EMI TEST REPORT

Test Report No. : 23FE0039-HO-1

Applicant	:	**DENSO CORPORATION**
Type of Equipment	:	**Electronic Key**
Model No.	:	**12BZE**
Test standard	:	**FCC Part 15 Subpart C Section15.209 and Section 15.231**
FCC ID	:	**HYQ12BZE**
Test Result	:	**Complied**

1. This test report shall not be reproduced in full or partial, without the written approval of A-Pex International Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with above regulation. We hereby certify that the data contain a true representation of the EMC profile.
4. The test results in this report are traceable to the national or international standards.
5. This test report does not constitute an endorsement by NIST/NVLAP or U.S. Government.

Date of test : February 24, 2003

Tested by : Y. Iwasa
Yoshiaki Iwasa
EMC Head Office Division

Approved by : T. Maeno
Tetsuo Maeno
Site Operation manager of EMC Head Office Division

A-Pex International Co., Ltd.
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SECTION 1: Client information

Company name	:	DENSO CORPORATION
Brand name	:	DENSO
Address	:	1-1 Syowa-cho, Kariya-city, Aichi-prefecture, 448-8661, Japan
Telephone Number	:	+81-566-61-2537
Facsimile Number	:	+81-566-25-4915
Contact Person	:	Mitsugi Ohtsuka

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment	:	Electronic Key
Model No.	:	12BZE
Rating	:	3V DC (One lithium battery)
Country of Manufacture	:	Japan
Receipt Date of Sample	:	February 24, 2003
Condition of EUT	:	Engineering prototype

2.2 Product Description

DENSO CORPORATION, Model: 12BZE (referred to as the EUT in this report) is the Keyless Entry System (Transmitter). This system is mainly used for locking or unlocking the doors of the vehicle. The transmitter sends a radio wave signal while the bottom is pushed. The receiver becomes active in response to the signal from the transmitter.

Frequency Operation	: 314.00MHz
Oscillator frequency	: 314.00MHz SAW resonator circuit
Type of Modulation	: A1D
Antenna Type	: Built-in type (Fixed)

SECTION 3: Test specification, procedures and results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.209 Radiated emission limits, general requirements
Section 15.231 Periodic operation in the band 40.66 – 40.70MHz
and above 70MHz

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Deviation	Worst margin	Results
1	Automatically Deactivate	ANSI C63.4:2001	Section 15.231(a)(1)	N/A	-	Complied
2	Electric Field Strength of Fundamental Emission	ANSI C63.4:2001	Section 15.231(b)	N/A	6.6dB 314.01MHz Horizontal	Complied
3	Electric Field Strength of Spurious Emission	ANSI C63.4:2001	Section 15.205 Section 15.209 Section 15.231(b)	N/A	4.2dB 2198.07MHz Vertical	Complied
4	-20dB Bandwidth	ANSI C63.4:2001	Section 15.231(c)	N/A	-	Complied

3.3 Additions to standards

No addition, deviation or exclusion has been made from standards.

3.4 Confirmation

A-Pex International Co., Ltd. hereby confirms that E.U.T. , in the configuration tested, complies with the specifications FCC Part15 Subpart C Section 15.209 and Section 15.231.

3.5 Uncertainty

Radiated Emission Test
The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is ±4.5dB.
The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is ±5.2dB.
The measurement uncertainty (with a 95% confidence level) for this test using Horn Antenna is ±6.6dB.
■The data listed in this test report may exceed the test limit because it does not have enough margin.
□The data listed in this test report has enough margin.

3.6 Test Location

A-Pex International Co., Ltd. EMC Head Office Division. No.2 semi anechoic chamber, 7.5 x 5.8 x 5.2m.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8116 Facsimile: +81 596 24 8124
This site has been fully described in a report submitted to FCC office, and listed on June 05, 2002 (Registration number: 846015).
Industry Canada number: IC4247-2

*NVLAP Lab. code: 200572-0

3.7 Test setup, Data of EMI and Test instruments

Refer to APPENDIX 1 to 3.

SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

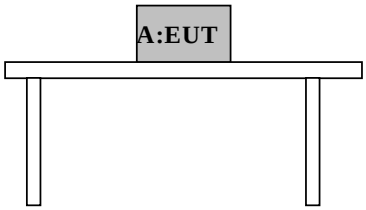
The EUT exercise program used during radiated testing was designed to exercise the various system components in a manner similar to typical use.
The operating mode/system was as follows:

Operation mode : Transmitting

Justification : The system was configured in typical fashion (as a customer would normally use it) for testing.

4.2 Configuration and peripherals

Front View



***** Test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	FCC ID
A	Electronic Key (Transmitter)	12BZE	EM53	DENSO CORPORATION	HYQ12BZE

SECTION 5: Radiated emission (Fundamental and Spurious Emission)

5.1 Operating environment

The test was carried out in No.2 semi anechoic chamber, 7.5 x 5.8 x 5.2m.

Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane.
The EUT was set on the center of the tabletop.
Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.
A drawing of the set up is shown in the photos of APPENDIX 1.

5.3 Test conditions

Frequency range : 30MHz-3200MHz
Test distance : 3m
EUT position : Tabletop
EUT operation mode : Transmitting

5.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on No.2 semi anechoic chamber with a ground plane and at a distance of 3m.
Measurements were performed with a Quasi-peak and peak detector (Below 1GHz), Average and Peak detector (Above 1GHz).
The measuring antenna height was varied between 1 to 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
The measurements were performed for both vertical and horizontal antenna polarization.
The radiated emission measurements were made with the following detector function of the test receiver.

	Below 1GHz	Above 1GHz
Detector Type	Quasi-peak/Peak	Average/Peak
IF Bandwidth	120kHz	1MHz

-The noise was measured at each position of all three axes X, Y and Z to compare the level, and the maximum noise level was recorded.
-The relative measurements were performed on the fundamental and the spurious emissions with each conduction of the key folded and the key set up. The key set-up condition was worse case under both the fundamental and the spurious emissions, we, therefore, tested while the key was set up. See the photograph.
-The reading level was reduced by 6.8dB for comparison to the limits as this EUT had 45.6% duty cycle.
See the data in APPENDIX 3.

5.5 Results

Summary of the test results: Pass
Date: February 24, 2003 Tested by: Yoshiaki Iwasa

APPENDIX 1: Photographs of test setup

APPENDIX 2: Test instruments

APPENDIX 3: Data of EMI test

APPENDIX 1: Photographs of test setup

Radiated emission(Worst case position)

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APPENDIX 2
Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Test Item	Calibration Date * Interval(month)
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	RE	2002/11/01 * 12
MAEC-02	Anechoic Chamber	TDK	Semi Anechoic Chamber 3m	RE	2002/04/12 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	RE	2002/12/24 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	RE	2002/05/02 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	RE	2002/05/09 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2002/05/02 * 12
MOS-02	Digital Humidity Indicator	N.T	NT-1800	RE	2002/12/10 * 12
MPA-04	Pre Amplifier	Agilent	8447D	RE	2002/03/13 * 12
MSA-02	Spectrum Analyzer	Advantest	R3265A	RE	2002/09/20 * 12
MTR-02	Test Receiver	Rohde & Schwarz	ESCS30	RE	2003/01/31 * 12
MHA-05	Horn Antenna	Schwarzbeck	BBHA9120D	RE	2003/01/11 * 12
MPA-01	Pre Amplifier	Agilent	8449B	RE	2003/02/08 * 12
MCC-05	Microwave Cable	Storm	421-011	RE	2003/01/14 * 12
MCC-06	Microwave Cable	Storm	421-011	RE	2003/01/14 * 12

All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

Test Item:

RE: Radiated emission

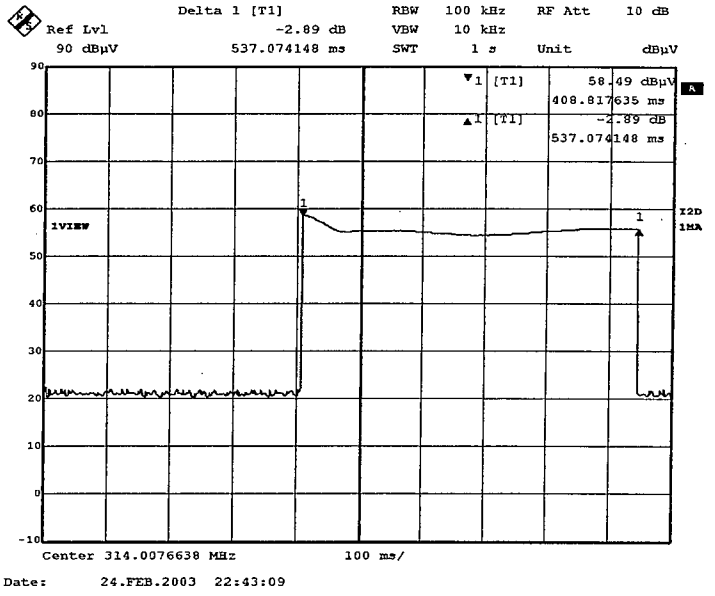
DATA OF AUTOMATICALLY DEACTIVATE

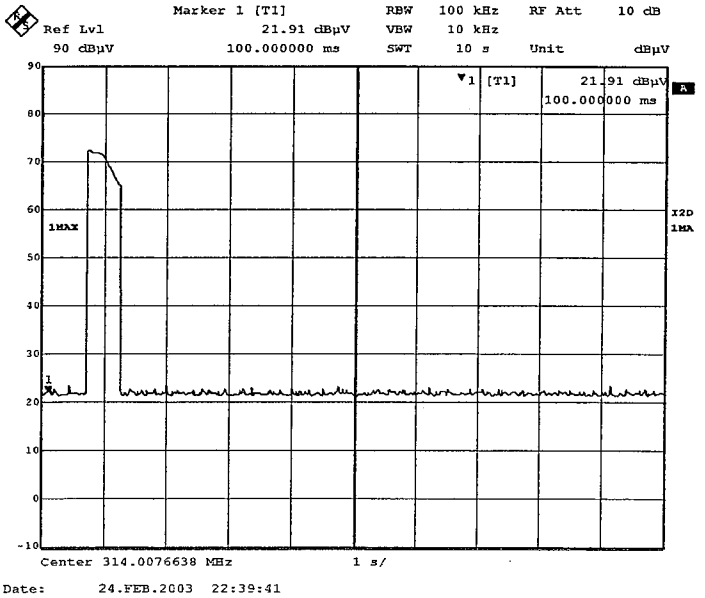
A-Pex International Co., Ltd.
EMC HEAD OFFICE DIVISION No.2 SEMI ANECHOIC CHAMBER

COMPANY	: DENSO CORPORATION	REPORT NO	: 23FE0039-HO - 1
EQUIPMENT	: Electronic Key (Transmitter)	REGULATION	: Fcc Part15 Subpart C 231(b) / 205
MODEL	: 12BZE	TEST DISTANCE	: -
S/N	: EM53	DATE	: 02/24/2003
FCC ID	: HYQ12BZE	TEMPERATURE	: 25℃
IC No.	: 1551A-12BZE	HUMIDITY	: 32%
POWER	: DC3.0V		
Mode	: Transmitting		

ENGINEER : Yoshiaki Iwasa

Time of Transmitting [sec]	Limit [sec]	Result
0.54	5.00	Pass





DATA OF RADIATED EMISSIONS

A-pex International Co., Ltd.
EMC HEAD OFFICE DIVISION No.2 SEMI ANECHOIC CHAMBER

COMPANY : DENSO CORPORATION
EQUIPMENT : Electronic Key (Transmitter)
MODEL : 12BZE
S/N : EM53
FCC ID : HYQ12BZE
IC Number : 1551A-12BZE
POWER : DC3.0V
Mode : Transmitting

REPORT NO : 23FE0039-HO-1
REGULATION : Fcc Part15 Subpart C 231(b) / 205
TEST DISTANCE : 3m
DATE : 02/24/2003
TEMPERATURE : 25℃
HUMIDITY : 32%

ENGINEER : Yoshiaki Iwasa

No.	FREQ	T/R READING : PK		ANT	AMP	LOSS	Duty	RESULT		Limit	MARGIN	
		HOR	VER	Factor	GAIN		Factor	HOR	VER		HOR	VER
	[MHz]	[dBuV/m]		[dB]	[dB]	[dB]	[dB]	[dBuV/m]		[dBuV/m]	[dB]	[dB]
1	314.01	79.2	75.0	14.8	26.3	8.1	-6.8	69.0	64.8	75.6	6.6	10.8

No.	FREQ	T/R READING : QP		ANT	AMP	LOSS	Duty	RESULT		Limit	MARGIN	
		HOR	VER	Factor	GAIN		Factor	HOR	VER		HOR	VER
	[MHz]	[dBuV/m]		[dB]	[dB]	[dB]	[dB]	[dBuV/m]		[dBuV/m]	[dB]	[dB]
2	628.02	36.8	34.2	19.1	27.7	9.4	0.0	37.6	35.0	55.6	18.0	20.6
3	942.03	31.7	29.1	22.7	27.0	10.0	0.0	37.5	34.9	55.6	18.2	20.8

No.	FREQ	T/R READING : PK		ANT	AMP	LOSS	Duty	RESULT		Limit	MARGIN	
		HOR	VER	Factor	GAIN		Factor	HOR	VER		HOR	VER
	[MHz]	[dBuV/m]		[dB]	[dB]	[dB]	[dB]	[dBuV/m]		[dBuV/m]	[dB]	[dB]
4	1256.04	46.2	47.3	23.5	37.3	10.8	0.0	43.2	44.3	75.6	32.4	31.3
5	1570.05	45.7	46.2	25.2	37.1	11.3	0.0	45.1	45.6	74.0	28.9	28.4
6	1884.06	45.8	49.6	29.2	36.9	11.7	0.0	49.9	53.7	75.6	25.7	21.9
7	2198.07	50.3	54.3	30.7	36.8	12.1	0.0	56.4	60.3	75.6	19.2	15.3
8	2512.08	47.3	46.2	30.8	36.7	12.5	0.0	53.8	52.7	75.6	21.8	22.9
9	2826.09	46.5	47.8	31.9	36.8	12.8	0.0	54.5	55.8	74.0	19.5	18.2
10	3140.10	44.8	46.1	32.2	36.8	13.2	0.0	53.4	54.6	75.6	22.3	21.0

No.	FREQ	T/R READING : AV		ANT	AMP	LOSS	Duty	RESULT		Limit	MARGIN	
		HOR	VER	Factor	GAIN		Factor	HOR	VER		HOR	VER
	[MHz]	[dBuV/m]		[dB]	[dB]	[dB]	[dB]	[dBuV/m]		[dBuV/m]	[dB]	[dB]
4	1256.04	32.9	33.4	23.5	37.3	10.8	0.0	29.9	30.4	55.6	25.7	25.2
5	1570.05	32.4	32.4	25.2	37.1	11.3	0.0	31.8	31.8	54.0	22.3	22.2
6	1884.06	32.1	34.1	29.2	36.9	11.7	0.0	36.2	38.2	55.6	19.4	17.4
7	2198.07	38.7	45.3	30.7	36.8	12.1	0.0	44.8	51.4	55.6	10.8	4.2
8	2512.08	35.7	31.6	30.8	36.7	12.5	0.0	42.2	38.1	55.6	13.4	17.5
9	2826.09	33.0	36.0	31.9	36.8	12.8	0.0	40.9	43.9	54.0	13.1	10.1
10	3140.10	31.6	32.9	32.2	36.8	13.2	0.0	40.1	41.4	55.6	15.5	14.2

REMARKS
ANTENNA TYPE:30-300MHz Biconical / 300-1000MHz Logperiodic / 1-3.2GHz Horn
CALCULATION RESULT=Reading + ANT Factor - Amp Gain + LOSS (Cable+ ATTEN.)+Duty factor
*Except for the above table : All other spurious emissions were less than 20dB for the limit.
*EUT was placed in X axis when the measurement antenna was positioned horizontally.
*EUT was placed in Y axis when the measurement antenna was positioned vertically.
*The noise was measured at each position of all three axes X, Y and Z to compare the level, and the maximum noise.

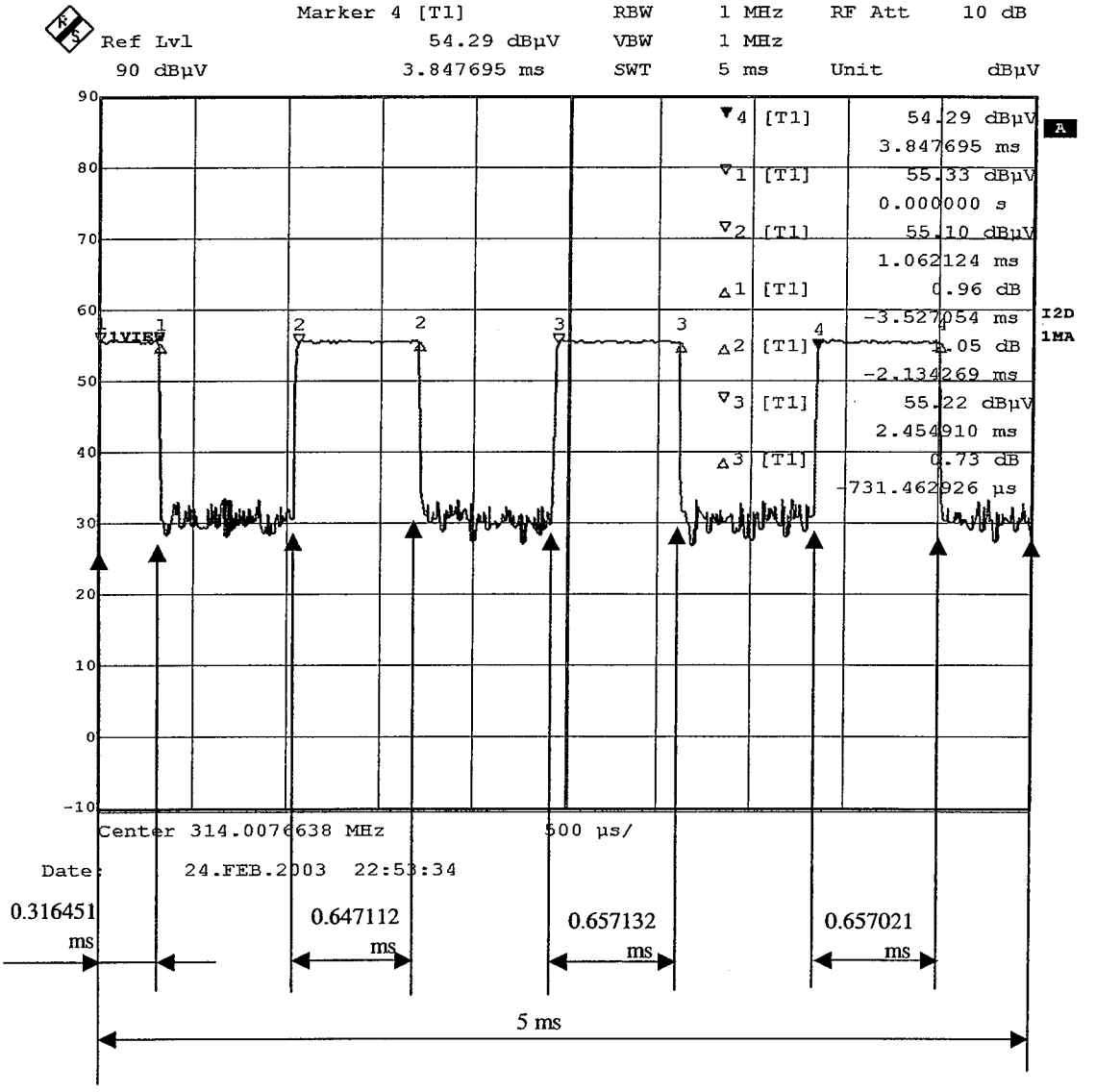
Duty cycle Factor Measurement
The duty cycle factor = 20log(Δ1: 0.316451 + Δ2 : 0.647112 + Δ3 : 0.657132 + Δ4 : 0.657021 / 5) = -6.829407

Duty Cycle

A-pex International Co., Ltd.
EMC HEAD OFFICE DIVISON No.2 SEMI ANECHOIC CHAMBER

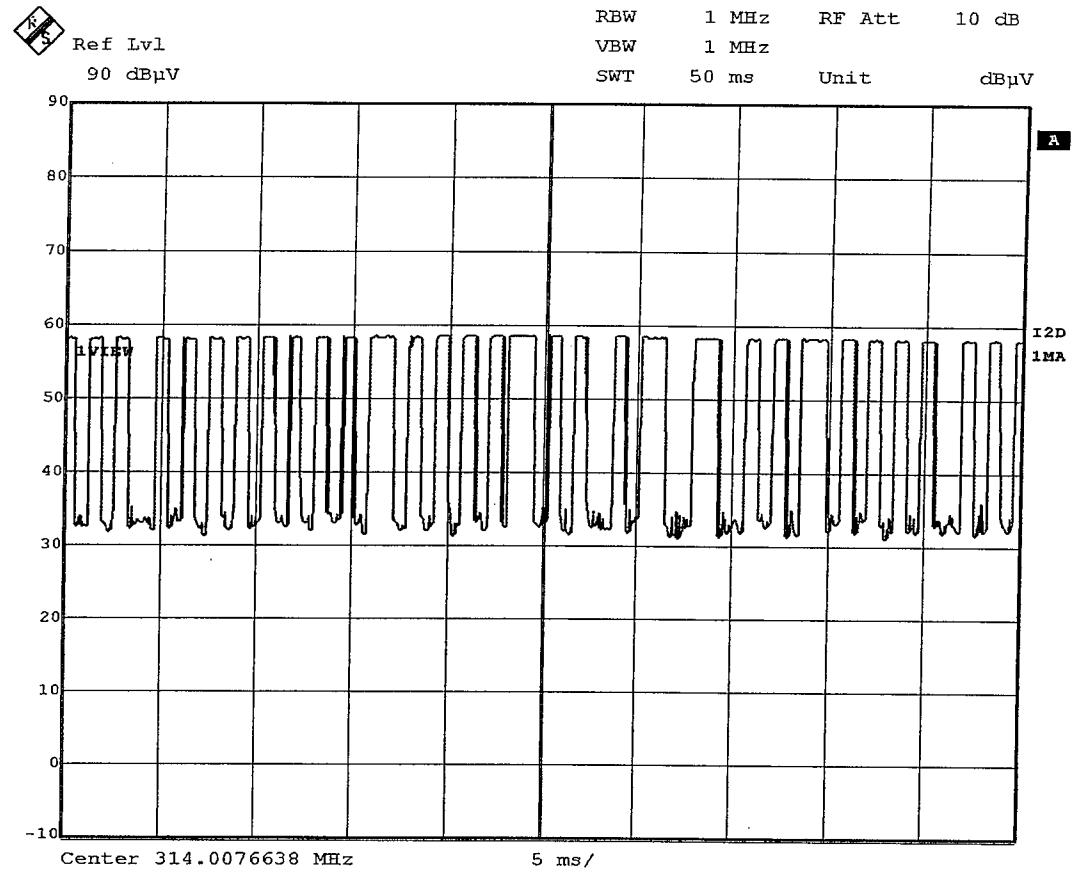
COMPANY	: DENSO CORPORATION	REPORT NO	: 23FE0039-HO- 1
EQUIPMENT	: Electronic Key (Transmitter)	REGULATION	: Fcc Part15 Subpart C 231(b) / 205
MODEL	: 12BZE	TEST DISTANCE	: -
S/N	: EM53	DATE	: 02/24/2003
FCC ID	: HYQ12BZE	TEMPERATURE	: 25℃
IC No.	: 1551A-12BZE	HUMIDITY	: 32%
POWER	: DC3.0V		
Mode	: Transmitting		

ENGINEER : Yoshiaki Iwasa



Duty Cycle : **45.55 %** (= (0.316451 + 0.647112 + 0.657132 + 0.657021) / 5.000)

Duty cycle factor : -6.83 (= 20*log(0.316451 + 0.647112 + 0.657132 + 0.657021) / 5.000))



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DATA OF -20dB-Bandwidth

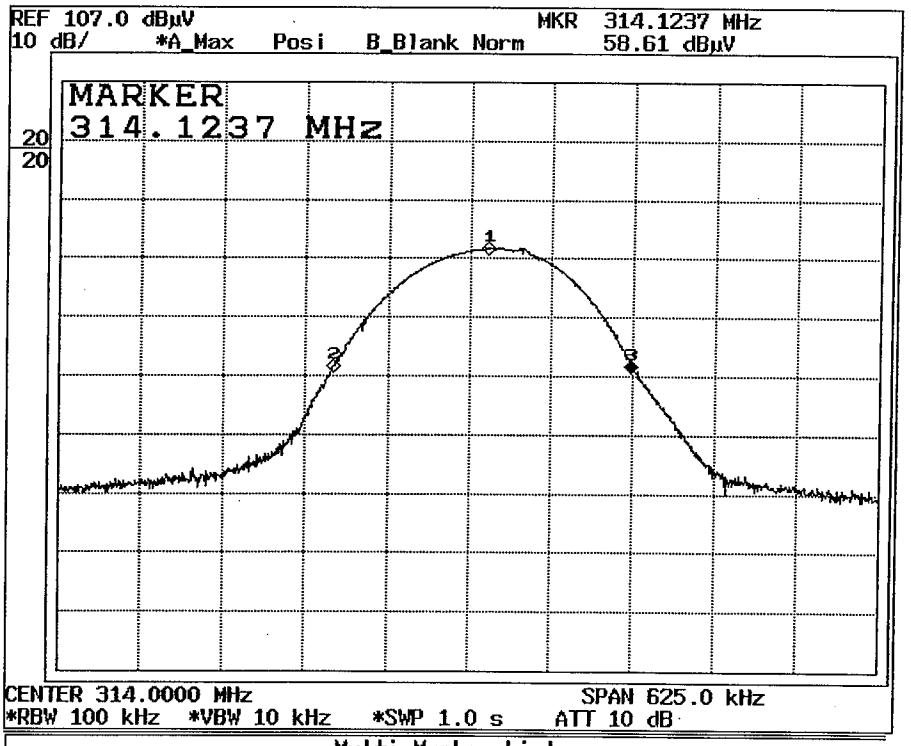
A-Pex International Co., Ltd.
EMC HEAD OFFICE DIVISION No.2 SEMI ANECHOIC CHAMBER

COMPANY	: DENSO CORPORATION	REPORT NO	: 23FE0039-HO-1
EQUIPMENT	: Electronic Key (Transmitter)	REGULATION	: Fcc Part15 Subpart C 231(b) / 205
MODEL	: 12BZE	TEST DISTANCE	: 3m
S/N	: EM53	DATE	: 02/24/2003
FCC ID	: HYQ12BZE	TEMPERATURE	: 25℃
IC No.	: 1551A-12BZE	HUMIDITY	: 32%
POWER	: DC3.0V		
Mode	: Transmitting		

ENGINEER : Yoshiaki Iwasa

Bandwidth Limit : Fundamental Frequency 314.01MHz X 0.25% = 785.025 kHz

-20dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
226.80	785.03	Pass



Multi Marker List

1:	314.0138 MHz	78.66 dBµV
2:	313.8969 MHz	58.61 dBµV
3:	314.1237 MHz	58.61 dBµV

-20dB BandWidth 314.1237 - 313.8969 = 226.80 kHz