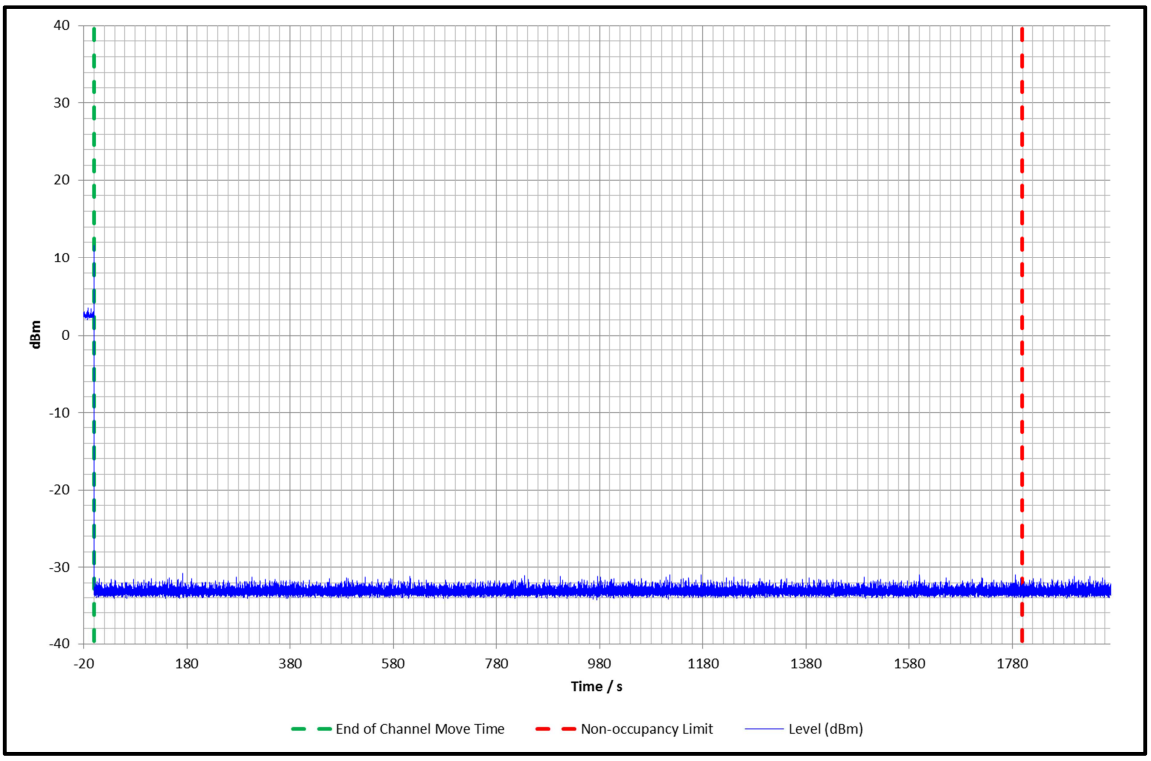
Non-occupancy Period (continued)

Results: Set-up 1

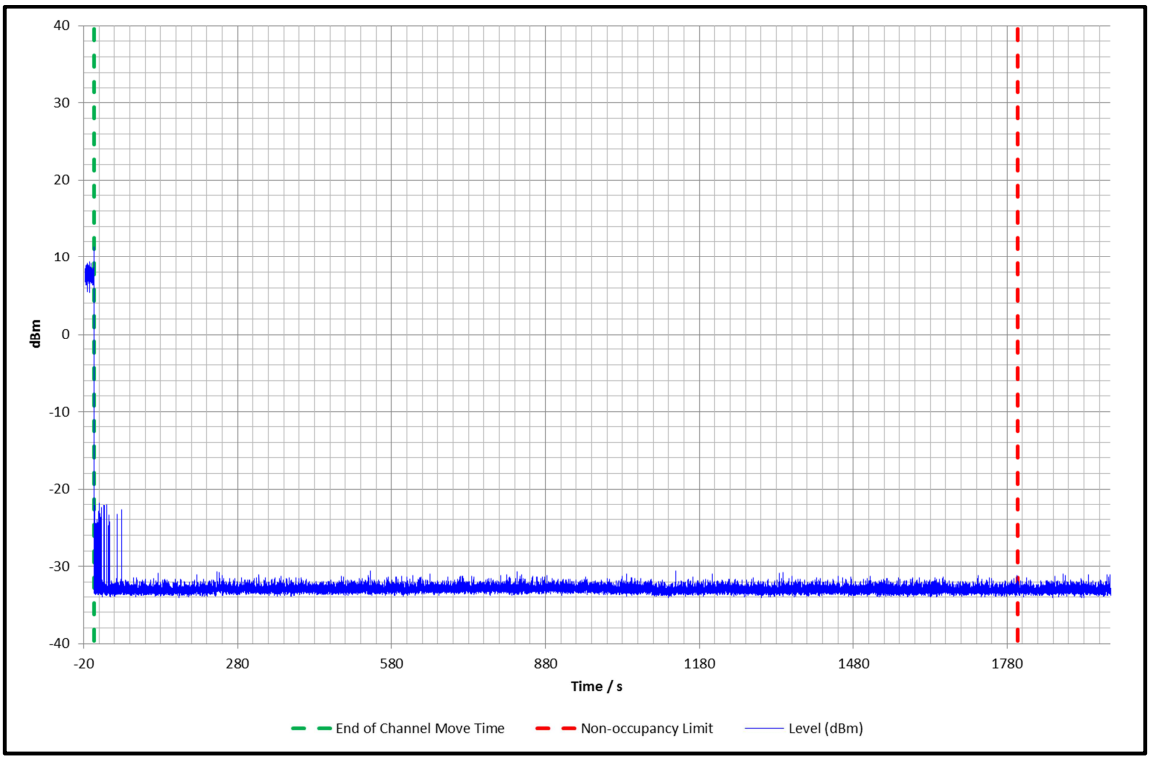
Channel (MHz)	Trial	Non-Occ (min)	Limit (min)	Margin (min)	Result
5500	1	>33.0	30	>3.0	Complied



Non-occupancy Period (continued)

Results: Set-up 2

Channel (MHz)	Trial	Non-Occ (min)	Limit (min)	Margin (min)	Result
5500	1	>33.1	30	>3.1	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.

KDB 905462 D02 Table 4: DFS Response Requirement Values

Parameter	Value
Non-occupancy period	Minimum 30 minutes

Non-occupancy Period (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1631	DFS Test System	Aeroflex	PXI 3000	300110/291	09 Jul 2017	24
M1883	Signal Analyser	Rohde & Schwarz	FSV-30	103084	09 May 2017	12
A1535	Step Attenuator	Hewlett Packard	8495B/8494B	00007	Calibrated before use	-
A1536	Step Attenuator	Hewlett Packard	8495B/8494B	3308A30801 / 3308A19649	Calibrated Before Use	-
A2181	Coaxial Circulator 4 – 18 GHz	Atlantec	ACC-20130-SF-SF-SF	120409229	Calibrated Before Use	-
A2183	Coaxial Circulator 4 – 18 GHz	Atlantec	ACC-20130-SF-SF-SF	120409232	Calibrated Before Use	-
A2119	Power Splitter	Mini-Circuits	ZN2PD-63-S+	SUU12701203	Calibrated Before Use	-
A162	50Ω Termination	Narda	3768NM	5204	Calibrated Before Use	-
A2491	50Ω Termination	Narda	TA06W5-M	121813#2	Calibrated Before Use	-
A2494	50Ω Termination	Narda	TA06W5-F	082013#2	Calibrated Before Use	-
M2001	Thermohygrometer	Testo	608-H1	45041824	02 Apr 2017	12

6. Measurement Uncertainty

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.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

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	Range	Confidence Level (%)	Calculated Uncertainty
DFS Radar Amplitude	5.25 GHz to 5.85 GHz	95%	±2.17 dB
Channel Shutdown Timing	5.25 GHz to 5.85 GHz	95%	±0.45 ms

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.

7. Report Revision History

Version Number	Revision Details		
	Page No(s)	**Clause**	**Details**
1.0	-	-	Initial Version
2.0	-	-	Appendix 5 (Test setup photos) removed
3.0	6 15 27 & 28	- -	Changed 'RFID' reference to 'NFC' Inserted Note 5 Inserted Appendices 5 & 6
4.0	5 19, 20, 21 & 22	KDB 905462 D02 Section 7.8.3	End test date changed and summary of results Non-Occupancy test plots added
5.0	5, 20	KDB 905462 D02 Section 7.8.3	Wording changed in the notes to add clarity.

Appendix 1. Radar Calibration

Radar calibration procedure.

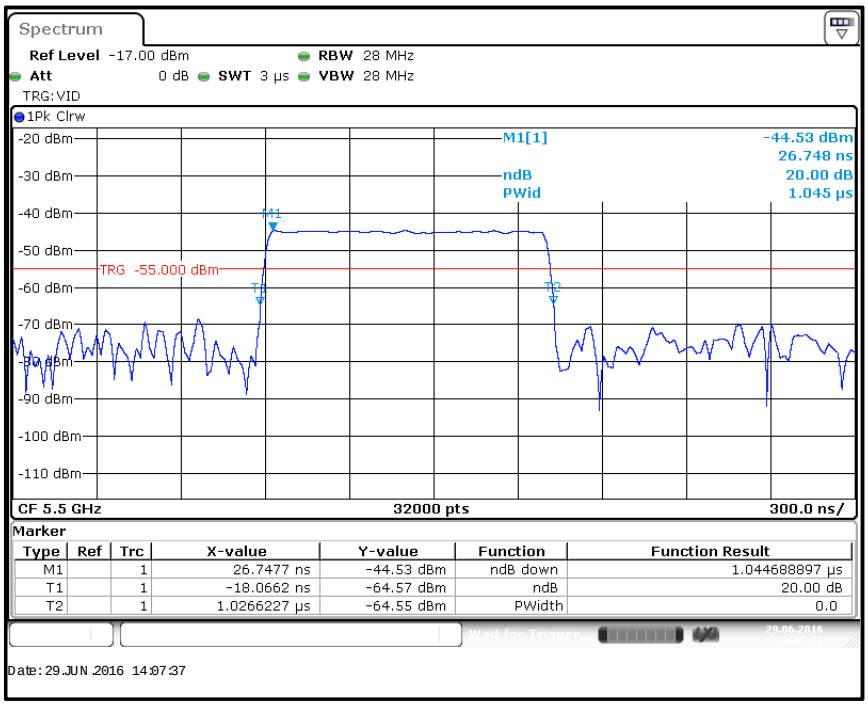
All radars were generated and produced by an Aeroflex DFS test system. The radar pulse generation of this system has previously been verified by the FCC (see Appendix 4).

The radar amplitude was calibrated using the setup diagram shown below. The spectrum analyser was replaced by a 50Ω load. The DFS Master was replaced by a spectrum analyser. The Aeroflex DFS test system was then set to transmit a CW signal with which to calibrate the radar level. The output level was adjusted to give the correct level into the Master device, as calculated in Section 4 of this Test Report, before the tests were performed.

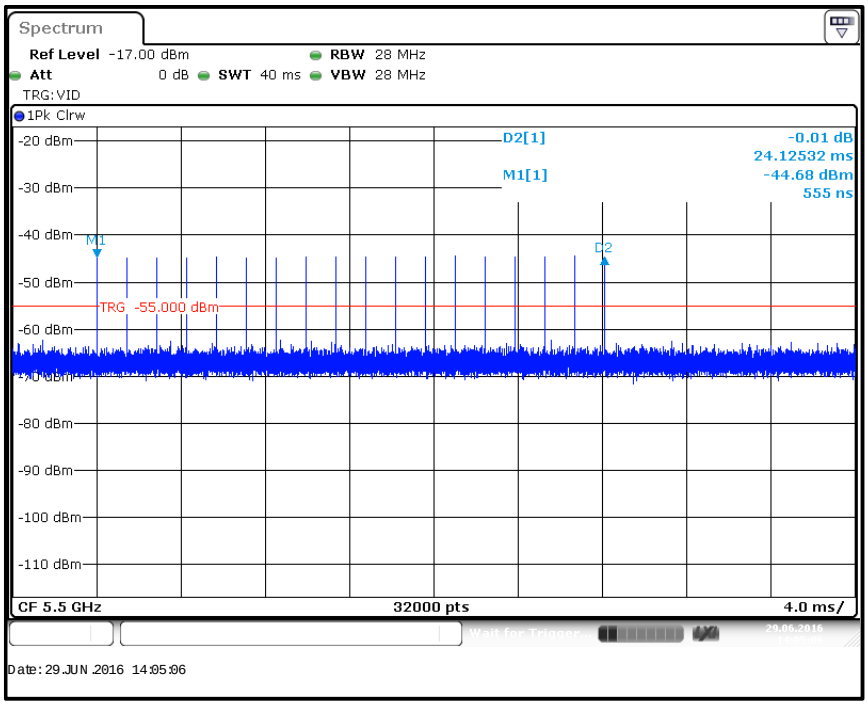
Radar Verification

The test system and its waveform generation has been validated by the FCC as an ‘approved’ device (see Appendix 2), so full analysis of each radar is not necessary. However, below are sample plots for each of the radar types. Note the timing plots of all the pulses in the waveform have inaccurate amplitudes. This is due to the amplitude being increased for timing verification due to the high noise floor of the signal analyser used when using wide RBW/VBW filters to avoid pulse desensitisation of the spectrum analyser. They are therefore accurate only as an example radar overview and for basic validation. Full more accurate validation has been performed previously with more suitable equipment.

Radar Type 0



Radar Type 0 – single 1 µs pulse



Radar Type 0 – full 18 pulse waveform

Appendix 2. Aeroflex Test Platform Approval email

From: Andrew Leimer [mailto:Andrew.Leimer@fcc.gov]
Sent: Friday, September 23, 2011 4:24 PM
To: Chisham, Steve
Cc: Carey, Tim; Hack, Barry; Rashmi Doshi; Joe Dichoso
Subject: RE: Certification for Aeroflex DFS solution

Hello Steve,

The Aeroflex "DXI based DFS test solution" system used for DFS alternative radar signal generation has been approved by the FCC and NTIA.

This approval permits the system to be used by labs in the testing of DFS devices for equipment authorization Certification. It is recommended that applicants that use your system for testing include a statement in the Test Report or a Letter Exhibit stating that the system has FCC and NTIA approval. This E-mail is your record of this approval.
Note that the appropriate term for your system is Approved as the term Certification is reserved for devices gaining equipment authorization through the FCC or a TCB.

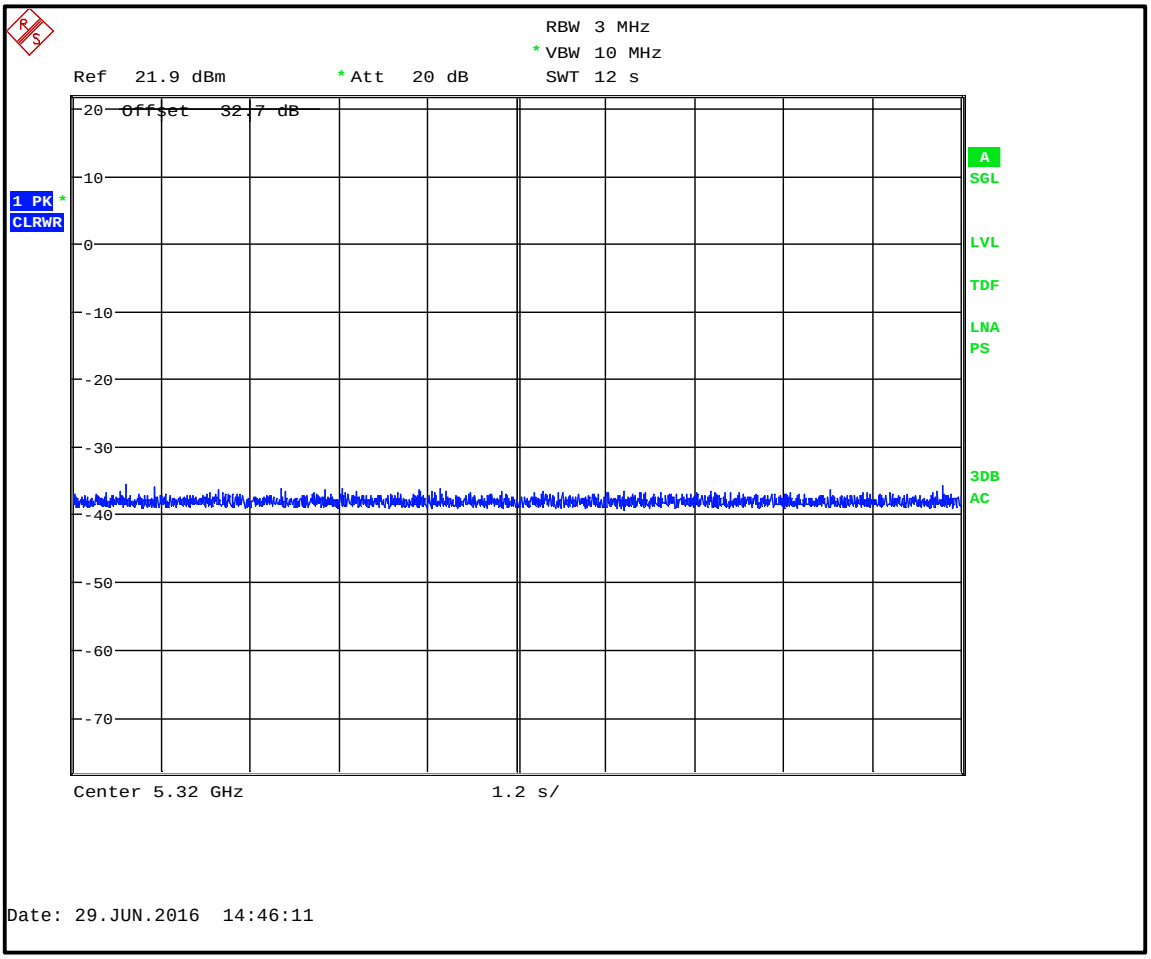
Regards,

Andy Leimer

FCC/OET/EACB

Appendix 3. System Noise Floor Reference Plots

As required by Section 8.3(d)(3) of KDB 905462 D02, the following plot shows the reference noise floor of the system used during measurement. It also shows compliance when the path loss of the coupling network shown in Section 4.2 of this Test Report (*Configuration and Peripherals)* is added to the noise floor as a reference level offset.



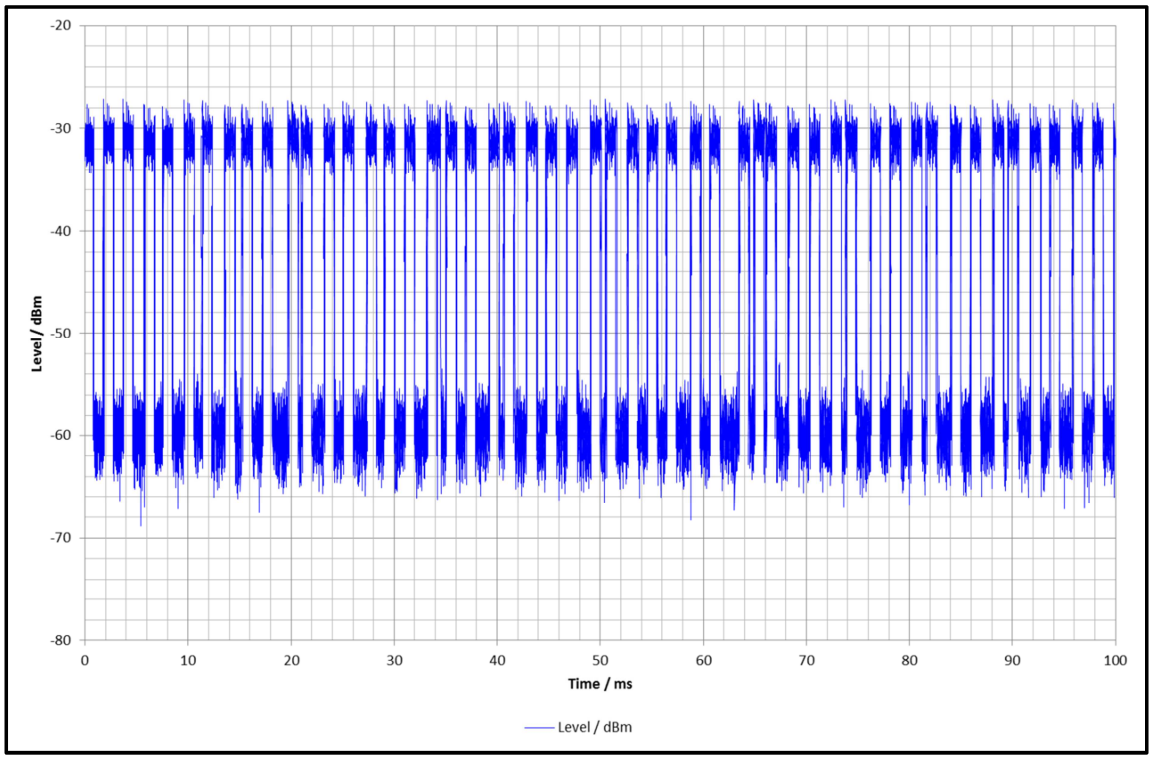
Noise Floor of Spectrum Analyser

Appendix 4. Channel Loading

As required by Section 8.3(c)(6) of KDB 605642 D02, the following plot and calculations shows the duty cycle of the channel used during testing.

Set-up 1

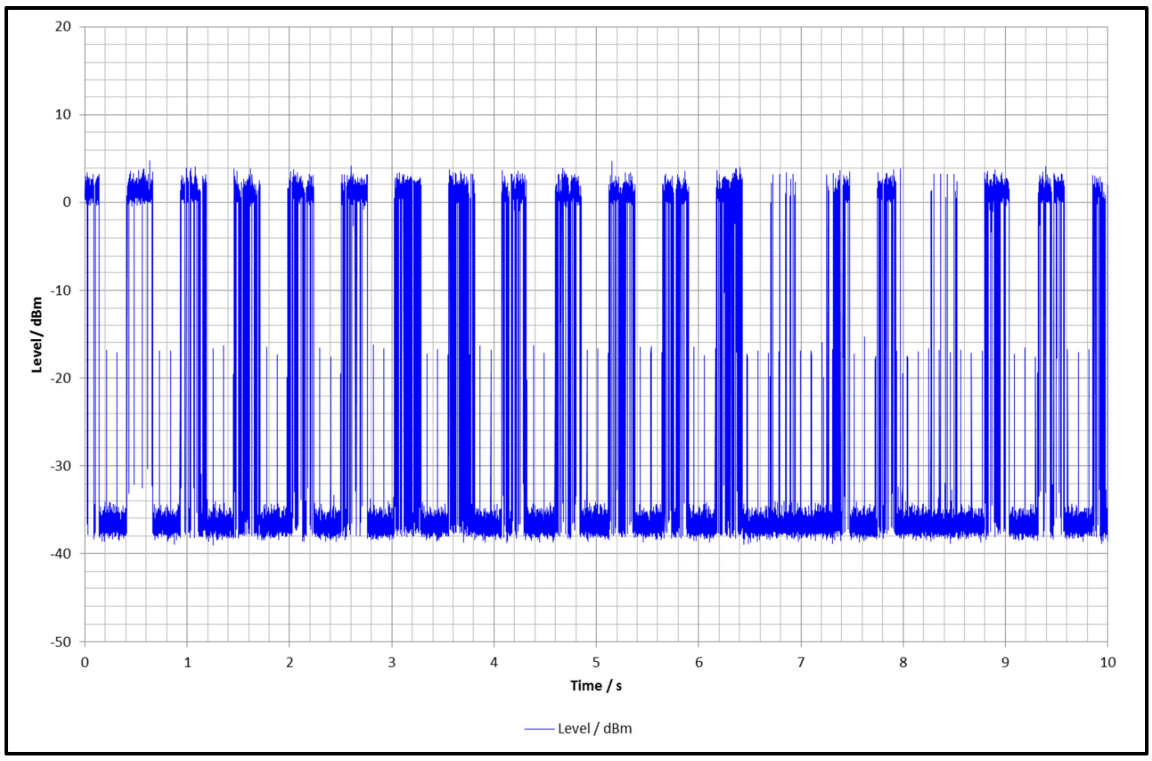
Streaming representative file types as defined in Section 7.7(a) of KDB 605642 D02, were found not to produce a high enough continuous duty cycle of >17%, as required by 7.7(c), on an 80 MHz channel bandwidth. This included lowest data rate with modulation coding scheme MCS0, maximum video size (1080p) and the minimum video compression ratio during encoding. Therefore alternative pseudo-random data transfer as per 7.7(b) was streamed to simulate data transfer. A suitable duty cycle was obtained using iPerf2 with a UDP data transfer.



The number of samples greater than -50 dBm was compared to the total number of samples to calculate the duty cycle. The EUT and test router were found to be transmitting above this threshold for 51.0% of the total, and therefore meeting the requirement of greater than 17% channel loading.

Set-up 2

Set-up 2 used the AirPlay protocol and hence the duty cycle was dictated by the maximum HD movie size and the coding scheme used between the test network RF leakage and the Apple TV. The stream created 30.9 % duty cycle, however the stream automatically used only a 20 MHz channel bandwidth, not the maximum 80 MHz channel. The AirPlay protocol could sometimes be seen to automatically select a wider channel bandwidth, but this yielded a far lower duty cycle, and therefore testing in set-up 2 was performed with the duty cycle shown below.



Appendix 5. Channel/Frequency plan

Wi-Fi Supported Channels			
Country	**Channels**		
	20 MHz	40 MHz	80 MHz
United States Canada	1 - 13 36 - 48 52 – 64 100 – 144 149 - 165	38 – 46 54 – 62 102 – 142 151 - 159	42 – 58 106 -138 155

Note(s):

1. Channels 120 – 128: Only used if DFS Master allows
2. Channels 36 – 64: Set to Indoor use only for Canada
3. The following channels are set to Active/Passive in FCC domain:

2.4 GHz Band
Channels 1 – 11: Active
Channels 12 – 13: Passive

5 GHz Band
Channels 36 – 48: Active
Channels 52 – 144: Passive DFS
Channels 149 – 165: Active

--- END OF REPORT ---