

FCC TEST REPORT

(Part 15, Subpart C)

Applicant:	Qingdao Intelligent & Precise Electronics Co., Ltd.
Address:	No.218 Qianwangang Road, Qingdao Economic & Technological Development Zone, Qingdao City, Shandong Province, P. R. China

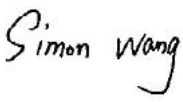
Manufacturer or Supplier:	Qingdao Intelligent & Precise Electronics Co., Ltd.
Address:	No.218 Qianwangang Road, Qingdao Economic & Technological Development Zone, Qingdao City, Shandong Province, P. R. China
Product:	WiFi/BT Module
Brand Name:	Hisense
Model Name:	MWH543S
FCC ID:	2AJVQ-MWH543S
Date of tests:	Nov.19, 2024 ~ Dec. 17, 2024

The tests have been carried out according to the requirements of the following standard:

☒ **FCC Part 15, Subpart C, Section 15.247**

☒ **ANSI C63.10-2020**

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Prepared by Simon Wang Engineer / Mobile Department	Approved by Luke Lu Manager / Mobile Department
 Date: Dec. 17, 2024	 Date: Dec. 17, 2024

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
PSU-NQN2412200117RF02	Original release	Dec. 17, 2024



1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247)		
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT
15.207	AC Power Conducted Emission	Compliance
15.205 15.209	Radiated Emissions	Compliance
15.247(d)	Out of band Emission Measurement	Compliance
15.247(a)(2)	6dB bandwidth	Compliance
15.247(b)	Conducted Output power	Compliance
15.247(e)	Power Spectral Density	Compliance
15.203	Antenna Requirement	Compliance

Note : 1.Except RSE, other data please refer to Appendix 1 (for WIFI-2.4G) and Appendix 2 (for BLE).



1.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	UNCERTAINTY
AC Power Conducted emissions	$\pm 2.70\text{dB}$
Radiated emissions (9KHz~30MHz)	$\pm 2.68\text{dB}$
Radiated emissions (30MHz~1GHz)	$\pm 4.98\text{dB}$
Radiated emissions (1GHz ~6GHz)	$\pm 4.70\text{dB}$
Radiated emissions (6GHz ~18GHz)	$\pm 4.60\text{dB}$
Radiated emissions (18GHz ~40GHz)	$\pm 4.12\text{dB}$
Conducted emissions	$\pm 4.01\text{dB}$
Occupied Channel Bandwidth	$\pm 43.58\text{KHz}$
Conducted Output power	$\pm 2.06\text{dB}$
Power Spectral Density	$\pm 0.85\text{ dB}$

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.



2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	WiFi/BT Module
BRAND NAME	Hisense
MODEL NAME	MWH543S
NOMINAL VOLTAGE	3.3Vdc (DC supply)
MODULATION	DSSS, OFDM, GFSK
TRANSMISSION RATE	802.11b: 11/ 5.5/ 2.0 / 1.0 Mbps 802.11g: 54/ 48/ 36 / 24 / 18 / 9/ 6 Mbps 802.11n(HT20): up to 144.4 Mbps 802.11n(HT40): up to 300 Mbps BT_LE: 0.125 Mbps /0.5 Mbps /1 Mbps/2 Mbps
OPERATING FREQUENCY	2412-2462MHz for 11b/g/n(HT20/40) 2402-2480MHz for BT-LE(GFSK)
MAX. OUTPUT POWER	WLAN: 291.072mW (Maximum) BT-LE: 4.677mW (Maximum)
ANTENNA TYPE	PIFA Antenna with 1.06dBi gain for WIFI and BLE
Directional Gain:	For Power/PSD: 1.06dBi(Uncorrelated) for WIFI
Beamforming Directional Gain:	N/A
HW VERSION	V1.00
SW VERSION	N/A
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	N/A



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NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. The EUT incorporates a SISIO function. Physically, the EUT provides one transmitter and one receiver.

MODULATION MODE	TX/RX FUNCTION
802.11b	1TX /1RX
802.11g	1TX /1RX
802.11n(HT20)	1TX /1RX
802.11n(HT40)	1TX /1RX
BT_LE(1MHz)	1TX /1RX
BT_LE(2MHz)	1TX /1RX
BT_LE(S2)	1TX /1RX
BT_LE(S8)	1TX /1RX

3. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
4. Antenna gain and EUT conducted cable loss are provided by the customer, and the laboratory will record the results based on these items that involve these two parameters.



2.2 DESCRIPTION OF TEST MODES

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2412 MHz	7	2442 MHz
2	2417 MHz	8	2447 MHz
3	2422 MHz	9	2452 MHz
4	2427 MHz	10	2457 MHz
5	2432 MHz	11	2462 MHz
6	2437 MHz		

7 channels are provided for 802.11n (HT40)

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
3	2422 MHz	7	2442 MHz
4	2427 MHz	8	2447 MHz
5	2432 MHz	9	2452 MHz
6	2437 MHz		

40 channels are provided for BT-LE (GFSK):

CHANNEL	FREQ. (MHZ)	CHANNEL	FREQ. (MHZ)	CHANNEL	FREQ. (MHZ)	CHANNEL	FREQ. (MHZ)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480



2.2.1 CONFIGURATION OF SYSTEM UNDER TEST

Please see section 4 photographs of the test configuration for reference.

2.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports.

The worst case was found when positioned on Y axis for radiated emission. Following test modes were selected for the final test, and the final worst case is marked in boldface and recorded in the report:

EUT CONFIGURE MODE	APPLICABLE TO				MODE
	RE<1G	RE≥1G	PLC	APCM	
-	√	√	√	√	-

Where **RE<1G**: Radiated Emission below 1GHz

RE≥1G: Radiated Emission above 1GHz

PLC: Power Line Conducted Emission

APCM: Antenna Port Conducted Measurement

NOTE: No need to concern of Conducted Emission due to the EUT is powered by battery.

RADIATED EMISSION TEST (BELOW 1GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ The following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	1.0
802.11g	1 to 11	1, 6, 11	OFDM	6.0
802.11n HT20	1 to 11	1, 6, 11	OFDM	MCS0
802.11n HT40	3 to 9	3,6,9	OFDM	MCS0
BT-LE	0 to 39	39	GFSK	1.0

**RADIATED EMISSION TEST (ABOVE 1GHz):**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ The following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	1.0
802.11g	1 to 11	1, 6, 11	OFDM	6.0
802.11n HT20	1 to 11	1, 6, 11	OFDM	MCS0
802.11n HT40	3 to 9	3,6,9	OFDM	MCS0
BT-LE	0 to 39	0,19, 39	GFSK	0.125&0.5&1.0
BT-LE	1 to 38	1,19, 38	GFSK	2.0

POWER LINE CONDUCTED EMISSION TEST

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ The following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	1.0

**BANDEDGE MEASUREMENT:**

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ The following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	1.0
802.11g	1 to 11	1, 6, 11	OFDM	6.0
802.11n HT20	1 to 11	1, 6, 11	OFDM	MCS0
802.11n HT40	3 to 9	3,6,9	OFDM	MCS0
BT-LE	0 to 39	0,19, 39	GFSK	0.125&0.5&1.0
BT-LE	1 to 38	1,19, 38	GFSK	2.0

**ANTENNA PORT CONDUCTED MEASUREMENT:**

- ☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ The following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	1.0
802.11g	1 to 11	1, 6, 11	OFDM	6.0
802.11n HT20	1 to 11	1, 6, 11	OFDM	MCS0
802.11n HT40	3 to 9	3,6,9	OFDM	MCS0
BT-LE	0 to 39	0,19, 39	GFSK	0.125&0.5&1.0
BT-LE	1 to 38	1,19, 38	GFSK	2.0

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE	TESTED BY
RE<1G	23deg. C, 70%RH	DC 3.3V By DC Supply	Jace Hu
RE≥1G	23deg. C, 70%RH	DC 3.3V By DC Supply	Jace Hu
PLC	25deg. C, 52%RH	DC 3.3V By DC Supply	Carl Xie
APCM	25deg. C, 60%RH	DC 3.6V By DC Supply	James Fu



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2.3 DUTY CYCLE OF TEST SIGNAL

Please Refer to Appendix1/2 Of this test report.



2.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C, Section 15.247

KDB 558074 D01 DTS Meas Guidance v05r02

ANSI C63.10-2020

Note :

1. All test items have been performed and recorded as per the above standards.
2. The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (Certification). The test report has been issued separately.

2.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Desktop	Lenovo	M73 SFF	PC04GRQV	N/A
2	Desktop	Lenovo	M73 SFF	PC06CS27	N/A
3	Laptop	Lenovo	Thinkpad T450	PC-049PT1	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	AC Line: Unshielded, Detachable 1.5m
2	AC Line: Unshielded, Detachable 1.5m
3	AC Line: Unshielded, Detachable 1.5m



3 TEST TYPES AND RESULTS

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	60	50

- NOTE:** 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

3.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR3	101900	Feb. 13,24	Feb. 12,25
EMC32 test software	Rohde&Schwarz	EMC32	NA	NA	NA
LISN network	Rohde&Schwarz	ENV216	101922	Mar. 09,24	Mar. 08,25

NOTE:

1. The test was performed in CE shielded room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.



3.1.3 TEST PROCEDURES

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

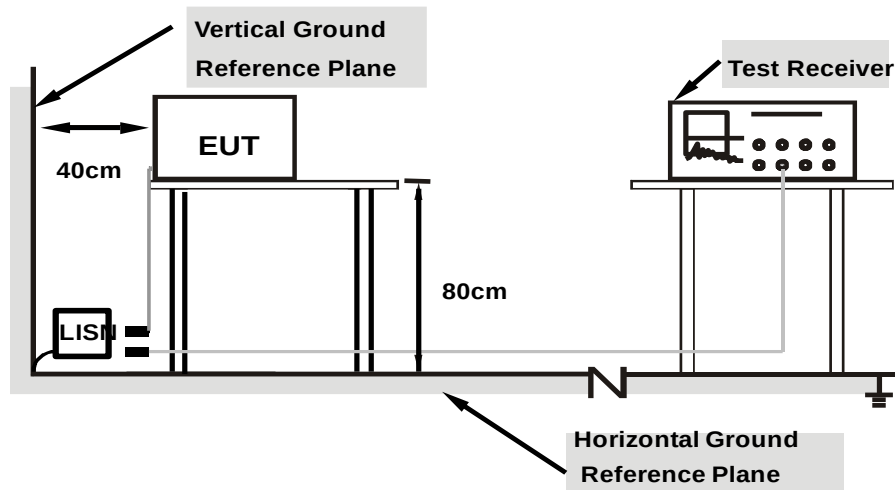
NOTE: All modes of operation were investigated and the worst-case emissions are reported.

3.1.4 DEVIATION FROM TEST STANDARD

No deviation.



3.1.5 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80
from other units and other metal planes

For the actual test configuration, please refer to the attached file (Test Setup Photo).

3.1.6 EUT OPERATING CONDITIONS

- Turned on the power and connected of all equipment.
- EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.



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3.1.7 TEST RESULTS

NA



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

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

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/meter)	MEASUREMENT DISTANCE (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.



3.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	Euroshieldpn-CT0001143-1216	Nov. 14,23	Nov. 13,26
Bilog Antenna	ETS-LINDGREN	3143B	00161965	Feb. 17,24	Feb. 16,25
Horn Antenna	ETS-LINDGREN	3117	00168692	Feb. 17,24	Feb. 16,25
Horn Antenna (18GHz-40GHz)	N/A	QWH-SL-18-40-K-SG/QMS-00361	15433	Sep.02, 24	Sep.01, 25
Test Software	E3	V 9.160323	N/A	N/A	N/A
Test Software	JS1120-3	3.2.06	N/A	N/A	N/A
10dB Attenuator	JFW/USA	50HF-010-SMA	N/A	May. 05,24	May. 04,25
MXE EMI Receiver	KEYSIGHT	N9038A-544	MY54450026	Mar. 27,24	Mar. 26,25
Signal Pre-Amplifier	EMSI	EMC 9135	980249	May. 05,24	May. 04,25
Signal Pre-Amplifier	EMSI	EMC 012645B	980257	May.09,24	May.08,25
Signal Pre-Amplifier	EMSI	EMC 184045B	980259	Feb. 16,24	Feb. 15,25
DC Source	Kikusui/JP	PMX18-5A	0000001	Aug. 10,24	Aug. 09,25
Power Meter	Anritsu	ML2495A	1506002	Feb. 13,24	Feb. 12,25
Power Sensor	Anritsu	MA2411B	1339352	Feb. 13,24	Feb. 12,25
Loop Antenna	Schwarzbeck	FMZB 1519B	00173	Sep.01,24	Aug.31,25

- NOTE:**
1. The calibration interval of the above test instruments is 12 months or 36 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
 2. The test was performed in 3m Chamber.
 3. The FCC Site Registration No. is 525120; The Designation No. is CN1171.



3.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using fresh batteries. The turntable was rotated to maximize the emission level.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($10 \log(1/\text{duty cycle})$).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

3.2.4 DEVIATION FROM TEST STANDARD

No deviation

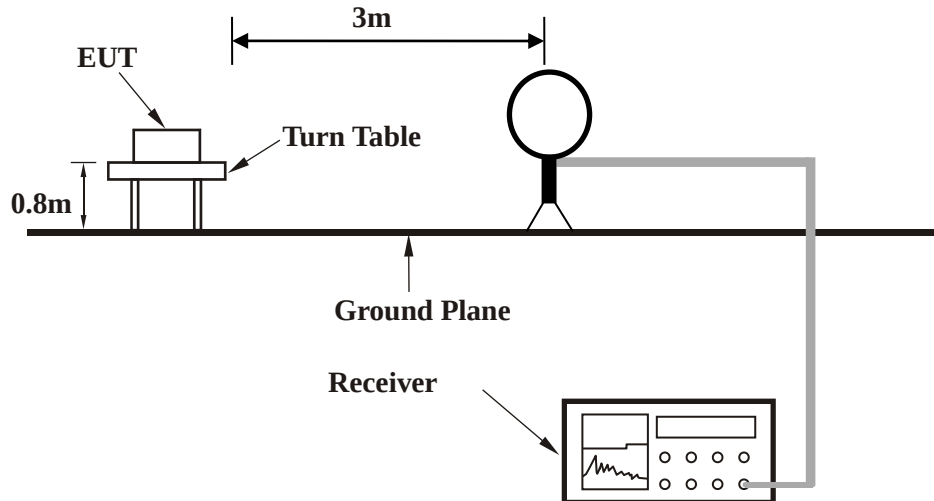


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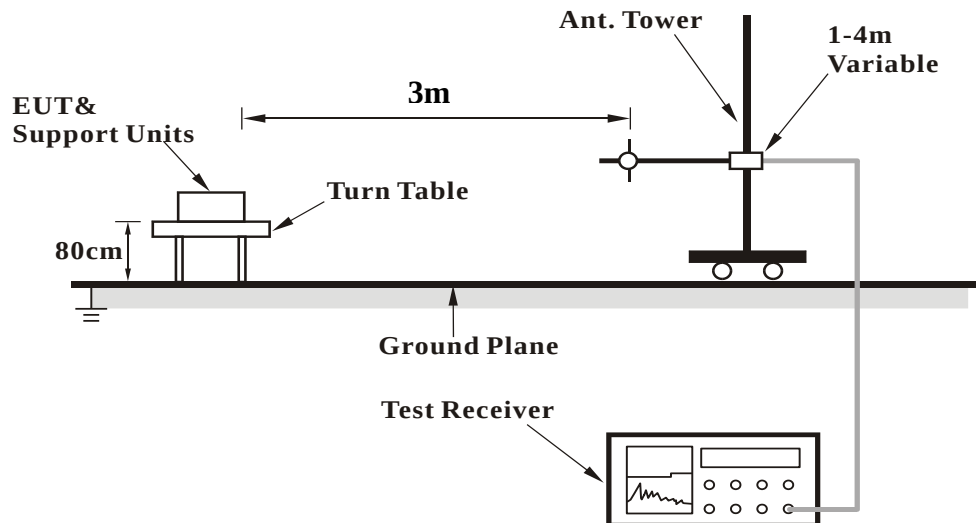
Test Report No.: PSU-NQN2412200117RF02

3.2.5 TEST SETUP

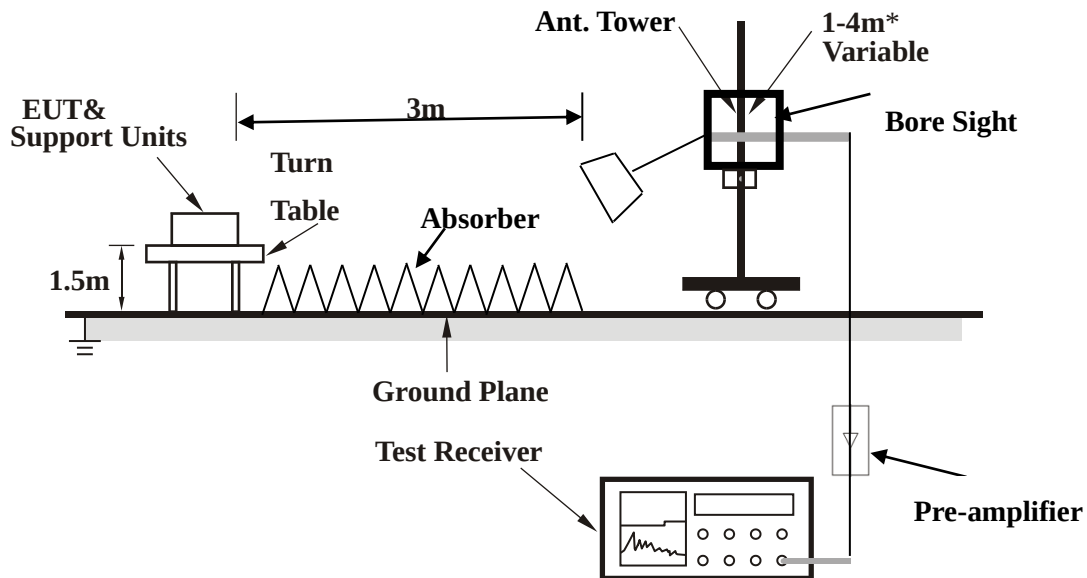
<Frequency Range 9KHz~30MHz >



< Frequency Range 30MHz~1GHz >



<Frequency Range above 1GHz>



Note: Above 1G is a directional antenna

Depends on the EUT height and the antenna 3dB beamwidth both, refer to section 7.3 of CISPR 16-2-3.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

3.2.6 EUT OPERATING CONDITIONS

- Set the EUT under full load condition and placed them on a testing table.
- Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.
- The necessary accessories enable the EUT in full functions.



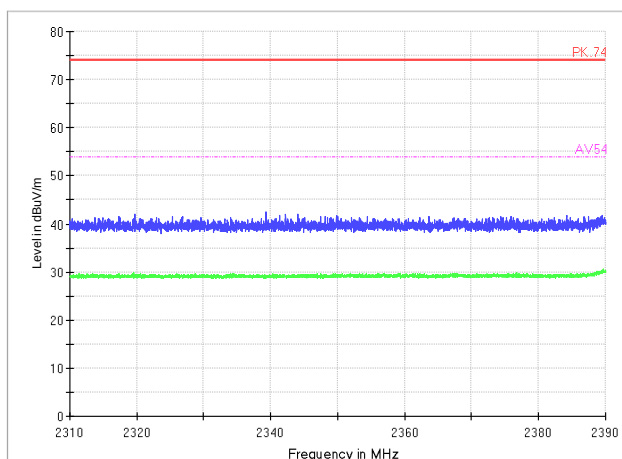
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Test Report No.: PSU-NQN2412200117RF02

3.2.7 TEST RESULTS

NOTE : The 9K~30MHz amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required in the report.

Radiated Emission Band Edge for BLE

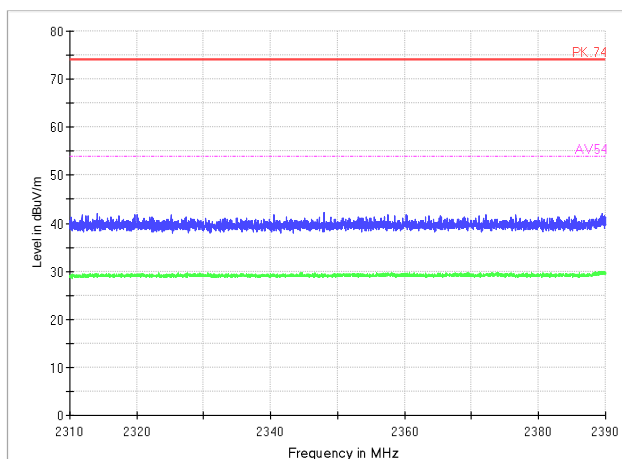


Carrier frequency (MHz): 2402

Channel No.:0

Test Mode: GFSK (LE 1Mbps)

Polarity: Vertical



Carrier frequency (MHz): 2402

Channel No.:0

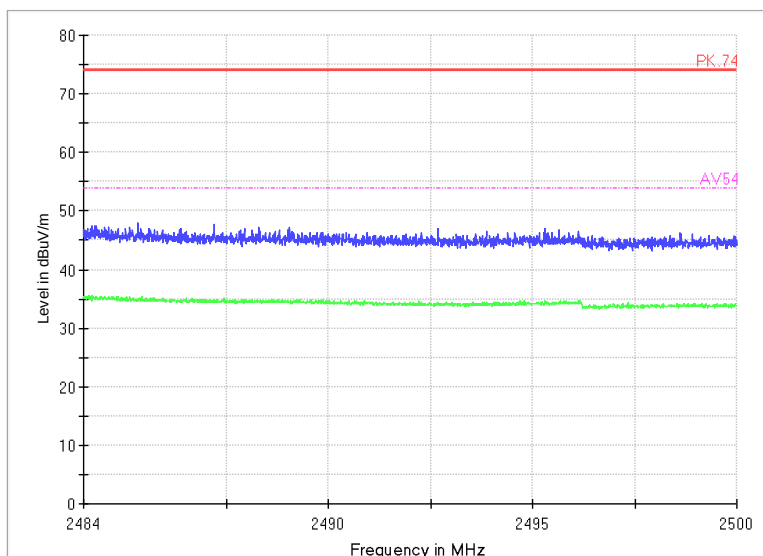
Test Mode: GFSK (LE 1Mbps)

Polarity: Horizontal



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Test Report No.: PSU-NQN2412200117RF02

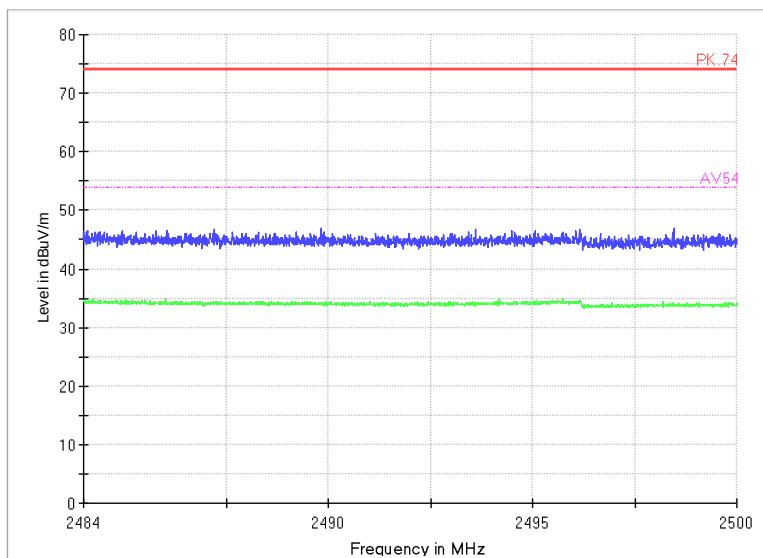


Carrier frequency (MHz): 2480

Channel No.:39

Test Mode: GFSK (LE 1Mbps)

Polarity: Vertical



Carrier frequency (MHz): 2480

Channel No.:39

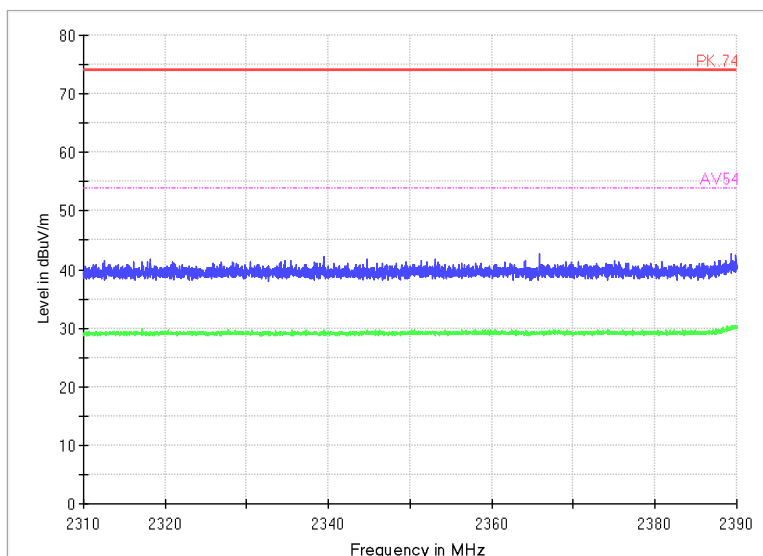
Test Mode: GFSK (LE 1Mbps)

Polarity: Horizontal



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VERITAS

Test Report No.: PSU-NQN2412200117RF02

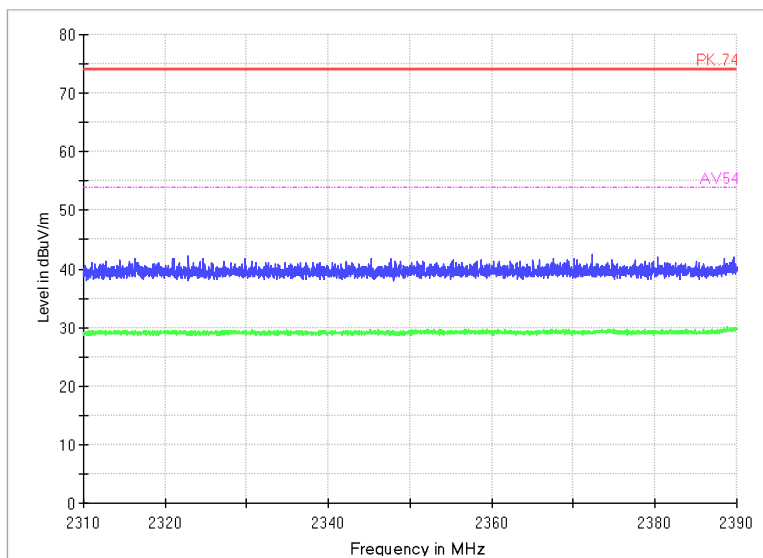


Carrier frequency (MHz): 2402

Channel No.:0

Test Mode: GFSK (LE 2Mbps)

Polarity: Vertical



Carrier frequency (MHz): 2402

Channel No.:0

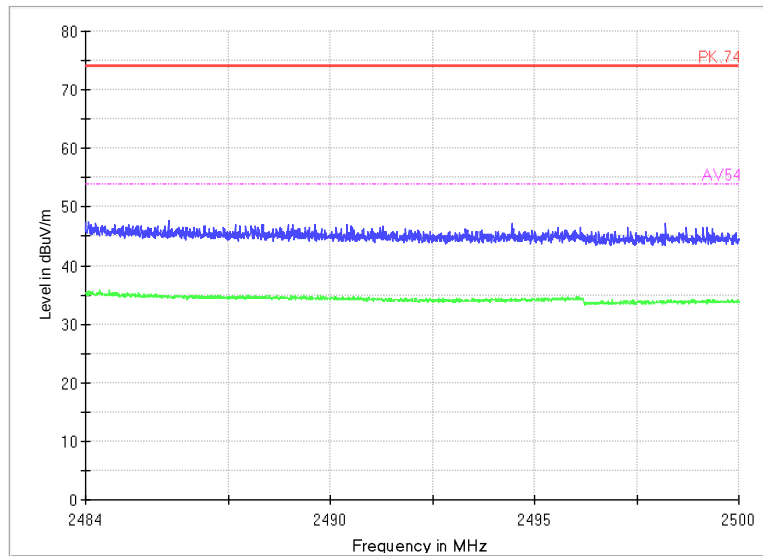
Test Mode: GFSK (LE 2Mbps)

Polarity: Horizontal



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

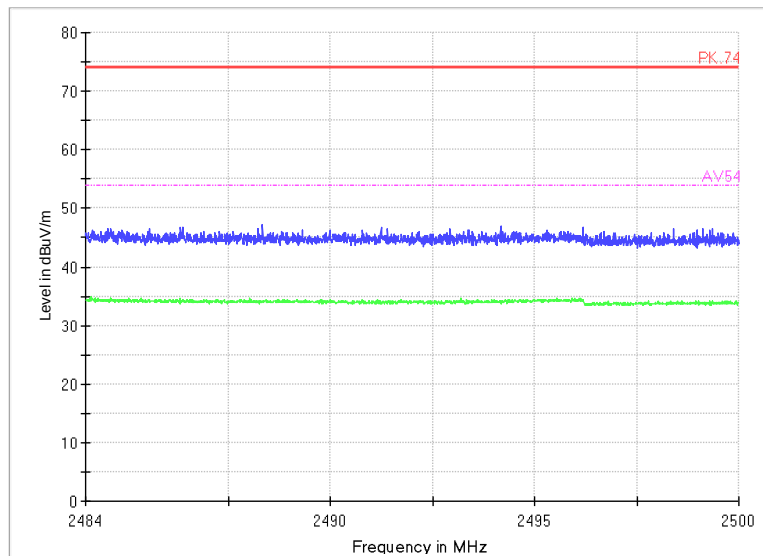


Carrier frequency (MHz): 2480

Channel No.:39

Test Mode: GFSK (LE 2Mbps)

Polarity: Vertical



Carrier frequency (MHz): 2480

Channel No.:39

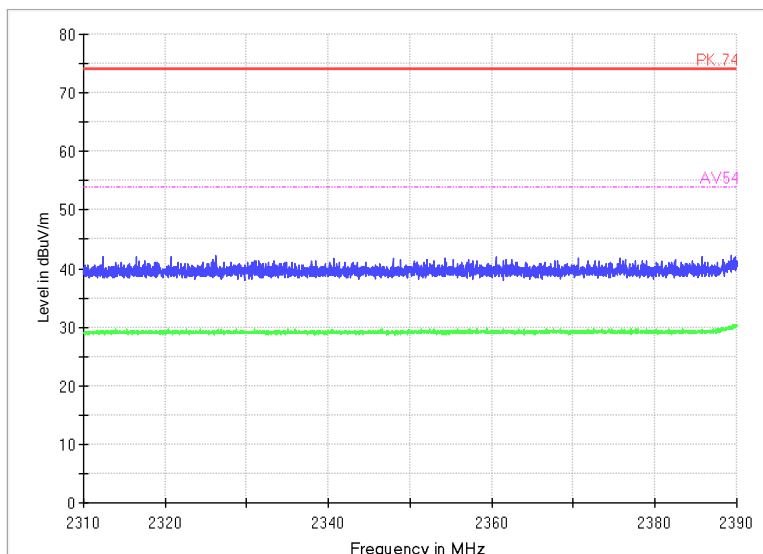
Test Mode: GFSK (LE 2Mbps)

Polarity: Horizontal



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

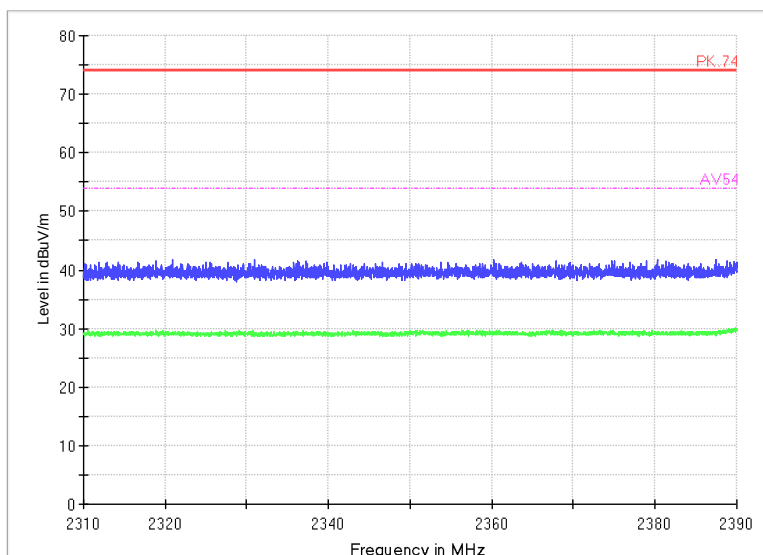


Carrier frequency (MHz): 2402

Channel No.:0

Test Mode: GFSK (LE 125Khz S=8)

Polarity: Vertical



Carrier frequency (MHz): 2402

Channel No.:0

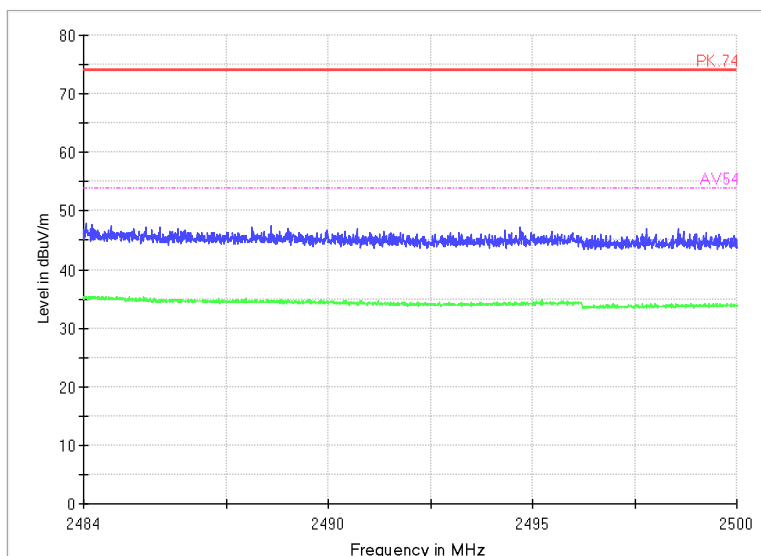
Test Mode: GFSK (LE 125Khz S=8)

Polarity: Horizontal



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

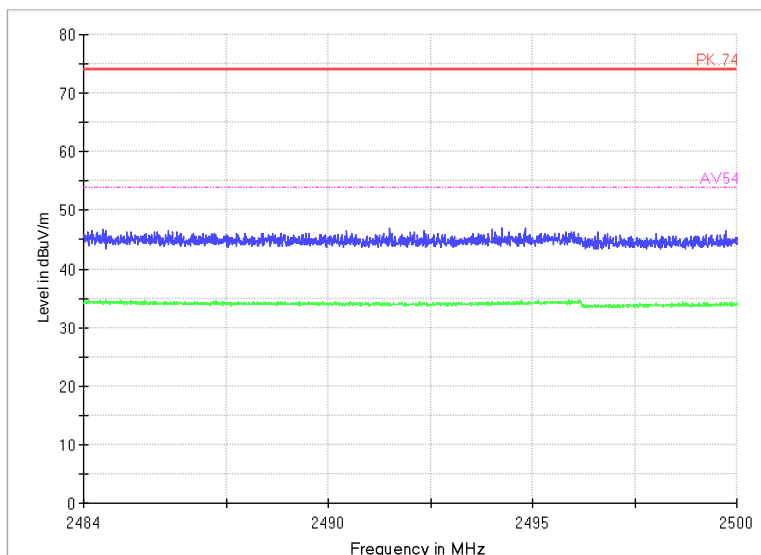


Carrier frequency (MHz): 2480

Channel No.:39

Test Mode: GFSK (LE 125Khz S=8)

Polarity: Vertical



Carrier frequency (MHz): 2480

Channel No.:39

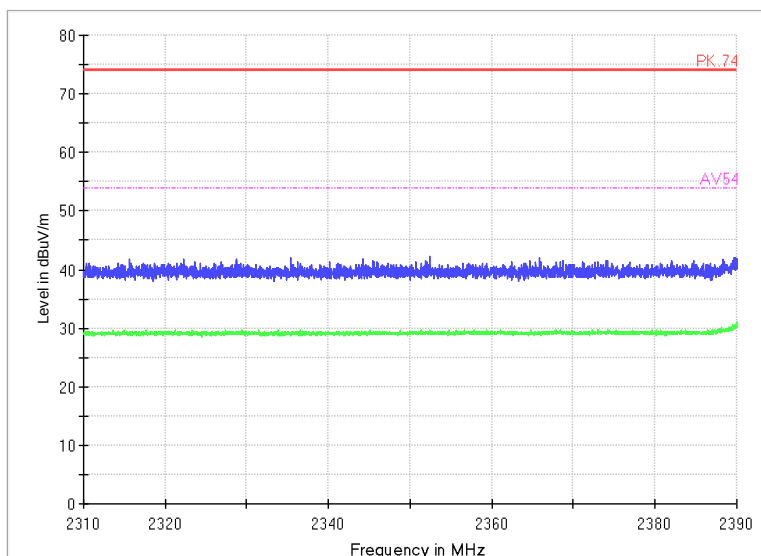
Test Mode: GFSK (LE 125Khz S=8)

Polarity: Horizontal



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

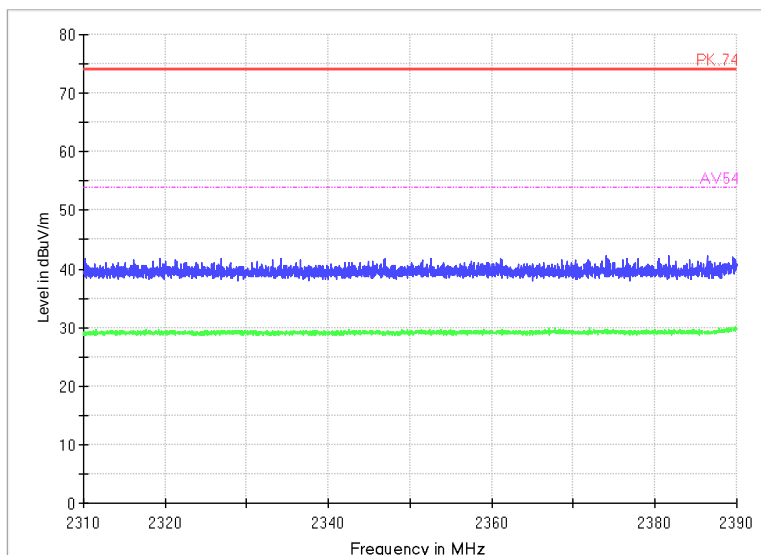


Carrier frequency (MHz): 2402

Channel No.:0

Test Mode: GFSK (LE 500Khz S=2)

Polarity: Vertical



Carrier frequency (MHz): 2402

Channel No.:0

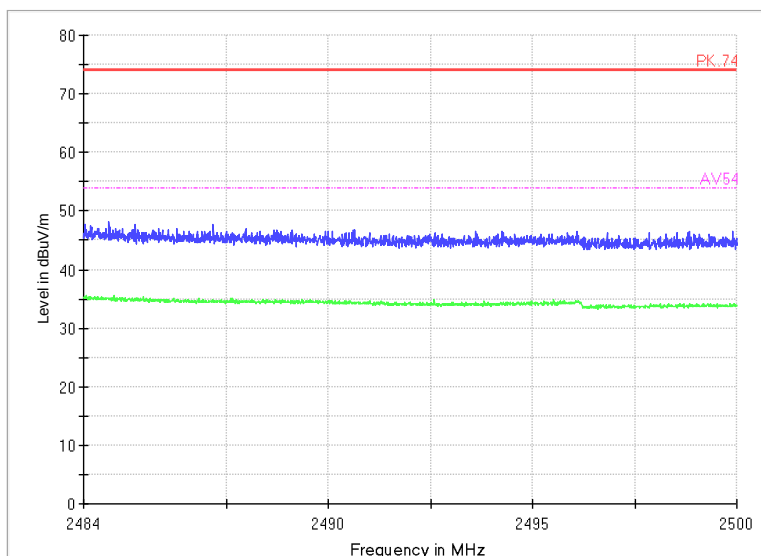
Test Mode: GFSK (LE 500Khz S=2)

Polarity: Horizontal



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

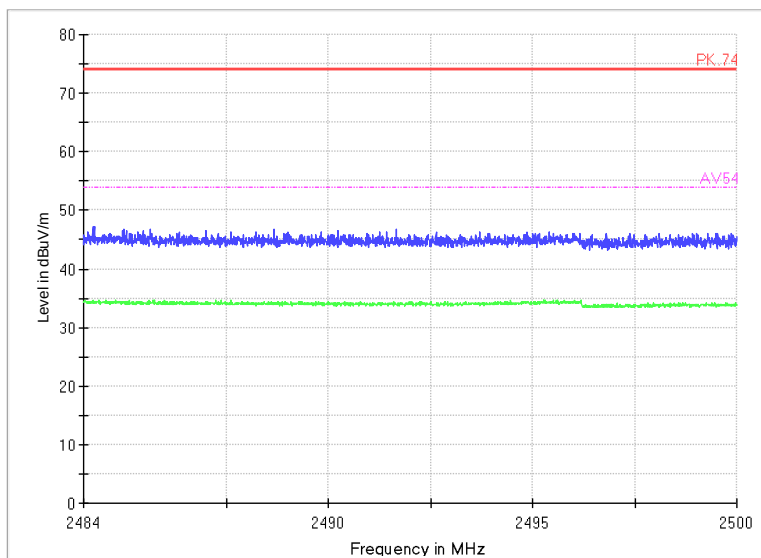


Carrier frequency (MHz): 2480

Channel No.:39

Test Mode: GFSK (LE 500Khz S=2)

Polarity: Vertical



Carrier frequency (MHz): 2480

Channel No.:39

Test Mode: GFSK (LE 500Khz S=2)

Polarity: Horizontal



Radiated Emission for BLE

After comparison, the worst case attitude is EUT lay down.

Determining Spurious Emissions Levels

A “reference path loss” is established and the A_{Rpl} is the attenuation of “reference path loss”, and including the gain of receive antenna, the gain of the preamplifier, the cable loss.

The measurement results are obtained as described below:

$$\text{Result} = P_{\text{mea}} + A_{Rpl}$$

Sample calculation: $(12.83 \text{ dB}\mu\text{V/m}) = (30.93 \text{ BuV}) + (-18.1 \text{ dB/m})$, the corresponding frequency is 36.014 MHz.

For GFSK (LE 1Mbps)

Channel No.:0

Frequency (MHz)	Result (dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
36.014	12.83	-18.1	30.93	Vertical	40	27.17
84.1745	22.14	-21.2	43.34	Vertical	40	17.86
168.322	19.69	-19.1	38.79	Vertical	43.5	23.81
270.56	26.39	-14.2	40.59	Vertical	46	19.61
390.7915	24.18	-11	35.18	Vertical	46	21.82
919.878	22.15	-0.3	22.45	Vertical	46	23.85

Channel No.:19

Frequency (MHz)	Result (dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
36.014	12.82	-18.1	30.92	Vertical	40	27.18
78.112	18.18	-21.7	39.88	Vertical	40	21.82
138.252	17.73	-20	37.73	Vertical	43.5	25.77
270.56	26.35	-14.2	40.55	Vertical	46	19.65
390.7915	24.17	-11	35.17	Vertical	46	21.83
745.569	22.82	-2.9	25.72	Vertical	46	23.18

Channel No.:39

Frequency	Result	ARpl	Pmea	Polarity	Limit	Margin
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BUREAU VERITAS Test Report No.: PSU-NQN2412200117RF02

(MHz)	(dBuV/m)	(dB)	(dBuV/m)		(dBuV/m)	(dB)
48.0905	13.65	-14.9	28.55	Vertical	40	26.35
84.1745	22.07	-21.2	43.27	Vertical	40	17.93
168.322	19.71	-19.1	38.81	Vertical	43.5	23.79
264.546	25.08	-14.4	39.48	Vertical	46	20.92
390.7915	24.17	-11	35.17	Vertical	46	21.83
893.009	20.82	-1	21.82	Vertical	46	25.18

For GFSK (LE 2Mbps)

Channel No.:0

Frequency (MHz)	Result (dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
36.014	12.81	-18.1	30.91	Vertical	40	27.19
78.1605	21.73	-21.7	43.43	Vertical	40	18.27
168.322	19.71	-19.1	38.81	Vertical	43.5	23.79
270.56	26.38	-14.2	40.58	Vertical	46	19.62
390.7915	24.18	-11	35.18	Vertical	46	21.82
745.569	22.83	-2.9	25.73	Vertical	46	23.17

Channel No.:19

Frequency (MHz)	Result (dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
36.014	12.79	-18.1	30.89	Vertical	40	27.21
84.1745	22.09	-21.2	43.29	Vertical	40	17.91
138.252	17.78	-20	37.78	Vertical	43.5	25.72
270.56	26.33	-14.2	40.53	Vertical	46	19.67
390.7915	24.15	-11	35.15	Vertical	46	21.85
935.1555	20.85	-0.3	21.15	Vertical	46	25.15

Channel No.:39

Frequency (MHz)	Result (dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
48.0905	14.35	-14.9	29.25	Vertical	40	25.65
84.126	19.9	-21.2	41.1	Vertical	40	20.1
168.322	19.71	-19.1	38.81	Vertical	43.5	23.79

**BUREAU VERITAS Test Report No.: PSU-NQN2412200117RF02**

270.56	26.35	-14.2	40.55	Vertical	46	19.65
378.7635	23.65	-11.2	34.85	Vertical	46	22.35
919.9265	22.54	-0.3	22.84	Vertical	46	23.46

For GFSK (LE 125Khz S=8)

Channel No.:0

Frequency (MHz)	Result (dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
36.014	12.84	-18.1	30.94	Vertical	40	27.16
78.112	18.19	-21.7	39.89	Vertical	40	21.81
168.322	19.72	-19.1	38.82	Vertical	43.5	23.78
299.6115	22.15	-13.4	35.55	Vertical	46	23.85
390.7915	24.2	-11	35.2	Vertical	46	21.8
874.676	19.77	-0.9	20.67	Vertical	46	26.23

Channel No.:19

Frequency (MHz)	Result (dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
48.042	11.58	-14.9	26.48	Vertical	40	28.42
78.112	18.2	-21.7	39.9	Vertical	40	21.8
168.322	19.73	-19.1	38.83	Vertical	43.5	23.77
270.56	26.41	-14.2	40.61	Vertical	46	19.59
390.7915	24.18	-11	35.18	Vertical	46	21.82
863.8605	19.58	-1.2	20.78	Vertical	46	26.42

Channel No.:39

Frequency (MHz)	Result (dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
48.0905	13.69	-14.9	28.59	Vertical	40	26.31
84.1745	22.08	-21.2	43.28	Vertical	40	17.92
168.322	19.71	-19.1	38.81	Vertical	43.5	23.79
270.56	26.36	-14.2	40.56	Vertical	46	19.64
390.7915	24.22	-11	35.22	Vertical	46	21.78
937.9685	22.76	-0.4	23.16	Vertical	46	23.24



BUREAU VERITAS Test Report No.: PSU-NQN2412200117RF02

For GFSK (LE 500Khz S=2)

Channel No.:0

Frequency (MHz)	Result (dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
36.014	12.83	-18.1	30.93	Vertical	40	27.17
84.126	19.9	-21.2	41.1	Vertical	40	20.1
168.322	19.72	-19.1	38.82	Vertical	43.5	23.78
270.56	26.33	-14.2	40.53	Vertical	46	19.67
390.7915	24.18	-11	35.18	Vertical	46	21.82
953.6825	19.93	-0.7	20.63	Vertical	46	26.07

Channel No.:19

Frequency (MHz)	Result (dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
36.014	12.82	-18.1	30.92	Vertical	40	27.18
84.1745	22.07	-21.2	43.27	Vertical	40	17.93
168.322	19.7	-19.1	38.8	Vertical	43.5	23.8
270.56	26.42	-14.2	40.62	Vertical	46	19.58
390.7915	24.18	-11	35.18	Vertical	46	21.82
932.7305	20.6	-0.2	20.8	Vertical	46	25.4

Channel No.:39

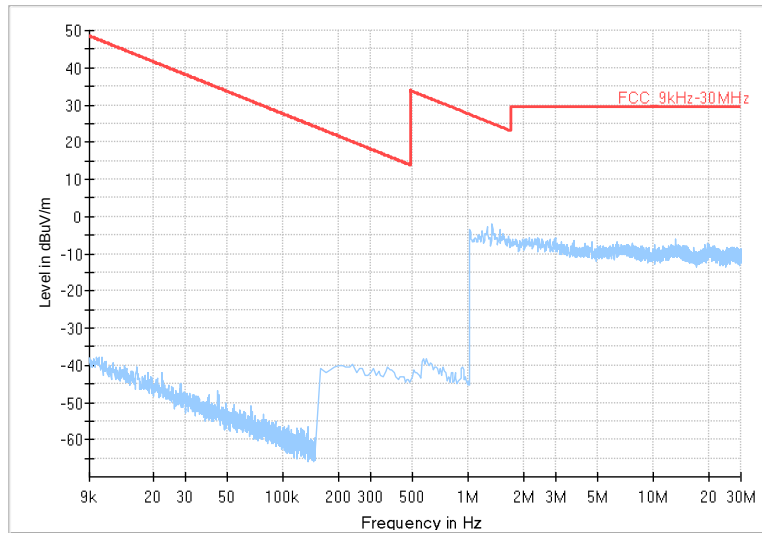
Frequency (MHz)	Result (dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
36.014	12.81	-18.1	30.91	Vertical	40	27.19
84.1745	22.07	-21.2	43.27	Vertical	40	17.93
168.322	19.69	-19.1	38.79	Vertical	43.5	23.81
270.56	26.29	-14.2	40.49	Vertical	46	19.71
390.7915	24.17	-11	35.17	Vertical	46	21.83
937.92	22.53	-0.4	22.93	Vertical	46	23.47



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Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



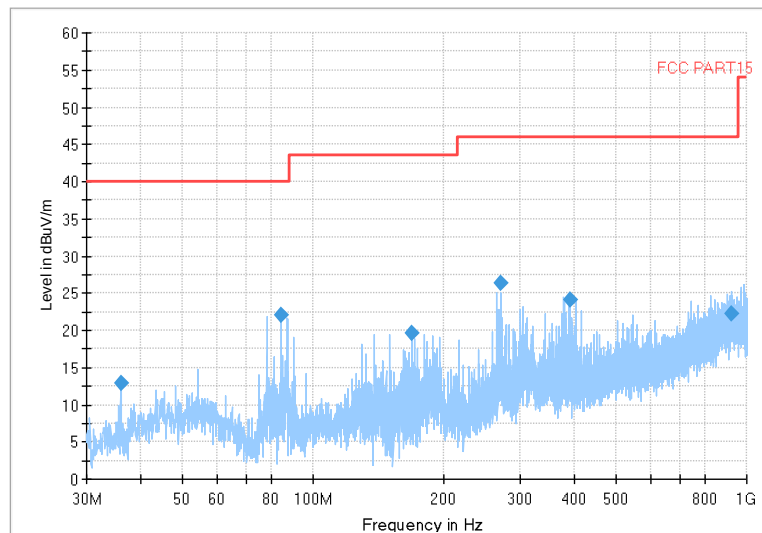
Frequency Range: 9kHz -30MHz

Detector: QP mode

Note: The relevant tests have been performed in order to verify in which mode would have the worst features, the result show above is the worst case.

Channel No.:0

Full Spectrum



Frequency Range: 30MHz-1GHz

Detector: QP mode

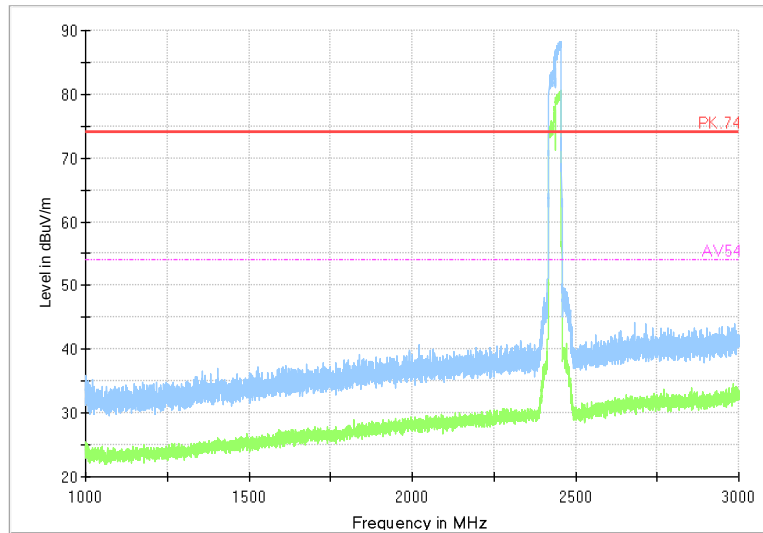
Modulation type: GFSK (LE 1Mbps)



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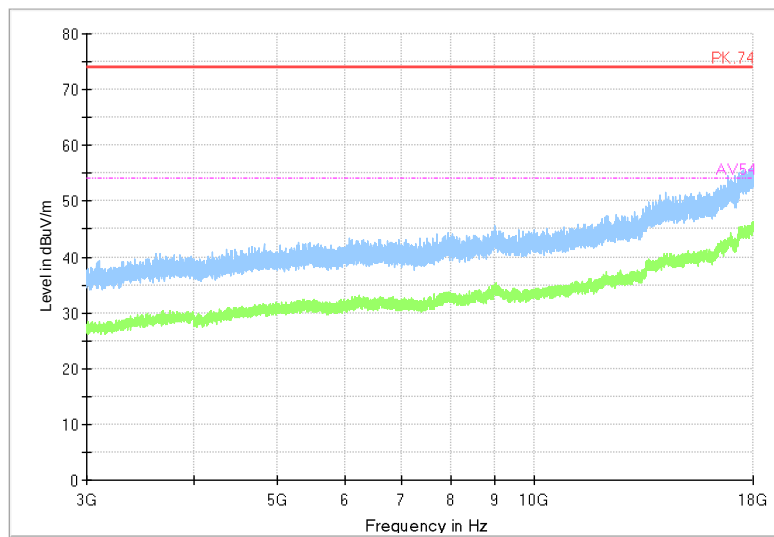
Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



Frequency Range: 1GHz-3GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE 1Mbps)

Full Spectrum



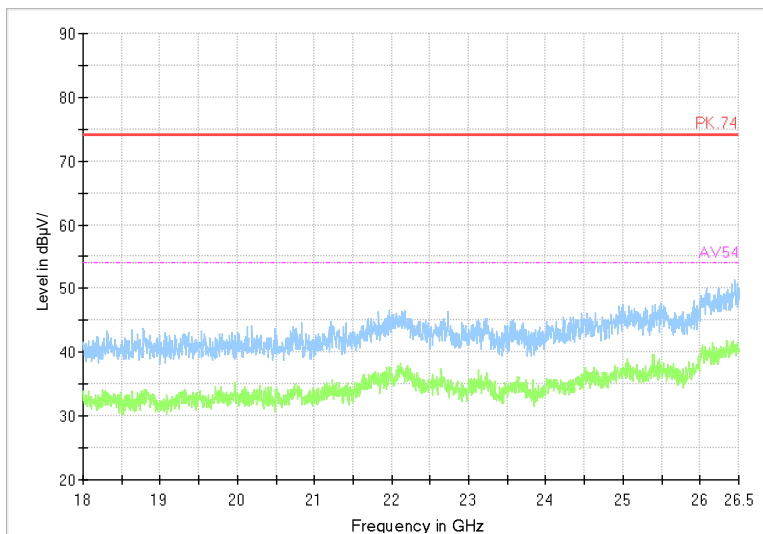
Frequency Range: 3GHz-18GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE 1Mbps)



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Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



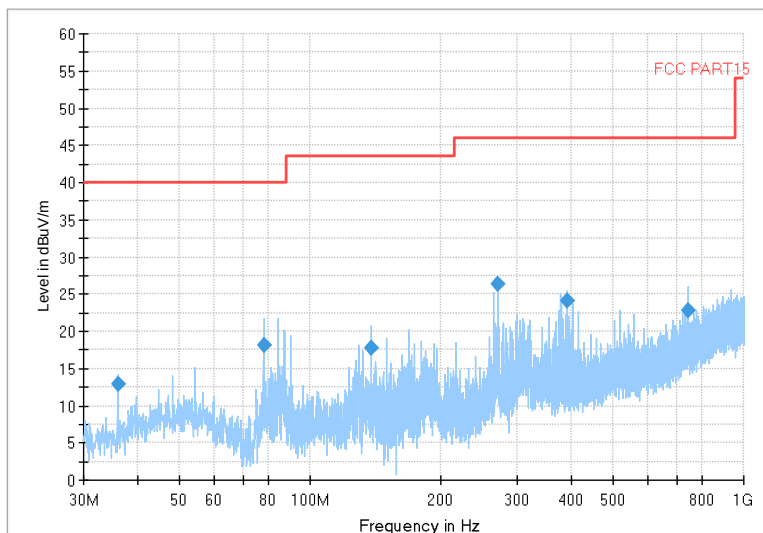
Frequency Range: 18GHz-26GHz

Detector: Av mode and PK mode

Modulation type: GFSK (LE 1Mbps)

Channel No.:19

Full Spectrum



Frequency Range: 30MHz-1GHz

Detector: QP mode

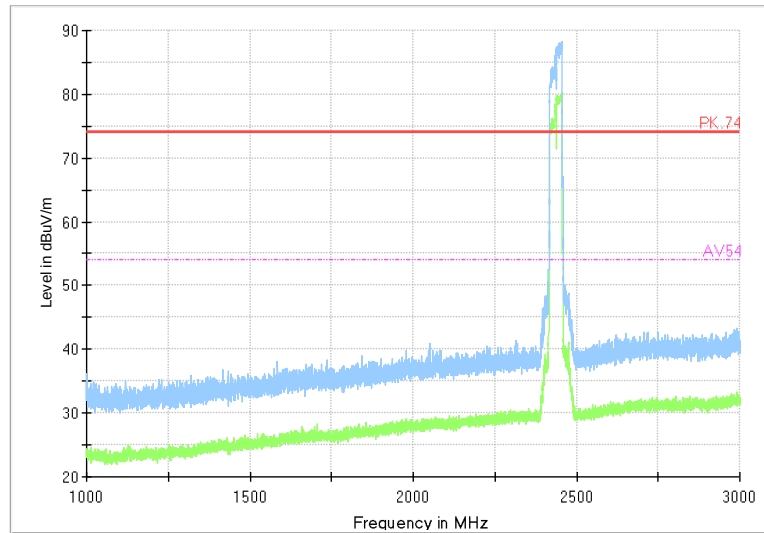
Modulation type: GFSK (LE 1Mbps)



BUREAU
VERITAS

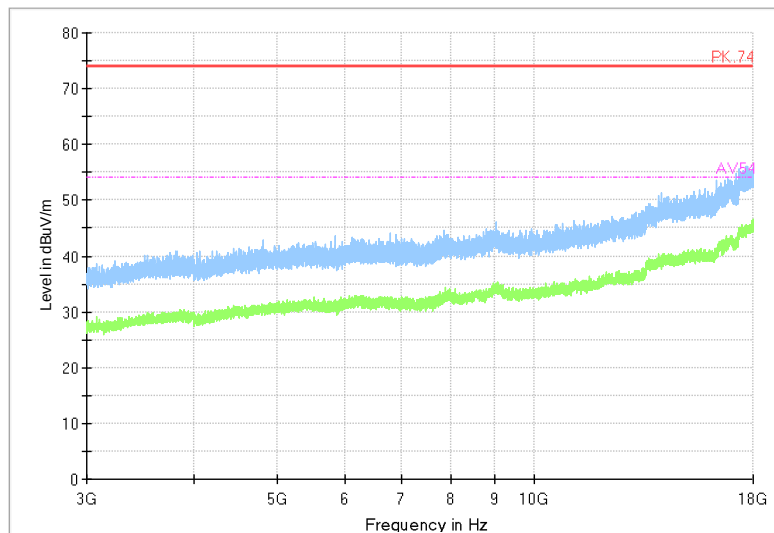
Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



Frequency Range: 1GHz-3GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE 1Mbps)

Full Spectrum



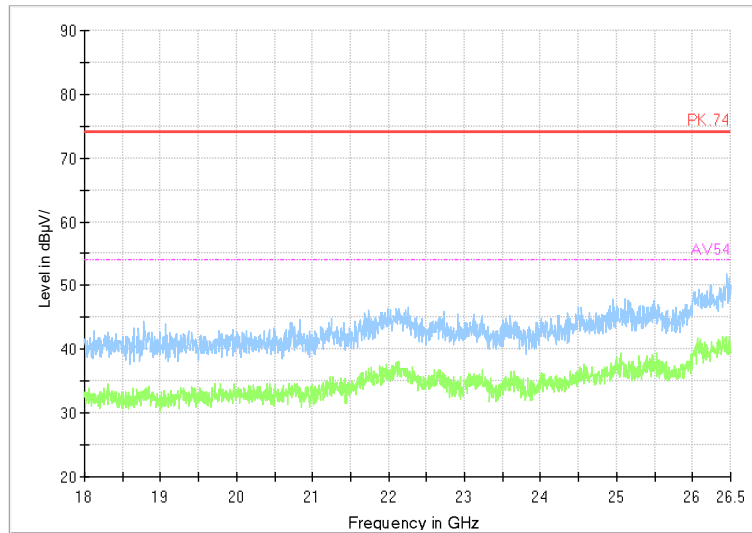
Frequency Range: 3GHz-18GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE 1Mbps)



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



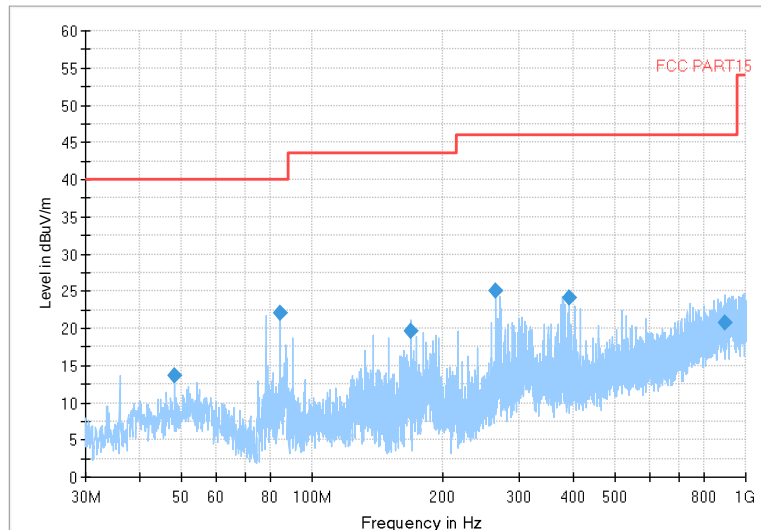
Frequency Range: 18GHz-26GHz

Detector: Av mode and PK mode

Modulation type: GFSK (LE 1Mbps)

Channel No.:39

Full Spectrum



Frequency Range: 30MHz-1GHz

Detector: QP mode

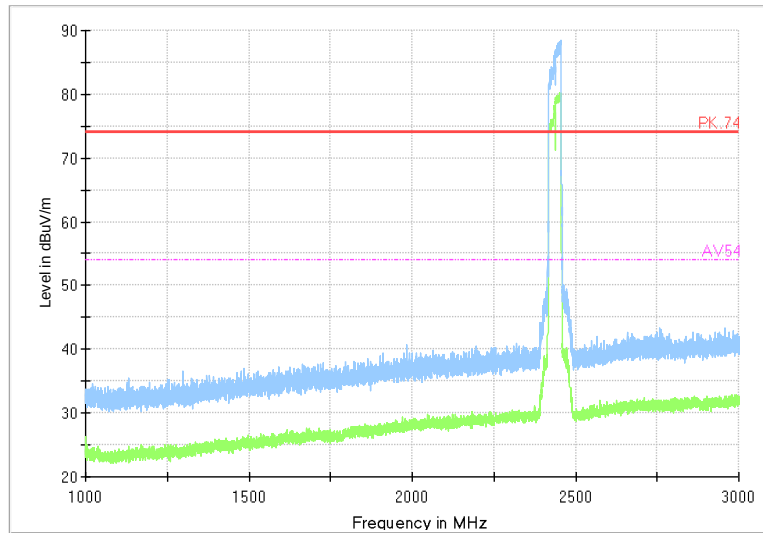
Modulation type: GFSK (LE 1Mbps)



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VERITAS

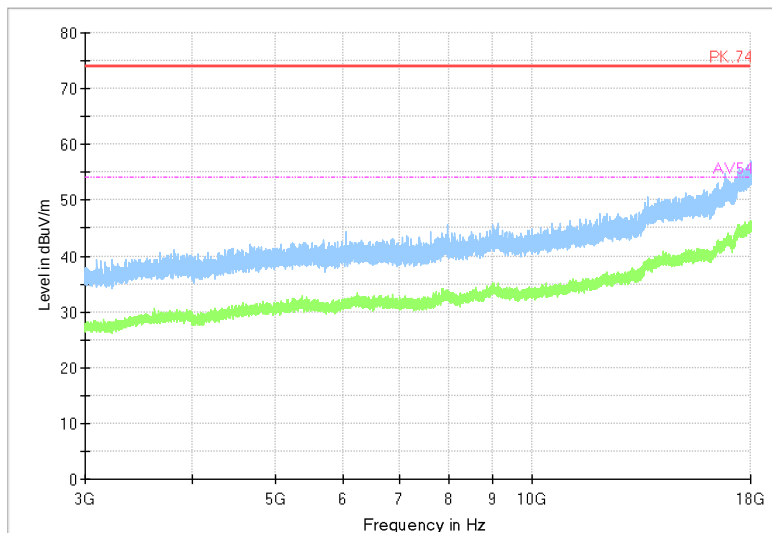
Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



Frequency Range: 1GHz-3GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE 1Mbps)

Full Spectrum



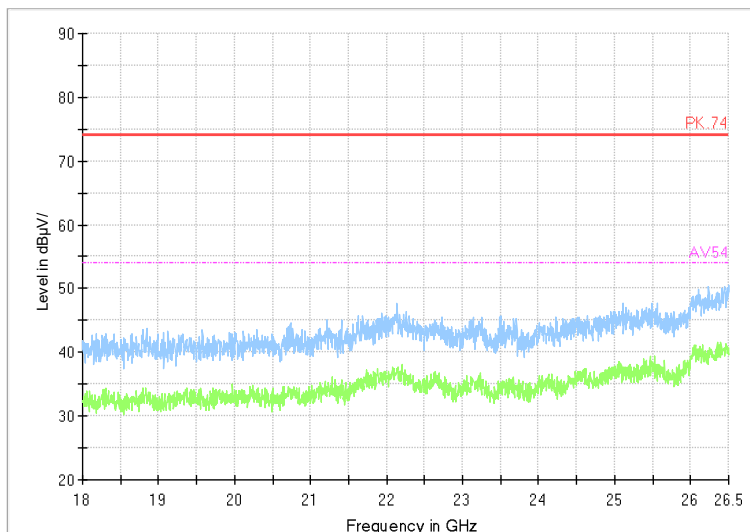
Frequency Range: 3GHz-18GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE 1Mbps)



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VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



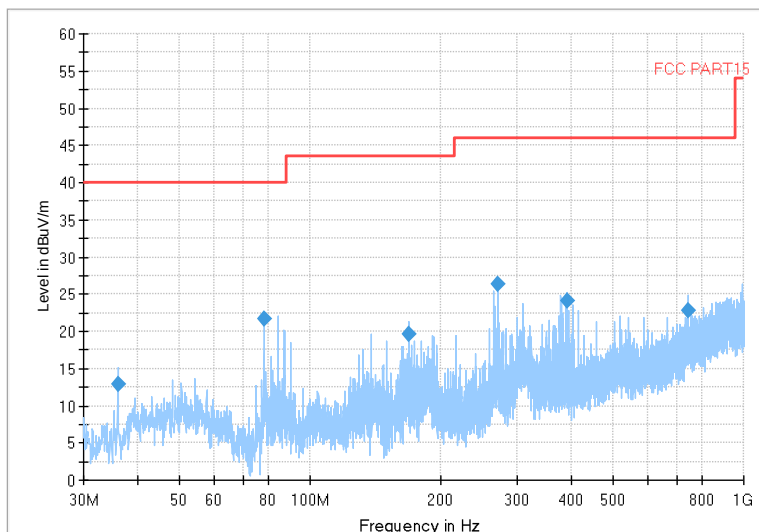
Frequency Range: 18GHz-26GHz

Detector: Av mode and PK mode

Modulation type: GFSK (LE 1Mbps)

Channel No.:0

Full Spectrum



Frequency Range: 30MHz-1GHz

Detector:QP mode

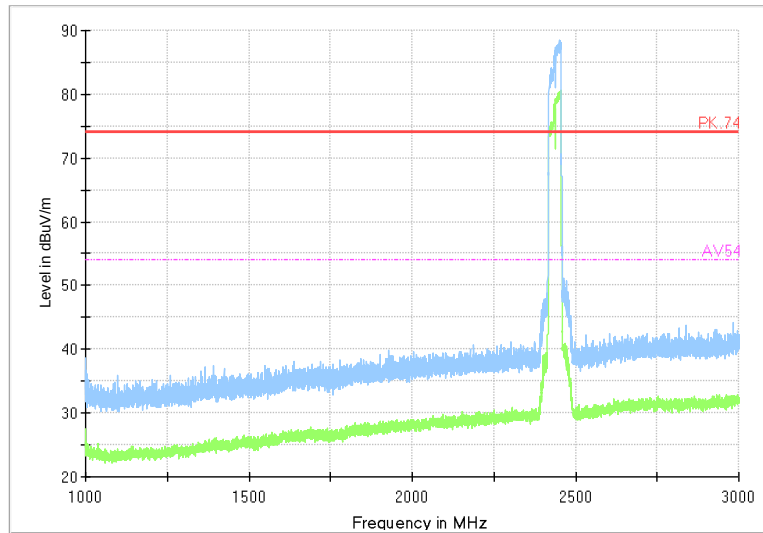
Modulation type: GFSK (LE 2Mbps)



BUREAU
VERITAS

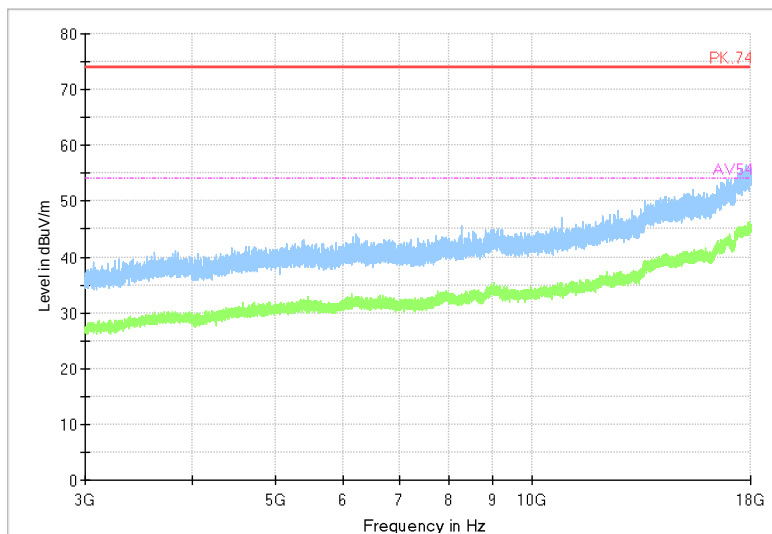
Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



Frequency Range: 1GHz-3GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE 2Mbps)

Full Spectrum



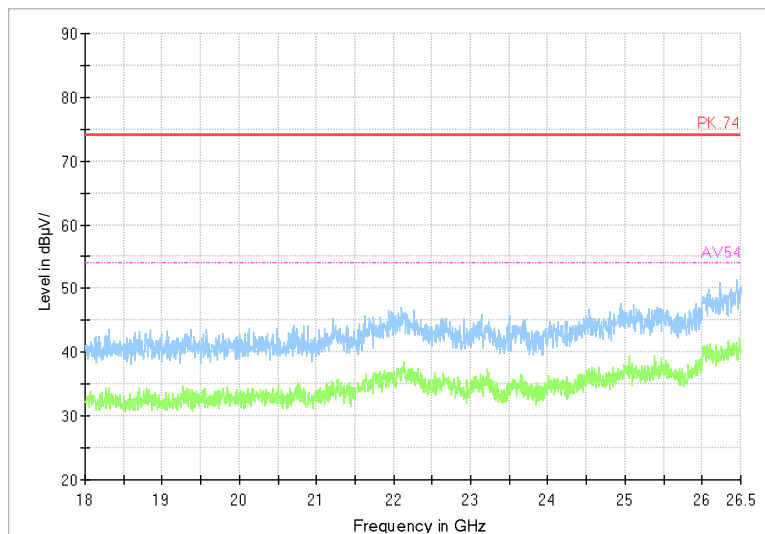
Frequency Range: 3GHz-18GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE 2Mbps)



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



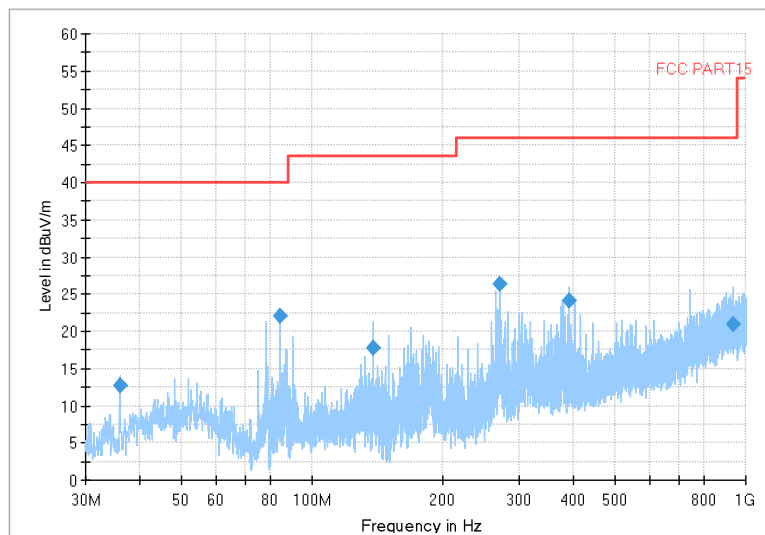
Frequency Range: 18GHz-26GHz

Detector: Av mode and PK mode

Modulation type: GFSK (LE 2Mbps)

Channel No.:19

Full Spectrum



Frequency Range: 30MHz-1GHz

Detector: QP mode

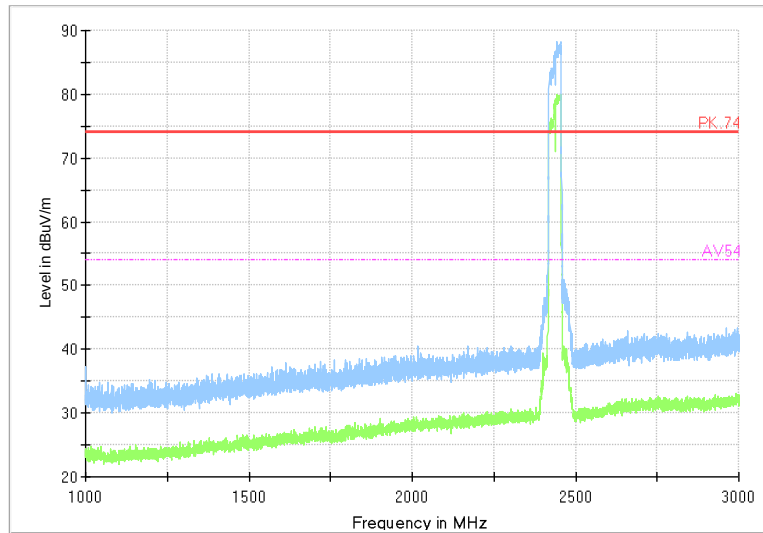
Modulation type: GFSK (LE 2Mbps)



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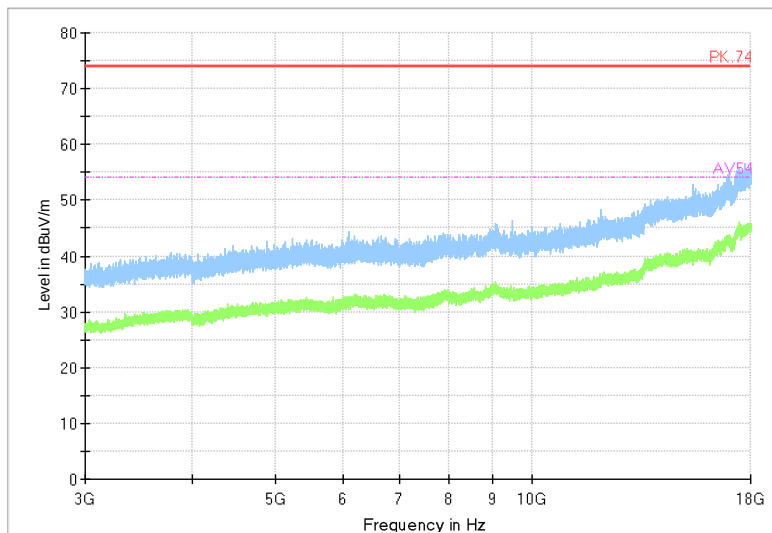
Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



Frequency Range: 1GHz-3GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE 2Mbps)

Full Spectrum



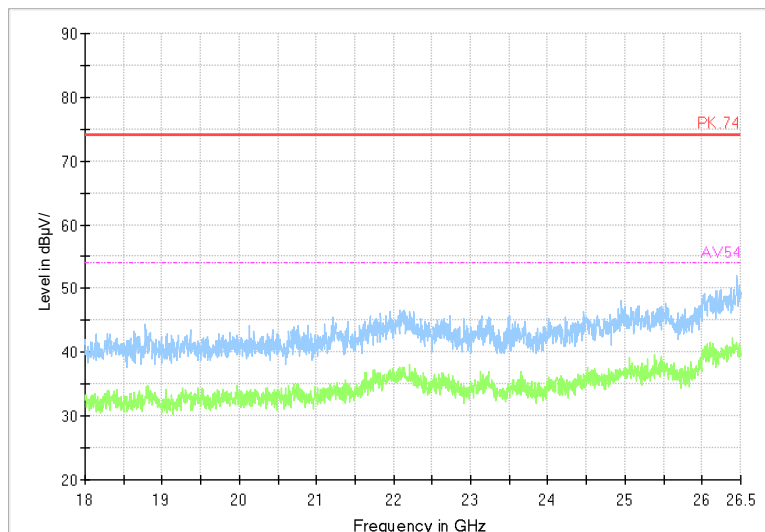
Frequency Range: 3GHz-18GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE 2Mbps)



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Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



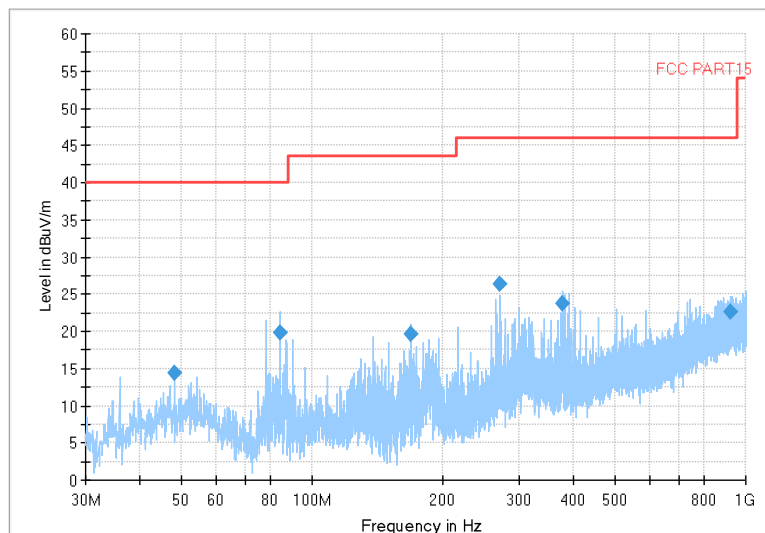
Frequency Range: 18GHz-26GHz

Detector: Av mode and PK mode

Modulation type: GFSK (LE 2Mbps)

Channel No.:39

Full Spectrum



Frequency Range: 30MHz-1GHz

Detector: QP mode

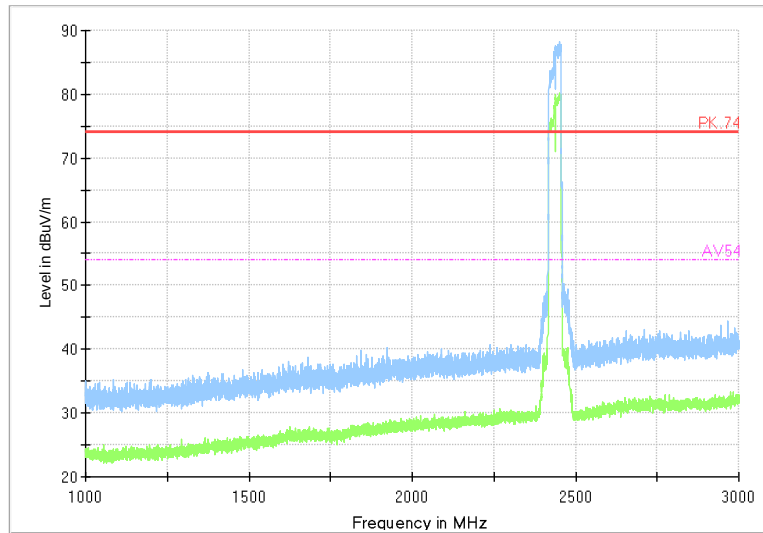
Modulation type: GFSK (LE 2Mbps)



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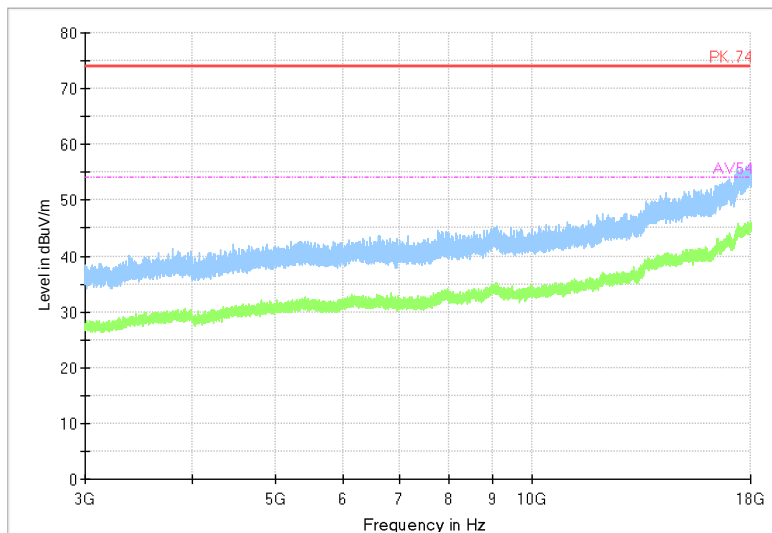
Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



Frequency Range: 1GHz-3GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE 2Mbps)

Full Spectrum



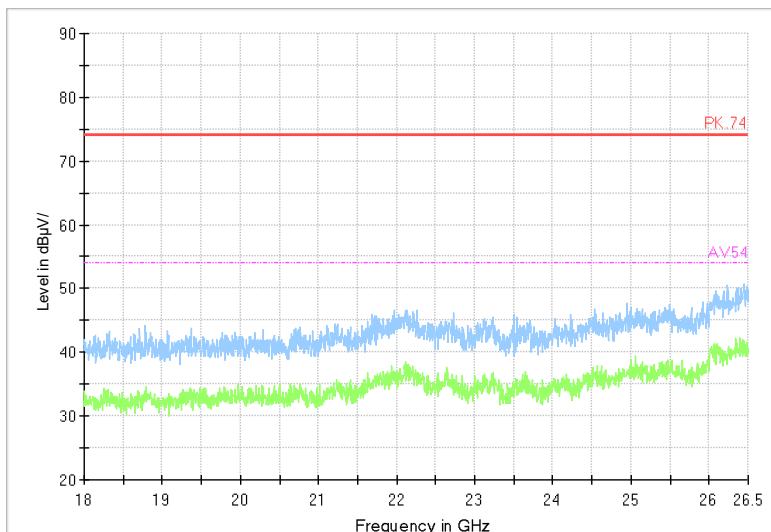
Frequency Range: 3GHz-18GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE 2Mbps)



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Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



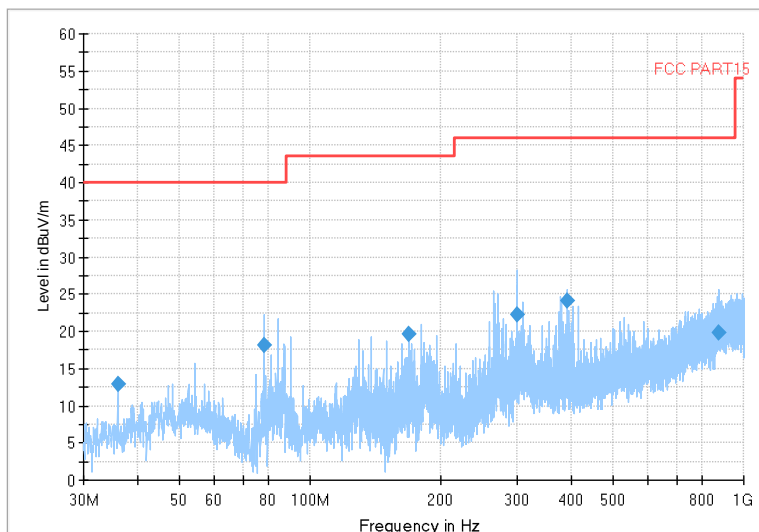
Frequency Range: 18GHz-26GHz

Detector: Av mode and PK mode

Modulation type: GFSK (LE 2Mbps)

Channel No.:0

Full Spectrum



Frequency Range: 30MHz-1GHz

Detector:QP mode

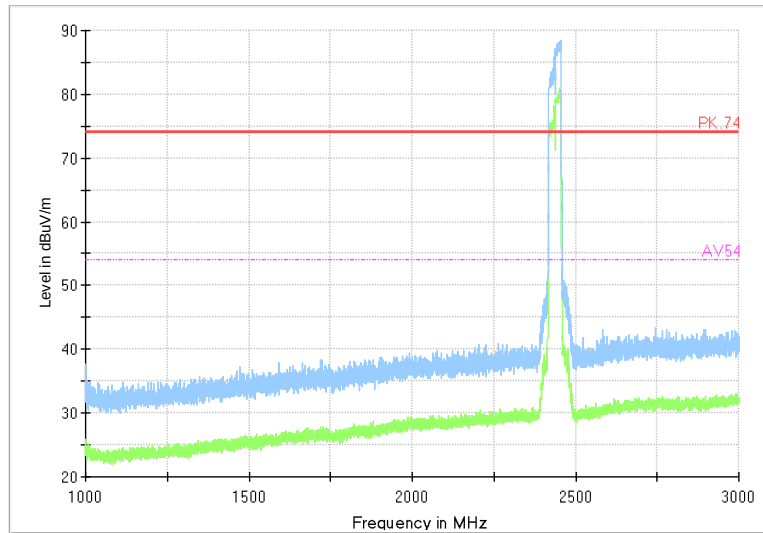
Modulation type: GFSK (LE 125Khz S=8)



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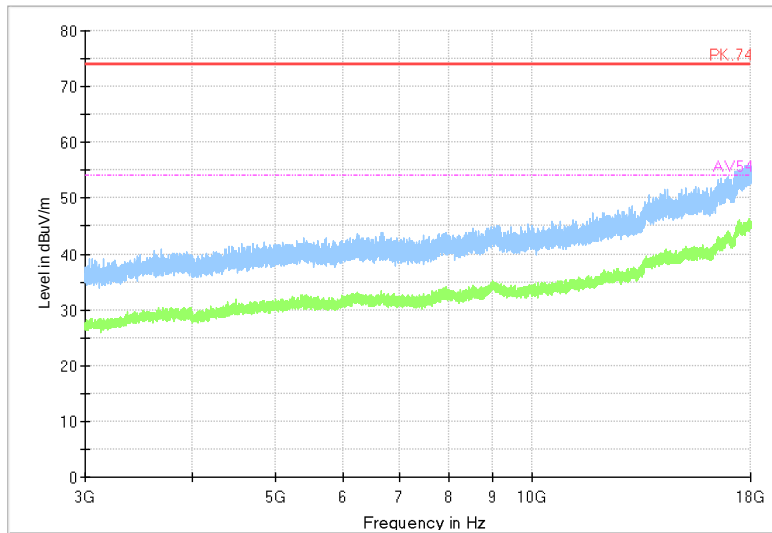
Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



Frequency Range: 1GHz-3GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE 125Khz S=8)

Full Spectrum



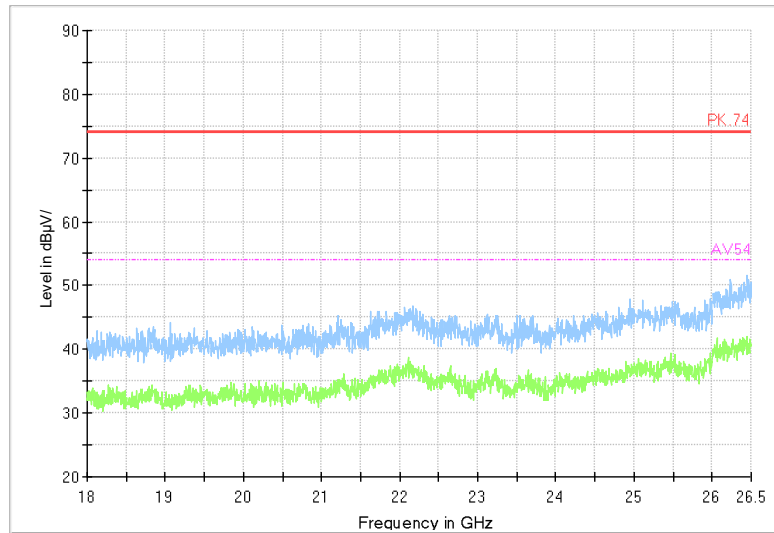
Frequency Range: 3GHz-18GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE 125Khz S=8)



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Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



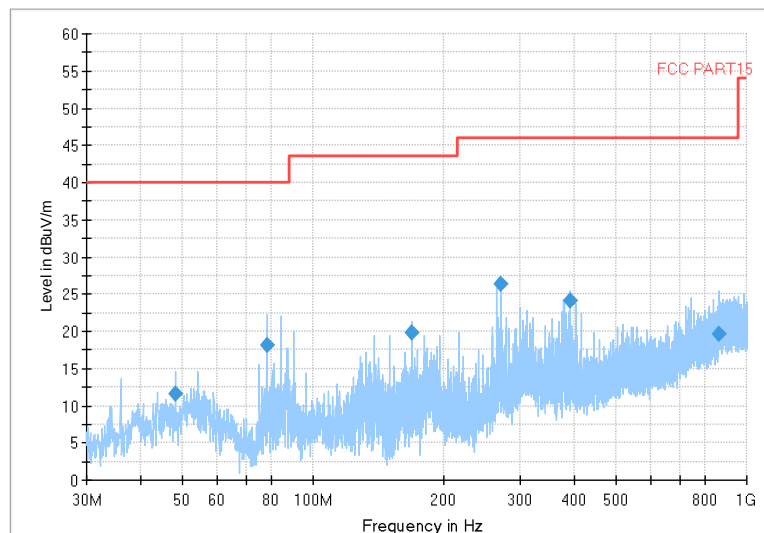
Frequency Range: 18GHz-26GHz

Detector: Av mode and PK mode

Modulation type: (LE 125Khz S=8)

Channel No.:19

Full Spectrum



Frequency Range: 30MHz-1GHz

Detector: QP mode

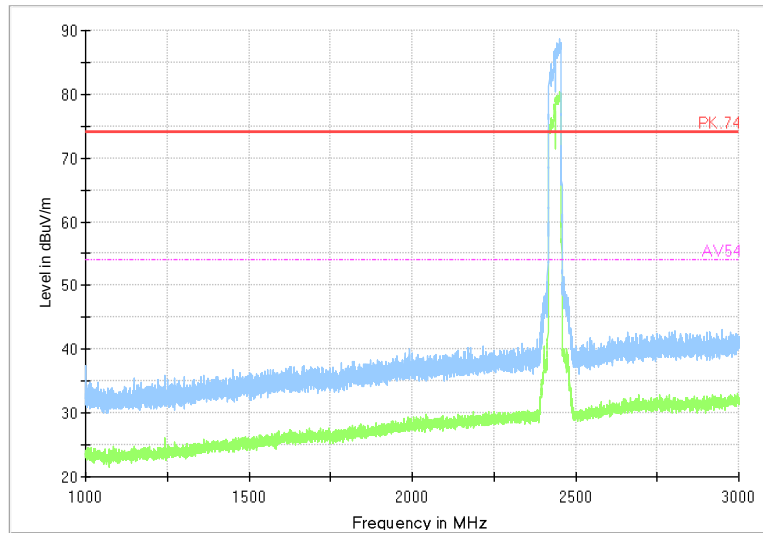
Modulation type: GFSK (LE 125Khz S=8)



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Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

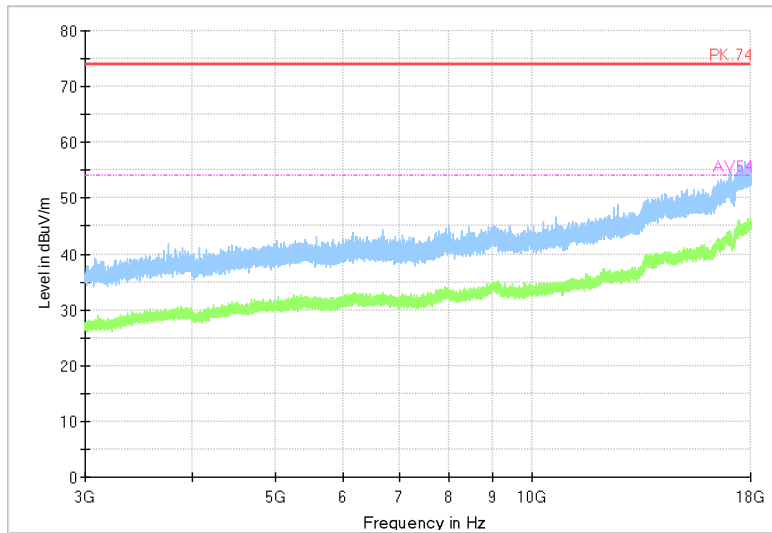


Frequency Range: 1GHz-3GHz

Detector: Av mode and PK mode

Modulation type: GFSK (LE 125Khz S=8)

Full Spectrum



Frequency Range: 3GHz-18GHz

Detector: Av mode and PK mode

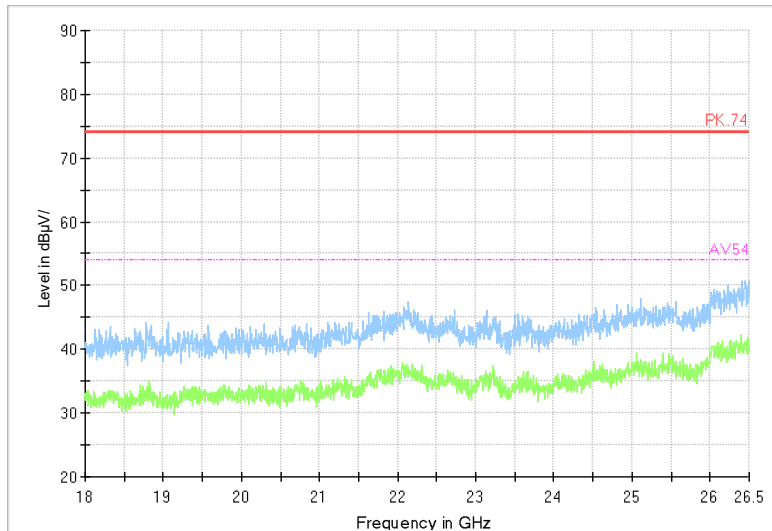
Modulation type: GFSK (LE 125Khz S=8)



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Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



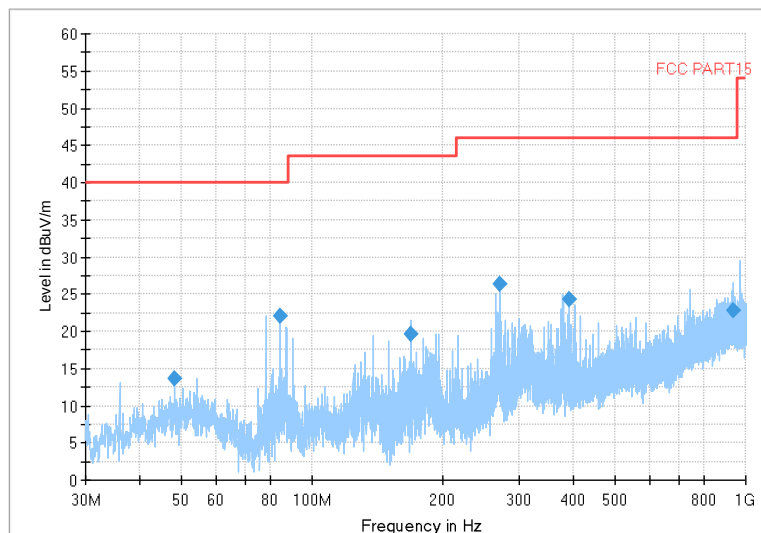
Frequency Range: 18GHz-26GHz

Detector: Av mode and PK mode

Modulation type: GFSK (LE 125Khz S=8)

Channel No.:39

Full Spectrum



Frequency Range: 30MHz-1GHz

Detector: QP mode

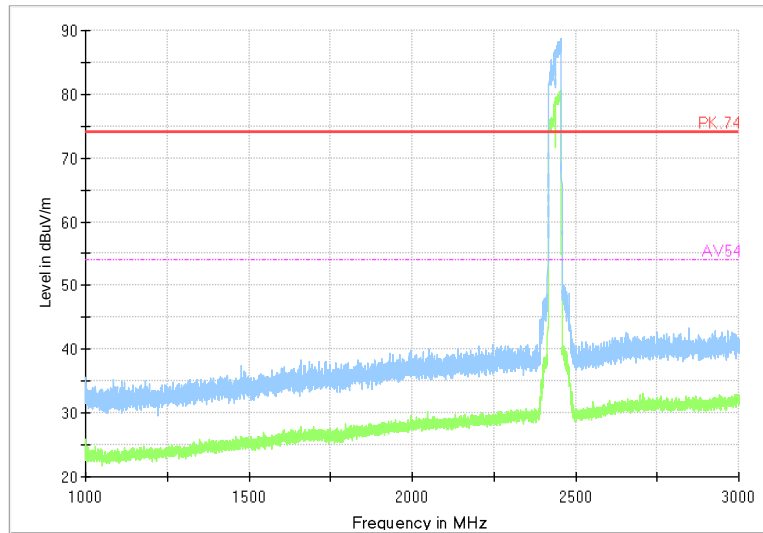
Modulation type: GFSK (LE 125Khz S=8)



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Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

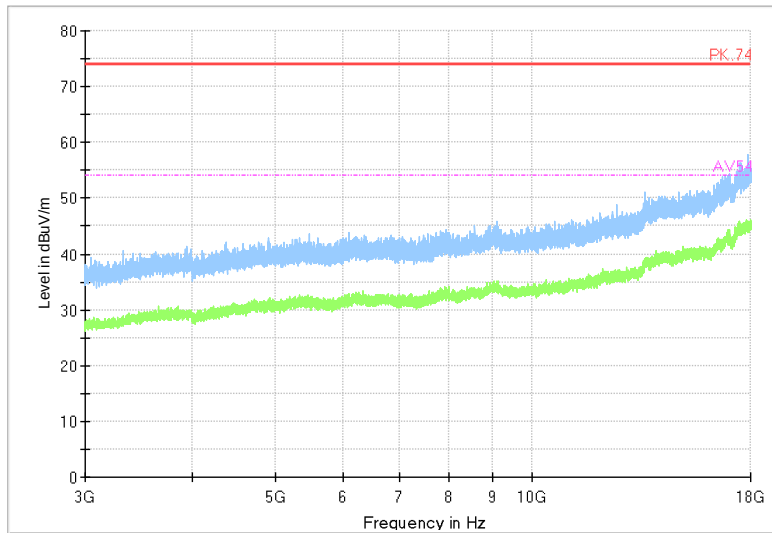


Frequency Range: 1GHz-3GHz

Detector: Av mode and PK mode

Modulation type: GFSK (LE 125Khz S=8)

Full Spectrum



Frequency Range: 3GHz-18GHz

Detector: Av mode and PK mode

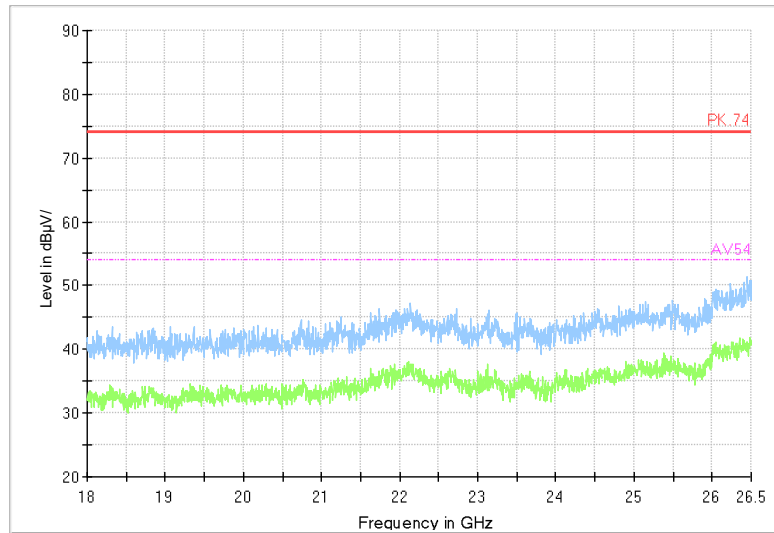
Modulation type: GFSK (LE 125Khz S=8)



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Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



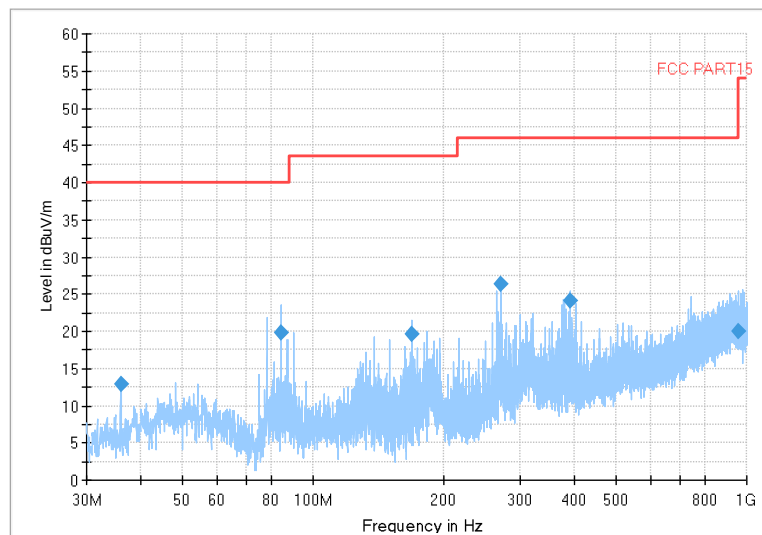
Frequency Range: 18GHz-26GHz

Detector: Av mode and PK mode

Modulation type: GFSK (LE 125Khz S=8)

Channel No.:0

Full Spectrum



Frequency Range: 30MHz-1GHz

Detector:QP mode

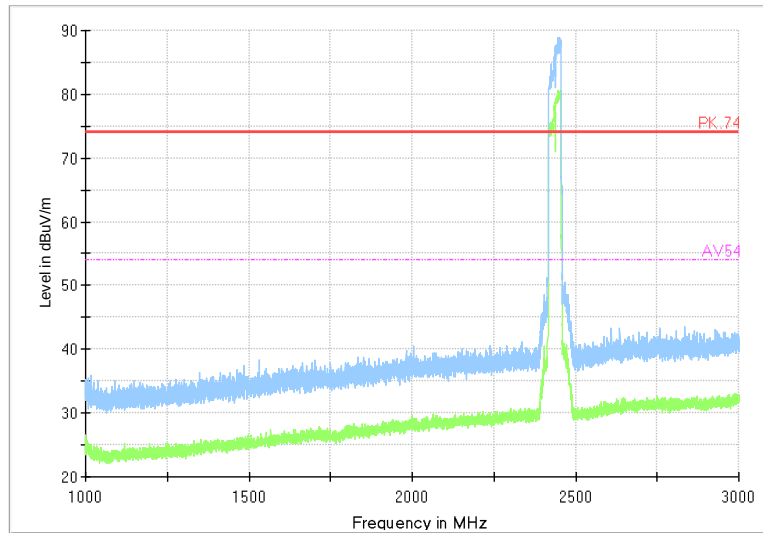
Modulation type: GFSK (LE 500Khz S=2)



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Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

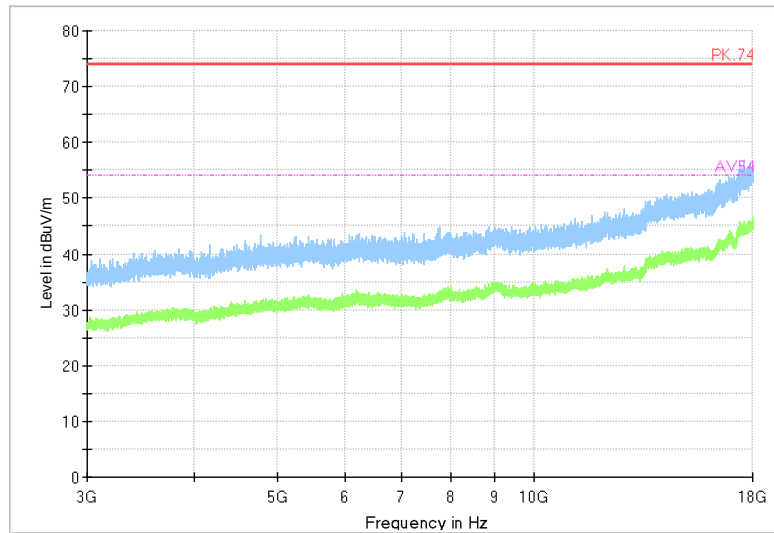


Frequency Range: 1GHz-3GHz

Detector: Av mode and PK mode

Modulation type: GFSK (LE 500Khz S=2)

Full Spectrum



Frequency Range: 3GHz-18GHz

Detector: Av mode and PK mode

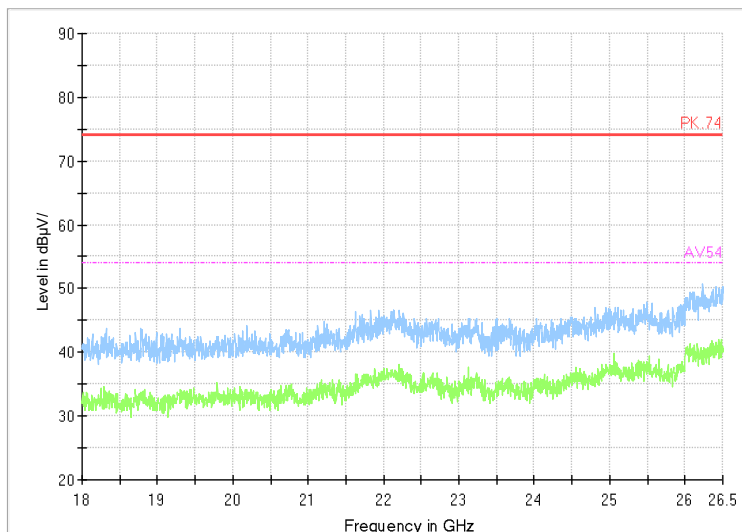
Modulation type: GFSK (LE 500Khz S=2)



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Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



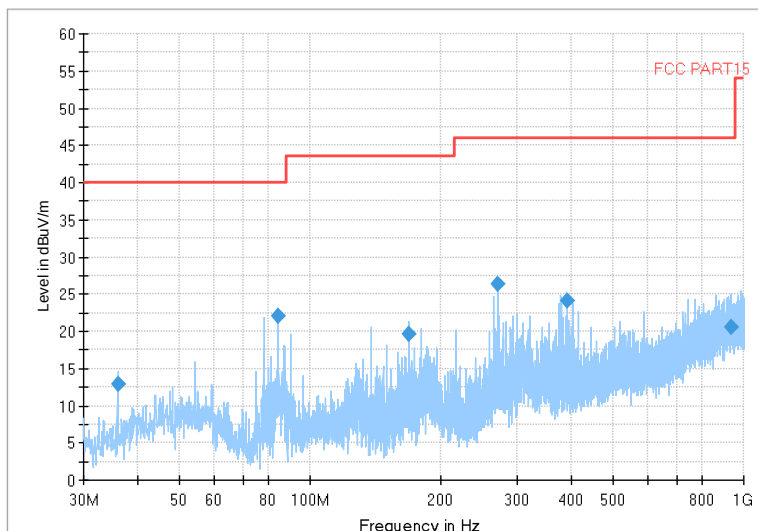
Frequency Range: 18GHz-26GHz

Detector: Av mode and PK mode

Modulation type: (LE 500Khz S=2)

Channel No.:19

Full Spectrum



Frequency Range: 30MHz-1GHz

Detector: QP mode

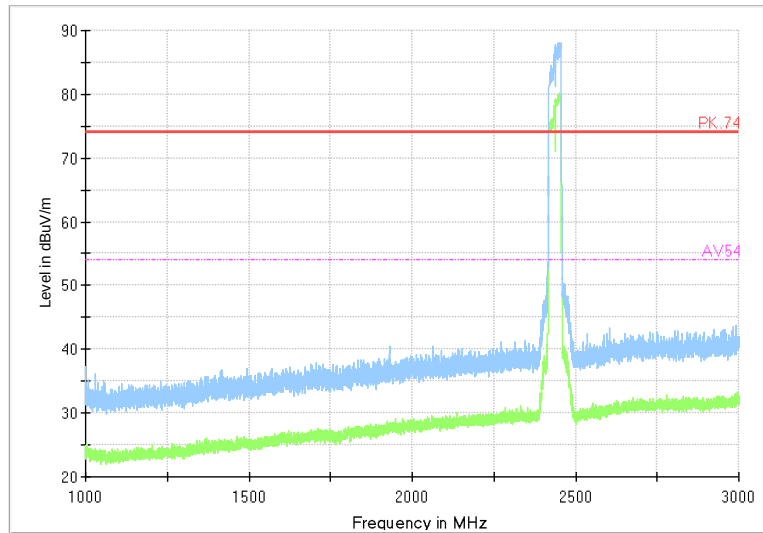
Modulation type: GFSK (LE 500Khz S=2)



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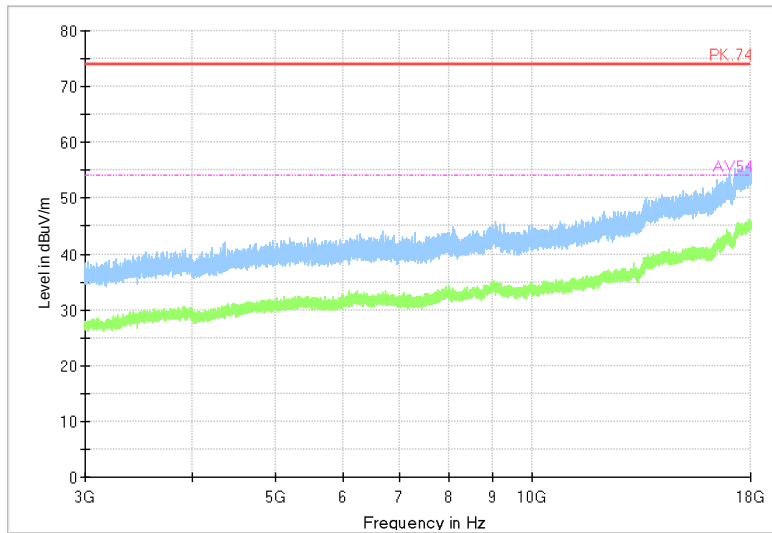
Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



Frequency Range: 1GHz-3GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE 500Khz S=2)

Full Spectrum



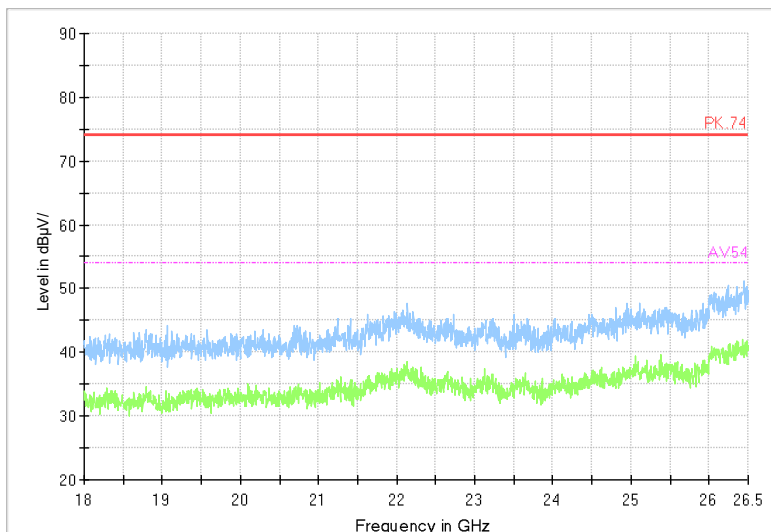
Frequency Range: 3GHz-18GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE 500Khz S=2)



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Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



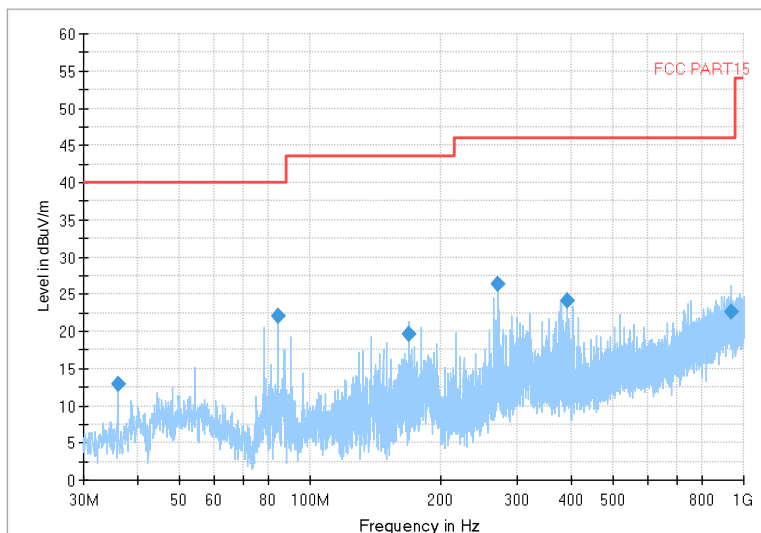
Frequency Range: 18GHz-26GHz

Detector: Av mode and PK mode

Modulation type: GFSK (LE 500Khz S=2)

Channel No.:39

Full Spectrum



Frequency Range: 30MHz-1GHz

Detector: QP mode

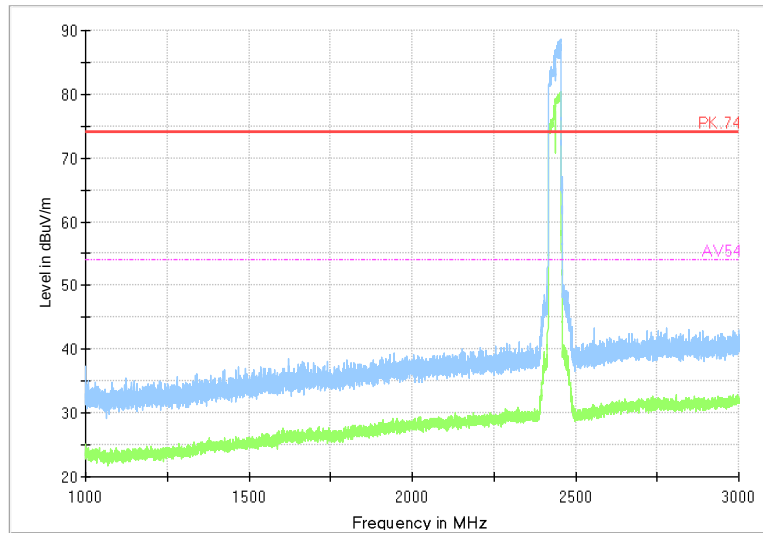
Modulation type: GFSK (LE 500Khz S=2)



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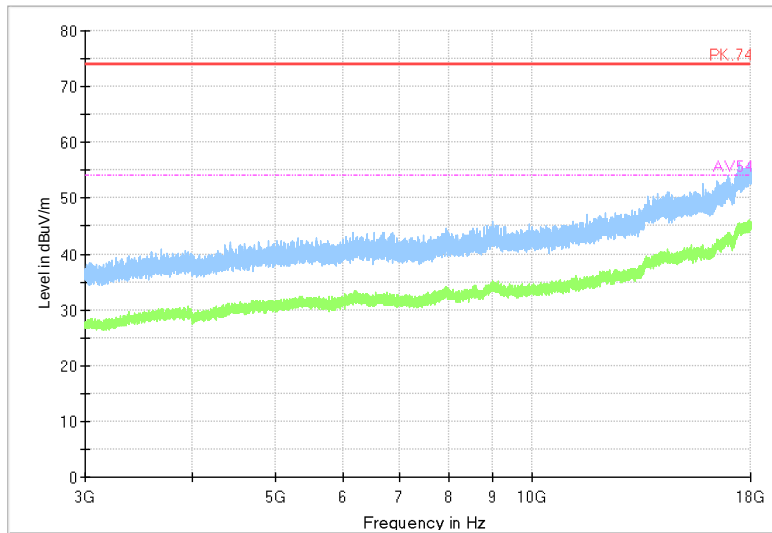
Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



Frequency Range: 1GHz-3GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE 500Khz S=2)

Full Spectrum



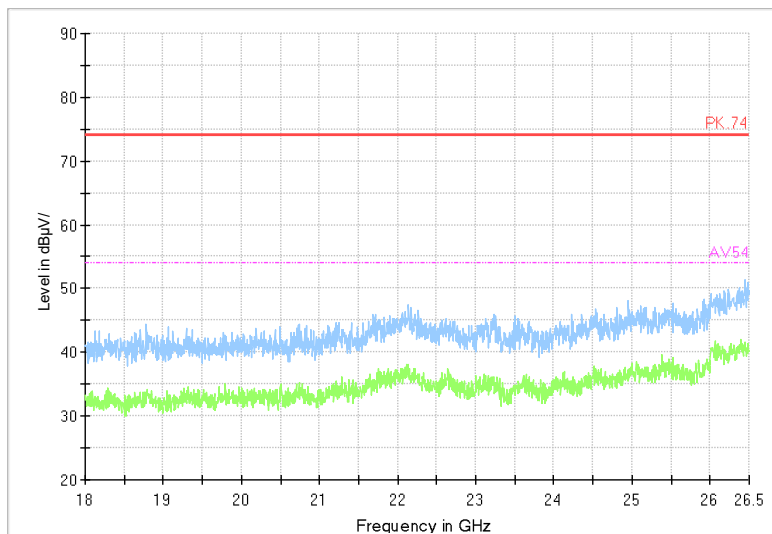
Frequency Range: 3GHz-18GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE 500Khz S=2)



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Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



Frequency Range: 18GHz-26GHz

Detector: Av mode and PK mode

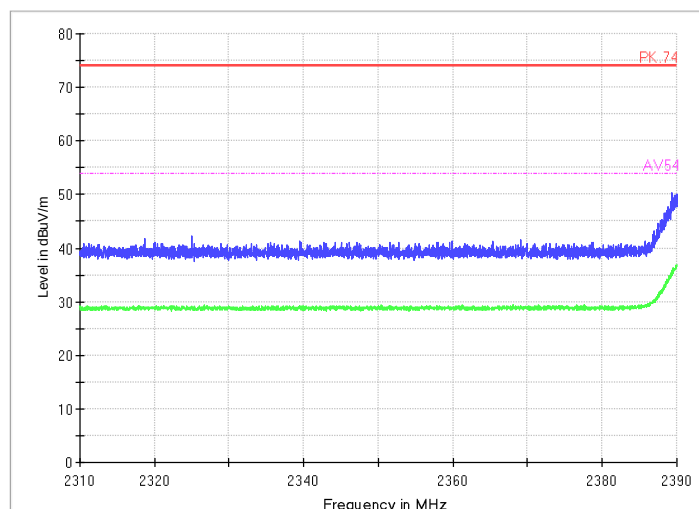
Modulation type: GFSK (LE 500Khz S=2)



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Test Report No.: PSU-NQN2412200117RF02

Radiated Emission Band Edge for WIFI

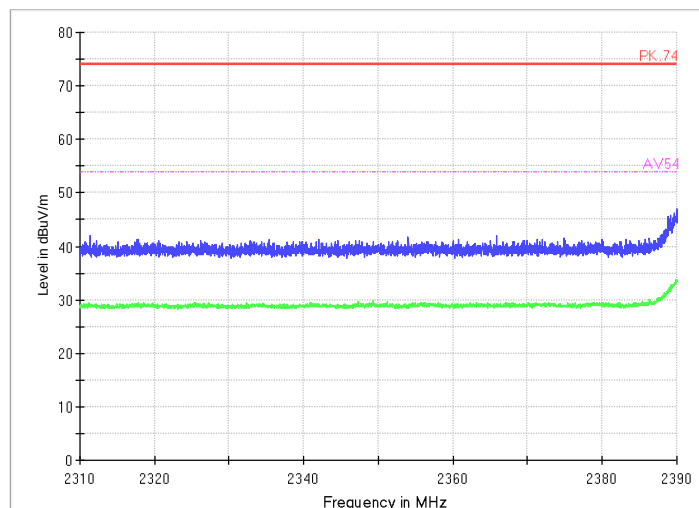


Radiated Emission Band Edge

Channel No.:1

Test Mode: 802.11b

Polarization: V



Radiated Emission Band Edge

Channel No.:1

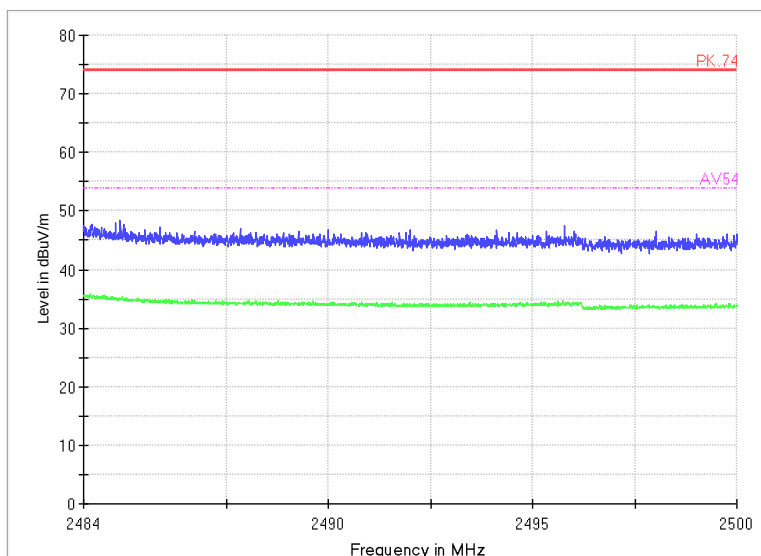
Test Mode: 802.11b

Polarization: H



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Test Report No.: PSU-NQN2412200117RF02

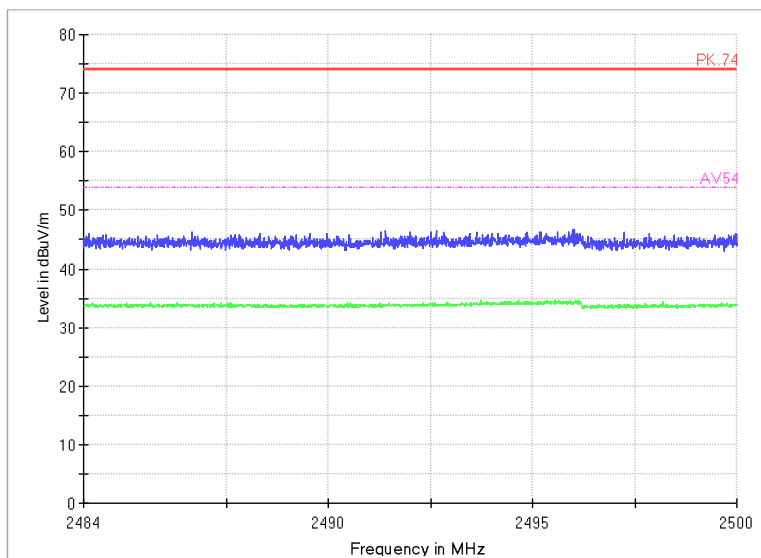


Radiated Emission Band Edge

Channel No.:11

Test Mode: 802.11b

Polarization: V



Radiated Emission Band Edge

Channel No.:11

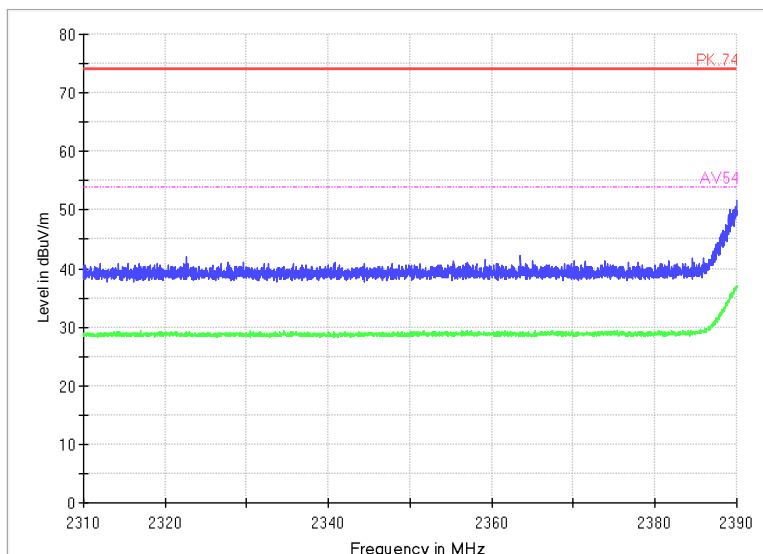
Test Mode: 802.11b

Polarization: H



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Test Report No.: PSU-NQN2412200117RF02

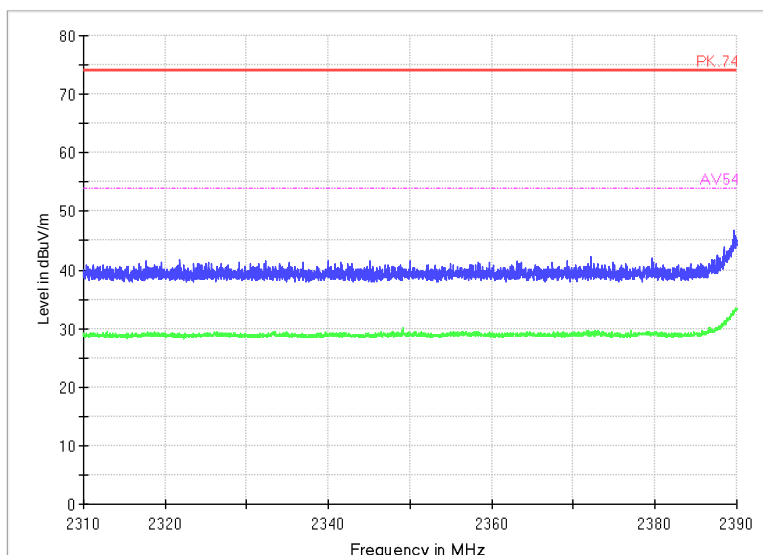


Radiated Emission Band Edge

Channel No.:1

Test Mode: 802.11g

Polarization: V



Radiated Emission Band Edge

Channel No.:1

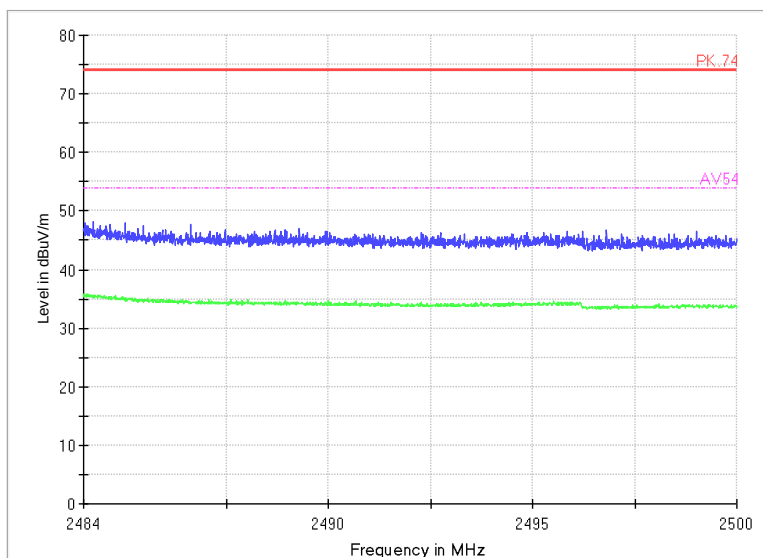
Test Mode: 802.11g

Polarization: H



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

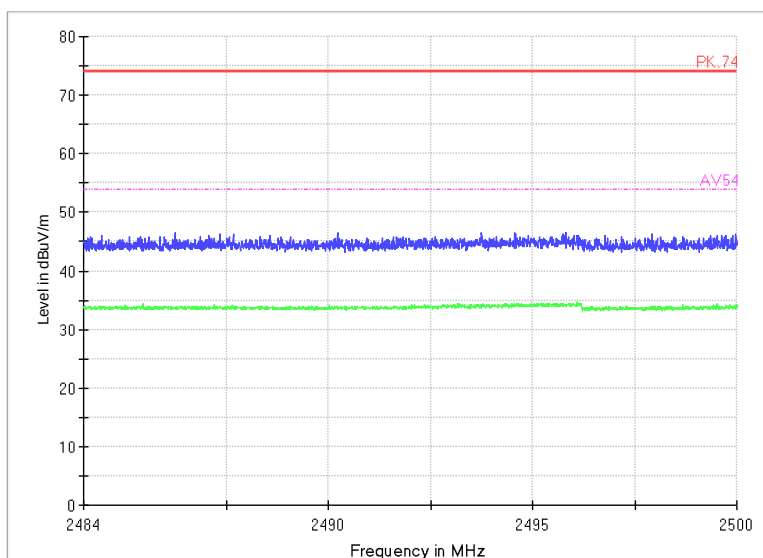


Radiated Emission Band Edge

Channel No.:11

Test Mode: 802.11g

Polarization: V



Radiated Emission Band Edge

Channel No.:11

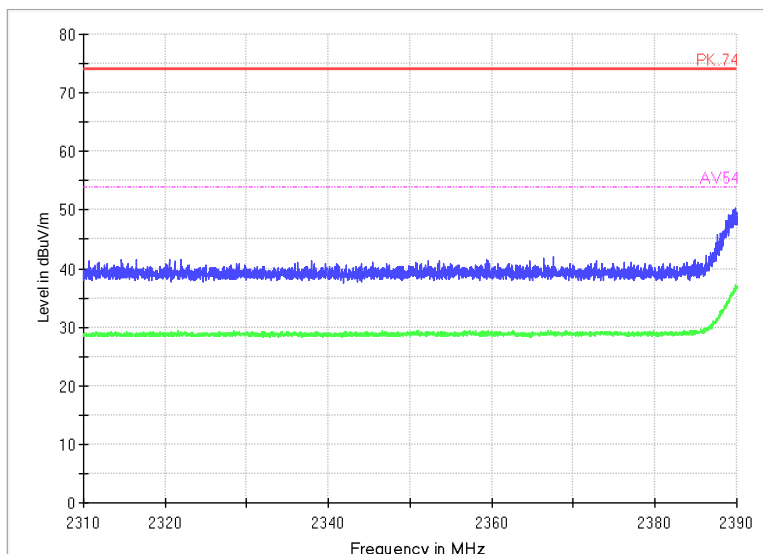
Test Mode: 802.11g

Polarization: H



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VERITAS

Test Report No.: PSU-NQN2412200117RF02

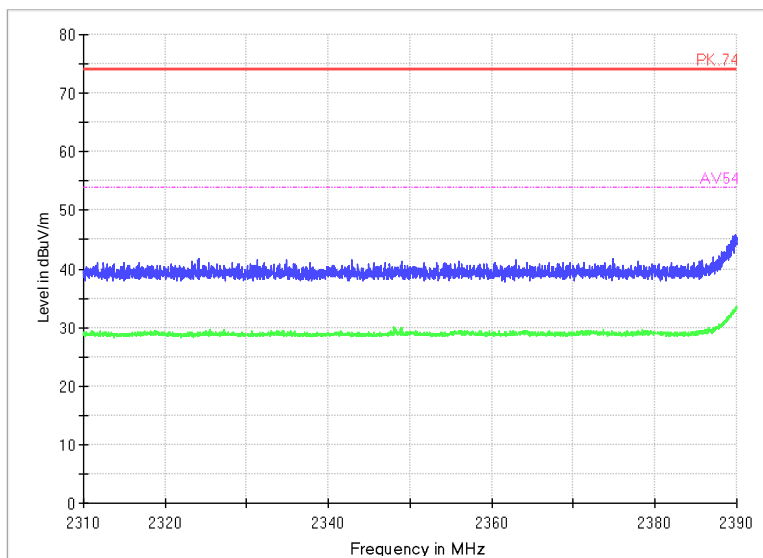


Radiated Emission Band Edge

Channel No.:1

Test Mode: 802.11n(HT20)

Polarization: V



Radiated Emission Band Edge

Channel No.:1

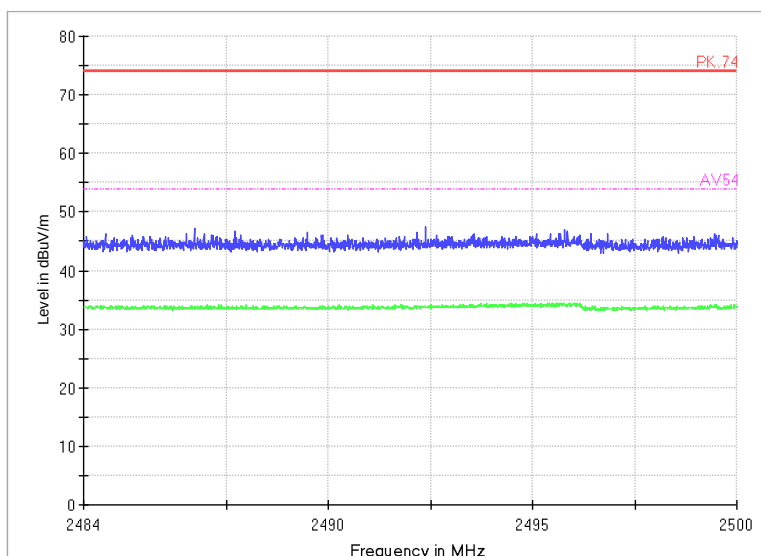
Test Mode: 802.11n(HT20)

Polarization: H



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VERITAS

Test Report No.: PSU-NQN2412200117RF02

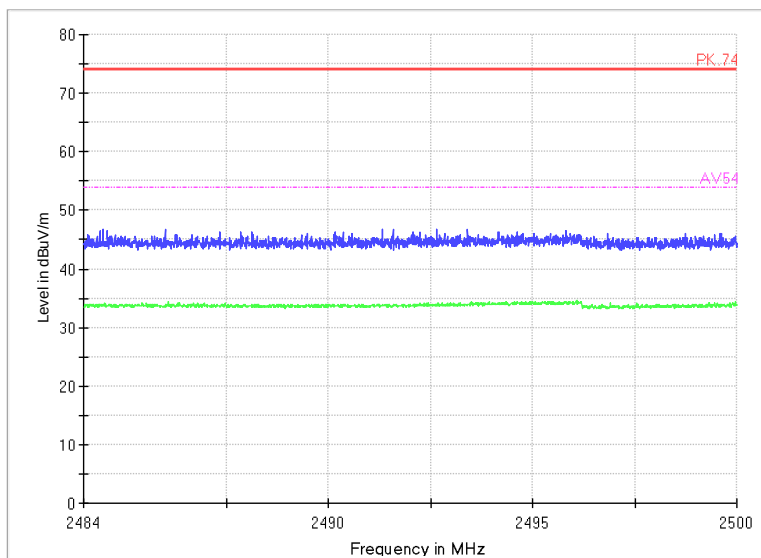


Radiated Emission Band Edge

Channel No.:11

Test Mode: 802.11n(HT20)

Polarization: V



Radiated Emission Band Edge

Channel No.:11

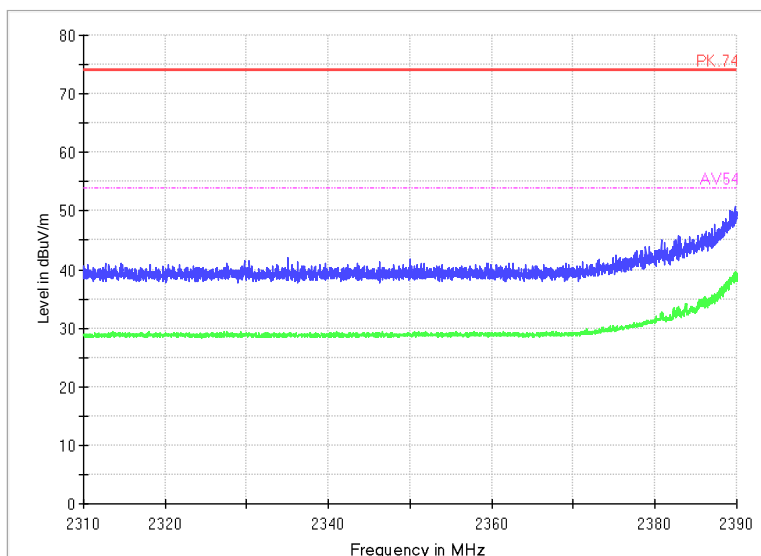
Test Mode: 802.11n(HT20)

Polarization: H



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

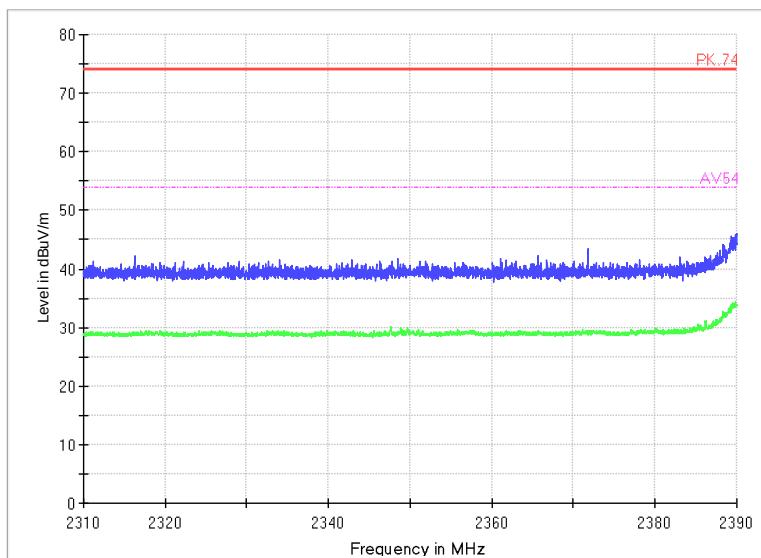


Radiated Emission Band Edge

Channel No.:3

Test Mode: 802.11n(HT40)

Polarization: V



Radiated Emission Band Edge

Channel No.:3

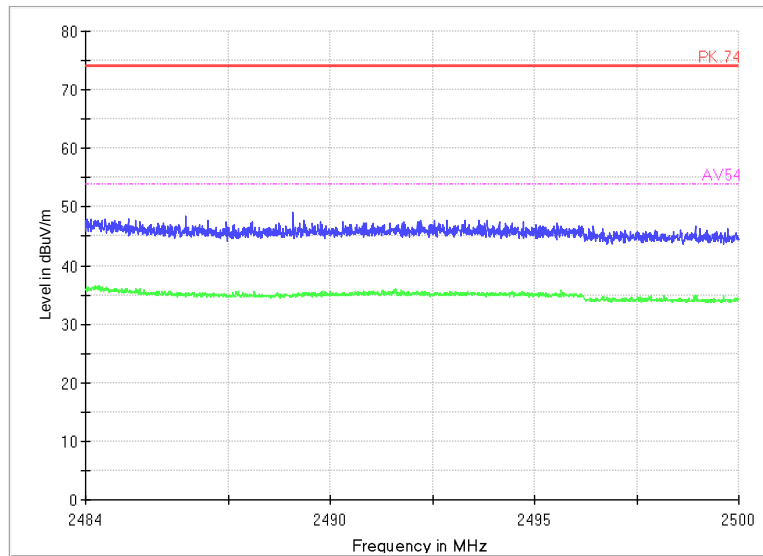
Test Mode: 802.11n(HT40)

Polarization: H



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

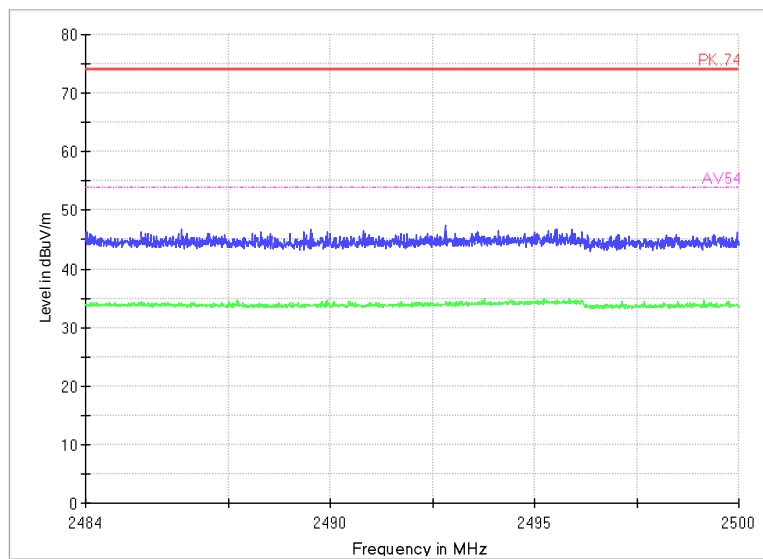


Radiated Emission Band Edge

Channel No.:9

Test Mode: 802.11n(HT40)

Polarization: V



Radiated Emission Band Edge

Channel No.:9

Test Mode: 802.11n(HT40)

Polarization: H



Radiated Emission for WIFI

After comparison, the worst case attitude is EUT lay down.

Determining Spurious Emissions Levels

A “reference path loss” is established and the A_{Rpl} is the attenuation of “reference path loss”, and including the gain of receive antenna, the gain of the preamplifier, the cable loss.

The measurement results are obtained as described below:

Result = $P_{mea} + A_{Rpl}$

Sample calculation: $(13.8 \text{ dB}\mu\text{V/m}) = (28.7 \text{ dB}\mu\text{V}) + (-14.9 \text{ dB/m})$, the corresponding frequency is 48.0905 MHz.

For 802.11b Channel No.:1

Frequency(MHz)	Result(dBuV/m)	A_{Rpl} (dB)	P_{mea} (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
48.0905	13.8	-14.9	28.7	Vertical	40	26.2
84.126	19.8	-21.2	41	Vertical	40	20.2
168.322	19.68	-19.1	38.78	Vertical	43.5	23.82
270.56	26.23	-14.2	40.43	Vertical	46	19.77
378.7635	23.59	-11.2	34.79	Vertical	46	22.41
912.215	20.17	-0.7	20.87	Vertical	46	25.83

For 802.11g Channel No.:1

Frequency(MHz)	Result(dBuV/m)	A_{Rpl} (dB)	P_{mea} (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
48.0905	13.76	-14.9	28.66	Vertical	40	26.24
84.126	19.89	-21.2	41.09	Vertical	40	20.11
168.322	19.72	-19.1	38.82	Vertical	43.5	23.78
270.56	26.33	-14.2	40.53	Vertical	46	19.67
378.7635	23.64	-11.2	34.84	Vertical	46	22.36
937.9685	22.67	-0.4	23.07	Vertical	46	23.33

For 802.11n(HT20) Channel No.:1

Frequency(MHz)	Result(dBuV/m)	A_{Rpl}	P_{mea}	Polarity	Limit	Margin
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VERITAS****Test Report No.: PSU-NQN2412200117RF02**

		(dB)	(dBuV/m)		(dBuV/m)	(dB)
36.014	12.8	-18.1	30.9	Vertical	40	27.2
84.1745	22.08	-21.2	43.28	Vertical	40	17.92
168.322	19.77	-19.1	38.87	Vertical	43.5	23.73
270.56	26.31	-14.2	40.51	Vertical	46	19.69
390.7915	24.3	-11	35.3	Vertical	46	21.7
877.8285	22.05	-0.9	22.95	Vertical	46	23.95

For 802.11b Channel No.:6

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
36.014	12.81	-18.1	30.91	Vertical	40	27.19
84.126	19.92	-21.2	41.12	Vertical	40	20.08
168.322	19.77	-19.1	38.87	Vertical	43.5	23.73
270.56	26.25	-14.2	40.45	Vertical	46	19.75
390.7915	24.27	-11	35.27	Vertical	46	21.73
919.878	22.03	-0.3	22.33	Vertical	46	23.97

For 802.11g Channel No.:6

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
36.014	12.83	-18.1	30.93	Vertical	40	27.17
78.112	18.22	-21.7	39.92	Vertical	40	21.78
168.322	19.74	-19.1	38.84	Vertical	43.5	23.76
270.56	26.32	-14.2	40.52	Vertical	46	19.68
390.7915	24.29	-11	35.29	Vertical	46	21.71
861.6295	19.42	-1.3	20.72	Vertical	46	26.58

For 802.11n(HT20) Channel No.:6

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
36.014	12.83	-18.1	30.93	Vertical	40	27.17
84.126	19.96	-21.2	41.16	Vertical	40	20.04
168.322	19.78	-19.1	38.88	Vertical	43.5	23.72
270.56	26.32	-14.2	40.52	Vertical	46	19.68

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VERITAS****Test Report No.: PSU-NQN2412200117RF02**

390.7915	24.3	-11	35.3	Vertical	46	21.7
924.8735	20.53	-0.3	20.83	Vertical	46	25.47

For 802.11n(HT40) Channel No.:6

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
36.014	12.84	-18.1	30.94	Vertical	40	27.16
84.1745	22.15	-21.2	43.35	Vertical	40	17.85
168.322	19.78	-19.1	38.88	Vertical	43.5	23.72
270.56	26.29	-14.2	40.49	Vertical	46	19.71
378.7635	23.65	-11.2	34.85	Vertical	46	22.35
922.982	20.92	-0.3	21.22	Vertical	46	25.08

For 802.11b Channel No.:11

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
36.014	12.83	-18.1	30.93	Vertical	40	27.18
84.126	19.94	-21.2	41.14	Vertical	40	20.06
168.322	19.81	-19.1	38.91	Vertical	43.5	23.69
299.5145	23.34	-13.4	36.74	Vertical	46	22.66
390.7915	24.24	-11	35.24	Vertical	46	21.76
919.9265	22.32	-0.3	22.62	Vertical	46	23.68

For 802.11g Channel No.:11

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
48.0905	13.68	-14.9	28.58	Vertical	40	26.32
78.112	18.28	-21.7	39.98	Vertical	40	21.72
99.937	11.26	-16.8	28.06	Vertical	43.5	32.24
270.56	26.22	-14.2	40.42	Vertical	46	19.78
378.7635	23.66	-11.2	34.86	Vertical	46	22.34
999.903	21.27	0	21.27	Vertical	54	32.73

For 802.11n(HT20) Channel No.:11

Frequency(MHz)	Result(dBuV/m)	ARpl	Pmea	Polarity	Limit	Margin
----------------	----------------	------	------	----------	-------	--------



		(dB)	(dBuV/m)		(dBuV/m)	(dB)
36.014	12.83	-18.1	30.93	Vertical	40	27.17
78.1605	21.84	-21.7	43.54	Vertical	40	18.16
168.322	19.77	-19.1	38.87	Vertical	43.5	23.73
270.56	26.37	-14.2	40.57	Vertical	46	19.63
390.7915	24.27	-11	35.27	Vertical	46	21.73
920.654	20.59	-0.3	20.89	Vertical	46	25.41

For 802.11n(HT40) Channel No.:3

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
36.014	12.86	-18.1	30.96	Vertical	40	27.14
84.126	19.92	-21.2	41.12	Vertical	40	20.08
168.322	19.74	-19.1	38.84	Vertical	43.5	23.76
270.56	26.36	-14.2	40.56	Vertical	46	19.64
390.7915	24.27	-11	35.27	Vertical	46	21.73
715.6445	25.59	-4.6	30.19	Vertical	46	20.41

For 802.11n(HT40) Channel No.:9

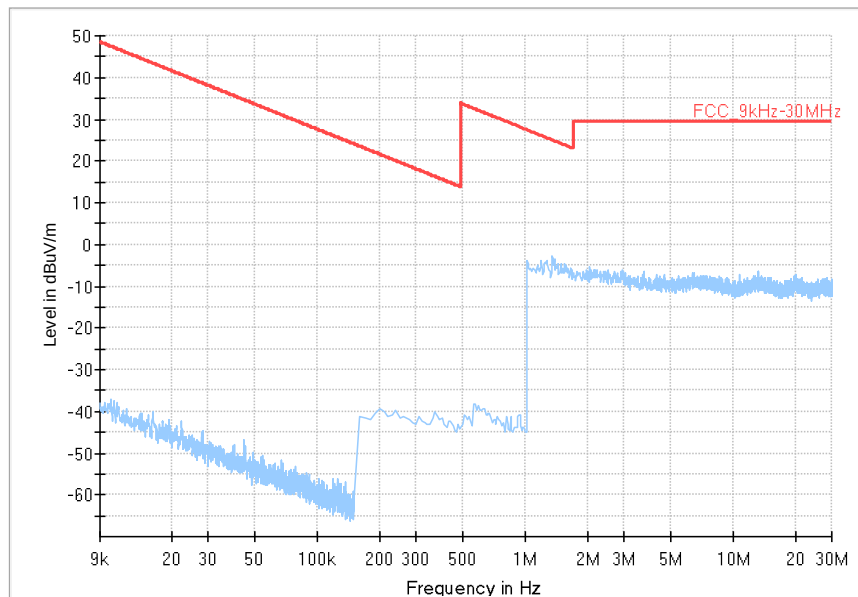
Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)	Margin (dB)
36.014	12.84	-18.1	30.94	Vertical	40	27.16
84.1745	22.14	-21.2	43.34	Vertical	40	17.86
138.252	17.77	-20	37.77	Vertical	43.5	25.73
270.56	26.28	-14.2	40.48	Vertical	46	19.72
390.7915	24.29	-11	35.29	Vertical	46	21.71
710.8915	16.24	-4.7	20.94	Vertical	46	29.76



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Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



Frequency Range: 9kHz -30MHz

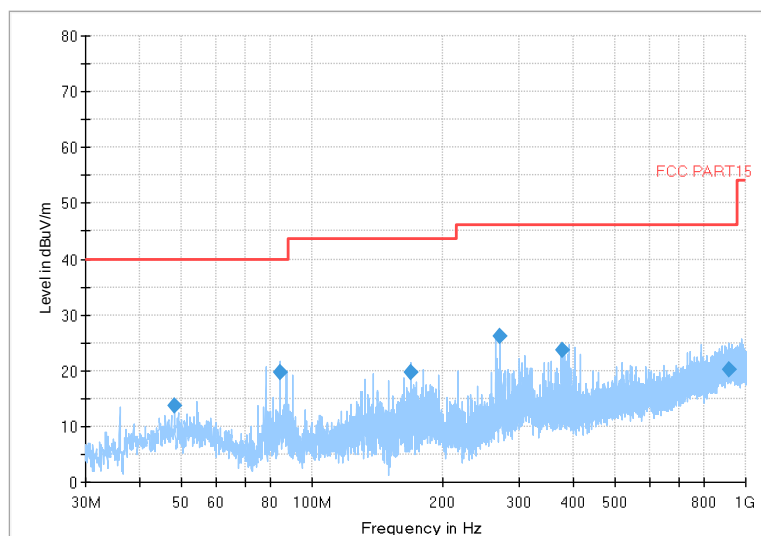
Detector: QP mode

Note : The relevant tests have been performed in order to verify in which mode would have the worst features, the result show above is the worst case.

Carrier frequency (MHz): 2412

Channel No.:1

Full Spectrum



Frequency Range 30MHz -1GHz

BV 7Layers Communications Technology
(Shenzhen) Co., Ltd

Room B37, Warehouse A5, No.3 Chiwan 4th Road,
Zhaoshang Street, Nanshan District Shenzhen,
Guangdong, People's Republic of China

Tel: +86 755 8869 6566
Fax: +86 755 8869 6577
Email: customerservice.sw@bureauveritas.com



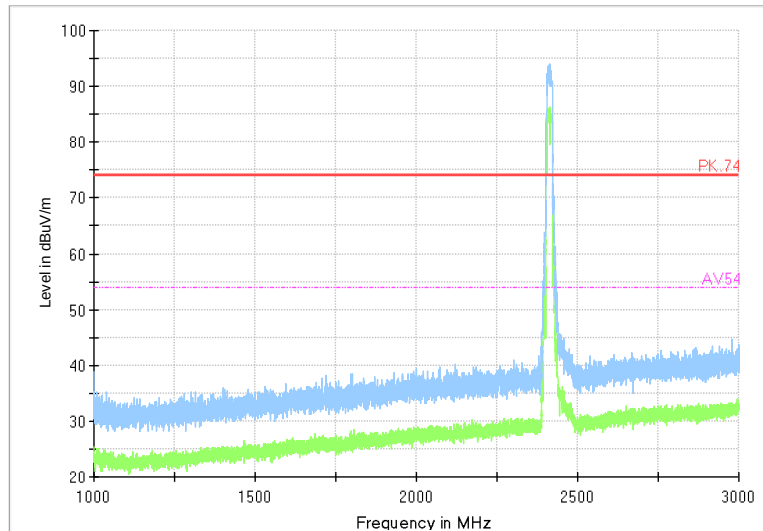
BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

Detector: QP mode

Modulation type: 802.11b

Full Spectrum

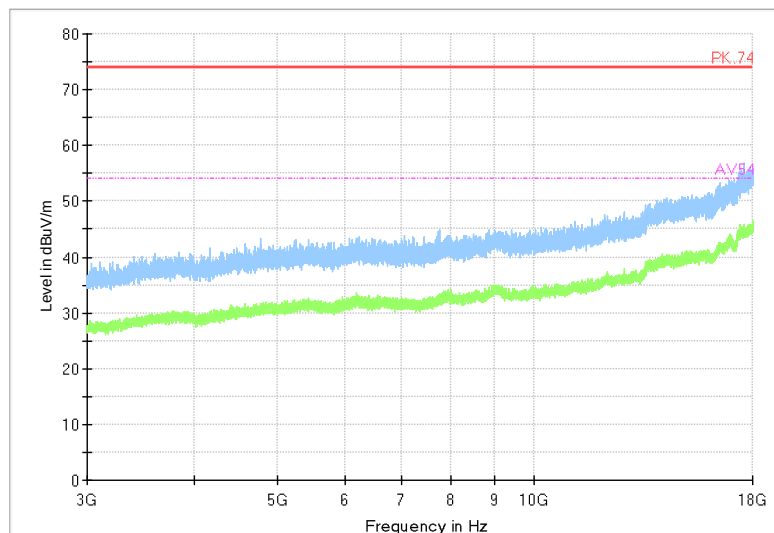


Frequency Range: 1GHz -3GHz

Detector: Av mode and PK mode

Modulation type: 802.11b

Full Spectrum



Frequency Range: 3GHz -18GHz

Detector: Av mode and PK mode

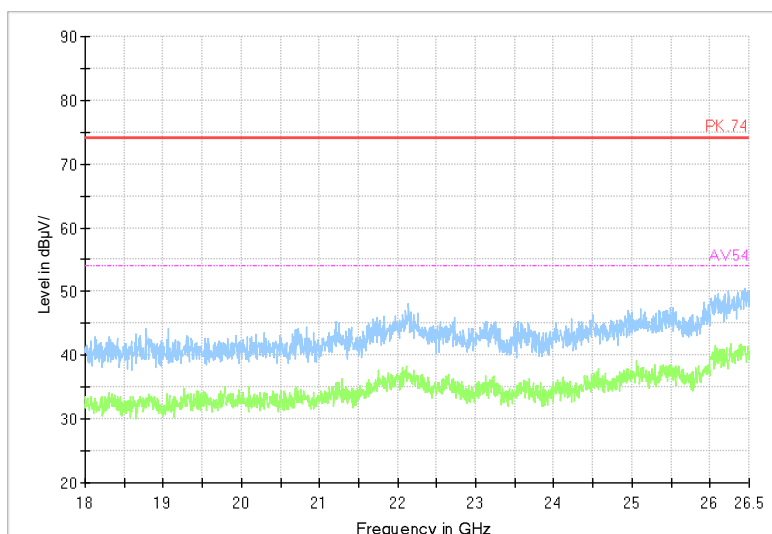
Modulation type: 802.11b



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

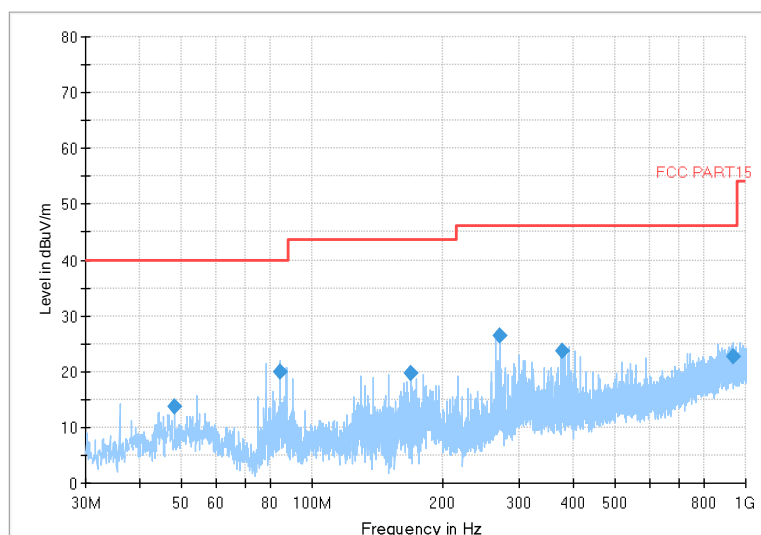


Frequency Range: 18GHz -26GHz

Detector: Av mode and PK mode

Modulation type: 802.11b

Full Spectrum



Frequency Range: 30MHz -1GHz

Detector: QP mode

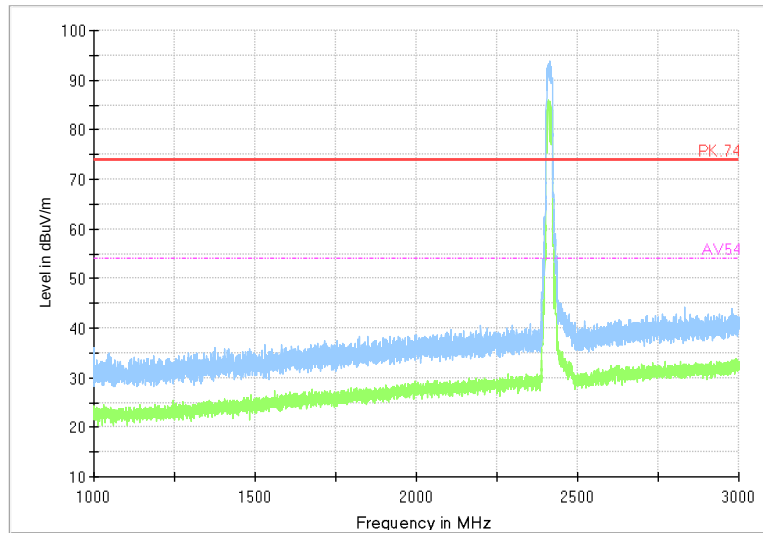
Modulation type: 802.11g



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

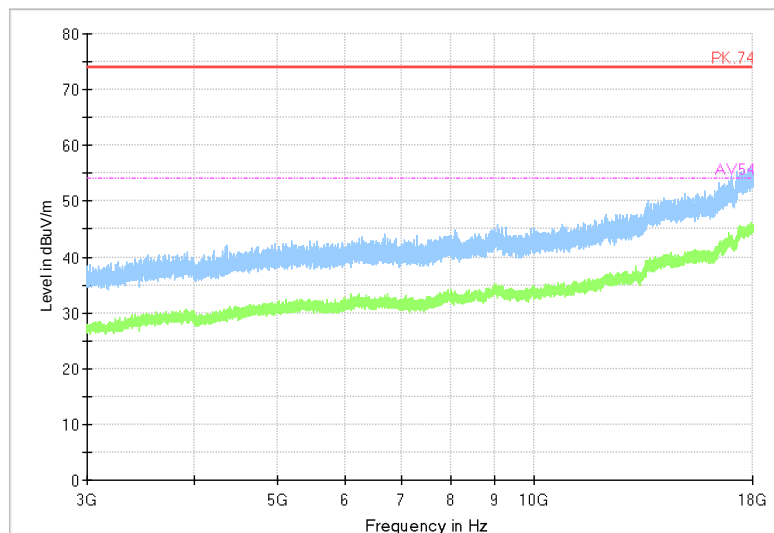


Frequency Range: 1GHz -3GHz

Detector: Av mode and PK mode

Modulation type: 802.11g

Full Spectrum



Frequency Range: 3GHz -18GHz

Detector: Av mode and PK mode

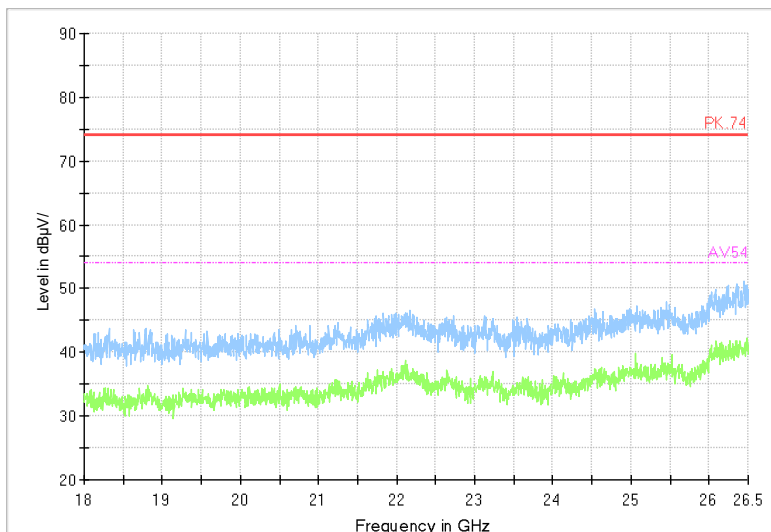
Modulation type: 802.11g



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VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

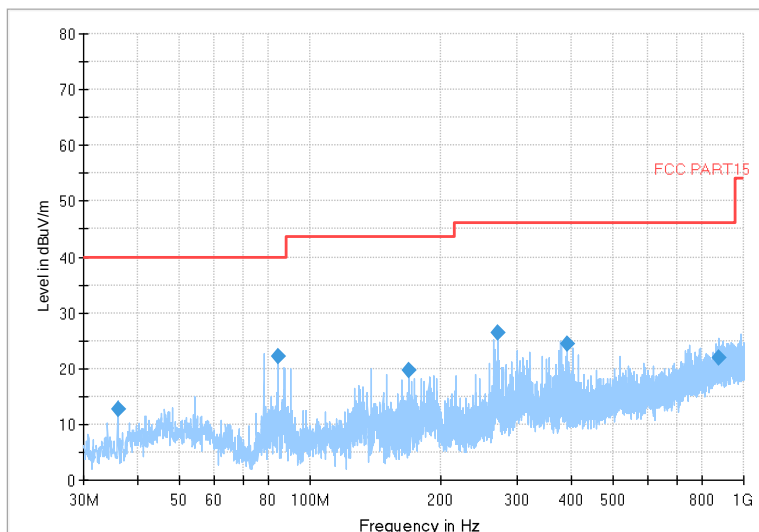


Frequency Range: 18GHz -26GHz

Detector: Av mode and PK mode

Modulation type: 802.11g

Full Spectrum



Frequency Range: 30MHz -1GHz

Detector: QP mode

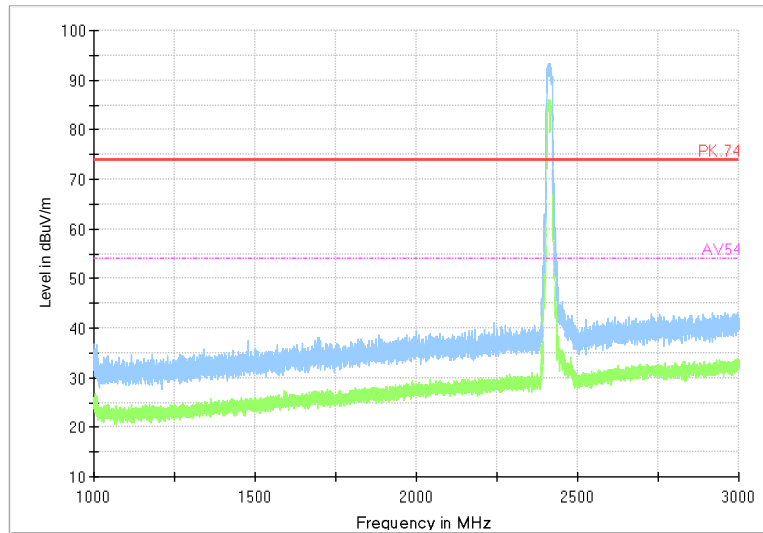
Modulation type: 802.11n(HT20)



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VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

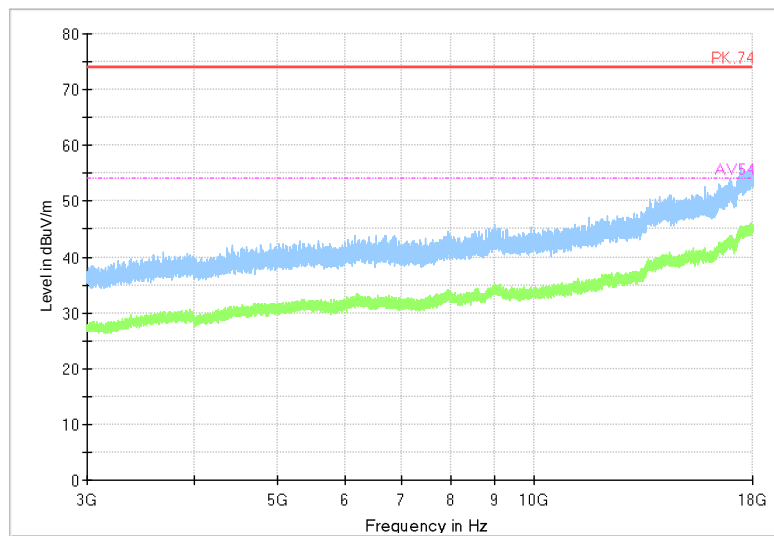


Frequency Range: 1GHz -3GHz

Detector: Av mode and PK mode

Modulation type: 802.11n(HT20)

Full Spectrum



Frequency Range: 3GHz -18GHz

Detector: Av mode and PK mode

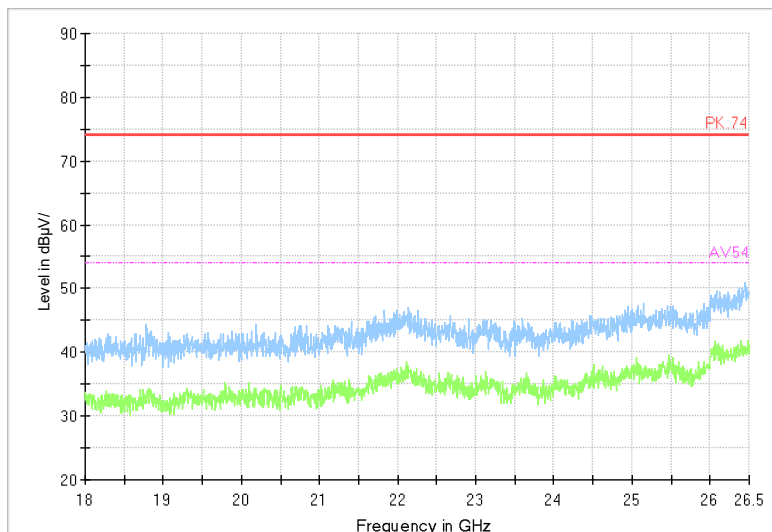
Modulation type: 802.11n(HT20)



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VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



Frequency Range: 18GHz -26GHz

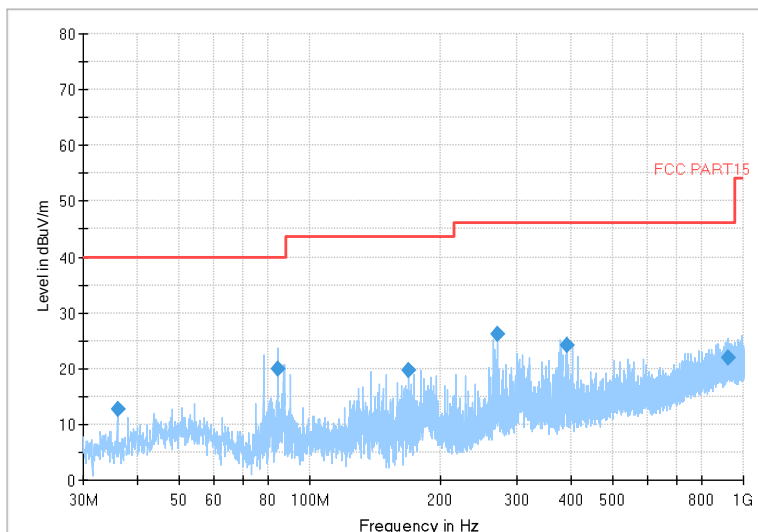
Detector: Av mode and PK mode

Modulation type: 802.11n(HT20)

Carrier frequency (MHz): 2437

Channel No.:6

Full Spectrum



Frequency Range: 30MHz -1GHz

Detector: QP mode

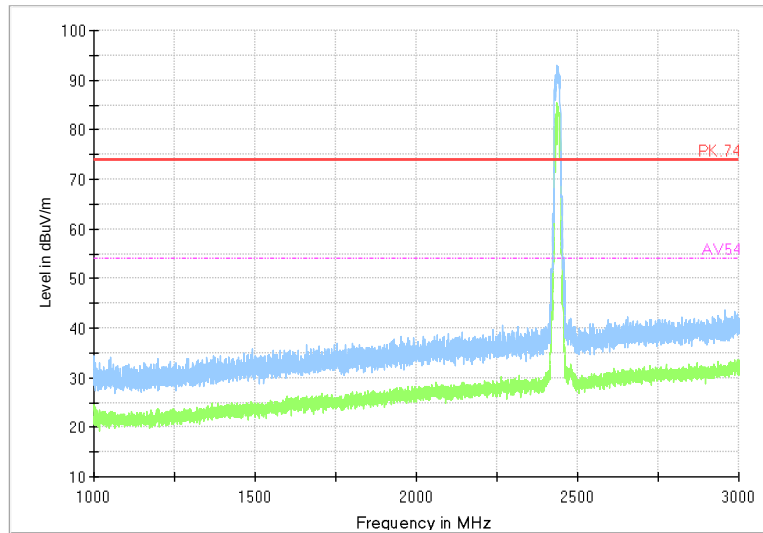
Modulation type: 802.11b



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VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

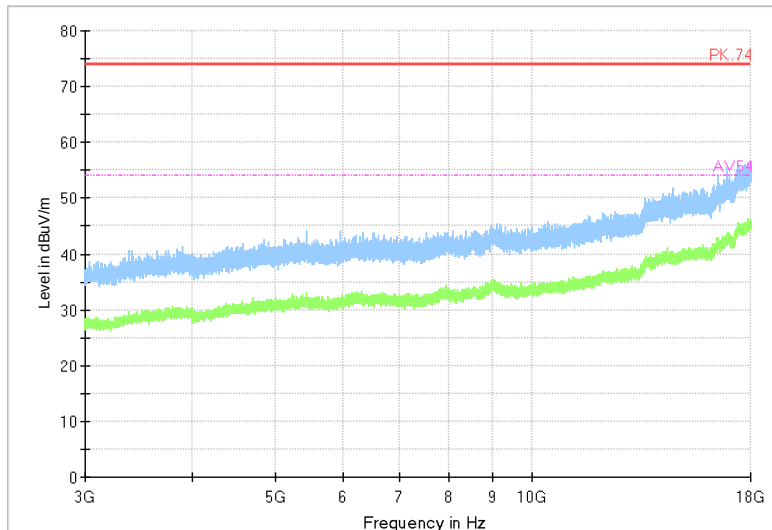


Frequency Range: 1GHz -3GHz

Detector: Av mode and PK mode

Modulation type: 802.11b

Full Spectrum



Frequency Range: 3GHz -18GHz

Detector: Av mode and PK mode

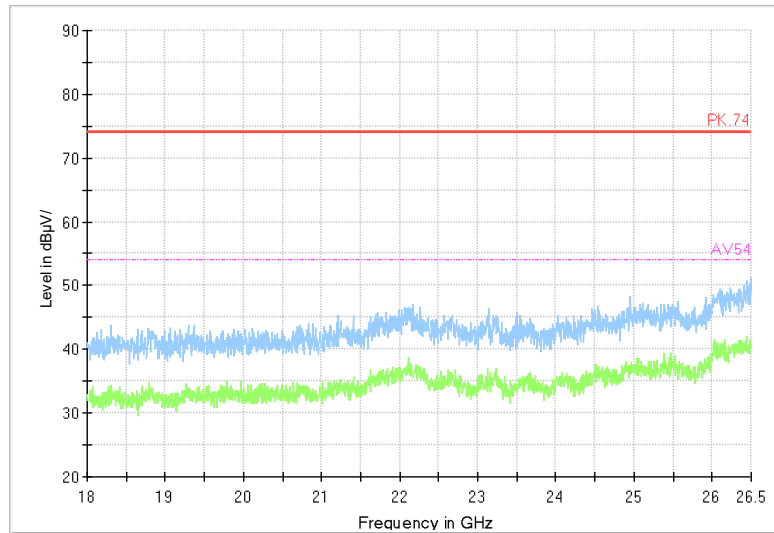
Modulation type: 802.11b



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

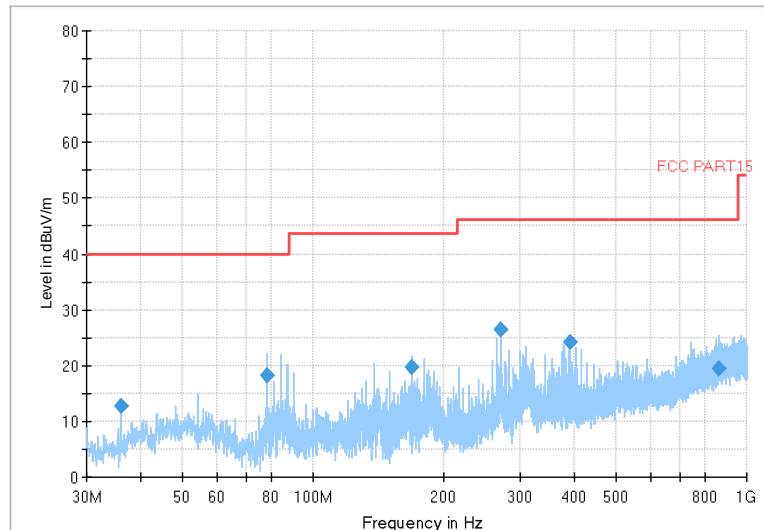


Frequency Range: 18GHz -26GHz

Detector: Av mode and PK mode

Modulation type: 802.11b

Full Spectrum



Frequency Range: 30MHz -1GHz

Detector: QP mode

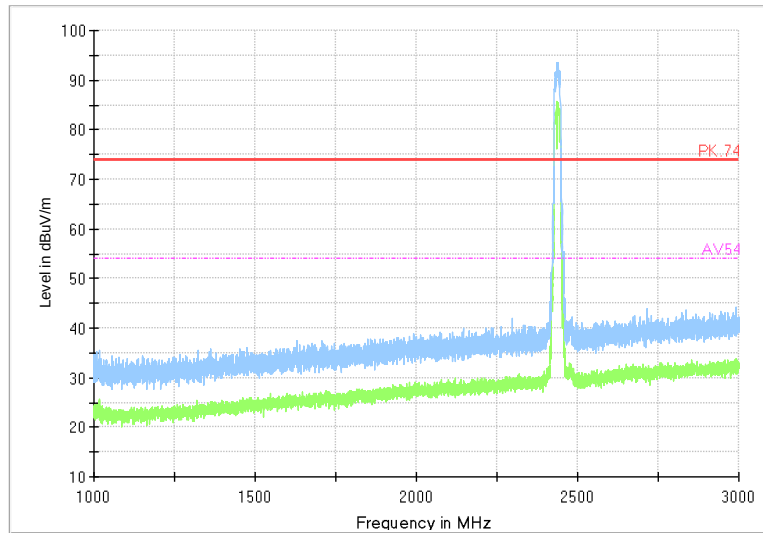
Modulation type: 802.11g



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

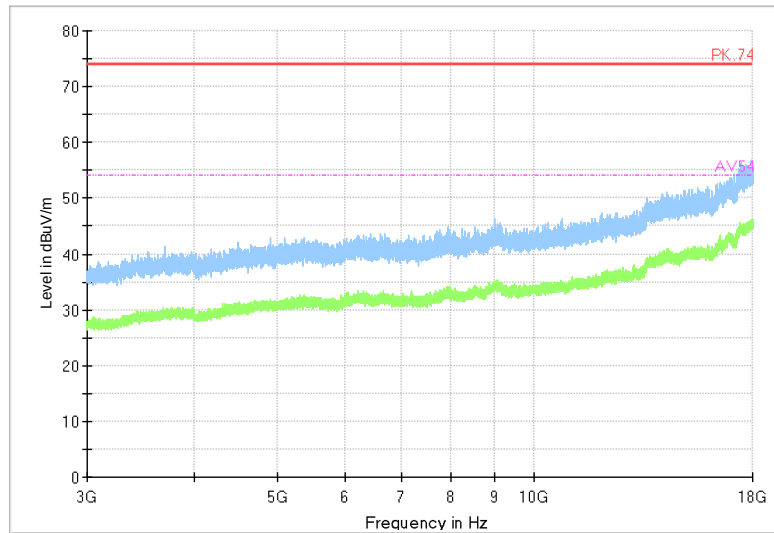


Frequency Range: 1GHz -3GHz

Detector: Av mode and PK mode

Modulation type: 802.11g

Full Spectrum



Frequency Range: 3GHz -18GHz

Detector: Av mode and PK mode

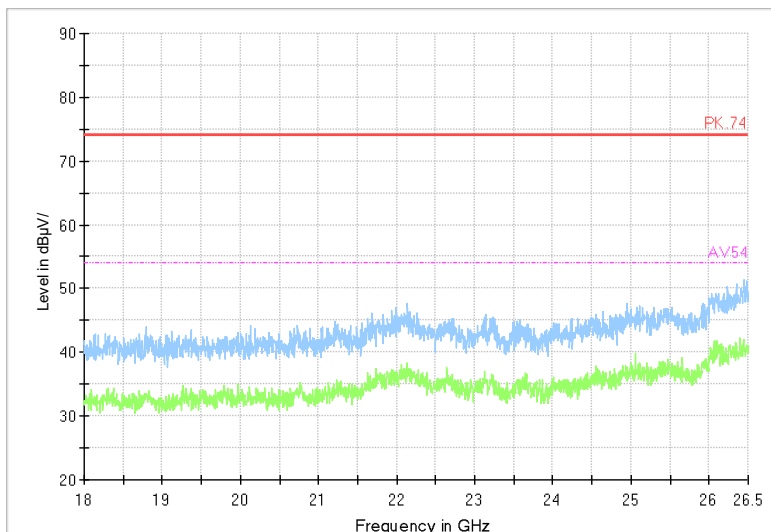
Modulation type: 802.11g



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VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

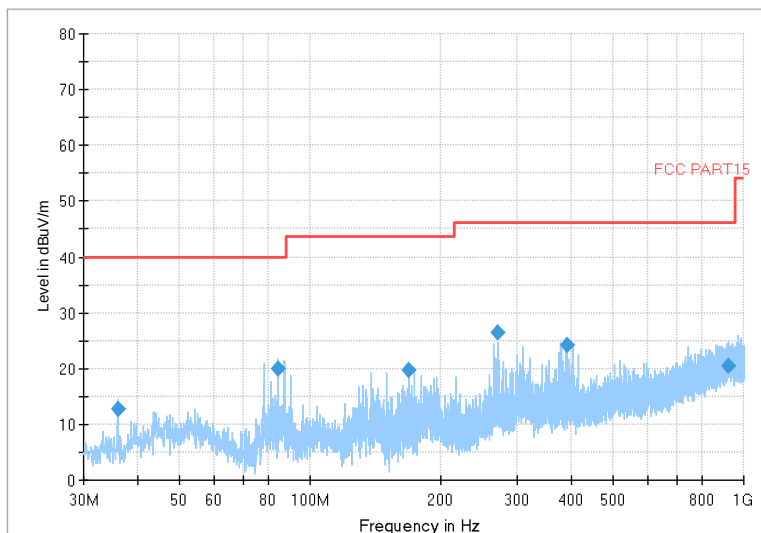


Frequency Range: 18GHz -26GHz

Detector: Av mode and PK mode

Modulation type: 802.11g

Full Spectrum



Frequency Range: 30MHz -1GHz

Detector: QP mode

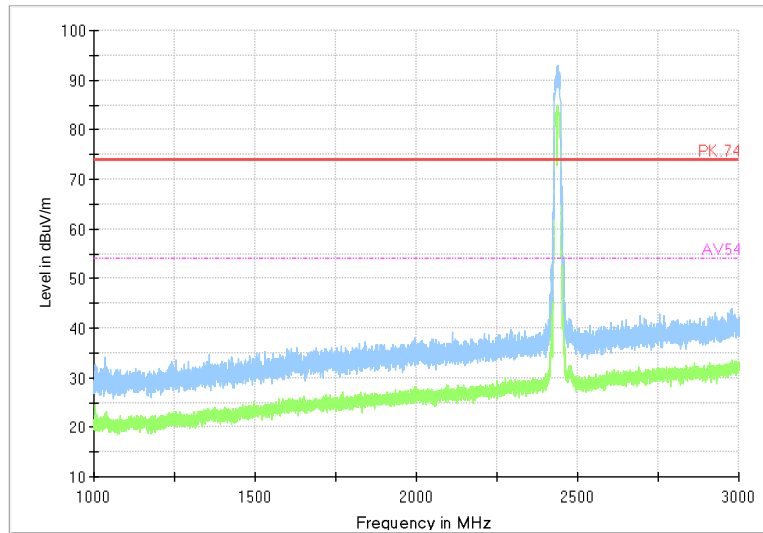
Modulation type: 802.11n(HT20)



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VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

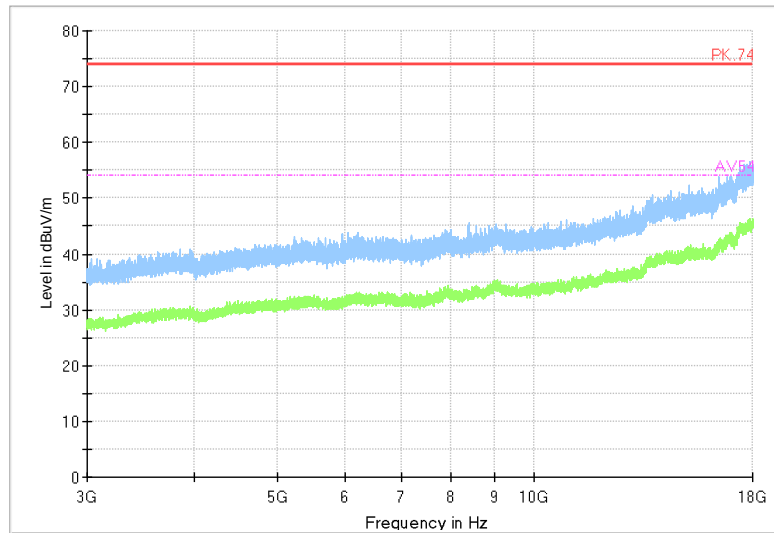


Frequency Range: 1GHz -3GHz

Detector: Av mode and PK mode

Modulation type: 802.11n(HT20)

Full Spectrum



Frequency Range: 3GHz -18GHz

Detector: Av mode and PK mode

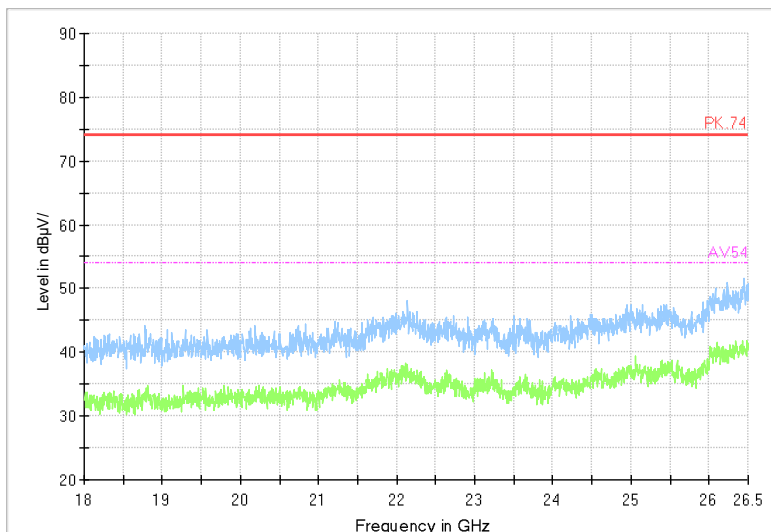
Modulation type: 802.11n(HT20)



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VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

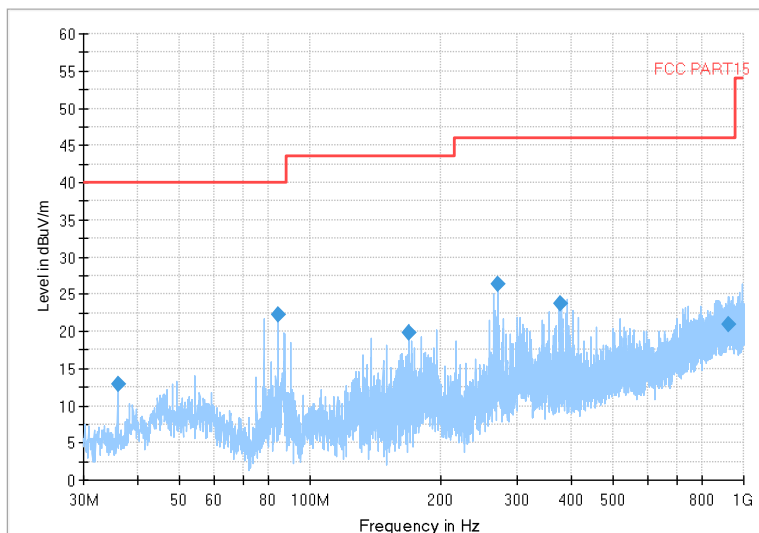


Frequency Range: 18GHz -26GHz

Detector: Av mode and PK mode

Modulation type: 802.11n(HT20)

Full Spectrum



Frequency Range: 30MHz -1GHz

Detector: QP mode

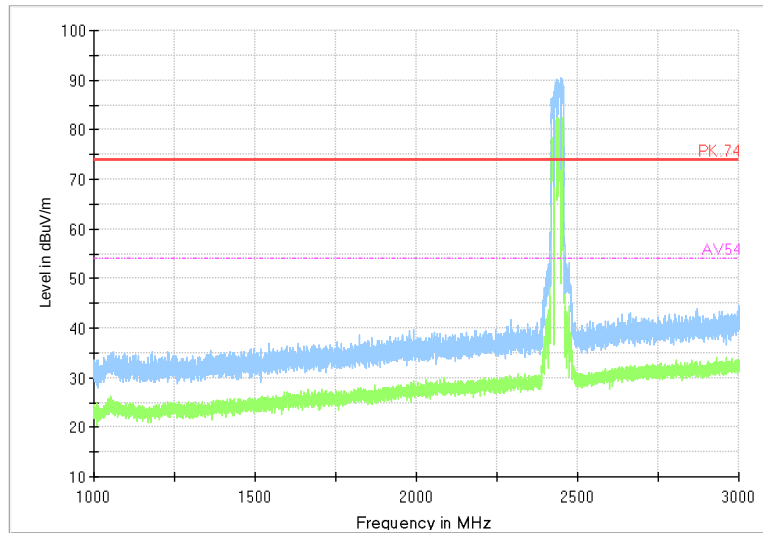
Modulation type: 802.11n(HT40)



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VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

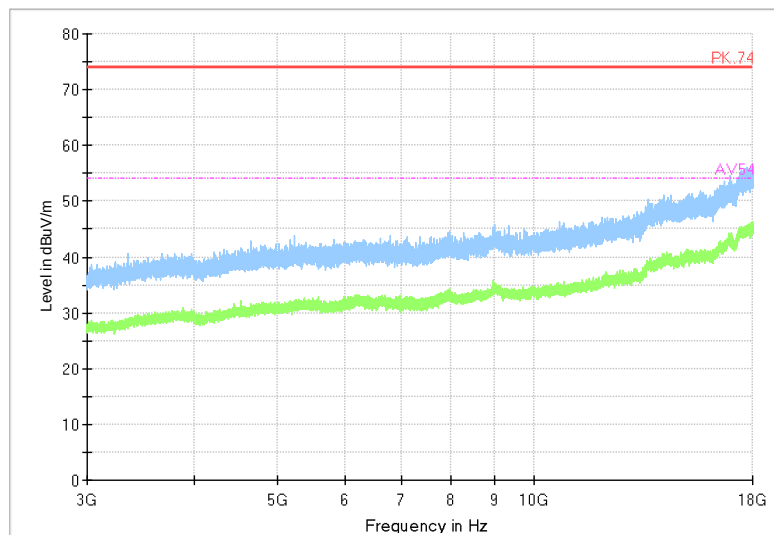


Frequency Range: 1GHz -3GHz

Detector: Av mode and PK mode

Modulation type: 802.11n(HT40)

Full Spectrum



Frequency Range: 3GHz -18GHz

Detector: Av mode and PK mode

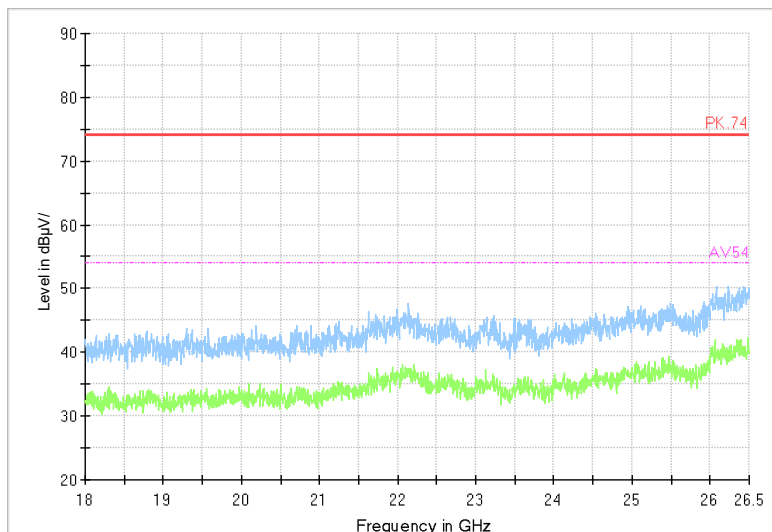
Modulation type: 802.11n(HT40)



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



Frequency Range: 18GHz -26GHz

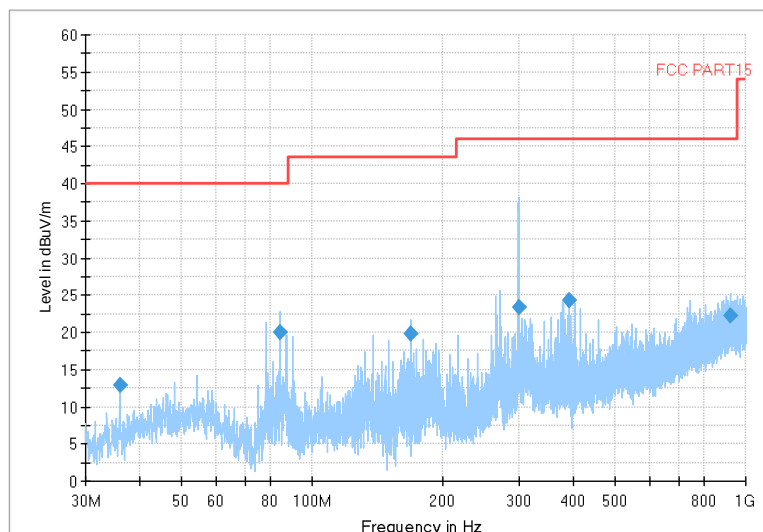
Detector: Av mode and PK mode

Modulation type: 802.11n(HT40)

Carrier frequency (MHz): 2462

Channel No.:11

Full Spectrum



Frequency Range: 30MHz -1GHz

Detector: QP mode

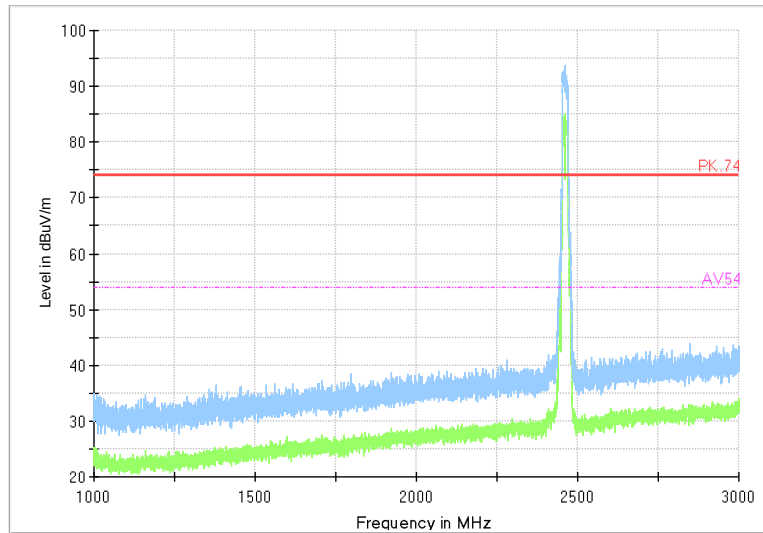
Modulation type: 802.11b



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

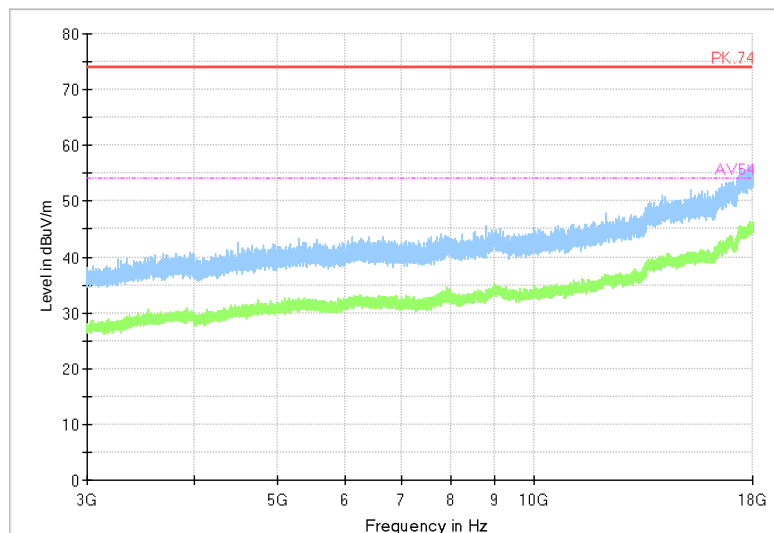


Frequency Range: 1GHz -3GHz

Detector: Av mode and PK mode

Modulation type: 802.11b

Full Spectrum



Frequency Range: 3GHz -18GHz

Detector: Av mode and PK mode

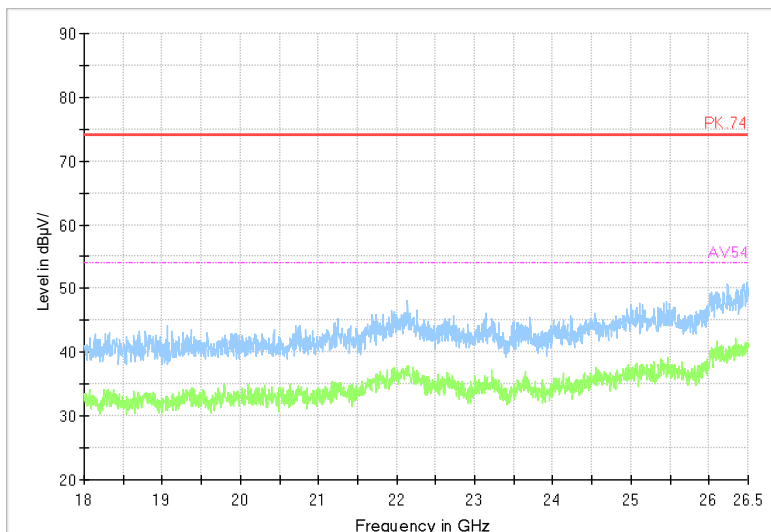
Modulation type: 802.11b



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

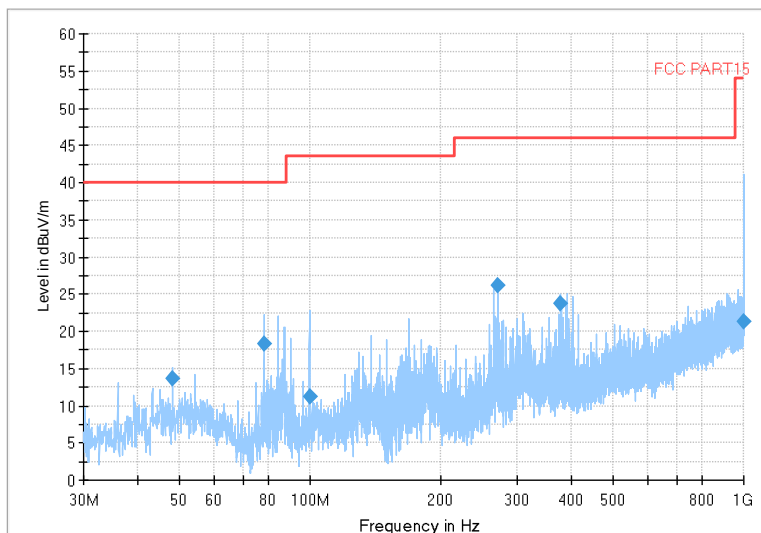


Frequency Range: 18GHz -26GHz

Detector: Av mode and PK mode

Modulation type: 802.11b

Full Spectrum



Frequency Range: 30MHz -1GHz

Detector: QP mode

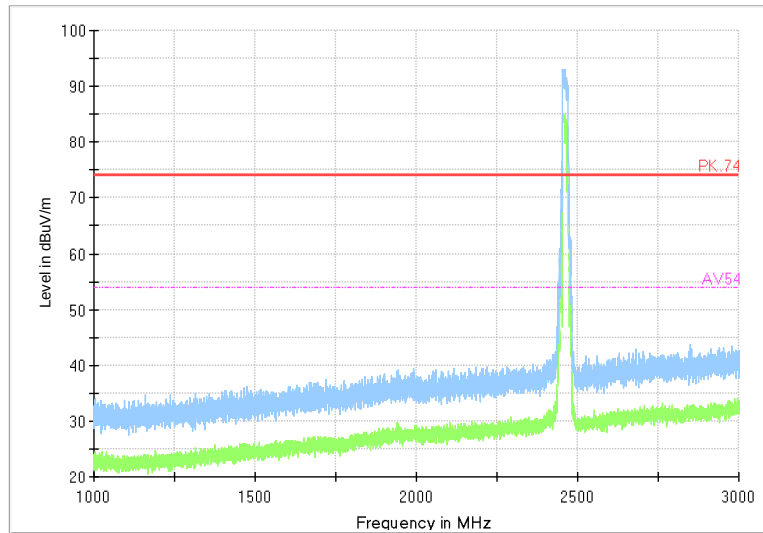
Modulation type: 802.11g



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

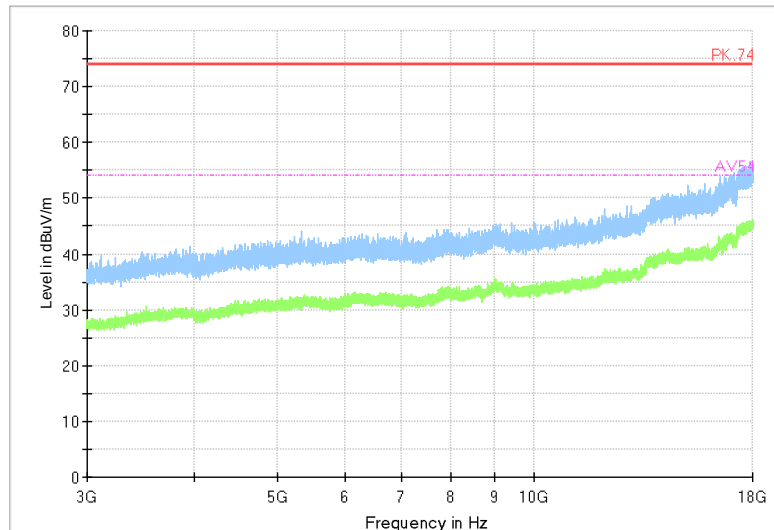


Frequency Range: 1GHz -3GHz

Detector: Av mode and PK mode

Modulation type: 802.11g

Full Spectrum



Frequency Range: 3GHz -18GHz

Detector: Av mode and PK mode

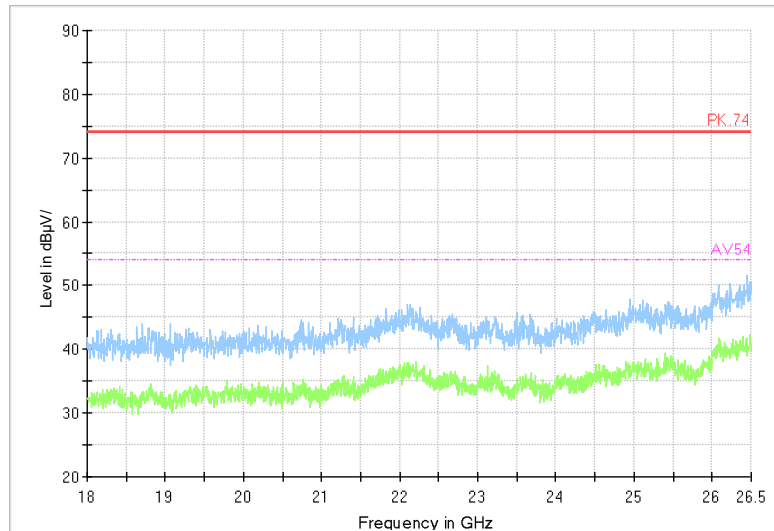
Modulation type: 802.11g



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

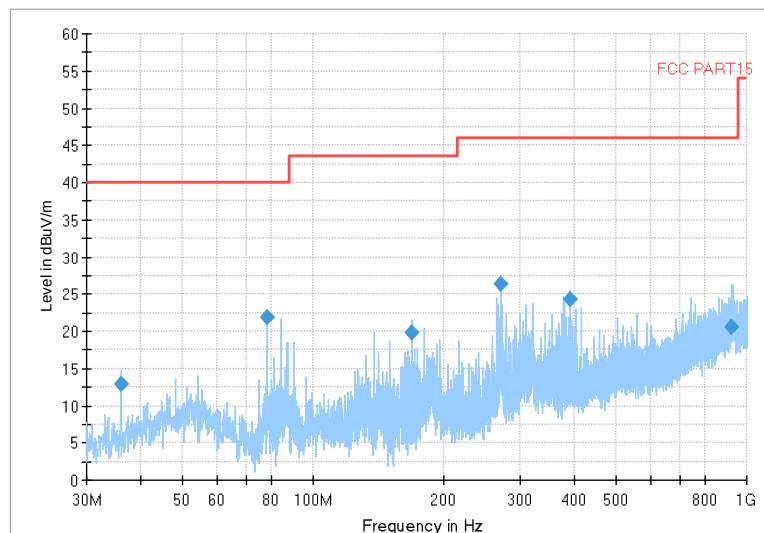


Frequency Range: 18GHz -26GHz

Detector: Av mode and PK mode

Modulation type: 802.11g

Full Spectrum



Frequency Range: 30MHz -1GHz

Detector: QP mode

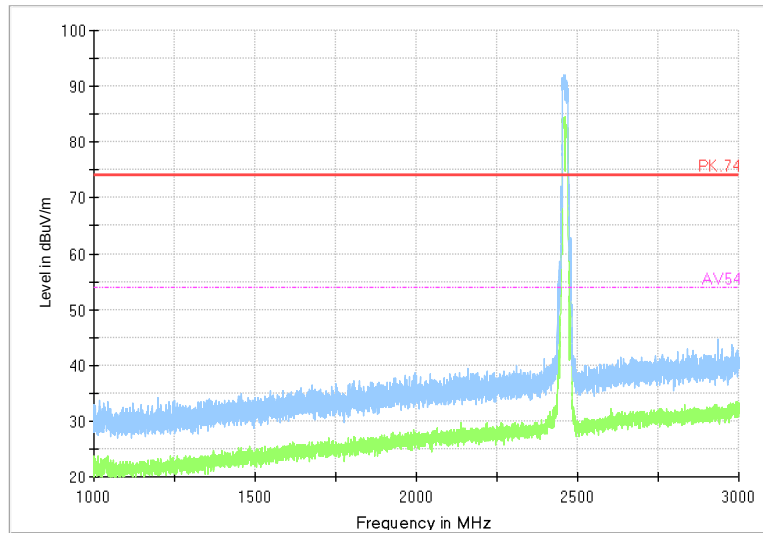
Modulation type: 802.11n(HT20)



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

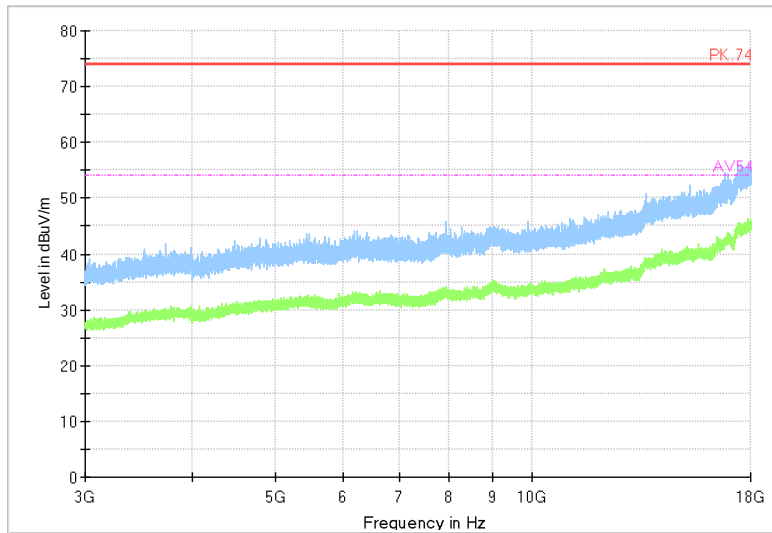


Frequency Range: 1GHz -3GHz

Detector: Av mode and PK mode

Modulation type: 802.11n(HT20)

Full Spectrum



Frequency Range: 3GHz -18GHz

Detector: Av mode and PK mode

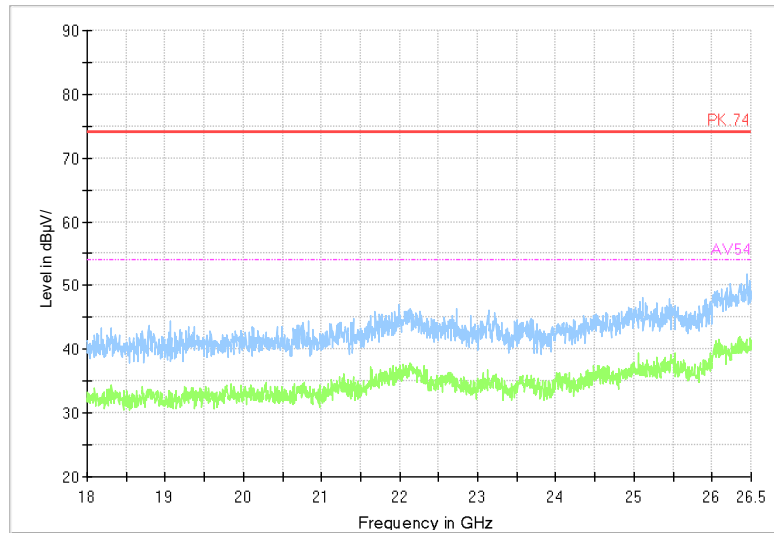
Modulation type: 802.11n(HT20)



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



Frequency Range: 18GHz -26GHz

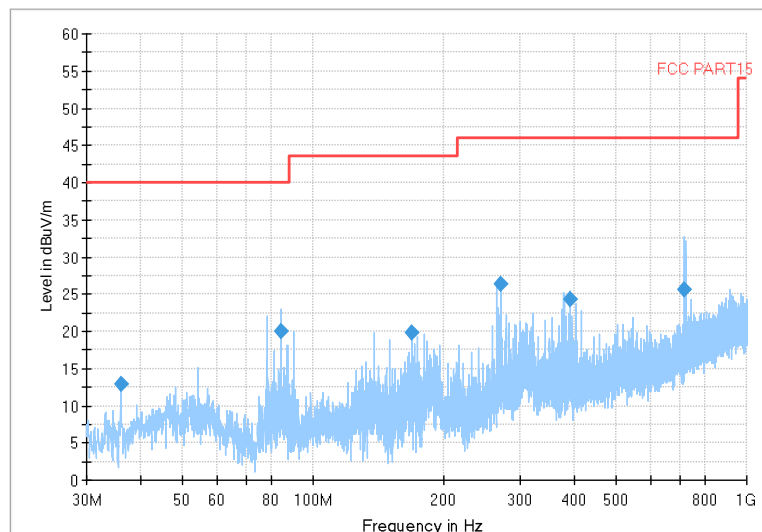
Detector: Av mode and PK mode

Modulation type: 802.11n(HT20)

Carrier frequency (MHz): 2422

Channel No.:3

Full Spectrum



Frequency Range: 30MHz -1GHz

Detector: QP mode

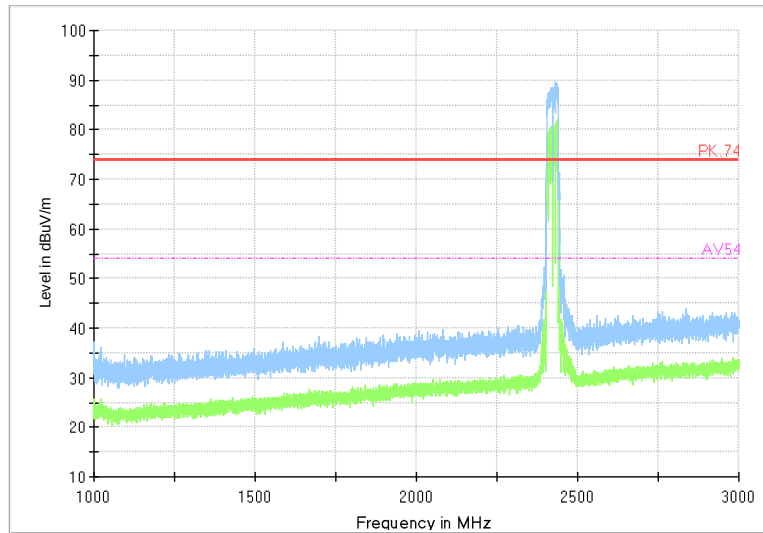
Modulation type: 802.11n(HT40)



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

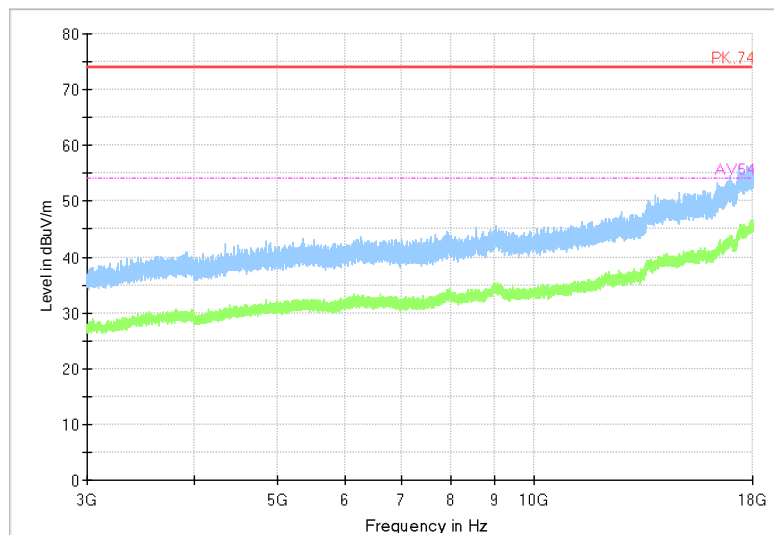


Frequency Range: 1GHz -3GHz

Detector: Av mode and PK mode

Modulation type: 802.11n(HT40)

Full Spectrum



Frequency Range: 3GHz -18GHz

Detector: Av mode and PK mode

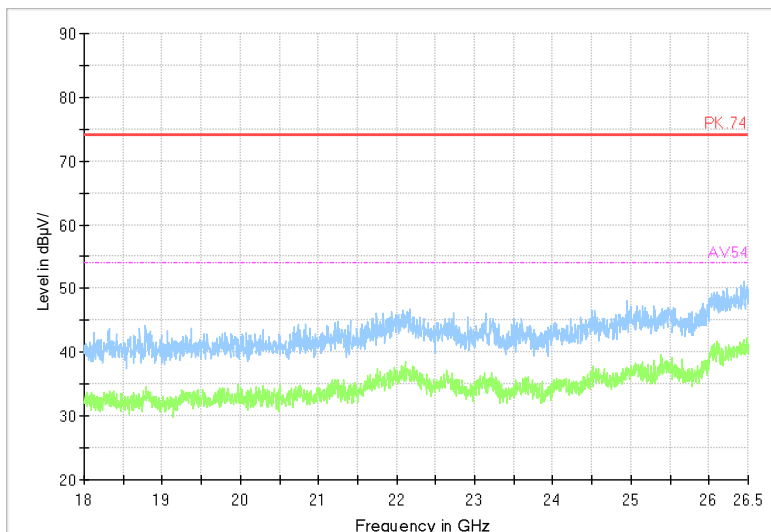
Modulation type: 802.11n(HT40)



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



Frequency Range: 18GHz -26GHz

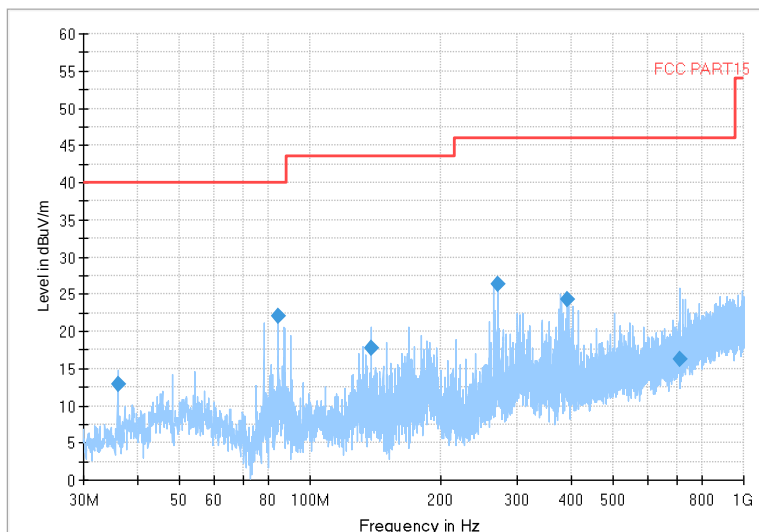
Detector: Av mode and PK mode

Modulation type: 802.11n(HT40)

Carrier frequency (MHz): 2452

Channel No.:9

Full Spectrum



Frequency Range: 30MHz -1GHz

Detector: QP mode

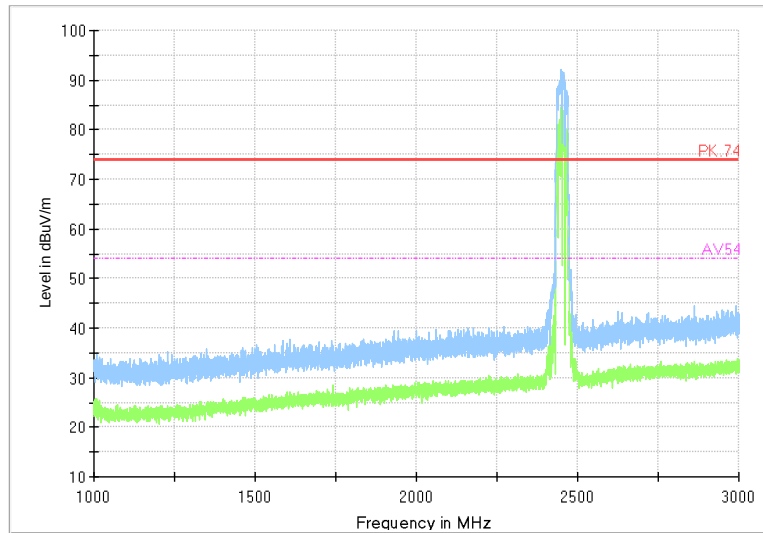
Modulation type: 802.11n(HT40)



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum

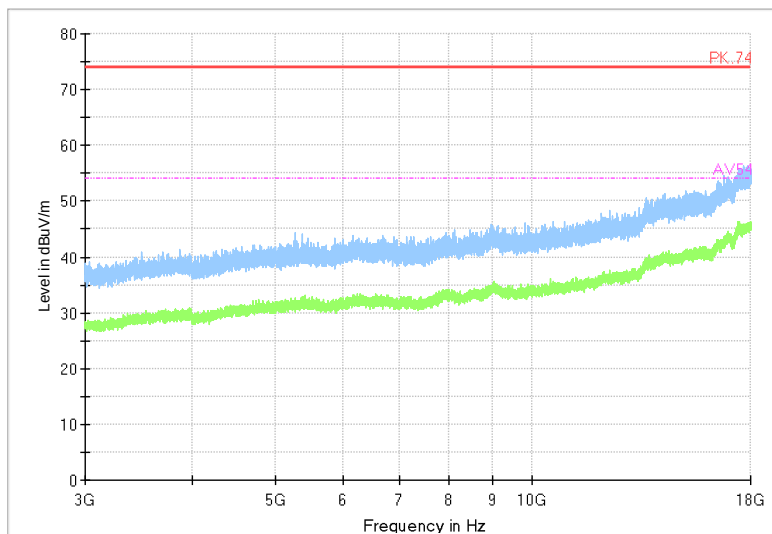


Frequency Range: 1GHz -3GHz

Detector: Av mode and PK mode

Modulation type: 802.11n(HT40)

Full Spectrum



Frequency Range: 3GHz -18GHz

Detector: Av mode and PK mode

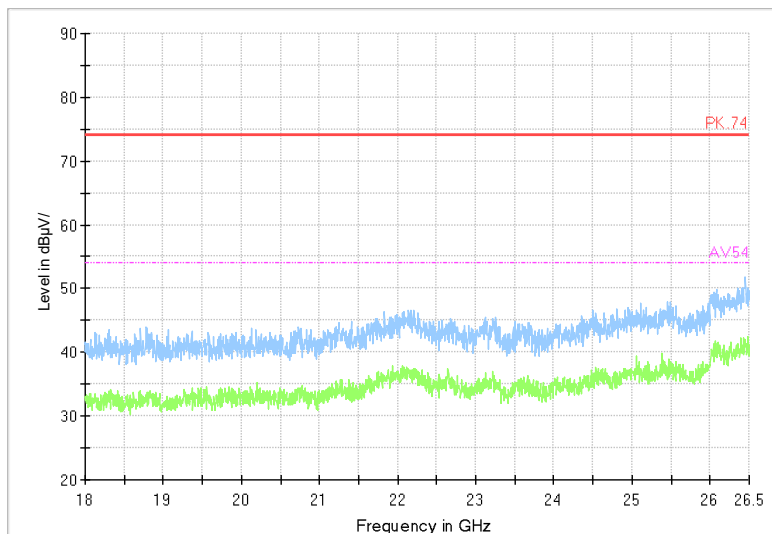
Modulation type: 802.11n(HT40)



BUREAU
VERITAS

Test Report No.: PSU-NQN2412200117RF02

Full Spectrum



Frequency Range: 18GHz -26GHz

Detector: Av mode and PK mode

Modulation type: 802.11n(HT40)



3.3 6 dB BANDWIDTH MEASUREMENT

3.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

3.3.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Power Meter	ANRITSU	ML2495A	1506002	Feb. 13,24	Feb. 12,25
EXA Signal Analyzer	KEYSIGHT	N9010A-526	MY54510523	Feb. 13,24	Feb. 12,25
EXA Signal Analyzer	KEYSIGHT	N9010A-544	MY54510355	May.09,24	May.08,25
Power Sensor	ANRITSU	MA2411B	1339352	Feb. 13,24	Feb. 12,25

NOTE:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
2. The test was performed in RF Oven room.

3.3.3 TEST PROCEDURE

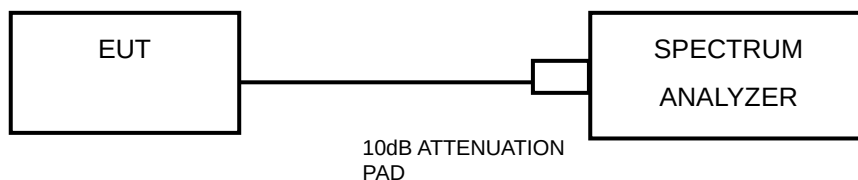
1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



3.3.4 DEVIATION FROM TEST STANDARD

No deviation.

3.3.5 TEST SETUP



3.3.6 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.



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3.3.7 TEST RESULTS

Please Refer to Appendix1/2 Of this test report.

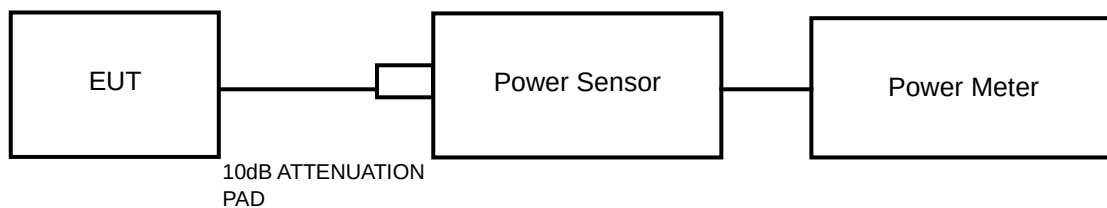


3.4 CONDUCTED OUTPUT POWER

3.4.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT

For systems using digital modulation in the 2400–2483.5 MHz band: 1 Watt (30dBm)

3.4.2 TEST SETUP



3.4.3 TEST INSTRUMENTS

Refer to section 3.3.2 to get information of above instrument.

3.4.4 TEST PROCEDURES

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

3.4.5 DEVIATION FROM TEST STANDARD

No deviation.

3.4.6 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.



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3.4.7 TEST RESULTS

3.4.7.1 MAXIMUM PEAK OUTPUT POWER

Please Refer to Appendix1/2 Of this test report.



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3.4.7.2 AVERAGE OUTPUT POWER (FOR REFERENCE)

The average power sensor was used on the output port of the EUT. A power meter was used to read the response of the power sensor. Record the power level.

Please Refer to Appendix1/2 Of this test report.



3.5 POWER SPECTRAL DENSITY MEASUREMENT

3.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm/3KHz.

3.5.2 TEST SETUP



3.5.3 TEST INSTRUMENTS

Refer to section 3.3.2 to get information of above instrument.

3.5.4 TEST PROCEDURE

1. Set the span to 1.5 times the DTS bandwidth
2. Set the RBW = 3 kHz, VBW $\geq 3 \times$ RBW, Detector = peak.
3. Sweep time = auto couple, Trace mode = max hold, allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

3.5.5 DEVIATION FROM TEST STANDARD

No deviation.

3.5.6 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.



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3.5.7 TEST RESULTS

Please Refer to Appendix1/2 Of this test report.

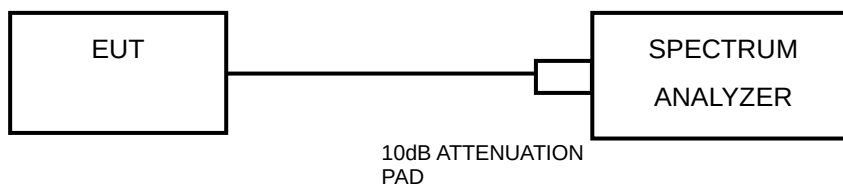


3.6 OUT OF BAND EMISSION MEASUREMENT

3.6.1 LIMITS OF OUT OF BAND EMISSION MEASUREMENT

Below –20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

3.6.2 TEST SETUP



3.6.3 TEST INSTRUMENTS

Refer to section 3.3.2 to get information of above instrument.

3.6.4 TEST PROCEDURE

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW $\geq$ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.



MEASUREMENT PROCEDURE OOB

1. Set RBW = 100 kHz.
2. Set VBW $\geq$ 300 kHz.
3. Set span to encompass the spectrum to be examined
4. Detector = peak.
5. Trace Mode = max hold.
6. Sweep = auto couple.

3.6.5 DEVIATION FROM TEST STANDARD

No deviation.

3.6.6 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

3.6.7 TEST RESULTS

The spectrum plots are attached on the following images. D1 line indicates the highest level. D2 line indicates the 20dB offset below D1. It shows compliance to the requirement.

Please Refer to Appendix1/2 Of this test report.



3.7 ANTENNA REQUIREMENTS

3.7.1 STANDARD APPLICABLE

If transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.7.2 ANTENNA CONNECTED CONSTRUCTION

An embedded-in antenna design is used.

3.7.3 ANTENNA GAIN

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit and PSD limit.

4 PHOTOGRAPHS OF THE TEST CONFIGURATION

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



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5 MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.



6 APPENDIX 1

WLAN 2.4G

DTS BANDWIDTH

TEST RESULT

Test Mode	Antenna	6 dB bandwidth(MHz)		
		Channel No.1	Channel No.6	Channel No.11
		2412MHz	2437MHz	2462MHz
802.11b	Chain0	9.06	8.57	7.77
802.11b	Chain1	9.04	9.57	7.65
802.11g	Chain0	14.68	16.33	14.79
802.11g	Chain1	16.38	13.58	16.39
802.11n HT20	Chain0	16.97	15.62	17.57
802.11n HT20	Chain1	17.53	17.58	17.59

Test Mode	Antenna	6 dB bandwidth(MHz)		
		Channel No.3	Channel No.6	Channel No.9
		2422MHz	2437MHz	2452MHz
802.11n HT40	Chain0	32.64	31.69	32.25
802.11n HT40	Chain1	34.92	30.06	33.86



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TEST GRAPHS

Test Mode: 802.11b

