ETSI EN 301 893 V2.2.1 (2024-11)

DYNAMIC FREQUENCY SELECTION

TEST REPORT

For

Renesas Design Korea Inc.

7th SiliconPark, 35 Pangyo-ro 255 beon-gil Bundang-gu, Seongnam-si, Gyeonggi-do, 13486 Republic of Korea

Tested Model: RRQ61001-009
Multiple Models: RRQ61001-010

Report Type:	**Product Type:**
Original Report	RRQ61001 Module

Report Number:	2602P42655E-22D
Report Date:	2026/3/11
Reviewed By:	Carlos Wu Project Engineer
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
1.0	2602P42655E-22D	Original Report	2026/3/11

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product Name:	RRQ61001 Module
EUT Model:	RRQ61001-009
Multiple Models:	RRQ61001-010
Model Difference:	Refer to Dos
Rated Input Voltage:	1.8~3.6Vdc (Typical:3.3Vdc)
Serial Number:	3GD9-2
EUT Received Date:	2026/1/20
EUT Received Status:	Good

Technical Specification

Operation Frequency Range (MHz):		802.11 a/n20/ac20/ax20: 5260-5320, 5500-5700
RF Output Power (EIRP) (dBm):		5.3G: 21.356 5.6G: 20.468
Number of Chains	**Transmit:**	1
	Receive:	1
Antenna Gain (dBi)_5.3G▲:		4.4
Antenna Gain (dBi)_5.6G▲:		4.4
Modulation Type:		OFDM, OFDMA

Note:
1.The manufacturer declares that the 802.11 ax HE mode only supports full RU and doesn't support partial RU.
2. The manufacturer declares that the EUT is a secondary device (client device) and without radar detection but with TPC function.

Objective

This report is prepared on behalf of ***Renesas Design Korea Inc.*** in accordance with ETSI EN 301 893 V2.2.1 (2024-11), 5 GHz WAS/RLAN;Harmonised Standard for access to radio spectrum.

The objective is to determine the compliance of EUT with ETSI EN 301 893 V2.2.1 (2024-11) for the following tests:

Dynamic Frequency Selection (DFS)

In order to determine compliance, the manufacturer or a contracted laboratory makes measurements and takes the necessary steps to ensure that the equipment complies with the appropriate technical standards.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in lowering the immunity should be checked to ensure that compliance has been maintained (i.e., harnessing and/or I/O cable change, etc.).

Test Methodology

All measurements contained in this report were conducted with ETSI EN 301 893 V2.2.1 (2024-11).

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China.

Declarations

The information marked ▲ is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

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Each test item follows the test standard(s) without deviation.

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing according to EN 301 893.

EUT Exercise Software

N/A

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Lenovo	Laptop	T430	AA887-03
EROADCOM	Router	AR5344	840112-840112000323

External Cable

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
/	/	/	/	/	/

SUMMARY OF TEST RESULTS

The following result table represents the list of measurements required under the EN 301 893 V2.2.1 (2024-11).

SN	Rules	Items	Description of Test	Result
1	4.2.6.2.2	Channel Availability Check	Initial Channel Availability Check Time	Not Applicable
			Beginning of Channel Availability Check Time	Not Applicable
			End of Channel Availability Check Time	Not Applicable
2	4.2.6.2.3	Off-Channel CAC	Radar Detection Threshold Level	Not Applicable
			Detection Probability	Not Applicable
3	4.2.6.2.4	In service Monitoring		Not Applicable
4	4.2.6.2.5	Channel shutdown	Channel Move Time	Compliant
			Channel Closing Transmission Time	Compliant
5	4.2.6.2.6	Non-occupancy period		Not Applicable
6	4.2.6.2.7	Uniform spreading		Not Applicable
7	Annex D.5	CAC Detection probability		Not Applicable

Note: EUT is a secondary device (client device) without radar detection.

APPLICABLE STANDARDS

DFS Requirement

ETSI EN 301 893 V2.2.1 (2024-11) §4.2.6; Annex D

Table 5 lists the DFS related technical requirements and their applicability for every operational mode. If the RLAN device is capable of operating in more than one operational mode then every operating mode shall be assessed separately.

Table 5: Applicability of DFS requirements

Requirement	DFS operational mode		
	Primary device	Secondary device without radar detection (see table D.2, note 2)	Secondary device with radar detection (see table D.2, note 2)
CAC	Required	Not required	Required (see note 2)
Off-channel CAC (see note 1)	Required	Not required	Required (see note 2)
In-service monitoring	Required	Not required	Required
Channel shutdown	Required	Required	Required
Non-occupancy period	Required	Not required	Required
Uniform spreading	Required	Not required	Not required

NOTE 1: If implemented.

NOTE 2: A secondary device with radar detection is not required to perform a CAC or off-channel CAC at initial use of a channel but only before returning to the use of a channel where it has detected a radar signal by in-service monitoring. Where the secondary device with radar detection is under the control of its primary device and does not start transmissions on the channel until connected to that primary device, then the secondary device with radar detection does not have to perform a CAC or off-channel CAC and may rely on the CAC performed by the primary device to enable in-service monitoring.

Channel Availability Check (CAC)

Definition

Channel Availability Check (CAC) is the process by which an RLAN device checks channels for the presence of radar signals. This process is used for identifying available and unavailable channels.

Limits

A CAC shall be performed during a continuous period in time (CAC time) which shall not be less than the value given in table D.1.

A CAC may be performed over a wider bandwidth than the nominal channel bandwidth. In this case, any channel whose nominal channel bandwidth falls completely within the bandwidth over which the CAC was performed becomes an available channel providing no radar was detected on that channel.

There shall be no transmissions by the RLAN device on the channels being checked during this process except by a secondary device in order to conform to the requirements specified in clause 4.2.6.1.4.2, point c).

During a CAC, the RLAN device shall be capable of detecting any of the radar test signals that fall within the ranges given by table D.4 with a level above the radar detection threshold defined in table D.2.

The RLAN device shall conform to the minimum detection probability as defined in table D.5.

Off-channel CAC

Definition

Off-channel CAC is an optional process by which an RLAN device operating within sub-band 1, sub-band 2, or sub-band 3 monitors channel(s), different from the operating channel(s), for the presence of radar signals.

Limits
Off-channel CAC may be used in addition to CAC as specified in clause 4.2.6.2.2 for identifying available channels.
An off-channel CAC may be performed by a number of non-continuous checks spread over a period in time. This period, which is required to determine the presence of radar signals, is the off-channel CAC time.
If implemented, the off-channel CAC time shall be noted in the test report. However, the off-channel CAC time shall be within the range specified in table D.1.
During an off-channel CAC, the RLAN device shall be capable of detecting any of the radar test signals that fall within the ranges given by table D.4 with a level above the radar detection threshold defined in table D.2.
The RLAN device shall conform to the minimum detection probability as defined in table D.5.

In-service monitoring

Definition
In-service monitoring is the process by which an RLAN device monitors each operating channel for the presence of radar signals.

Limits
In-service monitoring shall be used to monitor each operating channel.
In-service monitoring shall start immediately after the RLAN device has started transmissions on a channel.
During in-service monitoring, the RLAN device shall be capable of detecting any of the radar test signals that fall within the ranges given by table D.4 with a level above the radar detection threshold defined in table D.2.
The RLAN device shall conform to the minimum detection probability associated with a given radar test signal as defined in table D.5.

Channel shutdown

Definition
Channel shutdown is the process initiated by the RLAN device on an operating channel after a radar signal has been detected during in-service monitoring.

Limits
Radar signals can be detected by a primary device or by a secondary device with radar detection. If a radar signal was detected by a secondary device with radar detection, this secondary device shall inform its primary device that it has detected a radar.
The primary device shall instruct all associated secondary devices to stop transmitting on this operating channel, which they shall do within the channel move time. The primary device shall also stop its own transmissions on that operating channel within the channel move time.
The aggregate duration of all transmissions of the RLAN device on this channel during the channel move time shall be limited to the channel closing transmission time. The aggregate duration of all transmissions shall not include quiet periods in between transmissions.
For equipment having simultaneous transmissions on multiple (adjacent or non-adjacent) operating channels, only the channel(s) containing the frequency on which radar was detected is subject to the channel shutdown requirement. The equipment is allowed to continue transmissions on other operating channels.
The channel move time shall not exceed the limit given in table D.1.
The channel closing transmission time shall not exceed the limit given in table D.1.

Non-occupancy period

Definition
The non-occupancy period is the time during which the RLAN device does not transmit on a channel after a radar signal was detected on that channel.

Limits

During the non-occupancy period the RLAN device shall not make any transmissions on a channel once radar has been detected.
For equipment having simultaneous transmissions on multiple (adjacent or non-adjacent) operating channels, only the channel(s) containing the frequency on which radar was detected is (are) subject to the non-occupancy period requirement. The equipment is allowed to continue transmissions on other operating channels.
Before the RLAN device may transmit on a channel after the non-occupancy period ended, the channel shall be again identified as an available channel.
The non-occupancy period shall not be less than the value defined in table D.1.

Uniform spreading

Definition

Uniform spreading is a mechanism used to provide, on aggregate, a uniform loading of the spectrum across all devices.
The spreading can be achieved by various means. These means include network management functions controlling large numbers of RLAN devices as well as the channel selection function in an individual RLAN device.

Limits

Uniform spreading is only required in sub-band 2 and in sub-band 3. It is further limited to the usable channels within these frequency bands as specified as part of the channel plan.
Each of the channel plans shall make use of at least 60 % of the spectrum available in sub-band 2 and in sub-band 3.
Usable channels shall not be included in uniform spreading if they are precluded by either:
1) the intended outdoor usage of the RLAN device; or
2) previous detection of a radar on the channel (unavailable channel); or
3) national frequency usage conditions.
Each of the usable channels as defined above shall be used with approximately equal probability. Equipment for which the channel plan includes channels whose nominal channel bandwidth falls completely or partly within the band 5 600 MHz to 5 650 MHz may omit these channels from the list of usable channels at initial power up or at initial installation. Channels being used by other equipment may be omitted from the list of usable channels.

ETSI EN 301 893 V2.2.1 (2024-11) Annex D

Table D.1 to table D.5 contain the values and limits for the DFS specific parameters referred to in clause 4.2.6 and clause 5.4.8.
Figure D.1 shows a single burst for a radar test signal using a constant Pulse Repetition Frequency (PRF) which is representative for radar test signal 1 to radar test signal 4 from table D.4. Figure D.2 shows multiple bursts of these same test signals.
Figure D.3 shows a single burst of a pulse-based staggered PRF radar test signal. Figure D.4 shows a single burst of a packet-based staggered PRF radar test signal which is representative for radar test signal 5 and radar test signal 6 from table D.4. Figure D.5 shows multiple bursts of these same test signals.

Table D.1: DFS requirement values

Parameter	Value
Channel Availability Check (CAC) time	60 s (see note 1)
Minimum off-channel CAC time	6 minutes (see note 2)
Maximum off-channel CAC time	4 hours (see note 2)
Channel move time	10 s
Channel closing transmission time	1 s
Non-occupancy period	30 minutes
NOTE 1: For channels whose nominal channel bandwidth falls completely or partly within the band 5 600 MHz to 5 650 MHz, the CAC time shall be 10 minutes. NOTE 2: For channels whose nominal channel bandwidth falls completely or partly within the band 5 600 MHz to 5 650 MHz, the off-channel CAC time shall be within the range 1 hour to 24 hours.	

Table D.2: Radar detection threshold

Power Spectral Density (PSD) (dBm/MHz)	Radar detection threshold (dBm) (see note 1 and note 2)
10	-62
NOTE 1: This is the level at the input of the receiver of an RLAN device with a maximum PSD of 10 dBm/MHz and assuming a 0 dBi receive antenna. For devices employing a different PSD and/or a different receive antenna assembly gain G (dBi), the radar detection threshold at the receiver input follows the following relationship: radar detection threshold (dBm) = -62 + 10 - PSD (dBm/MHz) + G (dBi). However, the radar detection threshold shall not be less than -64 dBm assuming a 0 dBi receive antenna gain. NOTE 2: Secondary devices with a maximum RF output power of less than or equal to 23 dBm EIRP do not have to implement radar detection unless these devices are used in fixed outdoor point-to-point or fixed outdoor point-to-multipoint applications (see clause 4.2.6.1.3).	

Table D.3: Parameters of the reference DFS test signal

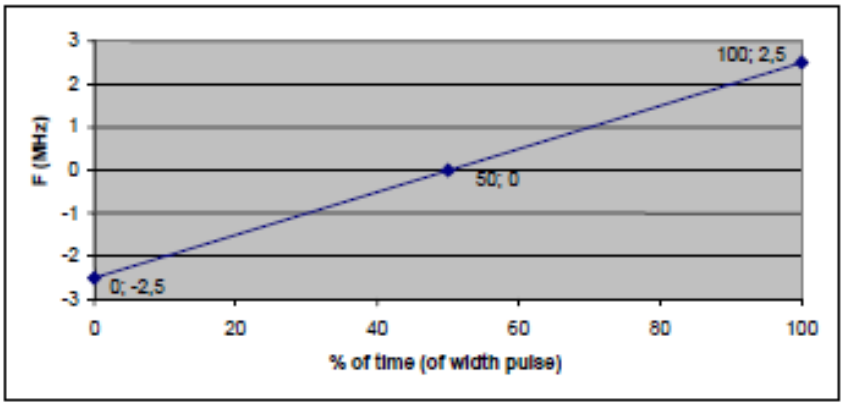
Pulse width W (µs)	PRF (PPS)	Pulses Per Burst (PPB)
1	700	18

Table D.4: Parameters of radar test signals

Radar test signal (see note 1 to note 3)	Pulse width W (µs)		PRF (PPS)		Number of different PRFs	PPB for each PRF (see note 5)
	Min	Max	Min	Max		
1	0,5	5	200	1 000	1	10 (see note 6)
2	0,5	15	200	1 600	1	15 (see note 6)
3	0,5	15	2 300	4 000	1	25
4	20	30	2 000	4 000	1	20
5	0,5	2	300	400	2/3	10 (see note 6)
6	0,5	2	400	1 200	2/3	15 (see note 6)

NOTE 1: Radar test signal 1 to signal 4 are signals with constant PRF (see figure D.1). These radar test signals are intended to simulate also radars using a packet-based staggered PRF (see figure D.2).

NOTE 2: Radar test signal 4 is a modulated radar test signal. The modulation is a chirp modulation with a ±2,5 MHz frequency deviation as shown in the following graph.



NOTE 3: Radar test signal 5 and radar test signal 6 are signals with single pulse-based staggered PRF using 2 or 3 different PRF values. For radar test signal 5, the difference between the PRF values chosen shall be between 20 PPS and 50 PPS. For radar test signal 6, the difference between the PRF values chosen shall be between 80 PPS and 400 PPS (see figure D.3).

NOTE 4: Apart from off-channel CAC testing, the radar test signals shall only contain a single burst of pulses (see figure D.1, figure D.3 and figure D.4).
For off-channel CAC testing, repetitive bursts shall be used for the total duration of the test (see figure D.2 and figure D.5 (see also clause 4.2.6.2.3, clause 5.4.8.2.1.4.2 and clause 5.4.8.2.1.4.3)).

NOTE 5: The total number of pulses in a burst is equal to the number of pulses for a single PRF multiplied by the number of different PRFs used.

NOTE 6: For the CAC and off-channel CAC requirements, the minimum number of pulses (for each PRF) for any of the radar test signals to be detected in the band 5 600 MHz to 5 650 MHz shall be 18.

Table D.5: Detection probability

Parameter	Detection probability (P_d) (see note)	
	Channels whose nominal channel bandwidth falls partly or completely within the 5 600 MHz to 5 650 MHz band	Other channels
CAC, off-channel CAC	99,99 %	60 %
In-service monitoring	60 %	60 %

NOTE: P_d gives the probability of detection per radar test signal and represents a minimum level of detection performance under defined conditions.

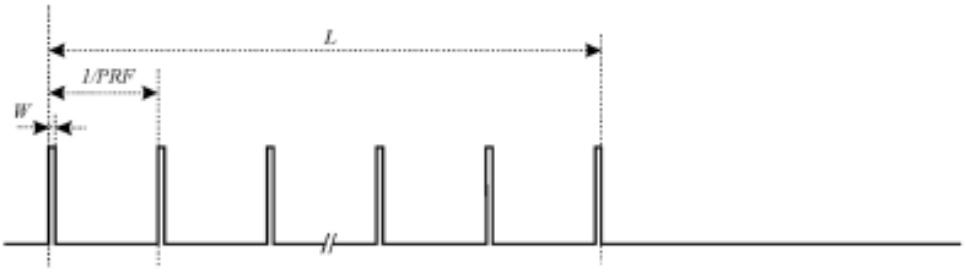


Figure D.1: General structure of a single-burst radar test signal with constant PRF

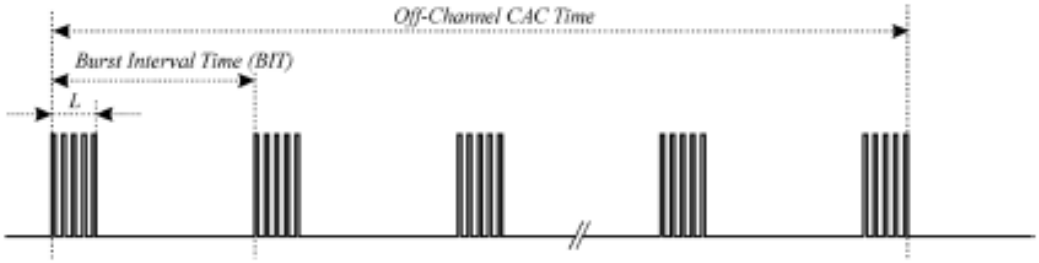


Figure D.2: General structure of a multi-burst radar test signal with constant PRF

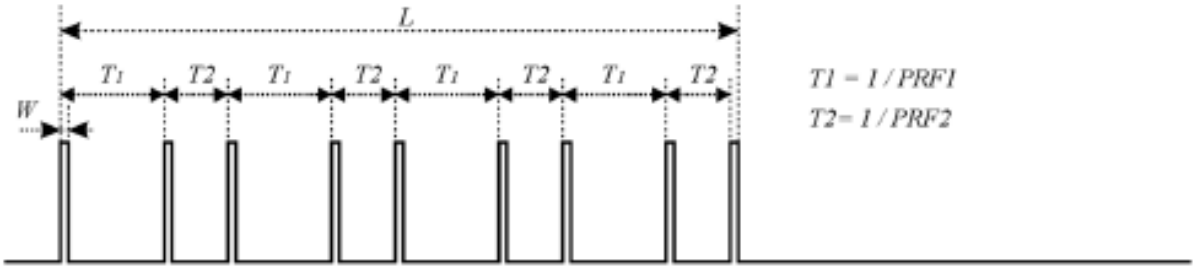


Figure D.3: General structure of a single-burst radar test signal with single pulse-based staggered PRF

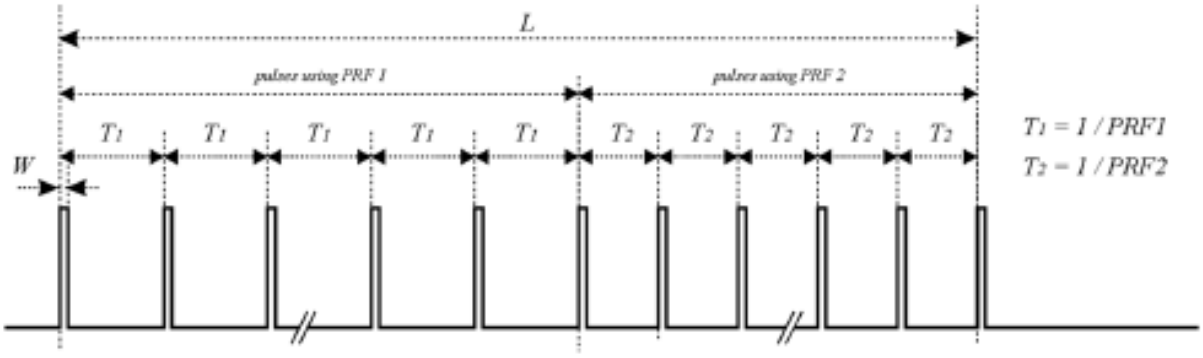


Figure D.4: General structure of a single-burst radar test signal with packet-based staggered PRF

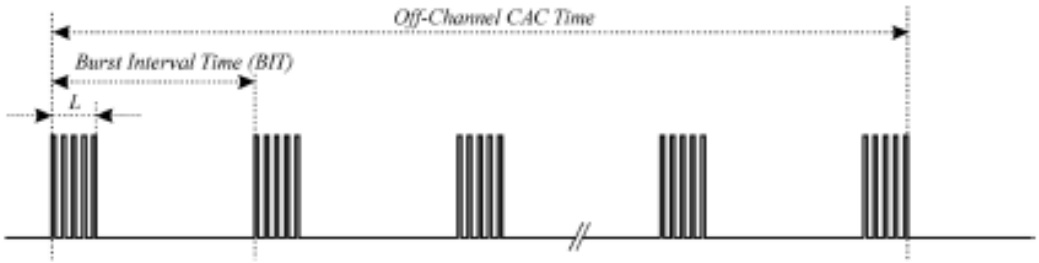
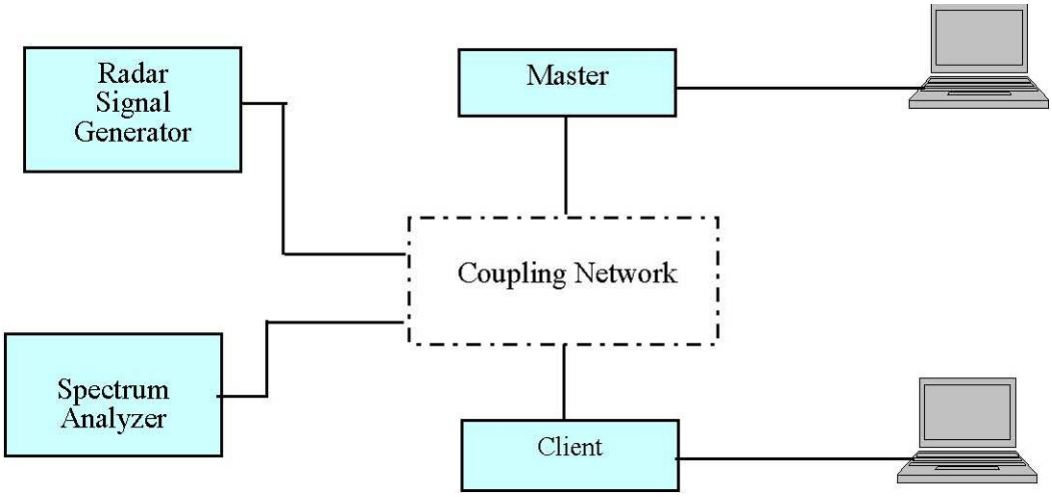


Figure D.5: General structure of a multi-burst radar test signal with packet-based staggered PRF

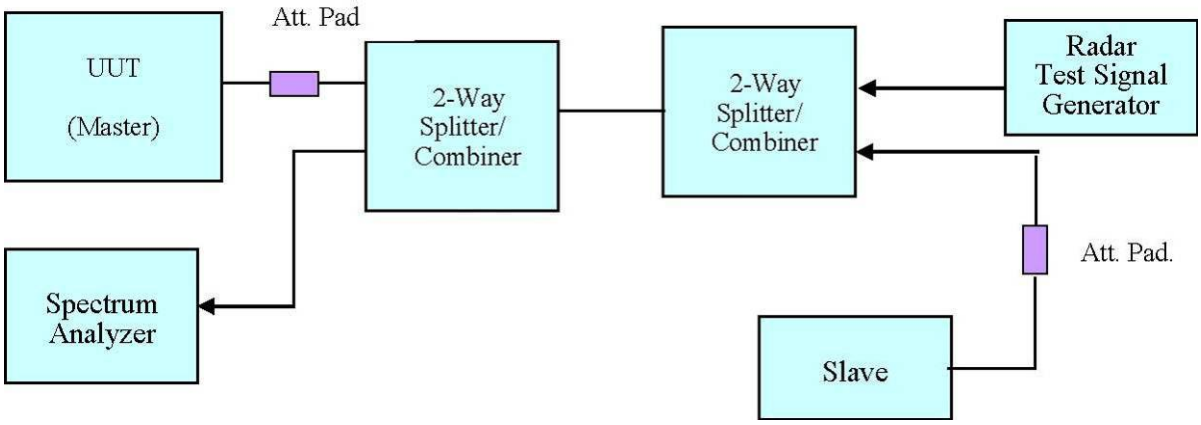
DFS MEASUREMENT SYSTEM

BACL DFS measurement system consists of two subsystems: (1) The radar signal generating subsystem and (2) the traffic monitoring subsystem.

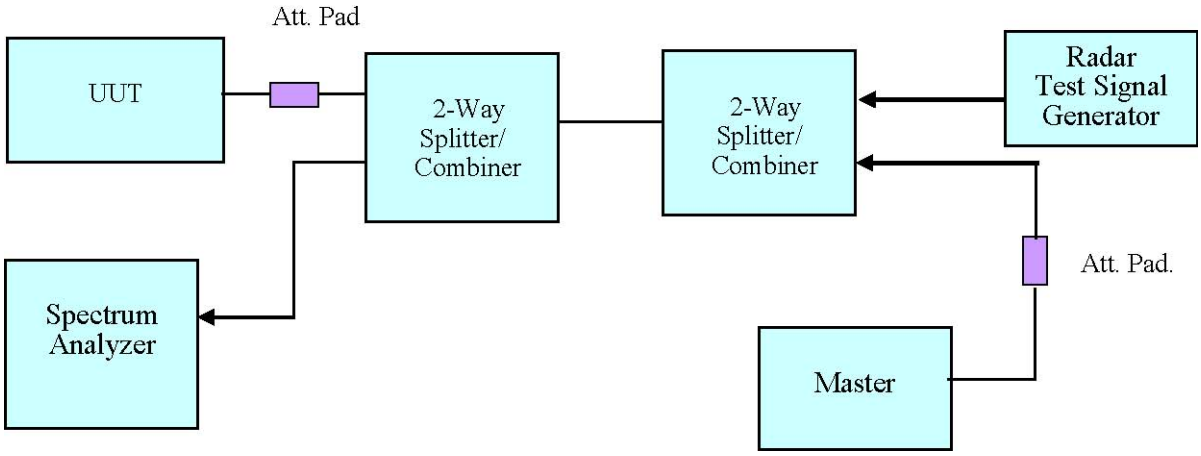
System Block Diagram



Conducted Method

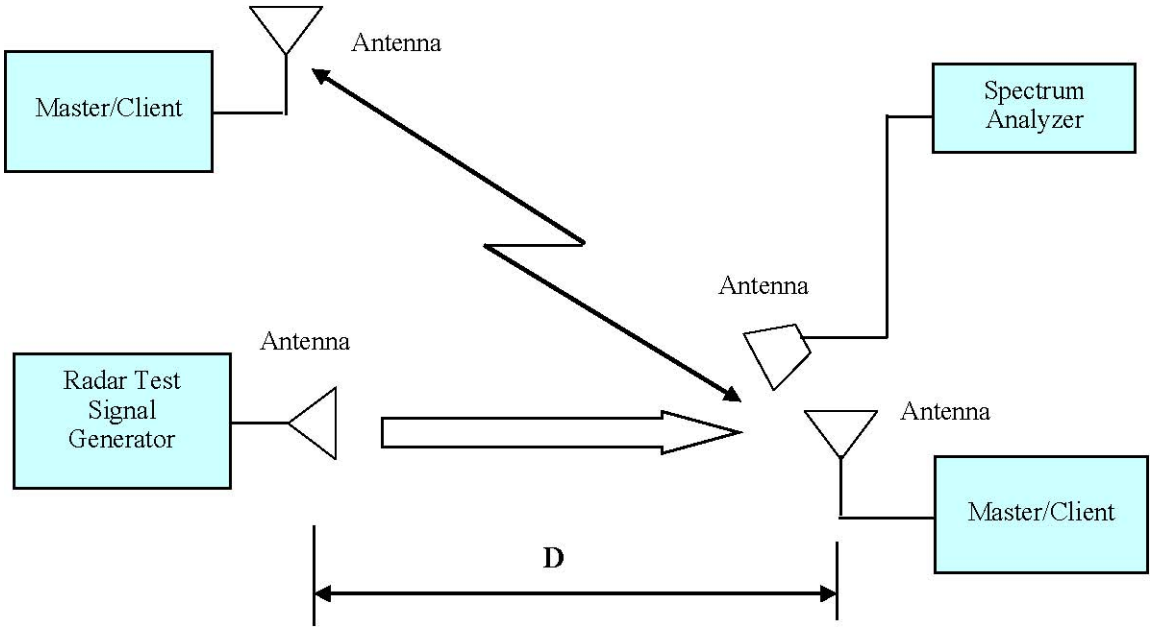


Setup for Master with injection at the Master



Setup for Client with injection at the Master

Radiated Method



Setup for Radiated Method

Test Procedure

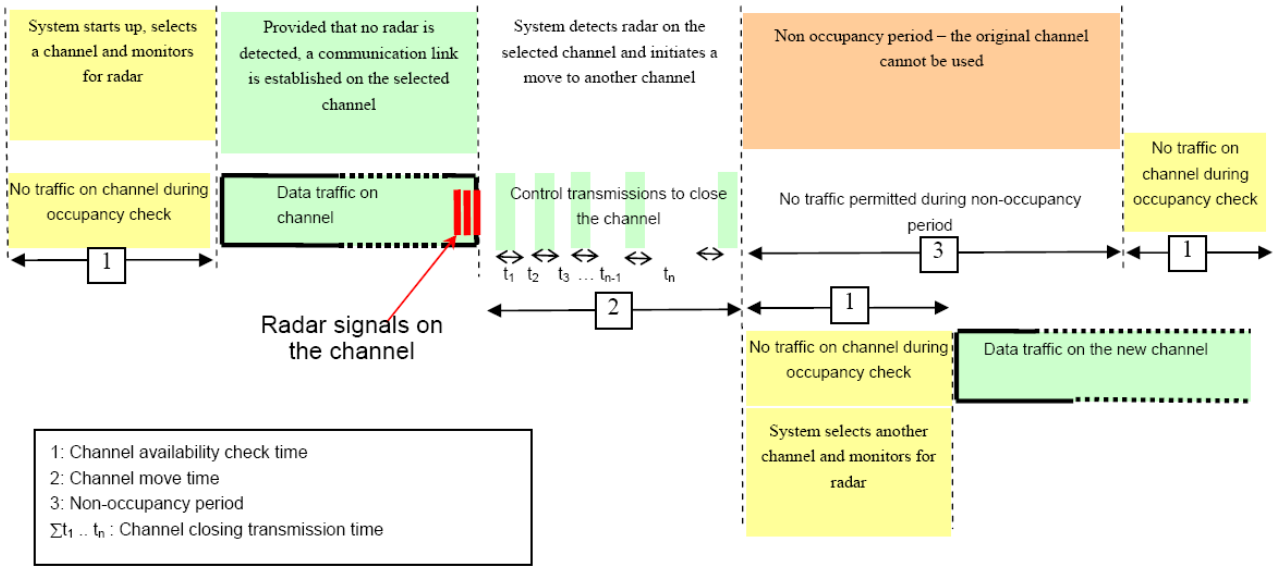
A spectrum analyzer is used as a monitor verifies that the EUT status including Channel Closing Transmission Time and Channel Move Time.

Test method

- ☒ Conducted with connector on UUT
- ☐ Radiated
- ☐ Test fixture relative
- ☐ Test fixture normalized
- ☐ Test fixture level independent

DFS Implementation

Please refer to the block diagram:



TEST RESULTS

Description of EUT

The EUT operates in 5250-5350MHz, and 5470-5725MHz range when performing DFS testing.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Keysight	MXA Signal Analyzer	N9020A	MY48490106	2025/7/29	2026/7/28
Agilent	MXG Vector Signal Generator	N5182A	MY49060274	2025/7/29	2026/7/28
Tonscend	RF Control Unit	JS0806-2	19G8060171	2025/7/29	2026/7/28
Eastsheep	Coaxial Attenuator	2W-SMA-JK-6G-10dB	F-08-EM509	2025/6/6	2026/6/5
Eastsheep	Coaxial Attenuator	2W-SMA-JK-6G-10dB	F-08-EM510	2025/6/6	2026/6/5
Eastsheep	Coaxial Attenuator	2W-SMA-JK-6G-10dB	F-08-EM505	2025/6/6	2026/6/5
HUBER+SUHNER	Coaxial Attenuator	6610_SMA-50-1	0064	2025/6/6	2026/6/5

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Environmental Conditions

Temperature:	25.8℃
Relative Humidity:	41%
ATM Pressure:	101.5kPa
Tester:	Harper Shen
Test Date:	2026/1/29

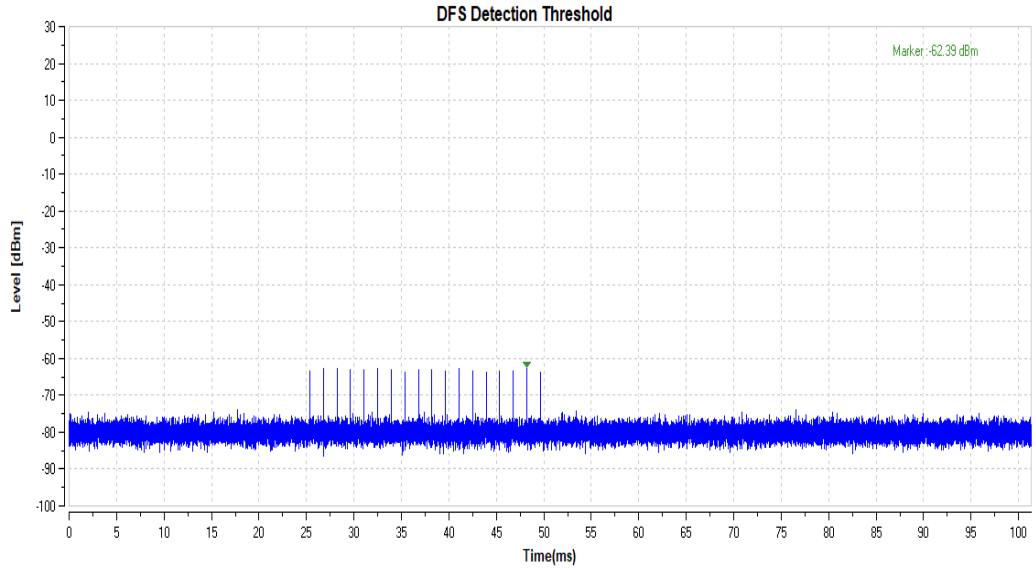
DFS Detection Thresholds

Test Result

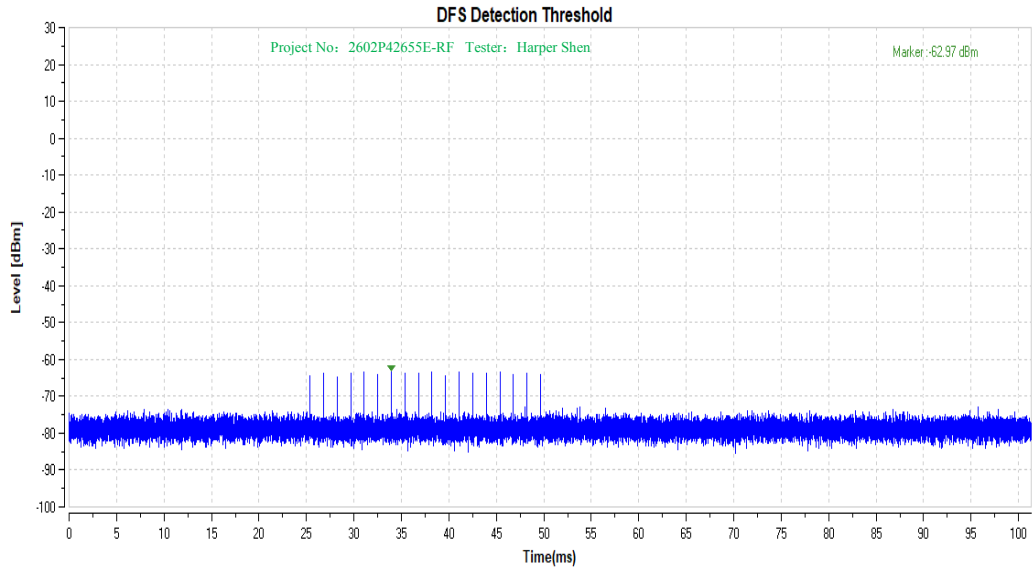
Test Mode	Frequency[MHz]	Radar Type	Result[dBm]
20M	5320	Reference	-62.39
	5500	Reference	-62.97

Plots of Radar Waveforms

20M_5320_Reference



20M_5500_Reference



Channel Move Time and Channel Closing Transmission Time

Test Procedure:

Perform radar at a level of 10 dB above the level defined in clause 5.4.8.2.1 on the selected channel.

The aggregate channel closing transmission time is calculated as follows:

Aggregate Transmission Time = N * Dwell Time

N is the number of spectrum analyzer bins showing a device transmission
Dwell Time is the dwell time per bin (i.e. Dwell Time = S/B, S is the sweep time and B is the number of bin, i.e. 8192)

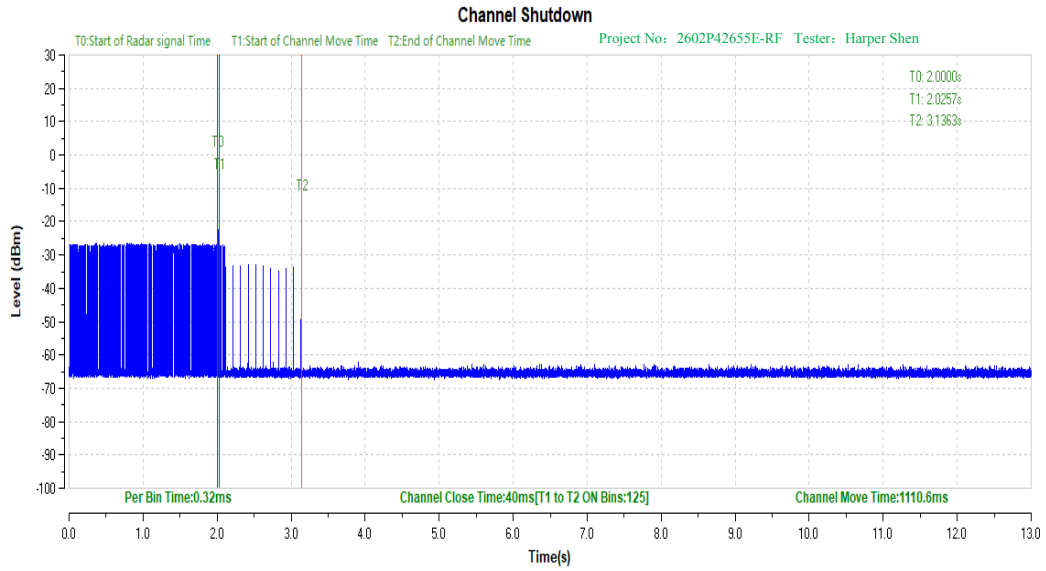
Results:

Test Mode	Frequency[MHz]	CCTT[ms]	Limit[ms]	CMT[ms]	Limit[ms]	Verdict
11AC20SISO	5320	40	1000	1110.6	10000	PASS
	5500	33.6	1000	1111.9	10000	PASS

Please refer to the following tables and plots.

Test Graphs

11AC20SISO_5320



11AC20SISO_5500

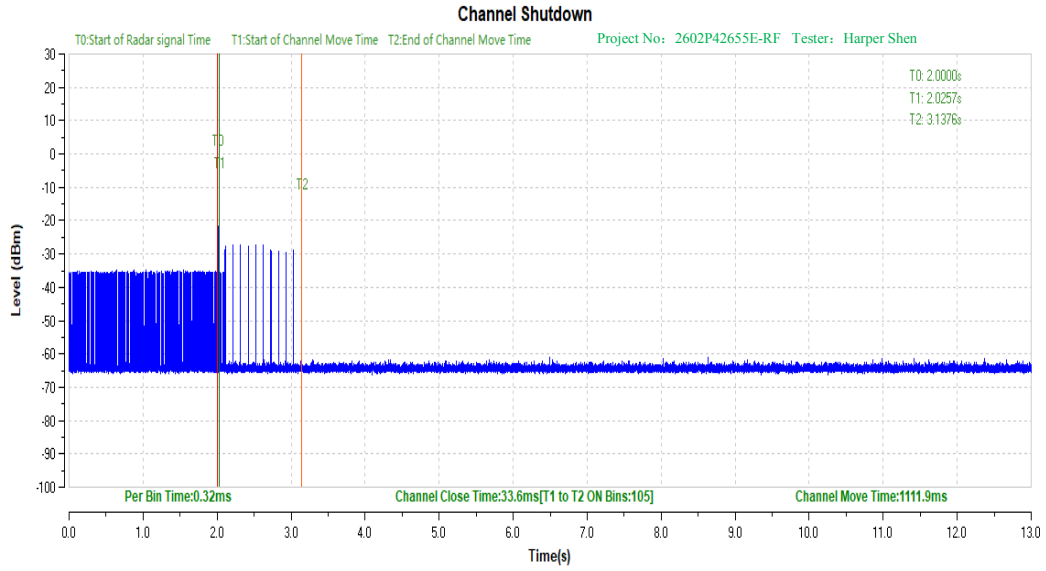
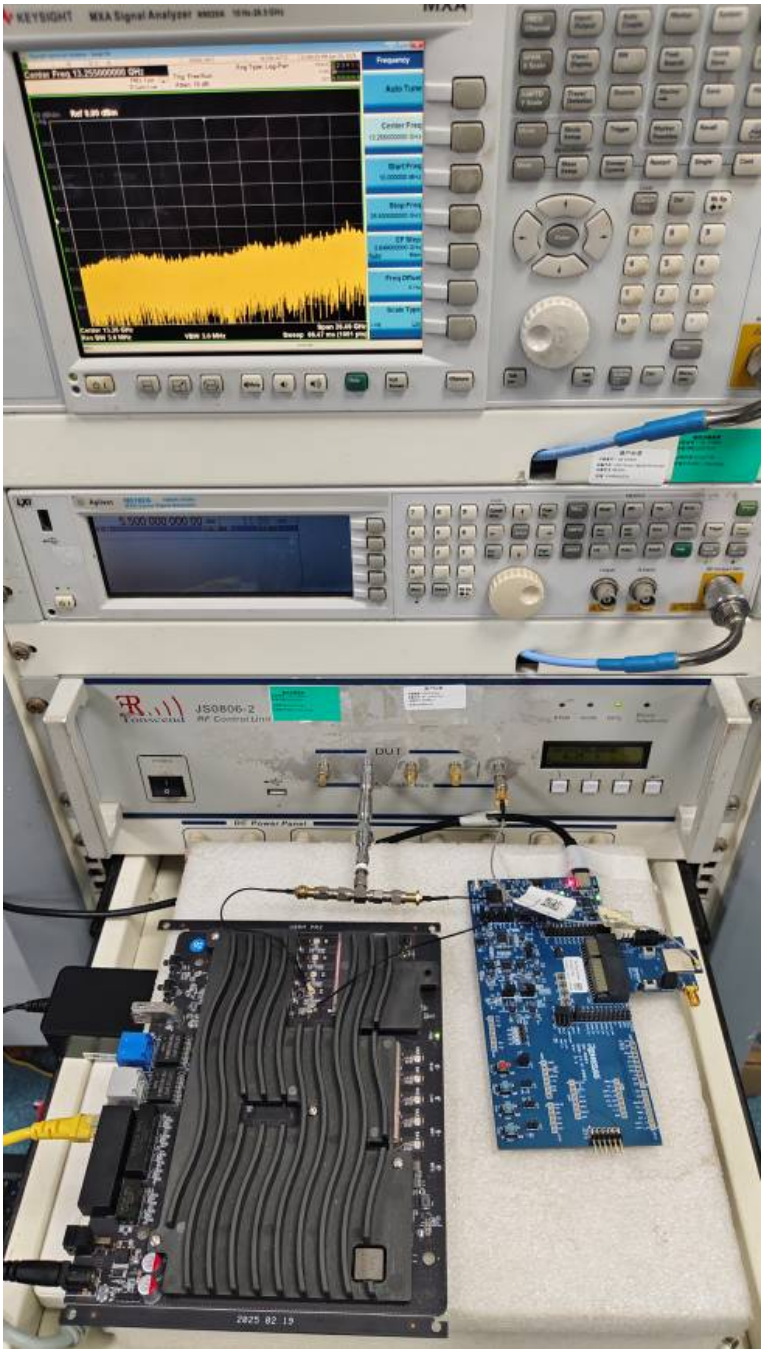


EXHIBIT A - EUT PHOTOGRAPHS

For photos in this section, please refer to report No.: 2602P42655E-22A.

EXHIBIT B - SETUP PHOTOGRAPH



DECLARATION OF SIMILARITY LETTER

Renesas Design Korea Inc.
Add: 7th SiliconPark, 35 Pangyo-ro 255 beon-gil Bundang-gu, Seongnam-si, Gyeonggi-do, 13486 Republic of Korea
Tel: + 82-2-567-1903
Email: kn.kim.pv@renesas.com

DECLARATION OF SIMILARITY

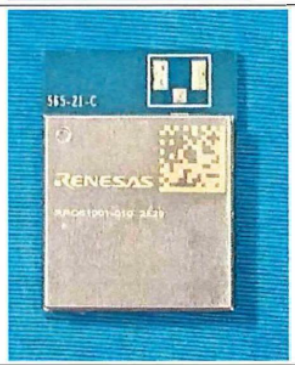
Date: 2026-01-19

To whom it may concern

Dear Sir or Madam:

We, Renesas Design Korea Inc., hereby declare that the product, named RRQ61001 Module, model RRQ61001-010 is electrically similar with the model RRQ61001-009 which was tested by Bay Area Compliance Laboratories Corp.(Dongguan).

The differences between those models and that are declared similar are as follows:

Model	Difference		Other
RRQ61001-009		With external antenna port	Only the different model name and with or without external antenna port. The software is same.
RRQ61001-010		Without external antenna port	

Please contact me should there be need for any additional clarification or information.

Best Regards,

Signature:
Printed Name: Kui Nam Kim
Title: Vice President

******END OF REPORT******