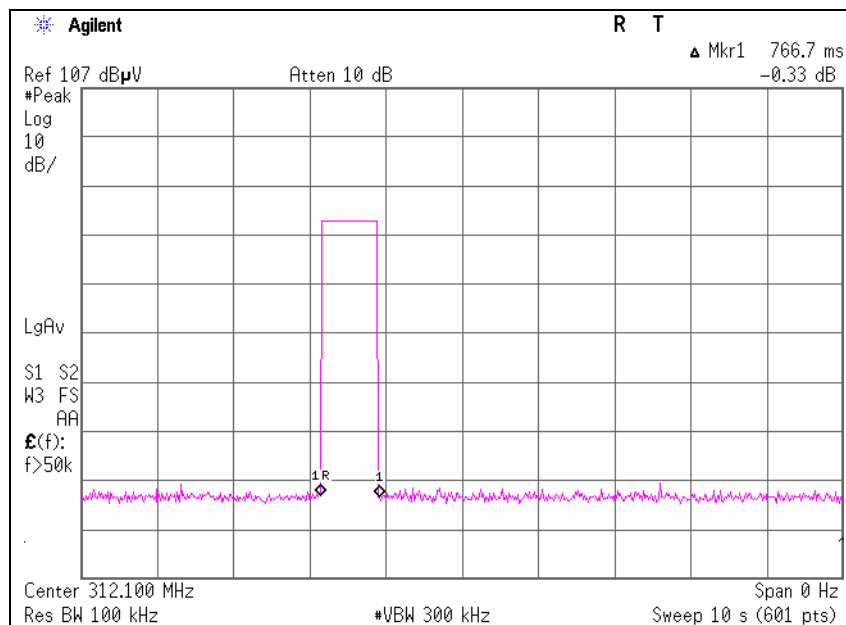


**APPENDIX 2: Data of EMI test**

**Automatically deactivate**

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber  
 Report No. 30HE0224-HO-01  
 Date 04/23/2010  
 Temperature/ Humidity 22 deg.C./ 45%  
 Engineer Hiroyuki Furutaka  
 Mode Normal use mode 312.10MHz

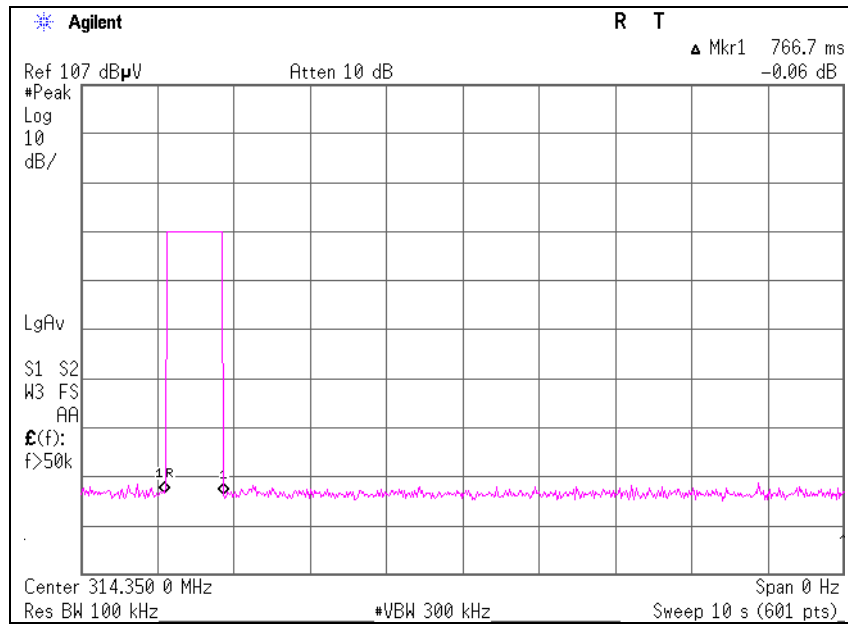
Time of Transmitting [sec]	Limit [sec]	Result
0.7667	5.00	Pass



### Automatically deactivate

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber  
 Report No. : 30HE0224-HO-01  
 Date : 05/21/2010  
 Temperature/ Humidity : 23 deg.C./ 48%  
 Engineer : Hiroyuki Furutaka  
 Mode : Normal use mode 314.35MHz

Time of Transmitting [sec]	Limit [sec]	Result
0.7667	5.00	Pass



## Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Report No. : 30HE0224-HO-01  
Date : 04/23/2010  
Temperature/ Humidity : 22 deg.C./ 45%  
Engineer : Hiroyuki Furutaka  
Mode : Transmitting mode 312.10MHz

**PK**

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 Inside or Outside of Restricted Bands
		Hor	Ver					Hor	Ver		Hor	Ver	
312.100	PK	76.0	71.2	16.2	9.7	31.9	-	70.0	65.2	95.4	25.4	30.2	Carrier
624.200	PK	33.0	32.7	20.6	11.6	32.1	-	33.1	32.8	75.4	42.3	42.6	Outside
936.300	PK	32.6	32.0	24.9	13.1	31.2	-	39.4	38.8	75.4	36.0	36.6	Outside
1248.400	PK	45.2	45.8	24.5	2.2	34.0	-	37.9	38.5	75.4	37.5	36.9	Outside
1560.500	PK	44.0	44.5	25.4	2.4	33.2	-	38.6	39.1	73.9	35.3	34.8	Inside
1872.600	PK	44.9	45.2	25.8	2.6	32.6	-	40.7	41.0	75.4	34.7	34.4	Outside
2184.700	PK	46.2	48.0	26.4	2.8	32.2	-	43.2	45.0	75.4	32.2	30.4	Outside
2496.800	PK	46.1	46.3	26.9	2.9	32.1	-	43.8	44.0	73.9	30.1	29.9	Inside
2808.900	PK	56.1	53.7	27.6	3.1	31.9	-	54.9	52.5	73.9	19.0	21.4	Inside
3121.000	PK	52.9	51.6	28.4	3.3	31.8	-	52.8	51.5	75.4	22.6	23.9	Outside

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

**PK with Duty factor**

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
		Hor	Ver					Hor	Ver		Hor	Ver	
312.100	PK	76.0	71.2	16.2	9.7	31.9	-4.9	65.1	60.3	75.4	10.3	15.1	Carrier
624.200	PK	33.0	32.7	20.6	11.6	32.1	-4.9	28.2	27.9	55.4	27.2	27.5	Outside
936.300	PK	32.6	32.0	24.9	13.1	31.2	-4.9	34.5	33.9	55.4	20.9	21.5	Outside
1248.400	PK	45.2	45.8	24.5	2.2	34.0	-4.9	33.0	33.6	55.4	22.4	21.8	Outside
1560.500	PK	44.0	44.5	25.4	2.4	33.2	-4.9	33.7	34.2	53.9	20.2	19.7	Inside
1872.600	PK	44.9	45.2	25.8	2.6	32.6	-4.9	35.8	36.1	55.4	19.6	19.3	Outside
2184.700	PK	46.2	48.0	26.4	2.8	32.2	-4.9	38.3	40.1	55.4	17.1	15.3	Outside
2496.800	PK	46.1	46.3	26.9	2.9	32.1	-4.9	38.9	39.1	53.9	15.0	14.8	Inside
2808.900	PK	56.1	53.7	27.6	3.1	31.9	-4.9	50.0	47.6	53.9	3.9	6.3	Inside
3121.000	PK	52.9	51.6	28.4	3.3	31.8	-4.9	47.9	46.6	55.4	7.5	8.8	Outside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier) + Duty factor (Refer to Duty factor data sheet)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

**Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)**

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Report No. 30HE0224-HO-01  
Date 04/23/2010  
Temperature/ Humidity 23 deg.C./ 68%  
Engineer Hiroyuki Furutaka  
Mode Transmitting mode 314.35MHz

**PK**

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 Inside or Outside of Restricted Bands
		Hor	Ver					Hor	Ver		Hor	Ver	
314.350	PK	76.4	71.5	16.2	9.8	31.9	-	70.5	65.6	95.5	25.0	29.9	Carrier
630.700	PK	33.6	32.9	20.7	11.6	32.1	-	33.8	33.1	75.5	41.7	42.4	Outside
946.050	PK	32.8	32.0	25.2	13.1	31.2	-	39.9	39.1	75.5	35.6	36.4	Outside
1257.400	PK	44.0	45.5	24.5	2.2	33.9	-	36.8	38.3	75.5	38.7	37.2	Outside
1571.750	PK	44.2	44.1	25.4	2.5	33.2	-	38.9	38.8	73.9	35.0	35.1	Inside
1886.100	PK	45.7	45.1	25.8	2.6	32.5	-	41.6	41.0	75.5	33.9	34.5	Outside
2200.450	PK	46.9	46.8	26.4	2.8	32.2	-	43.9	43.8	73.9	30.0	30.1	Inside
2514.800	PK	46.4	45.5	26.9	3.0	32.1	-	44.2	43.3	75.5	31.3	32.2	Outside
2829.150	PK	55.6	54.6	27.7	3.2	31.9	-	54.6	53.6	73.9	19.3	20.3	Inside
3143.500	PK	52.3	53.1	28.4	3.3	31.8	-	52.2	53.0	75.5	23.3	22.5	Outside

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

**PK with Duty factor**

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
		Hor	Ver					Hor	Ver		Hor	Ver	
314.350	PK	76.4	71.5	16.2	9.8	31.9	-4.9	65.6	60.7	75.5	9.9	14.8	Carrier
630.700	PK	33.6	32.9	20.7	11.6	32.1	-4.9	28.9	28.2	55.5	26.6	27.3	Outside
946.050	PK	32.8	32.0	25.2	13.1	31.2	-4.9	35.0	34.2	55.5	20.5	21.3	Outside
1257.400	PK	44.0	45.5	24.5	2.2	33.9	-4.9	31.9	33.4	55.5	23.6	22.1	Outside
1571.750	PK	44.2	44.1	25.4	2.5	33.2	-4.9	34.0	33.9	53.9	19.9	20.0	Inside
1886.100	PK	45.7	45.1	25.8	2.6	32.5	-4.9	36.7	36.1	55.5	18.8	19.4	Outside
2200.450	PK	46.9	46.8	26.4	2.8	32.2	-4.9	39.0	38.9	53.9	14.9	15.0	Inside
2514.800	PK	46.4	45.5	26.9	3.0	32.1	-4.9	39.3	38.4	55.5	16.2	17.1	Outside
2829.150	PK	55.6	54.6	27.7	3.2	31.9	-4.9	49.7	48.7	53.9	4.2	5.2	Inside
3143.500	PK	52.3	53.1	28.4	3.3	31.8	-4.9	47.3	48.1	55.5	8.2	7.4	Outside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier) + Duty factor (Refer to Duty factor data sheet)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\* The test above 1GHz was performed with PK detect. Average emission measurements were calculated with PK detect and Duty cycle factor.

\* Duty Factor was calculated with the assumption of the worst condition in 100msec.

\* All the measured noise was pulse emission.

**-20dB and 99% Occupied Bandwidth**

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber  
 Report No. 30HE0224-HO-01  
 Date 05/29/2010  
 Temperature/ Humidity 22 deg.C./ 42%  
 Engineer Takayuki Shimada  
 Mode Transmitting mode 312.10MHz / 314.35MHz

Bandwidth Limit : Fundamental Frequency  $312.1 \text{ MHz} \times 0.25\% = 780.25 \text{ kHz}$   
**312.1MHz** **314.35MHz**

-20dB Bandwidth [kHz]	-20dB Bandwidth [kHz]
69.88	68.64

-20dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
69.88+68.64=138.52	780.25	Pass

The worst case limit was applied as Bandwidth limit.

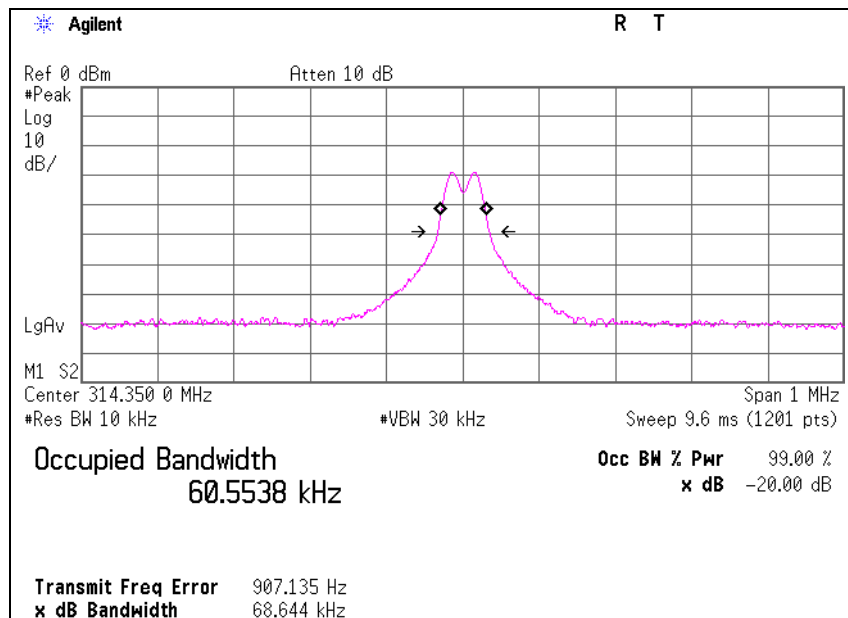
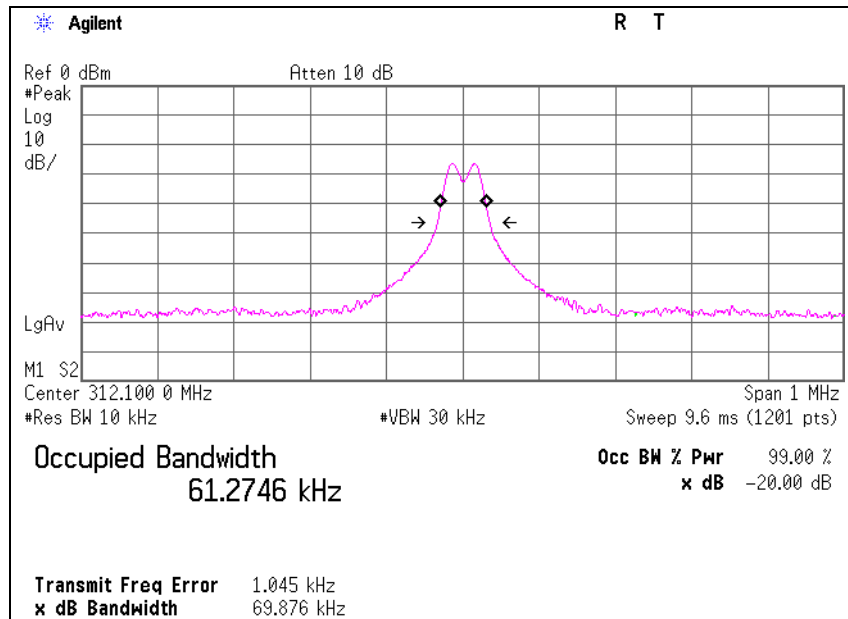
Bandwidth Limit : Fundamental Frequency  $312.1 \text{ MHz} \times 0.25\% = 780.25 \text{ kHz}$

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
61.27	780.25	Pass

Bandwidth Limit : Fundamental Frequency  $314.35 \text{ MHz} \times 0.25\% = 785.88 \text{ kHz}$

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
60.55	785.88	Pass

**-20dB and 99% Occupied Bandwidth**



## Duty Cycle

Test place                      Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Report No.                      30HE0224-HO-01  
Date                              05/21/2010  
Temperature/ Humidity        23 deg.C./ 48%  
Engineer                        Hiroyuki Furutaka  
Mode                              Normal use mode 312.10MHz

Type	Times	ON time(One pulse) [ms]	ON time(in 30ms) [ms]	ON time(in 100ms) [ms]
A	6	0.740	4.440	14.800
B	32	0.393	12.586	41.952

\*1)ON time(in 100ms) = Times \* ON time(One pulse)

\*2)The train of pulses was exceeding 100msec, and that sampled 100msec was the worst case against the pulse train

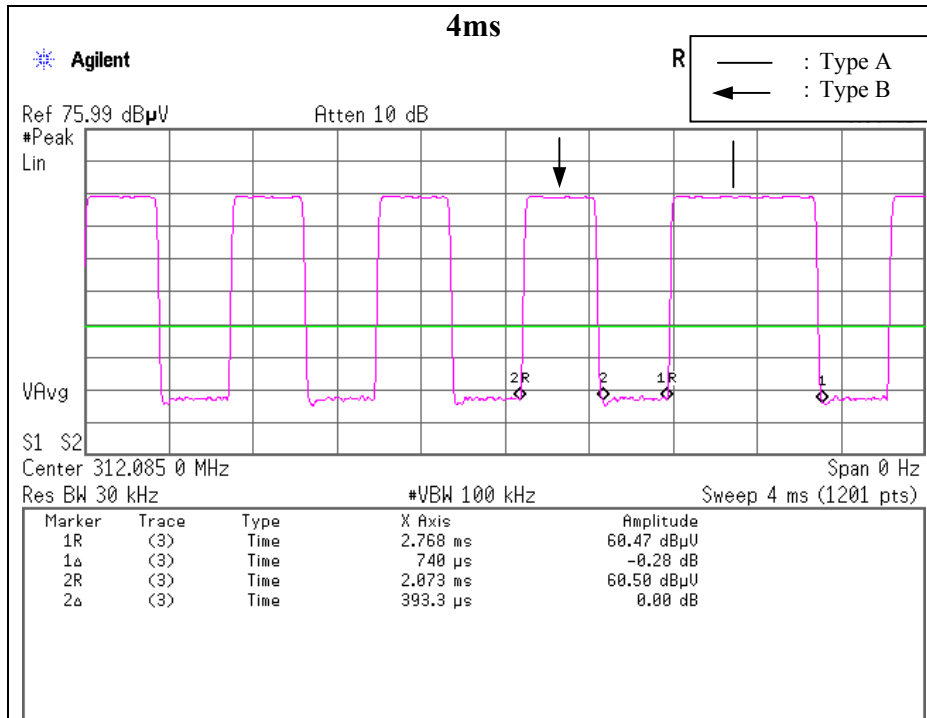
### **(Total)**

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
56.75	100.00	0.57	-4.9

\*3)ON time = Type A's ON time (in 100ms) + Type B's ON time (in 100ms)

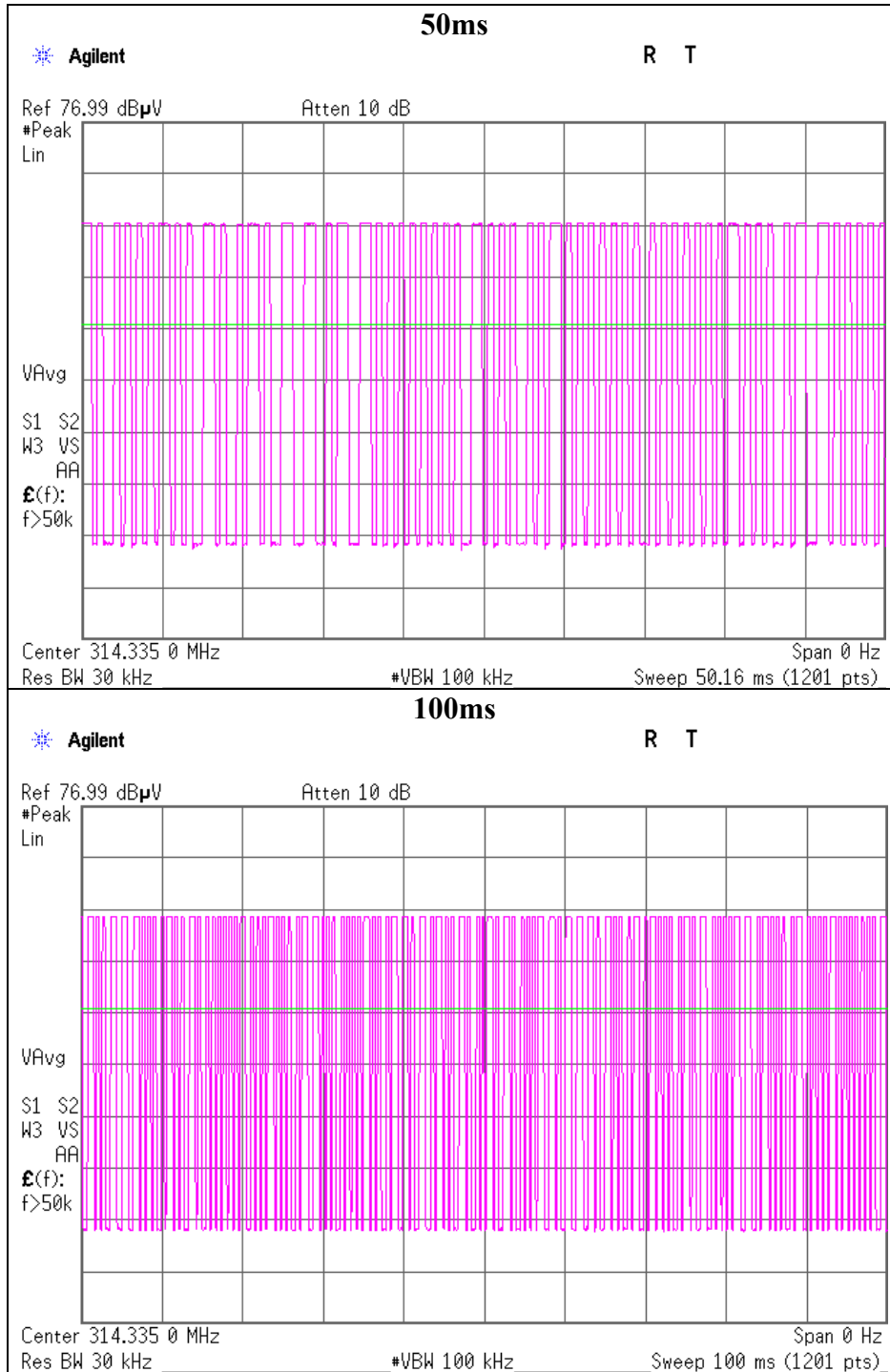
\*4)Duty = 20log<sub>10</sub>(ON time/Cycle)

### Duty Cycle





### Duty Cycle



### Duty Cycle

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Report No. 30HE0224-HO-01  
Date 04/23/2010  
Temperature/ Humidity 22 deg.C./ 45%  
Engineer Hiroyuki Furutaka  
Mode Normal use mode 314.35MHz

Type	Times	ON time(One pulse) [ms]	ON time(in 30ms) [ms]	ON time(in 100ms) [ms]
A	6	0.740	4.440	14.800
B	32	0.393	12.586	41.952

\*1)ON time(in 100ms) = Times \* ON time(One pulse)

\*2)The train of pulses was exceeding 100msec, and that sampled 100msec was the worst case against the pulse train

#### **(Total)**

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
56.75	100.00	0.57	-4.9

\*3)ON time = Type A's ON time (in 100ms) + Type B's ON time (in 100ms)

\*4)Duty =  $20\log_{10}(\text{ON time/Cycle})$

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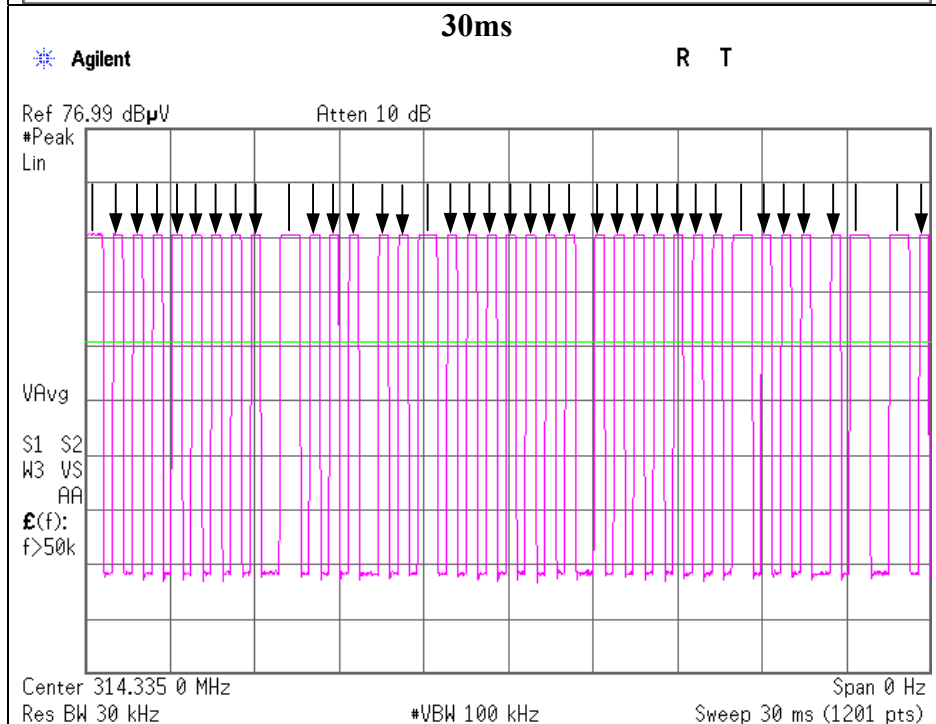
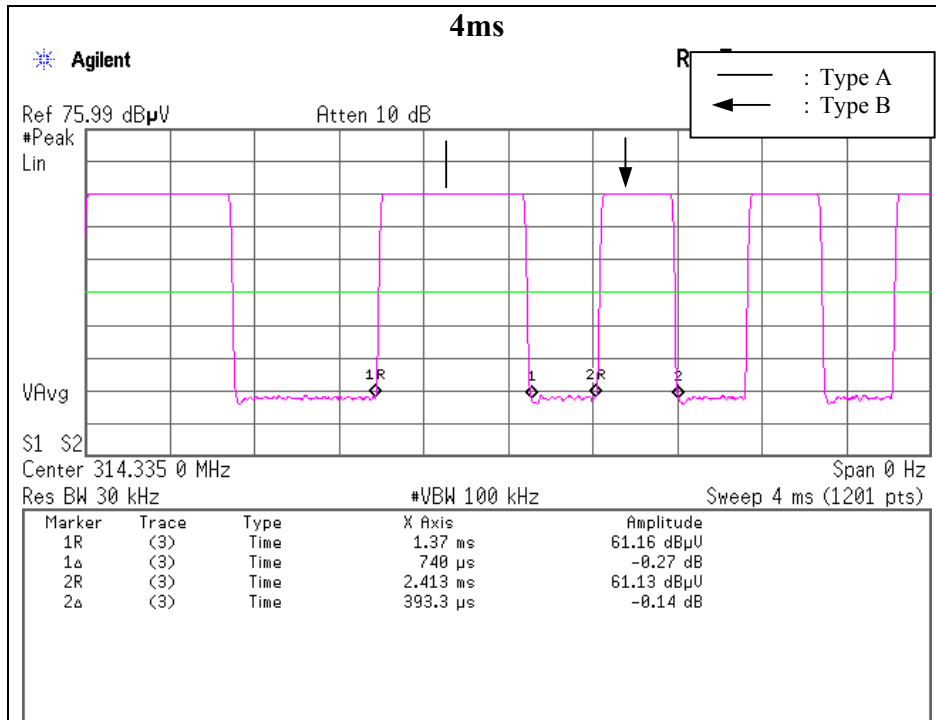
**Head Office EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

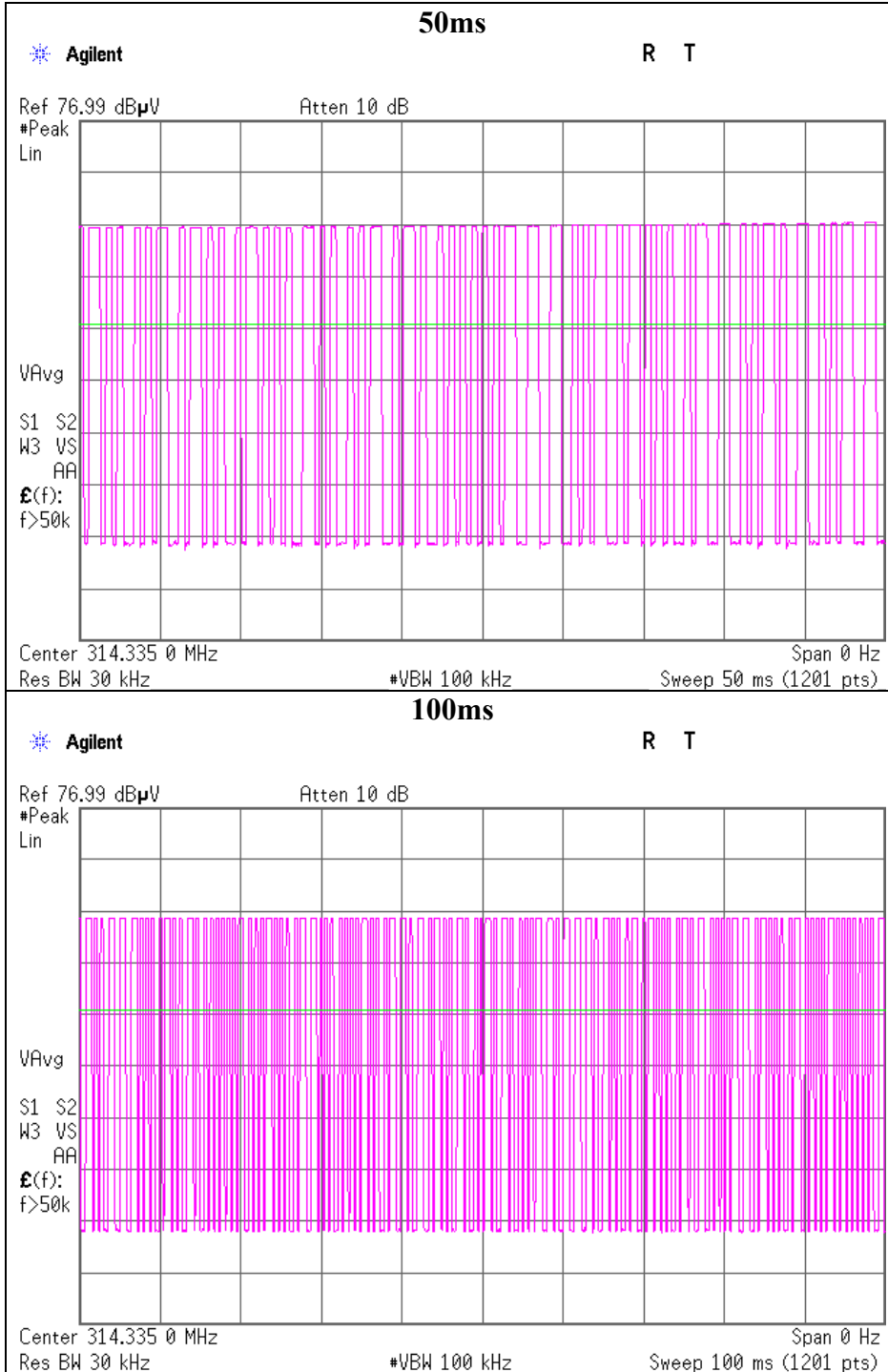
Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

### Duty Cycle



### Duty Cycle



## **APPENDIX 3:Test Instruments**

### **EMI test equipment**

<b>Control No.</b>	<b>Instrument</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Serial No</b>	<b>Test Item</b>	<b>Calibration Date * Interval(month)</b>
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2010/02/02 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE	2010/02/09 * 12
MJM-07	Measure	PROMART	SEN1955	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2009/08/25 * 12
MTR-07	Test Receiver	Rohde & Schwarz	ESCI	100635	RE	2009/10/23 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2010/03/22 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2010/01/23 * 12
MCC-50	Coaxial cable	UL Japan	-	-	RE	2010/03/18 * 12
MAT-51	Attenuator(6dB)	Weinschel	2	AS3557	RE	2010/01/20 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2010/03/05 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2009/08/10 * 12
MCC-57	Microwave Cable	Suhner	SUCOFLEX104	246769(1m) / 292411(5m)	RE	2009/11/17 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2010/03/16 * 12

**The expiration date of the calibration is the end of the expired month.**

**All equipment is calibrated with traceable calibrations. Each calibration 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: Radiated emission, 99% Occupied Bandwidth, -20dB bandwidth , Automatically deactivate and Duty cycle tests**

**UL Japan, Inc.**

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