

DENSO International America, Inc. B2NA0

FCC 15.209:2022, HKCA 1035 Inductive

Report: ENTI0013 Rev. 1, Issue Date: March 14, 2022







CERTIFICATE OF TEST



Last Date of Test: February 4, 2022 DENSO International America, Inc.

EUT: B2NA0

Standards

Specification	Method
FCC 15.209:2021, HKCA 1035	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.

REVISION HISTORY



Revision Number	Description	Date (yyyy-mm-dd)	Page Number
	FCC 15.209:2020 changed to FCC 15.209:2021	2022-03-14	1
	Removed row with FCC 15.209:2022 listed	2022-03-14	2
	Updated missing fields in configurations	2022-03-14	12-20
	Changed the last date for FF testing from 12/29 to the latest date shown in the FF data which is 12/30.	2022-03-14	21
	All serial number entries changed from "none" to "See Configuration"	2022-03-14	22-39, 41-65
01	Changed "Leveraging" verbiage to "Data presented are the worst case modes as determined during pre compliance testing"	2022-03-14	22-39, 41-65
	Updated frequency range to (9 kHz to 30 MHz)	2022-03-14	40-64
	Reordered tabs to be in ascending order of frequency range.	2022-03-14	53-54
	More detailed information added to the product description	2022-03-14	10
	Updated FCC 15.209:2021, HKCA 1035 to FCC 15.209:2022, HKCA 1035	2022-03-14	1, 2
	Updated Antenna information with newest version of table	2022-03-14	11

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 - Each laboratory is accredited by A2LA to ISO / IEC 17025, and as a product certifier to ISO / IEC 17065 which allows Element to certify transmitters to FCC and IC specifications.

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 - Recognized as an EU Notified Body validated for the EMCD and RED Directives.

United Kingdom

BEIS - Recognized by the UK as an Approved Body under the UK Radio Equipment and UK EMC Regulations.

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:

<u>California</u> <u>Minnesota</u> <u>Oregon</u> <u>Texas</u> <u>Washington</u>

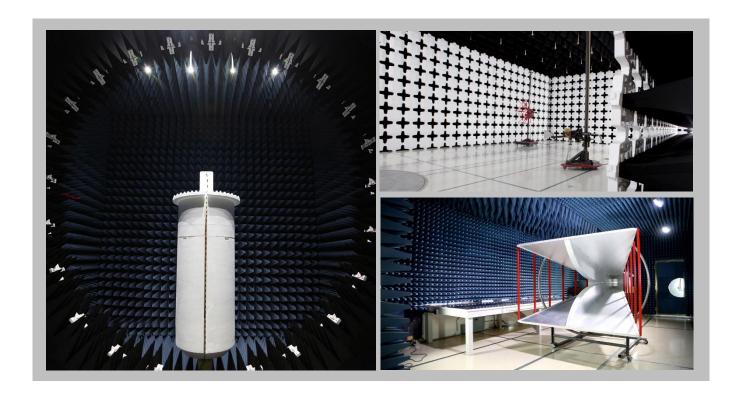
FACILITIES







California Labs OC01-17 41 Tesla Irvine, CA 92618 (44) 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 (460) 304-8755	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 98011			
(949) 861-8918 (612)-638-5136 (503) 844-4066 (469) 304-5255 (425)984-6600							
Lab Code: 3310.04	Lab Code: 3310.05	Lab Code: 3310.02	Lab Code: 3310.03	Lab Code: 3310.06			
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			
Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA							
US0158	US0175	US0017	US0191	US0157			



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)	3.2 dB	-3.2 dB

TEST SETUP BLOCK DIAGRAMS

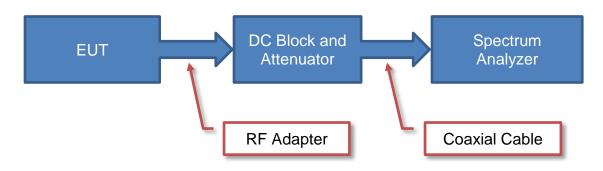


Measurement Bandwidths

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

Unless otherwise stated, measurements were made using the bandwidths and detectors specified. No video filter was used.

Antenna Port Conducted Measurements

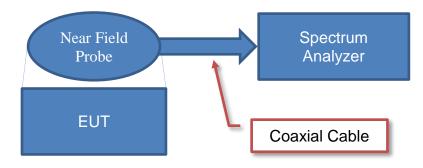


Sample Calculation (logarithmic units)

Measured Value Measured Level Coffset

71.2 = 42.6 + 28.6

Near Field Test Fixture Measurements



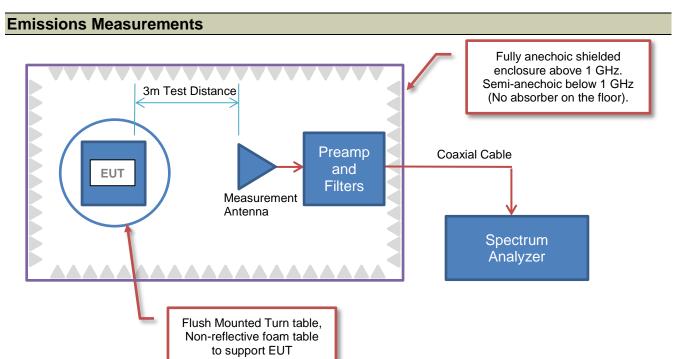
Sample Calculation (logarithmic units)

Measured Value Measured Level Coffset

71.2 = 42.6 + 28.6

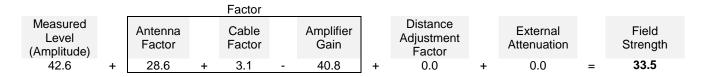
TEST SETUP BLOCK DIAGRAMS



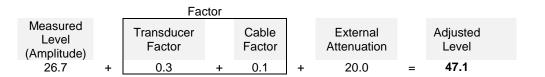


Sample Calculation (logarithmic units)

Radiated Emissions:



Conducted Emissions:

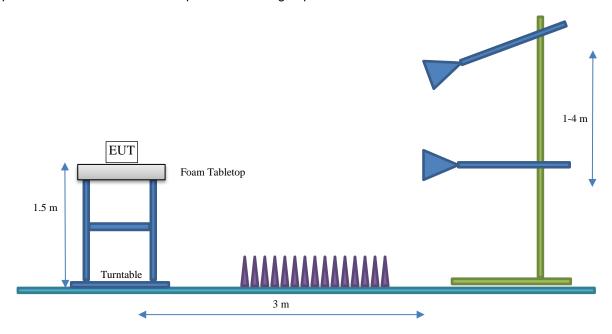


TEST SETUP BLOCK DIAGRAMS



Bore Sighting (>1GHz)

The diameter of the illumination area is the dimension of the line tangent to the EUT formed by 3 dB beamwidth of the measurement antenna at the measurement distance. At a 3 meter test distance, the diameter of the illumination area was 3.8 meters at 1 GHz and greater than 2.1 meters up to 6 GHz. Above 1 GHz, when required by the measurement standard, the antenna is pointed for both azimuth and elevation to maintain the receive antenna within the cone of radiation from the EUT. The specified measurement detectors were used for comparison of the emissions to the peak and average specification limits.



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:	B2NA0
First Date of Test:	December 29, 2021
Last Date of Test:	February 4, 2022
Receipt Date of Samples:	December 29, 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).

Radio Specification:

[Transmitter part]

Radio Type: LF Transmitter

Frequency of Operation: 125 kHz
Oscillation circuit: Crystal
Oscillator frequency: 16 MHz
Modulation: OOK / ASK

LF Antenna: Type1: Rocker Driver Antenna

Rocker Passenger Antenna

Trunk Antenna Bracket Antenna

Type2: Rear(Front) Bumper/Frunk Antenna

Interior Antenna

LF/IMMO Combo Antenna: Type3: IMMO Combo Antenna

Antenna Specification: Ferrite antenna coil

[Receiver part]

Frequency of Operation: 125 kHz Oscillator frequency: 16 MHz

Type of receiving system: Direct conversion
Antenna Specification: Ferrite antenna coil

Client attestation:

The manufacturer declares under its sole responsibility the antennas listed are compatible with the BCM, model B2NA0. Tested configurations are the worst-case scenarios, previously studied in pre compliance testing.

Testing Objective:

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

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

Internal	Appearance	Mount on Metal	Antenna name	Core dimension	Inductance	Impedance
			Trunk Antenna			
	*	Steel	Rocker Driver Antenna	62.0 x 8.0 x 3.2	495 [μH] ±15%	20 [Ω] (Max.)
			Rocker Passenger Antenna	[mm]		
		Aluminum*	Bracket Antenna			
		No	Rear (front) Bumper Frunk Antenna	59.7 x 12.0 x 2.5 [mm]	495 [μH] ±15%	20 [Ω] (Max.)
J	1	No	Combo (IMMO/LF) Antenna	62.0 x 8.0 x 5.0 [mm]	462 [μH] ±1%	2 [Ω] ±1 [Ω]
	L	No	Interior Antenna	59.7 x 12.0 x 2.5 [mm]	495 [μH] ±15%	20 [Ω] (Max.)

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



EUT							
Description	Manufacturer	Model/Part Number	Serial Number				
BCM Module 125 kHz	DENSO International America, Inc.	B2NA0	BCM2-EL-001				
Rear Bumper Frunk	DENSO International	Rear (front) Bumper	#01				
Antenna	America, Inc.	Frunk Antenna	#01				

Peripherals in Test Setup Boundary						
Description	Manufacturer	Model/Part Number	Serial Number			
Combo (IMMO/LF)	DENSO International	Combo (IMMO/LF)	#01			
Antenna	America, Inc.	Antenna	#01			
Bracket Antenna -	DENSO International	Bracket Antenna -	#03			
Aluminum Plate	America, Inc.	Aluminum Plate	#03			
Interior Antenna	DENSO International	Interior Antenna	#03			
Interior Anterina	America, Inc.	Interior Antenna				
Trunk Antenna - Steel	DENSO International	Trunk Antenna - Steel	#06			
Plate	America, Inc.	Plate				
Rocker Passenger	DENSO International	Rocker Passenger	#02			
Antenna - Steel Plate	America, Inc.	Antenna - Steel Plate	#02			
Bracket Antenna - Steel	DENSO International	Bracket Antenna - Steel	#05			
Plate	America, Inc.	Plate	#05			
VASS Switch Box	DENSO International	BI001	J2			
VAGG GWILCH BOX	America, Inc.	Bloot	JZ			
Driver Antenna - Steel	DENSO International	Driver Antenna - Steel	#07			
Plate	America, Inc.	Plate	#07			

Cables						
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2	
Antenna Cable (ANT3/4)	No	1.0m	No	BCM Module 125 kHz	Antenna	
Antenna Cable (ANT5/6)	No	1.0m	No	BCM Module 125 kHz	Antenna	
Antenna Cable (ANT9/10)	No	1.0m	No	BCM Module 125 kHz	Antenna	
Antenna Cable (IMMO Hi/Lo)	No	1.0m	No	BCM Module 125 kHz	Antenna	
Cable Harness - Switch Box	No	1.5m	No	BCM Module 125 kHz	VASS Switch Box	
DC Cable	No	2.0m	No	BCM Module 125 kHz	DC Power	
Antenna Cable (ANT1/1_R)	No	1.0m	No	BCM Module 125 kHz	Antenna	
Antenna Cable (ANT2/2_R)	No	1.0m	No	BCM Module 125 kHz	Antenna	
Antenna Cable (ANT7/7_R)	No	1.0m	No	BCM Module 125 kHz	Antenna	
Antenna Cable (ANT8/8_R)	No	1.0m	No	BCM Module 125 kHz	Antenna	



EUT							
Description	Manufacturer	Model/Part Number	Serial Number				
BCM Module 125 kHz	DENSO International America, Inc.	B2NA0	BCM2-EL-001				
Rocker Passenger Antenna - Steel Plate	DENSO International America, Inc.	Rocker Passenger Antenna - Steel Plate	#02				
Bracket Antenna - Steel Plate	DENSO International America, Inc.	Bracket Antenna - Steel Plate	#05				

Peripherals in Test Setup Boundary					
Description	Manufacturer	Manufacturer Model/Part Number			
Combo (IMMO/LF)	DENSO International	Combo (IMMO/LF)	#01		
Antenna	America, Inc.	Antenna	#01		
Bracket Antenna -	DENSO International	Bracket Antenna -	#03		
Aluminum Plate	America, Inc.	Aluminum Plate	#03		
Interior Antenna	DENSO International	Interior Antenna	#03		
interior Antenna	America, Inc.	Interior Afferina	#03		
Trunk Antenna - Steel Plate	DENSO International	Trunk Antenna - Steel	#06		
Trunk Antenna - Steer Flate	America, Inc.	Plate	#00		
Rear Bumper Frunk	DENSO International	Rear (front) Bumper	#01		
Antenna	America, Inc.	Frunk Antenna	#01		
VASS Switch Box	DENSO International	BI001	J2		
VASS SWILCTI BOX	America, Inc.	B1001	JZ		
Driver Antenna - Steel	DENSO International	Driver Antenna - Steel	#07		
Plate	America, Inc.	Plate	#07		

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Antenna Cable (ANT3/4)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT5/6)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT9/10)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (IMMO Hi/Lo)	No	1.0m	No	BCM Module 125 kHz	Antenna
Cable Harness - Switch Box	No	1.5m	No	BCM Module 125 kHz	VASS Switch Box
DC Cable	No	2.0m	No	BCM Module 125 kHz	DC Power
Antenna Cable (ANT1/1_R)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT2/2_R)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT7/7_R)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT8/8_R)	No	1.0m	No	BCM Module 125 kHz	Antenna



EUT					
Description	Manufacturer	Model/Part Number	Serial Number		
Combo (IMMO/LF)	DENSO International	Combo (IMMO/LF)	#01		
Antenna	America, Inc.	Antenna	#01		
BCM Module 125 kHz	DENSO International	B2NA0	BCM2-EL-001		
BCIVI IVIOdule 125 KHZ	America, Inc.	BZNAU	BCIVIZ-EL-001		

Peripherals in Test Setup Boundary					
Description	Manufacturer	Model/Part Number	Serial Number		
Bracket Antenna -	DENSO International	Bracket Antenna -	#03		
Aluminum Plate	America, Inc.	Aluminum Plate	#03		
Interior Antenna	DENSO International	Interior Antenna	#03		
interior Antenna	America, Inc.	Interior Anterina	#03		
Trunk Antenna - Steel	DENSO International	Trunk Antenna - Steel	#06		
Plate	America, Inc.	Plate	#00		
Rear Bumper Frunk	DENSO International	Rear (front) Bumper	#01		
Antenna	America, Inc.	Frunk Antenna	#01		
VASS Switch Box	DENSO International	BI001	J2		
VASS SWILCH BOX	America, Inc.	Віоот	JZ		
Driver Antenna - Steel	DENSO International	Driver Antenna - Steel	#07		
Plate	America, Inc.	Plate	#07		

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Antenna Cable (ANT3/4)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT5/6)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT7/8)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT9/10)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (IMMO Hi/Lo)	No	1.0m	No	BCM Module 125 kHz	Antenna
Cable Harness - Switch Box	No	1.5m	No	BCM Module 125 kHz	VASS Switch Box
DC Cable	No	2.0m	No	BCM Module 125 kHz	DC Power
Antenna Cable (ANT1/2)	No	1.0m	No	BCM Module 125 kHz	Antenna



EUT					
Description	Manufacturer	Model/Part Number	Serial Number		
BCM Module 125 kHz	DENSO International America, Inc.	B2NA0	BCM2-EL-001		
Interior Antenna	DENSO International America, Inc.	Interior Antenna	#03		
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	#05		

Peripherals in Test Setup Boundary					
Description	Manufacturer	Model/Part Number	Serial Number		
Combo (IMMO/LF) Antenna	DENSO International	Combo (IMMO/LF)	#01		
Combo (IIVIIVIO/LF) Antenna	America, Inc.	Antenna	#01		
Trunk Antenna - Steel Plate	DENSO International	Trunk Antenna - Steel	#06		
Trunk Antenna - Steel Plate	America, Inc.	Plate	#00		
Rocker Passenger Antenna -	DENSO International	Rocker Passenger	#02		
Steel Plate	America, Inc.	Antenna - Steel Plate	#02		
VASS Switch Box	DENSO International	BI001	12		
VASS SWILLII BUX	America, Inc.		J2		

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Antenna Cable (ANT3/4)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT5/6)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT7/8)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT9/10)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (IMMO Hi/Lo)	No	1.0m	No	BCM Module 125 kHz	Antenna
Cable Harness - Switch Box	No	1.5m	No	BCM Module 125 kHz	VASS Switch Box
DC Cable	No	2.0m	No	BCM Module 125 kHz	DC Power
Antenna Cable (ANT1/2)	No	1.0m	No	BCM Module 125 kHz	Antenna



EUT			
Description	Manufacturer	Model/Part Number	Serial Number
BCM Module 125 kHz	DENSO International America, Inc.	B2NA0	BCM2-EL-001
Bracket Antenna -	DENSO International	Bracket Antenna -	#03
Aluminum Plate	America, Inc.	Aluminum Plate	#03

Peripherals in Test Setup Boundary					
Description	Manufacturer	Model/Part Number	Serial Number		
Combo (IMMO/LF)	DENSO International	Combo (IMMO/LF)	#01		
Antenna	America, Inc.	Antenna	#01		
Interior Antenna	DENSO International	Interior Antenna	#03		
Interior Anterina	America, Inc.	Interior Africanna	#03		
Trunk Antenna - Steel	DENSO International	Trunk Antenna - Steel	#06		
Plate	America, Inc.	Plate	#00		
Rear Bumper Frunk	DENSO International	Rear (front) Bumper	#01		
Antenna	America, Inc.	Frunk Antenna	#01		
VASS Switch Box	DENSO International	BI001	J2		
VASS SWITCH BOX	America, Inc.	B100 1	JZ		
Driver Antenna - Steel	DENSO International	Driver Antenna - Steel	#07		
Plate	America, Inc.	Plate	#01		

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Antenna Cable (ANT3/4)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT5/6)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT7/8)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT9/10)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (IMMO Hi/Lo)	No	1.0m	No	BCM Module 125 kHz	Antenna
Cable Harness - Switch Box	No	1.5m	No	BCM Module 125 kHz	VASS Switch Box
DC Cable	No	2.0m	No	BCM Module 125 kHz	DC Power
Antenna Cable (ANT1/2)	No	1.0m	No	BCM Module 125 kHz	Antenna



EUT			
Description	Manufacturer	Model/Part Number	Serial Number
BCM Module 125 kHz	DENSO International America, Inc.	B2NA0	BCM2-EL-001
Bracket Antenna -	DENSO International	Bracket Antenna -	#03
Aluminum Plate	America, Inc.	Aluminum Plate	#03
Rear Bumper Frunk	DENSO International	Rear (front) Bumper	#01
Antenna	America, Inc.	Frunk Antenna	#01

Peripherals in Test Setup Boundary					
Description	Manufacturer	Model/Part Number	Serial Number		
Combo (IMMO/LF) Antenna	DENSO International	Combo (IMMO/LF)	#01		
Combo (IIVIIVIO/LF) Antenna	America, Inc.	Antenna	#01		
Interior Antenna	DENSO International	Interior Antenna	#03		
Interior Anterina	America, Inc.	Interior Africania	π03		
Trunk Antenna - Steel Plate	DENSO International	Trunk Antenna - Steel	#06		
Trunk Antenna - Steer Flate	America, Inc.	Plate	#00		
VASS Switch Box	DENSO International	BI001	J2		
VASS SWITCH BOX	America, Inc.	B100 1	JZ		
Driver Antenna - Steel Plate	DENSO International	Driver Antenna - Steel	#07		
Driver Ariterina - Steel Plate	America, Inc.	Plate	#07		

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Antenna Cable (ANT3/4)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT5/6)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT7/8)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT9/10)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (IMMO Hi/Lo)	No	1.0m	No	BCM Module 125 kHz	Antenna
Cable Harness - Switch Box	No	1.5m	No	BCM Module 125 kHz	VASS Switch Box
DC Cable	No	2.0m	No	BCM Module 125 kHz	DC Power
Antenna Cable (ANT1/2)	No	1.0m	No	BCM Module 125 kHz	Antenna



EUT						
Description	Manufacturer	Model/Part Number	Serial Number			
Combo (IMMO/LF)	DENSO International	Combo (IMMO/LF)	#01			
Antenna	America, Inc.	Antenna	#01			
BCM Module 125 kHz	DENSO International	B2NA0	BCM2-EL-001			
BCW Wodule 125 KHZ	America, Inc.	BZINAU	BCIVIZ-EL-001			
Rear Bumper Frunk	DENSO International	Rear (front) Bumper Frunk	#01			
Antenna	America, Inc.	Antenna	#01			

Peripherals in Test Setup	Peripherals in Test Setup Boundary					
Description	Manufacturer	Model/Part Number	Serial Number			
Bracket Antenna -	DENSO International	DENSO International Bracket Antenna -				
Aluminum Plate	America, Inc.	Aluminum Plate	#03			
Interior Antenna	DENSO International	Interior Antenna	#03			
Interior Anterina	America, Inc.	Interior Afflerina	#03			
Trunk Antenna - Steel	DENSO International	Trunk Antenna - Steel Plate	#06			
Plate	America, Inc.	Trunk Antenna - Steel Flate	#00			
VASS Switch Box	DENSO International	BI001	J2			
VASS SWILCH BOX	America, Inc.	Віоот	JZ			
Driver Antenna - Steel	DENSO International	Driver Antenna - Steel Plate	#07			
Plate	America, Inc.	Driver Ariterina - Steel Plate	#01			

Cables						
Cable Type	Type Shield Length (m) Ferrito		Ferrite	Connection 1	Connection 2	
Antenna Cable (ANT3/4)	No	1.0m	No	BCM Module 125 kHz	Antenna	
Antenna Cable (ANT5/6)	No	1.0m	No	BCM Module 125 kHz	Antenna	
Antenna Cable (ANT7/8)	No	1.0m	No	BCM Module 125 kHz	Antenna	
Antenna Cable (ANT9/10)	No	1.0m	No	BCM Module 125 kHz	Antenna	
Antenna Cable (IMMO Hi/Lo)	No	1.0m	No	BCM Module 125 kHz	Antenna	
Cable Harness - Switch Box	No	1.5m	No	BCM Module 125 kHz	VASS Switch Box	
DC Cable	No	2.0m	No	BCM Module 125 kHz	DC Power	
Antenna Cable (ANT1/2)	No	1.0m	No	BCM Module 125 kHz	Antenna	



EUT					
Description	Manufacturer	Model/Part Number	Serial Number		
Combo (IMMO/LE) Antonno	DENSO International	Combo (IMMO/LF)	#01		
Combo (IMMO/LF) Antenna	America, Inc.	Antenna	#01		
BCM Module 125 kHz	DENSO International	B2NA0	BCM2-EL-001		
BCM Module 125 kHz	America, Inc.	B2NAU	DCIVIZ-EL-UU I		
Transponder	DENSO International	PCF7939VA	#1.14		
Transponder	America, Inc.	PCF7939VA	#M1		

Peripherals in Test Setup Boundary					
Description	Manufacturer	Model/Part Number	Serial Number		
Bracket Antenna -	DENSO International	Bracket Antenna -	#03		
Aluminum Plate	America, Inc.	Aluminum Plate	#03		
Interior Antenna	DENSO International	Interior Antenna	#03		
Interior Anterina	America, Inc.	Intenoi Antenna	#03		
Trunk Antenna - Steel Plate	DENSO International	Trunk Antenna -	#06		
Trunk Antenna - Steer Flate	America, Inc.	Steel Plate			
Rear Bumper Frunk	DENSO International	Rear (front) Bumper	#01		
Antenna	America, Inc.	Frunk Antenna	#01		
VASS Switch Box	DENSO International	BI001	J2		
VASS SWILCH BOX	America, Inc.	DIOUT			
Driver Antenna - Steel Plate	DENSO International	Driver Antenna -	#07		
Driver Ariterina - Steel Plate	America, Inc.	Steel Plate	#07		

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Antenna Cable (ANT3/4)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT5/6)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT7/8)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT9/10)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (IMMO Hi/Lo)	No	1.0m	No	BCM Module 125 kHz	Antenna
Cable Harness - Switch Box	No	1.5m	No	BCM Module 125 kHz	VASS Switch Box
DC Cable	No	2.0m	No	BCM Module 125 kHz	DC Power
Antenna Cable (ANT1/2)	No	1.0m	No	BCM Module 125 kHz	Antenna



EUT				
Description	Manufacturer	Model/Part Number	Serial Number	
Combo (IMMO/LF)	DENSO International	Combo (IMMO/LF)	#01	
Antenna	America, Inc.	Antenna	#01	
Bracket Antenna -	DENSO International	Bracket Antenna -	#03	
Aluminum Plate	America, Inc.	Aluminum Plate	#03	
BCM Module 125 kHz	DENSO International America, Inc.	B2NA0	BCM2-EL-002	

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Antenna Cable (ANT3/4)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT5/6)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT7/8)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT9/10)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (IMMO Hi/Lo)	No	1.0m	No	BCM Module 125 kHz	Antenna
DC Cable	No	2.0m	No	BCM Module 125 kHz	DC Power
Antenna Cable (ANT1/2)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT1/1_R)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT2/2_R)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT7/7_R)	No	1.0m	No	BCM Module 125 kHz	Antenna
Antenna Cable (ANT8/8_R)	No	1.0m	No	BCM Module 125 kHz	Antenna

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2021-12-30	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	2022-02-04	Spurious Radiated Emission	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

FIELD STRENGTH OF FUNDAMENTAL - HALF BRIDGE, SINGLE CH



PSA-ESCI 2021 12 10 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. Test Mode: Single Ch PEPS on BCM Antenna Pins 01&01R.

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency 9 kHz	Stop Frequency	490 kHz
Start i requeries 5 km2	lotop i requerity	700 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
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2021-06-25	2022-06-25
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2021-08-26	2022-08-26

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 = CISPR Average Detector

FIELD STRENGTH OF FUNDAMENTAL - HALF BRIDGE, SINGLE CH



PSA-ESCI 2021.12.10.0

EmiR5 2021.09.09.0

										EmiR5 2021.09.09.0	P	SA-ESCI 2021.12.10.0	0
W	Vork Order:		Π0013		Date:	2021-							
	Project:	N	lone	Te	mperature:	19.2		1	16				
	Job Site:	0	C08		Humidity:	45.29	% RH		-	_			
Seri	al Number:		nfiguration	Baron	netric Pres.:	1014			Tested by:	Nolan De l	Ramos Vir	ncent Liwar	⊣ 1
3011		B2NA0	garation	Daion		1014			. Joilou by.	I. TOIGH DE I	.a	.com Liway	2_
C	nfiguration:												_
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			nternational A	America,	Inc.								_
	Attendees:												
E	EUT Power:	12 VDC											_
			ing 125 kHz	Half Brid	ge. Test Mod	e: Single C	h PEPS on	BCM Ante	nna Pins ∩	1&01R			_
Opera	ating Mode:	Transmit	g 120 Ki iz.	Tian Bila	go. 1001 mod	o. Onigio O	בו כ טוו	DOMATINO		100111.			
		NI											_
	Deviations:	None											
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		Data pres	sented are the	e worst ca	ase modes as	s determine	ed during pr	e complian	ce testing.				
(Comments:												
	cifications						Test Meth						_
CC 15.2	209:2021						ANSI C63.	10:2013					
													_
Run #	# 7	Test D	istance (m)	10	Antenna	Height(s)		1(m)		Results	P	ass	
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Freq	Amplitude	Factor	Antenna Height	Azimuth	Test Distance	External Attenuation	Transducer Type	Detector	Distance Adjustment	Adjusted	Spec. Limit	Compared to Spec.	
(MHz)	(dBuV)	(dB/m)	(meters)	(degrees)	(meters)	(dB)	Турс	Detector	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
(1411 12)	((25,)	(5.0.0)	(==9.003)	()	(32)			(35)	(2237,)	(3237,)	(32)	Comments
0.125	61.7	10.3	1.0	3.0	10.0	0.0	Perp to EUT	AV	-59.1	12.9	25.7	-12.8	Tx 125 kHz, EUT On S
0.125	61.6	10.3	1.0	102.0	10.0	0.0	Perp to EUT	AV	-59.1	12.8	25.7	-12.8	Tx 125 kHz, EUT Horz
0.125	56.4	10.3	1.0	21.0	10.0	0.0	Par to EUT	AV	-59.1	7.6	25.7	-12.9	Tx 125 kHz, EUT Horz
0.125	55.3	10.3	1.0	292.0	10.0	0.0	Par to EUT	AV	-59.1	6.5	25.7	-10.1	Tx 125 kHz, EUT On S
0.123	44.7	10.3	1.0	292.0	10.0	0.0	Par to GND	AV	-59.1 -59.1	-4.1	25.7	-19.2	Tx 125 kHz, EUT Horz
0.124	44.7 44.5	10.3	1.0	355.0	10.0	0.0	Par to GND	AV	-59.1 -59.1	-4.1 -4.3	25.7 25.7	-29.8 -30.0	Tx 125 kHz, EUT Vert
													· ·
0.124	64.5	10.3	1.0	102.0	10.0	0.0	Perp to EUT	PK	-59.1 -50.1	15.7 15.6	45.8 45.7	-30.1	Tx 125 kHz, EUT Horz Tx 125 kHz, EUT On S
0.125	64.4	10.3	1.0	3.0	10.0	0.0	Perp to EUT	PK	-59.1	15.6	45.7	-30.1	
0.126	43.8	10.3	1.0	309.0	10.0	0.0	Par to GND	AV	-59.1	-5.0 -7.9	25.6	-30.6	Tx 125 kHz, EUT On S Tx 125 kHz, EUT Vert
0.124	41.0 60.5	10.3 10.3	1.0 1.0	225.0 21.0	10.0 10.0	0.0	Perp to EUT	AV PK	-59.1 -59.1	-7.8 11 7	25.7 45.6	-33.5 -33.9	Tx 125 kHz, EUT Vert
U. 12b	nU.5	10.3	1.0	ZT 0	100	U U	Pario EUI	PK.	-ay 1	11/	40 h	1.1 9	LA LZO KOZ. EUT MOIZ

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225.0 283.0 10.0

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10.0 10.0 0.0

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Par to EUT

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PK

PK PK PK -59.1

-59.1

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-9.5 10.5

3.5

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1.9 1.1 45.6

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45.6 45.7 -33.9

-35.1

-35.2

-42.3

-42.5

-42.7

-43.7

0.126

0.126

0.125

0.124

0.124

0.126

0.126

60.5

39.3

59.3 52.3

52.2

51.9

50.7

Tx 125 kHz, EUT Horz Tx 125 kHz, EUT Vert

Tx 125 kHz, EUT Horz

Tx 125 kHz, EUT Vert

Tx 125 kHz, EUT Vert

Tx 125 kHz, EUT Vert

Tx 125 kHz, EUT On Side

Tx 125 kHz, EUT On Side

FIELD STRENGTH OF FUNDAMENTAL - HALF BRIDGE, DUAL CH



PSA-ESCI 2021.12.10.0

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. Test Mode: Dual Channel PEPS on BCM Antenna Pins 01&01R and 02&02R.

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 3

FREQUENCY RANGE INVESTIGATED

0, , =	O. E	1400 111
Start Frequency 9 kHz	Stop Frequency	l490 kHz
Start i requerity 13 KHZ	ISLOD I TEQUELICY	1430 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
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2021-06-25	2022-06-25
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2021-08-26	2022-08-26

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 = CISPR Average Detector

FIELD STRENGTH OF FUNDAMENTAL - HALF BRIDGE, DUAL CH



										EmiR5 2021.09.09.0	PS	SA-ESCI 2021.12.10.0	_
W	ork Order:		10013		Date:		-12-29			-			
	Project:	No	one		nperature:		2 °C			5			
Corio	Job Site:		C08 figuration		Humidity: tric Pres.:		% RH mbar		Tested by:	Nolon Do I	Domoo Vin	oont Liwoo	
Seria		B2NA0	liguration	Daronne	tille Fles	1014	IIIDai		rested by:	Noian De I	Kaiiios, viii	icent Liwag	<u></u>
Cont	figuration:												=
			ternational /	America. Ir	nc.								-
	Attendees:												=
	UT Power:												-
Operat	ing Mode:	Transmittii	ng 125 kHz.	Half Bridg	e. Test Mod	de: Dual Ch	nannel PEP	S on BCM	Antenna Pii	ns 01&01R	and 02&02	2R.	-
D	eviations:	None											_
С	omments:	Data prese	ented are th	e worst cas	se modes a	is determin	ed during pı	e compliar	nce testing.				
Test Spec	ifications						Test Meth	nd					
FCC 15.20							ANSI C63.						-
													_
Run #	6	Test Dis	stance (m)	10	Antenna	Height(s)		1(m)		Results	Pa	ass	-
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Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	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	64.3	10.3	1.0	89.0	10.0	0.0	Perp to EUT	AV	-59.1	15.5	25.7	-10.2	Tx 125 kHz, EUT Horz
0.125	61.2	10.3	1.0	0.0	10.0	0.0	Perp to EUT	AV	-59.1	12.4	25.7	-13.3	Tx 125 kHz, EUT On Side
0.126 0.125	58.5 55.6	10.3 10.3	1.0 1.0	0.0 93.0	10.0 10.0	0.0 0.0	Par to EUT Par to EUT	AV AV	-59.1 -59.1	9.7 6.8	25.7 25.7	-16.0 -18.9	Tx 125 kHz, EUT Horz Tx 125 kHz, EUT On Side
0.125	69.4	10.3	1.0	93.0 89.0	10.0	0.0	Perp to EUT	PK	-59.1 -59.1	20.6	45.7	-18.9 -25.1	Tx 125 kHz, EUT Horz
0.126	47.4	10.3	1.0	341.0	10.0	0.0	Par to EUT	AV	-59.1	-1.4	25.7	-27.1	Tx 125 kHz, EUT Vert
0.126	46.9	10.3	1.0	28.0	10.0	0.0	Par to GND	AV	-59.1	-1.9	25.6	-27.5	Tx 125 kHz, EUT Horz

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	Attenuation (dB)	Туре	Detector	Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Spec. (dB)	
(IVITIZ)	(ubur)	(05/11)	(motoro)	(409/000)	(motoro)	(45)			(42)	(dDd v/iii)	(05017111)	(45)	Comments
0.125	64.3	10.3	1.0	89.0	10.0	0.0	Perp to EUT	AV	-59.1	15.5	25.7	-10.2	Tx 125 kHz, EUT Horz
0.125	61.2	10.3	1.0	0.0	10.0	0.0	Perp to EUT	AV	-59.1	12.4	25.7	-13.3	Tx 125 kHz, EUT On Side
0.126	58.5	10.3	1.0	0.0	10.0	0.0	Par to EUT	AV	-59.1	9.7	25.7	-16.0	Tx 125 kHz, EUT Horz
0.125	55.6	10.3	1.0	93.0	10.0	0.0	Par to EUT	AV	-59.1	6.8	25.7	-18.9	Tx 125 kHz, EUT On Side
0.125	69.4	10.3	1.0	89.0	10.0	0.0	Perp to EUT	PK	-59.1	20.6	45.7	-25.1	Tx 125 kHz, EUT Horz
0.126	47.4	10.3	1.0	341.0	10.0	0.0	Par to EUT	AV	-59.1	-1.4	25.7	-27.1	Tx 125 kHz, EUT Vert
0.126	46.9	10.3	1.0	28.0	10.0	0.0	Par to GND	AV	-59.1	-1.9	25.6	-27.5	Tx 125 kHz, EUT Horz
0.123	64.0	10.3	1.0	0.0	10.0	0.0	Par to EUT	PK	-59.1	15.2	45.8	-30.6	Tx 125 kHz, EUT Horz
0.125	63.9	10.3	1.0	0.0	10.0	0.0	Perp to EUT	PK	-59.1	15.1	45.7	-30.6	Tx 125 kHz, EUT On Side
0.125	42.9	10.3	1.0	133.0	10.0	0.0	Par to GND	AV	-59.1	-5.9	25.7	-31.6	Tx 125 kHz, EUT On Side
0.125	42.5	10.3	1.0	251.0	10.0	0.0	Par to EUT	AV	-59.1	-6.3	25.7	-32.0	Tx 125 kHz, EUT Vert
0.125	40.3	10.3	1.0	74.0	10.0	0.0	Perp to GND	AV	-59.1	-8.5	25.7	-34.2	Tx 125 kHz, EUT Vert
0.126	59.5	10.3	1.0	93.0	10.0	0.0	Par to EUT	PK	-59.1	10.7	45.6	-34.9	Tx 125 kHz, EUT On Side
0.123	54.8	10.3	1.0	341.0	10.0	0.0	Par to EUT	PK	-59.1	6.0	45.8	-39.8	Tx 125 kHz, EUT Vert
0.124	54.3	10.3	1.0	28.0	10.0	0.0	Par to GND	PK	-59.1	5.5	45.7	-40.2	Tx 125 kHz, EUT Horz
0.121	52.4	10.3	1.0	133.0	10.0	0.0	Par to GND	PK	-59.1	3.6	45.9	-42.3	Tx 125 kHz, EUT On Side
0.128	51.4	10.3	1.0	251.0	10.0	0.0	Par to EUT	PK	-59.1	2.6	45.5	-42.9	Tx 125 kHz, EUT Vert
0.126	50.5	10.3	1.0	74.0	10.0	0.0	Perp to GND	PK	-59.1	1.7	45.6	-43.9	Tx 125 kHz, EUT Vert

FIELD STRENGTH OF FUNDAMENTAL - ROUND ROBIN



PSA-ESCI 2021.12.10.0

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. Test Mode: Round Robin

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 10

FREQUENCY RANGE INVESTIGATED

Start Frequency 9 kHz	Stop Frequency	490 kHz
Start Frequency 19 KHZ	Stop i requericy	1430 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
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2021-06-25	2022-06-25
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2021-08-26	2022-08-26

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 = CISPR Average Detector

FIELD STRENGTH OF FUNDAMENTAL - ROUND ROBIN



										EmiR5 2021.09.09.0	PS	SA-ESCI 2021.12.10.0	<u>.</u>
W	ork Order: Project:		TI0013 Ione	To	Date:		-01-07		-	5			
	Job Site:		C08	ie	Humidity:		% RH	_		5			
Seria	al Number:		nfiguration	Barom	etric Pres.:		mbar		Tested by:	Nolan De l	Ramos, Vin	cent Liwag	<u>.</u>
Con	EUT: figuration:	B2NA0 10											-
(Customer:	DENSO I	nternational	America, I	nc.								<u> </u>
	Attendees: UT Power:												_
	ting Mode:		ing 125 kHz.	Half-Brid	ge. Test Mod	le: Round l	Robin						-
Орега	ing wode.	Nana											_
D	Deviations:	None											
							ed during pre						=
С	comments:						ence only 1 a ents column						
		the anten	na was conn	ected									-
Test Spec							Test Metho						=
FCC 15.20	09:2022						ANSI C63.10	0:2013					
													_
Run #	15	Test D	istance (m)	10	Antenna	Height(s)		1(m)		Results	Pa	ass	_
70													
00													
60													
50								Щ				Ш	
30] L					
40										$\overline{}$			
							$\downarrow \downarrow \downarrow \downarrow \downarrow$						
E 30								₩				\square	
W/Nngp 20													
8 20										$\overline{}$		<u> </u>	
											~		
10													
0								1					
-10													
-10													
-20													
0.0	001			0.01	0			0.100				1.000	
						MHz				■ PK	◆ AV	QP	
						External	Polarity/ Transducer		Distance			Compared to	
Freq	Amplitude	Factor	Antenna Height	Azimuth	Test Distance	Attenuation	Type	Detector	Adjustment	Adjusted	Spec. Limit	Spec.	
(MHz)	(dBuV)	(dB/m)	(meters)	(degrees)	(meters)	(dB)			(dB)	(dBuV/m)	(dBuV/m)	(dB)	Comments
0.126 0.126	68.0 67.7	10.3 10.3	1.0 1.0	286.0 265.0	10.0 10.0	0.0 0.0	Perp to EUT Perp to EUT	AV AV	-59.1 -59.1	19.2 18.9	25.6 25.6	-6.4 -6.7	Tx 125 kHz, EUT Horz, Pin IMMO Hi/Lo Tx 125 kHz, EUT Horz, Pin 03&04
0.127 0.127	67.2 67.2	10.3 10.3	1.0 1.0	87.0 81.0	10.0 10.0	0.0	Perp to EUT Perp to EUT	AV AV	-59.1 -59.1	18.4 18.4	25.6 25.6	-7.2 -7.2	Tx 125 kHz, EUT Horz, Pin 05&06 Tx 125 kHz, EUT Horz, Pin 09&10
0.125	62.2	10.3	1.0	95.0	10.0	0.0	Perp to EUT	AV	-59.1	13.4	25.7	-12.3	Tx 125 kHz, EUT Horz, Pin 02&02R
0.125 0.125	62.0 61.6	10.3 10.3	1.0 1.0	100.0 87.0	10.0 10.0	0.0 0.0	Perp to EUT Perp to EUT	AV AV	-59.1 -59.1	13.2 12.8	25.7 25.7	-12.5 -12.9	Tx 125 kHz, EUT Horz, Pin 07&07R Tx 125 kHz, EUT Horz, Pin 01&01R
0.127 0.125	61.4 61.4	10.3 10.3	1.0 1.0	86.0 356.0	10.0 10.0	0.0	Perp to EUT Perp to EUT	AV AV	-59.1 -59.1	12.6 12.6	25.6 25.7	-13.0 -13.1	Tx 125 kHz, EUT Horz, Pin 08&08R Tx 125 kHz, EUT on Side, Pin 01&01R
0.125	56.3	10.3	1.0	17.0	10.0	0.0	Par to EUT	AV	-59.1	7.5	25.7	-18.2	Tx 125 kHz, EUT Horz, Pin 02&02R
0.125 0.124	56.0 55.8	10.3 10.3	1.0 1.0	9.0 88.0	10.0 10.0	0.0 0.0	Par to EUT Par to EUT	AV AV	-59.1 -59.1	7. <u>2</u> 7.0	25.7 25.8	-18.5 -18.8	Tx 125 kHz, EUT Horz, Pin 01&01R Tx 125 kHz, EUT on Side, Pin 01&01R
0.125 0.125	70.4 70.4	10.3 10.3	1.0 1.0	87.0 286.0	10.0 10.0	0.0 0.0	Perp to EUT Perp to EUT	PK PK	-59.1 -59.1	21.6 21.6	45.7 45.7	-24.1 -24.1	Tx 125 kHz, EUT Horz, Pin 05&06 Tx 125 kHz, EUT Horz, Pin IMMO Hi/Lo
0.126	70.2	10.3	1.0	81.0	10.0	0.0	Perp to EUT	PK	-59.1	21.4	45.6	-24.2	Tx 125 kHz, EUT Horz, Pin 09&10
0.126 0.123	69.9 45.8	10.3 10.3	1.0 1.0	265.0 333.0	10.0 10.0	0.0 0.0	Perp to EUT Par to EUT	PK AV	-59.1 -59.1	21.1 -3.0	45.6 25.8	-24.5 -28.8	Tx 125 kHz, EUT Horz, Pin 03&04 Tx 125 kHz, EUT Vert, Pin 01&01R
0.126 0.127	65.4 64.4	10.3 10.3	1.0 1.0	86.0 95.0	10.0 10.0	0.0 0.0	Perp to EUT Perp to EUT	PK PK	-59.1 -59.1	16.6 15.6	45.6 45.5	-29.0 -29.9	Tx 125 kHz, EUT Horz, Pin 08&08R Tx 125 kHz, EUT Horz, Pin 02&02R
0.124	64.6	10.3	1.0	100.0	10.0	0.0	Perp to EUT	PK	-59.1	15.8	45.7	-29.9	Tx 125 kHz, EUT Horz, Pin 07&07R
0.125 0.124	44.3 64.2	10.3 10.3	1.0 1.0	117.0 87.0	10.0 10.0	0.0	Par to GND Perp to EUT	AV PK	-59.1 -59.1	-4.5 15.4	25.7 45.8	-30.2 -30.4	Tx 125 kHz, EUT on Side, Pin 01&01R Tx 125 kHz, EUT Horz, Pin 01&01R
0.125 0.126	64.0 43.8	10.3 10.3	1.0 1.0	356.0 17.0	10.0 10.0	0.0	Perp to EUT Par to GND	PK AV	-59.1 -59.1	15.2 -5.0	45.7 25.6	-30.5 -30.6	Tx 125 kHz, EUT on Side, Pin 01&01R Tx 125 kHz, EUT Horz, Pin 01&01R
0.127	42.7	10.3	1.0	77.0	10.0	0.0	Perp to EUT	AV	-59.1	-6.1	25.5	-31.6	Tx 125 kHz, EUT Vert, Pin 01&01R
0.126 0.125	39.6 59.4	10.3 10.3	1.0 1.0	12.0 17.0	10.0 10.0	0.0 0.0	Par to GND Par to EUT	AV PK	-59.1 -59.1	-9.2 10.6	25.6 45.7	-34.8 -35.1	Tx 125 kHz, EUT Vert, Pin 01&01R Tx 125 kHz, EUT Horz, Pin 02&02R
0.124 0.123	59.3 58.9	10.3 10.3	1.0 1.0	88.0 9.0	10.0 10.0	0.0	Par to EUT Par to EUT	PK PK	-59.1 -59.1	10.5 10.1	45.8 45.8	-35.3 -35.7	Tx 125 kHz, EUT on Side, Pin 01&01R Tx 125 kHz, EUT Horz, Pin 01&01R
0.123	52.5	10.3	1.0	333.0	10.0	0.0	Par to EUT	PK	-59.1	3.7	45.8	-42.1	Tx 125 kHz, EUT Vert, Pin 01&01R
0.124 0.123	51.6 51.5	10.3 10.3	1.0 1.0	117.0 77.0	10.0 10.0	0.0	Par to GND Perp to EUT	PK PK	-59.1 -59.1	2.8 2.7	45.7 45.8	-42.9 -43.1	Tx 125 kHz, EUT on Side, Pin 01&01R Tx 125 kHz, EUT Vert, Pin 01&01R
0.123 0.120	51.0 49.9	10.3 10.3	1.0 1.0	17.0 12.0	10.0 10.0	0.0 0.0	Par to GND Par to GND	PK PK	-59.1 -59.1	2.2 1.1	45.9 46.0	-43.7 -44.9	Tx 125 kHz, EUT Horz, Pin 01&01R Tx 125 kHz, EUT Vert, Pin 01&01R
			-	-		-	-		-			-	* * * * * * * * * * * * * * * * * * * *

FIELD STRENGTH OF FUNDAMENTAL -FULL BRIDGE, SINGLE CH



PSA-FSCI 2021 12 10 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. Test Mode: Single Channel PEPS on BCM Antenna pins 05&06

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 6

FREQUENCY RANGE INVESTIGATED

Start Frequency 9 kHz	Stop Frequency	490 kHz	
Start i requerity 13 km2	Stop i requericy	430 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
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2021-06-25	2022-06-25
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2021-08-26	2022-08-26

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 = CISPR Average Detector

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



101			T10040		D (2004	10.00			EmiR5 2021.09.09.0	P	SA-ESCI 2021.12.10.0) T
W	ork Order: Project:		TI0013 lone	Ton	Date:		-12-30 .9 °C		-	5			
	Job Site:		C08	161	Humidity:		% RH			5			
Seria	al Number:		nfiguration	Barome	tric Pres.:		l mbar	-	Tested by:	Nolan De I	Ramos Vir	ncent Liwar	<u> </u>
		B2NA0	gu.u	24.0							ta00, v	iooni zimag	<u>.</u>
Conf	figuration:												=
			nternational A	America, Ir	IC.								- -
	Attendees:												- =
E	UT Power:												_
Operat	ting Mode:	Transmitt	ting 125 kHz.	Full Bridg	e. Test Mod	e: Single C	Channel PEF	S on BCM	1 Antenna p	oins 05&06			
•		None											_
D	Deviations:	NOTIC											
	Comments:	Data pres	sented are the	e worst ca	se modes a	s determin	ned during pr	e compliar	nce testing				-
C	Jonninents.												
T1 0	::::::						T4 M-41-						=
FCC 15.20	cifications						ANSI C63.1						=
FCC 15.20	09:2021						ANSI C63.1	10:2013					
Run #	9	Test D	istance (m)	10	Antenna	Height(s))	1(m)		Results	Pa	ass	_
70													
				+++									
60													
							+						
50							\rightarrow	\longleftarrow					
]					
40													
40													
											\		
E 30							++	+					
W//ngp 20													
ğ 20													
7 20													
								•			~		
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-10													
-10													
-20								0:				4000	
0.0	001			0.010)			0.100				1.000	
						MHz				■ PK	◆ AV	QP	
							Delevis (
						External	Polarity/ Transducer		Distance			Compared to	
Freq	Amplitude	Factor	Antenna Height	Azimuth	Test Distance	Attenuation	Туре	Detector	Adjustment	Adjusted	Spec. Limit	Spec.	
(MHz)	(dBuV)	(dB/m)	(meters)	(degrees)	(meters)	(dB)			(dB)	(dBuV/m)	(dBuV/m)	(dB)	Comments
0.125	67.7	10.3	1.0	100.0	10.0	0.0	Perp to EUT	AV	-59.1	18.9	25.7	-6.8	Tx 125 kHz, EUT Horz
0.125	67.7	10.3	1.0	7.0	10.0	0.0	Perp to EUT	AV	-59.1	18.9	25.7	-6.8	Tx 125 kHz, EUT on Side
0.125 0.125	64.1 63.8	10.3 10.3	1.0 1.0	94.0 11.0	10.0 10.0	0.0 0.0	Par to EUT Par to EUT	AV AV	-59.1 -59.1	15.3 15.0	25.7 25.7	-10.4 -10.7	Tx 125 kHz, EUT Vert Tx 125 kHz, EUT Horz
0.125	53.6	10.3	1.0	11.0	10.0	0.0	Par to EUT	AV	-59.1	4.8	25.7	-20.9	Tx 125 kHz, EUT on Side
0.126	52.9	10.3	1.0	205.0	10.0	0.0	Par to GND	AV	-59.1	4.1	25.6	-21.5	Tx 125 kHz, EUT Horz
0.126	52.4	10.3	1.0	282.0	10.0	0.0	Par to GND	AV	-59.1	3.6	25.6	-22.0	Tx 125 kHz, EUT Vert
0.125 0.124	69.9 69.7	10.3 10.3	1.0 1.0	83.0 -1.0	10.0 10.0	0.0 0.0	Perp to EUT Perp to EUT	PK PK	-59.1 -59.1	21.1 20.9	45.7 45.7	-24.6 -24.8	Tx 125 kHz, EUT Horz Tx 125 kHz, EUT Vert
0.124	48.4	10.3	1.0	289.0	10.0	0.0	Perp to EUT	AV	-59.1	-0.4	25.8	-24.8	Tx 125 kHz, EUT Vert
0.126	47.5	10.3	1.0	65.0	10.0	0.0	Par to GND	AV	-59.1	-1.3	25.6	-26.9	Tx 125 kHz, EUT on Side
0.126	65.0 64.2	10.3	1.0	94.0	10.0	0.0	Par to EUT	PK PK	-59.1 -59.1	16.2 15.4	45.6 45.7	-29.4 -30.3	Tx 125 kHz, EUT Vert Tx 125 kHz, EUT Horz
0.125 0.128	64.2 55.3	10.3 10.3	1.0 1.0	11.0 205.0	10.0 10.0	0.0 0.0	Par to EUT Par to GND	PK PK	-59.1 -59.1	15.4 6.5	45.7 45.5	-30.3 -39.0	Tx 125 kHz, EUT Horz
0.125	55.5	10.3	1.0	11.0	10.0	0.0	Par to EUT	PK	-59.1	6.7	45.7	-39.0	Tx 125 kHz, EUT on Side
0.126	54.6	10.3	1.0	282.0	10.0	0.0	Par to GND	PK	-59.1	5.8	45.6	-39.8	Tx 125 kHz, EUT Vert
0.128	53.3	10.3	1.0	252.0	10.0	0.0	Perp to EUT	PK	-59.1	4.5	45.5	-41.0	Tx 125 kHz, EUT on Side

-59.1 -59.1

4.5 3.4

PK PK PK PK

-41.0 -42.1

45.5 45.5

Tx 125 kHz, EUT on Side

53.3 52.2

10.3 10.3

1.0 1.0

0.128 0.128

252.0 65.0

0.0

Perp to EUT Par to GND

10.0 10.0

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



PSA-ESCI 2021.12.10.0

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. Test Mode: Single Channel PEPS on BCM Antenna Pins IMMO Hi/Lo.

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 4

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
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2021-06-25	2022-06-25
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2021-08-26	2022-08-26

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 = CISPR Average Detector

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



Work Order	: ENTI0013	Date:	2021-12-29								
Project		Temperature:	19.2 °C	C							
Job Site		Humidity:	45.2% RH	-							
Serial Number		Barometric Pres.:	1014 mbar	Teste	d by: Nolan De Ramos	s, Vincent Liwa					
	: B2NA0										
Configuration	: 4										
Customer	: DENSO International	America, Inc.									
Attendees											
EUT Power											
Operating Mode	Transmitting 125 kHz	nsmitting 125 kHz. Full Bridge. Test Mode: Single Channel PEPS on BCM Antenna Pins IMMO Hi/Lo.									
Deviations											
Comments	Data presented are th	e worst case modes as	determined during p	pre compliance te	esting						
t Specifications			Test Meti	hod							
C 15.209:2021			ANSI C63								
un # 5	Test Distance (m)	10 Antenna H	leight(s)	1(m)	Results	Pass					
70											
60											
60											
50											
60											
50 40											
50 40											
50 40											
60 50 40 30 20											
60 50 40 30 20											
60 50 40 30 20 10 0											
60 50 40 30 20 10		0.010		0.100		1.000					

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	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	68.2	10.3	1.0	1.0	10.0	0.0	Perp to EUT	AV	-59.1	19.4	25.7	-6.3	Tx 125 kHz, EUT Horz
0.125	68.1	10.3	1.0	0.0	10.0	0.0	Perp to EUT	AV	-59.1	19.3	25.7	-6.4	Tx 125 kHz, EUT On Side
0.125	62.5	10.3	1.0	90.0	10.0	0.0	Par to EUT	AV	-59.1	13.7	25.7	-12.0	Tx 125 kHz, EUT Horz
0.125	62.4	10.3	1.0	95.0	10.0	0.0	Par to EUT	AV	-59.1	13.6	25.7	-12.1	Tx 125 kHz, EUT On Side
0.125	58.0	10.3	1.0	350.0	10.0	0.0	Par to EUT	AV	-59.1	9.2	25.7	-16.5	Tx 125 kHz, EUT Vert
0.125	50.9	10.3	1.0	281.0	10.0	0.0	Par to GND	AV	-59.1	2.1	25.7	-23.6	Tx 125 kHz, EUT Horz
0.125	50.6	10.3	1.0	291.0	10.0	0.0	Par to GND	AV	-59.1	1.8	25.7	-23.9	Tx 125 kHz, EUT On Side
0.125	70.2	10.3	1.0	1.0	10.0	0.0	Perp to EUT	PK	-59.1	21.4	45.7	-24.3	Tx 125 kHz, EUT Horz
0.125	70.2	10.3	1.0	0.0	10.0	0.0	Perp to EUT	PK	-59.1	21.4	45.7	-24.3	Tx 125 kHz, EUT On Side
0.125	65.3	10.3	1.0	90.0	10.0	0.0	Par to EUT	PK	-59.1	16.5	45.7	-29.2	Tx 125 kHz, EUT Horz
0.124	65.0	10.3	1.0	95.0	10.0	0.0	Par to EUT	PK	-59.1	16.2	45.7	-29.5	Tx 125 kHz, EUT On Side
0.126	44.0	10.3	1.0	353.0	10.0	0.0	Par to GND	AV	-59.1	-4.8	25.6	-30.4	Tx 125 kHz, EUT Vert
0.125	63.2	10.3	1.0	350.0	10.0	0.0	Par to EUT	PK	-59.1	14.4	45.7	-31.3	Tx 125 kHz, EUT Vert
0.125	41.5	10.3	1.0	34.0	10.0	0.0	Perp to EUT	AV	-59.1	-7.3	25.7	-33.0	Tx 125 kHz, EUT Vert
0.125	56.6	10.3	1.0	281.0	10.0	0.0	Par to GND	PK	-59.1	7.8	45.7	-37.9	Tx 125 kHz, EUT Horz
0.124	55.9	10.3	1.0	291.0	10.0	0.0	Par to GND	PK	-59.1	7.1	45.8	-38.7	Tx 125 kHz, EUT On Side
0.126	52.6	10.3	1.0	353.0	10.0	0.0	Par to GND	PK	-59.1	3.8	45.6	-41.8	Tx 125 kHz, EUT Vert
0.120	51.3	10.3	1.0	34.0	10.0	0.0	Perp to EUT	PK	-59.1	2.5	46.0	-43.5	Tx 125 kHz, EUT Vert

FIELD STRENGTH OF FUNDAMENTAL -FULL BRIDGE, DUAL CH



PSA-ESCI 2021.12.10.

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. Test Mode: Dual Channel PEPS on BCM Antenna pins 05&06 & 03&04

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 7

FREQUENCY RANGE INVESTIGATED

0	a. –	400.111
Start Frequency 9 kHz	Stop Frequency	1490 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	3kHz - 1GHz RE Cables	OCB	2021-06-25	2022-06-25
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2021-08-26	2022-08-26

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 = CISPR Average Detector

FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, DUAL CH



										EmiR5 2021.09.09.0	P	SA-ESCI 2021.12.10.0	1
W	ork Order:	ENTI	0013		Date:		-12-30			2021.00.00.0		ON EGG1 2021.12.10.0	1
	Project:	No		Ter	nperature:		9 °C		16	3			
	Job Site:	00			Humidity:		% RH]
Seria	al Number:	See Conf B2NA0	iguration	Barome	etric Pres.:	1014	mbar		Tested by:	Nolan De I	Ramos, Vir	ncent Liwag	-
Con	figuration:	7											-
	Customer:	DENSO Int	ENSO International America, Inc.										-
		None											-
E	UT Power:	12 VDC											-
Operat	ting Mode:	Transmittin	g 125 kHz.	Full Bridge	e. Test Mod	e: Dual Cha	annel PEPS	on BCM A	Intenna pin	s 05&06 & (03&04		
	g	NI											-
	Deviations:	None											
		Data prese	ata presented are the worst case modes as determined during pre compliance testing									-	
C	comments:	· ·					01	•	Ü				
													_
Test Spec	ifications						Test Meth	od					-
FCC 15.20		•					ANSI C63.	10:2013	•				-
Run #	10	Test Dis	tance (m)	10	Antenna	Height(s)		1(m)		Results	P	ass	-
70													-
. 3													
60													
60													
50				+				\					
40													
							\downarrow						
E 30								$\Box \Box \Box$					
W/Nngp 20													
B													
8 20													
									•		\		
10													
0													
								`					
-10													
20													
-20 0.0	001			0.010	0			0.100				1.000	
						MHz				_			
										■ PK	◆ AV	• QP	
			Antenna			External	Polarity/		Dietones			Compared	
Freq	Amplitude	Factor	Antenna Height	Azimuth	Test Distance	Attenuation	Transducer Type	Detector	Distance Adjustment	Adjusted	Spec. Limit	Compared to Spec.	
(MHz)	(dBuV)	(dB/m)	(meters)	(degrees)	(meters)	(dB)			(dB)	(dBuV/m)	(dBuV/m)	(dB)	Comments
0.125	69.5	10.3	1.0	179.0	10.0	0.0	Perp to EUT	AV	-59.1	20.7	25.7	-5.0	Tx 125 kHz, EUT on Side
0.125	67.6	10.3	1.0	97.0	10.0	0.0	Perp to EUT	AV	-59.1	18.8	25.7	-6.9	Tx 125 kHz, EUT Horz
0.125 0.125	64.6	10.3	1.0	83.0	10.0	0.0	Par to EUT	AV	-59.1	15.8	25.7	-9.9	Tx 125 kHz, EUT on Side Tx 125 kHz, EUT Horz
0.125 0.125	63.7 53.7	10.3 10.3	1.0 1.0	1.0 97.0	10.0 10.0	0.0 0.0	Par to EUT Par to GND	AV AV	-59.1 -59.1	14.9 4.9	25.7 25.7	-10.8 -20.8	Tx 125 kHz, EUT norz
0.126	53.0	10.3	1.0	360.0	10.0	0.0	Par to EUT	AV	-59.1	4.2	25.6	-21.4	Tx 125 kHz, EUT Vert
0.124	52.6	10.3	1.0	359.0	10.0	0.0	Par to GND	AV	-59.1	3.8	25.7	-21.9	Tx 125 kHz, EUT Horz
0.125 0.125	70.2 69.7	10.3 10.3	1.0 1.0	97.0 12.0	10.0 10.0	0.0 0.0	Perp to EUT Perp to EUT	PK PK	-59.1 -59.1	21.4 20.9	45.7 45.7	-24.3 -24.8	Tx 125 kHz, EUT Horz Tx 125 kHz, EUT on Side
0.125	49.0	10.3	1.0	170.0	10.0	0.0	Perp to EUT	AV	-59.1	0.2	25.7	-25.5	Tx 125 kHz, EUT Vert
0.126	46.6	10.3	1.0	78.0	10.0	0.0	Par to GND	AV	-59.1	-2.2	25.6	-27.8	Tx 125 kHz, EUT Vert
0.126 0.125	65.4 64.7	10.3 10.3	1.0 1.0	83.0 1.0	10.0 10.0	0.0 0.0	Par to EUT Par to EUT	PK PK	-59.1 -59.1	16.6 15.9	45.6 45.7	-29.0 -29.8	Tx 125 kHz, EUT on Side Tx 125 kHz, EUT Horz
0.125	56.4	10.3	1.0	97.0	10.0	0.0	Par to EUT	PK PK	-59.1 -59.1	7.6	45.7 45.6	-29.8 -38.0	Tx 125 kHz, EUT on Side
0.126	55.6	10.3	1.0	360.0	10.0	0.0	Par to EUT	PK	-59.1	6.8	45.6	-38.8	Tx 125 kHz, EUT Vert
0.124	55.0	10.3	1.0	359.0	10.0	0.0	Par to GND	PK	-59.1	6.2	45.8 45.5	-39.6	Tx 125 kHz, EUT Horz
0.128 0.126	52.3 52.4	10.3 10.3	1.0 1.0	170.0 78.0	10.0 10.0	0.0 0.0	Perp to EUT Par to GND	PK PK	-59.1 -59.1	3.5 3.6	45.5 45.6	-42.0 -42.0	Tx 125 kHz, EUT Vert Tx 125 kHz, EUT Vert
0.120	J			. 5.0	. 5.0	0.0	0110		55.1	0.0	.5.0	72.0	,,

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



PSA-FSCI 2021.12.10.0

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. Test Mode: Dual Channel PEPS on BCM Antenna Pins IMMO Hi/Lo, 03&04.

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 8

FREQUENCY RANGE INVESTIGATED

0 5	O	400 111
Start Frequency 9 kHz	Stop Frequency	1490 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	3kHz - 1GHz RE Cables	OCB	2021-06-25	2022-06-25
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2021-08-26	2022-08-26

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 = CISPR Average Detector

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



PSA-ESCI 2021.12.10.0

Wo	ork Order: Project:		TI0013 Ione	Ten	Date:	2021-	-12-30 2 °C			EmiR5 2021.09.09.0	P	SA-ESCI 2021.12.10.0	
	Job Site:		C08		Humidity:		% RH			>			
Seria	I Number:		nfiguration	Barome	tric Pres.:	1013	mbar		Tested by:	Nolan De F	Ramos, Vir	ncent Liwaç	1
		B2NA0											=
	iguration:											_	
	Attendees:		ENSO International America, Inc.										=
		12 VDC											=
			ting 125 kHz.	Full Bridge	e. Test Mod	e: Dual Ch	annel PEPS	on BCM	Antenna Pir	ns IMMO Hi	Lo. 03&04	1	_
Operati	ing Mode:			9									
D	eviations:	None											=
	CVIations.												_
0.		Data pres	sented are the	e worst ca	se modes a	s determine	ed during pr	e complia	nce testing				
C	omments:												
	101 .1							•					
FCC 15.20							Test Metho ANSI C63.1						=
FCC 15.20	19.2021						ANSI COS. I	0.2013					
													_
Run #	13	Test D	istance (m)	10	Antenna	Height(s)		1(m)		Results	Pa	ass	=
70												\Box	
60					_							\square	
							igstar						
50													
50								7 .					
40													
							$\downarrow \downarrow \downarrow \downarrow \downarrow$						
E 30								$\bot \bot \bot$					
W//ngp 20								114					
B								111.					
병 20													
									,		\		
10													
0													
10									5				
-10													
-20	104			0.044				0.100				1.000	
0.0	IU I			0.010	J			0.100				1.000	
						MHz				■ PK	◆ AV	QP	
							Polarity/						
Form	A I'':	F	A-1 11 1	A-11	T D' -	External	Transducer		Distance	A div	0	Compared to	
Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	Attenuation (dB)	Туре	Detector	Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Spec. (dB)	
		(. 2)	((5)	()	(. - /			,,	((==)	Comments
0.125	70.1	10.3	1.0	107.0	10.0	0.0	Perp to EUT	AV	-59.1	21.3	25.7	-4.4	Tx 125 kHz, EUT Horz
0.125 0.125	70.0 64.7	10.3 10.3	1.0 1.0	355.0 24.0	10.0 10.0	0.0 0.0	Perp to EUT Par to EUT	AV AV	-59.1 -59.1	21.2 15.9	25.7 25.7	-4.5 -9.8	Tx 125 kHz, EUT on Side Tx 125 kHz, EUT Horz
0.125	63.5	10.3	1.0	122.0	10.0	0.0	Par to EUT	AV	-59.1	14.7	25.7	-11.0	Tx 125 kHz, EUT on Side
0.125	75.5	10.3	1.0	107.0	10.0		Perp to EUT	PK	-59.1	26.7	45.7	-19.0	Tx 125 kHz, EUT Horz
0.125 0.125	75.2 51.6	10.3 10.3	1.0 1.0	355.0 13.0	10.0 10.0	0.0 0.0	Perp to EUT Par to GND	PK AV	-59.1 -59.1	26.4 2.8	45.7 25.7	-19.3 -22.9	Tx 125 kHz, EUT on Side Tx 125 kHz, EUT Horz
0.125	51.3	10.3	1.0	308.0	10.0	0.0	Par to GND	AV	-59.1	2.5	25.7	-23.2	Tx 125 kHz, EUT on Side
0.125	50.4	10.3	1.0	248.0	10.0	0.0	Par to GND	AV	-59.1	1.6	25.7	-24.1	Tx 125 kHz, EUT Vert
0.125 0.124	70.3 69.2	10.3 10.3	1.0 1.0	24.0 122.0	10.0 10.0	0.0 0.0	Par to EUT Par to EUT	PK PK	-59.1 -59.1	21.5 20.4	45.7 45.8	-24.2 -25.4	Tx 125 kHz, EUT Horz Tx 125 kHz, EUT on Side
0.124	69.2 43.7	10.3	1.0	352.0	10.0	0.0	Par to EUT	AV	-59.1 -59.1	-5.1	45.8 25.7	-25.4 -30.8	Tx 125 kHz, EUT Vert
0.124	40.2	10.3	1.0	217.0	10.0	0.0	Perp to EUT	AV	-59.1	-8.6	25.7	-34.3	Tx 125 kHz, EUT Vert
0.126	58.5	10.3	1.0	13.0	10.0	0.0	Par to GND	PK	-59.1	9.7	45.6	-35.9	Tx 125 kHz, EUT Horz
0.125 0.127	58.3 57.7	10.3 10.3	1.0 1.0	248.0 308.0	10.0 10.0	0.0 0.0	Par to GND Par to GND	PK PK	-59.1 -59.1	9.5 8.9	45.7 45.6	-36.2 -36.7	Tx 125 kHz, EUT Vert Tx 125 kHz, EUT on Side
0.124	53.4	10.3	1.0	352.0	10.0	0.0	Par to GND	PK	-59.1	4.6	45.8	-41.2	Tx 125 kHz, EUT Vert

0.0

Par to GND Perp to EUT

-59.1 -59.1

4.6 1.8

45.8 45.7

-41.2 -43.9

Tx 125 kHz, EUT Vert Tx 125 kHz, EUT Vert

PK PK PK PK

53.4 50.6

0.124 0.125

10.3 10.3

1.0 1.0

352.0 217.0

10.0 10.0

FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, APPROACH



PSA-ESCI 2021.12.10.0

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. Test Mode: Approach on BCM Antenna Pins 01&02, 03&04, 05&06.

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 5

FREQUENCY RANGE INVESTIGATED

0	A: -	
Start Frequency 9 kHz	Stop Frequency	l490 kHz
Start requertey 13 km2	1 Stop i requericy	1430 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
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2021-06-25	2022-06-25
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2021-08-26	2022-08-26

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 = CISPR Average Detector

FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, APPROACH



				EmiR5 2021.09.09.0 PSA-ESCI 2021.12.10.0
Work Order:	ENTI0013	Date:	2021-12-30	
Project:	None	Temperature:	18.9 °C	26
Job Site:	OC08	Humidity:	54.5% RH	
Serial Number:	See Configuration	Barometric Pres.:	1014 mbar	Tested by: Nolan De Ramos, Vincent Liwag
EUT:	B2NA0			
Configuration:	5			
Customer:	DENSO International	America, Inc.		
Attendees:	None			
EUT Power:	12 VDC			
Operating Mode:	Transmitting 125 kHz.	Full Bridge. Test Mode	: Approach on BCM	Antenna Pins 01&02, 03&04, 05&06.
Deviations:	None			
Comments:		e worst case modes as	determined during p	re compliance testing
Test Specifications			Test Met	nod

 Test Specifications
 Test Method

 FCC 15.209:2021
 ANSI C63.10:2013

Test Distance (m) 10 Antenna Height(s) 1(m) Results Pass Run# 70 60 50 40 **QBn//m** 30 20 10 0 -10 -20 0.010 0.001 0.100 MHz QP ■ PK ◆ AV

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	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	66.4	10.3	1.0	15.0	10.0	0.0	Perp to EUT	AV	-59.1	17.6	25.7	-8.1	Tx 125 kHz, EUT on Side
0.127	60.4	10.3	1.0	24.0	10.0	0.0	Par to EUT	AV	-59.1	11.6	25.6	-14.0	Tx 125 kHz, EUT Horz
0.124	48.9	10.3	1.0	356.0	10.0	0.0	Par to EUT	AV	-59.1	0.1	25.7	-25.6	Tx 125 kHz, EUT on Side
0.125	48.9	10.3	1.0	76.0	10.0	0.0	Par to EUT	AV	-59.1	0.1	25.7	-25.6	Tx 125 kHz, EUT Vert
0.124	68.5	10.3	1.0	-1.0	10.0	0.0	Perp to EUT	PK	-59.1	19.7	45.7	-26.0	Tx 125 kHz, EUT on Side
0.124	48.1	10.3	1.0	180.0	10.0	0.0	Par to GND	AV	-59.1	-0.7	25.7	-26.4	Tx 125 kHz, EUT Horz
0.125	67.0	10.3	1.0	303.0	10.0	0.0	Perp to EUT	PK	-59.1	18.2	45.7	-27.5	Tx 125 kHz, EUT Horz
0.124	46.8	10.3	1.0	70.0	10.0	0.0	Par to GND	AV	-59.1	-2.0	25.7	-27.7	Tx 125 kHz, EUT on Side
0.126	64.6	10.3	1.0	24.0	10.0	0.0	Par to EUT	PK	-59.1	15.8	45.6	-29.8	Tx 125 kHz, EUT Horz
0.124	44.8	10.3	1.0	130.0	10.0	0.0	Par to GND	AV	-59.1	-4.0	25.8	-29.8	Tx 125 kHz, EUT Vert
0.125	40.4	10.3	1.0	61.0	10.0	0.0	Perp to EUT	AV	-59.1	-8.4	25.7	-34.1	Tx 125 kHz, EUT Vert
0.122	38.6	10.3	1.0	275.0	10.0	0.0	Perp to EUT	AV	-59.1	-10.2	25.9	-36.1	Tx 125 kHz, EUT Horz
0.123	52.8	10.3	1.0	180.0	10.0	0.0	Par to GND	PK	-59.1	4.0	45.8	-41.8	Tx 125 kHz, EUT Horz
0.124	52.7	10.3	1.0	356.0	10.0	0.0	Par to EUT	PK	-59.1	3.9	45.7	-41.8	Tx 125 kHz, EUT on Side
0.127	51.4	10.3	1.0	76.0	10.0	0.0	Par to EUT	PK	-59.1	2.6	45.6	-43.0	Tx 125 kHz, EUT Vert
0.124	50.9	10.3	1.0	70.0	10.0	0.0	Par to GND	PK	-59.1	2.1	45.7	-43.6	Tx 125 kHz, EUT on Side
0.123	49.7	10.3	1.0	293.0	10.0	0.0	Perp to EUT	PK	-59.1	0.9	45.8	-44.9	Tx 125 kHz, EUT Vert
0.121	49.4	10.3	1.0	130.0	10.0	0.0	Par to GND	PK	-59.1	0.6	46.0	-45.4	Tx 125 kHz, EUT Vert

FIELD STRENGTH OF FUNDAMENTAL -FULL BRIDGE, IMMOBILIZER



PSA-FSCI 2021 12 10 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. Test Mode: Immobilizer on BCM Antenna Pins IMMO Hi/Lo.

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 9

FREQUENCY RANGE INVESTIGATED

0, , =	O. E	1400 111
Start Frequency 9 kHz	Stop Frequency	l490 kHz
Start i requerity 13 KHZ	ISLOD I TEQUELICY	1430 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
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2021-06-25	2022-06-25
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2021-08-26	2022-08-26

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 = CISPR Average Detector

FIELD STRENGTH OF FUNDAMENTAL -**FULL BRIDGE, IMMOBILIZER**



										EmiR5 2021.09.09.0	PS	SA-ESCI 2021.12.10.0	<u>)</u>
W	ork Order:		10013		Date:		-12-30						
	Project:		one		nperature:		2 °C		1	5			
	Job Site:		008		Humidity:		% RH						1
Seria	al Number:		figuration	Barome	tric Pres.:	1013	mbar		Tested by:	Noian De F	kamos, vir	ncent Liwag	<u>l</u>
Cont	figuration:	B2NA0											_
			ternational /	America Ir	ıc.								=
	Attendees:		torriational /	unonoa, n	10.								-
	UT Power:												=
Operat	ting Mode:	Transmitti	ng 125 kHz.	Full Bridge	e. Test Mod	e: Immobil	izer on BCM	1 Antenna	Pins IMMO	Hi/Lo.			_
Operat	tilly woue.												_
D	Deviations:	None											
		Data prese	ented are the	e worst cas	se modes a	s determin	ed during pr	e complia	nce testing				_
С	comments:												
	cifications						Test Metho						_
FCC 15.20	09:2021						ANSI C63.1	10:2013					
Run #	14	Test Dis	stance (m)	10	Antenna	Height(s)		1(m)		Results	Pa	ass	_
70			(,			J. 1911(17)							-
60													
50								$\downarrow \downarrow \downarrow$					
] [
40					\rightarrow							<u> </u>	
5 00											-		
W//ngp 20								\mathcal{A}					
9 20													
											_		
10												111	
0													
0								1					
-10									•				
-20 0.0	001			0.010)			0.100				1.000	
5.0				0.010		MHz		0.100		B D (A 637	• QP	
										■ PK	◆ AV	- Qr	
						Futerral	Polarity/		Dieterra			Company	
Freq	Amplitude	Factor	Antenna Height	Azimuth	Test Distance	External Attenuation	Transducer Type	Detector	Distance Adjustment	Adjusted	Spec. Limit	Compared to Spec.	
(MHz)	(dBuV)	(dB/m)	(meters)	(degrees)	(meters)	(dB)			(dB)	(dBuV/m)	(dBuV/m)	(dB)	2
0.126	63.0	10.3	1.0	8.0	10.0	0.0	Perp to EUT	AV	-59.1	14.2	25.6	-11.4	Comments Tx 125 kHz, EUT on Side
0.125	58.0	10.3	1.0	83.0	10.0	0.0	Par to EUT	AV	-59.1	9.2	25.7	-11.4	Tx 125 kHz, EUT on Side
0.130	56.1	10.3	1.0	82.0	10.0	0.0	Perp to EUT	AV	-59.1	7.3	25.4	-18.1	Tx 125 kHz, EUT Horz
0.126 0.125	45.3 45.3	10.3 10.3	1.0 1.0	16.0 197.0	10.0 10.0	0.0 0.0	Par to GND Par to EUT	AV AV	-59.1 -59.1	-3.5 -3.5	25.6 25.7	-29.1 -29.2	Tx 125 kHz, EUT Horz Tx 125 kHz, EUT Vert
0.125 0.127	45.3 44.9	10.3	1.0	197.0	10.0	0.0	Par to EUT	AV	-59.1 -59.1	-3.5 -3.9	25.7 25.6	-29.2 -29.5	Tx 125 kHz, EUT on Side
0.125	65.0	10.3	1.0	82.0	10.0	0.0	Perp to EUT	PK	-59.1	16.2	45.7	-29.5	Tx 125 kHz, EUT Horz
0.126	64.8	10.3	1.0	8.0	10.0	0.0	Perp to EUT	PK	-59.1	16.0	45.6	-29.6	Tx 125 kHz, EUT on Side
0.124 0.125	60.2 60.1	10.3 10.3	1.0 1.0	22.0	10.0 10.0	0.0 0.0	Par to EUT Par to EUT	PK PK	-59.1 -59.1	11.4	45.8 45.7	-34.4 -34.4	Tx 125 kHz, EUT Horz Tx 125 kHz, EUT on Side
0.125 0.126	60.1 38.9	10.3	1.0	83.0 314.0	10.0	0.0	Par to EUT	AV	-59.1 -59.1	11.3 -9.9	45.7 25.6	-34.4 -35.5	Tx 125 kHz, EUT Vert
0.120	39.2	10.3	1.0	22.0	10.0	0.0	Par to EUT	AV	-59.1	-9.6	26.0	-35.6	Tx 125 kHz, EUT Horz
0.120	38.2	10.3	1.0	350.0	10.0	0.0	Perp to EUT	AV	-59.1	-10.6	26.0	-36.6	Tx 125 kHz, EUT Vert
0.126	52.6 52.4	10.3	1.0	197.0	10.0	0.0	Par to EUT	PK PK	-59.1 -59.1	3.8	45.6 45.5	-41.8 -41.0	Tx 125 kHz, EUT Vert Tx 125 kHz, EUT on Side
0.128 0.127	52.4 51.6	10.3 10.3	1.0 1.0	104.0 16.0	10.0 10.0	0.0 0.0	Par to GND Par to GND	PK PK	-59.1 -59.1	3.6 2.8	45.5 45.5	-41.9 -42.7	Tx 125 kHz, EUT on Side
0.126	50.5	10.3	1.0	350.0	10.0	0.0	Perp to EUT	PK	-59.1	1.7	45.6	-43.9	Tx 125 kHz, EUT Vert

PK PK PK PK

3.6 2.8 1.7 0.9

45.6 46.0

-59.1 -59.1 -59.1 -59.1

-43.9 -45.1

Tx 125 kHz. EUT Vert Tx 125 kHz, EUT Vert

0.126 0.121

50.5 49.7

10.3 10.3

1.0

350.0 314.0

10.0 10.0

0.0

Perp to EUT Par to GND

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - HALF BRIDGE, SINGLE CH



PSA-ESCI 2021.12.10.0

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. Test Mode: Single Ch PEPS on BCM Antenna Pins 01&01R.

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 2

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
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2021-06-25	2022-06-25
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2021-08-26	2022-08-26

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 = CISPR Average Detector

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

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - HALF BRIDGE, SINGLE CH



Project: None Temperature: 16.7 °C Job Site: OC10 Humildity: 41.7% RH Serial Number: Sec Onfiguration Barometric Pres.: 1026 mbar Tested by: Nolan De Ramos, Vincent Liwag EUT: SexNAO Configuration: 2 vo. Contiguration Sex Name Value Va											EmiR5 2021.09.09.0	P	SA-ESCI 2021.12.10.0)
Serial Number Serial Numbe						Date:								
Serial Number Sea Configuration Barometric Pres. 1026 mbar Tested by: Nolan De Ramos, Vincent Liwag					Ter					16				
EUT: BZNAD Configuration: 2 Customer: DENSO International America, Inc. Attendees: None EUT Power: 12 VDC Operating Mode Transmitting 125 kHz. Hall Bridge. Test Mode: Single Ch PEPS on BCM Antenna Pins 018/01R. Deviations: None Data presented are the worst case modes as determined during pre-compliance testing. Worst case from Field Strength of Fundamental: (Perp to EUT, EUT On Side). St Specifications: Test Method C 15/209-2022 ANSI C63.10/2013 Run # 4		Job Site:	OC1	0			41.79	% RH						
Configuration Comparison	Serial I	Number:	See Config	guration	Barome	etric Pres.:	1026	mbar		Tested by:	Nolan De F	Ramos, Vir	ncent Liwag	<u>-</u>
Couptions Customer 12 12 12 13 14 14 Test Distance (m) 3 Antenna Height(s) 15 16 16 16 16 16 16 16		EUT:								-				_
Customers DENSO International America, Inc.	Confid													_
Autondoes: None EUT Power 12 VDC Transmitting 125 kHz. Half Bridge. Test Mode: Single Ch PEPS on BCM Antenna Pins 01&01R.				rnational A	merica Ir	nc								-
Deviations Comments Comment				mationari	imonoa, ii	10.								=
Deviations Data presented are the worst case modes as determined during pre compliance testing. Worst case from Field Strength														_
Deviations De				405 111	LL-K D 2 L	. T N	0:	DE DO	DOM A	D'	1001D			-
Data presented are the worst case modes as determined during pre-compliance testing. Worst case from Field Strength	Operatin	ng Mode:	Iransmitting	125 kHz.	Half Bridg	e. Lest Mod	le: Single C	on PEPS on	BCM Ante	nna Pins 0°	1&01R.			
Comments:	De	viations:	None											_
Run # 4 Test Distance (m) 3 Antenna Height(s) 1(m) Results Pass	Coi							ed during pr	e complian	ce testing.	Worst case	from Field	d Strength	-
Run # 4 Test Distance (m) 3 Antenna Height(s) 1(m) Results Pass	ot Chaoiti	ications						Took Moth	. d					
Run # 4 Test Distance (m) 3 Antenna Height(s) 1(m) Results Pass														_
80 60 40 -20 -20 -40 -0.001 -0.001 -0.010 -0.010 -0.001 -0.000 -0.001 -0.001 -0.000 -0.001 -0.0000 -0.000 -0.000 -0.000 -0.000 -0.000 -0.000 -0.000 -0.000 -0.0000 -0.000 -0.000 -0.000 -0.000 -0.000 -0.000 -0.000 -0.000 -0.00000 -0.00000 -0.0000 -0.0000 -0.0000 -0.0000 -0.00000 -0.0000 -0.0000 -0.0000 -0.0000 -0.00000 -0.00000														
Freq Amplitude Factor Antenna Height Azimuth (edgrees) Test Distance Test Distance (edgrees) Test Distance (edgrees) Test Distance (edgrees) Test Distance (edgrees) Test Distance Test Distance (edgrees) Test Distance (edgrees) Test Distance (edgrees) Test Distance (edgrees) Test Distance Test Distance (edgrees) Test Distance (edgrees) Test Distance (edgrees) Test Distance (edgrees) Test Distance Test Distance (edgrees) Test Distance (edgrees) Test Distance (edgrees) Test Distance (edgrees) Test Distance Test Distance (edgrees) Test Distance (edgrees) Test Distance Test Distance (edgrees) Test Distance Test Distance (edgrees) Test Distance (edgrees) Test Distance (edgrees) Test Distance (edgrees) Test Distance Test Distance (edgrees) Test Distance (edgrees) Test Distance (edgrees) Test Distance (edgrees) Test Distance Test Distance (edgrees) Test Distance (edgrees) Test Distance Test Distance (edgrees) Test Distance (edgrees) Test Distance T		4	Test Dista	ance (m)	3	Antenna	Height(s)	1	1(m)		Results	Pa	ass	- -
40 -20 -40 -0.001 -20 -40 -40 -40 -40 -40 -40 -40 -40 -40 -4	80													
40 -20 -40 -0.001 -20 -40 -40 -40 -40 -40 -40 -40 -40 -40 -4														
40 -20 -40 -0.001 -20 -40 -40 -40 -40 -40 -40 -40 -40 -40 -4														
Pred Amplitude Factor (dB/m) Antenna Height (meters) Azimuth (meters) Azimuth (meters) Test Distance (meters) Type Detector Adjustment (dB) Type Detector Adjustment Adjustmen	60													
Pred Amplitude Factor (dB/m) Antenna Height (meters) Azimuth (meters) Azimuth (meters) Test Distance (meters) Type Detector Adjustment (dB) Type Detector Adjustment Adjustmen								+						
Pred Amplitude Factor (dB/m) Antenna Height (meters) Azimuth (meters) Azimuth (meters) Test Distance (meters) Type Detector Adjustment (dB) Type Detector Adjustment Adjustmen									$\downarrow\downarrow$					
Pred Amplitude Factor (dB/m) Antenna Height (meters) Azimuth (meters) Azimuth (meters) Test Distance (meters) Type Detector Adjustment (dB) Type Detector Adjustment Adjustmen										_				
Pred Amplitude Factor (dB/m) Antenna Height (meters) Azimuth (meters) Azimuth (meters) Test Distance (meters) Type Detector Adjustment (dB) Type Detector Adjustment Adjustmen	40													
-20 -40 -0.001 -20 -40 -40 -40 -40 -40 -40 -40 -40 -40 -4	.0													
-20 -40 -0.001 -20 -40 -40 -40 -40 -40 -40 -40 -40 -40 -4														
-20 -40 -0.001 -20 -40 -40 -40 -40 -40 -40 -40 -40 -40 -4								+				_		
-20 -40 -0.001 -20 -40 -40 -40 -40 -40 -40 -40 -40 -40 -4	E											_		
-20 -40 -0.001 -20 -40 -40 -40 -40 -40 -40 -40 -40 -40 -4	E													
-20 -40 -0.001 -20 -40 -40 -40 -40 -40 -40 -40 -40 -40 -4	E // N 20													
-20 -40 -0.001 -40 -0.001 -40 -40 -40 -40 -40 -40 -40 -40 -40 -40	E// 20 -											-		
-20 -40 -0.001 -40 -0.001 -40 -40 -40 -40 -40 -40 -40 -40 -40 -40	E//ngp 20													
-20 -40 -0.001 0.010 0.010 0.000 MHz PK + AV • QP PK + AV • QP PK PK + AV • QP PK PK PK PK PK PK PK	Bull 20 –													
-20 -40 -0.001 0.010 0.010 0.000 MHz PK + AV • QP PK + AV • QP PK PK + AV • QP PK PK PK PK PK PK PK												-		
-20 -40 -0.001 0.010 0.010 0.000 MHz PK + AV • QP PK + AV • QP PK PK + AV • QP PK PK PK PK PK PK PK												-		
-20 -40 -0.001 0.010 0.010 0.000 MHz PK + AV • QP PK + AV • QP PK PK + AV • QP PK PK PK PK PK PK PK														
-40 0.001 0.010 0.1000 0.10000 0.10000 0.10000 0.100														
-40 0.001 0.010 0.010 0.100 0	0										•			
-40 0.001 0.010 0.010 0.100 0	0										•			
0.001 0.010 MHz ■ PK ◆ AV ■ QP Freq Amplitude (dBuV) (dBW) (dBW	0										•			
0.001 0.010 MHz ■ PK ◆ AV ■ QP Freq Amplitude (dBuV) (dBW) (dBW	0										•			
Freq (MHz) Amplitude (dB/m) Factor (dB/m) Antenna Height (meters) Azimuth (degrees) Test Distance (degrees) Polarity/ Transducer (dB) Detector (dB) Distance Adjustment (dB) (dBU/m) Adjusted (dBU/m) Spec. Limit (dBU/m) Compared to Spec. (dB) 0.250 50.2 10.2 1.0 206.0 3.0 0.0 Perp to EUT AV -80.0 -19.6 19.6 -39.2 Tx, 125 kHz, EUT On S 0.250 54.1 10.2 1.0 206.0 3.0 0.0 Perp to EUT AV -80.0 -30.1 16.1 -46.2 Tx, 125 kHz, EUT On S 0.250 54.1 10.2 1.0 206.0 3.0 0.0 Perp to EUT AV -80.0 -39.2 Tx, 125 kHz, EUT On S	-20										•			
Freq Amplitude (dBuV) (dB/m) Antenna Height (meters) Azimuth (meters) (degrees) Freq (meters) (dB/m)	-20	4							0.100		•		1000	
Freq Amplitude (dBuV) (dBuV) (dBuV) (dBuV) (dBuV) (dBuV) (dBuV) (dBuV) (dBuV) (Detector (meters) (Detector (MHz) (Detector (MH	-20	1			0.01	0			0.100		•		1.000	
Freq MHz) Amplitude (dBuV) Factor (dBuV) Antenna Height (meters) Azimuth (degrees) External Attenuation (dB) Transducer Type Detector Detector Adjustment (dB) Distance Adjustment (dB) (dBuV/m) Spec. Limit (dBuV/m) Compared to Spec. Limit (dBuV/m) 0.250 50.2 10.2 1.0 206.0 3.0 0.0 Perp to EUT AV -80.0 -19.6 19.6 -39.2 Tx, 125 kHz, EUT On S 0.375 39.4 10.5 1.0 10.2 3.0 0.0 Perp to EUT AV -80.0 -30.1 16.1 -46.2 Tx, 125 kHz, EUT On S 0.250 54.1 10.2 1.0 206.0 3.0 0.0 Perp to EUT PK -80.0 -15.7 39.7 -55.4 Tx, 125 kHz, EUT On S	-20	1			0.01	0	MHz		0.100		•			
Freq (MHz) Amplitude (dBuV) Factor (dBuV) Antenna Height (meters) Azimuth (degrees) External Attenuation (dB) Transducer Type Detector Detector (dB) Distance Adjustment (dB) (dBuV/m) Adjusted (dBuV/m) Spec. Limit (dBuV/m) Compared to Spec. (dB) 0.250 50.2 10.2 1.0 206.0 3.0 0.0 Perp to EUT AV -80.0 -19.6 19.6 -39.2 Tx, 125 kHz, EUT On S 0.250 54.1 10.2 1.0 206.0 3.0 0.0 Perp to EUT AV -80.0 -30.1 16.1 -46.2 Tx, 125 kHz, EUT On S 0.250 54.1 10.2 1.0 206.0 3.0 0.0 Perp to EUT AV -80.0 -15.7 39.7 -55.4 Tx, 125 kHz, EUT On S	-20	1			0.01	0	MHz		0.100		•	◆ AV		
(MHz) (dBuV) (dBuW) (dB/m) (meters) (degrees) (meters) (dB/m) (-20	1			0.01	0		Polarity/	0.100		•	◆ AV	• QP	
Comments 1.0 206.0 3.0 0.0 Perp to EUT AV -80.0 -19.6 19.6 -39.2 Tx, 125 kHz, EUT On S 1.0 184.0 3.0 0.0 Perp to EUT AV -80.0 -30.1 16.1 -46.2 Tx, 125 kHz, EUT On S 1.0 206.0 3.0 0.0 Perp to EUT AV -80.0 -15.7 39.7 -55.4 Tx, 125 kHz, EUT On S	-20 - -40 - 0.00						External	Polarity/ Transducer			• • • • • • • • • • • • • • • • • • •		• QP	
0.250 50.2 10.2 1.0 206.0 3.0 0.0 Perp to EUT AV -80.0 -19.6 19.6 -39.2 Tx, 125 kHz, EUT On S 0.375 39.4 10.5 1.0 184.0 3.0 0.0 Perp to EUT AV -80.0 -30.1 16.1 -46.2 Tx, 125 kHz, EUT On S 0.250 54.1 10.2 1.0 206.0 3.0 0.0 Perp to EUT PK -80.0 -15.7 39.7 -55.4 Tx, 125 kHz, EUT On S	-20 -40 -0.00	Amplitude			Azimuth	Test Distance	External Attenuation	Polarity/ Transducer		Adjustment	PK Adjusted	Spec. Limit	Ompared to Spec.	
0.375 39.4 10.5 1.0 184.0 3.0 0.0 Perp to EUT AV -80.0 -30.1 16.1 -46.2 Tx, 125 kHz, EUT On S 0.250 54.1 10.2 1.0 206.0 3.0 0.0 Perp to EUT PK -80.0 -15.7 39.7 -55.4 Tx, 125 kHz, EUT On S	-20 - -40 - 0.00	Amplitude			Azimuth	Test Distance	External Attenuation	Polarity/ Transducer		Adjustment	PK Adjusted	Spec. Limit	Ompared to Spec.	Comments
0.250 54.1 10.2 1.0 206.0 3.0 0.0 Perp to EUT PK -80.0 -15.7 39.7 -55.4 Tx, 125 kHz, EUT On S	-20	Amplitude (dBuV)	(dB/m)	(meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	
	-20 -40 0.00 Freq (MHz) 0.250	Amplitude (dBuV)	(dB/m) 10.2	(meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Tx, 125 kHz, EUT On Si
	-20 -40 0.000 Freq (MHz) 0.250 0.375	Amplitude (dBuV) 50.2 39.4	(dB/m) 10.2 10.5	1.0 1.0	Azimuth (degrees) 206.0 184.0	Test Distance (meters) 3.0 3.0	External Attenuation (dB) 0.0 0.0	Polarity/ Transducer Type Perp to EUT Perp to EUT	Detector AV AV	Adjustment (dB) -80.0 -80.0	Adjusted (dBuV/m) -19.6 -30.1	Spec. Limit (dBuV/m) 19.6 16.1	Opport to Spec. (dB) -39.2 -46.2	Tx, 125 kHz, EUT On Si Tx, 125 kHz, EUT On Si

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - HALF BRIDGE, SINGLE CH



													EmiR5 2021.0	9.09.0		P	SA-ESC	12021.12.10	0
Wo	ork Order:		ΓΙ0013		Date:									_					
	Project:		lone	T	emperature:		7°C					26		9					
	Job Site:		C10		Humidity:	41.79	% RI	<u> </u>		_									
Seria	I Number:	See Co	nfiguration	Baroi	metric Pres.:	1026	mba	ar				Tested by	y: Nolan [De R	amo	s, Vir	ncen	t Liwa	<u> </u>
	EUT:	B2NA0											_						
Conf	figuration:																		_
	Customer:	DENISO I	nternational	America	Inc														_
			illerriational /	America,	iiic.														_
	Attendees:																		_
E	UT Power:																		_
Operat	ing Mode:	Transmitt	ing 125 kHz.	Half Brid	dge. Test Mod	de: Single C	Ch PE	EPS	on E	3CM	l Ante	nna Pins	01&01R.						_
D	eviations:	None																	_
C	omments:				case modes a , EUT On Side		ed du	ıring	pre	con	nplian	ce testing	g. Worst c	ase	from	Field	Stre	ength	_
Tast Snac	ifications						Toe	t Me	tho	Ч									=
CC 15.20		L						SI C6			12	l							_
00 10.20	JJ.ZUZZ						7 (1 40	J1 OC		0.20	10								
D #		T. (18)		-		11-1-1-4-1				4/									<u>-</u>
Run #	5	lest D	istance (m)	3	Antenna	Height(s)				1(m)		Resu	ılts		Pi	ass		_
70																			
50																			
30																			
E 30					$\overline{}$														
>																			
<u> </u>																			
M/Nab 10							+	+	-	++	+			-	-		++	-	
			•																
ł							_	+		+	+			_				1	
-10							_	+		+									
-30																			
-30																			
-50																			
-30	1			4	.0					1	0.0						10	0.00	
0.				'						'	5.0						10		
						MHz							■ P	ĸ	• /	٩V	•	QP	
						Fra: 1		olarity/				Di. :							
Freq	Amplitude	Factor	Antenna Height	Azimuth	Test Distance	External Attenuation		nsduce Type	er	Det	ector	Distance Adjustmen	t Adjuste	ed	Spec.	Limit		npared to Spec.	
(MHz)	(dBuV)	(dB/m)	(meters)	(degrees		(dB)		, Jpc		Dett	COLUI	(dB)	(dBuV/r		(dBu			(dB)	
(IVITIZ)	(dDdV)	(GD/III)	(motors)	(degrees	(meters)	(GD)						(GD)	(GDG V/I	,	(GDG	•,,,,,		(30)	Comments
0.625	35.6	10.6	1.0	209.0	3.0	0.0	Pern	to El	UT	C	(P	-40.0	6.2		31	.7	1	-25.5	Tx, 125 kHz, EUT On Side
0.750	33.9	10.6	1.0	219.0	3.0	0.0		to El			P P	-40.0	4.5		30			-25.6	Tx, 125 kHz, EUT On Side
0.499	36.4	10.7	1.0	167.0	3.0	0.0		to El			P.	-40.0	7.1		33			-26.5	Tx, 125 kHz, EUT On Side
	31.2	10.7	1.0	170.0	3.0	0.0		to El			P	-40.0	1.9		28			-26.9	Tx, 125 kHz, EUT On Side
0.875																			

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ - HALF BRIDGE, DUAL CH



PSA-ESCI 2021.12.10.0

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. Test Mode: Dual Channel PEPS on BCM Antenna Pins 01&01R and 02&02R.

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 3

FREQUENCY RANGE INVESTIGATED

	Start Frequency 9 kHz	Stop Frequency	30 MHz
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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
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2021-06-25	2022-06-25
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2021-08-26	2022-08-26

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
	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 = CISPR Average Detector

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

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ - HALF BRIDGE, DUAL CH



										EmiR5 2021.09.09.0	PS	SA-ESCI 2021.12.10.	.0
Wo	rk Order:		10013		Date:		-01-03						
	Project:		one	Ter	nperature:		7 °C		26				
	Job Site:		C10		Humidity:		% RH						
Serial	Number:		nfiguration	Barome	etric Pres.:	1026	mbar		Tested by:	Nolan De I	Ramos, Vin	cent Liwa	<u>g</u>
		B2NA0											_
Confi	guration:	3											
С	ustomer:	DENSO Ir	ternational A	America, Ir	nc.								
A	ttendees:	None											_
EU	T Power:	12 VDC											_
	ng Mode:		ng 125 kHz.	Half Bridg	e. Test Mod	de: Dual Ch	nannel PEPS	on BCM	Antenna Pir	ns 01&01R	and 02&02	R.	_
De	eviations:	None											
Co	omments:		ented are the nental: (Perp			s determine	ed during pr	e complian	nce testing. \	Worst case	from Field	Strength	
Test Speci	fications						Test Metho	od					
FCC 15.209		<u> </u>					ANSI C63.						_
													_
Run #	6	Test Di	stance (m)	3	Antenna	a Height(s)		1(m)		Results	Pa	ass	_
80													
60													
								$\dashv \mid$					
40													
₩/N ab											_		
0													
-20										•			
-40 ^L													
0.00	01			0.010	0	MHz		0.100		■ PK	◆ AV	1.000 • QP	
Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	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)	
0.250 0.250	51.1 59.0	10.3 10.2	1.0 1.0	113.0 113.0	3.0 3.0	0.0 0.0	Perp to EUT Perp to EUT	AV PK	-80.0 -80.0	-18.6 -10.8	19.7 39.7	-38.3 -50.5	Tx, 125 kHz, EUT Hor Tx, 125 kHz, EUT Hor

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ - HALF BRIDGE, DUAL CH



										EmiR5 2021.09.09.0	F	SA-ESCI 2021.12.10.0)
Wo	ork Order:		10013		Date:		-01-03	3-					
	Project:		one	Tei	mperature:		.7 °C		16				
	Job Site:		C10		Humidity:		% RH						
Seria	l Number:		nfiguration	Barome	etric Pres.:	1026	6 mbar		Tested by:	Nolan De	Ramos, Vir	ncent Liwag	<u>l</u>
	EUT:	B2NA0											_
Conf	iguration:	3											=
			nternational /	America, Ii	nc.								_
		None											=
EU	JT Power:		405 111-	LI-K D-1-I-		le Direl Ol	· · · · · · · · · · · · · · · · · · ·) DOM	A (- 04004D		\D	=
Operati	ing Mode:		ing 125 kHz.	Hair Bridg	je. i est iviod	de: Duai Cr	nannei PEPS	on BCM	Antenna Pir	1S 01&01R	and 02&02	źK.	_
D	eviations:	None											_
Co	omments:		ented are the nental: (Perp			s determin	ed during pre	e complian	ce testing.	Worst case	from Field	l Strength	
est Speci	ifications						Test Metho	od					
CC 15.20	9:2022						ANSI C63.		1				-
D #1	7	Took Di		2	Antonna			4(Doguito			_
Run #	7	Test Di	istance (m)	3	Antenna	Height(s)		1(m)		Results	P	ass	=
Γ													
70													
50													
50													
_ 30				+			+ + + + + + + + + + + + + + + + + + + +						
dBuV/m													
}													
9 10													
5													
ŀ													
-10													
-10													
-30				++++								+++	
-50													
0.	1			1.0				10.0				100.0	
						MHz				- D/4	A 417	• •	
										■ PK	◆ AV	QP	
							Polarity/						
Freq	Amplitude	Factor	Antenna Height	Azimuth	Test Distance	External Attenuation	Transducer	Dotosta	Distance Adjustment	Adjusted	Spec. Limit	Compared to Spec.	
(MHz)	(dBuV)	(dB/m)	(meters)	(degrees)	(meters)	(dB)	Туре	Detector	(dB)	(dBuV/m)	(dBuV/m)	Spec. (dB)	
` '				(,									Comments
0.625	38.9	10.6	1.0	111.0	3.0	0.0	Perp to EUT	QP	-40.0	9.5	31.7	-22.2	Tx, 125 kHz, EUT Ho

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - ROUND ROBIN



PSA-ESCI 2021 12 10 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. Test Mode: Round Robin

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 10

FREQUENCY RANGE INVESTIGATED

Start Frequency 9 kHz	Stop Frequency	30 MHz
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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
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2021-06-25	2022-06-25
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2021-08-26	2022-08-26

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 = CISPR Average Detector

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

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - ROUND ROBIN



									EmiR5 2021.09.09.0		SA-ESCI 2021.12.10.	_
Woı	rk Order:	ENTI0013		Date:	2022-							
	Project:	None		nperature:		7 °C		26				
	Job Site:	OC08		Humidity:		% RH						
Serial	Number:	See Configuration	Barome	tric Pres.:	1016	mbar		Tested by:	Nolan De I	Ramos, Vin	cent Liwag	<u>1</u>
		B2NA0										_
Config	guration:	10										_
Cı	ustomer:	DENSO International	America, In	C.								_
At	ttendees:	None										- "
EU.	T Power:	12 VDC										
Onevetin	ng Mode:	Transmitting 125 kHz	. Half-Bridge	e. Test Mod	de: Round F	Robin						_
Operatii	ng wode:	· ·	· ·									
D-		None										_
De	eviations:											
Co		Data presented are the of Fundamental: (Per connected. Hence or	p to EUT, E	UT Horz). D	During Roui	nd Robin mo	de, each a	antenna pin	will transm	nit if an ante	enna is	_
Test Specif	fications					Test Metho	od					_
FCC 15.209						ANSI C63.1						_
Run #	16	Toet Dictance (m)	I 10	Antonna	Hoight/c\		1/m\		Populto	l De	ass	_
	10	Test Distance (m)	10	Antenna	Height(s)		1(m)		Results	l Pa	155	_
80 _												
00												
40 — W// 30												
40 - w//ngp 20204040												
40 - w//ngp 20 - 020 -	01		0.010				0.100				1.000	
40 - w//ngp 20204040	01		0.010		MHz		0.100		•			
40	Amplitude (dBuV)	Factor (dB/m) Antenna Heigh (meters)	t Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	◆ AV Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
40 - W/\ngp 20 - 0 - 20 - 40 - 0.00	Amplitude (dBuV)	(dB/m) (meters) 10.2 1.0	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Transducer Type Perp to EUT	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Tx 125 kHz, EUT Hor
40	Amplitude (dBuV) 29.2 32.4	(dB/m) (meters) 10.2 1.0 10.3 1.0	Azimuth (degrees) 158.0 97.0	Test Distance (meters) 10.0 10.0	External Attenuation (dB)	Transducer Type Perp to EUT Perp to EUT	Detector AV AV	Distance Adjustment (dB) -59.1 -59.1	Adjusted (dBuV/m) -19.7 -16.4	Spec. Limit (dBuV/m) 16.1 19.8	• QP Compared to Spec. (dB) -35.8 -36.2	Tx 125 kHz, EUT Hor Tx 125 kHz, EUT Hor
40 - W/\ngp 20 - 0 - 20 - 40 - 0.00	Amplitude (dBuV)	(dB/m) (meters) 10.2 1.0	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Transducer Type Perp to EUT	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Tx 125 kHz, EUT Hor

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - ROUND ROBIN



										EmiR5 2021.09.09.0	P	SA-ESCI 2021.12.10.0	0_
	Work O		ENTI0013		Date:		01-07						
		ject:	None	Ter	nperature:	18.7			36				
	Job		OC08		Humidity:		% RH						
S	erial Num		e Configuration	Barome	etric Pres.:	1016	mbar		Tested by:	Nolan De F	Ramos, Vin	cent Liwag	<u>1</u>
		EUT: B2N	40										_
	Configura												_
	Custo		SO International	America, Ir	nc.								_
		lees: None											_
	EUT Po	wer: 12 V	DC										
Ор	erating M	ode: Tran	smitting 125 kHz	. Half-Bridg	e. Test Mod	le: Round F	Robin						_
	Deviati	ons: None)										
	Comme	of Fu	presented are the ndamental: (Per ected. Hence of	p to EUT, E	UT Horz). D	Ouring Roui	nd Robin m	ode, each	antenna pin	will transm	it if an ante	enna is	_
Test S	pecificati	ons					Test Metho	od					_
	5.209:202						ANSI C63.						_
Ru	ı n # 1	7 T e	st Distance (m)	10	Antenna	Height(s)		1(m)		Results	Pa	ass	_
8	80												
_													
7	70												
6	60												
	50												
4	40												
\$													
dBuV/m	30												
9													
_													
	20		•										
2	20		•		7								
			•		7								
	20		•		7								
			•		7								
	10		•		7								
			•		7								
	0		•		7								
	10				7								
	0		•		7								
۔	0		•		7								
۔	0		•	1.0	7			10.0				100.0	
۔	10 0			1.0	7	MU-		10.0					
۔	10 0			1.0	7	MHz		10.0		■ PK	◆ AV	100.0 • QP	
۔	10 0 10 10 20 0.1		ctor Antenna Heigh (meters)	1.0	Test Distance (meters)	MHz External Attenuation (dB)	Polarity/ Transducer Type	10.0	Distance Adjustment (dB)	Adjusted (dBuV/m)	◆ AV Spec. Limit (dBuV/m)		Comments
-/2 Frec (MH2	10 0 10 20 0.1 Ampli (dBi	uV) (dE	(meters)	Azimuth (degrees)	(meters)	External Attenuation (dB)	Transducer Type	Detector	Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments Tx 125 kHz. EUT Horz
-/-	10 0 10 10 20 0.1 Ampli (dBr) (dBr) 0 31	.9 (dE		Azimuth		External Attenuation	Transducer		Adjustment	Adjusted	Spec. Limit	OPP	Tx 125 kHz, EUT Horz
	10 0 10 0.1 Ampli (dBi (dBi 7 29)	.9 10 .9 10).4 1.0	Azimuth (degrees)	(meters)	External Attenuation (dB)	Transducer Type	Detector	Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments Tx 125 kHz, EUT Horz Tx 125 kHz, EUT Horz Tx 125 kHz, EUT Horz

QP

-19.1

17.9

28.8

-10.9

Perp to EUT

10.4

1.0

69.0

10.0

0.874

26.6

Tx 125 kHz, EUT Horz

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - FULL BRIDGE, SINGLE CH



PSA-ESCI 2021.12.10.0

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. Test Mode: Single Channel PEPS on BCM Antenna Pins 05&06.

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 6

FREQUENCY RANGE INVESTIGATED

Start Frequency 9 kHz Stop Frequency 30 MHz	rt Frequency 9 kHz	Stop Frequency	30 MHz
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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
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2021-06-25	2022-06-25
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2021-08-26	2022-08-26

MEASUREMENT BANDWIDTHS

Frequency Range	Peak Data	Quasi-Peak Data	Average Data
(MHz)	(kHz)	(kHz)	(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 = CISPR Average Detector

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

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - FULL BRIDGE, SINGLE CH



90 70 50 10 -10 -30 -50 0.001 0.010 0.010 0.100											EmiR5 2021.09.09.0	PS	SA-ESCI 2021.12.10.	0_
Serial Number Serial Numbe											5			
Serial Number: Sea Configuration: Barometric Pres.: 1026 mbar Tested bys: Notan De Ramos, Vincent Liwag EUT; BENAD Configuration: 6 Customer: DENSO International America, Inc. Attendess: None EUT Power: 17 VDC Deviations: None Data presented are the worst case modes as determined during pre-compliance testing. Worst case from Field Strength Comments: of Fundamental: (Perp to EUT, EUT On Side). 15 Specifications					Tei						5			
EUT: BCNAO Configuration: 6 Customer: DENSO International America, Inc. Attendees: None EUT Power: 12 VDC Deviations: None Deviations: None Deviations: None Deviations: None Data presented are the worst case modes as determined during pre compliance testing. Worst case from Field Strength of Fundamental: (Perp to EUT, EUT on Side). 1 Specifications Test Mothod ANSI C63.10:2013 Run # 12 Test Distance (m) 3 Antenna Height(s) 1(m) Results Pass 90 70 MHz WHz PR V V V Q PFReq Ameritade					D					Factori Issu	Nalaa Da I			
Custome: DENSO International America, Inc. Attendess: None EUT Power: 12 VDC Deviations: None Deviations: OF Fundamental (Perp to EUT, EUT On Side). Test Method ANSI C63.10:2013 Run # 12 Test Distance (m) 3 Antenna Height(s) 1 (m) Results Pass To 5.00-10.001 MHz Results Pass MHz Results Pass MHz Results Pass Freq Angelucte Results Annual Specifications To 6.001 Angelucte Results	Seriai i			ntiguration	Barome	etric Pres.:	1026	mbar		ested by:	Noian De i	Ramos, vin	icent Liwag	<u>1</u>
Customers DeNSO International America, Inc. Attendees None EUT Power 12 VDC	Confid													-
## Programmed				nternational /	America. Ir	nc.								_
Deviations: Deviations Name Deviations Deviation														_
Deviations None Data presented are the worst case modes as determined during pre compliance testing. Worst case from Field Strength														_
Data presented are the worst case modes as determined during pre compliance testing. Worst case from Field Strength of Fundamental: (Perp to EUT, EUT On Side). 1 Specifications 1 Test Method ANSI C63.10:2013 Run # 12 Test Distance (m) 3 Antenna Height(s) 1(m) Results Pass 90 70 10 10 10 10 10 10 10 10 10 10 10 10 10	Operatin	g Mode:	Transmitt	ing 125 kHz.	Full Bridg	e. Test Mod	e: Single C	hannel PEP	S on BCM	Antenna P	ins 05&06.			_
Test Method ANSI C63.10:2013 Test Method ANSI C63.10:2013 AN	De	viations:	None											_
ANSI C63.10:2013	Cor	mments:						ed during pre	e complian	ce testing.	Worst case	from Field	Strength	_
ANSI C63.10:2013	st Specifi	ications						Test Metho	nd					
Run # 12 Test Distance (m) 3 Antenna Height(s) 1(m) Results Pass										1				_
90 70 50 10 -10 -30 -50 0.001 0.010 0.010 0.100	Run#	12	Test D	istance (m)	3	Antenna	Height(s)	1	1(m)		Results	Pa	ass	_
70 50 10 -10 -30 -50 0.001 0.010 0.100 MHz Polamy/ (e8/m) Freeq Amplitude (e8/m) (e8/m														_
50 30 10 -30 -50 0.001 0.010 0.010 0.1000 0.10000 0.1000 0.1000 0.1000 0.1000 0.10000 0.10000 0.10000 0.100	30													
50 30 10 -30 -50 0.001 0.010 0.010 0.1000 0.10000 0.1000 0.1000 0.1000 0.1000 0.10000 0.10000 0.10000 0.100														
50 30 10 -30 -50 0.001 0.010 0.010 0.1000 0.10000 0.1000 0.1000 0.1000 0.1000 0.10000 0.10000 0.10000 0.100	70													
30 -10 -10 -10 -10 -10 -10 -10 -10 -10 -1														
30 -10 -10 -10 -10 -10 -10 -10 -10 -10 -1														
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	0.240	20.4	40.0	1.0	204.0	2.0	0.0	Dam to CUT	A\/	00.0	27.0	40.7	57.2	
	0.249													Tx, 125 kHz, EUT On

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - FULL BRIDGE, SINGLE CH



			1						EmiR5 2021.09.09.0	F	PSA-ESCI 2021.12	1.10.0
	rk Order:	ENTI0013		Date:	2022-				-5			
	Project:	None		nperature:		7 °C		1	5			
	Job Site:	OC10		Humidity:		% RH		Tantad bu	Nolon Do F	Damas Vii	naant Liu	
Seriai i	Number:	See Configuration B2NA0	Darome	etric Pres.:	1026	mbar		rested by:	Nolan De F	kamos, vii	ncent Liw	ag
Confic	guration:											
		DENSO International	America In	nc								
		None	, unonoa, in	10.								
		12 VDC										
		Transmitting 125 kHz	. Full Bridge	e. Test Mode	e: Sinale C	hannel PEP	S on BCM	Antenna Pi	ins 05&06.			
Operatin	ng Mode:											
De	eviations:	None										
Соі		Data presented are to of Fundamental: (Per				ed during pr	e complian	ce testing.	Worst case	from Field	d Strength	<u> </u>
ot Coosif	ications					Took Math	. al					
est Specifi CC 15.209:						ANSI C63.						
Run #	18	Test Distance (m)	3	Antenna	Height(s)		1(m)		Results	P	ass	
iταn π	10	rest Distance (III)		Antenna	· reigni(3)		1 (111)		Results		400	
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W/\np 10												
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#/\hat{Nngp} 10			1.0		NAL-		10.0				100.0	
-10 -30 -50			1.0		MHz		10.0		■ PK	◆ AV	100.0 • QP	
-10 -30 -50			1.0	7	MHz	Polaritui	10.0		■ PK	◆ AV		
-10 -30 -50 0.1				5	External	Polarity/ Transducer	10.0	Distance			• QP	ı to
-10 -30 -50 0.1	Amplitude	Factor Antenna Heigh	t Azimuth	Test Distance	External Attenuation		10.0	Adjustment	Adjusted	Spec. Limit	• QP Compared	ı to
-10 -30 -50 0.1		Factor (dB/m) Antenna Heigh (meters)		Test Distance (meters)	External	Transducer					• QP	l to Comments

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - FULL BRIDGE, SINGLE CH PEPS IMMO



PSA-ESCI 2021.12.10.0

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. Test Mode: Single Channel PEPS on BCM Antenna Pins IMMO Hi/Lo.

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 4

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
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2021-06-25	2022-06-25
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2021-08-26	2022-08-26

MEASUREMENT BANDWIDTHS

Frequency Range	Peak Data	Quasi-Peak Data	Average Data
(MHz)	(kHz)	(kHz)	(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 = CISPR Average Detector

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

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - FULL BRIDGE, SINGLE CH PEPS IMMO



										EmiR5 2021.09.09.0	F	SA-ESCI 2021.12.10.)
Wo	ork Order:		10013		Date:		-01-03						
	Project:		one	Te	emperature:		7 °C		26	3			
01 -	Job Site:		C10		Humidity:		% RH		Tardad bar	Natar Da F) \ <i>C</i> -	(1 %	
Seria	I Number:	B2NA0	nfiguration	Багоп	netric Pres.:	1026	mbar		Tested by:	inoian De F	kamos, vir	icent Liwag	<u>L</u>
Conf	figuration:												=
			nternational /	America	Inc								_
	Attendees:		itorriational 7	, unioniou,									_
	UT Power:												=
	ting Mode:		ng 125 kHz.	Full Brid	ge. Test Mod	le: Single C	hannel PEP	S on BCM	1 Antenna P	ins IMMO F	Hi/Lo.		-
D	Deviations.	None											_
C			ented are the nental: (Perp		ase modes a EUT Horz).	s determine	ed during pre	e compliar	nce testing.	Worst case	from Field	l Strength	
est Spec	ifications						Test Metho	od					•
CC 15.20							ANSI C63.1						-
		_						.,					_
Run#	8	Test Di	istance (m)	3	Antenna	Height(s)		1(m)		Results	P	ass	_
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-50 ^L													
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0.0)01												
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						External	Polarity/ Transducer		Distance			Compared to	
Freq	Amplitude	Factor	Antenna Height	Azimuth	Test Distance	Attenuation		Detector	Adjustment	Adjusted	Spec. Limit	Spec.	
		Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)		Transducer	Detector		Adjusted (dBuV/m)	Spec. Limit (dBuV/m)		Comments
Freq (MHz)	Amplitude (dBuV)			(degrees)		Attenuation	Transducer Type	Detector	Adjustment			Spec. (dB)	
Freq (MHz) 0.375 0.246	Amplitude (dBuV) 32.6 32.6	(dB/m) 10.5 10.3	1.0 1.0	(degrees) 166.0 205.0	3.0 3.0	Attenuation (dB) 0.0 0.0	Transducer Type Perp to EUT Perp to EUT	AV AV	Adjustment (dB) -80.0 -80.0	-36.9 -37.1	(dBuV/m) 16.1 19.8	Spec. (dB) -53.0 -56.9	Tx, 125 kHz, EUT Ho Tx, 125 kHz, EUT Ho
Freq (MHz) 0.375	Amplitude (dBuV)	(dB/m) 10.5	(meters)	(degrees)	(meters)	Attenuation (dB)	Transducer Type	AV	Adjustment (dB)	(dBuV/m) -36.9	(dBuV/m)	Spec. (dB)	Comments Tx, 125 kHz, EUT Hot

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - FULL BRIDGE, SINGLE CH PEPS IMMO



(MHz) (dBuV) (dB(m)) (meters) (degrees) (meters) (dB) (dB) (dB) (dBuV/m) (dBuV/m) (dB) (dBuV/m) (dBuV/m) (dB) (dBuV/m)											EmiR5 2021.09.09.0	P	PSA-ESCI 2021.12.10.	0
Serial Number See Configuration Barrometric Press. 1026 mbar Tested by: Nolan De Ramos, Vincent Liwag	Wo													
Serial Number See Configuration Serial Part Serial Par					Ter					26	3			
Customer: DENSO International America, Inc. Attendess None EUT Power: 12 VDC														
Constant Customs DeNSO International America, Inc.	Serial			figuration	Barome	etric Pres.:	1026	mbar		Tested by:	Nolan De I	Ramos, Vir	ncent Liwaç	<u> </u>
Customers DENSO International America, Inc.														_
Autonome 12 VDC	Confi	guration:	4 DENICO In		A									_
Power 12 V/C Transmitting 125 kHz. Full Bridge. Test Mode: Single Channel PEPS on BCM Antenna Pins IMMO Hi/Lo.				iternational A	America, ir	1C.								_
Deviations Data presented are the worst case modes as determined during pre compliance testing. Worst case from Field Strength of Pundamental: (Perp to EUT, EUT Horz).														_
Deviations Deviations Data presented are the worst case modes as determined during pre compliance testing. Worst case from Field Strength				ng 125 kHz	Full Bridge	o Toot Mod	lo: Cinalo C	Shannal DEC	S on BCI	A Antonno E	Dina IMMA I	Ji/Lo		_
Data presented are the worst case modes as determined during pre compliance testing. Worst case from Field Strength of Fundamental: (Perp to EUT, EUT Horz). St Specifications Test Method ANSI C63.10:2013	Operati	ng Mode:	Transmilli	ilg 125 Ki iz.	i uli bilug	e. Test Mod	ie. Sirigie C	maimer F L F	3 OH DON	i Antenna r	IIIS IIVIIVIO I	II/LU.		
Test Method ANSI C63.10.2013	De	eviations:	None											_
ANSI C63.10:2013	Co	omments:					s determine	ed during pr	e compliar	nce testing.	Worst case	from Field	I Strength	
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Tree (right) (9	l est Dis	stance (m)	3	Antenna	a Height(s)		1(m)		Results	Pa	ass	=
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Test Distance (MHz) PK AV QP														
Test Distance (MHz) PK AV QP														
Test Distance (MHz) PK AV QP	- 30				\downarrow									
-10 -30 -50 0.1 1.0 10.0 100.0 MHz Preq (MHz) (dB/W) (dB	<u> </u>													
-10 -30 -50 0.1 1.0 10.0 100.0 MHz Polarity/ Transducer Type Detector Adjustment (dBuV/m) (dBuV/m) (dBuV/m) (dBuV/m) (GBuV/m) (3					-								
-10 -30 -50 0.1 1.0 10.0 100.0 MHz Preq (MHz) (dB/W) (dB	9 10													
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0.1 1.0 10.0 MHz MHz Indicates Polarity/ Transducer Polarity/ Transducer Type Detector Distance (dBuV/m)														
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Freq (MHz)														
Freq (MHz)	0.1	1			1.0				10.0				100.0	
Freq (MHz) Amplitude (dBuV) Factor (dB/m) Antenna Height (meters) Azimuth (degrees) External Attenuation (dB) Transducer Type Detector Detector Distance Adjustment (dB) (dB) Adjusted (dBuV/m) Spec. Limit (dBuV/m) Compared to Spec. Limit (dB) 0.625 40.5 10.6 1.0 177.0 3.0 0.0 Perp to EUT QP -40.0 11.1 31.7 -20.6 Tx, 125 kHz, EUT Hc 0.500 32.3 10.7 1.0 350.0 3.0 0.0 Perp to EUT QP -40.0 3.0 33.6 -30.6 Tx, 125 kHz, EUT Hc							MHz				■ PK	◆ AV	• QP	_
0.625 40.5 10.6 1.0 177.0 3.0 0.0 Perp to EUT QP -40.0 11.1 31.7 -20.6 Tx, 125 kHz, EUT Ho 0.875 36.7 10.7 1.0 29.0 3.0 0.0 Perp to EUT QP -40.0 7.4 28.8 -21.4 Tx, 125 kHz, EUT Ho 0.500 32.3 10.7 1.0 350.0 3.0 0.0 Perp to EUT QP -40.0 3.0 33.6 -30.6 Tx, 125 kHz, EUT Ho	Freq						Attenuation	Transducer	Detector	Adjustment			Spec.	
0.625 40.5 10.6 1.0 177.0 3.0 0.0 Perp to EUT QP -40.0 11.1 31.7 -20.6 Tx, 125 kHz, EUT Ho 0.875 36.7 10.7 1.0 29.0 3.0 0.0 Perp to EUT QP -40.0 7.4 28.8 -21.4 Tx, 125 kHz, EUT Ho 0.500 32.3 10.7 1.0 350.0 3.0 0.0 Perp to EUT QP -40.0 3.0 33.6 -30.6 Tx, 125 kHz, EUT Ho	(MHz)	(dBuV)	(dB/m)	(meters)	(degrees)	(meters)	(dB)			(dB)	(dBuV/m)	(dBuV/m)	(dB)	Comments
0.875 36.7 10.7 1.0 29.0 3.0 0.0 Perp to EUT QP -40.0 7.4 28.8 -21.4 Tx, 125 kHz, EUT Ho 0.500 32.3 10.7 1.0 350.0 3.0 0.0 Perp to EUT QP -40.0 3.0 33.6 -30.6 Tx, 125 kHz, EUT Ho	0.625	40.5	10.6	1.0	177.0	3.0	0.0	Perp to EUT	QP	-40.0	11.1	31.7	-20.6	
0.500 32.3 10.7 1.0 350.0 3.0 0.0 Perp to EUT QP -40.0 3.0 33.6 -30.6 Tx, 125 kHz, EUT Ho	0.875													Tx, 125 kHz, EUT Ho
9747 284 106 10 2220 30 00 Perp to FUT OP -400 -10 302 -312 T⊻ 125 kHz FUT Ho	0.500	32.3	10.7	1.0	350.0	3.0	0.0	Perp to EUT	QP	-40.0	3.0	33.6	-30.6	
5 255.0 .50 .50 .50 .50 .50 .50 .50 .50	0.747	28.4	10.6	1.0	222.0	3.0	0.0	Perp to EUT	QP	-40.0	-1.0	30.2	-31.2	Tx, 125 kHz, EUT Ho

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - FULL BRIDGE, DUAL CH



PSA-ESCI 2021.12.10.0

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. Test Mode: Dual Channel PEPS on BCM Antenna Pins 05&06 and 03&04.

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 7

FREQUENCY RANGE INVESTIGATED

	Start Frequency 9 kHz	Stop Frequency	30 MHz
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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
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2021-06-25	2022-06-25
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2021-08-26	2022-08-26

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 = CISPR Average Detector

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

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - FULL BRIDGE, DUAL CH



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Wo	ork Order:		TI0013		Date:		2-01-03						
	Project:		lone	Te	mperature:		.7 °C			5			
Caria	Job Site: I Number:		OC10 Infiguration	Davam	Humidity: etric Pres.:		7% RH 6 mbar		Cootod by	Nolan De I	Damaa Vir	annt Live	
Seria		B2NA0	niiguration	Daroin	etric Pres.:	1020	nibai		rested by:	inolan De i	Kamos, vii	iceni Liwag	<u>l</u>
Conf	iguration:	7											=
		DENSO I	nternational A	America, I	nc.								=
		None		,									_
	UT Power:	12 VDC											=
Operati	ing Mode:	Transmitt	ting 125 kHz.	Full Bridg	e. Test Mod	e: Dual Ch	annel PEPS	on BCM A	ntenna Pin	s 05&06 an	d 03&04.		_
D	eviations:	None											-
Co	omments:		sented are the mental: (Perp				ed during pre	e complian	ce testing.	Worst case	from Field	Strength	-
est Speci	ifications						Test Metho	nd					
CC 15.20		1					ANSI C63.1		1				-
Run#	20	Tost D	istance (m)	3	Antonna	Height(s)	N	1(m)		Results	Г	ass	-
	20	Test D	ristance (III)	ა	Antenna	Height(S		1 (111)		Results	l Pi	ass	_
90													
70													
50								7 ~					
00											_		
€ 30													
M/Vu8b													
<u> </u>											-		
ا 10													
-													
-10													
-10													
-30													
										•			
										•			
-50													
0.0	01			0.01	0			0.100				1.000	
						MHz				■ 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/m)	(meters)	(degrees)	(meters)	(dB)	туре	Detector	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
													Comments
0.245 0.248	32.5 43.6	10.3 10.3	1.0 1.0	77.0 77.0	3.0 3.0	0.0 0.0	Perp to EUT Perp to EUT	AV PK	-80.0 -80.0	-37.2 -26.1	19.8 39.7	-57.0 -65.8	Tx, 125 kHz, EUT On Side Tx, 125 kHz, EUT On Side
0.240	₹3.0	10.5	1.0	17.0	3.0	0.0	i eib in FOI	1 (1)	-00.0	-20.1	55.1	-00.0	, 120 Ki iz, LOT OH Old

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - FULL BRIDGE, DUAL CH



										EmiR5 2021.09.09.0	P	SA-ESCI 2021.12.1
Work Orde		ENTI0013		Date:		-01-03						
Proje		None	Tei	mperature:		7 °C			16			
Job Sit	te:	OC10		Humidity:	41.79	% RH						
Serial Number	er: Se	e Configuration	Barom	etric Pres.:	1026	mbar			Tested by:	Nolan De F	Ramos, Vir	ncent Liwa
	JT: B2N										,	
Configuration												
		SO Internationa	l Amorica I	200								
			America, ii	IIC.								
Attendee												
EUT Powe												
Operating Mod	de: Tran	smitting 125 kHz	z. Full Bridg	e. Test Mod	e: Dual Ch	annel PE	PS o	n BCM /	Antenna Pin	s 05&06 an	d 03&04.	
Deviation												
Commen		presented are tundamental: (Pe				ed during	pre	complia	nce testing.	Worst case	from Field	Strength
est Specification	16					Test Me	thoc					
CC 15.209:2022	13					ANSI C						
Run # 21	T.	est Distance (m) 3	Antonna	Height(s)			1(m)		Results	D	ass
	16	ist Distance (III	J 3	Ailleillia	rieigiit(s)			1 (111)		Results	F	ass
80												
60												
40												
			+	_								
E │				_								
∑ ,,												
B 20												
8												
			•									
0			++++			+						+++
٠,										1	1 1 1	1 1 1
-20												
-20												
-20												
-20			1.0					10.0				100.0
-20			1.0		MHz			10.0				
-20			1.0		MHz			10.0		■ PK	◆ AV	100.0 • QP
-20			1.0		MHz			10.0		■ PK	◆ AV	
-20			1.0		MHz	Polarity/		10.0	Distance	■ PK	→ AV	• QP
-20 -40 0.1		ctor Antenna Heigt		Test Distance				10.0	Distance Adjustment	■ PK Adjusted	Spec. Limit	OP Compared to Spec.
-20 -40 0.1		ctor Antenna Heigh			External	Polarity/ Transduce						• QP
-20 -40 0.1			ıt Azimuth	Test Distance	External Attenuation	Polarity/ Transduce			Adjustment	Adjusted	Spec. Limit	OP Compared to Spec.
-20 -40 0.1	(d		ıt Azimuth	Test Distance	External Attenuation	Polarity/ Transduce	er		Adjustment	Adjusted	Spec. Limit	OP Compared to Spec.

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - FULL BRIDGE, DUAL CH PEPS IMMO



PSA-FSCI 2021 12:10.0

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. Test Mode: Dual Channel PEPS on BCM Antenna Pins IMMO Hi/Lo and 03&04.

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 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
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2021-06-25	2022-06-25
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2021-08-26	2022-08-26

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 = CISPR Average Detector

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

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - FULL BRIDGE, DUAL CH PEPS IMMO



										EmiR5 2021.09.09.0	P	SA-ESCI 2021.12.10	.0
Wo	ork Order:		TI0013		Date:		-01-03			-			
	Project:		None	Ter	nperature:		7 °C			5			
	Job Site:		C10		Humidity:		% RH						
Seria	I Number:		nfiguration	Barome	tric Pres.:	1026	mbar		Tested by:	Nolan De	Ramos, Vin	cent Liwa	<u>g</u>
		B2NA0											_
Conf	iguration:	8											_
			International /	America, Ir	ic.								<u></u>
Α	Attendees:	None											<u>_</u>
EU	JT Power:	12 VDC											
Operati	ing Mode:	Transmit	ting 125 kHz.	Full Bridge	e. Test Mod	le: Dual Ch	annel PEPS	on BCM /	Antenna Pin	s IMMO Hi	/Lo and 03	&04.	
D	eviations:	None											<u>_</u>
C	omments:		sented are the mental: (Perp			s determine	ed during pr	e compliar	nce testing. \	Norst case	from Field	Strength	
Test Speci	ifications						Test Metho	nd .					
FCC 15.20							ANSI C63.						_
													_
Run #	22	Test D	istance (m)	3	Antenna	a Height(s)		1(m)		Results	Pa	ass	_
90 [
70													
, ,													
50								—					
											_		
⊆ 30								$\sqcup \sqcup$					
Ę													
u//Nab													
9 40											-		
ت 10													
-10													
										_			
-30													
										•			
-50 ^L													
0.0	01			0.010)			0.100				1.000	
						MHz				■ PK	◆ AV	• QP	
							Polarity/						
F		_			T D	External	Transducer		Distance	A P		Compared to	
Freq	Amplitude	Factor	Antenna Height	Azimuth	Test Distance	Attenuation	Туре	Detector	Adjustment	Adjusted	Spec. Limit	Spec.	
(MHz)	(dBuV)	(dB/m)	(meters)	(degrees)	(meters)	(dB)			(dB)	(dBuV/m)	(dBuV/m)	(dB)	Comments
0.246	32.6	10.3	1.0	86.0	3.0	0.0	Perp to EUT	AV	-80.0	-37.1	19.8	-56.9	Tx, 125 kHz, EUT Hor
0.248	43.5	10.3	1.0	86.0	3.0	0.0	Perp to EUT	PK	-80.0	-26.2	39.7	-65.9	Tx, 125 kHz, EUT Hor
							•						

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - FULL BRIDGE, DUAL CH PEPS IMMO



										EmiR5 2021.09.09.0	F	SA-ESCI 2021.12.10.0)
Wo	ork Order:		ΓΙ0013		Date:		-01-03	3-					
	Project:		lone	Ter	nperature:	16.	7 °C		16				
	Job Site:		C10		Humidity:		% RH			_			
Serial	Number:		nfiguration	Barome	etric Pres.:	1026	mbar		Tested by:	Nolan De	Ramos, Vir	ncent Liwag	<u>l</u>
	EUT:	B2NA0											_
Confi	iguration:	8											=
			nternational /	America, Ir	nc.								=
		None											=
EU	JT Power:		: 105 H.L-	C. II Daida	- T+ M	la. Dual Ch	annal DEDC	DCM	\ D:	- 114140 11:	/// 00	9.04	=
Operati	ing Mode:		ing 125 kHz.	Full Briag	e. restiviod	ie: Duai Ch	annei PEPS	ON BCIVI A	Antenna Pin	S IMIMO HI	/Lo and 03	&U4.	_
De	eviations:	None											_
Co	omments:		sented are the mental: (Perp			s determine	ed during pre	e complian	ice testing.	Worst case	from Field	Strength	
est Speci	fications						Test Metho	od					
CC 15.209	9:2022						ANSI C63.		1				-
D #1	22	Took D	: (m)	2	Antonno			4()		Doculto	l 6		_
Run #	23	Test D	istance (m)	3	Antenna	Height(s)		1(m)		Results	l P	ass	_
60 -													
W//ngp				•	7								
0 -													
-20 -40													
0.	1			1.0				10.0				100.0	
						MHz				■ PK	◆ AV	• QP	
Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	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 Tx, 125 kHz, EUT H
0.625													

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - FULL BRIDGE, APPROACH



PSA-ESCI 2021.12.10.0

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. Test Mode: Approach on BCM Antenna Pins 01&02, 03&04, and 05&06.

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 5

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
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2021-06-25	2022-06-25
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2021-08-26	2022-08-26

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 = CISPR Average Detector

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

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - FULL BRIDGE, APPROACH



90 70 70 50 10 -10 -30 -50 0.001 0.010 MHz -Freq Amplitude (dBuV)														EmiR5 2021.09.09.0		PSA-ESCI 2021.12.10.	0_
Serial Number See Configuration Barometric Press: 1026 mbar Tested by: Nolan De Ramos, Vincent Liwage EUT: BZNAO	Wo																
Serial Number: Sea Configuration Barometric Pres: 1026 mbar Tested by: Nolan De Ramos, Vincent Liwage EUT power: ENNO EUT power: Tested Pres: 1026 mbar Tested by: Nolan De Ramos, Vincent Liwage EUT power: Tested Pres: Tested Pres													26				
EUT; BZNAO Configuration: 5 Customer; DENSO International America, Inc. Attendees: None EUT Power; 12 VDC Deviations: None Data presented are the worst case modes as determined during pre compliance testing, Worst case from Field Strength of Fundamentals (Perp to EUT, EUT on Side). 18 Specifications		Job Site:										_					
Customs: DeNSO International America, Inc.	Serial			nfiguration	Ba	rome	tric Pres.:	1026	mba	ar			Tested by:	Nolan De F	Ramos, Vi	incent Liwag]
Customers DENSO International America, Inc. Attendees None EUT Power 12 VDC		EUT:	B2NA0														_
Customers DENSO International America, Inc. Attendees None EUT Power 12 VDC	Confi	iguration:	5														_
Attandess None				nternational /	Ameri	ca. In	IC.										_
Deviation 12 VDC Operating Mode: Test Middle: Approach on BCM Antenna Pins 018.02, 038.04, and 058.06.				- Itomationa.		ou,											_
Test Method																	_
Deviations Deviations Data presented are the worst case modes as determined during pre compliance testing. Worst case from Field Strength				: 405 I-II-	E. II E)	. T4 M1	- · A	-1	DOM	1 0 4	D:	04 0 00 /	20004	05000		_
Data presented are the worst case modes as determined during pre-compliance testing. Worst case from Field Strength	Operati	ng Mode:	Transmitt	ing 125 kHz.	Full	Briage	e. Lest Mod	e: Approac	on on	BCIV	i Ante	nna Pi	ns 01&02, 0	J3&U4, and (05&06.		
Comments: of Fundamental: (Perp to EUT, EUT On Side).	De	eviations:	None														_
Ansil Ces. 10:2013	Co								ed dı	uring	pre co	omplia	nce testing.	Worst case	from Fiel	d Strength	_
Ansil Ces. 10:2013	ot Choois	fications							Too	+ Mai	had						
Run # 10 Test Distance (m) 3 Antenna Height(s) 1(m) Results Pass												2010					_
90 70 70 10 -10 -30 -50 -0.001 -0.010 -10 -10 -10 -10 -10 -10 -10 -10 -10																	
Treat Distance (redern) (degrees) Test Distance (redern) (degrees) Test Distance (redern) (degrees) Type Defector (redern) (re	Run#	10	Test D	istance (m)	3	3	Antenna	Height(s))			1(m)		Results	F	Pass	-
10	90 [
10																	
10	70																
10	70					_											
10																	
10									_	\leftarrow							
Test Distance (dBuV) (dB/m) Antenna Height (meters) (degrees) Type (dBy/m) (dB) (dBuV/m) (dB) (dB) (dB) (dB) (dB) (dB) (dB) (dB	50					-						1 -					
Test Distance (dBuV) (dB/m) Antenna Height (meters) (degrees) Type (dBy/m) (dB) (dBuV/m) (dB) (dB) (dB) (dB) (dB) (dB) (dB) (dB								_				\Box		_			
Test Distance (dBuV) (dB/m) Antenna Height (meters) (degrees) Type (dBy/m) (dB) (dBuV/m) (dB) (dB) (dB) (dB) (dB) (dB) (dB) (dB									+			\Box					
Test Distance (dBuV) (dB/m) Antenna Height (meters) (degrees) Type (dBy/m) (dB) (dBuV/m) (dB) (dB) (dB) (dB) (dB) (dB) (dB) (dB	- 30					\perp					$\overline{}$	$\bot\bot$					
-10 -30 -50 0.001 0.010 0.100 0.100 1.000 MHz PK • AV • QP Polarity/ Transducer Type Detector Type De	ا ٽ ج																
-10 -30 -50 0.001 0.010 0.100 0.100 1.000 MHz PK • AV • QP Polarity/ Transducer Type Detector Type De	≥ ∣																
-10 -30 -50 0.001 0.010 0.100 0.100 1.000 MHz PK • AV • QP Polarity/ Transducer Type Detector Type De	ച ∣														_		
-30 -50 0.001 0.010 MHz PK AV QP Polarity/ Transducer Polarity/ Transducer Type Detector Compared to Compared	ਰ 10 ├																
-30 -50 0.001 0.010 MHz PK AV QP Polarity/ Transducer Polarity/ Transducer Type Detector Compared to Compared																	
-30 -50 0.001 0.010 MHz PK AV QP Polarity/ Transducer Polarity/ Transducer Type Detector Compared to Compared	F																
-30 -50 0.001 0.010 MHz PK AV QP Polarity/ Transducer Polarity/ Transducer Type Detector Adjustment Adjusted (dBuV/m) (dB	40																
-30 -50 0.001 0.010 0.100 0.100 1.000 MHz PK AV QP Polarity/ Transducer Type Detector Adjustment (dBuV/m) (-10																
-30 -50 0.001 0.010 0.100 0.100 1.000 MHz PK AV QP Polarity/ Transducer Type Detector Adjustment (dBuV/m) (
-30 -50 0.001 0.010 0.100 0.100 1.000 MHz PK AV QP Polarity/ Transducer Type Detector Adjustment (dBuV/m) (_			
-50 0.001 0.010 0.100 1.000 MHz PK AV QP PK AV QP	-30													_			
0.001																	
0.001														•			
0.001																	
MHz Freq Amplitude Factor (dB/w) (dB/m) (meters) (degrees) (meters) (dB/w) (dB/w																	
Freq Amplitude (dBuV) (dB/m) Antenna Height (meters) (degrees) Test Distance (meters) (dB) Detector (dB/m) Antenna Height (meters) (dB/m) (dB) Detector (meters) Detector Adjustment (dB/m) Detector Adjustment (dB/m) (dB/		01				0.010)					0.100				1.000	
Freq Amplitude (dBuV) (dB/m) Antenna Height (meters) (degrees) Test Distance (meters) (dB) Detector (dB/m) Antenna Height (meters) (dB/m) (dB) Detector (meters) Detector Adjustment (dB/m) Detector Adjustment (dB/m) (dB/	0.00							МНэ									
Freq Amplitude Factor (dB/W) (dB/m) Antenna Height (meters) (degrees) Test Distance (meters) (degrees) Test Distance (meters) (dB/m) (d	0.00							1711 12						■ PK	AV	QP	
Freq Amplitude Factor (dB/W) (dB/m) Antenna Height (meters) (degrees) Test Distance (meters) (degrees) Test Distance (meters) (dB/m) (d	0.00								p.	olarity/							
Freq Amplitude GBuV GBwV GBwV GBwV Geres Test Distance Geres Geres Test Distance Geres	0.00							External					Distance			Compared to	
Comments	0.00											etector		Adjusted	Spec Limit		
0.376 29.6 10.5 1.0 220.0 3.0 0.0 Perp to EUT AV -80.0 -39.9 16.1 -56.0 Tx, 125 kHz, EUT On 0.246 32.2 10.3 1.0 34.0 3.0 0.0 Perp to EUT AV -80.0 -37.5 19.8 -57.3 Tx, 125 kHz, EUT On 0.371 41.1 10.5 1.0 220.0 3.0 0.0 Perp to EUT PK -80.0 -28.4 36.2 -64.6 Tx, 125 kHz, EUT On 0.371 41.1	0.00			Antenna Height	Azim	nuth	Test Distance	Attenuation		Type	L	0100101					
0.246 32.2 10.3 1.0 34.0 3.0 0.0 Perp to EUT AV -80.0 -37.5 19.8 -57.3 Tx, 125 kHz, EUT On 0.371 41.1 10.5 1.0 220.0 3.0 0.0 Perp to EUT PK -80.0 -28.4 36.2 -64.6 Tx, 125 kHz, EUT On 0.371 41.1 10.5 1.0 220.0 3.0 0.0 Perp to EUT PK -80.0 -28.4 36.2 -64.6 Tx, 125 kHz, EUT On 0.371 41.1 10.5 1.0 220.0 3.0 0.0 Perp to EUT PK -80.0 -28.4 36.2 -64.6 Tx, 125 kHz, EUT On 0.371 41.1 10.5 10.5 10.5 10.5 10.5 10.5 10.5 1										Турс		.0.00.0.					
0.371 41.1 10.5 1.0 220.0 3.0 0.0 Perp to EUT PK -80.0 -28.4 36.2 -64.6 Tx, 125 kHz, EUT On	Freq (MHz)	(dBuV)	(dB/m)	(meters)	(degi	rees)	(meters)	(dB)					(dB)	(dBuV/m)	(dBuV/m)	(dB)	
	Freq (MHz) 0.376	(dBuV)	(dB/m) 10.5	(meters)	(degr	o.0	(meters)	(dB) 0.0	Perp	to EL	JT.	AV	(dB)	(dBuV/m) -39.9	(dBuV/m)	(dB)	Tx, 125 kHz, EUT On Si
1.200 44.0 10.3 1.0 34.0 3.0 0.0 PEIP (0 EUT PN -60.0 -25.7 39.7 -65.4 TX, 125 KHZ, EUT OH	Freq (MHz) 0.376 0.246	(dBuV) 29.6 32.2	(dB/m) 10.5 10.3	1.0 1.0	220 34	0.0 1.0	3.0 3.0	(dB) 0.0 0.0	Perp Perp	to EU	JT JT	AV AV	-80.0 -80.0	-39.9 -37.5	(dBuV/m) 16.1 19.8	-56.0 -57.3	Tx, 125 kHz, EUT On Si Tx, 125 kHz, EUT On Si
	Freq (MHz) 0.376 0.246 0.371	(dBuV) 29.6 32.2 41.1	(dB/m) 10.5 10.3 10.5	1.0 1.0 1.0	220 34 220	0.0 4.0 0.0	3.0 3.0 3.0 3.0	0.0 0.0 0.0 0.0	Perp Perp Perp	to EU	JT JT JT	AV AV PK	-80.0 -80.0 -80.0	-39.9 -37.5 -28.4	(dBuV/m) 16.1 19.8 36.2	-56.0 -57.3 -64.6	Tx, 125 kHz, EUT On S Tx, 125 kHz, EUT On S Tx, 125 kHz, EUT On S

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - FULL BRIDGE, APPROACH



Work Cries: ENTIO013 Date: 2022-01-03											EmiR5 2021.09.09.0	P	SA-ESCI 2021.12.10	<u>0</u>
Serial Number See Configuration Barrometric Press 1026 mbar Tested by: Notan De Ramos, Vincent Livag EUT: SerVAID See Configuration See Configurat	W										-5			
Serial Number See Configuration Sex					ı e					1	5			
Configuration S S Customer: S S Customer: S S Customer: S S Customer: S S S Customer: S S S S Customer: S S S S S S S S S	Corio				Daram					Tooted by	Nolon Do I	Domos Vii	noont Livro	
Configuration:	Seria			niiguration	Daroin	etric Pres.:	1026	mbar		rested by:	Noian De i	Ramos, vii	ncent Liwa	<u>1</u>
Customer DeNoto Parametronal America, Inc. Attended None EUT Power 12 VDC	Con													_
Attended Strong 12 VDC				ntornational /	Amorica I	nc								_
Comments Transmitting 125 kHz. Full Bridge. Test Mode: Approach on BCM Antenna Pins 01802, 03804, and 05806. Deviations Transmitting 125 kHz. Full Bridge. Test Mode: Approach on BCM Antenna Pins 01802, 03804, and 05806. Deviations Transmitting 125 kHz. Full Bridge. Test Mode: Approach on BCM Antenna Pins 01802, 03804, and 05806. Deviations Transmitting 125 kHz. Full Bridge. Test Mode: Approach on BCM Antenna Pins 01802, 03804, and 05806. Deviations Transmitting 125 kHz. Full Bridge. Test Mode: Approach on BCM Antenna Pins 01802, 03804, and 05806. Transmitting 125 kHz. Full Bridge. Test Mode: Approach on BCM Antenna Pins 01802, 03804, and 05806. Transmitting 125 kHz. Full Bridge. Test Mode: Approach on BCM Antenna Pins 01802, 03804, and 05806. Transmitting 125 kHz. Full Bridge. Test Mode: Approach on BCM Antenna Pins 01802, 03804, and 05806. Transmitting 125 kHz. Full Bridge. Test Mode: Approach on BCM Antenna Pins 01802, 03804, and 05806. Transmitting 125 kHz. Full Bridge. Test Mode: Approach on BCM Antenna Pins 01802, 03804, and 05806. Transmitting 125 kHz. Full Bridge. Test Mode: Approach on BCM Antenna Pins 01802, 03804, and 05806. Transmitting 125 kHz. Full Bridge. Test Mode: Approach on BCM Antenna Pins 01802, 03804, and 05806. Transmitting 125 kHz. Full Bridge. Test Mode: Approach on BCM Antenna Pins 01802, 03804, and 05806. Transmitting 125 kHz. Full Bridge. Test Mode: Approach on BCM Antenna Pins 01802, 03804, and 05806. Transmitting 125 kHz. Full Bridge. Test Mode: Approach on BCM Antenna Pins 01802, 03804, and 05806. Transmitting 125 kHz. Full Bridge. Test Mode: Approach on BCM Antenna Pins 01802, 03804, and 05806. Transmitting 125 kHz. Full Bridge. Test Mode: Approach on BCM Antenna Pins 01802, 03804, and 05806. Transmitting 125 kHz. Full Bridge. Test Mode: Approach on BCM Antenna Pins 01802, 03804, and 05806. Transmitting 125 kHz. Full Bridge. Test Mode: Approach on BCM Antenna Pins 01802, 03804, and 05806. Transmitting 125 kHz. Full Bridge. Test Mod				illerriational F	America, i	IIC.								_
Deviations None														_
Deviations None Data presented are the worst case modes as determined during pre-compliance testing. Worst case from Field Strength				ing 125 kHz	Full Bride	no. Tost Mod	o: Approac	h on BCM A	Intonna Dir	25 01802 0	2804 and 1	05206		_
Data presented are the worst case modes as determined during pre compliance testing. Worst case from Field Strength of Fundamental: (Perp to EUT, EUT On Side). Test Specifications	Opera	ting Mode:	Transmit	ing 125 KHZ.	i uli bilug	je. Test Mou	е. дрргоас	II OII BOW A	unterma i n	13 0 1002, 0	Jao+, and t	oodoo.		
Data presented are the worst case modes as determined during pre compliance testing. Worst case from Field Strength of Fundamental: (Perp to EUT, EUT On Side). Test Specifications	_		None											_
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Test Specifications FCC 15.209.2022 ANSI C63.10.2013 Antenna Height(s) 1(m) Results Pass Results Results Pass Results Res			Data pres	sented are the	e worst ca	se modes as	s determine	ed during pr	e complian	ce testing.	Worst case	from Field	Strength	_
Test Specifications FCC 15.209:2022 ANSI C63.10:2013 ANSI C63.	С	comments:												
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Run # 11 Test Distance (m) 3 Antenna Height(s) 1(m) Results Pass	T 0							T	. 1					
Run # 11 Test Distance (m) 3 Antenna Height(s) 1(m) Results Pass														_
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80 60 40 0.1 1.0 MHz 10.0 100.0 MHz 10.0 Potenty (redens) Testional Comments (red)														
80 60 40 0.1 1.0 MHz 10.0 100.0 MHz 10.0 Potenty (redens) Testional Comments (red)														
80 60 40 0.1 1.0 MHz 10.0 100.0 MHz 10.0 Potenty (redens) Testional Comments (red)														
80 60 40 0.1 1.0 MHz 10.0 100.0 MHz Indicator Comments Com														
80 60 40 0.1 1.0 MHz 10.0 100.0 MHz 10.0 Potenty (redens) Testional Comments (red)														_
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Freq Amplitude Factor Amenimal Height Azimuth Test Distance (right) Tigned Scient Tigned Scien	80													
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-20 -40 0.1 1.0 10.0 MHz Polarity/ (dB/w) Factor (dB/w) Factor (dB/w) Resteroil (degrees) Resteroil (dB/w) Re														
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Freq (MHz)							2				■ PK	AV	QP	
Freq (MHz)								Polarity/						
(MHz) (dBuV) (dBlw) (degrees) (meters) (dB) (dB) (dB) (dBuV/m) (dBuV/m) (dBW/m) (dBW/m	_							Transducer						
0.625 32.5 10.6 1.0 177.0 3.0 0.0 Perp to EUT QP -40.0 3.1 31.7 -28.6 TX, 125 kHz, EUT On Side 0.490 32.5 10.7 1.0 22.0 3.0 0.0 Perp to EUT QP -40.0 -0.4 28.8 -29.2 TX, 125 kHz, EUT On Side 0.490 32.5 10.7 1.0 270.0 3.0 0.0 Perp to EUT QP -40.0 3.2 33.8 -30.6 TX, 125 kHz, EUT On Side	•							Туре	Detector					
0.625 32.5 10.6 1.0 177.0 3.0 0.0 Perp to EUT QP -40.0 3.1 31.7 -28.6 Tx, 125 kHz, EUT On Side 0.874 28.9 10.7 1.0 22.0 3.0 0.0 Perp to EUT QP -40.0 -0.4 28.8 -29.2 Tx, 125 kHz, EUT On Side 0.490 32.5 10.7 1.0 270.0 3.0 0.0 Perp to EUT QP -40.0 3.2 33.8 -30.6 Tx, 125 kHz, EUT On Side	(IVIHZ)	(uBuv)	(uB/m)	(meters)	(degrees)	(meters)	(dB)			(dB)	(ubuV/m)	(ubuv/m)	(dB)	Comments
0.874 28.9 10.7 1.0 22.0 3.0 0.0 Perp to EUT QP -40.0 -0.4 28.8 -29.2 Tx, 125 kHz, EUT On Side 0.490 32.5 10.7 1.0 270.0 3.0 0.0 Perp to EUT QP -40.0 3.2 33.8 -30.6 Tx, 125 kHz, EUT On Side	0.625	32.5	10.6	1.0	177.0	3.0	0.0	Perp to EUT	QP	-40.0	3.1	31.7	-28.6	
0.490 32.5 10.7 1.0 270.0 3.0 0.0 Perp to EUT QP 40.0 3.2 33.8 -30.6 Tx, 125 kHz, EUT On Side														
0.747 28.7 10.6 1.0 353.0 3.0 0.0 Perp to EUT QP -40.0 -0.7 30.2 -30.9 Tx, 125 kHz, EUT On Side		32.5	10.7	1.0	270.0	3.0	0.0	Perp to EUT			3.2	33.8	-30.6	
	0.747	28.7	10.6	1.0	353.0	3.0	0.0	Perp to EUT	QP	-40.0	-0.7	30.2	-30.9	Tx, 125 kHz, EUT On Side

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - FULL BRIDGE, IMMOBILIZER



PSA-FSCI 2021 12 10.0

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. Test Mode: Immobilizer on BCM Antenna Pins IMMO Hi/Lo.

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 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
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2021-06-25	2022-06-25
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2021-08-26	2022-08-26

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 = CISPR Average Detector

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

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - FULL BRIDGE, IMMOBILIZER



										EmiR5 2021.09.09.0	PS	SA-ESCI 2021.12.10.0	<u>.</u>
W	ork Order:		TI0013		Date:		2-01-03						
	Project:		lone	Те	mperature:		.7 °C			3			
Coric	Job Site: al Number:		OC10 Infiguration	Param	Humidity: etric Pres.:		7% RH 6 mbar		Factod by	Nolan De F	Domos Vir	oont Livron	_
Seria		B2NA0	niiguration	Daroili	etiic Fies	102	o Ilibai		resieu by.	INOIAII DE I	taiiios, vii	icent Liway	<u>L</u>
Con	figuration:												_
			nternational A	America, I	nc.								-
	Attendees:				-								-
	UT Power:												_
Onera	ting Mode:	Transmitt	ting 125 kHz.	Full Bridg	e. Test Mod	e: Immobi	lizer on BCM	Antenna F	ins IMMO	Hi/Lo.			_
Орогия													=
D	Deviations:	None											
		Data proc	sented are the	o worst ca	se modes as	e datarmir	ed during pre	complian	co tostina	Moret case	from Field	Strongth	_
C	Comments:		mental: (Perp				ied ddillig pie	Compilan	ce testing.	WOISI Case	IIOIII I IEIU	Ollerigui	
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not Spac	cifications						Test Metho	\ d					
CC 15.20							ANSI C63.1						-
JO 13.20	09.2022						ANOI 003.1	10.2013					
													=
Run #	24	Test D	istance (m)	3	Antenna	Height(s)	1(m)		Results	Pa	ass	_
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50								$\downarrow \downarrow \downarrow$					
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M/Nugb													
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50													
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U.C	001			0.01	U	NA! !-	_	0.100				1.000	
						MHz	4			■ PK	◆ AV	QP	
							Polarity/						
						External	Transducer		Distance			Compared to	
Freq	Amplitude	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	Attenuation (dB)	Туре	Detector	Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Spec. (dB)	
		(UD/III)			(IIIeleis)	(UD)				(UDUV/III)	(UDUV/III)	(UD)	
(MHz)	(dBuV)		(motoro)	(9)	, , , ,	(,			()	(, , , ,	(, , , ,	` ′	Comments
	32.5 43.9	10.3 10.2	1.0	150.0 150.0	3.0 3.0	0.0	Perp to EUT Perp to EUT	AV PK	-80.0 -80.0	-37.2 -25.9	19.8 39.6	-57.0 -65.5	Comments Tx, 125 kHz, EUT On Sid Tx, 125 kHz, EUT On Sid

SPURIOUS RADIATED EMISSIONS (LESS THAN 30 MHZ) - FULL BRIDGE, IMMOBILIZER



										EmiR5 2021.09.09.0	P	PSA-ESCI 2021.12.10.0)
Wo	ork Order:	ENTI			Date:		-01-03			-5			
	Project:	No		I ei	nperature:		7 °C			5			
0:-	Job Site:		10	Danama	Humidity: etric Pres.:		% RH		Tastad bu	Nalas Da I	D \/:-		
Seriai	I Number:	See Conf	riguration	Barome	etric Pres.:	1026	mbar		Tested by:	Noian De i	Ramos, vii	ncent Liwag	<u>L</u>
Confi	iguration:	B2NA0											=
			ternational /	America Ir	200								_
		None	terriational /	America, ii	10.								=
	UT Power:												_
			na 125 kHz.	Full Bridg	e. Test Mod	e: Immobili	zer on BCM	Antenna F	Pins IMMO I	Hi/Lo.			-
Operati	ing Mode:		.9										
De	eviations:	None											-
Co	omments:						ed during pr to EUT, EU						-
Test Speci	ifications						Test Metho	od					
FCC 15.20							ANSI C63.						=
Run#	25	Test Dis	stance (m)	3	Antenna	Height(s)	1	1(m)		Results	Р	'ass	-
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60													
40				-									
Ε					$\overline{}$								
≥ 20					7								
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-20													
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0.	.1			1.0				10.0				100.0	
						MHz				■ PK	◆ AV	• QP	
				_			Polarity/						
Eron	Amplitude	Footor	Antonno Hoi-t-t	Azimuth	Test Distance	External	Transducer	Detecto	Distance	Adjusted	Spec. Limit	Compared to	
Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	Attenuation (dB)	Туре	Detector	Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Spec. (dB)	
(,	,	, ,	()	,	(,			· · /	,	,		
0.626	30.7	10.6	1.0	150.0	3.0	0.0	Perp to EUT	QP	-40.0	1.3	31.7	-30.4	Comments Tx, 125 kHz, EUT On Side

SPURIOUS RADIATED EMISSIONS (GREATER THAN 30 MHZ) - HALF BRIDGE, SINGLE CH



PSA-ESCI 2022.1.12.0

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. Test Mode: Single Channel PEPS on BCM Antenna PINS 01&01R

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz	Stop Frequency	2000 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
Amplifier - Pre-Amplifier	Cernex	CBL01084020-xx	PAX	2021-10-12	2022-10-12
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	2021-10-12	2022-10-12
Antenna - Double Ridge	EMCO	3115	AHB	2020-04-08	2022-04-08
Amplifier - Pre-Amplifier	Miteq	AM-1402	AOZ	2021-10-12	2022-10-12
Cable	Northwest EMC	10kHz-1GHz RE Cables	OCH	2021-10-12	2022-10-12
Antenna - Biconilog	Teseq	CBL 6141A	AYE	2020-05-06	2022-05-06
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2022-01-12	2023-01-12

TEST DESCRIPTION

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

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 and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

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

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

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

SPURIOUS RADIATED EMISSIONS (GREATER THAN 30 MHZ) - HALF BRIDGE, SINGLE CH



Project: None Temperature: 18.4 °C 3.04 % RH	Wo	rk Order:		10013	T	Date:		02-04	5-		EmiR5 2021.09.09.0		PSA-ESCI 2022.1.12.0
Serial Number See Configuration Barometric Pres. 1031 mbar Tested by: Nolan De Ramos, Vincent Liwa;					Ten						3		
Configuration 2 Customer: Customer	Carial				Parama					Tooted by	Nolon Do E	Pamaa \/ir	oont Livrog
Countermal Cou	Serial			iliguration	Daionie	tille Fies	1031	IIIDai		rested by.	Noian De I	varrios, vii	icent Liway
Customer: DENSO International America, Inc. Attendess: None EUT Power: 12 VDC Operating Mode: Transmitting 125 kHz, Half Bridge. Test Mode: Single Channel PEPS on BCM Antenna PINS 01&01R Deviations: Comments: Test Specifications FCC 15.209.2022 ANSI C63.10.2013 Test Method ANSI C63.10.2013 ANSI C63.10.2013 Test Method ANSI C63.10.2013 Test Method Fig. 10 Ansi C63.10.2013 Test Method ANSI C63.10.2013 Test Method Fig. 10 Ans	Confi												
### Attendees: None				nternational	America In	ıc							
Command Person													
Deviations None Data presented are the worst case modes as determined during pre compliance testing.													
Data presented are the worst case modes as determined during pre compliance testing. Test Specifications Test Method			Transmitti	ng 125 kHz,	Half Bridge	e. Test Mod	le: Single C	hannel PE	PS on BCM	1 Antenna P	INS 01&01F	3	
Test Specifications Test Method	De	eviations:	None										
Run # 47 Test Distance (m) 3 Antenna Height(s) 1 to 4(m) Results Pass	Co	omments:		ented are th	e worst cas	se modes as	s determine	ed during p	re compliar	nce testing.			
Run # 47 Test Distance (m) 3 Antenna Height(s) 1 to 4(m) Results Pass	Tact Spaci	fications						Toet Moth	od				
Run # 47 Test Distance (m) 3 Antenna Height(s) 1 to 4(m) Results Pass													
Test (dBuv) Test Distance (dBuv) Test Distance (dBuv) Test Distance (meters) Test Distance (dBuv) Test D	Run#	47	Test Di	stance (m)	3	Antenna	Height(s)		1 to 4(m)		Results	Pi	ass
Test (dBuv) Test Distance (dBuv) Test Distance (dBuv) Test Distance (meters) Test Distance (dBuv) Test D													
Test (dBuv) Test Distance (dBuv) Test Distance (dBuv) Test Distance (meters) Test Distance (dBuv) Test D													
Freq (MHz)	80 +												
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Freq Amplitude (dBuV) (dB/m) Axtenna Height Azimuth (degrees) Transducer Type Detector Adjustment (dB)	″ T												
Freq Amplitude (dBuV) (dB/m) Axtenna Height Azimuth (degrees) Transducer Type Detector Adjustment (dB)													
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30	<u>, </u>												
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Test Distance (MHz)	8												
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Test Distance (MHz) Transducer (MHz) Transdu													
Freq (MHz)				100	-		1000	,		10000			100000
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938.160 14.6 18.8 2.0 60.0 3.0 0.0 Horz QP 0.0 33.4 46.0 -12.6 30.605 14.1 12.0 1.0 166.0 3.0 0.0 Horz QP 0.0 26.1 40.0 -13.9 100.831 24.6 0.2 1.0 203.0 3.0 0.0 Vert QP 0.0 24.8 43.5 -18.7 215.013 14.5 2.5 2.0 328.0 3.0 0.0 Horz QP 0.0 17.0 43.5 -26.5							Attenuation	Transducer	Detector	Adjustment			Spec.
938.160 14.6 18.8 2.0 60.0 3.0 0.0 Horz QP 0.0 33.4 46.0 -12.6 30.605 14.1 12.0 1.0 166.0 3.0 0.0 Horz QP 0.0 26.1 40.0 -13.9 100.831 24.6 0.2 1.0 203.0 3.0 0.0 Vert QP 0.0 24.8 43.5 -18.7 215.013 14.5 2.5 2.0 328.0 3.0 0.0 Horz QP 0.0 17.0 43.5 -26.5	37.510	22.3	9.6	1.0	78.0	3.0	0.0	Vert	QP	0.0	31.9	40.0	-8.1
100.831 24.6 0.2 1.0 203.0 3.0 0.0 Vert QP 0.0 24.8 43.5 -18.7 215.013 14.5 2.5 2.0 328.0 3.0 0.0 Horz QP 0.0 17.0 43.5 -26.5	938.160	14.6	18.8	2.0	60.0	3.0	0.0	Horz	QP	0.0	33.4	46.0	-12.6
215.013 14.5 2.5 2.0 328.0 3.0 0.0 Horz QP 0.0 17.0 43.5 -26.5													
100.001 17.2 2.0 1.0 54.0 5.0 0.0 VEIL QF 0.0 10.7 45.5 -20.8													
	130.001	14.2	۷.5	6.1	J4.U	3.0	0.0	veit	QГ	0.0	10.7	43.3	-20.0

SPURIOUS RADIATED EMISSIONS (GREATER THAN 30 MHZ) - HALF BRIDGE, DUAL CH



PSA-ESCI 2022.1.12.0

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. Test Mode: Dual Channel PEPS on BCM Antenna Pins 01&01R and 02&02R

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 3

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz	Stop Frequency	2000 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
Amplifier - Pre-Amplifier	Cernex	CBL01084020-xx	PAX	2021-10-12	2022-10-12
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	2021-10-12	2022-10-12
Antenna - Double Ridge	EMCO	3115	AHB	2020-04-08	2022-04-08
Amplifier - Pre-Amplifier	Miteq	AM-1402	AOZ	2021-10-12	2022-10-12
Cable	Northwest EMC	10kHz-1GHz RE Cables	OCH	2021-10-12	2022-10-12
Antenna - Biconilog	Teseq	CBL 6141A	AYE	2020-05-06	2022-05-06
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2022-01-12	2023-01-12

TEST DESCRIPTION

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

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 and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

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

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

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

SPURIOUS RADIATED EMISSIONS (GREATER THAN 30 MHZ) - HALF BRIDGE, DUAL CH



Wo	rk Order:	FNT	10013		Date:	2022-	02-02	III),		EmiR5 2021.09.09.0	P	PSA-ESCI 2022.1.12.0
- 110	Project:		one	Ter	nperature:		4 °C	3	5/			
	Job Site:		C10		Humidity:		% RH		1	>		
Serial	Number:	See Cor	nfiguration	Barome	etric Pres.:	1018	mbar		Tested by:	Nolan De F	Ramos, Vin	cent Liwag
		B2NA0										
	guration:											
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Operati	ng Mode:		ng 125 kHz,	нап впад	e. Test Mod	ie: Duai Ch	annei PEP	S ON BCIVI A	Antenna Pir	IS UT&UTR a	ina 02&02	K
De	eviations:	None										
Co	omments:	Data pres	ented are the	e worst cas	se modes a	s determine	ed during p	re complian	ice testing.			
Test Speci	fications						Test Meth	od				
FCC 15.209							ANSI C63					
Run#	33	Test Di	stance (m)	3	Antenna	Height(s)		1 to 4(m)		Results	Pa	ass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	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)
40.757	21.4	8.1	1.0	243.0	3.0	0.0	Vert	QP	0.0	29.5	40.0	-10.5
952.015	14.9	19.5	3.87	58.0	3.0	0.0	Vert	QP	0.0	34.4	46.0	-10.5
30.128	14.2	12.2	3.82	116.0	3.0	0.0	Vert	QP	0.0	26.4	40.0	-13.6
753.282	15.1	15.4	1.0	29.0	3.0	0.0	Horz	QP	0.0	30.5	46.0	-15.5
56.642 574.425	22.9 14.7	0.8 12.3	1.0 1.81	197.0 360.0	3.0 3.0	0.0 0.0	Vert Horz	QP QP	0.0 0.0	23.7 27.0	40.0 46.0	-16.3 -19.0
314.423	14.7	12.3	1.01	300.0	3.0	0.0	11012	QΓ	0.0	21.0	40.0	-18.0

SPURIOUS RADIATED EMISSIONS (GREATER THAN 30 MHZ) - ROUND ROBIN



PSA-ESCI 2022.1.12.0

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. Test Mode: Round Robin

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 10

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz	Stop Frequency	2000 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
Amplifier - Pre-Amplifier	Cernex	CBL01084020-xx	PAX	2021-10-12	2022-10-12
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	2021-10-12	2022-10-12
Antenna - Double Ridge	EMCO	3115	AHB	2020-04-08	2022-04-08
Amplifier - Pre-Amplifier	Miteq	AM-1402	AOZ	2021-10-12	2022-10-12
Cable	Northwest EMC	10kHz-1GHz RE Cables	OCH	2021-10-12	2022-10-12
Antenna - Biconilog	Teseq	CBL 6141A	AYE	2020-05-06	2022-05-06
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2022-01-12	2023-01-12

TEST DESCRIPTION

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

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 and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

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

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

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

SPURIOUS RADIATED EMISSIONS (GREATER THAN 30 MHZ) - ROUND ROBIN



PSA-ESCI 2022.1.12.0

EmiR5 2021.09.09.0

Wo	ork Order: Project:		TI0013 one	Ton	Date:	2022-	02-02 1 °C			EmiR5 2021.09.09.0		PSA-ESCI 2022.1.12.0
	Job Site:		C10	Ten	Humidity:		% RH			5		
Serial	Number:		nfiguration	Barome	tric Pres.:		mbar		Tested hy:	Nolan De F	Ramos Vir	cent Liwag
Oction		B2NA0	inguration	Daronic		1010	IIIDUI		rested by.	INGIAN DC I	tarrios, vii	icent Liwag
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	JT Power:											
	ng Mode:		ing 125 kHz,	Half Bridge	e. Test Mod	le: Round F	Robin					
De	eviations:	None										
Co	omments:	antenna p	ented are th in will transr etermine wo	nit if an ant	enna is con	nected. He						
Test Speci	fications						Test Meth	od				
FCC 15.20		l					ANSI C63.	10.2013				
Run#	37	Test Di	stance (m)	3	Antenna	Height(s)		1 to 4(m)		Results	Pa	ass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	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)
41.155	24.4	7.9	3.8	191.0	3.0	0.0	Horz	QP	0.0	32.3	40.0	-7.7
957.312	14.6	19.8	2.09	277.0	3.0	0.0	Horz	QP QP	0.0	34.4	46.0	-7.7 -11.6
32.155	14.2	11.5	1.0	209.0	3.0	0.0	Vert	QP	0.0	25.7	40.0	-14.3
292.396	25.1	3.7	1.0	200.0	3.0	0.0	Horz	QP	0.0	28.8	46.0	-17.2
104.023	25.4	0.7	1.0	115.0	3.0	0.0	Vert	QP	0.0	26.1	43.5	-17.4
394.542	17.1	7.5	1.5	109.0	3.0	0.0	Horz	QP	0.0	24.6	46.0	-21.4

SPURIOUS RADIATED EMISSIONS (GREATER THAN 30 MHZ) - FULL BRIDGE, SINGLE CH



PSA-ESCI 2022.1.12.0

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. Test Mode: Single Channel PEPS on BCM Antenna PINS 05&06

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 6

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz	Stop Frequency	2000 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
Amplifier - Pre-Amplifier	Cernex	CBL01084020-xx	PAX	2021-10-12	2022-10-12
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	2021-10-12	2022-10-12
Antenna - Double Ridge	EMCO	3115	AHB	2020-04-08	2022-04-08
Amplifier - Pre-Amplifier	Miteq	AM-1402	AOZ	2021-10-12	2022-10-12
Cable	Northwest EMC	10kHz-1GHz RE Cables	OCH	2021-10-12	2022-10-12
Antenna - Biconilog	Teseq	CBL 6141A	AYE	2020-05-06	2022-05-06
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2022-01-12	2023-01-12

TEST DESCRIPTION

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

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 and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

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

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

SPURIOUS RADIATED EMISSIONS (GREATER THAN 30 MHZ) - FULL BRIDGE, SINGLE CH



\ \	Work Order: Project:	ENTI0013 None	Te	Date:		-02-04 4 °C			EmiR5 2021.09.09.0	F	PSA-ESCI 2022.1.12.0
	Job Site:			Humidity:		% RH			>		
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		D-4	41					4			
		Data presented are	the worst ca	ise modes a	s determine	ea auring p	re compilar	ice testing.			
	Comments:										
Test Spe	ecifications					Test Meth	od				
	209:2022	l				ANSI C63					
Run	# 48	Test Distance (r	n) 3	Antenna	ı Height(s)		1 to 4(m)		Results	P:	ass
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Free	Amplitude	Factor Antenna Hei	ght Azimuth	Test Distance	External Attenuation	Polarity/ Transducer	Det :	Distance Adjustment	Adjusted	Spec. Limit	Compared to Spec.
Freq (MHz)	(dBuV)	(dB/m) (meters)	(degrees)	(meters)	(dB)	Туре	Detector	(dB)	(dBuV/m)	(dBuV/m)	Spec. (dB)
(141112)	(3501)	(((=0g.003)	(5,0.0)	(30)			(35)	(===+,,	(====,,	(35)
37.758	19.8	9.5 1.0	29.0	3.0	0.0	Vert	QP	0.0	29.3	40.0	-10.7
958.981		19.9 2.8	2.0	3.0	0.0	Horz	QP	0.0	34.6	46.0	-11.4
30.809	14.1	12.0 1.5	347.0	3.0	0.0	Horz	QP	0.0	26.1	40.0	-13.9
686.765		13.2 1.5	221.0	3.0	0.0	Vert	QP	0.0	27.7	46.0	-18.3
100.794		0.2 1.5 2.5 1.5	132.0 360.0	3.0 3.0	0.0 0.0	Vert	QP QP	0.0 0.0	24.7	43.5 43.5	-18.8 -26.9
214.541						Vert	(10	0.0	16.6		

SPURIOUS RADIATED EMISSIONS (GREATER THAN 30 MHZ) - FULL BRIDGE, SINGLE CH PEPS IMMO



PSA-ESCI 2022.1.12.0

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. Test Mode: Single Channel PEPS on BCM Antenna IMMO Hi/Lo

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 4

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz	Stop Frequency	2000 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
Amplifier - Pre-Amplifier	Cernex	CBL01084020-xx	PAX	2021-10-12	2022-10-12
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	2021-10-12	2022-10-12
Antenna - Double Ridge	EMCO	3115	AHB	2020-04-08	2022-04-08
Amplifier - Pre-Amplifier	Miteq	AM-1402	AOZ	2021-10-12	2022-10-12
Cable	Northwest EMC	10kHz-1GHz RE Cables	OCH	2021-10-12	2022-10-12
Antenna - Biconilog	Teseq	CBL 6141A	AYE	2020-05-06	2022-05-06
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2022-01-12	2023-01-12

TEST DESCRIPTION

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

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 and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

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

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

SPURIOUS RADIATED EMISSIONS (GREATER THAN 30 MHZ) - FULL BRIDGE, SINGLE CH PEPS IMMO



\Ma	rk Order:	ENTIC	2012		Date:	2022	02-04			EmiR5 2021.09.09.0	F	PSA-ESCI 2022.1.12.0	
VVC	Project:	Nor		Ter	nperature:		4 °C	3	-	5			
	Job Site:	OC	-		Humidity:		% RH			>			
Serial	Number:			Barome	etric Pres.:		mbar		Tested by:	Nolan De F	Ramos, Vir	cent Liwag	
	EUT:	B2NA0											
Confi	iguration:	4											
		DENSO Inte	ernational A	America, Ir	nc.								
	ttendees:												
EU	JT Power:												
Operati	ing Mode:		ansmitting 125 kHz, Full Bridge. Test Mode: Single Channel PEPS on BCM Antenna IMMO Hi/Lo										
De	eviations:	None	ne ta presented are the worst case modes as determined during pre compliance testing.										
Co	omments:	Data preser	nted are the	e worst ca	se modes a	s determine	ed during pr	e complian	ce testing.				
Test Speci	fications						Test Meth	od					
FCC 15.20							ANSI C63.						
D #1	40	Took Dies	tono ((m) l		Automore	Haimba(a)		4 + - 4()		Danita l	D		
Run#	49	Test Dist	tance (m)	3	Antenna	Height(s)		1 to 4(m)		Results	Pa	ass	
90 ⊤													
80													
											-		
70													
60													
_											-		
₹ 50 +												+++	
· 글													
W//ngp												Ш	
. · ·													
30 +						•						++1	
		•											
20													
				•									
40													
10 +													
0 +									Щ			Щ	
10			100			1000			10000			100000	
						MHz				■ PK	◆ AV	QP	
Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	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)	
44.130	24.6	6.4	1.0	95.0	3.0	0.0	Vert	QP	0.0	31.0	40.0	-9.0	
959.656	14.7	19.9	2.8	300.0	3.0	0.0	Horz	QP	0.0	34.6	46.0	-11.4	
30.904	13.9	12.0	1.0	36.0	3.0	0.0	Vert	QP	0.0	25.9	40.0	-14.1	
732.480	14.8	14.8	2.8	266.0	3.0	0.0	Vert	QP	0.0	29.6	46.0	-16.4	
100.813 140.048	24.4 14.0	0.2 2.5	1.11 3.8	16.0 286.0	3.0 3.0	0.0 0.0	Vert Vert	QP QP	0.0 0.0	24.6 16.5	43.5 43.5	-18.9 -27.0	
1-0.0-0	1-7.0	2.0	0.0	200.0	0.0	0.0	VOIL	≪ 1	0.0	10.0	-10.0	27.0	

SPURIOUS RADIATED EMISSIONS (GREATER THAN 30 MHZ) - FULL BRIDGE, DUAL CH



PSA-ESCI 2022.1.12.0

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. Test Mode: Dual Channel PEPS on BCM Antenna 03&04 and 05&06

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 7

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz	Stop Frequency	2000 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
Amplifier - Pre-Amplifier	Cernex	CBL01084020-xx	PAX	2021-10-12	2022-10-12
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	2021-10-12	2022-10-12
Antenna - Double Ridge	EMCO	3115	AHB	2020-04-08	2022-04-08
Amplifier - Pre-Amplifier	Miteq	AM-1402	AOZ	2021-10-12	2022-10-12
Cable	Northwest EMC	10kHz-1GHz RE Cables	OCH	2021-10-12	2022-10-12
Antenna - Biconilog	Teseq	CBL 6141A	AYE	2020-05-06	2022-05-06
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2022-01-12	2023-01-12

TEST DESCRIPTION

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

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 and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

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

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

SPURIOUS RADIATED EMISSIONS (GREATER THAN 30 MHZ) - FULL BRIDGE, DUAL CH



	Project: Job Site: I Number:	No OC	0013 one 010 figuration		Date: nperature: Humidity: etric Pres.:	18.4°	-02-04 4 °C % RH mbar			Nolan De F		ncent Liwag
C A	iguration: customer: ttendees:	7 DENSO In None	ternational i	America, Ir	IC.							
	JT Power: ing Mode:	Troposittis	ng 125 kHz,	Full Bridge	e. Test Mod	e: Dual Cha	annel PEPS	on BCM A	Antenna 038	k04 and 058	k06	
De	eviations:	None	ented are the	e worst ca	se modes a	s determine	ad during n	re compliar	oce testing			
Comments: Data presented are the worst case modes as determined during pre compliance testing.												
Test Speci	fications						Test Meth	od				
FCC 15.20	50	Test Dis	stance (m)	3	Antenna	· Height(s)	ANSI C63.	1 to 4(m)		Results	Pi	ass
						J (-)						
80												
70											_	
60												
ے ⁵⁰												
w//Ngp												
30					•							
20												
10												
0 +												Щ
10			100			1000 MHz			10000	■ PK	◆ AV	100000 • QP
Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	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)
35.517 44.014 955.297 381.639 30.671 796.413	20.3 23.2 14.8 25.6 14.1 15.0	10.5 6.5 19.7 6.7 11.9 15.6	2.0 1.0 3.95 2.51 3.81 1.5	50.0 97.0 297.0 343.0 91.0 20.0	3.0 3.0 3.0 3.0 3.0 3.0	0.0 0.0 0.0 0.0 0.0 0.0	Vert Vert Vert Horz Horz Horz	QP QP QP QP QP QP	0.0 0.0 0.0 0.0 0.0 0.0	30.8 29.7 34.5 32.3 26.0 30.6	40.0 40.0 46.0 46.0 40.0 46.0	-9.2 -10.3 -11.5 -13.7 -14.0 -15.4

SPURIOUS RADIATED EMISSIONS (GREATER THAN 30 MHZ) - FULL BRIDGE, DUAL CH PEPS IMMO



PSA-ESCI 2022.1.12.0

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. Test Mode: Dual Channel PEPS on BCM Antenna Pins IMMO Hi/Lo and 03&04

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 8

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz	Stop Frequency	2000 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
Amplifier - Pre-Amplifier	Cernex	CBL01084020-xx	PAX	2021-10-12	2022-10-12
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	2021-10-12	2022-10-12
Antenna - Double Ridge	EMCO	3115	AHB	2020-04-08	2022-04-08
Amplifier - Pre-Amplifier	Miteq	AM-1402	AOZ	2021-10-12	2022-10-12
Cable	Northwest EMC	10kHz-1GHz RE Cables	OCH	2021-10-12	2022-10-12
Antenna - Biconilog	Teseq	CBL 6141A	AYE	2020-05-06	2022-05-06
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2022-01-12	2023-01-12

TEST DESCRIPTION

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

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 and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

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

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

SPURIOUS RADIATED EMISSIONS (GREATER THAN 30 MHZ) - FULL BRIDGE, DUAL CH PEPS IMMO



Wo	rk Order:	FNT	10013		Date:	2022-	.02-02	ш,		EmiR5 2021.09.09.0	F	SA-ESCI 2022.1.12.0
***	Project:		one	Ter	nperature:		4 °C	3	-	5		
	Job Site:		C10		Humidity:		% RH			>		
Serial	Number:		nfiguration	Barome	tric Pres.:		mbar		Tested by:	Nolan De F	Ramos, Vir	cent Liwag
	EUT:	B2NA0				•		•				
	iguration:											
			ternational /	America, Ir	IC.							
	ttendees:											
EU	JT Power:		405111	E II D 2 L	T N. A	D 101	I DED	DOM 4		. 18 48 40 1 11 //		10.4
Operati	ng Mode:		ng 125 kHz,	Full Briage	e. Test Mod	e: Duai Cha	annei PEP	S ON BCIM F	intenna Pin	S IMMO HI/L	_o and 038	kU4
De	eviations:	None	ta presented are the worst case modes as determined during pre compliance testing.									
Co	omments:	Data prese	ented are th	e worst cas	se modes a	s determine	ed during p	re complian	ice testing.			
Test Speci	fications						Test Meth	od				
FCC 15.20							ANSI C63					
Run#	34	Test Di	stance (m)	3	Antenna	Height(s)		1 to 4(m)		Results	Pa	ass
80 +												
											_	
70												
60												
50												
∊ ⁵⁰ ⊤												
⋝												
w//Ngp												
ਰ ∣												
30 +						7						
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20												
10												
0												
10	·		100			1000	-		10000	-		100000
10			100			MHz			. 5 5 6 6			. 50000
						ıVI∏Z				■ PK	◆ AV	QP
Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	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)
43.515	31.9	6.7	1.0	122.0	3.0	0.0	Vert	QP	0.0	38.6	40.0	-1.4
43.515	29.2	6.7	1.0	228.0	3.0	0.0	Vert	QP QP	0.0	35.9	40.0	-1.4 -4.1
50.987	26.6	3.1	1.0	62.0	3.0	0.0	Vert	QP	0.0	29.7	40.0	-10.3
958.944	14.6	19.9	1.5	241.0	3.0	0.0	Vert	QP	0.0	34.5	46.0	-11.5
30.246	13.9	12.1	1.0	138.0	3.0	0.0	Horz	QP OB	0.0	26.0	40.0	-14.0
784.322	14.9	15.4	3.8	8.0	3.0	0.0	Horz	QP	0.0	30.3	46.0	-15.7

SPURIOUS RADIATED EMISSIONS (GREATER THAN 30 MHZ) - FULL BRIDGE, APPROACH



PSA-ESCI 2022.1.12.0

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. Test Mode: Approach on BCM Antenna Pins 01&02, 03&04, and 05&06

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 5

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz	Stop Frequency	2000 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
Amplifier - Pre-Amplifier	Cernex	CBL01084020-xx	PAX	2021-10-12	2022-10-12
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	2021-10-12	2022-10-12
Antenna - Double Ridge	EMCO	3115	AHB	2020-04-08	2022-04-08
Amplifier - Pre-Amplifier	Miteq	AM-1402	AOZ	2021-10-12	2022-10-12
Cable	Northwest EMC	10kHz-1GHz RE Cables	OCH	2021-10-12	2022-10-12
Antenna - Biconilog	Teseq	CBL 6141A	AYE	2020-05-06	2022-05-06
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2022-01-12	2023-01-12

TEST DESCRIPTION

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

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 and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

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

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

SPURIOUS RADIATED EMISSIONS (GREATER THAN 30 MHZ) - FULL BRIDGE, APPROACH



Social Number: See Configuration Barometric Press. 1018 mbar Tested by: Nolan De Ramos, Vincent Liwag EUT; B2NA0 Configuration 5 Customer: Det No International America, Inc.	Wo	rk Order: Project:		10013 one	Ter	Date:	18.4	-02-02 4 °C		56	EmiR5 2021.09.09.0		PSA-ESCI 2022.1.12.0
Configuration: S		Job Site:				Humidity:			_				
Configuration: 5 Customer: DENSO International America, Inc.	Serial			nfiguration	Barome	etric Pres.:	1018	mbar		Tested by:	Nolan De F	Ramos, Vir	ncent Liwag
Customer: DeNSO International America, Inc.													
## Attendees: None EUT Power: 12 VDC Operating Mode: Transmitting 125 kHz, Full Bridge. Test Mode: Approach on BCM Antenna Pins 018/02, 038/04, and 058/06 Deviations:													
Comments: Test Distance (m) 3 Antenna Height(s) 1 to 4(m) Results Pass				iternational i	America, ir	ic.							
Transmitting 125 kHz, Full Bridge. Test Mode: Approach on BCM Antenna Pins 01&02, 03&04, and 05&06													
Deviations: Data presented are the worst case modes as determined during pre compliance testing.				na 10E kUz	Full Dridge	Toot Mod	o: Appropa	h on DCM	Antonno Di	00 01 9 02 0	12804 and ()E 9 0 6	
Data presented are the worst case modes as determined during pre compliance testing. Test Method				11g 125 KHZ,	T ull Bridge	e. Test Mou	е. Арргоас	II OII BCIVI I	Antenna Fi	115 0 1002, 0	3004, and t	J3&00	
Test Specifications Test Method ANSI C63.10:2013	De	eviations:											
Run # 35 Test Distance (m) 3 Antenna Height(s) 1 to 4(m) Results Pass	Co	omments:	,										
Run # 35 Test Distance (m) 3 Antenna Height(s) 1 to 4(m) Results Pass	Test Speci	fications						Test Meth	od				
No. No.													
No. No.	Run#	35	Test Di	stance (m)	3	Antenna	Height(s)		1 to 4(m)		Results	P	ass
Freq (MHz)													
Freq (MHz)													
Freq (MHz)	80 +												
Freq (MHz)													
Freq (MHz)	70												
Spec. Limit (dBlwr) Transducer (dBlwr) Transd	,,												
Spec. Limit (dBlwr) Transducer (dBlwr) Transd													
Spec. Limit (dBlwr) Transducer (dBlwr) Transd	60												
Test Distance (MHz)													
Test Distance (MHz)												-	
30 20 100 1000 10000 100000 100000 100000 100000 MHz Freq (MHz) (dB/m) (dB/m) Antenna Height (degrees) (degrees) (degrees) (dB) (dB) (dB) (dB) (dB) (dB) (dB) (dB	- 50 +												
30 20 100 1000 10000 100000 100000 100000 100000 MHz Freq (MHz) (dB/m) (dB/m) Antenna Height (degrees) (degrees) (degrees) (dB) (dB) (dB) (dB) (dB) (dB) (dB) (dB	₹												
30 20 100 1000 10000 100000 100000 100000 100000 MHz Freq (MHz) (dB/m) (dB/m) Antenna Height (degrees) (degrees) (degrees) (dB) (dB) (dB) (dB) (dB) (dB) (dB) (dB	3 40												
30 20 100 1000 10000 100000 100000 100000 100000 MHz Freq (MHz) (dB/m) (dB/m) Antenna Height (degrees) (degrees) (degrees) (dB) (dB) (dB) (dB) (dB) (dB) (dB) (dB	9 40 T												
20 10 10 100 1000 10000 10000 10000 1000000	· ·												
20 10 10 100 1000 10000 10000 10000 1000000	30												
10 100 1000 10000 10000 10000 100000 MHz Freq (MHz)													
10 100 1000 10000 10000 10000 100000 MHz Freq (MHz)													
0 10 100 1000 10000 10000 10000 100000 MHz Freq (MHz)	20 +												
0 10 100 1000 10000 10000 10000 100000 MHz Freq (MHz)				7									
0 10 100 1000 10000 10000 10000 100000 MHz Freq (MHz)	40												
Test Distance (MHz) MHz Test Distance (MHz) Meters Mete	10 T												
Test Distance (MHz) MHz Test Distance (MHz) Meters Mete													
Test Distance (MHz) MHz Test Distance (MHz) Meters Mete	0 \												Щ
Freq (MHz)				100			1000			10000			100000
Freq (MHz)							MHz						
Freq (MHz) Amplitude (dBuV) Factor (dB/m) Antenna Height (meters) Azimuth (degrees) Test Distance (meters) External Attenuation (dB) Type Detector Detector Adjustment (dB) Adjusted (dBuV/m) Spec. Limit (dBuV/m) Compared to Spec. (dB) 947.150 14.6 19.2 1.0 167.0 3.0 0.0 Vert QP 0.0 33.8 46.0 -12.2 30.925 13.9 11.9 2.8 66.0 3.0 0.0 Horz QP 0.0 25.8 40.0 -14.2 100.692 25.9 0.2 1.0 215.0 3.0 0.0 Vert QP 0.0 26.1 43.5 -17.4 54.500 20.8 1.4 1.0 180.0 3.0 0.0 Vert QP 0.0 22.2 40.0 -17.8 675.187 14.5 13.2 2.82 221.0 3.0 0.0 Vert QP 0.0 27.7 46.0 -18.3											■ PK	◆ AV	QP
30.925 13.9 11.9 2.8 66.0 3.0 0.0 Horz QP 0.0 25.8 40.0 -14.2 100.692 25.9 0.2 1.0 215.0 3.0 0.0 Vert QP 0.0 26.1 43.5 -17.4 54.500 20.8 1.4 1.0 180.0 3.0 0.0 Vert QP 0.0 22.2 40.0 -17.8 675.187 14.5 13.2 2.82 221.0 3.0 0.0 Vert QP 0.0 27.7 46.0 -18.3							Attenuation	Transducer	Detector	Adjustment			Spec.
30.925 13.9 11.9 2.8 66.0 3.0 0.0 Horz QP 0.0 25.8 40.0 -14.2 100.692 25.9 0.2 1.0 215.0 3.0 0.0 Vert QP 0.0 26.1 43.5 -17.4 54.500 20.8 1.4 1.0 180.0 3.0 0.0 Vert QP 0.0 22.2 40.0 -17.8 675.187 14.5 13.2 2.82 221.0 3.0 0.0 Vert QP 0.0 27.7 46.0 -18.3	947.150	14.6	19.2	1.0	167.0	3.0	0.0	Vert	QP	0.0	33.8	46.0	-12.2
100.692 25.9 0.2 1.0 215.0 3.0 0.0 Vert QP 0.0 26.1 43.5 -17.4 54.500 20.8 1.4 1.0 180.0 3.0 0.0 Vert QP 0.0 22.2 40.0 -17.8 675.187 14.5 13.2 2.82 221.0 3.0 0.0 Vert QP 0.0 27.7 46.0 -18.3													
675.187 14.5 13.2 2.82 221.0 3.0 0.0 Vert QP 0.0 27.7 46.0 -18.3	100.692	25.9			215.0				QP		26.1		-17.4
		20.8	1.4	1.0	180.0	3.0	0.0					40.0	-17.8
วร.บาง 17.8 -0.1 1.0 194.0 3.0 0.0 Vert QP 0.0 17.7 40.0 -22.3													
	59.015	17.8	-0.1	1.0	194.0	3.0	0.0	vert	QP	0.0	1/.7	40.0	-22.3

SPURIOUS RADIATED EMISSIONS (GREATER THAN 30 MHZ) - FULL BRIDGE, IMMOBILIZER



PSA-ESCI 2022.1.12.0

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. Test Mode: Immobilizer on BCM Antenna Pins IMMO Hi/Lo

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0013 - 9

FREQUENCY RANGE INVESTIGATED

	Start Frequency	30 MHz	Stop Frequency	2000 MHz
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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
Amplifier - Pre-Amplifier	Cernex	CBL01084020-xx	PAX	2021-10-12	2022-10-12
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	2021-10-12	2022-10-12
Antenna - Double Ridge	EMCO	3115	AHB	2020-04-08	2022-04-08
Amplifier - Pre-Amplifier	Miteq	AM-1402	AOZ	2021-10-12	2022-10-12
Cable	Northwest EMC	10kHz-1GHz RE Cables	OCH	2021-10-12	2022-10-12
Antenna - Biconilog	Teseq	CBL 6141A	AYE	2020-05-06	2022-05-06
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2022-01-12	2023-01-12

TEST DESCRIPTION

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

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 and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

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

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

SPURIOUS RADIATED EMISSIONS (GREATER THAN 30 MHZ) - FULL BRIDGE, IMMOBILIZER



Project: None Temperature: 18.4 °C OC10 Humidity: 34.4% RH Serial Number: See Configuration Barometric Press: 1018 mbar Tested by: Nolan De Ramos, Vincent Liwa EUT: 82NAO Configuration: 9 Customer DENSO International America, Inc. Attendess: None EUT Power: 12 VDC Operating Mode: Transmitting 125 kHz, Full Bridge. Test Mode: Immobilizer on BCM Antenna Pins IMMO Hi/Lo Deviations: None Comments None Comments Test Method ANSI C63.10:2013 Run # 36 Test Distance (m) 3 Antenna Height(s) 1 to 4(m) Results Pass 80 70 MHz Provertiy PK • AV • QP	Wo	rk Order:	ENIT.	10012		Date:	2022	02.02			EmiR5 2021.09.09.0	P	SA-ESCI 2022.1.12.
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Customer Density None EUT Power 12 VDC										<u>-</u>			`
### Attendees: None	Confi	guration:	9										
Comments	С	ustomer:	DENSO In	nternational a	America, Ir	nc.							
Transmitting 125 kHz, Full Bridge. Test Mode: Immobilizer on BCM Antenna Pins IMMO HiVLo Deviations: Deviations: Data presented are the worst case modes as determined during pre compliance testing.													
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End of Test Report