TEST REPORT

Product Name	:	AOA/AOD
Brand Mark	:	N/A
Model No.	:	TLSR8278IP48D
FCC ID	:	OEOTLSR8278IP48D
Report Number	:	BLA-EMC-202102-A4601
Date of Sample Receipt	:	2021/2/25
Date of Test	:	2021/2/25 to 2021/3/10
Date of Issue	:	2021/3/10
Test Standard	:	47 CFR Part 15, Subpart C 15.247
Test Result	:	Pass

Prepared for:

Telink Semiconductor (Shanghai) CO.,LTD
Bldg 3, No.1500, Zuchongzhi Rd, Zhangjiang Hi-Tech Park, Shanghai 201203, China

Prepared by:

BlueAsia of Technical Services(Shenzhen) Co.,Ltd.
Building C, No. 107, Shihuan Road, Shiyan Sub-District, Baoan District, Shenzhen, Guangdong Province, China
TEL: +86-755-23059481

Compiled by: Sven

Review by: Sweet. Liang

Approved by: Kmen Li

Date: 2021/3/10

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REPORT REVISE RECORD

Version No.	Date	Description
00	2021/3/10	Original

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1 TEST SUMMARY

Test item	Test Requirement	Test Method	Class/Severity	Result
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.8 & Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.6 & Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass
Power Spectrum Density	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Minimum 6dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	Pass

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2 GENERAL INFORMATION

Applicant	Telink Semiconductor (Shanghai) CO.,LTD
Address	Bldg 3, No.1500, Zuchongzhi Rd, Zhangjiang Hi-Tech Park, Shanghai 201203, China
Manufacturer	Telink Semiconductor (Shanghai) CO.,LTD
Address	Bldg 3, No.1500, Zuchongzhi Rd, Zhangjiang Hi-Tech Park, Shanghai 201203, China
Factory	Telink Semiconductor (Shanghai) CO.,LTD
Address	Bldg 3, No.1500, Zuchongzhi Rd, Zhangjiang Hi-Tech Park, Shanghai 201203, China
Product Name	AOA/AOD
Test Model No.	TLSR8278IP48D

3 GENERAL DESCRIPTION OF E.U.T.

Hardware Version	NA
Software Version	NA

Operation Frequency:	2402MHz-2480MHz
Modulation Type:	GFSK
Channel Spacing:	2MHz
Number of Channels:	40
Antenna Type:	External Antenna with reversed polarity non standard antenna port
Antenna Gain:	0dBi(Provided by customer)

Note：
Antenna amount:8
All 8 antennas can not transmit simultaneously,only have SISO mode.

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4 TEST ENVIRONMENT

Environment	Temperature	Voltage
Normal	+25°C	3.3Vdc

5 TEST MODE

TEST MODE	TEST MODE DESCRIPTION
TX	Keep the EUT in transmitting mode with modulation
Remark:All 8 antennas SISO mode have been tested ,only the data of the worst mode would be recorded in this report.	

6 MEASUREMENT UNCERTAINTY

Parameter	Expanded Uncertainty (Confidence of 95%)
Radiated Emission(9kHz-30MHz)	±4.34dB
Radiated Emission(30Mz-1000MHz)	±4.24dB
Radiated Emission(1GHz-18GHz)	±4.68dB
AC Power Line Conducted Emission(150kHz-30MHz)	±3.45dB

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7 DESCRIPTION OF SUPPORT UNIT

Device Type	Manufacturer	Model Name	Serial No.	Remark
PC	HASEE	K610D	N/A	N/A

8 LABORATORY LOCATION

All tests were performed at:
BlueAsia of Technical Services(Shenzhen) Co., Ltd.
Building C, No. 107, Shihuan Road, Shiyan Sub-District, Baoan District, Shenzhen, Guangdong Province, China
Telephone: TEL: +86-755-28682673 FAX: +86-755-28682673
No tests were sub-contracted.

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9 TEST INSTRUMENTS LIST

Test Equipment Of Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Shield room	SKET	833	N/A	2020/11/25	2023/11/24
Receiver	R&S	ESPI3	101082	2020/10/12	2021/10/11
LISN	R&S	ENV216	3560.6550.15	2020/10/12	2021/10/11
LISN	AT	AT166-2	AKK1806000003	2020/10/12	2021/10/11
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A

Test Equipment Of Conducted Band Edges Measurement					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Radiated Spurious Emissions					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Chamber	SKET	966	N/A	2020/11/10	2023/11/9
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Receiver	R&S	ESR7	101199	2020/10/12	2021/10/11
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	2020/9/26	2022/9/25
Horn Antenna	Schwarzbeck	9120D	01892 P:00331	2020/9/26	2022/9/25

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Amplifier	SKET	PA-000318G-45	N/A	2020/10/16	2021/10/15
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	2020/9/26	2022/9/25
Controller	SKET	N/A	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-02	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-03	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-01	N/A	N/A	N/A

Test Equipment Of Radiated Emissions which fall in the restricted bands					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Chamber	SKET	966	N/A	2020/11/10	2023/11/9
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Receiver	R&S	ESR7	101199	2020/10/12	2021/10/11
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	2020/9/26	2022/9/25
Horn Antenna	Schwarzbeck	9120D	01892 P:00331	2020/9/26	2022/9/25
Amplifier	SKET	PA-000318G-45	N/A	2020/10/16	2021/10/15
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	2020/9/26	2022/9/25
Controller	SKET	N/A	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-02	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-03	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-01	N/A	N/A	N/A

Test Equipment Of Conducted Spurious Emissions					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11

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Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Power Spectrum Density					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Conducted Peak Output Power					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Minimum 6dB Bandwidth					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

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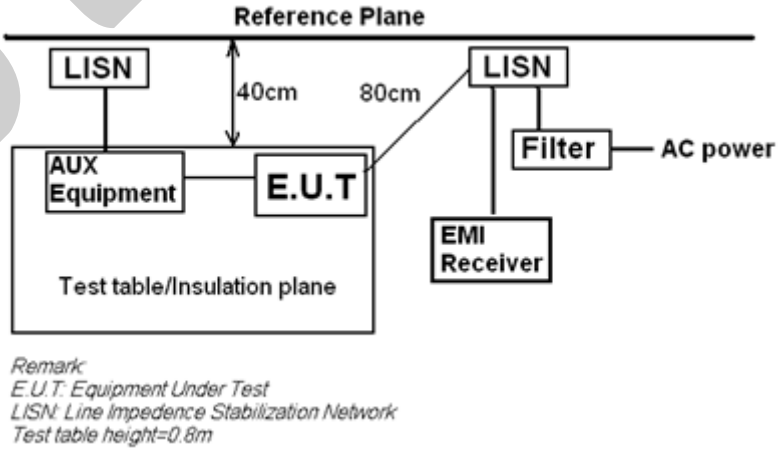
10 CONDUCTED EMISSIONS AT AC POWER LINE (150KHZ-30MHZ)

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Sven
Temperature	25℃
Humidity	52%

10.1 LIMITS

Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
*Decreases with the logarithm of the frequency.		

10.2 BLOCK DIAGRAM OF TEST SETUP



10.3 PROCEDURE

1) The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50?H + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as

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the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.
Remark: LISN=Read Level+ Cable Loss+ LISN Factor

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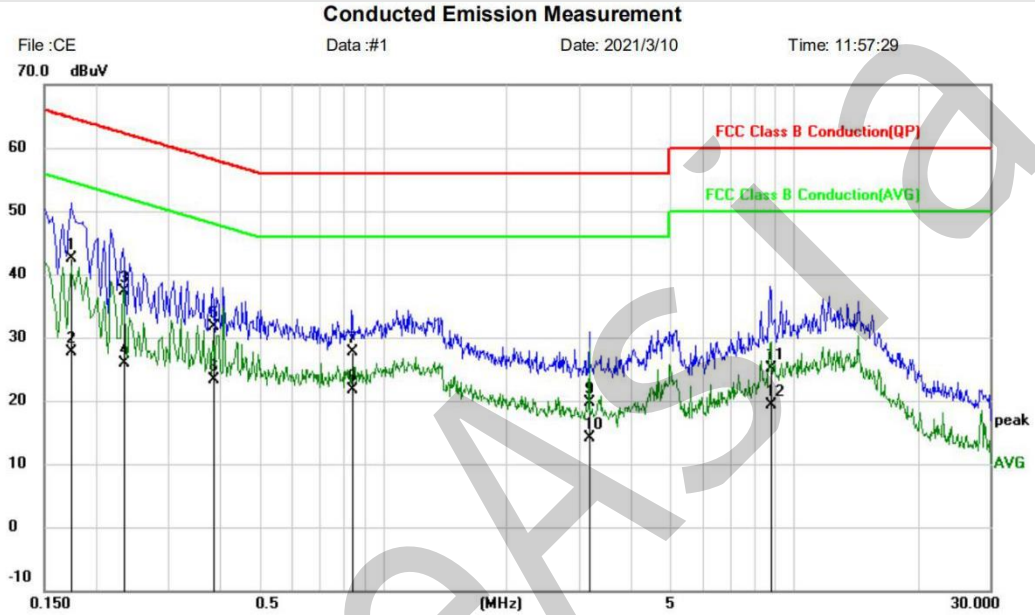
10.4 TEST DATA

[Test Mode: TX]; [Line: Neutral]
Power:AC120V60Hz



Site
Limit: FCC Class B Conduction(QP)
EUT:
M/N:
Mode:
Note:

Phase: N
Power:

Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1740	32.69	9.74	42.43	64.77	-22.34	QP	
2		0.1740	18.06	9.74	27.80	54.77	-26.97	AVG	
3		0.2340	27.52	9.76	37.28	62.31	-25.03	QP	
4		0.2340	16.06	9.76	25.82	52.31	-26.49	AVG	
5		0.3860	21.83	9.78	31.61	58.15	-26.54	QP	
6		0.3860	13.60	9.78	23.38	48.15	-24.77	AVG	
7		0.8420	17.83	9.83	27.66	56.00	-28.34	QP	
8		0.8420	11.84	9.83	21.67	46.00	-24.33	AVG	
9		3.1780	9.76	9.91	19.67	56.00	-36.33	QP	
10		3.1780	4.19	9.91	14.10	46.00	-31.90	AVG	
11		8.7340	15.08	10.09	25.17	60.00	-34.83	QP	
12		8.7340	9.28	10.09	19.37	50.00	-30.63	AVG	

*:Maximum data x:Over limit !:over margin 〈Reference Only

Test Result: Pass

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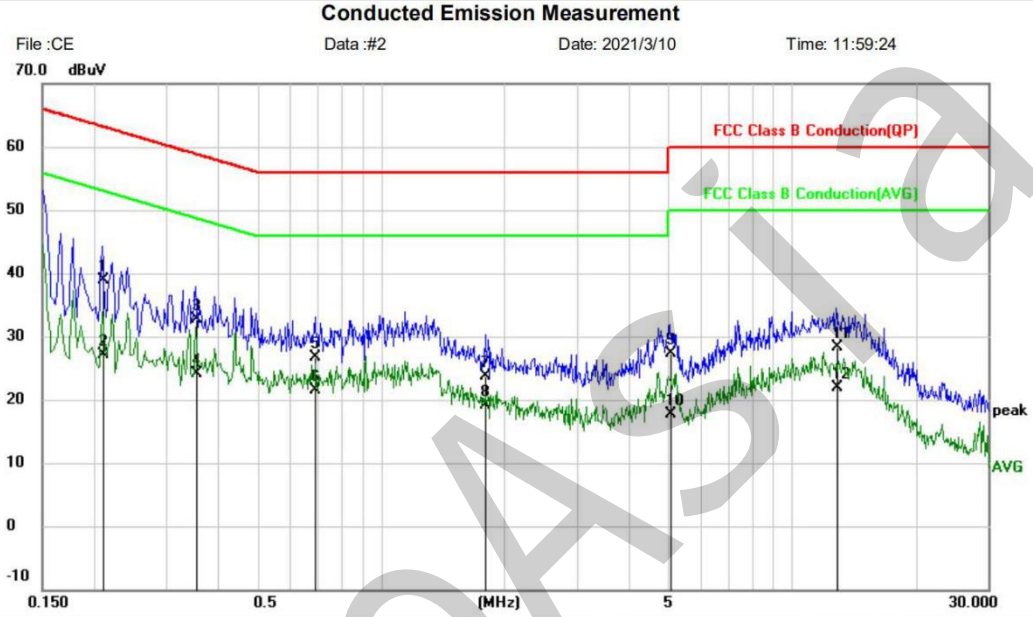
[Test Mode: TX]; [Line: Line]
Power:AC120V60Hz



Site
Limit: FCC Class B Conduction(QP)
EUT:
M/N:
Mode:
Note:

Phase: L1
Power:

Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.2100	29.08	9.83	38.91	63.21	-24.30	QP	
2		0.2100	17.25	9.83	27.08	53.21	-26.13	AVG	
3		0.3540	22.85	9.85	32.70	58.87	-26.17	QP	
4		0.3540	14.33	9.85	24.18	48.87	-24.69	AVG	
5		0.6900	16.77	9.89	26.66	56.00	-29.34	QP	
6		0.6900	11.67	9.89	21.56	46.00	-24.44	AVG	
7		1.7980	13.73	9.94	23.67	56.00	-32.33	QP	
8		1.7980	9.11	9.94	19.05	46.00	-26.95	AVG	
9		5.0540	17.20	10.02	27.22	60.00	-32.78	QP	
10		5.0540	7.74	10.02	17.76	50.00	-32.24	AVG	
11		12.8500	17.96	10.27	28.23	60.00	-31.77	QP	
12		12.8500	11.67	10.27	21.94	50.00	-28.06	AVG	

*:Maximum data x:Over limit !:over margin 〈Reference Only

Test Result: Pass

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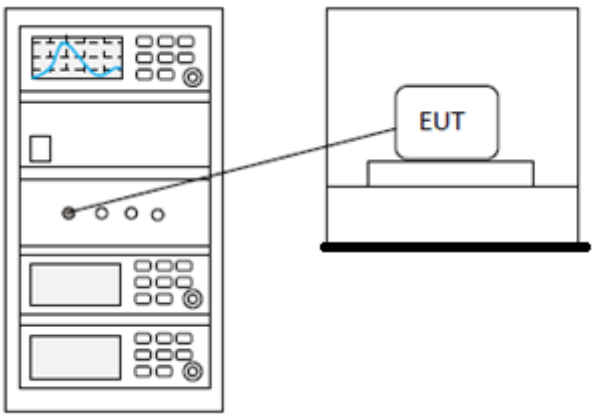
11 CONDUCTED BAND EDGES MEASUREMENT

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.8 & Section 11.13.3.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Sven
Temperature	25℃
Humidity	52%

11.1 LIMITS

Limit:	In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

11.2 BLOCK DIAGRAM OF TEST SETUP



11.3 TEST DATA

Pass: Please Refer To Appendix: For Details

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12 RADIATED SPURIOUS EMISSIONS

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.4,6.5,6.6
Test Mode (Pre-Scan)	TX Low channel;TX middle channel;TX high channel
Test Mode (Final Test)	TX Low channel;TX middle channel;TX high channel
Tester	Sven
Temperature	25℃
Humidity	52%

12.1 LIMITS

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.		

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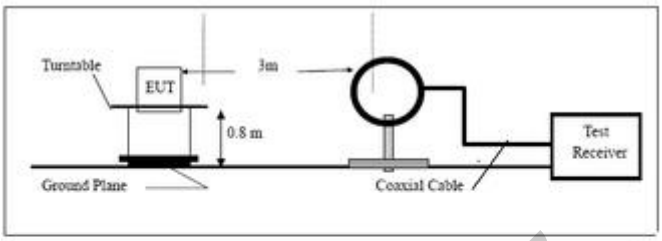
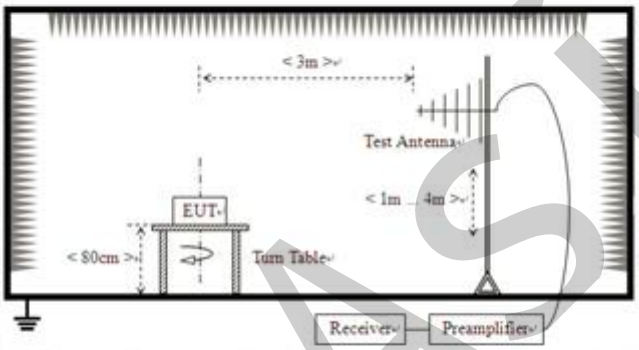
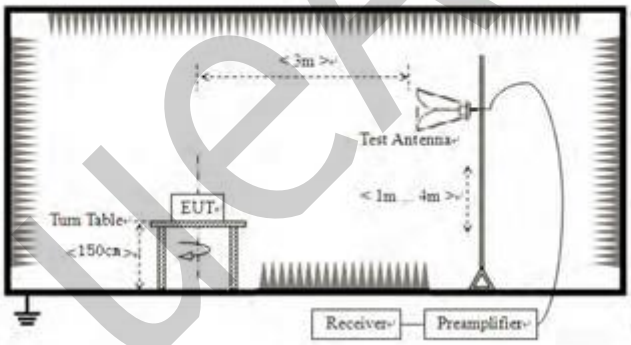
12.2 BLOCK DIAGRAM OF TEST SETUP







12.3 PROCEDURE

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

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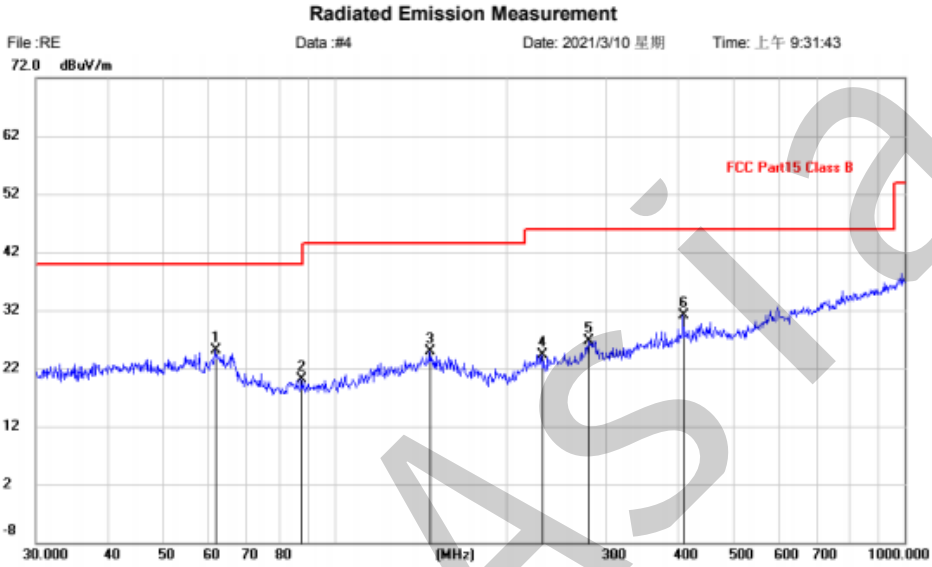
h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
j. Repeat above procedures until all frequencies measured was complete.

Remark:
1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level =Receiver Reading + Antenna Factor + Cable Factor-Preamplifier Factor
3) Scan from 9kHz to 25GHz, the disturbance above 12.75GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported. Fundamental frequency is blocked by filter, and only spurious emission is shown.
4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

BlueAsia

12.4 TEST DATA

[Test Mode: TX]; [Polarity: Horizontal]



Site
Limit: FCC Part15 Class B
EUT: AOA/AOD
M/N: TLSR8278IP48D
Mode: TX mode
Note:

Polarization: ***Horizontal***
Power:
Distance: 3m

Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		61.7781	2.12	22.89	25.01	40.00	-14.99	QP			
2		87.4177	0.87	19.17	20.04	40.00	-19.96	QP			
3		146.8877	1.57	23.24	24.81	43.50	-18.69	QP			
4		230.9068	2.01	22.30	24.31	46.00	-21.69	QP			
5		280.0237	3.28	23.49	26.77	46.00	-19.23	QP			
6	*	408.9460	3.79	27.36	31.15	46.00	-14.85	QP			

*:Maximum data x:Over limit !:over margin 〈Reference Only

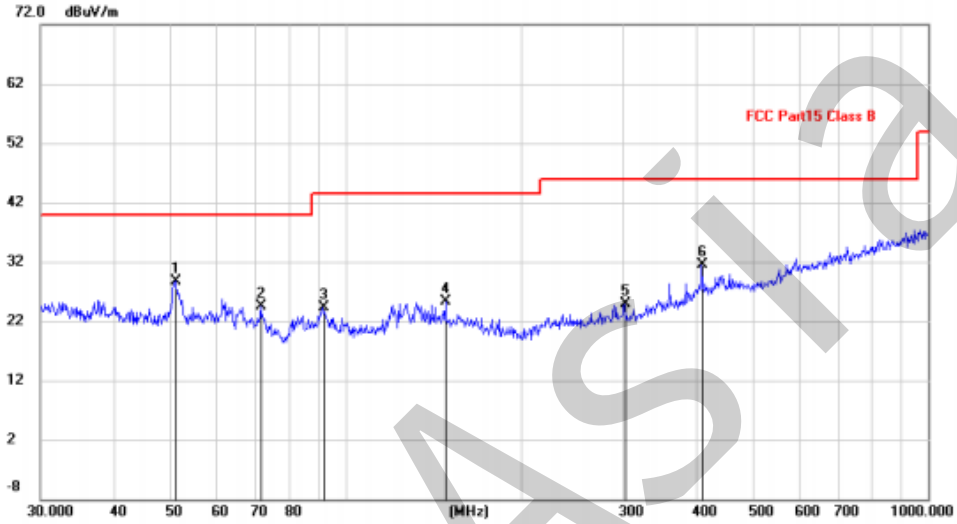
Test Result: Pass

BlueAsia

[Test Mode: TX]; [Polarity: Vertical]

Radiated Emission Measurement

File :RE Data :#3 Date: 2021/3/10 星期 Time: 上午 9:30:05



Site
Limit: FCC Part15 Class B
EUT: AOA/AOD
M/N: TLSR8278IP48D
Mode: TX mode
Note:

Polarization: *Vertical*
Power:
Distance: 3m

Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	51.1209	5.24	23.54	28.78	40.00	-11.22	QP			
2		71.5806	3.68	20.91	24.59	40.00	-15.41	QP			
3		91.4949	5.15	19.23	24.38	43.50	-19.12	QP			
4		148.4410	2.01	23.23	25.24	43.50	-18.26	QP			
5		301.4224	1.05	23.76	24.81	46.00	-21.19	QP			
6		408.9460	4.08	27.36	31.44	46.00	-14.56	QP			

*:Maximum data x:Over limit !:over margin 〈Reference Only

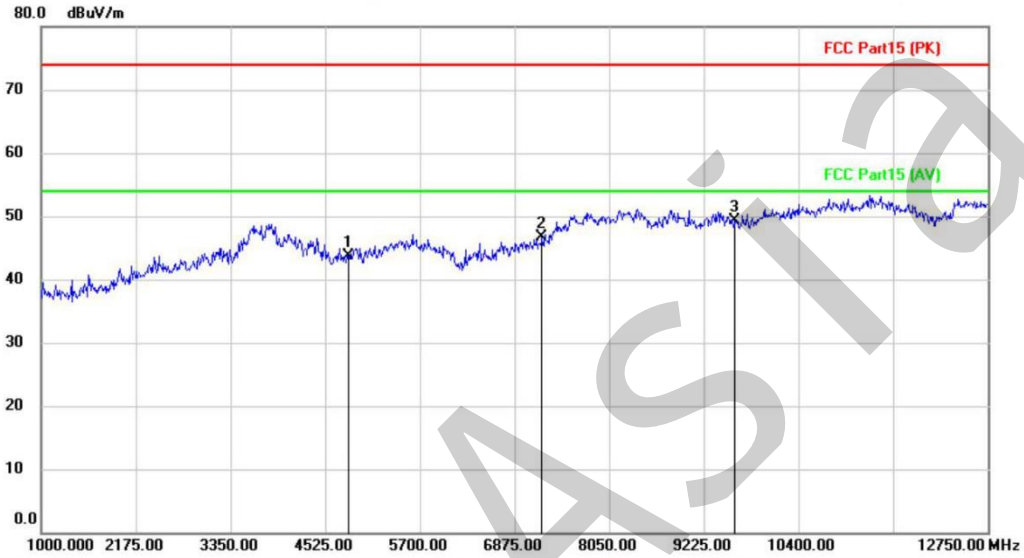
Test Result: Pass

BlueAsia

[Test Mode: TX Low channel]; [Polarity: Horizontal]

Radiated Emission Measurement

File :RE Data :#8 Date: 2021/3/10 星期 Time: 上午 10:10:25



Site
Limit: FCC Part15 (PK)
EUT: AOA/AOD
M/N: TLSR8278IP48D
Mode: TX-2402
Note:

Polarization: ***Horizontal***
Power:
Distance: 3m

Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		4804.000	50.91	-7.27	43.64	74.00	-30.36	peak			
2		7206.000	51.16	-4.42	46.74	74.00	-27.26	peak			
3	*	9608.000	49.62	-0.29	49.33	74.00	-24.67	peak			

*:Maximum data x:Over limit !:over margin 〈Reference Only

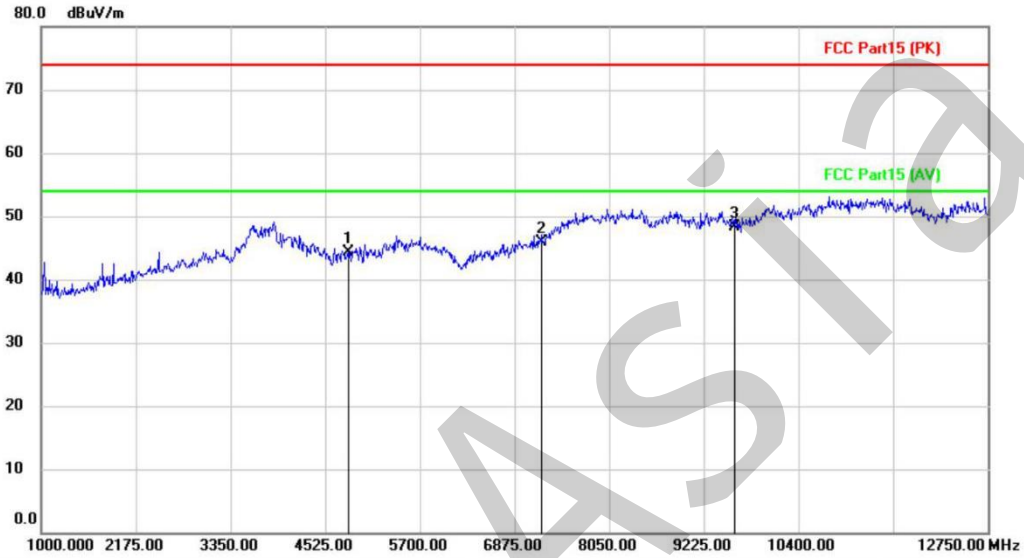
Test Result: Pass

BlueAsia

[Test Mode: TX Low channel]; [Polarity: Vertical]

Radiated Emission Measurement

File :RE Data :#7 Date: 2021/3/10 星期 Time: 上午 10:08:52



Site
Limit: FCC Part15 (PK)
EUT: AOA/AOD
M/N: TLSR8278IP48D
Mode: TX-2402
Note:

Polarization: *Vertical*
Power:
Distance: 3m

Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		4804.000	51.56	-7.27	44.29	74.00	-29.71	peak			
2		7206.000	50.28	-4.42	45.86	74.00	-28.14	peak			
3	*	9608.000	48.65	-0.29	48.36	74.00	-25.64	peak			

*:Maximum data x:Over limit !:over margin 〈Reference Only

Test Result: Pass

BlueAsia

[Test Mode: TX middle channel]; [Polarity: Horizontal]

Radiated Emission Measurement

File :RE Data :#12 Date: 2021/3/10 星期 Time: 上午 10:23:01

Site
Limit: FCC Part15 (PK)
EUT: AOA/AOD
M/N: TLSR8278IP48D
Mode: TX-2441
Note:

Polarization: ***Horizontal***
Power:
Distance: 3m

Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		4882.000	52.34	-7.51	44.83	74.00	-29.17	peak			
2		7323.000	50.22	-3.35	46.87	74.00	-27.13	peak			
3	*	9764.000	49.10	0.56	49.66	74.00	-24.34	peak			

*:Maximum data x:Over limit !:over margin 〈Reference Only

Test Result: Pass

BlueAsia

[Test Mode: TX middle channel]; [Polarity: Vertical]

Radiated Emission Measurement

File :RE Data :#11 Date: 2021/3/10 星期 Time: 上午 10:20:06

Site
Limit: FCC Part15 (PK)
EUT: AOA/AOD
M/N: TLSR8278IP48D
Mode: TX-2441
Note:

Polarization: *Vertical*
Power:
Distance: 3m

Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		4882.000	52.57	-7.51	45.06	74.00	-28.94	peak			
2		7323.000	50.76	-3.35	47.41	74.00	-26.59	peak			
3	*	9764.000	49.80	0.56	50.36	74.00	-23.64	peak			

*:Maximum data x:Over limit !:over margin 〈Reference Only

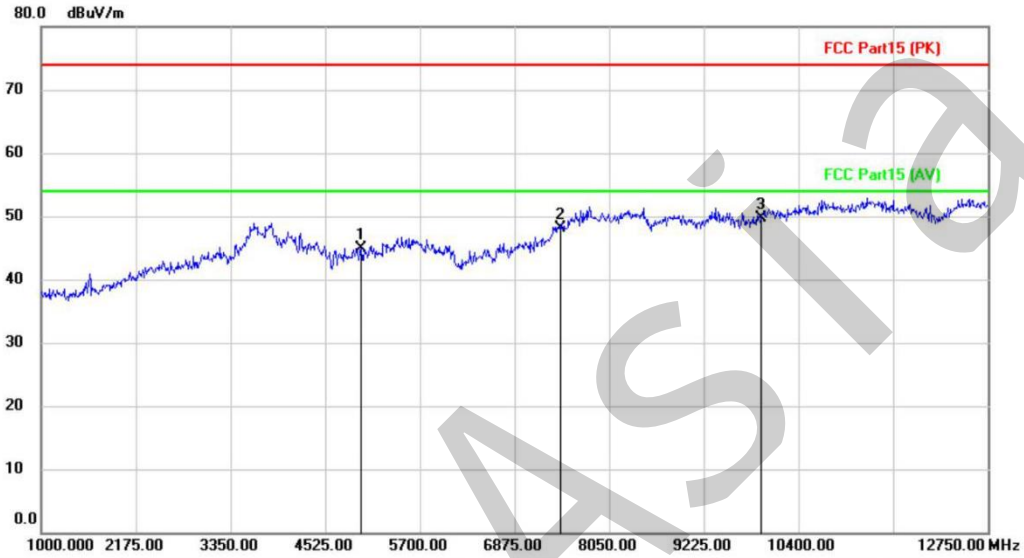
Test Result: Pass

BlueAsia

[Test Mode: TX high channel]; [Polarity: Horizontal]

Radiated Emission Measurement

File :RE Data :#13 Date: 2021/3/10 星期 Time: 上午 10:25:40



Site
Limit: FCC Part15 (PK)
EUT: AOA/AOD
M/N: TLSR8278IP48D
Mode: TX-2480
Note:

Polarization: ***Horizontal***
Power:
Distance: 3m

Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		4960.000	51.99	-6.99	45.00	74.00	-29.00	peak			
2		7440.000	50.52	-2.43	48.09	74.00	-25.91	peak			
3	*	9920.000	48.11	1.63	49.74	74.00	-24.26	peak			

*:Maximum data x:Over limit !:over margin 〈Reference Only

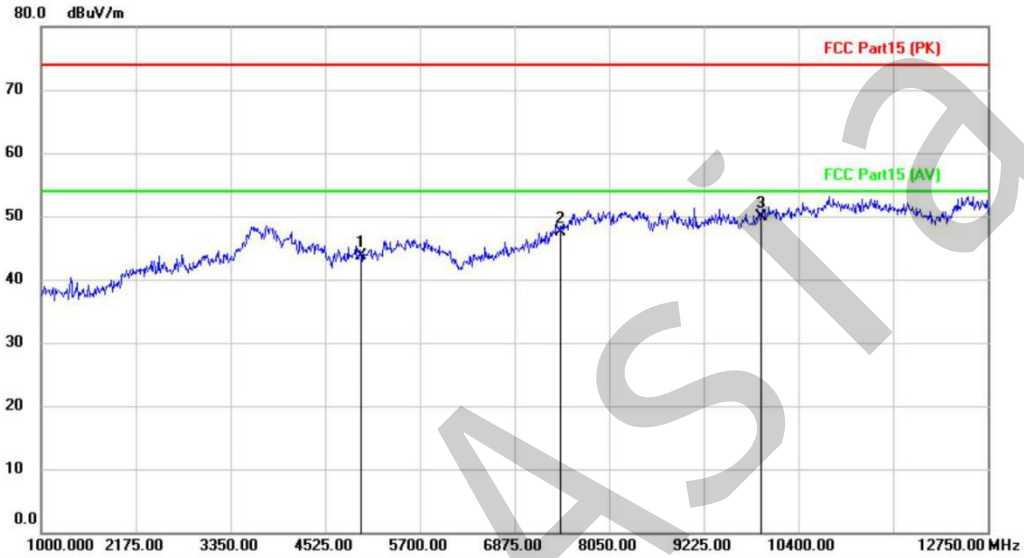
Test Result: Pass

BlueAsia

[Test Mode: TX high channel]; [Polarity: Vertical]

Radiated Emission Measurement

File :RE Data :#14 Date: 2021/3/10 星期 Time: 上午 10:27:32



Site
Limit: FCC Part15 (PK)
EUT: AOA/AOD
M/N: TLSR8278IP48D
Mode: TX-2480
Note:

Polarization: *Vertical*
Power:
Distance: 3m

Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		4960.000	50.63	-6.99	43.64	74.00	-30.36	peak			
2		7440.000	50.02	-2.43	47.59	74.00	-26.41	peak			
3	*	9920.000	48.20	1.63	49.83	74.00	-24.17	peak			

*:Maximum data x:Over limit !:over margin 〈Reference Only

Test Result: Pass

BlueAsia

13 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.10.5
Test Mode (Pre-Scan)	TX Low channel;TX high channel
Test Mode (Final Test)	TX Low channel;TX high channel
Tester	Sven
Temperature	25℃
Humidity	52%

13.1 LIMITS

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

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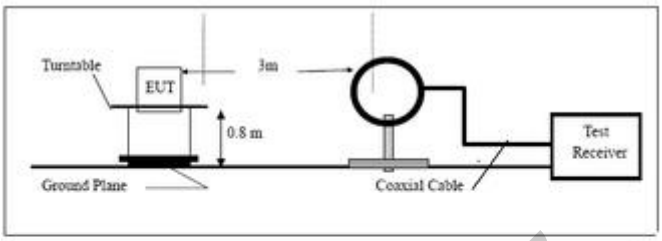
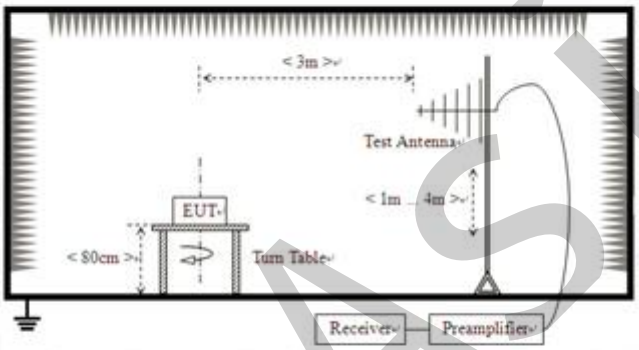
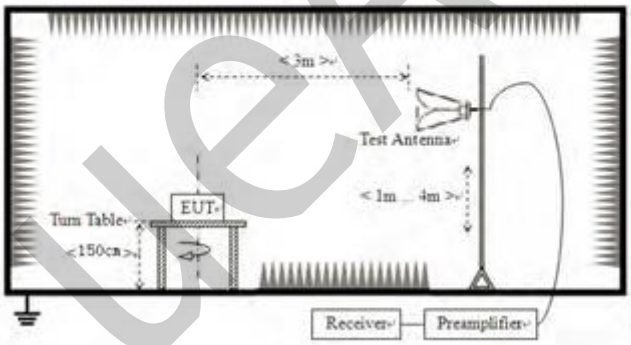
13.2 BLOCK DIAGRAM OF TEST SETUP







13.3 PROCEDURE

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

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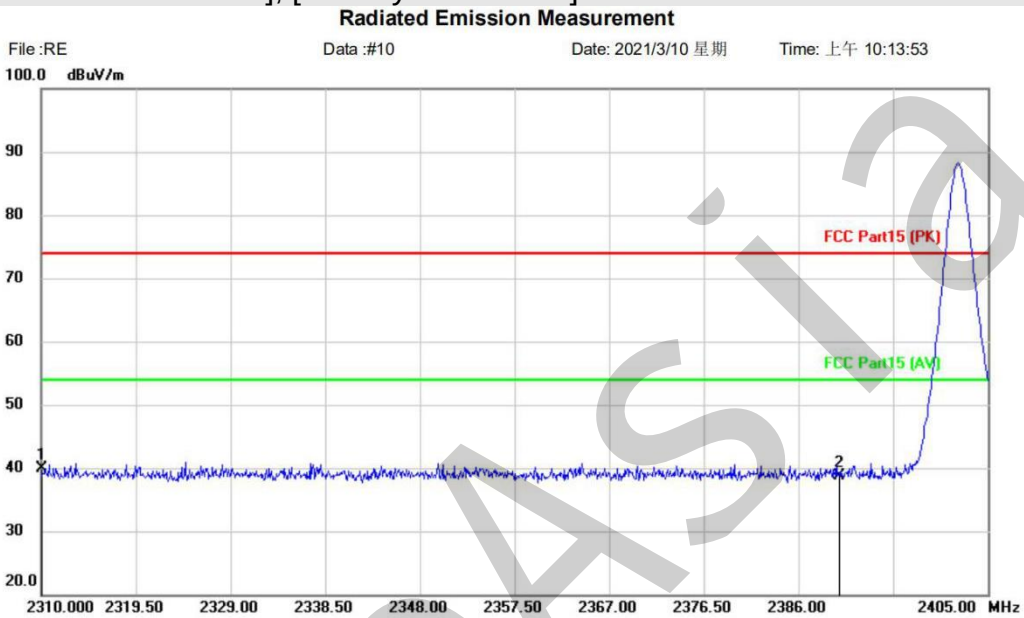
h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
j. Repeat above procedures until all frequencies measured was complete.
Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

BlueAsia

13.4 TEST DATA

[TestMode: TX Low channel]; [Polarity: Horizontal]



Site	Polarization: ***Horizontal***	Temperature:
Limit: FCC Part15 (PK)	Power:	Humidity: %
EUT: AOA/AOD	Distance: 3m	
M/N: TLSR8278IP48D		
Mode: TX-2402		
Note:		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2310.000	55.41	-15.49	39.92	74.00	-34.08	peak			
2		2390.000	53.94	-15.18	38.76	74.00	-35.24	peak			

*:Maximum data x:Over limit !:over margin 〈Reference Only

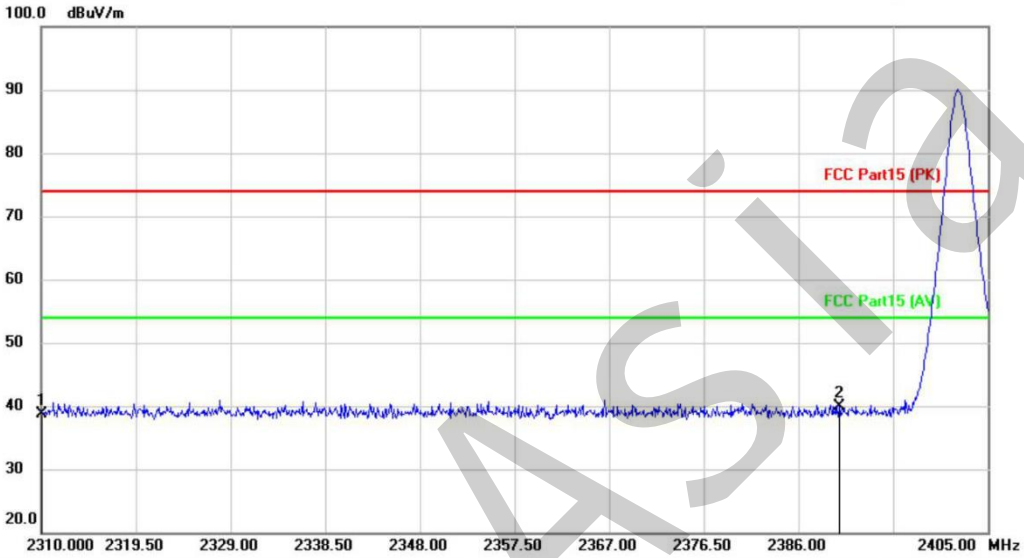
Test Result: Pass

BlueAsia

[TestMode: TX Low channel]; [Polarity: Vertical]

Radiated Emission Measurement

File :RE Data :#9 Date: 2021/3/10 星期 Time: 上午 10:13:17



Site
Limit: FCC Part15 (PK)
EUT: AOA/AOD
M/N: TLSR8278IP48D
Mode: TX-2402
Note:

Polarization: *Vertical*
Power:
Distance: 3m

Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2310.000	54.26	-15.49	38.77	74.00	-35.23	peak			
2	*	2390.000	55.10	-15.18	39.92	74.00	-34.08	peak			

*:Maximum data x:Over limit !:over margin 〈Reference Only

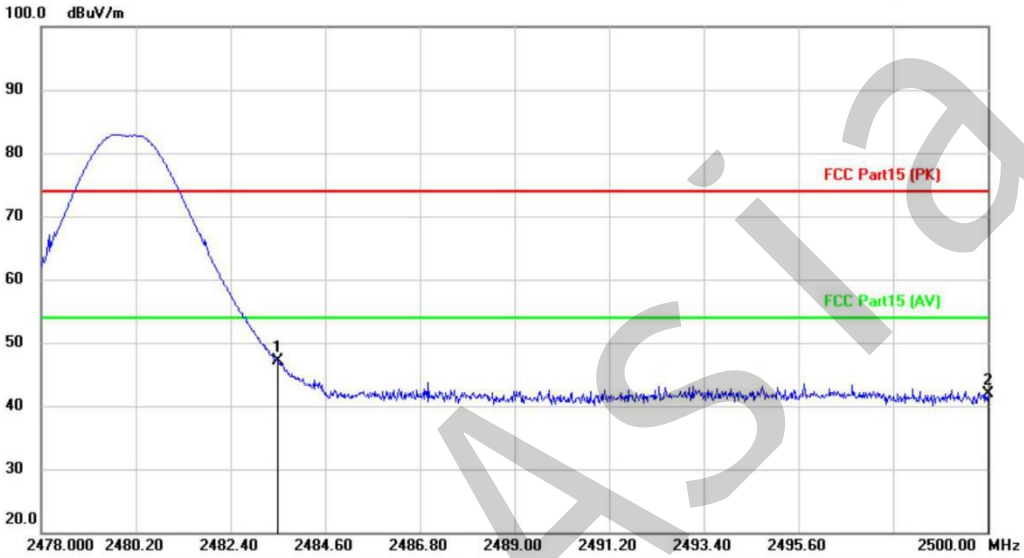
Test Result: Pass

BlueAsia

[TestMode: TX high channel]; [Polarity: Horizontal]

Radiated Emission Measurement

File :RE Data :#16 Date: 2021/3/10 星期 Time: 上午 10:50:06



Site
Limit: FCC Part15 (PK)
EUT: AOA/AOD
M/N: TLSR8278IP48D
Mode: TX-2480
Note:

Polarization: ***Horizontal***
Power:
Distance: 3m

Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2483.500	59.32	-12.21	47.11	74.00	-26.89	peak			
2		2500.000	54.27	-12.28	41.99	74.00	-32.01	peak			

*:Maximum data x:Over limit !:over margin 〈Reference Only

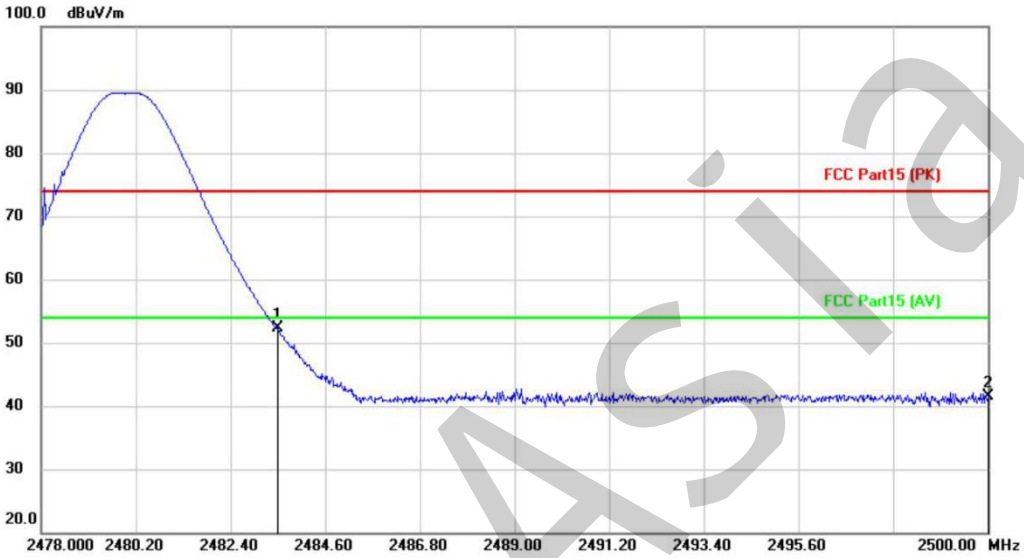
Test Result: Pass

BlueAsia

[TestMode: TX high channel]; [Polarity: Vertical]

Radiated Emission Measurement

File :RE Data :#15 Date: 2021/3/10 星期 Time: 上午 10:47:26



Site
Limit: FCC Part15 (PK)
EUT: AOA/AOD
M/N: TLSR8278IP48D
Mode: TX-2480
Note:

Polarization: *Vertical*
Power:
Distance: 3m

Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2483.500	64.44	-12.21	52.23	74.00	-21.77	peak			
2		2500.000	53.86	-12.28	41.58	74.00	-32.42	peak			

*:Maximum data x:Over limit !:over margin 〈Reference Only

Test Result: Pass

BlueAsia

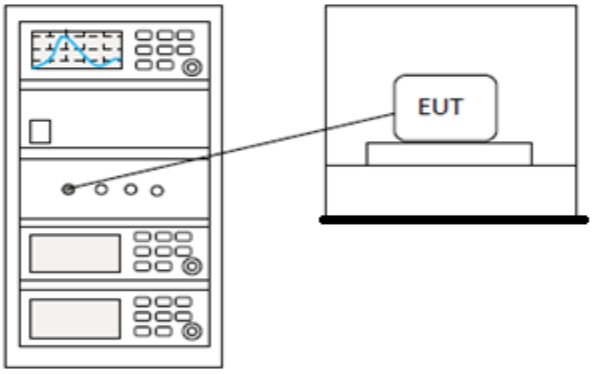
14 CONDUCTED SPURIOUS EMISSIONS

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.6 & Section 11.11
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Sven
Temperature	25℃
Humidity	52%

14.1 LIMITS

Limit:	In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

14.2 BLOCK DIAGRAM OF TEST SETUP



14.3 TEST DATA

Pass: Please Refer To Appendix: For Details

BlueAsia

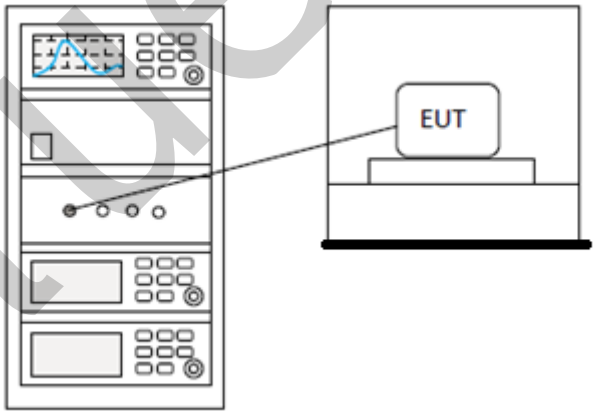
15 POWER SPECTRUM DENSITY

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 11.10.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Sven
Temperature	25℃
Humidity	52%

15.1 LIMITS

Limit:	≤8dBm in any 3 kHz band during any time interval of continuous transmission

15.2 BLOCK DIAGRAM OF TEST SETUP



15.3 TEST DATA

Pass: Please Refer To Appendix: For Details

BlueAsia

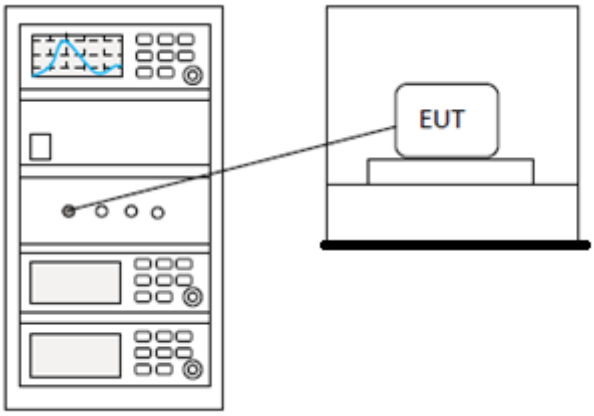
16 CONDUCTED PEAK OUTPUT POWER

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.5
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Sven
Temperature	25℃
Humidity	52%

16.1 LIMITS

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥50 hopping channels
	0.25 for 25≤ hopping channels <50
	1 for digital modulation
2400-2483.5	1 for ≥75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

16.2 BLOCK DIAGRAM OF TEST SETUP



16.3 EST DATA

Pass: Please Refer To Appendix: For Details

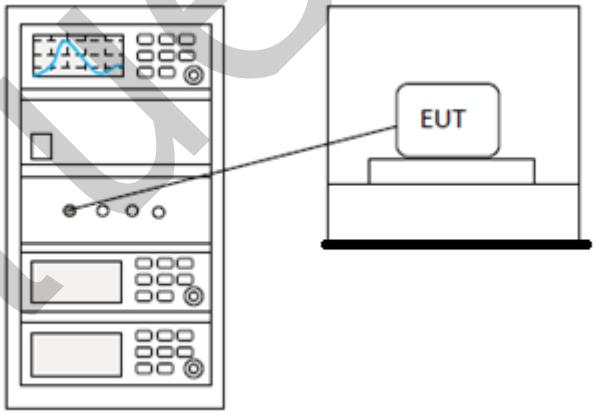
17 MINIMUM 6DB BANDWIDTH

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 11.8.1
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Sven
Temperature	25℃
Humidity	52%

17.1 LIMITS

Limit:	≥500 kHz

17.2 BLOCK DIAGRAM OF TEST SETUP



17.3 TEST DATA

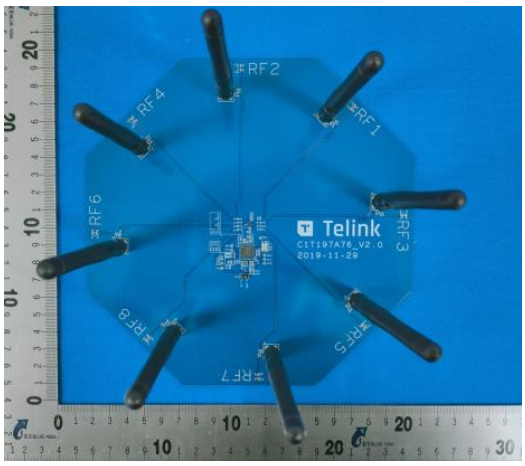
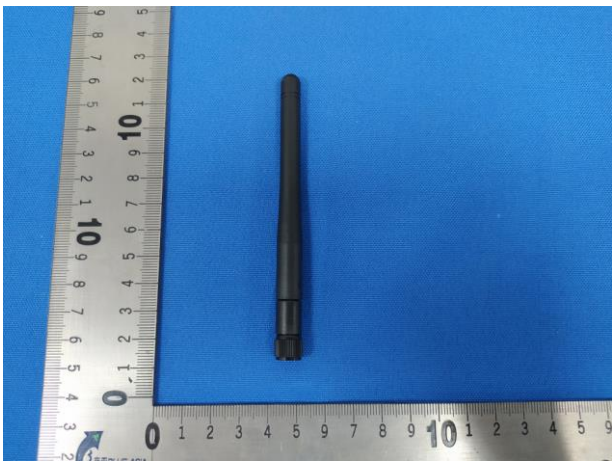
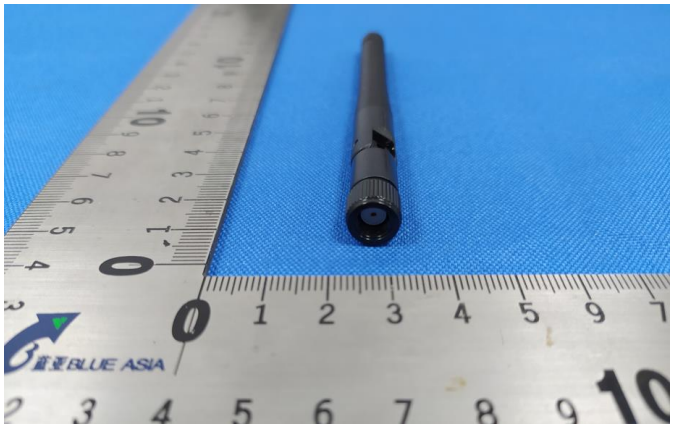
Pass: Please Refer To Appendix: For Details

BlueAsia

18 ANTENNA REQUIREMENT

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	N/A

CONCLUSION

Standard Requirement:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:
The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0.0dBi.