CANADA:

16 - 211 Schoolhouse Street

Coquitlam, British Columbia

Canada V3K 4X9

ELECTROMAGNETIC COMPATIBILITY TEST REPORT TO FCC 47 CFR Part 24 & INDUSTRY CANADA RSS-133 Issue 6

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Testing laboratory:	Quality Auditing Institute
Address:	16 – 211 Schoolhouse Street, Coquitlam, BC, V3K 4X9, Canada

Accreditations (ISO 17025):

Standard Council of Canada: Accredited Laboratory No. 743
International Accreditation Service Inc.: Accredited Laboratory: No. TL-239

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Applicant's name:	Star Solutions International, Inc.
Address:	Suite 120 4600 Jacombs Road, Richmond BC, V6V 3B1, Canada
Contact:	Rundeep Chatha, rundeep.chatha@starsolutions.com
Industry Canada Registration :	8076A-60901001
FCC Registration:	S52-6-09-01-00-1

Test Standard:	RSP-100 Iss 9; RSS-Gen Iss 3; RSS-102 Iss 4; RSS-133 Iss 6; FCC Part 2; FCC Part 24.
Test Procedure..... :	As called by the standards above and TIA/EIA-603-C

Trade Mark:	STARSOLUTIONS
Manufacturer:	Star Solutions International Inc.
Model Number:	CG9013.0 and CG9014.0
Model Description:	iCell COMPAC GSM IP-RAN 1900MHz DC GPS iCell COMPAC GSM IP-RAN 1900MHz CPU DC GPS

CANADA:
16 - 211 Schoolhouse Street
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Revision History

Date	Report Number	Rev #	Details	Authors Initials
Jan 20, 2016	E10599-1501	0.0	Draft Report	AJ
Jan 29, 2016	E10599-1501	1.0	Final Report Issued	AJ
Feb 2, 2016	E10599-1501	2.0	Model number corrected as per TCB response	AJ

All previous versions of this Report have been superseded by the latest dated Revision as listed in the above table. Please dispose of all previous electronic and paper printed revisions accordingly.

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Section I GENERAL TEST INFORMATION

The following tests demonstrate testimony for the FCC & IC Marks for Transceivers / electromagnetic compatibility testing for this EUT as required by FCC Part 24 and IC RSS-133 Issue 6.

Test / Requirement Description	Applicable FCC Rule Parts	Applicable Industry Canada Rule Parts	Results		Pass / Fail
			Limit	Measured	
Antenna Requirements	N/A	RSS-Gen	No	No	Pass
Frequency Range(s)	2.1033(c)(5) 24.229	RSP-100(7.2)(a)	1930-1990MHz	1932.25-1987.8 MHz	Pass
RF power output at antenna terminals	2.1033(c)(6) 2.1033(c)(7) 2.1046 24.232	RSP-100(7.2)(a) RSS-133	10W(40dBm)	40.1dBm	Pass
99% Bandwidth	N/A	RSS-GEN (4.4.1) RSS-133	N/A	237.6kHz	Pass
Occupied Bandwidth (26dB)	2.1049 24.200	-	N/A	307.6kHz	Pass
Spurious Emissions at antenna terminals	2.1051 2.1057 24.238	RSS-133	-13 dBm	>20dB margin	Pass
Spurious Emissions Radiated Field Strength	2.1053 2.1057	RSS-133	-13 dBm	>20dB margin	Pass
Frequency Stability	2.1055 24.235	RSS-GEN (4.7)	1ppm	0.8ppm	Pass

Tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with CFR 47 FCC Part 24 and Industry Canada RSS-133. The manufacturer is responsible for the tested product configuration, continued product compliance with these standards listed, and for the appropriate auditing of subsequent products as required.

Tested & Report Written by:
Aman Jathaul
EMC Project Manager

Reviwed By:
Parminder Singh
Director Technical & Business Development

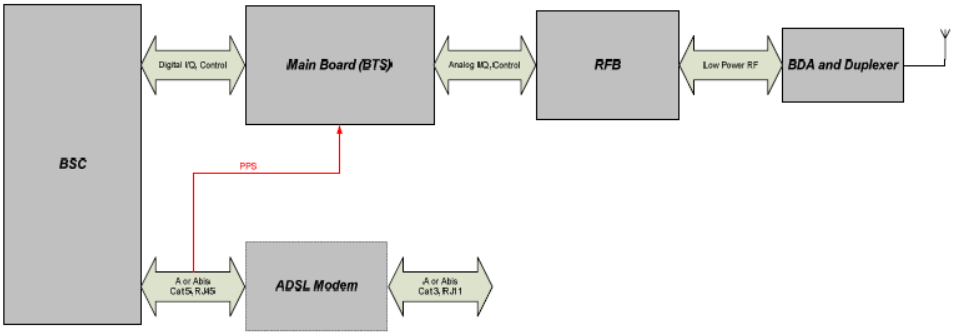
PRODUCT DESCRIPTION

Applicant: Star Solutions International, Inc.
Suite 120 – 4600 Jacombs Rd. Richmond BC, V6V 3B1, Canada

Equipment Under Test:

Part Number	FCC ID	IC ID	Model #	Description
24246871GS	S52-6-09-01-00-1	8076A-60901001	CG9013.0	iCell COMPAC GSM IP-RAN 1900MHz DC GPS
24246873GS	S52-6-09-01-00-1	8076A-60901001	CG9014.0	iCell COMPAC GSM IP-RAN 1900MHz CPU DC GPS

EUT	
Description	The Star Solutions iCell COMPAC IP-RAN (Radio Access Networks) is a complete outdoor GSM (3G) base station providing up to 10 watts RF power output or two TRX 5Watts each. The unit is passively cooled, avoiding the need for fans or air conditioning, and is specifically designed for low power consumption. The iCell COMPAC IP-RAN is a natural for use with alternative energy sources such as solar or wind powered hybrid systems when commercial power is not readily available. The iCell COMPAC IP-RAN comes with the inherent features common to all of Star Solutions' All-IP network architecture including IP interface to the network, local call routing, support for all transmission networks, including satellite, and significant reduction of backhaul bandwidth and usage. The All-IP Network distributed architecture, eliminates the need to carry traffic to a central BSC (or locatized BSC), reducing operational complexity. In addition, the COMPAC contains an integrated BSC; this provides the operators the flexibility to connect the units to a centralized BSC or to an integrated BSC. The iCell COMPAC IP-RAN can be easily transported and installed. It is ruggedized to IP-65 ratings and therefore can be mounted outdoors on pole tops, walls or building rooftops – suitable for deployment in almost any geographical location. The Compac contains Base Transceiver Station (BTS), power supplies, BDA, duplexer and a GPS receiver. The Compac BTS contains the Radio Frequency (RF) part of the system which contains the following components:, Main board, RFB, BDA, and Duplexer. The Compac BTS provides an All –IP GSM wireless cell site capable of providing up to 10 watts RF power output or two TRX with 5 watts output per TRX. The Compac BTS provides GSM single-carrier and dual carrier, single sector coverage with a 8 channel element capacity. The Compac uses a single main board that provides 1S-1F or 1S-2FA of service with 8CE where the channel is contiguous. The Compac BTS is designed to comply with the IS-97 standard for base stations for 1900 MHz Cell Band.

	 Compaq Block Diagram **Main Board** Main Board (DBB) – is the base-band board. It contains the main chips and higher layer processors chips for BTS. The GSM Base Station Controller (BSC – located on the ATOM board or remote server [Centralized at any convenient location]) controls BTS by managing call control and interconnections to the other Network Elements within the network. The BSC application is supported by an operating system that also provides platform services. **Radio Frequency Board (RFB)** Radio Frequency Board (RFB) – is the board that converts signal from/to the base-band to/from RF signal. • Radio control module (RCM) controls the RFB (Gain, PLL programming) and reads the temperature sensors. • BDA control Module – Enables/Disables the BDA, and reads temperature.
Antenna	No antenna was provided with this sample.
Ratings	48VDC
Test Channels	Lowest: 1932.2MHz Middle:1977.8MHz Highest:1987.8MHz
Software and Firmware	Production Release BTS Firmware Version 2.13.1.0 and ConfigCenter Version VanuBSS-3.13.1.0
Received Date	December 30, 2015
Received By	Parm Singh
Auxiliary Equipment	
Description	Laptop
Manufacturer	Dell
Model No.	PP18L Windows Vista
Description	GPS Antenna
Manufacturer	Trimble
Model No.	57860-20
Description	100w 30dB Attenuator
Model No.	JCATT-0825-30-100N
Description	4 x BLU Cell Phones
Model No.	ARIA Part# T174

Cable Supplied with EUT during tests

Description	Length	Connector A	Connector B	Shielded	Ferrites
2x Shielded Ethernet cables	10m	RJ45	RJ45	Yes	Yes
GPS Port	100m	SMA MALE	TNC MALE	Yes	No

TEST FACILITIES AND ACCREDITATIONS

Laboratory Headquarters: Quality Auditing Institute

Headquarters Location/Address: 16 – 211 Schoolhouse Street, Coquitlam, BC, 3K 4X9, Canada

Associated Laboratory: Quality Auditing Institute (Remote Location)

EMC Test Laboratory Location/Address:
Malcom Knapp Research Forest 14500 Silver Valley Road Maple Ridge, B.C. Canada V4R2R3

FCC Test Site Registration Number: 226383

FCC Designation Number: CA9543

Industry Canada Test Site Registration Number (3m SAC): 9543B-1

Standard Council of Canada: ISO/IEC 17025:2005 Accredited Laboratory No. 743

International Accreditation Service Inc.: ISO/IEC 17025:2005 Accredited Laboratory: No. TL-239

US EMC Facility:

Trade Name: QAI Laboratories

Headquarters Location/Address: 834 80th St SW Suite 200, Everett, WA 98203, United States

FCC Test Site Registration Number: 307482

FCC Designation Number: US1151

Industry Canada Test Site Registration Number (3m SAC): 11876A

ISO/IEC 17025: A2LA Cert. No: 3657.01

ENVIROMENTAL CONDITIONS:

INDOORS: Temperature: 22-28ºC R.H.: 39.7 - 54.4%

TESTING METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4, FCC CFR 47 Part 2, FCC CFR 47 Part 24, and RSS-Gen, Issue 3 and RSS-133, Issue 6. The FCC testing was also done using the FCC KDB 971168 D01 Measurement Guidance for Certification of Licensed Digital Transmitters v02r02.

EUT TESTING CONFIGURATION

For the purpose of compliance testing, the EUT was powered using 48VDC. The transmitter was set for continuous operation on various frequencies in modulated modes of operation as required for the test. Only the iCell COMPAC GSM IP-RAN 1900MHz CPU DC GPS (Model Number: CG9014.0) was tested, it has the extra CPU board installed, since this was considered the same as iCell COMPAC GSM IP-RAN 1900MHz DC GPS (Model Number: CG9013.0).

WORST TEST CASE

The worst-case channel is determined as the channel with the highest output power using the narrowest Bandwidth Modulation. The highest measured output power was on Low channel at 1932.2MHz when operating in DUAL TX Mode using GPRS.

TEST SETUP

The EUT was connected to 48VDC power source. The Ethernet ports of DUT and Laptop were connected to NetScreen-5GT trusted ports. Untrusted port of the NetScreen-5GT was connected to the local router for internet connection to set up VPN. After setting up VPN, DUT was accessed and control by typing its IP address in internet explorer. On the DUT webpage settings were changed to switch from one mode of transmission to other. All the measurements were performed separately on Low middle and high channels while EUT was operating at its different modes GPRS TX1, EDGE TX1, DUAL TX GPRS and DUAL TX EDGE. During conducted measurements RF Output terminal was connected to an EMI Receiver and Spectrum Analyzer or an RF Power Meter through the appropriate cables, attenuators and filters as required to make the RF Conducted measurements. The RF Output was terminated into a 50Ohm to make the Radiated Spurious Emissions measurements. The RF GPS port was connected to a 100meter cable and a GPS antenna that was located outside to receive the GPS data from the satellites. The GPS module was used for all RF and Spurious emissions measurements. The Clock module was used for Digital mode emissions measurements.

ANTENNA DESCRIPTION

No Antenna was included with this test. The Antenna(s) used for this transmiter must be fixed-mounted on permanent outdoor structures. RF exposure compliance is addressed at the time of licensing, as required by the responsible agencies, including antenna co-location requirements.

GENERAL TEST PROCEDURES

RF Conducted Emissions

The EUT is placed on a test bench connected directly to an EMI Receive and Spectrum Analyzer Conducted emissions are measured in the frequency range 10kHz to 20GHz using CISPR Peak, Quasi-Peak and Average detectors.

Radiated Emissions

The EUT is placed on the turntable 0.8m above a ground plane 3m away from a receiving antenna. Height of receiving antenna varied from 1m to 4m, its polarity changes from vertical to horizontal. Turntable rotates 360 degrees. Motion of turntable and receiving antenna allows determining position of maximum emission level. Quasi-peak detector applies for measurements of emissions with frequency range of 30 to 1000MHz. and average/peak detector otherwise.

Radiated Emissions for Out-Of-Band Spurious Emissions

The EUT output was terminated into a 50Ohm load and the Spurious emissions were measured using the Radiated Emissions procedure. He emission level was then re-measured using the Substitution method procedure as outlined in ANSI TIA/EIA-603 section 2.2.12 .

MEASUREMENT UNCERTAINTY

Radio Frequency	±1,5 x 10-5
Total RF power, conducted.....	±1 dB
RF power density, conducted.....	±2.75 dB
Spurious emissions, conducted.....	±3 dB
All emissions, radiated.....	±3.5 dB
Temperature.....	±1ºC
Humidity.....	±5 %
DC and low frequency voltages.....	±3 %

TESTING EQUIPMENT LIST

Equipment Description	Manufacturer	Model Number	Serial No.	Cal Date	Next Cal
Loop Antenna (10kHz-30MHz)	EMCO	6502	2178	Aug 21 2014	Aug 21 2017
Biconilog Antenna (30MHz-3GHz)	Sunol Sciences	JB3	A120106	Sep 24 2014	Sep 24 2017
Biconical Antenna (30MHz-200MHz)	EMCO	3110B	9903-3260	May 7 2013	May 7 2016
Log Periodic Antenna (200-1000MHz)	Electrometrics	LPA2	1189	Sep 8 2014	Sep 8 2017
Horn Antenna (1-18GHz)	Sunol Sciences	DRH 118	A052804	Aug 21 2014	Aug 21 2017
Horn Antenna (18-26.5)	EMCO	3160-09	9701-1071	Aug 30 2013	Aug 30 2016
EMI Receiver (20Hz-40GHz)	Rhode & Schwarz	ESU40	100011	Nov 20 2014	Nov 20 2017
Spectrum Analyzer (9kHz-40GHz)	Rhode & Schwarz	FSP	1726A00566	Nov 3 2013	Nov 3 2016
Pre-amplifier (0.1-1300MHz)	HP	8447F		Jan 18 2014	Jan 18 2017
Pre-amplifier (1-26.5GHz)	HP	8449B	2933A00198	May 3 2013	May 3 2016
Pre-amplifier (0.1-18GHz)	AH Systems	PAM-0118	2641	Conditional Use	Conditional Use
Pre-amplifier (18-40GHz)	AH Systems	PAM-1840VH	2696	Conditional Use	Conditional Use
Temperature Chamber	Cincinnati Sub Zero	ZH-16-2-2-H/AC	Z0013305	Conditional Use	Conditional Use

Measurement Software List

Manufacturer	Model	Version	Description
Rhode & Schwarz	EMC 32	6.20.0	Emissions Pre-scan Test Software

Section II: EUT TEST RESULTS

Part 1 - Occupied Bandwidth (26dB and 99% Bandwidth)

DATE: Jan 18 2016

TEST STANDARD: FCC Part 24, IC RSS-133 & RSS Gen

TEST VOLTAGE: -48VDC

TEST SETUP: The antenna port of EUT was directly connected to EMI Receiver.

MEASUREMENT METHOD: As called by the standards above.

DEVICE DESCRIPTIONS: As described in the above EUT description and set up section.

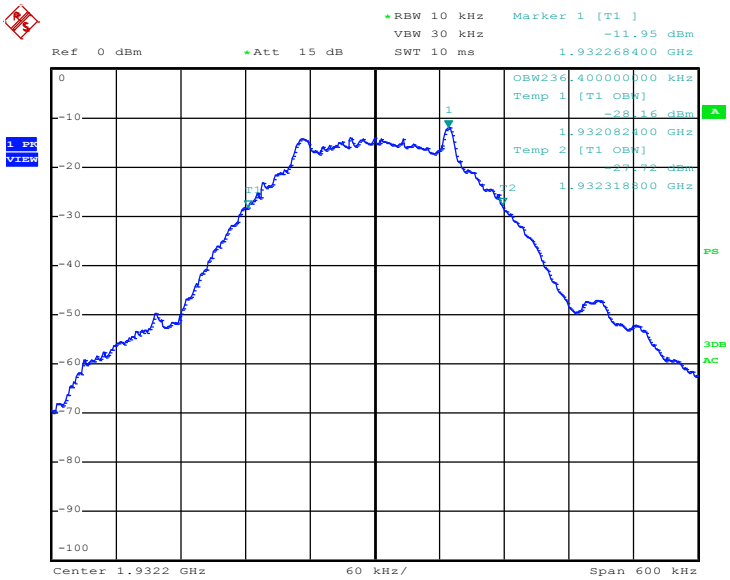
MEASURED DATA:

Frequency (MHz)	99% BW (kHz)	Mode		Frequency (MHz)	26dB BW (kHz)	Mode
1932.2	236.4	TX1 GPRS		1932.2	307.2	TX1 GPRS
1977.8	237.6	TX1 GPRS		1977.8	306	TX1 GPRS
1987.8	236.4	TX1 GPRS		1987.8	307.2	TX1 GPRS
1932.2	237.6	TX1 EDGE		1932.2	304.8	TX1 EDGE
1977.8	237.6	TX1 EDGE		1977.8	304.8	TX1 EDGE
1987.8	235.2	TX1 EDGE		1987.8	303.6	TX1 EDGE
1932.2	232.8	Dual GPRS		1932.2	300	Dual GPRS
1977.8	231.6	Dual GPRS		1977.8	301.2	Dual GPRS
1987.8	230.4	Dual GPRS		1987.8	300	Dual GPRS
1932.2	231	Dual Edge		1932.2	300	Dual Edge
1977.8	231.4	Dual Edge		1977.8	300	Dual Edge
1987.8	235.2	Dual Edge		1987.8	304.8	Dual Edge

OBSERVATIONS: The EUT performed as expected.

PERFORMANCE: Complies.

99% Occupied Bandwidth



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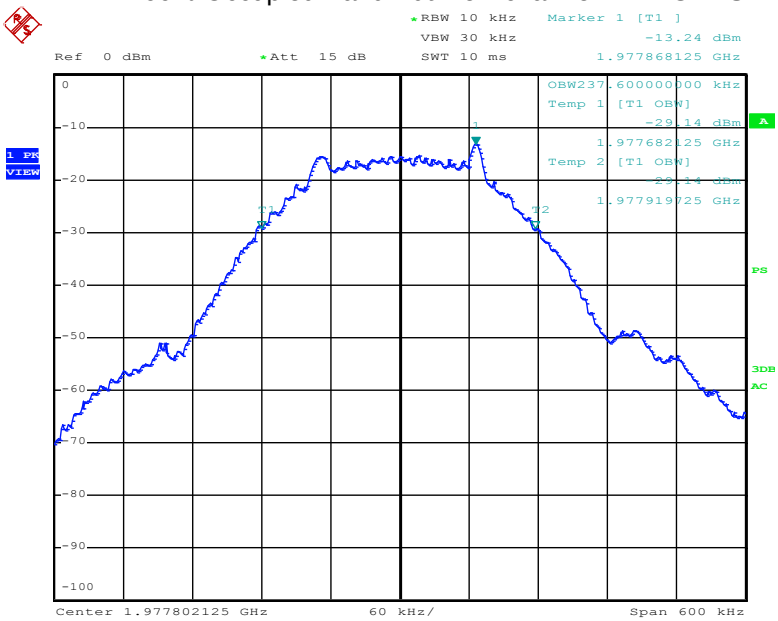
99% Occupied Bandwidth low channel- TX1 GPRS



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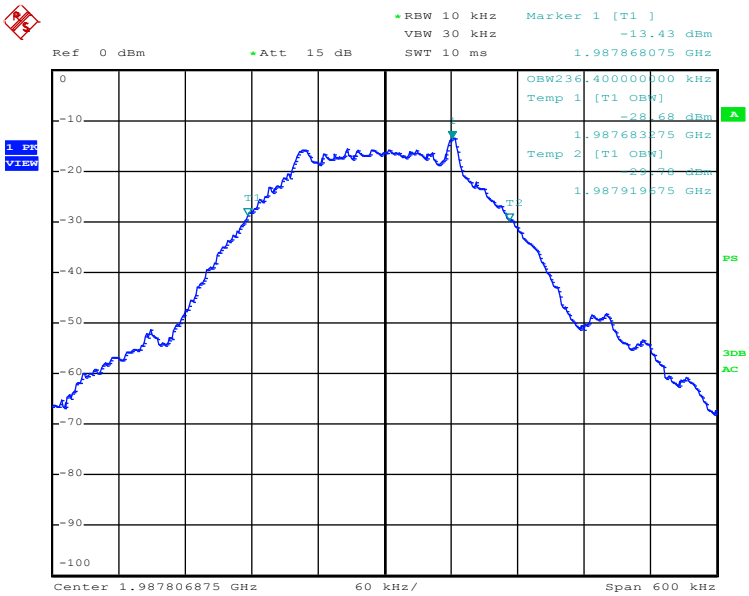

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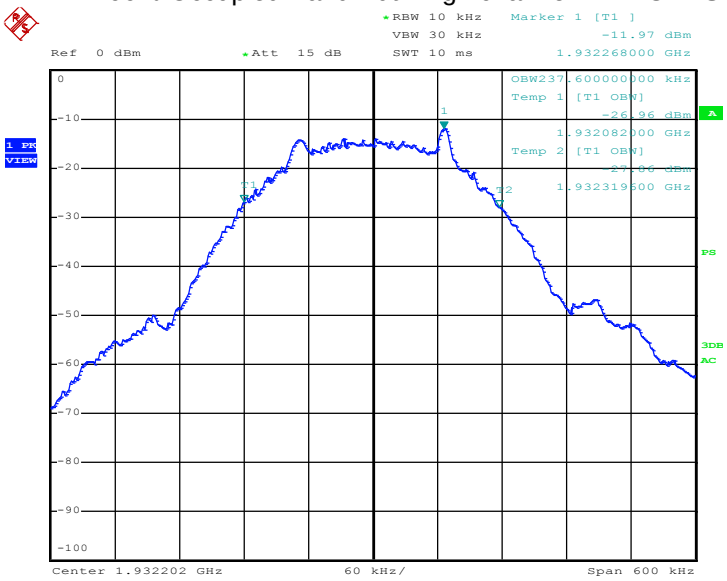

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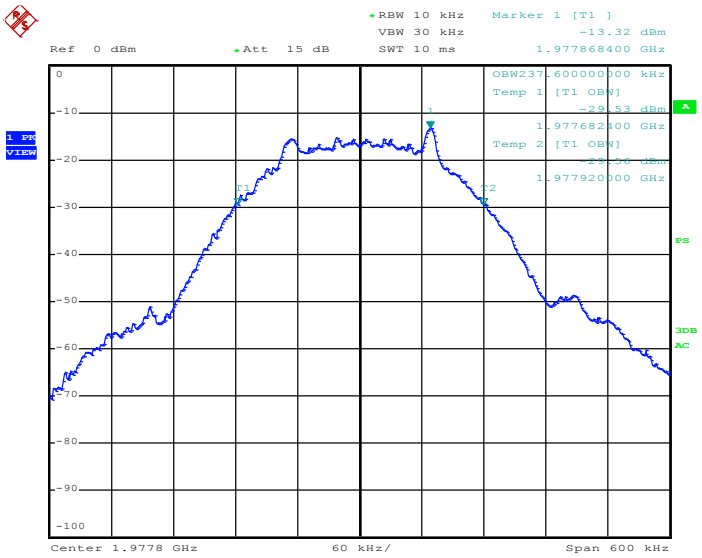

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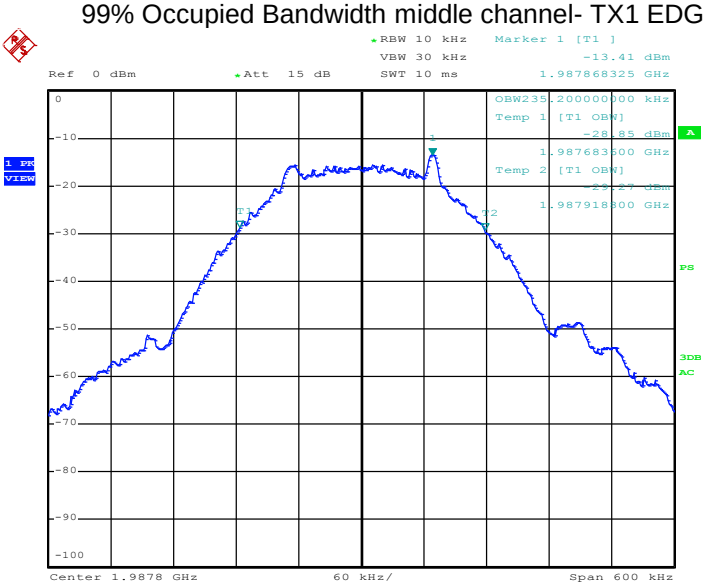

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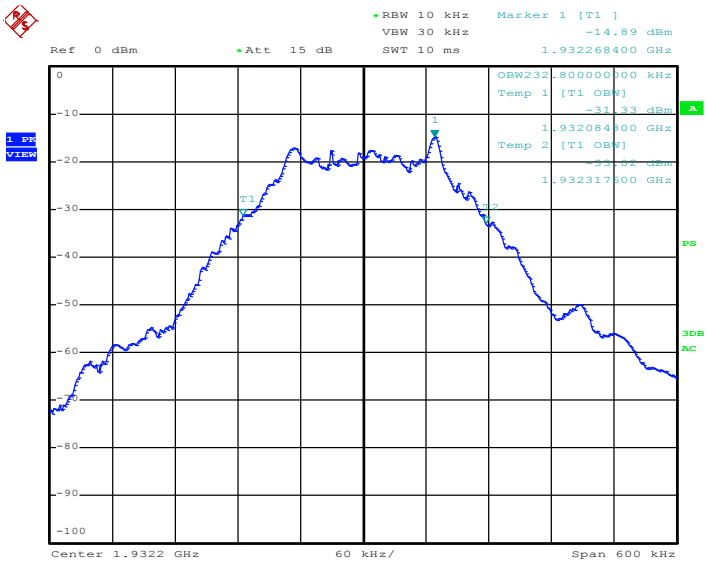

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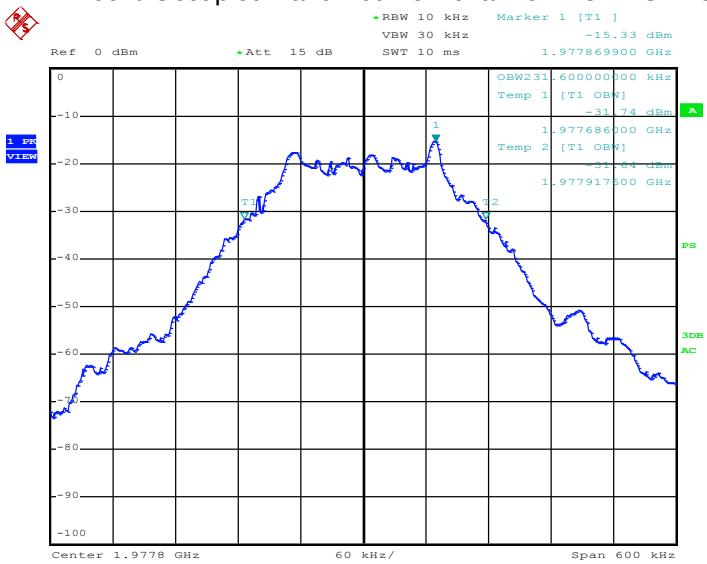
99% Occupied Bandwidth low channel- DUAL GPRS



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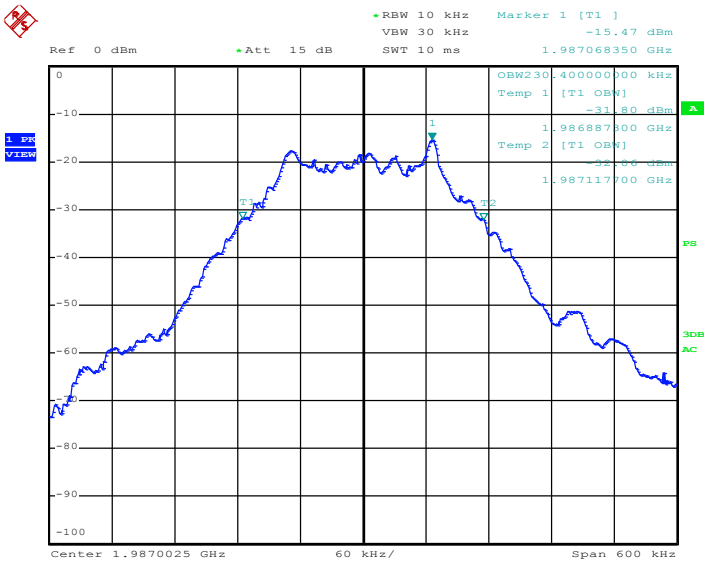

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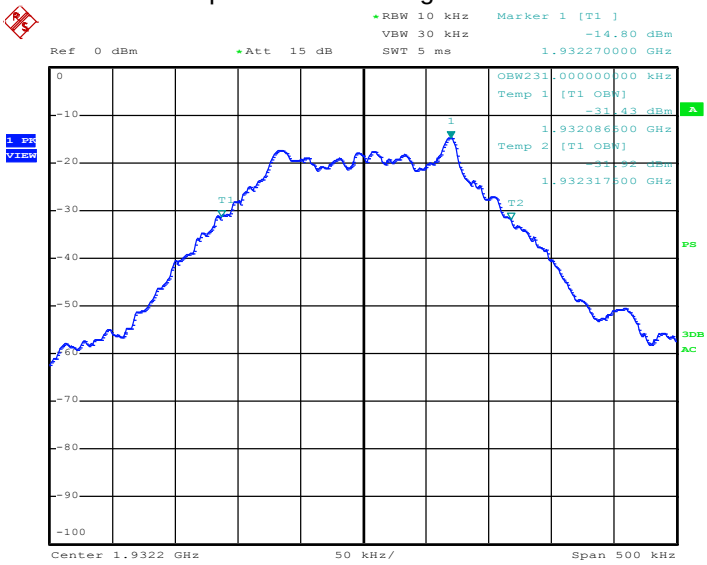

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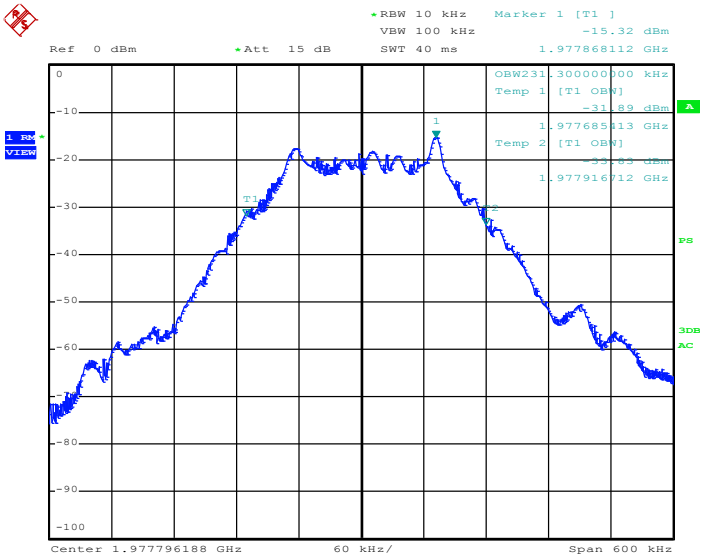

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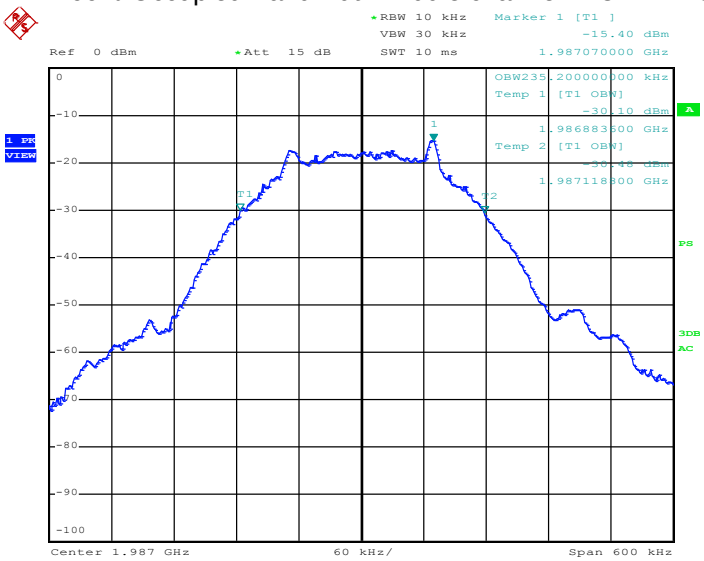
99% Occupied Bandwidth middle channel- DUAL EDGE



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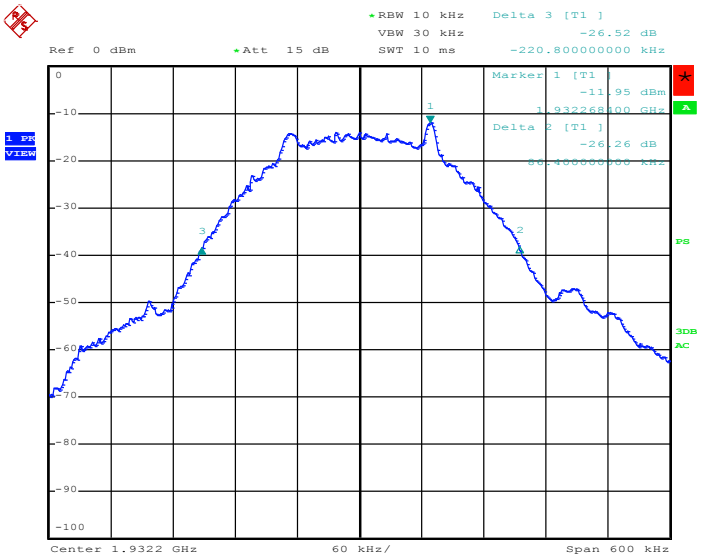
99% Occupied Bandwidth high channel- DUAL EDGE

26dB Occupied Bandwidth



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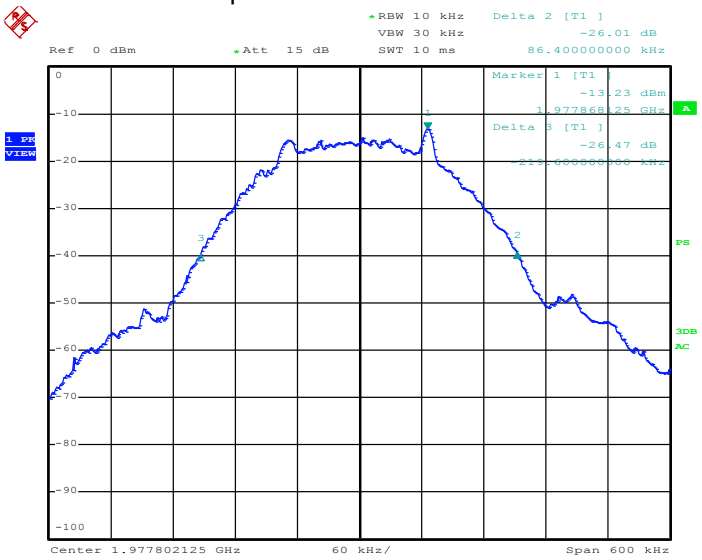
26dB Occupied Bandwidthlow channel- TX1 GPRS



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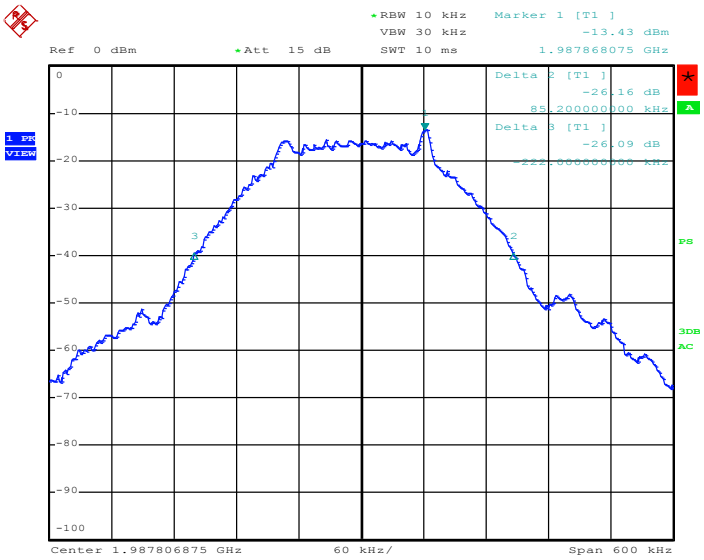

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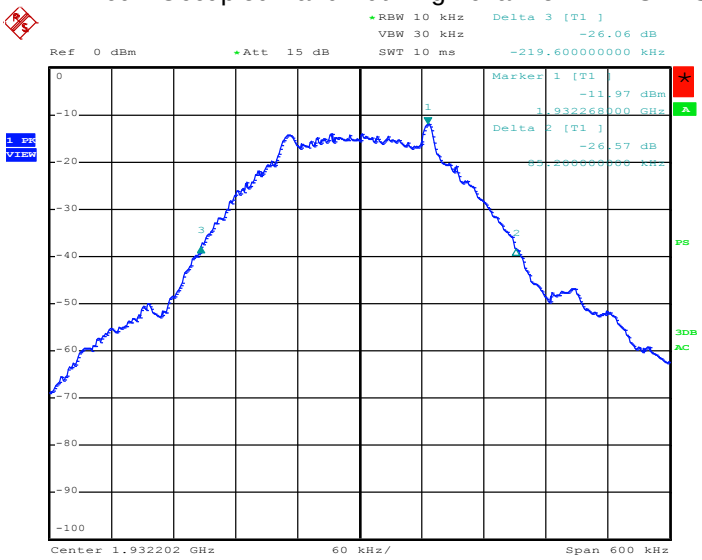
26dB Occupied Bandwidth high channel- TX1 GPRS



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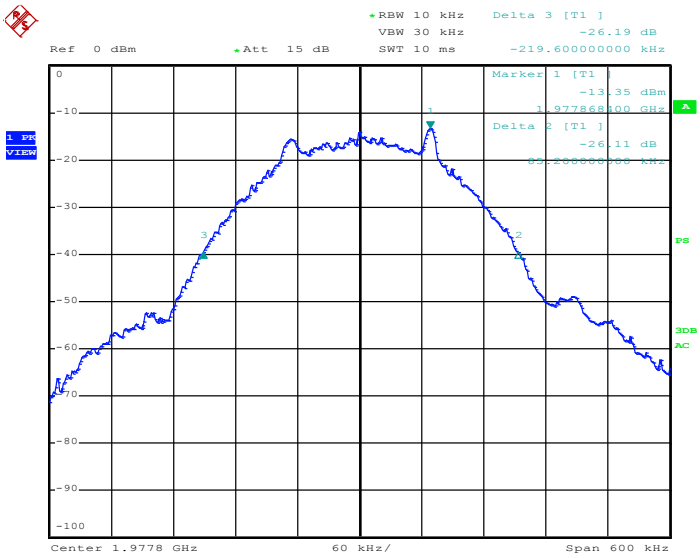
26dB Occupied Bandwidth low channel- TX1 EDGE



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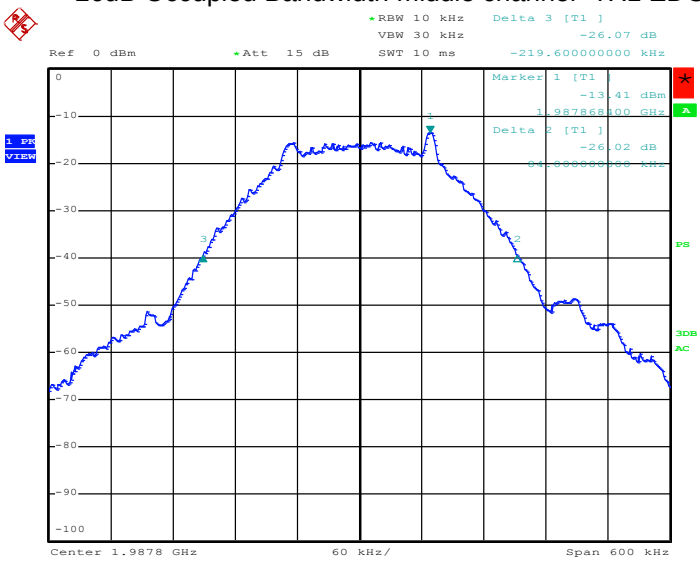
26dB Occupied Bandwidth middle channel- TX1 EDGE



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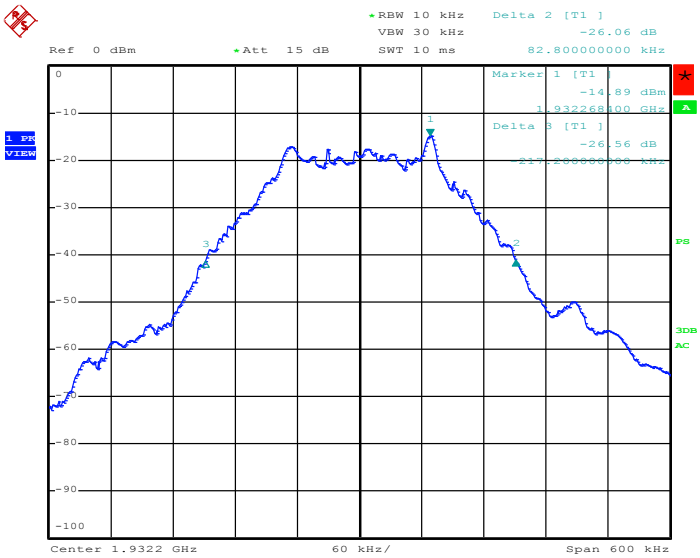
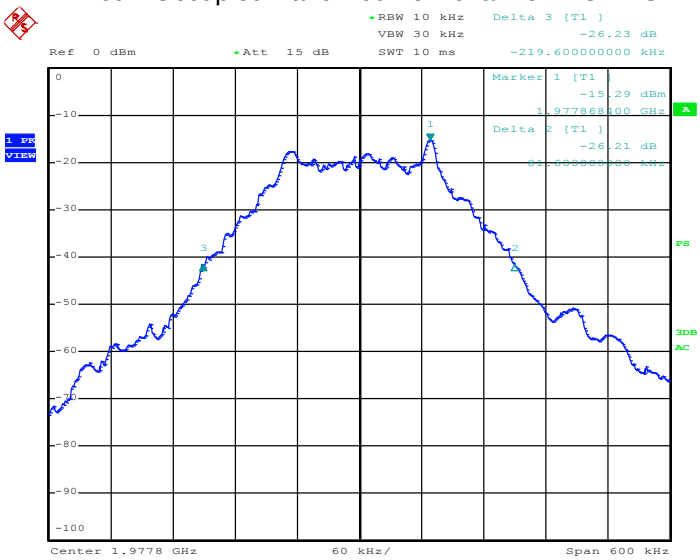
26dB Occupied Bandwidth high channel- TX1 EDGE



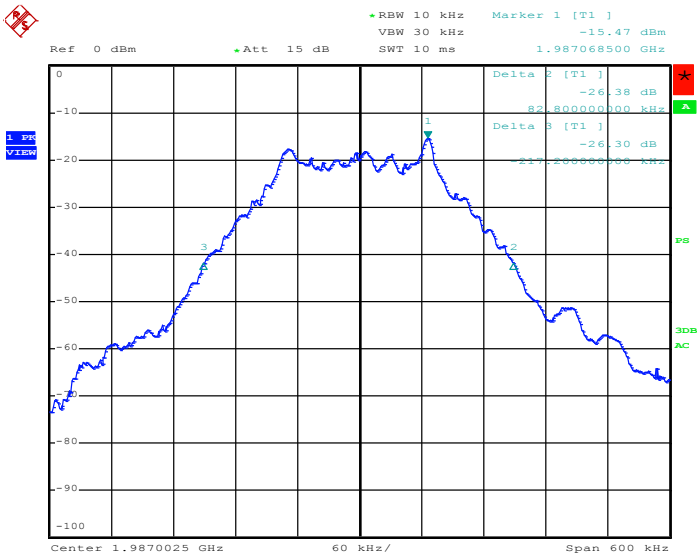
Date: 18.JAN.2016 15:41:28

26dB Occupied Bandwidth low channel- DUAL GPRS



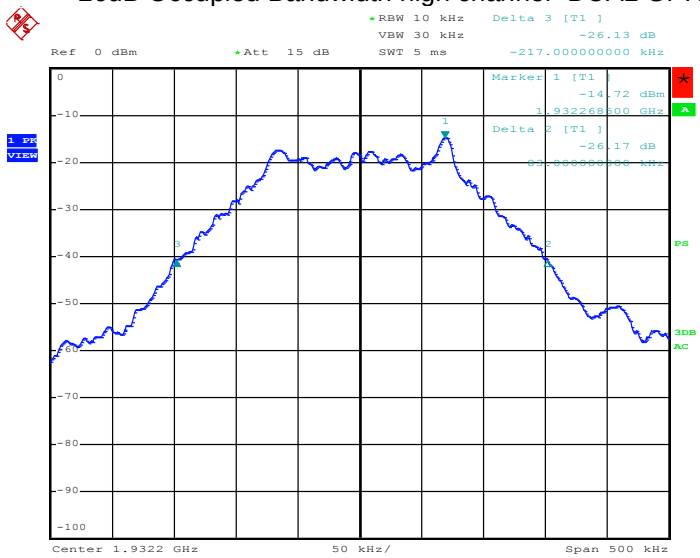
Date: 18.JAN.2016 16:49:43

26dB Occupied Bandwidth middle channel- DUAL GPRS



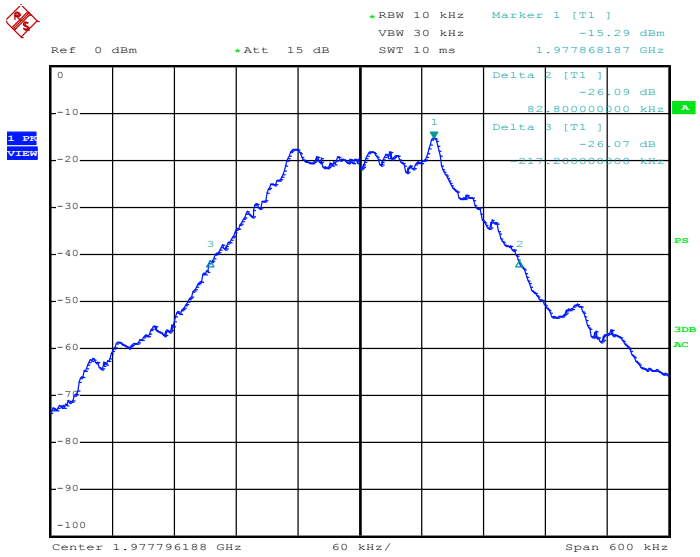
Date: 18.JAN.2016 17:04:22

26dB Occupied Bandwidth high channel- DUAL GPRS



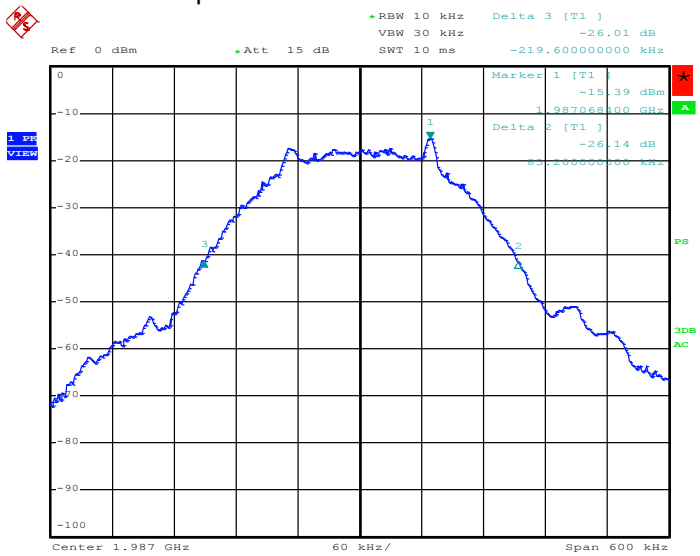
Date: 18.JAN.2016 17:35:06

26dB Occupied Bandwidth low channel- DUAL EDGE



Date: 18.JAN.2016 18:10:49

26dB Occupied Bandwidth middle channel- DUAL EDGE



Date: 18.JAN.2016 18:37:22

26dB Occupied Bandwidth high channel- DUAL EDGE

Part 2 - RF Output Power

DATE: Jan 18 2016

TEST STANDARD: FCC Part 24 and IC RSS-133

TEST VOLTAGE: -48VDC

MINIMUM STANDARD: Output Power specified by the Manufacturer is 10W(40dBm)

TEST SETUP: The antenna port of EUT was directly connected to EMI Receiver.

MEASUREMENT METHOD: As called by the standards above.

DEVICE DESCRIPTIONS: As described in the above EUT description and set up section.

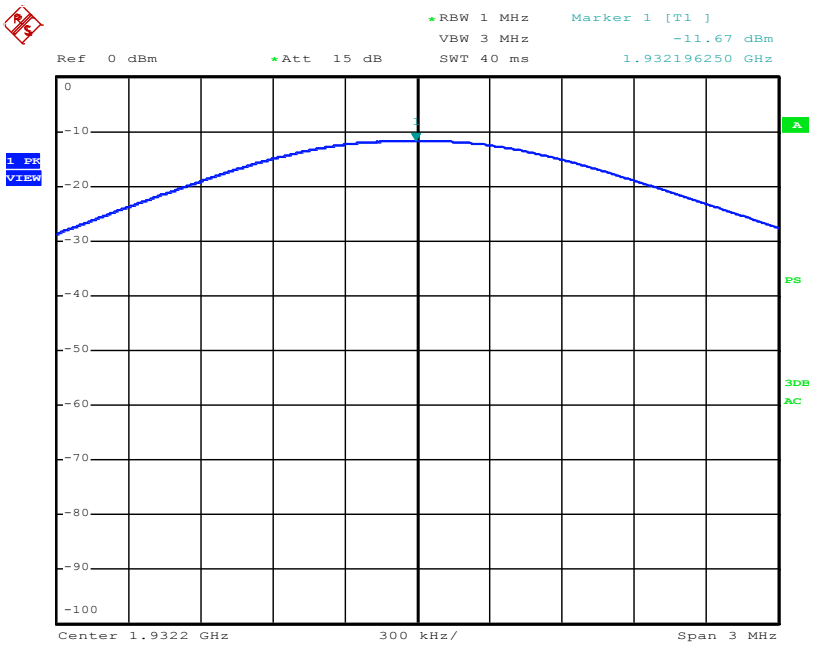
EMISSIONS DATA:

Frequency (MHz)	Raw Peak (dBm)	Correction Factor (dB)	Corrected Peak Power (dBm)	Transmitting Mode
1932.2	-11.68	51.36	39.68	TX1 GPRS
1977.8	-12.83	51.28	38.45	TX1 GPRS
1987.8	-13.28	51.23	37.95	TX1 GPRS
1932.2	-11.86	51.36	39.5	TX1 EDGE
1977.8	-12.99	51.28	38.29	TX1 EDGE
1987.8	-13.24	51.23	37.99	TX1 EDGE
1932.2	-11.2	51.36	40.16	Dual GPRS
1977.8	-11.3	51.28	39.98	Dual GPRS
1987.8	-11.4	51.23	39.83	Dual GPRS
1932.2	-11.2	51.36	40.16	Dual EDGE
1977.8	-11.27	51.28	40.01	Dual EDGE
1987.8	-11.34	51.23	39.89	Dual EDGE

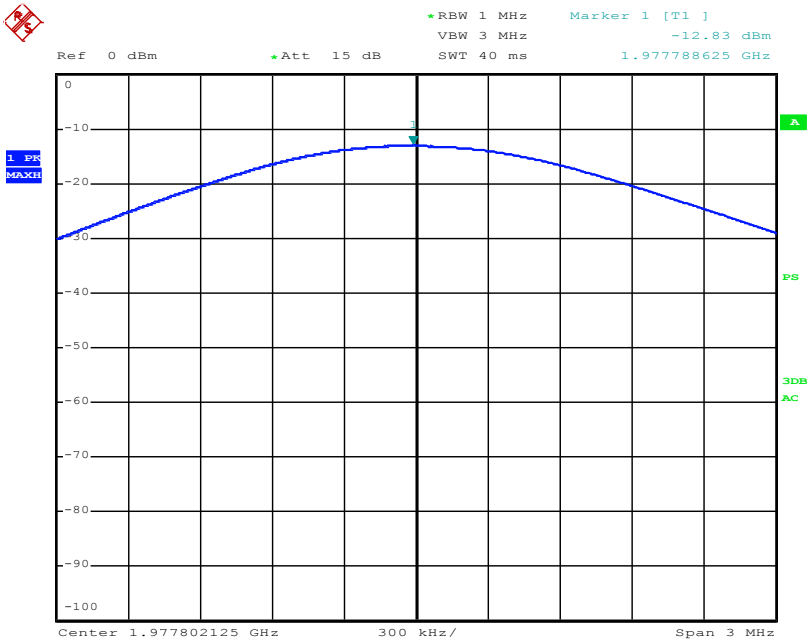
OBSERVATIONS: The EUT performed as expected.

PERFORMANCE: Complies.

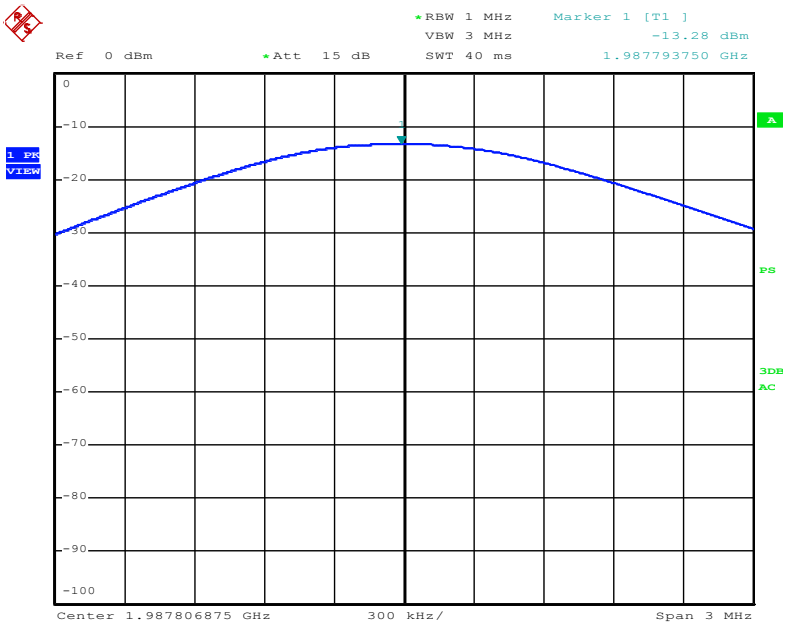
RF Output Power Plots



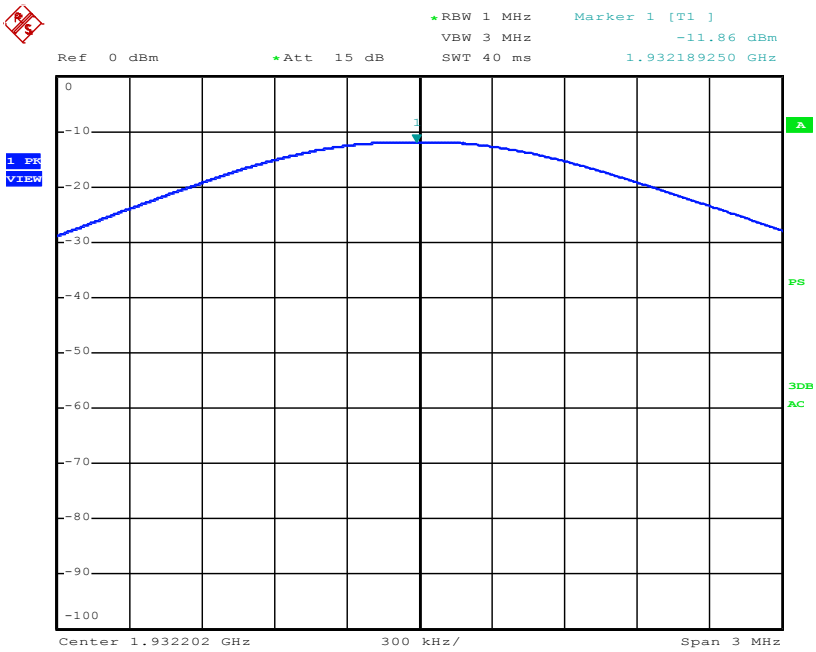
RF Output Power Low channel- TX1 GPRS



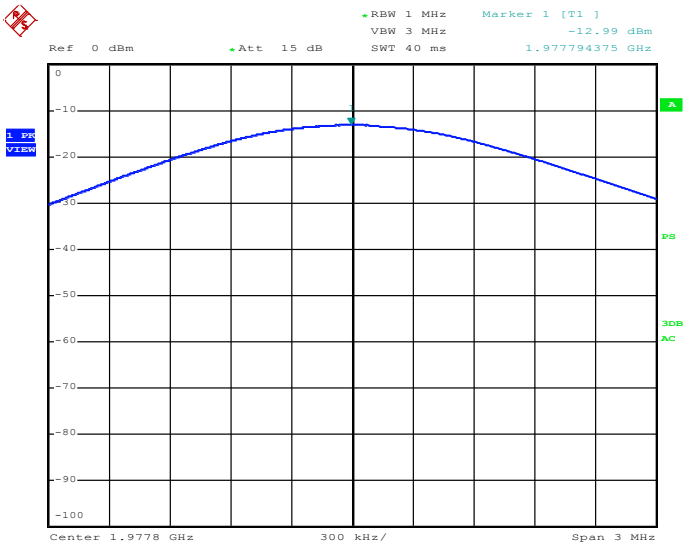
RF Output Power Middle channel- TX1 GPRS



RF Output Power High channel- TX1 GPRS

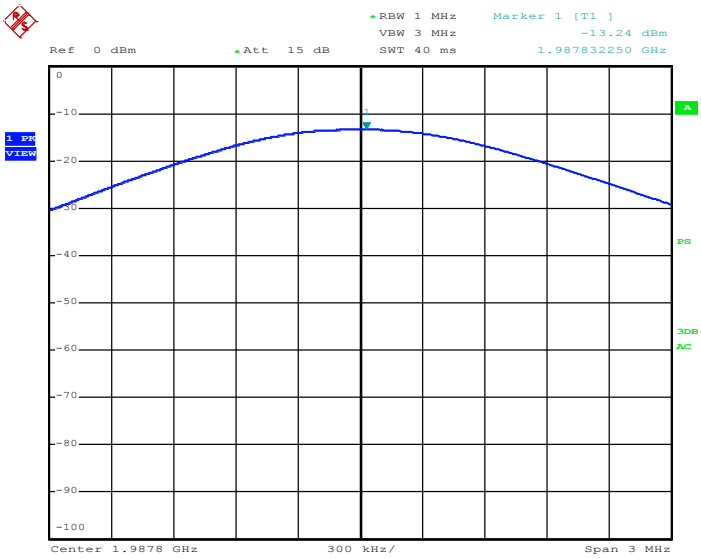


RF Output Power Low channel- TX1 EDGE



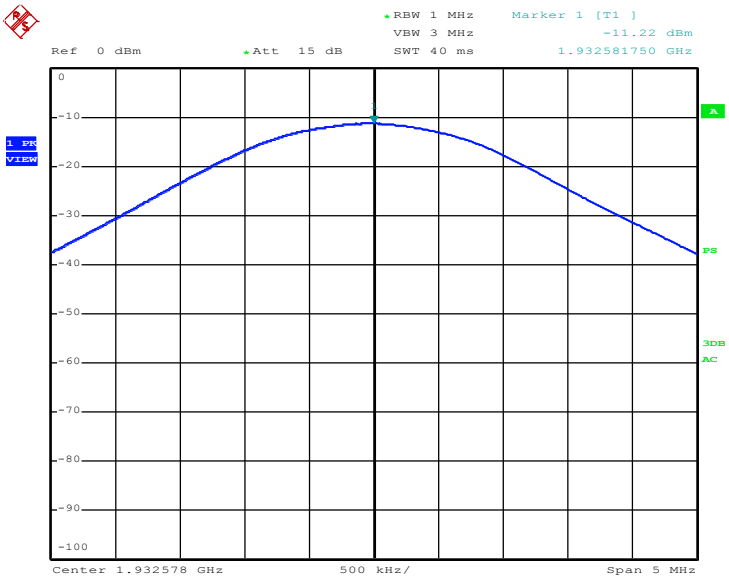
Date: 18.JAN.2016 14:08:15

RF Output Power Middle channel- TX1 EDGE



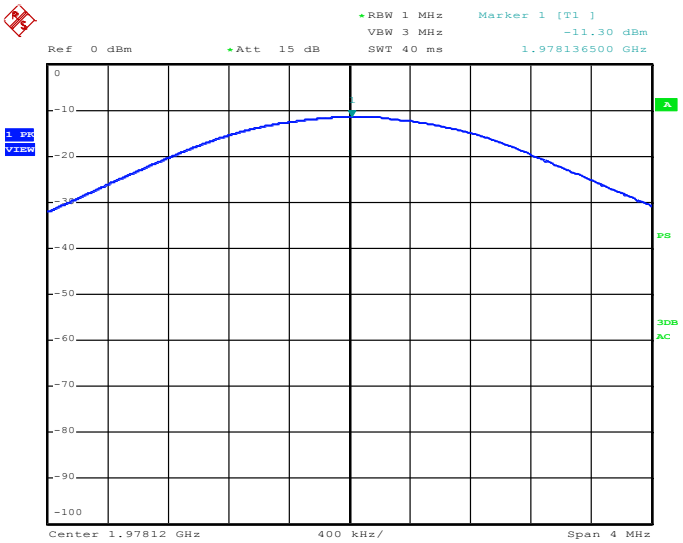
Date: 18.JAN.2016 14:26:46

RF Output Power High channel- TX1 EDGE



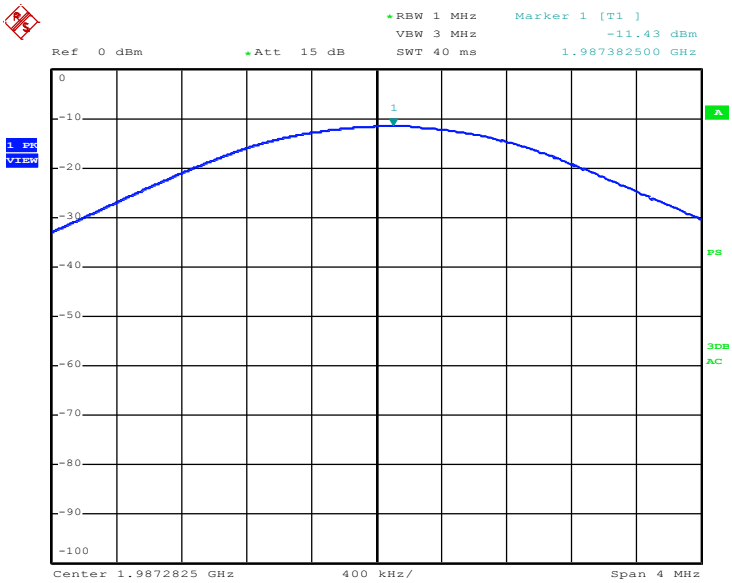
Date: 18.JAN.2016 15:45:30

RF Output Power Low channel- Dual GPRS



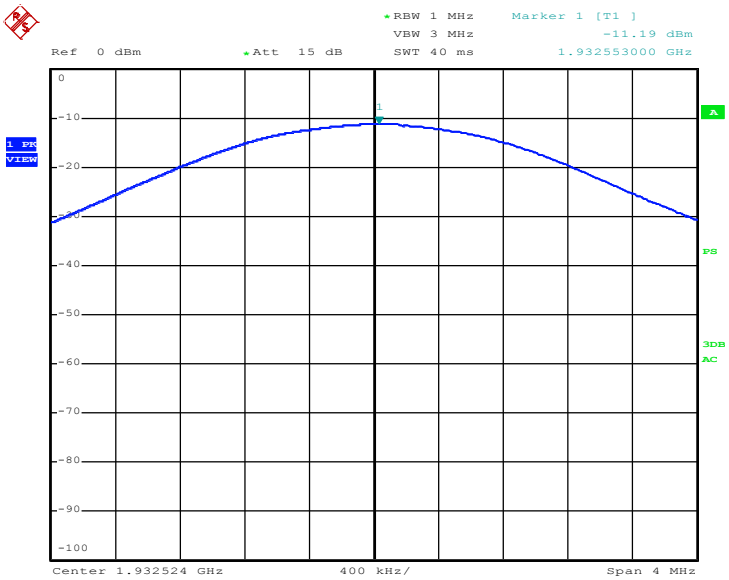
Date: 18.JAN.2016 16:51:39

RF Output Power Middle channel- Dual GPRS



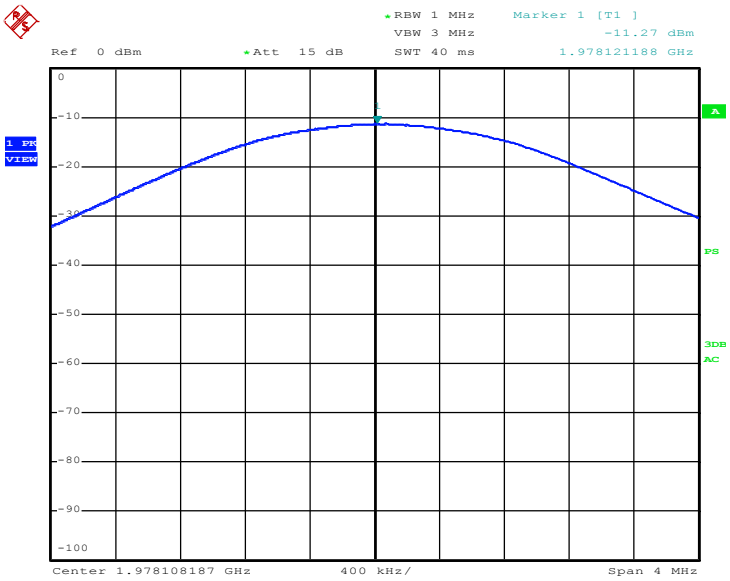
Date: 18.JAN.2016 17:07:03

RF Output Power High channel- Dual GPRS



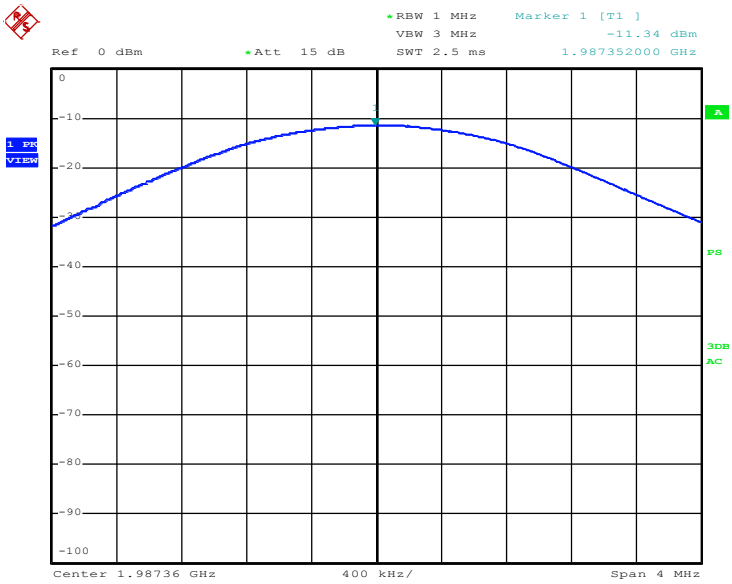
Date: 18.JAN.2016 17:38:32

RF Output Power Low channel- Dual EDGE



Date: 18.JAN.2016 18:12:32

RF Output Power Middle channel- Dual EDGE



Date: 18.JAN.2016 18:39:17

RF Output Power High channel- Dual EDGE

Part 3 - Peak-to-Average ratio

DATE(s): Jan 18, 2016

TEST STANDARD: FCC Part 24 and IC RSS-133

TEST VOLTAGE: 48VDC

MINIMUM STANDARD: 13dB

TEST SETUP: The antenna port of EUT was directly connected to a spectrum analyzer.

MEASUREMENT METHOD: As called by the standards above.

Average output power measurements measurement were performed as per procedure defined in clause 5.2.1 of Measurement guidance for certification of Licensed Digital transmitters. (i.e. 971168 D01 Power Meas License Digital Systems v02r02).

Peak output power measurements measurement were performed as per procedure defined in clause 5.1.1 of Measurement guidance for certification of Licensed Digital transmitters. (i.e. 971168 D01 Power Meas License Digital Systems v02r02).

DEVICE DESCRIPTIONS: As described in the above EUT description and set up section.

MEASURED DATA:

Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor (dB)	Corrected Peak (dBm)	Corrected Avg (dBm)	Peak to Avg Ratio (dB)	Limit PAR (dBm)	Transmitting Mode
1932.2	-11.68	-15.1	51.36	39.68	36.26	3.42	13	TX1 GPRS
1977.8	-12.83	-16.37	51.28	38.45	34.91	3.54	13	TX1 GPRS
1987.8	-13.28	-16.54	51.23	37.95	34.69	3.26	13	TX1 GPRS
1932.2	-11.86	-15.09	51.36	39.5	36.27	3.23	13	TX1 Edge
1977.8	-12.99	-16.47	51.28	38.29	34.81	3.48	13	TX1 Edge
1987.8	-13.24	-16.53	51.23	37.99	34.7	3.29	13	TX1 Edge
1932.2	-11.22	-17.9	51.36	40.14	33.46	6.68	13	Dual GPRS
1977.8	-11.3	-18.34	51.28	39.98	32.94	7.04	13	Dual GPRS
1987.8	-11.43	-18.59	51.23	39.8	32.64	7.16	13	Dual GPRS
1932.2	-11.19	-17.99	51.36	40.17	33.37	6.8	13	Dual EDGE
1977.8	-11.27	-18.34	51.28	40.01	32.94	7.07	13	Dual EDGE
1987.8	-11.34	-18.56	51.23	39.89	32.67	7.22	13	Dual EDGE

OBSERVATIONS: The EUT performed as expected.

PERFORMANCE: Complies.

Part 4 - Unwanted Emissions - BandEdge

DATE(s): Jan 18 2016

TEST STANDARD: FCC Part 24 and IC RSS-133

TEST VOLTAGE: 48VDC

MINIMUM STANDARD: -13dBm

TEST SETUP: The antenna port of EUT was directly connected to a spectrum analyzer.

MEASUREMENT METHOD: Measurements were performed at all mode of operation for the lowest and highest frequency within the band. The required measurement resolution bandwidth (RBW) is 1% of the emission bandwidth. Measurements were made at the RBW sufficient to show detail at edge of band. Therefore data presented must be corrected to the measurement bandwidth using the formula. The data in the following table must be added to the reading in the graph for the modulation under consideration. (Measurement guidance for certification of Licensed Digital transmitters. (i.e. 971168 D01 Power Meas License Digital Systems v02r02).

DEVICE DESCRIPTIONS: As described in the above EUT description and set up section.

MEASURED DATA:

Transmitting Mode	Block Edge (MHz)	Measured Level (dBm)	RBW Correction Factor (dB)	Corrected Level (dBm)	Limit (dBm)
TX1 GPRS	1930	-34.2	-2.11	-36.31	-13
TX1 GPRS	1990	-33.67	-2.11	-35.78	-13
TX1 EDGE	1930	-34.2	-2.14	-36.34	-13
TX1 EDGE	1990	-34.65	-2.16	-36.81	-13
Dual GPRS	1930	-20.83	0	-20.83	-13
Dual GPRS	1990	-25.16	0	-25.16	-13
Dual Edge	1930	-21.81	0.07	-21.74	-13
Dual Edge	1990	-27.9	0.07	-27.83	-13

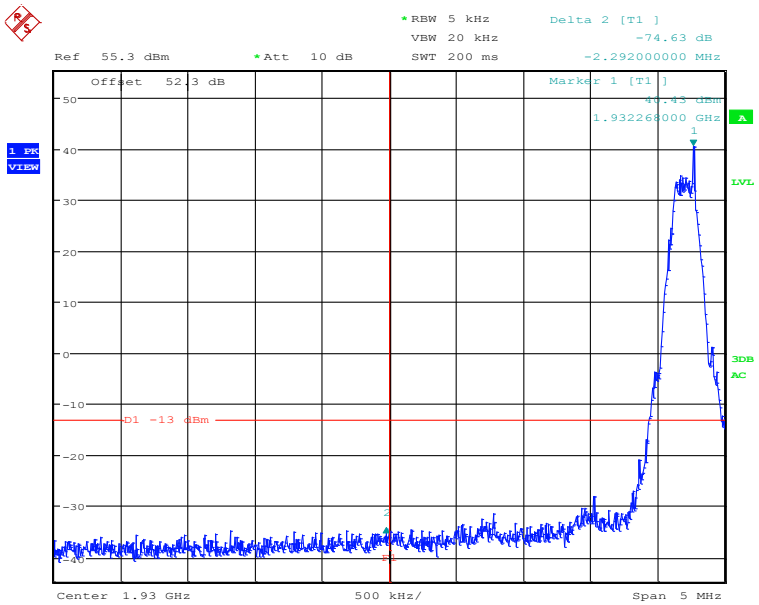
RBW Correction Factor

Transmitting Mode	Measured RBW (kHz)	Actual RBW (kHz)	RBW Correction Factor (dB)
TX1 GPRS	5	3.072	-2.11548793
TX1 GPRS	5	3.072	-2.11548793
TX1 EDGE	5	3.048	-2.149550417
TX1 EDGE	5	3.036	-2.166682371
Dual GPRS	3	3	0
Dual GPRS	3	3	0
Dual Edge	3	3	0
Dual Edge	3	3.048	0.068937079

OBSERVATIONS: The EUT performed as expected.

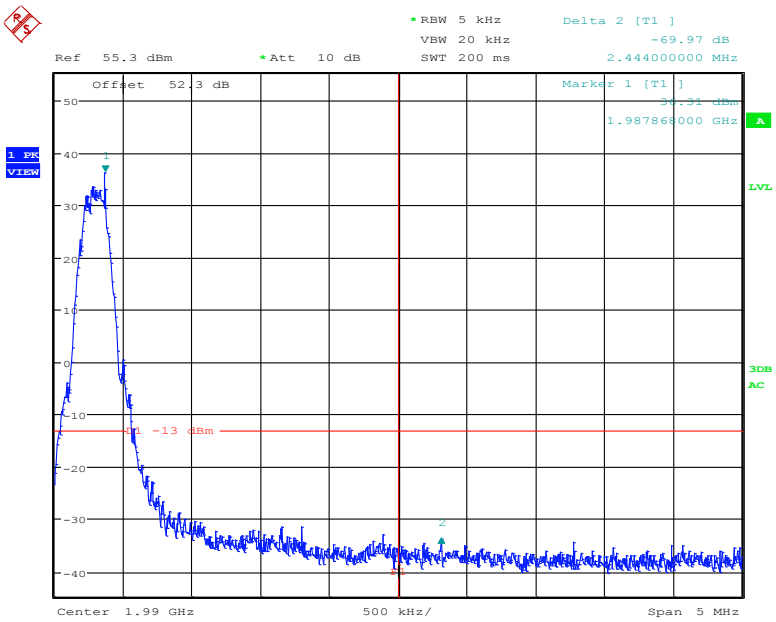
PERFORMANCE: Complies.

Bandedge Plots



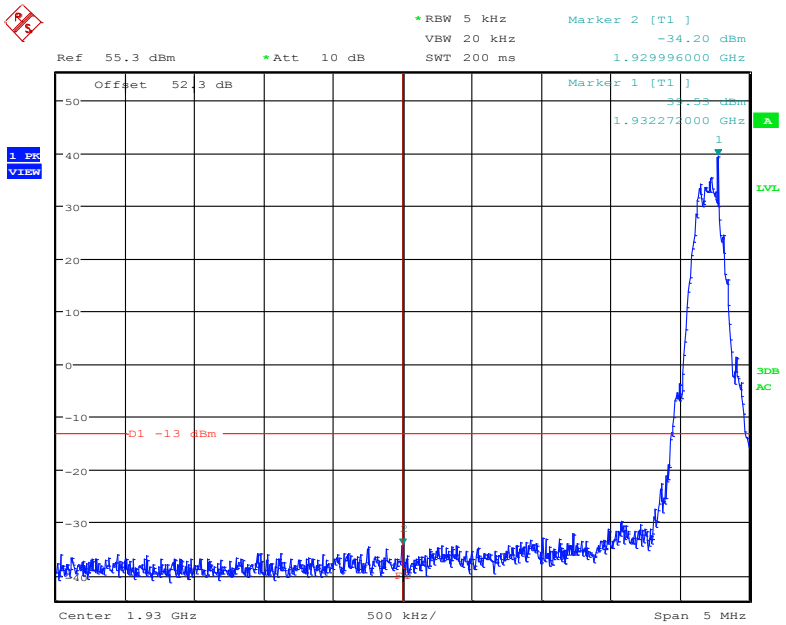
Date: 20.JAN.2016 17:34:59

Bandedge - Low Channel TX1 GPRS



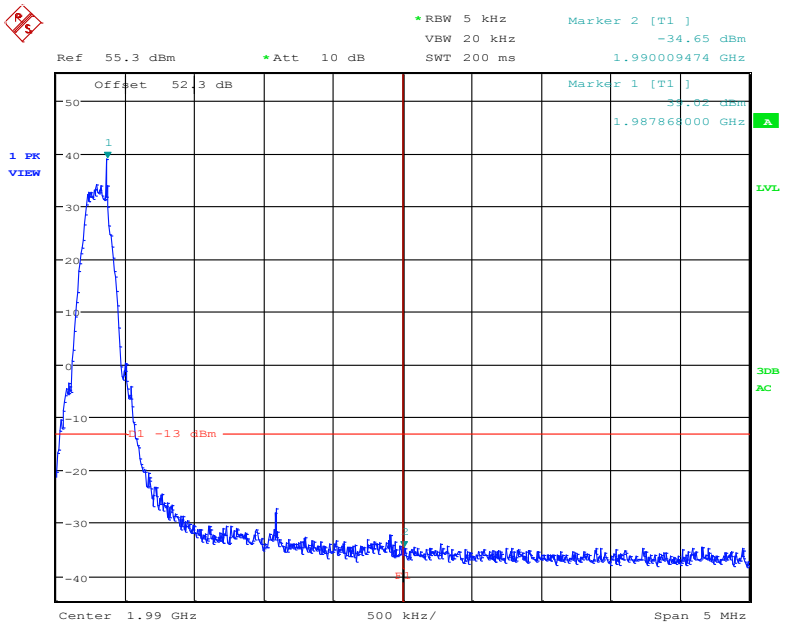
Date: 20.JAN.2016 17:30:10

Bandedge - High Channel TX1 GPRS



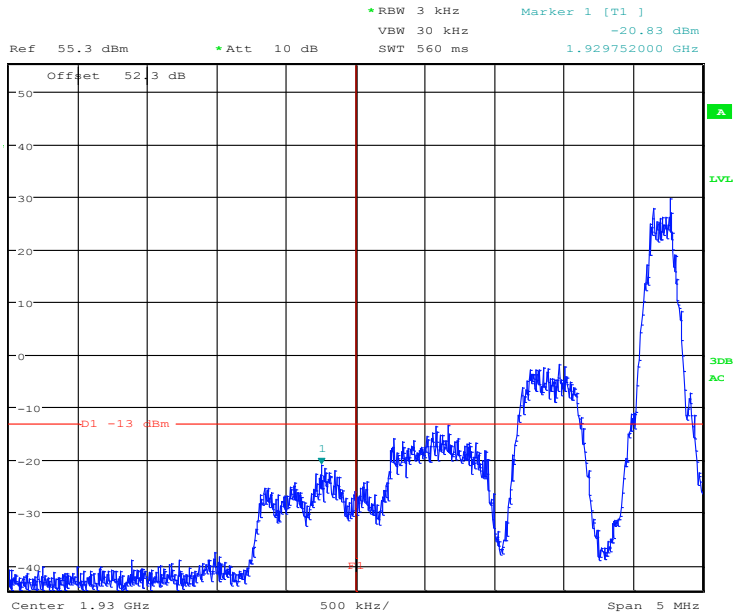
Date: 20.JAN.2016 17:24:02

Bandedge - Low Channel TX1 EDGE

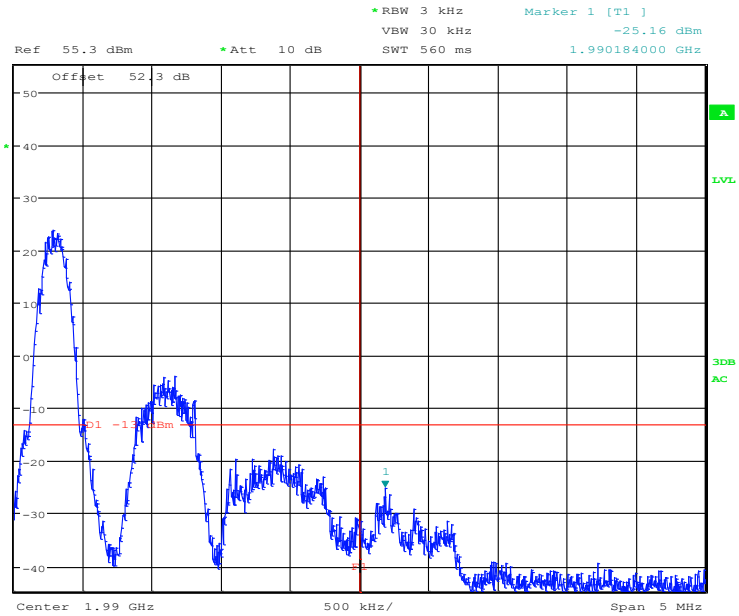


Date: 20.JAN.2016 17:16:17

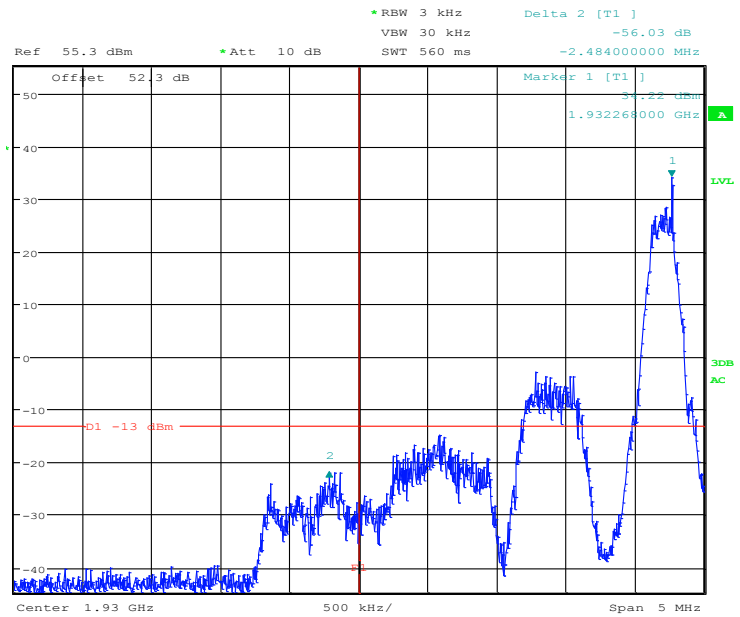
Bandedge - High Channel TX1 EDGE



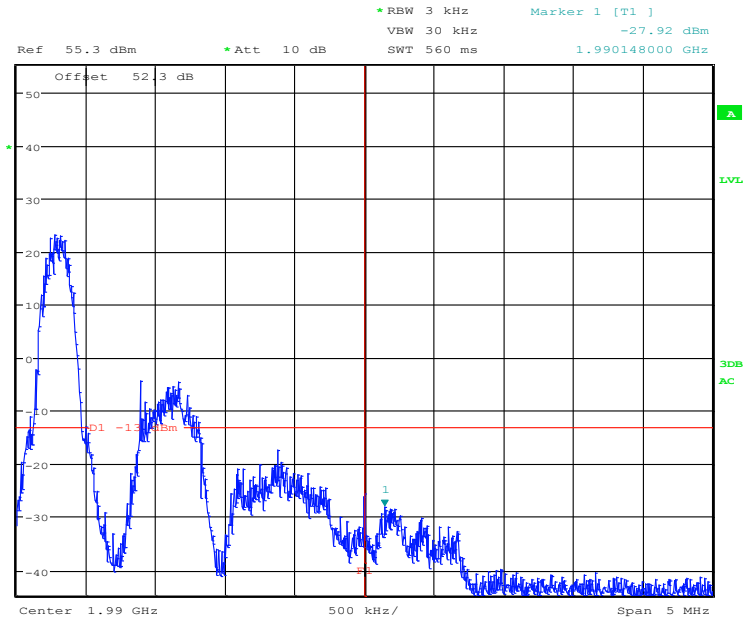
Bandedge - Low Channel Dual GPRS



Bandedge - High Channel Dual GPRS



Bandedge - Low Channel Dual EDGE



Bandedge - High Channel Dual EDGE

Part 5 - Out Of Band Spurious Emissions Conducted at Antenna Terminal

DATE:	Jan 19, 2016
TEST STANDARD:	FCC Part 24 and IC RSS-133
TEST VOLTAGE:	48VDC
TEST CONDITIONS:	Indoor – 3meter Semi Anechoic Chamber
MINIMUM STANDARD:	-13dBm
TEST SETUP:	The transmitter output terminal was connected directly to the spectrum analyzer through appropriate attenuators and filters using a 1 meter cable. The transmitter was set for continuous transmission. The lowest, middle and highest channels were measured for all emissions 10kHz to 20 GHz.
MEASUREMENT METHOD:	Measurements were made using spectrum analyser and receiver using the appropriate attenuators and filters to optimize the reading. The settings used were: 200Hz RBW average detector for the frequency range 9kHz-150kHz 9kHz RBW average detector for the Frequency range 150kHz to 30MHz 120kHz RBW quasi-peak detector for the frequency range 30MHz to 1GHz 1MHz RBW Average detector for the frequency range 1GHz to 20GHz
DEVICE DESCRIPTIONS:	As described in the above EUT description and setup section.
EMISSIONS DATA:	No transmitter Conducted Spurious Emissions were detected 9kHz to 30MHz. No data or plots are recorded 9kHz to 30MHz. Plots were taken using a standard set of Attenuators and filters. Then the identified frequencies were manually re-measured using the appropriate attenuators and filters to optimize the reading. Except the data reported in the following table, all other spurious emissions were 20dB below than the required limit.

Conducted Spurious Emissions at antenna terminal

Operating mode	Frequency (MHz)	Raw Peak (dBm)	Cable loss (dB)	Corrected Peak (dBm)	Limit (dBm)	Margin (dB)
TX1 GPRS Low channel	3864.9	-71.52	33.32	-38.2	-13	25.2
	5796.4	-77.5	35.44	-42.06	-13	29.06
TX1 GPRS Mid channel	3956.4	-71.77	32.8	-38.97	-13	25.97
	5933.4	-77.1	35.6	-41.5	-13	28.5
TX1 GPRS High channel	3975.6	-72.03	32.74	-39.29	-13	26.29
	5963.4	-77.14	35.92	-41.22	-13	28.22
TX1 EDGE Low channel	3864.9	-70.87	33.32	-37.55	-13	24.55
	5796.4	-77.9	35.44	-42.46	-13	29.46
TX1 EDGE Mid channel	3956.4	-71.23	32.8	-38.43	-13	25.43
	5933.4	-77.21	35.6	-41.61	-13	28.61
TX1 EDGE High channel	3975.6	-71.78	32.74	-39.04	-13	26.04
	5963.4	-76.87	35.92	-40.95	-13	27.95
Dual GPRS Low channel	3864.9	-72.9	33.32	-39.58	-13	26.58
	5796.1	-76.9	35.44	-41.46	-13	28.46
Dual GPRS MID channel	3956.4	-71.71	32.8	-38.91	-13	25.91
	5933.4	-76.5	35.6	-40.9	-13	27.9
Dual GPRS HI channel	3975.6	-72.58	32.74	-39.84	-13	26.84
	5963.6	-76.8	35.92	-40.88	-13	27.88
Dual Edge Low channel	3865.2	-72.82	33.32	-39.5	-13	26.5
	5796.1	-77.1	35.44	-41.66	-13	28.66
Dual Edge Mid channel	3956.4	-72.64	32.8	-39.84	-13	26.84
	5796.1	-76.6	35.6	-41	-13	28
Dual Edge Hi channel	3975.6	-72.84	32.74	-40.1	-13	27.1
	5963.6	-77.7	35.92	-41.78	-13	28.78

OBSERVATIONS: The EUT performed as expected.

PERFORMANCE: Complies.

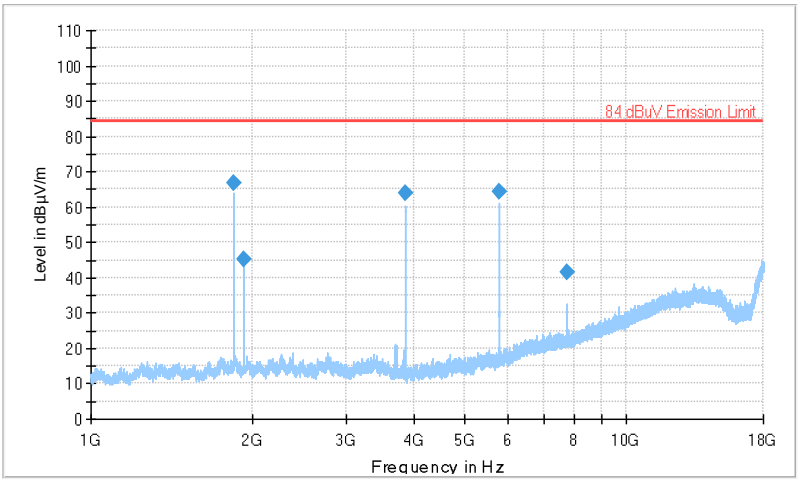
Part 6 - Out Of Band Spurious Emissions Radiated

DATE:	Jan 16 and 17 2016
TEST STANDARD:	FCC Part 24 and IC RSS-133
TEST VOLTAGE:	48VDC
TEST CONDITIONS:	Indoor – 3meter Semi Anechoic Chamber
MINIMUM STANDARD:	-13dBm EIRP
Conversion Formulas used:	For the frequency measurement: E(dBuV/m) = Measurement (dBuV) + Cable Loss(dB) + Antenna Factor (dB/m) EIRP(dBm) = E(dBuV)+20Log(D)-104.8 ERP=EIRP-2.15
TEST SETUP:	The EUT was tested in our 3 m SAC and was positioned on the center of the turntable and powered up. The Transmitter Output was connected to a 50Ohm Load using a 1 meter cable. The transmitter was set for continuous transmission. The lowest, middle and highest channels were measured for all radiated emissions 10kHz to 18 GHz. The EUT was placed flat on the table top as indicated in the test photos.
MEASUREMENT METHOD:	Measurements were made using spectrum analyser and receiver using the appropriate antennas, amplifiers, attenuators and filters. The settings used were: 200Hz RBW Peak detector for the frequency range 9kHz-150kHz 9kHz RBW Peak detector for the Frequency range 150kHz to 30MHz 10kHz RBW Peak detector for the frequency range 30MHz to 1GHz 1MHz RBW Peak detector for the frequency range 1GHz to 20GHz The emissions were then re-measured using the Substitution method as described in ANSI TIA/EIA-603 Section 2.2.12
DEVICE DESCRIPTIONS:	As described in the above EUT description and setup section.
EMISSIONS DATA:	No transmitter Radiated Spurious Emissions were detected 9kHz to 1GHz. No data or plots are recorded 9kHz to 30MHz. The 30MHz to 1GHz plot and data are only from the Digital Circuitry and are included for reference only. Radiated emissions were performed in all modes of operations from 9KHz-20GHz. Data reported below includes all emissions within 20dB of required limit. Plots provided in this report are for reference and from worst mode of operation.
OBSERVATIONS:	The EUT performed as expected.
PERFORMANCE:	Complies.

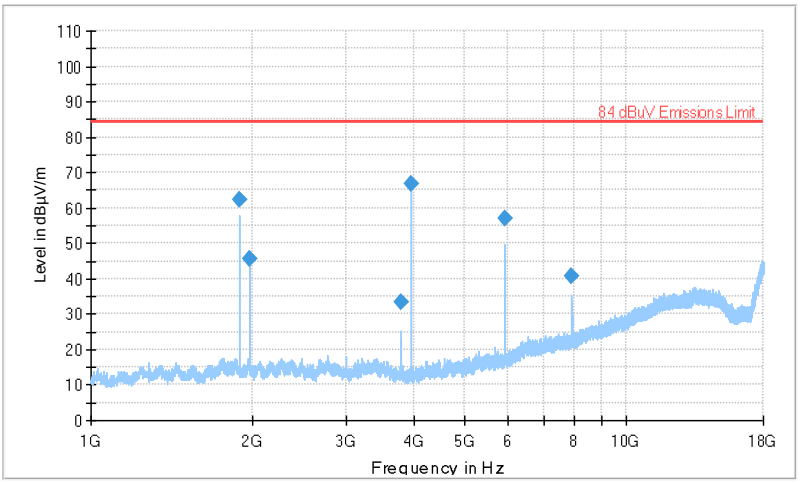
Radiated Spurious Emissions Data

Modulation	Channel	Frequency (MHz)	Antenna Pol. (V/H)	Peak EIRP (dBm)	Limit (dBm)	Margin (dBm)
TX1 EDGE	Low	3864.3333	H	-22.39	-13	9.39
		5796.6651	H	-19.56	-13	6.56
		7728.8868	H	-32.96	-13	19.96
	Middle	3955.5801	H	-23.89	-13	10.89
		5933.4999	H	-23.42	-13	10.42
		7911.3332	H	-30.85	-13	17.85
	High	3975.6346	H	-18.27	-13	5.27
		5963.4519	H	-25.82	-13	12.82
		7951.2692	H	-29.82	-13	16.82
TX1 GPRS	Low	3864.5384	H	-18.52	-13	5.52
		5796.6651	H	-19.66	-13	6.66
		7728.8868	H	-28.94	-13	15.94
	Middle	3955.4485	H	-25.16	-13	12.16
		5933.4999	H	-28.81	-13	15.81
		7911.3332	H	-31.27	-13	18.27
	High	3975.6346	H	-19.63	-13	6.63
		5963.4519	H	-27.3	-13	14.3
		7951.2692	H	-27.96	-13	14.96
Dual EDGE	Low	3864.9903	H	-30.21	-13	17.21
		5796.6651	H	-26.15	-13	13.15
		7728.8868	H	-32.71	-13	19.71
	Middle	3955.7234	H	-35.36	-13	22.36
		5933.4999	H	-33.36	-13	20.36
	High	3974.2698	H	-24.69	-13	11.69
		5960.682	H	-29.89	-13	16.89
Dual GPRS	Low	3864.9903	H	-30.15	-13	17.15
		5796.6651	H	-23.17	-13	10.17
		7728.8868	H	-30.69	-13	17.69
	Middle	3955.7234	H	-29.69	-13	16.69
		5933.4999	H	-32.79	-13	19.79
	High	3974.7467	H	-21.72	-13	8.72
		5962.1314	H	-29.7	-13	16.7
		7951.2692	H	-30.99	-13	17.99

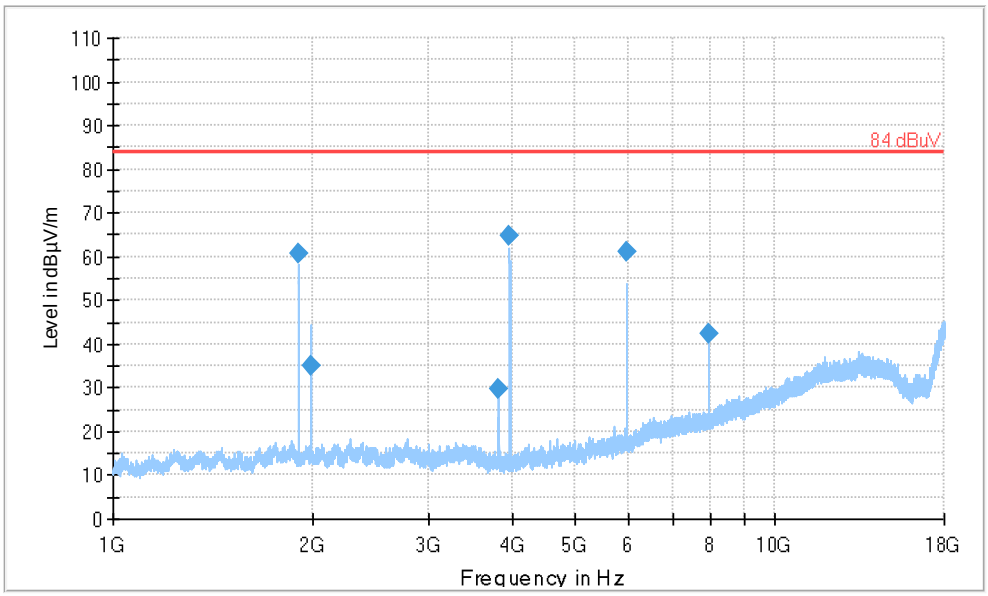
Radiated Emissions Plots



Low Channel-Dual TX mode EDGE



Middle Channel-Dual TX mode EDGE



High Channel-Dual TX mode EDGE

Part 7 - Frequency Stability

DATE: Jan 20 2016

TEST STANDARD: FCC Part 24 and IC RSS-133

TEST VOLTAGE: 120Vac 60Hz +/-15%

TEST CONDITIONS: Temperature Controlled Chamber -30 to +50ºCelsius

MINIMUM STANDARD: +/- 1ppm

TEST SETUP: The EUT was tested in our Temperature Chamber and was positioned on the center of the turntable and powered up. The Transmitter Output was connected to a Spectrum Analyzer using appropriate attenuators.

MEASUREMENT METHOD: The transmitter was not able to be set for CW Signals so the readings were taken with modulated signals using the ndB down method using 30kHz RBW.. Only the middle channel was measured. The EUT was soaked at each temperature for a minimum of 30 minutes prior to making the measurements.

DEVICE DESCRIPTIONS: As described in the above EUT description and setup section.

DATA:

Transmitting Mode	Temperture degree Celsius				
	21	55		-40	
	Frequency (GHz)	Frequency (GHz)	ppm	Frequency (GHz)	ppm
TX1, GPRS, Low Channel	1.932203526	1.932204186	0.66	1.932203024	-0.502
TX1, GPRS, High Channel	1.987802513	1.987802885	0.372	1.987802	-0.513
TX1, EDGE, Low Channel	1.932201923	1.932202128	0.205	1.932201512	-0.411
TX1, EDGE, High Channel	1.98780641	1.98780679	0.38	1.987805842	-0.568
DUAL, GPRS, Low Channel	1.932206731	1.932207092	0.3613	1.932205948	-0.783
DUAL, GPRS, High Channel	1.987001603	1.987002	0.397	1.98700098	-0.623
DUAL, EDGE, Low Channel	1.932206731	1.93220599	-0.741	1.932205965	-0.766
DUAL, EDGE, High Channel	1.987004808	1.987004405	-0.403	1.987003996	-0.812

OBSERVATIONS: The EUT performed as expected.

PERFORMANCE: Complies.

Part 8 - RF Exposue MPE

DATE: Jan 22 2016

TEST STANDARD: FCC Part 2.1091, FCC Part 24 and IC RSS-102 Annex A

MEASUREMENT METHOD: This device operates at frequencies in the 1900 MHz PCS Band. Maximum permissible exposure in this band is specified under per FCC Part 1, Section 1.1310, Table 1, as 1 mW/cm^2. FCC Part 1, Section 1.1307 states that Part 24E devices are excluded from routine environmental evaluation when operating at power levels less than 3280 Watts EIRP.

EIRP (Effective Isotropic Radiated Power) is the amount of power that a theoretical isotropic antenna (that evenly distributes power in all directions) would emit to produce the peak power density observed in the direction of maximum antenna gain. EIRP can take into account the losses in transmission line and connectors and includes the gain of the antenna.

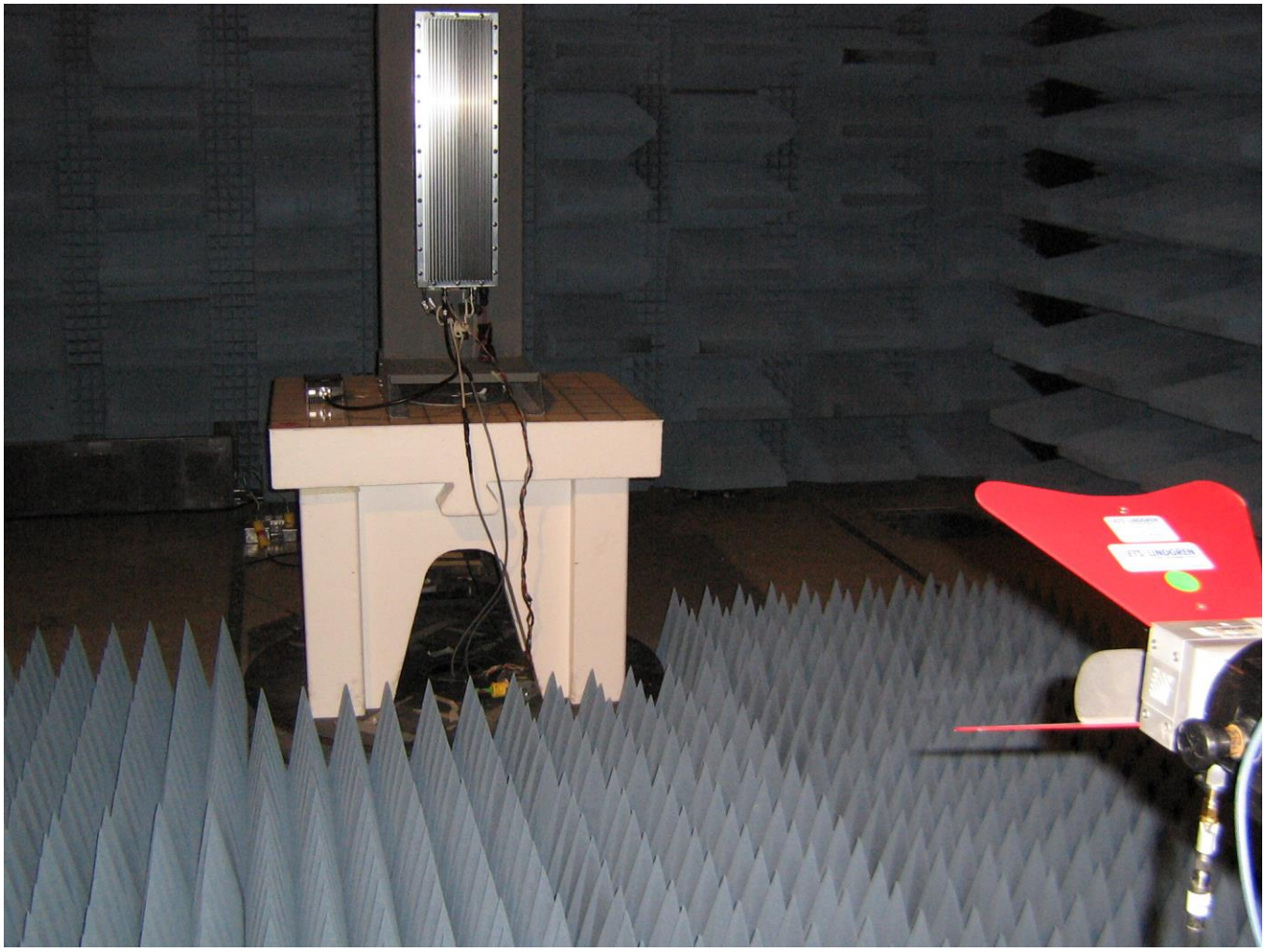
Where *EIRP* and P_t (power of transmitter) are in dBm, cable losses (L_c) is in dB, and antenna gain (G_a) is expressed in dBi, relative to a (theoretical) isotropic reference antenna. No antenna is supplied with this unit. Therefore, based on measured RF output power of 10.2 Watts at 1931.25 MHz and assumption of cable loss is zero, the maximum antenna gain that will allow the EIRP to remain under the environmental evaluation exclusion limit of 3280 Watts is 25.06 dBi.

MPE is determined by the following relationship:
Power Density P_d (mW/cm^2) = EIRP/4πd^2
Where d = distance.
3280 Watts = 3.28x10^6 mW
Therefore:
d = (EIRP/4πP_d)$^{1/2}$ = (3.28x10^2 mW/ 4π(1mW/cm^2))$^{1/2}$
= 510.89 = 5.1 m

RESULTS: The minimum safe distance from a radiating structure exhibiting a maximum gain of 25.1 dBi connected to the BTS when installed and transmitting at full output power is 5.1 m.

The antenna(s) used for this transmitter must be fixed-mounted on permanent outdoor structures. RF exposure compliance is addressed at the time of licensing, as required by the responsible FCC Bureau(s), including antenna co-location requirements of Section 1.1037(b)(3).

Appendix A: EUT photos during the testing



Radiated Emissions Setup above 1 GHz

CANADA:
16 - 211 Schoolhouse Street
Coquitlam, British Columbia
Canada V3K 4X9

End of report

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last page of this test report