RADIO TEST REPORT

Test Report No.: 10393347S-A

Applicant	:	**NIHON KOHDEN CORPORATION**
Type of Equipment	:	**SDIO Wireless Module**
Model No.	:	**SX-SDMAN**
FCC ID	:	**B6BGZ-1XXP**
Test item	:	**Average output power**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. The test results in this test report are traceable to the national or international standards.
4. The module has been certified.
   (FCC ID: N6C-SDMAN, Test report: 32IE0154-HO-01-A-R1 and 10195552-001H-A-R1)

Date of test: June 26 to 27, 2014

Representative test engineer:

S. Takano

Shinichi Takano
Engineer
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Approved by :

T. Imamura

Toyokazu Imamura
Leader
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REVISION HISTORY

Original Test Report No.: 10393347S-A

Revision	Test report No.	Date	Page revised	Contents
-(Original)	10393347S-A	July 15, 2014	-	-
1	10393347S-A	July 29, 2014	12,14,16,18,20	Update (Correction of title, table)
2	10393347S-A	August 5, 2014	6	Update (Rounding of result)
3	10393347S-A	August 21, 2014	6,12,14,16,18,20	Update (Correction of result)
4	10393347S-A	August 25, 2014	6	Update (Correction of result)

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SECTION 1: Customer information

Company Name	:	NIHON KOHDEN CORPORATION
Address	:	1-31-4, Nishiochiai, Shinjuku-ku, Tokyo, 161-8560, Japan
Telephone Number	:	+81-3-5996-8114
Facsimile Number	:	+81-3-5996-8374
Contact Person	:	Kazuyoshi Kitahara

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

2.1 Identification of E.U.T.

Type of Equipment	:	SDIO Wireless Module
Model No.	:	SX-SDMAN
Serial No.	:	008092 620886
Rating	:	DC3.3V
Receipt Date of Sample	:	June 26, 2014
Country of Mass-production	:	Japan
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

2.2 Product description

Model No: SX-SDMAN (referred to as the EUT in this report) is the SDIO Wireless Module.

General specification

Clock frequency(ies) in the system : 26MHz

Radio specification

Radio Type : Transceiver
Method of Frequency Generation : Synthesizer
Power Supply (inner) : DC1.2V

Specification of Wireless LAN (IEEE 802.11b/g/a/n-20)

Type of radio	IEEE802.11b	IEEE802.11g	IEEE802.11a	IEEE802.11n (20 M band)
Frequency of operation	2412-2462MHz	2412-2462MHz	5180-5320MHz 5745-5825MHz	2412 - 2462MHz 5180-5320MHz 5745-5825MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)	
Channel spacing	5MHz		20MHz	2.4GHz band: 5MHz 5GHz band: 20MHz
Antenna type	Mini-Nanoblade antenna: Laird Technologies Stand Alone antenna: Molex			
Antenna Gain	Mini-Nanoblade antenna: 2.5dBi (2.4GHz), 4.8dBi (5GHz) Stand Alone antenna: 3.0dBi (2.4GHz), 4.6dBi (5GHz)			
Antenna Connector type	U.FL connector			

SECTION 3: Test results

3.1 Results

KDB 447498D01(v05 r02) has the following exclusion for portable devices:

This device f = 2.48 GHz, distance = 5mm (minimum separation distance: 5 mm was used in the calculation) and the measured maximum average output power with tolerance was 7 mW.

So for this device:
7 mW [measured maximum average output power with tolerance] / 5 mm [minimum separation distance] * (√ 2.48) = 2.2

This device f = 5.85 GHz, distance = 5mm (minimum separation distance: 5 mm was used in the calculation) and the measured maximum average output power with tolerance was 1 mW.

So for this device:
1 mW [measured maximum average output power with tolerance] / 5 mm [minimum separation distance] * (√ 5.85) = 0.5

This is less than 3.0, so no SAR is required.

Note: UL Japan's Work Procedures No. 13-EM-W0422.

3.2 Uncertainty

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

Power measurement uncertainty above 1GHz for this test was: (±) 1.5dB

3.3 Test location

UL Japan, Inc. Shonan EMC Lab.
1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN
Telephone number : +81 463 50 6400
Facsimile number : +81 463 50 6401

	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	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☐ No.2 semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☐ No.3 semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
☐ No.4 semi-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	-
☐ No.1 measurement room	-	2.55 x 4.1 x 2.5	-	-

3.4 Test data & Test instruments

SECTION 4: Operation of E.U.T. during testing

4.1 Operating mode

Mode	Tested frequency	Worst data mode *1)	Tested antenna port *2)
Transmitting IEEE 802.11b	2412MHz, 2437MHz, 2462MHz	1Mbps	1
Transmitting IEEE 802.11g	2412MHz, 2437MHz, 2462MHz	6Mbps	1
Transmitting IEEE 802.11n-20HT	2412MHz, 2437MHz, 2462MHz	MCS0	1
Transmitting IEEE 802.11a	5745MHz, 5785MHz, 5825MHz	6Mbps	2
Transmitting IEEE 802.11n-20HT	5745MHz, 5785MHz, 5825MHz	MCS0	2

Test condition: Worst
The EUT transmits vital signs to 4 monitors. The lowest rate was selected since ON time of transmitting is longest.
Power setting:
IEEE 802.11b: 2412MHz: 13.0dBm, 2437MHz: 13.0dBm, 2462MHz: 13.0dBm
IEEE 802.11g: 2412MHz: 8.0dBm, 2437MHz: 11.0dBm, 2462MHz: 8.5dBm
IEEE 802.11n-20HT (2.4GHz): 2412MHz: 7.0dBm, 2437MHz: 10.0dBm, 2462MHz: 7.5dBm
IEEE 802.11a: 5745MHz: 13.0dBm, 5785MHz: 13.0dBm, 5825MHz: 13.0dBm
IEEE 802.11n-20HT (5GHz): 5745MHz: 13.0dBm, 5785MHz: 13.0dBm, 5825MHz: 13.0dBm

*1) Software (Firmware): ver.00-12A (Worst data mode based on ver.00-12)
*2) After the comparison between Antenna port 1 and Antenna port 2, test was performed with the antenna that had higher power as a representative.

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

SECTION 5: Average output power

Test procedure
The Output Power was measured with a power meter connected to the antenna port.

Refer to APPENDIX 1

Contents of APPENDIXES

APPENDIX 1: Data of Radio tests

Average output power

APPENDIX 2: Test instruments

Test instruments

APPENDIX 1: Data of Radio tests

Average output power (Conducted)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room		
Date	June 26, 2014			
Temperature / Humidity	25 deg.C , 63 %RH			
Engineer	Shinichi Takano			
Mode	Tx, IEEE802.11b, PN9,	worst antenna : 1	worst data mode :	1 Mbps

(* P/M: Power Meter with power senser, AV: Average)

Ch	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]		Result [dBm]	Result [mW]
1	2412	-4.74	0.86	9.65		5.77	3.78
6	2437	-4.33	0.86	9.66		6.19	4.16
11	2462	-4.23	0.87	9.66		6.30	4.27

Sample Calculation: Result = Reading + Cable Loss + Atten. Loss

[Pre check]

Antenna	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]		Result [dBm]	Result [mW]	
1	2437	-4.33	0.86	9.66		6.19	4.16	**Worst**
2	2437	-4.53	0.86	9.66		5.99	3.97	

Sample Calculation: Result = Reading + Cable Loss + Atten. Loss

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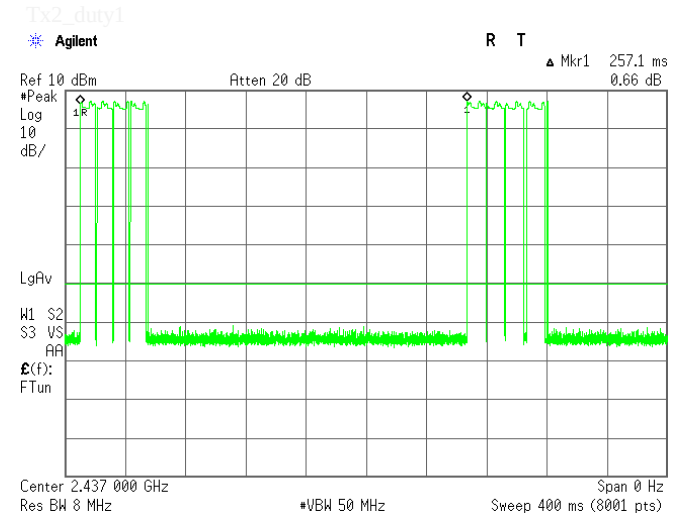
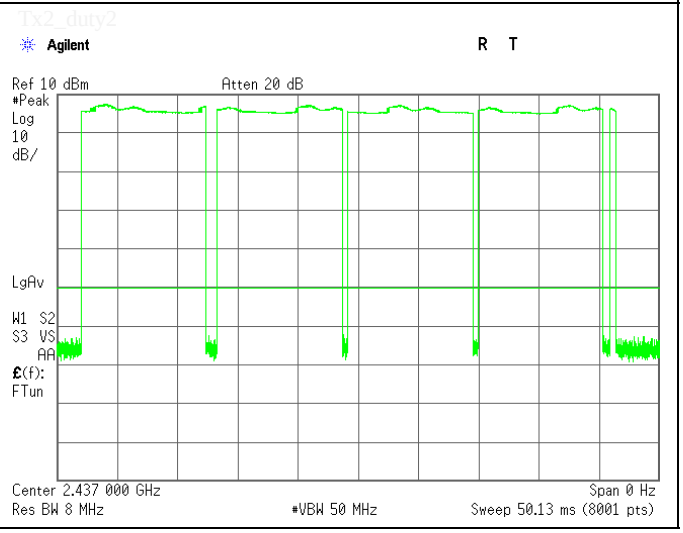
Duty Cycle

Tx, IEEE802.11b, PN9, worst antenna port 1, worst data mode 1Mbps	
1 cycle = 257.1 ms	**ON Time = 42.12 ms**
	

Average output power (Conducted)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room			
Date	June 26, 2014				
Temperature / Humidity	25 deg.C , 63 %RH				
Engineer	Shinichi Takano				
Mode	Tx, IEEE802.11g, PN9,	worst antenna :	1	worst data mode :	6 Mbps

(* P/M: Power Meter with power senser, AV: Average)

Ch	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]		Result [dBm]	Result [mW]
1	2412	-17.29	0.86	9.65		-6.78	0.21
6	2437	-14.76	0.86	9.66		-4.24	0.38
11	2462	-17.12	0.87	9.66		-6.59	0.22

Sample Calculation: Result = Reading + Cable Loss + Atten. Loss

[Pre check]

Antenna	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]		Result [dBm]	Result [mW]	
1	2437	-14.76	0.86	9.66		-4.24	0.38	**Worst**
2	2437	-14.95	0.86	9.66		-4.43	0.36	

Sample Calculation: Result = Reading + Cable Loss + Atten. Loss

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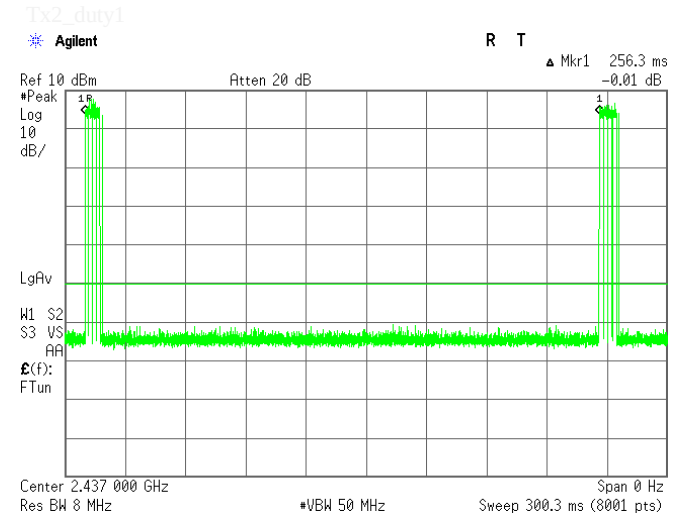
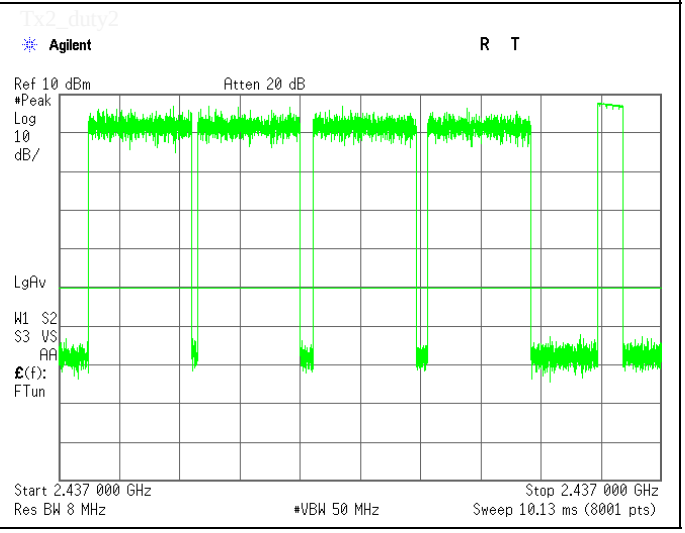
Duty Cycle

Tx, IEEE802.11g, PN9, worst antenna port 1, worst data mode 6Mbps	
1 cycle = 256.3 ms	**ON Time = 7.35 ms**
	

Average output power (Conducted)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room			
Date	June 26, 2014				
Temperature / Humidity	25 deg.C , 63 %RH				
Engineer	Shinichi Takano				
Mode	Tx, IEEE802.11n-20HT, PN9,	worst antenna :	1	worst data mode :	MCS0

(* P/M: Power Meter with power senser, AV: Average)

Ch	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]		Result [dBm]	Result [mW]
1	2412	-17.59	0.86	9.65		-7.08	0.20
6	2437	-15.23	0.86	9.66		-4.71	0.34
11	2462	-17.65	0.87	9.66		-7.12	0.19

Sample Calculation: Result = Reading + Cable Loss + Atten. Loss

[Pre check]

Antenna	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]		Result [dBm]	Result [mW]	
1	2437	-15.23	0.86	9.66		-4.71	0.34	**Worst**
2	2437	-15.46	0.86	9.66		-4.94	0.32	

Sample Calculation: Result = Reading + Cable Loss + Atten. Loss

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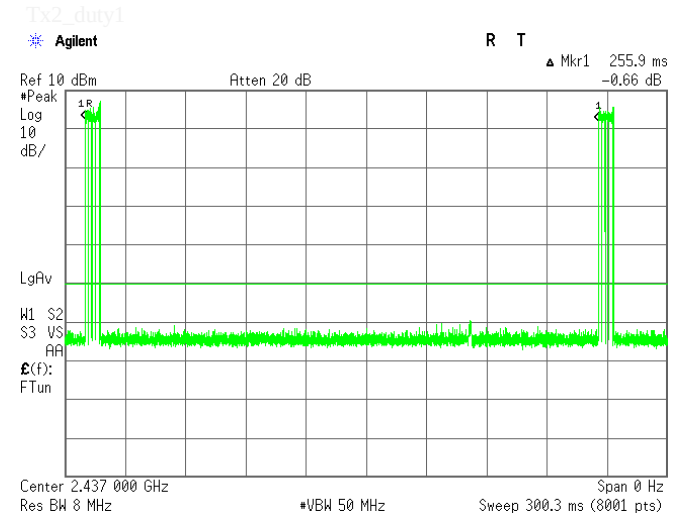
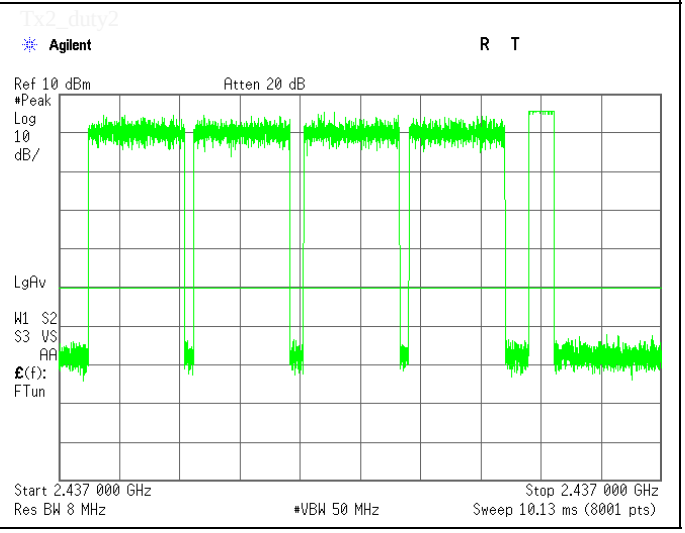
Duty Cycle

Tx, IEEE802.11n-20HT, PN9, worst antenna port 1, worst data mode MCS0	
1 cycle = 255.9 ms	**ON Time = 6.90 ms**
	

Average output power (Conducted)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room			
Date	June 27, 2014				
Temperature / Humidity	24 deg.C , 58 %RH				
Engineer	Shinichi Takano				
Mode	Tx, IEEE802.11a, PN9,	worst antenna :	2	worst data mode :	6 Mbps

(* P/M: Power Meter with power senser, AV: Average)

Ch	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]		Result [dBm]	Result [mW]
149	5745	-12.89	1.38	9.74		-1.77	0.67
157	5785	-13.35	1.36	9.73		-2.26	0.59
165	5825	-13.76	1.67	9.73		-2.36	0.58

Sample Calculation: Result = Reading + Cable Loss + Atten. Loss

[Pre check]

Antenna	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]		Result [dBm]	Result [mW]	
1	5785	-13.58	1.36	9.73		-2.49	0.56	
2	5785	-13.35	1.36	9.73		-2.26	0.59	**Worst**

Sample Calculation: Result = Reading + Cable Loss + Atten. Loss

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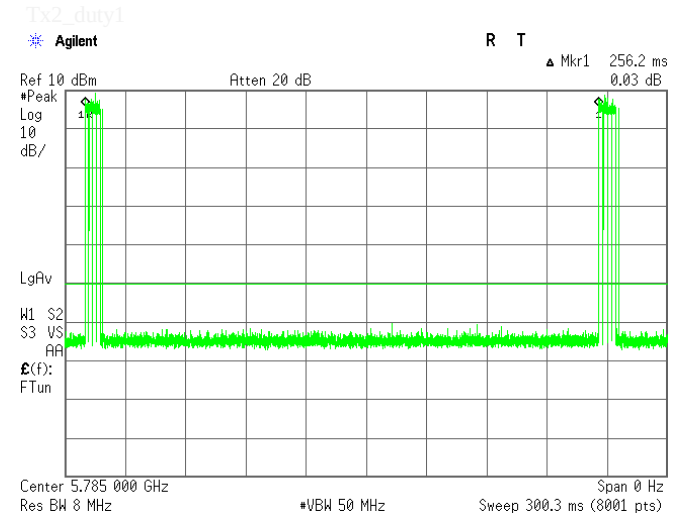
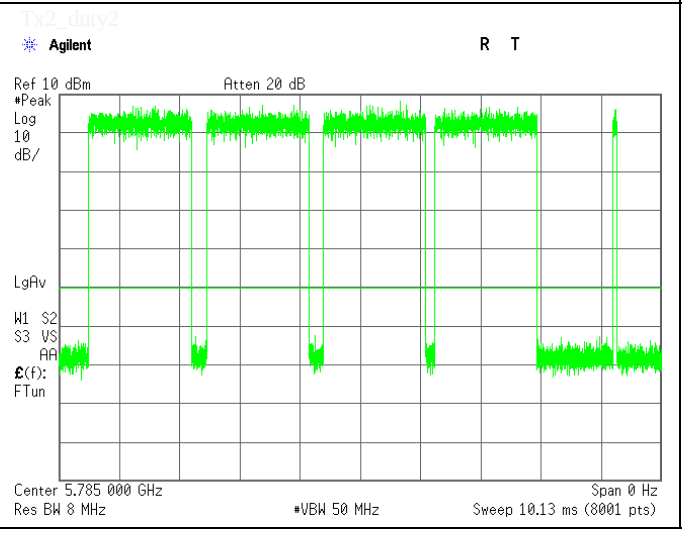
Duty Cycle

Tx, IEEE802.11a, PN9, worst antenna port 2, worst data mode 6Mbps	
1 cycle = 256.2 ms	**ON Time = 6.98 ms**
	

Average output power (Conducted)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room			
Date	June 27, 2014				
Temperature / Humidity	24 deg.C , 58 %RH				
Engineer	Shinichi Takano				
Mode	Tx, IEEE802.11n-20HT, PN9,	worst antenna :	2	worst data mode :	MCS0

(* P/M: Power Meter with power senser, AV: Average)

Ch	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]		Result [dBm]	Result [mW]
149	5745	-13.05	1.38	9.74		-1.93	0.64
157	5785	-13.56	1.36	9.73		-2.47	0.57
165	5825	-13.98	1.67	9.73		-2.58	0.55

Sample Calculation: Result = Reading + Cable Loss + Atten. Loss

[Pre check]

Antenna	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]		Result [dBm]	Result [mW]	
1	5785	-13.73	1.36	9.73		-2.64	0.54	
2	5785	-13.56	1.36	9.73		-2.47	0.57	**Worst**

Sample Calculation: Result = Reading + Cable Loss + Atten. Loss

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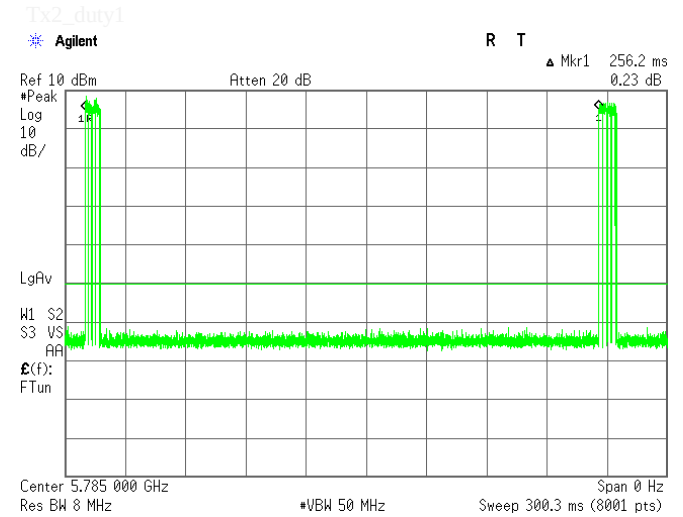
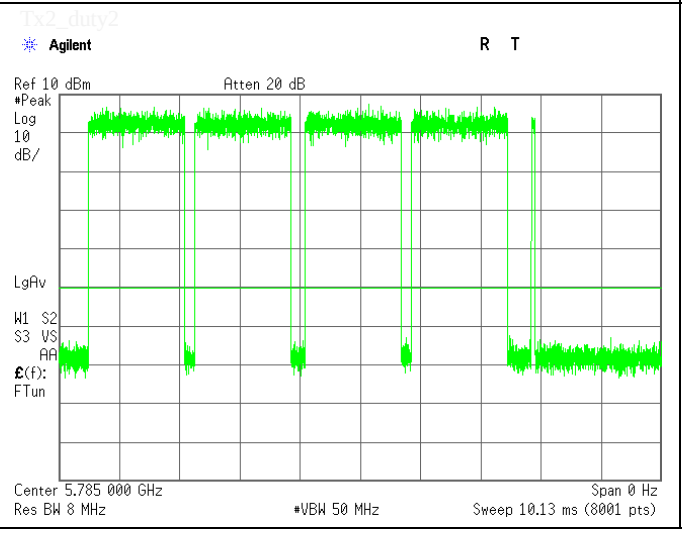
Duty Cycle

Tx, IEEE802.11n-20HT, PN9, worst antenna port 2, worst data mode MCS0	
1 cycle = 256.2 ms	**ON Time = 6.53 ms**
	

APPENDIX 2
Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	AT	2014/03/04 * 12
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2014/04/04 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY5326009	AT	2014/04/04 * 12
SCC-G27	Coaxial Cable	Junkosha	MWX241-01000KM SKMS	SEP-20-12-00 1	AT	2013/09/25 * 12
SDCPL-10	Directional Coupler	Mini-Circuits	ZGDC35-93HP+	0210	AT	2013/07/05 * 12
SAT10-09	Attenuator	Weinschel Corp.	54A-10	W5692	AT	2013/11/27 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2014/03/07 * 12
SCC-G13	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	AT	2014/03/14 * 12

The expiration date of the calibration is the end of the expired month .
As for some calibrations performed after the tested dates , those test equipment have been controlled by means of an unbroken chains of calibrations .

All equipment is calibrated with valid calibrations . Each measurement data is traceable to the national or international standards .
Test Item :
AT: Antenna terminal conducted test