47 CFR Part 15 Subpart B, ICES-003

Electromagnetic Compatibility Test Report

For

Tablet

ORDER NO.: 200511K004

REPORT NO.: FC200511K004 R1

ISSUED DATE: 15, July, 2020

MODEL NO.: SM-T970

Samsung Electronics Co.,Ltd.

129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Republic of Korea

Certificate #4068.03

Test Report Details

Test Report No.	FC200511K004 R1
Tests Performed By:	Bureau Veritas CPS ADT Korea Ltd. Innoplex No.2 106, Sinwon-ro 306, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Republic of Korea
Test site:	Bureau Veritas CPS ADT Korea Ltd. HeungAn-daero 49, DonAn-gu, Anyang-si, Gyeonggi-do, 11419, Republic of Korea
Applicant:	Samsung Electronics Co.,Ltd. 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Republic of Korea
Product Type:	Tablet
Model Number:	SM-T970
FCC ID	A3LSMT970
ISED Certification Number:	649E-SMT970
Product standards:	47 CFR Part 15 Subpart B, ICES-003 ANSI C63.4-2014
Classification	Class B
Sample Serial Number:	R32N5018PPL
Sample Receive Date:	08, June, 2020
Testing Start Date:	08, June, 2020
Date Testing Complete:	18, June, 2020
Overall Results:	**Complied**

RELEASE CONTROL RECORD

REPORT NO.	REASON FOR CHANGE	DATE ISSUED
FD200511K004	Original release	29, June, 2020
FD200511K004 R1	Add the test condition (Section 3.5.2)	15, July, 2020

This project has been tested and verified to comply with the requirements of ***Bureau Veritas CPS ADT Korea Ltd.*** Therefore, this certificate is issued.

PREPARED BY : _____ , **DATE :** 15. July, 2020
Bob Kim / Senior Engineer

APPROVED BY : _____ , **DATE :** 15. July, 2020
Wan Kim / Senior Manger

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1. EMC Result Conclusion (With Justification)

The following tests were performed on a sample submitted for evaluation of compliance with 47 CFR Part 15.107(b) / 47 CFR Part 15.109 (b) Class B, ICES-003			
Test requirements	**Standard**	**Results**	**Verdict**
Emissions			
Conducted RF Emissions	ANSI C63.4	Pass	Complied
Radiated RF Emissions		Pass	Complied
We tested the Tablet, Model: SM-T970, to determine if it was in compliance with the relevant standards as marked on the EMC Verification Summary. We found that the unit met the requirement of 47 CFR Part 15 Subpart B, ICES-003 / ANSI C63.4-2014 standards when tested as received. The production units are required to conform to the initial sample as received when the units are placed on the market.			

2. General Product Description

2.1 Equipment Description

The Equipment under Test (EUT) is the Tablet.
The test data contained in this report pertains only to the emissions due to the digital circuitry of the EUT.

2.2 Technical Data

This device contains the following capabilities.

802.11 b/g/n/ax WLAN, 802.11 a/n/ac/ax UNII, 2.4 GHz/5 GHz Wi-Fi Direct, Wi-Fi RSDB, Bluetooth (EDR, LE), WPT(for S-pen Charging).

3. Test Condition

3.1 Ancillary Equipment

Use*	Product Type	Manufacturer	Model	FCC ID & Certification Number
EUT	Tablet	Samsung Electronics Co.,Ltd.	SM-T970	A3LSMT970 649E-SMT970
AE	TRAVEL ADAPTER	SOLUM VINA COMPANY LIMITED	EP-TA200	-
AE	Earphone	Bujeon Electronics Inc.	GHSS028-K7	-
AE	Keyboard	Samsung Electronics Co.,Ltd.	EF-DT970	-
AE	S-Pen	WACOM	EJ-PT870	A3LEJPT870
AE	S-Pen	WACOM	EJ-PT870	A3LEJPT870
AE	Micro SD Card	Samsung Electronics Co.,Ltd.	EVO Plus (64G)	DoC
AE	Notebook Computer	Samsung Electronics Co.,Ltd.	NT950XBV	DoC
AE	AC/DC ADAPTER	Dongguan Yingju Power Co., Ltd.	PSCV650105A	DoC
AE	Monitor	HONHFUJIN PRECISION ELECTRONICS CO., LTD.	D18225WT0	DoC

* **Note:** EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment, SIM - Simulator (Not Subjected to Test)

3.2 Input/Output Ports

Port #	Name	Type*	Cable (m) Max. >3 m	Cable Shielded	Comments
1	TRAVEL ADAPTER	DC	1.0	Shielded	Power (Mode # C1, C2, R1)
2	Notebook Computer	DC, I/O	1.0	Shielded	Power, Data Link (Mode # C4, R5)
3	Monitor	I/O	1.8	Shielded	Audio, Video Out (Mode #R4)
4	Earphone	I/O	1.5	None-Shielded	Audio Out (Mode #R4)
5	S-Pen	I/O	-	-	Wireless Charging (Mode #C3, R3)
6	S-Pen	I/O	-	-	EMR Touch (Mode #C3, R3)
7	Keyboard	I/O	-	-	Pogo Pin (Mode #C1, C2, R1, R2)
8	Micro SD Card	I/O	-	-	External memory (Mode #C4, R5)

* Note: * AC = AC Power Port, DC = DC Power Port, N/E = Non-Electrical, I/O = Signal Input or Output Port (Not Involved in Process Control), TP = Telecommunication Ports

3.3 EUT Internal Operating Frequencies

Frequency (MHz)	Description	Frequency (MHz)	Description
5 825	Wi-Fi	-	-

3.4 Power Interface

Mode #	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Comments
Rated	3.85	-	-	DC	EUT
1	120	-	-	AC-60	TRAVEL ADAPTER
2	120	-	-	AC-60	Notebook Computer
3	3.85	-	-	DC	Internal Battery

3.5 Modes of Description

3.5.1 Conducted Emission Operating Mode

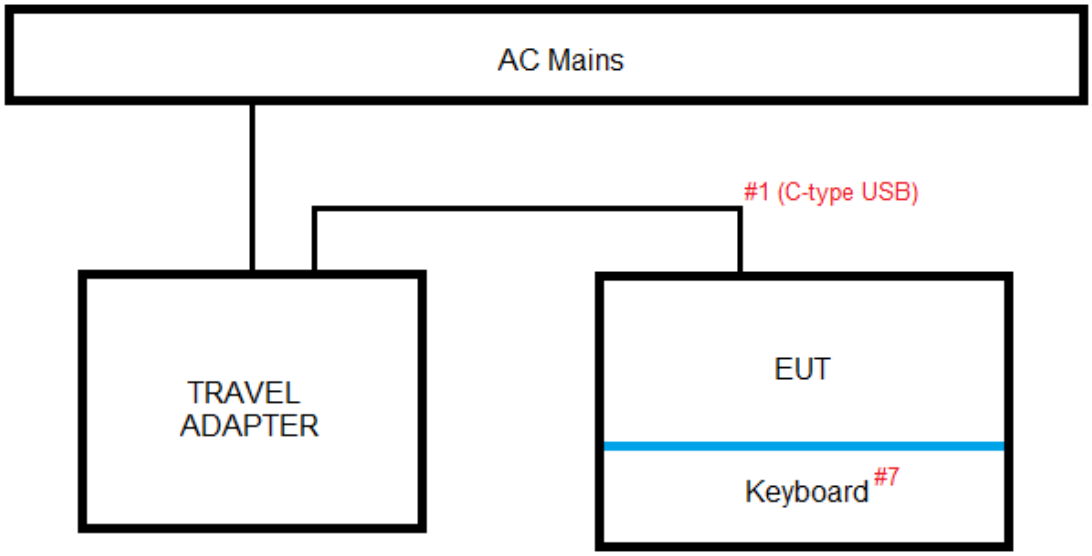
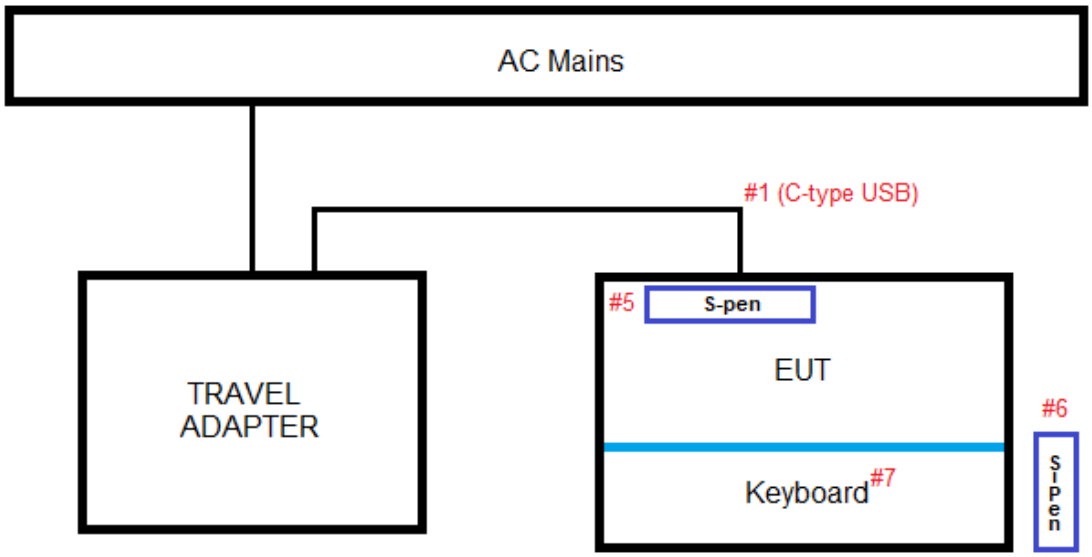
Mode #	Description
C1	Camera(Rear) + Charging(TA) + Keyboard(Pogo pin)
C2	Camera(Front) + Charging(TA) + Keyboard(Pogo pin)
C3	Video + Audio playback from internal memory data + EMR Touch Solution(S-Pen) + Wireless Charging (S-Pen) + Charging(TA)
C4	USB Data Communication with PC (From external memory data)

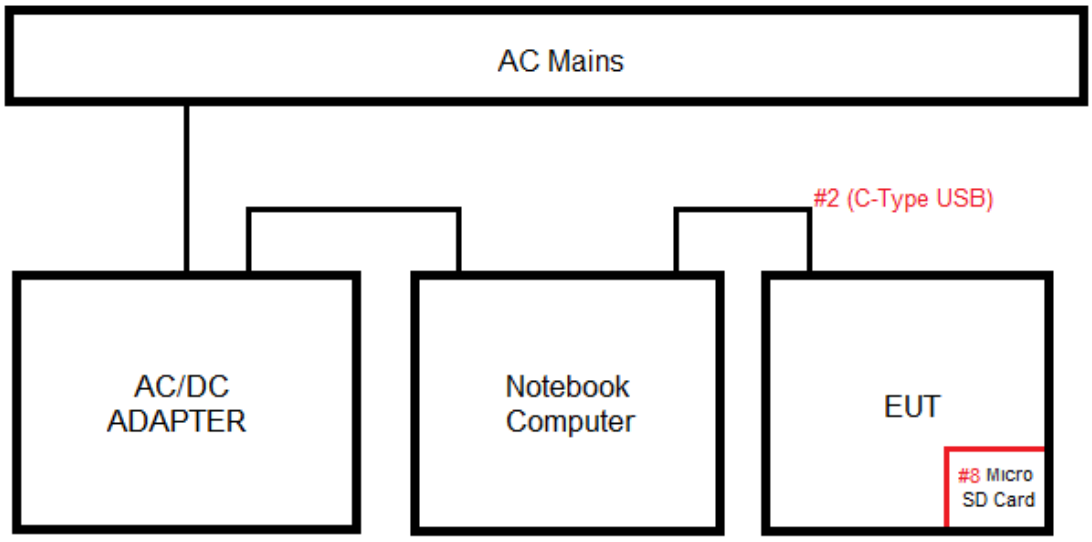
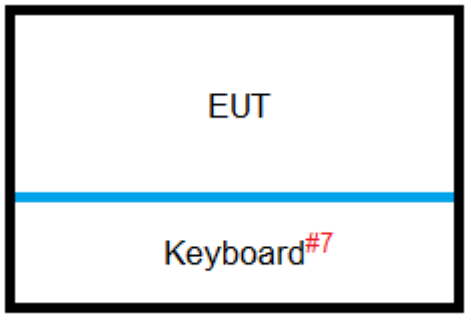
3.5.2 Radiated Emission Operating Mode

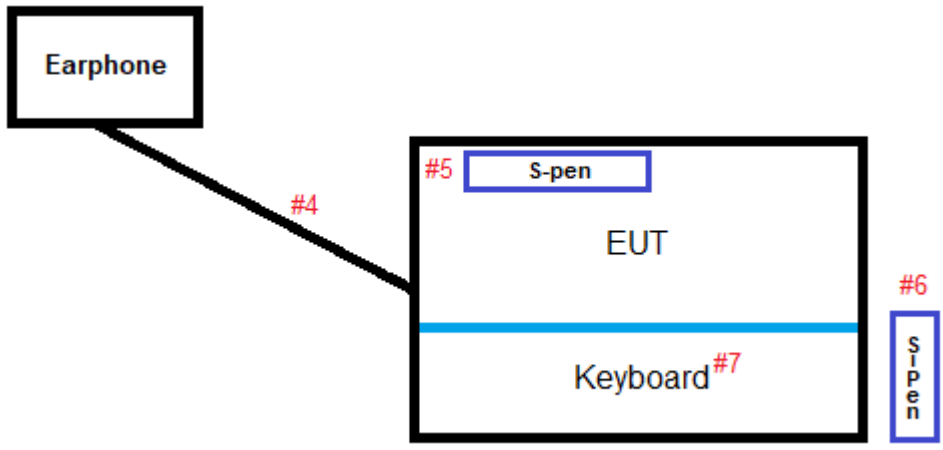
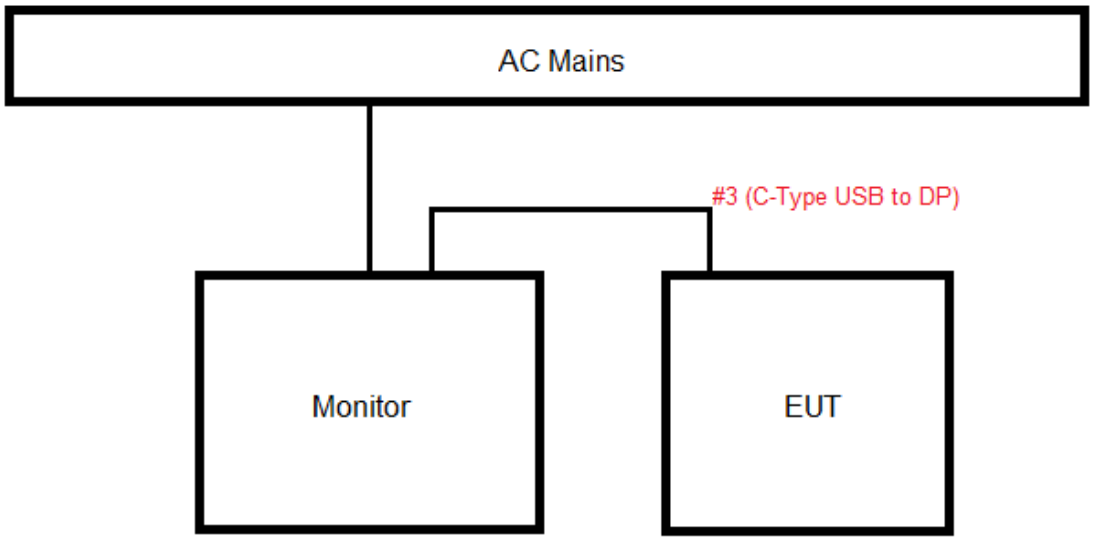
Mode #	Description
R1	Camera(Rear) + Charging(TA) + Keyboard(Pogo pin)
R2	Camera(Front) + Keyboard(Pogo pin)
R3	Video + Audio playback from internal memory data + EMR Touch Solution(S-Pen) + Wireless Charging (S-Pen) + Earphone
R4	Video + Audio playback from internal memory data + Display out(Direct DP Cable)
R5	USB Data Communication with PC (From external memory data)

Note1) The EUT was investigated in three orientations and the worst orientation reported.

3.6 Configuration

Description	
# C1, C2, R1	
# C3	

# C4, R5	 AC Mains #2 (C-Type USB) AC/DC ADAPTER Notebook Computer EUT #8 Micro SD Card
# R2	 EUT Keyboard#7

# R3	 Earphone #4 #5 S-pen EUT #6 Keyboard#7 S Pen
# R4	 AC Mains #3 (C-Type USB to DP) Monitor EUT

4. Test Condition and Results

4.1 Conducted Emissions

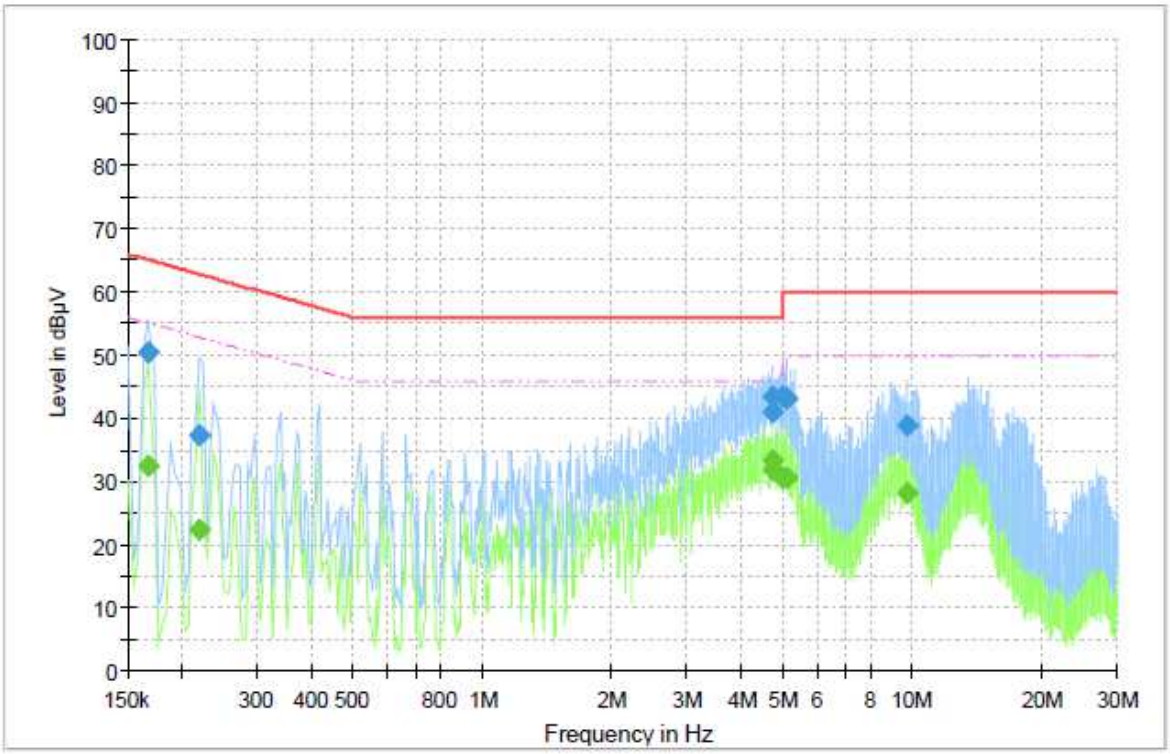
TEST: Limits of mains terminal disturbance voltage				
Method	The AMN placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane. This distance was between the closest points of the AMN and the EUT. All other units of the EUT and associated equipment were at least 0.8 m from the AMN. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.			
Parameters recorded during the test		Laboratory Ambient Temperature	23.2 °C	
		Relative Humidity	44.2 %	
		Frequency range on each side of line	**Measurement Point**	
Fully configured sample scanned over the following frequency range		150 kHz to 30 MHz	AC main power port	
Limits – Class B				
Frequency (MHz)	Limit (dBµV)			
	Quasi-Peak	Result	Average	Result
0.15 to 0.5	66 to 56	**Pass**	56 to 46	**Pass**
0.5 to 5	56	**Pass**	46	**Pass**
5 to 30	60	**Pass**	50	**Pass**
Conducted Emissions EUT Configuration Settings				
Power Interface Mode # (See Section 3.4)		EUT Operation Mode # (See Section 3.5)	EUT Configurations Mode # (See Section 3.6)	
1,2		C1, C2, C3, C4	C1, C2, C3, C4	

Test Equipment Used					
Description	**Manufacturer**	**Model**	**Identifier**	**Cal. Date**	**Cal. Due**
LISN	R&S	ENV216	102437	2019.12.26	2020.12.26
EMI Test Receiver	R&S	ESR	102529	2019.12.27	2020.12.27
SoftWare	R&S	EMC 32	Ver. 10.50.40	-	-

Note1) Formula
Final Value (QP and/or CAV) = Reading Value (QP and/or CAV) + Corr. (LISN Insertion Loss + Cable Loss)
Margin (QP and/or CAV) = Limit – Final Value (QP and/or CAV)
QP = Quasi-Peak, CAV = CISPR-Average, Corr. = Correction Factor

Table 1. Conducted emission Test data

Operation Mode #1

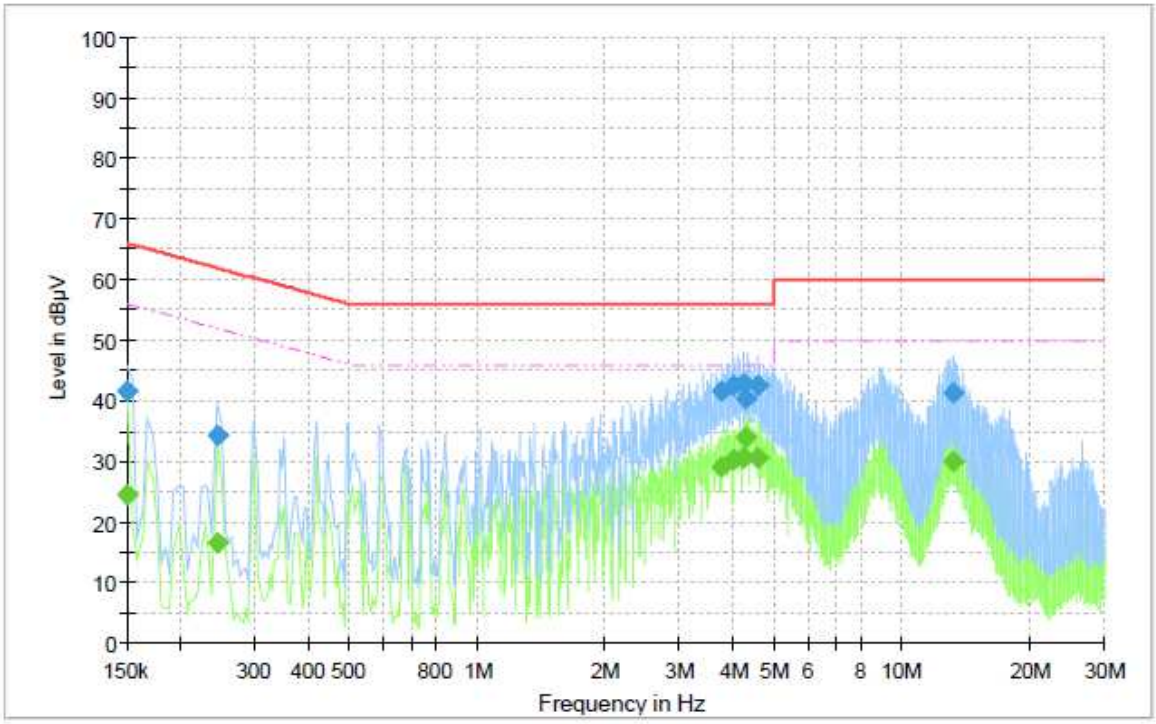


Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.167559	50.53	---	65.08	14.55	9.000	N	10.1
0.167559	---	32.41	55.08	22.67	9.000	N	10.1
0.220235	---	22.34	52.81	30.47	9.000	N	9.8
0.220235	37.46	---	62.81	25.35	9.000	N	9.8
4.724074	---	33.24	46.00	12.76	9.000	N	10.1
4.724074	40.87	---	56.00	15.13	9.000	N	10.1
4.737243	---	31.65	46.00	14.35	9.000	L1	10.0
4.737243	43.46	---	56.00	12.54	9.000	L1	10.0
4.987456	43.49	---	56.00	12.51	9.000	L1	10.1
4.987456	---	30.71	46.00	15.29	9.000	L1	10.1
5.084029	43.04	---	60.00	16.96	9.000	L1	10.1
5.084029	---	30.64	50.00	19.36	9.000	L1	10.1
9.763456	38.91	---	60.00	21.09	9.000	L1	10.2
9.763456	---	28.05	50.00	21.95	9.000	L1	10.2

Note1) Two graphs measured for both Live (L1) and Neutral (N) of the LISN are combined into one graph.

Operation Mode #2

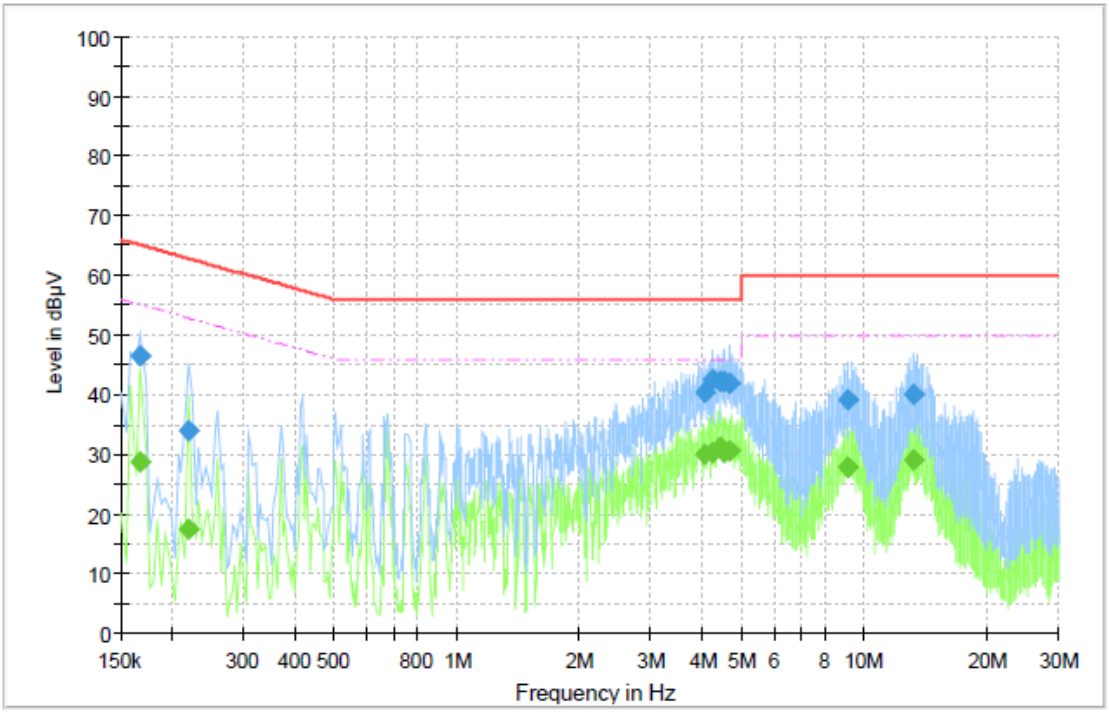


Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	---	24.44	56.00	31.56	9.000	L1	9.9
0.150000	41.59	---	66.00	24.41	9.000	L1	9.9
0.246574	---	16.59	51.87	35.28	9.000	L1	9.7
0.246574	34.22	---	61.87	27.65	9.000	L1	9.7
3.749559	---	29.12	46.00	16.88	9.000	L1	9.9
3.749559	41.68	---	56.00	14.32	9.000	L1	9.9
3.999772	---	30.14	46.00	15.86	9.000	L1	10.0
3.999772	42.46	---	56.00	13.54	9.000	L1	10.0
4.249985	---	30.59	46.00	15.41	9.000	L1	10.0
4.249985	42.93	---	56.00	13.07	9.000	L1	10.0
4.302662	40.36	---	56.00	15.64	9.000	N	10.0
4.302662	---	33.83	46.00	12.17	9.000	N	10.0
4.574824	---	30.53	46.00	15.47	9.000	L1	10.0
4.574824	42.51	---	56.00	13.49	9.000	L1	10.0
13.253272	41.41	---	60.00	18.59	9.000	L1	10.3
13.253272	---	29.87	50.00	20.13	9.000	L1	10.3

Note1) Two graphs measured for both Live (L1) and Neutral (N) of the LISN are combined into one graph.

Operation Mode #3

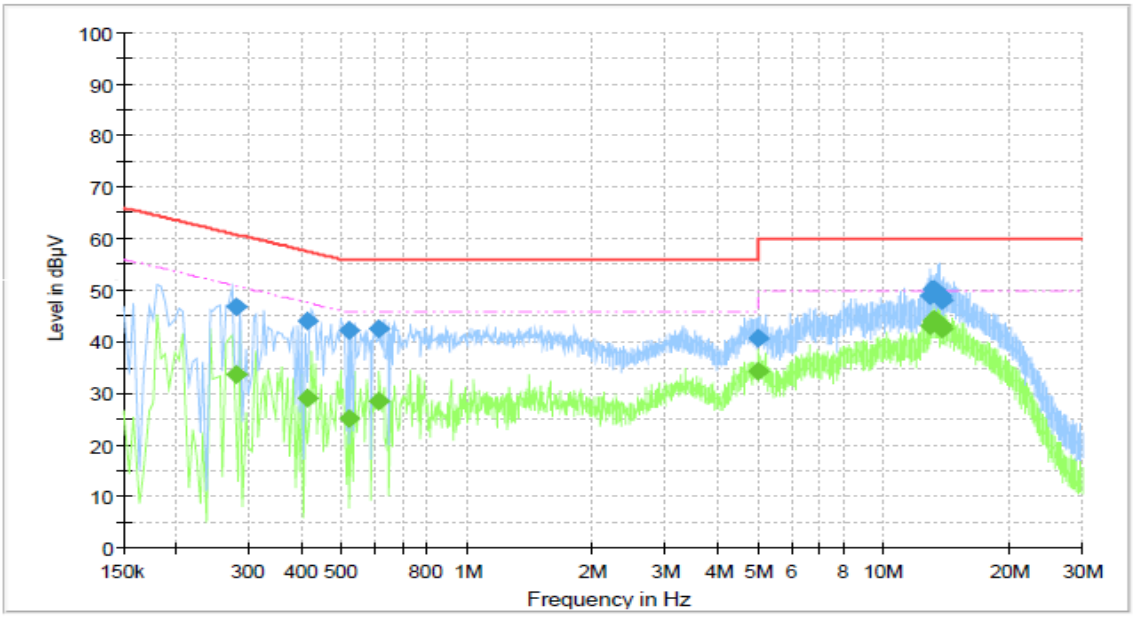


Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.167559	46.54	---	65.08	18.54	9.000	N	10.1
0.167559	---	28.79	55.08	26.29	9.000	N	10.1
0.220235	33.87	---	62.81	28.94	9.000	N	9.8
0.220235	---	17.58	52.81	35.23	9.000	N	9.8
4.061228	40.45	---	56.00	15.55	9.000	L1	10.0
4.061228	---	29.95	46.00	16.05	9.000	L1	10.0
4.258765	42.64	---	56.00	13.36	9.000	L1	10.0
4.258765	---	30.34	46.00	15.66	9.000	L1	10.0
4.438743	---	31.17	46.00	14.83	9.000	L1	10.0
4.438743	42.30	---	56.00	13.70	9.000	L1	10.0
4.508978	---	30.26	46.00	15.74	9.000	L1	10.0
4.508978	42.27	---	56.00	13.73	9.000	L1	10.0
4.658228	---	30.52	46.00	15.48	9.000	L1	10.0
4.658228	41.78	---	56.00	14.22	9.000	L1	10.0
9.135728	39.26	---	60.00	20.74	9.000	L1	10.1
9.135728	---	27.73	50.00	22.27	9.000	L1	10.1
13.262052	40.08	---	60.00	19.92	9.000	L1	10.3
13.262052	---	29.11	50.00	20.89	9.000	L1	10.3

Note1) Two graphs measured for both Live (L1) and Neutral (N) of the LISN are combined into one graph.

Operation Mode #4



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.279912	---	33.79	17.03	9.000	L1	9.8
0.279912	46.90	---	13.92	9.000	L1	9.8
0.413162	---	29.07	18.51	9.000	L1	10.1
0.413162	44.04	---	13.55	9.000	L1	10.1
0.519684	42.23	---	13.77	9.000	L1	10.1
0.519684	---	25.06	20.94	9.000	L1	10.1
0.615868	---	28.53	17.47	9.000	L1	10.1
0.615868	42.52	---	13.48	9.000	L1	10.1
4.983338	40.70	---	15.30	9.000	N	10.1
4.983338	---	34.37	11.63	9.000	N	10.1
12.919434	49.02	---	10.98	9.000	N	10.4
12.919434	---	43.00	7.00	9.000	N	10.4
13.097853	50.01	---	9.99	9.000	N	10.4
13.097853	---	44.14	5.86	9.000	N	10.4
13.247103	---	44.19	5.81	9.000	N	10.4
13.247103	50.12	---	9.88	9.000	N	10.4
13.525603	49.35	---	10.65	9.000	N	10.4
13.525603	---	43.52	6.48	9.000	N	10.4
13.638566	---	43.06	6.94	9.000	N	10.4
13.638566	48.87	---	11.14	9.000	N	10.4
13.642853	---	43.05	6.95	9.000	N	10.4
13.642853	48.91	---	11.09	9.000	N	10.4
13.671243	---	42.98	7.02	9.000	N	10.4
13.671243	48.75	---	11.25	9.000	N	10.4
13.883118	---	42.36	7.64	9.000	N	10.4
13.883118	48.11	---	11.89	9.000	N	10.4

Note1) Two graphs measured for both Live (L1) and Neutral (N) of the LISN are combined into one graph.

4.2 Radiated Emissions

TEST: Limits for radiated disturbance				
Method	Measurements were made in a 10-meter semi-anechoic chamber that complies to ANSI C63.4. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10-meter. The EUT was rotated 360° about its azimuth with the receive antenna located at 1, 2, 3 and 4 meter heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.			
Parameters recorded during the test	Laboratory Ambient Temperature		(21.4 - 23.1) °C	
	Relative Humidity		(45.3 - 46.3) %	
	Frequency range		**Measurement Point**	
Fully configured sample scanned over the following frequency range	30 MHz – 1 000 MHz		3 meter measurement distance	
	1 000 MHz – 30 000 MHz		3 meter measurement distance	
Limits – Class B				
Frequency (MHz)	Limit (dBµV/m)			
Below 1 GHz	Quasi-Peak		Results	
30 to 88	40		**Pass**	
88 to 216	43.5		**Pass**	
216 to 960	46		**Pass**	
960 to 1 000	54		**Pass**	
Above 1 GHz	Average	Peak	Result	
1 000 to 30 000	54	74	**Pass**	**Pass**
EUT Configuration Settings:				
Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.4)		EUT Configurations Mode # (See Section 3.5)	
1,2,3	R1, R2, R3, R4, R5		R1, R2, R3, R4, R5	

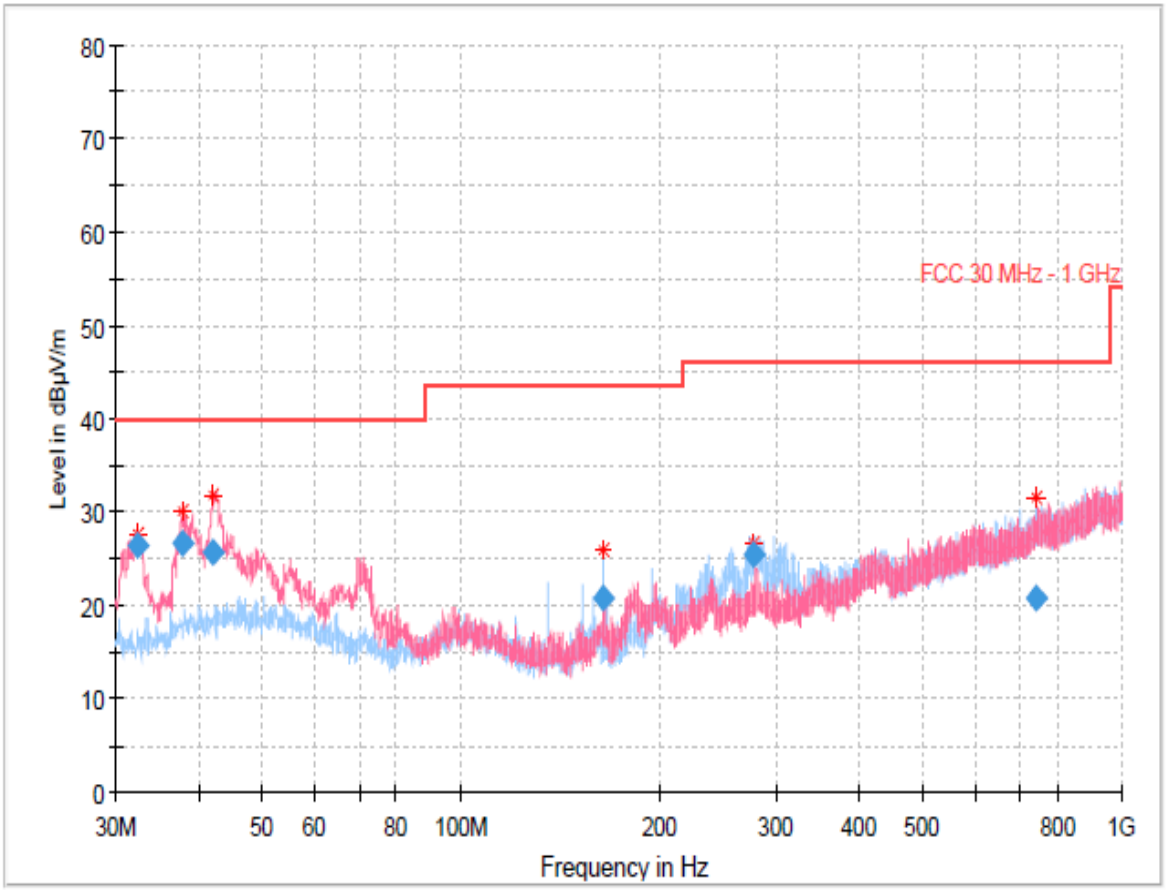
Test Equipment Used					
Description	**Manufacturer**	**Model**	**Identifier**	**Cal. Date**	**Cal. Due**
EMI Test Receiver	R&S	ESW44	101812	2020.02.20	2021.02.20
Trilog Antenna (with 6 dB ATT.)	Schwarzbeck	VULB 9163	01199	2019.04.03	2021.04.03
Horn Antenna	R&S	HF907	102773	2020.02.10	2021.02.10
Wideband Horn Antenna	R&S	QMS-00880	21911	2020.03.23	2021.03.23
Signal Conditioning Unit	R&S	SCU08F2	08400016	2019.12.30	2020.12.30
Pre-Amplifier	Miteq	LNAS-55-010 01800-22-10P	2139542	2020.04.07	2021.04.07
Pre-Amplifier	Miteq	JS44-180040 00-33-8P	2142087	2020.04.07	2021.04.07
SoftWare	R&S	EMC 32	Ver. 10.35.10	-	-

.

Note1) Formula
Final Value (PK and/or QP and/or CAV) = Reading Value (PK and/or QP and/or CAV) + Corr. (Antenna Factor + Cable Loss + Distance Correction - Amplifier Gain)
Margin (PK and/or QP and/or CAV) = Limit – Final Value (PK and/or QP and/or CAV)
PK = Peak, QP = Quasi-Peak, CAV = CISPR-Average, Corr. = Correction Factor
Note2) Distance (Antenna to Centre of Turntable), Antenna Height
Below 1 GHz, Distance = 3 m, Antenna Height = (1 to 4) m
Above 1 GHz, Distance = 4.5 m, Antenna Height (Considering size of EUT) = (1 to 4) m
Distance Correction = 20 log (d2 (m) / d1 (m)) = 20 log (4.5 / 3) = **3.5**

Table 2. Radiated emission Test data

Operation Mode #1 (Below 1 GHz)

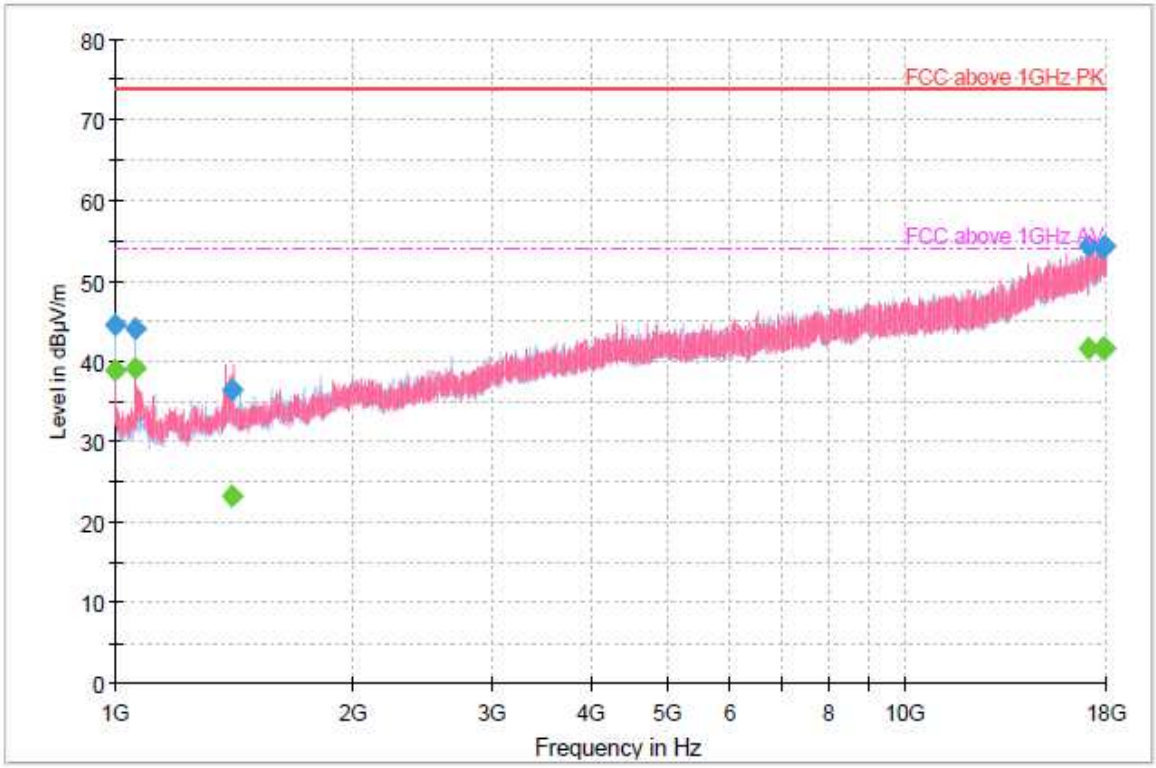


Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
32.425000	26.52	40.00	13.48	100.0	V	40.0	-23.3
37.975556	26.58	40.00	13.42	100.0	V	0.0	-21.3
42.071111	25.75	40.00	14.25	100.0	V	289.0	-20.3
163.806111	20.86	43.50	22.64	200.0	H	287.0	-24.9
277.781111	25.54	46.00	20.46	100.0	H	20.0	-20.0
740.363333	20.68	46.00	25.32	300.0	H	109.0	-10.6

Note1) Two graphs measured for both Vertical and Horizontal of the Antenna are combined into one graph.

Operation Mode #1 (1 GHz to 18 GHz)

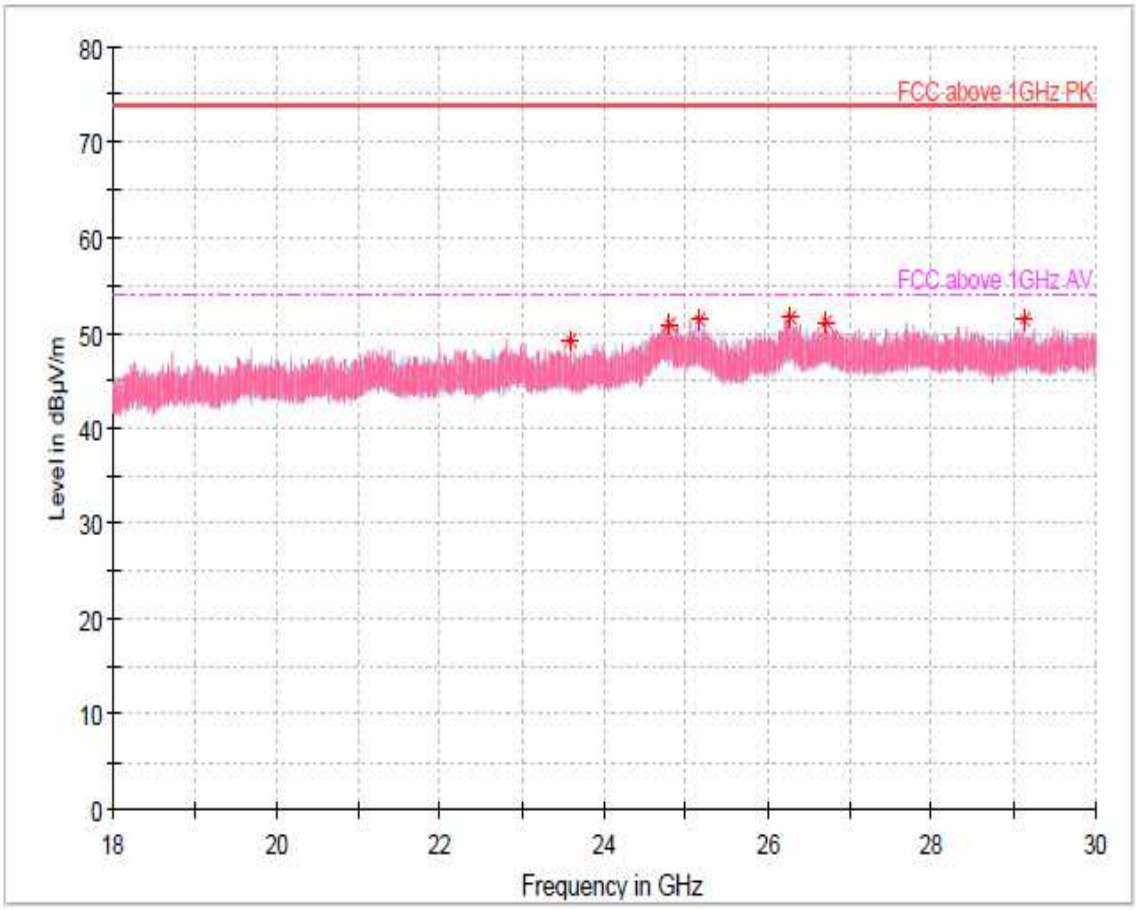


Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1000.000000	44.50	---	74.00	29.50	300.0	H	253.0	-33.8
1000.000000	---	38.86	54.00	15.14	300.0	H	253.0	-33.8
1062.605556	44.07	---	74.00	29.93	400.0	H	0.0	-33.5
1062.605556	---	39.03	54.00	14.97	400.0	H	0.0	-33.5
1407.905556	36.45	---	74.00	37.55	100.0	V	0.0	-32.0
1407.905556	---	23.26	54.00	30.74	100.0	V	0.0	-32.0
17074.716667	54.36	---	74.00	19.64	200.0	H	344.0	-2.5
17074.716667	---	41.55	54.00	12.45	200.0	H	344.0	-2.5
17809.055556	---	41.66	54.00	12.34	400.0	H	217.0	-1.4
17809.055556	54.14	---	74.00	19.86	400.0	H	217.0	-1.4
17888.755556	---	41.67	54.00	12.33	200.0	H	146.0	-1.3
17888.755556	54.19	---	74.00	19.81	200.0	H	146.0	-1.3

Note1) Two graphs measured for both Vertical and Horizontal of the Antenna are combined into one graph.

Operation Mode #1 (18 GHz to 30 GHz)



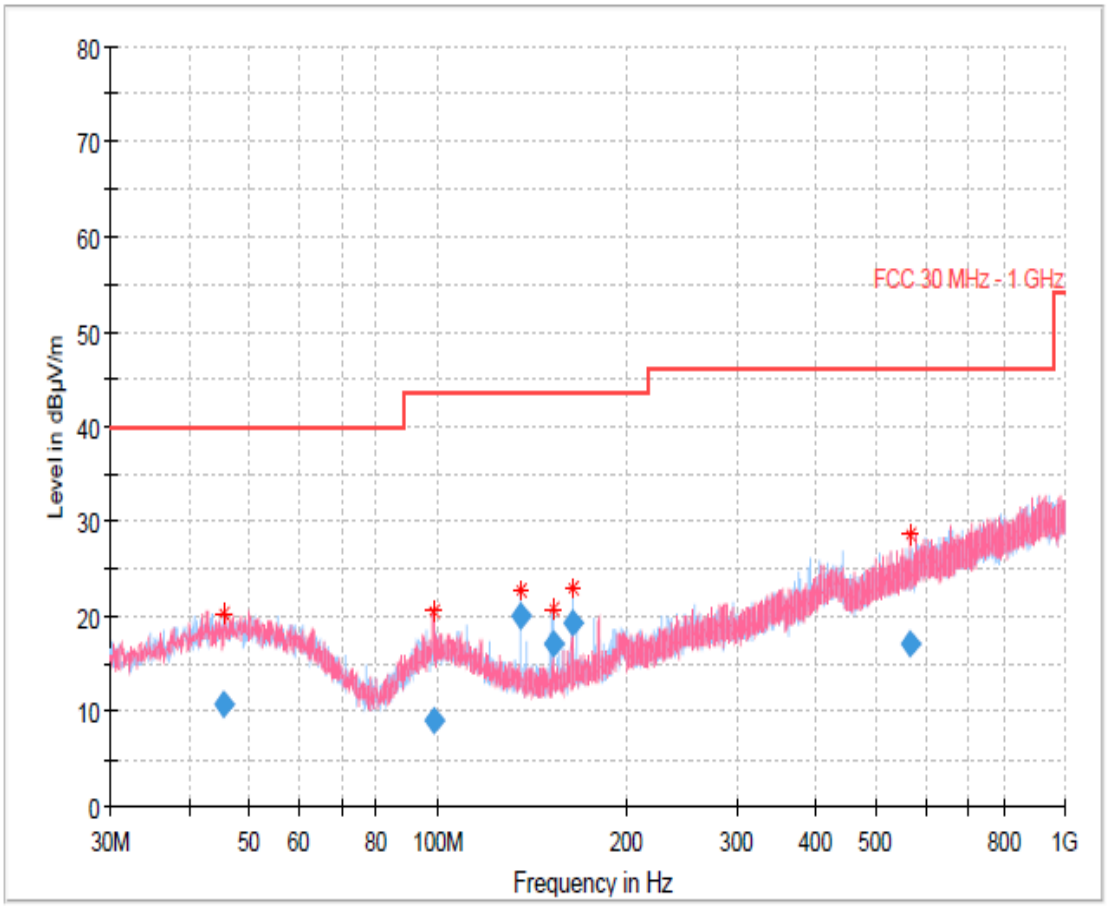
Critical Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
23596.000000	49.25	74.00	24.75	200.0	V	205.0	4.2
24800.333333	50.84	74.00	23.16	200.0	V	68.0	4.5
25169.000000	51.34	74.00	22.66	200.0	H	158.0	4.8
26277.666667	51.73	74.00	22.27	300.0	H	200.0	4.3
26705.666667	51.07	74.00	22.93	300.0	V	337.0	4.5
29130.000000	51.45	74.00	22.55	200.0	H	85.0	5.2

Note1) Two graphs measured for both Vertical and Horizontal of the Antenna are combined into one graph.

Note 2) Emission was scanned 18 GHz to 30 GHz; No emissions were detected above the noise floor which was at least 20 dB below the specification limit.

Operation Mode #2 (Below 1 GHz)

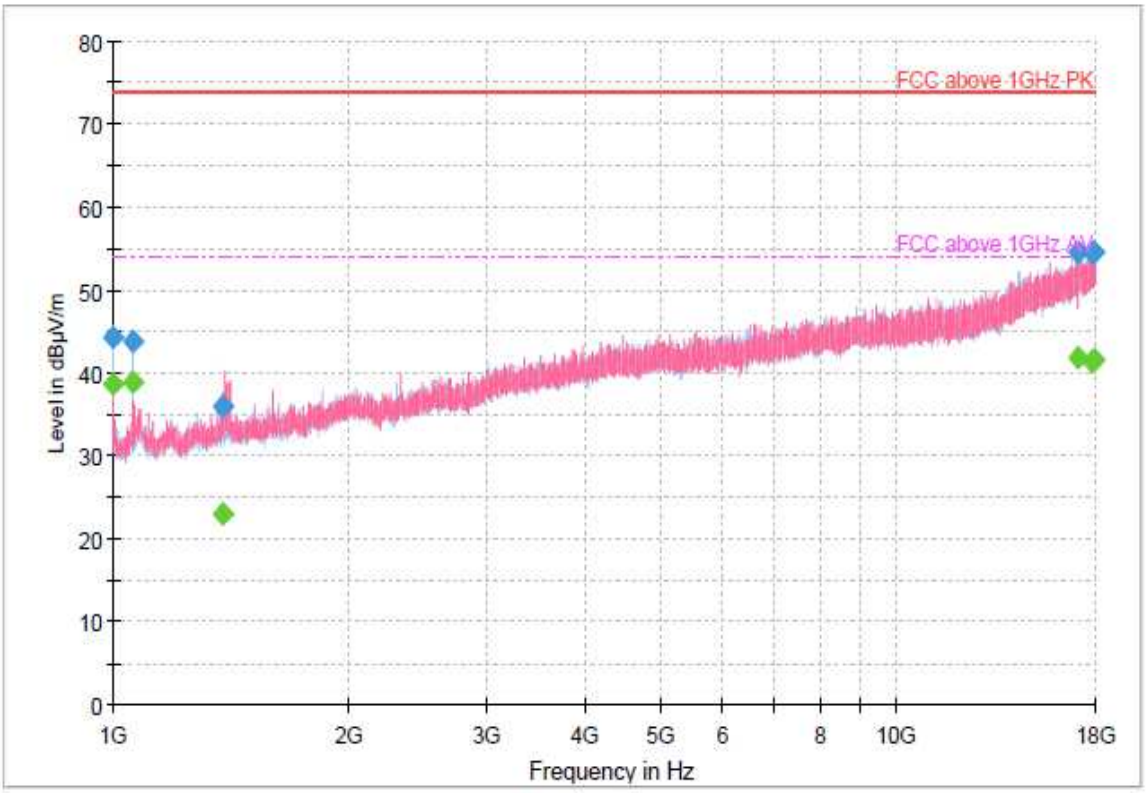


Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
45.495556	10.77	40.00	29.23	200.0	V	309.0	-19.8
98.597222	9.16	43.50	34.34	200.0	V	278.0	-22.4
135.540556	20.16	43.50	23.34	200.0	H	272.0	-25.6
152.809444	17.17	43.50	26.33	200.0	H	272.0	-25.6
163.832222	19.38	43.50	24.12	300.0	H	117.0	-24.9
567.593889	17.13	46.00	28.87	400.0	V	72.0	-13.6

Note1) Two graphs measured for both Vertical and Horizontal of the Antenna are combined into one graph.

Operation Mode #2 (1 GHz to 18 GHz)

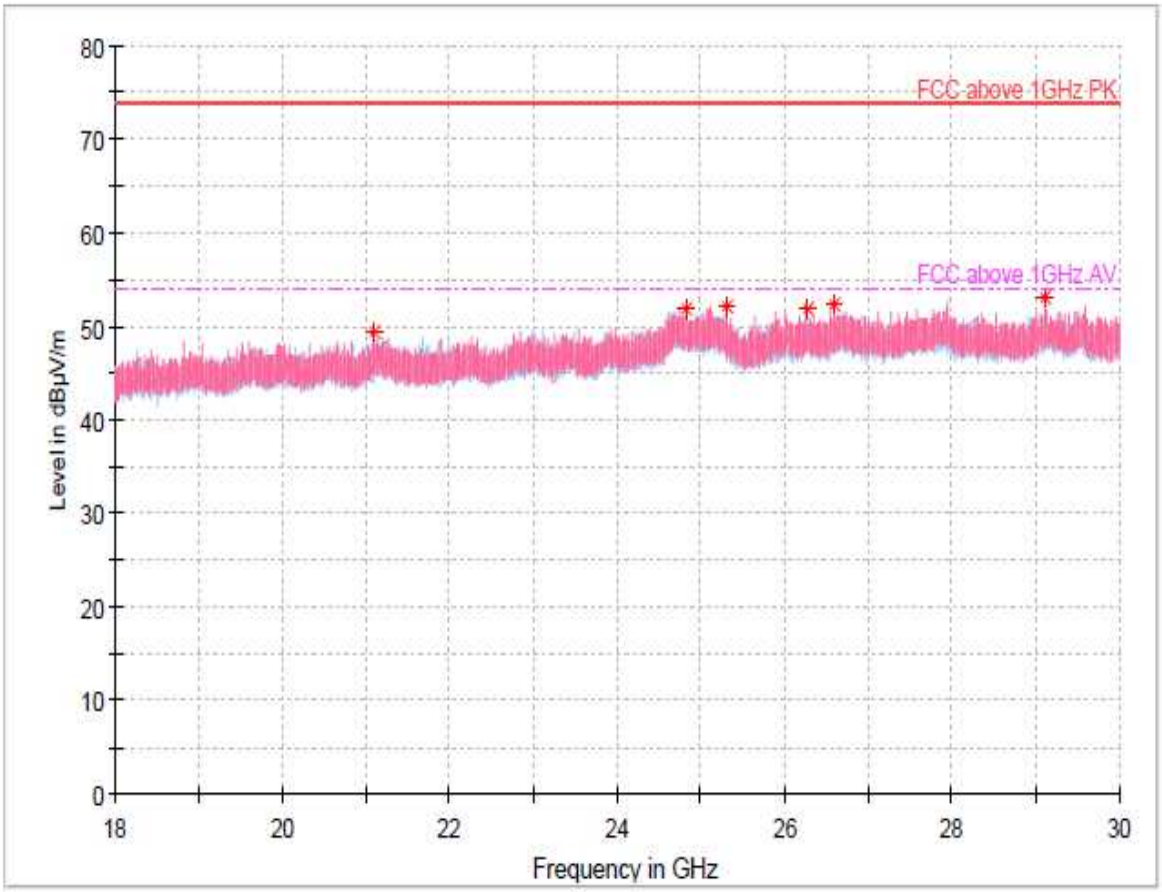


Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1000.000000	---	38.66	54.00	15.34	300.0	H	34.0	-33.8
1000.000000	44.36	---	74.00	29.64	300.0	H	34.0	-33.8
1062.605556	43.83	---	74.00	30.17	400.0	H	318.0	-33.5
1062.605556	---	38.98	54.00	15.02	400.0	H	318.0	-33.5
1383.677778	35.86	---	74.00	38.14	200.0	V	0.0	-32.1
1383.677778	---	22.88	54.00	31.12	200.0	V	0.0	-32.1
17072.933333	---	41.75	54.00	12.25	200.0	V	196.0	-2.5
17072.933333	54.58	---	74.00	19.42	200.0	V	196.0	-2.5
17767.427778	54.54	---	74.00	19.46	400.0	H	299.0	-1.7
17767.427778	---	41.41	54.00	12.59	400.0	H	299.0	-1.7
17915.350000	54.52	---	74.00	19.48	200.0	V	134.0	-1.2
17915.350000	---	41.69	54.00	12.31	200.0	V	134.0	-1.2

Note1) Two graphs measured for both Vertical and Horizontal of the Antenna are combined into one graph.

Operation Mode #2 (18 GHz to 30 GHz)



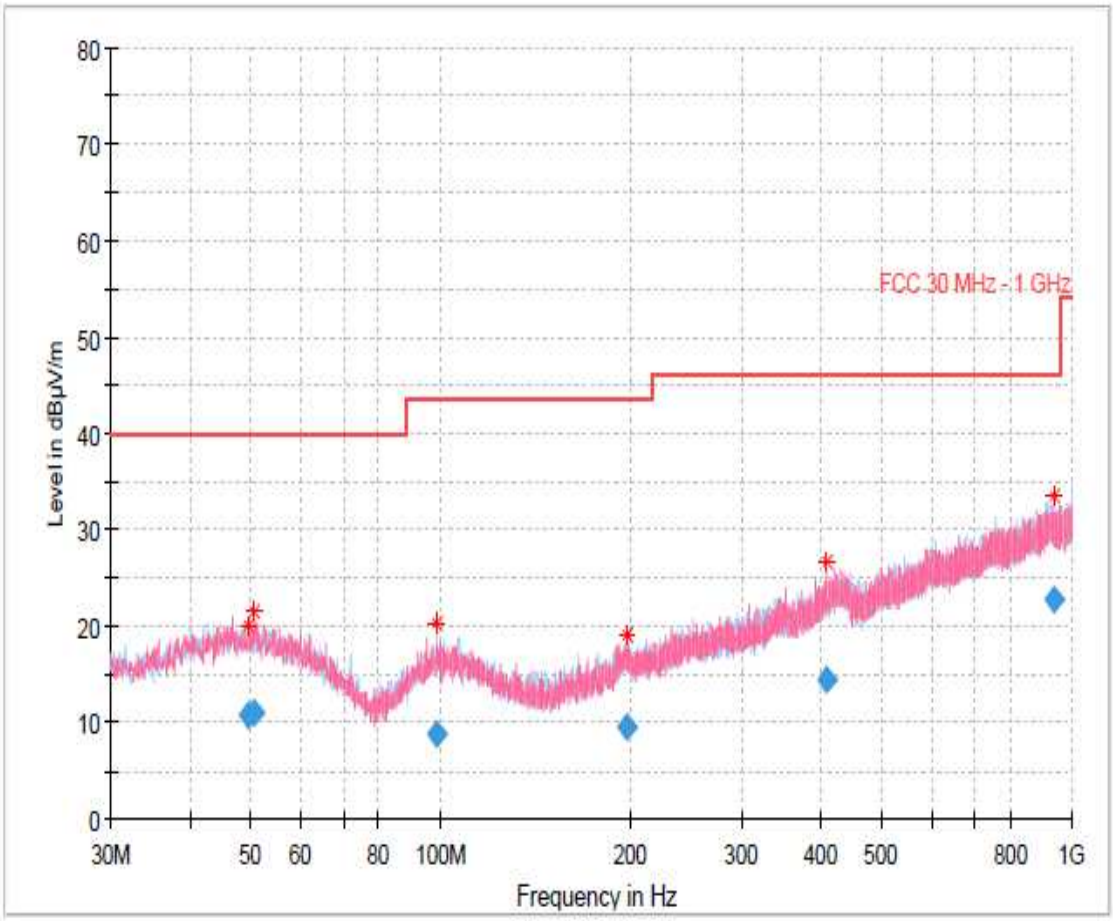
Critical Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
26265.466667	51.82	74.00	22.18	100.0	H	59.0	4.4
24812.000000	51.76	74.00	22.24	100.0	H	351.0	4.5
25298.866667	52.18	74.00	21.82	100.0	V	40.0	4.4
26597.333333	52.31	74.00	21.69	100.0	V	288.0	4.2
21105.466667	49.42	74.00	24.58	100.0	V	304.0	3.4
29109.933333	53.17	74.00	20.83	300.0	V	304.0	5.2

Note1) Two graphs measured for both Vertical and Horizontal of the Antenna are combined into one graph.

Note 2) Emission was scanned 18 GHz to 30 GHz; No emissions were detected above the noise floor which was at least 20 dB below the specification limit.

Operation Mode #3 (Below 1 GHz)

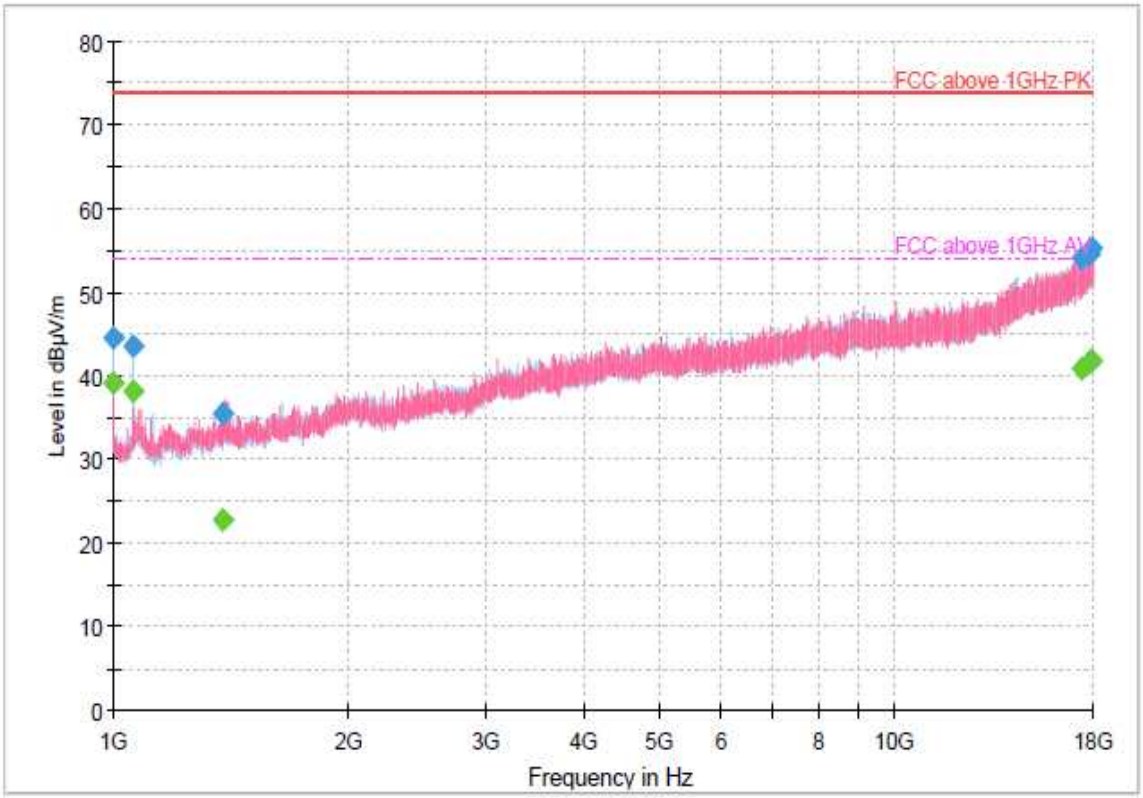


Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
49.775556	10.68	40.00	29.32	200.0	V	225.0	-19.8
50.559444	11.03	40.00	28.97	200.0	V	65.0	-19.8
98.576111	8.76	43.50	34.74	100.0	H	217.0	-22.4
197.538889	9.53	43.50	33.97	100.0	H	44.0	-21.6
410.175556	14.44	46.00	31.56	100.0	V	0.0	-16.3
938.445000	22.73	46.00	23.27	100.0	H	196.0	-9.3

Note1) Two graphs measured for both Vertical and Horizontal of the Antenna are combined into one graph.

Operation Mode #3 (1 GHz to 18 GHz)

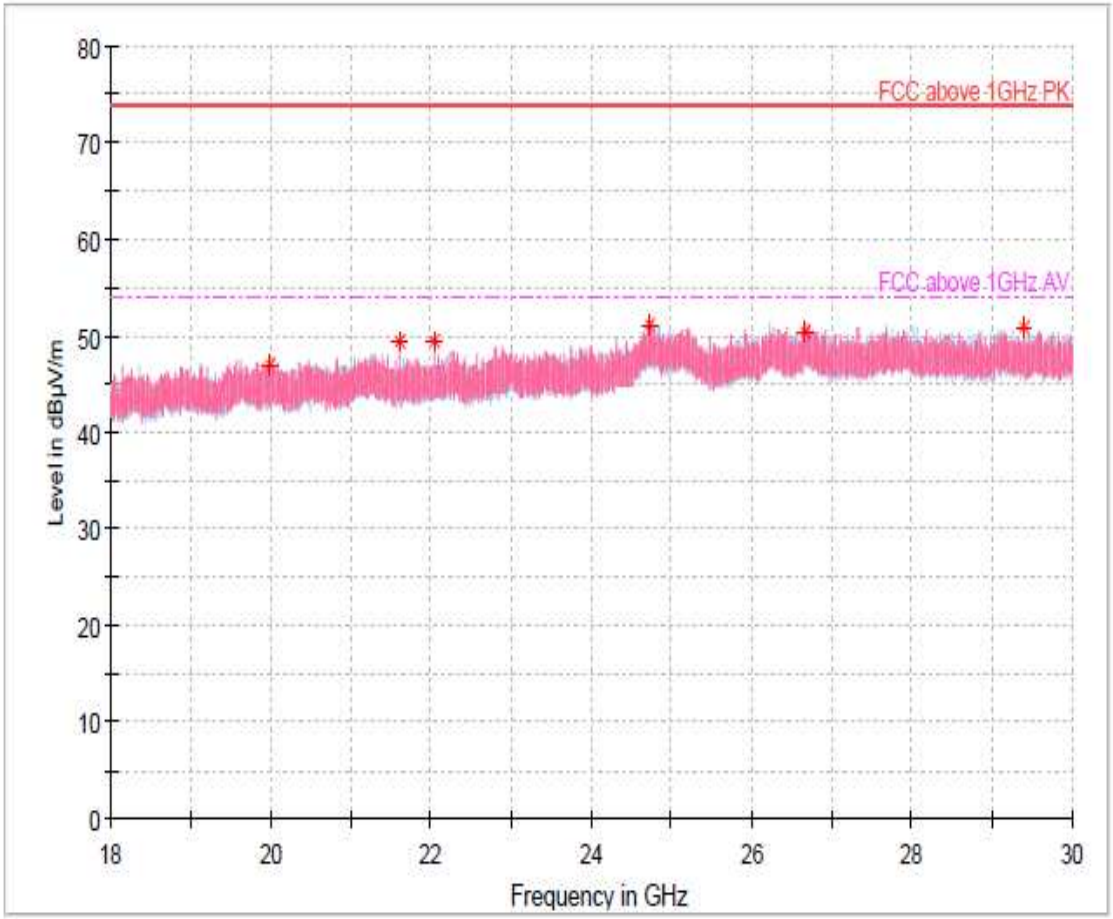


Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1000.000000	44.55	---	74.00	29.45	400.0	H	106.0	-33.8
1000.000000	---	39.23	54.00	14.77	400.0	H	106.0	-33.8
1062.533333	---	38.10	54.00	15.90	300.0	H	215.0	-33.5
1062.533333	43.59	---	74.00	30.41	300.0	H	215.0	-33.5
1384.877778	---	22.87	54.00	31.13	200.0	V	192.0	-32.1
1384.877778	35.56	---	74.00	38.44	200.0	V	192.0	-32.1
17356.483333	---	40.80	54.00	13.20	100.0	V	167.0	-2.7
17356.483333	53.97	---	74.00	20.03	100.0	V	167.0	-2.7
17798.450000	---	41.61	54.00	12.39	200.0	H	318.0	-1.5
17798.450000	54.52	---	74.00	19.48	200.0	H	318.0	-1.5
17891.011111	55.23	---	74.00	18.77	400.0	H	254.0	-1.3
17891.011111	---	41.83	54.00	12.17	400.0	H	254.0	-1.3

Note1) Two graphs measured for both Vertical and Horizontal of the Antenna are combined into one graph.

Operation Mode #3 (18 GHz to 30 GHz)



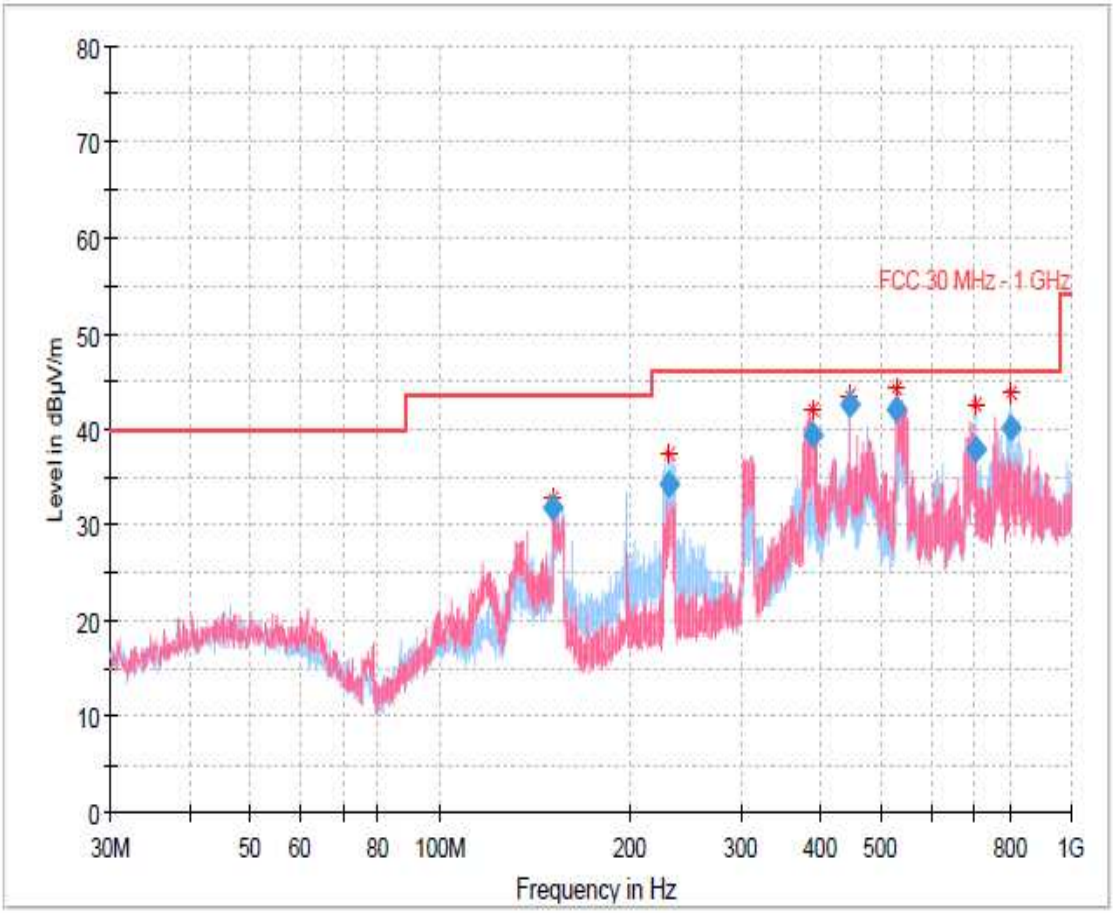
Critical Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
26666.866667	50.45	74.00	23.55	100.0	H	36.0	4.4
19994.000000	46.93	74.00	27.07	200.0	H	35.0	1.8
29384.666667	50.87	74.00	23.13	100.0	V	64.0	5.3
22031.333333	49.43	74.00	24.57	100.0	V	129.0	3.8
24722.333333	51.05	74.00	22.95	100.0	V	239.0	4.7
21613.333333	49.38	74.00	24.62	100.0	V	325.0	3.5

Note1) Two graphs measured for both Vertical and Horizontal of the Antenna are combined into one graph.

Note 2) Emission was scanned 18 GHz to 30 GHz; No emissions were detected above the noise floor which was at least 20 dB below the specification limit.

Operation Mode #4 (Below 1 GHz)

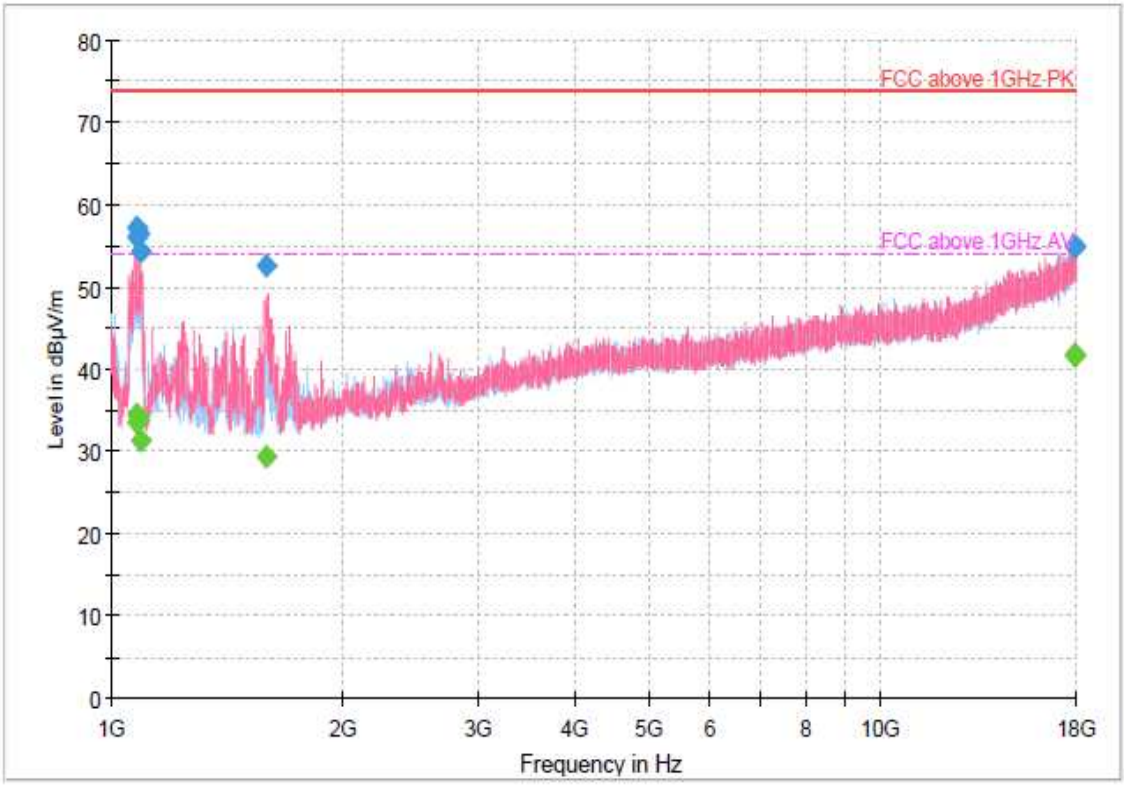


Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
151.145556	31.79	43.50	11.71	100.0	V	12.0	-25.7
231.066667	34.36	46.00	11.64	100.0	H	129.0	-21.2
390.613889	39.31	46.00	6.69	100.0	V	185.0	-16.8
446.263889	42.67	46.00	3.33	200.0	H	174.0	-15.8
529.751667	41.98	46.00	4.02	200.0	V	29.0	-14.3
707.188889	37.99	46.00	8.01	100.0	H	195.0	-11.9
801.125556	40.17	46.00	5.83	100.0	H	156.0	-10.6

Note1) Two graphs measured for both Vertical and Horizontal of the Antenna are combined into one graph.

Operation Mode #4 (1 GHz to 18 GHz)

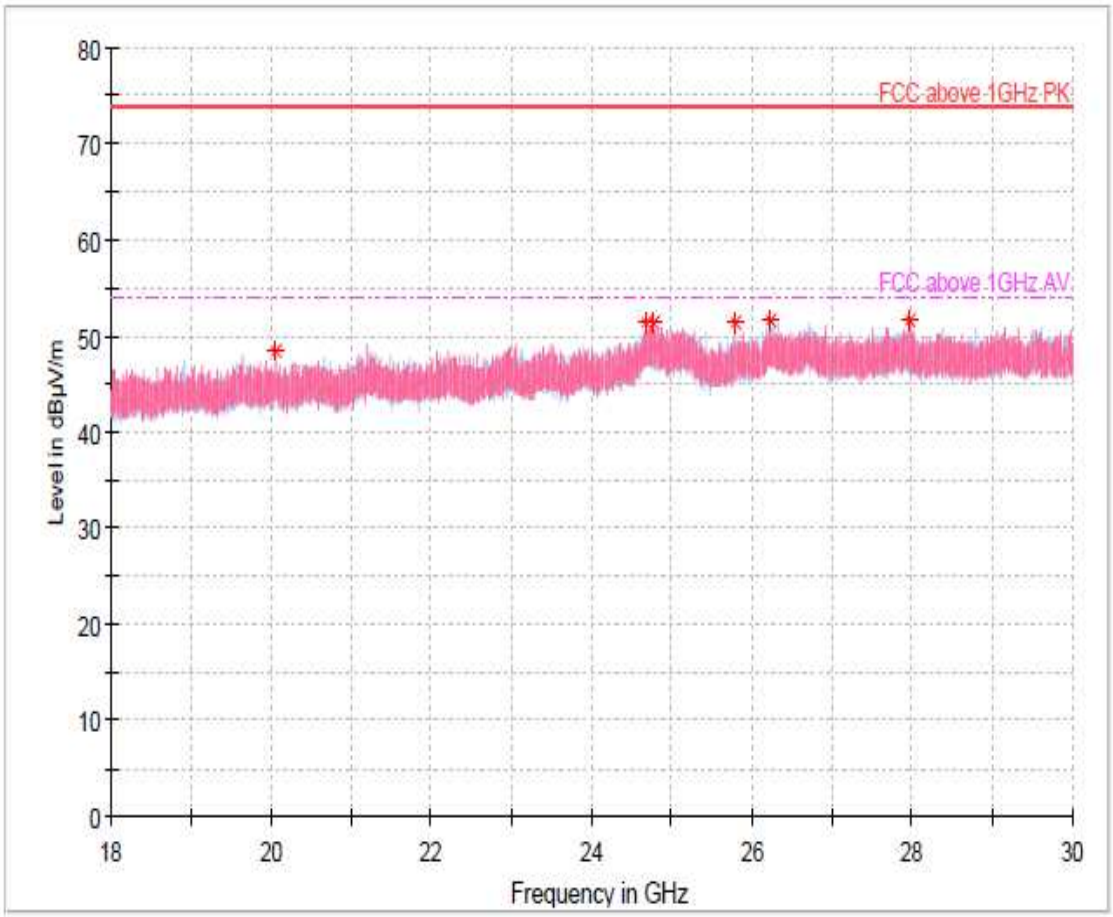


Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1076.666667	57.24	---	74.00	16.76	100.0	V	155.0	-33.5
1076.666667	---	34.61	54.00	19.39	100.0	V	155.0	-33.5
1077.022222	---	33.51	54.00	20.49	100.0	V	143.0	-33.5
1077.022222	55.97	---	74.00	18.03	100.0	V	143.0	-33.5
1085.961111	---	33.69	54.00	20.31	200.0	V	150.0	-33.5
1085.961111	56.47	---	74.00	17.53	200.0	V	150.0	-33.5
1093.844444	54.42	---	74.00	19.58	200.0	V	167.0	-33.5
1093.844444	---	31.37	54.00	22.63	200.0	V	167.0	-33.5
1594.144444	52.71	---	74.00	21.29	300.0	V	177.0	-31.0
1594.144444	---	29.27	54.00	24.73	300.0	V	177.0	-31.0
17876.944444	55.10	---	74.00	18.90	200.0	H	24.0	-1.3
17876.944444	---	41.67	54.00	12.33	200.0	H	24.0	-1.3
17897.805556	---	41.73	54.00	12.27	400.0	V	212.0	-1.2
17897.805556	54.90	---	74.00	19.10	400.0	V	212.0	-1.2

Note1) Two graphs measured for both Vertical and Horizontal of the Antenna are combined into one graph.

Operation Mode #4 (18 GHz to 30 GHz)



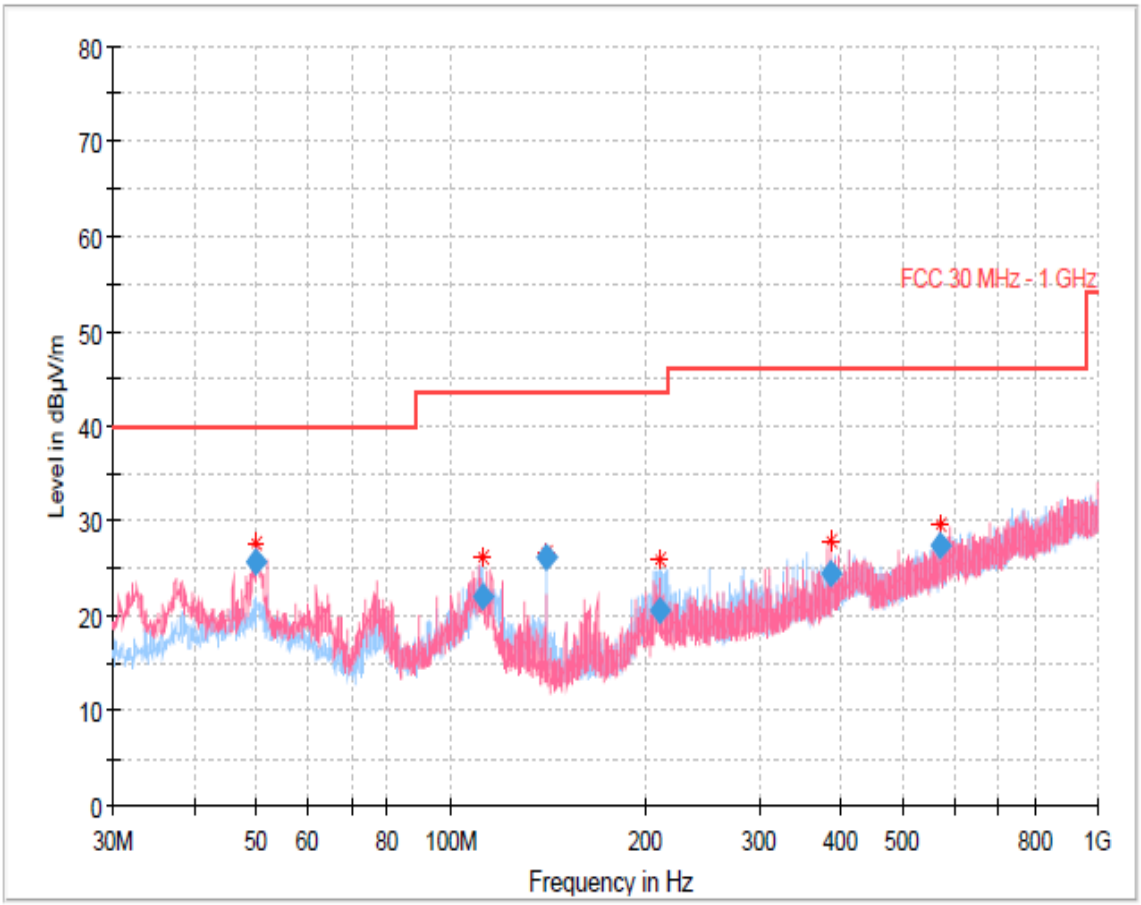
Critical Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
20063.333333	48.51	74.00	25.49	200.0	V	57.0	1.9
24673.333333	51.34	74.00	22.66	200.0	H	244.0	4.7
24766.333333	51.42	74.00	22.58	100.0	H	161.0	4.6
25792.666667	51.48	74.00	22.52	200.0	V	309.0	4.4
26230.666667	51.60	74.00	22.40	100.0	V	124.0	4.5
27974.333333	51.52	74.00	22.48	100.0	V	62.0	4.4

Note1) Two graphs measured for both Vertical and Horizontal of the Antenna are combined into one graph.

Note 2) Emission was scanned 18 GHz to 30 GHz; No emissions were detected above the noise floor which was at least 20 dB below the specification limit.

Operation Mode #5 (Below 1 GHz)

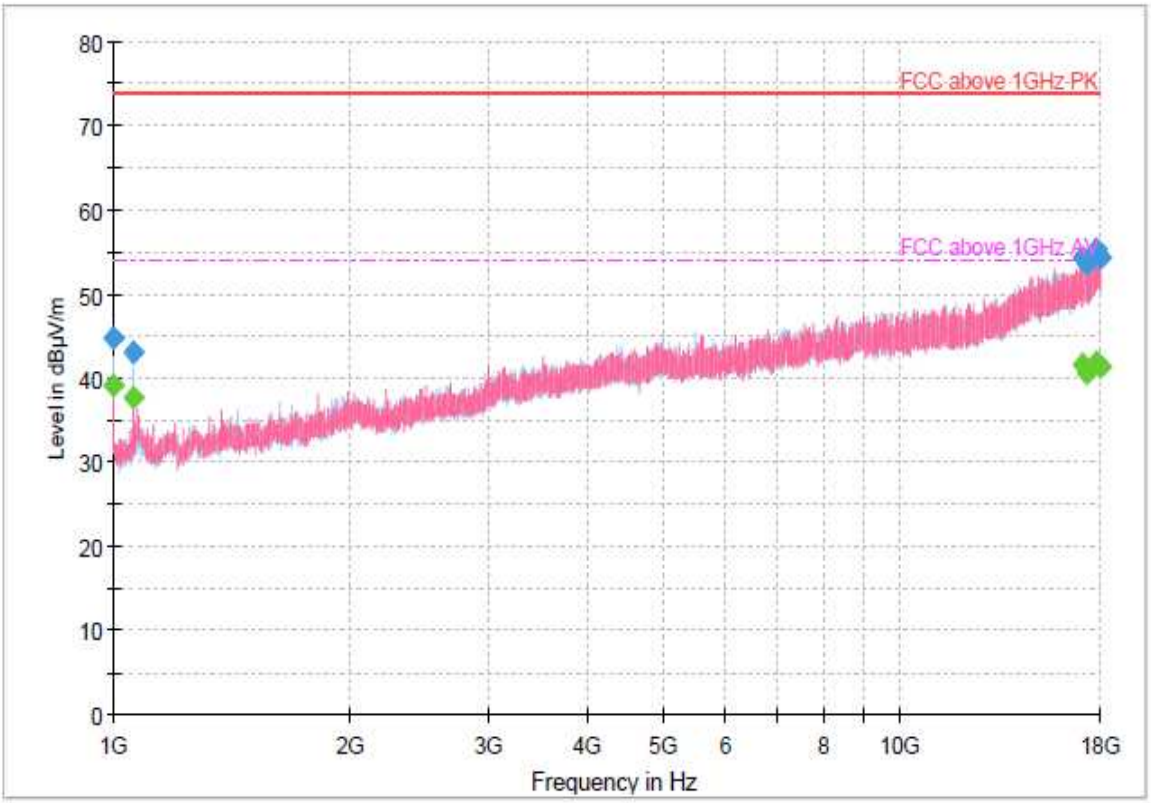


Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
50.116111	25.66	40.00	14.34	100.0	V	0.0	-19.8
112.218889	22.04	43.50	21.46	200.0	H	19.0	-22.9
140.418333	26.10	43.50	17.40	200.0	H	11.0	-25.8
211.103333	20.56	43.50	22.94	200.0	H	48.0	-22.5
387.067778	24.48	46.00	21.52	100.0	V	0.0	-17.0
571.906667	27.37	46.00	18.63	100.0	V	0.0	-13.6

Note1) Two graphs measured for both Vertical and Horizontal of the Antenna are combined into one graph.

Operation Mode #5 (1 GHz to 18 GHz)

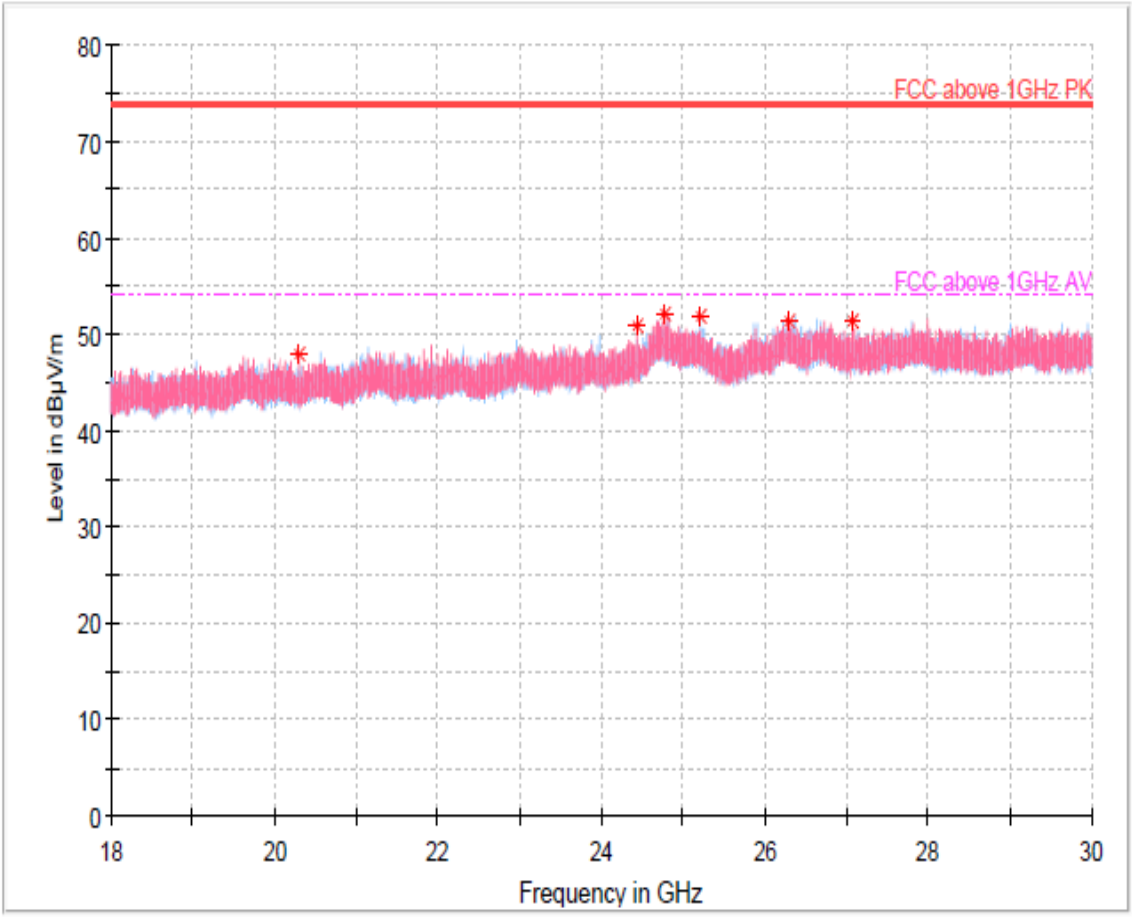


Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1000.000000	---	39.06	54.00	14.94	300.0	H	105.0	-33.8
1000.000000	44.75	---	74.00	29.25	300.0	H	105.0	-33.8
1062.533333	43.08	---	74.00	30.92	300.0	H	0.0	-33.5
1062.533333	---	37.77	54.00	16.23	300.0	H	0.0	-33.5
17075.444444	54.37	---	74.00	19.63	100.0	V	286.0	-2.5
17075.444444	---	41.57	54.00	12.43	100.0	V	286.0	-2.5
17264.183333	53.67	---	74.00	20.33	100.0	V	156.0	-2.5
17264.183333	---	40.65	54.00	13.35	100.0	V	156.0	-2.5
17827.116667	---	41.73	54.00	12.27	100.0	V	16.0	-1.4
17827.116667	55.27	---	74.00	18.73	100.0	V	16.0	-1.4
17961.700000	---	41.35	54.00	12.65	100.0	H	248.0	-1.1
17961.700000	54.34	---	74.00	19.66	100.0	H	248.0	-1.1

Note1) Two graphs measured for both Vertical and Horizontal of the Antenna are combined into one graph.

Operation Mode #5 (18 GHz to 30 GHz)



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
20305.333333	47.95	74.00	26.05	100.0	V	212.0	2.3
24434.666667	50.77	74.00	23.23	100.0	V	27.0	4.6
24776.000000	52.17	74.00	21.83	200.0	V	183.0	4.6
25201.000000	51.97	74.00	22.03	300.0	H	164.0	4.8
26293.000000	51.43	74.00	22.57	100.0	V	27.0	4.3
27067.333333	51.49	74.00	22.51	100.0	V	335.0	4.1

Note1) Two graphs measured for both Vertical and Horizontal of the Antenna are combined into one graph.

Note 2) Emission was scanned 18 GHz to 30 GHz; No emissions were detected above the noise floor which was at least 20 dB below the specification limit.

Appendix A. Test site accreditations

Certificate	Nation	Agency	Code	Remark
Accreditation	USA	A2LA	4068.03	31 July, 2019
Accreditation	KOREA	RRA	KR0158	10 January, 2020
Registration	Japan	VCCI	4013	17 February,2020
Accreditation	USA MRA	FCC	KR0158, 666061	17 March, 2020
Accreditation	CANADA MRA	ISED	KR0158, 25944	17 March, 2020
Accreditation	Vietnam MRA	MIC	KR0158	20 April, 2020

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the “General requirements for the competent of calibration and testing laboratory”.

Appendix B. Measurement Uncertainties

Test Item	Measurement uncertainty
Conducted emission	2.62 dB
Radiated emission (1㎓ Below)	4.04 dB
Radiated emission (1㎓ Over)	5.10 dB
Note 1: Measurement uncertainty is calculated in according with CISPR 16-4-2: 2011+A1:2014+A2:2018 The measurement uncertainty is given with a confidence of 95 % with the coverage factor, k=2.	