

FCC 15.247 & RSS-247 2.4GHz Test Report

for

FUTABA Corporation

**1080 Yabutsuka Chosei-mura Chosei-gun Chiba-ken
299-4395 JAPAN**

Product Name : Radio Control
Model Name : T16IZ
Brand : Futaba
FCC ID : AZP-T16IZ-24G
IC : 2914D-T16IZ

**Prepared by: : AUDIX Technology Corporation,
EMC Department**



The test report is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo.
The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

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APPENDIX A TEST DATA AND PLOTS
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TEST REPORT

Applicant : FUTABA Corporation
Manufacturer : FUTABA Corporation
EUT Description
(1) Product : Radio Control
(2) Model : T16IZ
(3) Brand : Futaba
(4) Power Supply : (1)DC 5V (USB)
(2)DC7.4V (Battery)

Applicable Standards:

Title 47 FCC CFR, Part 15, Subpart C
RSS-Gen (Issue 5), April 2018
RSS-247 (Issue 2), February 2017
ANSI C63.10:2013

Audix Technology Corp. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Audix Technology Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens and samples.

Date of Report: 2020. 12. 14

Reviewed by:



(Sabrina Wang/Administrator)

Approved by:



(Johnny Hsueh/Section Manager)

1. REVISION RECORD OF TEST REPORT

Edition No	Issued Date	Revision Summary	Report Number
0	2020. 12. 14	Original Report	EM-F200596

2. SUMMARY OF TEST RESULTS

Rule		Description	Results
FCC	IC		
15.207	RSS-Gen §8.8	Conducted Emission	PASS
15.247(d)/ 15.205	RSS-Gen §8.9 RSS-247 §5.5	Radiated Band Edge and Radiated Spurious Emission	PASS
15.247(a)(2)	RSS-247 §5.2(1)	6dB/Occupied Bandwidth	PASS
15.247(b)(3)	RSS-247 §5.4(4)	Maximum Peak Output Power	PASS
15.247(d)	RSS-247 §5.5	Conducted Band Edges and Conducted Spurious Emission	PASS
15.247 (e)	RSS-247 §5.2(2)	Peak Power Spectral Density	PASS
15.203	RSS-Gen §8.3	Antenna Requirement	Compliance

Note: The uncertainties value is not used in determining the result.

3. GENERAL INFORMATION

3.1. Description of Application

Applicant	FUTABA Corporation 1080 Yabutsuka Chosei-mura Chosei-gun Chiba-ken 299-4395 JAPAN
Manufacturer	FUTABA Corporation 1080 Yabutsuka Chosei-mura Chosei-gun Chiba-ken 299-4395 JAPAN
Product	Radio Control
Model	T16IZ
Brand	Futaba

3.2. Description of EUT

Test Model	T16IZ		
Serial Number	N/A		
Power Rating	(1)DC 5V (USB) (2)DC7.4V (Battery)		
RF Features	DSSS: FASSTest, FASST FHSS: S-FHSS, T-FHSS		
Test Sample	Sample No.	Test Item	Firmware
	-01	AC Conduction, RSE, Output Power	N/A
Sample Status	Production		
Date of Receipt	2020. 09. 10		
Date of Test	2020. 09. 15~ 12. 11		
Interface Ports of EUT	<ul style="list-style-type: none"> • Micro SD Card Slot x 1 • PC Port (Type C) x 1 • S.BUS (S.I/F) Connector x 1 • Trainer Connector x 1 • Charging Port (Type C) x 1 • Earphone Plug x 1 • Battery Connector x 1 		
Accessories Supplied	<ul style="list-style-type: none"> • Type C Cable 		

3.3. Reference Test Guidance

None

3.4. Antenna Information

No.	Antenna Type	Manufacture	Antenna Part Number	Frequency (MHz)	Max Gain (dBi)
1.	1/2λ Sleeve antenna	SANSEI	ANTB24	2400 - 2500	1.48

3.5. EUT Specifications Assessed in Current Report

Mode	Fundamental Range (MHz)	Channel Number	Modulation	Data Rate (kbps)
FASSTest	2405.376 - 2472.960	23	DSSS	136
FASST	2405.376 - 2477.056	36	DSSS	136

FASSTest							
Channel List							
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
02	2405.376	20	2423.808	38	2442.240	56	2460.672
05	2408.448	23	2426.880	41	2445.312	59	2463.744
08	2411.520	26	2429.952	44	2448.384	62	2466.816
11	2414.592	29	2433.024	47	2451.456	65	2469.888
14	2417.664	32	2436.096	50	2454.528	68	2472.960
17	2420.736	35	2439.168	53	2457.600		

FASST							
Channel List							
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
02	2405.376	20	2423.808	38	2442.240	56	2460.672
04	2407.424	22	2425.856	40	2444.288	58	2462.720
06	2409.472	24	2427.904	42	2446.336	60	2464.768
08	2411.520	26	2429.952	44	2448.384	62	2466.816
10	2413.568	28	2432.000	46	2450.432	64	2468.864
12	2415.616	30	2434.048	48	2452.480	66	2470.912
14	2417.664	32	2436.096	50	2454.528	68	2472.960
16	2419.712	34	2438.144	52	2456.576	70	2475.008
18	2421.760	36	2440.192	54	2458.624	72	2477.056

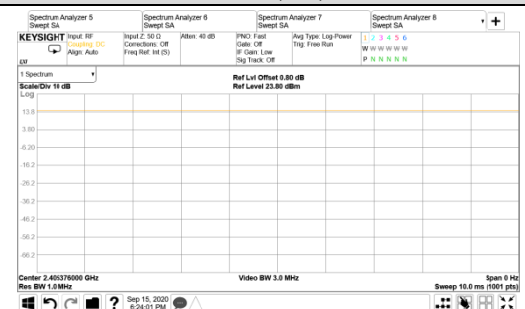
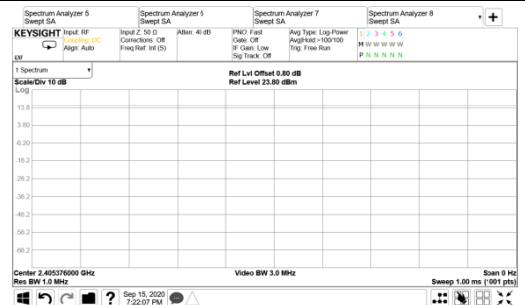
3.6. Descriptions of Key Components

Item	Supplier/Brand	Model	Specification
Wireless Module	Futaba	TC23B	DSSS: FASSTest, FASST FHSS: S-FHSS, T-FHSS
Lithium-ion polymer battery	Futaba	LT2F2000B	DC 7.4A, 2000mA, 14.8Wh
Type C Cable	Futaba	KH7674-011	USB AM-TYPE C 22AWG*2C+28AWG*2C L=1000mm

3.7. Test Configuration

Mode	TX _{on} (ms)	1/ TX _{on} (kHz)	Duty Cycle (x)	Duty Cycle Factor [10log(1/x)] (dB)
FASSTest	---	---	1.00	---
FASST	---	---	1.00	---

Note: When duty cycle is less than 98% (0.98) that duty cycle factor 10log(1/x) is needed to add in conducted test items measured in average detector.

Mode	TX _{on} (ms)	T _{on} +T _{off} (ms)
FASSTest		
FASST		

AC Conduction	
Test Case	Charge Mode

	Item	Mode	Test Channel
Radiated Test Case	Radiated Spurious Emission	Charge	---
	Radiated Band Edge ^{Note1}	FASSTest	2/68
		FASST	2/72
	Radiated Spurious Emission ^{Note1}	FASSTest	2/35/68
FASST		2/36/72	
Conducted Test Case	6dB Bandwidth	FASSTest	2/35/68
		FASST	2/36/72
	Peak Power Spectral Density	FASSTest	2/35/68
		FASST	2/36/72
	Peak Output Power	FASSTest	2/35/68
		FASST	2/36/72
	Band Edge	FASSTest	2/68
		FASST	2/72
	Spurious Emission	FASSTest	2/35/68
		FASST	2/36/72

Note 1: Mobile Device

Portable Device, and 3 axis were assessed. The worst scenario for Radiated Spurious Emission as follow: Lie Side Stand

3.8. Tested Supporting System List

3.8.1. Support Peripheral Unit

No.	Product	Brand	Model No.	Serial No.	Approval
1.	AC Adapter Wall-mount, 2C (DC 5V)	APD	WB-10G05R	N/A	N/A
2.	Power Socket	N/A	N/A	N/A	N/A
3.	Micro SD Card (4GB)	Transcend	N/A	N/A	N/A

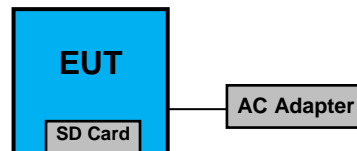
3.8.2. Cable Lists

No.	Cable Description Of The Above Support Units
1.	Type C Cable: Shielded, Detachable, 1.0m
2.	AC Power Cable: Unshielded, Undetachable, 1.8m

3.9. Setup Configuration

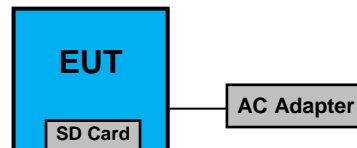
3.9.1. EUT Configuration for Power Line Emission

- Charge mode

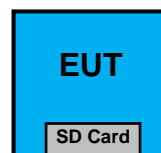


3.9.2. EUT Configuration for Radiated Emission

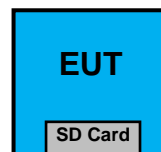
- Charge mode



- Transmit Mode



3.9.3. EUT Configuration for RF Conducted Test Items



3.10. Operating Condition of EUT

- Charge Mode: The EUT connects the AC adapter on charge mode.
- Transmit Mode: Press the button of the EUT is used for enabling EUT RF function under continues transmitting and choosing mode/channel. (The test program was installed in SD card)

3.11. Description of Test Facility

Name of Test Firm	Audix Technology Corporation / EMC Department No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan Tel: +886-2-26092133 Fax: +886-2-26099303 Website : www.audixtech.com Contact e-mail: attemc_report@audixtech.com
Accreditations	The laboratory is accredited by following organizations under ISO/IEC 17025:2017 (1) NVLAP(USA) NVLAP Lab Code 200077-0 (2) TAF(Taiwan) No. 1724
Test Facilities	FCC OET Designation Number under APEC MRA by NCC is : TW1724 ISED CAB Identifier Number under APEC TEL MRA by NCC is TW1724 (1) No.8 Shielded Room (2) No.1 3m Semi Anechoic Chamber (3) Fully Anechoic Chamber

3.12.Measurement Uncertainty

Test Items/Facilities		Frequency Range	Uncertainty
Conduction Test		9kHz-150kHz	±3.7dB
		150kHz-30MHz	±3.5dB
Radiation Test	☒ No.1 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±4.1dB
		200MHz-1000MHz, 3m, Horizontal	±3.9dB
		30MHz-200MHz, 3m, Vertical	±4.2dB
		200MHz-1000MHz, 3m, Vertical	±4.1dB
		1GHz-6GHz, 3m	±4.2dB
		6GHz-18GHz, 3m	±4.6dB
	☐ No.3 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±3.9dB
		200MHz-1000MHz, 3m, Horizontal	±3.9dB
		30MHz-200MHz, 3m, Vertical	±4.4dB
		200MHz-1000MHz, 3m, Vertical	±4.1dB
	☐ No.4 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±4.3dB
		200MHz-1000MHz, 3m, Horizontal	±4.0dB
		30MHz-200MHz, 3m, Vertical	±4.3dB
		200MHz-1000MHz, 3m, Vertical	±4.4dB
	☐ No.5 3m Semi Anechoic Chamber	1GHz-6GHz, 3m	±4.5dB
		6GHz-18GHz, 3m	±4.6dB
		30MHz-200MHz, 3m, Horizontal	±4.0dB
		200MHz-1000MHz, 3m, Horizontal	±3.9dB
		30MHz-200MHz, 3m, Vertical	±4.2dB
		200MHz-1000MHz, 3m, Vertical	±4.3dB
☒ Fully Anechoic Chamber	1GHz-6GHz, 3m	±4.3dB	
	6GHz-18GHz, 3m	±4.7dB	
	30MHz~1000MHz	±4.7dB	
	1GHz~18GHz	±5.3dB	
		18GHz~40GHz	±3.52dB
		40GHz~260GHz	±3.56dB

Remark : Uncertainty = $ku_c(y)$

Test Item	Uncertainty
6dB Bandwidth	± 0.05kHz
Maximum peak output power	± 0.33dB
Power spectral density	± 0.13dB
Conducted Emission Limitations	± 0.13dB

4. MEASUREMENT EQUIPMENTLIST

4.1. Conducted Emission Measurement

Item	Type	Brand	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Test Receiver	R&S	ESR3	101774	2020.02.04	1 Year
2.	A.M.N.	R&S	ENV432	101567	2020.04.20	1 Year
3.	L.I.S.N.	Kyoritsu	KNW-407	8-855-9	2020.12.10	1 Year
4.	Pulse Limiter	R&S	ESH3-Z2	100354	2020.01.05	1 Year
5.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.8 S/R	2020.04.17	1 Year
6.	Coaxial Cable	Yeida	RG/58AU	CE-08	2020.09.19	1 Year
7.	Test Software	Audix	e3	V6.120619c	N.C.R.	N.C.R.

4.2. Radiated Emission Measurement

Item	Type	Brand	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9030A-526	MY53400071	2020.01.16	1 Year
2.	Spectrum Analyzer	Keysight	N9010B-544	MY55460198	2020.04.29	1 Year
3.	Test Receiver	R&S	ESCS30	100039	2020.06.05	1 Year
4.	Amplifier	HP	8447D	2944A06305	2020.01.16	1 Year
5.	Amplifier	HP	8449B	3008A02678	2020.02.27	1 Year
6.	Amplifier	Keysight	83051A	MY53010042	2020.08.05	1 Year
7.	Loop Antenna	R&S	HFH2-Z2	891847/27	2019.12.26	2 Years
8.	Bilog Antenna	TESEQ	CBL6112D	33821	2020.01.17	1 Year
9.	Horn Antenna	EMCO	3117	00135902	2020.03.20	1 Year
10.	Horn Antenna	COM-POWER	AH-840	101092	2020.05.08	1 Year
11.	2.4GHz Notch Filter	K&L	7NSL10-2441.5/E 130.5-O/O	1	2020.07.24	1 Year
12.	High-Pass Filter	Microwave	H3G018G1	484796	2020.08.20	1 Year
13.	Coaxial Cable	MIYAZAKI	5D2W	CLAMP-01	2020.09.19	1 Year
14.	Coaxial Cable	MIYAZAKI	5D2W	RE-11	2020.01.31	1 Year
15.	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 104	RE-29	2020.09.19	1 Year
16.	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102	RE-30	2020.09.19	1 Year
17.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.1 3m A/C	2020.04.17	1 Year
18.	Digital Thermo-Hygro Meter	EVERY DAY	E-512	RF-02	2020.04.17	1 Year
19.	Test Software	Audix	e3	V6.120619c	N.C.R.	N.C.R.
20.	Test Software	Audix	e3	V6.110601	N.C.R.	N.C.R.

4.3. RF Conducted Measurement

Item	Type	Brand	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Keysight	N9020B-544	MY57120357	2020.01.10	1 Year
2.	Digital Thermo-Hygro Meter	Datronn	KT-905	RF	2020.04.17	1 Year

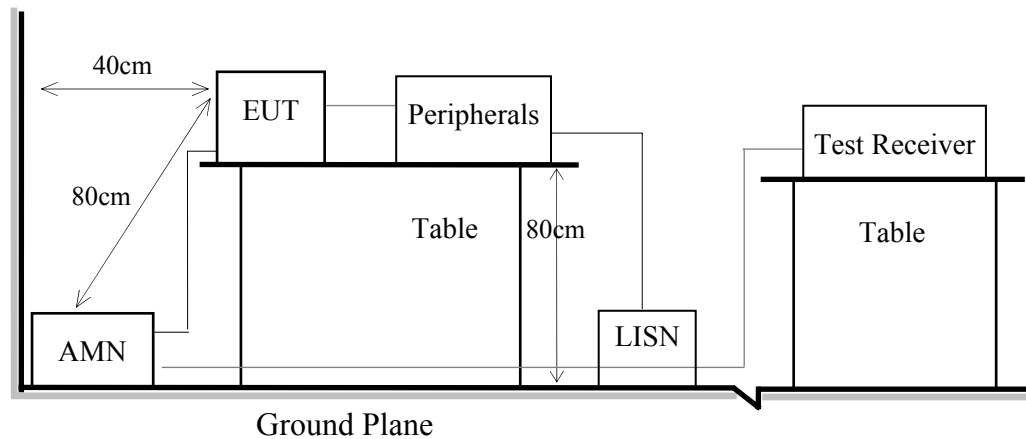
5. CONDUCTED EMISSION

5.1. Block Diagram of Test Setup

5.1.1. Block Diagram of EUT

Indicated as section 3.9

5.1.2. Shielded Room Setup Diagram



5.2. Conducted Emission Limit

Frequency	Conducted Limit	
	Quasi-Peak Level	Average Level
150kHz ~ 500kHz	66 ~ 56 dB μ V	56 ~ 46 dB μ V
500kHz ~ 5MHz	56 dB μ V	46 dB μ V
5MHz ~ 30MHz	60 dB μ V	50 dB μ V

Remark1.: If the average limit is met when using a Quasi-Peak detector, the measurement using the average detector is not required.

2.: The lower limit applies to the band edges.

5.3. Test Procedure

- 5.3.1. To set up the EUT as indicated in ANSI C63.10. The EUT was placed on the table which has 80 cm height to the ground and 40 cm distance to the conducting wall.
- 5.3.2. Power supplier of the EUT was connected to the AC mains through an Artificial Mains Network (A.M.N.).
- 5.3.3. The AC power supplies to all peripheral devices must be provided through line impedance stabilization network (L.I.S.N.)
- 5.3.4. Checking frequency range from 150kHz to 30 MHz and record the emission which does not have 20 dB below limit.

5.4. Test Results

Please refer to Appendix A.

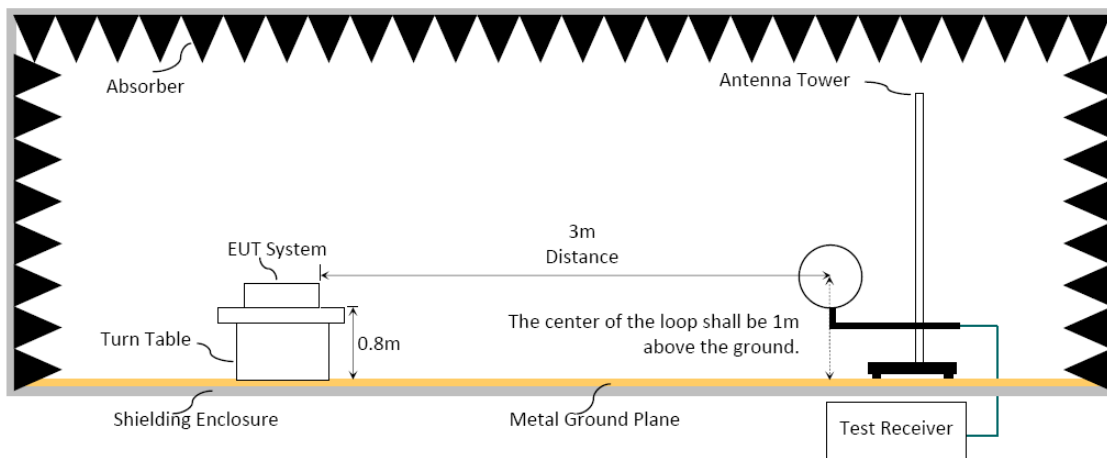
6. RADIATED EMISSION

6.1. Block Diagram of Test Setup

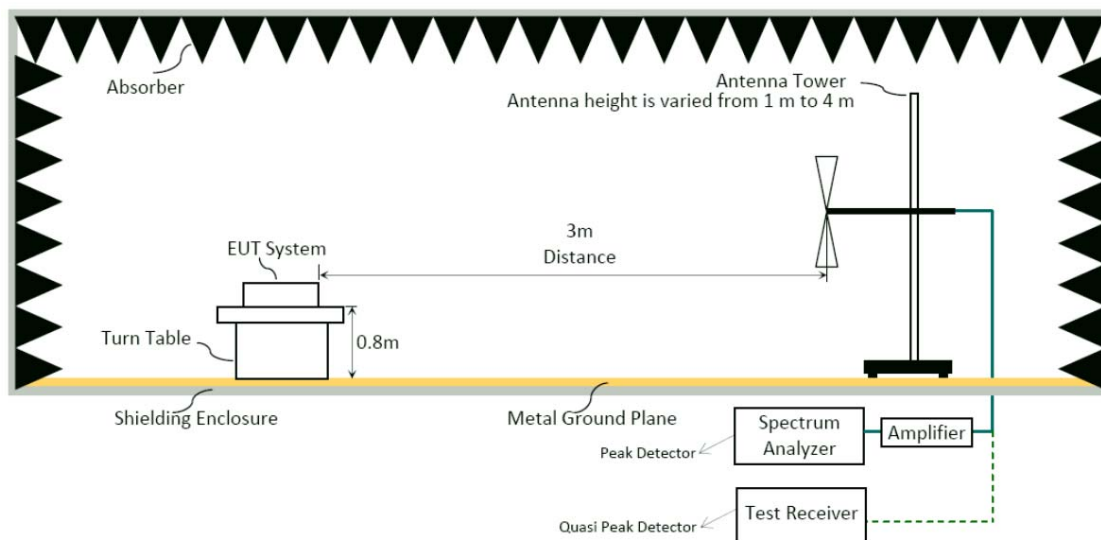
6.1.1. Block Diagram of EUT

Indicated as section 3.9

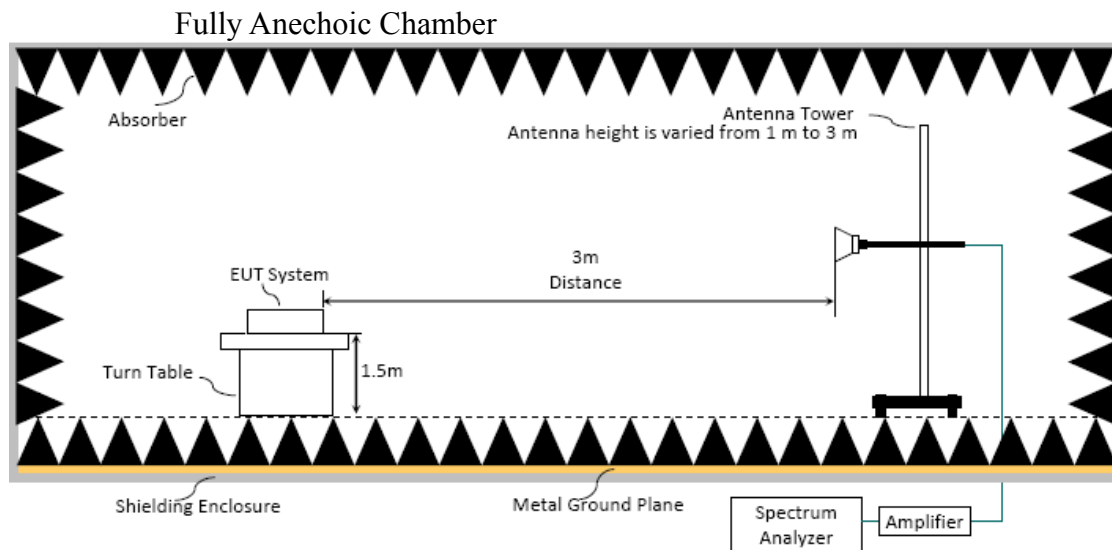
6.1.2. Setup Diagram for 9kHz-30MHz



6.1.3. Setup Diagram for 30-1000MHz



6.1.4. Setup Diagram for above 1GHz



6.2. Radiated Emission Limits

In any 100kHz bandwidth outside the frequency band, the radio frequency power produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205/RSS-Gen Section 8.10 table 6, must also comply with the radiated emission limits specified as below.

Frequency (MHz)	Distance(m)	Limits	
		dB μ V/m	μ V/m
0.009 - 0.490	300	67.6-20 log f(kHz)	2400/f kHz
0.490 - 1.705	30	87.6-20 log f(kHz)	24000/f kHz
1.705 - 30	30	29.5	30
30 - 88	3	40.0	100
88- 216	3	43.5	150
216- 960	3	46.0	200
Above 960	3	54.0	500
Above 1000	3	74.0 dB μ V/m (Peak) 54.0 dB μ V/m (Average)	

Remark : (1) dB μ V/m = 20 log (μ V/m)

- (2) The tighter limit applies to the edge between two frequency bands.
- (3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
- (4) Fundamental and emission fall within operation band are exempted from this section.
- (5) Pursuant to ANSI C63.10: 6.6.4.3, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

6.3. Test Procedure

Frequency Range 9kHz~30MHz:

The EUT setup on the turntable which has 0.8 m height to the ground. The turn table rotated 360 degrees and antenna fixed to 1 m to find the maximum emission level. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

- (1) RBW = 9kHz with peak and average detector.
- (2) Detector: average and peak (9kHz-490kHz)
Q.P. (490kHz-30MHz)

Frequency Range 30MHz ~ 25GHz:

The EUT setup on the turn table which has 80cm (for 30-1000MHz) and 1.5m (for above 1GHz) height to the ground. The turn table rotated 360 degrees and antenna varied from 1 m to 4 m (for 30-1000MHz) and from 1m to 3m (for above 1GHz at fully Anechoic Chamber) or from 1 m to 4 m (for above 1GHz at Semi Anechoic Chamber) to find the maximum emission level. Both horizontal and vertical polarization are required. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

Frequency below 1GHz:

Spectrum Analyzer is used for pre-testing with following setting:

- (1) RBW = 120KHz
- (2) VBW $\geq 3 \times$ RBW.
- (3) Detector = Peak.
- (4) Sweep time = auto.
- (5) Trace mode = max hold.
- (6) Allow sweeps to continue until the trace stabilizes.

Note 1: When peak-detected value is lower than limit that the measurement using the Q.P. detector is not required, otherwise using Q.P. for final measurement.

Note 2: When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds.

Frequency above 1GHz to 10th harmonic(up to 25 GHz):

Peak Detector:

- (1) RBW = 1MHz
- (2) VBW $\geq 3 \times$ RBW.
- (3) Detector = Peak.
- (4) Sweep time = auto.
- (5) Trace mode = max hold.
- (6) Allow sweeps to continue until the trace stabilizes.

Note: When peak-detected value is lower than limit that the measurement using the average detector is not required, otherwise using average detector for final measurement.

Average Detector:**■ Option 1:**

(1) RBW = 1MHz

(2) VBW \geq 1/T.

Modulation Type	TX _{on} (ms)	1/ TX _{on} (kHz)	VBW Setting(Hz)
FASSTest	---	---	10Hz
FASST	---	---	10Hz

N/A: 1/ T is not implemented when duty cycle presented in section 3.7 is \geq 98%.

(1) Detector = Peak.

(2) Sweep time = auto.

(3) Trace mode = max hold.

(4) Allow sweeps to continue until the trace stabilizes.

□ Option 2:

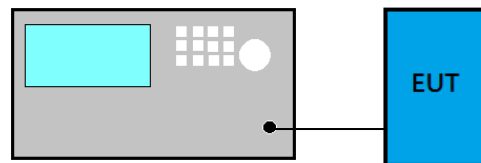
Average Emission Level = Peak Emission Level + D.C.C.F.

6.4. Measurement Result Explanation**■** Peak Emission Level = Antenna Factor + Cable Loss + Meter Reading (including Preamp factor if test used)**■** Average Emission Level = Antenna Factor + Cable Loss + Meter Reading (including Preamp factor if test used)**□** Average Emission Level = Peak Emission Level + DCCFDuty Cycle Correction Factor (DCCF) = $20\log(\text{TX}_{\text{on}}/\text{TX}_{\text{on+off}})$ presented in section 3.7**□** ERP = Peak Emission Level - 95.2dB - 2.14dB**6.5. Test Results**

Please refer to Appendix A.

7. 6dB/OCCUPIED BANDWIDTH

7.1. Block Diagram of Test Setup



7.2. Specification Limits

The minimum 6dB bandwidth shall be at least 500kHz.

7.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10:2013:

For 6dB Bandwidth

- (1) Set RBW = 100 kHz.
- (2) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- (3) Detector = Peak.
- (4) Trace mode = max hold.
- (5) Sweep = auto couple.
- (6) Allow the trace to stabilize.
- (7) Setting channel bandwidth function x to -6dB power to record the final bandwidth..

For 99% Occupied Bandwidth

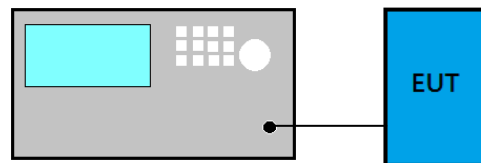
- (1) Set Span range 1.5~5 times the OBW
- (2) Set RBW close to 1% to 5% of OBW.
- (3) Set $VBW \geq 3 \times RBW$.
- (4) Detector = Peak.
- (5) Trace mode = Max hold
- (6) Sweep = Auto couple.
- (7) Allow the trace to stabilize.

7.4. Test Results

Please refer to Appendix A

8. MAXIMUM PEAK OUTPUT POWER

8.1. Block Diagram of Test Setup



8.2. Specification Limits

The Limits of maximum Peak Output Power for digital modulation in 2400-2483.5MHz is : 1Watt. (30dBm), and E.I.R.P.: 4Watt (36dBm)

8.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10:2013:

■ PKPM1 Peak power meter method:

EUT is connected to power sensor and record the maximum output power.

■ Maximum peak conducted output power method:

- (1) Set the RBW \geq DTS bandwidth
- (2) Set VBW $\geq 3 \times$ RBW
- (3) Set span $\geq 3 \times$ RBW.
- (4) Sweep time = auto couple
- (5) Detector = peak.
- (6) Trace mode = max hold.
- (7) Allow trace to fully stabilize.
- (8) Use peak marker function to determine the peak amplitude level.

■ Method AVGPM (Measurement using an RF average power meter):

EUT is connected to power sensor and record the maximum average output power and duty cycle factor is added when duty cycle presented in section 3.7 is $< 98\%$.

□ Method AVGSA-2 (Spectrum channel power)

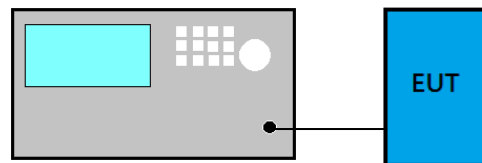
- (1) Set span to at least 1.5 times the OBW
- (2) Set RBW = 1 -5%of OBW
- (3) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- (4) Detector = RMS.
- (5) Trace mode = trace average at least 100 traces
- (6) Sweep = auto couple.
- (7) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges.
- (8) Duty cycle factor is added when duty cycle presented in section 3.7 is $< 98\%$.

8.4. Test Results

Please refer to Appendix A

9. EMISSION LIMITATIONS

9.1. Block Diagram of Test Setup



9.2. Specification Limits

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, that the required attenuation shall be 30 dB instead of 20 dB.

Attenuation below the general limits specified in Section 15.209(a)/RSS-Gen Section 8.9 table 4 is not required. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205(a)/RSS-Gen Section 8.10 table 6, must also comply with the radiated emission limits specified in Section 15.209(a)/RSS-Gen Section 8.9 table 4 (See Section 15.205(c)).

9.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10:2013:

■ Reference Level

- (1) Set analyzer center frequency to DTS channel center frequency.
- (2) Set the span to 1.5 times the DTS bandwidth.
- (3) Set the RBW to: 100 kHz.
- (4) Set the VBW $\geq 3 \times$ RBW.
- (5) Detector = peak.
- (6) Sweep time = auto couple.
- (7) Trace mode = max hold.
- (8) Allow trace to fully stabilize to find the max PSD as reference level.

■ Emission Level Measurement

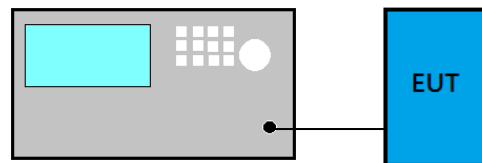
- (1) Set analyzer center frequency to DTS channel center frequency.
- (2) Set the span to 1.5 times the DTS bandwidth.
- (3) Set the RBW to: 100 kHz.
- (4) Set the VBW $\geq 3 \times$ RBW.
- (5) Detector = peak.
- (6) Sweep time = auto couple.
- (7) Trace mode = max hold.
- (8) Allow trace to fully stabilize to find the max level.

9.4. Test Results

Please refer to Appendix A

10. POWER SPECTRAL DENSITY

10.1. Block Diagram of Test Setup



10.2. Specification Limits

The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band.

10.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10:2013:

Method PKPSD (peak PSD)

- (1) Set analyzer center frequency to DTS channel center frequency.
- (2) Set the span to 1.5 times the DTS bandwidth.
- (3) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- (4) Set the VBW $\geq 3 \times \text{RBW}$.
- (5) Detector = peak.
- (6) Sweep time = auto couple.
- (7) Trace mode = max hold.
- (8) Allow trace to fully stabilize.
- (9) Use the peak marker function to determine the maximum amplitude level.
- (10) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Method AVGPSD-2

- (1) Using peak PSD procedure step 1 to step 4.
- (2) Detector = RMS detector
- (3) Sweep time = auto couple
- (4) Trace mode = trace averaging over a minimum of 100 traces
- (5) Use the peak marker function to determine the maximum amplitude level.
- (6) Duty cycle factor is added when duty cycle presented in section 3.7 < 98%.
- (7) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

10.4. Test Results

Please refer to Appendix A

11.DEVIATION TO TEST SPECIFICATIONS

【NONE】



*Audix Technology Corp.
No. 53-11, Dingfu, Linkou, Dist.,
New Taipei City 244, Taiwan*

*Tel: +886 2 26099301
Fax: +886 2 26099303*

APPDNDIX A

TEST DATA AND PLOTS

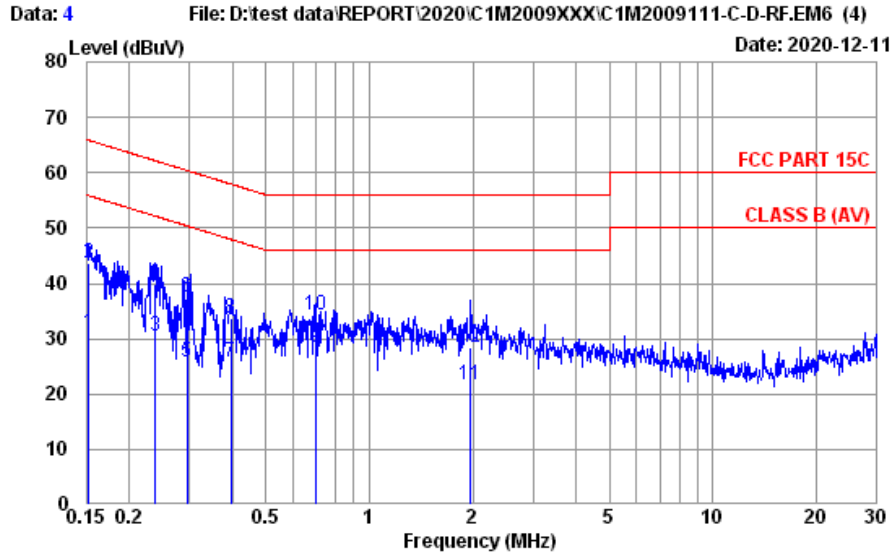
(Model: T16IZ)

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A.1 CONDUCTED EMISSION

Test Date	2020/12/11	Temp./Hum.	25°C/66%
Test Voltage	AC 120V 60Hz (Via AC Adapter)	Tested By	Chucky Chiu

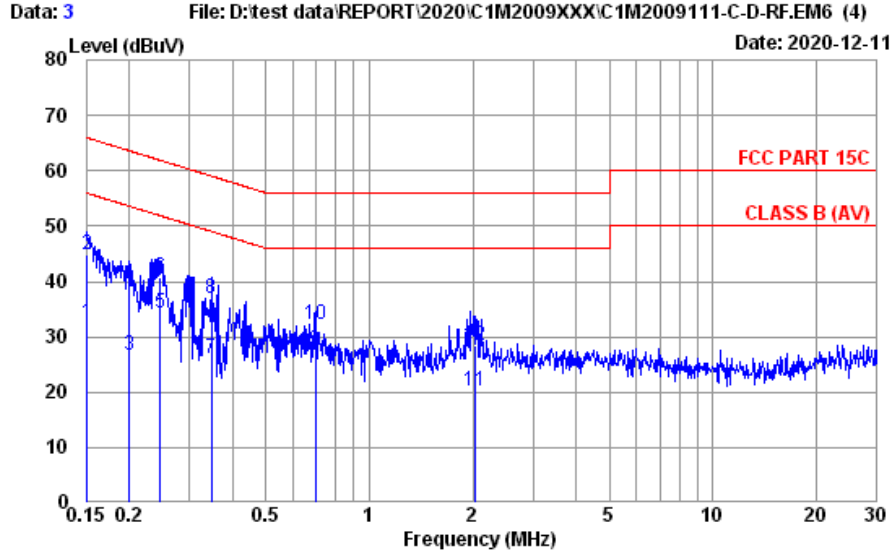


Site No.	: No.8 Shielded Room	Data No.	: 4
Instrument 1	: Receiver ESR(774)		
Instrument 2	: EIV432 (567)(A) CE-08 ESH3-Z2 (354)		
Limit	: FCC PART 15C	Phase	: NEUTRAL
Environment	: 25°C / 66%	Engineer	: Chucky Chiu
EUT Model	: T161Z	Test Rating	: 120Vac / 60Hz
Test Mode	: Charge		

	Freq. (MHz)	AMI Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBµV)	Emission Level (dBµV)	Limits (dBµV)	Margin (dB)	Remark
1	0.152	10.20	0.03	9.85	11.02	31.10	55.87	24.77	Average
2	0.152	10.20	0.03	9.85	23.63	43.71	65.87	22.16	QP
3	0.238	10.20	0.03	9.85	10.36	30.44	52.17	21.73	Average
4	0.238	10.20	0.03	9.85	19.90	39.98	62.17	22.19	QP
5	0.294	10.20	0.03	9.85	5.84	25.92	50.41	24.49	Average
6	0.294	10.20	0.03	9.85	17.29	37.37	60.41	23.04	QP
7	0.396	10.20	0.03	9.85	5.66	25.74	47.95	22.21	Average
8	0.396	10.20	0.03	9.85	13.61	33.69	57.95	24.26	QP
9	0.697	10.20	0.04	9.85	8.41	28.50	46.00	17.50	Average
10	0.697	10.20	0.04	9.85	14.07	34.16	56.00	21.84	QP
11	1.970	10.30	0.06	9.86	1.53	21.75	46.00	24.25	Average
12	1.970	10.30	0.06	9.86	8.15	28.37	56.00	27.63	QP

Remarks: 1. Emission Level= AMI Factor + Cable Loss + Pulse Att. + Reading.

Test Date	2020/12/11	Temp./Hum.	25°C/66%
Test Voltage	AC 120V 60Hz (Via AC Adapter)	Tested By	Chucky Chiu



Site No.	: No.8 Shielded Room	Data No.	: 3
Instrument 1	: Receiver ESR(774)		
Instrument 2	: EHV432 (567)(A) CE-08 ESH3-22 (354)		
Limit	: FCC PART 15C	Phase	: LINE
Environment	: 25°C / 66%	Engineer	: Chucky Chiu
EUT Model	: T161Z	Test Rating	: 120Vac / 60Hz
Test Mode	: Charge		

	Freq. (MHz)	AMI Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBµV)	Emission Level (dBµV)	Limits (dBµV)	Margin (dB)	Remark
1	0.151	10.20	0.03	9.85	12.46	32.54	55.96	23.42	Average
2	0.151	10.20	0.03	9.85	24.70	44.78	65.96	21.18	QP
3	0.201	10.20	0.03	9.85	6.68	26.76	53.58	26.82	Average
4	0.201	10.20	0.03	9.85	19.37	39.45	63.58	24.13	QP
5	0.247	10.20	0.03	9.85	14.30	34.38	51.86	17.48	Average
6	0.247	10.20	0.03	9.85	20.60	40.68	61.86	21.18	QP
7	0.346	10.20	0.03	9.85	6.03	26.11	49.05	22.94	Average
8	0.346	10.20	0.03	9.85	16.88	36.96	59.05	22.09	QP
9	0.696	10.20	0.04	9.85	7.32	27.41	46.00	18.59	Average
10	0.696	10.20	0.04	9.85	12.21	32.30	56.00	23.70	QP
11	2.033	10.30	0.06	9.86	-0.13	20.09	46.00	25.91	Average
12	2.033	10.30	0.06	9.86	8.31	28.53	56.00	27.47	QP

Remarks: 1. Emission Level= AMI Factor + Cable Loss + Pulse Att. + Reading.

A.2 RADIATED EMISSION

Test Date	2020/11/30~12/04	Temp./Hum.	21~22°C/58~67%
Test Voltage	(1)AC 120V 60Hz (Via AC Adapter) (2)DC 7.4V (Via Battery)	Tested By	Kuper Hsu

A.2.1 Emissions within Restricted Frequency Bands

A.2.1.1 Frequency 9kHz~30MHz

The emissions (9kHz~30MHz) not reported for there is no emission be found.

A.2.1.2 Frequency Below 1GHz

Mode	Charge Mode	Frequency	---					
Antenna at Horizontal Polarization								
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
76.560	12.92	2.12	26.39	42.81	31.46	40.00	8.54	Peak
204.600	15.70	3.60	25.86	45.35	38.79	43.50	4.71	Peak
296.750	19.24	4.52	0.00	18.90	42.66	46.00	3.34	QP
774.960	25.83	8.00	27.44	29.41	35.80	46.00	10.20	Peak
920.460	26.94	8.81	27.07	29.09	37.77	46.00	8.23	Peak
971.870	27.25	9.04	26.92	28.83	38.20	54.00	15.80	Peak
Antenna at Vertical Polarization								
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
34.850	22.18	1.35	0.00	14.50	38.03	40.00	1.97	QP
49.400	14.82	1.64	0.00	23.30	39.76	40.00	0.24	QP
74.620	12.80	2.09	0.00	19.60	34.49	40.00	5.51	QP
202.660	15.54	3.58	25.86	39.36	32.62	43.50	10.88	Peak
285.110	19.11	4.39	25.72	42.25	40.03	46.00	5.97	Peak
980.600	27.28	9.07	26.90	28.93	38.38	54.00	15.62	Peak

Mode	FASSTest	Frequency	TX 2405.376MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
32.910	22.98	1.29	26.53	27.53	25.27	40.00	14.73	Peak
152.220	17.10	3.08	26.04	39.08	33.22	43.50	10.28	Peak
210.420	16.12	3.65	25.85	39.83	33.75	43.50	9.75	Peak
412.180	22.06	6.13	26.64	34.14	35.69	46.00	10.31	Peak
730.340	25.33	7.77	27.47	30.40	36.03	46.00	9.97	Peak
969.930	27.23	9.03	26.92	28.77	38.11	54.00	15.89	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
31.940	23.35	1.26	26.53	28.47	26.55	40.00	13.45	Peak
137.670	18.14	2.91	26.11	43.86	38.80	43.50	4.70	Peak
210.420	16.12	3.65	25.85	36.55	30.47	43.50	13.03	Peak
531.490	23.94	6.96	27.32	31.36	34.94	46.00	11.06	Peak
849.650	26.48	8.42	27.28	29.48	37.10	46.00	8.90	Peak
980.600	27.28	9.07	26.90	28.58	38.03	54.00	15.97	Peak

Mode	FASST	Frequency	TX 2405.376MHz
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Antenna at Horizontal Polarization

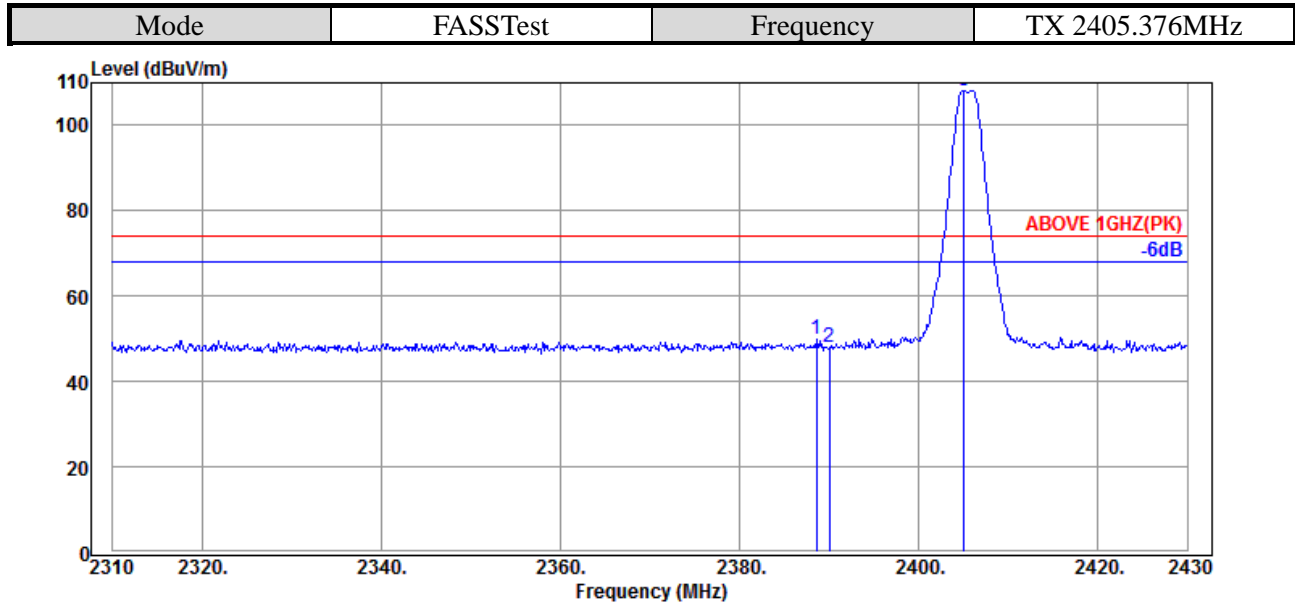
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
33.880	22.55	1.32	26.52	27.09	24.44	40.00	15.56	Peak
137.670	18.14	2.91	26.11	36.51	31.45	43.50	12.05	Peak
210.420	16.12	3.65	25.85	39.54	33.46	43.50	10.04	Peak
408.300	22.01	6.10	26.61	34.55	36.05	46.00	9.95	Peak
724.520	25.27	7.74	27.48	29.39	34.92	46.00	11.08	Peak
994.180	27.36	9.13	26.84	28.35	38.00	54.00	16.00	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
30.970	23.78	1.23	26.53	27.89	26.37	40.00	13.63	Peak
137.670	18.14	2.91	26.11	44.85	39.79	43.50	3.71	Peak
210.420	16.12	3.65	25.85	36.47	30.39	43.50	13.11	Peak
569.320	24.42	7.00	27.41	28.88	32.89	46.00	13.11	Peak
858.380	26.52	8.47	27.26	28.81	36.54	46.00	9.46	Peak
964.110	27.21	9.00	26.95	28.86	38.12	54.00	15.88	Peak

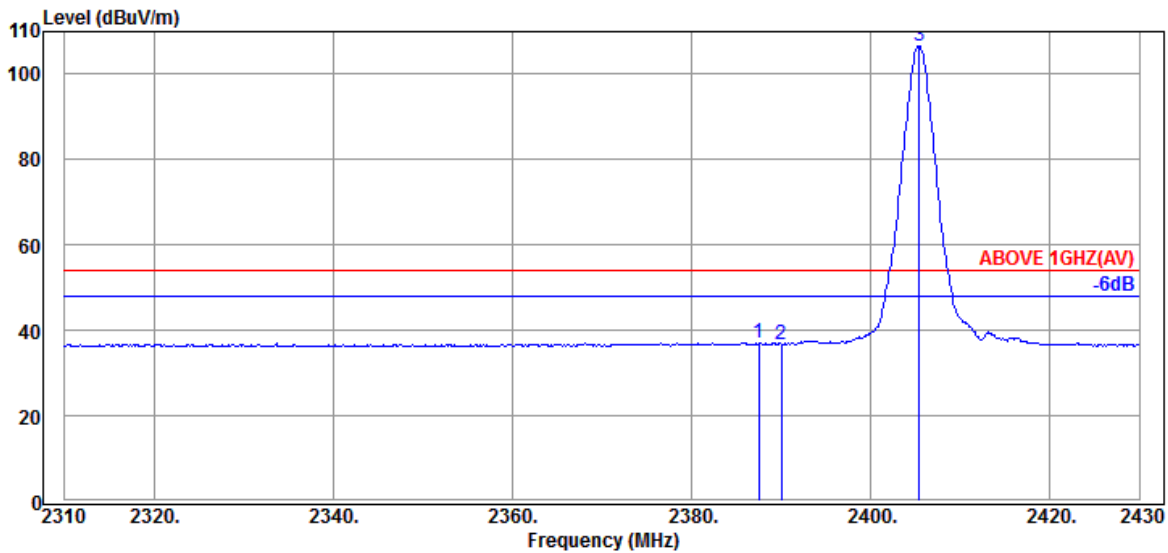
A.2.1.3 Frequency Above 1 GHz to 10th harmonics

Band Edge:



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2388.600	32.44	7.95	34.58	44.18	49.99	74.00	24.01	Peak
2390.040	32.44	7.95	34.58	42.05	47.86	74.00	26.14	Peak
@ 2405.040	32.43	7.95	34.59	102.42	108.21	---	---	Peak

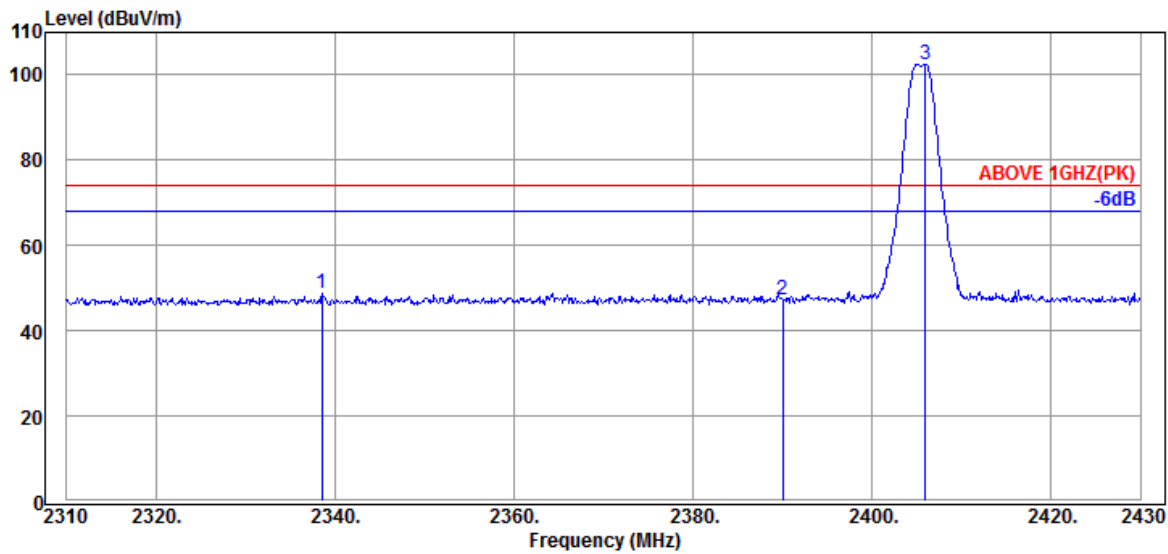


Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2387.520	32.44	7.95	34.58	31.20	37.01	54.00	16.99	Average
2390.040	32.44	7.95	34.58	31.03	36.84	54.00	17.16	Average
@ 2405.400	32.43	7.95	34.59	100.86	106.65	---	---	Average

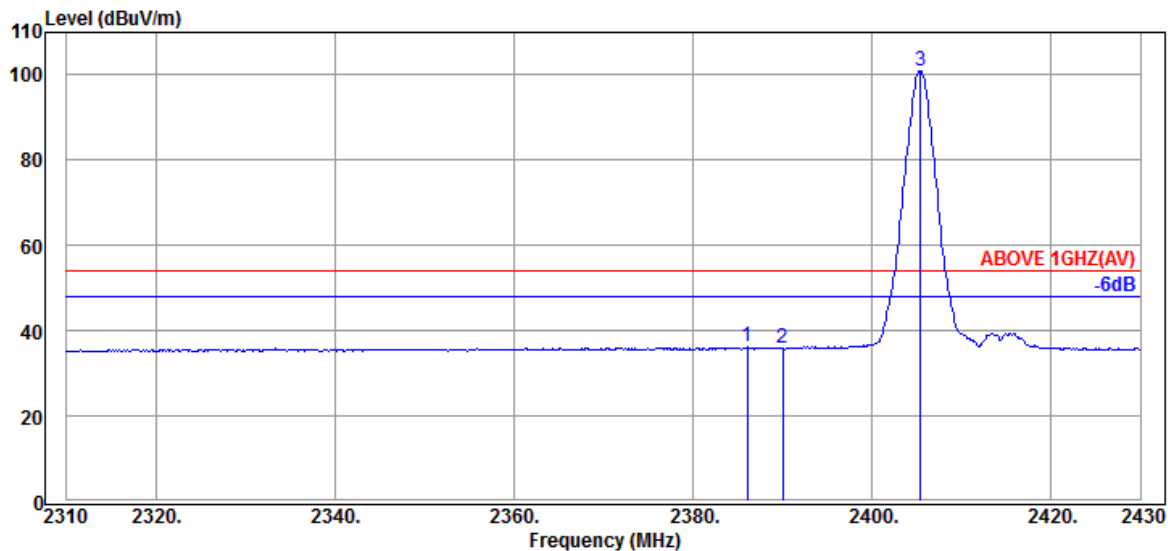
Remark: The “@” means fundamental frequency, it is ignored in this section.

Mode	FASSTest	Frequency	TX 2405.376MHz
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Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2338.560	32.17	7.92	34.57	43.39	48.91	74.00	25.09	Peak
2390.040	32.44	7.95	34.58	41.62	47.43	74.00	26.57	Peak
@ 2406.000	32.43	7.95	34.59	96.81	102.60	---	---	Peak

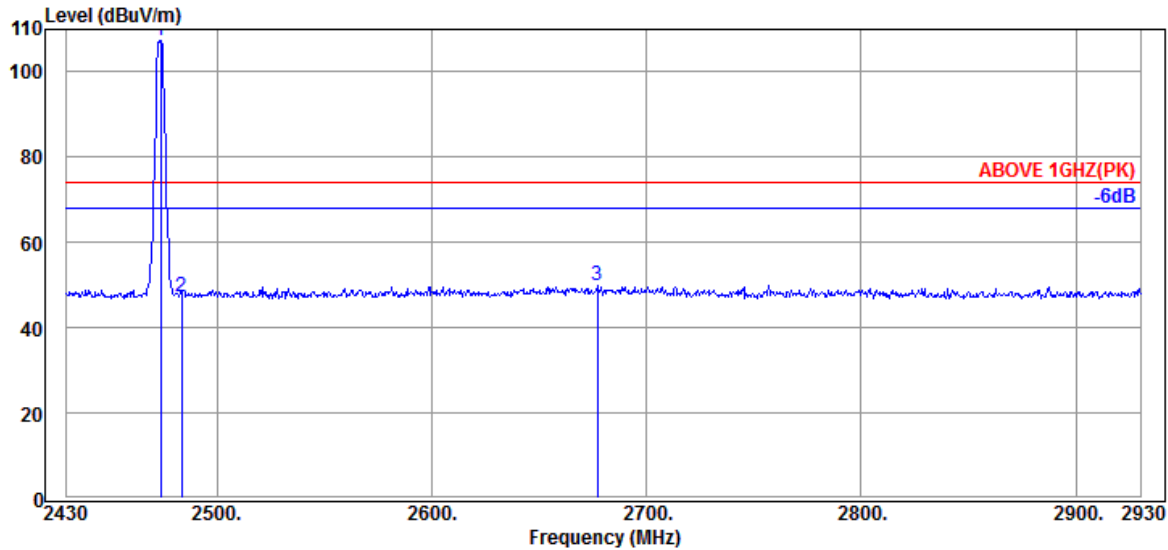


Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2386.080	32.44	7.95	34.58	30.33	36.14	54.00	17.86	Average
2390.040	32.44	7.95	34.58	30.00	35.81	54.00	18.19	Average
@ 2405.400	32.43	7.95	34.59	95.20	100.99	---	---	Average

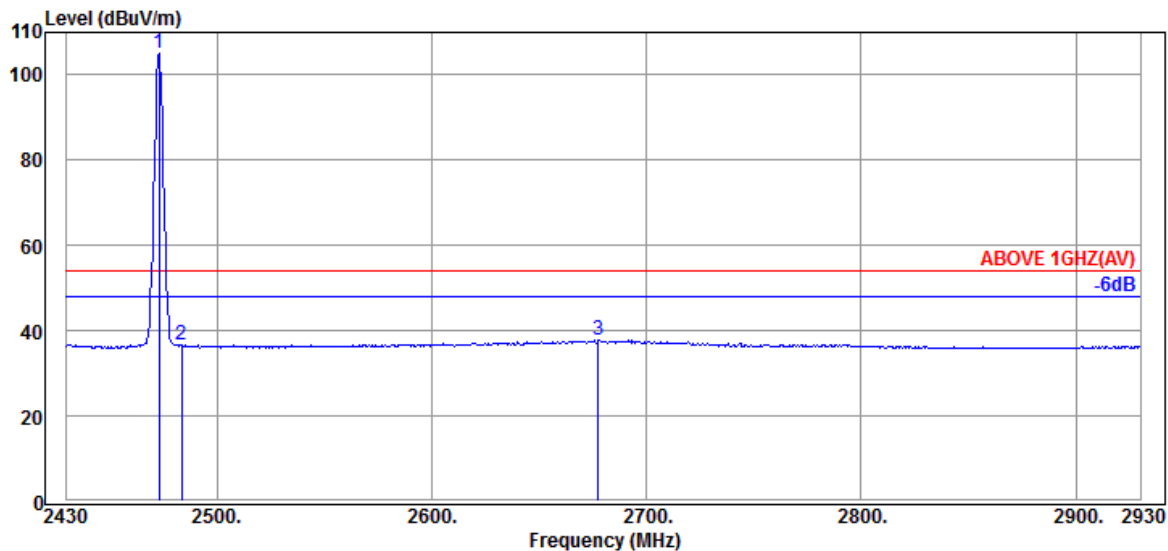
Remark: The "@" means fundamental frequency, it is ignored in this section.

Mode	FASSTest	Frequency	TX 2472.960MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@ 2474.000	32.09	7.99	34.60	101.83	107.31	---	---	Peak
2483.500	32.14	7.99	34.61	41.72	47.24	74.00	26.76	Peak
2677.000	32.31	8.08	34.64	44.31	50.06	74.00	23.94	Peak

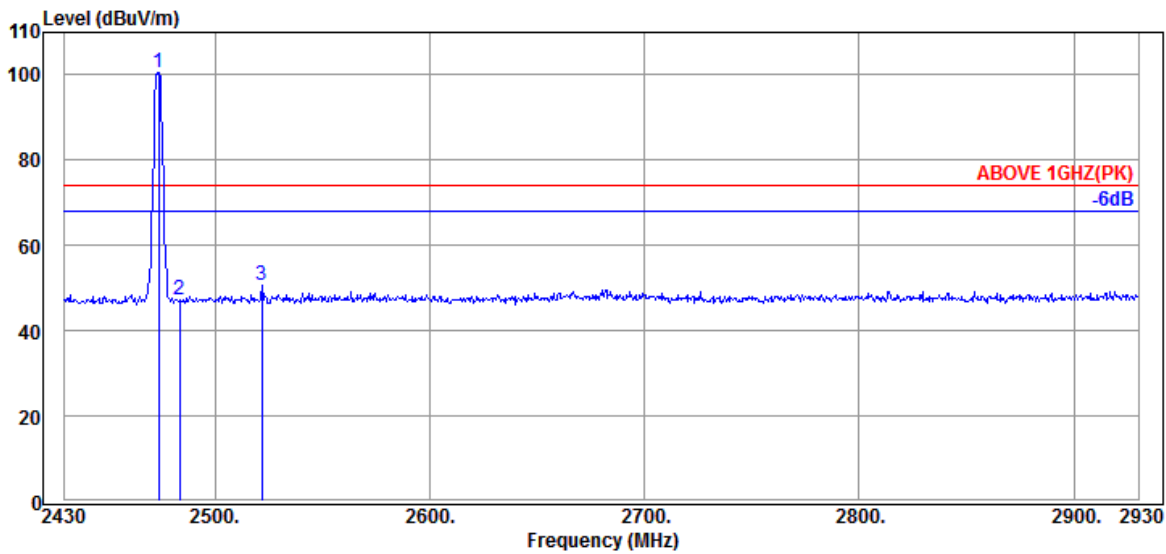


Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@ 2473.000	32.09	7.99	34.60	99.68	105.16	---	---	Average
2483.500	32.14	7.99	34.61	31.10	36.62	54.00	17.38	Average
2677.500	32.31	8.08	34.64	31.99	37.74	54.00	16.26	Average

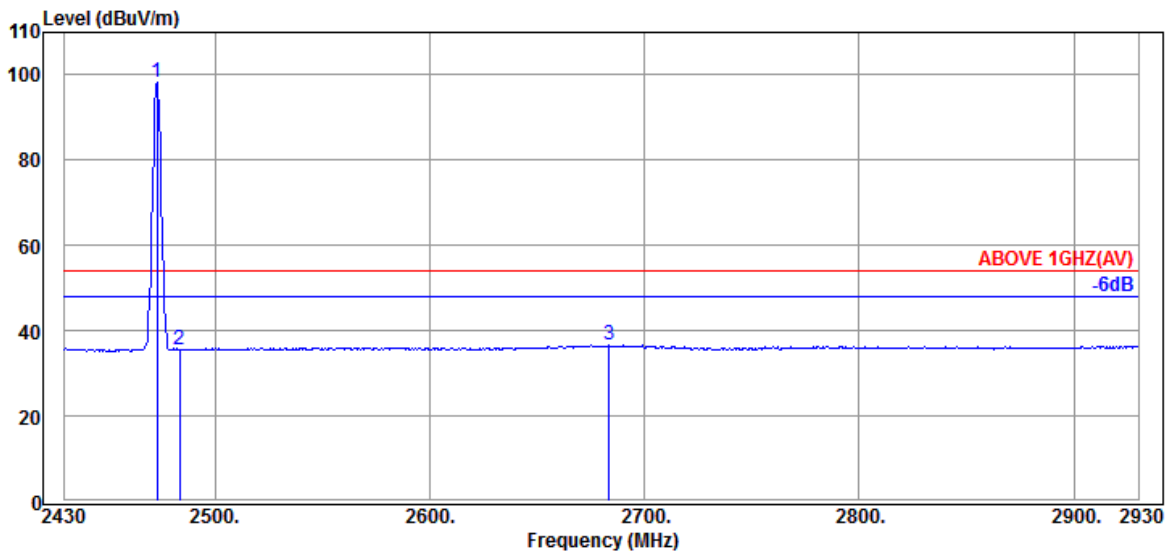
Remark: The "@" means fundamental frequency, it is ignored in this section.

Mode	FASSTest	Frequency	TX 2472.960MHz
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Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@ 2474.000	32.09	7.99	34.60	94.95	100.43	---	---	Peak
2483.500	32.14	7.99	34.61	41.75	47.27	74.00	26.73	Peak
2522.000	32.24	8.02	34.61	44.87	50.52	74.00	23.48	Peak

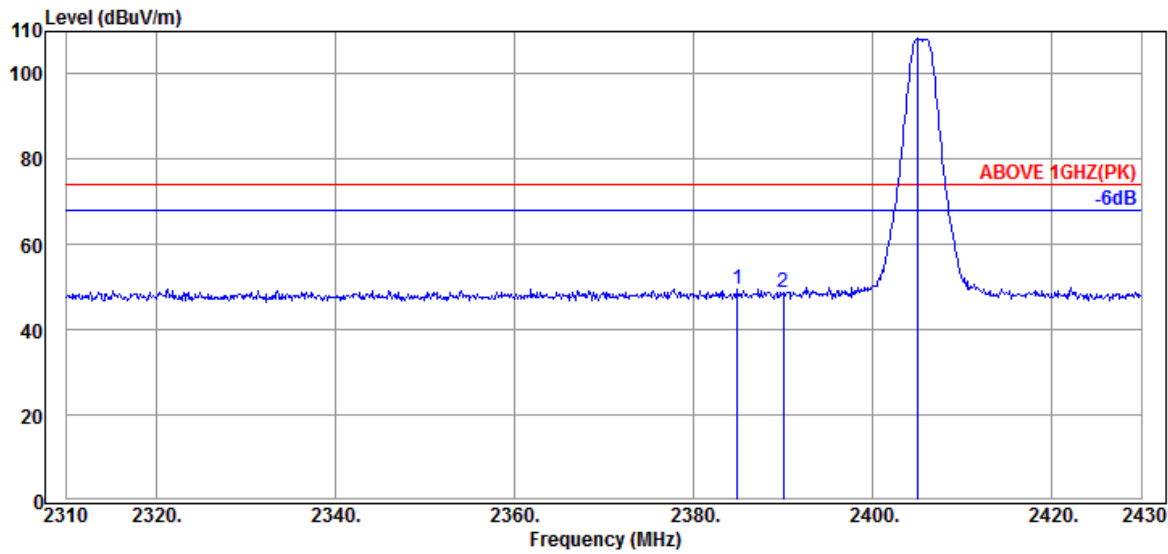


Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@ 2473.000	32.09	7.99	34.60	92.92	98.40	---	---	Average
2483.500	32.14	7.99	34.61	30.05	35.57	54.00	18.43	Average
2683.500	32.34	8.08	34.64	30.85	36.63	54.00	17.37	Average

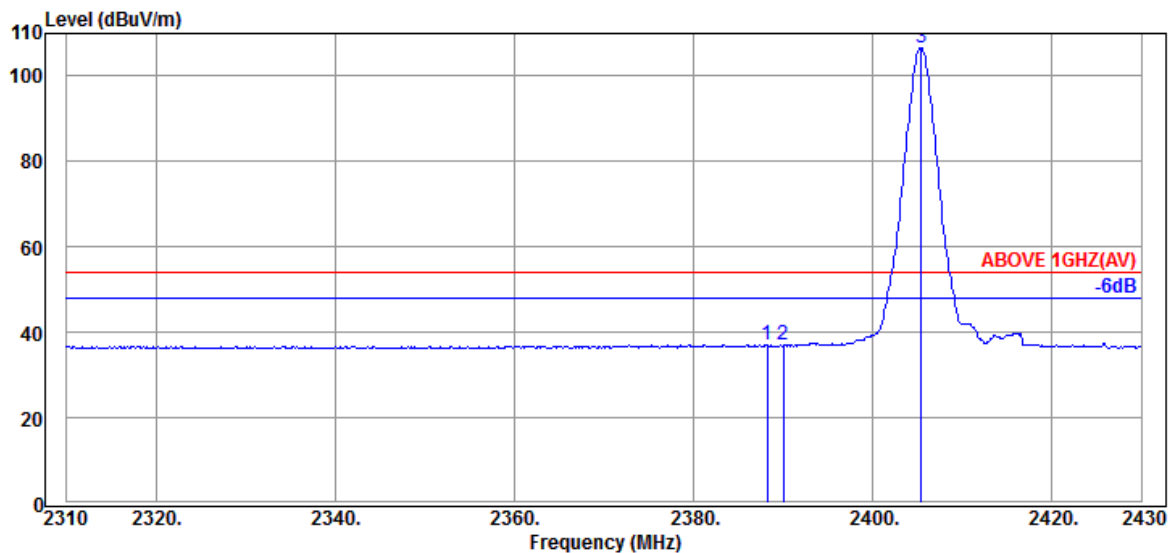
Remark: The "@" means fundamental frequency, it is ignored in this section.

Mode	FASST	Frequency	TX 2405.376MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2384.880	32.44	7.95	34.58	43.66	49.47	74.00	24.53	Peak
2390.040	32.44	7.95	34.58	42.83	48.64	74.00	25.36	Peak
@ 2405.040	32.43	7.95	34.59	102.51	108.30	---	---	Peak

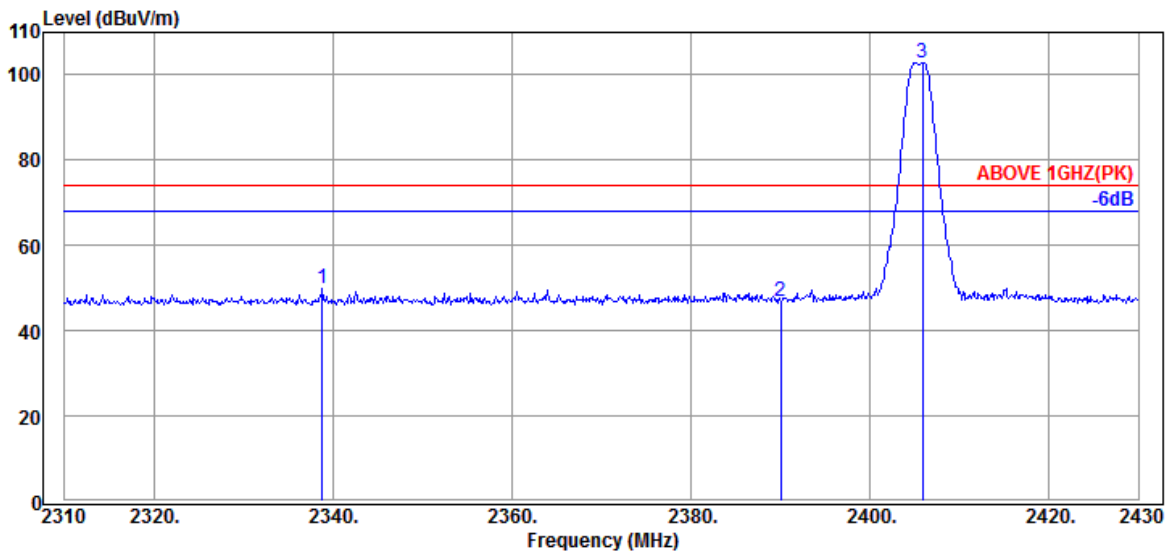


Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2388.240	32.44	7.95	34.58	31.27	37.08	54.00	16.92	Average
2390.040	32.44	7.95	34.58	31.08	36.89	54.00	17.11	Average
@ 2405.400	32.43	7.95	34.59	100.84	106.63	---	---	Average

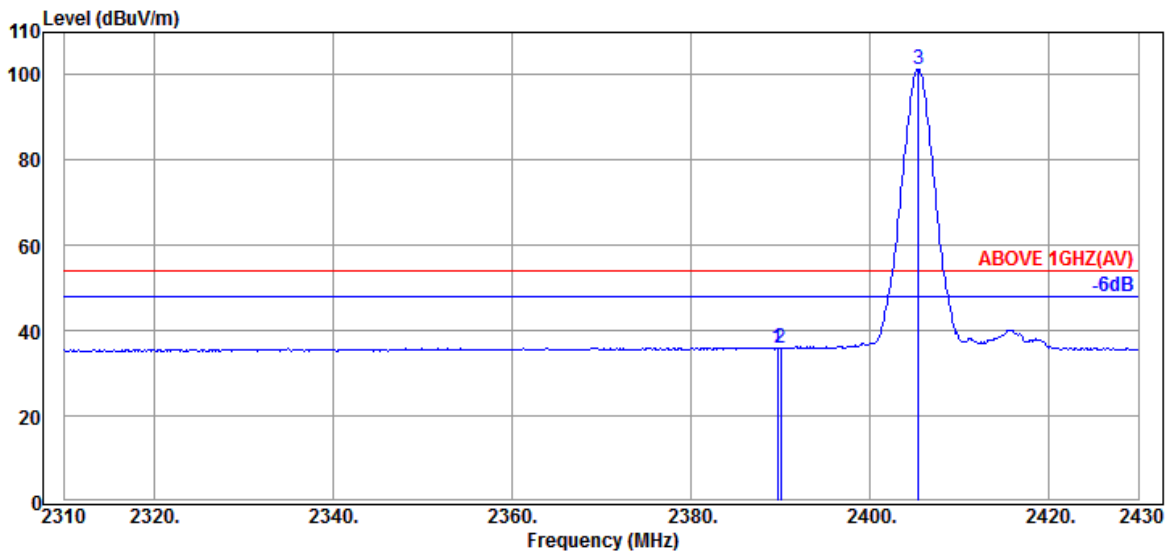
Remark: The “@” means fundamental frequency, it is ignored in this section.

Mode	FASST	Frequency	TX 2405.376MHz
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Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2338.800	32.17	7.92	34.57	44.24	49.76	74.00	24.24	Peak
2390.040	32.44	7.95	34.58	40.99	46.80	74.00	27.20	Peak
@ 2405.880	32.43	7.95	34.59	97.14	102.93	---	---	Peak

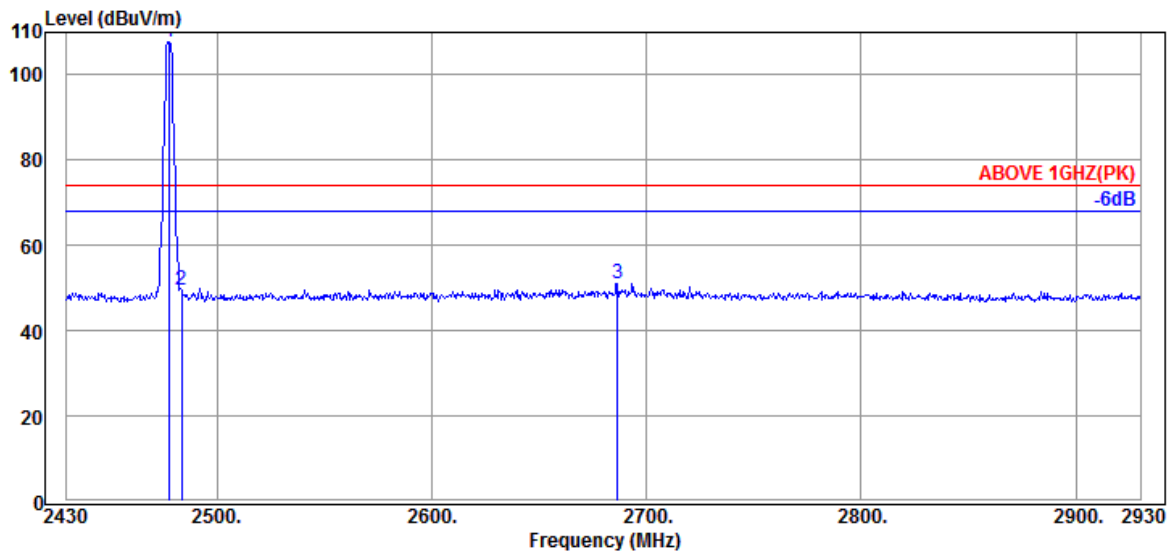


Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2389.680	32.44	7.95	34.58	30.28	36.09	54.00	17.91	Average
2390.040	32.44	7.95	34.58	30.09	35.90	54.00	18.10	Average
@ 2405.400	32.43	7.95	34.59	95.52	101.31	---	---	Average

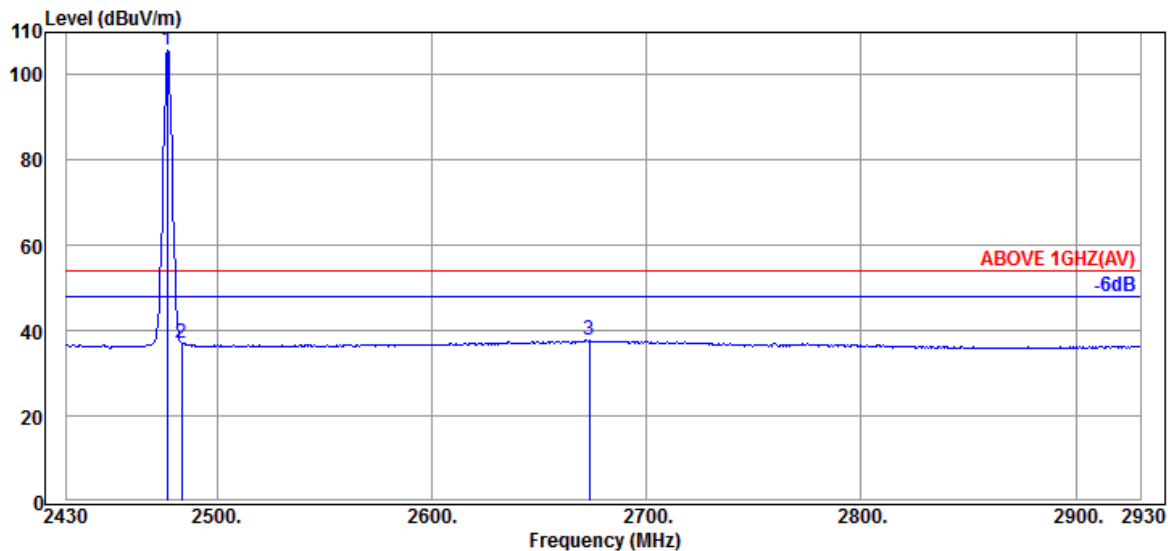
Remark: The "@" means fundamental frequency, it is ignored in this section.

Mode	FASST	Frequency	TX 2477.056MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@ 2478.000	32.11	7.99	34.60	102.11	107.61	---	---	Peak
2483.500	32.14	7.99	34.61	43.96	49.48	74.00	24.52	Peak
2686.500	32.34	8.09	34.65	45.35	51.13	74.00	22.87	Peak

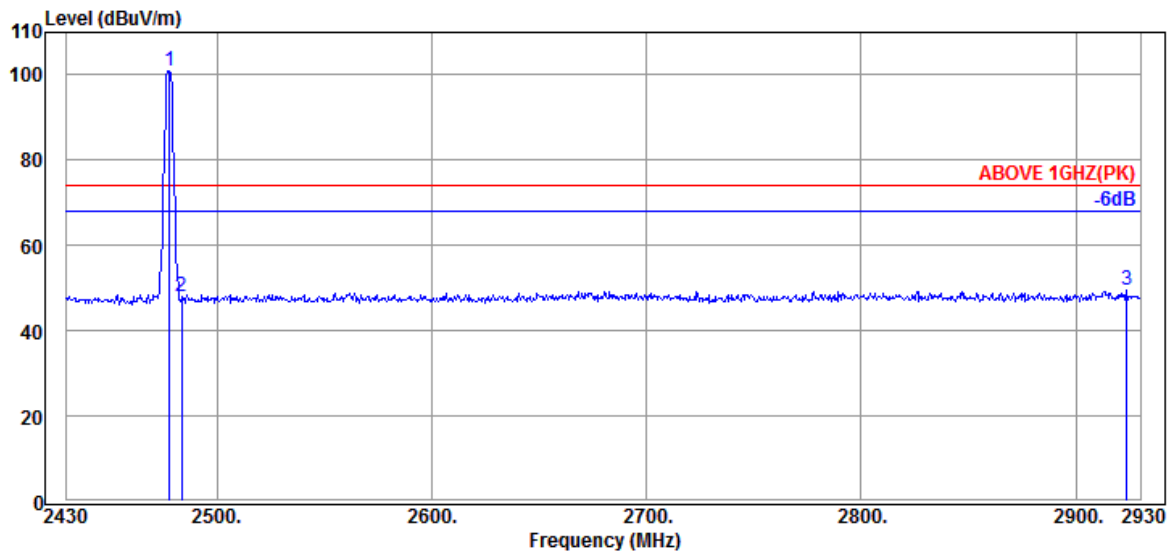


Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@ 2477.000	32.11	7.99	34.60	100.17	105.67	---	---	Average
2483.500	32.14	7.99	34.61	31.42	36.94	54.00	17.06	Average
2673.500	32.29	8.08	34.64	32.19	37.92	54.00	16.08	Average

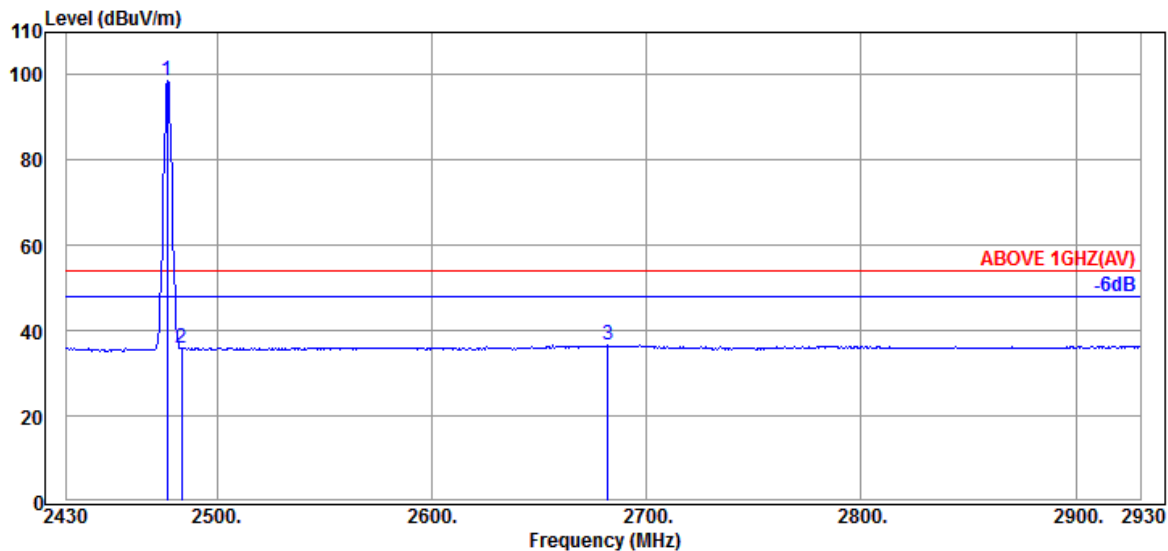
Remark: The “@” means fundamental frequency, it is ignored in this section.

Mode	FASST	Frequency	TX 2477.056MHz
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Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@ 2478.000	32.11	7.99	34.60	95.34	100.84	---	---	Peak
2483.500	32.14	7.99	34.61	42.41	47.93	74.00	26.07	Peak
2923.500	32.90	8.19	34.69	43.17	49.57	74.00	24.43	Peak



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@ 2477.000	32.11	7.99	34.60	93.29	98.79	---	---	Average
2483.500	32.14	7.99	34.61	30.22	35.74	54.00	18.26	Average
2682.000	32.31	8.08	34.64	30.80	36.55	54.00	17.45	Average

Remark: The “@” means fundamental frequency, it is ignored in this section.

A.2.2 Emissions outside the frequency band:

The emissions (up to 25GHz) not reported for there is no emission be found.

Mode	FASSTest	Frequency	TX 2405.376MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
3208.000	32.52	8.57	34.64	47.25	53.70	54.00	0.30	Peak
4810.000	34.10	10.49	34.47	36.94	47.06	54.00	6.94	Average
4810.000	34.10	10.49	34.47	46.25	56.37	74.00	17.63	Peak
7217.000	35.60	12.25	34.60	38.74	51.99	54.00	2.01	Average
7217.000	35.60	12.25	34.60	44.95	58.20	74.00	15.80	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
3208.000	32.52	8.57	34.64	44.02	50.47	54.00	3.53	Peak
4810.000	34.10	10.49	34.47	39.43	49.55	54.00	4.45	Average
4810.000	34.10	10.49	34.47	49.12	59.24	74.00	14.76	Peak
7217.000	35.60	12.25	34.60	36.45	49.70	54.00	4.30	Average
7217.000	35.60	12.25	34.60	42.74	55.99	74.00	18.01	Peak

Mode	FASSTest	Frequency	TX 2439.168MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
3254.000	32.60	8.68	34.63	47.23	53.88	54.00	0.12	Average
3254.000	32.60	8.68	34.63	49.21	55.86	74.00	18.14	Peak
4878.000	34.05	10.54	34.45	39.01	49.15	54.00	4.85	Peak
7319.000	35.60	12.29	34.68	36.99	50.20	54.00	3.80	Average
7319.000	35.60	12.29	34.68	48.43	61.64	74.00	12.36	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
3254.000	32.60	8.68	34.63	45.74	52.39	54.00	1.61	Peak
4878.000	34.05	10.54	34.45	41.28	51.42	54.00	2.58	Peak
7319.000	35.60	12.29	34.68	36.71	49.92	54.00	4.08	Average
7319.000	35.60	12.29	34.68	48.20	61.41	74.00	12.59	Peak

Mode	FASSTest	Frequency	TX 2472.960MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
3298.000	33.00	8.75	34.62	46.01	53.14	54.00	0.86	Average
3298.000	33.00	8.75	34.62	50.34	57.47	74.00	16.53	Peak
4946.000	34.10	10.58	34.44	37.12	47.36	54.00	6.64	Average
4946.000	34.10	10.58	34.44	47.46	57.70	74.00	16.30	Peak
7418.000	35.67	12.34	34.76	36.36	49.61	54.00	4.39	Average
7418.000	35.67	12.34	34.76	42.03	55.28	74.00	18.72	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
3298.000	33.00	8.75	34.62	45.99	53.12	54.00	0.88	Peak
4946.000	34.10	10.58	34.44	40.96	51.20	54.00	2.80	Average
4946.000	34.10	10.58	34.44	50.87	61.11	74.00	12.89	Peak
7418.000	35.67	12.34	34.76	38.30	51.55	54.00	2.45	Average
7418.000	35.67	12.34	34.76	44.19	57.44	74.00	16.56	Peak

Mode	FASST	Frequency	TX 2405.376MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
3208.000	32.52	8.57	34.64	47.17	53.62	54.00	0.38	Peak
4810.000	34.10	10.49	34.47	37.96	48.08	54.00	5.92	Average
4812.000	34.10	10.49	34.47	46.24	56.36	74.00	17.64	Peak
7217.000	35.60	12.25	34.60	39.62	52.87	54.00	1.13	Average
7217.000	35.60	12.25	34.60	45.51	58.76	74.00	15.24	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
3208.000	32.52	8.57	34.64	44.27	50.72	54.00	3.28	Peak
4810.000	34.10	10.49	34.47	42.88	53.00	54.00	1.00	Average
4810.000	34.10	10.49	34.47	47.68	57.80	74.00	16.20	Peak
7217.000	35.60	12.25	34.60	36.73	49.98	54.00	4.02	Average
7217.000	35.60	12.25	34.60	42.35	55.60	74.00	18.40	Peak

Mode	FASST	Frequency	TX 2440.192MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
3254.000	32.60	8.68	34.63	44.64	51.29	54.00	2.71	Average
3254.000	32.60	8.68	34.63	49.09	55.74	74.00	18.26	Peak
4880.000	34.05	10.54	34.45	38.70	48.84	54.00	5.16	Peak
7322.000	35.60	12.29	34.70	38.31	51.50	54.00	2.50	Average
7322.000	35.60	12.29	34.70	48.13	61.32	74.00	12.68	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
3254.000	32.60	8.68	34.63	45.65	52.30	54.00	1.70	Peak
4880.000	34.05	10.54	34.45	39.16	49.30	54.00	4.70	Peak
7322.000	35.60	12.29	34.70	44.77	57.96	74.00	16.04	Peak
7322.000	35.60	12.29	34.70	35.00	48.19	54.00	5.81	Average

Mode	FASST	Frequency	TX 2477.056MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
3254.000	32.60	8.68	34.63	46.80	53.45	54.00	0.55	Average
3254.000	32.60	8.68	34.63	50.72	57.37	74.00	16.63	Peak
4880.000	34.05	10.54	34.45	39.10	49.24	54.00	4.76	Peak
7319.000	35.60	12.29	34.68	50.62	63.83	74.00	10.17	Peak
7322.000	35.60	12.29	34.70	38.35	51.54	54.00	2.46	Average

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
3254.000	32.60	8.68	34.63	46.80	53.45	54.00	0.55	Peak
4880.000	34.05	10.54	34.45	41.41	51.55	54.00	2.45	Peak
7322.000	35.60	12.29	34.70	37.20	50.39	54.00	3.61	Average
7322.000	35.60	12.29	34.70	47.22	60.41	74.00	13.59	Peak

A.2.3 Emissions in Non-restricted Frequency Bands:

Pursuant to ANSI C63.10:2013 that emission levels below the FCC 15.209(a)/RSS-Gen Section 8.9table 4 general radiated emissions limits is not required.

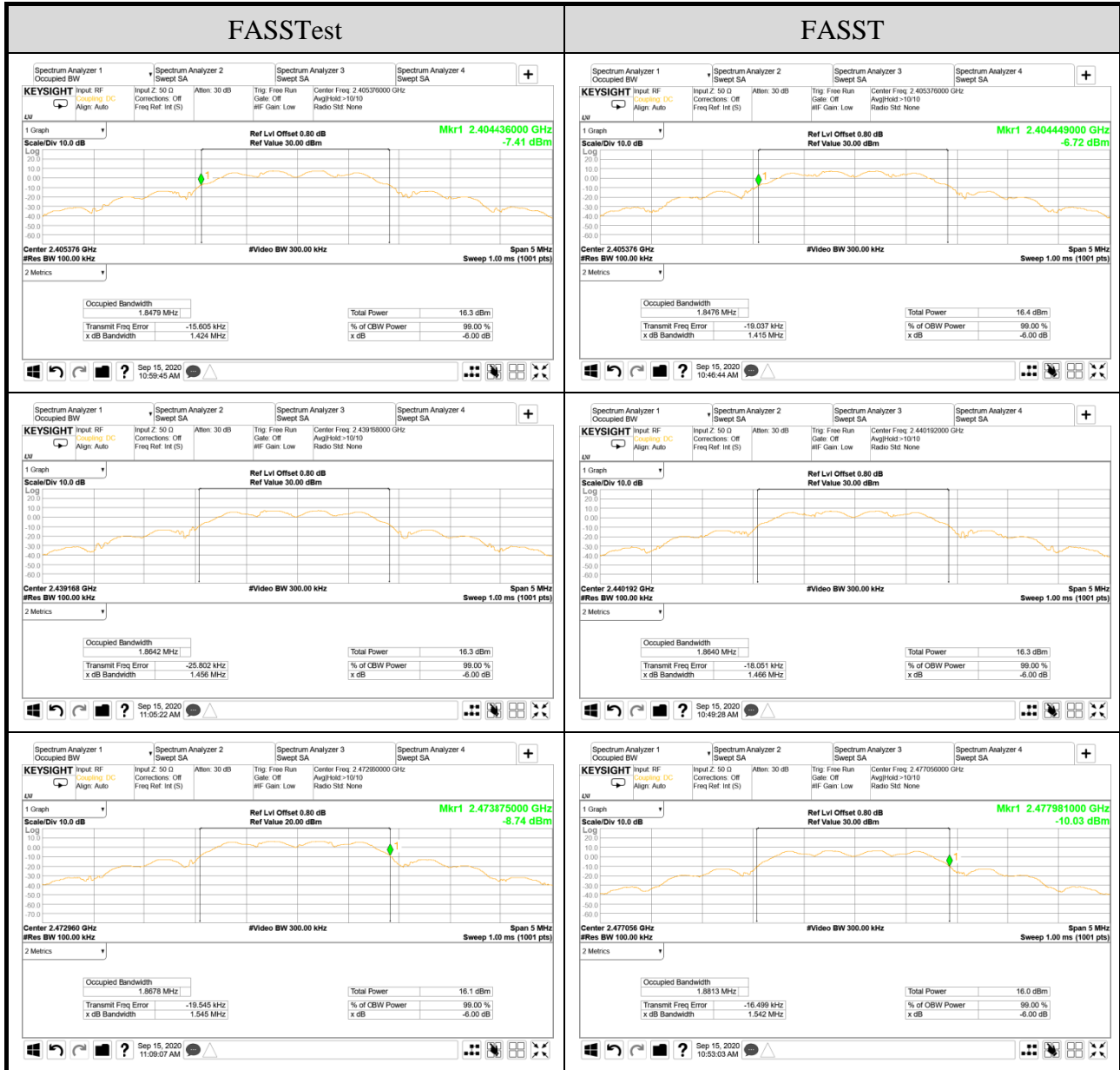
A.3 6dB/OCCUPIED BANDWIDTH

Test Date	2020/09/15	Temp./Hum.	25°C/52%
Cable Loss	0.80dB	Tested By	Kuper Hsu
Test Voltage	DC 7.4V (Via Battery)		

A.3.1 Emission Bandwidth Result

Mode	Centre Frequency (MHz)	6 dB Bandwidth (MHz)	Occupied (99%) Bandwidth (MHz)	Limit
FASSTest	2405.376	1.424	1.8479	>500kHz
	2439.168	1.456	1.8642	
	2472.960	1.545	1.8678	
FASST	2405.376	1.415	1.8476	
	2440.192	1.466	1.8640	
	2477.056	1.542	1.8813	

A.3.2 Measurement Plots



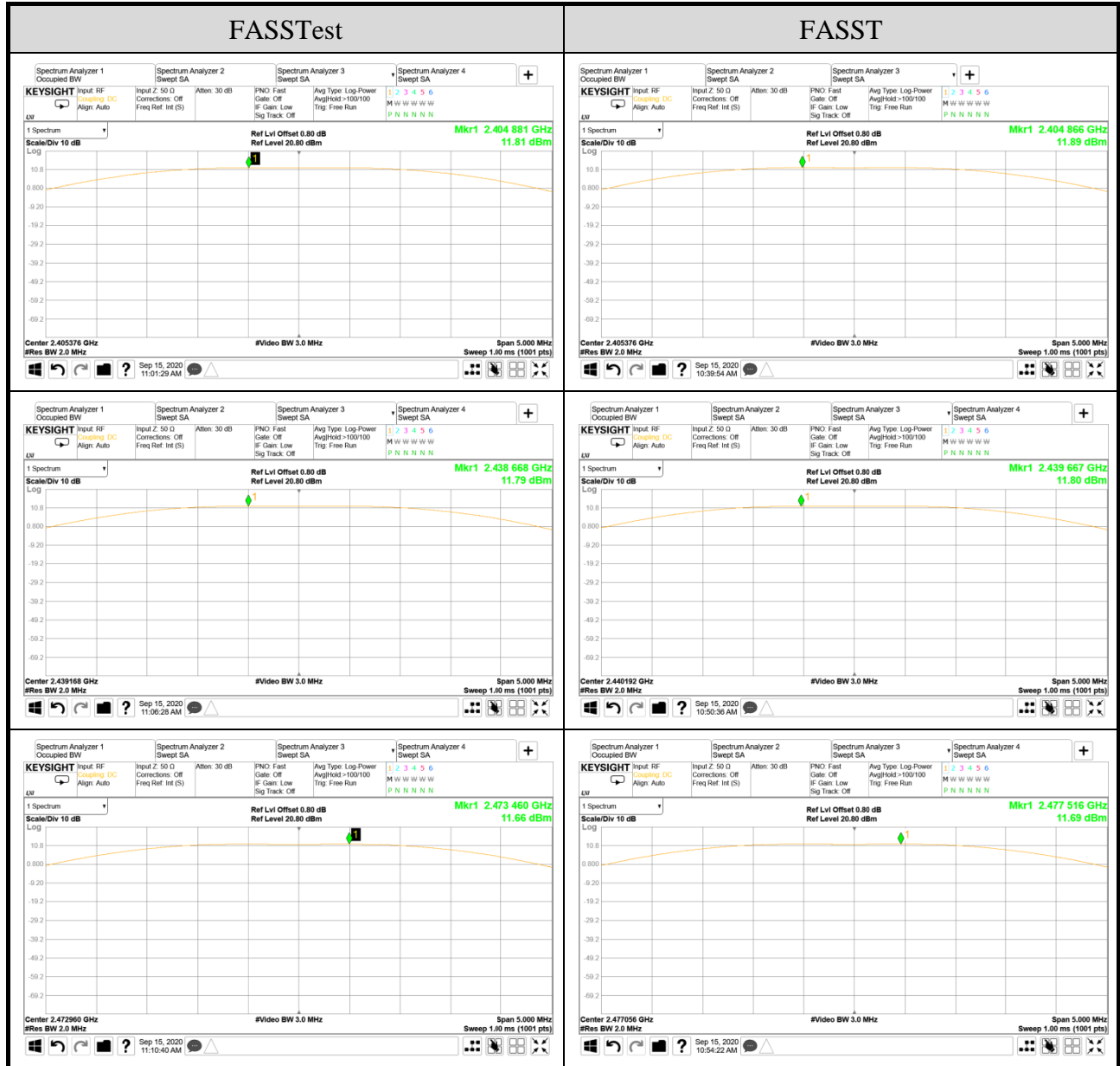
A.4 MAXIMUM PEAK OUTPUT POWER

Test Date	2020/09/15	Temp./Hum.	25°C/52%
Cable Loss	0.80dB	Tested By	Kuper Hsu
Test Voltage	DC 7.4V (Via Battery)		

A.4.1 Peak Output Power

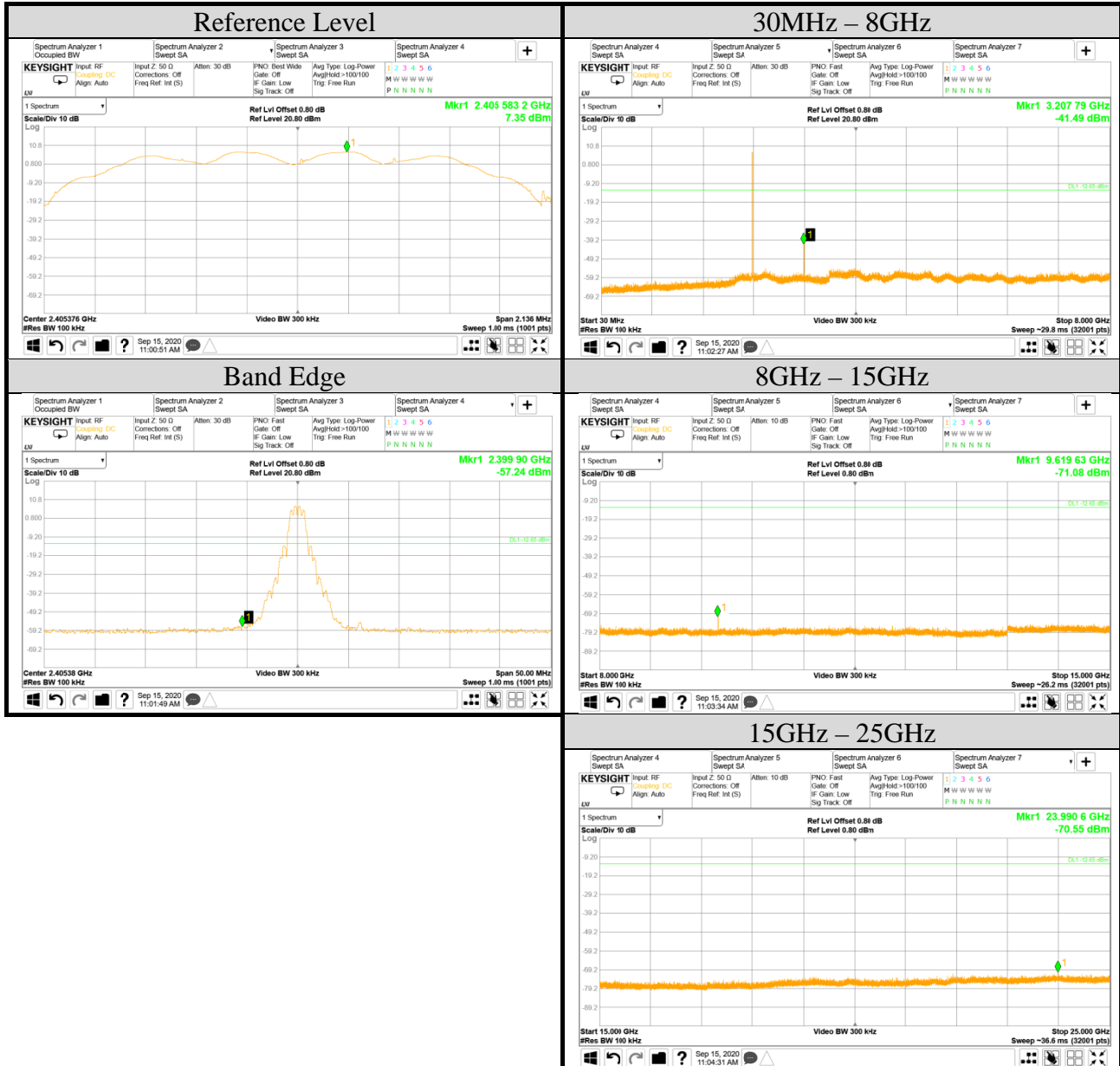
Mode	Centre Frequency (MHz)	Max. Peak Output Power		Antenna Gain (dBi)	Output Power (E.I.R.P.)		Limit
		(dBm)	(W)		(dBm)	(W)	
FASSTest	2405.376	11.81	0.0152	1.48	13.29	0.0213	<30dBm (1W) (Maximum Peak Output Power) <36dBm (4W) (E.I.R.P)
	2439.168	11.79	0.0151		13.27	0.0212	
	2472.960	11.66	0.0147		13.14	0.0206	
FASST	2405.376	11.89	0.0155	1.48	13.37	0.0217	
	2440.192	11.80	0.0151		13.28	0.0213	
	2477.056	11.69	0.0148		13.17	0.0207	

A.4.2 Measurement Plots

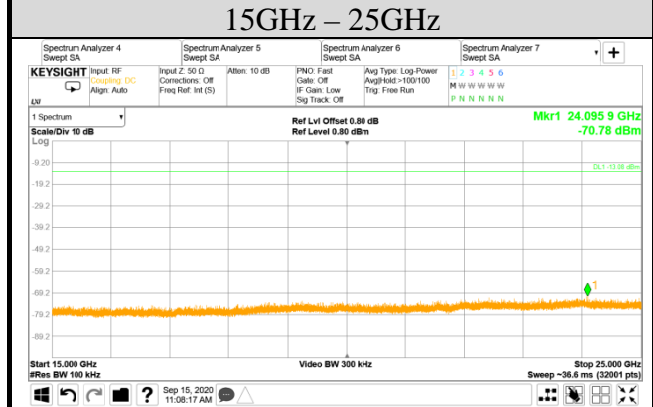
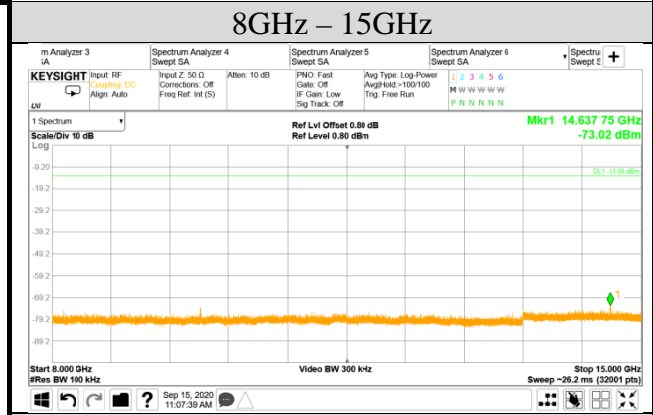
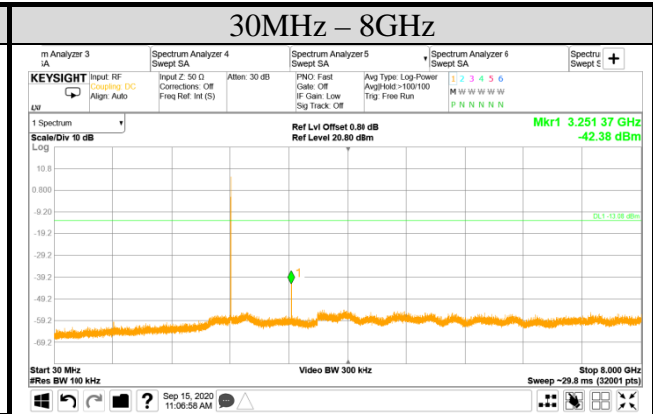
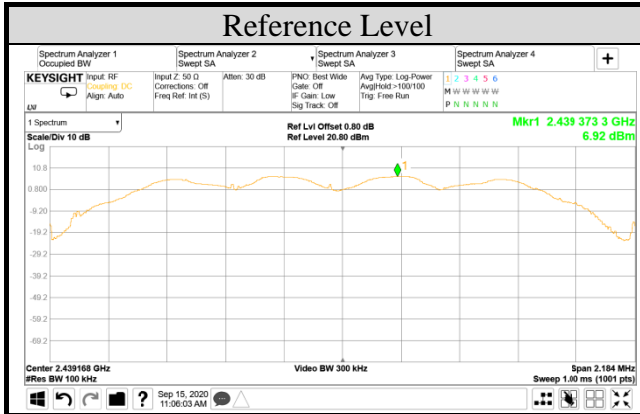


A.5 EMISSION LIMITATIONS

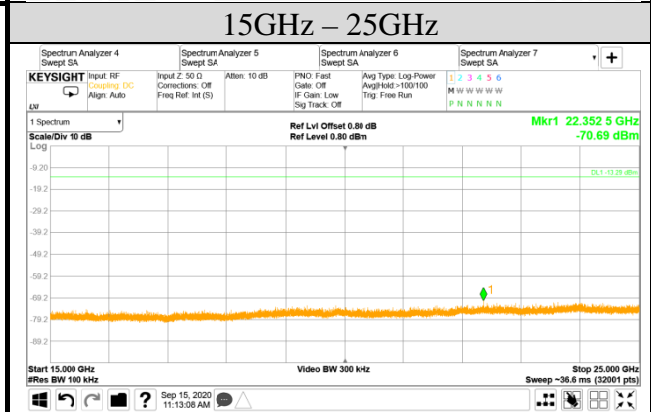
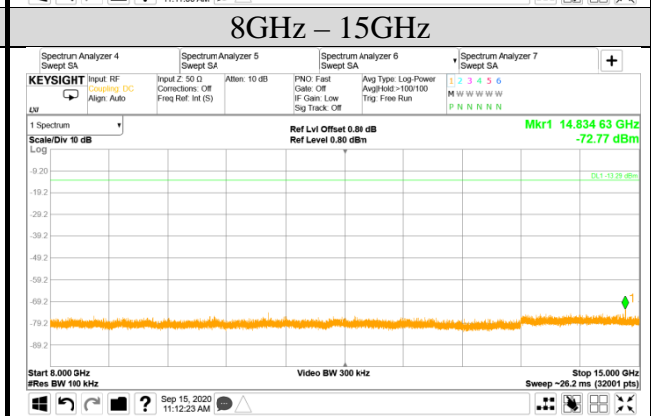
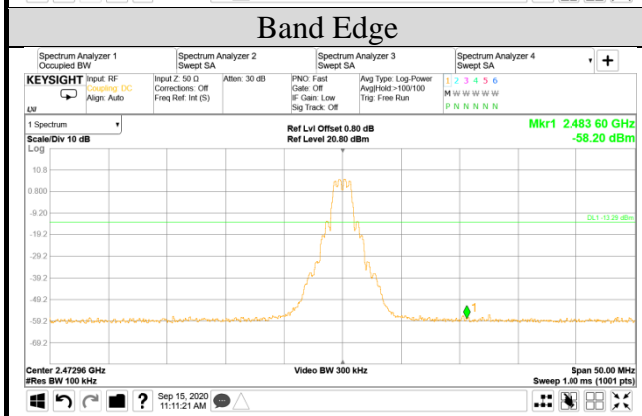
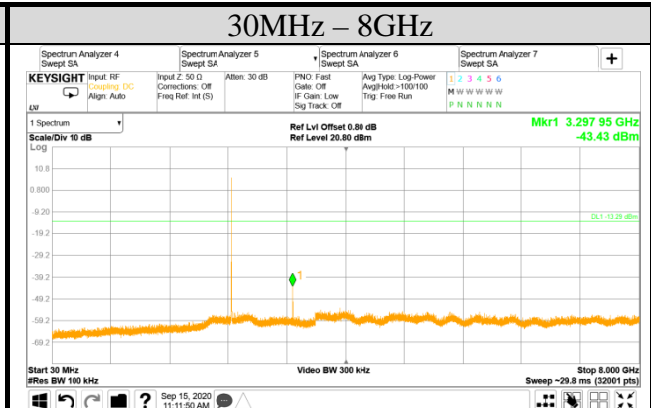
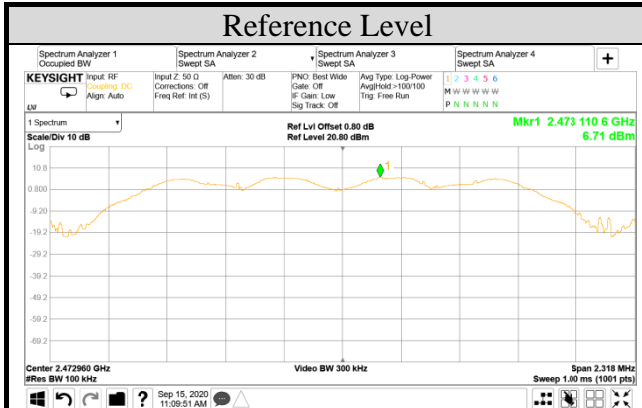
Test Date	2020/09/15	Temp./Hum.	25°C/52%
Cable Loss	0.80dB	Test Voltage	DC 7.4V (Via Battery)
Mode	FASSTest	Tested By	Kuper Hsu
Frequency	TX 2405.376MHz		
Simultaneous Factor 10 log(n) (Note: "n" is antenna number)			0dB



Test Date	2020/09/15	Temp./Hum.	25°C/52%
Cable Loss	0.80dB	Test Voltage	DC 7.4V (Via Battery)
Mode	FASSTest	Tested By	Kuper Hsu
Frequency	TX 2439.168MHz		
Simultaneous Factor 10 log(n) (Note: "n" is antenna number)			0dB



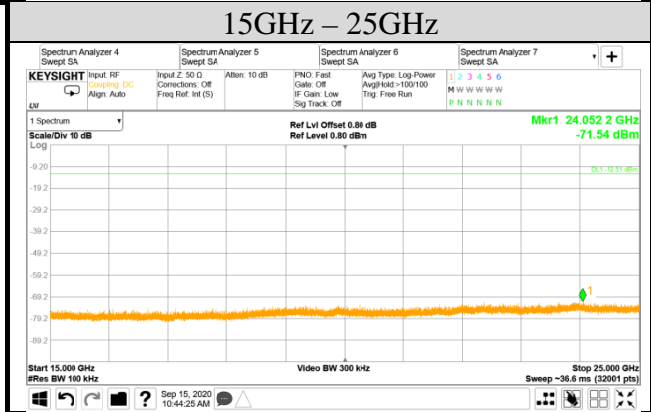
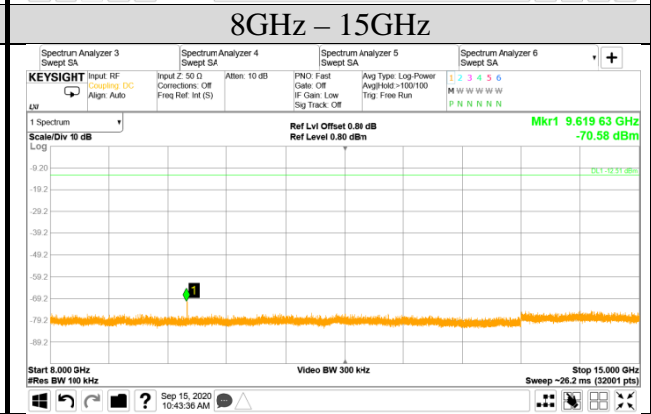
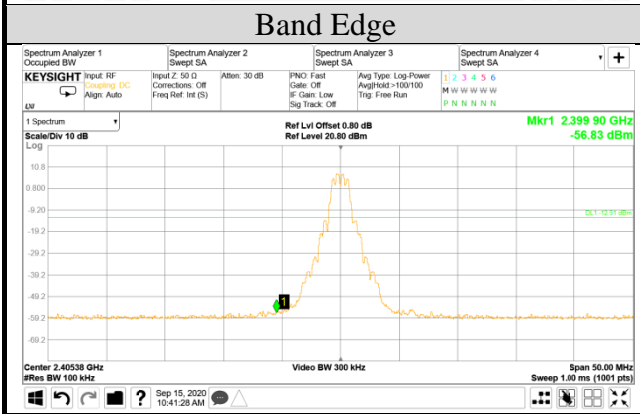
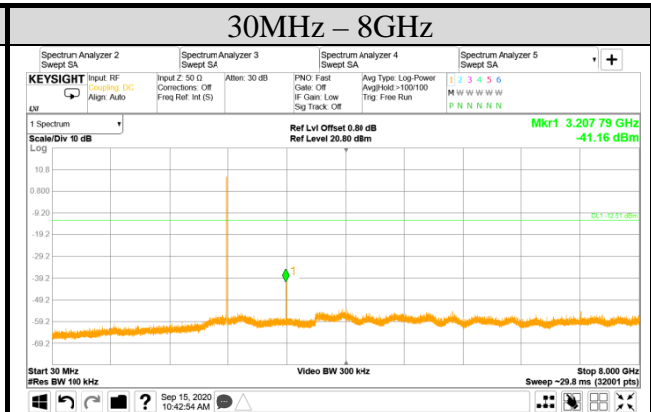
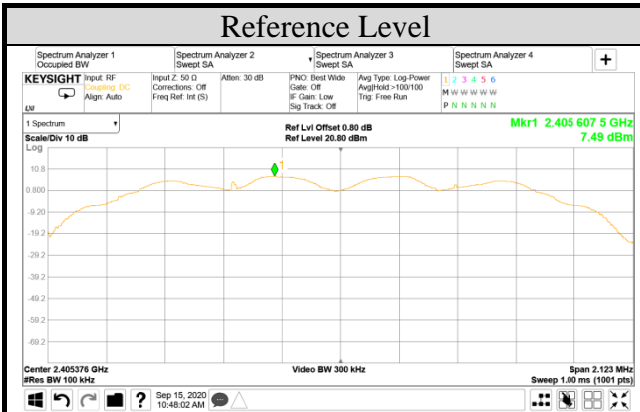
Test Date	2020/09/15	Temp./Hum.	25°C/52%
Cable Loss	0.80dB	Test Voltage	DC 7.4V (Via Battery)
Mode	FASSTest	Tested By	Kuper Hsu
Frequency	TX 2472.960MHz		
Simultaneous Factor 10 log(n) (Note: "n" is antenna number)			0dB



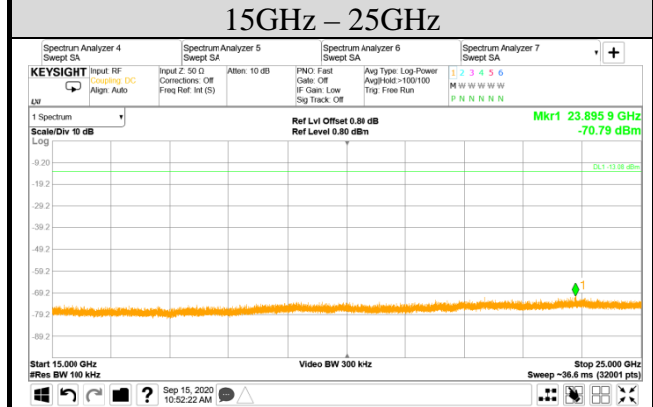
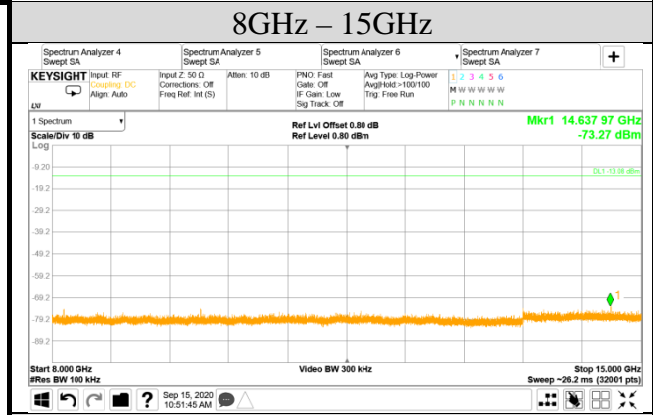
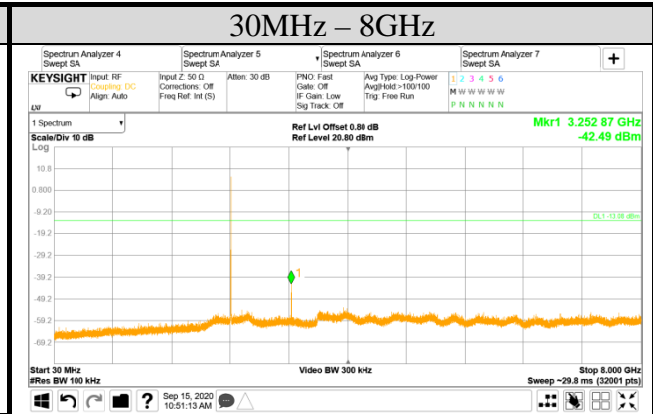
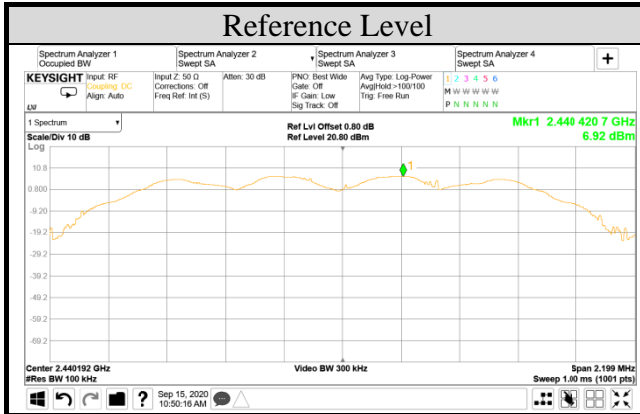
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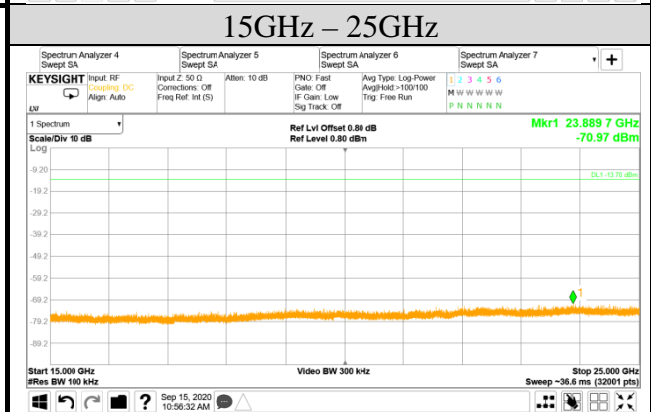
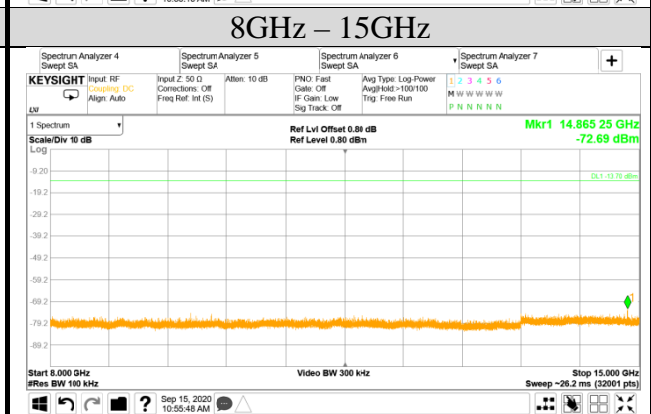
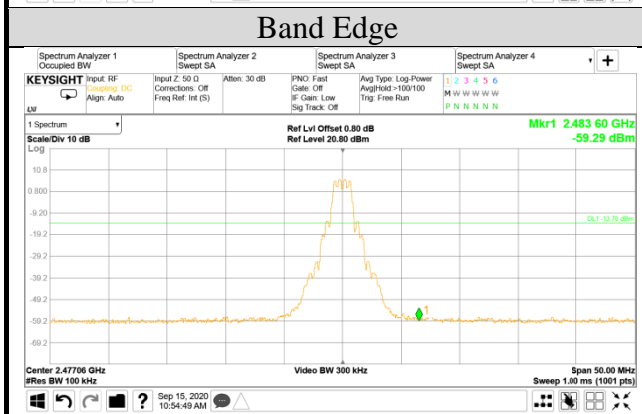
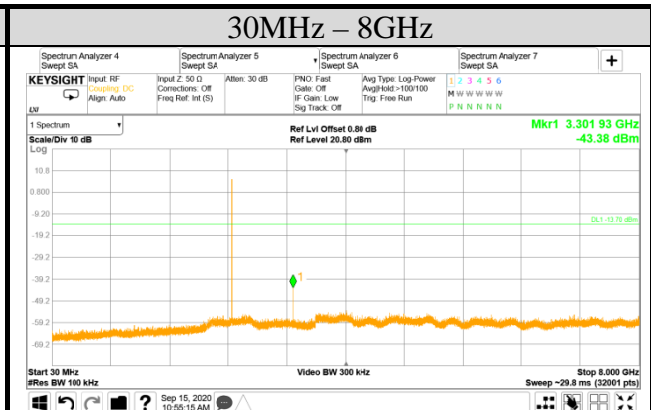
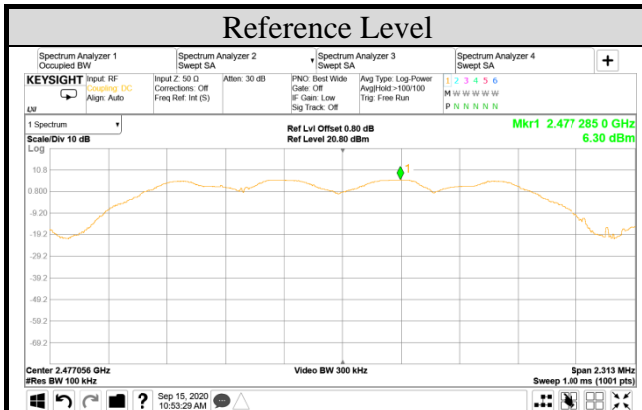
Test Date	2020/09/15	Temp./Hum.	25°C/52%
Cable Loss	0.80dB	Test Voltage	DC 7.4V (Via Battery)
Mode	FASST	Tested By	Kuper Hsu
Frequency	TX 2405.376MHz		
Simultaneous Factor 10 log(n) (Note: "n" is antenna number)			0dB



Test Date	2020/09/15	Temp./Hum.	25°C/52%
Cable Loss	0.80dB	Test Voltage	DC 7.4V (Via Battery)
Mode	FASST	Tested By	Kuper Hsu
Frequency	TX 2440.192MHz		
Simultaneous Factor 10 log(n) (Note: "n" is antenna number)			0dB



Test Date	2020/09/15	Temp./Hum.	25°C/52%
Cable Loss	0.80dB	Test Voltage	DC 7.4V (Via Battery)
Mode	FASST	Tested By	Kuper Hsu
Frequency	TX 2477.056MHz		
Simultaneous Factor 10 log(n) (Note: "n" is antenna number)			0dB



A.6 POWER SPECTRAL DENSITY

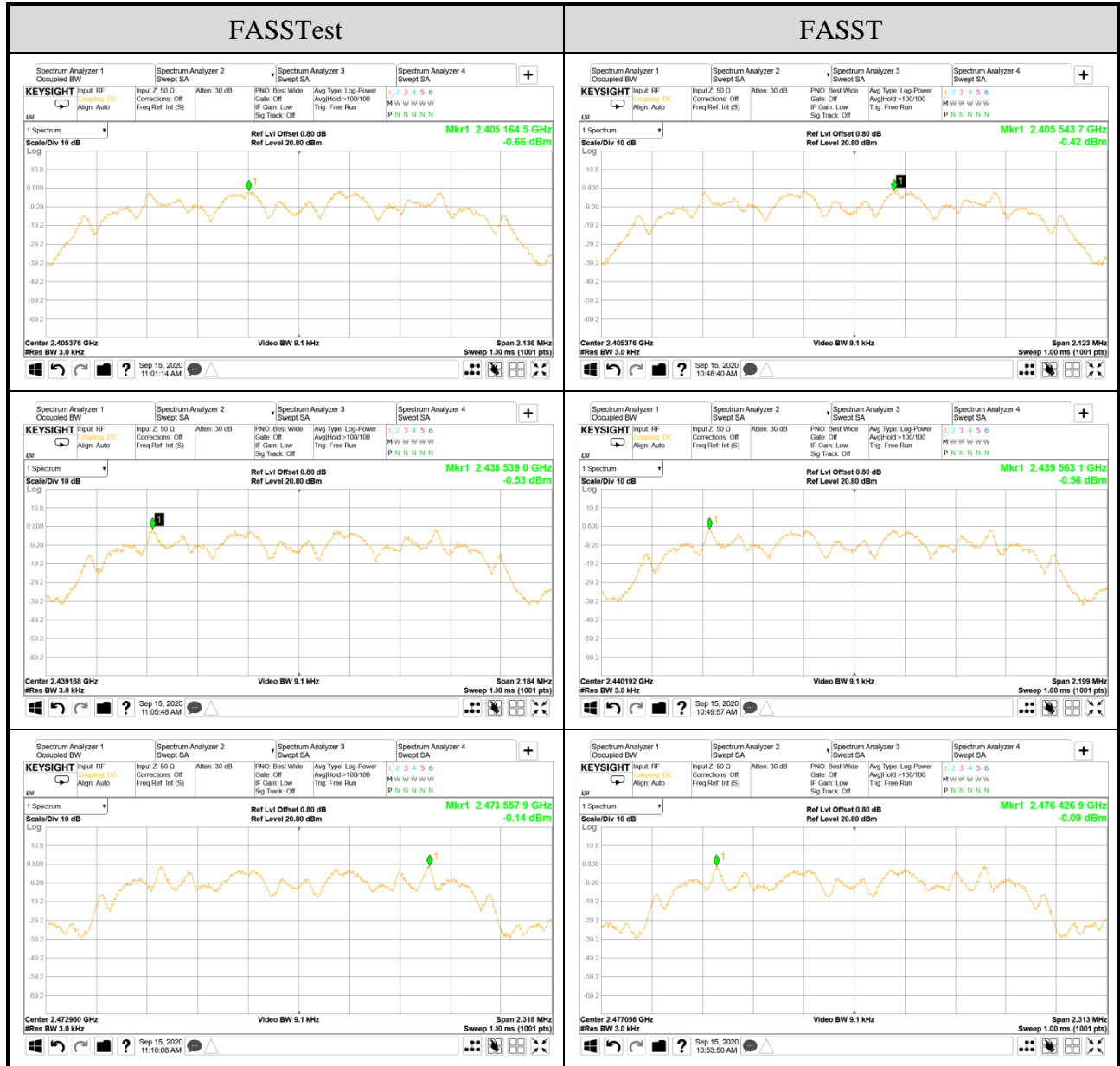
Test Date	2020/09/15	Temp./Hum.	25°C/52%
Cable Loss	0.80dB	Tested By	Kuper Hsu
Test Voltage	DC 7.4V (Via Battery)		

A.6.1 Power Spectral Density Result

Mode	Centre Frequency (MHz)	Power Spectral Density (dBm)	Limit
FASSTest	2405.376	-0.66	<8 dBm/3kHz
	2439.168	-0.53	
	2472.960	-0.14	
FASST	2405.376	-0.42	
	2440.192	-0.56	
	2477.056	-0.09	

Note: All results have been included cable loss and Simultaneous Factor.

A.6.2 Measurement Plots



Note: All results have been included cable loss and Simultaneous Factor.



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APPDNDIX B

TEST PHOTOGRAPHS

(Model: T16IZ)