

Report No.: EH/2014/10054 Issue Date: Mar. 06, 2014

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# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

# INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E REQUIREMENT

OF

Product Name: PDA Phone

**Brand Name:** Sony

Type No.: PM-0732-BV

Model Difference: N/A

FCC ID: **PY7PM-0732** 

**Report No.:** EH/2014/10054

Issue Date: Mar. 06, 2014

FCC Rule Part: §15.407

Prepared for: Sony Mobile Communications AB

Nya Vattentornet 22188 Lund/Sweden

Prepared by: SGS Taiwan Ltd.

**Electronics & Communication Laboratory** 

No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803





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# VERIFICATION OF COMPLIANCE

**Applicant:** Sony Mobile Communications AB

Nya Vattentornet 22188 Lund/Sweden

**Product Name:** PDA Phone

**Brand Name:** Sony

**Type No.:** PM-0732-BV

**Model Difference:** N/A

**FCC ID:** PY7PM-0732

**File Number:** EH/2014/10054

**Date of test:** Jan. 27, 2014 ~ Mar. 06, 2014

**Date of EUT Received:** Jan. 27, 2014

# We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4:2009 & ANSI C63.10: 2009 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.407.

The test results of this report relate only to the tested sample identified in this report.

Test By:	Marcus Iseng	Date:	Mar. 06, 2014
_	Marcus Tseng / Engineer		
Prepared By:	Tiffany Kao	Date:	Mar. 06, 2014
_	Tiffany Kao / Clerk		
Approved By:	Jim Chang	Date:	Mar. 06, 2014
_	Jim Chang / Supervisor		

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# **Revision History**

Report Number	Revision	Description	Issue Date	
EH/2014/10054 Rev.00		Initial creation of document	Mar. 06, 2014	

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		DFS: Standard Applicable	
		1.1	

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# **GENERAL INFORMATION**

# 1.1. Product Description

General:

Product Name:	PDA Phon	PDA Phone			
Brand Name:	Sony				
Type No.:	PM-0732-BV				
Model Difference:	N/A				
Data Cable (USB):	Type No.:	o.: EC450, Supplier: K-one AI-0700, Length: 100 cm o.: EC801, Supplier: Sony			
		AI-0401, Length: 100 cm			
Simple Hands-Free (SHF-White):	Model No. Type No.:	: MH410c, Supplier: Foster Electric AG-1100			
Simple Hands-Free (SHF-Black):	Model No.: MH410c, Supplier: Foster Electric Type No.: CCA-0004017				
Car Charger:		o.: AN400, Supplier: Salcomp CAA-0003013			
Hi-Fi Wireless Headset:	Model No.: MW600, Supplier: BALDA Type No.: DDA-0002029.B coupling with Simple Hands Free (Model No.: MH755, Supplier: BALDA Type No.: AG-0502)				
Hardware Version:	A				
Software Version:	18.2.A.0.9				
	3.8Vdc				
	Battery:	Model No.: LIS1546ERPC, Supplier: Sony Type No.: N/A			
Power Supply:	Adapter:	1.Model No.: EP800, Supplier: Salcomp Type No.: CAA-0002016-US			
		2.Model No.: EP880, Supplier: Salcomp Type No.: AC-0400-US			

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# Bluetooth\_BR+EDR:

Bluetooth Version:	V3.0+HS
Channel number:	79 channels
Modulation type:	Frequency Hopping Spread Spectrum
Transmit Power:	10.12dBm
Frequency Range:	2.402GHz – 2.480GHz
Dwell Time:	<= 0.4s
Antenna Designation:	PIFA Antenna, Gain: -1.34dBi

## Bluetooth Low Energy:

Frequency Range:	2402 – 2480MHz
Bluetooth Version:	V4.0 Dual mode
Channel number:	40 channels
Modulation type:	GFSK
Transmit Power:	1.79dBm (Peak)
Antenna Designation:	PIFA Antenna, Gain: -1.34dBi

#### NFC:

Operating Frequency	13.56MHz
Transmit Power	< 123dBuV/m at 3m.
Number of Channels	1
Antenna Type	Loop Antenna
Modulation Type	ASK, BPSK

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# ANT Plus:

Operating Frequency:	2402 – 2480MHz
Transmit Power:	102.10dBuV/m
Number of Channels:	79
Antenna Type:	PIFA Antenna, Gain: -1.34dBi
Modulation Type:	GFSK

#### WLAN 2.4GHz+5.7GHz:

Wi-Fi	Frequency Range	Channels	Rated Power	Modulation Technology			
11b/g	2412-2462	11	b: 20.40dBm g: 21.93dBm	DSSS, OFDM			
11n	HT20 2412-2462	11	HT20: 20.89dBm	OFDM			
11a	5725-5850	5 a: 20.66dBm					
11n (5GHz)	HT20 5725-5850	5	HT20: 19.89dBm	OFDM			
11n (5GHz)	HT40 5725-5850	2	HT40: 19.07dBm				
Antenna	Designation:	PIFA Antenna, 2.4GHz Gain: -1.34dBi 5GHz Gain: 4.51dBi (5725MHz-5850MHz)					
Modulation type:		CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM					
Transition Rate:		802.11 a: 802.11 b: 802.11 g: 802.11 n	64QAM, 16QAM, QPSK, BPSK for OFDM 802.11 a: 6/9/12/18/24/36/48/54 Mbps 802.11 b: 1/2/5.5/11 Mbps 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 65.0Mbps 802.11 n_40MHz: 13.5 – 135.0Mbps				

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## WLAN 5GHz:

Wi-Fi	Frequency Range	Channels	Rated Power (Avg)	Modulation Technology	
	5150~5250	4	13.98dBm		
11a	5250~5350	4	13.99dBm	OFDM	
	5470~5725	8	13.99dBm		
	HT20 5150~5250	4	HT20: 11.49dBm		
11n	HT20 5250~5350	4	HT20: 11.49dBm	OFDM	
	HT20 5470~5725	8	HT20: 11.48dBm		
	HT40 5150~5250	2	HT40: 10.48dBm		
11n	HT40 5250~5350	2	HT40: 10.46dBm	OFDM	
	HT40 5470~5725	3	HT40: 10.49dBm		
Antenna Designation		5GHz Gain	ina, : -0.38dBi (5150M : 0.10dBi (5250M : 3.98dBi (5470M	(Hz-5350MHz)	
Modulation type		64QAM, 16QAM, QPSK, BPSK for OFDM			
Transition Rate:		802.11 a: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 65.0Mbps 802.11 n_40MHz: 13.5 – 135.0Mbps			

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## GSM / WCDMA:

	Operating Frequency	Rated Power			
	GSM/GPRS 850, Class 33	824.2 MHz- 848.8 MHz	33dBm		
	EDGE 850, Class 33	824.2 MHz- 848.8 MHz	27dBm		
Cellular Phone Standards Frequency	GSM/GPRS 1900, Class 33	1850.2MHz – 1909.8MHz	30dBm		
Range and Power.	EDGE 1900, Class 33	1850.2MHz – 1909.8MHz	26dBm		
	WCDMA/HSUPA/HSDPA /HSPA+ Band II	1852.4MHz – 1907.6MHz	24dBm		
	WCDMA/HSUPA/HSDPA /HSPA+ Band V	826.4MHz - 846.6MHz	24dBm		
Type of Emission:	GSM 850: 249KGXW, GSM 1900: 255KGXW GPRS 850: 243KGXW, GPRS 1900: 254KGXW EDGE 850: 248KG7W, EDGE 1900: 251KG7W WCDMA Band II: 4M19F9W, WCDMA Band V: 4M18F9W HSDPA Band II: 4M18F9W, HSDPA Band V: 4M17F9W HSUPA Band II: 4M18F9W, HSUPA Band V: 4M18F9W				
IMEI:	004402146985134				

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# IEEE 802.11n Spec:

MCS Index Nss				NBPSC	NCBPS		MDDDG		Datarate(Mbps)			
	Nss	Modulation	R		NC.	BPS	ND	NDBPS		800nsGI		nsGI
					20MHz	40MHz	20MHz	40MHz	20MHz	40MHz	20MHz	40MHz
0	1	BPSK	1/2	1	52	108	26	54	6.5	13.5	7.200	15
1	1	QPSK	1/2	2	104	216	52	108	13.0	27.0	14.400	30
2	1	QPSK	3/4	2	104	216	78	162	19.5	40.5	21.700	45
3	1	16-QAM	1/2	4	208	432	104	216	26.0	54.0	28.900	60
4	1	16-QAM	3/4	4	208	432	156	324	39.0	81.0	43.300	90
5	1	64-QAM	2/3	6	312	648	208	432	52.0	108.0	57.800	120
6	1	64-QAM	3/4	6	312	648	234	486	58.5	121.5	65.000	135
7	1	64-QAM	5/6	6	312	648	260	540	65.0	135.0	72.200	150

Symbol	Explanation				
NSS	Number of spatial streams				
R	Code rate				
NBPSC	Number of coded bite per single carrier				
NCBPS	Number of coded bite per symbol				
NDBPS	Number of data bite per symbol				
GI	Guard interval				

This report applies for client device in order to be compliant DFS regulation.

Note: The pertinent information with regards to the parameters of the detected Radar Waveforms is not available and accessible to the end user.

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# 2. SUMMARY OF TEST RESULT

FCC Rules	<b>Description Of Test</b>	Result
§15.407(h)	TPC and DFS Measurement	Compliant

# 3. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
TPC and DFS Measurement	+/- 123.36 Hz
Temperature	+/- 0.8 °C
Humidity	+/- 4.7 %
DC / AC Power Source	DC= +/- 1%, AC=+/- 0.2%

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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# TPC and DFS MEASUREMENT

#### 4.1. **TPC: Standard Applicable**

According to §15.407(h)(1), Transmit power control (TPC). U-NII devices operating in the 5.25-5.35 GHz band and the 5.47-5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

**4.1.1. Result**: N/A, The output power is less than 500mW.

#### 4.2. **DFS: Standard Applicable**

According to §15.407(h)(2), Radar Detection Function of Dynamic Frequency Selection (DFS). U-NII devices operating in the 5.25-5.35 GHz and 5.47-5.725 GHz bands shall employ a DFS radar detection.

(a) Devices shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems (see Note below). The minimum DFS radar signal detection threshold is -62 dBm for devices with a maximum e.i.r.p. less than 200 mW, and -64 dBm for devices with a maximum e.i.r.p. of 200 mW to 1 W. The detection threshold power is the received power, averaged over a 1-microsecond reference to a 0 dBi antenna. The DFS process shall provide a uniform spreading of the loading over all the available channels.

Note: Test procedures for demonstrating compliance with the DFS radar detection requirements set out in this section are being evaluated by Industry Canada. As an interim measure, the Department will, until further notice, accept utilization of the DFS test procedures published by the U.S. Federal Communications Commission (FCC)3 to demonstrate compliance with the requirements of this section.

(b) Operational requirements: the requirement for channel availability check time applies in the master operational mode. The requirement for channel move time applies in both the master and slave operational modes.

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(i) In-service monitoring: an LE-LAN device should be able to monitor the operating channel to check that a co-channel radar has not moved or started operation within range of the LE-LAN device. During in-service monitoring, the LE-LAN radar detection function continuously searches for radar signals between normal LE-LAN transmissions.

- (ii) Channel availability check time: the device shall check if there is a radar system already operating on the channel before it initiates a transmission on a channel and when it moves to a channel. The device may start using the channel if no radar signal with a power level greater than the interference threshold value specified in A9.3 (a) above is detected within 60 seconds.
- (iii) Channel move time: after a radar's signal is detected, the device shall cease all transmissions on the operating channel within 10 seconds. Transmission during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. Intermittent management and control signals may also be sent during the remaining time to facilitate vacating the operating channel.
- (iv)Channel closing time: the maximum channel closing time is 260 ms. (v) Non-occupancy period: 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.

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#### **4.2.1.** Limit

Table 1: Applicability of DFS requirements prior to use of a channel

ie 1: Applicability of DFS req	urrements prior to use o	л а спаппеі			
	Operational Mode				
Requirement	Master	Client(without radar detection)	Client(with radar detection)		
Non-occupancy Period	Yes	Yes	Yes		
DFS Detection Thresh- old	Yes	Not required	Yes		
Channel Availability Check Time	Yes	Not required	Not required		
Uniform Spreading	Yes	Not required	Not required		

Table 2: Applicability of DFS requirements during normal operation

	Operational Mode				
Requirement	Master	Client(without radar detection)	Client(with radar detection)		
Cannel Closing Transmission time	Yes	Yes	Yes		
Channel Move time	Yes	Yes	Yes		

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Table 3: Interference Threshold values, Master or Client incorporating In-Service Monitoring

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Maximum Transmit Power	Value				
	(see note)				
≥ 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.

# Table 4: DFS Response requirement values

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
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.
U-NII Detection Bandwidth	Minimum 80% of the 99%
	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 transmission.

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 Channel changes (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%. Measurements are performed with no data traffic.

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**Table 5: Radar Test Waveforms** 

# **Short Pulse Radar**

Radar	Pulse Width	PRI	Number	Minimum	Minimum
Туре	(µsec)	(µsec)	of Pulses	Percentage of	Trials
				Successful	
				Detection	
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
Aggreg	ate (Radar Types 1	80%	120		

# Long Pulse Radar

Radar	Pulse	Chirp	PRI	Number of	Number of	Minimum	Minimum
Туре	Width	Width	(µsec)	Pulses per	Bursts	Percentage of	Trials
	(µsec)	(MHz)		Burst		Successful	
						Detection	
5	50-100	5-20	1000-	1-3	8-20	80%	30
			2000				

# **Frequency Hopping Radar**

	dar /pe	Pulse Width (µsec)	PRI (µsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Trials
(	6	1	333	9	.333	300	70%	30

The applicant of this given application confirms that information regarding the parameters of the detected Radar Waveforms is not available to the end user.

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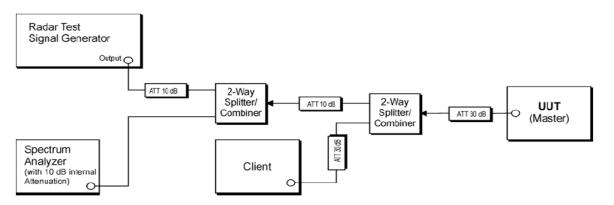


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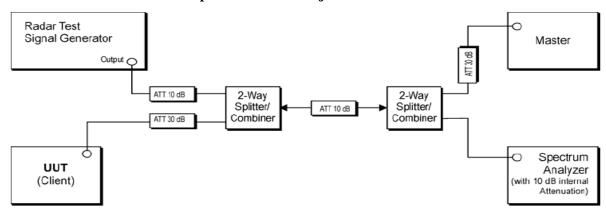
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# 4.2.2. Test Setup

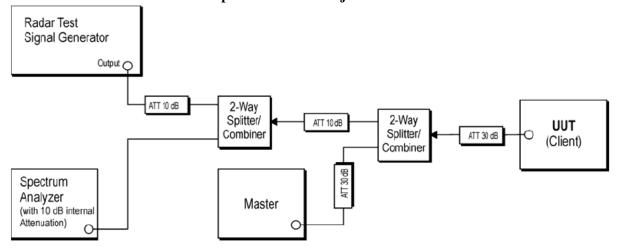
#### Setup for Master with injection at the Master



#### Setup for Client with injection at the Master



#### Setup for Client with injection at the Client



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# 4.2.3. Test Equipment Used:

Conducted Emission Test Site								
<b>EQUIPMENT</b>	MODEL	SERIAL	LAST	CAL DUE.				
TYPE		NUMBER	NUMBER	CAL.				
Signal Generator	Agilent	E4438C	MY45093613	07/30/2013	07/29/2014			
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/30/2013	05/29/2014			
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2013	02/27/2014			
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2013	02/27/2014			
Power Splitter	Mini-Circuits	ZN2PD-9G-S+	N/A	02/28/2013	02/27/2014			
Power Splitter	Mini-Circuits	ZN2PD-9G-S+	N/A	02/28/2013	02/27/2014			
Attenuator	Agilent	8495B	3308A22470	02/28/2013	02/27/2014			
Attenuator	HP	8494B	2812A170605	02/28/2013	02/27/2014			

Conducted Emission Test Site									
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.				
TYPE		NUMBER	NUMBER	CAL.					
DC Block	Mini-Circuits	BLK-18-S+	1	02/27/2014	02/26/2015				
Attenuator	Mini-Circuit	BW-S10W2+	002	02/27/2014	02/26/2015				
Power Splitter	Mini-Circuits	ZN2PD-9G-S+	N/A	02/27/2014	02/26/2015				
Power Splitter	Mini-Circuits	ZN2PD-9G-S+	N/A	02/27/2014	02/26/2015				
Attenuator	Agilent	8495B	3308A22470	02/27/2014	02/26/2015				
Attenuator	HP	8494B	2812A170605	02/27/2014	02/26/2015				

Note: The measurement was taken place with the long duration of the time, and additional equipment list as shown above indicate those equipment of which has been subject to undertake the calibration in intermediate period of time of the measurement.

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# 4.2.4. Description of EUT:

EUT operates over the 5250-5350MHz and 5470-5725MHz ranges and EUT is a slave device (client equipment) w/o radar detection and DFS capability. EUT has a gain of 2.70dBi in the 5GHz Band.

EUT has no TPC mechanism implemented with no adjustment of lowest, and highest power, but the level of power emission stays at fixed level.

The EUT utilizes the 802.11a architecture, with a nominal channel bandwidth of 20MHz WLAN traffic is generated by streaming the mpeg file from the master to slave in full monitor video mode using the media player.

The rated output power of the master unit is >23dBm(EIRP).therefore the required interference threshold level is -62dBm.after correction for antenna gain and procedural adjustments, the required conducted threshold at the antenna port is -62dBm, and the master device as employed for the applicable DFS test is CISCO router whose FCC ID= LDK102061

While calibrate the path on antenna port of DFS test equipment (master), measurements equipments (spectrum) is ensured to be 50 Ohms, and therefore verification on antenna gain measurement can be ignored.

Conducted test was performed with appropriate adjustment, and calibration to ensure power from DFS simulator injects to antenna port of DFS test equipment (DFS) is -62dBm

# Message or files that is used for communication between Master and Client:

IP based system:

For the required channel loading, the full motion, 30 frames per second MPEG video file from http://ntiacsd.ntia.doc.gov/dfs/ was streamed from a network on a test bench (server of the storage to download the mandatory format of Video file), via the DFS Master device, to the UE (mobile phone).

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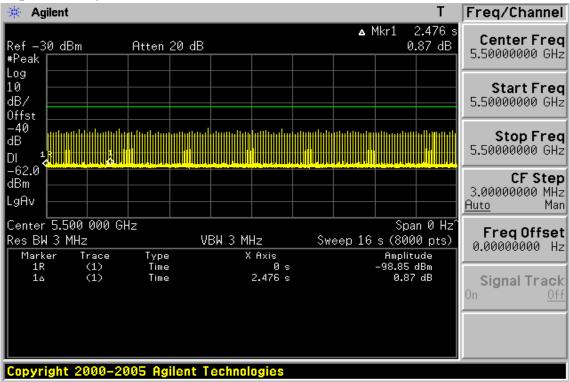


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#### 4.2.5. Test results

The time of power-on cycle (2.476s):



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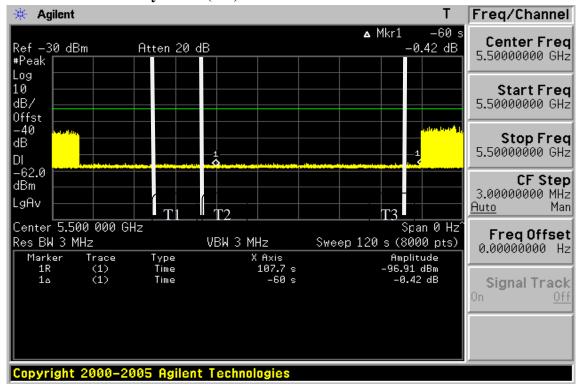
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# The time of channel availability check (60s)



Where T1~T2 indicates the time to power up, where T2~T3 represents the channel availability time.

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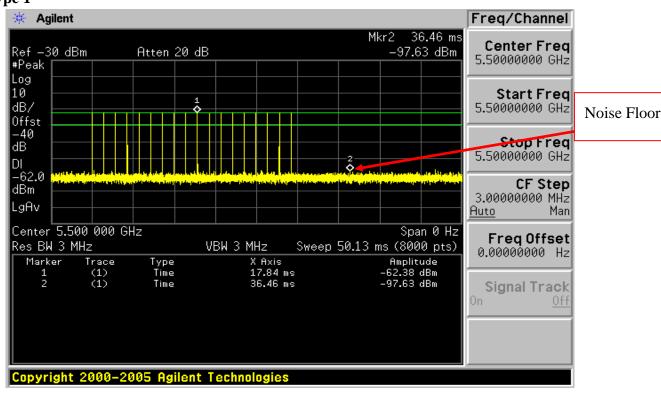
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# Calibration plots for each of the required radar waveforms Radar type 1



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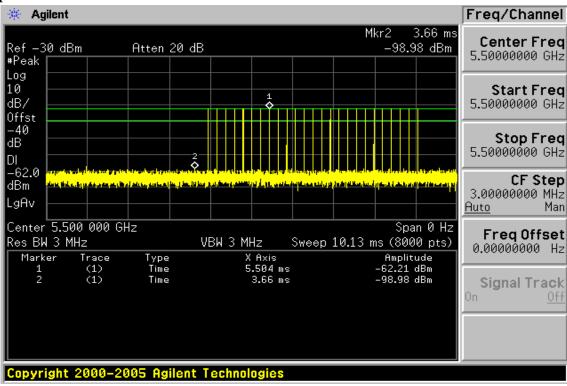
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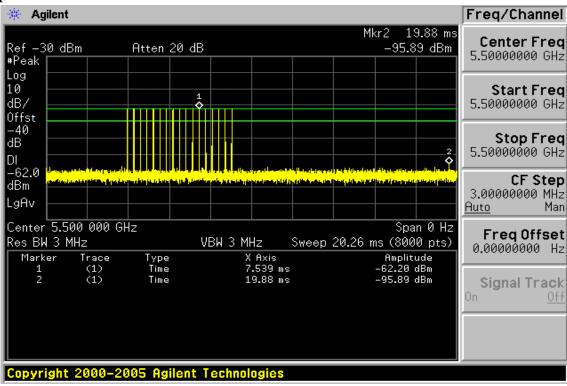
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# Radar type 2



# Radar type 3



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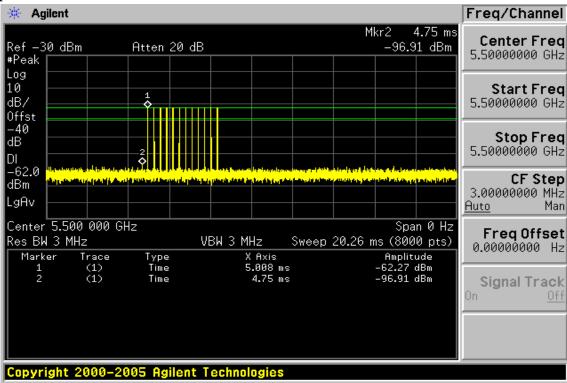
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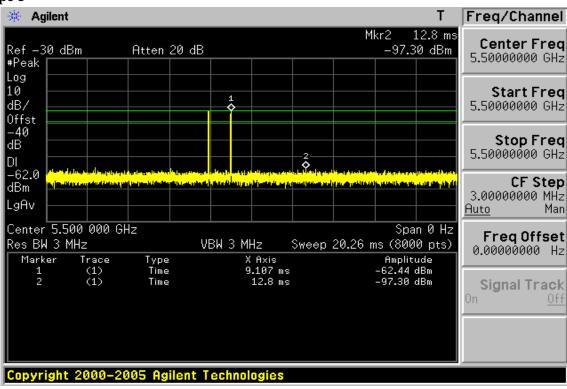
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# Radar type 4



# Radar type 5



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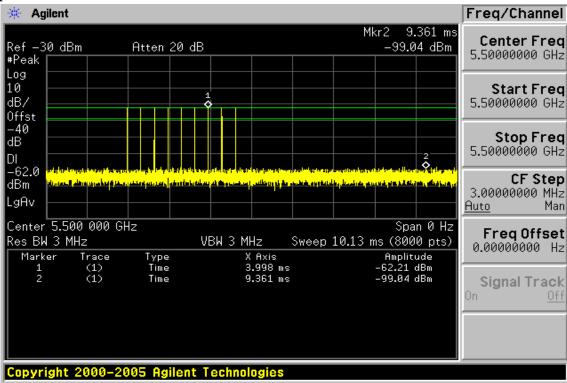
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# Radar type 6



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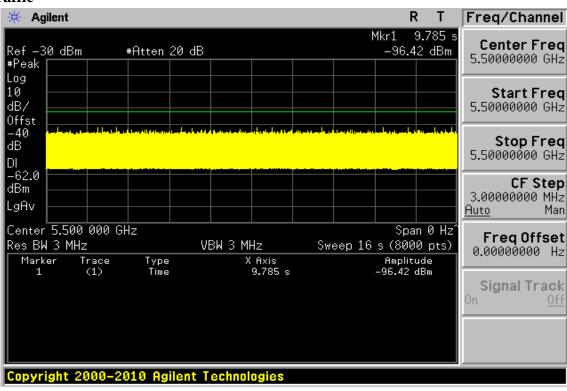
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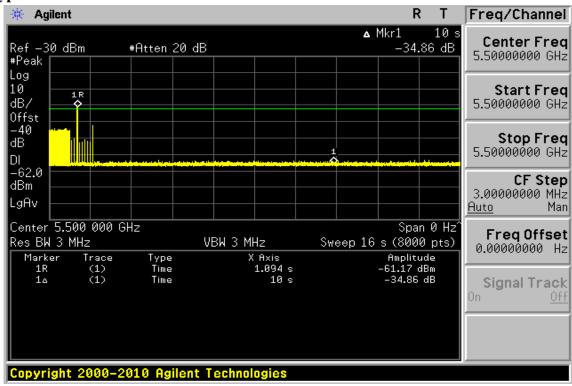
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#### **WLAN** traffic



## **Radar Type 1 Channel Move Time**



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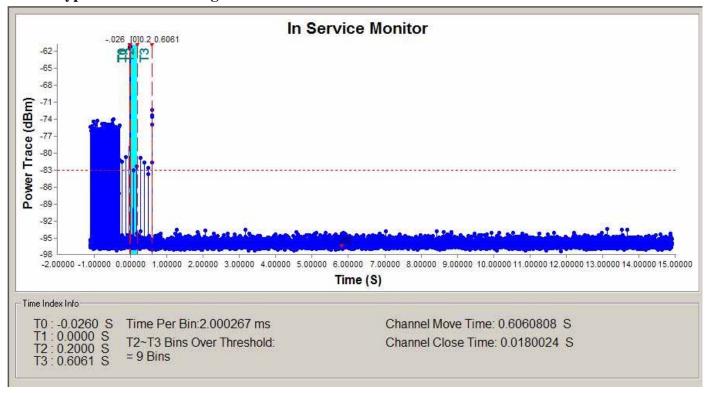
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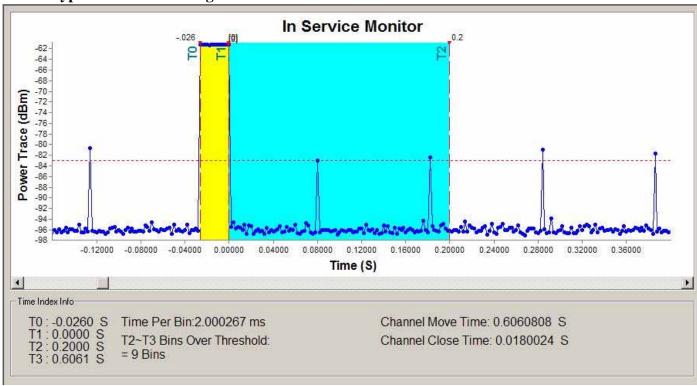
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# Radar Type 1 Channel Closing Transmission Time - 1



# Radar Type 1 Channel Closing Transmission Time - 2



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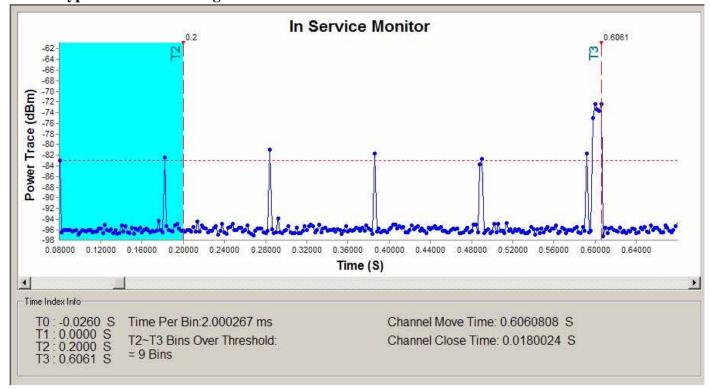
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# Radar Type 1 Channel Closing Transmission Time - 3



#### **Verdict:**

Time per bin: 2.0ms, Total Bins after 200ms: 9Bins, Total time intermittent control remains: 18.0ms. 18.0ms <60ms in the period of 10s.

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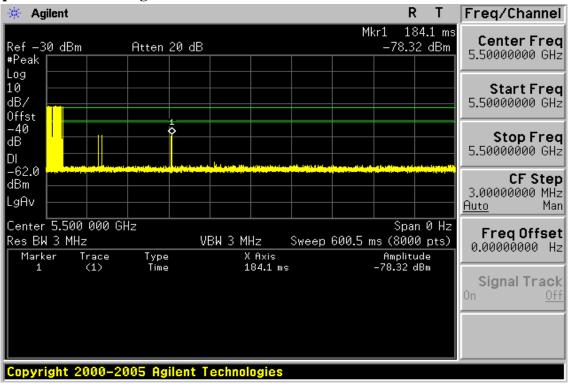
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# Radar Type 1 Channel Closing Transmission Time - 4



#### **Verdict:**

Note: narrowing the sweep time as the good engineering process for the verification of transmission closing in 200ms

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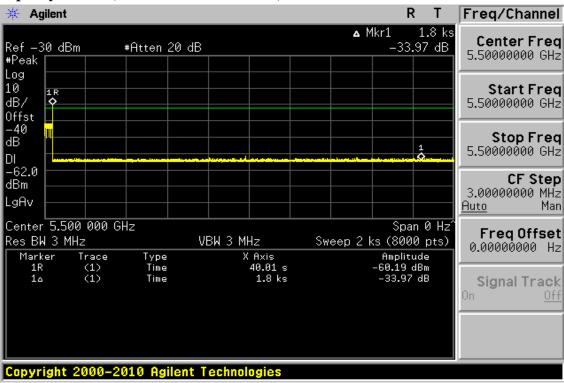
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# Non-occupancy Period (without radar detection)



#### **Verdict:**

To verify whether channel is unavailable to be operated in 30 minutes.

1.8ks = 1800s = 1800 s/min /60 = 30 minute

~ End of Report ~

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