# TEST REPORT OF A WIRELESS NETWORK ADAPTER MODULE, BRAND INTEL, MODEL 7260NGW

## TESTED IN CONFORMITY WITH THE DFS TECHNICAL REQUIREMENTS SPECIFICATION FOR CLIENT DEVICES, FCC PART 15 (10-1-12 EDITION) SECTION 15.407

FCC listed : 90828
Industry Canada : 2932G-2
VCCI Registered : R-1518, C-1598
R&TTE, LVD, EMC Notified Body : 1856

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## Description of test item

| | | |
|---|---|---|
| EUT | : | Wireless Network Adapter Module |
| Manufacturer | : | Intel Corporation |
| Brand | : | Intel |
| Model | : | 7260NGW |
| MAC address | : | 001500B6698F |
| Voltage input rating | : | +3.3 V |
| Voltage output rating | : | -- |
| Current input rating | : | -- |
| Antenna | : | AUX4 |
| Operating frequency | : | 2412–2462 MHz, 5180-5320 MHz, 5500-5700 MHz and 5745-5825 MHz |
| Modulation | : | DSSS and OFDM |
| Remarks | : | n.a. |

## Applicant information

| | | |
|---|---|---|
| Applicant's representative | : | Steven Hackett |
| Company | : | Intel Corporation |
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## Test(s) performed

| | | |
|---|---|---|
| Location | : | Leek |
| Test(s) started | : | January 11, 2013 |
| Test(s) completed | : | February 15, 2013 |
| Purpose of test(s) | : | Compliance with the DFS technical requirements specification for Client devices |
| Test specification(s) | : | FCC part 15 (10-1-12 Edition) section 15.407 |
| Project leader | : | R. van der Meer |
| Test engineer(s) | : | O.H. Hoekstra |
| Report written by | : | R. van der Meer |
| Report approved by | : | O.H. Hoekstra |
| Report date | : | March 22, 2013 |

# Table of contents

# 1 Remarks.

## 1.1 Applied standards.

The 7260NGW, brand Intel, model 7260NGW, has been tested in conformity with parts of the standard:

- FCC part 15 (10-1-12 Edition) section 15.407

The uncertainty figures have been calculated in accordance with the methods as described in the ETR 100-028-1 and ETR 100-028-2. The expansion factor used is 1.96, which provides a confidence level of 95% (Gaussian).

## 1.2 Description of the EUT.

The brand Intel model 7260NGW, hereafter referred to as EUT, is a PCIe small form factor IEEE 802.11a/b/g/n/ac + Bluetooth wireless network adapter module. The module will support MIMO (2x2) for 802.11n/ac modes and MISO (1x2) for 802.11a/b/g modes and utilizes DSSS and OFDM modulation techniques. Bluetooth operates with basic, EDR and BLE modes as SISO (1x1). When Bluetooth is operational wifi operates as SISO (1x1).

The module is sold under two different FCC ID numbers under the same model number (see table below). The FCC ID ending in “U” is intended to allow user installation conditions and host systems must be provided with a BiOS locking feature to provide mutual authentication between module and host devices.

| Brand | Model Number | Description | FCC/IC IDs |
|---|---|---|---|
| Intel | 7260NGW | 802.11a/b/g/n/ac + BT wireless network adapter module | PD97260NG<br>PD97260NGU<br>1000M-7260NG |

The content of this report and measurement results have not been changed other than the way of presenting the data..

## 1.3 Test modes of operation, test frequencies

| 5 GHz frequency band | Test frequencies (MHz) |
|---|---|
| channels 52 to 64 (5260 MHz to 5320 MHz) | 5280 |
| channels 100 to 140 (5500 MHz to 5700 MHz) | 5680 |

## 1.4 Description of test configuration.

**EUT**

| | | |
|---|---|---|
| Test item | : | 7260NGW |
| Manufacturer | : | Intel Corporation |
| Brand | : | Intel |
| Model | : | 7260NGW |
| MAC address | : | 00.15.00.B6.6E.53 |
| Receipt date | : | January 7, 2013 |

AUX1

| | | |
|---|---|---|
| Description | : | Cisco Aironet IOS Access Point |
| Manufacturer | : | Cisco |
| Brand | : | Cisco |
| Model | : | AIR-AP1252AG-E-K9 |
| MAC address | : | - |
| Voltage input rating | : | 56 $V_{dc}$ |
| Current input rating | : | - |
| Remarks | : | Access Point with a radar signal detection mechanism. |

AUX2

| | | |
|---|---|---|
| Product: | : | Laptop Computer |
| Brand: | | Lenovo |
| Model: | | ThinkPad X231s |
| Serial Number: | | MP-27LMO 12/1i |
| Remark: | | property applicant, host for testsoftware and EUT |

AUX3

| | |
|---|---|
| Product: | AC Adapter |
| Brand: | Lenovo |
| Model: | ADLX45NCC2A |
| Rated input Voltage: | 100-240Vac 1.3A 50-60Hz |
| Rated output Voltage: | 20Vdc 2.25A |
| Remarks: | connects AUX1 to mains |

AUX4

| | |
|---|---|
| Product: | Reference antennas |
| Manufacturer: | SkyCross Electronics (Shenzen) Co.,Ltd |
| Brand: | SkyCross Electronics (Shenzen) Co.,Ltd |
| Gain at 5G: | 5.0 dBi (declared by applicant) |
| Remarks: | connected to EUT and physically placed on lid of AUX2 |

The EUT was placed inside a host (laptop computer – AUX2).

# 2 Test conditions.

## 2.1 General.

The purpose of this test is to check the channel shutdown and the channel move time for slave devices, comparing with the limits of the applied standard. The EUT is configured as slave device. The Cisco Aironet IOS access point is configured as master device and has a build in radar signal detection mechanism for the 5 GHz frequency band. The block diagram of the test setup is shown below.

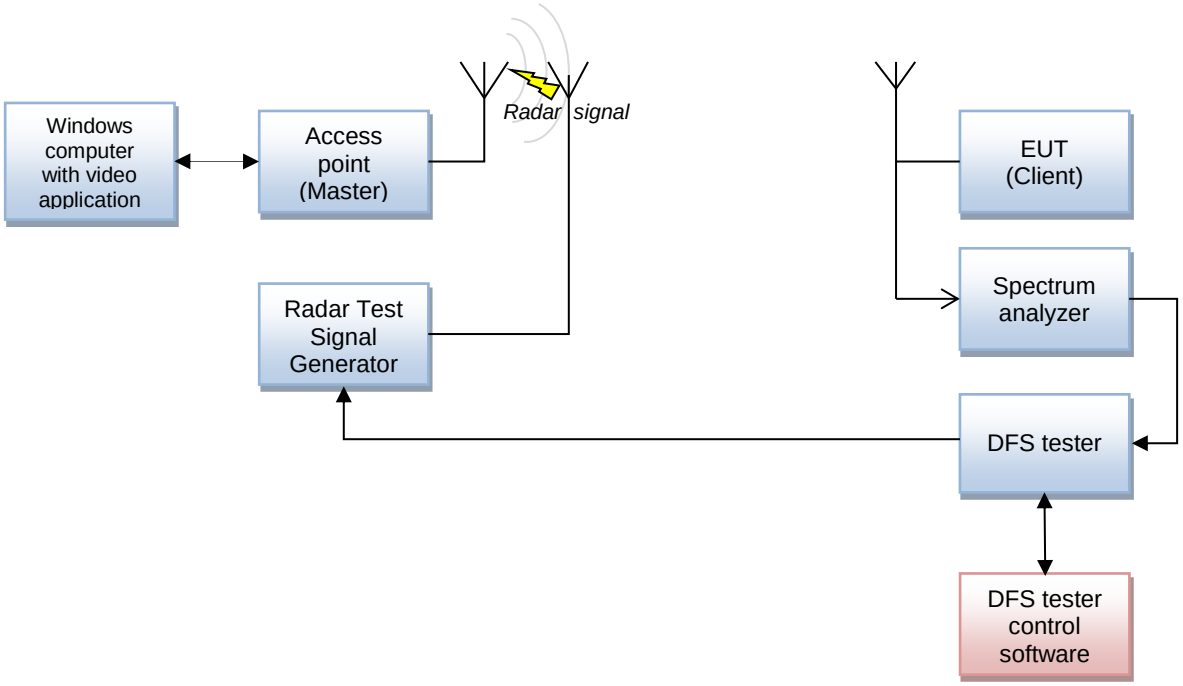



*Figure: 1 Test setup DFS test for slave devices*

A wireless connection between the EUT and the access point is established. Via the video application a continuously video stream has been sent to the EUT to transfer data. The input level of the DFS tester is adjusted so that it only measures the transmit levels and times of the radio signal of the EUT. The spectrum is set into zero span mode to monitor the broadcasts of the EUT in time domain.

A radar signal of 18 pulses with a pulse width of 1 µs and a pulse repetition frequency of 700 pps, will be broadcasted. The Access point detects the radar signal and instructs the EUT to stop transmitting on current radio channel and move to another channel. The time of stopping the broadcast on the current radio channel and moving to another channel, will be measured with the DFS tester. The DFS tester control software displays the measured values.

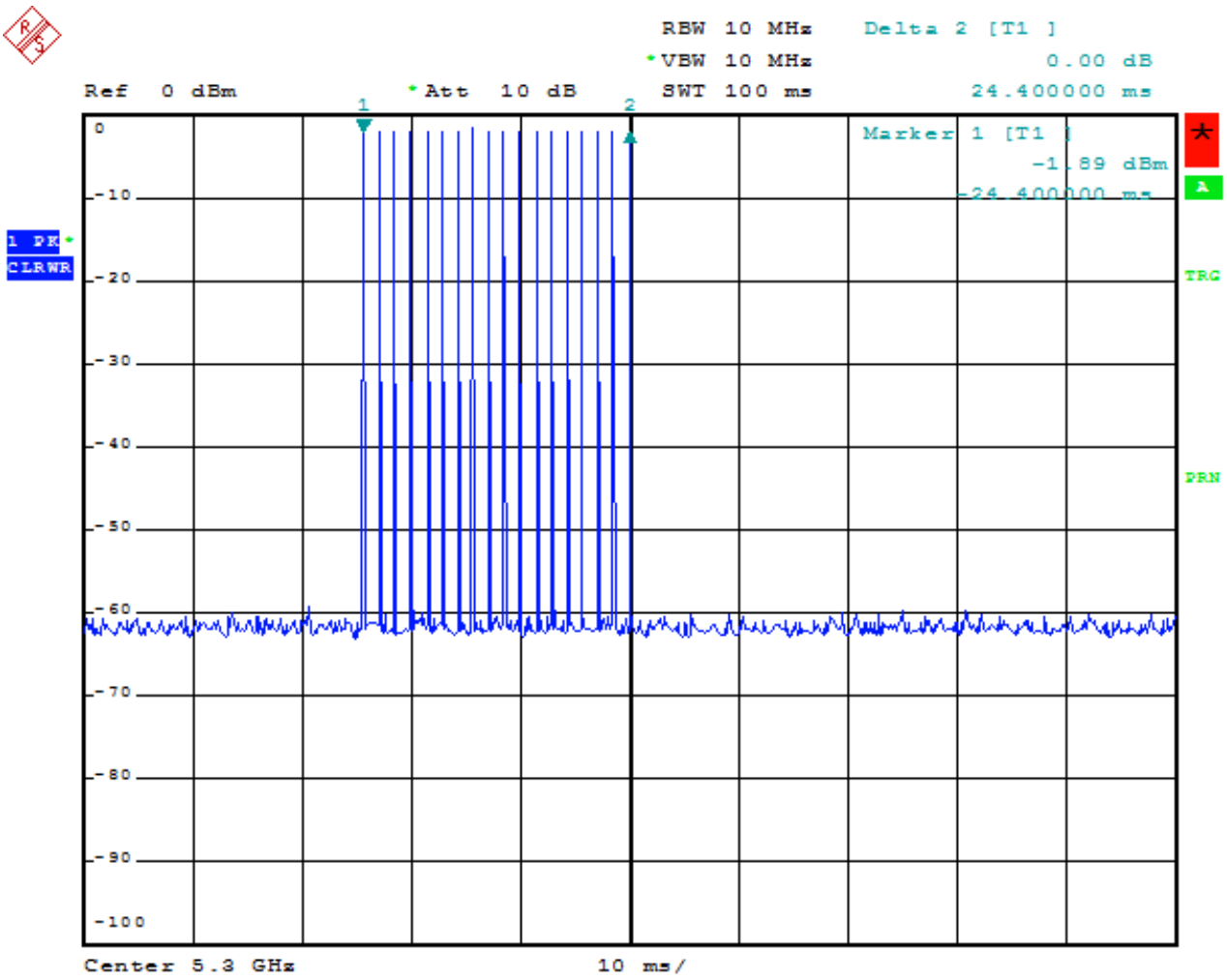



*Figure: 2 Radar burst*

## 2.2 Standard test conditions.

| Environmental condition | Parameter | Range |
|---|---|---|
| Temperature | °C | +20 to +23 |
| Relative humidity | % | 40 – 60 |
| Supply voltage EUT | Volts DC/~~AC~~ | 3.3 |

## 2.3 Extreme test conditions.

Not applicable for DFS testing.

# 3 Essential test suites (overview).

A summary of test results is given below.

## 3.1 Test suites and overview of results.

| Essential radio test suite | Applicable | Report clause | Compliance results |
|---|---|---|---|
| DFS: Channel Availability Check | No | 6.1 | - |
| DFS: In service Monitoring | No | 6.2 | - |
| DFS: Channel shutdown | Yes | 6.3 | Pass |
| DFS: Non-occupancy period | Yes | 6.4 | Pass |
| DFS: Uniform spreading | No | 6.5 | - |

# 4 Dynamic frequency selection (DFS).

## 4.1 Channel Availability Check.

Not applicable, the EUT is a slave device without radar detection.
Therefore the Channel Availability Check is not required.

## 4.2 In-Service Monitoring.

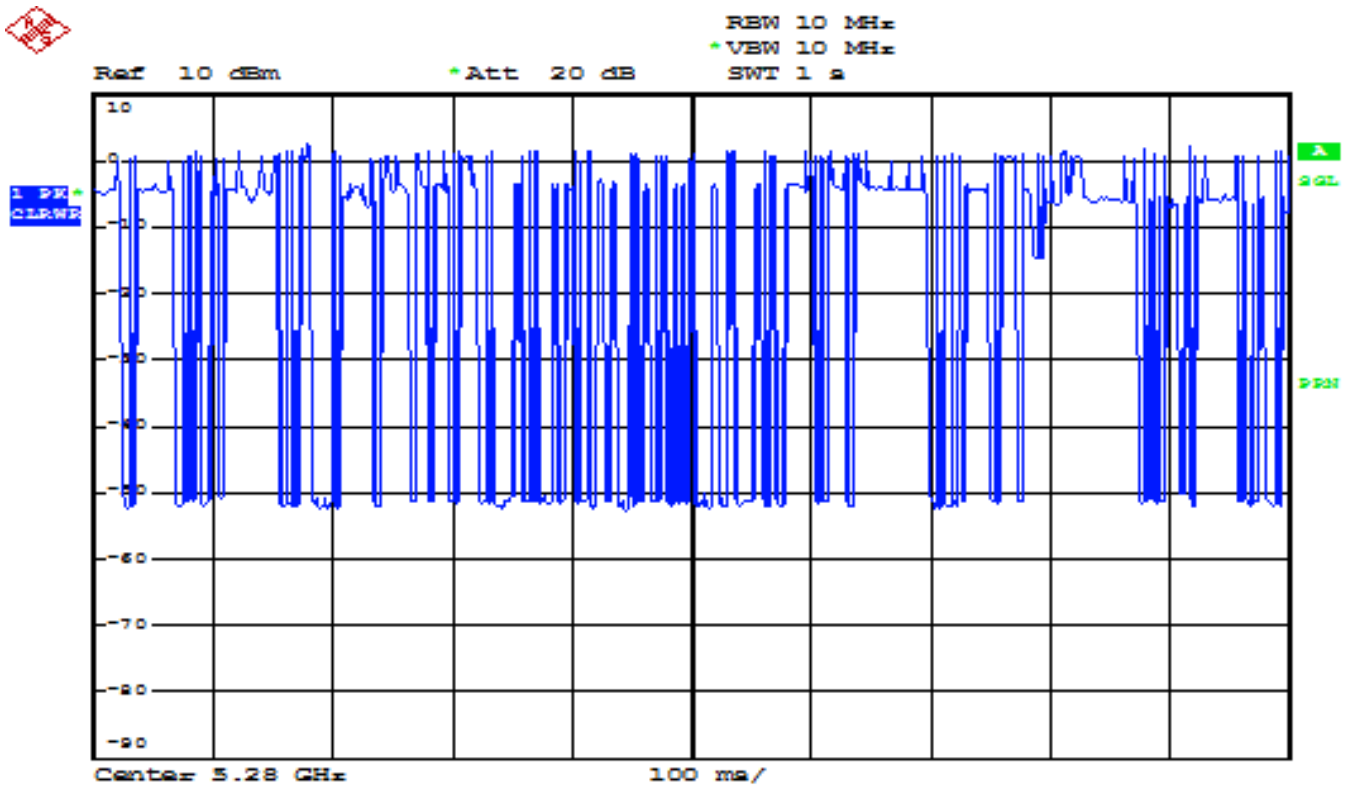
Not applicable, the EUT is a slave device without radar detection.
Therefore the In-Service Monitoring is not required.

## 4.3 Channel Shutdown.

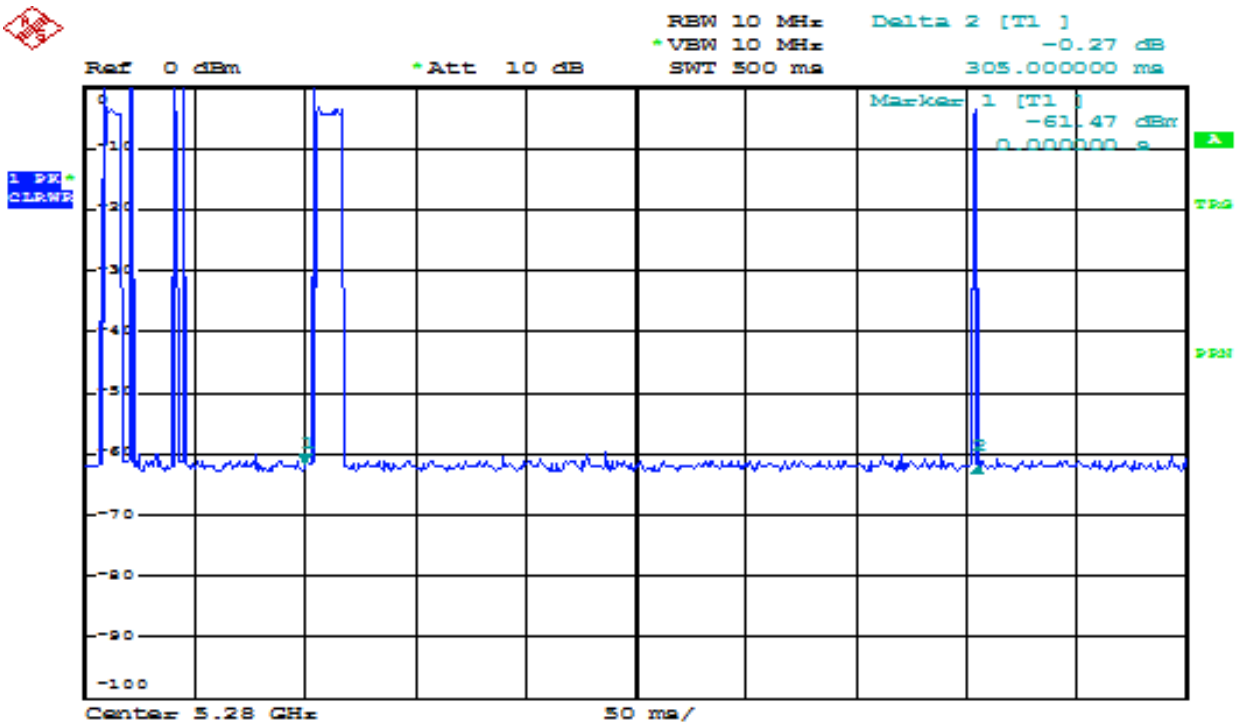
**Band 1**

| Test frequency 5280 MHz | Measured | | Limits |
|---|---|---|---|
| | | | FCC part 15 |
| **Channel Move Time (ms)** | 305.1 | | 10000 |
| **Channel Closing Transmission Time (ms)** | 11.7 | | 200 |
| **Non-occupancy period** | >30min | | >30min |
| **Measurement uncertainty** | **0.1% ± 21 µs** | | |

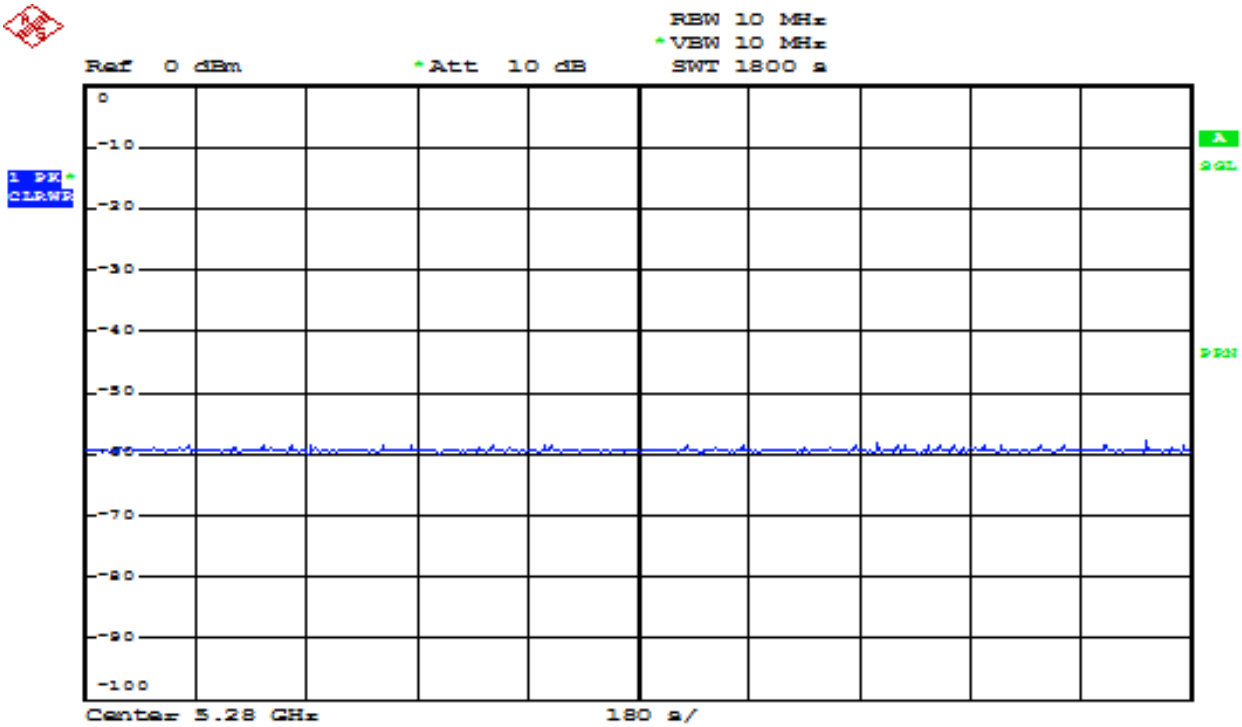
Note: tested with a Cisco Aironet 108 Access Point, model AIR-AP1252AG-E-K9.




*Traffic density*



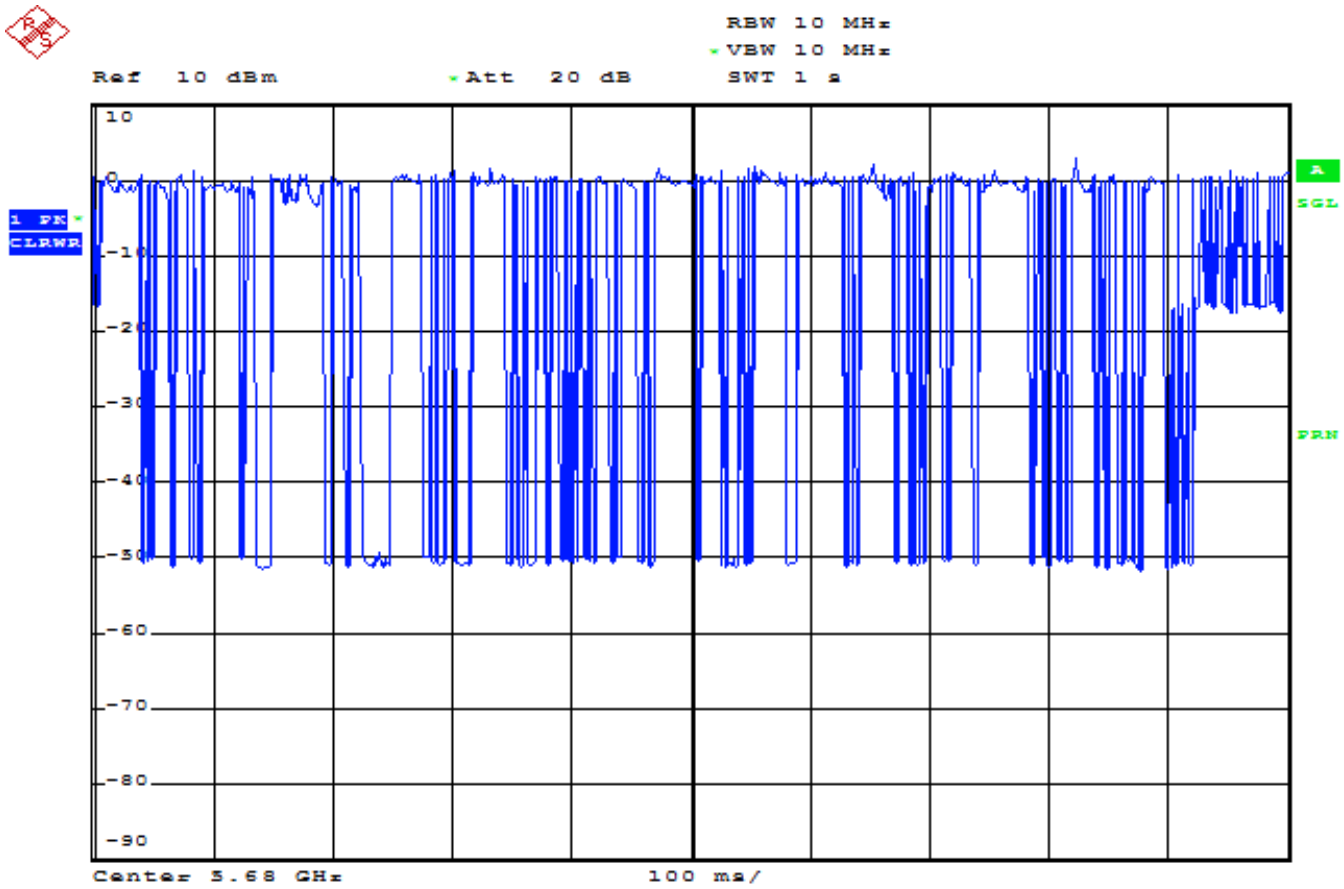

*Channel move time (Marker 1 represents end of the radar pulse)*



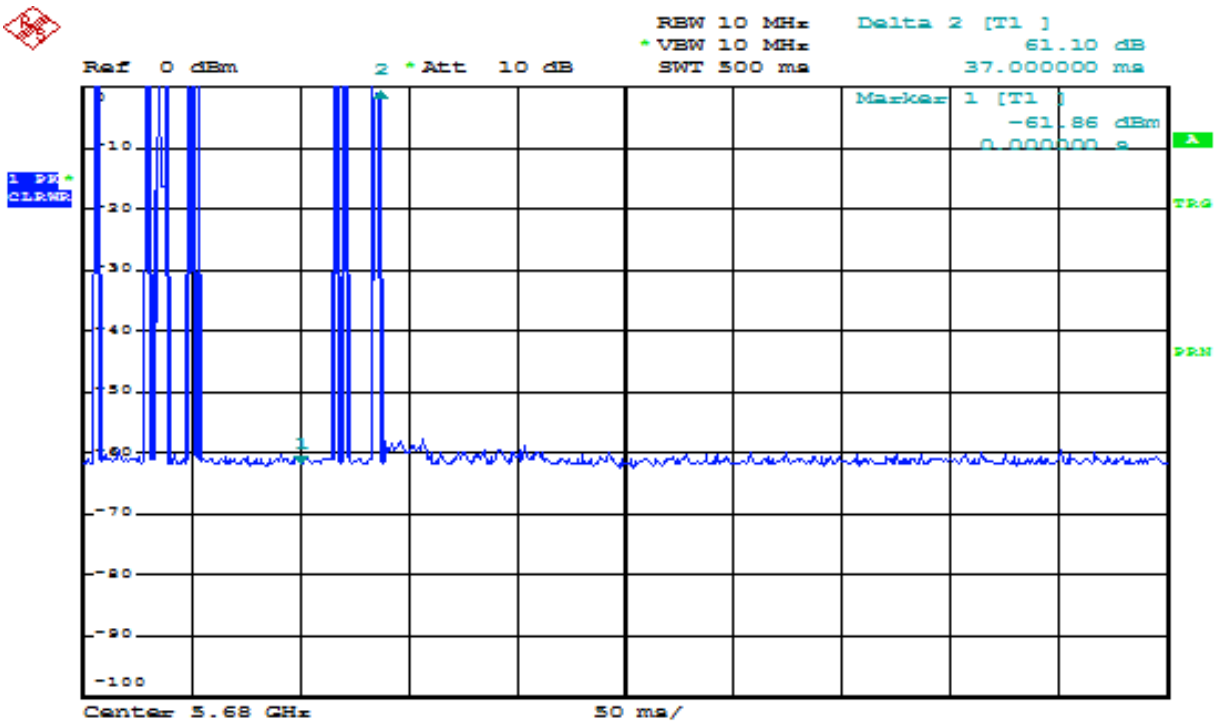

*Non-occupancy period at Radio channel 5280 MHz*

**Band 2**

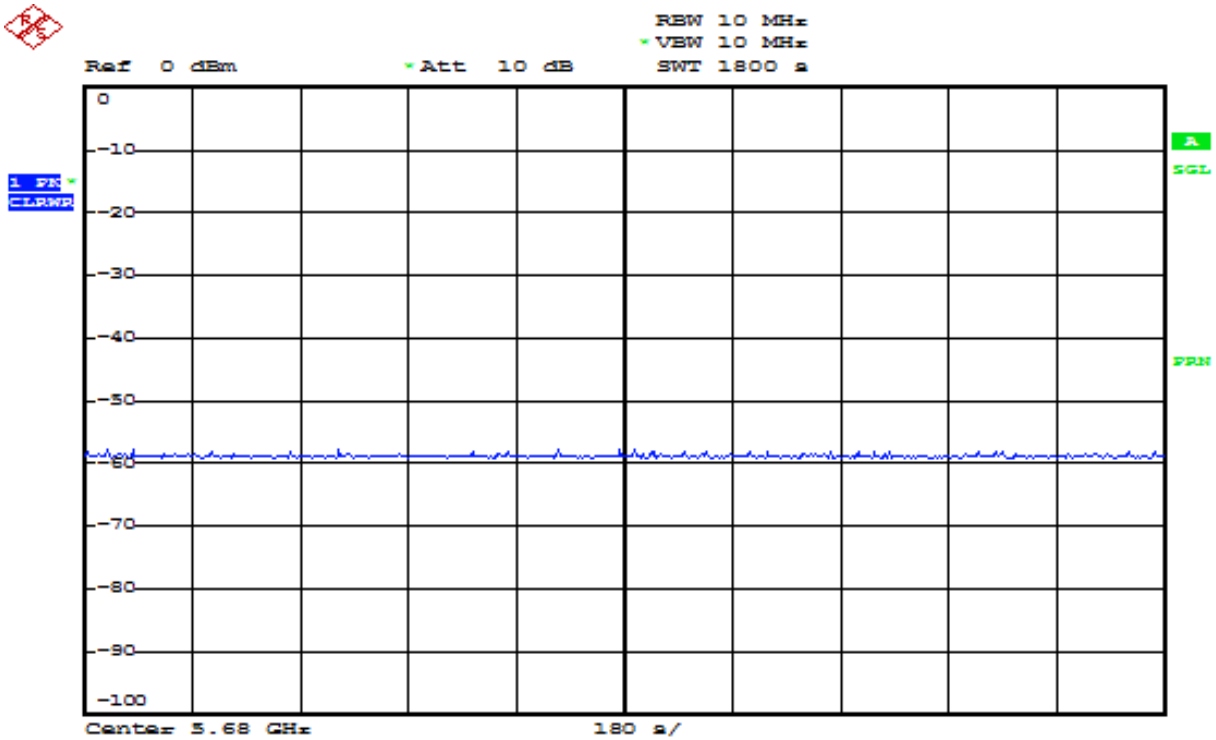
| Test frequency 5680 MHz | Measured | | Limits |
|---|---|---|---|
| | | | FCC part 15 |
| **Channel Move Time (ms)** | 37.0 | | 10000 |
| **Channel Closing Transmission Time (ms)** | 2.8 | | 200 |
| **Non-occupancy period** | >30min | | >30min |
| **Measurement uncertainty** | **0.1% ± 21 µs** | | |




*Traffic density*




*Channel Closing Time - Radio channel 5680 MHz (Marker 1 represents end of the radar pulse)*




*Non-occupancy Period at Radio channel 5680 MHz*

#### 4.3.1 Test equipment used (for reference see equipment list).

| | | | | | | |
|---|---|---|---|---|---|---|
| 12520 | 12559 | 13526 | 99550 | 99737 | 99738 | 99538 |

## 4.4 Non-Occupancy Period.

Part 15.407(iv) states: Non-occupancy period. 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.
The EUT fulfils this requirements, see section 6.3.

## 4.5 Uniform Spreading.

Not applicable, the EUT is a slave device without radar detection.
Therefore the Uniform Spreading is not required.

## 4.6 Medium Access Protocol

A medium access protocol is implemented in the equipment and is active under all circumstances.

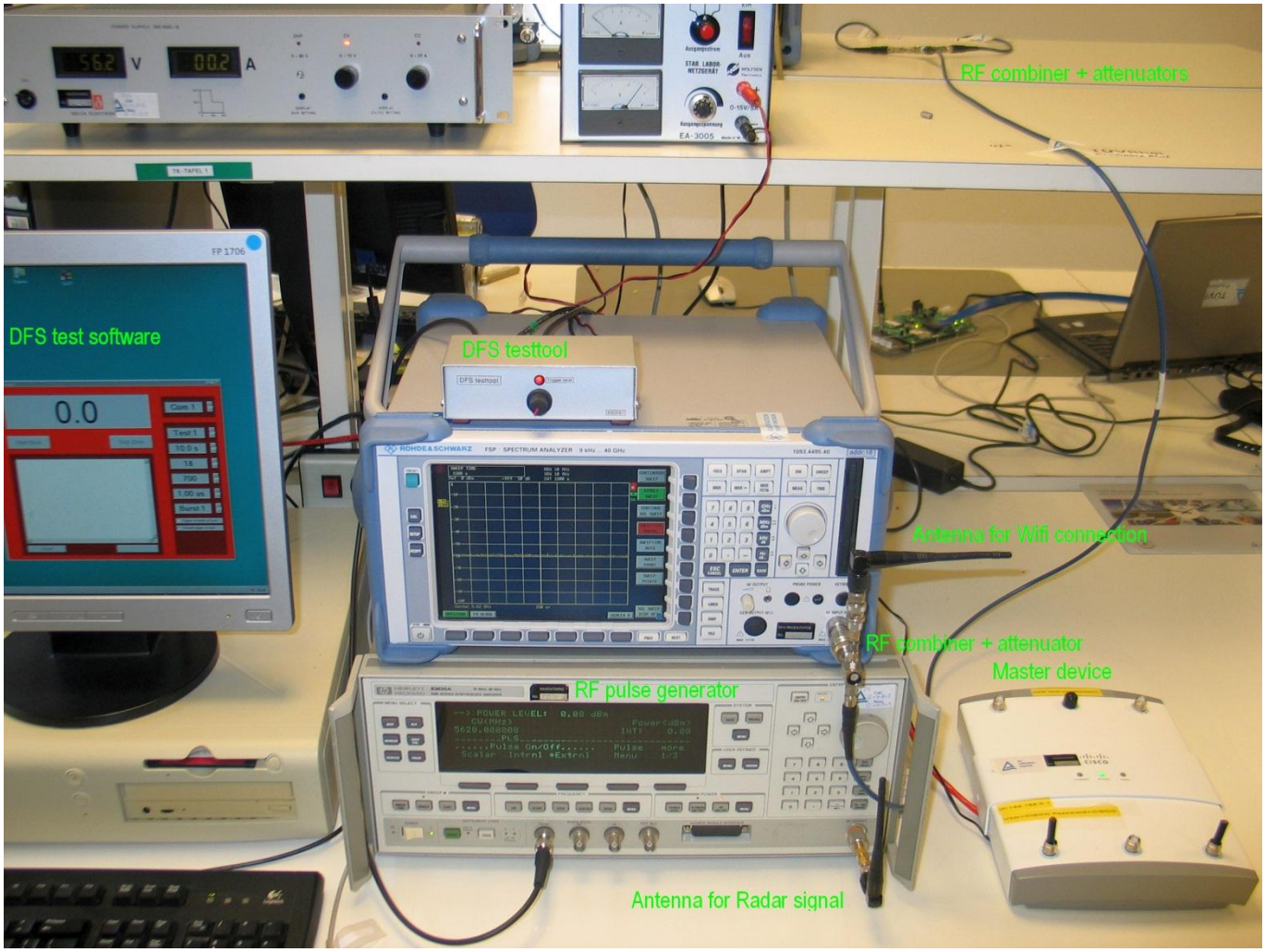
#### 4.6.1 Requirements (clause 4.8.2).

A medium access protocol shall be implemented by the equipment and shall be active under all circumstances.

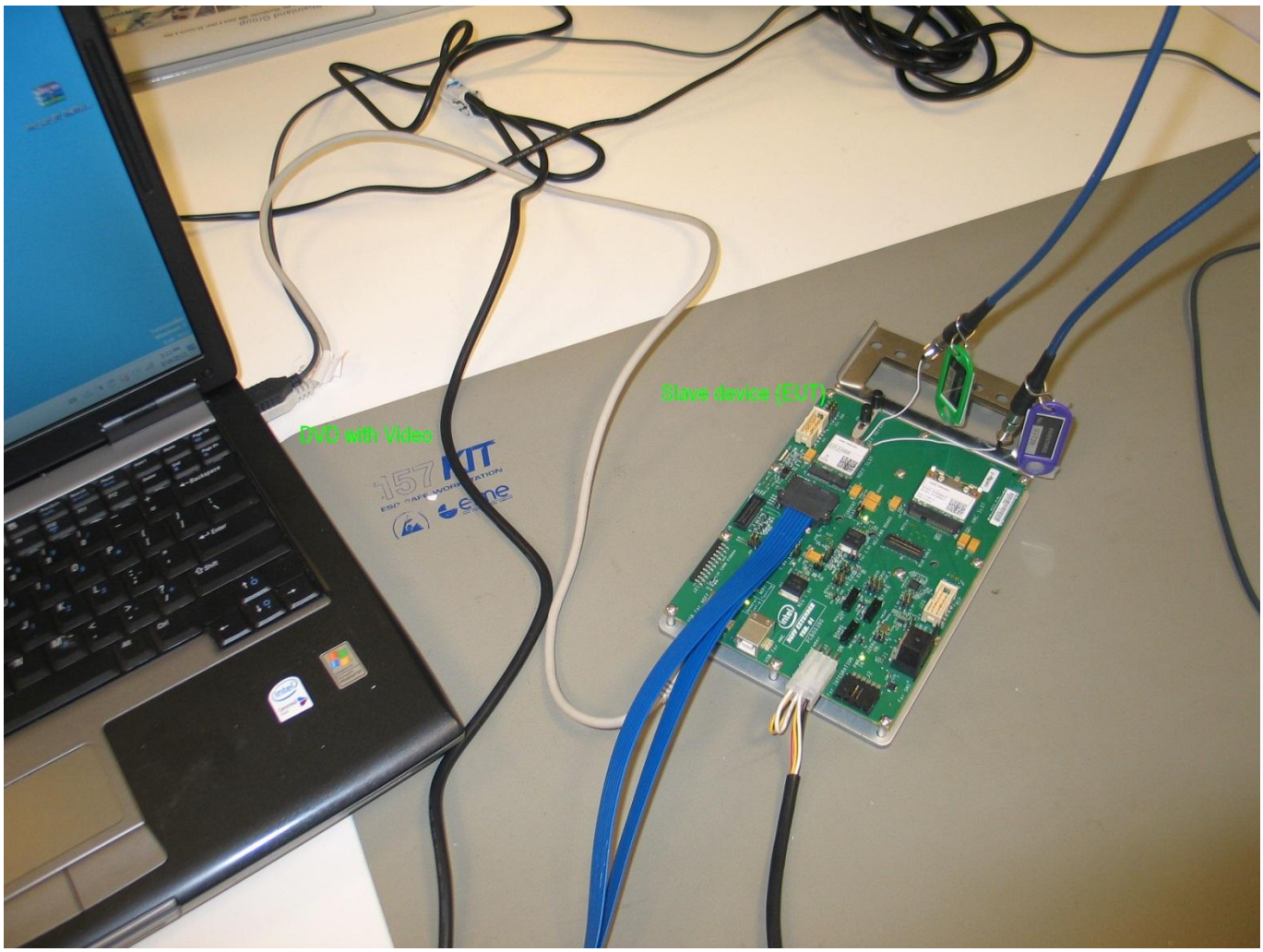
## 4.7 User Access Restrictions

DFS controls (hardware and software) related to radar detection are not accessible to the user.

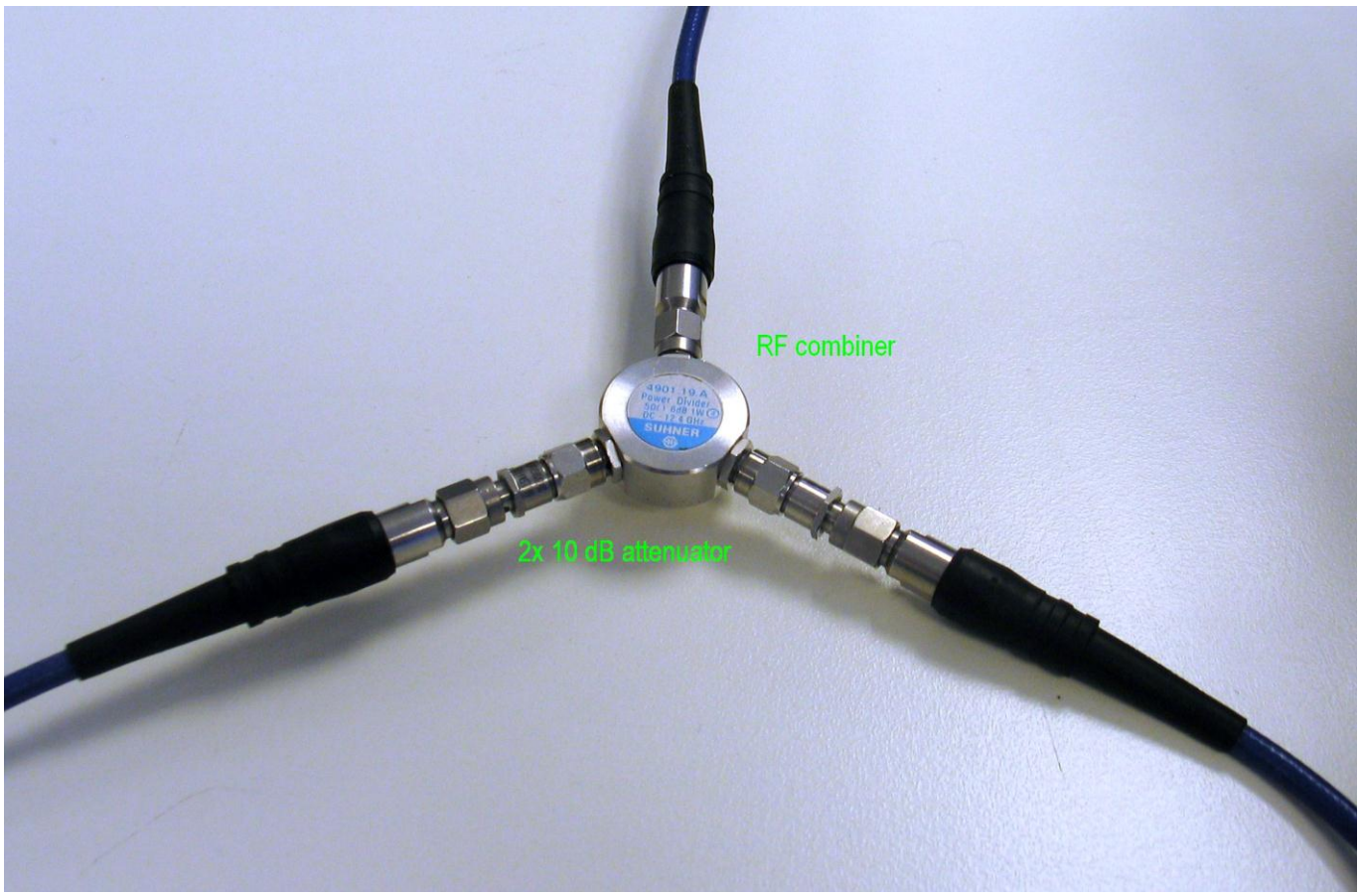
# 5 Test setup




*DFS test setup*




*EUT setup with laptop and DVD with Video. The video is displayed via the RF connection to the Access Point on a second laptop*




*Combiner and 2x 10 dB attenuator to combine the two antenna ports of the EUT. The output of the combiner is connected to the spectrum analyzer. The If output of the spectrum analyzer is connected to the DFS testtool.*

# 6 Test equipment and ancillaries used for tests.

To facilitate inclusion of the test equipment, used for performing the tests, on each page of this test report, each item of test equipment and ancillaries, such as cables, must be identified (numbered) by the test laboratory.

| Inventory number | Description | Brand | Model | Cal Date | Cal Due Date |
|---|---|---|---|---|---|
| 13526 | Signal generator | Hewlett & Packard | 83620A | 04/2012 | 04/2013 |
| 99550 | DFS test tool | TNO | TNO | Not Applicable | Not Applicable |
| 99538 | Spectrum analyzer | Rohde & Schwarz | FSP40 | 12/2012 | 12/2013 |
| 99737 | Cable RF | Huber + Suhner | Sucotest 18/Sucoflex 102 | 04/2012 | 04/2013 |
| 99738 | Cable RF | Huber + Suhner | Sucotest 18/Sucoflex 102 | 04/2012 | 04/2013 |