TEST REPORT

of

FCC Part 15 Subpart C

☒ New Application; ☐ Class I PC; ☐ Class II PC

Product :	**Smart HUD**
Brand:	**E-LEAD**
Model:	**EL-101**
Model Difference:	**N/A**
FCC ID:	**QYK-EL101**
FCC Rule Part:	**§15.239, Cat:DXX**
Applicant:	**E-LEAD ELECTRONIC CO., LTD.**
Address:	**NO. 37 Gungdung 1ST RD., Shengang Shiang, Changhua, 509, TAIWAN, R.O.C. (Chuan-Hsin Industrial Park)**

Test Performed by:

International Standards Laboratory
<Lung-Tan LAB>
*Site Registration No.
BSMI: SL2-IN-E-0013; MRA TW1036; TAF: 0997; IC: IC4067B-3;
*Address:
No. 120, Lane 180, San Ho Tsuen, Hsin Ho Rd.
Lung-Tan Hsiang, Tao Yuan County 325, Taiwan
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Report No.: **ISL-14LR166FCFM**

Issue Date : **2014/08/07**

VERIFICATION OF COMPLIANCE

Applicant:	E-LEAD ELECTRONIC CO., LTD.
Product Description:	Smart HUD
Brand Name:	E-LEAD
FCC ID:	QYK-EL101
FCC Rule Part:	§15.239
Model No.:	EL-101
Model Difference:	N/A
Date of test:	2014/06/25 ~ 2014/08/06
Date of EUT Received:	2014/06/25

We hereby certify that:

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

Test By:	Dino Chen	***Date:***	2014/08/07
	Dion Chang / Engineer		
Prepared By:	Gigi yeh	***Date:***	2014/08/07
	Gigi Yeh / Specialist		
Approved By:	Vincent Su	***Date:***	2014/08/07
	Vincent Su / Technical Manager		

Version

Version No.	Date	Description
00	2014/08/07	Initial creation of document

Table of Contents

1. GENERAL INFORMATION 5

1.1 PRODUCT DESCRIPTION 5
1.2 RELATED SUBMITTAL(S) / GRANT (S) 7
1.3 TEST METHODOLOGY 7
1.4 TEST FACILITY 7
1.5 SPECIAL ACCESSORIES 7
1.6 EQUIPMENT MODIFICATIONS 7

2. SYSTEM TEST CONFIGURATION 8

2.1 EUT CONFIGURATION 8
2.2 EUT EXERCISE 8
2.3 TEST PROCEDURE 8
2.4 LIMITATION 9
2.5 CONFIGURATION OF TESTED SYSTEM 11

3. SUMMARY OF TEST RESULTS 12

4. DESCRIPTION OF TEST MODES 12

5. CONDUCTED EMISSIONS TEST (NOT APPLY IN THE REPORT) 13

5.1 MEASUREMENT PROCEDURE: 13
5.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 13
5.3 MEASUREMENT EQUIPMENT USED: 13
5.4 MEASUREMENT RESULT: 13

6. RADIATED EMISSION TEST 14

6.1 MEASUREMENT PROCEDURE 14
6.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 14
6.3 MEASUREMENT EQUIPMENT USED: 15
6.4 FIELD STRENGTH CALCULATION 15
6.5 MEASUREMENT RESULT 16

7. 20DBOCCUPIED BANDWIDTH 20

7.1 MEASUREMENT PROCEDURE 20
7.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 20
7.3 MEASUREMENT EQUIPMENT USED: 20
7.4 MEASUREMENT RESULTS 20

1. GENERAL INFORMATION

1.1 Product Description

Product Name:	Smart HUD
Brand Name:	E-LEAD
Model Name:	EL-101
Power Supply:	5Vdc USB port through power adaptor or 3.7 Vdc re-chargeable battery
Power adaptor:	10~16Vdc from car battery
CCD Camera:	One provided
USB Port:	One provided for connect to power adaptor
Mini HDMI port:	One provided for CCD Camera
Simultaneous transmissions:	Yes
Hardware Version:	N/A
Software Version:	N/A

Bluetooth:

Frequency Range:	2402 – 2480MHz
Bluetooth Version:	BT 3.0
Channel number:	79 channels
Modulation type	Frequency Hopping Spread Spectrum
Modulation type:	GFSK + π /4 DQPSK + 8DPSK
Transmit Power:	1.41 dBm (Peak)
Dwell Time:	<= 0.4s
Antenna Designation:	Chip Antenna / 2.1 dBi

The EUT is compliance with Bluetooth EDR V3.0 Standard.

FM Transmitter:

Frequency Range:	88.1MHz – 107.9MHz
Transmit Power:	46.16 dBuV/m (Peak) at 3m
Modulation type:	FM
Transition Rate:	200KHz
Antenna Designation:	monopole Antenna

This test report applies for FM transmitter.

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **QYK-EL101** filing to comply with Section 15.239 of the FCC Part 15, Subpart C Rules.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2009. Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4 Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of **International Standards Laboratory** <Lung-Tan LAB> No. 120, Lane 180, San Ho Tsuen, Hsin Ho Rd., Lung-Tan Hsiang, Tao Yuan County 325, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2009. FCC Registration Number is: TW1036, Canada Registration Number: 4067B-3.

1.5 Special Accessories

Not available for this EUT intended for grant.

1.6 Equipment Modifications

Not available for this EUT intended for grant.

2. SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT (Transmitter) was tested with a test program to fix the Tx frequency that was for the purpose of the measurements. For more information please see test data and APPENDIX 1 for set-up photographs.

2.3 Test Procedure

2.3.1 Conducted Emissions (Not apply in the report)

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 7, 13 of ANSI C63.4-2009 and RSS-Gen:2010. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna. according to the requirements in Section 8 and 13 of ANSI C63.4-2009.

2.4 Limitation

(1) Conducted Emission

According to section 15.207(a) Conducted Emission Limits is as following.

Frequency range MHz	Limits dB (uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

(2) Radiated Emission

a. Emission from the intentional radiator shall be confined with a band 200kHz wide centered on the operation frequency. The 200kHz band shall lie wholly within the frequency range of 88-108 MHz.

b. The field strength of any emission within the permitted 200kHz band shall not exceed 250 micro volts/meter at 3 meters. (48dBμV at 3m) The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in section 15.35 for limiting peak emissions apply.

c.The field strength of any emissions radiated on any frequency outside of the specified 200kHz band shall not exceed the general radiated emission limits in section Part 15.209 and RSS-210 2.7 Table 2 (Intentional Radiators general limit).as below.

Frequency (MHz)	Field strength μV/m	Distance (m)	Field strength at 3m dBμV/m
1.705-30	30	30	69.54
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

Remark: 1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of ξ 15.205 and RSS-210 2.7 Table 1
4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of ξ15.205 and RSS-210 2.7 Table 1, then the general radiated emission limits in ξ 15.209 and RSS-210 2.7 Table 2 apply.

2.5 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

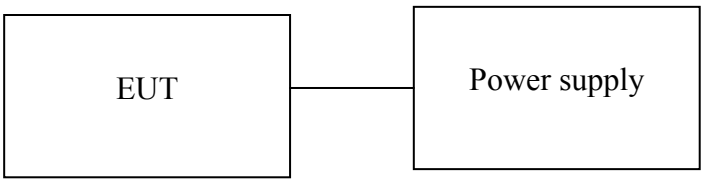


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1.	Power supply	MRL	TH-3205	NA	NA	Non-shield

3. SUMMARY OF TEST RESULTS

Description Of Test	Remark
Conducted Emission	N/A
Radiated Emission	Complied
26dB Bandwidth	Complied

4. Description of test modes

The frequency 88.1MHz、98MHz and 107.9 MHz are chosen with 2.5kHz audio signal for full testing. And the EUT stay in continuous transmitting mode.

5. CONDUCTED EMISSIONS TEST (NOT APPLY IN THE REPORT)

5.1 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

5.2 Test SET-UP (Block Diagram of Configuration)

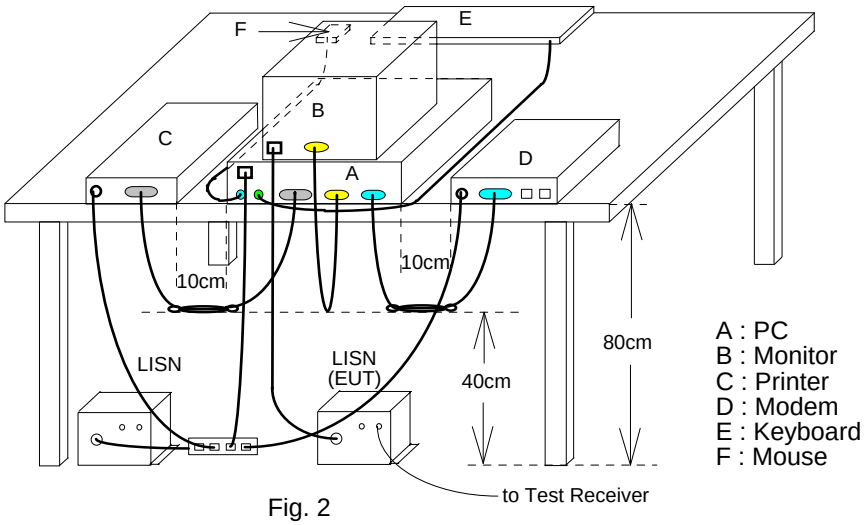


Fig. 2

5.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Conduction 04-1 Cable	WOKEN	CFD 300-NL	Conduction 04 -1	09/24/2013	09/23/2014
EMI Receiver 16	Rohde & Schwarz	ESCI	101221	06/13/2014	06/12/2015
LISN 18	ROHDE & SCHWARZ	ENV216	101424	03/13/2014	03/12/2015
LISN 19	ROHDE & SCHWARZ	ENV216	101425	03/13/2014	03/12/2015

5.4 Measurement Result:

N/A

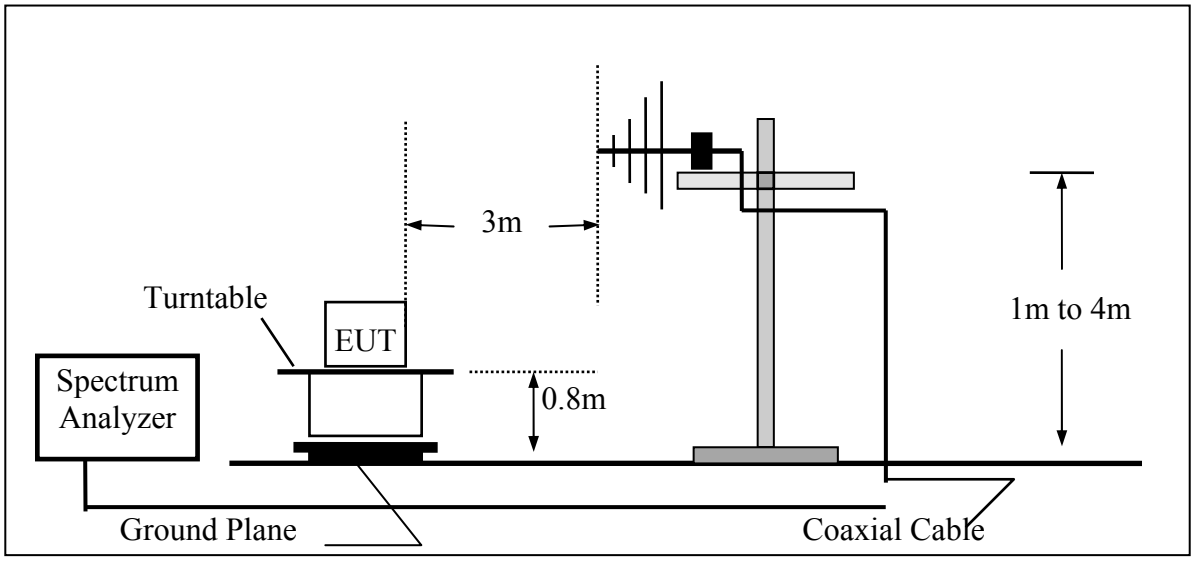
6. RADIATED EMISSION TEST

6.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.

6.2 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



6.3 Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Spectrum Analyzer 21(26.5GHz)	Agilent	N9010A	MY49060537	07/18/2014	07/17/2015
Spectrum Analyzer 20(6.5GHz)	Agilent	E4443A	MY48250315	05/26/2014	05/25/2015
Spectrum Analyzer 22(43GHz)	R&S	FSU43	100143	05/03/2014	05/02/2015
Loop Antenna9K-30M	A.H.SYSTEM	SAS-564	294	03/07/2013	03/06/2015
Bilog Antenna30-1G	Schaffner	CBL 6112B	2756	01/08/2014	01/07/2015
Horn antenna1-18G(06)	EMCO	3117	0006665	11/04/2013	11/03/2014
Horn antenna18-26G(04)	Com-power	AH-826	081001	05/15/2013	05/14/2015
Preamplifier9-1000M	HP	8447D	NA	02/20/2014	02/19/2015
Preamplifier1-18G	MITEQ	AFS44-00101800-25-10P-44	1329256	07/18/2014	07/17/2015
Preamplifier1-26G	EM	EM01M26G	NA	02/20/2014	02/19/2015
Cable1-18G	HUBER SUHNER	Sucoflex 106	NA	02/17/2014	02/16/2015
Cable UP to 1G	HUBER SUHNER	RG 214/U	NA	10/14/2013	10/13/2014
SUCOFLEX 1GHz~40GHz cable	HUBER SUHNER	Sucoflex 102	27963/2&37421/2	10/03/2013	10/02/2015
2.4G Filter	Micro-Tronics	Brm50702	76	12/27/2013	12/26/2014

6.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Average Value = Peak Value + 20 Log (Ton/Tp) ……. Pulse Modulation

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

6.5 Measurement Result

Fundamental Measurement Result

Operation Mode : TX mode
Fundamental Frequency : 88.1 MHz
Temp : 25 ℃
Test Date : 2014/07/29
Test By : Dino
Hum. : 60%

Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
88.10	53.70	-18.28	35.42	67.95	-32.53	Peak	VERTICAL
88.10	58.29	-18.28	40.01	67.95	-27.94	Peak	HORIZONTAL

Operation Mode : TX mode
Fundamental Frequency : 98MHz
Temp : 25 ℃
Test Date : 2014/07/29
Test By : Dino
Hum. : 60%

Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
98.00	57.26	-17.64	39.62	67.95	-28.33	Peak	VERTICAL
98.00	62.54	-17.64	44.90	67.95	-23.05	Peak	HORIZONTAL

Operation Mode : TX mode
Fundamental Frequency : 107.9 MHz
Temp : 25 ℃
Test Date : 2014/07/29
Test By : Dino
Hum. : 60%

Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
107.90	58.55	-15.91	42.64	67.95	-25.31	Peak	VERTICAL
107.90	62.07	-15.91	46.16	67.95	-21.79	Peak	HORIZONTAL

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode: Transmitting Mode Test Date: 2014/07/29
Fundamental Frequency: 88.1MHz Test By: Dino
Temperature : 25 ℃ Humidity : 65 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	231.76	46.97	-13.76	33.21	46.00	-12.79	Peak	VERTICAL
2	264.30	41.72	-12.36	29.36	46.00	-16.64	Peak	VERTICAL
3	317.12	44.91	-10.79	34.12	46.00	-11.88	Peak	VERTICAL
4	534.40	40.88	-7.16	33.72	46.00	-12.28	Peak	VERTICAL
5	681.84	38.92	-4.54	34.38	46.00	-11.62	Peak	VERTICAL
6	844.80	36.11	-1.86	34.25	46.00	-11.75	Peak	VERTICAL
1	176.20	42.24	-13.26	28.98	43.50	-14.52	Peak	HORIZONTAL
2	198.78	53.32	-14.75	38.57	43.50	-4.93	Peak	HORIZONTAL
3	264.30	42.51	-12.36	30.15	46.00	-15.85	Peak	HORIZONTAL
4	498.51	47.50	-7.68	39.82	46.00	-6.18	Peak	HORIZONTAL
5	725.49	40.87	-3.59	37.28	46.00	-8.72	Peak	HORIZONTAL
6	176.20	42.24	-13.26	28.98	43.50	-14.52	Peak	HORIZONTAL

Remark:

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
2 Measuring frequencies from the lowest internal frequency to the 1GHz.
3 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
4 Measurement result within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz, VBW=300KHz.
6 Peak is below the average limit, so that the average result is not measured

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode: Transmitting Mode Test Date: 2014/07/29
Fundamental Frequency: 98MHz Test By: Dino
Temperature : 25 ℃ Humidity : 65 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	134.76	39.37	-13.08	26.29	43.50	-17.21	Peak	VERTICAL
2	198.78	47.53	-14.75	32.78	43.50	-10.72	Peak	VERTICAL
3	334.58	44.40	-10.50	33.90	46.00	-12.10	Peak	VERTICAL
4	414.12	42.92	-8.96	33.96	46.00	-12.04	Peak	VERTICAL
5	497.54	42.28	-7.70	34.58	46.00	-11.42	Peak	VERTICAL
6	715.79	39.97	-3.84	36.13	46.00	-9.87	Peak	VERTICAL
1	198.78	51.90	-14.75	37.15	43.50	-6.35	Peak	HORIZONTAL
2	262.80	48.29	-12.43	35.86	46.00	-10.14	Peak	HORIZONTAL
3	294.00	41.39	-11.29	30.10	46.00	-15.90	Peak	HORIZONTAL
4	480.08	44.57	-7.89	36.68	46.00	-9.32	Peak	HORIZONTAL
5	525.67	44.34	-7.29	37.05	46.00	-8.95	Peak	HORIZONTAL
6	628.49	41.41	-5.32	36.09	46.00	-9.91	Peak	HORIZONTAL

Remark:

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.

2 Measuring frequencies from the lowest internal frequency to the 1GHz.

3 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.

4 Measurement result within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz, VBW=300KHz.

6 Peak is below the average limit, so that the average result is not measured

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode: Transmitting Mode Test Date: 2014/07/29
Fundamental Frequency: 107.9MHz Test By: Dino
Temperature : 25 ℃ Humidity : 65 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	201.69	50.53	-14.79	35.74	43.50	-7.76	Peak	VERTICAL
2	215.80	44.47	-14.60	29.87	43.50	-13.63	Peak	VERTICAL
3	322.70	36.05	-10.70	25.35	46.00	-20.65	Peak	VERTICAL
4	544.10	44.04	-7.01	37.03	46.00	-8.97	Peak	VERTICAL
5	726.46	39.82	-3.57	36.25	46.00	-9.75	Peak	VERTICAL
1	199.75	54.00	-14.78	39.22	43.50	-4.28	Peak	HORIZONTAL
2	215.80	41.25	-14.60	26.65	43.50	-16.85	Peak	HORIZONTAL
3	257.95	51.48	-12.67	38.81	46.00	-7.19	Peak	HORIZONTAL
4	322.70	36.89	-10.70	26.19	46.00	-19.81	Peak	HORIZONTAL
5	480.08	45.32	-7.89	37.43	46.00	-8.57	Peak	HORIZONTAL
6	793.39	39.25	-2.58	36.67	46.00	-9.33	Peak	HORIZONTAL

Remark:

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.

2 Measuring frequencies from the lowest internal frequency to the 1GHz.

3 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.

4 Measurement result within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz, VBW=300KHz.

6 Peak is below the average limit, so that the average result is not measured

7. 20DBOCCUPIED BANDWIDTH

7.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation
3. Set SPA Center Frequency = fundamental frequency, RBW=10KHz, VBW= 30KHz, Span =200KHz.
4. Set SPA Max hold. Mark peak, -20dB.

7.2 Test SET-UP (Block Diagram of Configuration)

Same as 6.2 Radiated Emission Measurement.

7.3 Measurement Equipment Used:

Same as 6.3 Radiated Emission Measurement.

7.4 Measurement Results

88.1MHz = 0.08495MHz

98.0MHz = 0.08550 MHz

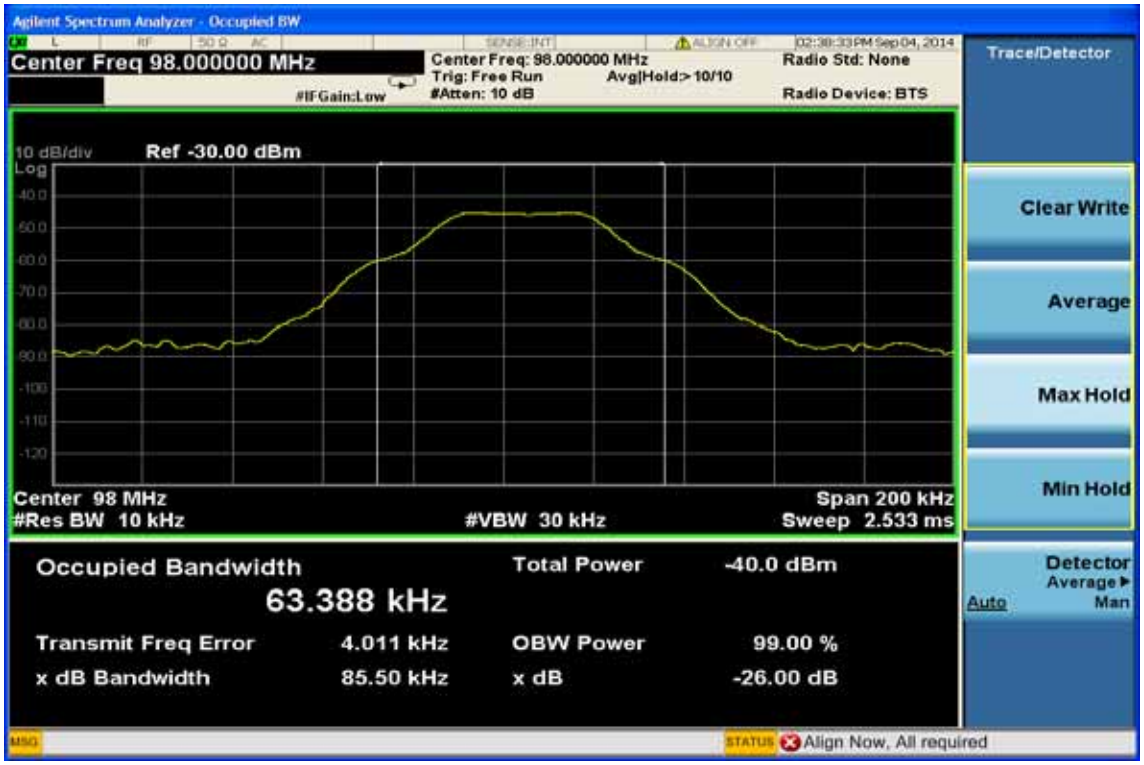
107.9MHz = 0.08501 MHz

Refer to attached data chart.

20dB Band Width Test Data

Low

Mid



High


Agilent Spectrum Analyzer - Occupied BW
Center Freq 107.900000 MHz
Center Freq: 107.900000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 10 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
Trace/Detector
10 dB/div
Ref -30.00 dBm
Log
Clear Write
Average
Max Hold
Min Hold
Center 107.9 MHz
#Res BW 10 kHz
#VBW 30 kHz
Span 200 kHz
Sweep 2.533 ms
Occupied Bandwidth
63.534 kHz
Total Power
-38.0 dBm
Transmit Freq Error
4.528 kHz
OBW Power
99.00 %
x dB Bandwidth
85.01 kHz
x dB
-26.00 dB
Detector
Average
Auto
Man
Align Now, All required