

5.6 Number of hopping Frequency

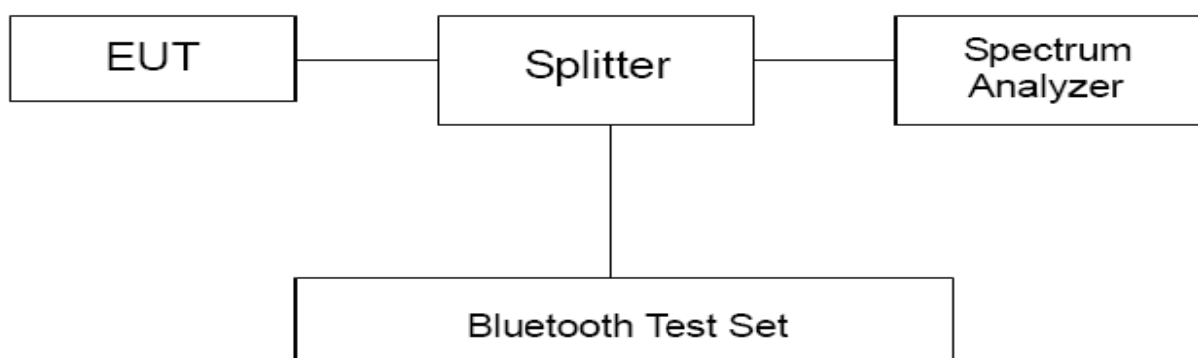
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer and Bluetooth test set via a power splitter with a known loss. RBW is set to 100kHz and VBW is set to 300kHz on spectrum analyzer. Set EUT on Hopping on mode.

Test setup



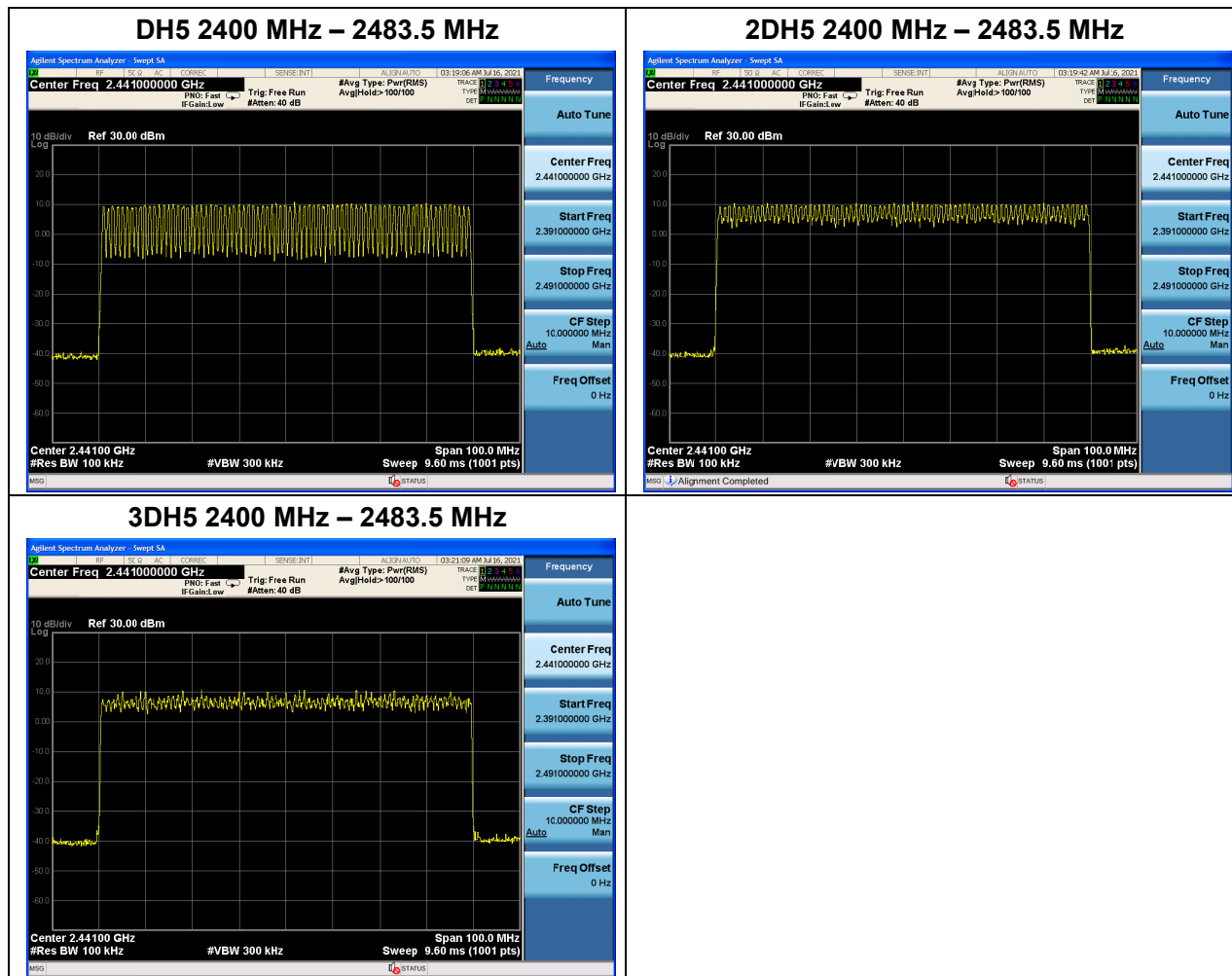
Limits

Rule Part 15.247(a) (1) (iii) specifies that "Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels."

Limits	≥ 15 channels
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Test Results:

Test Mode		Number of hopping channels	conclusion
BT	DH5	79	PASS
	2DH5	79	PASS
	3DH5	79	PASS



5.7 Spurious RF Conducted Emissions

Ambient condition

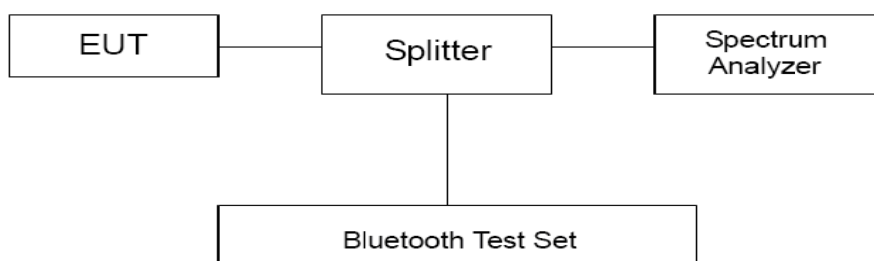
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer and Bluetooth test set via a power splitter with a known loss. The spectrum analyzer scans from 30MHz to the 10th harmonic of the carrier. The peak detector is used. Set RBW 100kHz and VBW 300 kHz, Sweep is set to ATUO.

The test is in transmitting mode.

Test setup



Limits

Rule Part 15.247(d) pacifies that “In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.”

Test Mode	Carrier frequency (MHz)	Reference value (dBm)	Limit
DH5	2402	3.69	-16.31
	2441	3.39	-16.61
	2480	3.27	-16.73
2DH5	2402	2.25	-17.75
	2441	2.31	-17.69
	2480	4.03	-15.97
3DH5	2402	4.93	-15.07
	2441	6.78	-13.22
	2480	4.58	-15.42

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

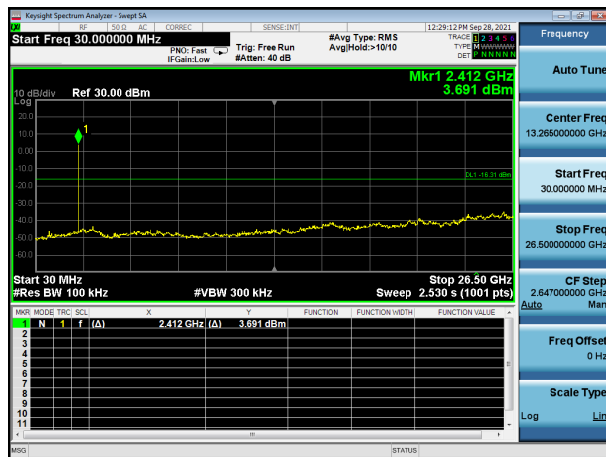
Frequency	Uncertainty
100kHz-2GHz	0.684 dB
2GHz-26GHz	1.407 dB



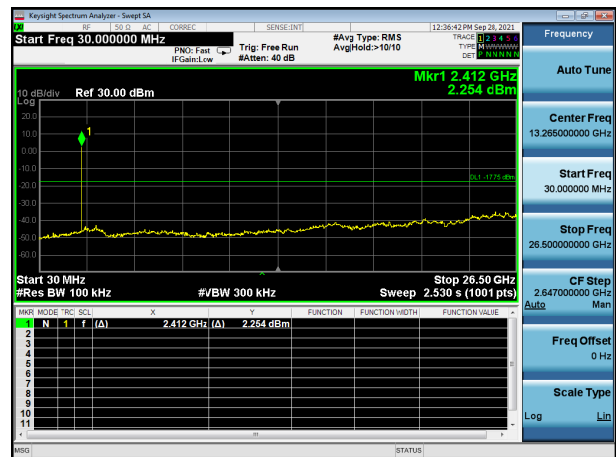
Test Results:

The signal beyond the limit is carrier.

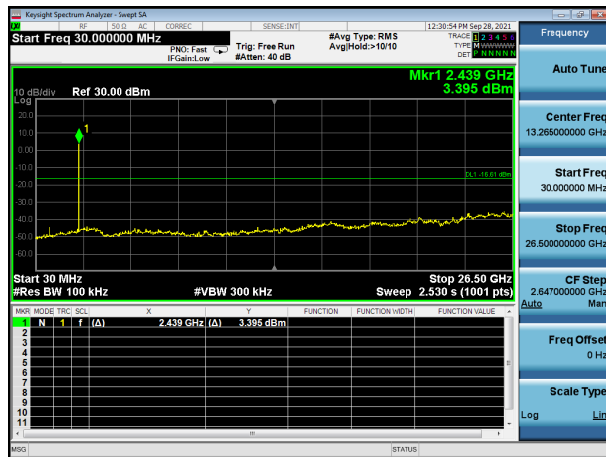
DH5-CH0 30MHz to 26.5GHz



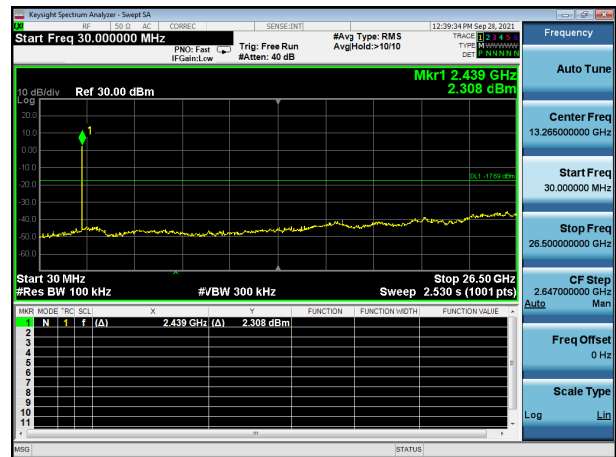
2DH5-CH0 30MHz to 26.5GHz



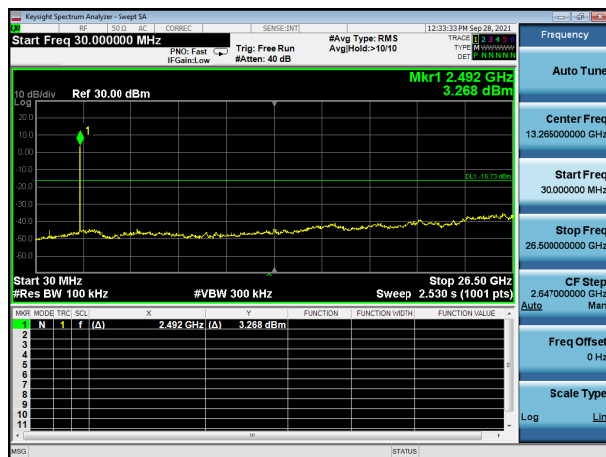
DH5-CH39 30MHz to 26.5GHz



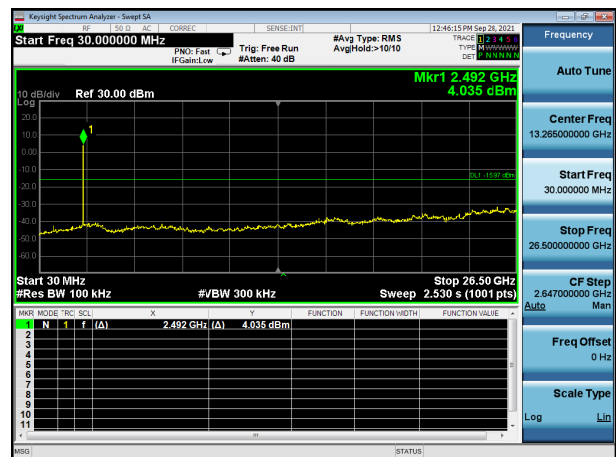
2DH5-CH39 30MHz to 26.5GHz



DH5-CH78 30MHz to 26.5GHz

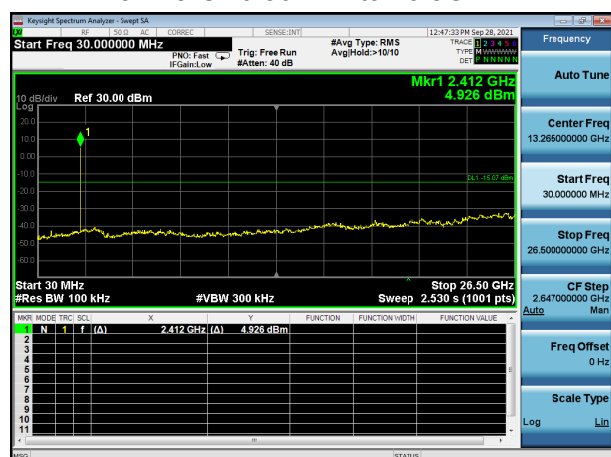


2DH5-CH78 30MHz to 26.5GHz

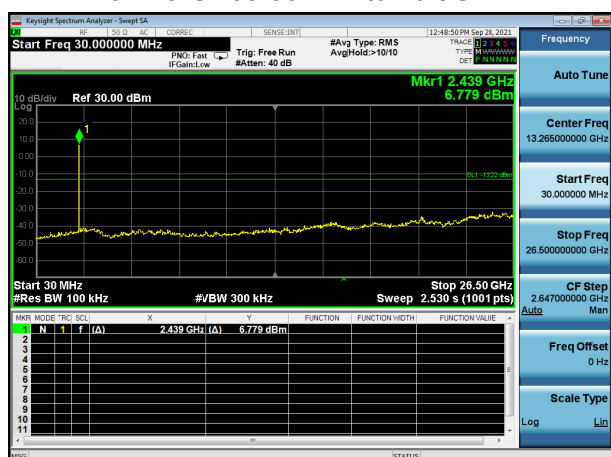




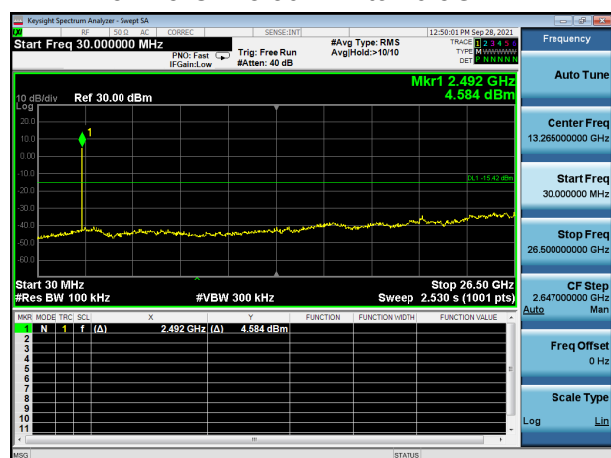
3DH5-CH0 30MHz to 26.5GHz



3DH5-CH39 30MHz to 26.5GHz



3DH5-CH78 30MHz to 26.5GHz



5.8 Unwanted Emission

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The test set-up was made in accordance to the general provisions of ANSI C63.10. The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The radiated emissions measurements were made in a typical installation configuration.

Sweep the whole frequency band through the range from 9 kHz to the 10th harmonic of the carrier, and the emissions less than 20 dB below the permissible value are reported.

During the test, below 30MHz, the center of the loop shall be 1 meters; above 30MHz, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.

Set the spectrum analyzer in the following:

9kHz~150 kHz

RBW=200Hz, VBW=1kHz/ Sweep=AUTO

150 kHz~30MHz

RBW=9KHz, VBW=30KHz,/ Sweep=AUTO

Below 1GHz

RBW=100kHz / VBW=300kHz / Sweep=AUTO

Above 1GHz

(a) PEAK: RBW=1MHz VBW=3MHz/ Sweep=AUTO

(b) AVERAGE: RBW=1MHz / VBW=3MHz / Sweep=AUTO

detector; The measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

The dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from $20\log(\text{dwell time}/100 \text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit.

If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak- average correction factor, derived from the appropriate duty cycle calculation.

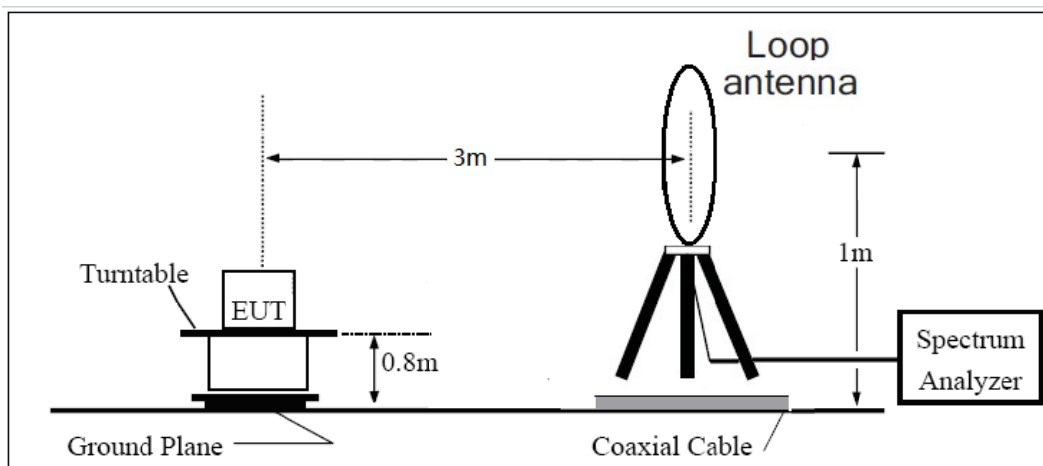
This setting method can refer to **KDB 558074 D01**.

This mode was measured in the following mode: EUT with cradle and EUT without cradle. The worst emission was found in EUT with cradle mode and the worst case was recorded.

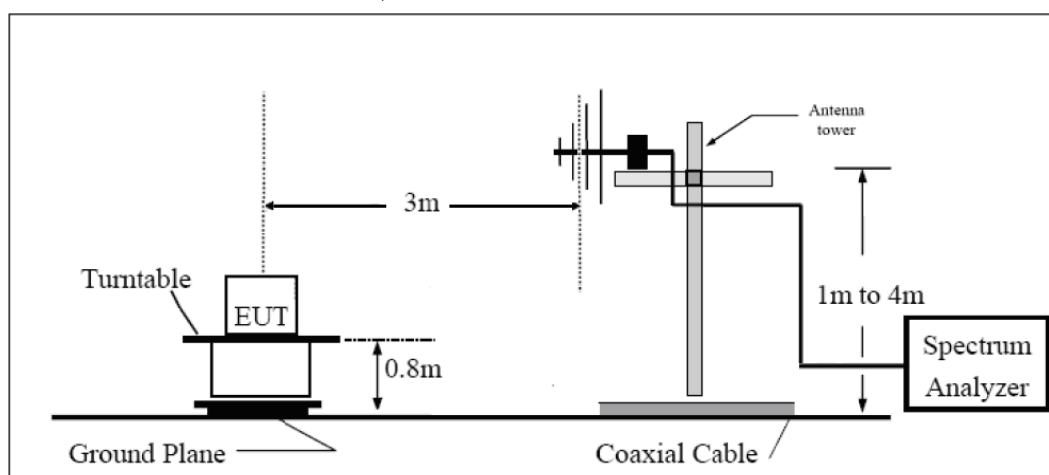
The test is in transmitting mode.

Test setup

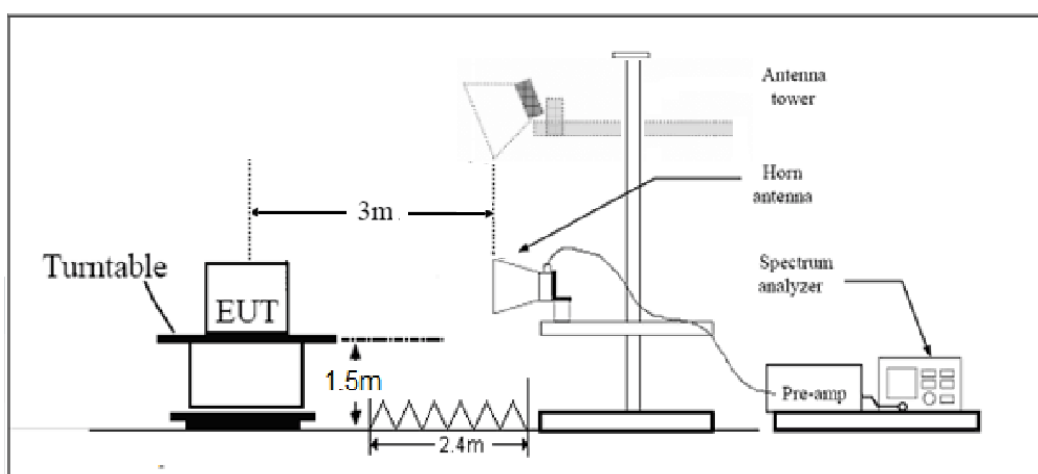
9KHz ~ 30MHz



30MHz ~ 1GHz



Above 1GHz



Limits

Rule Part 15.247(d) specifies that “In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).”

Limit in restricted band

Frequency of emission (MHz)	Field strength(uV/m)	Field strength(dBuV/m)
0.009–0.490	2400/F(kHz)	/
0.490–1.705	24000/F(kHz)	/
1.705–30.0	30	/
30-88	100	40
88-216	150	43.5
216-960	200	46
Above960	500	54

§15.35(b)

There is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.

Peak Limit=74dBuV/m

Average Limit=54dBuV/m

Spurious Radiated Emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

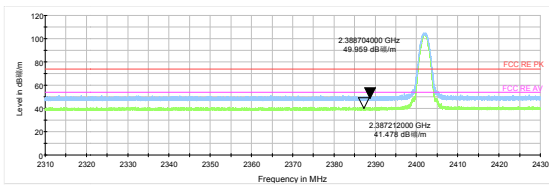
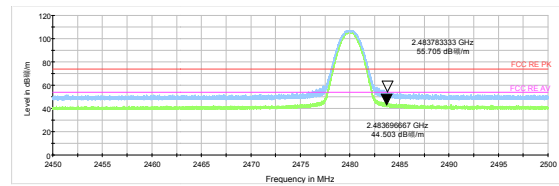
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

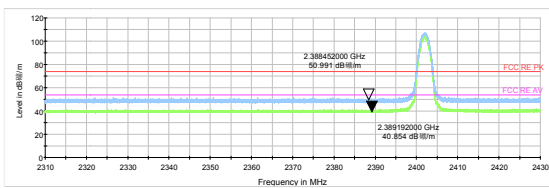
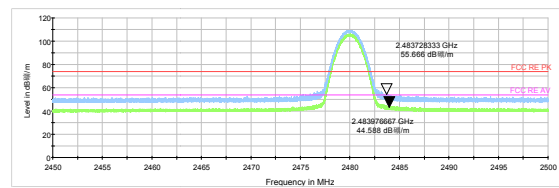
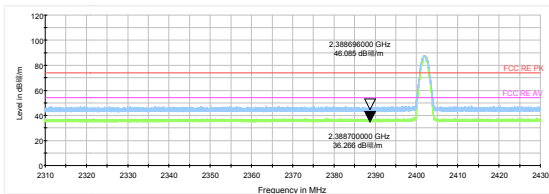
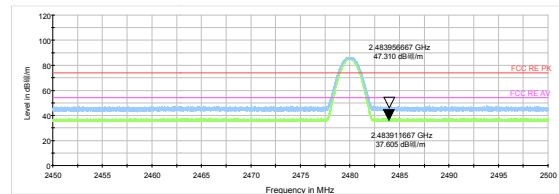
Frequency	Uncertainty
9KHz-30MHz	3.55 dB
30MHz-200MHz	4.17 dB
200MHz-1GHz	4.84 dB
1-18GHz	4.35 dB
18-26.5GHz	5.90 dB
26.5GHz~40GHz	5.92 dB

**Test Results:**

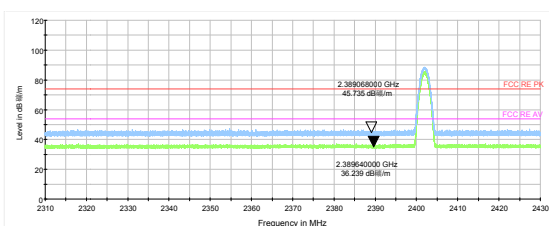
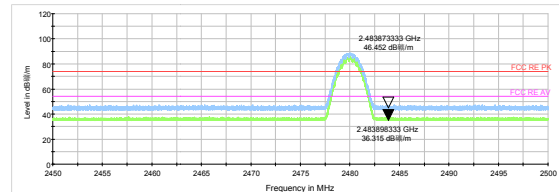
The signal beyond the limit is carrier.

ESP32-PICO-MINI-02**DH5-Channel 0: Peak& Average****DH5-Channel 78: Peak& Average**

The bandage was performed in all EDR mode(2DH5 and 3DH5), 3DH5 was selected as the worse condition. The test data of the worst-case condition was recorded in this report.

3DH5-Channel 0: Peak& Average**3DH5-Channel 78: Peak& Average****ESP32-PICO-MINI-02U****DH5-Channel 0: Peak& Average****DH5-Channel 78: Peak& Average**

The bandage was performed in all EDR mode(2DH5 and 3DH5), 3DH5 was selected as the worse condition. The test data of the worst-case condition was recorded in this report.

3DH5-Channel 0: Peak& Average**3DH5-Channel 78: Peak& Average**

Result of RE

Test result

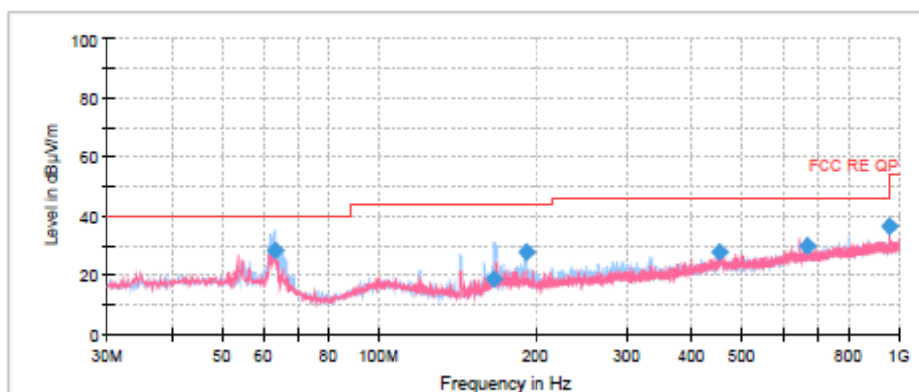
Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the Emissions in the frequency band 9kHz-30MHz and 18GHz -26.5GHz are more than 20dB below the limit are not reported.

The following graphs display the maximum values of horizontal and vertical by software.
For above 1GHz, Blue trace uses the peak detection, Green trace uses the average detection.

ESP32-PICO-MINI-02

During the test, the Radiates Emission from 30MHz to 1GHz was performed in all modes with all channels, BT DH5-Channel 0 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

Continuous TX mode:

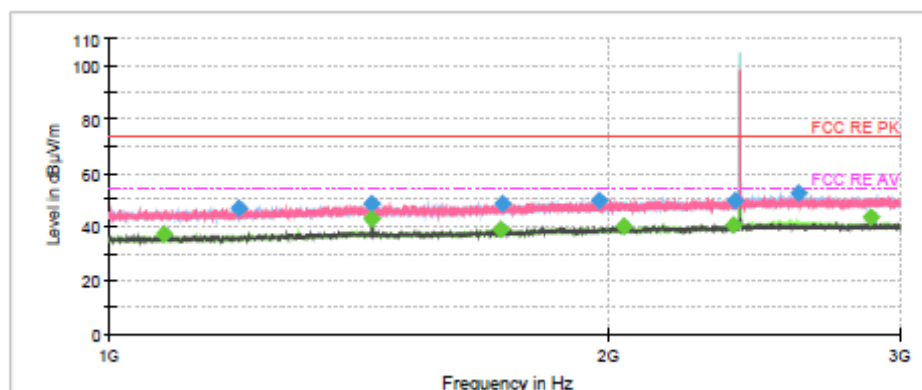


Radiates Emission from 30MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
63.302500	28.08	225.0	H	4.0	12	11.92	40.00
166.245000	18.23	225.0	H	230.0	10	25.27	43.50
191.947500	27.83	125.0	H	225.0	12	15.67	43.50
450.823750	27.46	100.0	V	322.0	18	18.54	46.00
664.223750	29.79	225.0	H	255.0	22	16.21	46.00
959.988750	36.34	100.0	H	0.0	25	9.66	46.00

Remark: 1. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

2. Margin = Limit – Quasi-Peak

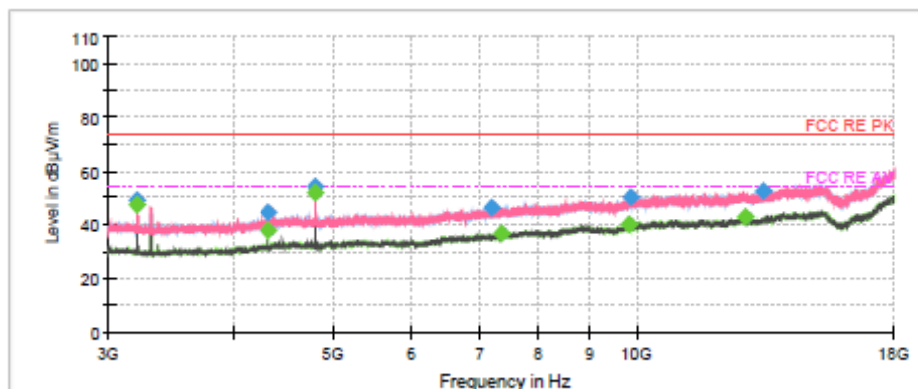


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1080.200000	---	37.37	54.00	16.63	200.0	H	324.0	-9
1196.400000	46.74	---	74.00	27.26	100.0	V	256.0	-9
1439.000000	48.27	---	74.00	25.73	200.0	H	0.0	-7
1440.600000	---	42.65	54.00	11.35	100.0	V	256.0	-7
1723.933333	---	38.72	54.00	15.28	200.0	V	152.0	-6
1727.933333	48.30	---	74.00	25.70	200.0	H	334.0	-6
1973.266667	49.38	---	74.00	24.62	200.0	V	0.0	-5
2044.133333	---	39.85	54.00	14.15	100.0	V	284.0	-5
2382.400000	---	40.37	54.00	13.63	200.0	H	303.0	-4
2383.733333	49.84	---	74.00	24.16	100.0	H	80.0	-4
2602.933333	52.21	---	74.00	21.79	100.0	H	201.0	-4
2881.466667	---	43.63	54.00	10.37	100.0	V	88.0	-3

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

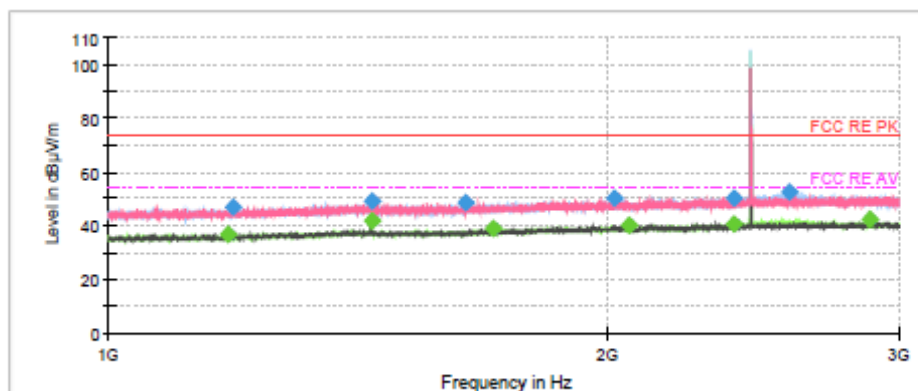


Note: The signal beyond the limit is carrier.

Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3202.500000	---	47.39	54.00	6.61	100.0	V	105.0	-13
3202.500000	49.16	---	74.00	24.84	100.0	V	105.0	-13
4322.000000	---	37.70	54.00	16.30	200.0	H	42.0	-10
4322.000000	44.64	---	74.00	29.36	100.0	H	42.0	-10
4803.500000	---	51.86	54.00	2.14	200.0	V	236.0	-9
4803.500000	53.95	---	74.00	20.05	200.0	V	236.0	-9
7199.000000	46.25	---	74.00	27.75	100.0	V	326.0	-4
7347.500000	---	36.72	54.00	17.28	100.0	V	128.0	-3
9843.500000	---	40.31	54.00	13.70	200.0	H	196.0	-1
9855.000000	50.14	---	74.00	23.86	100.0	H	229.0	-1
12816.000000	---	42.85	54.00	11.15	200.0	V	247.0	2
13340.500000	52.45	---	74.00	21.55	100.0	H	64.0	3

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

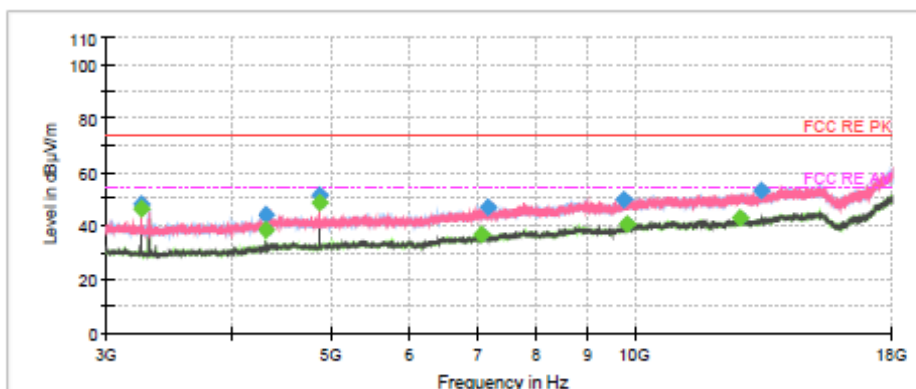


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1181.666667	---	36.77	54.00	17.23	200.0	V	62.0	-9
1188.933333	46.57	---	74.00	27.43	100.0	H	28.0	-9
1440.733333	49.25	---	74.00	24.75	100.0	V	256.0	-7
1440.733333	---	41.91	54.00	12.09	100.0	V	256.0	-7
1644.733333	48.38	---	74.00	25.62	100.0	H	7.0	-6
1707.000000	---	38.69	54.00	15.31	100.0	V	0.0	-6
2022.466667	50.05	---	74.00	23.95	200.0	V	188.0	-5
2059.866667	---	40.20	54.00	13.80	100.0	V	133.0	-5
2384.066667	50.15	---	74.00	23.85	100.0	H	68.0	-4
2384.666667	---	40.60	54.00	13.40	200.0	H	198.0	-4
2577.733333	52.29	---	74.00	21.71	200.0	H	320.0	-4
2881.400000	---	42.45	54.00	11.55	100.0	V	184.0	-3

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)



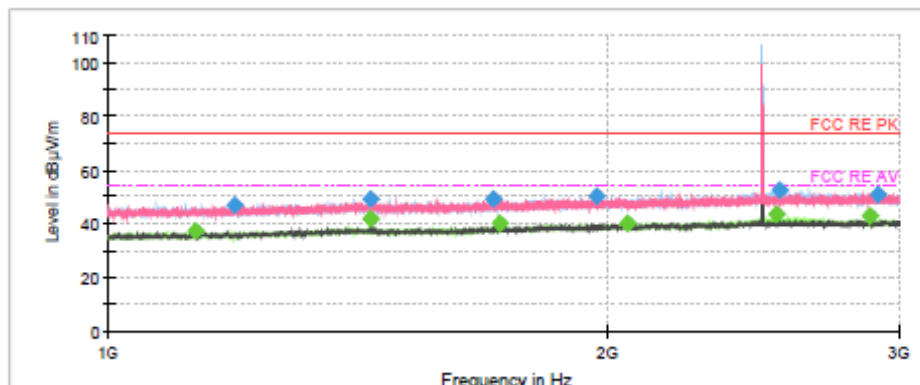
Radiates Emission from 3GHz to 18GHz

Note: The signal beyond the limit is carrier.

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3254.500000	---	46.26	54.00	7.74	200.0	V	69.0	-13
3254.500000	48.07	---	74.00	25.93	200.0	V	69.0	-13
4321.500000	43.92	---	74.00	30.08	100.0	H	0.0	-10
4322.000000	---	38.30	54.00	15.70	200.0	H	12.0	-10
4882.000000	51.20	---	74.00	22.80	100.0	H	188.0	-9
4882.000000	---	48.25	54.00	5.75	100.0	H	188.0	-9
7046.500000	---	36.70	54.00	17.30	200.0	V	280.0	-3
7155.500000	46.91	---	74.00	27.09	100.0	V	147.0	-4
9775.500000	49.82	---	74.00	24.18	100.0	V	350.0	-2
9841.000000	---	40.66	54.00	13.34	200.0	V	225.0	-1
12717.500000	---	42.82	54.00	11.18	100.0	V	214.0	3
13342.000000	53.15	---	74.00	20.85	200.0	H	111.0	3

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

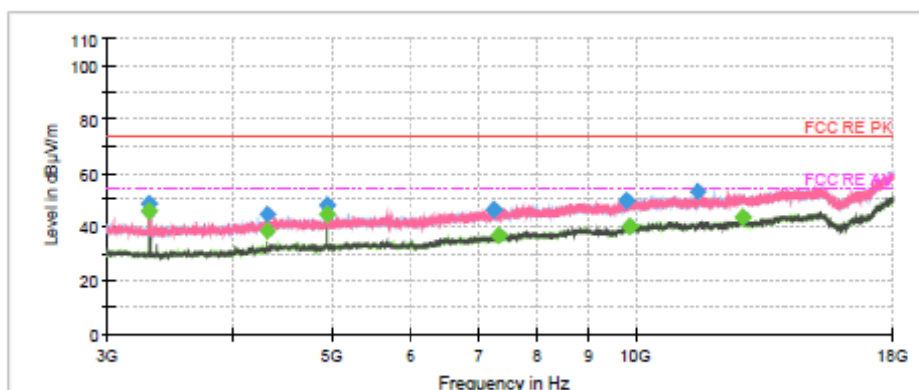
DH5-Channel 78



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1128.866667	---	37.12	54.00	16.88	200.0	H	168.0	-9
1190.800000	46.61	---	74.00	27.39	100.0	V	314.0	-9
1440.600000	---	41.95	54.00	12.05	100.0	V	244.0	-7
1440.600000	48.86	---	74.00	25.14	100.0	V	244.0	-7
1706.133333	48.84	---	74.00	25.16	200.0	V	64.0	-6
1722.533333	---	39.78	54.00	14.22	200.0	V	190.0	-6
1972.933333	49.97	---	74.00	24.03	100.0	H	140.0	-5
2058.266667	---	40.21	54.00	13.79	100.0	V	203.0	-5
2527.733333	---	43.36	54.00	10.64	100.0	H	201.0	-4
2542.666667	52.23	---	74.00	21.77	200.0	H	337.0	-4
2881.333333	---	42.72	54.00	11.28	100.0	V	121.0	-3
2914.000000	50.64	---	74.00	23.36	200.0	V	44.0	-3

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)



Radiates Emission from 3GHz to 18GHz

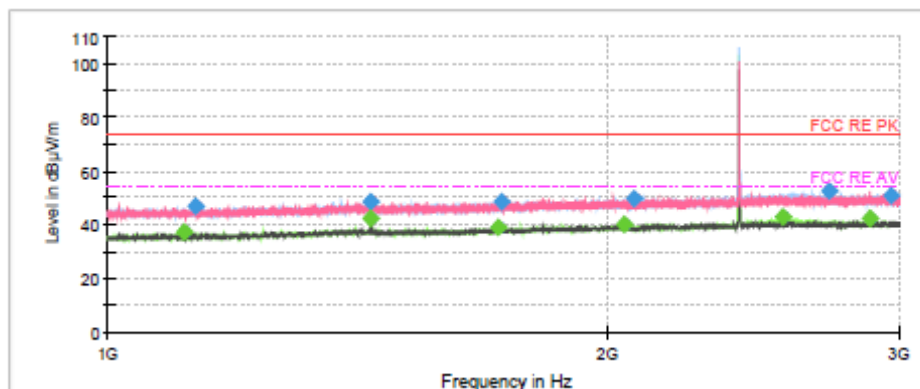
Note: The signal beyond the limit is carrier.

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3306.500000	---	45.95	54.00	8.05	100.0	V	103.0	-13
3306.500000	48.30	---	74.00	25.70	200.0	H	30.0	-13
4321.000000	44.31	---	74.00	29.69	100.0	H	7.0	-10
4321.500000	---	38.48	54.00	15.52	200.0	H	12.0	-10
4959.500000	---	44.54	54.00	9.46	100.0	V	279.0	-8
4959.500000	47.92	---	74.00	26.08	100.0	V	279.0	-8
7234.000000	45.99	---	74.00	28.01	200.0	V	349.0	-4
7330.000000	---	36.75	54.00	17.25	100.0	V	203.0	-3
9791.500000	49.68	---	74.00	24.32	100.0	H	0.0	-2
9855.500000	---	40.17	54.00	13.83	200.0	H	63.0	-1
11539.500000	52.84	---	74.00	21.16	100.0	V	114.0	1
12788.500000	---	43.17	54.00	10.83	100.0	V	170.0	2
3306.500000	---	45.95	54.00	8.05	100.0	V	103.0	-13

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

The Radiates Emission was performed in all EDR mode(2DH5 and 3DH5), 3DH5 was selected as the worse condition. The test data of the worst-case condition was recorded in this report.

3DH5-Channel 0

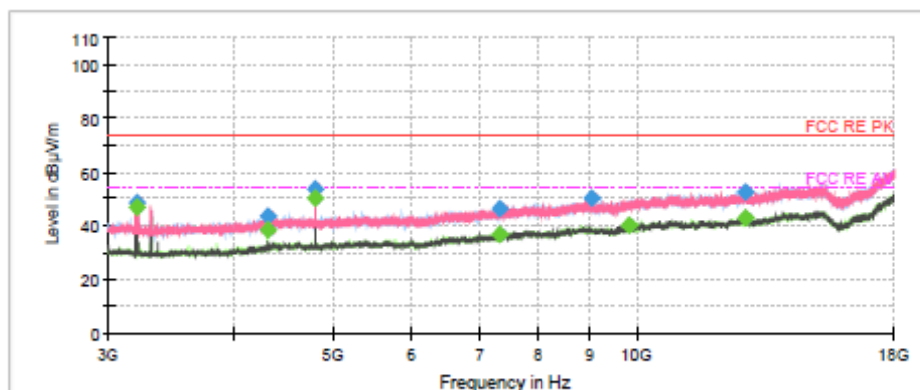


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1110.800000	---	36.96	54.00	17.04	200.0	H	348.0	-9
1127.866667	46.99	---	74.00	27.01	100.0	H	128.0	-9
1440.466667	---	42.20	54.00	11.80	100.0	V	224.0	-7
1440.600000	48.71	---	74.00	25.29	200.0	V	0.0	-7
1719.733333	---	38.78	54.00	15.22	100.0	V	1.0	-6
1727.733333	48.46	---	74.00	25.54	100.0	H	4.0	-6
2047.533333	---	40.00	54.00	14.00	200.0	H	322.0	-5
2075.800000	49.86	---	74.00	24.14	100.0	H	87.0	-5
2553.933333	---	42.87	54.00	11.13	100.0	H	187.0	-4
2722.533333	52.38	---	74.00	21.62	200.0	H	322.0	-4
2881.333333	---	42.26	54.00	11.74	100.0	V	111.0	-3
2965.266667	50.66	---	74.00	23.34	100.0	V	90.0	-3

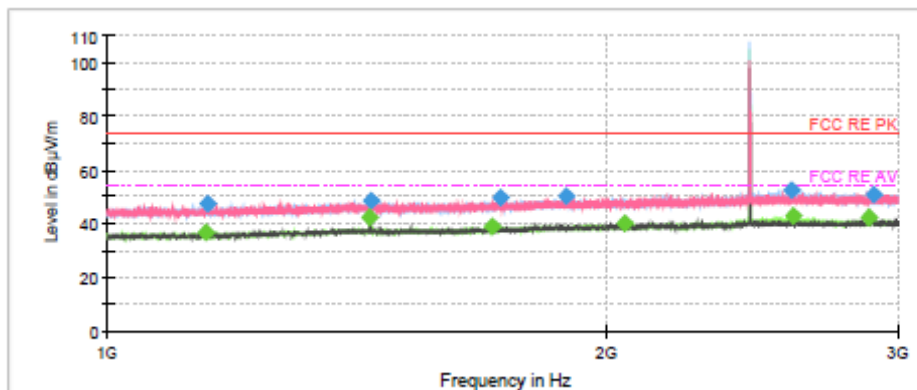
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)



Radiates Emission from 3GHz to 18GHz
Note: The signal beyond the limit is carrier.

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3202.500000	---	46.80	54.00	7.20	100.0	V	117.0	-13
3202.500000	48.24	---	74.00	25.76	100.0	V	117.0	-13
4321.500000	43.57	---	74.00	30.43	200.0	H	0.0	-10
4322.000000	---	38.11	54.00	15.89	200.0	H	2.0	-10
4804.000000	53.72	---	74.00	20.28	100.0	V	0.0	-9
4804.000000	---	50.39	54.00	3.61	100.0	V	0.0	-9
7320.500000	---	36.81	54.00	17.19	200.0	V	195.0	-3
7326.000000	46.23	---	74.00	27.77	100.0	V	71.0	-3
9043.000000	50.02	---	74.00	23.98	200.0	H	0.0	-2
9845.500000	---	40.13	54.00	13.87	200.0	V	338.0	-1
12813.500000	52.37	---	74.00	21.64	100.0	V	260.0	2
12835.000000	---	42.62	54.00	11.38	100.0	V	356.0	2

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

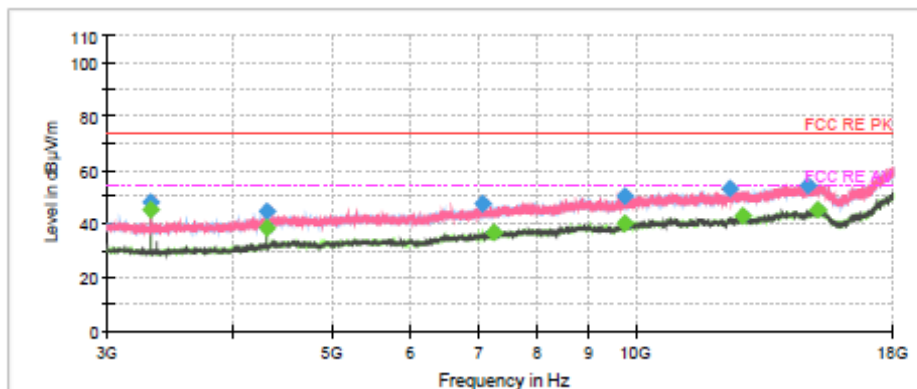


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1147.600000	---	36.94	54.00	17.06	200.0	V	96.0	-9
1149.933333	47.35	---	74.00	26.65	100.0	H	60.0	-9
1440.533333	---	42.25	54.00	11.75	100.0	V	230.0	-7
1440.800000	48.47	---	74.00	25.53	100.0	H	50.0	-7
1705.066667	---	38.75	54.00	15.25	100.0	H	169.0	-7
1726.733333	49.40	---	74.00	24.60	200.0	V	283.0	-6
1894.733333	50.05	---	74.00	23.95	200.0	V	65.0	-5
2053.600000	---	40.18	54.00	13.82	100.0	H	50.0	-5
2589.000000	52.46	---	74.00	21.54	200.0	H	181.0	-4
2592.200000	---	42.76	54.00	11.24	200.0	H	341.0	-4
2881.266667	---	42.24	54.00	11.76	100.0	V	33.0	-3
2899.800000	50.95	---	74.00	23.06	200.0	H	130.0	-3

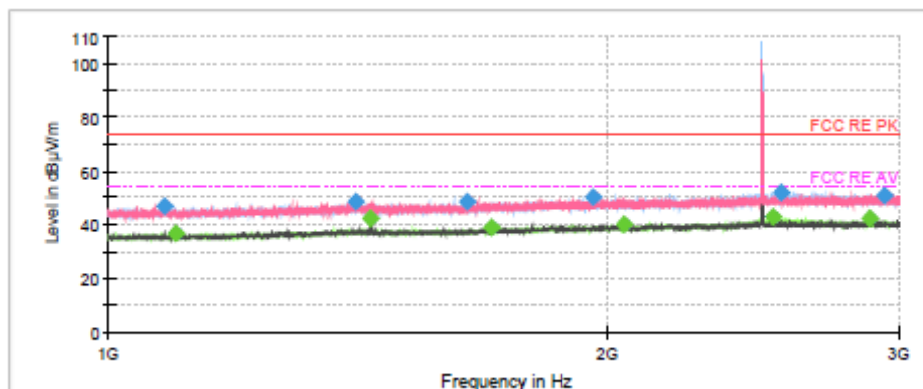
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)



Radiates Emission from 3GHz to 18GHz
Note: The signal beyond the limit is carrier.

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3311.500000	48.16	---	74.00	25.84	200.0	V	324.0	-13
3312.000000	---	44.99	54.00	9.01	200.0	V	324.0	-13
4322.000000	---	38.14	54.00	15.86	100.0	H	5.0	-10
4322.500000	44.52	---	74.00	29.48	100.0	H	10.0	-10
7058.500000	47.54	---	74.00	26.46	200.0	V	303.0	-3
7240.500000	---	36.68	54.00	17.32	100.0	H	178.0	-4
9772.500000	---	40.31	54.00	13.69	200.0	V	0.0	-2
9777.000000	50.38	---	74.00	23.62	200.0	V	344.0	-2
12402.000000	52.77	---	74.00	21.23	100.0	H	5.0	2
12791.500000	---	42.90	54.00	11.10	100.0	H	48.0	2
14810.500000	53.88	---	74.00	20.12	200.0	V	359.0	5
15148.500000	---	45.13	54.00	8.87	200.0	V	324.0	5

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

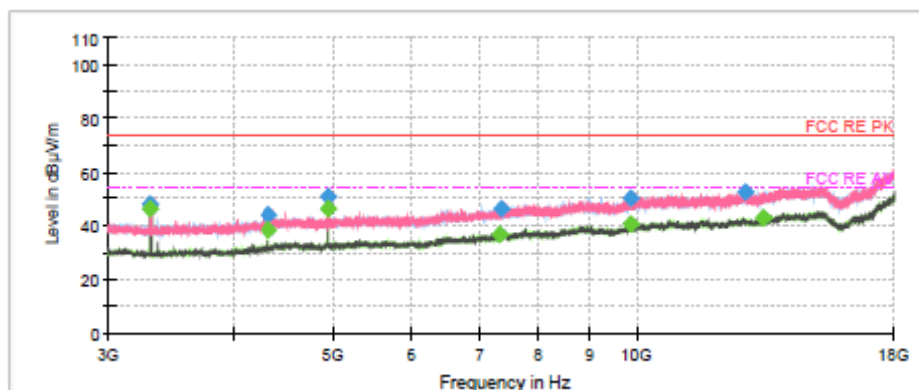


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1081.000000	46.93	---	74.00	27.07	200.0	H	266.0	-9
1099.933333	---	36.66	54.00	17.34	200.0	H	246.0	-9
1410.066667	48.41	---	74.00	25.59	100.0	H	128.0	-7
1440.533333	---	42.17	54.00	11.83	100.0	V	119.0	-7
1646.466667	48.66	---	74.00	25.34	200.0	V	80.0	-6
1702.466667	---	38.65	54.00	15.35	100.0	V	345.0	-6
1963.600000	50.11	---	74.00	23.89	100.0	H	85.0	-5
2048.400000	---	40.09	54.00	13.91	200.0	H	76.0	-5
2520.000000	---	42.70	54.00	11.30	200.0	H	316.0	-4
2543.800000	52.12	---	74.00	21.88	100.0	H	199.0	-4
2881.466667	---	42.44	54.00	11.56	100.0	V	87.0	-3
2940.733333	50.56	---	74.00	23.44	200.0	H	86.0	-3

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)



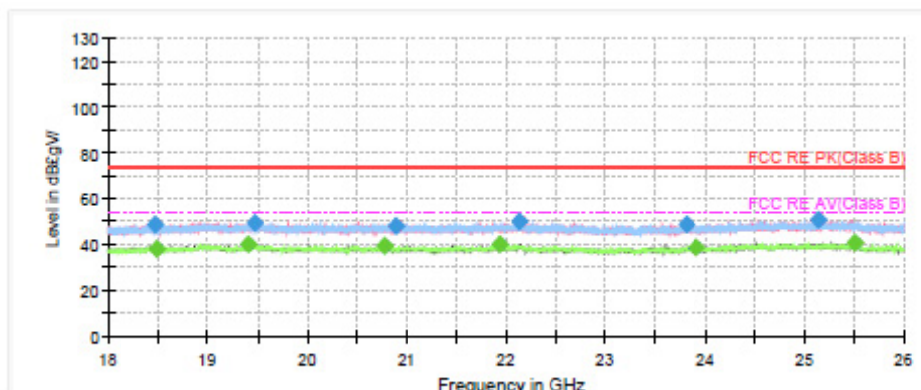
Radiates Emission from 3GHz to 18GHz

Note: The signal beyond the limit is carrier.

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3306.500000	---	46.02	54.00	7.98	100.0	V	327.0	-13
3306.500000	48.00	---	74.00	26.00	100.0	V	327.0	-13
4321.500000	---	38.24	54.00	15.76	200.0	H	358.0	-10
4322.000000	44.06	---	74.00	29.94	100.0	H	9.0	-10
4960.000000	---	46.28	54.00	7.72	200.0	H	189.0	-8
4960.000000	50.71	---	74.00	23.29	200.0	H	189.0	-8
7323.000000	---	36.69	54.00	17.31	100.0	V	338.0	-3
7340.500000	46.33	---	74.00	27.67	100.0	V	0.0	-3
9880.000000	50.38	---	74.00	23.62	200.0	H	156.0	-1
9880.500000	---	40.79	54.00	13.21	100.0	H	0.0	-1
12807.500000	52.24	---	74.00	21.76	200.0	H	2.0	2
13342.000000	---	42.84	54.00	11.16	100.0	V	352.0	3

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

During the test, the Radiates Emission from 18GHz to 26.5GHz was performed in all modes with all channels, DH5-Channel 0 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.



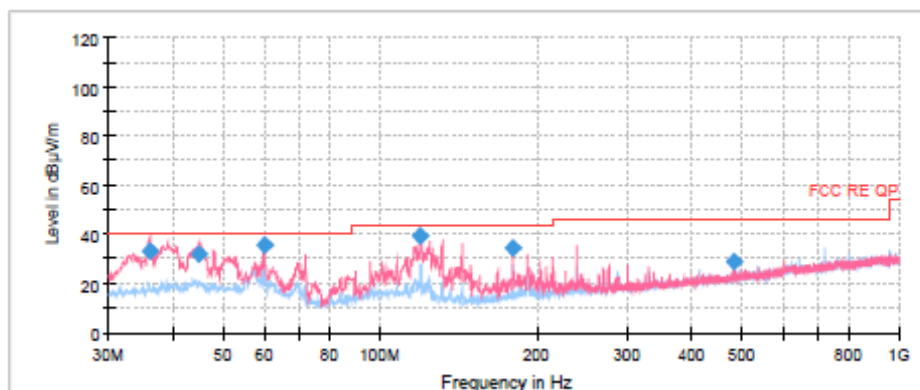
Radiates Emission from 18GHz to 26.5GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18475.200000	48.57	---	74.00	25.43	100.0	V	281.0	-4.3
18487.733333	---	38.32	54.00	15.68	200.0	V	119.0	-4.3
19407.466667	---	39.86	54.00	14.14	200.0	V	164.0	-3.3
19465.600000	49.31	---	74.00	24.69	100.0	H	61.0	-3.3
20773.600000	---	39.52	54.00	14.48	200.0	V	32.0	-2.3
20890.933333	48.03	---	74.00	25.97	100.0	V	281.0	-2.3
21928.800000	---	39.96	54.00	14.04	200.0	H	161.0	-1.3
22130.666667	49.74	---	74.00	24.26	100.0	H	0.0	-1.1
23810.133333	48.65	---	74.00	25.35	200.0	V	32.0	-0.5
23903.200000	---	38.87	54.00	15.13	200.0	V	132.0	-0.4
25132.533333	50.72	---	74.00	23.28	100.0	H	168.0	1.0
25505.866667	---	40.86	54.00	13.14	100.0	H	28.0	0.7

ESP32-PICO-MINI-02U

During the test, the Radiates Emission from 30MHz to 1GHz was performed in all modes with all channels, BT 3DH5-Channel 39 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

Continuous TX mode:

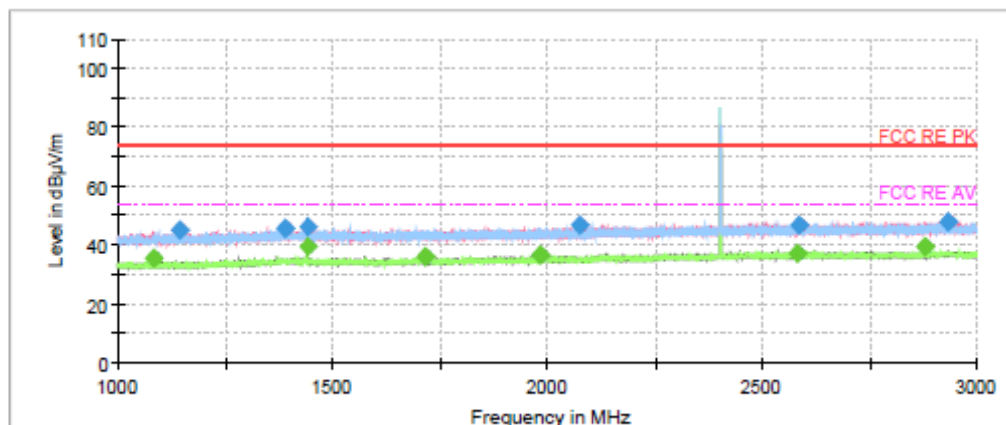


Radiates Emission from 30MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
36.062500	33.37	105.0	V	95.0	13.1	6.63	40.00
44.913750	32.09	100.0	V	120.0	14.1	7.91	40.00
59.988750	35.79	100.0	V	216.0	13.6	4.21	40.00
120.128750	39.27	100.0	V	156.0	10.9	4.23	43.50
180.067500	34.75	100.0	V	172.0	10.6	8.75	43.50
480.000000	28.89	175.0	H	155.0	19.1	17.11	46.00

Remark: 1. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

2. Margin = Limit – Quasi-Peak

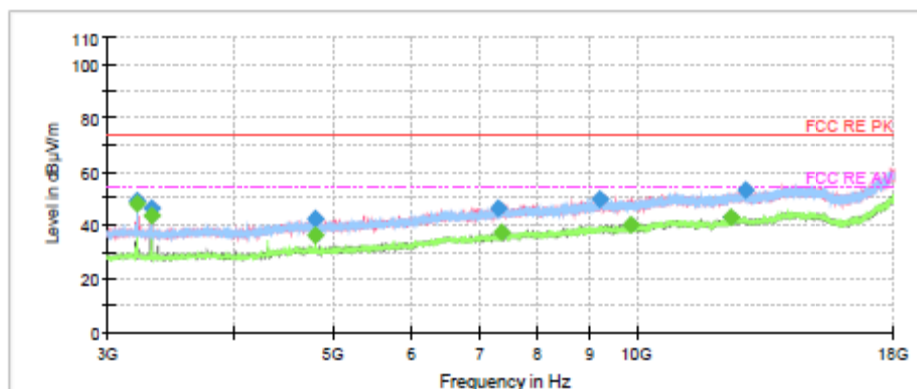


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1080.600000	---	35.32	54.00	18.68	200.0	V	283.0	-11.1
1143.600000	44.90	---	74.00	29.10	100.0	V	237.0	-10.8
1387.400000	45.67	---	74.00	28.33	200.0	V	342.0	-9.4
1440.466667	---	39.56	54.00	14.44	100.0	V	278.0	-9.2
1443.266667	46.03	---	74.00	27.97	100.0	V	28.0	-9.2
1713.666667	---	36.02	54.00	17.98	200.0	H	52.0	-8.9
1983.333333	---	36.54	54.00	17.46	100.0	H	299.0	-8.0
2074.866667	46.62	---	74.00	27.38	200.0	H	11.0	-7.7
2583.800000	---	37.35	54.00	16.65	100.0	V	6.0	-6.1
2588.666667	46.87	---	74.00	27.13	200.0	H	6.0	-6.1
2881.266667	---	39.32	54.00	14.68	100.0	V	334.0	-5.9
2933.333333	48.21	---	74.00	25.79	200.0	H	17.0	-5.9

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

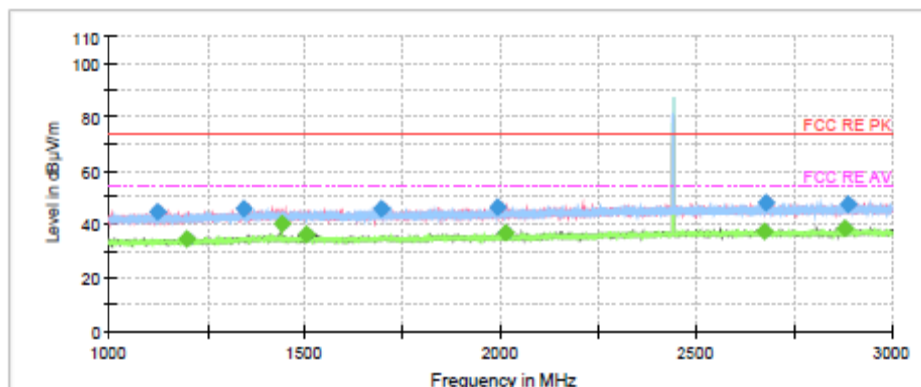


Radiates Emission from 3GHz to 18GHz

Note: The signal beyond the limit is carrier.

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3202.500000	49.19	---	74.00	24.81	200.0	V	153.0	-15.3
3202.500000	---	47.89	54.00	6.11	200.0	V	153.0	-15.3
3312.000000	46.20	---	74.00	27.80	100.0	V	295.0	-15.2
3312.000000	---	43.51	54.00	10.49	100.0	V	295.0	-15.2
4804.000000	42.14	---	74.00	31.86	200.0	H	296.0	-10.3
4804.000000	---	35.98	54.00	18.02	100.0	V	109.0	-10.3
7305.500000	46.46	---	74.00	27.54	200.0	V	125.0	-3.5
7343.000000	---	37.27	54.00	16.73	200.0	V	167.0	-3.4
9214.000000	49.80	---	74.00	24.20	100.0	V	281.0	-2.3
9874.000000	---	40.00	54.00	14.00	200.0	H	282.0	-1.2
12417.000000	---	43.12	54.00	10.88	200.0	H	254.0	1.6
12821.000000	52.80	---	74.00	21.20	100.0	V	253.0	2.5

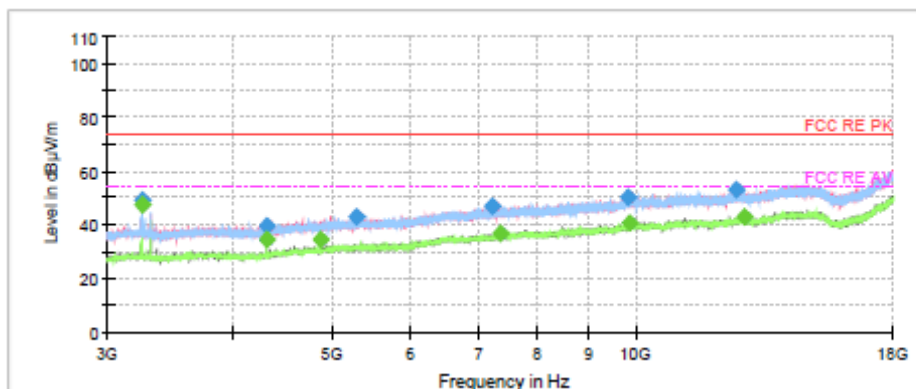
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1125.133333	44.41	---	74.00	29.59	100.0	V	223.0	-10.9
1196.400000	---	34.63	54.00	19.37	100.0	V	7.0	-10.7
1342.266667	45.92	---	74.00	28.08	200.0	H	170.0	-9.6
1440.666667	---	39.78	54.00	14.22	200.0	V	139.0	-9.2
1502.333333	---	36.00	54.00	18.00	200.0	H	184.0	-9.1
1694.666667	45.68	---	74.00	28.32	200.0	H	292.0	-8.9
1991.533333	46.19	---	74.00	27.81	100.0	H	358.0	-7.9
2013.066667	---	36.86	54.00	17.14	200.0	H	170.0	-7.9
2675.466667	---	37.43	54.00	16.57	100.0	V	92.0	-6.0
2679.666667	48.09	---	74.00	25.91	200.0	V	356.0	-6.0
2881.266667	---	38.36	54.00	15.64	100.0	V	263.0	-5.9
2889.066667	47.21	---	74.00	26.79	100.0	H	204.0	-5.9

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)



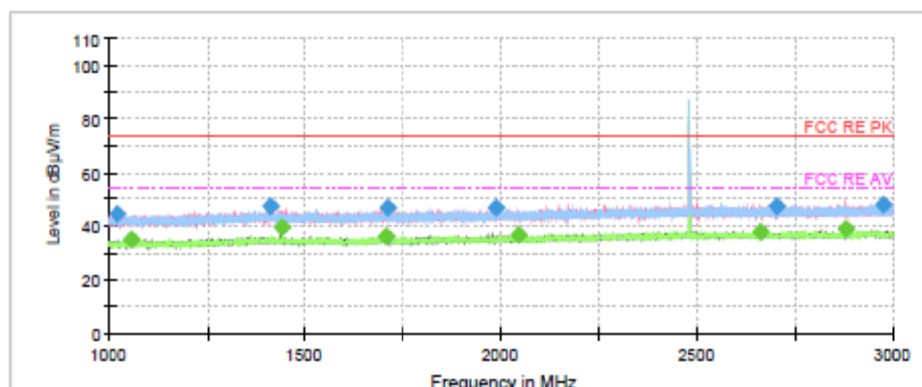
Radiates Emission from 3GHz to 18GHz

Note: The signal beyond the limit is carrier.

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3257.000000	49.03	---	74.00	24.97	200.0	V	155.0	-15.3
3257.000000	---	47.51	54.00	6.49	200.0	V	155.0	-15.3
4321.000000	39.40	---	74.00	34.60	100.0	H	233.0	-12.2
4321.500000	---	34.17	54.00	19.83	100.0	H	233.0	-12.2
4882.000000	---	34.62	54.00	19.38	200.0	V	271.0	-10.3
5283.500000	42.89	---	74.00	31.11	200.0	H	0.0	-8.9
7215.500000	46.87	---	74.00	27.13	100.0	V	266.0	-3.7
7336.000000	---	36.55	54.00	17.45	200.0	H	263.0	-3.4
9821.000000	50.19	---	74.00	23.81	200.0	V	2.0	-1.3
9861.500000	---	40.35	54.00	13.65	100.0	V	0.0	-1.3
12565.000000	52.94	---	74.00	21.06	100.0	V	357.0	2.1
12803.500000	---	42.85	54.00	11.15	200.0	V	184.0	2.5

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

DH5-Channel 78

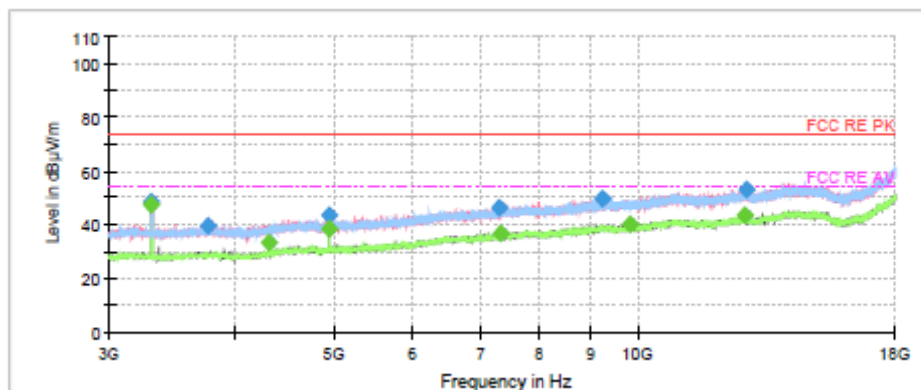


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1021.133333	44.33	---	74.00	29.67	100.0	H	343.0	-11.3
1057.266667	---	34.72	54.00	19.28	100.0	H	322.0	-11.3
1414.933333	47.17	---	74.00	26.83	100.0	V	191.0	-9.2
1440.533333	---	39.35	54.00	14.65	100.0	V	152.0	-9.2
1706.000000	---	35.99	54.00	18.01	100.0	H	358.0	-8.8
1709.533333	46.54	---	74.00	27.46	100.0	V	32.0	-8.9
1987.600000	46.64	---	74.00	27.36	100.0	V	0.0	-8.0
2046.533333	---	36.64	54.00	17.36	200.0	H	346.0	-7.7
2659.600000	---	37.64	54.00	16.36	100.0	V	0.0	-6.0
2701.400000	47.58	---	74.00	26.42	200.0	V	190.0	-6.1
2881.466667	---	38.91	54.00	15.09	100.0	V	1.0	-5.9
2976.000000	48.05	---	74.00	25.95	200.0	H	8.0	-5.8

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)



Radiates Emission from 3GHz to 18GHz

Note: The signal beyond the limit is carrier.

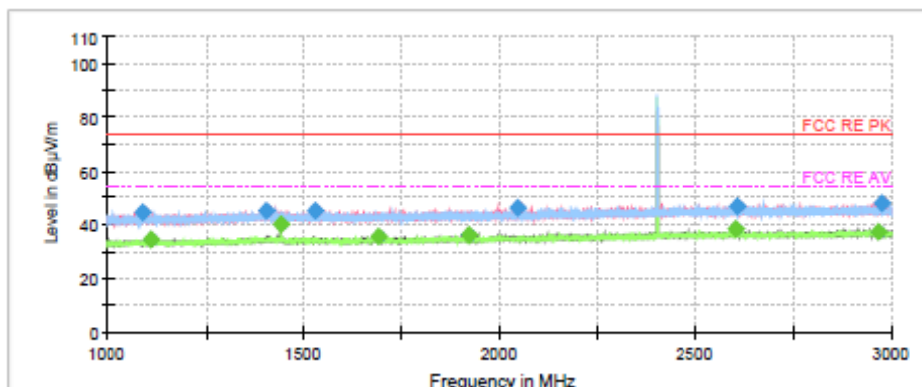
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3306.500000	48.60	---	74.00	25.40	100.0	V	147.0	-15.2
3306.500000	---	47.35	54.00	6.65	100.0	V	147.0	-15.2
3758.000000	39.51	---	74.00	34.49	200.0	V	0.0	-14.1
4321.500000	---	33.22	54.00	20.78	100.0	H	211.0	-12.2
4959.500000	---	38.37	54.00	15.63	200.0	V	212.0	-10.0
4960.000000	43.24	---	74.00	30.76	100.0	V	194.0	-9.9
7297.500000	46.45	---	74.00	27.55	100.0	V	180.0	-3.5
7323.000000	---	36.63	54.00	17.37	100.0	H	348.0	-3.4
9241.500000	49.40	---	74.00	24.60	100.0	H	54.0	-2.4
9815.500000	---	40.27	54.00	13.73	100.0	H	5.0	-1.4
12773.500000	---	43.30	54.00	10.70	200.0	H	239.0	2.5
12801.500000	53.17	---	74.00	20.83	100.0	H	255.0	2.5

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)



The Radiates Emission was performed in all EDR mode (2DH5 and 3DH5), 3DH5 was selected as the worse condition. The test data of the worst-case condition was recorded in this report.

3DH5-Channel 0

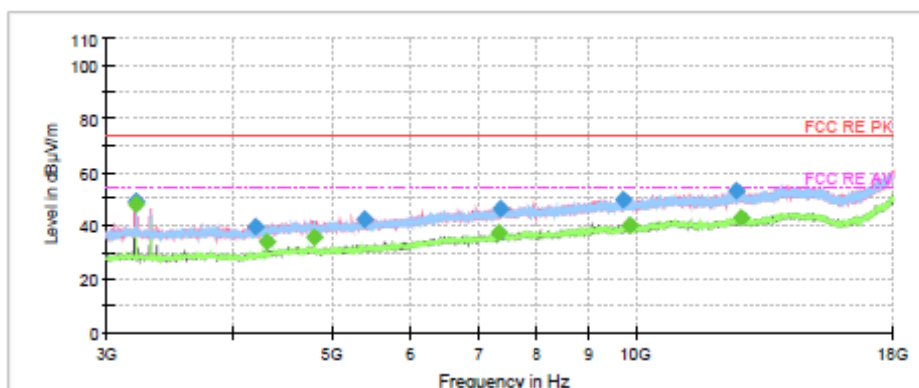


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1092.466667	44.75	---	74.00	29.25	200.0	H	131.0	-11.0
1109.733333	---	34.48	54.00	19.52	100.0	H	96.0	-10.9
1406.733333	45.25	---	74.00	28.75	200.0	H	0.0	-9.3
1440.600000	---	40.04	54.00	13.96	100.0	V	0.0	-9.2
1529.200000	45.28	---	74.00	28.72	100.0	V	0.0	-9.1
1690.000000	---	35.72	54.00	18.28	200.0	V	349.0	-8.9
1920.933333	---	36.02	54.00	17.98	100.0	V	104.0	-8.3
2043.866667	46.43	---	74.00	27.57	200.0	V	26.0	-7.7
2604.733333	---	38.10	54.00	15.90	200.0	V	269.0	-6.1
2609.466667	47.08	---	74.00	26.92	100.0	V	359.0	-6.1
2968.400000	---	37.00	54.00	17.00	200.0	V	164.0	-5.8
2977.200000	48.16	---	74.00	25.84	200.0	V	178.0	-5.8

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)



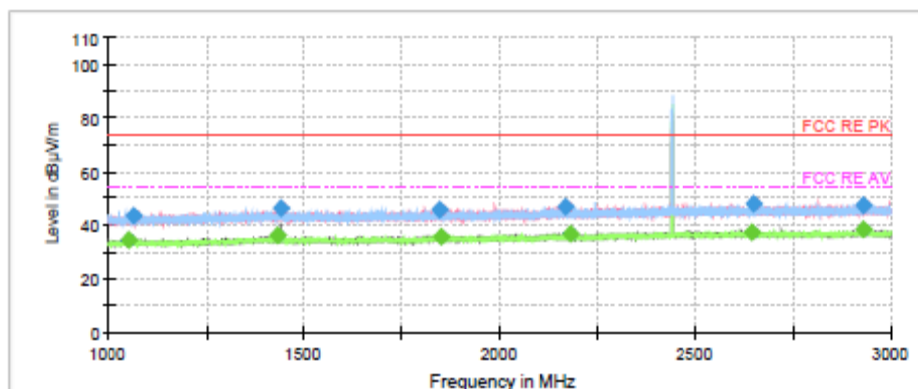
Radiates Emission from 3GHz to 18GHz

Note: The signal beyond the limit is carrier.

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3202.500000	49.30	---	74.00	24.70	200.0	V	141.0	-15.3
3202.500000	---	47.99	54.00	6.01	200.0	V	141.0	-15.3
4214.000000	39.47	---	74.00	34.53	200.0	H	0.0	-12.5
4322.000000	---	33.82	54.00	20.18	100.0	H	27.0	-12.2
4804.000000	---	35.63	54.00	18.37	100.0	H	313.0	-10.3
5388.000000	42.33	---	74.00	31.67	100.0	V	309.0	-8.6
7320.500000	---	36.99	54.00	17.01	100.0	H	153.0	-3.5
7340.000000	46.31	---	74.00	27.69	200.0	H	190.0	-3.4
9728.500000	49.67	---	74.00	24.33	100.0	H	96.0	-2.1
9852.000000	---	40.27	54.00	13.73	100.0	V	206.0	-1.3
12576.000000	53.23	---	74.00	20.77	100.0	V	0.0	2.2
12710.000000	---	43.10	54.00	10.90	100.0	V	0.0	2.5

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

3DH5-Channel 39

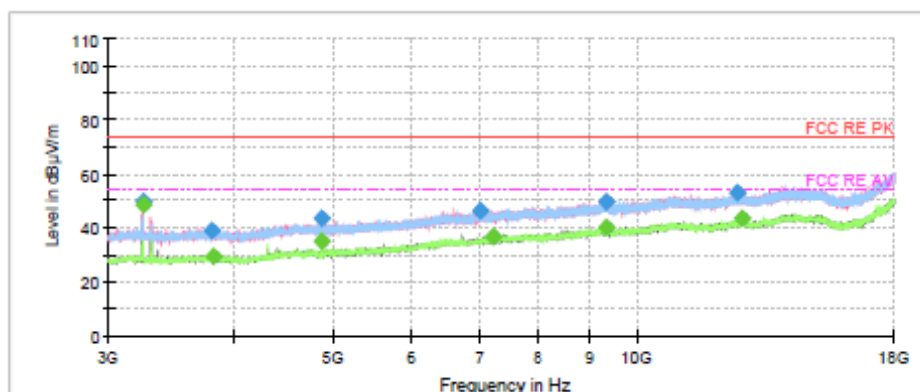


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1053.400000	---	34.41	54.00	19.59	100.0	V	2.0	-11.3
1066.666667	43.67	---	74.00	30.33	100.0	H	0.0	-11.2
1434.866667	---	35.88	54.00	18.12	100.0	V	273.0	-9.2
1440.400000	46.22	---	74.00	27.78	100.0	V	287.0	-9.2
1848.466667	45.76	---	74.00	28.24	100.0	V	358.0	-8.6
1850.066667	---	35.51	54.00	18.49	100.0	V	127.0	-8.6
2169.133333	46.84	---	74.00	27.16	100.0	V	193.0	-7.3
2181.466667	---	36.68	54.00	17.32	100.0	H	280.0	-7.2
2645.733333	---	37.32	54.00	16.68	100.0	V	206.0	-6.1
2646.933333	47.89	---	74.00	26.11	200.0	H	248.0	-6.1
2929.266667	47.21	---	74.00	26.79	200.0	H	248.0	-5.9
2930.533333	---	38.11	54.00	15.89	100.0	H	0.0	-5.9

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)



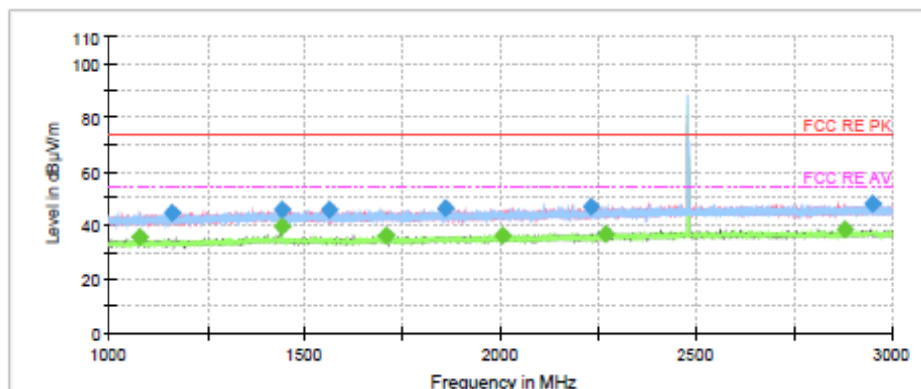
Radiates Emission from 3GHz to 18GHz

Note: The signal beyond the limit is carrier.

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3254.500000	49.63	---	74.00	24.37	200.0	V	142.0	-15.3
3254.500000	---	48.68	54.00	5.32	200.0	V	142.0	-15.3
3800.500000	39.00	---	74.00	35.00	200.0	V	354.0	-13.9
3809.000000	---	29.58	54.00	24.42	100.0	H	287.0	-13.8
4881.500000	43.33	---	74.00	30.67	100.0	V	204.0	-10.3
4882.000000	---	35.20	54.00	18.80	100.0	V	204.0	-10.3
7008.000000	46.54	---	74.00	27.46	100.0	V	245.0	-3.3
7209.000000	---	36.67	54.00	17.33	200.0	H	34.0	-3.7
9341.000000	---	40.00	54.00	14.00	200.0	V	354.0	-2.3
9349.000000	49.51	---	74.00	24.49	100.0	V	218.0	-2.3
12568.500000	52.78	---	74.00	21.22	100.0	V	274.0	2.2
12733.500000	---	43.25	54.00	10.75	200.0	V	332.0	2.5

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

3DH5-Channel 78

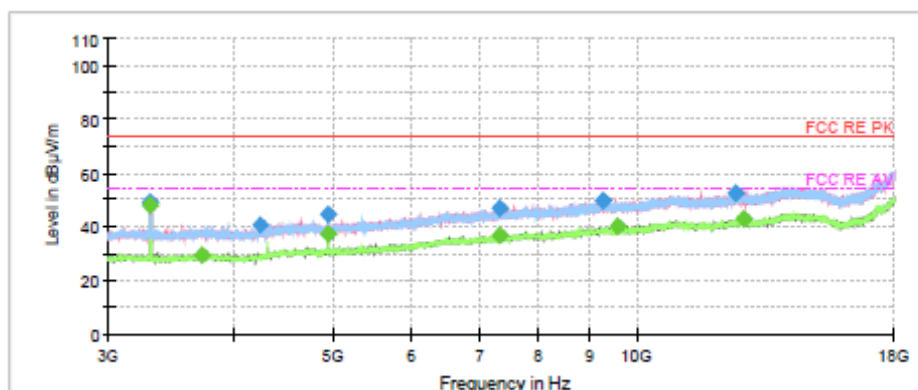


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1080.400000	---	35.78	54.00	18.22	200.0	V	305.0	-11.1
1161.800000	44.50	---	74.00	29.50	100.0	V	334.0	-10.8
1440.333333	---	39.34	54.00	14.66	100.0	V	291.0	-9.2
1440.666667	45.64	---	74.00	28.36	100.0	V	264.0	-9.2
1560.933333	45.79	---	74.00	28.21	200.0	V	340.0	-9.1
1706.533333	---	35.96	54.00	18.04	100.0	V	104.0	-8.8
1858.533333	46.52	---	74.00	27.48	100.0	H	356.0	-8.5
2004.466667	---	36.33	54.00	17.67	100.0	V	52.0	-7.9
2231.133333	46.60	---	74.00	27.40	100.0	H	358.0	-7.1
2266.866667	---	36.59	54.00	17.41	100.0	V	237.0	-7.0
2881.133333	---	38.39	54.00	15.61	100.0	V	264.0	-5.9
2951.800000	48.07	---	74.00	25.93	200.0	H	180.0	-5.8

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)



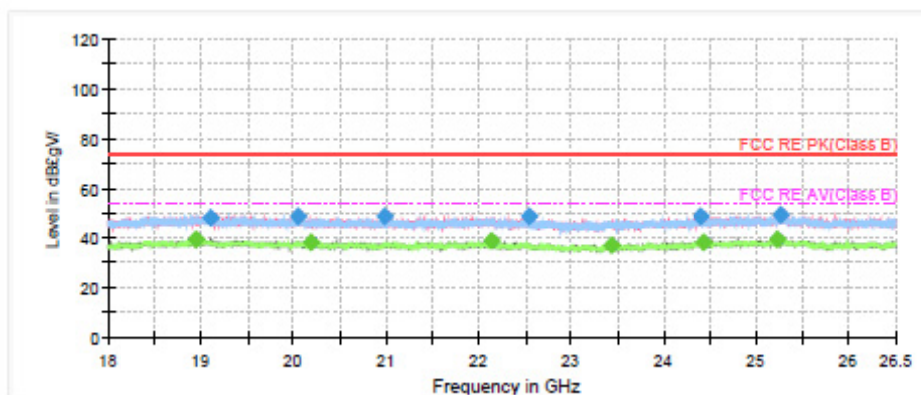
Radiates Emission from 3GHz to 18GHz

Note: The signal beyond the limit is carrier.

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3306.500000	49.34	---	74.00	24.66	100.0	V	150.0	-15.2
3306.500000	---	47.68	54.00	6.32	100.0	V	150.0	-15.2
3713.000000	---	29.51	54.00	24.49	100.0	H	268.0	-14.2
4239.000000	40.39	---	74.00	33.61	200.0	H	54.0	-12.4
4960.000000	44.48	---	74.00	29.52	100.0	V	284.0	-9.9
4960.000000	---	37.02	54.00	16.98	200.0	V	206.0	-9.9
7319.500000	---	36.75	54.00	17.25	200.0	V	12.0	-3.5
7333.500000	46.57	---	74.00	27.43	100.0	H	268.0	-3.4
9278.500000	49.65	---	74.00	24.35	200.0	H	18.0	-2.4
9572.500000	---	39.81	54.00	14.19	200.0	V	74.0	-2.1
12561.500000	52.74	---	74.00	21.26	100.0	V	0.0	2.1
12794.500000	---	42.94	54.00	11.06	200.0	H	18.0	2.5

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

During the test, the Radiates Emission from 18GHz to 26.5GHz was performed in all modes with all channels, 3DH5-Channel 39 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.



Radiates Emission from 18GHz to 26.5GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18942.083333	---	39.13	54.00	14.87	200.0	V	22.0	-3.5
19112.366667	47.96	---	74.00	26.04	200.0	H	32.0	-3.4
20057.000000	48.84	---	74.00	25.16	200.0	V	57.0	-3.0
20187.333333	---	37.91	54.00	16.09	200.0	V	100.0	-2.8
20978.400000	48.42	---	74.00	25.58	100.0	H	115.0	-2.2
22139.783333	---	38.62	54.00	15.38	100.0	H	108.0	-1.1
22539.283333	48.37	---	74.00	25.63	200.0	H	273.0	-0.9
23426.116667	---	37.23	54.00	16.77	200.0	H	308.0	-1.0
24398.800000	48.68	---	74.00	25.32	100.0	V	76.0	0.4
24436.200000	---	38.38	54.00	15.62	200.0	H	315.0	0.4
25216.500000	---	39.27	54.00	14.73	100.0	H	326.0	1.1
25262.966667	49.22	---	74.00	24.78	200.0	V	50.0	1.0

5.9 Conducted Emission

Ambient condition

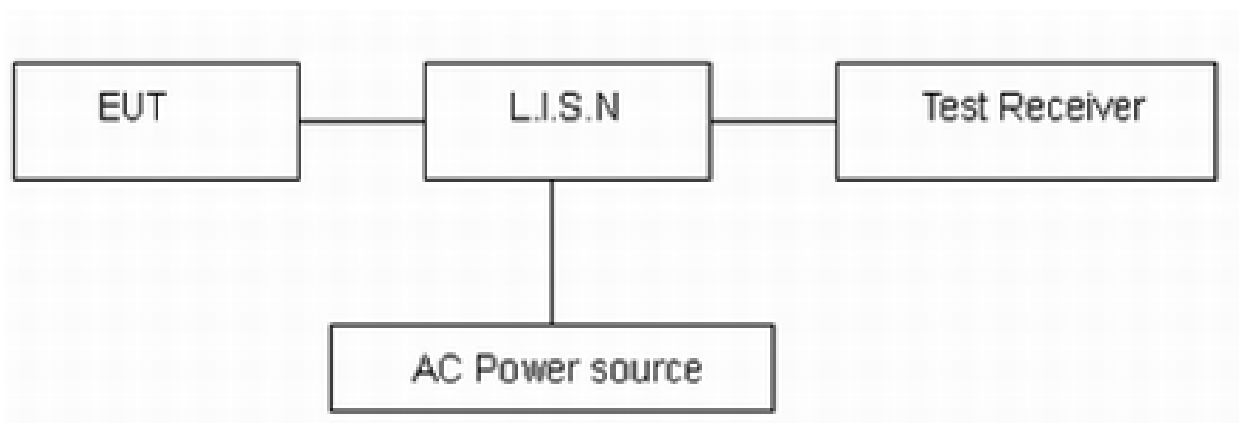
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

The EUT is placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.10. Connect the AC power line of the EUT to the L.I.S.N. Use EMI receiver to detect the average and Quasi-peak value. RBW is set to 9 kHz, VBW is set to 30kHz. The measurement result should include both L line and N line.

The test is in transmitting mode.

Test Setup



Note: AC Power source is used to 120V/60Hz.

Limits

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
*: Decreases with the logarithm of the frequency.		

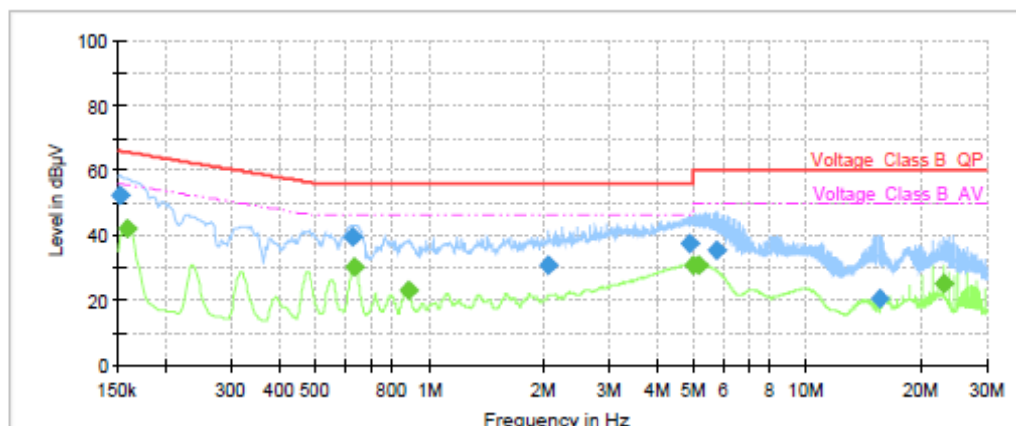
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$, $U=2.69$ dB.

Test Results:

ESP32-PICO-MINI-02

Following plots, Blue trace uses the peak detection, Green trace uses the average detection. During the test, the Conducted Emission was performed in all modes with all channels, BT 3DH5-Channel 0, are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

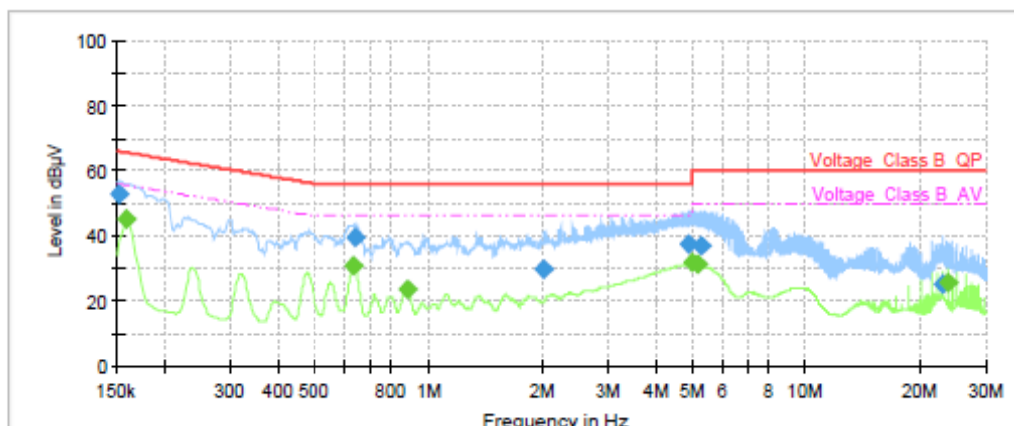


Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.15	52.54	---	65.88	13.34	70.0	9.000	L1	ON	21
0.16	---	42.25	55.52	13.27	70.0	9.000	L1	ON	21
0.63	39.51	---	56.00	16.49	70.0	9.000	L1	ON	20
0.63	---	30.39	46.00	15.61	70.0	9.000	L1	ON	20
0.88	---	23.17	46.00	22.83	70.0	9.000	L1	ON	20
2.07	30.77	---	56.00	25.23	70.0	9.000	L1	ON	20
4.92	37.49	---	56.00	18.51	70.0	9.000	L1	ON	19
4.99	---	30.86	46.00	15.14	70.0	9.000	L1	ON	19
5.18	---	30.82	50.00	19.18	70.0	9.000	L1	ON	19
5.73	35.32	---	60.00	24.68	70.0	9.000	L1	ON	19
15.57	20.72	---	60.00	39.28	70.0	9.000	L1	ON	20
23.09	---	25.34	50.00	24.66	70.0	9.000	L1	ON	20

Remark: Correct factor=cable loss + LISN factor

L line

Conducted Emission from 150 KHz to 30 MHz



Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.15	53.02	---	65.88	12.86	70.0	9.000	N	ON	21
0.16	---	45.00	55.52	10.52	70.0	9.000	N	ON	21
0.64	---	30.75	46.00	15.25	70.0	9.000	N	ON	20
0.64	39.31	---	56.00	16.69	70.0	9.000	N	ON	20
0.88	---	23.39	46.00	22.61	70.0	9.000	N	ON	20
2.02	29.81	---	56.00	26.19	70.0	9.000	N	ON	20
4.88	37.37	---	56.00	18.63	70.0	9.000	N	ON	19
4.98	---	31.98	46.00	14.02	70.0	9.000	N	ON	19
5.14	---	31.14	50.00	18.86	70.0	9.000	N	ON	19
5.28	36.96	---	60.00	23.04	70.0	9.000	N	ON	19
23.03	25.11	---	60.00	34.89	70.0	9.000	N	ON	20
23.79	---	25.82	50.00	24.18	70.0	9.000	N	ON	20

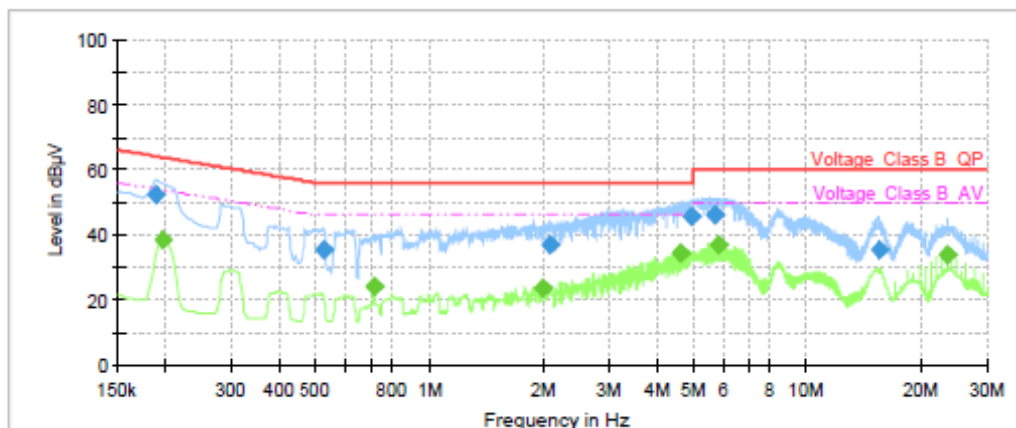
Remark: Correct factor=cable loss + LISN factor

N line

Conducted Emission from 150 KHz to 30 MHz

ESP32-PICO-MINI-02U

Following plots, Blue trace uses the peak detection, Green trace uses the average detection. During the test, the Conducted Emission was performed in all modes with all channels, BT 3DH5-Channel 39, are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

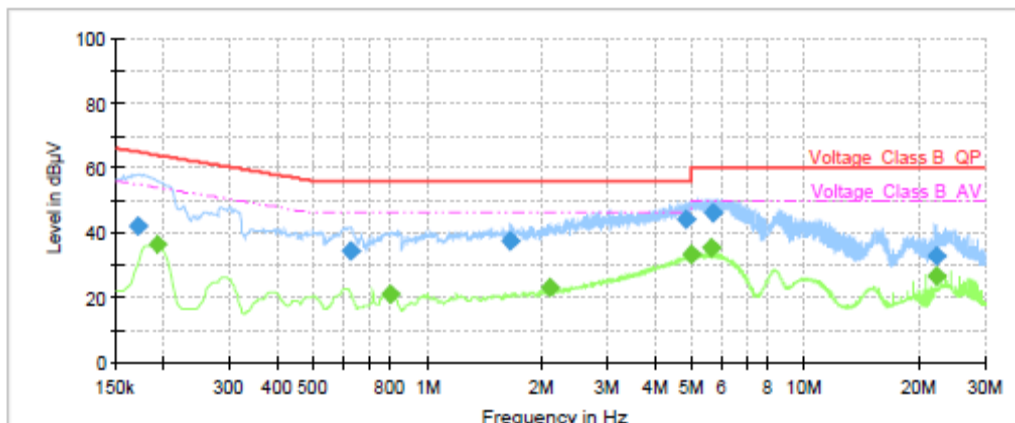


Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.19	52.42	---	64.11	11.69	70.0	9.000	L1	ON	21
0.20	---	38.61	53.73	15.12	70.0	9.000	L1	ON	21
0.53	35.25	---	56.00	20.75	70.0	9.000	L1	ON	20
0.71	---	24.18	46.00	21.82	70.0	9.000	L1	ON	20
1.99	---	23.61	46.00	22.39	70.0	9.000	L1	ON	20
2.10	36.84	---	56.00	19.16	70.0	9.000	L1	ON	20
4.64	---	34.59	46.00	11.41	70.0	9.000	L1	ON	19
4.95	45.45	---	56.00	10.55	70.0	9.000	L1	ON	19
5.70	46.38	---	60.00	13.62	70.0	9.000	L1	ON	19
5.82	---	36.70	50.00	13.30	70.0	9.000	L1	ON	19
15.58	35.46	---	60.00	24.54	70.0	9.000	L1	ON	20
23.52	---	33.62	50.00	16.38	70.0	9.000	L1	ON	20

Remark: Correct factor=cable loss + LISN factor

L line

Conducted Emission from 150 KHz to 30 MHz



Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.17	42.22	---	64.95	22.73	70.0	9.000	N	ON	21
0.19	---	36.17	53.92	17.75	70.0	9.000	N	ON	21
0.63	34.19	---	56.00	21.81	70.0	9.000	N	ON	20
0.80	---	20.93	46.00	25.07	70.0	9.000	N	ON	20
1.67	37.21	---	56.00	18.79	70.0	9.000	N	ON	20
2.10	---	23.17	46.00	22.83	70.0	9.000	N	ON	20
4.83	44.06	---	56.00	11.94	70.0	9.000	N	ON	19
4.99	---	33.11	46.00	12.89	70.0	9.000	N	ON	19
5.65	---	35.31	50.00	14.69	70.0	9.000	N	ON	19
5.71	46.07	---	60.00	13.93	70.0	9.000	N	ON	19
22.24	32.73	---	60.00	27.27	70.0	9.000	N	ON	20
22.27	---	26.75	50.00	23.25	70.0	9.000	N	ON	20

Remark: Correct factor=cable loss + LISN factor

N line

Conducted Emission from 150 KHz to 30 MHz

6 Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Wireless Communication Tester	R&S	CMW270	100673	2021-05-15	2022-05-14
Signal Analyzer	R&S	FSV30	100815	2020-12-13	2021-12-12
EMI Test Receiver	R&S	ESCI	100948	2021-05-15	2022-05-14
Loop Antenna	Schwarzbeck	FMZB1519	1519-047	2020-04-02	2023-04-01
TRILOG Broadband Antenna	SCHWARZBECK	VULB 9163	391	2019-12-16	2022-12-15
Horn Antenna	R&S	HF907	102723	2021-08-10	2023-08-09
Standard Gain Horn	QPAR	QMS-00225	19928	2020-02-26	2023-02-25
EMI Test Receiver	R&S	ESR	101667	2021-05-16	2022-05-15
LISN	R&S	ENV216	101171	2018-12-15	2021-12-14
Spectrum Analyzer	Agilent	N9010A	MY47191109	2021-05-15	2022-05-14
RF Cable	Agilent	SMA 15cm	0001	2021-06-13	2021-12-12
Power Splitter	Hua Xiang	SHX-GF2-2-13	10120101	/	/
Software	R&S	EMC32	9.26.0	/	/

*****END OF REPORT *****



ANNEX A: The EUT Appearance

The EUT Appearance are submitted separately.



ANNEX B: Test Setup Photos

The Test Setup Photos are submitted separately.