BL

FCC Radio Test Report

FCC ID: 2AR2STAFS1GC

This report concerns: Original Grant

Project No.	:	2201C013
Equipment	:	Wireless Home Speaker
Brand Name	:	
		PHILIPS or
Test Model	:	TAFS1GC
Series Model	:	TAFS1, TAFS1/10, TAFS1GC/10, TAFS1/37, TAFS1GC/37, TAFS1/98, TAFS1GC/98, TAFS1xx/yy (xx=A-Z or blank, yy=00-99 or blank for conutry code)
Applicant	:	MMD Hong Kong Holding Limited
Address	:	Unit 1006, 10th Floor, C-Bons International Center, 108 Wai Yip Street,
		Kwun Tong, Kowloon, HongKong
Manufacturer	:	MMD Hong Kong Holding Limited
Address	:	Unit 1006, 10th Floor, C-Bons International Center, 108 Wai Yip Street,
		Kwun Tong, Kowloon, HongKong
Factory	:	Guoguang Electric Co.,Ltd.
Address	:	No.8 Jinghu Road, Xinya Street, Huadu Reg, Guangzhou, China
Date of Receipt	:	Jan. 19, 2022
Date of Test	:	Jan. 19, 2022 ~ Mar. 11, 2022
Issued Date	:	Apr. 19, 2022
Report Version	:	R00
Test Sample	:	Engineering Sample No.: DG2022011385 for AC Power Line Conducted Emissions and radiated emissions 9kHz ~ 30MHz, DG2022011384 for radiated emissions above 30MHz, DG2022011384-1 for conducted.
Standard(s)	:	FCC CFR Title 47, Part 15, Subpart E FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01 ANSI C63.10-2013

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

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BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective. Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.



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APPENDIX H - FREQUENCY STABILITY

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REPORT ISSUED HISTORY

Report No.	Version	Description	Issued Date	Note
BTL-FCCP-3-2201C013	R00	Original Report.	Apr. 19, 2022	Valid

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

	FCC CFR Title 47, Part 15, Subpart E					
Standard(s) Section	Test Item	Test Item Test Result		Remark		
15.207 15.407(b)	AC Power Line Conducted Emissions	APPENDIX A	PASS			
15.407(b) 15.205(a) 15.209(a)	Radiated Emissions	APPENDIX B APPENDIX C APPENDIX D	PASS			
15.407(a) 15.407(e)	Bandwidth	APPENDIX E	PASS			
15.407(a)	Maximum Output Power	APPENDIX F	PASS			
15.407(a)	Power Spectral Density	APPENDIX G	PASS			
15.407(g)	Frequency Stability	APPENDIX H	PASS			
15.203	Antenna Requirements		PASS	NOTE (2)		
15.407(c)	Automatically Discontinue Transmission		PASS	NOTE (3)		

Note:

- (1) "N/A" denotes test is not applicable in this test report.
- (2) The device what use a permanently attached antenna were considered sufficient to comply with the provisions of 15.203.

(3) During no any information transmission, the EUT can automatically discontinue transmission and become standby mode for power saving. the EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

- (4) For UNII-1 this device was functioned as a
 - Outdoor access point device
 - ☐ Indoor access point device
 - ☐ Fixed point-to-point access points device
 - Client device



1.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No. 3 Jinshagang 1st Rd. Shixia, Dalang Town Dongguan City, Guangdong 523792 People's Republic of China. BTL's Registration Number for FCC: 357015 BTL's Designation Number for FCC: CN1240

1.2 MEASUREMENT UNCERTAINTY

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)) The BTL measurement uncertainty as below table:

A. AC power line conducted emissions test:

Test Site	Method	Measurement Frequency Range	U,(dB)
DG-C02	CISPR	150kHz ~ 30MHz	2.60

B. Radiated emissions test:

Test Site	Method	Measurement Frequency Range	U,(dB)
DG-CB01	CISPR	9kHz ~ 30MHz	2.36

Test Site	Method	Measurement Frequency Range	Ant. H / V	U,(dB)	
DG-CB03 (3m)		30MHz ~ 200MHz	V	4.36	
	CISPR	30MHz ~ 200MHz		3.32	
	CISFK	3m) 200MHz ~ 1,000MHz		V	4.08
		200MHz ~ 1,000MHz	Н	3.96	

Test Site	Method	Measurement Frequency Range	
DG-CB03 (3m)		1GHz ~ 6GHz	3.80
	CISPR	6GHz ~ 18GHz	4.82

Test Site	Method	Measurement Frequency Range	U,(dB)
DG-CB03 (1m)		18 ~ 26.5 GHz	3.62
	CISPR	26.5 ~ 40 GHz	4.00

C. Other Measurement test:

Test Item	Uncertainty
Bandwidth	±3.8 %
Maximum Output Power	±0.95 dB
Power Spectral Density	±0.86 dB
Frequency Stability	±0.16 dB
Temperature	±0.08 °C
Humidity	±1.5%

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.



1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Test Voltage	Tested By
AC Power Line Conducted Emissions	20°C	58%	AC 120V/60Hz	Rod Tang
Radiated Emissions-9kHz to 30MHz	17°C	59%	AC 120V/60Hz	Torocat Yuan
Radiated Emissions-30MHz to 1000MHz	22°C	51%	AC 230V/50Hz	Chen Mo
Radiated Emissions-Above 1000 MHz	22°C	51%	AC 120V/60Hz	Chen Mo
Bandwidth	18°C~24°C	50%~53%	AC 120V/60Hz	Nicole Chen
Maximum Output Power	18°C~24°C	50%~53%	AC 120V/60Hz	Nicole Chen
Power Spectral Density	18°C~24°C	50%~53%	AC 120V/60Hz	Nicole Chen
Frequency Stability	Normal & Extreme	50%~53%	Normal & Extreme	Nicole Chen

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Wireless Home Speaker
Brand Name	PHILIPS or
Test Model	TAFS1GC
Series Model	TAFS1, TAFS1/10, TAFS1GC/10, TAFS1/37, TAFS1GC/37, TAFS1/98, TAFS1GC/98, TAFS1xx/yy (xx=A-Z or blank, yy=00-99 or blank for conutry code)
Model Difference(s)	Only differ in model name.
Module Model	Ambilight Module
Power Source	DC voltage supplied from AC adapter. Model: NSA57ED-190300
Power Rating	I/P: 100-240V~ 50/60Hz 1.5A O/P: 19.0V 3.0A
Operation Frequency Band(s)	UNII-1: 5150 MHz ~ 5250 MHz UNII-2A: 5250 MHz ~ 5350 MHz UNII-2C: 5470 MHz ~ 5725 MHz UNII-3: 5725 MHz ~ 5850 MHz
Modulation Type	IEEE 802.11a/n: OFDM
Bit Rate of Transmitter	IEEE 802.11a: 54/48/36/24/18/12/9/6 Mbps IEEE 802.11n: up to 150 Mbps
Maximum Output Power_UNII-1	IEEE 802.11a: 14.36 dBm (0.0273 W)
Maximum Output Power_UNII-2A	IEEE 802.11a: 14.39 dBm (0.0275 W)
Maximum Output Power_UNII-2C	IEEE 802.11a: 14.25 dBm (0.0266 W)
Maximum Output Power_UNII-3	IEEE 802.11a: 14.06 dBm (0.0255 W)

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

2. Channel List:

3

IEEE 802.11a IEEE 802.11n(HT20)		IEEE 802.11n(HT40)		
UNII-1		UN	II-1	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	
36	5180	38	5190	
40	5200	46	5230	
44	5220			
48	5240			

IEEE 802.11a IEEE 802.11n(HT20)		IEEE 802.11n(HT40)	
UNII-2A		UNI	I-2A
Channel	Frequency (MHz)	Channel	Frequency (MHz)
52	5260	54	5270
56	5280	62	5310
60	5300		
64	5320		

IEEE 802.11a IEEE 802.11n(HT20)		IEEE 802.11n(HT40)	
UNII-2C		UNII-2C	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
100	5500	102	5510
104	5520	110	5550
108	5540	118	5590
112	5560	126	5630
116	5580	134	5670
120	5600		
124	5620		
128	5640		
132	5660		
136	5680		
140	5700		

IEEE 802.11a IEEE 802.11n(HT20)		IEEE 802.11n(HT40)	
UNII-3		UN	II-3
Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	151	5755
153	5765	159	5795
157	5785		
161	5805		
165	5825		

3. Table for Filed Antenna:

1 Negear EAN00228	РСВ	I-PEX	5.69

Note: The antenna gain is provided by the manufacturer.



The test system was pre-tested based on the consideration of all possible combinations of EUT operation mode.

Pretest Mode	Description
Mode 1	TX A Mode Channel 36/40/48 (UNII-1)
Mode 2	TX N(HT20) Mode Channel 36/40/48 (UNII-1)
Mode 3	TX N(HT40) Mode Channel 38/46 (UNII-1)
Mode 4	TX A Mode Channel 52/60/64 (UNII-2A)
Mode 5	TX N(HT20) Mode Channel 52/60/64 (UNII-2A)
Mode 6	TX N(HT40) Mode Channel 54/62 (UNII-2A)
Mode 7	TX A Mode Channel 100/116/140 (UNII-2C)
Mode 8	TX N(HT20) Mode Channel 100/116/140 (UNII-2C)
Mode 9	TX N(HT40) Mode Channel 102/110/134 (UNII-2C)
Mode 10	TX A Mode Channel 149/157/165 (UNII-3)
Mode 11	TX N(HT20) Mode Channel 149/157/165 (UNII-3)
Mode 12	TX N(HT40) Mode Channel 151/159 (UNII-3)
Mode 13	TX A Mode Channel 64 (UNII-2A)

Following mode(s) was (were) found to be the worst case(s) and selected for the final test.

AC power line conducted emissions test		
Final Test Mode	Description	
Mode 13	TX A Mode Channel 64 (UNII-2A)	

Radiated Emissions Test - Below 1GHz		
Final Test Mode Description		
Mode 13	TX A Mode Channel 64 (UNII-2A)	



Radiated Emissions Test - Above 1GHz		
Final Test Mode	Description	
Mode 1	TX A Mode Channel 36/40/48 (UNII-1)	
Mode 2	TX N(HT20) Mode Channel 36/40/48 (UNII-1)	
Mode 3	TX N(HT40) Mode Channel 38/46 (UNII-1)	
Mode 4	TX A Mode Channel 52/60/64 (UNII-2A)	
Mode 5	TX N(HT20) Mode Channel 52/60/64 (UNII-2A)	
Mode 6	TX N(HT40) Mode Channel 54/62 (UNII-2A)	
Mode 7	TX A Mode Channel 100/116/140 (UNII-2C)	
Mode 8	TX N(HT20) Mode Channel 100/116/140 (UNII-2C)	
Mode 9	TX N(HT40) Mode Channel 102/110/134 (UNII-2C)	
Mode 10	TX A Mode Channel 149/157/165 (UNII-3)	
Mode 11	TX N(HT20) Mode Channel 149/157/165 (UNII-3)	
Mode 12	TX N(HT40) Mode Channel 151/159 (UNII-3)	

Conducted Test		
Final Test Mode	Description	
Mode 1	TX A Mode Channel 36/40/48 (UNII-1)	
Mode 2	TX N(HT20) Mode Channel 36/40/48 (UNII-1)	
Mode 3	TX N(HT40) Mode Channel 38/46 (UNII-1)	
Mode 4	TX A Mode Channel 52/60/64 (UNII-2A)	
Mode 5	TX N(HT20) Mode Channel 52/60/64 (UNII-2A)	
Mode 6	TX N(HT40) Mode Channel 54/62 (UNII-2A)	
Mode 7	TX A Mode Channel 100/116/140 (UNII-2C)	
Mode 8	TX N(HT20) Mode Channel 100/116/140 (UNII-2C)	
Mode 9	TX N(HT40) Mode Channel 102/110/134 (UNII-2C)	
Mode 10	TX A Mode Channel 149/157/165 (UNII-3)	
Mode 11	TX N(HT20) Mode Channel 149/157/165 (UNII-3)	
Mode 12	TX N(HT40) Mode Channel 151/159 (UNII-3)	

Note:

(1) For AC power line conducted emissions and radiated emission below 1 GHz test, the TX A Mode Channel 64 (UNII-2A) is found to be the worst case and recorded.

(2) For radiated emission above 1 GHz test, the spurious points of 1GHz~26.5GHz and 26.5GHz~40GHz have been pre-tested and in this report only recorded the worst case. The remaining spurious points are all below the limit value of 20dB.

(3) All the bit rate of transmitter have been tested and found the lowest rate is found to be the worst case and recorded.

2.3 PARAMETERS OF TEST SOFTWARE

UNII-1				
Test Software Version				
Frequency (MHz)	5180	5200	5240	
IEEE 802.11a	1C	1C	1C	
IEEE 802.11n(HT20)	1A	1A	1A	
Frequency (MHz)	5190	5230		
IEEE 802.11n(HT40)	1B	1B		

UNII-2A			
Test Software Version			
Frequency (MHz)	5260	5300	5320
IEEE 802.11a	1C	1C	1C
IEEE 802.11n(HT20)	1A	1A	1A
Frequency (MHz)	5270	5310	
IEEE 802.11n(HT40)	1B	1B	

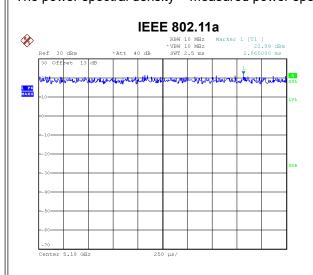
UNII-2C			
Test Software Version			
Frequency (MHz)	5500	5580	5700
IEEE 802.11a	1C	1C	1A
IEEE 802.11n(HT20)	1A	1A	1A
Frequency (MHz)	5510	5550	5670
IEEE 802.11n(HT40)	1B	1B	1B

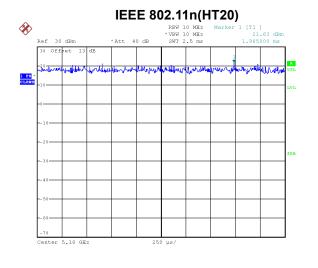
UNII-3			
Test Software Version			
Frequency (MHz)	5745	5785	5825
IEEE 802.11a	1A	1A	1C
IEEE 802.11n(HT20)	1A	1A	1A
Frequency (MHz)	5755	5795	
IEEE 802.11n(HT40)	1B	1B	



2.4 DUTY CYCLE

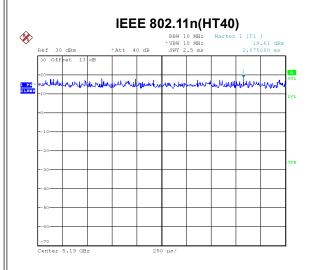
If duty cycle is \geq 98 %, duty factor is not required. If duty cycle is < 98 %, duty factor shall be considered. The output power = measured power + duty factor. The power spectral density = measured power spectral density + duty factor.





Date: 26.JAN.2022 19:48:42

Duty cycle = 2.500 ms / 2.500 ms = 100% Duty Factor = 10 log(1 / Duty cycle) = 0.00



Date: 26.JAN.2022 19:49:54

Duty cycle = 2.500 ms / 2.500 ms = 100% Duty Factor = 10 log(1 / Duty cycle) = 0.00 Date: 26.JAN.2022 19:49:19

Duty cycle = 2.500 ms / 2.500 ms = 100%Duty Factor = $10 \log(1 / \text{ Duty cycle}) = 0.00$



NOTE:

For IEEE 802.11a:

For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1 kHz (Duty cycle \ge 98%).

For IEEE 802.11n(HT20):

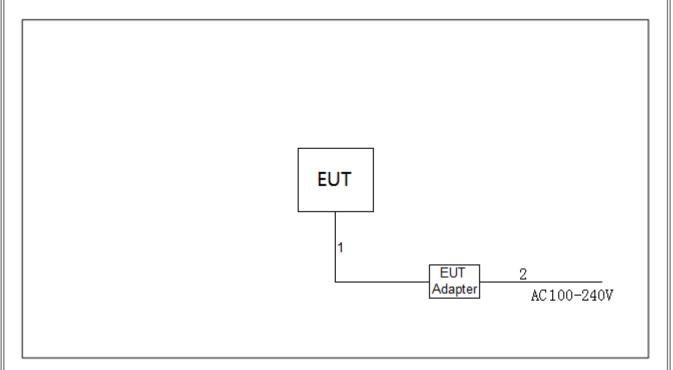
For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1 kHz (Duty cycle \ge 98%).

For IEEE 802.11n(HT40):

For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 2 kHz (Duty cycle \ge 98%).



2.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



2.6 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.
-	_	-	_	_

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	DC Cable	NO	NO	1m
2	AC Cable	NO	NO	1m



3. AC POWER LINE CONDUCTED EMISSIONS

3.1 LIMIT

Frequency	Limit (dBµV)
(MHz)	Quasi-peak	Average
0.15 - 0.5	66 to 56*	56 to 46*
0.5 - 5.0	56	46
5.0 - 30.0	60	50

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.

3.2 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. 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.
- c. 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.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item -EUT Test Photos.

The following table is the setting of the receiver:

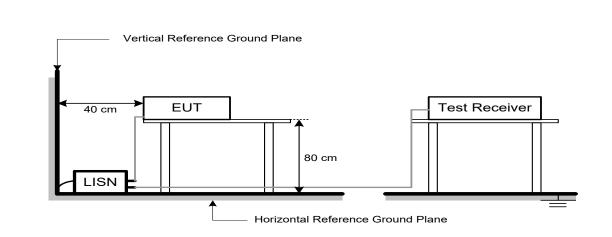
Receiver Parameter	Setting
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.3 DEVIATION FROM TEST STANDARD

No deviation



3.4 TEST SETUP



3.5 EUT OPERATION CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

The EUT was programmed to be in continuously transmitting/TX mode.

3.6 TEST RESULTS

Please refer to the APPENDIX A.



4. RADIATED EMISSIONS

4.1 LIMIT

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

LIMITS OF RADIATED EMISSIONS MEASUREMENT (9 kHz to 1000 MHz)

Frequency	Field Strength	Measurement Distance
(MHz)	(microvolts/meter)	(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

LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS (Above 1000 MHz)

Frequency	EIRP Limit	Equivalent Field Strength at 3m
(MHz)	(dBm/MHz)	(dBµV/m)
5150-5250	-27	68.2
5250-5350	-27	68.2
5470-5725	-27	68.2
	-27	68.2
5725-5850	10	105.2
NOTE (2)	15.6	110.8
	27	122.2

NOTE:

(1) The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength: 1000000√30P E

$$=$$
 $\mu V/m$, where P is the eirp (Watts)

(2) According to 15.407(b)(4)(i), all emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.



4.2 TEST PROCEDURE

- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- c. The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; 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. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1 GHz)
- h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1 GHz)
- i. For the actual test configuration, please refer to the related Item -EUT Test Photos.

The following table is the setting of the receiver:

Spectrum Parameters	Setting
Start ~ Stop Frequency	9 kHz~150 kHz for RBW 200 Hz
Start ~ Stop Frequency	0.15 MHz~30 MHz for RBW 9 kHz
Start ~ Stop Frequency	30 MHz~1000 MHz for RBW 100 kHz

Spectrum Parameters	Setting
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic or 40 GHz, whichever is lower
RBW / VBW	1 MHz / 3 MHz for PK value
(Emission in restricted band)	1 MHz / 1/T Hz for AVG value

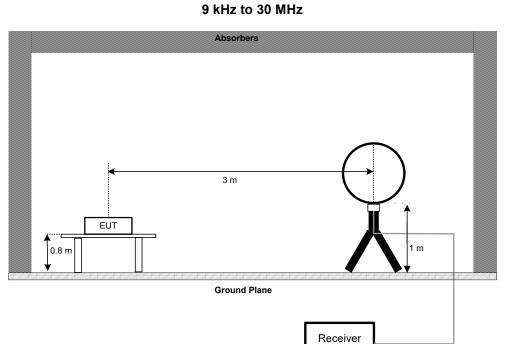
Receiver Parameters	Setting
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30 MHz~1000 MHz for QP detector
Start ~ Stop Frequency	1 GHz~40 GHz for PK/AVG detector



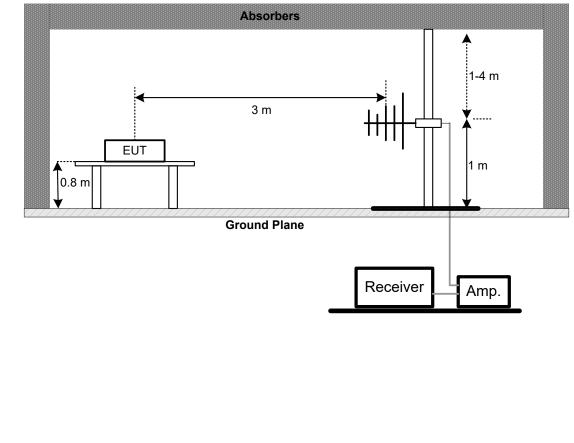
4.3 DEVIATION FROM TEST STANDARD

No deviation.

4.4 TEST SETUP

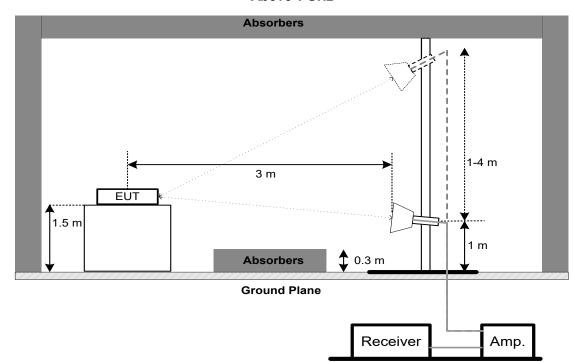


30 MHz to 1 GHz





Above 1 GHz



4.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

4.6 TEST RESULTS - 9 KHZ TO 30 MHZ

Please refer to the APPENDIX B.

Remark:

- (1) Distance extrapolation factor = 40 log (specific distance / test distance) (dB).
- (2) Limit line = specific limits (dBuV) + distance extrapolation factor.

4.7 TEST RESULTS - 30 MHZ TO 1000 MHZ

Please refer to the APPENDIX C.

4.8 TEST RESULTS - ABOVE 1000 MHZ

Please refer to the APPENDIX D.

Remark:

(1) No limit: This is fundamental signal, the judgment is not applicable. For fundamental signal judgment was referred to Peak output test.



5. BANDWIDTH

5.1 LIMIT

Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.407(a) FCC 15.407(e)	26 dB Bandwidth	-	5150-5250
	26 dB Bandwidth	-	5250-5350
	26 dB Bandwidth	-	5470-5725
	6 dB Bandwidth	Minimum 500 kHz	5725-5850

5.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below

b. Spectrum Setting:

For UNII-1, UNII-2A, UNII-2C:

Spectrum Parameter	Setting
Span Frequency	> 26 dB Bandwidth
RBW	Appromiximately 1% of the emission bandwidth
VBW	> RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

For UNII-3:

Spectrum Parameter	Setting
Span Frequency	> 6 dB Bandwidth
RBW	100 kHz
VBW	300 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

For 99% Occupied Bandwidth:

Spectrum Parameter	Setting	
Span Frequency	1.5 times to 5 times the OBW	
RBW	1% to 5% of the OBW	
VBW	≥3*RBW	
Detector	Peak	
Trace	Max Hold	
Sweep Time	Auto	

c. Measured the spectrum width with power higher than 26 dB / 6 dB below carrier.

5.3 DEVIATION FROM STANDARD

No deviation.



5.4 TEST SETUP



5.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

5.6 TEST RESULTS

Please refer to the APPENDIX E.



6. MAXIMUM OUTPUT POWER

6.1 LIMIT

Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.407(a)	Maximum Output Power	Client device: 250 mW (23.98 dBm)	5150-5250
		250 mW (23.98 dBm)	5250-5350
		250 mW (23.98 dBm)	5470-5725
		1 Watt (30dBm)	5725-5850

Note:

- a. For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
- b. For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10log B, where B is the 26dB Bandwidth in megahertz.

6.2 TEST PROCEDURE

- a. The EUT was directly connected to the power meter and antenna output port as show in the block diagram below.
- b. Test test was performed in accordance with method of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP



6.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

6.6 TEST RESULTS

Please refer to the APPENDIX F.



7. POWER SPECTRAL DENSITY

7.1 LIMIT

	Section	Test Item	Limit	Frequency Range (MHz)
		Power Spectral Density	Client device: 11 dBm/MHz	5150-5250
	FCC 15.407(a)		11 dBm/MHz	5250-5350
			11 dBm/MHz	5470-5725
			30 dBm/500 kHz	5725-5850

7.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Spectrum Setting:
 - For UNII-1, UNII-2A, UNII-2C:

Spectrum Parameter	Setting
Span Frequency	Encompass the entire emissions bandwidth (EBW)
Span Frequency	of the signal
RBW	1 MHz.
VBW	3 MHz.
Detector	RMS
Trace average	100 trace
Sweep Time	Auto

For UNII-3:

Spectrum Parameter	Setting
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	100 kHz.
VBW	300 kHz.
Detector	RMS
Trace average	100 trace
Sweep Time	Auto

Note:

- For UNII-3, according to KDB publication 789033 D02 General UNII Test Procedures New Rules v02r01, section II.F.5., it is acceptable to set RBW at 100kHz and VBW at 300kHz if the spectrum analyzer does not have 500 kHz RBW. Then, add 10 log (500 kHz/100 kHz) to the measured result, i.e. 7 dB.
- 2. During the test of U-NII 3 PSD, the measurement result with RBW=100kHz has been added 7 dB by compensating offset. For example, the cable loss is 13 dB, and the final offset is 13 + 7 = 20 dB when RBW=100kHz is used.

7.3 DEVIATION FROM STANDARD

No deviation.



7.4 TEST SETUP



7.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

7.6 TEST RESULTS

Please refer to the APPENDIX G.



8. FREQUENCY STABILITY

8.1 LIMIT

Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.407(g)	Frequency Stability	An emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.	5150-5250 5250-5350 5470-5725 5725-5850

8.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Spectrum Setting:

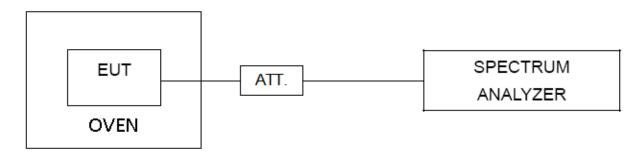
Spectrum Parameter	Setting
Span Frequency	Entire absence of modulation emissions bandwidth
RBW	10 kHz
VBW	10 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

- c. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value.
- d. User manual temperature is 0°C~45°C.

8.3 DEVIATION FROM STANDARD

No deviation.

8.4 TEST SETUP



8.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

8.6 TEST RESULTS

Please refer to the APPENDIX H.

9. MEASUREMENT INSTRUMENTS LIST

	AC Power Line Conducted Emissions						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until		
1	EMI Test Receiver	R&S	ESCI	100382	Jan. 22, 2022 Jan. 22, 2023		
2	LISN	EMCO	3816/2	52765	Jan. 22, 2022 Jan. 22, 2023		
3	TWO-LINE V-NETWORK	R&S	ENV216	101447	Jan. 22, 2022 Jan. 22, 2023		
4	50Ω Terminator	SHX	TF5-3	15041305	N/A		
5	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A		
6	Cable	N/A	RG223	12m	Mar. 08, 2022 Mar. 08, 2023		
7	643 Shield Room	ETS	6*4*3	N/A	N/A		

	Radiated Emissions - 9 kHz to 30 MHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	MXE EMI Receiver	Keysight	N9038A	MY56400091	Jan. 22, 2022 Jan. 22, 2023	
2*	Active Loop Antenna	R&S	HFH2-Z2	830749/020	Aug. 23, 2024	
3	Cable	N/A	RG 213/U(9kHz~1GHz)	N/A	May 27, 2022	
4	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A	
5	966 Chamber Room	ETS	9*6*6	N/A	Jul. 17, 2022	

	Radiated Emissions - 30 MHz to 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	Antenna	Schwarzbeck	VULB9160	9160-3232	Mar. 15, 2022	
2	Amplifier	HP	8447D	2944A08742	Jan. 22, 2022 Jan. 22, 2023	
3	Cable	emci	LMR-400	N/A	Nov. 30, 2022	
4	Controller	СТ	SC100	N/A	N/A	
5	Controller	MF	MF-7802	MF780208416	N/A	
6	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A	
7	Receiver	Agilent	N9038A	MY52130039	Jan. 22, 2022 Jan. 22, 2023	
8	966 Chamber Room	RM	9*6*6	N/A	Jul. 24, 2022	



	Radiated Emissions - Above 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	Double Ridged Horn Antenna	ARA	DRG-118A	16554	Apr. 21, 2022	
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jun. 30, 2022	
3	Amplifier	Agilent	8449B	3008A02584	Jul. 10, 2022	
4	Controller	СТ	SC100	N/A	N/A	
5	Controller	MF	MF-7802	MF780208416	N/A	
6	Receiver	Agilent	N9038A	MY52130039	Jan. 22, 2022 Jan. 22, 2023	
7	EXA Spectrum Analyzer	Keysight	N9010A	MY56480488	Jan. 22, 2022 Jan. 22, 2023	
8	Low Noise Amplifier	CONNPHY	CLN-18G40G-4330 -K	619413	Jul. 16, 2022	
9	Cable	N/A	A81-SMAMSMAM- 12.5M	N/A	Oct. 15, 2022	
10	Cable	Talent microwave	A40-2.92M2.92M-2. 5M	N/A	Nov. 30, 2022	
11*	Band Reject Filter	Micro-Tronics	BRC50703-01	7	Feb. 27, 2024	
12*	Band Reject Filter	Micro-Tronics	BRC50704-01	8	Feb. 27, 2024	
13*	Band Reject Filter	Micro-Tronics	BRC50705-01	10	Feb. 27, 2024	
14	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A	
15	1266 Chamber Room	RM	12*6*6	N/A	Jul. 03, 2022	

Bandwidth & Power Spectral Density					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Jul. 10, 2022
2	Attenuator	WOKEN	6SM3502	VAS1214NL	N/A
3	RF Cable	Tongkaichuan	N/A	N/A	N/A
4	DC Block	Mini	N/A	N/A	N/A

	Maximum Output Power					
	Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
	1	Peak Power Analyzer	Keysight	8990B	MY51000506	Jul. 10, 2022
ſ	2	Wideband power sensor	Keysight	N1923A	MY58310004	Jul. 10, 2022
	3	Attenuator	WOKEN	6SM3502	VAS1214NL	N/A
	4	RF Cable	Tongkaichuan	N/A	N/A	N/A

	Frequency Stability					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	Spectrum Analyzer	R&S	FSP40	100185	Jul. 10, 2022	
2	Precision Oven Tester	CEPREI	CEEC-M64T-40	15-008	Jan. 22, 2022 Jan. 22, 2023	
3	Attenuator	WOKEN	6SM3502	VAS1214NL	N/A	
4	RF Cable	Tongkaichuan	N/A	N/A	N/A	
5	DC Block	Mini	N/A	N/A	N/A	

Remark: "N/A" denotes no model name, serial no. or calibration specified.

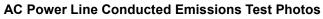
"*" calibration period of equipment list is three year.

Except * item, all calibration period of equipment list is one year.



10. EUT TEST PHOTOS



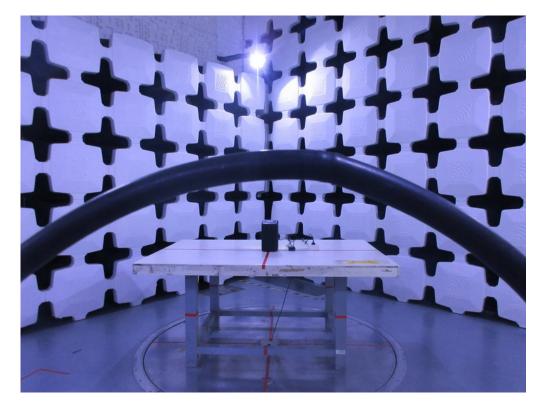


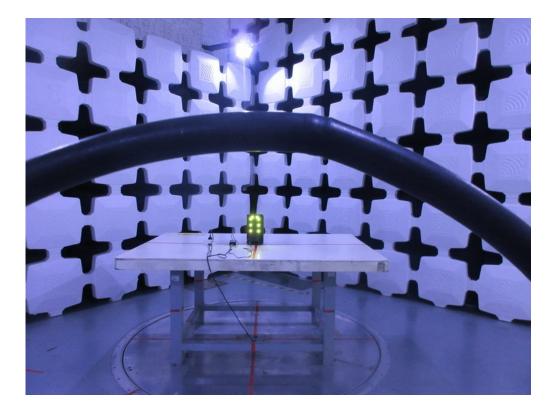




Radiated Emissions Test Photos

9 kHz to 30 MHz

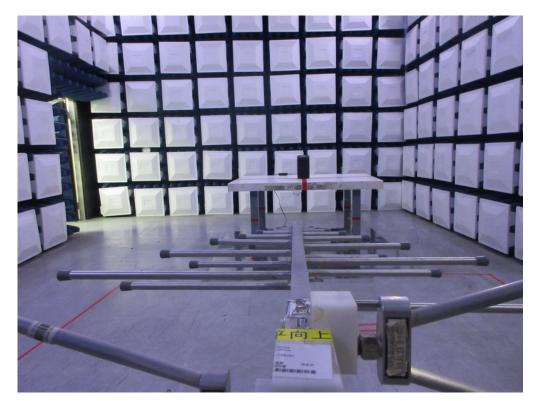






Radiated Emissions Test Photos

30 MHz to 1000 MHz

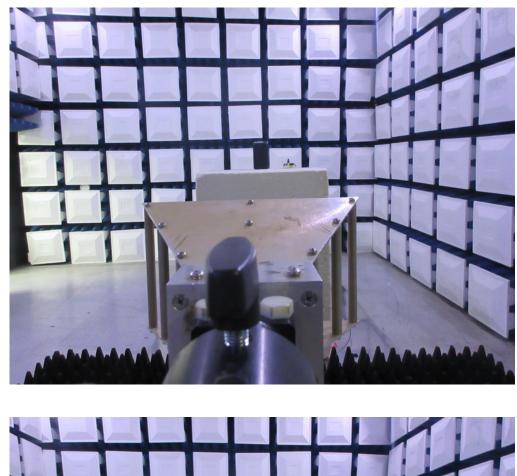






Radiated Emissions Test Photos

Above 1 GHz





BL

Conducted Test Photos

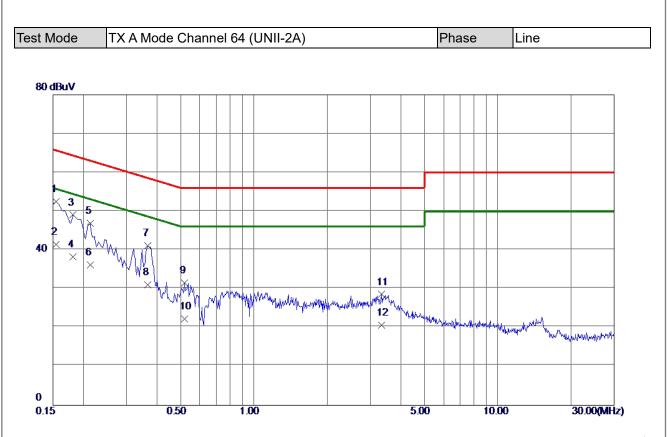






APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS



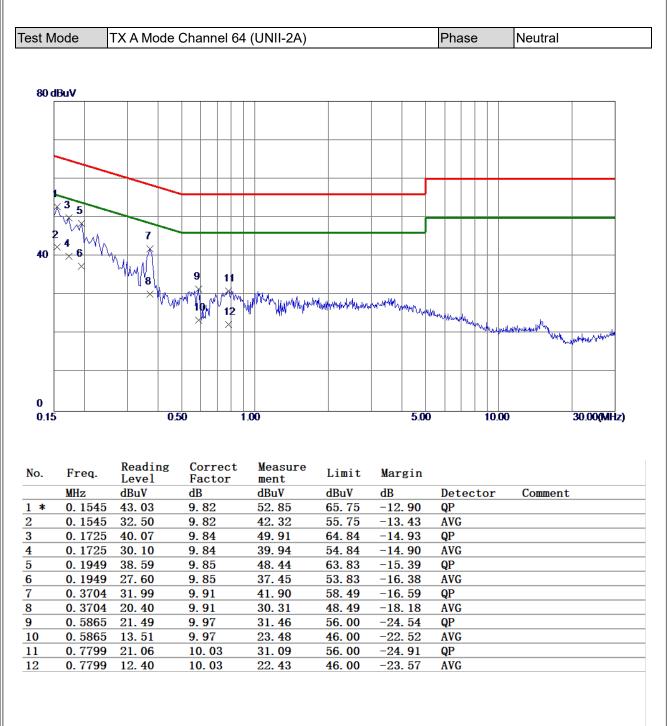


No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1 *	0.1545	42.70	9.78	52.48	65.75	-13.27	QP	
2	0.1545	31.60	9.78	41.38	55.75	-14. 37	AVG	
3	0. 1815	39.24	9.80	49.04	64.4 2	-15.38	QP	
4	0. 1815	28. 50	9.80	38. 30	54.4 2	-16. 12	AVG	
5	0.2130	37.00	9.82	46. 82	63.09	-16.27	QP	
6	0.2130	26.30	9.82	36.12	53. 0 9	-16. 97	AVG	
7	0.3660	31.33	9.84	41.17	58. 59	-17.42	QP	
8	0.3660	21. 20	9.84	31. 04	48. 59	-17.55	AVG	
9	0.5190	21.66	9.87	31. 53	56.00	-24.47	QP	
10	0.5190	12.30	9.87	22.17	46.00	-23.83	AVG	
11	3. 3405	18.35	10.21	28. 56	56.00	-27.44	QP	
12	3. 3405	10. 40	10.21	20. 61	46.00	-25. 39	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value Limit Value.
- (3) The test result has included the cable loss.





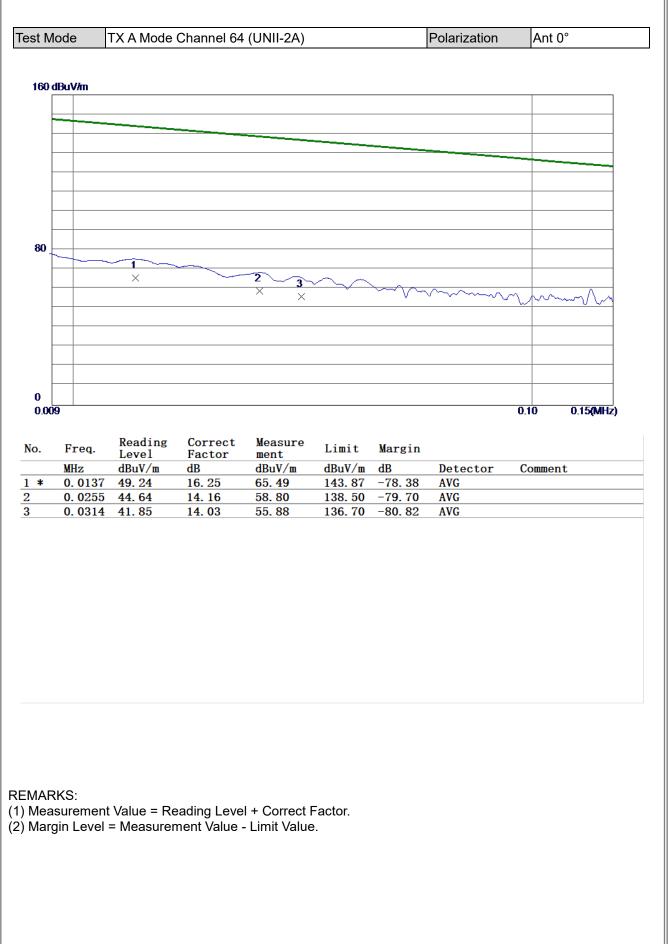
REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.
- (3) The test result has included the cable loss.

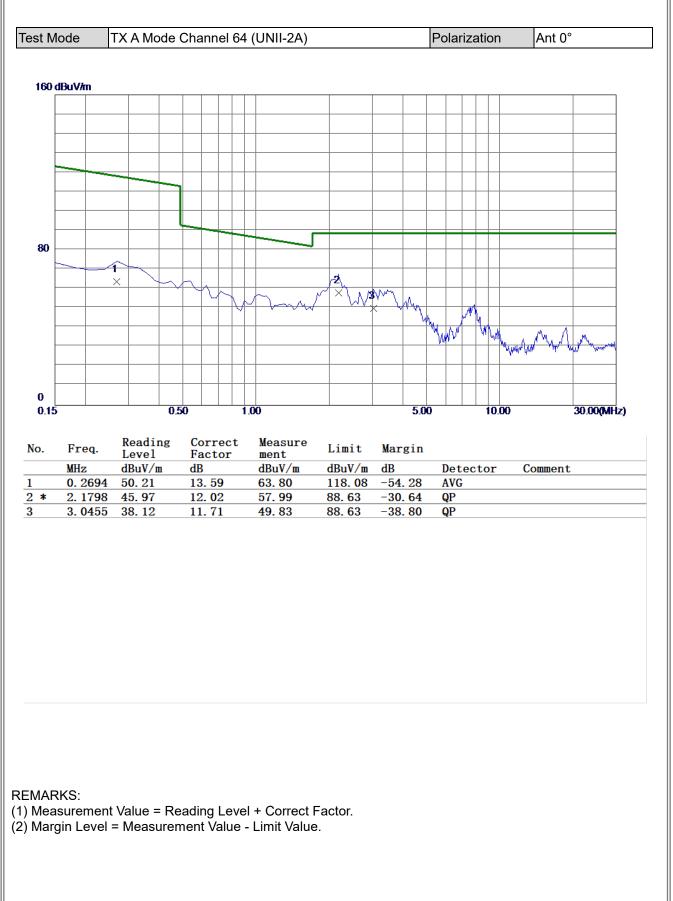


APPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ

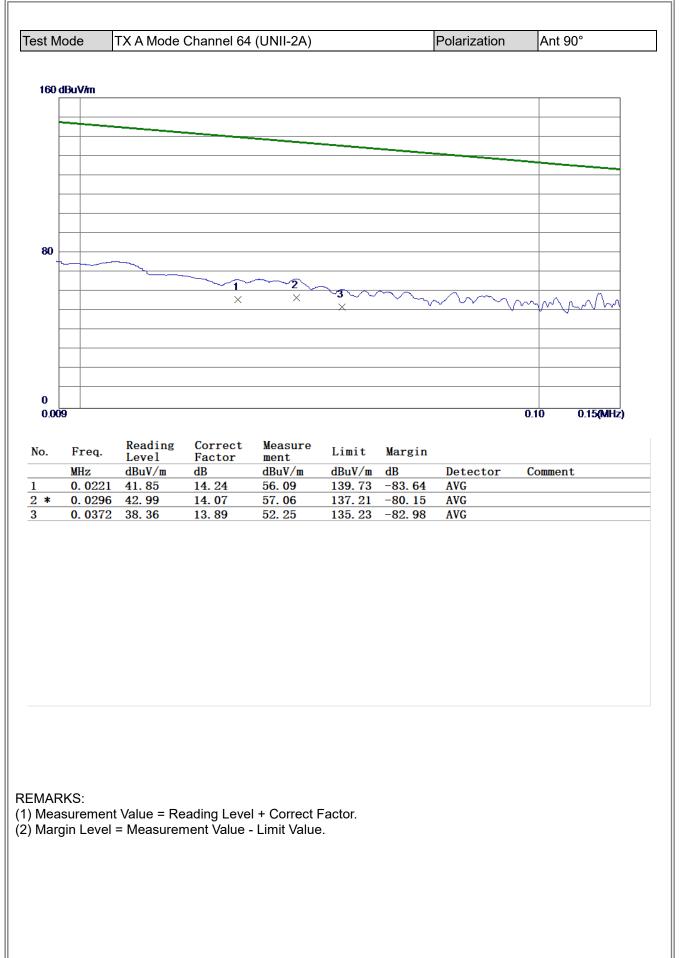




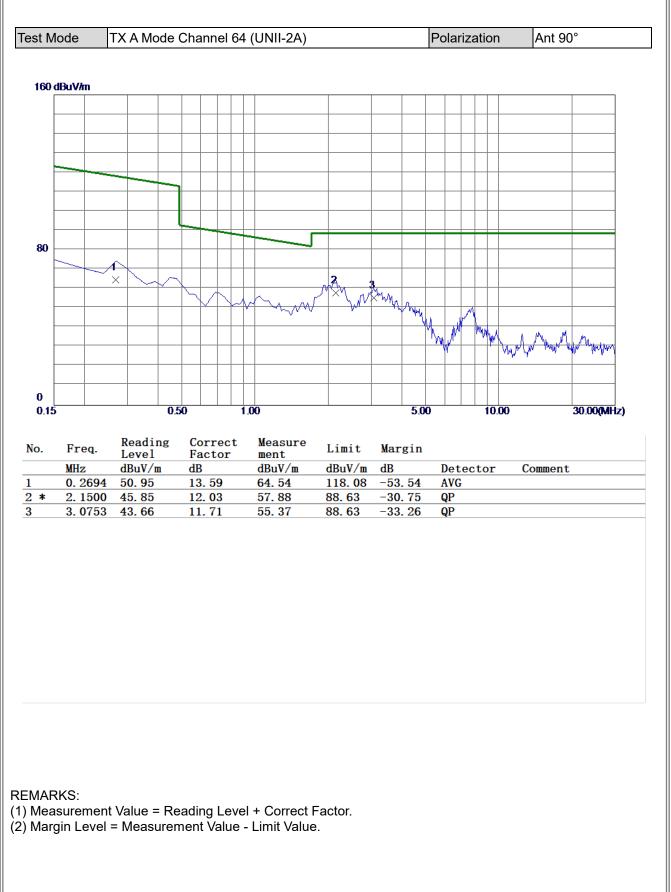




BL



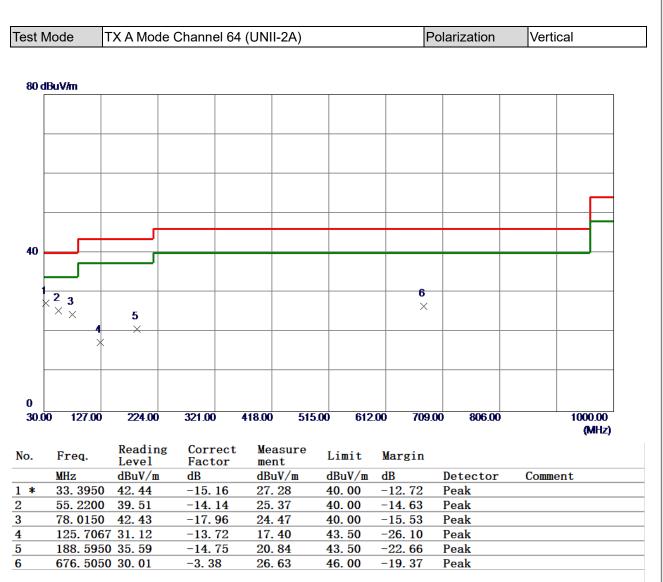






APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ

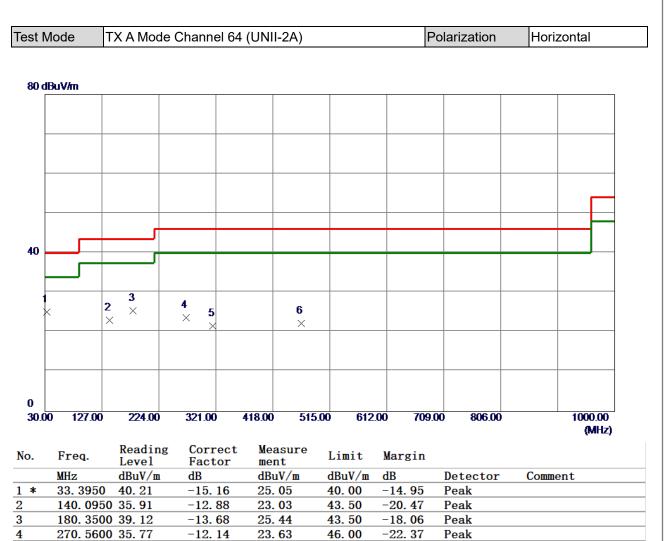




REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.





46.00

46.00

-24.35

-23.74

Peak

Peak

REMARKS:

5

6

316. 1500 32. 24

466. 9850 29. 37

(1) Measurement Value = Reading Level + Correct Factor.

-10.59

-7.11

21.65

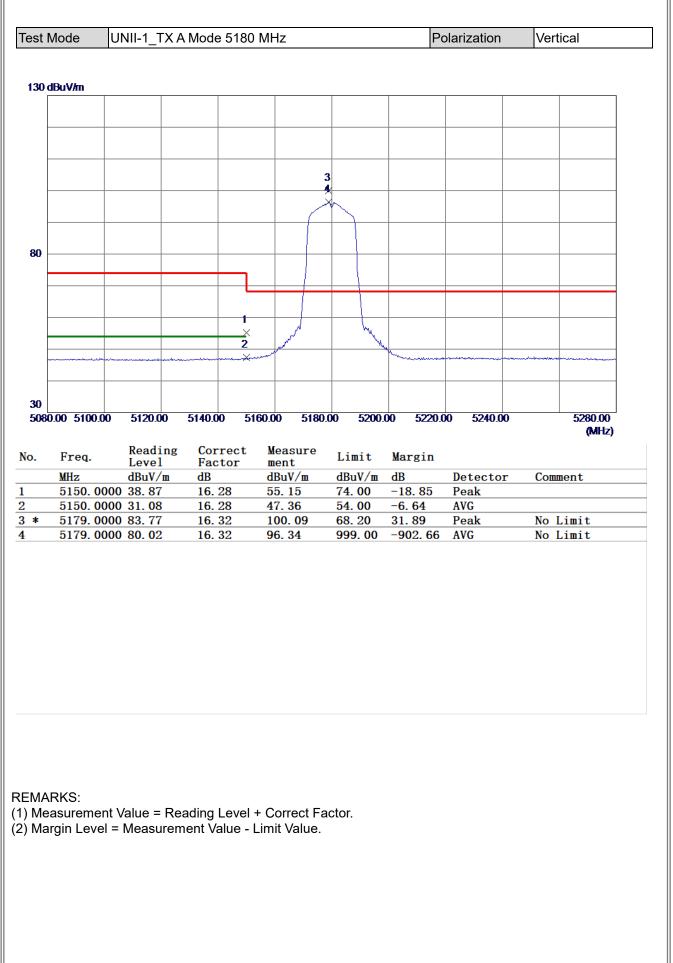
22.26

(2) Margin Level = Measurement Value - Limit Value.

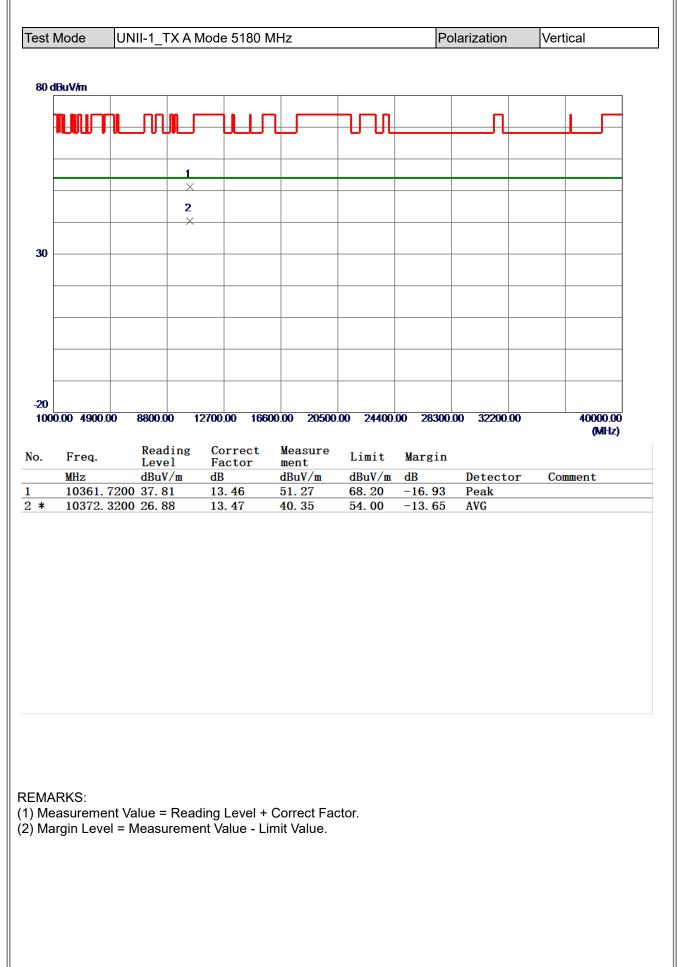


APPENDIX D - RADIATED EMISSION - ABOVE 1000 MHZ

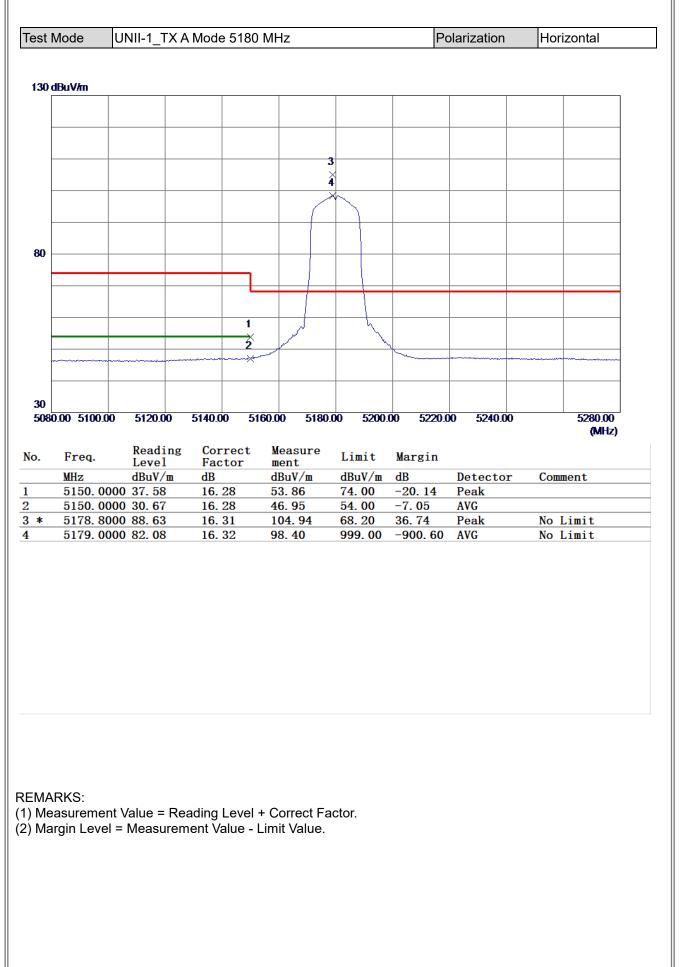




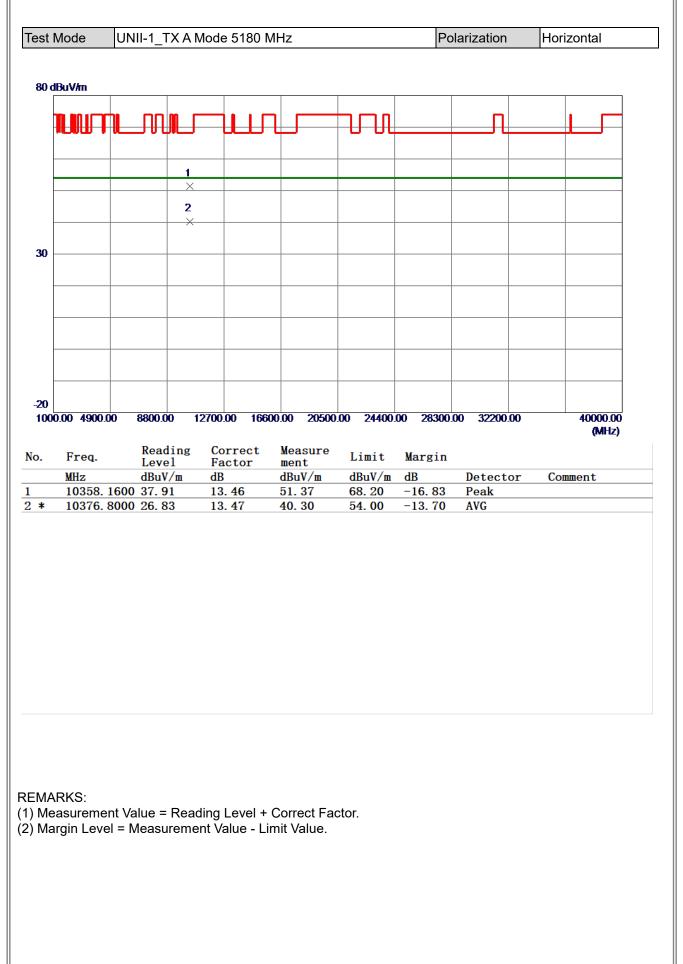




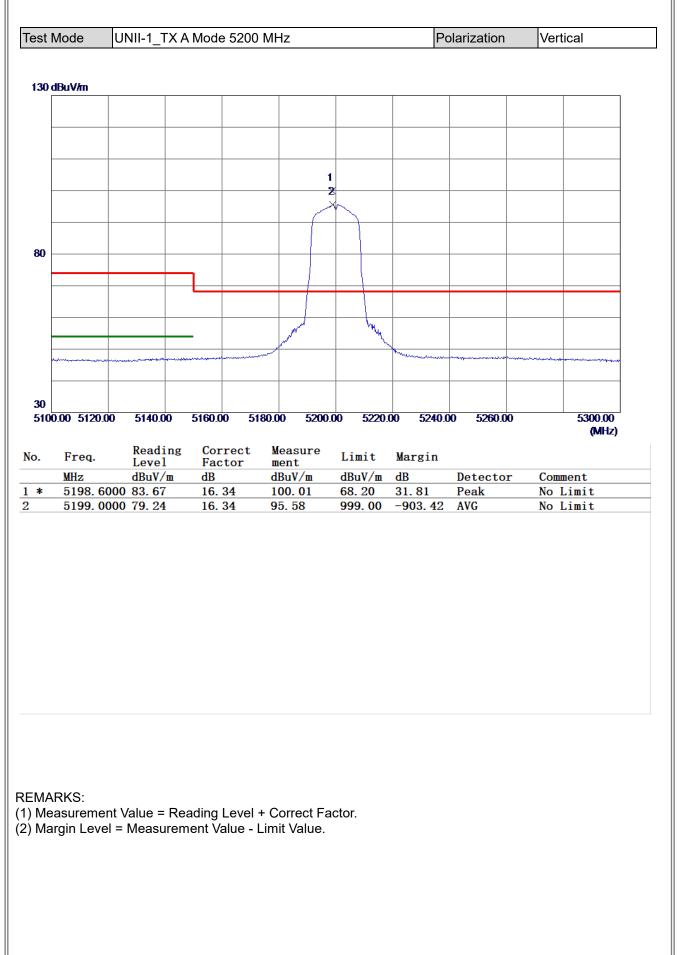




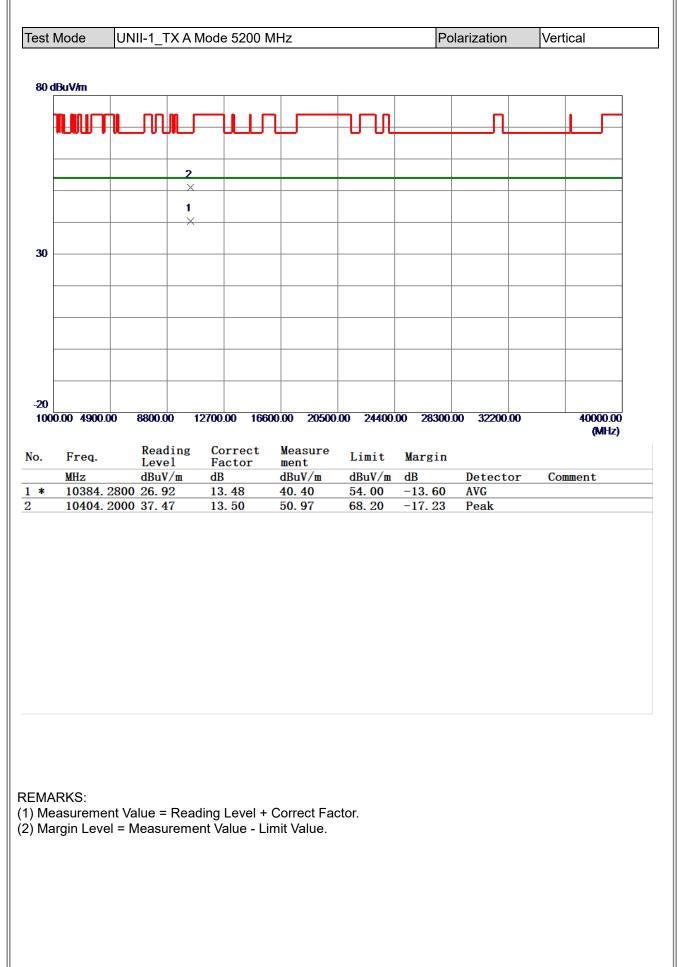




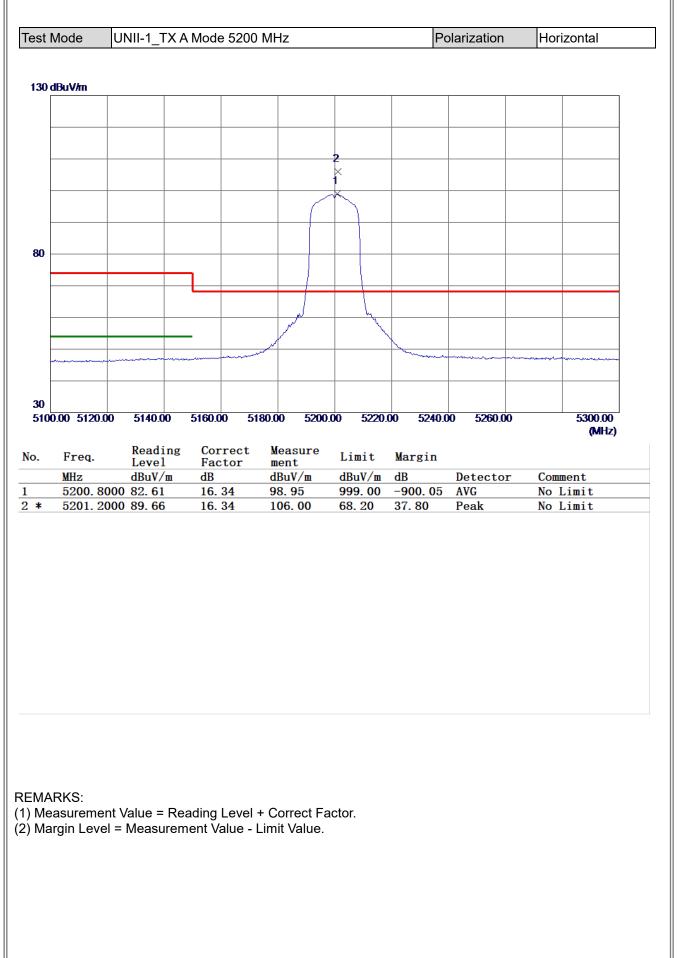




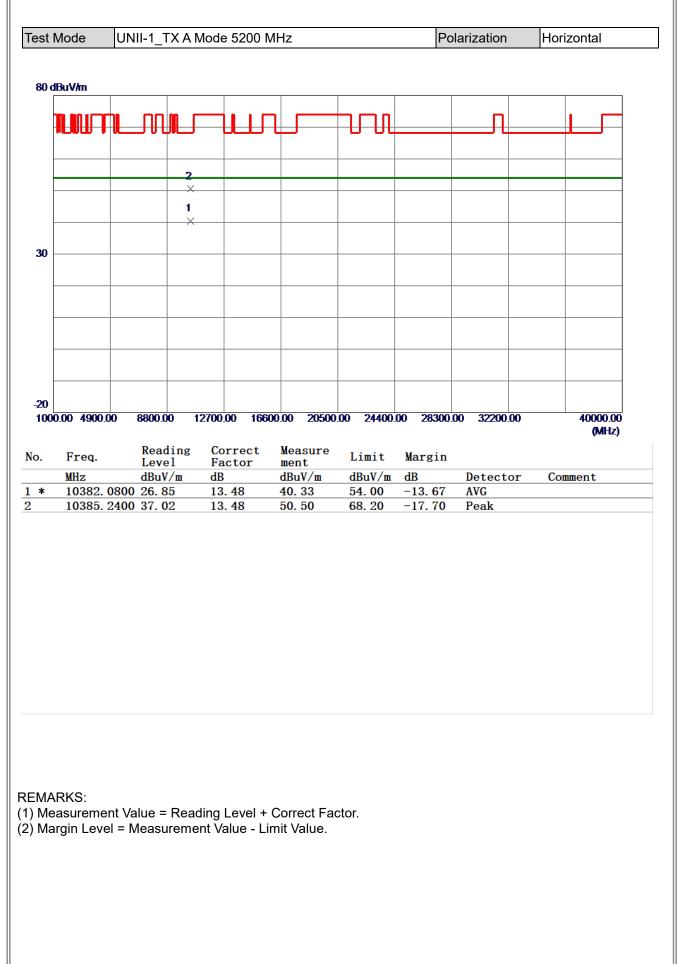




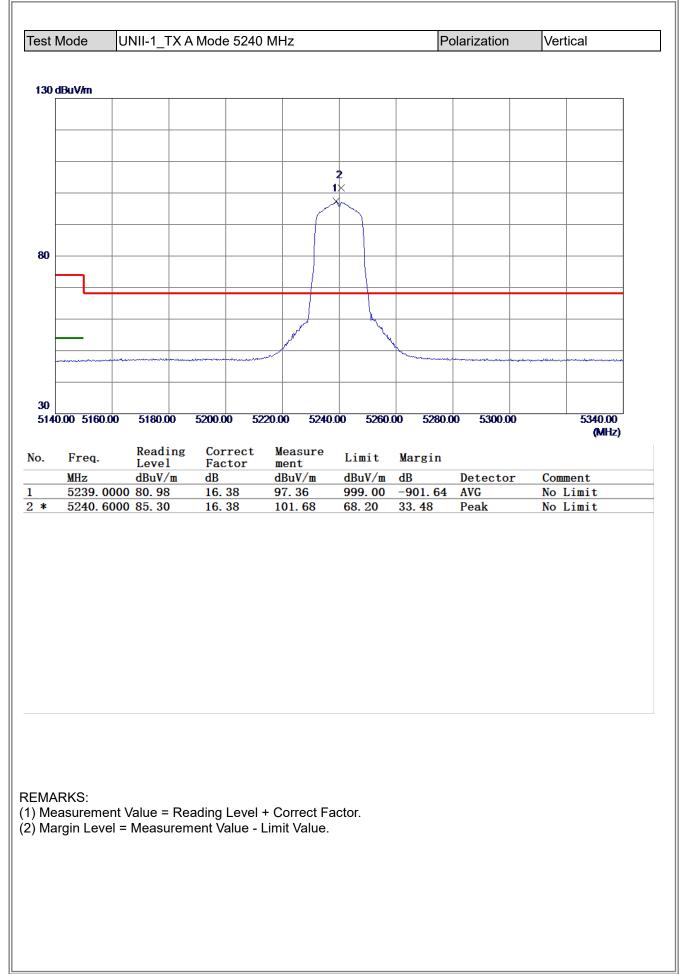




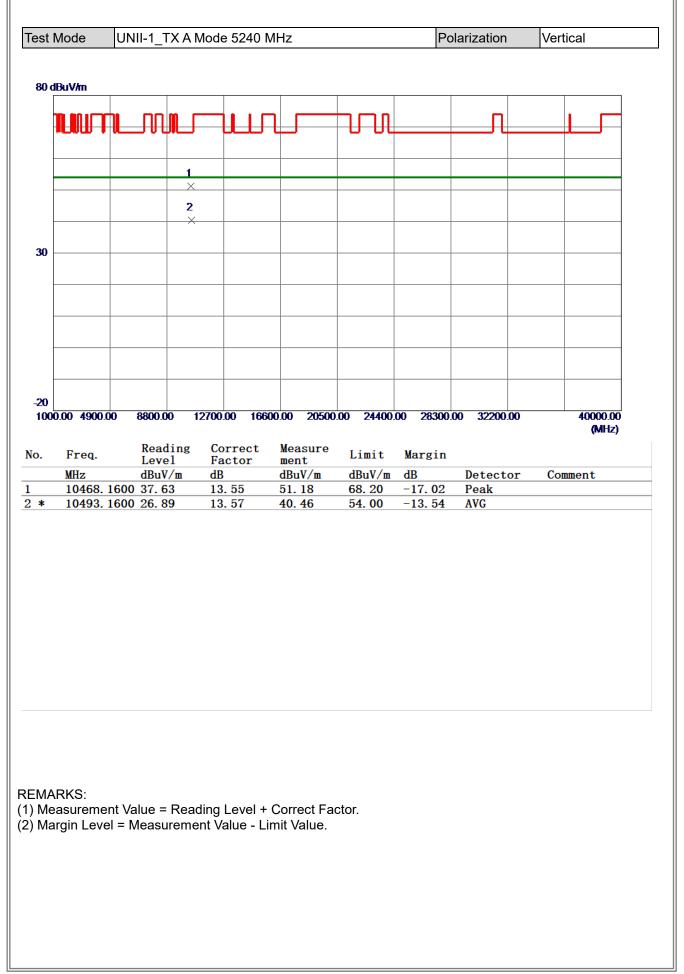




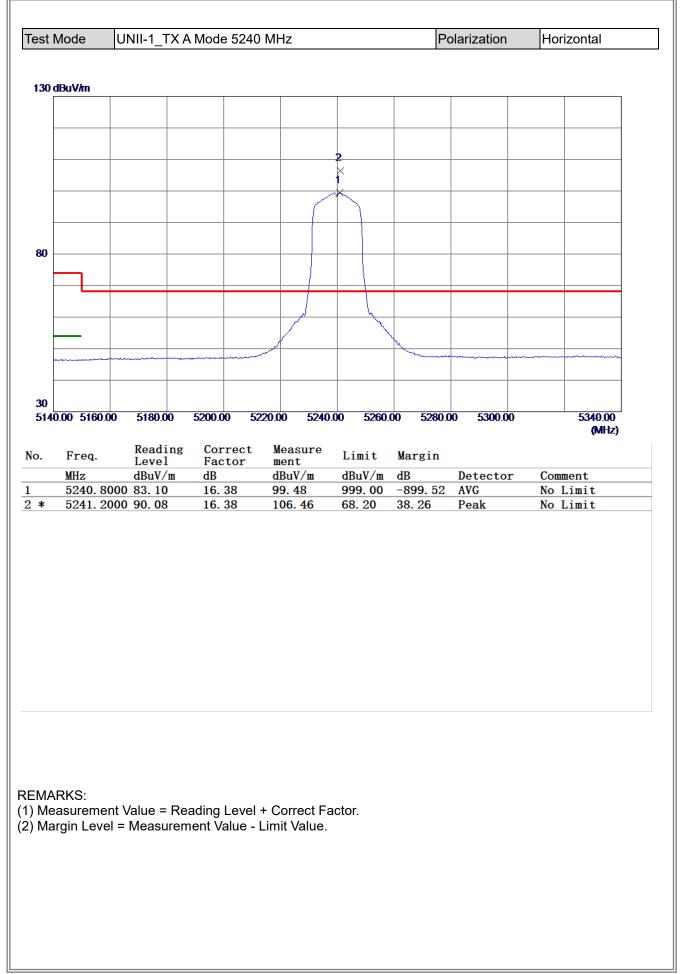
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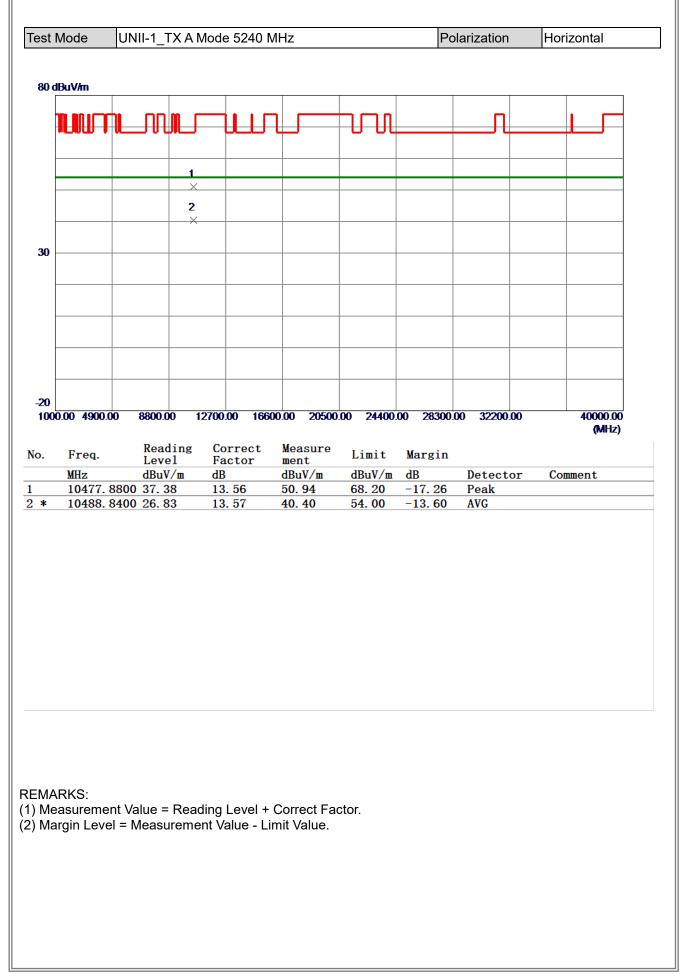




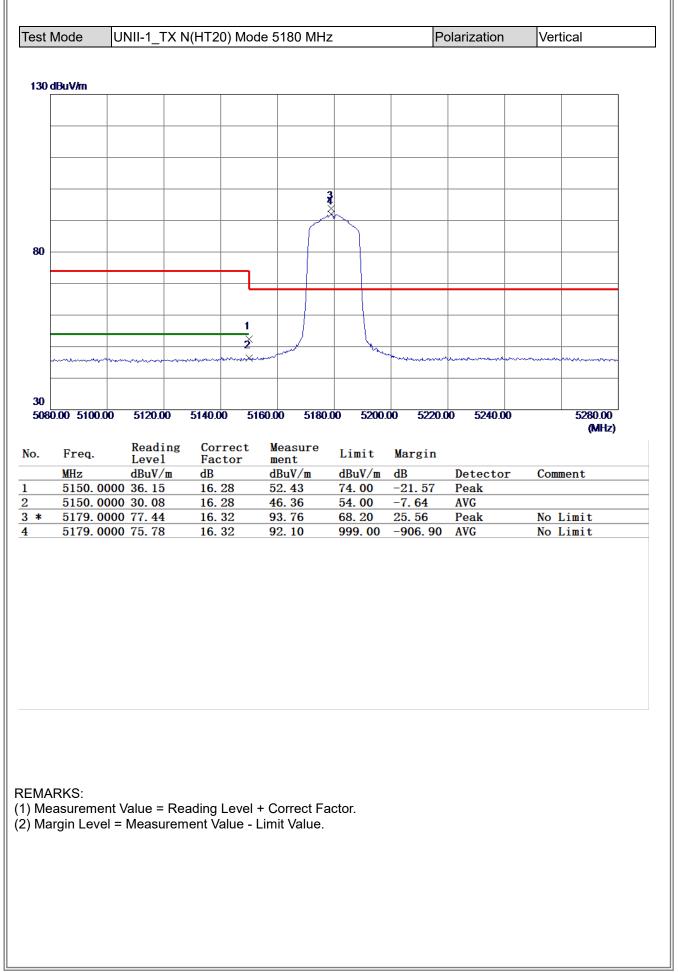
BL



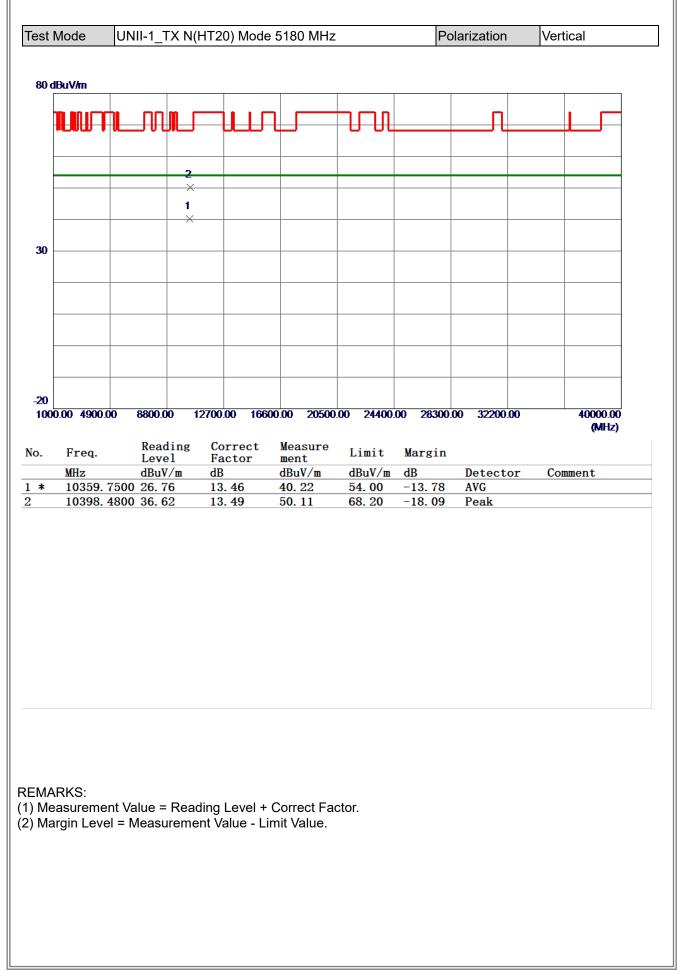




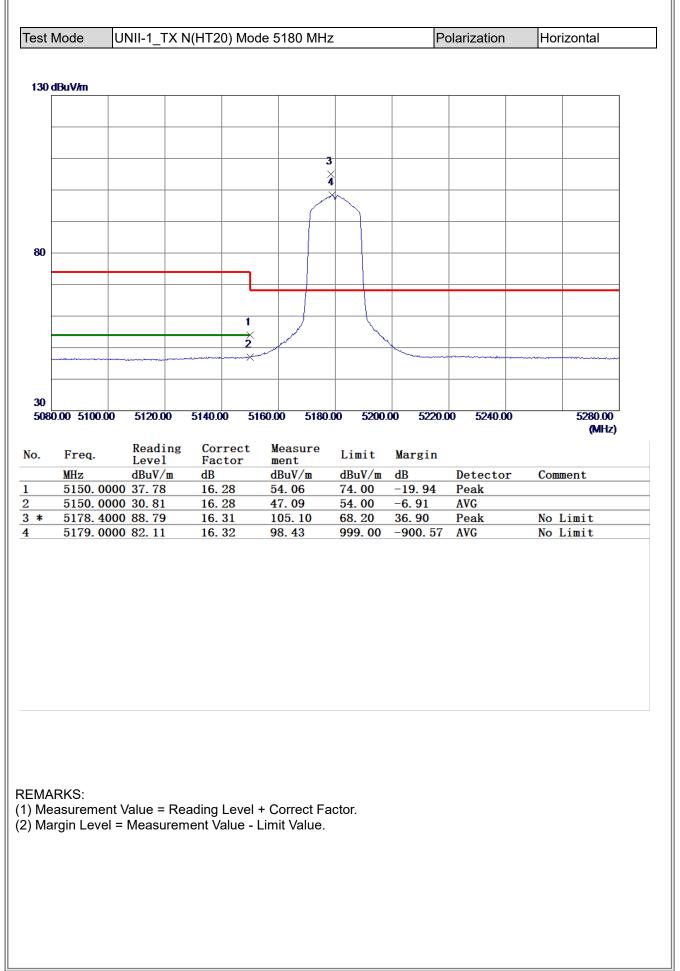




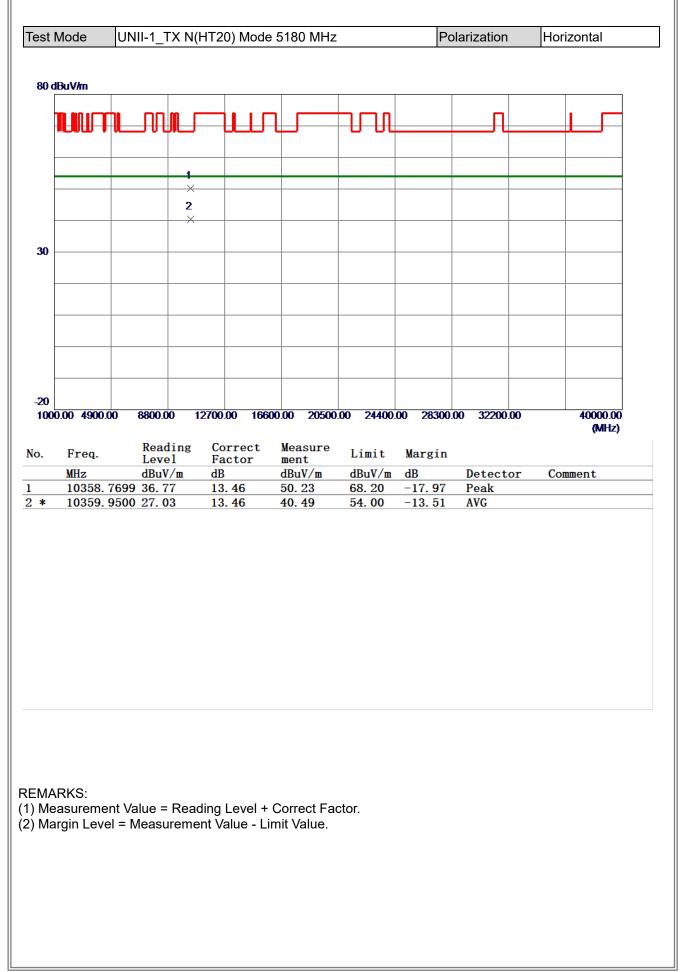




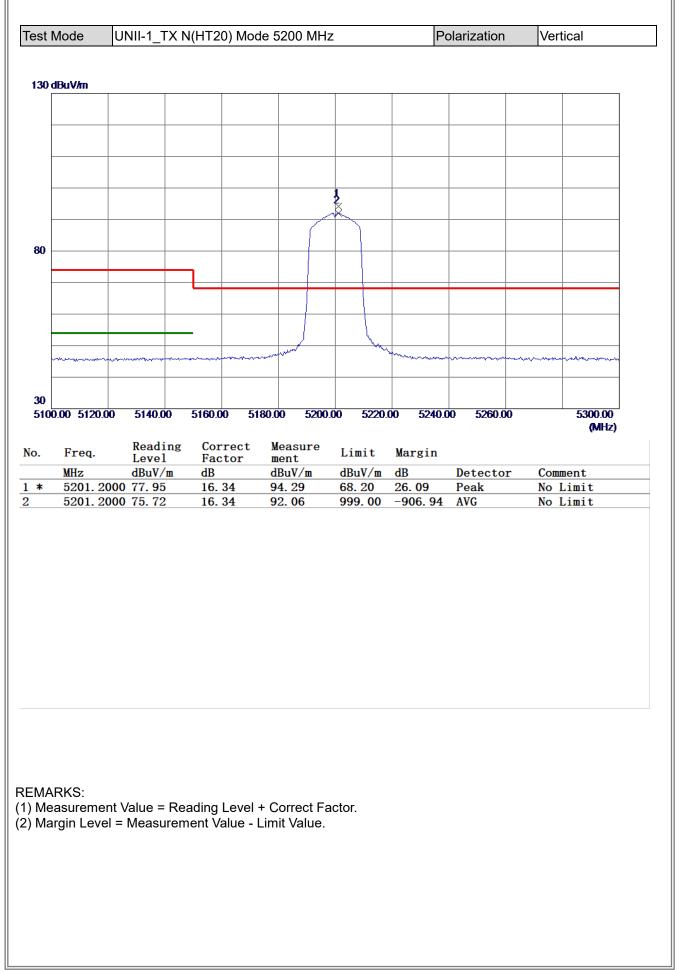




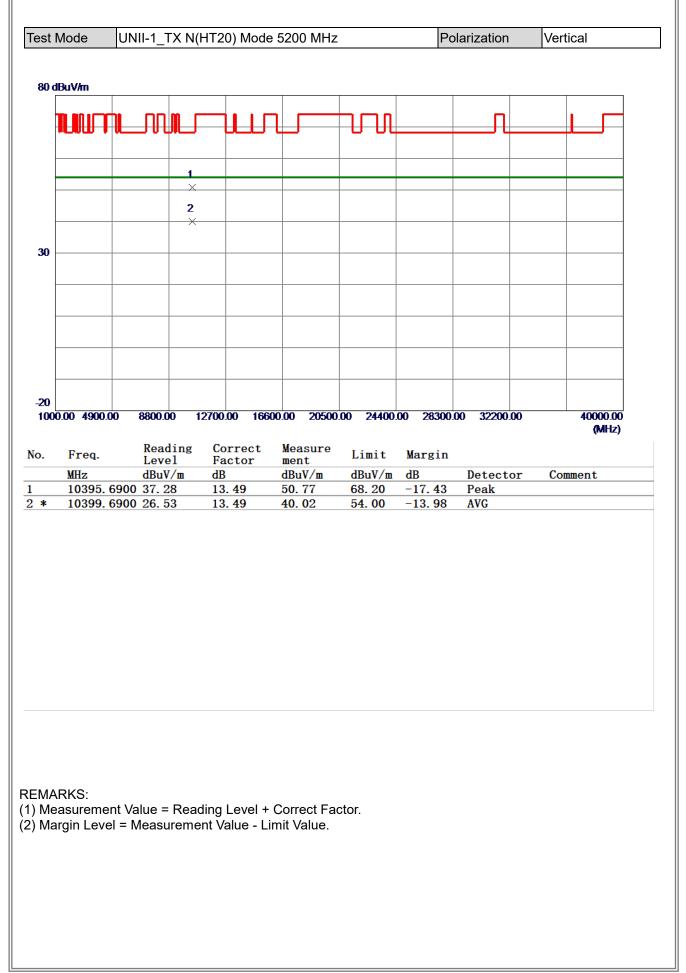




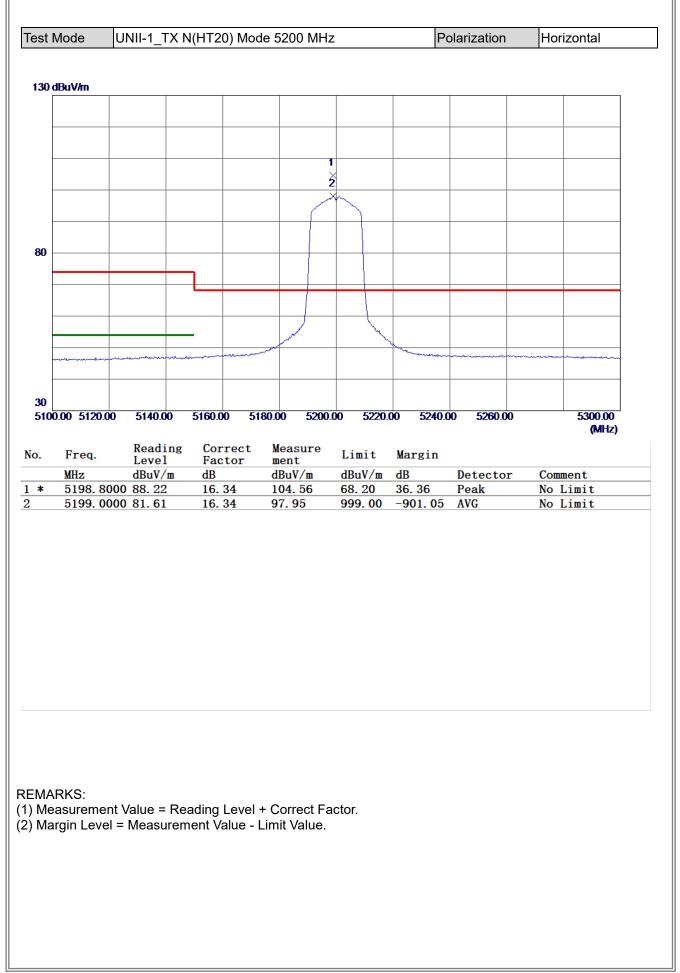




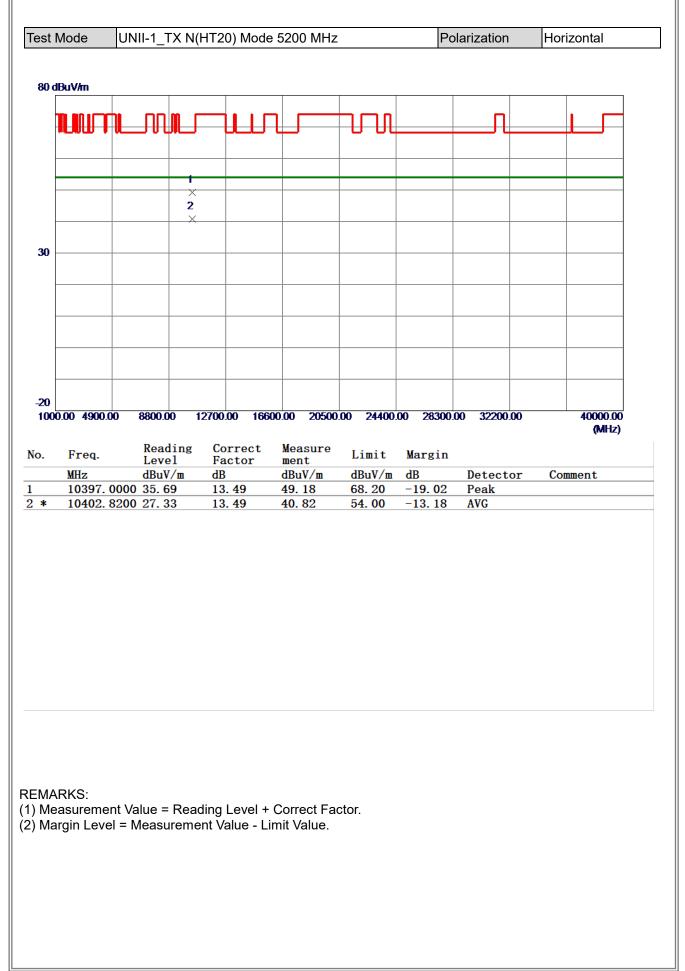




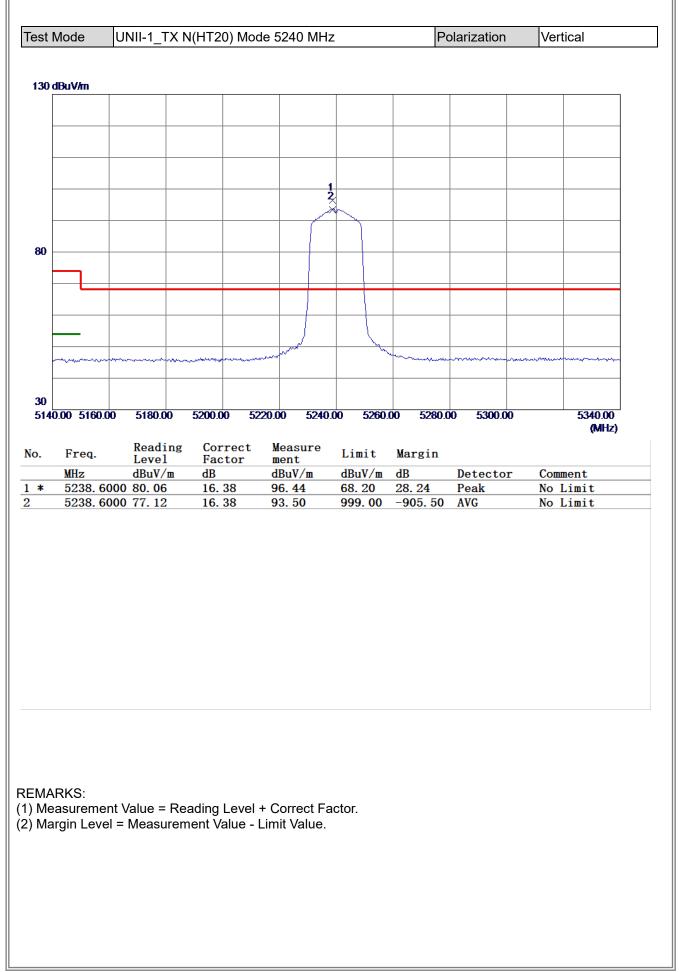




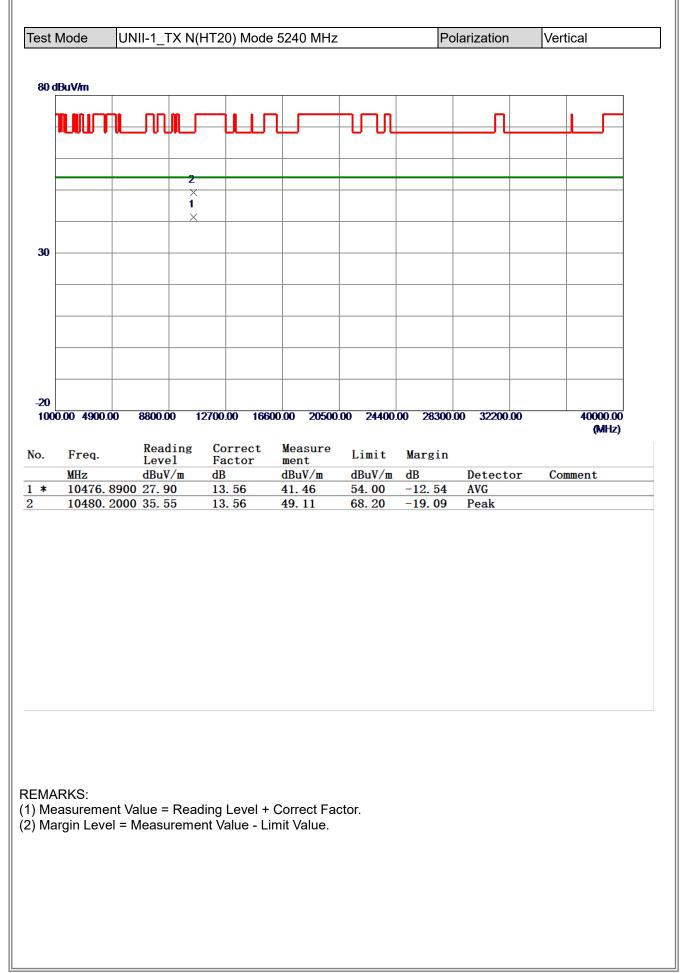




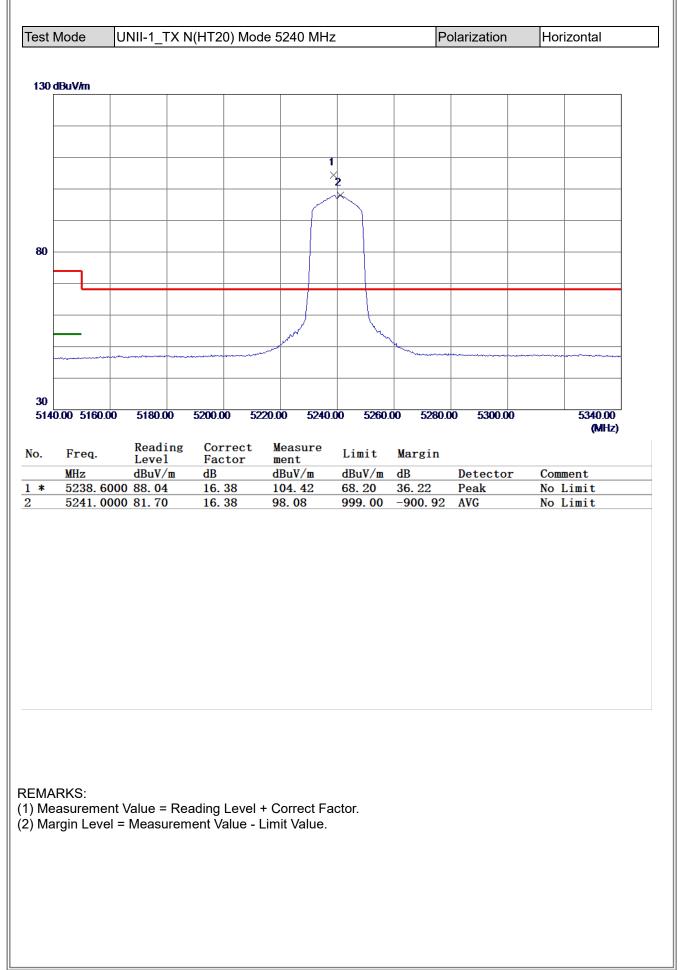




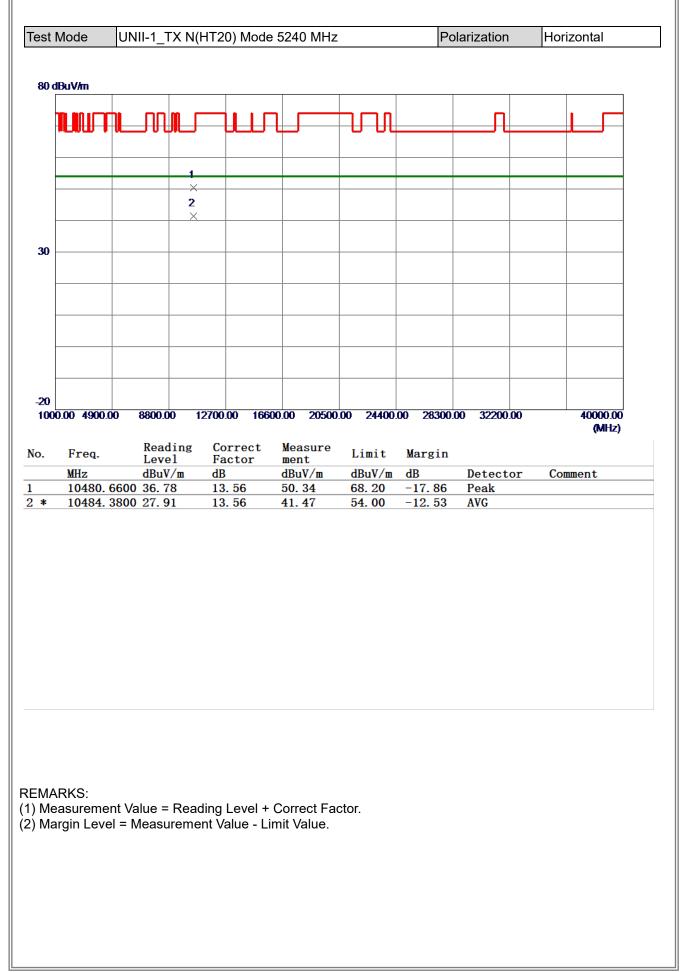




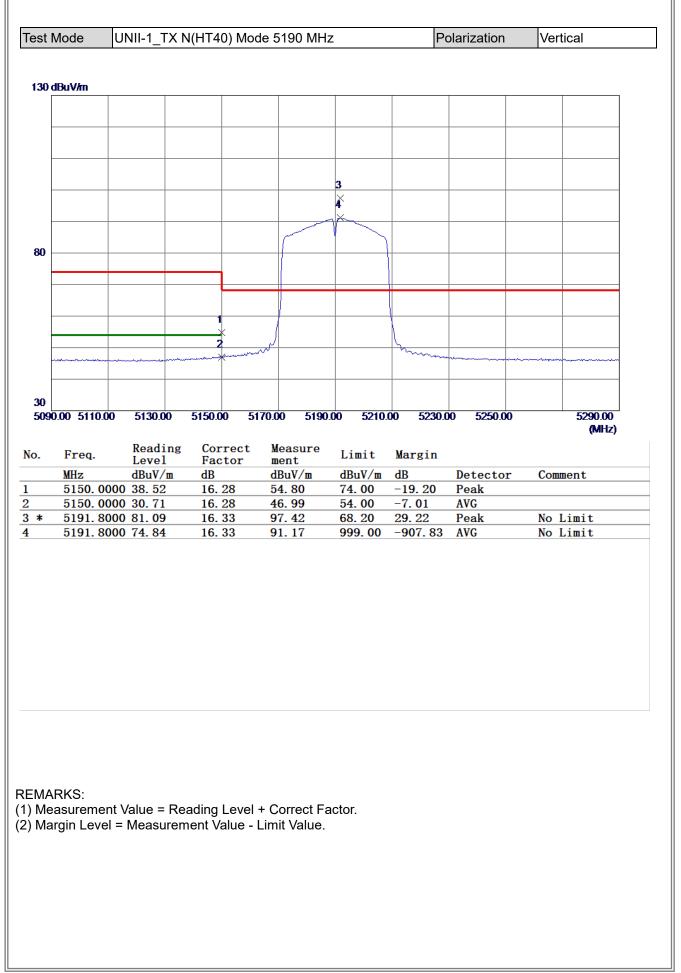




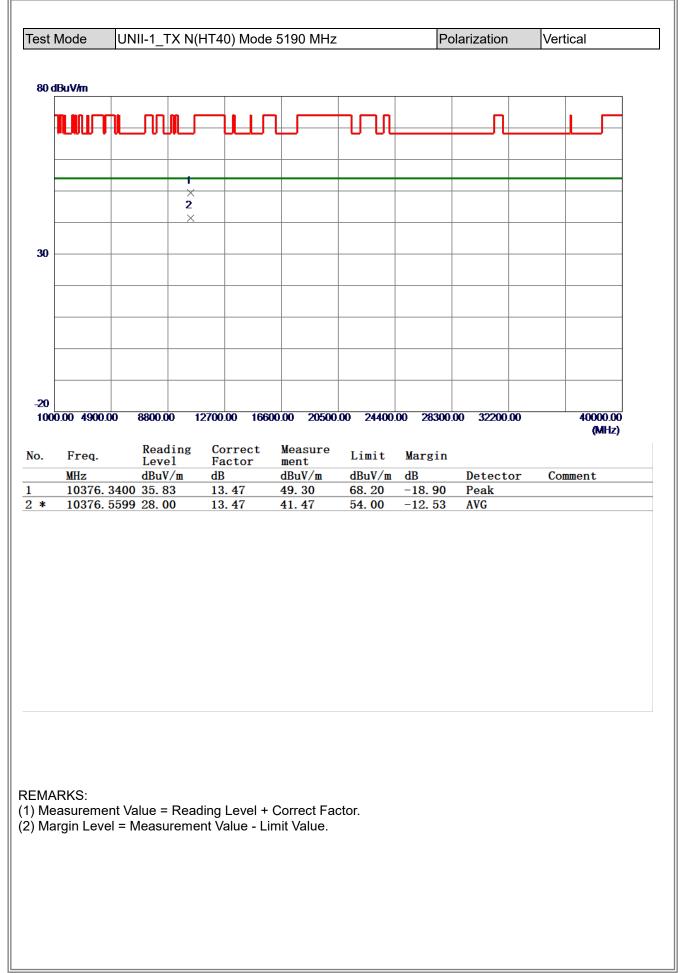




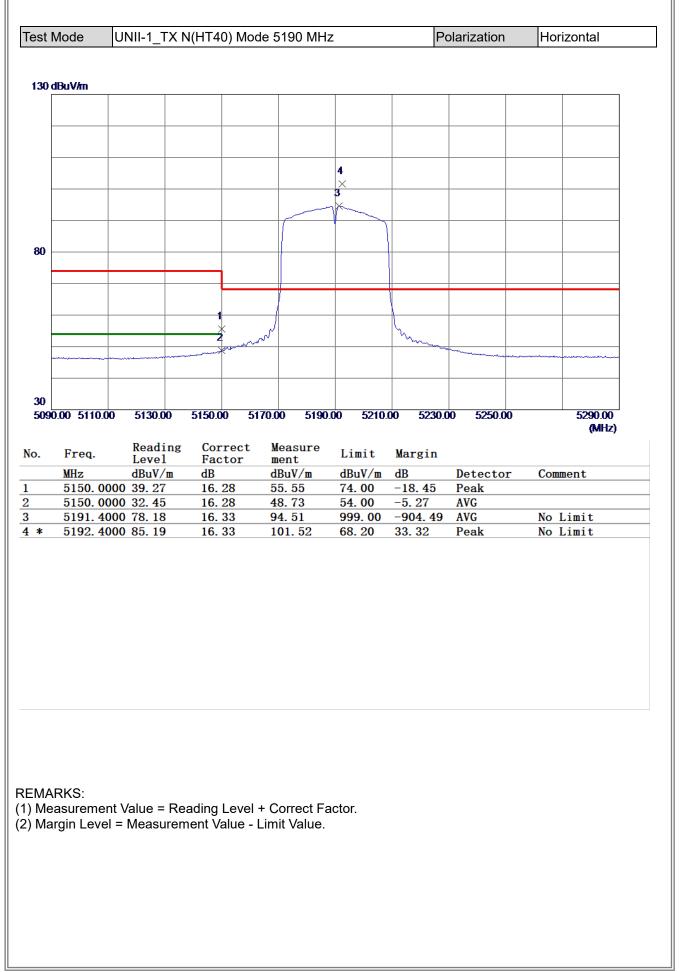




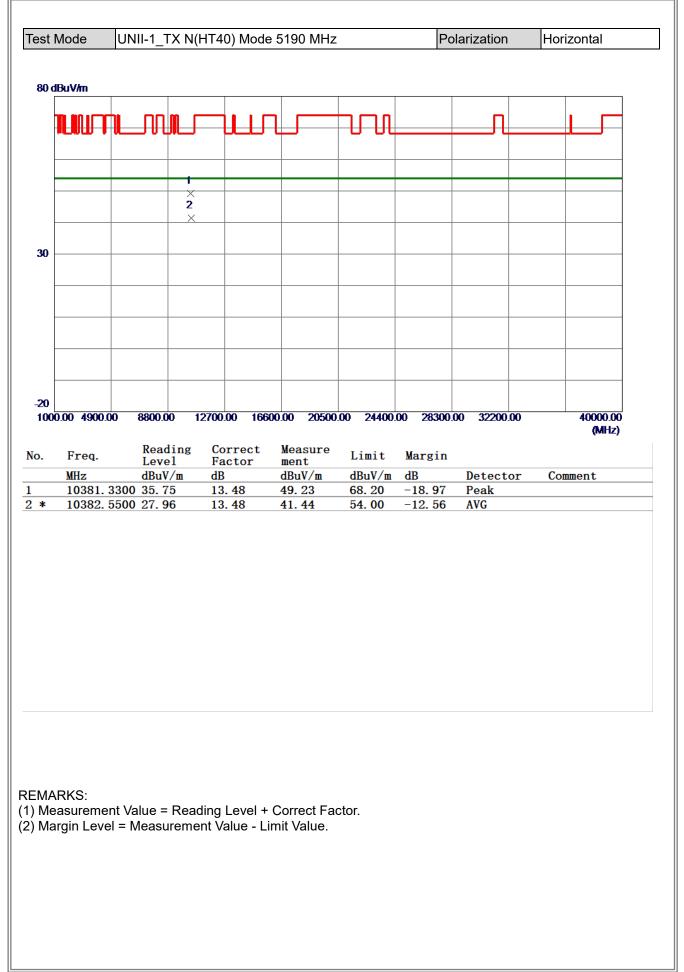




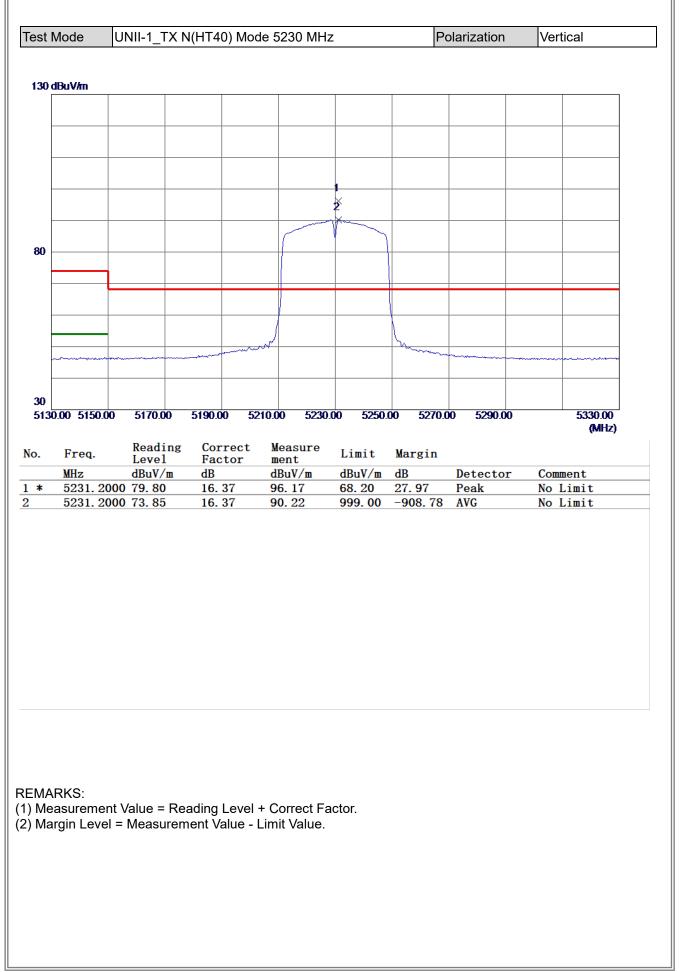




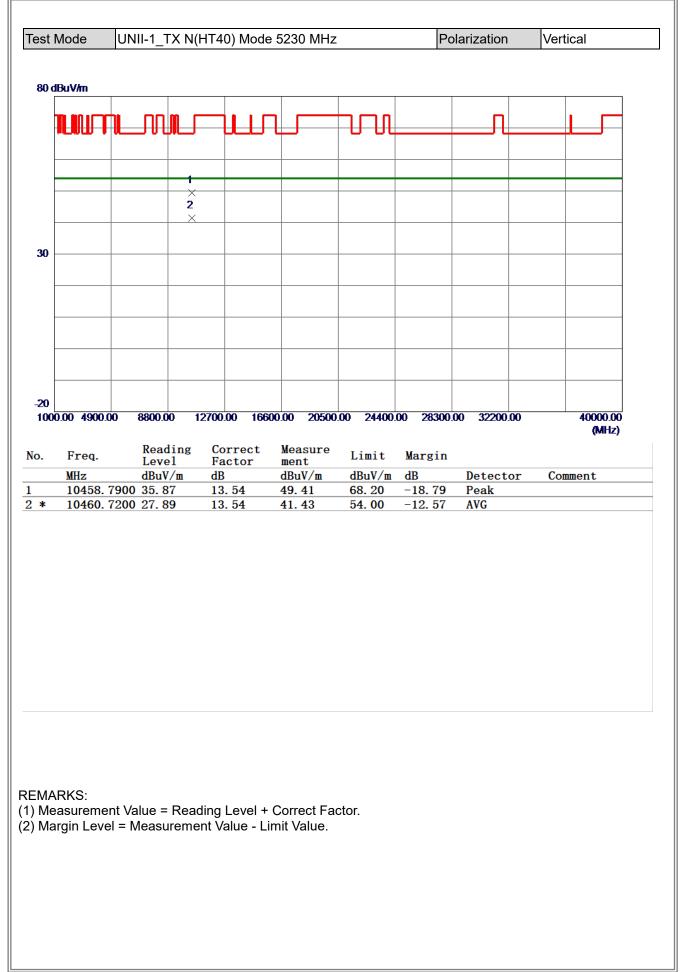




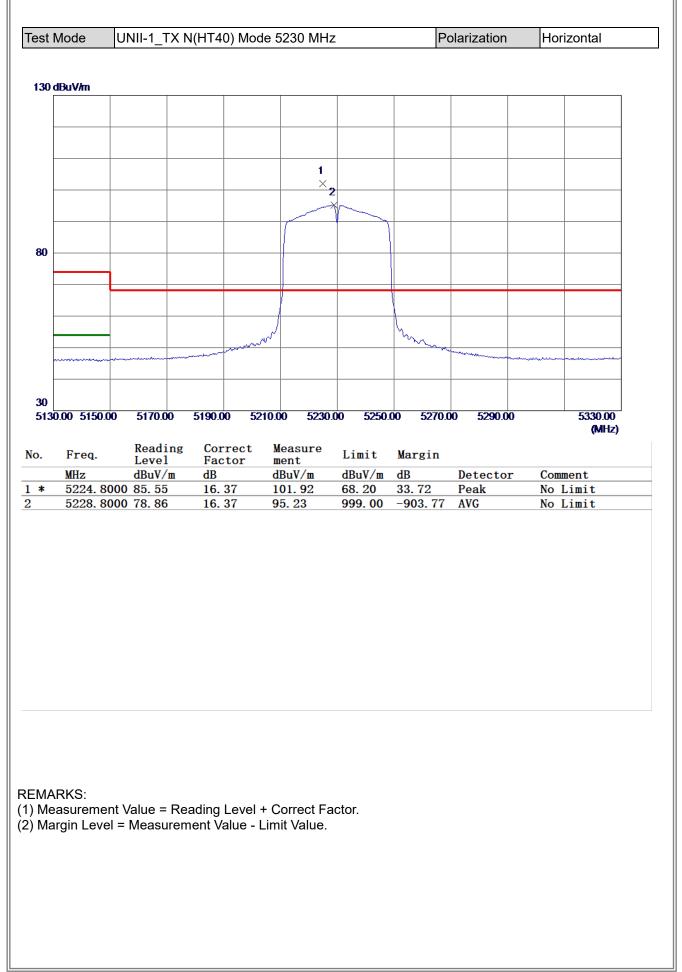




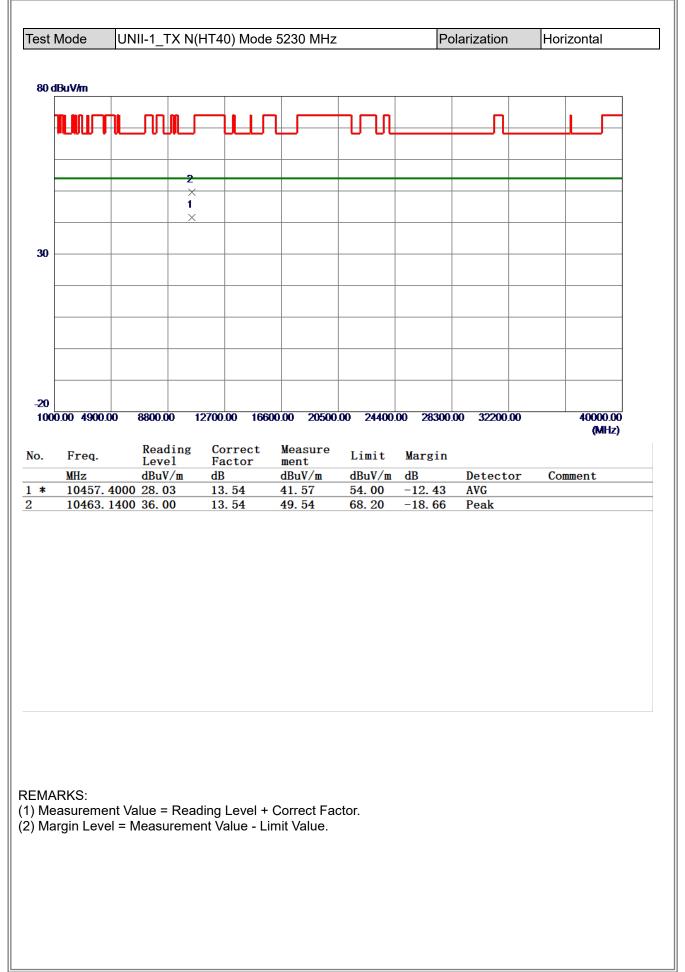




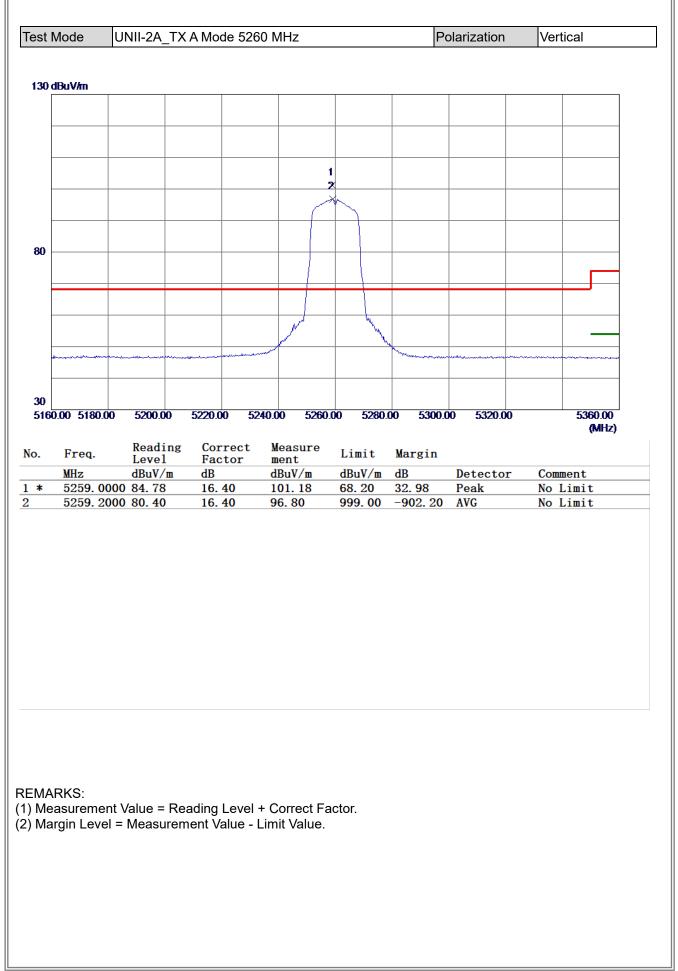




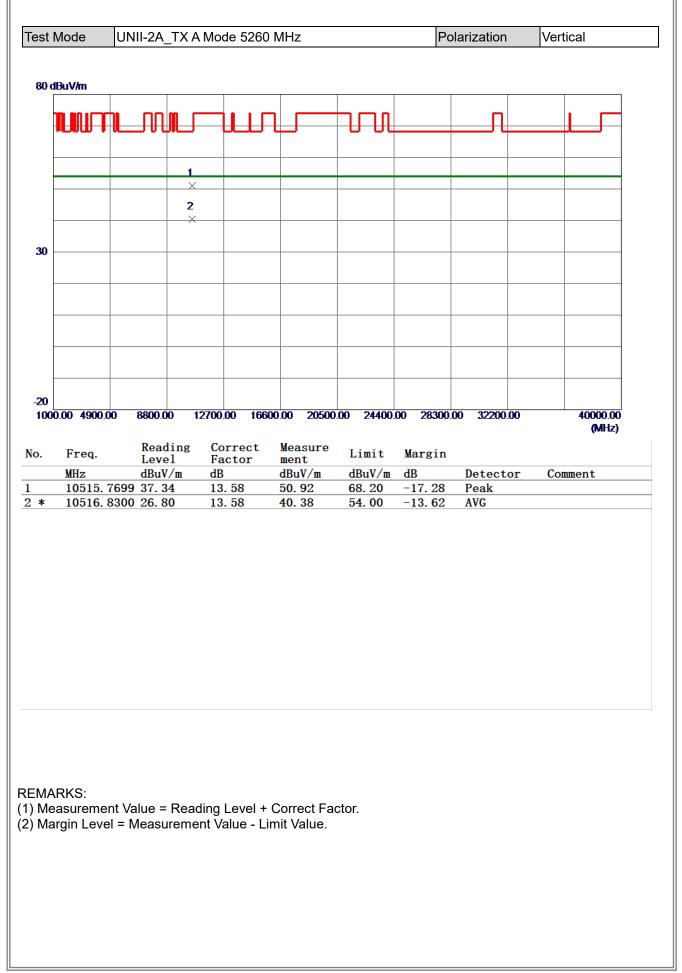




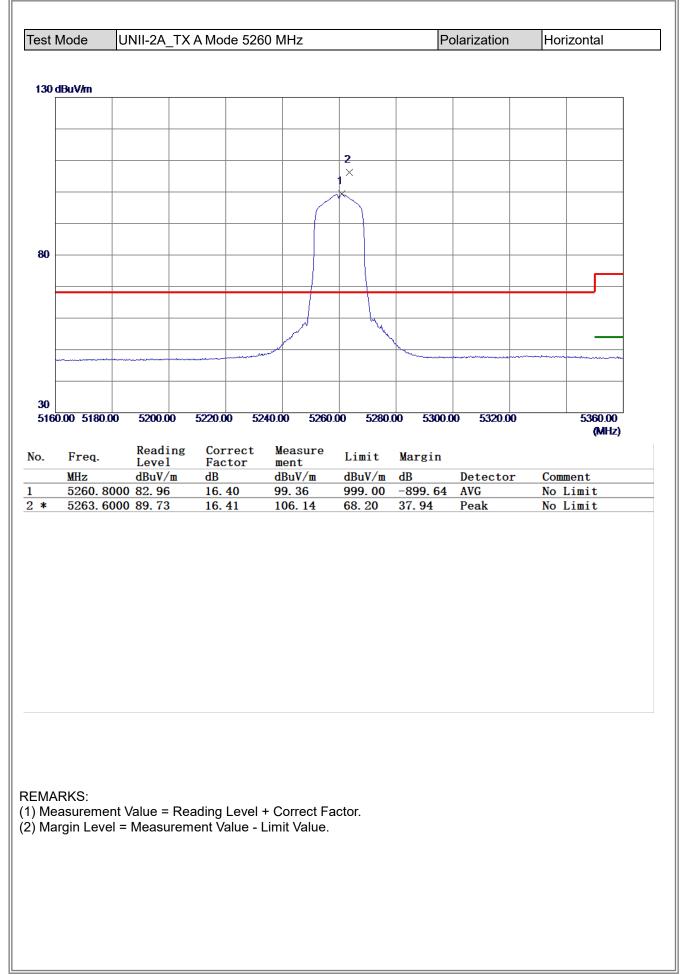
BL



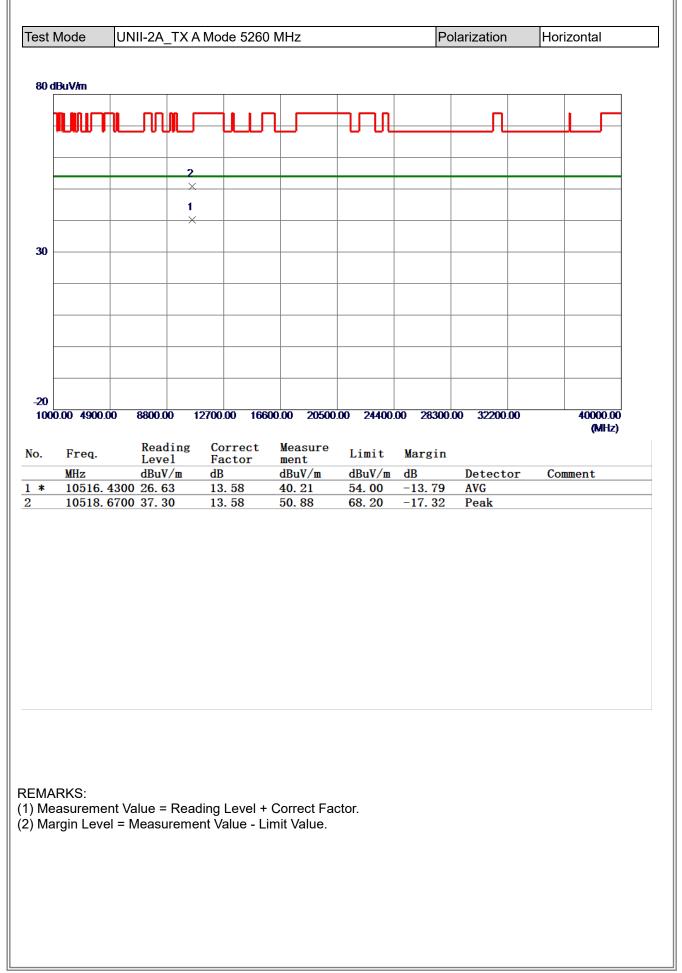




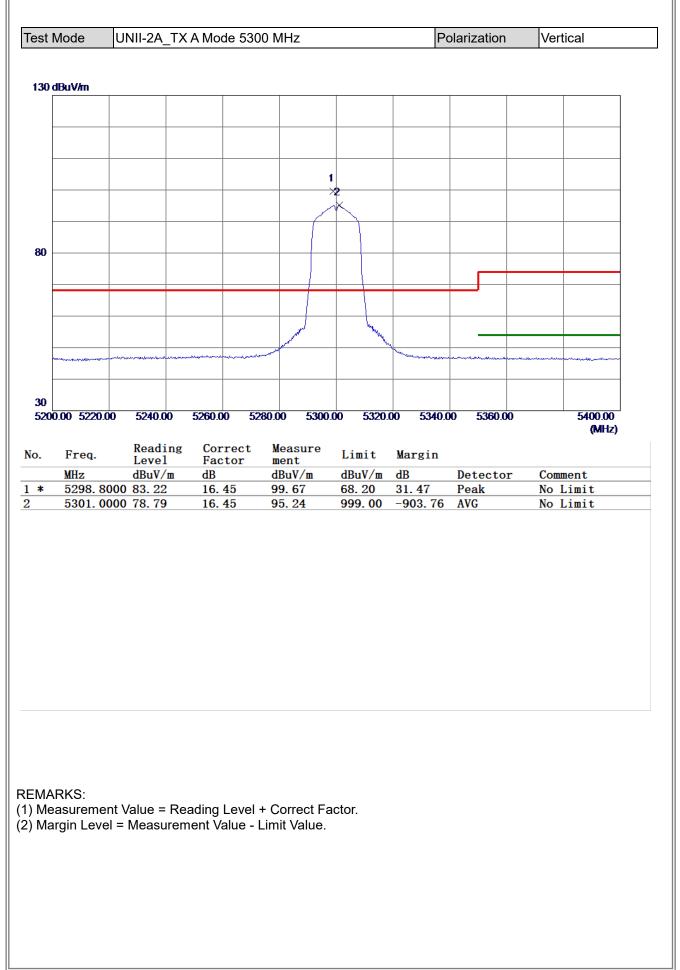
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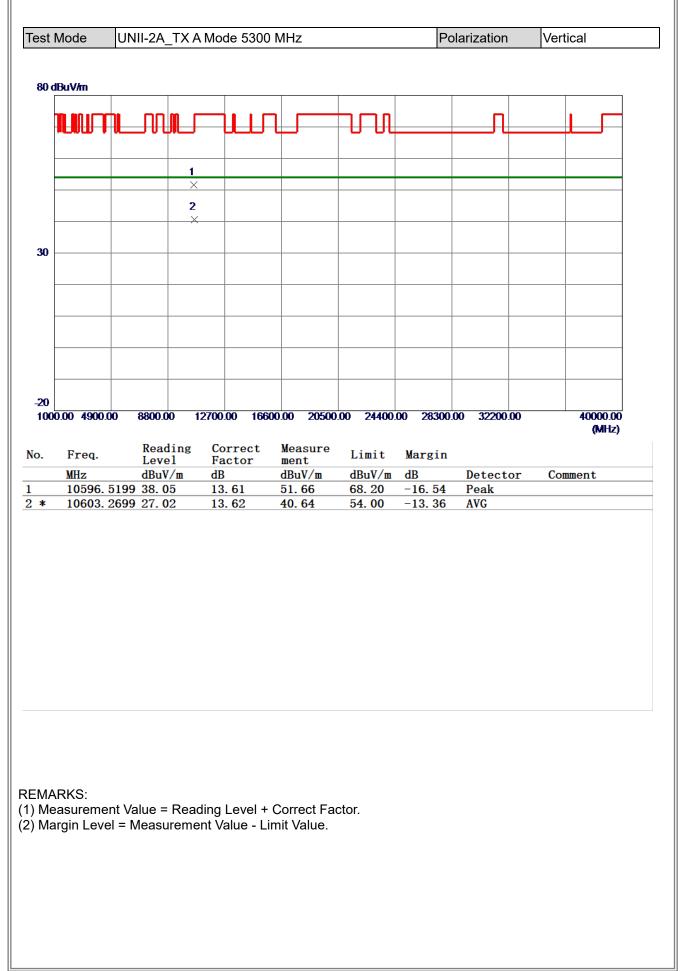




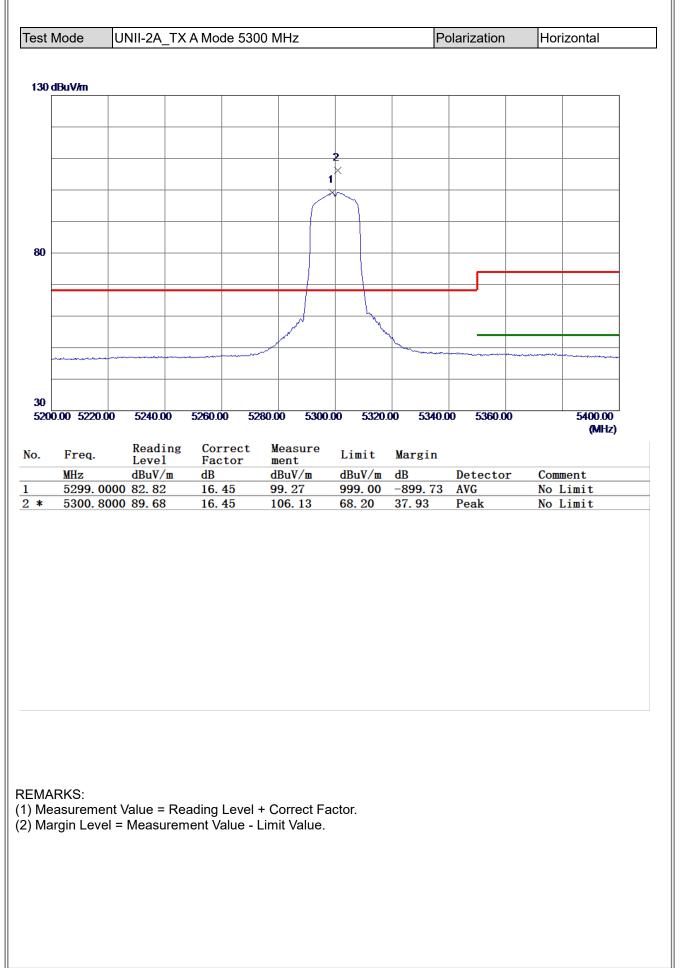




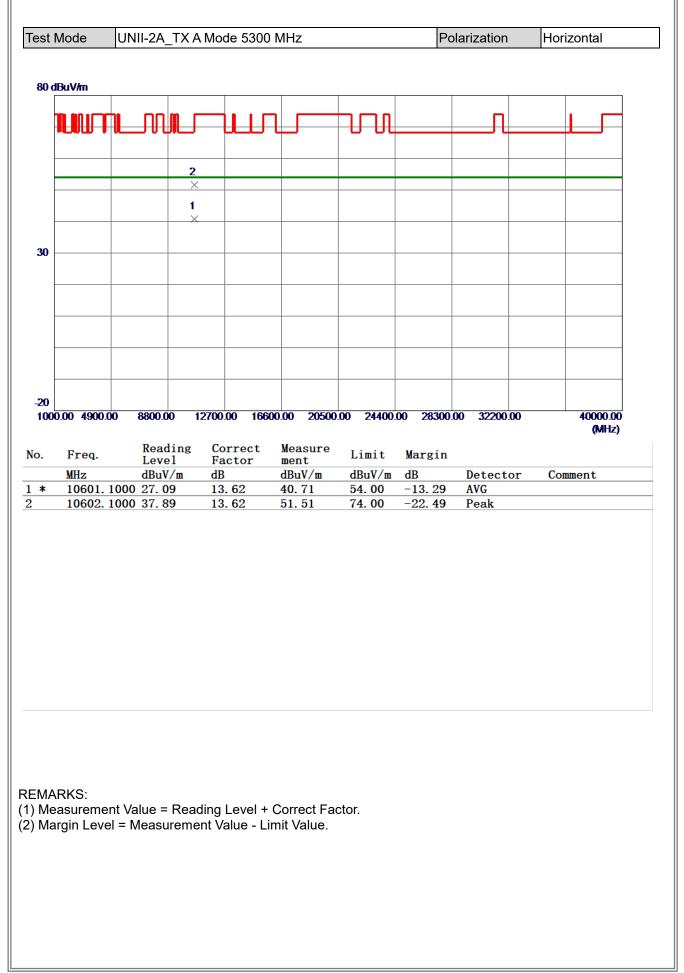




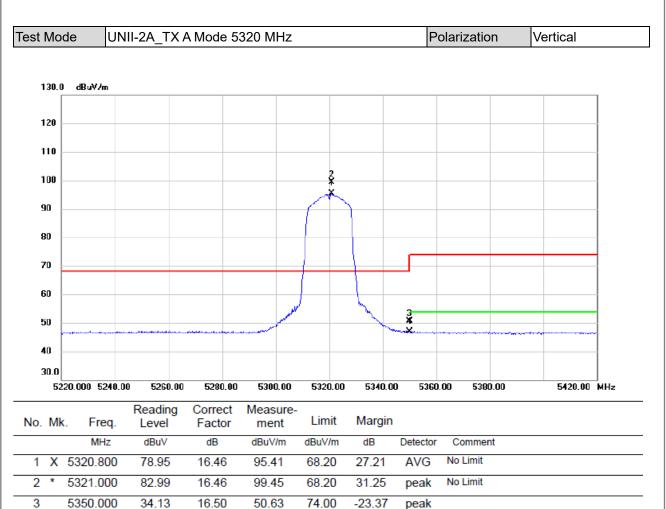












4

5350.000

(1) Measurement Value = Reading Level + Correct Factor.

16.50

46.99

54.00

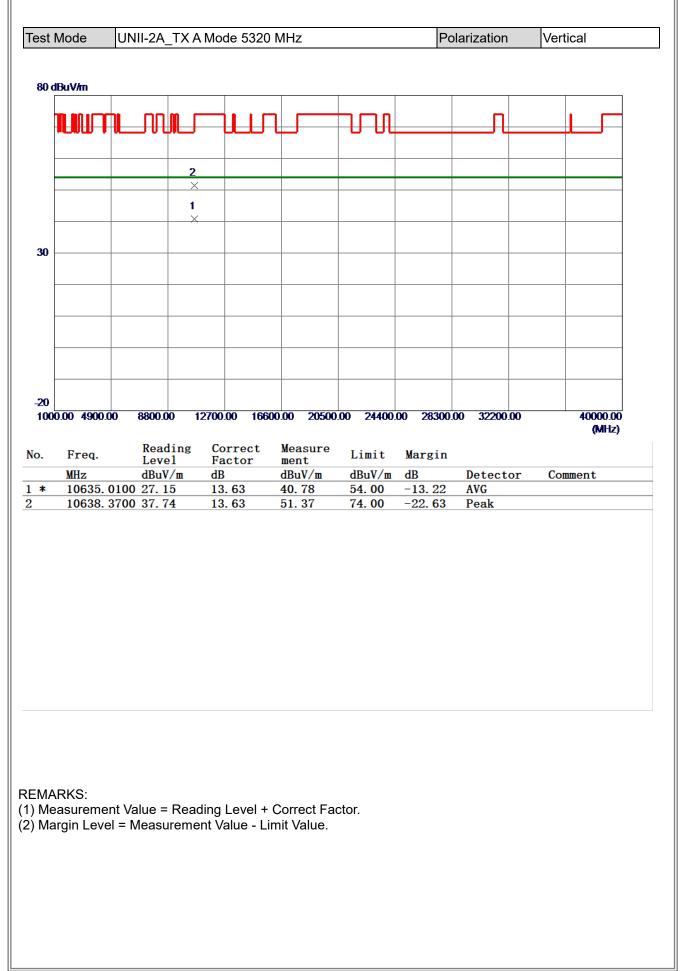
-7.01

AVG

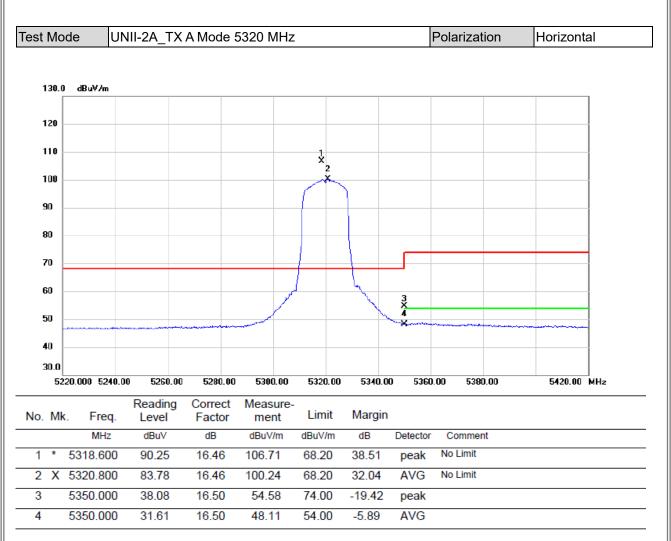
(2) Margin Level = Measurement Value - Limit Value.

30.49



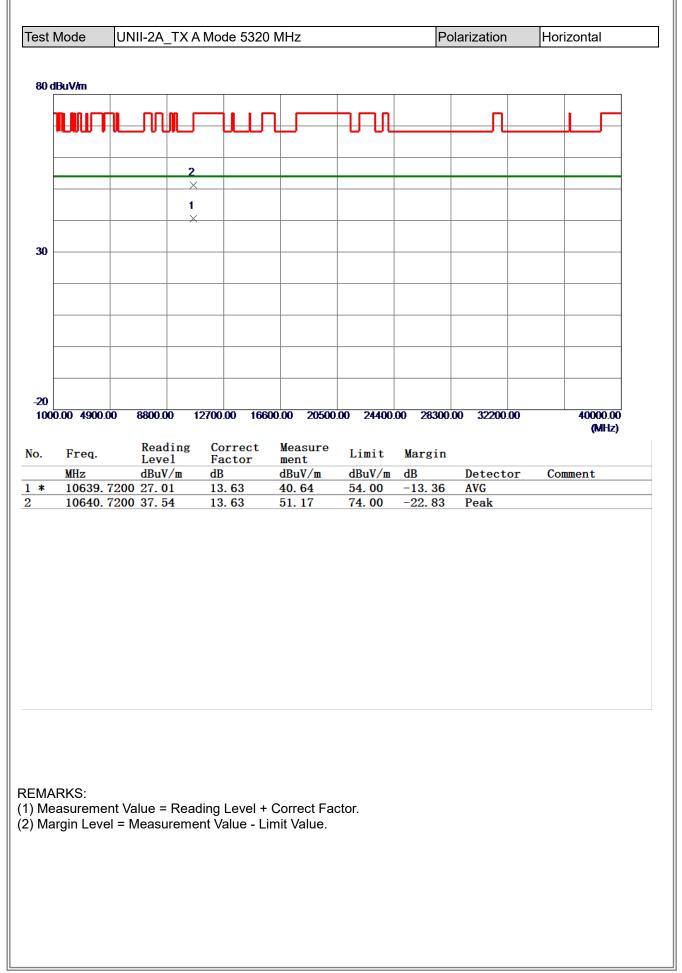




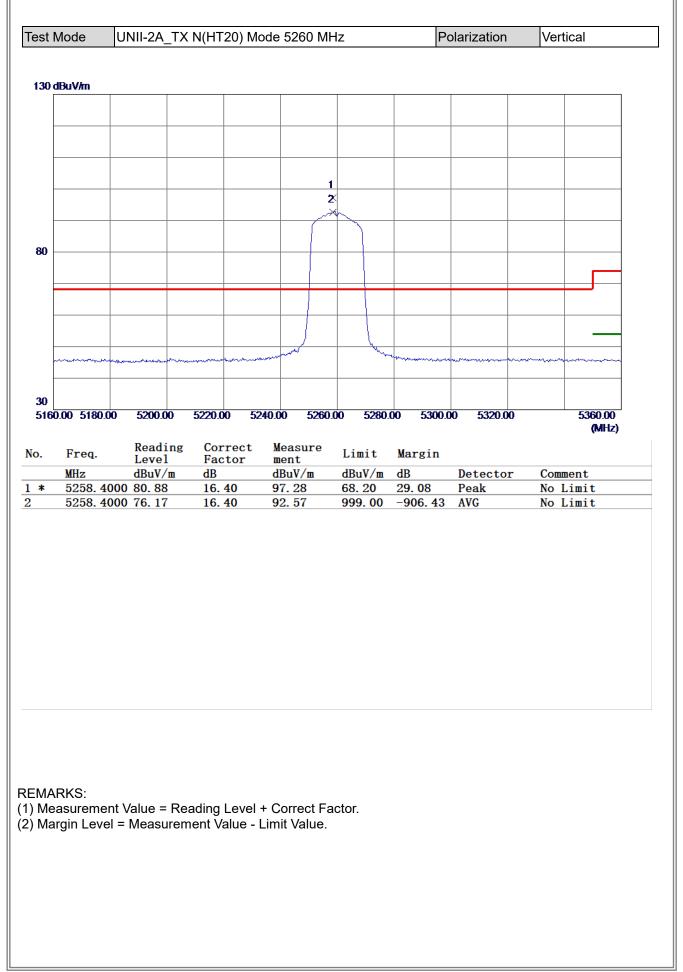


- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.

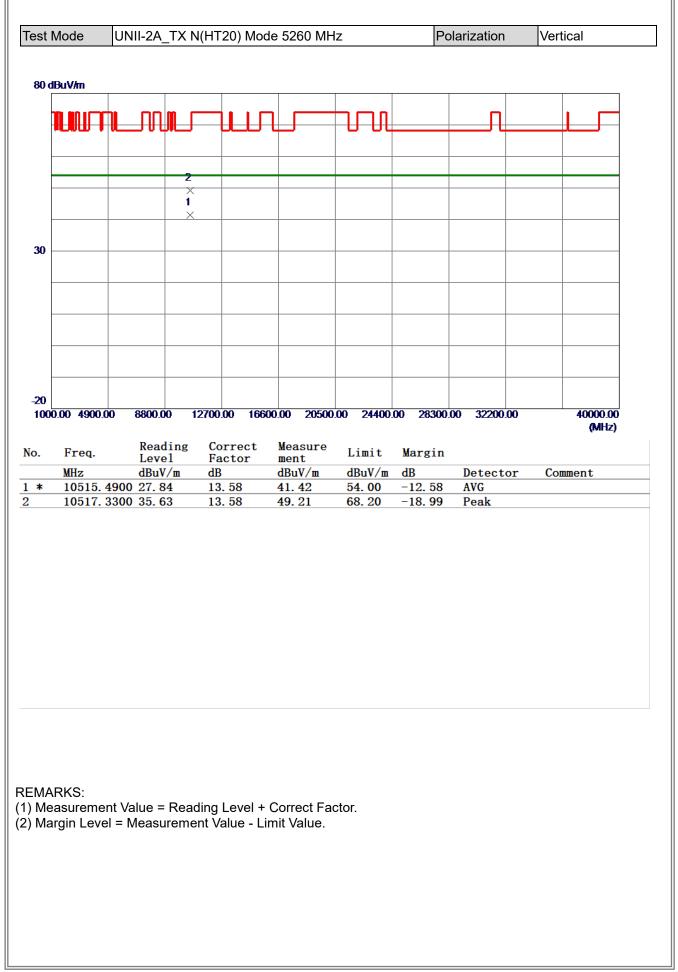




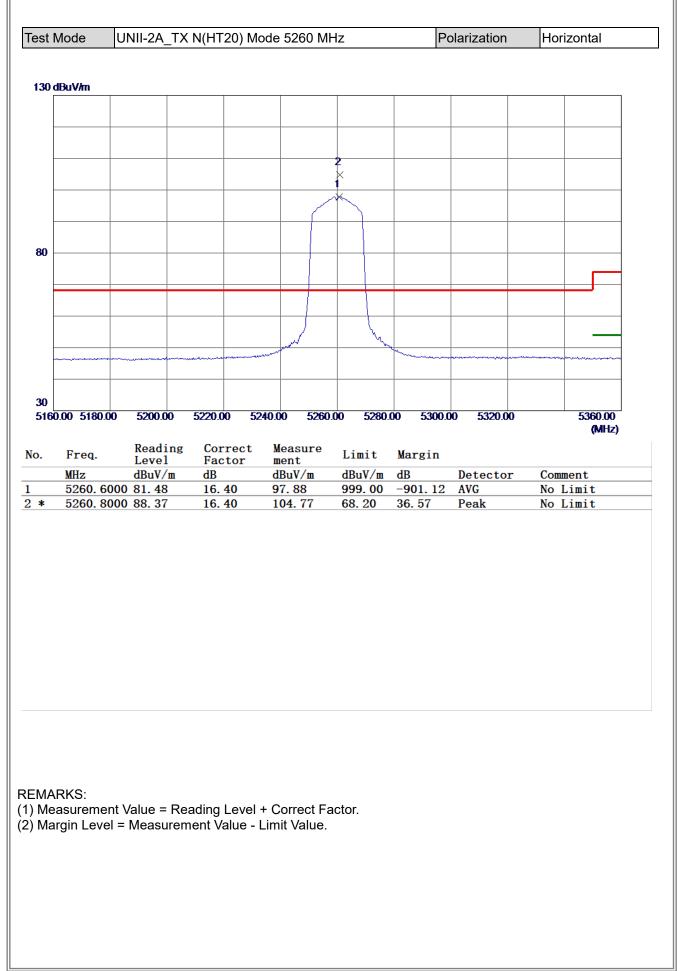




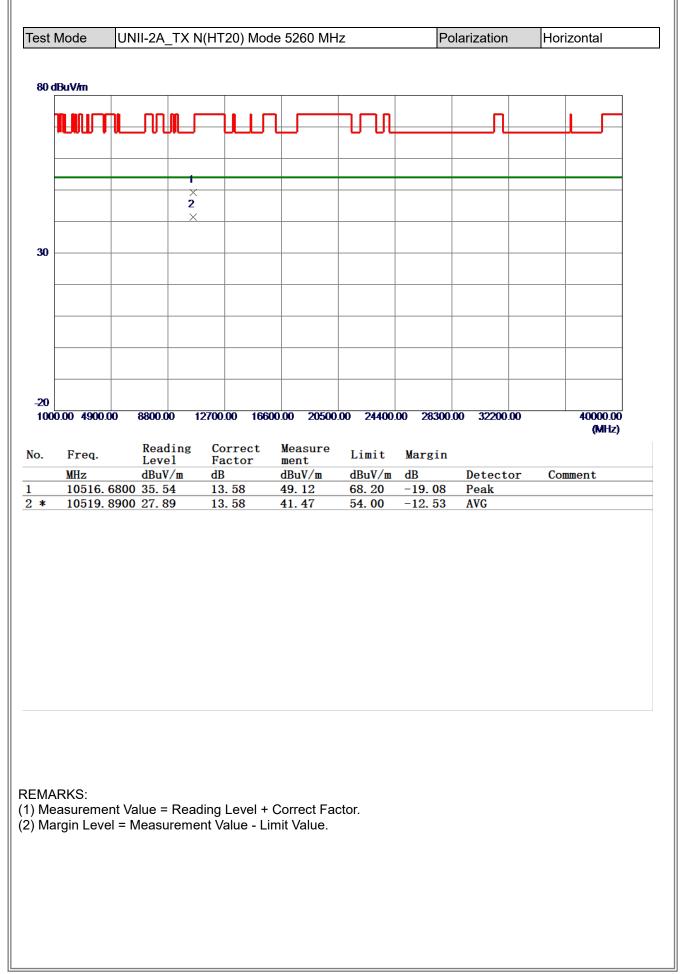




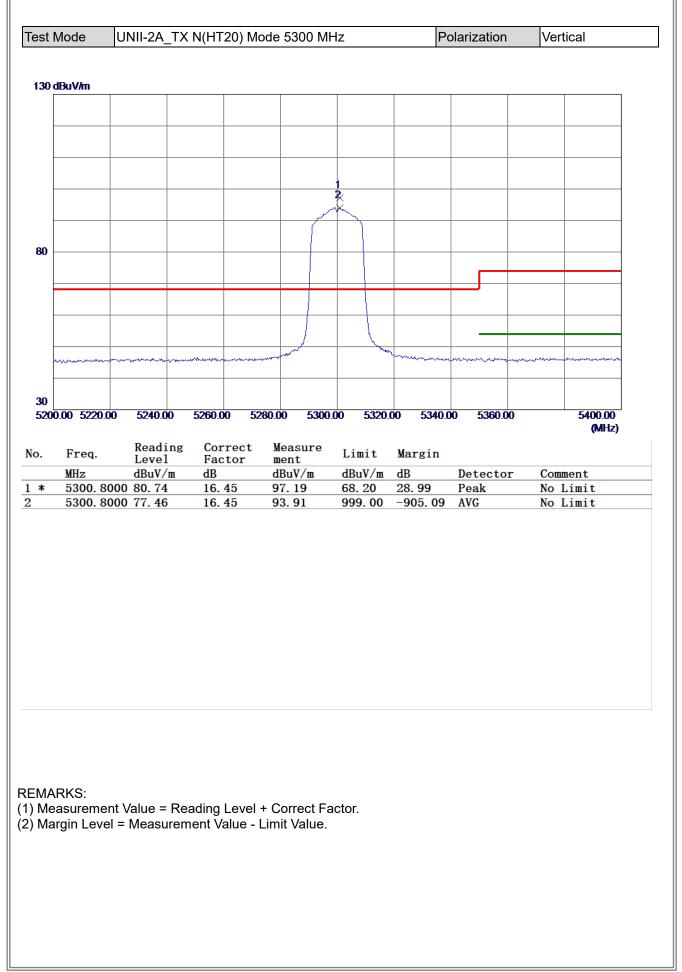




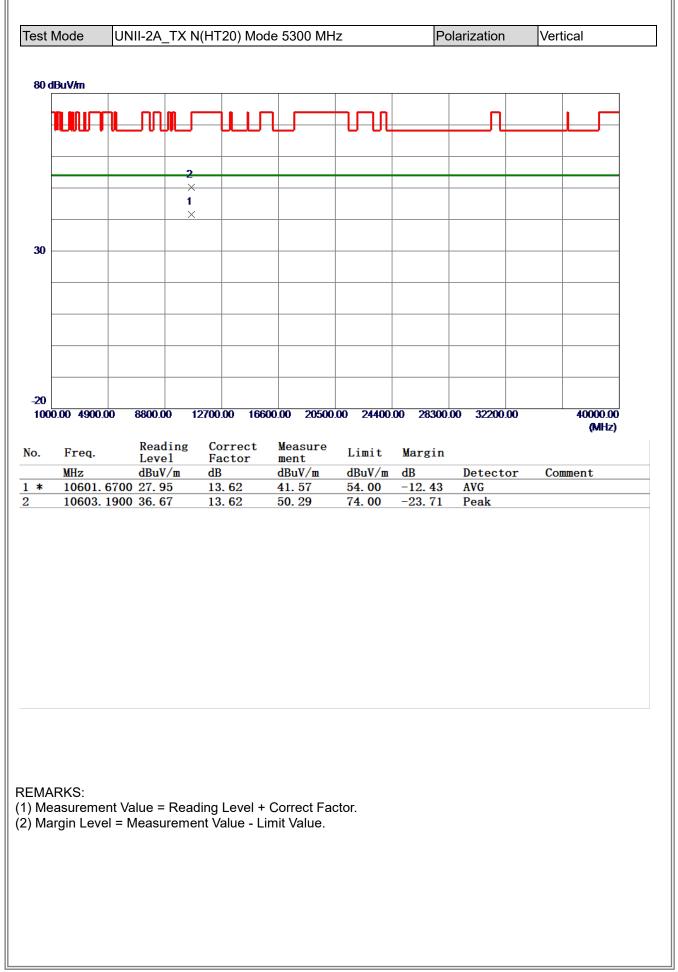




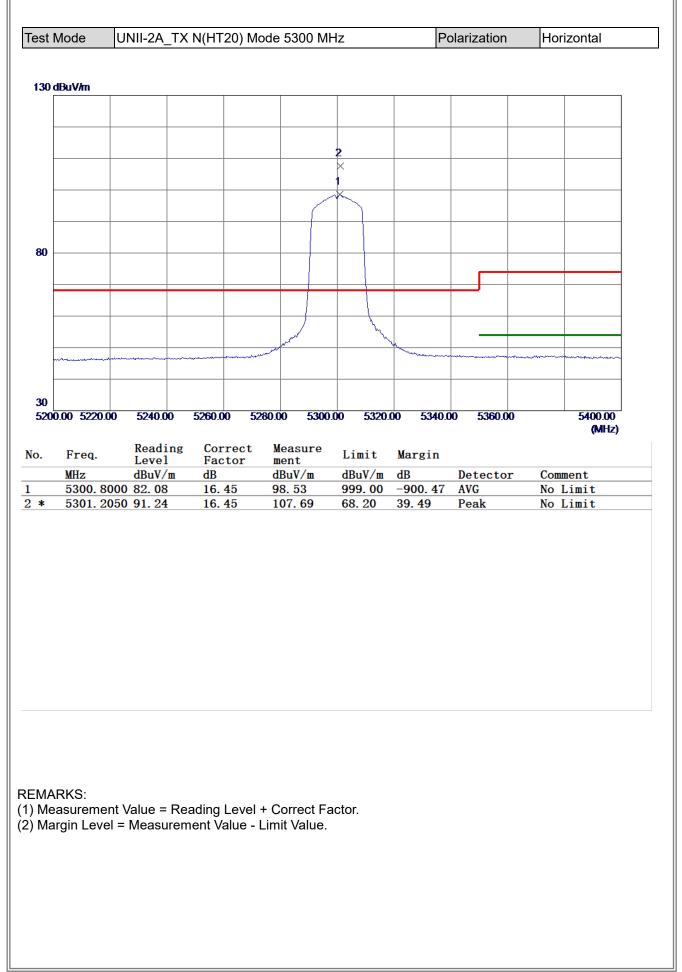




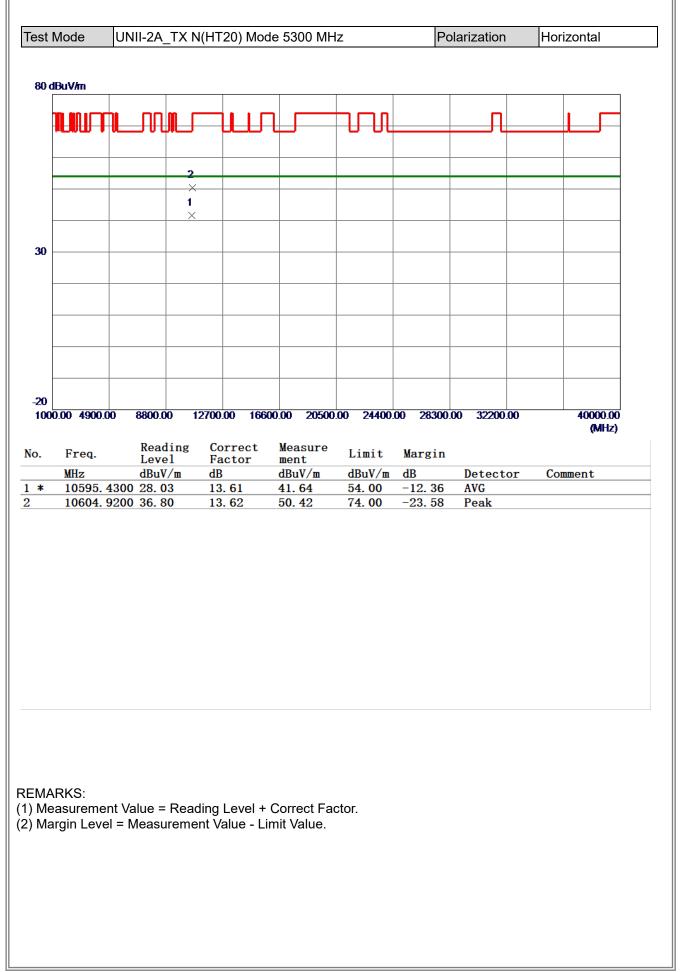




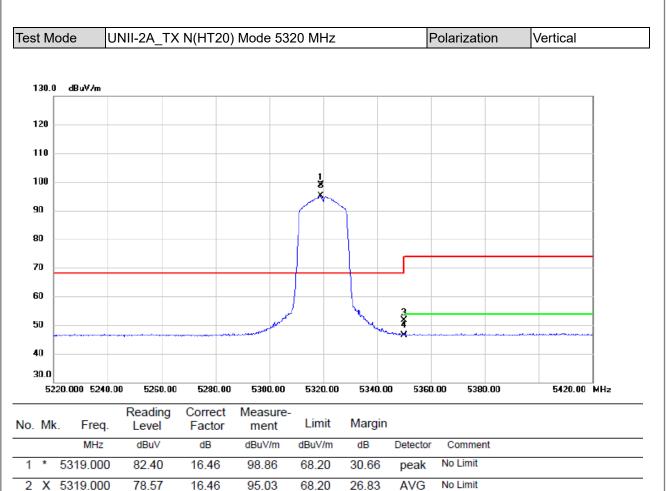












3

4

5350.000

5350.000

(1) Measurement Value = Reading Level + Correct Factor.

16.50

16.50

51.57

46.36

74.00

54.00

-22.43

-7.64

peak

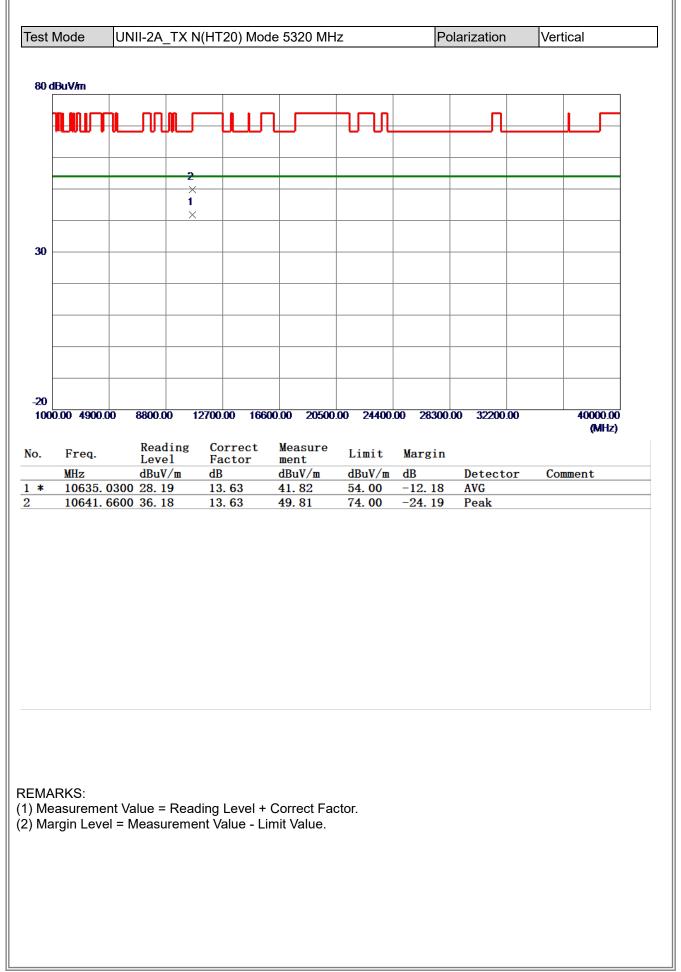
AVG

(2) Margin Level = Measurement Value - Limit Value.

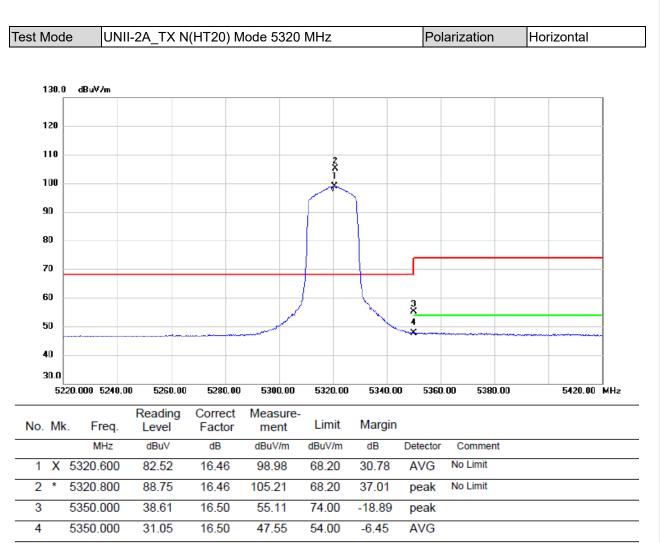
35.07

29.86



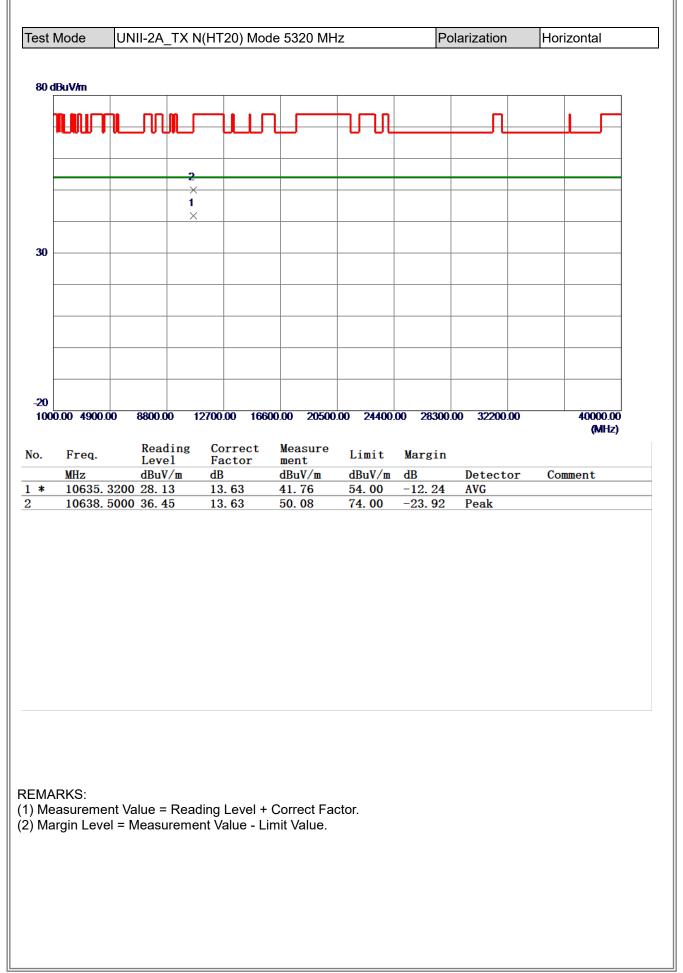




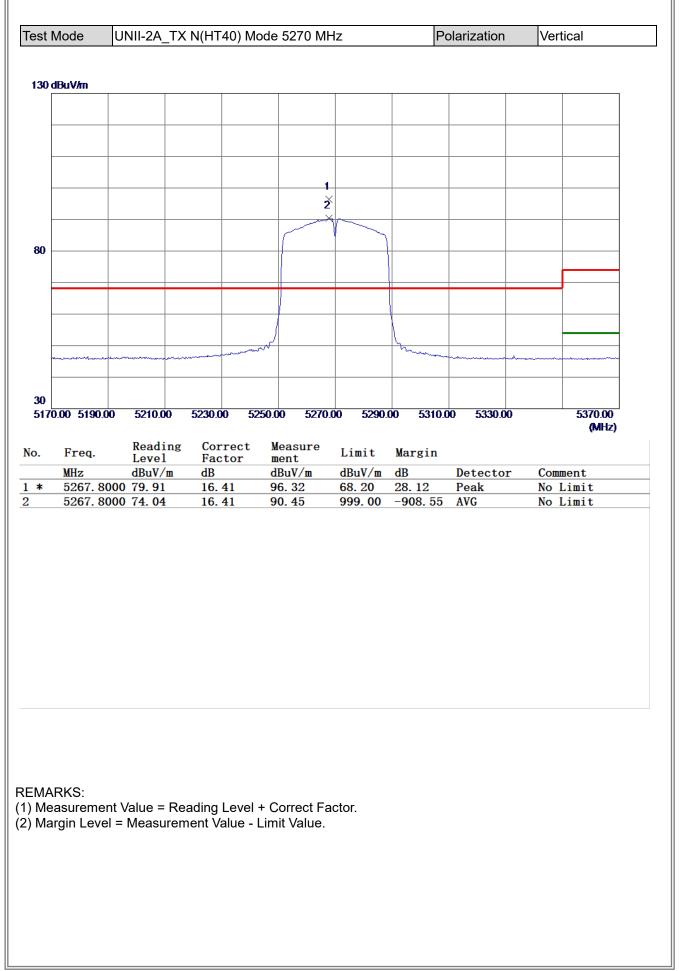


- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.

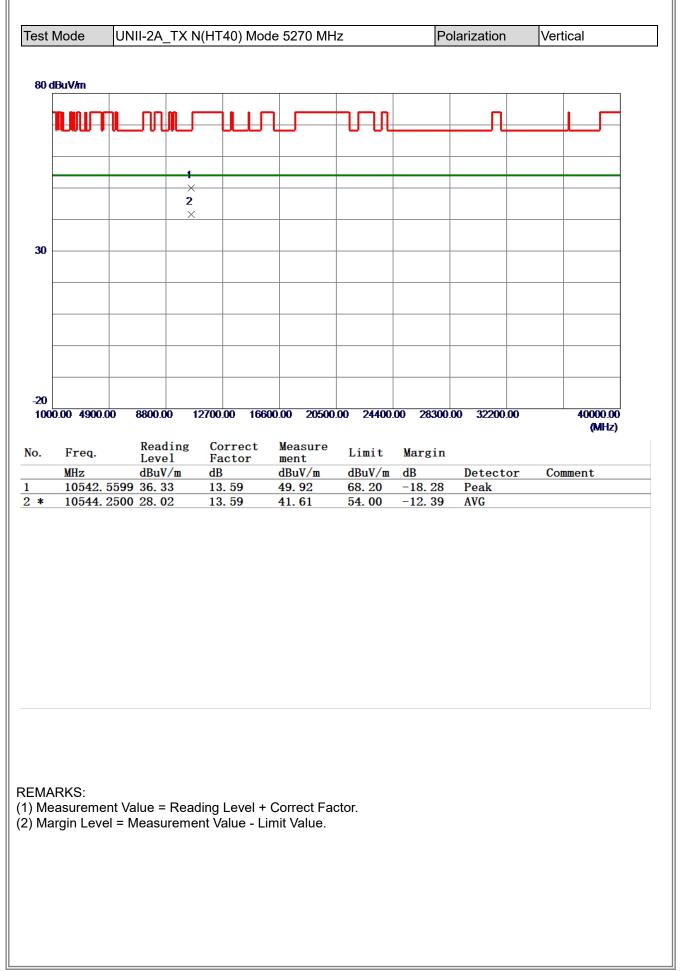




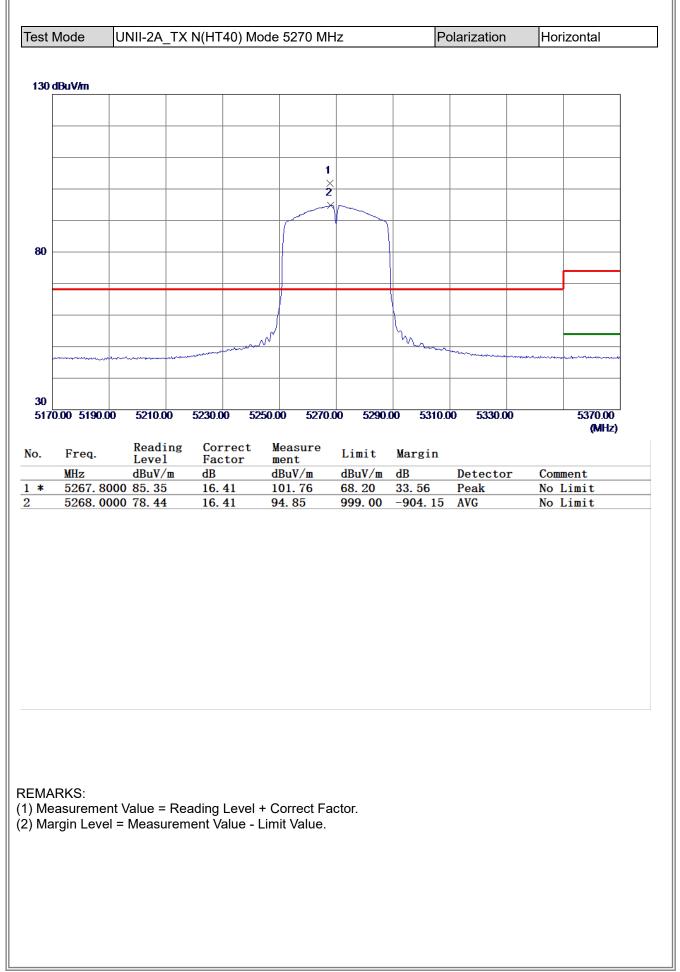




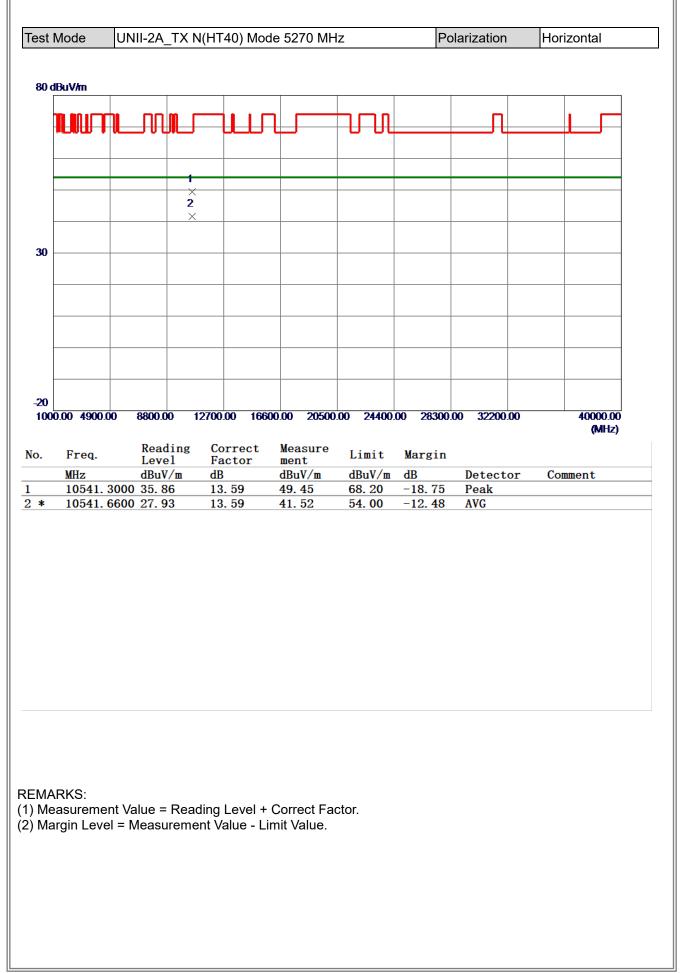




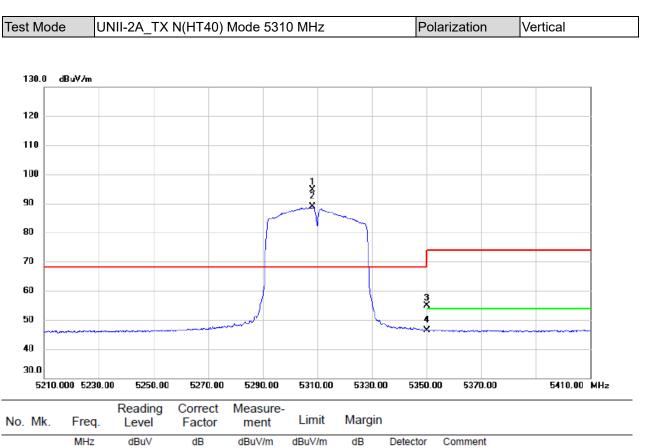










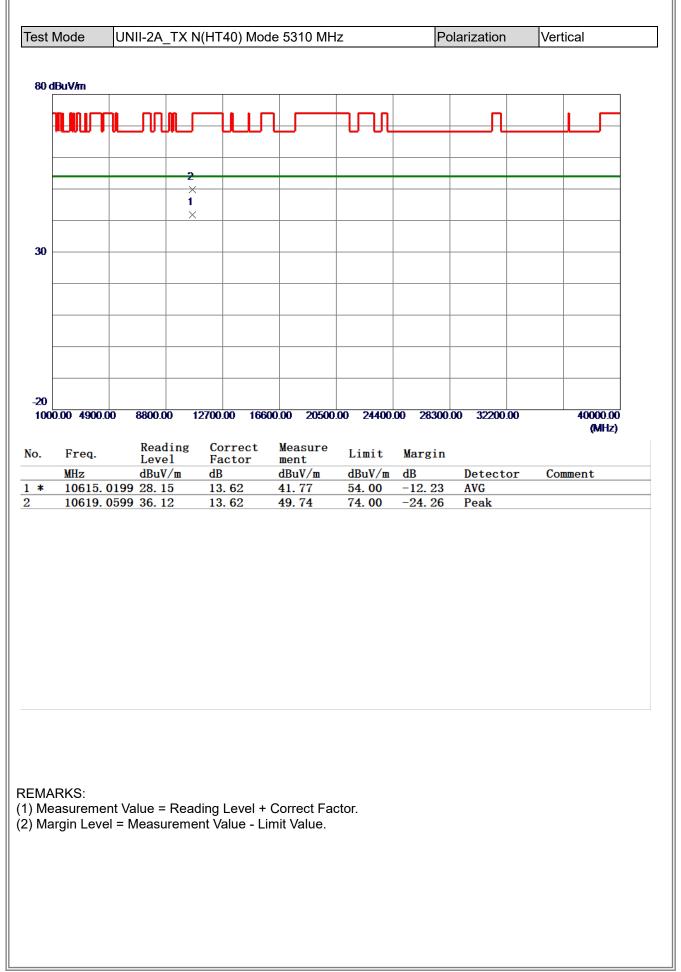


		rioq.	LOVOI	1 actor	ment		5		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	* 5	308.400	78.17	16.46	94.63	68.20	26.43	peak	No Limit
2	X 5	308.400	72.34	16.46	88.80	68.20	20.60	AVG	No Limit
3	5	350.000	38.26	16.50	54.76	74.00	-19.24	peak	
4	5	350.000	29.92	16.50	46.42	54.00	-7.58	AVG	

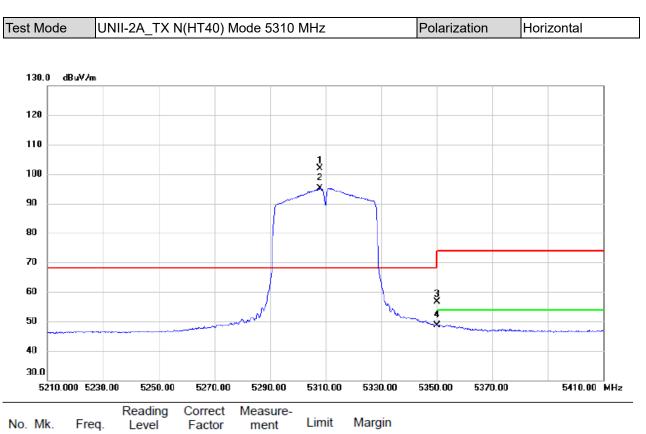
REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.







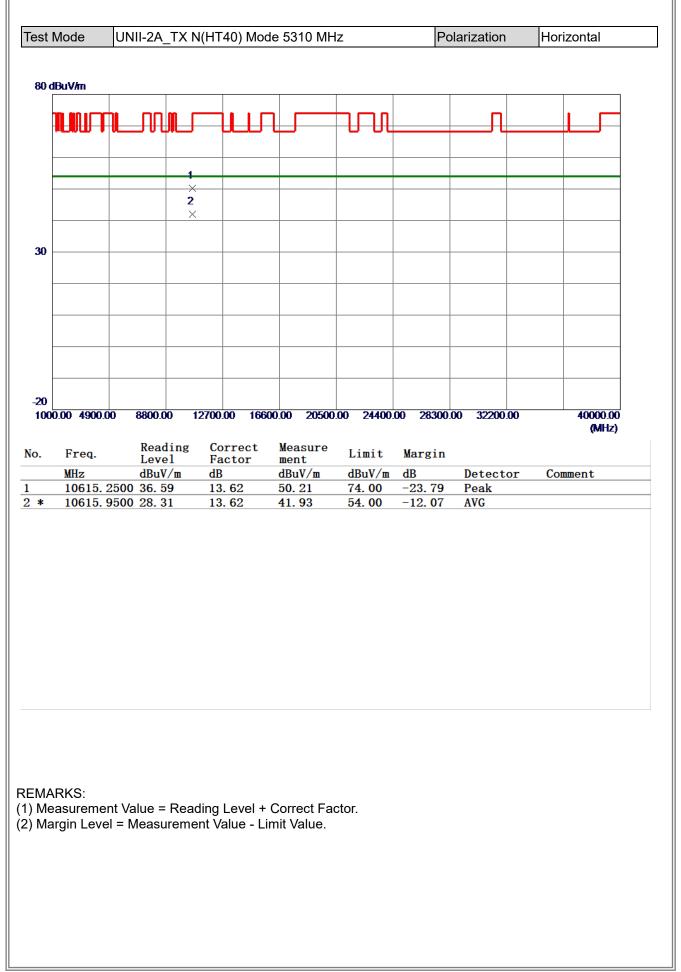


No.	Mk	. Freq.	Level	Factor	ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	5308.000	85.49	16.45	101.94	68.20	33.74	peak	No Limit
2	Х	5308.000	78.64	16.45	95.09	68.20	26.89	AVG	No Limit
3		5350.000	40.17	16.50	56.67	74.00	-17.33	peak	
4		5350.000	32.13	16.50	48.63	54.00	-5.37	AVG	

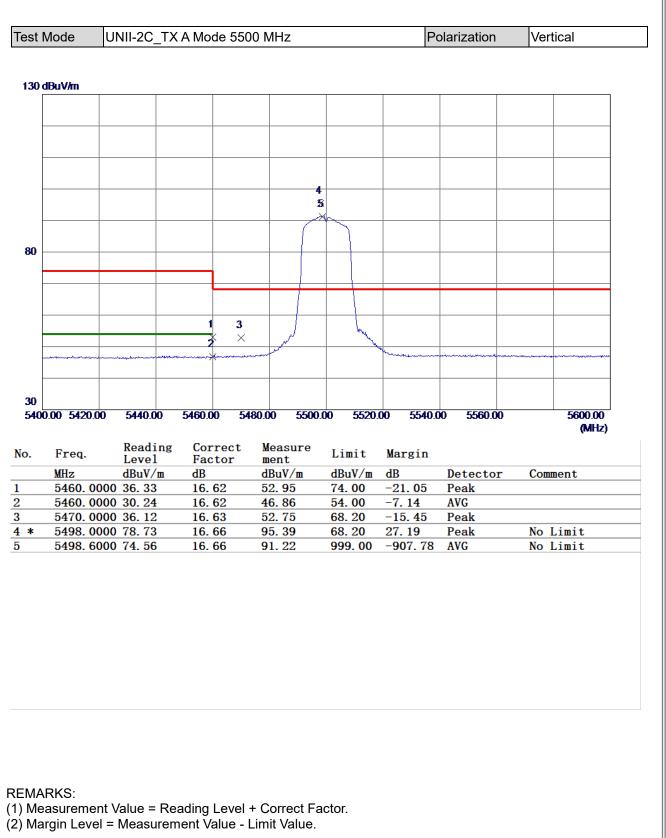
REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value Limit Value.

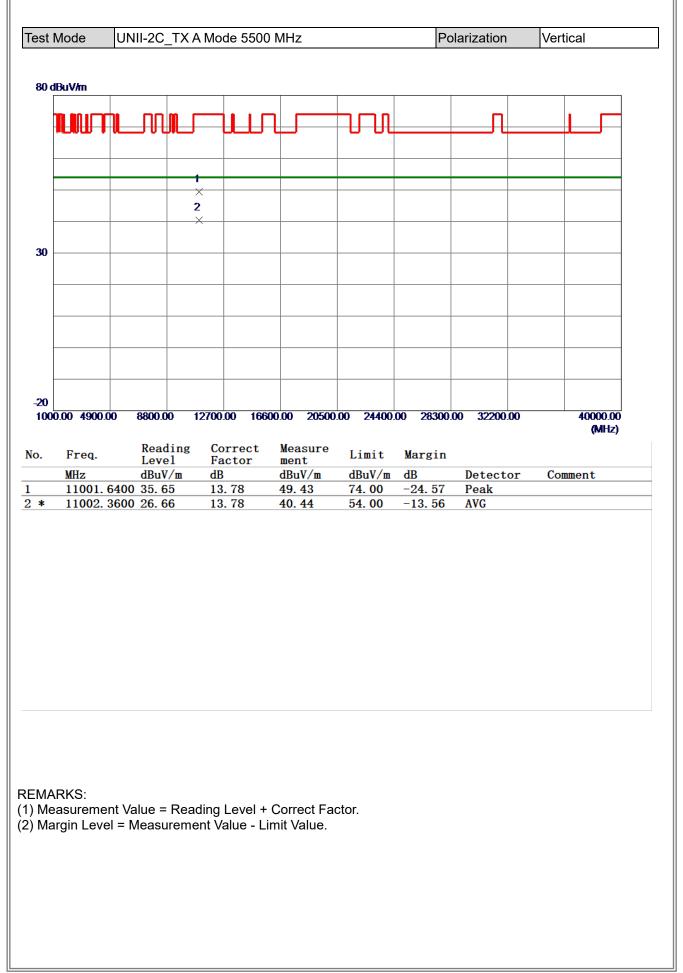


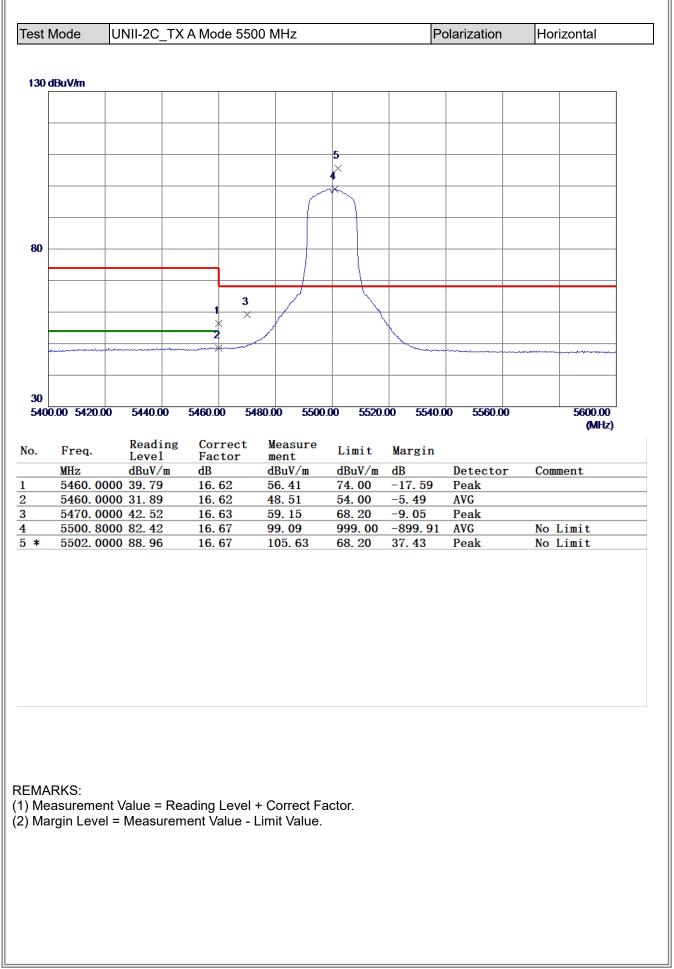




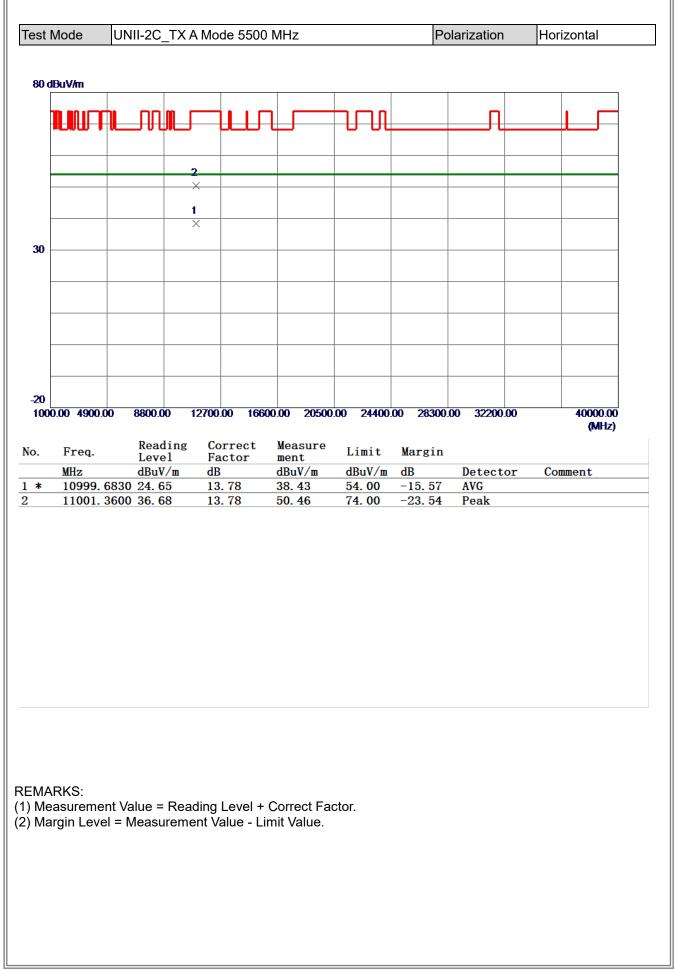


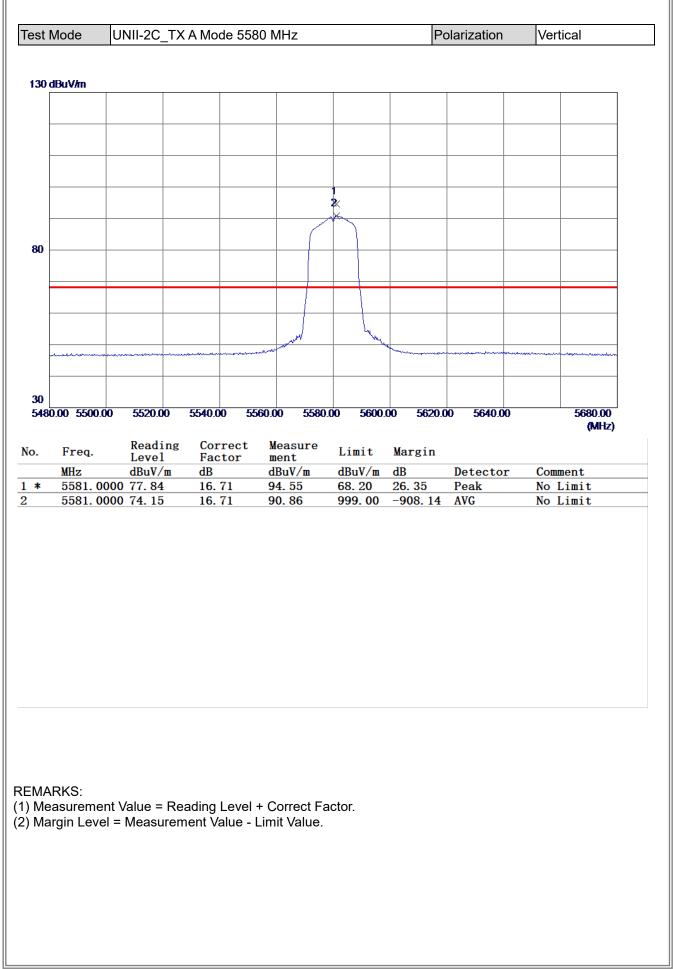




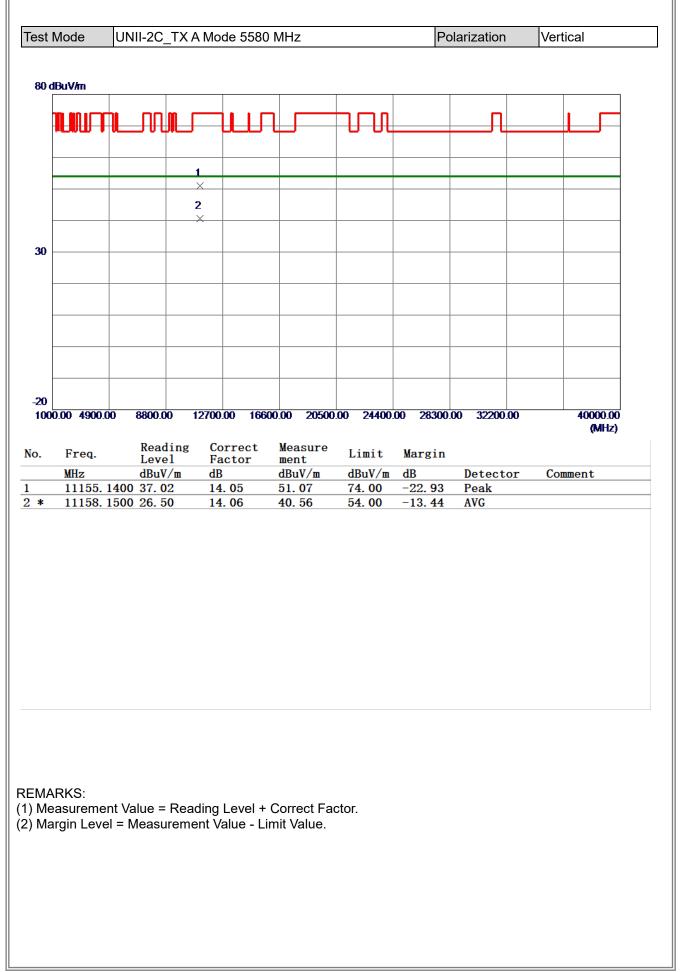


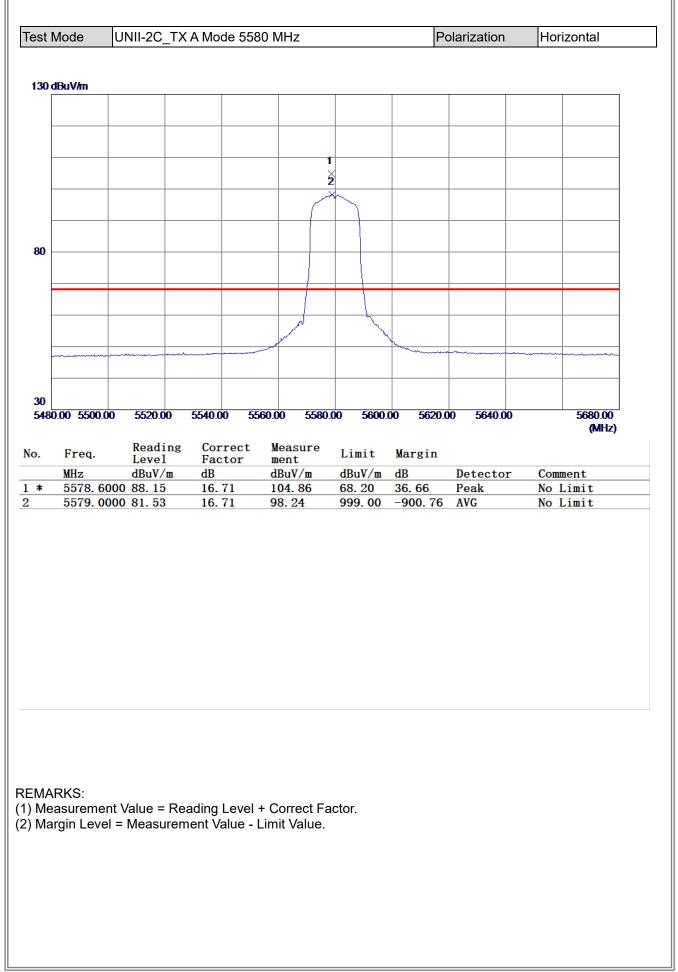




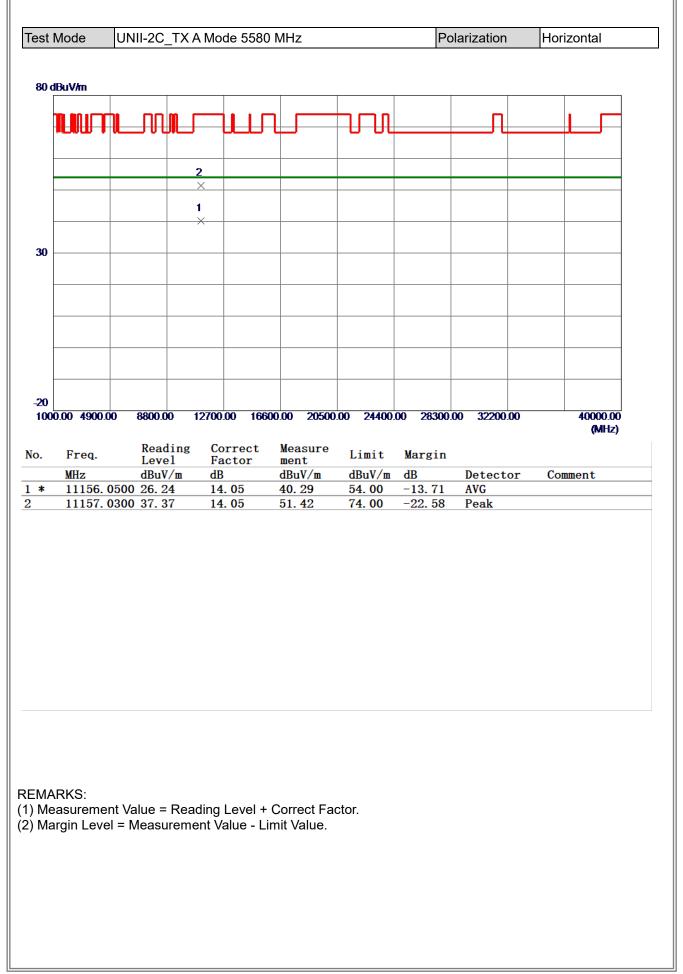


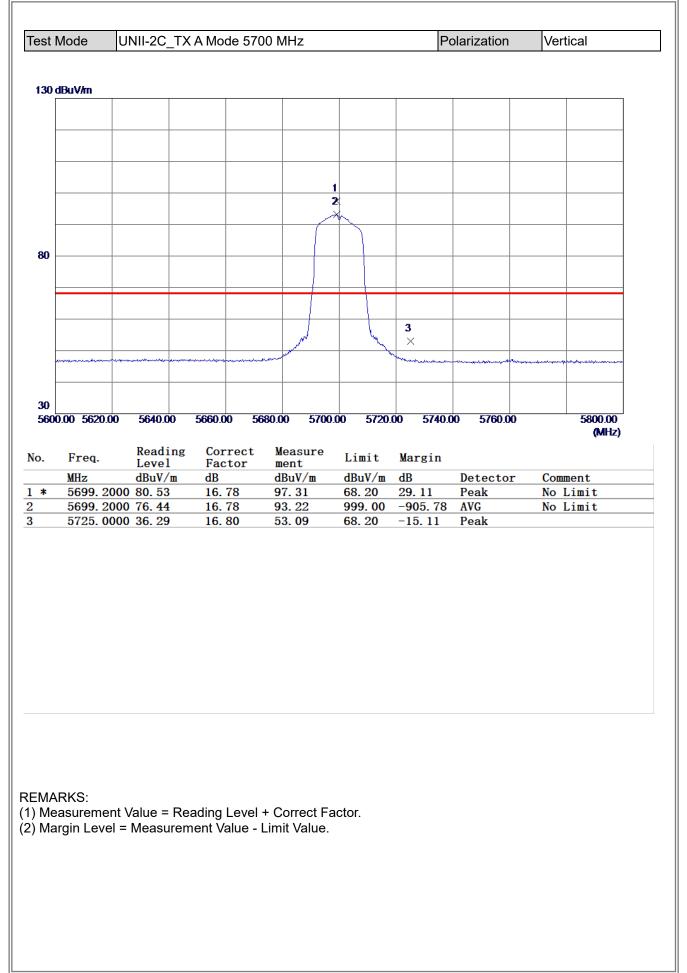




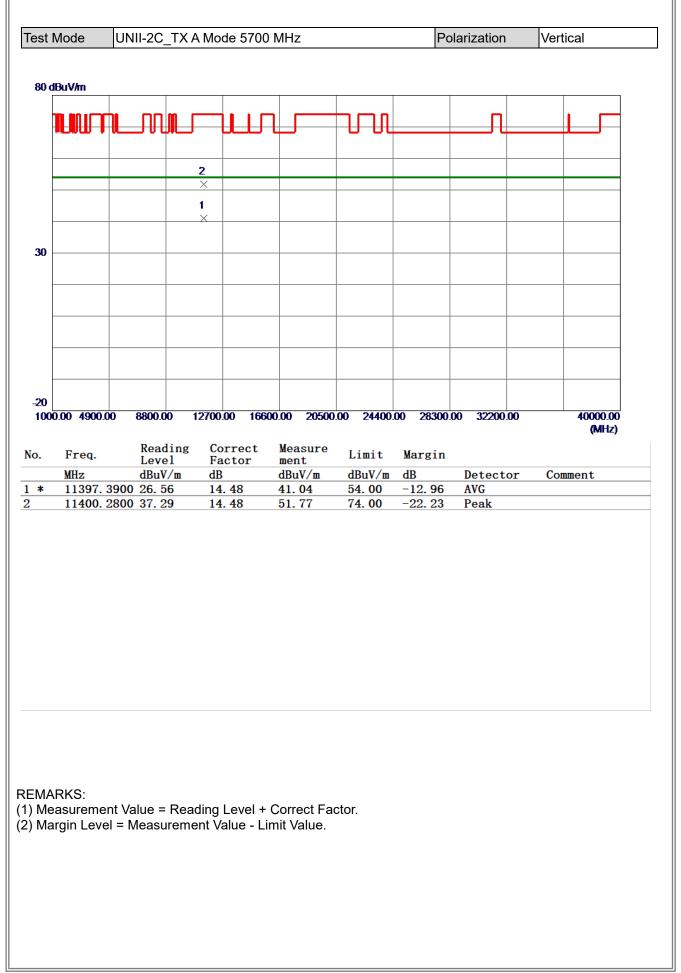


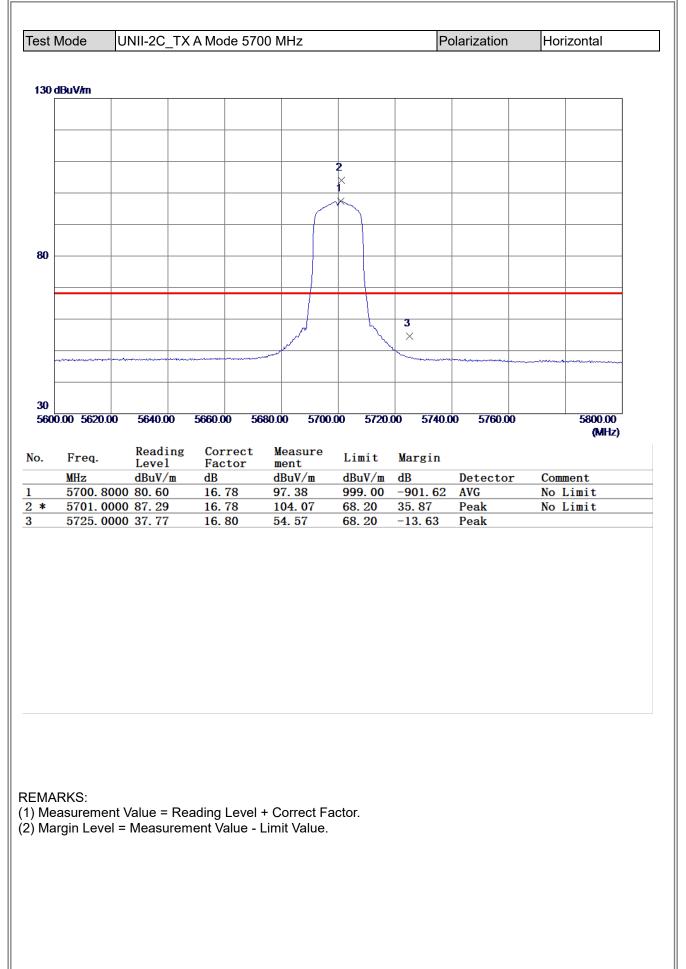




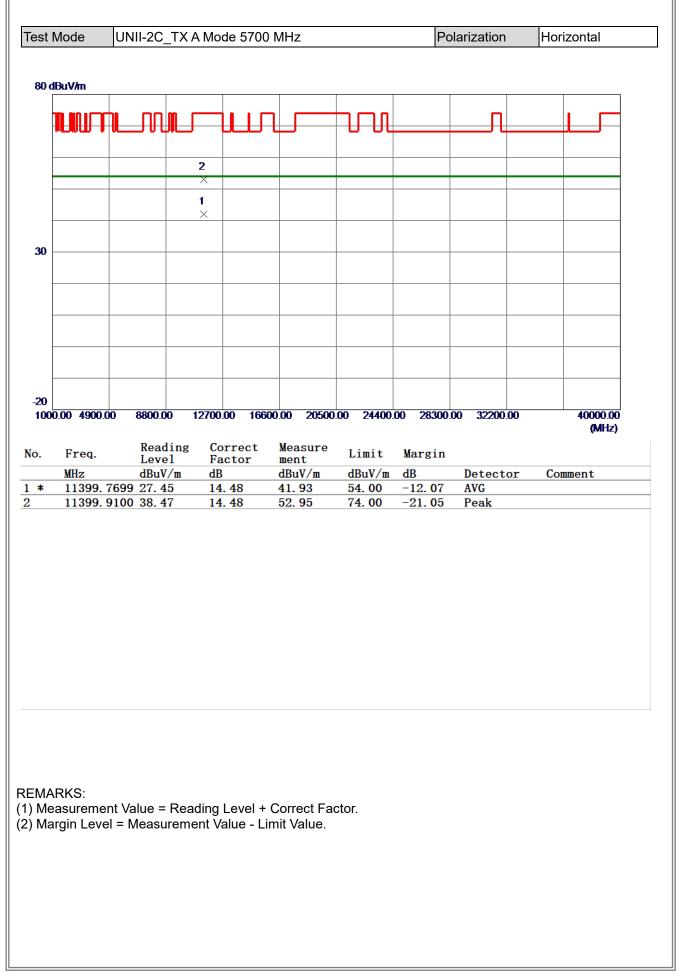




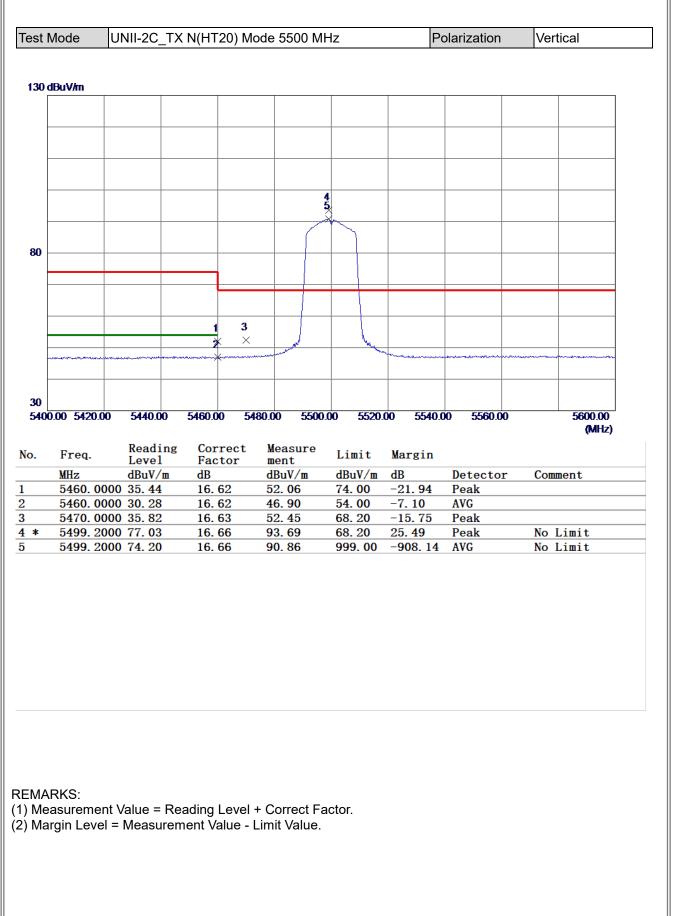




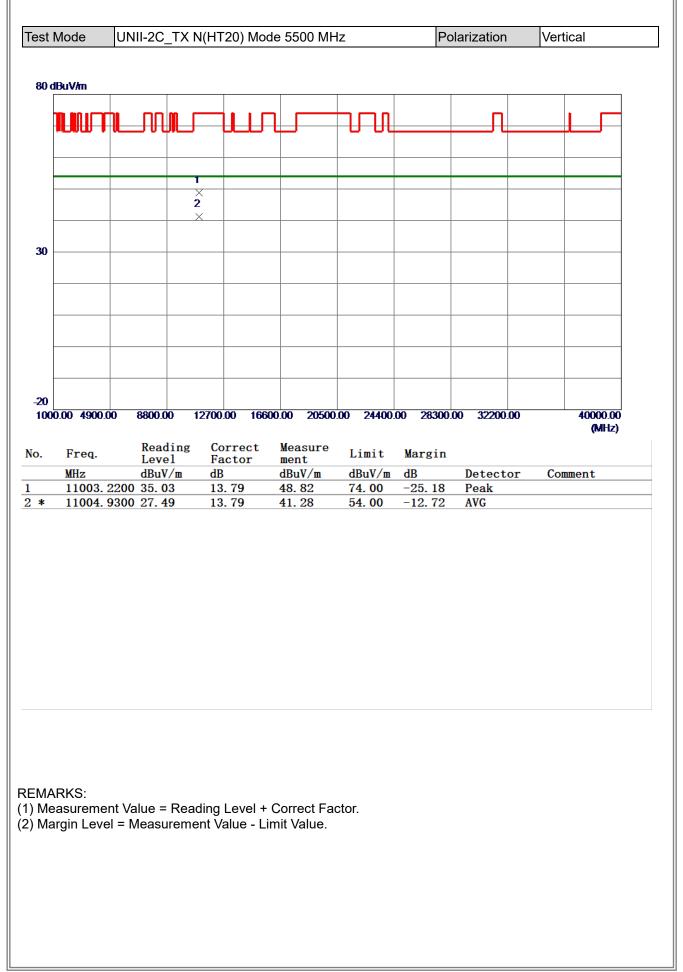




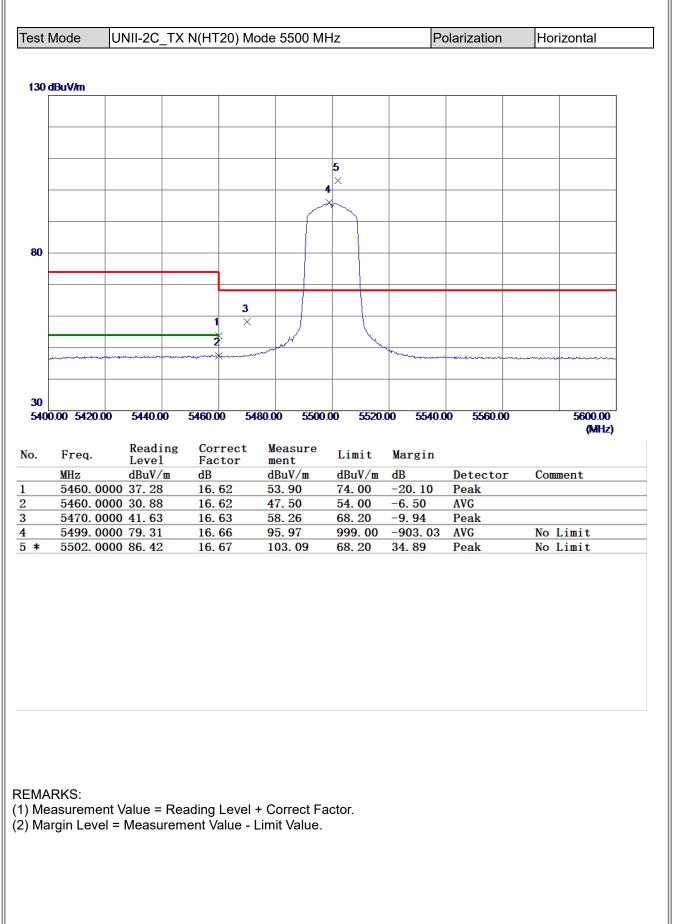




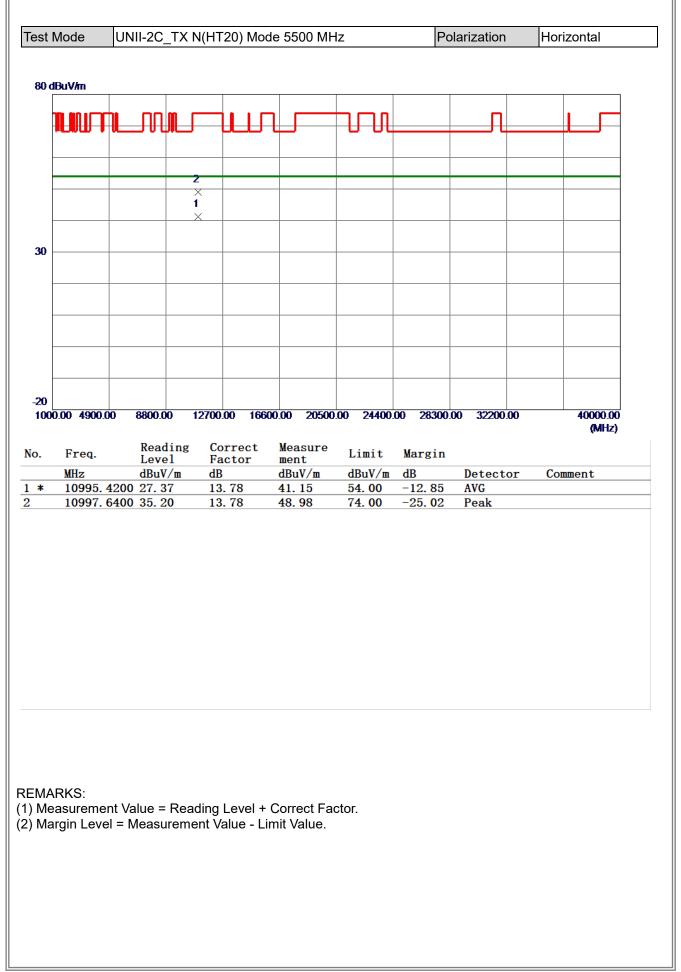




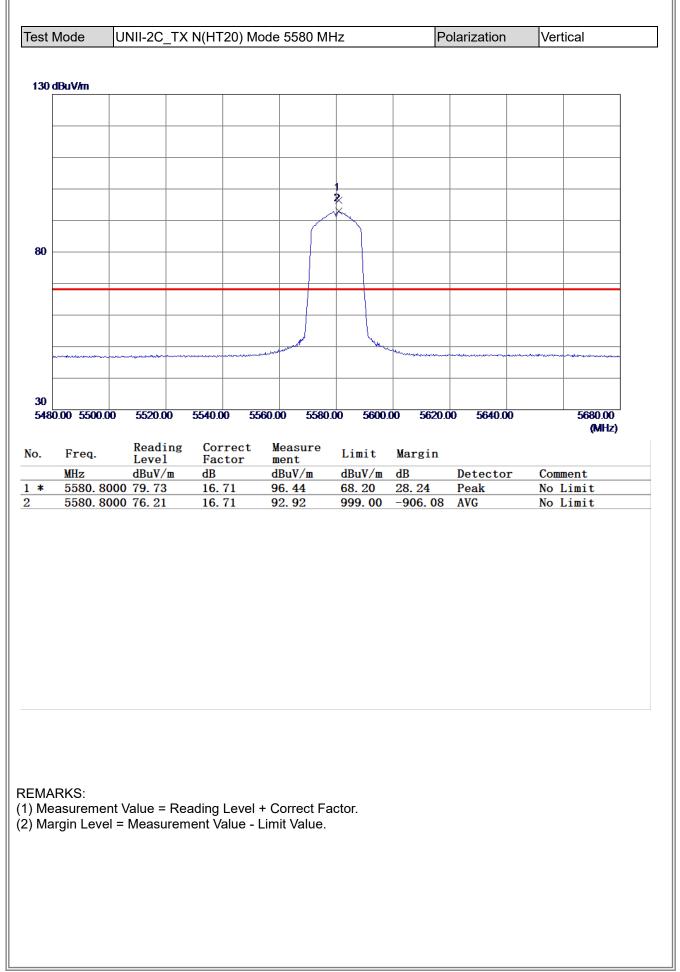




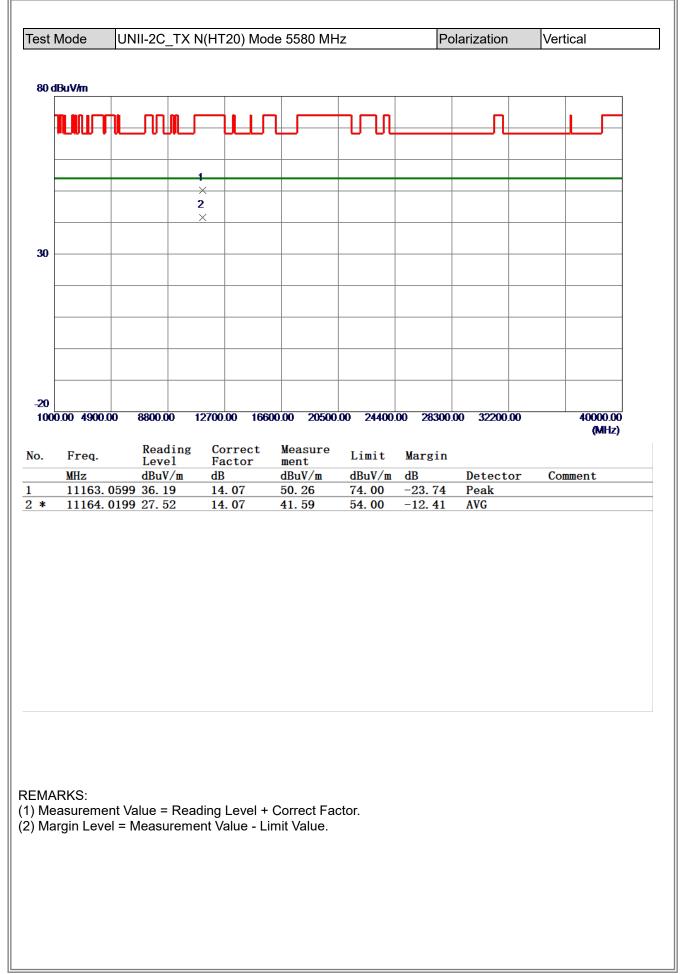




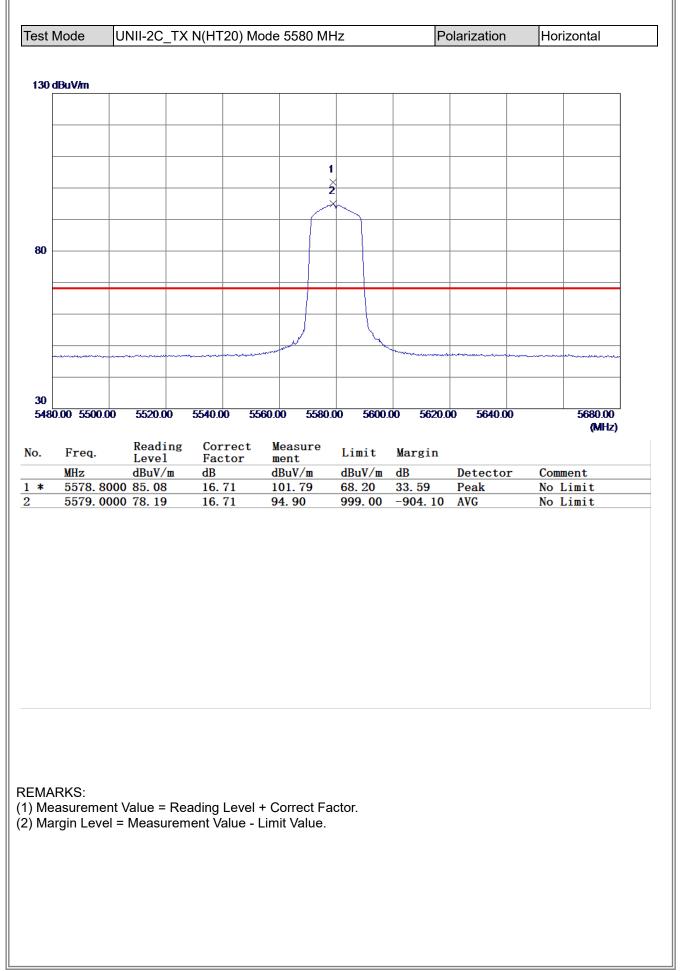




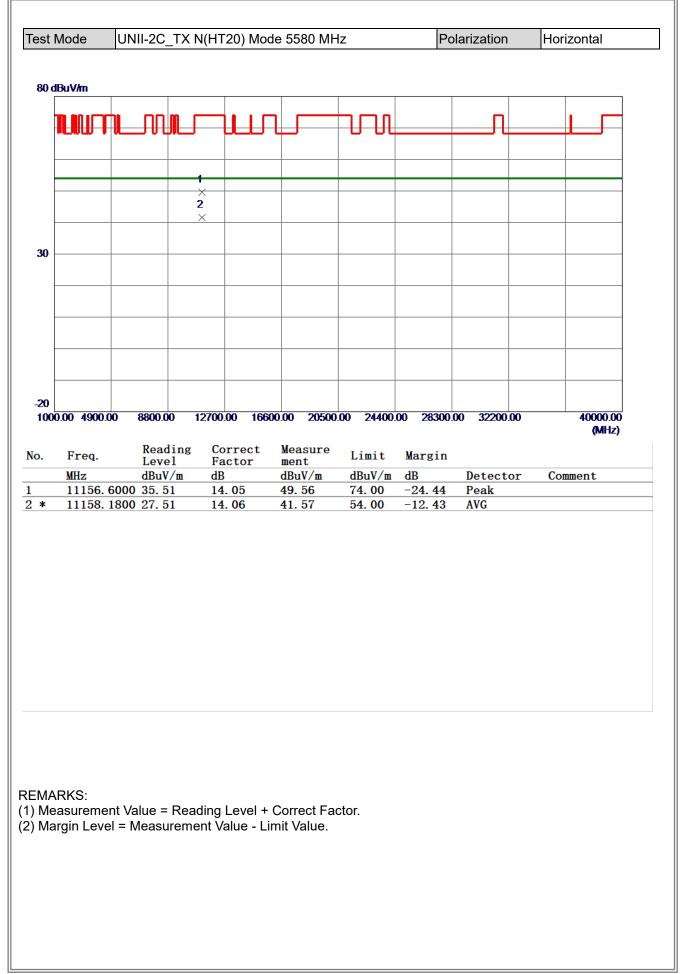




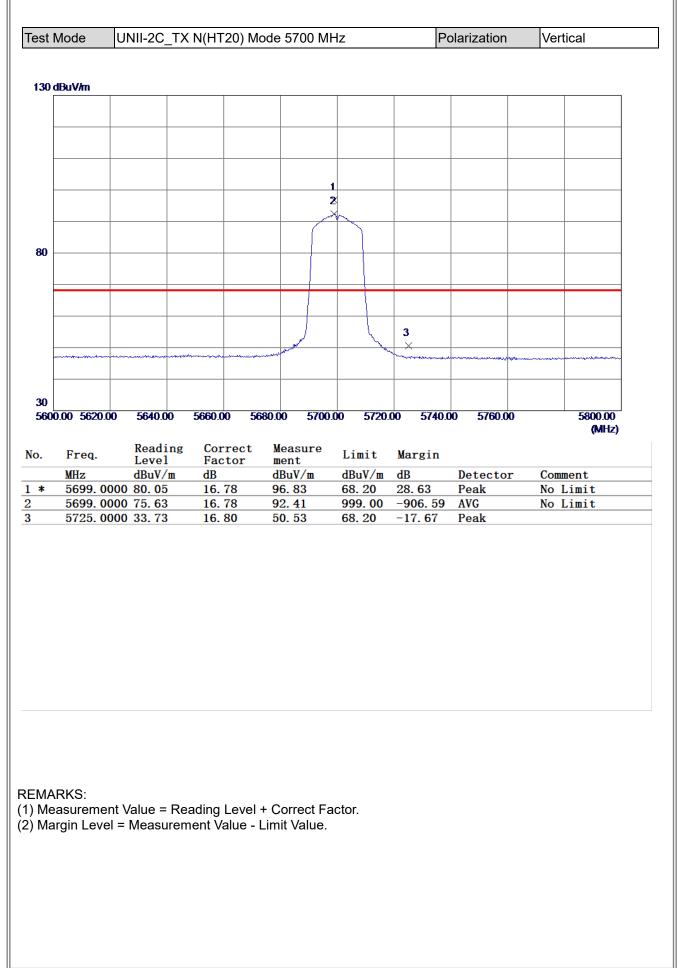




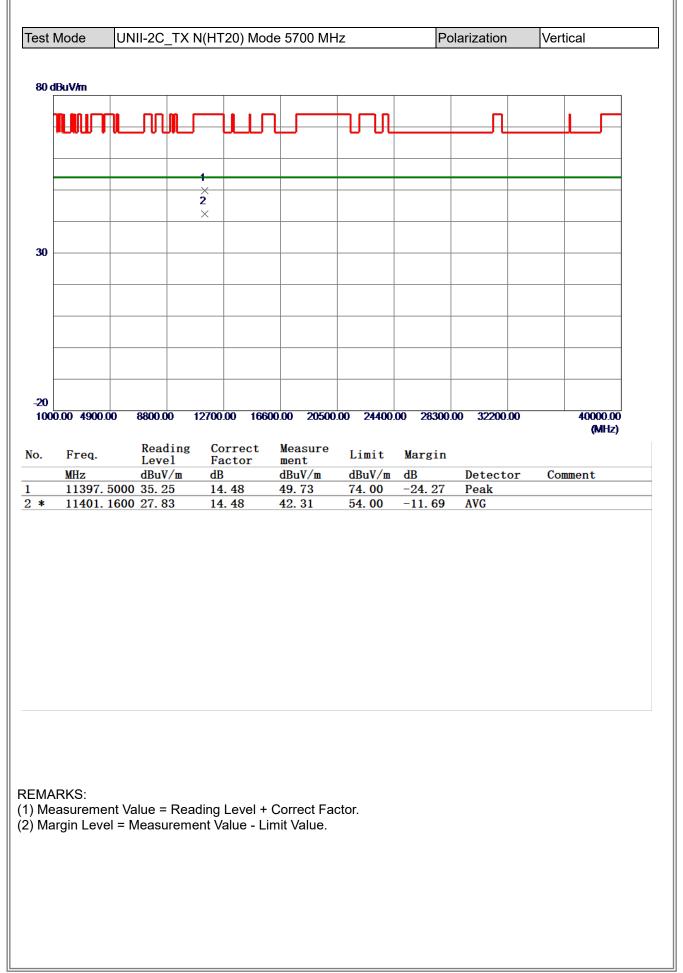




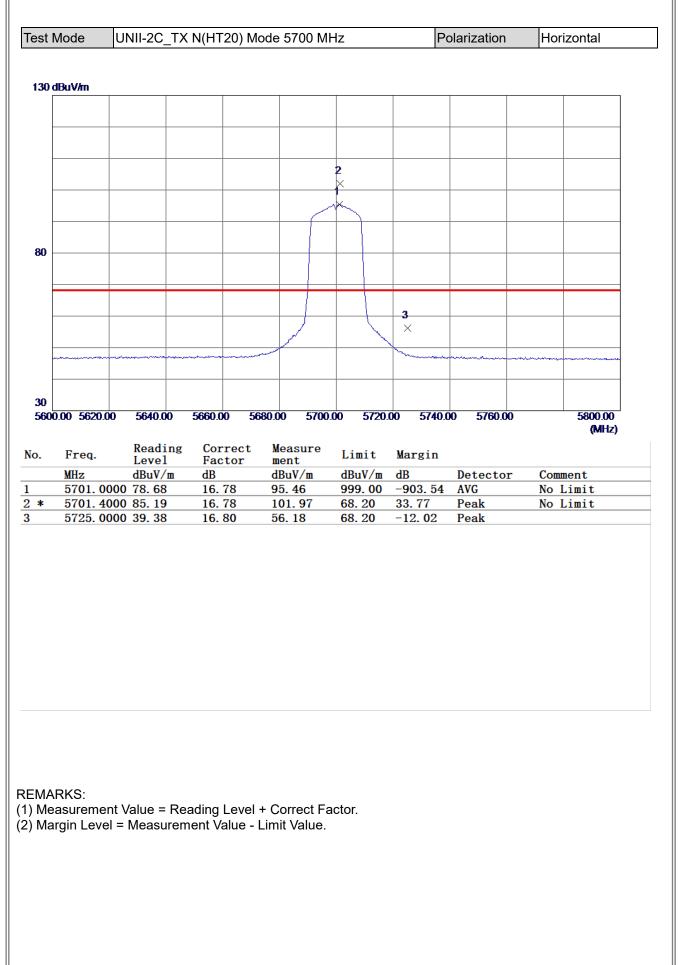




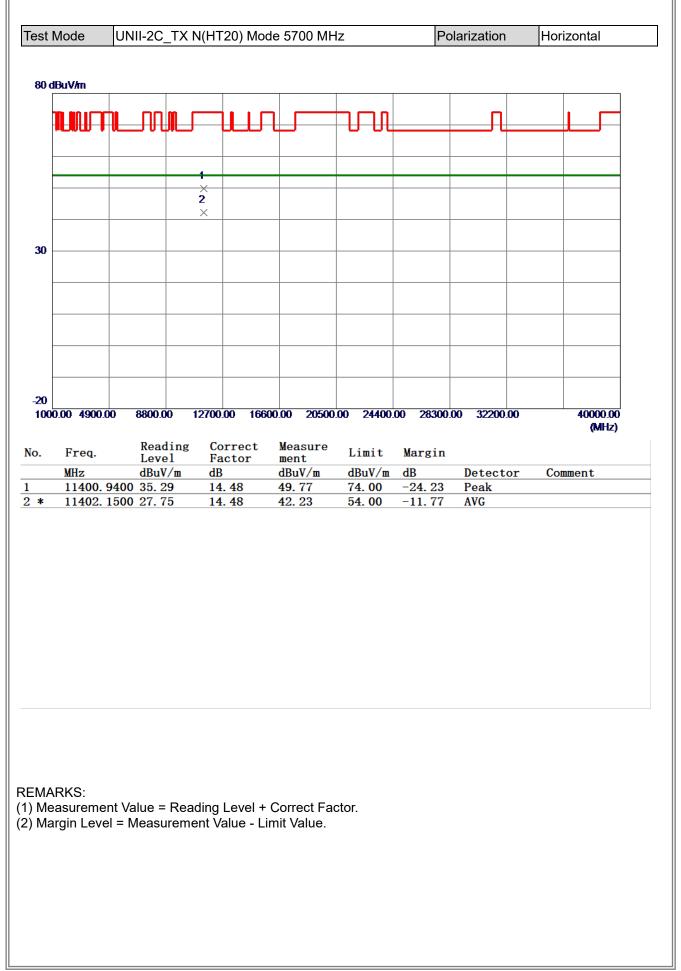




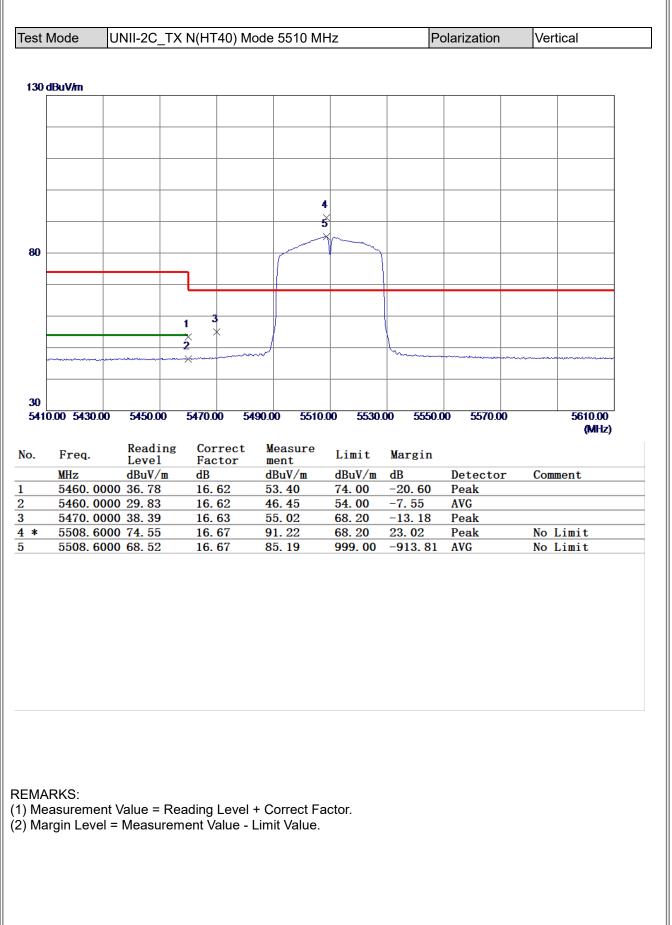




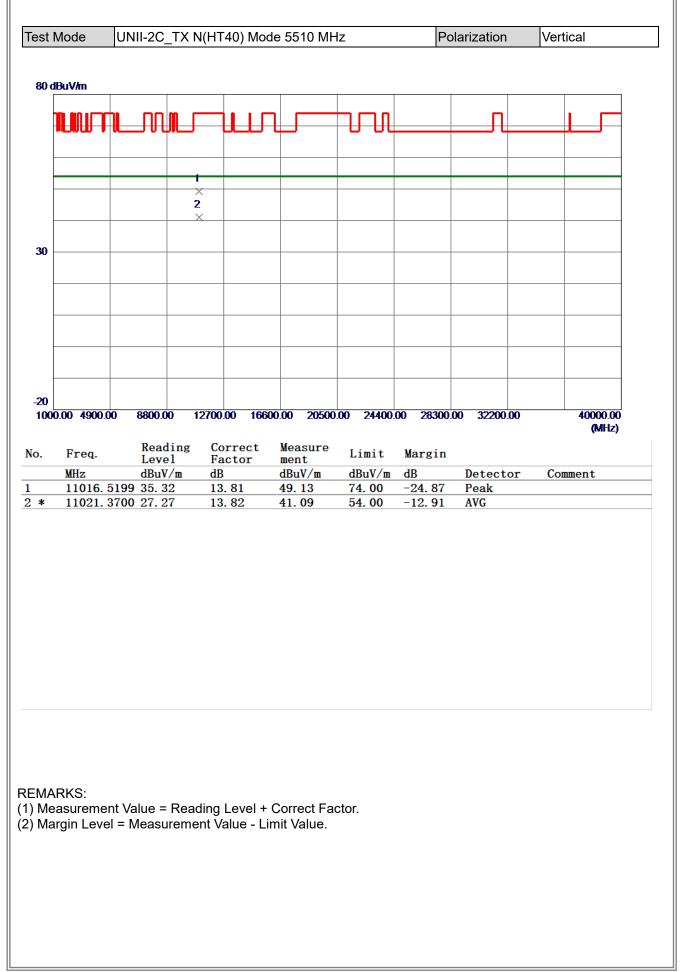




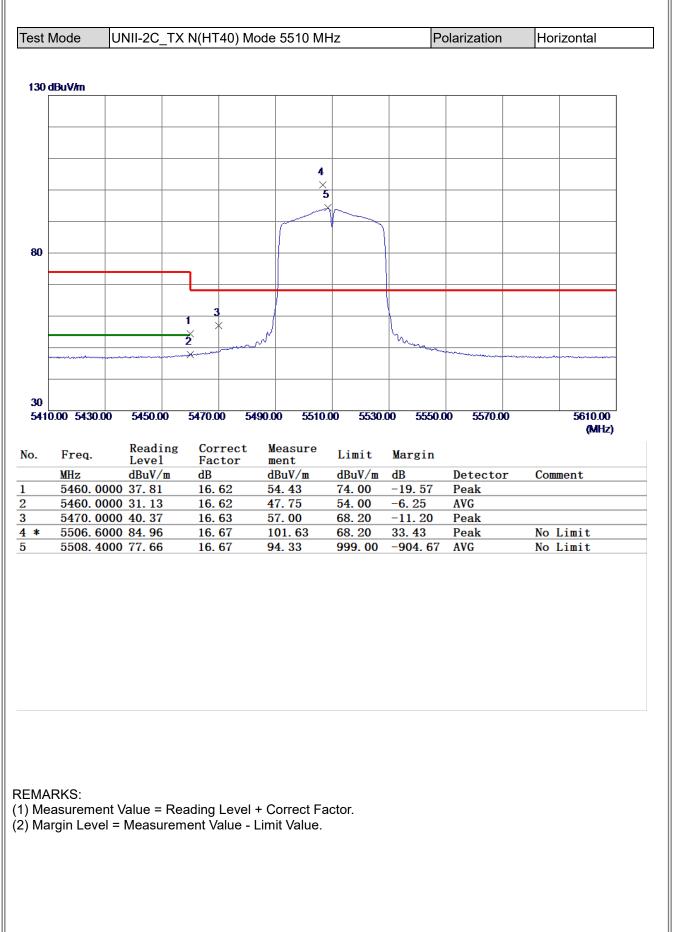




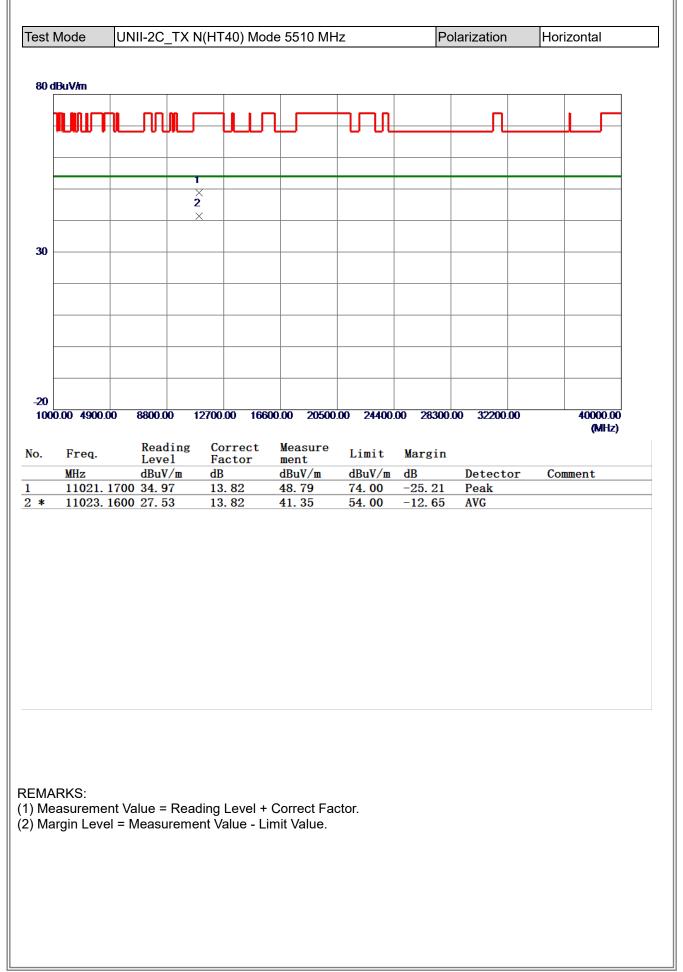




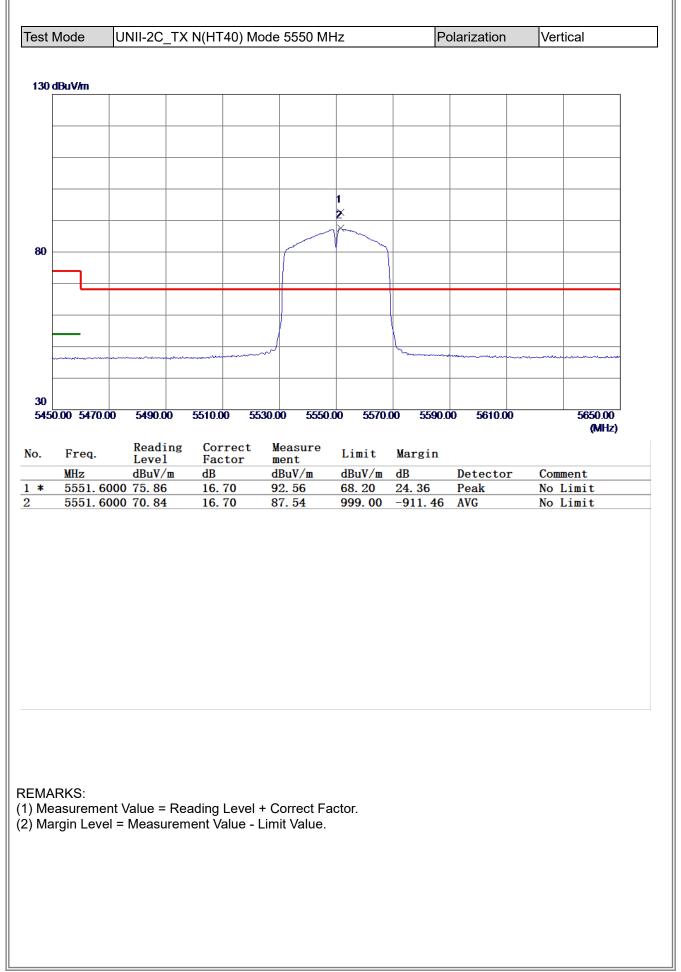




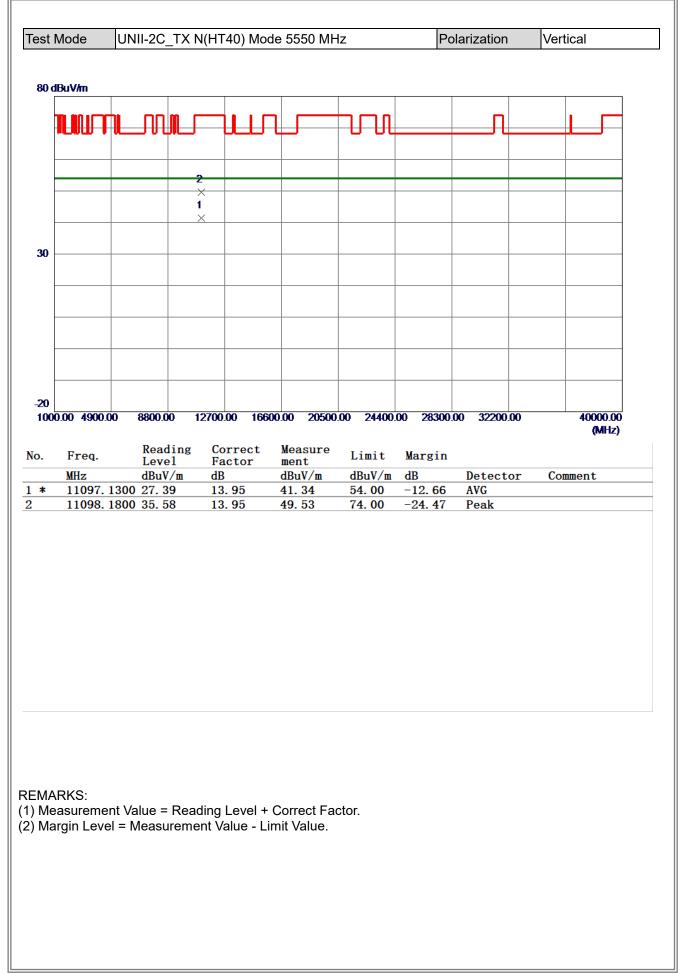




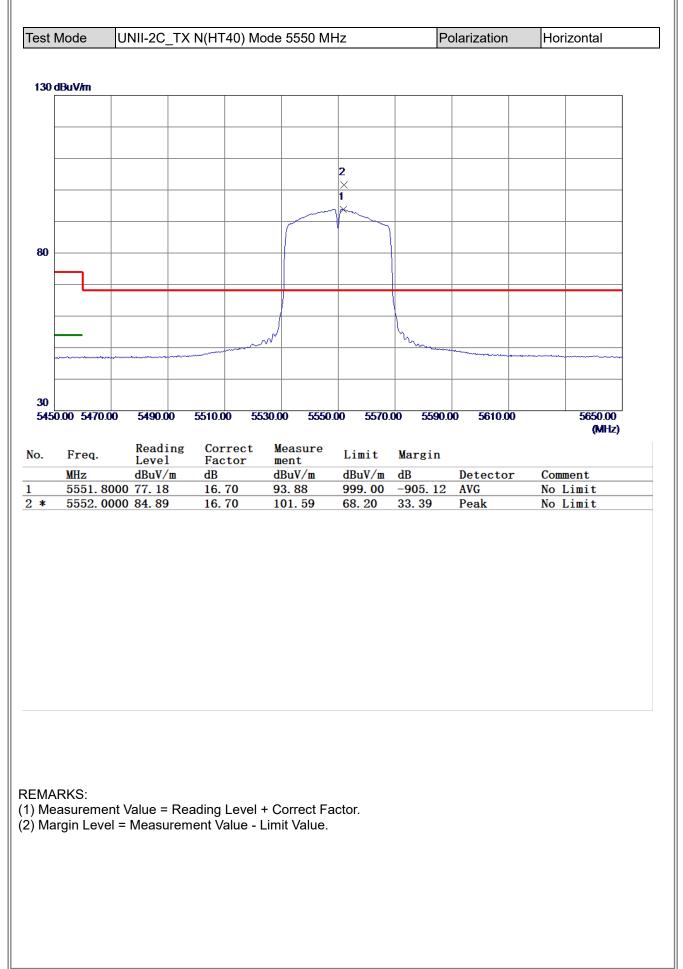




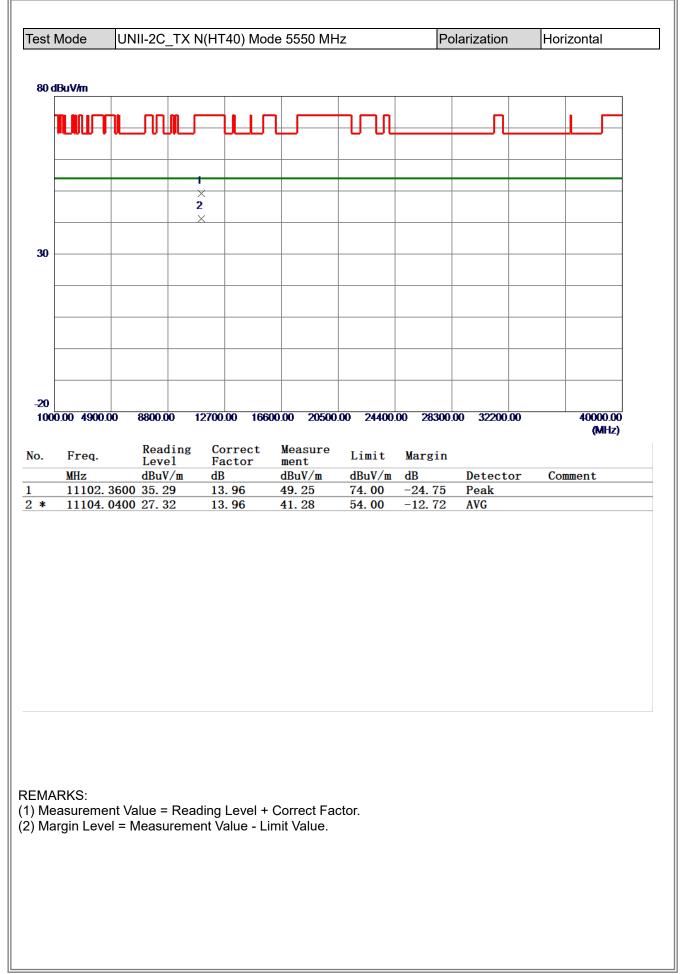




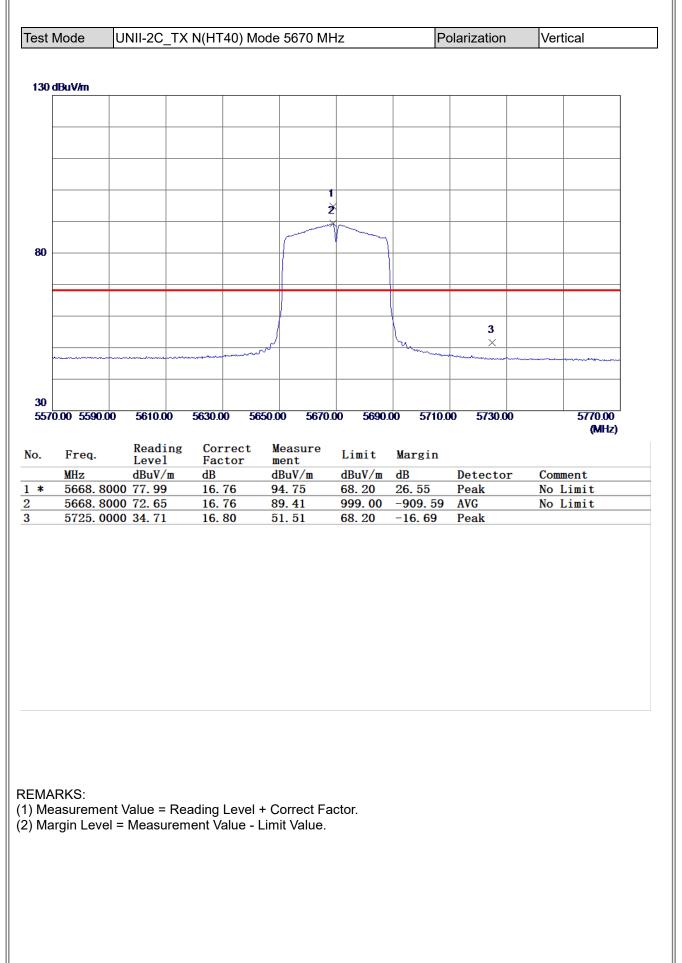




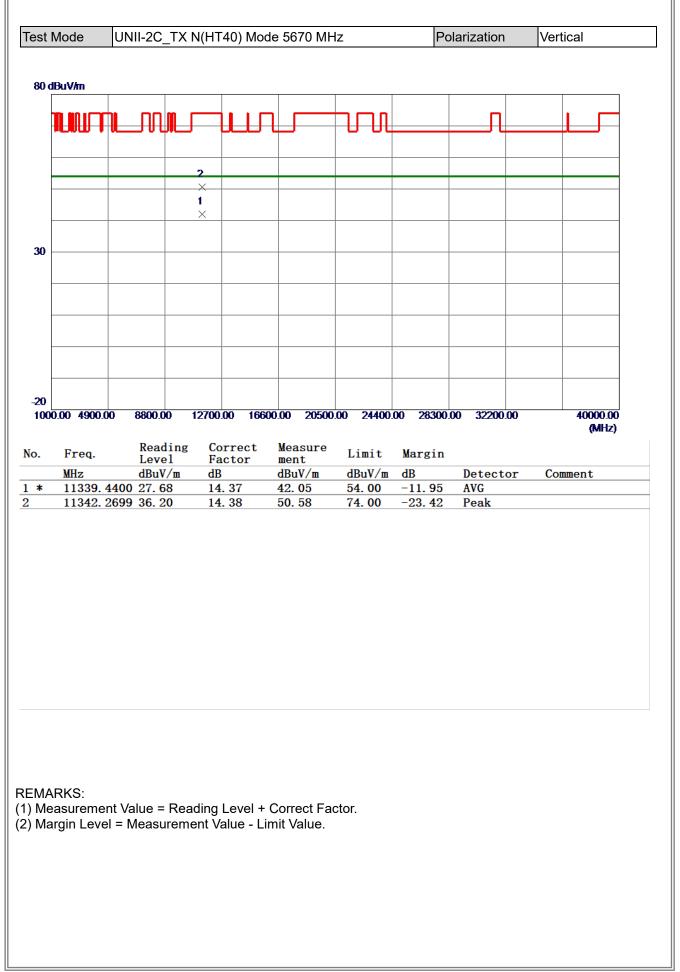




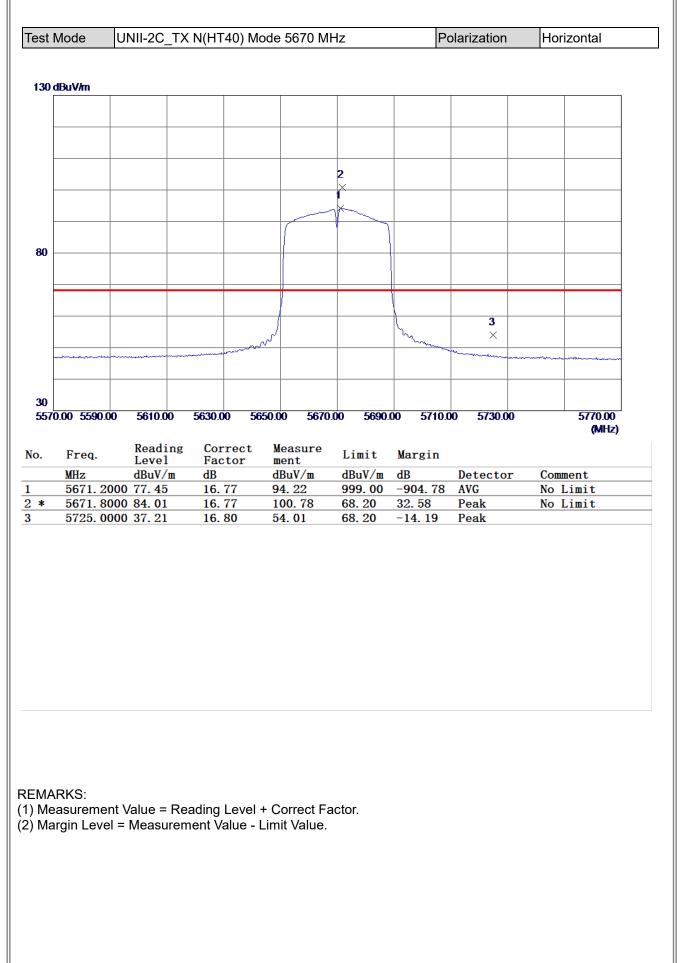




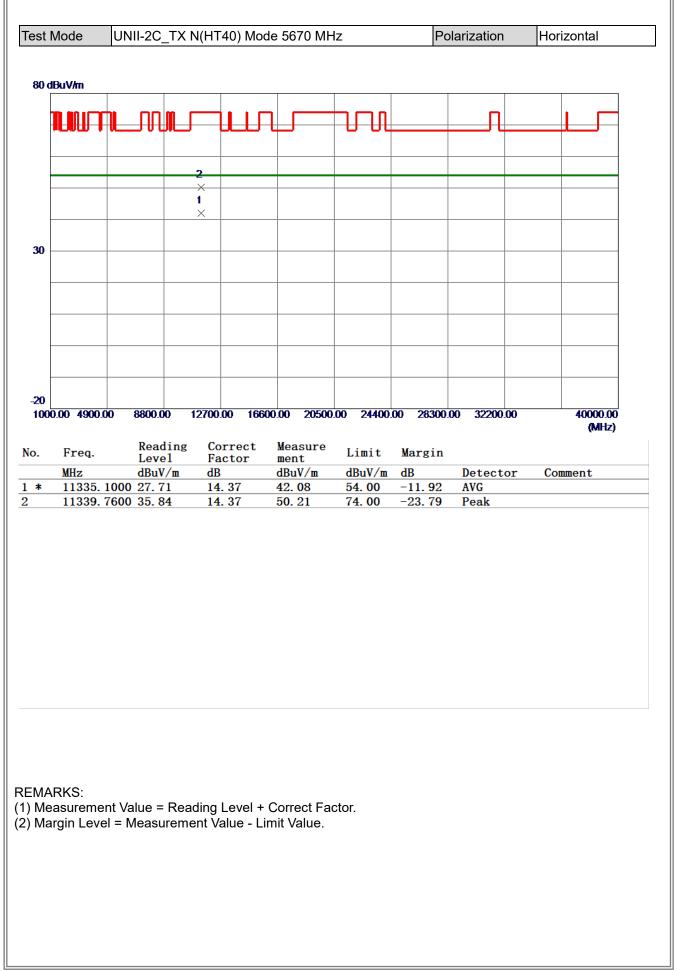




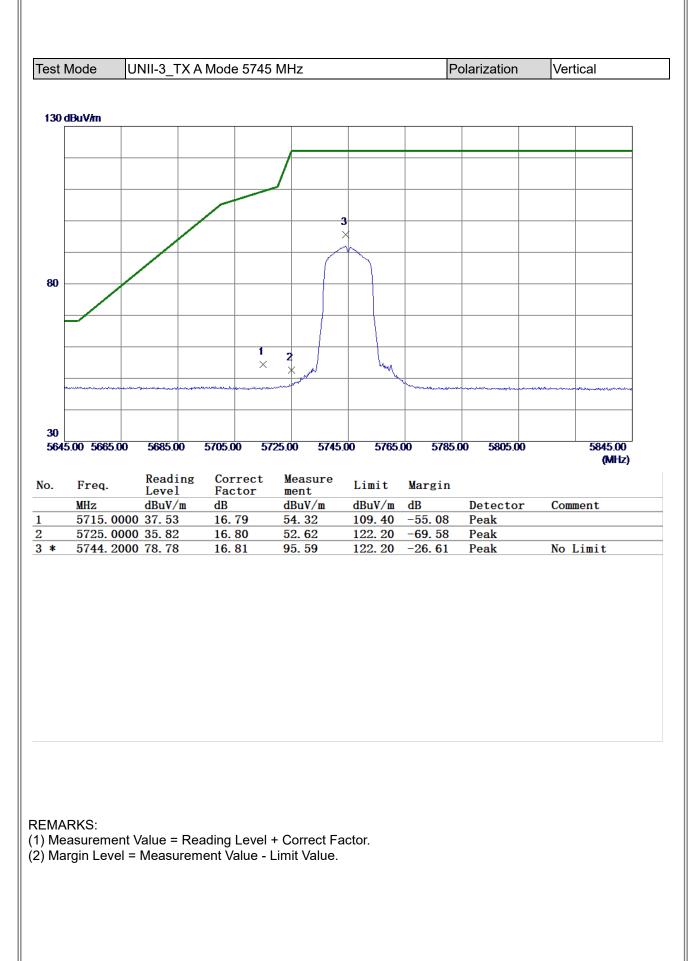




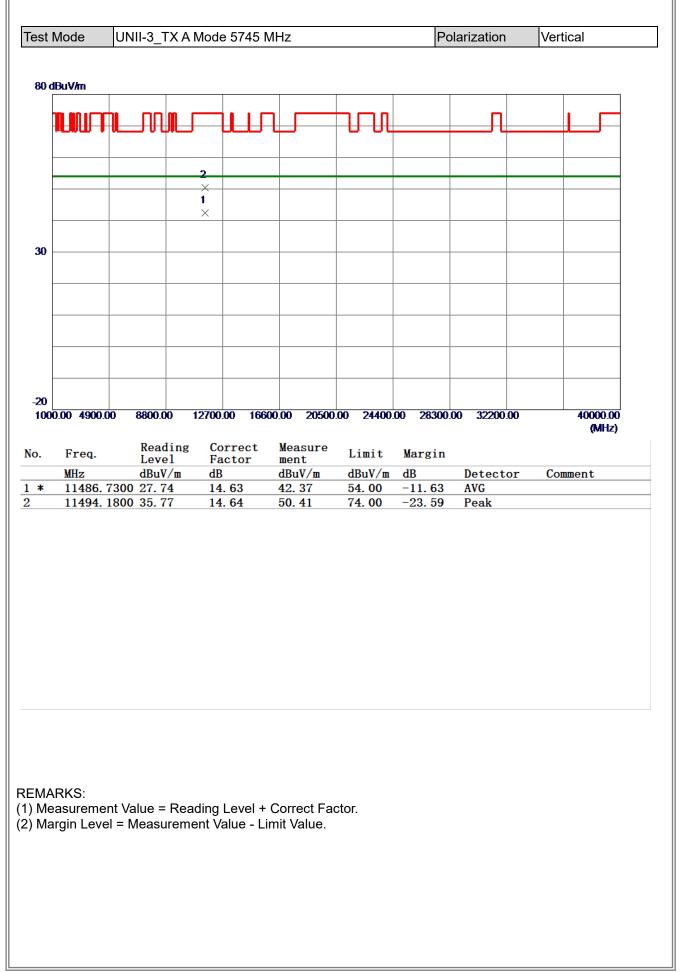




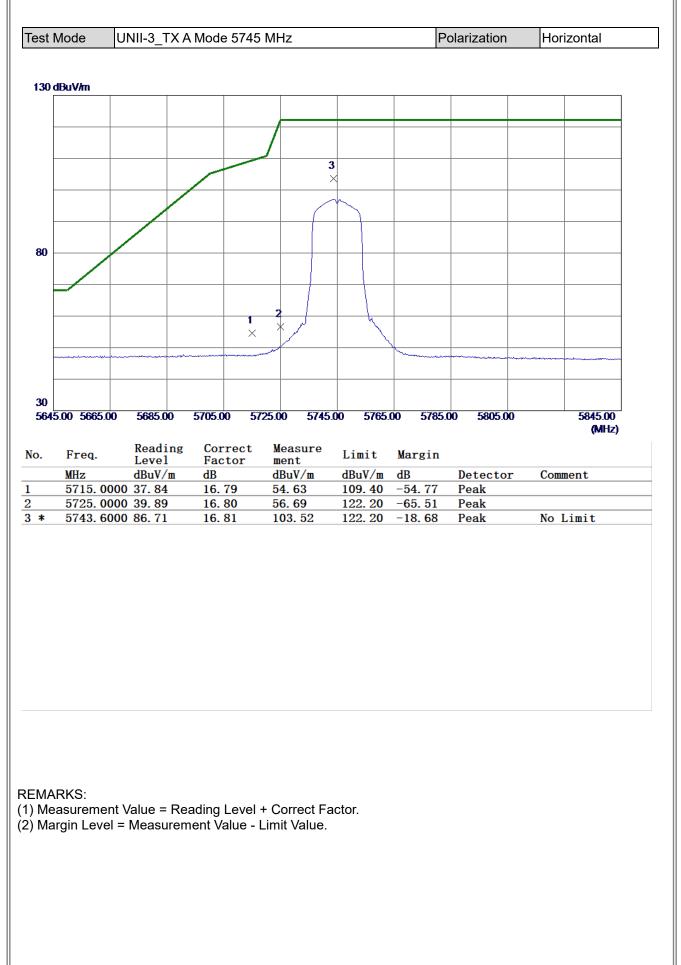




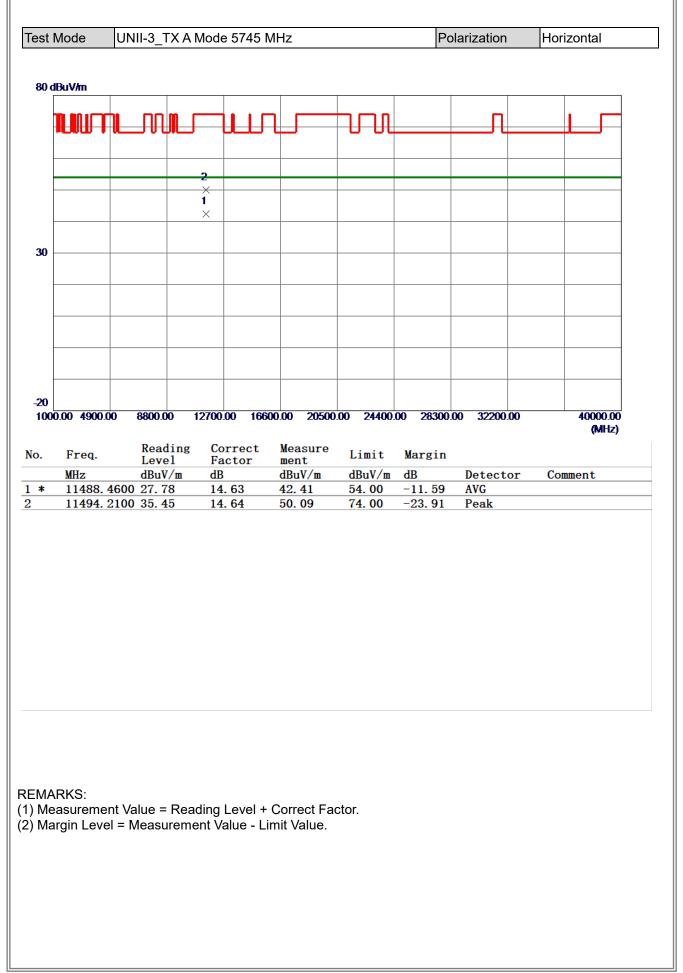




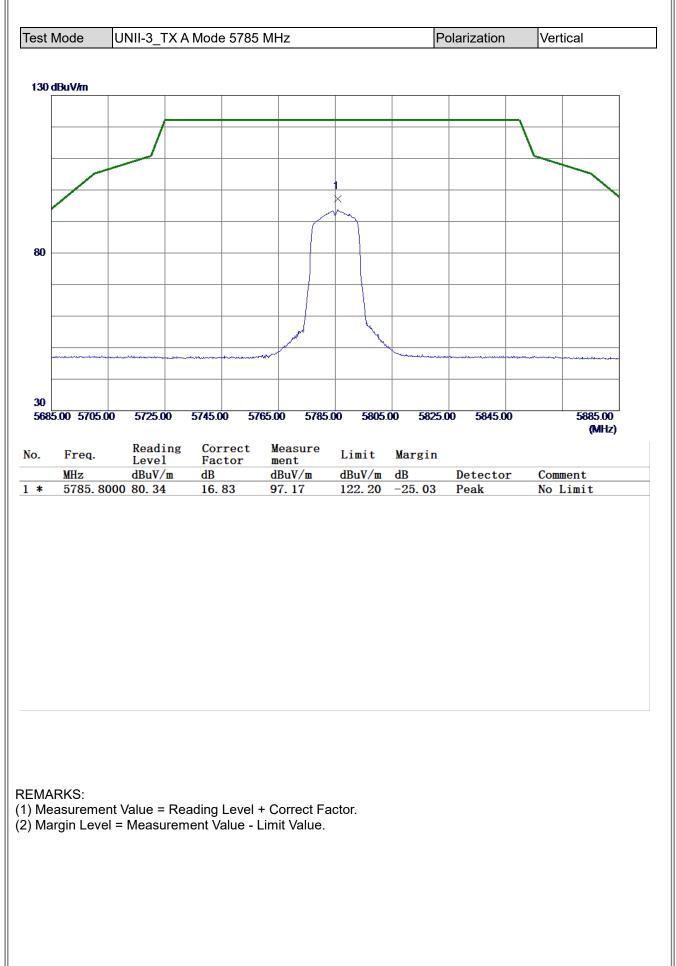




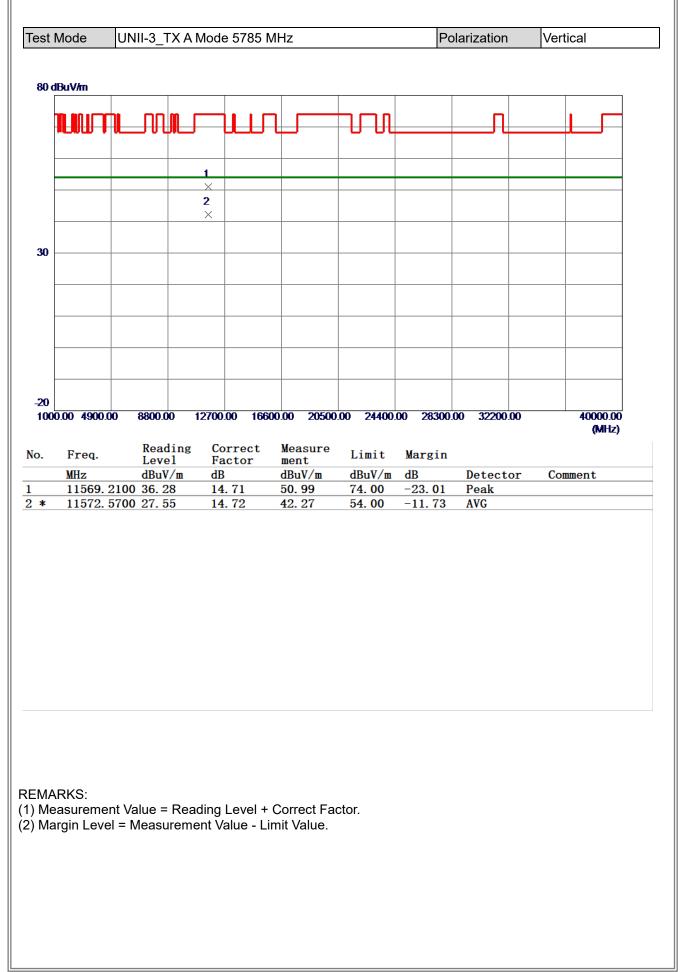




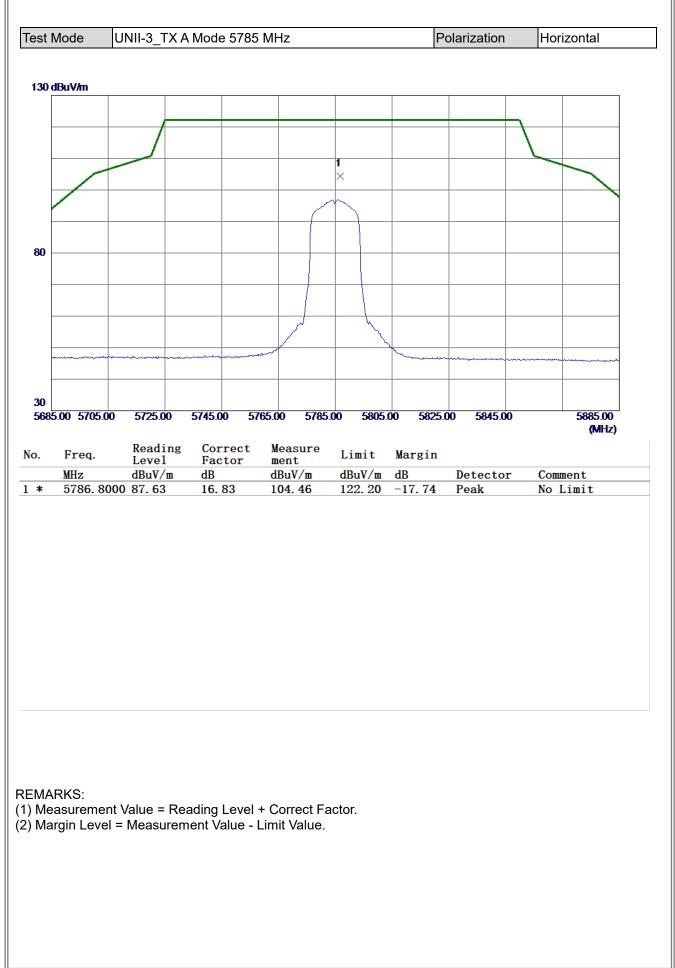




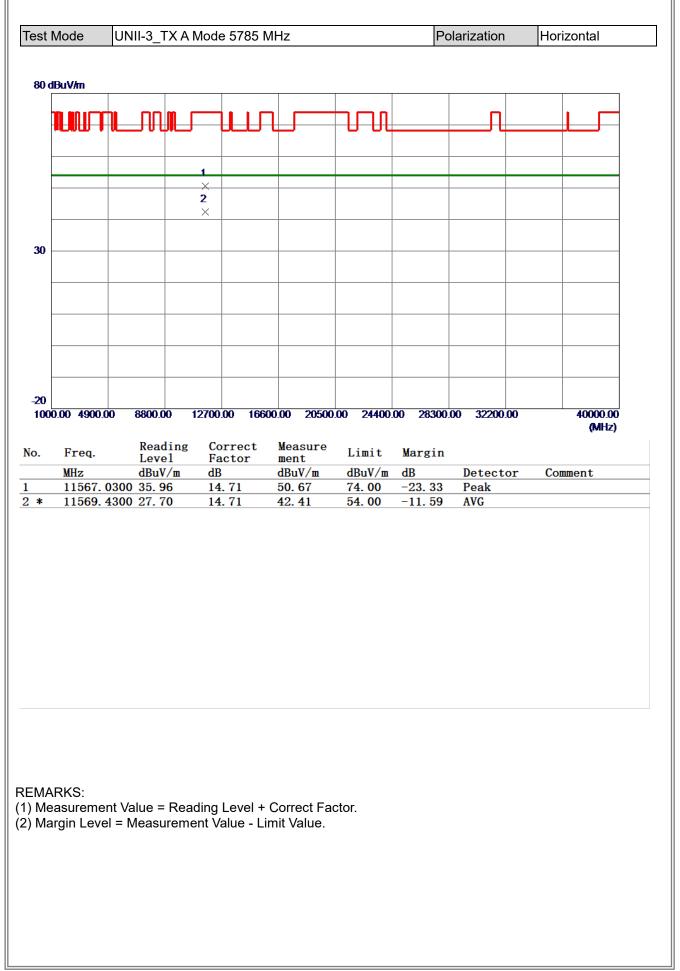












BL

