Shenzhen Huatongwei International Inspection Co., Ltd.
Keji S,12th , Road, Hi-tech Industrial Park, Shenzhen, Guangdong, China
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CNASL1225

FCC PART 90 TEST REPORT

FCC Part 90

Report Reference No.....:	**TRE12040099**
FCC ID.....:	**YAMPT580HF4**
Compiled by (position+printed name+signature)..:	File administrators Eric Zhang
Supervised by (position+printed name+signature)..:	Test Engineer Wenliang Li
Approved by (position+printed name+signature)..:	Manager Wenliang Li
Date of issue.....:	June 19, 2012
Testing Laboratory Name .....:	**Shenzhen Huatongwei International Inspection Co., Ltd**
Address.....:	Keji Nan No.12 Road, Hi-tech Park, Shenzhen, China
Applicant's name.....:	**Hytera Communications Corporation Ltd.**
Address.....:	HYT Tower,Hi-Tech Industrial Park North,Nanshan District,Shenzhen China.518057
Test specification:	
Standard .....:	**FCC Part 90 / FCC Part 2** **FCC Waiver for Tetra FCC 11-63 and FCC DA 11-1604**
TRF Originator.....:	Shenzhen Huatongwei International Inspection CO., Ltd
Master TRF.....:	Dated 2006-06

Test item description .....:	TETRA Digital Portable Terminal
Trade Mark .....:	Hytera
Manufacturer .....:	**Hytera Communications Corporation Ltd.**
Model/Type reference.....:	PT580H F4
Listed Models .....:	/
Modulation .....:	pi/4DQPSK
Channel Separation.....	25KHz
Rated Power .....:	3.0 Watts(34.77dBm)
Operation Frequency.....	410MHz-470MHz
Ratings.....:	DC 7.40 V
Result.....:	**Positive**

TEST REPORT

Test Report No. :	TRE12040099	June 19, 2012 Date of issue

Equipment under Test	:	TETRA Digital Portable Terminal
Model /Type	:	PT580H F4
Listed Models	:	/
Applicant	:	**Hytera Communications Corporation Ltd.**
Address	:	HYT Tower,Hi-Tech Industrial Park North,Nanshan District,Shenzhen China.518057
Manufacturer	:	**Hytera Communications Corporation Ltd.**
Address	:	HYT Tower,Hi-Tech Industrial Park North,Nanshan District,Shenzhen China.518057

Test Result according to the standards on page 4:	**Positive**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Contents

1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 90: PRIVATE LAND MOBILE RADIO SERVICES.

TIA/EIA 603: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

FCC Rules Part 15 Subpart B: RADIO FREQUENCY DEVICES-Unintertional Radiators

FCC Part 2: FREQUENCY ALLOCA-TIONS AND RADIO TREATY MAT-TERS; GENERAL RULES AND REG-ULATIONS

FCC Waiver for Tetra FCC 11-63 and FCC DA 11-1604

2 . SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Apr 23, 2012
Testing commenced on	:	Apr 23, 2012
Testing concluded on	:	June 19, 2012

2.2. Product Description

The Hytera Communications Corporation Ltd.'s Model: PT580H F4 or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

Name of EUT	TETRA Digital Portable Terminal	
Model Number	PT580H F4	
FCC ID	YAMPT580HF4	
Rated Output Power	3.0 Watt(34.77dBm)	
Modilation Type	pi/4DQPSK	
Channel Separation	25KHz	
Emission Designation	20K0DXW/20K0GXW	
Antenna Type	External	
Frequency Range	410MHz-470MHz	
Maximum Transmitter Power	DMO	3.56 W for 25 KHz Channel Separation
	TMO	3.60 W for 25 KHz Channel Separation

2.3. Equipment under Test

Power supply system utilised

Power supply voltage	:	○	120V / 60 Hz	○	115V / 60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 7.40 V

Test frequency list

Modulation Type	Test Mode	Test Channel	Test Frequency		Remark
			Tx	Rx	
DQPSK	TMO	Low Channel	450 MHz	460 MHz	Only for FCC
		High Channel	460 MHz	470 MHz	Only for FCC
	DMO	Low Channel	450 MHz	450 MHz	Only for FCC
		Middle Channel	460 MHz	460 MHz	Only for FCC
		High Channel	470 MHz	470 MHz	Only for FCC

2.4. Short description of the Equipment under Test (EUT)

410-470 MHz U frequency band TETRA Digital Portable Terminal with GPS function (PT580H F4).

For more details, refer to the user's manual of the EUT.

Serial number: Prototype

FCC ID: YAMPT580HF4

2.5. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commission's requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.6. EUT operation mode

The EUT was operating in normal operation mode according to ETSI EN 300 392-1 during the tests (unless otherwise stated)

2.7. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

○	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/
○	Multimeter	Manufacturer :	/
		Model No. :	/

2.8. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **YAMPT580HF4** filing to comply with FCC Part 90 Rules and FCC Wavier for Tetra FCC 11-63 and FCC DA 11-1604.

2.9. Modifications

No modifications were implemented to meet testing criteria.

2.10. Note

1. The EUT is a U frequency band (410-470 MHz) TETRA Digital Portable Terminal with GPS function,The functions of the EUT listed as below:

	Test Standards	Reference Report
Radio	FCC Part 90 & FCC Waiver	TRE12040099

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Huatongwei International Inspection Co., Ltd
Keji Nan No.12 Road, Hi-tech Park, Shenzhen, China
Phone: 86-755-26715686 Fax: 86-755-26748089

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2009) and CISPR Publication 22.

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection Co., Ltd has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: August 02, 2007. Valid time is until Feb 28, 2015.

A2LA-Lab Cert. No. 2243.01

Shenzhen Huatongwei International Inspection Co., Ltd, EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. Valid time to Sep 30, 2013.

FCC-Registration No.: 662850

Shenzhen Huatongwei International Inspection Co., Ltd, EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 662850, Renewal date June 01, 2012.

IC-Registration No.: 5377

The 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377 on February 24th, 2011.

ACA

Shenzhen Huatongwei International Inspection Co., Ltd, EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

NEMKO-Aut. No.: ELA125

Shenzhen Huatongwei International Inspection Co., Ltd has been assessed the quality assurance system, the testing facilities, qualifications and testing practices of the relevant parts of the organization. The quality assurance system of the Laboratory has been validated against ISO/IEC 17025:2005 or equivalent. The laboratory also fulfils the conditions described in Nemko Document NLA-10; the Authorization is valid through July 07, 2013.

VCCI

The 3m Semi-anechoic chamber (12.2m×7.95m×6.7m) and Shielded Room (8m×4m×3m) of Shenzhen Huatongwei International Inspection Co., Ltd has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2484. Date of Registration: December 20, 2009. Valid time is until December 19, 2012.

Main Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: C-2726. Date of Registration: December 20, 2009. Valid time is until December 19, 2012.

DNV

Shenzhen Huatongwei International Inspection Co Ltd has been found to comply with the requirements of DNV towards subcontractor of EMC and safety testing services in conjunction with the EMC and Low voltage Directives and in the voluntary field. The acceptance is based on a formal quality Audit and follow-ups according to relevant parts of ISO/IEC Guide 17025(2005), in accordance with the requirements of the DNV Laboratory Quality Manual towards subcontractors. Valid time is until 24 Augest, 2013.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4. Configuration of Tested System

Fig. 2-1 Configuration of Tested System

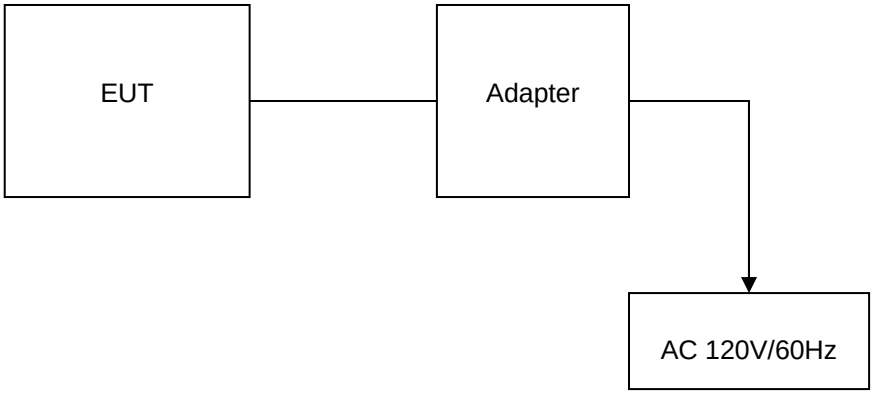


Table 2-1 Equipment Used in Tested System

Adapter: P/N: PS1014
Model: DSA-15P-12 US 120120
Input:100-240V～50/60Hz 0.5A
Output: +12V DC 1A
Power Cable: 180cm
◇ Shielded ◆ Unshielded

3.5. Discription of Tested Modes

The EUT (TETRA Digital Portable Terminal) has been tested under normal operating condition. Six channels (the high, the middle and the low) are chosen for testing at channel separation (25 KHz).

3.6. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen Huatongwei laboratory is reported:

Test Items	Measurement Uncertainty	Notes
Frequency stability	150 Hz	(1)
Transmitter power conducted	0.30 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emission 9KHz-12.75 GHz	1.60 dB	(1)
Radiated spurious emission 9KHz-12.75 GHz	2.20 dB	(1)
Conducted Emission 9KHz-30MHz	3.39 dB	(1)
Radiated Emission 30~1000MHz	4.24 dB	(1)
Radiated Emissio 1~18GHz	5.16 dB	(1)
Radiated Emissio 18-40GHz	5.54 dB	(1)
Occupied Bandwidth	---------	(1)
Emission Mask	---------	(1)
Modulation Characteristic	---------	(1)
Transmitter Frequency Behavior	---------	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

3.7. Test Description

FCC Rules	Description of Test	Test Result
§ 15.107	Conducted Emission	Complies
§ 15.109	Receiver Radiated Spurious Emssion	Complies
§ 15.109	Receiver Conducted Spurious Emssion	Complies
§ 90.205	Maximum Transmitter Power	Complies
§ 90.207	Modulation Characteristic	N/A
§ 90.209	Occupied Bandwidth	Complies
§ 90.210	Emission Mask	N/A
§ 90.221	Adjacent Channel Power	Complies
§ 90.213	Frequency Stability	Complies
§ 90.214	Transmitter Frequency Behavior	N/A
§ 90.210	Transmitter Radiated Spurious Emssion	Complies
§ 90.210	Spurious Emssion On Antenna Port	Complies

3.8. Equipments Used during the Test

AC Power Conducted Emission				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Artificial Mains	Rohde&Schwarz	ESH2-Z5	100028	10/23/2012
EMI Test Receiver	Rohde&Schwarz	ESCS 30	100038	10/23/2012
Pulse Limiter	Rohde&Schwarz	ESHSZ2	100044	10/23/2012
EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	10/23/2012

Transmitter Radiated Spurious Emssion & Occupied Bandwidth & Emission Mask & Receiver Radiated Spurious Emssion & ACP				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Ultra-Broadband Antenna	Rohde&Schwarz	HL562	100015	10/23/2012
EMI Test Receiver	Rohde&Schwarz	ESI 26	100009	10/23/2012
RF Test Panel	Rohde&Schwarz	TS / RSP	335015/ 0017	N/A
HORN ANTENNA	Rohde&Schwarz	HF906	100039	10/23/2012
Turntable	ETS	2088	2149	N/A
Antenna Mast	ETS	2075	2346	N/A
Filter	Compliance Direction systems	BSU-6	34202	10/23/2012
EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	10/23/2012
Spectrum Analzyer	Aglient	E4407B	MY44210775	10/23/2012
TETRA Signal Analyzer	IFR	2310	231001/168	10/23/2012
Spectrum Analzye	Rohde&Schwarz	FSP40	1164.4391.40	10/23/2012

Frequency Stability				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Receiver	Rohde&Schwarz	ESI 26	100009	10/23/2012
Climate Chamber	ESPEC	EL-10KA	05107008	10/23/2012

Maximum Transmitter Power & Spurious Emssion On Antenna Port				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Receiver	Rohde&Schwarz	ESI 26	100009	10/23/2012
Attenuator	R&S	ESH3-22	100449	10/23/2012
Filter	Compliance Direction systems	BSU-6	34202	10/23/2012

Transient Frequency Behavior				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Signal Generator	Rohde&Schwarz	SMT03	100059	23/10/2012
Storage Oscilloscope	Tektronix	TDS3054B	B033027	23/10/2012
TETRA Signal Analyzer	IFR	2310	231001/168	10/23/2012

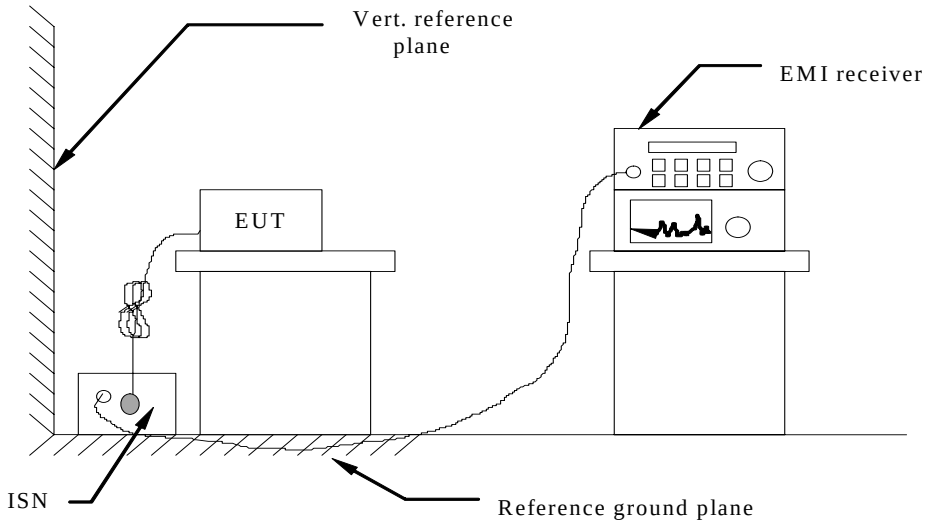
4. TEST CONDITIONS AND RESULTS

4.1. Conducted Emissions Test

TEST APPLICABLE

The EUT was tested according to ANSI C63.4 - 2009. The frequency spectrum from 0.15 MHz to 30 MHz was investigated. The LISN used was 50 ohm / 50 u Henry as specified by section 5.1 of ANSI C63.4 - 2009. Cables and peripherals were moved to find the maximum emission levels for each frequency.

TEST CONFIGURATION



TEST PROCEDURE

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4-2009.
2 Support equipment, if needed, was placed as per ANSI C63.4-2009.
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4-2009.
4 If a EUT received DC power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8 During the above scans, the emissions were maximized by cable manipulation.

Conducted Power Line Emission Limit

For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following：

Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

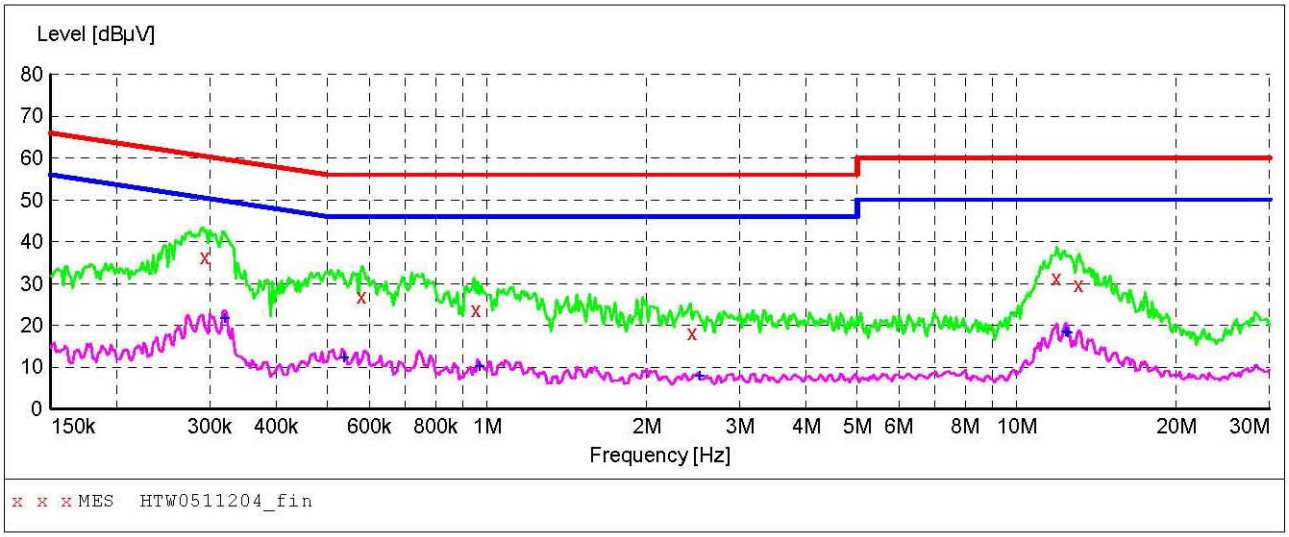
For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

TEST RESULTS

For DMO Mode

SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "HTW0511204_fin"

5/11/2012 6:01AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.292930	36.30	9.7	60	24.1	QP	L1	GND
0.581273	26.80	9.8	56	29.2	QP	L1	GND
0.952650	23.60	9.8	56	32.4	QP	L1	GND
2.439360	18.20	9.8	56	37.8	QP	L1	GND
11.910316	31.20	9.7	60	28.8	QP	L1	GND
13.105381	29.70	9.7	60	30.3	QP	L1	GND

MEASUREMENT RESULT: "HTW0511204_fin2"

5/11/2012 6:01AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.319768	21.60	9.7	50	28.1	AV	L1	GND
0.536750	12.20	9.7	46	33.8	AV	L1	GND
0.967950	10.10	9.8	46	35.9	AV	L1	GND
2.518370	7.90	9.8	46	38.1	AV	L1	GND
12.394408	18.30	9.7	50	31.7	AV	L1	GND
12.493565	18.10	9.7	50	31.9	AV	L1	GND

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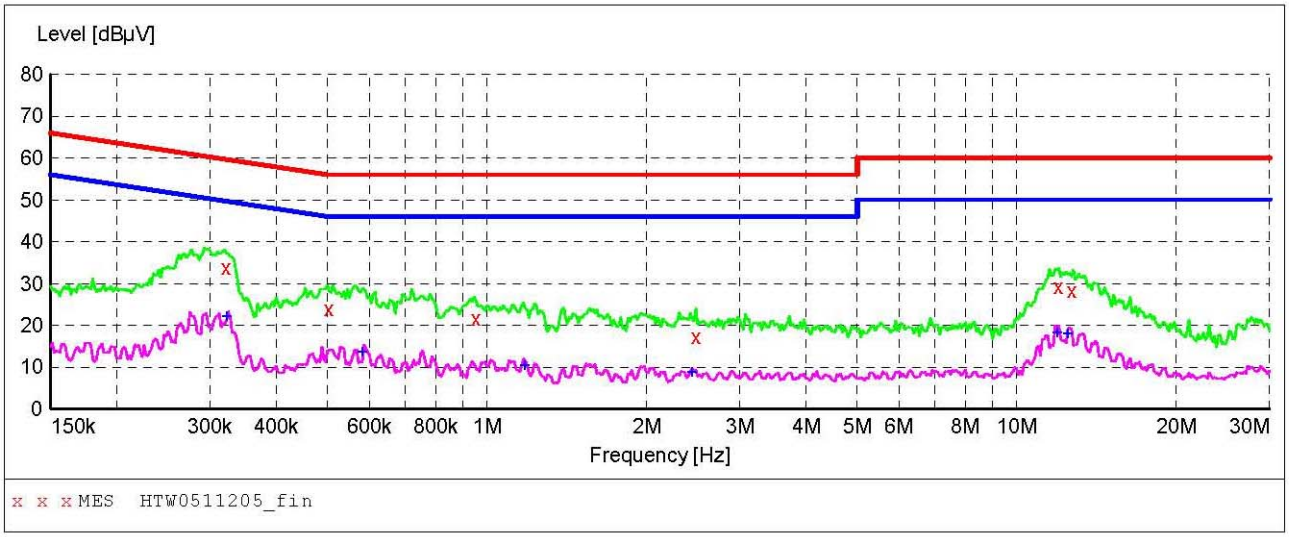
SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "HTW0511205_fin"

5/11/2012 6:13AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.322326	33.70	9.7	60	25.9	QP	N	GND
0.503600	24.00	9.7	56	32.0	QP	N	GND
0.952650	21.60	9.8	56	34.4	QP	N	GND
2.478551	17.20	9.8	56	38.8	QP	N	GND
12.005592	29.30	9.7	60	30.7	QP	N	GND
12.694260	28.30	9.7	60	31.7	QP	N	GND

MEASUREMENT RESULT: "HTW0511205_fin2"

5/11/2012 6:13AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.322330	22.10	9.7	50	27.5	AV	N	GND
0.581270	13.50	9.8	46	32.5	AV	N	GND
1.181320	10.40	9.9	46	35.6	AV	N	GND
2.439360	8.70	9.8	46	37.3	AV	N	GND
11.910310	18.20	9.7	50	31.8	AV	N	GND
12.493570	17.90	9.7	50	32.1	AV	N	GND

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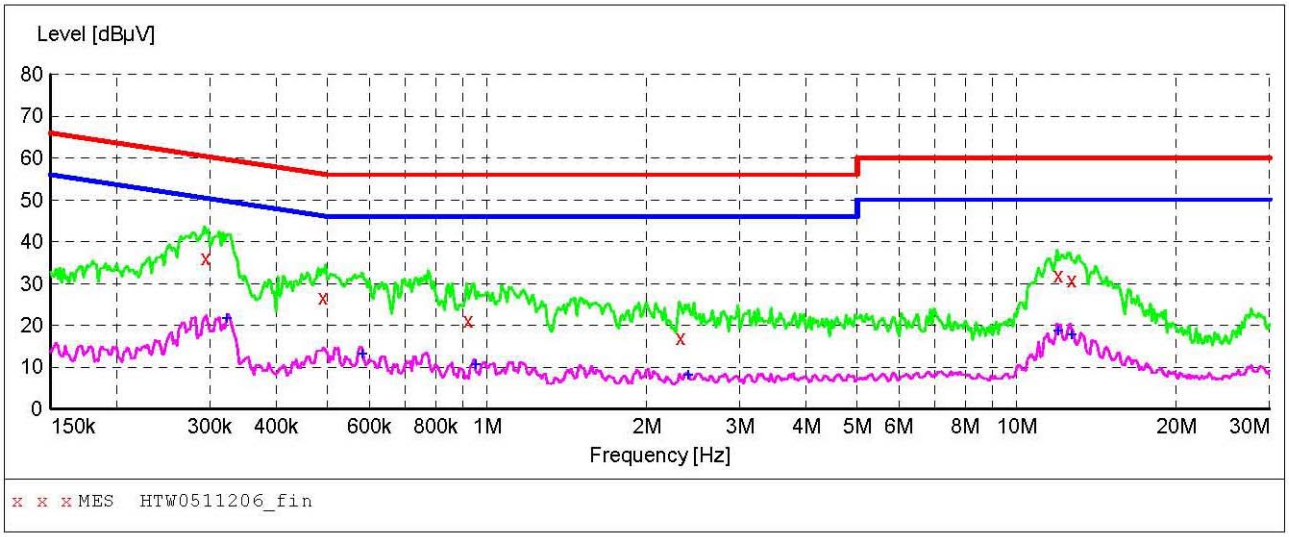
For TMO

SCAN TABLE: "Voltage (9K-30M)FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "HTW0511206_fin"

5/11/2012 6:20AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.295278	36.20	9.7	60	24.2	QP	L1	GND
0.491710	26.70	9.7	56	29.4	QP	L1	GND
0.922759	21.20	9.8	56	34.8	QP	L1	GND
2.325480	17.00	9.8	56	39.0	QP	L1	GND
12.005599	32.00	9.7	60	28.0	QP	L1	GND
12.694260	30.90	9.7	60	29.1	QP	L1	GND

MEASUREMENT RESULT: "HTW0511206_fin2"

5/11/2012 6:20AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.322330	21.50	9.7	50	28.1	AV	L1	GND
0.581270	13.00	9.8	46	33.0	AV	L1	GND
0.952650	10.60	9.8	46	35.4	AV	L1	GND
2.400797	8.00	9.8	46	38.0	AV	L1	GND
12.005599	18.50	9.7	50	31.5	AV	L1	GND
12.694260	17.80	9.7	50	32.2	AV	L1	GND

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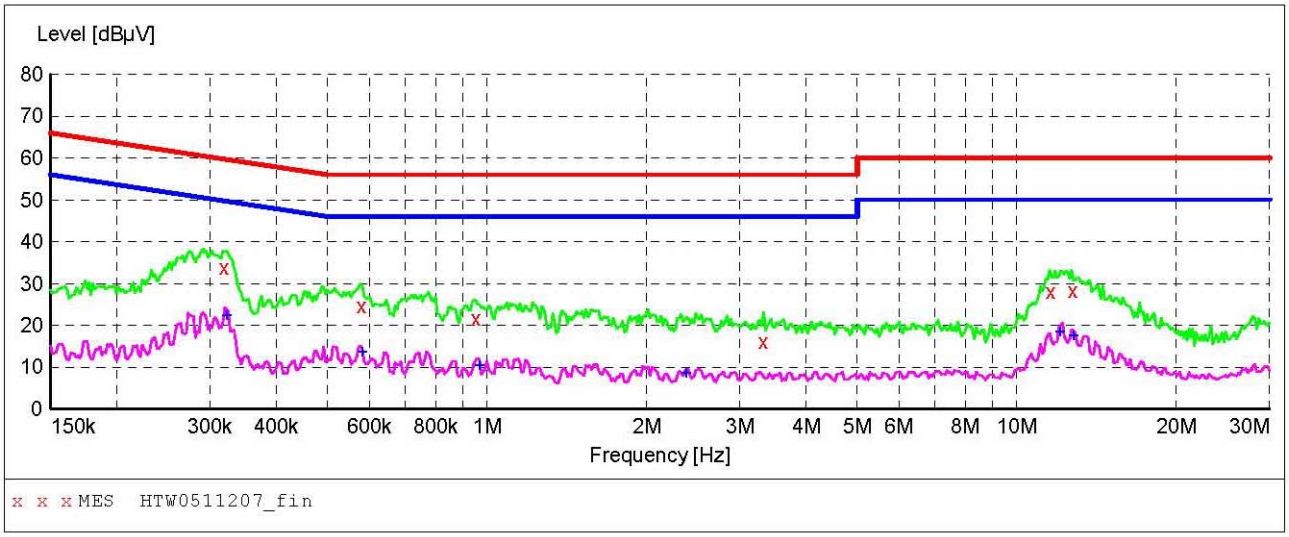
SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "HTW0511207_fin"

5/11/2012 6:27AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.319770	33.90	9.7	60	25.8	QP	N	GND
0.581270	24.50	9.8	56	31.5	QP	N	GND
0.952650	21.50	9.8	56	34.5	QP	N	GND
3.328416	16.10	9.8	56	39.9	QP	N	GND
11.628980	28.10	9.7	60	31.9	QP	N	GND
12.795812	28.20	9.7	60	31.8	QP	N	GND

MEASUREMENT RESULT: "HTW0511207_fin2"

5/11/2012 6:27AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.322330	22.30	9.7	50	27.3	AV	N	GND
0.581270	13.50	9.8	46	32.5	AV	N	GND
0.967950	10.40	9.8	46	35.6	AV	N	GND
2.381743	8.50	9.8	46	37.5	AV	N	GND
12.101640	18.30	9.7	50	31.7	AV	N	GND
12.795812	17.40	9.7	50	32.6	AV	N	GND

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4.2. Occupied Bandwidth, Adjacent Channel Power Test

TEST APPLICABLE

(a). Occupied Bandwidth: The EUT was connected to the audio signal generator and the spectrum analyzer via the main RF connector, and through an appropriate attenuator. The EUT was controlled to transmit its maximum power. Then the bandwidth of 99% power can be measured by the spectrum analyzer.
(b). For the frequency bands indicated in 90.209, operations using equipment designedto operate with a 25 kHz channel bandwidth may be authorized up to a 22 kHz bandwidth if the equipment meets the adjacent channel power (ACP) limits below.The table specifies a value for the ACP as a function of the displacement from the channel center frequency and a measurement bandwidth of 25 kHz.

Maximum adjacent power levels for frequencies below 700MHz:

Frequency Offset	Maximum ACP (dBc) for devices 1 watt and less	Maximum ACP (dBc) for devices above 1 watt
25 kHz	-55 dBc	-60 dBc
50 kHz	-70 dBc	-70 dBc
75 kHz	-70 dBc	-70 dBc

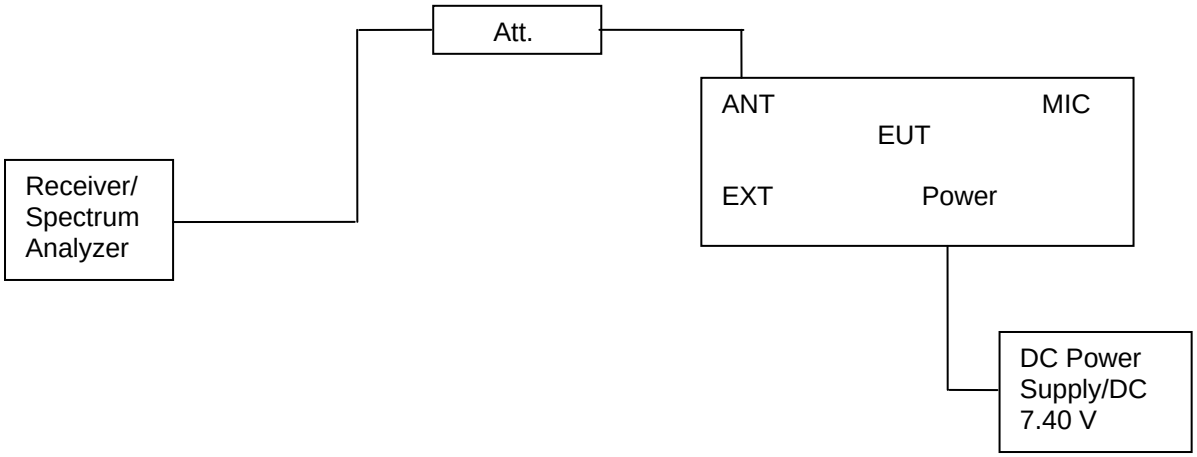
In any case, no requirement in excess of -36 dBm shall apply.

Maximum adjacent power levels for frequencies above 700MHz:

Frequency Offset	Maximum ACP (dBc) for devices less than 15 watts	Maximum ACP (dBc) for devices 15 watts and above
25 kHz	-55 dBc	-55 dBc
50 kHz	-65 dBc	-65 dBc
75 kHz	-65 dBc	-70 dBc

In any case, no requirement in excess of -36 dBm shall apply.
On any frequency removed from the assigned frequency by more than 75 kHz, the attenuation of any emission must be at least 43 + 10 log (P) dB.

TEST CONFIGURATION



TEST PROCEDURE

1 The EUT was placed on a turn table which is 0.8m above ground plane.
2 Set EUT as normal operation.
3 Set SPA Center Frequency = fundamental frequency, RBW=300Hz, VBW= 3 KHz, span =50 KHz.
4 Set SPA Max hold. Mark peak, Set 99% Occupied Bandwidth and 26dB Occupied Bandwidth.
5 Set SPA Center Frequency=fundamental frequency, RBW=300Hz, VBW=3 KHz span=50 KHz for 25 KHz channel spacing.
6 Set SPA Certer Frequency= fundamental frequency,set ACP measurement function to test ACP.

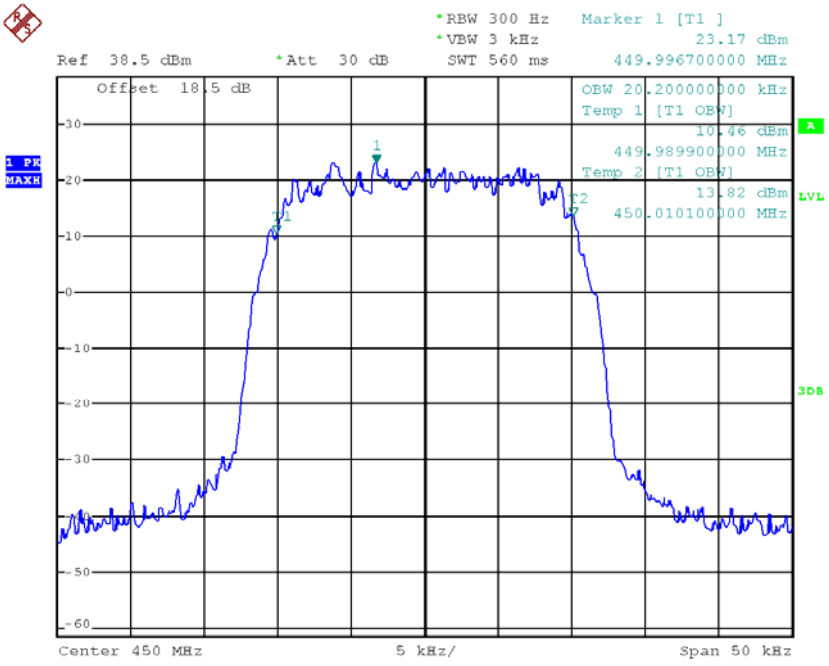
TEST RESULTS

4.2.1 Occupied Bandwidth

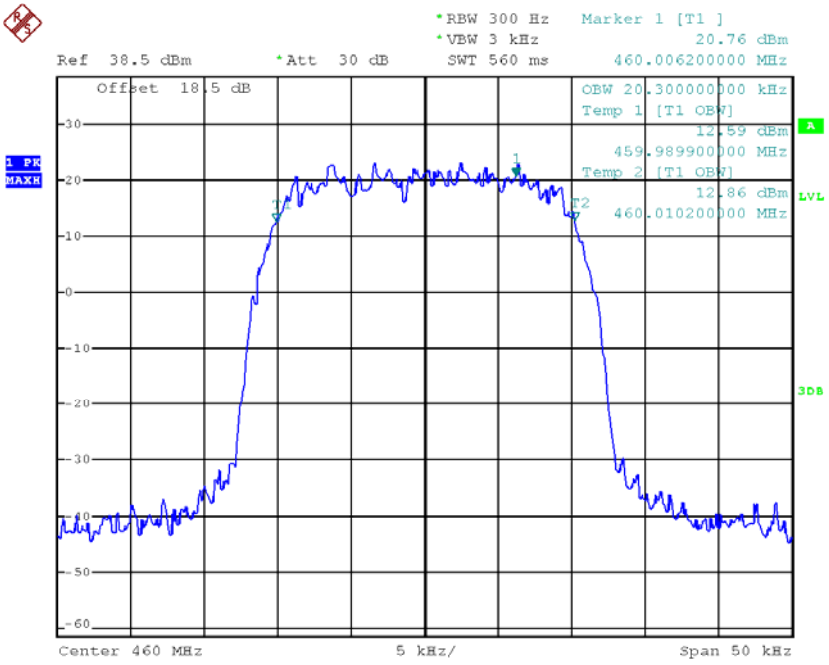
Modulation Type	Channel Sparation	Test Mode	Test Channel	Test Frequency	99% Occupied Bandwidth	Remak
pi/4DQPSK	25KHz	TMO	Low	450 MHz	20.20 KHz	Note 1
			High	460 MHz	20.30 KHz	Note 1
		DMO	Low	450 MHz	20.10 KHz	Note 1
			Middle	460 MHz	20.40 KHz	Note 1
			High	470 MHz	20.20 KHz	Note 1
Limit			22KHz for 25KHz Channel Separtion			
Test Results			Compliance			
Note 1: Operations using equipment designed to operate with a 25 kHz channel bandwidth may be authorized up to a 22 kHz bandwidth if the equipment meets the Adjacent Channel Power limits of § 90.221.						

Plots of 99% Bandwidth Measurement

Modulation Type	Mode	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	FCC Limit (KHz)	Results
pi/4DQPSK	TMO	25 KHz	450	20.20	22.00	Complicance

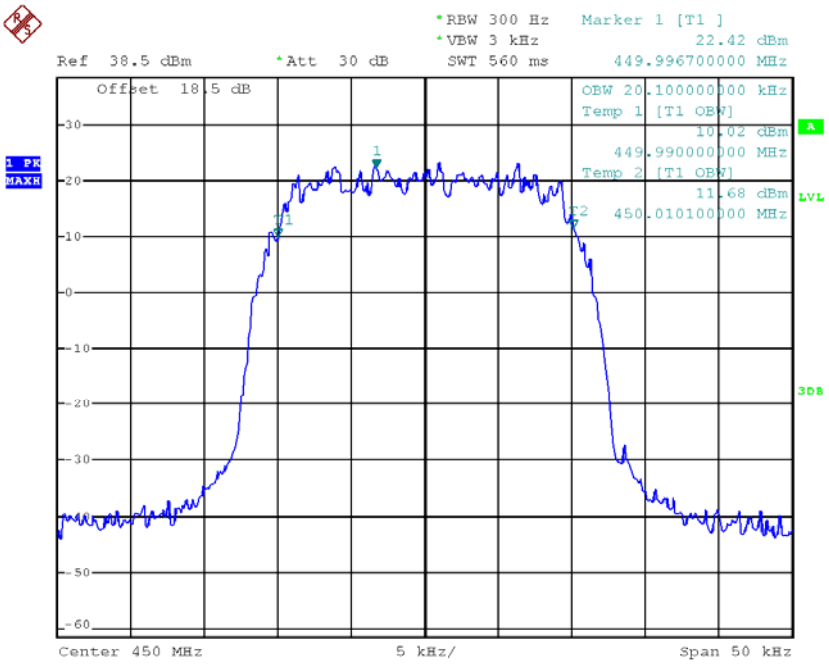


Modulation Type	Mode	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	FCC Limit (KHz)	Results
pi/4DQPSK	TMO	25 KHz	460	20.30	22.00	Complicance



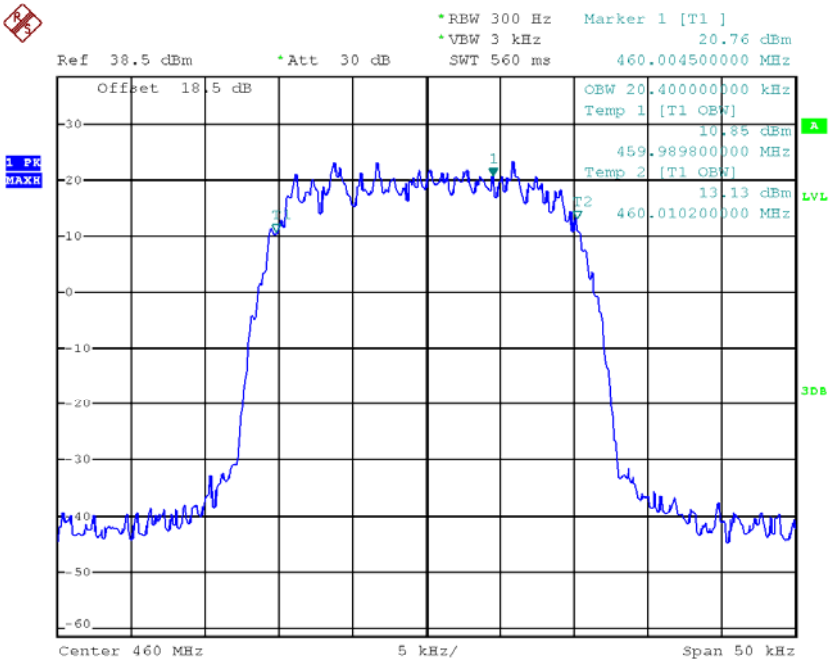
Date: 25.APR.2012 04:04:08

Modulation Type	Mode	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	FCC Limit (KHz)	Results
pi/4DQPSK	DMO	25 KHz	450	20.10	22.00	Complicance



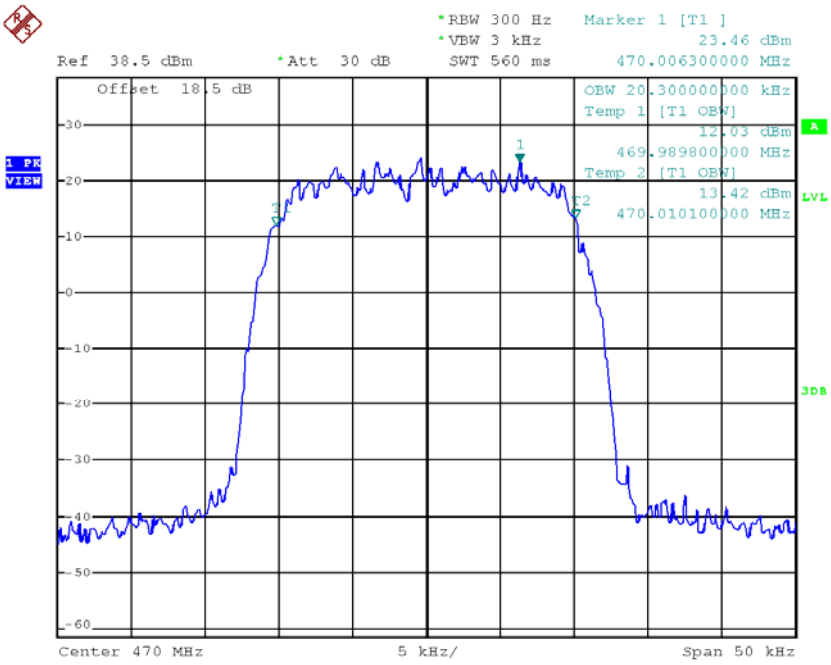
Date: 25.APR.2012 04:00:06

Modulation Type	Mode	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	FCC Limit (KHz)	Results
pi/4DQPSK	DMO	25 KHz	460	20.40	22.00	Complicance



Date: 25.APR.2012 03:57:54

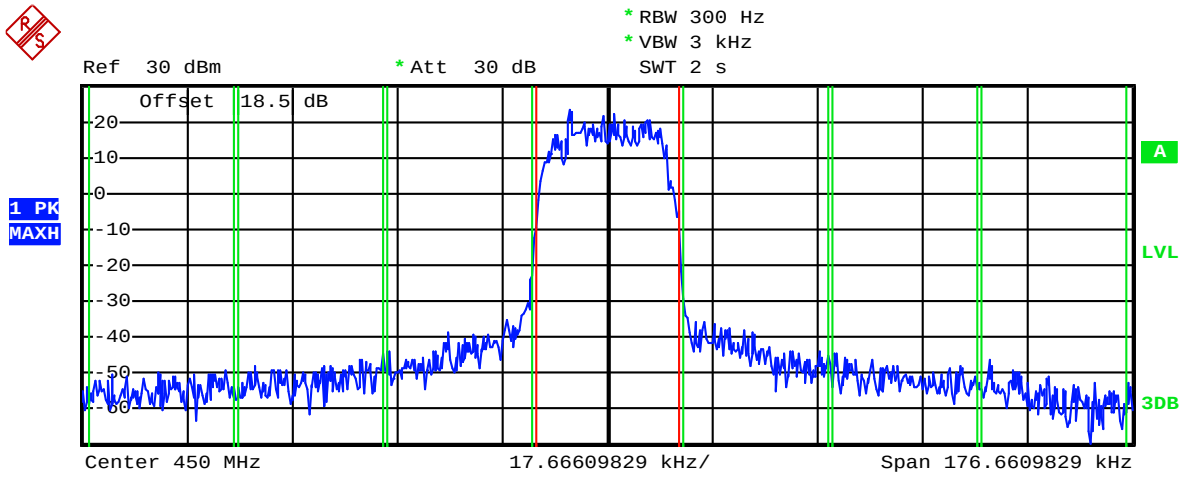
Modulation Type	Mode	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	FCC Limit (KHz)	Results
pi/4DQPSK	DMO	25 KHz	470	20.30	22.00	Complicance



Date: 25.APR.2012 03:56:24

4.2.2 Adjacent Channel Power (Only for FCC)

Modulation Type	Channel Separation	Mode	Freq.(MHz)	Results
pi/4DQPSK	25 KHz	TMO	450	Complicance



TETRA

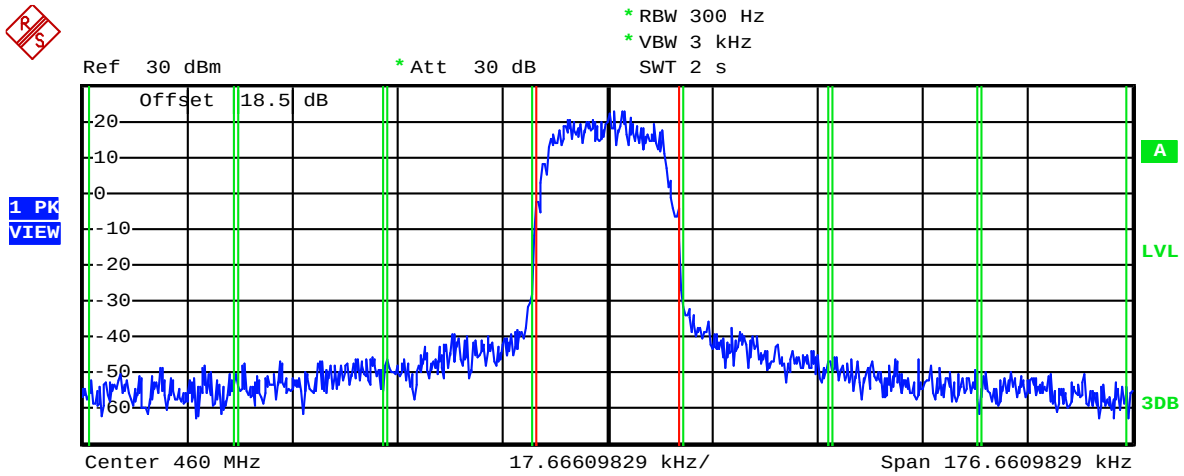
Tx Channel			
Bandwidth	24.3 kHz	Power	34.97 dBm
Adjacent Channel			
Bandwidth	24.3 kHz	Lower	-62.43 dB
Spacing	25 kHz	Upper	-62.91 dB
Alternate Channel			
Bandwidth	24.3 kHz	Lower	-72.78 dB
Spacing	50 kHz	Upper	-72.55 dB
2nd Alternate Channel			
Bandwidth	24.3 kHz	Lower	-74.55 dB
Spacing	75 kHz	Upper	-74.90 dB

Date: 7.JUN.2012 16:43:52

25 kHz Channel Spacing, 450 MHz only for FCC

Frequency Offset	Measurement Results		Limit(dBc)
	Lower(dBc)	Upper(dBc)	
-25KHz	-62.43	-62.91	-60
-50KHz	-72.78	-72.55	-70
-75KHz	-74.55	-74.90	-70

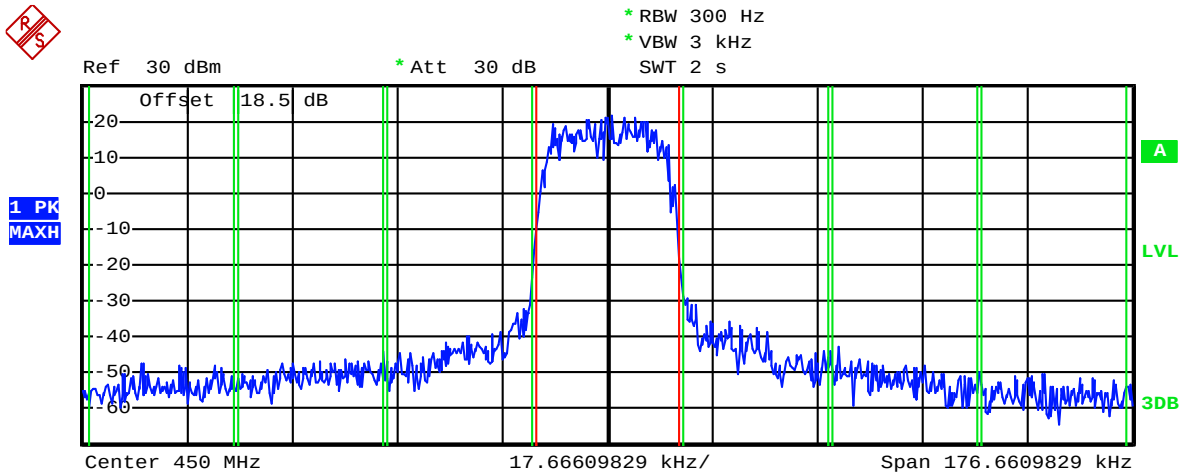
Modulation Type	Channel Separation	Mode	Freq.(MHz)	Results
pi/4DQPSK	25 KHz	TMO	460	Complicance



25 kHz Channel Spacing, 460 MHz only for FCC

Frequency Offset	Measurement Results		Limit(dBc)
	Lower(dBc)	Upper(dBc)	
-25KHz	-62.93	-63.50	-60
-50KHz	-72.78	-73.32	-70
-75KHz	-74.92	-74.13	-70

Modulation Type	Channel Separation	Mode	Freq.(MHz)	Results
pi/4DQPSK	25 KHz	DMO	450	Complicance



TETRA

Tx Channel
Bandwidth 24.3 kHz
Power 34.59 dBm

Adjacent Channel
Bandwidth 24.3 kHz
Spacing 25 kHz
Lower -62.66 dB
Upper -62.04 dB

Alternate Channel
Bandwidth 24.3 kHz
Spacing 50 kHz
Lower -72.26 dB
Upper -72.19 dB

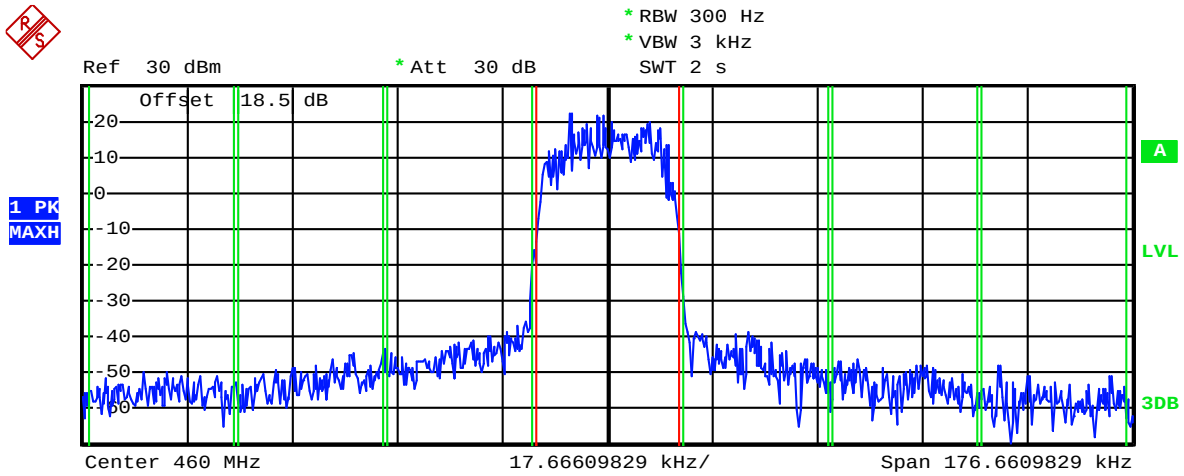
2nd Alternate Channel
Bandwidth 24.3 kHz
Spacing 75 kHz
Lower -74.33 dB
Upper -74.35 dB

Date: 7.JUN.2012 16:44:31

25 kHz Channel Spacing, 450 MHz only for FCC

Frequency Offset	Measurement Results		Limit(dBc)
	Lower(dBc)	Upper(dBc)	
-25KHz	-62.66	-62.04	-60
-50KHz	-72.26	-72.19	-70
-75KHz	-74.33	-74.35	-70

Modulation Type	Channel Separation	Mode	Freq.(MHz)	Results
pi/4DQPSK	25 KHz	DMO	460	Complicance



TETRA

Tx Channel
Bandwidth 24.3 kHz
Power 33.06 dBm

Adjacent Channel
Bandwidth 24.3 kHz
Spacing 25 kHz
Lower -62.08 dB
Upper -62.37 dB

Alternate Channel
Bandwidth 24.3 kHz
Spacing 50 kHz
Lower -72.73 dB
Upper -73.49 dB

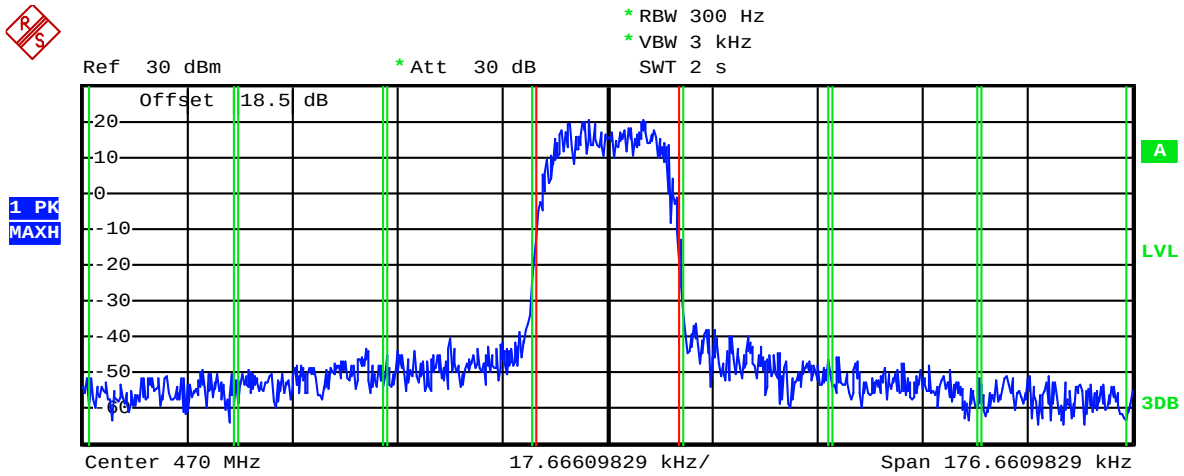
2nd Alternate Channel
Bandwidth 24.3 kHz
Spacing 75 kHz
Lower -74.98 dB
Upper -74.03 dB

Date: 7.JUN.2012 16:46:46

25 kHz Channel Spacing, 460 MHz only for FCC

Frequency Offset	Measurement Results		Limit(dBc)
	Lower(dBc)	Upper(dBc)	
-25KHz	-62.08	-62.37	-60
-50KHz	-72.73	-73.49	-70
-75KHz	-74.98	-74.03	-70

Modulation Type	Channel Separation	Mode	Freq.(MHz)	Results
pi/4DQPSK	25 KHz	DMO	470	Complicance



Tx Channel TETRA

Bandwidth	24.3 kHz	Power	33.37 dBm
Adjacent Channel			
Bandwidth	24.3 kHz	Lower	-62.51 dB
Spacing	25 kHz	Upper	-62.14 dB
Alternate Channel			
Bandwidth	24.3 kHz	Lower	-72.34 dB
Spacing	50 kHz	Upper	-72.19 dB
2nd Alternate Channel			
Bandwidth	24.3 kHz	Lower	-74.34 dB
Spacing	75 kHz	Upper	-74.26 dB

Date: 7.JUN.2012 16:47:24

25 kHz Channel Spacing, 470 MHz only for FCC

Frequency Offset	Measurement Results		Limit(dBc)
	Lower(dBc)	Upper(dBc)	
-25KHz	-62.51	-62.14	-60
-50KHz	-72.34	-72.19	-70
-75KHz	-74.34	-74.26	-70

4.3. Transmitter Radiated Spurious Emssion

TEST APPLICABLE

According to the TIA/EIA 603 test method, and according to Section 90.210, the power of each unwanted emission shall be less than Transmitted Power as specified below for transmitters designed to operate with 12.5 KHz channel bandwidth:

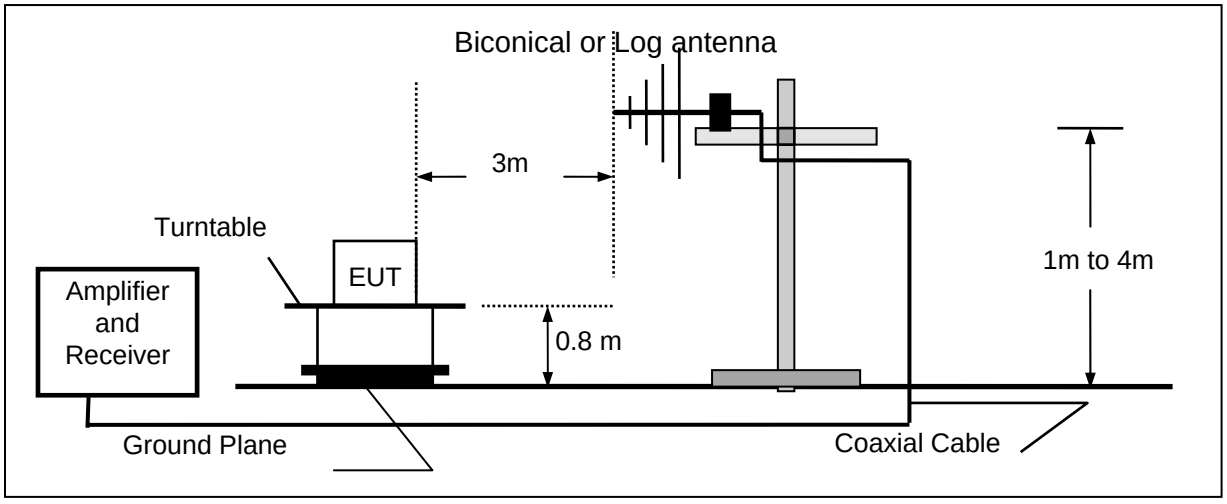
1 On any frequency removed from the center of the authorized bandwidth fo to 5.625 KHz removed from fo: Zero dB
2 On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) fo of more than 5.625 KHz but no more than 12.5 KHz: At least 7.27dB
3 On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) fo of more than 12.5 KHz: At least 50+10 log (P) dB or 70 dB, which ever is lesser attenuation.

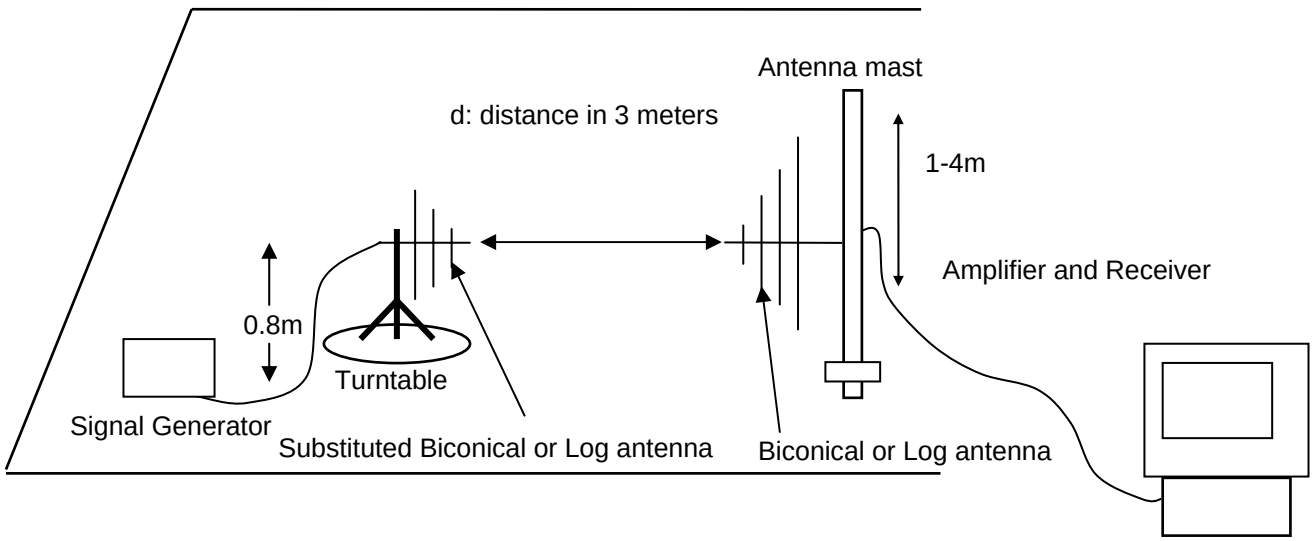
For transmitters designed to transmit with 25 KHz channel separation and equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as following:

1 On any frequency removed from the assigned frequency by more than 50 percent, but no more than 100 percent of the authorized bandwidth: At least 25 dB.
2 On any frequency removed from the assigned frequency by more than 100 percent, but no more than 250 percent of the authorized bandwidth: At least 35 dB.
3 On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43+10Log (P) dB.

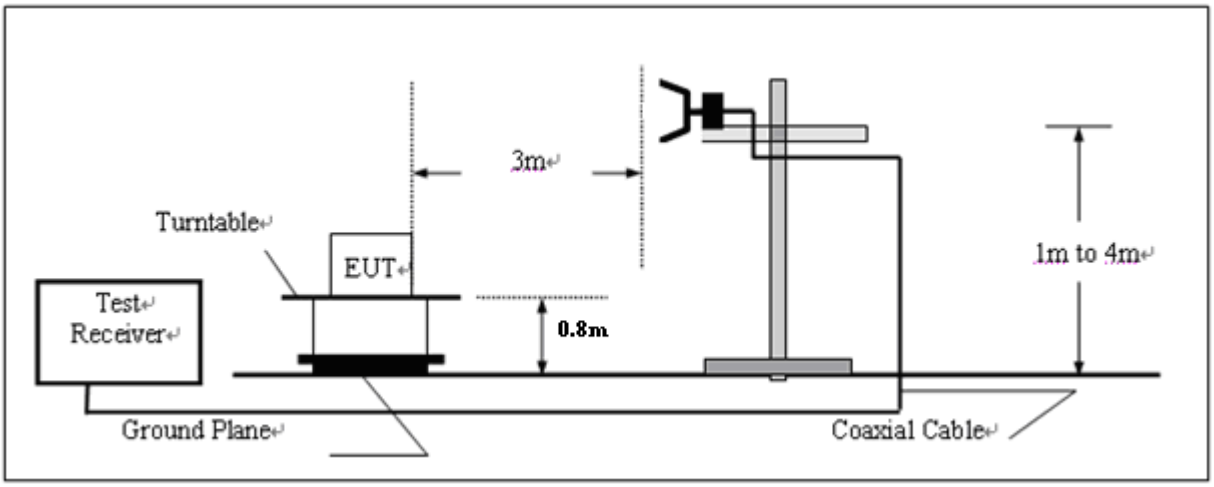
TEST CONFIGURATION

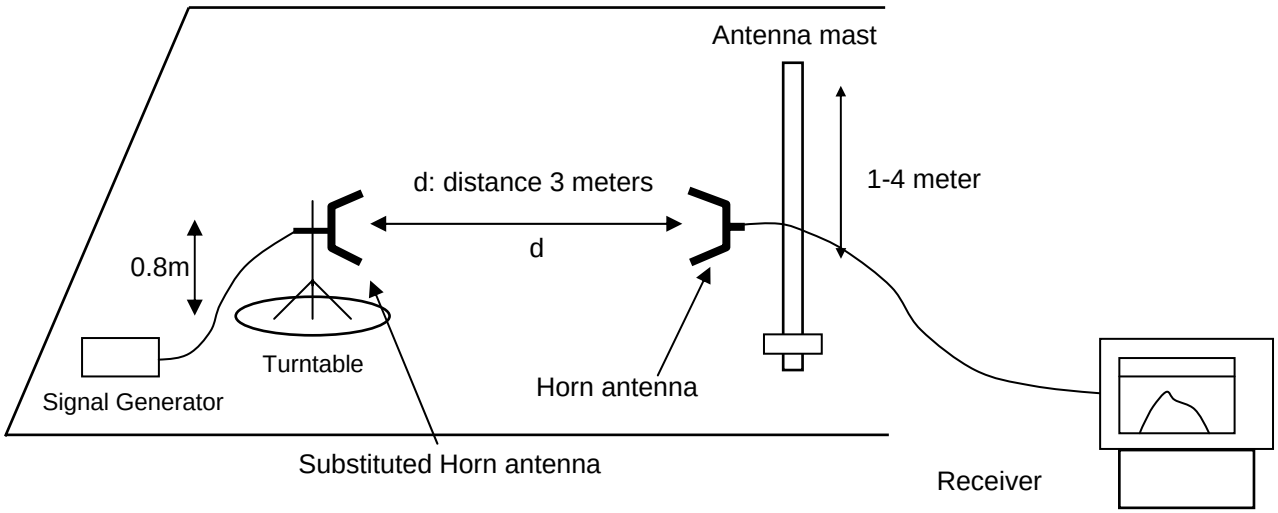
Below 1GHz





Above 1GHz





TEST PROCEDURE

1 Set the EMI Receiver (for measuring E-Field) and Receiver (for measuring EIRP) as follows:
Center Frequency: equal to the signal source
Resolution BW: 100 KHz
Video BW: VBW > RBW
Detector Mode: positive
Average: off
Span: 3 x the signal bandwidth
2 Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor+Amplifier Gain
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB)
3 The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
4 Substitute the EUT by a signal generator and one of the following transmitting antenna (substitution antenna):
DIPOLE antenna for frequency from 30-1000 MHz or
HORN antenna for frequency above 1 GHz}.
5 Mount the transmitting antenna at 1.0 meter high from the ground plane.
6 Use one of the following antenna as a receiving antenna:
DIPOLE antenna for frequency from 30-1000 MHz or
HORN antenna for frequency above 1 GHz}.
7 If the DIPOLE antenna is used, tune it's elements to the frequency as specified in the calibration manual.
8 Adjust both transmitting and receiving antenna in a VERTICAL polarization.
9 Tune the EMI Receivers to the test frequency.
10 Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
11 The transmitter was rotated through 360^{o} about a vertical axis until a higher maximum signal was received.
12 Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.

13 Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.
14 Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:
$P = P_1 - L_1 = (P_2 + L_2) – L_1 = P_3 + A + L_2 - L_1$
$EIRP = P + G1 = P_3 + L_2 - L_1 + A + G_1$
$ERP = EIRP – 2.15$ dB
Total Correction factor in EMI Receiver = $L_2 – L_1 + G_1$
Where:
P: Actual RF Power fed into the substitution antenna port after corrected.
P_1: Power output from the signal generator
P_2: Power measured at attenuator A input
P_3: Power reading on the Average Power Meter
EIRP: EIRP after correction
ERP: ERP after correction
15 Adjust both transmitting and receiving antenna in a Horizontal polarization, then repeat step (11) to (14).
16 Repeat step (4) to (16) for different test frequency
17 Repeat steps (3) to (12) with the substitution antenna oriented in horizontal polarization.
18 Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

TEST RESULTS

Modulation Type/Mode: pi/4DQPSK/TMO

FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 11 (25 kHz bandwidth only): On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f d in kHz) of more than 12.5 kHz at least:
Low: 43 + 10 log (Pwatts) = 43 + 10 log (3.56) =48.51 dB
High: 43 + 10 log (Pwatts) = 43 + 10 log (3.60) =48.56 dB
Note: In general, the worse case attenuation requirement shown above was applied.
Calculation: Limit (dBm) =EL-43-10log10 (TP)
Notes: EL is the emission level of the Output Power expressed in dBm,
In this application, the EL is 34.77 dBm.
Limit (dBm) =34.77-43-10log10 (3.60) = -13 dBm

Modulation Type/Mode: pi/4DQPSK/DMO

FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 11 (25 kHz bandwidth only): On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f d in kHz) of more than 12.5 kHz at least:
Low: 43 + 10 log (Pwatts) = 43 + 10 log (3.40) =48.32 dB
High: 43 + 10 log (Pwatts) = 43 + 10 log (3.56) =48.51 dB
Note: In general, the worse case attenuation requirement shown above was applied.
Calculation: Limit (dBm) =EL-43-10log10 (TP)
Notes: EL is the emission level of the Output Power expressed in dBm,
In this application, the EL is 34.77 dBm.
Limit (dBm) =34.77 -43-10log10 (3.56) = -13 dBm

Note: 1. In general, the worse case attenuation requirement shown above was applied.
2. The measurement frequency range from 30 MHz to 5 GHz.
3. ******* means that the emission level is too low to be measured or at least 20 dB down than the limit.

Modulation/Mode		pi/4DQPSK/TMO		Channel Separation		25KHz		
Test Channel		Low Channel		Test Frequency		450 MHz		
Frequency (MHz)	E-Field Level (dBuv/m)	EMI Detector (Peak/QP)	Antenna Polarization	Antenna Height (cm)	Table Angle (Degree)	ERP measured by Substitution Method (dBm)	Limit (dBm)	Margin (dB)
900.000	45.71	Peak	H	350	36	-51.26	-13	38.26
1350.000	43.09	Peak	H	200	144	-53.45	-13	40.45
2250.000	43.66	Peak	H	200	128	-53.00	-13	40.00
…	…		H					
900.000	44.78	Peak	V	155	165	-52.02	-13	39.02
1350.000	42.98	Peak	V	100	9	-53.89	-13	40.89
2250.000	43.42	Peak	V	125	182	-53.25	-13	40.25
…	…		V					

Modulation/Mode		pi/4DQPSK/TMO		Channel Separation		25KHz		
Test Channel		High Channel		Test Frequency		460 MHz		
Frequency (MHz)	E-Field Level (dBuv/m)	EMI Detector (Peak/QP)	Antenna Polarization	Antenna Height (cm)	Table Angle (Degree)	ERP measured by Substitution Method (dBm)	Limit (dBm)	Margin (dB)
920.000	45.74	Peak	H	100	329	-51.03	-13	38.03
1380.000	43.72	Peak	H	150	147	-53.22	-13	40.22
1840.000	43.52	Peak	H	200	155	-53.06	-13	40.06
…	…		H					
920.000	44.63	Peak	V	108	300	-51.85	-13	38.85
1380.000	43.39	Peak	V	100	170	-53.44	-13	40.44
1840.000	43.52	Peak	V	124	176	-53.20	-13	40.20
…	…		V					

Modulation/Mode		pi/4DQPSK/DMO		Channel Separation		25KHz		
Test Channel		Low Channel		Test Frequency		450 MHz		
Frequency (MHz)	E-Field Level (dBuv/m)	EMI Detector (Peak/QP)	Antenna Polarization	Antenna Height (cm)	Table Angle (Degree)	ERP measured by Substitution Method (dBm)	Limit (dBm)	Margin (dB)
900.000	44.93	Peak	H	350	100	-51.62	-13	38.62
1350.000	42.71	Peak	H	300	122	-53.87	-13	40.87
2250.000	43.42	Peak	H	100	74	-53.16	-13	40.16
…	…		H					
900.000	44.74	Peak	V	105	356	-52.09	-13	39.09
1350.000	43.28	Peak	V	100	300	-53.50	-13	40.50
2250.000	43.49	Peak	V	100	171	-53.33	-13	40.33
…	…		V					

Modulation/Mode		pi/4DQPSK/DMO		Channel Separation		25KHz		
Test Channel		High Channel		Test Frequency		460 MHz		
Frequency (MHz)	E-Field Level (dBuv/m)	EMI Detector (Peak/QP)	Antenna Polarization	Antenna Height (cm)	Table Angle (Degree)	ERP measured by Substitution Method (dBm)	Limit (dBm)	Margin (dB)
920.000	45.70	Peak	H	154	222	-51.14	-13	3814
1380.000	43.66	Peak	H	100	179	-53.22	-13	40.22
1840.000	43.44	Peak	H	250	300	-53.00	-13	40.00
…	…		H					
920.000	45.17	Peak	V	100	4	-51.74	-13	38.74
1380.000	43.58	Peak	V	150	342	-53.26	-13	40.26
1840.000	43.22	Peak	V	150	288	-53.51	-13	40.51
…	…		V					

Modulation/Mode		pi/4DQPSK/DMO		Channel Separation		25KHz		
Test Channel		High Channel		Test Frequency		470 MHz		
Frequency (MHz)	E-Field Level (dBuv/m)	EMI Detector (Peak/QP)	Antenna Polarization	Antenna Height (cm)	Table Angle (Degree)	ERP measured by Substitution Method (dBm)	Limit (dBm)	Margin (dB)
940.000	45.17	Peak	H	200	56	-51.63	-13	38.63
1410.000	43.66	Peak	H	100	147	-53.18	-13	40.18
1880.000	45.44	Peak	H	100	325	-53.06	-13	40.06
…	…		H					
940.000	44.82	Peak	V	100	330	-51.70	-13	38.70
1410.000	43.74	Peak	V	155	74	-53.14	-13	40.14
1880.000	43.00	Peak	V	150	285	-53.21	-13	40.21
…	…		V					

4.4. Spurious Emssion on Antenna Port

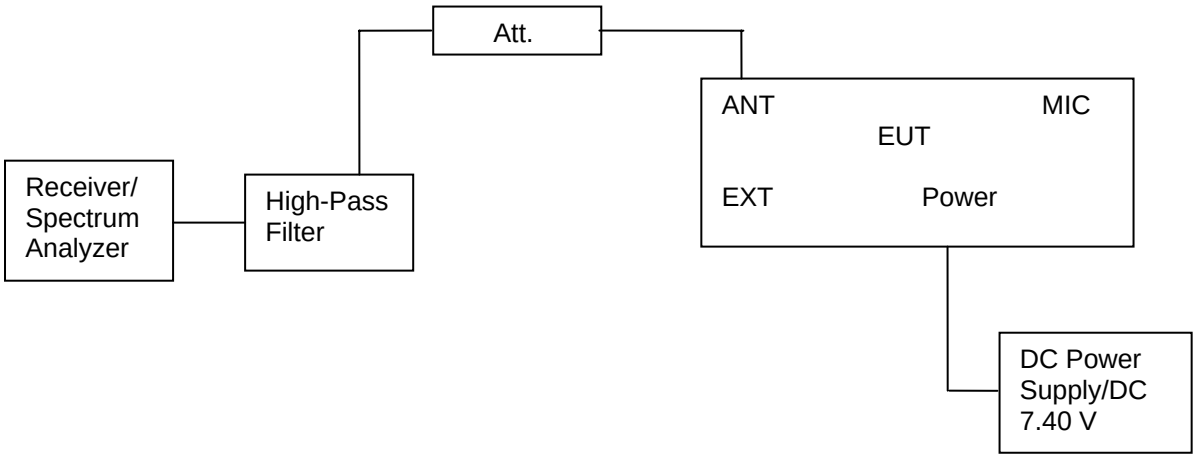
TEST APPLICABLE

The same as Section 4.3

TEST PROCEDURE

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set to 100 kHz. Sufficient scans were taken to show any out of band emission up to 10th. Harmonic for the lower and the highest frequency range. Set RBW 100 kHz, VBW 300 kHz in the frequency band 30MHz to 1GHz,while set RBW=1MHz.VBW=3MHz from the 1GHz to 10^{th} Harmonic.
The audio input was set to 0 to get the unmodulated carrier, the resulting picture is print out for each channel separation.

TEST CONFIGURATION



TEST RESULTS

Modulation Type/Mode: pi/4DQPSK/TMO

FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 11 (25 kHz bandwidth only): On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f d in kHz) of more than 12.5 kHz at least:
Low: 43 + 10 log (Pwatts) = 43 + 10 log (3.56) =48.51 dB
High: 43 + 10 log (Pwatts) = 43 + 10 log (3.60) =48.56 dB
Note: In general, the worse case attenuation requirement shown above was applied.
Calculation: Limit (dBm) =EL-43-10log10 (TP)
Notes: EL is the emission level of the Output Power expressed in dBm,
In this application, the EL is 34.77 dBm.
Limit (dBm) =34.77-43-10log10 (3.60) = -13 dBm

Modulation Type/Mode: pi/4DQPSK/DMO

FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 11 (25 kHz bandwidth only): On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f d in kHz) of more than 12.5 kHz at least:
Low: 43 + 10 log (Pwatts) = 43 + 10 log (3.40) =48.32 dB
High: 43 + 10 log (Pwatts) = 43 + 10 log (3.56) =48.51 dB
Note: In general, the worse case attenuation requirement shown above was applied.
Calculation: Limit (dBm) =EL-43-10log10 (TP)
Notes: EL is the emission level of the Output Power expressed in dBm,
In this application, the EL is 34.77 dBm.
Limit (dBm) =34.77 -43-10log10 (3.56) = -13 dBm

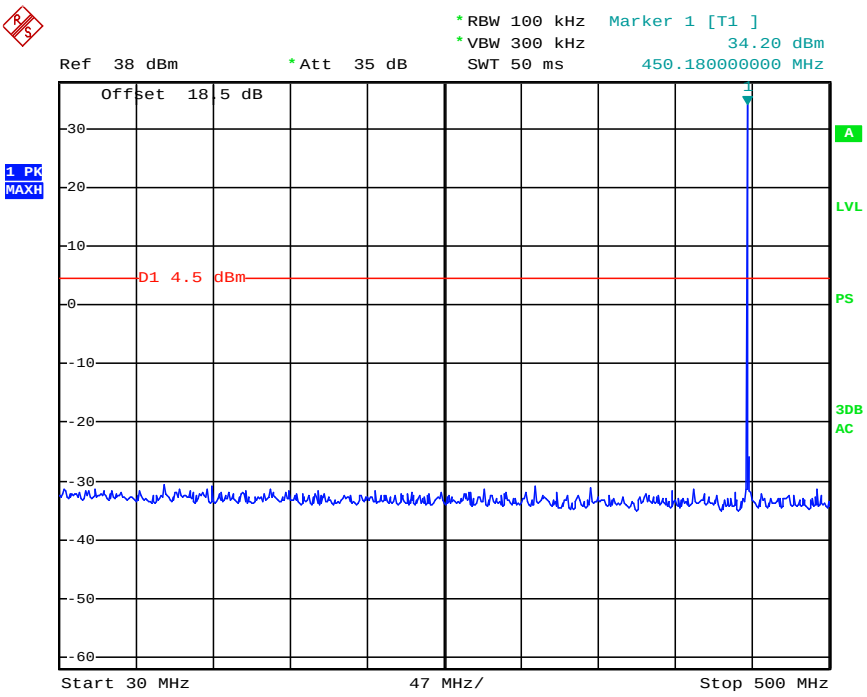
Note: 1. In general, the worse case attenuation requirement shown above was applied.
2. The measurement frequency range from 30 MHz to 5 GHz.

3. ******* means that the emission level is too low to be measured or at least 20 dB down than the limit.

Modulation Type/Mode	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz	
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)
pi/4DQPSK/TMO	25KHz	Low	450	900.00	-51.00	1710.00	-56.24
		High	460	635.00	-42.05	1380.00	-56.09
pi/4DQPSK/DMO		Low	450	900.00	-49.92	5540.00	-58.96
		Middle	460	635.00	-40.45	4610.00	-58.91
		High	470	941.00	-55.92	2350.00	-58.75
Limit		-13dBm for 25KHz Channel Separtion					
Test Results		Compliance					

Plots of Spurious Emission on Antenna Port Measurement

Modulation Type/Mode	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
pi/4DQPSK/TMO	25KHz	Low	450	900.00	-51.00	1710.00	-56.24	-13dBm
Test Results				Compliance				



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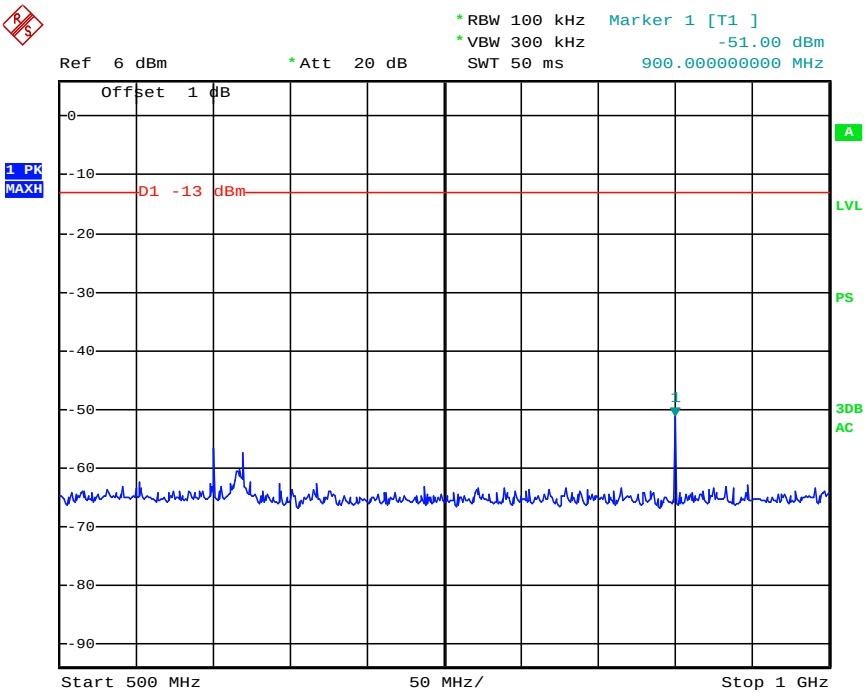

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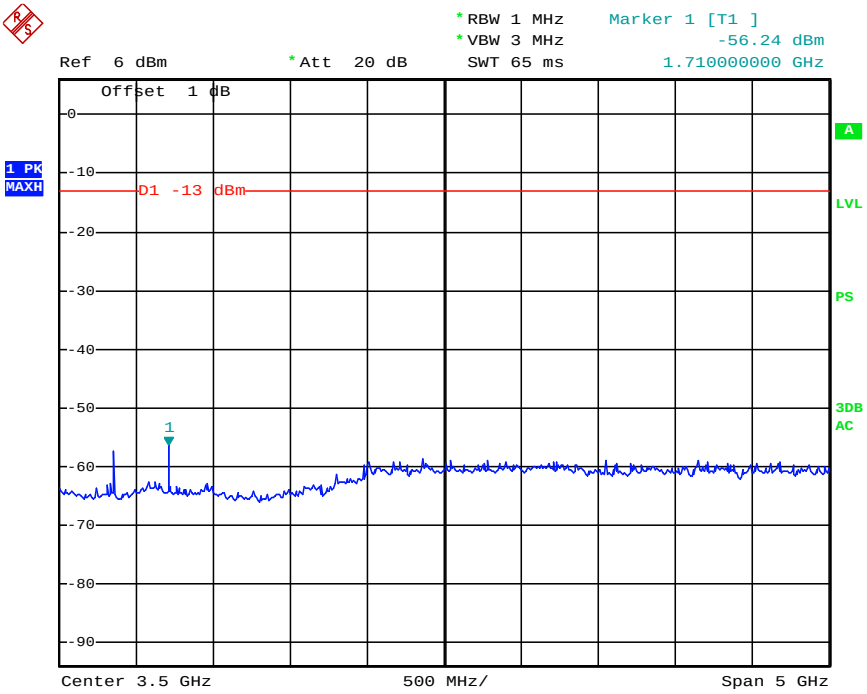
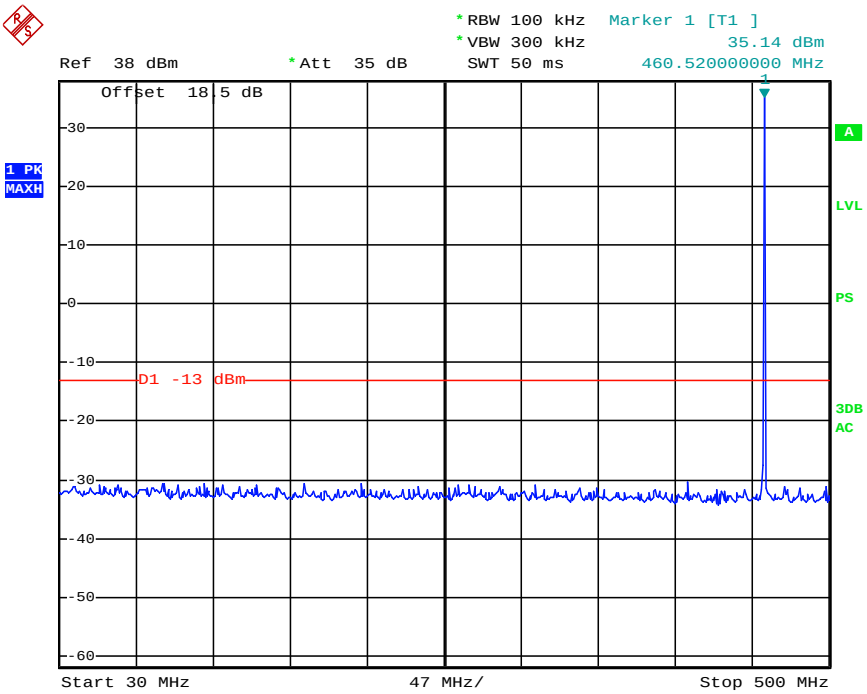


Date: 19.JUN.2012 16:31:33

Modulation Type/Mode	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
pi/4DQPSK/TMO	25KHz	High	460	635.00	-42.05	1380.00	-56.09	-13dBm
Test Results				Compliance				



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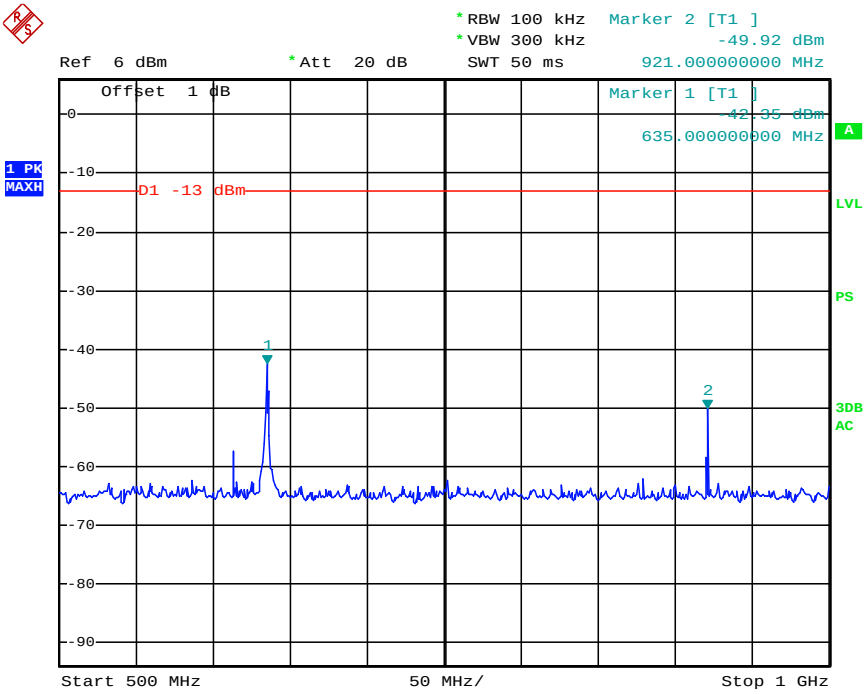
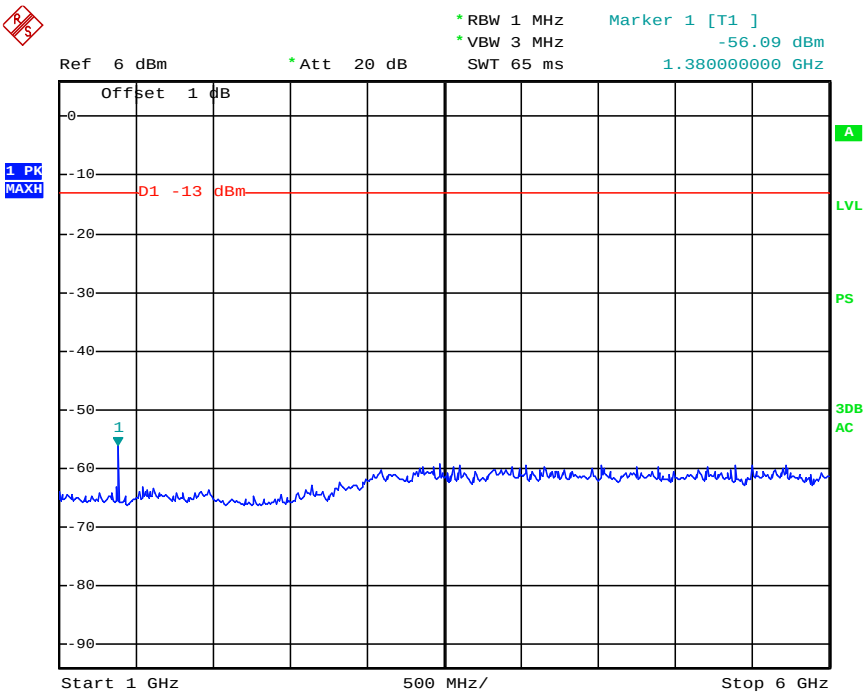
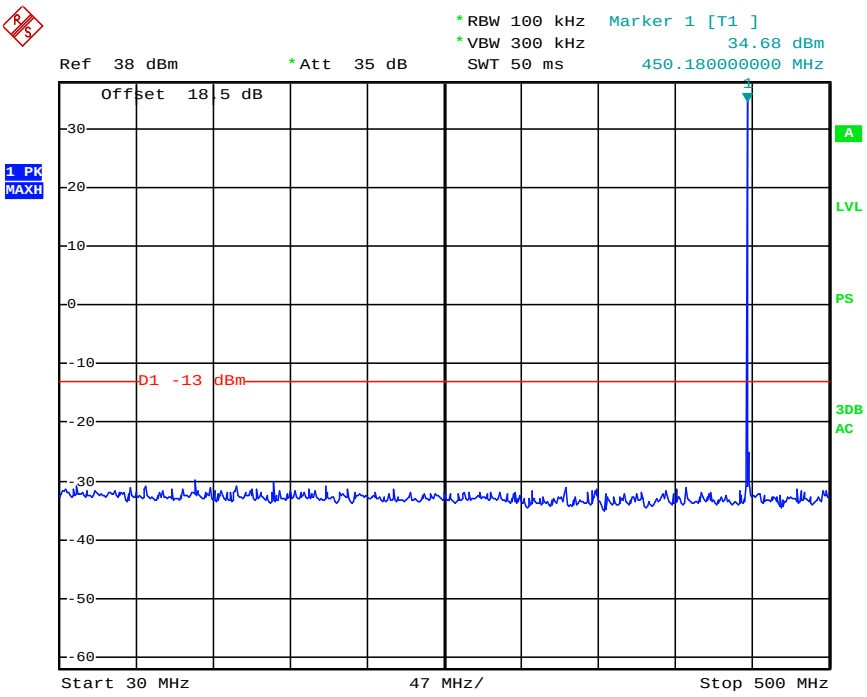


Date: 19.JUN.2012 15:43:20



Date: 19.JUN.2012 15:41:52

Modulation Type/Mode	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
pi/4DQPSK/DMO	25KHz	Low	450	900.00	-49.92	5540.00	-58.96	-13dBm
Test Results				Compliance				



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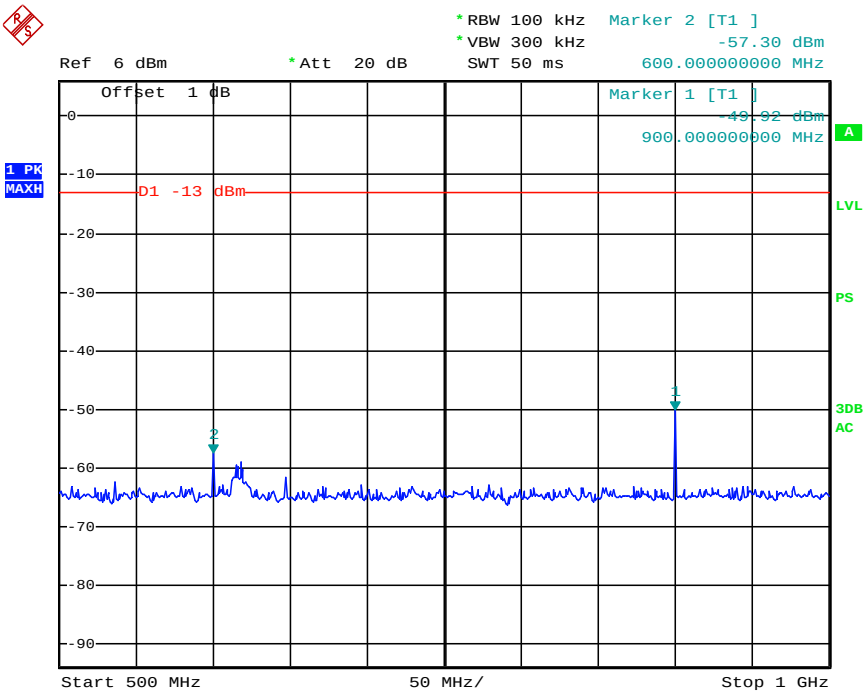

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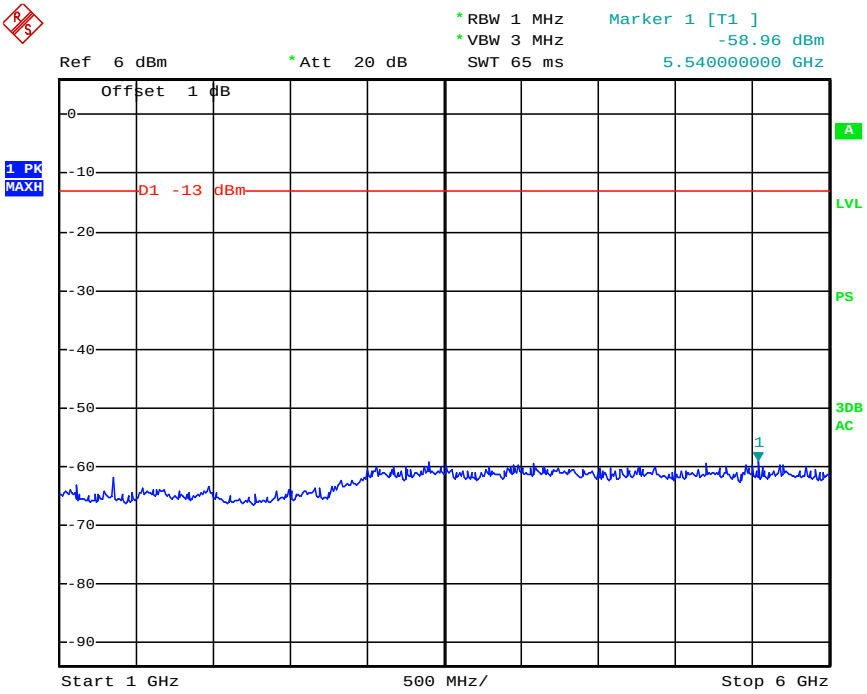
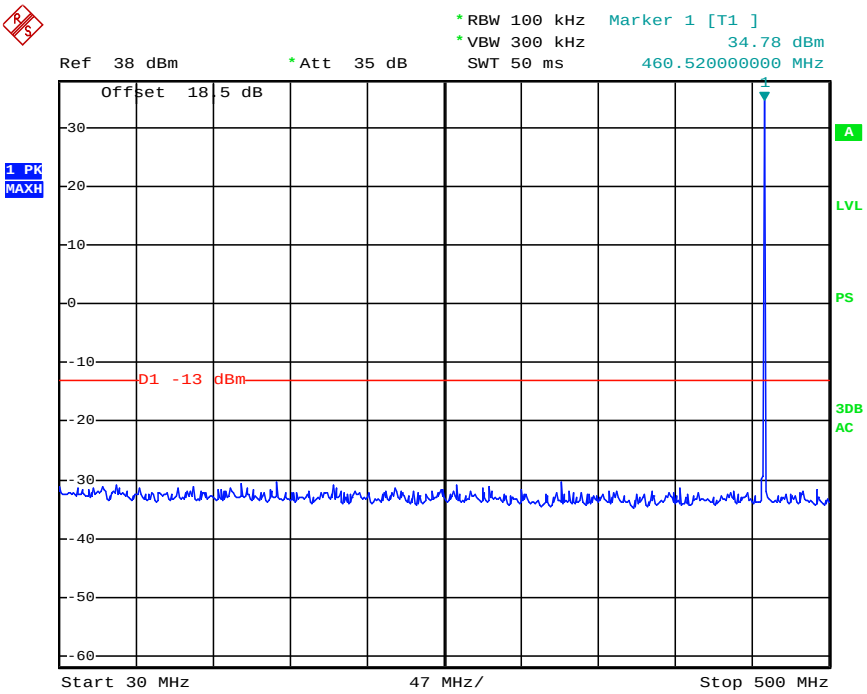


Date: 19.JUN.2012 15:40:58

Modulation Type/Mode	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
pi/4DQPSK/DMO	25KHz	Middle	460	635.00	-40.45	4610.00	-58.91	-13dBm
Test Results				Compliance				



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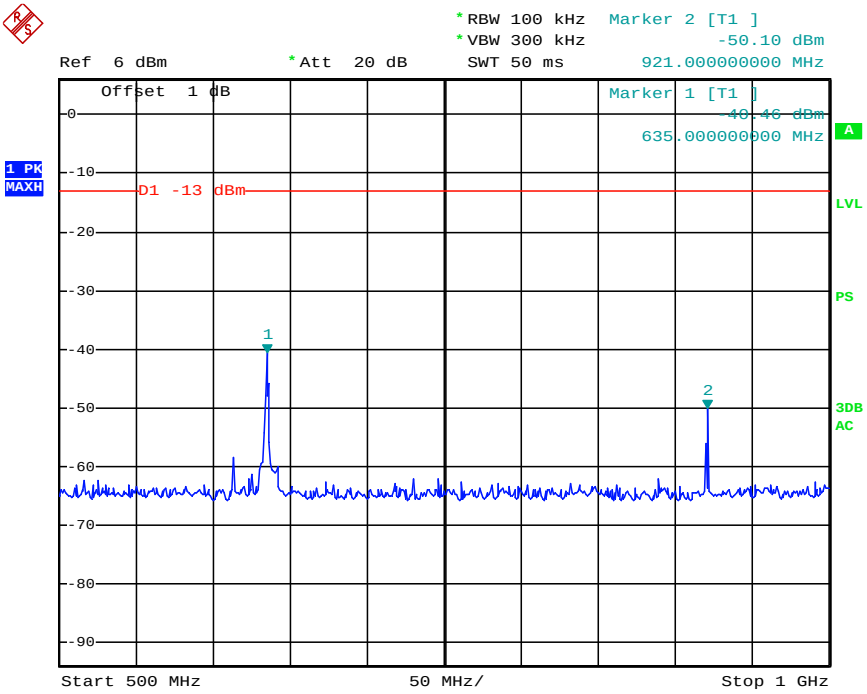

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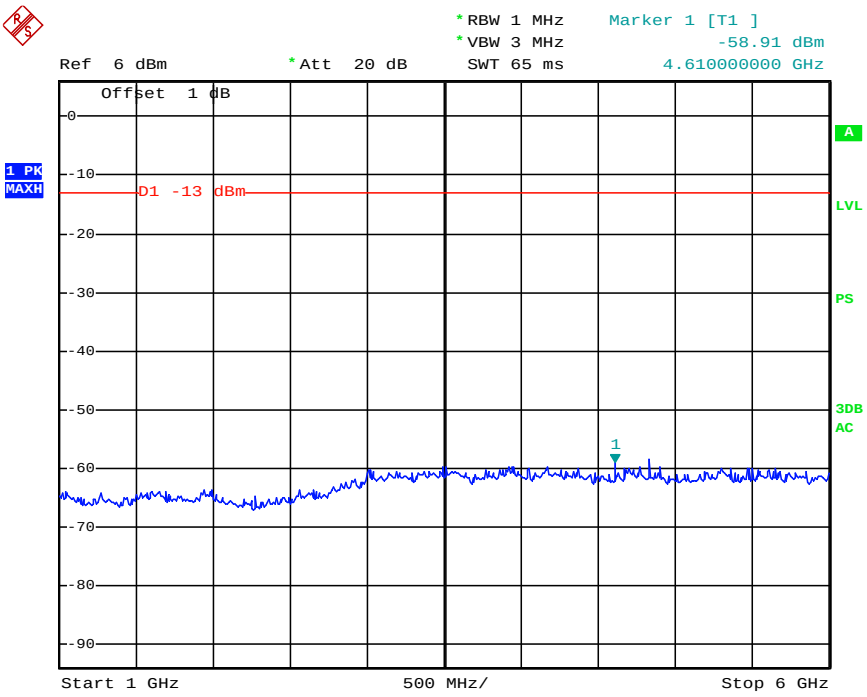
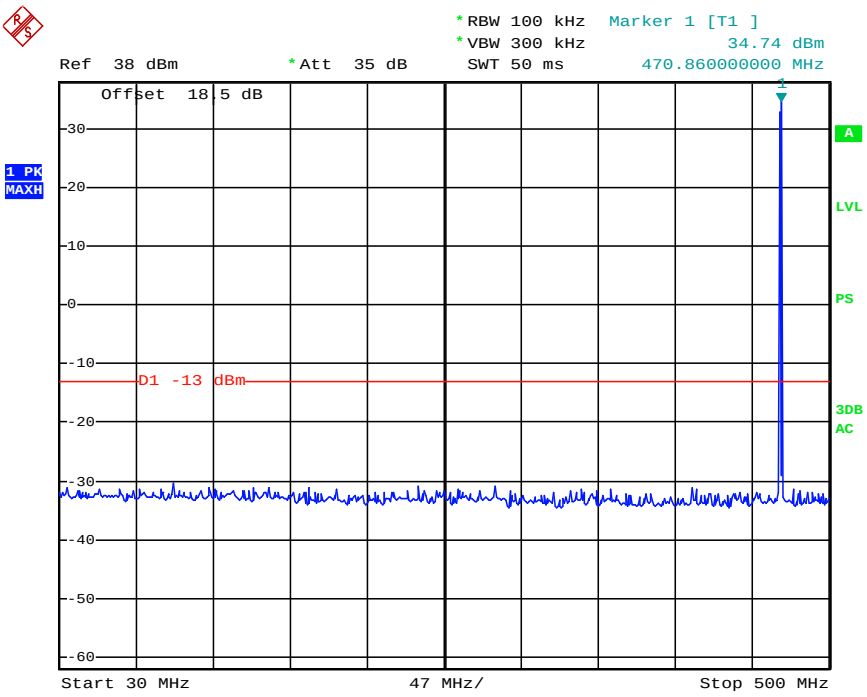
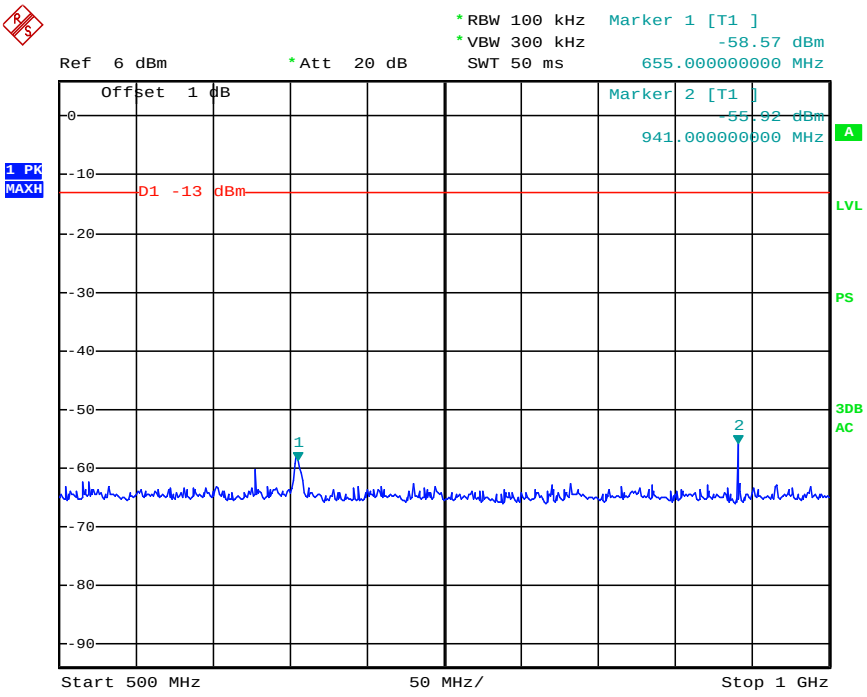


Date: 19.JUN.2012 15:37:06

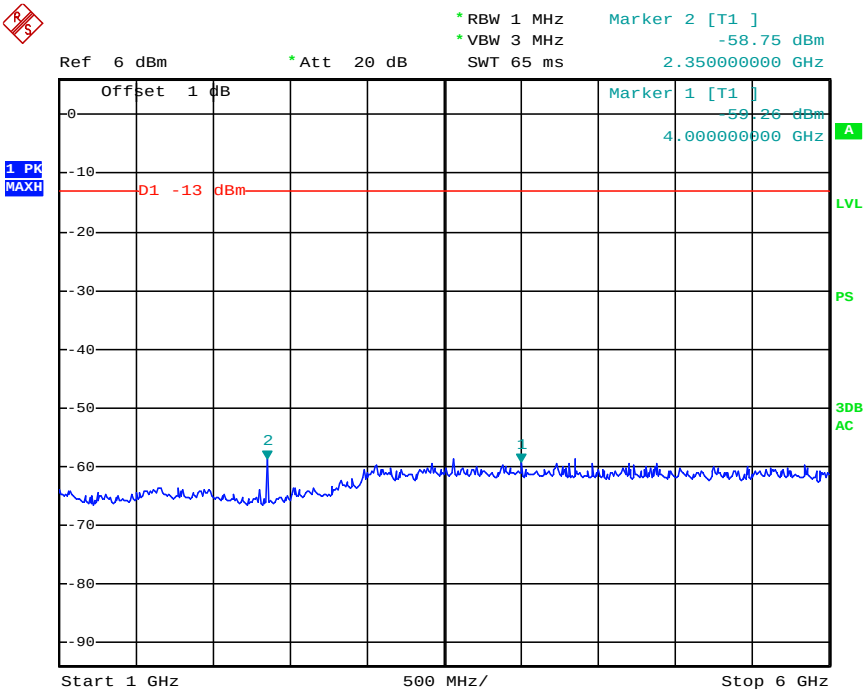
Modulation Type/Mode	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
pi/4DQPSK/DMO	25KHz	High	470	941.00	-55.92	2350.00	-58.75	-13dBm
Test Results				Compliance				



Date: 19.JUN.2012 15:25:52



Date: 19.JUN.2012 15:38:50



Date: 19.JUN.2012 15:38:00

4.5. Modulation Charcateristics

TEST APPLICABLE

According toCFR47 section 2.1047(a), for Voice Modulation Communication Equipment, the frequency response of the audio modulation circuit over a range of 100 to 5000Hz shall be measured.

TEST PROCEDURE

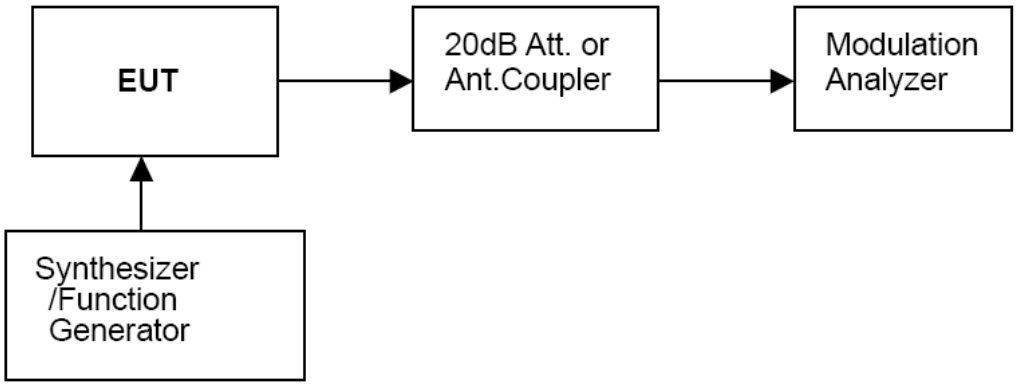
Modulation Limit

1 Configure the EUT as shown in figure 1, adjust the audio input for 60% of rated system deviation at 1 KHz using this level as a reference (0dB) and vary the input level from –20 to +20dB. Record the frequency deviation obtained as a function of the input level.
2 Repeat step 1 with input frequency changing to 300, 1004, 1500 and 2500Hz in sequence.

Audio Frequency Response

1 Configure the EUT as shown in figure 1.
2 Adjust the audio input for 20% of rated system deviation at 1 KHz using this level as a reference (0dB).
3 Vary the Audio frequency from 100 Hz to 3 KHz and record the frequency deviation.
4 Audio Frequency Response =20log10 (Deviation of test frequency/Deviation of 1 KHz reference).

TEST CONFIGURATION



TEST RESULTS

Modulation type: pi/4DQPSk

Channel bandwidth: 25 kHz

It is not applicable for devices which operate with the digitized voice/data modulation type.

b). Audio Frequency Response:

Rule Part No.: Part 2.1407(a) (b)

Method of Measurement:

The audio frequency response was measured in accordance with TIA/EIA Specification 603 with no exception. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 300-3000Hz shall be submitted and Audio Post Limiter Low Pass Filter Response from 3.0 KHz to 50KHz.However, the audio frequency response should test from 100Hz to 5.0 KHz according to FCC Part 90.

Modulation type: pi/4DQPSK

Channel bandwidth: 25 kHz

It is not applicable for devices which operate with the digitized voice/data modulation type.

4.6. Frequency Stability Test

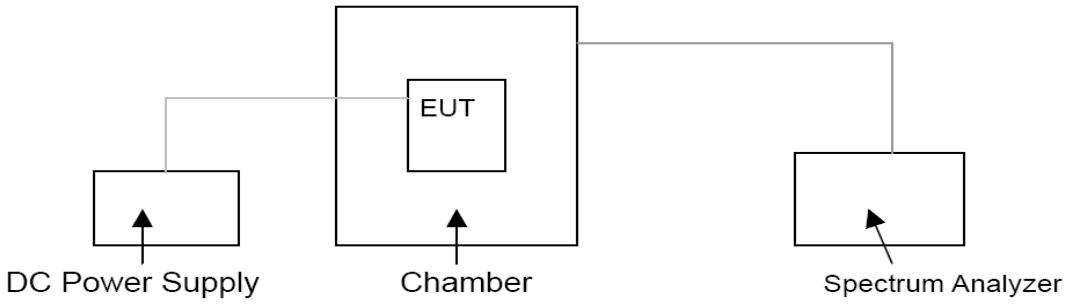
TEST APPLICABLE

1 According to FCC Part 2 Section 2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from -30℃ to +60℃ centigrade.
2 According to FCC Part 2 Section 2.1055 (a) (2), for battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.
3 Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment and end point voltage was 6.22 V.
4 According to §90.213, the frequency stability limit is 5.0 ppm for operation frequency frequency 450MHz-470MHz.

TEST PROCEDURE

The EUT was set in the climate chamber and connected to an external DC power supply. The RF output was directly connected to Spectrum Analyzer ESI 26. The coupling loss of the additional cables was recorded and taken in account for all the measurements. After temperature stabilization (approx. 20 min for each stage), the frequency for the lower, the middle and the highest frequency range was recorded. For Frequency stability Vs. Voltage the EUT was connected to a DC power supply and the voltage was adjusted in the required ranges. The result was recorded.

TEST CONFIGURATION



TEST LIMITS

According to 90.213, Transmitters used must have minimum frequency stability as specified in the following table.

Frequency range (MHz)	Fixed and base stations	Mobile stations	
		Over 2 watts output power	2 watts or less output power
Below 25	[1,2,3] 100	100	200
25–50	20	20	50
72–76	5	.....	50
150–174	[5,11] 5	[6] 5	[4,6] 50
216–220	1.0	.....	1.0
220–222 [12]	0.1	1.5	1.5
421–512	[7,11,14] 2.5	[8] 5	[8] 5
806–809	[14] 1.0	1.5	1.5
809–824	[14] 1.5	2.5	2.5
851–854	1.0	1.5	1.5
854–869	1.5	2.5	2.5
896–901	[14] 0.1	1.5	1.5
902–928	2.5	2.5	2.5
902–928 [13]	2.5	2.5	2.5
929–930	1.5	.....	.....
935–940	0.1	1.5	1.5
1427–1435	[9] 300	300	300
Above 2450 [10]	.....	.....	.....

TEST RESULTS

Modulation Type/Mode	Channel Separation	Test conditions		Frequency error (ppm)	
		Voltage(V)	Temp(℃)	Low	High
pi/4DQPSK/TMO	25 KHz	7.40	-30	0.60	0.59
			-20	0.57	0.57
			-10	0.51	0.52
			0	0.49	0.46
			10	0.46	0.42
			20	0.41	0.40
			30	0.41	0.40
			40	0.45	0.44
			50	0.56	0.50
		6.22 (End point)	20	0.41	0.40
		6.29 (85% Rated)	20	0.41	0.42
		8.51 (115% Rated)	20	0.43	0.42
Limit			5.0 ppm		
Conclusion			Complies		

Modulation Type/Mode	Channel Separation	Test conditions		Frequency error (ppm)		
		Voltage(V)	Temp(℃)	Low	Middle	High
pi/4DQPSK/ DMO	25 KHz	7.40	-30	0.60	0.59	0.57
			-20	0.58	0.55	0.53
			-10	0.55	0.52	0.51
			0	0.49	0.50	0.48
			10	0.45	0.44	0.43
			20	0.42	0.41	0.39
			30	0.42	0.41	0.39
			40	0.45	0.43	0.42
			50	0.57	0.52	0.49
		6.22 (End point)	20	0.42	0.41	0.40
		6.29 (85% Rated)	20	0.41	0.41	0.39
		8.51 (115% Rated)	20	0.42	0.41	0.39
Limit			5.0 ppm			
Conclusion			Complies			

4.7. Maximum Transmitter Power

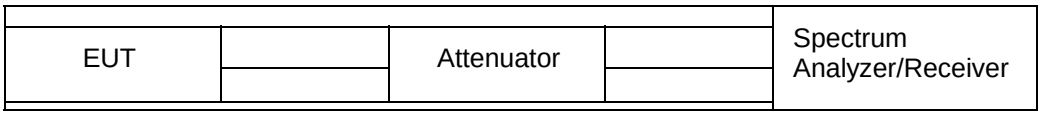
TEST APPLICABLE

Per FCC «2.1046 and «90.205: Maximum ERP is dependent upon the station's antenna HAAT and required service area.

TEST PROCEDURE

Measurements shall be made to establish the radio frequency power delivered by the transmitter the standard output termination. The power output shall be monitored and recorded and no adjustment shall be made to the transmitter after the test has begun, except as noted bellow:
If the power output is adjustable, measurements shall be made for the highest and lowest power levels.
The EUT connect to the Receiver through attenuator.
Measurement with Spectrum Analyzer ESI 26 conducted, external power supply with 7.40 V stabilized supply voltage.

TEST CONFIGURATION



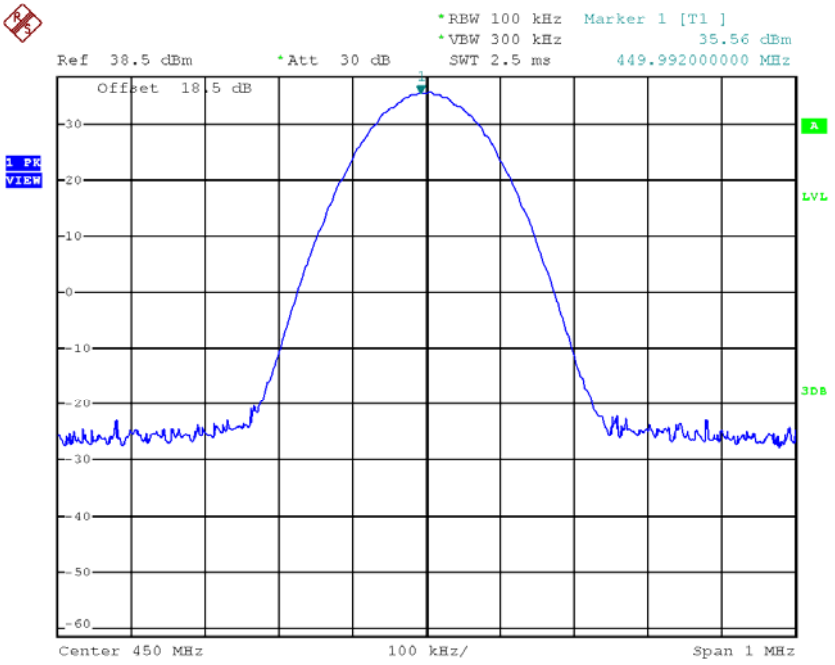
The EUT was directly connected to a RF Communication
Test set by attenuator

TEST RESULTS

Modulation Type/Mode	Channel Separation	Test Channel	Test Frequency (MHz)	Maximum Transmitter Power at Rated High Power Level (dBm)
pi/4DQPSK/TMO	25KHz	Low	450	35.56
		High	460	35.51
pi/4DQPSK/DMO		Low	450	35.46
		Middle	460	35.51
		High	470	35.32
Limit		The limit is dependent upon the station's antenna HAAT and required service area.		
Test Results		Complicance		

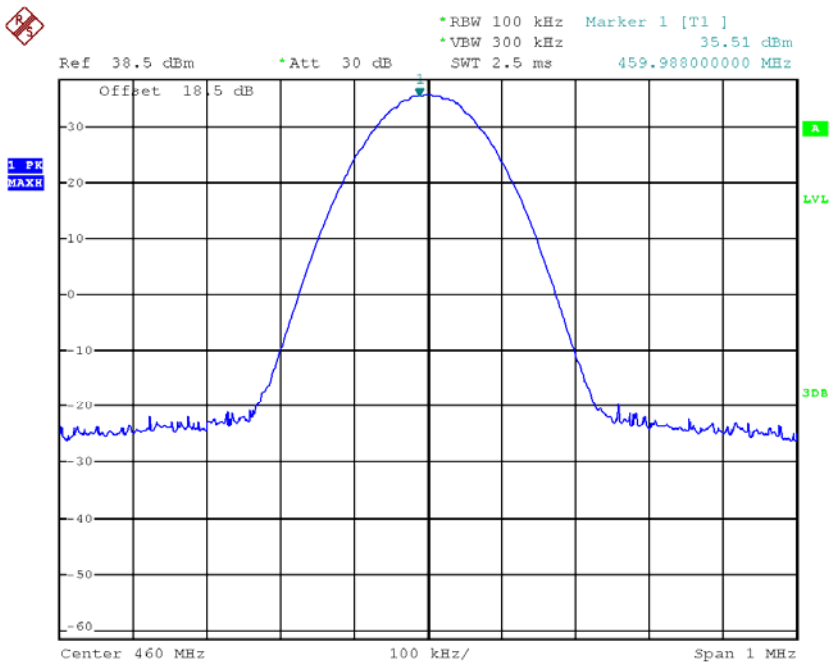
Plots of Maximum Transmitter Power Measurement

Modulation Type/Mode	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
pi/4DQPSK/TMO	25 KHz	450	3.0	35.56	Varies	Complicance



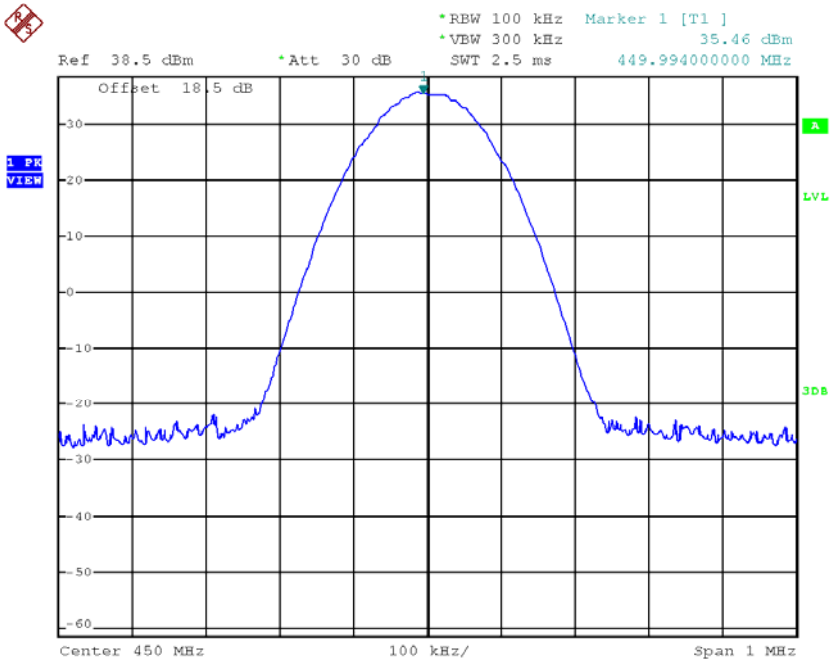
Date: 25.APR.2012 03:41:52

Modulation Type/Mode	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
pi/4DQPSK/TMO	25 KHz	460	3.0	35.51	Varies	Complicance



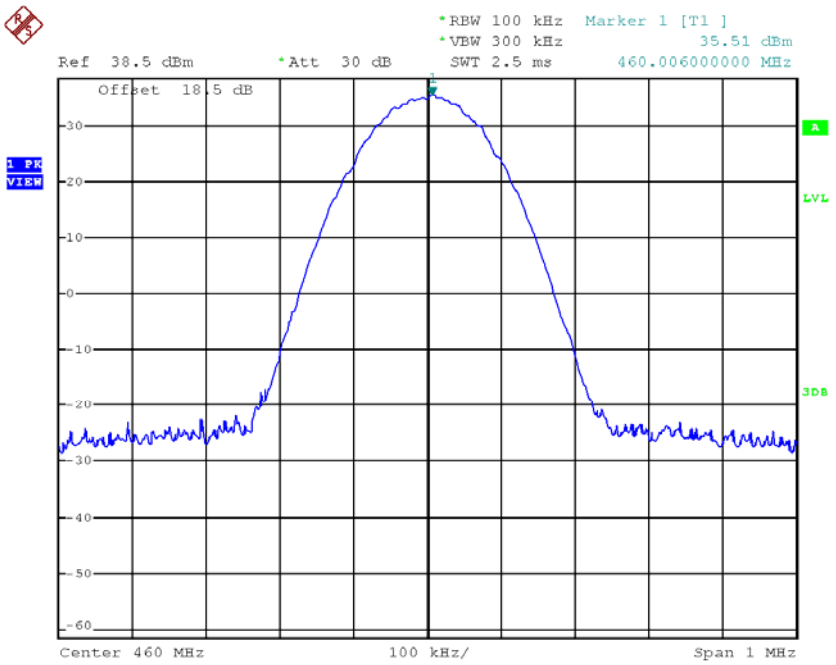
Date: 25.APR.2012 03:42:42

Modulation Type/Mode	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
pi/4DQPSK/DMO	25 KHz	450	3.0	35.46	Varies	Complicance



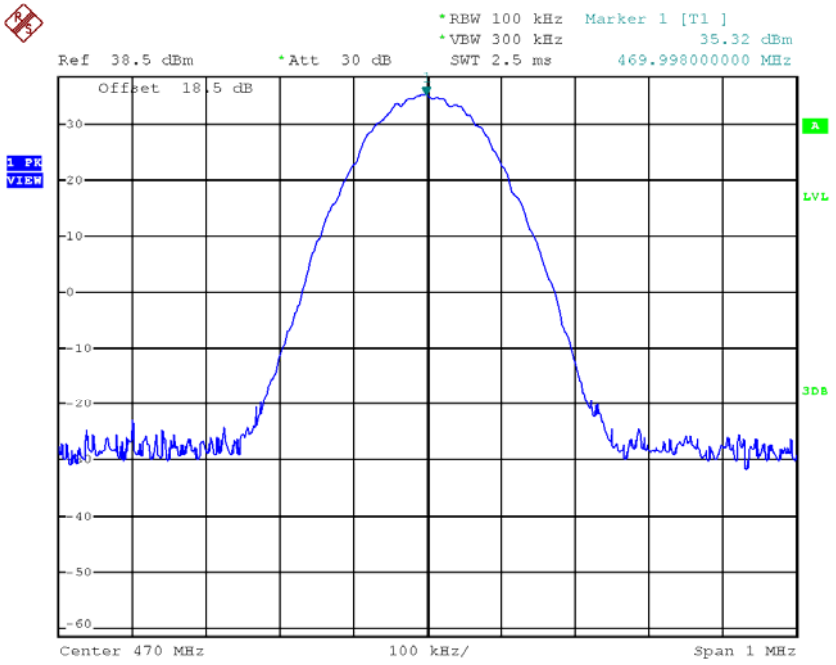
Date: 25.APR.2012 03:44:09

Modulation Type/Mode	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
pi/4DQPSK/DMO	25 KHz	460	3.0	35.51	Varies	Complicance



Date: 25.APR.2012 03:45:16

Modulation Type/Mode	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
pi/4DQPSK/DMO	25 KHz	470	3.0	35.32	Varies	Complicance



Date: 25.APR.2012 03:53:27

4.8. Transmitter Frequency Behavior

TEST APPLICABLE

Section 90.214
Transient frequencies must be within the maximum frequency difference limits during the time intervals indicated:

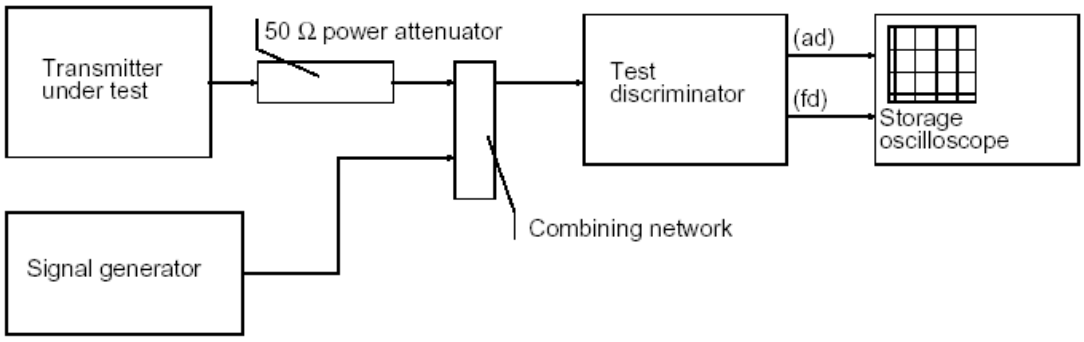
Time intervals [1, 2]	Maximum frequency difference [3]	All equipment	
		150 to 174 MHz	421 to 512MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 KHz Channels			
t_1 [4]	± 25.0 KHz	5.0 ms	10.0 ms
t_2	± 12.5 KHz	20.0 ms	25.0 ms
t_3 [4]	± 25.0 KHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 KHz Channels			
t_1 [4]	± 12.5 KHz	5.0 ms	10.0 ms
t_2	± 6.25 KHz	20.0 ms	25.0 ms
t_3 [4]	± 12.5 KHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 KHz Channels			
t_1 [4]	±6.25 KHz	5.0 ms	10.0 ms
t_2	±3.125 KHz	20.0 ms	25.0 ms
t_3 [4]	±6.25 KHz	5.0 ms	10.0 ms

1. t_{on} is the instant when a 1 KHz test signal is completely suppressed, including any capture time due to phasing.
   t_1 is the time period immediately following t_{on}.
   t_2 is the time period immediately following t_1.
   t_3 is the time period from the instant when the transmitter is turned off until t_{off}.
   t_{off} is the instant when the 1 KHz test signal starts to rise.
2. During the time from the end of t_2 to the beginning of t_3, the frequency difference must not exceed the limits specified in § 90.213.
3. Difference between the actual transmitter frequency and the assigned transmitter frequency.
4. If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

TEST PROCEDURE

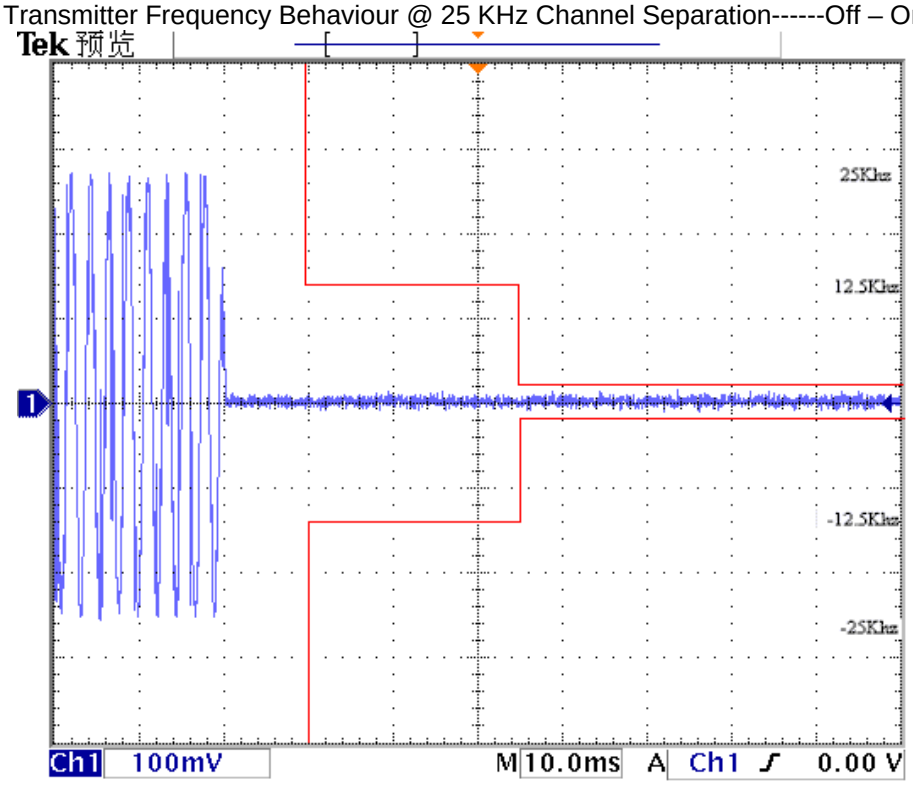
TIA/EIA-603 2.2.19

TEST CONFIGURATION

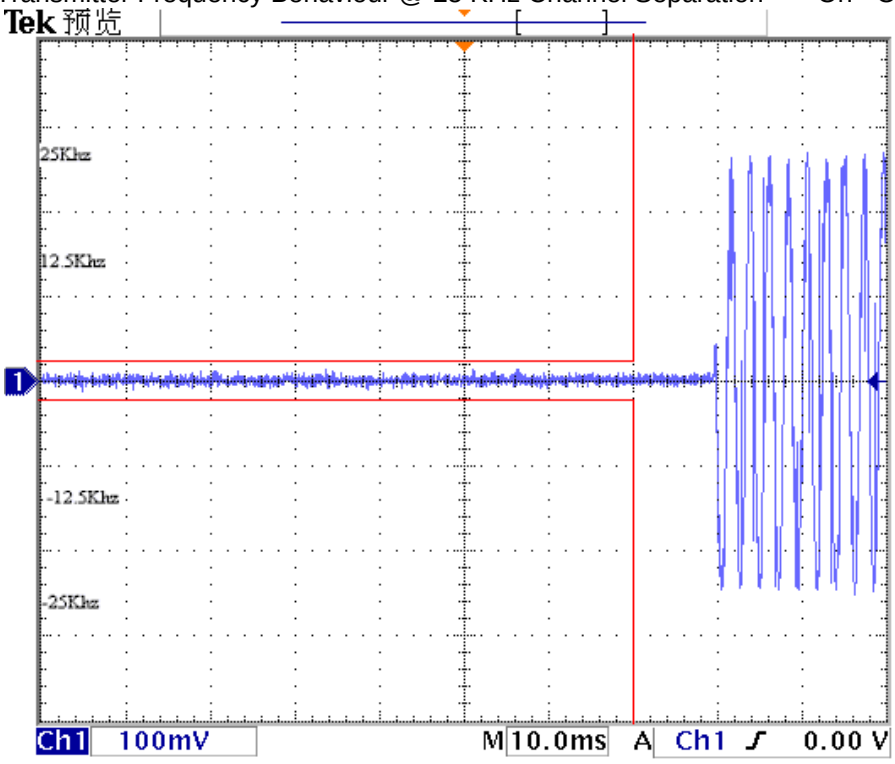


TEST RESULTS

Transmitter Frequency Behaviour @ 25 KHz Channel Separation------Off – On



Transmitter Frequency Behaviour @ 25 KHz Channel Separation------On - Off



4.9. Receiver Radiated Spurious Emssion

TEST APPLICABLE

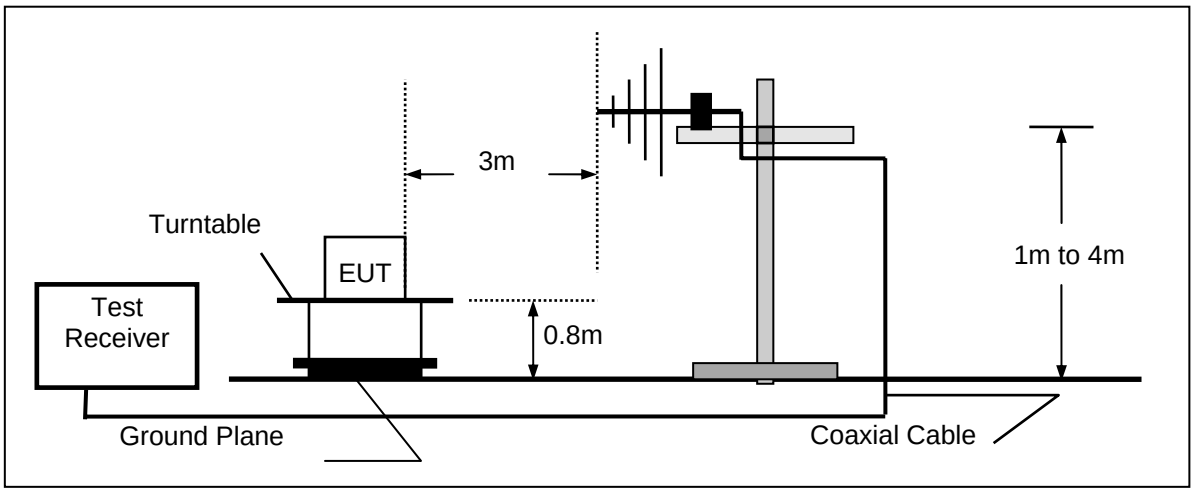
The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

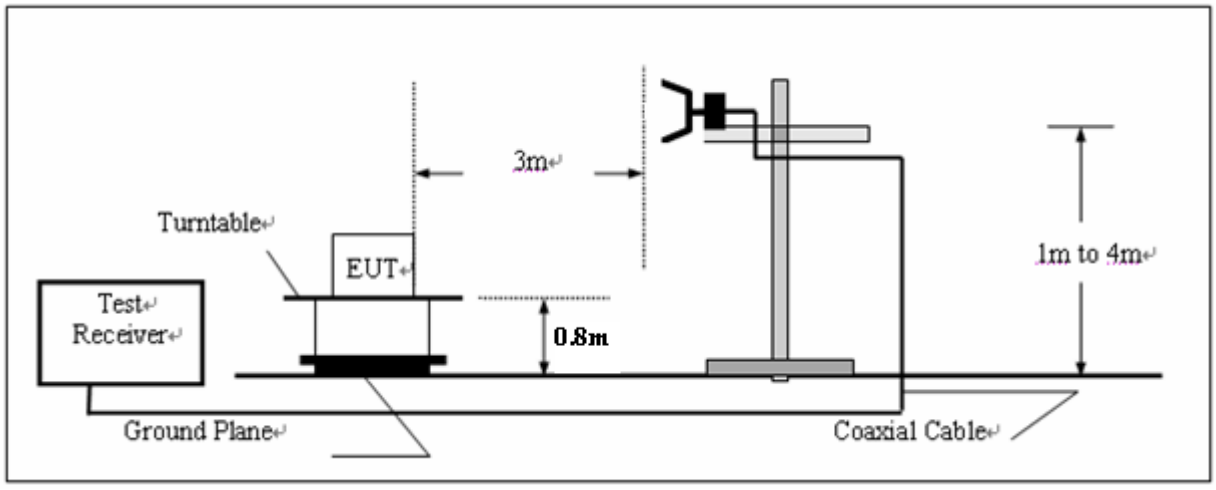
Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

TEST CONFIGURATION

(A) Radiated Emission Test Set-Up, Frequency below 1000MHz



(B) Radiated Emission Test Set-Up, Frequency above 1000MHz



TEST PROCEDURE

1 The EUT was placed on a turn table which is 0.8m above ground plane.
2 Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT
3 And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4 Repeat above procedures until all frequency measurements have been completed.

RECEIVER RADIATED SPOUIOUS LIMIT

For unintentional device, according to § 15.109(a) and RSS-Gen, except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values：

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

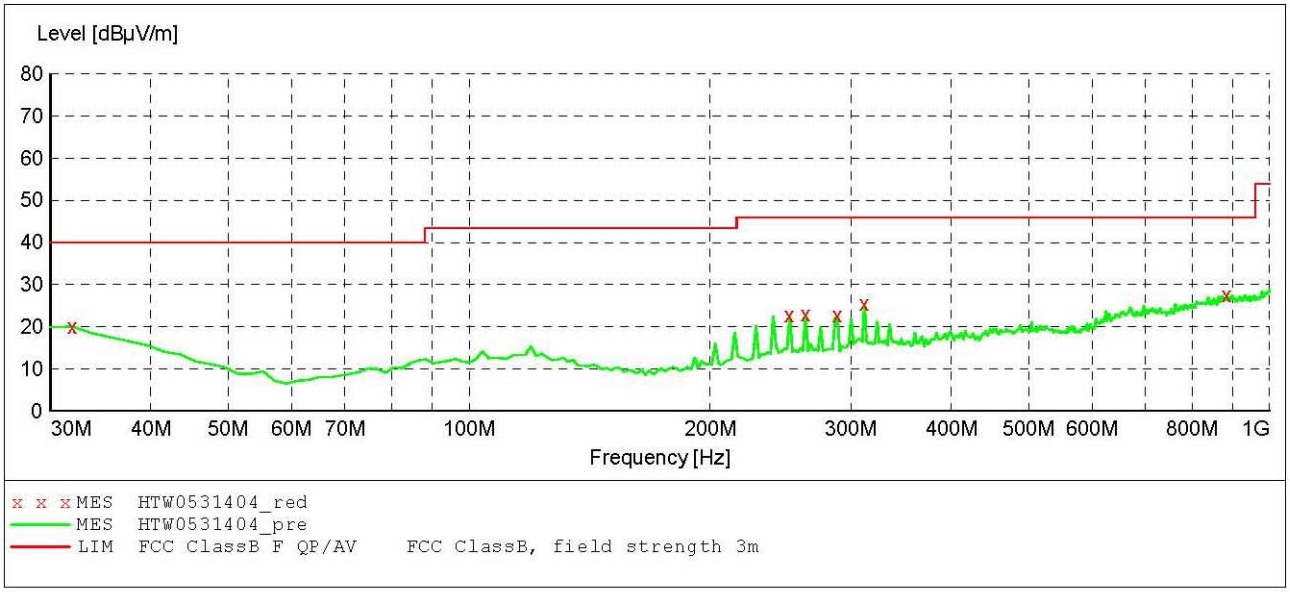
TEST RESULTS

The Radiated Measurement are performed to the three channels (the high channel middle channel and the low channel), the datum recorded below is the worst case for each mode;and the EUT shall be scanned from 30 MHz to the 5th harmonic of the highest oscillator frequency in the digital devices or 1 GHz whichever is higher.

Modulation Type/Mode	Channel Separation	Test Frequency (MHz)	Polar.	Maximum Radiated Emissions		FCC Limit (dBuV/m)
				Frequency (MHz)	Datum (dBuV/m)	
pi/4DQPSK/TMO	25 KHz	460	H	885.31	27.60	46.00
			V	37.78	30.70	40.00
Test Results			Compliance			

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	120 kHz	HL562 201106



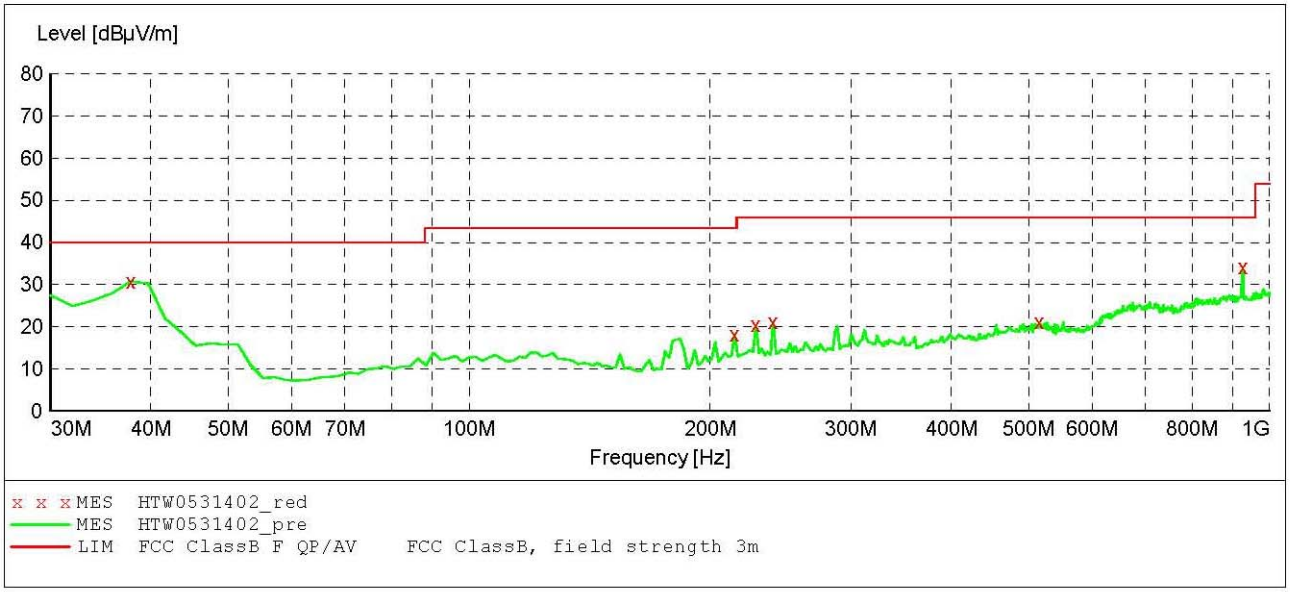
MEASUREMENT RESULT: "HTW0531404_red"

5/31/2012 10:10PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
31.943888	20.00	-12.3	40.0	20.0	PK	100.0	95.00	HORIZONTAL
251.603206	22.80	-18.4	46.0	23.2	PK	100.0	44.00	HORIZONTAL
263.266533	22.90	-18.1	46.0	23.1	PK	100.0	37.00	HORIZONTAL
288.537074	22.70	-17.6	46.0	23.3	PK	100.0	327.00	HORIZONTAL
311.863727	25.50	-16.3	46.0	20.5	PK	100.0	309.00	HORIZONTAL
885.310621	27.60	-6.8	46.0	18.4	PK	100.0	126.00	HORIZONTAL

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	120 kHz	HL562 201106



MEASUREMENT RESULT: "HTW0531402_red"

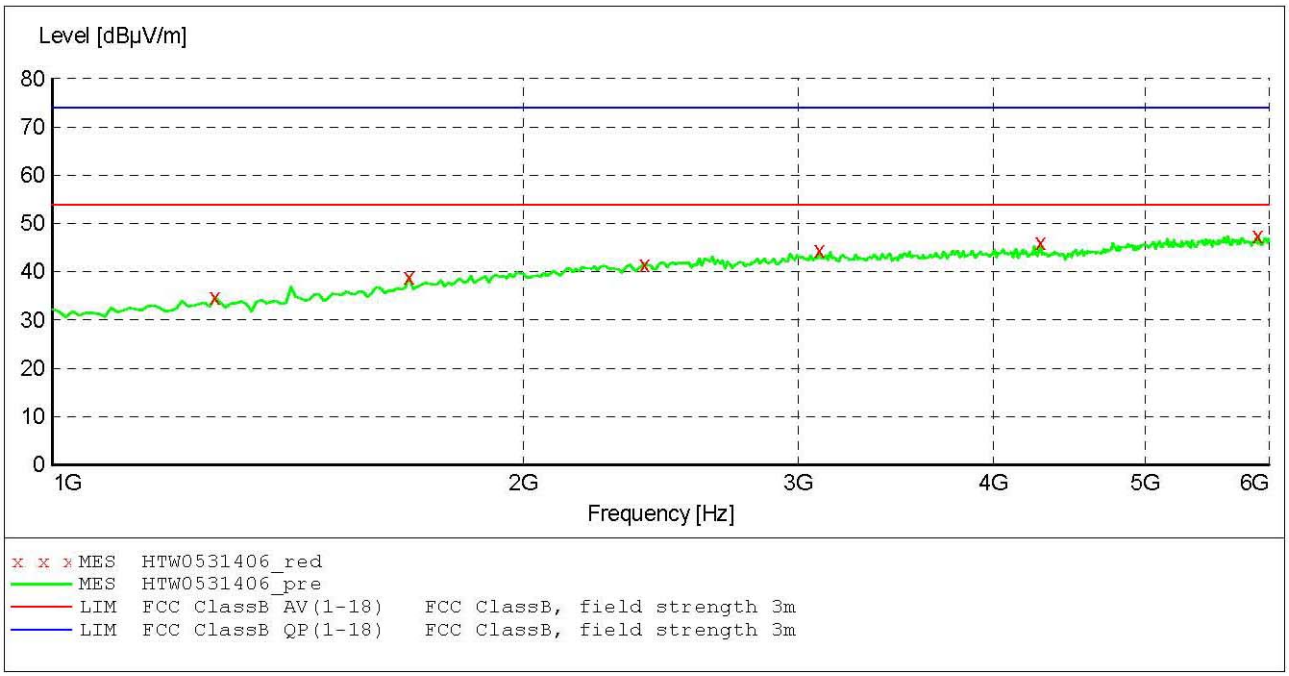
5/31/2012 10:06PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
37.775551	30.70	-15.3	40.0	9.3	PK	100.0	49.00	VERTICAL
214.669339	18.20	-20.7	43.5	25.3	PK	100.0	121.00	VERTICAL
228.276553	20.40	-19.8	46.0	25.6	PK	100.0	164.00	VERTICAL
239.939880	21.20	-18.8	46.0	24.8	PK	100.0	264.00	VERTICAL
515.971944	21.10	-13.0	46.0	24.9	PK	100.0	289.00	VERTICAL
926.132265	34.20	-7.1	46.0	11.8	PK	100.0	215.00	VERTICAL

Modulation Type/Mode	Channel Separation	Test Frequency (MHz)	Polar.	Maximum Radiated Emissions		FCC Limit (dBuV/m)
				Frequency (MHz)	Datum (dBuV/m)	
pi/4DQPSK/TMO	25 KHz	460	H	5959.92	47.30	54.00
			V	5909.82	47.10	54.00
Test Results			Compliance			

SWEEP TABLE: "test (1G-18G) P"

Short Description:			EN 55022 Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
1.0 GHz	18.0 GHz	MaxPeak	500.0 ms	1 MHz	HF906 2011



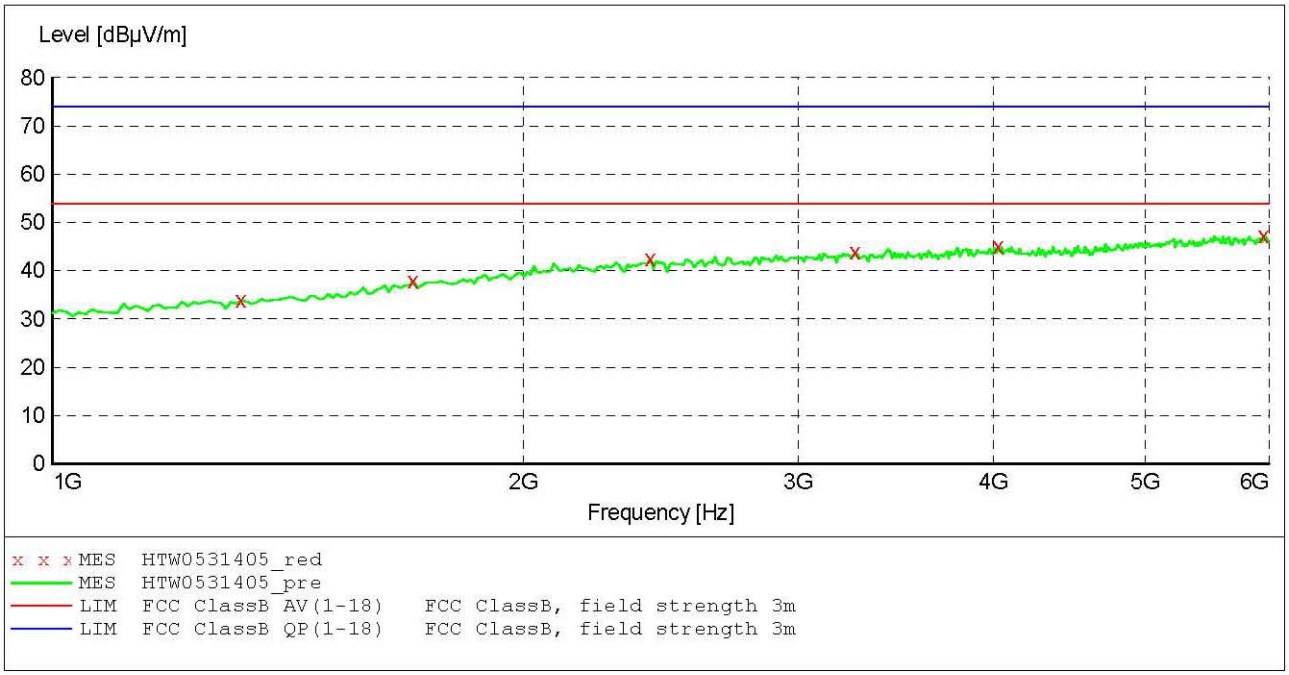
MEASUREMENT RESULT: "HTW0531406_red"

5/31/2012 4:03AM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
1270.541082	34.70	-7.6	53.9	19.2	PK	100.0	315.00	VERTICAL
1691.382766	38.90	-4.0	53.9	15.0	PK	100.0	39.00	VERTICAL
2392.785571	41.60	0.4	53.9	12.3	PK	100.0	282.00	VERTICAL
3094.188377	44.40	2.2	53.9	9.5	PK	100.0	248.00	VERTICAL
4286.573146	46.10	3.5	53.9	7.8	PK	100.0	110.00	VERTICAL
5909.819639	47.40	7.2	53.9	6.5	PK	100.0	187.00	VERTICAL

SWEEP TABLE: "test (1G-18G) P"

Short Description:			EN 55022 Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
1.0 GHz	18.0 GHz	MaxPeak	500.0 ms	1 MHz	HF906 2011



MEASUREMENT RESULT: "HTW0531405_red"

5/31/2012 4:01AM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
1320.641283	33.90	-7.2	53.9	20.0	PK	100.0	147.00	HORIZONTAL
1701.402806	38.00	-3.9	53.9	15.9	PK	100.0	0.00	HORIZONTAL
2412.825651	42.50	0.5	53.9	11.4	PK	100.0	360.00	HORIZONTAL
3264.529058	43.80	2.4	53.9	10.1	PK	100.0	318.00	HORIZONTAL
4026.052104	45.00	3.6	53.9	8.9	PK	100.0	6.00	HORIZONTAL
5959.919840	47.30	7.3	53.9	6.6	PK	100.0	351.00	HORIZONTAL