



RADIO TEST REPORT

Test Report No.: 31BE0249-SH-01-A

Applicant : Panasonic Corporation Automotive Systems Company
Type of Equipment : Bluetooth Module Assy
Model No. : YEP0PTA184
FCC ID : ACJ932PTA184
Test regulation : FCC Part15 Subpart C: 2010
Test result : Complied

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Date of test: October 27, 28, December 8 and 12, 2010

**Representative
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RTL02610

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1 Applicant information

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*Panasonic Corporation Automotive Systems Company is on behalf of the applicant: Panasonic Corporation of North America

2 Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : Bluetooth Module Assy
Model No. : YEP0PTA184
Serial No. : 9689
Rating : DC5.0V (Supplied power to test jig)
Country of Mass-production : China, Czech
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No modification by the test lab.
Receipt Date of Sample : October 25, 2010

2.2 Product description

Model: YEP0PTA184 (referred to as the EUT in this report) is a Bluetooth Module Assy.

Equipment type : Transceiver
Frequency of operation : 2402-2480MHz
Clock frequency : 1.5MHz/ 25.8048MHz/ 26MHz
Bandwidth & channel spacing : 1MHz
Type of modulation : FHSS
Antenna model & type : Monopole antenna
Antenna gain with cable loss : 2.63dBi
Antenna connector type : U.FL (Coaxial connector)
ITU code : F1D, G1D
Operation temperature range : -30 to +85 deg.C.

FCC Part15.31 (e)

The Bluetooth transmitter is provided with stable power supply (DC 3.3V and DC 1.5V), therefore, the equipment complies power supply regulation.

FCC Part15.203 Antenna requirement

The EUT has a unique coupling antenna connector. Therefore the equipment complies with the requirement of 15.203.

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3 Test specification, procedures and results

3.1 Test specification

Test specification : FCC Part 15 Subpart C: 2010, final revised on October 13, 2010
 Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
 Section 15.207 Conducted limits
 Section 15.209 Radiated emission limits, general requirements
 Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz,
 and 5725-5850MHz

3.2 Procedures & Results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.4:2003 7. AC power line conducted emission measurements	FCC Section 15.207	-	N/A *1)	N/A	N/A
Carrier frequency separation	FCC Public Notice DA 00-705 & ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.247 (a)(1)	Conducted	N/A	*See data.	Complied
20dB bandwidth	FCC Public Notice DA 00-705 & ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.247 (a)(1)	Conducted	N/A		Complied
Number of hopping frequency	FCC Public Notice DA 00-705 & ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.247 (a)(1)(iii)	Conducted	N/A		Complied
Dwell time	FCC Public Notice DA 00-705 & ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.247 (a)(1)(iii)	Conducted	N/A		Complied
Maximum peak output power	FCC Public Notice DA 00-705 & ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.247 (b)(1)	Conducted	N/A		Complied
Band edge compliance & Spurious emission	FCC Public Notice DA 00-705 & ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.247 (d) Section15.209	Conducted/ Radiated	N/A	7.2dB (71.588MHz, Vertical, Tx 2480MHz, 3-DH5)	Complied
Note: UL Japan's EMI Work Procedures No.QPM05 and QPM15. *1) The test is not applicable since the EUT has no AC mains.						

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3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied bandwidth (99%)	ANSI C63.4:2003 13. Measurement of intentional radiators RSS-Gen 4.6.1	RSS-Gen 4.6.1	Conducted	-	Complied

* Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Item	Frequency range	No.1 SAC ^{*1} /SR ^{*2} (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
Radiated emission (Measurement distance: 3m)	9kHz-30MHz	3.4 dB	2.7 dB	3.4 dB
	30MHz-300MHz	4.6 dB	4.5 dB	4.9 dB
	300MHz-1GHz	4.5 dB	4.6 dB	5.1 dB
	1GHz-13GHz	3.9 dB	3.9 dB	4.0 dB
Radiated emission (Measurement distance: 1m)	13GHz-18GHz	4.8 dB	4.8 dB	4.8 dB
	18GHz-40GHz	4.2 dB	4.2 dB	4.2 dB

*1: SAC=Semi-Anechoic Chamber

*2: SR= Shielded Room is applied besides radiated emission

Radiated emission test

The data listed in this test report has enough margin, more than site margin.

Antenna port conducted test

Power Measurement uncertainty above 1GHz for this test was: (±) 0.8dB

Conducted emissions Measurement (below 1GHz) uncertainty for this test was: (±) 1.1dB

Conducted emissions Measurement (1G-3GHz) uncertainty for this test was: (±) 1.2dB

Conducted emissions Measurement (3G-18GHz) uncertainty for this test was: (±) 2.9dB

Conducted emissions Measurement (18G-26.5GHz) uncertainty for this test was: (±) 3.4dB

Bandwidth Measurement uncertainty for this test was: (±) 5.4%

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3.5 Test location

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JAB Accreditation No. : RTL02610

	FCC Registration No.	IC Registration No.	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
☐ No.1 Semi-anechoic chamber	697847	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☐ No.2 Semi-anechoic chamber	697847	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☒ No.3 Semi-anechoic chamber	697847	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
☐ No.4 Full-anechoic chamber	-	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
☐ No.1 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
☐ No.2 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
☐ No.3 shielded room	-	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
☐ No.4 shielded room	-	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
☒ No.5 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
☐ No.6 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-

3.6 Test setup, Data of EMI & Test instruments

Refer to Appendix 1 to 3.

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4 System test configuration

4.1 Justification

The system was configured in typical fashion (as a customer would normally use it) for testing.

Test item	Operating mode	Tested frequency
Conducted emission	-	-
Carrier frequency separation	Transmitting Hopping ON (DH5/3-DH5)/Inquiry, Payload: PRBS9	-
20dB bandwidth	Transmitting Hopping OFF (DH5/3-DH5)/Inquiry, Payload: PRBS9	2402MHz, 2441MHz, 2480MHz
Number of hopping frequency	Transmitting Hopping ON (DH5/3-DH5)/Inquiry, Payload: PRBS9	-
Dwell time	Transmitting (Hopping ON) -DH1, -DH3, -DH5 -3-DH1, -3-DH3, -3-DH5 -Inquiry	-
Maximum peak output power	Transmitting Hopping OFF (DH5/3-DH5)/Inquiry, Payload: PRBS9 -DH5 -2-DH5 -3-DH5	2402MHz, 2441MHz, 2480MHz
Band edge compliance & Spurious emission (Conducted)	Transmitting (DH5/3-DH5), Payload: PRBS9 -Hopping ON/Inquiry -Hopping OFF	Band edge compliance: 2402MHz, 2480MHz
(Radiated)	Transmitting (DH5/3-DH5), Payload: PRBS9	Spurious emission: 2402MHz, 2441MHz, 2480MHz(Tx)
99% occupied bandwidth	Transmitting (DH5/3-DH5), Payload: PRBS9 -Hopping ON -Hopping OFF	2402MHz, 2441MHz, 2480MHz
*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload (except Dwell time test) * Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not influence on the output power and bandwidth of the EUT. However, the limit level 125mWof AFH mode was used due to the overlap of the bandwidth. *Software for testing: HCITester2 (Rev: 0.991d) Power settings: Fixed (The setting is not controlled by the software and it is equivalent to that of mass-produced items.) Above setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting.		

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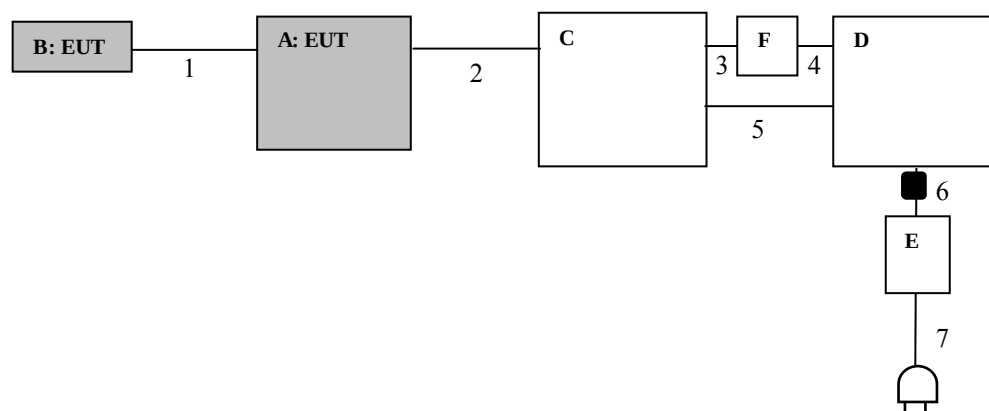
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4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Bluetooth Module Assy	YEP0PTA184	9689	Panasonic Corporation Automotive Systems Company	EUT
B	Bluetooth Antenna Assy	N1KYYYYY00023	-	NISSEI ELECTRIC CO., LTD.	EUT
C	Test jig	-	20100308-3	Panasonic Corporation Automotive Systems Company	-
D	Laptop PC	Type 2373	L3-64H12	IBM	-
E	AC Adaptor	08K8208	11S08K8208Z1Z 9MA5AB0U2	IBM	-
F	USB-Serial Converter	UC-SGT	16085E	ELECOM	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	U-FL Cable	0.15	Shielded	Shielded	-
2	Flat harness	0.1	Unshielded	Unshielded	-
3	Serial	1.5	Shielded	Shielded	-
4	USB	0.4	Shielded	Shielded	-
5	USB	3.0	Shielded	Shielded	-
6	DC	1.8	Unshielded	Unshielded	With a standard ferrite core
7	AC	0.8	Unshielded	Unshielded	-

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5 Carrier frequency separation

Test procedure

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna port.

Summary of the test results: Pass

6 20dB bandwidth & Occupied bandwidth (99%)

Test procedure

The bandwidth was measured with a spectrum analyzer connected to the antenna port.

The channel separation in Hopping mode and Inquiry mode was separated by 25kHz and 2/3 of the 20dB bandwidth.

Summary of the test results: Pass

7 Number of hopping frequency

Test procedure

The Number of Hopping Frequency was measured with a spectrum analyzer connected to the antenna port.

Summary of the test results: Pass

8 Dwell time

Test procedure

The Dwell time was measured with a spectrum analyzer connected to the antenna port.

Summary of the test results: Pass

9 Maximum peak output power

Test procedure

The Maximum Peak Output Power was measured with a power meter connected to the antenna port.

Summary of the test results: Pass

10 Out of band emissions (Antenna port conducted)

Test procedure

The Out of Band Emissions was measured with a spectrum analyzer connected to the antenna port.

In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a conducted measurement.

Summary of the test results: Pass

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11 Out of band emissions (Radiated)

11.1 Operating environment

The test was carried out in No.3 Semi-anechoic chamber.

11.2 Test configuration

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity.

The configuration was set in accordance with ANSI C63.4: 2003. Photographs of the set up are shown in Appendix 1.

11.3 Test conditions

Frequency range : 30MHz - 13GHz 13GHz-26GHz
Test distance : 3m 1m

11.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on a semi-anechoic chamber with a ground plane and at a distance of 3m(below 13GHz) / 1m(above 13GHz). Measurements were performed with quasi-peak, peak and average detector. The measuring antenna height was varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization.

The radiated emission measurements were made with the following detection of the test receiver and Spectrum Analyzer.

Frequency	Below 1GHz	Above 1GHz
Instrument used	Test Receiver	Spectrum Analyzer
Detector IF Bandwidth	QP: BW 120kHz	PK: RBW: 1MHz/VBW: 3MHz, AV*1): RBW: 1MHz, VBW: See data
Measuring antenna	Biconical (30-300MHz) Logperiodic (300MHz-1GHz)	Horn

*1) When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

The VBW was based on the inverse of the duty cycle (Refer to Appendix 2).

The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Combinations of the worst position

Model	Worst position	
	Below 1GHz	Above 1GHz
Module	Horizontal: X, Vertical: X	Horizontal: Y, Vertical: Y
Antenna	Horizontal: X, Vertical: X	Horizontal: X, Vertical: Z

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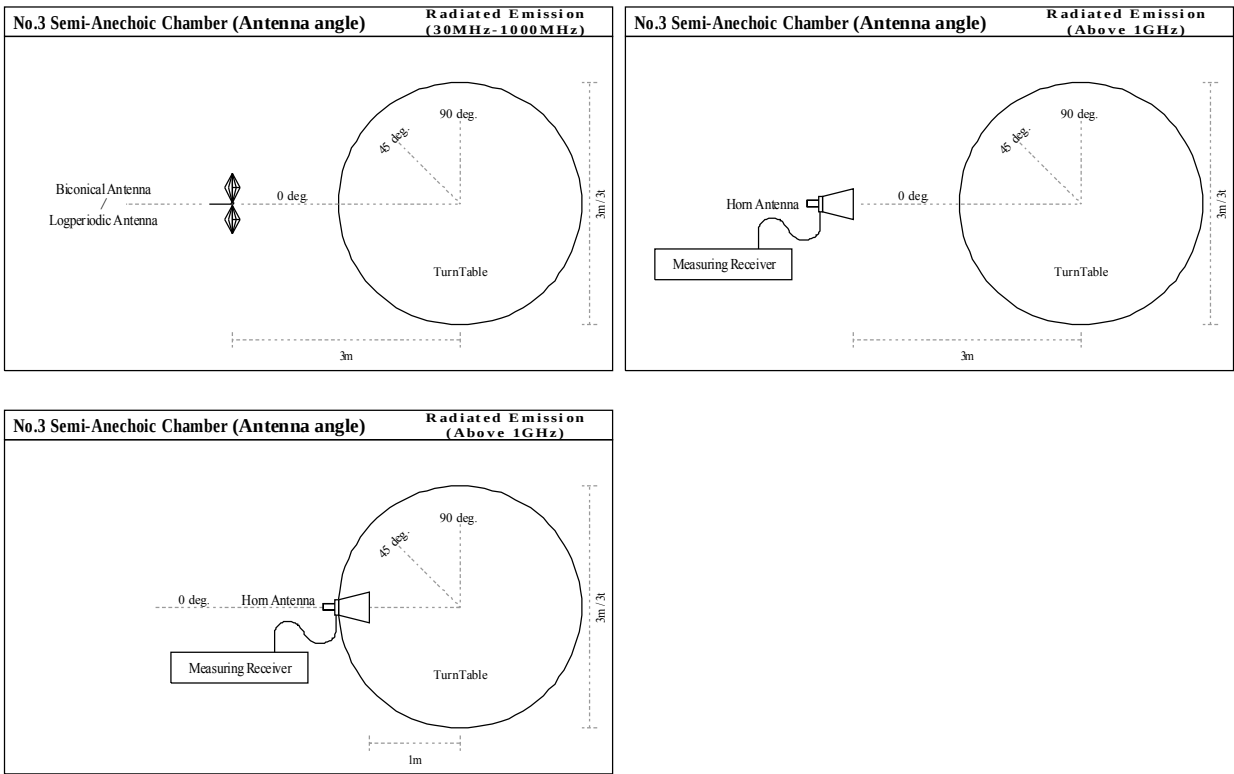
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Figure 1. Antenna angle
No.3 Semi-Anechoic Chamber



11.5 Band edge

Band edge level at 2400MHz is less than 20dB of peak point of the carrier. Refer to the data of Out of Band Emissions (Antenna Port Conducted). Band edge level at 2390MHz, 2400MHz and 2483.5MHz is below the limits of FCC 15.209. Refer to the data of Radiated emission.

11.6 Results

Summary of the test results : Pass *No noise was detected above the 5th order harmonics.

APPENDIX 1: Photographs of test setup

Radiated emission

Pre-check of the worst position

APPENDIX 2: Test data

20dB bandwidth and Carrier frequency separation

Number of hopping frequency

Dwell time

Maximum peak output power

Out of band emissions (Antenna Port Conducted)

Out of band emissions (Radiated)

Occupied bandwidth (99%)

APPENDIX 3: Test instruments

Test instruments

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