

KCTL Inc.

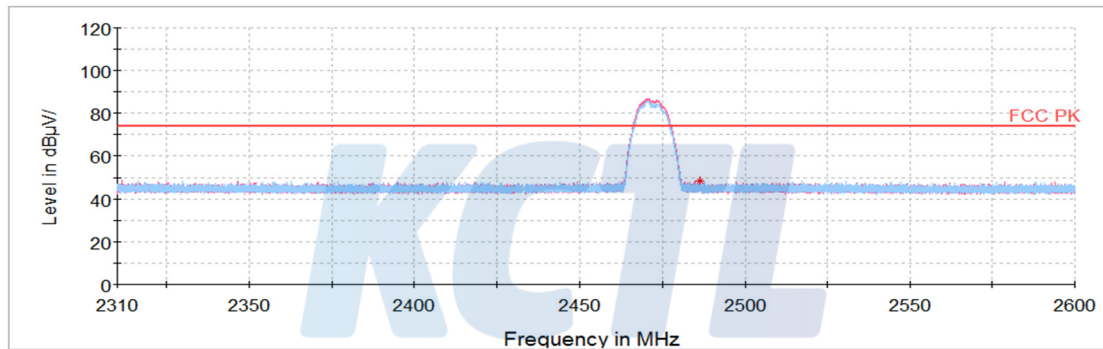
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR19-SRF0090-A

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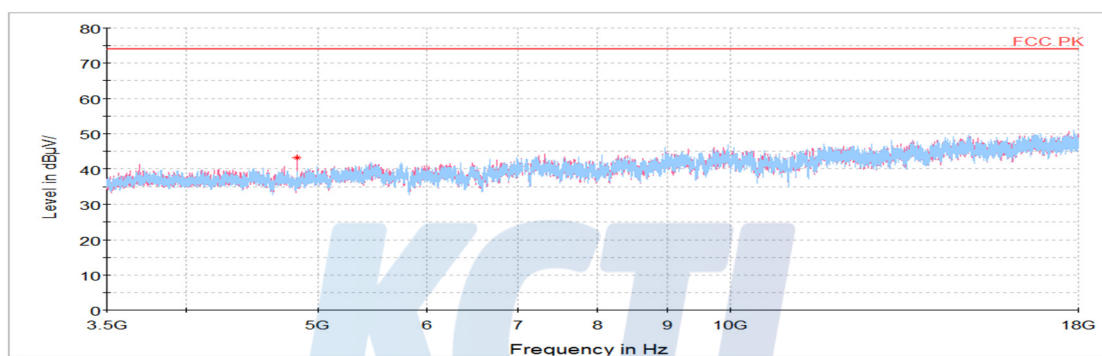
KCTL**Test results Spot check (Above 1 000 MHz)****802.11b – Band-edge Worst case****13 Channel**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
Peak data								
2 486.24 ¹⁾	H	46.42	32.09	-29.89	-	48.62	74.00	25.38
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Horizontal/Vertical for Band-edge

802.11b – Harmonic Worst case**1 Channel**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
Peak data								
4 824.03 ¹⁾	V	65.89	33.79	-56.52	-	43.16	74.00	30.84
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Horizontal/Vertical for 3.5 GHz ~ 18 GHz

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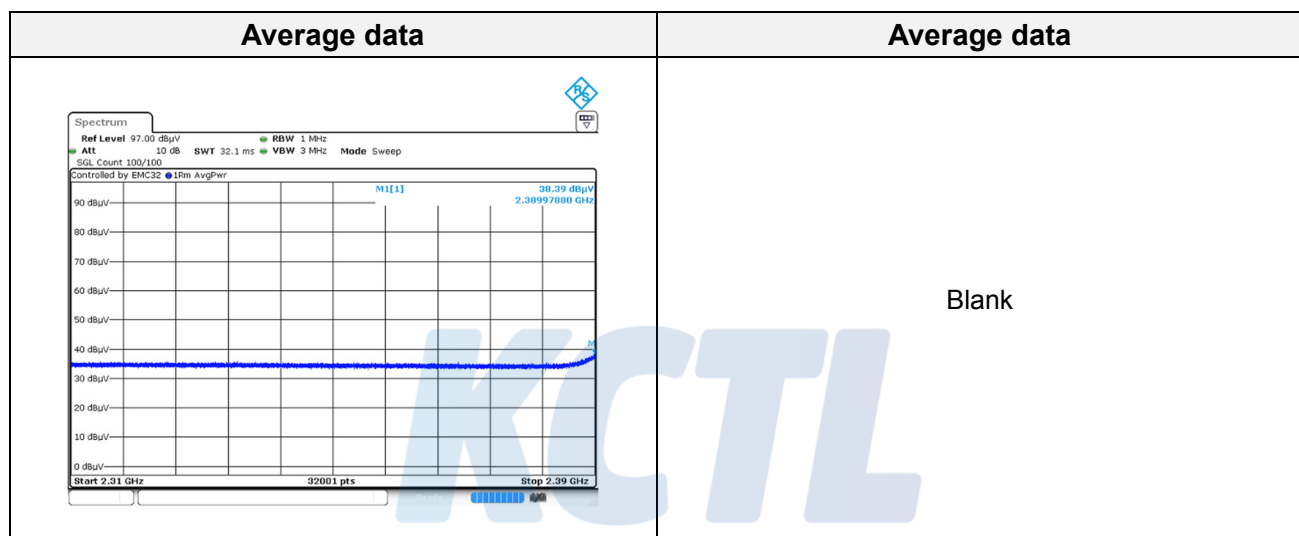
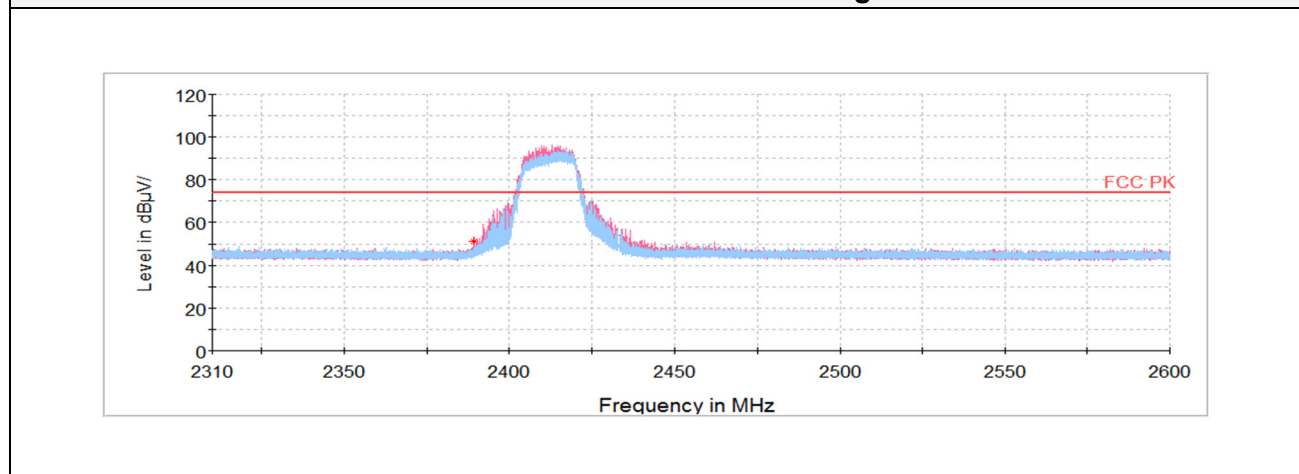
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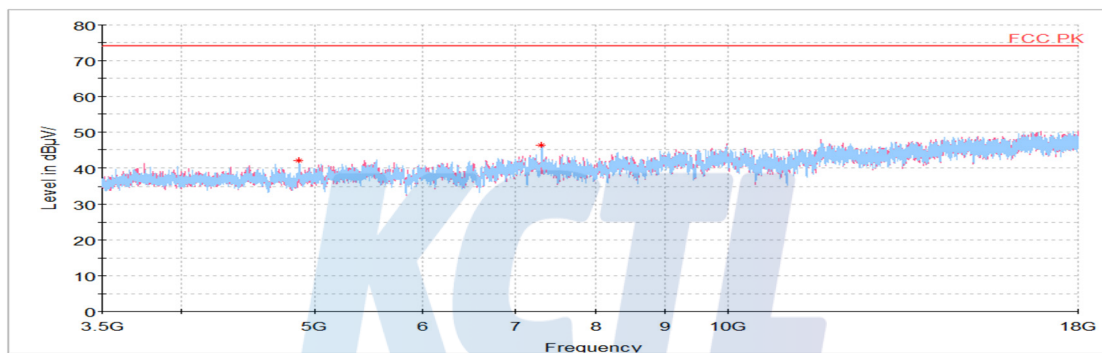
KCTL**802.11g – Band-edge Worst case****1 Channel**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
Peak data								
2 389.98 ¹⁾	V	49.16	32.01	-29.79	-	51.38	74.00	22.62
Average Data								
2 389.98 ¹⁾	V	38.39	32.01	-29.79	0.35	40.96	54.00	13.04

**Horizontal/Vertical for Band-edge**

802.11g – Harmonic Worst case**6 Channel**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
Peak data								
4 874.17 ¹⁾	H	64.87	33.82	-56.65	-	42.04	74.00	31.96
7 307.16 ¹⁾	H	65.17	35.50	-54.29	-	46.38	74.00	27.62
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Horizontal/Vertical for 3.5 GHz ~ 18 GHz

KCTL Inc.

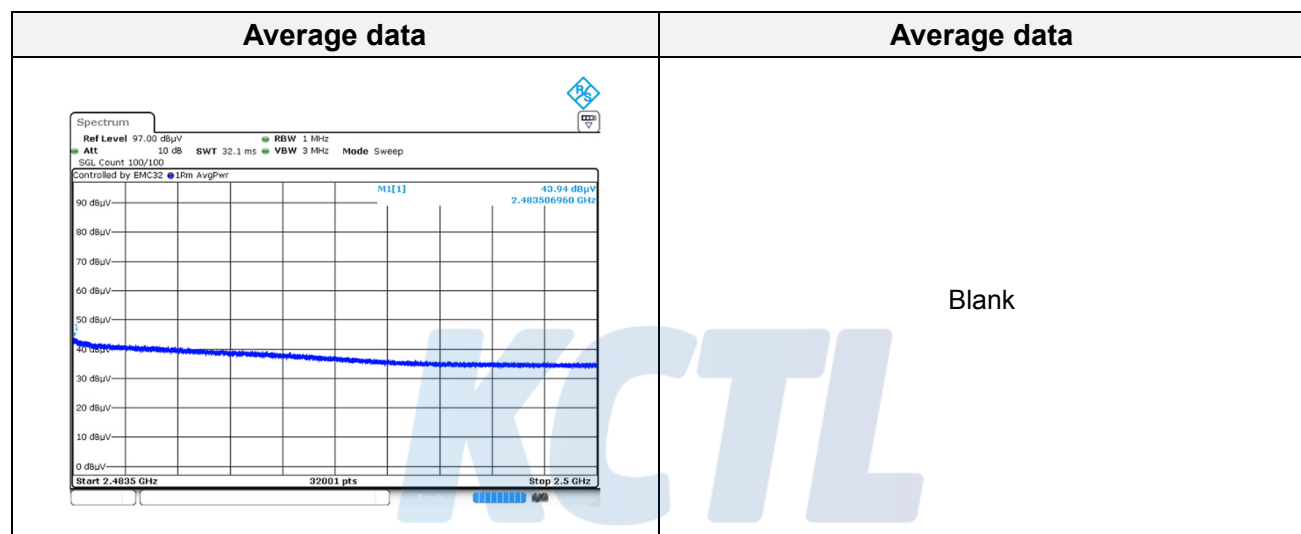
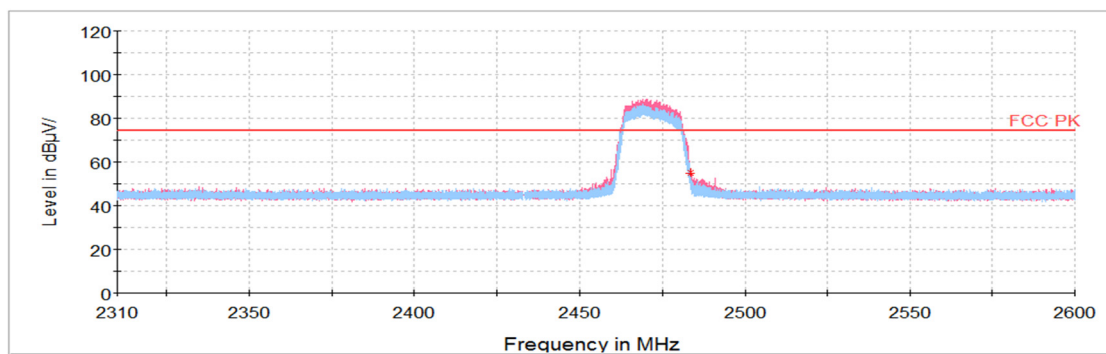
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KCTL**802.11n20 – Band-edge Worst case****13 Channel**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
Peak data								
2 483.51 ¹⁾	V	52.81	32.09	-29.88	-	55.02	74.00	18.98
Average Data								
2 483.51 ¹⁾	V	43.94	32.09	-29.88	0.23	46.38	54.00	7.62

**Horizontal/Vertical for Band-edge**

KCTL Inc.

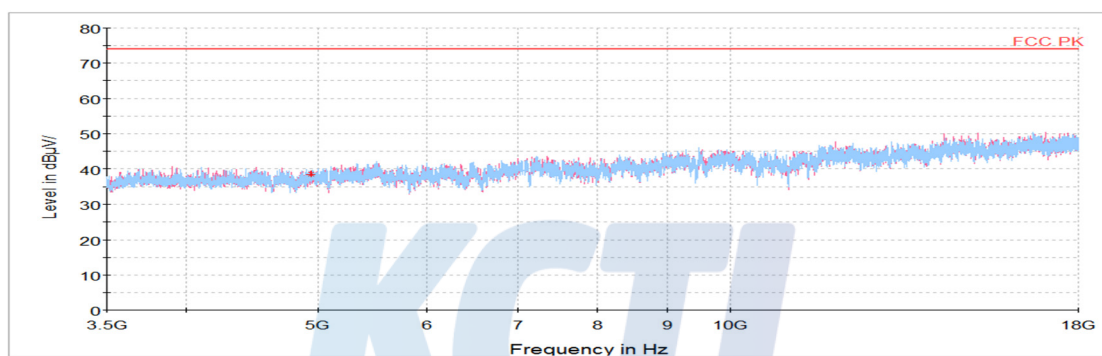
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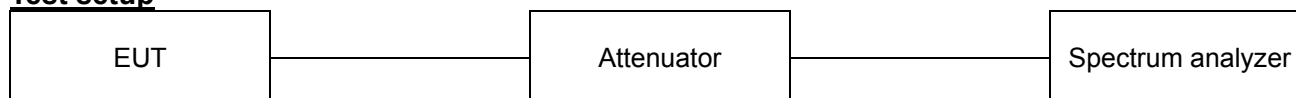
KCTL**802.11n20 – Harmonic Worst case****13 Channel**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
Peak data								
4 944.47 ¹⁾	H	61.16	33.87	-56.38	-	38.65	74.00	35.35
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Horizontal/Vertical for 3.5 GHz ~ 18 GHz

7.5. Conducted Spurious Emission

Test setup



Limit

According to §15.247(d), 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 C63.10-2013 - 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 $\geq [3 \times \text{RBW}]$
- 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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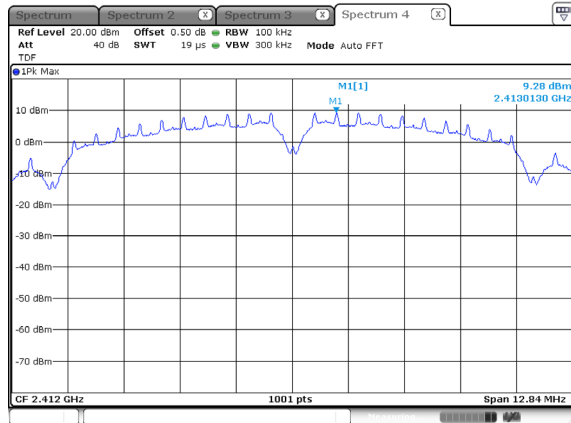


Test results

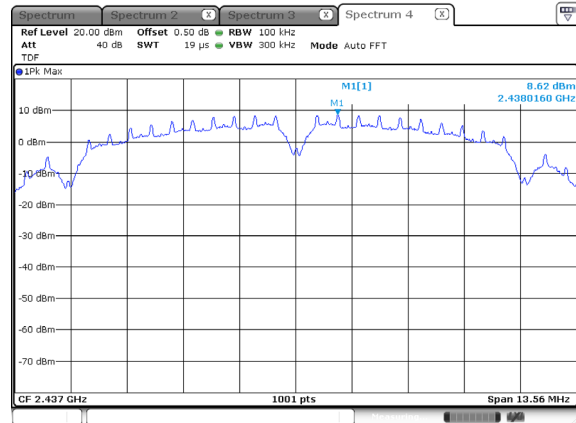
Test mode : 802.11b

Reference

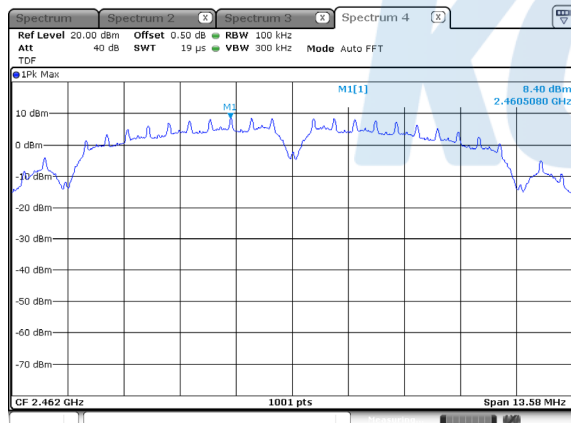
802.11b / 1 ch.



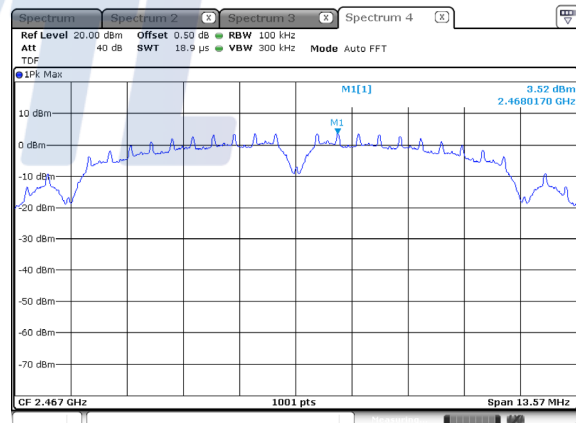
802.11b / 6 ch.



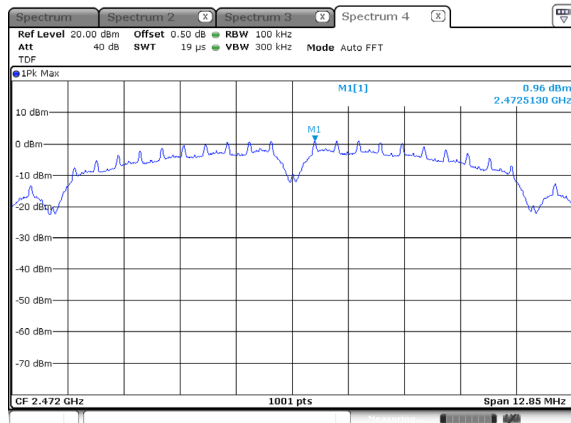
802.11b / 11 ch.



802.11b / 12 ch.



802.11b / 13 ch.



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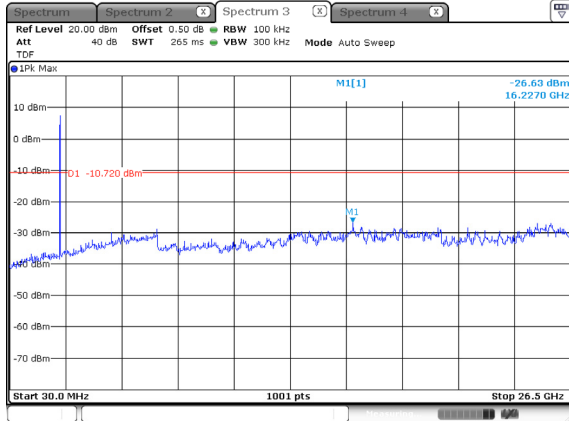
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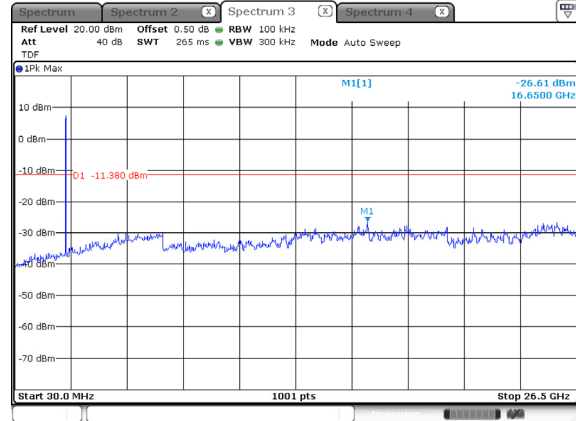
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Conducted Emissions

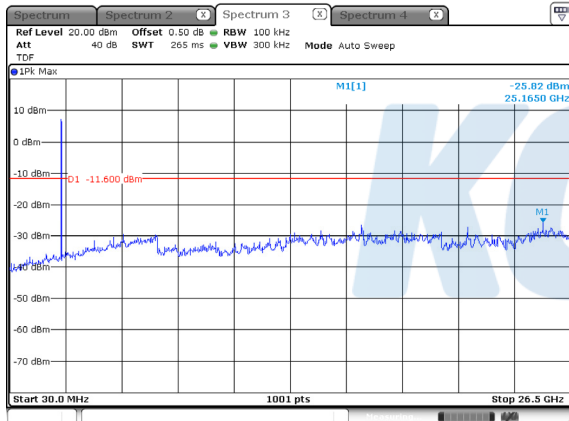
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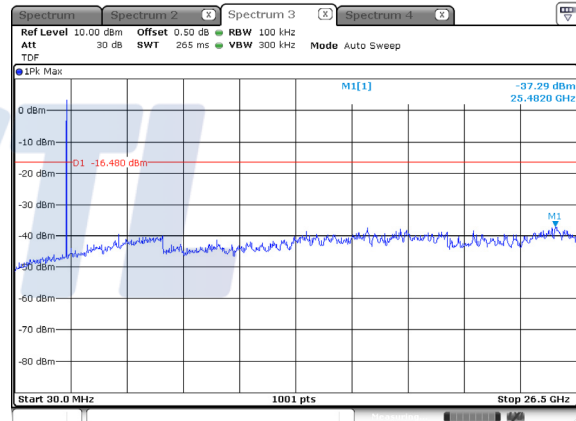
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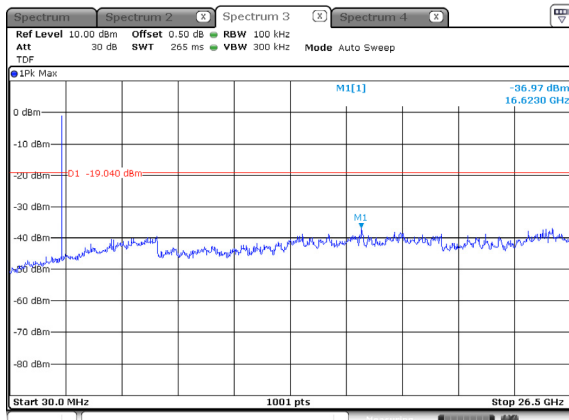
802.11b / 11 ch.



802.11b / 12 ch.



802.11b / 13 ch.



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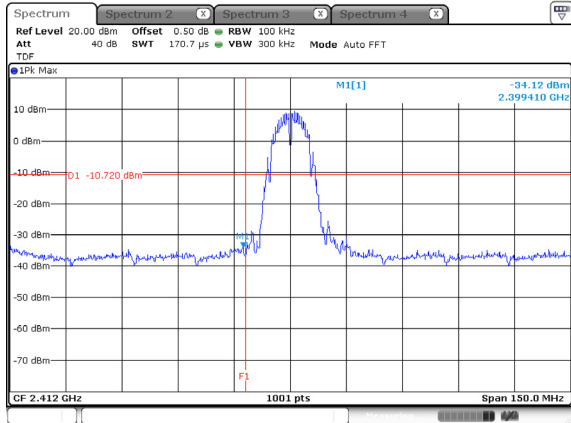
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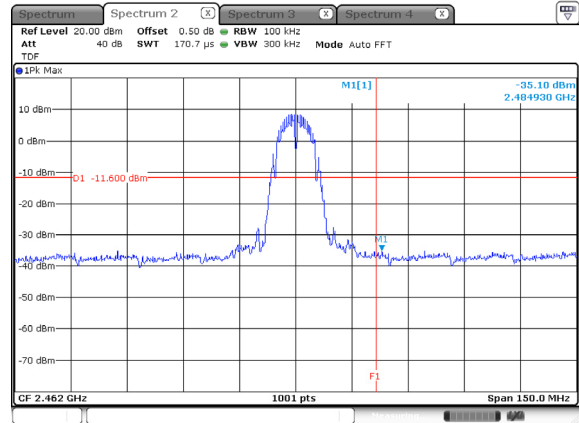
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Band edge

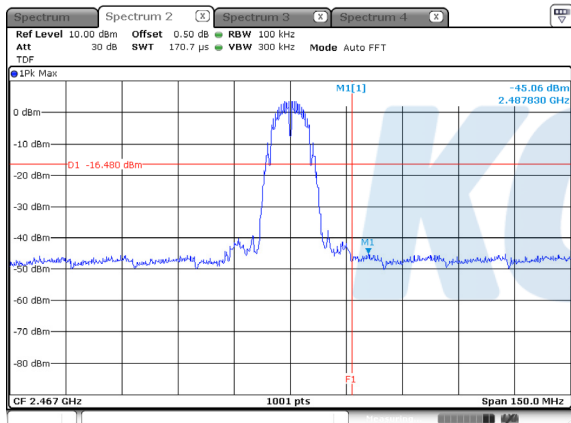
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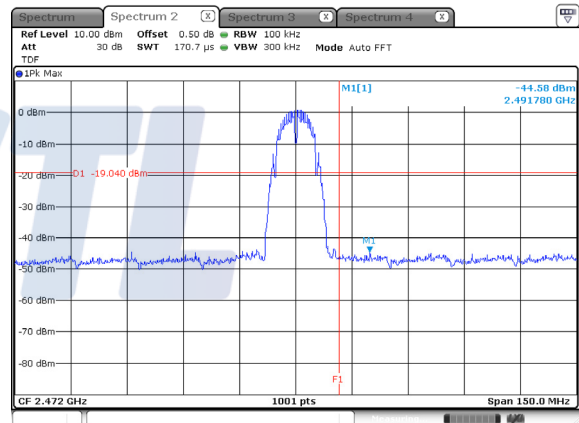
802.11b / 11 ch



802.11b / 12 ch.



802.11b / 13 ch.



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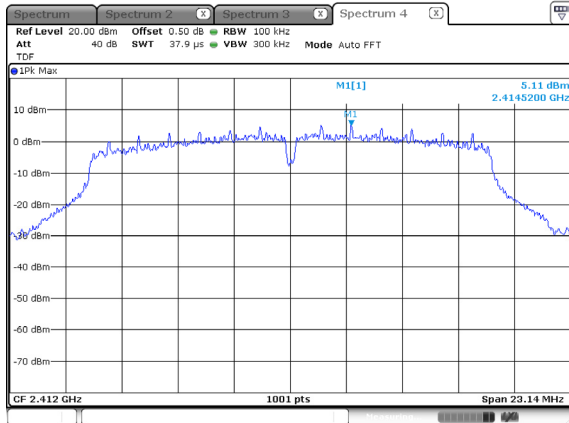
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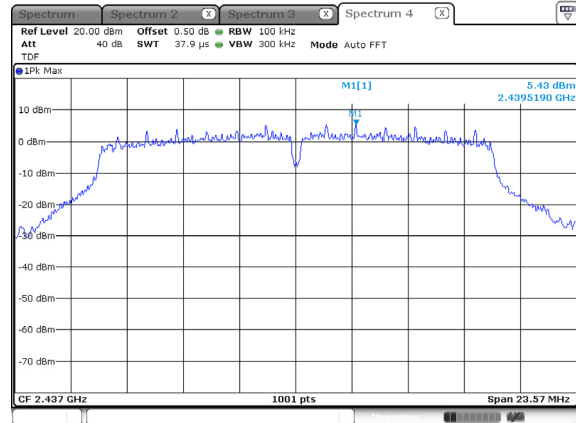
Test mode : 802.11g

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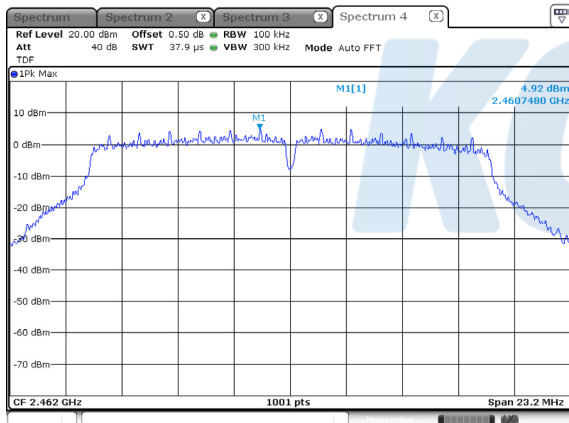
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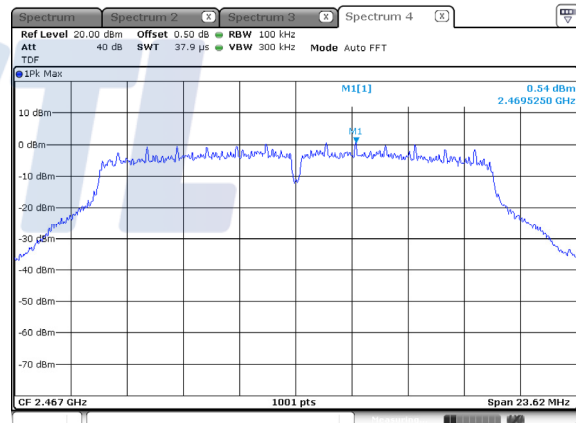
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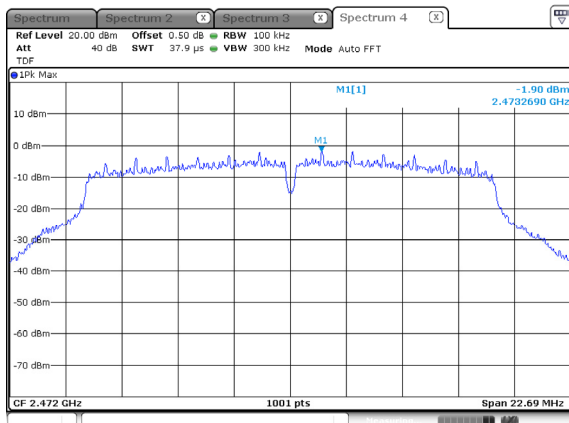
802.11g / 11 ch.



802.11g / 12 ch.



802.11g / 13 ch.



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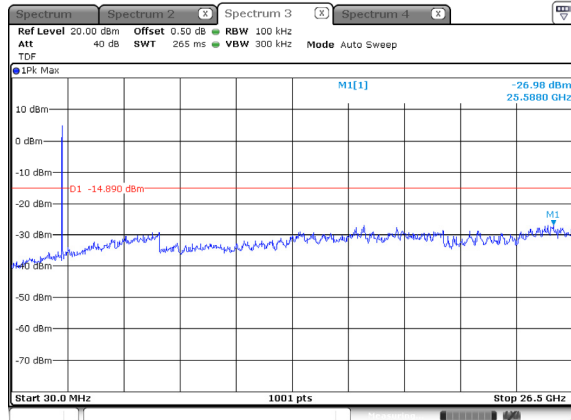
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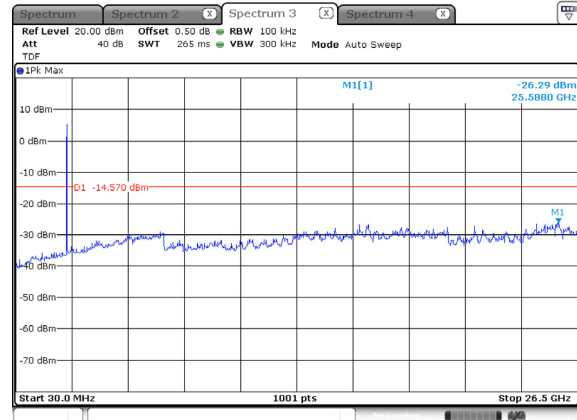
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Conducted Emissions

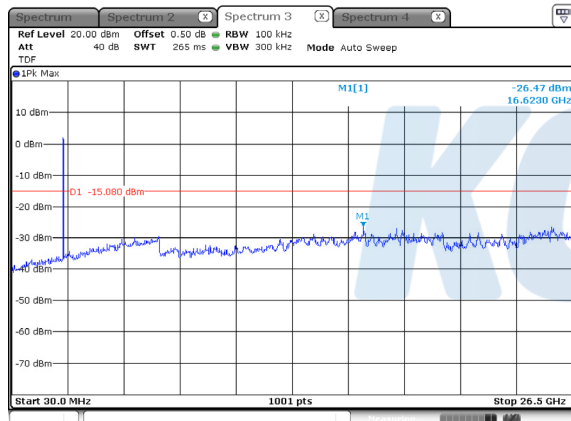
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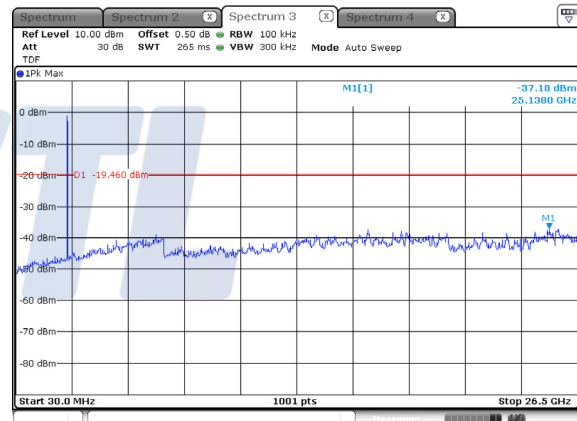
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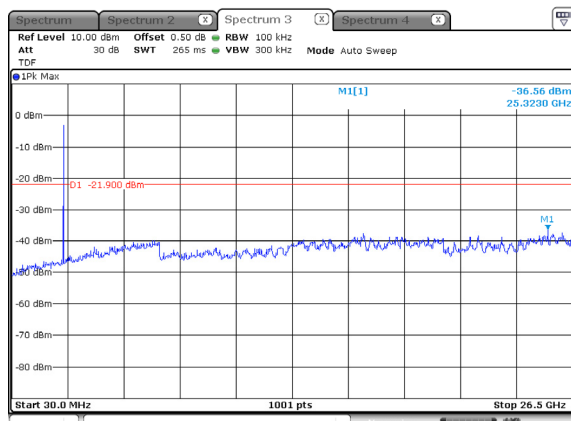
802.11g / 11 ch.



802.11g / 12 ch.



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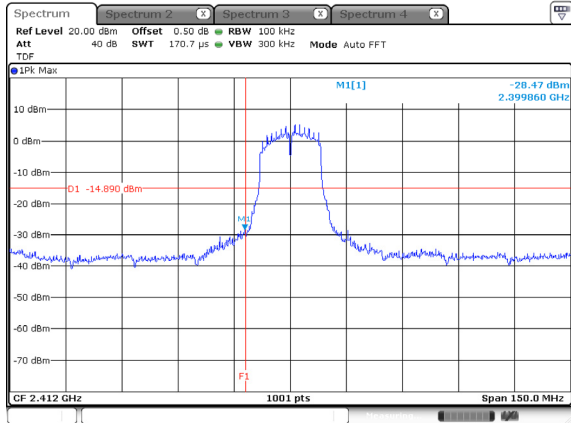
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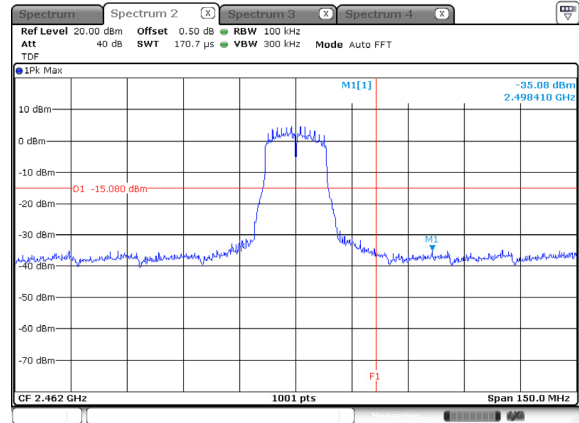
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Band edge

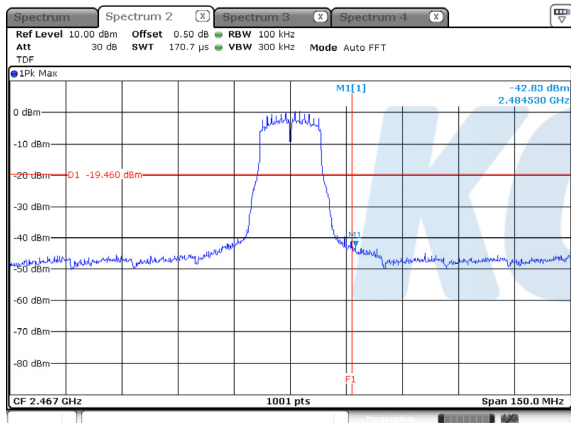
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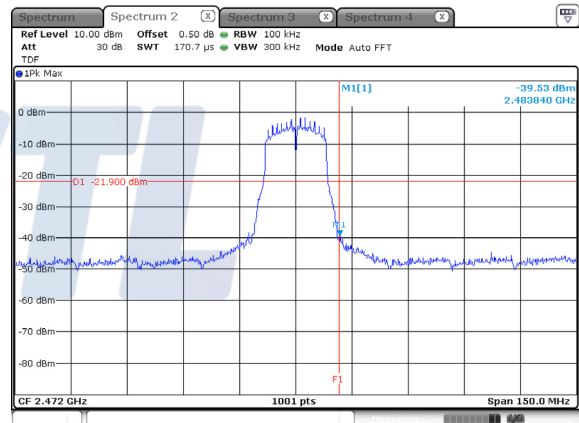
802.11g / 11 ch



802.11g / 12 ch.



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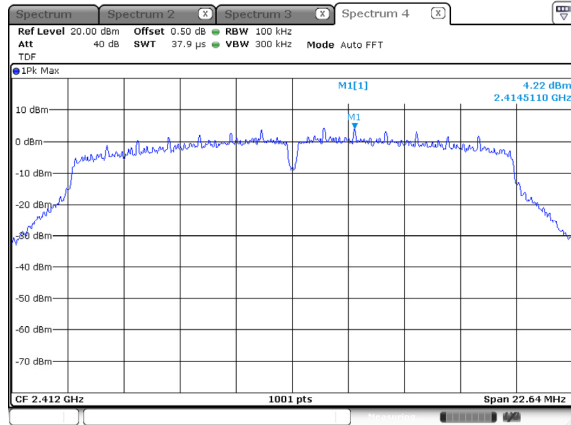
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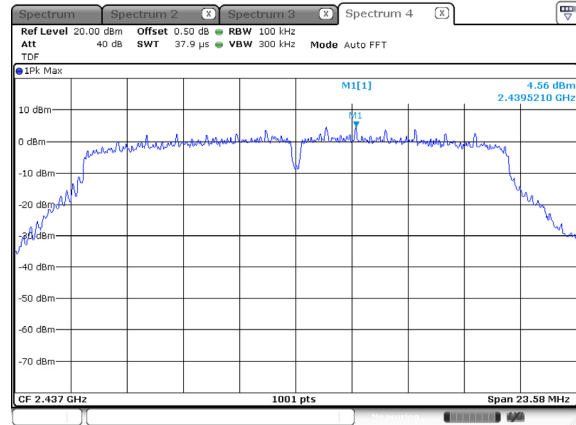
Test mode : 802.11n HT20

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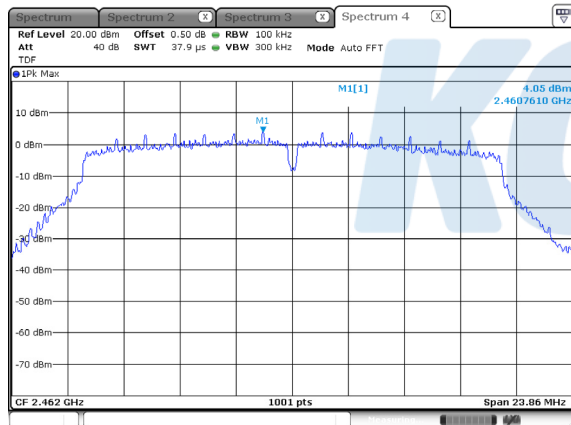
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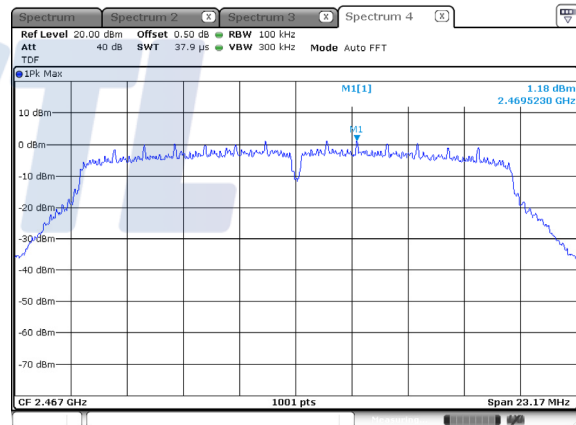
802.11n HT20 / 6 ch.



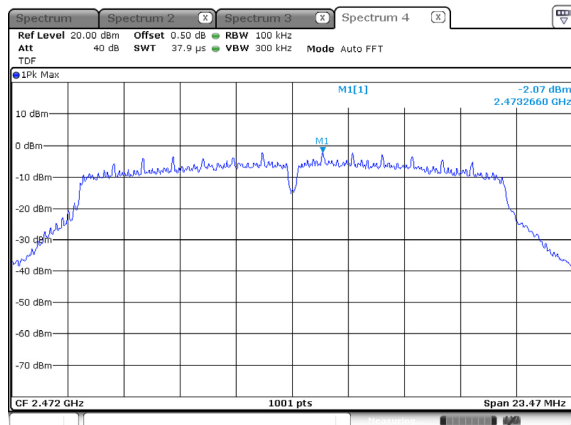
802.11n HT20 / 11 ch.



802.11n HT20 / 12 ch.



802.11n HT20 / 13 ch.



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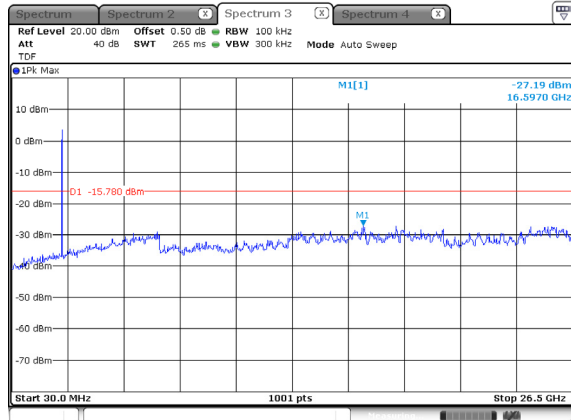
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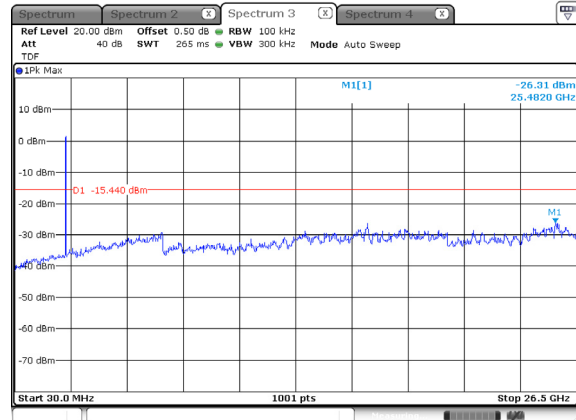
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Conducted Emissions

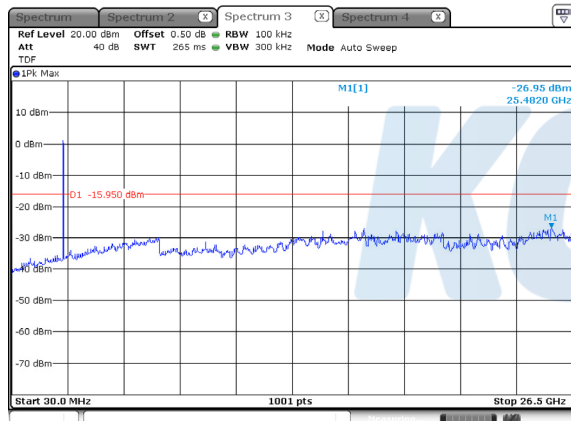
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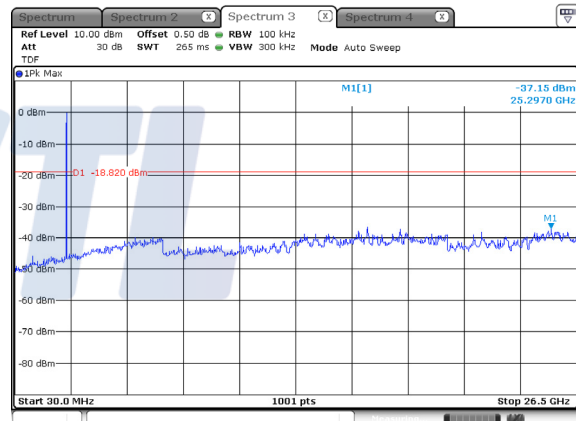
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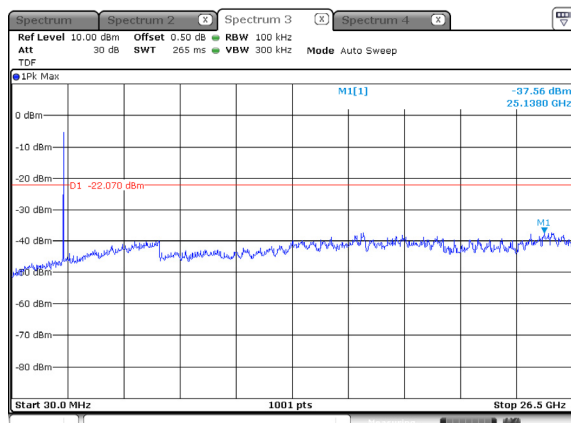
802.11n HT20 / 11 ch.



802.11n HT20 / 12 ch.



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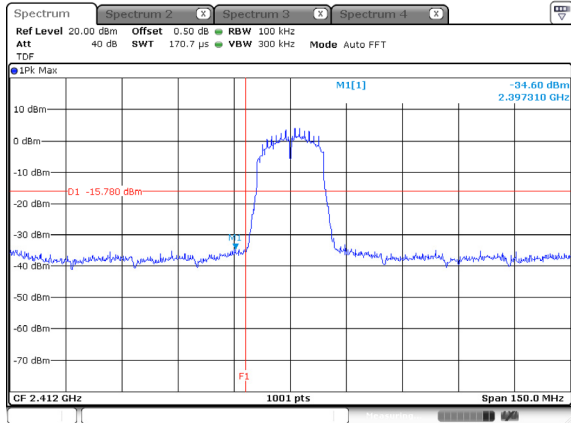
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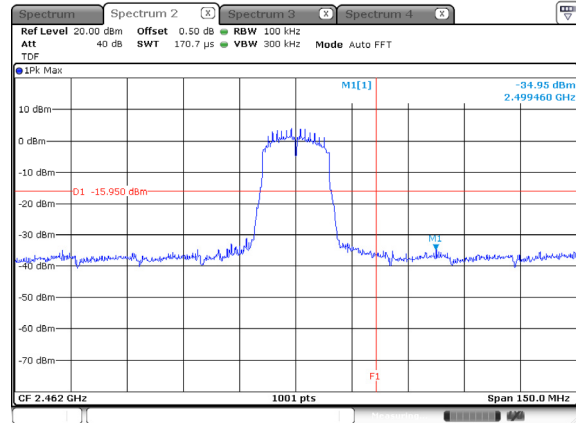
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Band edge

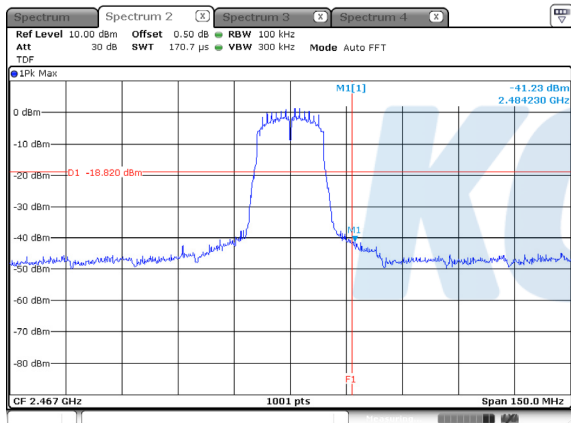
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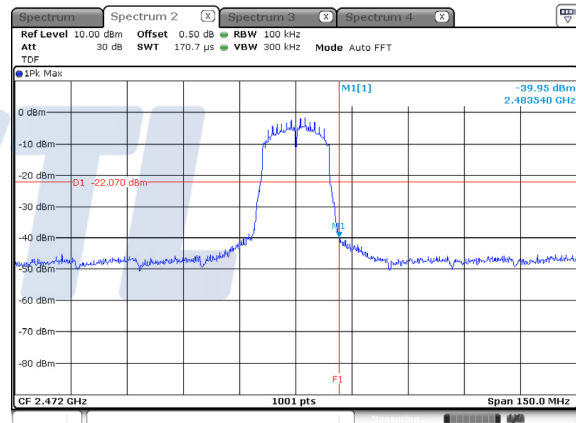
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802.11n HT20 / 12 ch.

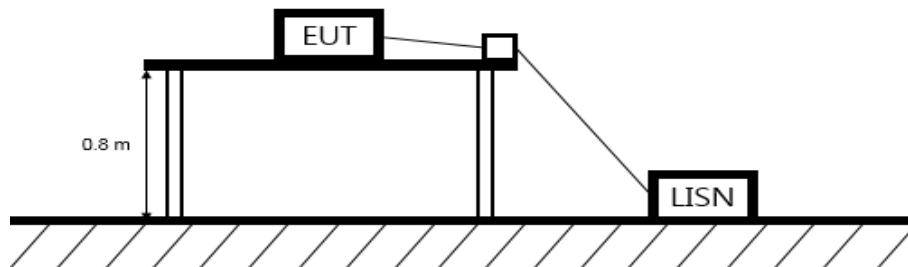


802.11n HT20 / 13 ch.



7.6. AC Conducted emission

Test setup



Limit

According to 15.207(a), 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 μ H/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequencies ranges.

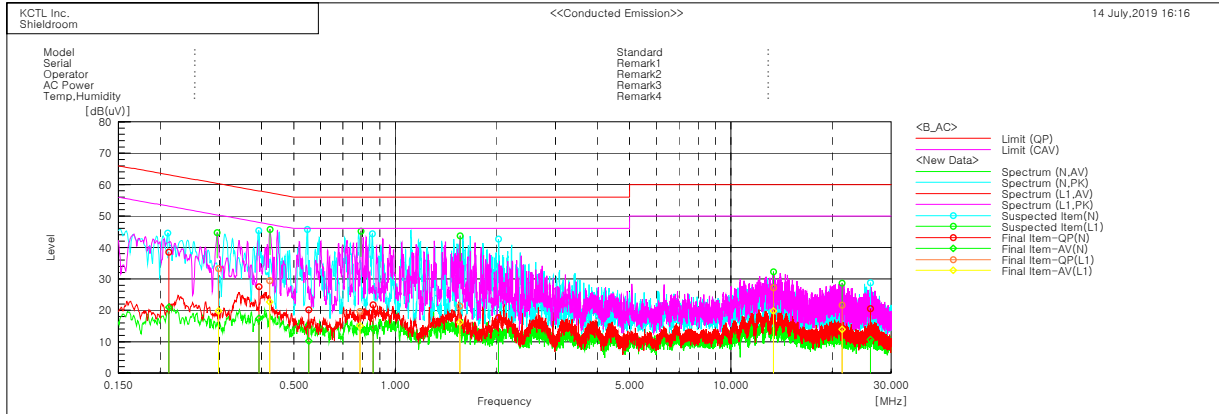
Frequency of Emission (MHz)	Conducted limit (dB μ V/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

Test procedure

ANSI C63.10-2013 - Section 6.2

Test settings

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 Ω /50 μ 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 is 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.

Test results**Worst case: 802.11n HT20 / 6 channel****Final Result****--- N 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	0.2121	28.7	11.1	9.8	38.5	20.9	63.1	53.1	24.6	32.2
2	0.3939	17.7	7.6	9.8	27.5	17.4	58.0	48.0	30.5	30.6
3	0.55307	10.4	0.4	9.8	20.2	10.2	56.0	46.0	35.8	35.8
4	0.85954	11.9	4.4	9.8	21.7	14.2	56.0	46.0	34.3	31.8
5	2.03145	7.9	2.1	9.7	17.6	11.8	56.0	46.0	38.4	34.2
6	26.03206	10.4	0.6	10.0	20.4	10.6	60.0	50.0	39.6	39.4

--- L1 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	0.29797	23.5	10.0	9.8	33.3	19.8	60.3	50.3	27.0	30.5
2	0.42385	19.6	12.8	9.9	29.5	22.7	57.4	47.4	27.9	24.7
3	0.78655	9.7	5.1	9.9	19.6	15.0	56.0	46.0	36.4	31.0
4	1.55901	11.5	6.3	9.8	21.3	16.1	56.0	46.0	34.7	29.9
5	13.38888	17.0	9.7	10.1	27.1	19.8	60.0	50.0	32.9	30.2
6	21.45595	11.4	3.7	10.2	21.6	13.9	60.0	50.0	38.4	36.1

8. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV30	100810	19.08.01
Spectrum Analyzer	R&S	FSV40	100988	20.01.04
Wideband Power Sensor	R&S	NRP-Z81	102398	20.01.25
ATTENUATOR	R&S	DNF Dämpfungsglied 10 dB in N-50 Ohm	31212	20.05.13
EMI TEST RECEIVER	R&S	ESC17	100732	19.08.23
Bi-Log Antenna	SCHWARZBECK	VULB 9168	583	20.05.04
Amplifier	SONOMA INSTRUMENT	310N	284608	19.08.23
COAXIAL FIXED ATTENUATOR	Agilent	8491B-003	2708A18758	20.05.04
Horn antenna	ETS.lindgren	3116	00086632	20.02.15
Horn antenna	ETS.lindgren	3117	155787	19.10.23
Broadband PreAmplifier	SCHWARZBECK	BBV9718	216	19.08.01
AMPLIFIER	L-3 Narda-MITEQ	AFS5-00101800-25-S- 5	2054571	20.02.21
AMPLIFIER	L-3 Narda-MITEQ	AMF-7D-01001800 -22-10P	2031196	20.02.21
AMPLIFIER	L-3 Narda-MITEQ	JS44-18004000-33 -8P	2000997	19.08.02
LOOP Antenna	R&S	HFH2-Z2	100355	20.08.24
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	-
Highpass Filter	WT	WT-A1698-HS	WT160411001	20.05.14
TWO-LINE V - NETWORK	R&S	ENV216	101358	20.04.05
EMI TEST RECEIVER	R&S	ESCI	100001	19.08.23
Vector Signal Generator	R&S	SMBV100A	257566	20.01.04
Signal Generator	R&S	SMR40	100007	20.05.13
Cable Assembly	RadiAll	2301761768000PJ	1724.659	-
Cable Assembly	gigalane	RG-400	-	-
Cable Assembly	HUER+SUHNER	SUCOFLEX 104	MY4342/4	-

End of test report