

FCC ID:U9A277IWLAN-V211

EMI - TEST REPORT

- FCC Part 15.407, DFS -



Test Report No. :	T34493-00-19HS
28. January 2011 Date of issue	

Type / Model Name : MobilePanel277FIWLAN RF

Product Description : Mobile Human Machine Interface

Applicant : Siemens AG, I IA AS RD ST TT

Address : Werner-von-Siemens-Str. 50

92224 AMBERG, GERMANY

Manufacturer : Siemens AG, I IA AS

Address : Gleiwitzer Str. 555

90475 NUERNBERG, GERMANY

Licence holder : Siemens AG, I IA AS RD ST TT

Address : Werner-von-Siemens-Str. 50

92224 AMBERG, GERMANY

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
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The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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ATTACHMENT A, T34493

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart E – Unlicensed National Information Infrastructure Devices

(October, 2009)

Part 15, Subpart E, Section 15.407

Operation within the bands 5.15 - 5.25 GHz, 5.25 - 5.35 GHz, 5.47 - 5.725 GHz and 5.725 - 5.825 GHz

ET Docket No. 03-122, FCC 06-96

Released June 30, 2006, Memorandum Opinion and Order
concerning DFS

mikes

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2 SUMMARY

GENERAL REMARKS:

The EUT consists of 1 WLAN Module and 1 RFID Module (13.56 MHz). The EUT can be configured as client only. The EUT has an input voltage stabilisation and a voltage stabilisation directly in the RF module. Therefore no influence will be expected by voltage variations. For this reason the tests have been performed with nominal voltage only. For the compliance of the RFID Module please refer to test report T34493-00-00AA by mikes-testingpartners gmbh.

Available Features:

The WLAN miniPCI module is compatible with 802.11h technology. It is able to operate in the 5 GHz frequency band. The EUT has no ad-hoc or peer-to-peer mode.

- 802.11h Mode 5.25 GHz – 5.35 GHz and 5.470 GHz – 5.725 GHz

The module uses DSSS or OFDM modulation and is capable to provide following data rates:

- 802.11h 54, 48, 36, 24, 18, 12, 9, 6 Mbps, auto-fallback

The EUT is equipped with 2 internal WLAN antennas (gain = 3 dBi at 2.4 GHz, 5 dBi at 5 GHz) and 1 RFID antenna.

The EUT provides the following channels in 802.11h mode:

Channel	Frequency
52	5260
56	5280
60	5300
64	5320
100	5500
104	5520
108	5540
112	5560
116	5580
120	5600
124	5620
128	5640
132	5660
136	5680
140	5700

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FINAL ASSESSMENT:

The equipment under test **fulfills** the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 22 November 2010

Testing concluded on : 29 November 2010

Checked by:

Tested by:

Klaus Gegenfurtner
Dipl.-Ing.(FH)
Manager: Radio Group

Hermann Smetana
Dipl.-Ing.(FH)
Radio Expert

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3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT – Detailed photos see attachment A

3.2 Power supply system utilised

Power supply voltage : 7.2 VDC Battery
Power supply voltage (alternative) : Input: 100-240 VAC, 50-60 Hz, Output: 12 VDC

3.3 Short description of the equipment under test (EUT)

The MobilePanel277FIWLAN RF permits remote control to systems are controlled by more than one PLC. The HMI device communicates with the PLC via WLAN. The access to one of the system part is determined by a zone recognition function (RFID) of the HMI.

Number of tested samples: 1
Serial number: 64

EUT operation mode:

The equipment under test was operated during the measurement under the following conditions:

- Data transmission (Client mode)
- Continuous transmit mode (conducted test mode only)

EUT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

The following peripheral devices and interface cables were connected during the measurements:

- AC/DC power supply Model : MEAN WELL GS60A12
- Model :

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4 TEST ENVIRONMENT

4.1 Address of the test laboratory

mikes-testingpartners gmbh
Ohmstrasse 2-4
94342 STRASSKIRCHEN
GERMANY

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader may notice that tolerances within the calibration of the equipment and facilities may cause additional uncertainty. The measurement uncertainty is calculated for all measurements listed in this test report acc. to CISPR 16-4-2 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurement“ and documented in the **mikes-testingpartners gmbh** quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, **mikes-testingpartners gmbh**, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component diversity and modifications in production process of devices may result in additional deviation. If necessary, refer to the test lab for the actual measurement uncertainty for the specific test. The manufacturer has the sole responsibility of continued compliance of the EUT.

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5 TEST CONDITIONS AND RESULTS

5.1 DFS (slave mode)

For test instruments and accessories used see section 6 Part **DFS**.

5.1.1 Description of the test location

Test location: AREA4

5.1.2 General

The requirements and measurements applies are based on a client device without radar detection. The associated master device was an FCC approved Cisco AIR-AP1250 access point, certified under FCC ID: LDK102061.

5.1.3 Applicable standard

According to FCC Part 15 Subpart D, Section 15.407, (h)(2):

Devices operating in the bands 5250 – 5350 MHz and 5470 – 5725 MHz shall comply with the following:

Table 1: Applicability of DFS requirements prior to use of a channel (FCC 06-96)

Requirement	Operational mode		
	Master	Client without radar detection	Client with radar detection
<i>Non-Occupancy Period</i>	Yes	Not required	Yes
<i>DFS Detection Threshold</i>	Yes	Not required	Yes
<i>Channel Availability Check Time</i>	Yes	Not required	Not required
<i>Uniform Spreading</i>	Yes	Not required	Not required
<i>U-NII Detection Bandwidth</i>	Yes	Not required	Yes

Table 2: Applicability of DFS requirements during normal operation (FCC 06-96)

Requirement	Operational mode		
	Master	Client without radar detection	Client with radar detection
<i>DFS Detection Threshold</i>	Yes	Not required	Yes
<i>Channel Closing Transmission Time</i>	Yes	Yes	Yes
<i>Channel Move Time</i>	Yes	Yes	Yes
<i>U-NII Detection Bandwidth</i>	Yes	Not required	Yes

5.1.4 Description of measurement

The measurement setup is regarding the ET Docket No.03-122 of FCC 06-96. System testing was performed with continuous ping from AP to the client creating continuous traffic.

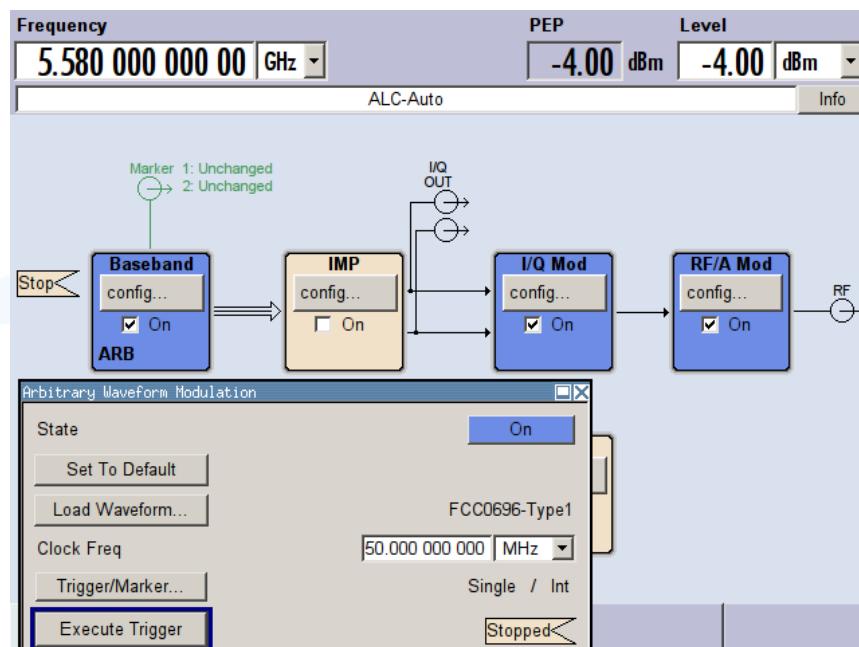
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5.1.1 Radar test waveforms

Table 5 – Short pulse radar test waveforms (FCC 06-96)

Radar type	Pulse width (usec)	PRI (usec)	Number of pulses	Minimum percentage of successful detection	Minimum number of trials
1	1	1428	18	60%	30
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

FCC Radar Types 1 to 4 system diagram



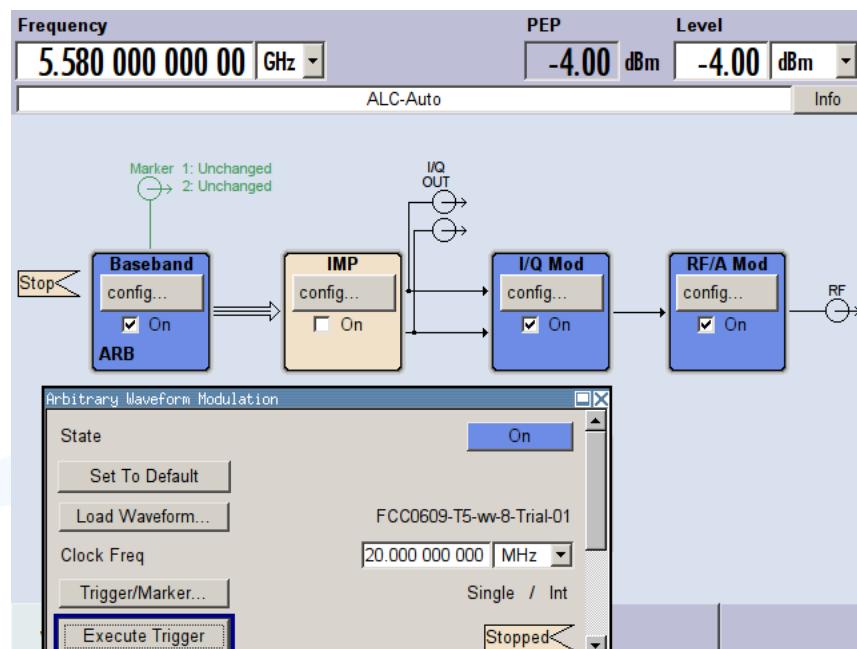
The appropriate radar test pattern is generated by an R&S SMBV100A (Vector SG with one ARB). The K6 sequencer software has been used for creating complex waveforms to generate the puls and burst sequence.

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Table 6 – Long pulse radar test waveform (FCC 06-96)

Radar type	Pulse width (μsec)	Chirp width (MHz)	PRI (μsec)	Number of pulses per burst	Number of bursts	Minimum percentage of successful detection	Minimum number of trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

FCC Radar Type 5 system diagram



The appropriate radar test pattern is generated by an R&S SMBV100A (Vector SG with one ARB). The K6 sequencer software has been used for creating complex waveforms to generate the puls and burst sequence.

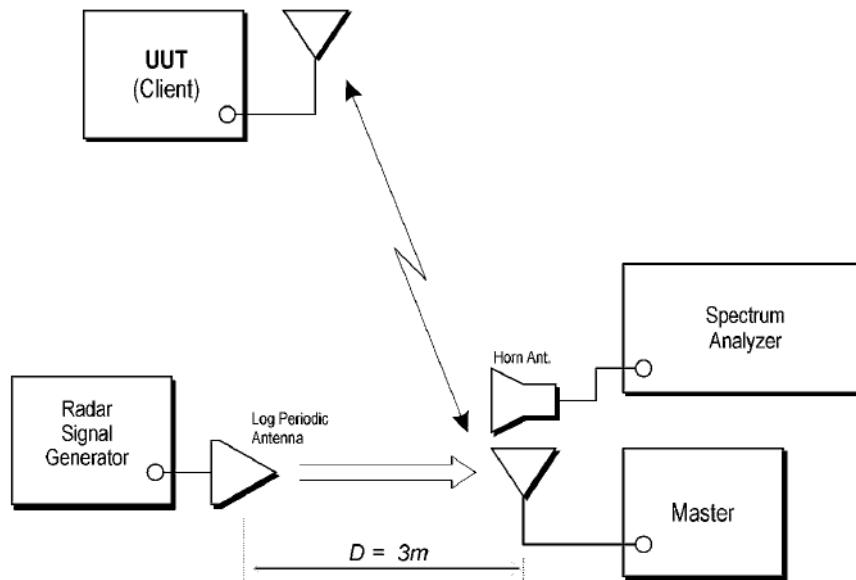
Due to testing a client without radar detection the target is to show the performance in channel moving and closing and not in detecting several kinds of pulses. Therefore the client is tested with the radar puls 1 only.

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5.1.2 Test setup and radiated calibration diagram for client with injection at the master

5.1.3

Test setup:



The interference radar detection threshold is as follows:

Table 3: DFS detection thresholds for master devices and client devices with radar detection (FCC 06-96)

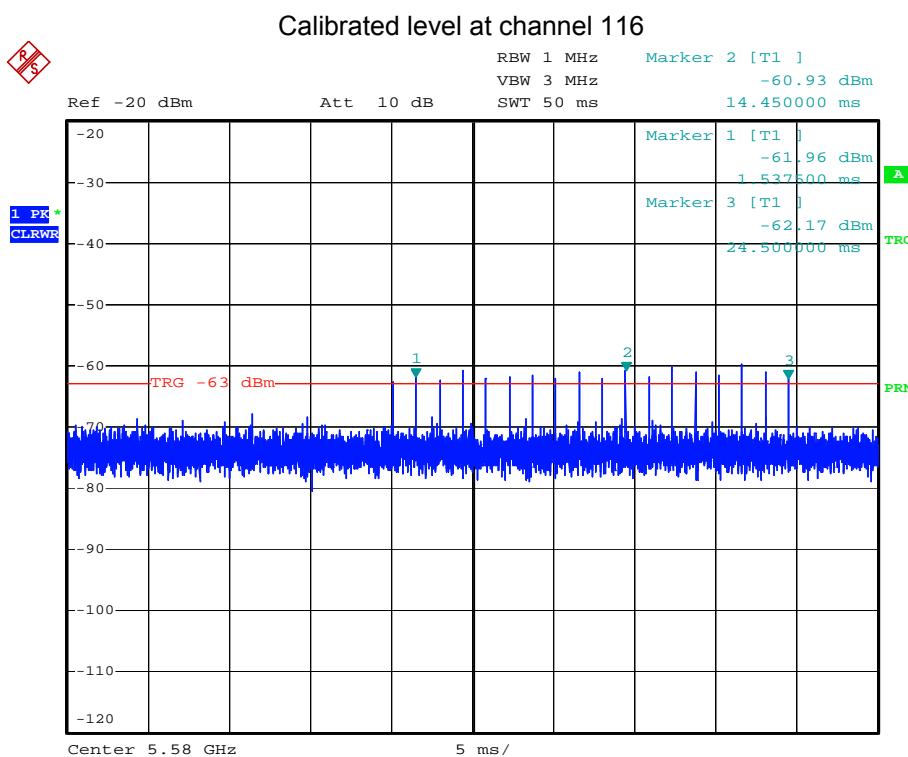
Maximum Transmit Power	Value (See Notes 1 and 2)
≥ 200 milliwatt	-64 dBm
< 200 milliwatt	-62 dBm

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 1 dB 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.

The applied interference radar detection threshold conducted at the input of the AP is -64 dBm. Therefore the level at the AP connector + 1 dB variation in measurement equipment = -63 dBm. This calibration level is shown with the plot below.

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5.1.4 Channel move time

Requirement according to FCC Part 15 Subpart D, Section 15.407, (h)(2)(iii):
 The requirement for channel move time applies in both the master and the slave operational modes.

Table 4: DFS response requirement values (FCC 06-96)

Parameter	Value
<i>Non-occupancy period</i>	Minimum 30 minutes
<i>Channel Availability Check Time</i>	60 seconds
Channel Move Time	10 seconds, See Note 1.
Channel Closing Transmission Time	200 ms + an aggregate of 60 ms over remaining 10 s period. See Notes 1 and 2.
<i>U-NII Detection Bandwidth</i>	Minimum 80% of the U-NII 99% transmission power bandwidth. See Note 3.

Note 1: The instant that the *Channel Move Time* and the *Channel Closing Transmission Time* begins is as follows:

- For the Short Pulse Radar Test Signals this instant is the end of the *Burst*.
- For the Frequency Hopping radar Test Signal, this instant is the end of the last radar *Burst* generated.
- For the Long Pulse Radar Test Signal this instant is the end of the 12 second period defining the *Radar Waveform*.

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 facilitating 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.

Note 3: During the *U-NII Detection Bandwidth* detection test, radar type 1 is used and for each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

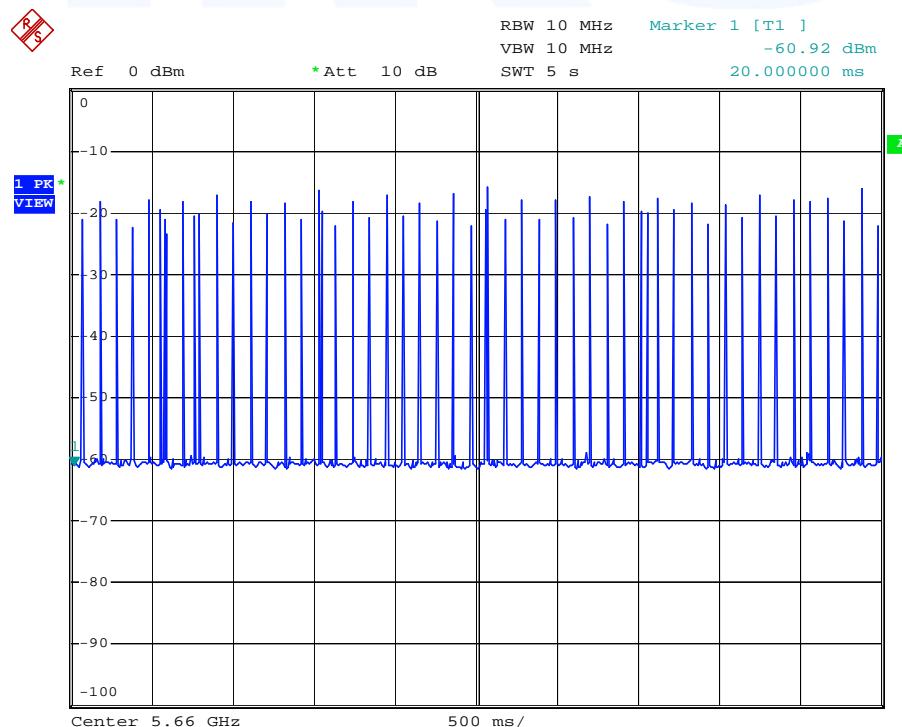
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5.1.4.1 Photo documentation of the test set-up



5.1.4.2 Test result

Channel 132, with normal traffic:

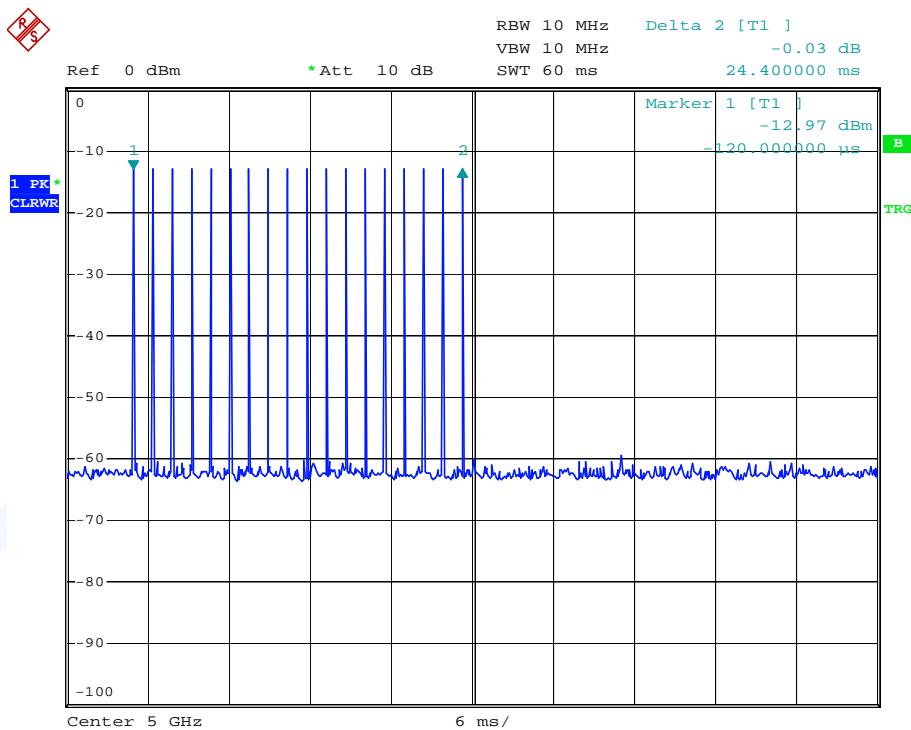


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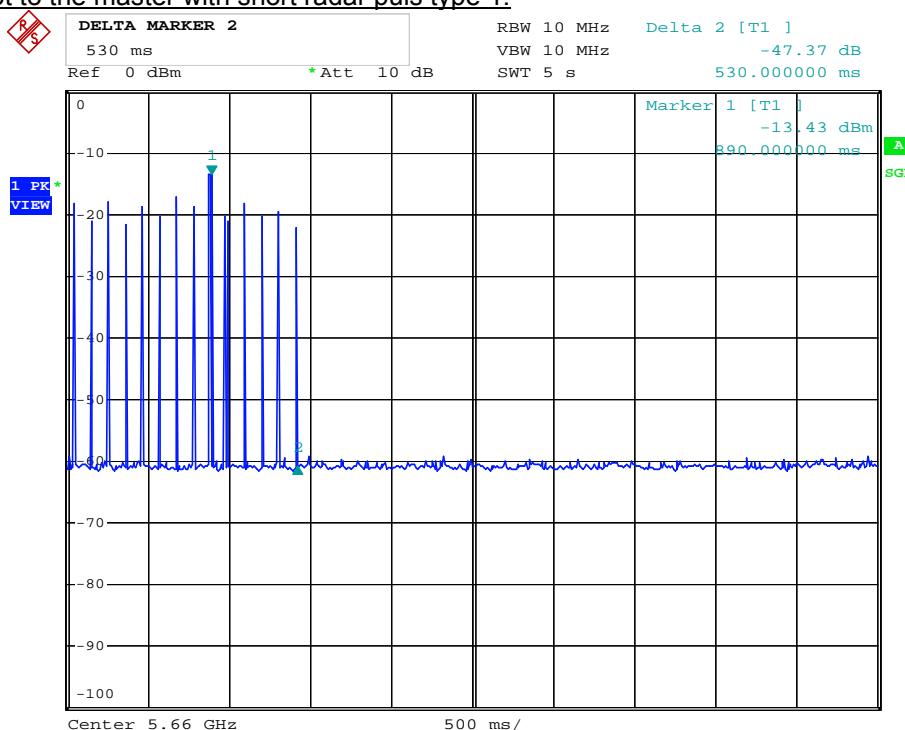
Short puls radar type 1:

Applied sample:

RADAR TYPE 1					Rohde & Schwarz K6 Pulse Sequencer
Trial #	Number of Pulses per Burst	Pulse Width (μ sec)	PRI (μ s)	Detection (yes/no)	
1	18	1	1428	y	

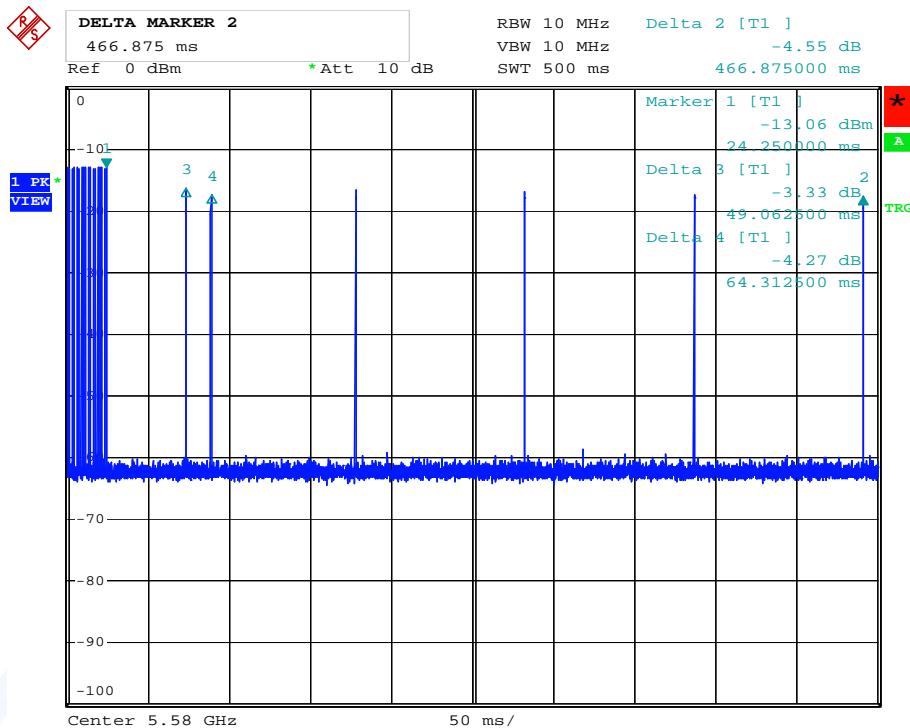


Channel 132, shot to the master with short radar puls type 1:



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The plot starts at the beginning of the radar burst type 1 at $T_0 = 0$ s.



Calculation of the channel move time:

$$T_{\text{cmt}} = \text{all transmissions from } T_1 \text{ (Marker1) to } T_2 \text{ (Marker2)}$$

Burst length of the radar pulses T_0 to T_1 : 24 ms;

End time of all transmissions T_2 : 491 ms;

$$T_{\text{cmt}} = T_2 - T_1 = 491 \text{ ms} - 24 \text{ ms};$$

$$T_{\text{cmt}} = 467 \text{ ms};$$

Limit according to FCC Part 15 Subpart D, Section 15.407, (h)(2)(iii):

After the radar signal is detected, the device shall cease all transmissions on the operating channel within 10 s.

Transmission during this period shall consist of normal traffic for a minimum 200 ms after detection of the radar signal. In addition, the intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel.

The requirements are **FULFILLED**.

Remarks:

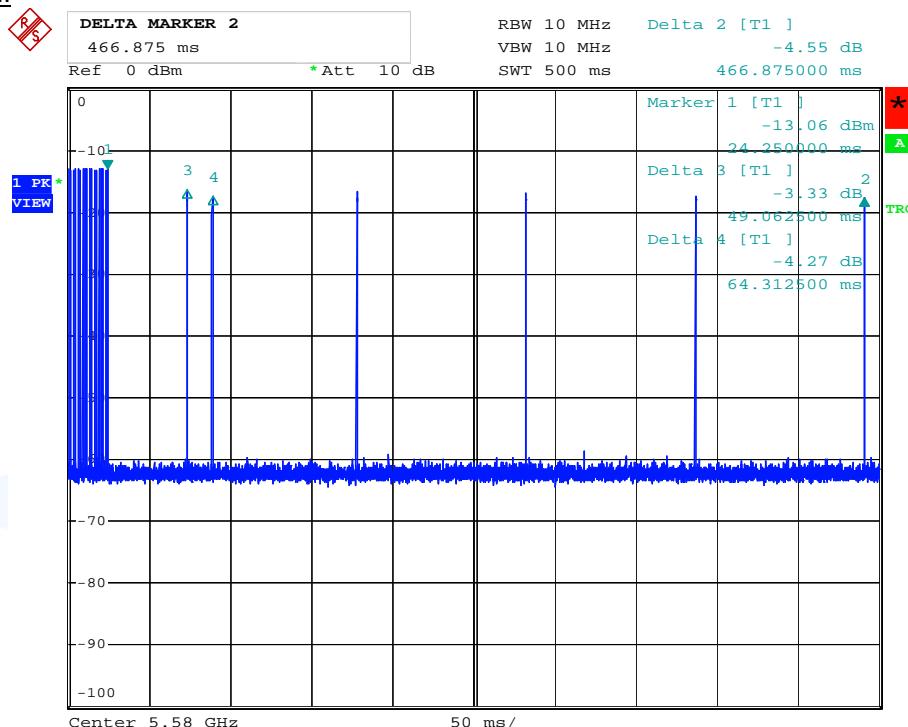
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5.1.5 Channel closing time

Requirement according to FCC Part 15 Subpart D, Section 15.407, (h)(2)(iv):
The requirement for channel closing time is 200 ms + 60 ms. (See table 4)

5.1.5.1 Test result

Channel 116 zoomed:



Calculation of the Channel closing time:

Channel 116:

$T_{cct} = \text{aggregate duration of all transmission from T1 to T2 of Client}$
6 pulses remain after radar detection. The pulswidth of one remaining puls is 330 μ s.
 $T_{cct} = 330 \mu\text{s} * 6 = 1.98 \text{ ms}$;

Limit according to FCC Part 15 Subpart D, Section 15.407, (h)(2)(iii):
The channel closing time shall not exceed 200 ms.

The requirements are **FULFILLED**.

Remarks:

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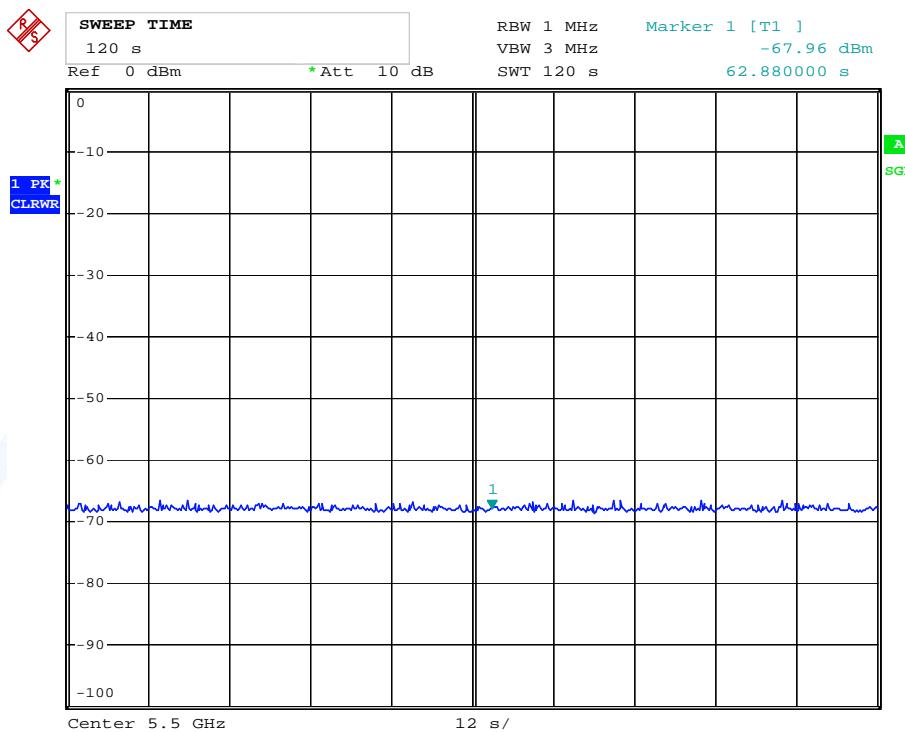
5.1.6 Non-Occupancy period

Requirement according to FCC Part 15 Subpart D, Section 15.407, (h)(2)(iv):

The requirement for testing the non-occupancy period does not exist (see Table 1) but the EUT has to ensure that no transmission of any type occurred for 30 minutes.

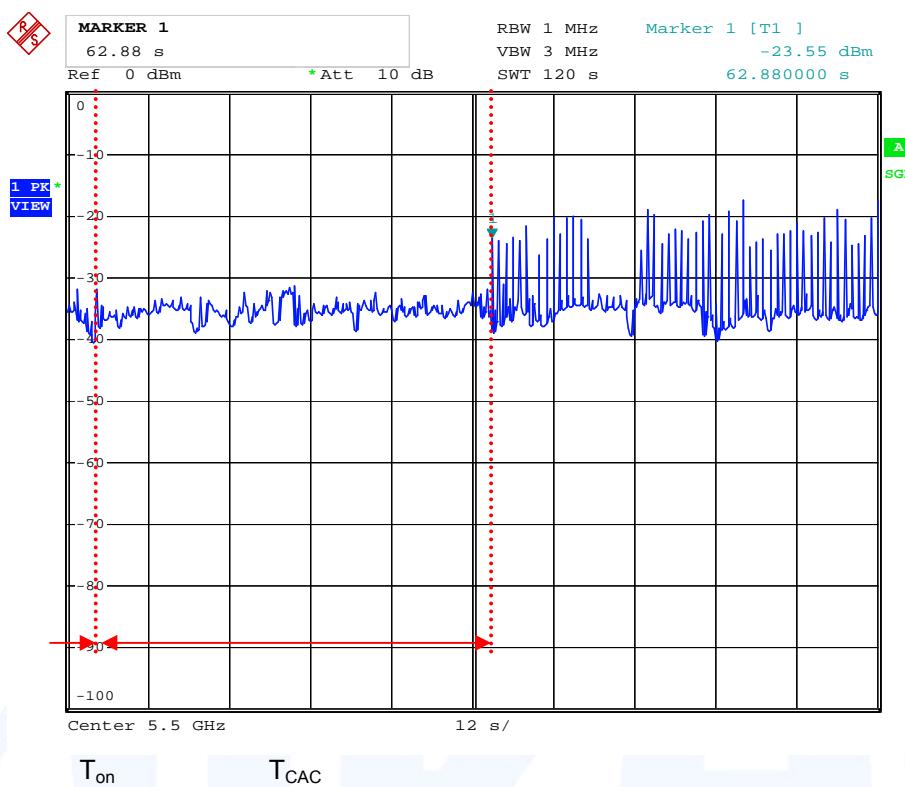
5.1.6.1 Test result

Behaviour at "Power On" without association to the AP:



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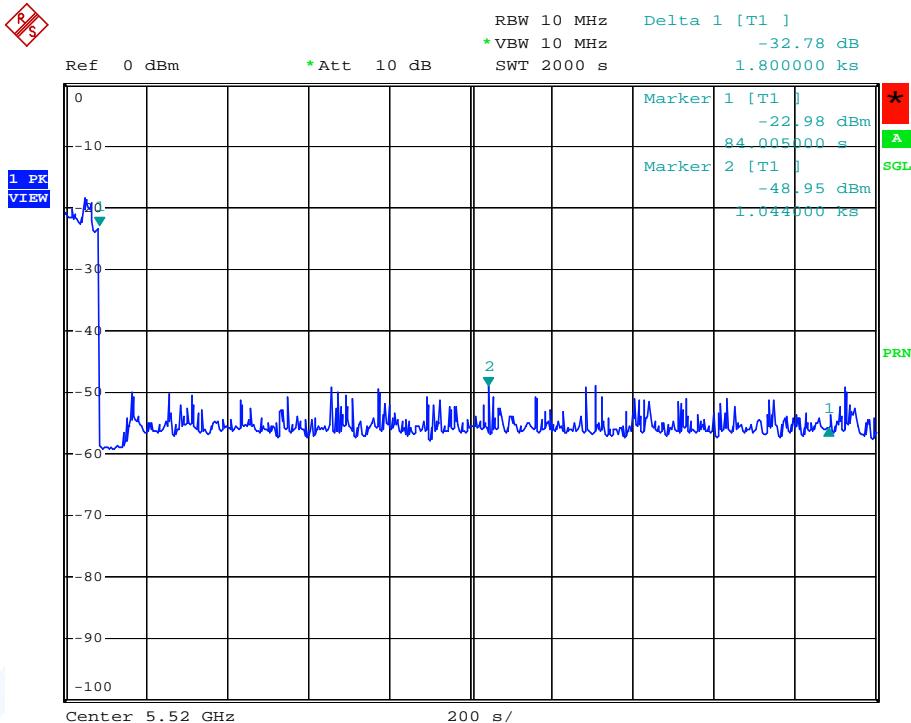
Behaviour at "Power On" associated to the AP:



T_{on} = 2.88 s (time for boot and system setup)
 T_{CAC} = 60 s (Channel availability check)

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Non occupancy period for at least 30 min:



The requirements are **FULFILLED**.

Remarks:

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6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used, in addition to the test accessories, are calibrated and verified regularly.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
DFS	AIR-AP1250	02-01/50-10-001				
	SMBV100A	02-02/05-09-001	12/03/2012	12/03/2009	04/03/2011	04/03/2010
	FSP 30	02-02/11-05-001	04/05/2011	04/05/2010		
	LOBB 18	02-02/24-05-026	07/09/2011	07/09/2010		
	6011	02-02/50-05-081				