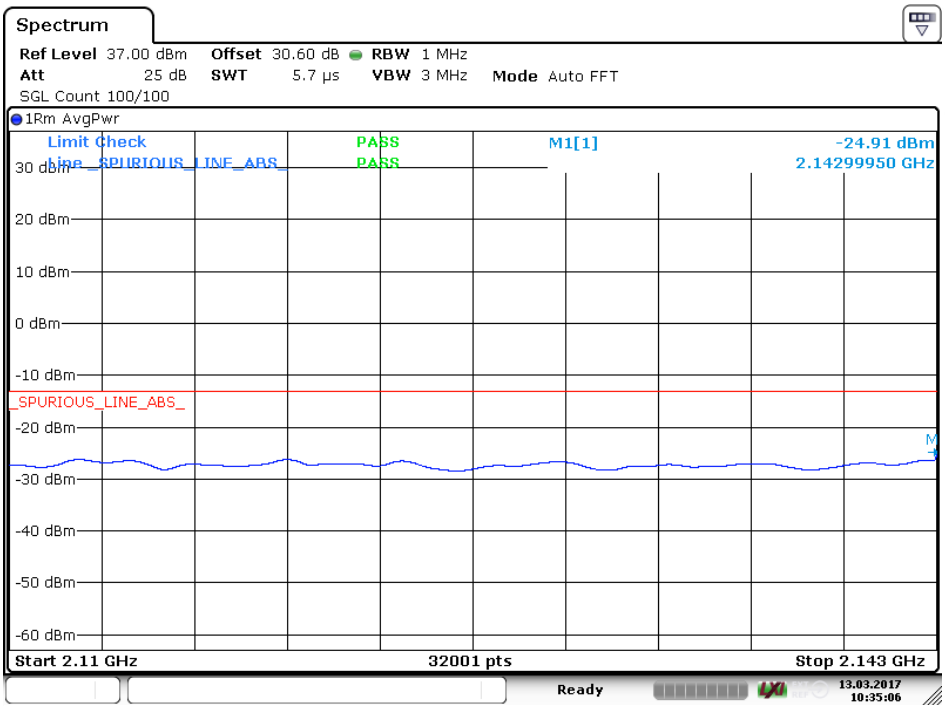
GSM low ch

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 13.MAR.2017 10:34:29

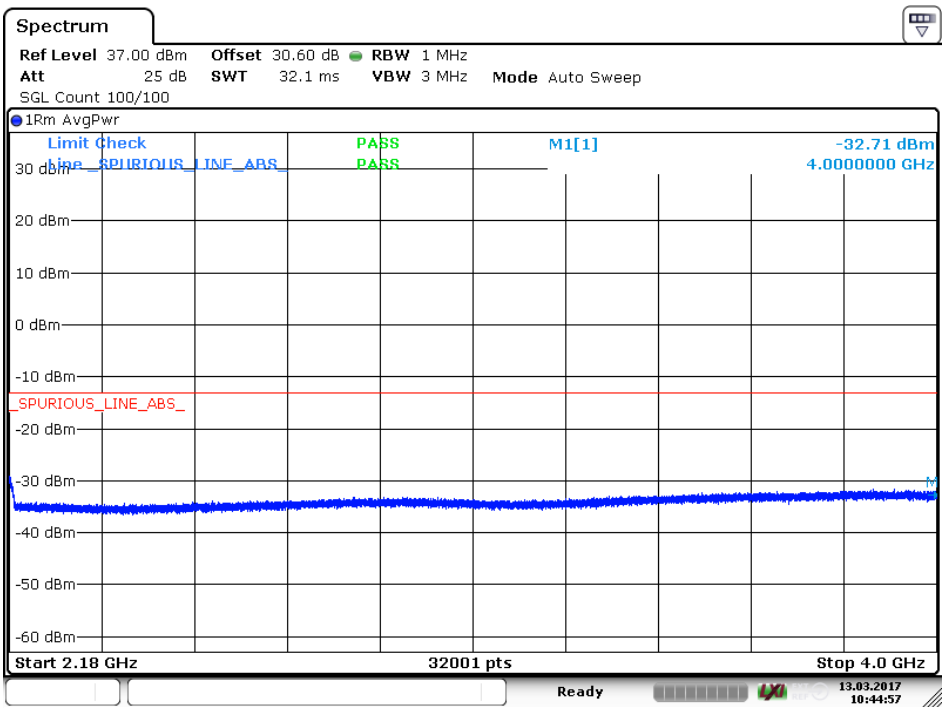
GSM mid ch



Date: 13.MAR.2017 10:35:06

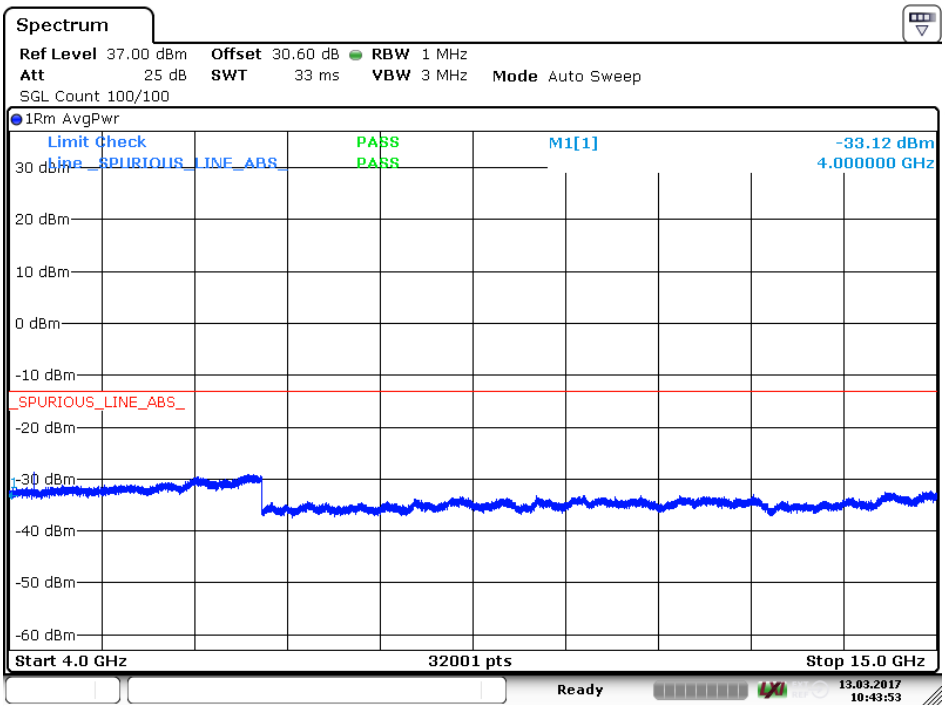
GSM mid ch

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 13 MAR 2017 10:44:57

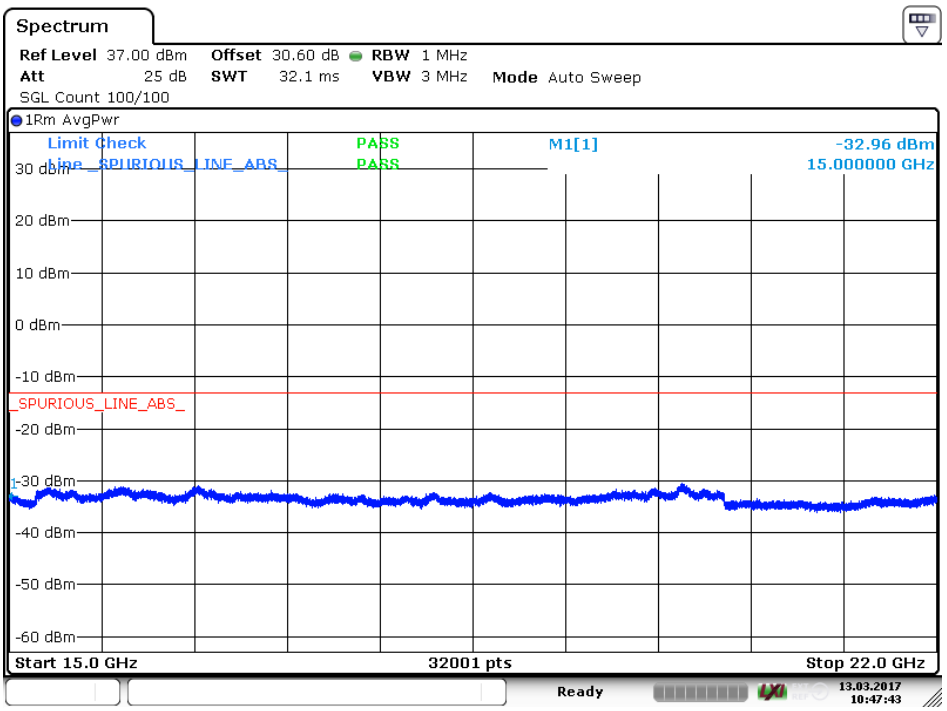
GSM mid ch



Date: 13 MAR 2017 10:43:53

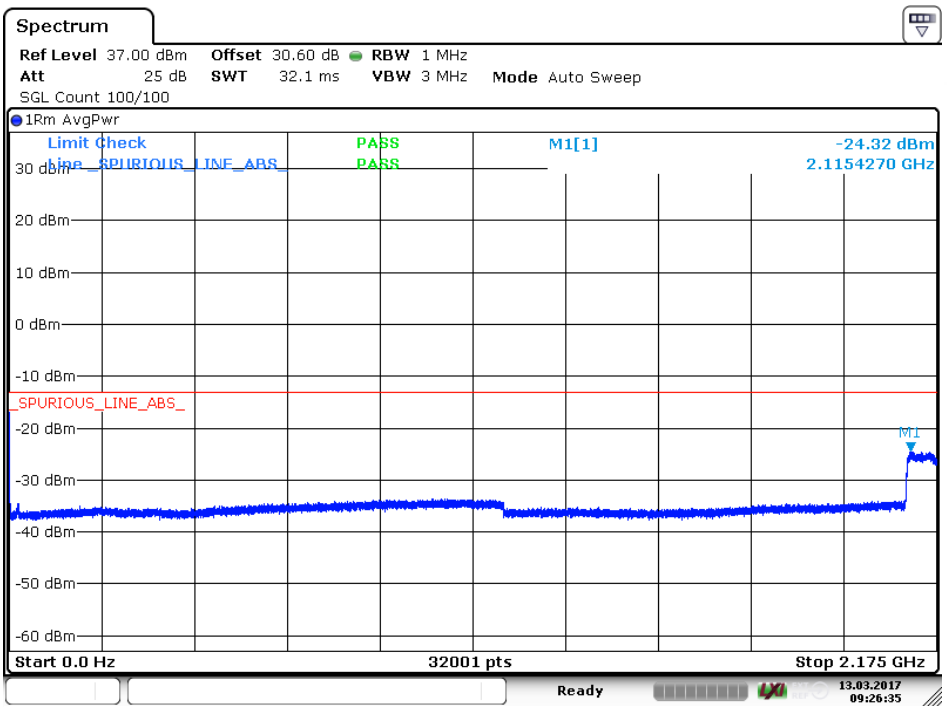
GSM mid ch

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 13.MAR.2017 10:47:43

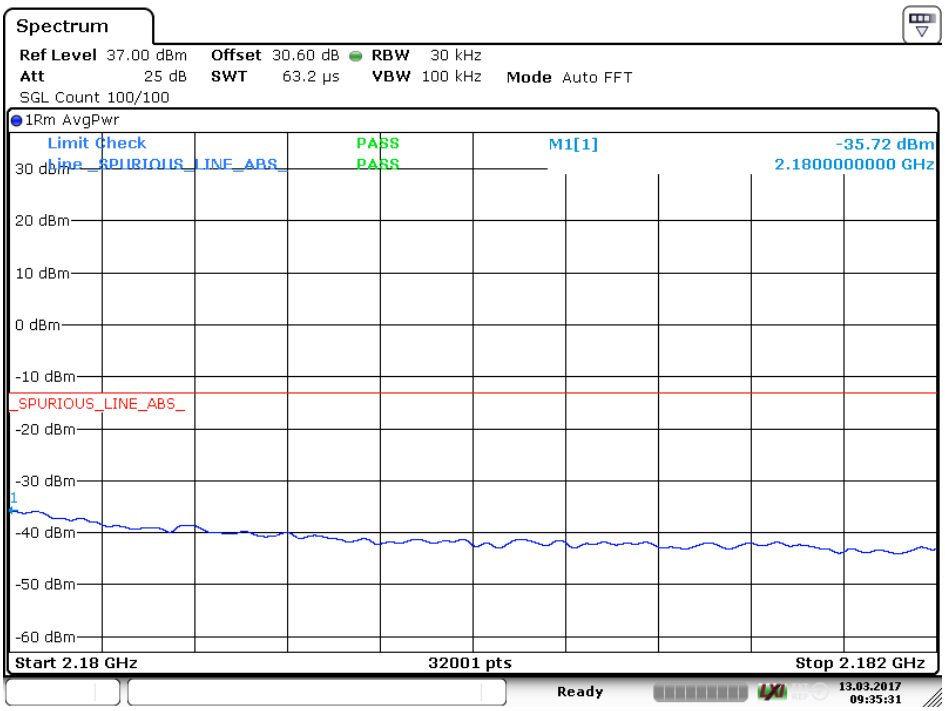
GSM mid ch



Date: 13.MAR.2017 09:26:35

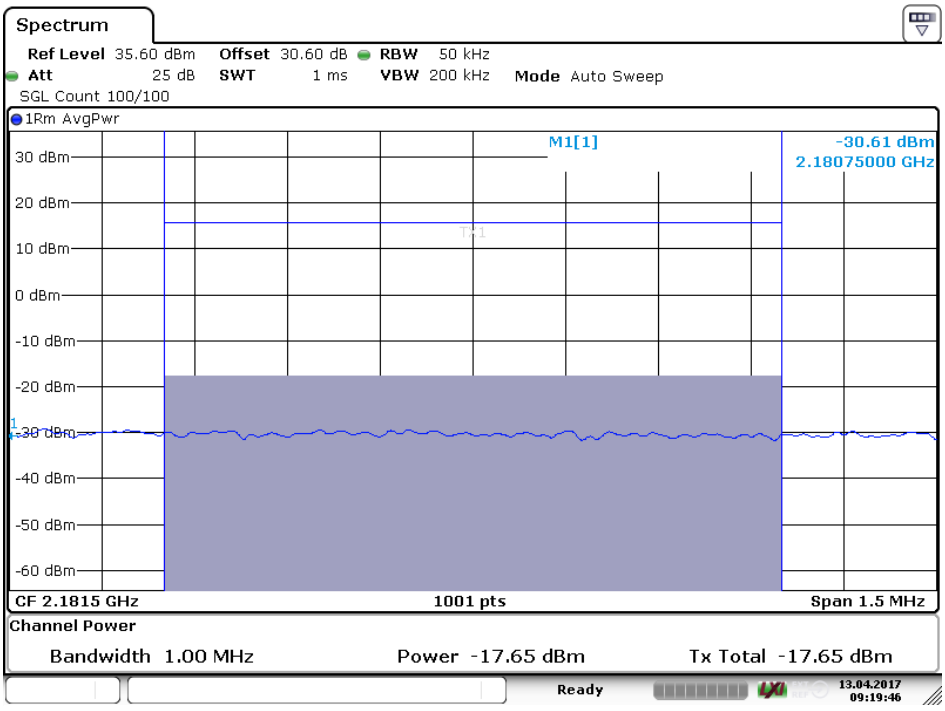
GSM high ch

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 13.MAR.2017 09:35:31

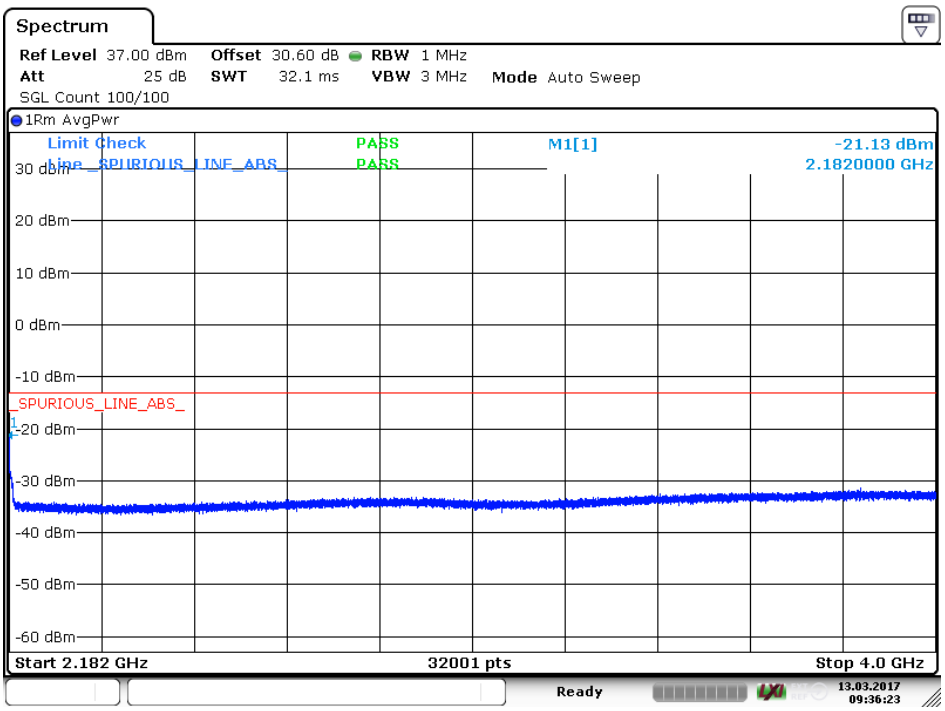
GSM high ch



Date: 13.APR.2017 09:19:46

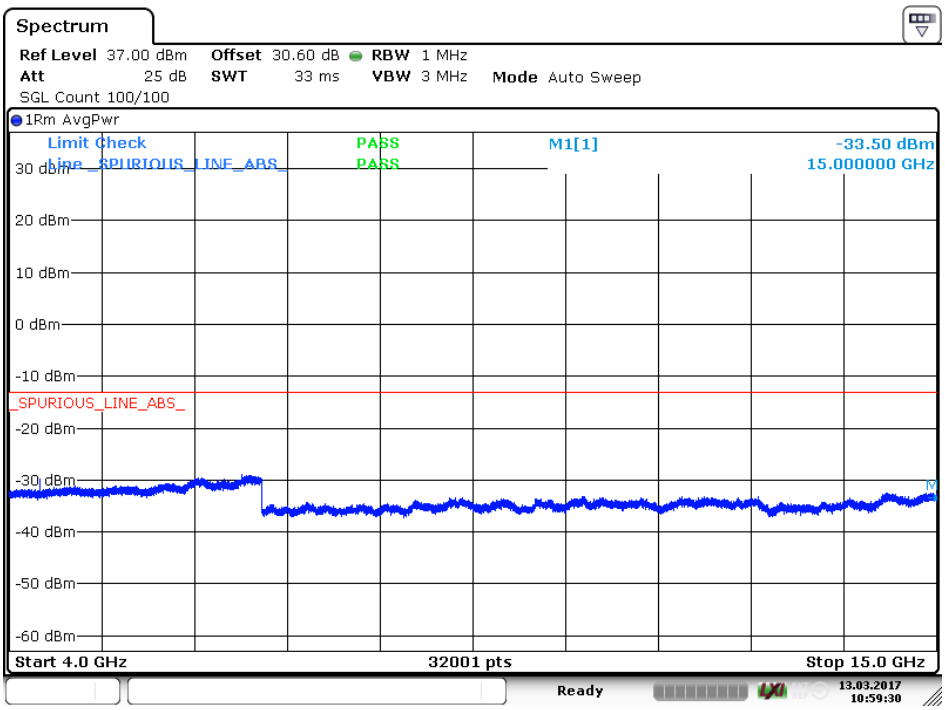
GSM high ch

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 13.MAR.2017 09:36:23

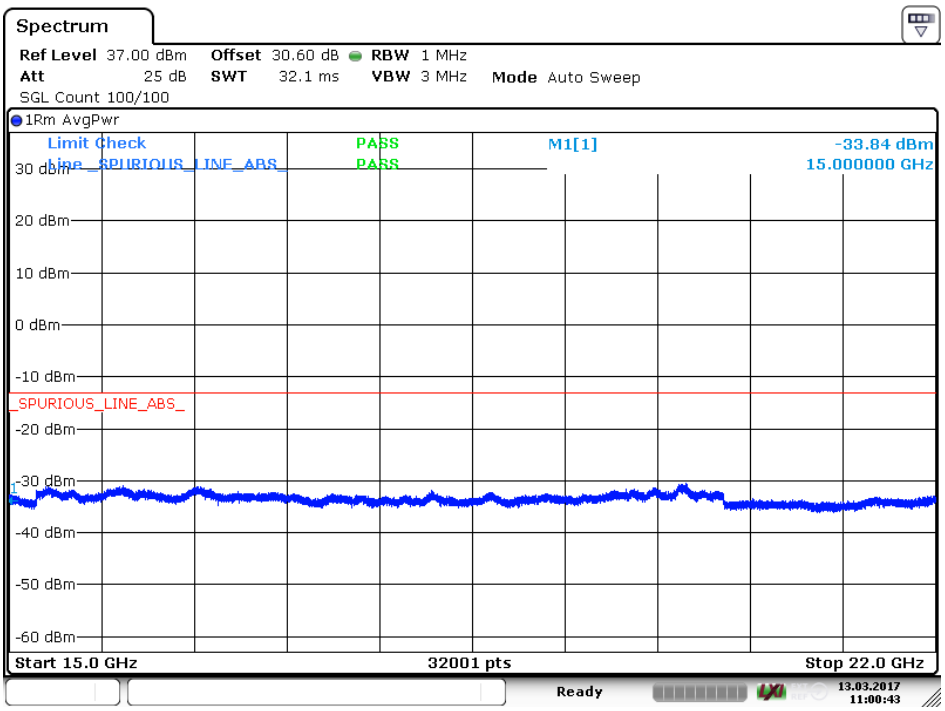
GSM high ch



Date: 13.MAR.2017 10:59:30

GSM high ch

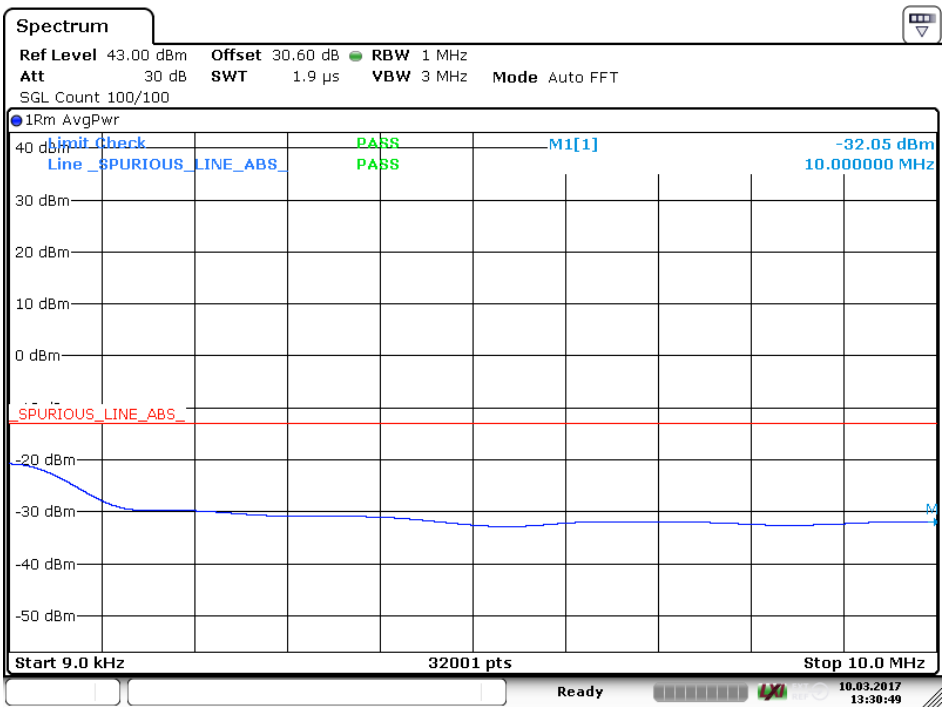
Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 13.MAR.2017 11:00:43

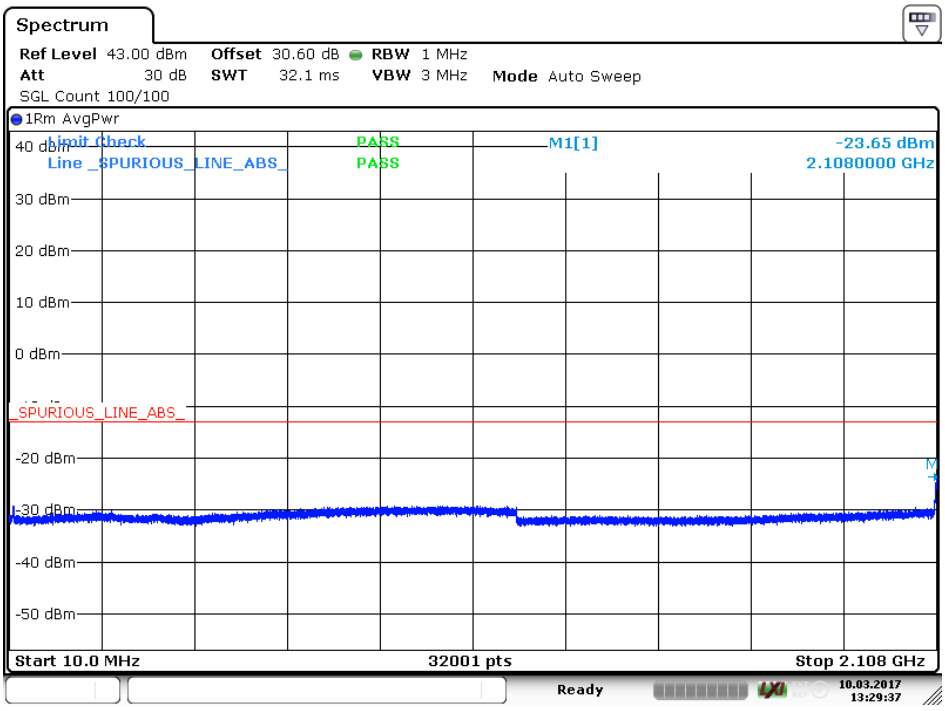
GSM high ch

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 10.MAR.2017 13:30:49

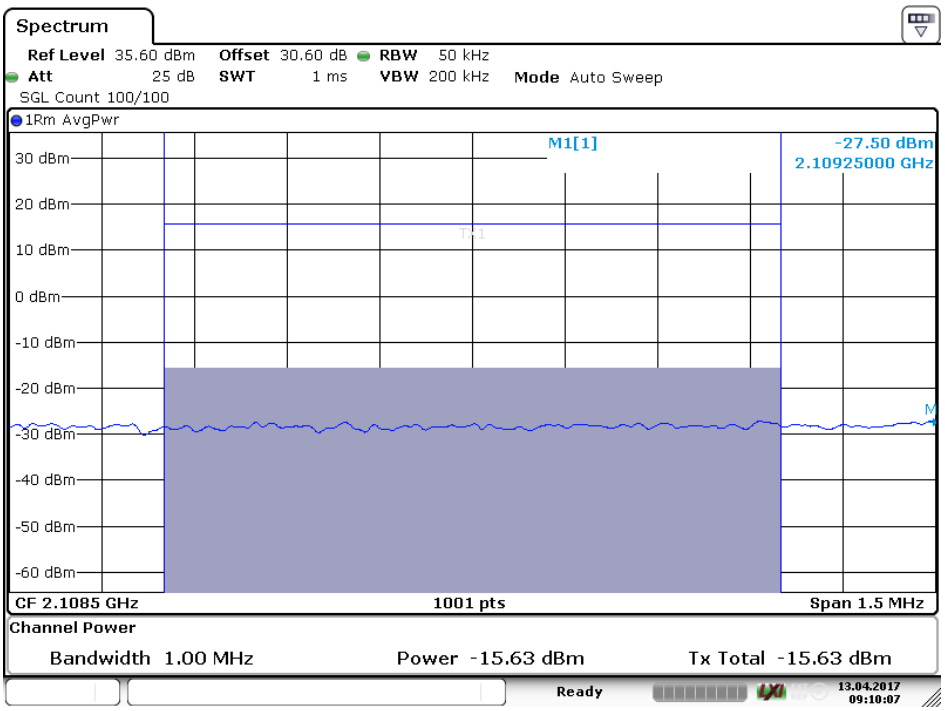
AWGN low channel



Date: 10.MAR.2017 13:29:37

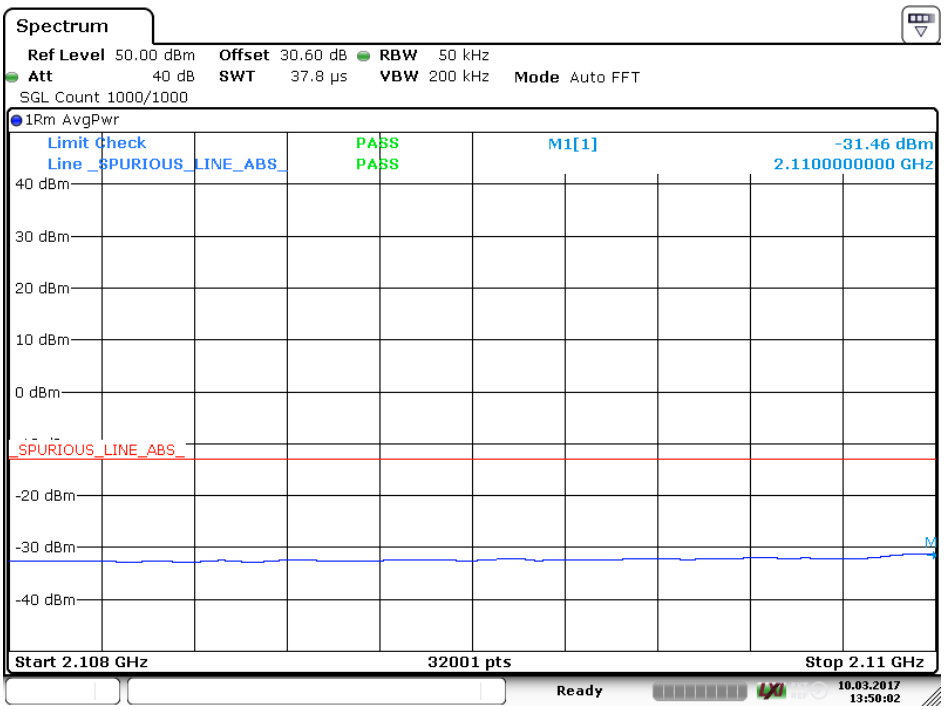
AWGN low channel

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 13.APR.2017 09:10:07

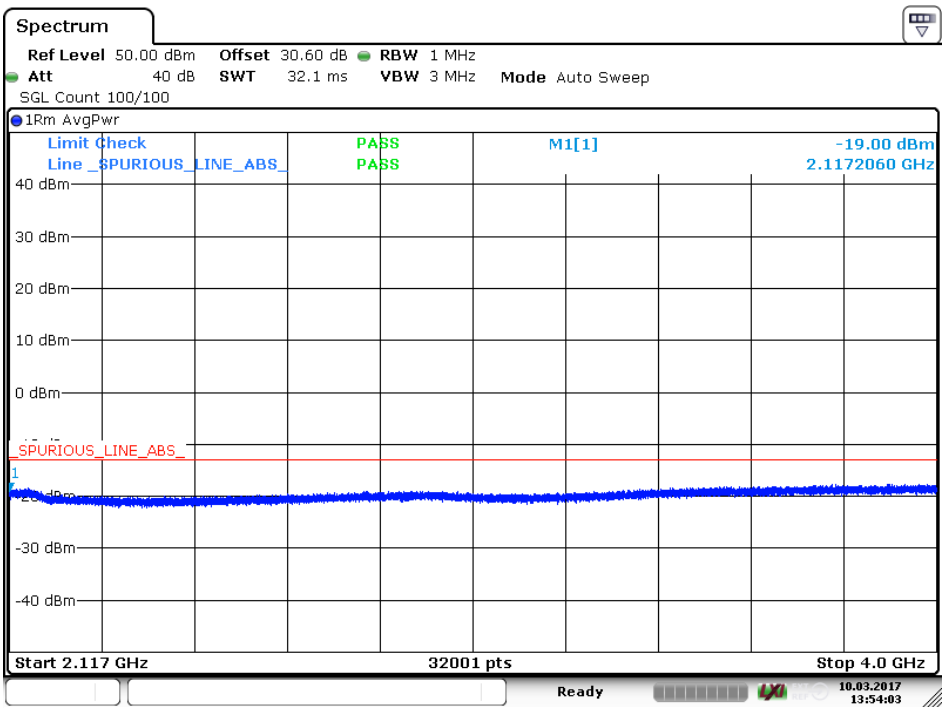
AWGN low channel



Date: 10.MAR.2017 13:50:03

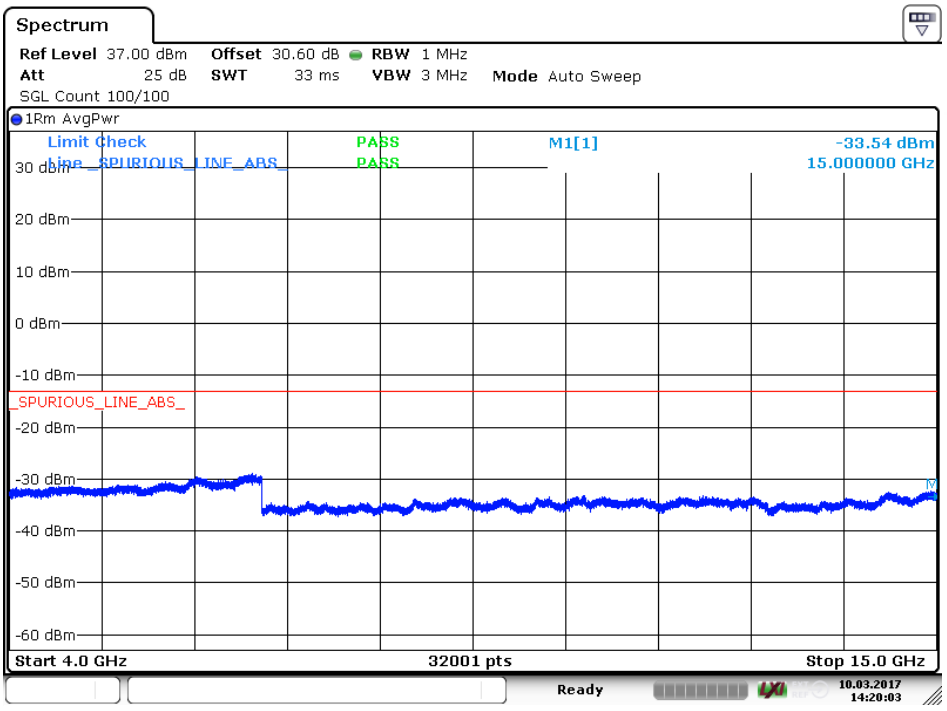
AWGN low channel

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 10.MAR.2017 13:54:03

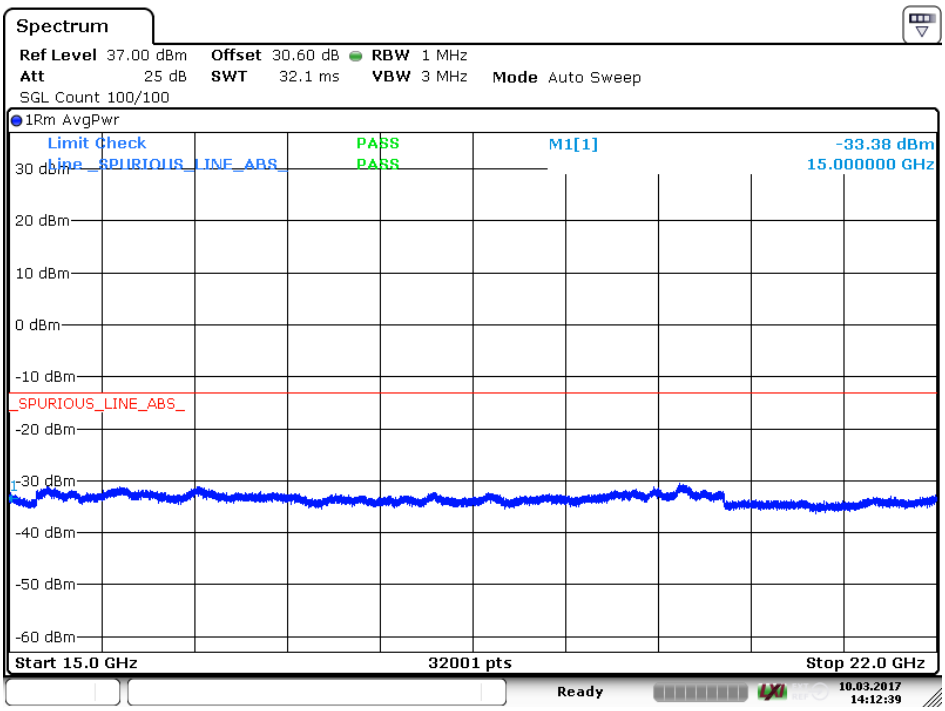
AWGN low channel



Date: 10.MAR.2017 14:20:04

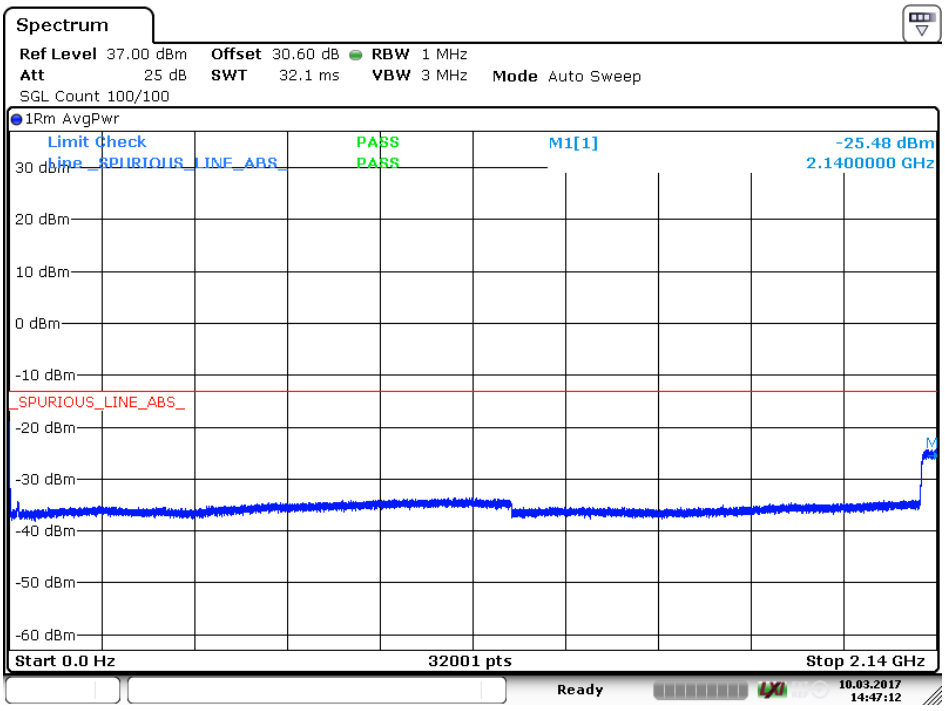
AWGN low channel

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 10.MAR.2017 14:12:39

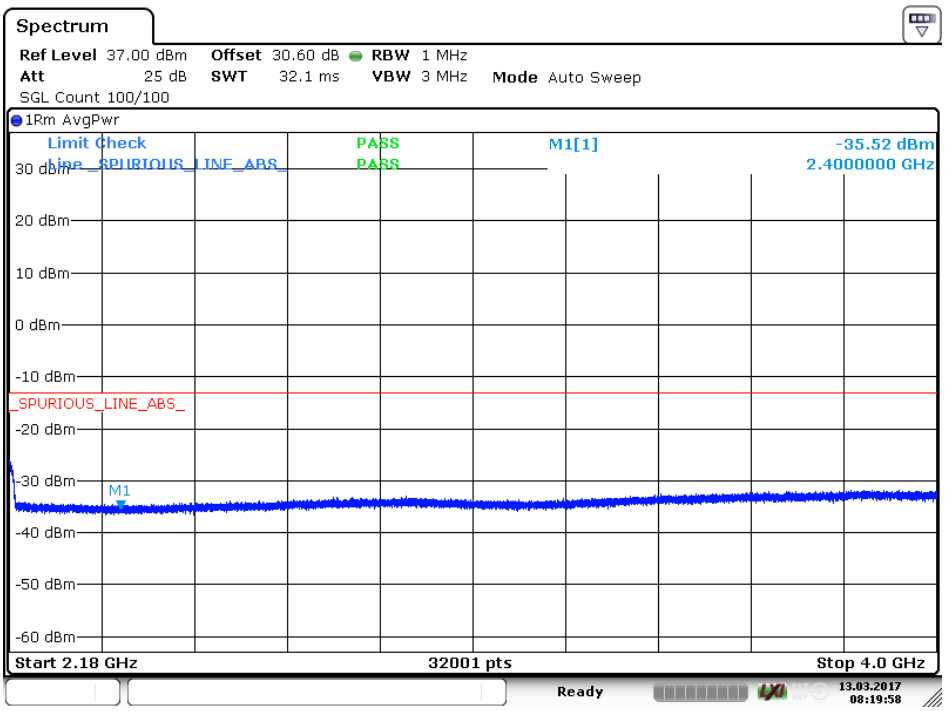
AWGN low channel



Date: 10.MAR.2017 14:47:12

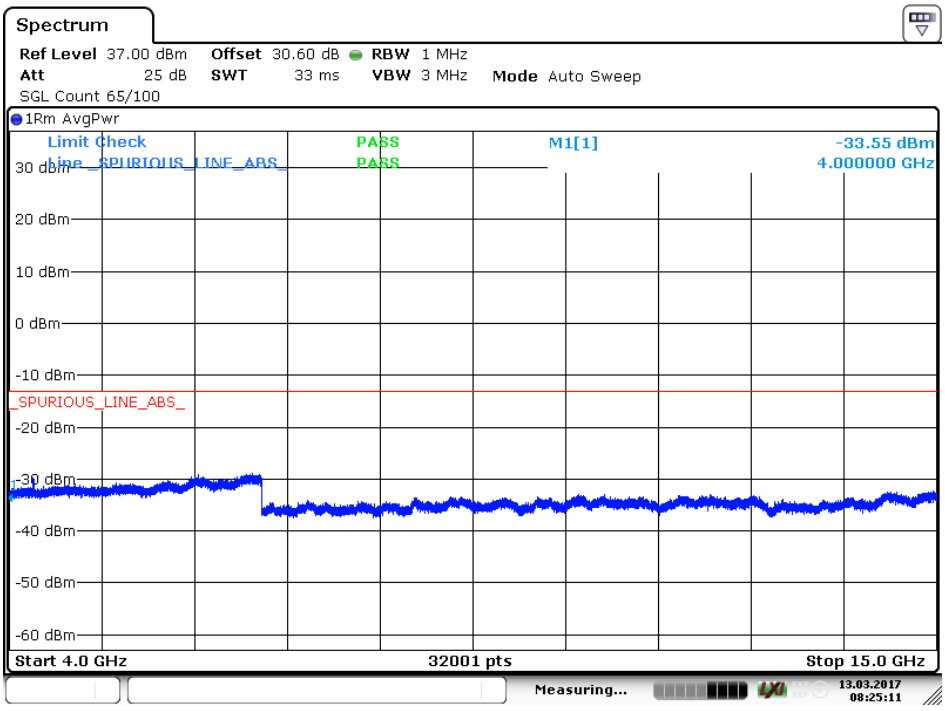
AWGN mid channel

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 13.MAR.2017 08:19:59

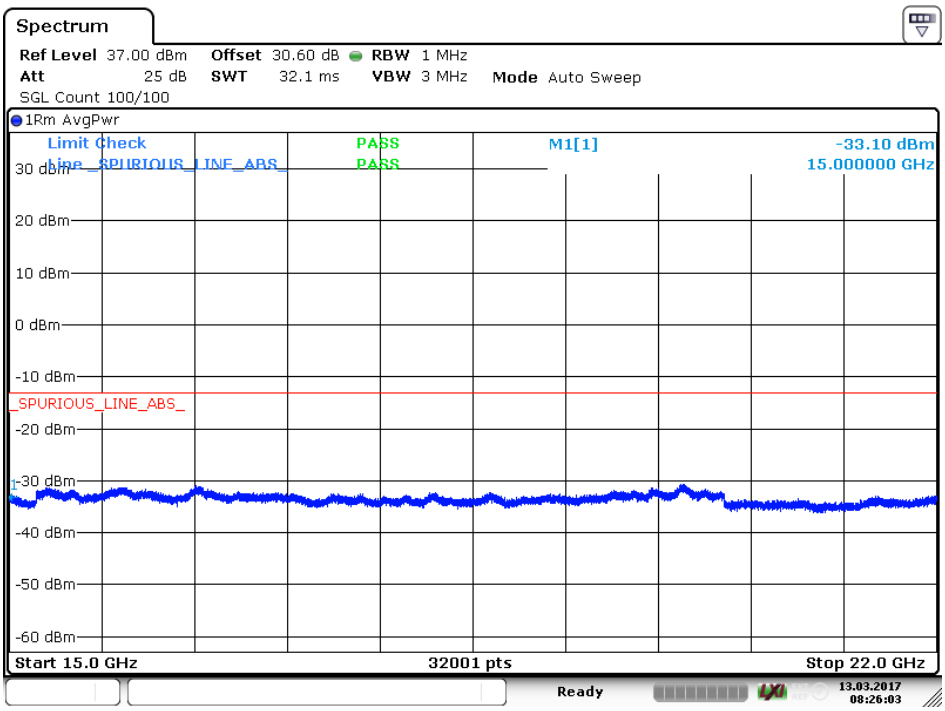
AWGN mid channel



Date: 13.MAR.2017 08:25:10

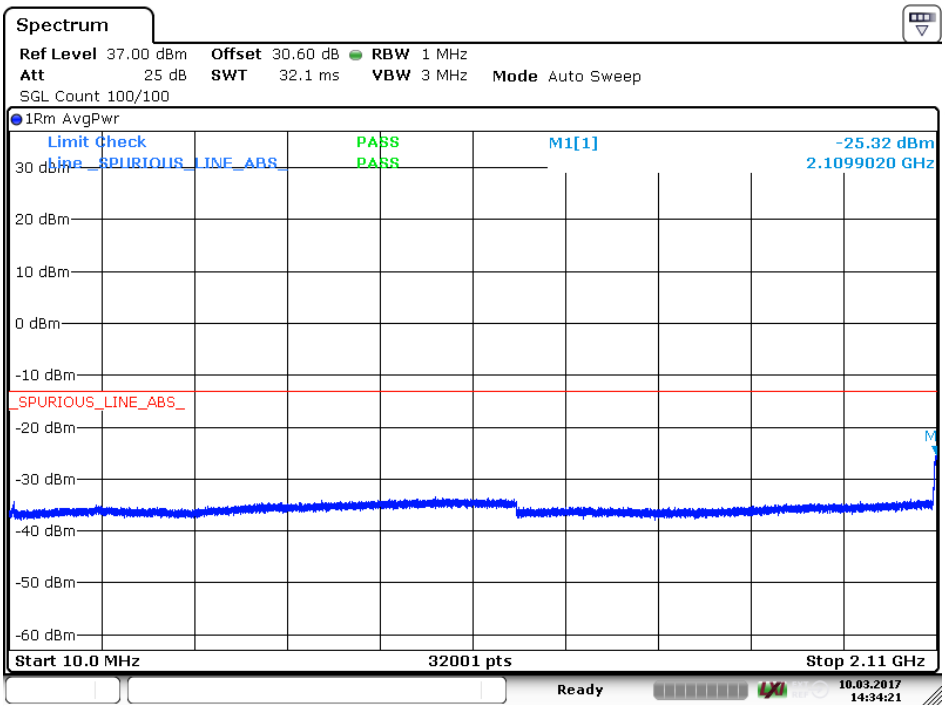
AWGN mid channel

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 13.MAR.2017 08:26:04

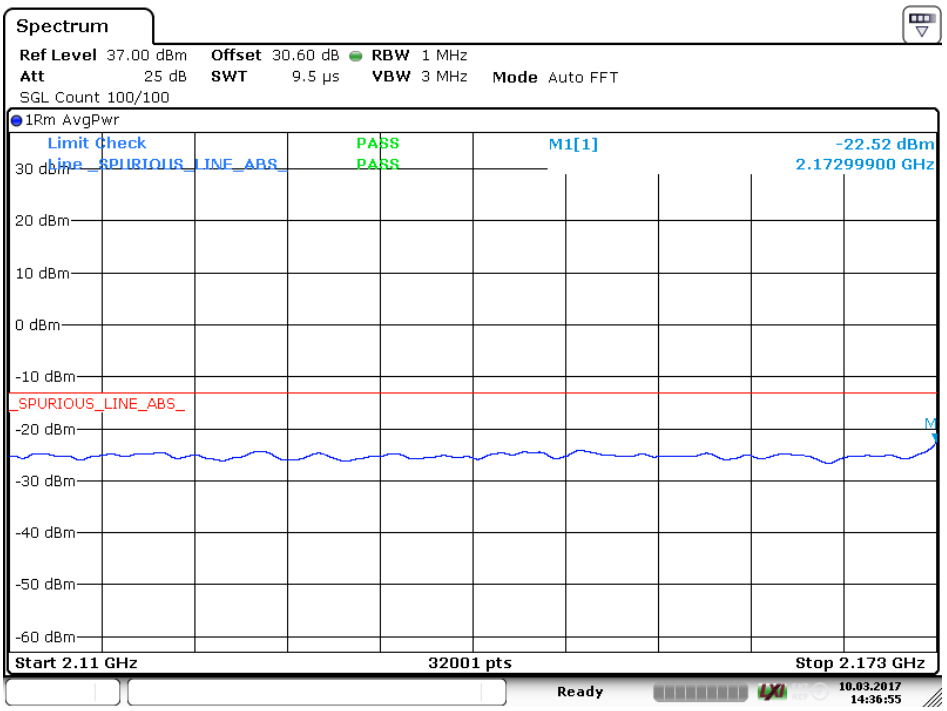
AWGN mid channel



Date: 10.MAR.2017 14:34:21

AWGN high channel

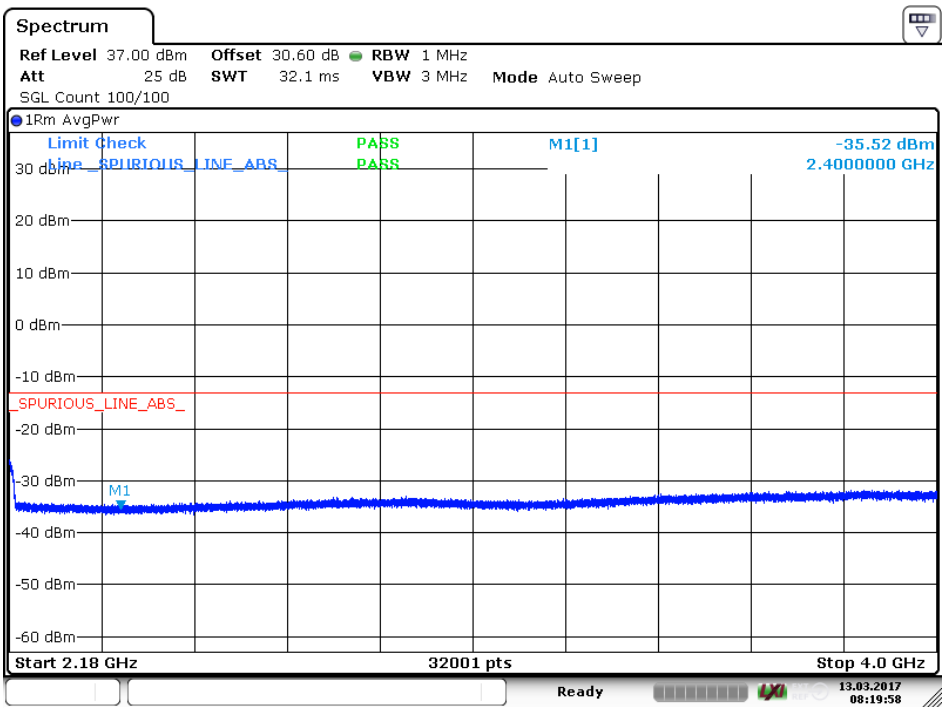
Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 10.MAR.2017 14:36:55

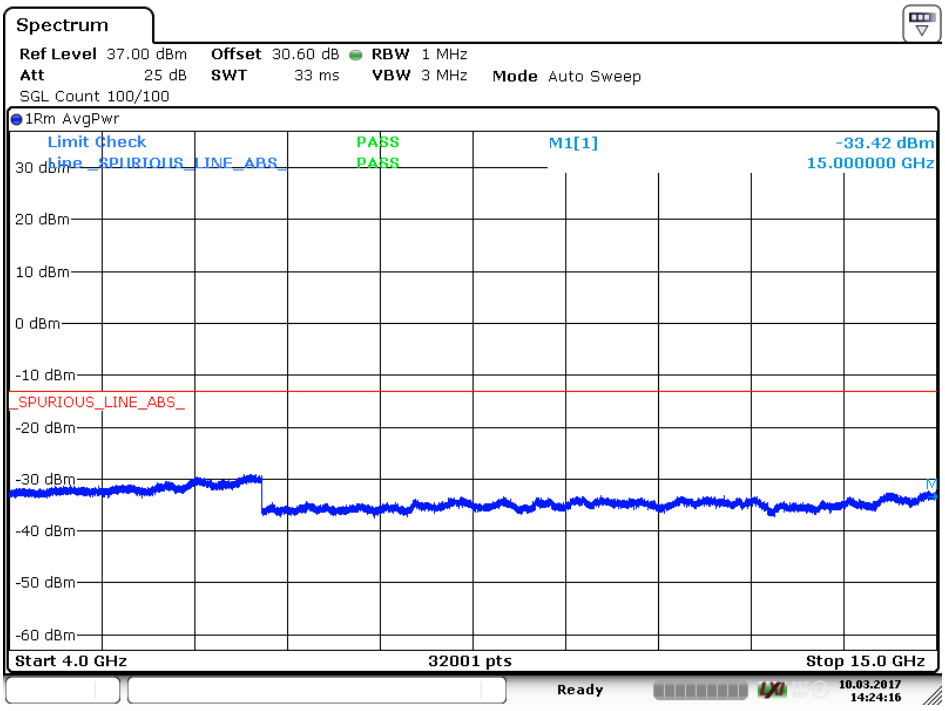
AWGN high channel

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 13.MAR.2017 08:19:59

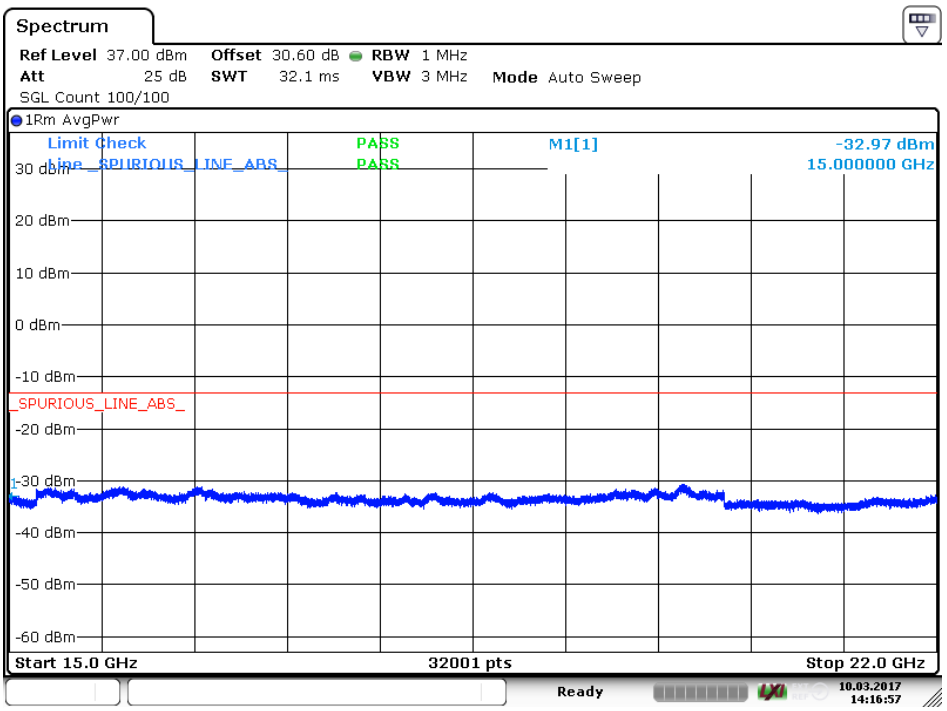
AWGN high channel



Date: 10.MAR.2017 14:24:16

AWGN high channel

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



Date: 10.MAR.2017 14:16:57

AWGN high channel

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Spectrum analyser	Rohde & Schwarz	FSV	32594	7/2017
Rf-attenuator	Narda	776B-10	8337	7/2017
Rf-attenuator	Huber Suhner	5920_N-50-010/199_N	32697	7/2017
Rf cable	Huber Suhner	Sucoflex 104PE	39076	7/2017
Rf cable	Huber Suhner	Sucoflex 104PE	39077	7/2017
Rf cable	Huber Suhner	Sucoflex 104PE	39079	7/2017
Signal generator	Rohde & Schwarz	SMIQ03B	12792	7/2017
Signal generator	Rohde & Schwarz	SMBV100	32593	7/2017

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address

10 RADIATED SPURIOUS EMISSION

Date of test:	2017-03-08	Test location:	Björkhallen
EUT Serial:	99992	Ambient temp.	21ºC
Tested by:	MTV	Relative humidity	28 %
Test result:	Pass	Margin:	> 20 dB

10.1 Test set-up

The test method is in accordance with ANSI C63.26 and ANSI-TIA-603-D-2010.
Both receiver and transmitter are active during the tests.
The EUT was placed on an insulating support above the turntable which is part of the reference ground plane.

Overview sweeps were performed with the measurement receiver in max-hold mode and the peak detector activated. Above 1 GHz both peak and average detector is activated.

Signal generator was connected to the FOI unit which converted rf signal to optical signal. The optical signal was then fed via fibre to the EUT.
The EUT's output port was terminated to the 50 Ω terminator.

A PC was connected to FOI via Ethernet hub. The PC was then used to control the EUT.

10.2 Test conditions

Test set-up: **30 MHz to 1000 MHz**
Test receiver set-up:
Preview test: Peak, RBW 120 kHz, VBW 1 MHz
Final test: Quasi-Peak, RBW 120 kHz, VBW 1 MHz
Measuring distance: 3 m
EUT height above ground plane: 0.8 m
Measuring angle: 0 – 359□
Antenna
Height above ground plane: 1 – 4 m
Polarisation: Vertical and Horizontal
Type: Bilog

Test set-up: **1 GHz – 22 GHz**
Test receiver set-up:
Preview test: Peak, RBW 1 MHz, VBW 3 MHz
Average, RBW 1 MHz, VBW 3 MHz
Final test: Average, RBW 1 MHz, VBW 3 MHz
Peak, RBW 1 MHz, VBW 3 MHz
Measuring distance: 3 m
EUT height above ground plane: 1.5 m
Measuring angle: 0 – 359□
Antenna
Height above ground plane: 1 – 4 m
Polarisation: Vertical and Horizontal
Type: Horn
Antenna tilt: Activated

10.3 Requirement

The power of any emission outside of the authorized operating frequency ranges must be attenuated
below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.
This gives a limit -13 dBm.

The frequency range to be inspected is up to the tenth harmonics of the highest fundamental frequency according to 47 CFR 2.1057 and RSS-Gen Section 6.13.

The field strength limit is calculated using the plane wave relation.
$GP/4\pi R^2 = E^2 / 120\pi$

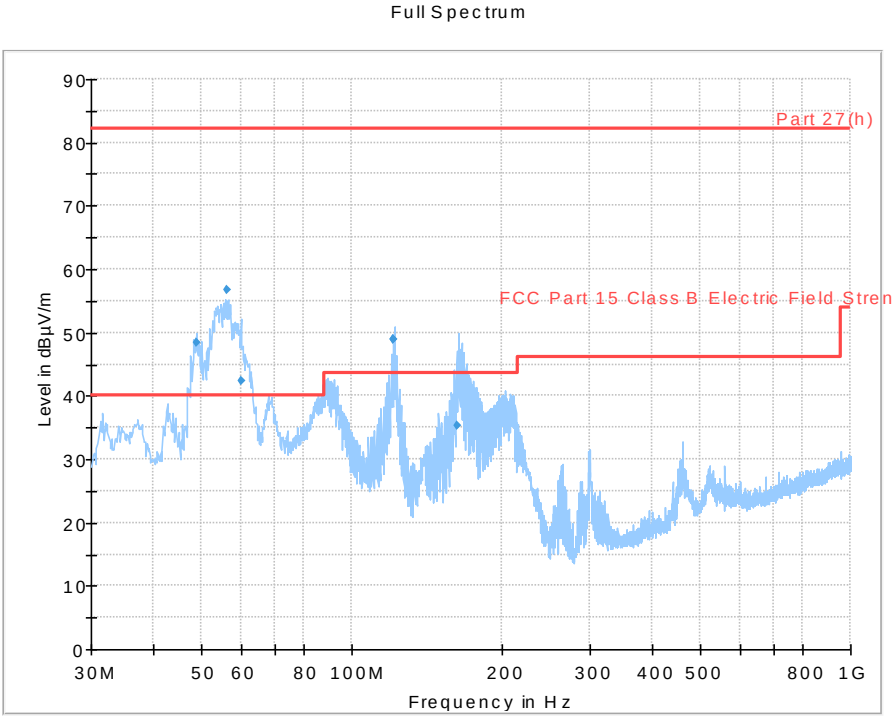
G: antenna gain
P: power (W)
R: measurement distance (m)

-13 dBm EIRP gives a field strength limit of 82.2 dBµV/m at a 3 m measurement distance in an anechoic chamber.

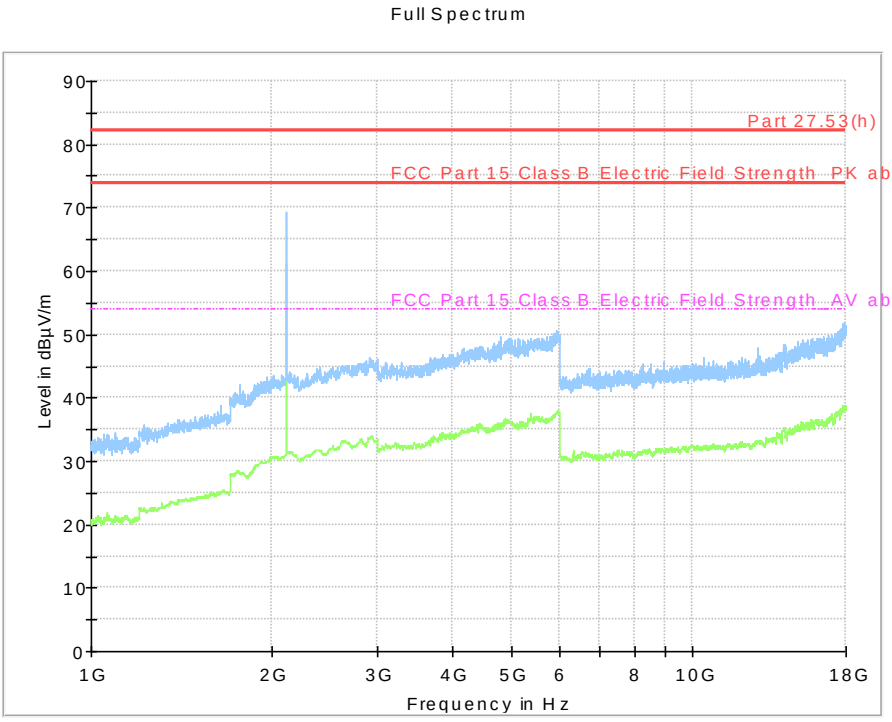
Because all measured field strength results had more than 20 dB margins to the limit substitution measurements were not performed.

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address

10.4 Test results

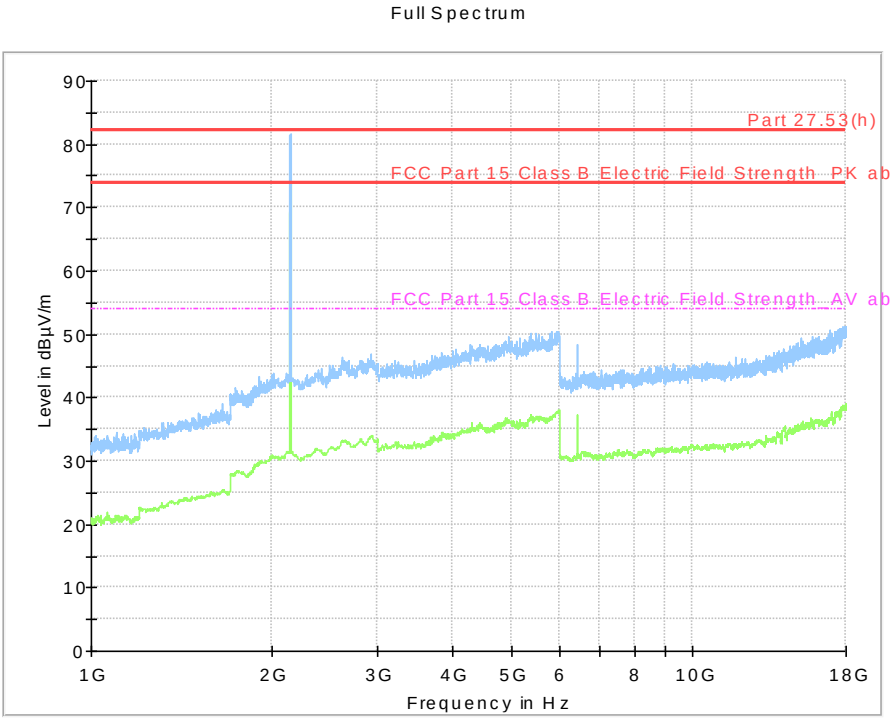


30 MHz – 1000 MHz

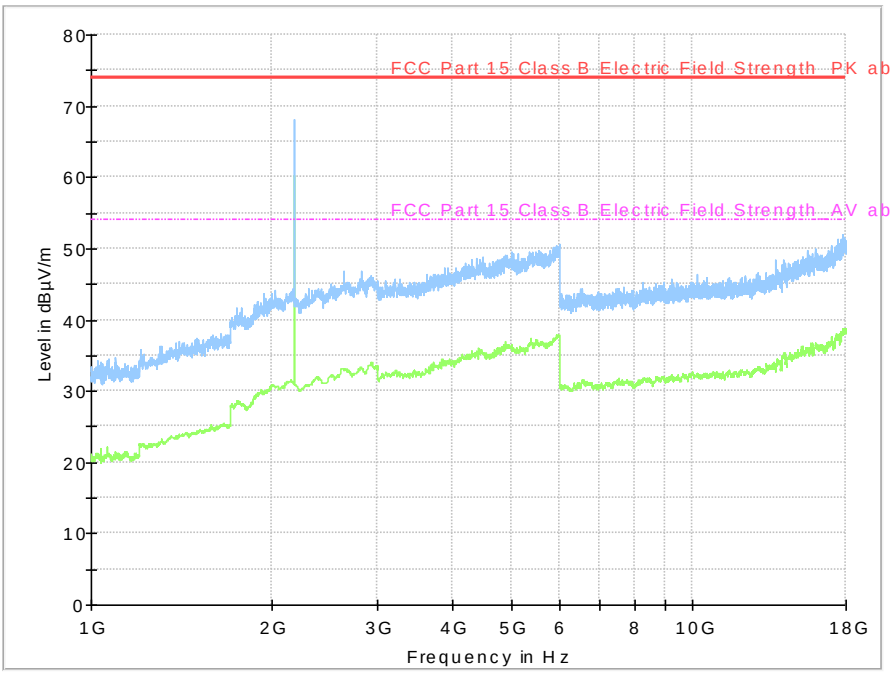


1-18 GHz low channel

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address

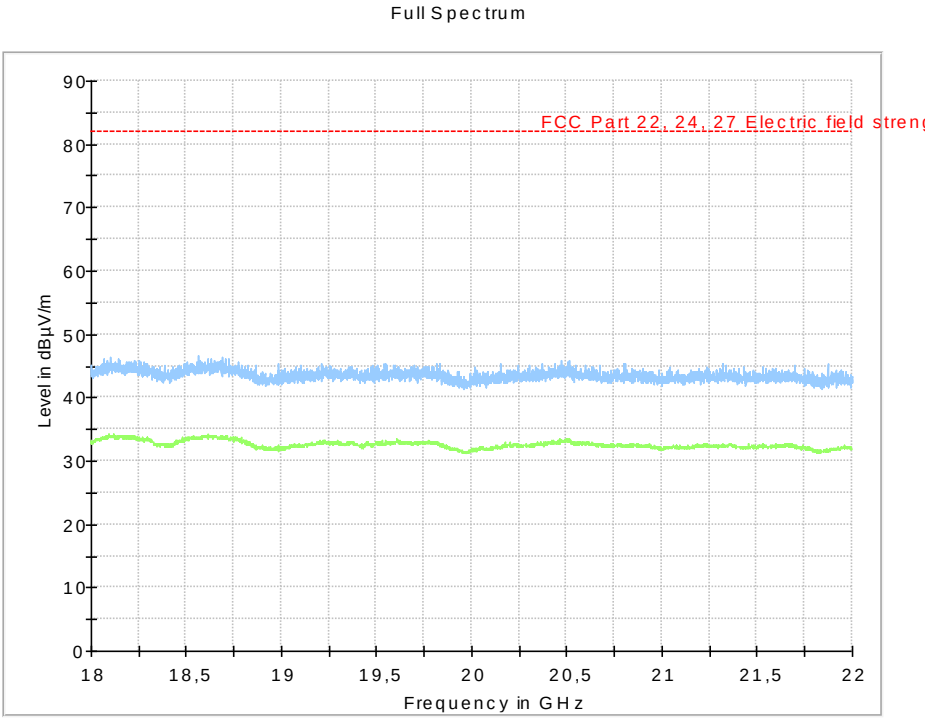


1-18 GHz middle channel

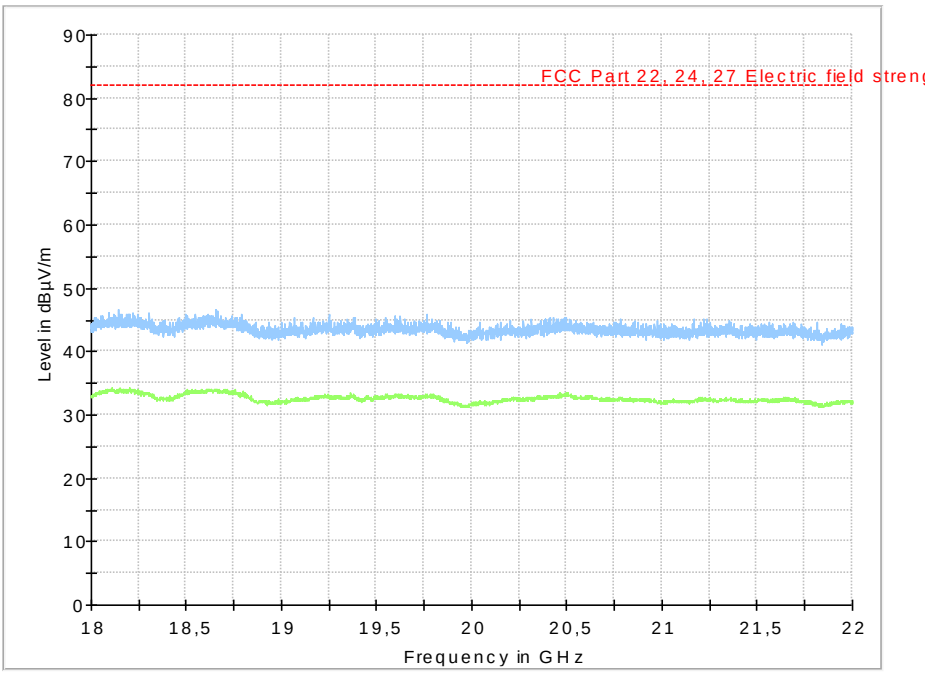


1-18 GHz high channel

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address

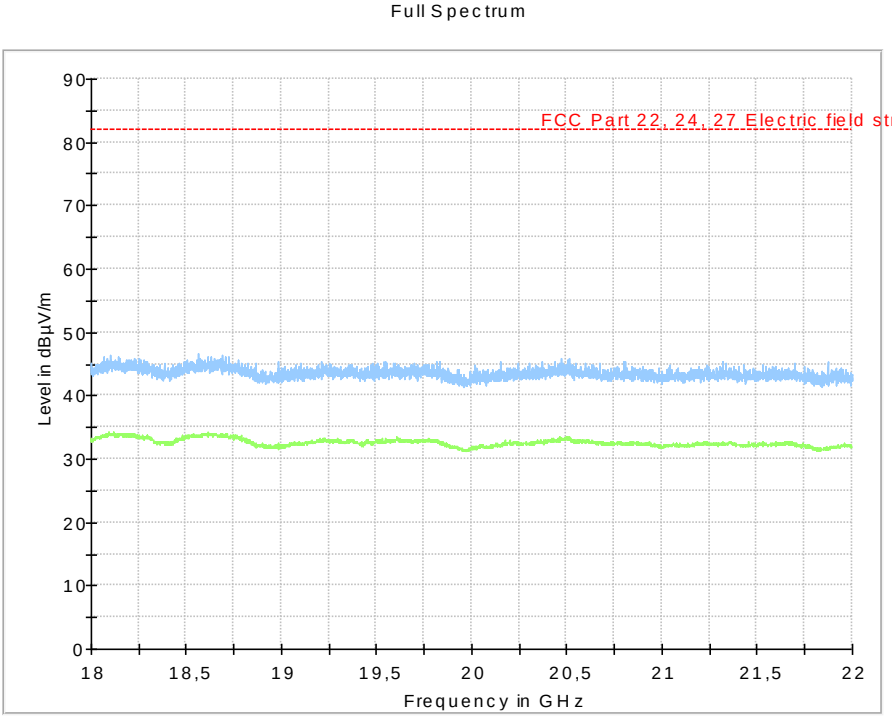


18-22 GHz low channel



18-22 GHz mid channel

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address



18-22 GHz high channel

Frequency (MHz)	QuasiPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol
48.817	48.3	-	82.2	33.9	V
56.051	56.8	-	82.2	31.4	V
60.022	42.5	-	82.2	45.7	V
121.042	49.0	-	82.2	39.2	H
121.064	49.0	-	82.2	39.2	H
163.147	35.3	-	82.2	46.9	V

10.5 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Measurement receiver	Rohde & Schwarz	ESI 26	32291	7/2017
Measurement receiver	Rohde & Schwarz	ESU 40	13178	7/2017
UltraLog antenna	Rohde & Schwarz	HL562	30711	12/2017
Horn antenna	Rohde & Schwarz	HF907	32307	7/2018
Pre amplifier	Rohde & Schwarz	TS-pre1	32306	7/2017
Horn antenna + preamp	Bonn	BLMA 1826-5A	31247	1/2020
Rf cable	Megaphase	GC12-K1K1-315	39127	7/2017

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address

11 FREQUENCY STABILITY

Date of test:	2017-03-29	Test location:	EMC center
EUT Serial:	99992	Ambient temp.	20 ºC
Tested by:	MTV	Relative humidity	33 %
Test result:	Pass	Margin:	NA

11.1 Requirement

CFR 47 §27.54 and RSS-139 clause 6.4 The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

11.2 Test set-up and test procedure

The frequency stability shall be measured with variation of ambient temperature as follows:(1) From −30° to + 50° centigrade at intervals of not more than 10° centigrade through the range.

The frequency stability shall be measured with variation of primary supply voltage as follows: Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment

Signal generator generating a CW signal was connected to the FOI unit which converted rf signal to optical signal. The optical signal was then fed via fibre to the EUT.
The EUT's output port was connected to frequency counter via rf cables and 30 dB attenuator.

11.3 Test results

Temperature (ºC)	Voltage	Test signal frequency (Hz)	Output signal frequency (Hz)	Deviation (Hz)	Result
+50	120V / 60 Hz	2150 000 000	2150 000 000	0	Pass
+40	120V / 60 Hz	2150 000 000	2150 000 000	0	Pass
+30	120V / 60 Hz	2150 000 000	2150 000 000	0	Pass
+10	120V / 60 Hz	2150 000 000	2150 000 000	0	Pass
0	120V / 60 Hz	2150 000 000	2150 000 000	0	Pass
-10	120V / 60 Hz	2150 000 000	2150 000 000	0	Pass
-20	120V / 60 Hz	2150 000 000	2150 000 000	0	Pass
-30	120V / 60 Hz	2150 000 000	2150 000 000	0	Pass

Temperature (ºC)	Voltage	Test signal frequency (Hz)	Output signal frequency (Hz)	Deviation (Hz)	Result
+20	120V / 60 Hz	2150 000 000	2150 000 000	0	
+20	85V / 60 Hz	2150 000 000	2150 000 000	0	Pass
+20	276V / 60 Hz	2150 000 000	2150 000 000	0	Pass

11.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Signal generator	Rohde & Schwarz	SMIQ 03	12792	7/2017
Frequency counter	Phillips	PM6685R/07	5616	4/2017
Climate chamber	Vötsch	VC4100	8848	4/2017

12 MEASUREMENT UNCERTAINTY

Uncertainties summary

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT.
Measurement uncertainty is calculated in accordance with EA-4/02-1997.
The measurement uncertainty is given with a confidence of 95% (k=2).

Radiated disturbance, field strength, 30 MHz - 1000 MHz	
30 to 300 MHz at 3 m	± 4,7 dB
200 to 1000 MHz at 3 m	± 4,8 dB
Radiated disturbance, field strength, 1 to 40 GHz in Semi Anechoic Chambers "Stora Hallen"and "Björkhallen"	
1 to 18 GHz with filter or attenuator	± 5,4 dB
1 to 18 GHz without filter or attenuator	± 5,2 dB
18 to 26 GHz without filter or attenuator	± 5,5 dB
Conducted disturbances at the antenna port on radio equipment	
Frequency range 9 kHz – 1 GHz	± 0,9 dB
Frequency range 1 GHz – 7 GHz	± 1,4 dB
Frequency range 7 GHz -18GHz	± 2,4 dB
Frequency range 18 GHz -26,5GHz	± 3,0 dB
Output power	
Digital signals, conducted	± 0,6 dB
Peak power density	
Conducted:	
Spectrum analyser	± 2,5 dB

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30
www.intertek.se
Registered in Sweden: No: SE556024059901, Registered office: As address