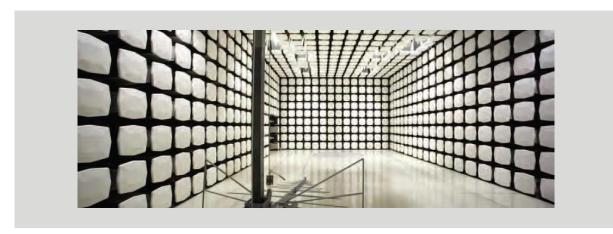


DENSO International America, Inc.

BCM Module 125kHz, Model: B1NA5

FCC 15.209:2021 Inductive Radio

Report: ENTI0008, Issue Date: May 4, 2021







NVLAP LAB CODE: 200676-0

CERTIFICATE OF TEST



Last Date of Test: February 12, 2021 DENSO International America, Inc. EUT: BCM Module 125kHz, Model: B1NA5

Radio Equipment Testing

Standards

Specification	Method
FCC 15.209:2021	ANSI C63.10:2013

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for a battery powered EUT.
6.4	Field Strength of Fundamental	Yes	Pass	
6.4, 6.5	Spurious Radiated Emissions	Yes	Pass	

Deviations From Test Standards

None

Approved By:

Victor Ratinoff, Operations Manager

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing.

Report No. ENTI0008 2/69

REVISION HISTORY



Revision Number	Description	Date (yyyy-mm-dd)	Page Number
00	None		

Report No. ENTI0008 3/69

ACCREDITATIONS AND AUTHORIZATIONS



United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Element to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB) and as a CAB for the acceptance of test data.

European Union

European Commission - Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

MSIT / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Israel

MOC - Recognized by MOC as a CAB for the acceptance of test data.

Hong Kong

OFCA – Recognized by OFCA as a CAB for the acceptance of test data.

Vietnam

MIC – Recognized by MIC as a CAB for the acceptance of test data.

SCOPE

For details on the Scopes of our Accreditations, please visit: https://www.nwemc.com/emc-testing-accreditations

Report No. ENTI0008 4/69

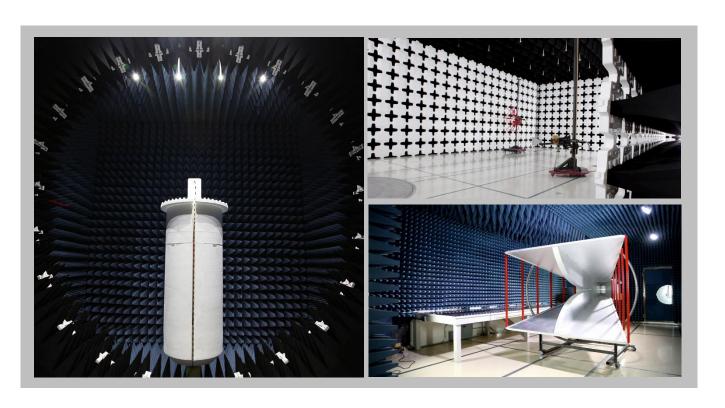
FACILITIES







California Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-11 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Oregon Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 98011 (425)984-6600	
		NVLAP			
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0	
	Innovation, Science and Economic Development Canada				
2834B-1, 2834B-3	2834E-1, 2834E-3	2834D-1	2834G-1	2834F-1	
	BSMI				
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R	
	VCCI				
A-0029	A-0109	A-0108	A-0201	A-0110	
Re	Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA				
US0158	US0175	US0017	US0191	US0157	



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MEASUREMENT UNCERTAINTY



Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found in the table below. A lab specific value may also be found in the applicable test description section. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

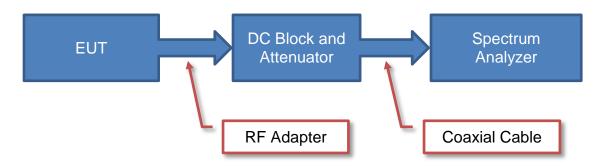
Test	+ MU	- MU
Frequency Accuracy	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.1 dB	-5.1 dB
AC Powerline Conducted Emissions (dB)	2.6 dB	-2.6 dB

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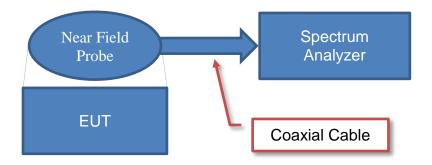
Test Setup Block Diagrams



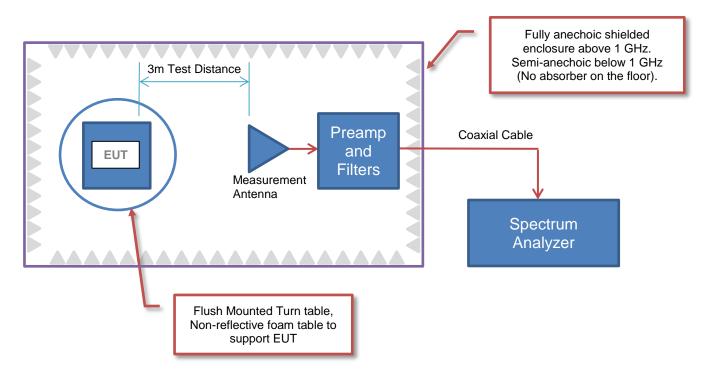
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



Report No. ENTI0008 7/69

PRODUCT DESCRIPTION



Client and Equipment Under Test (EUT) Information

Company Name:	DENSO International America, Inc.
Address:	24777 Denso Drive
City, State, Zip:	Southfield, MI 48033
Test Requested By:	Jason Summerford
EUT:	BCM Module 125kHz, Model: B1NA5
First Date of Test:	February 8, 2021
Last Date of Test:	February 12, 2021
Receipt Date of Samples:	February 8, 2021
Equipment Design Stage:	Production Prototype
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

Smart key system for vehicles using a 125 kHz radio. PEPS: Passive Entry Passive Start System (LF transmitter and transceiver).

Client attestation:

The manufacturer declares under its sole responsibility that the following antennas are compatible with the BCM, model B1NA5. Tested configurations are the worst-case scenarios and correspond to previously studied in the ENTI0005 report.

Rear Bumper Frunk Antenna Trunk Antenna - Steel Plate Bracket Antenna - Aluminum Plate Rocker Driver Antenna - Steel Plate Rocker Passenger Antenna - Steel Plate Interior Antenna Combo (IMMO/LF) Antenna

Testing Objective:

To demonstrate compliance of the inductive portion of the device to FCC Part 15.209 specifications.

Report No. ENTI0008 8/69



Configuration ENTI0008-4

Software/Firmware Running during test			
Description	Version		
Software	220057		

EUT					
Description	Manufacturer	Model/Part Number	Serial Number		
BCM	DENSO International America, Inc.	GEN1.5 PV2	3120350000000018		
Rear Bumper Frunk Antenna	DENSO International America, Inc.	Rear (front) Bumper Frunk Antenna	#01		

Peripherals in test setup boundary					
Description	Manufacturer	Model/Part Number	Serial Number		
VASS Switch Box	DENSO International America, Inc.	BI001	J3		
DC Power Supply	Agilent	E3648A	MY51120046		
Rear Bumper Frunk Antenna	DENSO International America, Inc.	Rear (front) Bumper Frunk Antenna	#02		
Bracket Antenna - Steel Plate	DENSO International America, Inc.	Bracket Antenna - Steel Plate	#04		
Bracket Antenna - Steel Plate	DENSO International America, Inc.	Bracket Antenna - Steel Plate	#05		
Bracket Antenna - Steel Plate	DENSO International America, Inc.	Bracket Antenna - Steel Plate	#06		
Bracket Antenna - Aluminum Plate	DENSO International America, Inc.	Bracket Antenna - Aluminum Plate	#01		
Bracket Antenna - Aluminum Plate	DENSO International America, Inc.	Bracket Antenna - Aluminum Plate	#03		
Combo (IMMO/LF) Antenna	DENSO International America, Inc.	Combo (IMMO/LF) Antenna	#01		

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Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Cable Harness - Switch Box	No	1.5m	No	Switch Box	BCM
DC Cables	No	2.0m	No	BCM	DC Power Supply
Antenna Cable (ANT1/1_R & ANT2/2_R)	No	1.0m	No	ВСМ	Antennas
Antenna Cable (ANT7/7_R & ANT8/8_R)	No	1.0m	No	BCM	Antennas
Antenna Cable (ANT1/2)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT7/8)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT3/4)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT5/6)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT9/10)	No	1.0m	No	BCM	Antenna
Antenna Cable (IMMO Hi/Lo)	No	1.0m	No	BCM	Antenna



Configuration ENTI0008-5

Software/Firmware Running during test			
Description	Version		
Software	220057		

EUT				
Description	Manufacturer	Model/Part Number	Serial Number	
BCM	DENSO International	GEN1.5 PV2	3120350000000018	
BCIVI	America, Inc.	GENT.5 FVZ		
Rear Bumper Frunk Antenna	DENSO International	Rear (front) Bumper	#02	
Real Bullipel Flulk Alitellia	America, Inc.	Frunk Antenna	#02	
Bracket Antenna - Steel Plate	DENSO International	Bracket Antenna -	#04	
Bracket Afflerina - Steel Flate	America, Inc.	Steel Plate	#04	

Peripherals in test setup boundary					
Description	Manufacturer	Model/Part Number	Serial Number		
VASS Switch Box	DENSO International America, Inc.	BI001	J3		
DC Power Supply	Agilent	E3648A	MY51120046		
Bracket Antenna - Steel Plate	DENSO International America, Inc.	Bracket Antenna - Steel Plate	#05		
Bracket Antenna - Steel Plate	DENSO International America, Inc.	Bracket Antenna - Steel Plate	#06		
Bracket Antenna - Aluminum Plate	DENSO International America, Inc.	Bracket Antenna - Aluminum Plate	#01		
Bracket Antenna - Aluminum Plate	DENSO International America, Inc.	Bracket Antenna - Aluminum Plate	#03		
Combo (IMMO/LF) Antenna	DENSO International America, Inc.	Combo (IMMO/LF) Antenna	#01		
Rocker Passenger Antenna - Steel Plate	DENSO International America, Inc.	Rocker Passenger Antenna - Steel Plate	#01		

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Cable Harness - Switch Box	No	1.5m	No	Switch Box	BCM
DC Cables	No	2.0m	No	BCM	DC Power Supply
Antenna Cable (ANT1/1_R & ANT2/2_R)	No	1.0m	No	BCM	Antennas
Antenna Cable (ANT7/7_R & ANT8/8_R)	No	1.0m	No	BCM	Antennas
Antenna Cable (ANT1/2)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT7/8)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT3/4)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT5/6)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT9/10)	No	1.0m	No	BCM	Antenna
Antenna Cable (IMMO Hi/Lo)	No	1.0m	No	BCM	Antenna



Configuration ENTI0008-6

Software/Firmware Running during test				
Description	Version			
Software	220057			

EUT					
Description	Manufacturer	Model/Part Number	Serial Number		
Bracket Antenna - Aluminum	DENSO International	Bracket Antenna -	#01		
Plate	America, Inc.	Aluminum Plate	#01		
BCM	DENSO International	B1NA5	31203500000000008		
DCIVI	America, Inc.	DINAS	31203300000000000		

Peripherals in test setup boundary					
Description Manufacturer Model/Part Number Serial Number					
VASS Switch Box	DENSO International America, Inc	BI001	J3		
DC Power Supply	Agilent	E3648A	MY51120046		

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Cable Harness - Switch Box	No	1.5m	No	Switch Box	BCM
DC Cables	No	2.0m	No	BCM	DC Power Supply
Antenna Cable (ANT1/2)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT1/1_R & ANT2/2_R)	No	1.0m	No	BCM	Unterminated
Antenna Cable (ANT7/7_R & ANT8/8_R)	No	No	No	BCM	Unterminated
Antenna Cable (ANT7/8)	No	No	No	BCM	Unterminated
Antenna Cable (ANT3/4)	No	No	No	BCM	Unterminated
Antenna Cable (ANT5/6)	No	No	No	BCM	Unterminated
Antenna Cable (ANT9/10)	No	No	No	BCM	Unterminated
Antenna Cable (IMMO Hi/Lo)	No	No	No	BCM	Unterminated



Configuration ENTI0008-7

Software/Firmware Running during test				
Description	Version			
Software	220057			

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
	DENSO		
BCM	International	GEN1.5 PV2	3120350000000018
	America, Inc.		
	DENSO	Bracket Antenna -	
Bracket Antenna - Aluminum Plate	International	Aluminum Plate	#01
	America, Inc.		

Peripherals in test setup boundary					
Description	ription Manufacturer Model/		Serial Number		
VASS Switch Box	DENSO International America, Inc.	BI001	J3		
DC Power Supply	Agilent	E3648A	MY51120046		
Rear Bumper Frunk Antenna	DENSO International America, Inc.	Rear (front) Bumper Frunk Antenna	#01		
Bracket Antenna - Steel Plate	DENSO International America, Inc.	Bracket Antenna - Steel Plate	#04		
Bracket Antenna - Steel Plate	DENSO International America, Inc.	Bracket Antenna - Steel Plate	#05		
Bracket Antenna - Aluminum Plate	DENSO International America, Inc.	Bracket Antenna - Aluminum Plate	#03		
Combo (IMMO/LF) Antenna	DENSO International America, Inc.	Combo (IMMO/LF) Antenna	#01		

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Cable Harness - Switch Box	No	1.5m	No	Switch Box	BCM
DC Cables	No	2.0m	No	BCM	DC Power Supply
Antenna Cable (ANT1/2)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT7/8)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT3/4)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT5/6)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT9/10)	No	1.0m	No	BCM	Antenna
Antenna Cable (IMMO Hi/Lo)	No	1.0m	No	BCM	Antenna



Configuration ENTI0008-8

Software/Firmware Running during test				
Description	Version			
Software	220057			

EUT					
Description	Manufacturer	Model/Part Number	Serial Number		
ВСМ	DENSO International America, Inc.	GEN1.5 PV2	3120350000000018		
Combo (IMMO/LF) Antenna	DENSO International America, Inc.	Combo (IMMO/LF) Antenna	#01		

Peripherals in test setup boundary					
Description	Manufacturer	Model/Part Number	Serial Number		
VASS Switch Box	DENSO International America, Inc.	BI001	J3		
DC Power Supply	Agilent	E3648A	MY51120046		
Rear Bumper Frunk Antenna	DENSO International America, Inc.	Rear (front) Bumper Frunk Antenna	#01		
Rear Bumper Frunk Antenna	DENSO International America, Inc.	Rear (front) Bumper Frunk Antenna	#02		
Bracket Antenna - Steel Plate	DENSO International America, Inc.	Bracket Antenna - Steel Plate	#04		
Bracket Antenna - Steel Plate	DENSO International America, Inc.	Bracket Antenna - Steel Plate	#05		
Bracket Antenna - Aluminum Plate	DENSO International America, Inc.	Bracket Antenna - Aluminum Plate	#03		

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Cable Harness - Switch Box	No	1.5m	No	Switch Box	BCM
DC Cables	No	2.0m	No	BCM	DC Power Supply
Antenna Cable (ANT1/2)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT7/8)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT3/4)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT5/6)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT9/10)	No	1.0m	No	BCM	Antenna
Antenna Cable (IMMO Hi/Lo)	No	1.0m	No	BCM	Antenna



Configuration ENTI0008-9

Software/Firmware Running during test				
Description	Version			
Software	220057			

EUT				
Description	Manufacturer	Model/Part Number	Serial Number	
BCM	DENSO International GEN1.5 PV2		3120350000000018	
DCIVI	America, Inc.	GENT.5 F VZ	312033000000018	
Rear Bumper Frunk Antenna	DENSO International	Rear (front) Bumper	#02	
Real Bulliper Frunk Antenna	America, Inc.	Frunk Antenna	#02	
Bracket Antenna - Aluminum Plate	DENSO International	Bracket Antenna -	#01	
Bracket Antenna - Aluminum Plate	America, Inc.	Aluminum Plate	#01	

Peripherals in test setup boundary					
Description	Manufacturer	Model/Part Number	Serial Number		
VASS Switch Box	DENSO International America, Inc.	BI001	J3		
DC Power Supply	Agilent	E3648A	MY51120046		
Rear Bumper Frunk Antenna	DENSO International America, Inc.	Rear (front) Bumper Frunk Antenna	#01		
Bracket Antenna - Steel Plate	DENSO International America, Inc.	Bracket Antenna - Steel Plate	#04		
Bracket Antenna - Steel Plate	DENSO International America, Inc.	Bracket Antenna - Steel Plate	#05		
Combo (IMMO/LF) Antenna	DENSO International America, Inc.	Combo (IMMO/LF) Antenna	#01		

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Cable Harness - Switch Box	No	1.5m	No	Switch Box	BCM
DC Cables	No	2.0m	No	BCM	DC Power Supply
Antenna Cable (ANT1/2)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT7/8)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT3/4)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT5/6)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT9/10)	No	1.0m	No	BCM	Antenna
Antenna Cable (IMMO Hi/Lo)	No	1.0m	No	BCM	Antenna



Configuration ENTI0008- 10

Software/Firmware Running during test				
Description	Version			
Software	220057			

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
BCM	DENSO International	GEN1.5 PV2	3120350000000018
BCIVI	America, Inc.	GENT.5 F VZ	
Rear Bumper Frunk Antenna	DENSO International	Rear (front) Bumper	#02
Real Bullipel Flulik Alilelilia	America, Inc.	Frunk Antenna	#02
Combo (IMMO/LE) Antonno	DENSO International	Combo (IMMO/LF)	#01
Combo (IMMO/LF) Antenna	America, Inc.	Antenna	#01

Peripherals in test setup boundary					
Description	Manufacturer	Model/Part Number	Serial Number		
VASS Switch Box	DENSO International America, Inc.	BI001	J3		
DC Power Supply	DENSO International America, Inc.	E3648A	MY51120046		
Rear Bumper Frunk Antenna	DENSO International America, Inc.	Rear (front) Bumper Frunk Antenna	#01		
Bracket Antenna - Steel Plate	DENSO International America, Inc.	Bracket Antenna - Steel Plate	#04		
Bracket Antenna - Steel Plate	DENSO International America, Inc.	Bracket Antenna - Steel Plate	#05		
Bracket Antenna - Aluminum Plate	DENSO International America, Inc.	Bracket Antenna - Aluminum Plate	#01		

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Cable Harness - Switch Box	No	1.5m	No	Switch Box	BCM
DC Cables	No	2.0m	No	BCM	DC Power Supply
Antenna Cable (ANT1/2)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT7/8)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT3/4)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT5/6)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT9/10)	No	1.0m	No	BCM	Antenna
Antenna Cable (IMMO Hi/Lo)	No	1.0m	No	BCM	Antenna



Configuration ENTI0008- 11

Software/Firmware Running during test				
Description	Version			
Software	220057			

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
BCM	DENSO International America, Inc.	GEN1.5 PV2	3120350000000018
Rear Bumper Frunk Antenna	DENSO International America, Inc.	Rear (front) Bumper Frunk Antenna	#02
Bracket Antenna - Steel Plate	DENSO International America, Inc.	Bracket Antenna - Steel Plate	#04
Interior Antenna	DENSO International America, Inc.	Interior Antenna	#01

Peripherals in test setup boundary						
Description	Manufacturer	Model/Part Number	Serial Number			
VASS Switch Box	DENSO International America, Inc.	BI001	J3			
DC Power Supply	Agilent	E3648A	MY51120046			
Bracket Antenna - Steel Plate	DENSO International America, Inc.	Bracket Antenna - Steel Plate	#05			
Bracket Antenna - Aluminum Plate	DENSO International America, Inc.	Bracket Antenna - Aluminum Plate	#01			
Combo (IMMO/LF) Antenna	DENSO International America, Inc.	Combo (IMMO/LF) Antenna	#01			

Cables						
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2	
Cable Harness - Switch Box	No	1.5m	No	Switch Box	BCM	
DC Cables	No	2.0m	No	BCM	DC Power Supply	
Antenna Cable (ANT1/2)	No	1.0m	No	BCM	Antenna	
Antenna Cable (ANT7/8)	No	1.0m	No	BCM	Antenna	
Antenna Cable (ANT3/4)	No	1.0m	No	BCM	Antenna	
Antenna Cable (ANT5/6)	No	1.0m	No	BCM	Antenna	
Antenna Cable (ANT9/10)	No	1.0m	No	BCM	Antenna	
Antenna Cable (IMMO Hi/Lo)	No	1.0m	No	BCM	Antenna	



Configuration ENTI0008- 12

Software/Firmware Running during test				
Description	Version			
Software	220057			

EUT						
Description	Manufacturer	Model/Part Number	Serial Number			
BCM	DENSO International	GEN1.5 PV2	3120350000000018			
BCIVI	America, Inc.	GENT.5 F VZ				
Combo (IMMO/LF) Antenna	DENSO International	Combo (IMMO/LF)	#01			
Combo (livilviO/LF) Afterma	America, Inc.	Antenna	#01			

Peripherals in test setup boundary					
Description	Manufacturer	Model/Part Number	Serial Number		
VASS Switch Box	DENSO International America, Inc.	BI001	J3		
DC Power Supply	Agilent	E3648A	MY51120046		
Rear Bumper Frunk Antenna DENSO International America, Inc.		Rear (front) Bumper Frunk Antenna	#02		
Bracket Antenna - Steel Plate	DENSO International America, Inc.	Bracket Antenna - Steel Plate	#04		
Bracket Antenna - Steel Plate	DENSO International America, Inc.	Bracket Antenna - Steel Plate	#05		
Bracket Antenna - Aluminum Plate	DENSO International America, Inc.	Bracket Antenna - Aluminum Plate	#01		
Interior Antenna	DENSO International America, Inc.	Interior Antenna	#01		
Transponder	DENSO International America, Inc.	PCF7939VA	M1		

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Cable Harness - Switch Box	No	1.5m	No	Switch Box	BCM
DC Cables	No	2.0m	No	BCM	DC Power Supply
Antenna Cable (ANT1/2)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT7/8)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT3/4)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT5/6)	No	1.0m	No	BCM	Antenna
Antenna Cable (ANT9/10)	No	1.0m	No	BCM	Antenna
Antenna Cable (IMMO Hi/Lo)	No	1.0m	No	BCM	Antenna

Report No. ENTI0008 18/69



Configuration ENTI0008-13

Software/Firmware Running during test				
Description	Version			
Software	220057			

EUT							
Description	Manufacturer	Model/Part Number	Serial Number				
Combo (IMMO/LF) Antenna	DENSO International America, Inc.	Combo (IMMO/LF) Antenna	#01				
BCM	DENSO International America, Inc.	B1NA5	3120350000000008				

Peripherals in test setup boundary						
Description	Manufacturer	Model/Part Number	Serial Number			
VASS Switch Box	DENSO International America, Inc.	BI001	J3			
DC Power Supply	Agilent	E3648A	MY51120046			

Cables						
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2	
Cable Harness - Switch Box	No	1.5m	No	Switch Box	BCM	
DC Cables	No	2.0m	No	BCM	DC Power Supply	
Antenna Cable (IMMO Hi/Lo)	No	1.0m	No	BCM	Antenna	
Antenna Cable (ANT1/2)	No	No	No	BCM	Unterminated	
Antenna Cable (ANT7/8)	No	No	No	BCM	Unterminated	
Antenna Cable (ANT3/4)	No	No	No	BCM	Unterminated	
Antenna Cable (ANT5/6)	No	No	No	BCM	Unterminated	
Antenna Cable (ANT9/10)	No	No	No	BCM	Unterminated	

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2021-02-08	Field Strength of Fundamental	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	2021-02-12	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

Report No. ENTI0008 20/69

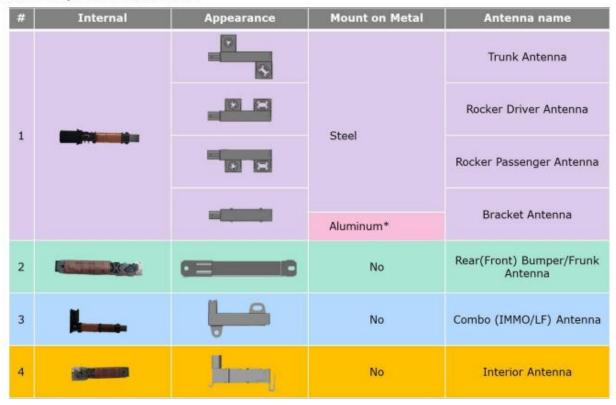
POWER SETTINGS AND ANTENNAS



The power settings, antenna gain value(s) and cable loss (if applicable) used for the testing contained in this report were provided by the customer and will affect the validity of the results. Element assumes no responsibility for the accuracy of this information.

ANTENNA INFORMATION

Operational description: Antenna variations



No adjustable power settings were provided. The EUT was tested using power settings pre-defined by the manufacturer.

Report No. ENTI0008 21/69

FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, APPROACH



PSA-ESCI 2021.01.22.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 125 kHz. Full-Bridge: Approach on BCM Pins 01&02, 03&04, and 05&06

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 11

FREQUENCY RANGE INVESTIGATED

Start Frequency 9 kHz	Stop Frequency	490 kHz
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SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2020-08-20	2021-08-20
Cable	Northwest EMC	3 kHz - 1 GHz RE Cables	OCB	2020-07-01	2021-07-01
Antenna - Loop	EMCO	6502	AZB	2019-09-11	2021-09-11

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

The fundamental carrier of the EUT was maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

Report No. ENTI0008 22/69

FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, APPROACH



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Wo	rk Order:	ENT	80001		Date:		-02-10		11.		,		
	Project:		one	Ter	nperature:		1 °C		1-1		1		
	Job Site:		008		Humidity:		% RH	_					
Serial		See Conf			etric Pres.:	1018	mbar		ested by:	Mark Bayta	an		_
Confi			ule 125kHz,	Model: B1	NA5								_
	guration:		ternational i	Amoriae Ir									_
	ttendees:		terriational i	America, ii	IC.								_
													_
	EUT Power: 12 VDC rating Mode: Transmitting 125 kHz. Full-Bridge: Approach on BCM Pins 01&02, 03&04, and 05&06												
De	eviations:	Nana											
Co		in this ope	rating mode	: Bracket	Antenna on	Steel, Rea	osure and a ar Bumper/Fi Perp to EU	runk Anten	na, and Inte				_
est Specif	fications						Test Metho	od					_
CC 15.209							ANSI C63.						_
Run #	19	Test Dis	stance (m)	10	Antenna	Height(s)		1 to 4(m)		Results	Pa	ass	<u>-</u>
80 _													
70													
60													
60													
50								$\downarrow \downarrow \downarrow$					
40													
ے							$\downarrow \downarrow \downarrow \downarrow \downarrow$						
dBuV/m								$\downarrow \downarrow \downarrow$				<u> </u>	
<u> </u>													
20													
20													
40											_		
10								•					
0													
-10												+++	
-20 L													
0.00	01			0.010	0			0.100				1.000	
						MHz				■ PK	◆ AV	• QP	
							Polarity/						
		-				External	Transducer		Distance			Compared to	
Freq	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	Attenuation (dB)	Туре	Detector	Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Spec. (dB)	
(MHz)	(ubdv)	(ub)	(meters)	(uegrees)	(meters)	(UD)			(ub)	(dbdv/III)	(ubuv/iii)	(UB)	Commer
													Comme
0.125 0.125	56.5 62.5	10.5 10.5	1.25 1.25	0.0 0.0	10.0 10.0	0.0 0.0	Perp to EUT Perp to EUT	AV PK	-59.1 -59.1	7.9 13.9	25.7 45.7	-17.8 -31.8	EUT on S

Report No. ENTI0008 23/69

FIELD STRENGTH OF FUNDAMENTAL -FULL BRIDGE, DUAL CH PEPS IMMO



PSA-ESCI 2021.01.22.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 125 kHz. Full-Bridge: Dual Channel PEPS on BCM Pins IMMO Hi&Lo and 03&04

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 10

FREQUENCY RANGE INVESTIGATED

Start Frequency 9 kHz	Stop Frequency	490 kHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Cable	Northwest EMC	3 kHz - 1 GHz RE Cables	OCB	2020-07-01	2021-07-01
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2020-08-20	2021-08-20
Antenna - Loop	EMCO	6502	AZB	2019-09-11	2021-09-11

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

The fundamental carrier of the EUT was maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

Report No. ENTI0008 24/69

FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, DUAL CH PEPS IMMO



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Wo	ork Order:		8000		Date:		-02-10		11,		•			
	Project:		ne	Te	mperature:		.1 °C		1-1		1			
	Job Site:		08		Humidity:		6% RH							
Seria	I Number:	See Cont	igurations ule 125kHz,		etric Pres.:	1018	3 mbar		ested by:	Mark Bayta	an		_	
Conf	iguration:		ile i∠sk⊓z,	Model: B	CANII								_	
COIII	uetomor:	DENISO In	ternational /	Amorica I	nc								_	
Δ	ttendees:	None	terriational /	America, i	iic.								_	
	JT Power:												-	
	ing Mode:		ransmitting 125 kHz. Full-Bridge: Dual Channel PEPS on BCM Pins IMMO Hi&Lo and 03&04											
D	eviations:	None												
C	omments:	in this ope	e measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas this operating mode: Combo Antenna and Rear Bumper/Frunk Antenna. Worst case positions from preliminary field ength testing: Rx Ant Perp to EUT, EUT on Side.											
Test Speci	ifications						Test Metho	od					_	
CC 15.20							ANSI C63.						_	
Run #	16	Test Dis	stance (m)	10	Antenna	ı Height(s)	1 to 4(m)		Results	l Pa	ass	_	
80			/		7		/	(.11)					_	
80														
70														
60												<u> </u>		
50														
40														
ط 40												<u> </u>		
\$											_			
dBuV/m														
20												 		
											-			
10														
0														
-10												++-		
-20 [[]														
0.0	01			0.01	0			0.100				1.000		
						MHz	<u>:</u>			■ PK	◆ AV	• QP		
							Polarity/							
Erca	Amplitude	Foctor	Antonno Haista	Agine	Toot Distance	External	Transducer	Detrois	Distance Adjustment	Adirected	Cnoo Limit	Compared to		
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	Attenuation (dB)	Туре	Detector	Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Spec. (dB)		
													Comments	
0.125	64.2	10.5	1.29	237.0	10.0	0.0	Perp to EUT	AV	-59.1	15.6	25.7	-10.1	EUT on Sid	
0.125	70.1	10.5	1.29	237.0	10.0	0.0	Perp to EUT	PK	-59.1	21.5	45.7	-24.2	EUT on Sid	

Report No. ENTI0008 25/69

FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, DUAL CH



PSA-ESCI 2021.01.22.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 125 kHz. Full-Bridge: Dual Channel PEPS on BCM Pins 05&06 and 03&04

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 9

FREQUENCY RANGE INVESTIGATED

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2020-08-20	2021-08-20
Cable	Northwest EMC	3 kHz - 1 GHz RE Cables	OCB	2020-07-01	2021-07-01
Antenna - Loop	EMCO	6502	AZB	2019-09-11	2021-09-11

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

The fundamental carrier of the EUT was maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

Report No. ENTI0008 26/69

FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, DUAL CH

0.125

0.125

68.2

10.5

10.5



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We	ork Order:		10008		Date:		-02-10		11		-		
	Project:		one		Temperature:		1 °C		4		1		
	Job Site:		C08		Humidity:		% RH			,			
Seria	I Number:	See Conf	figurations	Bare	ometric Pres.:	1018	mbar		Tested by:	Mark Bayta	an	<u>.</u>	
	EUT:	BCM Modu	ule 125kHz	Model:	: B1NA5								
Conf	figuration:	9											
	Customer:	DENSO In	ternational	America	a, Inc.								
	Attendees:				•								
	UT Power:												
	ing Mode:		ansmitting 125 kHz. Full-Bridge: Dual Channel PEPS on BCM Pins 05&06 and 03&04										
D	eviations:	None											
С	omments:	in this ope	measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas is operating mode: Bracket antenna mounted on aluminum and Rear Bumper/Frunk Antenna. Worst case positions preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.										
Test Spec							Test Meth						
FCC 15.20							ANSI C63						
Run #	13	Test Dis	stance (m)	10	Antenna	a Height(s)		1 to 4(m)		Results	P:	ass	
			()			J(9)	l				· · ·		
80													
70													
60													
50								\					
4 0													
dBuV/m													
명 20													
10													
0													
-10													
-20					0.010	·		0.100				1.000	
0.0	001		_	0).010	MHz		0.100		■ PK	◆ AV	1.000 • QP	
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimu (degree		External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	

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Perp to EUT

Perp to EUT

-59.1

ΑV

PK

19.6

25.7

45.7

-6.1

-26.2

EUT on Side

EUT on Side

10.0

10.0

0.0

FIELD STRENGTH OF FUNDAMENTAL -FULL BRIDGE, IMMOBILIZER



PSA-ESCI 2021.01.22.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 125 kHz. Full-Bridge: Immobilizer on BCM Pin IMMO Hi&Lo

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 12

FREQUENCY RANGE INVESTIGATED

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2020-08-20	2021-08-20
Cable	Northwest EMC	3 kHz - 1 GHz RE Cables	OCB	2020-07-01	2021-07-01
Antenna - Loop	EMCO	6502	AZB	2019-09-11	2021-09-11

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

The fundamental carrier of the EUT was maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

Report No. ENTI0008 28/69

FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, IMMOBILIZER



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W	ork Order:	ENTI0008		Date:		-02-10		1/2		•				
	Project:	None	Те	mperature:		.1 °C		1-1		1				
	Job Site:			Humidity:		% RH			/	<u> </u>				
Seria	al Number:	See Configurations	Barom	etric Pres.:	1018	3 mbar		Tested by:	Mark Bayta	an				
	EUT:	BCM Module 125kHz	, Model: B	1NA5				-						
Conf	figuration:		*											
		DENSO International	America	Inc										
	Attendees:		America,	IIIC.										
E	UT Power:													
Operat	ting Mode:	Transmitting 125 kHz	nsmitting 125 kHz. Full-Bridge: Immobilizer on BCM Pin IMMO Hi&Lo											
D	Deviations:	None												
С	comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Combo Antenna (Only antenna applicable to this mode). Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.												
Test Spec	ifications					Test Metho	od							
FCC 15.20		<u> </u>				ANSI C63.		I						
D #	I 00	Tart Piatona (m)	10				4 + - 4()		Do ovilto					
Run #	22	Test Distance (m)	10	Antenna	Height(s)		1 to 4(m)		Results	l Pi	ass			
70														
70														
						+								
50														
30				_										
_						+				_				
€ 30							$\searrow \sqcup \sqcup$				111			
dBuV/m								_						
ω M														
쁑							_	.]						
							•			_				
10											 			
-10											 			
00														
-30														
0.0	JU1		0.01	10			0.100				1.000			
					MHz				B 517	A 817	• OB			
									■ PK	◆ AV	QP			
						Polarity/								
					External	Transducer		Distance			Compared to			
Freq	Amplitude	Factor Antenna Height	Azimuth	Test Distance	Attenuation	Туре	Detector	Adjustment	Adjusted	Spec. Limit	Spec.			
(MHz)	(dBuV)	(dB) (meters)	(degrees)	(meters)	(dB)			(dB)	(dBuV/m)	(dBuV/m)	(dB)			
												nments		
0.125	63.5	10.5 1.25	0.0	10.0	0.0	Perp to EUT	AV	-59.1	14.9	25.7		on Side		
0.125	64.1	10.5 1.25	0.0	10.0	0.0	Perp to EUT	PK	-59.1	15.5	45.7	-30.2 EUT	on Side		

Report No. ENTI0008 29/69

FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, SINGLE CH PEPS IMMO



PSA-ESCI 2021.01.22.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 125 kHz. Full-Bridge: Single Channel PEPS on BCM Pins IMMO Hi/Lo

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 8

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	490 kHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2020-08-20	2021-08-20
Cable	Northwest EMC	3 kHz - 1 GHz RE Cables	OCB	2020-07-01	2021-07-01
Antenna - Loop	EMCO	6502	AZB	2019-09-11	2021-09-11

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

The fundamental carrier of the EUT was maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

Report No. ENTI0008 30/69

FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, SINGLE CH PEPS IMMO

171.0

10.0

10.0

1.53

1.53

0.125

0.125

67.7

10.5

10.5



											EmiR5 2021.01.08.0	P	SA-ESCI 2021.01.22.0	
Wo	rk Order:	ENT	80001		Date:	2021	-02-10			1 1				
	Project:		one	T	emperature:	20.	1 °C		_	4	6	5,4		
	Job Site:		C08		Humidity:		% RH					7		
Serial	Number:	See Conf	figurations	Baroi	metric Pres.:	1018	mbar			Tested by:	Mark Bayta	an		
			ule 125kHz,	Model: E	B1NA5									
Confi	guration:	8												
С	ustomer:	DENSO In	nternational a	America,	Inc.									
	ttendees:												<u>.</u>	
EU	IT Power:	12 VDC											<u>.</u>	
Operation	ng Mode:	Transmittii	ng 125 kHz.	Full-Brid	lge: Single Ch	nannel PEP	S on BC	/l Pin	s IMMO	Hi/Lo			_	
De	eviations:	None												
Co	mments:	mode: Cor		a (only a	case orienta ntenna applic UT on Side.									
Test Specif	fications						Test Me	thod						
FCC 15.209							ANSI C		2013	•				
D	40	To d D'		40		11-1-1-1-7-1			1					
Run#	10	lest Di	stance (m)	10	Antenna	Height(s)		1	to 4(m)		Results	Pa	ass	
80 _														
70														
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60													111	
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gan//m												-		
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-10													 	
-20														
0.00)1			0.0)10				0.100				1.000	
0.00				0.0		MHz			5.100				1.000	
						WITZ					■ PK	◆ AV	QP	
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transduce Type		Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments

Report No. ENTI0008 31/69

Perp to EUT

Perp to EUT

ΑV

PΚ

-59.1

19.1

25.7

-6.6

-25.5

EUT on Side

FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, SINGLE CH



PSA-ESCI 2021.01.22.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 125 kHz. Full-Bridge: Single Channel PEPS on BCM Pins 05&06

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 7

FREQUENCY RANGE INVESTIGATED

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2020-08-20	2021-08-20
Cable	Northwest EMC	3 kHz - 1 GHz RE Cables	OCB	2020-07-01	2021-07-01
Antenna - Loop	EMCO	6502	AZB	2019-09-11	2021-09-11

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

The fundamental carrier of the EUT was maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

Report No. ENTI0008 32/69

FIELD STRENGTH OF FUNDAMENTAL -**FULL BRIDGE, SINGLE CH**



								_		EmiR5 2021.01.08.0	P:	SA-ESCI 2021.01.22.0	<u>)</u>
	Work Order:		80001		Date:		-02-10		1/2				
	Project:		one	Те	mperature:		.1 °C		1-1		1	_	
0-	Job Site:		208	Danam	Humidity:		% RH		Tanta d buu	Marili Davida			_
Se	rial Number: EUT:		figurations ule 125kHz,		etric Pres.:	1018	9 mbar		Tested by:	Mark Bayta	an		_
Co	onfiguration:		ule 125kHz,	Model. B	IINAS								_
	Customer:		ternational	America I	nc								=
	Attendees:		itorria il oriari	, unioniou, i	110.								_
	EUT Power:												-
0			na 125 kHz.	Full-Bride	ge: Single Ch	annel PEF	S on BCM F	Pins 05&06	;				=
Ope	rating Mode:		J	`	, ,								
	Deviations:	None											
	Deviations.												_
					case orientat		osure and a	ntenna is s	hown. Wors	st case ante	enna in this	operating	
	Comments:	mode: Bra	cket antenn	a mounte	d on aluminu	m.							
													=
	ecifications						Test Meth						
FCC 15	.209:2021						ANSI C63.	10:2013					
	" -	T (D)	. (()	40		11-1-1 (/-)		4.6.46		December			_
Run		rest Di	stance (m)	10	Antenna	Height(s)		1 to 4(m)		Results	P	ass	=
80	0												
70	o			+									
60	n												
0.							\downarrow						
-													
50	J												
_ 40	0												
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dBuV/m	o							$\prec \downarrow \downarrow \downarrow$					
Δ													
20	n 🗀												
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								•	•				
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	0.001			0.01	0			0.100				1.000	
						MHz	:			■ PK	◆ AV	QP	
										■ FK	▼ AV	♥ Qi	
						Ends1	Polarity/		Dieter			Company	
Freq	Amplitude	Factor	Antenna Height	Azimuth	Test Distance	External Attenuation	Transducer Type	Detector	Distance Adjustment	Adjusted	Spec. Limit	Compared to Spec.	
(MHz)		(dB)	(meters)	(degrees)	(meters)	(dB)	, i		(dB)	(dBuV/m)	(dBuV/m)	(dB)	
0.425	67.2	10.5	2.25	2F9.0	10.0	0.0	Porn to ELIT	AV	50.1	10.6	2F 7	7.1	Comments EUT on Side
0.125 0.125	67.2 66.9	10.5 10.5	2.25 1.06	358.0 89.0	10.0 10.0	0.0 0.0	Perp to EUT Perp to EUT	AV	-59.1 -59.1	18.6 18.3	25.7 25.7	-7.1 -7.4	EUT Horz
0.125		10.5	1.0	84.0	10.0	0.0	Para to EUT	AV	-59.1	13.9	25.7	-11.8	EUT on Side
0.125	61.1	10.5	1.0	17.0	10.0	0.0	Para to EUT	AV	-59.1	12.5	25.7	-13.2	EUT Horz
0.125	57.2	10.5	3.65	89.0	10.0	0.0	Para to GND	AV	-59.1	8.6	25.7	-17.1	EUT on Side
0.125 0.125		10.5 10.5	3.5 1.0	0.0 93.0	10.0 10.0	0.0 0.0	Para to GND Para to EUT	AV AV	-59.1 -59.1	7.1 2.0	25.7 25.7	-18.6 -23.7	EUT Horz EUT Vert
	50.0			80.0	10.0	0.0	Para to GND	AV	-59.1	0.8	25.7	-24.9	
0.125	49.4	10.5	3.73	00.0					FO 4				EUT Vert
0.125	68.8	10.5	1.0	83.0	10.0	0.0	Perp to EUT	PK	-59.1	20.2	45.7	-25.5	EUT Horz
0.125 0.125	68.8 68.4	10.5 10.5	1.0 2.25	83.0 358.0	10.0	0.0	Perp to EUT	PK	-59.1	19.8	45.7	-25.9	EUT Horz EUT on Side
0.125 0.125 0.125	68.8 68.4 63.8	10.5 10.5 10.5	1.0 2.25 1.0	83.0 358.0 84.0	10.0 10.0	0.0 0.0	Perp to EUT Para to EUT	PK PK	-59.1 -59.1	19.8 15.2	45.7 45.7	-25.9 -30.5	EUT Horz EUT on Side EUT on Side
0.125 0.125	68.8 68.4	10.5 10.5	1.0 2.25	83.0 358.0	10.0	0.0	Perp to EUT	PK	-59.1	19.8	45.7	-25.9	EUT Horz EUT on Side
0.125 0.125 0.125 0.125 0.125 0.125	68.8 68.4 63.8 43.3 62.2 58.4	10.5 10.5 10.5 10.5 10.5 10.5	1.0 2.25 1.0 2.97 1.0 3.65	83.0 358.0 84.0 158.0 17.0 89.0	10.0 10.0 10.0 10.0 10.0	0.0 0.0 0.0 0.0 0.0	Perp to EUT Para to EUT Perp to EUT Para to EUT Para to GND	PK PK AV PK PK	-59.1 -59.1 -59.1 -59.1 -59.1	19.8 15.2 -5.3 13.6 9.8	45.7 45.7 25.7 45.7 45.7	-25.9 -30.5 -31.0 -32.1 -35.9	EUT Horz EUT on Side EUT on Side EUT Vert EUT Horz EUT on Side
0.125 0.125 0.125 0.125 0.125 0.125 0.125	68.8 68.4 63.8 43.3 62.2 58.4 56.6	10.5 10.5 10.5 10.5 10.5 10.5	1.0 2.25 1.0 2.97 1.0 3.65 3.5	83.0 358.0 84.0 158.0 17.0 89.0	10.0 10.0 10.0 10.0 10.0 10.0	0.0 0.0 0.0 0.0 0.0 0.0	Perp to EUT Para to EUT Perp to EUT Para to EUT Para to GND Para to GND	PK PK AV PK PK PK	-59.1 -59.1 -59.1 -59.1 -59.1 -59.1	19.8 15.2 -5.3 13.6 9.8 8.0	45.7 45.7 25.7 45.7 45.7 45.7	-25.9 -30.5 -31.0 -32.1 -35.9 -37.7	EUT Horz EUT on Side EUT on Side EUT Vert EUT Horz EUT on Side EUT Horz
0.125 0.125 0.125 0.125 0.125 0.125 0.125 0.125	68.8 68.4 63.8 43.3 62.2 58.4 56.6 51.9	10.5 10.5 10.5 10.5 10.5 10.5 10.5	1.0 2.25 1.0 2.97 1.0 3.65 3.5	83.0 358.0 84.0 158.0 17.0 89.0 0.0 93.0	10.0 10.0 10.0 10.0 10.0 10.0 10.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0	Perp to EUT Para to EUT Perp to EUT Para to EUT Para to GND Para to GND Para to EUT	PK PK AV PK PK PK PK	-59.1 -59.1 -59.1 -59.1 -59.1 -59.1 -59.1	19.8 15.2 -5.3 13.6 9.8 8.0 3.3	45.7 45.7 25.7 45.7 45.7 45.7 45.7	-25.9 -30.5 -31.0 -32.1 -35.9 -37.7 -42.4	EUT Horz EUT on Side EUT on Side EUT Vert EUT Horz EUT on Side EUT Horz EUT Horz EUT Vert
0.125 0.125 0.125 0.125 0.125 0.125 0.125	68.8 68.4 63.8 43.3 62.2 58.4 56.6 51.9	10.5 10.5 10.5 10.5 10.5 10.5	1.0 2.25 1.0 2.97 1.0 3.65 3.5	83.0 358.0 84.0 158.0 17.0 89.0	10.0 10.0 10.0 10.0 10.0 10.0	0.0 0.0 0.0 0.0 0.0 0.0	Perp to EUT Para to EUT Perp to EUT Para to EUT Para to GND Para to GND	PK PK AV PK PK PK	-59.1 -59.1 -59.1 -59.1 -59.1 -59.1	19.8 15.2 -5.3 13.6 9.8 8.0	45.7 45.7 25.7 45.7 45.7 45.7	-25.9 -30.5 -31.0 -32.1 -35.9 -37.7	EUT Horz EUT on Side EUT on Side EUT Vert EUT Horz EUT on Side EUT Horz

Report No. ENTI0008 33/69

FIELD STRENGTH OF FUNDAMENTAL - HALF BRIDGE, DUAL CH



PSA-ESCI 2021.01.22.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 125 kHz. Half Bridge: Dual Channel PEPS on BCM Pins 01&01R and 02&02R.

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 5

FREQUENCY RANGE INVESTIGATED

Start Frequency 9 kHz	Stop Frequency	490 kHz
Otal Licquelley 15 Kilz	Otop i requeries	THOU KI IZ

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2020-08-20	2021-08-20
Cable	Northwest EMC	3 kHz - 1 GHz RE Cables	OCB	2020-07-01	2021-07-01
Antenna - Loop	EMCO	6502	AZB	2019-09-11	2021-09-11

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

The fundamental carrier of the EUT was maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

Report No. ENTI0008 34/69

FIELD STRENGTH OF FUNDAMENTAL -HALF BRIDGE, DUAL CH



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Wo	ork Order:	ENTI0008		Date:		-02-10		11						
	Project:		Te	mperature:		1 °C		1	4	>/-				
	Job Site:	OC08	_	Humidity:		% RH								
Seria	I Number:			etric Pres.:	1019	mbar		Tested by:	Mark Bayt	an		_		
0		BCM Module 125kh	iz, Model: B	1NA5								_		
Conf	iguration:	DENSO Internation	al Amarica									_		
	ttendees:		ai America, i	nc.								_		
	JT Power:											_		
			ransmitting 125 kHz. Half Bridge: Dual Channel PEPS on BCM Pins 01&01R and 02&02R.											
Operati	ing Mode:													
D	eviations:	None										_		
Co	omments:	The measurement of in this operating mo preliminary field stre	de: Bracket	Antenna mo	unted on s	teel and Re								
Test Speci	ifications					Test Metho	nd							
FCC 15.20		l				ANSI C63.						_		
Run #	4	Test Distance (r	n) 10	Antonna	Height(s)		1 to 4(m)		Results	Г	ass	_		
	4	Test Distance (I	10	Antenna	neigni(s)		1 (0 4(111)		Results		a55	_		
80														
70														
60											<u> </u>			
50							$\overline{}$							
40														
dBuV/m										_				
≥ 30							\longrightarrow							
쁑														
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10														
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-20														
0.	0		0.	0			0.1				1.0			
					MHz				■ PK	◆ AV	• QP			
					Futama!	Polarity/ Transducer		Distance			Company			
Freq	Amplitude	Factor Antenna Hei	ght Azimuth	Test Distance	External Attenuation	Type	Detector	Distance Adjustment	Adjusted	Spec. Limit	Compared to Spec.			
(MHz)	(dBuV)	(dB) (meters)	(degrees)	(meters)	(dB)	.,		(dB)	(dBuV/m)	(dBuV/m)	(dB)			
0.125	62.5	10.5	96.0	10.0	0.0	Pern to ELIT	AV	-50.1	1/ 0	25.7	-10.0	Commer EUT Ho		
0.125 0.125	63.5 64.6	10.5 1.0 10.5 1.0	86.0 86.0	10.0 10.0	0.0 0.0	Perp to EUT Perp to EUT	PK	-59.1 -59.1	14.9 16.0	25.7 45.7	-10.8 -29.7	EUT Hor		

Report No. ENTI0008 35/69

FIELD STRENGTH OF FUNDAMENTAL - HALF BRIDGE, SINGLE CH



PSA-ESCI 2021.01.22.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 125 kHz. Half Bridge: Single Channel PEPS on BCM Pins 01&01R.

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 4

FREQUENCY RANGE INVESTIGATED

Chart Francisco Old In	Cton Fraguesia	400 1411-
Start Frequency 9 kHz	Stop Frequency	490 kHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2020-08-20	2021-08-20
Cable	Northwest EMC	3 kHz - 1 GHz RE Cables	OCB	2020-07-01	2021-07-01
Antenna - Loop	EMCO	6502	AZB	2019-09-11	2021-09-11

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

The fundamental carrier of the EUT was maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

FIELD STRENGTH OF FUNDAMENTAL - HALF BRIDGE, SINGLE CH



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				11	, ,	
					- C	1
					11.1.5	
			1018 mbar	Tested k	y: Mark Baytan	
		Model: B1NA5				
Configuration:	4					
Customer:	DENSO International	America, Inc.				
EUT Power:						
perating Mode:	Transmitting 125 kHz.	Half Bridge: Single Char	nnel PEPS on BCM	Pins 01&01R.		
Deviations	None					
Comments			n of enclosure and a	antenna is shown. W	orst case antenna	in this operating
Specifications			Test Meth	nod		
15.209:2021						
un # 1	Test Distance (m)	10 Antenna H	eight(s)	1 to 4(m)	Results	Pass
80						
70						
60						
50				\		<u> </u>
40						
30						
20						
10						
0						
I						
-10				<u> </u>		
-10				•		
	Project: Job Site: Serial Number: EUT: Configuration: Customer: Attendees: EUT Power: Deviations: Comments: Specifications 5.209:2021	Customer: DENSO International Attendees: None EUT Power: 12 VDC Derating Mode: Transmitting 125 kHz. Deviations: None Comments: mode: Rear Bumper/ Specifications 5.209:2021 Test Distance (m) 80 70 60 40 30 20 10	Project: None Temperature: Job Site: OC08 Humidity: See Configurations Barometric Pres.: EUT: BCM Module 125kHz, Model: B1NA5 Configuration: 4 Customer: DENSO International America, Inc. Attendees: None EUT Power: 12 VDC Derating Mode: None Deviations: None The measurement of the worst case orientation mode: Rear Bumper/Frunk Antenna. Specifications 5.209:2021 In # 1 Test Distance (m) 10 Antenna H 80 70 40 30 20 10	Project: None Temperature: 20.7 °C Job Site: OC08 Humidity: 49.3% RH Serial Number: See Configurations Barometric Pres.: 1018 mbar EUT: BCM Module 125kHz, Model: B1NA5 Configuration: 4 Customer: DENSO International America, Inc. Attendees: None EUT Power: 12 VDC Transmitting 125 kHz. Half Bridge: Single Channel PEPS on BCM None Deviations: None The measurement of the worst case orientation of enclosure and mode: Rear Bumper/Frunk Antenna. Specifications Test Meti 5.209:2021 ANSI C63 ANSI C63 ANSI C63	Project: None Temperature: 20.7 °C Job Site: OC08 Humidity: 49.3% RH EUT: BCM Module 125kHz, Model: B1NA5 Configuration: 4 Customer: DENSO International America, Inc. Attendees: None EUT Power: 12 VDC perating Mode: Deviations: Transmitting 125 kHz. Half Bridge: Single Channel PEPS on BCM Pins 01&01R. Deviations: The measurement of the worst case orientation of enclosure and antenna is shown. W mode: Rear Bumper/Frunk Antenna. Specifications 5.209:2021 Test Method ANSI C63.10:2013	Work Order: ENTIO008 Date: 2021-02-08 Project: None Temperature: 2027 °C Job Site: OC08 Humidity: 49.3% RH Serial Number: See Configurations Barometric Press: 1018 mbar Tested by: Mark Baytan EUT: BCM Model: 425kHz, Model: B1NA5 Configuration: J4 Customer: DENSO International America, Inc. Attendess: None EUT Power: 12 VDC verating Mode: Transmitting 125 kHz. Half Bridge: Single Channel PEPS on BCM Pins 01&01R. Deviations: None Comments: The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna mode: Rear Bumper/Frunk Antenna. Specifications Test Method ANSI C63.10:2013

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.125	62.6	10.5	1.15	92.0	10.0	0.0	Perp to EUT	AV	-59.1	14.0	25.7	-11.7	EUT Horz
0.125	61.5	10.5	1.62	12.0	10.0	0.0	Perp to EUT	AV	-59.1	12.9	25.7	-12.8	EUT on Side
0.125	56.3	10.5	1.0	10.0	10.0	0.0	Para to EUT	AV	-59.1	7.7	25.7	-18.0	EUT Horz
0.125	55.1	10.5	1.0	115.0	10.0	0.0	Para to EUT	AV	-59.1	6.5	25.7	-19.2	EUT on Side
0.125	52.5	10.5	3.88	360.0	10.0	0.0	Para to GND	AV	-59.1	3.9	25.7	-21.8	EUT Horz
0.125	51.9	10.5	3.69	85.0	10.0	0.0	Para to GND	AV	-59.1	3.3	25.7	-22.4	EUT on Side
0.125	44.1	10.5	1.0	124.0	10.0	0.0	Para to EUT	AV	-59.1	-4.5	25.7	-30.2	EUT Vert
0.125	43.6	10.5	3.62	131.0	10.0	0.0	Para to GND	AV	-59.1	-5.0	25.7	-30.7	EUT Vert
0.125	63.6	10.5	1.15	92.0	10.0	0.0	Perp to EUT	PK	-59.1	15.0	45.7	-30.7	EUT Horz
0.125	62.6	10.5	1.62	12.0	10.0	0.0	Perp to EUT	PK	-59.1	14.0	45.7	-31.7	EUT on Side
0.125	57.3	10.5	1.0	10.0	10.0	0.0	Para to EUT	PK	-59.1	8.7	45.7	-37.0	EUT Horz

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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.125	56.3	10.5	1.0	115.0	10.0	0.0	Para to EUT	PK	-59.1	7.7	45.7	-38.0	EUT on Side
0.125	35.8	10.5	1.0	90.0	10.0	0.0	Perp to EUT	AV	-59.1	-12.8	25.7	-38.5	EUT Vert
0.125	53.8	10.5	3.88	360.0	10.0	0.0	Para to GND	PK	-59.1	5.2	45.7	-40.5	EUT Horz
0.125	53.0	10.5	3.69	85.0	10.0	0.0	Para to GND	PK	-59.1	4.4	45.7	-41.3	EUT on Side
0.125	45.8	10.5	1.0	124.0	10.0	0.0	Para to EUT	PK	-59.1	-2.8	45.7	-48.5	EUT Vert
0.125	45.2	10.5	3.62	131.0	10.0	0.0	Para to GND	PK	-59.1	-3.4	45.7	-49.1	EUT Vert
0 125	39.3	10.5	1.0	90.0	10.0	0.0	Pero to FUT	PK	-59 1	-9.3	45.7	-55.0	FUT Vert

Report No. ENTI0008 38/69

FIELD STRENGTH OF FUNDAMENTAL - ROUND ROBIN



PSA-ESCI 2021.01.22.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 125 kHz. Round Robin Mode

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 13

ENTI0008 - 6

FREQUENCY RANGE INVESTIGATED

Start Frequency 9 kHz	Stop Frequency	490 kHz
	Ctop i roquorio,	

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2020-08-20	2021-08-20
Cable	Northwest EMC	3 kHz - 1 GHz RE Cables	OCB	2020-07-01	2021-07-01
Antenna - Loop	EMCO	6502	AZB	2019-09-11	2021-09-11

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

The fundamental carrier of the EUT was maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

Report No. ENTI0008 39/69

FIELD STRENGTH OF FUNDAMENTAL - ROUND ROBIN

0.010

-10

-20 ____ 0.001



1.000

Work Order:	ENTI0008	Date:	2021-02-11	1		
Project:	None	Temperature:	20.9 °C	11,	6/3	/
Job Site:	OC08	Humidity:	52% RH		9	
Serial Number:		Barometric Pres.:	1018 mbar	Tested by	: Mark Baytan	
	BCM Module 125kHz,			100000000		
Configuration:						
	DENSO International A	America, Inc.				
Attendees:	None	·				
EUT Power:	12 VDC					
Operating Mode:	Transmitting 125 kHz.	Round Robin Mode				
Deviations:	None					
	The measurement of t mode: Bracket Antenr	he worst case orientation na on Aluminum	n of enclosure and a	antenna is shown. Wo	rst case antenna	in this opera
Specifications			Test Meth	nod		
				3.10:2013		
15.209:2021			ANSI C63	.10.2013		
	Test Distance (m)	10 Antenna H		1 to 4(m)	Results	Pass
	Test Distance (m)	10 Antenna H			Results	Pass
Run# 25	Test Distance (m)	10 Antenna H			Results	Pass
Run # 25 80	Test Distance (m)	10 Antenna H			Results	Pass
Run# 25	Test Distance (m)	10 Antenna H			Results	Pass
Run # 25 80 70	Test Distance (m)	10 Antenna H			Results	Pass
Run # 25	Test Distance (m)	10 Antenna H			Results	Pass
Run # 25 80 70 60	Test Distance (m)	10 Antenna H			Results	Pass
Run # 25 80 70	Test Distance (m)	10 Antenna H			Results	Pass
80 70 60 50	Test Distance (m)	10 Antenna H			Results	Pass
80 70 60 50	Test Distance (m)	10 Antenna H			Results	Pass
80 70 60 50	Test Distance (m)	10 Antenna H			Results	Pass
80 70 60 50	Test Distance (m)	10 Antenna H			Results	Pass
80 70 60 50	Test Distance (m)	10 Antenna H			Results	Pass
80 70 60 50 40	Test Distance (m)	10 Antenna H			Results	Pass
80 70 60 50	Test Distance (m)	10 Antenna H			Results	Pass
80 70 60 50 40	Test Distance (m)	10 Antenna H			Results	Pass

0.0				0.0	•			00					
						MHz				■ PK	◆ AV	• QP	
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.125	67.9	10.5	0.99	0.0	10.0	0.0	Perp to EUT	AV	-59.1	19.3	25.7	-6.4	EUT on Side, Pin 9/10
0.125	67.8	10.5	0.99	0.0	10.0	0.0	Perp to EUT	AV	-59.1	19.2	25.7	-6.5	EUT on Side, Pin 3/4
0.125	67.7	10.5	0.99	0.0	10.0	0.0	Perp to EUT	AV	-59.1	19.1	25.7	-6.6	EUT on Side, Pin 5/6
0.125	61.6	10.5	0.99	0.0	10.0	0.0	Perp to EUT	AV	-59.1	13.0	25.7	-12.7	EUT on Side, Pin 7/8
0.125	61.1	10.5	1.0	0.0	10.0	0.0	Perp to EUT	AV	-59.1	12.5	25.7	-13.2	EUT on Side, Pin 1/2
0.125	60.5	10.5	2.0	90.0	10.0	0.0	Perp to EUT	AV	-59.1	11.9	25.7	-13.8	EUT Horz, Pin 1/2
0.125	56.1	10.5	1.0	90.0	10.0	0.0	Para to EUT	AV	-59.1	7.5	25.7	-18.2	EUT on Side, Pin 1/2
0.125	54.4	10.5	1.0	185.0	10.0	0.0	Para to EUT	AV	-59.1	5.8	25.7	-19.9	EUT Horz, Pin 1/2
0.125	52.1	10.5	4.0	89.0	10.0	0.0	Para to GND	AV	-59.1	3.5	25.7	-22.2	EUT on Side, Pin 1/2
0.125	50.8	10.5	4.0	180.0	10.0	0.0	Para to GND	AV	-59.1	2.2	25.7	-23.5	EUT Horz, Pin 1/2
0.125	68.8	10.5	0.99	0.0	10.0	0.0	Perp to EUT	PK	-59.1	20.2	45.7	-25.5	EUT on Side, Pin 3/4
0.125	68.8	10.5	0.99	0.0	10.0	0.0	Perp to EUT	PK	-59.1	20.2	45.7	-25.5	EUT on Side, Pin 9/10
0.125	68.7	10.5	0.99	0.0	10.0	0.0	Perp to EUT	PK	-59.1	20.1	45.7	-25.6	EUT on Side, Pin 5/6
0.125	62.6	10.5	0.99	0.0	10.0	0.0	Perp to EUT	PK	-59.1	14.0	45.7	-31.7	EUT on Side, Pin 7/8
0.125	42.4	10.5	1.0	45.0	10.0	0.0	Para to EUT	AV	-59.1	-6.2	25.7	-31.9	EUT Vert, Pin 1/2
0.125	42.2	10.5	4.0	46.0	10.0	0.0	Para to GND	AV	-59.1	-6.4	25.7	-32.1	EUT Vert, Pin 1/2
0.125	61.9	10.5	1.0	0.0	10.0	0.0	Perp to EUT	PK	-59.1	13.3	45.7	-32.4	EUT on Side, Pin 1/2

0.100

Report No. ENTI0008 40/69

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.125	61.5	10.5	2.0	90.0	10.0	0.0	Perp to EUT	PK	-59.1	12.9	45.7	-32.8	EUT Horz, Pin 1/2
0.125	57.0	10.5	1.0	90.0	10.0	0.0	Para to EUT	PK	-59.1	8.4	45.7	-37.3	EUT on Side, Pin 1/2
0.125	55.8	10.5	1.0	185.0	10.0	0.0	Para to EUT	PK	-59.1	7.2	45.7	-38.5	EUT Horz, Pin 1/2
0.125	53.0	10.5	4.0	89.0	10.0	0.0	Para to GND	PK	-59.1	4.4	45.7	-41.3	EUT on Side, Pin 1/2
0.125	52.0	10.5	4.0	180.0	10.0	0.0	Para to GND	PK	-59.1	3.4	45.7	-42.3	EUT Horz, Pin 1/2
0.125	26.1	10.5	1.0	359.0	10.0	0.0	Perp to EUT	AV	-59.1	-22.5	25.7	-48.2	EUT Vert, Pin 1/2
0.125	43.8	10.5	4.0	46.0	10.0	0.0	Para to GND	PK	-59.1	-4.8	45.7	-50.5	EUT Vert, Pin 1/2
0.125	43.8	10.5	1.0	45.0	10.0	0.0	Para to EUT	PK	-59.1	-4.8	45.7	-50.5	EUT Vert, Pin 1/2
0.125	32.9	10.5	1.0	359.0	10.0	0.0	Perp to EUT	PK	-59.1	-15.7	45.7	-61.4	EUT Vert, Pin 1/2

Report No. ENTI0008 41/69

FIELD STRENGTH OF FUNDAMENTAL - ROUND ROBIN



										EmiR5 2021.01.08.0	PS	A-ESCI 2021.01.22.0)
Wo	rk Order:		Π0008		Date:		-02-11		11	, _	7		
	Project:		lone	Ten	nperature:		9 °C		1	-	7/-		
	Job Site:		C08	Danama	Humidity:		6 RH	-	Tanta d lava	Marie David			_
Seriai	Number: EUT:		nfigurations dule 125kHz,		etric Pres.:	1018	mbar		Tested by:	магк ваук	an		=
Confi	guration:	13	ule 125kHz,	Model. Di	CAN								_
	ustomer:		nternational	Δmerica In	nc .								=
	ttendees:	None	ntorriationar z	runonoa, n	10.								_
	JT Power:	12 VDC											=
			ing 125 kHz.	Round Ro	bin Mode								=
Operatii	ng Mode:												_
De	eviations:	None											_
Co	omments:		surement of tombo Antenn										-
Test Specif	fications						Test Metho	od					_
FCC 15.209	9:2021						ANSI C63.	10:2013					
Dr #	26	Test Di	iotonos (m)	10	Antony	Hoight/c\		1 to 4/m\		Pocult-	l 5	200	-
Run #	26	lest D	istance (m)	10	Antenna	Height(s)		1 to 4(m)		Results	l Pa	ass	_
80													
70													
60													
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50								$\downarrow \downarrow \downarrow$					
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40								$\perp \downarrow \downarrow \downarrow \downarrow$					
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₹ ₃₀											_		
dBuV/m								\mathcal{A}					
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0.00	01			0.010)			0.100				1.000	
						MHz				■ DI/	▲ Λ\/	• QP	
										■ PK	◆ AV	<u> </u>	
Freq	Amplitude	Factor	Antenna Height	Azimuth	Test Distance	External Attenuation	Polarity/ Transducer Type	Detector	Distance Adjustment	Adjusted	Spec. Limit	Compared to Spec.	
(MHz)	(dBuV)	(dB)	(meters)	(degrees)	(meters)	(dB)			(dB)	(dBuV/m)	(dBuV/m)	(dB)	Comments
0.125	68.3	10.5	0.99	0.0	10.0	0.0	Perp to EUT	AV	-59.1	19.7	25.7	-6.0	EUT on Side, Pin Hi/L
0.125	69.5	10.5	0.99	0.0	10.0	0.0	Perp to EUT	PK	-59.1	20.9	45.7	-24.8	EUT on Side, Pin Hi/L

Report No. ENTI0008 42/69

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, APPROACH



PSA-ESCI 2021.01.22.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 125 kHz. Full-Bridge: Approach on BCM Pins 01&02, 03&04, and 05&06

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 11

FREQUENCY RANGE INVESTIGATED

Chart Francisco Old In	Cton Francisco	20 MH-
Start Frequency 9 kHz	Stop Frequency	30 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2020-08-20	2021-08-20
Cable	Northwest EMC	3 kHz - 1 GHz RE Cables	OCB	2020-07-01	2021-07-01
Antenna - Loop	EMCO	6502	AZB	2019-09-11	2021-09-11

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These "pre-scans" are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height (where applicable) and polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

Report No. ENTI0008 43/69

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, APPROACH



										EmiR5 2021.01.08.0	P	SA-ESCI 2021.01.22.0	0
	Order:	ENTI0			Date:		-02-10		11	,			
	roject:	Non		Te	mperature:		1 °C		11/		7/-		
	b Site:	OC0			Humidity:		% RH						
Serial Nu		See Config			etric Pres.:	1018	mbar		Tested by:	Mark Bayta	an		_
0		BCM Module	25KHZ,	Model: B	INA5								_
Configu		DENSO Inte	rnational	Amorico I	no.								_
	ndees:		malionai <i>i</i>	America, i	nc.								_
		12 VDC											-
			125 kHz	Full-Bride	je: Approach	on BCM F	Pine 01&02	03&04 and	1 058.06				_
Operating	Mode:	Transmitting	120 KI IZ.	i uli-bilaç	jc. Approach	OII DOWN	1113 0 1002,	oodo+, and	1 00000				
Devi	ations:	None											_
		The measure	ement of t	he worst (case orientat	ion of encl	osure and a	ntenna is s	hown Wors	st case con	nhination o	f antennas	_
Com					Antenna on								
					strength testi								
est Specifica						N N	Test Metho						
CC 15.209:2							ANSI C63.						-
								. 5.2510					
Run #	20	Test Dista	ance (m)	10	Antenna	Height(s)		1 to 4(m)		Results	P	ass	- -
70													
							\downarrow						
50								$\downarrow\downarrow\downarrow$					
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30 Buv/m								$\downarrow\downarrow\downarrow\downarrow$					
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10													
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0.001				0.01	•	MHz		0.100				1.000	
						WHZ				■ PK	◆ AV	QP	
							Polerity/						
						External	Polarity/ Transducer		Distance			Compared to	
	mplitude	Factor Ar	ntenna Height	Azimuth	Test Distance	Attenuation	Type	Detector	Adjustment	Adjusted	Spec. Limit	Spec.	
					(.,,,,	Detector					
	(dBuV)	(dB)	(meters)	(degrees)	(meters)	(dB)	1,400	Detector	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Comm
(MHz)					(meters)		Perp to EUT	AV					Comm

Report No. ENTI0008 44/69

Perp to EUT

PK

-59.1

39.7

-43.7

EUT on Side

0.250

44.5

1.25

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, APPROACH



Work Order: ENTIO036 Date: 2021-02-10 Project: None Temperature: 20-11-02 Job Site: OC08 Humidity: 51-6% RH EUT: SCM Module 126/Hz, Model: 61NAS Customer: DENSO International America, Inc. Attendess: None Tested by: Mark Baytan EUT: SCM Module 126/Hz, Model: 61NAS Customer: DENSO International America, Inc. Attendess: None Tested by: Mark Baytan EUT: Power: 12 VDC Operating Mode. Deviations: None The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas positions from preliminary field strength testing: Rx Ant Pero to EUT. EUT on Side. Test Specifications Test Specifications Test Module 126 VBC ANSI C63.10.2013 MHz EVA Areginule Results Pass Test Module Results											EmiR5 2021.01.08.0	P	SA-ESCI 2021.01.22	0
Serial Number: See Configurations Barometric Pres. 1018 mbar Tested by: Mark Baytan						Date:				11	,			
Serial Number: See Configurations: 11 Customer: DE NSO International America, Inc. Attendees: None EUT Power: 12 VDC Operating Mode: The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas positions from preliminary field strength testing: Rx Ant Pero EUT. EUT on Side. Test Specifications FCC 15 209/2021 Run # 21 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass Run # 21 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass MHz ### Power for the specifications Pass of the specifications of the specificat					Te					4		7/-		
EUT: BCM Module 125Ktz, Model BTNA5 Configuration: 11 Customer: DENSO International America, Inc. Attendees: None EUT Power: 12 VDC Operating Mode: Tensmitting 125 kHz. Full-Bridge: Approach on BCM Pins 01&02, (03&04, and 05&06) Poviations: The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas positions from preliminary field strength instance. X Ant Perp 1 be UT; EUT on Side. Test Specifications FCC 15,209,2021 Run # 21 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass Run # 21 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass MHz By A A A A A A A A A A A A A A A A A A A					D					Table d boo	Maril David			
Configuration: 11 Gustomer: DENSO International America, Inc. Attendees: None EUT Power: 12 VDC Operating Mode: Deviations: None The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket Antenna on Steel, Rear Bumper/Frunk Antenna, and Interior Antenna. Worst case positions from preliminary field strength testing. Rx Ant Perp to EUT. EUT on Side. Test Specifications FCC 15.209-2021 Run # 21 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass Run # 21 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass MHz WHz PR • AV • QP Freq (dBV) Results Factor (GB) (GB) Reares 16(gf) Antenna Test Datance Antennas (GB) (GB) Reares 16(gf) (Seriai i		See Configu	Jations			1018	mbar		rested by:	Mark Bayta	an		_
Attenders: None EUT Power: 12 VDC Operating Mode: Transmitting 125 kHz. Full-Bridge: Approach on BCM Pins 018.02, 038.04, and 058.06 Deviations: None Comments: In this operating mode: Bracket Antenna on Steel, Rear Bumper(Fruk Antenna, and Interior Antenna. Worst case positions from preliminary field strength testing: Rx Ant Pep to EUT, EUT on Side. Test Specifications FCC 15.209:2021 ANSI C63.10.2013 Run # 21 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass ### Power P	Confid			i izaknz,	Model. D	CANII								_
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EUT Power: 12 VDC Operating Mode: Transmitting 125 kHz. Full-Bridge: Approach on BCM Pins 01&02, 03&04, and 05&08 Deviations: None The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket Antenna on Steel, Rear Bumper/Funk Antenna, and Interior Antenna. Worst case positions from preliminary field strength testing: Rx An Perp to EUT, EUT on Side. Test Specifications FCC 15.209.2021 Run # 21 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass Run # 21 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass WHIZ WHIZ Pass Freq (GBU) Picture Any Operating Mode: Special Ling (GBU) (national i	minorioa,									_
Operating Mode: Transmitting 125 kHz. Full-Bridge: Approach on BCM Pins 01&02, 03&04, and 05&06 Deviations: The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket Antenna on Steel, Rear Bumper/Frunk Antenna, and Interior Antenna. Worst case ositions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side. Test Specifications Test Method ANSI C63.10.2013 Run # 21 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 80 70 60 MHz WHz Priority/ Transmitting 125 kHz. Full-Bridge: Approach on BCM Pins 01&02, 03&04, and 05&06 Transmitting 125 kHz. Full-Bridge: Approach on BCM Pins 01&02, 03&04, and 05&06 Transmitting 125 kHz. Full-Bridge: Approach on BCM Pins 01&02, 03&04, and 05&06 Transmitting 125 kHz. Full-Bridge: Approach on BCM Pins 01&02, 03&04, and 05&06 Test Specifications Test Whole Approach on BCM Pins 01&02, 03&04, and 05&06 Test Specifications Test Whole Antenna, is shown. Worst case combination of antennas shown. Worst case combination of antennas positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side. NNSI C63.10.2013 Run # 21 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0														_
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Comments: In this operating mode: Bracket Antenna on Steel, Rear Bumper/Frunk Antenna, and Interior Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side. Test Specifications Test Method	Dev	viations:	None											_
Run # 21 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass	Cor		in this operat	ing mode	: Bracke	t Antenna on	Steel, Rea	ar Bumper/F	runk Ante	enna, and Int				_
Run # 21 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass	Test Specifi	cations						Test Meth	od					_
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Trest Distance (MHz) Amplitude (GBUV) Arteena Height (Azimuth (meters) Azimuth (meters) A														_
Trest Distance (MHz) Amplitude (GBUV) Arteena Height (Azimuth (meters) Azimuth (meters) A	00													
Freq (MHz) Amplitude (GBuV) Antenna Height (Gegrees) Test Distance (MHz) Test Distance (GBuV) Trype Detector Adjustment (GBuV) Adjusted (GBuV) Spec. Limit (GBuV) Comments Compared to Spec. (GB) Comments	80													
Freq (MHz) Amplitude (GBuV) Antenna Height (Gegrees) Test Distance (MHz) Test Distance (GBuV) Trype Detector Adjustment (GBuV) Adjusted (GBuV) Spec. Limit (GBuV) Comments Compared to Spec. (GB) Comments														
Freq (MHz) Amplitude (dBuV) Factor (degrees) Antenna Height Azimuth (meters) Test Distance (meters) Antenna Height (degrees) Test Distance (meters) Antenna Height (degrees) Test Distance (degrees) Trype Detector Type Detector (dBuV/m) Detector Adjusted (dBuV/m) Compared to Spec. (dBuV/m) Compared to Spec. (dBuV/m) Comments	70													
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0.1 1.0 MHz 10.0 100.0 MHz PK • AV • QP Freq (MHz) Amplitude (dBuV) (dB) Factor (dBuV) Antenna Height (meters) Antenna Height (degrees) Test Distance (meters) Attenuation (dB) External Attenuation (dB) Polarity/ Transducer Type Detector Adjustment (dB) Adjusted (dBuV/m) Compared to Spec. Limit (dBuV/m) Comments	10				++++									
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Freq Amplitude (dBuV) (dB) Antenna Height (meters) (degrees) (degr							МНэ							
Freq (MHz) (dBuV) (dB) Antenna Height (degrees) (degrees							1911 12				■ PK	◆ AV	QP	
							Attenuation	Transducer	Detector	Adjustment			Spec.	
	0.500	31.9	10.6	1.25	0.0	10.0	0.0	Perp to EUT	QP	-19.1	23.4	33.6	-10.2	

Report No. ENTI0008 45/69

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, DUAL CH PEPS IMMO



PSA-ESCI 2021.01.22.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 125 kHz. Full-Bridge: Dual Channel PEPS on BCM Pins IMMO Hi&Lo and 03&04

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 10

FREQUENCY RANGE INVESTIGATED

TREGOLIOT RANGE INVESTIGATED										
Start Frequency 9 kHz	Stop Frequency	30 MHz								

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2020-08-20	2021-08-20
Cable	Northwest EMC	3 kHz - 1 GHz RE Cables	OCB	2020-07-01	2021-07-01
Antenna - Loop	EMCO	6502	AZB	2019-09-11	2021-09-11

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These "pre-scans" are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height (where applicable) and polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

Report No. ENTI0008 46/69

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, DUAL CH PEPS IMMO



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Wo	ork Order:	ENTI0008		Date:		-02-10		11		>		
	Project:	None	Te	emperature:		1 °C		11/		7/-		
	Job Site:	OC08		Humidity:		% RH						
Seria	I Number:		s Baron	netric Pres.:	1018	mbar		Tested by:	Mark Bayta	an		_
		BCM Module 125kl	tz, Model: E	31NA5								_
	figuration:			_								_
	Customer:	DENSO Internation	al America,	Inc.								_
	Attendees:											_
El	UT Power:											_
Operat	ing Mode:	Transmitting 125 kl	Hz. Full-Brid	ge: Dual Cha	nnel PEPS	S on BCM Pi	ins IMMO F	Hi&Lo and C)3&04			_
D	eviations:	None										_
C	omments:	The measurement in this operating mostrength testing: Rx	de: Combo	Antenna an	d Rear Bur							.
Test Spec	ifications					Test Metho	od	l				=
FCC 15.20						ANSI C63.		l				_
. 55 15.20						101 000.	. 5.2010					
Run #	17	Test Distance (r	n) 10	Antenna	Height(s)		1 to 4(m)		Results	Pa	ass	_
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70												
						+						
50						\longrightarrow	\longrightarrow				 	
] ~	_				
									_			
						\perp						
E 20										_		
5 30												
dBuV/m												
쁑												
										_		
10											+++	
-			+			+						
-10											 	
									•			
20												
-30 ¹			0.0	10			0.400	<u> </u>			1.000	
0.0	001		0.0	10			0.100				1.000	
					MHz				■ PK	◆ AV	QP	
									FR	▼ AV	<u> </u>	
					E	Polarity/		Dist				
					External	Transducer		Distance			Compared to	
Eroa	Amplitudo	Factor Antonna Uni	abt Azimuth	Toot Diotonos			Dotostas	Adjustment	Adjusted	Spac Limit		
Freq	Amplitude (dBuV)	Factor Antenna Hei		Test Distance (meters)	Attenuation	Туре	Detector	Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Spec.	
Freq (MHz)	Amplitude (dBuV)	Factor Antenna Hei (meters)	ght Azimuth (degrees)	Test Distance (meters)			Detector	Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)		
(MHz)					Attenuation		Detector	,			Spec.	Comments
	(dBuV)	(dB) (meters)	(degrees)	(meters)	Attenuation (dB)	Туре		(dB)	(dBuV/m)	(dBuV/m)	Spec. (dB)	

Report No. ENTI0008 47/69

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, DUAL CH PEPS IMMO



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Wo	ork Order:	ENTI0008		Date:		-02-10		11		>		
	Project:	None	Te	mperature:		.1 °C		4		7/-		
	Job Site:	OC08		Humidity:		% RH						
Seria	I Number:		Barom	etric Pres.:	1018	3 mbar		Tested by:	Mark Bayta	an		_
		BCM Module 125kHz	z, Model: B	1NA5								_
Conf	iguration:	10 DENICO I (''										_
	Attendees:	DENSO Internationa	i America,	inc.								_
	JT Power:											_
		Transmitting 125 kHz	- Full Dride	as: Dual Cha	nnal DEDO	e on PCM D	ina IMMO I	Liel a and O	2804			_
Operat	ing Mode:	Transmilling 125 Km	z. Full-bilu(ge. Duai Cha	illiei PEPS	OII DOW P	IIIS IIVIIVIO I	nialo ano o	3004			
D	eviations:	None										- -
C	omments:	The measurement of in this operating mod strength testing: Rx A	le: Combo	Antenna an	d Rear Bur							_
Test Spec	ifications					Test Meth	od					_
FCC 15.20						ANSI C63.		-				_
Run #	18	Test Distance (m) 10	Antenna	Height(s)		1 to 4(m)	I	Results	P	ass	_
												_
80												
70												
70												
60												
= ⁵⁰			-									
m//ngp												
30												
30												
20											+++	
10			_									
0												
0.1	1		1.0				10.0			-	100.0	
0.1	'		1.0		MHz		10.0		■ PK	◆ AV	• QP	
Freq (MHz)	Amplitude (dBuV)	Factor (dB) Antenna Heigh (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments EUT on Side
0.500	51.7	10.0	500.0	10.0	0.0	OPICEUI	Q1	13.1	20.2	55.0	10.4	

Report No. ENTI0008 48/69

SPURIOUS RADIATED EMISSIONS -FULL BRIDGE, DUAL CH



PSA-ESCI 2021.01.22.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 125 kHz. Full-Bridge: Dual Channel PEPS on BCM Pins 05&06 and 03&04

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 9

FREQUENCY RANGE INVESTIGATED

Start Frequency 9 kHz Stop Frequency 30 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2020-08-20	2021-08-20
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Antenna - Loop	EMCO	6502	AZB	2019-09-11	2021-09-11

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These "pre-scans" are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height (where applicable) and polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

Report No. ENTI0008 49/69

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, DUAL CH



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W	ork Order:	ENTI0008		Date:		-02-10	100			-		Ī
	Project:	None	Te	emperature:		1 °C		11		7/-		
	Job Site:	OC08		Humidity:		% RH						
Seria	al Number:		s Baron	netric Pres.:	1018	mbar		Tested by:	Mark Bayta	an		_
0		BCM Module 125kl	HZ, Model: E	31NA5								_
	figuration:	DENSO Internation	al America	Inc								_
	Attendees:		ai America,	IIIC.								_
	UT Power:											_
	ting Mode:	Transmitting 125 kl	Hz. Full-Brid	ge: Dual Cha	nnel PEPS	on BCM Pi	ns 05&06	and 03&04				_
	Deviations:	None										_
(The measurement in this operating mo from preliminary fie	ode: Bracke	t antenna mo	unted on a	aluminum ar	nd Rear Bu					
Toct Sno		non prominary no	ia onongin i	oomig: Total	о.р то	Test Metho						
FCC 15.2	cifications					ANSI C63.		I				_
Run #	‡ 14	Test Distance (i	n) 10	Antenna	Height(s)		1 to 4(m)		Results	l Pa	ass	<u>-</u>
70												
						+						
50			+			++	$\overline{}$					
_						+				_		
E 30							+					
dBuV/m												
8												
•										_		
10											 	
									_			
									•			
-10											111	
-30	004		2.2	10			0.400				1.000	
0.	001		0.0	10			0.100				1.000	
					MHz				■ PK	◆ AV	QP	
						Delevity/						
					External	Polarity/ Transducer		Distance			Compared to	
			ight Azimuth	Test Distance	Attenuation	Type	Detector	Adjustment	Adjusted	Spec. Limit	Spec.	
Freq	Amplitude	Factor Antenna He				Туре	Detector					
Freq (MHz)	Amplitude (dBuV)	Factor Antenna He (dB) (meters)		(meters)	(dB)	Туре	Detector	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Comments
						Perp to EUT Perp to EUT	AV PK					Comments EUT on Side

Report No. ENTI0008 50/69

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, DUAL CH



Project: None											EmiR5 2021.01.08.0	ı	PSA-ESCI 2021.01.22.	0
Serial Number See Configurations Boundaries Procedure Process 1018 mbar Tested by: Mark Baytan EUT BOM Module 1256ktz, Model: BTNA5 Configuration: 9 Customer: [PENSO International America, Inc. Attendess None EUT Power: 12 VDC Operating Mode Transmitting 125 kHz. Full-Bridge: Dual Channel PEPS on BCM Pins 05806 and 03804 Deviations: None The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket antenna mounted on aluminum and Rear Bumper/Funk Antenna. Worst case positions from preliminary field strength testing. Rx Ant Perp to EUT, EUT on Side. Run # 15 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass ### Pas	Wor					Date:				11	, _	2		
Serial Number: See Configurations Barometric Pres. 1018 mbar Tested By: Mark Baytan					Te					-	6	2/-		
Configuration: 9 Customer: DENSO International America, Inc. Attendess: None EUT Power: 12 VDC Operating Mode: Transmitting 125 kHz. Full-Bridge: Dual Channel PEPS on BCM Pins 05&06 and 03&04 Deviations: Comments: In this operating mode: Bracket antenan amounted on aluminum and Rear Bumper/Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT. EUT on Side. FCC 15.209.2021 ANSI C63.10.2013 Run # 15 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass Omition Permission of Antenna Height(s) 1 to 4(m) Results Pass White AV QP Freq Arreliude (sidu/m) Antenna Height (signess) Transducer (sidu/m) (signess) Transducer (sidu/m) (signess) Recursion (signess) Recursion (sidu/m) Results Specifical Editory (sidu/m) Results Spec														
Counter (DENSO International America, Inc. Attendess) None EUT Power: 12 VDC Operating Mode Deviations None The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket antenna mounted on aluminum and Rear Bumper/Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side. Test Specifications Test Wethod ANSI C63.10.2013 Run # 15 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass ### Pass ### ### ### ### ### ### ### ### ###	Serial I		See Config	gurations			1018	3 mbar		Tested by:	Mark Bayta	an		_
Customer: DENSO International America, Inc. Attendess: None EUT Power: 12 VDC Operating Mode: Transmitting 125 kHz. Full-Bridge: Dual Channel PEPS on BCM Pins 05806 and 03804 Deviations: The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket antenna mounted on aluminum and Rear Bumper/Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side. Run # 15				e 125kHz,	Model: B	1NA5								_
Attendees: None EUT Power: 12 VDC Operating Mode: Transmitting 125 kHz. Full-Bridge: Dual Channel PEPS on BCM Pins 05&06 and 03&04 None														_
Peter Power: 12 VDC Operating Mode: Transmitting 125 kHz. Full-Bridge: Dual Channel PEPS on BCM Pins 05806 and 03804				ernational.	America, I	nc.								_
Transmitting 125 kHz. Full-Bridge: Dual Channel PEPS on BCM Pins 05&06 and 03&04														_
The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket antenna mounted on aluminum and Rear Bumper/Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side Specifications Test Method	EU1	Γ Power:												
The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket antenna mounted on aluminum and Rear Bumper/Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT. EUT on Side. Test Specifications Test Method	Operatin	g Mode:	Transmitting	g 125 kHz.	Full-Brido	ge: Dual Cha	nnel PEPS	S on BCM P	ins 05&0	6 and 03&04				_
Comments: In this operating mode: Bracket antenna mounted on aluminum and Rear Bumper/Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side. Test Specifications Test Method ANSI C63.10:2013	De	viations:												_
Run # 15 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 80 70 60	Cor		in this opera	ating mode	e: Bracket	antenna mo	ounted on	aluminum aı	nd Rear I					
Run # 15 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 80 70 60	Test Specifi	ications						Test Meth	od					-
Run # 15 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 80 70 60			1											-
80 70 60 90 10 0.1 1.0 MHz 10.0 10.0 10.0 MHz PK • AV • QP Freq (MHz) Armitude (dBuV) (dBb) Armena Height Azimuth (meters) (degrees) (recters) Attenuation (dBb) Type (dBb) (dBb) (dBb) (Comment Spec. (dBb) (CDB)	Run #	15	Test Dist	ance (m)	10	Antenna	ı Height(s))	1 to 4(n	n)	Results	P	ass	_
Treed (GB) Antenna Height (Gegrees) Test Distance (GB) Type (GB) Antenna Height (MHz) Test Distance (GB) Type (GB) T		J				•	<u> </u>			,				_
Treed (GB) Antenna Height (Gegrees) Test Distance (GB) Type (GB) Antenna Height (MHz) Test Distance (GB) Type (GB) T														
Freq (MHz) Amplitude (GBuV) Factor (MHz) Azimuth (degrees) Antenna Height (degrees) Test Distance (Meters) Azimuth (degrees) Test Distance (MHz) Tes	80				+									
Freq (MHz) Amplitude (GBuV) Factor (MHz) Azimuth (degrees) Antenna Height (degrees) Test Distance (Meters) Azimuth (degrees) Test Distance (MHz) Tes														
Freq (MHz) Amplitude (GBuV) Factor (MHz) Azimuth (degrees) Antenna Height (degrees) Test Distance (Meters) Azimuth (degrees) Test Distance (MHz) Tes														
Freq (MHz) Amplitude (dBuV) (dB) Antenna Height Azimuth (meters) Test Distance Antennation (dB) Type Detector Adjustment (dB) Detector Adjustment (dB) Spec. Limit Compared to Spec. (dB) Comment	70													
Freq (MHz) Amplitude (dBuV) (dB) Antenna Height Azimuth (meters) Test Distance Antennation (dB) Type Detector Adjustment (dB) Detector Adjustment (dB) Spec. Limit Compared to Spec. (dB) Comment														
Freq (MHz) Amplitude (dBuV) (dB) Antenna Height Azimuth (meters) Test Distance Antennation (dB) Type Detector Adjustment (dB) Detector Adjustment (dB) Spec. Limit Compared to Spec. (dB) Comment	00													
Transducer (MHz) Amplitude (dBuV) Antenna Height (meters) Antenna Height (meters) Antenna Height (degrees) Test Distance (meters) Attenuation (dB) Transducer Type Detector Adjustment (dB) Adjusted (dBuV/m) Compared to Spec. Limit (dB) Comment	60													
Transducer (MHz) Amplitude (dBuV) Antenna Height (meters) Antenna Height (meters) Antenna Height (degrees) Test Distance (meters) Attenuation (dB) Transducer Type Detector Adjustment (dB) Adjusted (dBuV/m) Compared to Spec. Limit (dB) Comment														
Transducer (MHz) Amplitude (dBuV) Antenna Height (meters) Antenna Height (meters) Antenna Height (degrees) Test Distance (meters) Attenuation (dB) Transducer Type Detector Adjustment (dB) Adjusted (dBuV/m) Compared to Spec. Limit (dB) Comment	50													
30 20 10 0.1 1.0 10.0 100.0 MHz PK AV QP Freq (MHz) Amplitude (dBuV) (dB) Antenna Height (meters) (degrees) Test Distance (meters) (degrees) Test Distance (meters) (dB) Restaurce (meters) (dB) Restaurce (meters) Restaurc	E 30													
30 20 10 0.1 1.0 10.0 100.0 MHz PK AV QP Freq (MHz) Amplitude (dBuV) (dB) Antenna Height (meters) (degrees) Test Distance (meters) (degrees) Test Distance (meters) (dB) Restaurce (meters) (dB) Restaurce (meters) Restaurc	>													
30 20 10 0.1 1.0 10.0 100.0 MHz PK AV QP Freq (MHz) Amplitude (dBuV) (dB) Antenna Height (meters) (degrees) Test Distance (meters) (degrees) Test Distance (meters) (dB) Restaurce (meters) (dB) Restaurce (meters) Restaurc	₽ 40													
20 10 0.1 1.0 MHz PK AV QP	뜅													
20 10 0.1 1.0 MHz PK AV QP														
Treq (MHz) Amplitude (dBuV) Antenna Height (degrees) Antenna Height (degrees) Test Distance (meters) Antenna Height (degrees) Test Distance (meters) Antenna Height (degrees) Test Distance (meters) Test Distance (dBuV) Transducer Type Detector Distance Adjusted (dBuV/m) Adjusted (dBuV/m) Compared to Spec. Limit (dBuV/m) Compared to Spec. (dB) Comment	30				\longrightarrow									
Treq (MHz) Amplitude (dBuV) Antenna Height (degrees) Antenna Height (degrees) Test Distance (meters) Antenna Height (degrees) Test Distance (meters) Antenna Height (degrees) Test Distance (meters) Test Distance (dBuV) Transducer Type Detector Distance Adjusted (dBuV/m) Adjusted (dBuV/m) Compared to Spec. Limit (dBuV/m) Compared to Spec. (dB) Comment						<u> </u>								
Treq (MHz) Amplitude (dBuV) Antenna Height (degrees) Antenna Height (degrees) Test Distance (meters) Antenna Height (degrees) Test Distance (meters) Antenna Height (degrees) Test Distance (meters) Test Distance (dBuV) Transducer Type Detector Distance Adjusted (dBuV/m) Adjusted (dBuV/m) Compared to Spec. Limit (dBuV/m) Compared to Spec. (dB) Comment				•		7								
O 0.1 1.0 10.0 100.0 MHz Polarity/ Transducer Type Detector Adjusted (dBuV/m) (dB) V/m (dB) V/m (dB) V/m (dB) V/m (Compared to Spec. (dB) Comment	20													
O 0.1 1.0 10.0 100.0 MHz Polarity/ Transducer Type Detector Adjusted (dBuV/m) (dB) V/m (dB) V/m (dB) V/m (dB) V/m (Compared to Spec. (dB) Comment														
O 0.1 1.0 10.0 100.0 MHz Polarity/ Transducer Type Detector Adjusted (dBuV/m) (dB) V/m (dB) V/m (dB) V/m (dB) V/m (Compared to Spec. (dB) Comment	40													
0.1 1.0 1.0 10.0 MHz MHz ■ PK ◆ AV ■ QP Freq (MHz)	10													
0.1 1.0 1.0 10.0 MHz MHz ■ PK ◆ AV ■ QP Freq (MHz)														
0.1 1.0 1.0 10.0 MHz MHz ■ PK ◆ AV ■ QP Freq (MHz)	0													
MHz ■ PK ◆ AV ■ QP Freq (MHz) Amplitude (dBuV) (dB) Antenna Height (meters) (degrees) Test Distance (meters) (degrees) (degrees) (dB) (dB) (meters) (dB) (dB) (dB) (dB) (dB) (dB) (dB) (dB					1 0				10.0				100.0	
Freq Amplitude (dBuV) (dB) Antenna Height (meters) (degrees) Test Distance (meters) (dB) (degrees) (meters) (degrees) (meters) (dB) (dB) (dB) (dB) (dB) (dB) (dB) (dB	0.1				1.0		8417		10.0				100.0	
Freq Amplitude (dBuV) (dB) Antenna Height (meters) (degrees) Test Distance (meters) (degrees) (meters) (dB) (meters) (dB) (meters) (dB) (meters) (dB) (dB) (dB) (dB) (dB) (dB) (dB) (dB							WHZ				■ PK	AV	QP	
Freq Amplitude (dBuV) (dB) Antenna Height (degrees) Test Distance (MHz) (dBuV) (dB) (dBuV) (dB) (dBuV) (dB) (dBuV) (dB) (degrees) (meters) (degrees) (meters) (dB) (dBuV) (dB) (dBuV/m) (dB) (dBuV/m) (dB) (dBuV/m) (dB) (dBuV/m) (dB) (comment degrees) (dB) (dBuV/m) (dB) (dBuV/m) (dB) (dBuV/m) (dB) (comment degrees) (dB) (dBuV/m) (dB) (dBuV/m) (dB) (dB) (dB) (dB) (dB) (dB) (dB) (dB														
Freq Amplitude (dBuV) (dB) Antenna Height (meters) (degrees) (degr							External			Distance			Compared to	
(MHz) (dBuV) (dB) (meters) (degrees) (meters) (dB) (dB) (dBuV/m) (dBuV/m) (dBuV/m) (dB) Comment	Frea	Amplitude	Factor A	ntenna Height	Azimuth	Test Distance			Detector		Adjusted	Spec. Limit		
Comment								,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,						
0.500 31.7 10.6 1.0 0.0 10.0 0.0 Perp to EUT QP -19.1 23.2 33.6 -10.4 EUT on S														Comments
	0.500	31.7	10.6	1.0	0.0	10.0	0.0	Perp to EUT	QP	-19.1	23.2	33.6	-10.4	EUT on Side

Report No. ENTI0008 51/69

SPURIOUS RADIATED EMISSIONS -FULL BRIDGE, IMMOBILIZER



PSA-ESCI 2021.01.22.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 125 kHz. Full-Bridge: Immobilizer on BCM Pin IMMO Hi&Lo

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 12

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	30 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2020-08-20	2021-08-20
Cable	Northwest EMC	3 kHz - 1 GHz RE Cables	OCB	2020-07-01	2021-07-01
Antenna - Loop	EMCO	6502	AZB	2019-09-11	2021-09-11

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These "pre-scans" are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height (where applicable) and polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

Report No. ENTI0008 52/69

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, IMMOBILIZER



								1		EmiR5 2021.01.08.0	P	SA-ESCI 2021.01.22.	0
Wo	rk Order:	ENTI00			Date:		-02-10	1	/				
	Project:	None		Te	mperature:		1 °C	-	1-2 6		/		
	Job Site:	OC0			Humidity:		% RH						
Serial	Number:	See Configu	urations	Barom	etric Pres.:	1018	mbar		Tested by:	Mark Bayta	an		_
		BCM Module	: 125kHz,	Model: B	1NA5								_
Confi	iguration:	12											_
		DENSO Inter	rnational /	America, I	nc.								_
	ttendees:												_
EU	JT Power:	12 VDC											
Operati	ng Mode:	Transmitting	125 kHz.	Full-Bridg	je: Immobiliz	er on BCN	1 Pin IMMO	Hi&Lo					_
De	eviations:	None											_
Co		The measure operating mo strength test	de: Com	bo Anten	na (Only anto	enna appli							_
Test Speci	fications						Test Meth	od					_
FCC 15.20							ANSI C63.		1				_
		T		40				4.4		D			_
Run #	23	Test Dista	ance (m)	10	Antenna	Height(s)		1 to 4(m)		Results	Pa	ass	_
70													
50 -													
dBuV/m													
10													
-10										•			
-30													
0.00	01			0.01	0			0.100				1.000	
0.00	.			0.01	•	MHz		0.100		■ PK	◆ AV	• QP	
Freq (MHz)	Amplitude (dBuV)	Factor An	itenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.250 0.250	32.1 45.6	10.6 10.6	1.25 1.25	0.0 0.0	10.0 10.0	0.0 0.0	Perp to EUT Perp to EUT	AV PK	-59.1 -59.1	-16.4 -2.9	19.7 39.7	-36.1 -42.6	EUT on Sid EUT on Sid

Report No. ENTI0008 53/69

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, IMMOBILIZER



										EmiR5 2021.01.08.0	F	PSA-ESCI 2021.01.22.	0
	Order:	ENTI0			Date:		-02-10		11				
-	Project:	Non		Т	emperature:		.1 °C		4		7/-		
	ob Site:	OCC			Humidity:		% RH						
Serial N		See Config	urations		metric Pres.:	1018	3 mbar		Tested by:	Mark Bayta	an		_
0		BCM Module	e 125KHZ	, Model: I	B1NA5								_
Configu	uration:	TZ		A!	I.e. e								_
	endees:	DENSO Inte	ernational	America	, Inc.								_
													_
	Power:		. 105 kH=	Full Dai	dge: Immobiliz	or on DCN	A Die IMMO	11:01 a					_
Operating	g Mode:	Transmitting) 123 KHZ	. rull-bill	age. IIIIIIIobiiiz	ei on bon	A PIN IIVIIVIO	ΠΙαΕΟ					
Dev	lations:	None											- -
Com	nments:	operating m	ode: Con	nbo Ante	t case orienta nna (Only ant to EUT, EUT	enna appli							_
Test Specific	cations						Test Metho	od					_
FCC 15.209:2							ANSI C63.		•				_
Run #	24	Test Dist	ance (m)	10	Antenna	Height(s)		1 to 4(m)	ı	Results	l p	ass	_
Ruii #	2-7	TOST DIST	anoc (m)	10	Antonio	ricigiit(5)		1 10 4(111)	I	results	'	400	_
80													
70													
60													
50													
_													
₽ 40 ⊢													
W//NBp													
<u> </u>													
30													
					7								
20			T										
10													
10													
0													
-10													
0.100				1.0	000			10.000				100.000	
						MHz							
						.*2				■ PK	◆ AV	QP	
							Polarity/						
E	A 174.	E			T	External	Transducer		Distance	A direct	0	Compared to	
	Amplitude (dBuV)	Factor A (dB)	ntenna Height (meters)	Azimuth (degrees		Attenuation (dB)	Туре	Detector	Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Spec. (dB)	
(MHz)	(3507)	(05)	((Gogices	((35)			(35)	(000 4/111)	(0007/111)	(45)	Comments
	32.0	10.6	1.25	0.0	10.0	0.0	Perp to EUT	QP	-19.1	23.5	33.6	-10.1	EUT on Side

Report No. ENTI0008 54/69

SPURIOUS RADIATED EMISSIONS -FULL BRIDGE, SINGLE CH PEPS IMMO



PSA-FSCI 2021.01.22.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 125 kHz. Full-Bridge: Single Channel PEPS on BCM Pins IMMO Hi/Lo

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 8

FREQUENCY RANGE INVESTIGATED

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2020-08-20	2021-08-20
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Antenna - Loop	EMCO	6502	AZB	2019-09-11	2021-09-11

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These "pre-scans" are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height (where applicable) and polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

Report No. ENTI0008 55/69

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, SINGLE CH PEPS IMMO



										EmiR5 2021.01.08.0	PS	SA-ESCI 2021.01.22	0
Wo	ork Order:		10008		Date:		-02-10		11		-		
	Project:		one	Te	mperature:		.1 °C		4		>/-	-	
	Job Site:		C08		Humidity:		% RH						
Serial	Number:		figurations ule 125kHz,		etric Pres.:	1018	3 mbar		lested by:	Mark Bayta	an		_
Conf	iguration:		ule 125KHZ,	Model: B	CANII								_
			nternational A	America I	nc								_
	ttendees:		iterriational F	America, i	no.								_
	JT Power:												_
	ing Mode:		ng 125 kHz.	Full-Bridg	je: Single Ch	nannel PE	PS on BCM I	Pins IMMO	Hi/Lo				_
D	eviations:	None											_
Ce	omments:	operating	urement of t mode: Comb esting: Rx A	oo Antenn	a (Only ante	enna applio							_
Test Speci	ifications						Test Metho	od					_
FCC 15.20							ANSI C63.		•				_
Run #	11	Test Di	stance (m)	10	Antenna	ı Height(s	A	1 to 4(m)		Results	l P:	ass	_
iαii π	- ''	Test Di	starice (iii)	10	Antenna	rreignt(s	/	1 10 4(111)		Results		200	_
70													
70													
							\perp						
50													
30													
						_							
							\downarrow						
€ 30								$\downarrow\downarrow\downarrow\downarrow$				<u> </u>	
dBuV/m													
B													
ס													
10													
-													
-10												 	
										•			
										•			
-30													
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						MHz	:			■ PK	◆ AV	• QP	
							Polarity/						
Eroa	Amplitudo	Easter	Antonno Hoight	Azimuth	Test Distance	External	Transducer	Dotostas	Distance	Adjusted	Spac Limit	Compared to	
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	Attenuation (dB)	Туре	Detector	Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Spec. (dB)	
(IVITIZ)	(3507)	(3D)	((4091000)	(51010)	(35)			(35)	(0.50 47111)	(4547/11)	(05)	Comments
0.250	32.4	10.5	3.04	32.0	10.0	0.0	Perp to EUT	AV	-59.1	-16.2	19.6	-35.8	EUT on Side
0.250	44.3	10.5	3.04	32.0	10.0	0.0	Perp to EUT	PK	-59.1	-4.3	39.7	-44.0	EUT on Side

Report No. ENTI0008 56/69

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, SINGLE CH PEPS IMMO



										EmiR5 2021.01.08.0	PS	SA-ESCI 2021.01.22.0
W	ork Order:	ENTI	8000		Date:		-02-10		11			
	Project:	No	ne	T	emperature:	20.	1 °C		1	4	5/	
	Job Site:	00	208		Humidity:	51.6	% RH				1	
Seria	al Number:			Baror	netric Pres.:		mbar		Tested by:	Mark Bavta	an	
	EUT:	BCM Modu	ıle 125kHz,	Model: F	31NA5							
Con	figuration:		10 1201112,	Wiodol. L	7114710							
0011	Customer:	DENISO In	tornational	1 morico	Inc							
	Attendees:	None	terriational	America,	IIIC.							
	Attenuees.	10116										
	UT Power:											
Operat	ting Mode:	I ransmittir	ng 125 kHz.	Full-Brid	lge: Single Ch	nannel PEP	S on BCM	Pins IMMC) Hı/Lo			
С	Deviations:	None										
C	comments:	mode: Con	nbo Antenn	a (Only a	case orientat antenna applic EUT on Side.							
Test Spec	cifications						Test Meth	od				
FCC 15.20							ANSI C63.					
D	10	Total D'		40	Auto	Hai ab 4		4 40 4/22		Deart		
Run#	12	l est Dis	stance (m)	10	Antenna	Height(s)		1 to 4(m)		Results	l Pa	ass
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80												
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m//mgp												
5 40												
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30												
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0.	1			1.	0			10.0				100.0
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						MHz				■ PK	◆ AV	• QP
										- FK	* AV	<u> </u>
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)

Report No. ENTI0008 57/69

Perp to EUT

0.500

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, SINGLE CH



PSA-ESCI 2021.01.22.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 125 kHz. Full-Bridge: Single Channel PEPS on BCM Pins 05&06

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 7

FREQUENCY RANGE INVESTIGATED

Start Frequency 9 kHz	Stop Frequency	30 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2020-08-20	2021-08-20
Cable	Northwest EMC	3 kHz - 1 GHz RE Cables	OCB	2020-07-01	2021-07-01
Antenna - Loop	EMCO	6502	AZB	2019-09-11	2021-09-11

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These "pre-scans" are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height (where applicable) and polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

Report No. ENTI0008 58/69

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, SINGLE CH



PSA-ESCI 2021.01.22.0

EmiR5 2021.01.08.0

Work Order: ENT10008											EmiR5 2021.01.08.0	PS	SA-ESCI 2021.01.22	.0
Serial Number: See Configurations Barometric Press; 1018 mbar Tested by: Mark Baytan	Wo									11,		>		
Serial Number: See Configurations EUT Pewer: JEX/M Model 125kHz, Model 181AS Configuration: / Customer: DENSO International America, Inc. Attendess: None EUT Pewer: JEX/DC Operating Mode: Transmitting 125 kHz, Full-Bridge: Single Channel PEPS on BCM Pins 05&06 Deviations: The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Bracket antenna mounted on aluminum. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side. Test Method Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass FCC 15.209.2021 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass MHz Pass MHz Pass Pass Against Against Against Against Against Against Against Against Against Specific Comments to Specific Comments (all provided to the pass) and the pass of t					Tei					1		1	_	
EUT; BCM Module 125kHz, Model: BTNAS Configuration: 7 Customer: DENSO International America, Inc. Attendess: None EUT Power: 12 VDC Operating Model Deviations: The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating to EUT; EUT on Side. Test Specifications FCC 15.209-2021 ANSI C63.10-2013 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass FCC 15.209-2021 RNS C63.10-2013 MHz Pass P														
Configuration: 7 Custorier; DENSO International America, Inc. Attendees: None EUT Power: 12 VDC Operating Mode: Deviations: None Transmitting 125 kHz. Full-Bridge: Single Channel PEPS on BCM Pins 05&06 Deviations: None Comments: Inc. Authorizer of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Bracket antenna mounted on aluminum. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side. Test Specifications Test Method ANSI C63.10.2013 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 MHz Planting PR AV QP Frag Angilistic General (General) Ansirable (General) December Angilia Angilia (General) Ansirable (Gene	Serial						1018	mbar		Tested by:	Mark Bayta	an		_
Customer: DENSO International America, Inc. Attendes: None EUT Power: 12 VDC Operating Mode: Transmitting 125 kHz. Full-Bridge: Single Channel PEPS on BCM Pins 05&06 Deviations: None Comments: mode: Bracket antenna mounted on aluminum. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side. Test Specifications FCC 15.209:2021 ANSI C63.10:2013 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass FCC 15.209:2021 RNS C63.10:2013 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass MHz BPK • AV • QP FRQ (MHz) G(Bill 0) G(ule 125kHz,	Model: B1	NA5								_
Attendees: None EUT Power: 12 VDC Operating Mode: Transmitting 125 kHz. Full-Bridge: Single Channel PEPS on BCM Pins 058.06 Deviations: None Comments: mode: Bracket antenna mounted on aluminum. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side. FCC 15.209.2021 Test Method ANSI C63.10.2013 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass To MHz Run # 0.0001 Antenna Height(Confi	iguration:	7											_
Power: 12 VDC Operating Mode: Transmitting 125 kHz. Full-Bridge: Single Channel PEPS on BCM Pins 058.06 Deviations: The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Bracket antenna mounted on aluminum. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side. Test Specifications Test Method	С	ustomer:	DENSO In	nternational A	America, II	nc.								_
Transmitting 125 kHz. Full-Bridge: Single Channel PEPS on BCM Pins 058.06	At	ttendees:	None											_
Deviations: The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Bracket antenna mounted on aluminum. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side. Test Specifications Test Method ANSI C63.10:2013 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Antenna Height(s) 1 to 4(m) Re	EU	JT Power:	12 VDC											_
The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Bracket antenna mounted on aluminum. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side. Test Specifications FCC 15.209.2021 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass To MHz Results Pass The Method ANSI C63.10:2013 Antenna Height(s) 1 to 4(m) Results Pass To MHz Results Pass The Method Antenna Height(s) 1 to 4(m) Results Pass The Method Antenna Height(s)	Operati	ng Mode:	Transmitti	ng 125 kHz.	Full-Bridg	e: Single Ch	annel PEP	S on BCM F	Pins 05&06					
Comments: mode: Bracket antenna mounted on aluminum. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side. Test Specifications Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 1 to 4(m) Results Pass 70 Run # 8 Test Distance (m) 1 to 4(m) Run # 1 to 4(m) Run	De	eviations:												_
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Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass	Test Specif	fications						Test Metho	od					_
Run # 8 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass										1				_
50 MHz	Run #	8	Test Di	stance (m)	10	Antenna	Height(s)		1 to 4(m)		Results	Pa	ass	_
50 MHz														_
50 MHz														
50 MHz	70													
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-30 0.001 0.010 0.000 0.100 0.	Γ													
-30 0.001 0.010 0.100 0.100 MHz PK • AV • QP Freq (MHz) Applitude (dBuV) (dB) Antenna Height (meters) Test Distance (meters) Test Distance (meters) Attenuation (dB) External Attenuation (dB) External Attenuation (dB) Type Detector Distance Adjustment (dBuV/m) Spec. Limit (dBuV/m) Compared to Spec. (dB) Commercial Compared to Spec. (dB)											_			
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0.001 O.010 MHz O.100 O.10														
0.001 O.010 MHz O.100 O.10											•			
0.001 O.010 MHz O.100 O.10														
0.001 O.010 MHz O.100 O.10	-30													
Freq Amplitude (dBuV) (dB) Antenna Height (meters) (degrees) (degrees) Freq (meters) (dB) (meters) (dB) (meters) (dB) (meters) (dB) (dB) (dB) (dB) (dB) (dB) (dB) (dB		01			0.01	0			0.100				1.000	
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Commer								Туре	Detector				Spec.	
	(MHz)	(dBuV)	(dB)	(meters)	(degrees)	(meters)	(dB)			(dB)	(dBuV/m)	(dBuV/m)	(dB)	Comment
		20.2	10.4	2.16	222.0	10.0	0.0	Dam to FUT	4)/	50.4	40.5	10.1	05.0	

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Perp to EUT

Perp to EUT

Perp to EUT

-59.1

-16.3

-4.4

19.7

39.7

36.1

-36.0

-44.1

EUT on Side

EUT on Side

EUT on Side

0.250

0.250

0.375

32.2

44.1

10.6

10.6

2.88

163.0

322.0

10.0

10.0

10.0

0.0

0.0

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, SINGLE CH



PSA-ESCI 2021.01.22.0

EmiR5 2021.01.08.0

Wo				_					EmiR5 2021.01.08.0		SA-ESCI 2021.01.22.0	-
	ork Order:	ENTI0008		Date:	2021-			11,		>		
	Project:	None	Те	mperature:	20.1			11/2	0	1		
	Job Site:	OC08		Humidity:	51.6%]
Serial	I Number:		Barom	etric Pres.:	1018	mbar		Tested by:	Mark Bayta	an		_
		BCM Module 125kH	z, Model: B´	INA5								_
Confi	iguration:	7										
C	Customer:	DENSO International	l America, I	nc.								
Α	ttendees:	None										
EU	JT Power:	12 VDC										='
Operati	ing Mode:	Transmitting 125 kH	z. Full-Bridg	e: Single Cha	annel PEPS	S on BCM	Pins 05&06	i				
D	eviations:	None										-
Co	omments:	The measurement o mode: Bracket anter to EUT, EUT on Side	ina mounte									_
Test Speci	ifications				1	Test Meth	od	l				
FCC 15.20						ANSI C63.		l				-
Run #	9	Test Distance (m) 10	Antenna	Height(s)		1 to 4(m)		Results	P:	ass	-
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Nap 40 - 30 -												
30				7								
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30 -		•		<u></u>								
30				<u></u>								
30 -				7								
30 -				7								
30 - 20 - 10 -			1.0	J			10.0				100.0	
30 - 20 - 10 -			1.0		MHz		10.0					
30 - 20 - 10 -			1.0		MHz		10.0		■ PK	◆ AV	100.0 • QP	
30 - 20 - 10 -	Amplitude (dBuV)	Factor (dB) Antenna Heig (meters)		Test Distance (meters)	MHz External Attenuation (dB)	Polarity/ Transducer Type	10.0	Distance Adjustment (dB)	Adjusted (dBuV/m)	◆ AV Spec. Limit (dBuV/m)		Comme

Report No. ENTI0008 60/69

0.625

0.500

0.749

0.875

29.9

31.7

27.9

26.2

10.6

10.6

10.6

10.6

1.0

1.0

1.0

1.0

151.0

329.0

348.0

275.0

10.0

10.0

10.0

10.0

0.0

0.0

0.0

Perp to EUT

Perp to EUT

Perp to EUT

Perp to EUT

QP

QΡ

QP

-19.1

-19.1

-19.1

-19.1

21.4

23.2

19.4

31.7

33.6

30.1

28.8

-10.3

-10.4

-10.7

-11.1

EUT on Side

EUT on Side

EUT on Side

EUT on Side

SPURIOUS RADIATED EMISSIONS - HALF BRIDGE, DUAL CH



PSA-ESCI 2021.01.22.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 125 kHz. Half Bridge: Dual Channel PEPS on BCM Pins 01&01R and 02&02R.

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 5

FREQUENCY RANGE INVESTIGATED

Start Frequency	10 kHz	Stop Frequency	30 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2020-08-20	2021-08-20
Cable	Northwest EMC	3 kHz - 1 GHz RE Cables	OCB	2020-07-01	2021-07-01
Antenna - Loop	EMCO	6502	AZB	2019-09-11	2021-09-11

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These "pre-scans" are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height (where applicable) and polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

Report No. ENTI0008 61/69

SPURIOUS RADIATED EMISSIONS - HALF BRIDGE, DUAL CH



None Temperature: 19.1 °C 19											EmiR5 2021.01.08.0	P	SA-ESCI 2021.01.22.	0
200 Size: CC03	Wo	ork Order:	ENT	10008		Date:	2021-	-02-10		11	EIIIIK3 2021.01.00.0		5A-L3012021.0122.	
Serial Number: See Configurations Barometric Press: 1019 mbar Tested by: Mark Baytan EUTS EMM Module 125kHz, Model: BINAS Customer: DENSO International America, Inc. Attendees: None EUT Power: 12 VDC Operating Mode: Transmitting 125 kHz. Half Bridge: Dual Channel PEPS on BCM Pins 01&01R and 02&02R. Deviations: None Comments: In this operating mode: Bracket Antenna mounted on steel and Rear Bumper Frunk Antenna. Worst case positions from proliminary field strength testing: Rx Ant Perp to EUT, EUT Horz. Set Specifications: Test Method ANSI C63.10:2013 Test Method ANSI C63.10:2013 Test Method ANSI C63.10:2013 Test Method ANSI C63.40:2013 Test Method ANSI C63.40:2013 Test Method ANSI C63.40:2013 Test Method ANSI C63.40:2013 Test Method Ansightor Pictor Advensity (General September From Advens		Project:			Ter	nperature:	19.	1 °C		4	6	5,1		
EUT: BCM Module 125kHz, Model: BINA5 Configuration: 5 Customer: DENSO International America, Inc. Attendees: None EUT Power: 12 VDC Operating Mode: Transmitting 125 kHz. Half Bridge: Dual Channel PEPS on BCM Pins 01801R and 02802R. Deviations: The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket Antenna mounted on steel and Rear Bumper Frunk Antenna. Worst case positions from preliminary field strength testing. Rx Ant Perip to UT; EUT Horz. 20 15 209:2021 Run # 5 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass To MHz WHz Pass None Anystications Test Method Anystication of the service o									-	39				
Continguration: Sex So International America, Inc. Attendess: None Sex So International America, Inc. Periatric Mode: The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas proliminary field strength testing: Rx Ant Perp to EUT, EUT Horz. Periatric Sex Specifications Sex	Serial						1019	mbar		Tested by:	Mark Bayta	an		_
Customer: DENSO International America, Inc. Attendees: None EUT Power: 12 VDC Operating Mode: Transmitting 125 kHz. Half Bridge: Dual Channel PEPS on BCM Pins 01&01R and 02&02R. Peviations: None Comments: In this operating mode: Bracket Antenna mounted on steel and Rear Bumper Frunk Antenna. Worst case combination of antennas preliminary field strength testing: Rx Ant Perp to EUT, EUT Hor. Period Total Comments: Rx Ant Perp to EUT, EUT Hor. Period Total Comments: Rx Ant Perp to EUT, EUT Hor. ANSI C63.10:2013 Test Method ANSI C63.10:2013 Test Distance (m) 10 Antenna Height(s) 11:0 4(m) Results Pass Pass Test Distance (m) 10 Antenna Height(s) 11:0 4(m) Results Pass MHz EPK • AV • OP Freq Angilluda Fractor (express) International America (exp				ule 125kHz,	Model: B1	NA5								_
### Attendees: None EUT Power: 12 VDC														_
Deviations: None Deviations: The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket Antenna mounted on steel and Rear Bumper Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT House. Set Specifications: To test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass To test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass To test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass To test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass To test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass To test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass To test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass To test Distance (m) 10 Antenna Height (m) 1 to 4(m) Results Pass To test Distance (m) 10 Antenna Height (m) 1 to 4(m) Results Pass To test Distance (m)				nternational A	America, In	nc.								_
Transmitting 125 kHz. Half Bridge: Dual Channel PEPS on BCM Pins 01801R and 02802R. Deviations: None														_
Deviations: None The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket Antenna mounted on steel and Rear Bumper Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT Horz. Set Specifications Comments: Test Method ANSI C63.10:2013 Run # 5 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass To 15.209.2021 Run # 5 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass To 4 Test Method ANSI C63.10:2013 Run # 6 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass To 4 Test Method ANSI C63.10:2013 Run # 7 Test Method ANSI C63.10:2013 Run # 8 Test Method ANSI C63.10:2013 ANSI C63.10:2013 Run # 7 Test Method ANSI C63.10:2013 ANSI C63.10				na 125 kHz	Half Bridge	e: Dual Cha	nnel PEPS	on BCM Pi	ns	2 and 02&03	PR			_
Comments: In this operating mode: Bracket Antenna mounted on steel and Rear Bumper Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT. EUT Horz. Set Specifications		ing wode.		11g 125 KHZ.	Trail Bridge	c. Duai Gria		ON BOWN		t und 02002				_
Run # 5 Test Distance (m) 10 Antenna Height(s) 1 to 4(m) Results Pass	Co	omments:	in this ope	erating mode	: Bracket A	Antenna moi	unted on st	eel and Rea						_
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50 10 -10 -30 0.0 MHz ■ PK ◆ AV ● QP Freq (MHz) (degrees)	Run #	5	Test Di	stance (m)	10	Antenna	Height(s)		1 to 4(m)		Results	Pa	ass	- -
50 10 -10 -30 0.0 MHz ■ PK ◆ AV ● QP Freq (MHz) (degrees)	Γ													
50 10 -10 -30 0.0 MHz ■ PK ◆ AV ● QP Freq (MHz) (degrees)														
50 10 -10 -30 0.0 MHz ■ PK ◆ AV ● QP Freq (MHz) (degrees)														
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Note Pred Amplitude Factor Anterna Height Azimuth Test Distance Alternation Alternation Transcrucer Type Detector Adjustment Adjustme								\perp						
Note Pred Amplitude Factor Anterna Height Azimuth Test Distance Alternation Alternation Transcrucer Type Detector Adjustment Adjustme	50													
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Freq (MHz) Amplitude (dBuV) Factor (dBuV/m) Antenna Height (meters) Azimuth (degrees) Test Distance (meters) External Attenuation (dB) Type Detector Distance Adjustment (dB) Adjusted (dBuV/m) Spec. Limit (dBuV/m) Compared to Spec. (dB) Comments 0.250 32.2 10.6 1.0 25.0 10.0 0.0 Perp to EUT AV -59.1 -16.3 19.7 -36.0 EUT Horz		.0			0.0				0.1				1.0	
Freq (MHz)							MHz	!			■ PK	◆ AV		
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0.250 32.2 10.6 1.0 25.0 10.0 0.0 Perp to EUT AV -59.1 -16.3 19.7 -36.0 EUT Horz	Freq	Amplitude	Factor	Antenna Height	Azimuth	Test Distance			Detector		Adjusted	Spec. Limit		
							Attenuation		Detector	Adjustment			Spec.	
	(MHz)	(dBuV)	(dB)	(meters)	(degrees)	(meters)	Attenuation (dB)	Туре		Adjustment (dB)	(dBuV/m)	(dBuV/m)	Spec. (dB)	Comments

Report No. ENTI0008 62/69

SPURIOUS RADIATED EMISSIONS - HALF BRIDGE, DUAL CH



									EmiR5 2021.01.08.0		PSA-ESCI 2021.01.2	2.0
W	Vork Order:	ENTI0008		Date:	2021-	02-10		11		-		
	Project:	None		perature:		1 °C		4	6	2/-		
	Job Site:	OC08		Humidity:		% RH						
Seria	al Number:	See Configurations		tric Pres.:	1019	mbar		Tested by:	Mark Bayta	ın		_
		BCM Module 125kHz	, Model: B1N	NA5								_
	nfiguration:											_
		DENSO International	America, Inc	C.								_
	Attendees:											_
E	UT Power:											_
Operat	ating Mode:	Transmitting 125 kHz	. Half Bridge	e: Dual Char	nnel PEPS	on BCM P	ins 01&01F	R and 02&02	2R.			<u>_</u>
	Deviations:	None										
	Comments:	The measurement of in this operating mod										
	comments.	preliminary field stren					ai builipei	Flulik Alitei	ilia. Wolst	case posi	tions nom	
est Spec	cifications					Test Meth	od					_
CC 15.20	09:2021					ANSI C63						_
Run #	# 6	Test Distance (m)	10	Antenna	Height(s)		1 to 4(m)		Results	P	oass	
ituii #	, 0	rest Distance (iii)	10	Antoma	ricigiit(3)		1 10 4(111)		results		ass	_
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20	.1		1.0		MHz		10.0		■ PK	◆ AV	100.0 • QP	
20	1.1		1.0	<u></u>	MHz	Polarity	10.0		■ PK	◆ AV		
30 d d d d d d d d d d d d d d d d d d d				5	External	Polarity/ Transducer		Distance			• QP	0
30 20 10 0 0.	Amplitude	Factor Antenna Heigh	t Azimuth	Test Distance	External Attenuation		10.0	Adjustment	Adjusted	Spec. Limit	Ompared to Spec.	0
30 d d d d d d d d d d d d d d d d d d d		Factor (dB) Antenna Heigh (meters)		Test Distance (meters)	External	Transducer					• QP	o Comments

Report No. ENTI0008 63/69

SPURIOUS RADIATED EMISSIONS - HALF BRIDGE, SINGLE CH



PSA-ESCI 2021.01.22.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 125 kHz. Half Bridge: Single Channel PEPS on BCM Pins 01&01R.

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 4

FREQUENCY RANGE INVESTIGATED

Start Frequency 9 kHz	Stop Frequency	30 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2020-08-20	2021-08-20
Cable	Northwest EMC	3 kHz - 1 GHz RE Cables	OCB	2020-07-01	2021-07-01
Antenna - Loop	EMCO	6502	AZB	2019-09-11	2021-09-11

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified. For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These "pre-scans" are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height (where applicable) and polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

Report No. ENTI0008 64/69

SPURIOUS RADIATED EMISSIONS - HALF BRIDGE, SINGLE CH



PSA-ESCI 2021.01.22.0

EUT Horz

EmiR5 2021.01.08.0

					_					EmiR5 2021.01.08.0	PS	SA-ESCI 202 <u>1.01.22</u>	.0
W	ork Order:		Π0008		Date:		02-10		4	/	<i>-</i>		
	Project:		one	Те	mperature:		1 °C		1		7-		
	Job Site:		C08		Humidity:		% RH						
Seria	l Number:		figurations		etric Pres.:	1019	mbar		Tested by:	Mark Bayta	an		<u></u>
	EUT:	BCM Mod	lule 125kHz,	Model: B1	NA5								
Conf	figuration:	4											_
	Customer:	DENSO I	nternational	America. I	nc.								_
	Attendees:												_
	UT Power:												_
		Tue 10 a 10 2 (44)	n a 10E kl l=	Llolf Dride	o. Cinala Ch	onnal DED	C on DCM I	Dina 01 9 01	I.D.				_
Operat	ing Mode:	Transmitt	ing 125 kHz.	пан внад	je: Single Ch	iannei PEP	S ON BCIVI I	Pins UT&UT	ıĸ.				
		Nina											_
D	eviations:	None											
				_									_
			surement of t										
С	omments:	mode: Re	ar Bumper/F	runk Ante	nna. Worst	case positi	ons from pr	eliminary fi	eld strength	testing: R	Ant Perp	to EUT,	
		EUT Horz	, 						_	_			
T+ C	:::::						To at Math.	1					
Test Spec							Test Metho						_
FCC 15.20)9:2021						ANSI C63.	10:2013					
Run #	2	Tost Di	istance (m)	10	Antonna	Height(s)		1 to 4(m)		Results	D,	ass	_
ixuii #		1631 D	istance (iii)	10	Antenna	rieigiit(s)	l	1 10 4(111)		Nesuits	1 .	233	
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70					_								
50								\longrightarrow					
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Eron	Amelitude	Fontar	Antonna Haish	Azimush	Toot Distance	External	Transducer	Detrois	Distance	Adirestad	Cnoo Limit	Compared to	
Freq	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	Attenuation (dB)	Туре	Detector	Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Spec. (dB)	
(MHz)	(ubuv)	(db)	(meters)	(degrees)	(meters)	(ub)			(UB)	(ubuv/III)	(ubuv/III)	(db)	Commen
0.250	32.4	10.6	1.0	14.0	10.0	0.0	Perp to EUT	AV	-59.1	-16.10	19.7	-35.8	EUT Horz
0.230	28.8	10.6	1.0	155.0	10.0	0.0	Perp to EUT	AV	-59.1	-10.10	16.1	-36.0	EUT Horz
0.375	41.2	10.4	1.0	155.0	10.0	0.0	Perp to EUT	PK	-59.1	-7.50	36.1	-43.6	EUT Horz
0.070	44.0	10.1	1.0	14.0	10.0	0.0	Porp to EUT	DK	-50.1	-4.50	30.7	-44.2	FUT Horz

Report No. ENTI0008 65/69

Perp to EUT

-4.50

10.0

0.250

10.6

SPURIOUS RADIATED EMISSIONS - HALF BRIDGE, SINGLE CH



												EmiR5 2021.01.08.0		P	SA-ESCI 2021.01.2	2.0
W	ork Order:	ENT	80001		Date:	2021	-02-1	0			11		_			
	Project:	No	one	Te	emperature:	19.	1°C		1	_	1	4	5	1		
	Job Site:	00	C08		Humidity:	52.8	% RF	1	1				/	,		
Seria	al Number:		figurations	Baron	netric Pres.:) mba				Tested by:	Mark Bayt	an			
	EUT:	BCM Mod	ule 125kHz,	Model: B	1NA5				•							_
Con	figuration:	4														_
(Customer:	DENSO In	ternational a	America,	Inc.											_
	Attendees:															
E	UT Power:	12 VDC														
Operat	ting Mode:	Transmittii	ng 125 kHz.	Half Brid	ge: Single Ch	annel PEF	PS on	BCM	Pins (01&0	1R.					_
С	Deviations:	None														
C	comments:		ar Bumper/F		case orientat enna. Worst											_
Test Snec	cifications	1					Test	t Meth	hod							
FCC 15.20		I							.10:20	113						_
		T		40	Autom	Heistaf			4 :	Alex S		D. 1	ı			_
Run #	3	Test Di	stance (m)	10	Antenna	Height(s))		1 to	4(m)		Results		Pa	ass	_
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0.	.1			1.0)				1	0.0					100.0	
						MHz						■ PK	* /	٩V	QP	
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Tran	larity/ sducer ype	Det	tector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. (dBu\	Limit	Compared t Spec. (dB)	o Commen
0.497	31.9	10.6	3.43	165.0	10.0	0.0	Perp	to EU1		QΡ	-19.1	23.4	33	.7	-10.3	EUT Horz
0.613	30.0	10.6	2.93	248.0	10.0	0.0		to EU1		QΡ	-19.1	21.5	31		-10.4	EUT Horz
0.746	28.2	10.6	1.0	297.0	10.0	0.0		to EUT		QP NP	-19.1 -19.1	19.7	30		-10.5 -10.8	EUT Horz

Report No. ENTI0008 66/69

Perp to EUT

-19.1

18.1

28.9

-10.8

EUT Horz

0.865

26.6

10.6

331.0

10.0

0.0

SPURIOUS RADIATED EMISSIONS - ROUND ROBIN



PSA-FSCI 2021 01 22 0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 125 kHz. Round Robin Mode

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 13

FREQUENCY RANGE INVESTIGATED

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2020-08-20	2021-08-20
Cable	Northwest EMC	3 kHz - 1 GHz RE Cables	OCB	2020-07-01	2021-07-01
Antenna - Loop	EMCO	6502	AZB	2019-09-11	2021-09-11

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These "pre-scans" are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height (where applicable) and polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

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SPURIOUS RADIATED EMISSIONS -ROUND ROBIN



										EmiR5 2021.01.08.0	PS	SA-ESCI 2021.01.22.	0
Wo	ork Order:	ENT	10008		Date:	2021-	-02-12	1	/				1
	Project:	N	one	Ter	nperature:		4 °C	-	(-/ E	5	/		
	Job Site:		C08		Humidity:		% RH						
Serial	Number:		figurations		etric Pres.:	1014	mbar		Tested by:	Mark Bayt	an		_
			dule 125kHz,	Model: B1	NA5								_
Conf	iguration:	13											_
			nternational /	America, Ir	nc.								_
	ttendees: JT Power:												_
			ing 125 kHz.	Dound Do	hin Mada								_
Operati	ing Mode:	TTATISTIILL	ilig 125 KHZ.	Kouliu Ko	DITI WOULE								
D	eviations:	None											_
Ce	omments:		surement of t mode: Coml										_
Test Speci	ifications						Test Metho	nd					
FCC 15.20		l					ANSI C63.		l				_
													_
Run #	27	Test D	istance (m)	10	Antenna	Height(s)		1 to 4(m)		Results	J Pa	ass	_
Γ													
70													
50								\ _					
_											_		
₹ ³⁰													
dBuV/m													
쁑													
40											_		
10													
-10													
-10										•			
-30													
0.0	01			0.010	0			0.100				1.000	
						MHz							
						2				■ PK	◆ AV	QP	
							Polarity/						
Freq	Amplitude	Factor	Antenna Height	Azimuth	Test Distance	External Attenuation	Transducer Type	Detector	Distance Adjustment	Adjusted	Spec. Limit	Compared to Spec.	
(MHz)	(dBuV)	(dB)	(meters)	(degrees)	(meters)	(dB)	1 3 P C	Detector	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
													Comments
0.250	38.3 34.9	10.5 10.4	1.5 1.0	0.0	10.0	0.0	Perp to EUT Perp to EUT	AV AV	-59.1 -59.1	-10.3	19.6	-29.9	EUT on Side EUT on Side
0.375 0.375	34.9 40.6	10.4	1.0	53.0 53.0	10.0 10.0	0.0 0.0	Perp to EUT	PK	-59.1 -59.1	-13.8 -8.1	16.1 36.1	-29.9 -44.2	EUT on Side
0.250	43.9	10.5	1.5	0.0	10.0	0.0	Perp to EUT	PK	-59.1	-4.7	39.6	-44.3	EUT on Side

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SPURIOUS RADIATED EMISSIONS -ROUND ROBIN



												EmiR5 2021.01.08.0	0	PSA-ESCI 2021.01.22	.0
Wo	rk Order:		ΓΙ0008		Date:	2021				1	/				
	Project:	N	lone	Te	mperature:		4 °C		-	-	1-1	(),·	1		
	Job Site:		C08		Humidity:	36.4				- 2					
Serial	Number:	See Cor	nfigurations		etric Pres.:	1014	mb	ar			Tested by	/: Mark Bayt	tan		_
			dule 125kHz,	Model: B	1NA5										_
Confi	iguration:	13													_
C	ustomer:	DENSO I	nternational /	America, I	nc.										_
	ttendees:														_
EU	T Power:														_
Operati	ng Mode:	Transmitt	ing 125 kHz.	Round R	obin Mode										
	eviations:	None													_
Co	omments:		surement of t mode: Com												-
Test Speci	fications						Too	st Met	thor	1					
FCC 15.209		L								0:2013					_
													_		_
Run #	28	Test D	istance (m)	10	Antenna	Height(s)			1	I to 4(m)	1	Results	i I	Pass	_
80															
00															
70															
60															
50															
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न 40 ⊢															
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30									+						
					<u> </u>										
20															
20															
10				++++			-		+						
0 ⊢										46.5				400.0	
0.1				1.0						10.0				100.0	
						MHz						■ PK	◆ AV	QP	
								olarity/							
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Tra	olarity/ insducei Type	r	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.625	29.8	10.6	1.0	330.0	10.0	0.0		to EU		QP	-19.1	21.3	31.7	-10.4	EUT on Sid
0.750	28.0	10.6	1.0	213.0	10.0	0.0		to EL		QP	-19.1	19.5	30.1	-10.6	EUT on Sid
0.500 0.875	31.3 26.5	10.6	3.72 1.0	116.0 330.0	10.0	0.0		to EL		QP QP	-19.1 -19.1	22.8	33.6 28.8	-10.8 -10.8	EUT on Sid EUT on Sid
0.675	∠0.5	10.6	1.0	33U.U	10.0	0.0	rer) IU EL	1	QP	-19.1	18.0	∠8.8	-10.8	EU I ON SIG

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