ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Applicant:	Quanta Computer Inc. No.188, Wenhua 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan (R.O.C)
Product Name:	All-in-One PC
Brand Name:	HP
Model No.:	TPC-Q065-32
Model Difference:	N/A
Report Number:	E2/2019/80056
FCC ID:	HFSQTA-NZF
FCC Rule Part:	Part 15C
Issue Date:	Oct. 07, 2019
Date of Test:	Aug. 14, 2019 ~ Sep. 12, 2019
Date of EUT Received:	Aug. 14, 2019

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15C.

The test results of this report relate only to the tested sample identified in this report.

Tested By: Nick Lin

Nick Lin / Sr. Engineer

Approved By: Blue Yang

Blue Yang / Asst. Manager

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Revision History

Revision	Description	Issue Date	Remark
Rev.00	Original.	Sep. 24, 2019	Revised By: Yuri Tsai
Rev.01	Updated product name	Oct. 07, 2019	Revised By: Yuri Tsai

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1 GENERAL INFORMATION

1.1 Product Description

Product Name:	All-in-One PC	
Brand Name:	HP	
Model No.:	TPC-Q065-32	
Model Difference:	N/A	
Hardware Version:	N/A	
Software Version:	N/A	
Power Supply:	19.5Vdc from AC/DC Adapter	
	Adapter:	Model No.: TPC-DA60, Supplier: Delta

Radio Technology:	WPC
Operating Frequency	120~130 kHz
Transmit Power	79.60dBuV/m at 3m.
Number of Channels	1
Antenna Type	Loop Antenna
Modulation Type	ASK/FSK

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1.2 Test Methodology

FCC Part 15, Supbpart C

ANSI C63.10:2013
Note: All test items have been performed and record as per the above standards..

1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803 (TAF code 0513)
FCC Designation number: TW0001

1.4 Special Accessories

There is no special accessory used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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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 Transmitter was operated in the normal operating mode. The Tx frequency was fixed which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50uH/50 ohm of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Radiated Emissions

The EUT is a placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. 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 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.

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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 3 meters.
3. Distance extrapolation factor = 40 log (required distance/ test distance) (dB);
4. The measurement was undertaken in closer distance at 3m, where extrapolation factor is offset to convert the limit of the measurement. Ex.20*log(30)+40*log(30/3) = 69.54dBuV/m
5. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of §15.205.
6. The general radiated emission limits in §15.209 apply for the spurious emission generate from UE, except for the fundamental emission where the respective section specifies otherwise.

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2.4 Configuration of Tested System

Fig. 2-1 Emission test set up configuration

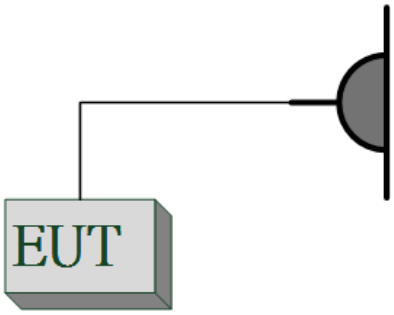

Fig. 2-2 Conduction test set up configuration

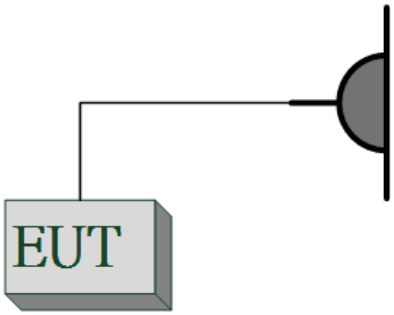

Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WPC Test software	N/A	N/A	N/A	N/A	N/A

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3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207	AC Power Line Conducted Emission	Compliant
§15.209	Radiated Emission Limits, general requirement	Compliant
§15.215 (c)	20 dB OCCUPIED BANDWIDTH	Compliant
§15.203	Antenna Requirement	Compliant

4 DESCRIPTION OF TEST MODES

The EUT stay in continuous transmitting mode. The frequency 131kHz is the default channel to test, where it is the only manipulative channel as this application supports.

The field strength of spurious radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode), the worst case E2 position was reported.

The data rate as the lowest supported is selected while tests are conducted.

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Frequency Stability	+/- 123.36 Hz
20 dB OCCUPIED BANDWIDTH	+/- 123.36 Hz
Temperature	+/- 0.8 °C
Humidity	+/- 4.7 %
DC / AC Power Source	DC= +/- 1%, AC=+/- 0.2%

Radiated Spurious Emission Measurement Uncertainty	
Polarization: Vertical	9kHz~30MHz: +-2.3dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB
Polarization: Horizontal	9kHz~30MHz: +-2.3dB
	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

Note:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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6 CONDUCTED EMISSIONS TEST

6.1 Limitation

Conducted Emission

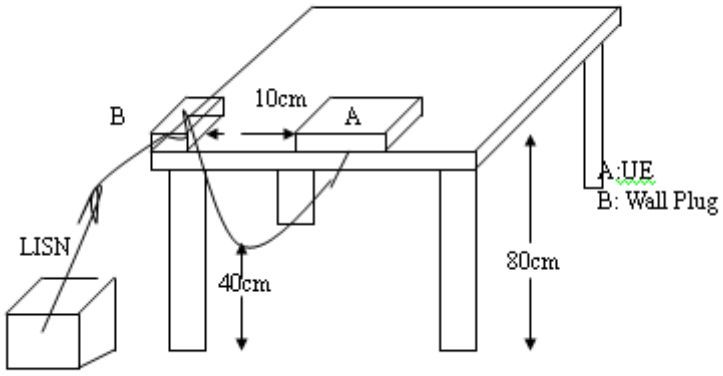
According to section 15.207(a) Conducted Emission Limits is as following.

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.		

6.2 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. Sweep frequency starting from 150 kHz to 30 MHz for phase L1.
4. Repeating the measurement as lists above for phase neutral.

6.3 Test SET-UP (Block Diagram of Configuration)



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6.4 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
EMI Test Receiver	R&S	ESCI 3	100335	02/12/2019	02/11/2020
Coaxial Cables	N/A	WK CE Cable	N/A	11/26/2018	11/25/2019
LISN	SCHWARZBECK	NSLK 8127	8127-649	04/02/2019	04/01/2020
LISN	FCC	FCC-LISN-50/250-25-2-01	4034	04/09/2019	04/08/2020
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R	N.C.R

6.5 Measurement Result:

Note: Refer to next page for measurement data and plots.
Note2: The * reveals the worst-case results that closet to the limit.

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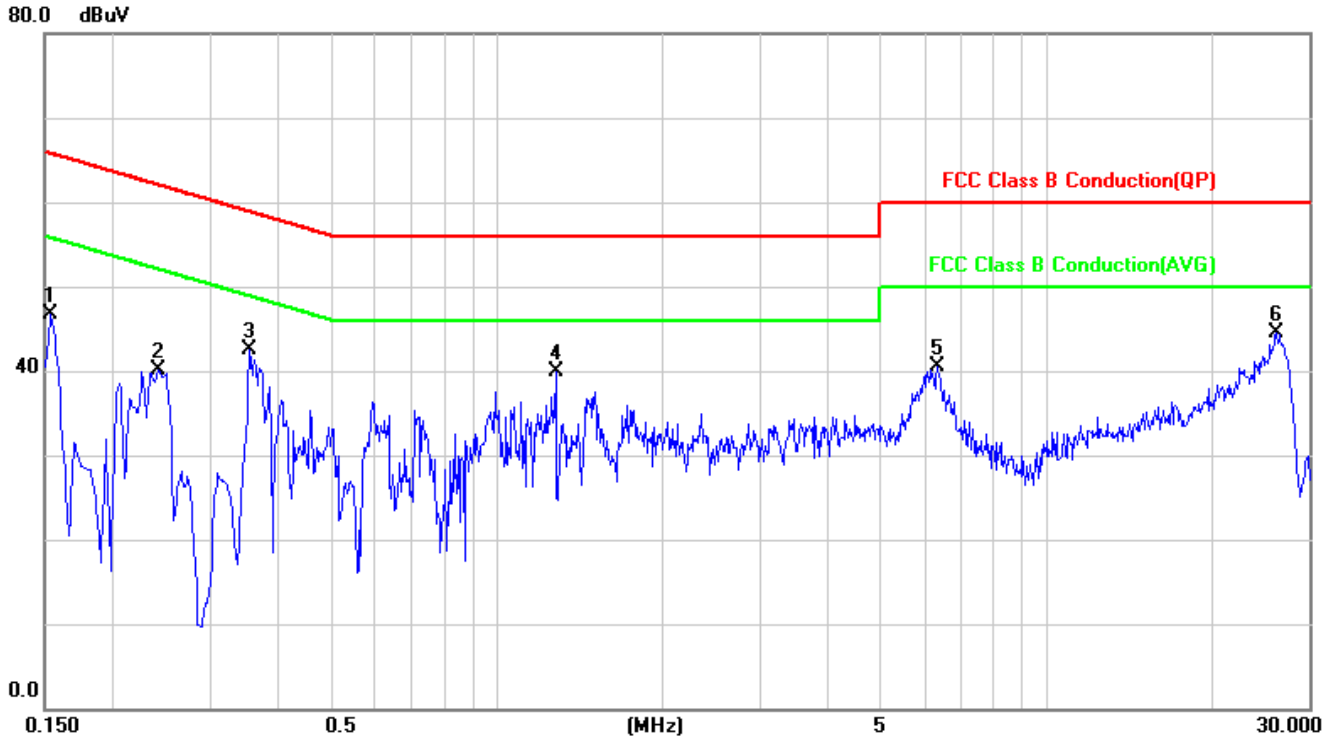
AC POWER LINE CONDUCTED EMISSION TEST DATA

Description:	**Operation**	**Date:**	**2019/9/5**
Line:	**L1**	**Temp.(℃)/Hum.(%):**	**22.5(℃)/50%**
Test Voltage:	**AC 120V/60Hz**	**Test By:**	**Nick**



No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Comment
		(MHz)	dBuV	(dB)	(dBuV)	(dBuV)	(dB)		
1		0.1540	46.80	0.00	46.80	65.78	-18.98	peak	
2		0.2420	40.00	0.01	40.01	62.03	-22.02	peak	
3		0.3540	42.41	0.01	42.42	58.87	-16.45	peak	
4		1.2780	39.83	0.06	39.89	56.00	-16.11	peak	
5		6.3340	40.25	0.21	40.46	60.00	-19.54	peak	
6	*	26.2220	43.88	0.59	44.47	60.00	-15.53	peak	

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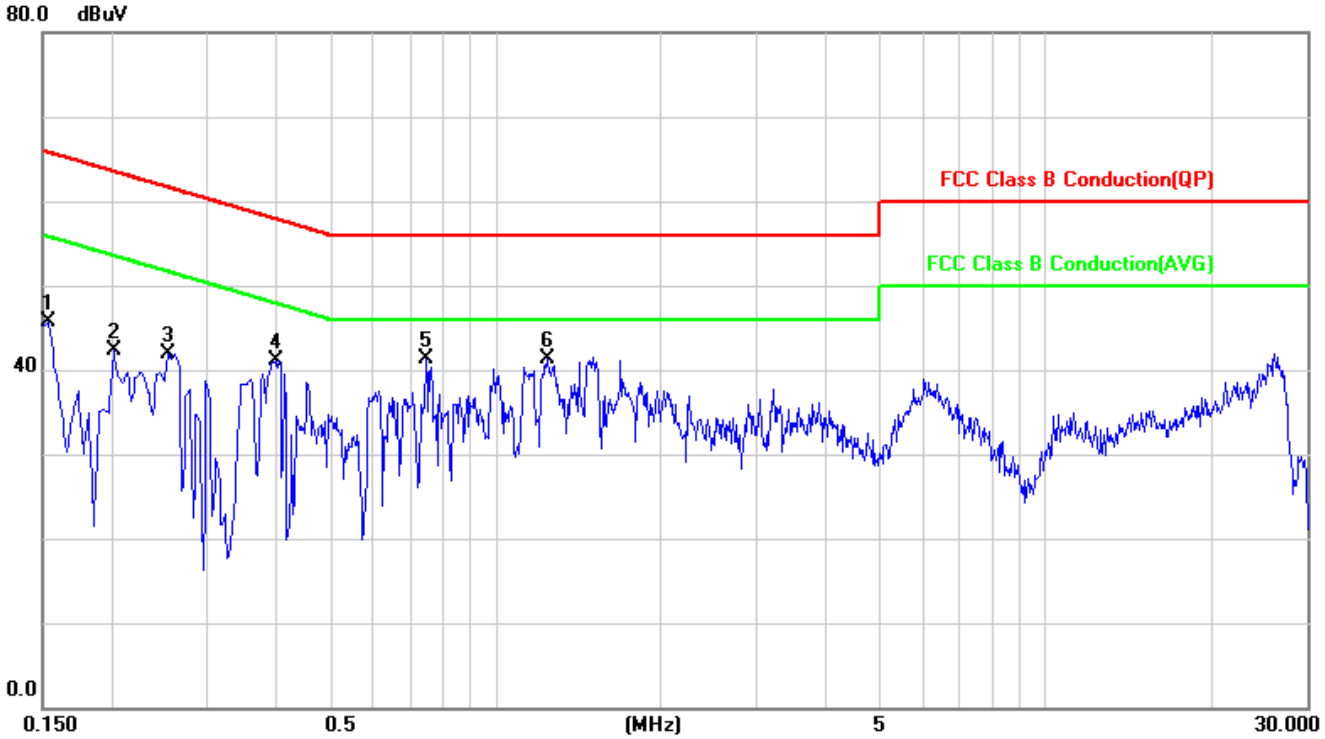
Description:	**Operation**	**Date:**	**2019/9/5**
Line:	**N**	**Temp.(℃)/Hum.(%):**	**22.5(℃)/50%**
Test Voltage:	**AC 120V/60Hz**	**Test By:**	**Nick**



No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Comment
		(MHz)	dBuV	(dB)	(dBuV)	(dBuV)	(dB)		
1		0.1540	45.60	0.03	45.63	65.78	-20.15	peak	
2		0.2020	42.23	0.03	42.26	63.53	-21.27	peak	
3		0.2540	41.93	0.03	41.96	61.63	-19.67	peak	
4		0.3980	41.03	0.03	41.06	57.90	-16.84	peak	
5		0.7500	41.17	0.04	41.21	56.00	-14.79	peak	
6	*	1.2460	41.23	0.06	41.29	56.00	-14.71	peak	

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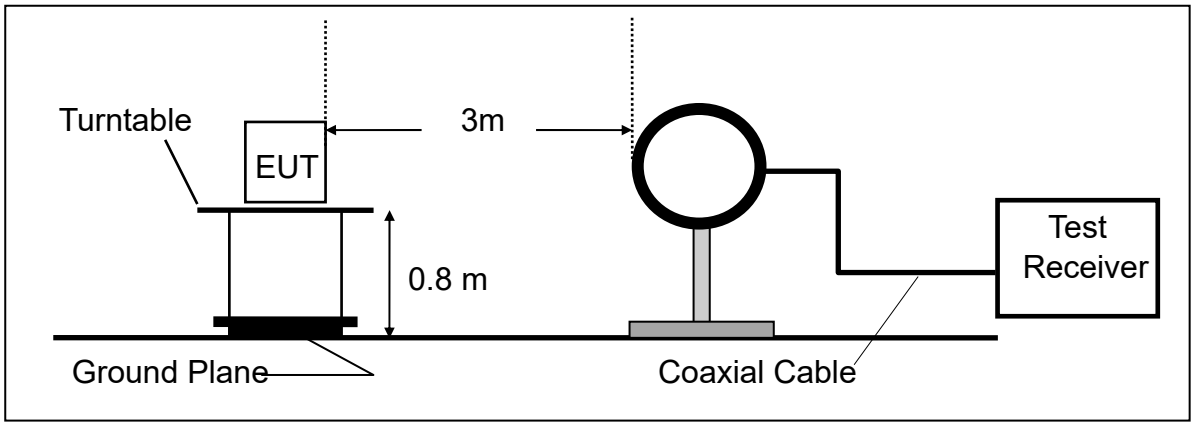
7 RADIATED EMISSION TEST

7.1 Measurement Procedure

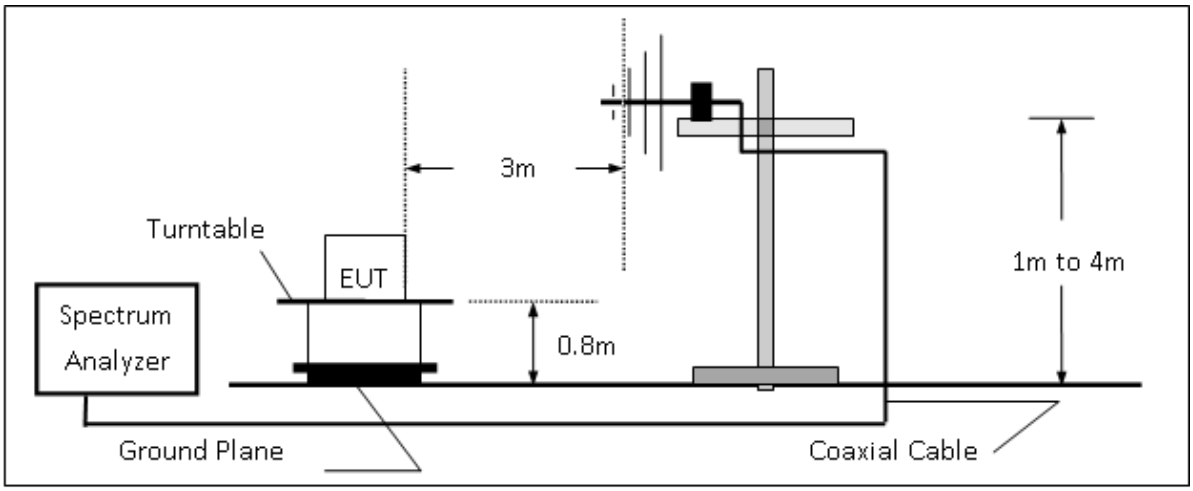
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

7.2 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



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



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7.3 Measurement Equipment Used:

SGS 966 Chamber No.C					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Bi-log Antenna	TESEO	CBL 6112D	35242 & AT-N0555	01/10/2019	01/09/2020
3m Site NSA	SGS	966 chamber	N/A	01/02/2019	01/01/2020
Loop Antenna	ETS.LINDGREN	6502	148045	10/08/2018	10/07/2019
PXA Spectrum Analyzer	Agilent	N9030A	MY53120760	04/22/2019	04/21/2020
EMI Test Receiver	R&S	ESCI 3	100335	02/12/2019	02/11/2020
Pre-Amplifier	HP	8447D	2944A09469	01/02/2019	01/01/2020
Low Loss Cable	Huber Suhner	966_RX	9	01/02/2019	01/01/2020
Software	e3 V6.11-20180413				

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7.4 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

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

7.5 Field Strength of Fundamental Emission

7.5.1 Limit

Below 30MHz

Frequency (MHz)	Limit (μV/m)	Measurement distance (meters)	Remark
0.009-0.490	2400/F(kHz)	300	Quasi-Peak Value
0.490-1.705	24000/F(kHz)	30	Quasi-Peak Value
1.705-30.0	30	30	Quasi-Peak Value

Above 30MHz

Frequency (MHz)	Limit (dBμV/m @3m)	Remark
30-88	40	Quasi-Peak Value
88-216	43.5	Quasi-Peak Value
216-960	46	Quasi-Peak Value
Above 960	54	Quasi-Peak Value
Above 1GHz	54	Average Value
	74	Peak Value

Note:

1. The measurement was undertaken in closer distance at 3m, where extrapolation factor is offset to convert the limit of the measurement. Ex.20*log(30)+40*log(30/3) = 69.54dBuV/m
2. The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
3. Actual FS(dBμV/m) = Spectrum. Reading level(dBμV) + Factor(dB)
   Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

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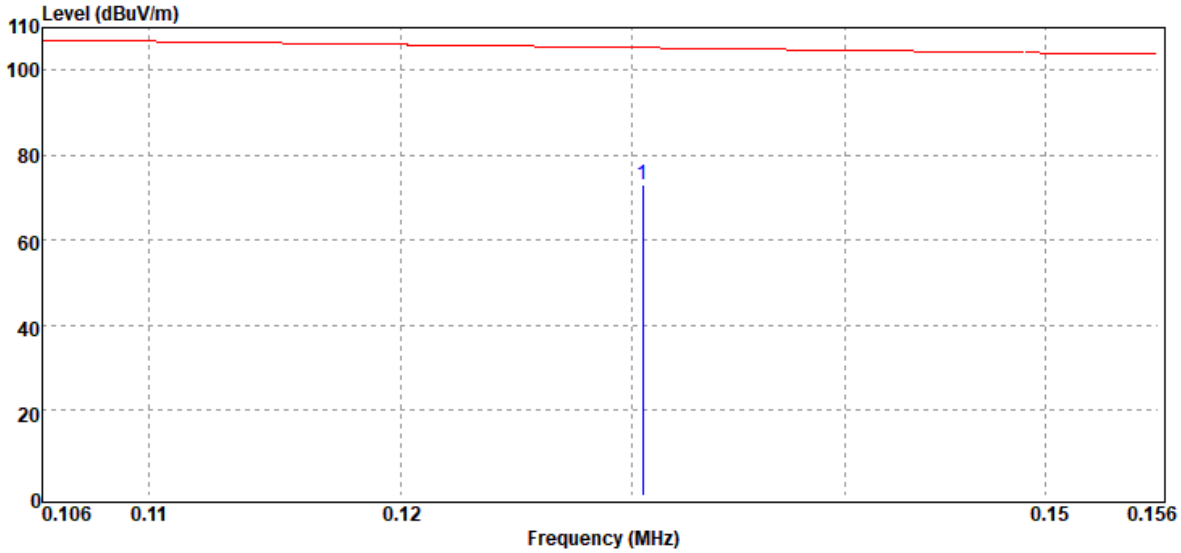
7.5.2 Below 30 MHz test result

Report Number	:E2-2019-80056	Test Date	:2019-08-30
Operation Mode	:WPC	Temp./Humi.	:25.2/73
Test Channel	:131 KHz	Antenna Pol.	:VERTICAL
Test Mode	:Main ch Mid	Engineer	:Nick
EUT Pol	:E2 Plane		



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
0.13	Peak	62.39	10.86	73.25	105.29	-32.04

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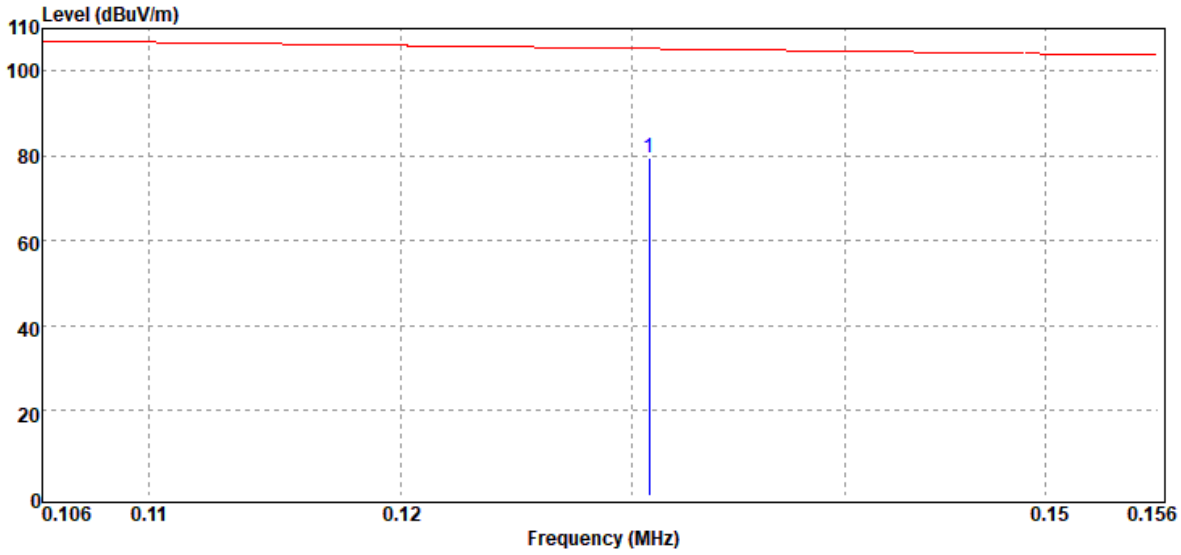
Report Number	:E2-2019-80056	Test Date	:2019-08-30
Operation Mode	:WPC	Temp./Humi.	:25.2/73
Test Channel	:131 KHz	Antenna Pol.	:HORIZONTAL
Test Mode	:Main ch Mid	Engineer	:Nick
EUT Pol	:E2 Plane		



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
0.13	Peak	68.74	10.86	79.60	105.27	-25.67

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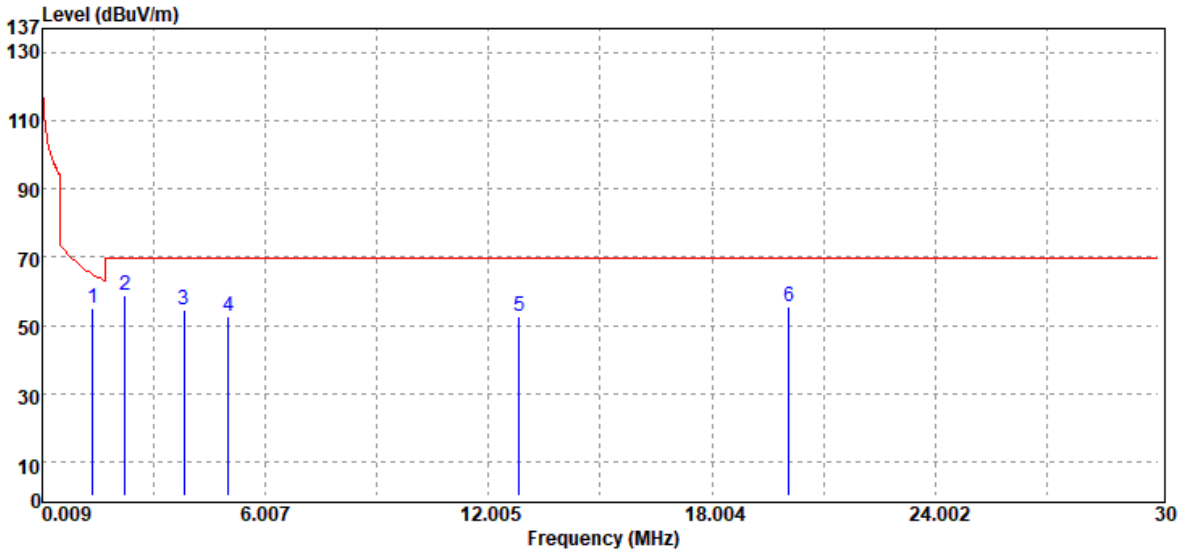
Report Number	:E2-2019-80056	Test Date	:2019-08-30
Operation Mode	:WPC	Temp./Humi.	:25.2/73
Test Channel	:131 KHz	Antenna Pol.	:VERTICAL
Test Mode	:Tx ch Mid	Engineer	:Nick
EUT Pol	:E2 Plane		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
1.36	Peak	43.95	11.00	54.95	64.94	-9.99
2.23	Peak	47.74	10.81	58.55	69.54	-10.99
3.82	Peak	43.77	10.90	54.67	69.54	-14.87
5.02	Peak	41.56	11.12	52.68	69.54	-16.86
12.82	Peak	41.28	11.32	52.60	69.54	-16.94
20.07	Peak	44.55	10.85	55.40	69.54	-14.14

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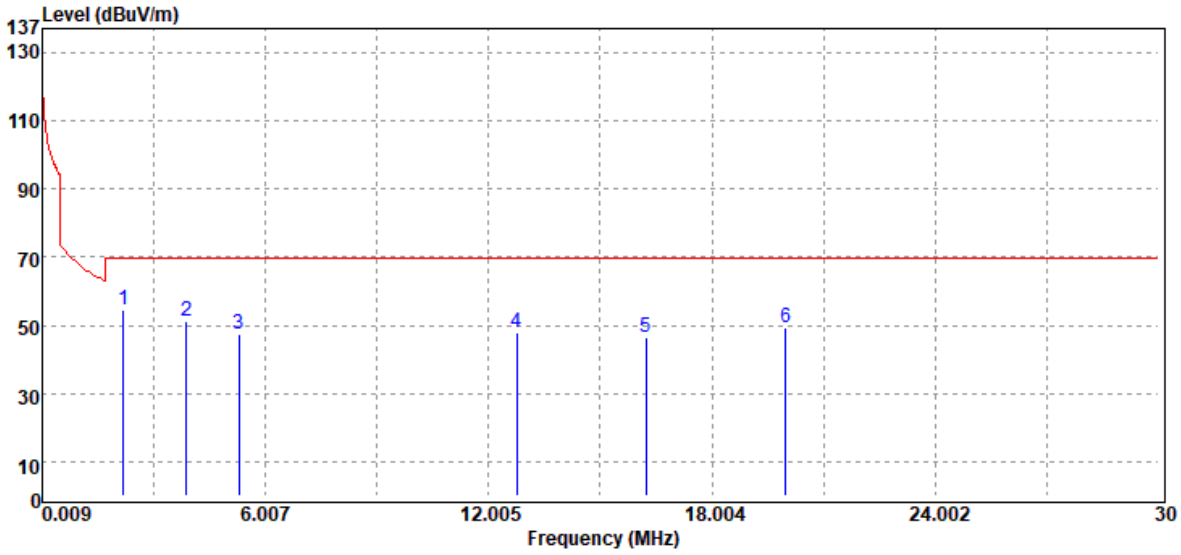
Report Number	:E2-2019-80056	Test Date	:2019-08-30
Operation Mode	:WPC	Temp./Humi.	:25.2/73
Test Channel	:131 KHz	Antenna Pol.	:HORIZONTAL
Test Mode	:Tx ch Mid	Engineer	:Nick
EUT Pol	:E2 Plane		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2.20	Peak	43.64	10.81	54.45	69.54	-15.09
3.88	Peak	40.19	10.91	51.10	69.54	-18.44
5.29	Peak	36.18	11.16	47.34	69.54	-22.20
12.76	Peak	36.71	11.32	48.03	69.54	-21.51
16.23	Peak	35.50	11.08	46.58	69.54	-22.96
19.98	Peak	38.36	10.87	49.23	69.54	-20.31

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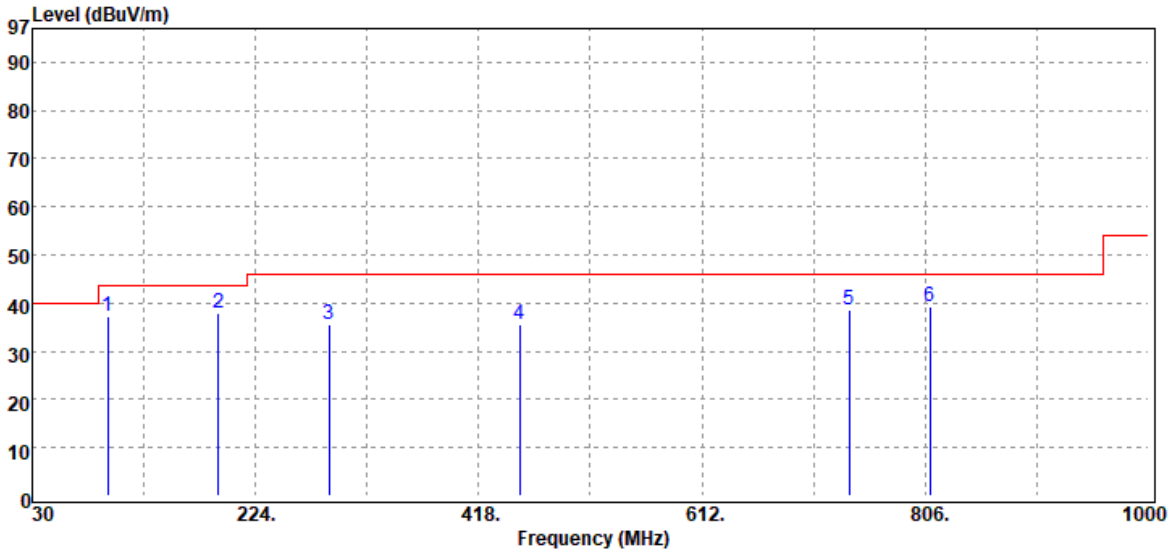
7.5.3 Above 30MHz test result

Report Number	:E2-2019-80056	Test Date	:2019-09-05
Operation Mode	:WPC	Temp./Humi.	:25.2/73
Test Channel	:131 KHz	Antenna Pol.	:VERTICAL
Test Mode	:Tx ch Mid	Engineer	:Nick
EUT Pol	:E2 Plane		



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
95.96	QP	50.45	-13.12	37.33	43.50	-6.17
191.99	QP	50.97	-13.10	37.87	43.50	-5.63
288.02	Peak	44.35	-8.74	35.61	46.00	-10.39
453.89	Peak	41.58	-6.01	35.57	46.00	-10.43
740.04	Peak	40.35	-1.89	38.46	46.00	-7.54
809.88	Peak	39.65	-0.35	39.30	46.00	-6.70

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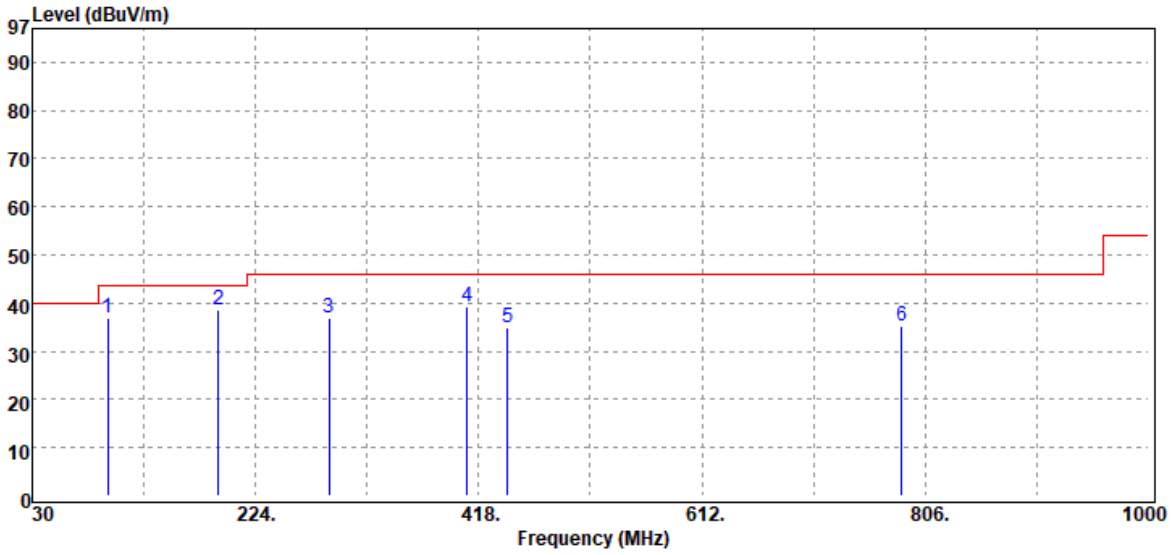
Report Number	:E2-2019-80056	Test Date	:2019-09-05
Operation Mode	:WPC	Temp./Humi.	:25.2/73
Test Channel	:131 KHz	Antenna Pol.	:HORIZONTAL
Test Mode	:Tx ch Mid	Engineer	:Nick
EUT Pol	:E2 Plane		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
95.96	Peak	50.05	-13.12	36.93	43.50	-6.57
191.99	QP	51.74	-13.10	38.64	43.50	-4.86
288.02	Peak	45.67	-8.74	36.93	46.00	-9.07
408.30	Peak	45.10	-5.68	39.42	46.00	-6.58
443.22	Peak	41.23	-6.29	34.94	46.00	-11.06
785.63	Peak	36.73	-1.40	35.33	46.00	-10.67

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8 20 dB OCCUPIED BANDWIDTH MEASUREMENT

8.1 Standard Applicable:

§2.1049 & §15.215 (c)

8.2 Limit:

None

8.3 Test Set-up

Refer to section 6.2 in this report

8.4 Measurement Procedure

20dB bandwidth

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak mode.
2. 20dB Bandwidth the resolution bandwidth of 200 Hz and the video bandwidth of 1 kHz were used.
3. Measured the spectrum width with power higher than 20dB below carrier.

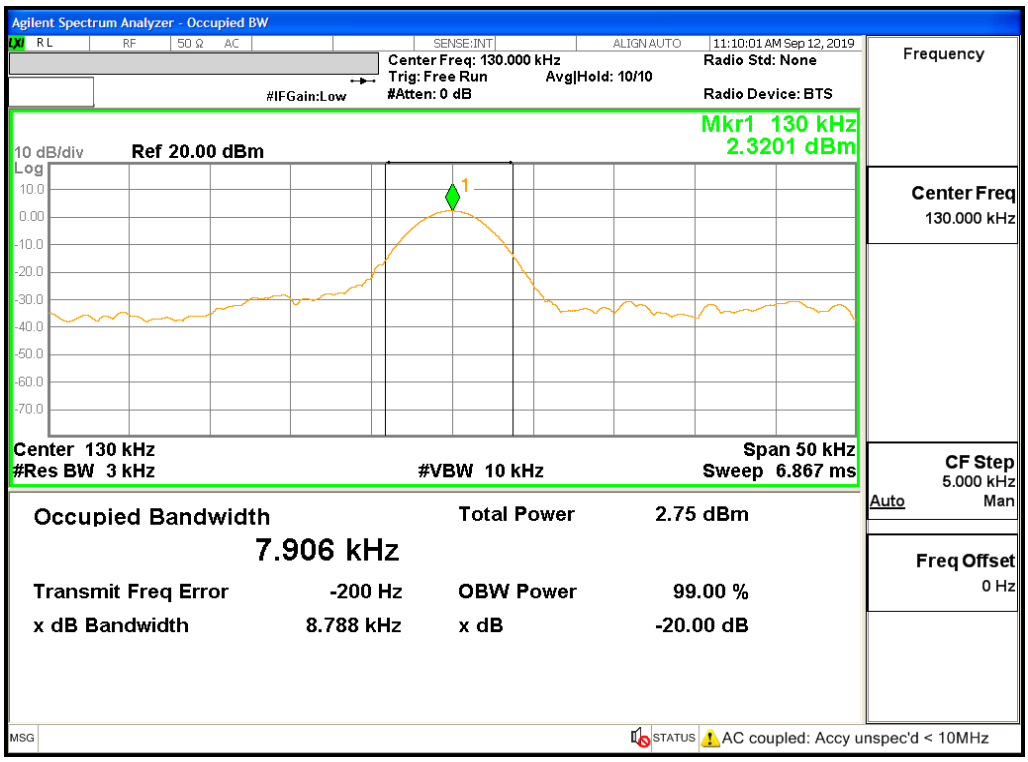
8.5 Measurement Equipment Used:

Refer to section 7.3 in this report

8.6 Measurement Result

-20dB Bandwidth

20dB Bandwidth	Limit
8.788kHz	No requirement



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9 ANTENNA REQUIREMENT

9.1 Standard Applicable:

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

9.2 Antenna Connected Construction:

The antenna is designed as permanently attached and no consideration of replacement. Please see EUT photo and antenna spec. for details.

~ End of Report ~

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