

Prüfbericht-Nr.: Test Report No.:	16803597 001	Auftrags-Nr.: Order No.:	1140013772	Seite 1 von 37 Page 1 of 37
Kunden-Referenz-Nr.: Client Reference No.:	412990	Auftragsdatum: Order date:	2014-06-18	
Auftraggeber: Client:	Beijing GODA Instruments Co., LTD. Hongfu Enterprise Incubation Yard 10, No.2 Workshop 2-4, Chang Ping Dist, Beijing 102209 P.R. China			
Prüfgegenstand: Test item:	Pulse Radar Level Instrument			
Bezeichnung / Typ-Nr.: Identification / Type No.:	Refer to section 2.2			
Auftrags-Inhalt: Order content:	FCC certification			
Prüfgrundlage: Test specification:	FCC Part 15 Subpart C Section 15.256			
Wareneingangsdatum: Date of receipt:	2014-06-18	Refer to external photo		
Prüfmuster-Nr.: Test sample No.:	Engineering sample			
Prüfzeitraum: Testing period:	2014-08-11 to 2014-08-12			
Ort der Prüfung: Place of testing:	Refer to section 1.1			
Prüflaboratorium: Testing laboratory:	Refer to section 1.1			
Prüfergebnis*: Test result*:	Pass			
geprüft von / tested by:		kontrolliert von / reviewed by:		
2014-08-12	Yang, Kai/ PE	2014-08-12	Sun, Lixun/Reviewer	
Datum Date	Name / Stellung Name / Position	Unterschrift Signature	Datum Date	Name / Stellung Name / Position
Sonstiges / Other:				
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.				

V04

TEST SUMMARY

4.1.1 MODULATED BANDWIDTH

RESULT: Passed

4.1.2 FUNDAMENTAL EMISSION

RESULT: Passed

4.1.3 ANTENNA REQUIRMENT

RESULT: Passed

4.1.4 RADIATED SPURIOUS EMISSION

RESULT: Passed

4.1.5 FREQUENCY STABILITY

RESULT: Passed

4.2.1 ELECTROMAGNETIC FIELDS

RESULT: Passed

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1. Test Sites

1.1 Test Facilities

Laboratory 1: TA Beijing Limited (FCC Registration No.: 413514)
Address: Building B-4, No.1, JingHai 3rd Road, BDA East Park, Beijing, 100176 China

Laboratory 2: China Household Electrical Appliance Research Institute (FCC Registration Number: 161284)
Address: No.29 Xiaxie Str. XuanWu District, Beijing 100053, P.R. China

Laboratory 3: The State Radio_Monitoring_Center Testing (SRTC) (FCC Registration No.: 910917)
Address: No.98 BeiLishi Road, Xicheng District, Beijing 100037

1.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Lab 1: (Fundamental emission bandwidth, Fundamental emission(EIRP), Frequency stability)

Kind of Equipment	Type	S/N	Manufacturer	Calibrated until
Signal Analyzer	FSUP	101355	ROHDE & SCHWARZ	2015-01-29
Horn Antenna	3160-09	00165118	ETS-Lindgren	2017-03-21
DC Power Supply	RS-1303DF	05022506	TFS	2015-05-24
Temperature Chamber	VT4002	58566170850020	Votsch	2015-06-24
Laser Beam	Multi-Point Laser	N/A	Boxin	N/A

Lab 2: (Radiated spurious emission (below 1GHz))

Kind of Equipment	Type	S/N	Manufacturer	Calibrated until
EMI Receiver	ESCI7	0304826-03	R&S	2014-11-11
Bi-log Antenna	HL562	0304826-06	R&S	2014-11-15
Loop Antenna	HFH2-Z2	8486241002	R&S	2014-11-26

Lab 3: (Radiated spurious emission (above 1GHz))

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Kind of Equipment	Type	S/N	Manufacturer	Calibrated until
Spectrum Analyzer	FSQ40	200065	R&S	2015-03-11
Harmonic Mixer(40-60GHz)	FS-Z60	100053	R&S	2015-03-11
Harmonic Mixer(60-90GHz)	FS-Z90	100021	R&S	2015-03-11
Harmonic Mixer(75-110GHz)	FS-Z110	100019	R&S	2015-03-11
Horn Antenna(1-18GHz)	HF906	100029	R&S	2015-08-20
Horn Antenna(18-26.5GHz)	3160-09	760840	ETS	2015-08-20
Horn Antenna(26.5-40GHz)	3160-10	808234	ETS	2015-08-20
Horn Antenna(75-110GHz)	27240-20	112	FLANN	2015-03-11
Horn Antenna(60-90GHz)	26240-20	110	FLANN	2015-03-11
Horn Antenna(40-60GHz)	24240-20	103	FLANN	2015-03-11

1.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology P.R. China) or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations.

1.4 Calibration

Equipment requiring calibration is calibrated periodically by the lab or according to lab's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

1.5 Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO/IEC 17025 are:

Table 2: Measurement Uncertainty

Items		Extended Uncertainty
RE (30-1000MHz)	Field strength (dBuV/m)	$U=\pm 4.94\text{dB}$, $k=2$, $\sigma=95\%$
RE (1-110GHz)	Field strength (dBuV/m)	$U=\pm 4.34\text{dB}$, $k=2$, $\sigma=95\%$

2. General Product Information

2.1 Product Function and Intended Use

The EUT (equipment under test) is Pulse Radar Level Instrument which is based on radar technology and is used to detect the distance between product surface and sensor by means of high frequency electromagnetic waves. The electronic part uses the running time of the signals reflected by the product surface to calculate the distance to the product surface, For more information, please refer to the user manual.

2.2 Ratings and System Details

Table 3: Rating and Technical Specification of EUT

Kind of Equipment:	Pulse Radar Level Instrument
Type Designation:	Refer to table 4
FCC ID	2ACSOGDRD5X6XA
Rated Input Voltage	DC 24V
Rated consumption power	Less than 1W
Operating Frequency band	25.4GHz
Channel Number	1

Table 4: Type Designation:

Model	GDRD56-(1)(2)(3)(4)(5)(6)(7)(8)(9)
Meaning of wildcard	Option
(1) Explosion Proof Approval	P: Standard I: Intrinsically Safe Exia IIC T6 Ga
(2) Shape of Antenna	C: (T)Horn Φ 78mm/ L227 H: (T)Horn Φ 98mm/ L288 J: (T)Horn Φ 123mm/ L620 Z: (Z)Horn Φ 78mm/Flexible
(3) Process Connection/Material	GP: (H)thread G1 $\frac{1}{2}$ A/Stainless Steel 316L GA: (H)thread 1 $\frac{1}{2}$ NPT/Stainless Steel 316L GB: (G)thread G1 $\frac{1}{2}$ PP GC: (J)thread G1 $\frac{1}{2}$ A/Stainless Steel 316L/temperature(-60~250)°C GE: (I)thread G1 $\frac{1}{2}$ A/Stainless Steel 316L(Huff)
(4) Flange/Material	FA:DN50/PP, GA:DN80/PP,HA:DN100/PP, IA:DN125/PP, FB:DN50/PTFE, GB:DN80/PTFE, HB:DN100/PTFE,

	IB:DN125/PTFE FC:DN50/Stainless Steel, GC:DN80/Stainless Steel, HC:DN100/Stainless Steel, IC:DN125/Stainless Steel MA:ANSI 3"/Stainless Steel MB: ANSI 4"/Stainless Steel MC:ANSI 6"/Stainless Steel NA:ANSI 3"/PTFE NB: ANSI 4"/PTFE NC:ANSI 6"/PTFE F0:NO
(5) Seal/Process Temperature	2: Viton(-60~150) °C 3: Kalrez(-60~250) °C 4: Graphite(-60~400) °C
(6) Electronic	B: (4-20)mA/HART 2-Wire
(7) Housing/Protection	A: Aluminium/IP67
(8) Cable Entry	M: M20x1.5, N: 1/2NPT
(9) Display/Programming	A: Yes, X:No

Model	GDRD57-(1)(2)(3)(4)(5)(6)
Meaning of wildcard	Option
(1) Explosion Proof Approval	P: Standard I: Intrinsically Safe Exia IIC T6 Ga
(2) Shape of Antenna	C:(U)Flange DN80(ANSI 3") D:(U)Flange DN100(ANSI 4")
(3) Electronic	B: (4-20)mA/HART 2-Wire
(4) Housing/Protection	A: Aluminium/IP67
(5) Cable Entry	M: M20x1.5, N: 1/2NPT
(6) Display/Programming	A: Yes, X:No

Model	GDRD61-(1)(2)(3)(4)(5)(6)(7)(8)
Meaning of wildcard	Option
(1) Explosion Proof Approval	P: Standard I: Intrinsically Safe Exia IIC T6 Ga L:Enhanced
(2) Shape of Antenna	P: Horn Φ78mm/L221
(3) Process Connection/Material	GB: (G)thread G1" NPT PP GD: Lifting frame
(4) Electronic	B: (4-20)mA/HART 2-Wire
(5) Housing/Protection	A: IP68
(6) Display/Programming	A: Yes, X:No
(7) Sun shield	A: Yes, X:No
(8) Cable	A: Standard twin-core shielded (length of 10m) B: Length of twin-core shielded (length:X m) C: Length of 7-core shielded (length:X m)

The products are made up of electronic part, housing part, process connection part, flange accessories part and antenna. All electronic parts including RF circuit are same within these models, and differences of other parts such as Explosion Proof Approval, Process Connection/Material, Flange/Material etc. can not affect RF performance of the product. So tests were carried out according to the description of Table 5: Combination Under Test which considering all worst situation and can cover all combination.

Table 5: Antenna Information

Antenna Type	Gain(dBi)	Side lobe gain(dB)	Beam angle
(T)Horn Φ 78mm/L227	24.4	-31.8	11°
(T)Horn Φ 98mm/L288	27.4	-35.1	8°
(T)Horn Φ 123mm/L620	29.2	-37.5	6°
(U)Flange DN80	22.0	-30.0	11°
(U)Flange DN100	24.9	-32.2	8°
(Z)Horn Φ 78mm/Flexible	24.0	-30.5	11°
(P)Horn Φ 78mm/L221	24.1	-31.4	11°

Table 6: Combination Under Test

For all models have same RF circuit, display circuit, power circuit and similar construction, so for Fundamental emission bandwidth and Frequency stability tests were carried out on Sample 1 which was the most typical one comparing to other models declared by manufacturer, and for Fundamental emission tests were carried out on models that having maximum antenna gain of each type of antenna (Sample 1, Sample 3, Sample 5, Sample 6). For Unwanted emissions tests were carried out on samples which were listed below which cover all types of antenna with maximum and minimum gain:

Description in the report	Model	Antenna
Sample 1	GDRD56-PJGPF02BAMA	(T)Horn Φ 123mm/L620
Sample 2	GDRD56-PCGPF02BAMA	(T)Horn Φ 78mm/L227
Sample 3	GDRD56-PZGPF02BAMA	(Z)Horn Φ 78mm/ Flexible
Sample 4	GDRD57-PCBAMA	(U)Flange DN80
Sample 5	GDRD57-PDBAMA	(U)Flange DN100
Sample 6	GDRD61-PPGBAAAA	(P)Horn Φ 78mm/L221

2.3 Independent Operation Modes

The basic operation modes are:

- A. On, transmitting
- B. Off

2.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

2.5 Submitted Documents

- | | |
|--------------------|----------------------|
| - Bill of Material | - Circuit Diagram |
| - PCB Layout | - Instruction Manual |
| - Photo Document | - Rating Label |

3. Test Set-up and Operation Modes

3.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum power level. The test modes were adapted accordingly in reference to the instructions for use.

3.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All testing were performed according to the procedures in ANSI C63.10: 2009.

3.3 Special Accessories and Auxiliary Equipment

None.

3.4 Countermeasures to achieve EMC/RF Compliance

The test sample which has been tested contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

3.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test

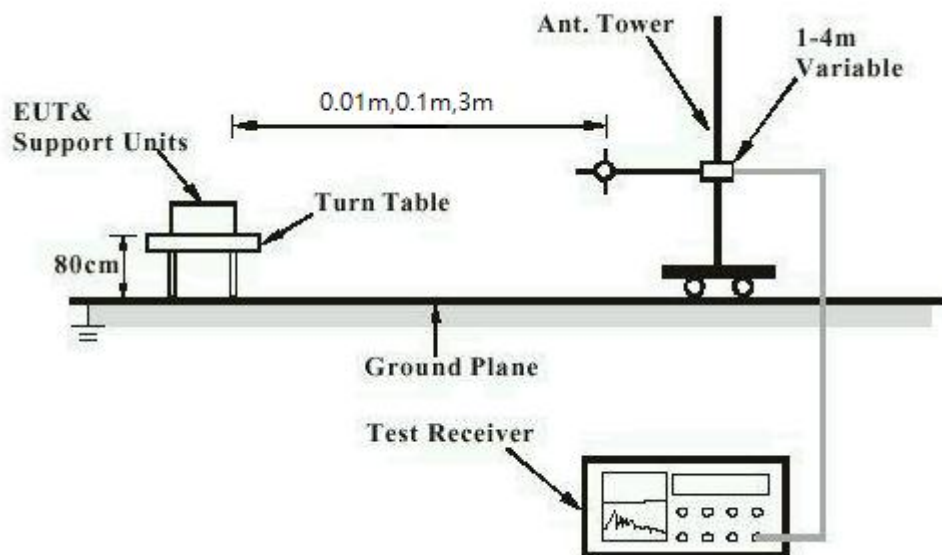
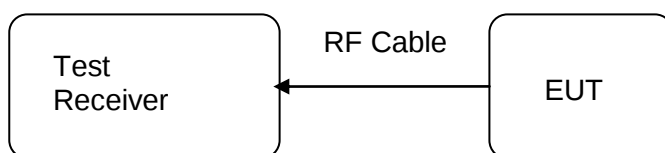


Diagram of Measurement Equipment Configuration for Transmitter Measurement



4. Test Results

4.1 Transmitter Requirement & Test Suites

4.1.1 Modulated Bandwidth

RESULT:**Passed**

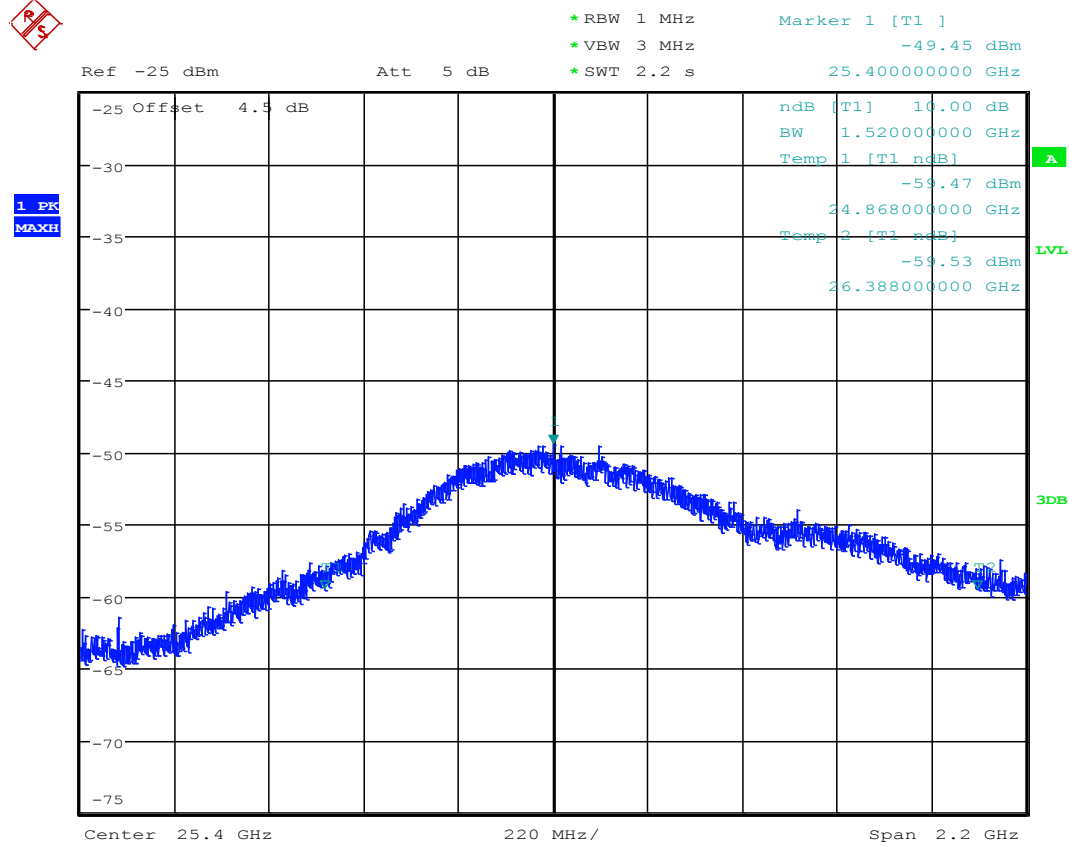
Test date : 2014-08-11
Test standard : FCC Part 15.256(f)(1)
Limit : The minimum fundamental emission bandwidth shall be 50 MHz

The minimum 10dB bandwidth was measured using a 50 ohm spectrum analyser with the resolution bandwidth set at 1MHz and the video bandwidth set at 3MHz. The spectrum analyser's display markers were set to -10dB using max hold until the spectrum was filled and a plot taken.

Table 7: Test result of 10dB Bandwidth

Channel Frequency (GHz)	10dB Bandwidth (MHz)	Limit(MHz)
25.4	1520	>50

Test Graph of Modulated Bandwidth



Note: offset 4.5dB means cable loss compensation.

4.1.2 Fundamental Emission

RESULT:**Passed**

Test date	:	2014-08-11
Test standard	:	FCC Part 15.256(g)(3)
Basic standard	:	ANSI C63.10: 2009,KDB890966 D01
		Meas Level Probing Radars v01r01
Limit	:	-14dBm(measured in 1MHz with average detector)
		26dBm(measured in 50MHz with peak detector)
Kind of test site	:	3m full anechoic chamber

Test setup

Operation Mode	:	A
Ambient temperature	:	24°C
Relative humidity	:	47%
Atmospheric pressure	:	101 kPa
Number of Sampling	:	1601
BINS		
Measurement	:	3m
Distance(D)		
Site Correction	:	-0.7dB/m
Factor(antenna factor+cable loss+amplifier gain)		

All power averaging (RMS) emission levels are to be measured utilizing a 1 MHz resolution bandwidth with a one millisecond dwell time over each 1 MHz segment. The frequency span of the analyzer should equal the number of sampling bins times 1 MHz and the sweep rate of the analyzer should equal the number of sampling bins times one millisecond. The video bandwidth of the measurement instrument shall not be less than the resolution bandwidth and trace averaging shall not be employed. The RMS average and peak emission measurement is to be repeated over multiple sweeps with the analyzer set for maximum hold until the amplitude stabilizes.

$$\text{EIRP (dBm)} = E \text{ (dB}\mu\text{V/m)} - 104.8 + 20 \text{ Log } D$$

Table 8: Test result of Fundamental emission

Channel Frequency (GHz)	Sample Number	Direct value measured (dBuV)	Site Correction Factor(dB/m)	Corrected Average result E (dBuV/m)	Final EIRP result(dBm)	Limit (dBm)	Margin (dB)
25.4	Sample 1	64.68	-0.7	63.98	-31.28	-14	17.28

Channel Frequency (GHz)	Sample Number	Direct value measured (dBuV)	Site Correction Factor(dB/m)	Corrected Peak result E (dBuV/m)	Final EIRP result(dBm)	Limit ⁽¹⁾ (dBm)	Margin (dB)
25.4	Sample 1	84.66	-0.7	83.96	-11.3	18	29.3

Channel Frequency (GHz)	Sample Number	Direct value measured (dBuV)	Site Correction Factor(dB/m)	Corrected Average result E (dBuV/m)	Final EIRP result(dBm)	Limit (dBm)	Margin (dB)
25.4	Sample 3	59.74	-0.7	59.04	-36.22	-14	22.22

Channel Frequency (GHz)	Sample Number	Direct value measured (dBuV)	Site Correction Factor(dB/m)	Corrected Peak result E (dBuV/m)	Final EIRP result(dBm)	Limit ⁽¹⁾ (dBm)	Margin (dB)
25.4	Sample 3	70.57	-0.7	69.87	-25.39	18	43.39

Channel Frequency (GHz)	Sample Number	Direct value measured (dBuV)	Site Correction Factor(dB/m)	Corrected Average result E (dBuV/m)	Final EIRP result(dBm)	Limit (dBm)	Margin (dB)
25.4	Sample 5	60.12	-0.7	59.42	-35.84	-14	21.84

Channel Frequency (GHz)	Sample Number	Direct value measured (dBuV)	Site Correction Factor(dB/m)	Corrected Peak result E (dBuV/m)	Final EIRP result(dBm)	Limit ⁽¹⁾ (dBm)	Margin (dB)
25.4	Sample 5	80.65	-0.7	79.95	-15.31	18	33.31

Channel Frequency (GHz)	Sample Number	Direct value measured (dBuV)	Site Correction Factor(dB/m)	Corrected Average result E (dBuV/m)	Final EIRP result(dBm)	Limit (dBm)	Margin (dB)
25.4	Sample 6	57.23	-0.7	56.53	-38.73	-14	24.73

Channel Frequency (GHz)	Sample Number	Direct value measured (dBuV)	Site Correction Factor(dB/m)	Corrected Peak result E (dBuV/m)	Final EIRP result(dBm)	Limit ⁽¹⁾ (dBm)	Margin (dB)
25.4	Sample 6	67.7	-0.7	67.0	-28.26	18	46.26

(1)Note: Since the R&S spectrum analyzer had a lower RBW than the 50MHz, a lower RBW of 20MHz was used and a adjustment to the limit is made by $20\log(\text{RBW}/50)$ dB. The resolution bandwidth used is 20MHz; therefore $20\log(20/50)=-8\text{dB}$ reduction of the limit for the 50MHz EIRP, from 26dBm to 18dBm.

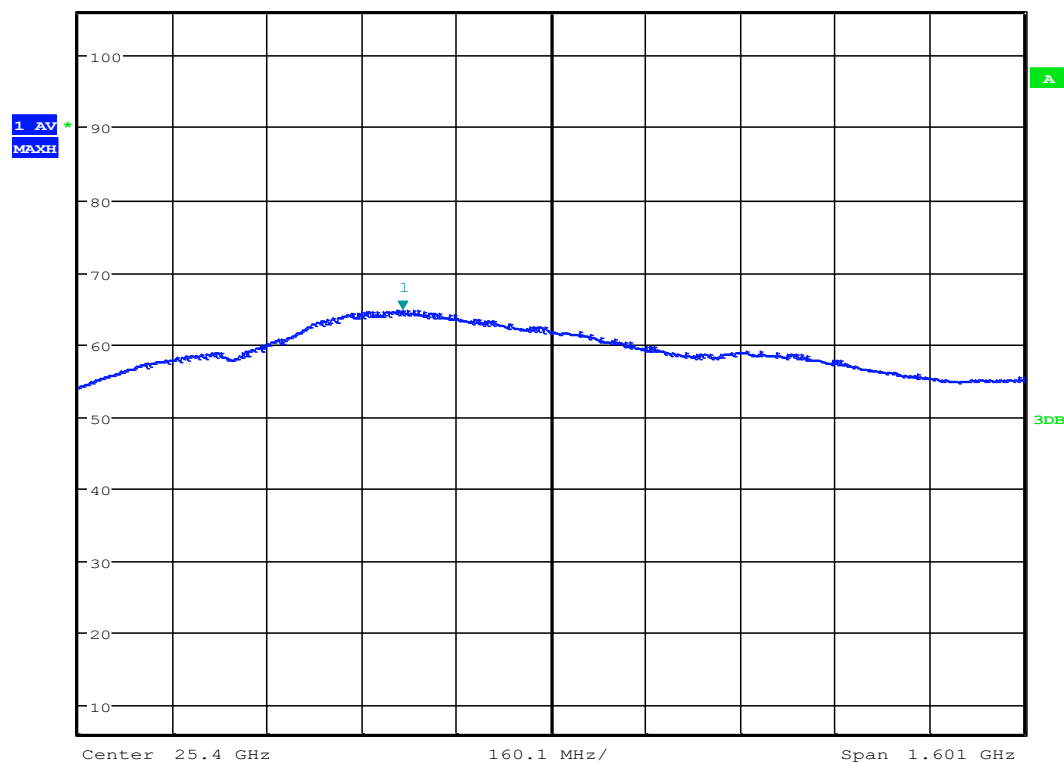
Test Graph of Fundamental Emission

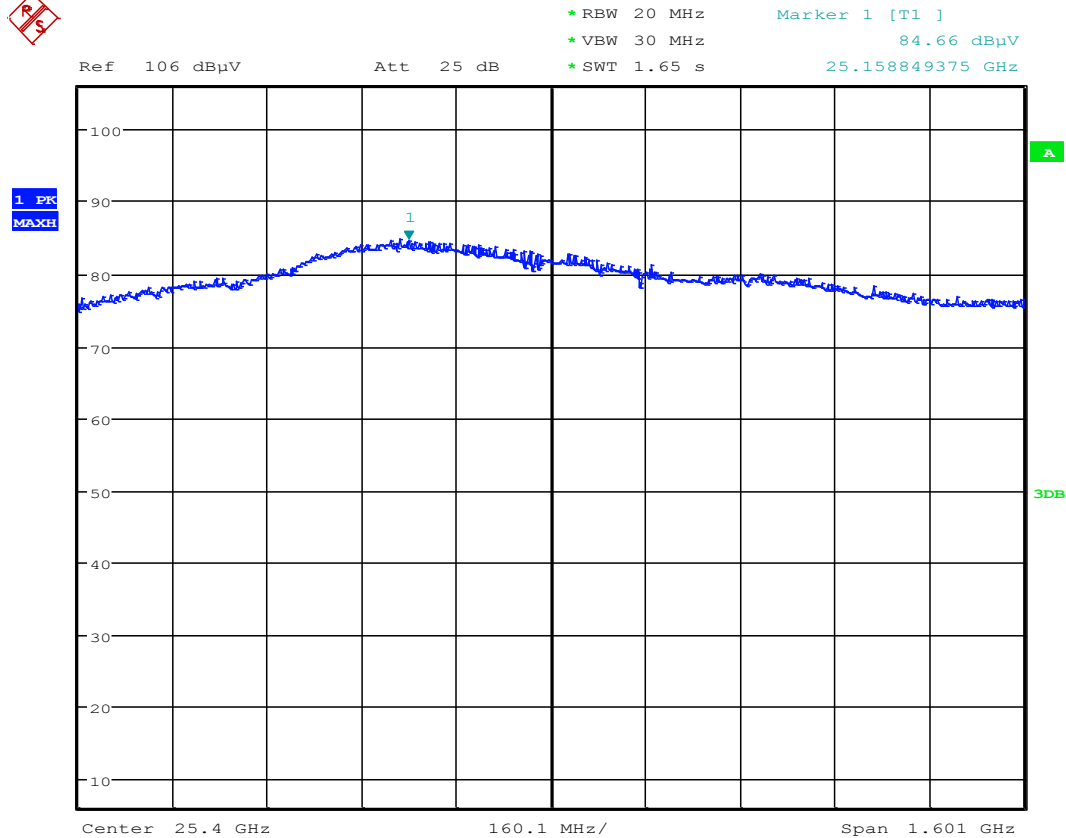
Sample 1

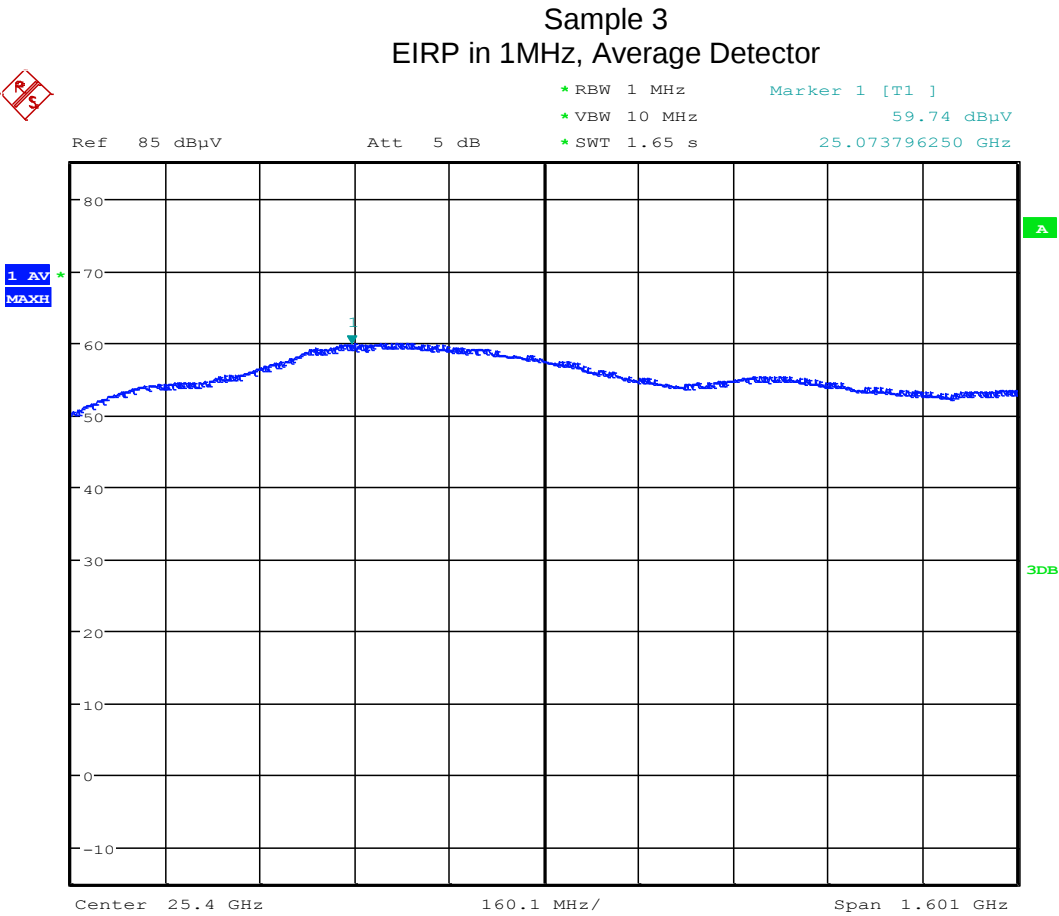
EIRP in 1MHz, Average Detector

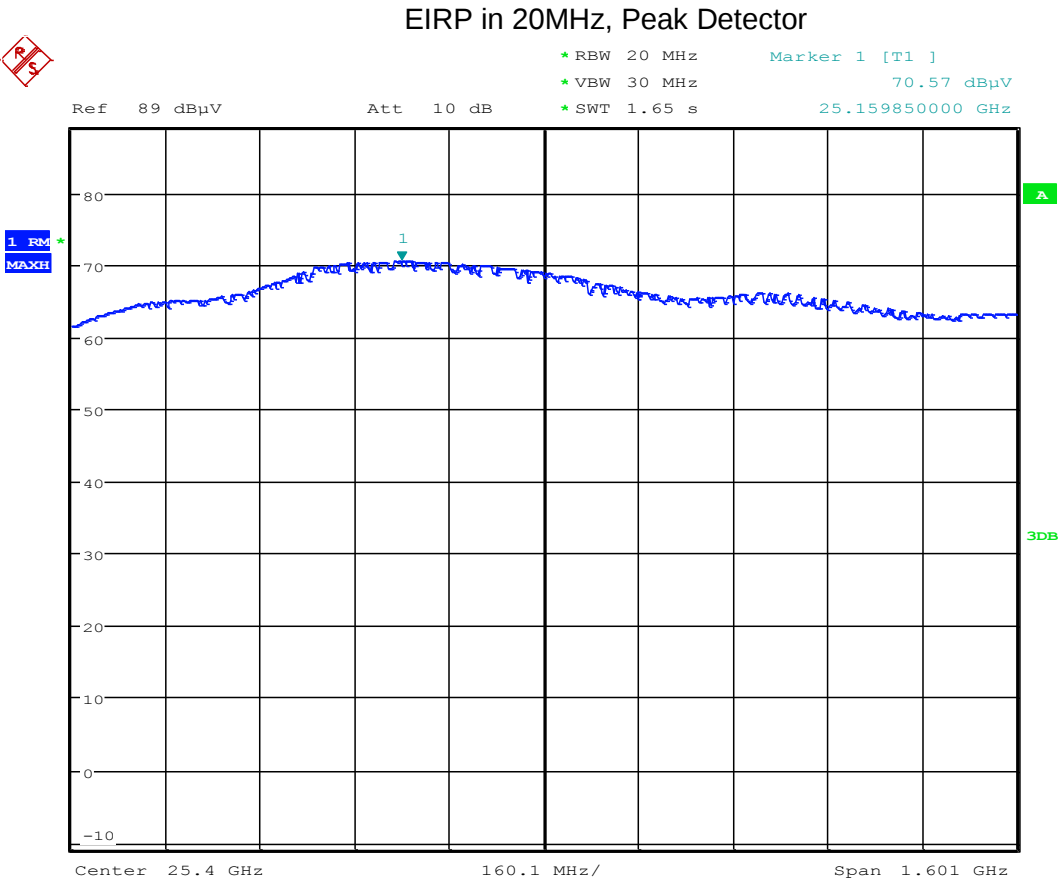


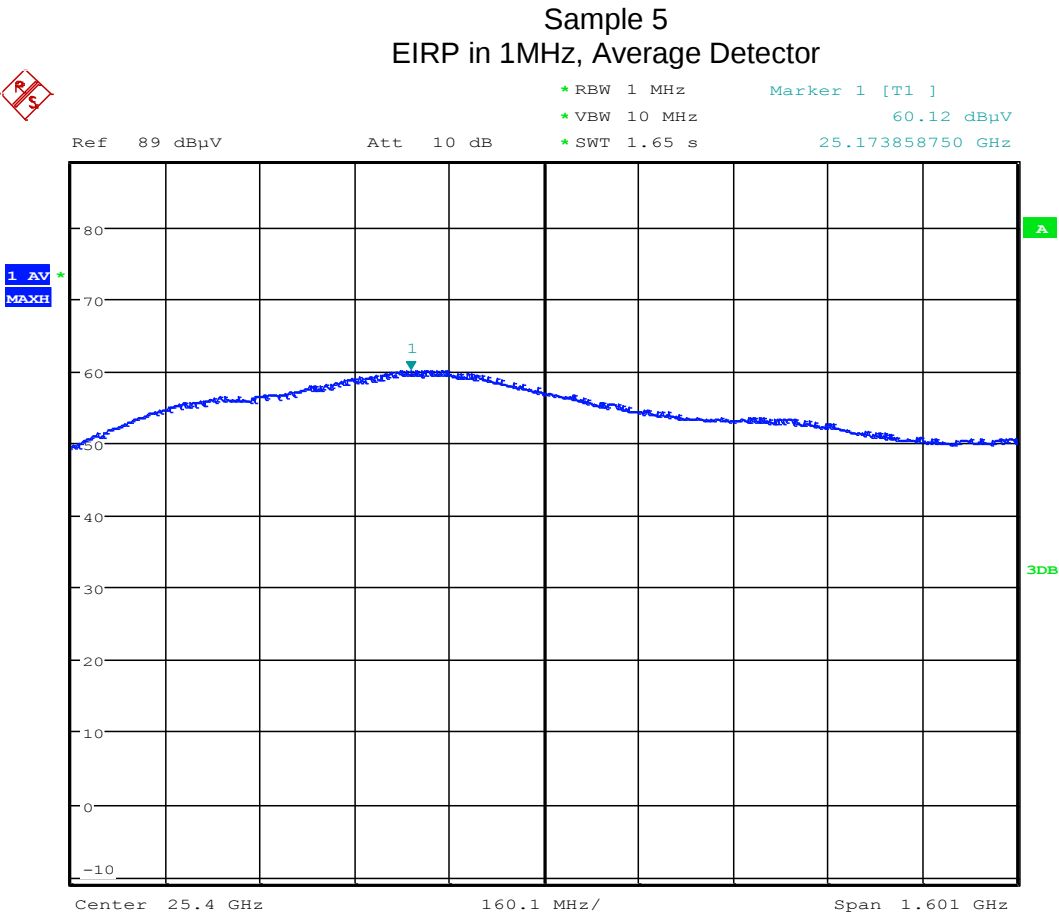
Ref 106 dBuV Att 25 dB
 * RBW 1 MHz Marker 1 [T1]
 * VBW 10 MHz 64.68 dBuV
 * SWT 1.65 s 25.148843125 GHz




EIRP in 20MHz, Peak Detector








EIRP in 20MHz, Peak Detector

Ref 89 dBμV Att 10 dB

* RBW 20 MHz * VBW 30 MHz * SWT 1.65 s

Marker 1 [T1] 80.65 dBμV 25.228893125 GHz

1 PK MAXH

3dB

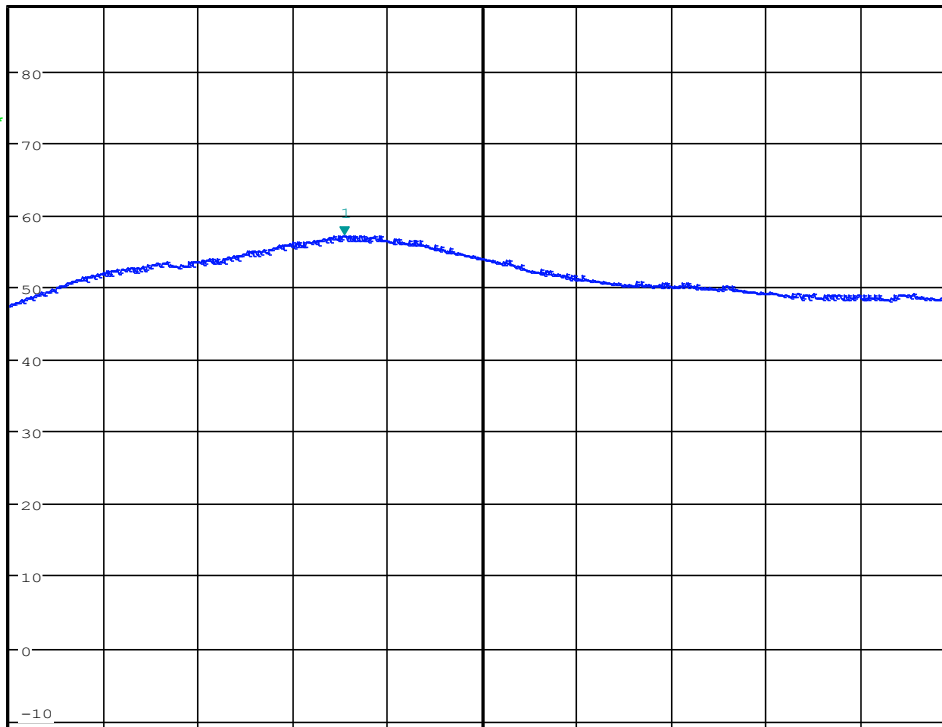
Center 25.4 GHz 160.1 MHz/ Span 1.601 GHz

Sample 6
EIRP in 1MHz, Average Detector



Ref 89 dBμV Att 10 dB
 * RBW 1 MHz Marker 1 [T1]
 * VBW 10 MHz 57.23 dBμV
 * SWT 1.65 s 25.166854375 GHz

1 AV
MAXH



Center 25.4 GHz 160.1 MHz/ Span 1.601 GHz

EIRP in 20MHz, Peak Detector

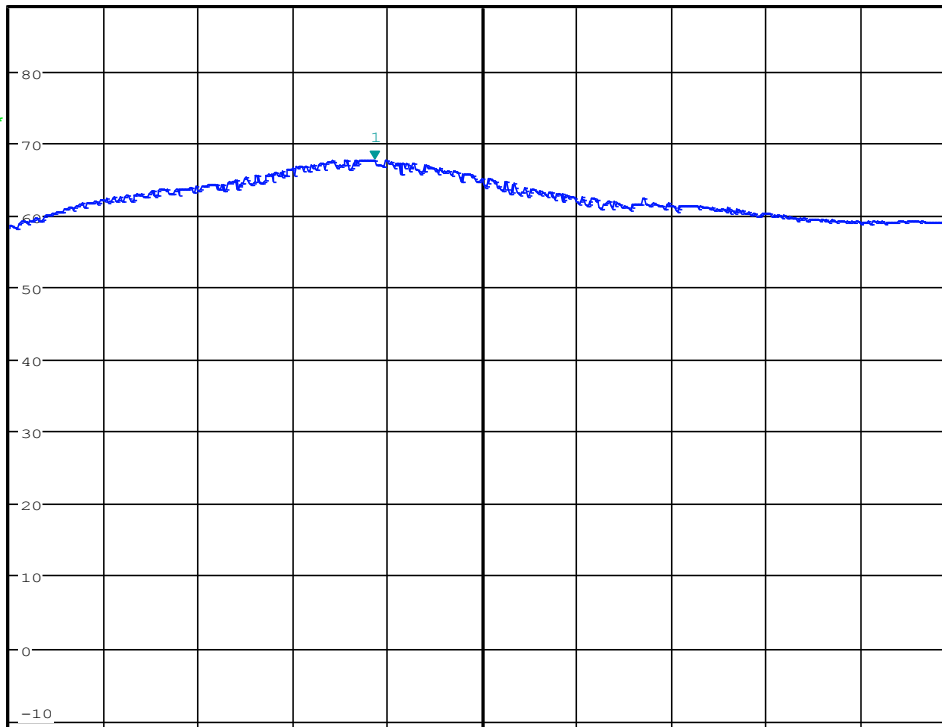


Ref 89 dBμV Att 10 dB

* RBW 20 MHz * VBW 30 MHz * SWT 1.65 s

Marker 1 [T1] 67.70 dBμV 25.216885625 GHz

1 RM
MAXH



Center 25.4 GHz 160.1 MHz/ Span 1.601 GHz

A

3DB

4.1.3 Antenna Requirment

RESULT:
Passed

Date of testing : 2014-06-20
 Test standard and limit : FCC Part 15.256(h)(j)

According to the FCC Part 15.256(h), LPR devices operating under the provisions of this section within the 5.925-7.250 GHz and 24.05-29.00 GHz bands must use an antenna with a -3 dB beamwidth no greater than 12 degrees.

According to the FCC Part 15.256(j), LPR devices operating under the provisions of this section must limit the side lobe antenna gain relative to the main beam gain for off-axis angles from the main beam of greater than 60 degrees to the levels provided in the table below:

Frequency Range (GHz)	Antenna Side Lobe Gain Limit Relative to Main Beam Gain (dB)
5.925-7.250	-22
24.05-29.00	-27
75-85	-38

According to the manufacturer's declaration, the parameter of the antennas is:

Antenna Type	Gain(dBi)	Side lobe gain(dB)	Beam angle
(T)Horn Φ78mm/L227	24.4	-31.8	11°
(T)Horn Φ98mm/L288	27.4	-35.1	8°
(T)Horn Φ123mm/L620	29.2	-37.5	6°
(U)Flange DN80	22	-30	11°
(U)Flange DN100	24.9	-32.2	8°
(Z)Horn Φ78mm/Flexible	24	-30.5	11°
(P)Horn Φ78mm/L221	24.1	-31.4	11°

Therefore it compliances with requirement of FCC Part 15.256(h) and (j).

4.1.4 Radiated Spurious Emission

RESULT:**Passed**

Date of testing : 2014-08-12
Test standard : FCC part 15.256(h),(k)
Basic standard : ANSI C63.10: 2009
Limits : Refer to 15.209(a) and 15.256.
Kind of test site : 3m Semi-Anechoic Chamber(<1GHz), 5m
Full Anechoic Chamber(>1GHz)

Test setup

Operation mode : A
Ambient temperature : 25°C
Relative humidity : 51%
Atmospheric pressure : 101 kPa
Distance of testing : 3m(9kHz-18GHz), 0.1m(18-90GHz), 0.01m(90-110GHz)

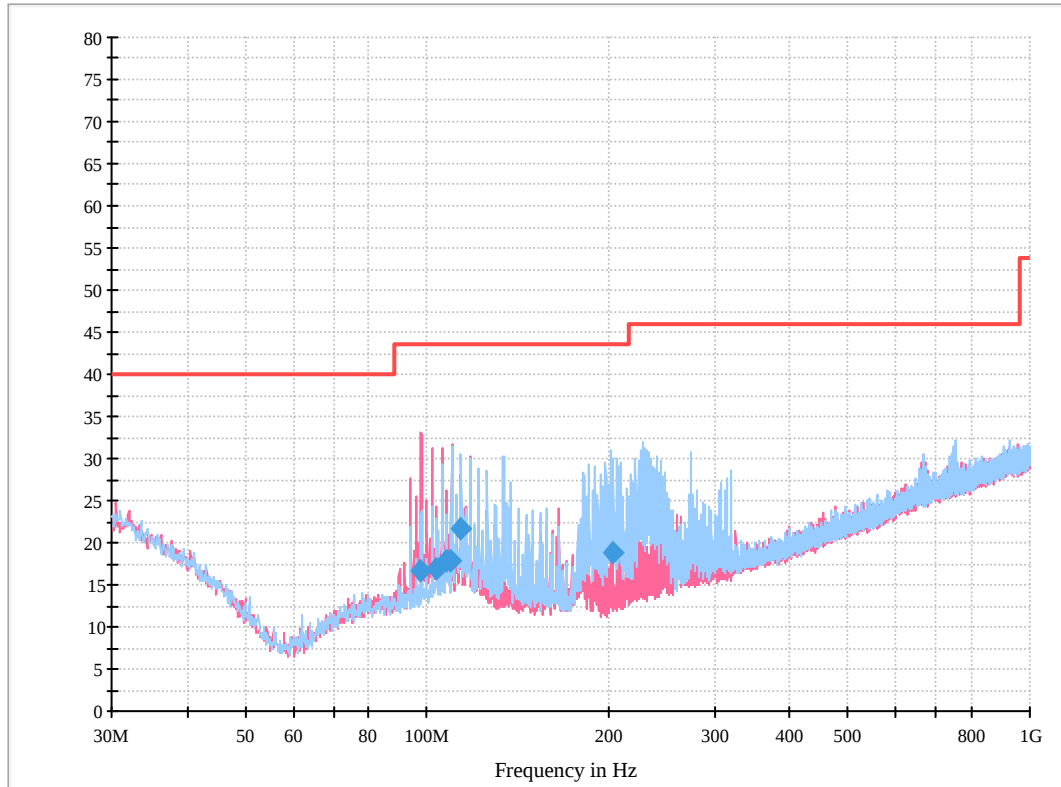
During the test, the EUT was checked in the three orthogonal planes with the receive antenna in both horizontal and vertical polarizations. A resolution bandwidth of 120kHz was used for frequency under 1GHz, and a resolution bandwidth of 1MHz was used for frequency above 1GHz.

A pre-test was performed on all of the samples listed in the table 6, no radiated harmonics or unintentional emission was found below 30MHz and above 1GHz. The following plots are provided as reference. The 18-90GHz plots were taken with the measure antenna close to the transmit antenna at 0.1m distance and 0.01m for 90-110GHz to reduce the impact of background noise, and the limit at 0.1m converted from 3m limit for 18-90GHz is 83.54dBuV/m and the limit at 0.01m converted from 3m limit for 90-110GHz is 103.54dBuV/m.

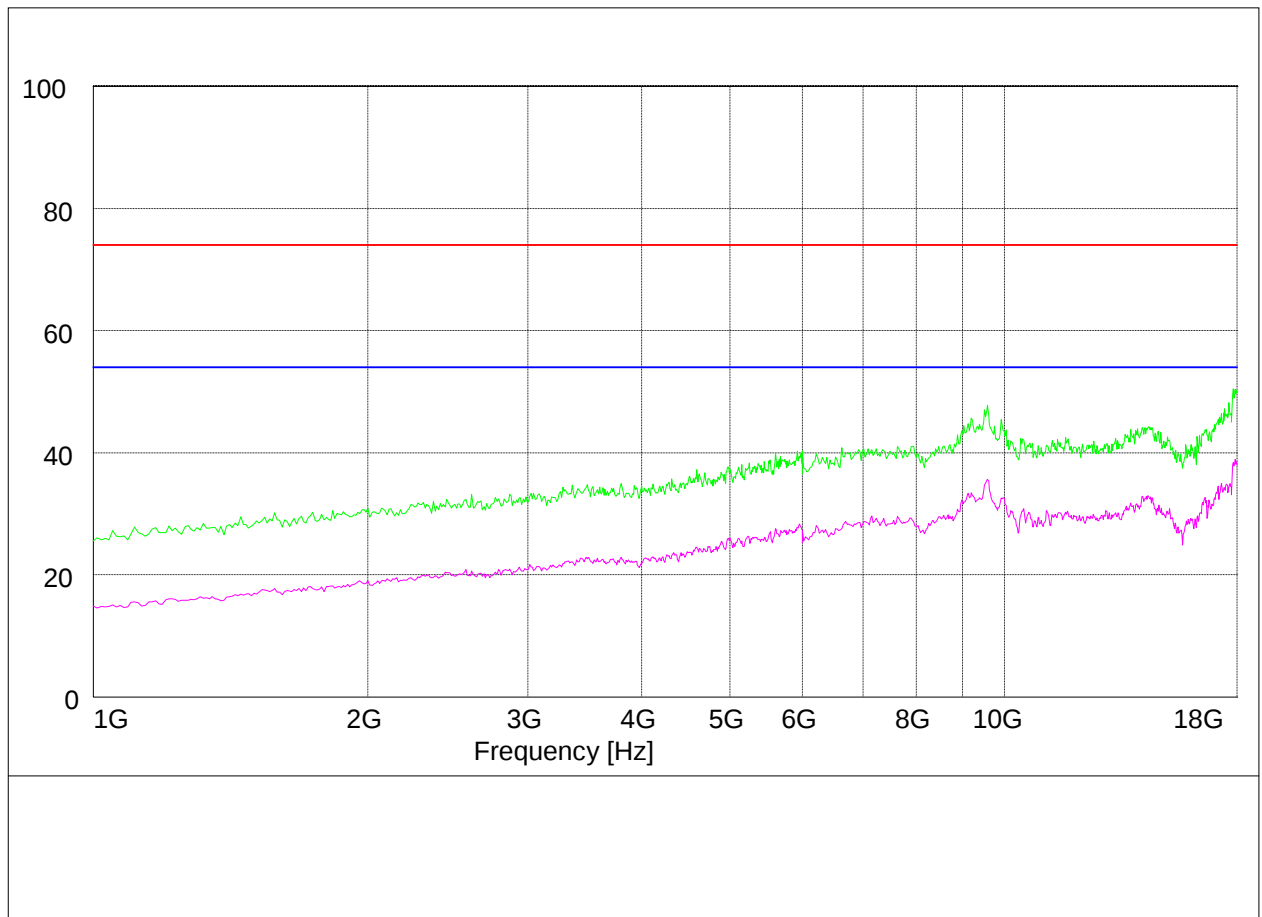
9 kHz - 30 MHz emission result was far below limit, hence not presented in this test report.

Emission below 1GHz
Figure 1: Spurious emission measurement results, worst data

Level in dB μ V/m

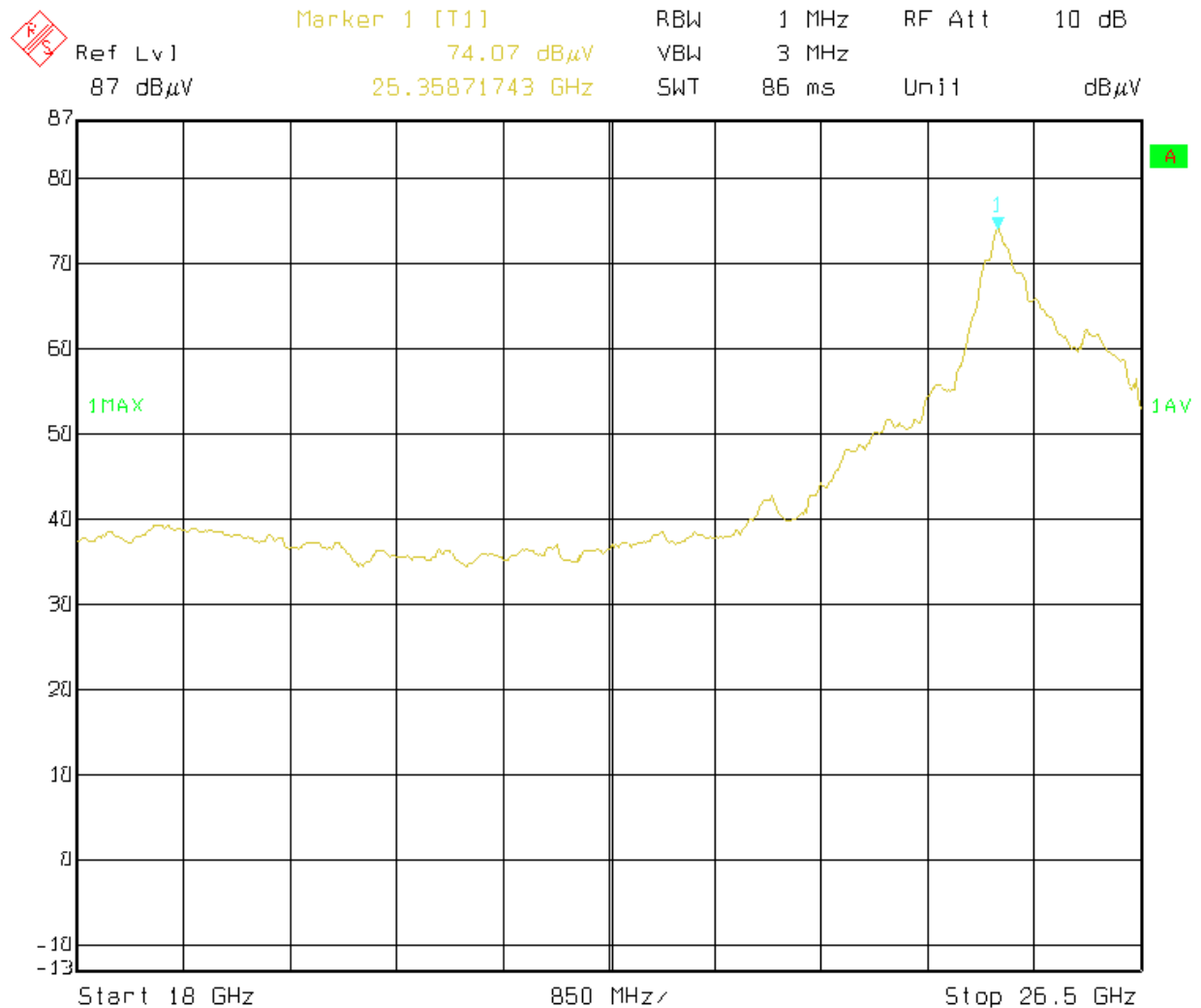


Frequency (MHz)	QuasiPeak (dB μ V/m)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dB μ V/m)
97.900000	16.1	100.0	V	0.0	27.4	43.5
102.022500	17.1	100.0	V	0.0	26.4	43.5
106.023750	17.2	100.0	V	0.0	26.3	43.5
110.025000	17.8	100.0	V	359.0	25.7	43.5
113.905000	22.5	200.0	H	43.0	21	43.5
201.932500	17.5	100.0	H	74.0	26	43.5

Emission above 1GHz**Figure 2: Spurious emission measurement results, 1GHz-18GHz, worst data**

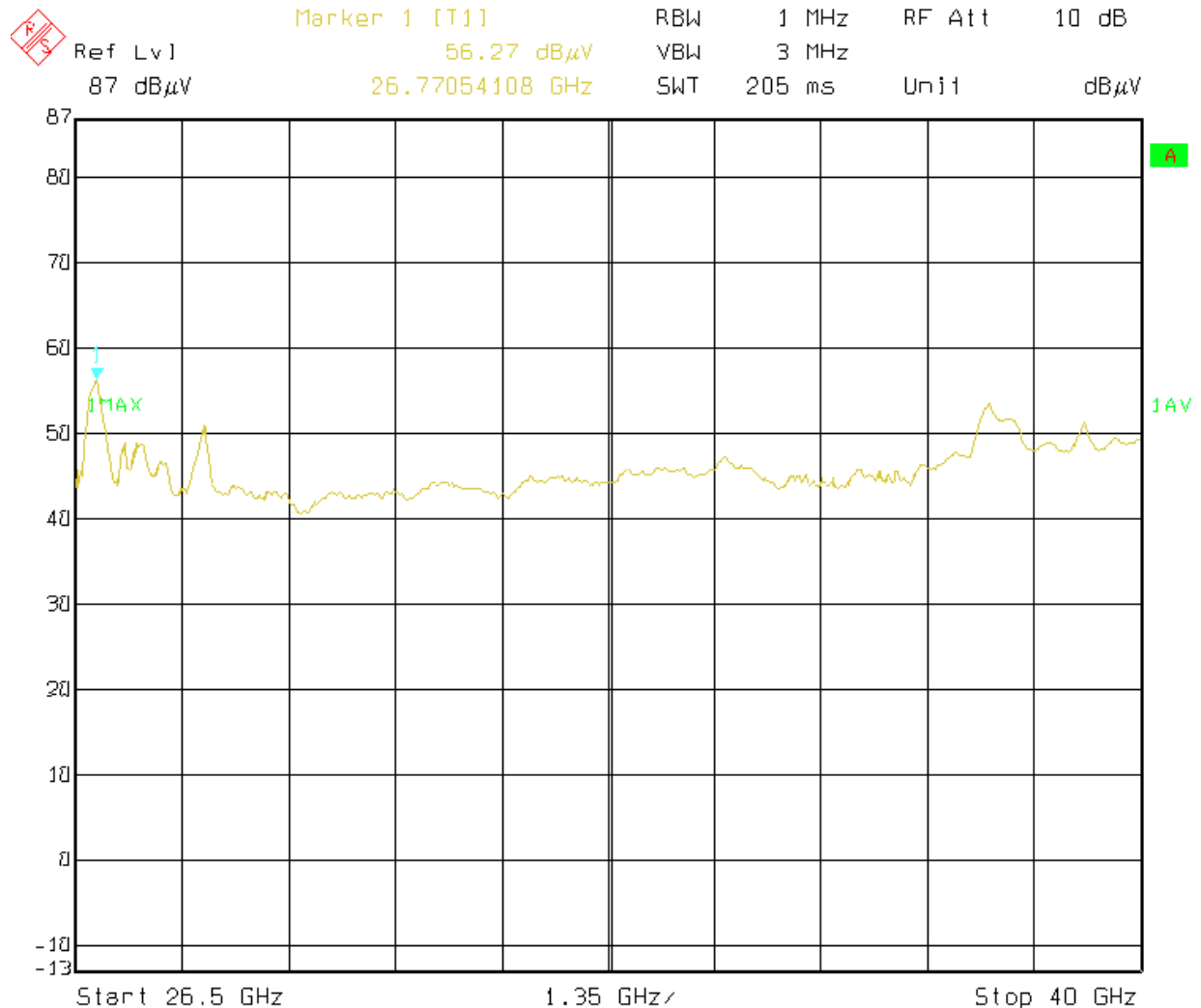
Final measurement result:

No emission was found above the background noise.

Figure 3: Spurious emission measurement results, 18GHz-26.5GHz, worst data


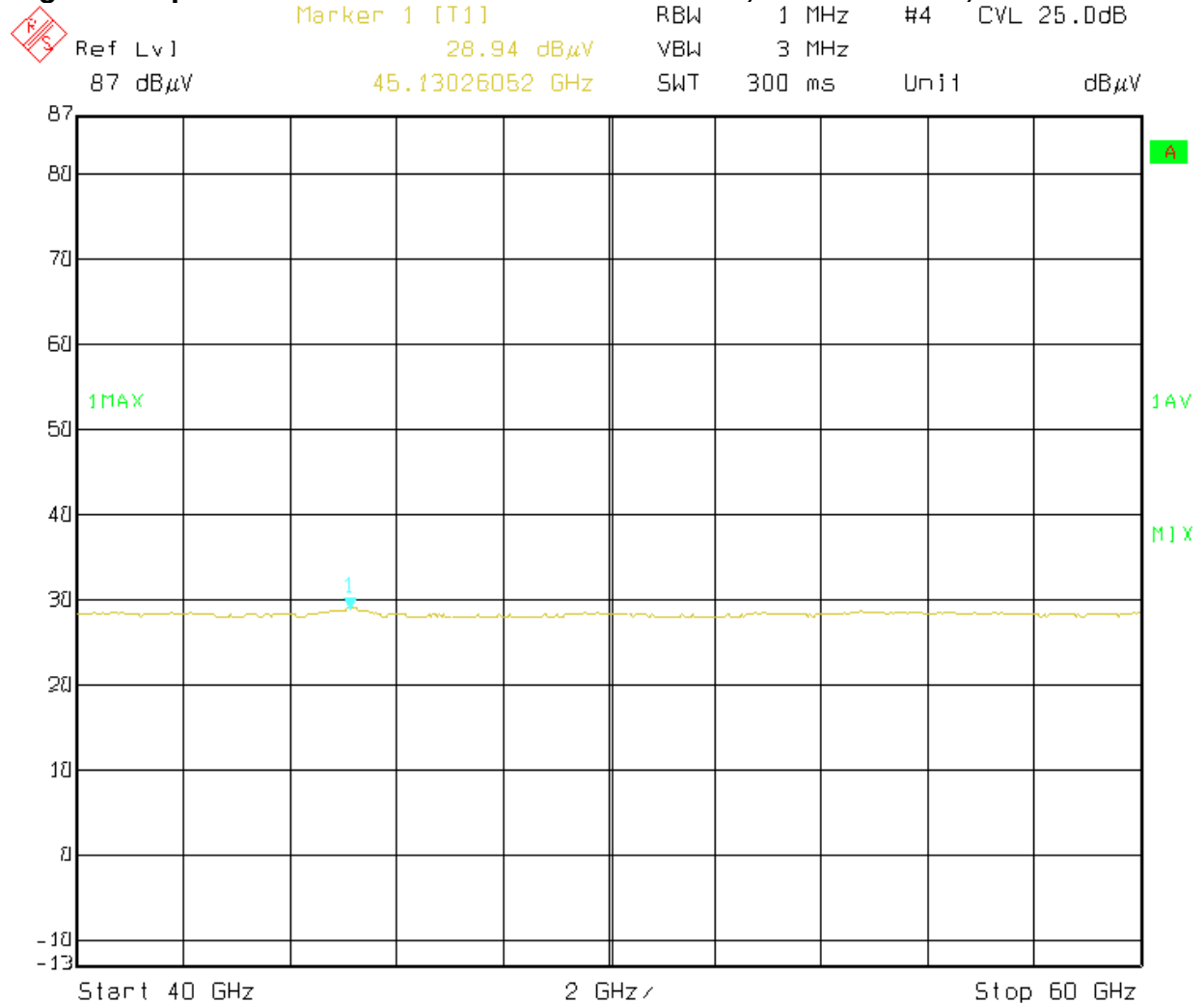
Final measurement result:

Frequency (GHz)	Direct value measured (dBμV)	Correction Factor(dB/m)	Corrected Measurement (dBμV/m)	Limit at 0.1m (dBμV/m)	Margin (dB)
No spurious emission points over the limit were found.				83.54	----

Figure 4: Spurious emission measurement results, 26.5GHz-40GHz, worst data


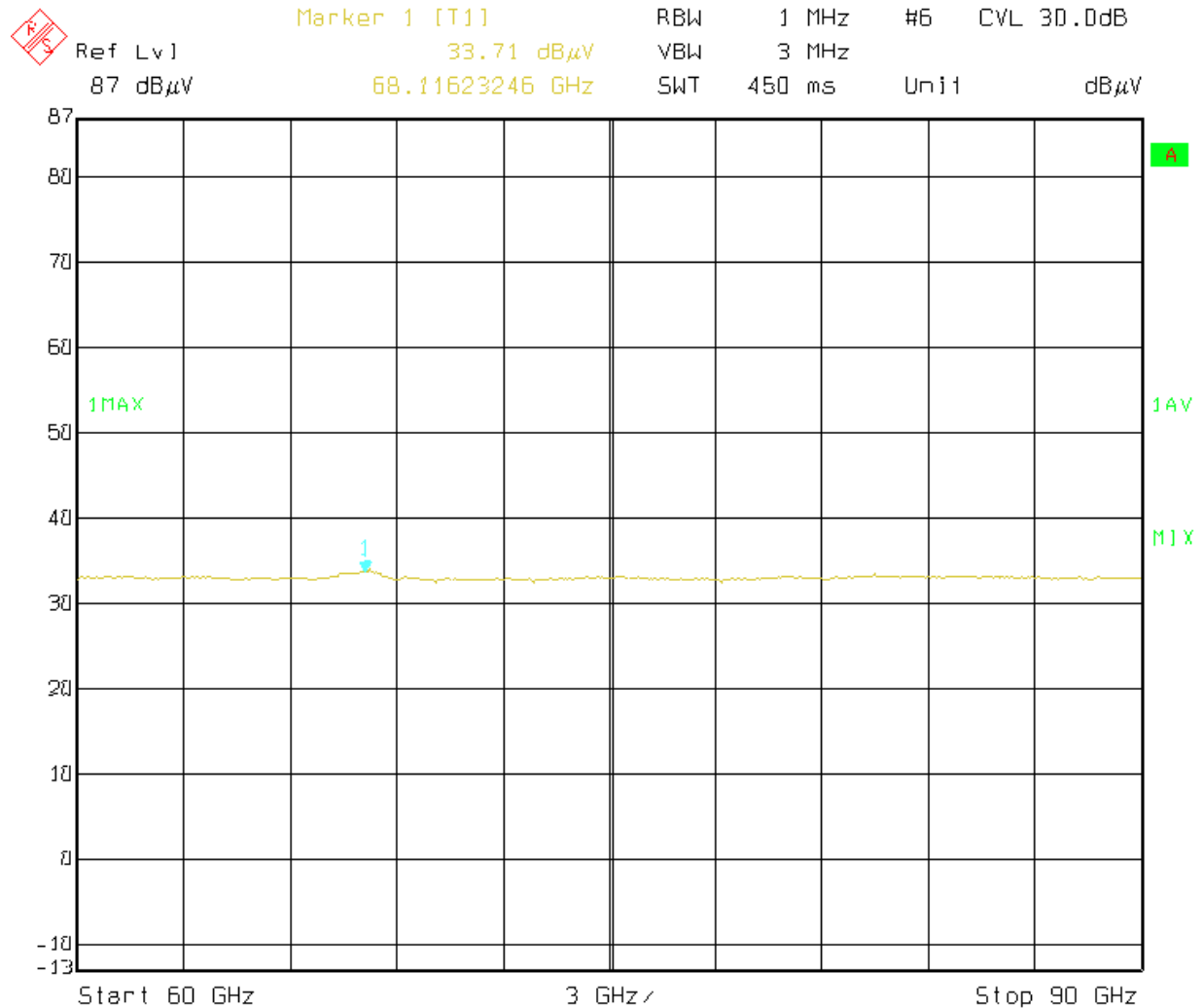
Final measurement result:

Frequency (GHz)	Direct value measured (dBuV)	Correction Factor(dB/m)	Corrected Measurement (dBuV/m)	Limit at 0.1m (dBμV/m)	Margin (dB)
26.77	56.27	10.27	66.54	83.54	17

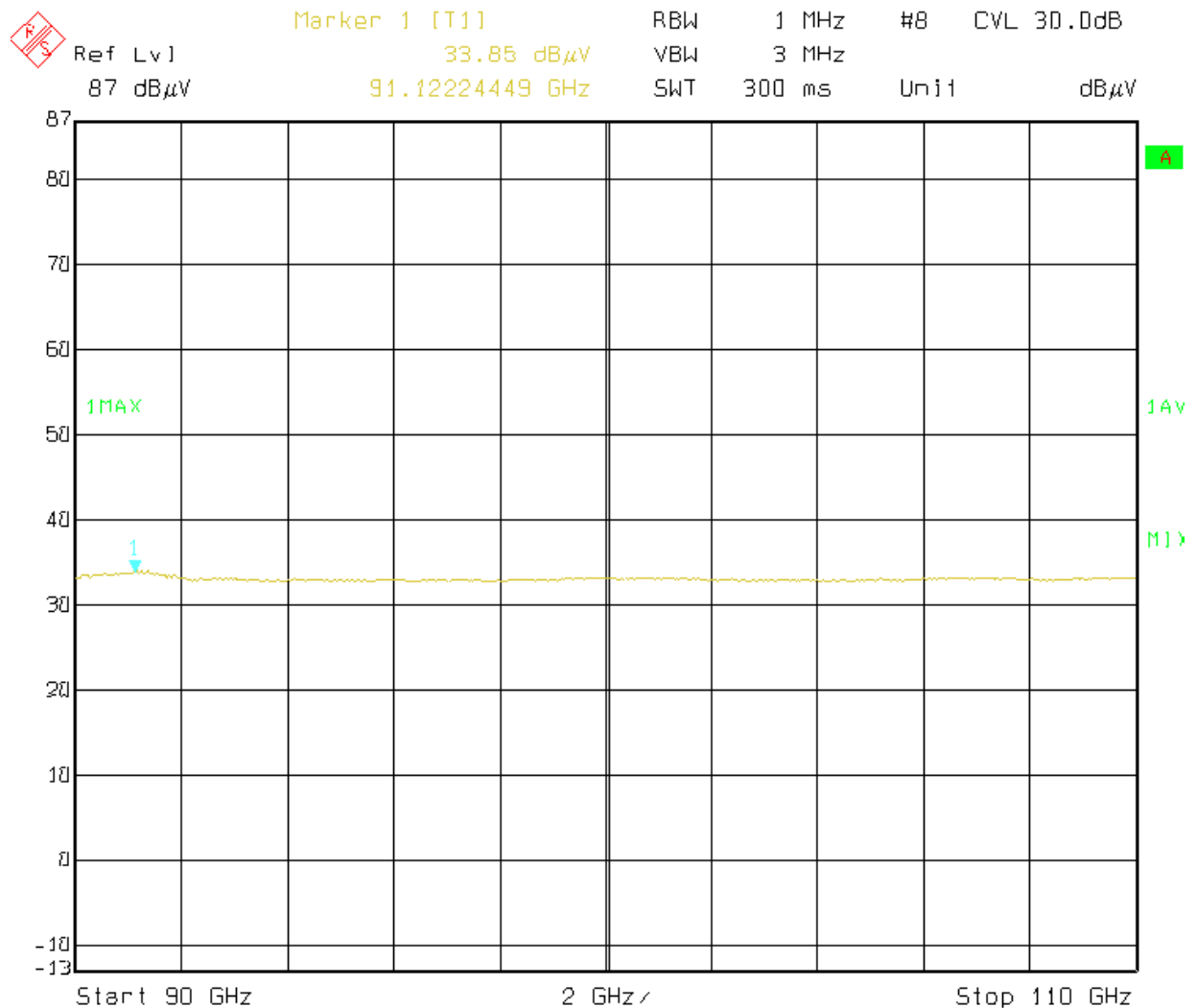
Figure 5: Spurious emission measurement results, 40GHz-60GHz, worst data


Final measurement result:

Frequency (GHz)	Direct value measured (dBμV)	Correction Factor(dB/m)	Corrected Measurement (dBμV/m)	Limit at 0.1m (dBμV/m)	Margin (dB)
45.13	28.94	37.62	66.56	83.54	16.98

Figure 6: Spurious emission measurement results, 60GHz-90GHz, worst data

Final measurement result:

Frequency (GHz)	Direct value measured (dBμV)	Correction Factor(dB/m)	Corrected Measurement (dBμV/m)	Limit at 0.1m (dBμV/m)	Margin (dB)
68.12	33.71	42.26	75.97	83.54	7.57

Figure 7: Spurious emission measurement results, 90GHz-110GHz, worst data


Final measurement result:

Frequency (GHz)	Direct value measured (dBuV)	Correction Factor(dB/m)	Corrected Measurement (dBuV/m)	Limit at 0.01m (dBμV/m)	Margin (dB)
91.12	33.85	52.66	86.51	103.54	17.03

4.1.5 Frequency Stability

RESULT:**Passed**

Test date : 2014-08-11
Test standard : FCC KDB890966 D01 Meas Level Probing
Radars v01r01
Limit : FCC Part 15.256(f)(2): LPR devices operating under
this section must confine their fundamental emission
bandwidth within the 5.925-7.250 GHz, 24.05-29.00 GHz,
and 75-85 GHz bands under all conditions of operation

According to the FCC KDB890966 D01 Meas Level Probing Radars v01r01, the bandwidth of the fundamental emission must be contained within the frequency band over the temperature range -20 to +50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage.

Therefore, the normal and extreme test conditions are listed below:

Normal test condition		Extreme test condition	
Voltage	Temperature	Voltage	Temperature
DC 24V	20°C	DC 20.4V and DC 27.6V	-20°C and 50°C

Table 9: Test result of Frequency Stanbility

Test Conditions		Frequency range measured in a 1MHz bandwidth			
Temperature	Voltage (V)	f _L at Low Channel edge (GHz)		f _H at High Channel edge(GHz)	
		Measure Result	Limit	Measure Result	Limit
T = -20°C	V _{min}	24.839	f _L > 24.05	26.513	f _H < 29.00
	V _{nor}	24.839	f _L > 24.05	26.509	f _H < 29.00
	V _{max}	24.839	f _L > 24.05	26.509	f _H < 29.00
T = -10°C	V _{min}	24.871	f _L > 24.05	26.509	f _H < 29.00
	V _{nor}	24.823	f _L > 24.05	26.513	f _H < 29.00
	V _{max}	24.855	f _L > 24.05	26.509	f _H < 29.00
T = 0°C	V _{min}	24.883	f _L > 24.05	26.445	f _H < 29.00
	V _{nor}	24.891	f _L > 24.05	26.445	f _H < 29.00
	V _{max}	24.879	f _L > 24.05	26.497	f _H < 29.00
T = 10°C	V _{min}	24.887	f _L > 24.05	26.389	f _H < 29.00
	V _{nor}	24.899	f _L > 24.05	26.389	f _H < 29.00
	V _{max}	24.883	f _L > 24.05	26.389	f _H < 29.00
T = 20°C	V _{min}	24.887	f _L > 24.05	26.385	f _H < 29.00
	V _{nor}	24.899	f _L > 24.05	26.353	f _H < 29.00
	V _{max}	24.899	f _L > 24.05	26.373	f _H < 29.00
T = 30°C	V _{min}	24.899	f _L > 24.05	26.389	f _H < 29.00
	V _{nor}	24.891	f _L > 24.05	26.397	f _H < 29.00
	V _{max}	24.891	f _L > 24.05	26.393	f _H < 29.00
T = 40°C	V _{min}	24.891	f _L > 24.05	26.389	f _H < 29.00
	V _{nor}	24.891	f _L > 24.05	26.389	f _H < 29.00
	V _{max}	24.891	f _L > 24.05	26.389	f _H < 29.00
T = 50°C	V _{min}	24.887	f _L > 24.05	26.357	f _H < 29.00
	V _{nor}	24.883	f _L > 24.05	26.393	f _H < 29.00
	V _{max}	24.883	f _L > 24.05	26.393	f _H < 29.00

4.2 Radio Frequency Exposure Compliance

4.2.1 Electromagnetic Fields

RESULT:**Passed**

Date of testing : 2014-08-11
Test standard : FCC KDB Publication 447498 D01 General RF Exposure
Guidance v05r02
FCC 1.1310

MPE Calculation
According to the formula

$$Pd = \frac{P_{out} * G}{4\pi R^2}$$

Where

Pd = power density in mW/cm²

Pout = output power to antenna in mW

G = Antenna gain in numeric

π = 3.14159

R = Distance between observation point and the center of radiator in cm

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user. Warning statement to the user for keeping the safety distance from the antenna should be included in the user manual.

The highest measured power including antenna gain is -11.3dBm(0.0741mW), hence the Maximum Permissible Exposure (MPE) value:

$$Pd = \frac{P_{out} * G}{4\pi R^2} = \frac{0.0741 \times 1}{4 \times 3.14159 \times 20^2} = 1.474 \times 10^{-5} \text{ mW} / \text{cm}^2 < 1 \text{ mW} / \text{cm}^2$$

Therefore the device is exclusion from SAR test, and compliance with MPE limit.

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