



### **Radiated Emissions Above 1GHz Test Setup**

#### **8.4 MEASUREMENT RESULTS**

Preliminary calculation	Final Result			
P(dBm)=30+10log【P(W)】=36.02dBm	Limit= Preliminary calculation-60dB=-24dBm			

- 1. Factor=Antenna Factor + Cable loss. (Below 1GHz)
- 2. Factor=Antenna Factor+ Cable loss -Pre-amplifier. (Above 1 GHz)
- 3. Margin=Limit- Level
- 4. the unwanted emission should be attenuated below TP by at least 60 dB.
- 5. In the frequency range of 9KHz-30MHz, in addition to displaying the Fundamental level, the radiated spurious emission level is much less than 60dB of the carrier power, so it is ignored.

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Test	Mode:	TX-C	CH1		Po	plarity:		Horizonta	al
		40 30 20 10 -10 -10 -10 -10 -10 -10 -10 -10 -10	- Limit * Final Test	P <sup>2</sup> M Horizontal	FCC Part 95D O	PER TX		12	756
	NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
	1	80.5750	-83.42	-56.80	-24.00	32.80	26.62	220	Horizontal
	2	107.8750	-85.06	-60.09	-24.00	36.09	24.97	34	Horizontal
	3	350.6500	-90.43	-57.22	-24.00	33.22	33.21	351	Horizontal
	4	512.5000	-91.23	-54.46	-24.00	30.46	36.77	127	Horizontal
3	5	539.8000	-77.81	-40.08	-24.00	16.08	37.73	109	Horizontal
	6	566.1250	-75.03	-36.37	-24.00	12.37	38.66	109	Horizontal
			G	8					
Test	Mode:	TX-0	CH1		Po	plarity:		Vertical	
		40 30 10 10 -10 -0 -10 -0 -10 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0	e <sup>3</sup> e <sup>3</sup> 100 - Limit <b>x</b> Final Test	************************************	FCC Part 95D O	PER TX		12	756
3			Deading					Anglo	
	NO.	Freq. [MHz]	[dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	[°]	Polarity
	1	53.2750	-85.22	-54.90	-24.00	30.90	30.32	111	Vertical
	2	80.5750	-77.67	-49.06	-24.00	25.06	28.61	121	Vertical
	3	107.8750	-88.07	-57.32	-24.00	33.32	30.75	56	Vertical
	4	350.6500	-92.85	-59.86	-24.00	35.86	32.99	65	Vertical

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-24.00

-24.00

-45.20

-44.46

21.20

20.46

37.31

37.92

269

232

Vertical

Vertical

-82.51

-82.38

5

6

539.8000

566.1250



omplian

Test	viode:		1X-0	H19		P	olarity:		Horizonta	al
		Level(dBm)	40 30 20 10 0 -10 -20 -30 -40 -50 -60 -60 -70 -80 -90 -100 25M	Limit * Final Test	)M Horizontal	FCC Part 95D O	PPER TX		1	2.75G
	NO.	Freq [MHz	:]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
	1	543.70	00	-78.54	-40.67	-24.00	16.67	37.87	100	Horizontal
1	2	571.00	00	-80.30	-41.47	-24.00	17.47	38.83	109	Horizontal



#### - Limit 🔹 Final Test ----- Vertical

٦	NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
	1	54.2500	-84.77	-54.29	-24.00	30.29	30.48	102	Vertical
	2	81.5500	-77.20	-48.63	-24.00	24.63	28.57	112	Vertical
	3	108.8500	-88.63	-57.69	-24.00	33.69	30.94	102	Vertical
	4	517.3750	-89.37	-52.58	-24.00	28.58	36.79	223	Vertical
	5	543.7000	-84.10	-46.70	-24.00	22.70	37.40	260	Vertical
	6	4209.2459	-46.53	-43.34	-13.00	30.34	3.19	0	Vertical

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Test Mode:		e: TX-CH40			Po	Polarity:			Horizontal	
		40 30 20 10 -10 -10 -10 -10 -10 -10 -10 -10 -10	      	P <sup>2</sup>	FCC Part 95D O	PER TX	1 1 1   1 1 1	12	756	
2	NO.	Freq. [MHz]	- Limit * Final Test Reading [dBm]	Level	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity	
	1	81.5500	-80.57	-54.12	-24.00	30.12	26.45	212	Horizontal	
-	2	108.8500	-84.98	-59.96	-24.00	35.96	25.02	27	Horizontal	
	3	521.2750	-85.40	-48.32	-24.00	24.32	37.08	100	Horizontal	
	4	548.5750	-78.23	-40.19	-24.00	16.19	38.04	100	Horizontal	
	5	575.8750	-85.32	-46.32	-24.00	22.32	39.00	110	Horizontal	
	6	1714.4714	-44.49	-46.10	-24.00	22.10	-1.61	73	Horizontal	
			<u> </u>	8				-	5	
Test M	lode:	TX-C	CH40		Po	plarity:		Vertical		
		40 30 20 10 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0	* <sup>1</sup> * <sup>2</sup>	₽ <sup>3</sup>	Frequency[			12	1756	
8	N	_	– Limit 🔹 Final Test	Vertical					- 6	
	NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity	
	1	54.2500	-84.51	-54.03	-24.00	30.03	30.48	112	Vertical	
	2	81.5500	-76.58	-48.01	-24.00	24.01	28.57	112	Vertical	
	3	108.8500	-88.24	-57.30	-24.00	33.30	30.94	84	Vertical	
	4	521 2750	-87 14	-50 26	-24 00	26 26	36.88	251	Vertical	

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-24.00

-24.00

22.75

24.80

37.52

43.40

260

214

Vertical

Vertical

-46.75

-48.80

-84.27

-92.20

548.5750

908.3500

5

6



#### 8.5 EMISSION MASK PLOT

The detailed procedure employed for Emission Mask measurements are specified as following:

-Connect the equipment as illustrated.

-Spectrum set as follow:

- 1. Centre frequency = fundamental frequency, Span=50kHz for 10kHz , RBW=300Hz, VBW=1000Hz ;
- 2. Sweep = auto, Detector function = peak, Trace = max hold
- 3. Key the transmitter, and set the level of the unmodulated carrier to a full scale reference line. This is the 0dB reference for the measurement.
- Modulate the transmitter with a 2500 Hz sine wave at an input level 16 dB greater than that necessary to produce 50% of rated system deviation
  - The input level shall be established at the frequency of maximum response of the audio modulating circuit.
- 5. Transmitters employing digital modulation techniques that bypass the limiter and the audio low-pass filter shall be modulated as specified by the manufacturer.
- 6. Measure and record the results in the test report.



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#### Test plot as follows:



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# 9. SPURIOUS EMISSION ON ANTENNA PORT

### 9.1 PROVISIONS APPLICABLE

Please refer to FCC 47 CFR 2.1051, 2.1057 & 95.979 for specification details. Emissions shall be attenuated below the mean output power of the transmitter as follows:

FCC Rules	Attenuation Limit (dBc)
§ 95.979	At least 53 + 10 log (P) dB
§ 95.979	60 dB in any frequency band centered on a harmonic (i.e., an integer multiple of two or more times) of the carrier frequency.

53 + 10 log (Pwatts)

Calculation: Limit (dBm) =EL-53-10log10 (TP)

Notes: EL is the emission level of the Output Power expressed in dBm,

In this application, the EL is P(dBm).

Limit (dBm) = P( dBm)-53-10 log (Pwatts) = -23 dBm

### 9.2 MEASUREMENT METHOD

- 1. The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation.
- 2. The resolution bandwidth of the spectrum analyzer was set to 100 kHz. Sufficient scans were taken to
- 3. show any out of band emission up to 10th . Harmonic for the lower and the highest frequency range.
- Set RBW 1 kHz, VBW 3 kHz in the frequency band 9KHz to 150KHz; Set RBW 10 kHz, VBW 30 kHz in the frequency band 150KHz to 20MHz; Set RBW 100 kHz, VBW 300 kHz in the frequency band 20MHz to 1GHz; While set RBW=1MHz.VBW=3MHz from the 1GHz to 10th Harmonic.
- 5. The audio input was set the unmodulated carrier, the resulting picture is print out for each channel separation.

### 9.3 MEASUREMENT SETUP



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#### 9.4 MEASUREMENT RESULTS



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### **10. MAXIMUMN TRANSMITTER POWER**

### **10.1 PROVISIONS APPLICABLE**

FCC Part 95.967, FCC Part2.1046(a)

Each CBRS transmitter type must be designed such that the transmitter power can not exceed the following limits:

(a) When transmitting amplitude modulated (AM) voice signals, the mean carrier power must not exceed 4 Watts.

(b) When transmitting single sideband (SSB) voice signals, the peak envelope power must not exceed 12 Watts.

#### **10.2 MEASUREMENT METHOD**

Conducted RF Output Power:

- 1. The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.
- 2. The DUT was connected to a Spectrum Analyzer (SA) via a 30dB attenuator connected to the DUT's antenna port. The SA was configured as above using the Automatic 6dB Cursor Bandwidth measurement. The output power of the DUT was set to the manufacturer's highest output power setting at the Low, Mid and High frequency channels as permitted by the device. The DUT was set to transmit at its maximum Duty Cycle.
- 3. Spectrum set as follow:

Centre frequency = fundamental frequency, Span=50kHz , RBW=300Hz, VBW=3KHz ;

Sweep = auto, Detector function = peak, Trace = max hold



### **10.3 MEASUREMENT SETUP**

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#### **10.4 MEASUREMENT RESULTS**

Conducted Power Measurement Results						
Mode	Mode Channel Separation Test Channel Measurement Result (dBm					
CBRS TX	S S	26.965 MHz	36.006			
	10 kHz	27.205 MHz	35.979			
	0	27.405 MHz	35.977			

#### Test plot as follows:



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### **11.MODULATION CHARACTERISTICS**

#### **11.1 PROVISIONS APPLICABLE**

#### FCC Part 95.975, FCC Part 2.1047(b)

Each CBRS transmitter type must be designed such that the modulation characteristics are in compliance with the rules in this section.

When emission type A3E is transmitted with voice modulation, the modulation percentage must be at least 85%, but not more than 100%.

When emission type A3E is transmitted by a CBRS transmitter having a transmitter output power of more than 2.5 W, the transmitter must contain a circuit that automatically prevents the modulation percentage from exceeding 100%.

### **11.2 MEASUREMENT METHOD**

#### (A) Audio frequency response

Connect the equipment as illustrated.

Adjust to deliver 50% modulation at the audio frequency that produces the maximum modulation level Record the modulation input level (mV) and use this level as 0dB for plotting modulation limiting. Vary the modulating frequency from 100Hz to 10000Hz and record the input levels necessary to maintain a constant 50% modulation.

Graph the audio level in dB relative to the 0dB reference level as a function of the modulating frequency. Record audio frequency where it is impossible to perform the measurement.

#### (B) Modulation limiting

Connect the equipment as illustrated.

Adjust to deliver 50% modulation at the audio frequency that produces the maximum modulation level Record the modulation input level (mV) and use this level as 0dB for plotting modulation limiting. Increment the audio signal level to 40dB above the reference level. Record the modulation level (%). Repeat the measurements using a 400Hz and a 2500Hz sinusoidal audio signal, record the modulation level (%), perform for both positive and negative modulation.

### **11.3 MEASUREMENT SETUP**

RF Communication Test set

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### **11.4 MEASUREMENT RESULTS**

### (A). MODULATION LIMIT:

10kHz, AM modulation, Assigned Frequency:27.405MHz-4W							
Modulation Level (mV)	Peak Freq. Deviation At 300 Hz (%)	Peak Freq. Deviation At 600 Hz (%)	Peak Freq. Deviation At 1000 Hz (%)	Peak Freq. Deviation At 2500 Hz (%)			
1	16	25	27	28			
10	20	59	61	60			
100	27	73	60	63			
300	31	84	74	76			
500	32	86	79	77			
700	37	89	77	79			
800	47	92	81	82			
900	55	93	83	85			
1000	58	91	82	85			



Note: All the modes had been tested, but only the worst data recorded in the report

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/Inspection

#### (B). AUDIO FREQUENCY RESPONSE:

	10kHz, AM modulation, As	signed Frequency:2	7.405MHz-4W		
Frequency (Hz)	modulation level (mV)	Deviation (kHz)	Audio Frequency Response(dB)		
100		- C+-			
200					
300	14.20	0.03	-29.15		
400	8.50	0.06	-23.13		
500	7.50	0.09	-19.61		
600	6.25	0.25	-10.73		
700	5.80	0.41	-6.43		
800	5.40	0.45	-5.63		
900	5.30	0.55	-3.88		
1000	5.20	0.61	-2.98		
1200	5.20	0.62	-2.84		
1400	5.40	0.73	-1.42		
1600	5.75	0.75	-0.56		
1800	6.80	0.86	0.00		
2000	7.25	0.82	-0.41		
2400	7.60	0.74	-1.31		
2500	7.90	0.65	-2.43		
2800	8.50	0.61	-2.98		
3000	8.62	0.54	-4.04		
3200	8.80	0.27	-10.06		
3600	9.10	0.11	-14.88		
4000	9.70	0.09	-19.61		
6000	11.26	0.05	-24.71		
7500					
9000	·		<u></u>		
10000	· · · · · · · · · · · · · · · · · · ·		- C+-		

Audio Frequency Response@50%MI

# **10 KHz Channel Separations**



### Any Note: All the modes had been tested, but only the worst data recorded in the report by the

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# **APPENDIX I: PHOTOGRAPHS OF TEST SETUP&EUT**

Refer to the Report No.: AGC01284210601AP01

----END OF REPORT----

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#### Conditions of Issuance of Test Reports

1. All samples and goods are accepted by the Attestation of Global Compliance (Shenzhen) Co., Ltd (the "Company") solely for testing and reporting in accordance with the following terms and conditions. The company provides its services on the basis that such terms and conditions constitute express agreement between the company and any person, firm or company requesting its services (the "Clients").

2. Any report issued by Company as a result of this application for testing services (the "Report") shall be issued in confidence to the Clients and the Report will be strictly treated as such by the Company. It may not be reproduced either in its entirety or in part and it may not be used for advertising or other unauthorized purposes without the written consent of the Company. The Clients to whom the Report is issued may, however, show or send it, or a certified copy thereof prepared by the Company to its customer, supplier or other persons directly concerned. The Company will not, without the consent of the Clients, enter into any discussion or correspondence with any third party concerning the contents of the Report, unless required by the relevant governmental authorities, laws or court orders.

3. The Company shall not be called or be liable to be called to give evidence or testimony on the Report in a court of law without its prior written consent, unless required by the relevant governmental authorities, laws or court orders.

4. The non-CMA report issued by AGC is only permitted to be used by the client as internal reference use and shall not be used for public demonstration purpose.

5. In the event of the improper use of the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.

6. Samples submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.

7. The Company will not be liable for or accept responsibility for any loss or damage however arising from the use of information contained in any of its Reports or in any communication whatsoever about its said tests or investigations.

8. Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.

9. The Company is not responsible for recalling the electronic version of the original report when any revision is made to them. The Client assumes the responsibility to providing the revised version to any interested party who uses them.

10. Subject to the variable length of retention time for test data and report stored hereinto as otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of the test report for a period of six years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after retention period. Under no circumstances shall we be liable for damage of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.

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