FCC Test Report

Report No.:	RFBICK-WTW-P24120901
FCC ID:	CWTB2401
Test Model:	B2401
Received Date:	Dec. 24, 2024
Test Date:	Feb. 17 ~ Feb. 18, 2025
Issued Date:	Mar. 06, 2025
Applicant:	ALPS ALPINE CO., LTD.
Address:	6-3-36 Furukawanakazato, Osaki-city, Miyagi Prefecture, 989-6181 Japan
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location:	(1) No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan (2) No. 70, Wenming Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)
FCC Registration / Designation Number:	(1) 788550 / TW0003 (2) 281270 / TW0032

Testing Laboratory
2021

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
RFBICK-WTW-P24120901	Original Release	Mar. 06, 2025

1 Certificate of Conformity

Product:	Kick sensor
Brand:	ALPS ALPINE CO., LTD.
Test Model:	B2401
Sample Status:	Engineering Sample
Applicant:	ALPS ALPINE CO., LTD.
Test Date:	Feb. 17 ~ Feb. 18, 2025
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.255)

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Celine Chou , **Date:** Mar. 06, 2025

Celine Chou / Senior Specialist

Approved by : Jeremy Lin , **Date:** Mar. 06, 2025

Jeremy Lin / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.255)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	NA	EUT is powered by DC power supply
15.255(c)	10dB Bandwidth	Pass	Meet the requirement of limit.
15.255(c)	Output Power	Pass	Meet the requirement of limit.
15.255(d) 15.205 15.209	Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -9.8dB at 783.69MHz.
15.255(f)	Frequency Stability	Pass	Meet the requirement of limit.

N/A: Not Applicable

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.90 dB
Radiated Emissions	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.59 dB
	200MHz ~1000MHz	3.60 dB
	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB
	40GHz ~ 66GHz	4.59 dB
	66GHz ~ 100GHz	5.37 dB
	Above 100GHz	5.40 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Kick sensor
Brand	ALPS ALPINE CO., LTD.
Test Model	B2401
Sample Status	Engineering Sample
Power Supply Method	13.5Vdc
Modulation Type	Pulse Modulation
Operating Frequency	57 ~ 64GHz
Output Power (EIRP)	12.07dBm

Note:

1. The antenna information is listed as below.

Antenna type	Antenna Net Gain (dBi)	Connector Type
Folded dipole antennas, integrated in the package (AiP)	7.90	N/A (integral antenna)

* Only radiated measurements are used to show compliance with FCC limits for fundamental and spurious emissions.

2. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

Operating Frequency is provided for EUT.

Operating Frequency (GHz)
57~64

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To						Description
	PLC	BW	OP	FS	RE < 1G	RE ≥ 1G	
-	Note 1	√	√	√	√	√	-

Where PLC: Power Line Conducted Emission BW: 10dB Bandwidth

OP: Output Power FS: Frequency Stability

RE < 1G: Radiated Emission below 1GHz RE ≥ 1G: Radiated Emission above 1GHz

Note:
1. EUT is powered by DC power supply.
2. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on Z-plane.

10dB Bandwidth Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type
1	1	Pulse Modulation

Output Power Measurement:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type
1	1	Pulse Modulation

Frequency Stability Test:

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type
1	1	Pulse Modulation

Radiated Emission Test (Below 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type
1	1	Pulse Modulation

Radiated Emission Test (Above 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type
1	1	Pulse Modulation

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested By
BW	25 deg. C, 66 %RH	13.5Vdc	Wade Huang
OP	25 deg. C, 66 %RH	13.5Vdc	Wade Huang
FS	25 deg. C, 66 %RH	13.5Vdc	Wade Huang
RE<1G	24 deg. C, 64 %RH	13.5Vdc	Edison Lee
RE≥1G	24 deg. C, 64 %RH 25 deg. C, 66 %RH	13.5Vdc	Edison Lee Wade Huang

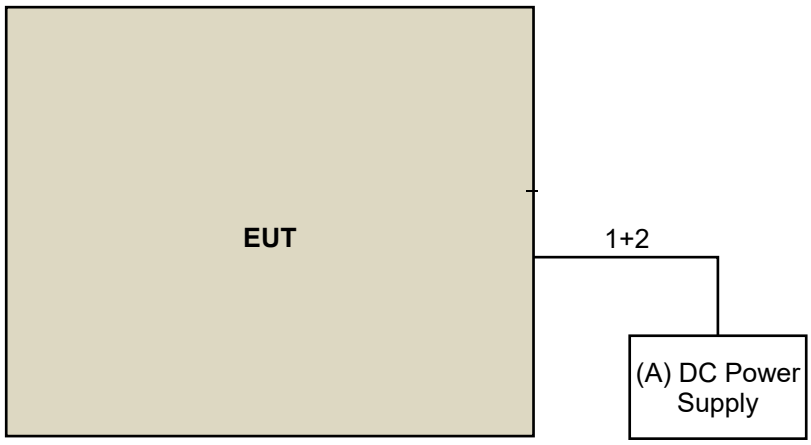
3.3 Description of Support Units

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

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	DC Power Supply	Topward	6603A	725906	N/A	Provided by Lab

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC Cable	1	1.5	No	0	Supplied by applicant
2.	DC Cable	1	2	No	0	Provided by Lab

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.255)

ANSI C63.10-2020/Cor.1-2023

All test items have been performed and recorded as per the above standards.

4 Test Types and Results

4.1 Radiated Emission Measurement

4.1.1 Limits of Radiated Emission Measurement

Spurious Emission	
Frequency Range	Limitation
Radiated emissions below 40GHz	Part 15.209
Between 40GHz and 200GHz	90pW/cm^2 (at 3 meter)
Note: The levels of the spurious emissions shall not exceed the level of the fundamental emission.	

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

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

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.
4. Section 15.205 restricted bands of operation shall compliance with the limits in Section 15.209.

4.1.2 Test Instruments

For Below 40GHz and Frequency Stability

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver Rohde & Schwarz	ESR3	102579	Jul. 11, 2024	Jul. 10, 2025
Spectrum Analyzer KEYSIGHT	N9020B	MY60110462	Apr. 22, 2024	Apr. 21, 2025
BILOG Antenna SCHWARZBECK	VULB9168	9168-995	Oct. 09, 2024	Oct. 08, 2025
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-404	Nov. 10, 2024	Nov. 09, 2025
HORN Antenna SCHWARZBECK	BBHA 9170	995	Nov. 10, 2024	Nov. 09, 2025
Loop Antenna TESEQ	HLA 6121	45745	Aug. 21, 2024	Aug. 20, 2025
Preamplifier EMCI	EMC330N	980783	Jan. 14, 2025	Jan. 13, 2026
Preamplifier EMCI	EMC118A45SE	980810	Dec. 26, 2024	Dec. 25, 2025
Preamplifier EMCI	EMC184045SE	980787	Jan. 14, 2025	Jan. 13, 2026
RF signal cable EMCI	EMC104-SM-SM-(9000+2000+1000)	201230+ 201242+ 210101	Jan. 14, 2025	Jan. 13, 2026
RF signal cable EMCI	EMCCFD400-NM-NM-(9000+300+500)	201252+ 201250+ 201245	Jan. 14, 2025	Jan. 13, 2026
RF signal cable EMCI	EMC101G-KM-KM-(5000+3000+2000)	201261+201258+ 201249	Jan. 14, 2025	Jan. 13, 2026
Software BV CPS	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Turn Table Max-Full	MFT-151SS-0.5T	NA	NA	NA
Turn Table Controller Max-Full	MF-7802BS	MF780208675	NA	NA
Antenna Tower KaiTuo	NA	NA	NA	NA
Antenna Tower Controller KaiTuo	KT-2000	NA	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Temperature & Humidity Chamber Terchy	MHU-225AU	920842	Jun. 21, 2024	Jun. 20, 2025
Digital Storage Oscilloscope Keysight	DSO-X 6004A	MY55190202	Jun. 17, 2024	Jun. 16, 2025

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in WM Chamber 7.

For Above 40GHz:

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer Keysight	N9042B	US60360159	Apr. 16, 2024	Apr. 15, 2025
*OXE89 Horn Antenna (33~55GHz) QuinStar	QWH-QPRR00	QWH-QPRR00-1	Apr. 09, 2024	Apr. 08, 2025
*Conical Horn Antenna (50~75GHz) Keysight	WR15CH-Conical	RCHO15RL-1	Apr. 09, 2024	Apr. 08, 2025
*Conical Horn Antenna (75~110GHz) Keysight	WR10CH-Conical	RCHO10RL-1	Apr. 09, 2024	Apr. 08, 2025
*Conical Horn Antenna (110~170GHz) Keysight	WR6.5CH-Conical	RCHO6RL-1	Apr. 09, 2024	Apr. 08, 2025
*Conical Horn Antenna (140~220GHz) Keysight	WR5.1CH-Conical	RCHO5RL-1	Apr. 09, 2024	Apr. 08, 2025
Extension Module_down converter (50-75GHz) 9VDC supply Keysight	N9029AV15	SAX 381	Apr. 16, 2024	Apr. 15, 2025
Extension Module_down converter (75-110GHz) 9VDC supply Keysight	N9029AV10	SAX 378	Apr. 16, 2024	Apr. 15, 2025
Extension Module_down converter (110-170GHz) 9VDC supply Keysight	N9029AV06	SAX723	Apr. 16, 2024	Apr. 15, 2025
Extension Module_down converter (140-220GHz) 9VDC supply Keysight	N9029AV05	SAX722	Apr. 16, 2024	Apr. 15, 2025
PSG analog signal generator Keysight	E8257D	MY60020399	Jan. 13, 2025	Jan. 12, 2026
*Power Meter VDI (110-325GHz)	PM5B	571V	Apr. 16, 2024	Apr. 15, 2025
*Power Meter Keysight (50-110GHz)	U8489A	US59290810	Mar. 08, 2024	Mar. 07, 2025
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in WM Chamber 7.

4.1.3 Test Procedures

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission 30MHz to 40GHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) and Average detection (AV) at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

For Radiated emission above 40GHz

a. Connect the test antenna covering the appropriate frequency range to a spectrum analyzer via an external mixer to the spectrum analyzer.

b. Set spectrum analyzer RBW = 1 MHz, VBW = 3 MHz, average detector.

c. Calculate the distance to the far field boundary and determine the maximum measurement distance.

d. Perform an exploratory search for emissions and determine the approximate direction at which each observed emission emanates from the EUT.

e. Exploratory measurements be made at a closer distance than the validated maximum measurement distance.

f. Perform a final measurement; begin with the test antenna at the approximate position where the maximum level occurred during the exploratory scan.

g. Slowly scan the test antenna around this position, slowly vary the test antenna polarization by rotating through at least 0° to 180°, and slowly vary the orientation of the test antenna to find the final position, polarization, and orientation at which the maximum level of the emission is observed.

h. Record the measured reading with the test antenna fixed at this maximized position, polarization, and orientation. Record the measurement distance.

i. Calculate the maximum field strength of the emission at the measurement distance and the adjusted/corrected power at the output of the test antenna.

j. Calculate the EIRP from the measured field strength and then convert to the linear.

k. Calculate the power density at the distance specified by the limit from the field strength at the distance specified by the limit.

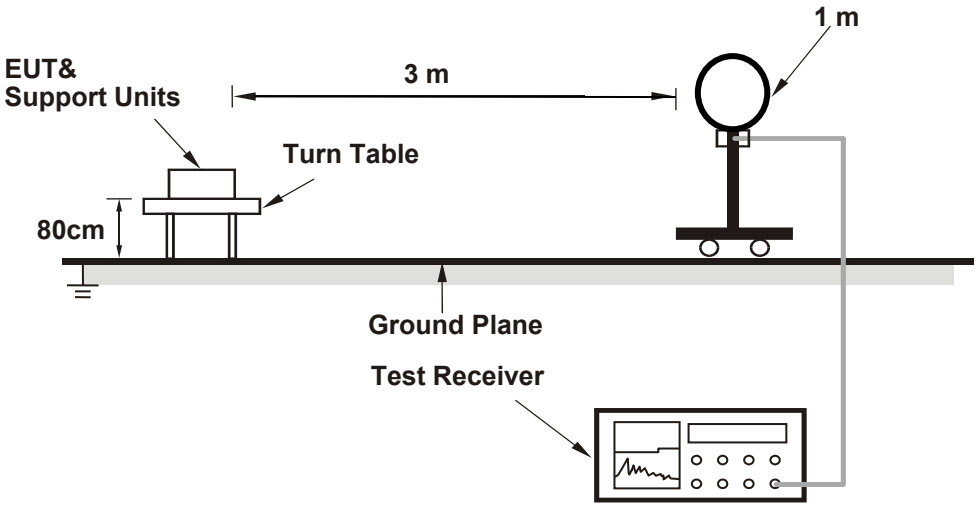
l. Repeat the preceding sequence for every emission observed in the frequency band under investigation.

4.1.4 Deviation from Test Standard

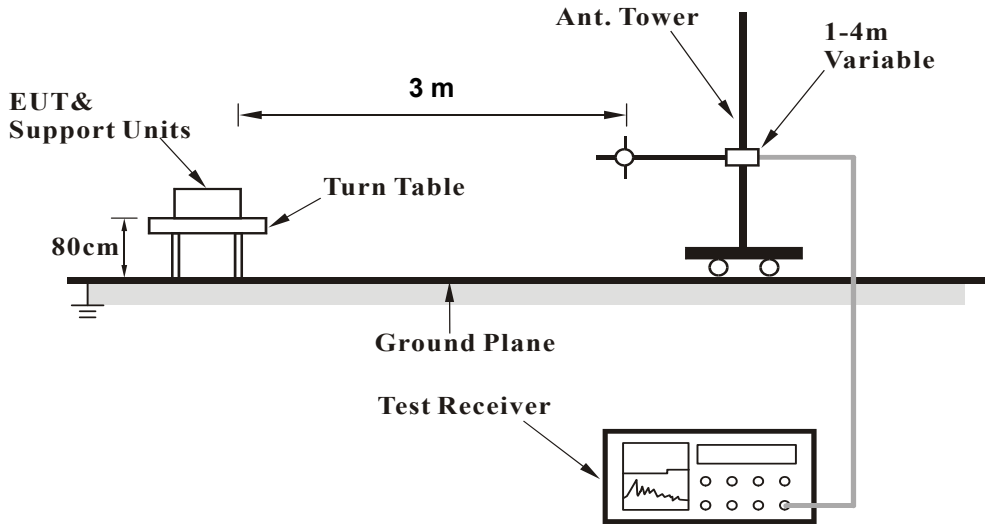
No deviation.

4.1.5 Test Setup

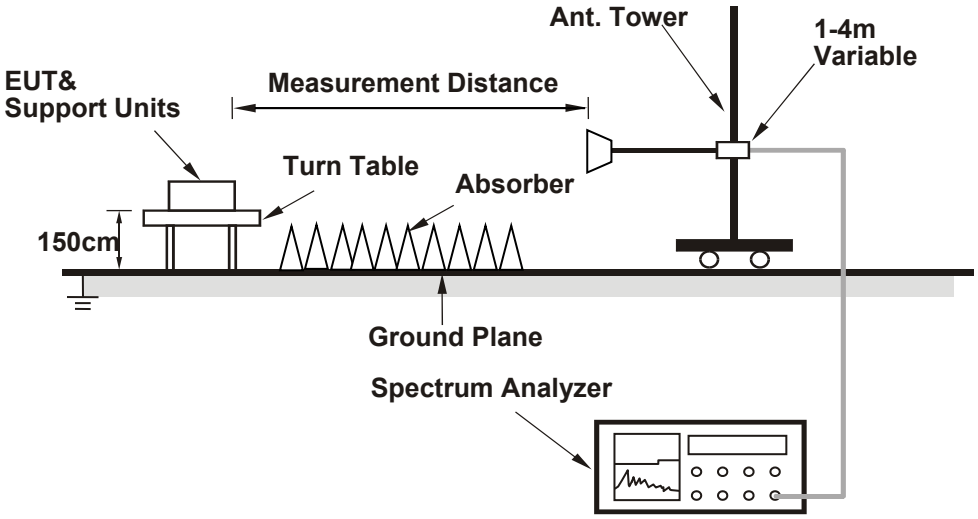
For Radiated emission below 30MHz



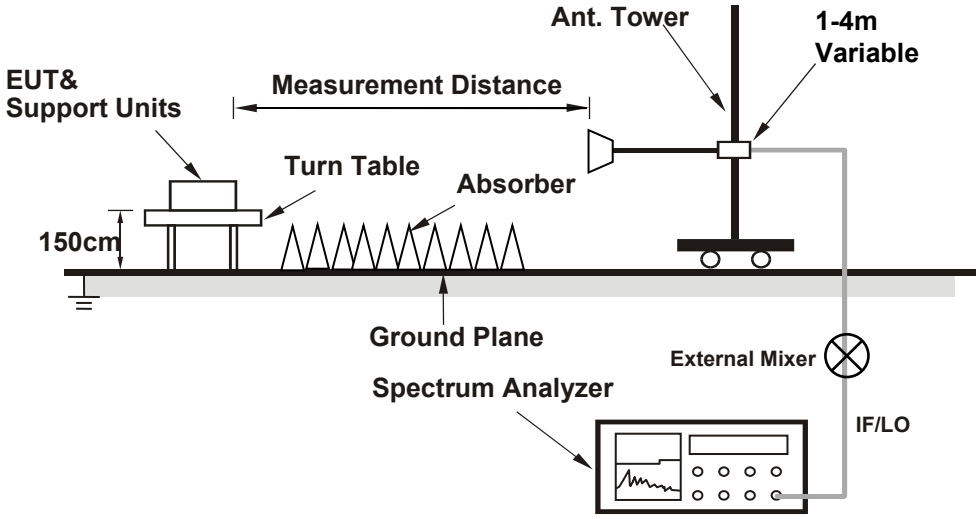
For Radiated emission 30MHz to 1GHz



For Radiated emission 1GHz to 40GHz



For Radiated emission above 40GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

a. Placed the EUT on the testing table.

b. The EUT is connected to the simulator at frequency channel individually.

4.1.7 Test Results

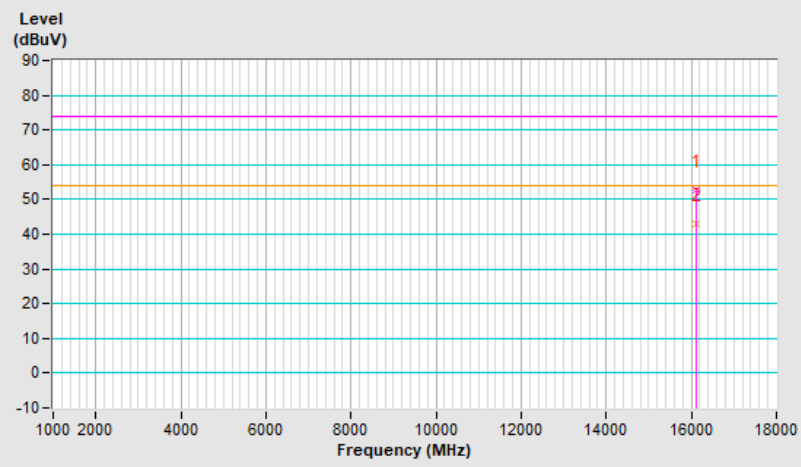
Above 1GHz Data:

Channel	CH 1：60.50GHz		
Frequency Range	1GHz ~ 18GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	16118.67	52.8 PK	74.0	-21.2	1.43 H	301	39.6	13.2
2	16118.67	42.9 AV	54.0	-11.1	1.43 H	301	29.7	13.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

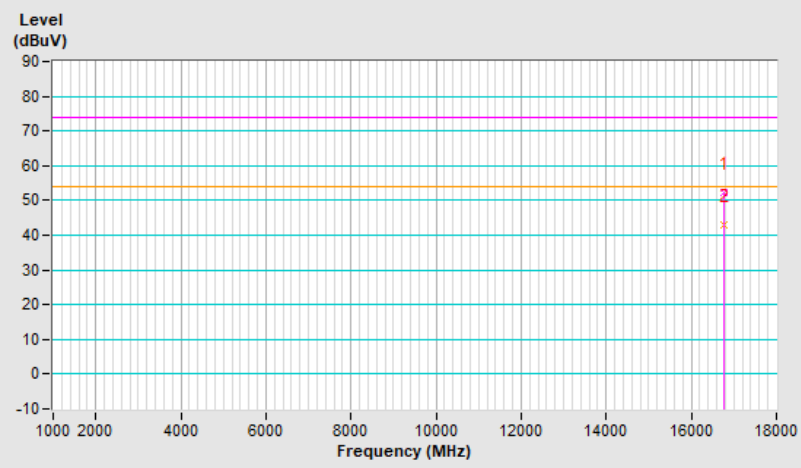


Channel	CH 1 : 60.50GHz		
Frequency Range	1GHz ~ 18GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	16778.36	52.5 PK	74.0	-21.5	1.82 V	13	39.1	13.4
2	16778.36	42.8 AV	54.0	-11.2	1.82 V	13	29.4	13.4

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

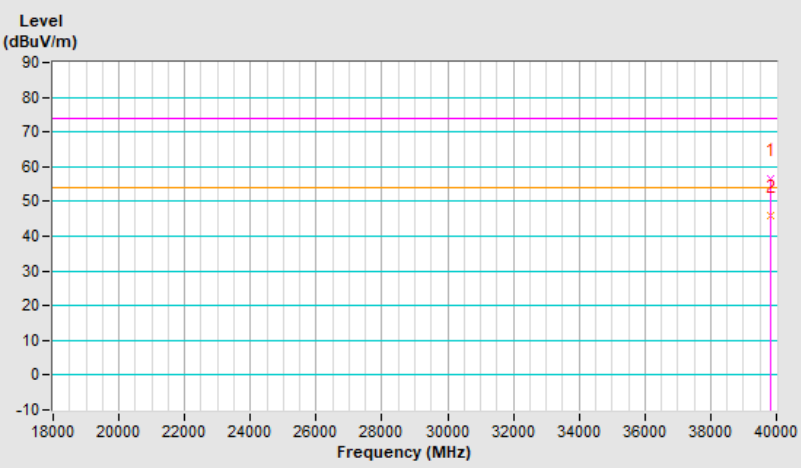


Channel	CH 1 : 60.50GHz		
Frequency Range	18GHz ~ 40GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	39825.10	56.7 PK	74.0	-17.3	1.20 H	117	39.5	17.2
2	39825.10	45.9 AV	54.0	-8.1	1.20 H	117	28.7	17.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

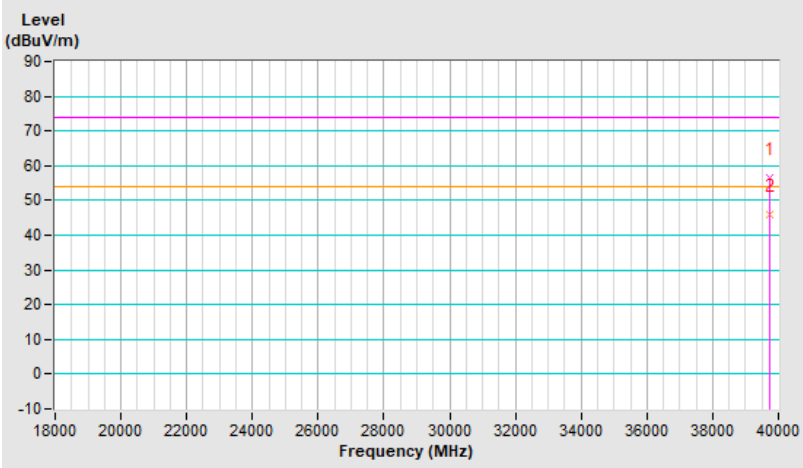


Channel	CH 1 : 60.50GHz		
Frequency Range	18GHz ~ 40GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	39712.25	56.4 PK	74.0	-17.6	1.56 V	150	40.5	15.9
2	39712.25	46.1 AV	54.0	-7.9	1.56 V	150	30.2	15.9

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.



Channel	CH 1：60.50GHz		
Frequency Range	40GHz ~ 200GHz	Detector Function	Average (AV)

Antenna Polarity: Horizontal									
No.	Frequency (GHz)	Power (dBm)	Gain of test Antenna (dBi)	EMeas (dBμV/m)	EIRP Level (dBm/ MHz)	Power Density (pW/cm^2)	Power Density Limit (pW/cm^2)	Margin (pW/cm^2)	Pass/ Fail
1	43.66	-111.51	22.50	36.05	-68.77	0.00	90.00	-90.00	Pass
2	51.13	-79.14	21.50	70.79	-34.03	0.35	90.00	-89.65	Pass
3	66.09	-83.21	21.50	68.95	-35.87	0.23	90.00	-89.77	Pass
4	103.64	-94.79	21.60	61.18	-43.64	0.04	90.00	-89.96	Pass
5	169.29	-95.06	22.00	64.77	-40.05	0.09	90.00	-89.91	Pass
6	170.21	-78.05	21.30	82.53	-22.29	5.22	90.00	-84.78	Pass
Antenna Polarity : Vertical									
No.	Frequency (GHz)	Power (dBm)	Gain of test Antenna (dBi)	EMeas (dBμV/m)	EIRP Level (dBm/ MHz)	Power Density (pW/cm^2)	Power Density Limit (pW/cm^2)	Margin (pW/cm^2)	Pass/ Fail
1	43.89	-111.26	22.50	36.34	-68.48	0.00	90.00	-90.00	Pass
2	50.82	-78.85	21.50	71.03	-33.79	0.37	90.00	-89.63	Pass
3	65.78	-82.97	21.50	69.15	-35.67	0.24	90.00	-89.76	Pass
4	103.68	-94.52	21.60	61.45	-43.37	0.04	90.00	-89.96	Pass
5	169.57	-94.80	22.00	65.04	-39.78	0.09	90.00	-89.91	Pass
6	170.09	-77.90	21.30	82.67	-22.15	5.39	90.00	-84.61	Pass

Remarks:

Follow ANSI 63.10-2020 section 9.2.2 Equations to calculate EIRP

EIRP Level (dBm/MHz) = 21.98-20log(λ)+20*log(d_{Meas})+P-G

E_{Meas} is the field strength of the emission at the measurement distance, in dBμV/m

d_{Meas} is the measurement distance, in m

Measurements made at 1 meter distance.

2. Power density formula as follows

Follow ANSI 63.10-2020 section 9.2.3 Equations to calculate power density

$PD=EIRP_{Linear}/4\pi d^2$

PD is is the power density at the distance specified by the limit, in W/m^2

$EIRP_{Linear}$ is the equivalent isotropically radiated power, in watts

d is the 3m distance.

3. The far-field boundary is given in ANSI 63.10 as:

R far field = (2 * L^2) / λ

L is the Largest Antenna Dimension of measurement antenna, including the reflector

λ is the wavelength

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
40	0.03	0.0075	0.240
50	0.03	0.0060	0.300

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
50	0.025	0.0060	0.208
75	0.025	0.0040	0.313

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
75	0.018	0.0040	0.162
110	0.018	0.0027	0.238

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
110	0.012	0.0027	0.106
170	0.012	0.0018	0.163

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
170	0.008	0.0018	0.073
260	0.008	0.0012	0.111

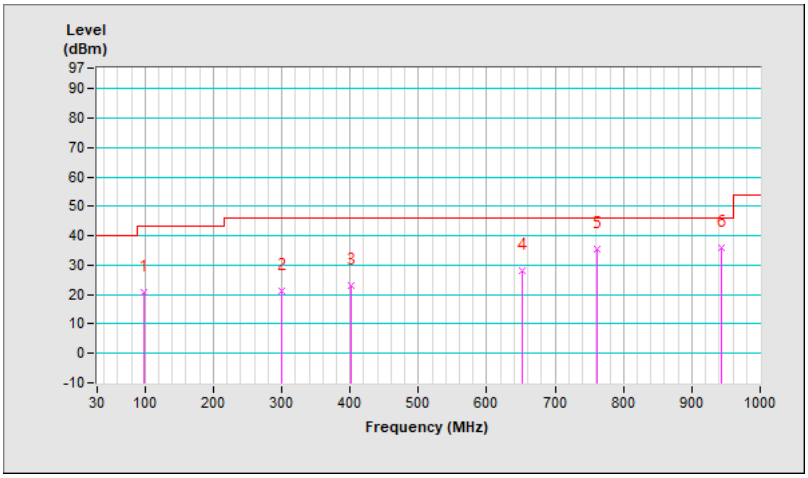
Below 1GHz Data:

Channel	CH 1 : 60.50GHz		
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	98.87	20.6 QP	43.5	-22.9	1.15 H	154	38.1	-17.5
2	299.66	21.1 QP	46.0	-24.9	1.05 H	211	33.2	-12.1
3	402.48	22.9 QP	46.0	-23.1	1.57 H	7	32.6	-9.7
4	651.77	28.2 QP	46.0	-17.8	1.99 H	316	32.4	-4.2
5	762.35	35.3 QP	46.0	-10.7	1.35 H	3	37.4	-2.1
6	943.74	35.7 QP	46.0	-10.3	1.02 H	0	35.6	0.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

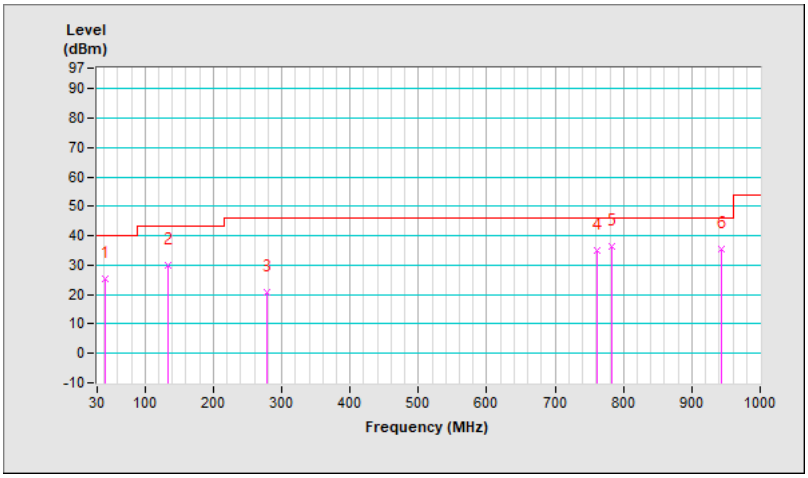


Channel	CH 1 : 60.50GHz		
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	42.61	25.3 QP	40.0	-14.7	1.57 V	84	38.4	-13.1
2	132.82	30.0 QP	43.5	-13.5	1.16 V	66	43.7	-13.7
3	279.29	20.9 QP	46.0	-25.1	1.35 V	8	33.7	-12.8
4	762.35	35.1 QP	46.0	-10.9	1.05 V	217	37.2	-2.1
5	**783.69**	**36.2 QP**	**46.0**	**-9.8**	**1.15 V**	**174**	**38.1**	**-1.9**
6	943.74	35.6 QP	46.0	-10.4	1.64 V	295	35.5	0.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

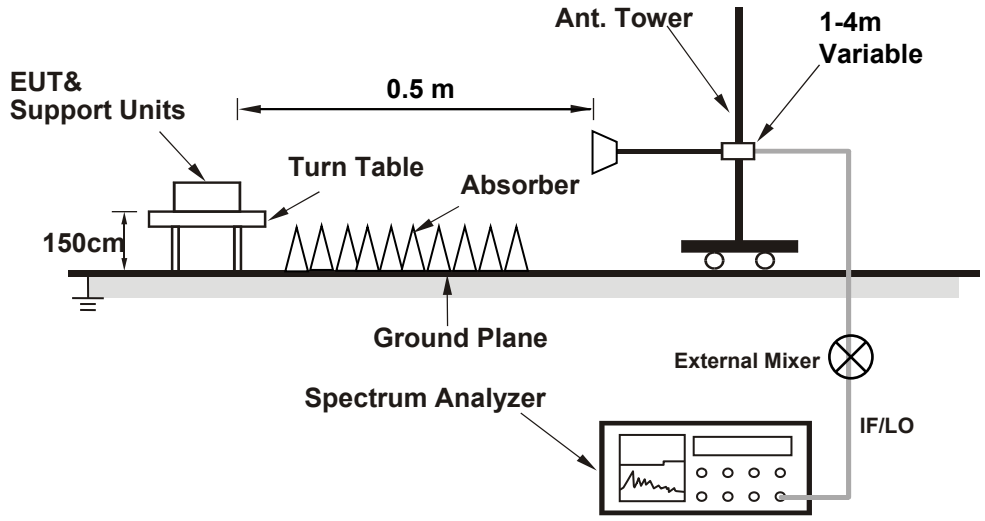


4.2 10dB Bandwidth Measurement

4.2.1 Limits of 10dB Bandwidth Measurement

For pulsed field disturbance sensors/radars operating in the 57-64 GHz band that have a maximum pulse duration of 6 ns, the average EIRP shall not exceed 13 dBm and the transmit duty cycle shall not exceed 10% during any 0.3 µs time window. In addition, the average integrated EIRP within the frequency band 61.5-64.0 GHz shall not exceed 5 dBm in any 0.3 µs time window. Peak emissions shall not exceed 20 dB above the maximum permitted average emission limit applicable to the equipment under test. The radar bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna.

4.2.2 Test Setup



4.2.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 24, 2024	Dec. 23, 2025
Spectrum Analyzer (50~110GHz) Keysight	N9030A	MY55330160	Jan. 16, 2025	Jan. 15, 2026
Conical Horn Antenna (50~75GHz) Keysight	WR15CH-Conical	RCH015RL-2	Apr. 09, 2024	Apr. 08, 2025
DC Power Supply TOPWARD	6306A	727263	NA	NA
Temperature & Humidity Chamber TERCHY	HRM-120RF	931022	Jan. 09, 2025	Jan. 08, 2026

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.2.4 Test Procedure

a. Set resolution bandwidth (RBW) = 10MHz

b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.

c. Trace mode = max hold.

d. Sweep = auto couple.

e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 10 dB relative to the maximum level measured in the fundamental emission

4.2.5 Deviation from Test Standard

No deviation.

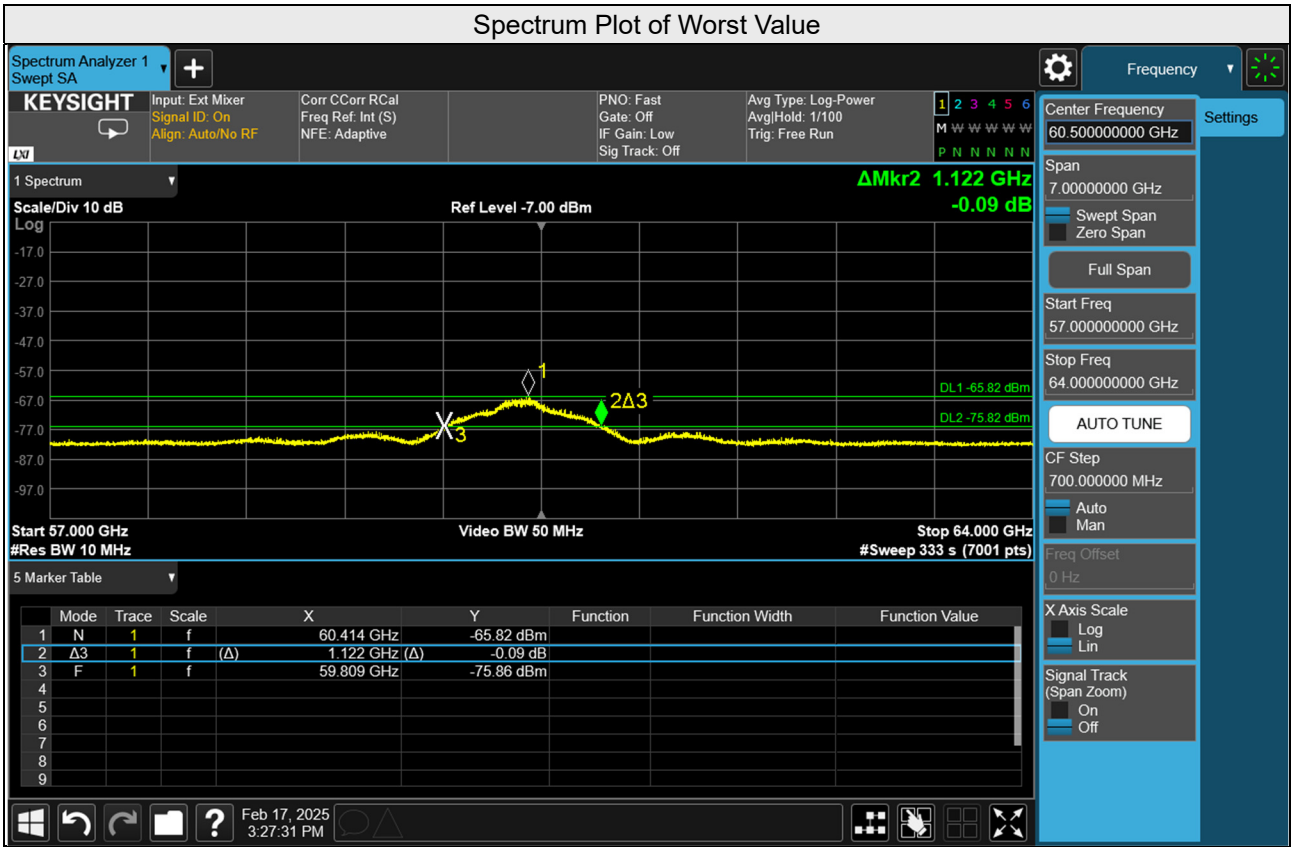
4.2.6 EUT Operating Conditions

Same as 4.1.6.

4.2.7 Test Result

Channel	Frequency (GHz)	10dB Bandwidth (GHz)
1	60.50	1.122

Spectrum Plot of Worst Value

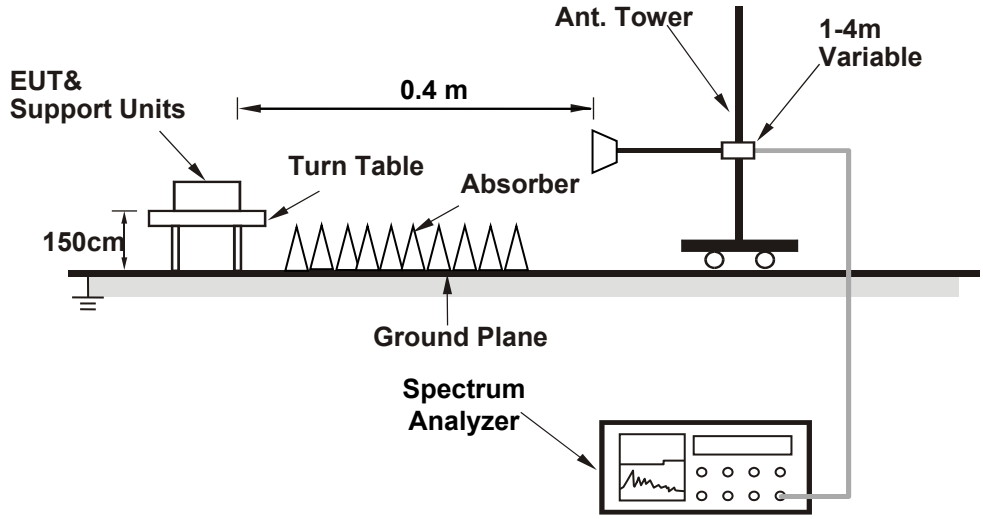


4.3 Output Power Measurement

4.3.1 Limits of Output Power Measurement

For pulsed field disturbance sensors/radars operating in the 57-64 GHz band that have a maximum pulse duration of 6 ns, the average EIRP shall not exceed 13 dBm and the transmit duty cycle shall not exceed 10% during any 0.3 µs time window. In addition, the average integrated EIRP within the frequency band 61.5-64.0 GHz shall not exceed 5 dBm in any 0.3 µs time window. Peak emissions shall not exceed 20 dB above the maximum permitted average emission limit applicable to the equipment under test. The radar bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna.

4.3.2 Test Setup



4.3.3 Test Instruments

Same as Item 4.1.2.

4.3.4 Test Procedures

Method of measurement: Refer as ANSI C63.10-2020 clause 9.8 and Annex C.

4.3.5 Deviation from Test Standard

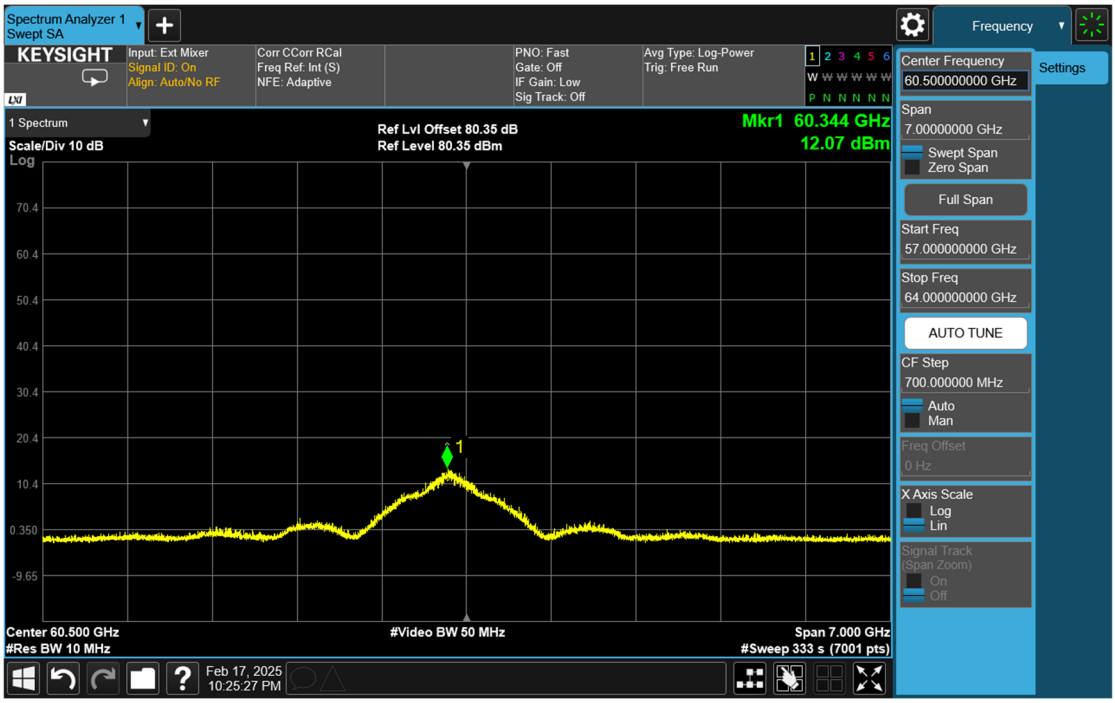
No deviation.

4.3.6 EUT Operating Conditions

Same as 4.1.6.

4.3.7 Test Results

Max Peak EIRP (dBm)	Peak EIRP Limit (dBm)	Result
12.07	33	Pass



Spectrum Analyzer

Frequency (F) (MHz)	Ant Gain (dBi)	VDI Conversion loss	d (m)	Desensitization Factor (dB)	Free space loss (dB)	Ref Lvl Offset (dB)
60500	21.4	13.42	0.4	28.16	60.17	80.35

Note 1: Ref Lvl Offset =Free Space loss-Ant. Gain+ Cable Loss+ Desensitization Factor
Note 2: The Mixer conversion loss has been offset in mixer mode of spectrum analyser.
Note 3: The Free-space propagation path loss is determind from Equation(G.9) of Annex G in ANSI C63.10
=20log(F) + 20log (d) - 27.5
Note 4: The far-field boundary is given in ANSI 63.10 as:
R far field = (2 * L^2) /λ
L is the Largest Antenna Dimension of either the EUT antenna or measurement antenna, including the reflector
λ is the wavelength

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field)
60.5	0.0075828	0.00496	0.023

The Desensitization factor:

Start Frequency (GHz)	Stop Frequency (GHz)	Chirp Width (MHz)	Chirp Time (ns)	RBW (MHz)	Desensitization factor (dB)
57	64	7000	2.48	10	-28.16

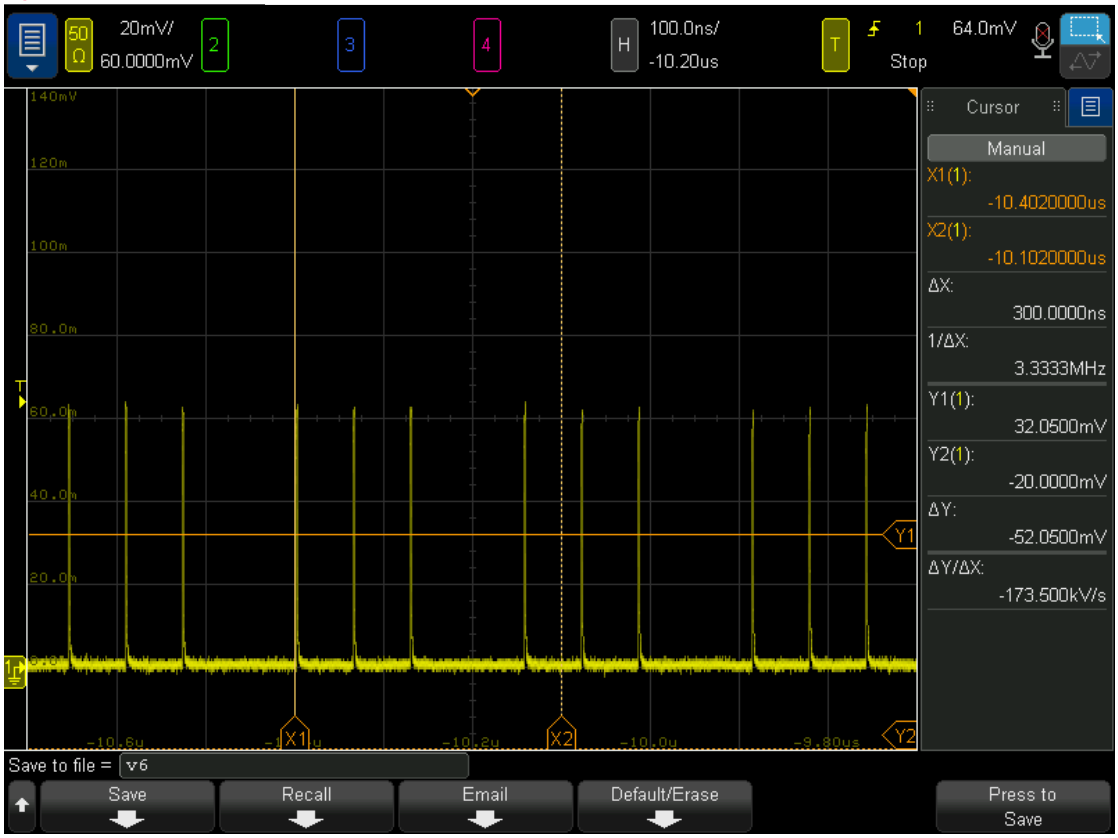
$\alpha_L(dB) = 20\log(\tau \times PRF)$

Measurement	EUT	Limit
Maximum Pulse Duration	2.5 ns	6 ns
Duty factor within 0.3 μs time window	2.5%	10%
Averaged integrated E.I.R.P withins 61.5-64 GHz within 0.3us	-10.41 dBm	5 dBm
Average EIRP	-4.33 dBm	13 dBm

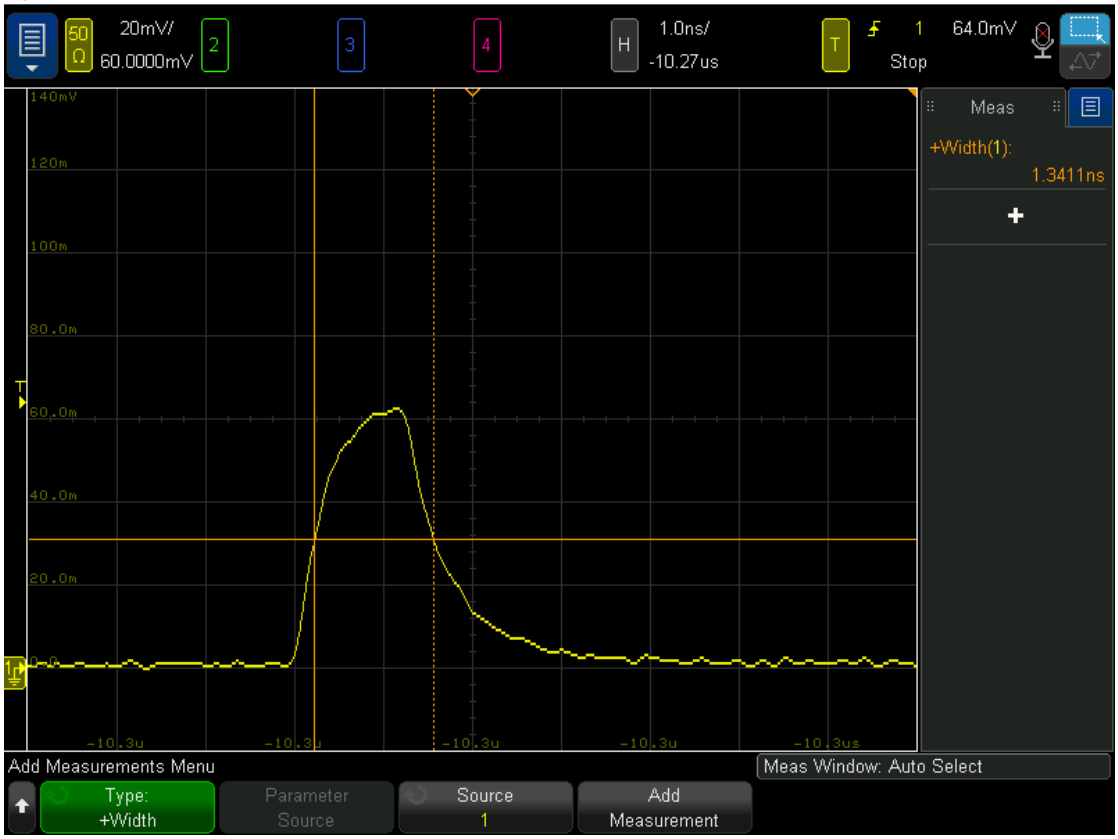
Determination of the short pulse duration:

Measurement	EUT	Limit
Maximum Pulse Duration	1.3 ns	6 ns
Duty factor within 0.3 μs time window	1.7%	10%

Determination of maximum number of pulses within 0.3μs: Worst case of 4 pulses



Determination of pulse duration of one of the 4 pulses: 1.3ns

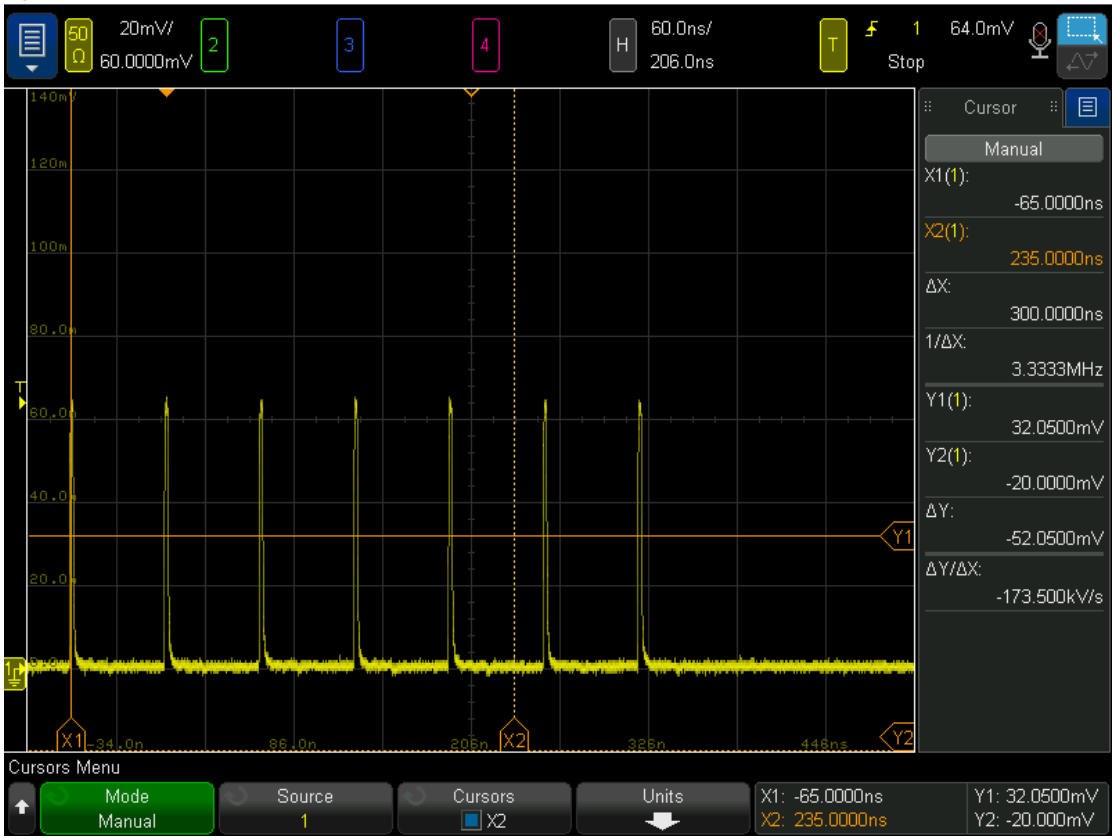


Result:
Duty factor within 300 ns(0.3us):4x 1.3ns/300ns = 1.7%

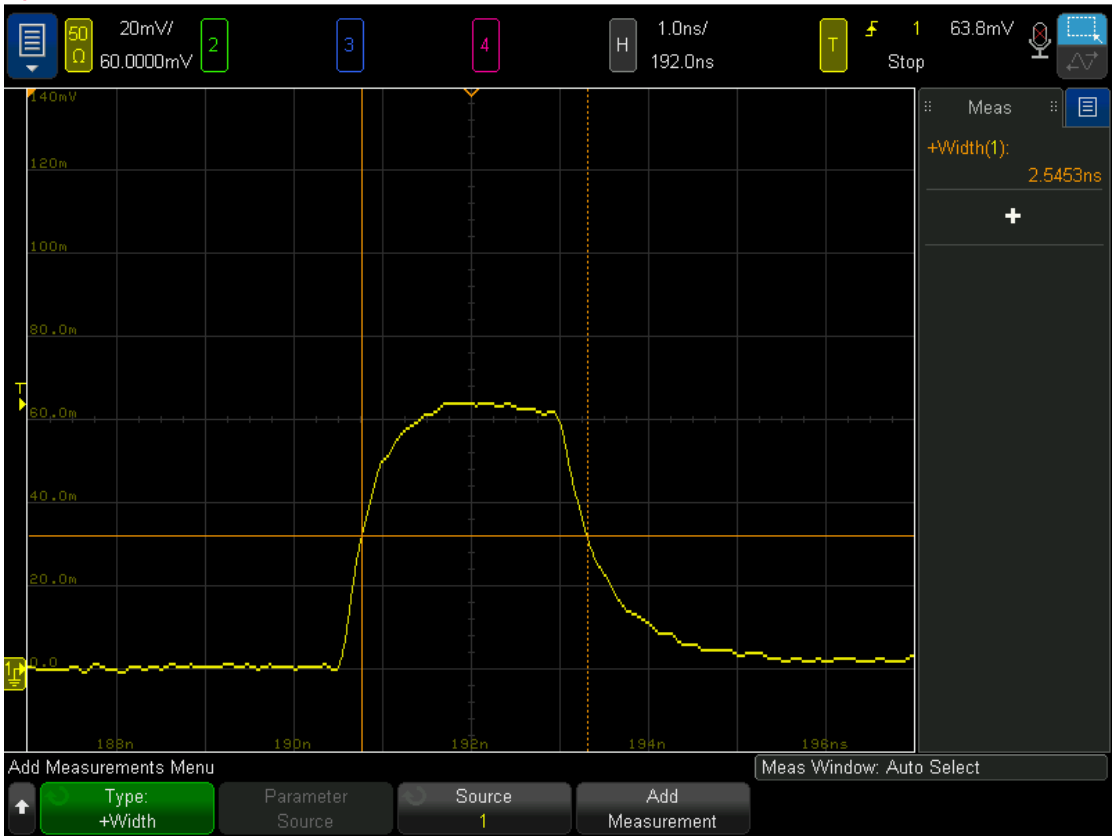
Determination of the longest pulse duration:

Measurement	EUT	Limit
Maximum Pulse Duration	2.5 ns	6 ns
Duty factor within 0.3 μs time window	2.5%	10%

Determination of the long pulses within 0.3μs



Determination of the long pulses duration of one of the 5 pulses: 2.5 ns



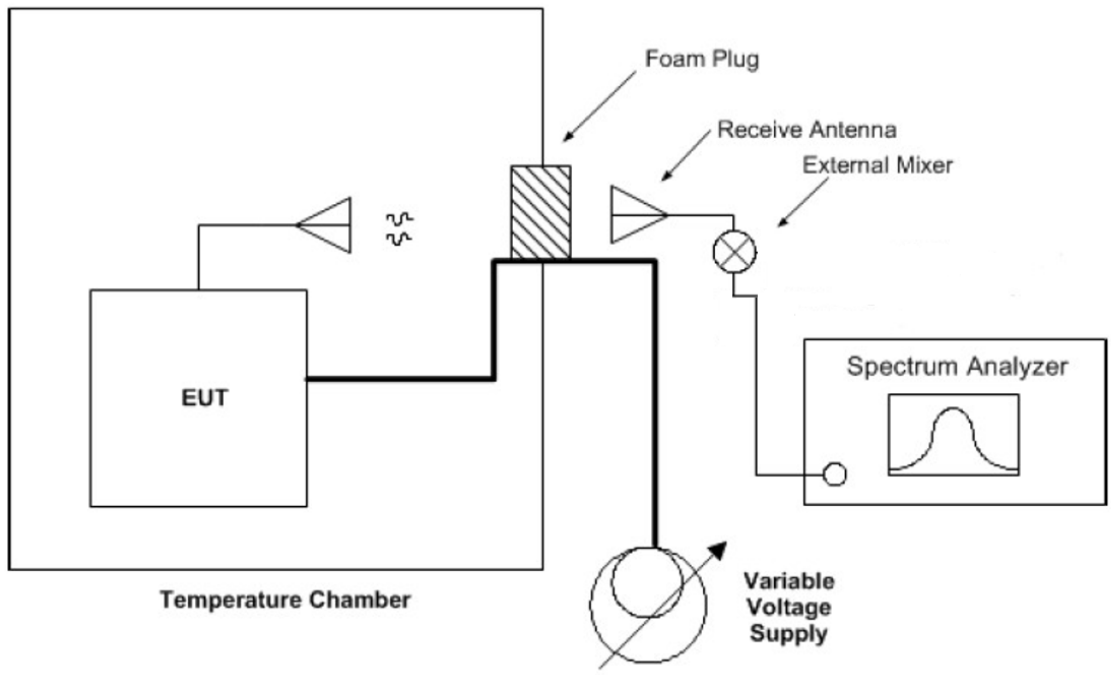
Result:
Duty factor within 300 ns(0.3us):5x2.5 ns/300 ns = 2.5%

4.4 Frequency Stability Measurement

4.4.1 Limits of Frequency Stability Measurement

15.255(f) Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation.

4.4.2 Test Setup



4.4.3 Test Instruments

Same as Item 4.2.3.

4.4.4 Test Procedure

a. Arrange EUT and test equipment as above setup configuration.

b. With the EUT at ambient temperature and voltage source set to the EUT nominal operating voltage (100%), record the spectrum mask of the EUT emission on the spectrum analyzer.

c. Vary EUT power supply between 85% and 115% of nominal, and record the frequency excursion of the EUT emission mask.

d. Set the power supply to 100% nominal setting, and raise EUT operating temperature to 50 °C.

e. Record the frequency excursion of the EUT emission mask.

f. Repeat step d) at each 10 °C increment down to −20 °C

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Condition

Same as 4.1.6.

4.4.7 Test Results

Frequency Stability Versus Temperature													
Operating Frequency: 60500MHz													
Temp. (℃)	Power Supply (Vdc)	0 Minute			2 Minutes			5 Minutes			10 Minutes		
		Measured Frequency (MHz)		Test Result	Measured Frequency (MHz)		Test Result	Measured Frequency (MHz)		Test Result	Measured Frequency (MHz)		Test Result
		FL	FH		FL	FH		FL	FH		FL	FH	
50	13.5	59.93892	61.06092	Pass	59.93891	61.06091	Pass	59.93893	61.06093	Pass	59.93892	61.06092	Pass
40	13.5	59.93876	61.06076	Pass	59.93877	61.06077	Pass	59.93875	61.06075	Pass	59.93875	61.06075	Pass
30	13.5	59.93932	61.06132	Pass	59.93929	61.06129	Pass	59.93931	61.06131	Pass	59.93933	61.06133	Pass
20	13.5	59.93884	61.06084	Pass	59.93880	61.06080	Pass	59.93885	61.06085	Pass	59.93885	61.06085	Pass
10	13.5	59.93898	61.06098	Pass	59.93898	61.06098	Pass	59.93897	61.06097	Pass	59.93899	61.06099	Pass
0	13.5	59.93895	61.06095	Pass	59.93892	61.06092	Pass	59.93895	61.06095	Pass	59.93895	61.06095	Pass
-10	13.5	59.93919	61.06119	Pass	59.93913	61.06113	Pass	59.93915	61.06115	Pass	59.93917	61.06117	Pass
-20	13.5	59.93919	61.06119	Pass	59.93914	61.06114	Pass	59.93914	61.06114	Pass	59.93917	61.06117	Pass

Frequency Stability Versus Voltage													
Operating Frequency: 60500MHz													
Temp. (℃)	Power Supply (Vdc)	0 Minute			2 Minutes			5 Minutes			10 Minutes		
		Measured Frequency (MHz)		Test Result	Measured Frequency (MHz)		Test Result	Measured Frequency (MHz)		Test Result	Measured Frequency (MHz)		Test Result
		FL	FH		FL	FH		FL	FH		FL	FH	
20	15.525	59.93893	61.06093	Pass	59.93895	61.06095	Pass	59.93891	61.06091	Pass	59.93897	61.06097	Pass
	13.5	59.93884	61.06084	Pass	59.93880	61.06080	Pass	59.93885	61.06085	Pass	59.93885	61.06085	Pass
	11.475	59.93889	61.06089	Pass	59.93890	61.06090	Pass	59.93890	61.06090	Pass	59.93889	61.06089	Pass

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
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Email: service.adt@tw.bureauveritas.com
Web Site: http://ee.bureauveritas.com.tw

The address and road map of all our labs can be found in our web site also.

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