

# **TEST REPORT**

For

Applicant : Quanzhou Risen Electronics Co., Ltd

- Address : No.26, Zishan Road, Jiangnan High-Tech Industrial Zone, Licheng District, Quanzhou, Fujian, China 362000
- Product Name : DIGITAL HANDHELD RADIO
  - Model Name : RS-619D, DSR-619D
  - Brand Name : RECENT, DSRPRO
    - Remark : Only difference in model names
  - FCC Number : FCC ID:2AGRS-619D
    - Report No. : MTE/FCF/B17050942
  - Date of Issue : May.17, 2017
    - Issued by : Most Technology Service Co., Ltd.
      - No.5, 2nd Langshan Road, North District, Hi-tech Industrial
        - Park, Nanshan, Shenzhen, Guangdong, China
          - Tel: 86-755-8602 6850
          - Fax : 86-755-2601 6850

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# 1. TEST STANDARDS

The tests were performed according to following standards:

FCC Part 90: PRIVATE LAND MOBILE RADIO SERVICES

TIA/EIA 603-D-2010: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

47 CFR FCC Part 15 Subpart B - Unintentional Radiators FCC Part 2: FREQUENCY ALLOCA-TIONS AND RADIO TREATY MAT-TERS; GENERAL RULES AND REG-ULATIONS

# **1.1 VERIFICATION OF CONFORMITY**

Equipment Under Test:	DIGITAL HANDHELD RADIO
Brand Name:	RECENT, DSRPRO
Model Number:	RS-619D, DSR-619D
FCC ID:	FCC ID:2AGRS-619D
Applicant:	Quanzhou Risen Electronics Co., Ltd
Manufacturer:	No.26, Zishan Road, Jiangnan High-Tech Industrial Zone, Licheng District, Quanzhou, Fujian, China 362000 Quanzhou Risen Electronics Co.,Ltd No.26, Zishan Road, Jiangnan High-Tech Industrial Zone, Licheng District, Quanzhou, Fujian, China 362000
Technical Standards:	FCC Part 90
File Number:	MTE/FCF/B17050942
Date of test:	May. 10-17. 2017
Deviation:	None
Condition of Test Sample:	Normal
Test Result:	PASS

The above equipment was tested by Most Technology Service Co., Ltd. for compliance with the requirements set forth in FCC rules and the Technical Standards mentioned above. This said equipment in the configuration described in this report shows the maximum emission levels emanating from equipment and the level of the immunity endurance of the equipment are within the compliance requirements.

The test results of this report relate only to the tested sample identified in this report.

Tested by (+ signature):	Lulu
	Lulu Fu (Engineer) May 10 17, 2017
Review by (+ signature):	John Lin (Engineer) May 17, 2017.
Approved by (+ signature):	Jarth Don ** # 031111
	Yvette Zhou (Manager) May 17, 2017

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# 2. <u>SUMMARY</u>

# 2.1 General Remarks

Data of receipt of test sample	:	May 10, 2017
Testing commenced on	:	May 10-17, 2017
Testing concluded on	:	May 17, 2017

# 2.2 Equipment Under Test

# Power supply system utilised

Power supply voltage	:	0	120V/60 Hz	0	115V/60Hz
		0	12V DC	0	24V DC
		•	Other(specified in blank below)		

7.4V by battery

# 2.3 Short description of the Equipment under Test (EUT)

The Quanzhou Risen Electronics Co., Ltd Model: RS-619D 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	DIGITAL HANDHELD RADIO				
Model Number	RS-619D				
FCC ID Number	FCC ID:2AGRS-619D				
Rated Output Power	5Watts(36.98dBm)				
Support data rate	9.6 kbps				
	4FSK for Digital Voice/ Digita	al Data			
Madulation Truca	4FSK for Digital Data				
Modulation Type	Digital	F1W&F1D for 12.5KHz Channel Separation			
	Analog F3E for 12.5KHz Channel Separation				
	Digital Voice/ Data	12.5KHz: F1W			
Channel Separation	Digital Data	12.5KHz: F1D			
	Analog Voice	12.5KHz: F3E			
Antenna Type	External				
Frequency Range	From 400MHz to 470MHz				
Maximum Qutaut Dawar	Digital	5.0W for 12.5KHz Channel Separation			
Maximum Output Power	Analog	5.0W for 12.5KHz Channel Separation			

Note: The product has the same digital working characters when operating in both two digitized voice/data mode. So only one set of test results for digital modulation modes are provided in this test report.

### Test frequency list

Frequency Range	ncy Range Modulation Type		cy Range Modulation Type Channel Separation		Test frequency	
(MHz)		(KHz)	(MHz)			
			406.5000 MHz			
	Digital/4FSK 12.5	10.5	429.5000 MHz			
		12.5	469.5000 MHz			
400-470			406.5000 MHz			
		10.5	429.5000 MHz			
	Analog/FM	12.5	469.5000 MHz			

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

400-470MHz DIGITAL HANDHELD RADIO (RS-619D). For more details, refer to the user's manual of the EUT. Serial number: DSR-619D

# 2.5 EUT operation mode

The EUT has been tested under typical operating condition.

# 2.6 EUT operation mode

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

- - supplied by the manufacturer
- $\bigcirc$  supplied by the lab

$\bigcirc$	Power Cable	Length(m):	1
		Shield:	1
		Detachable:	1
$\bigcirc$	Multimeter	Manufacturer:	1
		Model No:	1

# 2.7 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2AGRS-619D filing to comply with the FCC Part 90 Rules.

# 2.8 Modifications

No modifications were implemented to meet testing criteria.

# 3. TEST ENVIRONMENT

# 3.1 TEST FACILITY

Test Site: Location:	Most Technology Service Co., Ltd No.5, Langshan 2nd Rd., North Hi-Tech Industrial park, Nanshan, Shenzhen, Guangdong, China
Description:	There is one 3m semi-anechoic an area test sites and two line conducted labs for final test. The Open Area Test Sites and the Line Conducted labs are constructed and
	calibrated to meet the FCC requirements in documents ANSI C63.4:2014 and CISPR 16 requirements.
	The FCC Registration Number is <b>490827.</b> The <b>IC</b> Registration Number is <b>7103A-1.</b>
Site Filing:	The site description is on file with the Federal Communications
	Commission, 7435 Oakland Mills Road, Columbia, MD 21046.
Instrument	All measuring equipment is in accord with ANSI C63.4:2014 and CISPR 16
Tolerance:	requirements that meet industry regulatory agency and accreditation agency
	requirement.
Ground Plane:	Two conductive reference ground planes were used during the Line Conducted
	Emission, one in vertical and the other in horizontal. The dimensions of these ground
	planes are as below. The vertical ground plane was placed distancing 40 cm to the
	rear of the wooden test table on where the EUT and the support equipment were
	placed during test. The horizontal ground plane projected 50 cm beyond the footprint
	of the EUT system and distanced 80 cm to the wooden test table. For Radiated
	Emission Test, one horizontal conductive ground plane extended at least 1m beyond
	the periphery of the EUT and the largest measuring antenna, and covered the entire
	area between the EUT and the antenna.

# **3.2 Environmental conditions**

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

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

# 3.3 Configuration of Tested System

Configuration of Tested System

Table 2-1 Equipment Used in Tested System

Adapter: Input:100-240V~50/60Hz Output: 12V DC 0.5A Power Cable: 150cm ◇ Shielded ◆ Unshielded

# 3.4 Measurement uncertainty

No.	Item	Uncertainty
1.	Uncertainty for Conducted Disturbance Test	1.25dB
2.	Uncertainty for Radiated Disturbance Test	3.15dB

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration	Calibration
		Widdel Wo.	Serial IVO.	Date	Due Date
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2016/07/11	2017/07/10
EMI Test Receiver&	R&S	ESCI	103710	2016/07/09	2017/07/08
Spectrum Analyzer		2001	100710	2010/01/03	2011/01/00
Spectrum Analyzer	Agilent	E4407B	E4407B	2016/07/05	2017/07/04
opoolium analyzoi			MY45108355	2010/01/00	2011/01/01
Controller	EM Electronics	Controller	N/A	2016/07/05	2017/07/04
		EM 1000			
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2016/07/11	2017/07/10
Horn Antenna	SCHWARZBECK	BBHA9170	1562	2016/07/11	2017/07/10
Active Loop	SCHWARZBECK	FMZB1519	1519-037	2016/07/11	2017/07/10
Antenna					
LISN	R&S	ENV216	101316	2016/07/09	2017/07/08
LISN	SCHWARZBECK	NSLK8127	8127687	2016/07/09	2017/07/08
Microwave	HP	8349B	3155A00882	2016/07/09	2017/07/08
Preamplifier					
Amplifier	HP	8447D	3113A07663	2016/07/09	2017/07/08
Transient Limiter	Com-Power	LIT-153	532226	2016/07/09	2017/07/08
Radio	R&S	CMU200	3655A03522	2016/07/05	2017/07/04
Communication					
Tester					
Temperature/Humidi	zhicheng	ZC1-2	22522	2016/07/09	2017/07/08
ty Meter					
SIGNAL	HP	8647A	3200A00852	2016/07/09	2017/07/08
GENERATOR					
Wideband Peak	Anritsu	ML2495A	220.23.35	2016/07/05	2017/07/04
Power Meter					
Climate Chamber	ESPEC	EL-10KA	A20120523	2016/07/05	2017/07/04
High-Pass Filter	K&L	9SH10-2700/X	1	2016/07/05	2017/07/04
		12750-0/0			
High-Pass Filter	K&L	41H10-1375/U 12750-O/O	/	2016/07/05	2017/07/04
Storage	KENWOOD	CS-5450	3070002	2016/07/17	2017/07/16
oscilloscope					

# 3.5. Equipments Used during the Test

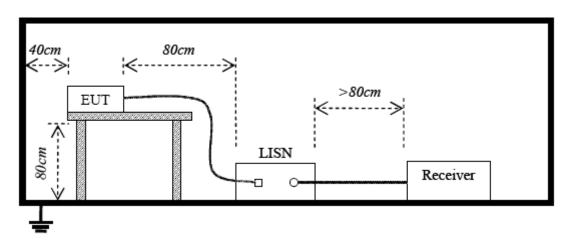
FCC Rules	Description of Test	Test Result
§ 90.205	Maximum Transmitter Power	Complies
§ 90.207	Modulation Characteristic	Complies
§ 90.209	Occupied Bandwidth	Complies
§ 90.210	Emission Mask	Complies
§ 90.213	Frequency Stability	Complies
§ 90.214	Transient frequency behavior	Complies
§ 90.210	Transmitter Radiated Spurious Emission	Complies
§ 90.210	Spurious Emission On Antenna Port	Complies

# 3.6. General Technical Requirements and Summary of Test Results

# 4. TEST CONDITIONS AND RESULTS

# 4.1 Conducted Emissions Test

# 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.
- 2 Support equipment, if needed, was placed as per ANSI C63.4.
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
- 4 The EUT received DC7.4V power from the battery.
- 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 :

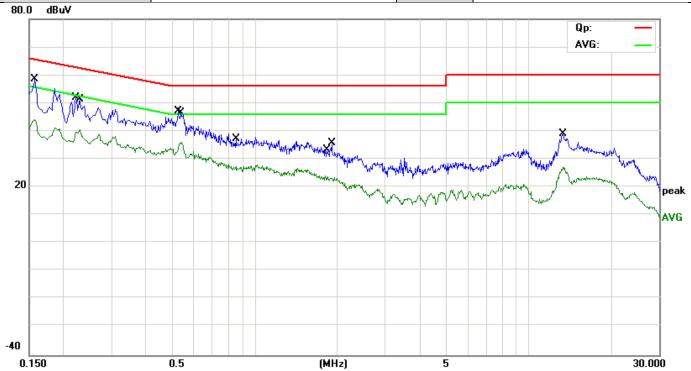
	Maximum RF Line Voltage (dBµV)							
Frequency (MHz)	CL	ASS A	CLASS B					
	Q.P.	Ave.	Q.P.	Ave.				
0.15-0.50	79	66	66-65	56-46				
0.50-5.00	73	60	56	46				
5.00-30.0	73	60	60	50				

\* 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

EUT:	Digital Handheld Radio	M/N:	RS-619D
Mode:	4FSK mode	Phase:	L
Tested by:	Iby (Engineer)	Power:	DC 12V by Adapter
Temperature: / Humidity	25℃/ 53%	Test date:	2017-05-15

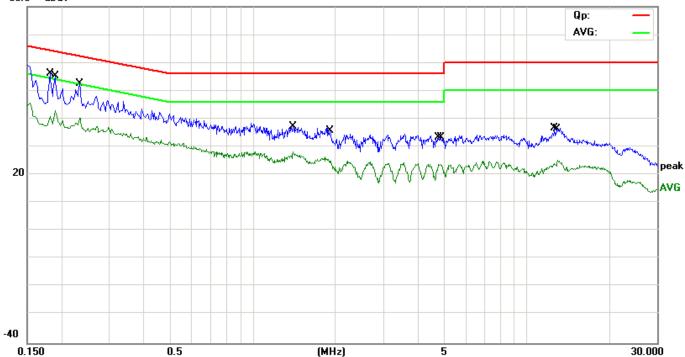


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over			
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment	
1	*	0.1580	49.04	9.60	58.64	65.57	-6.93	QP		
2		0.1580	34.54	9.60	44.14	55.57	-11.43	AVG		
3		0.2220	42.41	9.60	52.01	62.74	-10.73	QP		
4		0.2300	30.86	9.60	40.46	52.45	-11.99	AVG		
5		0.5260	37.42	9.59	47.01	56.00	-8.99	QP		
6		0.5420	26.45	9.59	36.04	46.00	-9.96	AVG		
7		0.8540	27.72	9.60	37.32	56.00	-18.68	QP		
8		0.8540	17.85	9.60	27.45	46.00	-18.55	AVG		
9		1.8140	14.35	9.60	23.95	46.00	-22.05	AVG		
10		1.9180	26.10	9.60	35.70	56.00	-20.30	QP		
11		13.3620	29.32	9.70	39.02	60.00	-20.98	QP		
12		13.4580	17.26	9.70	26.96	50.00	-23.04	AVG		

\*:Maximum data x:Over limit !:over margin

EUT:	Digital Handheld Radio	M/N:	RS-619D
Mode:	4FSK mode	Phase:	Ν
Tested by:	Iby (Engineer)	Power:	DC 12V by Adapter
Temperature: / Humidity	25℃/ 53%	Test date:	2017-05-15





0.130		0.5			ניייינ				50.000
No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over			
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment	
1 *	0.1820	46.51	9.61	56.12	64.39	-8.27	QP		
2	0.1900	33.35	9.60	42.95	54.04	-11.09	AVG		
3	0.2340	43.00	9.60	52.60	62.31	-9.71	QP		
4	0.2340	30.65	9.60	40.25	52.31	-12.06	AVG		
5	1.4100	27.52	9.60	37.12	56.00	-18.88	QP		
6	1.4100	18.58	9.60	28.18	46.00	-17.82	AVG		
7	1.9100	26.06	9.60	35.66	56.00	-20.34	QP		
8	1.9100	15.31	9.60	24.91	46.00	-21.09	AVG		
9	4.7660	14.03	9.63	23.66	46.00	-22.34	AVG		
10	4.8740	23.79	9.63	33.42	56.00	-22.58	QP		
11	12.7020	26.96	9.70	36.66	60.00	-23.34	QP		
12	12.9980	15.58	9.70	25.28	50.00	-24.72	AVG		

\*:Maximum data x:Over limit !:over margin

# 4.2 Occupied Bandwidth and Emission Mask

# PROVISIONS 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). Emission Mask B: For transmitters that are equipped with an audio low-pass filter pursuant to §90.211(a), the power of any emission must be below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not 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 not 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 + 10 log (P) dB.

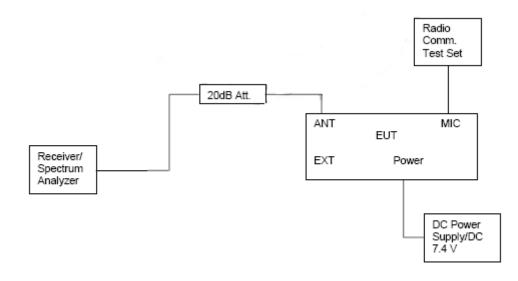
(c). Emission Mask D, 12.5 kHz channel bandwidth equipment: For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1) On any frequency from the center of the authorized bandwidth f0 to 5.625 kHz removed from f0: Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least 7.27(fd -2.88 kHz) dB.

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

# **TEST CONFIGURATION**



### **TEST PROCEDURE**

1 Set EUT as normal operation.

2 Set SPA Center Frequency = fundamental frequency, RBW=300Hz, VBW= 3 KHz, span = 50 KHz.

3 Set SPA Max hold. Mark peak, Set 99% Occupied Bandwidth and 26dB Occupied Bandwidth.

4 Set SPA Center Frequency=fundamental frequency, set =100Hz, VBW=1 KHz, span=50 KHz for 12.5 channel spacing and set =100Hz, VBW=1 KHz, span=50 KHz for 6.25 channel spacing

#### TEST RESULTS:

# 4.2.1 Occupied Bandwidth

Modulation Type	Channel Separation	Test Channel	Test Frequency	99% Occupied Bandwidth	26dB Occupied Band width			
-56-	~~paranteri		1 2	(KHz) 4.00	(KHz) 5.12			
	-	Low	406.5000 MHz					
4FSK	12.5KHz	Middle	429.5000 MHz	3.84	4.80			
		High	469.5000 MHz	3.84	4.96			
	12.5KHz	Low	406.5000 MHz	7.56	9.12			
FM		Middle	429.5000 MHz	7.56	9.12			
		High	469.5000 MHz	7.52	9.28			
Lin	Limit -		11.25KHz for 12.5KHz Channel Separation					
			6.00KHz for 6.25KHz Channel Separation					
Test R	esults	Compliance						

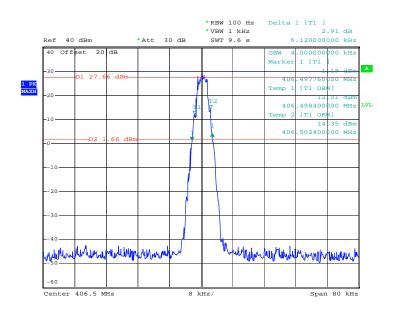
# Low power:

Modulation Type	Channel Separation	Test Channel	Test Frequency	99% Occupied Bandwidth (KHz)	26dB Occupied Band width (KHz)			
		Low	406.5000 MHz	4.00	5.12			
4FSK	12.5KHz	Middle	429.5000 MHz	3.84	4.96			
		High	469.5000 MHz	3.84	4.64			
	12.5KHz	Low	406.5000 MHz	7.52	9.12			
FM		Middle	429.5000 MHz	7.36	9.12			
		High	469.5000 MHz	7.52	9.28			
Lin	Limit		11.25KHz for 12.5KHz Channel Separation					
Lin			6.00KHz for 6.25KHz Channel Separation					
Test Re	esults	Compliance						

# Plots of 99% and 26dB Bandwidth Measurement

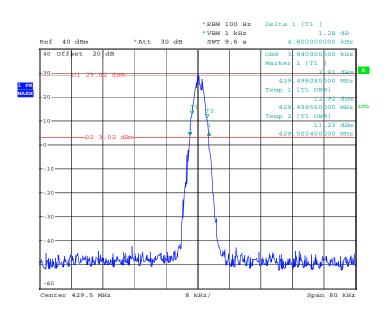
High	power:
111511	power.

Modulation	Channel	Freq.(MHz)	99%	26dB	FCC Limit	Results
Туре	Separation		Bandwidth	Bandwidth	(KHz)	
			(KHz)	(KHz)		
4FSK	12.5KHz	406.5000	4.00	5.12	11.25	Compliance



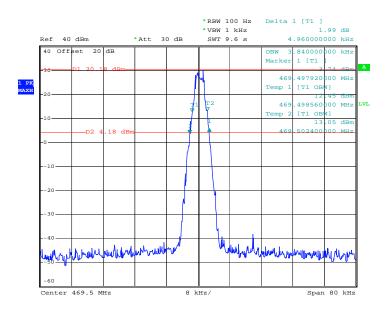
High power:

Modulation	Channel	Freq.(MHz)	99%	26dB	FCC Limit	Results
Туре	Separation		Bandwidth	Bandwidth	(KHz)	
			(KHz)	(KHz)		
4FSK	12.5KHz	429.5000	3.84	4.80	11.25	Compliance



### High power:

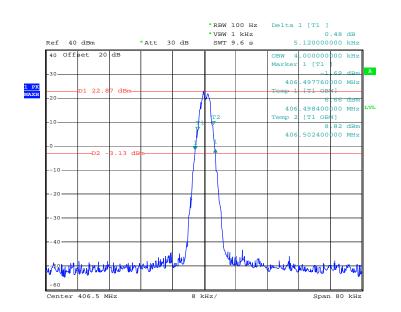
Modulation	Channel	Freq.(MHz)	99%	26dB	FCC Limit	Results
Туре	Separation		Bandwidth	Bandwidth	(KHz)	
			(KHz)	(KHz)		
4FSK	12.5KHz	469.5000	3.84	4.96	11.25	Compliance



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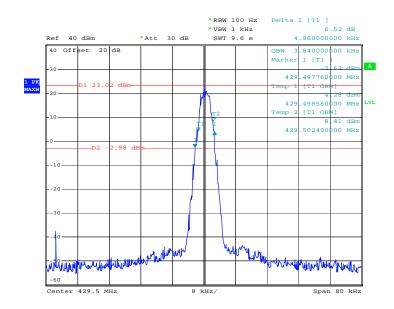
#### Low power:

Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth	26dB Bandwidth	FCC Limit (KHz)	Results
Type	ocparation		(KHz)	(KHz)	(1012)	
4FSK	12.5KHz	406.5000	4.00	5.12	11.25	Compliance



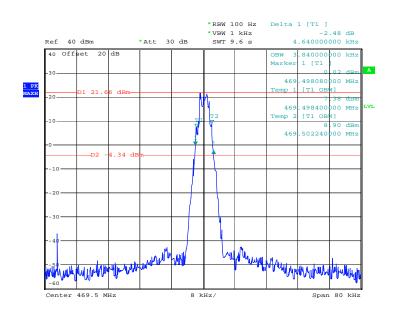
#### Low power:

Modulation	Channel	Freq.(MHz)	99%	26dB	FCC Limit	Results
Туре	Separation		Bandwidth	Bandwidth	(KHz)	
			(KHz)	(KHz)		
4FSK	12.5KHz	429.5000	3.84	4.96	11.25	Compliance



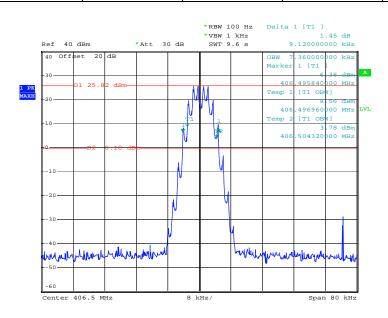
Low power:

Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth	26dB Bandwidth	FCC Limit (KHz)	Results
			(KHz)	(KHz)	. ,	
4FSK	12.5KHz	469.5000	3.84	4.64	11.25	Compliance



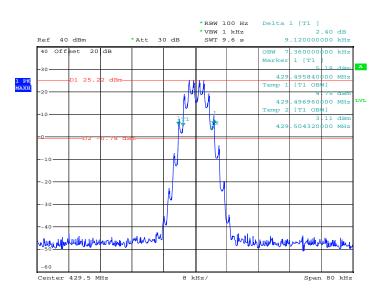
#### High Power

Modulation	Channel	Freq.(MHz)	99%	26dB	FCC Limit	Results
Туре	Separation		Bandwidth	Bandwidth	(KHz)	
			(KHz)	(KHz)		
FM	12.5KHz	406.5000	7.36	9.12	11.25	Compliance

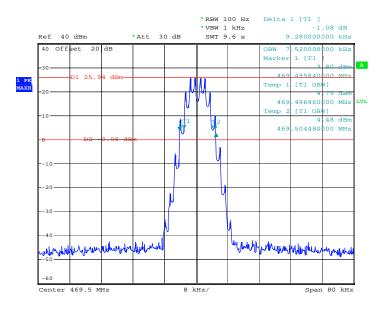


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Modulation	Channel	Freq.(MHz)	99%	26dB	FCC Limit	Results
Туре	Separation		Bandwidth	Bandwidth	(KHz)	
			(KHz)	(KHz)		
FM	12.5KHz	429.5000	7.36	9.12	11.25	Compliance

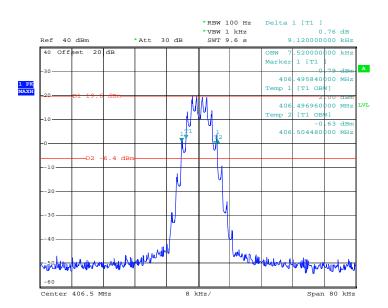


Modulation	Channel	Freq.(MHz)	99%	26dB	FCC Limit	Results
Туре	Separation		Bandwidth	Bandwidth	(KHz)	
			(KHz)	(KHz)	. ,	
FM	12.5KHz	469.5000	7.52	9.28	11.25	Compliance

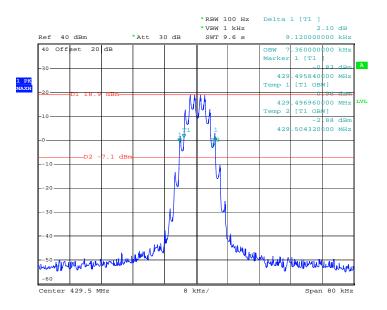


#### Low Power

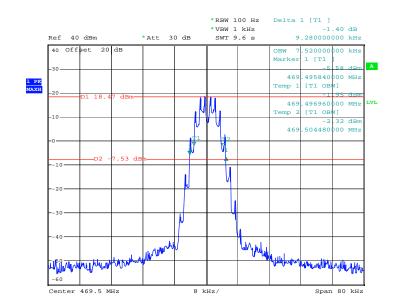
Modulation	Channel	Freq.(MHz)	99%	26dB	FCC Limit	Results
Туре	Separation	1.04.(	Bandwidth	Bandwidth	(KHz)	rtoouno
. ) [ -			(KHz)	(KHz)	(****=)	
FM	12.5KHz	406.5000	7.52	9.12	11.25	Compliance



Modulation	Channel	Freq.(MHz)	99%	26dB	FCC Limit	Results
Туре	Separation		Bandwidth	Bandwidth	(KHz)	
			(KHz)	(KHz)		
FM	12.5KHz	429.5000	7.36	9.12	11.25	Compliance



Modulation	Channel	Freq.(MHz)	99%	26dB	FCC Limit	Results
Туре	Separation		Bandwidth	Bandwidth	(KHz)	
			(KHz)	(KHz)		
FM	12.5KHz	469.5000	7.52	9.28	11.25	Compliance



# 4.3 Emission Mask

### Applicable Standard

FCC § 90.210

(b) Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not 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 not 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  $43 + 10 \log (P) dB$ .

(d) Emission Mask D—12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1) On any frequency from the center of the authorized bandwidth f0 to 5.625 kHz removed from f0: Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least 7.27(fd–2.88 kHz) dB.

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least  $50 + 10 \log (P) dB$  or 70 dB, whichever is the lesser attenuation.

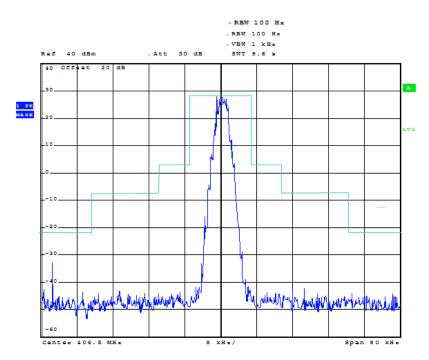
(4) The reference level for showing compliance with the emission mask shall be established using a resolution bandwidth sufficiently wide (usually two or three times the channel bandwidth) to capture the true peak emission of the equipment under test. In order to show compliance with the emission mask up to and including 50 kHz removed from the edge of the authorized bandwidth, adjust the resolution bandwidth to 100 Hz with the measuring instrument in a peak hold mode. A sufficient number of sweeps must be measured to insure that the emission profile is developed. If video filtering is used, its bandwidth must not be less than the instrument resolution bandwidth. For emissions beyond 50 kHz from the edge of the authorized bandwidth, see paragraph (o) of this section. If it can be shown that use of the above instrumentation settings do not accurately represent the true interference potential of the equipment under test, an alternate procedure may be used provided prior Commission approval is obtained.

Modulation Type	Channel Separation	Test Channel	Test Frequency	FCC Applicable Mask	RBW	
	12.5KHz	Low	406.5000 MHz	В	100Hz	
4FSK		Middle	429.5000 MHz	D	100Hz	
		High	469.5000 MHz	D	100Hz	
		Low	406.5000 MHz	В	100Hz	
FM	12.5KHz	Middle	429.5000 MHz	D	100Hz	
		High	469.5000 MHz	D	100Hz	
Test Results		Compliance				

## Referred as the attached plot hereinafter

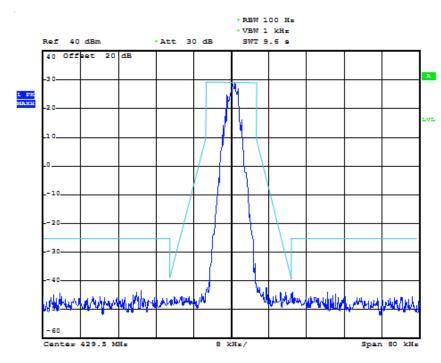
High power

Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
4FSK	12.5KHz	406.5000	В	100Hz	/	Compliance



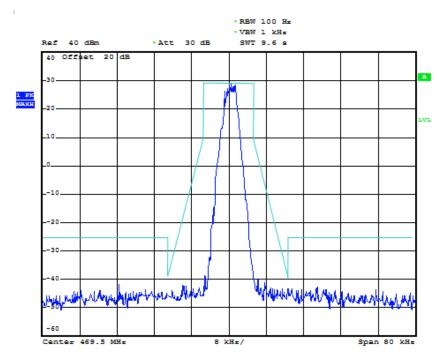
12.5 kHz Channel Spacing, 406.5000 MHz, 4FSK Modulation Only

High power						
Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
4FSK	12.5KHz	429.5000	D	100Hz	1	Compliance

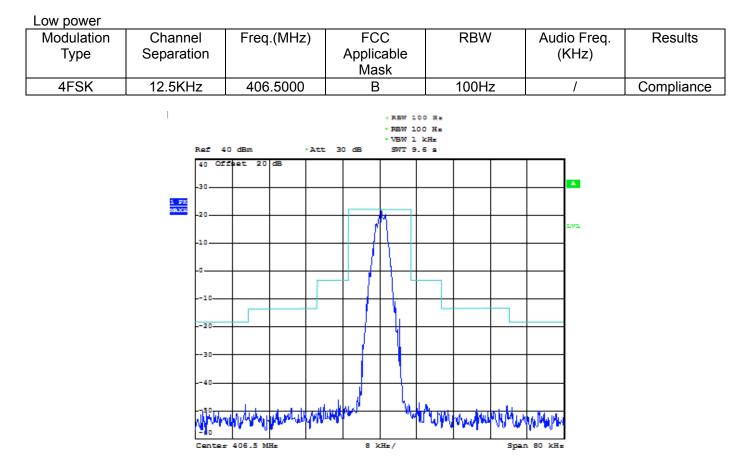


12.5 kHz Channel Spacing, 429.5000 MHz, 4FSK Modulation Only

High power						
Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
4FSK	12.5KHz	469.5000	D	100Hz	/	Compliance

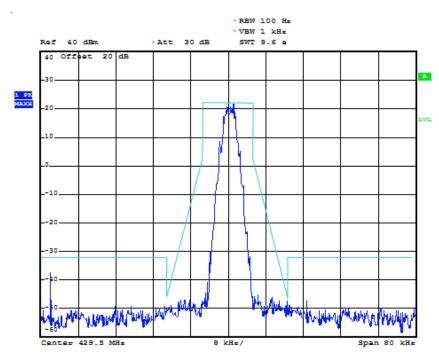


12.5 kHz Channel Spacing, 469.5000 MHz, 4FSK Modulation Only



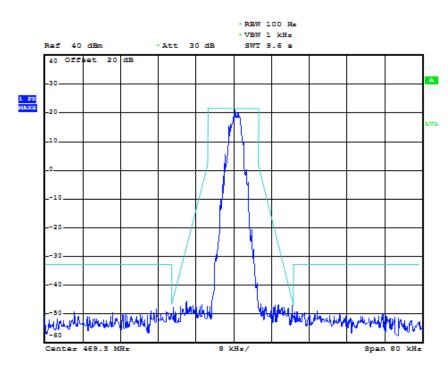
12.5 kHz Channel Spacing, 406.5000 MHz, 4FSK Modulation Only

Low power						
Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
4FSK	12.5KHz	429.5000	D	100Hz	/	Compliance



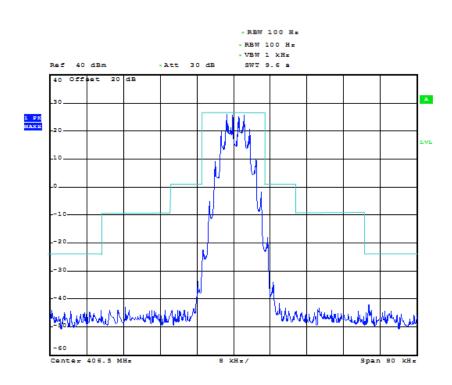
12.5 kHz Channel Spacing, 429.5000 MHz, 4FSK Modulation Only

Low power						
Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
4FSK	12.5KHz	469.5000	D	100Hz	/	Compliance

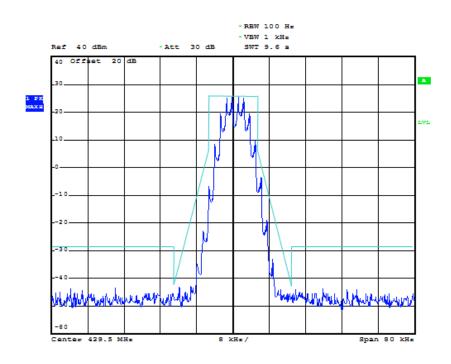


12.5 kHz Channel Spacing, 469.5000 MHz, 4FSK Modulation Only

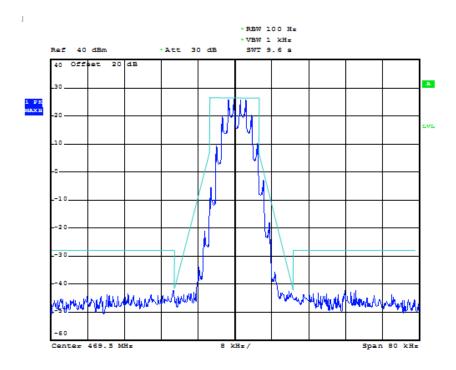
High power						
Modulation	Channel	Freq.(MHz)	FCC	RBW	Audio Freq.	Results
Туре	Separation		Applicable		(KHz)	
	•		Mask			
FM	12.5KHz	406.5000	В	100Hz	/	Compliance



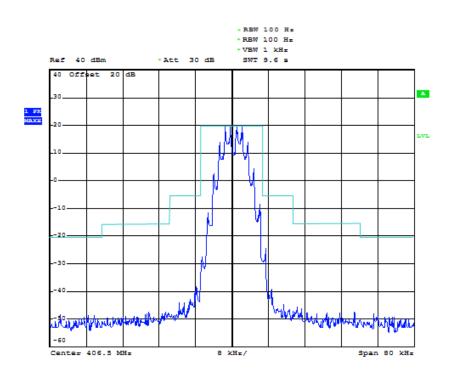
High power						
Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
FM	12.5KHz	429.5000	D	100Hz	/	Compliance



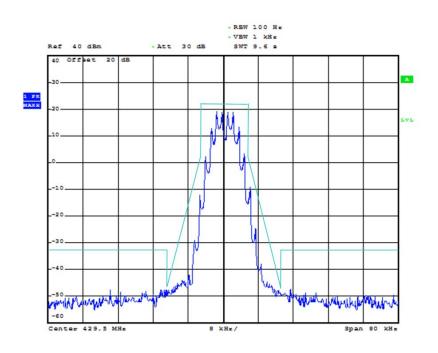
High power						
Modulation	Channel	Freq.(MHz)	FCC	RBW	Audio Freq.	Results
Туре	Separation		Applicable		(KHz)	
			Mask			
FM	12.5KHz	469.5000	D	100Hz	/	Compliance



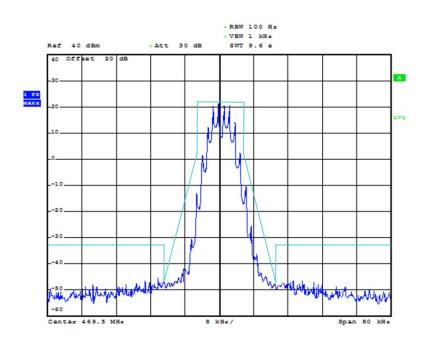
Low po	wer						
Modul	lation	Channel	Freq.(MHz)	FCC	RBW	Audio Freg.	Results
Тур	ре	Separation		Applicable		(KHz)	
,		•		Mask			
FN	N	12.5KHz	406.5000	В	100Hz	/	Compliance



l	_ow power						
	Modulation	Channel	Freq.(MHz)	FCC	RBW	Audio Freg.	Results
	Туре	Separation		Applicable		(KHz)	
	,,	•		Mask			
	FM	12.5KHz	429.5000	D	100Hz	/	Compliance



Low power						
Modulation	Channel	Freq.(MHz)	FCC	RBW	Audio Freg.	Results
Туре	Separation		Applicable		(KHz)	
<b>7</b> F -			Mask		~ /	
FM	12.5KHz	469.5000	D	100Hz	/	Compliance



# 4.3. Radiated Spurious Emission Test

### 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 6.25 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:

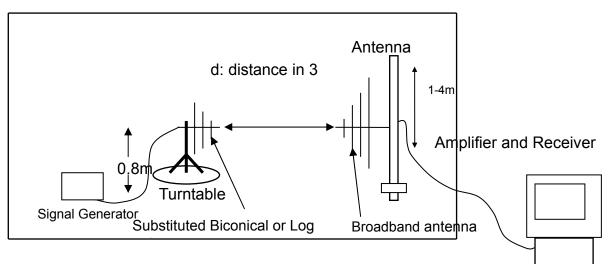
1 On any frequency from the center of the authorized bandwidth f0 to 3.0 kHz removed from f0: Zero dB.

2 On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 3.0 kHz but no more than 4.6 kHz: At least 30 + 16.67(fd-3 kHz) or 55 + 10 log (P) or 65 dB, whichever is the lesser attenuation.

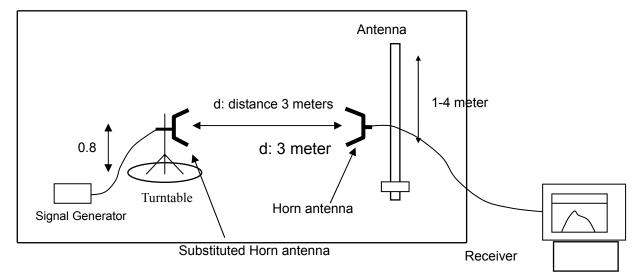
3 On any frequency removed from the center of the authorized bandwidth by more than 4.6 kHz: At least 55 + 10 log (P) or 65 dB, whichever is the lesser attenuation.

#### **TEST CONFIGURATION**

#### Below 1GHz:



#### Above 1GHz:



#### TEST PROCEDURE

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load, which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis. The frequency range up to teeth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB =10 1g (TXpwr in Watts/0.001)-the absolute level Spurious attenuation limit in dB =50+10 Log<sub>10</sub> (power out in Watts) for EUT with a 12.5 kHz channel bandwidth.

#### TEST RESULTS

#### Modulation Type: 4FSK/FM

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.

# Report No.: MTE/FCF/B17050942

Modu	lation	4F	SK	Channel S	Separation	12.	5KHz	
Test Cl	nannel	Low C	Channel	Test Fre	equency	406.50	000 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)
200.011	45.02	Peak	Н	140	247	-53.26	-20	-33.26
2431.33	47.34	Peak	Н	120	152	-47.37	-20	-27.37
3214.05	40.86	Peak	Н	120	47	-54.88	-20	-34.88
			Н					
513.37	50.28	Peak	V	100	345	-47.64	-20	-27.64
2376.59	49.81	Peak	V	130	94	-46.75	-20	-26.75
3235.52	43.43	Peak	V	120	123	-54.82	-20	-34.82
		/	V	/	/	/	/	/

Modu	lation	4F	SK	Channel S	Separation	12.	5KHz			
Test Cl	nannel	Middle	Channel	Test Fre	equency	429.50	000 MHz			
Frequency	E-Field	EMI	Antenna	Antenna	Table	ERP	Limit	Margin		
(MHz)	Level	Detector	Polarization	Height	Angle	measured by	(dBm)	(dB)		
	(dBuv/m)	(Peak/QP)		(cm)	(Degree)	Substitution				
						Method(dBm)				
455.14	45.25	Peak	Н	140	261	-47.25	-20	-27.25		
2362.36	47.47	Peak	Н	120	156	-42.37	-20	-22.37		
3136.88	45.09	Peak	Н	120	44	-53.44	-20	-33.44		
			Н							
481.41	51.32	Peak	V	100	350	-45.53	-20	-25.53		
2344.23	54.04	Peak	V	130	101	-43.64	-20	-23.64		
3258.25	41.66	Peak	V	120	147	-47.72	-20	-27.72		
		/	V	/	/	/	/	/		

Modu	lation	4F	SK	Channel S	Separation	12.	5KHz	
Test Cl	nannel	High (	Channel	Test Fre	equency	469.5	000 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)
554.67	40.18	Peak	Н	100	302	-51.65	-20	-31.65
2416.29	44.82	Peak	Н	200	78	-42.72	-20	-22.72
3274.22	42.13	Peak	Н	200	149	-53.53	-20	-33.53
			Н					
482.34	48.25	Peak	V	100	274	-44.33	-20	-24.33
2443.26	51.77	Peak	V	200	105	-45.54	-20	-25.54
3146.68	43.99	Peak	V	100	43	-56.34	-20	-36.34
		/	V	/	/	/	/	/

Modul	lation	F	M	Channel S	Separation	25	5KHz	
Test Ch	nannel	Low C	Channel	Test Fre	equency	406.50	00 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)
200.011	45.02	Peak	Н	140	247	-53.35	-20	-33.35
2431.33	47.34	Peak	Н	120	152	-47.43	-20	-27.43
3214.05	40.86	Peak	Н	120	47	-54.54	-20	-34.54
			Н					
513.37	50.28	Peak	V	100	345	-47.64	-20	-27.64
2376.59	49.81	Peak	V	130	94	-46.75	-20	-26.75
3235.52	43.43	Peak	V	120	123	-54.82	-20	-34.82
		/	V	/	/	/	/	/

Modu	lation	F	FM	Channel S	Separation	25	5KHz	
Test Cl	nannel	Middle	Channel	Test Fre	equency	429.5	000 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)
455.14	45.25	Peak	Н	140	261	-47.51	-20	-27.51
2362.36	47.47	Peak	Н	120	156	-42.72	-20	-22.72
3136.88	45.09	Peak	Н	120	44	-53.53	-20	-33.53
			Н					
481.41	51.32	Peak	V	100	350	-45.24	-20	-25.24
2344.23	54.04	Peak	V	130	101	-43.55	-20	-23.55
3258.25	41.66	Peak	V	120	147	-47.46	-20	-27.46
		/	V	/	/	/	/	/

Modu	ation	F	M	Channel S	Separation	25	5KHz	
Test Ch	nannel	High (	Channel	Test Fre	equency	469.50	200 MHz	
Frequency	E-Field	EMI	Antenna	Antenna	Table	ERP	Limit	Margin
(MHz)	Level	Detector	Polarization	Height	Angle	measured by	(dBm)	(dB)
	(dBuv/m)	(Peak/QP)		(cm)	(Degree)	Substitution		
	. ,			. ,		Method(dBm)		
554.67	40.18	Peak	Н	100	302	-52.67	-20	-32.67
2416.29	44.81	Peak	Н	200	78	-44.78	-20	-24.78
3274.22	42.13	Peak	Н	200	149	-56.59	-20	-36.59
			Н					
482.34	48.25	Peak	V	100	274	-48.31	-20	-28.31
2443.26	51.77	Peak	V	200	105	-47.52	-20	-27.52
3146.68	43.99	Peak	V	100	43	-53.33	-20	-33.33
		/	V	/	/	/	/	/

# 4.4. Spurious Emission On Antenna Port

#### TEST APPLICABLE

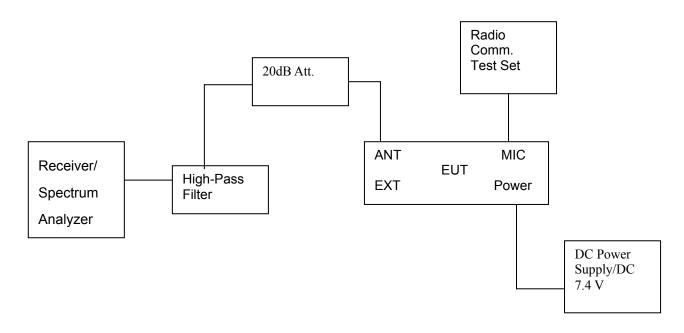
The same as Section 4.3

### **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 10th 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: 4FSK /FM

Note: 1. In general, the worse case attenuation requirement shown above was applied.

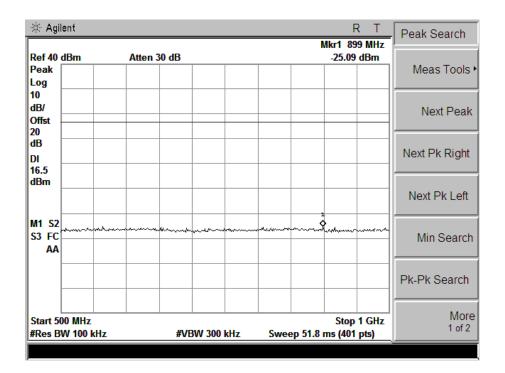
2. The measurement frequency range from 30 MHz to 5 GHz.

#### Plots of Spurious Emission on Antenna Port Measurement

See next pages.

Modulation Type	Channel Separation	Rated Power (Watt)	Test Frequency (MHz)	Condu Spurious E	1 2		num Icted missions 1GHz Results (dBm)	FCC limit
4FSK	12.5KHz	5	406.5000	899.00	-25.09	2950.00	-14.97	-20dBc
Test R	esults			Compliance				

🔆 Agilent							F Akr1 40		Display
Ref 40 dBm	Atte	n 30 dB					36.53	dBm	
Peak Log						:	>		Full Scree
10 dB/ Offst 20									Display Lii 16.53 dE <u>On</u>
dB DI 16.5 dBm									
									Lim
M1 S2 S3 FC	nmhigh	under motor	n.n.had	~~~~~	norman	man	lannaan	marana sana	
									Titl
Start 30 MHz #Res BW 100 kH		#VE	3W 300 I	ر Hz	Sweep	o 48.69 i	Stop 50 ns (401		Preferences



🔆 Agile	ent				R T	Peak Search
Ref 40 d Peak	lBm	Atten 30 dB			Mkr1 2.950 GH: -14.97 dBm	
Log						Meas Tools
10 dB/ Offst - 20						Next Peak
dB DI 16.5						Next Pk Right
dBm	way and the first of the	Maran	T T	mhunhammu		Next Pk Left
M1 S2 S3 FC AA						Min Search
-						Pk-Pk Search
Start 1 ( #Res BV	GHz N 1 MHz	#	VBW 3 MHz	Sweep	Stop 5 GH 10 ms (401 pts)	Z More 1 of 2

Modulation Type	Channel Separation	Rated Power (Watt)	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz Frequency Results (MHz) (dBm)		Maxir Condu Spurious E Above Frequency (MHz)	icted missions	FCC limit
4FSK	12.5KHz	5	429.5000	576	-25.6	3740	-16.94	-20dBc
Test R	esults			Compliance				

崇 Agilent				R T	Marker
Ref 40 dBm	Atten 30 dB		Mkr1 4 35.9	9 dBm	, Select Marker
Peak Log			¢ †		1  2  3
10 dB/ Offst 20					Norma
dB DI 15.9					Delta
dBm					Delta Pair (Tracking Ref) Ref <u>Delta</u>
M1 S2 S3 FC AA		unathana an	un an	where even	Span Pai <sub>Span <u>Cente</u></sub>
					Of
Start 30 MHz #Res BW 100 kH	  z #	VBW 300 kHz Sv	Stop 50 veep 48.69 ms (401	)0 MHz pts)	More 1 of 2

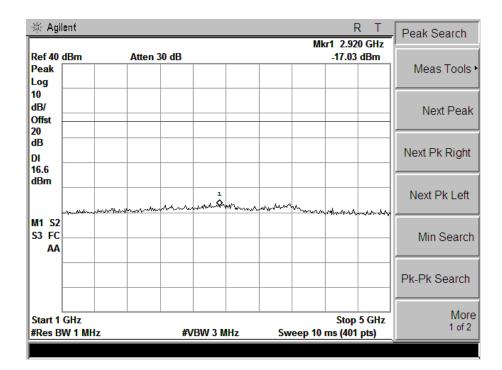
举 Agile	ent						N	F Akr1 57		Peak Search
Ref 40 c Peak Log	IBm	Atten 3	0 dB					-25.6	dBm	Meas Tools
10 dB/ Offst 20										Next Peak
dB DI 15.9	Marker									Next Pk Right
dBm	576.000 -25.6 d		VIHZ							Next Pk Left
M1 S2 S3 FC AA	**************************************	·····	~ Maren	water deserve	w.~~m	~~~~	M-N-N-N-MA	w-waardad	en en en	Min Search
-										Pk-Pk Search
Start 50 #Res BV	0 MHz V 100 kHz		#VB	W 300 I	٢Hz	Swee	ep 51.8 i	-	1 GHz pts)	More 1 of 2

🔆 Agil	lent			Mk	R T	Peak Search
Ref 40 Peak Log	dBm	Atten 30 dB			-16.94 dBm	Meas Tools
10 dB/ Offst 20						Next Peak
20 dB DI 15.9						Next Pk Right
		wanter	wanter	in the second	malippera	Next Pk Left
M1 S2 S3 FC AA						Min Search
						Pk-Pk Search
Start 1 #Res B	GHz W 1 MHz	#V	BW 3 MHz	Sweep 10 I	Stop 5 GHz ns (401 pts)	More 1 of 2

Modulation Type	Channel Separation	Rated Power (Watt)	Test Frequency (MHz)	Maxir Condu Spurious E Below Frequency (MHz)	icted missions	Maxin Condu Spurious E Above Frequency (MHz)	icted missions	FCC limit
4FSK	12.5KHz	5	469.5000	764	-25.74	2920	-17.03	-20dBc
Test R	esults		C	ompliance				

∰ Agilent				R T	Marker
Ref 40 dBm	Atten 30 d	В		Mkr1 469 MH 36.64 dBm	_
Peak Log				\$	<u>1 2 3</u>
10 dB/ Offst 20					Norma
dB DI					Delta
16.6 dBm					Delta Pai (Tracking Ref) Ref Delt
M1 S2 S3 FC AA	www.www.ww	and the second	anglee	m	Span Pai Span <u>Cente</u>
					O
Start 30 MHz #Res BW 100 kHz		#VBW 300 kHz	Sweep 48.6	Stop 500 MH: 9 ms (401 pts)	z Mor 1 of 2

🔆 Agiler	nt							R T	Peak Search
Ref 40 dl Peak Log	Bm	Atten 3	0 dB				Akr1 76 -25.74		، Meas Tools ،
10 dB/ Offst - 20									Next Peak
dB DI 16.6									Next Pk Right
dBm									Next Pk Left
M1 S2 S3 FC ~ AA	~~~~~	wy	man	n.n.	and the second	n	r-marine and the	An som	Min Search
_									Pk-Pk Search
Start 500 #Res BW	) MHz / 100 kHz		#VBW	300 kHz	Swee	ep 51.8 i		1 GHz pts)	More 1 of 2



Modulation Type	Channel Separation	Rated Power (Watt)	Test Frequency (MHz)	Maxir Condu Spurious E Below Frequency (MHz)	icted missions	Maxir Condu Spurious E Above Frequency (MHz)	icted missions	FCC limit
FM	12.5KHz	5	406.5000	536.00	-26.25	2930.00	-15.82	-20dBc
Test R	esults			C	ompliance			

∰ Agilent			Mkr1 4	R T	Marker
Ref 40 dBm	Atten 30	dB		4 dBm	Select Marker
Peak Log			¢		<u>1 2 3</u>
10 dB/ Offst 20					Norma
dB DI 16.5					Delta
dBm					Delta Pai (Tracking Ref) Ref <u>Delt</u>
M1 S2 S3 FC AA	man	manhaman	ar and a second	landean allan	Span Pa Span <u>Cente</u>
					0
Start 30 MHz #Res BW 100 k	Hz	#VBW 300 kHz	Stop 50 Sweep 48.69 ms (401		Mor 1 of 2

🔆 Agile	ent							N	/ /kr1 53	R Τ 6 MHz	Peak Search
Ref 40 d Peak Log	lBm		Atten	30 dB					-26.25	dBm	Meas Tools •
10 dB/ Offst 20											Next Peak
dB DI 16.5			000	N 41 1-							Next Pk Right
IBm _		.25 c		MHz							Next Pk Left
M1 S2 S3 FC AA		Withington	man	han war	umb	www.www.	nnenter	marta	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Min Search
-											Pk-Pk Search
Start 50 #Res BV		κHz		#VE	300 W	kHz	Swee	ep 51.8 i		1 GHz pts)	More 1 of 2

🔆 Agilo	ent							ML	F r1 2.93		Peak Search
Ref 40 o Peak Log	dBm		Atten 3	0 dB					-15.82		Meas Tools •
10 dB/ Offst 20											Next Peak
dB DI 16.5 dBm		rker 3000	0000	GH	7						Next Pk Right
uom .		.82 d			- 	www.		manu	dealaha	. a rate a she	Next Pk Left
M1 S2 S3 FC AA											Min Search
-											Pk-Pk Search
Start 1 #Res B\		z		#V	/BW 3 N	IHz	Sw	eep 10	-	5 GHz pts)	More 1 of 2

Modulation Type	Channel Separation	Rated Power (Watt)	Test Frequency (MHz)	Maxir Condu Spurious E Below Frequency (MHz)	icted missions	Maxir Condu Spurious E Above Frequency (MHz)	icted Emissions	FCC limit	
FM	12.5KHz	5	429.5000	863.00	-26.08	3020.00	-17.1	-20dBc	
Test R	esults			Compliance					

🔆 Agile	ent									RT	, 1	Marker	
Ref 40 c	1Bm		Atten	30 dB				I		430 MHz .89 dBm			
Peak Log									Ŷ			ct Mark <u>2 3</u>	er :
10 dB/ Offst 20												Nor	ma
dB DI	Ma	rker										De	elta
15.9 dBm				MHz							-	Delta P	
	30	.89 d	BW								Ref	acking Re D	er) )elta
M1 S2 S3 FC AA	an a	waaren oo	·	en veren en e	natra	www.eeee		m	yrullu		Span	Span F <u>Cer</u>	<sup>D</sup> aii
-													Of
 Start 30 #Res B\		ر Hz		#VE	SW 300	kHz	Swee	p 48.69		500 MHz 01 pts)			lore of 2

🔆 Agi	lent									R	Т	Peak Search
Ref 40 Peak Log	dBm		Atten 3	30 dB				N		863 M 08 dB		Meas Tools
10 dB/ Offst 20												Next Peak
dB DI 15.9												Next Pk Right
dBm												Next Pk Left
M1 S2 S3 FC AA		un marca	w	Veran	-	mm	www.www.edv	1	wM	hnar	~~~	Min Search
												Pk-Pk Search
	00 MHz W 100 I			#VE	3W 300	kHz	Swee	ep 51.8 i		op 1 ( 01 pts		More 1 of 2

₩ Agilent			M	R T kr1 3.020 GHz	Peak Search
Ref 40 dBm Peak	Atten 30 dB			- <b>17.1 dBm</b>	Meas Tools
Log					ivieas roois
10 dB/					Next Peak
Offst					
JB DI					Next Pk Right
15.9 dBm					
	www.www.www.www.www.	manna	www.www.www.ww		Next Pk Left
M1 S2 S3 FC					Min Search
					Pk-Pk Search
Start 1 GHz #Res BW 1 MHz		VBW 3 MHz	<u> </u>	Stop 5 GHz ms (401 pts)	More 1 of 2

Modulation Type	Channel Separation	Rated Power (Watt)	Test Frequency (MHz)	Maxin Condu Spurious E Below Frequency (MHz)	icted missions	Maxin Condu Spurious E Above Frequency (MHz)	cted missions	FCC limit
FM	12.5KHz	5	469.5000	860.00	-26.24	3680.00	-15.84	-20dBc
Test R	esults			Compliance				

🔆 Agili	ent								F		, M	arker
Ref 40 o	dBm		Atten	30 dB					Akr1 46 36.7	9 MHz dBm	Soloc	t Marker
Peak Log										Ŷ	<u>1 2</u>	
10 dB/ Offst 20												Norma
20 1B DI 16.7	Mar											Delta
dBm		.000 .7 dl		MHz								Delta Pai <sup>cking Ref)</sup> <u>Delt</u>
M1 S2 S3 FC AA	nnnnn	provent and	n warden war Na san warden w	-	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	******	mun	haran an a	***~~~	ullana	Span	Span Pai <u>Cente</u>
												O
Start 30 #Res B\	) MHz W 100 kł	Ηz		#VE	300 W	kHz	Sweep		Stop 50 ns (401			Mor 1 of 2

🔆 Agil	ent							F Mkr1 86		Peak Search
Ref 40 Peak Log	dBm	Atter	30 dB					-26.24		Meas Tools
10 dB/ Offst 20										Next Peak
dB DI 16.4										Next Pk Right
dBm										Next Pk Left
M1 S2 S3 FC AA	un an			andaliyata-adda	ukunun	d vor der berefordet.	1 2 2 2	nnhorm-	Veneration - Lan	Min Search
										Pk-Pk Search
Start 50 #Res B	00 MHz W 100 kHz		#VE	3W 300 I	kHz	Swee	ep 51.8 i	-	1 GHz pts)	More 1 of 2

✤ Agilent			R	T Peak Search
Ref 40 dBm Peak	Atten 30 dB		Mkr1 3.680 -15.84 d	
Log 10				
dB/ Offst				Next Peak
dB DI 16.7				Next Pk Right
dBm	able man and and			Next Pk Left
M1 S2 S3 FC AA				Min Search
				Pk-Pk Search
Start 1 GHz #Res BW 1 MHz		W 3 MHz S	Stop 5 weep 10 ms (401 p	

# 4.5. Modulation Characteristics

# 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

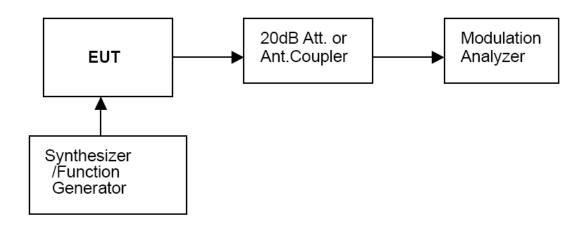
1 Configure the EUT as shown in figure 1.

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

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

# 4.6. Frequency Stability Measurement

#### 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°C to +50°C 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.

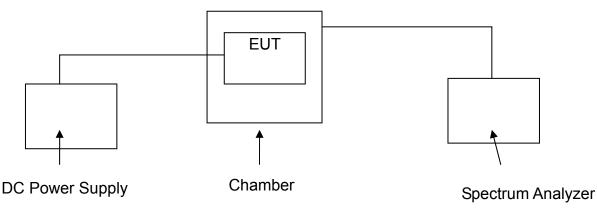
3 Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment and tested end point voltage.

4 According to §90.213, the frequency stability limit is 2.5 ppm for 12.5 KHz channel separation and 1.0 ppm for 6.25KHz channel separation.

#### 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 ESCI. 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 SETUP BLOCK DIAGRAM**



# TEST LIMITS

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

		Mobile s	stations
Frequency range (MHz)	Fixed and base stations	Over 2 watts output power	2 watts or less output power
Below 25 25–50 72–76 150–174 216–220	<sup>1,2,3</sup> 100 20 5 5,11 5 1.0	100 20 ° 5	200 50 50 4.6 50 1.0
220–222 <sup>12</sup> 421–512	0.1	1.5 ≈5	1.5 ≈5
806–809 809–824	<sup>14</sup> 1.0 <sup>14</sup> 1.5	1.5 2.5	1.5 2.5
851–854 854–869	1.0 1.5	1.5 2.5	1.5 2.5
896–901 902–928 902–928 13	14 0.1 2.5 2.5	1.5 2.5 2.5	1.5 2.5 2.5
929–930 935–940	1.5 0.1	1.5	1.5
1427–1435 Above 2450 <sup>10</sup>	° 300	300	300

Modulation Type	Channel separation	Test conditions		Frequency e	error (ppm)	
Type	Separation	Voltage(V)	Temp(℃)	406.5000 (MHz)	429.5000 (MHz)	469.5000 (MHz)
		7.40	-30	-0.41	-0.62	-0.53
			-20	-0.54	-0.65	-0.56
			10	-0.57	-0.58	-0.59
	Digital/4FSK 12.5KHz		0	-0.51	-0.52	-0.43
Digital/4FSK 12.5KHz		10	-0.44	-0.45	-0.36	
			20	-0.27	-0.18	-0.19
			30	-0.31	-0.32	-0.33
			40	-0.44	-0.45	-0.46
			50	-0.67	-0.48	-0.59
		6.25 (End Point)	25	-0.51	-0.62	-0.63
		6.29 (85% Rated)	20	-0.34	-0.35	-0.26
		8.51 (115% Rated)	20	-0.27	-0.28	-0.29
Limit	Limit			1.00	1.00	1.00
Conclusion			Complies			

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Modulation Type	Channel separation	Test conditions		Frequency	error (ppm)	
Type	Separation	Voltage(V)	Temp(℃)	406.5000 (MHz)	429.5000 (MHz)	469.5000 (MHz)
		7.40	-30	-0.42	-0.67	-0.56
			-20	-0.54	-0.65	-0.58
			10	-0.53	-0.53	-0.56
FM	12.5KHz		0	-0.51	-0.54	-0.47
FIVI			10	-0.45	-0.46	-0.38
			20	-0.26	-0.18	-0.18
			30	-0.30	-0.32	-0.36
			40	-0.45	-0.45	-0.48
			50	-0.64	-0.46	-0.59
		6.25 (End Point)	25	-0.52	-0.65	-0.69
		6.29 (85% Rated)	20	-0.33	-0.33	-0.28
		8.51 (115% Rated)	20	-0.25	-0.28	-0.24
Limit				1.00	1.00	1.00
Conclusion			Complies			

# 4.7. Conducted Output Power

### TEST APPLICABLE

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

Typical transmitter output powers are 110 watts for base and/or fixed stations (paging transmitters excepted), and 30 watts for mobile stations. Higher powers may be certified, but it should be noted that mobile stations are normally only licensed up to 30 watts. See the SRSP relevant to the operating frequency for equipment power limits.

#### 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:

f the power output is adjustable, measurements shall be made for the highest and lowest power levels.

The EUT connect to the Receiver through 40 dB attenuator.

Measurement with Spectrum Analyzer FSP40 or Aglient E4407B conducted, external power supply with 12.50 V stabilized supply voltage.

#### TEST CONFIGURATION

	 	 Spectrum
EUT	Attenuator	Analyzer/Receiver

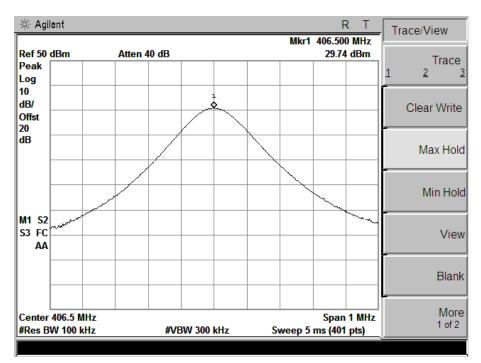
The EUT was directly connected to a RF Communication

Test set by a 20 dB attenuator

# TEST RESULTS

# Plots of Maximum Transmitter Power Measurement

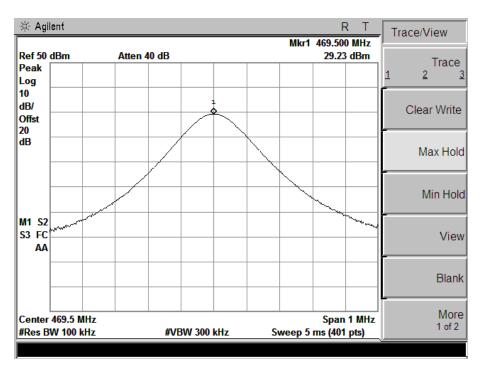
Modulation	Channel	Freq.(MHz)	Rated Power	Measurement	FCC Limit	Type Results
	Separation		(Watt)	(dBm)		
4FSK	12.5 KHz	406.5000	1	29.74	Varies	Compliance



Modulation	Channel	Freq.(MHz)	Rated Power	Measurement	FCC Limit	Type Results
	Separation		(Watt)	(dBm)		
4FSK	12.5 KHz	429.5000	1	29.50	Varies	Compliance

🔆 Agile	ent				R T	Peak Search
Ref 50 d Peak	Bm	Atten 40 dB		Mkr1	429.500 MHz 29.5 dBm	, Meas Tools
Log _ 10 dB/ _ Offst _ 20						Next Peak
dB						Next Pk Right
_						Next Pk Left
M1 S2 S3 FC AA	warden and the second se					Min Search
_						Pk-Pk Search
	129.5 MHz V 100 kHz	 #VI	BW 300 kHz	Sweep 5	Span 1 MHz ms (401 pts)	More 1 of 2

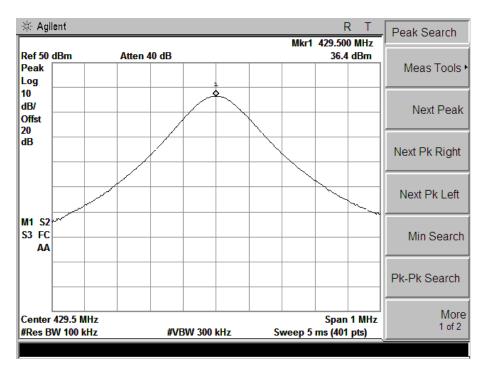
Modulation	Channel	Freq.(MHz)	Rated Power	Measurement	FCC Limit	Type Results
	Separation		(Watt)	(dBm)		
4FSK	12.5 KHz	469.5000	1	29.23	Varies	Compliance



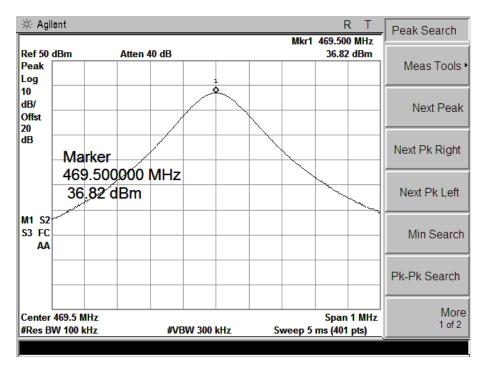
Modulation	Channel	Freq.(MHz)	Rated Power	Measurement	FCC Limit	Type Results
	Separation		(Watt)	(dBm)		
4FSK	12.5 KHz	406.5000	5	36.98	Varies	Compliance

🔆 Agile	ent							Mkr1	R 406.498	T MHz	Peak Search
Ref 50 o Peak Log	lBm		Atten	40 dB					36.98		Meas Tools
10 dB/ Offst 20						2					Next Peak
dB			000	N AL 1-							Next Pk Right
-		.490 .98 c	1	MHz							Next Pk Left
M1 S2+ S3 FC AA	~~~										Min Search
-											Pk-Pk Search
Center 4 #Res BV				#VE	3W 300	kHz	S	weep 5	Span 1 ms (401 j		More 1 of 2

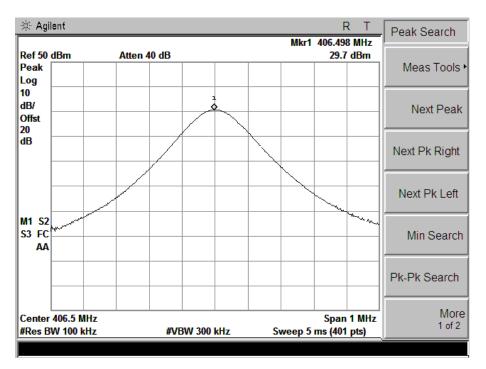
Modulation	Channel	Freq.(MHz)	Rated Power	Measurement	FCC Limit	Type Results
	Separation		(Watt)	(dBm)		
4FSK	12.5 KHz	429.5000	5	36.4	Varies	Compliance



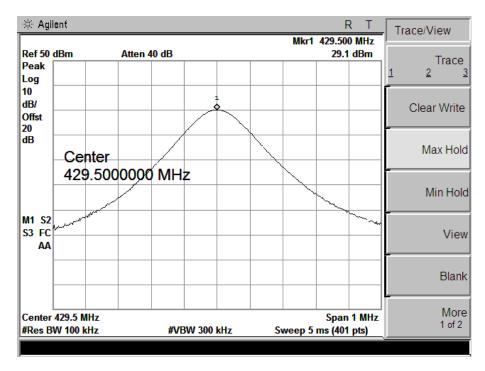
Modulation	Channel	Freq.(MHz)	Rated Power	Measurement	FCC Limit	Type Results
	Separation		(Watt)	(dBm)		
4FSK	12.5 KHz	469.5000	5	36.82	Varies	Compliance



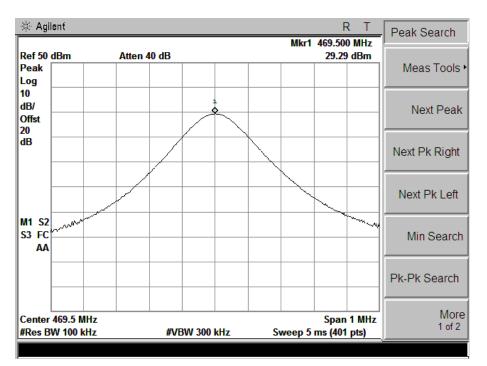
Modulation	Channel	Freq.(MHz)	Rated Power	Measurement	FCC Limit	Type Results
	Separation		(Watt)	(dBm)		
FM	12.5 KHz	406.5000	1	29.7	Varies	Compliance



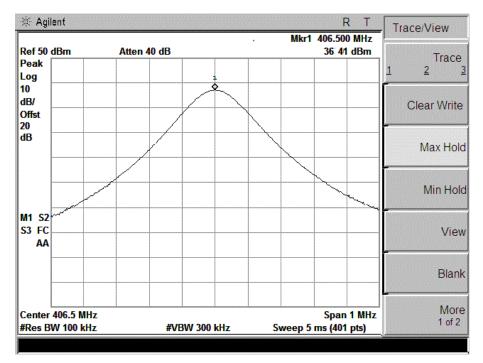
Modulation	Channel	Freq.(MHz)	Rated Power	Measurement	FCC Limit	Type Results
	Separation		(Watt)	(dBm)		
FM	12.5 KHz	429.5000	1	29.1	Varies	Compliance



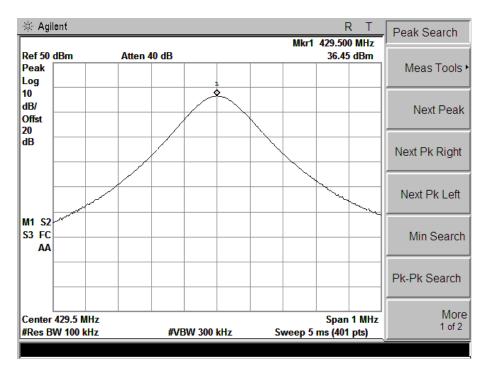
Modulation	Channel	Freq.(MHz)	Rated Power	Measurement	FCC Limit	Type Results
	Separation		(Watt)	(dBm)		
FM	12.5 KHz	469.5000	1	29.29	Varies	Compliance



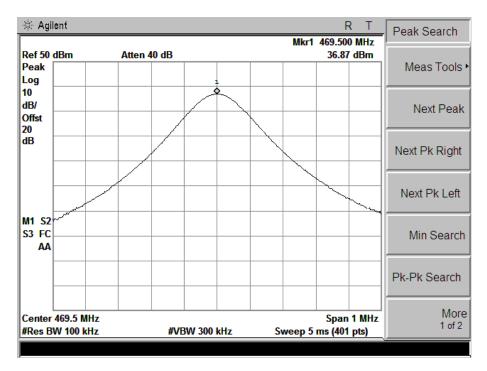
Modulation	Channel	Freq.(MHz)	Rated Power	Measurement	FCC Limit	Type Results
	Separation		(Watt)	(dBm)		
FM	12.5 KHz	406.5000	5	36.41	Varies	Compliance



Modulation	Channel	Freq.(MHz)	Rated Power	Measurement	FCC Limit	Type Results
	Separation		(Watt)	(dBm)		
FM	12.5 KHz	429.5000	5	36.45	Varies	Compliance



Modulation	Channel	Freq.(MHz)	Rated Power	Measurement	FCC Limit	Type Results
	Separation		(Watt)	(dBm)		
FM	12.5 KHz	469.5000	5	36.87	Varies	Compliance



# 4.8. Transient frequency behavior

### TEST APPLICABLE

#### Section 90.214

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

Time intervals <sup>1, 2</sup>	Maximum frequency	All ec	luipment
Time intervais	difference <sup>3</sup>	150 to 174 MHz	421 to 512MHz
Transient Frequer	ncy Behavior for Equipment I	Designed to Operate on 2	25 KHz Channels
t <sub>1</sub> <sup>4</sup>	± 25.0 KHz	5.0 ms	10.0 ms
t <sub>2</sub>	± 12.5 KHz	20.0 ms	25.0 ms
t <sub>3</sub> <sup>4</sup>	± 25.0 KHz	5.0 ms	10.0 ms
Transient Frequence	by Behavior for Equipment D	esigned to Operate on 1	2.5 KHz Channels
t <sub>1</sub> <sup>4</sup>	± 12.5 KHz	5.0 ms	10.0 ms
t <sub>2</sub>	± 6.25 KHz	20.0 ms	25.0 ms
t <sub>3</sub> <sup>4</sup>	± 12.5 KHz	5.0 ms	10.0 ms
Transient Frequence	by Behavior for Equipment D	esigned to Operate on 6	.25 KHz Channels
t <sub>1</sub> <sup>4</sup>	±6.25 KHz	5.0 ms	10.0 ms
t <sub>2</sub>	±3.125 KHz	20.0 ms	25.0 ms
t <sub>3</sub> <sup>4</sup>	±6.25 KHz	5.0 ms	10.0 ms

 t<sub>on</sub> is the instant when a 1 KHz test signal is completely suppressed, including any capture time due to phasing. t<sub>1</sub> is the time period immediately following t<sub>on</sub>.

 $t_2$  is the time period immediately following  $t_1$ .

t<sub>3</sub> is the time period from the instant when the transmitter is turned off until toff.

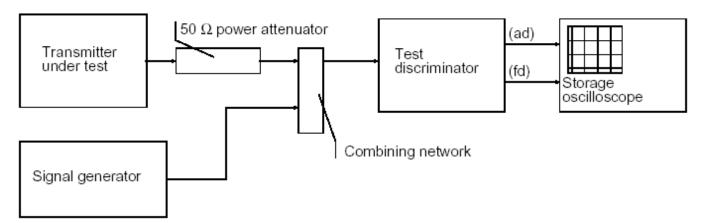
toff is the instant when the 1 KHz test signal starts to rise.

- During the time from the end of t<sub>2</sub> to the beginning of t<sub>3</sub>, 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.

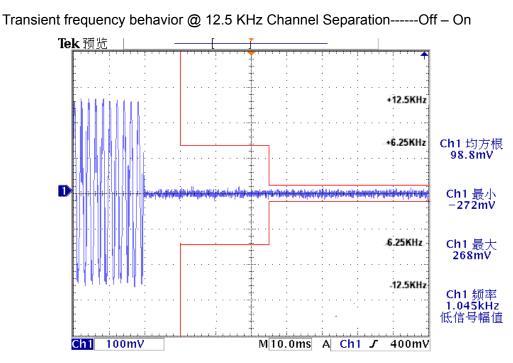
#### TEST PROCEDURE

TIA/EIA-603 2.2.19

#### **TEST CONFIGURATION**

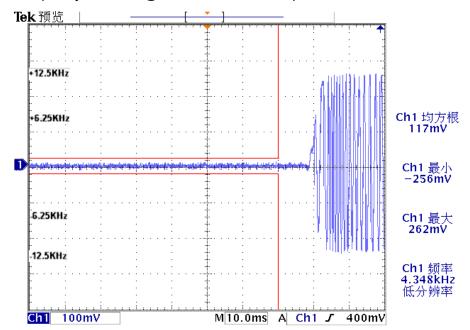


### TEST RESULTS

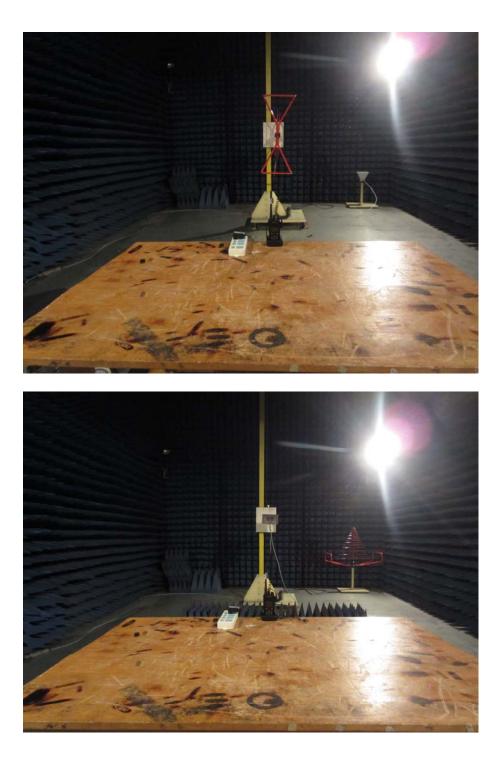


Modulation Type: 4FSK





# **5 Test Setup Photos of the EUT**



Radiated emission test

# Conducted emission test



RF test



End of the report