Test Report No.:
FCCSZ2023-0025-RF2

RF Test Report

FCC ID	:	**2BD97TK2**
EUT	:	**AI Care Sensor**
MODEL	:	**TK2?*(see section 2.1)**
BRAND NAME	:	**N/A**
APPLICANT	:	**TsingLan Technology (Shenzhen) Co., Ltd**
Classification of Test	:	**N/A**

CVC Testing Technology (Shenzhen) Co., Ltd.

Applicant	**Name : TsingLan Technology (Shenzhen) Co., Ltd** **Address : 602, Block A, Wanhai Building, No. 1031, Nanhai Avenue, Yanshan Communi,Shenzhen,China**
Manufacturer	**Name : TsingLan Technology (Shenzhen) Co., Ltd** **Address : 602, Block A, Wanhai Building, No. 1031, Nanhai Avenue, Yanshan Communi,Shenzhen,China**
Equipment Under Test	**Name :AI Care Sensor** **Model/Type: TK2?*(see section 2.1)** **Trade mark : N/A** **Serial NO.:N/A** **Sampe NO.:3-1**

Date of Receipt.	**2023.12.06**	Date of Testing	**2023.12.06～2024.01.22**

Test Specification	**Test Result**
FCC Part 15, Subpart C (15.255)	PASS

Evaluation of Test Result	The equipment under test was found to comply with the requirements of the standards applied. Seal of CVC **Issue Date: 2024.01.22**

Tested by:	Tested by:	Approved by:
Liang Jiatong	Huang Meng	Dong Sanbi
Name Signature	Name Signature	Name Signature

Other Aspects: NONE.

Abbreviations:OK, Pass= passed Fail = failed N/A= not applicable EUT= equipment, sample(s) under tested

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
FCCSZ2023-0025-RF2	Original release	2024.01.22

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15.255			
STANDARD SECTION	**TEST TYPE AND LIMIT**	**RESULT**	**REMARK**
15.207	AC Power Conducted Emission	PASS	See section 3.1
15.255(d)	Transmitter Spurious Emissions	PASS	See section 3.2
15.215(c)	20dB bandwidth	PASS	See section 3.4
---	Occupied Bandwidth Measurement	Report only	See section 3.4
15.255(c)	Duty cycle, Off Time Requirement	PASS	See section 3.2
15.255(c)	EIRP	PASS	See section 3.5
15.255(f)	Frequency stability	PASS	See section 3.6
15.255(h)	Group Installation	N/A	The test is not applicable since there are no external phase-locking inputs in this EUT

1.1 LIST OF TEST AND MEASUREMENT INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial Number	Cal. interval	Cal. Due
Radiation Spurious(1GHz-40GHz)					/
Signal&Spectrum Analyzer	Rohde&Schwarz	FSV 40	101898	1 year	2024.5.21
EMI Test Receiver	Rohde&Schwarz	ESR3	102693	1 year	2024.5.25
Antenna(30MHz~1001MHz)	SCHWARZBECK	VULB 9168	1133	1 year	2024.2.21
Horn antenna(1GHz-18GHz)	ETS	3117	227611	1 year	2024.3.25
Horn antenna(18GHz-40GHz)	QMS	QMS-00880	22051	1 year	2024.3.25
3m anechoic chamber	MORI	966	CS0300011	3 year	2026.5.18
Filter group(RSE-BT/WiFi)	Rohde&Schwarz	WiFi /BT Variant 1	100820	1 year	2024.5.21
Filter group(RSE-Cellular)	Rohde&Schwarz	Cellular Variant 1	100768	1 year	2024.5.21
Preamplifier(10kHz-1GHz)	Rohde&Schwarz	SCU-01F	100299	1 year	2024.5.21
Preamplifier(1GHz-18GHz)	Rohde&Schwarz	SCU-18F	100799	1 year	2024.5.21
Preamplifier(1GHz-18GHz)	Rohde&Schwarz	SCU-18F	100801	1 year	2024.5.21
Preamplifier(18Gz-40GHz)	Rohde&Schwarz	SCU-40A	101209	1 year	2024.5.21
#2 control room	MORI	433	CS0300028	3 year	2024.5.21
Temperature and humidity meter	/	C193561517	C193561517	1 year	2024.5.21
Radiation Spurious(Below 1GHz)					/
EMI Test Receiver	Rohde&Schwarz	ESR 26	101718	1 year	2024.5.25
Loop antenna（8.3k~30MHz）	Rohde&Schwarz	HFH2-Z2E	100951	1 year	2024.5.26
Antenna(30MHz~1000MHz)	SCHWARZBECK	VULB 9168	1132	1 year	2024.2.14
3m anechoic chamber	MORI	966	CS0200019	3 year	2026.5.18
Attenuator	/	SJ-5dB	607684	1 year	2024.2.21
#1 control room	MORI	433	CS0300028	3 year	2026.5.16
Temperature and humidity meter	/	C193561473	CS0200071	1 year	2024.5.21
Conducted emission					/
EMI Test Receiver	Rohde&Schwarz	ESR3	102694	1 year	2024.5.25
limiter（10 dB）	Rohde&Schwarz	ESH3-Z2	102824	1 year	2024.5.16
Voltage probe	Rohde&Schwarz	CVP9222C	28	1 year	2024.5.16
Current probe	Rohde&Schwarz	EZ-17	101442	1 year	2024.5.21
ISN network	Rohde&Schwarz	ENV 81	100401	1 year	2024.5.16
ISN network	Rohde&Schwarz	ENV 81 Cat6	101896	1 year	2024.5.16
LISN（single-phase ）	Rohde&Schwarz	ENV216	102569	1 year	2024.4.11
#1Shielding room	MORI	854	N/A	3 year	2026.5.16
Radiation Spurious(Above 40GHz)					/
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. interval**	**Cal. Due**
3m anechoic chamber	MORI	966	CS0300011	3 year	2026.5.18
#2 control room	MORI	433	CS0300028	3 year	2024.5.21
Temperature and humidity meter	/	C193561517	C193561517	1 year	2024.5.21
Signal&Spectrum Analyzer	keysight	N9040B	CS0300074	1 year	2024.9.24
SA Expansion Module(40-60GHz)	VDI	N9029AV19	CS0300075	3 year	2025.9.14
SA Expansion Module(60-90GHz)	VDI	N9029AV12	CS0300076	3 year	2025.9.14
SA Expansion Module(90-140GHz)	VDI	N9029AV08	CS0300077	3 year	2025.9.14
SA Expansion Module(140-220GHz)	VDI	N9029AV05	CS0300078	3 year	2025.9.14
SA Expansion Module(220-330GHz)	VDI	N9029AV03	CS0300079	3 year	2025.9.14
Horn antenna(40-60GHz)	CMI	HO19R	CS0300086	3 year	2025.9.14
Horn antenna(60-90GHz)	CMI	HO12R	CS0300088	3 year	2025.9.14
Horn antenna(90-140GHz)	CMI	HO08R	CS0300090	3 year	2025.9.14
Horn antenna(140-220GHz)	CMI	HO05R	CS0300092	3 year	2025.9.14
Horn antenna(220-330GHz)	CMI	HO03R	CS0300094	3 year	2025.9.14

1.2 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 Uncertainty		
No.	**Item**	**Measurement Uncertainty**
1	Occupied Channel Bandwidth	±1.86%
2	Radiated Emissions(30MHz-1GHz)	±5.0dB
3	Radiated Emissions(1GHz-18GHz)	±4.8dB
4	Radiated Emissions(18GHz-40GHz)	±5.1dB
5	Radiated Emissions(40GHz-60GHz)	±4.8dB
6	Radiated Emissions(60GHz-90GHz)	±4.8dB
7	Radiated Emissions(90GHz-140GHz)	±5.0dB
8	Radiated Emissions(140GHz-220GHz)	±5.1dB
9	Radiated Emissions(220GHz-300GHz)	±4.8dB
10	Temperature	±0.73°C
11	Supply voltages	±0.37 %
12	Humidity	±3.9 %
Remark: 95% Confidence Levels, k=2.		

1.3 TEST LOCATION

The tests and measurements refer to this report were performed by EMC testing Lab. of CVC Testing Technology (Shenzhen) Co., Ltd.

Lab Address: No. 1301, Guanguang Road, Xinlan Community, Guanlan Street, Longhua District, Shenzhen City, Guangdong Province 518110 P.R.China
Post Code：518110 Tel：0755-23763060-8805
Fax：0755-23763060 E-mail：sz-kf@cvc.org.cn
FCC(Test firm designation number：CN1363)
IC(Test firm CAB identifier number：CN0137)
CNAS(Test firm designation number：L16091)

2 GENERAL INFORMATION

2.1 GENERAL PRODUCT INFORMATION

PRODUCT	AI Care Sensor
BRAND	N/A
TEST MODEL	HC2?*(Note 4)
ADDITIONAL MODEL	N/A
POWER SUPPLY	AC 100-240V
MODULATIONTECHNOLOGY	FMCW
FREQUENCY RANGE	60.5GHz-62.5GHz
PEAK OUTPUT POWER	10.54dBm (Maximum)
ANTENNA TYPE(Note 4)	Embedded Antennas in the Package with gain 2dBi
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	N/A

Note:

1. For more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
3. EUT photo refer to report (Report NO.: FCCSZ2023-0025-EUT).
4. "?" and "*" are wildcard. "?" and "*" is a single letter from A to Z or a number from 1 to 9, representing different versions.
5. Since the above data and/or information is provided by the client, CVC is not responsible for the authenticity, integrity and results of the data and information and/or the validity of the conclusion.

2.2 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product, according to the specifications of the manufacturers. It must comply with the requirements of the following standards:

FCC PART 15, Subpart C. Section 15.255

KDB 364244 Meas 15.255 Radars DR01-45264
ANSI C63.10-2020
TCBC Workshop(2023.10.25) Part 15.255 Rules Amendment
Keysight Application Note 5952-1039

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

2.3 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.

Support Equipment					
NO	**Description**	**Brand**	**Model No.**	**Serial Number**	**Supplied by**
1	Laptop	Lenovo	K4e-ARE120	MP20kshe	Lab

Support Cable							
NO	**Description**	**Quantity (Number)**	**Length (cm)**	**Detachable (Yes/ No)**	**Shielded (Yes/ No)**	**Cores (Number)**	**Supplied by**

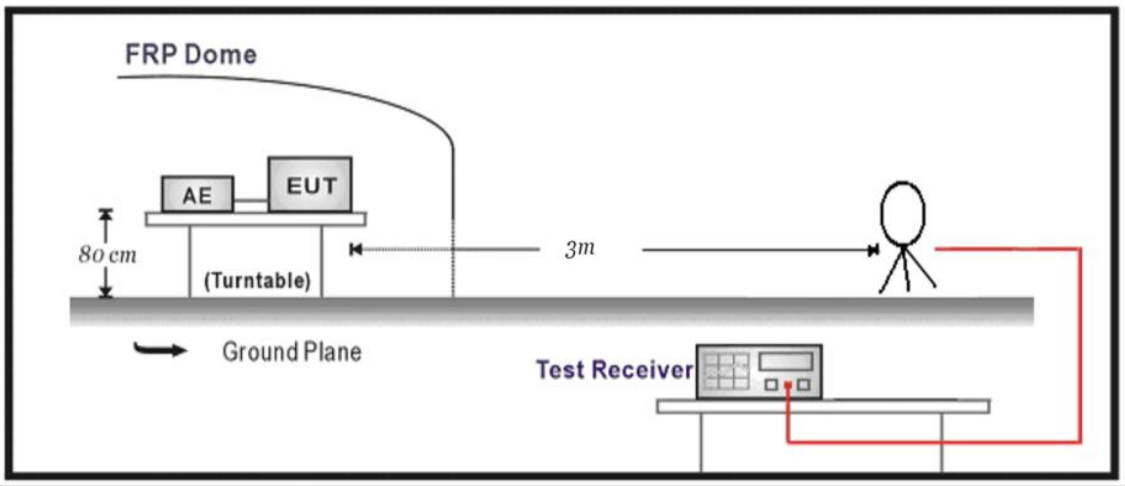
2.4 FAR FIELD CONDITION FOR FREQUENCY ABOVE 18GHZ

The equipment under test was transmitting while connected to its integral antenna and is placed on a turn table.The measurement antenna is in the far field of the EUT per formula $2D^2/\lambda$ where D is the larger between the dimension of the measurement antenna and the transmitting antenna of the EUT. In this case, "D" is the largest dimension of the measurement antenna. The EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer.

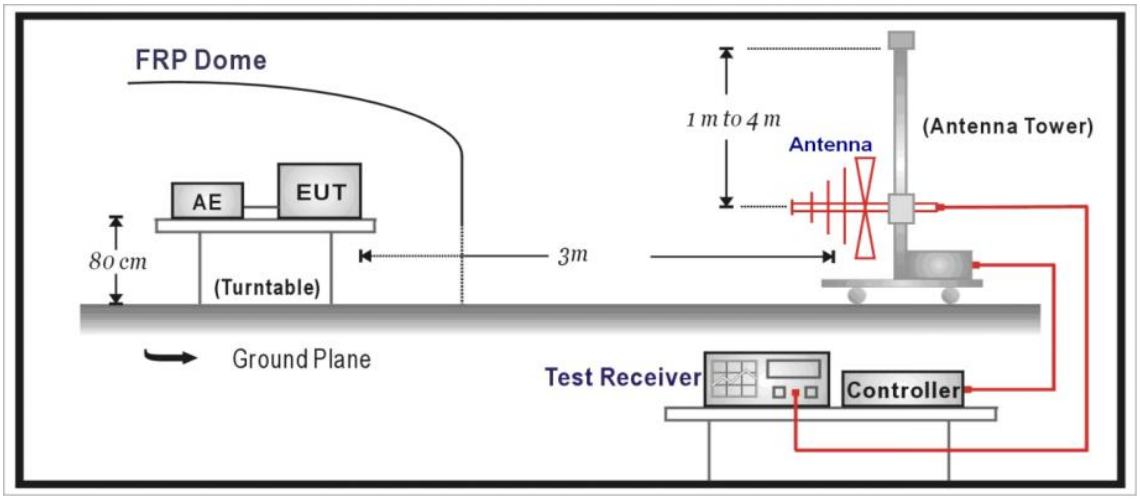
HornAntenna	Frequency (GHz)	Antenna Dimension A(mm)	Wavelength (λ)(m)	Far field R(m)>=$2D^2/\lambda$	Measurement Distance(D)(m)
QMS-00880	18	0.08	0.0167	0.77	3
	40	0.08	0.0075	1.71	
HO19R	40	0.046	0.0075	0.56	1
	60	0.046	0.005	0.85	
HO12R	60	0.03	0.005	0.36	1
	90	0.03	0.0033	0.55	
HO8R	90	0.019	0.0033	0.22	1
	140	0.019	0.0021	0.34	
HO5R	140	0.012	0.0021	0.14	1
	220	0.012	0.0014	0.21	
HO3R	220	0.008	0.0014	0.09	1
	330	0.008	0.0009	0.14	

2.5 RADIATED TEST SETUP

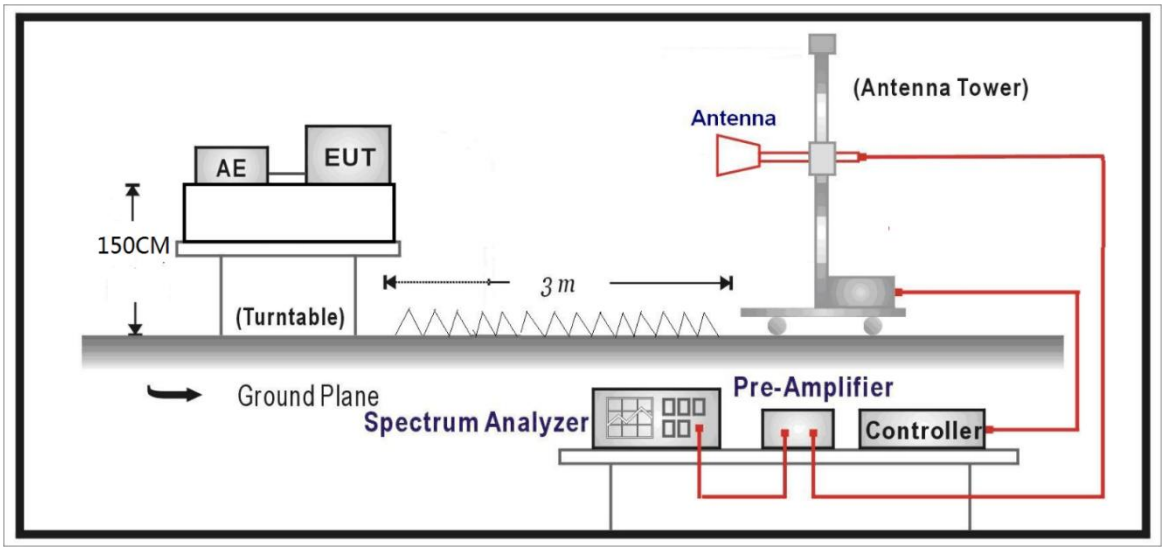
Below 30MHz Test Setup:



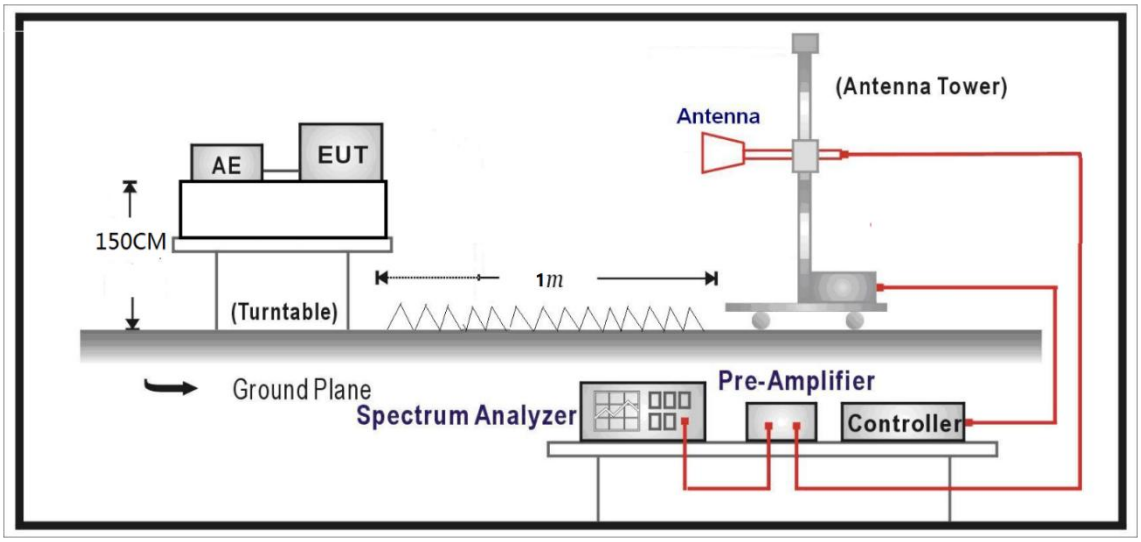
30MHz-1GHz Test Setup:



1GHz -40GHz Test Setup:



Above 40GHz Test Setup:



3 TEST TYPES AND RESULTS

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 Limit

Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46*
0.5 - 5	56	46
5 - 30	60	50
NOTE: 1. The lower limit shall apply at the transition frequencies. NOTE: 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.		

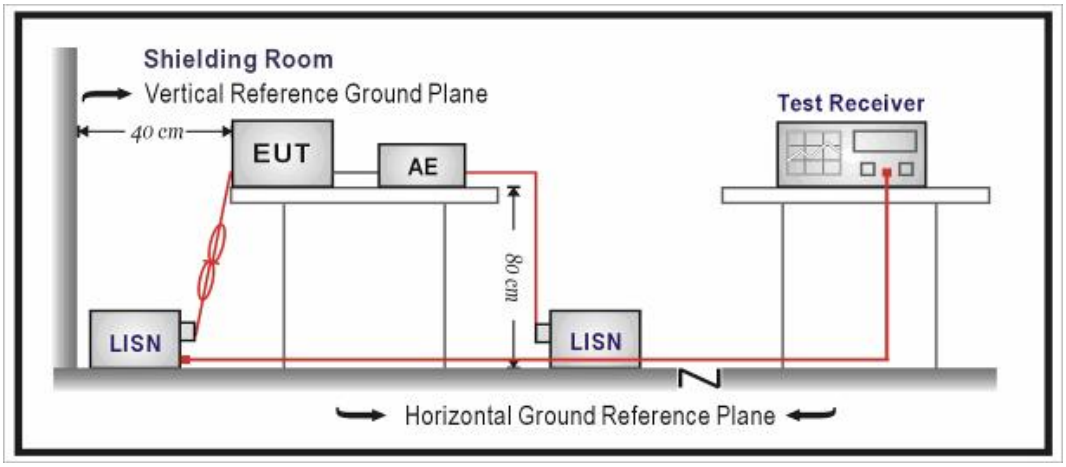
3.1.2 Measurement procedure

a. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the Test photographs) Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.The equipment under test shall be placed on a support of non-metallic material, the height of which shall be1.5m above the ground,

b. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

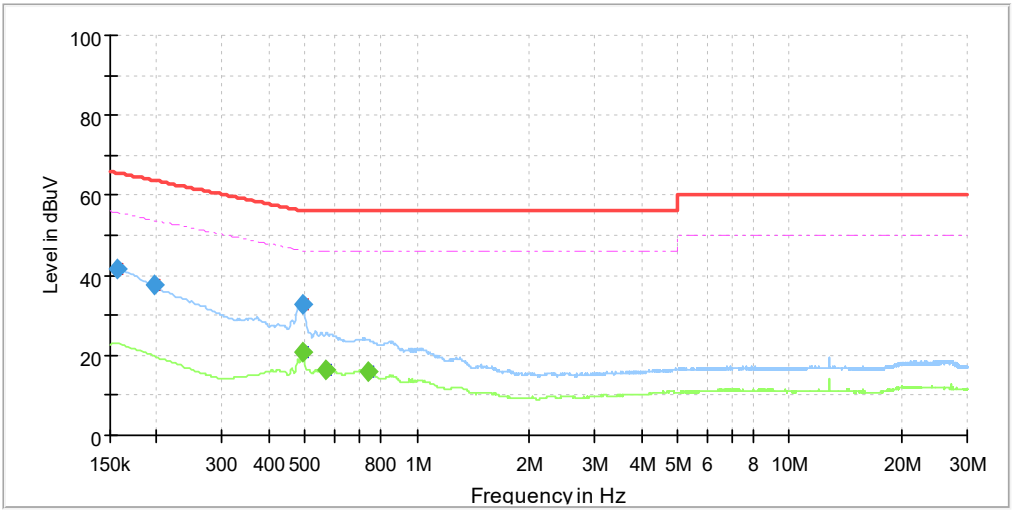
c. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

3.1.3 Test setup



3.1.4 Test results

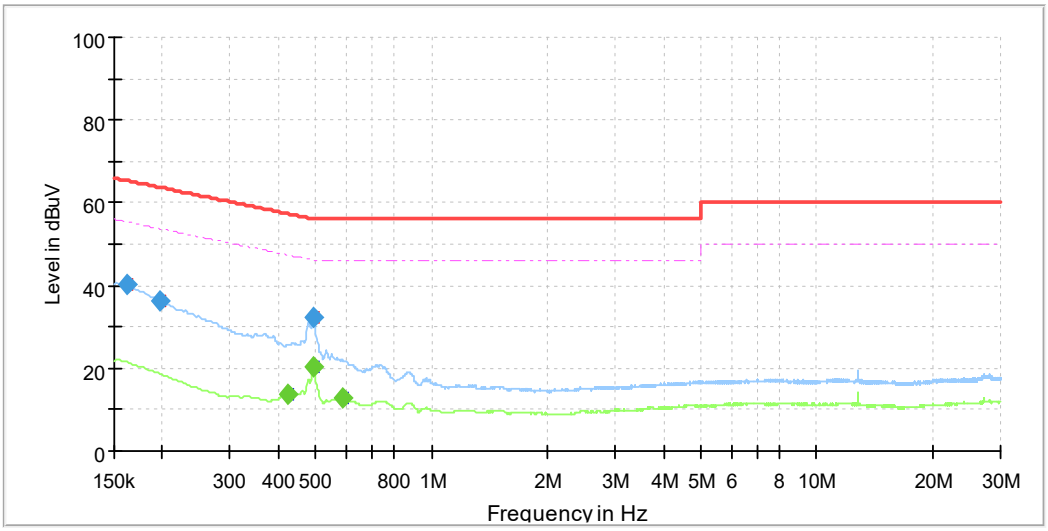
Test Mode	61.5GHz	Frequency Range	150KHz ~ 30MHz
PHASE	Line (L)		



NO	Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr.Factor (dB)
1	0.157	41.8	---	65.6	23.9	L1	19.5
2	0.197	37.4	---	63.7	26.3	L1	19.5
3	0.494	32.7	---	56.1	23.4	L1	19.5
4	0.494	---	20.8	46.1	25.2	L1	19.5
5	0.569	---	16.3	46.0	29.7	L1	19.5
6	0.737	---	16.1	46.0	29.9	L1	19.5

Remark: The emission levels of other frequencies were very low against the limit.

Test Mode	**61.5GHz**	**Frequency Range**	150KHz ~ 30MHz
PHASE	Line (N)		



NO	Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr.Factor (dB)
1	0.161	40.5	---	65.4	24.9	N	19.5
2	0.197	36.1	---	63.7	27.6	N	19.5
3	0.425	---	13.7	47.4	33.7	N	19.4
4	0.494	32.4	---	56.1	23.7	N	19.5
5	0.494	---	20.2	46.1	25.9	N	19.5
6	0.587	---	12.8	46.0	33.2	N	19.5

Remark: The emission levels of other frequencies were very low against the limit.

3.2 TRANSMITTER SPURIOUS EMISSIONS MEASUREMENT

3.2.1 Limit

Below 40 GHz radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90pW/cm2 at a distance of 3 meters.

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.
NOTE: 2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
NOTE: 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.

3.2.2 Measurement procedure

Measurement of harmonic and spurious emissions below 40 GHz

a. The EUT was placed on the top of a rotating table 1.5 meters(above 1GHz) and 0.8 meters(below 1GHz) above the ground at a 3 meters semi-anechoic chamber. 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. For below 1GHz was used bilog antenna, and above 1GHz was used horn antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. For below 30MHz, a loop antenna with its vertical plane is place 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1m above the ground.
g. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using fresh batteries. The turntable was rotated to maximize the emission level.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ⩾ 1/T (Duty cycle < 98%) or 10Hz(Duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.
5. The testing of the EUT was performed on all 3 orthogonal axes; the worst-case test configuration was reported on the file test setup photo.

Measurement of harmonic and spurious emissions above 40 GHz

a. Connect the test antenna covering the appropriate frequency range to a spectrum analyzer via an external mixer.
b. Set spectrum analyzer RBW = 1MHz, VBW = 3MHz, average detector.
c. Maximize all observed emissions. Note the maximum power indicated on the spectrum analyzer. Adjust this reading, if necessary, by the conversion loss of the external mixer used at the frequency under investigation and the external mixer IF cable loss.
d. Calculate the maximum field strength of the emission at the measurement distance
e. Calculate the power density at the distance specified by the limit from the field strength at the distance specified by the limit
f. Repeat the preceding sequence for every emission observed in the frequency band under investigation.

3.2.3 Test setup

See section 2.5 of this report.

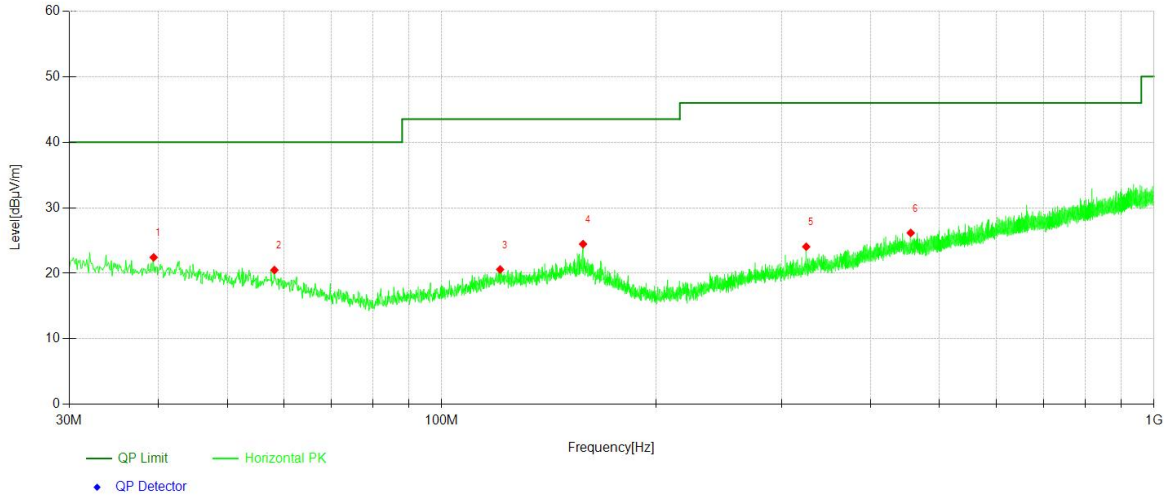
3.2.4 Test results(9kHz-30MHz)

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

3.2.5 Test results(30MHz-1GHz)

BELOW 1GHz WORST-CASE DATA:

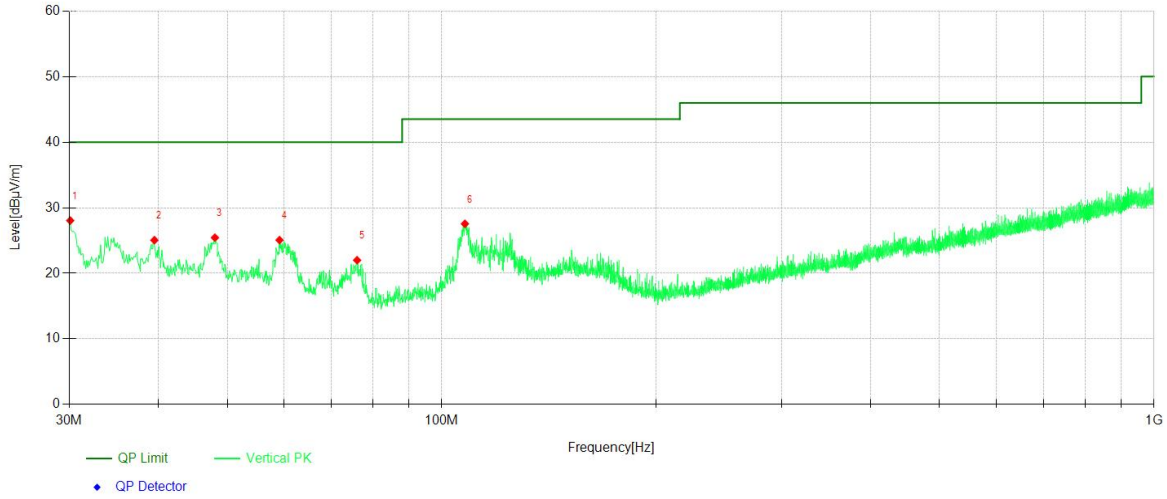
Test Mode:	**61.5GHz**	Frequency Range	30MHz-1000MHz
Detector Function	Quasi-Peak(QP)		



NO.	Freq. [MHz]	Reading [dBµV]	Factor [dB/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39.410	2.11	20.32	22.43	40.00	17.57	300	97	Horizont
2	58.230	1.44	19.06	20.50	40.00	19.50	300	121	Horizont
3	120.801	0.70	19.89	20.59	43.50	22.91	200	191	Horizont
4	157.956	3.41	21.05	24.46	43.50	19.04	200	2	Horizont
5	324.910	2.69	21.37	24.06	46.00	21.94	100	0	Horizont
6	455.485	1.69	24.47	26.16	46.00	19.84	100	247	Horizont

Remark: 1. Level (dBuV/m) = Reading (dBuV) + Factor (dB/m).
2. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. Margin(dB) = Limit[dBµV/m] - Level [dBµV/m]

Test Mode:	**61.5GHz**	Frequency Range	30MHz-1000MHz
Detector Function	Quasi-Peak(QP)		



NO.	Freq. [MHz]	Reading [dBµV]	Factor [dB/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	30.097	7.85	20.20	28.05	40.00	11.95	100	33	Vertical
2	39.507	4.74	20.32	25.06	40.00	14.94	100	327	Vertical
3	48.044	5.68	19.76	25.44	40.00	14.56	100	113	Vertical
4	59.200	6.06	19.01	25.07	40.00	14.93	100	137	Vertical
5	76.080	5.74	16.26	22.00	40.00	18.00	100	360	Vertical
6	107.802	9.28	18.27	27.55	43.50	15.95	100	358	Vertical

Remark: 1. Level (dBuV/m) = Reading (dBuV) + Factor (dB/m).
2. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. Margin(dB) = Limit[dBµV/m] - Level [dBµV/m]

3.2.6 Test results(1GHz-18GHz)

Frequency	61.5GHz	Frequency Range	1-18GHz

Data List								
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	2440.14	37.59	11.09	48.68	54.00	5.32	RMS	Horizontal
2	2458.15	46.69	11.14	57.83	74.00	16.17	PK	Horizontal
3	7199.82	40.52	12.85	53.37	74.00	20.63	PK	Horizontal
4	7199.82	36.20	12.85	49.05	54.00	4.95	RMS	Horizontal
5	15125.02	28.55	19.50	48.05	54.00	5.95	RMS	Horizontal
6	15125.02	33.80	19.50	53.30	74.00	20.70	PK	Horizontal
7	2434.54	46.61	11.01	57.62	74.00	16.38	PK	Vertical
8	2434.74	38.79	11.02	49.81	54.00	4.19	RMS	Vertical
9	7199.82	42.61	12.85	55.46	74.00	18.54	PK	Vertical
10	7199.82	39.15	12.85	52.00	54.00	2.00	RMS	Vertical
11	15125.02	28.58	19.50	48.08	54.00	5.92	RMS	Vertical
12	15125.02	34.18	19.50	53.68	74.00	20.32	PK	Vertical

Remark: 1. The emission levels of other frequencies were greater than 20dB margin.
2. Level (dBuV/m) = Reading (dBuV) + Factor (dB/m).
3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
4. Margin(dB) = Limit(dBuV/m) - Level (dBuV/m)

3.2.7 Test results(18GHz-40GHz)

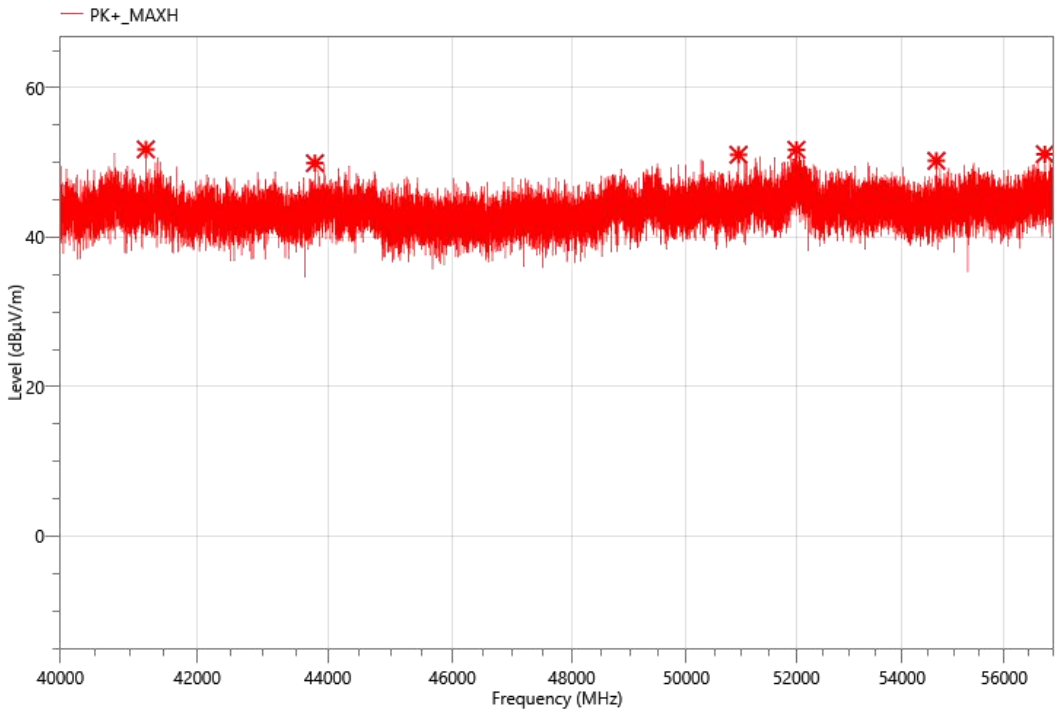
Frequency	61.5GHz	Frequency Range	18-40GHz

Data List								
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	32409.24	37.77	7.54	45.31	54.00	8.69	RMS	Horizontal
2	32631.46	46.24	7.79	54.03	74.00	19.97	PK	Horizontal
3	35623.76	44.21	8.64	52.85	74.00	21.15	PK	Horizontal
4	35634.76	37.11	8.65	45.76	54.00	8.24	RMS	Horizontal
5	38409.24	43.03	10.29	53.32	74.00	20.68	PK	Horizontal
6	39537.95	36.61	10.14	46.75	54.00	7.25	RMS	Horizontal
7	32310.23	45.38	7.55	52.93	74.00	21.07	PK	Vertical
8	32380.64	37.77	7.54	45.31	54.00	8.69	RMS	Vertical
9	35621.56	44.92	8.65	53.57	74.00	20.43	PK	Vertical
10	35674.37	38.02	8.67	46.69	54.00	7.31	RMS	Vertical
11	38349.84	44.83	10.29	55.12	74.00	18.88	PK	Vertical
12	38349.84	36.67	10.29	46.96	54.00	7.04	RMS	Vertical

Remark:1. The emission levels of other frequencies were greater than 20dB margin.
2. Level (dBuV/m) = Reading (dBuV) + Factor (dB/m).
3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
4. Margin(dB) = Limit(dBuV/m) - Level (dBuV/m)

3.2.8 Test results(40GHz-200GHz)

Frequency	61.5GHz	Frequency Range	40-57GHz

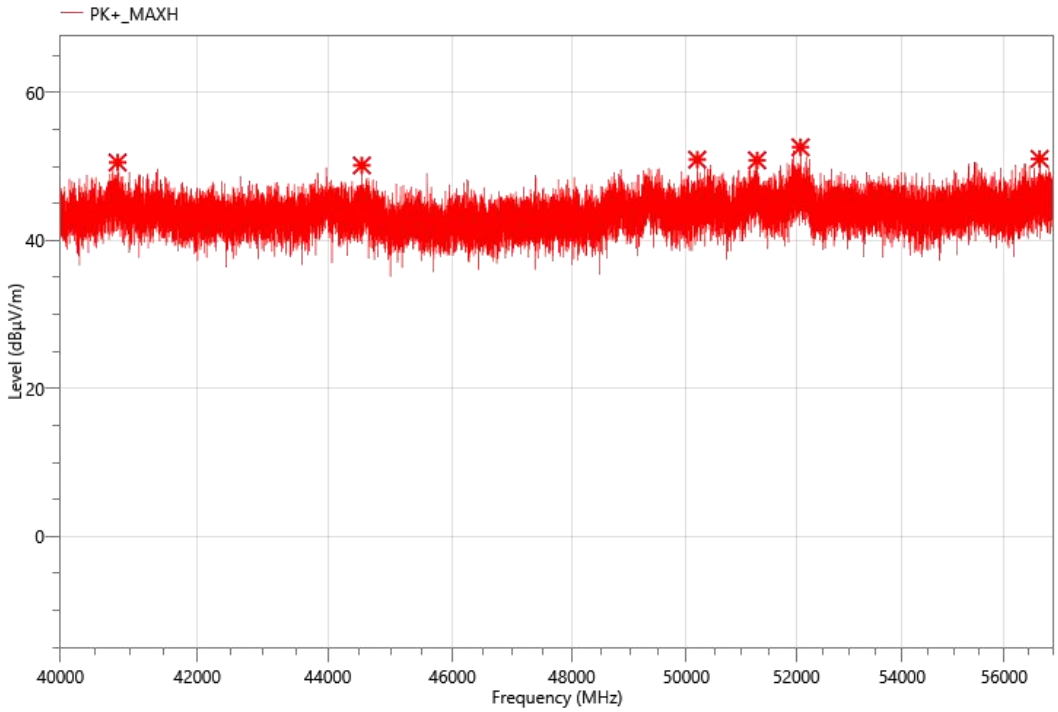


Freq. (MHz)	Reading @1m (dBµV)	Corr. (dB/m)	Meas. @1m (dBµV/m)	Meas. @3m (dBµV/m)	Power Density (pW/cm^2)	Limit (pW/cm2)	Pol.
41236.75	24.72	27.05	51.77	42.23	0.004	90	V
43798.22	22.59	27.34	49.93	40.39	0.003	90	V
50940.35	23.88	27.17	51.05	41.51	0.004	90	V
52003.27	21.47	30.25	51.72	42.18	0.004	90	V
54664.62	23.23	27.01	50.24	40.7	0.003	90	V
56821.07	22.14	28.98	51.12	41.58	0.004	90	V

Note:

1. Meas.@1m(dBµV/m) = Reading@1m(dBµV) + Corr.(dB/m)
2. Corr.(dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) + Mixer Conversion Loss (dB)
3. Meas.@3m = Mea.@1m + 20 * log(1m / 3m)
4. Power Density = $(10^8 / 377) * \{10^{[(\text{Meas. @3m } -120) / 20]}\}^2$

Frequency	**61.5GHz**	**Frequency Range**	40-57GHz

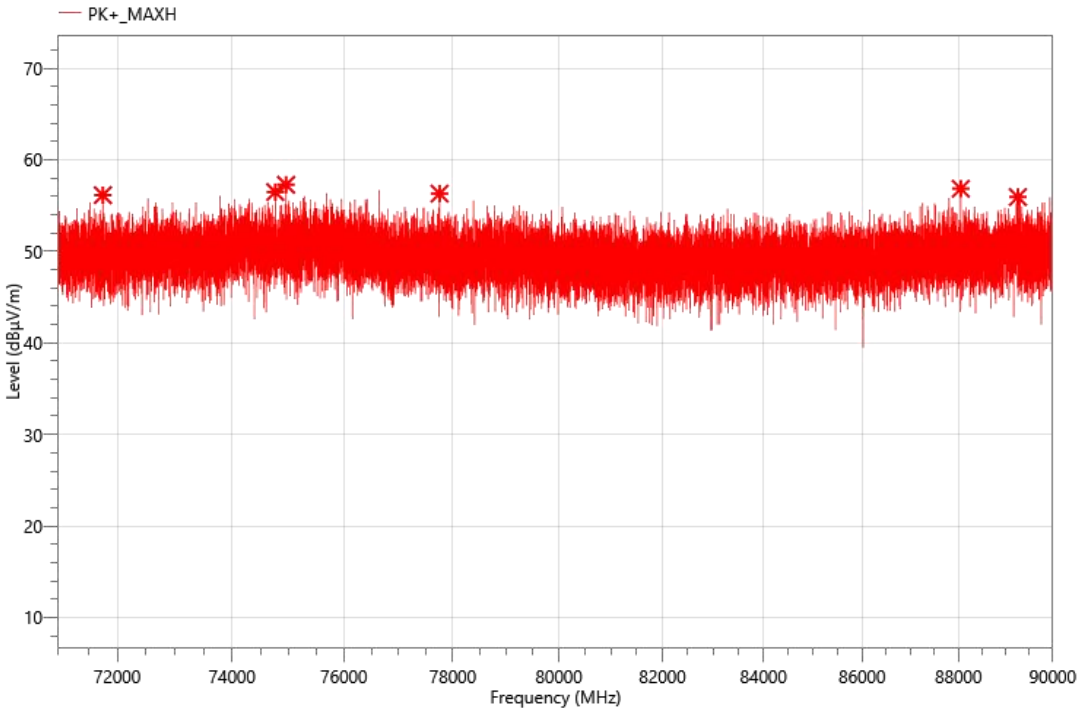


Freq. (MHz)	Reading @1m (dBµV)	Corr. (dB/m)	Meas. @1m (dBµV/m)	Meas. @3m (dBµV/m)	Power Density (pW/cm^2)	Limit (pW/cm2)	Pol.
40822.8	22.48	28.07	50.55	41.01	0.003	90	H
44536.87	22.97	27.18	50.15	40.61	0.003	90	H
50195.75	23.18	27.76	50.94	41.4	0.004	90	H
51278.65	22.57	28.28	50.85	41.31	0.004	90	H
52078.07	22.81	29.8	52.61	43.07	0.005	90	H
56713.55	22.17	28.87	51.04	41.5	0.004	90	H

Note:

1. Meas.@1m(dBµV/m) = Reading@1m(dBµV) + Corr.(dB/m)
2. Corr.(dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) + Mixer Conversion Loss (dB)
3. Meas.@3m = Mea.@1m + 20 * log(1m / 3m)
4. Power Density = $(10^8 / 377) * \{10^{[(\text{Meas. @3m } -120) / 20]}\}^2$

Frequency	**61.5GHz**	**Frequency Range**	64-90GHz

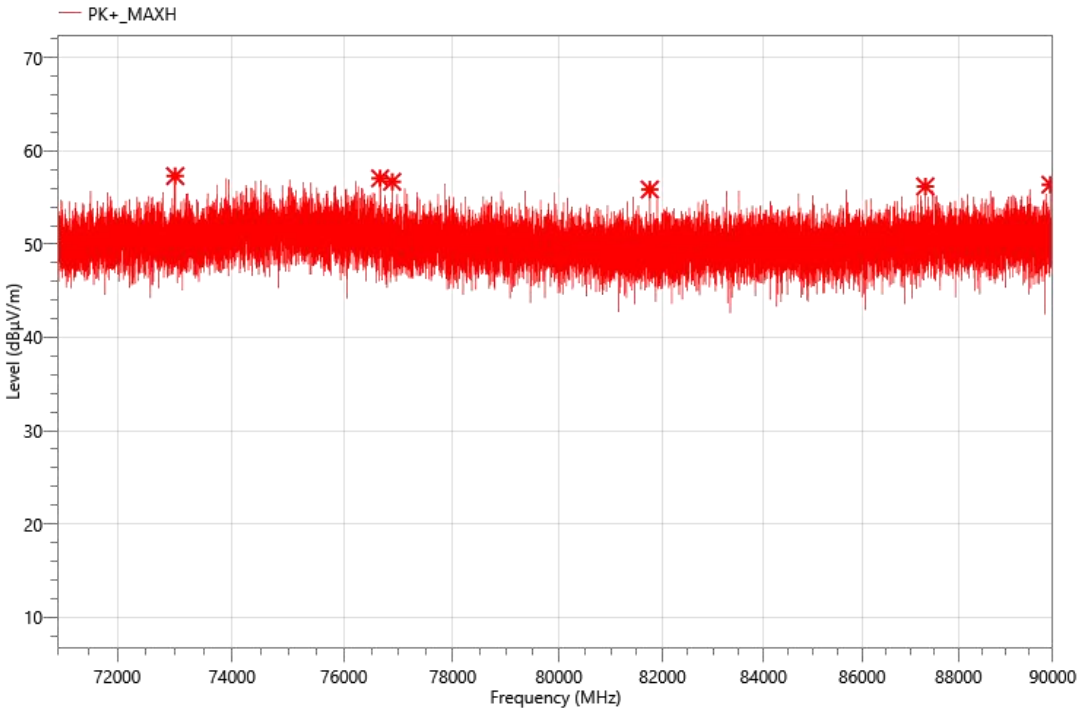


Freq. (MHz)	Reading @1m (dBµV)	Corr. (dB/m)	Meas. @1m (dBµV/m)	Meas. @3m (dBµV/m)	Power Density (pW/cm^2)	Limit (pW/cm2)	Pol.
71753.35	23.23	32.91	56.14	46.6	0.012	90	H
74765.8	22.82	33.66	56.48	46.94	0.013	90	H
74959.12	23.38	33.89	57.27	47.73	0.016	90	H
77754.97	23.07	33.24	56.31	46.77	0.013	90	H
88046.8	22.55	34.29	56.84	47.3	0.014	90	H
89254.25	20.84	35.09	55.93	46.39	0.012	90	H

Note:

1. Meas.@1m(dBµV/m) = Reading@1m(dBµV) + Corr.(dB/m)
2. Corr.(dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) + Mixer Conversion Loss (dB)
3. Meas.@3m = Mea.@1m + 20 * log(1m / 3m)
4. Power Density = $(10^8 / 377) * \{10^{[(\text{Meas. @3m } -120) / 20]}\}^2$

Frequency	**61.5GHz**	**Frequency Range**	64-90GHz

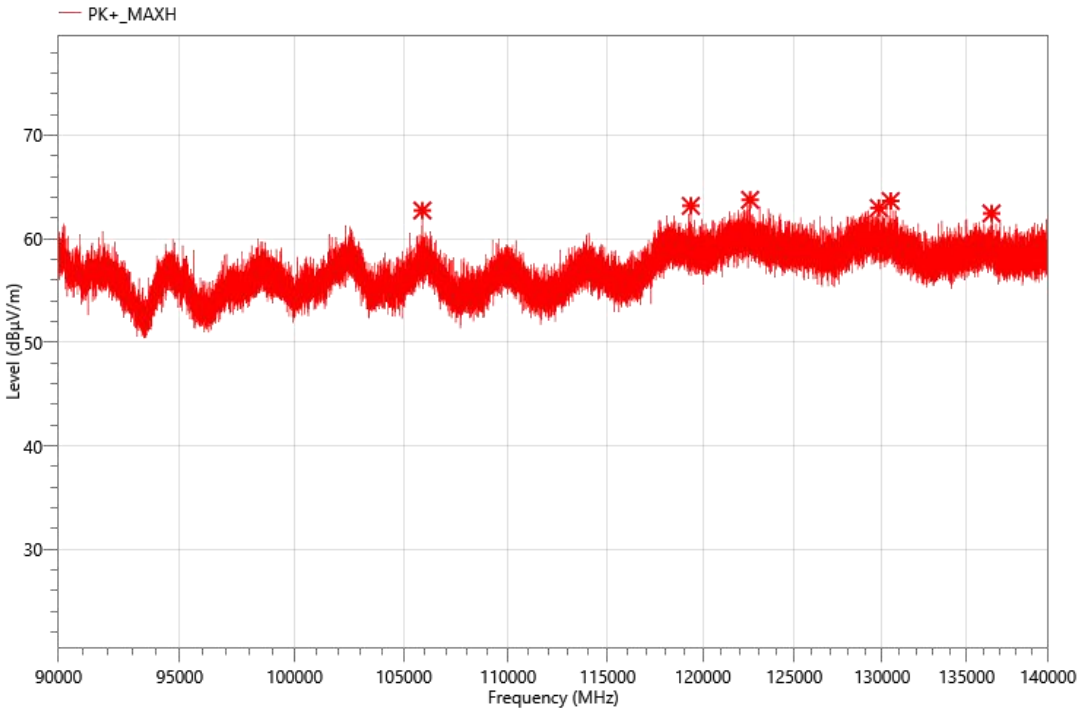


Freq. (MHz)	Reading @1m (dBµV)	Corr. (dB/m)	Meas. @1m (dBµV/m)	Meas. @3m (dBµV/m)	Power Density (pW/cm^2)	Limit (pW/cm2)	Pol.
73002.6	24.04	33.27	57.31	47.77	0.016	90	V
76659.15	23.72	33.35	57.07	47.53	0.015	90	V
76881.92	23.72	32.98	56.7	47.16	0.014	90	V
81752.57	22.85	33.02	55.87	46.33	0.011	90	V
87306.27	22.24	33.96	56.2	46.66	0.012	90	V
89951.07	21.67	34.72	56.39	46.85	0.013	90	V

Note:

1. Meas.@1m(dBµV/m) = Reading@1m(dBµV) + Corr.(dB/m)
2. Corr.(dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) + Mixer Conversion Loss (dB)
3. Meas.@3m = Mea.@1m + 20 * log(1m / 3m)
4. Power Density = $(10^8 / 377) * \{10^{[(\text{Meas. @3m } -120) / 20]}\}^2$

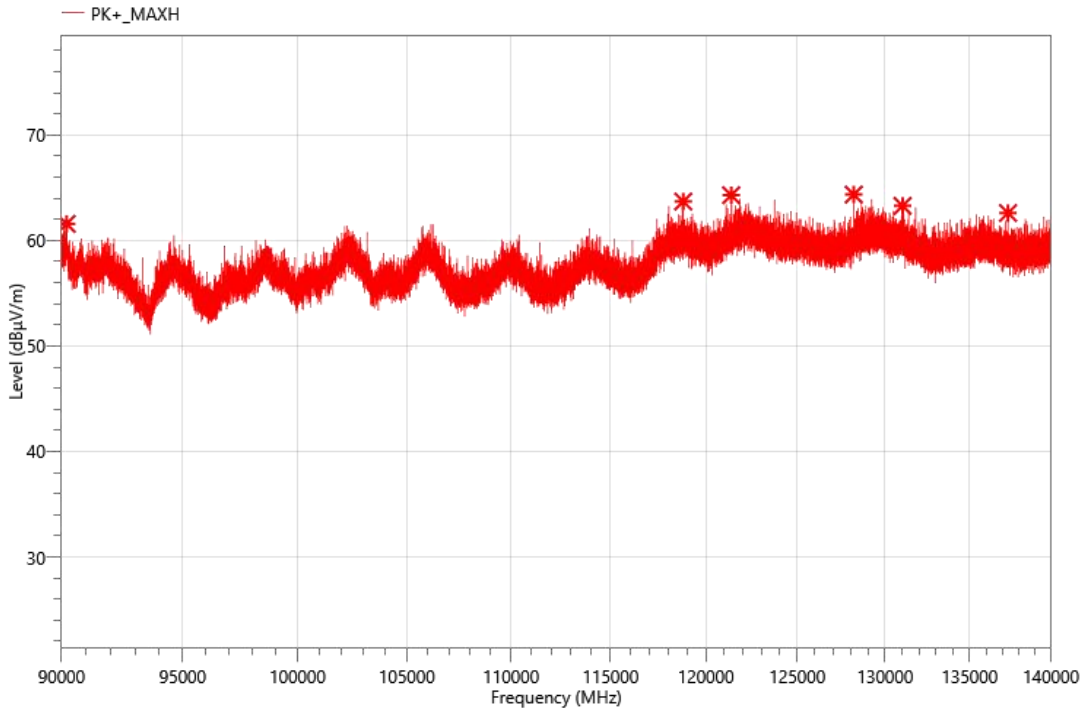
Frequency	**61.5GHz**	**Frequency Range**	90-140GHz



Freq. (MHz)	Reading @1m (dBµV)	Corr. (dB/m)	Meas. @1m (dBµV/m)	Meas. @3m (dBµV/m)	Power Density (pW/cm^2)	Limit (pW/cm2)	Pol.
105877.5	25.73	37	62.73	53.19	0.055	90	H
119361.25	25.17	38.01	63.18	53.64	0.061	90	H
122565	24.93	38.83	63.76	54.22	0.07	90	H
129813.75	23.96	39.01	62.97	53.43	0.058	90	H
130500	24.81	38.84	63.65	54.11	0.068	90	H
136515	23.17	39.28	62.45	52.91	0.052	90	H

Note:
1. Meas.@1m(dBµV/m) = Reading@1m(dBµV) + Corr.(dB/m)
2. Corr.(dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) + Mixer Conversion Loss (dB)
3. Meas.@3m = Mea.@1m + 20 * log(1m / 3m)
4. Power Density = $(10^8 / 377) * \{10^{[(\text{Meas. @3m } -120) / 20]}\}^2$

Frequency	**61.5GHz**	**Frequency Range**	90-140GHz

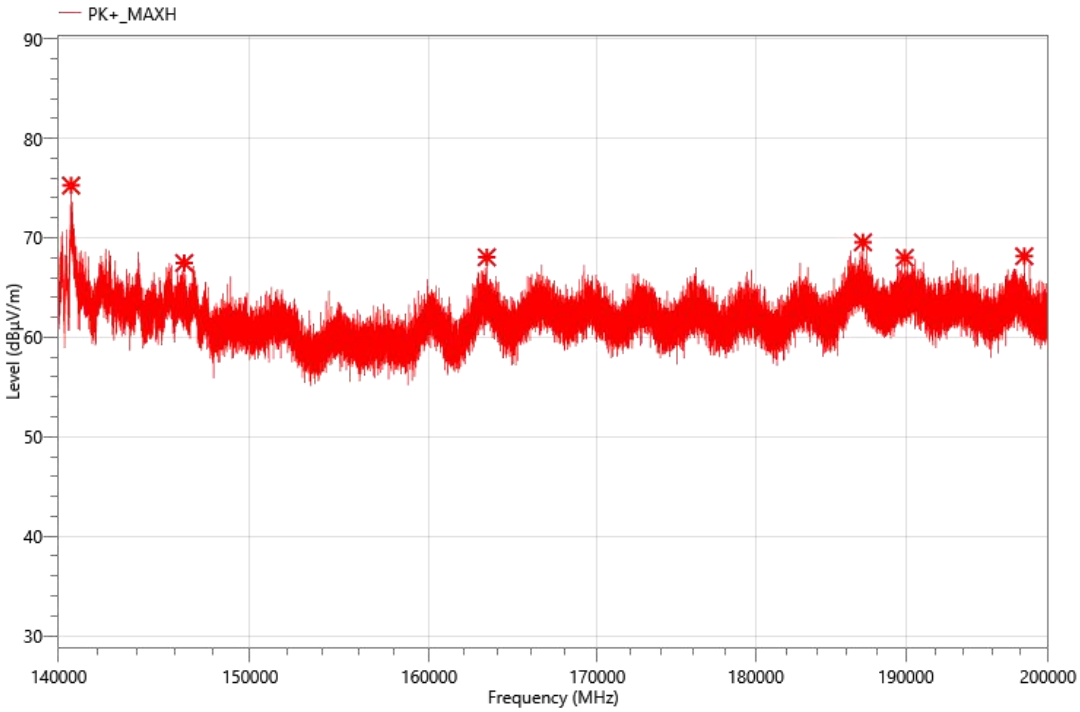


Freq. (MHz)	Reading @1m (dBµV)	Corr. (dB/m)	Meas. @1m (dBµV/m)	Meas. @3m (dBµV/m)	Power Density (pW/cm^2)	Limit (pW/cm2)	Pol.
90202.5	24.49	37.09	61.58	52.04	0.042	90	V
118796.2	25.67	38.03	63.7	54.16	0.069	90	V
121368.7	25.77	38.53	64.3	54.76	0.079	90	V
128193.7	25.83	38.53	64.36	54.82	0.08	90	V
131021.2	24.59	38.7	63.29	53.75	0.063	90	V
137336.2	23.69	38.92	62.61	53.07	0.054	90	V

Note:

1. Meas.@1m(dBµV/m) = Reading@1m(dBµV) + Corr.(dB/m)
2. Corr.(dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) + Mixer Conversion Loss (dB)
3. Meas.@3m = Mea.@1m + 20 * log(1m / 3m)
4. Power Density = $(10^8 / 377) * \{10^{[(\text{Meas. @3m } -120) / 20]}\}^2$

Frequency	**61.5GHz**	**Frequency Range**	140-200GHz

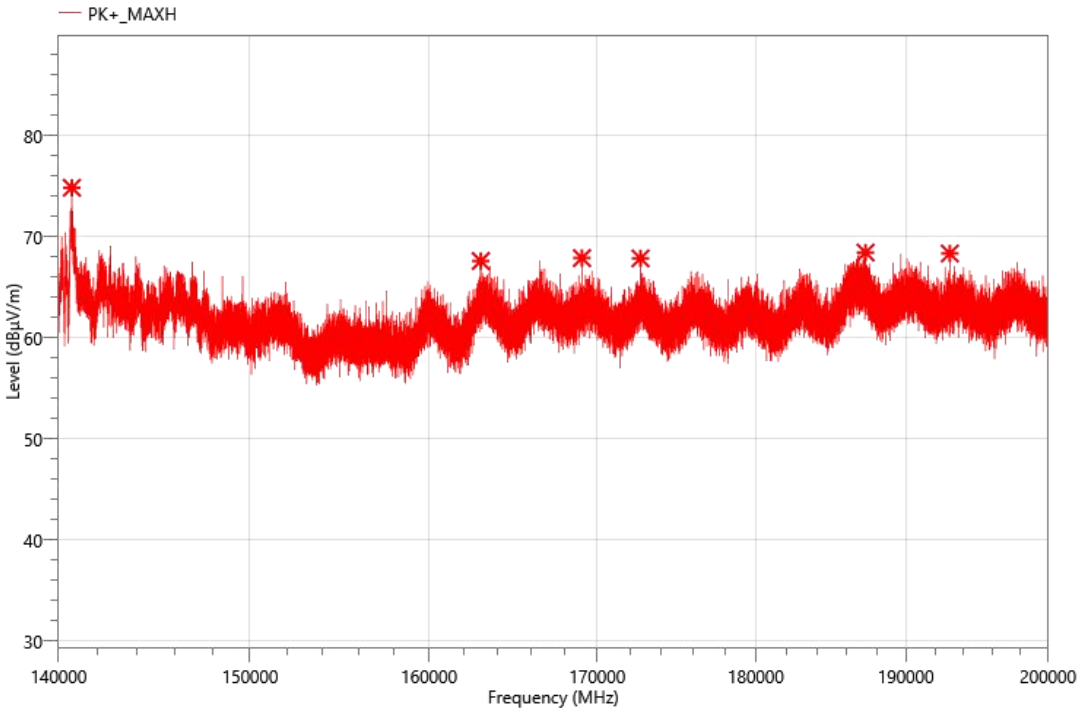


Freq. (MHz)	Reading @1m (dBµV)	Corr. (dB/m)	Meas. @1m (dBµV/m)	Meas. @3m (dBµV/m)	Power Density (pW/cm^2)	Limit (pW/cm2)	Pol.
140631.5	34.88	40.38	75.26	65.72	0.99	90	H
146487.5	27.28	40.19	67.47	57.93	0.165	90	H
163367	26.51	41.54	68.05	58.51	0.188	90	H
187089.5	26.73	42.82	69.55	60.01	0.266	90	H
189932	25.81	42.18	67.99	58.45	0.186	90	H
198293	26.45	41.7	68.15	58.61	0.193	90	H

Note:

1. Meas.@1m(dBµV/m) = Reading@1m(dBµV) + Corr.(dB/m)
2. Corr.(dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) + Mixer Conversion Loss (dB)
3. Meas.@3m = Mea.@1m + 20 * log(1m / 3m)
4. Power Density = $(10^8 / 377) * \{10^{[(\text{Meas. @3m } -120) / 20]}\}^2$

Frequency	**61.5GHz**	**Frequency Range**	140-200GHz



Freq. (MHz)	Reading @1m (dBµV)	Corr. (dB/m)	Meas. @1m (dBµV/m)	Meas. @3m (dBµV/m)	Power Density (pW/cm^2)	Limit (pW/cm2)	Pol.
140672	34.36	40.5	74.86	65.32	0.903	90	V
163014.5	26.39	41.22	67.61	58.07	0.17	90	V
169070	27.07	40.83	67.9	58.36	0.182	90	V
172671.5	26.8	41.07	67.87	58.33	0.181	90	V
187269.5	25.69	42.76	68.45	58.91	0.206	90	V
193043	26.83	41.52	68.35	58.81	0.202	90	V

Note:

1. Meas.@1m(dBµV/m) = Reading@1m(dBµV) + Corr.(dB/m)
2. Corr.(dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) + Mixer Conversion Loss (dB)
3. Meas.@3m = Mea.@1m + 20 * log(1m / 3m)
4. Power Density = $(10^8 / 377) * \{10^{[(\text{Meas. @3m } -120) / 20]}\}^2$

3.3 DUTY CYCLE, OFF TIME REQUIREMENT

3.3.1 Limit

The sum of continuous transmitter off-times of at least two milliseconds shall equal at least 25.5 milliseconds within any contiguous interval of 33 milliseconds, except as specific in paragraph (c)(2)(iii)(B) of this section

3.3.2 Test Procedure

The duty cycle was tested with the spectrum analyzer set to zero-span.

3.3.3 Test setup

See section 2.5 of this report.

3.3.4 Test results

Chirp number in Burst Period(124ms)

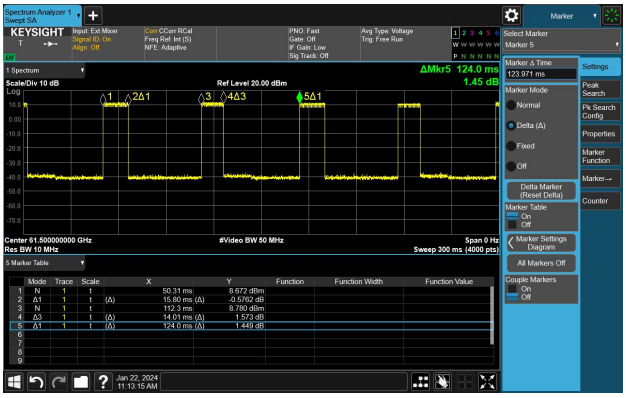
Chirp Width(us)	Chirp period(us)	Chirp number in Burst Period	Burst Period (ms)	TX ON Time (ms)	TX OFF Time (ms)	TX OFF Time Ratio(%)	TX OFF Time Ratio Limit (%)	Verdict
16.13	62.04	481	124	7.76	116.24	93.74	⩾77.27	PASS

Chirp number in Burst Period = 15.80ms/62.04us+14.01/62.04us
Transmission Time = Chirp number in Burst Period * Chirp Width
OFF Time(ms) = Burst Period(ms)-ON Time (ms)
TX OFF Time Ratio = TX OFF Time(ms) /Burst Period(ms)
TX OFF Time Ratio Limit(%) = (25.50ms / 33ms) *100% = 77.27%

Chirp number in 33ms

Chirp Width(us)	Chirp period(us)	Chirp number in Burst Period	Burst Period (ms)	TX ON Time (ms)	TX OFF Time (ms)	TX OFF Limit(ms)	Verdict
16.13	62.04	255	33	4.11	28.89	25.5	PASS

Chirp number in Burst Period = 15.80ms/62.04us
Transmission Time = Chirp number in Burst Period * Chirp Width
OFF Time(ms) = Burst Period(ms)-ON Time (ms)
TX OFF Time Ratio = TX OFF Time(ms) /Burst Period(ms)

Chirp Width	Burst Period
	

3.4 BANDWIDTH MEASUREMENT

3.4.1 Limits

99% Occupied Bandwidth and 6dB Bandwidth are for reporting only.Limit for 20 dB Bandwidth: Per Part15.215(C), the device shall operate in the 57 - 64 GHz band.The emission bandwidth (EBW) is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least the specified amount below the maximum level of the modulated carrier.

3.4.2 Measurement procedure

MEASUREMENT PARAMETER	
Detector:	Peak
Resolution bandwidth:	8 MHz (The analyzer limits maximum RBW at 8 MHz.)
Video bandwidth:	50 MHz
Trace-Mode:	Max Hold
Sweep	Auto couple.

Measurement procedures:Bandwidth: ANSI C63.10-2020 6.9 / 9.3
Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower)

3.4.3 Test setup

See section 2.5 of this report.

3.4.4 Test results

Center Frequency (GHz)	99% Occupied Bandwidth (GHz)	20dB Bandwidth (GHz)	Verdict
61.5	1.9381	2.0285	Pass
99% Occupied Bandwidth Lower(GHz)	**99% Occupied Bandwidth Upper(GHz)**	**Lower limit (GHz)**	**Upper limit (GHz)**
60.55743	62.49555	57	64

99% Occupied Bandwidth & 20dB Bandwidth

3.5 EIRP POWER MEASUREMENT

3.5.1 Limits

The peak EIRP shall not exceed 14 dBm, and the sum of continuous transmitter off-times of at least two milliseconds shall equal at least 25.5 milliseconds within any contiguous interval of 33 milliseconds, except as specific in paragraph (c)(2)(iii)(A) of this section;

3.5.2 Measurement procedure

Test Settings
1. Radiated power measurements are performed using the signal analyzer's swept mode measurement capability for signals with continuous operation.
2. RBW = 1MHz
3. VBW ≥ 3 x RBW
4. Span as required, enough to observe the fundamental spike around 61.5 GHz
5. No. of sweep points ≥ 2 x span / RBW
6. Detector and Trace mode = Suitable for peak and average measurements respectively over 100 sweeps
7. The trace was allowed to stabilize

Method of measurement:
Refer as TCBC Workshop(2023.10.25) Part 15.255 Rules Amendment

FMCW desensitization factor:
Desensitization factor and sweep time considerations for measurements of FMCW signals in ANSI C63.10-2020 Annex L
The derivation of the FMCW desensitization factor is given in Keysight Application Note 5952-1039 Appendix B.

3.5.3 Test setup

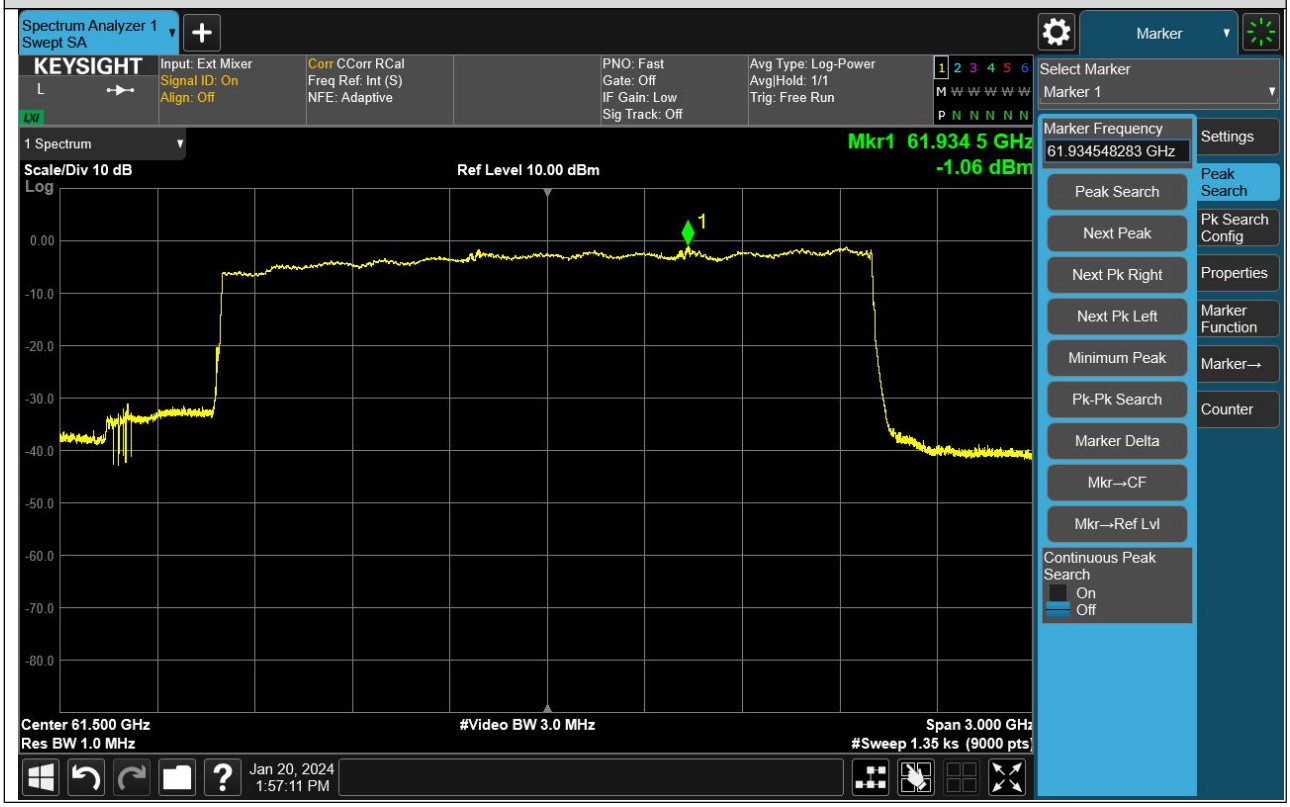
See section 2.5 of this report.

3.5.4 Test results

Item	Level (dBm)	desensitization factor (dB)	Result (dBm)	Peak EIRP Limit(dBm)	Marin(dB)	Verdict
Peak EIRP	-1.06	11.6	10.54	14	3.46	PASS

Level(dBm) = Mixer Loss(dB) + Cable Loss(dB) + FSPL(dB) - Antenna Gain(dBi) + reading(dBm)
Result(dBm) = desensitization factor (dB) + Level(dBm)

Peak EIRP



FMCW desensitization factor =-20 * Log(α) =-20 * log(0.2629) = 11.60dB

$$\alpha = \frac{1}{\sqrt[4]{1+\left(\frac{2\ln(2)}{\pi}\right)^2\left(\frac{F_s}{T_s B^2}\right)^2}}$$

F_s = Sweep width = 2028.5MHz

T_s = Sweep time = 62.04us

B = 3 dB IF bandwidth = 1MHz

3.6 FREQUENCY STABILITY

3.6.1 Description of Frequency Stability Measurement

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency range, 57GHz – 64GHz.

3.6.2 Measurement Procedure

Method of measurement: Refer as ANSI C63.10-2020 clause 9.5

3.6.3 Test setup

See section 2.5 of this report.

3.6.4 Test results

FREQUENCY STABILITY					
Temperature (°C)	Voltage (Volt)	FL (GHz)	FH (GHz)	Limit (GHz)	Result
50	Normal Voltage	60.4940	62.5225	57-64GHz	PASS
40		60.4942	62.5240		
30		60.4958	62.5234		
20		60.4936	62.5237		
10		60.4940	62.5209		
0		60.4943	62.5220		
-10		60.4943	62.5217		
-20		60.4923	62.5242		
-30		60.4923	62.5223		
20	115%	60.4946	62.5205		
20	85%	60.4938	62.5231		

4 PHOTOGRAPHS OF TEST SETUP

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

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5 PHOTOGRAPHS OF THE EUT

Please refer to the attached file (External Photos report and Internal Photos).

------ End of the Report ------

Important

(1) The test report is valid without the official stamp of CVC;

(2) Any part photocopies of the test report are forbidden without the written permission from CVC;

(3) The test report is invalid without the signatures of Approval and Reviewer;

(4) The test report is invalid if altered;

(5) Objections to the test report must be submitted to CVC within 15 days.

(6) Generally, commission test is responsible for the tested samples only.

(7) As for the test result “-” or “N” means “not applicable”, “/” means “not test”, “P” means “pass” and “F” means “fail”

The test data and test results given in this test report should only be used for purposes of scientific research, teaching and internal quality control when the CMA symbol is not presented.

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