

Report No.: ER/2015/40163 **Issue Date: Jun. 10, 2015** 

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# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

# INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E REQUIREMENT DFS TEST REPORT

OF

**PDA Phone Product Name:** 

Sony **Brand Name:** 

PM-0872-BV Type No.:

N/A **Model Difference:** 

PY7-PM0872 FCC ID:

ER/2015/40163 **Report No.:** 

Jun. 10, 2015 **Issue Date:** 

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

PM-0872-BV Type No.:

**Model Difference:** N/A

FCC ID: PY7-PM0872

File Number: ER/2015/40163

Date of test: Apr. 22, 2015 ~ Jun. 10, 2015

**Date of EUT Received:** Apr. 22, 2015

# 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 C63.10: 2009 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits. The test results of this report relate only to the tested sample identified in this report.

Test By:	Marcus Tseng	Date:	Jun. 10, 2015	
Prepared By:	Marcus Tseng / Engineer  Allen Tsai	Date:	Jun. 10, 2015	
Approved By:	Allen Tsai / Engineer  Jim Chang / Asst. Manager	Date:	Jun. 10, 2015	

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# **Revision History**

Report Number	Revision	Description	Issue Date
ER/2015/40163	Rev.00	Initial creation of document	Jun. 10, 2015

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PH	ОТО	GRAPHS OF EUT	尚未定義書籤。

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# **GENERAL INFORMATION**

#### 1.1 **Product Description**

General:

General:	T		
Product Name:	PDA Phone		
Brand Name:	Sony		
Type No.:	PM-0872-BV		
Model Difference:	N/A		
Data Cable (USB):		: EC450, Supplier: K-one 1242-6715.3, Length: 100 cm	
Simple Hands-Free (SHF-White):	Model No : MH/110c Supplier: Foster Electric		
Car Charger: Model No.: AN400, Supplier: Salcomp Type No.: CAA-0003013		: AN400, Supplier: Salcomp	
BT PHF:	Model No.: MW600, Supplier: BALDA Type No.: DDA-0002029.Bcoupling with Simple Hands Free (Model No.: MH755, Supplier: BALDA, Type No.: AG-0502)		
Product SW/HW version:	30.0.A.0.20 / A		
Radio SW/HW version:	30.0.A.0.20 / A		
Test SW Version:	WIFI Tool for MT6630		
RF power setting in TEST SW:	N/A		
	3.8Vdc		
D 6 1	Battery:	Model No.: AGPB016-A001, Supplier: Sony Type No.: N/A	
Power Supply:	Adapter:	<ol> <li>M odel No.: EP800, Supplier: Phihong         Type No.: AC-0300-US</li> <li>Model No.: EP800, Supplier: Salcomp         Type No.: AC-0030-US</li> </ol>	

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# WLAN 5GHz:

Wi-Fi	Frequency Range	Channels	Rated Power (Avg.)	Modulation Technology
	5150~5250	4	12.92dBm	
11a	5250~5350	4	12.99dBm	OFDM
114	5470~5725	11	12.99dBm	OFDM
	5725-5850	5	12.98dBm	
	HT20 5150~5250	4	11.92dBm	
11n	HT20 5250~5350	4	11.97dBm	OFDM
1111	HT20 5470~5725	11	11.95dBm	OFDM
	HT20 5725-5850	5	11.98dBm	
Antenna	Designation		PIFA Antenna, 5GHz Gain: -6.18dBi (5150MHz-5 5GHz Gain: -5.23dBi (5250MHz-5 5GHz Gain: -4.84dBi (5470MHz-5 5GHz Gain: -5.08dBi (5725MHz-5	350MHz) 725MHz)
Modulati	on type		64QAM, 16QAM, QPSK, BPSK fo	,
Transitio	n Rate:		802.11 a: 6/9/12/18/24/36/48/54 M 802.11 n_20MHz: 6.5 – 65Mbps	bps

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# **Product Feature of Equipment Under Test**

The equipment under Test (Hereafter Called: EUT) is PDA Phone supporting, GSM / WCDMA / LTE,

Wi-Fi 802 11abon Bluetooth with NFC features, and below is details of information

	Product Feature		
Product Name:	PDA Phone		
Brand Name:	Sony		
Type No.:	PM-0872-BV		
Model Difference:	N/A		
FCC ID	PY7-PM0872		
GSM Operating Band(s)	GSM 850/900/1800/1900MHz		
GPRS / EGPRS Multi Slot Class	Class 12		
WCDMA Operating Band(s)	FDD Band II / IV / V		
WCDMA Rel. Version	Release 8		
LTE Operating Band(s)	FCC Band 2 / 4 / 5 / 7 / 12 / 13 / 17		
LTE Rel. Version	Release 9 / Category 4		
Wi-Fi Specification	802.11a/b/g/n		
Bluetooth Version	V4.0 dual mode + HS		
NFC Specification	NFC		

Note: The above EUT information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

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# **Test Methodology of Applied Standards**

FCC Part 15, Subpart E §15.407

FCC KDB 905462

All test items have been performed and record as per the above standards.

#### 1.4 **Test Facility**

SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan. (TAF code 0513)

FCC Registration Numbers are: 990257 Canada Registration Number: 4620A-5.

#### 1.5 **Special Accessories**

There are no special accessories used while test was conducted.

#### 1.6 **Equipment Modifications**

There was no modification incorporated into the EUT.

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## SUMMARY OF TEST RESULT

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

### Note:

Type no, PM-0872-BV, and Type no PM-0873-BV share the equivalently identical enclosure, material of coating, I/O function, PCB board, display, and power source. In addition, PM-0872-BV, and Type no. PM-0873-BV implement the same Bluetooth/WLAN chipset/module with the same antenna that operates with the same transmitted power level. Hence, this given test report contains the identical test results that inherent from PM-0873-BV.

# **MEASUREMENT UNCERTAINTY**

Test Items	Uncertainty
TPC and DFS Measurement	+/- 123.36 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, 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) and FCC KDB 905462 D02, Radar Detection Function of Dynamic Frequency Selection (DFS).

Radar Detection Function of Dynamic Frequency Selection (DFS). U-NII devices operating with any part of its 26 dB emission bandwidth in the 5.25-5.35 GHz and 5.47-5.725 GHz bands shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems. Operators shall only use equipment with a DFS mechanism that is turned on when operating in these bands. The device must sense for radar signals at 100 percent of its emission bandwidth. The minimum DFS detection threshold for devices with a maximum e.i.r.p. of 200 mW to 1 W is -64 dBm. For devices that operate with less than 200 mW e.i.r.p. and a power spectral density of less than 10 dBm in a 1 MHz band, the minimum detection threshold is -62 dBm. The detection threshold is the received power averaged over 1 microsecond referenced to a 0 dBi antenna. For the initial channel setting, the manufacturers shall be permitted to provide for either random channel selection or manual channel selection.

- (i) Operational Modes. The DFS requirement applies to the following operational modes:
- (A) The requirement for channel availability check time applies in the master operational mode.
- (B) The requirement for channel move time applies in both the master and slave operational modes.
- (ii) Channel Availability Check Time. A U-NII device shall check if there is a radar system already operating on the channel before it can initiate a transmission on a channel and when it has to move to a new channel. The U-NII device may start using the channel if no radar signal with a power level greater than the interference threshold values listed in paragraph (h)(2) of this section, is detected within 60 seconds.

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(iii) Channel Move Time. 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.

(iv) 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.



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# 4.2.1. Limit

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

e 1. Applicability of DFS fet	<u> </u>	Operational Mode	
Requirement	Master	Client(without radar detection)	Client(with radar detection)
Non-occupancy Period	Yes	Yes	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Band- width	Yes	Not required	Yes

Table 2: Applicability of DFS requirements during normal operation

	Operational Mode		
Requirement	Master Device or Client with Radar Detection	Client Without Radar Detection	
DFS Detection Threshold	Yes	Not required	
Cannel Closing Transmission time	Yes	Yes	
Channel Move time	Yes	Yes	
U-NII Detection Bandwidth	Yes	Not required	

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Additional requirements for devices with multiple bandwidth mode	Master Device or Client with Radar Detection	Client Without Radar Detection
U-NII Detection Band- width and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Trans- mission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required

Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.

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

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
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 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.

Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911

**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 100% of the U- NII 99% transmission power bandwidth. See Note 3.		

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.

Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

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**Table 5: Radar Test Waveforms** 

### **Short Pulse Radar**

Radar Type			The state of the s		Minimum Number of Trials	
0			18	See Note 1	See Note	
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a	Roundup $ \begin{bmatrix} \left(\frac{1}{360}\right) \\ \left(\frac{19 \cdot 10^6}{\text{PRI}_{\mu \text{sec}}}\right) \end{bmatrix} $	60%	30	
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 µsec, with a minimum increment of 1 µsec, excluding PRI values selected in Test A				
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	
ggregate (	Radar Type	s 1-4)		80%	120	

Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.

# Long Pulse Radar

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

# Frequency Hopping Radar

	adar Type	Pulse Width (µsec)	PRI (µsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
$\vdash$	6	1	333	9	0.333	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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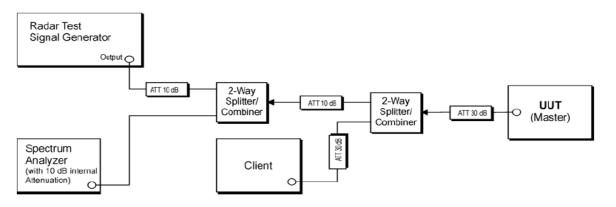


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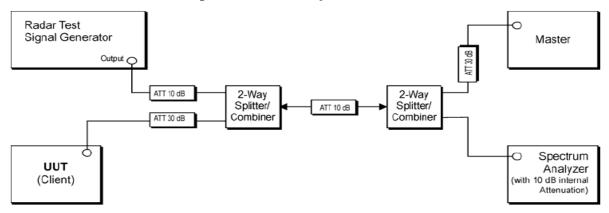
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# 4.2.2. Test Setup

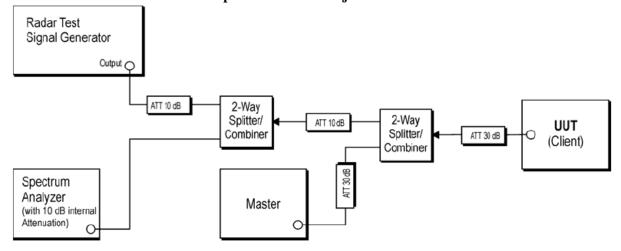
## Setup for Master with injection at the Master



# 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								
EQUIPMENT MFR		MODEL	SERIAL	LAST	CAL DUE.			
TYPE		NUMBER	NUMBER	CAL.				
Signal Generator	Agilent	E4438C	MY45093613	08/06/2014	08/05/2015			
Spectrum Analyzer	Agilent	E4446A	MY51100003	01/29/2015	01/28/2016			
DC Block	DC Block Mini-Circuits		1	01/02/2015	01/01/2016			
Attenuator	Mini-Circuit	BW-S10W2+	002	01/02/2015	01/01/2016			
Power Splitter Mini-Circuits		ZN2PD-9G-S+	N/A	01/02/2015	01/01/2016			
Power Splitter Mini-Circuits		ZN2PD-9G-S+	N/A	01/02/2015	01/01/2016			
Attenuator	Agilent	8495B	3308A22470	01/02/2015	01/01/2016			

# **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 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 40MHz

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

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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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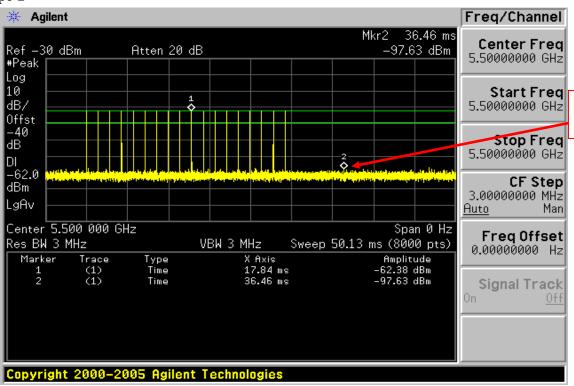
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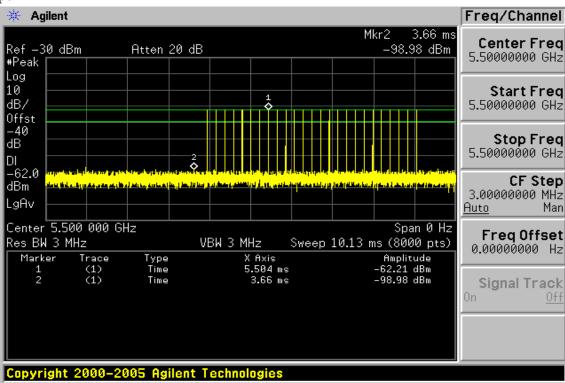
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# 4.2.5. Test results

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



### Radar type 2



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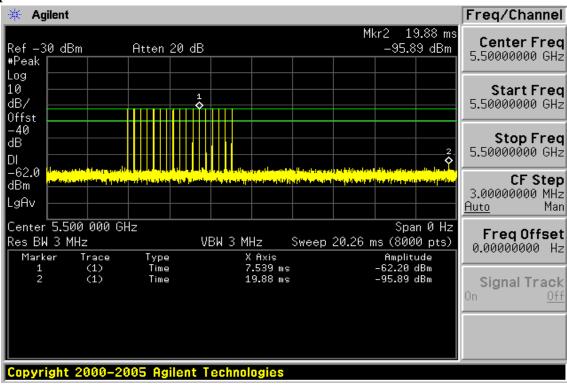
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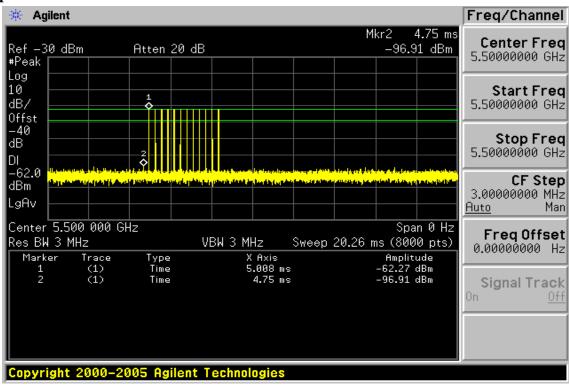
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# Radar type 3



# Radar type 4



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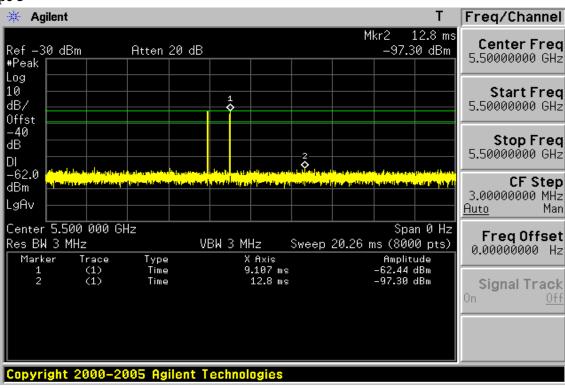
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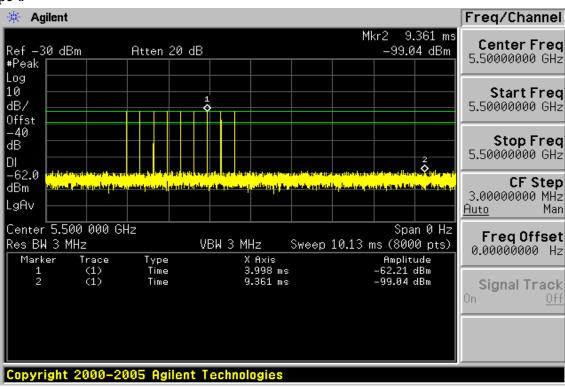
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# Radar type 5



# Radar type 6



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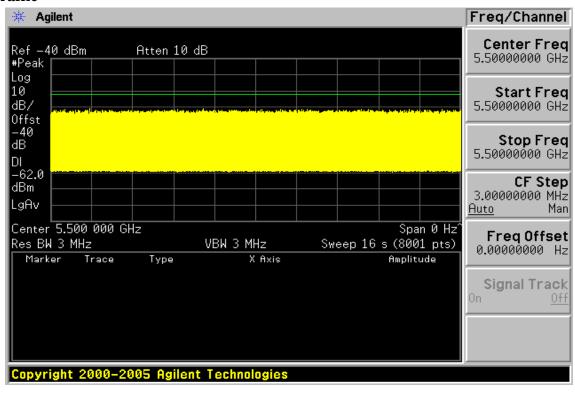
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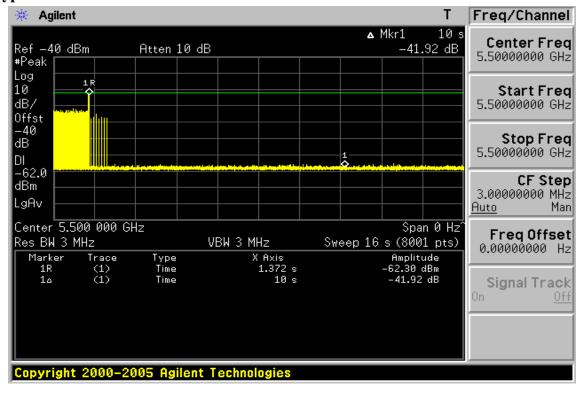
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#### **WLAN** traffic



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



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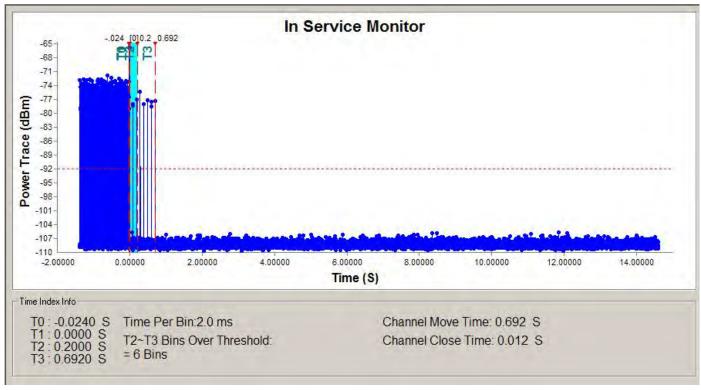
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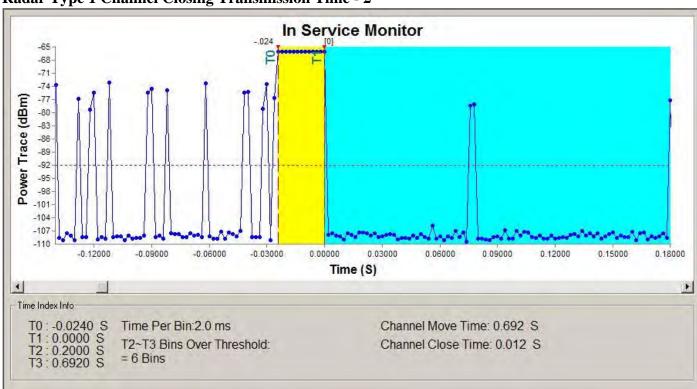
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# Radar Type 1 Channel Closing Transmission Time - 1



# Radar Type 1 Channel Closing Transmission Time - 2



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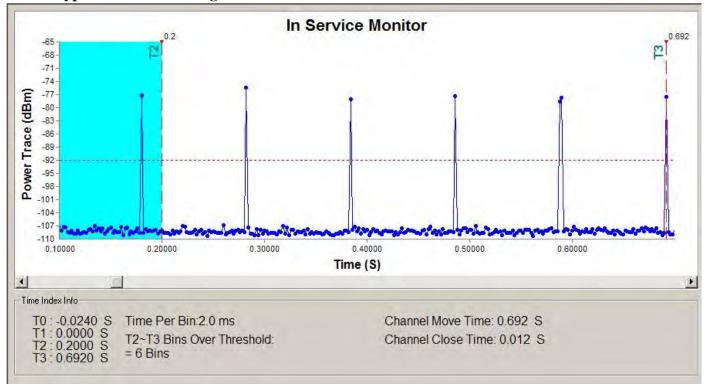
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# Radar Type 1 Channel Closing Transmission Time - 3



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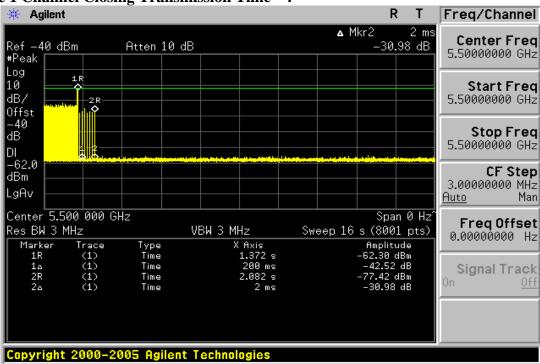
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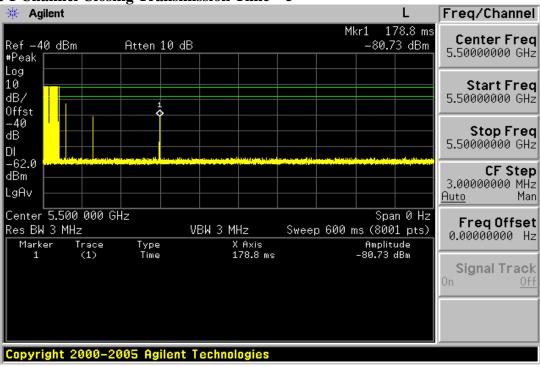
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Radar Type 1 Channel Closing Transmission Time - 4



Radar Type 1 Channel Closing Transmission Time – 5



## **Verdict:**

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

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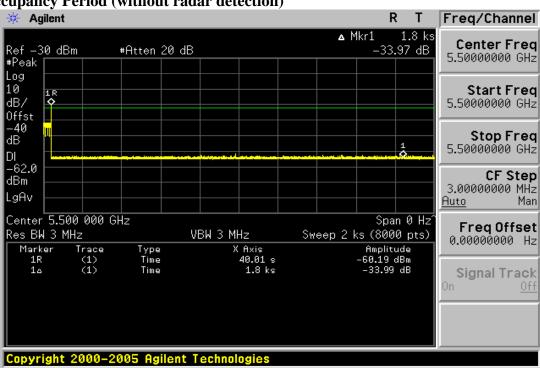
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**Non-occupancy Period (without radar detection)** 



### **Verdict:**

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

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

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