FCC TEST REPORT

Test report No:	**EMC- FCC- R0068**
FCC ID:	**OSGPMA**
Type of Equipment:	**Power Metering Adaptor**
Model Name:	**PMA**
Applicant:	**GeneTel Systems, Inc.**
FCC Rule Part(s):	**FCC Part 15 Subpart C** **Section 15.203, Section 15.209** **Section 15.207, Section 15.247**
Frequency Range:	**2 405 MHz ~ 2 480 MHz**
Test result:	**Complied**

The above equipment was tested by EMC compliance Testing Laboratory for compliance with the requirements of FCC Rules and Regulations.
The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Date of test: July 16, 2012 ~ July 19, 2012

Issued date: July 23, 2012

Tested by: LEE, CHANG WON

Approved by: KIM, CHANG MIN

[Contents]

480-5 Shin-dong, Yeongtong-gu, Suwon-city, Gyunggi-do, 443-390, Korea
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1. Client information

Applicant:	GeneTel Systems, Inc.
Address:	518 Yongsan-Dong Yuseong-Gu Daejoen, Korea
Telephone number:	+82-42-335-3001
Facsimile number :	+82-42-335-3003
Contact person:	JONG-UK CHAE / juchae@genetel.co.kr

Manufacturer :	GeneTel Systems, Inc.
Address:	518 Yongsan-Dong Yuseong-Gu Daejoen, Korea

2. Laboratory information

Address
EMC Compliance Ltd.
480-5 Shin-dong, Yeongtong-gu, Suwon-city, Gyunggi-do, 443-390, Korea
Telephone Number: 82 31 336 9919 Facsimile Number: 82 31 336 4767

Certificate
CBTL Testing Laboratory, KOLAS NO.: 231
FCC Filing No.: 508785
VCCI Registration No.: C-1713, R-1606, T-258

SITE MAP

3. Description of E.U.T.

3.1 Basic description

Applicant :	GeneTel Systems, Inc.
Address of Applicant:	518 Yongsan-Dong Yuseong-Gu Daejoen, Korea
Manufacturer:	GeneTel Systems, Inc.
Address of Manufacturer:	518 Yongsan-Dong Yuseong-Gu Daejoen, Korea
Type of equipment:	Power Metering Adaptor
Basic Model:	PMA
Serial number:	Proto Type

3.2 General description

Model Name	Power Metering Adaptor
Communication	IEEE 802.15.4
Frequency Range	2 405 ~ 2 480 MHz
Type of Modulation	O-QPSK
Channel capacity	16 ch
Antenna Gain	3.94 dBi
Type of Antenna	Chip ANTENNA
Power supply	AC 120V / 60 Hz
Operating temperature	-20 ~ 55 °C
Dimension	62 mm * 110 mm * 48 mm

3.3 Test frequency

	Frequency
Low frequency	2 405 MHz
Middle frequency	2 445 MHz
High frequency	2 480 MHz

3.4 Test Voltage

mode	**Voltage**
Norminal voltage	AC 120V / 60 Hz

4. Summary of test results

4.1 Standards & results

Rule Reference	Parameter	Report Section	Test Result
15.203, 15.247(b)(4)	Antenna Requirement	5.1	C
15.247(b)(3)	Maximum Peak Output Power	5.2	C
15.247(e)	Peak Power Spectral Density	5.3	C
15.247(a)(2)	6 dB Channel Bandwidth	5.4	C
15.247(d), 15.205(a), 15.209(a)	Spurious Emission, Band Edge, and Restricted bands	5.5	C
15.207(a)	Conducted Emissions	5.6	C
15.247(i), 1.1307(b)(1)	RF Exposure	5.7	C

Note: C=complies
NC= Not complies
NT=Not tested
NA=Not Applicable

4.2 Uncertainty

Measurement Item	Combined Standard Uncertainty Uc	Expanded Uncertainty U = KUc (K = 2)
Conducted RF power	± 0.75 dB	± 1.3 dB
Radiated disturbance	+2.280dB / - 2.278 dB	+4.560dB / - 4.556 dB
Conducted disturbance	+1.883 dB / - 1.676 dB	+3.766dB / - 3.352 dB

5. Test results

5.1 Antenna Requirement

5.1.1 Regulation

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.1.2 Result

-Complied

The transmitter has an integral dipole antenna. type of antenna connector reverse sma female.
The directional gain of the antenna is 3.94 dBi.

5.2 Maximum Peak Output Power

5.2.1 Regulation

According to §15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to §15.247(b)(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.2.2 Measurement Procedure

5.2.2.1 Measurement Procedure PK1:

1. This procedure requires availability of a spectrum analyzer resolution bandwidth that is ≥ EBW.
2. Set the RBW ≥ EBW.
3. Set VBW ≥ 3 x RBW.
4. Set span = zero.
5. Sweep time = auto couple.
6. Detector = peak.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use peak marker function to determine the peak amplitude level within the fundamental emission.

5.2.3 Test Result

-Complied

Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	2 405	-3.49	30.00	33.49
Middle	2 445	-3.32	30.00	33.32
High	2 480	-3.05	30.00	33.05

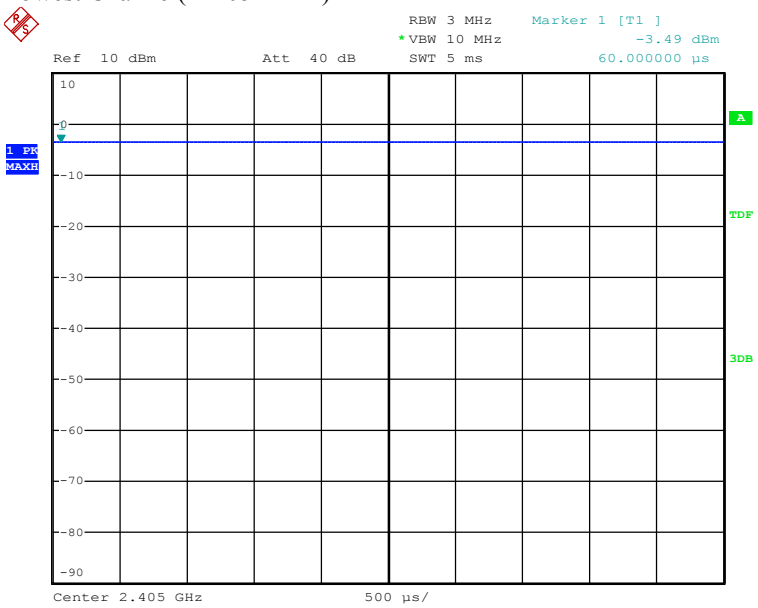
-NOTE:

1. Since the directional gain of the integral antenna declared by the manufacturer (G_{ANT} = 3.94 dBi) does not exceed 6.0 dBi, there was no need to reduce the output power.
2. We took the insertion loss of the cable loss into consideration within the measuring instrument.

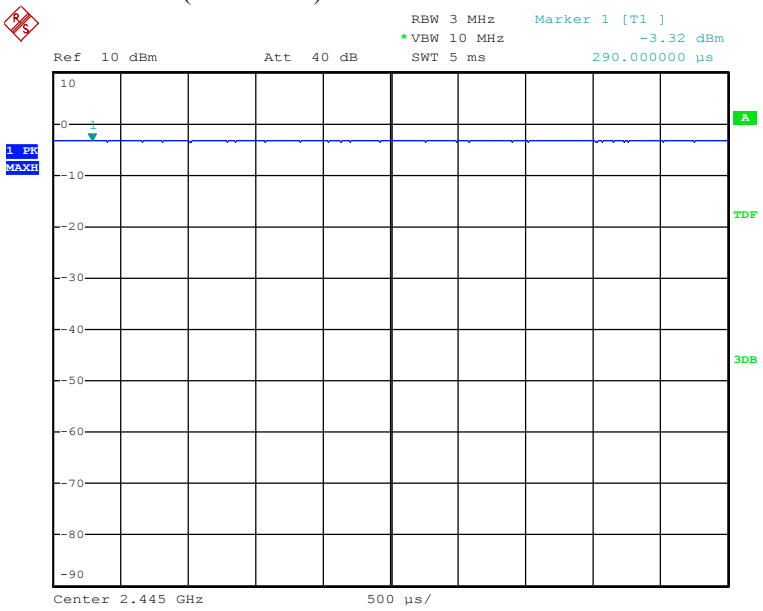
5.2.4 Test Plot

Figure 1. Plot of the Maximum Peak Output Power

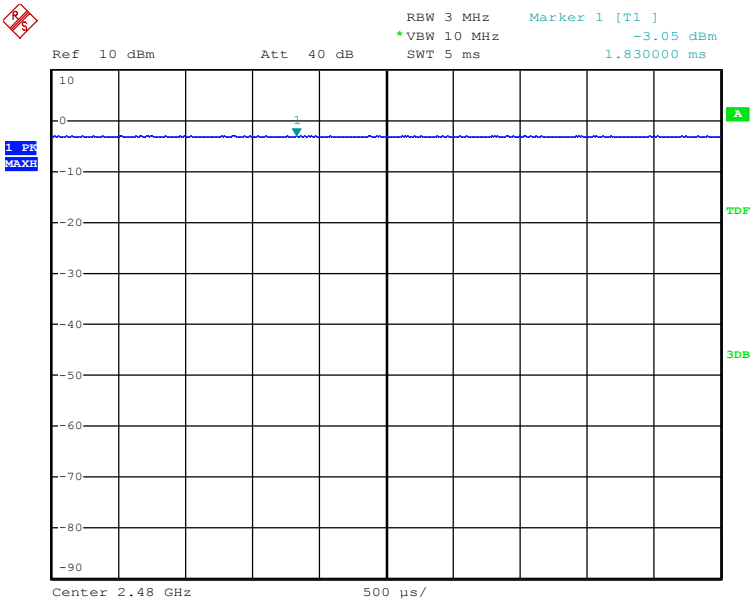
- Lowest Channel(2 405 MHz)



- Middle Channel (2 445 MHz)



- Highest Channel (2 480 MHz)



5.3 Peak Power Spectral Density

5.3.1 Regulation

According to §15.247(e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

5.3.2 Measurement Procedure

Measurement Procedure PKPSD:

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 100 kHz.
3. Set the VBW ≥ 300 kHz.
4. Set the span to 5-30 % greater than the EBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
10. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log(3 kHz/100 kHz= -15.2 dB).
11. The resulting peak PSD level must be ≤ 8 dBm.

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5.3.3 Test Result

-Complied

-802.11b mode

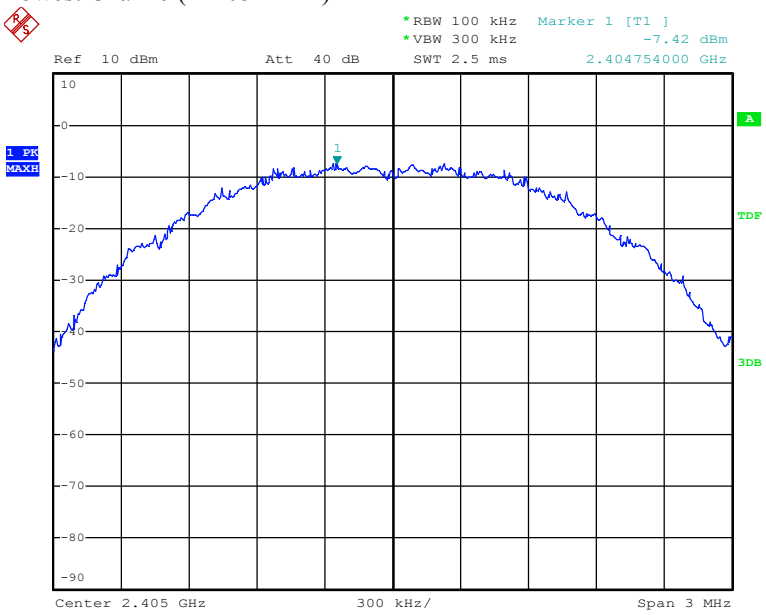
Channel	Reading [dBm]	BWCF [dB]	Result [dBm]	Limit [dBm]	Margin [dBm]
Low	-7.42	-15.20	-22.62	8.00	30.62
Middle	-7.49	-15.20	-22.69	8.00	30.69
High	-7.27	-15.20	-22.47	8.00	30.47

NOTE: We took the insertion loss of the cable loss into consideration within the measuring instrument.

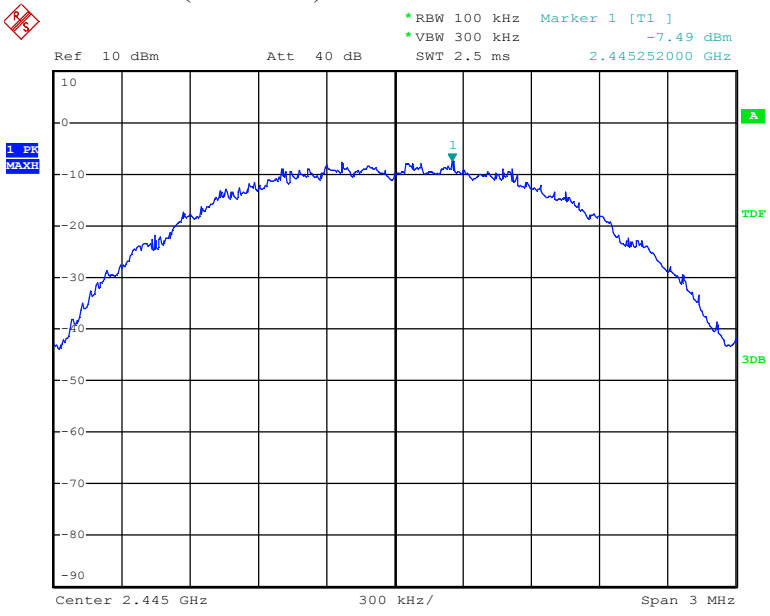
5.3.4 Test Plot

Figure 2. Plot of the Power Density (Conducted)

- Lowest Channel(2 405 MHz)



- Middle Channel (2 445 MHz)



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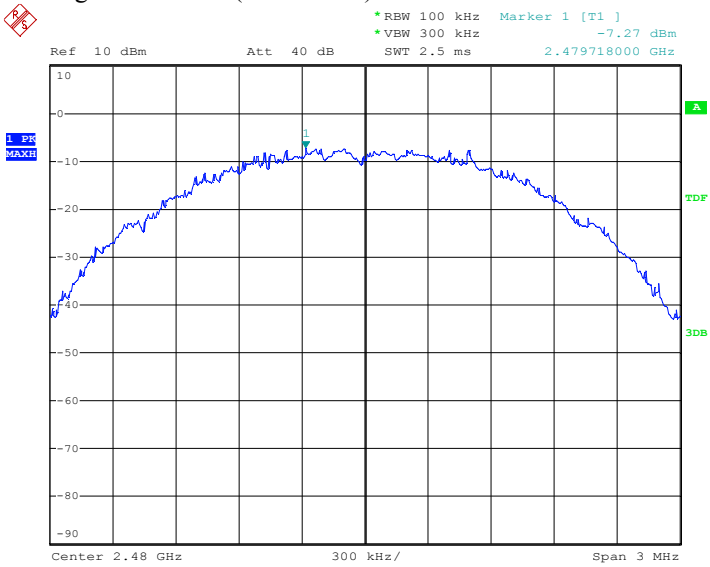
- Highest Channel (2 480 MHz)



5.4 6 dB Bandwidth

5.4.1 Regulation

Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

5.4.2 Measurement Procedure

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, and peak detection was used. The 6dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 6dB.

5.4.3 Test Result

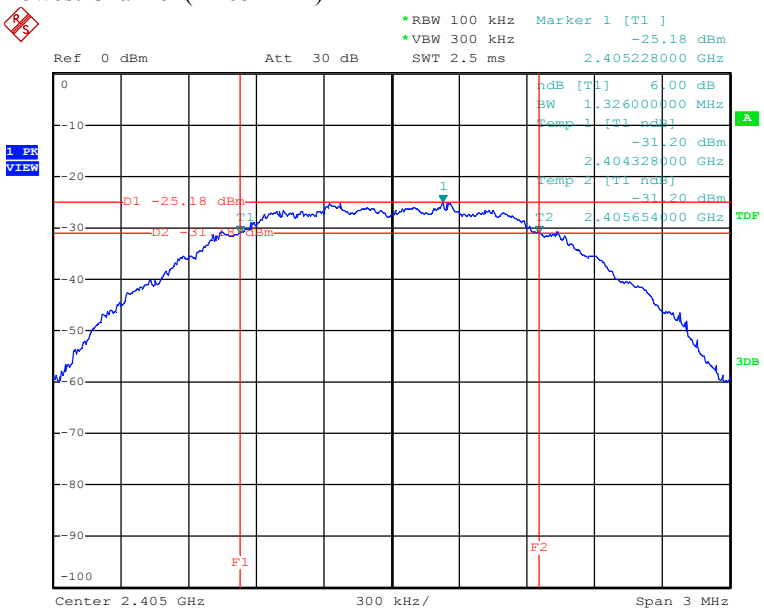
-Complied

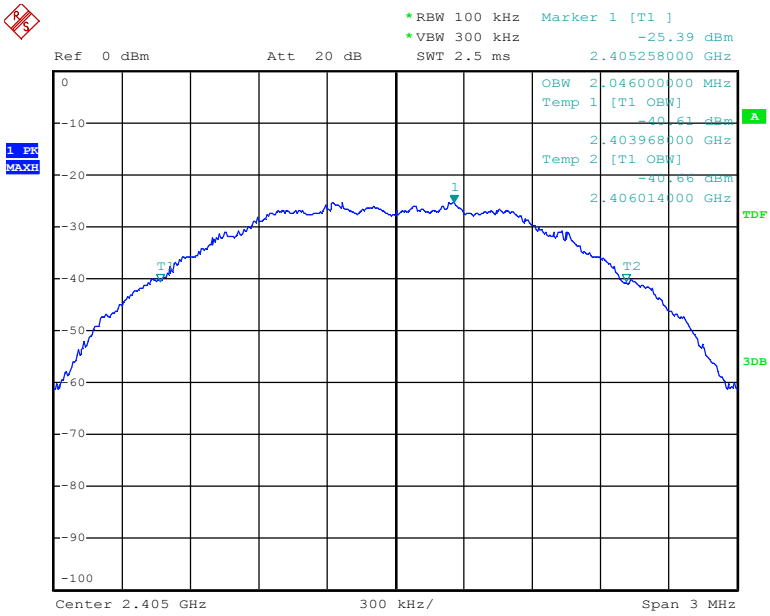
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)
Low	2 405	1.326	2.046	500
Middle	2 445	1.314	2.046	500
High	2 480	1.320	2.052	500

5.4.4 Test Plot

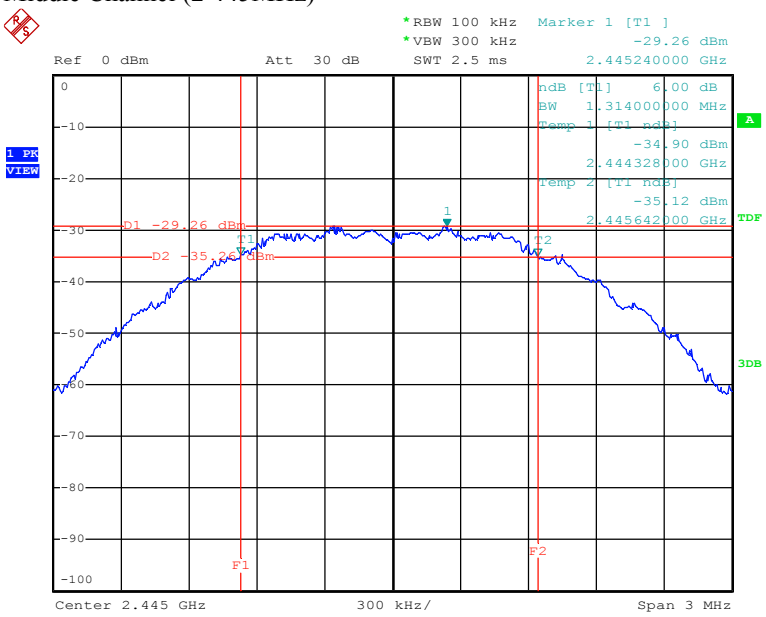
Figure 3. Plot of the 6dB Bandwidth (Conducted)

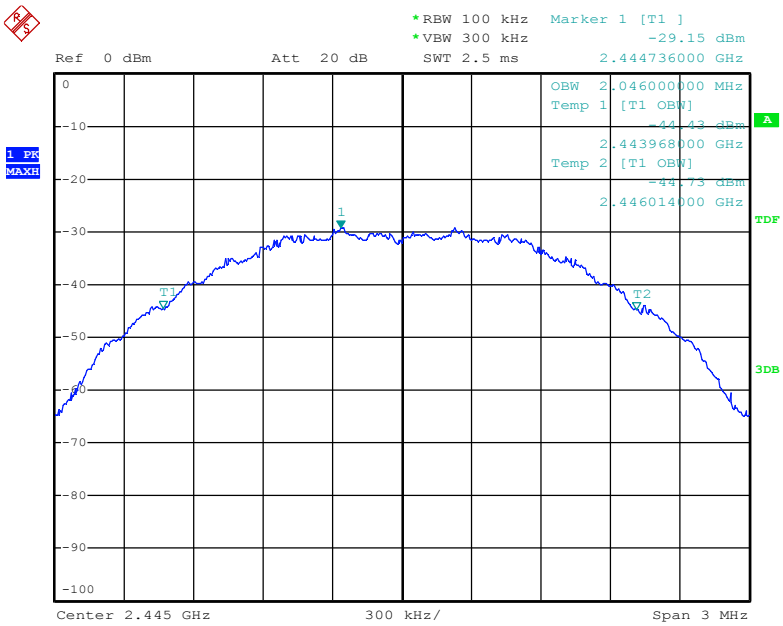
- Lowest Channel (2 405 MHz)



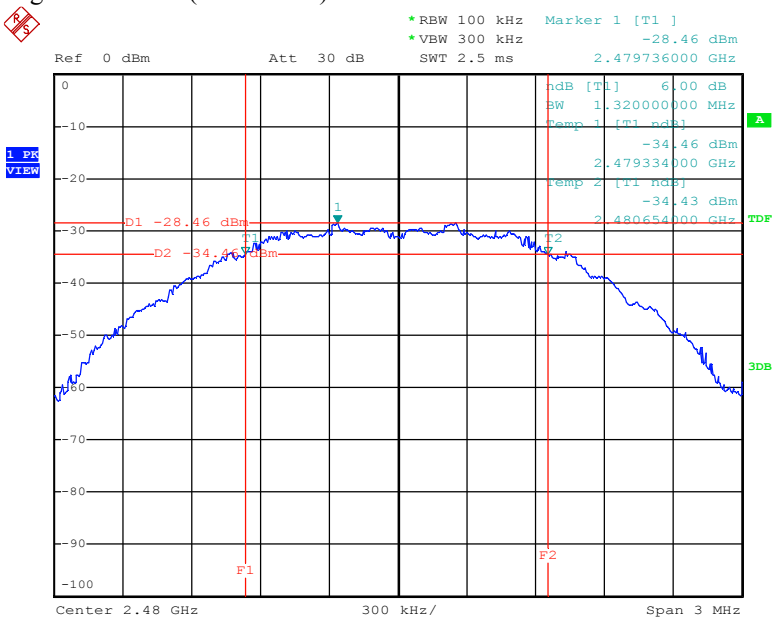


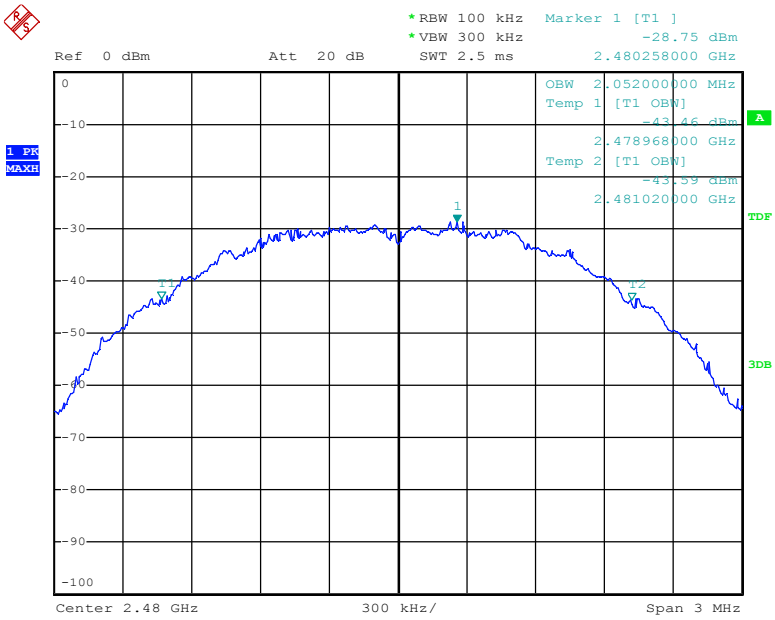
- Middle Channel (2 445MHz)





- Highest Channel (2 480 MHz)





5.5 SPURIOUS EMISSION, BAND EDGE, AND RESTRICTED BANDS

5.5.1 Regulation

According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, 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) (see Section 15.205(c)).
According to §15.209(a), for an intentional device, the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Field strength (μV/m @ 3m)	Field strength (dBμV/m @ 3m)
30–88	100	40.0
88–216	150	43.5
216–960	200	46.0
Above 960	500	54.0

According to §15.109(a), for an unintentional device, except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the above table.

** The emission limits shown in the above table are based on measurement instrumentation employing a CISPR quasi-peak detector and above 1000 MHz are based on the average value of measured emissions.

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5.5.2 Measurement Procedure

1) Band-edge Compliance of RF Conducted Emissions
2)

1. Set the spectrum analyzer as follows:
   Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation
   RBW ≥ 1% of the span
   VBW ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold
2. Allow the trace to stabilize. Set the marker on the emission at the band-edge, or on the highest modulation product outside of the band, if this level is greater than that at the band-edge. Enable the marker-delta function, and then use the marker-to-peak function to move the marker to the peak of the in-band emission.
3. Now, using the same instrument settings, enable the hopping function of the EUT. Allow the trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit.

2) Spurious RF Conducted Emissions:

1. Set the spectrum analyzer as follows:
   Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
   RBW = 100 kHz
   VBW ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold
2. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.

a 4 × 4 meter at the Open Area Test Site. The EUT was tested at a distance 3 meters.

5. Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.

3) Spurious Radiated Emissions:

1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 3 meters.
2. The EUT was placed on the top of the 0.8-meter height, 1 × 1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360˚.
3. The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 9 kHz to 30 MHz using the loop antenna, and from 30 to 1000 MHz using the TRILOG broadband antenna, and from 1000 MHz to 26500 MHz using the horn antenna.
4. To obtain the final measurement data, the EUT was arranged on a turntable situated on a 4 × 4 meter at the Open Area Test Site. The EUT was tested at a distance 3 meters.
5. Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.

5.5.3 Test Result

-complied

1. Band edge compliance of RF Conducted Emissions was shown in figure 4.
2. Band edge compliance of RF Radiated Emissions was shown in figure 5.
3. Spurious RF conducted Emissions were shown in the Figure 6.

   Note: We took the insertion loss of the cable into consideration within the measuring instrument.

4. Measured value of the Field strength of spurious Emissions (Radiated)

   - **Low channel (2 405 MHz)**

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(μV)]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
Quasi-Peak DATA. Emissions below 30 MHz							
9.102	9	V	22.1*	-18.8	3.3	29.5	26.2
Quasi-Peak DATA. Emissions below 1GHz							
33.258	120	V	30.7	-15.3	15.4	40.0	24.6
195.255	120	V	31.3	-16.1	15.2	43.5	28.3
Peak DATA. Emissions above 1GHz							
2 345.699	1 000	V	42.8	-2.3	40.5	74.0	33.5
4 810.750	1 000	V	53.1	6.8	59.9	74.0	14.1
Above 4 900.000	**Not Detected**	-	-	-	-	-	-
Average DATA. Emissions above 1GHz							
2 350.015	1 000	V	29.1	-2.3	27.2	54.0	26.8
4 810.750	1 000	V	43.1	6.8	49.9	54.0	4.1
Above 4 900.000	**Not Detected**	-	-	-	-	-	-

* Test Distance: 3m
  Spec Distance: 30m
  Reading value = reading + Distance correction factor(-20 dB) = 22.1 dB

- **Middle channel (2 445 MHz)**

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(μV)]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
Quasi-Peak DATA. Emissions below 30 MHz							
9.102	9	V	22.7*	-18.8	3.9	29.5	25.6
Quasi-Peak DATA. Emissions below 1GHz							
33.253	120	V	30.6	-15.3	15.3	40.0	24.7
193.553	120	V	29.1	-16.0	13.1	43.5	30.4
Peak DATA. Emissions above 1GHz							
4 890.830	1 000	H	53.2	6.7	59.9	74.0	14.1
Above 4 900.000	**Not Detected**	-	-	-	-	-	-
Average DATA. Emissions above 1GHz							
4 890.830	1 000	H	43.1	6.7	49.8	54.0	4.2
Above 4 900.000	**Not Detected**	-	-	-	-	-	-

* Test Distance: 3m
Spec Distance: 30m
Reading value = reading + Distance correction factor(-20 dB) = 22.7 dB

- **High channel (2 480 MHz)**

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(μV)]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
Quasi-Peak DATA. Emissions below 30 MHz							
9.102	9	V	22.5*	-18.8	3.7	29.5	25.8
Quasi-Peak DATA. Emissions below 1GHz							
33.336	120	V	30.1	-15.3	14.8	40.0	25.2
198.659	120	V	29.4	-16.2	13.2	43.5	30.3
Peak DATA. Emissions above 1GHz							
2 492.767	1 000	H	42.44	-2	40.4	74.0	33.6
4 959.000	1 000	H	55.5	6.8	62.3	74.0	11.7
Above 5 000.000	**Not Detected**	-	-	-	-	-	-
Average DATA. Emissions above 1GHz							
2 483.500	1 000	H	29.97	-2	29.9	54.0	24.1
4 959.000	1 000	H	43.5	6.8	50.3	54.0	3.7
Above 5 000.000	**Not Detected**	-	-	-	-	-	-

* Test Distance: 3m
Spec Distance: 30m
Reading value = reading + Distance correction factor(-20 dB) = 22.5 dB

Factor(dB) = ANT Factor+ Amp Gain + Cable Loss
Margin (dB) = Limit - Result
[Result = Reading – Factor]
1. H = Horizontal, V = Vertical Polarization
2. ATT = Attenuation (10dB pad and/or Insertion Loss of HPF), AF/CL = Antenna Factor and Cable Loss

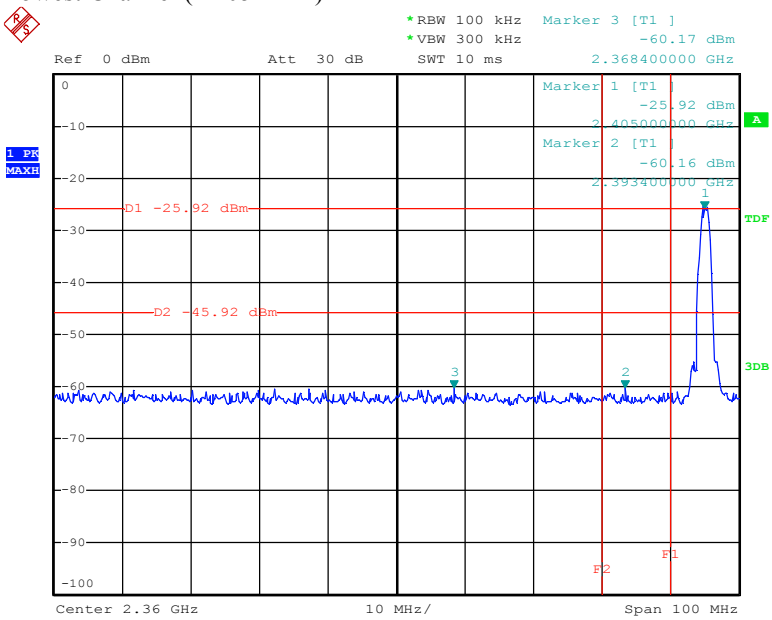
- The spurious emission at the frequency does not fall in the restricted bands.
- The measured result is within the test standard limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance.

NOTE: All emissions not reported were more than 20 dB below the specified limit or in the noise floor.

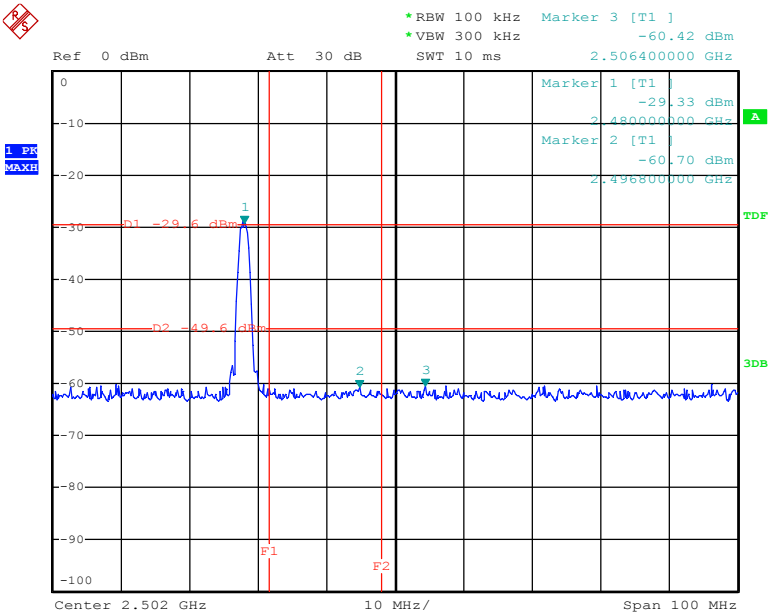
5.5.4 Test Plot

Figure 4. Plot of the Band Edge (Conducted)

- Lowest Channel (2 405 MHz)



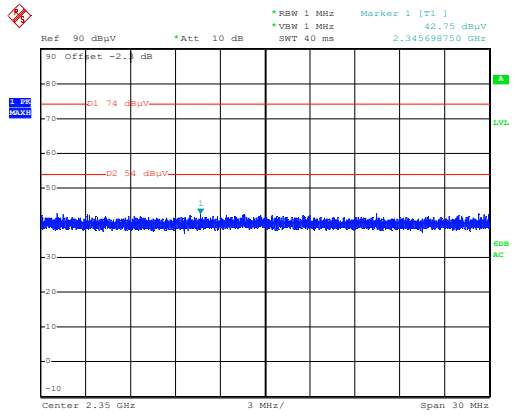
- Highest Channel (2 480MHz)



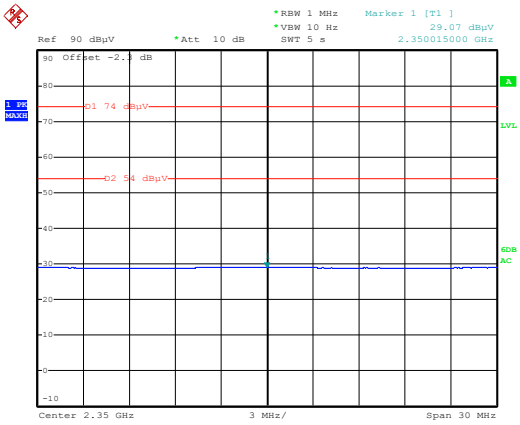
5.5.5 Test Plot (Continue)

Figure 5. Plot of the Band Edge (Radiated)

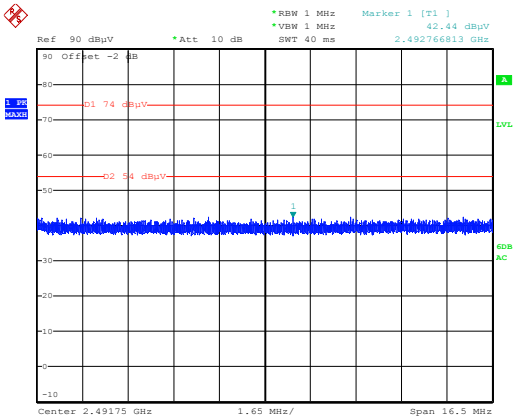
Lowest Channel(2 405 MHz): PEAK



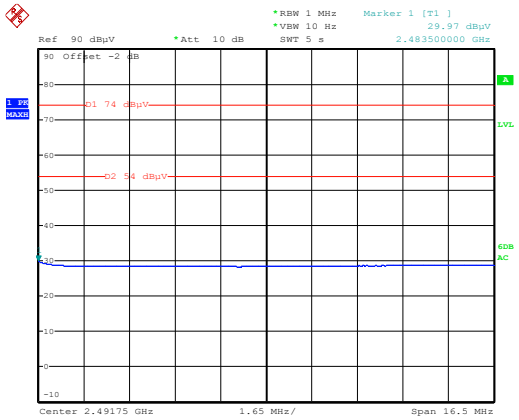
Lowest Channel(2 405 MHz): AVERAGE



Highest Channel(2 480 MHz): PEAK



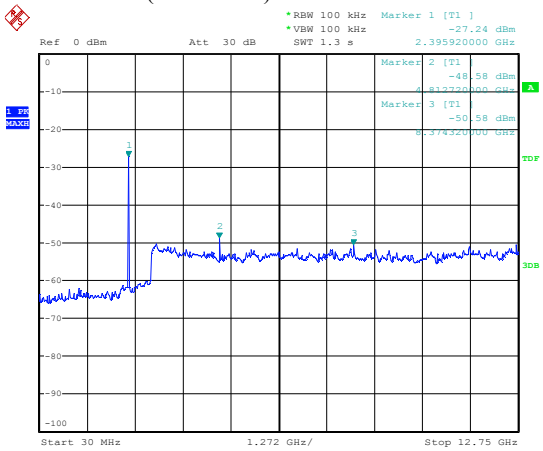
Highest Channel(2 480 MHz): AVERAGE



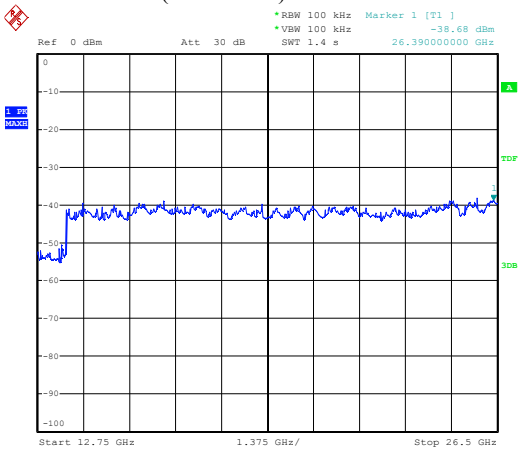
*** offset = Factor (ANT Factor+ Amp Gain + Cable Loss) [dB]**
= 2.3 dB (2 405 MHz)
= 2.0 dB (2 480 MHz)

Figure 6. Plot of the Spurious RF conducted emissions

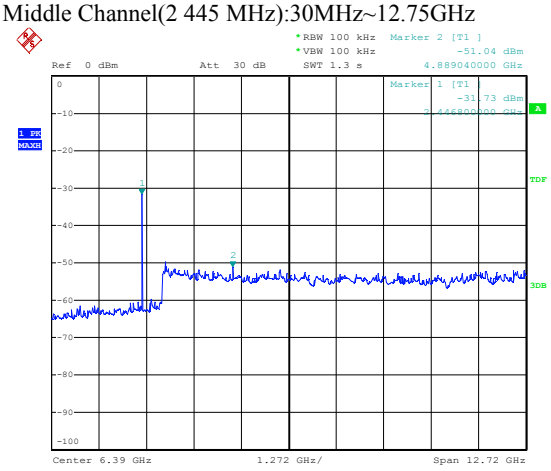
Lowest Channel(2 405 MHz):30MHz~12.75GHz



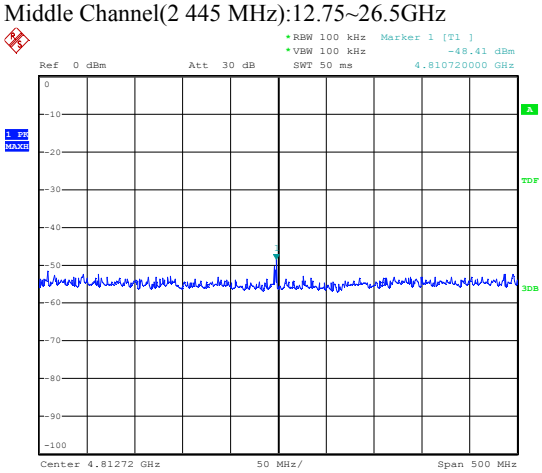
Lowest Channel(2 405 MHz):12.75~26.5GHz



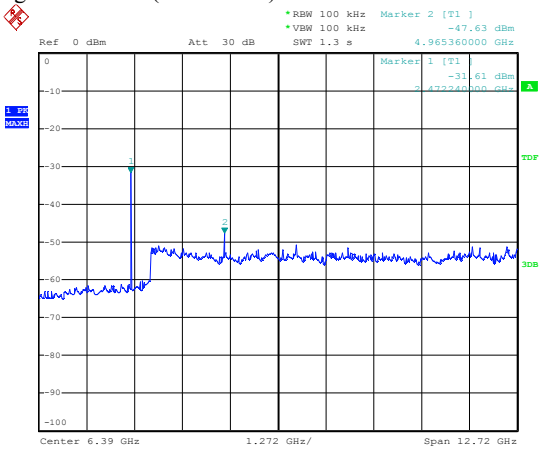
Middle Channel(2 445 MHz):30MHz~12.75GHz



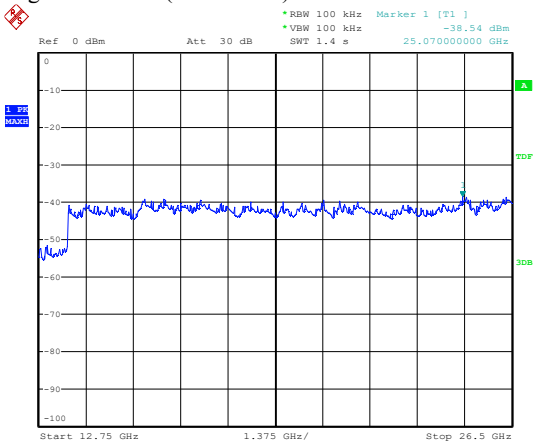
Middle Channel(2 445 MHz):12.75~26.5GHz



Highest Channel(2 480 MHz):30MHz~12.75GHz



Highest Channel(2 480 MHz):12.75~26.5GHz



5.6 Conducted Emission

5.6.1 Regulation

According to §15.207(a), 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 50μH/50Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Qausi-peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50

* Decreases with the logarithm of the frequency.

According to §15.107(a), for unintentional device, except for Class A digital devices, line conducted emission limits are the same as the above table.

5.6.2 Measurement Procedure

1. The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 cm in which is located 40 cm away from the vertical wall and 1.5m away from the side wall of the shielded room.
2. Each current-carrying conductor of the EUT power cord was individually connected through a 50Ω/50μH 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.

5.6.3 Test Result

-Complied

Frequency [MHz]	Correction Factor		Line	Quasi-peak				Average			
	LISN	Cable		Limit [dBuV]	Reading [dBuV]	Result [dBuV]	Margin [dB]	Limit [dBuV]	Reading [dBuV]	Result [dBuV]	Margin [dB]
0.159	9.96	0.01	N	65.21	30.92	40.89	24.32	55.21	13.82	23.79	31.42
0.165	9.96	0.01	N	63.95	30.23	40.27	23.68	53.95	15.04	25.08	28.87
0.351	10.02	0.01	N	62.86	29.60	39.64	23.22	52.86	14.18	24.22	28.64
0.426	10.90	0.01	H	62.74	27.44	37.48	25.26	52.74	16.42	26.46	26.28
0.429	10.11	0.01	N	62.89	28.61	38.65	23.24	51.89	10.73	20.77	31.12
0.561	10.11	0.01	H	56.00	27.85	37.97	18.03	46.00	19.74	29.86	16.14
1.032	9.92	0.02	H		29.36	39.58	16.42		21.83	32.05	13.95
1.113	9.92	0.02	N		27.65	37.69	18.31		18.85	28.89	17.11
2.286	9.86	0.02	N		18.14	28.08	27.92		8.72	18.66	27.34
4.870	10.19	0.04	H		20.57	30.55	25.45		10.82	20.80	25.20
8.610	11.25	0.07	H	60.00	16.75	26.98	33.02	50.00	6.09	16.32	33.68
9.250	11.01	0.07	H		9.86	27.50	32.50		4.07	21.71	28.29
9.260	11.25	0.07	N		7.80	25.36	34.64		2.31	19.87	30.13

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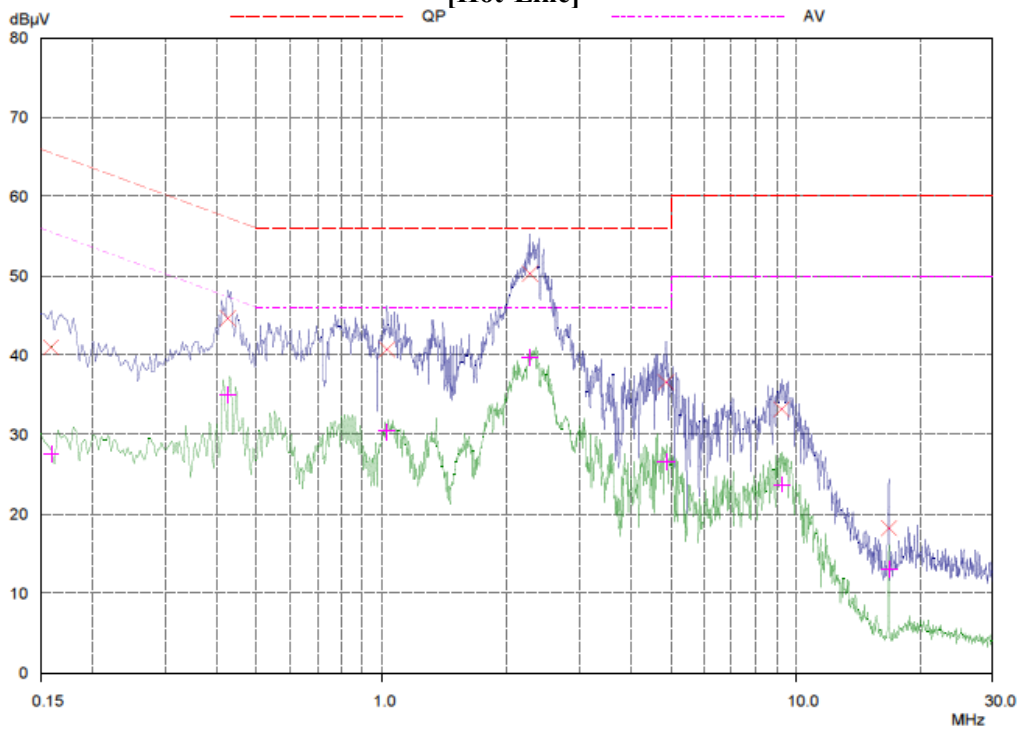
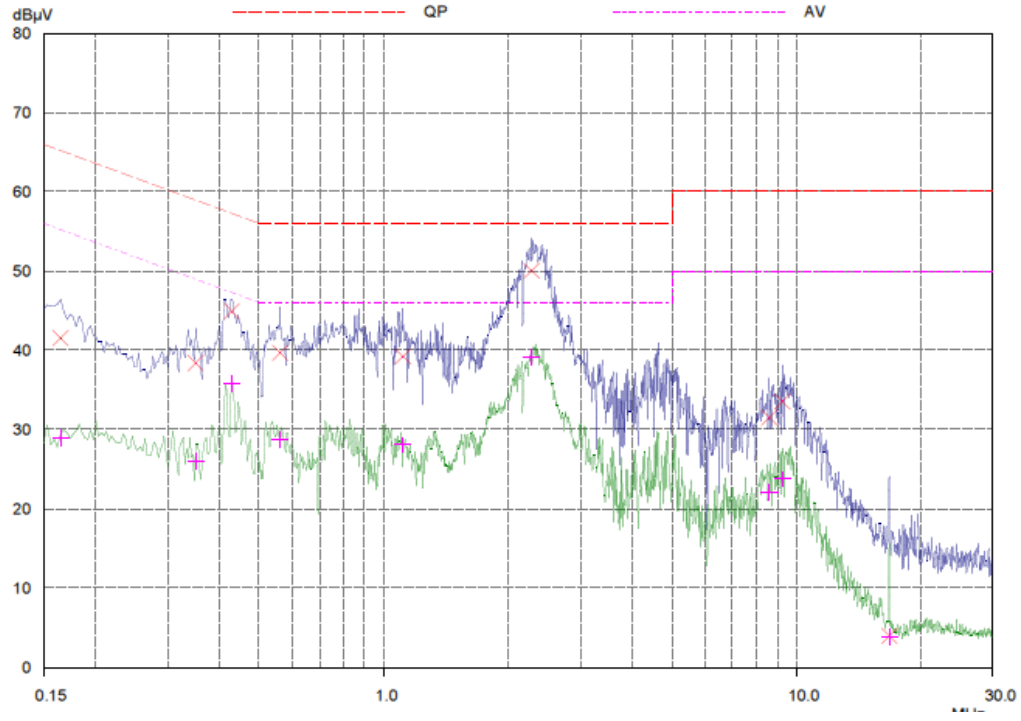
5.6.4 Test plot

[Hot-Line]



[Neutral-Line]



5.7 RF Exposure

5.7.1 Regulation

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this Chapter.

Limits for Maximum Permissive Exposure: RF exposure is calculated.

Frequency Range	Electric Field Strength [V/m]	Magnetic Field Strength [A/m]	Power Density [mW/cm^2]	Averaging Time [minute]
Limits for General Population / Uncontrolled Exposure				
0.3 ~ 1.34	614	1.63	*(100)	30
1.34 ~ 30	824 /f	2.19/f	*(180/f^2)	30
30 ~ 300	27.5	0.073	0.2	30
300 ~ 1500	/	/	f/1500	30
1500 ~ 15000	/	/	1.0	30

*f=frequency in MHz, *= plane-wave equivalent power density*

MPE (Maximum Permissive Exposure) Prediction
Predication of MPE limit at a given distance: Equation from page 18 of OET Bulletin 65, Edition 97-01

$S = PG/4\pi R^2 \quad \left(\Rightarrow R = \sqrt{PG/4\pi S}\right)$

S=power density [mW/cm^2]
P=Power input to antenna [mW]
G=Power gain of the antenna in the direction of interest relative to an isotropic radiator
R= distance to the center of radiation of the antenna [cm]

EUT: Maximum peak output power = 0.5 [mW] (= -3.05 dBm) Antenna gain=2.5 (= 3.94 [dBi])	
100 mW, at 20 cm from an antenna 6[dBi]	S = PG/4πR² = 100 × 3.98 / (4 × π × 400) = 0.0792 [mW/cm^2] < 1.0 [mW/cm^2]
0.5 mW, at 20 cm from an antenna 3.94 [dBi]	S = PG/4πR²= 0.00024868 [mW/cm^2] < 1.0 [mW/cm^2]
0.5 mW, at 2.5 cm from an antenna 3.94 [dBi]	S = PG/4πR²= 0.01591549 [mW/cm^2] < 1.0 [mW/cm^2]

5.7.2 RF Exposure Compliance Issue

The information should be included in the user's manual:
This appliance and its antenna must not be co-located or operation in conjunction with any other antenna or transmitter. A minimum separation distance of 20 cm must be maintained between the antenna and the person for this appliance to satisfy the RF exposure requirements.

6. Test equipment used for test

	Description	Manufacture	Model No.	Serial No.	Next Cal Date.
□	Temp & humidity chamber	taekwang	TK-04	TK001	12.12.10
□	Temp & humidity chamber	taekwang	TK-500	TK002	12.09.05
□	Power Meter	Agilent	E4416A	GB41292365	12.10.26
□	Frequency Counter	HP	53150A	US39250565	12.09.07
□	Spectrum Analyzer	Agilent	E4407B	US39010142	12.10.26
■	Spectrum Analyzer	R & S	FSP40	100209	12.10.26
■	Signal Generator	R & S	SMR40	100007	13.06.27
□	Modulation Analyzer	HP	8901B	3538A05527	12.10.26
□	Audio Analyzer	HP	8903B	3729A19213	12.10.28
■	AC Power Supply	KIKUSUI	PCR2000W	GB001619	12.10.25
□	DC Power Supply	Tektronix	PS2520G	TW50517	13.02.06
□	DC Power Supply	Tektronix	PS2521G	TW53135	12.10.25
□	Dummy Load	BIRD	8141	7560	12.09.16
□	Dummy Load	BIRD	8401-025	799	12.09.16
■	EMI Test Receiver	R&S	ESCI	100001	13.07.10
□	Attenuator	HP	8494A	2631A09825	12.10.26
□	Attenuator	HP	8496A	3308A16640	12.10.26
□	Attenuator	R & S	RBS1000	D67079	12.10.26
□	Power sensor	R & S	NRP-Z81	100677	13.05.04
■	LOOP Antenna	EMCO	EMCO6502	9205-2745	13.05.23
■	BILOG Antenna	Schwarzbeck	VULB 9168	375	13.09.21
■	HORN Antenna	ETS	3115	00062589	13.09.06
□	HORN Antenna	ETS	3116	00086632	13.11.15
□	Power Divider	Weinschel	1580-1	NX375	12.10.26
□	Power Divider	Weinschel	1580-1	NX380	12.09.14
□	Power Divider	Weinschel	1594	671	12.09.14
■	Test Receiver	R&S	ESHS30	828765/009	12.10.28
■	LISN	R&S	ENV216	101358	12.10.26
■	LISN	PMM	L2-16A	0000J10705	-

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