



**FCC CFR47 PART 15 SUBPART C
CERTIFICATION
TEST REPORT**

FOR

SMART CARD KEY

MODEL NUMBER: 14ABS

FCC ID: HYQ14ABS

REPORT NUMBER: 06J10224-1

ISSUE DATE: APRIL 25, 2006

Prepared for
DENSO CORP.
1-1 SHOWA-CHO, KARIYA
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Revision History

Rev.	Issue Date	Revisions	Revised By
-	4/25/06	Initial Issue	A. Ilarina

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: DENSO CORP.
1-1 SHOWA-CHO
KARIYA, AICHI 448-8661, JAPAN

EUT DESCRIPTION: SMART CARD KEY

MODEL: 14ABS

SERIAL NUMBER: 01725

DATE TESTED: APRIL 20-21, 2006

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note : The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Tested By:



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ENGINEERING SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES



THANH NGUYEN
EMC TECHNICIAN
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is mainly used for locking or unlocking the door of the vehicle. The product sends signals using radio frequency when it receives the WAKE signal emitted from the smart entry system in the vehicle.

Product Type Number		14ABS
RF characteristic	Nominal frequency	312.15MHz
	Local oscillator frequency	312.15MHz SAW resonator
	Radio frequency output power	Less than 75.4dB μ V (Average level)
Antenna		Built-in type (Fixed)
Transmitting Time		Periodic < 5 seconds
Power Supply	Nominal supply voltage	3V DC
	Type of Battery	One lithium battery

5.2. SOFTWARE AND FIRMWARE

The EUT driver software installed in the host support equipment during testing was Smart05.
The test utility software used during testing was BU9870FV-W.

5.3. WORST-CASE CONFIGURATION AND MODE

Three orthogonal orientations were investigated, X, Y and Z; the highest measured output power was in the X orientation.

5.4. DESCRIPTION OF TEST SETUP

The EUT is a stand-alone unit and powered by 3 VDC batteries, for the purpose of the testing an oscillator, antenna check-bench and laptop are used to control the EUT.

5.5. DESCRIPTION OF AVAILABLE ANTENNAS

The device uses a printed pattern antenna for transmitting.

5.6. DETAILS OF TESTED SYSTEM

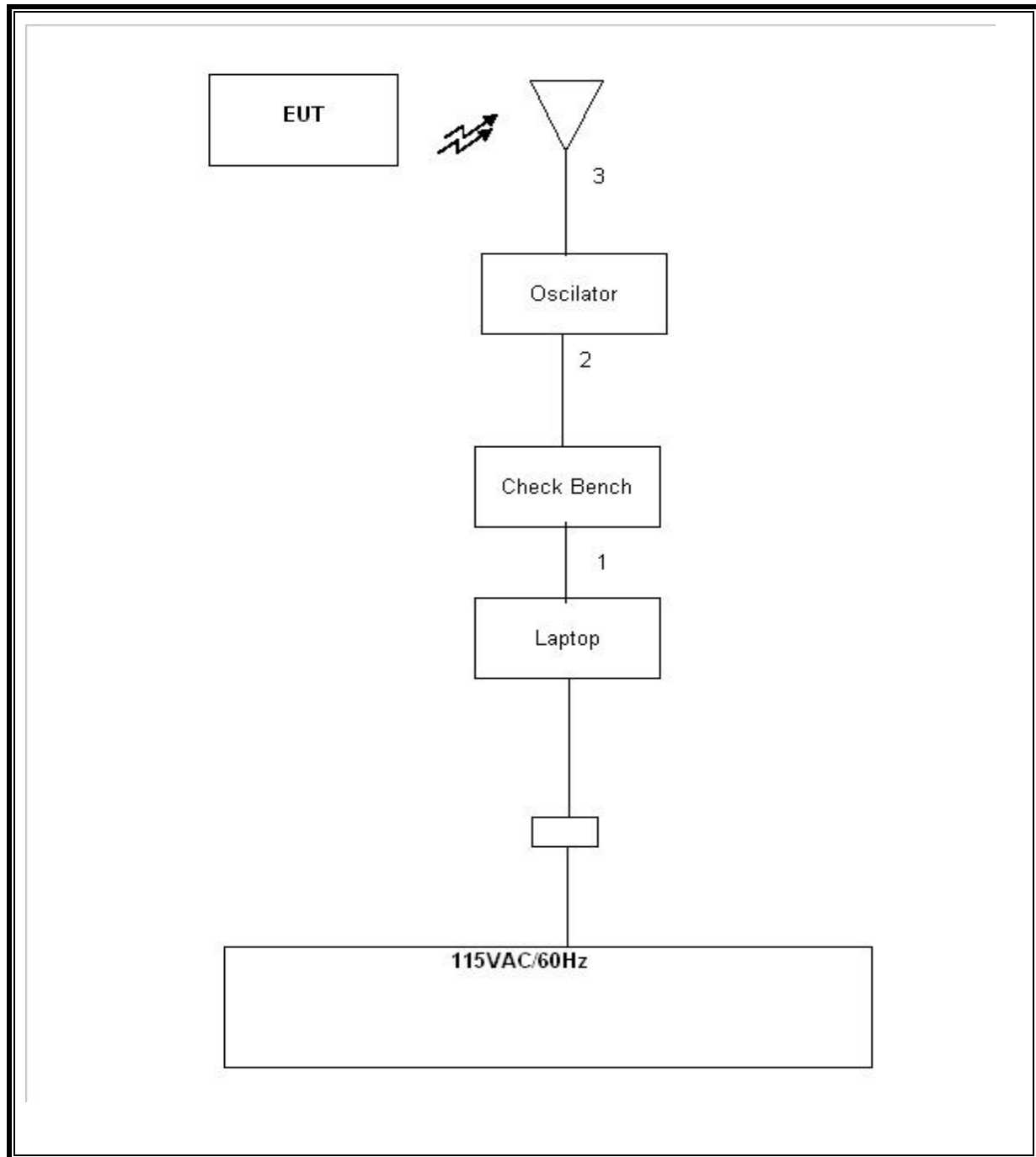
SUPPORT EQUIPMENT & PERIPHERALS

TEST PERIPHERALS				
Device Type	Manufacturer	Model Number	Serial Number	FCC ID
Laptop	Dell	PP04S	CN-0P5792-36521-541-207F	DoC
AC Adapter	Dell	AA22-850	CN-0T2357-18291-043I	DoC
Check Bench	Denso	NA	NA	NA
Oscillator	Toyota	89991-68050	4L09	NA
Antenna (Door Handle)	NA	NA	NA	NA

I/O CABLES

TEST I / O CABLES								
Cable No	I/O Port	# of I/O Port	Connector Type	Type of Cable	Cable Length	Data Traffic	Bundled	Remark
1	USB	1	USB	Un-shielded	1m	Yes	No	N/A
2	Oscillator	3	Jack	Un-shielded	0.5m	No	No	N/A
3	Antenna	1	Door Handle	Un-shielded	0.5m	Yes	No	N/A

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Cal Due
Quasi-Peak Adaptor	Agilent / HP	85650A	2521A01038	1/11/2008
SA Display Section 2	Agilent / HP	85662A	2816A16696	4/7/2008
SA RF Section, 1.5 GHz	Agilent / HP	85680B	2814A04227	1/7/2008
Preamplifier, 1300 MHz	Agilent / HP	8447D	2944A06550	9/1/2006
Antenna, Log Periodic 200 ~ 1000 MHz	EMCO	3146	9107-3163	3/1/2007
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A	US42070220	7/29/2006
EMI Receiver, 9 kHz ~ 2.9 GHz	Agilent / HP	8542E	3942A00286	2/4/2007
RF Filter Section	Agilent / HP	85420E	3705A00256	2/4/2007
Antenna, Bilog 30 MHz ~ 2 GHz	Sunol Sciences	JB1	A121003	9/3/2006

7. LIMITS AND RESULTS

7.1. 20dB BANDWIDTH

LIMIT

§15.231 (c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

99% Bandwidth is just for reporting purpose.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer.

20dB Bandwidth: The RBW is set to 100 KHz. The VBW is set to 100 KHz. The sweep time is coupled. Bandwidth is determined at the points 20 dB down from the modulated carrier.

99% Bandwidth: The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

No non-compliance noted:

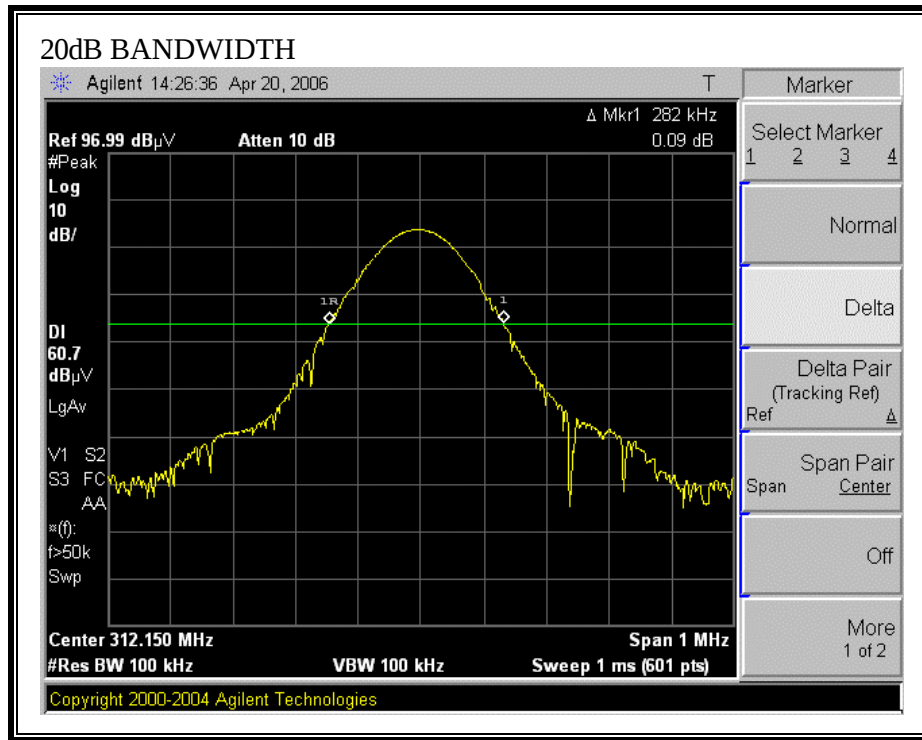
20dB Bandwidth

Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
312.15	282	780.375	-498.375

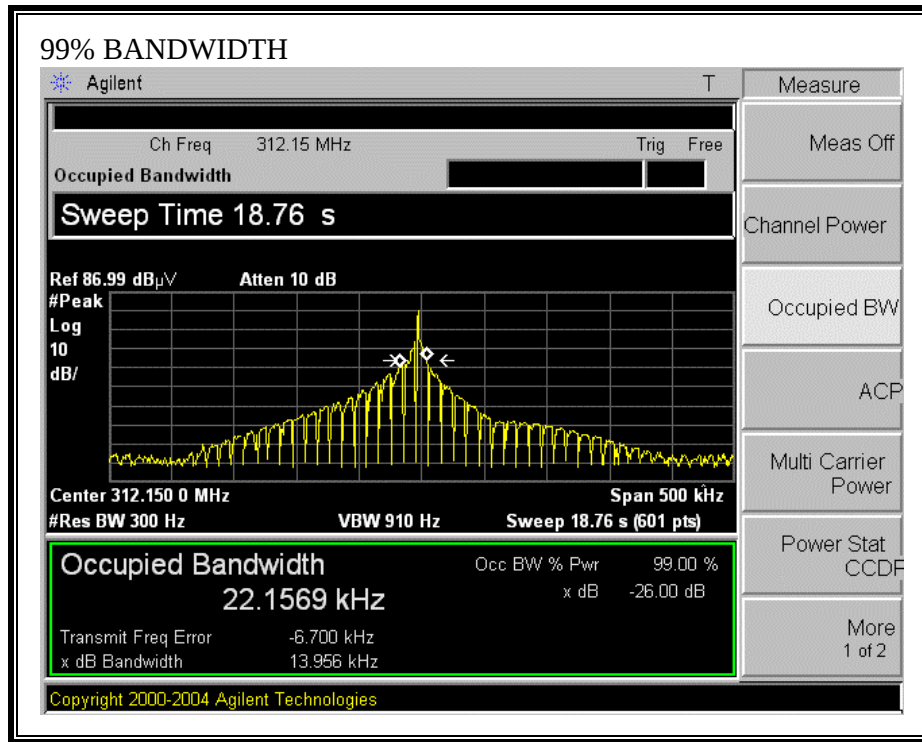
99% Bandwidth

Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
312.15	22.1569	780.375	-758.2181

20dB BANDWIDTH



99% BANDWIDTH



7.2. MAXIMUM MODULATION PERCENTAGE (M%)

LIMIT

§15.35 (c) the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer or radiated field strength. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled and the span is set to 0 Hz. The number of pulses is measured and calculated in a 100 ms scan.

CALCULATION:

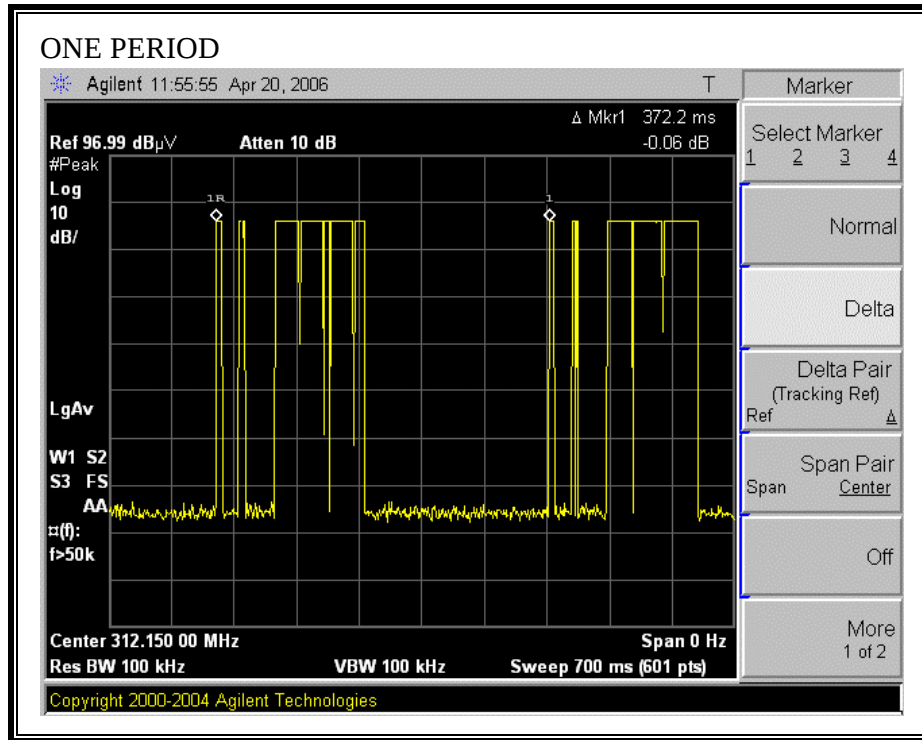
Average Reading = Peak Reading (dBuV/m) + 20log (Duty Cycle), Where Duty Cycle is
(# of long pulses * long pulse width) + (# of short pulses * short pulse width) / 100 or T

RESULTS

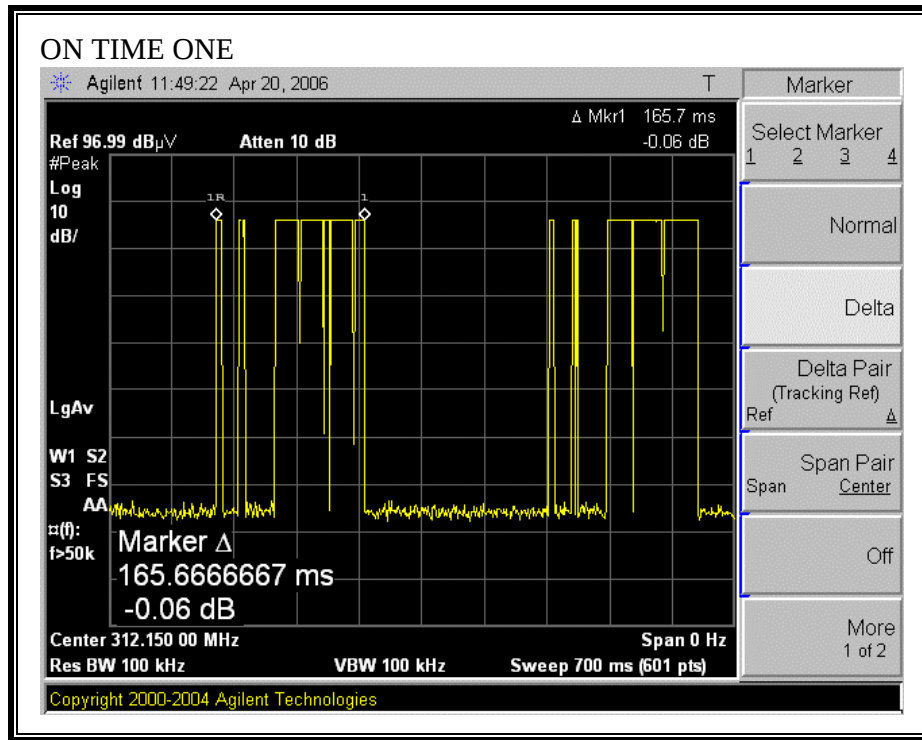
No non-compliance noted:

One Period (ms)	Long Pulse Width (ms)	# of Long Pulses	Short Width (ms)	# of Short Pulses	Duty Cycle	20*Log Duty Cycle (dB)
372.2	1.375	16	0.63	45	0.501	-6.00

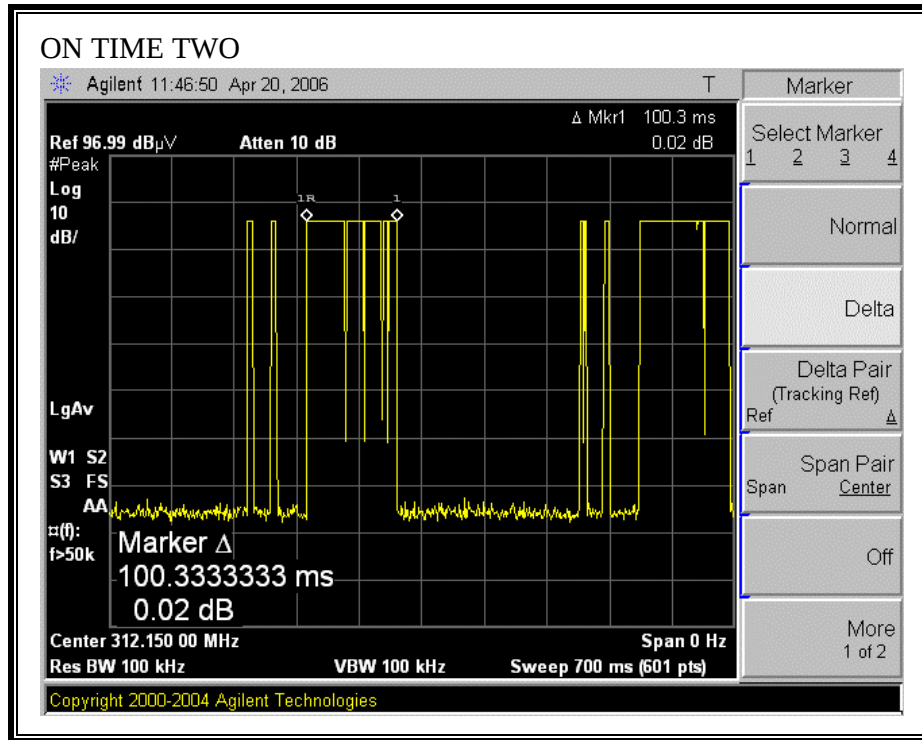
ONE PERIOD



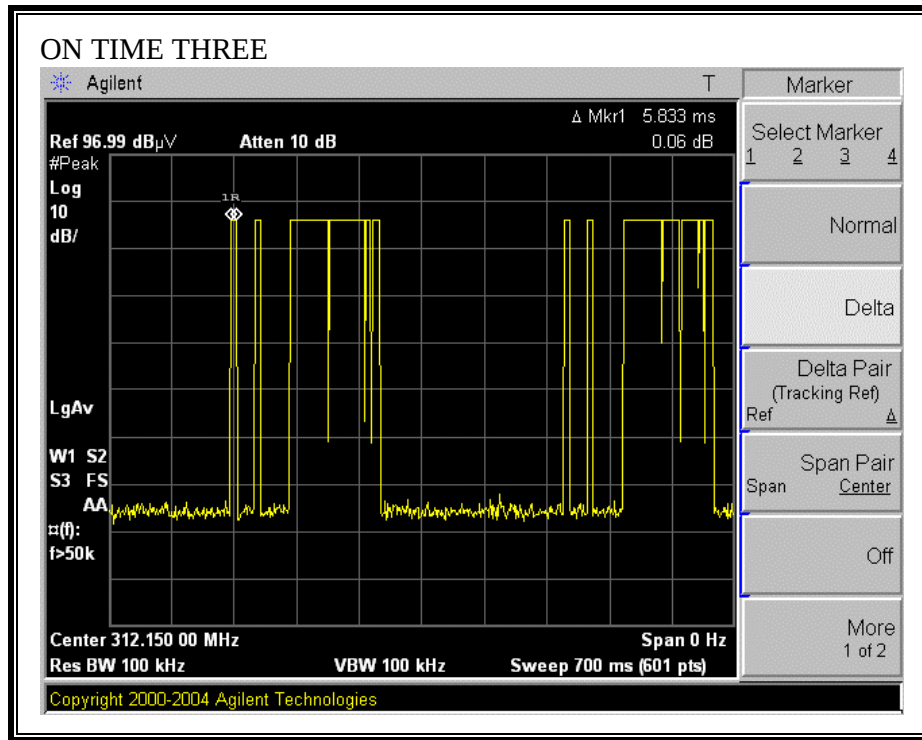
DUTY CYCLE 1



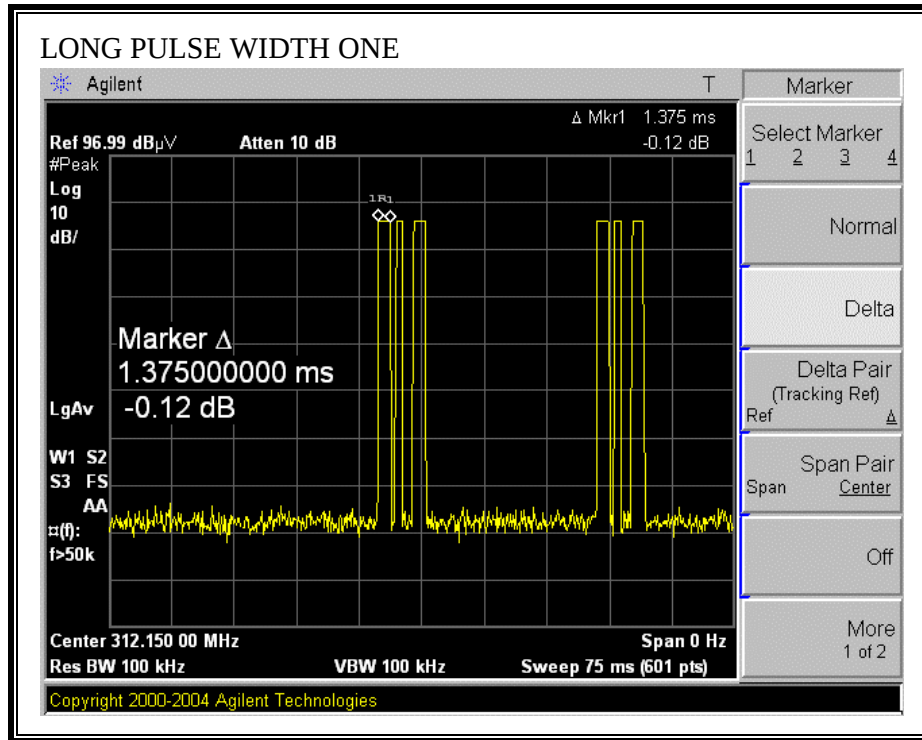
DUTY CYCLE 2



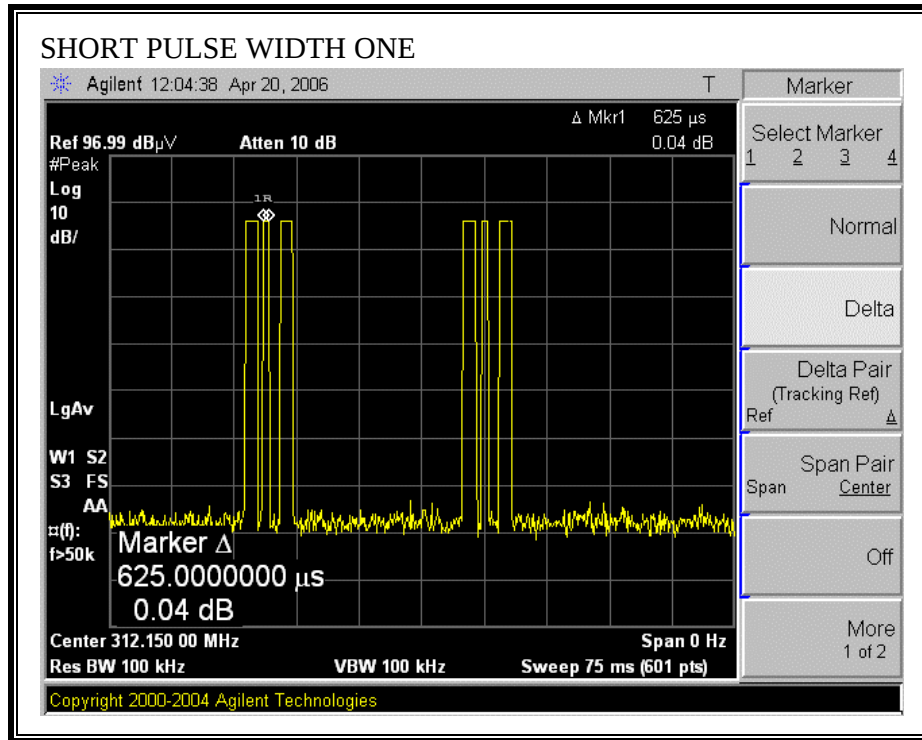
DUTY CYCLE 3



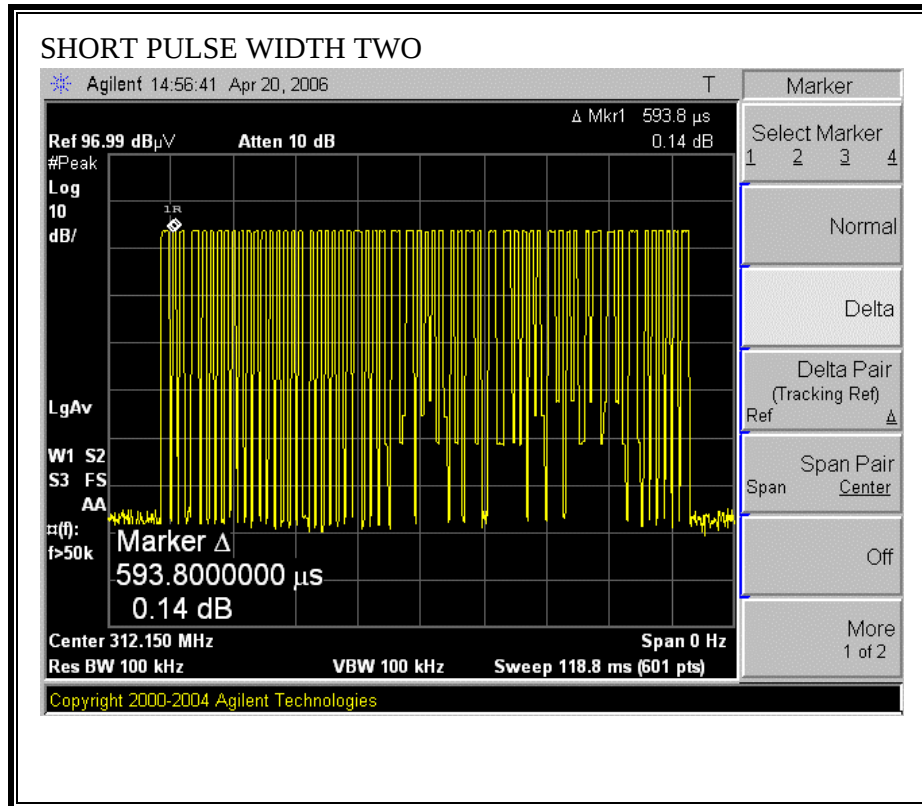
DUTY CYCLE 4



DUTY CYCLE 6



DUTY CYCLE 7



7.3. LESS THAN 5 SECONDS PLOT

LIMIT

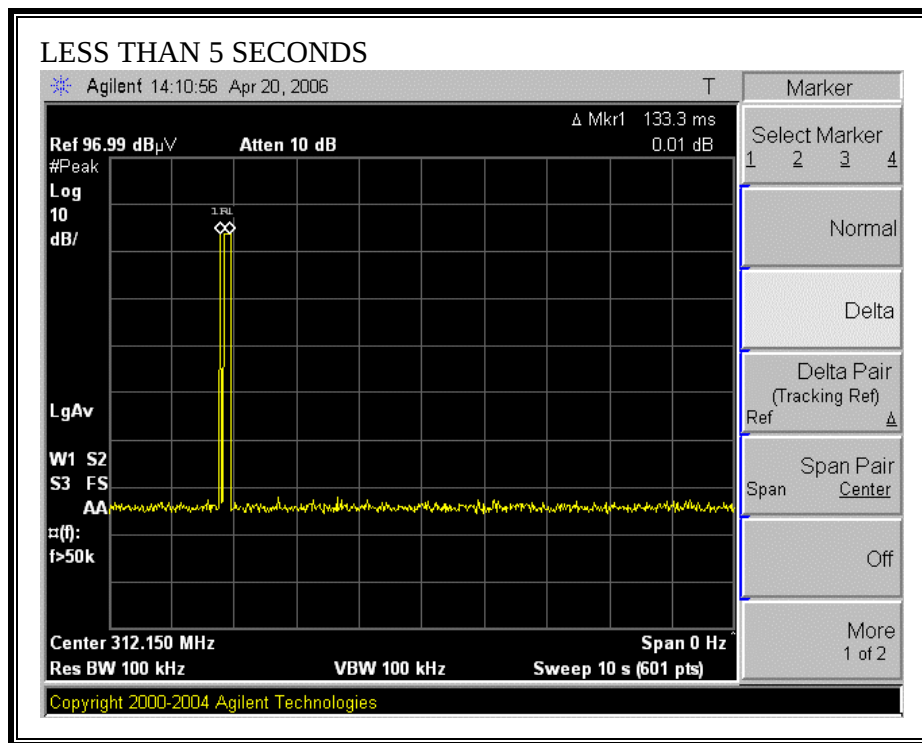
§15.231 (a) (2) a transmitter activated automatically shall cease transmission within 5 seconds after activation.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer or radiated field strength. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is set to 10 seconds and the span is set to 0 Hz.

RESULTS

No non-compliance noted:



7.4. RADIATED EMISSIONS

7.4.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

LIMITS

§15.231 (b) In addition to the provisions of § 15.205, the field strength of emissions from Intentional radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental Frequency (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750 ¹	125 to 375 ¹
174 - 260	3,750	375
260 - 470	3,750 to 12,500 ¹	375 to 1,250 ¹
Above 470	12,500	1,250

¹ Linear interpolation

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

FUNDAMENTAL, HARMONICS AND SPURIOUS EMISSIONS 30 – 1000 MHz



FCC, VCCI, CISPR, CE, AUSTEL, NZ
UL, CSA, TUV, BSMI, DHHS, NVLAP

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Project #: 06J10224
Report #: 060420C1
Date & Time: 04/20/2006, 16:13
Test Engr: Thanh Nguyen

Company: DENSO CORPORATION
EUT Description: SMART CARD KEY
Test Configuration: EUT Stands Alone
Type of Test: FCC 15.231b
Mode of Operation: Transmitting

$$M\% = ((t1+t2+t3+...)/T) * 100\% = 50.10\%$$

$$Av \text{ Reading} = Pk \text{ Reading} + 20 \log(M\%)$$

$$20 * \log(M\%) = -6.00$$

Freq. (MHz)	Pk Rdg (dBuV)	Av Rdg (dBuV)	AF (dB)	Closs (dB)	Pre-amp (dB)	Pk Level (dBuV/m)	Av Level (dBuV/m)	Pk Limit FCC_B	Av Limit FCC_B	Pk Margin (dB)	Avg Margin (dB)	Pol (H/V)	Az (Deg)	Height (Meter)
X-Position (EUT Lay down)														
312.15	88.00	82.00	13.56	2.46	26.48	77.54	71.54	95.45	75.45	-17.91	-3.91	3mV	0.00	1.00
312.15	83.20	77.20	13.56	2.46	26.48	72.74	66.74	95.45	75.45	-22.71	-8.71	3mH	0.00	2.00
Y-Position (EUT Standup)														
312.15	73.70	67.70	13.56	2.46	26.48	63.24	57.24	95.45	75.45	-32.21	-18.21	3mV	0.00	1.00
312.15	72.20	66.20	13.56	2.46	26.48	61.74	55.74	95.45	75.45	-33.71	-19.71	3mH	0.00	2.00
Z-Position (EUT Side Lay down)														
312.15	76.30	70.30	13.56	2.46	26.48	65.84	59.84	95.45	75.45	-29.61	-15.61	3mV	0.00	1.00
312.15	73.90	67.90	13.56	2.46	26.48	63.44	57.44	95.45	75.45	-32.01	-18.01	3mH	0.00	2.00
Worst Position:														
624.29	46.80	40.80	18.82	5.04	27.83	42.83	36.83	75.45	55.45	-32.62	-18.62	3mV	0.00	1.00
624.29	48.50	42.50	18.82	5.04	27.83	44.53	38.53	75.45	55.45	-30.92	-16.92	3mH	0.00	2.00
936.45	46.00	40.00	22.86	8.07	27.08	49.85	43.85	75.45	55.45	-25.60	-11.60	3mV	0.00	1.00
936.45	46.80	40.80	22.86	8.07	27.08	50.65	44.65	75.45	55.45	-24.80	-10.80	3mH	0.00	2.00
1248.60	40.40	34.40	28.04	6.83	25.64	49.63	43.63	75.45	55.45	-25.82	-11.82	3mV	0.00	1.00
1248.60	40.75	34.75	28.04	6.83	25.64	49.98	43.98	75.45	55.45	-25.47	-11.47	3mH	0.00	2.00

[illegible]

7.4.2. RECEIVER SPURIOUS EMISSIONS LIMIT

LIMITS

§15.109 (a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Limits for radiated disturbance of Class B ITE at measuring distance of 3 m	
Frequency range (MHz)	Quasi-peak limits (dB μ V/m)
30 to 88	40
88 to 216	43.5
216 to 960	46
Above 960 MHz	54
Note: The lower limit shall apply at the transition frequency.	

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to receive in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 5th harmonic is investigated with the transmitter set to the middle channel.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

RESULTS

No non-compliance noted:

RECEIVER SPURIOUS EMISSIONS 30MHz - 1GHz (HORIZONTAL)

		561F Monterey Road Morgan Hill, CA 95037 Tel: (408) 463-0888 Fax: (408) 463-0885			
Data#: 6	File#: Denso.EMI	Date: 04-21-2006	Time: 13:47:12		
Audix ATC					
Condition: FCC CLASS-B HORIZONTAL Test Operator : Thanh Nguyen Project # : 06J10224 Company : DENSO Corporation EUT : SMART CARD KEY Model No : 14ABS S/N : 01725 Configuration : EUT and support equipment Mode of operation: Receive mode					
Page: 1					
	Freq	Read Level Factor	Limit Level	Over Limit	Remark
	MHz	dBuV	dB dBuV/m	dBuV/m	dB
1	75.590	23.01	9.14	32.15	40.00 -7.86 Peak
2	124.090	18.04	15.23	33.27	43.50 -10.23 Peak
3	177.440	22.22	13.11	35.33	43.50 -8.17 Peak
4	310.330	24.54	16.00	40.54	46.00 -5.46 Peak
5	390.840	18.13	17.83	35.96	46.00 -10.04 Peak
6	487.840	16.35	20.00	36.35	46.00 -9.65 Peak

RECEIVER SPURIOUS EMISSIONS 30MHz - 1GHz (VERTICAL)

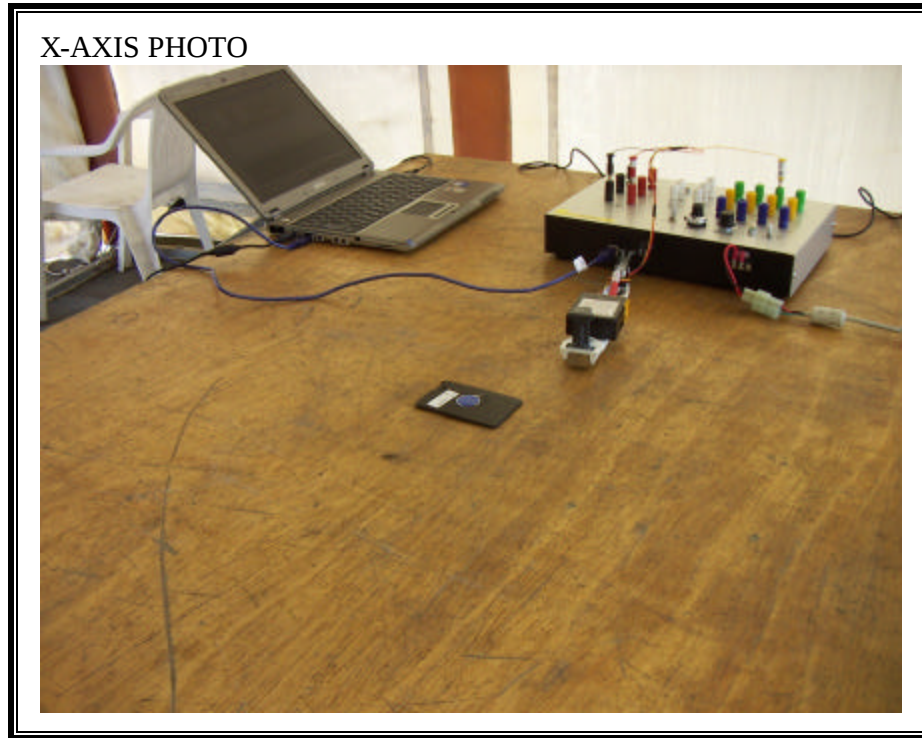
		561F Monterey Road Morgan Hill, CA 95037 Tel: (408) 463-0888 Fax: (408) 463-0885					
Data#: 5	File#: Denso.EMI	Date: 04-21-2006	Time: 13:42:44				
Audix ATC							
Condition: FCC CLASS-B VERTICAL							
Test Operator : Thanh Nguyen							
Project # : 06J10224							
Company : DENSO Corporation							
EUT : SMART CARD KEY							
Model No : 14ABS							
S/N : 01725							
Configuration : Support equipment, no EUT							
Mode of operation: Receive mode							
Page: 1							
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	62.980	27.65	8.90	36.55	40.00	-3.45	Peak
2	200.720	24.13	14.41	38.54	43.50	-4.96	Peak
3	324.880	20.91	16.28	37.19	46.00	-8.81	Peak
4	349.130	20.06	16.89	36.95	46.00	-9.05	Peak
5	523.730	18.17	20.62	38.79	46.00	-7.21	Peak
6	906.880	13.49	26.01	39.50	46.00	-6.50	Peak

RECEIVER SPURIOUS EMISSIONS ABOVE 1GHz

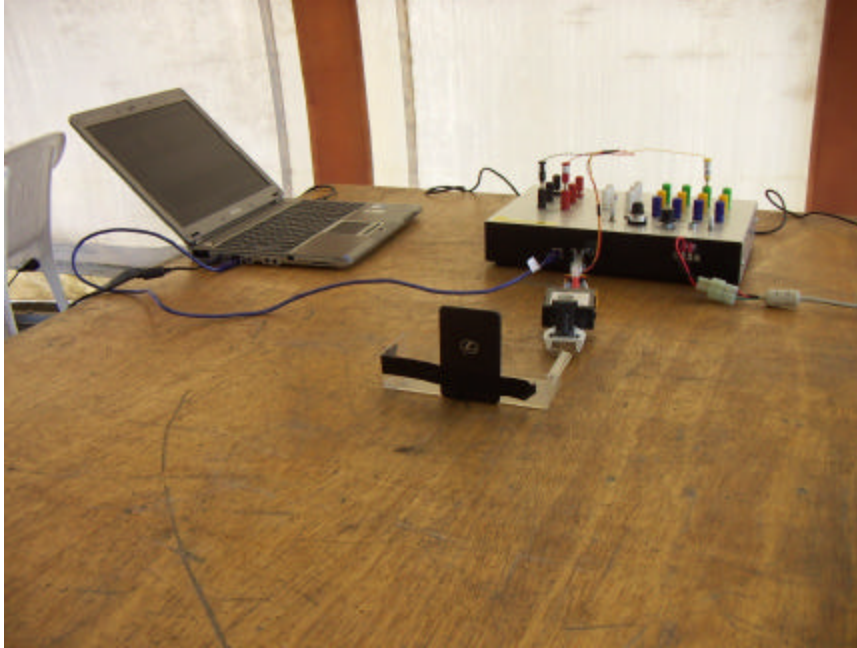
No emissions were found from 1GHz to 10th harmonic.

8. SETUP PHOTOS

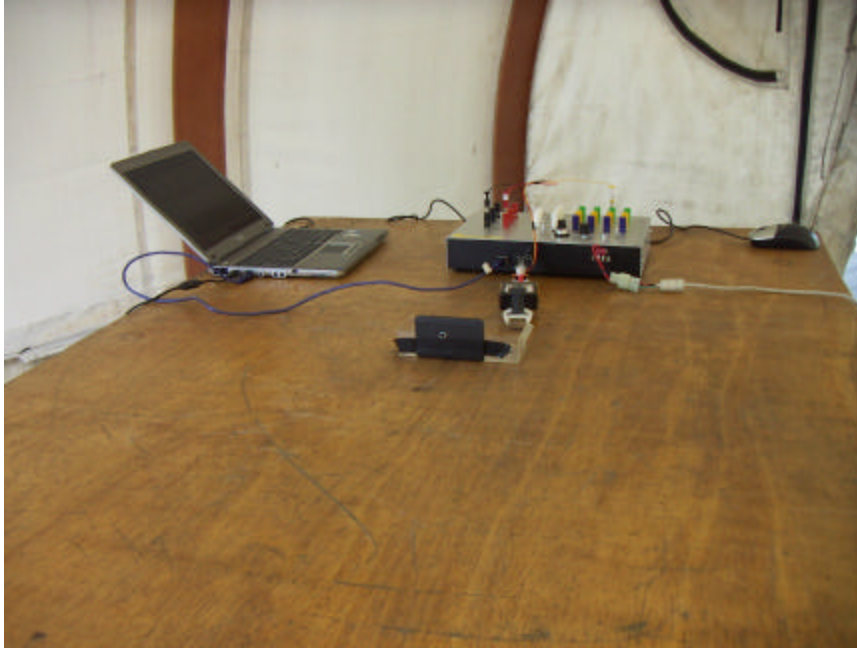
RADIATED RF MEASUREMENT SETUP FOR PORTABLE CONFIGURATION



Y-AXIS PHOTO



Z-AXIS PHOTO



END OF REPORT