

# KCTL Inc.

65, Sinwon-ro, Yeongtong-gu,  
Suwon-si, Gyeonggi-do, 16677, Korea  
TEL: 82-31-285-0894 FAX: 82-505-299-8311  
[www.kctl.co.kr](http://www.kctl.co.kr)

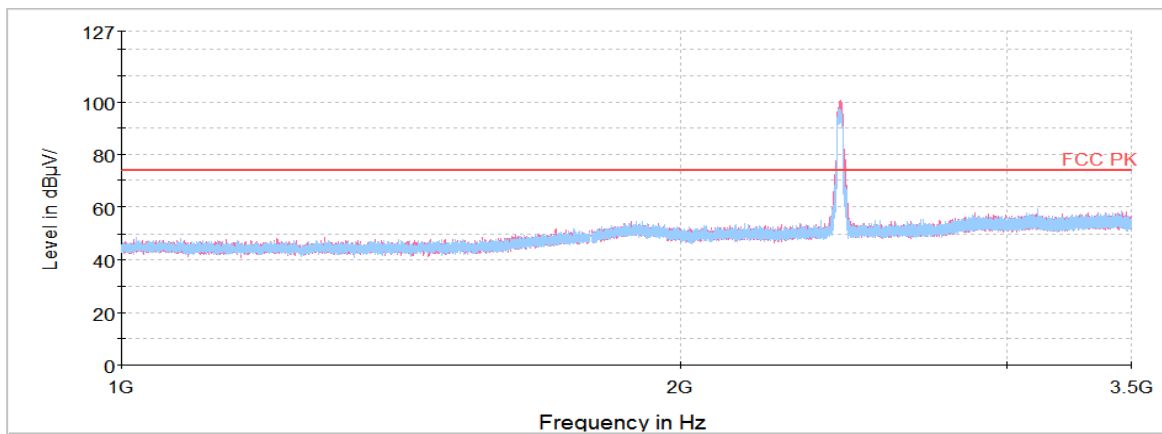
Report No.:  
KR21-SRF0090-C  
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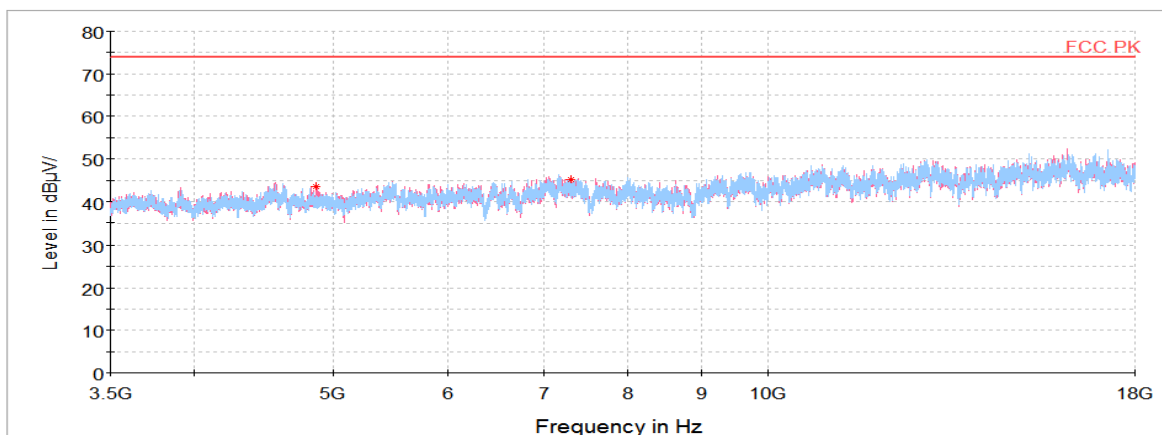
## 802.11g\_2 437 MHz

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
4 867.53 <sup>1)</sup>	V	62.89	33.82	-53.16	-	43.55	74.00	30.45
7 307.16 <sup>1)</sup>	V	60.70	35.30	-50.76	-	45.24	74.00	28.76
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								

### Horizontal/Vertical for 1 GHz ~ 3.5 GHz



### Horizontal/Vertical for 3.5 GHz ~ 18 GHz



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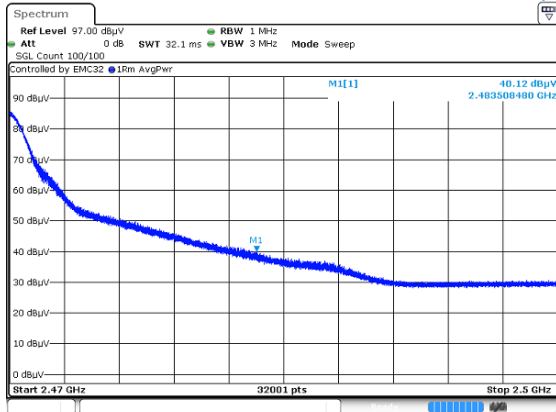
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## 802.11g\_2 462 MHz

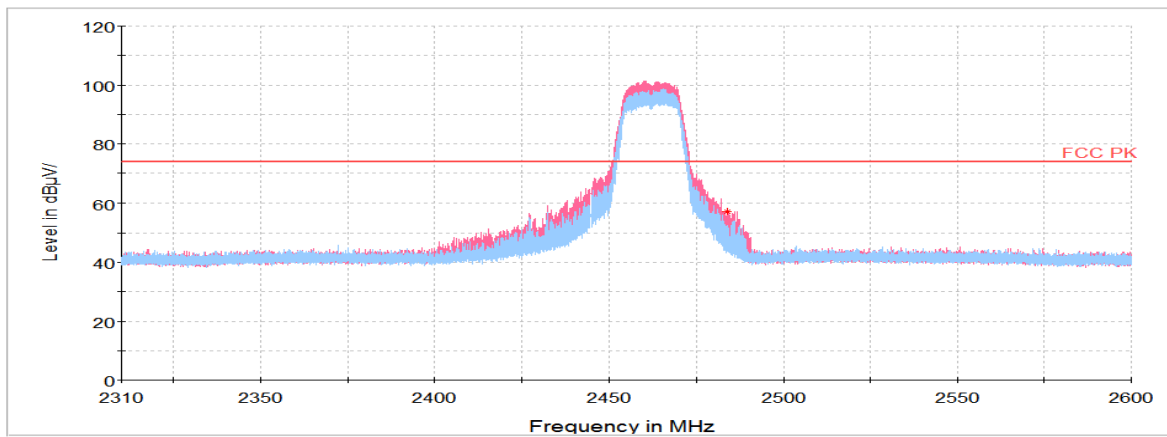
Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.51 <sup>1)</sup>	V	55.27	32.17	-27.95	-	59.49	74.00	14.51
4 925.98 <sup>1)</sup>	V	62.25	33.86	-53.23	-	42.88	74.00	31.12
7 388.27 <sup>1)</sup>	H	62.32	35.30	-50.75	-	46.87	74.00	27.13
<b>Average Data</b>								
2 483.51 <sup>1)</sup>	V	40.12	32.17	-27.95	0.32	44.66	54.00	9.34

### Average data



Blank

### Horizontal/Vertical for Band-edge



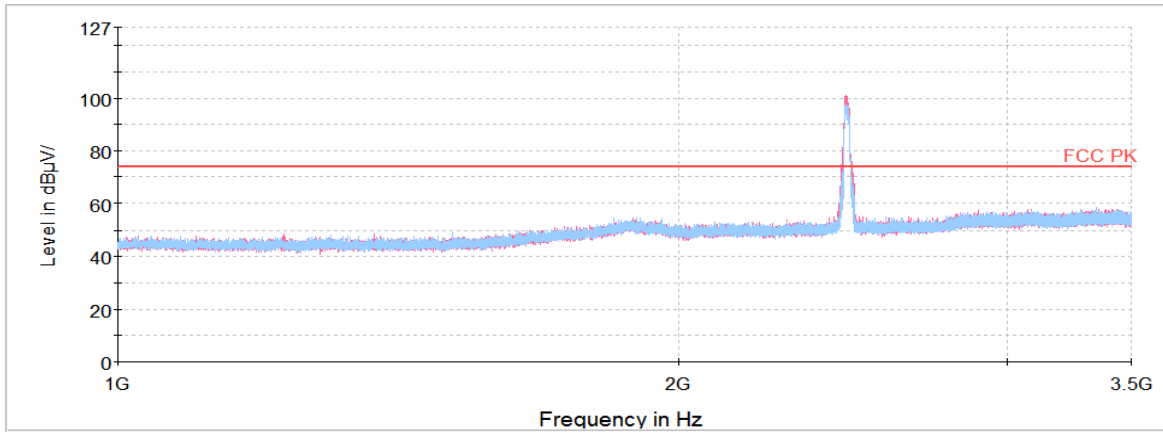
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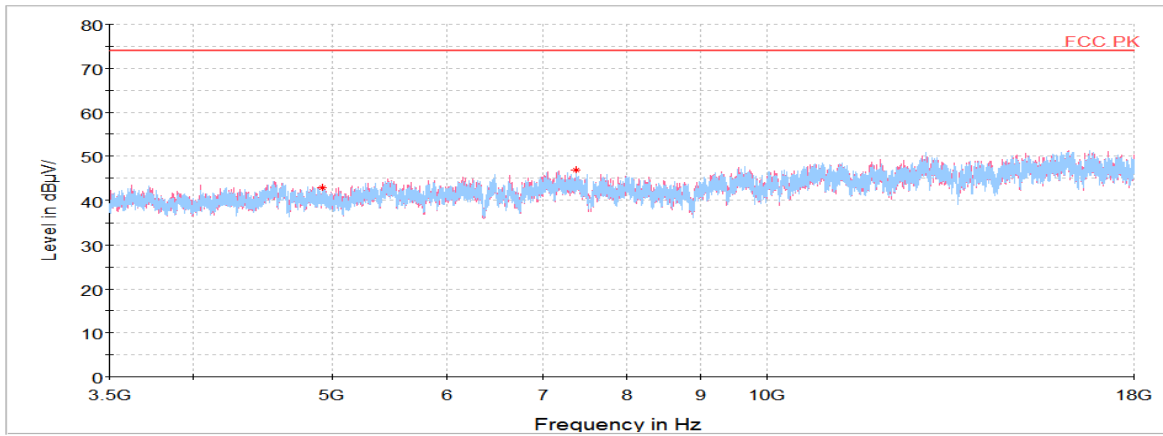
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## Horizontal/Vertical for 1 GHz ~ 3.5 GHz



## Horizontal/Vertical for 3.5 GHz ~ 18 GHz



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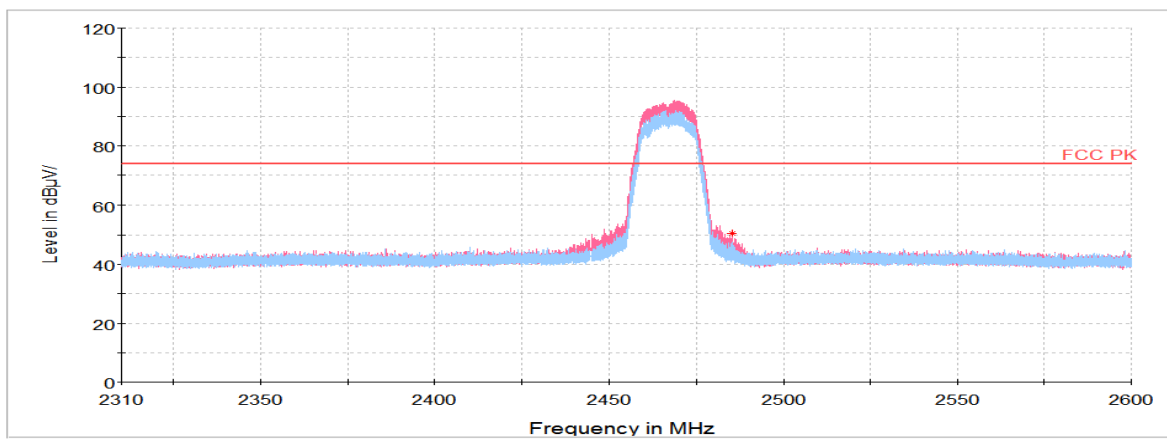
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## 802.11g\_2 467 MHz

Frequency (MHz)	Pol. (V/H)	Reading (dB( $\mu$ V))	Ant. Factor (dB)	Amp. + Cable (dB)	DCF (dB)	Result (dB( $\mu$ V/m))	Limit (dB( $\mu$ V/m))	Margin (dB)
<b>Peak data</b>								
2 485.35 <sup>1)</sup>	V	46.25	32.17	-27.96	-	50.46	74.00	23.54
4 935.50 <sup>1)</sup>	V	62.35	33.86	-53.27	-	42.94	74.00	31.06
7 424.97 <sup>1)</sup>	V	61.59	35.30	-50.74	-	46.15	74.00	27.85
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								

### Horizontal/Vertical for Band-edge



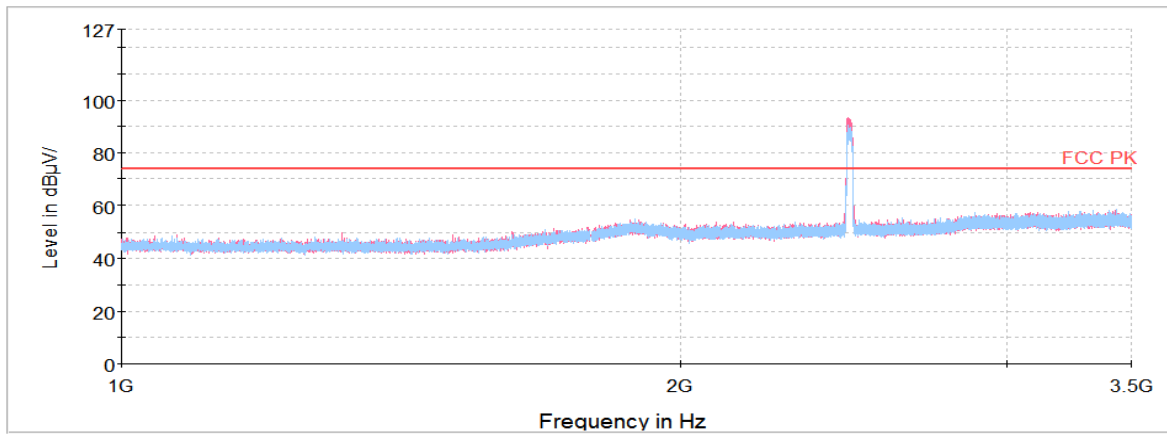
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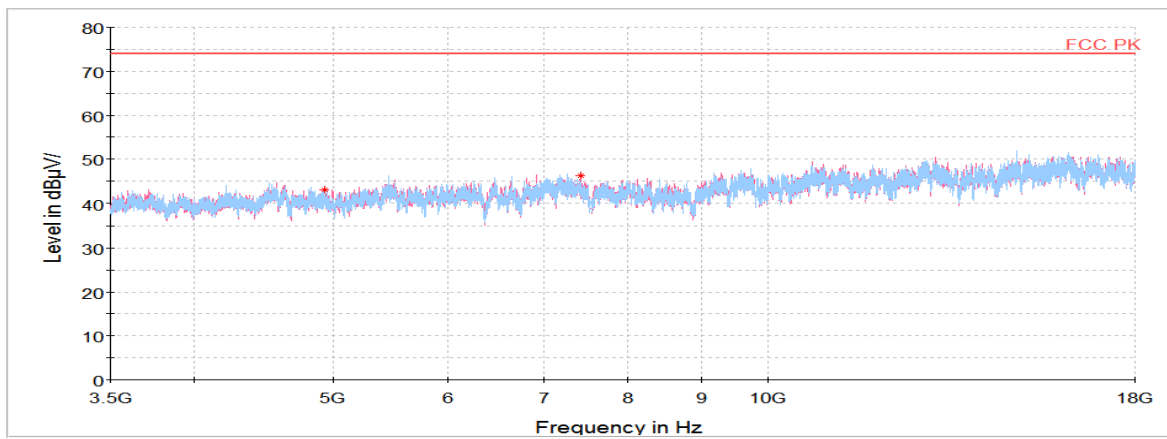
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## Horizontal/Vertical for 1 GHz ~ 3.5 GHz



## Horizontal/Vertical for 3.5 GHz ~ 18 GHz



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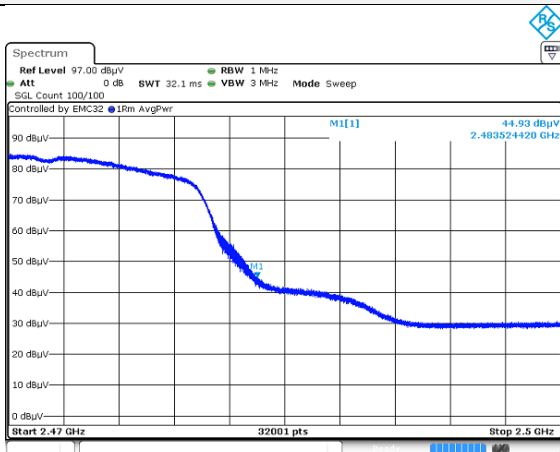
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## 802.11g\_2 472 MHz

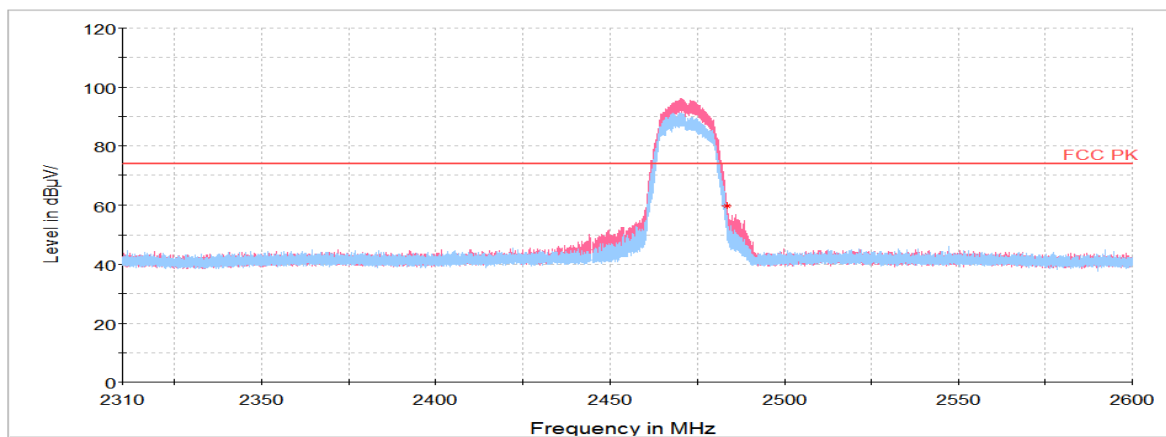
Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB( $\mu$ V))	(dB)	(dB)	(dB)	(dB( $\mu$ V/m))	(dB( $\mu$ V/m))	(dB)
<b>Peak data</b>								
2 483.52 <sup>1)</sup>	V	55.27	32.17	-27.95	-	59.49	74.00	14.51
4 957.70 <sup>1)</sup>	H	61.79	33.87	-53.37	-	42.29	74.00	31.71
7 377.39 <sup>1)</sup>	H	63.03	35.30	-50.75	-	47.58	74.00	26.42
<b>Average Data</b>								
2 483.52 <sup>1)</sup>	V	44.93	32.17	-27.95	0.32	49.47	54.00	4.53

### Average data



Blank

### Horizontal/Vertical for Band-edge



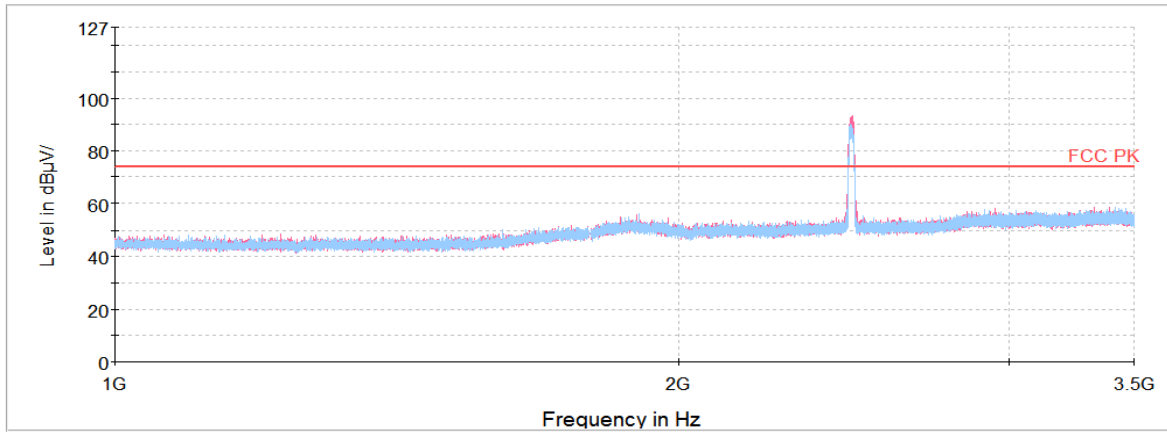
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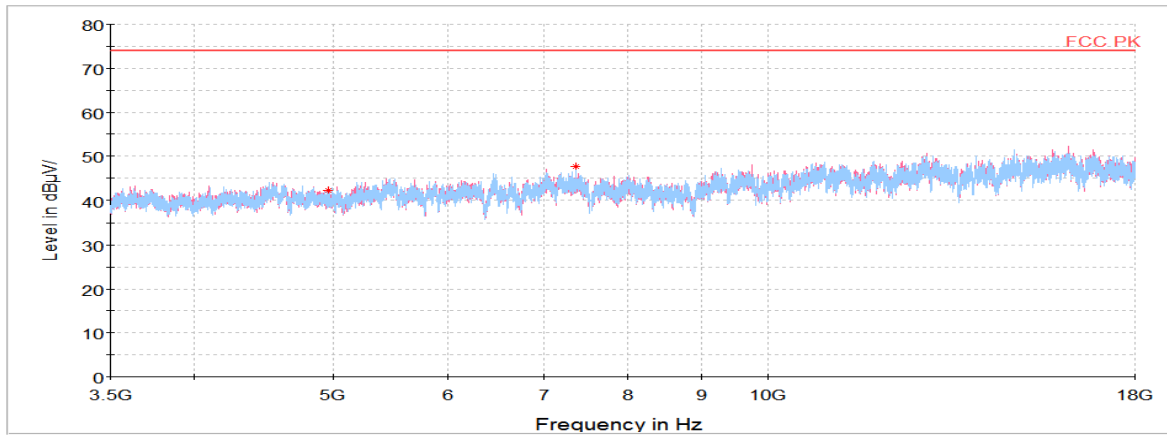
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## Horizontal/Vertical for 1 GHz ~ 3.5 GHz



## Horizontal/Vertical for 3.5 GHz ~ 18 GHz



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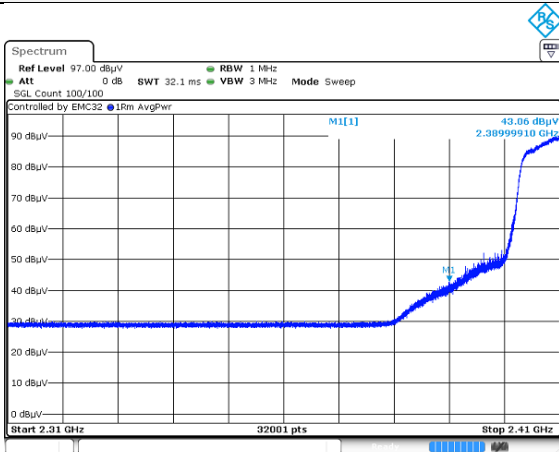
Report No.:  
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## 802.11n HT20\_2 412 MHz

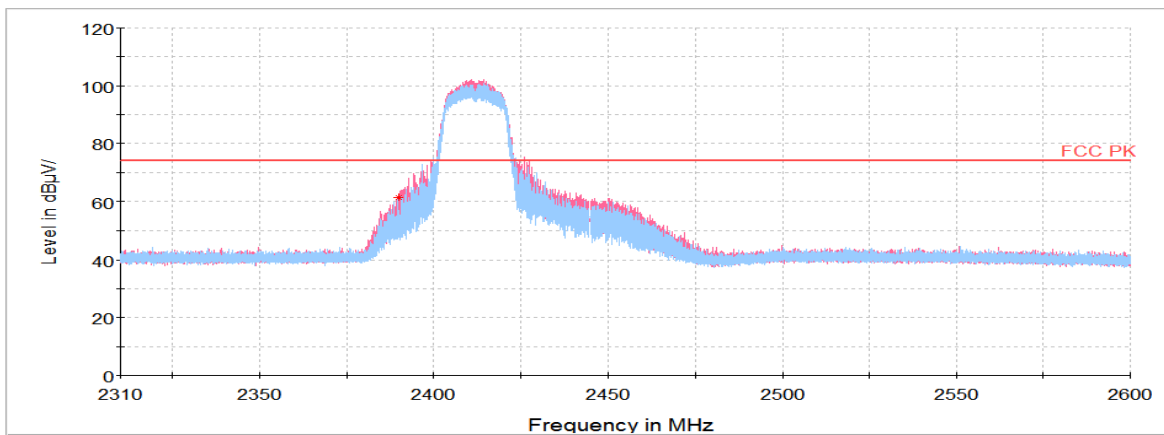
Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB( $\mu V$ ))	(dB)	(dB)	(dB)	(dB( $\mu V/m$ ))	(dB( $\mu V/m$ ))	(dB)
<b>Peak data</b>								
2 390.00 <sup>1)</sup>	V	57.29	32.00	-27.88	-	61.41	74.00	12.59
4 821.77 <sup>1)</sup>	V	67.02	33.79	-53.23	-	47.58	74.00	26.42
7 256.41 <sup>1)</sup>	V	60.84	35.30	-50.78	-	45.36	74.00	28.64
<b>Average Data</b>								
2 390.00 <sup>1)</sup>	V	43.06	32.00	-27.88	0.35	47.53	54.00	6.47

### Average data



Blank

### Horizontal/Vertical for Band-edge





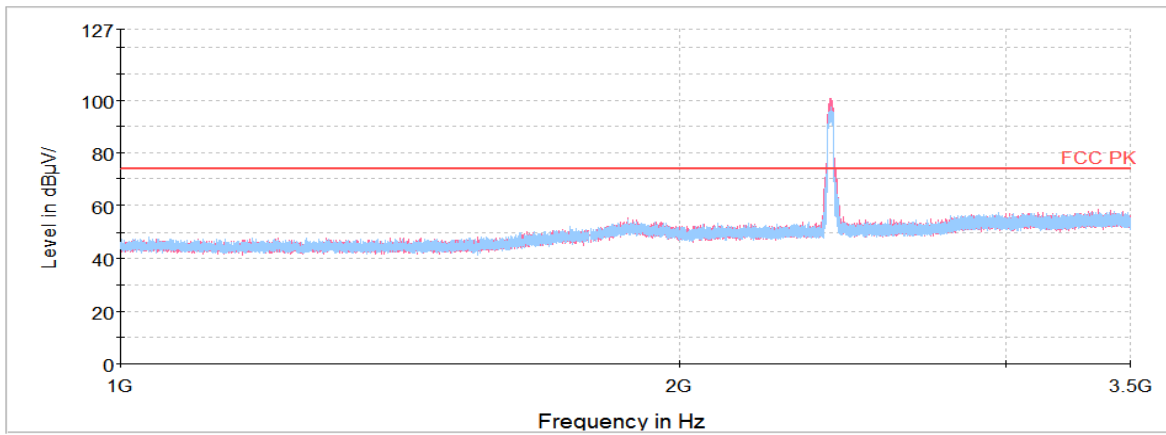
# KCTL Inc.

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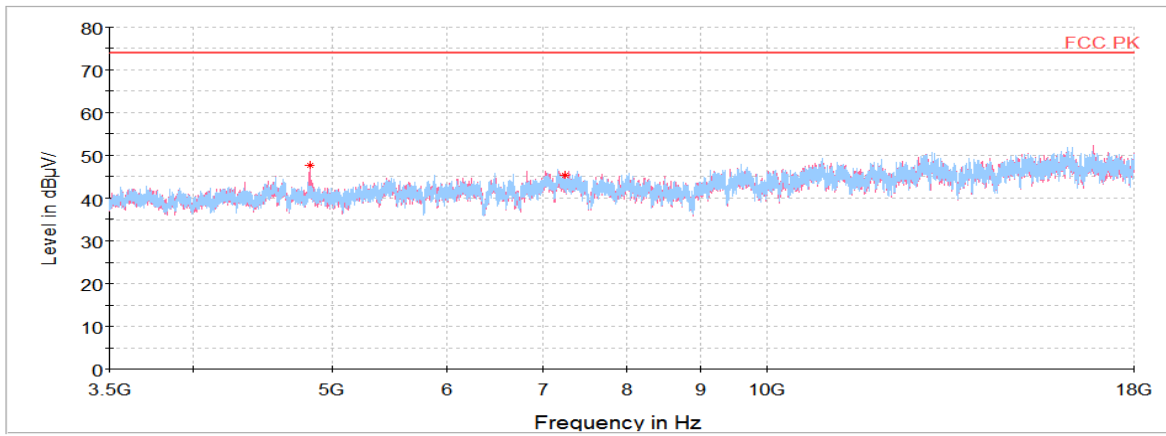
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## Horizontal/Vertical for 1 GHz ~ 3.5 GHz



## Horizontal/Vertical for 3.5 GHz ~ 18 GHz



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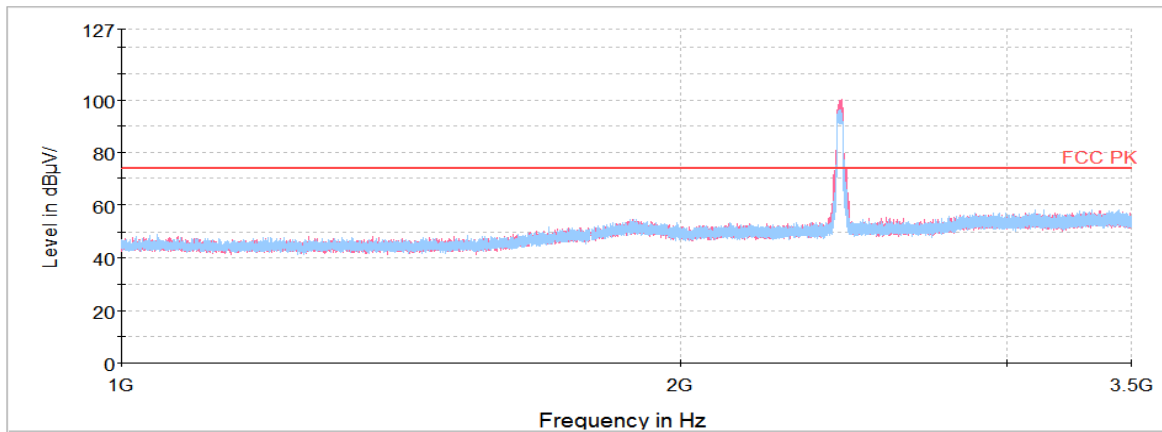
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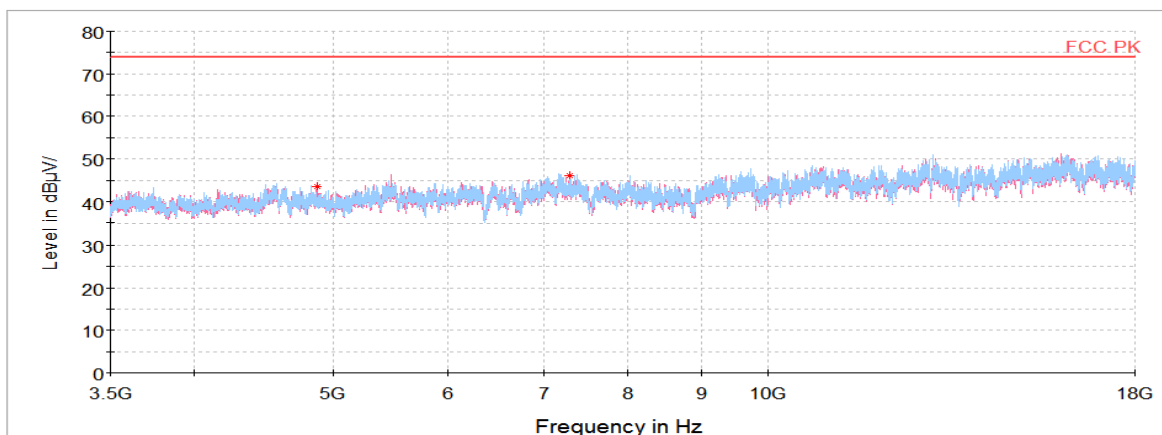
## 802.11n HT20\_2 437 MHz

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB( $\mu$ V))	(dB)	(dB)	(dB)	(dB( $\mu$ V/m))	(dB( $\mu$ V/m))	(dB)
<b>Peak data</b>								
4 872.52 <sup>1)</sup>	V	62.85	33.82	-53.15	-	43.52	74.00	30.48
7 305.34 <sup>1)</sup>	H	61.64	35.30	-50.77	-	46.17	74.00	27.83
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								

### Horizontal/Vertical for 1 GHz ~ 3.5 GHz



### Horizontal/Vertical for 3.5 GHz ~ 18 GHz



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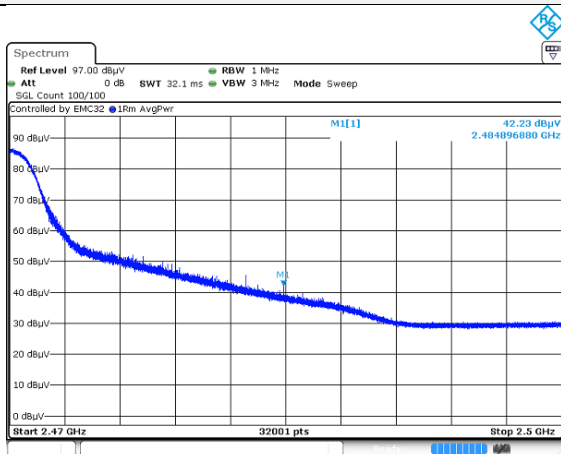
Report No.:  
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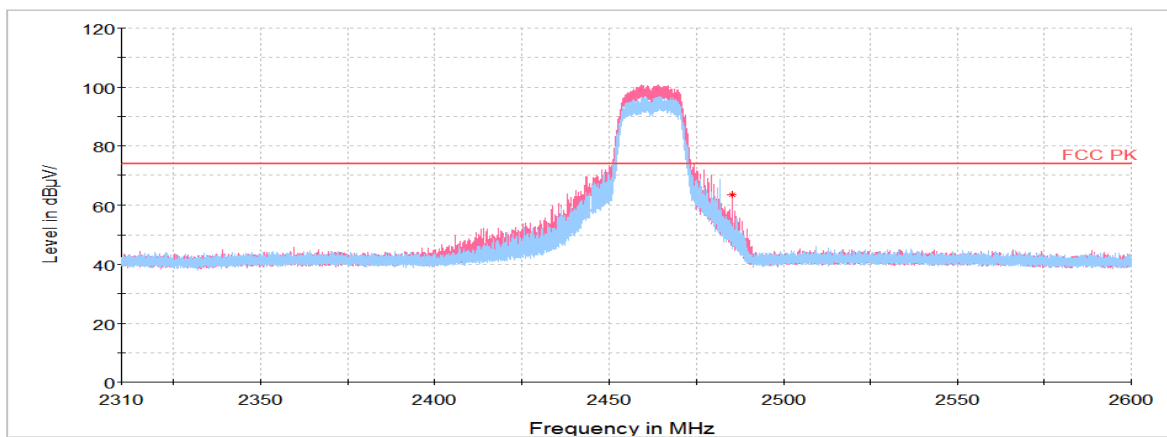
## 802.11n HT20\_2 462 MHz

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 484.90 <sup>1)</sup>	V	59.26	32.17	-27.96	-	63.47	74.00	10.53
4 924.17 <sup>1)</sup>	H	62.98	33.85	-53.22	-	43.61	74.00	30.39
7 230.13	H	62.70	35.30	-50.78	-	47.22	74.00	26.78
<b>Average Data</b>								
2 484.90 <sup>1)</sup>	V	42.23	32.17	-27.96	0.35	46.79	54.00	7.21

### Average data



### Horizontal/Vertical for Band-edge



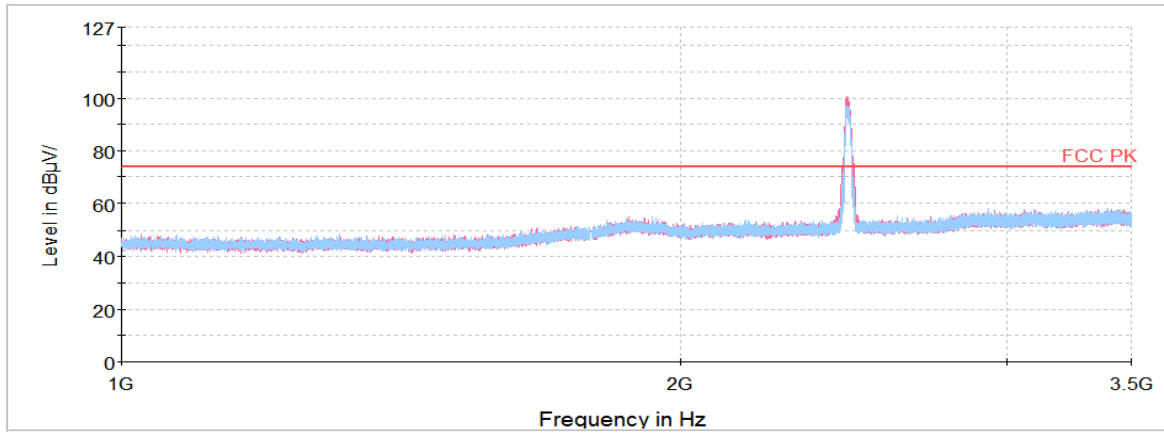
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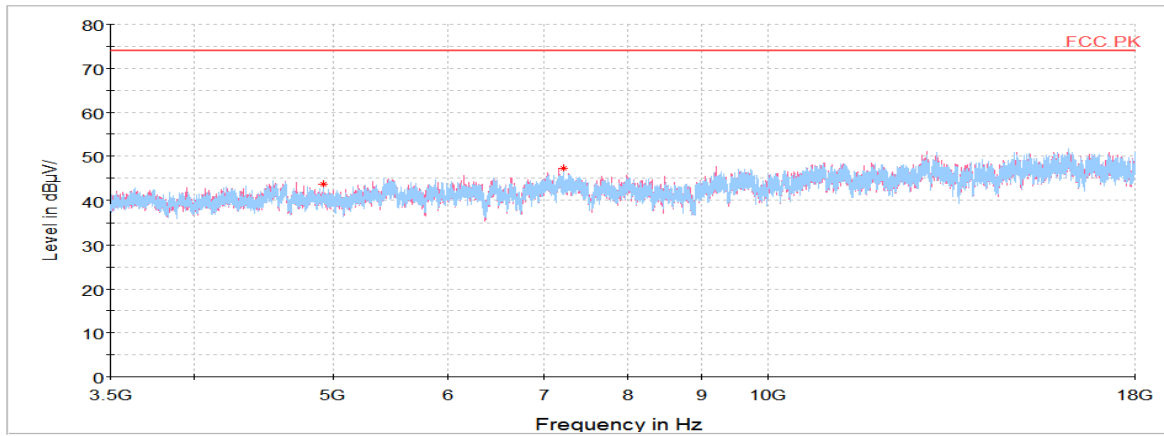
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## Horizontal/Vertical for 1 GHz ~ 3.5 GHz



## Horizontal/Vertical for 3.5 GHz ~ 18 GHz



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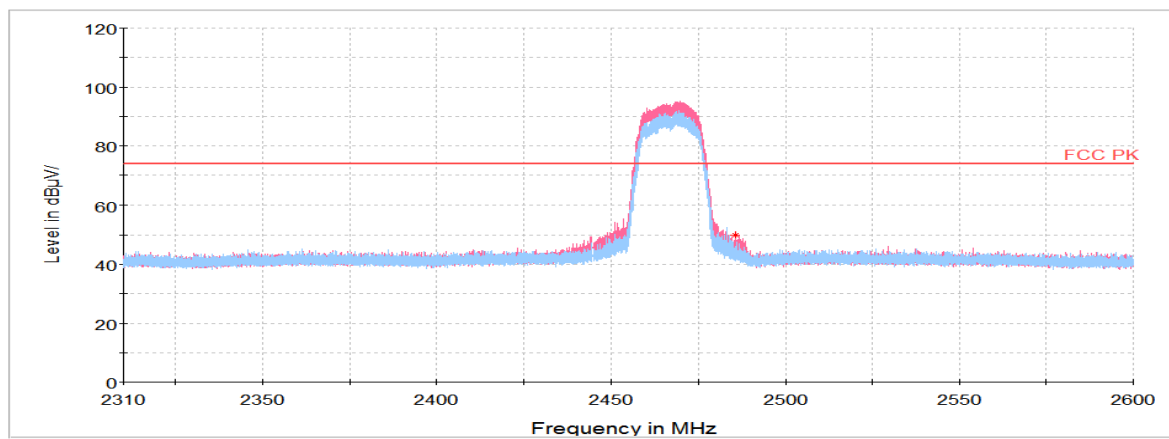
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## 802.11n HT20\_2 467 MHz

Frequency (MHz)	Pol. (V/H)	Reading (dB( $\mu$ V))	Ant. Factor (dB)	Amp. + Cable (dB)	DCF (dB)	Result (dB( $\mu$ V/m))	Limit (dB( $\mu$ V/m))	Margin (dB)
<b>Peak data</b>								
2 485.68 <sup>1)</sup>	V	45.65	32.17	-27.96	-	49.86	74.00	24.14
4 936.41 <sup>1)</sup>	V	62.09	33.86	-53.27	-	42.68	74.00	31.32
7 425.88 <sup>1)</sup>	H	61.19	35.30	-50.74	-	45.75	74.00	28.25
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								

### Horizontal/Vertical for Band-edge



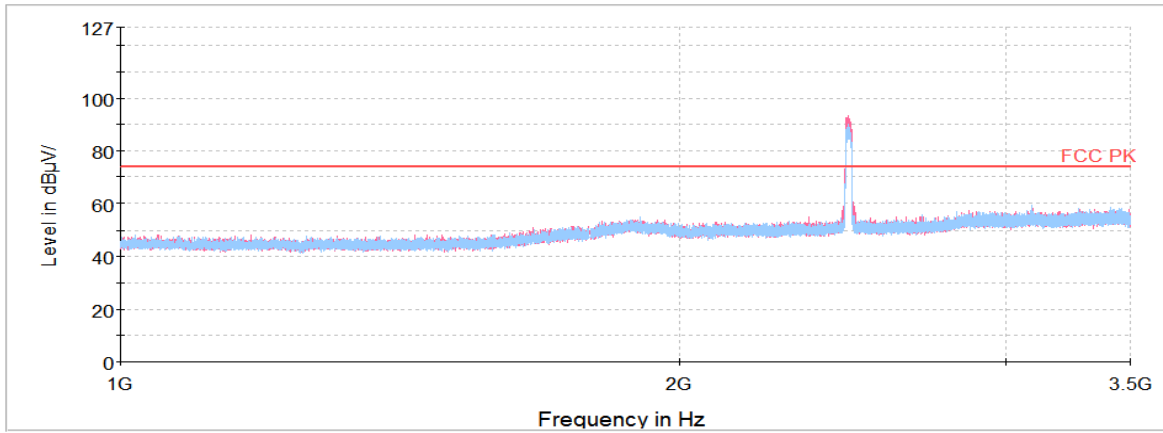
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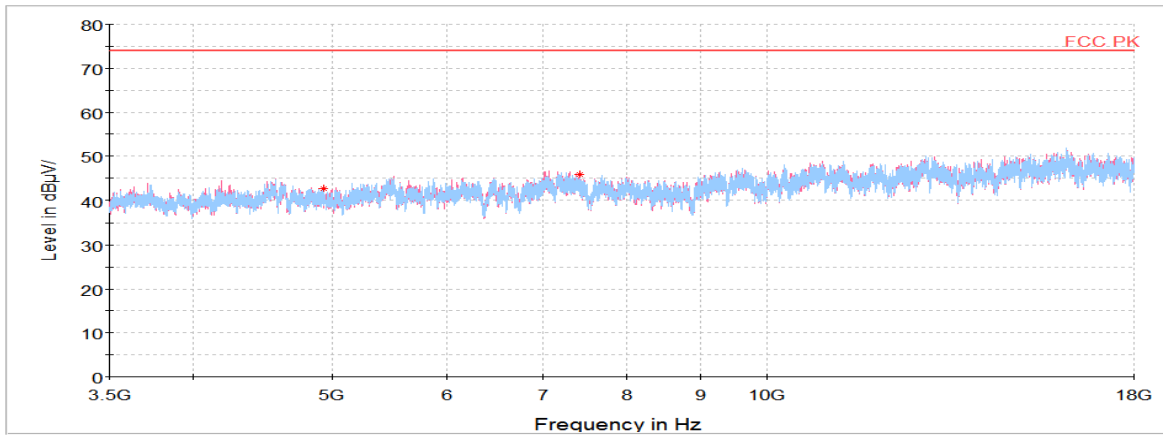
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## Horizontal/Vertical for 1 GHz ~ 3.5 GHz



## Horizontal/Vertical for 3.5 GHz ~ 18 GHz



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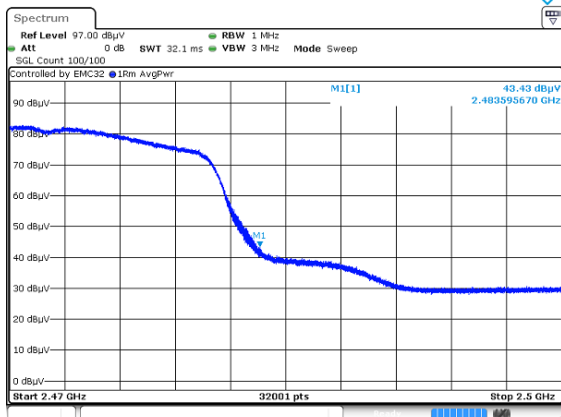
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## 802.11n HT20\_2 472 MHz

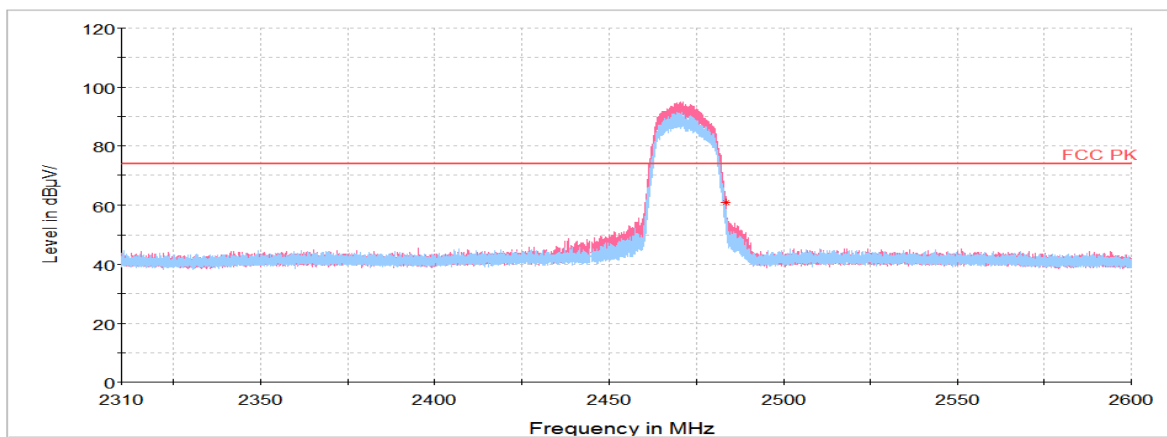
Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.60 <sup>1)</sup>	V	56.48	32.17	-27.95	-	60.70	74.00	13.30
4 948.64 <sup>1)</sup>	V	61.95	33.87	-53.33	-	42.49	74.00	31.51
7 384.64 <sup>1)</sup>	H	61.87	35.30	-50.75	-	46.42	74.00	27.58
<b>Average Data</b>								
2 483.60 <sup>1)</sup>	V	43.43	32.17	-27.95	0.35	48.00	54.00	6.00

### Average data



Blank

### Horizontal/Vertical for Band-edge



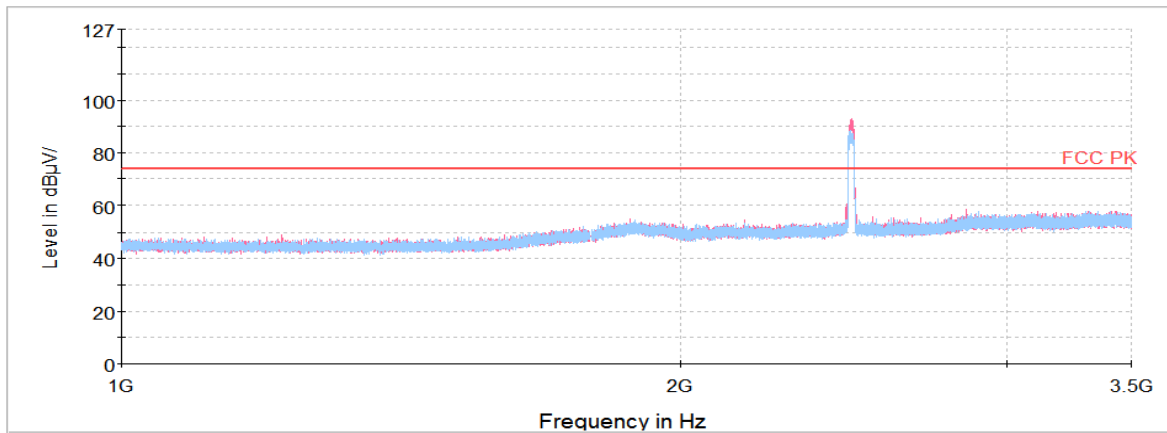
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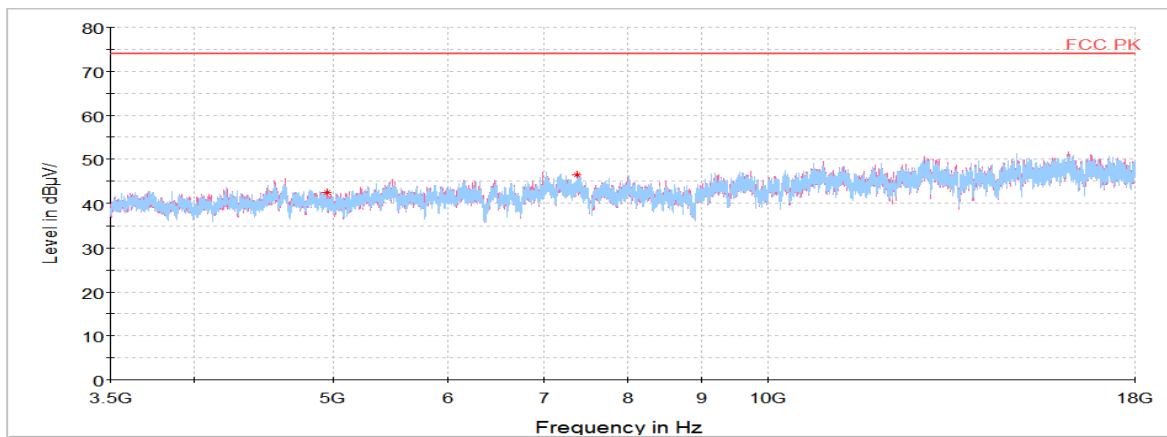
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## Horizontal/Vertical for 1 GHz ~ 3.5 GHz



## Horizontal/Vertical for 3.5 GHz ~ 18 GHz





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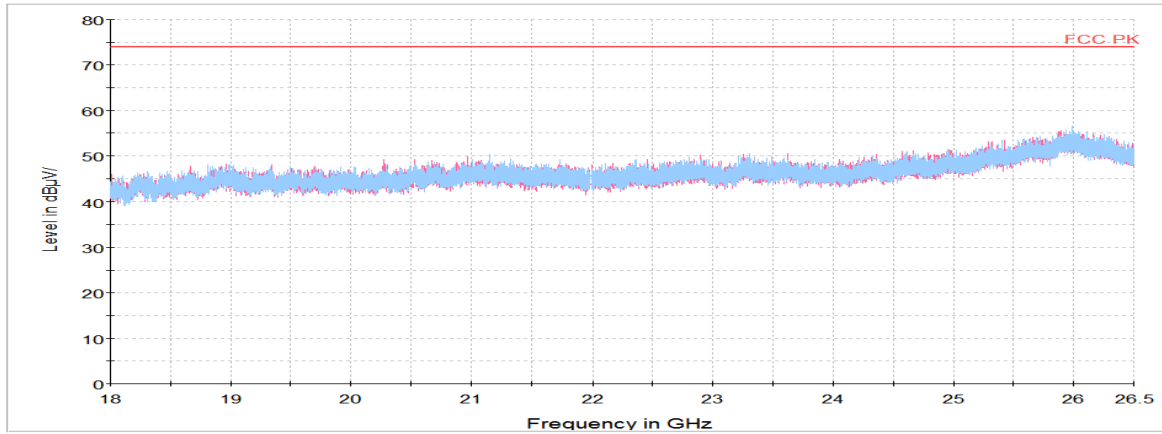
65, Sinwon-ro, Yeongtong-gu,  
Suwon-si, Gyeonggi-do, 16677, Korea  
TEL: 82-31-285-0894 FAX: 82-505-299-8311  
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Test results (Above 18 GHz) – Worst Case : 802.11b mode / 2 412 MHz

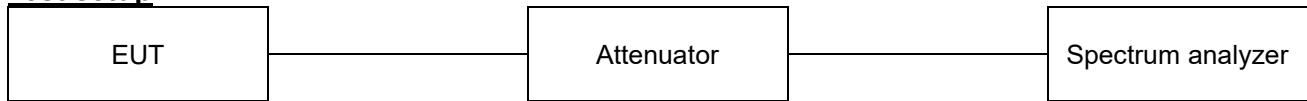
## Horizontal/Vertical for 18 GHz ~ 26.5 GHz



**Note:** The Worst case was based on the lowest margin condition considering Harmonic and Spurious Emission

## 8.5. Conducted Spurious Emission

### Test setup



### Limit

According to §15.247(d) and RSS-247(5.5), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operation, 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation specified in §15.209(a) is not required. In addition, radiated emission limits specified in §15.209(a) (see §15.205(c)).

Limit : 20 dBc

### Test procedure

ANSI C63.10 - Section 11.11.3, 14.3.3

KDB 558074 D01 v05 - Section 8.5

KDB 662911 D01 v02r01 – section (E)(3)(b)

### Test settings

Establish an emission level by using the following procedure:

- 1) Set the center frequency and span to encompass frequency range to be measured.
- 2) Set the RBW = 100 kHz
- 3) Set the VBW  $\geq$  [3 x RBW]
- 4) Detector = peak
- 5) Sweep time = auto couple
- 6) Trace mode = max hold
- 7) Allow trace to fully stabilize.
- 8) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

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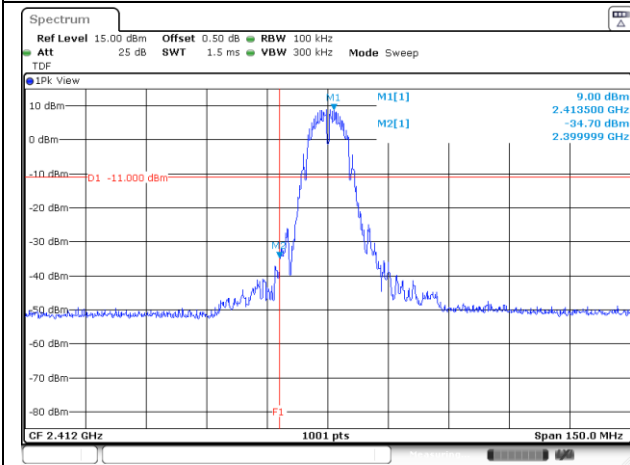
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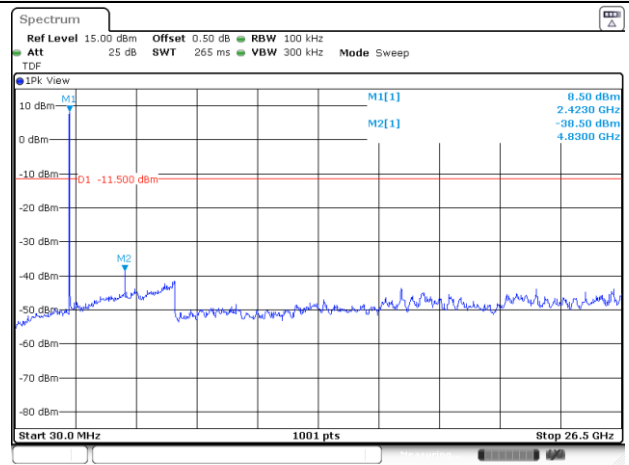
## Test results

### 802.11b

#### Conducted band-edge / 2 412 MHz



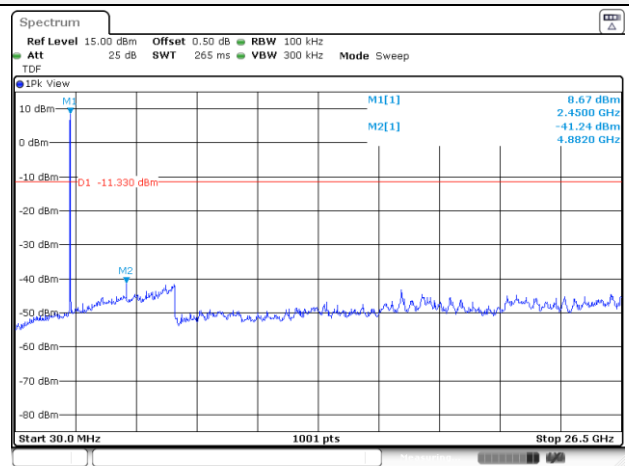
#### Conducted spurious / 2 412 MHz



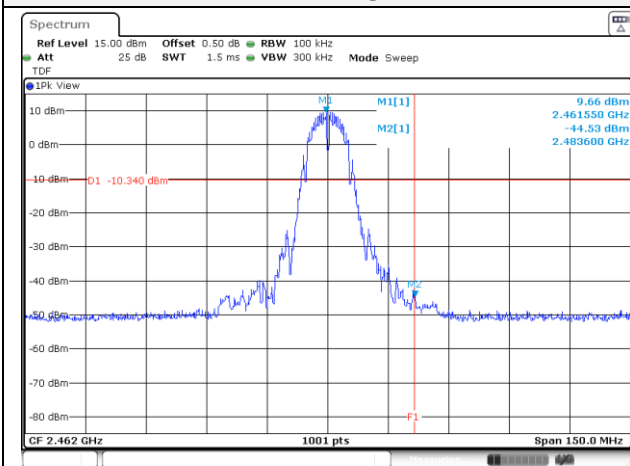
#### Conducted band-edge / 2 437 MHz

Blank

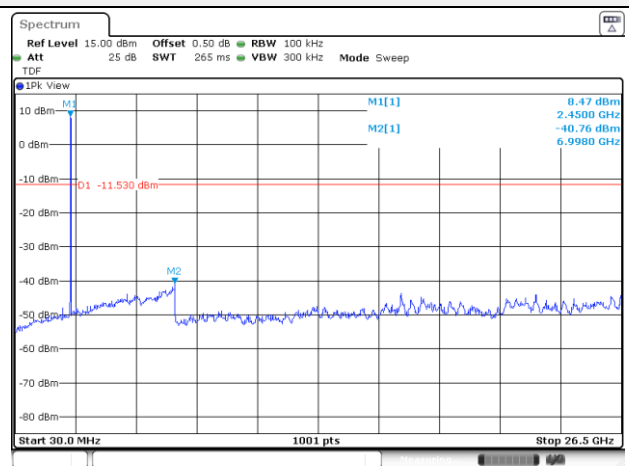
#### Conducted spurious / 2 437 MHz



#### Conducted band-edge / 2 462 MHz



#### Conducted spurious / 2 462 MHz



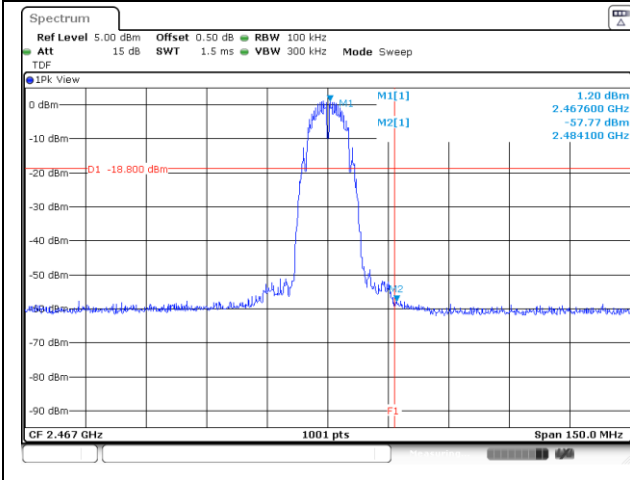
# KCTL Inc.

65, Sinwon-ro, Yeongtong-gu,  
Suwon-si, Gyeonggi-do, 16677, Korea  
TEL: 82-31-285-0894 FAX: 82-505-299-8311  
[www.kctl.co.kr](http://www.kctl.co.kr)

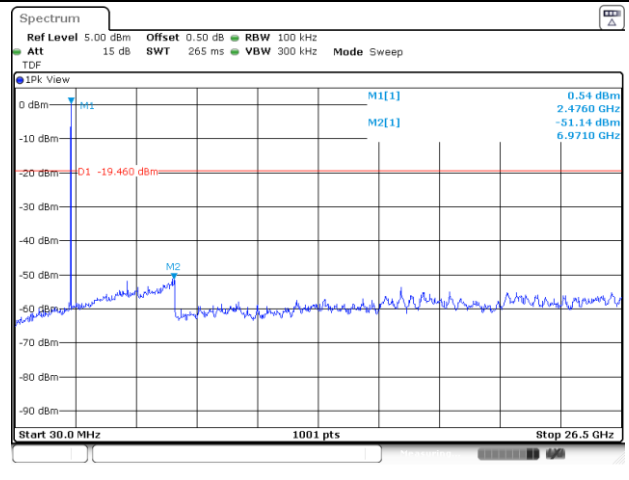
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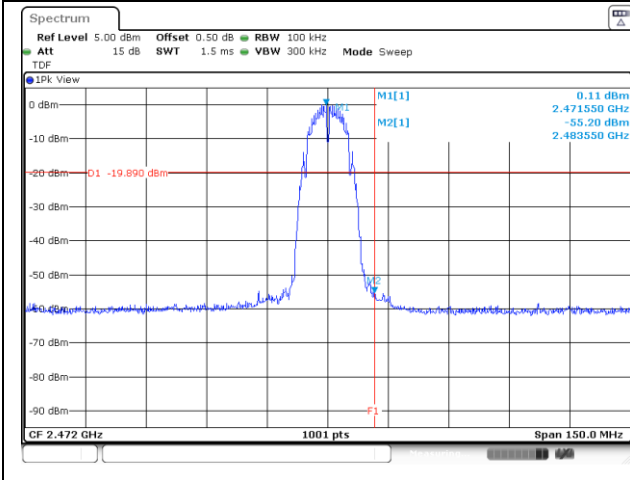
## Conducted band-edge / 2 467 MHz



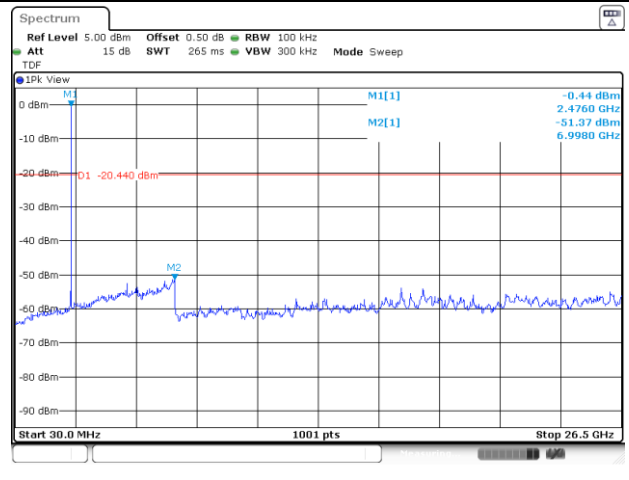
## Conducted spurious / 2 467 MHz



## Conducted band-edge / 2 472 MHz



## Conducted spurious / 2 472 MHz



# KCTL Inc.

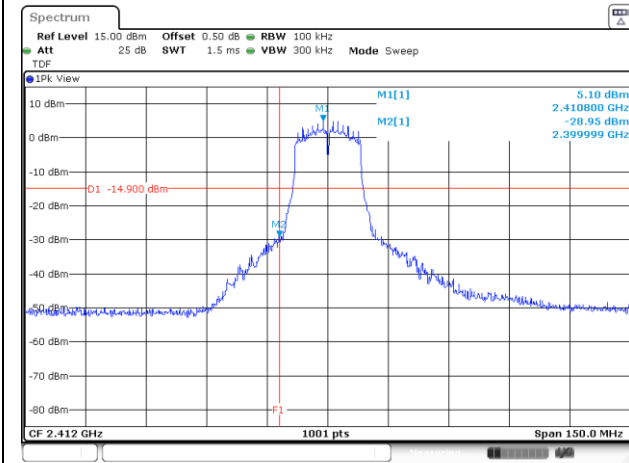
65, Sinwon-ro, Yeongtong-gu,  
Suwon-si, Gyeonggi-do, 16677, Korea  
TEL: 82-31-285-0894 FAX: 82-505-299-8311  
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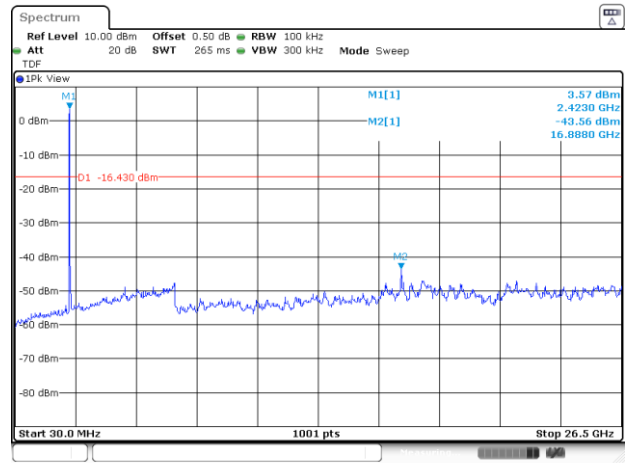


## 802.11g

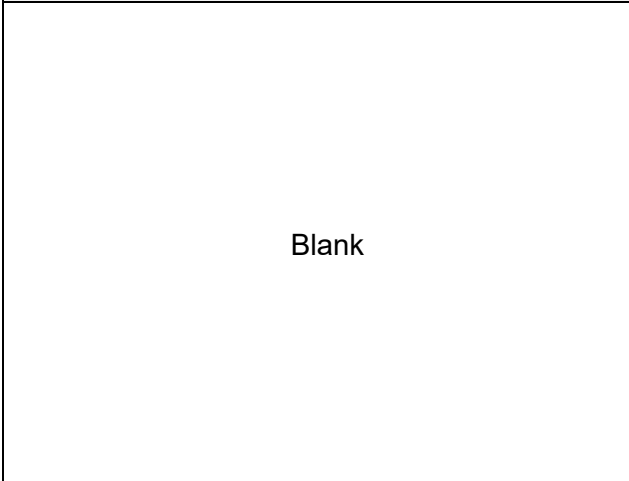
### Conducted band-edge / 2 412 MHz



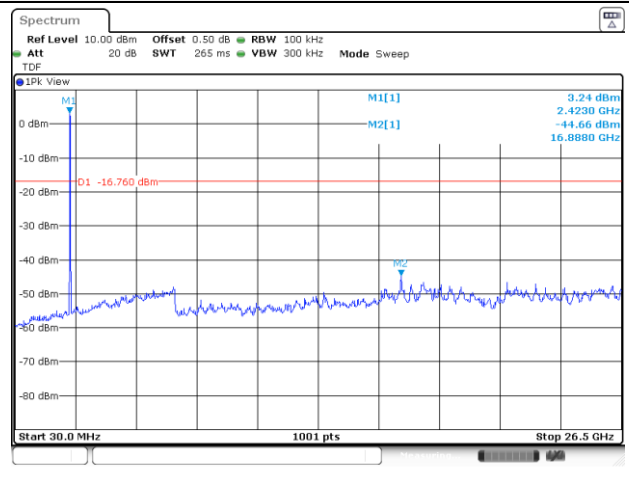
### Conducted spurious / 2 412 MHz



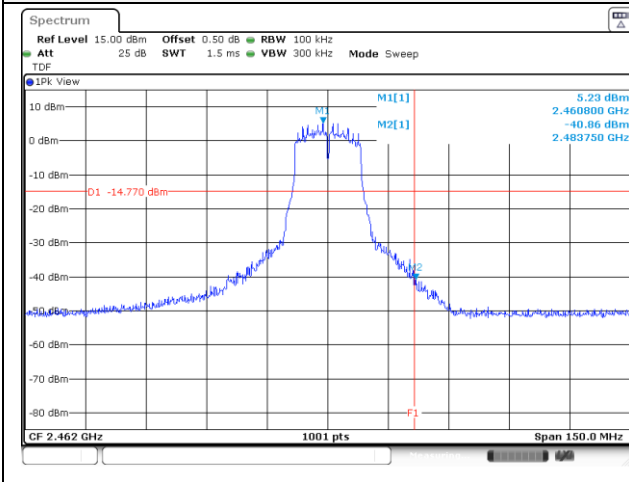
### Conducted band-edge / 2 437 MHz



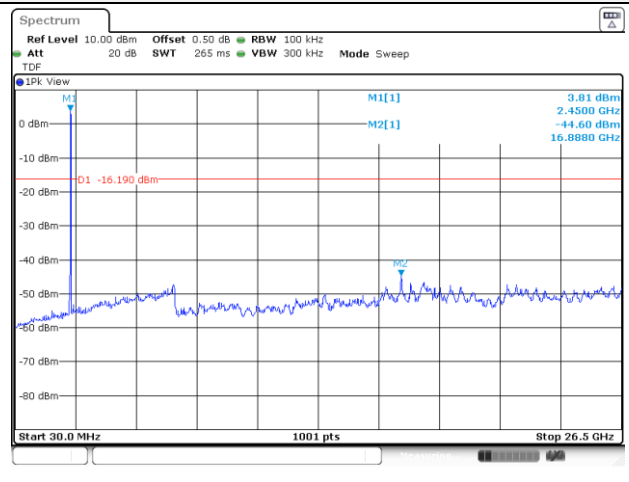
### Conducted spurious / 2 437 MHz



### Conducted band-edge / 2 462 MHz



### Conducted spurious / 2 462 MHz



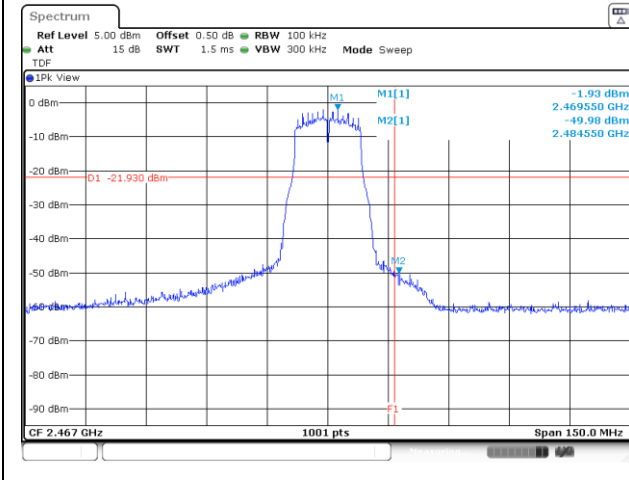
# KCTL Inc.

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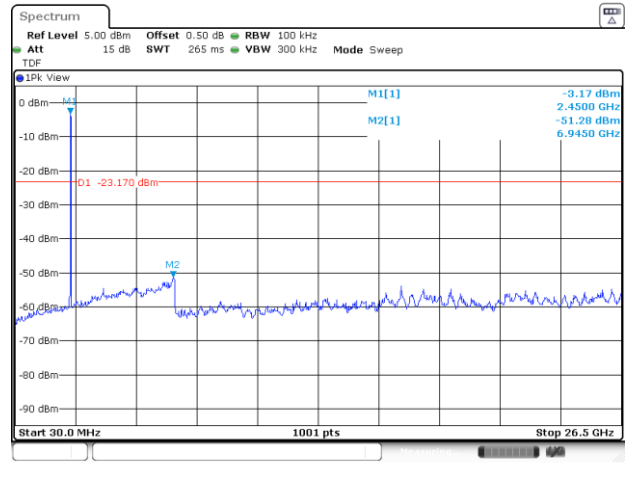
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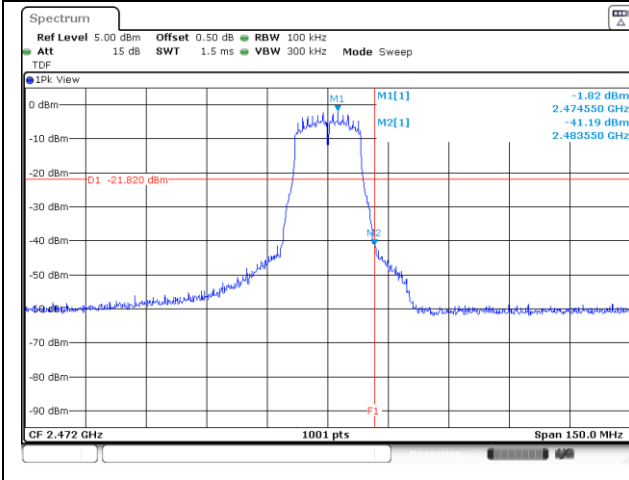
## Conducted band-edge / 2 467 MHz



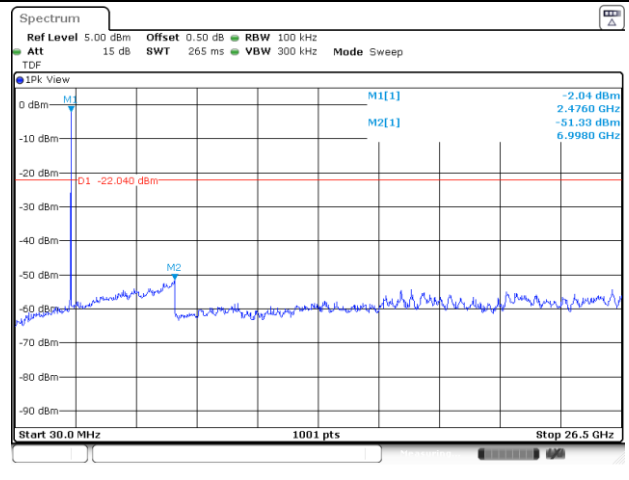
## Conducted spurious / 2 467 MHz



## Conducted band-edge / 2 472 MHz



## Conducted spurious / 2 472 MHz



# KCTL Inc.

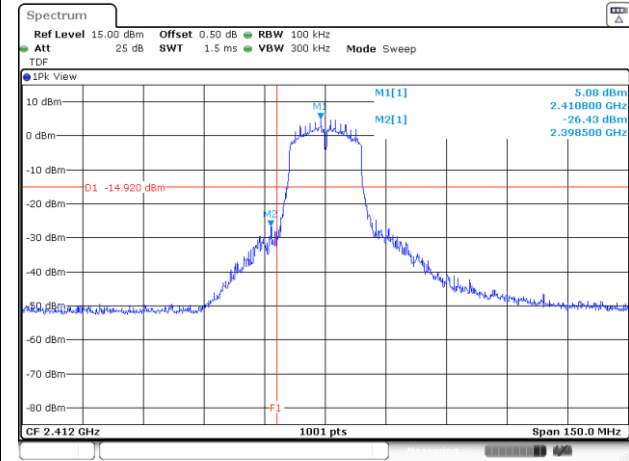
65, Sinwon-ro, Yeongtong-gu,  
Suwon-si, Gyeonggi-do, 16677, Korea  
TEL: 82-31-285-0894 FAX: 82-505-299-8311  
[www.kctl.co.kr](http://www.kctl.co.kr)

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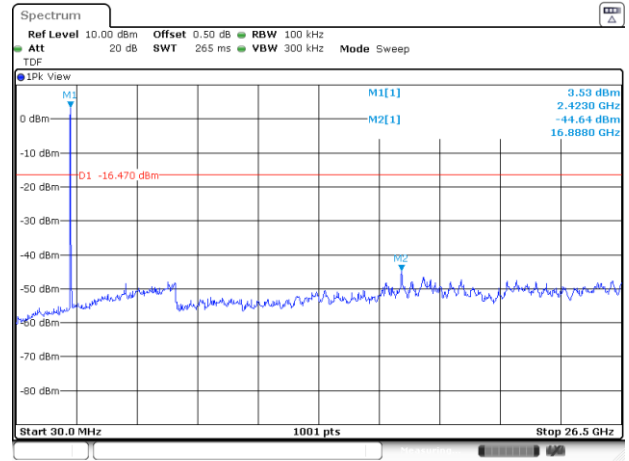


## 802.11n HT20

### Conducted band-edge / 2 412 MHz



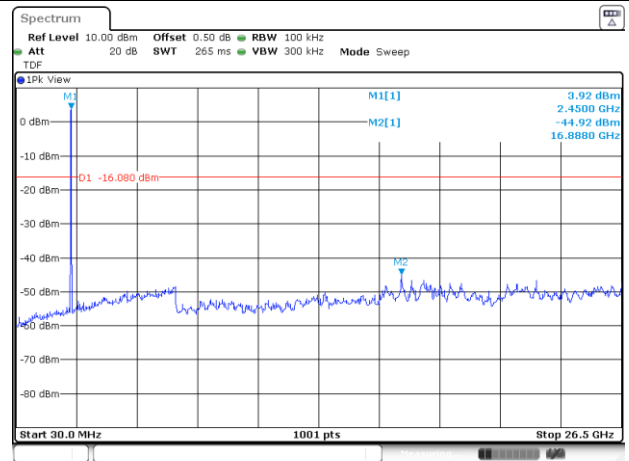
### Conducted spurious / 2 412 MHz



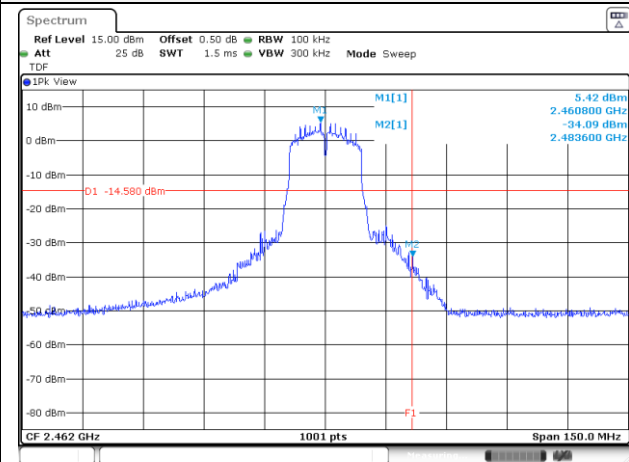
### Conducted band-edge / 2 437 MHz

Blank

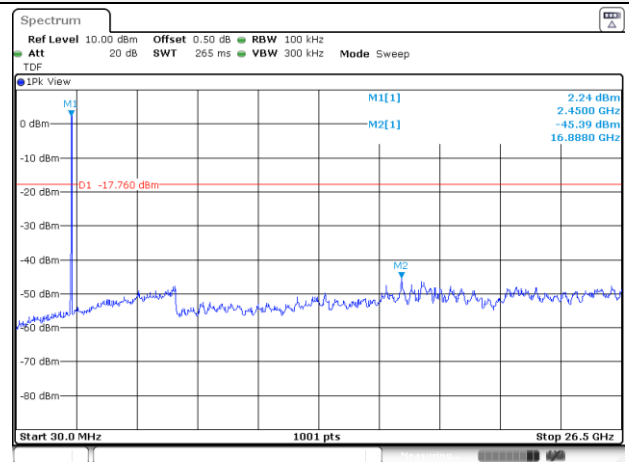
### Conducted spurious / 2 437 MHz



### Conducted band-edge / 2 462 MHz



### Conducted spurious / 2 462 MHz



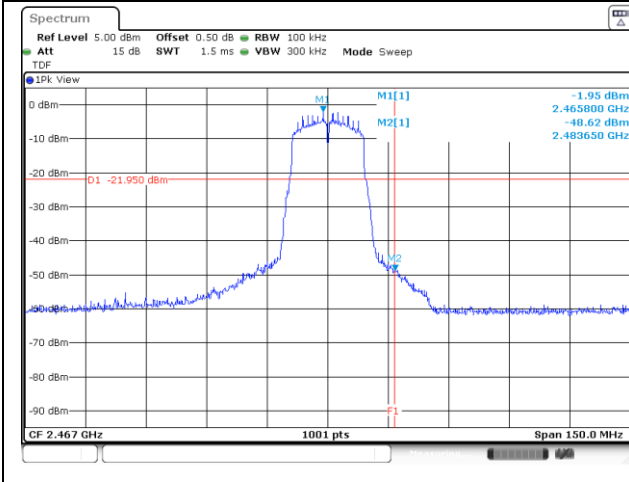
# KCTL Inc.

65, Sinwon-ro, Yeongtong-gu,  
Suwon-si, Gyeonggi-do, 16677, Korea  
TEL: 82-31-285-0894 FAX: 82-505-299-8311  
[www.kctl.co.kr](http://www.kctl.co.kr)

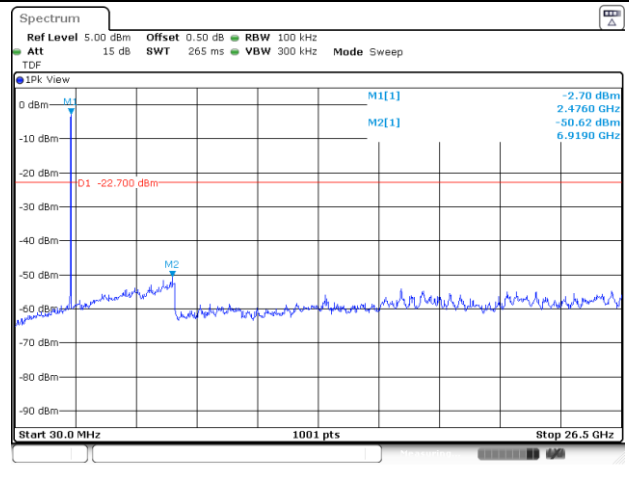
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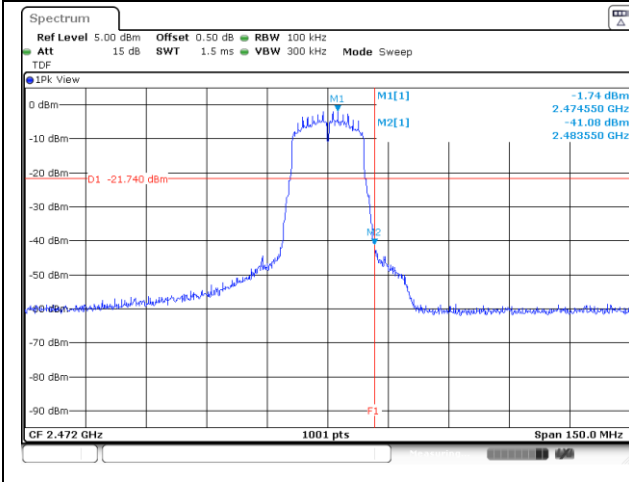
## Conducted band-edge / 2 467 MHz



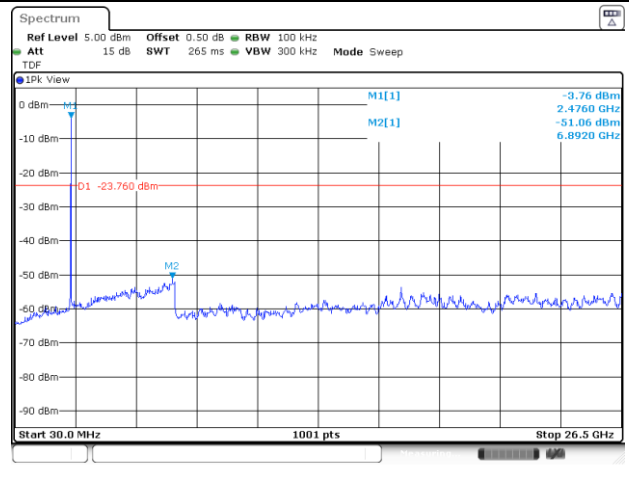
## Conducted spurious / 2 467 MHz



## Conducted band-edge / 2 472 MHz



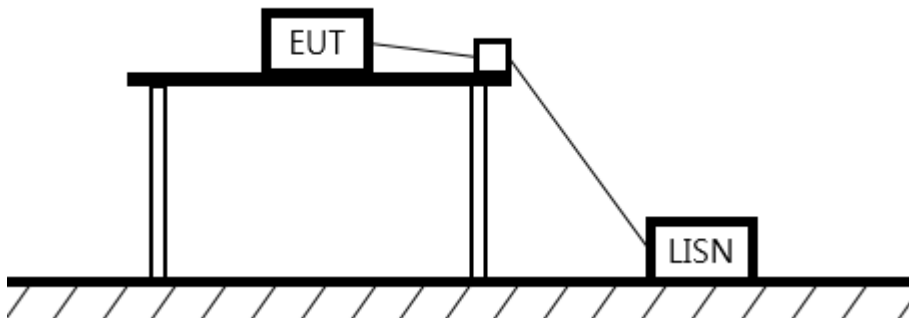
## Conducted spurious / 2 472 MHz





## 8.6. AC Conducted emission

### Test setup



### Limit

According to 15.207(a) and RSS-Gen(8.8), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 $\mu$ H/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall be on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower value applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted limit (dB $\mu$ V/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

### Measurement procedure

1. The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 cm in which is located 40 cm away from the vertical wall and 1.5m away from the side wall of the shielded room.
2. Each current-carrying conductor of the EUT power cord was individually connected through a 50 $\Omega$ /50 $\mu$ H LISN, which is an input transducer to a spectrum analyzer or an EMI/Field Intensity Meter, to the input power source.
3. Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
4. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment in the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.
5. The measurements were made with the detector set to peak amplitude within a bandwidth of 10 kHz or to quasi-peak and average within a bandwidth of 9 kHz. The EUT was in transmitting mode during the measurements.

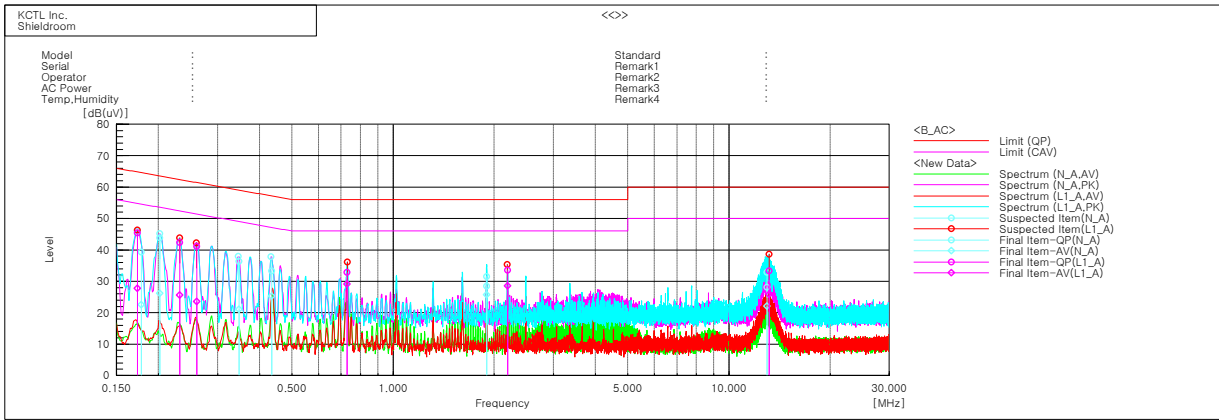
# KCTL Inc.

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## Test results – Worst case: 802.11n b mode / 2 462 MHz



### Final Result

#### --- N\_A Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.17783	29.1	12.3	10.2	39.3	22.5	64.6	54.6	25.3	32.1
2	0.20206	33.7	16.1	10.0	43.7	26.1	63.5	53.5	19.8	27.4
3	0.3475	26.4	11.1	9.9	36.3	21.0	59.0	49.0	22.7	28.0
4	0.43496	23.2	15.2	10.0	33.2	25.2	57.2	47.2	24.0	22.0
5	1.89701	18.5	15.8	9.9	28.4	25.7	56.0	46.0	27.6	20.3
6	12.98273	17.9	11.8	10.2	28.1	22.0	60.0	50.0	31.9	28.0

#### --- L1\_A Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.17328	35.2	17.5	10.2	45.4	27.7	64.8	54.8	19.4	27.1
2	0.23164	32.5	15.8	9.8	42.3	25.6	62.4	52.4	20.1	26.8
3	0.26022	31.3	13.8	9.8	41.1	23.6	61.4	51.4	20.3	27.8
4	0.72869	23.0	19.1	9.9	32.9	29.0	56.0	46.0	23.1	17.0
5	2.19236	23.6	18.7	9.9	33.5	28.6	56.0	46.0	22.5	17.4
6	13.18009	22.8	15.4	10.4	33.2	25.8	60.0	50.0	26.8	24.2

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## 9. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV30	100808	21.07.29
Attenuator	API Inmet	40AH2W-10	10	21.07.29
Signal Generator	R&S	SMB100A	176206	22.01.20
Vector Signal Generator	R&S	SMBV100A	257566	21.07.13
Power Sensor	R&S	NRP-Z81	1137.9009.02-106223-bB	22.05.11*
Attenuator	R&S	DNF Dämpfungsglied 10 dB in N-50 Ohm	31211	22.05.11*
DC Power Supply	Agilent	E3632A	MY40008800	21.07.28
Spectrum Analyzer	R&S	FSV40	100989	21.12.23
EMI TEST RECEIVER	R&S	ESC13	101408	21.08.20
Bi-Log Antenna	TESEQ	CBL 6112D	55545	22.04.24
Attenuator	KEYSIGHT	8491B-6dB	MY39271060	21.12.24
Spectrum Analyzer	R&S	ESC17	100732	22.03.05
ISOLATION TRANSFORMER	ONETECH CO., LTD	OT-IT500VA	OTR1-16026	22.04.02
Amplifier	SONOMA INSTRUMENT	310N	284608	21.08.20
COAXIAL FIXED ATTENUATOR	Agilent	8491B-003	2708A18758	22.04.23
Directional Bridge	AGILENT	86205A	MY31400127	22.01.20
Horn antenna	ETS.lindgren	3117	00155787	21.10.28
Horn antenna	ETS.lindgren	3116	00086632	22.01.29
Attenuator	API Inmet	40AH2W-10	12	22.05.11*
Broadband Pre-Amplifier	SCHWARZBECK	BBV9718	216	21.07.28
AMPLIFIER	L-3 Narda-MITEQ	AMF-7D-01001800 -22-10P	2003683	21.08.28
AMPLIFIER	L-3 Narda-MITEQ	JS44-18004000-33-8P	2000996	22.01.21
LOOP Antenna	R&S	HFH2-Z2	100355	22.08.21
Antenna Mast	Innco Systems	MA4640-XP-ET	-	-
Turn Table	Innco Systems	DT2000	79	-
Antenna Mast	Innco Systems	MA4000-EP	303	-
Turn Table	Innco Systems	DT2000	79	-
High pass Filter	WT	WT-A1698-HS	WT160411001	22.05.10*
TWO-LINE V - NETWORK	R&S	ENV216	101358	21.09.29
EMI TEST RECEIVER	R&S	ESCI	100001	21.08.20

\* Tests related to this equipment were progressed after the calibration was completed.

**End of test report**