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Report On

FCC Testing of the Sharp SHF32 Quad-band GSM (850/900/1800/1900) & Dual-band UMTS (FDDI, FDDV) & Dual-band LTE (B1, B26) multi mode cellular phone with Bluetooth, WLAN, SRD(FeliCa) and GPS
In accordance with FCC 47 CFR Part 24 and FCC 47 CFR Part 2 (PCS1900)

COMMERCIAL-IN-CONFIDENCE
FCC ID: APYHRO00224

Document 75930192 Report 06 Issue 1 June 2015

Product Service

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REPORT ON

FCC Testing of the
Sharp SHF32 Quad-band GSM (850/900/1800/1900) & Dual-band UMTS (FDDI, FDDV) & Dual-band LTE (B1, B26) multi mode cellular phone with Bluetooth, WLAN, SRD(FeliCa) and GPS
In accordance with FCC 47 CFR Part 24 and FCC 47 CFR Part 2 (PCS1900)

Document 75930192 Report 06 Issue 1

June 2015

PREPARED FOR

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Authorised Signatory

DATED 19 June 2015

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 24 and FCC 47 CFR Part 2. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

M Choudhury M Russell G Lawler

UKAS TESTING 0141

Product Service

CONTENTS

Product Service

SECTION 1

REPORT SUMMARY

FCC Testing of the
Sharp SHF32 Quad-band GSM (850/900/1800/1900) & Dual-band UMTS (FDDI, FDDV) & Dual-band LTE (B1, B26) multi mode cellular phone with Bluetooth, WLAN, SRD(FeliCa) and GPS
In accordance with FCC 47 CFR Part 24 and FCC 47 CFR Part 2 (PCS1900)

Product Service

1.1 INTRODUCTION

The information contained in this report is intended to show the verification of FCC Testing of the Sharp SHF32 Quad-band GSM (850/900/1800/1900) & Dual-band UMTS (FDDI, FDDV) & Dual-band LTE (B1, B26) multi mode cellular phone with Bluetooth, WLAN, SRD(FeliCa) and GPS to the requirements of FCC 47 CFR Part 24 and FCC 47 CFR Part 2.

Objective	To perform FCC Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Sharp Corporation
Model Number(s)	SHF32
Serial Number(s)	IMEI 004401115362432 IMEI 004401115362374
Number of Samples Tested	3
Test Specification/Issue/Date	FCC 47 CFR Part 24 (2014) FCC 47 CFR Part 2 (2014)
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	10534 17 April 2015
Start of Test	24 May 2015
Finish of Test	9 June 2015
Name of Engineer(s)	M Choudhury M Russell G Lawler
Related Document(s)	ANSI C63.4 (2009) ANSI TIA-603-C (2004)

Product Service

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 24 and FCC 47 CFR Part 2 is shown below.

Section	Specification Clause		Test Description	Result	Comments/Base Standard
	Part 24	Part 2			
PCS 1900					
2.1	24.229 and 24.238	2.1051	Spurious Emissions at Band Edge	Pass	
2.2	24.232 (d)	-	Peak to Average Ratio	Pass	
2.3	24.232	2.1046	Maximum Conducted Output Power	Pass	
2.4	24.235	2.1055	Frequency Stability	Pass	
2.5	24.238	2.1053	Emission Limitations for Broadband PCS Equipment	Pass	
2.6	24.238	2.1049 (h)	26 dB Bandwidth	Pass	
2.7	-	2.1047 (d)	Modulation Characteristics	-	Customer Declaration

1.3 PRODUCT TECHNICAL DESCRIPTION

Please refer to the SHF32 Model Description Form.

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Sharp SHF32 Quad-band GSM (850/900/1800/1900) & Dual-band UMTS (FDDI, FDDV) & Dual-band LTE (B1, B26) multi mode cellular phone with Bluetooth, WLAN, SRD(FeliCa) and GPS. A full technical description can be found in the manufacturer's documentation.

1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure.

The EUT was powered from a 4.0 V DC supply.

FCC Measurement Facility Registration Number
90987 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standard were made during testing.

1.7 MODIFICATION RECORD

Modification 0 - No modifications were made to the test sample during testing.

Product Service

SECTION 2

TEST DETAILS

FCC Testing of the
Sharp SHF32 Quad-band GSM (850/900/1800/1900) & Dual-band UMTS (FDDI, FDDV) & Dual-band LTE (B1, B26) multi mode cellular phone with Bluetooth, WLAN, SRD(FeliCa) and GPS
In accordance with FCC 47 CFR Part 24 and FCC 47 CFR Part 2 (PCS1900)

Product Service

2.1 SPURIOUS EMISSIONS AT BAND EDGE

2.1.1 Specification Reference

FCC 47 CFR Part 24, Clause 24.229 and 24.238
FCC 47 CFR Part 2, Clause 2.1051

2.1.2 Equipment Under Test and Modification State

SHF32 S/N: IMEI 004401115362432 - Modification State 0

2.1.3 Date of Test

29 May 2015

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Procedure

This test was performed in accordance with KDB 971168 D021 v02r02, clause 6.

Remarks

An RMS detector and trace averaging were used to perform the measurements.

2.1.6 Environmental Conditions

Ambient Temperature	23.9°C
Relative Humidity	32.2%

Product Service

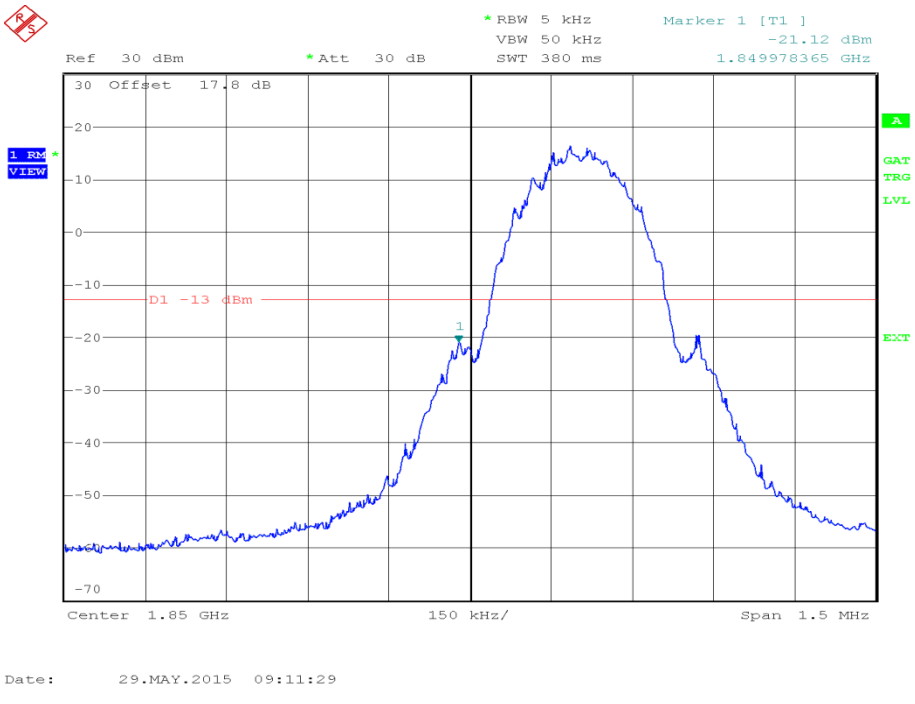
2.1.7 Test Results

4.0 V DC Supply

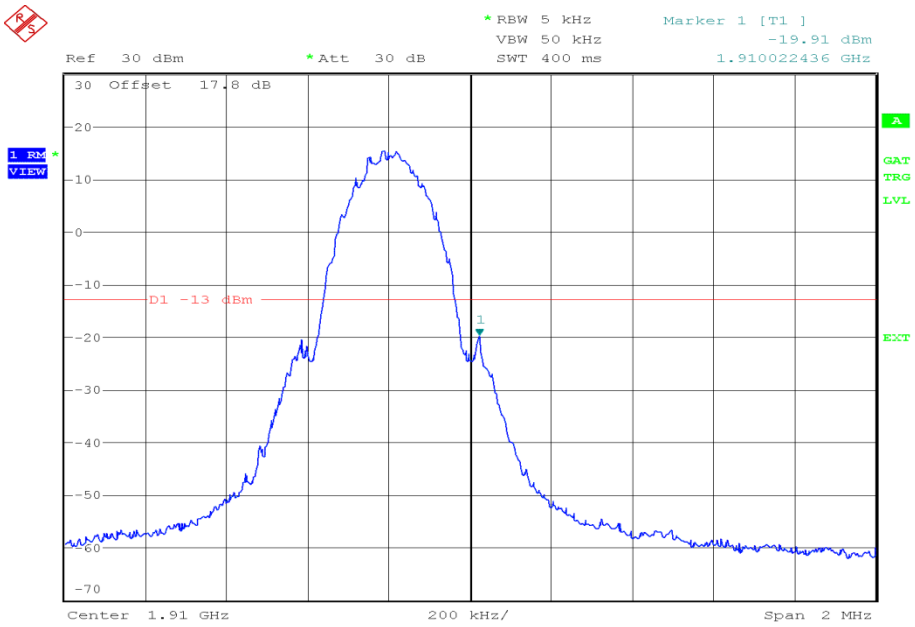
PCS 1900, Circuit Switched Voice, GMSK, Spurious Emissions at Band Edge Results

Block Edge	Frequency Block (MHz)	
	A :1850 MHz – 1865 MHz	C :1895 MHz – 1910 MHz
Lower	Channel: 512 1850.2 MHz	-
Upper	-	Channel: 810 1909.8 MHz

PCS 1900, Circuit Switched Voice, GMSK, Frequency Block A, Spurious Emissions at Band Edge Plot



PCS 1900, Circuit Switched Voice, GMSK, Frequency Block C, Spurious Emissions at Band Edge Plot



FCC 47 CFR Part 24, Limit Clause 24.229 (a)

Mobile Transmitters:

Block A: 1850 to 1865 MHz paired with 1930 to 1945 MHz
Block B: 1870 to 1885 MHz paired with 1950 to 1965 MHz

FCC 47 CFR Part 24, Limit Clause 24.238 (a)

43 + 10 log (P) dB or -13 dBm.

2.2 PEAK TO AVERAGE RATIO

2.2.1 Specification Reference

FCC 47 CFR Part 24, Clause 24.232 (d)

2.2.2 Equipment Under Test and Modification State

SHF32 S/N: IMEI 004401115362432 - Modification State 0

2.2.3 Date of Test

28 May 2015

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Procedure

The test was performed in accordance with KDB 971168 D01 v02r02, Clause 5.7.2.

Remarks

KDB 971168 D01 v02r02, clause 5.1.2 was used to measure the peak power.
KDB 971168 D01 v02r02, clause 5.2.3 was used to measure the average power.

2.2.6 Environmental Conditions

Ambient Temperature	25.3°C
Relative Humidity	32.5%

2.2.7 Test Results

PCS 1900, Peak to Average Ratio Results

1850.2 MHz	1880.0 MHz	1909.8 MHz
dB	dB	dB
0.19	0.19	0.18

FCC 47 CFR Part 24, Limit Clause 24.232 (d)

< 13 dB

2.3 MAXIMUM CONDUCTED OUTPUT POWER

2.3.1 Specification Reference

FCC 47 CFR Part 24, Clause 24.232
FCC 47 CFR Part 2, Clause 2.1046

2.3.2 Equipment Under Test and Modification State

SHF32 S/N: IMEI 004401115362432 - Modification State 0

2.3.3 Date of Test

28 May 2015

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Test Procedure

This test was performed in accordance with KDB 971168 D01 v02r02, clause 5.2.3.

Remarks

Results have been expressed in terms of EIRP as per KDB 412172 D01 v01.

2.3.6 Environmental Conditions

Ambient Temperature	25.3°C
Relative Humidity	32.5%

2.3.7 Test Results

4.0 V DC Supply

PCS 1900, Circuit Switched Voice, Maximum Peak Conducted Output Power Results

Frequency	Conducted Power (dBm)	Antenna Gain	EIRP (dBm)	EIRP (W)
1850.2 MHz	28.51	2.0 dBi	30.51	1.125
1880.0 MHz	28.59	2.0 dBi	30.59	1.146
1909.8 MHz	28.58	2.0 dBi	30.58	1.143

FCC 47 CFR Part 24, Limit Clause 24.232 (c)

Mobile and portable stations: 2 Watts.

Product Service

2.4 FREQUENCY STABILITY

2.4.1 Specification Reference

FCC 47 CFR Part 24, Clause 24.235
FCC 47 CFR Part 2, Clause 2.1055

2.4.2 Equipment Under Test and Modification State

SHF32 S/N: IMEI 004401115362432 - Modification State 0

2.4.3 Date of Test

8 June 2015 & 9 June 2015

2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Test Procedure

This test was performed in accordance with FCC 47 CFR Part 24, clause 24.235 and FCC 47 CFR Part 2, clause 2.1055.

Remarks

The frequency measurement function of a CMU 200 was used to measure the frequency error. The CMU 200 was configured in Circuit Switched mode to an uplink frequency of1880.0 MHz.

The frequency error was recorded from the CMU 200 Tx measurement function. The CMU 200 was connected to a 10 MHz frequency standard to improve the measurement accuracy.

2.4.6 Environmental Conditions

Ambient Temperature	21.1 - 24.9°C
Relative Humidity	30.9 - 33.6%

Product Service

2.4.7 Test Results

PCS 1900, 1880.0 MHz, Circuit Switched Voice,GMSK, Frequency Stability Under Temperature Variations Results

Temperature	Fundamental Measured Frequency (MHz)
-30 ºC	1880.000066
-20 ºC	1880.000068
-10 ºC	1880.000063
0 ºC	1880.000062
+10 ºC	1880.000061
+20 ºC	1880.000058
+30 ºC	1880.000062
+40 ºC	1880.000062
+50 ºC	1880.000059

PCS 1900, 1880.0 MHz, Circuit Switched Voice, GMSK, Frequency Stability Under Voltage Variations Results

Voltage	Fundamental Measured Frequency (MHz)
4.0 V DC	1880.000060
3.7 V DC	1880.000064

Remark

The measured frequency error over temperature and voltage extremes does not cause the fundamental emission to go outside the authorised frequency block.

FCC 47 CFR Part 24, Limit Clause 24.235

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorised frequency block.

Product Service

2.5 EMISSION LIMITATIONS FOR BROADBAND PCS EQUIPMENT

2.5.1 Specification Reference

FCC 47 CFR Part 24, Clause 24.238
FCC 47 CFR Part 2, Clause 2.1053

2.5.2 Equipment Under Test and Modification State

SHF32 S/N: IMEI 004401115362374 - Modification State 0

2.5.3 Date of Test

24 May 2015 & 26 May 2015

2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Test Procedure

The test was performed in accordance with KDB 971168 D01 v02r02, Clause 5.8 and 7 and ANSI TIA-603-C, Clause 2.2.12. The EUT was configured as defined in ANSI C63.4.

2.5.6 Environmental Conditions

Ambient Temperature	21.0 - 21.4°C
Relative Humidity	37.0 - 42.0%

Product Service

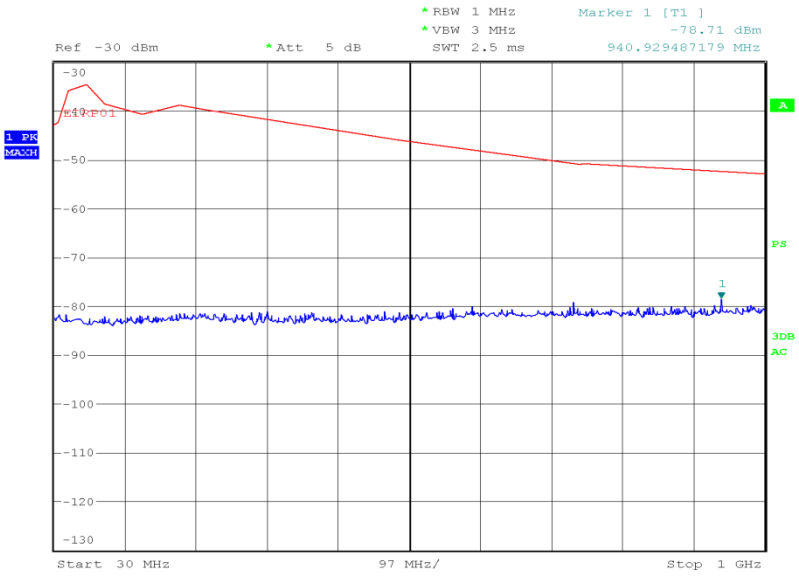
2.5.7 Test Results

PCS 1900, 1850.2 MHz, 30 MHz to 20 GHz, Emission Limitations for Broadband PCS Equipment Results

Frequency (MHz)	Emission Results (dBm)
*	

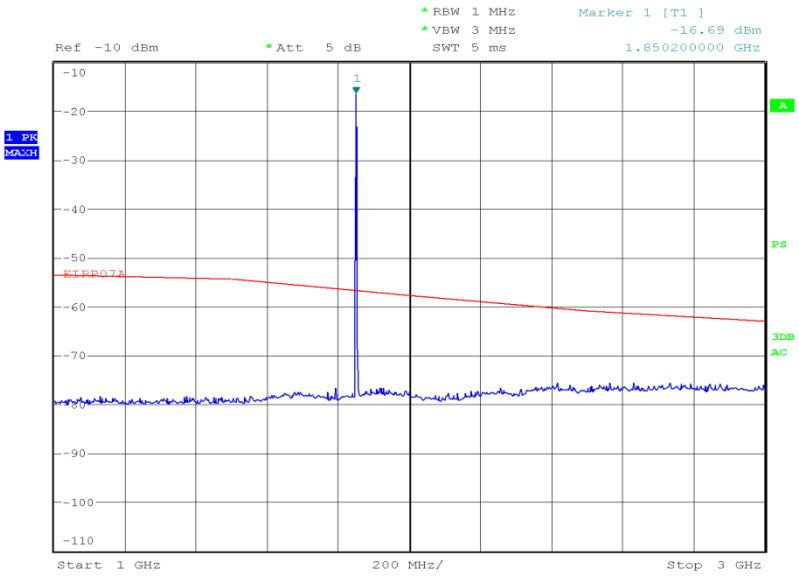
*No emissions were detected within 10 dB of the limit.

PCS 1900, 1850.2 MHz, 30 MHz to 1 GHz, Emission Limitations for Broadband PCS Equipment Results



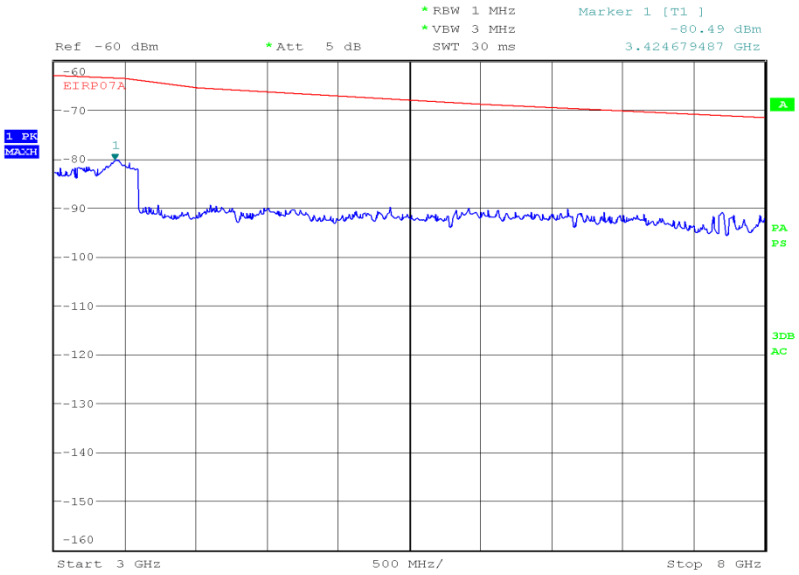
Product Service

PCS 1900, 1850.2 MHz, 1 GHz to 3 GHz, Emission Limitations for Broadband PCS Equipment Plot



Date: 24.MAY.2015 22:20:01

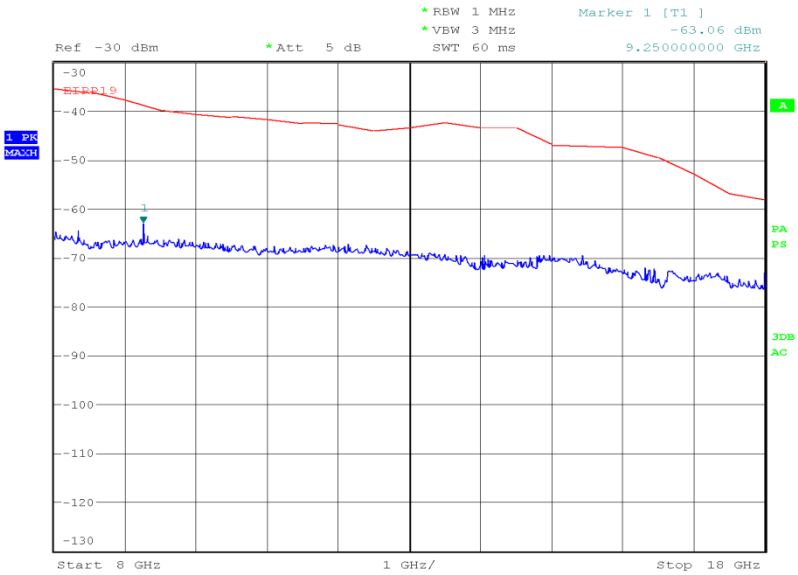
PCS 1900, 1850.2 MHz, 3 GHz to 8 GHz, Emission Limitations for Broadband PCS Equipment Plot



Date: 24.MAY.2015 22:29:55

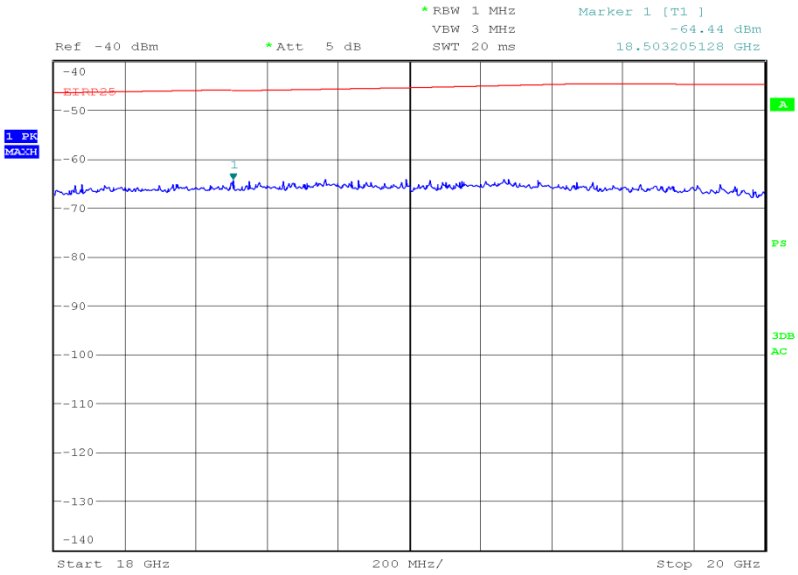
Product Service

PCS 1900, 1850.2 MHz, 8 GHz to 18 GHz, Emission Limitations for Broadband PCS Equipment Plot



Date: 24.MAY.2015 22:12:54

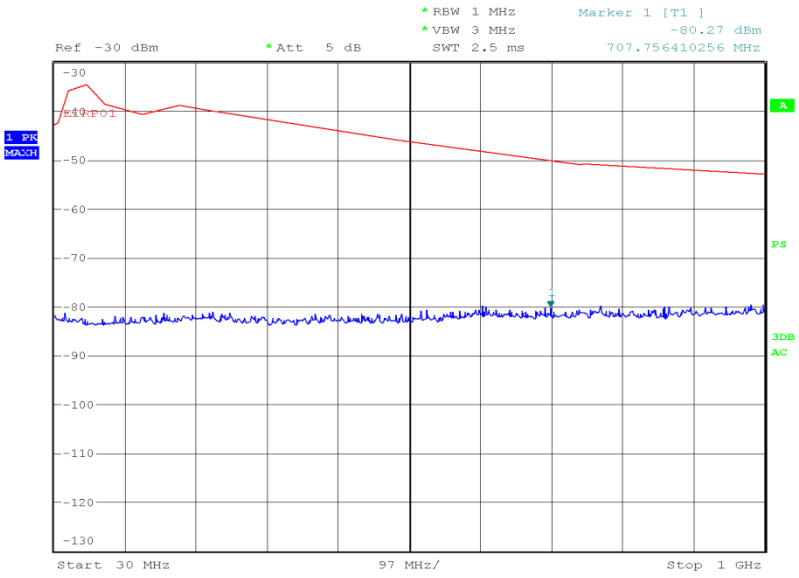
PCS 1900, 1850.2 MHz, 18 GHz to 20 GHz, Emission Limitations for Broadband PCS Equipment Plot



Date: 26.MAY.2015 22:26:34

Product Service

PCS 1900, 1880.0 MHz, 30 MHz to 1 GHz, Emission Limitations for Broadband PCS Equipment Results



Date: 24.MAY.2015 22:36:24

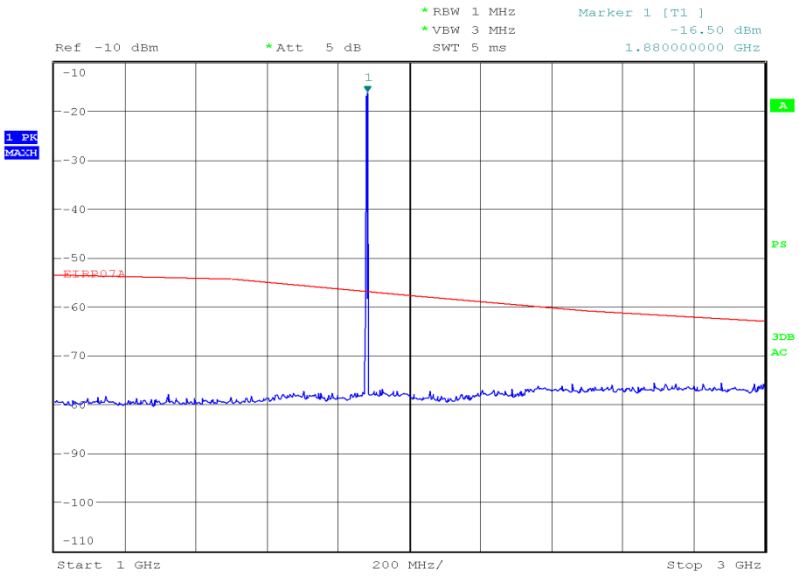
PCS 1900, 1880.0 MHz, 1 GHz to 20 GHz, Emission Limitations for Broadband PCS Equipment Results

Frequency (MHz)	Emission Results (dBm)
*	

*No emissions were detected within 10 dB of the limit.

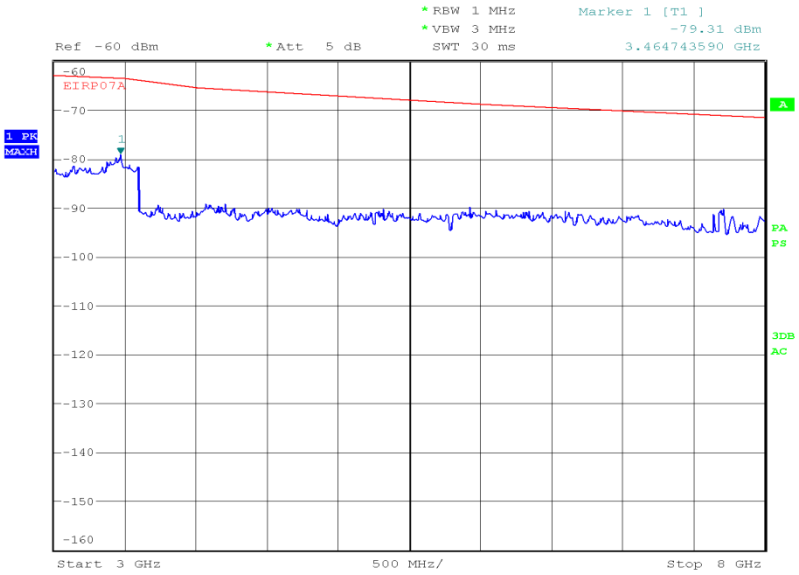
Product Service

PCS 1900, 1880.0 MHz, 1 GHz to 3 GHz, Emission Limitations for Broadband PCS Equipment Plot



Date: 24.MAY.2015 22:21:40

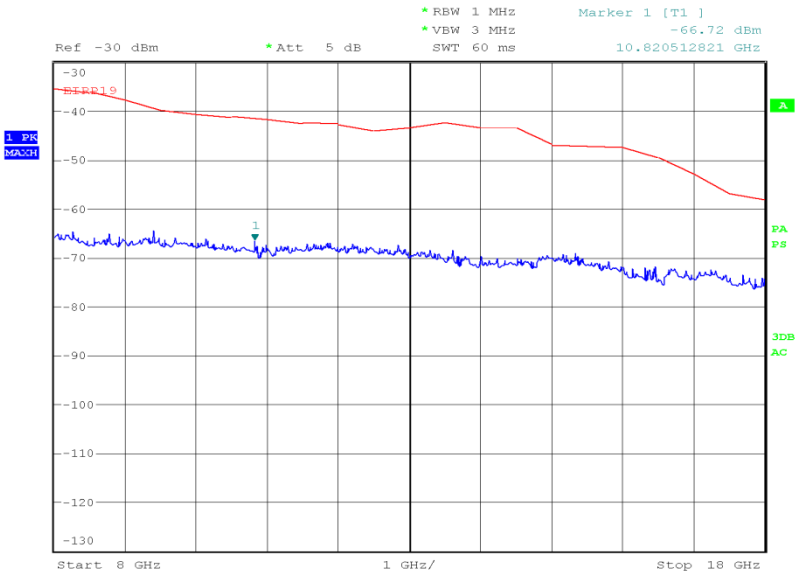
PCS 1900, 1880.0 MHz, 3 GHz to 8 GHz, Emission Limitations for Broadband PCS Equipment Plot



Date: 24.MAY.2015 22:28:12

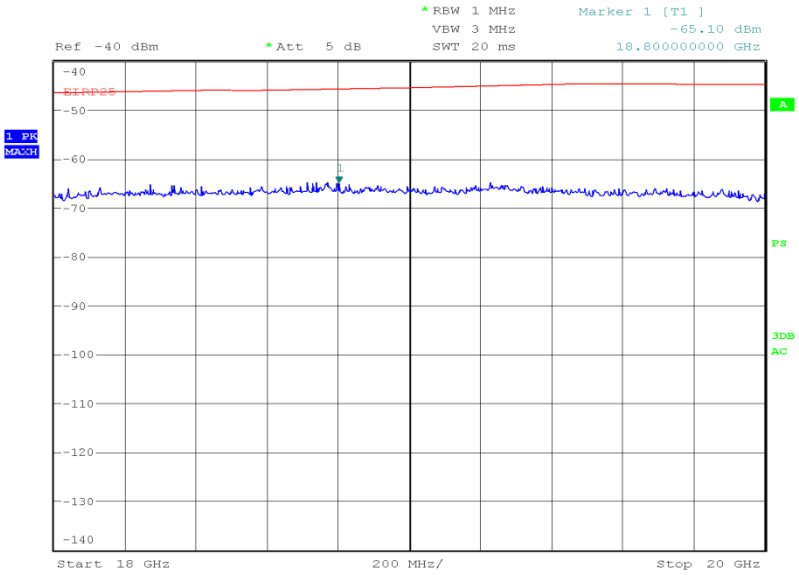
Product Service

PCS 1900, 1880.0 MHz, 8 GHz to 18 GHz, Emission Limitations for Broadband PCS Equipment Plot



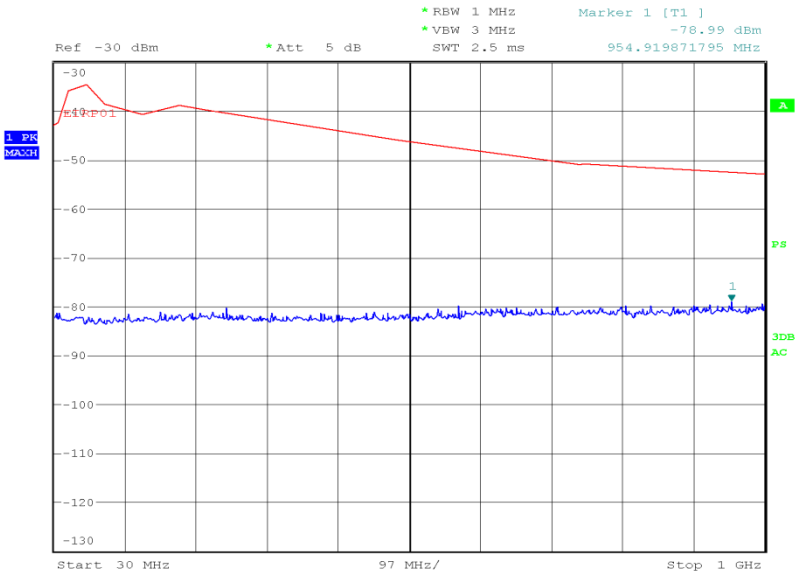
Date: 24.MAY.2015 22:11:28

PCS 1900, 1880.0 MHz, 18 GHz to 20 GHz, Emission Limitations for Broadband PCS Equipment Plot



Date: 26.MAY.2015 22:31:44

PCS 1900, 1909.8 MHz, 30 MHz to 1 GHz, Emission Limitations for Broadband PCS Equipment Results



Date: 24.MAY.2015 22:45:22

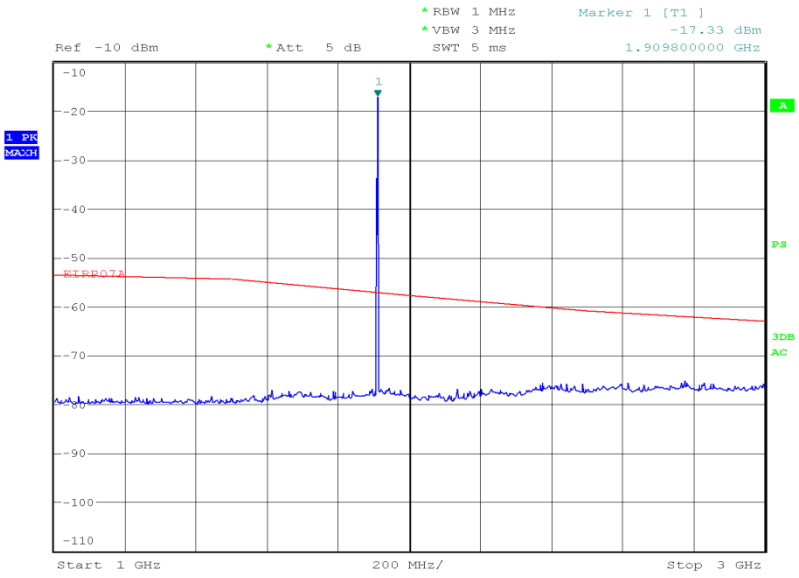
PCS 1900, 1909.8 MHz, 1 GHz to 20 GHz, Emission Limitations for Broadband PCS Equipment Results

Frequency (MHz)	Emission Results (dBm)
*	

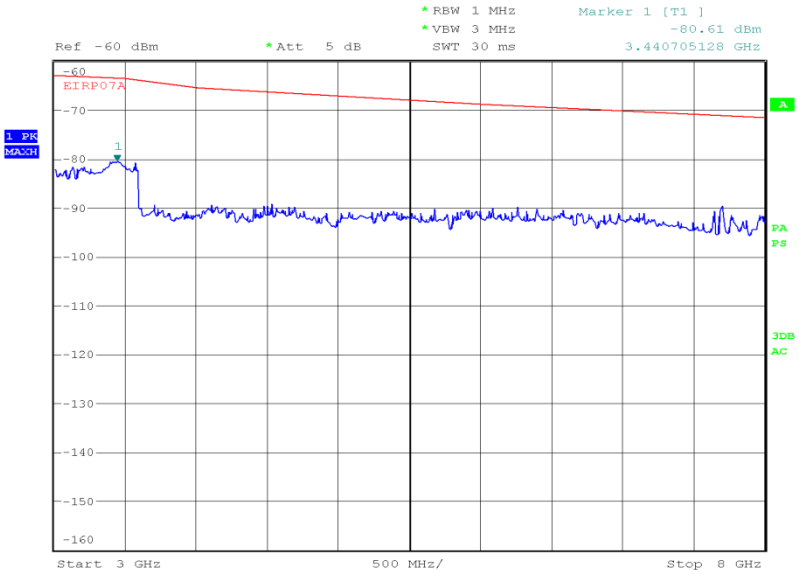
*No emissions were detected within 10 dB of the limit.

Product Service

PCS 1900, 1909.8 MHz, 1 GHz to 3 GHz, Emission Limitations for Broadband PCS Equipment Plot

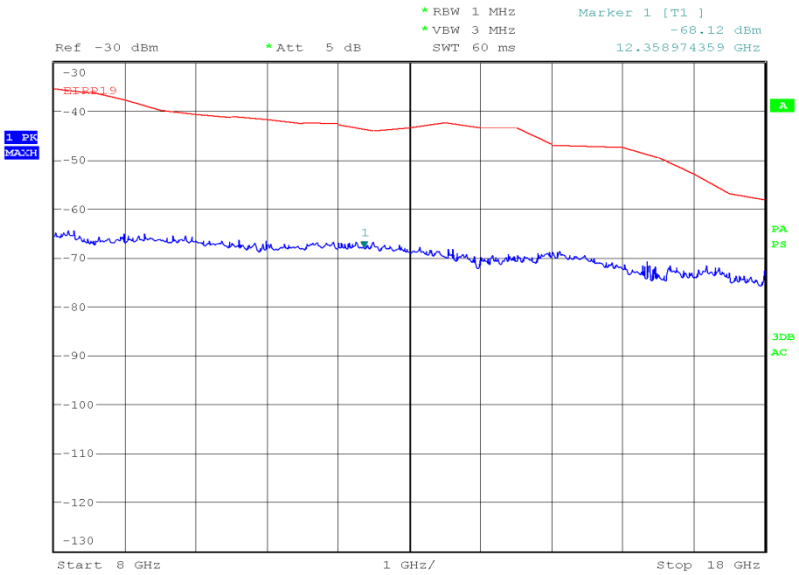


PCS 1900, 1909.8 MHz, 3 GHz to 8 GHz, Emission Limitations for Broadband PCS Equipment Plot



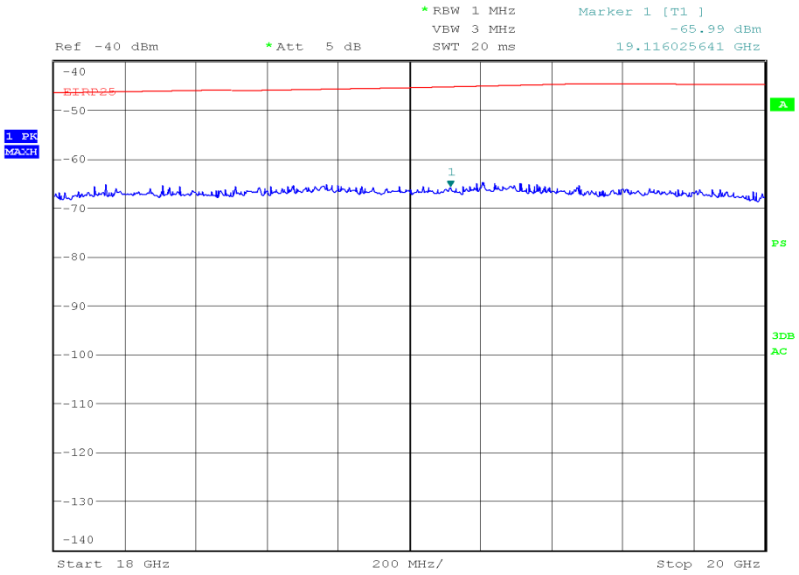
Product Service

PCS 1900, 1909.8 MHz, 8 GHz to 18 GHz, Emission Limitations for Broadband PCS Equipment Plot



Date: 24.MAY.2015 22:09:50

PCS 1900, 1909.8 MHz, 18 GHz to 20 GHz, Emission Limitations for Broadband PCS Equipment Plot



Date: 26.MAY.2015 22:35:14

FCC 47 CFR Part 24, Limit Clause 24.238 (a)

43 + 10 log (P) dB or -13 dBm.

2.6 26 dB BANDWIDTH

2.6.1 Specification Reference

FCC 47 CFR Part 24, Clause 24.238
FCC 47 CFR Part 2, Clause 2.1049 (h)

2.6.2 Equipment Under Test and Modification State

SHF32 S/N: IMEI 004401115362432 - Modification State 0

2.6.3 Date of Test

29 May 2015 & 12 June 2015

2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.5 Test Procedure

This test was performed in accordance with KDB 971168 D01 v02r02, clause 4.1.

2.6.6 Environmental Conditions

Ambient Temperature	23.0 - 24.0°C
Relative Humidity	32.4 – 59.0%

Product Service

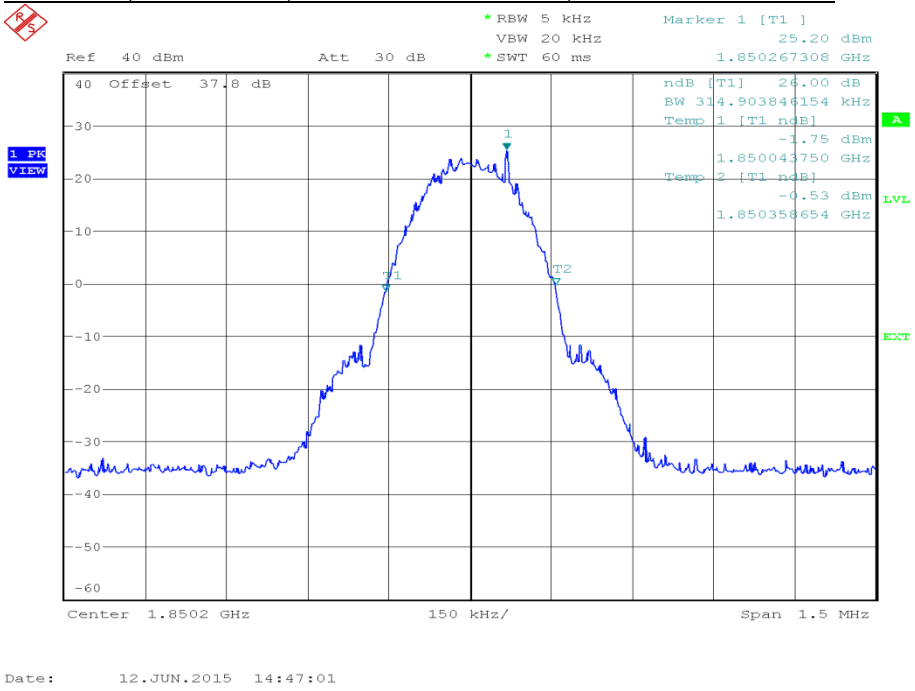
2.6.7 Test Results

4.0 V DC Supply

PCS 1900, Circuit Switched Voice, 26 dB Bandwidth Results

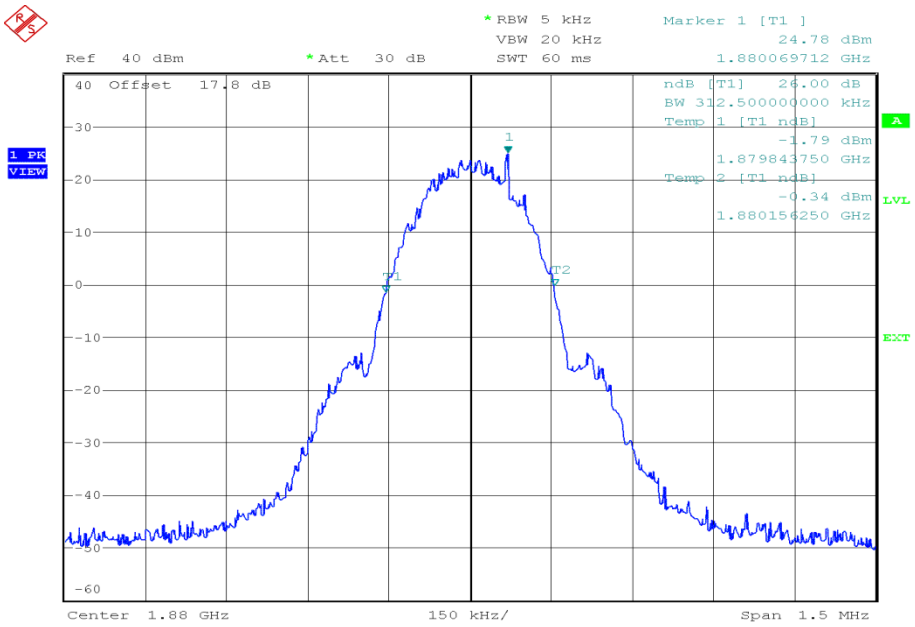
1850.2 MHz	1880.0 MHz	1909.8 MHz
kHz	kHz	kHz
314.904	312.500	317.308

PCS 1900, 1850.2 MHz, Circuit Switched Voice, 26 dB Bandwidth Plot



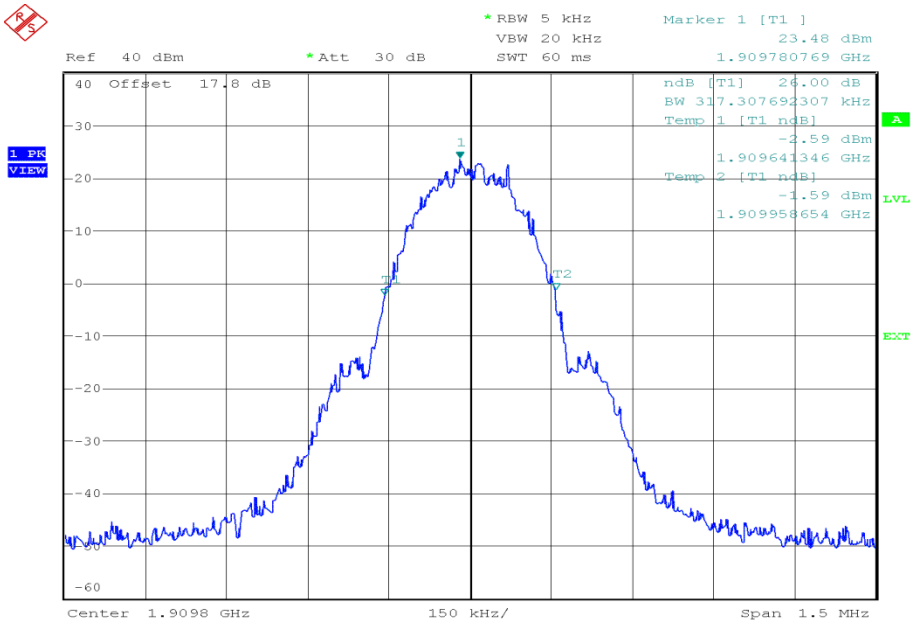
Product Service

PCS 1900, 1880.0 MHz, Circuit Switched Voice, 26 dB Bandwidth Plot



Date: 29.MAY.2015 08:58:54

PCS 1900, 1909.8 MHz, Circuit Switched Voice, 26 dB Bandwidth Plot



Date: 29.MAY.2015 09:00:02

FCC 47 CFR Part 24, Limit Clause 24.238

The emission bandwidth is defined as the width of the signal between two points, one below the carrier centre frequency and one above the carrier centre frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

Product Service

2.7 MODULATION CHARACTERISTICS

2.7.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1047 (d)

2.7.2 Equipment Under Test

SHF32

2.7.3 Test Results

PCS 1900, Modulation Characteristics, Customer Description

Description of Modulation Technique

The modulation scheme used in GSM is called Gaussian Minimum Shift Keying (GMSK). GMSK facilitates the use of narrow bandwidth and allows for both coherent and non coherent detection capabilities. It is a scheme in which the transitions from One to Zero or Zero to One do not occur quickly, but over a period of time. If pulses are transmitted quickly harmonics are transmitted. The power spectrum for a square wave is rich in harmonics, and the power within the side lobes is wasted, and can be a cause of potential interference.

A method to reduce the harmonics is to round off the edges of the pulses thus lowering the spectral components of the signal. In GSM this is done by using a Gaussian pre-filter which typically has a bandwidth of 81.25kHz. The output from the Gaussian filter then phase modulates the carrier. As there are no dramatic phase transitions of the carrier this gives a constant envelope and low spectral component output from the transmitter.

The spectral efficiency is calculated by

bit rate / Channel bandwidth = 270.83333 kbit/s / 200 kHz = 1.354 bit/s/Hz.

The bandwidth product BT = Bandwidth x bit duration = 81.25 kHz x 3.6923 micros = 0.3

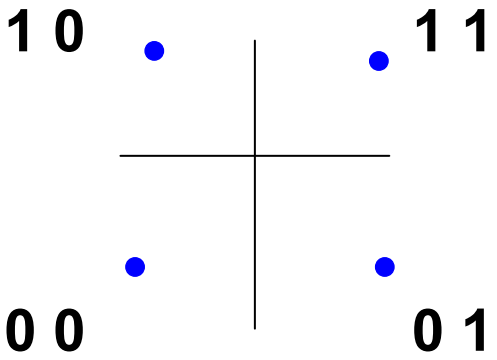
GMSK OVERVIEW

The modulation scheme used for the EUT is GMSK.

A brief overview of how GMSK works is shown below.

GMSK (Gaussian Minimum Shift Keying)

The fundamental principal behind GMSK is Phase shift keying. This splits a data stream into a series of 2-digit phase shifts, using the following phase shifts to represent data pairs.



Therefore for the BIT sequence 0 0 1 1 1 0 0 1 The corresponding phase shift will be used

BIT SEQUENCE		0 0	1 1	1 0	01
PHASE	225º	45º	135º	315º	

This is called QPSK (Quadratic Phase Shift Keying)

However

There is a problem with QPSK: transition from e.g. 00 to 11 gives phase shift of 180° (π radians). This has the effect of inverting the carrier waveform and this can lead to detection errors at the receiver.

Solution: restrict phase changes to ± 90°

1. Split bitstream into 2 streams e.g.

	0 0		1 1		0 1		1 0	
I Stream	0		1		0		1	
Q stream		0		1		1		0

2. Modulate each stream with PSK (1 = 90° or π/2, 0 = -90° or – π/2 phase shift)

I Stream	0		1		0		1	
	-π/2		-π/2		-π/2		π/2	
Q stream		0		1		1		0
		-π/2		π/2		π/2		-π/2

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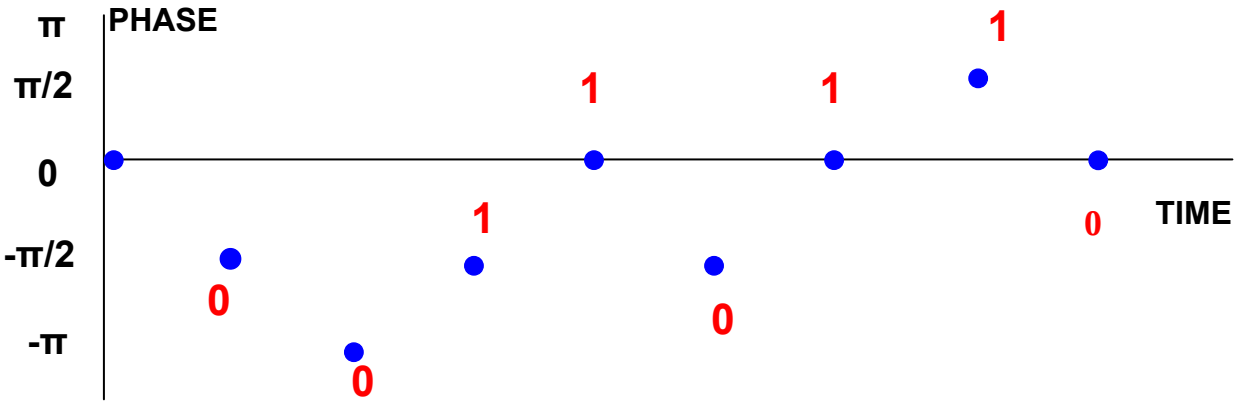
3. Combine (add) the two PSK signals:

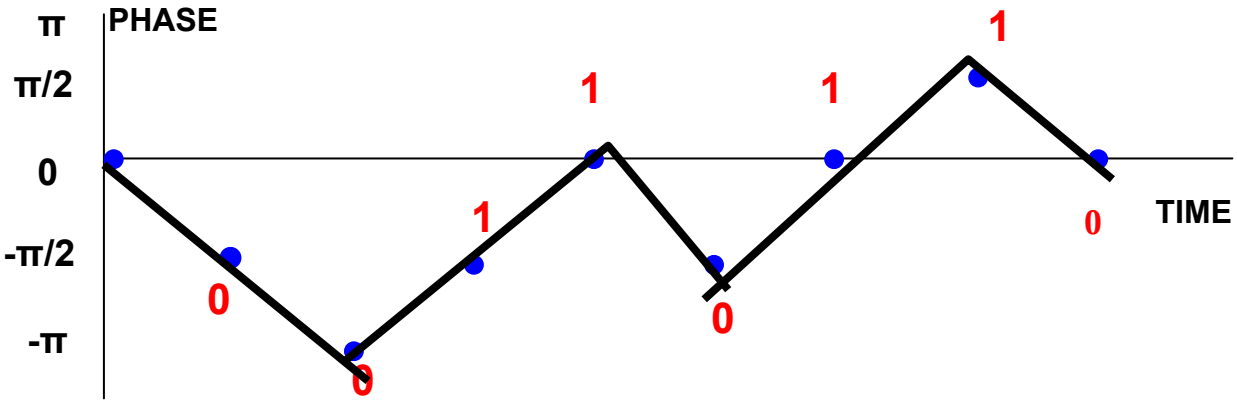
Combined Phase	-π/2	-π	-π/2	0	-π/2	0	π/2	0

Result: offset – QPSK, phase change is restricted to ± π/2 radians:



It would be preferable to have "gradual" changes in place between each pair of bits (Continuous-phase modulation). Replacing each "rectangular" shaped pulse (for 1 or 0) with a sinusoidal pulse can do this:

Result: Minimum Shift Keying (MSK):



Gaussian Minimum Shift Keying

MSK has high sidebands relative to the main lobes in the frequency domain – this can lead to interference with adjacent signals.

If the rectangular pulses corresponding to the bitstream are filtering using a Gaussian-shaped impulse response filter, we get Gaussian MSK (GMSK) – this has low sidelobes compared to MSK.

FCC 47 CFR Part 2, Limit Clause 2.1047 (d)

A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

SECTION 3

TEST EQUIPMENT USED

Product Service

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1 - Spurious Emissions at Band Edge					
Radio Communications Test Set	Rohde & Schwarz	CMU 200	39	12	15-Dec-2015
Power Supply Unit	Hewlett Packard	6253A	441	-	O/P Mon
Attenuator (10dB)	Weinschel	47-10-34	481	12	1-Apr-2016
Power Splitter	Weinschel	1506A	606	12	24-Mar-2016
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	28-Jul-2015
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	20-Jan-2016
Hygrometer	Rotronic	I-1000	2891	12	16-Jul-2015
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	16-Sep-2015
Hygrometer	Rotronic	I-1000	3220	12	24-Jul-2015
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	12-Dec-2015
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	6-Aug-2015
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	3-Sep-2015
Combiner/Splitter	Weinschel	1506A	3877	12	24-Mar-2016
DC - 12.4 GHz 10 dB Attenuator 1 W	Suhner	6810.17.A	3964	12	22-Oct-2015
True RMS Multimeter	Fluke	179	4007	12	31-Jul-2015
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4144	12	7-Nov-2015
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	24-Sep-2015
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	28-Jul-2015
Wideband Radio Test Set	Rohde & Schwarz	CMW500	4546	12	23-Jan-2016
Section 2.2 - Peak to Average Ratio					
Attenuator (10dB)	Weinschel	47-10-34	481	12	1-Apr-2016
Power Splitter	Weinschel	1506A	606	12	24-Mar-2016
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
Multimeter	Iso-tech	IDM101	2419	12	7-Oct-2015
Hygrometer	Rotronic	I-1000	2891	12	16-Jul-2015
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	16-Sep-2015
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	3-Sep-2015
P-Series Power Meter	Agilent Technologies	N1911A	3980	12	22-Sep-2015
50 MHz-18 GHz Wideband Power Sensor	Agilent Technologies	N1921A	3982	12	22-Sep-2015
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	24-Sep-2015
1 metre SMA Cable	IW Microwave	3PS-1806LC-394-3PS	4523	12	29-Jan-2016

Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.3 – Maximum Conducted Output Power					
Radio Communications Test Set	Rohde & Schwarz	CMU 200	39	12	15-Dec-2015
Power Supply Unit	Hewlett Packard	6253A	441	-	O/P Mon
20dB/2W Attenuator	Narda	4772-20	462	-	TU
Attenuator (10dB)	Weinschel	47-10-34	481	12	1-Apr-2016
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	28-Jul-2015
Multimeter	Iso-tech	IDM101	2419	12	7-Oct-2015
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	20-Jan-2016
Hygrometer	Rotronic	I-1000	2891	12	16-Jul-2015
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	16-Sep-2015
Hygrometer	Rotronic	I-1000	3220	12	24-Jul-2015
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	12-Dec-2015
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	6-Aug-2015
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	3-Sep-2015
Combiner/Splitter	Weinschel	1506A	3877	12	24-Mar-2016
DC - 12.4 GHz 10 dB Attenuator 1 W	Suhner	6810.17.A	3964	12	22-Oct-2015
P-Series Power Meter	Agilent Technologies	N1911A	3980	12	22-Sep-2015
P-Series Power Meter	Agilent Technologies	N1911A	3981	12	22-Sep-2015
50 MHz-18 GHz Wideband Power Sensor	Agilent Technologies	N1921A	3982	12	22-Sep-2015
50 MHz-18 GHz Wideband Power Sensor	Agilent Technologies	N1921A	3983	12	22-Sep-2015
True RMS Multimeter	Fluke	179	4007	12	31-Jul-2015
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4144	12	7-Nov-2015
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	24-Sep-2015
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	28-Jul-2015
2 metre N-Type Cable	IW Microwave	NPS-1806LC-788-NPS	4503	12	20-May-2016
Wideband Radio Test Set	Rohde & Schwarz	CMW500	4546	12	23-Jan-2016
Section 2.4 - Frequency Stability					
Radio Communications Test Set	Rohde & Schwarz	CMU 200	39	12	15-Dec-2015
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Power Supply Unit	Hewlett Packard	6253A	441	-	O/P Mon
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	28-Jul-2015
Multimeter	Iso-tech	IDM101	2419	12	7-Oct-2015
Digital Thermometer	Digitron	T208	2831	12	31-Jul-2015
Radio Communications Test Set	Rohde & Schwarz	CMU 200	3035	12	6-Nov-2015
Attenuator (30dB/50W)	Aeroflex / Weinschel	47-30-34	3164	12	12-Dec-2015
Thermocouple Thermometer	Fluke	51	3173	12	4-Dec-2015
Hygrometer	Rotronic	I-1000	3220	12	24-Jul-2015
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	12-Dec-2015
MasterCard Reference Terminal	Sagem Monetel	EFT 30	3745	-	TU
DC - 12.4 GHz 10 dB Attenuator 1 W	Suhner	6810.17.A	3964	12	22-Oct-2015
DC - 12.4 GHz 10 dB Attenuator	Suhner	6810.17.A	3965	12	22-Oct-2015
True RMS Multimeter	Fluke	179	4007	12	31-Jul-2015
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4144	12	7-Nov-2015
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	28-Jul-2015
2 metre SMA Cable	IW Microwave	3PS-1806LC-788-3PS	4525	12	29-Jan-2016

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.5 - Emission Limitations for Broadband PCS Equipment					
Antenna (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230	24	26-Nov-2015
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	29-Apr-2016
Dual Power Supply Unit	Thurlby	PL320	288	-	TU
Pre-Amplifier	Phase One	PS04-0086	1533	12	23-Dec-2015
Pre-Amplifier	Phase One	PSO4-0087	1534	12	23-Dec-2015
Screened Room (5)	Rainford	Rainford	1545	24	26-Jun-2015
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	10-Jun-2015
Radio Communications Test Set	Rohde & Schwarz	CMU 200	3035	12	6-Nov-2015
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	27-Oct-2015
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	-	TU
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Hygropalm Temperature and Humidity Meter	Rotronic	HP21	4410	12	15-Apr-2016
Suspended Substrate Highpass Filter	Advance Power Components	11SH10-3000/X18000-O/O	4411	12	24-Mar-2016
2m K-Type Cable (Rx)	Scott Cables	KPS-1501-2000-KPS	4527	6	29-Jul-2015
0.5m SMA Cable (Rx)	Scott Cables	SLSLL18-SMSM-00.50M	4528	6	29-Jul-2015
Section 2.6 - 26 dB Bandwidth					
Radio Communications Test Set	Rohde & Schwarz	CMU 200	39	12	15-Dec-2015
Power Supply Unit	Hewlett Packard	6253A	441	-	O/P Mon
Attenuator (10dB)	Weinschel	47-10-34	481	12	1-Apr-2016
Power Splitter	Weinschel	1506A	606	12	24-Mar-2016
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	28-Jul-2015
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	20-Jan-2016
Hygrometer	Rotronic	I-1000	2891	12	16-Jul-2015
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	16-Sep-2015
Hygrometer	Rotronic	I-1000	3220	12	24-Jul-2015
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	12-Dec-2015
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	6-Aug-2015
Combiner/Splitter	Weinschel	1506A	3877	12	24-Mar-2016
DC - 12.4 GHz 10 dB Attenuator 1 W	Suhner	6810.17.A	3964	12	22-Oct-2015
True RMS Multimeter	Fluke	179	4007	12	31-Jul-2015
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4144	12	7-Nov-2015
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	28-Jul-2015
Wideband Radio Test Set	Rohde & Schwarz	CMW500	4546	12	23-Jan-2016

TU – Traceability Unscheduled
O/P MON – Output Monitored with Calibrated Equipment

Product Service

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	MU
Modulation Characteristics	-
26 dB Bandwidth	± 13.64 kHz
Maximum Conducted Output Power	± 0.70 dB
Spurious Emissions at Band Edge	± 0.70 dB ± 17.93 kHz
Emission Limitations for Broadband PCS Equipment	30 MHz to 1 GHz: ± 5.1 dB 1 GHz to 40 GHz: ± 6.3 dB
Frequency Stability	± 47.75 Hz
Peak to Average Ratio	± 0.70 dB

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).