RADIO TEST REPORT

Test Report No. : 10261262H

Applicant	:	**Panasonic Corporation**
Type of Equipment	:	**SMART ECU**
Model No.	:	**YEP0FX1515** **YEP0FX1518**
FCC ID	:	**ACJ932YEP0FX1515**
Test regulation	:	**FCC Part 15 Subpart C: 2014**
Test Result	:	**Complied**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Date of test: March 20 to April 17, 2014

Representative test engineer:
Masatoshi Nishiguchi
Engineer
Consumer Technology Division

Approved by:
Motoya Imura
Engineer
Consumer Technology Division

NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

UL Japan, Inc.
Ise HQ EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
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REVISION HISTORY

Original Test Report No.: 10261262H

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10261262H	May 27, 2014	-	-

CONTENTS **PAGE**

SECTION 1: Customer information

Company Name	:	Panasonic Corporation
Address	:	4261, Ikonobe-cho, Tsuzuki, Yokohama, 224-8520, Japan
Telephone Number	:	+81-45-939-1144
Facsimile Number	:	+81-45-939-1917
Contact Person	:	Masahiro Yoshii

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

2.1 Identification of E.U.T.

Type of Equipment	:	SMART ECU
Model No.	:	YEP0FX1515 YEP0FX1518
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 6.0 to 16.0 V
Receipt Date of Sample	:	March 18, 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: YEP0FX1515 / YEP0FX1518 (referred to as the EUT in this report) is the SMART ECU.

General Specification

Clock frequency(ies) in the system	:	16MHz (CPU Main Clock) 32.768kHz (CPU Sub Clock)

Radio Specification

Equipment Type	:	Transceiver
Frequency of Operation	:	125kHz
Mode of Operation	:	Simplex
Method of Frequency Generation	:	Crystal
Antenna Type	:	Ferrite antenna

List of Model No.

Model No.	YEP0FX1515 (Original model: tested model)	YEP0FX1518 (Variant model: tested model)	YEP0FX1519 (Variant model)	YEP0FX1514 (Variant model)
Difference from original model	* This model controls 4doors.	Antennas, Software and Electric circuit * This model controls 5doors.	Software and Electric circuit * This model controls 5doors.	Appearance * This model controls 4doors.

The differences among the above three models do not influence on radio specification.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C: 2014, final revised on March 6, 2014 and effective April 7, 2014
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted Emission Section 15.209 Radiated emission limits, general requirements

* The revision on March 6, 2014 does not affect the test specification applied to the EUT.

FCC 15.31 (e)
This test was performed with the New Battery (DC 12V) and the constant voltage was supplied to this EUT during the tests. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement
It is impossible for end users to replace the antenna, because the antenna is mounted inside of the vehicle. Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted Emission	<FCC> ANSI C63.4:2003 7. AC powerline conducted emission measurements <IC> RSS-Gen 7.2.4	<FCC> Section 15.207 <IC> RSS-Gen 7.2.4	-	N/A *1)	N/A	N/A
2	Electric Field Strength of Fundamental Emission	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 4.8, 4.11	<FCC> Section 15.209 <IC> RSS-210 2.5.1 RSS-Gen 7.2.5	Radiated	N/A	16.3dB 0.12500MHz 0 deg., PK with Duty factor (R Antenna)	Complied
3	Electric Field Strength of Spurious Emission	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 4.9, 4.11	<FCC> Section 15.209 <IC> RSS-210 2.5.1 RSS-Gen 7.2.5	Radiated	N/A	11.0dB 38.495MHz, QP, Vertical (FRDR Antenna)	Complied
4	-26dB Bandwidth	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> -	<FCC> Reference data <IC> -	Radiated	N/A	N/A	N/A

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420.
*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.

3.3 Addition to standard

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	RSS-Gen 4.6.1	RSS-Gen 4.6.1	Radiated	N/A	N/A	N/A

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

3.4 Uncertainty

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

Test room (semi-anechoic chamber)	**Radiated emission**						
	(3m*)(±dB)				**(1m*)(±dB)**		**(0.5m*)(±dB)**
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	4.2dB

*3m/1m/0.5m = Measurement distance

Radiated emission test(3m)
[Electric Field Strength of Fundamental Emission]
The data listed in this report meets the limits unless the uncertainty is taken into consideration.

[Electric Field Strength of Spurious Emission]
The data listed in this test report has enough margin, more than the site margin.

3.5 Test Location

UL Japan, Inc. Ise HQ EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999 Facsimile : +81 596 24 8124

	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	4.0 x 4.5 x 2.7m	4.75 x 5.4 m	-
No.6 measurement room	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	8.8 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	3.1 x 3.4 x 3.0m	4.8 x 4.6m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Data of EMI, Test instruments, and Test set up

Refer to APPENDIX.

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

4.1 Operating Modes

The mode is used: Transmitting mode (Tx) 125kHz

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

The EUT has 2 types: Sedan type (YEP0FX1515) and Wagon type (YEP0FX1518).
Sedan type has 6 types of LF Antennas (F Antenna, R Antenna, M/TI Antenna, TR Antenna, FRDR Antenna, FRAS Antenna).
Wagon type has 6 types of LF Antennas (F Antenna, M/TI Antenna, R Antenna, TR Antenna, FRDR Antenna, FRAS Antenna).

Between Model No. YEP0FX1519, Model No.YEP0FX1514 and Model No. YEP0FX1515, they are completely identical in Radio characteristics.
Therefore, the test was performed with Model No. YEP0FX1515 as representative.

Sedan type: FRDR Antenna, TR Antenna, R Antenna, F Antenna
Wagon type: FRDR Antenna, R Antenna

*The EUT does not transmit simultaneously from multiple antennas.
During testing, transmitting antenna was fixed to one of antennas.

4.2 Configuration and peripherals

This page has been submitted for a separate exhibit.

SECTION 5: Radiated emission (Fundamental and Spurious Emission)

Test Procedure
The Radiated Electric Field Strength intensity has been measured on No 1, No 3, and No.4 semi anechoic chamber with a ground plane and at a distance of 3m.

Frequency : From 9kHz to 30MHz at distance 3m
The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
The measurements were performed for vertical polarization (antenna angle: 0deg., 45deg., 90deg., 135 deg., and 180 deg.) and horizontal polarization.
*Refer to Figure 1 about Direction of the Loop Antenna.

Frequency : From 30MHz to 1GHz at distance 3m
The measuring antenna height 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.

Measurements were performed with a QP and PK detector.
The radiated emission measurements were made with the following detector function of the test receiver (below 1GHz).

	From 9kHz to 90kHz and From 110kHz to 150kHz	From 90kHz to 110kHz	From 150kHz to 490kHz	From 490kHz to 30MHz	From 30MHz to 1GHz
Detector Type	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz
Distance factor *1)	-80dB	-80dB	-80dB	-40dB	-

*1) -80dB = 40 x log (3m/300m)
-40dB = 40 x log (3m /30m)

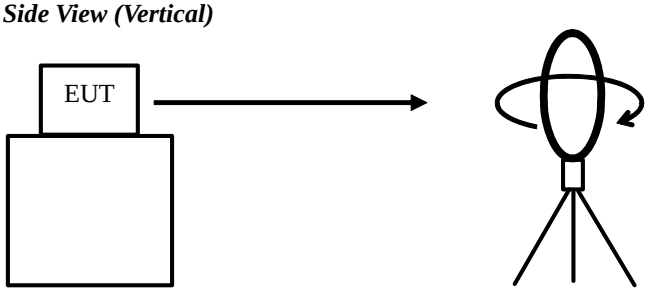
- The carrier level (or, noise levels) was (or were) measured at each position of all three axes X, Y and Z, and the position that has the maximum noise was determined.
With the position, the noise levels of all the frequencies were measured.

Test data : APPENDIX 1
Test result : Pass

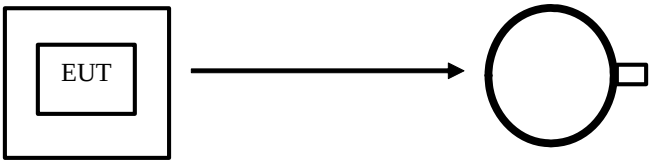
Date: March 20, 2014 Test engineer: Masatoshi Nishiguchi
March 22, 2014 Keisuke Kawamura
April 17, 2014 Shinya Watanabe, Tsubasa Takayama

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

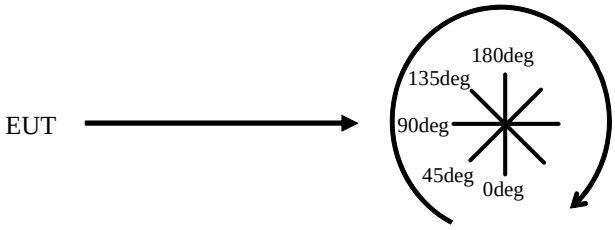


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise

SECTION 6: -26dB Bandwidth

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
-26dB Bandwidth	100kHz	1kHz	3kHz	Auto	Peak	Max Hold	Spectrum Analyzer

Test data : APPENDIX 1
Test result : Pass

SECTION 7: 99% Occupied Bandwidth

Test Procedure

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 % of Span	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer
*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100%.							

Test data : APPENDIX 1
Test result : Pass

APPENDIX 1: Data of EMI test

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

FRDR Antenna (YEP0FX1515)

Test place	Ise HQ EMC Lab. No.1 Semi Anechoic Chamber
Order No.	10261262H
Date	03/20/2014
Temperature/ Humidity	21 deg. C / 43% RH
Engineer	Masatoshi Nishiguchi
Mode	Tx 125kHz, FRDR Antenna (YEP0FX1515)

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m	Margin [dB]	Remark
0	0.12500	PK	103.0	20.0	-74.0	32.3	-	16.7	45.6	28.9	Fundamental
0	0.25000	PK	66.7	19.9	-73.9	32.2	-	-19.5	39.6	59.1	
0	0.37500	PK	71.5	19.8	-73.9	32.2	-	-14.8	36.1	50.9	
0	0.50000	QP	39.3	19.8	-33.9	32.2	-	-7.0	33.6	40.6	
0	0.62500	QP	60.9	19.8	-33.8	32.2	-	14.7	31.7	17.0	
0	0.75000	QP	33.2	19.8	-33.8	32.2	-	-13.0	30.1	43.1	
0	0.87500	QP	54.7	19.8	-33.8	32.2	-	8.5	28.7	20.2	
0	1.00000	QP	31.8	19.8	-33.8	32.2	-	-14.4	27.6	42.0	
0	1.12500	QP	50.2	19.8	-33.8	32.2	-	4.0	26.5	22.5	
0	1.25000	QP	31.3	19.8	-33.7	32.2	-	-14.8	25.6	40.4	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amprifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m	Margin [dB]	Remark
0	0.12500	PK	103.0	20.0	-74.0	32.3	-12.8	3.9	25.6	21.7	Fundamental
0	0.25000	PK	66.7	19.9	-73.9	32.2	-12.8	-32.3	19.6	51.9	
0	0.37500	PK	71.5	19.8	-73.9	32.2	-12.8	-27.6	16.1	43.7	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amprifier) + Duty factor *

* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	103.0	20.0	5.9	32.3	-	96.6	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier)

* All spurious emissions lower than this result.

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

TR Antenna (YEP0FX1515)

Test place	Ise HQ EMC Lab. No.1 Semi Anechoic Chamber
Order No.	10261262H
Date	03/20/2014
Temperature/ Humidity	21 deg. C / 43% RH
Engineer	Masatoshi Nishiguchi
Mode	Tx 125kHz, TR Antenna (YEP0FX1515)

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m	Margin [dB]	Remark
0	0.12500	PK	103.2	20.0	-74.0	32.3	-	16.9	45.6	28.7	Fundamental
0	0.25000	PK	65.1	19.9	-73.9	32.2	-	-21.1	39.6	60.7	
0	0.37500	PK	74.2	19.8	-73.9	32.2	-	-12.1	36.1	48.2	
0	0.50000	QP	40.3	19.8	-33.9	32.2	-	-6.0	33.6	39.6	
0	0.62500	QP	63.7	19.8	-33.8	32.2	-	17.5	31.7	14.2	
0	0.75000	QP	34.3	19.8	-33.8	32.2	-	-11.9	30.1	42.0	
0	0.87500	QP	57.4	19.8	-33.8	32.2	-	11.2	28.7	17.5	
0	1.00000	QP	32.1	19.8	-33.8	32.2	-	-14.1	27.6	41.7	
0	1.12500	QP	52.9	19.8	-33.8	32.2	-	6.7	26.5	19.8	
0	1.25000	QP	31.6	19.8	-33.7	32.2	-	-14.5	25.6	40.1	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amprifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m	Margin [dB]	Remark
0	0.12500	PK	103.2	20.0	-74.0	32.3	-12.9	4.0	25.6	21.6	Fundamental
0	0.25000	PK	65.1	19.9	-73.9	32.2	-12.9	-34.0	19.6	53.6	
0	0.37500	PK	74.2	19.8	-73.9	32.2	-12.9	-25.0	16.1	41.1	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amprifier) + Duty factor *

* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	103.2	20.0	5.9	32.3	-	96.8	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier)

* All spurious emissions lower than this result.

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Radiated Emission below 30MHz (Fundamental and Spurious Emission)

M/TI Antenna (YEP0FX1515)

Test place	Ise HQ EMC Lab. No.1 Semi Anechoic Chamber
Order No.	10261262H
Date	03/20/2014
Temperature/ Humidity	21 deg. C / 43% RH
Engineer	Masatoshi Nishiguchi
Mode	Tx 125kHz, M/TI Antenna (YEP0FX1515)

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m	Margin [dB]	Remark
0	0.12500	PK	103.4	20.0	-74.0	32.3	-	17.1	45.6	28.5	Fundamental
0	0.25000	PK	67.0	19.9	-73.9	32.2	-	-19.2	39.6	58.8	
0	0.37500	PK	73.0	19.8	-73.9	32.2	-	-13.3	36.1	49.4	
0	0.50000	QP	42.0	19.8	-33.9	32.2	-	-4.3	33.6	37.9	
0	0.62500	QP	62.1	19.8	-33.8	32.2	-	15.9	31.7	15.8	
0	0.75000	QP	34.2	19.8	-33.8	32.2	-	-12.0	30.1	42.1	
0	0.87500	QP	55.8	19.8	-33.8	32.2	-	9.6	28.7	19.1	
0	1.00000	QP	31.9	19.8	-33.8	32.2	-	-14.3	27.6	41.9	
0	1.12500	QP	51.2	19.8	-33.8	32.2	-	5.0	26.5	21.5	
0	1.25000	QP	31.3	19.8	-33.7	32.2	-	-14.8	25.6	40.4	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amprifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m	Margin [dB]	Remark
0	0.12500	PK	103.4	20.0	-74.0	32.3	-14.7	2.4	25.6	23.2	Fundamental
0	0.25000	PK	67.0	19.9	-73.9	32.2	-14.7	-33.9	19.6	53.5	
0	0.37500	PK	73.0	19.8	-73.9	32.2	-14.7	-28.0	16.1	44.1	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amprifier) + Duty factor *

* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	103.4	20.0	5.9	32.3	-	97.0	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier)

* All spurious emissions lower than this result.

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

F Antenna (YEP0FX1515)

Test place	Ise HQ EMC Lab. No.1 Semi Anechoic Chamber
Order No.	10261262H
Date	03/20/2014
Temperature/ Humidity	21 deg. C / 43% RH
Engineer	Masatoshi Nishiguchi
Mode	Tx 125kHz, F Antenna (YEP0FX1515)

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m	Margin [dB]	Remark
0	0.12500	PK	104.0	20.0	-74.0	32.3	-	17.7	45.6	27.9	Fundamental
0	0.25000	PK	67.5	19.9	-73.9	32.2	-	-18.7	39.6	58.3	
0	0.37500	PK	73.7	19.8	-73.9	32.2	-	-12.6	36.1	48.7	
0	0.50000	QP	41.6	19.8	-33.9	32.2	-	-4.7	33.6	38.3	
0	0.62500	QP	62.8	19.8	-33.8	32.2	-	16.6	31.7	15.1	
0	0.75000	QP	33.8	19.8	-33.8	32.2	-	-12.4	30.1	42.5	
0	0.87500	QP	56.6	19.8	-33.8	32.2	-	10.4	28.7	18.3	
0	1.00000	QP	31.9	19.8	-33.8	32.2	-	-14.3	27.6	41.9	
0	1.12500	QP	52.0	19.8	-33.8	32.2	-	5.8	26.5	20.7	
0	1.25000	QP	31.4	19.8	-33.7	32.2	-	-14.7	25.6	40.3	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amprifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m	Margin [dB]	Remark
0	0.12500	PK	104.0	20.0	-74.0	32.3	-14.0	3.7	25.6	21.9	Fundamental
0	0.25000	PK	67.5	19.9	-73.9	32.2	-14.0	-32.7	19.6	52.3	
0	0.37500	PK	73.7	19.8	-73.9	32.2	-14.0	-26.6	16.1	42.7	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amprifier) + Duty factor *

* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	104.0	20.0	5.9	32.3	-	97.6	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier)

* All spurious emissions lower than this result.

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Radiated Emission below 30MHz (Fundamental and Spurious Emission)

FRDR Antenna (YEP0FX1518)

Test place	Ise HQ EMC Lab. No.3 Semi Anechoic Chamber
Order No.	10261262H
Date	03/22/2014
Temperature/ Humidity	20 deg. C / 31% RH
Engineer	Keisuke Kawamura
Mode	Tx 125kHz, FRDR Antenna (YEP0FX1518)

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m	Margin [dB]	Remark
0	0.12500	PK	107.9	20.0	-74.1	32.3	-	21.5	45.6	24.1	Fundamental
0	0.25000	PK	74.5	19.9	-74.0	32.2	-	-11.8	39.6	51.4	
0	0.37500	PK	73.0	19.8	-74.0	32.2	-	-13.4	36.1	49.5	
0	0.50000	QP	39.0	19.8	-34.0	32.2	-	-7.4	33.6	41.0	
0	0.62500	QP	57.6	19.8	-34.0	32.2	-	11.2	31.7	20.5	
0	0.75000	QP	32.4	19.8	-34.0	32.2	-	-14.0	30.1	44.1	
0	0.87500	QP	51.7	19.8	-34.0	32.2	-	5.3	28.7	23.4	
0	1.00000	QP	31.1	19.8	-34.0	32.2	-	-15.3	27.6	42.9	
0	1.12500	QP	47.4	19.8	-34.0	32.2	-	1.0	26.5	25.5	
0	1.25000	QP	30.5	19.8	-33.9	32.2	-	-15.8	25.6	41.4	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amprifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m	Margin [dB]	Remark
0	0.12500	PK	107.9	20.0	-74.1	32.3	-13.0	8.5	25.6	17.1	Fundamental
0	0.25000	PK	74.5	19.9	-74.0	32.2	-13.0	-24.8	19.6	44.4	
0	0.37500	PK	73.0	19.8	-74.0	32.2	-13.0	-26.4	16.1	42.5	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amprifier) + Duty factor *

* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	107.9	20.0	5.9	32.3	-	101.5	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier)

* All spurious emissions lower than this result.

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

R Antenna (YEP0FX1518)

Test place	Ise HQ EMC Lab. No.4 Semi Anechoic Chamber
Order No.	10261262H
Date	04/17/2014
Temperature/ Humidity	21 deg. C / 43% RH
Engineer	Tsubasa Takayama
Mode	Tx 125kHz , R Antenna

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m	Margin [dB]	Remark
0	0.12500	PK	109.8	20.0	-73.9	32.2	-	23.7	45.6	21.9	Fundamental
0	0.25000	PK	80.2	19.9	-73.9	32.1	-	-5.9	39.6	45.5	
0	0.37500	PK	72.2	19.8	-73.9	32.1	-	-14.0	36.1	50.1	
0	0.50000	QP	40.4	19.8	-33.8	32.1	-	-5.7	33.6	39.3	
0	0.62500	QP	60.8	19.8	-33.8	32.1	-	14.7	31.7	17.0	
0	0.75000	QP	34.0	19.8	-33.8	32.1	-	-12.1	30.1	42.2	
0	0.87500	QP	54.5	19.8	-33.8	32.1	-	8.4	28.7	20.3	
0	1.00000	QP	31.3	19.8	-33.8	32.1	-	-14.8	27.6	42.4	
0	1.12500	QP	50.0	19.8	-33.8	32.1	-	3.9	26.5	22.6	
0	1.25000	QP	32.4	19.8	-33.8	32.1	-	-13.7	25.6	39.3	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amprifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m	Margin [dB]	Remark
0	0.12500	PK	109.8	20.0	-73.9	32.2	-14.4	9.3	25.6	16.3	Fundamental
0	0.25000	PK	80.2	19.9	-73.9	32.1	-14.4	-20.3	19.6	39.9	
0	0.37500	PK	72.2	19.8	-73.9	32.1	-14.4	-28.4	16.1	44.5	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amprifier) + Duty factor *

* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	109.8	20.0	6.0	32.2	-	103.6	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier)

* All spurious emissions lower than this result.

Radiated Emission above 30MHz (Spurious Emission)

FRDR Antenna (YEP0FX1515)

DATA OF RADIATED EMISSION TEST

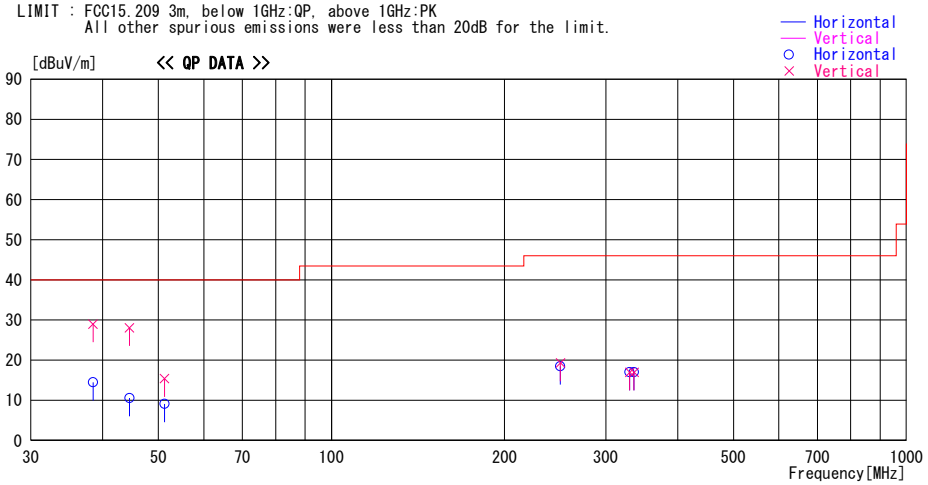
UL Japan, Ise HQ EMC Lab. No.4 Semi Anechoic Chamber
Date : 2014/04/17

Report No. : 10261262H

Temp./Humi. : 21deg.C / 36% RH
Engineer : Shinya Watanabe

Mode / Remarks : LF Tx 125kHz, Ant(FRDR Antenna), Worst-axis(Hori PCU:X, Ant:X /Vert PCU:X, Ant:X)

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
38.495	24.4	QP	15.0	-24.9	14.5	64	147	Hori.	40.0	25.5	
38.495	38.9	QP	15.0	-24.9	29.0	147	100	Vert.	40.0	11.0	
44.530	22.7	QP	12.7	-24.8	10.6	0	100	Hori.	40.0	29.4	NS
44.530	40.2	QP	12.7	-24.8	28.1	0	100	Vert.	40.0	11.9	
51.252	23.2	QP	10.5	-24.6	9.1	0	100	Hori.	40.0	30.9	
51.252	29.5	QP	10.5	-24.6	15.4	144	100	Vert.	40.0	24.6	
250.137	23.6	QP	17.3	-22.4	18.5	90	118	Hori.	46.0	27.5	
250.137	24.4	QP	17.3	-22.4	19.3	0	100	Vert.	46.0	26.7	
330.000	22.1	QP	16.7	-21.8	17.0	0	100	Hori.	46.0	29.0	NS
330.000	22.1	QP	16.7	-21.8	17.0	0	100	Vert.	46.0	29.0	NS
336.000	22.1	QP	16.7	-21.8	17.0	0	100	Hori.	46.0	29.0	NS
336.000	22.1	QP	16.7	-21.8	17.0	0	100	Vert.	46.0	29.0	NS

* NS = No signal detected.

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+FILTER) - GAIN(AMP)

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Radiated Emission above 30MHz (Spurious Emission)

TR Antenna (YEP0FX1515)

DATA OF RADIATED EMISSION TEST

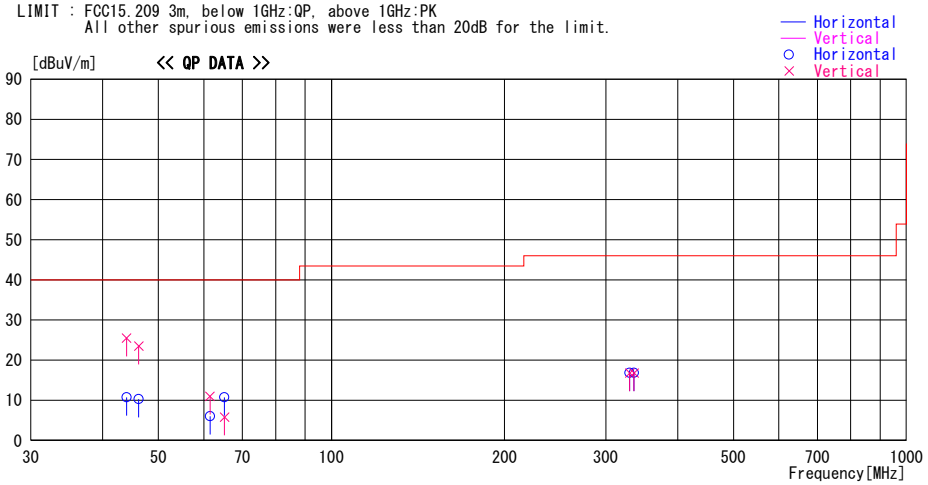
UL Japan, Ise HQ EMC Lab. No.4 Semi Anechoic Chamber
Date : 2014/04/17

Report No. : 10261262H

Temp./Humi. : 21deg.C / 36% RH
Engineer : Shinya Watanabe

Mode / Remarks : LF Tx 125kHz, Ant(TR Antenna), Worst-axis(Hori PCU:X, Ant:X /Vert PCU:X, Ant:X)

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
44.020	22.6	QP	12.9	-24.8	10.7	0	100	Hori.	40.0	29.3	NS
44.020	37.4	QP	12.9	-24.8	25.5	162	100	Vert.	40.0	14.5	
46.243	22.9	QP	12.1	-24.7	10.3	0	100	Hori.	40.0	29.7	NS
46.243	36.1	QP	12.1	-24.7	23.5	168	100	Vert.	40.0	16.5	
61.529	23.1	QP	7.4	-24.5	6.0	0	100	Hori.	40.0	34.0	
61.529	28.1	QP	7.4	-24.5	11.0	83	100	Vert.	40.0	29.0	
65.170	28.2	QP	6.9	-24.4	10.7	94	120	Hori.	40.0	29.3	
65.170	23.3	QP	6.9	-24.4	5.8	0	100	Vert.	40.0	34.2	
330.000	21.9	QP	16.7	-21.8	16.8	0	100	Hori.	46.0	29.2	NS
330.000	21.9	QP	16.7	-21.8	16.8	0	100	Vert.	46.0	29.2	NS
336.000	21.9	QP	16.7	-21.8	16.8	0	100	Hori.	46.0	29.2	NS
336.000	21.9	QP	16.7	-21.8	16.8	0	100	Vert.	46.0	29.2	NS

* NS = No signal detected.

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+FILTER) - GAIN(AMP)

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Radiated Emission above 30MHz (Spurious Emission)

M/TI Antenna (YEP0FX1515)

DATA OF RADIATED EMISSION TEST

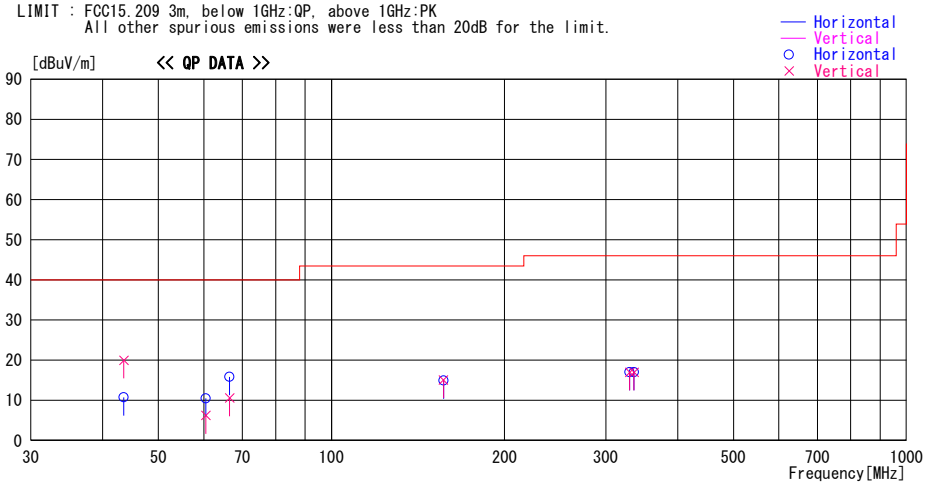
UL Japan, Ise HQ EMC Lab. No.4 Semi Anechoic Chamber
Date : 2014/04/17

Report No. : 10261262H

Temp./Humi. : 21deg.C / 36% RH
Engineer : Shinya Watanabe

Mode / Remarks : LF Tx 125kHz, Ant(M/TI Antenna), Worst-axis(Hori PCU:X, Ant:X /Vert PCU:X, Ant:X)

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
43.541	22.4	QP	13.1	-24.8	10.7	0	100	Hori.	40.0	29.3	NS
43.541	31.7	QP	13.1	-24.8	20.0	136	100	Vert.	40.0	20.0	
60.503	27.5	QP	7.5	-24.5	10.5	179	369	Hori.	40.0	29.5	
60.503	23.2	QP	7.5	-24.5	6.2	0	100	Vert.	40.0	33.8	
66.497	33.5	QP	6.7	-24.4	15.8	0	319	Hori.	40.0	24.2	
66.497	28.3	QP	6.7	-24.4	10.6	127	100	Vert.	40.0	29.4	
156.613	22.9	QP	15.3	-23.3	14.9	0	100	Hori.	43.5	28.6	
156.613	23.1	QP	15.3	-23.3	15.1	245	100	Vert.	43.5	28.4	
330.000	22.1	QP	16.7	-21.8	17.0	0	100	Hori.	46.0	29.0	NS
330.000	22.1	QP	16.7	-21.8	17.0	0	100	Vert.	46.0	29.0	NS
336.000	22.1	QP	16.7	-21.8	17.0	0	100	Hori.	46.0	29.0	NS
336.000	22.1	QP	16.7	-21.8	17.0	0	100	Vert.	46.0	29.0	NS

* NS = No signal detected.

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+FILTER) - GAIN(AMP)

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Radiated Emission above 30MHz (Spurious Emission)

F Antenna (YEP0FX1515)

DATA OF RADIATED EMISSION TEST

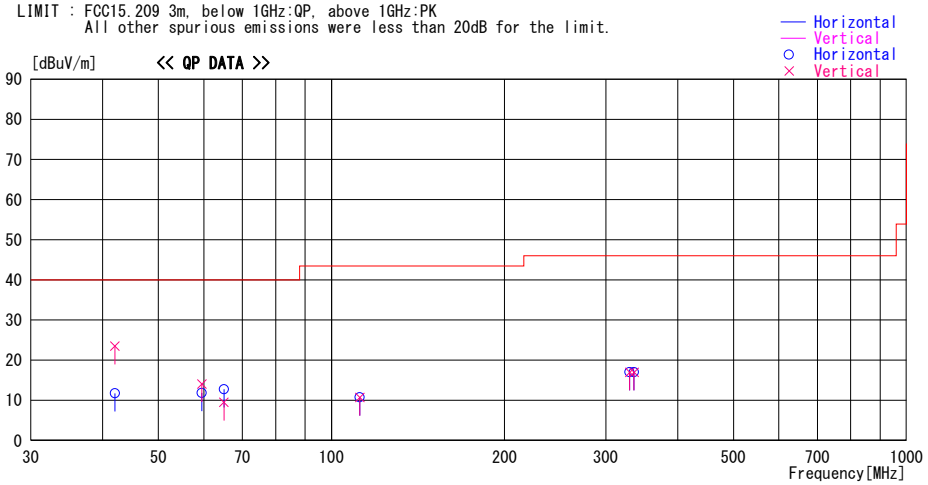
UL Japan, Ise HQ EMC Lab. No.4 Semi Anechoic Chamber
Date : 2014/04/17

Report No. : 10261262H

Temp./Humi. : 21deg.C / 36% RH
Engineer : Shinya Watanabe

Mode / Remarks : LF Tx 125kHz, Ant(F Antenna), Worst-axis(Hori PCU:X, Ant:X /Vert PCU:X, Ant:X)

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
42.019	22.8	QP	13.7	-24.8	11.7	0	100	Hori.	40.0	28.3	
42.019	34.6	QP	13.7	-24.8	23.5	122	100	Vert.	40.0	16.5	
59.532	28.6	QP	7.7	-24.5	11.8	0	192	Hori.	40.0	28.2	
59.532	30.9	QP	7.7	-24.5	14.1	127	100	Vert.	40.0	25.9	
65.018	30.2	QP	6.9	-24.4	12.7	0	251	Hori.	40.0	27.3	
65.018	27.0	QP	6.9	-24.4	9.5	205	100	Vert.	40.0	30.5	
112.000	22.7	QP	11.8	-23.8	10.7	0	100	Hori.	43.5	32.8	NS
112.000	22.7	QP	11.8	-23.8	10.7	0	100	Vert.	43.5	32.8	NS
330.000	22.1	QP	16.7	-21.8	17.0	0	100	Hori.	46.0	29.0	NS
330.000	22.1	QP	16.7	-21.8	17.0	0	100	Vert.	46.0	29.0	NS
336.000	22.1	QP	16.7	-21.8	17.0	0	100	Hori.	46.0	29.0	NS
336.000	22.1	QP	16.7	-21.8	17.0	0	100	Vert.	46.0	29.0	NS

* NS = No signal detected.

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+FILTER) - GAIN(AMP)

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Radiated Emission above 30MHz (Spurious Emission)

FRDR Antenna (YEP0FX1518)

DATA OF RADIATED EMISSION TEST

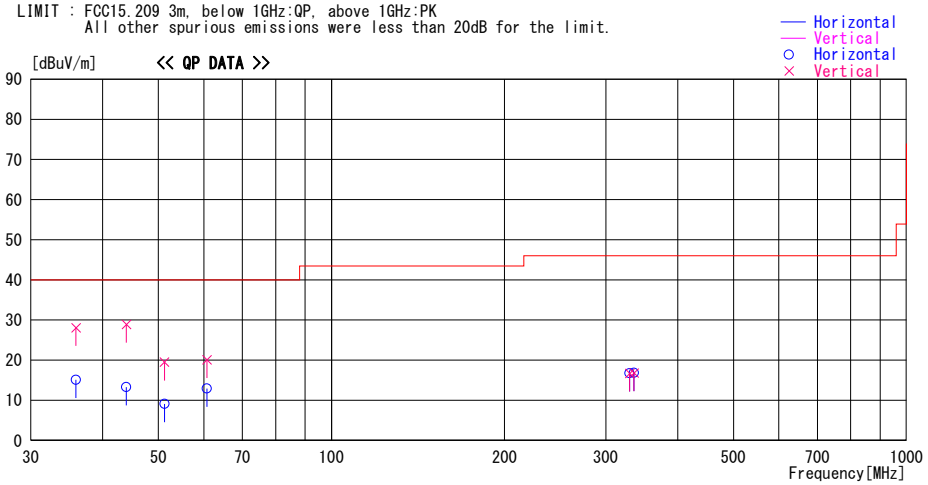
UL Japan, Ise HQ EMC Lab. No.4 Semi Anechoic Chamber
Date : 2014/04/17

Report No. : 10261262H

Temp./Humi. : 21deg.C / 36% RH
Engineer : Shinya Watanabe

Mode / Remarks : LF Tx 125kHz, Ant(FRDR Antenna), Worst-axis(Hori PCU:X, Ant:X /Vert PCU:X, Ant:X)

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
35.952	24.0	QP	16.0	-24.9	15.1	66	306	Hori.	40.0	24.9	
35.952	37.0	QP	16.0	-24.9	28.1	134	100	Vert.	40.0	11.9	
43.998	25.2	QP	12.9	-24.8	13.3	69	320	Hori.	40.0	26.7	
43.998	40.8	QP	12.9	-24.8	28.9	107	100	Vert.	40.0	11.1	
51.238	23.2	QP	10.5	-24.6	9.1	69	320	Hori.	40.0	30.9	
51.238	33.6	QP	10.5	-24.6	19.5	107	100	Vert.	40.0	20.5	
60.734	29.9	QP	7.5	-24.5	12.9	322	350	Hori.	40.0	27.1	
60.734	37.1	QP	7.5	-24.5	20.1	156	100	Vert.	40.0	19.9	
330.000	21.8	QP	16.7	-21.8	16.7	0	100	Hori.	46.0	29.3	NS
330.000	21.8	QP	16.7	-21.8	16.7	0	100	Vert.	46.0	29.3	NS
336.000	21.9	QP	16.7	-21.8	16.8	0	100	Hori.	46.0	29.2	NS
336.000	21.9	QP	16.7	-21.8	16.8	0	100	Vert.	46.0	29.2	NS

* NS = No signal detected.

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+FILTER) - GAIN(AMP)

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Radiated Emission above 30MHz (Spurious Emission)

R Antenna (YEP0FX1518)

DATA OF RADIATED EMISSION TEST

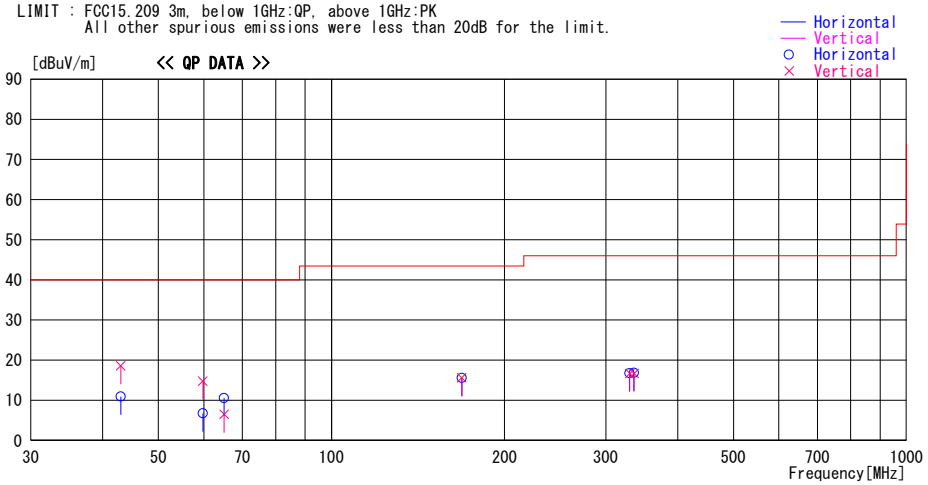
UL Japan, Ise HQ EMC Lab. No.4 Semi Anechoic Chamber
Date : 2014/04/17

Report No. : 10261262H

Temp./Humi. : 21deg.C / 36% RH
Engineer : Shinya Watanabe

Mode / Remarks : LF Tx 125kHz, Ant(R Antenna), Worst-axis(Hori PCU:X, Ant:X /Vert PCU:X, Ant:X)

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
43.010	22.4	QP	13.3	-24.8	10.9	359	300	Hori.	40.0	29.1	NS
43.010	30.1	QP	13.3	-24.8	18.6	110	100	Vert.	40.0	21.4	
59.750	23.5	QP	7.7	-24.5	6.7	169	318	Hori.	40.0	33.3	
59.750	31.6	QP	7.7	-24.5	14.8	0	100	Vert.	40.0	25.2	
65.061	28.1	QP	6.9	-24.4	10.6	0	302	Hori.	40.0	29.4	
65.061	24.0	QP	6.9	-24.4	6.5	127	100	Vert.	40.0	33.5	
168.517	23.0	QP	15.8	-23.2	15.6	29	300	Hori.	43.5	27.9	
168.517	23.0	QP	15.8	-23.2	15.6	0	100	Vert.	43.5	27.9	
330.000	21.8	QP	16.7	-21.8	16.7	0	100	Hori.	46.0	29.3	NS
330.000	21.8	QP	16.7	-21.8	16.7	0	100	Vert.	46.0	29.3	NS
336.000	21.9	QP	16.7	-21.8	16.8	0	100	Hori.	46.0	29.2	NS
336.000	21.8	QP	16.7	-21.8	16.7	0	100	Vert.	46.0	29.3	NS

* NS = No signal detected.

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+FILTER) - GAIN(AMP)

*The test result is rounded off to one or two decimal places, so some differences might be observed.

-26dB Bandwidth and 99% Occupied Bandwidth

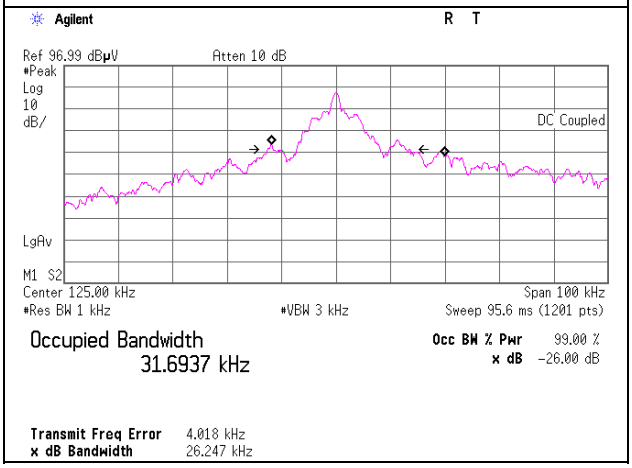
FRDR Antenna (YEP0FX1515)

Test place	Ise HQ EMC Lab. No.4 Semi Anechoic Chamber
Order No.	10261262H
Date	04/17/2014
Temperature/ Humidity	21 deg. C / 36% RH
Engineer	Shinya Watanabe
Mode	Tx 125kHz, FRDR Antenna

-26dB Bandwidth [kHz]
26.247

99% Occupied Bandwidth [kHz]
31.6937

DR Antenna



-26dB Bandwidth and 99% Occupied Bandwidth

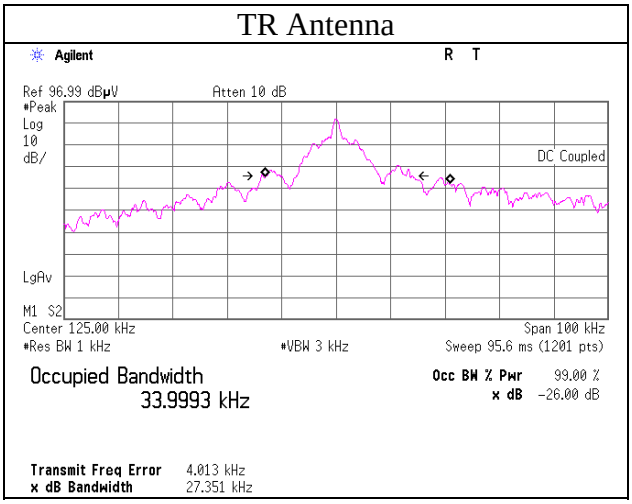
TR Antenna (YEP0FX1515)

Test place	Ise HQ EMC Lab. No.4 Semi Anechoic Chamber
Order No.	10261262H
Date	04/17/2014
Temperature/ Humidity	21 deg. C / 36% RH
Engineer	Shinya Watanabe
Mode	Tx 125kHz, TR Antenna (YEP0FX1515)

-26dB Bandwidth [kHz]
27.351

99% Occupied Bandwidth [kHz]
33.9993

TR Antenna



-26dB Bandwidth and 99% Occupied Bandwidth

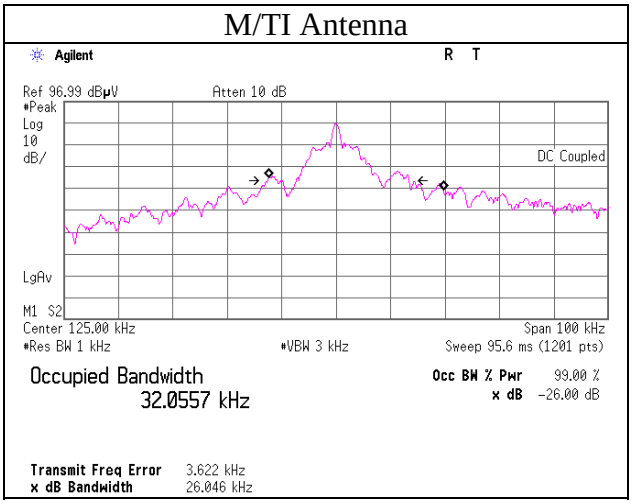
M/TI Antenna (YEP0FX1515)

Test place	Ise HQ EMC Lab. No.4 Semi Anechoic Chamber
Order No.	10261262H
Date	04/17/2014
Temperature/ Humidity	21 deg. C / 36% RH
Engineer	Shinya Watanabe
Mode	Tx 125kHz, M/TI Antenna (YEP0FX1515)

-26dB Bandwidth [kHz]
26.046

99% Occupied Bandwidth [kHz]
32.0557

M/TI Antenna



-26dB Bandwidth and 99% Occupied Bandwidth

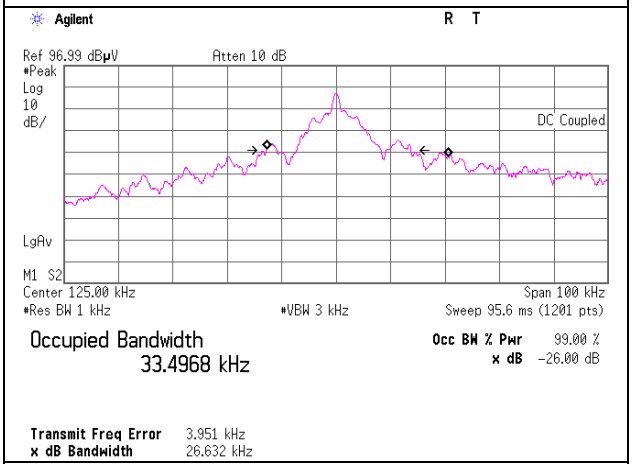
F Antenna (YEP0FX1515)

Test place	Ise HQ EMC Lab. No.4 Semi Anechoic Chamber
Order No.	10261262H
Date	04/17/2014
Temperature/ Humidity	21 deg. C / 36% RH
Engineer	Shinya Watanabe
Mode	Tx 125kHz, F Antenna (YEP0FX1515)

-26dB Bandwidth [kHz]
26.632

99% Occupied Bandwidth [kHz]
33.4968

F Antenna



-26dB Bandwidth and 99% Occupied Bandwidth

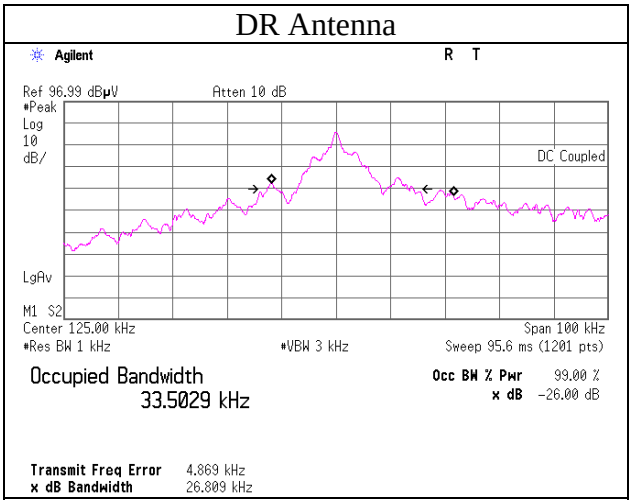
FRDR Antenna (YEP0FX1518)

Test place	Ise HQ EMC Lab. No.4 Semi Anechoic Chamber
Order No.	10261262H
Date	04/17/2014
Temperature/ Humidity	21 deg. C / 36% RH
Engineer	Shinya Watanabe
Mode	Tx 125kHz, FRDR Antenna (YEP0FX1518)

-26dB Bandwidth [kHz]
26.809

99% Occupied Bandwidth [kHz]
33.5029

DR Antenna



-26dB Bandwidth and 99% Occupied Bandwidth

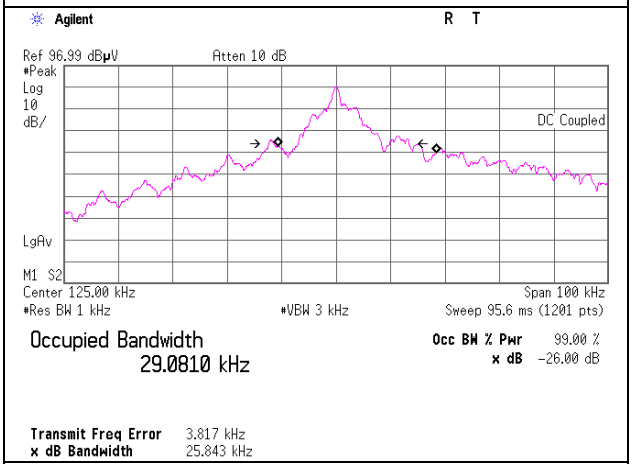
R Antenna (YEP0FX1518)

Test place	Ise HQ EMC Lab. No.4 Semi Anechoic Chamber
Order No.	10261262H
Date	04/17/2014
Temperature/ Humidity	21 deg. C / 36% RH
Engineer	Shinya Watanabe
Mode	Tx 125kHz, R Antenna (YEP0FX1518)

-26dB Bandwidth [kHz]
25.843

99% Occupied Bandwidth [kHz]
29.0810

R Antenna



Duty Cycle

Test place	Ise HQ EMC Lab. No.4 Semi Anechoic Chamber
Report No.	10261262H
Date	04/17/2014
Temperature/ Humidity	21 deg. C / 43% RH
Engineer	Tsubasa Takayama
Mode	LF Tx 125kHz FRDR Antenna (YEP0FX1515)

Type	Times	ON time(One pulse) [ms]	ON time(in 1Period) [ms]
A	1	0.401	0.401
B	25	0.285	7.125
C	55	0.151	8.322
D	1	3.653	3.653

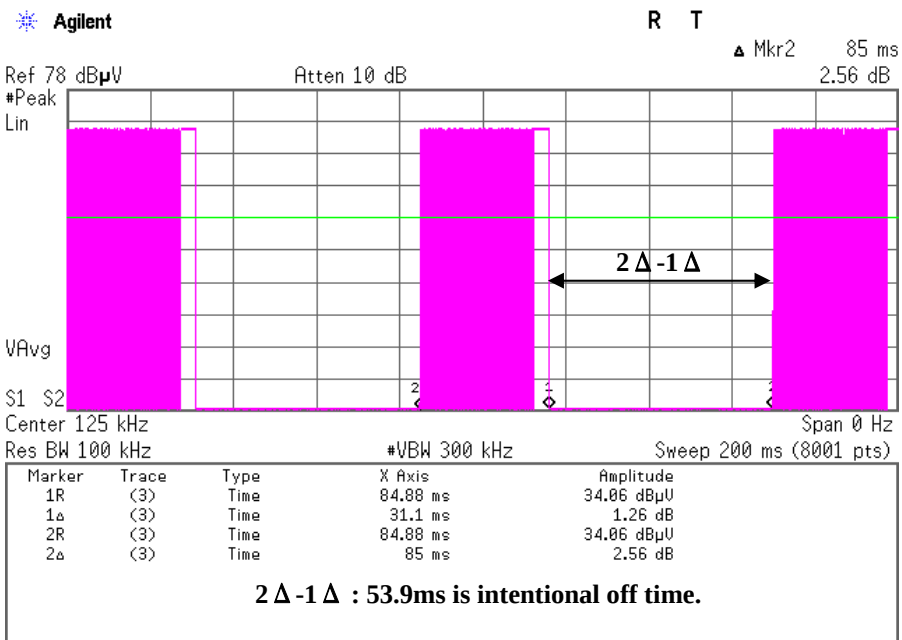
(Total)

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
19.50	85.00	0.23	-12.8

*ON time = Type A's ON time + Type B's ON time + Type C' ON time + Type D' ON time
*Duty = $20\log_{10}$(ON time/Cycle)

Duty Cycle

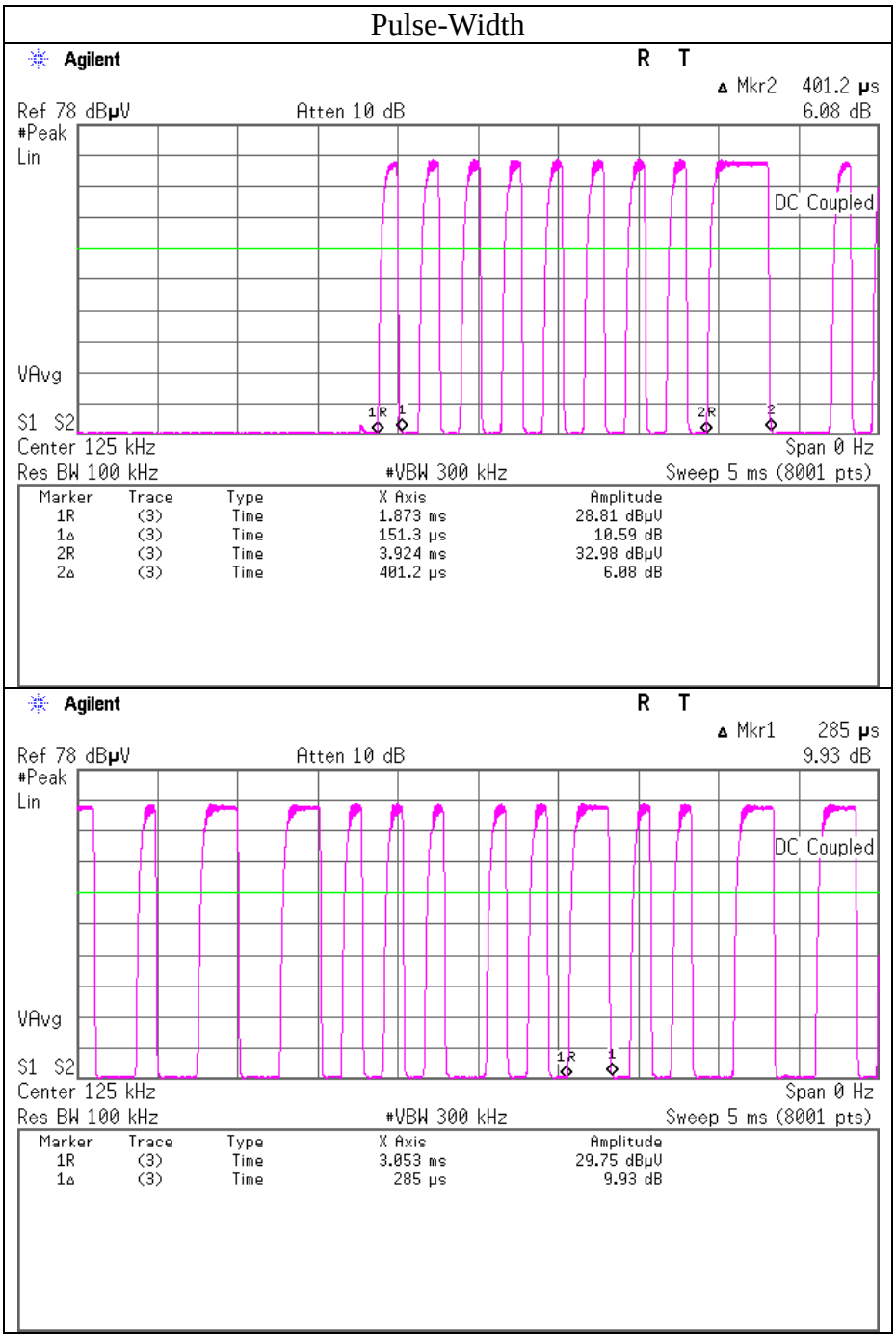
Pulse-Period



2Δ-1Δ : 53.9ms is intentional off time.

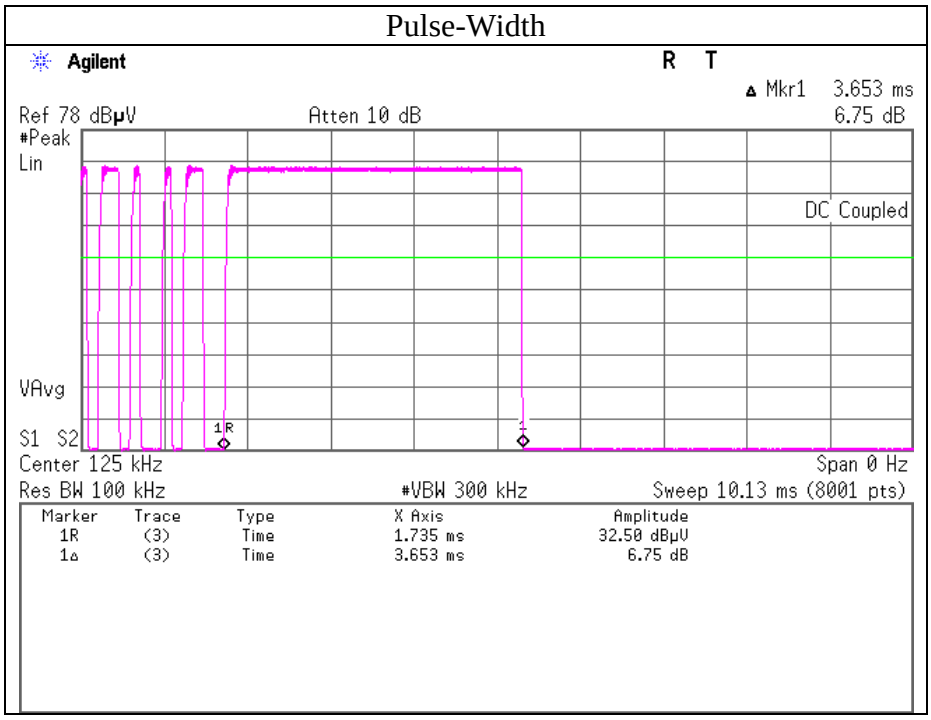
Duty Cycle

Pulse-Width



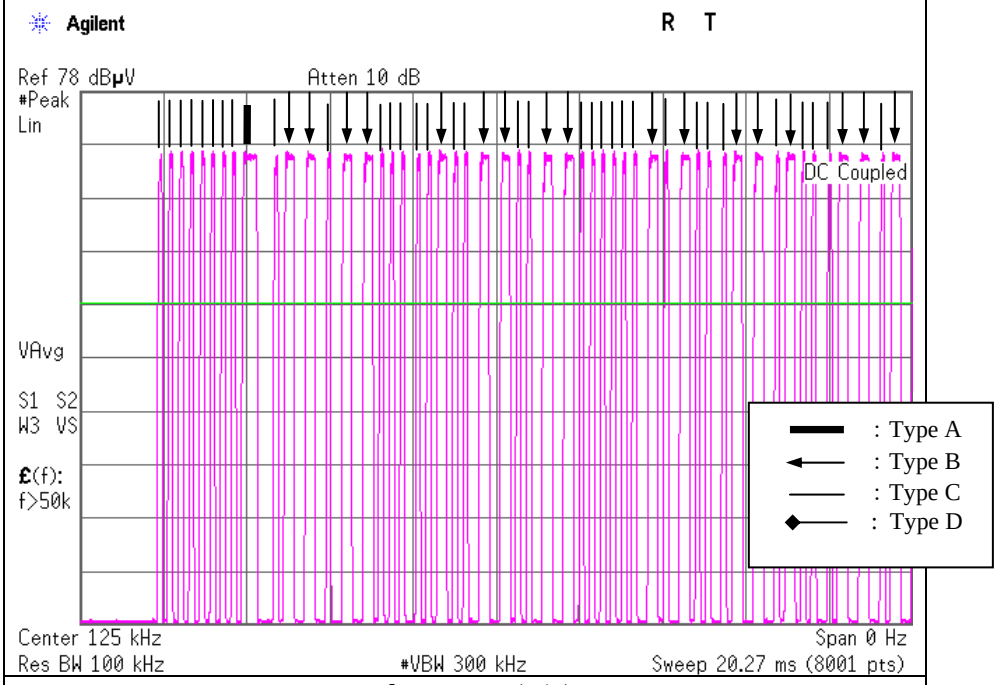
Duty Cycle

Pulse-Width

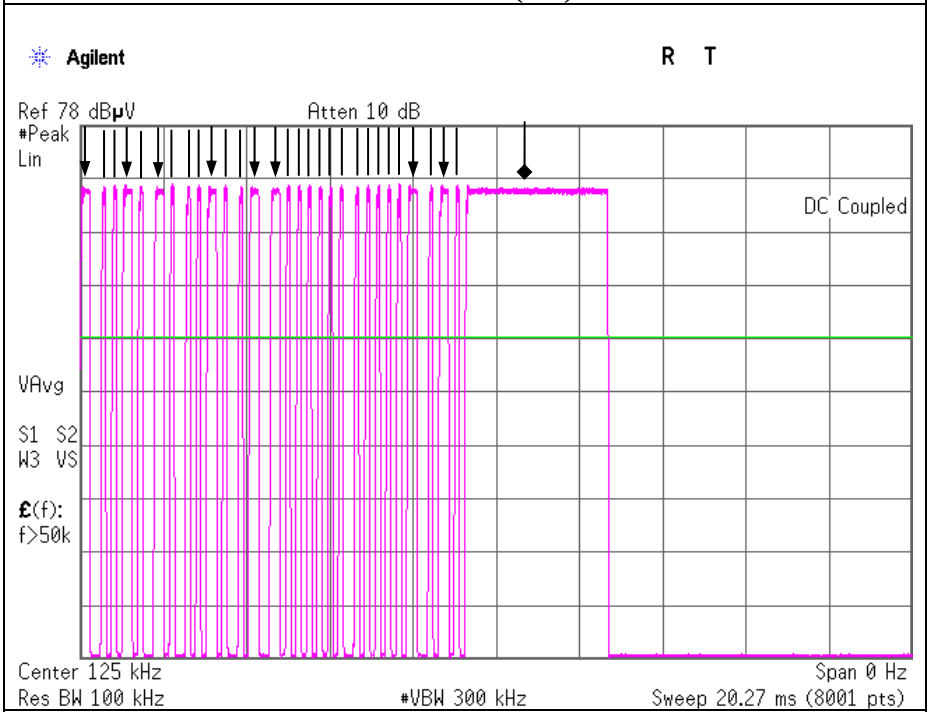


Duty Cycle

Pulse-Train (1/2)



Pulse-Train (2/2)



Duty Cycle

Test place	Ise HQ EMC Lab. No.4 Semi Anechoic Chamber
Report No.	10261262H
Date	04/17/2014
Temperature/ Humidity	21 deg. C / 43% RH
Engineer	Tsubasa Takayama
Mode	LF Tx 125kHz TR Antenna (YEP0FX1515)

Type	Times	ON time(One pulse) [ms]	ON time(in 1Period) [ms]
A	1	0.416	0.416
B	27	0.285	7.695
C	51	0.151	7.716
D	1	3.529	3.529

(Total)

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
19.36	85.00	0.23	-12.9

*ON time = Type A's ON time + Type B's ON time + Type C' ON time + Type D' ON time
*Duty = $20\log_{10}$(ON time/Cycle)

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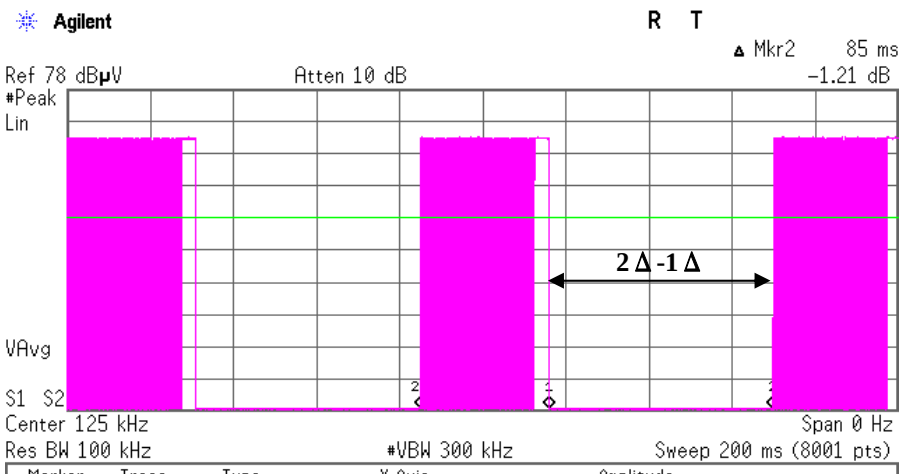
Duty Cycle

Pulse-Period

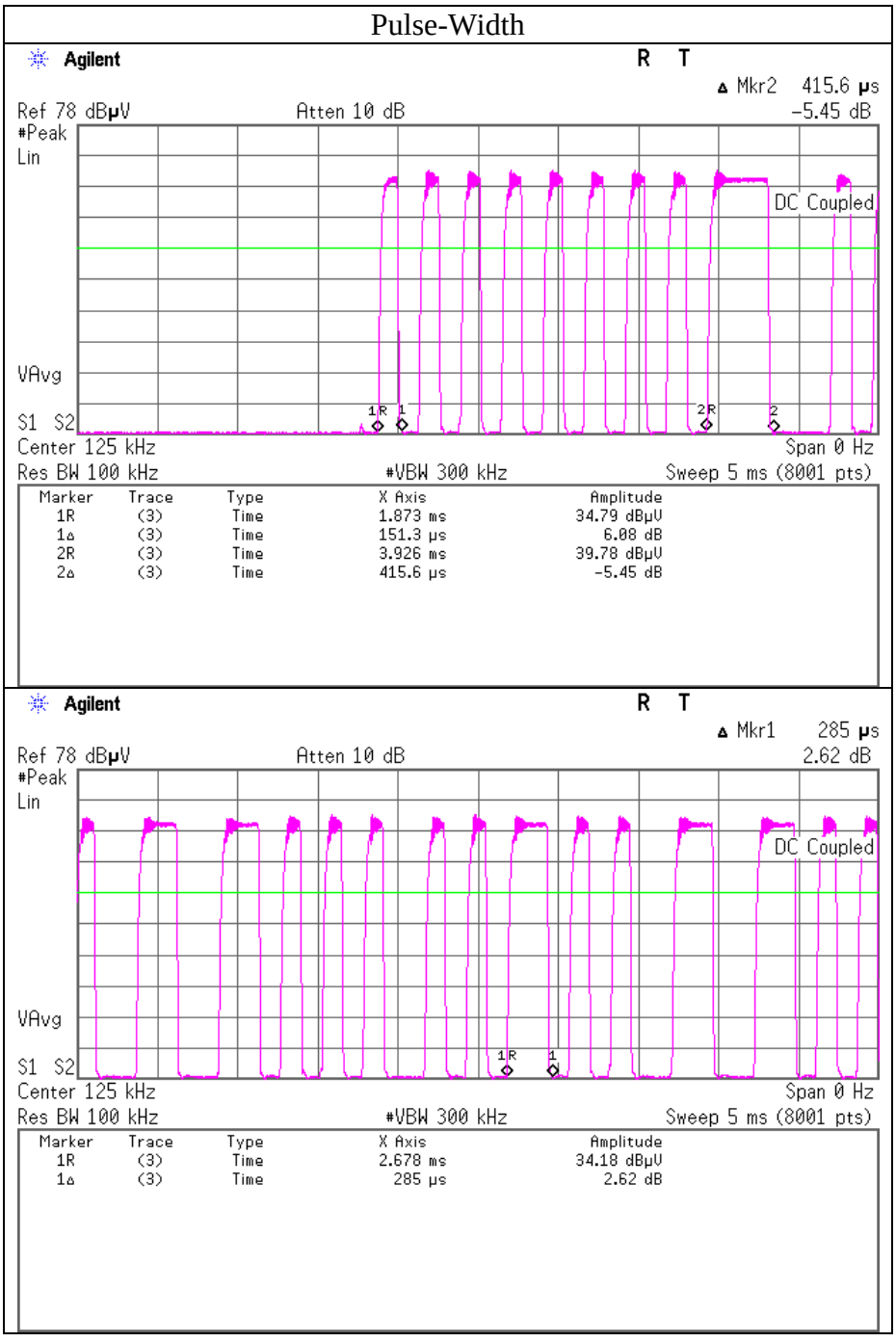


Marker	Trace	Type	X Axis	Amplitude
1R	(3)	Time	84.9 ms	35.36 dBµV
1Δ	(3)	Time	31.05 ms	0.12 dB
2R	(3)	Time	84.9 ms	35.36 dBµV
2Δ	(3)	Time	85 ms	-1.21 dB

2Δ-1Δ : 53.95ms is intentional off time.

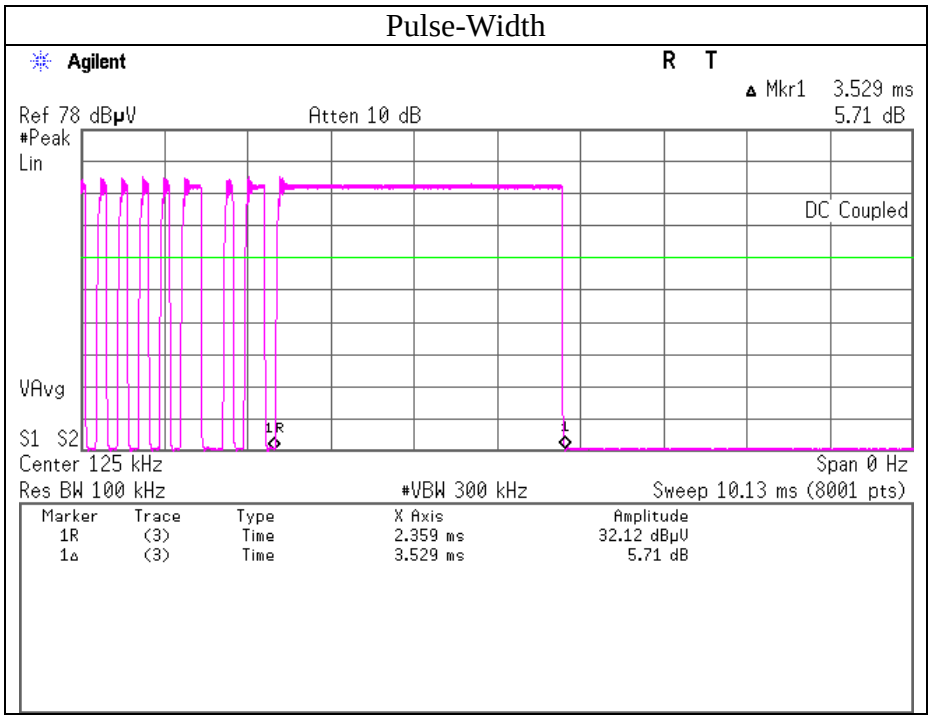
Duty Cycle

Pulse-Width



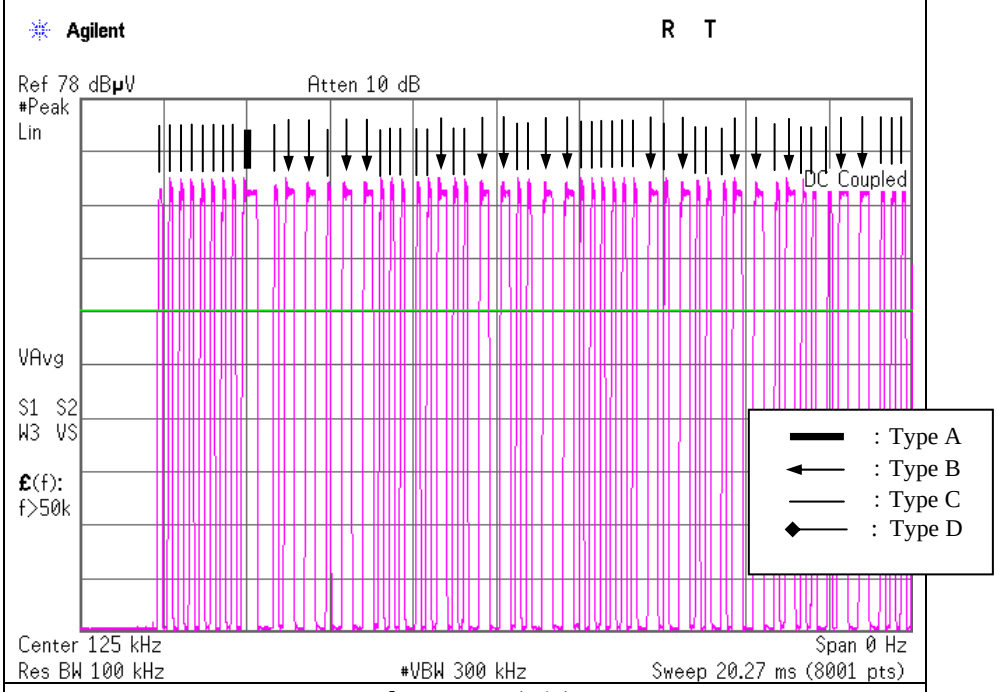
Duty Cycle

Pulse-Width

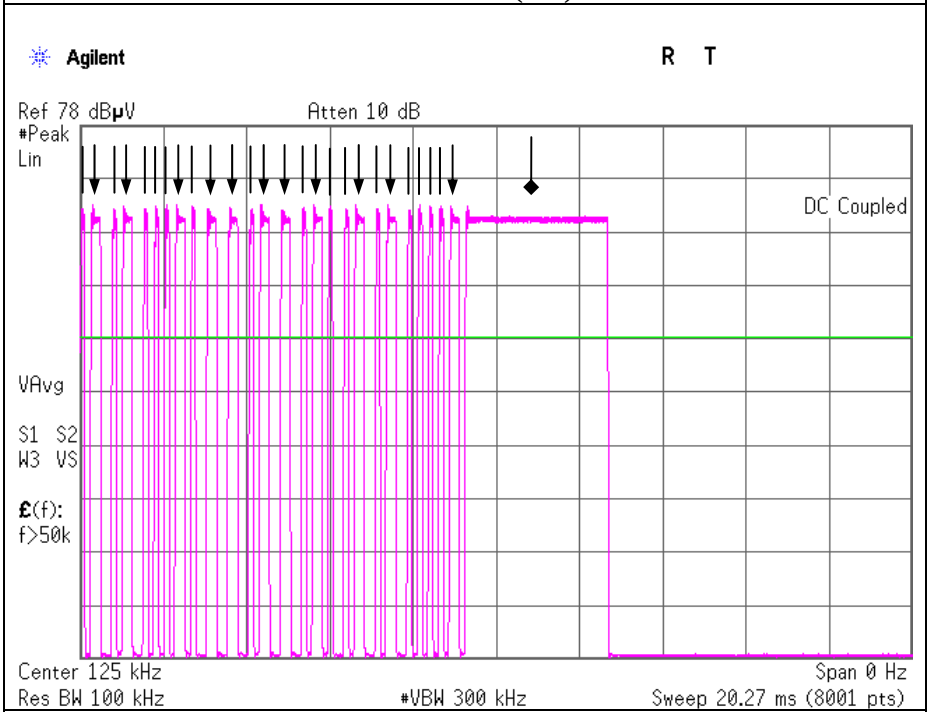


Duty Cycle

Pulse-Train (1/2)



Pulse-Train (2/2)



Duty Cycle

Test place	Ise HQ EMC Lab. No.4 Semi Anechoic Chamber
Report No.	10261262H
Date	04/17/2014
Temperature/ Humidity	21 deg. C / 43% RH
Engineer	Tsubasa Takayama
Mode	LF Tx 125kHz M/TI Antenna (YEP0FX1515)

Type	Times	ON time(One pulse) [ms]	ON time(in 1Period) [ms]
A	1	0.408	0.408
B	25	0.279	6.985
C	53	0.140	7.420
D	1	3.526	3.526

(Total)

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
18.34	100.00	0.18	-14.7

*ON time = Type A's ON time + Type B's ON time + Type C' ON time + Type D' ON time
*Duty = $20\log_{10}$(ON time/Cycle)

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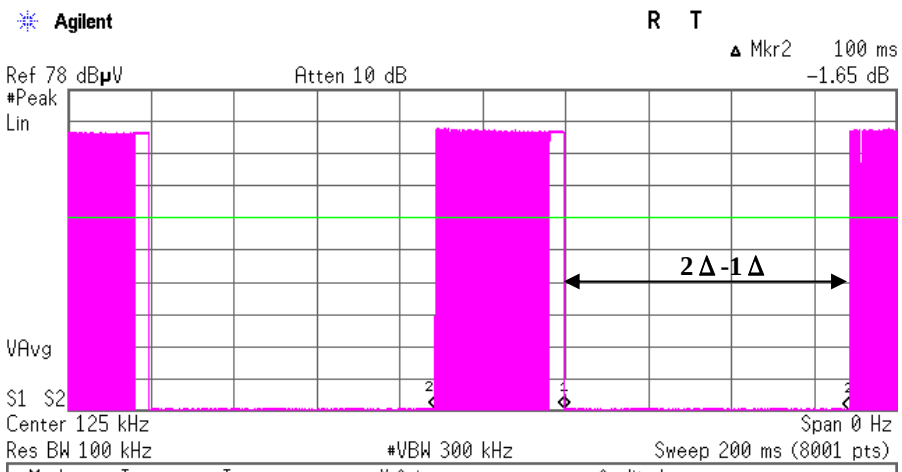
Duty Cycle

Pulse-Period

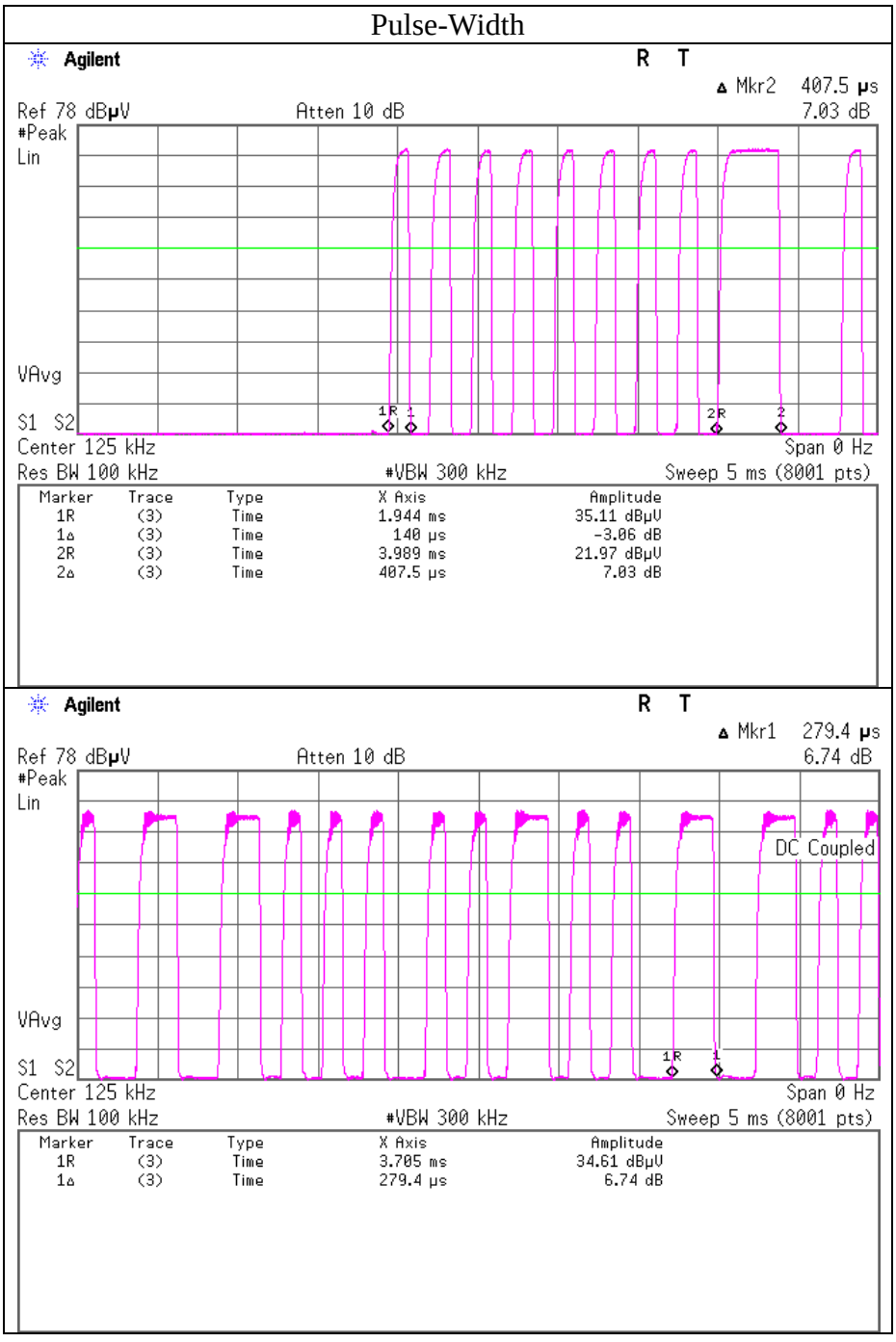


Marker	Trace	Type	X Axis	Amplitude
1R	(3)	Time	88.4 ms	34.28 dBµV
1Δ	(3)	Time	31.22 ms	-0.04 dB
2R	(3)	Time	88.4 ms	34.28 dBµV
2Δ	(3)	Time	100 ms	-1.65 dB

2Δ-1Δ : 68.78ms is intentional off time.

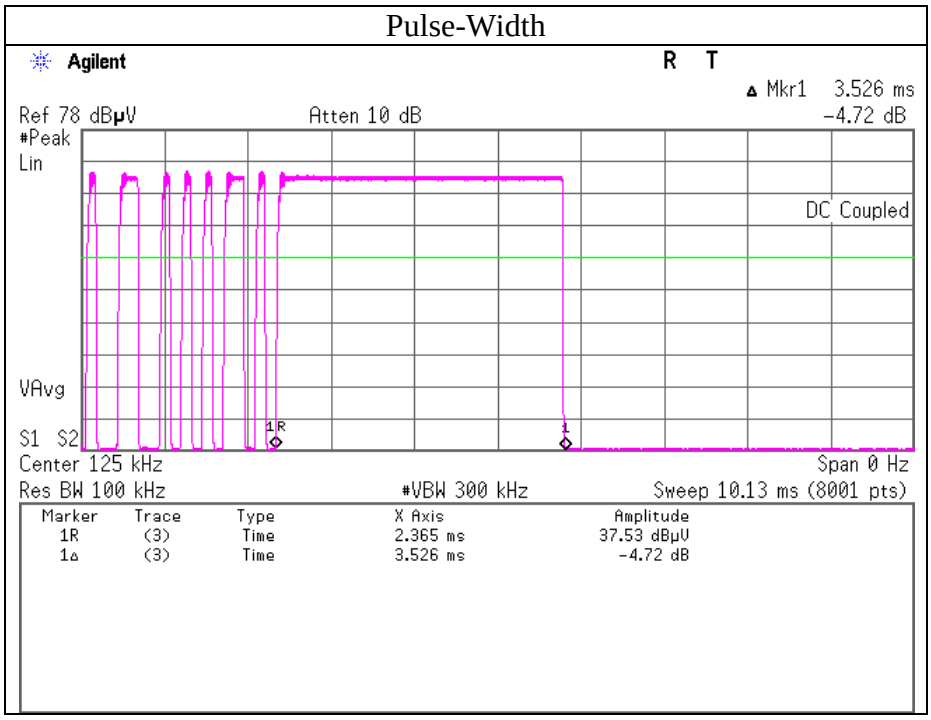
Duty Cycle

Pulse-Width



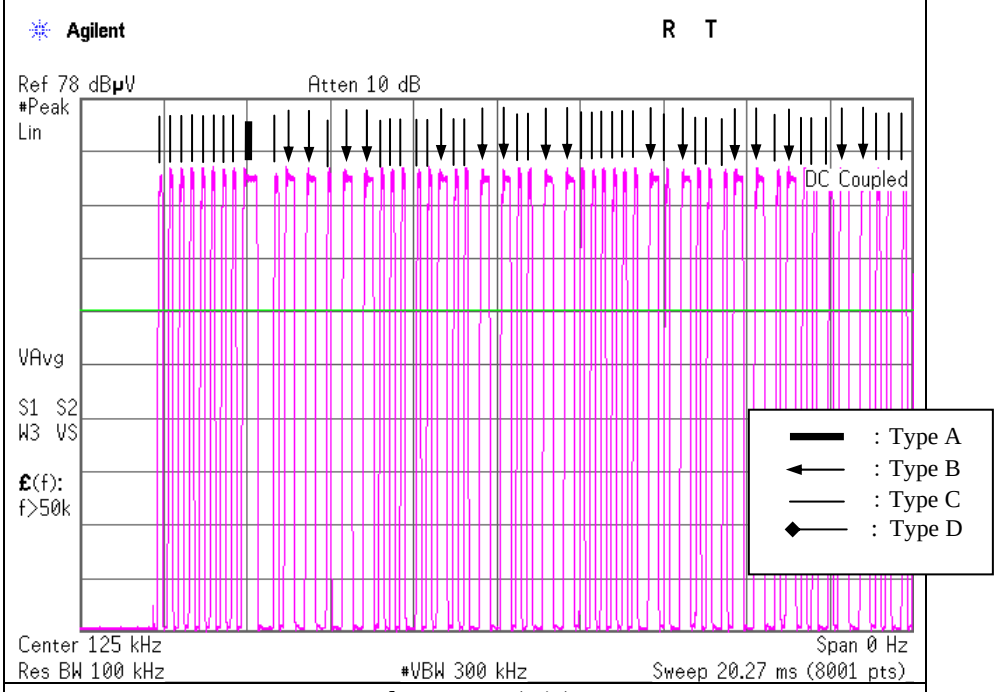
Duty Cycle

Pulse-Width

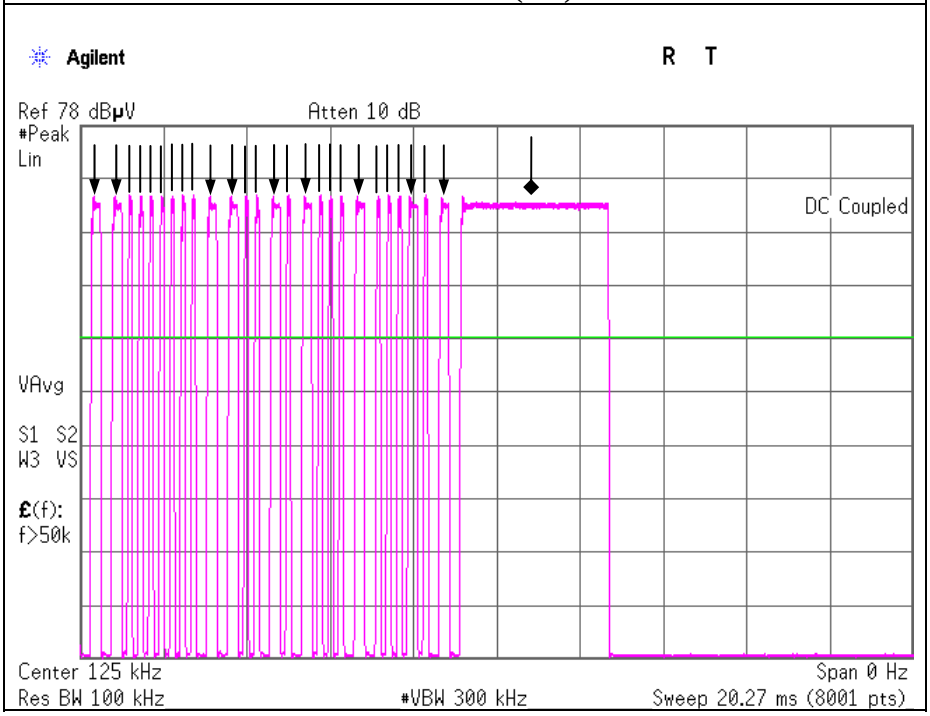


Duty Cycle

Pulse-Train (1/2)



Pulse-Train (2/2)



Duty Cycle

Test place	Ise HQ EMC Lab. No.4 Semi Anechoic Chamber
Report No.	10261262H
Date	04/17/2014
Temperature/ Humidity	21 deg. C / 43% RH
Engineer	Tsubasa Takayama
Mode	LF Tx 125kHz F Antenna (YEP0FX1515)

Type	Times	ON time(One pulse) [ms]	ON time(in 1Period) [ms]
A	1	0.416	0.416
B	26	0.288	7.491
C	53	0.160	8.480
D	1	3.668	3.668

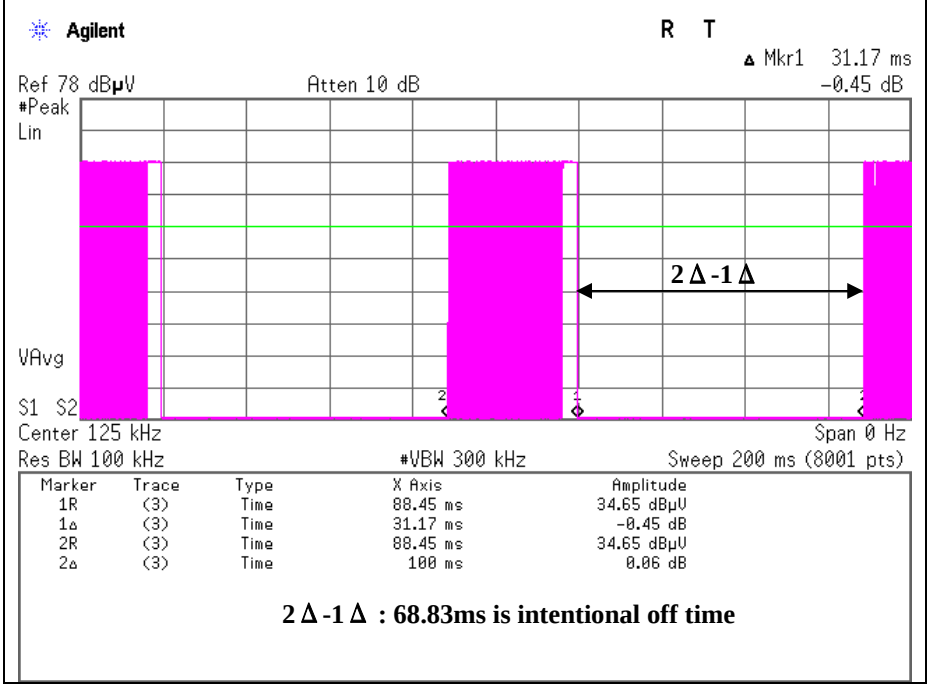
(Total)

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
20.05	100.00	0.20	-14.0

*ON time = Type A's ON time + Type B's ON time + Type C' ON time + Type D' ON time
*Duty = $20\log_{10}$(ON time/Cycle)

Duty Cycle

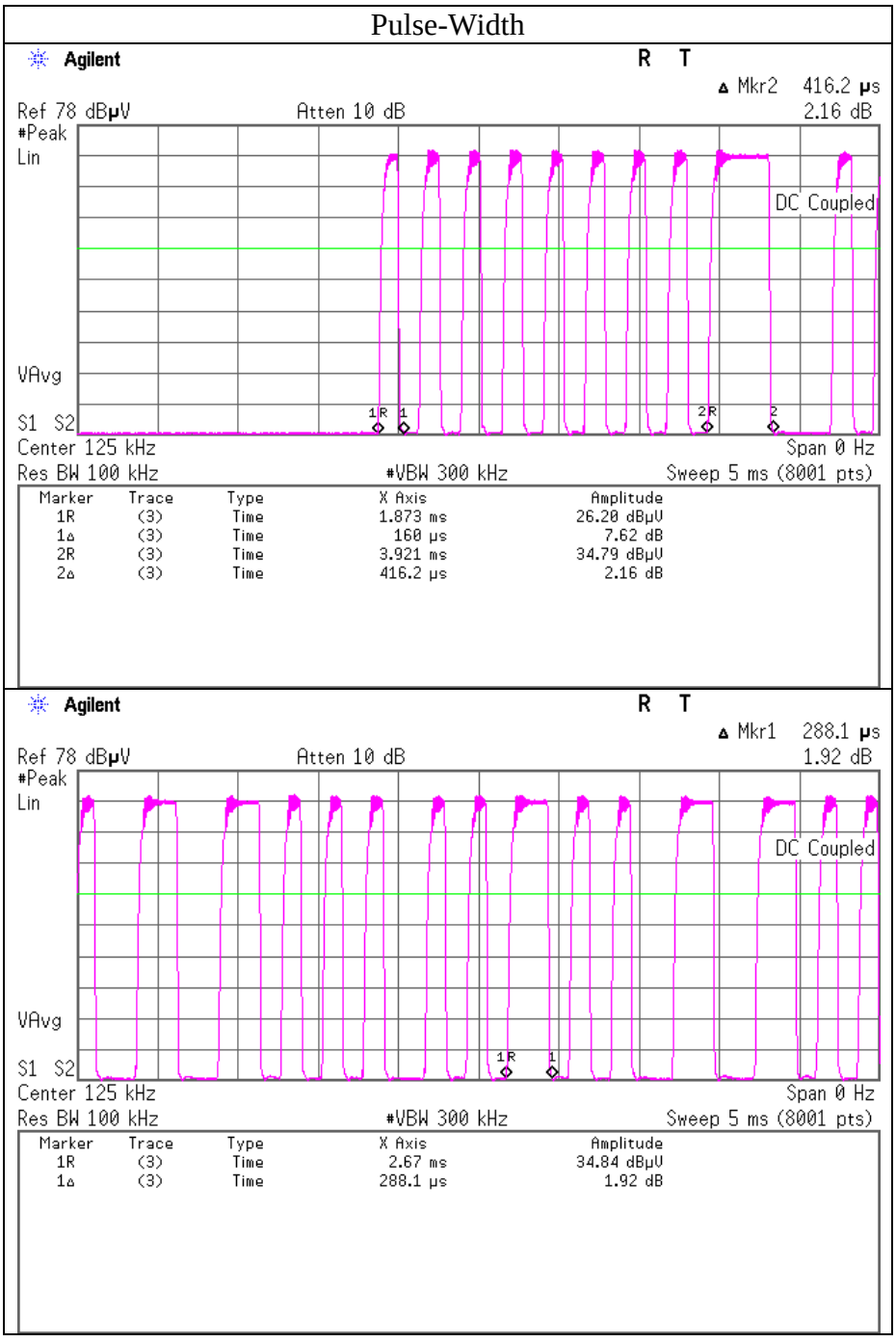
Pulse-Period



2Δ-1Δ : 68.83ms is intentional off time

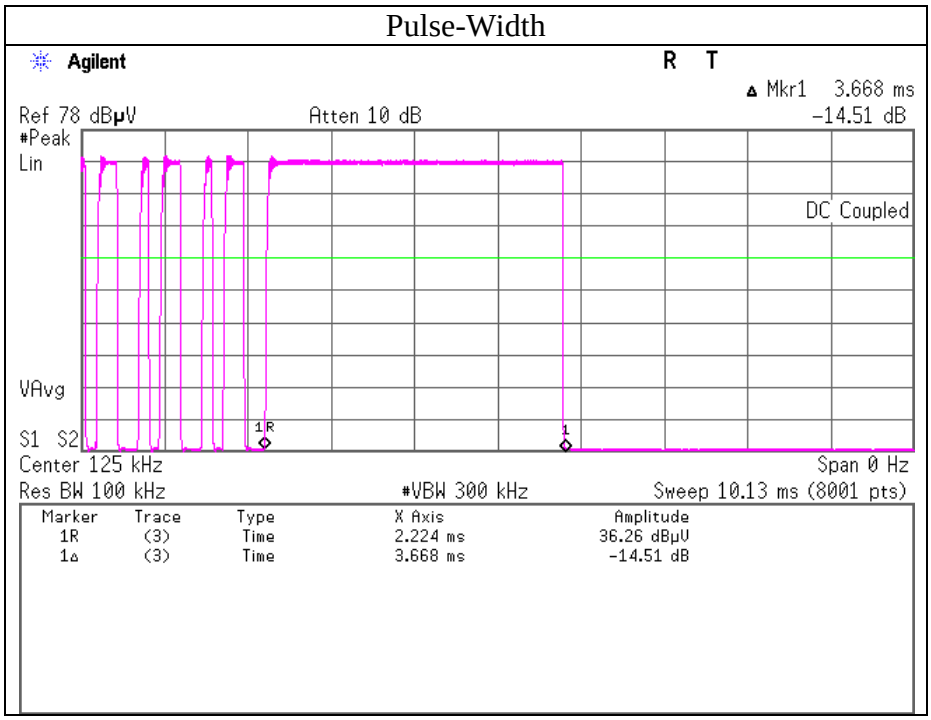
Duty Cycle

Pulse-Width



Duty Cycle

Pulse-Width



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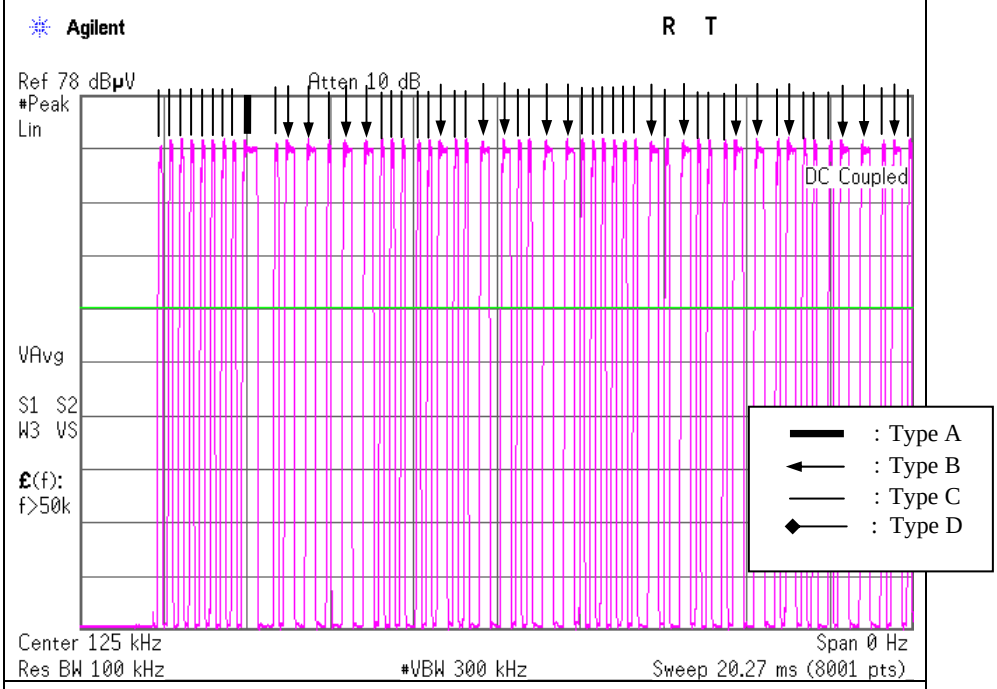
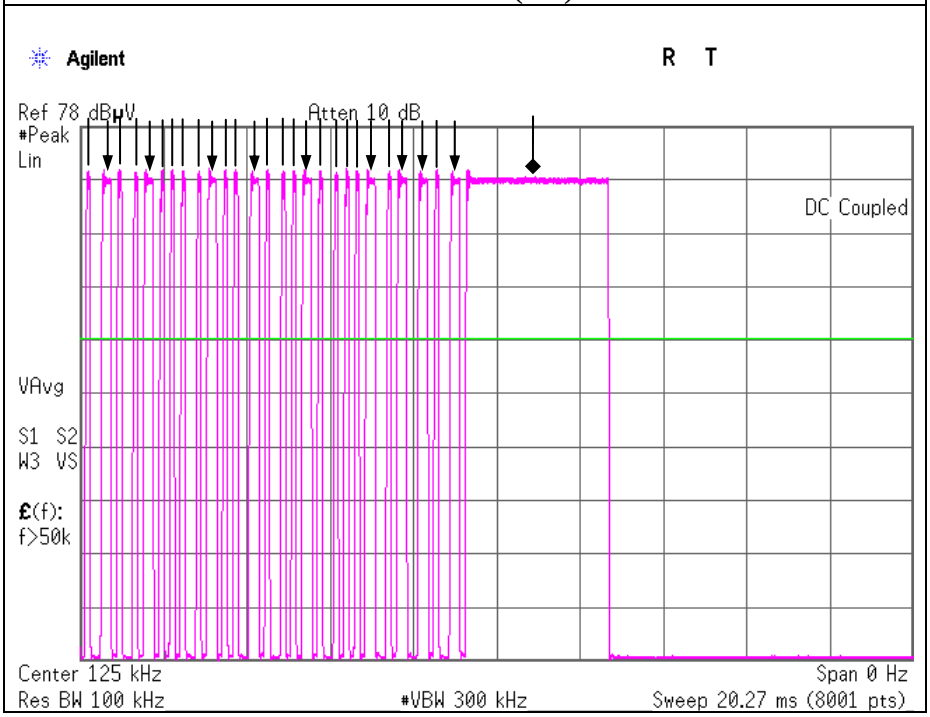
Duty Cycle

Pulse-Train (1/2)



Pulse-Train (2/2)



Duty Cycle

Test place	Ise HQ EMC Lab. No.4 Semi Anechoic Chamber
Report No.	10261262H
Date	04/17/2014
Temperature/ Humidity	21 deg. C / 43% RH
Engineer	Tsubasa Takayama
Mode	LF Tx 125kHz FRDR Antenna (YEP0FX1518)

Type	Times	ON time(One pulse) [ms]	ON time(in 1Period) [ms]
A	1	0.411	0.411
B	26	0.282	7.329
C	52	0.148	7.701
D	1	3.530	3.530

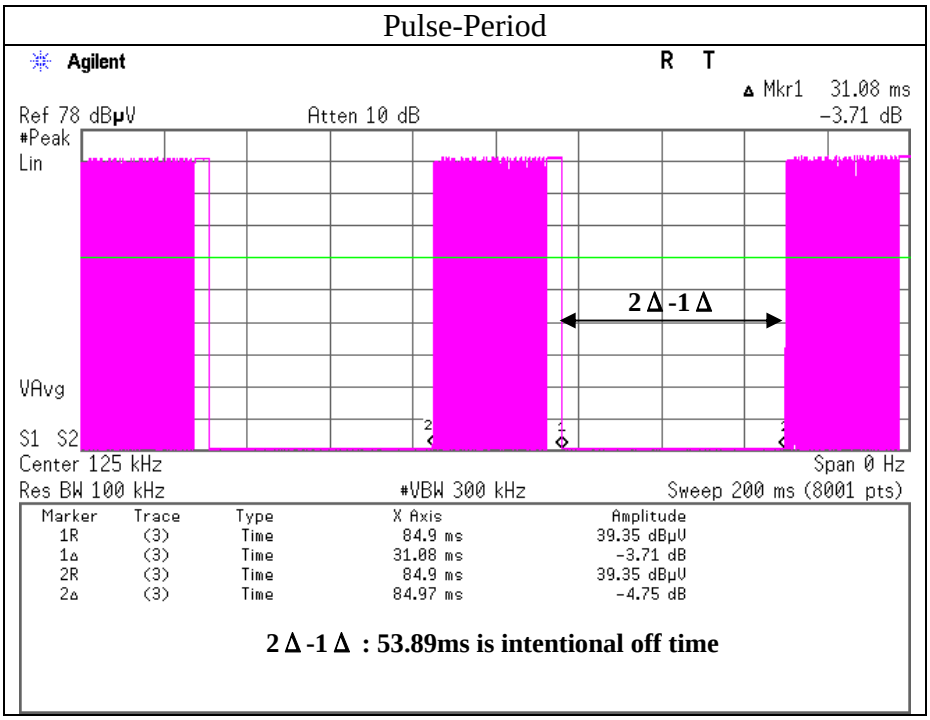
(Total)

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
18.97	84.97	0.22	-13.0

*ON time = Type A's ON time + Type B's ON time + Type C' ON time + Type D' ON time
*Duty = $20\log_{10}$(ON time/Cycle)

Duty Cycle

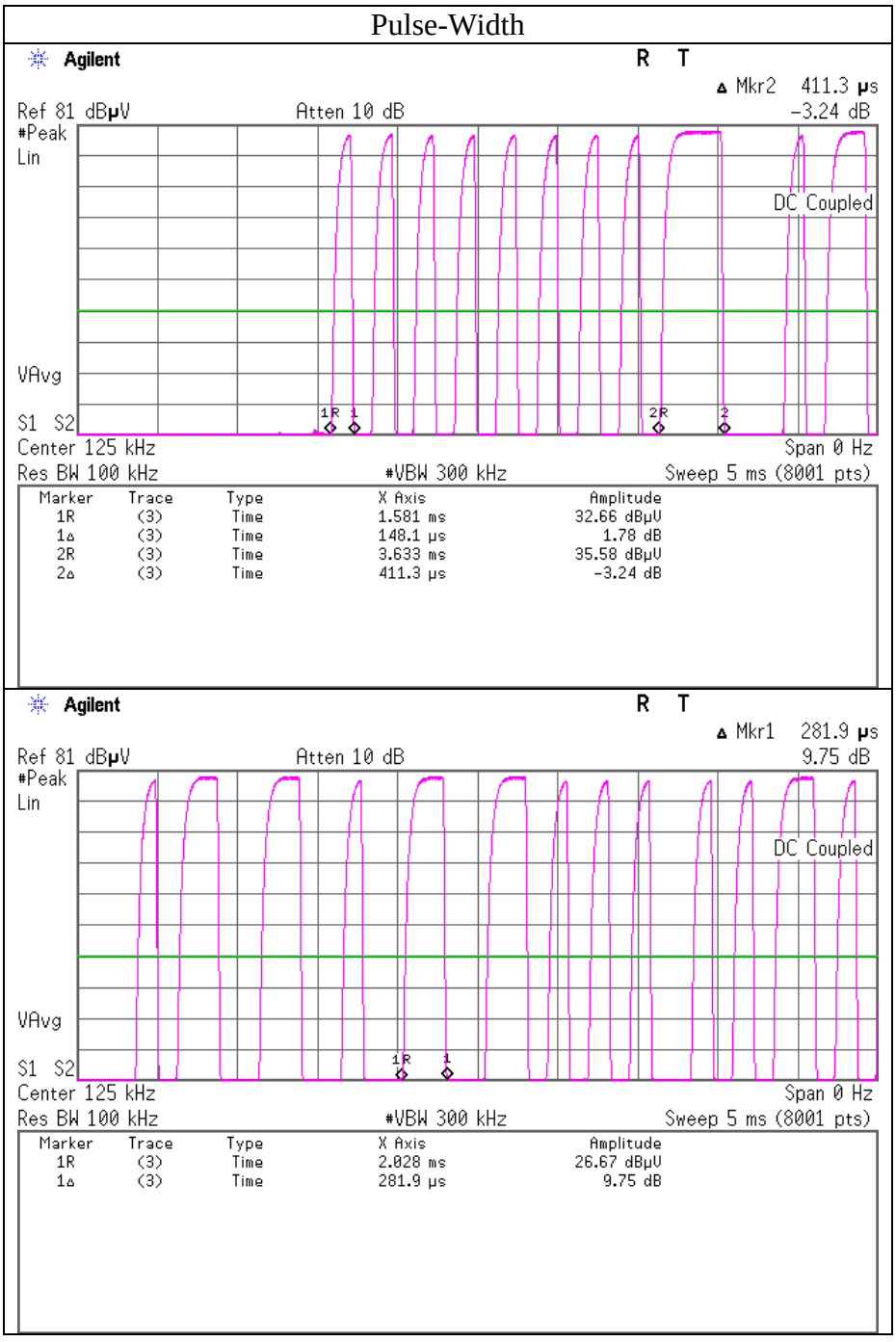
Pulse-Period



2Δ-1Δ : 53.89ms is intentional off time

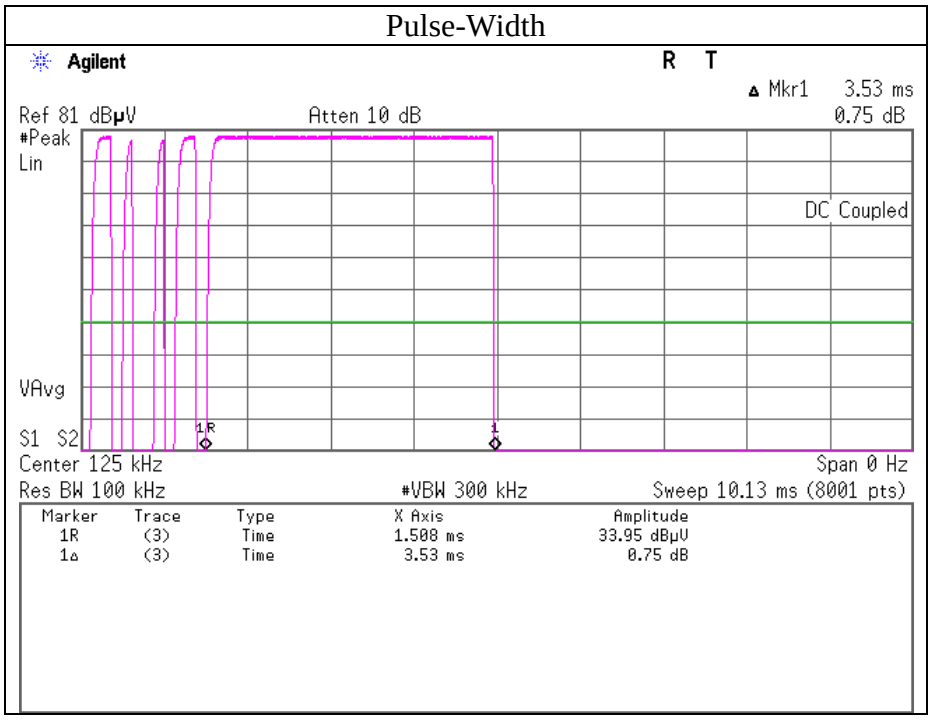
Duty Cycle

Pulse-Width



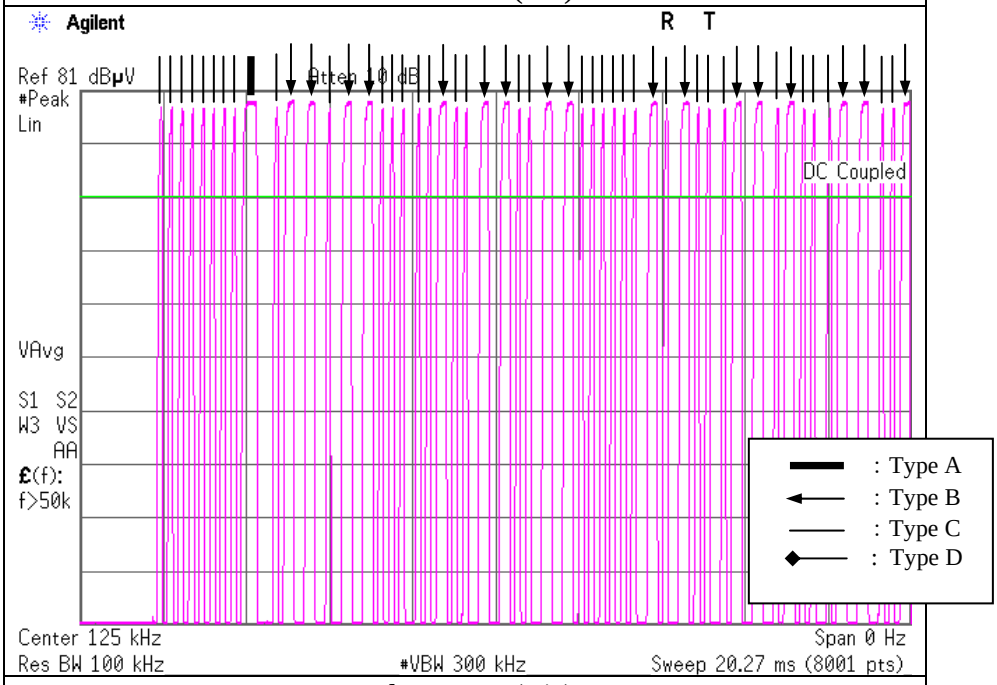
Duty Cycle

Pulse-Width

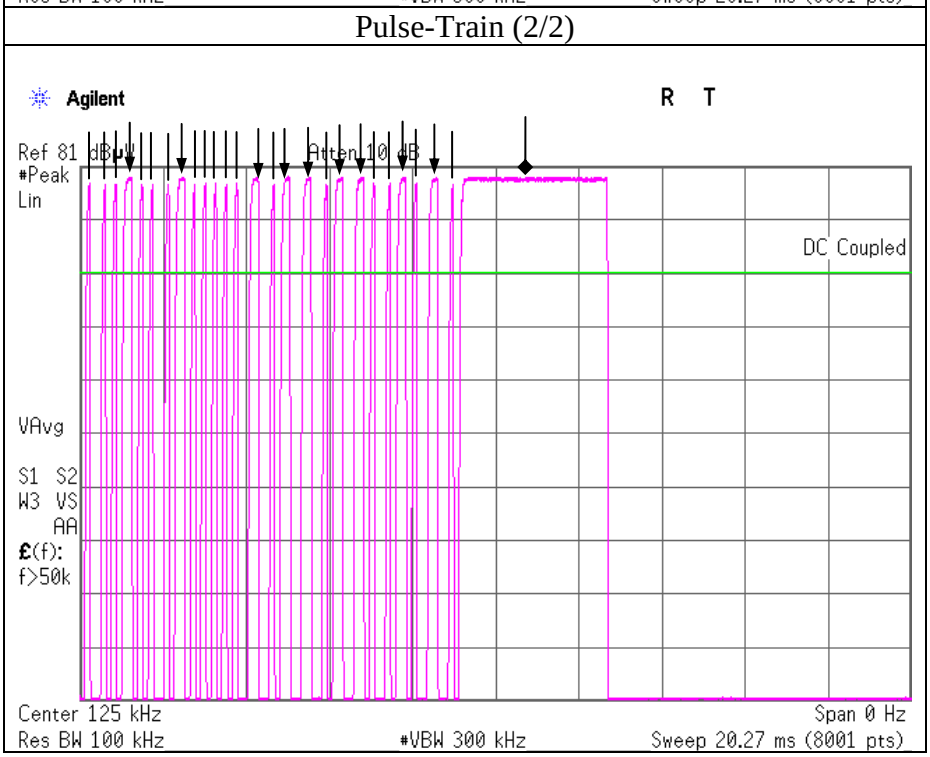


Duty Cycle

Pulse-Train (1/2)



Pulse-Train (2/2)



Duty Cycle

Test place	Ise HQ EMC Lab. No.4 Semi Anechoic Chamber
Report No.	10261262H
Date	04/17/2014
Temperature/ Humidity	21 deg. C / 43% RH
Engineer	Tsubasa Takayama
Mode	LF Tx 125kHz R Antenna (YEP0FX1518)

Type	Times	ON time(One pulse) [ms]	ON time(in 1Period) [ms]
A	1	0.409	0.409
B	27	0.284	7.660
C	51	0.145	7.395
D	1	3.528	3.528

(Total)

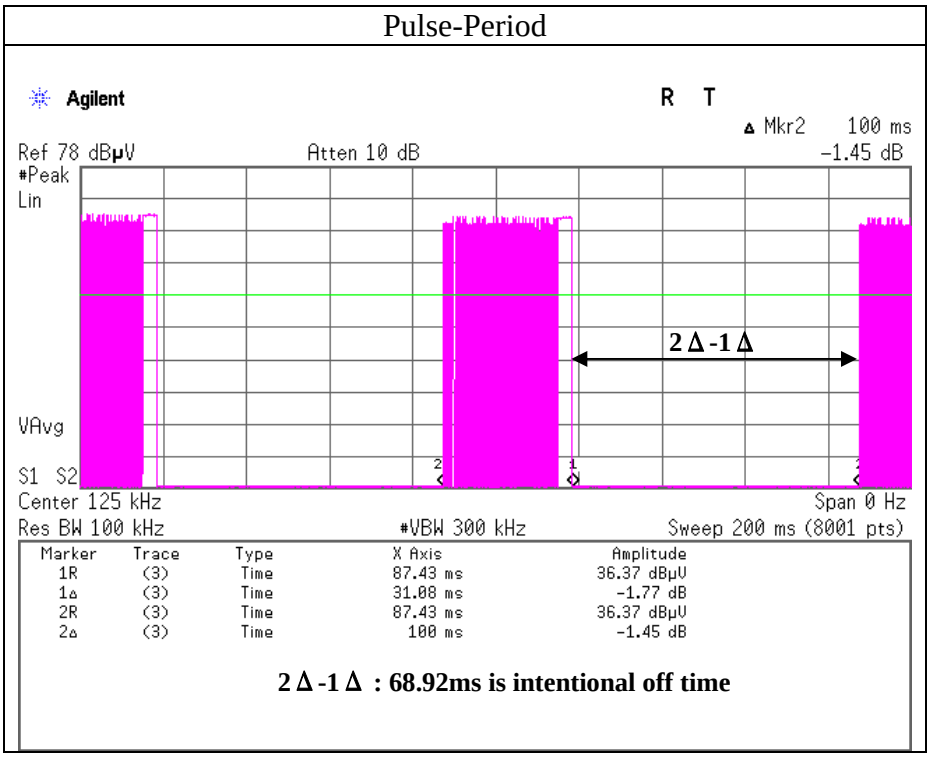
ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
18.99	100.00	0.19	-14.4

*ON time = Type A's ON time + Type B's ON time + Type C' ON time + Type D' ON time
*Duty = $20\log_{10}$(ON time/Cycle)

UL Japan, Inc.
Ise HQ EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

Duty Cycle

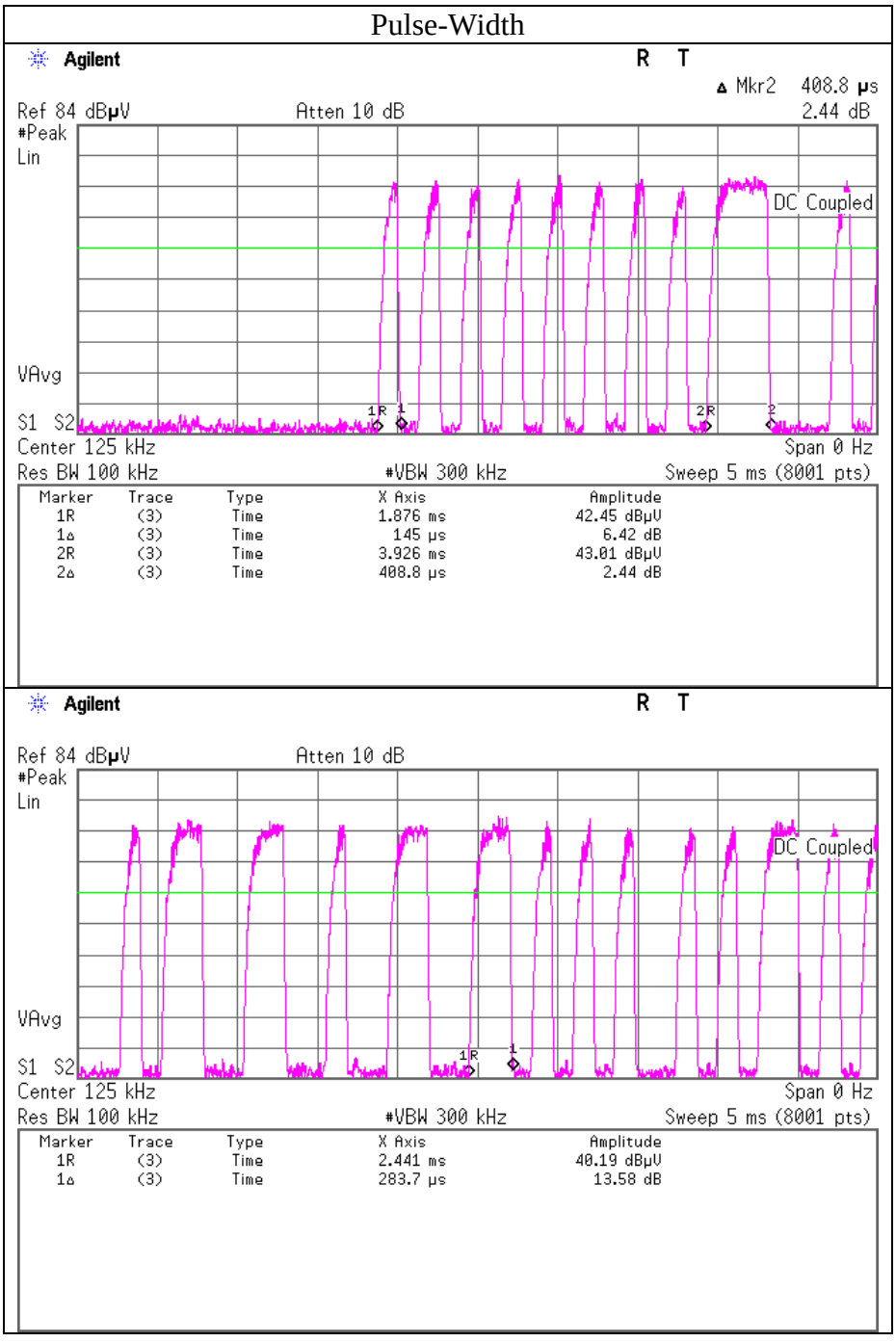
Pulse-Period



2Δ-1Δ : 68.92ms is intentional off time

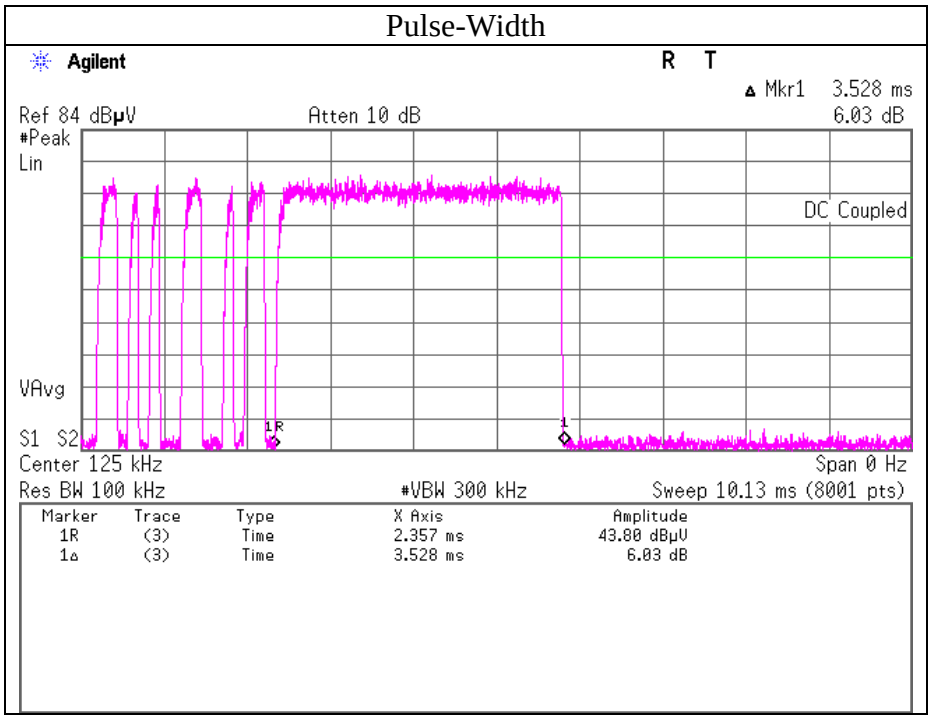
Duty Cycle

Pulse-Width



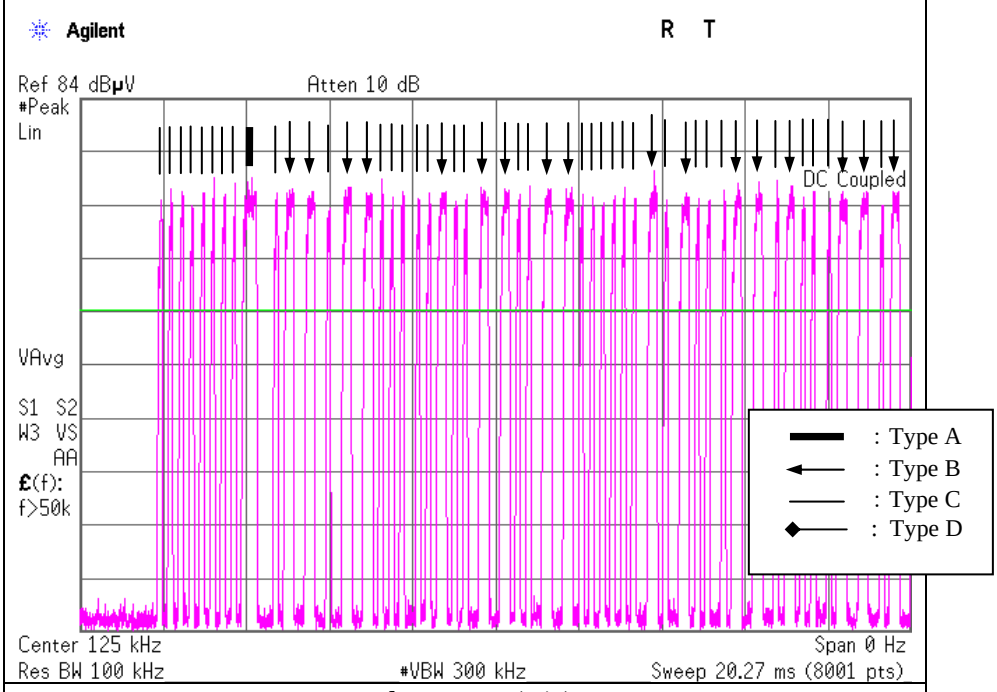
Duty Cycle

Pulse-Width

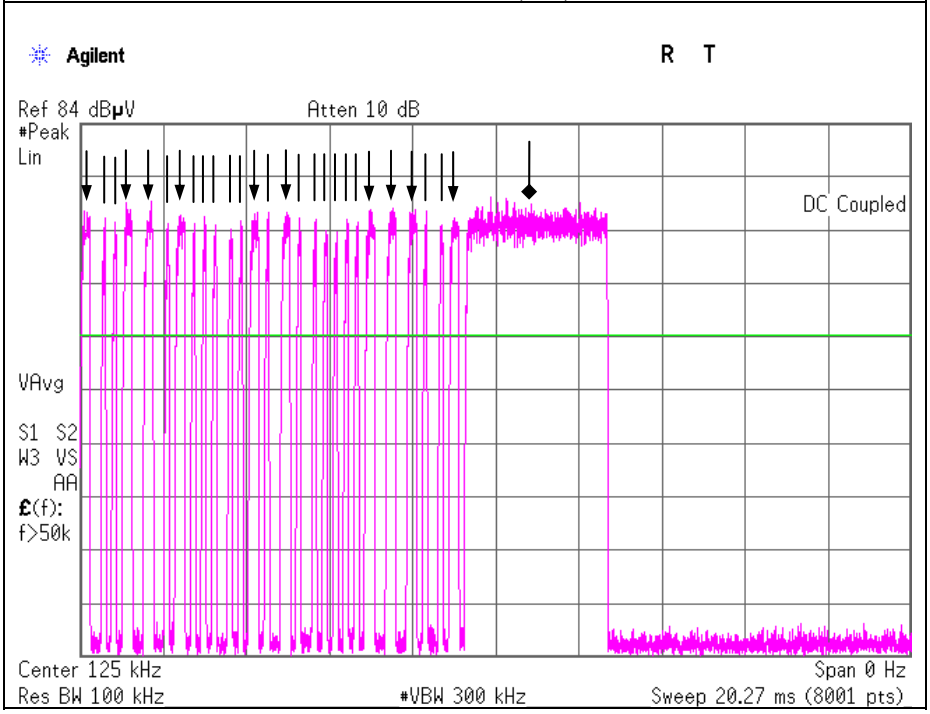


Duty Cycle

Pulse-Train (1/2)



Pulse-Train (2/2)



APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2014/02/28 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2014/02/20 * 12
MJM-22	Measure	ASKUL	-	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	100084	RE	2013/11/12 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2013/11/24 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2013/11/24 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2013/06/18 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2013/11/26 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2014/03/14 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2014/02/27 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2014/02/20 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
MRENT-114	Spectrum Analyzer	Agilent	E4440A	MY46187105	RE	2013/11/11 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2013/08/20 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2013/10/30 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/ SFM141(3m)/ sucoform141-PE(1m)/ 421-010(1.5m)/ RFM-E321(Switcher)	-/00640	RE	2013/07/23 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2013/07/22 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2014/03/14 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2013/04/05 * 12
MJM-09	Measure	KDS	E19-55	-	RE	-
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/ SFM141(5m)/ 421-010(1m)/ sucoform141-PE(1m)/ RFM-E121(Switcher)	-/04178	RE	2013/07/23 * 12
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE	2013/08/01 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE	2014/02/20 * 12
MJM-21	Measure	KOMELON	KMC-36	-	RE	-
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	RE	2013/06/07 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W(20m)/3D-2W(7.5m)/RG400u(1.5m)/RFM-E421(Switcher)	-/01068(Switcher)	RE	2013/09/12 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2013/11/26 * 12

The expiration date of the calibration is the end of the expired month.
All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test Item:

RE: Spurious emission