

**APPENDIX 2: Data of EMI test**

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

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Report No. 30CE0008-YK-01  
Date 06/15/2010  
Temperature/ Humidity 23 deg. C. / 67% 22 deg. C. / 60%  
Engineer Katsunori Okai Hiroyuki Furutaka  
(Above 1GHz) (Below 1GHz)  
Mode Transmitting mode, 916.2204MHz

**QP or 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]	
		Hor	Ver					Hor	Ver		Hor	Ver
188.480	QP	21.8	22.0	17.0	8.1	28.0	-	18.9	19.1	43.5	24.6	24.4
375.245	QP	21.9	21.7	16.7	9.3	28.2	-	19.7	19.5	46.0	26.3	26.5
560.331	QP	26.9	28.3	19.0	10.0	28.8	-	27.1	28.5	46.0	18.9	17.5
572.618	QP	26.5	30.2	19.1	10.0	28.8	-	26.8	30.5	46.0	19.2	15.5
884.735	QP	32.3	25.4	22.3	11.1	28.0	-	37.7	30.8	46.0	8.3	15.2
902.000	QP	21.6	21.5	22.5	11.2	28.0	-	27.3	27.2	46.0	18.7	18.8
916.220	QP	87.8	83.9	22.6	11.3	27.9	-	93.8	89.9	93.9	0.1	4.0
1832.441	PK	55.8	56.9	26.3	3.0	32.5	-	52.6	53.7	73.9	21.3	20.2
2748.661	PK	48.8	50.5	27.3	3.4	32.3	-	47.2	48.9	73.9	26.7	25.0
3664.882	PK	43.8	44.8	28.3	3.9	31.8	-	44.2	45.2	73.9	29.7	28.7
4581.102	PK	45.6	46.7	30.2	3.7	31.4	-	48.1	49.2	73.9	25.8	24.7
5497.322	PK	NS	NS	-	-	-	-	-	-	73.9	-	-
6413.543	PK	NS	NS	-	-	-	-	-	-	73.9	-	-
7329.763	PK	NS	NS	-	-	-	-	-	-	73.9	-	-
8245.984	PK	NS	NS	-	-	-	-	-	-	73.9	-	-
9162.204	PK	NS	NS	-	-	-	-	-	-	73.9	-	-

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]	
		Hor	Ver					Hor	Ver		Hor	Ver
1832.441	PK	55.8	56.9	26.3	3.0	32.5	-3.1	49.5	50.6	53.9	4.4	3.3
2748.661	PK	48.8	50.5	27.3	3.4	32.3	-3.1	44.1	45.8	53.9	9.8	8.1
3664.882	PK	43.8	44.8	28.3	3.9	31.8	-3.1	41.1	42.1	53.9	12.8	11.8
4581.102	PK	45.6	46.7	30.2	3.7	31.4	-3.1	45.0	46.1	53.9	8.9	7.8
5497.322	PK	NS	NS	-	-	-	-3.1	-	-	53.9	-	-
6413.543	PK	NS	NS	-	-	-	-3.1	-	-	53.9	-	-
7329.763	PK	NS	NS	-	-	-	-3.1	-	-	53.9	-	-
8245.984	PK	NS	NS	-	-	-	-3.1	-	-	53.9	-	-
9162.204	PK	NS	NS	-	-	-	-3.1	-	-	53.9	-	-

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).

\*NS: No Signal

\* 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.

\* The noise measured with PK detect was pulse emission.

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

Test place : Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Report No. : 30CE0008-YK-01  
Date : 06/15/2010  
Temperature/ Humidity : 23 deg. C. / 67%      22 deg. C. / 60%  
Engineer : Katsunori Okai      Hiroyuki Furutaka  
(Above 1GHz)      (Below 1GHz)  
Mode : Transmitting mode, 918.0636MHz

**QP or 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]	
		Hor	Ver					Hor	Ver		Hor	Ver
560.332	QP	26.4	26.8	19.0	10.0	28.8	-	26.6	27.0	46.0	19.4	19.0
855.244	QP	26.7	23.6	22.1	11.0	28.1	-	31.7	28.6	46.0	14.3	17.4
884.734	QP	27.0	25.0	22.3	11.1	28.0	-	32.4	30.4	46.0	13.6	15.6
918.064	QP	87.7	85.3	22.6	11.3	27.9	-	93.7	91.3	93.9	0.2	2.6
1836.127	PK	55.6	57.3	26.3	3.0	32.5	-	52.4	54.1	73.9	21.5	19.8
2754.191	PK	49.1	50.4	27.3	3.4	32.3	-	47.5	48.8	73.9	26.4	25.1
3672.254	PK	43.9	44.3	28.3	3.9	31.8	-	44.3	44.7	73.9	29.6	29.2
4590.318	PK	45.1	46.7	30.2	3.7	31.4	-	47.6	49.2	73.9	26.3	24.7
5508.382	PK	NS	NS	-	-	-	-	-	-	73.9	-	-
6426.445	PK	NS	NS	-	-	-	-	-	-	73.9	-	-
7344.509	PK	NS	NS	-	-	-	-	-	-	73.9	-	-
8262.572	PK	NS	NS	-	-	-	-	-	-	73.9	-	-
9180.636	PK	NS	NS	-	-	-	-	-	-	73.9	-	-

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]	
		Hor	Ver					Hor	Ver		Hor	Ver
1836.127	PK	55.6	57.3	26.3	3.0	32.5	-3.1	49.3	51.0	53.9	4.6	2.9
2754.191	PK	49.1	50.4	27.3	3.4	32.3	-3.1	44.4	45.7	53.9	9.5	8.2
3672.254	PK	43.9	44.3	28.3	3.9	31.8	-3.1	41.2	41.6	53.9	12.7	12.3
4590.318	PK	45.1	46.7	30.2	3.7	31.4	-3.1	44.5	46.1	53.9	9.4	7.8
5508.382	PK	NS	NS	-	-	-	-3.1	-	-	53.9	-	-
6426.445	PK	NS	NS	-	-	-	-3.1	-	-	53.9	-	-
7344.509	PK	NS	NS	-	-	-	-3.1	-	-	53.9	-	-
8262.572	PK	NS	NS	-	-	-	-3.1	-	-	53.9	-	-
9180.636	PK	NS	NS	-	-	-	-3.1	-	-	53.9	-	-

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).

\*NS: No Signal

\* 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.

\* The noise measured with PK detect was pulse emission.

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

Test place : Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Report No. : 30CE0008-YK-01  
Date : 06/15/2010  
Temperature/ Humidity : 23 deg. C. / 67%      22 deg. C. / 60%  
Engineer : Katsunori Okai      Hiroyuki Furutaka  
(Above 1GHz)      (Below 1GHz)  
Mode : Transmitting mode, 923.5932MHz

**QP or 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]	
		Hor	Ver					Hor	Ver		Hor	Ver
589.823	QP	26.7	28.7	19.4	10.1	28.8	-	27.4	29.4	46.0	18.6	16.6
634.061	QP	26.2	28.5	19.8	10.3	28.7	-	27.6	29.9	46.0	18.4	16.1
884.734	QP	26.4	26.0	22.3	11.1	28.0	-	31.8	31.4	46.0	14.2	14.6
923.593	QP	87.6	86.3	22.6	11.3	27.9	-	93.6	92.3	93.9	0.3	1.6
1847.186	PK	54.6	56.7	26.3	3.0	32.5	-	51.4	53.5	73.9	22.5	20.4
2770.780	PK	48.3	50.4	27.3	3.4	32.3	-	46.7	48.8	73.9	27.2	25.1
3694.373	PK	43.9	44.2	28.3	3.9	31.8	-	44.3	44.6	73.9	29.6	29.3
4617.966	PK	45.3	46.8	30.2	3.7	31.4	-	47.8	49.3	73.9	26.1	24.6
5541.559	PK	NS	NS	-	-	-	-	-	-	73.9	-	-
6465.152	PK	NS	NS	-	-	-	-	-	-	73.9	-	-
7388.746	PK	NS	NS	-	-	-	-	-	-	73.9	-	-
8312.339	PK	NS	NS	-	-	-	-	-	-	73.9	-	-
9235.932	PK	NS	NS	-	-	-	-	-	-	73.9	-	-

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]	
		Hor	Ver					Hor	Ver		Hor	Ver
1847.186	PK	54.6	56.7	26.3	3.0	32.5	-3.1	48.3	50.4	53.9	5.6	3.5
2770.780	PK	48.3	50.4	27.3	3.4	32.3	-3.1	43.6	45.7	53.9	10.3	8.2
3694.373	PK	43.9	44.2	28.3	3.9	31.8	-3.1	41.2	41.5	53.9	12.7	12.4
4617.966	PK	45.3	46.8	30.2	3.7	31.4	-3.1	44.7	46.2	53.9	9.2	7.7
5541.559	PK	NS	NS	-	-	-	-3.1	-	-	53.9	-	-
6465.152	PK	NS	NS	-	-	-	-3.1	-	-	53.9	-	-
7388.746	PK	NS	NS	-	-	-	-3.1	-	-	53.9	-	-
8312.339	PK	NS	NS	-	-	-	-3.1	-	-	53.9	-	-
9235.932	PK	NS	NS	-	-	-	-3.1	-	-	53.9	-	-

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).

\*NS: No Signal

\* 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.

\* The noise measured with PK detect was pulse emission.

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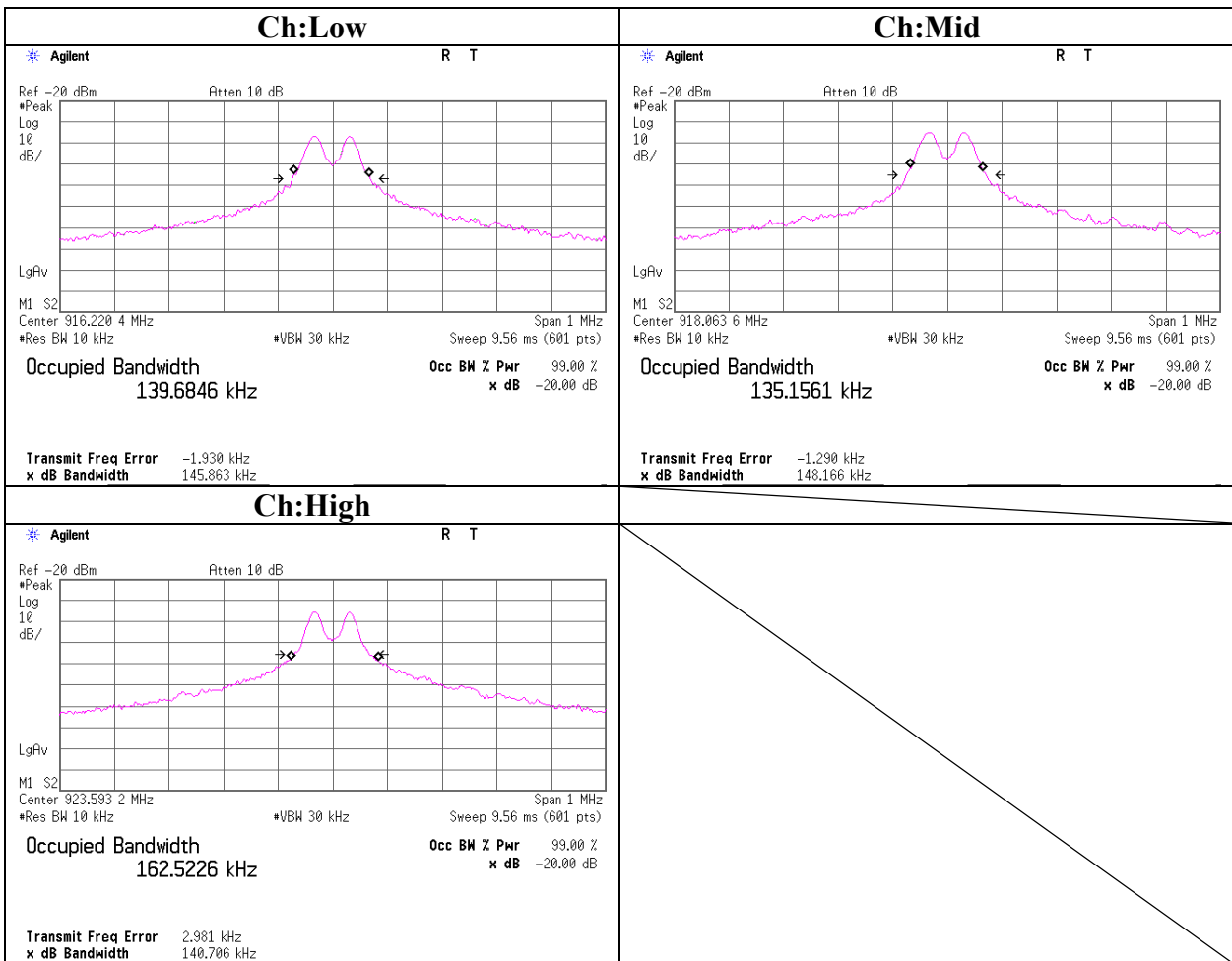
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### 20dB Bandwidth

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber  
 Report No. 30CE0008-YK-01  
 Date 06/16/2010  
 Temperature/ Humidity 24 deg. C. / 69%  
 Engineer Katsunori Okai  
 Mode Transmitting mode

Frequency [MHz]	20dB Bandwidth [kHz]	Limit [kHz]
916.2204	145.863	-
918.0636	148.166	-
923.5932	140.706	-



### Duty Cycle

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No.	30CE0008-YK-01
Date	06/15/2010
Temperature/ Humidity	23 deg. C. / 67%
Engineer	Katsunori Okai
Mode	Transmitting mode

Type	Times	ON time(One pulse) [ms]	ON time(in 10ms) [ms]	ON Time(in 100ms) [ms]
A	1	0.400	0.4	4.0000
B	1	0.292	0.2917	2.9170
C	3	0.258	0.7749	7.7490
D	6	0.192	1.1502	11.5020
E	19	0.133	2.5327	25.3270
F	21	0.083	1.7493	17.4930

\*1)ON time(in 10ms) = Times \* ON time(One pulse)

\*2)ON time(in 100ms) = On time(in 10ms) \* 100 / 10

\*3)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]
68.99	100.00	0.69	-3.2

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

\* The value of the theoretical worst duty condition for signal pattern in the specification is as follows.

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
70.10	100.00	0.70	-3.1

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

Duty “-3.1dB” which was the theoretical worst condition was applied since the average value was more strict for limit when it was calculated by duty factor of the theoretical worst condition.

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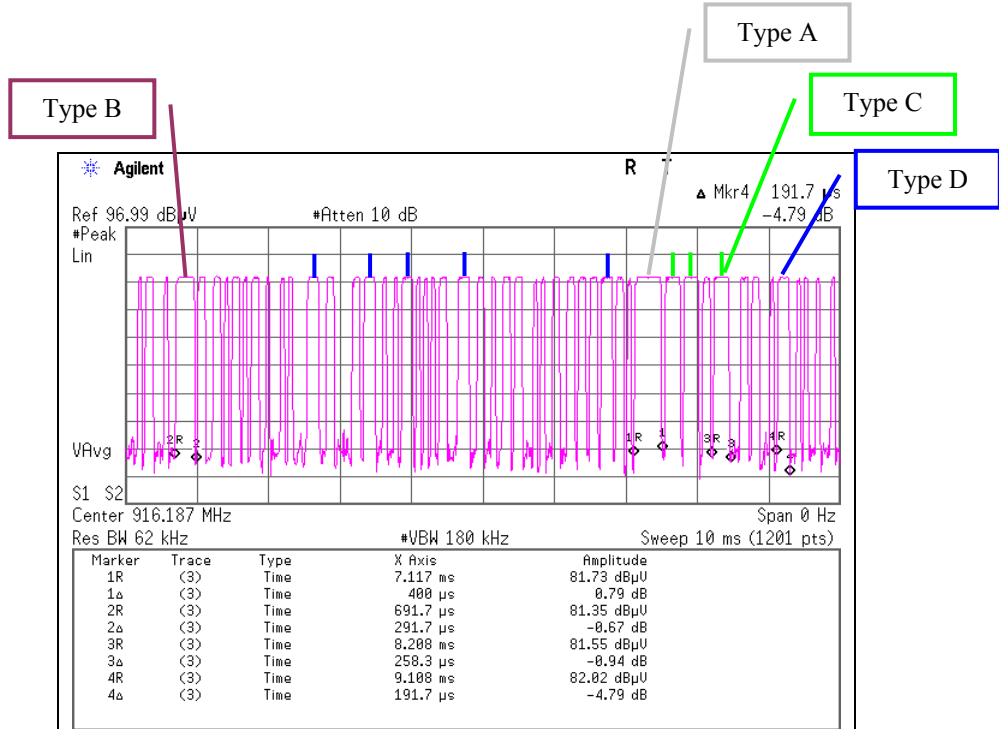
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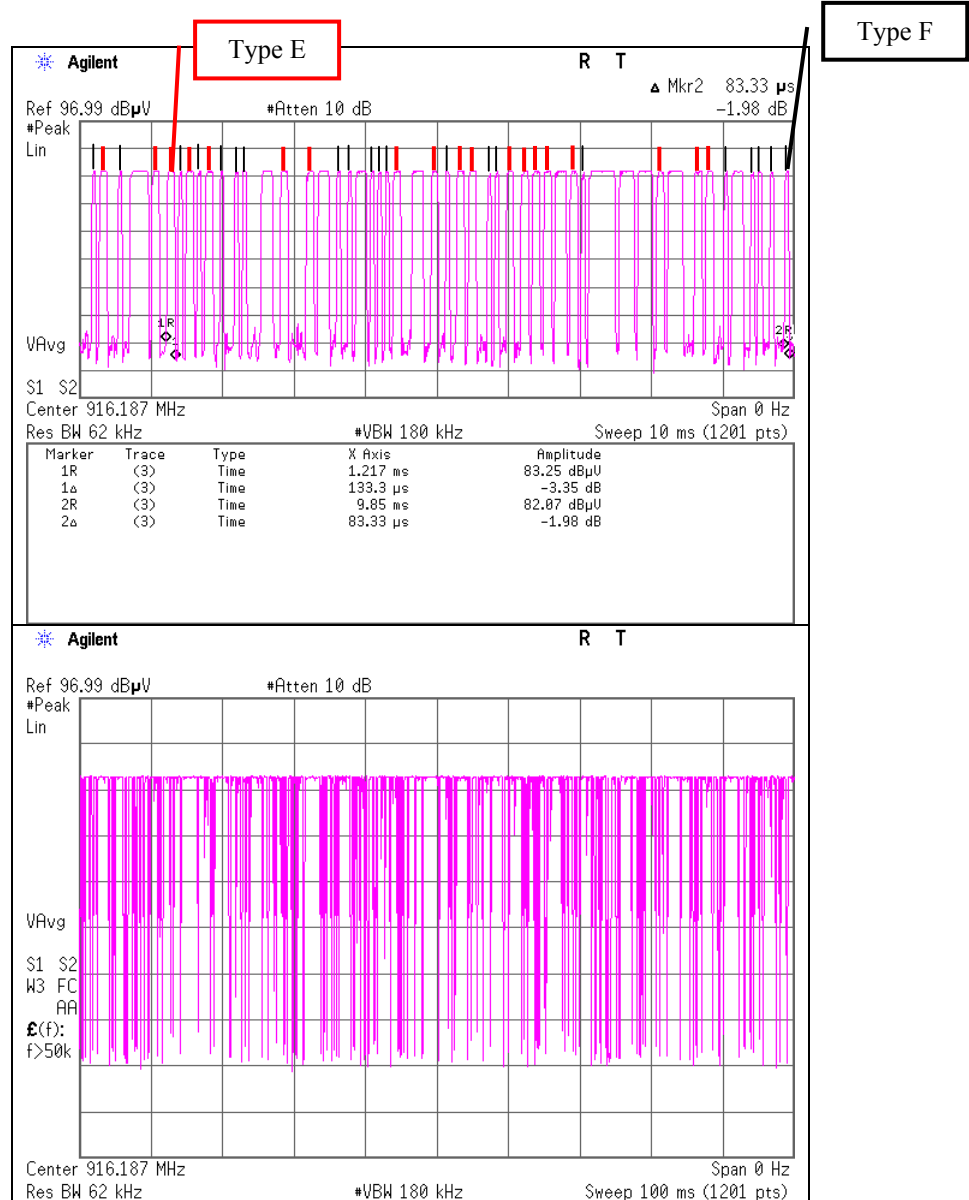
### Duty Cycle

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No.	30CE0008-YK-01
Date	06/15/2010
Temperature/ Humidity	23 deg. C. / 67%
Engineer	Katsunori Okai
Mode	Transmitting mode



### Duty Cycle

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No.	30CE0008-YK-01
Date	06/15/2010
Temperature/ Humidity	23 deg. C. / 67%
Engineer	Katsunori Okai
Mode	Transmitting mode



### **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-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2009/08/17 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2010/02/09 * 12
MJM-05	Measure	PROMART	SEN1955	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2009/11/20 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2010/04/19 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2009/10/05 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2010/01/23 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2010/02/22 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2009/11/12 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2009/09/02 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2010/01/19 * 12
MCC-47	Microwave Cable	Suhner	SUCOFLEX104	295123(5m) / 287573(1m)	RE	2009/11/19 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2009/09/14 * 12
MBF-13	Band Pass Filter	M-CiTY	BPF0850-01	UL0011	RE	2009/09/11 * 12
MCC-77	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	278942/4	RE	2009/12/19 * 12
MHF-18	High Pass Filter 3.5-18.0GHz	TOKIMEC	TF323DCA	7002	RE	2009/12/19 * 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, 20dB bandwidth , Automatically deactivate and Duty cycle tests**

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