

FCC RADIO TEST REPORT

FCC ID: 2AMDJMATRIXRTK

Product : MatrixRTK GNSS Receiver

Trade Name : **TERSUS**

Model Name : MatrixRTK

Serial Model : N/A

Report No. : STUEMO017071304116RF

Prepared for

Tersus GNSS Inc.

Rm 210, Building A, No. 666 Zhangheng Road, Zhangjiang Hi-tech Park,
Pudong, Shanghai, P.R.C

Prepared by

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Shenzhen, China

TEST RESULT CERTIFICATION

Applicant's name : Tersus GNSS Inc.

Address : Rm 210, Building A, No. 666 Zhangheng Road, Zhangjiang
Hi-tech Park, Pudong, Shanghai, P.R.C

Manufacture's Name : Tersus GNSS Inc.

Address : Rm 210, Building A, No. 666 Zhangheng Road, Zhangjiang
Hi-tech Park, Pudong, Shanghai, P.R.C

Product description

Product name : MatrixRTK GNSS Receiver

Model and/or type reference : MatrixRTK

Trade Name: **TERSUS**

Standards : FCC Part 15B: 2016

Test procedure ANSI C63.4: 2014

This device described above has been tested by BZT, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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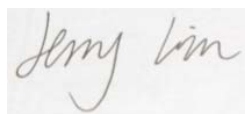
Date of Test :

Date (s) of performance of tests : 01 Jun. 2017 ~17 Jun. 2017

Date of Issue : 17 Jun. 2017

Test Result : **Pass**

Testing Engineer :



(Jerry Lin)

Technical Manager :



(Jimmy Yao)

Authorized Signatory :



(Terry Yang)

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1. TEST SUMMARY

Test procedures according to the technical standards:

EMC Emission				
Standard	Test Item	Limit	Judgment	Remark
FCC Part 15B: 2016 ANSI C63.4:2014	Conducted Emission	Class B	PASS	
	Radiated Emission	Class B	PASS	

1.1 TEST FACILITY

BZT Testing Technology Co., Ltd.

Add.:1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen P.R. China.

FCC Registered No.: 701733

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately **95 %**.

A. Conducted Measurement :

Test Site	Method	Measurement Frequency Range	U , (dB)	NOTE
BZTC01	ANSI	150 KHz ~ 30MHz	3.2	

B. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	U , (dB)	NOTE
BZTA01	ANSI	30MHz ~ 1000MHz	4.7	
		1GHz ~6GHz	5.0	

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	MatrixRTK GNSS Receiver	
Brand Name	TERSUS	
Model Name.	MatrixRTK	
Serial No	N/A	
Model Difference	N/A	
Product Description	The EUT is a MatrixRTK GNSS Receiver.	
	Connecting I/O port:	USB Port,RJ-45 Port
	Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.	
Adapter	Model: GS40A12 Input: 100-240V~, 50/60Hz, 1A Output: 12V $\overline{\text{---}}$, 3.34A	
Battery	DC 7.4V, 12500mAH	

2.2 DESCRIPTION OF TEST MODES

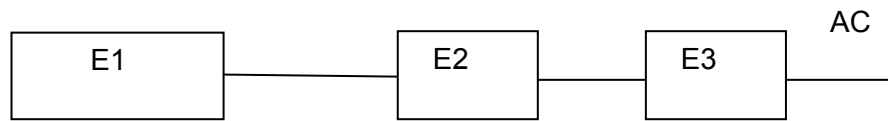
To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	PC Mode

For Conducted Test	
Final Test Mode	Description
Mode 1	PC Mode

For Radiated Test	
Final Test Mode	Description
Mode 1	PC Mode

2.3 DESCRIPTION OF TEST SETUP



2.4 DESCRIPTION TEST PERIPHERAL AND EUT PERIPHERAL

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	MatrixRTK GNSS Receiver	TERSUS	MatrixRTK	N/A	EUT
E-2	Notebook	DELL	PP10L	N/A	
E-3	Notebook Adapter	DELL	HA65NS1-00	N/A	

Item	Shielded Type	Ferrite Core	Length	Note
C1	No	No	1.5M	

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

2.5 MEASUREMENT INSTRUMENTS LIST

Radiation Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2016.07.06	2017.07.05	1 year
2	Test Receiver	R&S	ESPI	101318	2017.06.07	2018.06.06	1 year
3	Bilog Antenna	TESEQ	CBL6111D	31216	2016.07.06	2017.07.05	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2017.06.07	2018.06.06	1 year
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	2017.06.07	2018.06.06	1 year
6	Horn Antenna	EM	EM-AH-10180	2011071402	2016.07.06	2017.07.05	1 year
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2016.07.06	2017.07.05	1 year
8	Amplifier	EM	EM-30180	060538	2016.12.22	2017.12.21	1 year
9	Loop Antenna	ARA	PLA-1030/B	1029	2017.06.08	2018.06.07	1 year
10	Power Meter	R&S	NRVS	100696	2016.07.06	2017.07.05	1 year
11	Power Sensor	R&S	URV5-Z4	0395.1619.05	2016.07.06	2017.07.05	1 year

Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	R&S	ESCI	101160	2017.06.06	2018.06.05	1 year
2	LISN	R&S	ENV216	101313	2016.08.24	2017.08.23	1 year
3	LISN	EMCO	3816/2	00042990	2016.08.24	2017.08.23	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2017.06.07	2018.06.06	1 year
5	Passive Voltage Probe	R&S	ESH2-Z3	100196	2017.06.07	2018.06.06	1 year
6	Absorbing clamp	R&S	MOS-21	100423	2017.06.08	2018.06.07	1 year

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class B (dBuV)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

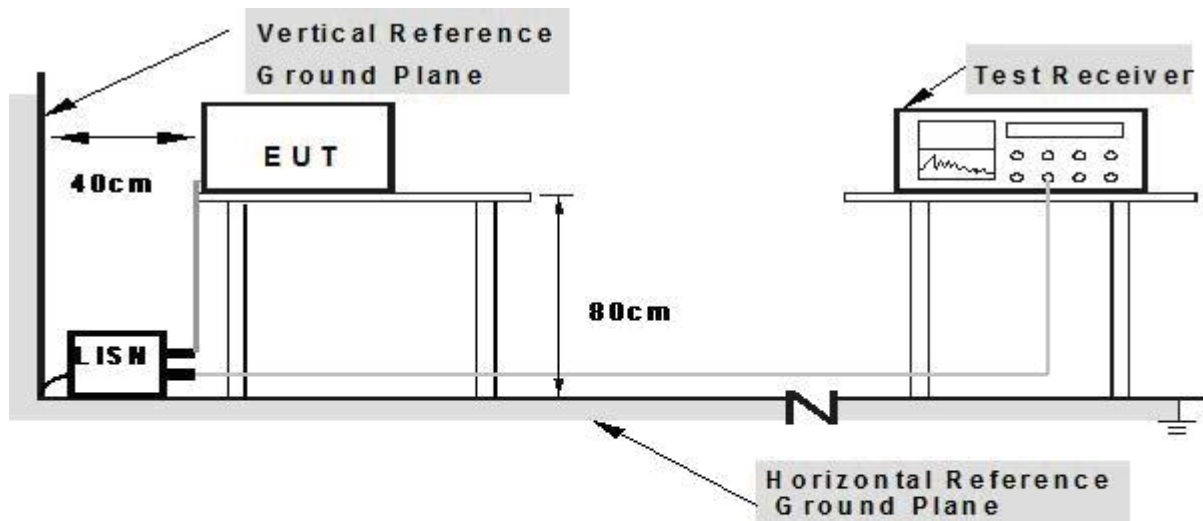
The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.2 TEST PROCEDURE

- The EUT was placed 0.4 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 TEST SETUP



Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

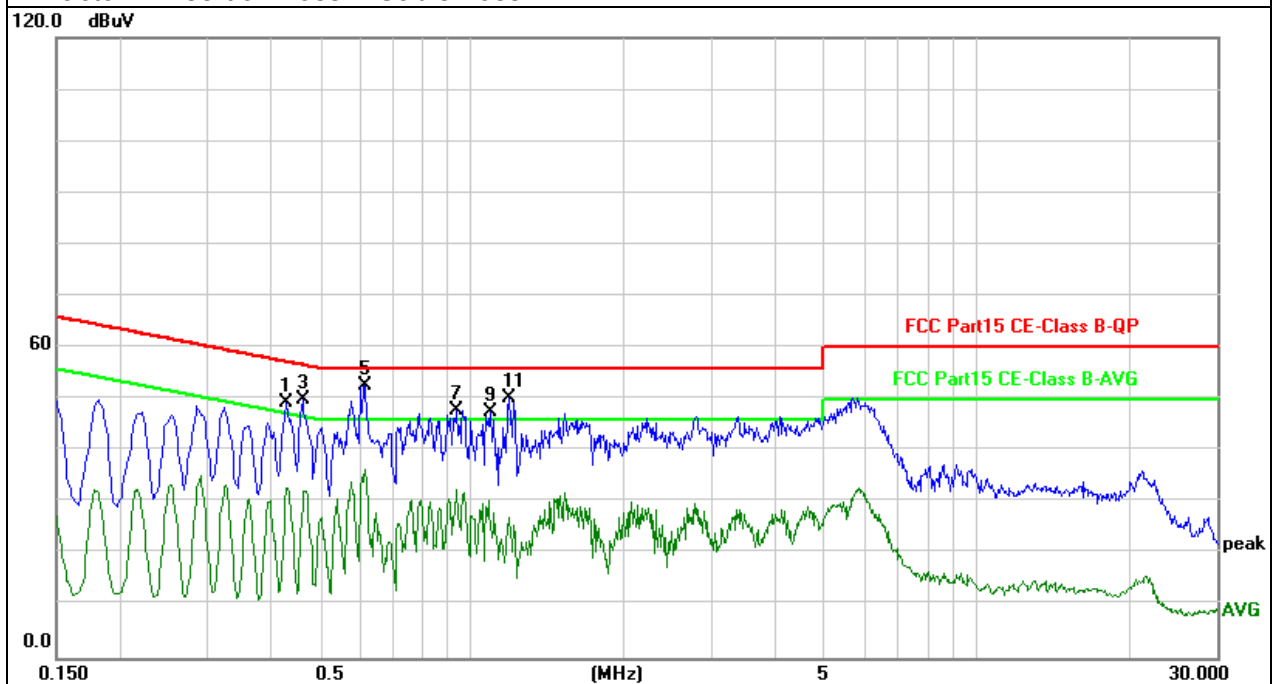
3.1.5 TEST RESULTS

EUT :	MatrixRTK GNSS Receiver	Model Name. :	MatrixRTK
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Phase :	L
Test Voltage :	AC120V/60Hz	Test Mode :	Mode 1

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Detector Type
0.4300	39.33	10.11	49.44	57.25	-7.81	QP
0.4300	22.83	10.11	32.94	47.25	-14.31	AVG
0.4620	39.70	10.11	49.81	56.66	-6.85	QP
0.4620	22.20	10.11	32.31	46.66	-14.35	AVG
0.6140	42.53	10.13	52.66	56.00	-3.34	QP
0.6140	26.37	10.13	36.50	46.00	-9.50	AVG
0.9340	37.61	10.16	47.77	56.00	-8.23	QP
0.9340	22.36	10.16	32.52	46.00	-13.48	AVG
1.0900	37.48	10.17	47.65	56.00	-8.35	QP
1.0900	20.34	10.17	30.51	46.00	-15.49	AVG
1.1860	40.09	10.17	50.26	56.00	-5.74	QP
1.1860	17.03	10.17	27.20	46.00	-18.80	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

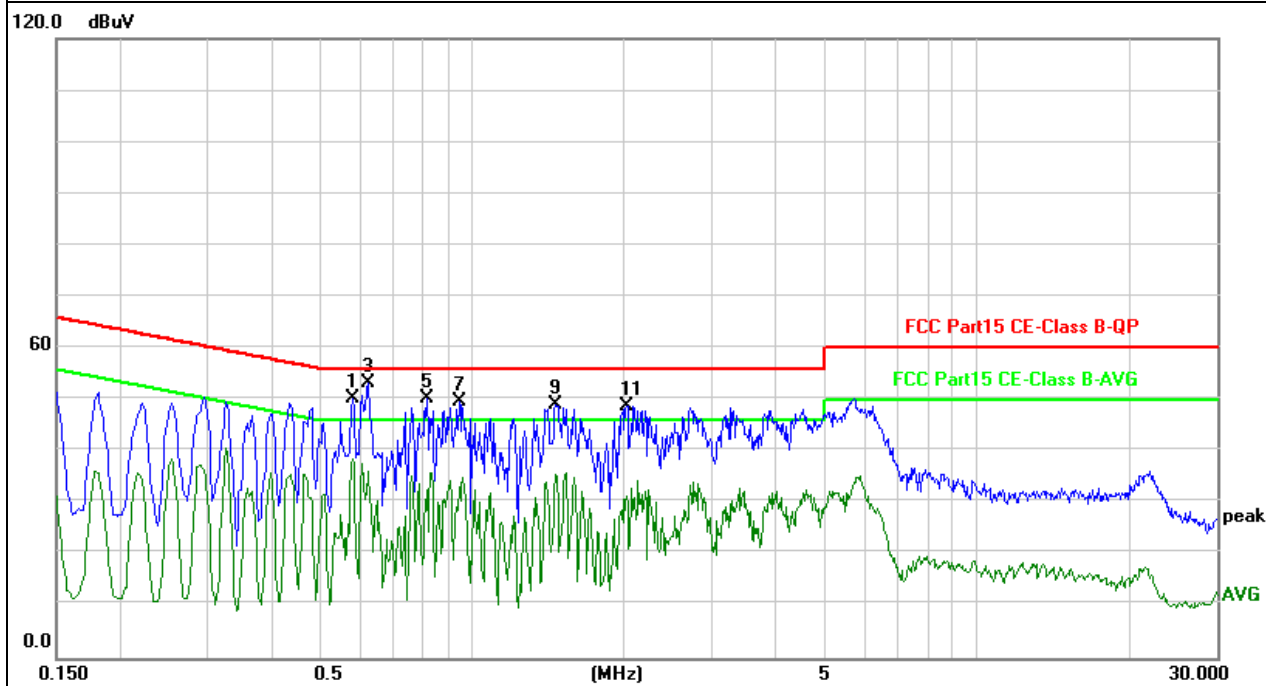


EUT :	MatrixRTK GNSS Receiver	Model Name. :	MatrixRTK
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Phase :	N
Test Voltage :	AC120V/60Hz	Test Mode :	Mode 1

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Detector Type
0.5820	40.25	10.12	50.37	56.00	-5.63	QP
0.5820	28.42	10.12	38.54	46.00	-7.46	AVG
0.6220	43.18	10.13	53.31	56.00	-2.69	QP
0.6220	26.07	10.13	36.20	46.00	-9.80	AVG
0.8140	40.23	10.15	50.38	56.00	-5.62	QP
0.8140	25.83	10.15	35.98	46.00	-10.02	AVG
0.9460	39.46	10.16	49.62	56.00	-6.38	QP
0.9460	24.90	10.16	35.06	46.00	-10.94	AVG
1.4660	38.88	10.17	49.05	56.00	-6.95	QP
1.4660	25.46	10.17	35.63	46.00	-10.37	AVG
2.0300	38.62	10.18	48.80	56.00	-7.20	QP
2.0300	22.52	10.18	32.70	46.00	-13.30	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

FREQUENCY (MHz)	Class A (at 10m)	Class B (at 3m)
	dBuV/m	dBuV/m
30 ~ 88	39.0	40.0
88 ~ 216	43.5	43.5
216 ~ 960	46.5	46.0
Above 960	49.5	54.0

Notes:

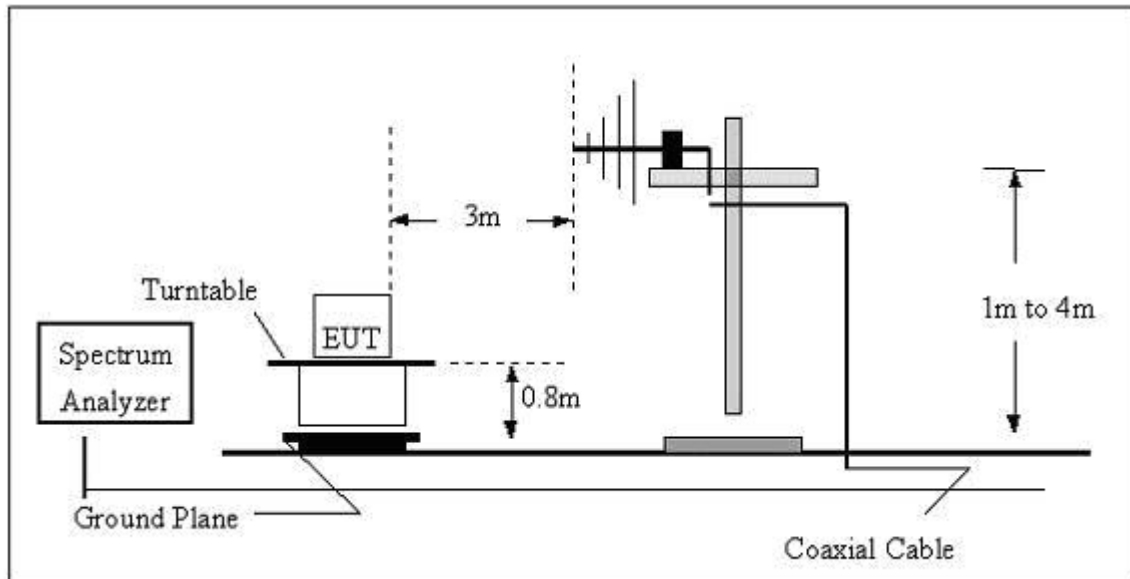
- (1) The limit for radiated test was performed according to as following:
FCC PART 15B /ICES-003.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

3.2.2 TEST PROCEDURE

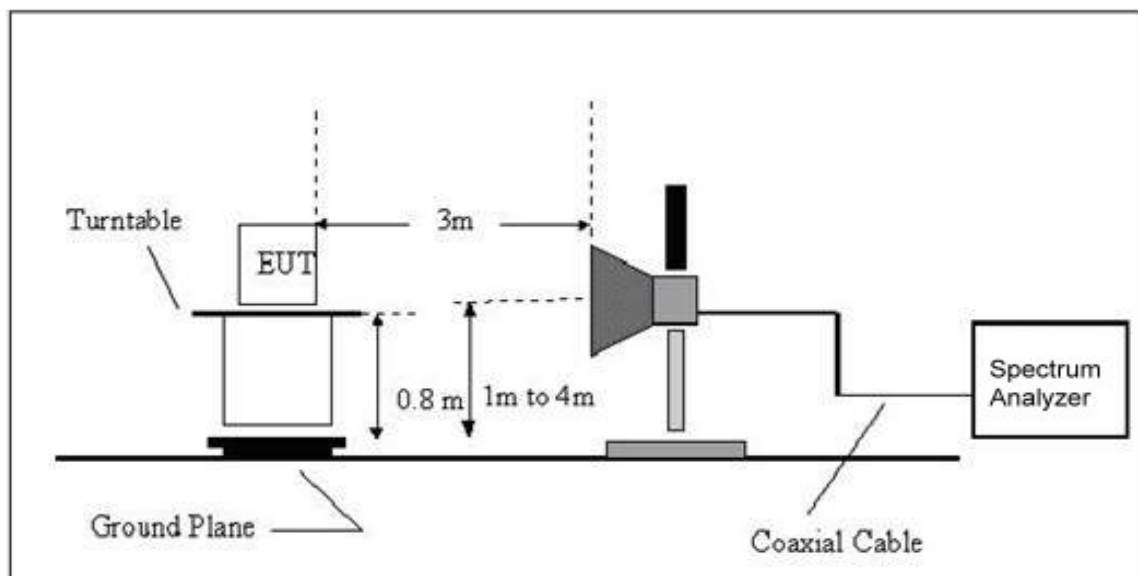
- a. The measuring distance of at 10 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured, above 1G Average detector mode will be instead.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP(AV) Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.2.3 TEST SETUP

(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



(B) Radiated Emission Test Set-Up Frequency Above 1GHz



3.2.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.5 TEST RESULTS(Blow 30MHZ)

EUT :	MatrixRTK GNSS Receiver	Model Name :	MatrixRTK
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	AC120V
Test Mode :	Mode 1	Polarization :	--

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

NOTE:

- 1.The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
- 2.Distance extrapolation factor =40 log (specific distance/test distance)(dB);
- 3.Limit line = specific limits(dBuv) + distance extrapolation factor.

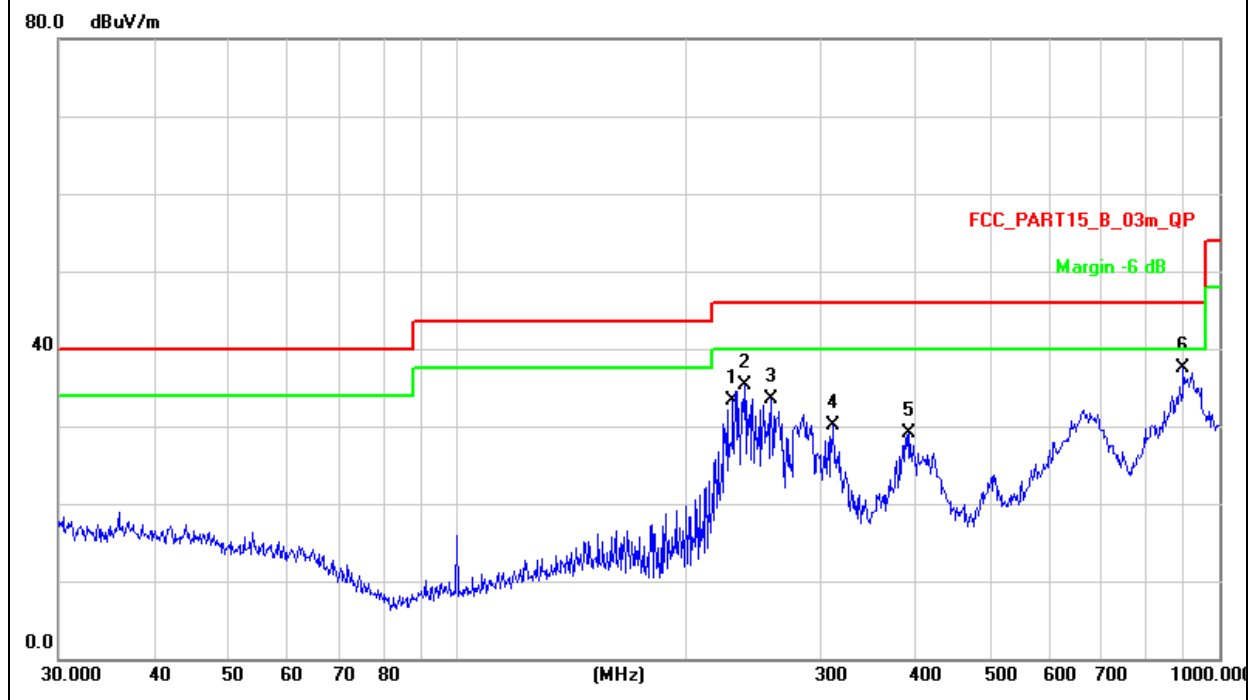
3.2.6 TEST RESULTS(30MHZ-1GHZ)

EUT :	MatrixRTK GNSS Receiver	Model Name :	MatrixRTK
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	AC120V
Test Mode :	Mode 1	Polarization :	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
230.0985	48.37	-15.05	33.32	46.00	-12.68	QP
238.3102	49.85	-14.58	35.27	46.00	-10.73	QP
258.3263	47.55	-13.98	33.57	46.00	-12.43	QP
311.0867	42.31	-12.29	30.02	46.00	-15.98	QP
392.0951	39.47	-10.38	29.09	46.00	-16.91	QP
896.9964	39.02	-1.48	37.54	46.00	-8.46	QP

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

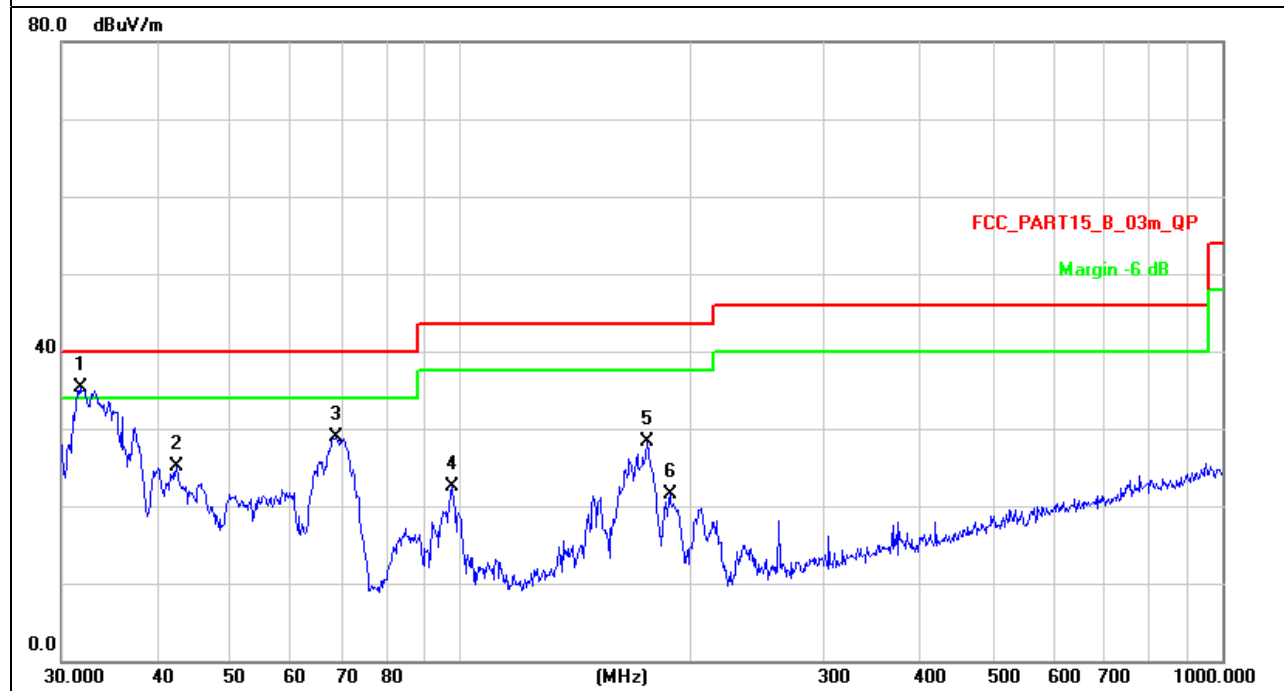


EUT :	MatrixRTK GNSS Receiver	Model Name :	MatrixRTK
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	AC120V
Test Mode :	Mode 1	Polarization :	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
31.7313	43.62	-8.25	35.37	40.00	-4.63	QP
42.4508	34.27	-9.16	25.11	40.00	-14.89	QP
68.8721	42.94	-14.08	28.86	40.00	-11.14	QP
97.4560	39.28	-16.76	22.52	43.50	-20.98	QP
176.2684	42.36	-14.01	28.35	43.50	-15.15	QP
188.4123	36.78	-15.37	21.41	43.50	-22.09	QP

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.



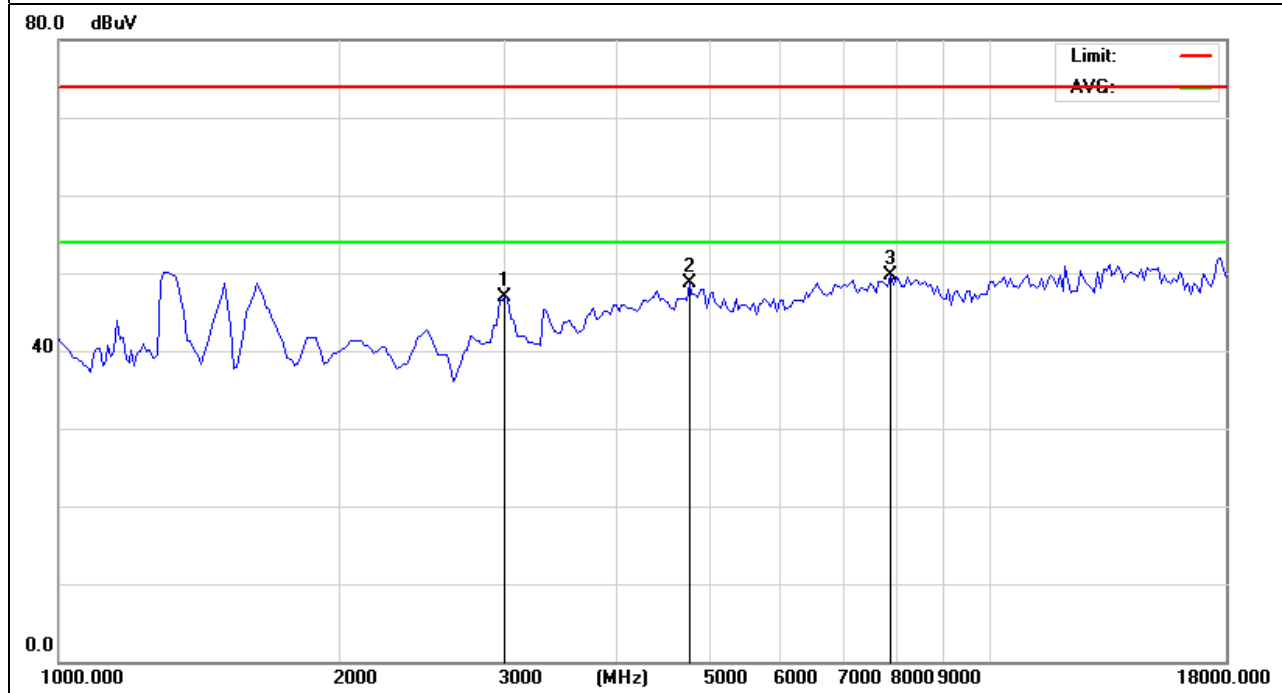
3.2.7 TEST RESULTS(Above 1GHz)

EUT :	MatrixRTK GNSS Receiver	Model Name :	MatrixRTK
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	AC120V
Test Mode :	Model 1	Polarization :	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
3040	58.6	-11.63	46.97	74	-27.03	peak
4782.5	52.64	-3.91	48.73	74	-25.27	peak
7842.5	49.33	0.44	49.77	74	-24.23	peak

Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

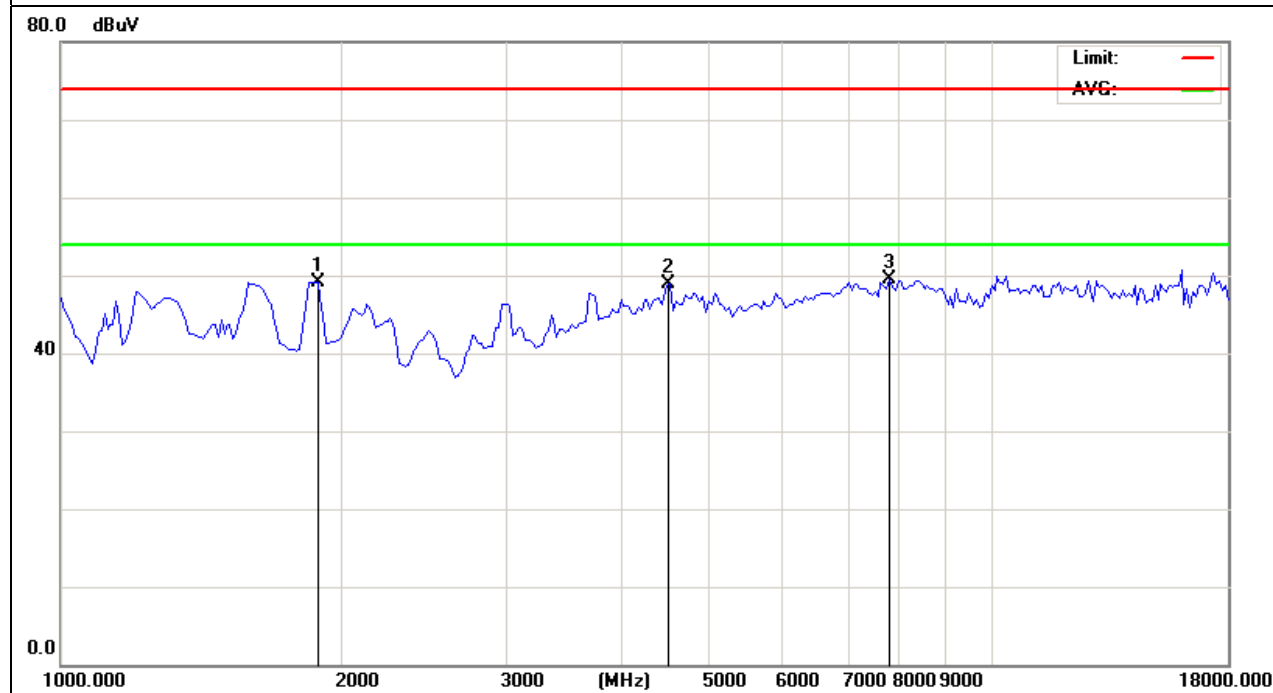


EUT :	MatrixRTK GNSS Receiver	Model Name :	MatrixRTK
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	AC120V
Test Mode :	Model 1	Polarization :	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
1892.5	63.44	-14.28	49.16	74	-24.84	peak
4527.5	54.53	-5.59	48.94	74	-25.06	peak
7800	48.99	0.55	49.54	74	-24.46	peak

Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.



RADIATED SPURIOUS EMISSION



CONDUCTED EMISSION TEST

