SEQAL

129 Samsung-ro,
Yeongtong-gu, Suwon City,
Gyeonggi – Do, Korea
443-742

Tel: 82-31-301-2839
Fax: 82-31-279-7799

FCC TEST REPORT

Manufacturer : Samsung Electronics, Co., Ltd.
Model : SC-02G
FCC ID : A3LSWDSC02G
Application Type : Certification
EUT Type : Portable Handset

UKAS TESTING
1911

Prepared By ..... Date 2014.09.01
S Park – Test Engineer

Checked By ..... Date 2014.09.01
YG Choi – Deputy Technical Manager

Authorized By ..... Date 2014.09.01
WT Jang - Technical Manager

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§ 2.1033 General Information

APPLICANT:	SAMSUNG Electronics Co., Ltd
APPLICANT ADDRESS:	129 Samsung-ro, Yeongtong-gu, Suwon City, Gyeonggi – Do, Korea 443-742
TEST SITE:	SEQAL Korea
TEST SITE ADDRESS:	129 Samsung-ro, Yeongtong-gu, Suwon City, Gyeonggi – Do, Korea 443-742
FCC RULE PART(S):	Part 15.407(UNII)
MODEL NAME:	SC-02G
FCC ID:	A3LSWDSC02G
DEVICE CLASSIFICATION	Client Only Device, No Radar Detection Capability
FCC CLASSIFICATION:	Unlicensed National Information Infrastructure(UNII)
DATE(S) OF TEST:	2014.08.08 ~ 2014.08.11
TEST DEVICE SERIAL NO.:	FCL-002-C

1.0 INTRODUCTION

1.1 Scope

This report has been prepared to demonstrate compliance with the requirements for Dynamic Frequency Selection (DFS) as stated in FCC 06-96. Testing was performed on the **Samsung Portable Handset FCC ID: A3LSWDSC02G** in accordance with the measurement procedure described in Appendix B of FCC 06-96. As of July 20, 2007 all devices operating in the 5250 – 5350 MHz and/or the 5470 -5725 MHz bands must comply with the DFS requirements. As the EUT does not have radar detection capability it was evaluated as a Client Only Device. All test results reported herein are applicable to the sample selected for testing. The unit used for testing was supplied by **Samsung Electronics, Co., Ltd.**

1.2 Evaluation Procedure

Conducted test methodology was used for the DFS evaluation procedure of the **Samsung Portable Handset FCC ID: A3LSWDSC02G.** No deviations to the test procedure and test methods occurred during the evaluation of the EUT.

1.3 Test Condition

Temperature	**23.7℃**
Humidity	**52%**

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSWDSC02G.**

Mode of Operation:	
Master Device	**No**
Client Device (No radar detection)	**Yes**
Client Device with Radar Detection	**No**

Parameters of EUT:	
Frequency	5260 – 5320 MHz (UNII-2A Band) 5500 – 5700 MHz (UNII-2C Band)
Output Power	24.434mW (13.88 dBm) Conducted (802.11n UNII Band 2A) 25.882mW (14.13 dBm) Conducted (802.11n UNII Band 2C)
Modulation	OFDM
Channel Bandwidth	20 MHz, 40MHz, 80MHz

2.2 EUT Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850 WCDMA/HSPA, 802.11a/b/g/n/ac WLAN, Bluetooth (1x, EDR, LE, HS), NFC, ANT+.

2.3 Modifications

No modifications to the EUT were required in order to comply with the DFS specifications.

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3.0 DESCRIPTION OF DYNAMIC FREQUENCY SELECTION TEST

3.1 Applicability

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Client With Radar Detection
Non-occupancy Period	Yes	Not Required	Yes
DFS Detection Threshold	Yes	Not Required	Yes
Channel Availability Check Time	Yes	Not Required	Not Required
Uniform Spreading	Yes	Not Required	Not Required
U-NII Detection Bandwidth	Yes	Not Required	Yes

Table 3-1. DFS Applicability

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Client With Radar Detection
DFS Detection Threshold	Yes	Not Required	Yes
Channel Closing Transmission Time	Yes	Yes	Yes
Channel Move Time	Yes	Yes	Yes
U-NII Detection Bandwidth	Yes	Not Required	Yes
Client Beacon Test	N/A	Yes	Yes

Table 3-2. DFS Applicability During Normal Operation

3.2 Requirement

Per FCC 06-96 the following are the requirements for Client Devices:

a) A Client Device will not transmit before having received appropriate control signals from a Master Device.
b) A Client Device will stop all its transmissions whenever instructed by a Master Device to which it is associated and will meet the Channel Move Time and Channel Closing Transmission Time requirements. The Client Device will not resume any transmission until it has again received control signals from a Master Device.
c) If a Client Device is performing In-Service Monitoring and detects a Radar Waveform above the DFS Detection Threshold, it will inform the Master Device. This is equivalent to the Master Device detection the Radar Waveform and d) through f) of section 5.1.1 apply.
d) d) Irrespective of Client Device or Master Device detection the Channel Move Time and Channel Closing Transmission Time requirements remain the same.

Channel Move Time and Channel Closing Transmission Time requirements are listed in the following table.

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 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 200milliseconds 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 1 is used and for each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

Table 3-3. DFS Response Requirements

3.3 DFS Detection Threshold Values

The DFS detection thresholds are defined for Master devices and Client Devices with In-service monitoring. These detection thresholds are listed in the following table.

Maximum Transmit Power	Value (See Notes 1 and 2)
≥ 200 milliwatt	-64 dBm
< 200 milliwat	-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 3-4. Detection Thresholds for Master Device and Client Devices with Radar Detection

3.4 Parameters of DFS Test Signals

As the EUT is a Client Device with no Radar Detection only one type radar pulse is required for the testing. Radar Pulse type 1 was used in the evaluation of the Client device for the purpose of measuring the Channel Move Time and the Channel Closing Transmission Time. Table 3-5 lists the parameters for the Short Pulse Radar Waveforms. A plot of the Radar Pulse Type 1 used for testing is included in Section 5.0 of this report.

Radar Type	Pulse Width (μ sec)	PRI (μ sec)	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

Table 3-5. Parameters for Short Pulse Radar Waveforms

Radar Type	Pulse Width (μ sec)	Chirp Width (MHz)	PRI (μ sec)	Number of Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	5-20	1-3	8-20	60%	30

Table 3-6. Parameters for Long Pulse Radar Waveforms

Radar Type	Pulse Width (μ sec)	PRI (μ sec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

Table 3-7. Parameters for Frequency Hopping Radar Waveforms

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3.5 Procedure

The FCC 06-96 describes a radiated test setup and a conducted test setup. The conducted test setup was used for this testing. Figure 3-1 shows the typical test setup. In Band 2, one channel selected between 5260 and 5350MHz is chosen for the testing. In band 3, one channel selected between 5500 and 5700MHz was chosen for testing.

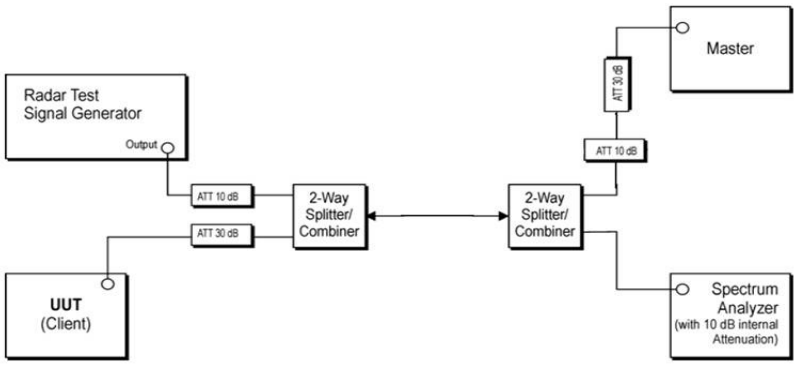

Figure 3-1. Conducted Test Setup for DFS

1. The radar pulse generator is setup to provide a pulse at the frequency that the Master and Client are operating. A Type 1 radar pulse with a 1μs pulse width and a 1428μs PRI is used for the testing.

2. The vector signal generator is adjusted to provide the radar burst(18 pulses) at a level of approximately -62dBm at the antenna of the Master device.

3. A trigger is provided from the pulse generator to the DFS monitoring system in order to capture the traffic and the occurrence of the radar pulse.

4. The Client Device (EUT) is set up per the diagram in Figure 3-1 and communications between the Master device and the Client is established.

5. The MPEG file specified by the FCC(“6 1/2 Magic Hours”) is streamed from the “file computer” through the Master to the Slave Device and played in order to properly load the network.

6. The real time spectrum analyzer is set to record a 12sec window to any transmissions occurring up to and after 10sec.

7. The system is again setup and the monitoring time is shortened in order to capture the Channel Closing Transmission Time. This time is measured to insure that the Client ceases transmission within 200ms and the aggregate of emissions occurring after 200ms up to 10sec do not exceed 60ms.
   (Note: the channel may be different since the Master and Client have changed channels due to the detection of the initial radar pulse.)

8. After the initial radar burst the channel is monitored for 30 minutes to insure no transmissions or beacons occur. A second monitoring setup is used verify that the Master and Client have both move to different channels.

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4.0 TEST EQUIPMENT

4.1 Measuring instrument calibration

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

TEST EQUIPMENT LIST						
Description	**Model**	**Manufacture**	**Cal Date**	**Cal Interval**	**Cal Due**	**S/N**
PXA Signal Analyzer	N9030A	Agilent	2013.10.22	Annual	2014.10.22	MY52350977
ESG Vector Signal Generator	E4438C	Agilent	2014.05.30	Annual	2015.05.30	MY47272353
Attenuator 10dB	VAT-10W2+2W	MCL	2013.12.06	Annual	2014.12.06	1250-1
Attenuator 10dB	VAT-10W2+2W	MCL	2013.12.06	Annual	2014.12.06	1250-2
Attenuator 30dB	VAT-30W2+2W	MCL	2013.12.09	Annual	2014.12.09	1312-1
Attenuator 30dB	VAT-30W2+2W	MCL	2013.12.09	Annual	2014.12.09	1312-2
Power Splitter	ZFRSC-183-S+	Mini-Clrcults	2013.10.24	Annual	2014.10.24	Y19449
Power Splitter	ZFRSC-183-S+	Mini-Clrcults	2013.10.24	Annual	2014.10.24	Y19450

4.2 Additional Equipment

Device	Manufacturer	Model	Description	S/N	FCC ID:
Master	HP	MRLBB-1002	Wireless AP	CN31DLM0N8	RTP-MRLBB1003S

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5.0 Summary of Test Results

The **Samsung Portable Handset FCC ID: A3LSWDSC02G** was found to be compliant with the requirements for DFS as required for a Client Device per Part 15.407(h) and FCC 06-96. The following table lists the measured parameters. The actual data and plots can be found in Section 5 and 6 of this report.

	Parameter	Measured	Limit	Result
5260 - 5320MHz UNII – 2A Band	Channel Move Time	417.0 ms	10 seconds	PASS
	Channel Closing Transmission Time	< 200 ms + 4.50 ms (aggregate)	200ms + aggregate of 60ms over remaining 10 second period	PASS
	Non-occupancy Period	Monitored > 30 minutes (No transmission occurred)	30 minutes	PASS
5470 - 5725MHz UNII –2C Band	Channel Move Time	474.0 ms	10 seconds	PASS
	Channel Closing Transmission Time	< 200 ms + 4.50 ms (aggregate)	200ms + aggregate of 60ms over remaining 10 second period	PASS
	Non-occupancy Period	Monitored > 30 minutes (No transmission occurred)	30 minutes	PASS

Table 5-1. DFS Test Results Summary

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5.1 TEST PLOTS AND DATA – UNII BAND 2A

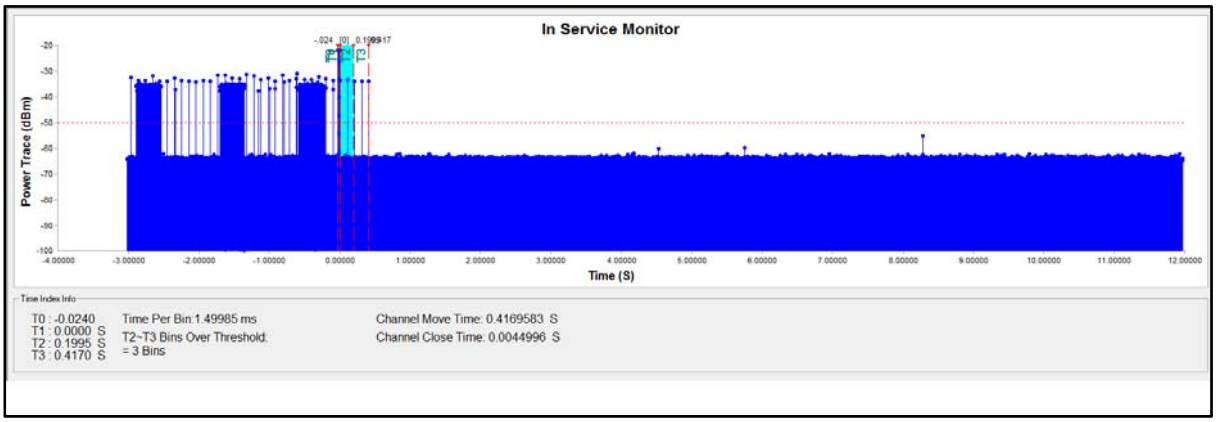

Figure 5-1. Move Time and Aggregate Time

5.2 TEST PLOTS AND DATA – UNII BAND 2A

No EUT transmissions were observed on the test channel during the 30-minute observation time.

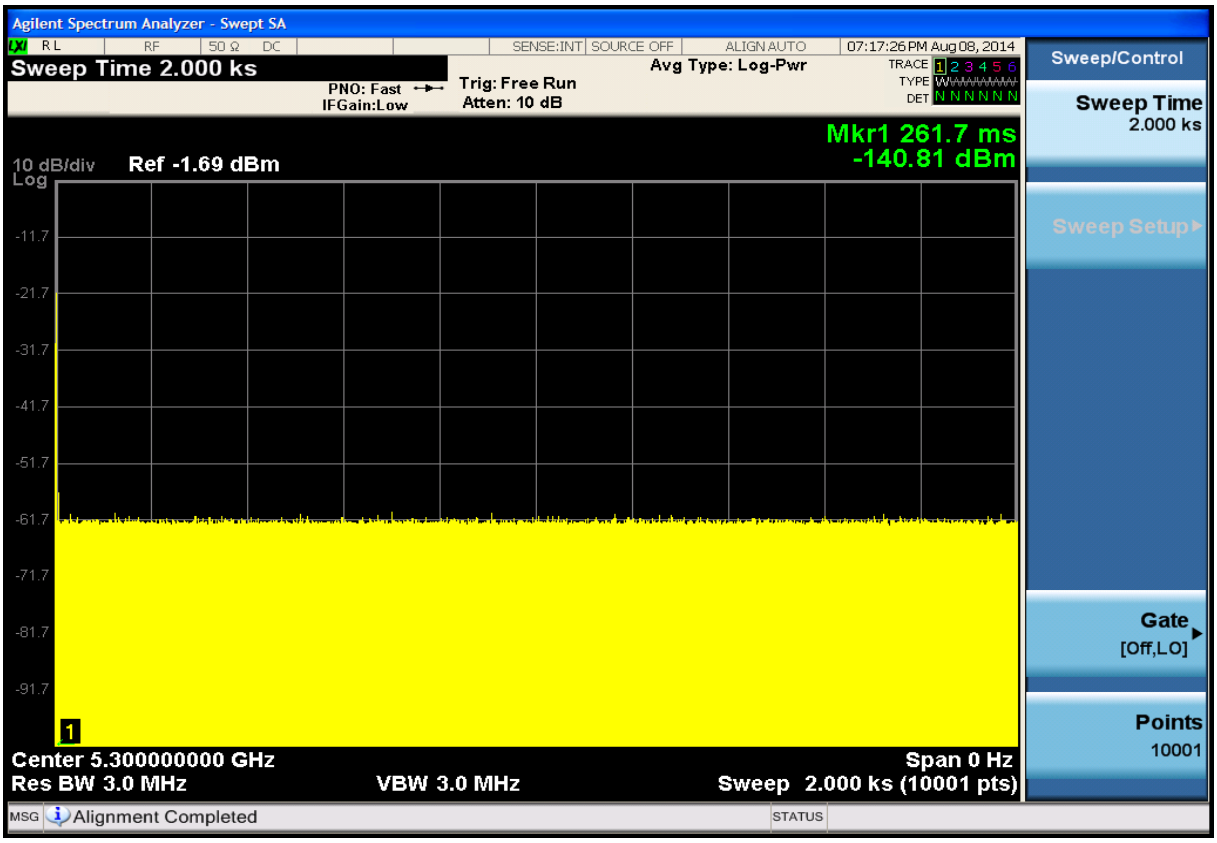

Figure 5-2. Non-occupancy Period – Monitoring live spectrum – Elapse time 30 minutes

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5.3 TEST PLOTS AND DATA – UNII BAND 2C

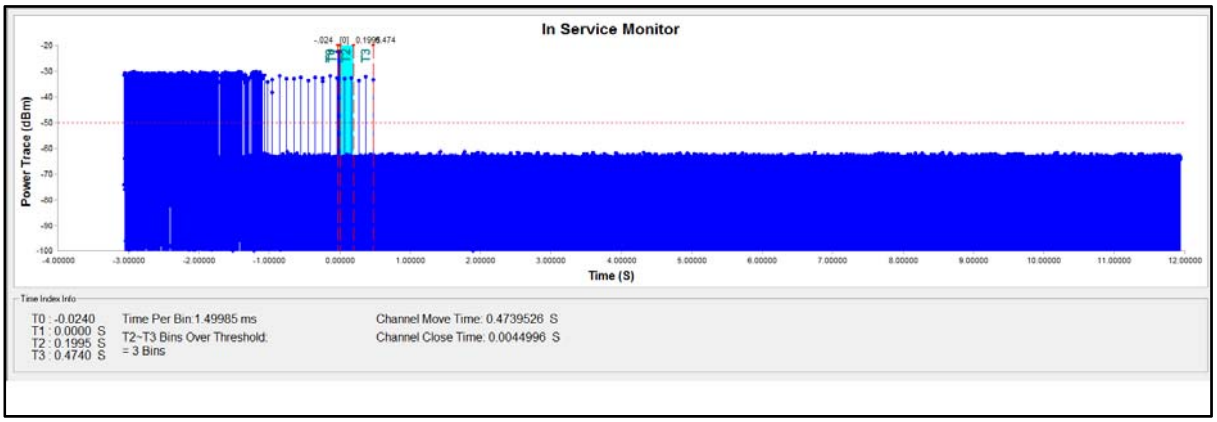

Figure 5-3. Move Time and Aggregate Time

5.4 TEST PLOTS AND DATA – UNII BAND 2C

No EUT transmissions were observed on the test channel during the 30-minute observation time.

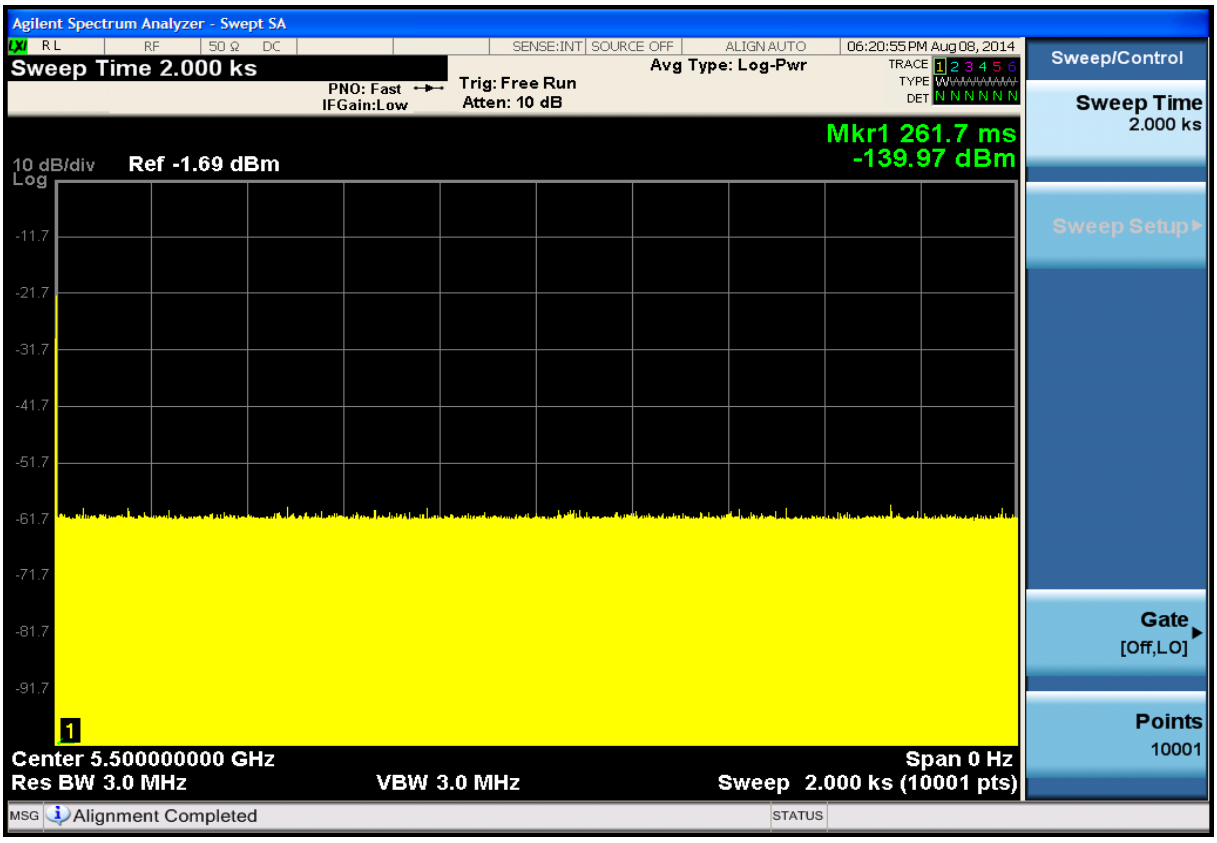

Figure 5-4. Non-occupancy Period – Monitoring live spectrum – Elapse time 30 minutes

6.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSWDSC02G** is in compliance with the DFS requirements for a Client Device without radar detection in accordance with Part 15.407 of the FCC Rules.

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