

低功率射頻電機試驗報告

申請廠商 鴻海精密工業股份有限公司
新北市土城區中山路66號

製造廠商 鴻海精密工業股份有限公司

產品名稱 AloT Module(BT+WLAN)

廠牌 SHARP

系列型號 FPWB-A002BBKZ

發射功率 請見本報告第1.1章節產品描述

工作頻率 請見本報告第1.1章節產品描述

調變方式 OFDM

使用規範 LP0002 4.7節

實驗室資訊

程智科技股份有限公司 五股實驗室
新北市五股區五工六路11號
認證有效期間：105年10月18日起至108年10月17日止
受理日期 民國108年07月04日
完成日期 民國108年07月12日



報告簽署人
蔡永譚 簽章



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Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
T190412W04-RD4	Rev.00	Initial creation of document	All	Jun. 19, 2019	Elle Chang
T190412W04-RD4	Rev.01	補 EIRP 功率	Page 16	Jun. 27, 2019	Elle Chang
T190704W03-RD4	Rev.02	Updated Model no. & remark on page 3	Page 1, 3, 7, 12	Jul. 12, 2019	Elle Chang

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測試標準

國家通訊傳播委員會低功率射頻電機技術規範

民國 107 年 1 月 10 日版本

待測裝置已於程智科技股份有限公司 五股實驗室，依據國家通訊傳播委員會於中華民國一百零七年一月頒佈之低功率射頻電機技術規範測試。

程智科技股份有限公司根據此條文規範項目測試，測試各項數據皆能符合此規範規定之限度值。

程智科技股份有限公司依低功率射頻電機技術規範審驗要點規範製作測試結果報告，測試結果評判為 合格。

備註：

1. 報告中所描述之測試結果和待測設備的架構組合，均根據實際量測情況作詳實的記錄，且本測試報告僅對上述待測設備樣品負責。
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3. 系列申請，除型號差異，及僅針對電源供應線路變更，其餘內部不論機板構造及電路均相同，特此說明。

測試人員：

翁浩程

日期：

07/12/2019

翁浩程 / 工程師

報告製作：

張瑜健

日期：

07/12/2019

張瑜健 / 行政

報告審核：

蔡永譚

日期：

07/12/2019

蔡永譚 / 副理

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測試實驗室資料:

實驗室認可登錄：中華民國實驗室認證體系

認可編號：TAF 1309，認可頻率範圍9kHz ~ 40GHz

認證有效期間：105年10月18日起至108年10月17日止

測試場地：新北市五股區五工六路11號

實驗室名稱：程智科技股份有限公司
五股實驗室

實驗室地址：新北市五股區五工六路11號

電話：886-2-22999720

傳真：886-2-22981882

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實驗室之量測不確定度

測試項目	測試場地 / 測試頻率	不確定度(dB)
TPC and DFS Measurement	Conducted test site	+/- 123.36 Hz
Temperature		+/- 0.65 °C
Humidity		+/- 4.6 %
DC / AC Power Source		DC= +/- 0.13%, AC=+/- 0.2%

附註: K=2 即代表測試結果具有95%的量測可信度。

符合性判定僅依據試驗結果，不考慮其試驗結果的量測不確定度

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1 一般資料

1.1 產品描述

產品名稱	AIoT Module(BT+WLAN)
系列型號	FPWB-A002BBKZ
產品商標	SHARP
SW version:	DVT
HW version:	N/A
使用電源	3.3V from DC Power Supply

調變	發射頻帶 (MHz)		輸出功率 (dBm)	頻道數 (Channels)
802.11 a mode	5150 ~5250		13.95	4
	5250 ~5350		13.98	4
	5470 ~5725		13.94	12
	5725 ~5850		13.94	5
802.11n HT20 mode	HT20:	5150 ~5250	13.92	4
	HT20:	5250 ~5350	13.98	4
	HT20:	5470 ~5725	13.96	11
	HT20:	5725 ~5850	13.97	5
802.11n HT40 mode	HT40:	5150 ~5250	13.93	2
	HT40:	5250 ~5350	13.98	2
	HT40:	5470 ~5725	13.93	5
	HT40:	5725 ~5850	13.98	2
調變方式	64QAM, 16QAM, QPSK, BPSK for OFDM			

天線型式/天線增益

天線型式	Supplier	Model No.	發射頻帶(MHz)	天線增益(dBi)
PCB	Foxconn	N/A	5150~5250	1.30
			5250~5350	2.14
			5470~5725	2.74
			5725~5850	3.26

註:測試報告T190412W04-RD4，NCC ID:CCAJ19LP67D0T4，受理日期 民國108年04月12日之所有測試數據沿用於 T190704W03-RD4報告中。

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1.2 產品特性

此裝置符合IEEE Std 802.11a/ac/n 標準。其發射頻率落於5150MHz至5250MHz,5250MHz至5350MHz及5470MHz至5725MHz, 5725MHz至5850MHz。

802.11a/n/ac mode 採用正交分頻多工OFDM調變技術之發射頻率全段：落於5150-5250MHz 共有4個頻道，5250-5350 MHz 共有4個頻道及5350MHz及5470MHz 共有11個頻道，及5725MHz及5850MHz 共有5個頻道。

Operated band in 5150 MHz ~5250 MHz:				
802.11a / n HT20 Mode			802.11 n HT40 Mode	
Channel	Frequency		channel	Frequency
36	5180		38	5190
40	5200		46	5230
44	5220			
48	5240			
Operated band in 5250 MHz ~5350 MHz:				
802.11a / n HT20 Mode			802.11 n HT40 Mode	
channel	Frequency		channel	Frequency
52	5260		54	5270
56	5280		62	5310
60	5300			
64	5320			

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Operated band in 5470 MHz ~5725 MHz:				
802.11a / n HT20 Mode			802.11 n HT40 Mode	
Channel	Frequency		channel	Frequency
100	5500		102	5510
104	5520		110	5550
108	5540		118	5590
112	5560		126	5630
116	5580		134	5670
120	5600			
124	5620			
128	5640			
132	5660			
136	5680			
140	5700			
Operated band in 5470 MHz ~5725 MHz:				
802.11a / n HT20 Mode			802.11 n HT40 Mode	
Channel	Frequency		channel	Frequency
149	5745		151	5755
153	5765		159	5795
157	5785			
161	5805			
165	5825			

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1.3 測試方法之依據

本測試報告之所有項目皆依據國家通訊傳播委員會低功率射頻電機技術規範(LP0002, 107.1.10 版本) 如無國家標準可適用者，得依美國 EIA、IEEE ANSI 檢驗法檢驗，及美國 FCC 47 CFR Part 2 有關檢驗之規定及參考 ANSI 63.10:2013、FCC CFR 47 15.407、FCC 14-30、KDB 789033D02 之檢驗法。

低功率射頻電機技術規範4.7節及FCC Part 15.407

項次	測試項目	適用規範	測試結果	量測設備	備註
1	發射功率控制(TPC)及動態頻率選擇(DFS)	低功率射頻電機技術規範4.7.7	請參閱11.6節	請參閱11.4節	合格

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2 適用規範

依據 NCC 低功率射頻電機技術規範 4.7.7 節之要求，發射功率控制(TPC)及動態頻率選擇

發射功率控制(TPC)：操作於5.25 GHz~5.35 GHz 與5.470 GHz~5.725 GHz 頻段的設備，應具備發射功率控制功能。設備必須至少具有6 dB低於平均EIRP 30 dBm的能力。EIRP 低於500 mW 之系統不須具備TPC 功能。

動態頻率選擇(DFS):操作於5.25 GHz~5.35 GHz與5.470 GHz~5.725 GHz頻段之設備應具備動態頻率選擇雷達偵測功能並啟動之，以完整偵測使用頻帶內之雷達訊號，避免與雷達系統同頻道操作。相關規定如下：

(1) 最低動態頻率選擇的偵測門檻

(A) 最大EIRP 為200 mW~1 W之設備，其最低動態頻率選擇的偵測門檻值為-64dBm。

(B) 最大EIRP 低於200 mW，且功率頻譜密度小於10 dBm/MHz 之設備，其最低動態頻率選擇的偵測門檻值為-62 dBm。

(C) 最大EIRP 低於200 mW，且功率頻譜密度大於或等於10 dBm/MHz 之設備，其最低動態頻率選擇的偵測門檻值為-64 dBm。

(D) 此偵測門檻值為1 微秒內之平均接收功率，並以0 dBi 天線為參考基準。頻道初始設定得由系統隨機選取或使用者手動選取。

(2) 操作模式：動態頻率選擇之規定適用於以下之操作模式：

(A) 頻道可用性檢查時間之規定，適用於主控運作模式。

(B) 頻道移動時間之規定，適用於主控及受控運作模式。

(3) 頻道可用性檢查時間：設備必須檢查其可在某一頻道上起始傳送之前是否有雷達系統已經操作在該頻道上，以及何時其必須移動到另一新的頻道，在60 秒內若沒有偵測到功率位準大過上述之干擾門檻值的雷達訊號時，設備才可開始使用該頻道。

(4) 頻道移動時間：在偵測到雷達的存在後，所有在該操作頻道上的所有傳輸須在10秒內停止，在偵測到雷達訊號後，該期間內的傳輸應維持最多200 毫秒的正常通訊。

另外，間歇性的管理與控制訊號可在剩餘的時間中傳送，以便撤離該操作頻道。

(5) 不可佔用期間：某一頻道已被頻道可用性檢查或"服務中"監視顯示含有雷達系統，至少須有30 分鐘的不可佔用期間。不可佔用期間起始於偵測到雷達系統的當時。

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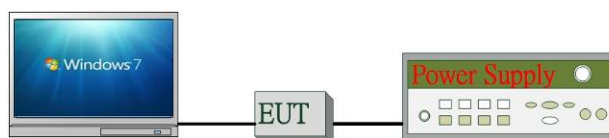
3 受測裝置之系統說明

裝置名稱	製造者/申請者	型號	纜線說明
* AloT Module(BT+WLAN)	鴻海精密工業股份有限公司/ 鴻海精密工業股份有限公司	FPWB-A002BB KZ	無纜線

標記：“*”表欲申請之受測物。

3.1 待測物與測試設備系統圖

3.1.1 量測配置圖



3.2 輔助測試週邊設備名稱描述

編號	產品別	商標	型號	序號	信號線線長(米)	電源線長(米)
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2.	Notebook	Lenovo	L420	LR-6MEX0	Shielded	Un-shielded
3.	DC Power Supply	Agilent	E3634A	MY53180030	N/A	Un-shielded

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4 量測儀器設備

4.1 功率控制與動態頻率選擇之量測儀器

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Signal Generator	Agilent	N5182B	MY56200007	08/13/2018	08/12/2019
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY57120290	02/13/2019	02/12/2020
Splitter	RF-LAMBAD	RFLT4W1G18G	SPCD10-004	02/26/2019	02/25/2020
Splitter	RF-LAMBAD	RFLT2W1G18G	11-JSPF412-020	02/26/2019	02/25/2020
Splitter	RF-LAMBAD	RFLT2W1G18G	11-JSPF412-017	02/26/2019	02/25/2020
Attenuator	Agilent	8494B	MY42152151	02/26/2019	02/25/2020
Attenuator	Agilent	8496B	MY42147434	02/26/2019	02/25/2020
Splitter	RF-LAMBAD	RFLT2W1G18G	11-JSPD022-013	02/26/2019	02/25/2020
DC Power Supply	Agilent	E3640A	KR93300208	08/15/2018	08/14/2019
DC Block	Mini-Circuits	BLK-18-S+	31129(1)	02/26/2019	02/25/2020
Accece Ponit	LINKSYS	WRT3200ACM	1981060B614986 FCC ID:Q87- WRT3200ACM IC:3839A- WRT3200ACM	N/A	N/A

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5 功率控制與動態頻率選擇

5.1 適用標準

發射功率控制(TPC)：操作於5.25 GHz~5.35 GHz 與5.470 GHz~5.725 GHz 頻段的設備，應具備發射功率控制功能。設備必須至少具有6 dB低於平均EIRP 30 dBm的能力。EIRP 低於500 mW 之系統不須具備TPC 功能。

動態頻率選擇(DFS):操作於5.25 GHz~5.35 GHz與5.470 GHz~5.725 GHz頻段之設備應具備動態頻率選擇雷達偵測功能並啟動之，以完整偵測使用頻帶內之雷達訊號，避免與雷達系統同頻道操作。相關規定如下：

(1) 最低動態頻率選擇的偵測門檻

- (A) 最大EIRP 為200 mW~1 W之設備，其最低動態頻率選擇的偵測門檻值為-64dBm。
- (B) 最大EIRP 低於200 mW，且功率頻譜密度小於10 dBm/MHz 之設備，其最低動態頻率選擇的偵測門檻值為-62 dBm。
- (C) 最大EIRP 低於200 mW，且功率頻譜密度大於或等於10 dBm/MHz 之設備，其最低動態頻率選擇的偵測門檻值為-64 dBm。
- (D) 此偵測門檻值為1 微秒內之平均接收功率，並以0 dBi 天線為參考基準。頻道初始設定得由系統隨機選取或使用者手動選取。

(2) 操作模式：動態頻率選擇之規定適用於以下之操作模式：

- (A) 頻道可用性檢查時間之規定，適用於主控運作模式。
- (B) 頻道移動時間之規定，適用於主控及受控運作模式。

(3) 頻道可用性檢查時間：設備必須檢查其可在某一頻道上起始傳送之前是否有雷達系統已經操作在該頻道上，以及何時其必須移動到另一新的頻道，在60 秒內若沒有偵測到功率位準大過上述之干擾門檻值的雷達訊號時，設備才可開始使用該頻道。

(4) 頻道移動時間：在偵測到雷達的存在後，所有在該操作頻道上的所有傳輸須在10秒內停止，在偵測到雷達訊號後，該期間內的傳輸應維持最多200 毫秒的正常通訊。 另外，間歇性的管理與控制訊號可在剩餘的時間中傳送，以便撤離該操作頻道。

(5) 不可佔用期間：某一頻道已被頻道可用性檢查或“服務中”監視顯示含有雷達系統，至少須有30分鐘的不可佔用期間。不可佔用期間起始於偵測到雷達系統的當時。

5.2 測試方式

將發射機之天線埠經由適當之衰減直接連至測試儀器。設定於待測物正常使用頻將功率設置於最小位準,將其紀錄

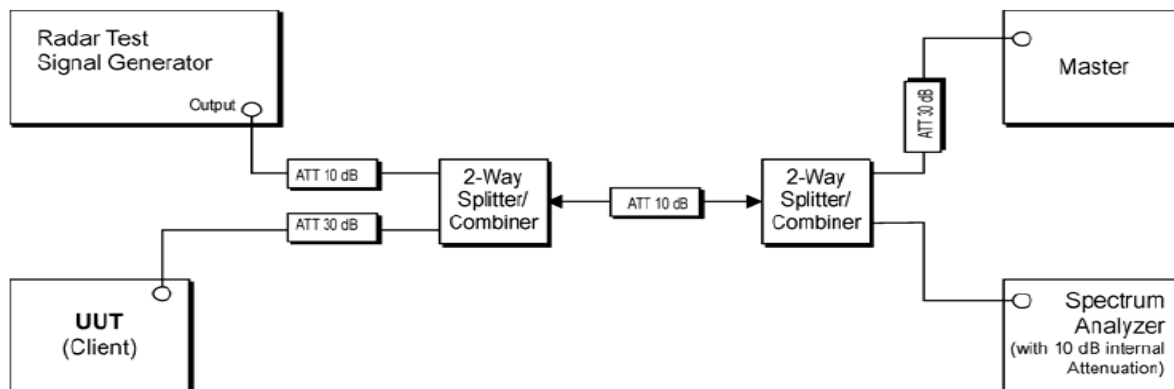
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5.3 測試配置

裝置為 slave 無雷達偵測功能



5.4 動態頻率測試限制

1. 操作模式，動態頻率選擇的規定適用於以下之操作模式：

(I)頻道可用性檢查時間的規定，適用於主控運作模式。

(II)頻道移動時間的規定，適用於主控及受控運作模式。

2. 頻道可用性檢查時間：設備必須檢查其可在某一頻道上起始傳送之前是否有雷達系統已經操作在該頻道上，以及何時其必須移動到另一新的頻道，在 60 秒內若沒有偵測到功率位準大過上述之干擾門檻值的雷達信號時，設備才可開始使用該頻道。

3. 頻道移動時間：在偵測到雷達的存在後，所有在該操作頻道上的所有傳輸須在 10 秒內停止，在偵測到雷達信號後，該期間內的傳輸應維持最多 200 毫秒的正常通訊。另外，間歇性的管理與控制信號可在剩餘的時間中傳送，以便撤離該操作頻道。

4. 不可佔用期間：某一頻道已被頻道可用性檢查或“服務中”監視顯示含有雷達系統，至少須有 30 分鐘的不可佔用期間。不可佔用期間起始於偵測到雷達系統的當時。

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5.5 功率控制與動態頻率選擇量測結果

5.5.1 功率小於 500mW 不需有功率控制功能

EIRP

調變	發射頻帶 (MHz)		輸出功率 (dBm)	EIRP(dBm)	EIRP(mW)
802.11 a mode	5150 ~5250		13.95	15.25	33.50
	5250 ~5350		13.98	16.12	40.93
	5470 ~5725		13.94	13.94	24.77
	5725 ~5850		13.94	17.2	52.48
802.11n HT20 mode	HT20:	5150 ~5250	13.92	15.22	33.27
	HT20:	5250 ~5350	13.98	16.12	40.93
	HT20:	5470 ~5725	13.96	13.96	24.89
	HT20:	5725 ~5850	13.97	17.23	52.84
802.11n HT40 mode	HT40:	5150 ~5250	13.93	15.23	33.34
	HT40:	5250 ~5350	13.98	16.12	40.93
	HT40:	5470 ~5725	13.93	13.93	24.72
	HT40:	5725 ~5850	13.98	17.24	52.97

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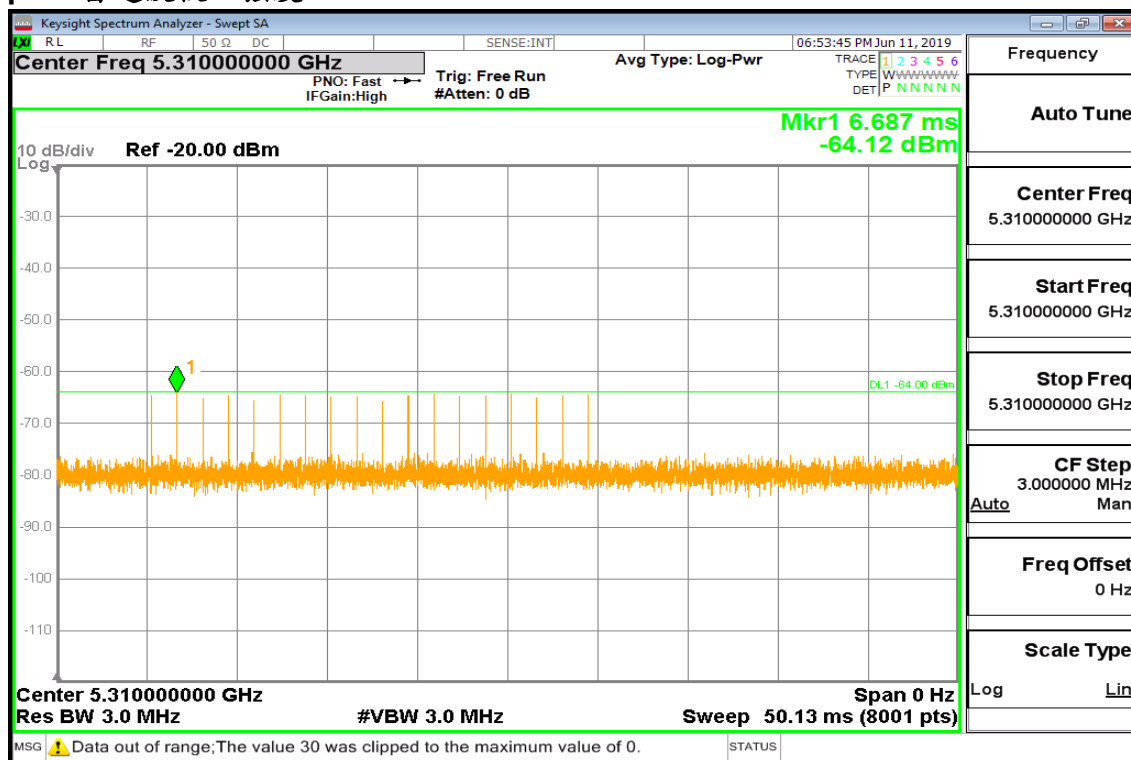
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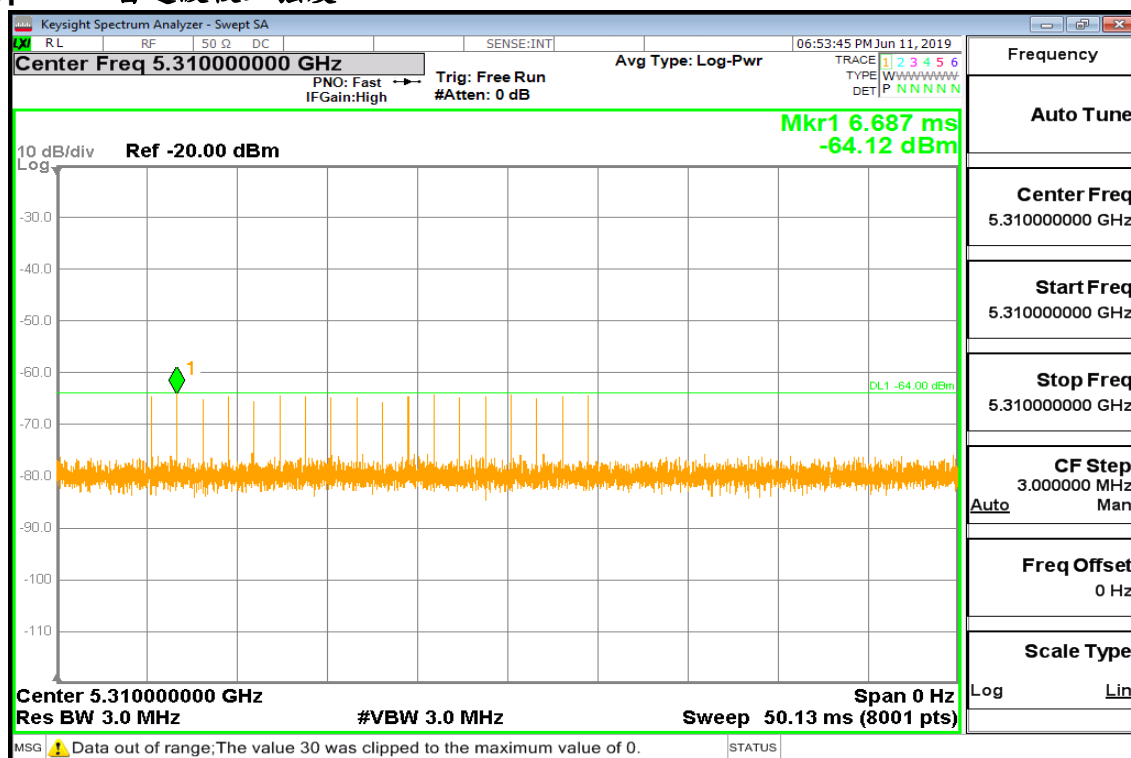
5.5.2 動態頻率選擇測試結果

5310

Radar type 0 雷達波校正強度



Radar type 1-A 雷達波校正強度

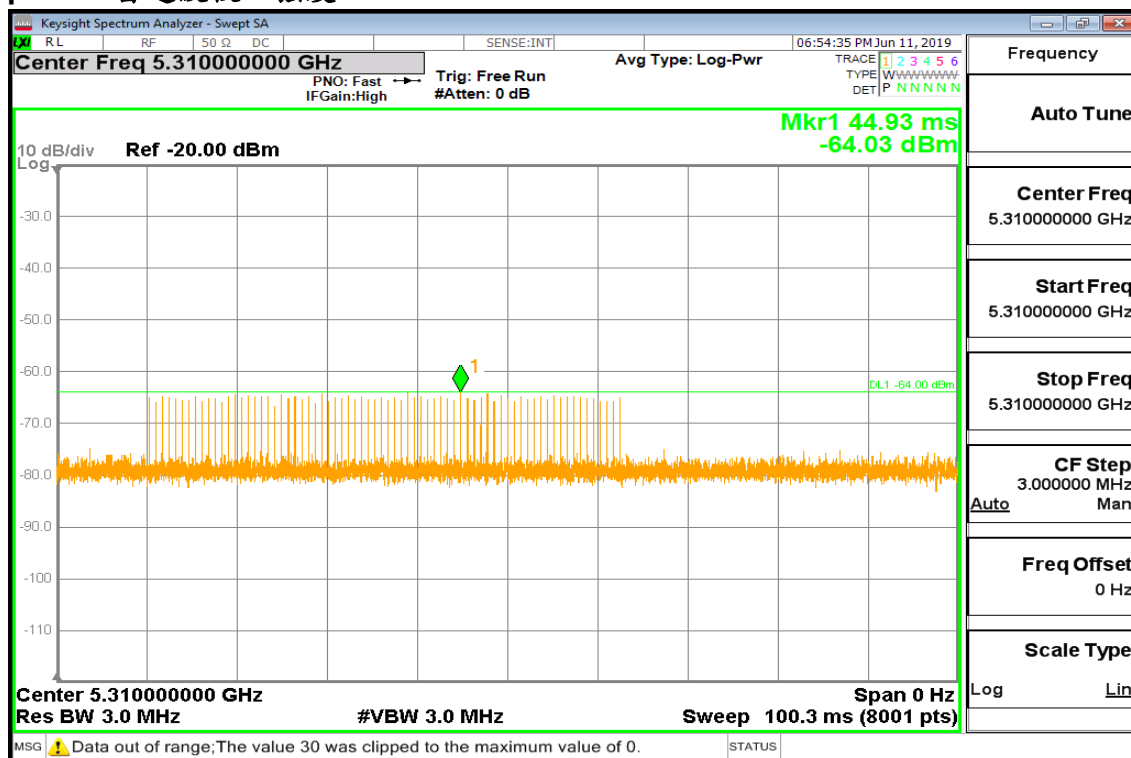


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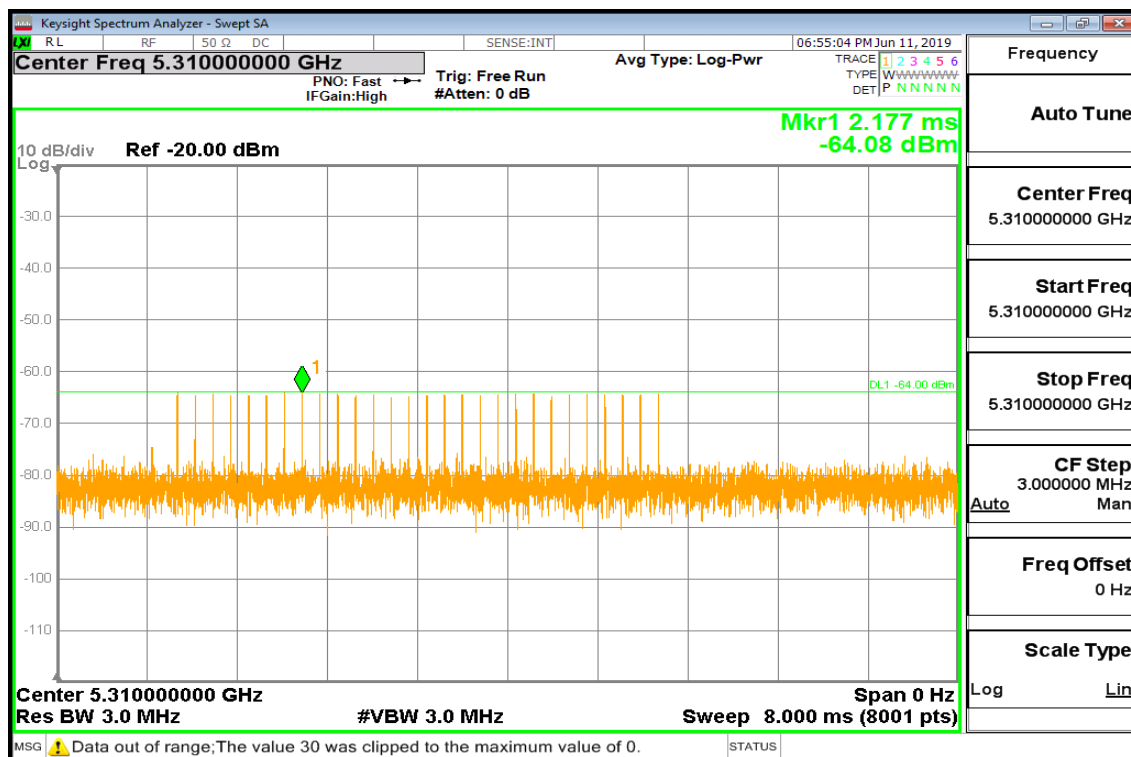
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Radar type 1-B 雷達波校正強度



Radar type 2

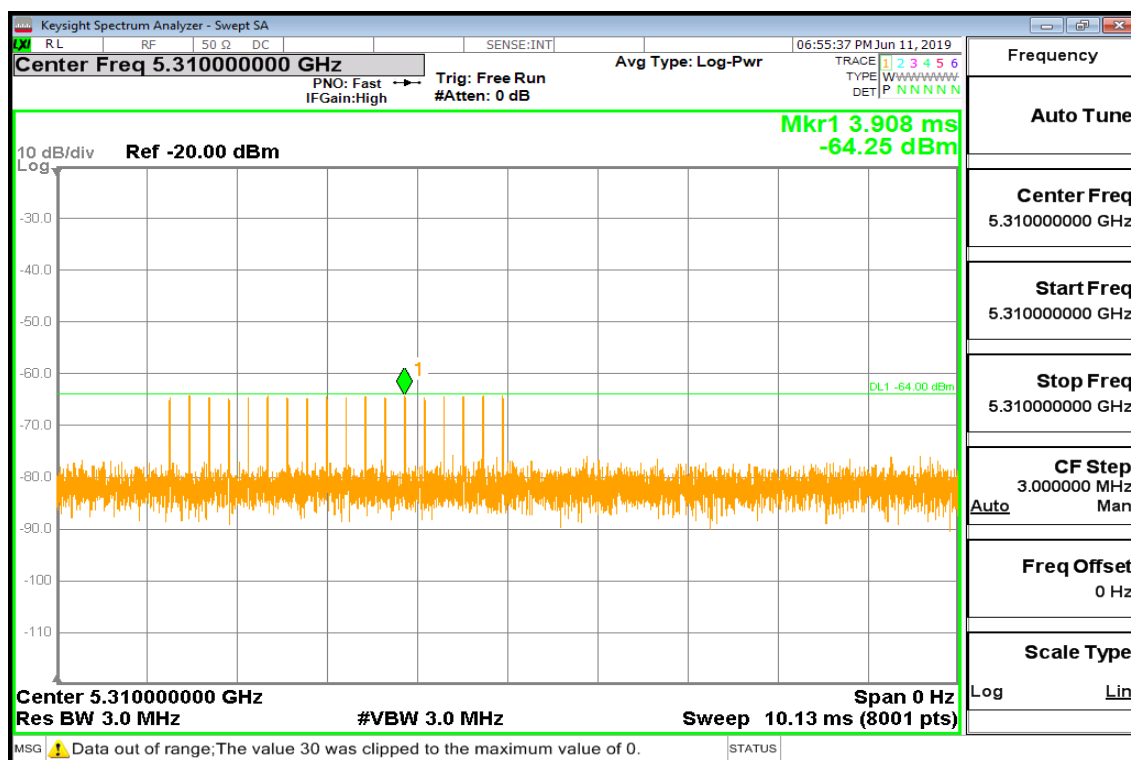


Radar type 3

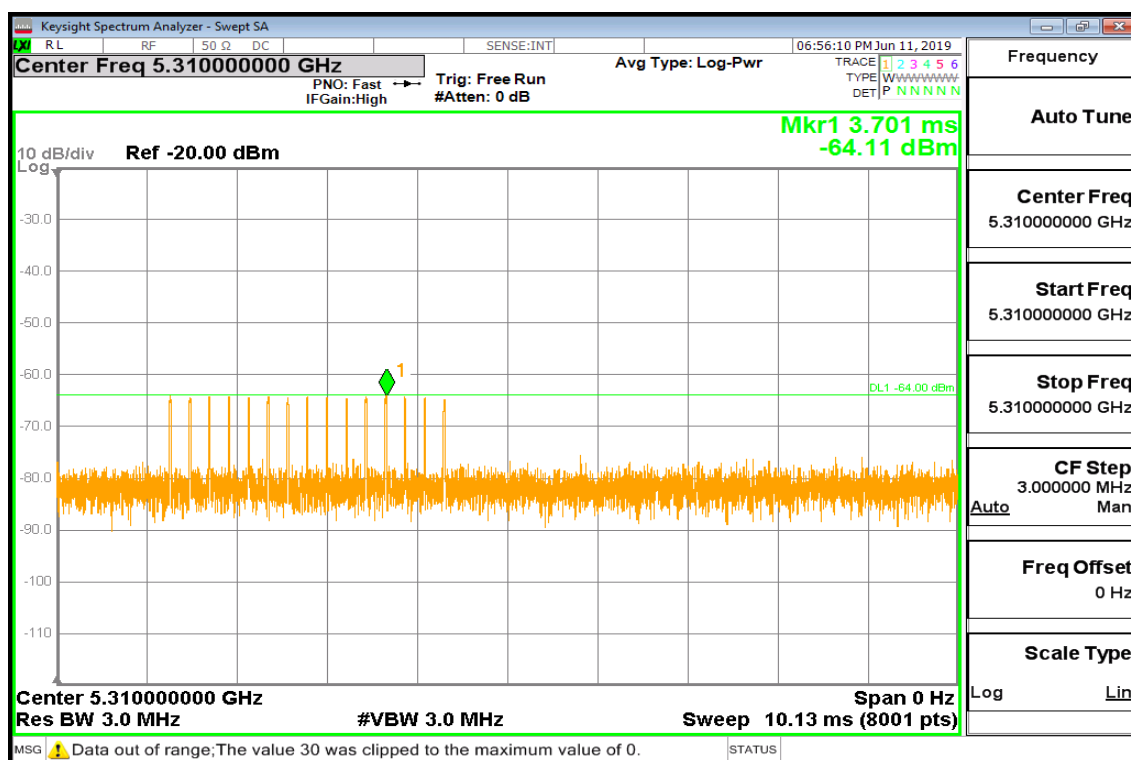
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Radar type 4

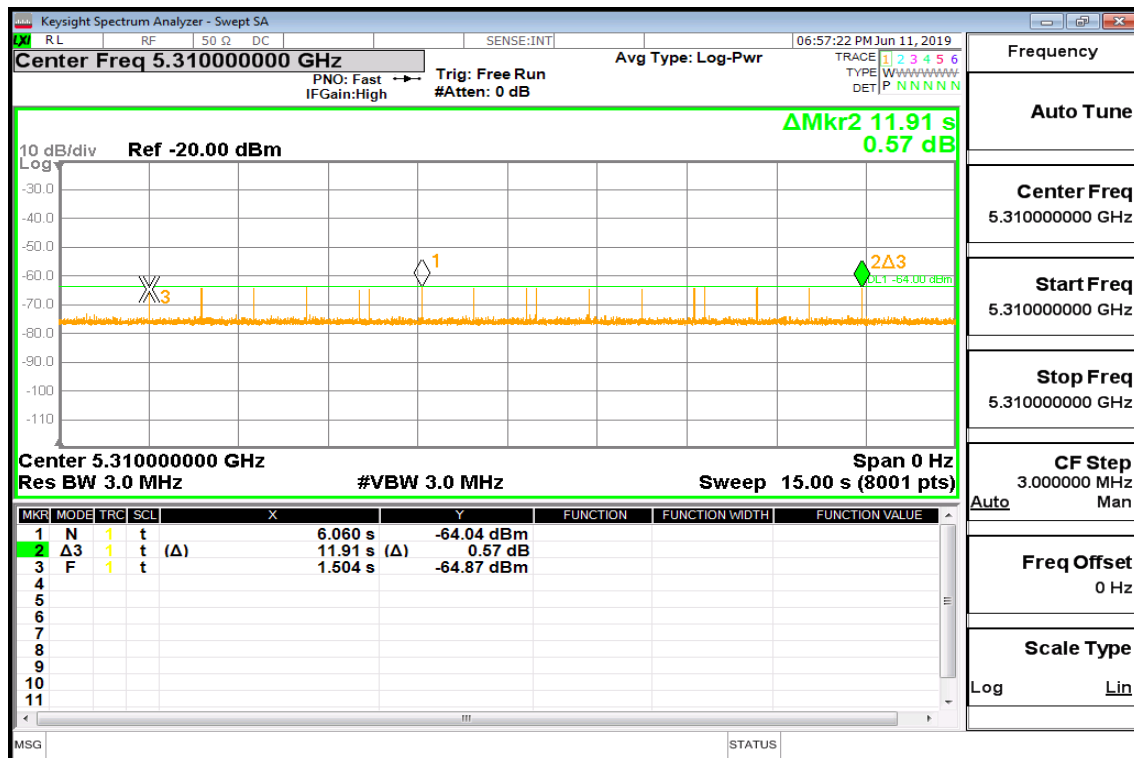


Radar type 5

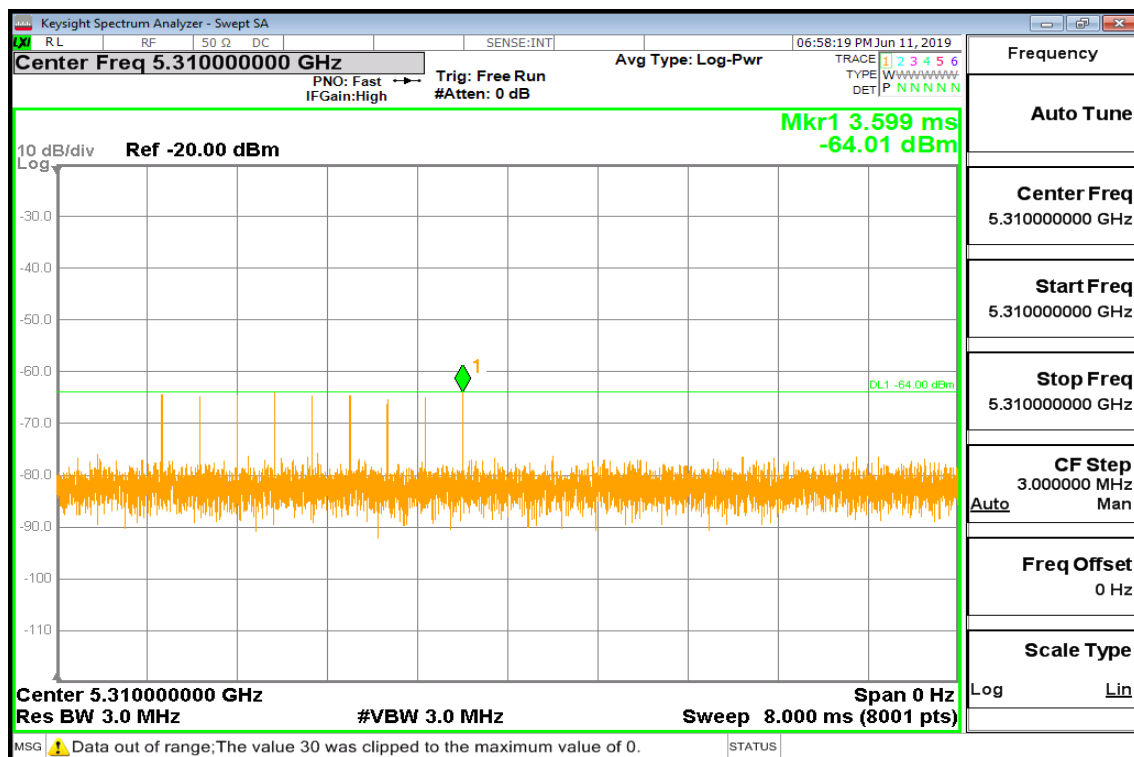
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Radar type 6



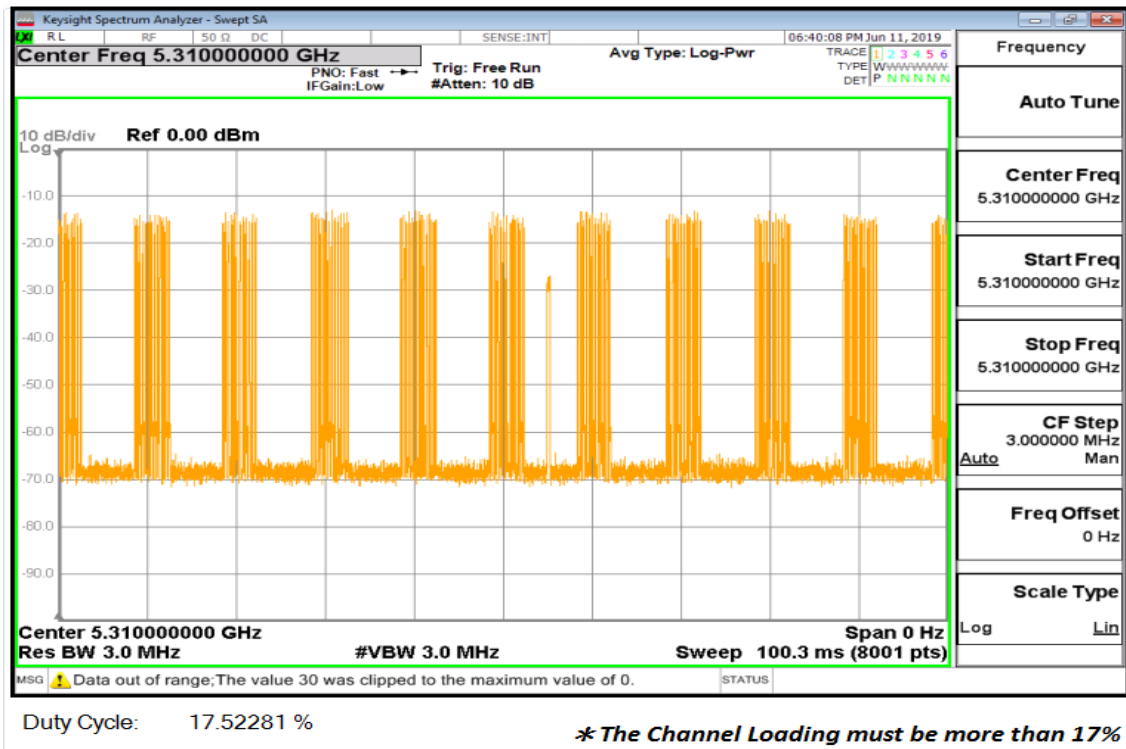
802.11n HT40 Mode Test Data Plot

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WLAN traffic

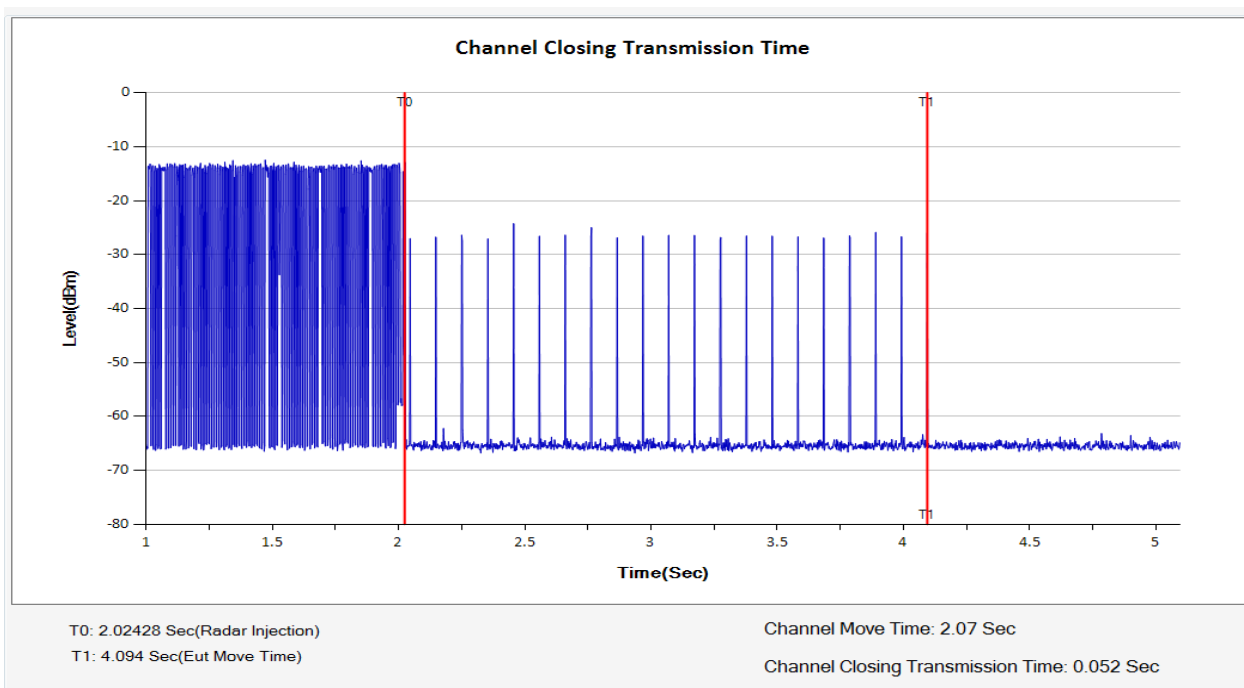
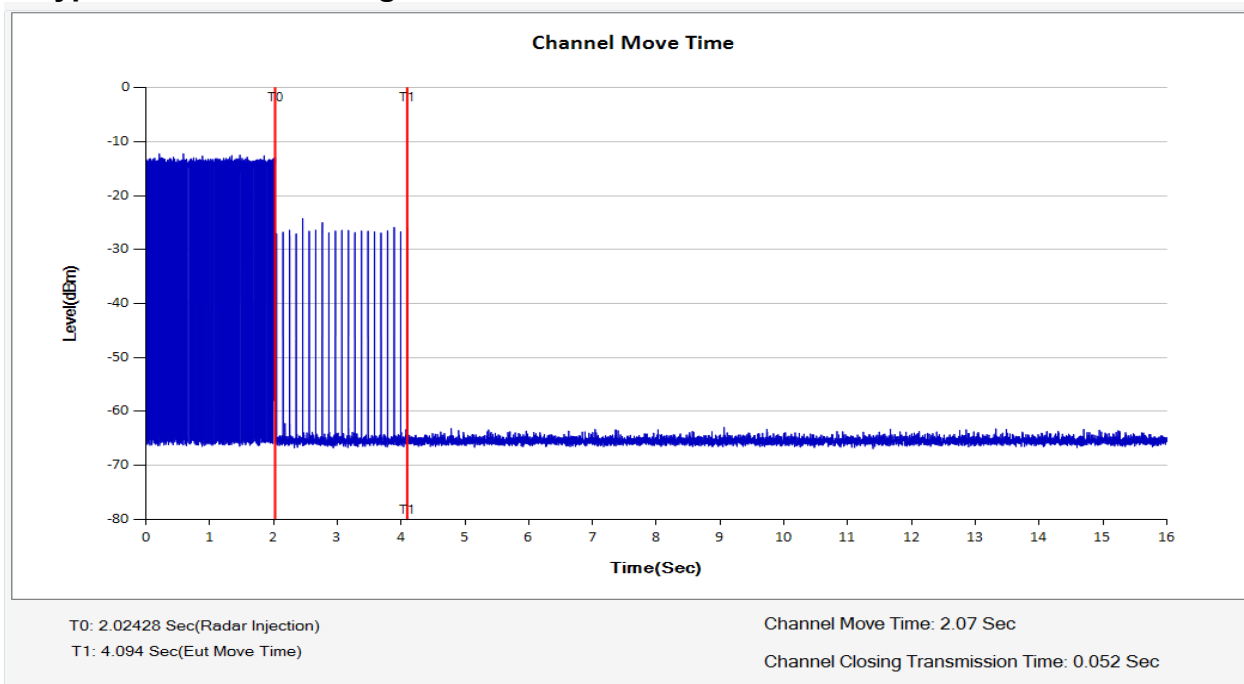


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Radar Type 1 Channel Closing Transmission Time



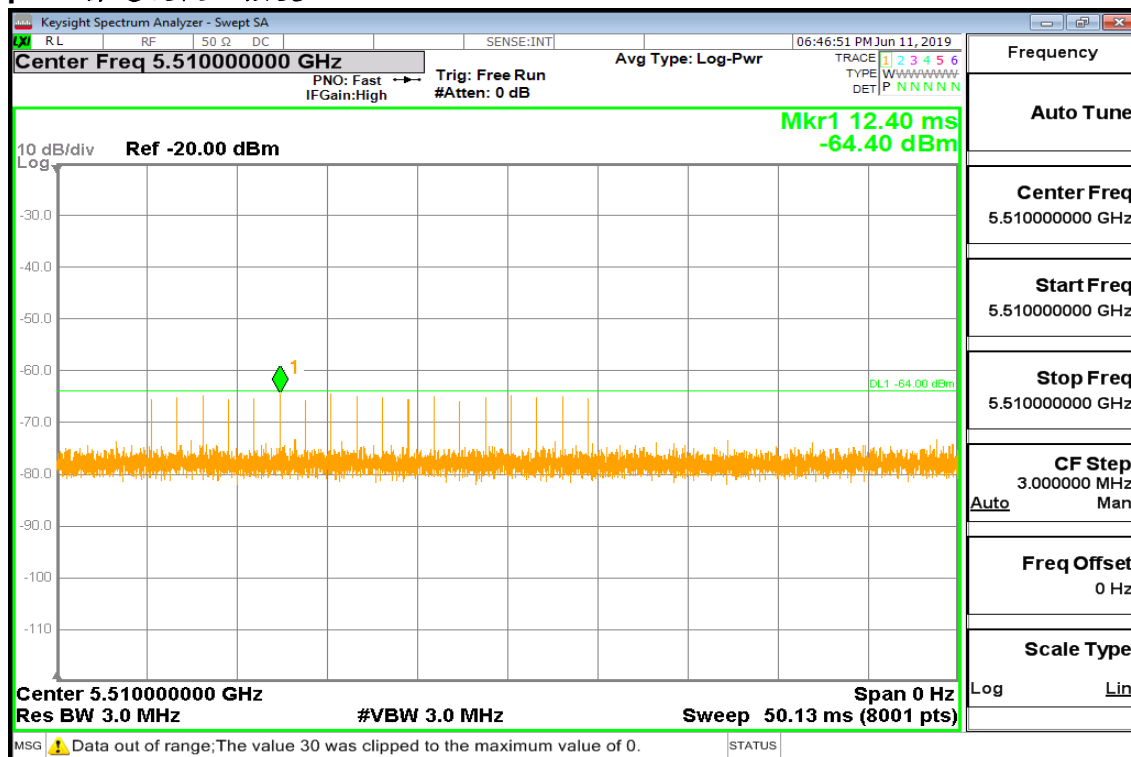
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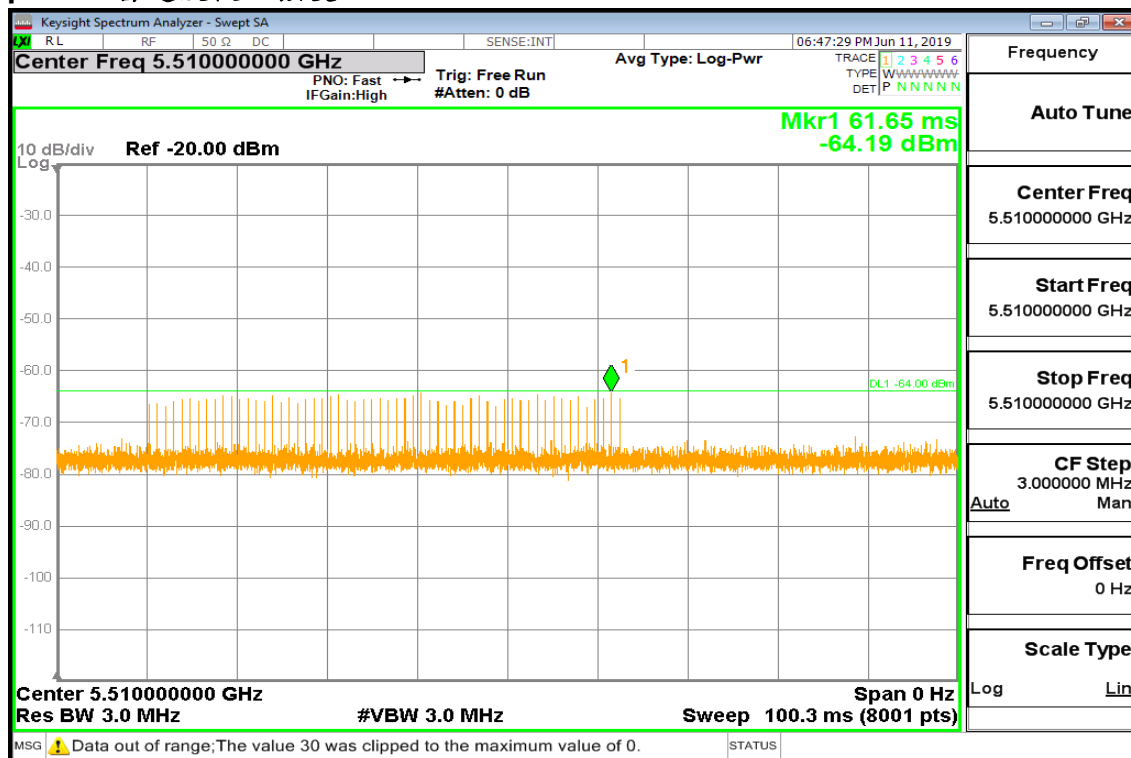
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5510

Radar type 0 雷達波校正強度



Radar type 1-A 雷達波校正強度

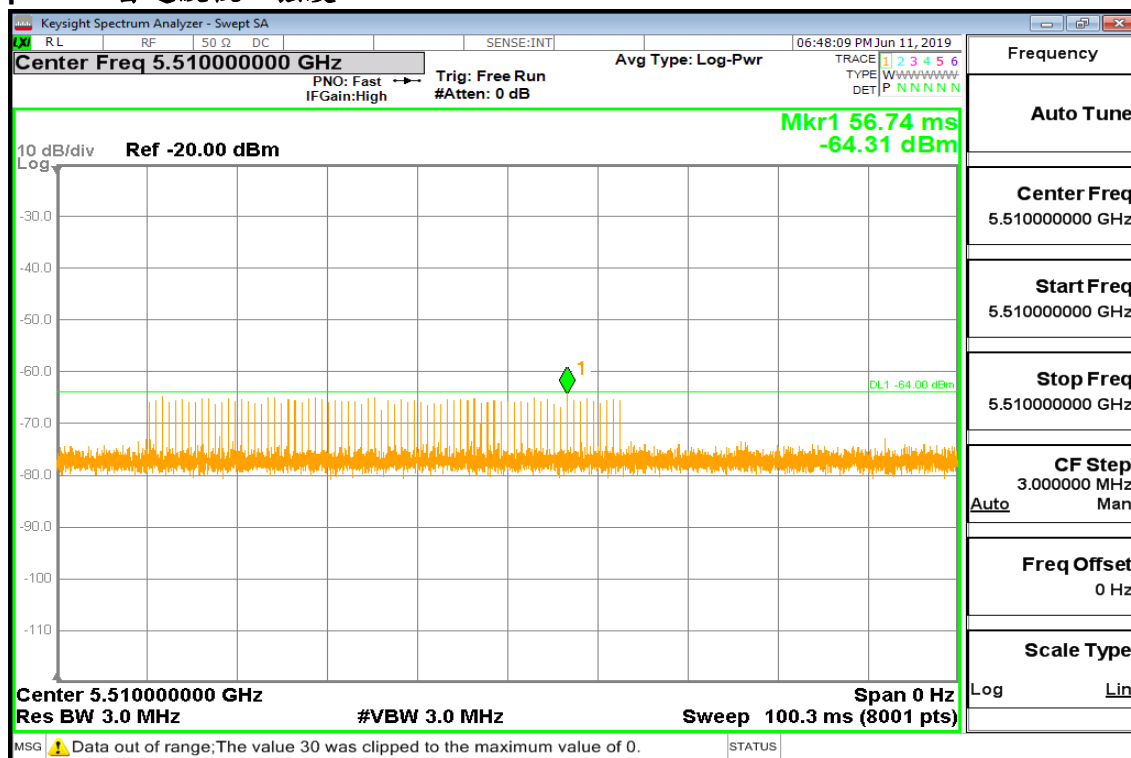


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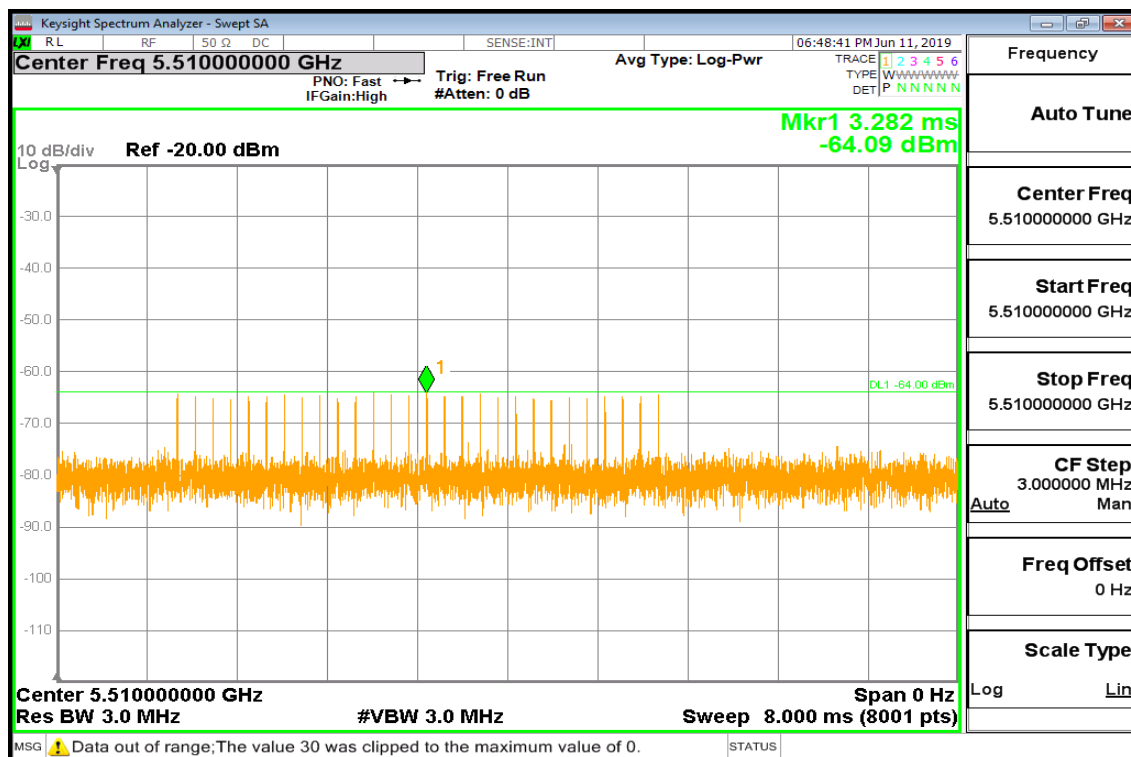
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Radar type 1-B 雷達波校正強度



Radar type 2

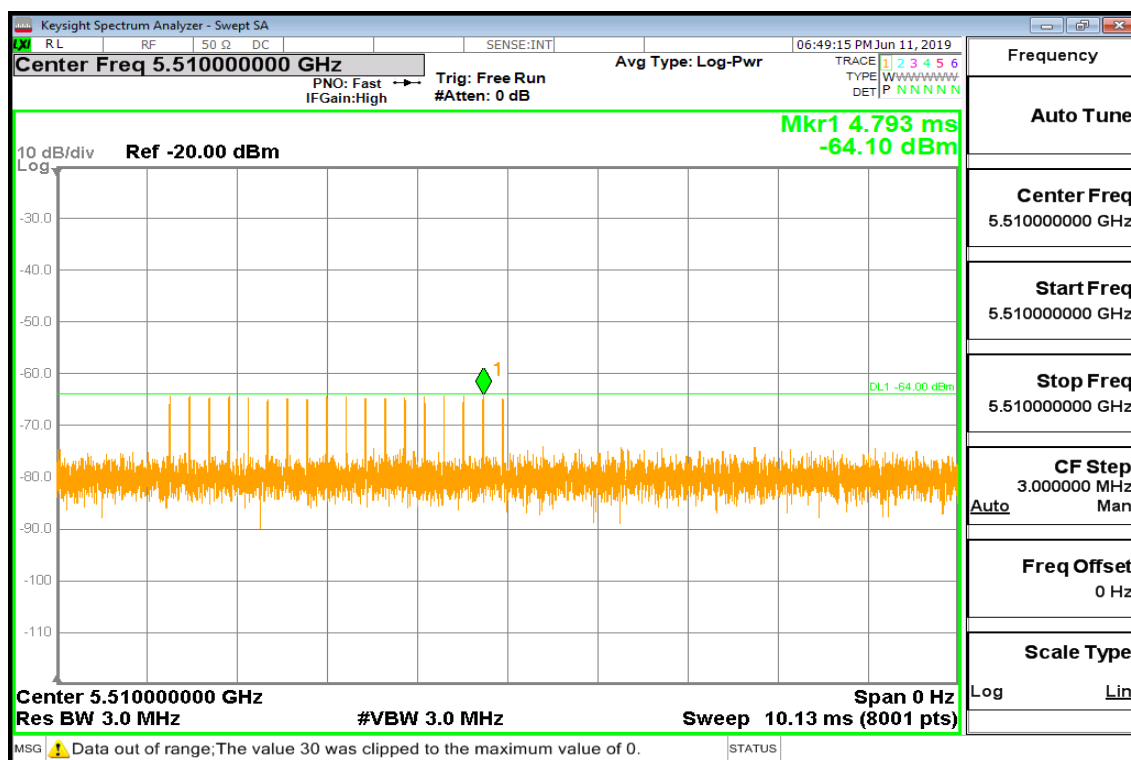


Radar type 3

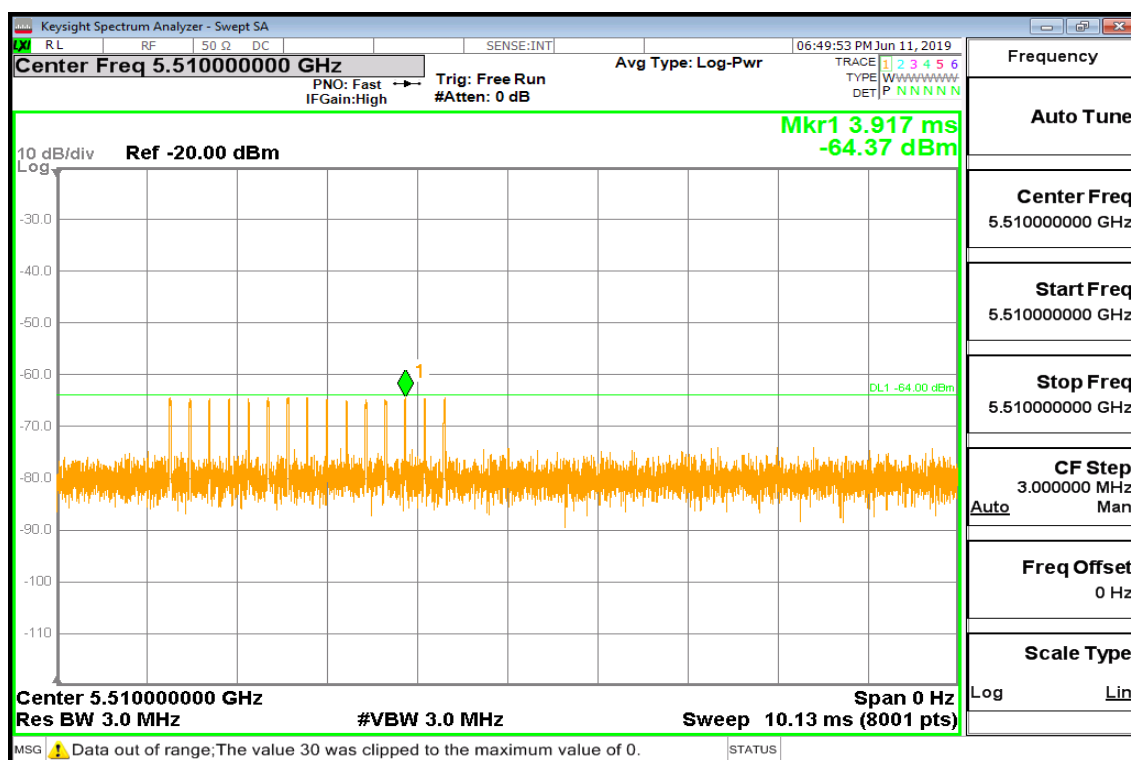
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Radar type 4

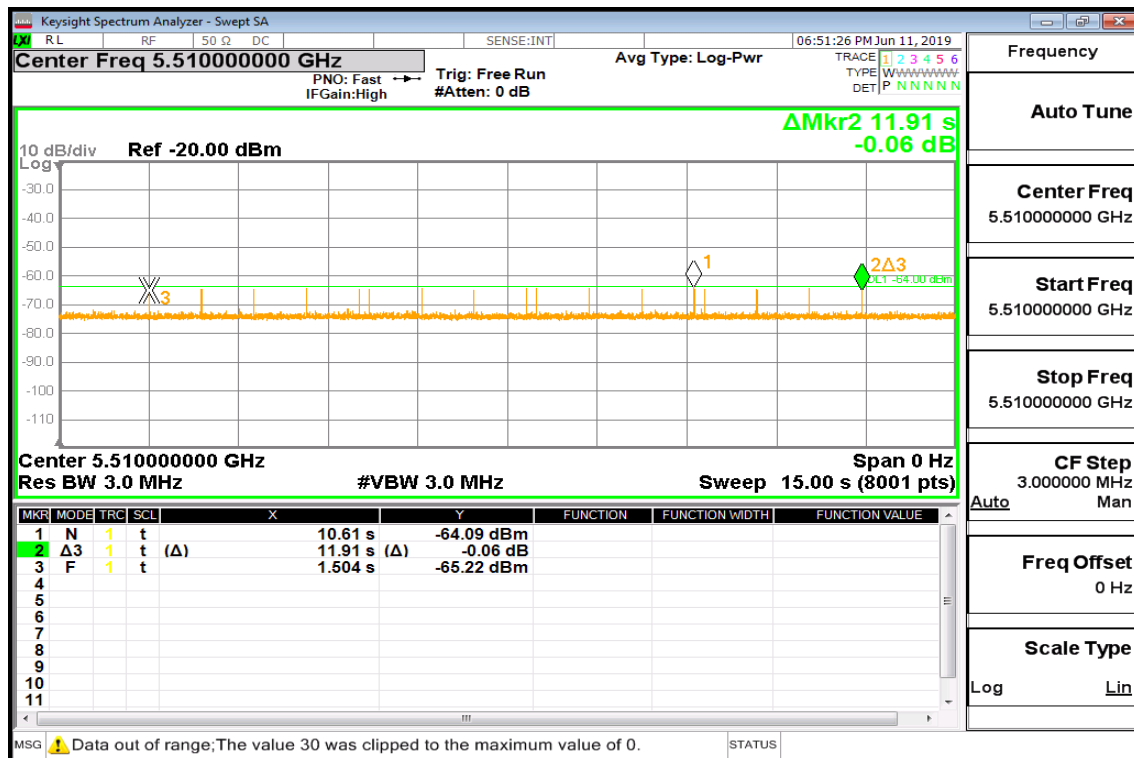


Radar type 5

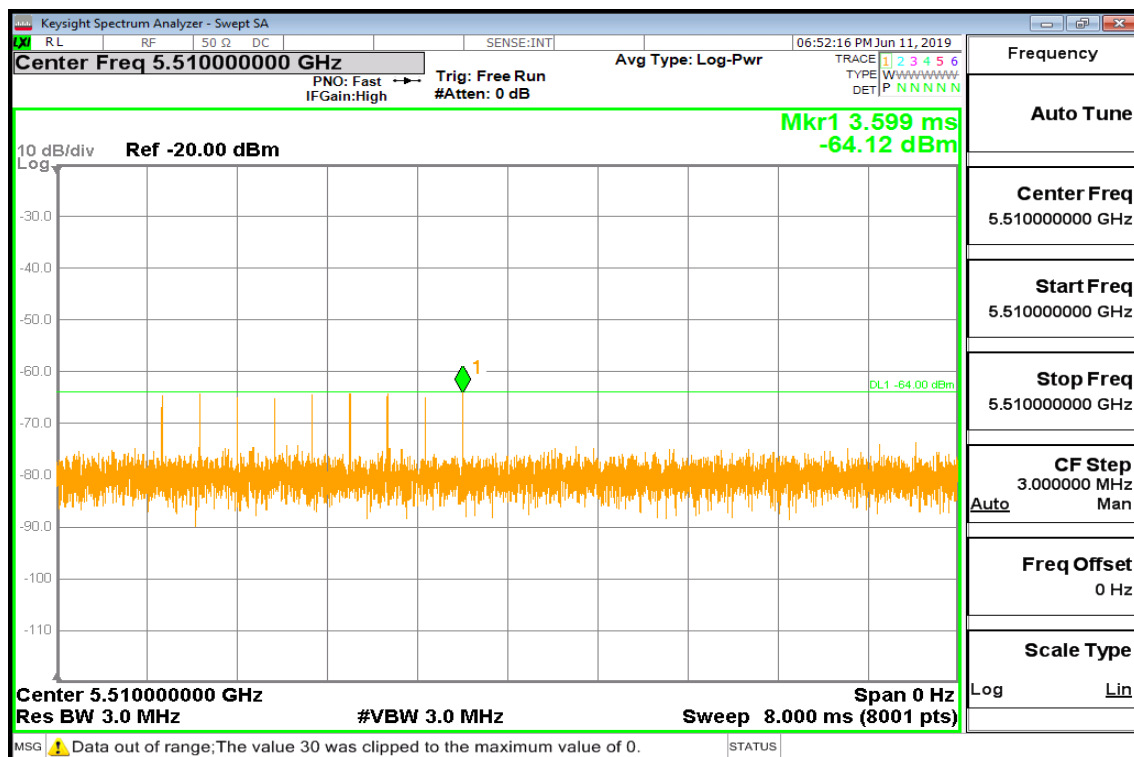
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Radar type 6



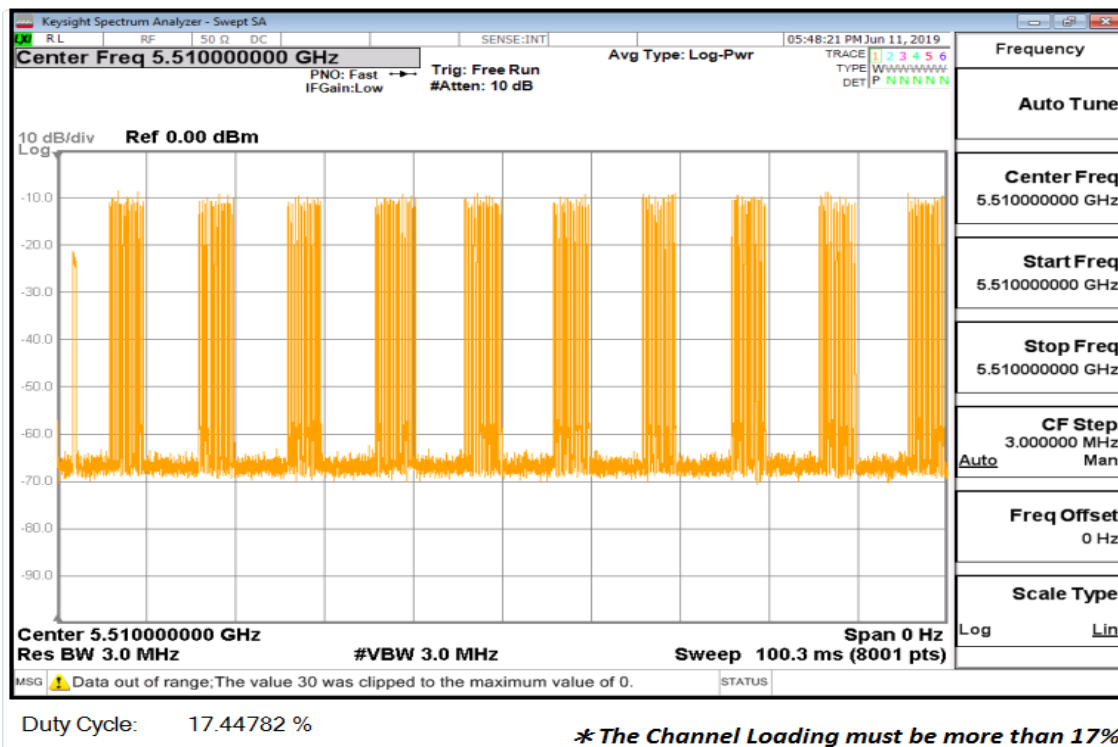
802.11n HT40 Mode Test Data Plot

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WLAN traffic



Non-occupancy Period 不可佔用期間

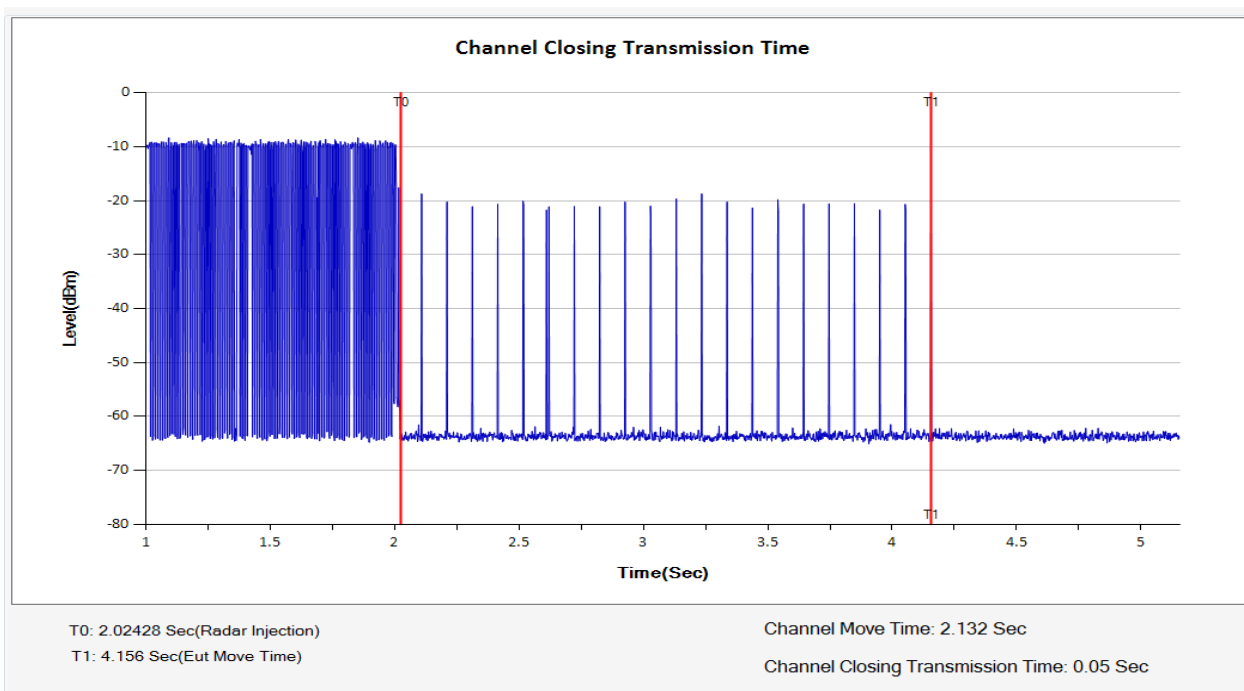
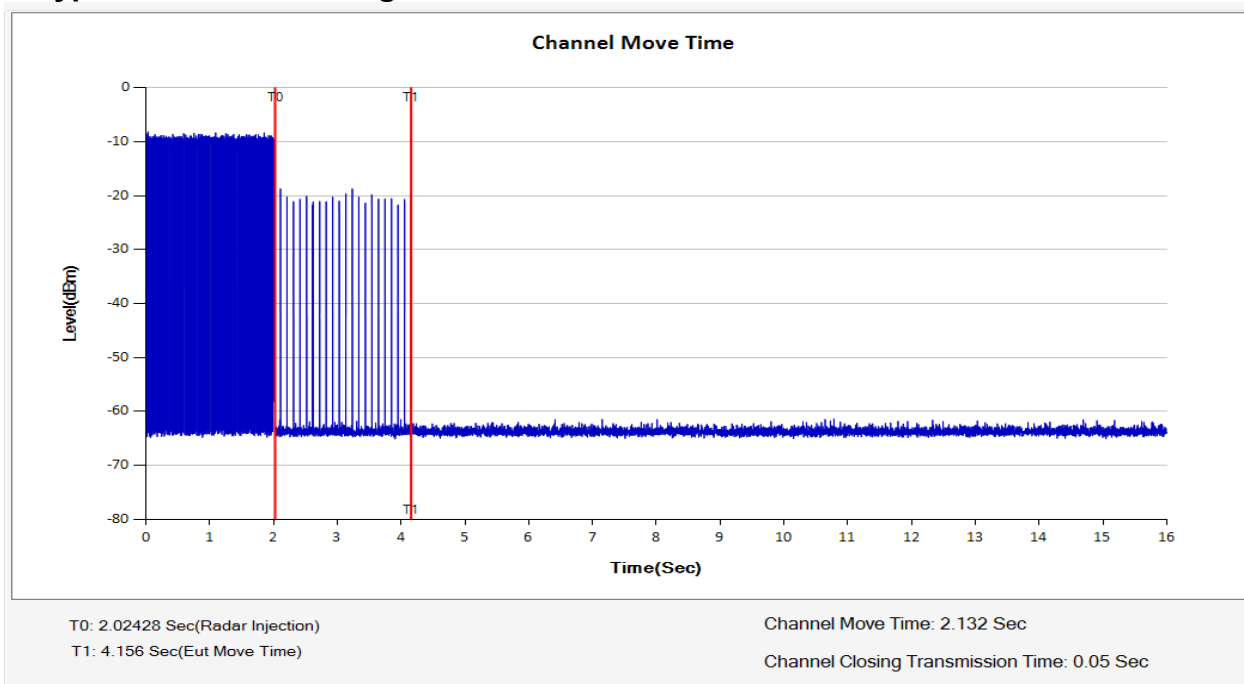


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Radar Type 1 Channel Closing Transmission Time



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11.6.3 功率控制與動態頻率選擇量測結果

測試項目	測試結果	結果判定
頻道移動/結束時間	請參閱12.6節	合格
不可佔用期間	請參閱12.6節	合格
功率控制	EIRP值<500mW	不須具備TPC機能

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