

APPENDIX 2: Data of EMI test

Radiated Emission
(Type 4)

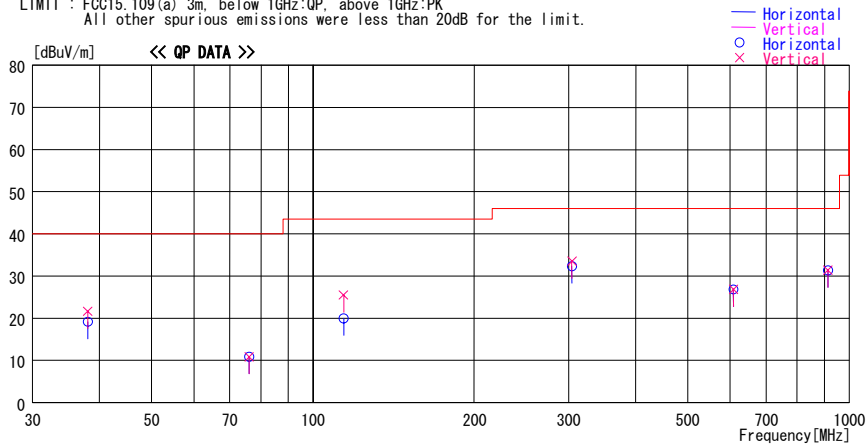
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2010/03/05

Company : DENSO CORPORATION Report No. : 30HE0023-HO-01
Kind of EUT : Tire Pressure Monitoring System Power : DC 5.0V
Model No. : 13BCX (Type4) Temp./Humi. : 24deg.C / 41%
Serial No. : 004 Engineer : Kazuya Yoshioka

Mode / Remarks : Receiving mode Worst-axis(Hor:Y-axis Ver:Z-axis)

LIMIT : FCC15.109(a) 3m. below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
38.035	38.5	QP	15.0	-34.3	19.2	359	300	Hori.	40.0	20.8	
38.035	40.9	QP	15.0	-34.3	21.6	168	100	Vert.	40.0	18.4	
76.070	38.0	QP	6.4	-33.6	10.8	359	300	Hori.	40.0	29.2	
76.070	38.0	QP	6.4	-33.6	10.8	44	100	Vert.	40.0	29.2	
114.105	40.7	QP	12.1	-32.8	20.0	193	286	Hori.	43.5	23.5	
114.105	46.2	QP	12.1	-32.8	25.5	44	100	Vert.	43.5	18.0	
304.280	49.5	QP	13.4	-30.6	32.3	219	209	Hori.	46.0	13.7	
304.280	50.7	QP	13.4	-30.6	33.5	210	171	Vert.	46.0	12.5	
608.560	36.4	QP	19.1	-28.7	26.8	359	100	Vert.	46.0	19.2	
608.560	36.4	QP	19.1	-28.7	26.8	359	100	Hori.	46.0	19.2	
912.840	35.7	QP	22.4	-26.7	31.4	359	100	Hori.	46.0	14.6	
912.840	35.7	QP	22.4	-26.7	31.4	359	100	Vert.	46.0	14.6	

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

Radiated Emission
(Type 4)

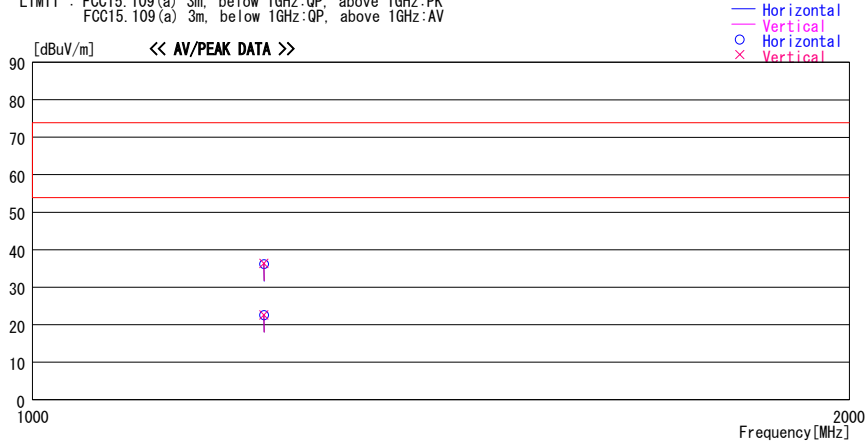
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2010/03/06

Company : DENSO CORPORATION Report No. : 30HE0023-H0-01
Kind of EUT : Tire Pressure Monitoring System Power : DC 5.0V
Model No. : 13BCX (Type4) Temp./Humi. : 24deg. C. / 41%
Serial No. : 004 Engineer : Kazuya Yoshioka

Mode / Remarks : Receiving mode Worst-axis(Hor:Y-axis Ver:Z-axis)

LIMIT : FCC15.109(a) 3m. below 1GHz:QP, above 1GHz:PK
FCC15.109(a) 3m. below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit	Margin	Comment
			Factor [dB/m]	Gain [dB]					[dBuV/m]	[dB]	
1217.120	45.6	PK	25.7	-35.0	36.3	359	100	Vert.	73.9	37.6	
1217.120	31.9	AV	25.7	-35.0	22.6	359	100	Hori.	53.9	31.3	
1217.120	45.5	PK	25.7	-35.0	36.2	359	100	Hori.	73.9	37.7	
1217.120	31.9	AV	25.7	-35.0	22.6	359	100	Vert.	53.9	31.3	

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

Radiated Emission
(Type 1: Reference data)

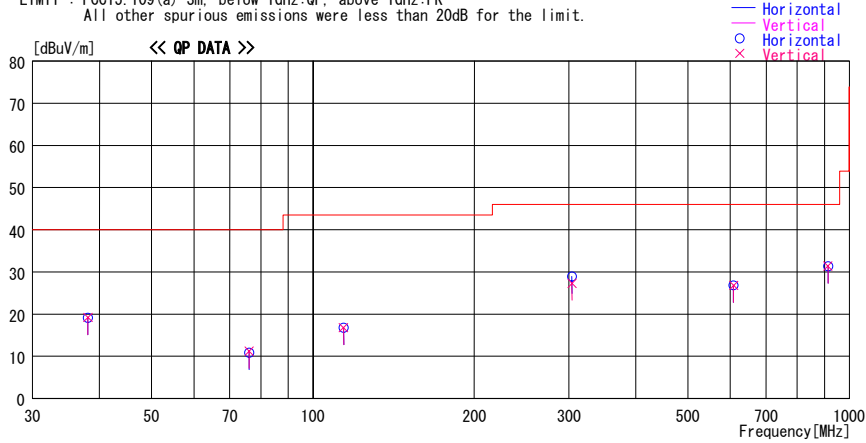
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2010/03/05

Company : DENSO CORPORATION Report No. : 30HE0023-HO-01
Kind of EUT : Tire Pressure Monitoring System Power : DC 5.0V
Model No. : 13BCX (Type1) Temp./Humi. : 24deg.C / 41%
Serial No. : 001 Engineer : Kazuya Yoshioka

Mode / Remarks : Receiving mode Worst-axis(Hor:Z-axis Ver:Z-axis)

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
38.035	38.5	QP	15.0	-34.3	19.2	359	100	Vert.	40.0	20.8	
38.035	38.5	QP	15.0	-34.3	19.2	359	300	Hori.	40.0	20.8	
76.070	38.4	QP	6.4	-33.6	11.2	181	100	Vert.	40.0	28.8	
76.070	38.0	QP	6.4	-33.6	10.8	359	300	Hori.	40.0	29.2	
114.105	37.5	QP	12.1	-32.8	16.8	359	100	Vert.	43.5	26.7	
114.105	37.5	QP	12.1	-32.8	16.8	359	300	Hori.	43.5	26.7	
304.280	44.5	QP	13.4	-30.6	27.3	121	269	Vert.	46.0	18.7	
304.280	46.1	QP	13.4	-30.6	28.9	186	100	Hori.	46.0	17.1	
608.560	36.4	QP	19.1	-28.7	26.8	359	100	Vert.	46.0	19.2	
608.560	36.4	QP	19.1	-28.7	26.8	359	100	Hori.	46.0	19.2	
912.840	35.7	QP	22.4	-26.7	31.4	359	100	Vert.	46.0	14.6	
912.840	35.7	QP	22.4	-26.7	31.4	359	100	Hori.	46.0	14.6	

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

Radiated Emission
(Type 1: Reference data)

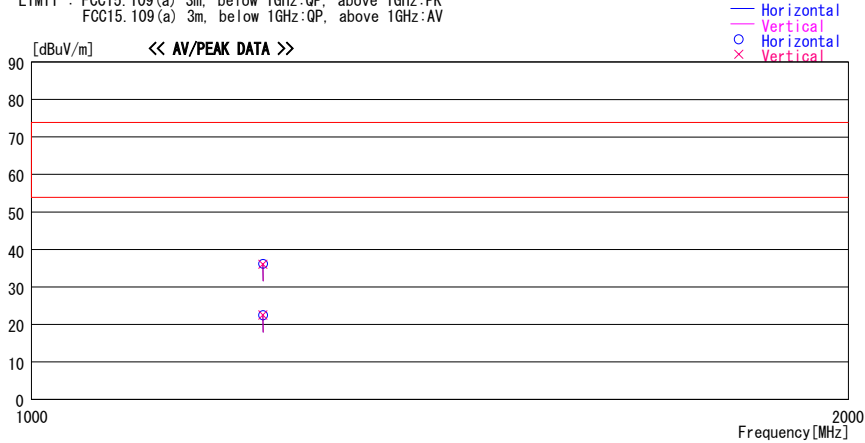
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
 Date : 2010/03/06

Company : DENSO CORPORATION Report No. : 30HE0023-H0-01
 Kind of EUT : Tire Pressure Monitoring System Power : DC 5.0V
 Model No. : 13BCX (Type1) Temp./Humi. : 24deg. C. / 41%
 Serial No. : 001 Engineer : Kazuya Yoshioka

Mode / Remarks : Receiving mode Worst-axis(Hor:Z-axis Ver:Z-axis)

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
 FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
1217.120	45.4	PK	25.7	-35.0	36.1	359	100	Vert.	73.9	37.8	
1217.120	31.8	AV	25.7	-35.0	22.5	359	100	Hori.	53.9	31.4	
1217.120	45.5	PK	25.7	-35.0	36.2	359	100	Hori.	73.9	37.7	
1217.120	31.8	AV	25.7	-35.0	22.5	359	100	Vert.	53.9	31.4	

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

Radiated Emission
(Type 2: Reference data)

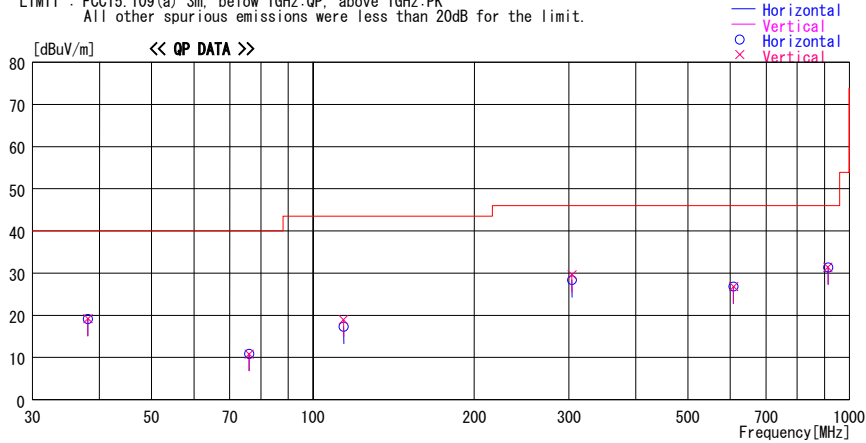
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2010/03/05

Company : DENSO CORPORATION Report No. : 30HE0023-H0-01
Kind of EUT : Tire Pressure Monitoring System Power : DC 5.0V
Model No. : 13BCX (Type2) Temp./Humi. : 24deg. C. / 41%
Serial No. : 002 Engineer : Kazuya Yoshioka

Mode / Remarks : Receiving mode Worst-axis(Hor:Z-axis Ver:Y-axis)

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
38.035	38.5	QP	15.0	-34.3	19.2	359	300	Hori.	40.0	20.8	
38.035	38.5	QP	15.0	-34.3	19.2	359	100	Vert.	40.0	20.8	
76.070	38.0	QP	6.4	-33.6	10.8	359	300	Hori.	40.0	29.2	
76.070	38.0	QP	6.4	-33.6	10.8	359	100	Vert.	40.0	29.2	
114.105	38.0	QP	12.1	-32.8	17.3	359	387	Hori.	43.5	26.2	
114.105	39.7	QP	12.1	-32.8	19.0	244	100	Vert.	43.5	24.5	
304.280	46.8	QP	13.4	-30.6	29.6	254	164	Vert.	46.0	16.4	
304.280	45.6	QP	13.4	-30.6	28.4	247	100	Hori.	46.0	17.6	
608.560	36.4	QP	19.1	-28.7	26.8	359	100	Hori.	46.0	19.2	
608.560	36.4	QP	19.1	-28.7	26.8	359	100	Vert.	46.0	19.2	
912.840	35.7	QP	22.4	-26.7	31.4	359	100	Vert.	46.0	14.6	
912.840	35.7	QP	22.4	-26.7	31.4	359	100	Hori.	46.0	14.6	

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

Radiated Emission
(Type 2: Reference data)

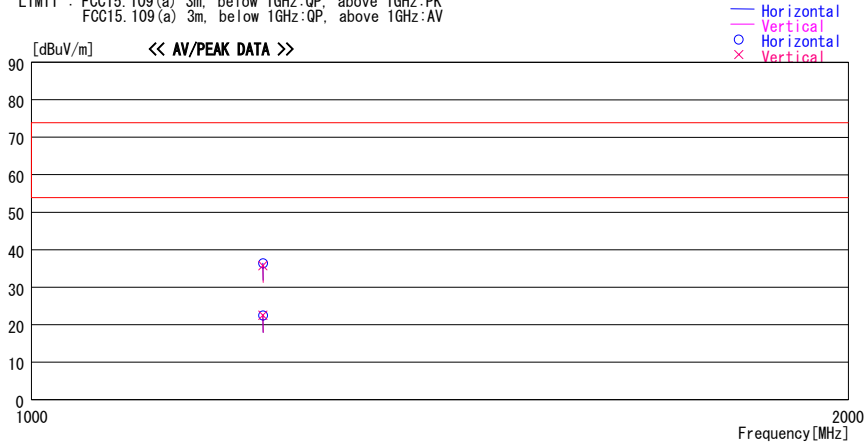
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2010/03/06

Company : DENSO CORPORATION Report No. : 30HE0023-H0-01
Kind of EUT : Tire Pressure Monitoring System Power : DC 5.0V
Model No. : 13BCX (Type2) Temp./Humi. : 24deg. C. / 41%
Serial No. : 002 Engineer : Kazuya Yoshioka

Mode / Remarks : Receiving mode Worst-axis(Hor:Z-axis Ver:Y-axis)

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit	Margin	Comment
			Factor [dB]	Gain [dB]					[dBuV/m]	[dB]	
1217.120	45.1	PK	25.7	-35.0	35.8	359	100	Vert.	73.9	38.1	
1217.120	31.8	AV	25.7	-35.0	22.5	359	100	Hori.	53.9	31.4	
1217.120	45.7	PK	25.7	-35.0	36.4	359	100	Hori.	73.9	37.5	
1217.120	31.8	AV	25.7	-35.0	22.5	359	100	Vert.	53.9	31.4	

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

Radiated Emission
(Type 3: Reference data)

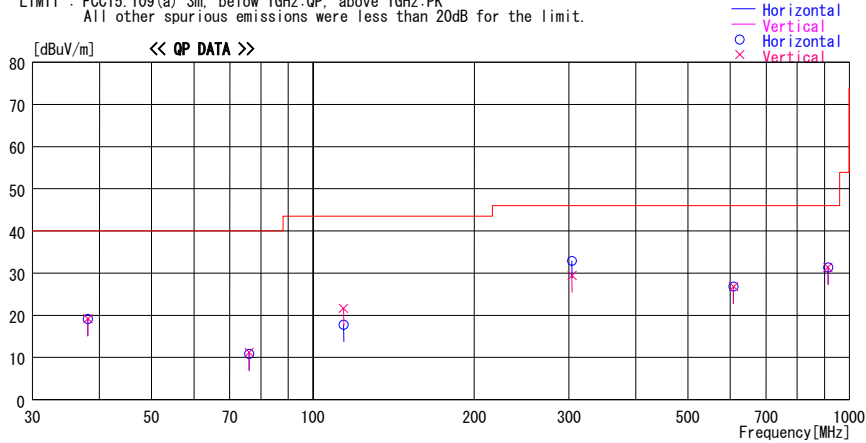
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2010/03/05

Company : DENSO CORPORATION Report No. : 30HE0023-H0-01
Kind of EUT : Tire Pressure Monitoring System Power : DC 5.0V
Model No. : 13BCX (Type3) Temp./Humi. : 24deg. C. / 41%
Serial No. : 003 Engineer : Kazuya Yoshioka

Mode / Remarks : Receiving mode Worst-axis(Hor:Z-axis Ver:Y-axis)

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
38.035	38.5	QP	15.0	-34.3	19.2	359	300	Hori.	40.0	20.8	
38.035	38.5	QP	15.0	-34.3	19.2	359	100	Vert.	40.0	20.8	
76.070	38.0	QP	6.4	-33.6	10.8	359	300	Hori.	40.0	29.2	
76.070	38.4	QP	6.4	-33.6	11.2	163	100	Vert.	40.0	28.8	
114.105	38.5	QP	12.1	-32.8	17.8	205	140	Hori.	43.5	25.7	
114.105	42.3	QP	12.1	-32.8	21.6	108	100	Vert.	43.5	21.9	
304.280	50.1	QP	13.4	-30.6	32.9	178	100	Hori.	46.0	13.1	
304.280	46.7	QP	13.4	-30.6	29.5	200	160	Vert.	46.0	16.5	
608.560	36.4	QP	19.1	-28.7	26.8	359	100	Hori.	46.0	19.2	
608.560	36.4	QP	19.1	-28.7	26.8	359	100	Vert.	46.0	19.2	
912.840	35.7	QP	22.4	-26.7	31.4	359	100	Hori.	46.0	14.6	
912.840	35.7	QP	22.4	-26.7	31.4	359	100	Vert.	46.0	14.6	

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

Radiated Emission
(Type 3: Reference data)

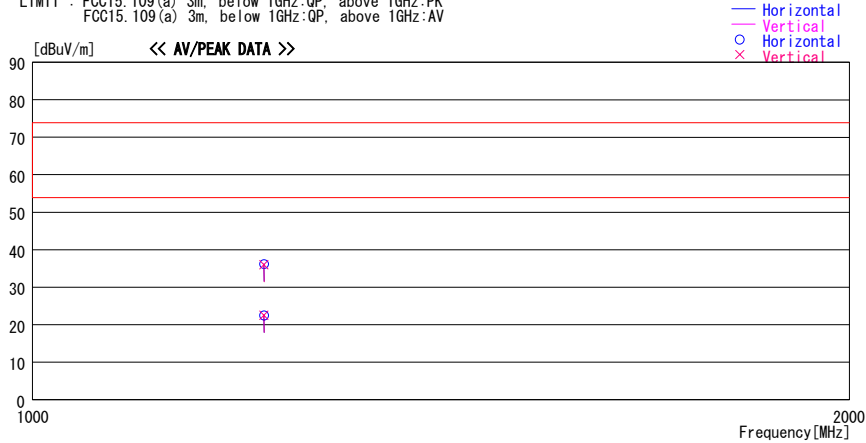
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
 Date : 2010/03/06

Company : DENSO CORPORATION Report No. : 30HE0023-H0-01
 Kind of EUT : Tire Pressure Monitoring System Power : DC 5.0V
 Model No. : 13BCX (Type3) Temp./Humi. : 24deg. C. / 41%
 Serial No. : 003 Engineer : Kazuya Yoshioka

Mode / Remarks : Receiving mode Worst-axis(Hor:Z-axis Ver:Y-axis)

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
 FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain					[dBuV/m]	[dB]	
1217.120	45.3	PK	25.7	-35.0	36.0	359	100	Vert.	73.9	37.9	
1217.120	31.8	AV	25.7	-35.0	22.5	359	100	Hori.	53.9	31.4	
1217.120	45.5	PK	25.7	-35.0	36.2	359	100	Hori.	73.9	37.7	
1217.120	31.8	AV	25.7	-35.0	22.5	359	100	Vert.	53.9	31.4	

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

APPENDIX 3: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE	2009/06/26 * 12
MOS-01	Digital Humidity Indicator	N.T	NT-1800	MOS01	RE	2010/02/09 * 12
MJM-01	Measure	KDS	ES19-55	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-01	Test Receiver	Rohde & Schwarz	ES140	100084	RE	2009/12/17 * 12
MBA-01	Biconical Antenna	Schwarzbeck	BBA9106	VHA9103200 7	RE	2009/10/03 * 12
MLA-09	Logperiodic Antenna	Schwarzbeck	USLP9143B	9143B006	RE	2009/10/03 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2009/11/13 * 12
MCC-01	Coaxial Cable 0.1-3000MHz	Suhner/storm/Agilent /TSJ	-	-	RE	2009/10/09 * 12
MPA-20	Pre Amplifier	Elena	EPA-4020YA	030801	RE	2009/03/17 * 12
MHA-05	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	253	RE	2009/06/15 * 12
MCC-18	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX 104	233010(1m) / 292410(5m)	RE	2009/09/16 * 12
MPA-01	Pre Amplifier	Agilent	8449B	3008A01671	RE	2010/02/12 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2009/11/20 * 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

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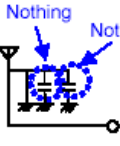
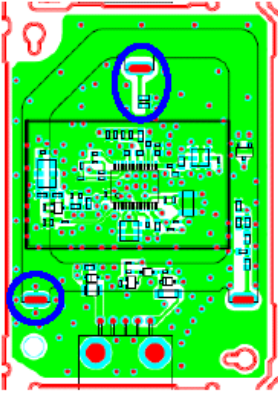
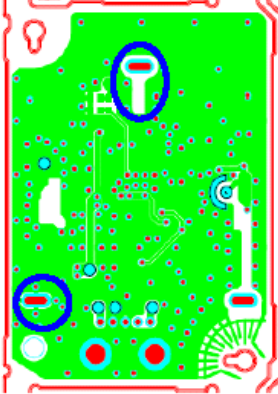

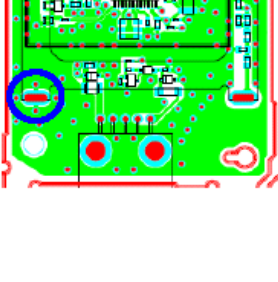

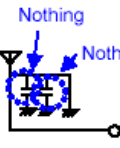
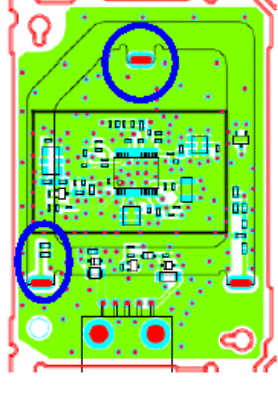
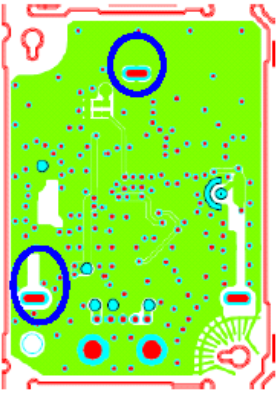
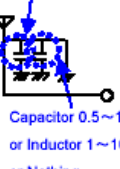
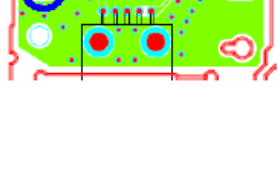

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Facsimile : +81 596 24 8124

APPENDIX 4: Information of Variant Type (Type 1 to 4)

Differences are shown in circle .

Type		Component Side	Solder Side
TYPE 1	 <p>Nothing Nothing</p>		
TYPE 3	 <p>Capacitor 0.5~100pF or Inductor 1~100nH</p> <p>Capacitor 0.5~100pF or Inductor 1~100nH, or Nothing</p>		
TYPE 2	 <p>Nothing Nothing</p>		
TYPE 4	 <p>Capacitor 0.5~100pF or Inductor 1~100nH</p> <p>Capacitor 0.5~100pF or Inductor 1~100nH, or Nothing</p>		

Difference between Type 4 and Type 1

Ground points are different.

Type 4 has elements on them, and Type 1 has vacant terminals.

Difference between Type 4 and Type 2

Type 4 has elements on them, and Type 2 has vacant terminals.

Difference between Type 4 and Type 3

Ground points are different.

Type 4 which was used for the tests has 307 "Capacitor 7pF" and 308 "Nothing".

The result of Radiated emission test was mainly from characteristics of Local Oscillator.

If the range of 307 "Capacitor 7pF" becomes "Capacitor 0.5 - 100pF", or "Inductor 1 - 100nH", and if the location for 308 mounted "Capacitor 0.5 - 100pF", or "Inductor 1 - 100nH", or "Nothing", there is no influence on the result of Radiated emission test.

Refer to the attached photo of variations on the next page.

UL Japan, Inc.

Head Office EMC Lab.

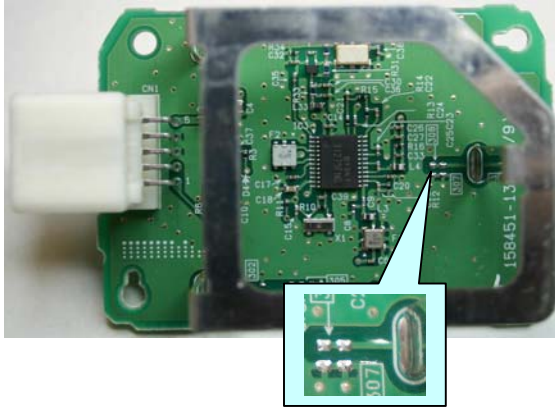
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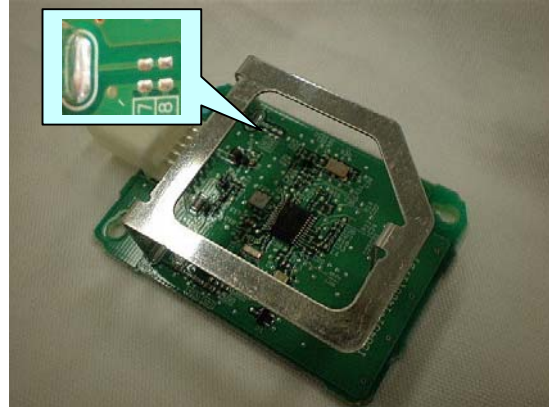
Facsimile : +81 596 24 8124

Photos of variations

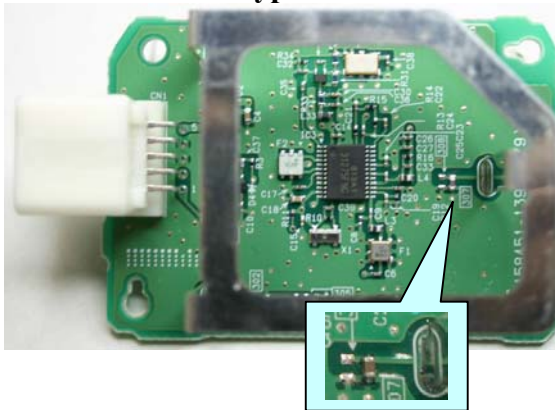
Type1



Type2



Type3



Type4

