TEST REPORT

Test Report No. : UL-RPT-RP15107067-1616A

Manufacturer	:	SECO S.p.A.
Model Name / HMN	:	KIOSK-HEAD27"
Contains FCC ID	:	2ALZB-AS2DTGM
Contains IC	:	22688-AS2DTGM
Technology	:	WLAN 802.11 (a/n/ac/ax)
Test Standard(s)	:	FCC Part 15.407(h)(2)(iii) & (h)(2)(iv) ISED Canada RSS-247 6.3.2(c), 6.3.2(d) & 6.3.2(e)

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2. The results in this report apply only to the sample(s) tested.
3. The sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 2.0 supersedes all previous versions.

Date of Issue: 18 December 2024

Checked by:

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Report Revision History

Version Number	Issue Date	Revision Details	Revised By
1.0	16/12/2024	Initial Version	Ben Mercer
2.0	18/12/2024	Corrected HMN	Ben Mercer

Table of Contents

1 Attestation of Test Results

1.1 Description of EUT

The equipment under test was a HMI touchscreen containing a 2.4 GHz WLAN / 5 GHz WLAN / *Bluetooth* module (FCC ID: 2ALZB-AS2DTGM & IC: 22688-AS2DTGM) and an NFC / *Bluetooth* LE module (FCC ID: 2ARDN0615D & IC: 24364-0615D).

1.2 General Information

Specification Reference:	47CFR15.407
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart E (Unlicensed National Information Infrastructure Devices) - Section 15.407
Specification Reference:	RSS-247 Issue 3 August 2023
Specification Title:	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
Site Registration:	FCC: 685609, ISEDC: 20903
FCC Lab. Designation No.:	UK2011
ISEDC CABID:	UK0001
Location of Testing:	Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Date:	15 April 2024

1.3 Summary of Test Results

FCC Reference (47CFR)	ISED Canada Reference	Measurement	Note	Result
Part 15.407(h)(2)(iii)	RSS-247 6.3.2(c) & 6.3.2(d)	Channel Closing Transmission Time and Channel Move Time	-	✓
Part 15.407(h)(2)(iv)	RSS-247 6.3.2(e)	Non-Occupancy Period	2	✓

Key to Results

✓ = Complied ✗ = Did not comply

Note(s):

1. The manufacturer confirms that the information regarding the parameters of the radar waveforms is not available to the end user.
2. This test is not required for a client without radar detection according to Tables 1 and 2 of KDB 905462 D02, however it was performed to show compliance with KDB 905462 D02 5.1.2 e) and KDB 905462 D03, section (b)(5) and (b)(6).

1.4 Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

2 Summary of Testing

2.1 Facilities and Accreditation

The test site and measurement facilities used to collect data are located at Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom.

UL International (UK) Ltd is accredited by United Kingdom Accreditation Service (UKAS). UKAS is one of the signatories to the International Laboratory Accreditation Co-operation (ILAC) Arrangement for the mutual recognition of test reports. The tests reported herein have been performed in accordance with its terms of accreditation

2.2 Methods and Procedures

Reference:	FCC KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02 (April 08, 2016)
Title:	Compliance Measurement Procedures for Unlicensed-National Information Infrastructure Devices Operating in the 5250-5350 MHz and 5470-5725 MHz Bands Incorporating Dynamic Frequency Selection

2.3 Calibration and Uncertainty

Measuring Instrument Calibration

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

Measurement Uncertainty & Decision Rule

Overview

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

Decision Rule

Measurement system instrumentation shall be used with an accuracy specification meeting the accuracy specification limits according to IEC/IECEE OD-5014.

As applicable, unless specified otherwise in this report, the compliance “Decision Rule” is based on Simple Acceptance. If the measured value is on the limit, the result is defined as a pass. In this case the risk of a false positive is 50%. For further information regarding risk assessment refer to ILAC G8:09/2019.

Measurement Uncertainty

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Confidence Level (%)	Calculated Uncertainty
DFS Channel Shutdown Timing	95%	±0.45 ms
DFS Non-Occupancy Timing	95%	±79.25 ms
DFS Radar Amplitude	95%	±2.17 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

2.4 Test and Measurement Equipment

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2001	Thermohygrometer	Testo	608-H1	45041824	27 Dec 2024	12
M1883	Signal Analyser	Rohde & Schwarz	FSV30	103084	21 Aug 2024	12
G0615	Vector Signal Generator	Rohde & Schwarz	SMBV100A	260473	30 Jan 2026	36
A248	Step Attenuator	Narda	743-60	01411	Calibrated before use	-
A1065	Step Attenuator	Hewlett Packard	8494B	3308A38165	Calibrated before use	-
A1536	Step Attenuator	Hewlett Packard	8494B & 8496B	3308A30801 & 3308A19649	Calibrated before use	-
A212636	Power Splitter	Mini-Circuits	MCS-PWD-2W-2G-18G-10W-Sf	000078	Calibrated before use	-
A215492	Power Splitter	Mini-Circuits	AAMCS-PWD-2W-2G-18G-10W-Sf	000080	Calibrated before use	-
A242135	Power Splitter	Mini-Circuits	MCS-PWD-2W-2G-18G-10W-Sf	000084	Calibrated before use	-

3 Equipment Under Test (EUT)

3.1 Identification of Equipment Under Test (EUT)

Brand Name:	Technogym
Model Name / HMN:	KIOSK-HEAD27”
Test Sample Serial Number:	0WR01635AC-ENR *(Conducted Sample)*
Hardware Version:	Not marked or stated
Software Version:	5.10.110_v1
Firmware Version:	17.92.1.p136.131
Contains FCC ID:	2ALZB-AS2DTGM
Contains IC:	22688-AS2DTGM
Date of Receipt:	19 February 2024

3.2 Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.3 Additional Information Related to Testing

Technology Tested:	WLAN (IEEE 802.11a,n,ac,ax) / U-NII	
Type of Unit:	Transceiver	
Modulation Types:	BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM	
Transmit / Receive Frequency Range:	5250 to 5350 MHz 5470 to 5850 MHz	
Transmit / Receive Channels Tested at 80 MHz Bandwidth setting:	**Channel ID**	**Channel Centre Frequency (MHz)**
	106 (Control Channel 100)	5530

3.4 Description of Available Antennas

The radio utilizes 2 internal antennas, with the following maximum gain:

Frequency Range (MHz)	Antenna Gain (dBi)
5250 to 5850	4.8

3.5 Description of Test Setup

Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	Wireless Dual Band Router (DFS Master)
Brand Name:	ASUS
Model Name or Number:	RT-AX88U
FCC ID:	MSQ-RTAXHP00
ISEDC Canada Certification Number:	IC: 3568A-RTAXHP00 CAN ICES-3 (B)/NMB-3(B)
Serial Number:	JBIUHP000173

Description:	Test Laptop
Brand Name:	Lenovo
Model Name or Number:	ThinkPad L480
Serial Number:	PF1EHZPL

Description:	Test Laptop
Brand Name:	Lenovo
Model Name or Number:	ThinkPad L480
Serial Number:	PF1EHZQ0

Description:	AC Adapter
Brand Name:	EDACPOWER ELEC.
Model Name or Number:	EM10952F
Serial Number:	234700007

Description:	USB – DB9 Cable
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Operating Modes

The EUT was tested in the following operating modes, unless otherwise stated:

- Operating on the channel selected by the Master device in the U-NII-2C band.
- The Master device controls the channel bandwidth of the EUT. The Master device was set to a the maximum supported channel bandwidth of 80 MHz with auto-rate to ensure a stable channel loading.
- The EUT test data and rate used gave >17% channel loading as required by KDB 905462 D02 Section 7.7.2.

Configuration and Peripherals

The EUT was tested in the following configuration(s):

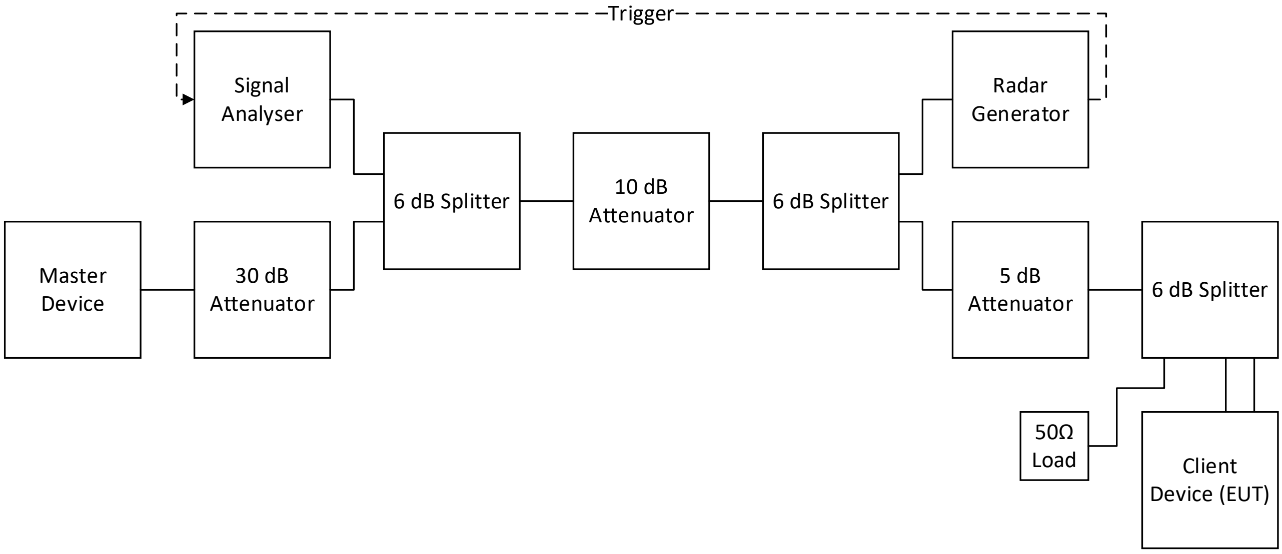
- All measurements were performed in a conducted configuration.
- The EUT is a DFS Client without Radar Detection capability. It was tested in combination with an FCC / ISEDC approved ASUS DFS enabled router being used as the Master. A Radar Type 0 was injected to the Master to test the Clients Channel Move Time and Channel Closing Transmission Time after receiving the channel shutdown command from the Master.
- A test laptop was used to configure the EUT parameters via Teraterm. The test laptop was connected to the EUT via USB to DB9 cable.
- Further details of the conducted test network and set-up can be found in Appendix 1 of this test report.
- The DFS detection threshold of -61.0 dBm (-62 + 1 dB) was used at the Master device antenna port. Note this is not dependent on the EUT EIRP, Spectral Density or EUT Antenna Gain, only the antenna gain of the master device, as the EUT does not have radar detection. The Asus DFS Master test router was configured with an internal setting for a 0 dBi antenna.
- EUT had 2 antenna ports. These were connected to the test network via a 2-way splitter / combiner.
- The EUT was powered by an AC to DC power supply connected to a 120 VAC 60 Hz mains supply for all measurements.

KDB 905462 D02 Table 3: DFS Detection Thresholds for Master Devices and Client Devices With Radar Detection

Maximum Transmit Power	Value (see notes)
EIRP ≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna **Note 2:** Throughout these test procedures an additional 1dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. **Note 3:** EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

Test Setup Diagrams

Setup diagram for test of DFS Client without Radar Detection:



4 Test Results

4.1 Channel Closing Transmission Time and Channel Move Time

Test Summary:

Test Engineer:	Raghavendra Katti	**Test Date:**	15 April 2024
Test Sample Serial Number:	0WR01635AC-ENR		

FCC Reference:	Part 15.407(h)(2)(iii)
ISED Canada Reference:	RSS-247 6.3.2(c) & RSS-247(d)
Test Method Used:	KDB 905462 D02 Section 7.8.3

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	40

Note(s):

1. In accordance with KDB 905462 D02 Table 2, the Channel Closing Transmission Time and Channel Move test was performed on the widest supported channel bandwidth of 80 MHz.
2. The channel move time is the time taken from the end of the radar burst to the ceasing of tranmissions of the EUT.
3. The Total Aggregate Channel Closing Transmission Time shown in the table below was measured from 200 ms after the end of the radar burst and compared to the 60 ms limit.
4. Although the EUT and DFS master device 80 MHz operating channel was centred on 5530 MHz, the spectrum analyser was tuned to zero span at 5500 MHz. The radar was also fired at 5500 MHz. This allowed any control signals to be monitored in addition to the 80 MHz data transfer.

Channel Closing Transmission Time and Channel Move Time (continued)

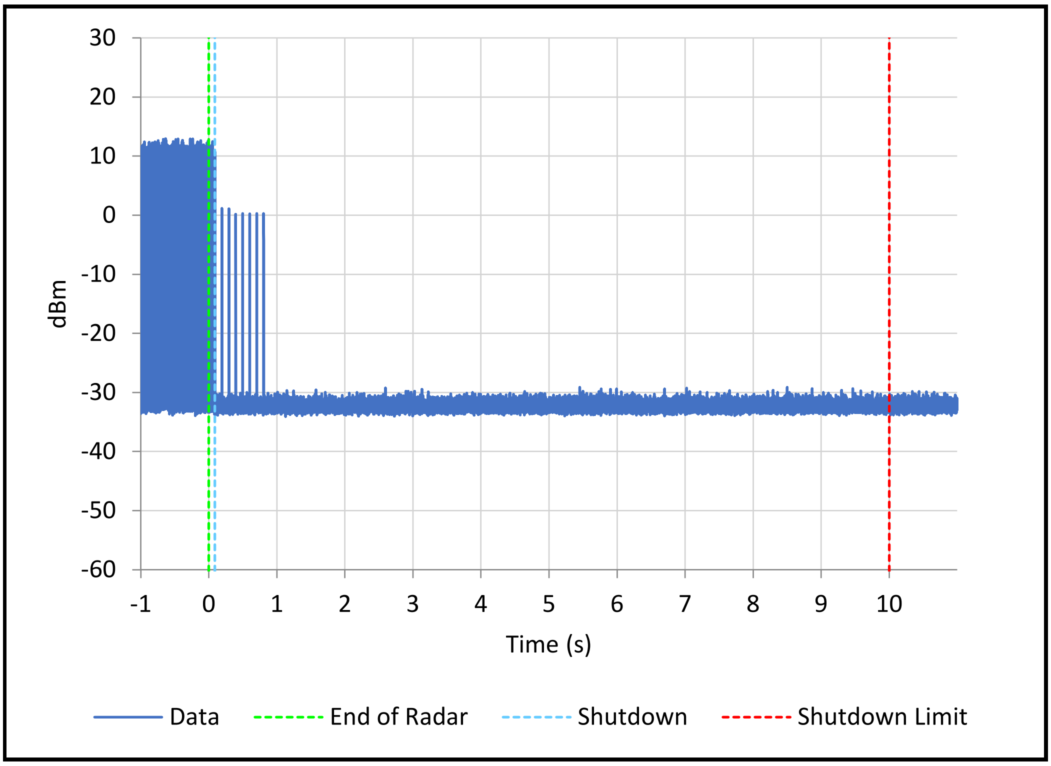
Results: Channel Move Time

Frequency (MHz)	Move Time (ms)	Limit (ms)	Margin (ms)	Result
5530	89.0	10000	9911.0	Complied

Results: Channel Closing Transmission Time

Frequency (MHz)	Total Aggregate Tx Time (ms)	Limit (ms)	Margin (ms)	Tx Time >200ms after end of radar	Limit (ms)	Margin (ms)	Result
5530	35.6	260.0	224.4	0.0	60	60.0	Complied

Results: 80 MHz EUT to Master



Plot showing the full 10 second shutdown limit

Channel Closing Transmission Time and Channel Move Time (continued)

Limits:

Part 15.407(h)(2)(iii)

After a radar's presence is detected, all transmissions shall cease on the operating channel within 10 seconds. Transmissions during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. In addition, intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel.

RSS-247 Section 6.3.2(c) & 6.3.2(d)

Channel move time: after a radar signal is detected, the device shall cease all transmissions on the operating channel within 10 seconds.

Channel closing transmission time: is comprised of 200 ms starting at the beginning of the channel move time plus any additional intermittent control signals required to facilitate a channel move (an aggregate of 60 ms) over the remaining 10-second period of the channel move time.

KDB 905462 D02 Table 4: DFS Response Requirement Values

Parameter	Value
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
Note 1: *Channel Move Time* and the *Channel Closing Transmission Time* should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. **Note 2:** The *Channel Closing Transmission Time* is comprised of 200 milliseconds starting at the beginning of the *Channel Move Time* plus any additional intermittent control signals required to facilitate a *Channel* move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.	

4.2 Non-occupancy Period

Test Summary:

Test Engineer:	Raghavendra Katti	**Test Date:**	15 April 2024
Test Sample Serial Number:	0WR01635AC-ENR		

FCC Reference:	Part 15.407(h)(2)(iv)
ISED Canada Reference:	RSS-247 6.3.2(e)
Test Method Used:	KDB 905462 D02 Section 7.8.3

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	40

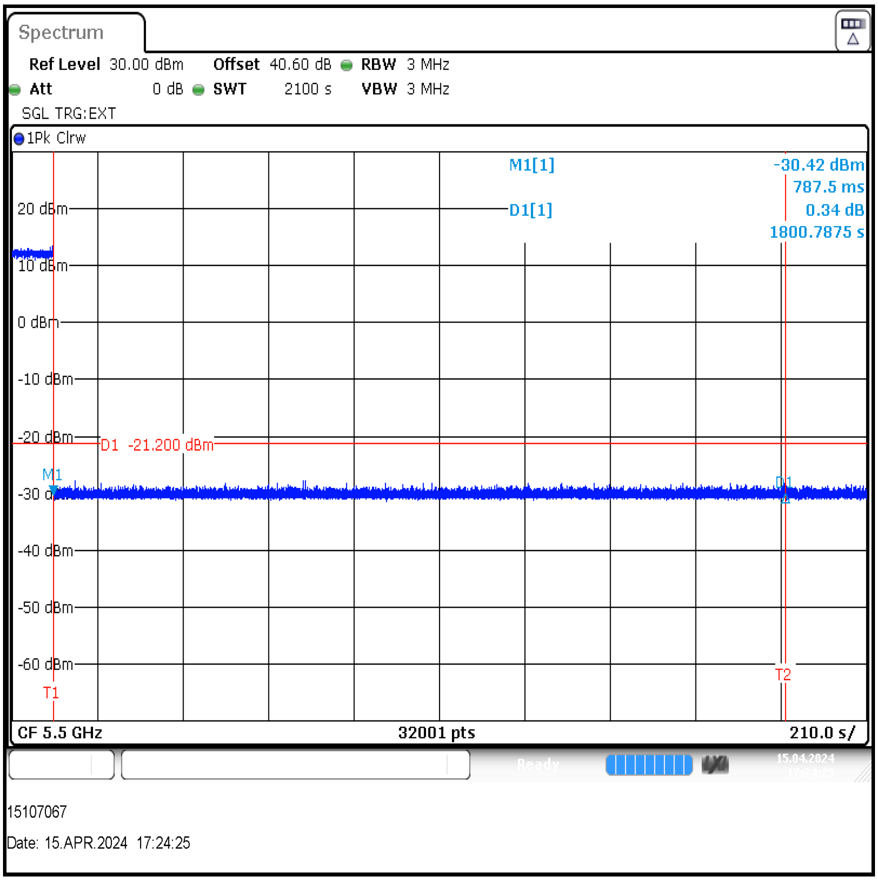
Notes:

1. This test is not required for a client without radar detection according to Tables 1 and 2 of KDB 905462 D02, however it was performed to show compliance with KDB 905462 D02 5.1.2 e) and KDB 905462 D03, section (b)(5) and (b)(6). Therefore no specified bandwidth requirement is given and so was performed using an 80 MHz channel bandwidth; as used for *Channel Closing Transmission Time and Channel Move Time.*
2. Radar burst type 0 was detected and the channel was vacated for >1800 seconds. Since the client has no radar detection and is therefore not performing an ‘intelligent’ blacklisting of the channel, the device was shown not to transmit for greater than 30 minutes after its own shutdown time, not the shutdown of the DFS master.
3. Although the EUT and DFS master device were in 80 MHz operating channel was centred on 5530 MHz, the spectrum analyser was tuned to zero span at 5500 MHz. The radar was also fired at 5500 MHz. This allowed any control signals to be monitored in addition to the 80 MHz data transfer.
4. The noise floor remained below the -21.2 dBm/MHz (74 dBµV/m at 3m) unintentional radiator limit for the 30 minute (1800 seconds) non-occupancy period. Therefore the EUT is deemed to comply.

Non-occupancy Period (continued)

Results:

Frequency (MHz)	Non-occupancy (min)	Limit (min)	Margin (min)	Result
5530	>33.3	30.0	>3.3	Complied



Limits:

Part 15.407(h)(2)(iv)

A channel that has been flagged as containing a radar system, either by a channel availability check or in-service monitoring, is subject to a non-occupancy period of at least 30 minutes. The non-occupancy period starts at the time when the radar system is detected.

RSS-247 Section 6.3.2(e)

A channel that has been flagged as containing a radar signal, either by a channel availability check or in-service monitoring, is subject to a 30 minute non-occupancy period where the channel cannot be used by the LE-LAN device. The non-occupancy period starts from the time that the radar signal is detected.

KDB 905462 D02 Table 4: DFS Response Requirement Values

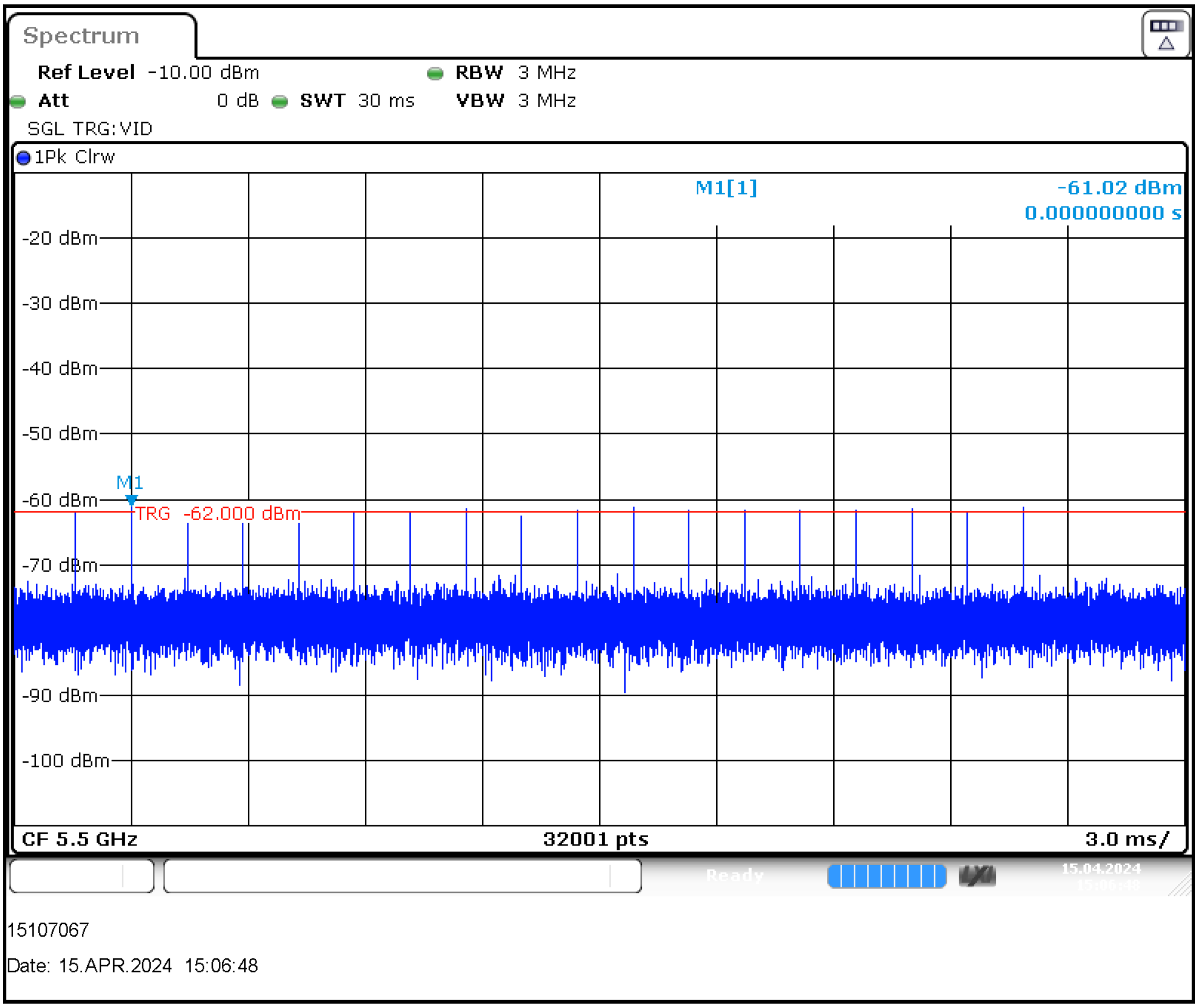
Parameter	Value
Non-occupancy period	Minimum 30 minutes

Appendix 1. Radar Type 0 Calibration

Radar calibration procedure.

The system was configured as shown in section 3.5, but with the path from the EUT to the signal analyser terminated into a 50Ω load, and the path from the radar generator to the master connected to the signal analyser. The radar was then replayed by the SMBV100A vector signal generator, the waveform captured, and the amplitude adjusted until correct.

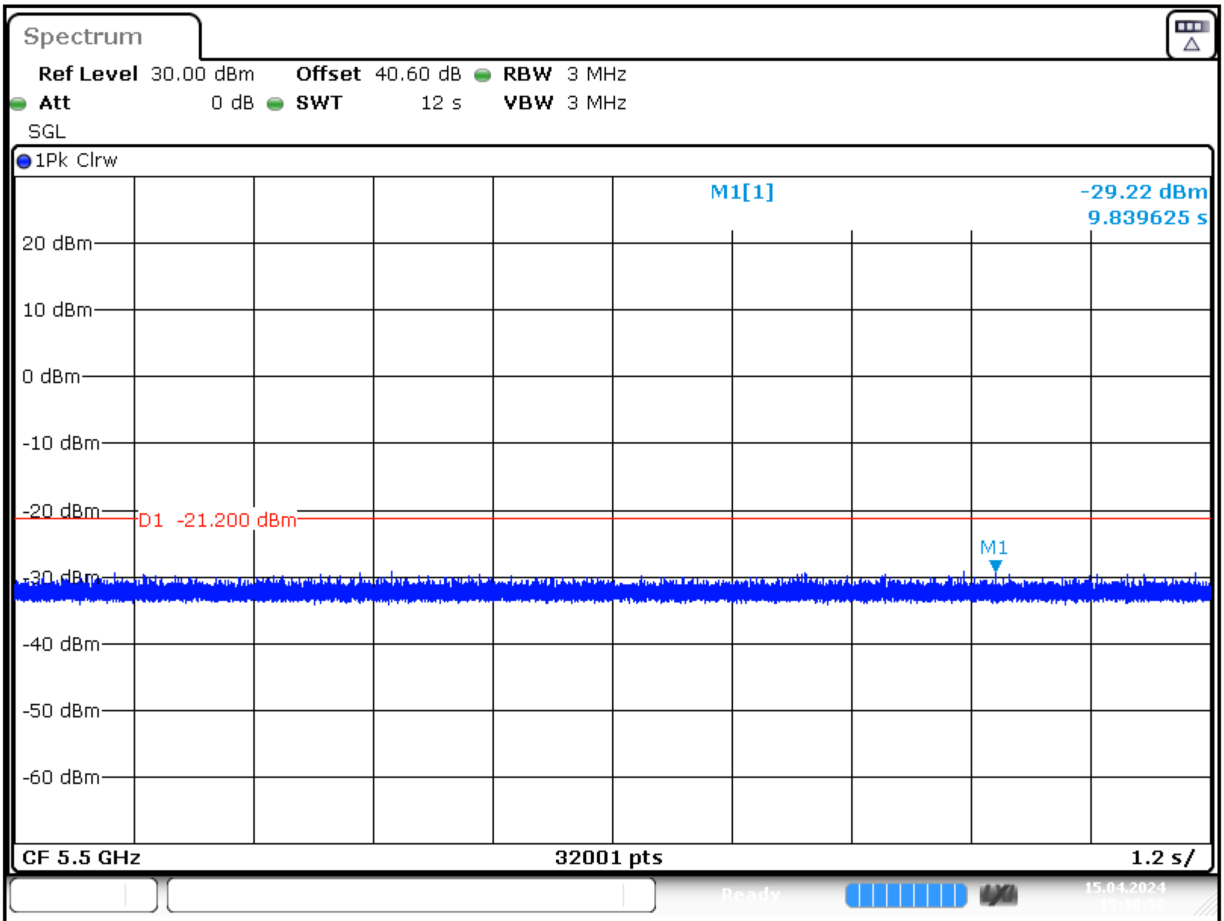
Below is an example plot of the type 0 radar burst at the master port of the attenuation network. The vector signal generator was set to –14.7 dBm output to give the -61.0 dBm level.



Radar Type 0 – full 18 pulse waveform

Appendix 2. System Noise Floor Reference Plots

Noise floor plots are presented below as required by Section 8.3 d)3) and 8.3 g) of KDB 905462 D02.



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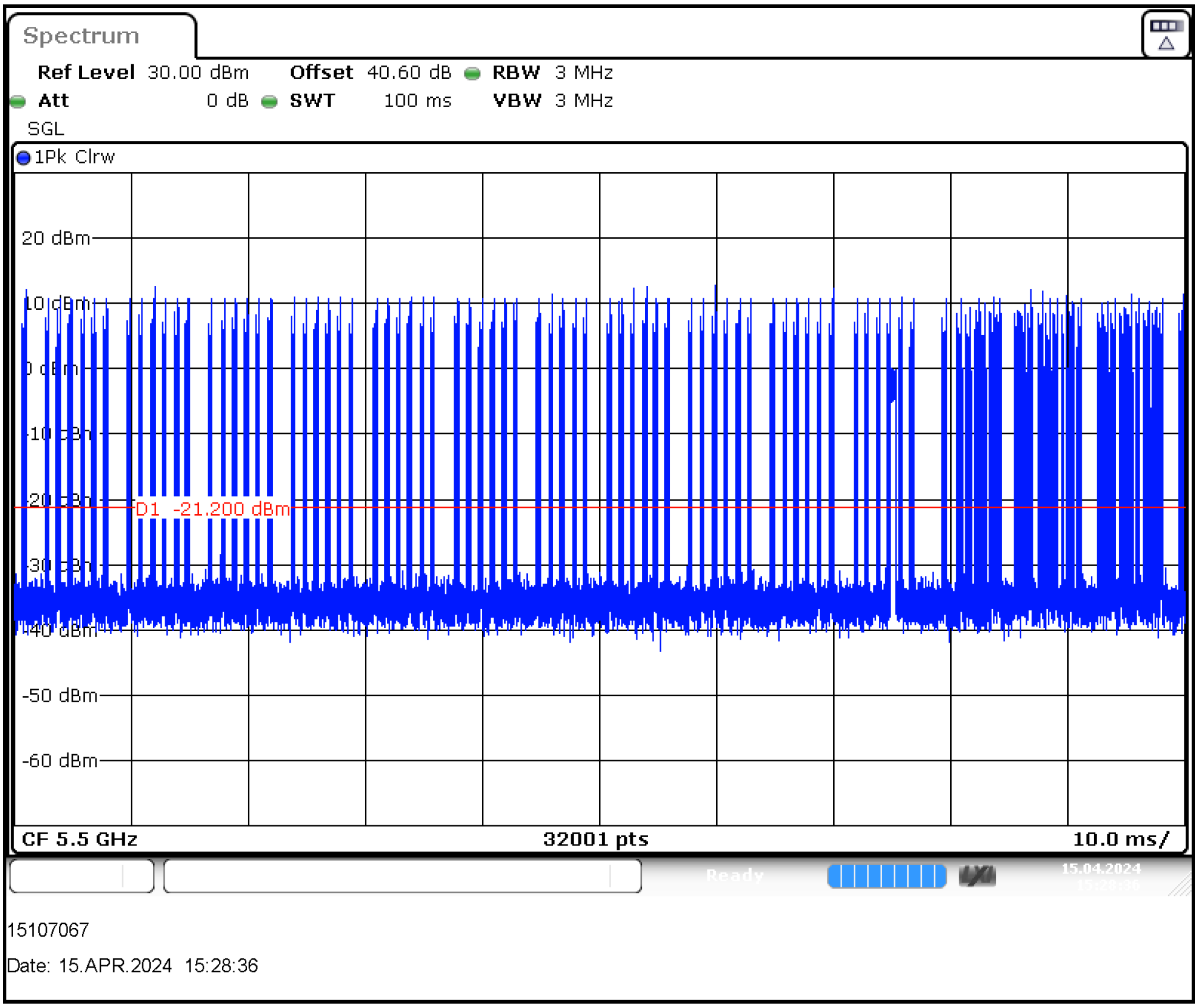
Noise Floor of Spectrum Analyser

Appendix 3. Channel Loading

As required by Section 8.3. c) 6) of KDB 905462 D02, the following plot and calculations shows the duty cycle of the channel used during testing.

UDP data was transmitted from EUT to Master. The duty cycle was calculated over 100 milliseconds. This was captured on a spectrum analyser in the time domain using a 0 Hz span and 32001 sweep points to ensure it included any longer term variations, whilst maintaining accurate to a 3.125 µs sample size.



17.5% Channel Loading at 80 MHz Bandwidth

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