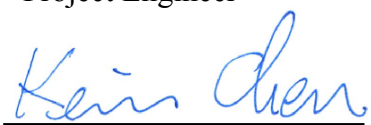
EMC
TEST REPORT

Report No. : EME-050119
Model No. : Lamp Flasher
Issued Date : May 17, 2005

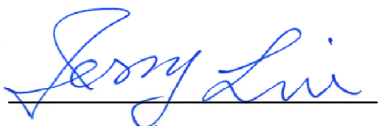
Applicant : Clarity, a Division of Plantronics, Inc.
4289 Bonny Oaks Drive 106, Chattanooga, Tennessee 37406, U.S.A.
Test By : Intertek Testing Services Taiwan Ltd.
No. 11, Ko-Tze-Nan Chia-Tung Li, Shiang-Shan District, Hsinchu, Taiwan

Project Engineer



Kevin Chen

Reviewed By



Jerry Liu

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Summary of Tests

Remote Control Switch -Model: Lamp Flasher
FCC ID: ACELAMPFLASHER

Test	Reference	Results
Conducted Emission of AC Power	15.207	Complies
Radiated Emission test	15.231(b), 15.209	Complies
Measured bandwidth	15.231(c)	Complies

1. General information

1.1 Identification of the EUT

Applicant	: Clarity, a Division of Plantronics, Inc.
Product	: Remote Control Switch
Trade Name:	: Clarity Professional
Model No.	: Lamp Flasher
FCC ID.	: ACELAMPFLASHER
Frequency Range	: 315MHz
Channel Number	: 1 channel
Frequency of each channel	: 315MHz
Type of Modulation	: ASK
Power Supply	: 115Vac, 60Hz with Adapter (Clarity, C2210)
Power Cord	: N/A
Data Cable	: RJ-11 Unshielded Cable 3meter × 1
Sample Received	: Jan. 20, 2005
Test Date(s)	: Jan. 20, 2005 ~ May 12, 2005

1.2 Additional information about the EUT

The EUT is Home Automation. It has been designed and tested to offer safe service provided it is installed, operated, maintained and tested in strict accordance with the instructions and warnings contained in instruction manual.

For more detail features, please refer to User's manual as file name “Installation guide.pdf”

1.3 Antenna description

The EUT uses a permanently connected antenna.

Antenna Gain : 0dBi
Antenna Type : PCB Printed
Connector Type : N/A

1.4 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.	FCC ID
Telephone	CLARiTY	C2210	N/A	FCC DoC Approved
Exchange Board	Teltone	250-00193-07	94948	FCC DoC Approved

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Section 15.231.

2.2 Operation mode

During conducted emission test, the EUT was in normal operating mode.
While in other test, it worked in the status of continuously transmitting.

2.3 Test equipment

Equipment	Brand	Frequency range	Model No.	Intertek ID No.	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	9kHz~2.75GHz	ESCS 30	EC303	04/17/2006
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	EC353	07/13/2005
Spectrum Analyzer	Rohde & Schwarz	20Hz~40GHz	FSEK 30	EC365	10/18/2005
Horn Antenna	EMCO	1GHz~18GHz	3115	EC338	08/16/2005
Bilog Antenna	SCHWARZBECK	25MHz~1.7GHz	VULB 9160	EC368	02/20/2006
Pre-Amplifier	MITEQ	100MHz~26.5GHz	919981	EC373	12/30/2005
Controller	HDGmbH	N/A	HD 100	EP317-1	N/A
Antenna Tower	HDGmbH	N/A	MA 240	EP317-2	N/A
Turn Table	HDGmbH	N/A	DS 420S	EP317-3	N/A
LISN	Rohde & Schwarz	9KHz~30MHz	ESH3-Z5	EC344	01/13/2006

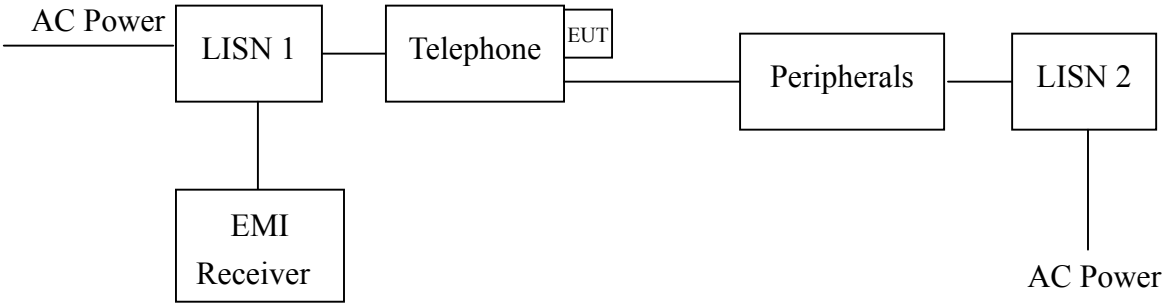
Note: The above equipments are within the valid calibration period.

3. Conducted emission test FCC 15.207

3.1 Operating environment

Temperature:	23	℃
Relative Humidity:	55	%
Atmospheric Pressure:	1023	hPa

3.2 Test setup & procedure



The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.
Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/1992 on conducted measurement.
The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

3.3 Emission limit

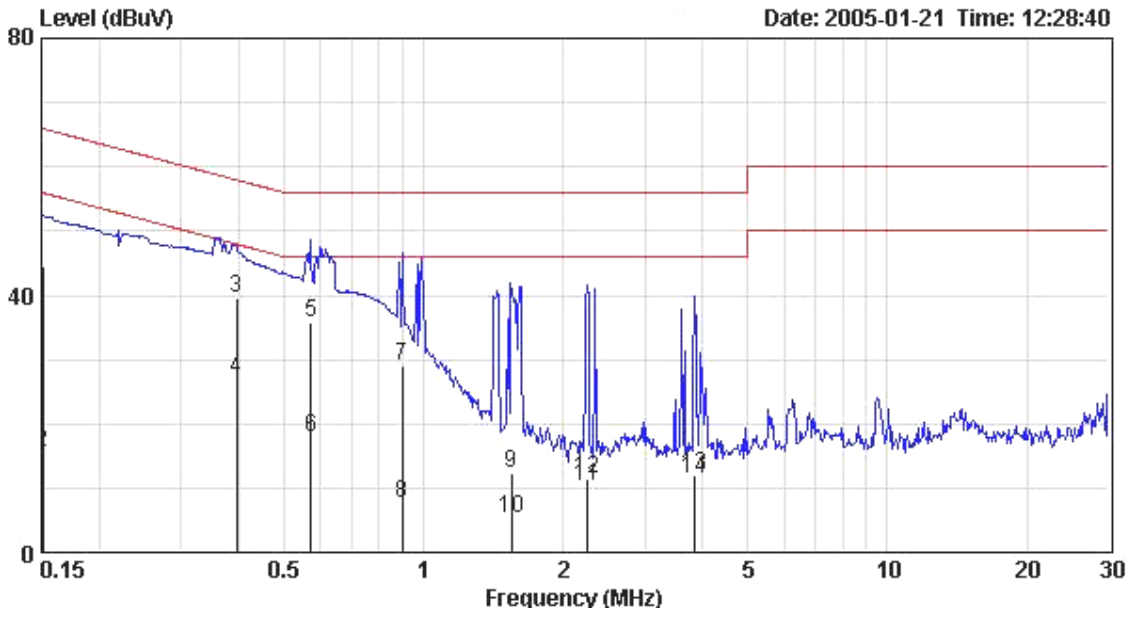
Freq. (MHz)	Maximum RF Line Voltage			
	Class A (dB μ V)		Class B (dB μ V)	
	Q.P.	Ave.	Q.P.	Ave.
0.15~0.50	79	66	66~56	56~46
0.50~5.00	73	60	56	46
5.00~30.0	73	60	60	50

3.4 Conducted emission data FCC 15.207

Phase : Line
EUT : Lamp Flasher
Worst Case : Tx at 315MHz (Ring)

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Av
0.151	0.10	44.53	65.93	15.57	55.93	-21.40	-40.36
0.396	0.10	39.68	57.94	27.00	47.94	-18.26	-20.94
0.572	0.10	35.85	56.00	17.89	46.00	-20.15	-28.11
0.901	0.10	28.90	56.00	7.52	46.00	-27.10	-38.48
1.549	0.11	12.18	56.00	5.36	46.00	-43.82	-40.64
2.253	0.13	10.17	56.00	11.42	46.00	-45.83	-34.58
3.842	0.23	12.00	56.00	11.49	46.00	-44.00	-34.51

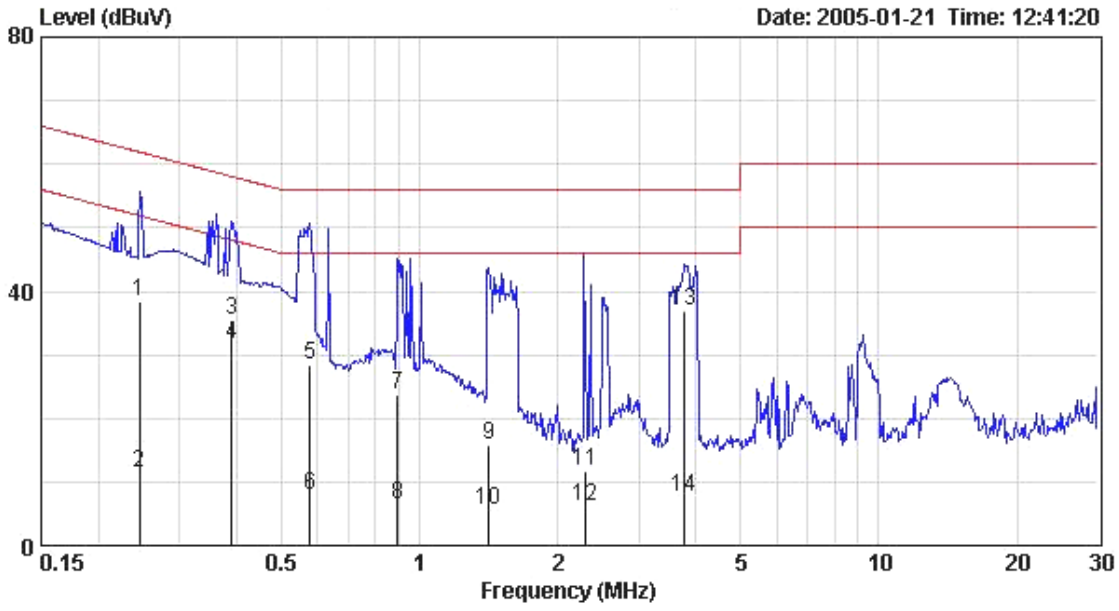
Remark:
1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



Phase : Neutral
EUT : Lamp Flasher
Worst Case : Tx at 315MHz (Ring)

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Av
0.246	0.10	38.50	61.90	11.30	51.90	-23.40	-40.60
0.390	0.10	35.46	58.07	31.74	48.07	-22.61	-16.33
0.577	0.10	28.50	56.00	7.86	46.00	-27.50	-38.14
0.894	0.10	23.63	56.00	6.54	46.00	-32.37	-39.46
1.419	0.11	15.95	56.00	5.51	46.00	-40.05	-40.49
2.289	0.13	11.78	56.00	6.20	46.00	-44.22	-39.80
3.781	0.22	36.98	56.00	7.58	46.00	-19.02	-38.42

Remark:
1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



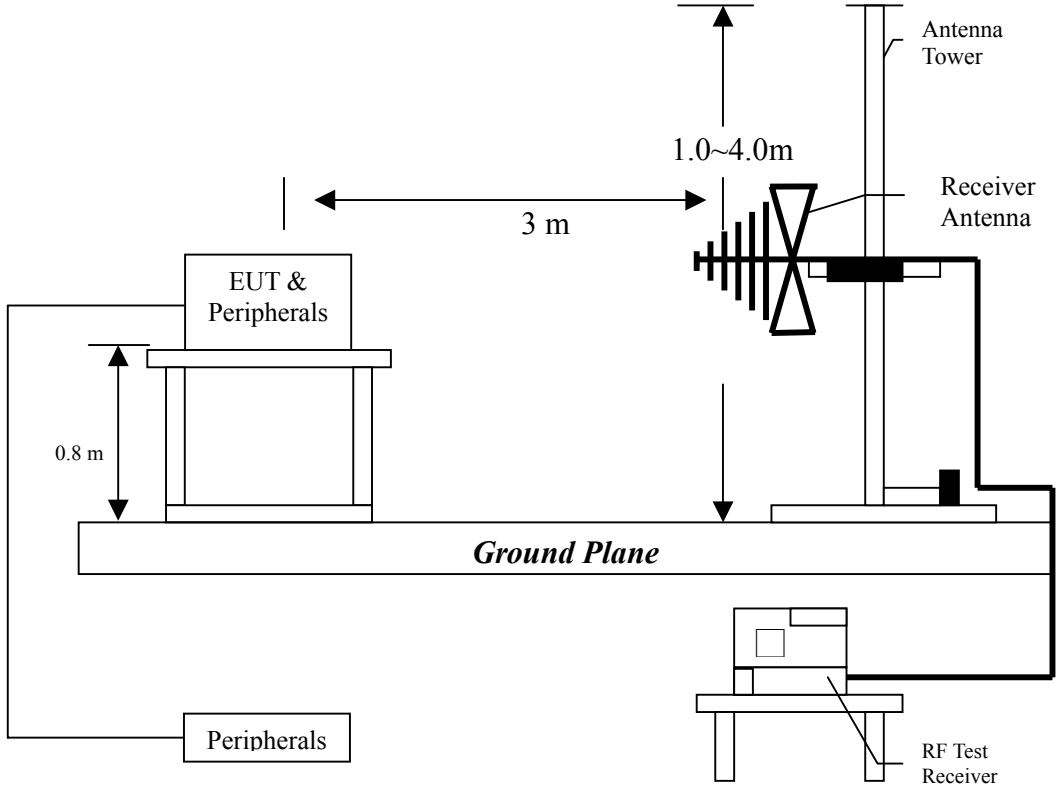
4. Radiated emission test FCC 15.231 (b)

4.1 Operating environment

Temperature:	23	℃
Relative Humidity:	55	%
Atmospheric Pressure	1023	hPa

4.2 Test setup & procedure

The Diagram below shows the test setup, which is utilized to make these measurements.



The signal is maximized through rotation and placement in the two orthogonal axes.
Radiated emission measurements were performed from 30MHz to 25GHz. Spectrum Analyzer Resolution Bandwidth is 100kHz or greater for frequencies 30MHz to 1GHz, 1MHz – for frequencies above 1GHz.
The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

The signal is maximized through rotation and placement in the two orthogonal axes.

Setup 1

Setup 2

After verifying two axes, we found the maximum electromagnetic field was occurred at setup 2 configuration. The final test data was executed under this configuration.

The EUT configuration please refer to the "Spurious set-up photo.pdf".

4.3 Radiated emission limit

4.3.1 Fundamental and harmonics emission limits

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	(uV/m@3m)	(dBuV/m@3m)	(uV/m@3m)	(dBuV/m@3m)
315	6041.68	75.62	604.17	55.62

4.3.2 General radiated emission limit

The spurious Emission shall test through the 10th harmonic. 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).

Frequency MHz	15.209 Limits (dB μ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:
1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

   Uncertainty was calculated in accordance with NAMAS NIS 81. Expanded uncertainty (k=2) of radiated emission measurement is 3.078 dB.

4.4 Calculation of Average Factor

The specification for output field strengths in accordance with the FCC rules specify measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The time period over which the duty cycle is measured in 24.5 ms or the repetition cycle, whichever is a shorter time frame. The duty cycle is measured by placing the spectrum analyzer in zero span mode at 100kHz resolution bandwidth.

Averaging factor in dB = 20log (duty cycle)

The duty cycle is simply the on-time divided by the period:

The duration of one cycle = 18.41 ms

The number of short pulses in each period (12) multiplied by the duration of each short pulses (588.27μs) = 7.059ms

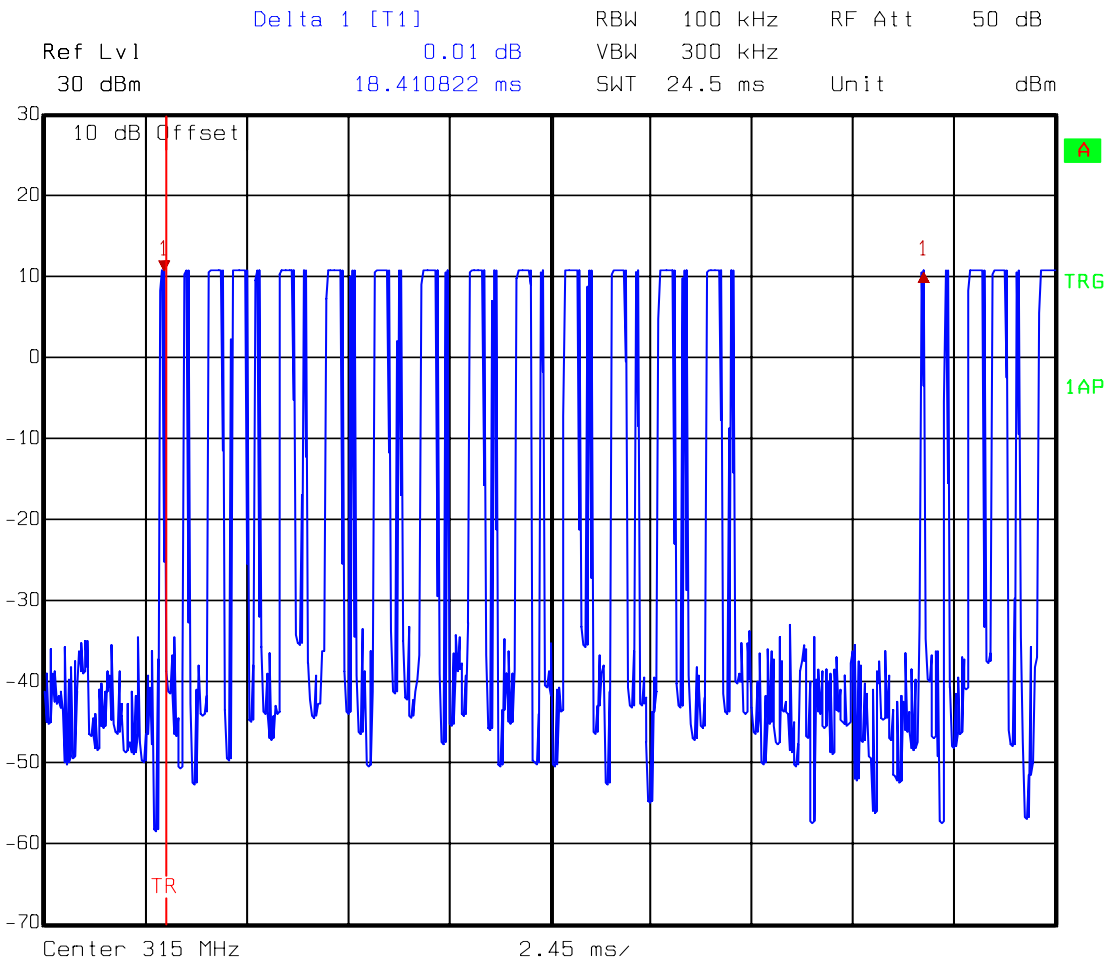
The number of long pulses in each period (13) multiplied by the duration of each long pulses (79.72μs) = 1.036ms

Effective period of the cycle = 8.095 ms

DC = 8.095 ms / 18.41 ms = 0.4397

Therefore, the averaging factor is fond by 20 $\log_{10}$ 0.4397 = -7.14 dB

Please see the plot below.



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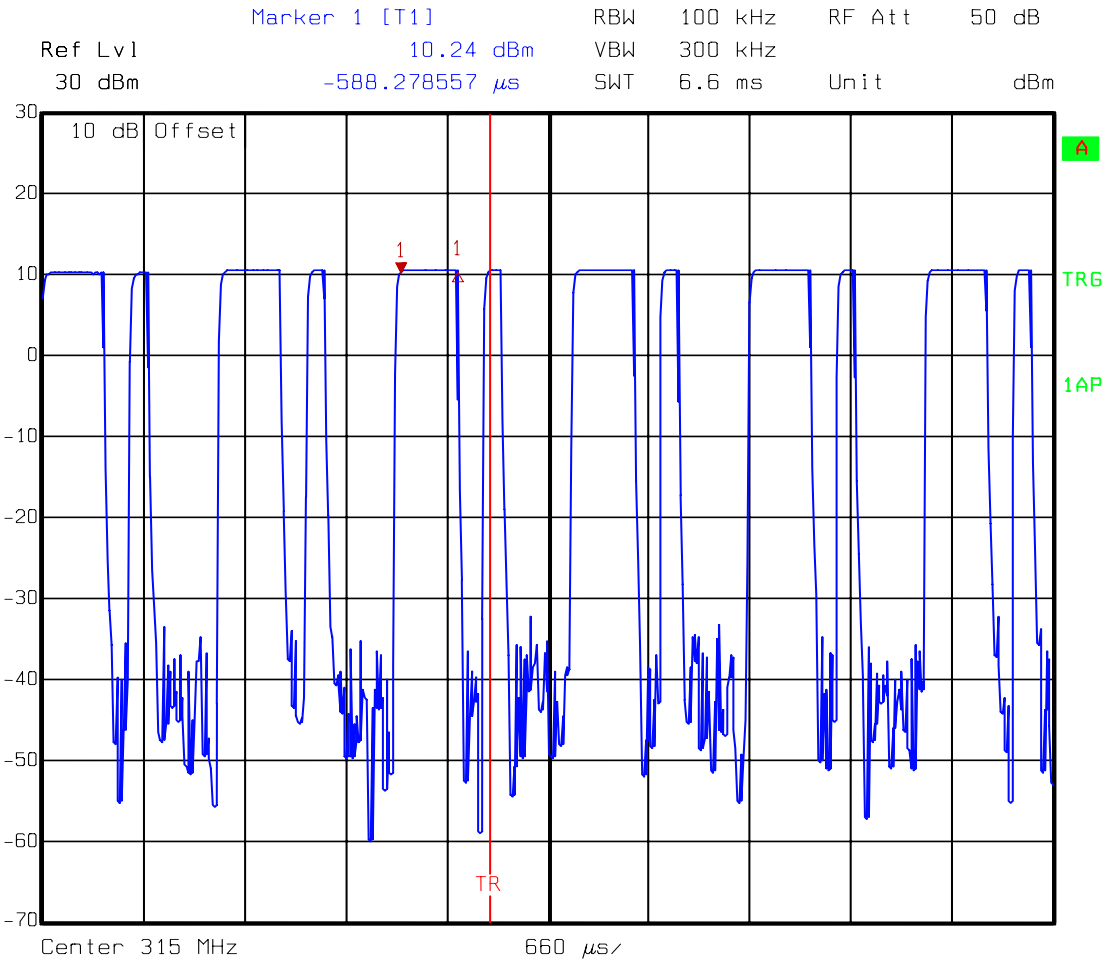

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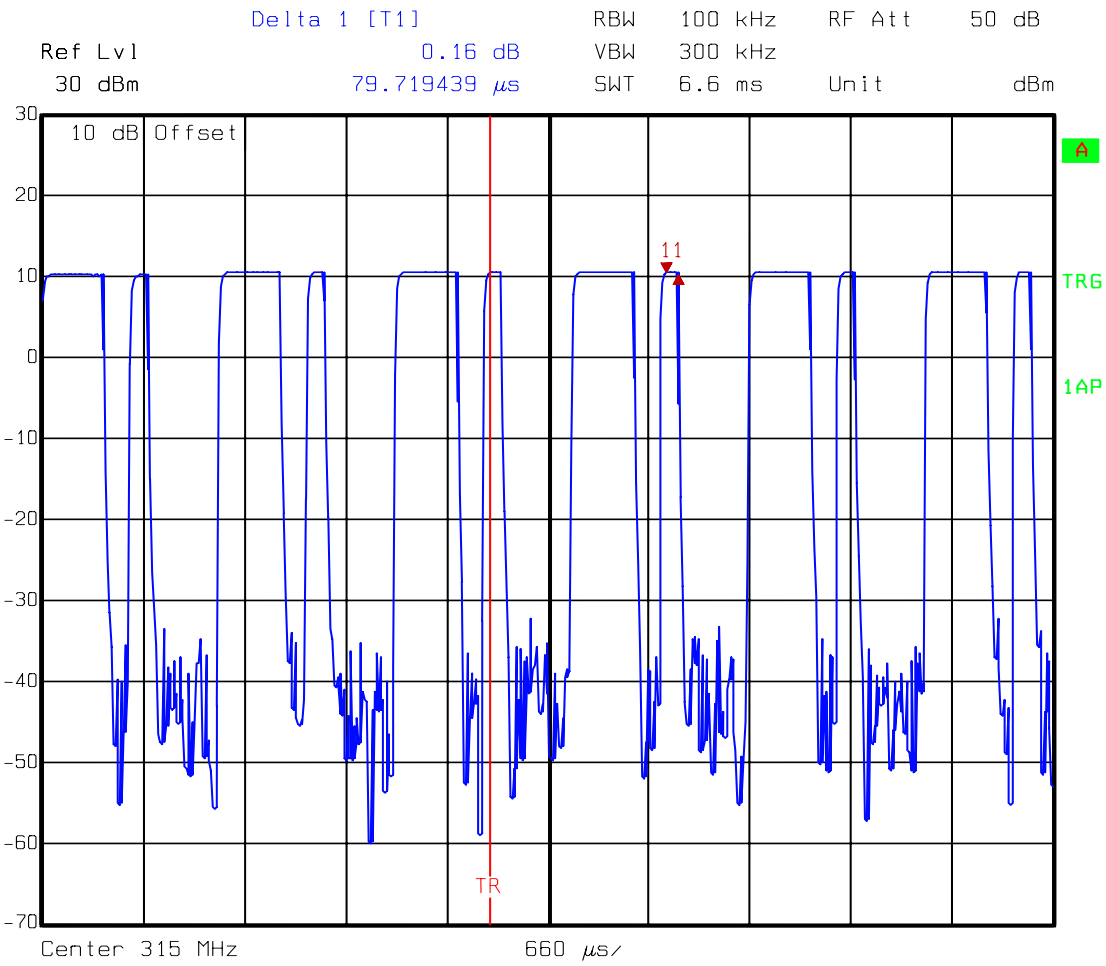

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4.5 Radiated emission test data FCC 15.231

4.5.1 Measurement results: Fundamental Radiated Emission Data

The EUT has two kinds of setup, the worst case was found at setup 2.

EUT : Lamp Flasher
Worst Case : Tx at 315MHz with setup 2

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV/m)	Average Factor (dB)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV//m)	Margin (dB)	Antenna high (m)	Turn Table angle (degree)
315.020	PK	V	14.37	50.80	0.00	65.17	95.60	-30.43	1.01	255.00
315.020	AV	V	14.37	50.80	-7.14	58.03	75.60	-17.57	1.01	255.00
630.010	PK	V	21.19	28.71	0.00	49.90	75.60	-25.70	1.06	142.00
630.010	AV	V	21.19	28.71	-7.14	42.76	55.60	-12.84	1.06	142.00
945.030	PK	V	25.23	11.93	0.00	37.16	75.60	-38.44	1.03	132.00
945.030	AV	V	25.23	11.93	-7.14	30.02	55.60	-25.58	1.03	132.00
315.010	PK	H	14.64	63.57	0.00	78.21	95.60	-17.39	1.15	184.00
315.010	AV	H	14.64	63.57	-7.14	71.07	75.60	-4.53	1.15	184.00
630.050	PK	H	21.25	27.78	0.00	49.03	75.60	-26.57	1.23	55.00
630.050	AV	H	21.25	27.78	-7.14	41.89	55.60	-13.71	1.23	55.00
945.020	PK	H	25.44	18.85	0.00	44.29	75.60	-31.31	1.08	312.00
945.020	AV	H	25.44	18.85	-7.14	37.15	55.60	-18.45	1.08	312.00

Remark:
1. Corrected Level = Correction Factor + Reading + Average Factor
2. Correction Factor = Antenna Factor + Cable Loss
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

For PK:
1GHz-3GHz: 50dBuV
3GHz-14GHz: 54dBuV
14GHz-26.5GHz: 60dBuV

For AV:
1GHz-3GHz: 41.5dBuV
3GHz-14GHz: 46dBuV
14GHz-26.5GHz: 46.5dBuV

4.5.2 Measurement results: frequencies above 1GHz

EUT : Lamp Flasher
Test Condition : Tx at 315MHz with setup 1

No Spurious emissions were found above the spectrum analyzer noise floor in the frequency range 1GHz to 4GHz.

Noise floor level
For PK:
1GHz-4GHz: 20dBuV

For AV:
1GHz-4GHz: 10dBuV

EUT : Lamp Flasher
Test Condition : Tx at 315MHz with setup 2

No Spurious emissions were found above the spectrum analyzer noise floor in the frequency range 1GHz to 25GHz.

Noise floor level
For PK:
1GHz-3GHz: 20dBuV
3GHz-14GHz: 27dBuV
14GHz-26.5GHz: 39dBuV

For AV:
1GHz-3GHz: 10dBuV
3GHz-14GHz: 16dBuV
14GHz-26.5GHz: 28dBuV

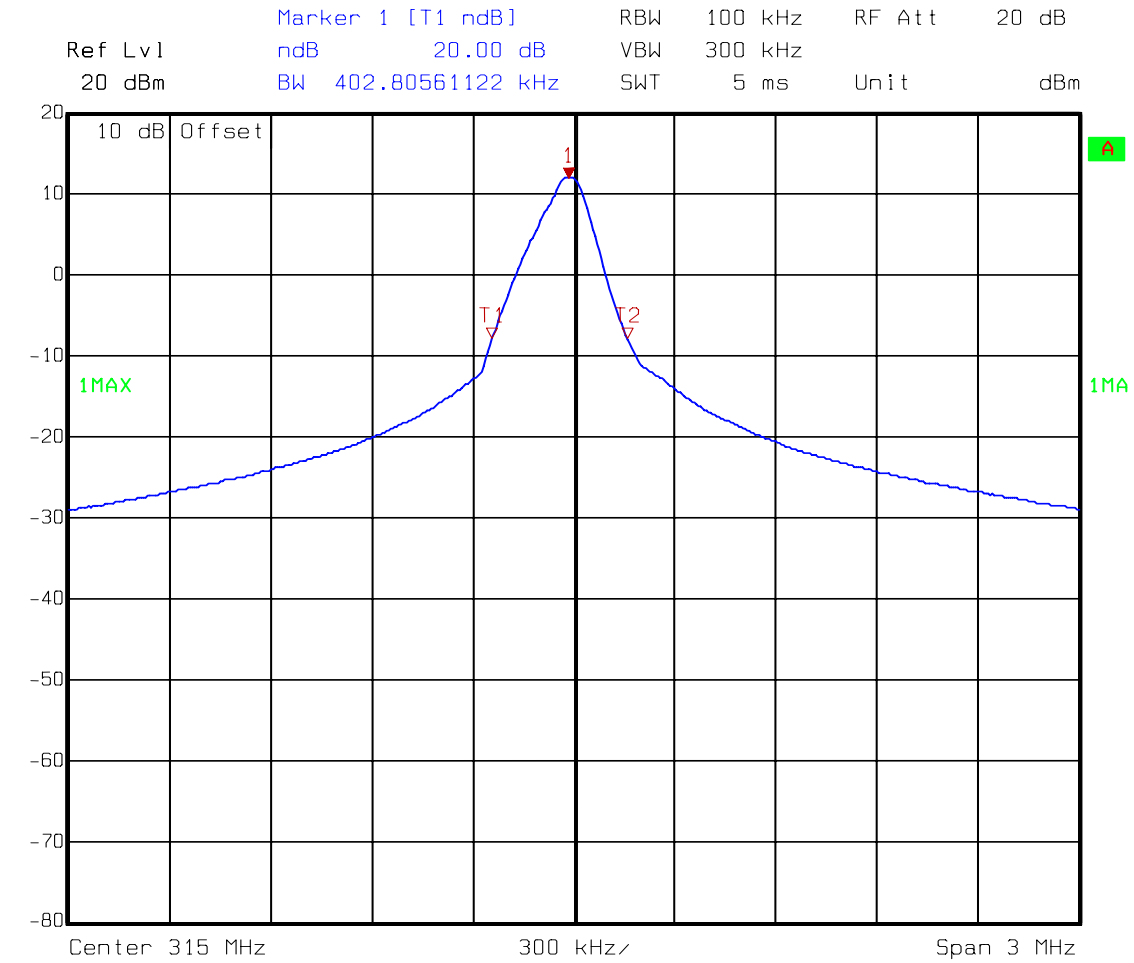
4.6 Measured bandwidth FCC 15.231(C)

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. Bandwidth is determined at the points 20dB down from the modulated carrier.

B.W(20dBc) Limit = 0.25% × f(MHz) = 0.25% ×315MHz = 787.5KHz

From the plot, the bandwidth is observed to be 315MHz, at 20dBc where the bandwidth limit is 787.5KHz.

Please see the plot below.



Comment A: 20dB Band-width
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