FCC PART 15.247

TEST REPORT

For

Lumenari Technologies, Inc.

200-3071 No. 5 Road, Richmond, British Columbia, V6X 2T4, Canada

FCC ID: 2AM62SCBRE26

Report Type:	**Product Name:**
Original Report	ELA Chroma BR30

Report Number:	RSC171209002-0C
Report Date:	2017-12-19
Reviewed By:	Sula Huang EMC Director
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Chengdu) No.5040, Huilongwan Plaza, No. 1, Shawan Road, Jinniu District, Chengdu, Sichuan, China Tel: 028-65525123 Fax: 028-65525125 www.baclcorp.com

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The **Lumenari Technologies, Inc.**'s product, model number: **LUM-EBR-SC12E26 (FCC ID: 2AM62SCBRE26)** or the "EUT" as referred to in this report was the **ELA Chroma BR30**.

Mechanical Description of EUT

The EUT was measured approximately: φ95 mm x 129 mm.

Rated input voltage: 100-240V~50/60Hz.

Note: The products, test model: LUM-EBR-SC12E26, multiple models: LUM-EBR-SC09E26. Their differences were presented in Product Difference Statement provided by the applicant of this report. So we selected model LUM-EBR-SC12E26 to fully test and LUM-EBR-SC09E26 was performed AC power line conducted emissions and radiated emissions (Below 1GHz) test.

**All measurement and test data in this report were gathered from final production sample, serial number: 171209002/01 (LUM-EBR-SC12E26) & 171209002/05 (LUM-EBR-SC09E26) (assigned by BACL). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-12-08, and EUT complied with test requirement.*

Objective

This report is prepared on behalf of ***Lumenari Technologies, Inc.*** in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules.

The tests were performed in order to determine the compliance of the EUT with FCC Part 15-Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

None.

Measurement Uncertainty

Item			Uncertainty
AC power line conducted emission			2.71 dB
Radiated Emission(Field Strength)	30MHz-200MHz	H	4.57 dB
		V	4.81 dB
	200MHz-1GHz	H	5.69 dB
		V	6.07 dB
	1GHz-6GHz		5.49 dB
	6GHz-18GHz		5.57 dB
	18GHz-25GHz		5.48 dB
Conducted RF Power			±0.61dB
Power Spectrum Density			±0.61dB
Occupied Bandwidth			±5%
Humidity			±5%
Temperature			±1℃

Test Methodology

All measurements contained in this report were conducted with:

1. ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

2. KDB558074 D01 DTS Meas Guidance v04.

Test Facility

The test site used by BACL to collect test data is located No. 5040, Huilongwan Plaza, No. 1, Shawan Road, Jinniu District, Chengdu, Sichuan, China

BACL(Chengdu) is accredited by A2LA in accordance with the recognized international standard ISO/IEC 17025, A2LA cert No.: 4324.01. The Federal communications commission has on file and is listed under FCC Test Firm Registration No.: 910975.

BACL(Chengdu) has been fully described in reports on file and registered with the Innovation, Science and Economic Development Canada under Registration Numbers: 3062C-1.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in testing mode, which was provided by manufacturer.

For Zigbee mode, 15 channels are provided for testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
11	2405	19	2445
12	2410	20	2450
13	2415	21	2455
14	2420	22	2460
15	2425	23	2465
16	2430	24	2470
17	2435	25	2475
18	2440	-	-

EUT was tested with channel 11, 18 and 25.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

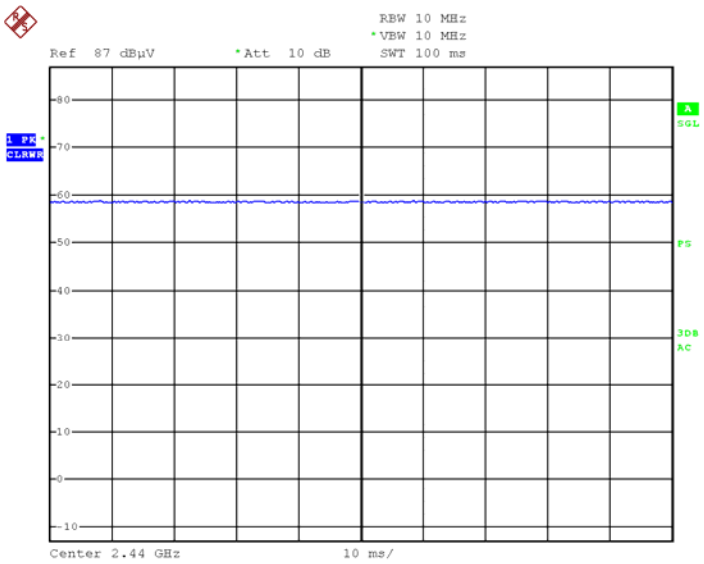
For Zigbee mode, the maximum power setting provided by the manufacturer is below:

Test Software Version	Lettin		
Test Frequency	2405 MHz	2440 MHz	2475 MHz
Data Rate	Default	Default	Default
Power Level	Default	Default	Default

The software configured maximum duty cycle as below:

Test Mode	T_{on} (ms)	T_{on+off} (ms)	Duty Cycle (%)
Zigbee	100	100	100

Duty Cycle



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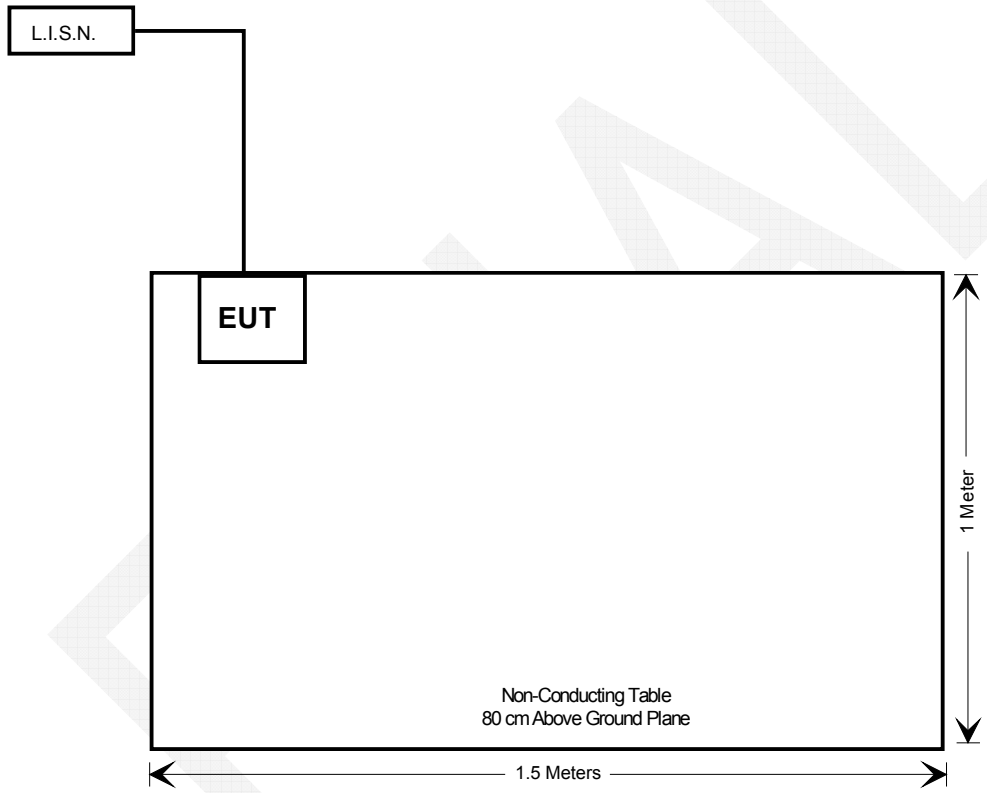
External I/O Cable

Cable Description	Length (m)	From	To
AC Power Cable	1.0	L.I.S.N.	EUT

Block Diagram of Test Setup

AC power line conducted emissions test：



Test Equipments List

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCS 30	836858/0016	2017-12-02	2018-12-01
Rohde & Schwarz	L.I.S.N.	ENV216	100018	2017-05-20	2018-05-19
Rohde & Schwarz	RF Limiter	ESH3Z2	DE14781	2017-11-10	2018-11-09
N/A	Conducted Cable	NO.5	N/A	2017-11-10	2018-11-09
Rohde & Schwarz	EMC32	N/A	V 8.52.0	N/A	N/A
Radiated Emissions Test					
Sonoma	Pre-Amplifier	310N	186684	2017-08-18	2018-08-17
Rohde & Schwarz	EMI Test Receiver	ESIB 40	100215	2017-09-12	2018-09-11
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2017-05-20	2018-05-19
Sunol Sciences	Broadband Antenna	JB3	A121808	2017-05-18	2020-05-17
ETS	Horn Antenna	3115	003-6076	2017-05-19	2020-05-18
A.H.Systems,inc	Horn Antenna	SAS-574	505	2016-12-02	2019-12-01
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2017-05-20	2018-05-19
INMET	Attenuator	18N-6dB	64671	2017-11-10	2018-11-09
Quinstar	Pre-Amplifier	QLW-18405536-JO	15964004001	2017-05-20	2018-05-19
Sinoscite.,Co Ltd	Reject Band Filter	BSF 2402-2480MN	0898-005	2017-11-12	2018-11-11
EMCT	Semi-Anechoic Chamber	966	N/A	2015-04-24	2018-04-23
N/A	RF Cable (below 1GHz)	NO.1	N/A	2017-11-10	2018-11-09
N/A	RF Cable (below 1GHz)	NO.4	N/A	2017-11-10	2018-11-09
N/A	RF Cable (above 1GHz)	NO.2	N/A	2017-11-10	2018-11-09
Rohde & Schwarz	EMC32	N/A	V 8.52.0	N/A	N/A

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247(i), §2.1091 & §1.1307(b)(1)	Maximum Permissible exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.247(d)	Spurious Emissions at Antenna Port	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247(a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum conducted output power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

FCC §15.247 (I), §2.1091 & §1.1307(B)(1) - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i)and subpart §1.1310, 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 level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f²)	30
30–300	27.5	0.073	0.2	30
300–1500	-	-	f/1500	30
1500–100,000	-	-	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = PG/4\pi R^2$$

Where:
S = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Mode	Frequency	Antenna Gain		Tune-up Conducted Power		Evaluation Distance	Power Density	Limit
	MHz	dBi	numeric	dBm	mW	cm	mW/cm^2	mW/cm^2
Zigbee	2475	1.5	1.41	0	1.0	20	0.0003	1.0

Note: The device meet FCC MPE at 20 cm distance.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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 user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Antenna Connector Construction

The EUT have one PCB antenna, which was permanently attached and the antenna gain is 1.5 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

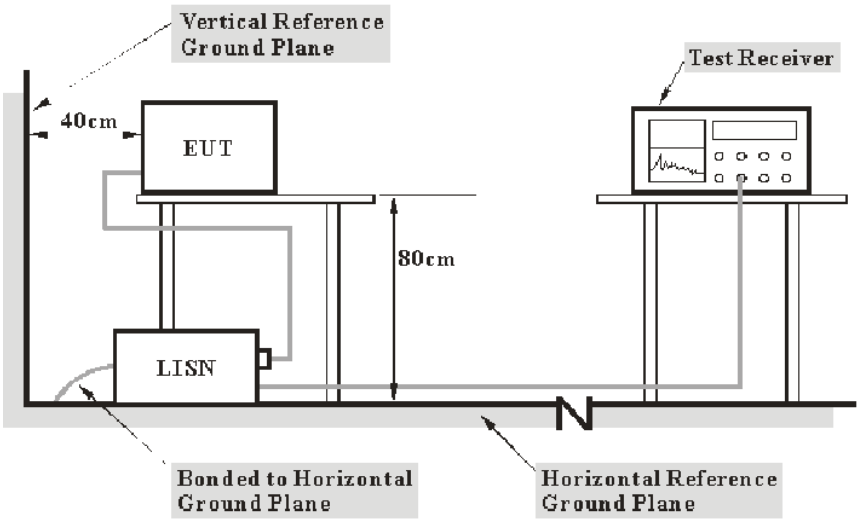
Result: Compliant.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

EUT Setup



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

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The EUT was connected to a 120 V/60 Hz AC power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the EUT was connected to the first LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$V_C = V_R + A_C + VDF$
$C_f = A_C + VDF$

Herein,
V_C (cord. Reading): corrected voltage amplitude
V_R: reading voltage amplitude
A_c: attenuation caused by cable loss
VDF: voltage division factor of AMN
C_f: Correction Factor

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Data

Environmental Conditions

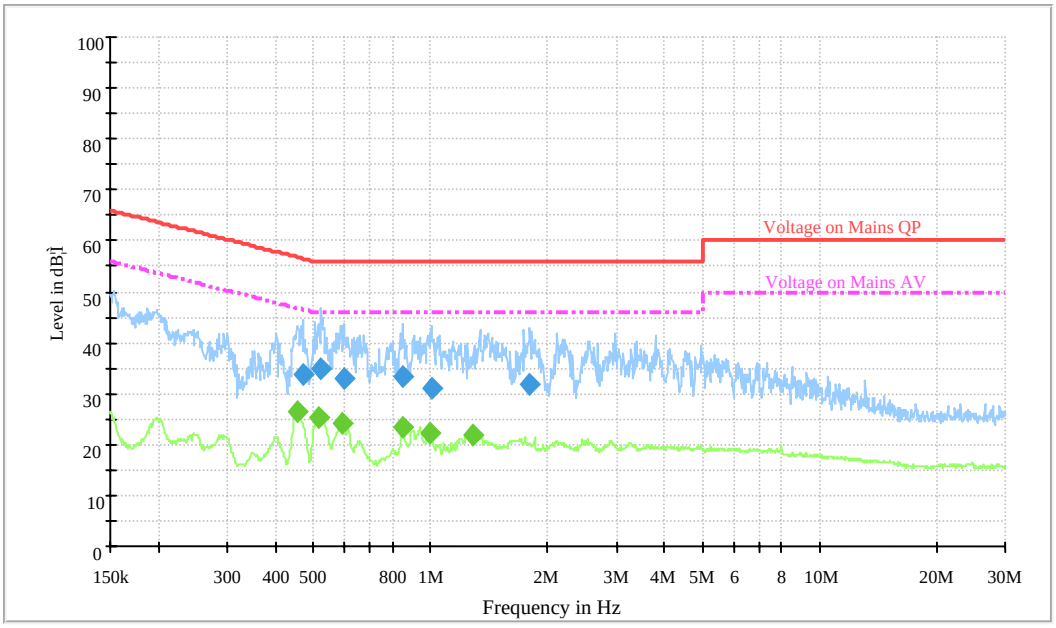
Temperature:	18 °C
Relative Humidity:	42 %
ATM Pressure:	96.3 kPa

The testing was performed by Jacky Gu on 2017-12-11.

Test Mode: Transmitting

Test model: LUM-EBR-SC12E26

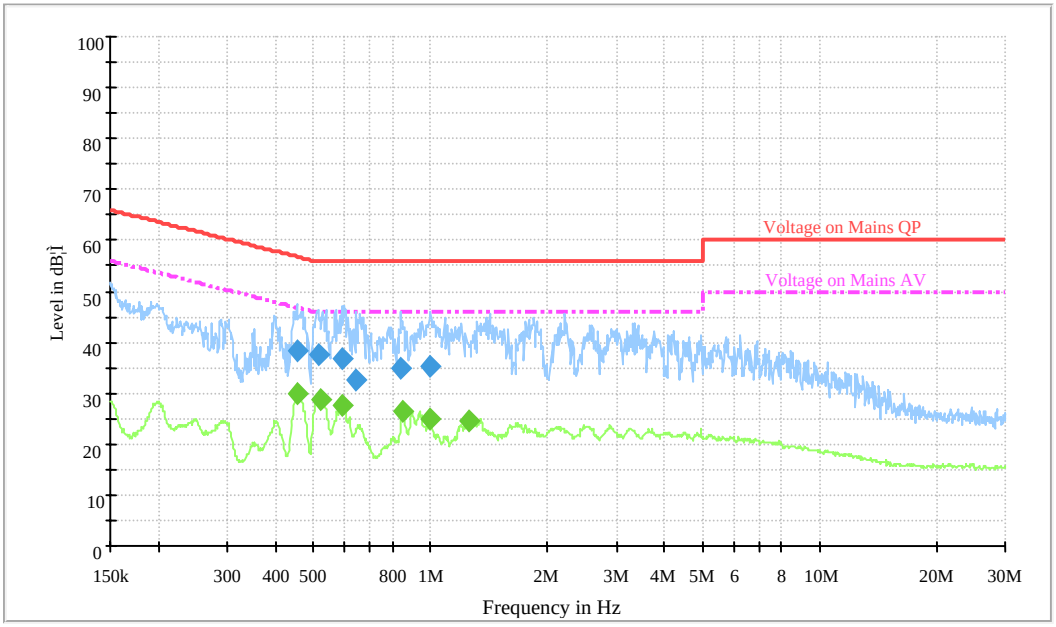
AC120V/60Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBµV)
0.469822	33.8	9.000	L1	19.8	22.7	56.5
0.521207	34.8	9.000	L1	19.8	21.2	56.0
0.599363	33.1	9.000	L1	19.8	22.9	56.0
0.848248	33.2	9.000	L1	19.7	22.8	56.0
1.003088	31.0	9.000	L1	19.8	25.0	56.0
1.803826	31.6	9.000	L1	19.8	24.4	56.0

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBµV)
0.456875	26.3	9.000	L1	19.8	20.4	46.7
0.515002	25.4	9.000	L1	19.8	20.6	46.0
0.589868	24.0	9.000	L1	19.8	22.0	46.0
0.848248	23.3	9.000	L1	19.7	22.7	46.0
0.995111	22.0	9.000	L1	19.8	24.0	46.0
1.289920	21.8	9.000	L1	19.7	24.2	46.0

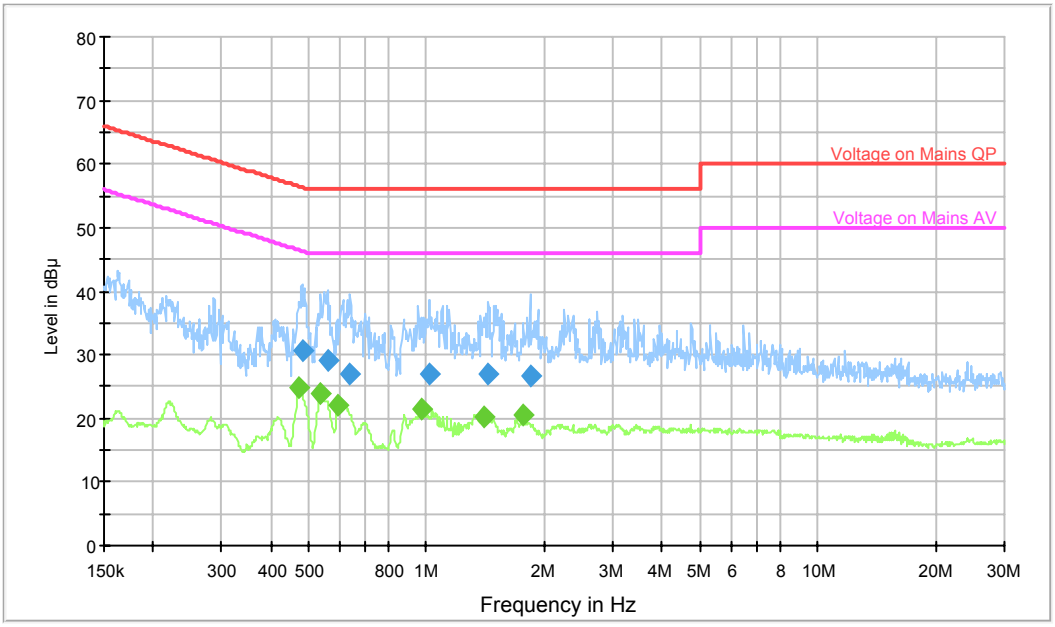
AC120V/60Hz, Neutral



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBµV)
0.453242	38.2	9.000	N	19.5	18.6	56.8
0.512950	37.7	9.000	N	19.5	18.3	56.0
0.589868	36.6	9.000	N	19.5	19.4	56.0
0.644016	32.8	9.000	N	19.5	23.2	56.0
0.838150	34.7	9.000	N	19.5	21.3	56.0
0.999091	35.1	9.000	N	19.5	20.9	56.0

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBµV)
0.455055	30.0	9.000	N	19.5	16.8	46.8
0.521207	28.8	9.000	N	19.5	17.2	46.0
0.592228	27.4	9.000	N	19.5	18.6	46.0
0.848248	26.3	9.000	N	19.5	19.7	46.0
0.999091	25.0	9.000	N	19.5	21.0	46.0
1.249376	24.6	9.000	N	19.5	21.4	46.0

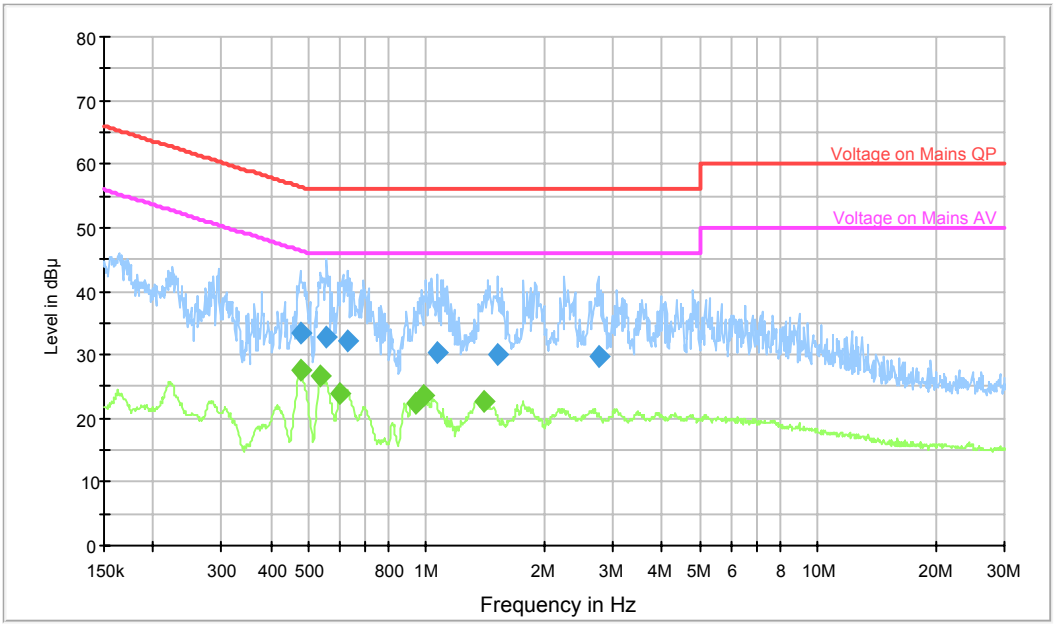
Multiple model: LUM-EBR-SC09E26



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBµV)
0.481211	30.7	9.000	L1	19.8	25.6	56.3
0.557806	29.1	9.000	L1	19.8	26.9	56.0
0.638895	27.1	9.000	L1	19.8	28.9	56.0
1.019234	27.0	9.000	L1	19.8	29.0	56.0
1.442470	26.9	9.000	L1	19.8	29.1	56.0
1.840192	26.6	9.000	L1	19.8	29.4	56.0

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBµV)
0.473588	24.9	9.000	L1	19.8	21.6	46.5
0.538121	23.8	9.000	L1	19.8	22.2	46.0
0.592228	22.1	9.000	L1	19.8	23.9	46.0
0.975445	21.3	9.000	L1	19.8	24.7	46.0
1.402719	20.4	9.000	L1	19.8	25.6	46.0
1.775251	20.7	9.000	L1	19.8	25.3	46.0

AC120V/60Hz, Neutral



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBµV)
0.475483	33.5	9.000	N	19.5	22.9	56.4
0.555584	32.7	9.000	N	19.5	23.3	56.0
0.628774	32.0	9.000	N	19.5	24.0	56.0
1.064988	30.4	9.000	N	19.5	25.6	56.0
1.519305	29.9	9.000	N	19.5	26.1	56.0
2.754027	29.9	9.000	N	19.6	26.1	56.0

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBµV)
0.475483	27.5	9.000	N	19.5	18.9	46.4
0.538121	26.5	9.000	N	19.5	19.5	46.0
0.601760	23.8	9.000	N	19.5	22.2	46.0
0.937272	22.4	9.000	N	19.5	23.6	46.0
0.983264	23.5	9.000	N	19.5	22.5	46.0
1.397131	22.8	9.000	N	19.5	23.2	46.0

Note:
1) Correction Factor =LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
The corrected factor has been input into the transducer of the test software.
2) Corrected Amplitude = Reading + Correction Factor
3) Margin = Limit – Corrected Amplitude

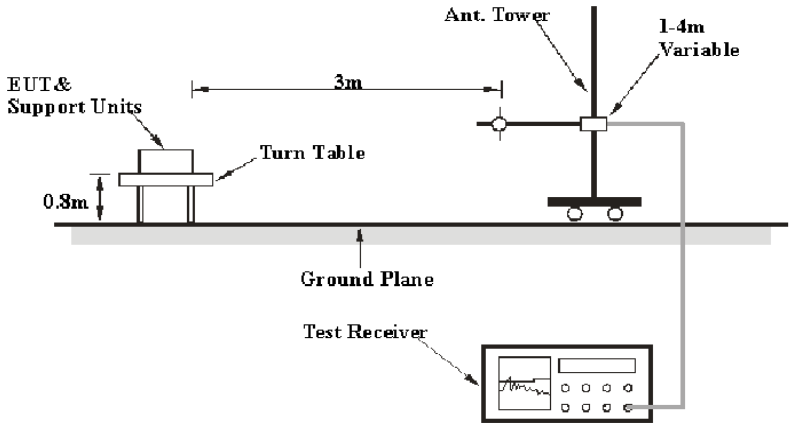
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

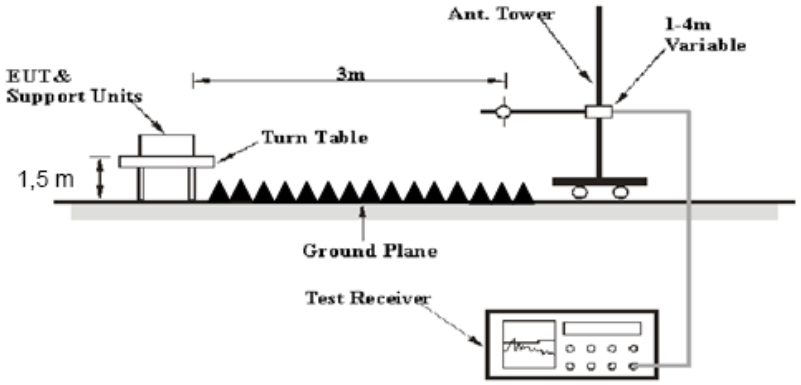
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The EUT was connected to a 120 V/60 Hz AC power source.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP

Frequency Range	RBW	Video B/W	Duty Cycle	Measurement
Above 1 GHz	1MHz	3 MHz	Any	PK
	1MHz	10Hz	>98%	AV
	1MHz	1/T	<98%	AV

Note: T is Transmission Duration

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit –Corrected Amplitude

Test Data

Environmental Conditions

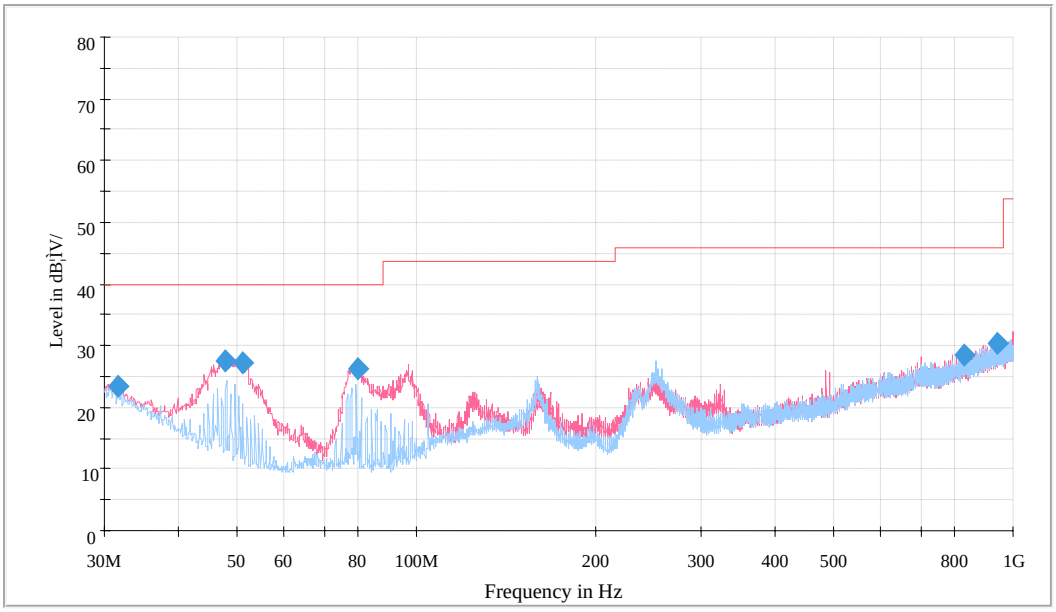
Temperature:	21 °C
Relative Humidity:	46 %
ATM Pressure:	96.1 kPa

** The testing was performed by Jacky Gu on 2017-12-14.*

Test Mode: Transmitting

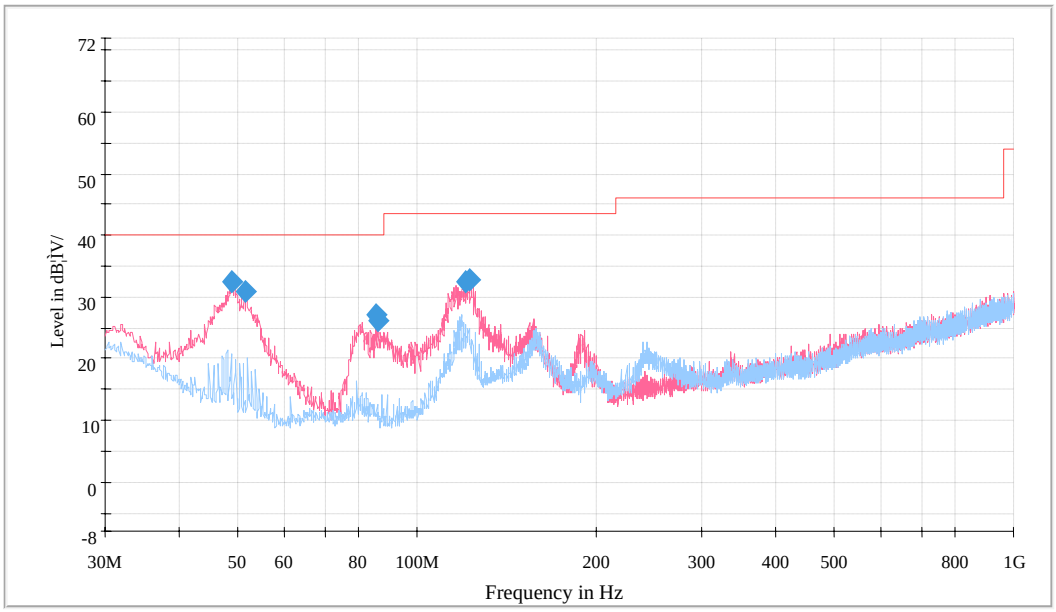
30 MHz to 1 GHz:

Test model: LUM-EBR-SC12E26



Frequency (MHz)	QuasiPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corrected Factor (dB/m)	Margin (dB/m)	Limit (dBµV/m)
31.697500	23.5	104.8	V	56.0	-6.0	16.5	40.0
47.945000	27.5	118.2	V	322.0	-15.8	12.5	40.0
51.340000	27.2	105.9	V	216.0	-17.1	12.8	40.0
79.712500	26.4	113.6	V	98.0	-16.7	13.6	40.0
826.248750	28.6	101.4	V	341.0	-1.5	17.4	46.0
938.283750	30.4	158.2	H	228.0	0.8	15.6	46.0

Multiple model: LUM-EBR-SC09E26



Frequency (MHz)	QuasiPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corrected Factor (dB/m)	Margin (dB/m)	Limit (dBµV/m)
49.036250	32.3	100.0	V	90.0	-16.4	7.7	40.0
51.461250	31.0	100.0	V	47.0	-17.1	9.0	40.0
85.290000	27.0	100.0	V	244.0	-17.2	13.0	40.0
86.138750	26.2	100.0	V	252.0	-17.2	13.8	40.0
120.573750	32.3	100.0	V	269.0	-12.1	11.2	43.5
122.513750	32.7	100.0	V	285.0	-11.8	10.8	43.5

1GHz-25GHz:

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Measurement	Polar	Factor					
MHz	dBμV	PK/AV	H/V	dB(1/m)	dB	dB	dBμV/m	dBμV/m	dB
2405 MHz									
2405	57.40	PK	H	28.72	3.00	0.00	89.12	N/A	N/A
2405	54.68	AV	H	28.72	3.00	0.00	86.40	N/A	N/A
2405	63.23	PK	V	28.72	3.00	0.00	94.95	N/A	N/A
2405	60.76	AV	V	28.72	3.00	0.00	92.48	N/A	N/A
2400	31.72	PK	V	28.70	3.00	0.00	63.42	74.00	10.58
2400	17.14	AV	V	28.70	3.00	0.00	48.84	54.00	5.16
2390	29.91	PK	V	28.67	3.00	0.00	61.58	74.00	12.42
2390	16.38	AV	V	28.67	3.00	0.00	48.05	54.00	5.95
4810	42.89	PK	V	33.87	5.12	26.87	55.01	74.00	18.99
4810	31.73	AV	V	33.87	5.12	26.87	43.85	54.00	10.15
4810	38.04	PK	H	33.87	5.12	26.87	50.16	74.00	23.84
4810	27.12	AV	H	33.87	5.12	26.87	39.24	54.00	14.76
7215	35.84	PK	V	36.40	6.17	26.35	52.06	74.00	21.94
7215	24.91	AV	V	36.40	6.17	26.35	41.13	54.00	12.87
7215	36.99	PK	H	36.40	6.17	26.35	53.21	74.00	20.79
7215	25.87	AV	H	36.40	6.17	26.35	42.09	54.00	11.91
2440 MHz									
2440	58.35	PK	H	28.82	3.00	0.00	90.17	N/A	N/A
2440	55.78	AV	H	28.82	3.00	0.00	87.60	N/A	N/A
2440	63.13	PK	V	28.82	3.00	0.00	94.95	N/A	N/A
2440	60.73	AV	V	28.82	3.00	0.00	92.55	N/A	N/A
4880	43.21	PK	V	34.06	5.09	26.87	55.49	74.00	18.51
4880	32.73	AV	V	34.06	5.09	26.87	45.01	54.00	8.99
4880	38.99	PK	H	34.06	5.09	26.87	51.27	74.00	22.73
4880	28.02	AV	H	34.06	5.09	26.87	40.30	54.00	13.70
7320	36.22	PK	V	36.55	6.22	26.40	52.59	74.00	21.41
7320	25.39	AV	V	36.55	6.22	26.40	41.76	54.00	12.24
7320	37.90	PK	H	36.55	6.22	26.40	54.27	74.00	19.73
7320	26.89	AV	H	36.55	6.22	26.40	43.26	54.00	10.74

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Measurement	Polar	Factor					
MHz	dBµV	PK/AV	H/V	dB(1/m)	dB	dB	dBµV/m	dBµV/m	dB
2475 MHz									
2475	57.74	PK	H	28.93	2.99	0.00	89.66	N/A	N/A
2475	54.90	AV	H	28.93	2.99	0.00	86.82	N/A	N/A
2475	64.77	PK	V	28.93	2.99	0.00	96.69	N/A	N/A
2475	61.94	AV	V	28.93	2.99	0.00	93.86	N/A	N/A
2483.5	31.33	PK	V	28.95	2.99	0.00	63.27	74.00	10.73
2483.5	16.71	AV	V	28.95	2.99	0.00	48.65	54.00	5.35
4950	43.25	PK	V	34.26	5.05	26.88	55.68	74.00	18.32
4950	33.62	AV	V	34.26	5.05	26.88	46.05	54.00	7.95
4950	39.69	PK	H	34.26	5.05	26.88	52.12	74.00	21.88
4950	28.76	AV	H	34.26	5.05	26.88	41.19	54.00	12.81
7425	36.58	PK	V	36.70	6.27	26.45	53.10	74.00	20.90
7425	25.49	AV	V	36.70	6.27	26.45	42.01	54.00	11.99
7425	38.46	PK	H	36.70	6.27	26.45	54.98	74.00	19.02
7425	27.59	AV	H	36.70	6.27	26.45	44.11	54.00	9.89

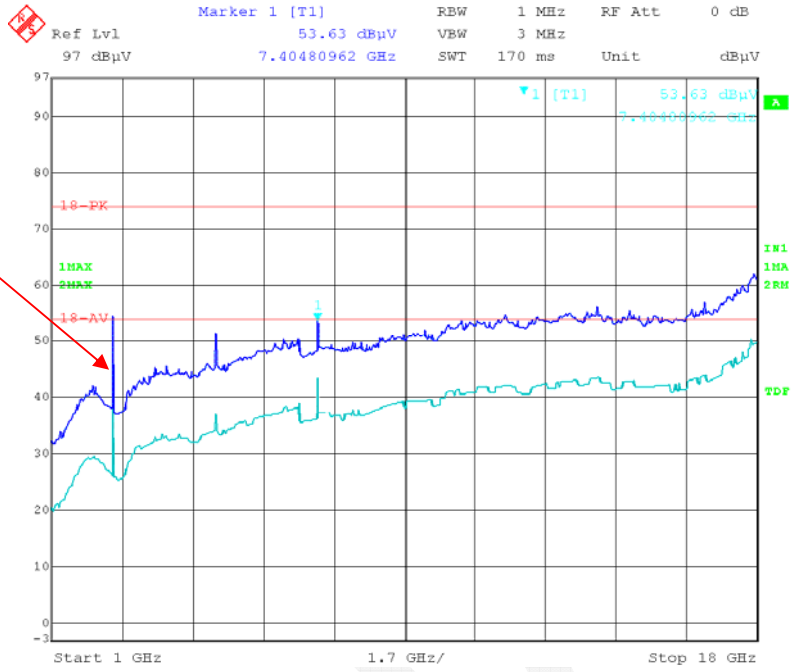
Note:
Corrected Amplitude = Corrected Factor + Reading
Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor
Margin = Limit- Corr. Amplitude

Spurious emissions more than 20 dB below the limit were not reported.

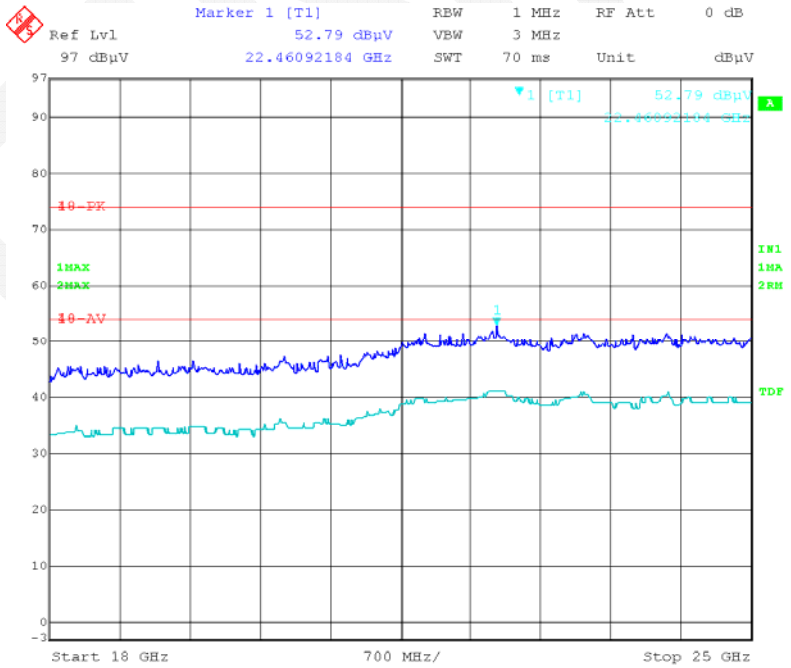
Please refer to the below pre-scan plot of worst case:

High Channel_Horizontal_1GHz-18GHz

Fundamental with Reject Band Filter

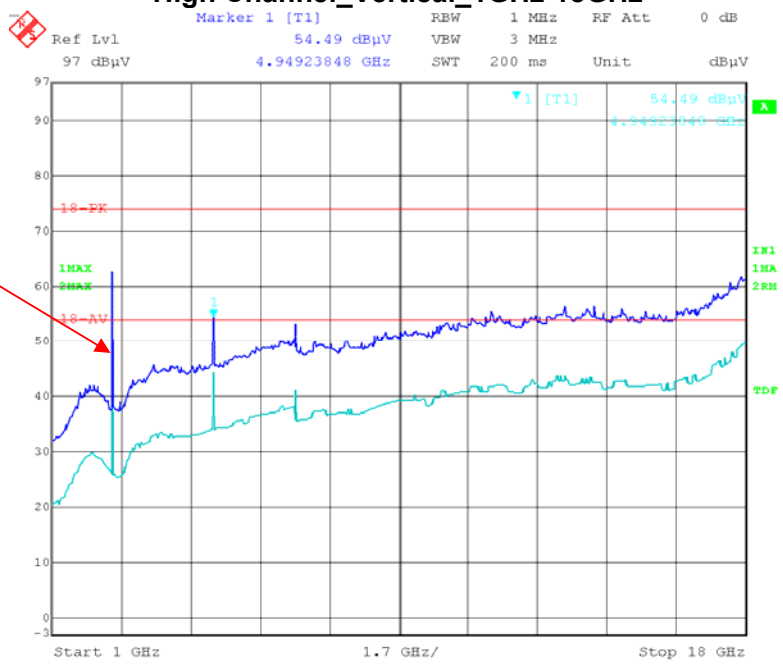


High Channel_Horizontal_18GHz-26GHz

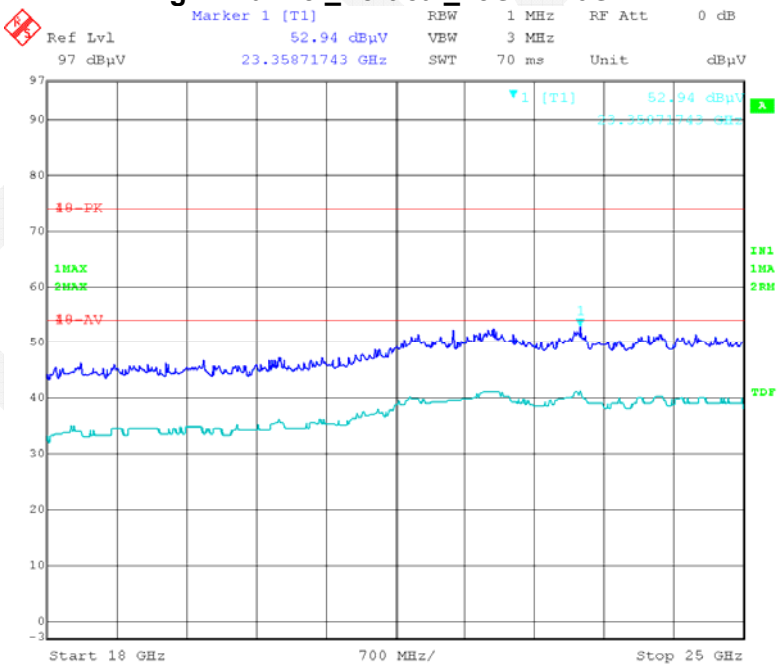


High Channel_Vertical_1GHz-18GHz

Fundamental with Reject Band Filter



High Channel_Vertical_18GHz-26GHz



FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

Applicable Standard

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.

Test Procedure (Radiated Test)

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3×RBW
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to 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.

Test Data

Environmental Conditions

Temperature:	20 °C
Relative Humidity:	54 %
ATM Pressure:	96.3 kPa

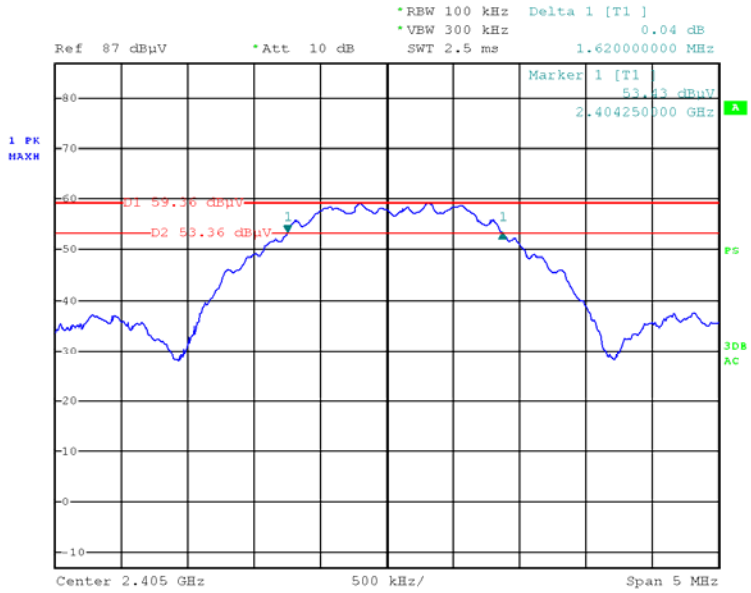
** The testing was performed by Jacky Gu on 2017-12-13.*

Test Mode: Transmitting

Test Result: Compliant. Please refer to the following table and plots.

Test Mode	Channel	Frequency (MHz)	6dB Bandwidth （MHz）	Limit （MHz）
Zigbee	Low	2405	1.62	≥0.5
	Middle	2440	1.62	≥0.5
	High	2475	1.62	≥0.5

Low Channel



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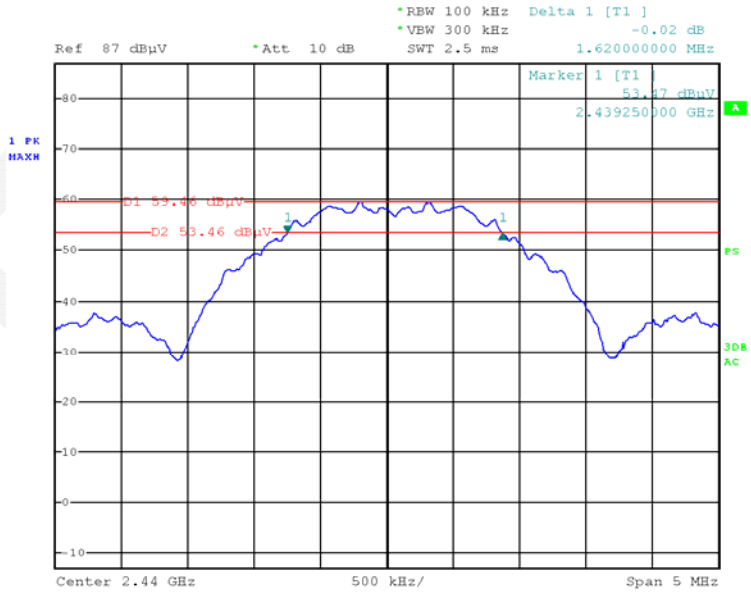
Middle Channel



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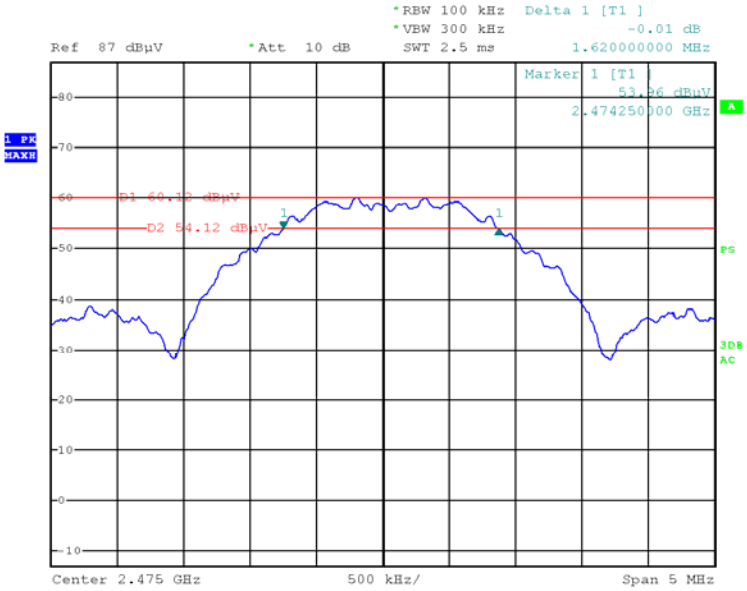
High Channel



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FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §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.

Test Procedure (Radiated Test)

According to ANSI C63.10-2013.

Test Data

Environmental Conditions

Temperature:	21 °C
Relative Humidity:	50 %
ATM Pressure:	96.9 kPa

** The testing was performed by Jacky Gu on 2017-12-13.*

Test Mode: Transmitting

Test Result: Compliant. Please refer to the following table.

Test Mode	Frequency (MHz)	Field Strength (dBμV/m)	EIRP (dBm)	Antenna Gain (dBi)	Conducted Output Power (dBm)	Limit （dBm）
Zigbee	2405	94.95	-0.25	1.5	-1.75	30
	2440	94.95	-0.25	1.5	-1.75	30
	2475	96.69	1.49	1.5	-0.01	30

Note: EIRP[dBm] = E[dBμV/m]-95.2 when distance is 3 meter
EIRP[dBm] = Conducted Output Power[dBm] + Antenna Gain

Where: E is the field strength in dBμV/m
EIRP is the equivalent isotropic radiated power in dBm

FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

Applicable Standard

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 §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure (Radiated Test)

1. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
2. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
3. Repeat above procedures until all measured frequencies were complete.

Test Data

Environmental Conditions

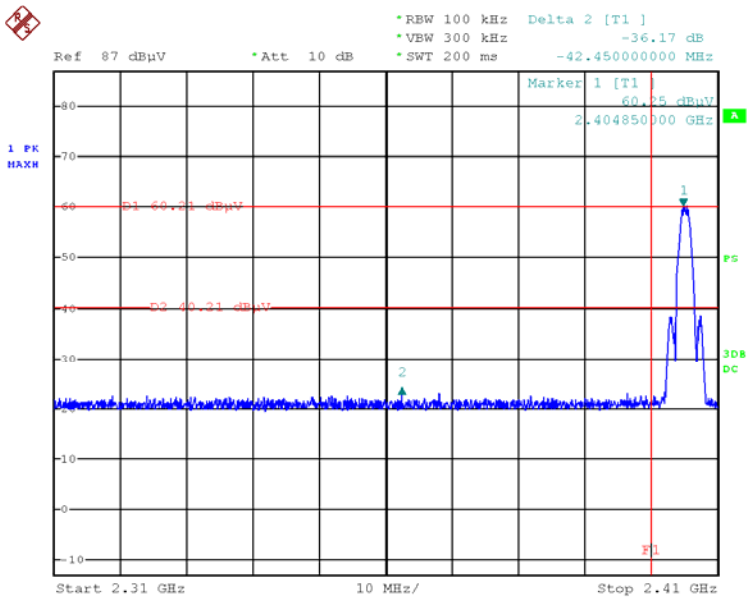
Temperature:	20 °C
Relative Humidity:	54 %
ATM Pressure:	96.3 kPa

** The testing was performed by Jacky Gu on 2017-12-13.*

Test Mode: Transmitting

Test Result: Compliant. Please refer to the following plots.

Band Edge, Left Side



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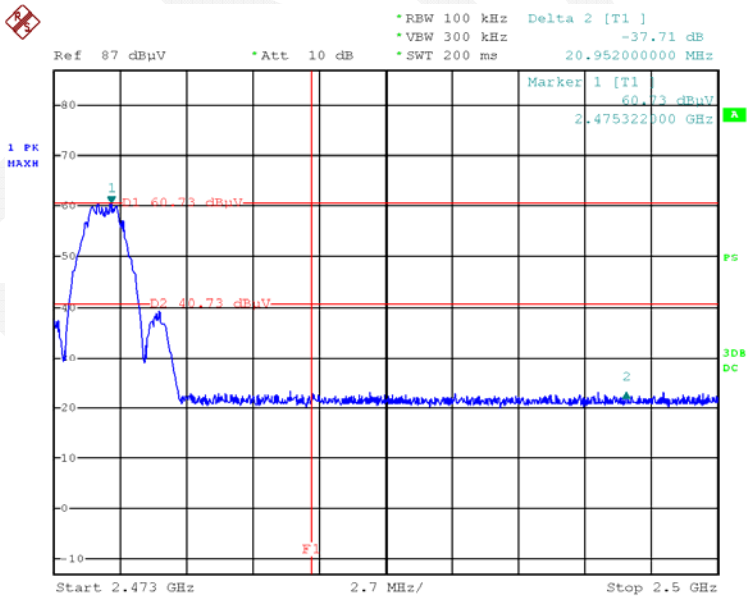
Band Edge, Right Side



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FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

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.

Test Procedure (Radiated Test)

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ 3×RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Test Data

Environmental Conditions

Temperature:	20 °C
Relative Humidity:	52 %
ATM Pressure:	96.3 kPa

** The testing was performed by Jacky Gu on 2017-12-13.*

Test Mode: Transmitting

Test Result: Compliant. Please refer to the following table and plots.

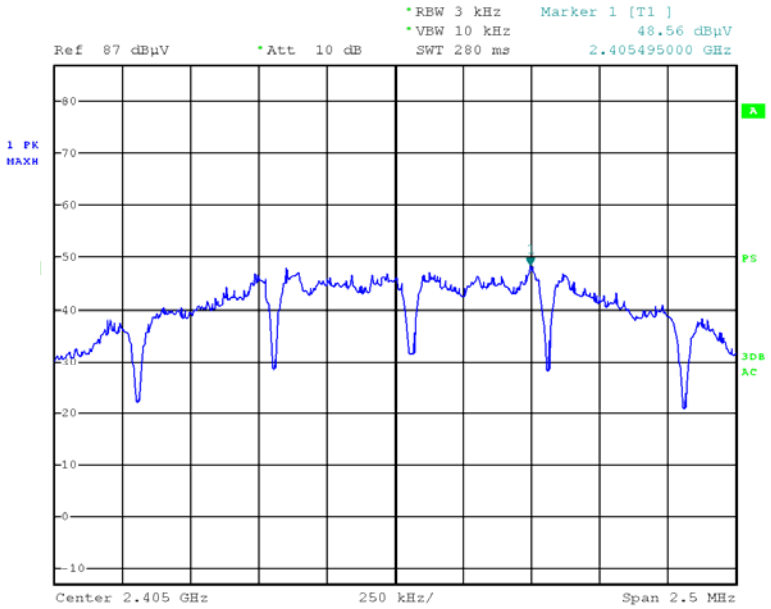
Frequency (MHz)	Reading (dBµV)	Polarity (H/V)	Factor (dB/m)	Cable Loss (dB)	Pre-Amp (dB)	Corrected Amplitude (dBµV/m)	Detector
2405	48.56	V	28.72	3.00	0.00	80.28	Peak
2440	47.72	V	28.82	3.00	0.00	79.54	Peak
2475	48.32	V	28.93	3.00	0.00	80.25	Peak

Tset Mode	Frequency (MHz)	Field Strength (dBµV/m)	EIRP (dBm)	Antenna Gain (dBi)	PSD (dBm/3kHz)	Limit （dBm）
Zigbee	2405	80.28	-14.92	1.5	-16.42	≤8
	2440	79.54	-15.66	1.5	-17.16	≤8
	2475	80.25	-14.95	1.5	-16.45	≤8

Note: EIRP[dBm] = E[dBµV/m]-95.2 when distance is 3 meter
EIRP[dBm] = Conducted Output Power[dBm] + Antenna Gain

Where: E is the field strength in dBµV/m
EIRP is the equivalent isotropic radiated power in dBm

Power Spectral Density, Low Channel



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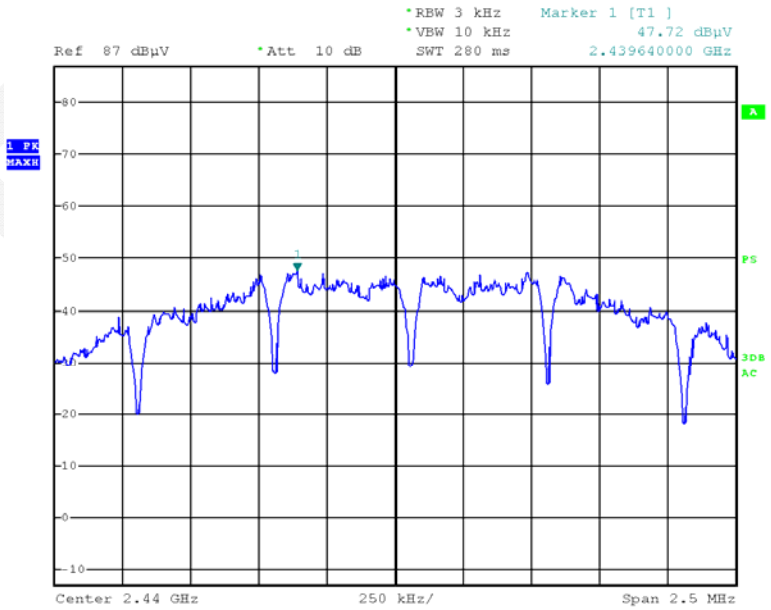
Power Spectral Density, Middle Channel



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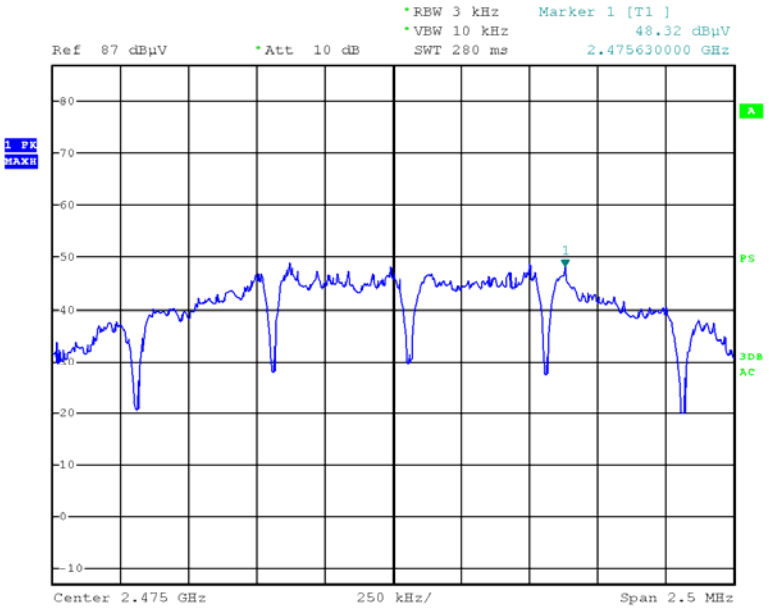
Power Spectral Density, High Channel



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