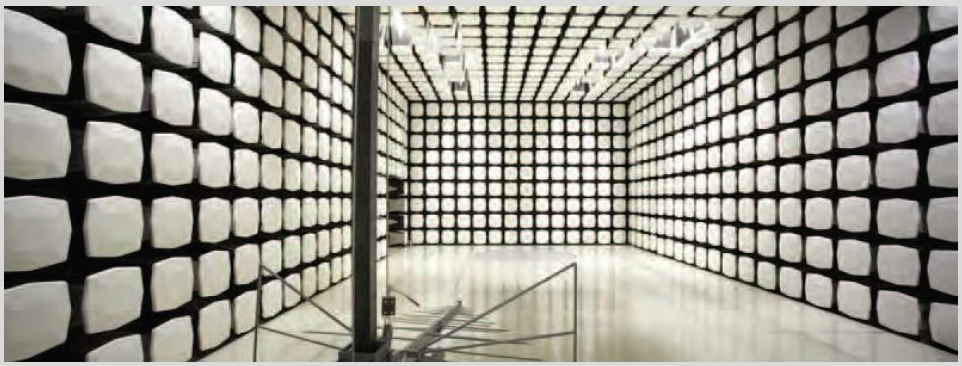
DENSO International America, Inc.

BCM Module 125kHz, Model: B1NA5

FCC 15.209:2021

Inductive Radio

Report: ENTI0008, Issue Date: May 4, 2021



NVLAP LAB CODE: 200676-0

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CERTIFICATE OF TEST

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

Radio Equipment Testing

Standards

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

Results

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

Deviations From Test Standards

None

Approved By:

Victor Ratinoff, Operations Manager

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

REVISION HISTORY

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

ACCREDITATIONS AND AUTHORIZATIONS

United States

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

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

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

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

European Union

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

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

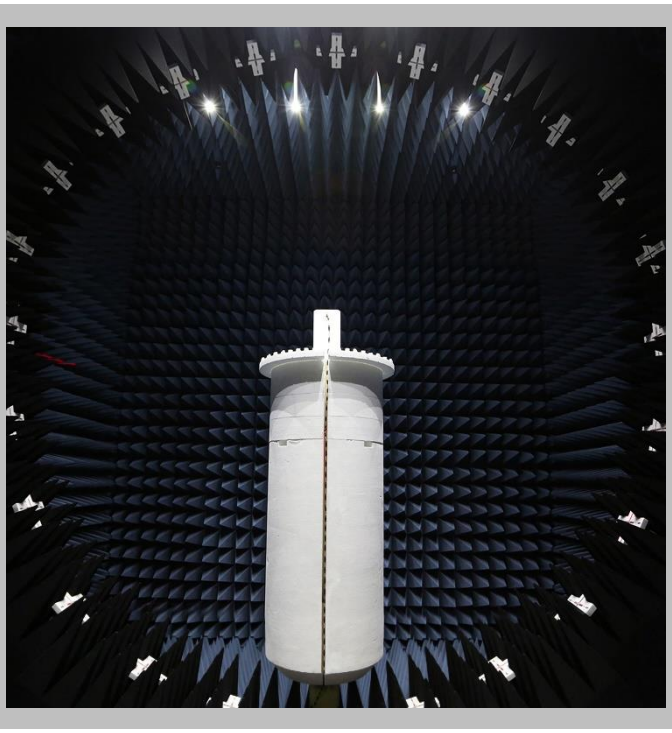
MIC – Recognized by MIC as a CAB for the acceptance of test data.

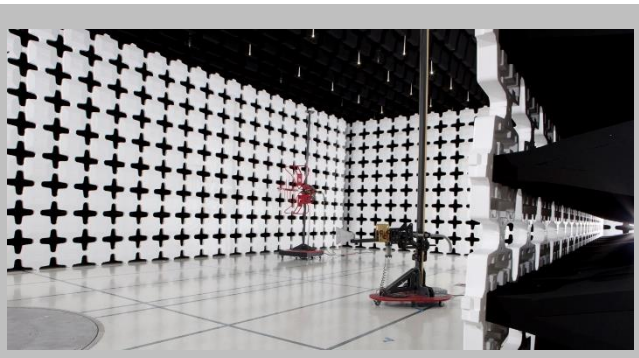
SCOPE

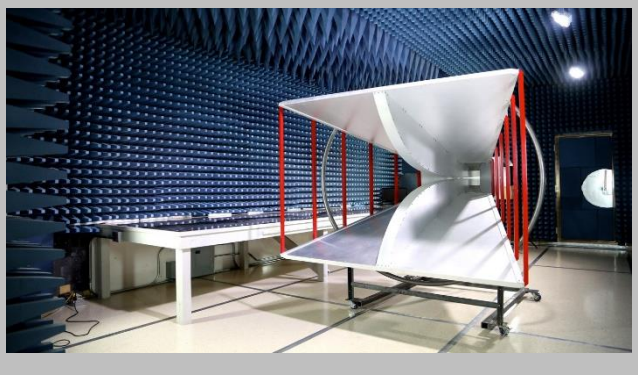
For details on the Scopes of our Accreditations, please visit:
https://www.nwemc.com/emc-testing-accreditations

FACILITIES

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







MEASUREMENT UNCERTAINTY

element
TMU.2015.07.10

Measurement Uncertainty

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

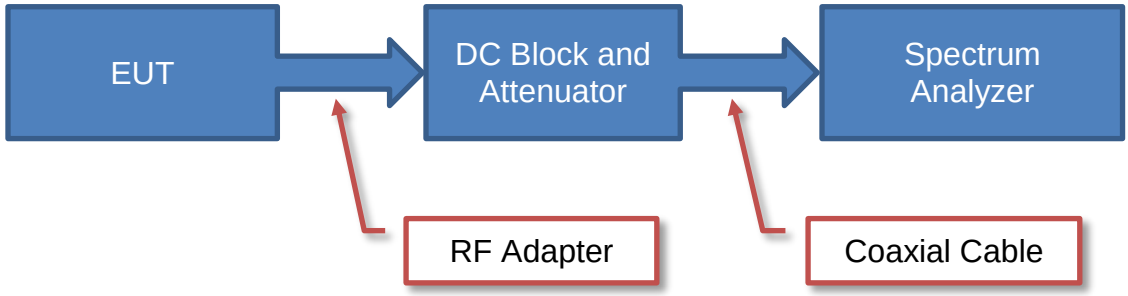
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found in the table below. A lab specific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

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

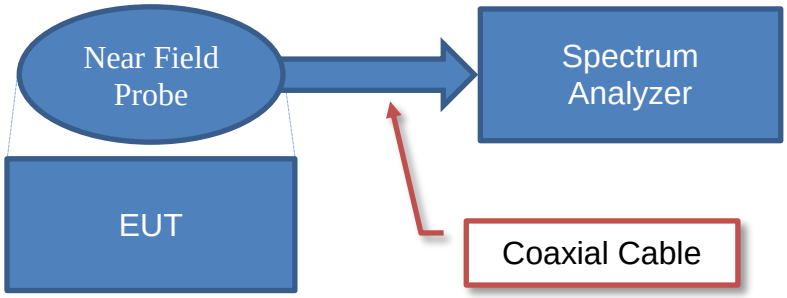
Test	+ MU	- MU
Frequency Accuracy	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field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

Test Setup Block Diagrams

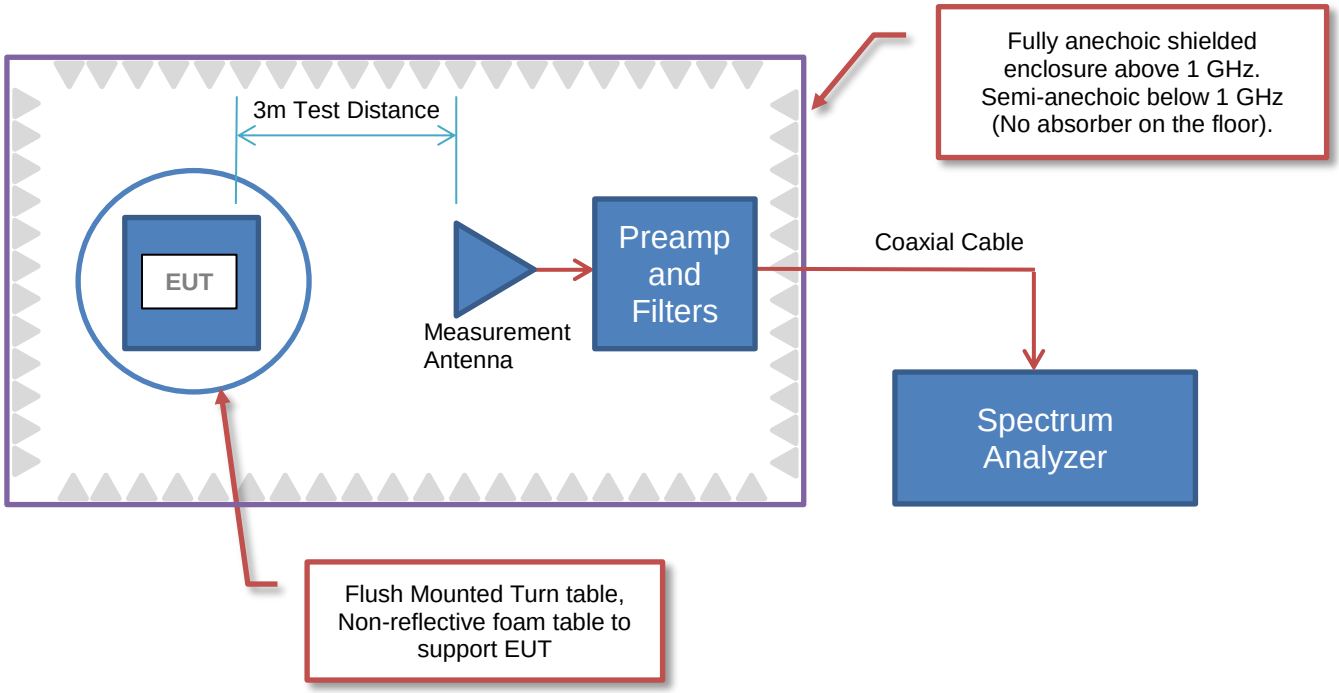
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

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

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

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

Client attestation:

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

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

Testing Objective:

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

CONFIGURATIONS

Configuration ENTI0008- 4

Software/Firmware Running during test	
Description	**Version**
Software	220057

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

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

CONFIGURATIONS

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

CONFIGURATIONS

Configuration ENTI0008- 5

Software/Firmware Running during test	
Description	**Version**
Software	220057

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

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

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

CONFIGURATIONS

Configuration ENTI0008- 6

Software/Firmware Running during test	
Description	**Version**
Software	220057

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Bracket Antenna - Aluminum Plate	DENSO International America, Inc.	Bracket Antenna - Aluminum Plate	#01
BCM	DENSO International America, Inc.	B1NA5	3120350000000008

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

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

CONFIGURATIONS

Configuration ENTI0008- 7

Software/Firmware Running during test	
Description	**Version**
Software	220057

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

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

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

CONFIGURATIONS

Configuration ENTI0008- 8

Software/Firmware Running during test	
Description	**Version**
Software	220057

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

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

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

CONFIGURATIONS

Configuration ENTI0008- 9

Software/Firmware Running during test	
Description	**Version**
Software	220057

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

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

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

CONFIGURATIONS

Configuration ENTI0008- 10

Software/Firmware Running during test	
Description	**Version**
Software	220057

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
BCM	DENSO International America, Inc.	GEN1.5 PV2	3120350000000018
Rear Bumper Frunk Antenna	DENSO International America, Inc.	Rear (front) Bumper Frunk Antenna	#02
Combo (IMMO/LF) Antenna	DENSO International America, Inc.	Combo (IMMO/LF) Antenna	#01

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

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

CONFIGURATIONS

Configuration ENTI0008- 11

Software/Firmware Running during test	
Description	**Version**
Software	220057

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

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

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

CONFIGURATIONS

Configuration ENTI0008- 12

Software/Firmware Running during test	
Description	**Version**
Software	220057

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

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

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

CONFIGURATIONS

Configuration ENTI0008- 13

Software/Firmware Running during test	
Description	**Version**
Software	220057

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

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

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

MODIFICATIONS

Equipment Modifications

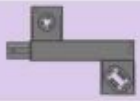
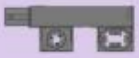
Item	Date	Test	Modification	Note	Disposition of EUT
1	2021-02-08	Field Strength of Fundamental	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	2021-02-12	Spurious Radiated Emissions	Tested as delivered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

POWER SETTINGS AND ANTENNAS

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

ANTENNA INFORMATION

Operational description: Antenna variations

#	Internal	Appearance	Mount on Metal	Antenna name
1			Steel	Trunk Antenna
				Rocker Driver Antenna
				Rocker Passenger Antenna
			Aluminum*	Bracket Antenna
2			No	Rear(Front) Bumper/Frunk Antenna
3			No	Combo (IMMO/LF) Antenna
4			No	Interior Antenna

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

FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, APPROACH

PSA-ESCI 2021.01.22.0

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

MODES OF OPERATION

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

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 11

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	490 kHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

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

TEST DESCRIPTION

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

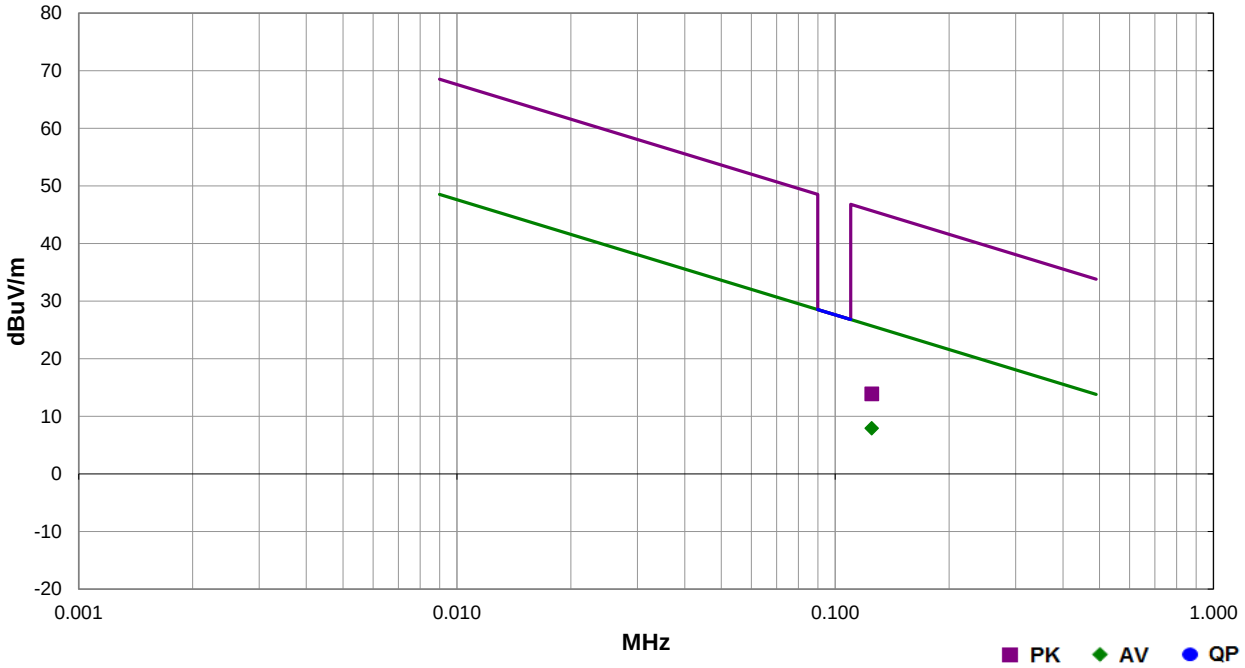
FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, APPROACH

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	20.1 °C		
Job Site:	OC08	**Humidity:**	51.6% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	11				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Full-Bridge: Approach on BCM Pins 01&02, 03&04, and 05&06				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket Antenna on Steel, Rear Bumper/Frunk Antenna, and Interior Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.				

Test Specifications	Test Method
FCC 15.209:2021	ANSI C63.10:2013

Run #	19	Test Distance (m)	10	Antenna Height(s)	1 to 4(m)	Results	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.125	56.5	10.5	1.25	0.0	10.0	0.0	Perp to EUT	AV	-59.1	7.9	25.7	-17.8	EUT on Side
0.125	62.5	10.5	1.25	0.0	10.0	0.0	Perp to EUT	PK	-59.1	13.9	45.7	-31.8	EUT on Side

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

PSA-ESCI 2021.01.22.0

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

MODES OF OPERATION

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

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 10

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	490 kHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

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

TEST DESCRIPTION

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

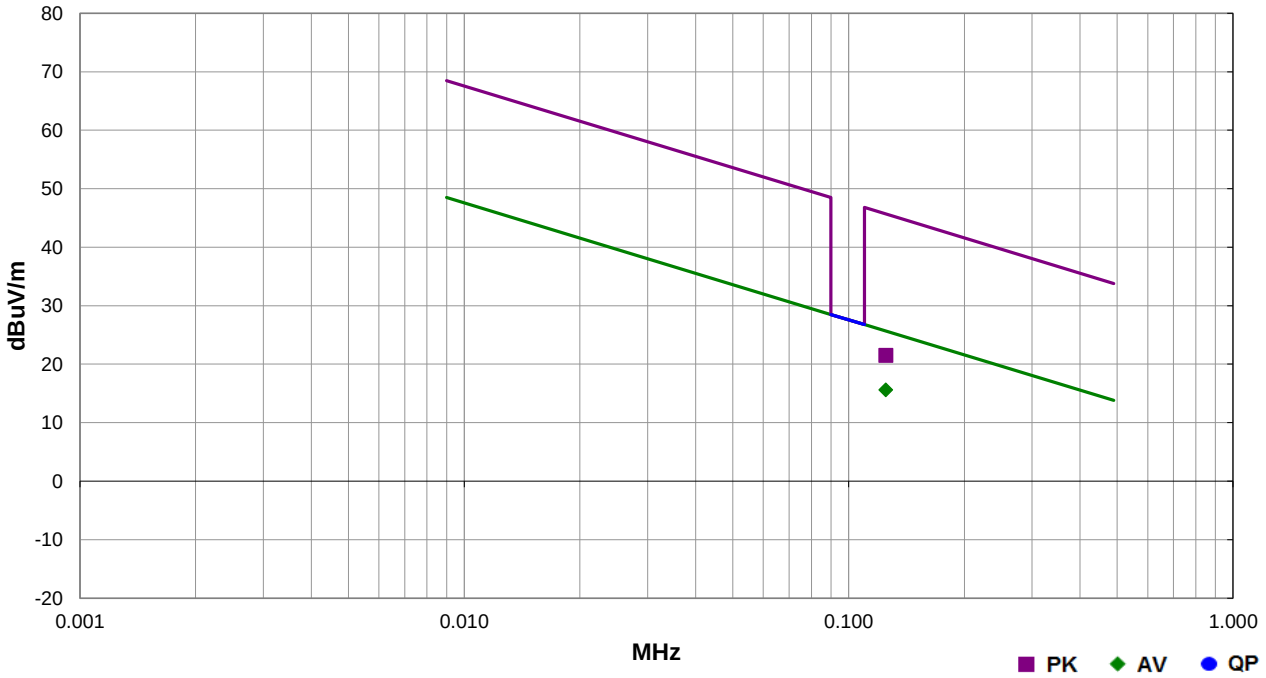
FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, DUAL CH PEPS IMMO

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	20.1 °C		
Job Site:	OC08	**Humidity:**	51.6% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	10				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Full-Bridge: Dual Channel PEPS on BCM Pins IMMO Hi&Lo and 03&04				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Combo Antenna and Rear Bumper/Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	16	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.125	64.2	10.5	1.29	237.0	10.0	0.0	Perp to EUT	AV	-59.1	15.6	25.7	-10.1	EUT on Side
0.125	70.1	10.5	1.29	237.0	10.0	0.0	Perp to EUT	PK	-59.1	21.5	45.7	-24.2	EUT on Side

FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, DUAL CH

PSA-ESCI 2021.01.22.0

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

MODES OF OPERATION

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

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 9

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	490 kHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

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

TEST DESCRIPTION

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

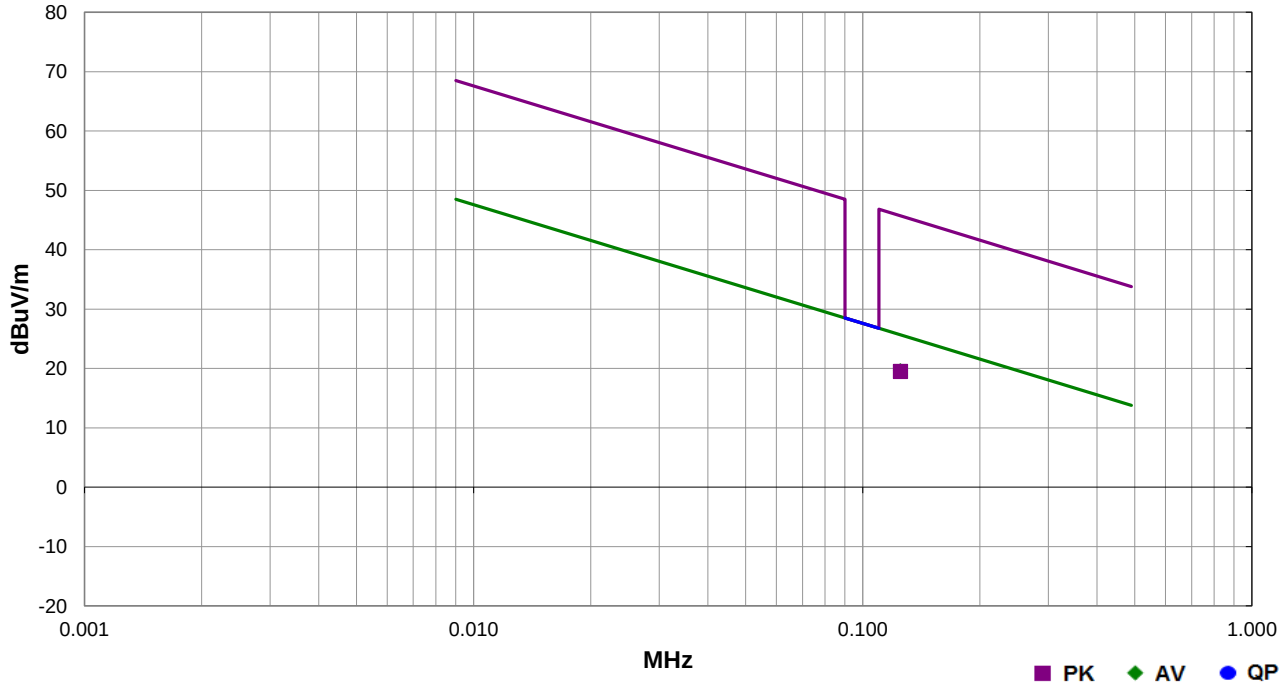
FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, DUAL CH

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	20.1 °C		
Job Site:	OC08	**Humidity:**	51.6% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	9				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Full-Bridge: Dual Channel PEPS on BCM Pins 05&06 and 03&04				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket antenna mounted on aluminum and Rear Bumper/Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	13	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.125	68.2	10.5	1.8	0.0	10.0	0.0	Perp to EUT	AV	-59.1	19.6	25.7	-6.1	EUT on Side
0.125	68.1	10.5	1.8	0.0	10.0	0.0	Perp to EUT	PK	-59.1	19.5	45.7	-26.2	EUT on Side

FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, IMMOBILIZER

PSA-ESCI 2021.01.22.0

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

MODES OF OPERATION

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

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 12

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	490 kHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

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

TEST DESCRIPTION

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

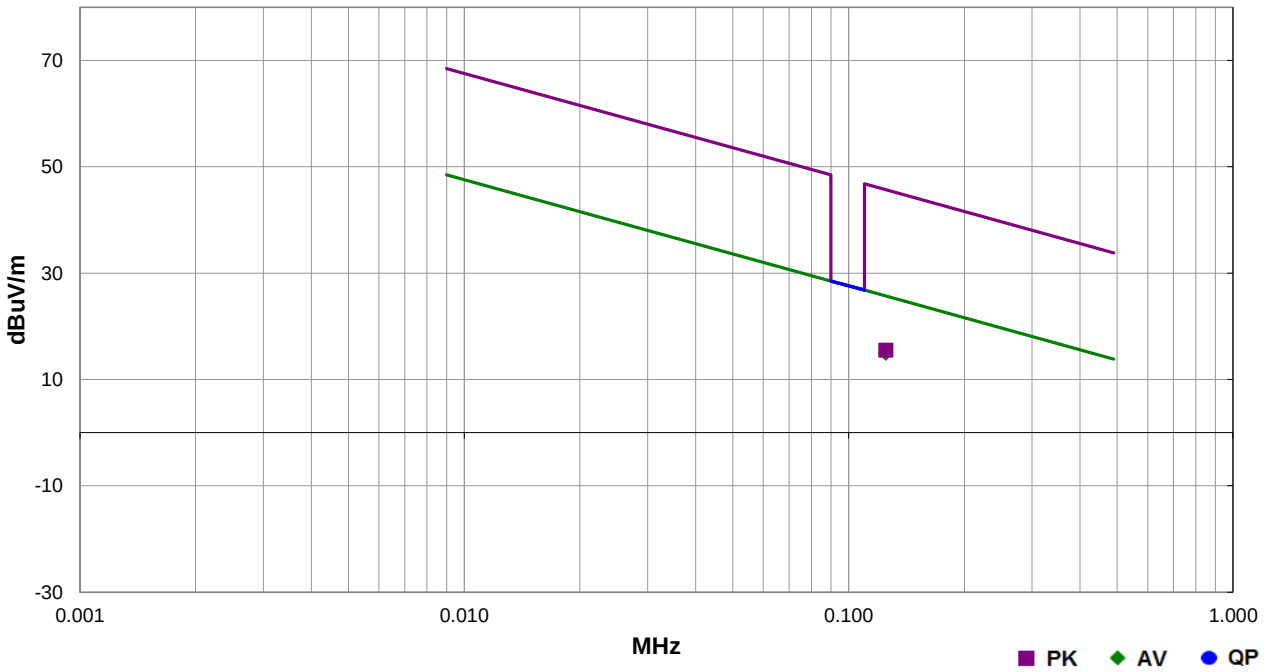
FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, IMMOBILIZER

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	20.1 °C		
Job Site:	OC08	**Humidity:**	51.6% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	12				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Full-Bridge: Immobilizer on BCM Pin IMMO Hi&Lo				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Combo Antenna (Only antenna applicable to this mode). Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	22	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.125	63.5	10.5	1.25	0.0	10.0	0.0	Perp to EUT	AV	-59.1	14.9	25.7	-10.8	EUT on Side
0.125	64.1	10.5	1.25	0.0	10.0	0.0	Perp to EUT	PK	-59.1	15.5	45.7	-30.2	EUT on Side

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

PSA-ESCI 2021.01.22.0

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

MODES OF OPERATION

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

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 8

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	490 kHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

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

TEST DESCRIPTION

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

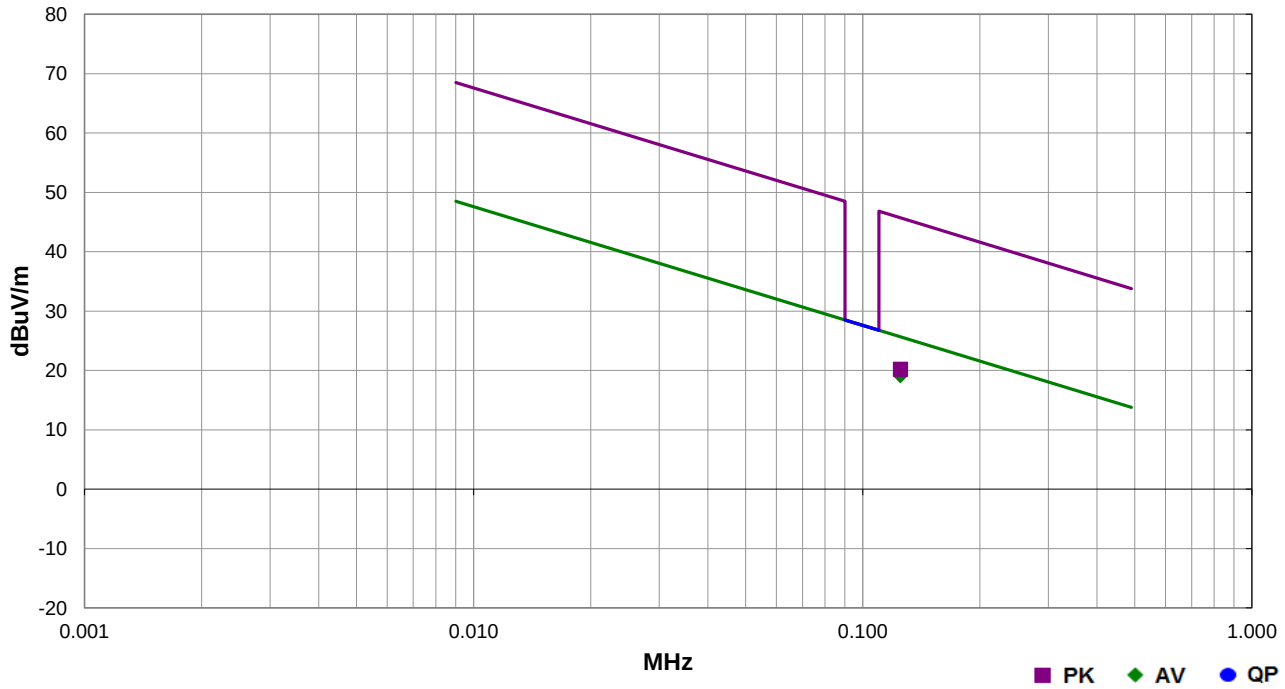
FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, SINGLE CH PEPS IMMO

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	20.1 °C		
Job Site:	OC08	**Humidity:**	51.6% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	8				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Full-Bridge: Single Channel PEPS on BCM Pins IMMO Hi/Lo				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Combo Antenna (only antenna applicable to this mode). Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	10	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.125	67.7	10.5	1.53	171.0	10.0	0.0	Perp to EUT	AV	-59.1	19.1	25.7	-6.6	EUT on Side
0.125	68.8	10.5	1.53	171.0	10.0	0.0	Perp to EUT	PK	-59.1	20.2	45.7	-25.5	EUT on Side

FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, SINGLE CH

PSA-ESCI 2021.01.22.0

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

MODES OF OPERATION

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

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 7

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	490 kHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

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

TEST DESCRIPTION

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

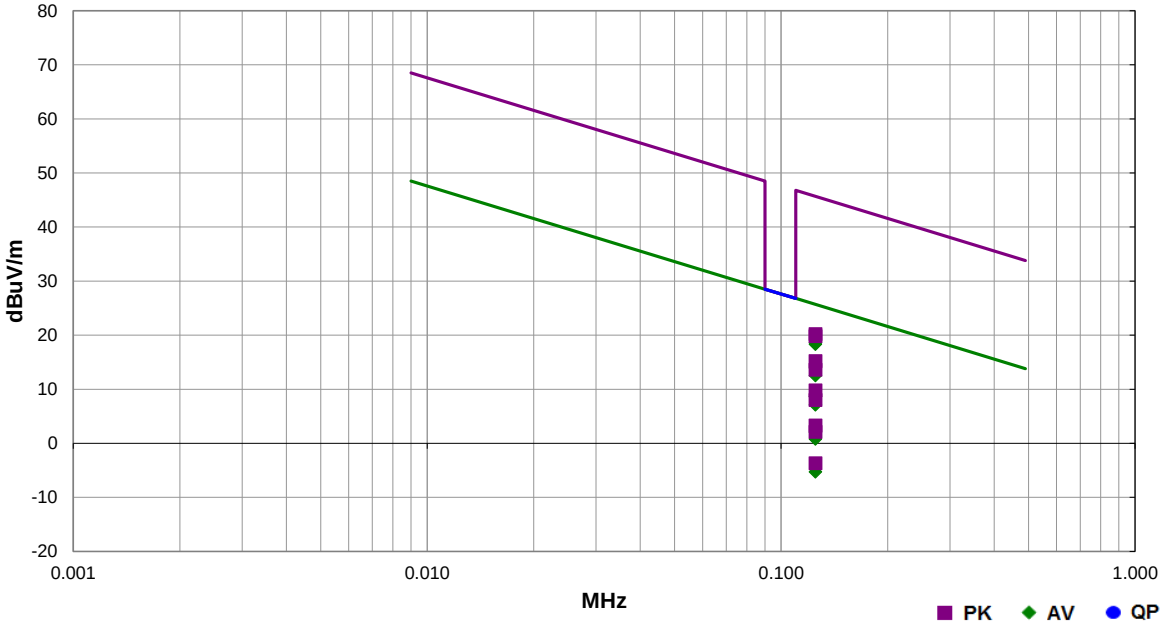
FIELD STRENGTH OF FUNDAMENTAL - FULL BRIDGE, SINGLE CH

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	19.1 °C		
Job Site:	OC08	**Humidity:**	52.8% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1019 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	7				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Full-Bridge: Single Channel PEPS on BCM Pins 05&06				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Bracket antenna mounted on aluminum.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	7	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.125	67.2	10.5	2.25	358.0	10.0	0.0	Perp to EUT	AV	-59.1	18.6	25.7	-7.1	EUT on Side
0.125	66.9	10.5	1.06	89.0	10.0	0.0	Perp to EUT	AV	-59.1	18.3	25.7	-7.4	EUT Horz
0.125	62.5	10.5	1.0	84.0	10.0	0.0	Para to EUT	AV	-59.1	13.9	25.7	-11.8	EUT on Side
0.125	61.1	10.5	1.0	17.0	10.0	0.0	Para to EUT	AV	-59.1	12.5	25.7	-13.2	EUT Horz
0.125	57.2	10.5	3.65	89.0	10.0	0.0	Para to GND	AV	-59.1	8.6	25.7	-17.1	EUT on Side
0.125	55.7	10.5	3.5	0.0	10.0	0.0	Para to GND	AV	-59.1	7.1	25.7	-18.6	EUT Horz
0.125	50.6	10.5	1.0	93.0	10.0	0.0	Para to EUT	AV	-59.1	2.0	25.7	-23.7	EUT Vert
0.125	49.4	10.5	3.73	80.0	10.0	0.0	Para to GND	AV	-59.1	0.8	25.7	-24.9	EUT Vert
0.125	68.8	10.5	1.0	83.0	10.0	0.0	Perp to EUT	PK	-59.1	20.2	45.7	-25.5	EUT Horz
0.125	68.4	10.5	2.25	358.0	10.0	0.0	Perp to EUT	PK	-59.1	19.8	45.7	-25.9	EUT on Side
0.125	63.8	10.5	1.0	84.0	10.0	0.0	Para to EUT	PK	-59.1	15.2	45.7	-30.5	EUT on Side
0.125	43.3	10.5	2.97	158.0	10.0	0.0	Perp to EUT	AV	-59.1	-5.3	25.7	-31.0	EUT Vert
0.125	62.2	10.5	1.0	17.0	10.0	0.0	Para to EUT	PK	-59.1	13.6	45.7	-32.1	EUT Horz
0.125	58.4	10.5	3.65	89.0	10.0	0.0	Para to GND	PK	-59.1	9.8	45.7	-35.9	EUT on Side
0.125	56.6	10.5	3.5	0.0	10.0	0.0	Para to GND	PK	-59.1	8.0	45.7	-37.7	EUT Horz
0.125	51.9	10.5	1.0	93.0	10.0	0.0	Para to EUT	PK	-59.1	3.3	45.7	-42.4	EUT Vert
0.125	50.7	10.5	3.73	80.0	10.0	0.0	Para to GND	PK	-59.1	2.1	45.7	-43.6	EUT Vert
0.125	44.9	10.5	2.97	158.0	10.0	0.0	Perp to EUT	PK	-59.1	-3.7	45.7	-49.4	EUT Vert

FIELD STRENGTH OF FUNDAMENTAL - HALF BRIDGE, DUAL CH

PSA-ESCI 2021.01.22.0

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

MODES OF OPERATION

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

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 5

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	490 kHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

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

TEST DESCRIPTION

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

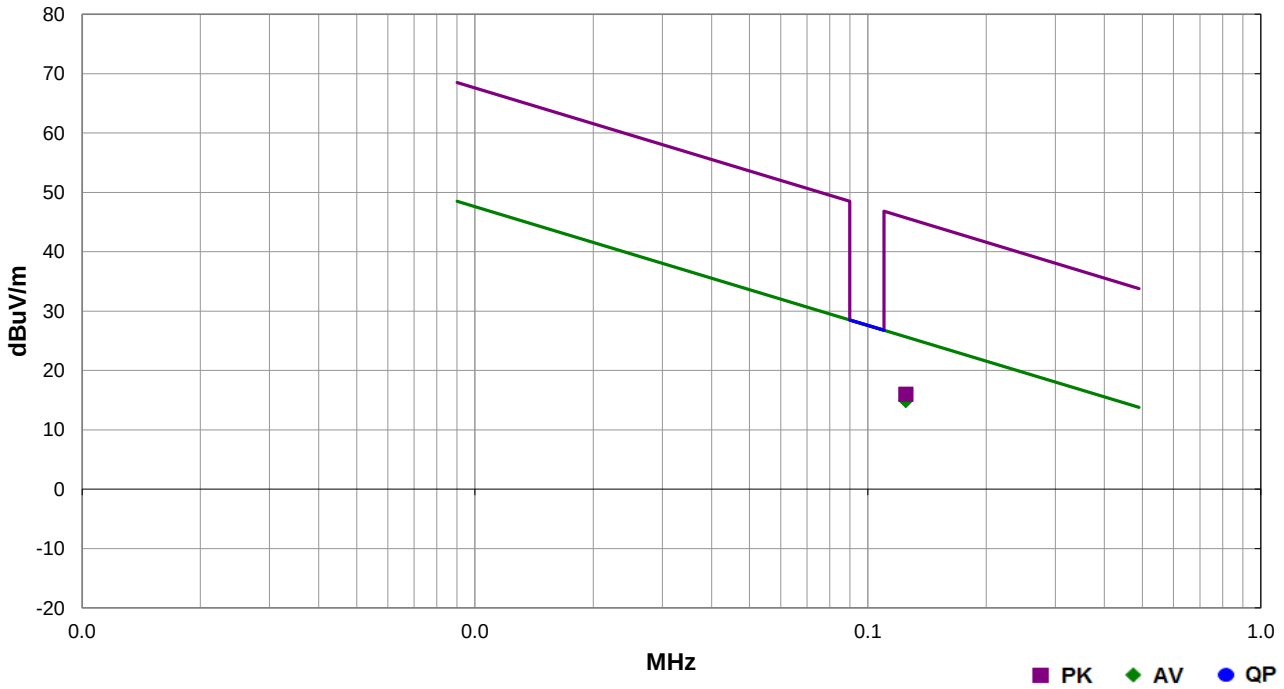
FIELD STRENGTH OF FUNDAMENTAL - HALF BRIDGE, DUAL CH

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	19.1 °C		
Job Site:	OC08	**Humidity:**	52.8% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1019 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	5				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Half Bridge: Dual Channel PEPS on BCM Pins 01&01R and 02&02R.				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket Antenna mounted on steel and Rear Bumper Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT Horz.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	4	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.125	63.5	10.5	1.0	86.0	10.0	0.0	Perp to EUT	AV	-59.1	14.9	25.7	-10.8	EUT Horz
0.125	64.6	10.5	1.0	86.0	10.0	0.0	Perp to EUT	PK	-59.1	16.0	45.7	-29.7	EUT Horz

FIELD STRENGTH OF FUNDAMENTAL - HALF BRIDGE, SINGLE CH

PSA-ESCI 2021.01.22.0

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

MODES OF OPERATION

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

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 4

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	490 kHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

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

TEST DESCRIPTION

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

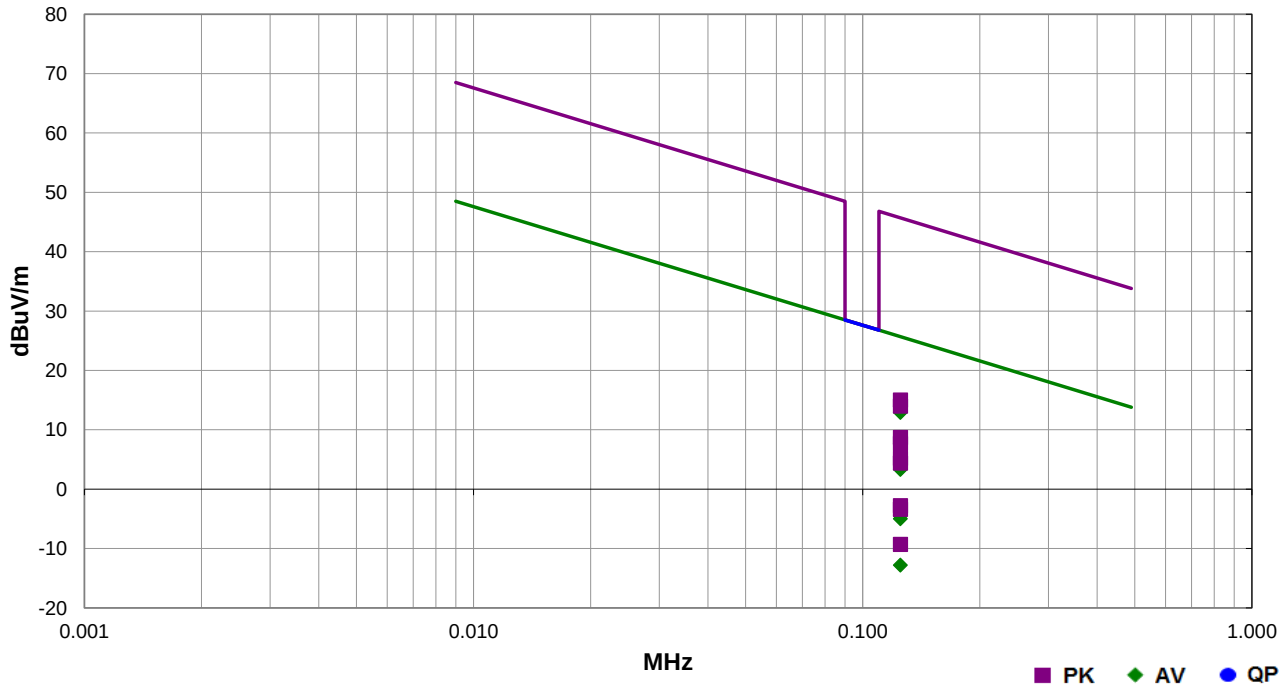
FIELD STRENGTH OF FUNDAMENTAL - HALF BRIDGE, SINGLE CH

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-08		
Project:	None	**Temperature:**	20.7 °C		
Job Site:	OC08	**Humidity:**	49.3% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	4				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Half Bridge: Single Channel PEPS on BCM Pins 01&01R.				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Rear Bumper/Frunk Antenna.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	1	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



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

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

FIELD STRENGTH OF FUNDAMENTAL - ROUND ROBIN

PSA-ESCI 2021.01.22.0

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

MODES OF OPERATION

Transmitting 125 kHz. Round Robin Mode

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 13

ENTI0008 - 6

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	490 kHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

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

TEST DESCRIPTION

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

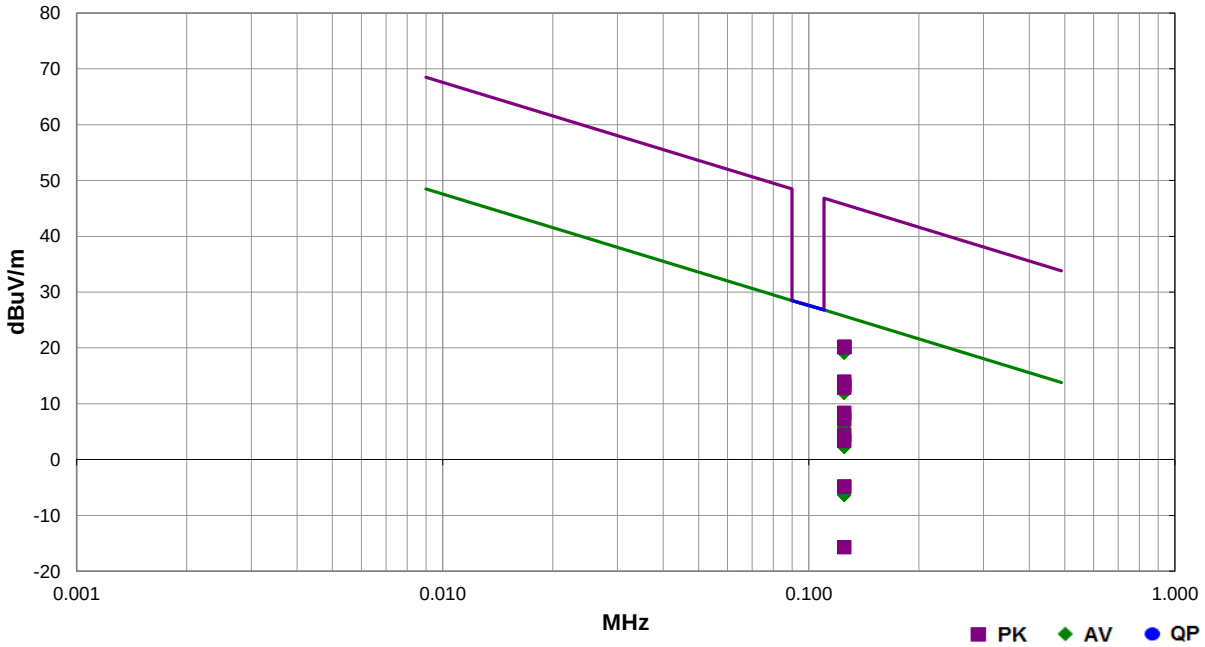
FIELD STRENGTH OF FUNDAMENTAL - ROUND ROBIN

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-11		
Project:	None	**Temperature:**	20.9 °C		
Job Site:	OC08	**Humidity:**	52% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	6				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Round Robin Mode				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Bracket Antenna on Aluminum				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	25	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



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

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

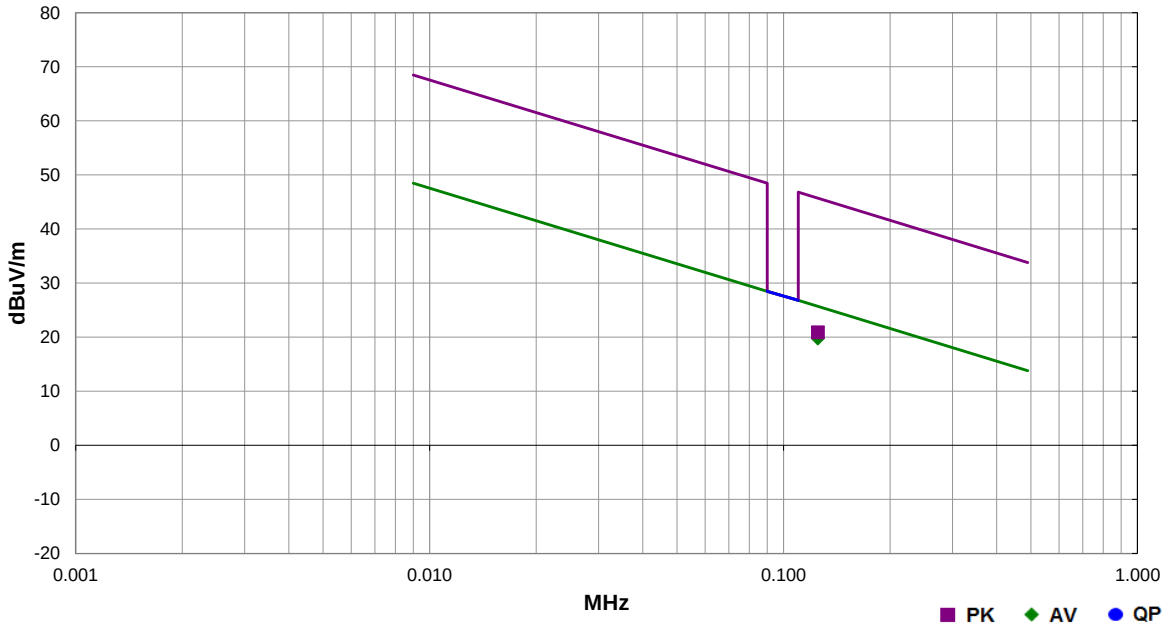
FIELD STRENGTH OF FUNDAMENTAL - ROUND ROBIN

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-11		
Project:	None	**Temperature:**	20.9 °C		
Job Site:	OC08	**Humidity:**	52% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	13				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Round Robin Mode				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Combo Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side				

Test Specifications	Test Method
FCC 15.209:2021	ANSI C63.10:2013

Run #	26	Test Distance (m)	10	Antenna Height(s)	1 to 4(m)	Results	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.125	68.3	10.5	0.99	0.0	10.0	0.0	Perp to EUT	AV	-59.1	19.7	25.7	-6.0	EUT on Side, Pin Hi/Lo
0.125	69.5	10.5	0.99	0.0	10.0	0.0	Perp to EUT	PK	-59.1	20.9	45.7	-24.8	EUT on Side, Pin Hi/Lo

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, APPROACH

PSA-ESCI 2021.01.22.0

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

MODES OF OPERATION

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

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 11

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	30 MHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

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

TEST DESCRIPTION

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

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

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

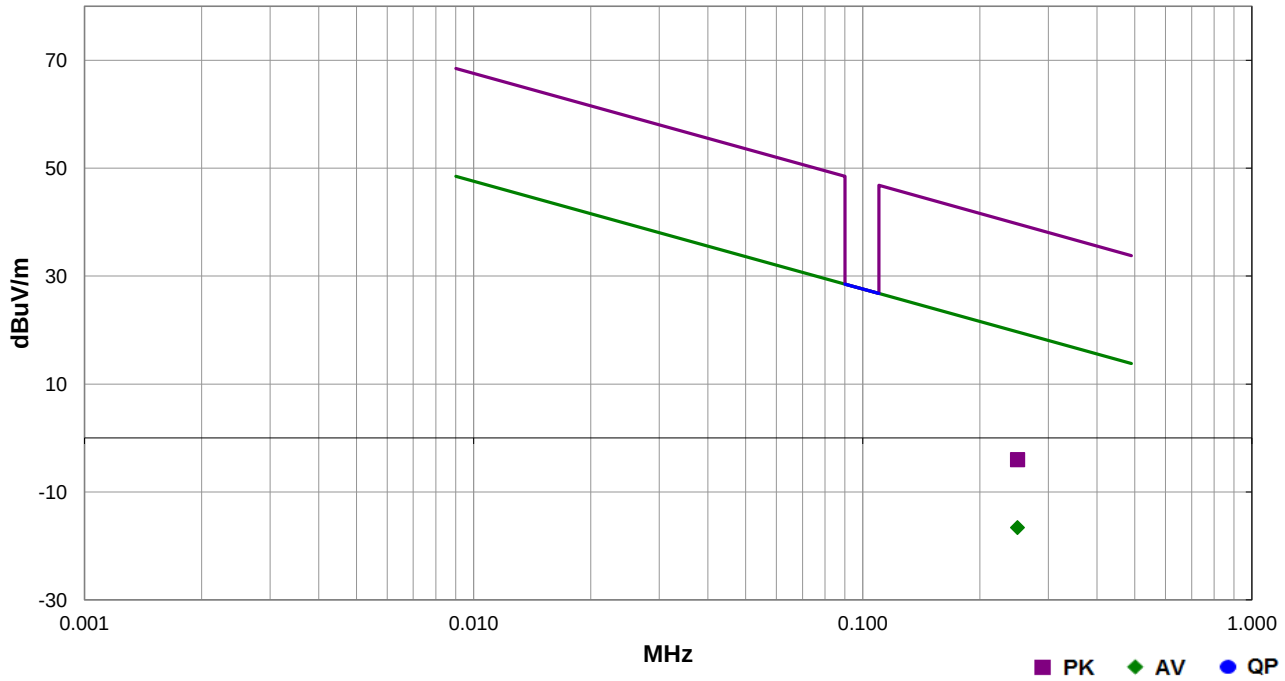
SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, APPROACH

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	20.1 °C		
Job Site:	OC08	**Humidity:**	51.6% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	11				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Full-Bridge: Approach on BCM Pins 01&02, 03&04, and 05&06				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket Antenna on Steel, Rear Bumper/Frunk Antenna, and Interior Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	20	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.250	32.0	10.5	1.25	0.0	10.0	0.0	Perp to EUT	AV	-59.1	-16.6	19.7	-36.3	EUT on Side
0.250	44.5	10.6	1.25	0.0	10.0	0.0	Perp to EUT	PK	-59.1	-4.0	39.7	-43.7	EUT on Side

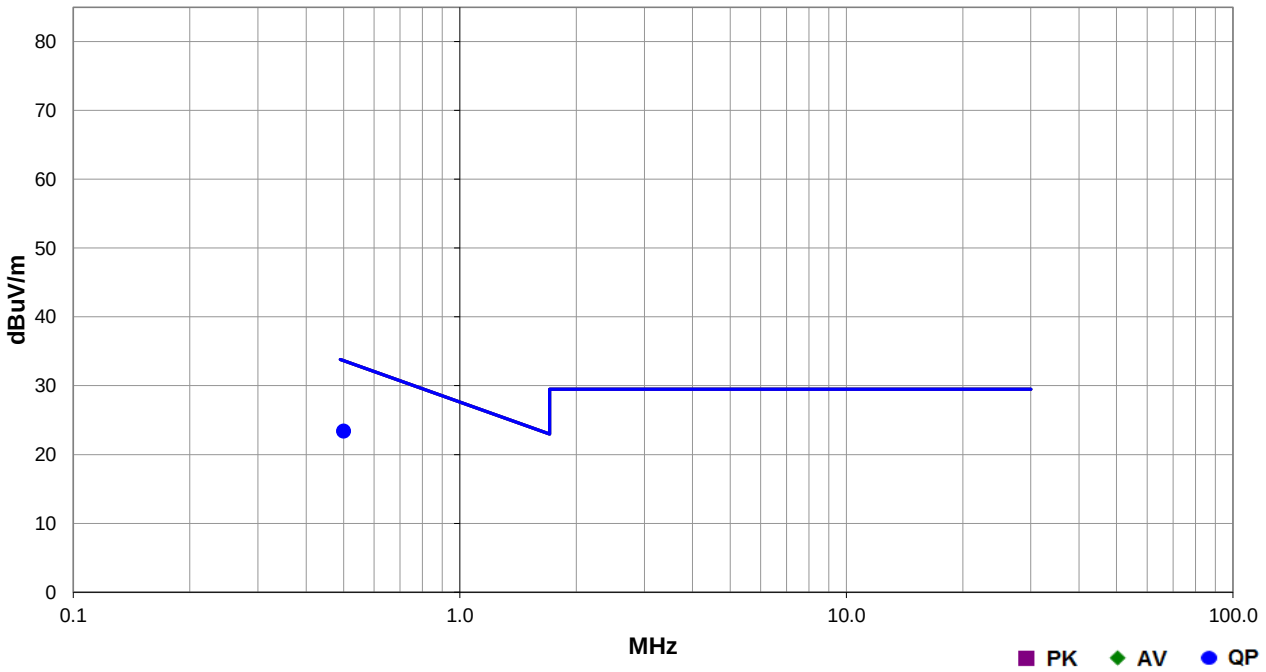
SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, APPROACH

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	20.1 °C		
Job Site:	OC08	**Humidity:**	51.6% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	11				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Full-Bridge: Approach on BCM Pins 01&02, 03&04, and 05&06				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket Antenna on Steel, Rear Bumper/Frunk Antenna, and Interior Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	21	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.500	31.9	10.6	1.25	0.0	10.0	0.0	Perp to EUT	QP	-19.1	23.4	33.6	-10.2	EUT on Side

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, DUAL CH PEPS IMMO

PSA-ESCI 2021.01.22.0

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

MODES OF OPERATION

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

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 10

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	30 MHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

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

TEST DESCRIPTION

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

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

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

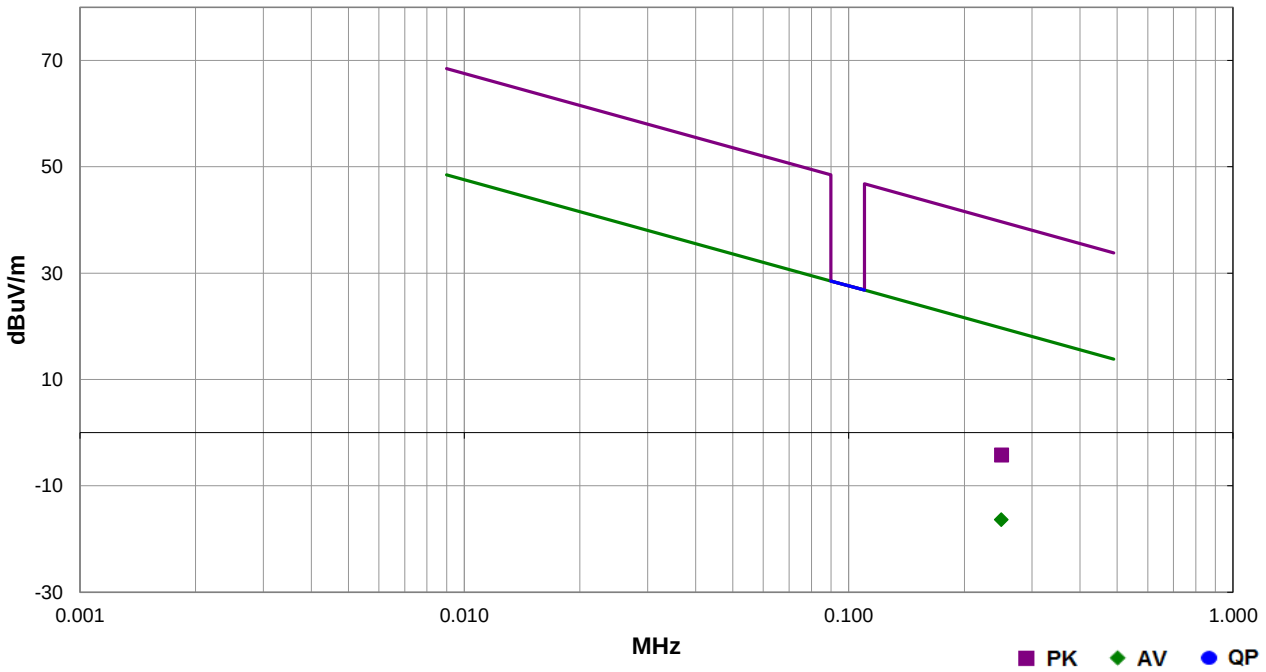
SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, DUAL CH PEPS IMMO

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	20.1 °C		
Job Site:	OC08	**Humidity:**	51.6% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	10				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Full-Bridge: Dual Channel PEPS on BCM Pins IMMO Hi&Lo and 03&04				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Combo Antenna and Rear Bumper/Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	17	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.250	32.1	10.6	1.0	164.0	10.0	0.0	Perp to EUT	AV	-59.1	-16.4	19.7	-36.1	EUT on Side
0.250	44.3	10.6	1.0	164.0	10.0	0.0	Perp to EUT	PK	-59.1	-4.2	39.7	-43.9	EUT on Side

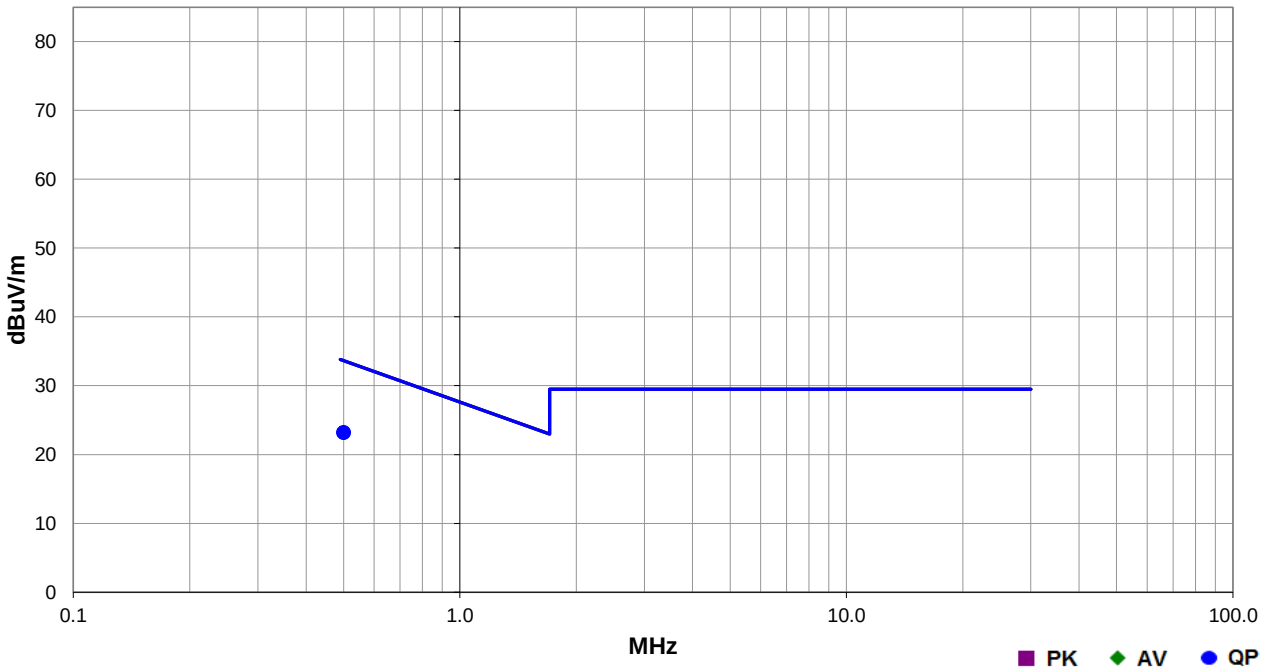
SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, DUAL CH PEPS IMMO

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	20.1 °C		
Job Site:	OC08	**Humidity:**	51.6% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	10				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Full-Bridge: Dual Channel PEPS on BCM Pins IMMO Hi&Lo and 03&04				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Combo Antenna and Rear Bumper/Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	18	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.500	31.7	10.6	1.0	300.0	10.0	0.0	Perp to EUT	QP	-19.1	23.2	33.6	-10.4	EUT on Side

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, DUAL CH

PSA-ESCI 2021.01.22.0

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

MODES OF OPERATION

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

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 9

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	30 MHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

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

TEST DESCRIPTION

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

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

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

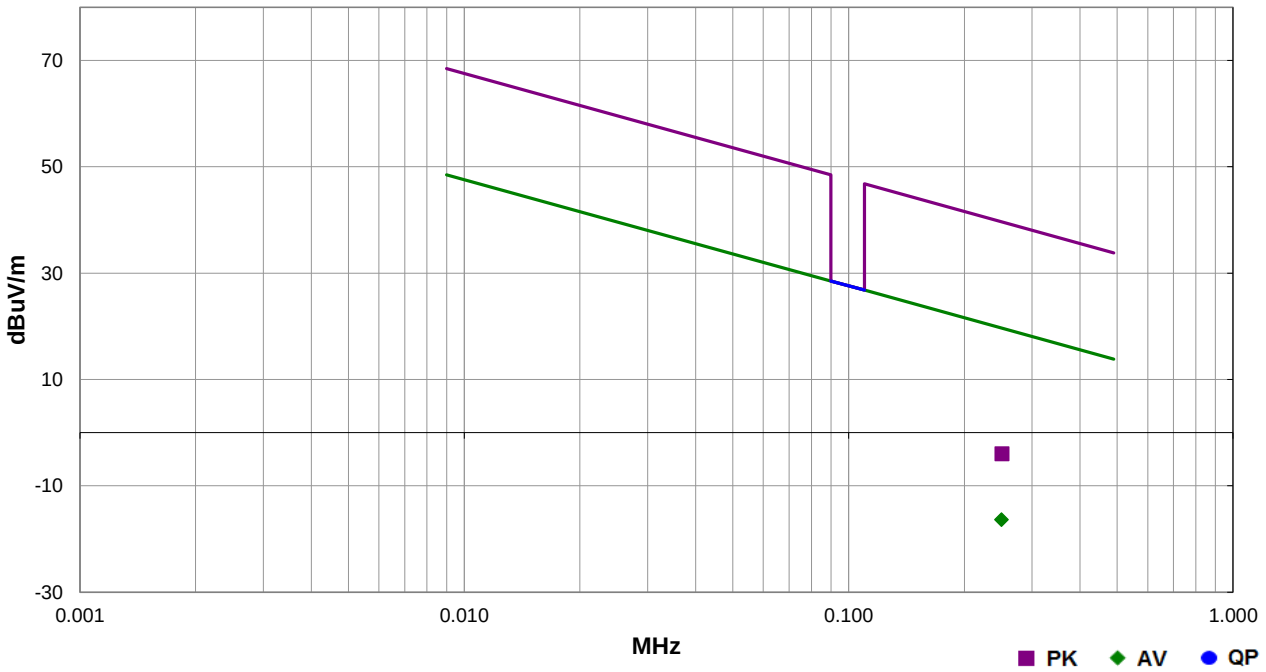
SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, DUAL CH

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	20.1 °C		
Job Site:	OC08	**Humidity:**	51.6% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	9				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Full-Bridge: Dual Channel PEPS on BCM Pins 05&06 and 03&04				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket antenna mounted on aluminum and Rear Bumper/Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	14	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.250	32.1	10.6	3.8	216.0	10.0	0.0	Perp to EUT	AV	-59.1	-16.4	19.7	-36.1	EUT on Side
0.250	44.6	10.5	3.8	216.0	10.0	0.0	Perp to EUT	PK	-59.1	-4.0	39.6	-43.6	EUT on Side

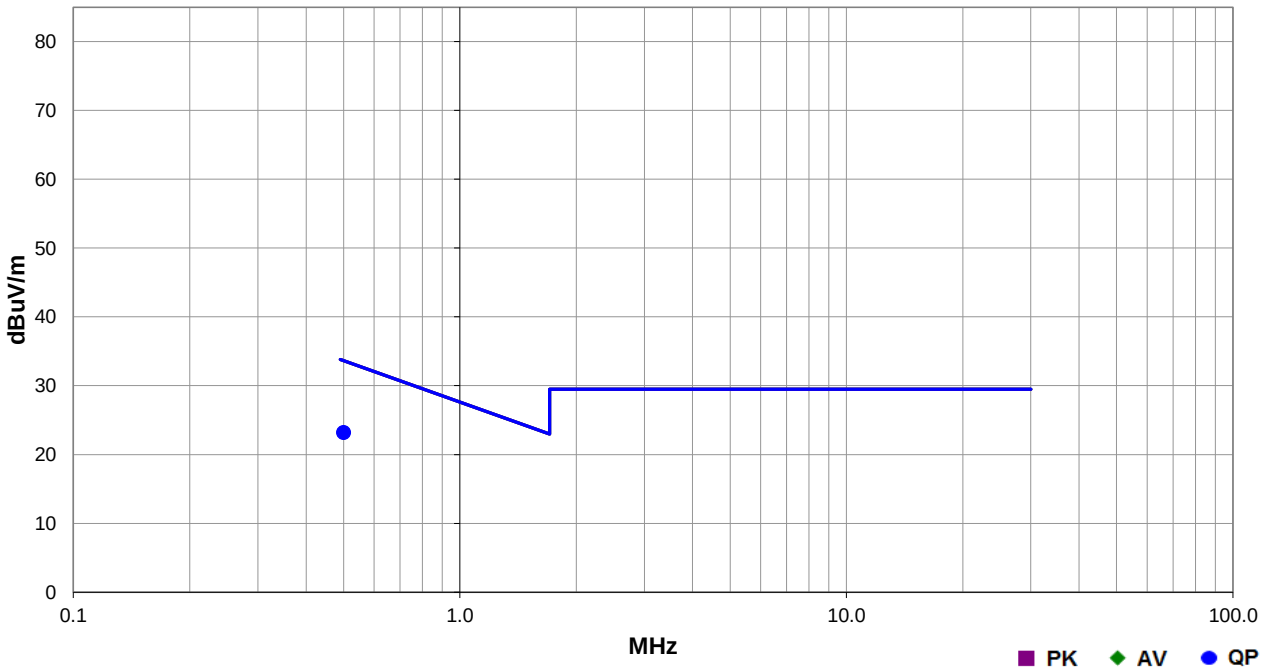
SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, DUAL CH

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	20.1 °C		
Job Site:	OC08	**Humidity:**	51.6% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	9				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Full-Bridge: Dual Channel PEPS on BCM Pins 05&06 and 03&04				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket antenna mounted on aluminum and Rear Bumper/Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	15	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.500	31.7	10.6	1.0	0.0	10.0	0.0	Perp to EUT	QP	-19.1	23.2	33.6	-10.4	EUT on Side

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, IMMOBILIZER

PSA-ESCI 2021.01.22.0

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

MODES OF OPERATION

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

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 12

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	30 MHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

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

TEST DESCRIPTION

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

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

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

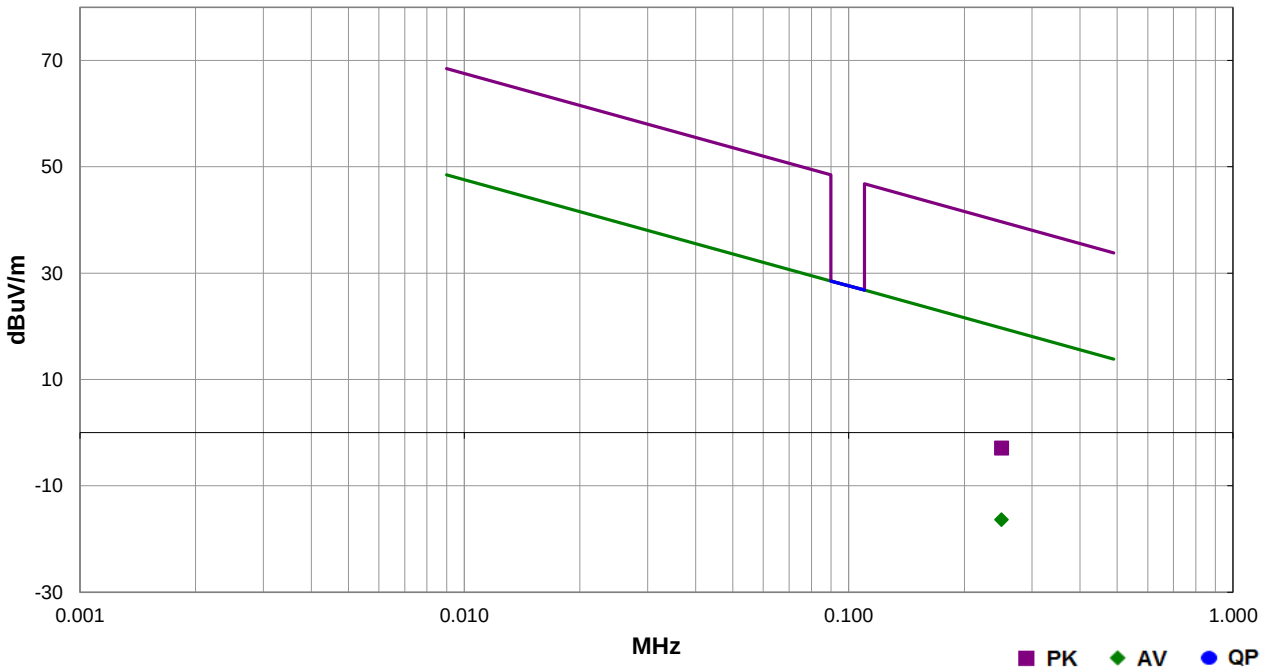
SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, IMMOBILIZER

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	20.1 °C		
Job Site:	OC08	**Humidity:**	51.6% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	12				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Full-Bridge: Immobilizer on BCM Pin IMMO Hi&Lo				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Combo Antenna (Only antenna applicable to this mode). Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	23	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.250	32.1	10.6	1.25	0.0	10.0	0.0	Perp to EUT	AV	-59.1	-16.4	19.7	-36.1	EUT on Side
0.250	45.6	10.6	1.25	0.0	10.0	0.0	Perp to EUT	PK	-59.1	-2.9	39.7	-42.6	EUT on Side

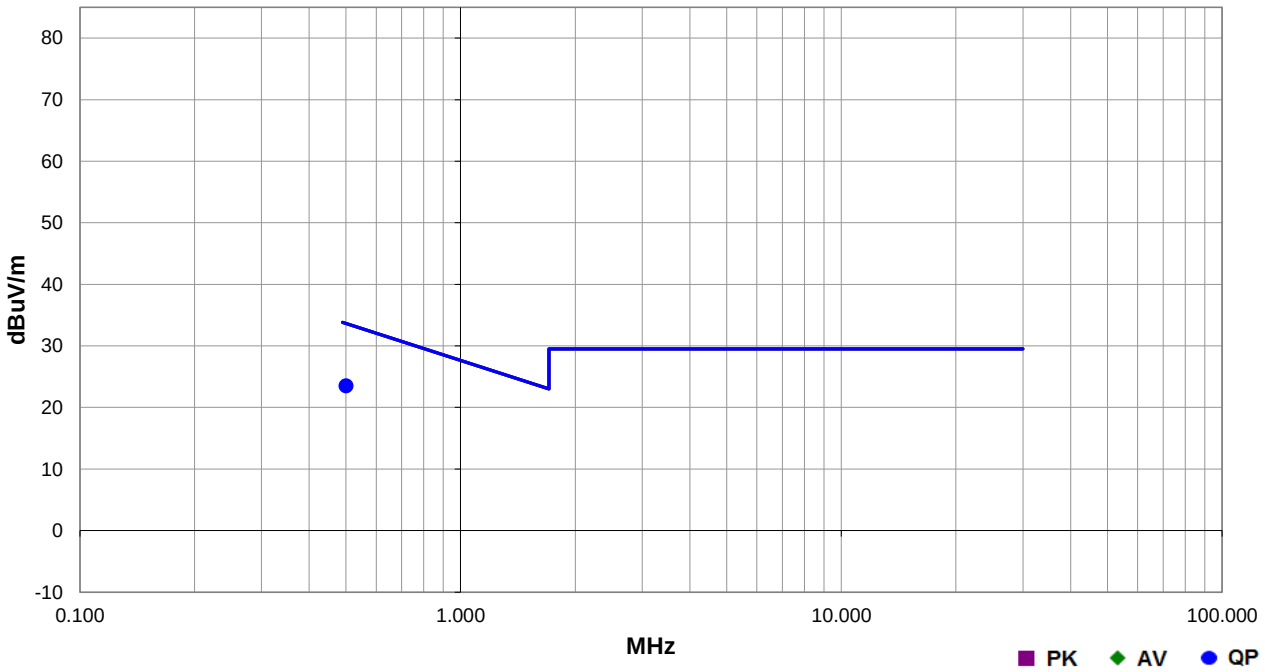
SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, IMMOBILIZER

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	20.1 °C		
Job Site:	OC08	**Humidity:**	51.6% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	12				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Full-Bridge: Immobilizer on BCM Pin IMMO Hi&Lo				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Combo Antenna (Only antenna applicable to this mode). Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	24	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.500	32.0	10.6	1.25	0.0	10.0	0.0	Perp to EUT	QP	-19.1	23.5	33.6	-10.1	EUT on Side

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, SINGLE CH PEPS IMMO

PSA-ESCI 2021.01.22.0

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

MODES OF OPERATION

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

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 8

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	30 MHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

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

MEASUREMENT BANDWIDTHS

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

TEST DESCRIPTION

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

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

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

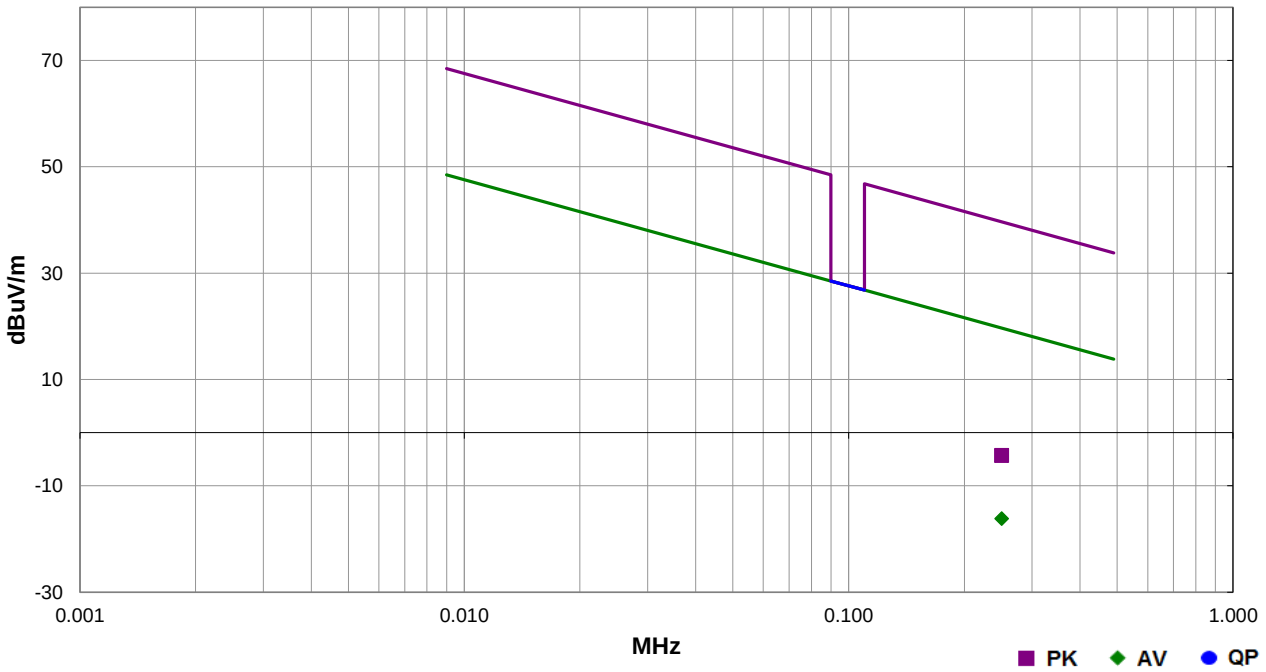
SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, SINGLE CH PEPS IMMO

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	20.1 °C		
Job Site:	OC08	**Humidity:**	51.6% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	8				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Full-Bridge: Single Channel PEPS on BCM Pins IMMO Hi/Lo				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Combo Antenna (Only antenna applicable to this mode). Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	11	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.250	32.4	10.5	3.04	32.0	10.0	0.0	Perp to EUT	AV	-59.1	-16.2	19.6	-35.8	EUT on Side
0.250	44.3	10.5	3.04	32.0	10.0	0.0	Perp to EUT	PK	-59.1	-4.3	39.7	-44.0	EUT on Side

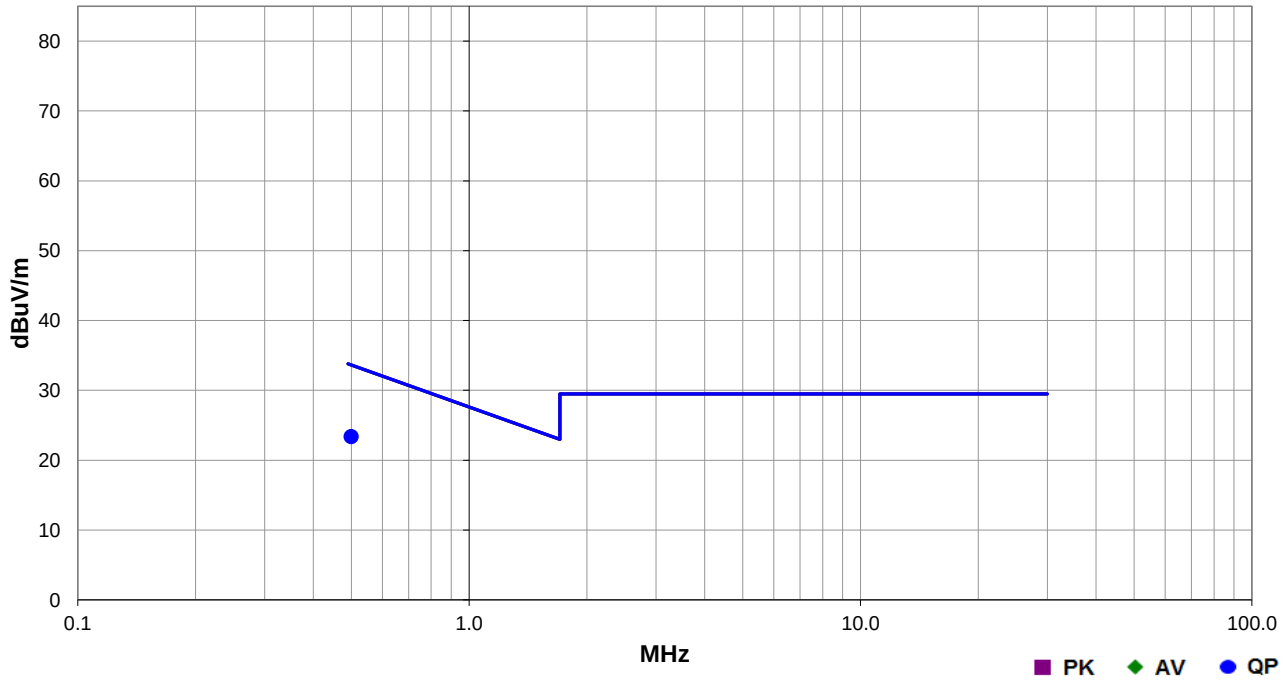
SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, SINGLE CH PEPS IMMO

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	20.1 °C		
Job Site:	OC08	**Humidity:**	51.6% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	8				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Full-Bridge: Single Channel PEPS on BCM Pins IMMO Hi/Lo				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Combo Antenna (Only antenna applicable to this mode). Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	12	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.500	31.9	10.6	3.24	265.0	10.0	0.0	Perp to EUT	QP	-19.1	23.4	33.6	-10.2	EUT on Side

SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, SINGLE CH

PSA-ESCI 2021.01.22.0

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

MODES OF OPERATION

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

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 7

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	30 MHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

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

TEST DESCRIPTION

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

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

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

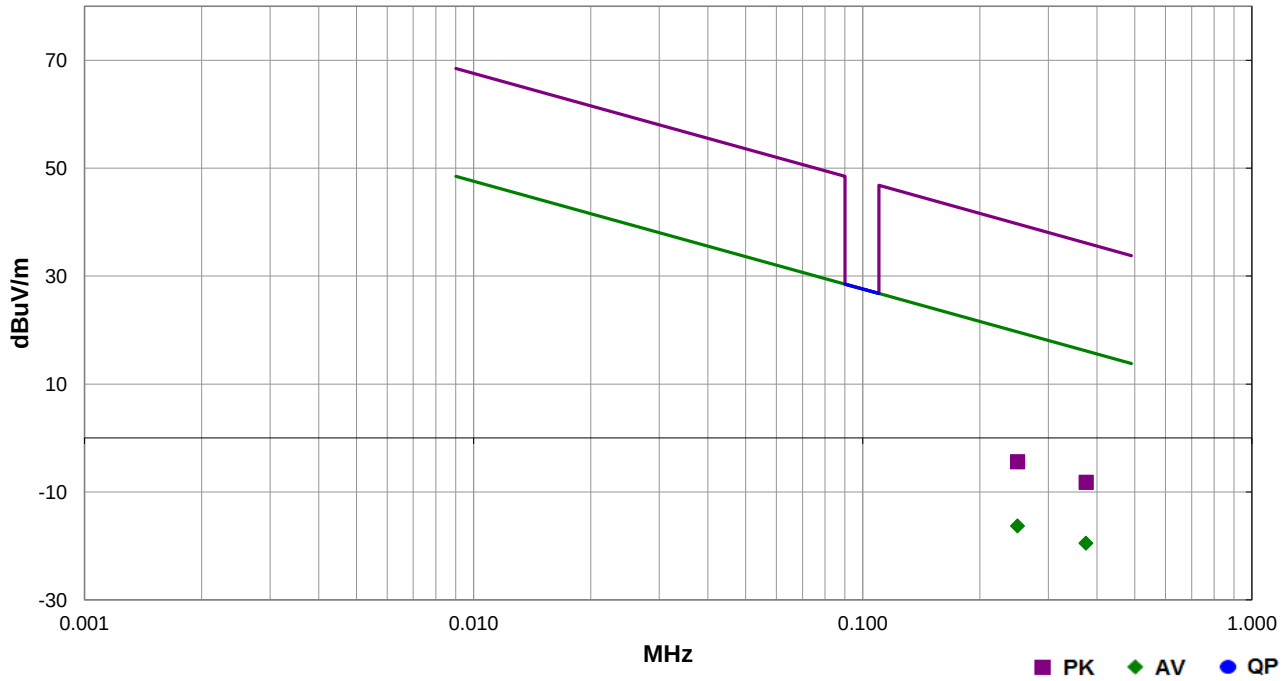
SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, SINGLE CH

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	20.1 °C		
Job Site:	OC08	**Humidity:**	51.6% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	7				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Full-Bridge: Single Channel PEPS on BCM Pins 05&06				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Bracket antenna mounted on aluminum. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	8	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.375	29.2	10.4	3.16	322.0	10.0	0.0	Perp to EUT	AV	-59.1	-19.5	16.1	-35.6	EUT on Side
0.250	32.2	10.6	2.88	163.0	10.0	0.0	Perp to EUT	AV	-59.1	-16.3	19.7	-36.0	EUT on Side
0.250	44.1	10.6	2.88	163.0	10.0	0.0	Perp to EUT	PK	-59.1	-4.4	39.7	-44.1	EUT on Side
0.375	40.5	10.4	3.16	322.0	10.0	0.0	Perp to EUT	PK	-59.1	-8.2	36.1	-44.3	EUT on Side

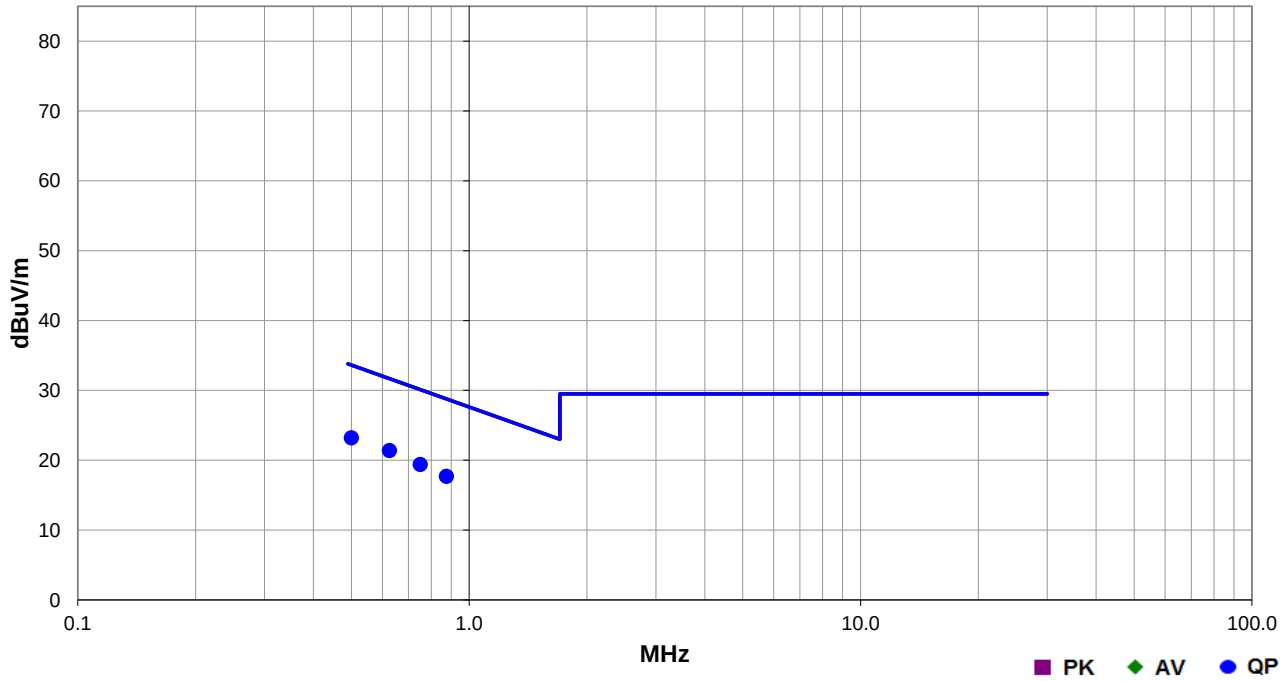
SPURIOUS RADIATED EMISSIONS - FULL BRIDGE, SINGLE CH

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	20.1 °C		
Job Site:	OC08	**Humidity:**	51.6% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1018 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	7				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Full-Bridge: Single Channel PEPS on BCM Pins 05&06				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Bracket antenna mounted on aluminum. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	9	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.625	29.9	10.6	1.0	151.0	10.0	0.0	Perp to EUT	QP	-19.1	21.4	31.7	-10.3	EUT on Side
0.500	31.7	10.6	1.0	329.0	10.0	0.0	Perp to EUT	QP	-19.1	23.2	33.6	-10.4	EUT on Side
0.749	27.9	10.6	1.0	348.0	10.0	0.0	Perp to EUT	QP	-19.1	19.4	30.1	-10.7	EUT on Side
0.875	26.2	10.6	1.0	275.0	10.0	0.0	Perp to EUT	QP	-19.1	17.7	28.8	-11.1	EUT on Side

SPURIOUS RADIATED EMISSIONS - HALF BRIDGE, DUAL CH

PSA-ESCI 2021.01.22.0

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

MODES OF OPERATION

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

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 5

FREQUENCY RANGE INVESTIGATED

Start Frequency	10 kHz	Stop Frequency	30 MHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

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

TEST DESCRIPTION

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

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

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

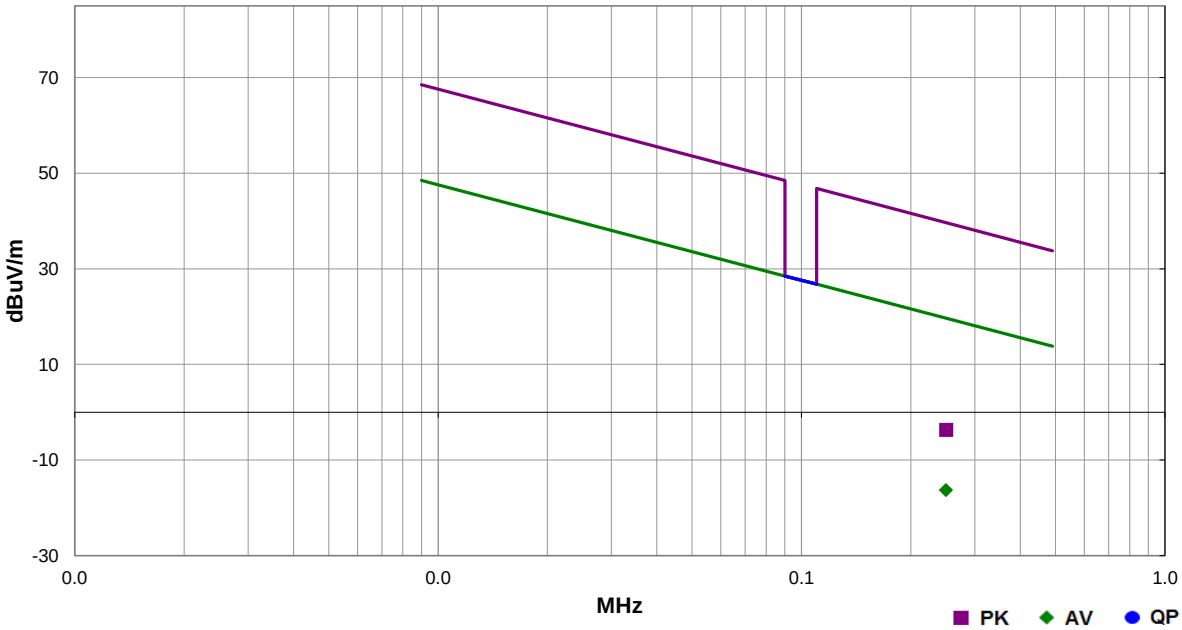
SPURIOUS RADIATED EMISSIONS - HALF BRIDGE, DUAL CH

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	19.1 °C		
Job Site:	OC08	**Humidity:**	52.8% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1019 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	5				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Half Bridge: Dual Channel PEPS on BCM Pins 01&01R and 02&02R.				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket Antenna mounted on steel and Rear Bumper Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT Horz.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	5	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.250	32.2	10.6	1.0	25.0	10.0	0.0	Perp to EUT	AV	-59.1	-16.3	19.7	-36.0	EUT Horz
0.250	44.9	10.5	1.0	25.0	10.0	0.0	Perp to EUT	PK	-59.1	-3.7	39.6	-43.3	EUT Horz

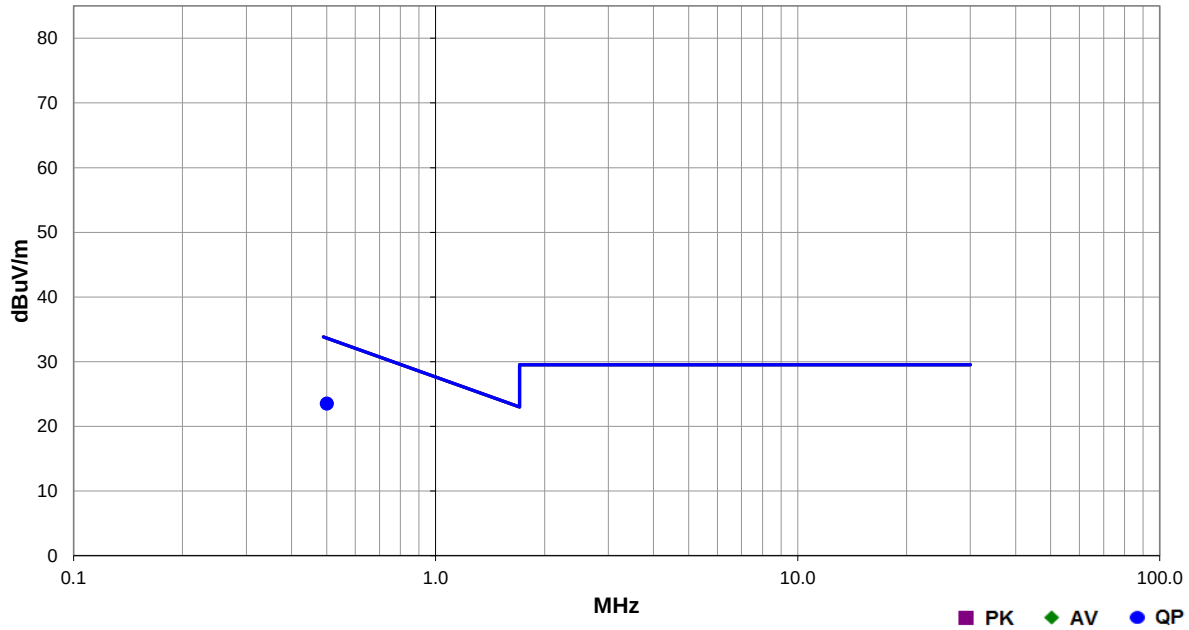
SPURIOUS RADIATED EMISSIONS - HALF BRIDGE, DUAL CH

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	19.1 °C		
Job Site:	OC08	**Humidity:**	52.8% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1019 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	5				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Half Bridge: Dual Channel PEPS on BCM Pins 01&01R and 02&02R.				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case combination of antennas in this operating mode: Bracket Antenna mounted on steel and Rear Bumper Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT Horz.				

Test Specifications	Test Method
FCC 15.209:2021	ANSI C63.10:2013

Run #	6	Test Distance (m)	10	Antenna Height(s)	1 to 4(m)	Results	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.501	32.0	10.6	1.0	288.0	10.0	0.0	Perp to EUT	QP	-19.1	23.5	33.6	-10.1	EUT Horz

SPURIOUS RADIATED EMISSIONS - HALF BRIDGE, SINGLE CH

PSA-ESCI 2021.01.22.0

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

MODES OF OPERATION

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

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 4

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	30 MHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

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

TEST DESCRIPTION

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

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

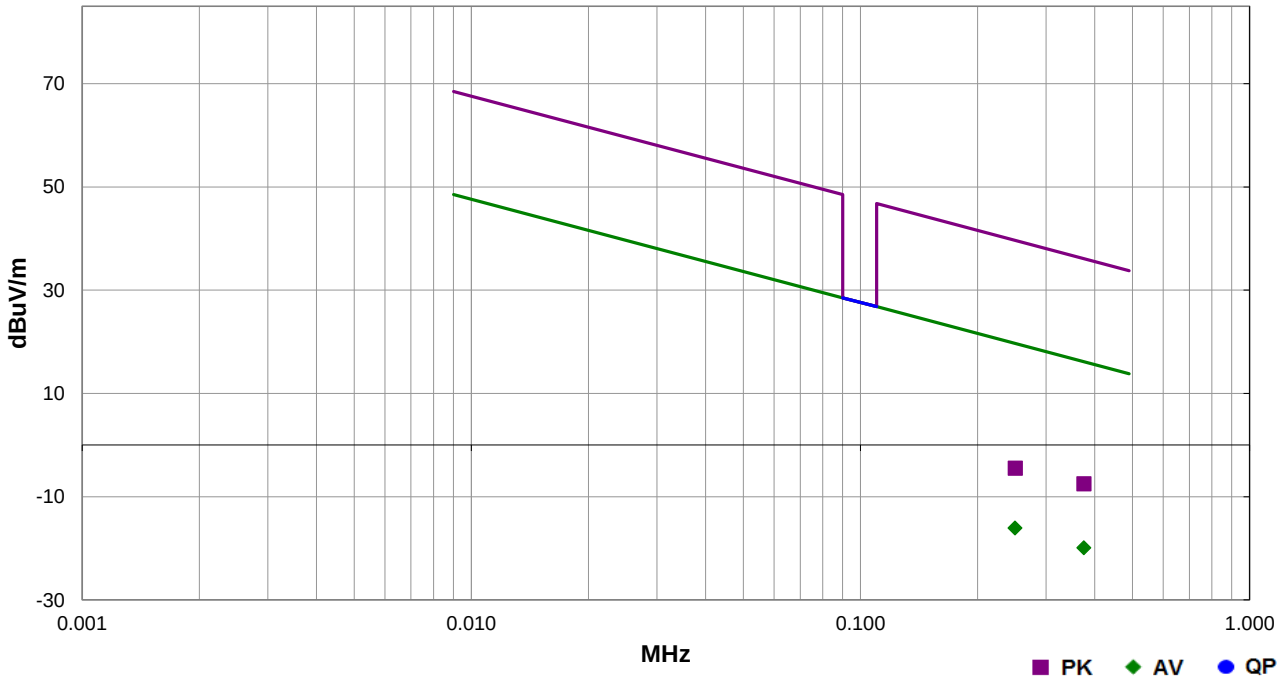
SPURIOUS RADIATED EMISSIONS - HALF BRIDGE, SINGLE CH

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	19.1 °C		
Job Site:	OC08	**Humidity:**	52.8% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1019 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	4				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Half Bridge: Single Channel PEPS on BCM Pins 01&01R.				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Rear Bumper/Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT Horz.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	2	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.250	32.4	10.6	1.0	14.0	10.0	0.0	Perp to EUT	AV	-59.1	-16.10	19.7	-35.8	EUT Horz
0.375	28.8	10.4	1.0	155.0	10.0	0.0	Perp to EUT	AV	-59.1	-19.90	16.1	-36.0	EUT Horz
0.375	41.2	10.4	1.0	155.0	10.0	0.0	Perp to EUT	PK	-59.1	-7.50	36.1	-43.6	EUT Horz
0.250	44.0	10.6	1.0	14.0	10.0	0.0	Perp to EUT	PK	-59.1	-4.50	39.7	-44.2	EUT Horz

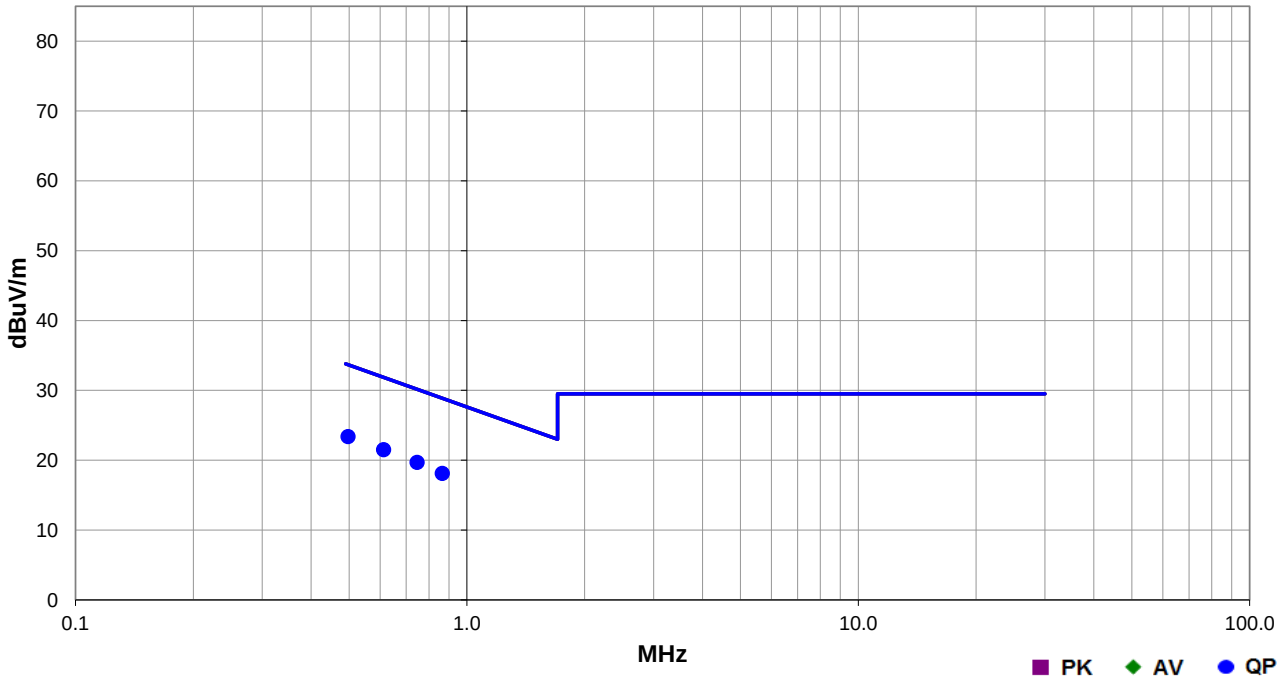
SPURIOUS RADIATED EMISSIONS - HALF BRIDGE, SINGLE CH

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-10		
Project:	None	**Temperature:**	19.1 °C		
Job Site:	OC08	**Humidity:**	52.8% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1019 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	4				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Half Bridge: Single Channel PEPS on BCM Pins 01&01R.				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Rear Bumper/Frunk Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT Horz.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	3	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.497	31.9	10.6	3.43	165.0	10.0	0.0	Perp to EUT	QP	-19.1	23.4	33.7	-10.3	EUT Horz
0.613	30.0	10.6	2.93	248.0	10.0	0.0	Perp to EUT	QP	-19.1	21.5	31.9	-10.4	EUT Horz
0.746	28.2	10.6	1.0	297.0	10.0	0.0	Perp to EUT	QP	-19.1	19.7	30.2	-10.5	EUT Horz
0.865	26.6	10.6	1.0	331.0	10.0	0.0	Perp to EUT	QP	-19.1	18.1	28.9	-10.8	EUT Horz

SPURIOUS RADIATED EMISSIONS - ROUND ROBIN

PSA-ESCI 2021.01.22.0

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MODES OF OPERATION

Transmitting 125 kHz. Round Robin Mode

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ENTI0008 - 13

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	30 MHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

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

MEASUREMENT BANDWIDTHS

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

TEST DESCRIPTION

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

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

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

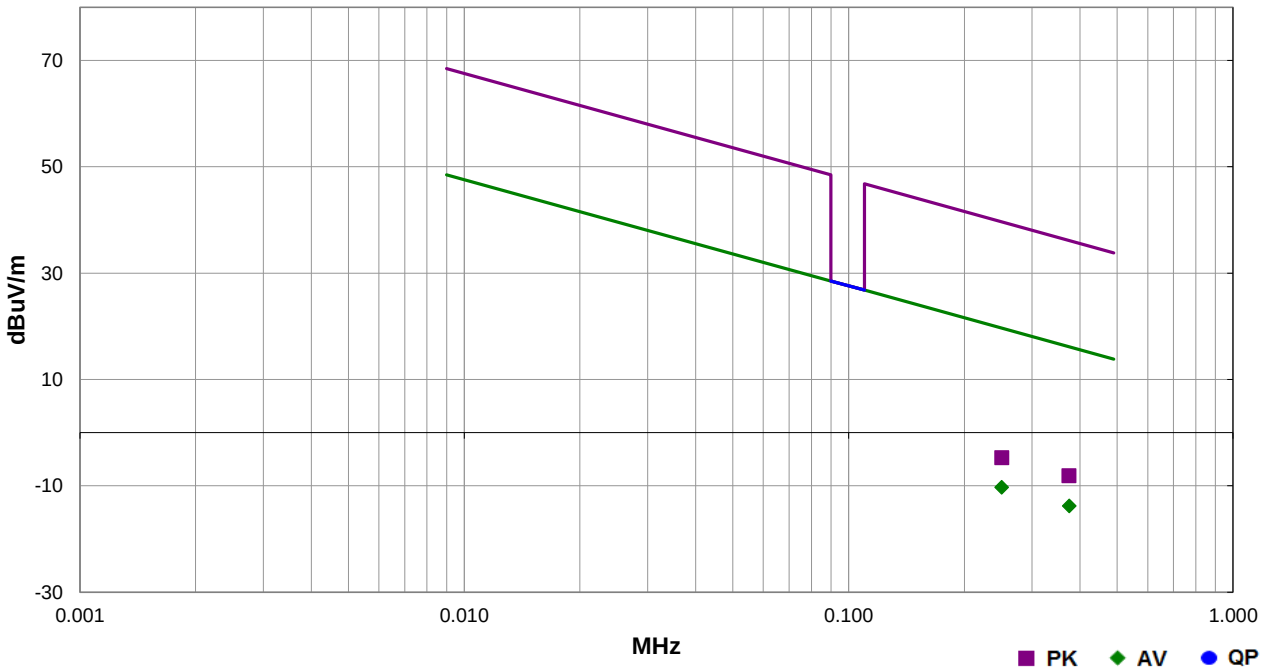
SPURIOUS RADIATED EMISSIONS - ROUND ROBIN

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-12		
Project:	None	**Temperature:**	27.4 °C		
Job Site:	OC08	**Humidity:**	36.4% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1014 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	13				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Round Robin Mode				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Combo Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	27	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.250	38.3	10.5	1.5	0.0	10.0	0.0	Perp to EUT	AV	-59.1	-10.3	19.6	-29.9	EUT on Side
0.375	34.9	10.4	1.0	53.0	10.0	0.0	Perp to EUT	AV	-59.1	-13.8	16.1	-29.9	EUT on Side
0.375	40.6	10.4	1.0	53.0	10.0	0.0	Perp to EUT	PK	-59.1	-8.1	36.1	-44.2	EUT on Side
0.250	43.9	10.5	1.5	0.0	10.0	0.0	Perp to EUT	PK	-59.1	-4.7	39.6	-44.3	EUT on Side

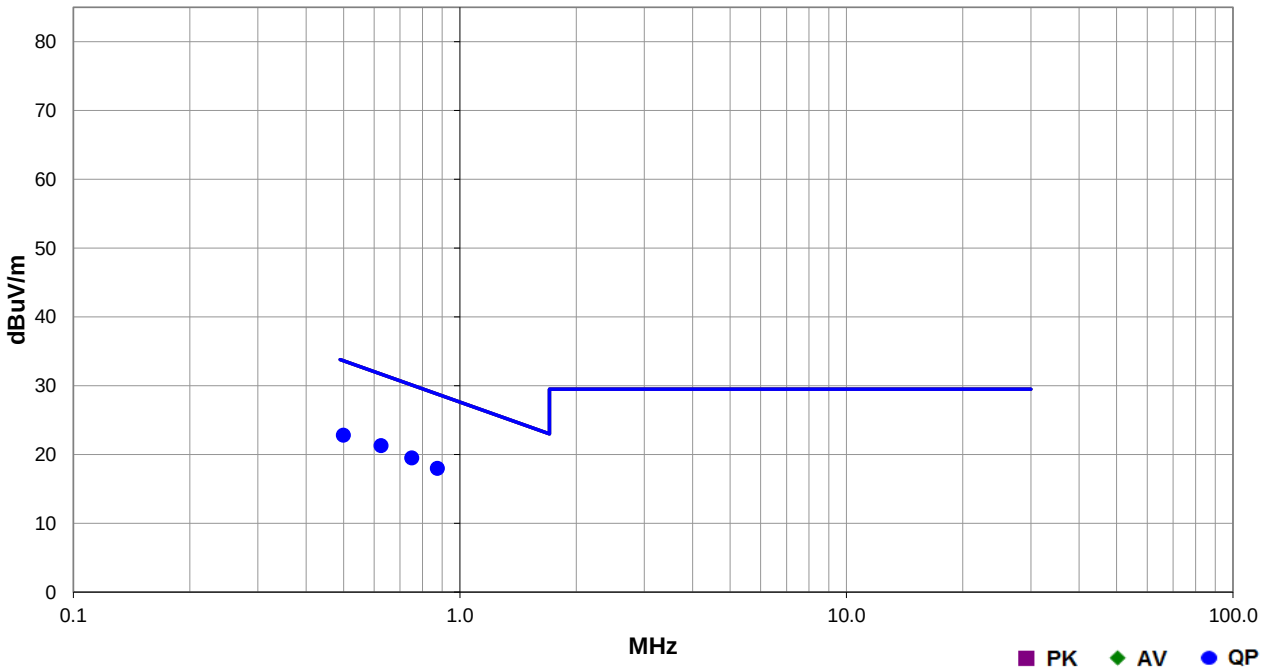
SPURIOUS RADIATED EMISSIONS - ROUND ROBIN

EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	ENTI0008	**Date:**	2021-02-12		
Project:	None	**Temperature:**	27.4 °C		
Job Site:	OC08	**Humidity:**	36.4% RH		
Serial Number:	See Configurations	**Barometric Pres.:**	1014 mbar	**Tested by:**	Mark Baytan
EUT:	BCM Module 125kHz, Model: B1NA5				
Configuration:	13				
Customer:	DENSO International America, Inc.				
Attendees:	None				
EUT Power:	12 VDC				
Operating Mode:	Transmitting 125 kHz. Round Robin Mode				
Deviations:	None				
Comments:	The measurement of the worst case orientation of enclosure and antenna is shown. Worst case antenna in this operating mode: Combo Antenna. Worst case positions from preliminary field strength testing: Rx Ant Perp to EUT, EUT on Side.				

Test Specifications	**Test Method**
FCC 15.209:2021	ANSI C63.10:2013

Run #	28	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.625	29.8	10.6	1.0	330.0	10.0	0.0	Perp to EUT	QP	-19.1	21.3	31.7	-10.4	EUT on Side
0.750	28.0	10.6	1.0	213.0	10.0	0.0	Perp to EUT	QP	-19.1	19.5	30.1	-10.6	EUT on Side
0.500	31.3	10.6	3.72	116.0	10.0	0.0	Perp to EUT	QP	-19.1	22.8	33.6	-10.8	EUT on Side
0.875	26.5	10.6	1.0	330.0	10.0	0.0	Perp to EUT	QP	-19.1	18.0	28.8	-10.8	EUT on Side