FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 7
INDUSTRY CANADA RSS-GEN ISSUE 2

CERTIFICATION TEST REPORT

FOR

SMART CARD KEY

MODEL NUMBER: 14AEF

FCC ID: HYQ14AEF

IC: 1551A-14AEF

REPORT NUMBER: 08J11701-1

ISSUE DATE: APRIL 2, 2008

Prepared for

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

Prepared by

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Revision History

Rev.	Issue Date	Revisions	Revised By
--	04/02/08	Initial Issue	F. Ibrahim

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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: 14AEF

SERIAL NUMBER: CS02133

DATE TESTED: MARCH 31 – APRIL 1, 2008

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	NO NON-COMPLIANCE NOTED
INDUSTRY CANADA RSS-210 ISSUE 7	NO NON-COMPLIANCE NOTED
INDUSTRY CANADA RSS-GEN ISSUE 2	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:

FRANK IBRAHIM
ENGINEERING SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

TOM CHEN
TEST ENGINEER
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, FCC CFR 47 Part 15, RSS-GEN Issue 2, and RSS-210 Issue 7.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

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
Power Line Conducted Emission	+/- 2.3 dB
Radiated Emission	+/- 3.4 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.

5.2. DESCRIPTION OF AVAILABLE ANTENNAS

The device uses an integrated loop antenna for transmitting.

5.3. 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.

5.4. WORST-CASE CONFIGURATION AND MODE

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

5.5. DETAILS OF TESTED SYSTEM

SUPPORT EQUIPMENT & PERIPHERALS

TEST PERIPHERALS				
Device Type	**Manufacturer**	**Model Number**	**Serial Number**	**FCC ID**
Laptop PC	Dell	PP04S	CN-0P5792-36521-541-207F	DoC
AC Adapter	Dell	PA1650-05D2	CN-0F7970-71615-34BC	DoC
Check Bench	Denso	NA	NA	NA
Oscillator	Toyota	89991-68050	4L09	NA
Antenna (Door Handle)	NA	NA	NA	NA
AC Adapter	FUTABA	RC45-12	7206	NA

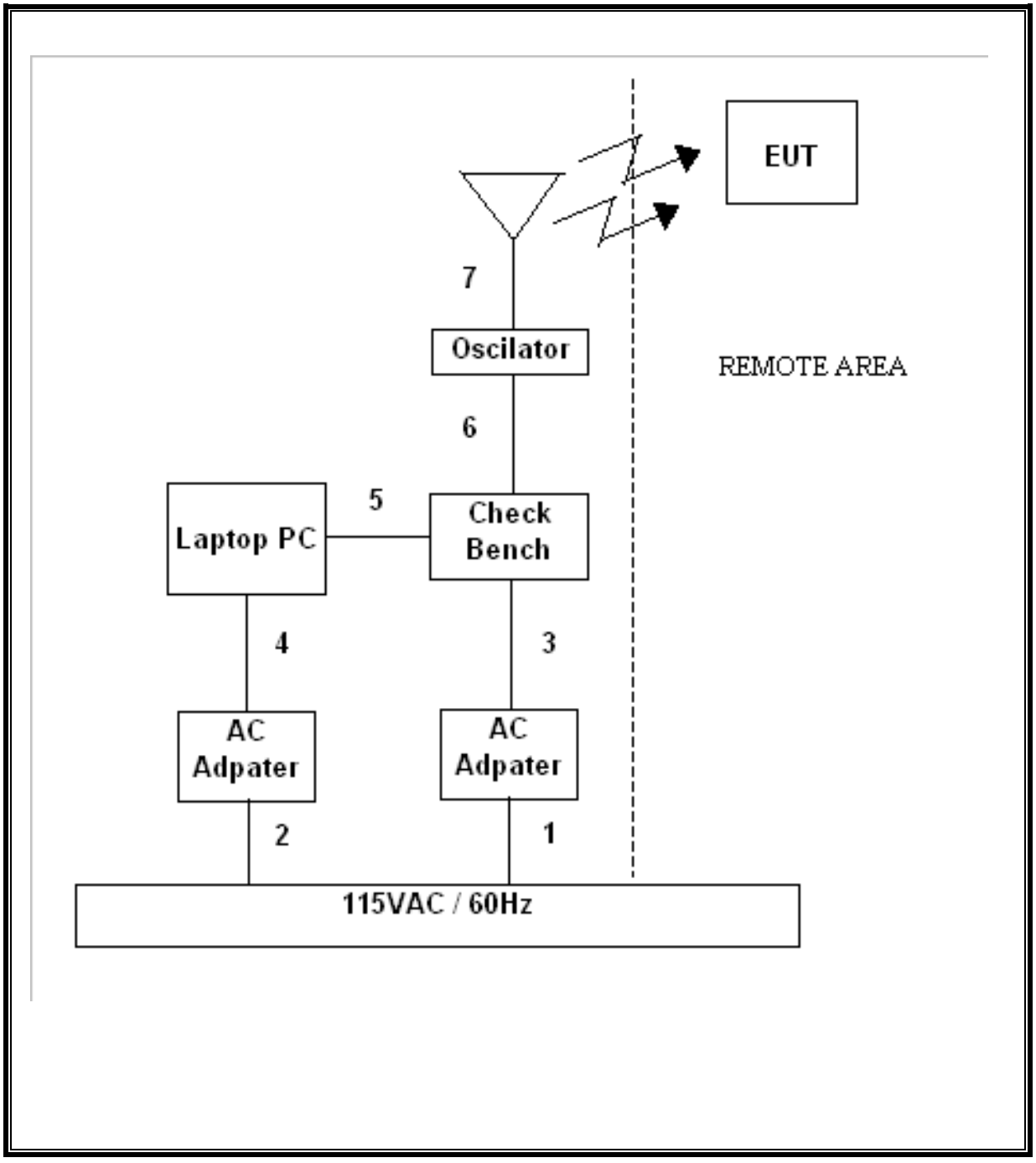
I/O CABLES

TEST I/O CABLES						
Cable No	**I/O Port**	**# of I/O Port**	**Connector Type**	**Type of Cable**	**Cable Length**	**Remark**
1	AC	1	AC	Un-shielded	1m	N/A
2	AC	1	AC	Un-shielded	1m	N/A
3	DC	1	DC	Un-shielded	1.5m	N/A
4	DC	1	DC	Un-shielded	0.5m	N/A
5	USB	1	USB	Un-shielded	1m	N/A
6	Oscilator	3	Jack	Un-shielded	0.5m	N/A
7	Antenna	1	Door Handle	Un-shielded	0.5m	N/A

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 PC are used to control the EUT.

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**	**Asset**	**Cal Date**	**Cal Due**
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01016	09/28/07	09/28/08
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	10/03/06	09/27/08
Antenna, Horn, 18 GHz	EMCO	3115	C00872	04/15/07	04/15/08
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/14/06	03/18/08

7. ANTENNA PORT TEST RESULTS

7.1. 20 dB AND 99% BANDWIDTH

LIMIT

FCC §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.

IC A1.1.3
For the purpose of Section A1.1, the 99% Bandwidth shall be no wider than 0.25% of the center frequency for devices operating between 70-900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency.

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 300 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:

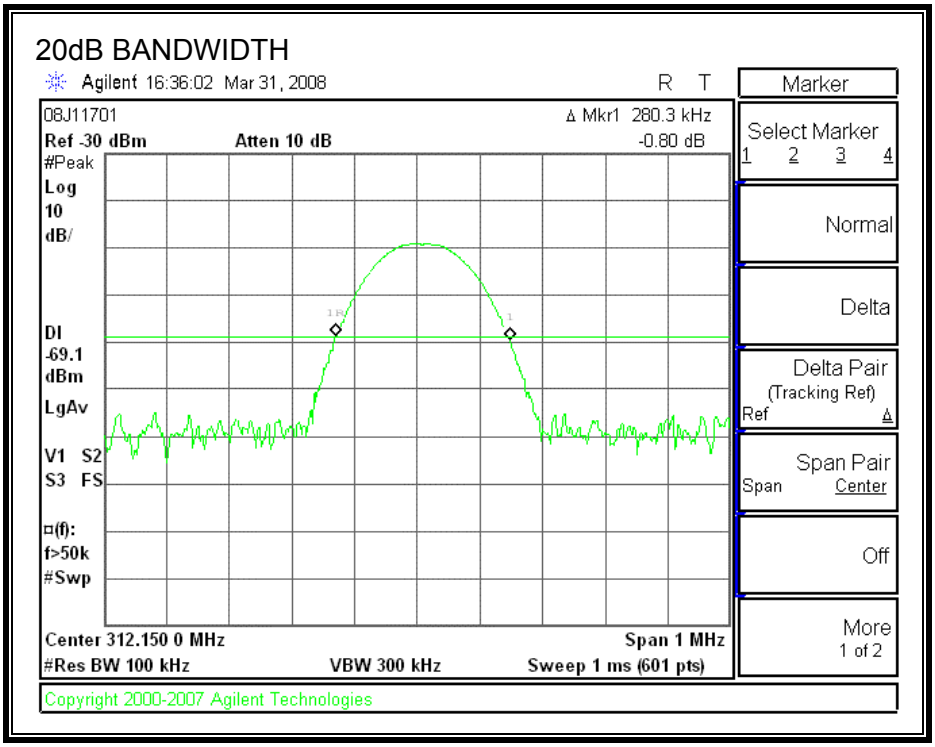
20dB Bandwidth

Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
312.15	280.3	780.375	-500.075

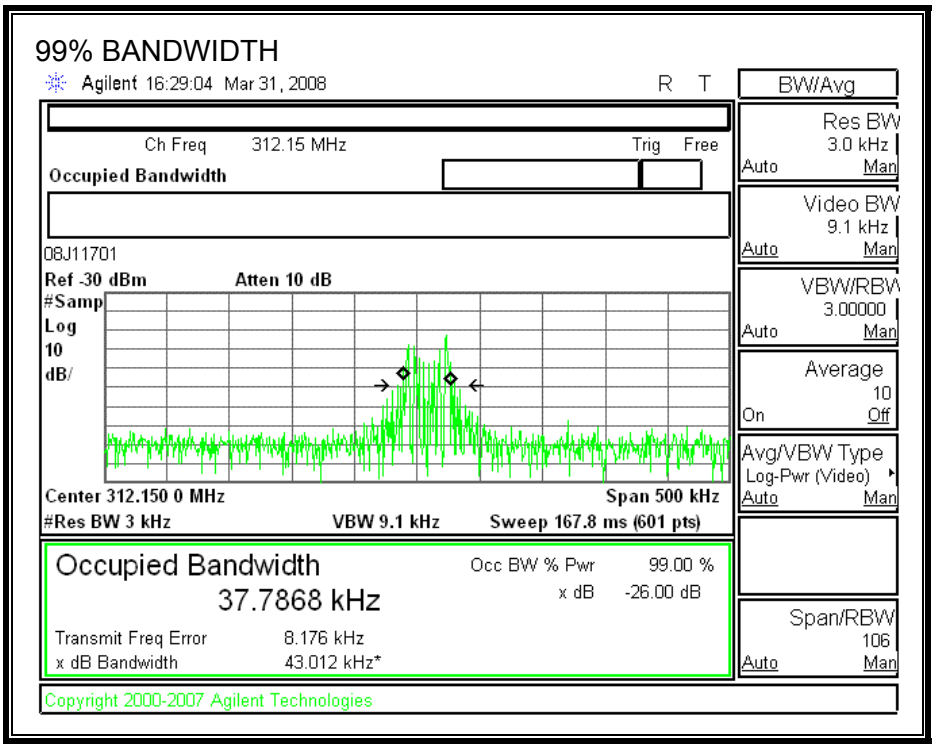
99% Bandwidth

Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
312.15	37.7868	780.375	-742.5882

20dB BANDWIDTH



99% BANDWIDTH



7.2. DUTY CYCLE

LIMIT

FCC §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:

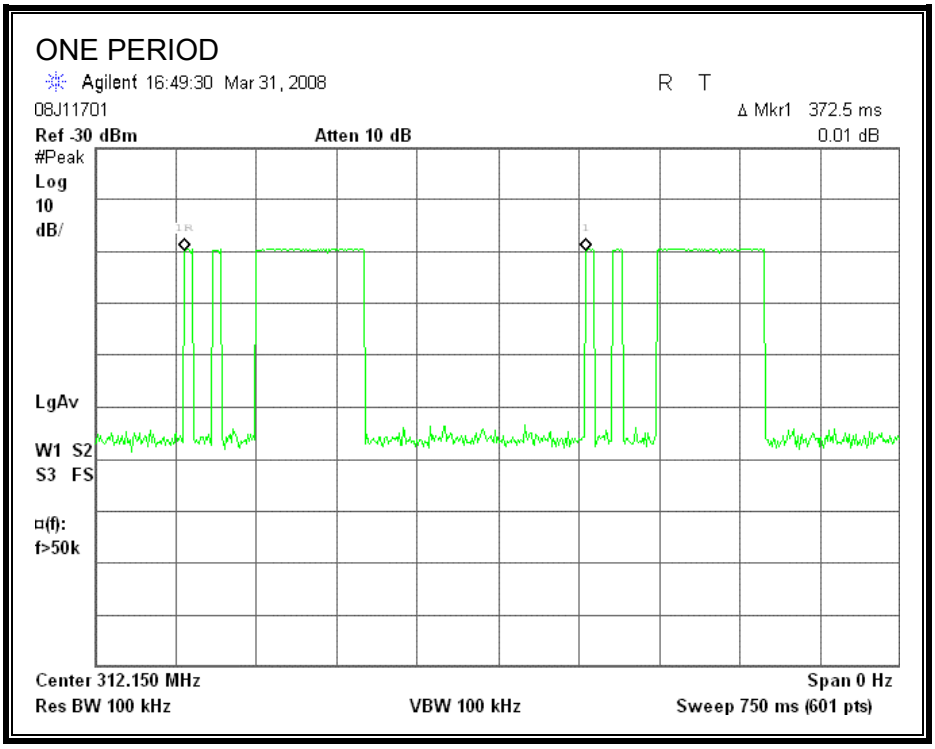
Average Reading = Peak Reading (dBuV/m) + 20log (Duty Cycle), Where Duty Cycle is
(# of long pulses * long pulse width) + (# of short pulses * short pulse width) / 100 or T

RESULTS

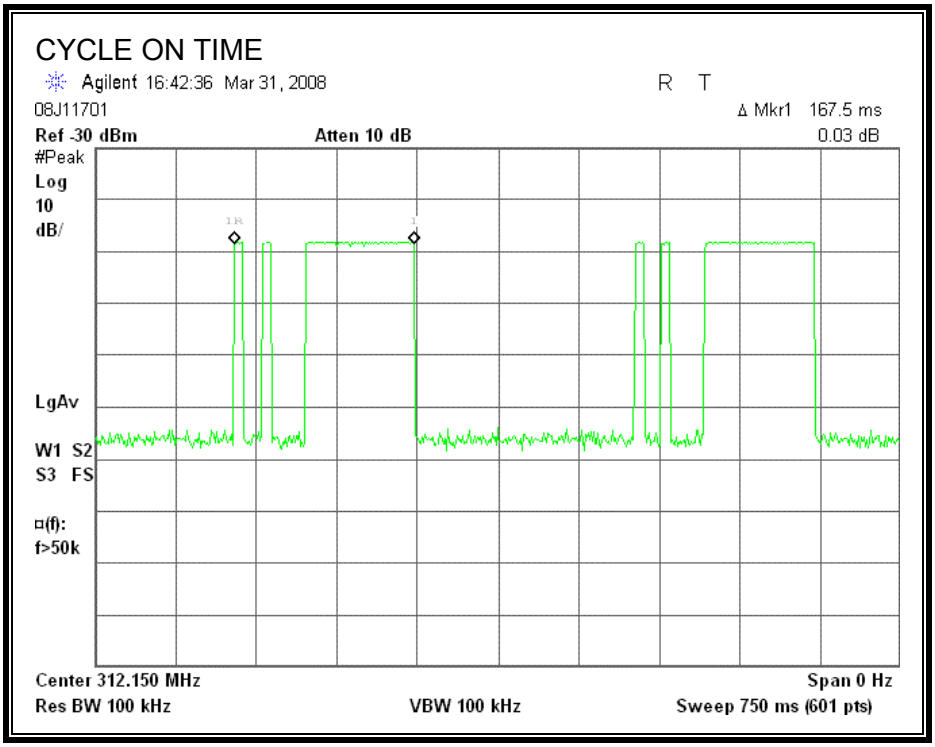
No non-compliance noted:

One Period (ms)	Long Pulse Width (ms)	# of Long Pulses	Short Width (ms)	# of Short Pulses	Duty Cycle	20*Log Duty Cycle (dB)
372.5	100.5	1	7.50	2	1.000	0.00

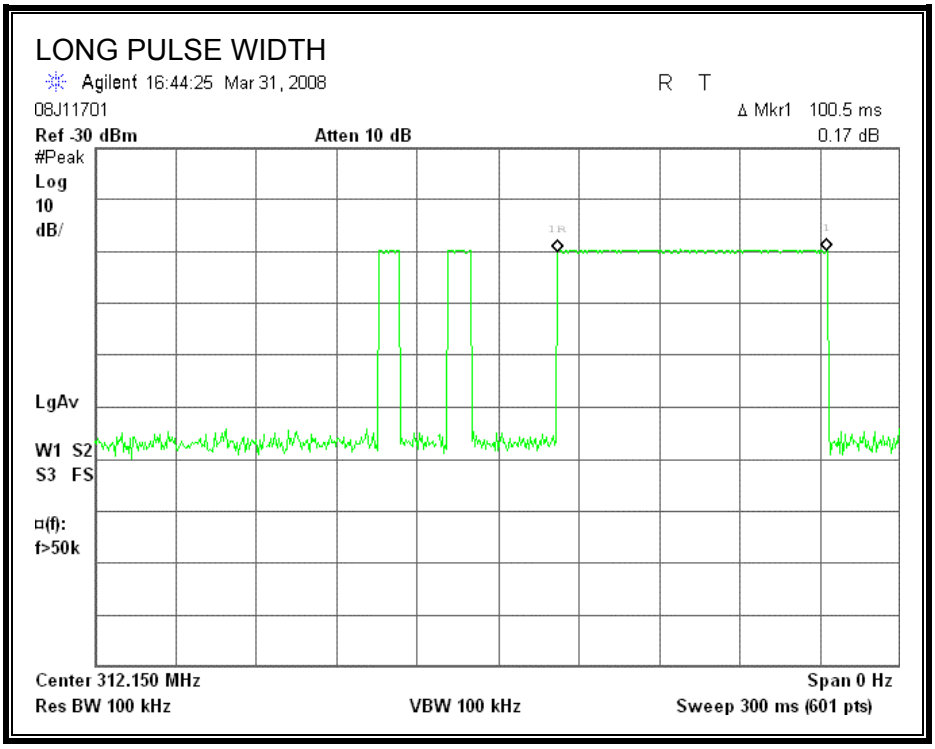
ONE PERIOD



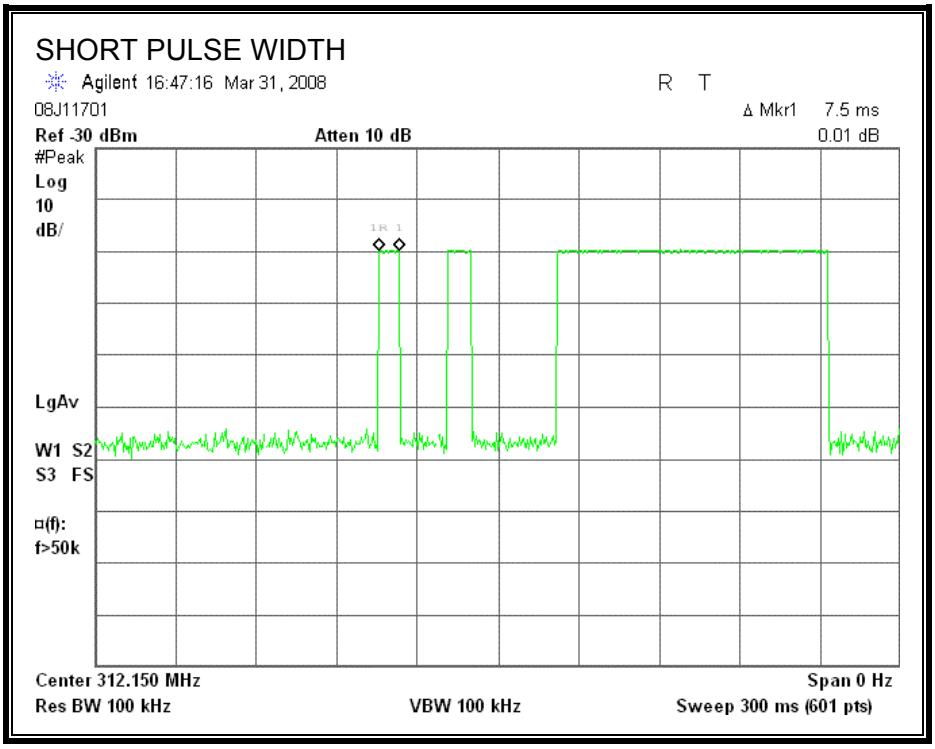
CYCLE ON TIME



LONG PULSE WIDTH



SHORT PULSE WIDTH



7.3. TRANSMISSION TIME

LIMIT

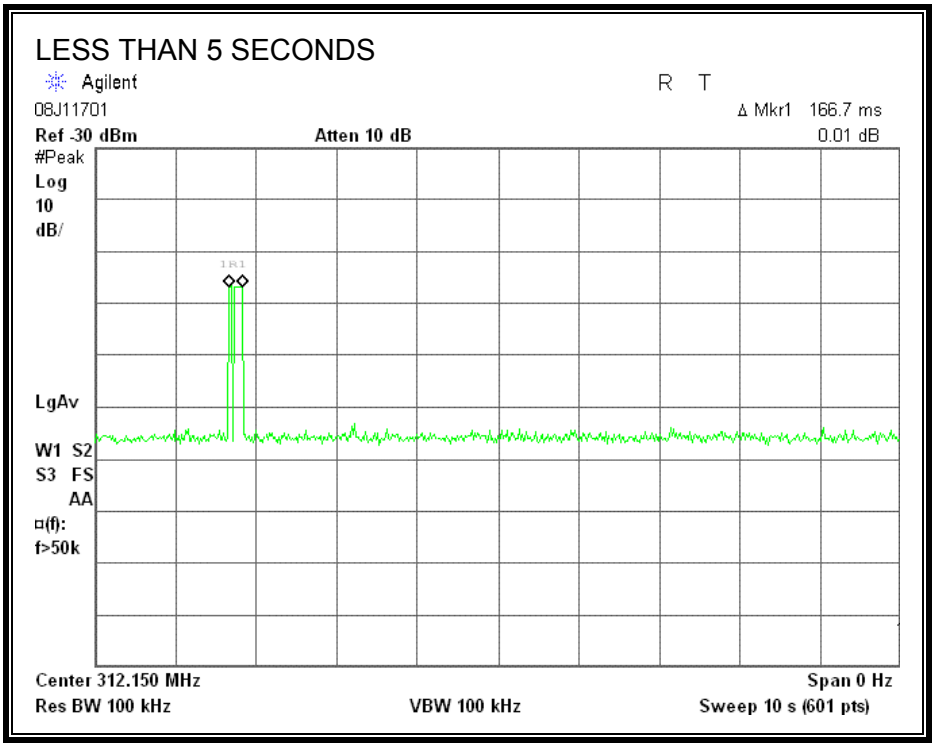
FCC §15.231 (a) (2)
IC A1.1.1 (b)
A transmitter activated automatically shall cease transmission within 5 seconds after activation.

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:



8. RADIATED EMISSION RESULTS

8.1. TRANSMITTER RADIATED SPURIOUS EMISSION

LIMITS

FCC §15.231 (b)
IC A1.1.2
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 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	([2])
13.36 – 13.41	322 - 335.4		

[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

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Project #:	08J11701
Report #:	08J11701-1
Date& Time:	03/31/08
Test Engr:	Tom Chen

Company:	DENSO
EUT Description:	Smart Card Key
Test Configuration :	EUT Stand Alone
Type of Test:	FCC 15.231b
Mode of Operation:	Transmitting

M% = ((t1+t2+t3+...)/T)= 100.00%

Av Reading = Pk Reading + 20*log(M%)
20 * log (M%) = 0.00

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	35.69	35.69	17.00	1.82	0.00	54.51	54.51	95.45	75.45	-40.94	-20.94	3mV	0.00	1.50
312.15	44.78	44.78	17.00	1.82	0.00	63.60	63.60	95.45	75.45	-31.85	-11.85	3mH	0.00	1.00
Y-Position (EUT Standup)														
312.15	41.11	41.11	17.00	1.82	0.00	59.93	59.93	95.45	75.45	-35.52	-15.52	3mV	0.00	2.00
312.15	38.22	38.22	17.00	1.82	0.00	57.04	57.04	95.45	75.45	-38.41	-18.41	3mH	0.00	1.00
Z-Position (EUT Side Lay down)														
312.15	41.60	41.60	17.00	1.82	0.00	60.42	60.42	95.45	75.45	-35.03	-15.03	3mV	0.00	2.00
312.15	40.95	40.95	17.00	1.82	0.00	59.77	59.77	95.45	75.45	-35.68	-15.68	3mH	0.00	1.20
Worst Position: X														
624.30	27.00	27.00	22.65	2.83	0.00	52.48	52.48	75.45	55.45	-22.97	-2.97	3mV	0.00	1.60
624.30	28.00	28.00	22.65	2.83	0.00	53.48	53.48	75.45	55.45	-21.97	-1.97	3mH	0.00	1.20

HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Denso
Project #: 08J11701
Date: 3/31/2008
Test Engineer: Tom Chen
Configuration: EUT With Support NB PC
Mode: TX On

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T120; S/N: 29310 @3m	T144 Miteq 3008A00931			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		C-5m Chamber		

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.247	3.0	58.3	58.3	26.7	3.0	-39.1	0.0	0.0	48.8	48.8	75.45	55.45	-26.6	-6.6	V
1.556	3.0	39.0	39.0	27.8	0.0	-38.7	0.0	0.0	28.1	28.1	75.45	55.45	-47.4	-27.4	V
1.247	3.0	60.5	60.5	26.7	0.0	-39.1	0.0	0.0	48.0	48.0	75.45	55.45	-27.4	-7.4	H
1.556	3.0	48.3	48.3	27.8	0.0	-38.7	0.0	0.0	37.4	37.4	75.45	55.45	-38.1	-18.1	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

8.2. RECEIVER RADIATED SPURIOUS EMISSION

LIMITS

IC RSS-Gen Issue 2, section 7.2.3.2

All spurious emissions shall comply with the limits shown below:

Limits for radiated disturbance of Class B ITE at measuring distance of 3 m	
Frequency range (MHz)	Quasi-peak limits (dBµV/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

No RX spurious was detected above the system noise floor level.

HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz

No RX spurious was detected above the system noise floor level.