

TEST REPORT



CTK Co., Ltd.
(Ho-dong), 113, Yejik-ro, Cheoin-gu,
Yongin-si, Gyeonggi-do, Korea
Tel: +82-31-339-9970
Fax: +82-31-624-9501

Report No.:
CTK-2019-01409
Page (1) / (43) Pages

1. Client

- Name : SystemBase Co., Ltd.
- Address : Daerung Post Tower-1 16F, 288, Digital-ro, Guro-gu, Seoul, Republic of Korea
- Date of Receipt : 2019-01-25

2. Manufacturer

- Name : SystemBase Co., Ltd.
- Address : Daerung Post Tower-1 16F, 288, Digital-ro, Guro-gu, Seoul, Republic of Korea

3. Use of Report : For FCC Certification

4. Test Sample / Model: sLory-1010DIL/ALL / sLory



5. Date of Test : 2019-03-19 to 2019-04-19

6. Test Standard(method) used : FCC 47 CFR part 15 subpart C 15.247,
ANSI C63.10-2013

7. Testing Environment: Temp.: (23 ± 1) °C, Humidity: (48 ± 5) % R.H.

8. Test Results : Compliance

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

Affirmation	Gwanyong Kim:  (Signature)	Technical Manager Young-taek Lee:  (Signature)
-------------	---	--

2019-04-19

Republic of KOREA **CTK Co., Ltd.**



CTK Co., Ltd.
(Ho-dong), 113, Yejik-ro, Cheoin-gu,
Yongin-si, Gyeonggi-do, Korea
Tel: +82-31-339-9970
Fax: +82-31-624-9501

Report No. :
CTK-2019-01409
Page (2) / (43) Pages

REPORT REVISION HISTORY

Date	Revision	Page No
2019-04-19	Issued (CTK-2019-01409)	all

This report shall not be reproduced except in full, without the written approval of CTK Co., Ltd. This document may be altered or revised by CTK Co., Ltd. personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by CTK Co., Ltd. will constitute fraud and shall nullify the document.



CTK Co., Ltd.
(Ho-dong), 113, Yejik-ro, Cheoin-gu,
Yongin-si, Gyeonggi-do, Korea
Tel: +82-31-339-9970
Fax: +82-31-624-9501

Report No. :
CTK-2019-01409
Page (3) / (43) Pages

CONTENTS

1. General Product Description	4
1.1 Client Information	4
1.2 Product Information.....	4
1.3 Peripheral Devices	4
2. Facility and Accreditations.....	5
2.1 Test Facility	5
2.2 Laboratory Accreditations and Listings.....	5
2.3 Calibration Details of Equipment Used for Measurement.....	5
3. Test Specifications	6
3.1 Standards	6
3.2 Mode of operation during the test	7
3.3 Maximum Measurement Uncertainty	7
4. Technical Characteristic Test.....	8
4.1 6dB Bandwidth	8
4.2 Maximum peak Conducted Output Power	13
4.3 Power Spectral Density	17
4.4 Band Edge & Conducted Spurious emission	19
4.5 Radiated Emission	30
4.6 AC Conducted Emissions	38
APPENDIX A – Test Equipment Used For Tests	43



CTK Co., Ltd.
(Ho-dong), 113, Yejik-ro, Cheoin-gu,
Yongin-si, Gyeonggi-do, Korea
Tel: +82-31-339-9970
Fax: +82-31-624-9501

Report No. :
CTK-2019-01409
Page (4) / (43) Pages

1. General Product Description

1.1 Client Information


Company	SystemBase Co., Ltd.
Contact Point	Daerung Post Tower-1 16F, 288, Digital-ro, Guro-gu, Seoul, Republic of Korea
Contact Person	Name : Myunghyun Kim E-mail : mkim@sysbas.com Tel : +82-2-855-0501

1.2 Product Information

FCC ID	PROSLORY1010DILA
Product Description	sLory-1010DIL/ALL
Basia Model name	sLory
Variant Model name	rLory-1010DIL/ALL The variant model has no electrical / electronic characteristics, circuit, appearance or structural difference with the basic model. It does not transmit the data signal coming from the serial port to LoRa like basic model but sends the signal coming in LoRa back to other device as LoRa signal. It serves as a repeater.
Operating Frequency	917.3 MHz - 923.3 MHz
RF Output Power	8.746 dBm (7.492 mW)
Antenna type	Dipole Antenna
Antenna gain	2.625 dBi
Number of channels	20
Type of Modulation	DSSS
Power Source	DC 5 V (Adapter & Serial Port)

1.3 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.
Notebook Computer	HP	15-bs563TU	CND7253R6P
AC/DC Adapter	HP	HSTNN-LA40	7628207801





 <p>CTK Co., Ltd. The Prime Leader of Global Regulatory Certification</p>	<p>CTK Co., Ltd. (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea Tel: +82-31-339-9970 Fax: +82-31-624-9501</p>	<p>Report No. : CTK-2019-01409 Page (5) / (43) Pages</p>	
---	--	--	--

2. Facility and Accreditations

2.1 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea.

2.2 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Registration Number	Logo
USA	FCC	FCC Part 15 & 18 EMI (Electromagnetic Interference / Emission)	805871	
CANADA	ISED	ISED EMI (3/10m test site)	8737A-2	
JAPAN	VCCI	VCCI V-3 EMI (Electromagnetic Interference / Emission)	C-986 T-1843 R-3627 G-387	
KOREA	MSIP	EMI (Electromagnetic Interference / Emission) EMS (Electromagnetic Susceptibility / Immunity)	KR0025	

2.3 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.



CTK Co., Ltd.
(Ho-dong), 113, Yejik-ro, Cheoin-gu,
Yongin-si, Gyeonggi-do, Korea
Tel: +82-31-339-9970
Fax: +82-31-624-9501

Report No. :
CTK-2019-01409
Page (6) / (43) Pages

3. Test Specifications

3.1 Standards

Section in FCC	Requirement(s)	Status (Note 1)	Test Condition
15.247(a)	6 dB Bandwidth	C	Conducted
15.247(e)	Transmitter power spectral density	C	
15.247(b)	Maximum peak conducted output power	C	
15.247(d)	Unwanted emission	C	
15.209	Transmitter emission	C	Radiated
15.207(a)	AC Conducted Emission	C	Line Conducted

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: The data in this test report are traceable to the national or international standards.

Note 3: The sample was tested according to the following specification: FCC Part 15.247, ANSI C63.10-2013

Note 4: The tests were performed according to the method of measurements prescribed in KDB No.558074.



CTK Co., Ltd.
(Ho-dong), 113, Yejik-ro, Cheoin-gu,
Yongin-si, Gyeonggi-do, Korea
Tel: +82-31-339-9970
Fax: +82-31-624-9501

Report No. :
CTK-2019-01409
Page (7) / (43) Pages

3.2 Mode of operation during the test

The EUT is operated in a manner representative of the typical of the equipments.
During at testing, system components were manipulated within the confines of typical usage to maximize each emission. All modulation modes were tests.
The results are only attached worst cases.

Test Frequency

Lowest channel	Middle channel	Highest channel
917.3 MHz	920.3 MHz	923.3 MHz

Test mode

Modulation	Duty Cycle
DSSS	24.8 % (On time : 249 ms, Off time : 753 ms)

Power Source

Adapter	DC 5 V
Serial Port	DC 5 V

3.3 Maximum Measurement Uncertainty

The value of the measurement uncertainty for the measurement of each parameter.
Coverage factor $k = 2$, Confidence levels of 95 %

Description	Uncertainty
Conducted RF Output Power	1.5 dB
Power Spectral Density	1.5 dB
Occupied Bandwidth	0.1 MHz
Unwanted Emission(conducted)	3.0 dB
Radiated Emissions ($f \leq 1$ GHz)	4.0 dB
Radiated Emissions ($f > 1$ GHz)	5.0 dB



CTK Co., Ltd.
(Ho-dong), 113, Yejik-ro, Cheoin-gu,
Yongin-si, Gyeonggi-do, Korea
Tel: +82-31-339-9970
Fax: +82-31-624-9501

Report No. :
CTK-2019-01409
Page (8) / (43) Pages

4. Technical Characteristic Test

4.1 6dB Bandwidth

Test Procedures(ANSI C63.10-2013 6.9.2)

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.

Test Procedures(ANSI C63.10-2013 6.9.3)

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

Use the 99% power bandwidth function of the instrument and report the measured bandwidth.

Test Settings :

Center frequency = the highest, middle and the lowest channels

- a) RBW = 100 kHz
- b) VBW $\geq 3 \times$ RBW
- c) Detector = peak
- d) Trace mode = Max hold
- e) Sweep = auto couple
- f) Allow trace to fully stabilize
- g) 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.

Limit :

6 dB Bandwidth > 500kHz



CTK Co., Ltd.
(Ho-dong), 113, Yejik-ro, Cheoin-gu,
Yongin-si, Gyeonggi-do, Korea
Tel: +82-31-339-9970
Fax: +82-31-624-9501

Report No. :
CTK-2019-01409
Page (9) / (43) Pages

Test Data : Adapter

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	99% Bandwidth [MHz]	Result
Low	917.3	0.770	0.795	Complies
Middle	920.3	0.763	0.787	
High	923.3	0.776	0.796	

Test Data : Serial Port

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	99% Bandwidth [MHz]	Result
Low	917.3	0.757	0.786	Complies
Middle	920.3	0.765	0.791	
High	923.3	0.773	0.803	

See next pages for actual measured spectrum plots.

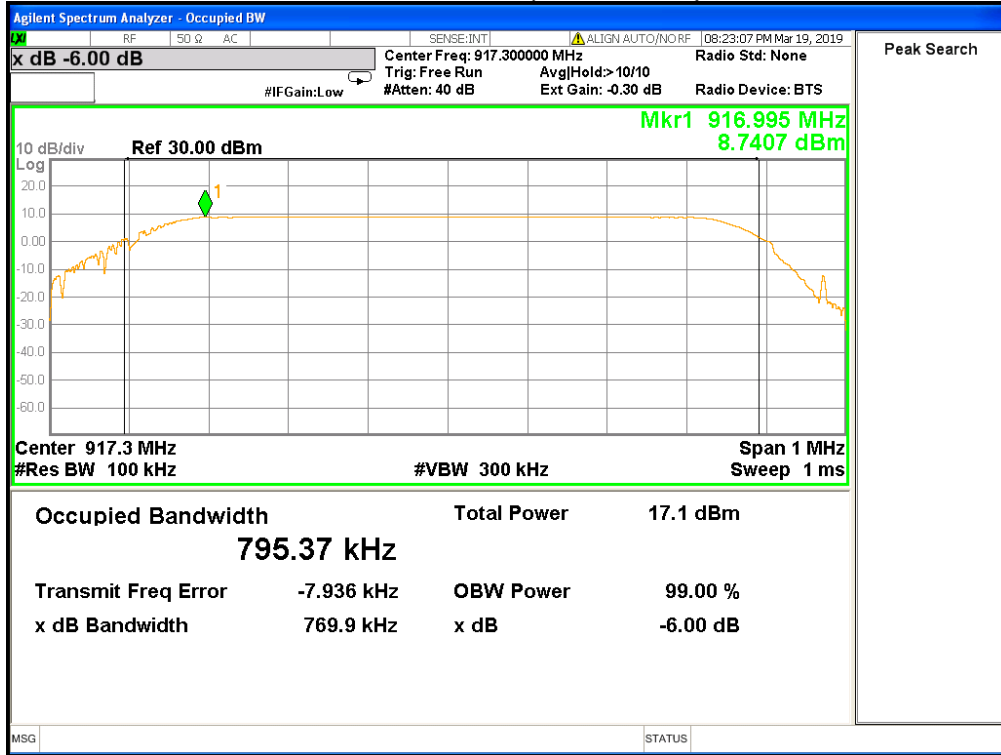


CTK Co., Ltd.
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,
 Yongin-si, Gyeonggi-do, Korea
 Tel: +82-31-339-9970
 Fax: +82-31-624-9501

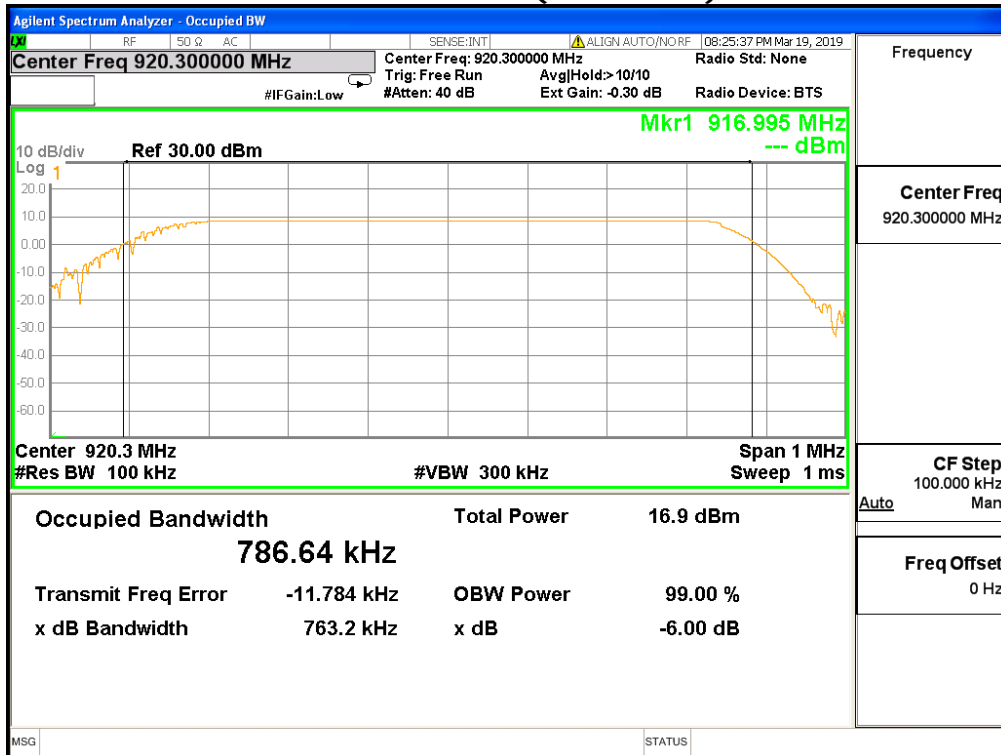
Report No. :
 CTK-2019-01409
 Page (10) / (43) Pages

Test Data : Adapter

Low channel (917.3 MHz)



Middle channel (920.3 MHz)

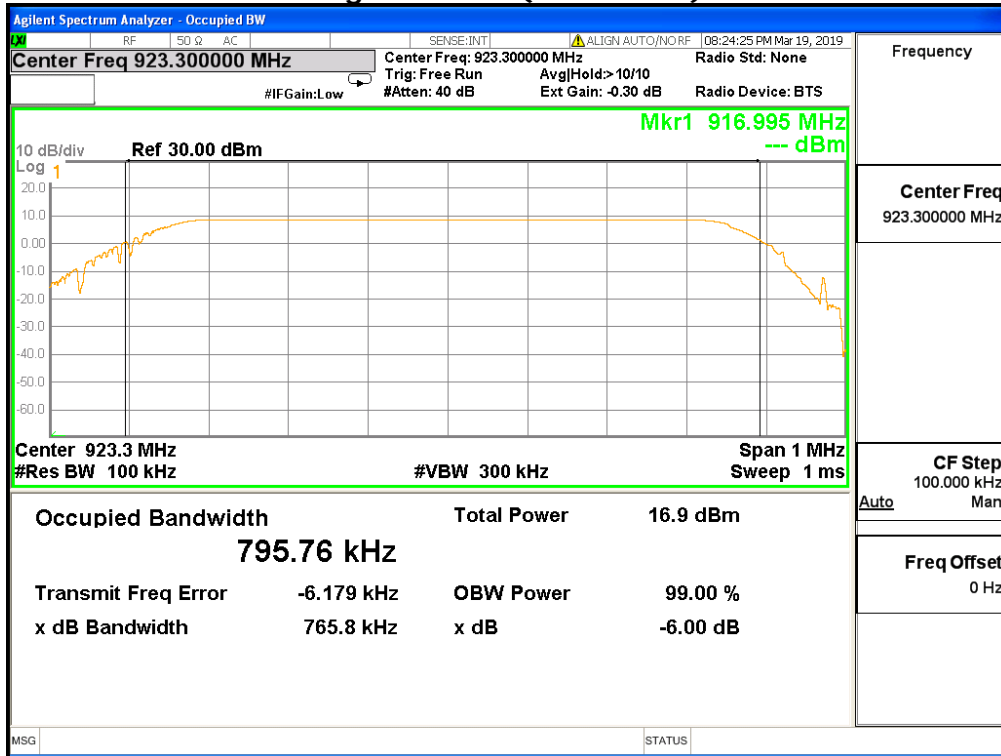




CTK Co., Ltd.
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,
 Yongin-si, Gyeonggi-do, Korea
 Tel: +82-31-339-9970
 Fax: +82-31-624-9501

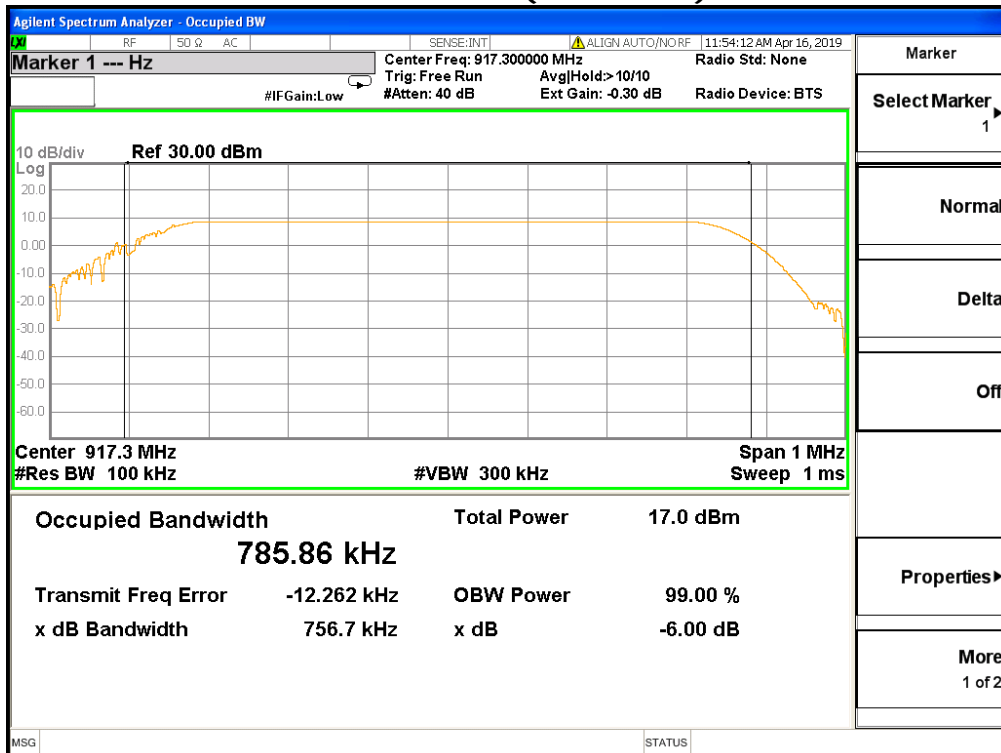
Report No. :
 CTK-2019-01409
 Page (11) / (43) Pages

High channel (923.3 MHz)



Test Data : Serial Port

Low channel (917.3 MHz)

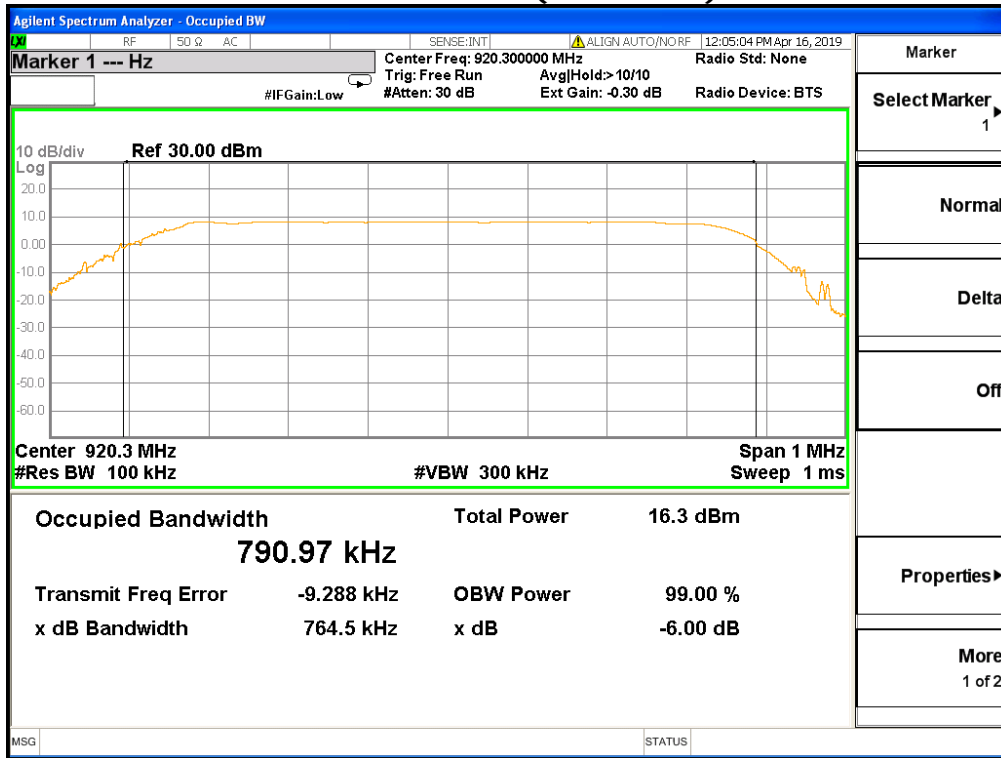




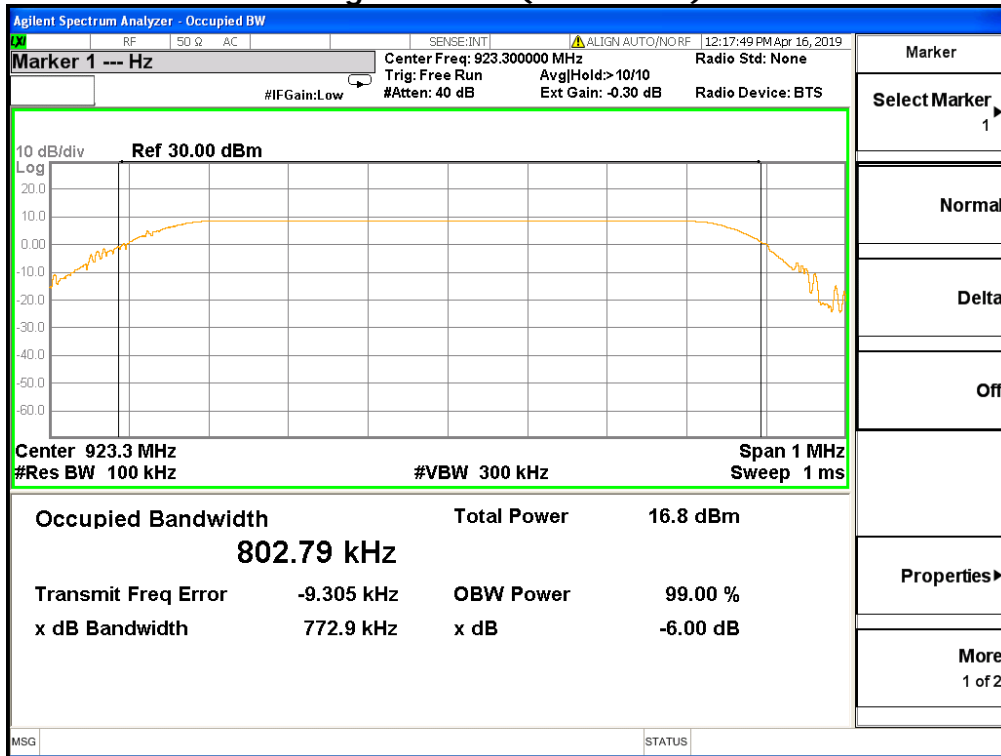
CTK Co., Ltd.
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,
 Yongin-si, Gyeonggi-do, Korea
 Tel: +82-31-339-9970
 Fax: +82-31-624-9501

Report No. :
 CTK-2019-01409
 Page (12) / (43) Pages

Middle channel (920.3 MHz)



High channel (923.3 MHz)





4.2 Maximum peak Conducted Output Power

Test Procedures(ANSI C63.10-2013 11.9.1)

The following procedure can be used when the maximum available RBW of the instrument is less than the DTS bandwidth:

Test Settings:

Center frequency = the highest, middle and the lowest channels

- a) RBW \geq DTS Bandwidth
- b) VBW \geq 3 x RBW
- c) span \geq 3 x RBW
- d) Sweep time = auto couple
- e) Detector = peak
- f) Trace mode= max hold
- g) Allow trace to fully stabilize
- h) Use peak marker function to determine the peak amplitude level.

Limit :

Maximum Output Power < 1 W (30 dBm)

Test Data : Adapter

Channel	Frequency [MHz]	Measurement data [dBm]	Limit [dBm]	Result
Low	917.3	8.746	30	Complies
Middle	920.3	8.642	30	
High	923.3	8.533	30	

Test Data : Serial Port

Channel	Frequency [MHz]	Measurement data [dBm]	Limit [dBm]	Result
Low	917.3	8.654	30	Complies
Middle	920.3	8.452	30	
High	923.3	8.439	30	

See next pages for actual measured spectrum plots.

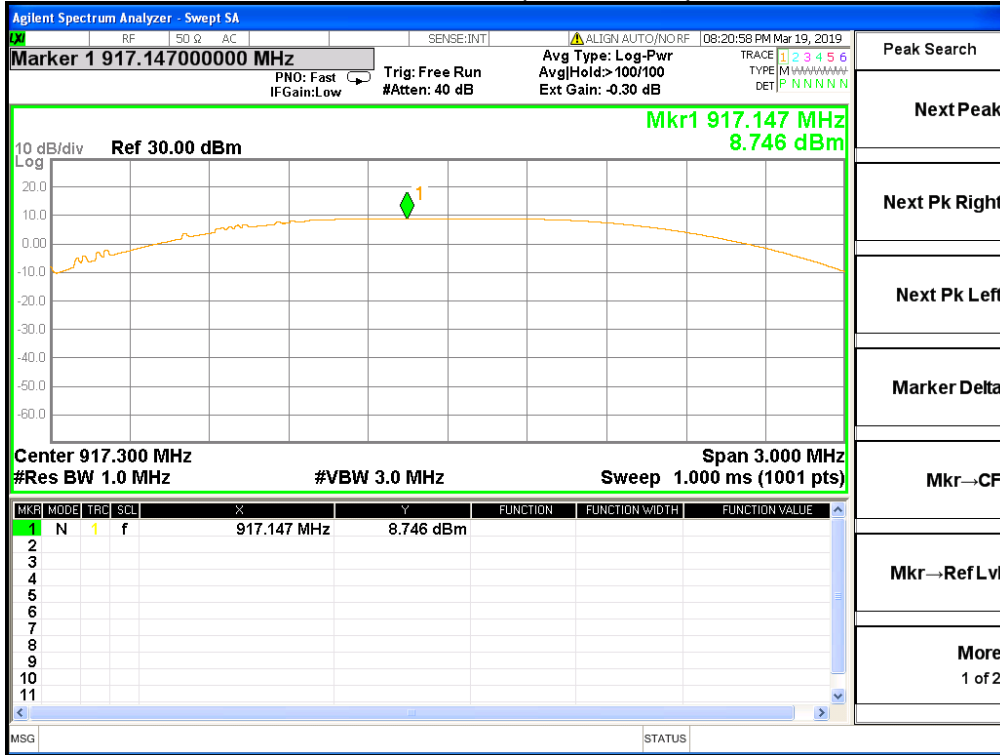


CTK Co., Ltd.
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,
 Yongin-si, Gyeonggi-do, Korea
 Tel: +82-31-339-9970
 Fax: +82-31-624-9501

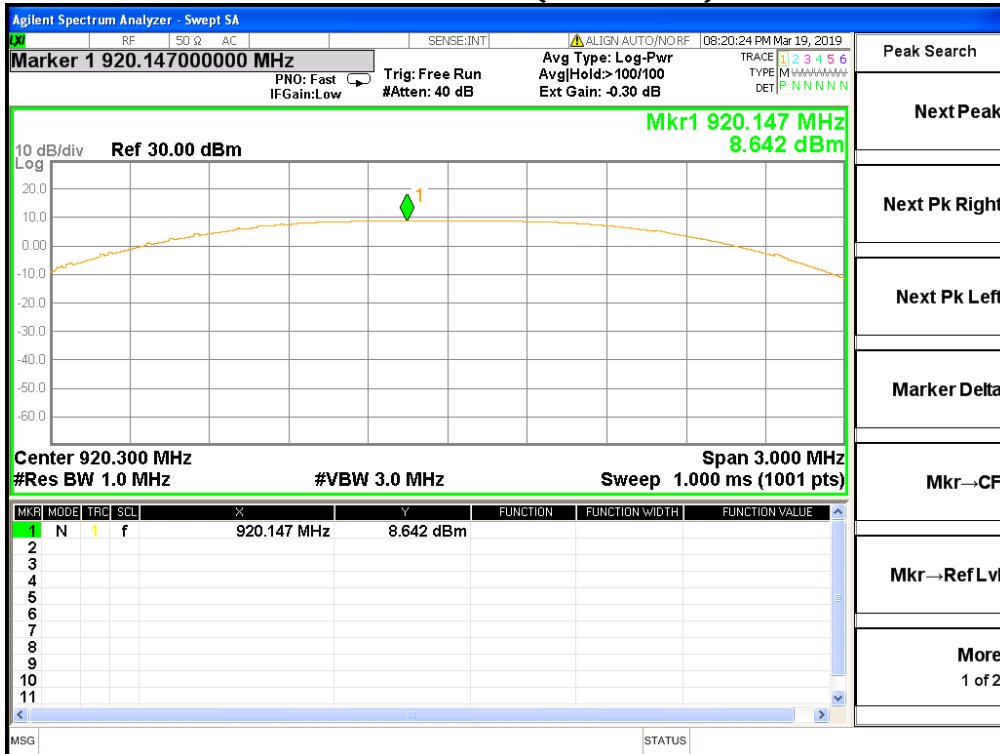
Report No. :
 CTK-2019-01409
 Page (14) / (43) Pages

Test Data : Adapter

Low channel (917.3 MHz)



Middle channel (920.3 MHz)

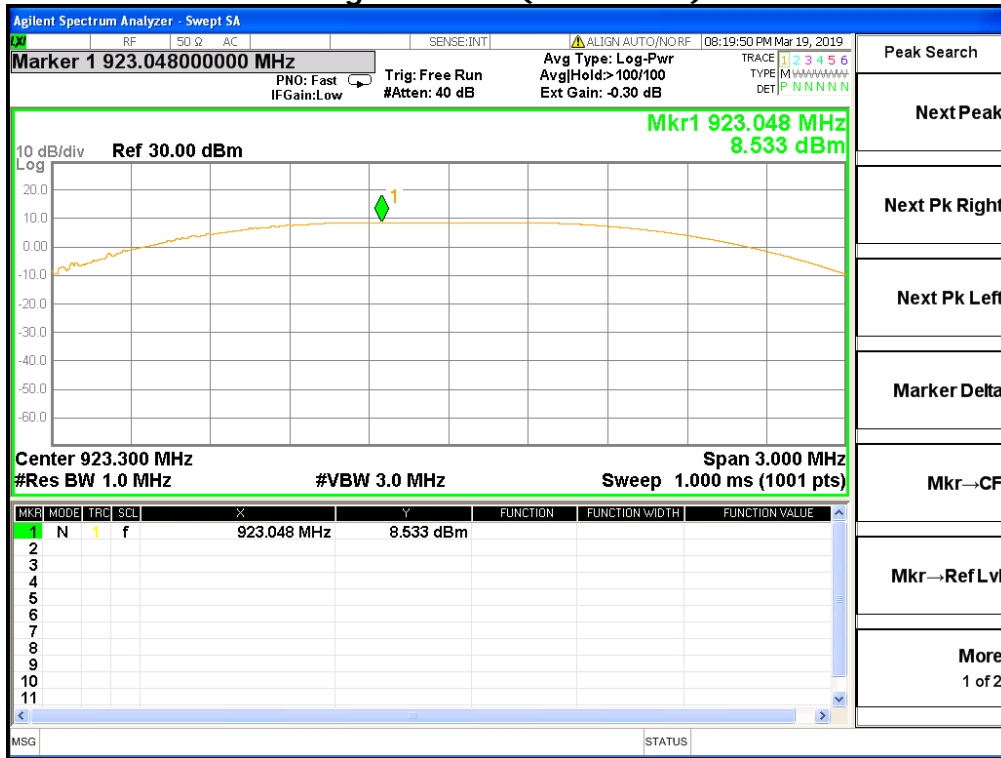




CTK Co., Ltd.
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,
 Yongin-si, Gyeonggi-do, Korea
 Tel: +82-31-339-9970
 Fax: +82-31-624-9501

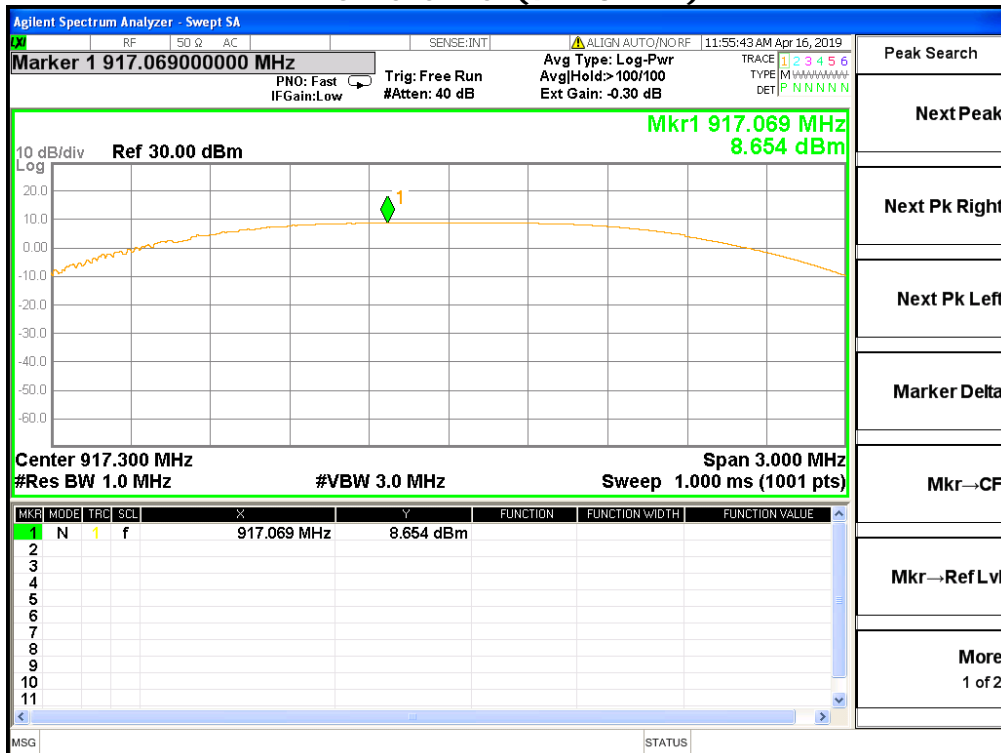
Report No. :
 CTK-2019-01409
 Page (15) / (43) Pages

High channel (923.3 MHz)



Test Data : Serial Port

Low channel (917.3 MHz)

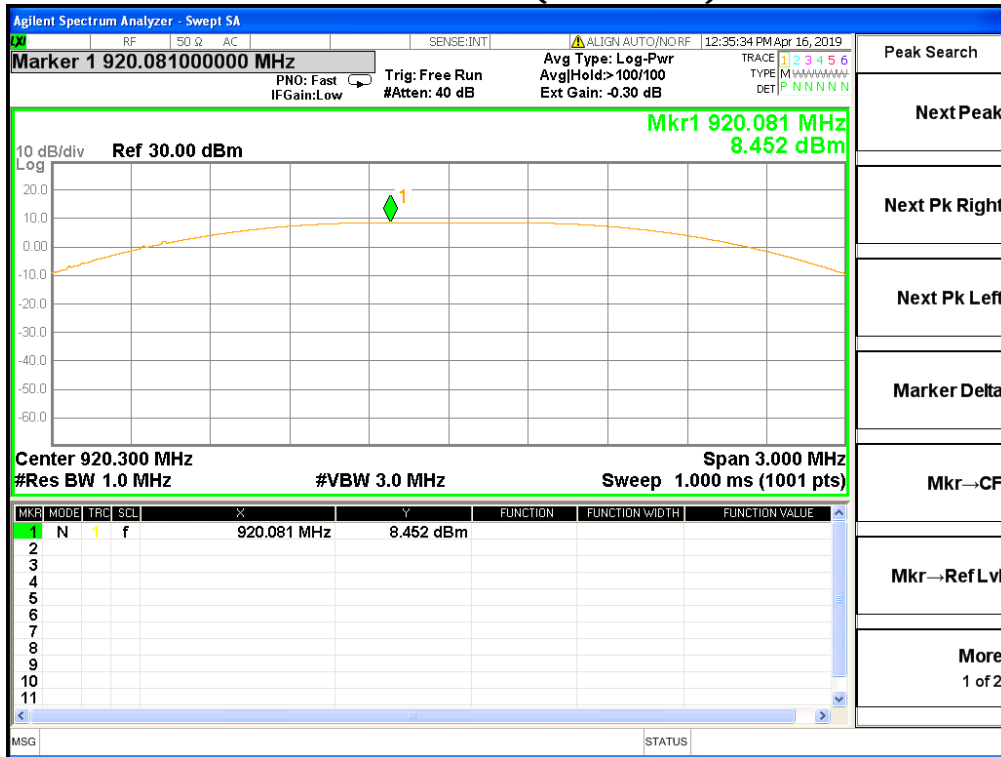




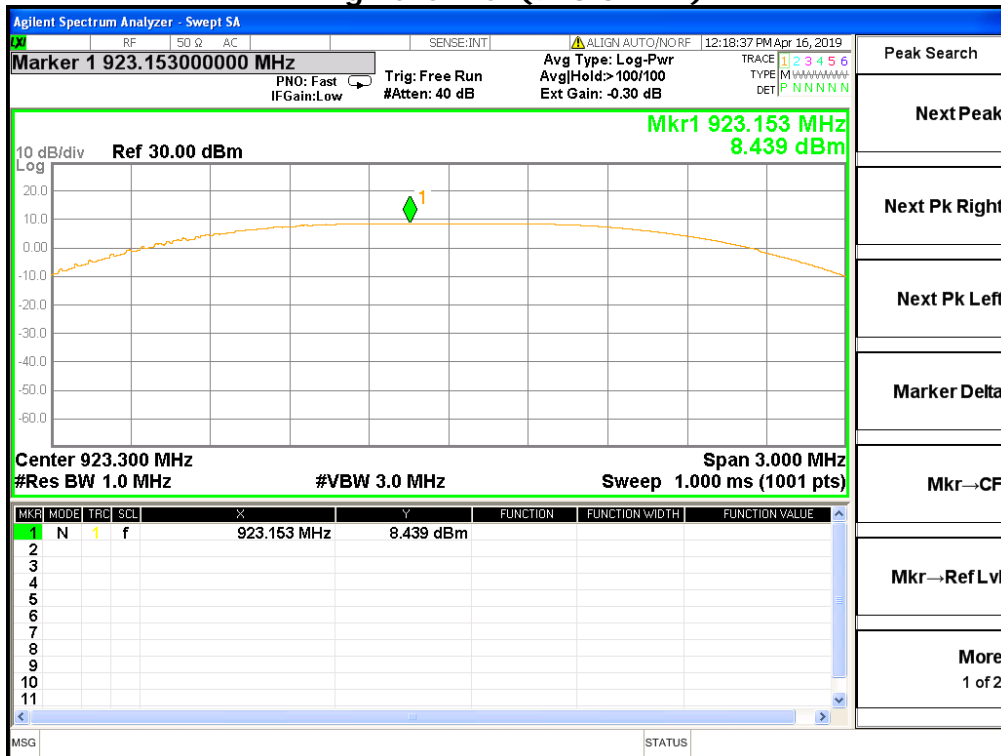
CTK Co., Ltd.
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,
 Yongin-si, Gyeonggi-do, Korea
 Tel: +82-31-339-9970
 Fax: +82-31-624-9501

Report No. :
 CTK-2019-01409
 Page (16) / (43) Pages

Middle channel (920.3 MHz)



High channel (923.3 MHz)



4.3 Power Spectral Density

Test Procedures(ANSI C63.10-2013 11.10.2)

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance.

Test Settings:

Center frequency = the highest, middle and the lowest channels

- a) RBW : $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
- b) VBW $\geq 3 \times \text{RBW}$
- c) span $\geq 1.5 \times \text{DTS bandwidth}$
- d) Sweep time = auto couple
- e) Detector = peak
- f) Trace mode= max hold
- g) Allow trace to fully stabilize
- h) Use the peak marker function to determine the maximum amplitude level within the RBW.

Limit :

Power Spectral Density < 8 dBm @ 3 kHz BW

Test Data : Adapter

Channel	Frequency [MHz]	Measurement data [dBm]	Limit [dBm]	Result
Low	917.3	5.166	8	Complies
Middle	920.3	5.093		
High	923.3	4.938		

Test Data : Serial Port

Channel	Frequency [MHz]	Measurement data [dBm]	Limit [dBm]	Result
Low	917.3	5.076	8	Complies
Middle	920.3	4.165		
High	923.3	4.276		

See next pages for actual measured spectrum plots.

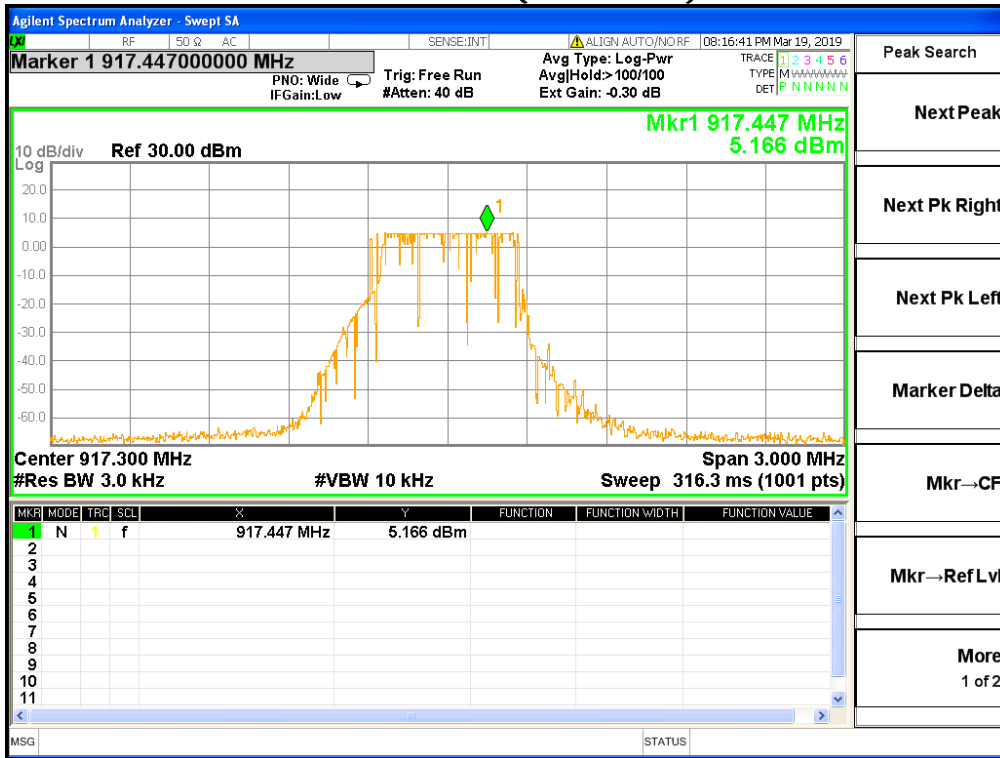


CTK Co., Ltd.
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,
 Yongin-si, Gyeonggi-do, Korea
 Tel: +82-31-339-9970
 Fax: +82-31-624-9501

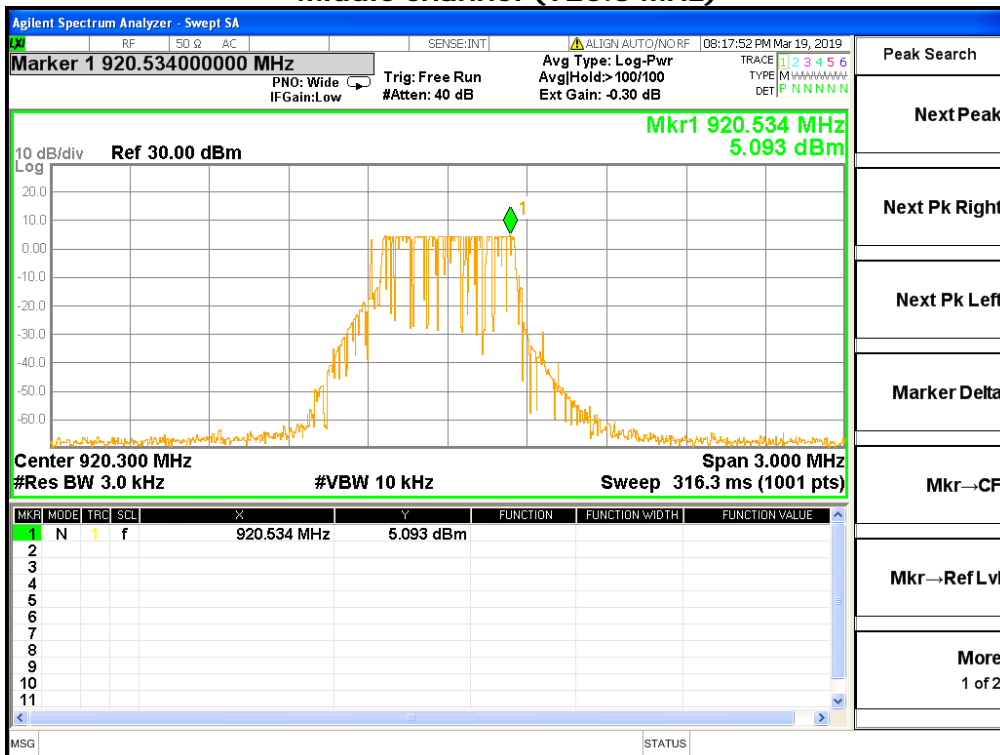
Report No. :
 CTK-2019-01409
 Page (18) / (43) Pages

Test Data : Adapter

Low channel (917.3 MHz)



Middle channel (920.3 MHz)

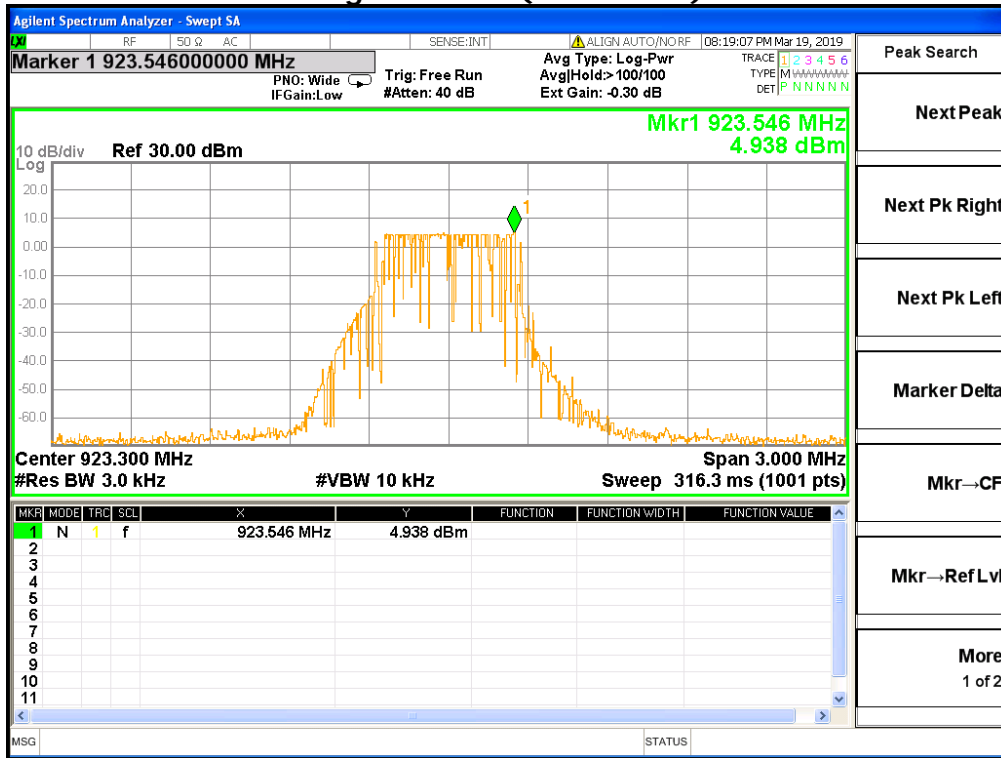




CTK Co., Ltd.
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,
 Yongin-si, Gyeonggi-do, Korea
 Tel: +82-31-339-9970
 Fax: +82-31-624-9501

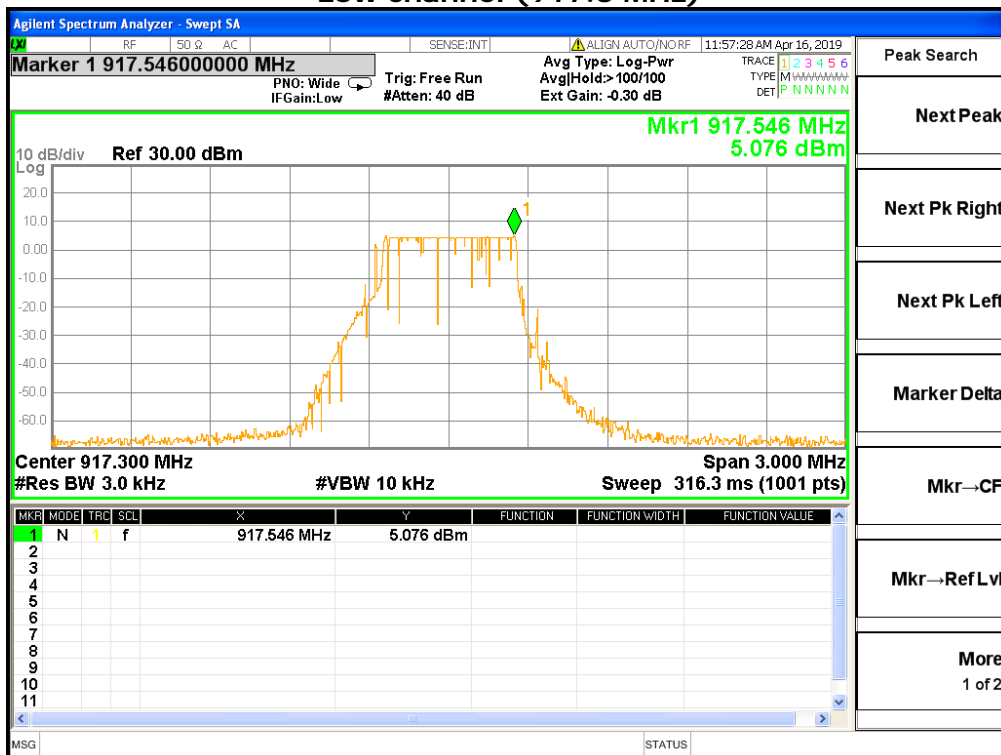
Report No. :
 CTK-2019-01409
 Page (19) / (43) Pages

High channel (923.3 MHz)



Test Data : Serial Port

Low channel (917.3 MHz)

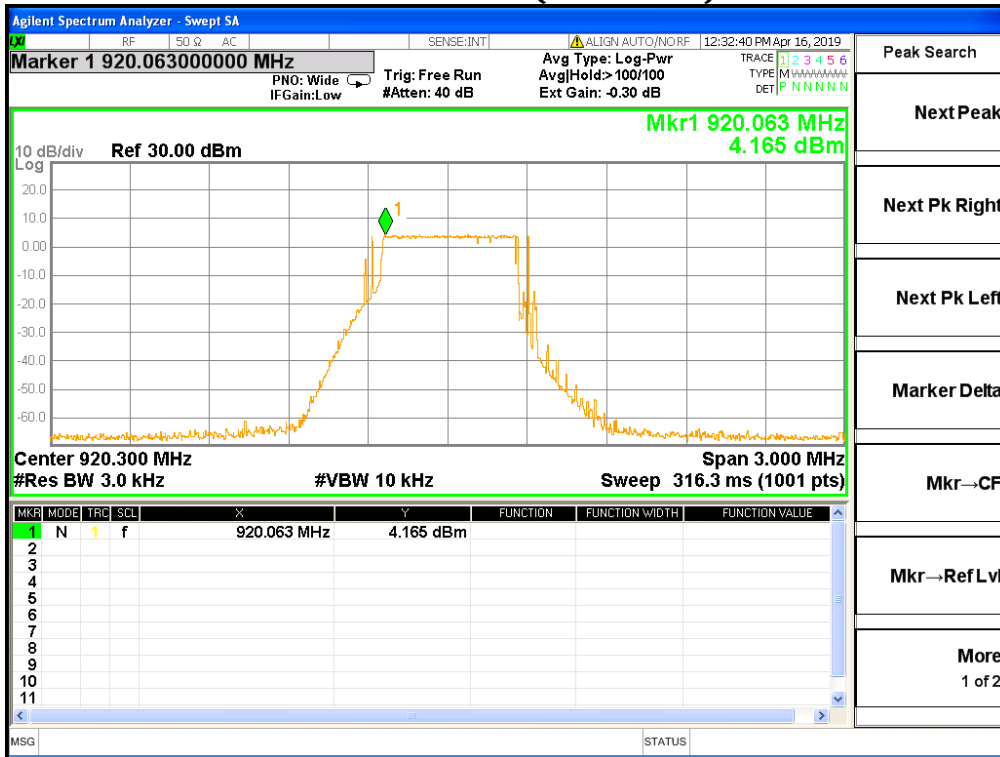




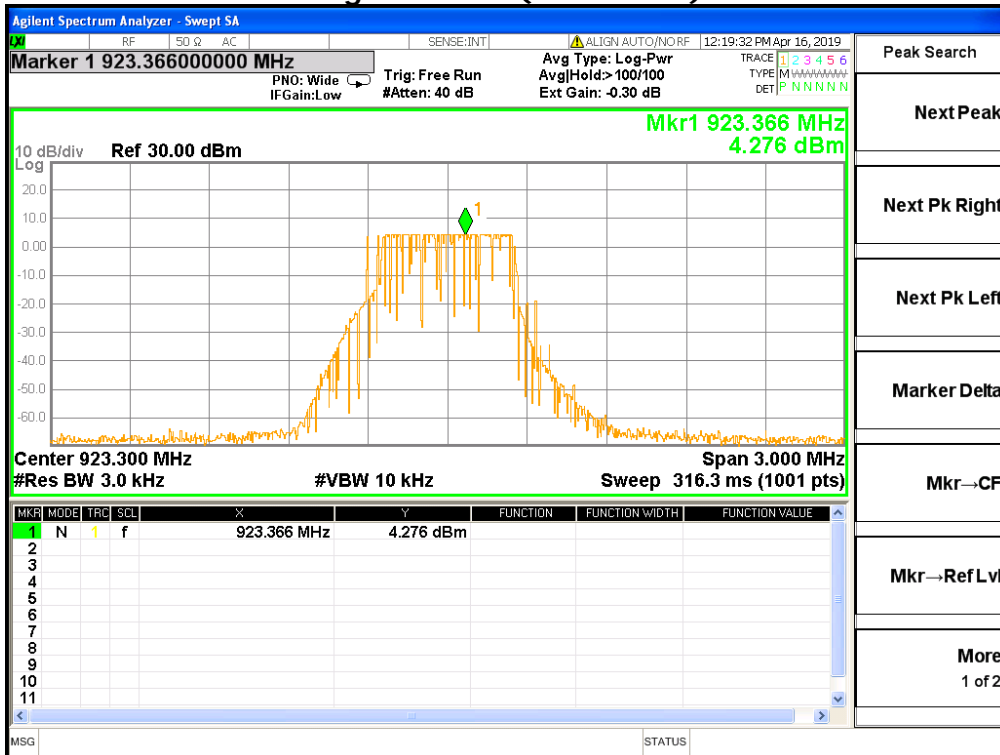
CTK Co., Ltd.
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,
 Yongin-si, Gyeonggi-do, Korea
 Tel: +82-31-339-9970
 Fax: +82-31-624-9501

Report No.:
 CTK-2019-01409
 Page (20) / (43) Pages

Middle channel (920.3 MHz)



High channel (923.3 MHz)





4.4 Band Edge & Conducted Spurious emission

Test Procedures(ANSI C63.10-2013 11.11.3)

The Unwanted emission from the EUT were measured according to the dictates PKPSD measurement procedure in section 11.11 of ANSI C63.10-2013.

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Test Settings:

Center frequency = the highest, middle and the lowest channels

- a) RBW = 100 kHz
- b) VBW $\geq 3 \times$ RBW
- c) Detector = peak
- d) Sweep time = auto couple
- e) Trace mode= max hold
- f) Allow trace to fully stabilize
- g) Use the peak marker function to determine the maximum amplitude level.

Limit :

Emission level < 20 dBc

Test results: Complies

- All conducted emission in any 100kHz bandwidth outside of the spread spectrum band was at least 20dB lower than the highest in-band spectral density. Therefore the applying equipment meets the requirement.

See next pages for actual measured spectrum plots.

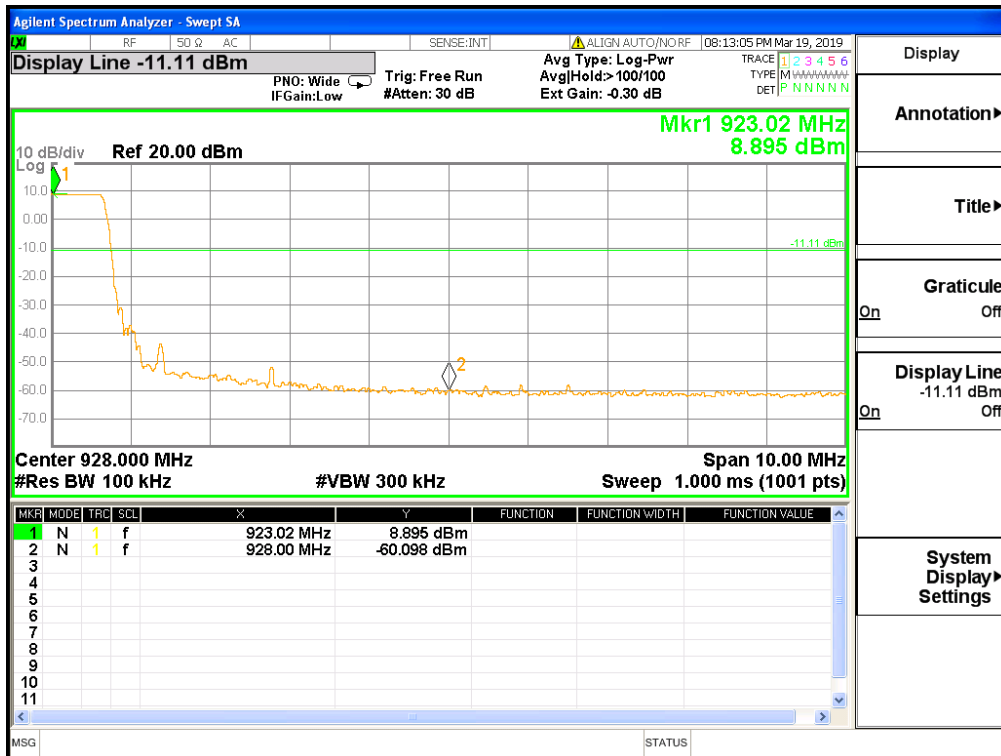
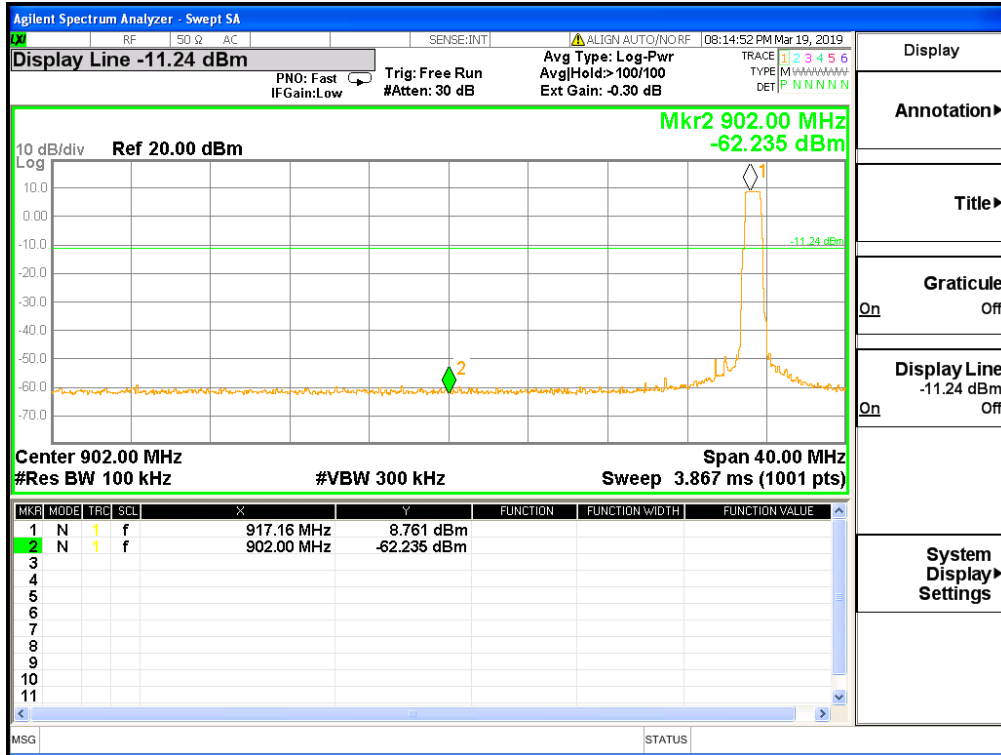


CTK Co., Ltd.
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,
 Yongin-si, Gyeonggi-do, Korea
 Tel: +82-31-339-9970
 Fax: +82-31-624-9501

Report No. :
 CTK-2019-01409
 Page (22) / (43) Pages

Test Data : Adapter

Band-edge



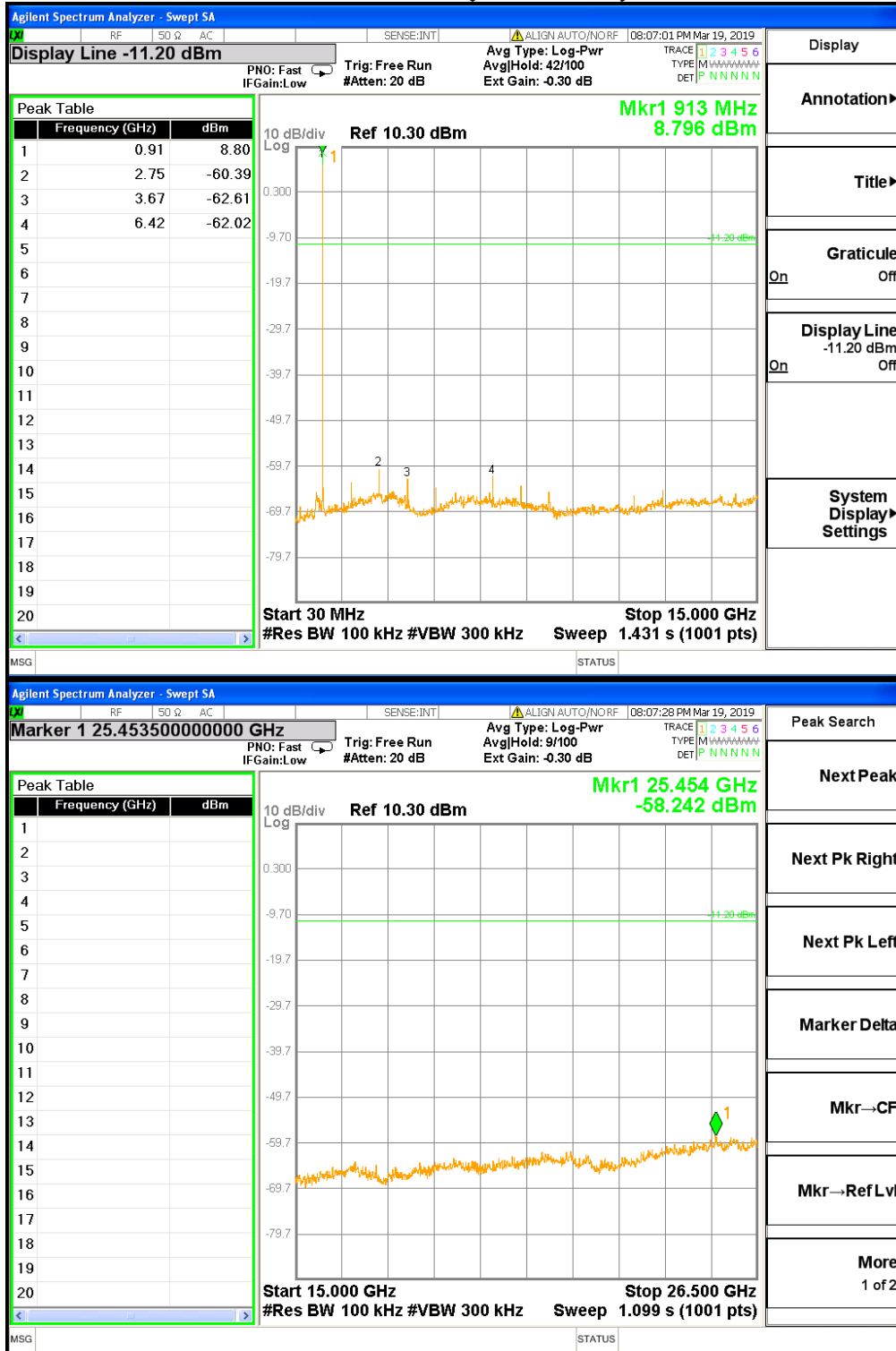


CTK Co., Ltd.
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,
 Yongin-si, Gyeonggi-do, Korea
 Tel: +82-31-339-9970
 Fax: +82-31-624-9501

Report No. :
 CTK-2019-01409
 Page (23) / (43) Pages

Conducted Spurious emission

Low channel (917.3 MHz)

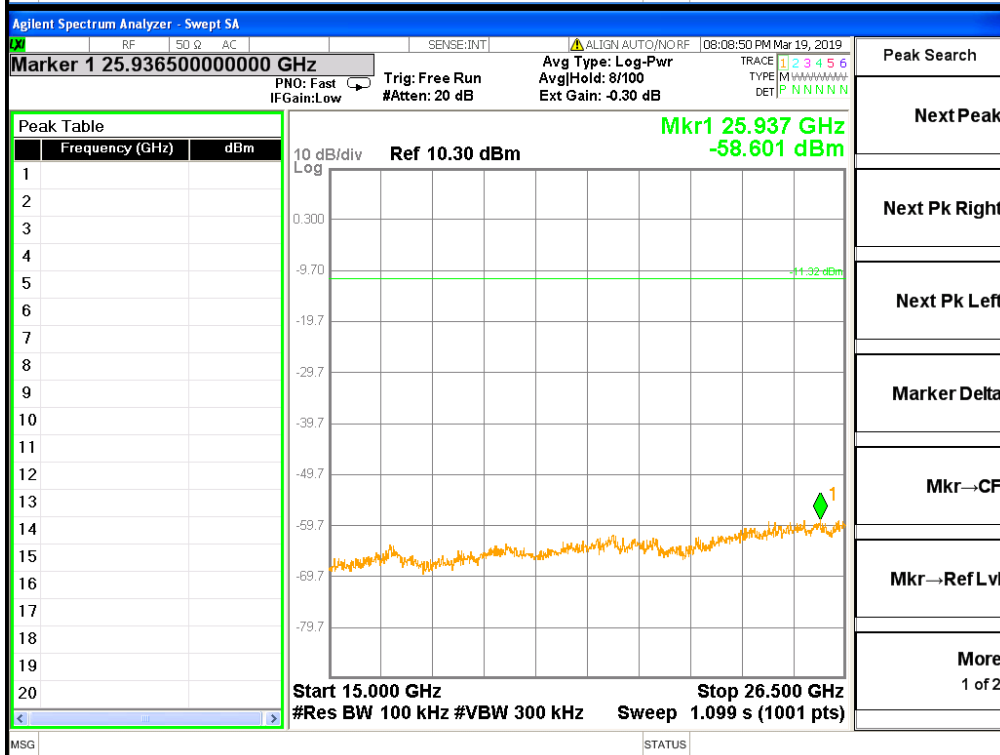
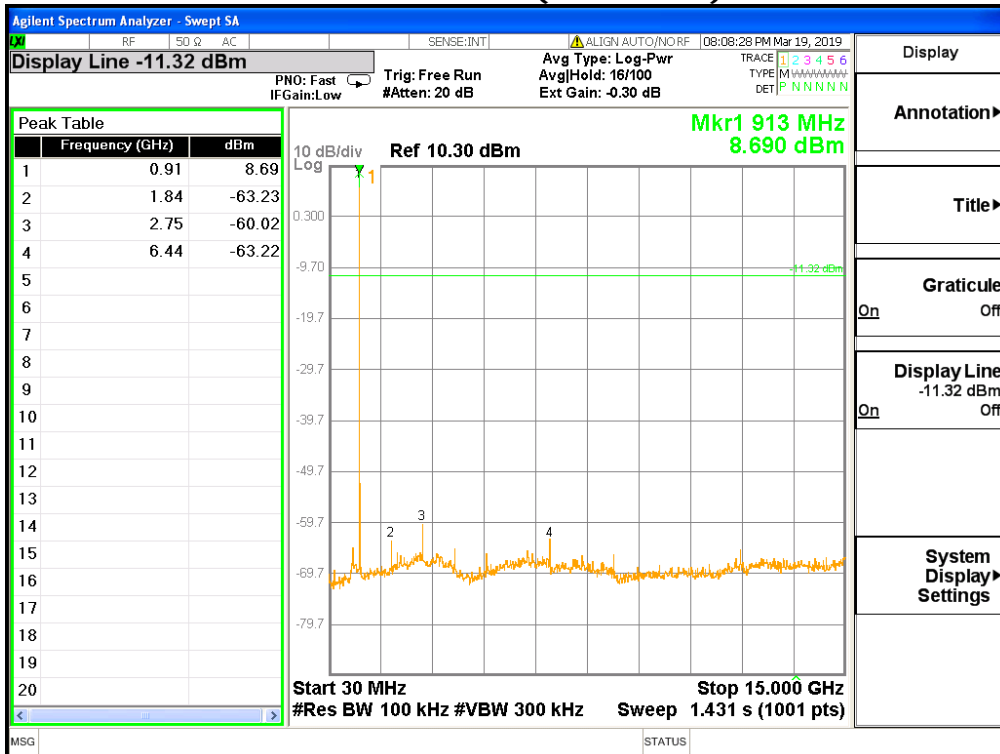




CTK Co., Ltd.
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,
 Yongin-si, Gyeonggi-do, Korea
 Tel: +82-31-339-9970
 Fax: +82-31-624-9501

Report No. :
 CTK-2019-01409
 Page (24) / (43) Pages

Middle channel (920.3 MHz)

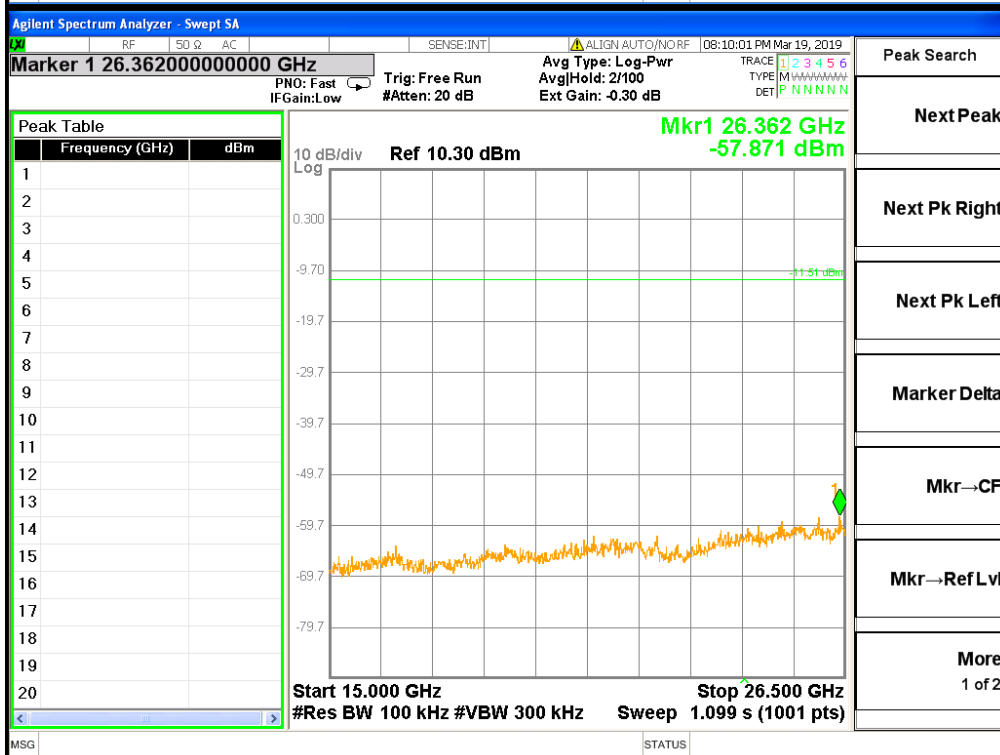
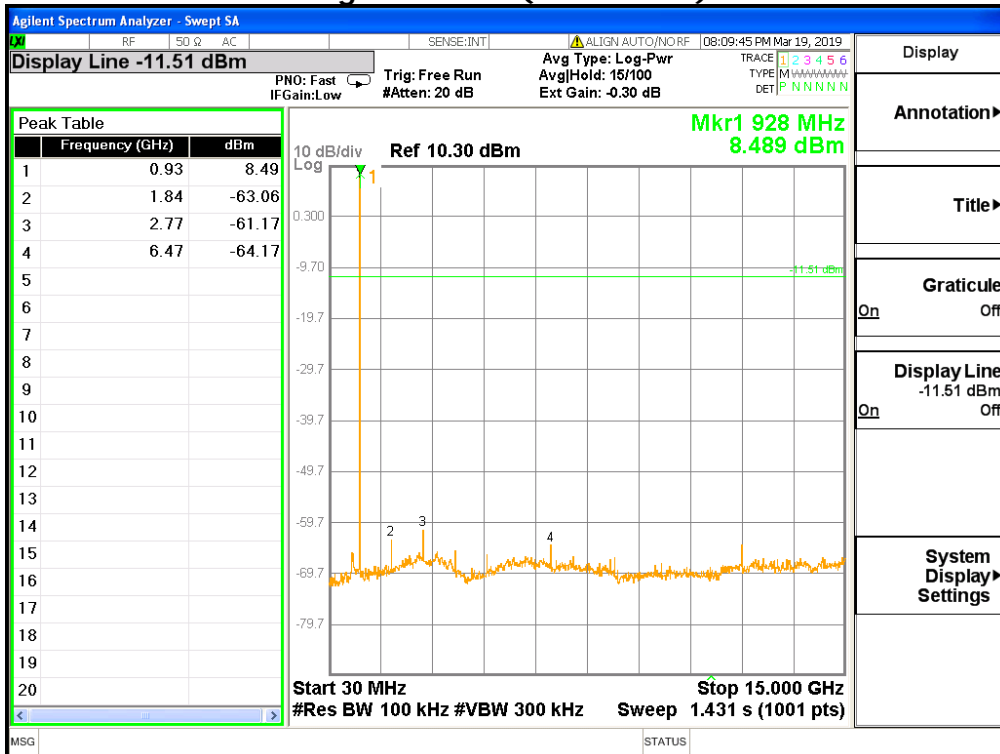




CTK Co., Ltd.
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,
 Yongin-si, Gyeonggi-do, Korea
 Tel: +82-31-339-9970
 Fax: +82-31-624-9501

Report No. :
 CTK-2019-01409
 Page (25) / (43) Pages

High channel (923.3 MHz)



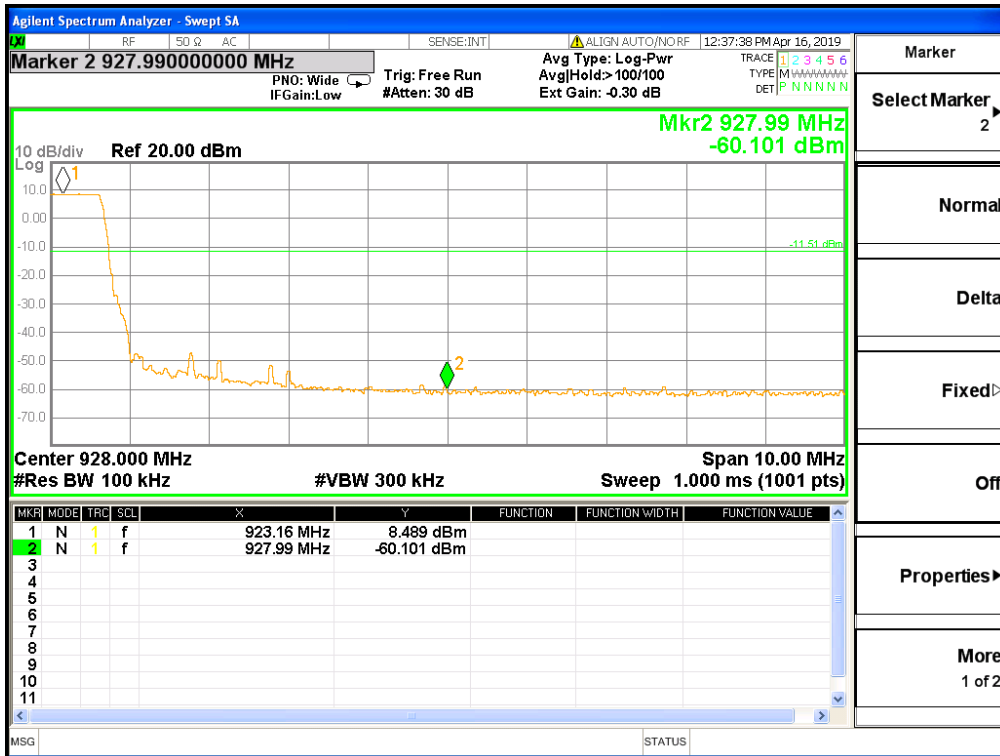
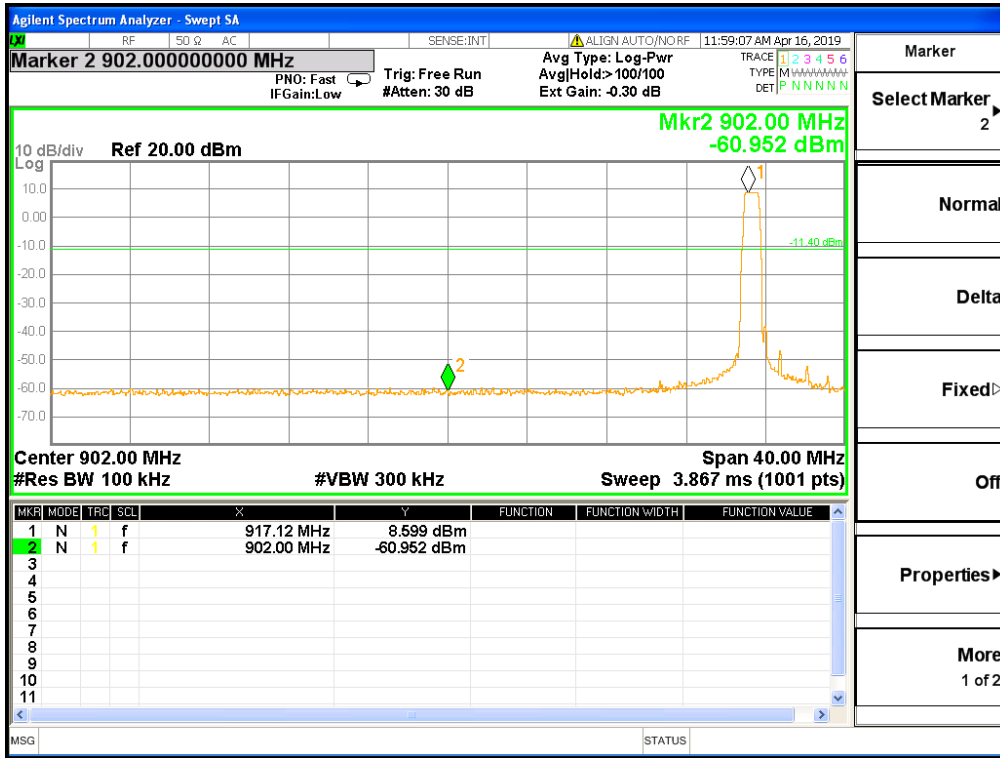


CTK Co., Ltd.
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,
 Yongin-si, Gyeonggi-do, Korea
 Tel: +82-31-339-9970
 Fax: +82-31-624-9501

Report No.:
 CTK-2019-01409
 Page (26) / (43) Pages

Test Data : Serial Port

Band-edge



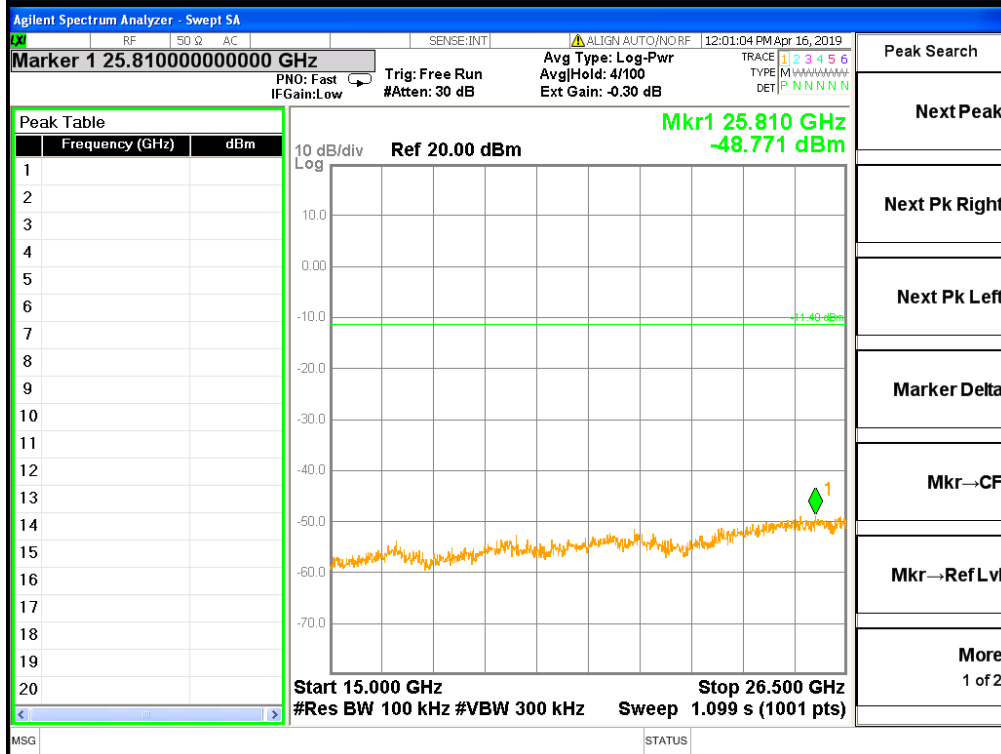
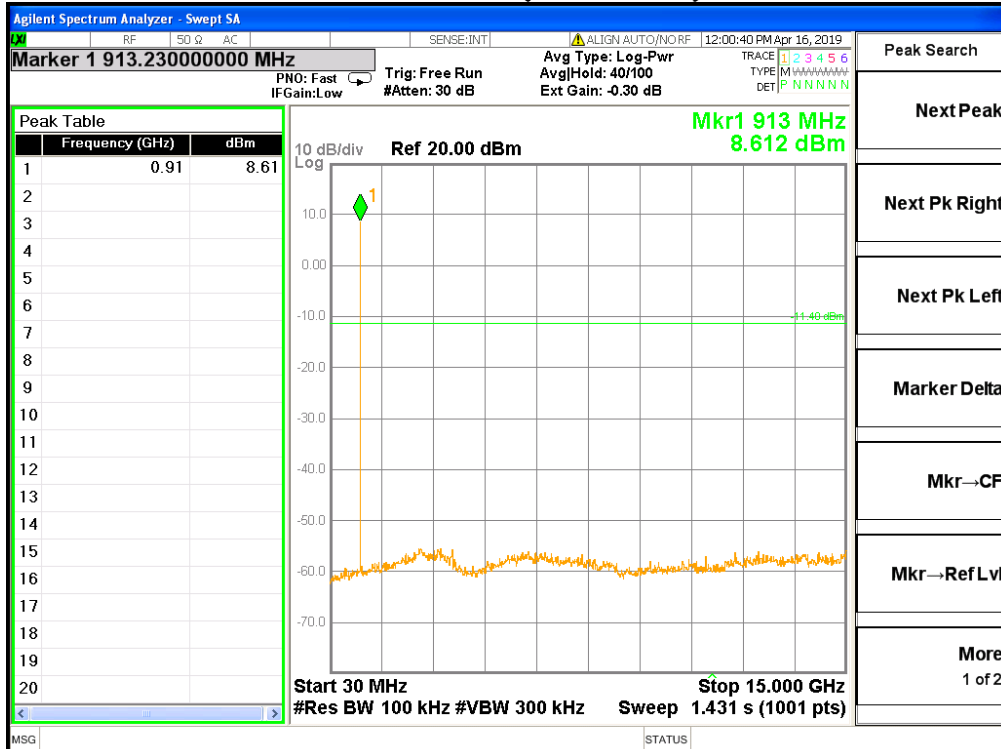


CTK Co., Ltd.
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,
 Yongin-si, Gyeonggi-do, Korea
 Tel: +82-31-339-9970
 Fax: +82-31-624-9501

Report No. :
 CTK-2019-01409
 Page (27) / (43) Pages

Conducted Spurious emission

Low channel (917.3 MHz)

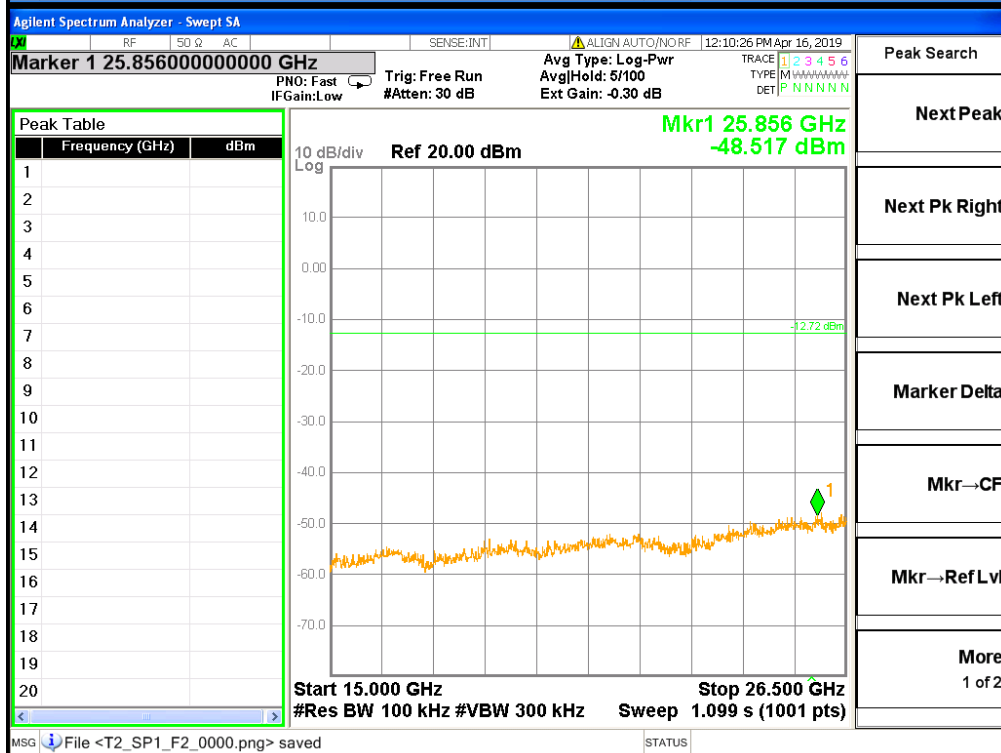
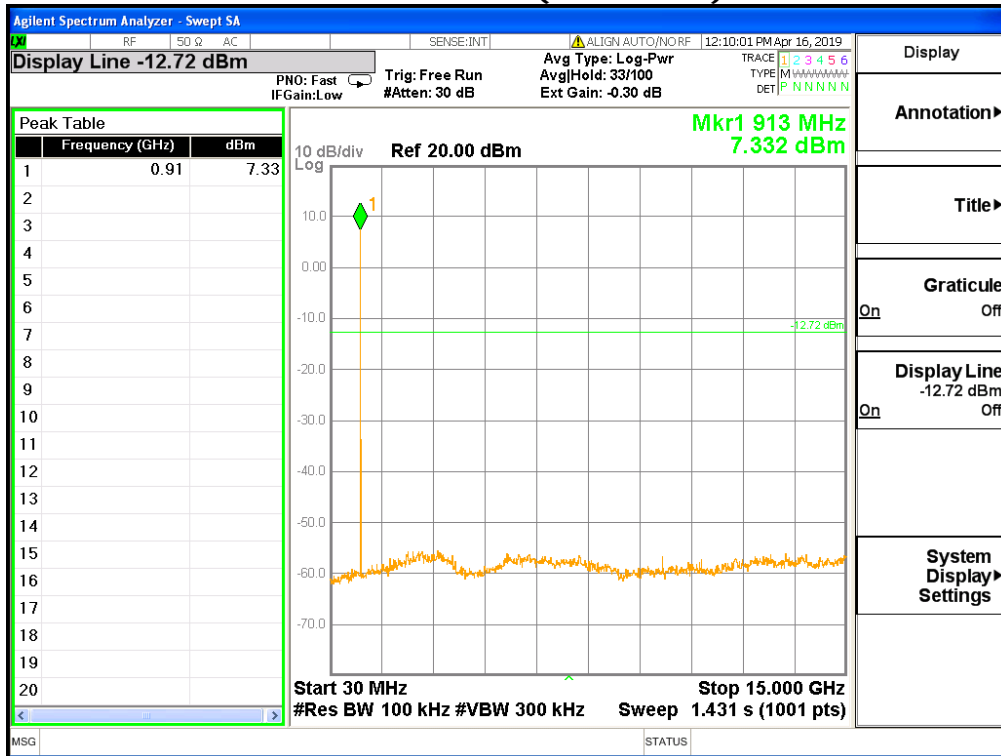




CTK Co., Ltd.
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,
 Yongin-si, Gyeonggi-do, Korea
 Tel: +82-31-339-9970
 Fax: +82-31-624-9501

Report No. :
 CTK-2019-01409
 Page (28) / (43) Pages

Middle channel (920.3 MHz)

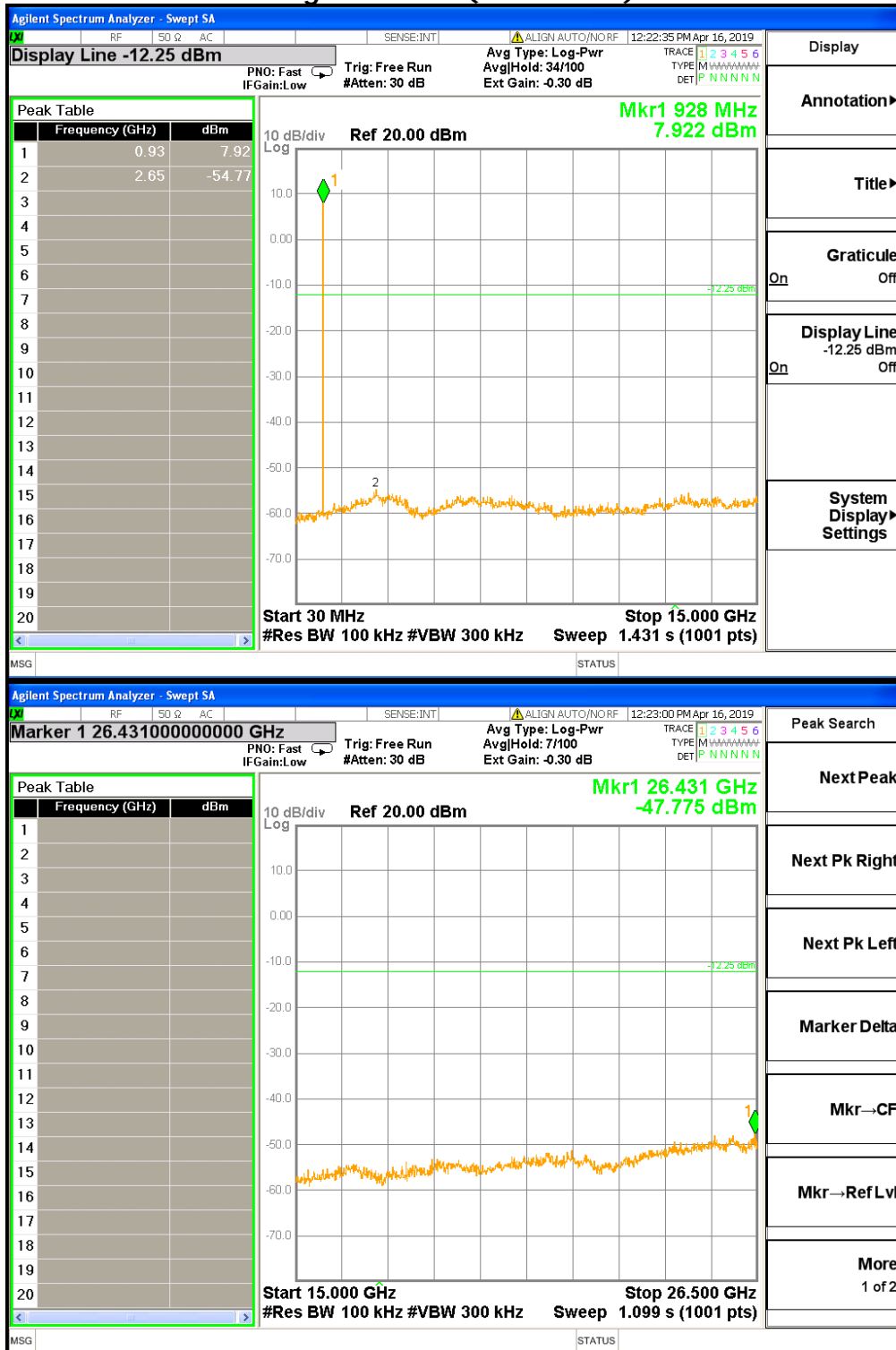




CTK Co., Ltd.
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,
 Yongin-si, Gyeonggi-do, Korea
 Tel: +82-31-339-9970
 Fax: +82-31-624-9501

Report No.:
 CTK-2019-01409
 Page (29) / (43) Pages

High channel (923.3 MHz)





CTK Co., Ltd.

(Ho-dong), 113, Yejik-ro, Cheoin-gu,
Yongin-si, Gyeonggi-do, Korea
Tel: +82-31-339-9970
Fax: +82-31-624-9501

Report No. :
CTK-2019-01409
Page (30) / (43) Pages

4.5 Radiated Emission

Test Location

- 10 m SAC (test distance : 10 m, 3 m)
- 3 m SAC (test distance : 3 m)

Test Procedures

- 1) In the frequency range of 9 kHz to 30 MHz, magnetic field is measured with Loop Antenna. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- 2) In the frequency range above 30 MHz, Bi-Log Test Antenna(30 MHz to 1 GHz) and Horn Test Antenna(above 1 GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is carried from 1m to 4m above the ground to determine the maximum value of the field strength. The emissions levels at both horizontal and vertical polarizations should be tested.

Instrument Settings

Frequency Range = 9 kHz ~ 12.75 GHz (10th harmonic)

- a) RBW = 1 MHz for $f \geq 1$ GHz, 120 kHz for $f < 1$ GHz, 9 kHz for $f < 30$ MHz
- b) VBW \geq RBW
- c) Sweep time = auto couple



Limit :

FCC Part 15 § 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

Table 1. Restricted Frequency Bands

MHz	MHz	MHz	MHz	MHz	GHz
0.09-0.11	8.37626-8.38675	73-74.6	399.9-410	2690-2900	10.6-12.7
¹ 0.495-0.505	8.41425-8.41475	74.8-75.2	608-614	3260-3267	13.25-13.4
2.1735-2.1905	12.29-12.293	108-121.94	960-1240	3332-3339	14.47-14.5
4.125-4.128	12.51975-12.52025	123-138	1300-1427	3345.8-3358	15.35-16.2
4.17725-4.17775	12.57675-12.57725	149.9-150.05	1435-1626.5	3600-4400	17.7-21.4
4.20725-4.20775	13.36-13.41	156.52475- 156.52525	1645.5-1646.5	4500-5150	22.01-23.12
6.215-6.218	16.42-16.423	156.7-156.9	1660-1710	5350-5460	23.6-24
6.26775-6.26825	16.69475-16.69525	162.0125-167.17	1718.8-1722.2	7250-7750	31.2-31.8
6.31175-6.31225	16.80425-16.80475	167.72-173.2	2200-2300	8025-8500	36.43-36.5
8.291-8.294	25.5-25.67	240-285	2310-2390	9000-9200	² Above 38.6
8.362-8.366	37.5-38.25	322-335.4	2483.5-2500	9300-9500	

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

§ 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

FCC Part 15 § 15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table :

Table 2. General Field Strength Limits for Licence-Exempt Transmitters

Frequency(MHz)	Field Strength uV/m@3m	Field Strength dBuV/m@3m	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705-30	30	-	30
30-88	100**	40	3
88-216	150**	43.5	3
216-960	200**	46	3
Above 960	500	54	3

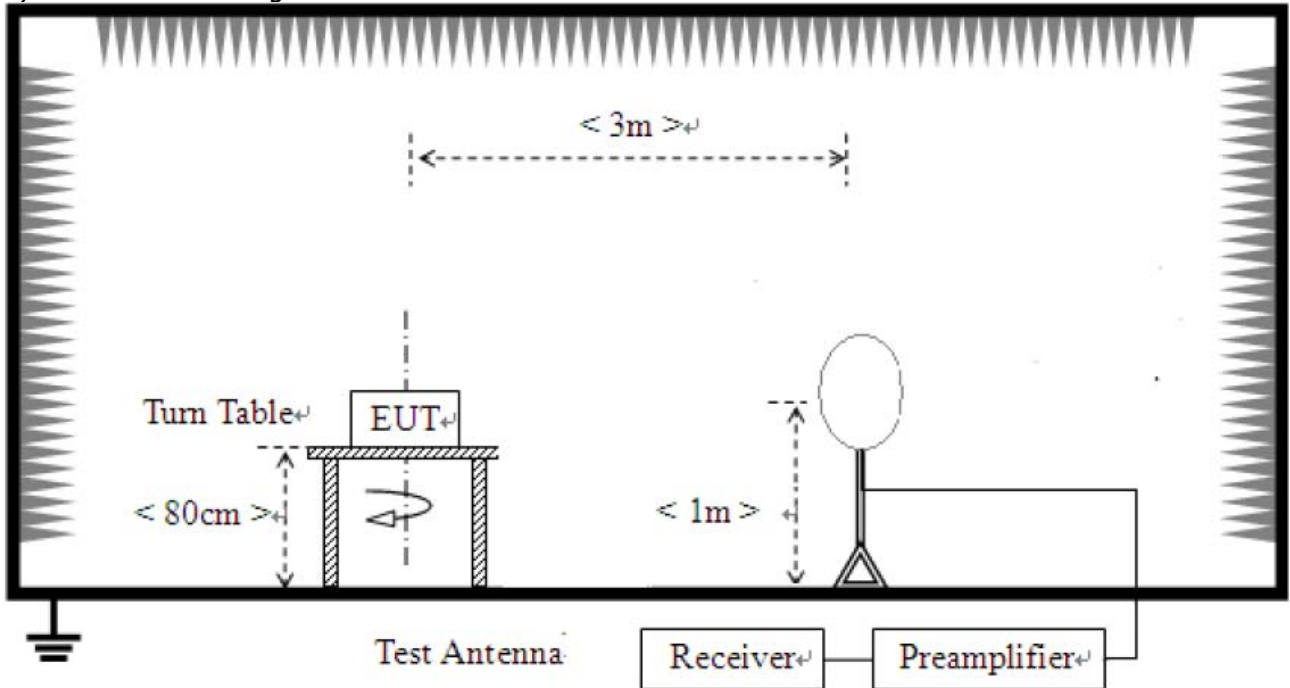
** Except as provided in 15.209(g).fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz, 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g.15.231 and 15.241.

Note :

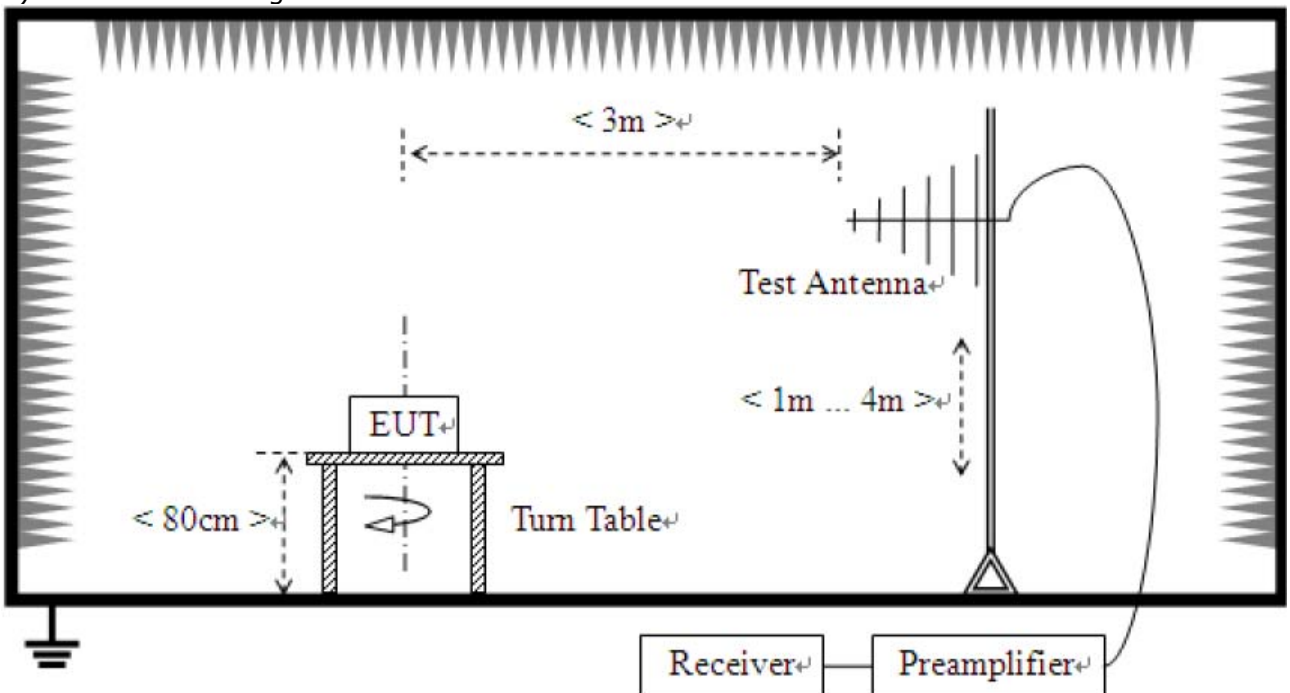
- 1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
- 2) For above 1 GHz, limit field strength of harmonics : 54 dBuV/m@3m (AV) and 74 dBuV/m@3m (PK)
- 3) For measurement above 1GHz, the resolution bandwidth is set to 1 MHz and video bandwidth is set to 3 MHz for peak measurement.

Test Setup:

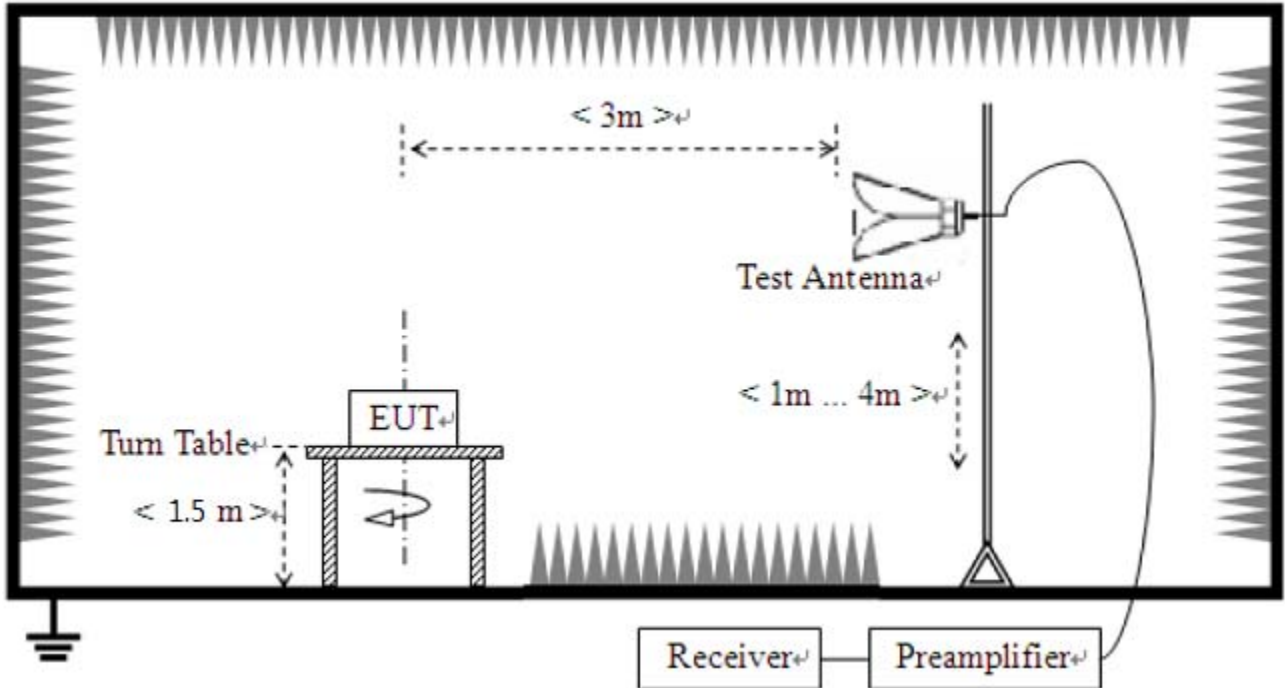
- 1) For field strength of emissions from 9 kHz to 30 MHz



- 2) For field strength of emissions from 30 MHz to 1 GHz



3) For field strength of emissions above 1 GHz



Test results

1) 9 kHz to 30 MHz

The requirements are:

Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
-	-	-	See note

Note :

The amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB)

3) 1 GHz to 12.75 GHz

The requirements are:

Complies

Test Data : Adapter

Channel	Frequency [MHz]	Ant. Pol. (V/H)	Reading [dBuV/m]	c.f [dB/m]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Low	5 504.88	H	45.70	3.4	49.10	54	4.90	Peak
	5 504.88	V	48.50	3.4	51.90	54	2.10	Peak
Middle	5 522.02	H	44.00	3.5	47.50	54	6.50	Peak
	5 520.70	V	45.70	3.5	49.20	54	4.80	Peak
High	5 984.90	H	41.90	5.5	47.40	54	6.60	Peak
	5 537.85	V	45.30	3.6	48.90	54	5.10	Peak

Test Data : Serial Port

Channel	Frequency [MHz]	Ant. Pol. (V/H)	Reading [dBuV/m]	c.f [dB/m]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Low	2 751.53	H	53.00	-3.4	49.60	54	4.40	Peak
	2 751.53	V	53.60	-3.4	50.20	54	3.80	Peak
Middle	2 759.17	H	52.60	-3.4	49.20	54	4.80	Peak
	2 759.17	V	53.80	-3.4	50.40	54	3.60	Peak
High	2 768.71	H	50.00	-3.4	46.60	54	7.40	Peak
	2 768.71	V	51.50	-3.4	48.10	54	5.90	Peak

Remarks

1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain
4. The peak value is lower than the average limit value. (Peak < 54 dBuV/m)



CTK Co., Ltd.
(Ho-dong), 113, Yejik-ro, Cheoin-gu,
Yongin-si, Gyeonggi-do, Korea
Tel: +82-31-339-9970
Fax: +82-31-624-9501

Report No. :
CTK-2019-01409
Page (38) / (43) Pages

4.6 AC Conducted Emissions

A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz-30 MHz, shall not exceed the limits.

Instrument Settings

IF Band Width: 9 kHz

Test Procedures

The EUT was placed on a non-metallic table 0.8m above the metallic, grounded floor and 0.4m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8m.

Amplitude measurements were performed with a quasi-peak detector and an average detector.

Limit

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average **
0.15 ~ 0.5	66 to 56*	56 to 46*
0.5 ~ 5	56	46
5 ~ 30	60	50

* The level decreases linearly with the logarithm of the frequency.

** A linear average detector is required.

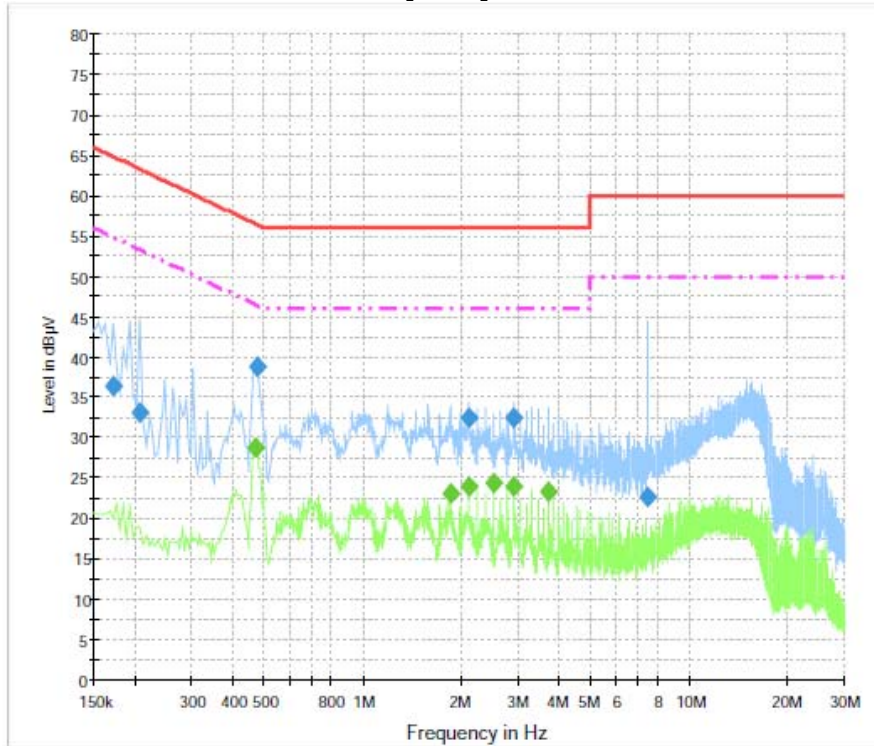
Test Results

The requirements are:

Complies

Test Data : Adapter

[LINE]



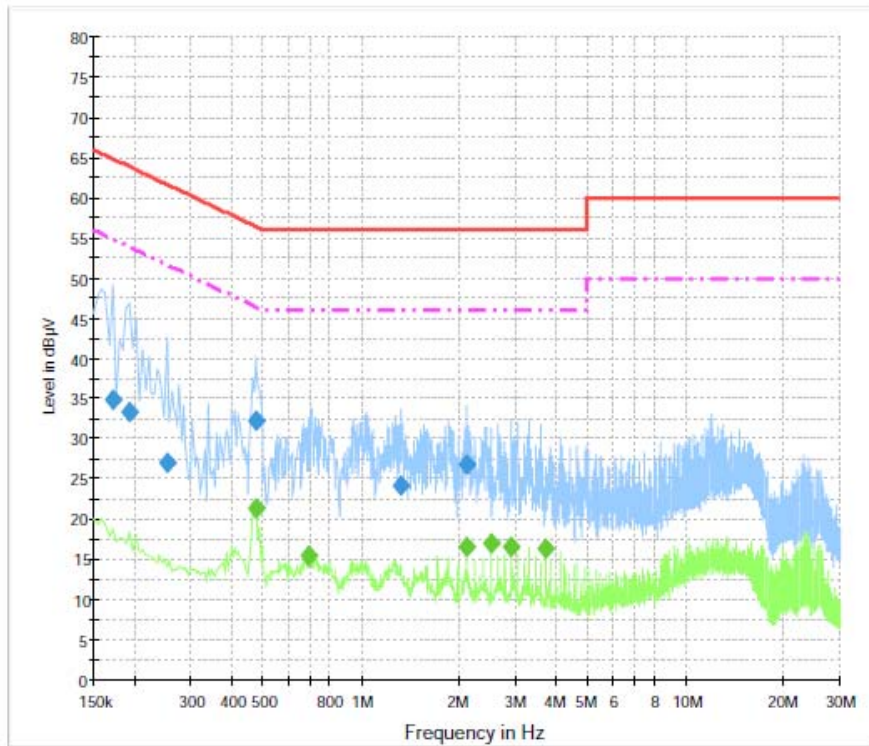
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.172500	36.3	1000.0	9.000	On	L1	10.3	28.5	64.8
0.208500	33.1	1000.0	9.000	On	L1	10.1	30.2	63.3
0.474000	38.7	1000.0	9.000	On	L1	10.1	17.7	56.4
2.121000	32.5	1000.0	9.000	On	L1	10.0	23.5	56.0
2.917500	32.5	1000.0	9.000	On	L1	10.0	23.5	56.0
7.480500	22.6	1000.0	9.000	On	L1	10.1	37.4	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.469500	28.7	1000.0	9.000	On	L1	10.1	17.8	46.5
1.855500	23.0	1000.0	9.000	On	L1	9.9	23.0	46.0
2.121000	24.0	1000.0	9.000	On	L1	10.0	22.0	46.0
2.521500	24.5	1000.0	9.000	On	L1	10.0	21.5	46.0
2.917500	24.0	1000.0	9.000	On	L1	10.0	22.0	46.0
3.714000	23.3	1000.0	9.000	On	L1	10.0	22.7	46.0

[NEUTRAL]



Final Result 1

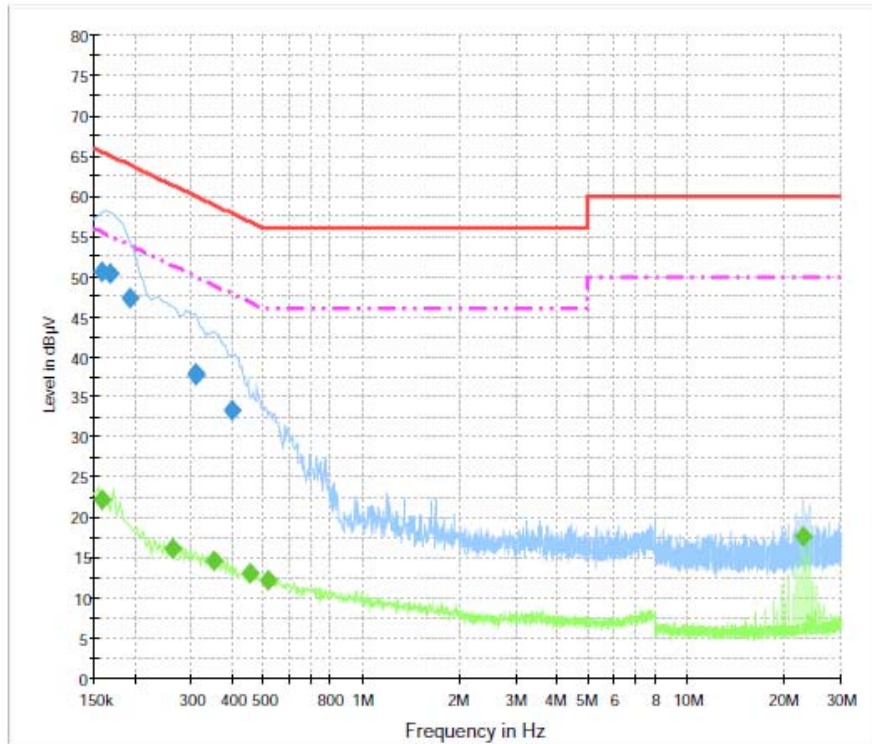
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.172500	34.9	1000.0	9.000	On	N	10.6	30.0	64.8
0.195000	33.3	1000.0	9.000	On	N	10.4	30.5	63.8
0.253500	27.1	1000.0	9.000	On	N	10.2	34.6	61.6
0.474000	32.2	1000.0	9.000	On	N	10.5	24.3	56.4
1.329000	24.3	1000.0	9.000	On	N	10.3	31.7	56.0
2.121000	26.8	1000.0	9.000	On	N	10.3	29.2	56.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.478500	21.5	1000.0	9.000	On	N	10.5	24.9	46.4
0.694500	15.6	1000.0	9.000	On	N	10.4	30.4	46.0
2.121000	16.7	1000.0	9.000	On	N	10.3	29.3	46.0
2.521500	16.9	1000.0	9.000	On	N	10.3	29.1	46.0
2.917500	16.5	1000.0	9.000	On	N	10.3	29.5	46.0
3.714000	16.3	1000.0	9.000	On	N	10.3	29.7	46.0

Test Data : Serial Port

[LINE]



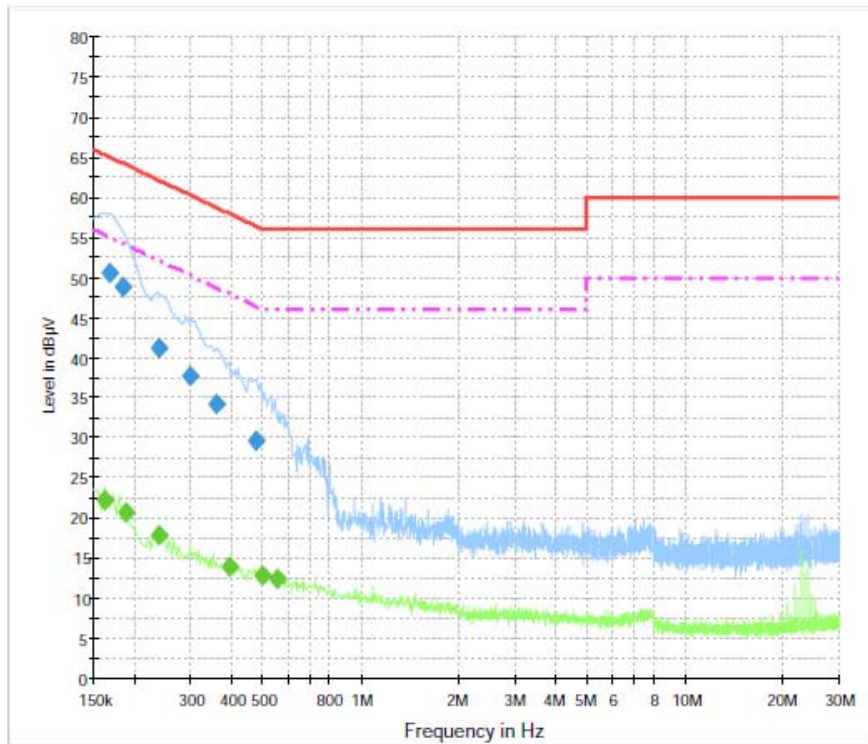
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.159000	50.7	1000.0	9.000	On	L1	10.2	14.8	65.5
0.168000	50.4	1000.0	9.000	On	L1	10.3	14.7	65.1
0.195000	47.4	1000.0	9.000	On	L1	10.2	16.4	63.8
0.307500	38.0	1000.0	9.000	On	L1	10.1	22.1	60.0
0.307500	37.7	1000.0	9.000	On	L1	10.1	22.4	60.0
0.397500	33.4	1000.0	9.000	On	L1	10.1	24.5	57.9

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.159000	22.1	1000.0	9.000	On	L1	10.2	33.4	55.5
0.262500	16.0	1000.0	9.000	On	L1	10.0	35.3	51.4
0.352500	14.6	1000.0	9.000	On	L1	10.1	34.3	48.9
0.456000	13.1	1000.0	9.000	On	L1	10.1	33.7	46.8
0.519000	12.2	1000.0	9.000	On	L1	10.2	33.8	46.0
22.965000	17.6	1000.0	9.000	On	L1	10.3	32.4	50.0

[NEUTRAL]



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.168000	50.5	1000.0	9.000	On	N	10.6	14.6	65.1
0.186000	48.8	1000.0	9.000	On	N	10.5	15.4	64.2
0.240000	41.1	1000.0	9.000	On	N	10.3	21.0	62.1
0.298500	37.8	1000.0	9.000	On	N	10.3	22.5	60.3
0.361500	34.3	1000.0	9.000	On	N	10.5	24.4	58.7
0.474000	29.7	1000.0	9.000	On	N	10.5	26.8	56.4

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.163500	22.3	1000.0	9.000	On	N	10.5	33.0	55.3
0.190500	20.6	1000.0	9.000	On	N	10.5	33.4	54.0
0.240000	17.9	1000.0	9.000	On	N	10.3	34.2	52.1
0.393000	14.0	1000.0	9.000	On	N	10.5	34.0	48.0
0.496500	12.9	1000.0	9.000	On	N	10.5	33.1	46.1
0.555000	12.3	1000.0	9.000	On	N	10.6	33.7	46.0



CTK Co., Ltd.
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,
 Yongin-si, Gyeonggi-do, Korea
 Tel: +82-31-339-9970
 Fax: +82-31-624-9501

Report No. :
 CTK-2019-01409
 Page (43) / (43) Pages

APPENDIX A – Test Equipment Used For Tests

	Name of Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Signal Analyzer	Rohde & Schwarz	FSV40	101574	2019-01-28	2020-01-28
2	Signal Generator	Rohde & Schwarz	SMB100A	175528	2018-10-24	2019-10-24
3	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2018-10-25	2019-10-25
4	Bilog Antenna	Schaffner	CBL6111C	2551	2018-05-10	2020-05-10
5	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-125	2018-05-02	2020-05-02
6	6dB Attenuator	Rohde & Schwarz	DNF	272.4110.50-2	2018-10-25	2019-10-25
7	AMPLIFIER	SONOMA	310	291721	2019-01-28	2020-01-28
8	Preamplifier	Agilent	8449B	3008A02011	2018-12-03	2019-12-03
9	EMI Test Receiver	Rohde & Schwarz	ESU40	100336	2019-01-29	2020-01-29
10	Preamplifier	Agilent	8449B	3008A02011	2018-12-03	2019-12-03
11	Horn Antenna	ETS-Lindgren	3117	00154525	2017-09-14	2019-09-14
12	Signal Analyzer	Agilent	N9020A	MY50510324	2019-01-28	2020-01-28
13	Band Reject Filter	FILTRON	R16025FL	1604001S-6	2018-10-24	2019-10-24
14	Trilog Broadband Antenna	SCHWARZBEC	VULB 9161 SE	9161-4133	2017-06-15	2019-06-15
15	Dual-Tracking DC Power Supply	Topward Electric Instruments Co.,Ltd.	6303D	711196	2019-01-21	2020-01-21
16	LISN	Rohde & Schwarz	ENV216	101760	2019-01-29	2020-01-29
17	EMI Test Receiver	Rohde & Schwarz	ESU40	100336	2019-01-29	2020-01-29