



7.4. Power Spectral Density Measurement

7.4.1. Test Limit

The maximum permissible power spectral density is 8dBm in any 3 kHz band. And for antenna gain greater than 6dBi the limit shall reduce by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.4.2. Test Procedure Used

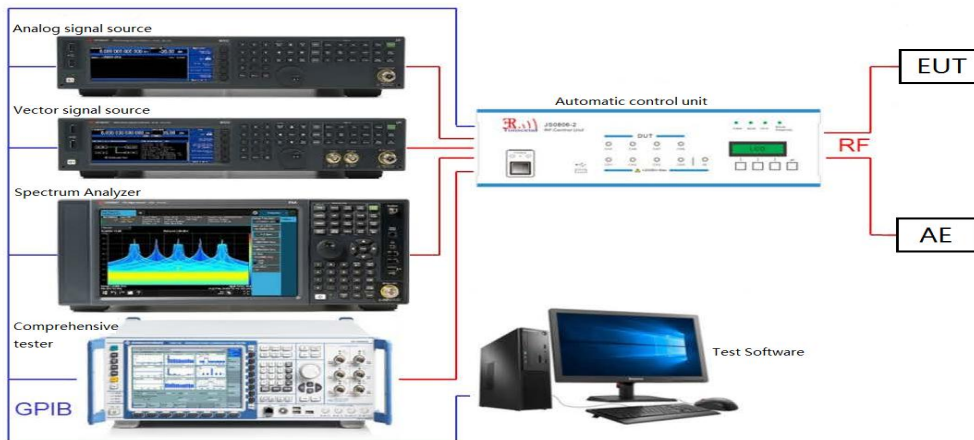
KDB 558074 D01 v05r02 - Section 8.4

ANSI C63.10 – Section 11.10.2

7.4.3. Test Setting

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq [3 \times \text{RBW}]$.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.

7.4.4. Test Setup

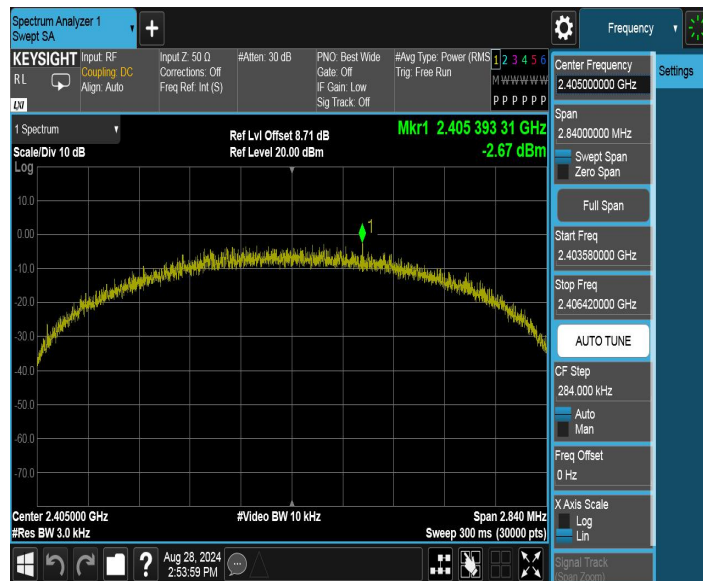


7.4.5. Test Result

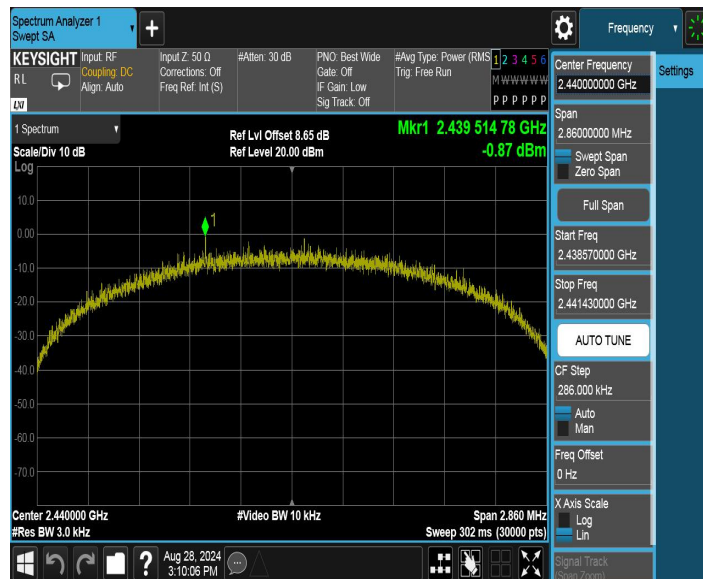
Test Mode	Antenna	Channel	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
Zigbee	Ant1	2405	-2.67	≤8.00	PASS
		2440	-0.87	≤8.00	PASS
		2480	-4.12	≤8.00	PASS

Test Graphs

ZIGB_Ant1_2405



ZIGB_Ant1_2440



ZIGB_Ant1_2480



7.5. Conducted Band Edge and Out-of-Band Emissions

7.5.1. Test Limit

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100 kHz bandwidth per the PSD procedure.

7.5.2. Test Procedure Used

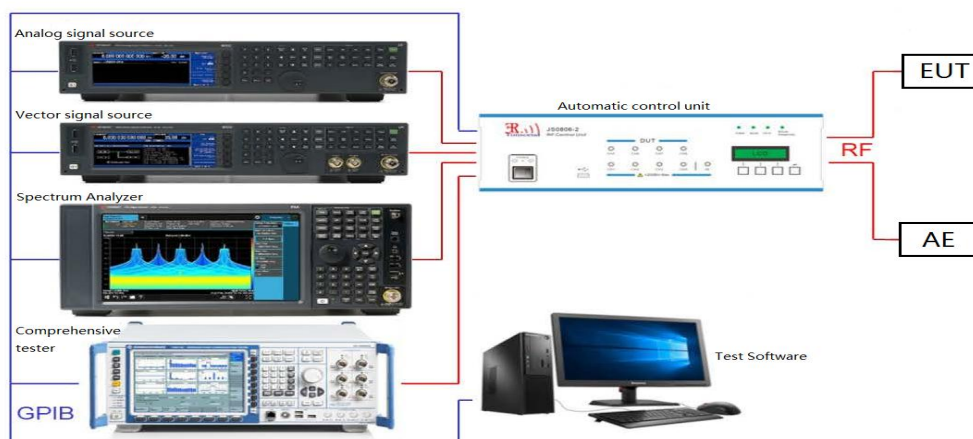
KDB 558074 D01 v05r02 - Section 8.5 & Section 8.6

ANSI C63.10 – Section 11.11&11.12

7.5.3. Test Setting

- (a) Set the center frequency and span to encompass frequency range to be measured
- (b) RBW = 100kHz
- (c) VBW = 300kHz
- (d) Detector = Peak
- (e) Trace mode = max hold
- (f) Sweep time = auto couple
- (g) The trace was allowed to stabilize

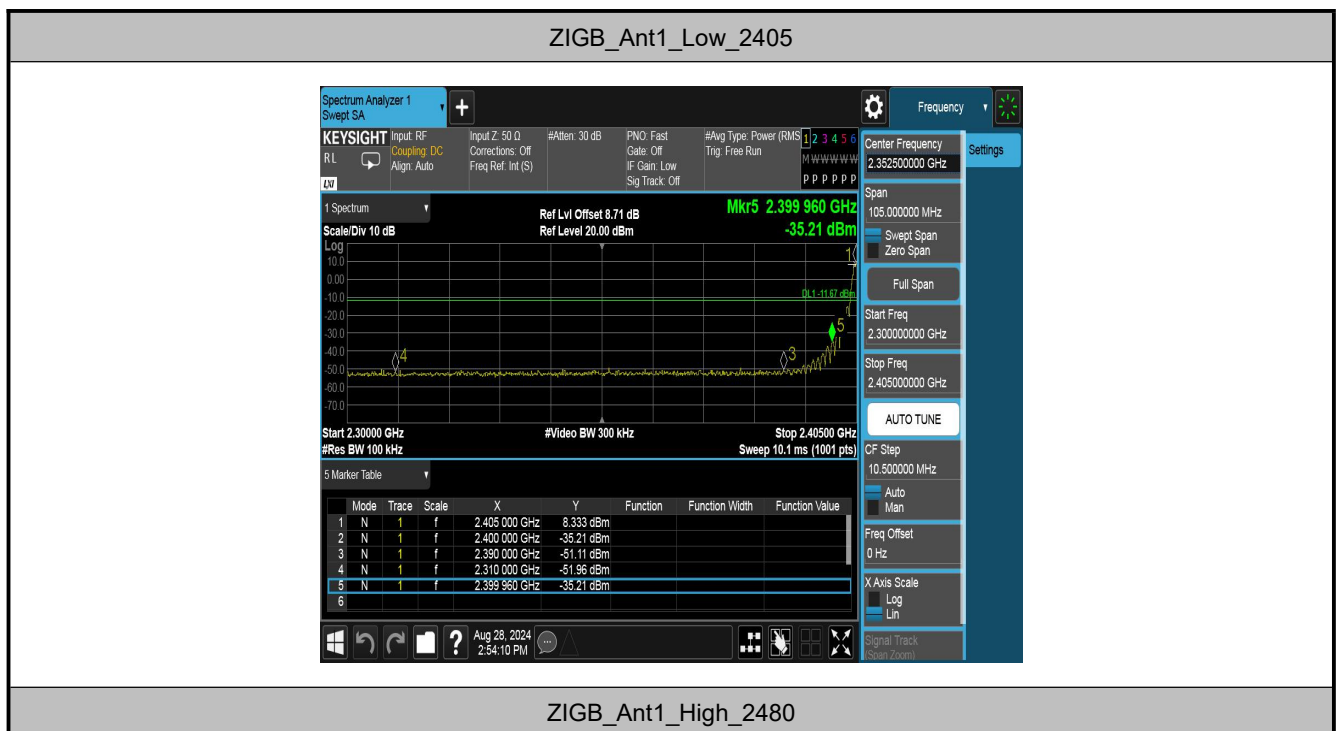
7.5.4. Test Setup



7.5.5. Test Result

Test Mode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
Zigbee	Ant1	2405	Reference	8.76	8.76	---	PASS
			30~1000	8.76	-60.95	≤-11.24	PASS
			1000~26500	8.76	-47.34	≤-11.24	PASS
		2440	Reference	8.30	8.30	---	PASS
			30~1000	8.30	-61.29	≤-11.7	PASS
			1000~26500	8.30	-51.07	≤-11.7	PASS
		2480	Reference	7.11	7.11	---	PASS
			30~1000	7.11	-60.44	≤-12.89	PASS
			1000~26500	7.11	-49.84	≤-12.89	PASS

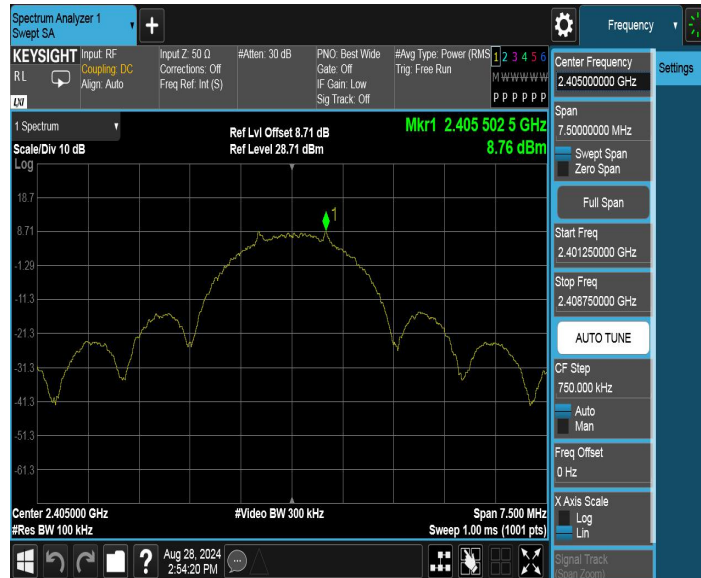
Test Graphs of Band Edge



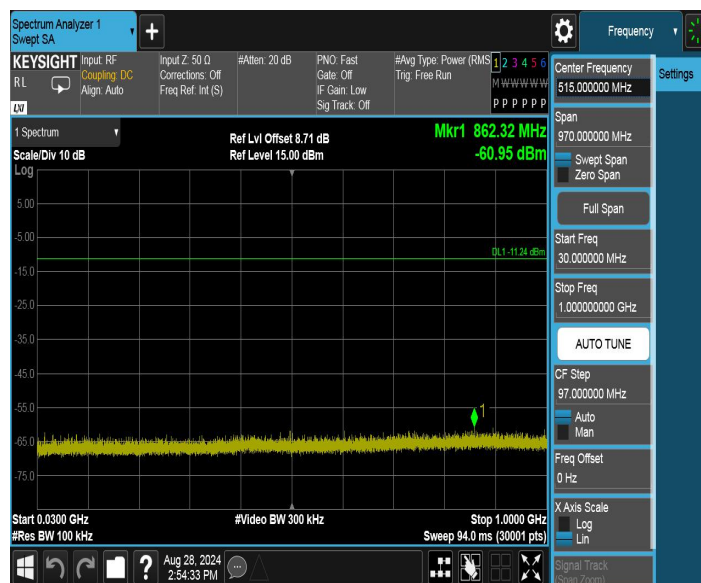


Test Graphs of Out-of-Band Emissions

ZIGB_Ant1_2405_0~Reference



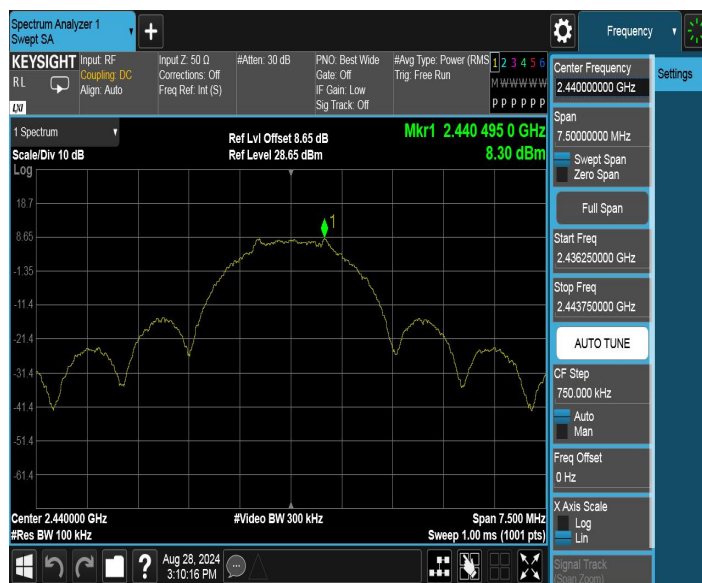
ZIGB_Ant1_2405_30~1000



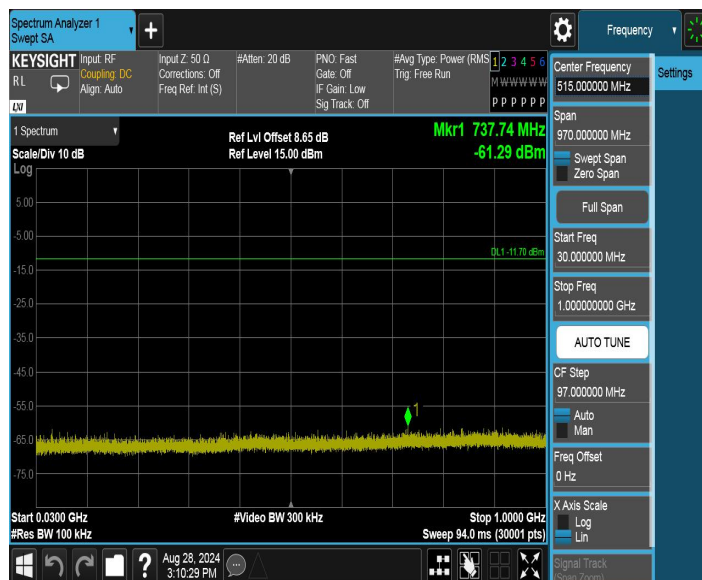
ZIGB_Ant1_2405_1000~26500



ZIGB_Ant1_2440_0~Reference



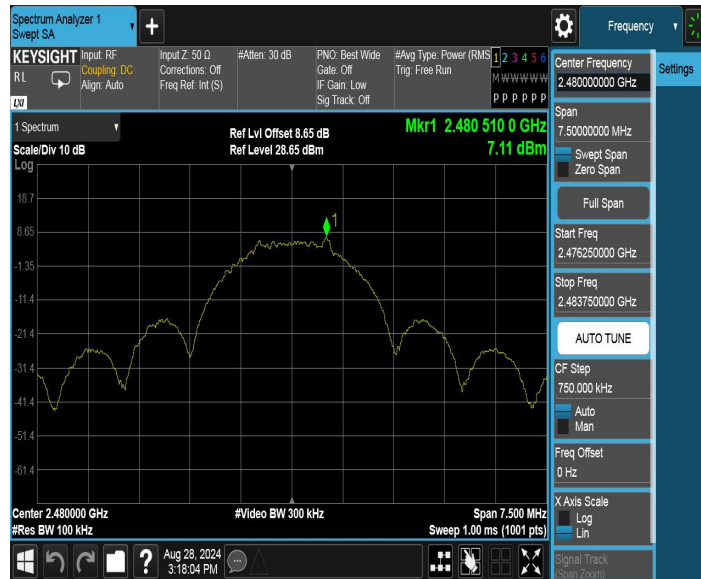
ZIGB_Ant1_2440_30~1000



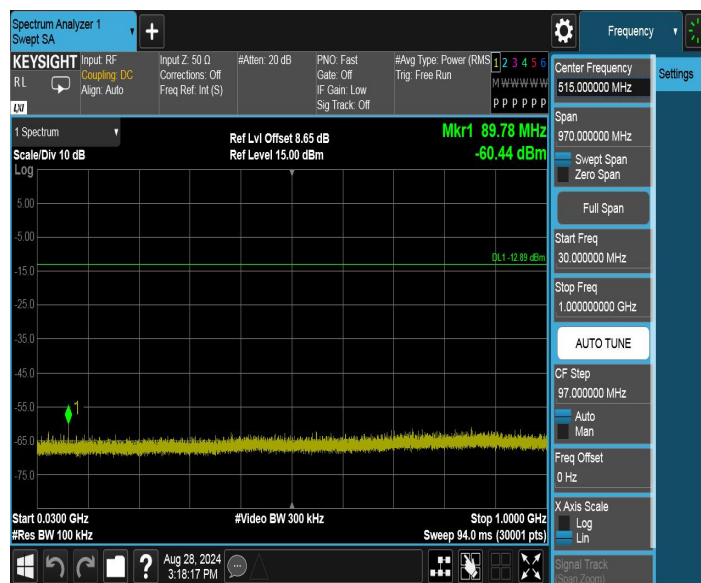
ZIGB_Ant1_2440_1000~26500



ZIGB_Ant1_2480_0~Reference



ZIGB_Ant1_2480_30~1000



ZIGB_Ant1_2480_1000~26500



7.6. Radiated Spurious Emission Measurement

7.6.1. Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 – 0.490	2400/F (kHz)	300
0.490 – 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

7.6.2. Test Procedure Used

ANSI C63.10-2013 – Section 6.6.4.3

7.6.3. Test Setting

Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in Table 1
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold

- Trace was allowed to stabilize

Table 1 - RBW as a function of frequency

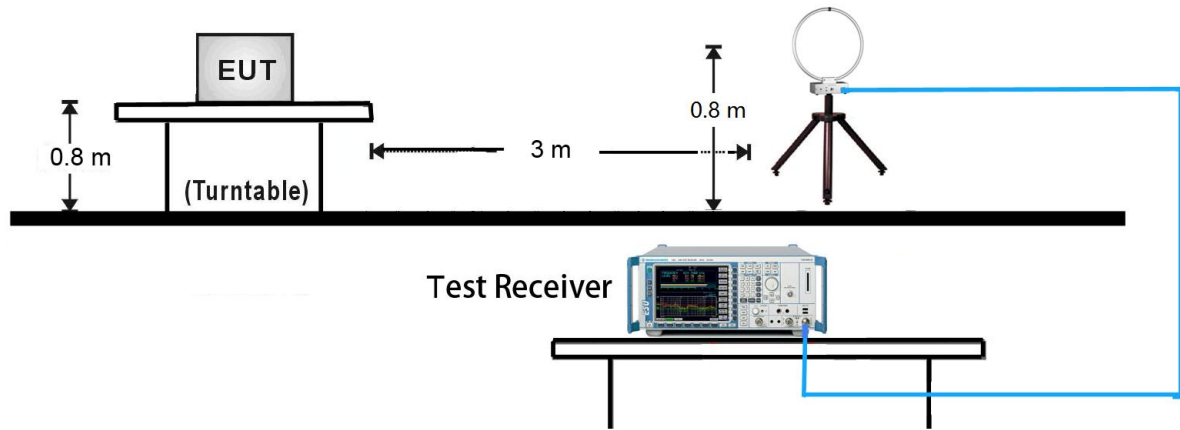
Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000 MHz	1 MHz

Average Field Strength Measurements

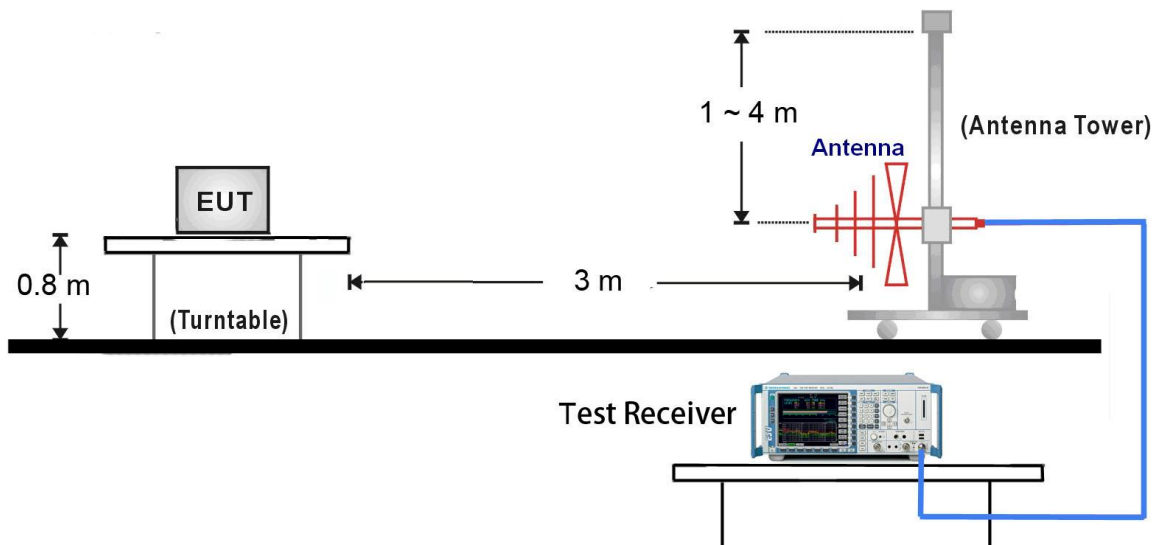
- Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
- RBW = 1MHz
- VBW = 3MHz
- Detector = Power Average (RMS)
- Number of sweep point = 2001 (Number of sweep points must be $\geq 2 \times \text{span} / \text{RBW}$)
- Sweep time = auto
- Trace (RMS) averaging was performed over at least 100 traces.

7.6.4. Test Setup

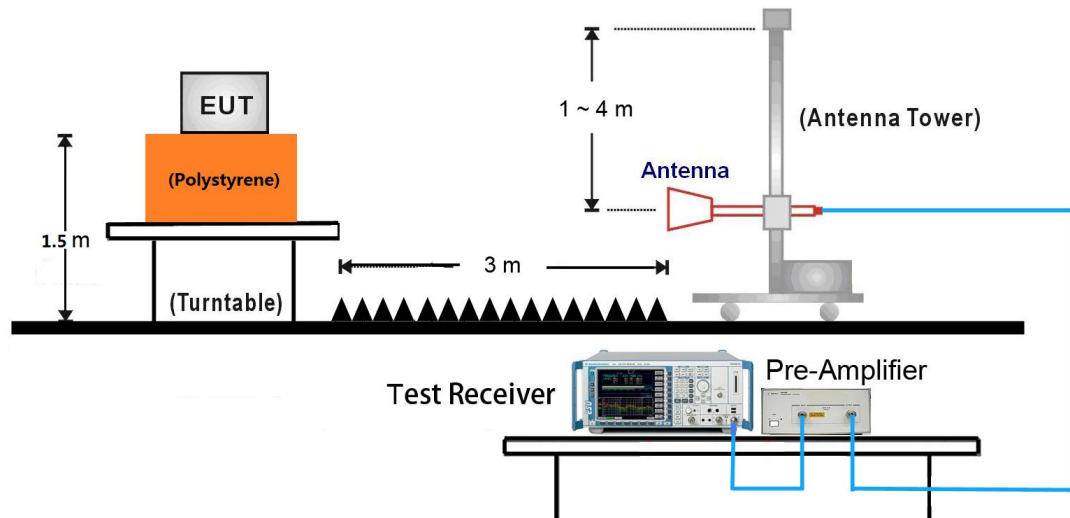
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



1GHz ~ 26.5GHz Test Setup:



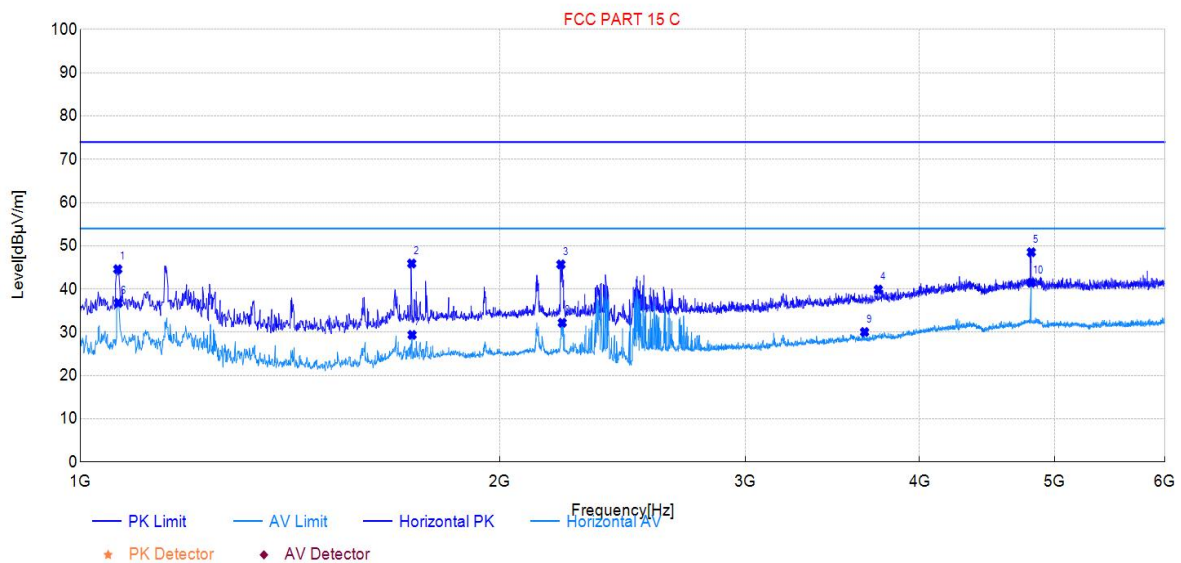
7.6.5. Test Result

The worst case of Radiated Emission above 1GHz:

1GHz – 6GHz Test Data

EUT:	Smart Soil Moisture Sensor	Polarity:	Horizontal
Model:	3RSM0147Z	Test Date:	2024-08-30
Mode:	Transmit at Zigbee Channel 11	Voltage:	DC 1.5V
Environment:	Temp: 23°C; Humi:51%	Engineer:	Chuang Li

Test Graph



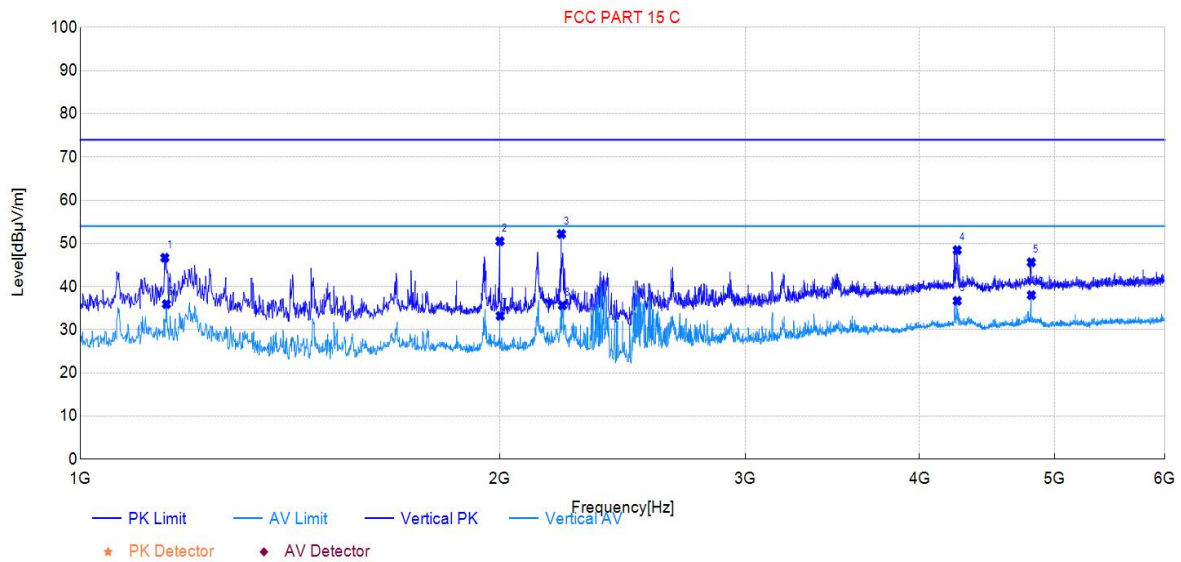
Suspected Data List

NO.	Frequency [MHz]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol
1	1064.00	44.59	-24.00	74.00	29.41	PK	Horizontal
2	1729.00	45.90	-20.09	74.00	28.10	PK	Horizontal
3	2212.00	45.69	-17.16	74.00	28.31	PK	Horizontal
4	3737.00	39.89	-10.73	74.00	34.11	PK	Horizontal
5	4811.00	48.52	-6.76	74.00	25.48	PK	Horizontal
6	1065.00	36.79	-23.99	54.00	17.21	AV	Horizontal
7	1730.00	29.40	-20.08	54.00	24.60	AV	Horizontal
8	2217.00	32.21	-17.15	54.00	21.79	AV	Horizontal
9	3653.00	30.06	-11.26	54.00	23.94	AV	Horizontal
10	4810.00	41.44	-6.76	54.00	12.56	AV	Horizontal

Note 1: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 26.5GHz), therefore no data appear in the report.

EUT:	Smart Soil Moisture Sensor	Polarity:	Vertical
Model:	3RSM0147Z	Test Date:	2024-08-30
Mode:	Transmit at Zigbee Channel 11	Voltage:	DC 1.5V
Environment:	Temp: 23°C; Humi:51%	Engineer:	Chuang Li

Test Graph

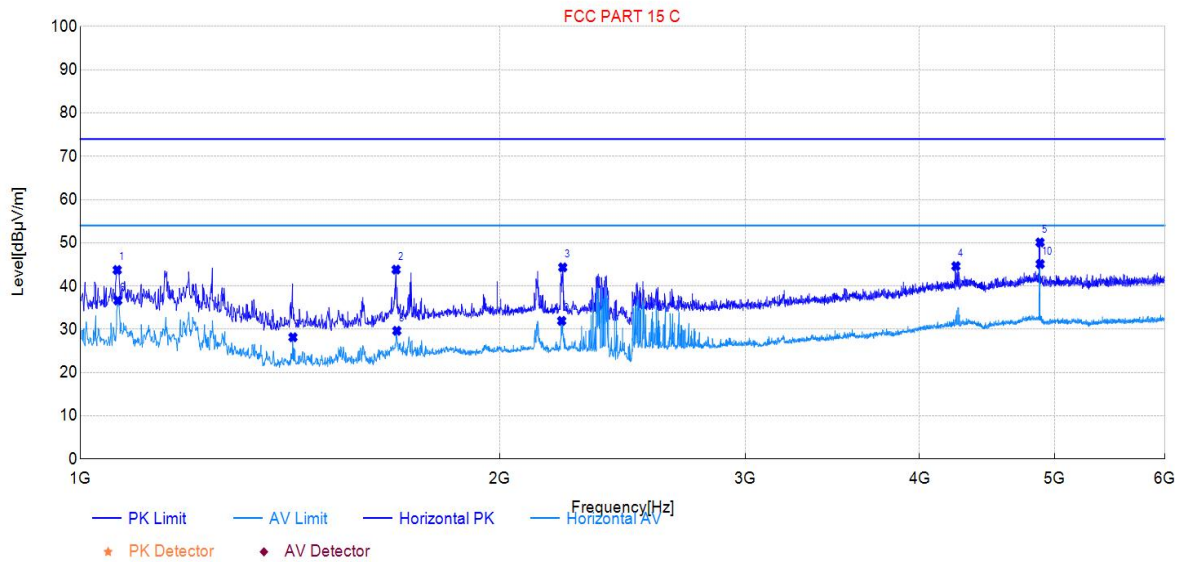


Suspected Data List

NO.	Frequency [MHz]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol
1	1150.00	46.67	-22.64	74.00	27.33	PK	Vertical
2	2000.00	50.50	-17.76	74.00	23.50	PK	Vertical
3	2214.00	52.18	-17.06	74.00	21.82	PK	Vertical
4	4257.00	48.44	-7.78	74.00	25.56	PK	Vertical
5	4811.00	45.61	-7.31	74.00	28.39	PK	Vertical
6	1153.00	35.92	-22.63	54.00	18.08	AV	Vertical
7	2001.00	33.21	-17.76	54.00	20.79	AV	Vertical
8	2218.00	35.63	-17.05	54.00	18.37	AV	Vertical
9	4257.00	36.68	-7.78	54.00	17.32	AV	Vertical
10	4812.00	38.02	-7.31	54.00	15.98	AV	Vertical

EUT:	Smart Soil Moisture Sensor	Polarity:	Horizontal
Model:	3RSM0147Z	Test Date:	2024-08-30
Mode:	Transmit at Zigbee Channel 18	Voltage:	DC 1.5V
Environment:	Temp: 23°C; Humi:51%	Engineer:	Chuang Li

Test Graph



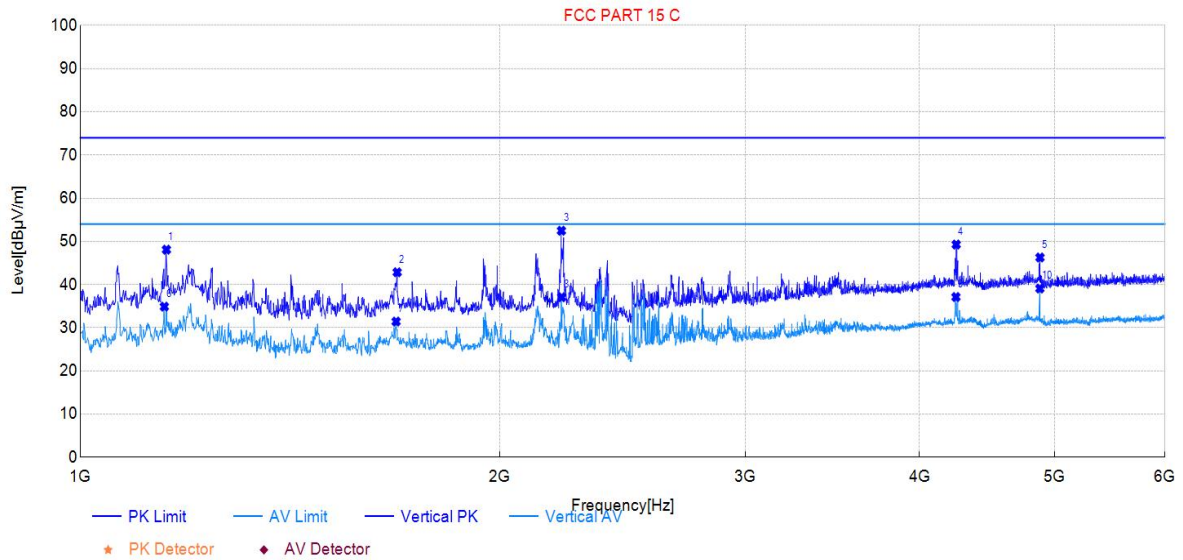
Suspected Data List

NO.	Frequency [MHz]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol
1	1063.00	43.72	-24.00	74.00	30.28	PK	Horizontal
2	1685.00	43.81	-20.44	74.00	30.19	PK	Horizontal
3	2219.00	44.32	-17.14	74.00	29.68	PK	Horizontal
4	4248.00	44.61	-7.81	74.00	29.39	PK	Horizontal
5	4881.00	50.09	-6.56	74.00	23.91	PK	Horizontal
6	1064.00	36.67	-24.00	54.00	17.33	AV	Horizontal
7	1421.00	28.16	-22.09	54.00	25.84	AV	Horizontal
8	1687.00	29.65	-20.43	54.00	24.35	AV	Horizontal
9	2215.00	31.95	-17.15	54.00	22.05	AV	Horizontal
10	4882.00	45.09	-6.56	54.00	8.91	AV	Horizontal

Note 1: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 26.5GHz), therefore no data appear in the report.

EUT:	Smart Soil Moisture Sensor	Polarity:	Vertical
Model:	3RSM0147Z	Test Date:	2024-08-30
Mode:	Transmit at Zigbee Channel 18	Voltage:	DC 1.5V
Environment:	Temp: 23°C; Humi:51%	Engineer:	Chuang Li

Test Graph

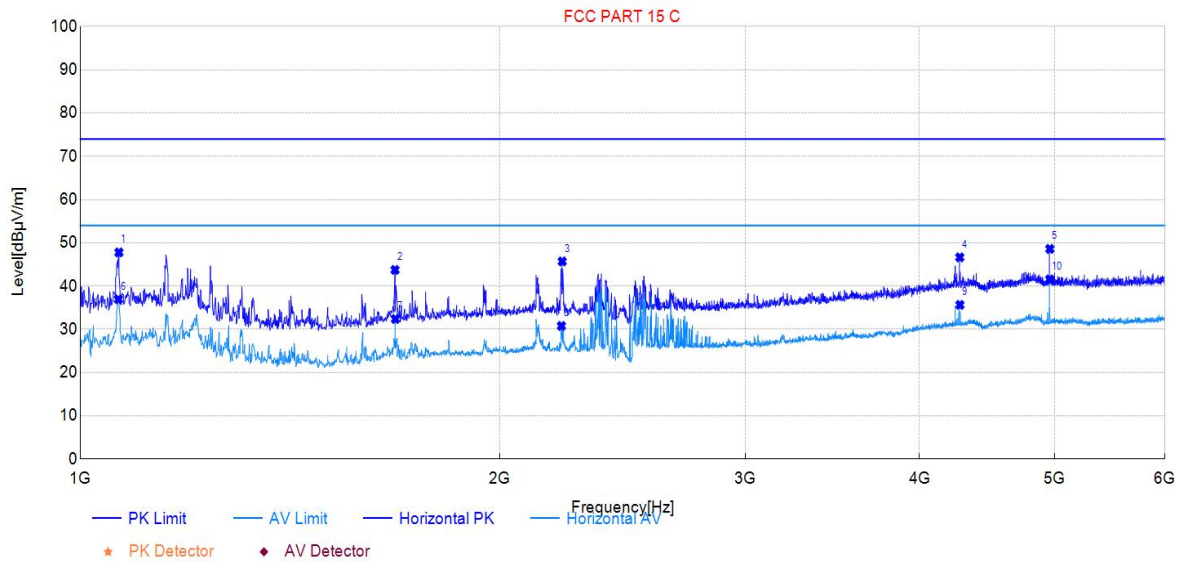


Suspected Data List

NO.	Frequency [MHz]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol
1	1153.00	48.08	-22.63	74.00	25.92	PK	Vertical
2	1688.00	42.84	-19.77	74.00	31.16	PK	Vertical
3	2214.00	52.47	-17.06	74.00	21.53	PK	Vertical
4	4250.00	49.27	-7.80	74.00	24.73	PK	Vertical
5	4881.00	46.27	-7.16	74.00	27.73	PK	Vertical
6	1149.00	34.88	-22.63	54.00	19.12	AV	Vertical
7	1685.00	31.43	-19.79	54.00	22.57	AV	Vertical
8	2215.00	37.07	-17.05	54.00	16.93	AV	Vertical
9	4248.00	37.11	-7.81	54.00	16.89	AV	Vertical
10	4880.00	39.08	-7.17	54.00	14.92	AV	Vertical

EUT:	Smart Soil Moisture Sensor	Polarity:	Horizontal
Model:	3RSM0147Z	Test Date:	2024-08-30
Mode:	Transmit at Zigbee Channel 26	Voltage:	DC 1.5V
Environment:	Temp: 23°C; Humi:51%	Engineer:	Chuang Li

Test Graph



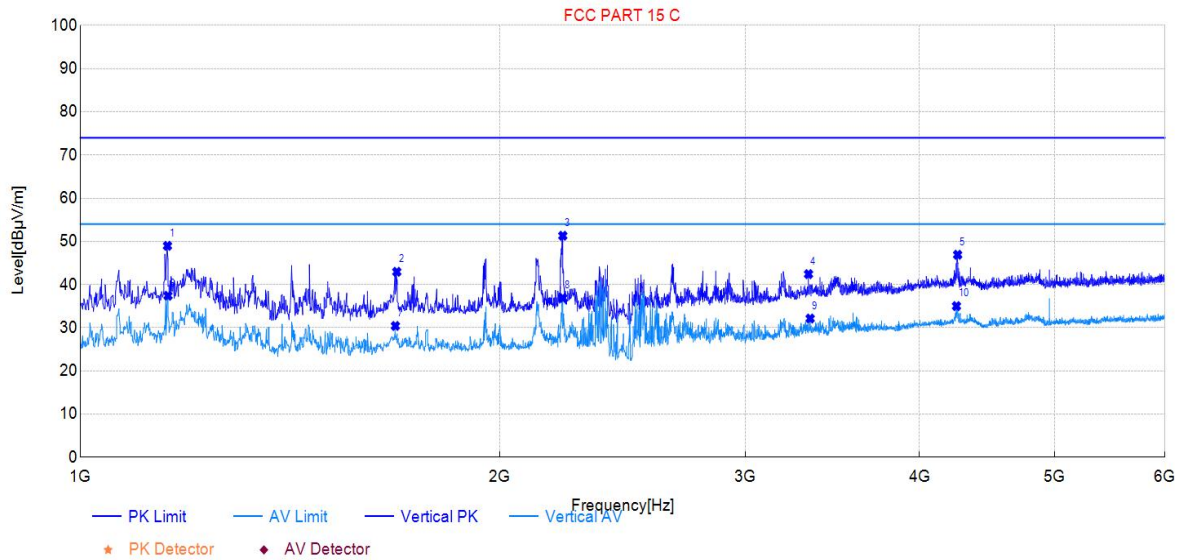
Suspected Data List

NO.	Frequency [MHz]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol
1	1066.00	47.78	-23.99	74.00	26.22	PK	Horizontal
2	1682.00	43.73	-20.47	74.00	30.27	PK	Horizontal
3	2217.00	45.70	-17.15	74.00	28.30	PK	Horizontal
4	4275.00	46.64	-7.70	74.00	27.36	PK	Horizontal
5	4961.00	48.59	-6.21	74.00	25.41	PK	Horizontal
6	1065.00	36.94	-23.99	54.00	17.06	AV	Horizontal
7	1683.00	32.38	-20.46	54.00	21.62	AV	Horizontal
8	2214.00	30.77	-17.16	54.00	23.23	AV	Horizontal
9	4276.00	35.64	-7.70	54.00	18.36	AV	Horizontal
10	4960.00	41.54	-6.21	54.00	12.46	AV	Horizontal

Note 1: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 26.5GHz), therefore no data appear in the report.

EUT:	Smart Soil Moisture Sensor	Polarity:	Vertical
Model:	3RSM0147Z	Test Date:	2024-08-30
Mode:	Transmit at Zigbee Channel 26	Voltage:	DC 1.5V
Environment:	Temp: 23°C; Humi:51%	Engineer:	Chuang Li

Test Graph



Suspected Data List

NO.	Frequency [MHz]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol
1	1155.00	48.97	-22.62	74.00	25.03	PK	Vertical
2	1687.00	42.95	-19.78	74.00	31.05	PK	Vertical
3	2219.00	51.31	-17.05	74.00	22.69	PK	Vertical
4	3330.00	42.42	-12.42	74.00	31.58	PK	Vertical
5	4260.00	46.90	-7.77	74.00	27.10	PK	Vertical
6	1156.00	37.41	-22.62	54.00	16.59	AV	Vertical
7	1683.00	30.41	-19.81	54.00	23.59	AV	Vertical
8	2219.00	36.89	-17.05	54.00	17.11	AV	Vertical
9	3339.00	32.13	-12.38	54.00	21.87	AV	Vertical
10	4252.00	35.01	-7.79	54.00	18.99	AV	Vertical