

FCC TEST REPORT FOR CERTIFICATION

On Behalf of

Planet Computers Limited

Gemini

Model No.: Gemini 4G

FCC ID: 2A07Q-X600M1

Prepared for : Planet Computers Limited
Suite #9, 56 Sloane Square, London, SW1W 8AX, United Kingdom

Prepared By : Audix Technology (Shenzhen) Co., Ltd.
No. 6, Kefeng Road, Science & Technology Park,
Nanshan District , Shenzhen, Guangdong, China

Tel: (0755) 26639496

Report Number : ACS-F18056

Date of Test : Dec.28, 2017~Jul.04, 2018

Date of Report : Jul.05, 2018

TABLE OF CONTENTS

Description	Page
1. SUMMARY OF STANDARDS AND RESULTS	1-1
1.1. Description of Standards and Results	1-1
2. GENERAL INFORMATION	2-1
2.1. Description of Device (EUT).....	2-1
2.2. Tested Supporting System Details	2-2
2.3. Block diagram of connection between the EUT and simulators	2-2
2.4. Test Information.....	2-2
2.5. Test Facility	2-3
2.6. Measurement Uncertainty (95% confidence levels, k=2).....	2-3
3. EFFECTIVE ISOTROPIC RADIATED POWER.....	3-1
3.1. Test Equipment.....	3-1
3.1. Limit.....	3-1
3.2. Test Procedure	3-1
3.3. Test Result	3-2
4. OUT OF BAND EMISSIONS AT ANTENNA TERMINALS AND BAND EDGE ..	4-1
4.1. Test Equipment.....	4-1
4.2. Limit.....	4-1
4.3. Test Procedure	4-1
4.4. Test result.....	4-1
5. 99% & 26dB Occupied Bandwidth Test.....	5-1
5.1. Test Equipment.....	5-1
5.2. Test Procedure	5-1
5.3. Test Result	5-1
6. RF POWER OUTPUT TEST	6-1
6.1. Test Equipment.....	6-1
6.2. Limit.....	6-1
6.3. Test Procedure	6-1
6.4. Test Result	6-2
7. PEAK-TO-AVERAGE POWER RATIO TEST.....	7-1
7.1. Test Equipment.....	7-1
7.2. Limit.....	7-1
7.3. Test Procedure	7-1
7.4. Test Result	7-2
8. FIELD STRENGTH OF RADIATED SPURIOUS EMISSIONS.....	8-1
8.1. Test Equipment.....	8-1
8.2. Limit.....	8-1
8.3. Test Procedure	8-1
8.4. Test Result	8-2
9. FREQUENCY STABILITY V.S. TEMPERATURE AND VOLTAGE.....	9-1
9.1. Test Equipment.....	9-1
9.1. Limit.....	9-1
9.2. Test procedure.....	9-1
9.3. Test Result	9-2
10. DEVIATION TO TEST SPECIFICATIONS	10-1
11. PHOTOGRAPH OF TEST	11-1
12. PHOTOS OF THE EUT.....	12-1

TEST REPORT CERTIFICATION

Applicant : Planet Computers Limited

Manufacture : Planet Computers Limited

Product : Gemini

FCC ID : 2A07Q-X600M1

(A) Model No. : Gemini 4G

(B) Serial No. : N/A

(C) Test Voltage : DC 5V From Adapter Input AC 120V/60Hz

Tested for comply with:
FCC part 2, 22H & 24E
Test Method:
KDB971168 D01 v03; ANSI C63.26 2015

The device described above is tested by AUDIX TECHNOLOGY (SHENZHEN) CO., LTD. to confirm comply with all the FCC part 2, 22H & 24E requirements.

The test results are contained in this test report and AUDIX TECHNOLOGY (SHENZHEN) CO., LTD. is assumed full responsibility for the accuracy and completeness of these tests. This report contains data that are not covered by the NVLAP accreditation. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC and IC requirements.

This Report is made under FCC part 2, 22H & 24E. No modifications were required during testing to bring this product into compliance.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of AUDIX TECHNOLOGY (SHENZHEN) CO., LTD.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

Date of Test : Dec.28, 2017~Jul.04, 2018 Report of date: Jul.05, 2018

Prepared by : Monica Liu
Monica Liu / Assistant

Reviewed by : Sunny Lu
Sunny Lu / Deputy Manager



Approved & Authorized Signer :

1. SUMMARY OF STANDARDS AND RESULTS

1.1. Description of Standards and Results

The EUT has been tested according to the applicable standards as referenced below.

EMISSION		
Description of Test Item	Standard	Results
Effective Isotropic Radiated Power	2.1046(a) 22.913(a) 24.232(c)	PASS
Out of Band Emissions at antenna Terminals and Band Edge	2.1051 22.917(a) 24.238(a)	PASS
99% & 26dB Occupied Bandwidth	2.1049	PASS
RF Output Power	2.1046	PASS
Peak to Average Power Ratio	24.232(d)	PASS
Field Strength of Spurious Emissions	2.1053 22.917(a) 24.238(a)	PASS
Frequency Stability vs. Temperature and Voltage	22.355 24.235	PASS

2. GENERAL INFORMATION

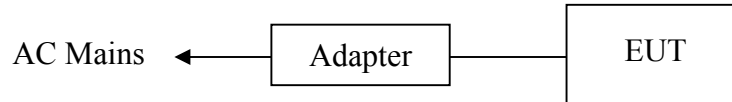
2.1. Description of Device (EUT)

Product	: Gemini
Model No.	: Gemini 4G
FCC ID	: 2A07Q-X600M1
Operating Frequency	: GSM 850: 824-849MHz PCS 1900: 1850-1910MHz
Antenna Type and Gain	: PIFA Antenna, GSM850: -3.5dBi PCS1900: 0.7dBi
Applicant	: Planet Computers Limited Suite #9, 56 Sloane Square, London, SW1W 8AX, United Kingdom
Manufacturer	: Planet Computers Limited Suite #9, 56 Sloane Square, London, SW1W 8AX, United Kingdom
Factory	: SHENZHEN YIXU ELECTRONICS CO., LTD. Building B, Area E, Yuwei, Qingxiang Rd, Longhua, Shenzhen
Power Adapter	: Manufacturer: Planet, M/N: TPA-10120125UUA-MTK; Cable: Unshielded, Detachable, 1.0m
Date of Test	: Dec.28, 2017~Jul.04, 2018
Date of Receipt	: Dec.26, 2017
Sample Type	: Prototype production

2.2. Tested Supporting System Details

[None]

2.3. Block diagram of connection between the EUT and simulators



(EUT: Gemini)

2.4. Test Information

TM1: GSM/GPRS mode with GMSK modulation

TM2: Edge mode with 8PSK modulation

TM1 has the Max power compared with TM2, so out of Band Emission at antenna terminals and Band edge. Field strength of Radiated Spurious emission were tested use TM1 mode.

Test Mode	Frequency (MHz)	CH
GSM 850	824.2	128
	836.6	190
	848.8	251
PCS 1900	1850.2	512
	1880.0	661
	1909.8	810

2.5. Test Facility

Site Description

Name of Firm

Audix Technology (Shenzhen) Co., Ltd.
No. 6, Kefeng Road, Science & Technology
Park, Nanshan District, Shenzhen, Guangdong,
China

EMC Lab.

Certificated by Industry Canada
: Registration Number: IC 5183A-1
Valid Date: May.07, 2020

Certificated by DAkkS, Germany
: Registration No: D-PL-12151-01-00
Valid Date: Dec.07, 2021

Accredited by NVLAP, USA
: NVLAP Code: 200372-0
Valid Date: Mar.31, 2018

Certificated by FCC, USA
Designation Number: CN5022
Valid Date: Mar.31, 2018

2.6. Measurement Uncertainty (95% confidence levels, k=2)

Test Item	Uncertainty
Uncertainty for Radiated Spurious Emission test in RF chamber	3.6dB
Uncertainty for Conduction Spurious emission test	2.0dB
Uncertainty for Output power test	0.8dB
Uncertainty for Power density test	2.0dB
Uncertainty for Frequency range test	7×10^{-8}
Uncertainty for Bandwidth test	83 kHz
Uncertainty for DC power test	0.1 %
Uncertainty for test site temperature and humidity	0.6°C
	3%

3. EFFECTIVE ISOTROPIC RADIATED POWER

3.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	PXA Signal Analyzer	Agilent	N9030A	MY53311015	Oct.15,17	1 Year
2.	Preamplifier	HP	8449B	3008A02495	Apr.22.17	1 Year
3.	Preamplifier	Agilent	8447D	2944A11159	Apr.22,17	1Year
4.	Trilog-Broadband Antenna	SCHWARZB ECK	VULB 9168	493	Jun.27.17	1 Year
5.	Horn Antenna	ETC	MCTD 1209	DRH15F03006	May.15,17	1 Year
6.	Horn Antenna	EMCO	3116	0062643	Oct.10,17	1 Year
7.	Antenna and turn table controller	CT	SC100	CT-0091	N/A	N/A
8.	RF Cable	Hubersuhner	SUCOFLEX104	274094/4	Apr.22,17	1 Year
9.	Test Software	AUDIX	e3	6.2009-5-21a(n)	N/A	N/A

Note: N/A means Not applicable.

3.1. Limit

22.913(a) Mobile station are limited to 7W ERP.

Part 24.232(b) Mobile station are Limited to 2W EIRP.

3.2. Test Procedure

The EUT was placed on a non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer. During the measurement, the EUT was communication with the station. The highest emission was recorded with the rotation of the turntable and lowering of the test antenna from 4m to 1m. The reading was recorded and the field strength(E in dBuV/m) was calculated.

ERP in frequency band 824.2-848.8MHz were measured using substitution method. The EUT was replaced by dipole antenna connected, the S.G. output was recorded and ERP was calculated as follow:

EIRP in frequency band 1850.2-1909.8MHz were measured using a substitution method. The EUT was replaced by a horn antenna connected, the S.G. output was recorded and EIRP was calculated as follows:

ERP=S.G. output (dBm) + Antenna Gain (dBd) - Cable Loss(dB)

EIRP= S.G. output (dBm) + Antenna Gain (dBi) - Cable Loss(dB)

dBd=dBi-2.15dB

3.3.Test Result

EUT: Gemini		
M/N: Gemini 4G		
Test date: 2017-12-28	Pressure: 102.1±1.0 kpa	Humidity: 53.2±3.0%
Tested by: Alice_Yang	Test site: RF site	Temperature:22.4±0.6 °C

GSM 850

Test Result :

The RBW, VBW of SPA for frequency
Below 1GHz was RBW= 300kHz, VBW=1MHz;
Above 1GHz was RBW=1MHz, VBW=3MHz.

TM1

Test Mode	Frequency (MHz)	CH	Antenna Pol.	SPA Reading (dBuv)	Receive Antenna Factor (dB/m)	Receive Cable Loss (dB)	Field Strength (dBuv/m)
GSM 850	824.2	128	V	87.44	28.67	4.65	120.76
			H	87.38	28.67	4.65	120.70
	836.6	190	V	87.04	28.81	4.72	120.57
			H	86.92	28.81	4.72	120.45
	848.8	251	V	86.81	28.93	4.79	120.53
			H	86.71	28.93	4.79	120.43

S.G. output (dBm)	Antenna Gain (dBd)	Tx Cable loss (dB)	Result ERP/EIRP (dBm)	Limit
				ERP/EIRP(dBm)
28.35	1	3.68	25.67	38.45
28.28	1	3.68	25.60	38.45
28.26	1	3.74	25.52	38.45
28.22	1	3.74	25.48	38.45
28.30	1	3.8	25.50	38.45
28.26	1	3.8	25.46	38.45

TM2

Test Mode	Frequency (MHz)	CH	Antenna Pol.	SPA Reading (dBuv)	Receive Antenna Factor (dB/m)	Receive Cable Loss (dB)	Field Strength (dBuv/m)
GSM 850	824.2	128	V	84.53	28.67	4.65	117.85
			H	84.41	28.67	4.65	117.73
	836.6	190	V	84.12	28.81	4.72	117.65
			H	84.09	28.81	4.72	117.62
	848.8	251	V	83.88	28.93	4.79	117.60
			H	83.86	28.93	4.79	117.58

S.G.output (dBm)	Antenna Gain (dBd)	Tx Cable loss (dB)	Result ERP/EIRP (dBm)	Limit
				ERP/EIRP(dBm)
25.33	1	3.68	22.65	38.45
25.21	1	3.68	22.53	38.45
25.24	1	3.74	22.50	38.45
25.21	1	3.74	22.47	38.45
25.25	1	3.8	22.45	38.45
25.09	1	3.8	22.29	38.45

PCS 1900
Test Result :

The RBW, VBW of SPA for frequency
Below 1GHz was RBW= 300kHz, VBW=1MHz;
Above 1GHz was RBW=1MHz, VBW=3MHz.

TM1

Test Mode	Frequency (MHz)	CH	Antenna Pol.	SPA Reading (dBuv)	Receive Antenna Factor (dB/m)	Receive Cable Loss (dB)	Field Strength (dBuv/m)
PCS 1900	1850.2	512	V	90.58	26.42	9.03	126.03
			H	90.41	26.42	9.03	125.86
	1880.0	661	V	90.25	26.53	9.14	125.92
			H	90.09	26.53	9.14	125.76
	1909.8	810	V	89.97	26.63	9.24	125.84
			H	89.61	26.63	9.24	125.48

S.G. output (dBm)	Antenna Gain (dBd)	Tx Cable loss (dB)	Result ERP/EIRP (dBm)	Limit
				ERP/EIRP(dBm)
33.75	3.15	6.11	30.79	33
33.60	3.15	6.11	30.64	33
33.76	3.15	6.19	30.72	33
33.53	3.15	6.19	30.49	33
33.76	3.15	6.26	30.65	33
33.17	3.15	6.26	30.06	33

Conclusion: PASS

TM2

Test Mode	Frequency (MHz)	CH	Antenna Pol.	SPA Reading (dBuv)	Receive Antenna Factor (dB/m)	Receive Cable Loss (dB)	Field Strength (dBuv/m)
PCS 1900	1850.2	512	V	87.63	26.42	9.03	123.08
			H	86.93	26.42	9.03	122.42
	1880.0	661	V	87.12	26.53	9.14	122.79
			H	86.51	26.53	9.14	122.18
	1909.8	810	V	87.02	26.63	9.24	122.89
			H	86.22	26.63	9.24	122.09

S.G.output (dBm)	Antenna Gain (dBd)	Tx Cable loss (dB)	Result ERP/EIRP (dBm)	Limit
				ERP/EIRP(dBm)
30.79	3.15	6.11	27.83	33
29.98	3.15	6.11	27.02	33
30.63	3.15	6.19	27.59	33
29.85	3.15	6.19	26.81	33
30.63	3.15	6.26	27.52	33
29.33	3.15	6.26	26.22	33

Conclusion: PASS

4. OUT OF BAND EMISSIONS AT ANTENNA TERMINALS AND BAND EDGE

4.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	PXA Signal Analyzer	Agilent	N9030A	MY53311015	Oct.15,17	1 Year
2.	Attenuator	Agilent	8491B	MY39262165	Apr.27,17	1 Year
3.	RF Cable	Marvelous Microwave Inc	SFL402105FLEX	NO.1	Oct.15,17	1 Year
4.	HF Cable	Hubersuhner	Sucoflex104	274094/4	Apr.22,17	1 Year

4.2. Limit

FCC part 22.917(a), 24.238(a) the magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specification in the instruction manual and/or alignment procedure, shall not be less than $43+10\log(\text{Mean power in watts})$ dBc below the mean power output outside a license's frequency block(-13dBm).

4.3. Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emission is any up to 10th harmonic. For the out of band: set RBW, VBW=1MHz, stat=30MHz, stop= 10 th harmonic. Limit=-13dBm Band Edge requirements: In 1Mhz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 % of bandwidth of fundamental emission of the transmitter any be employed to measure the out of band emission. Limit=-13dBm.

Per KDB890810 add an additional correction factor of $10 \log (RBW1/ RBW2)$ to the $43 +10 \log (P)$ limit. RBW1 is the narrower measurement resolution bandwidth and RBW2 is either the 1% emissions bandwidth or 1MHz.

Correction Factor = $10 \log (5.1\text{kHz} / 1\% \text{ of emissions bandwidth})$

$$= 10 \log (5.1\text{kHz} / 3.2 \text{ kHz}) = 2.02\text{dB}$$

So the limit should be $-13\text{dBm} + 2.02\text{dB} = -10.98\text{dBm}$

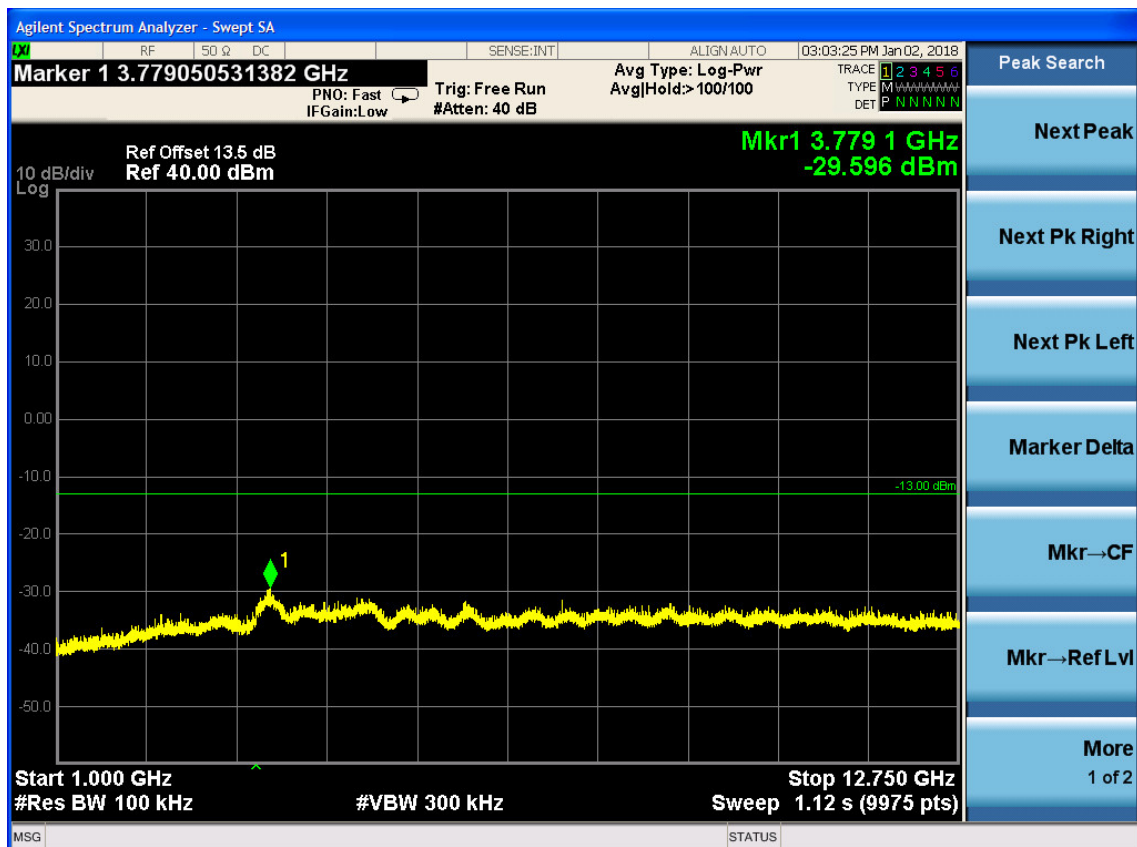
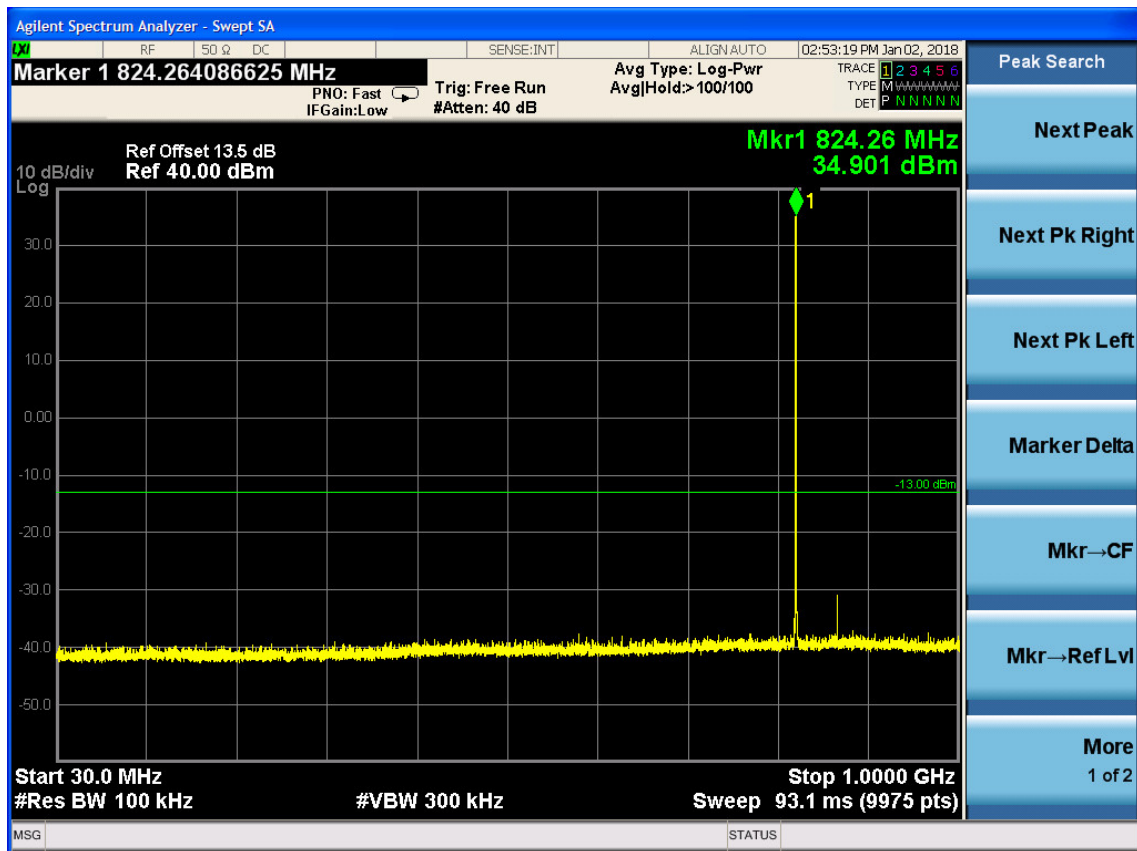
4.4. Test result

PASS (The testing data was attached in the next pages.)

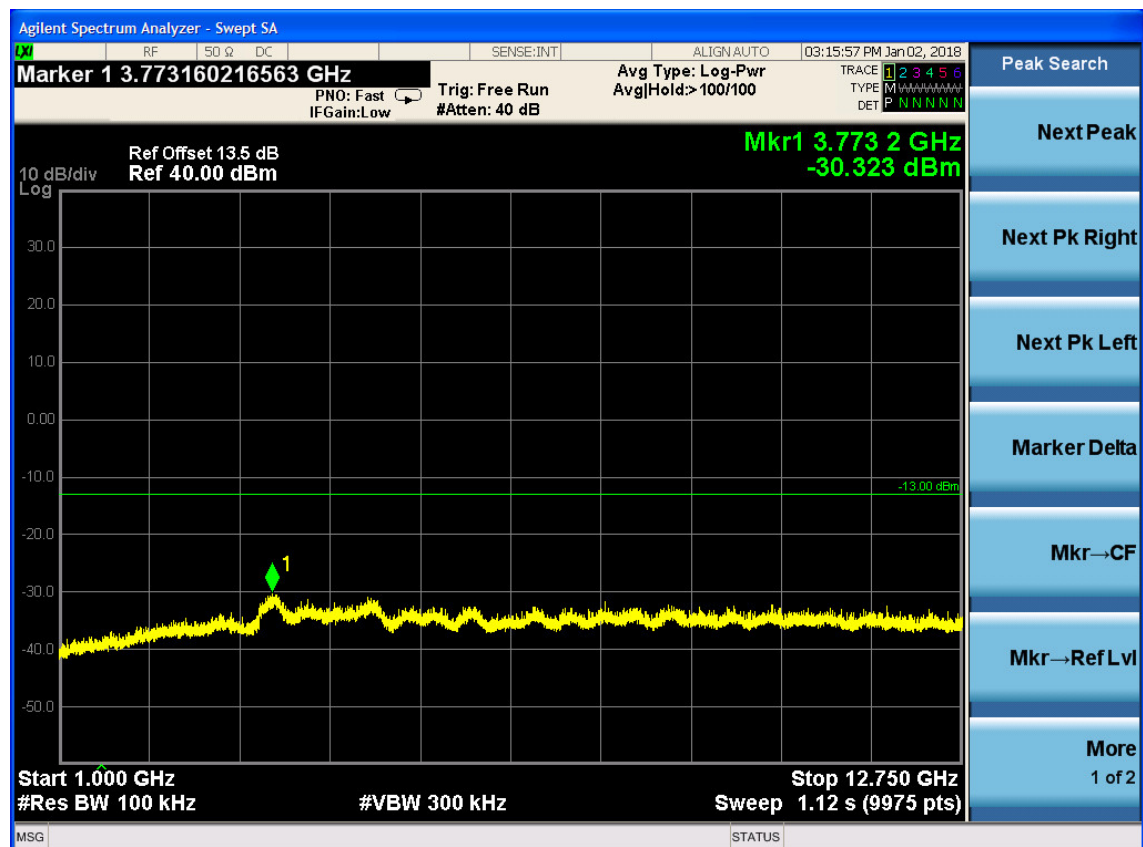
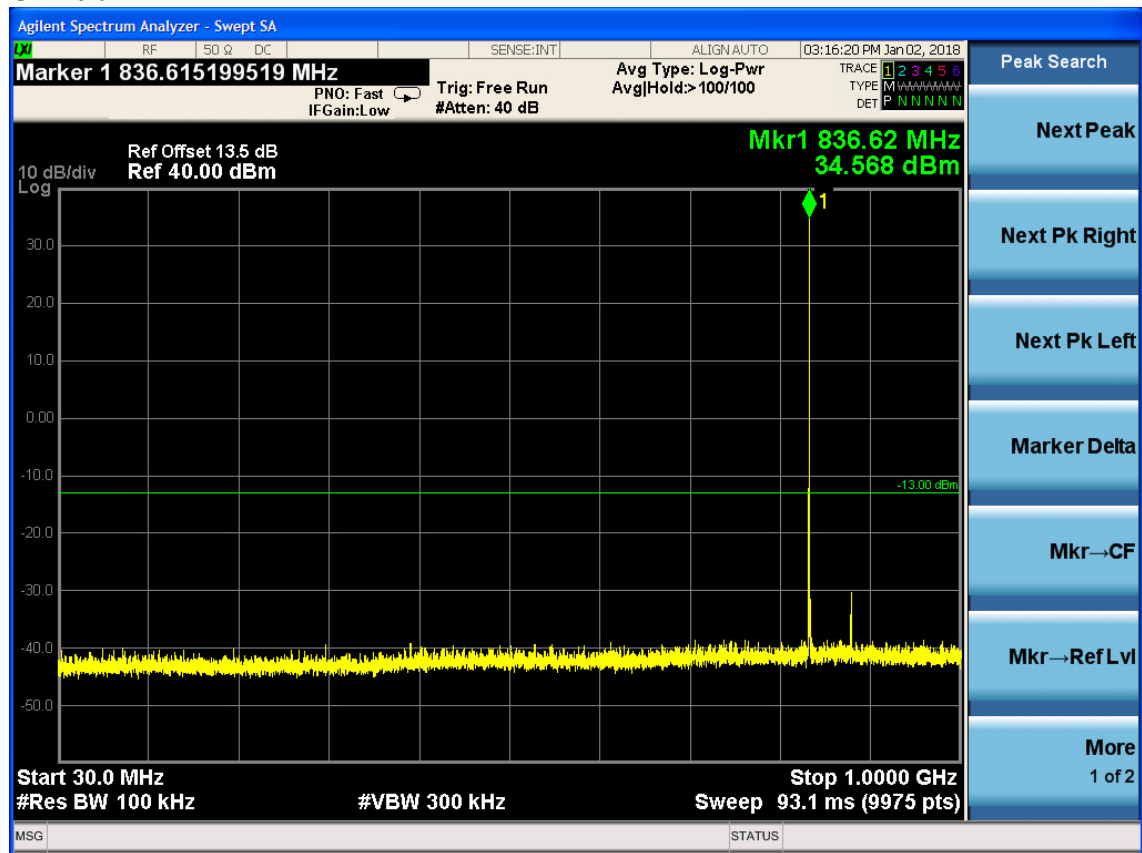
Band edge Result Table

Mode	CH	Reading Frequency (MHz)	Reading Level(dBm)	Original Limit(dBm)	Correct factor (dB)	Corrected Limit (dBm)	Conclusion
GSM850	128	823.978	-23.986	-13	2.02	-10.98	Pass
	251	849.03	-23.942	-13	2.02	-10.98	Pass
PCS1900	512	1849.992	-27.929	-13	2.02	-10.98	Pass
	810	1910.016	-27.461	-13	2.02	-10.98	Pass

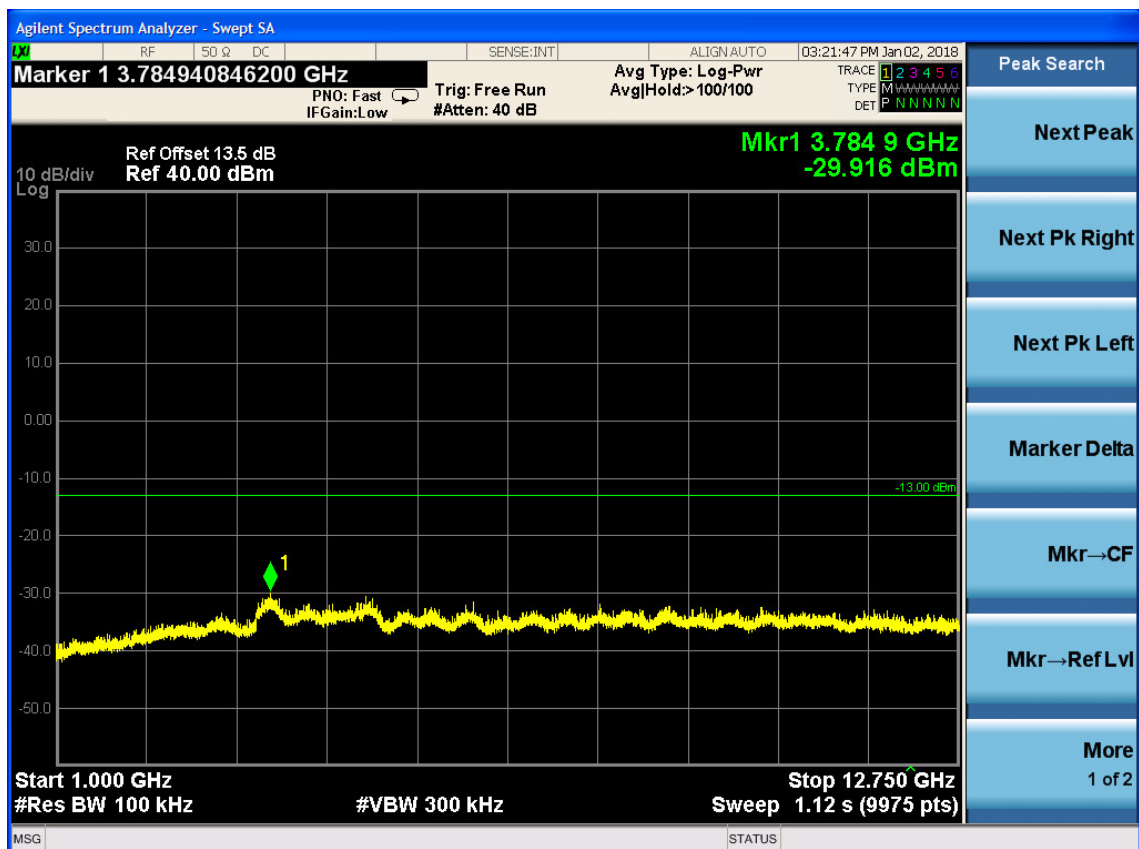
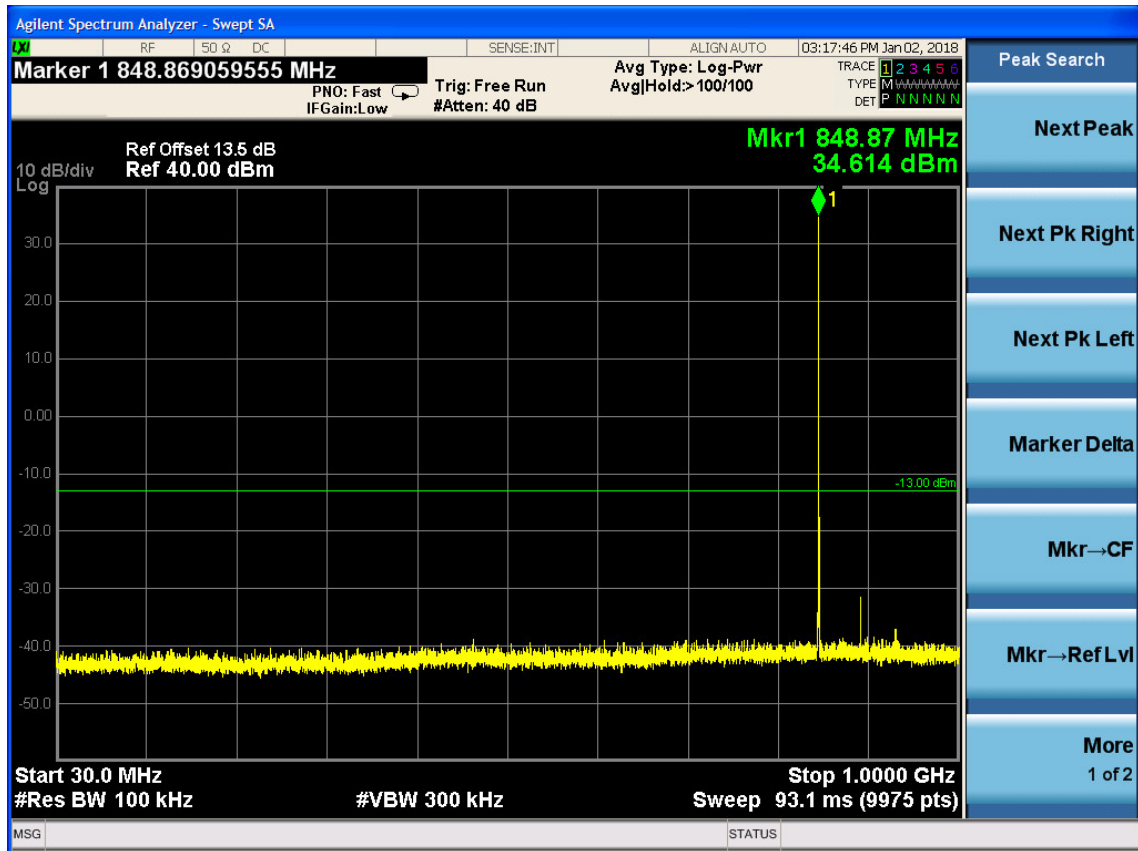
GSM 850
TM 1
CH 128



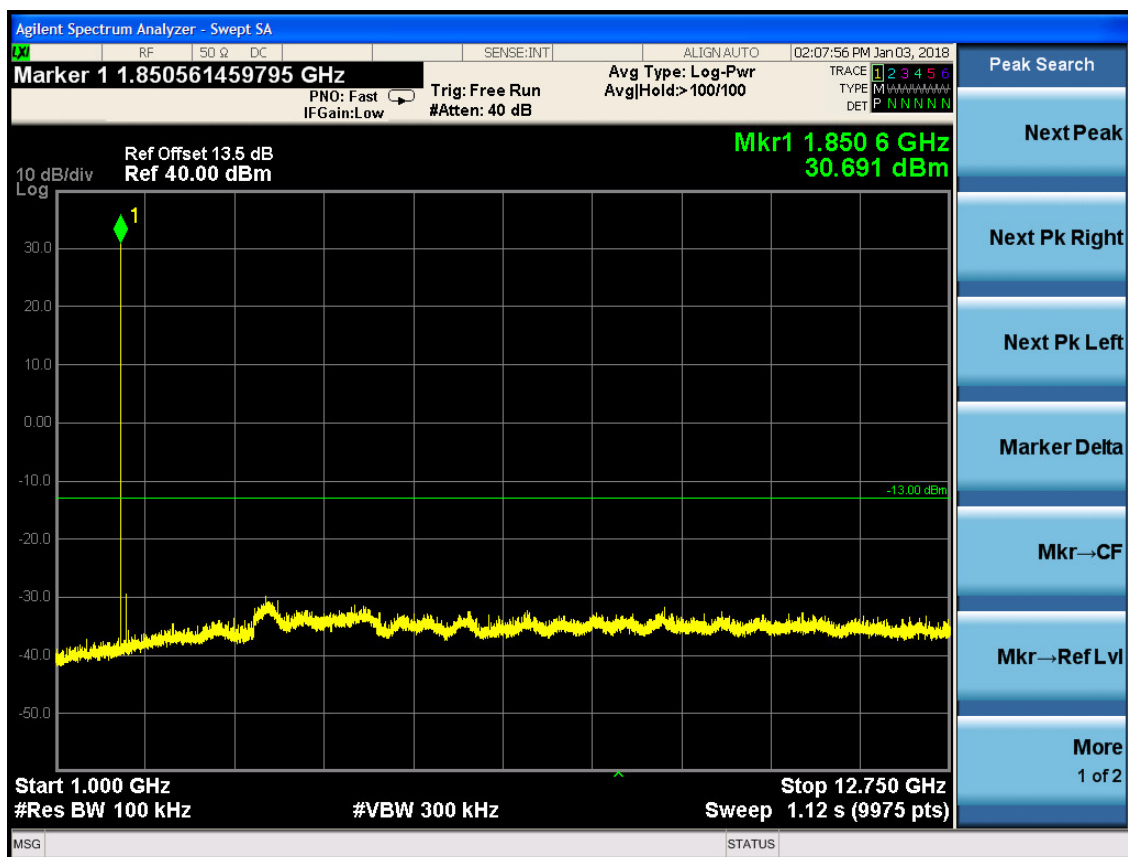
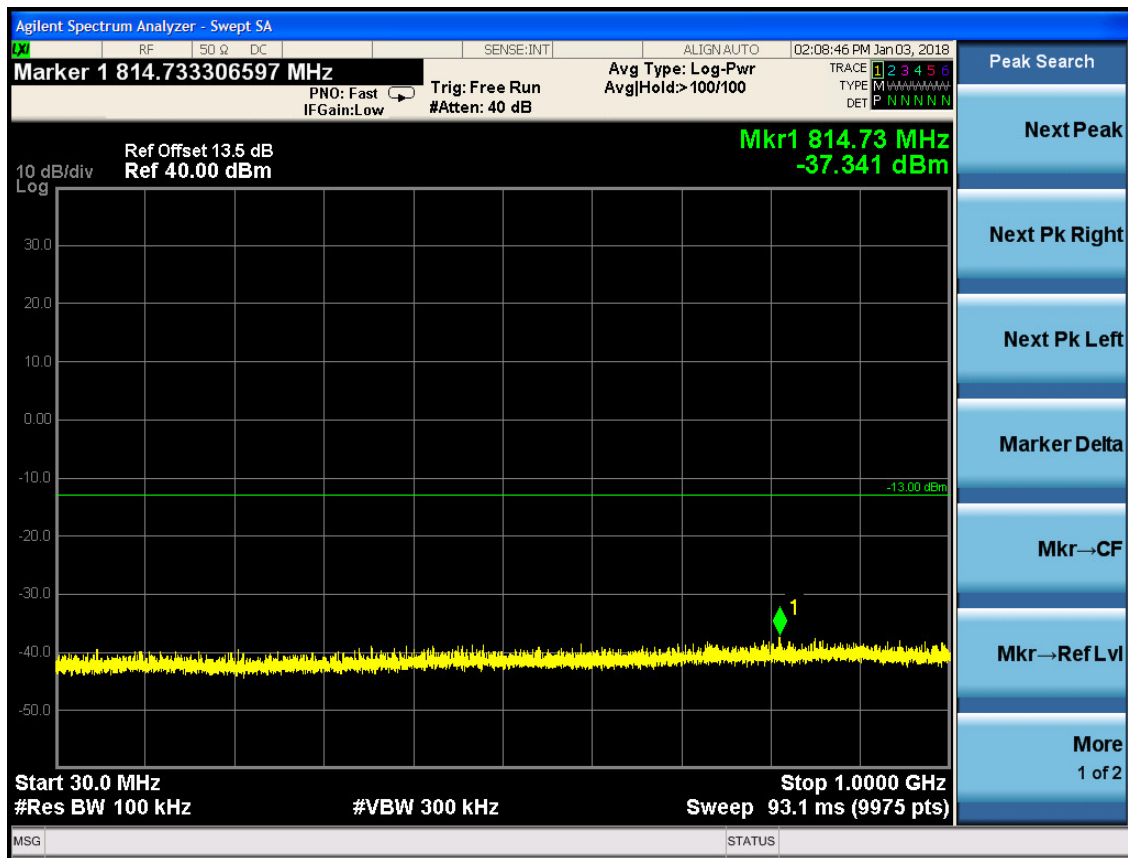
CH 190

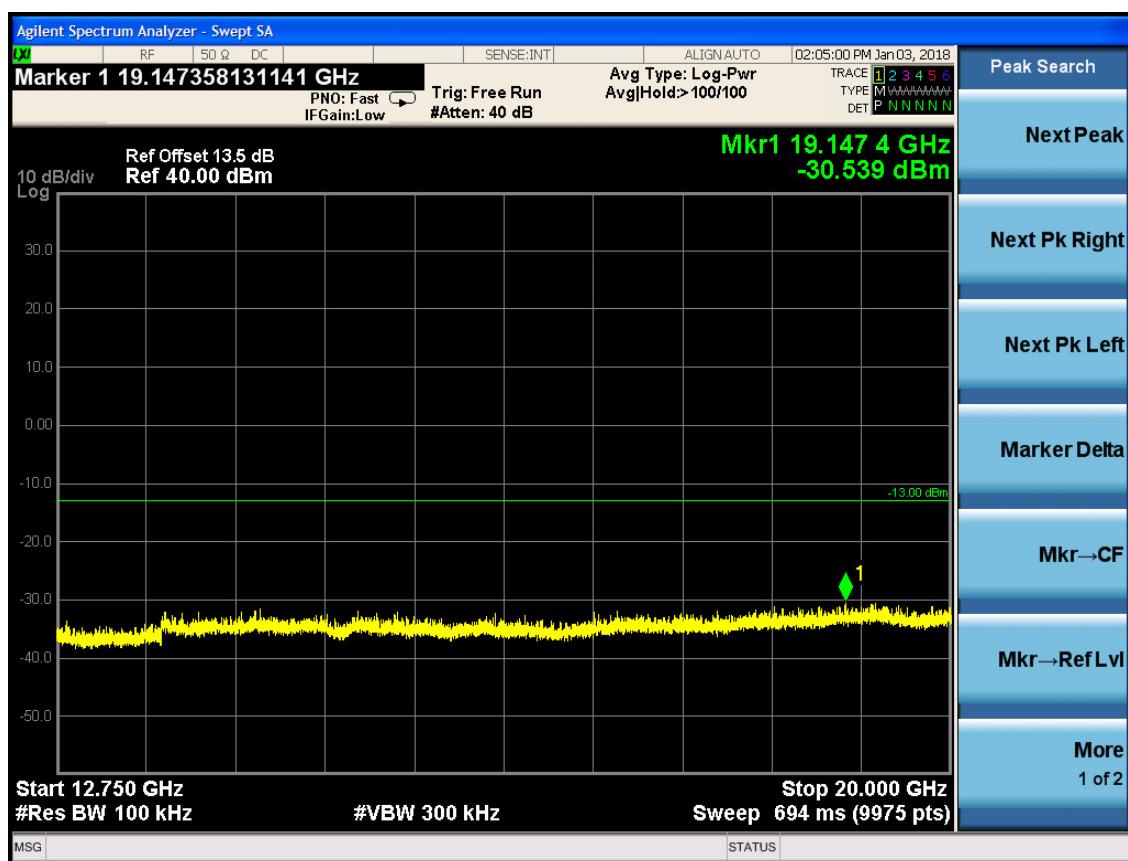


CH 251

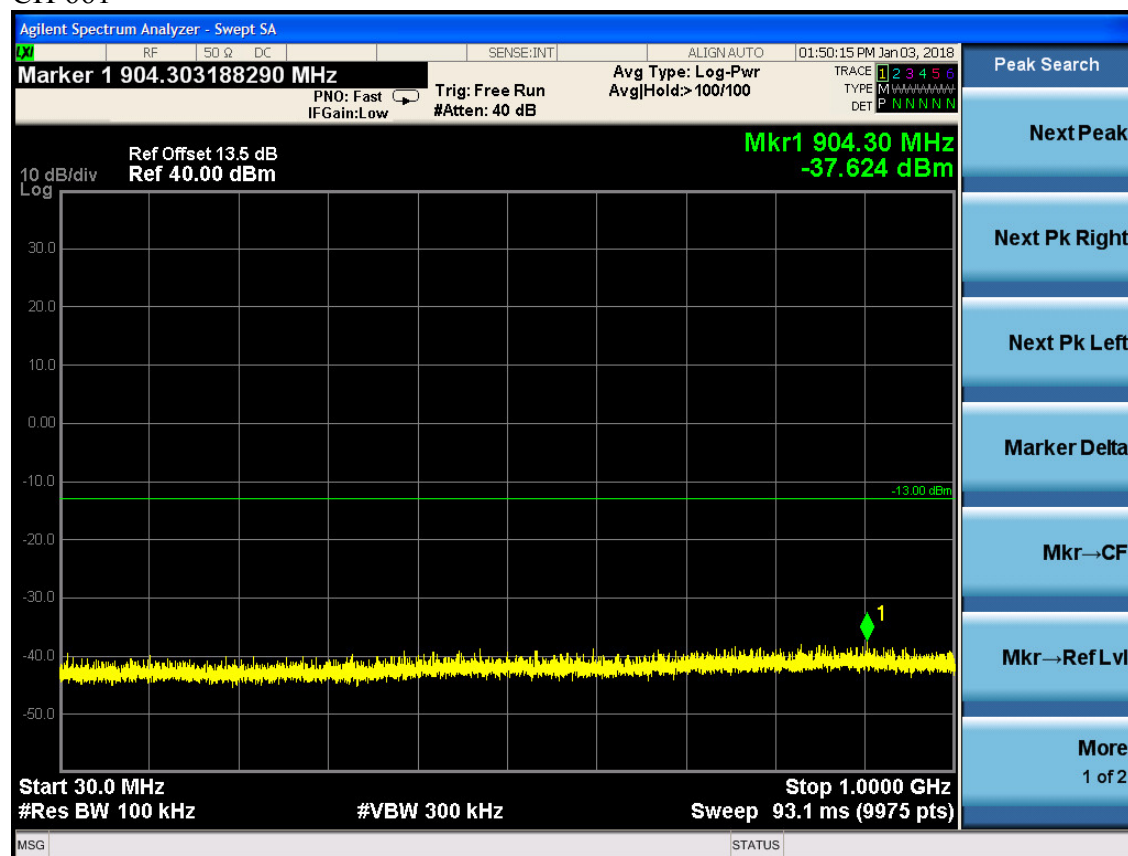


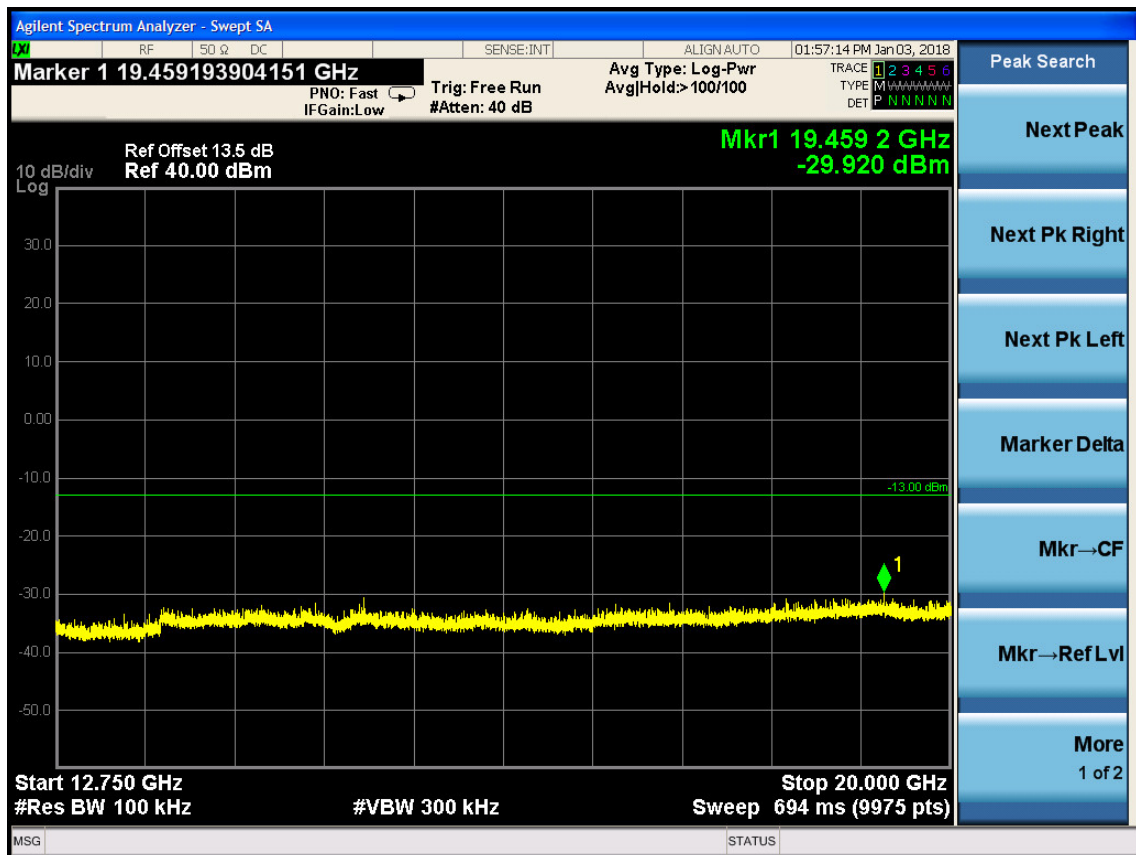
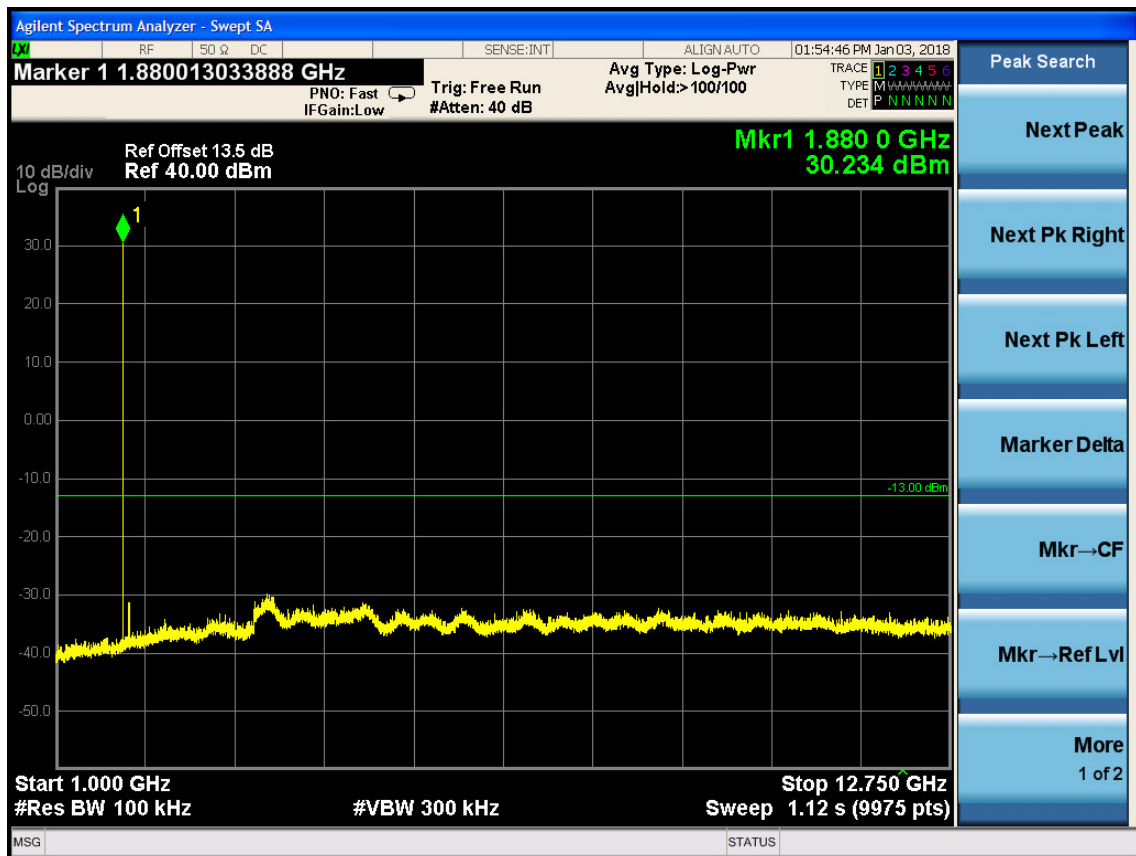
PCS 1900MHz
TM 1
CH 512



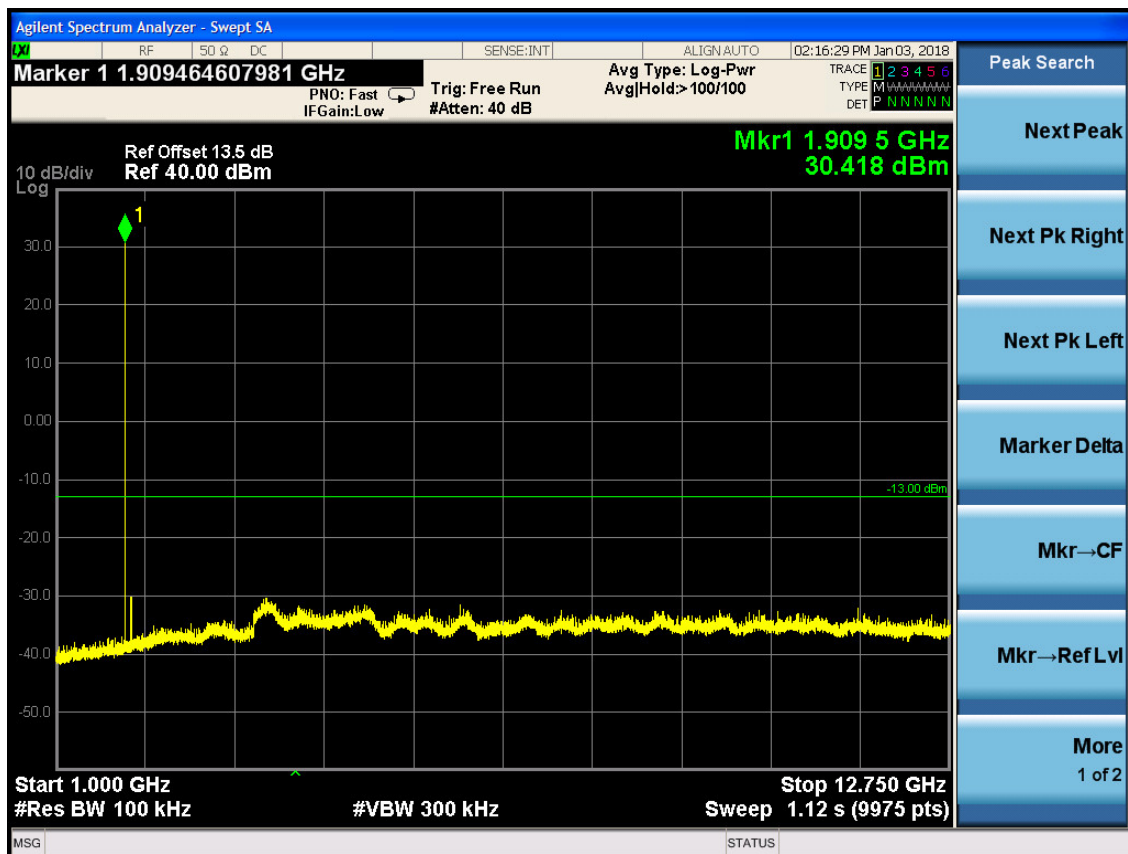
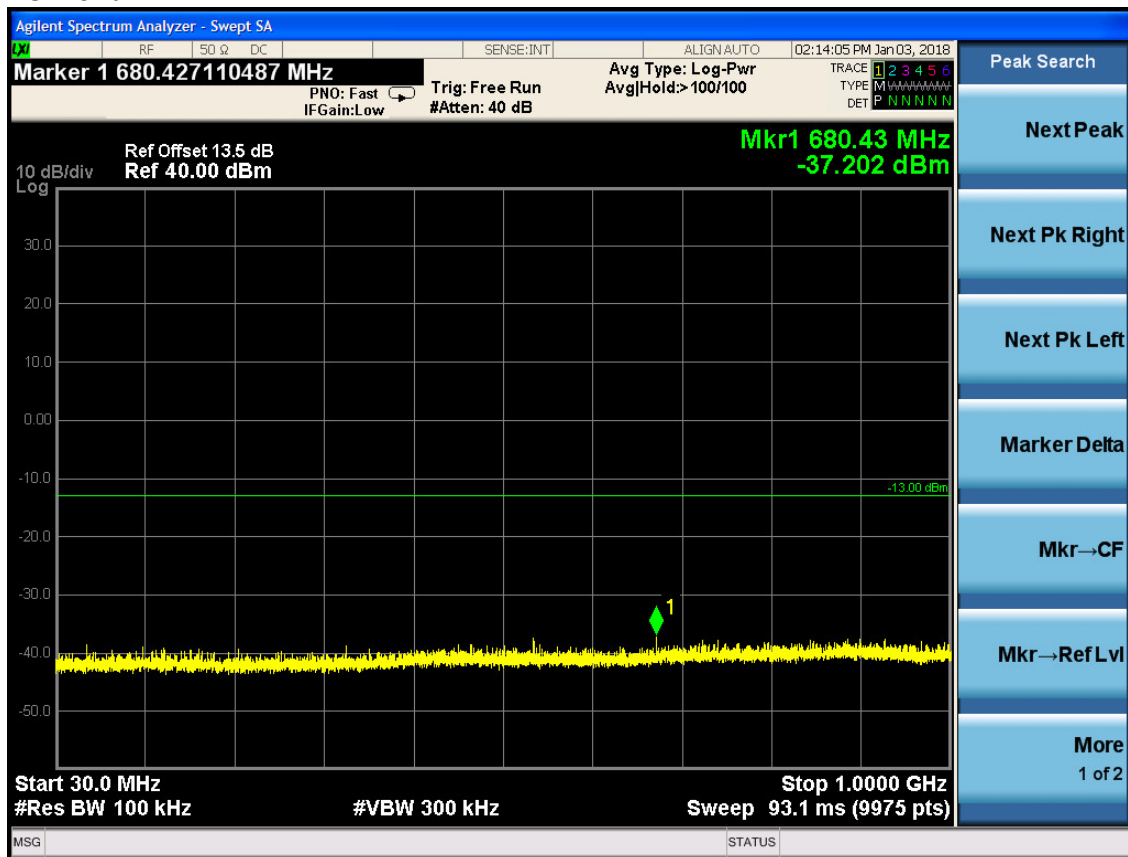


CH 661





CH 810

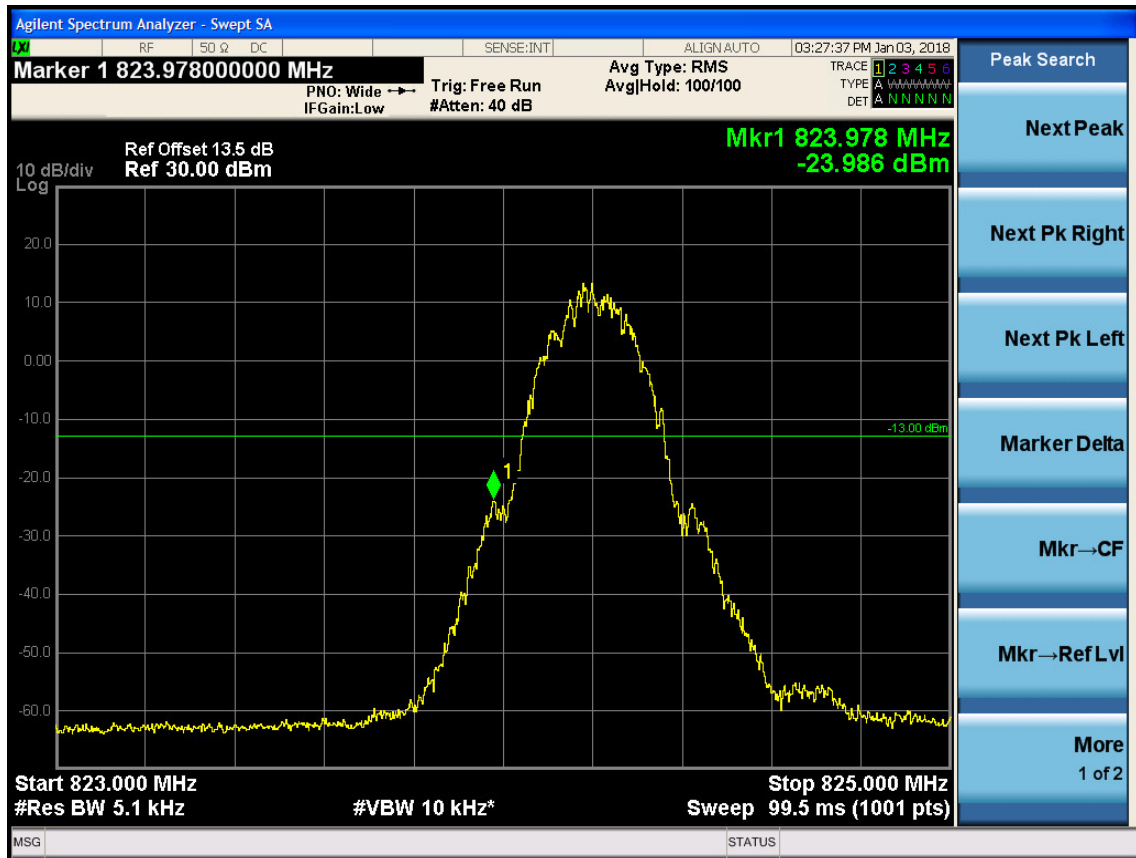




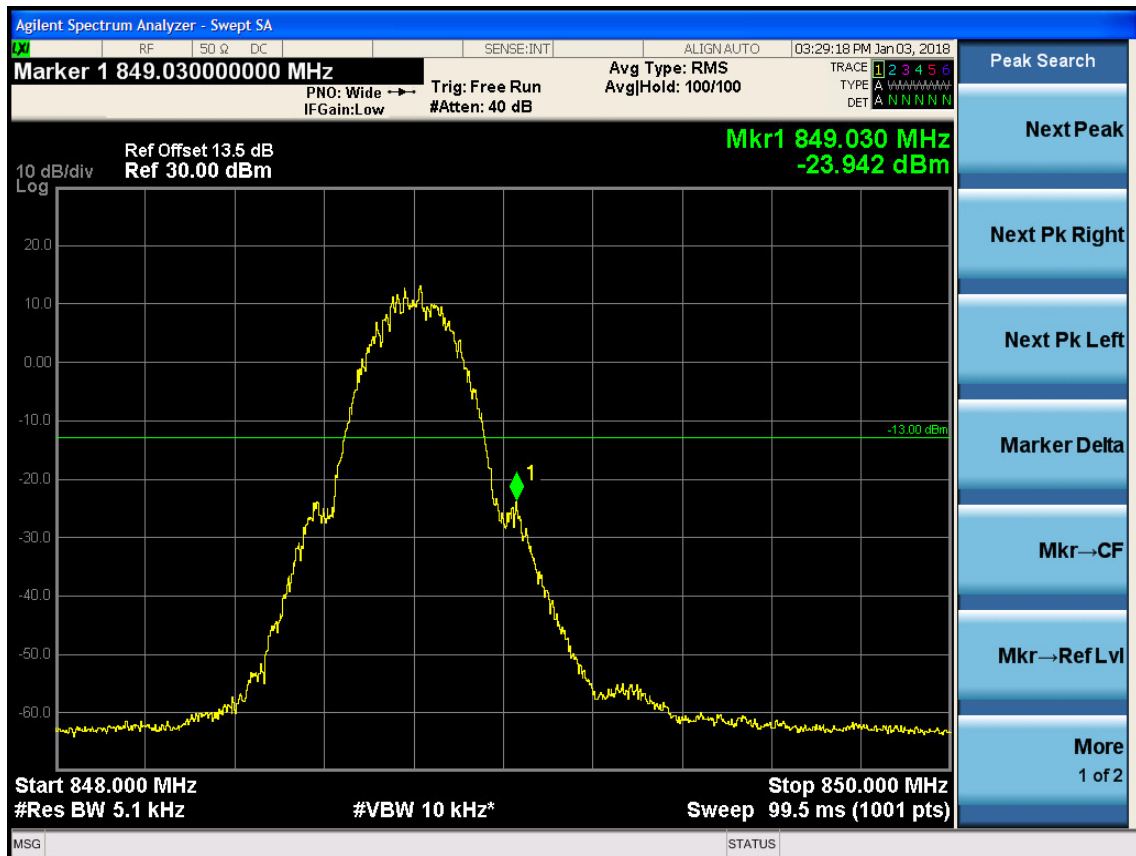
GSM 850

TM 1

CH 128



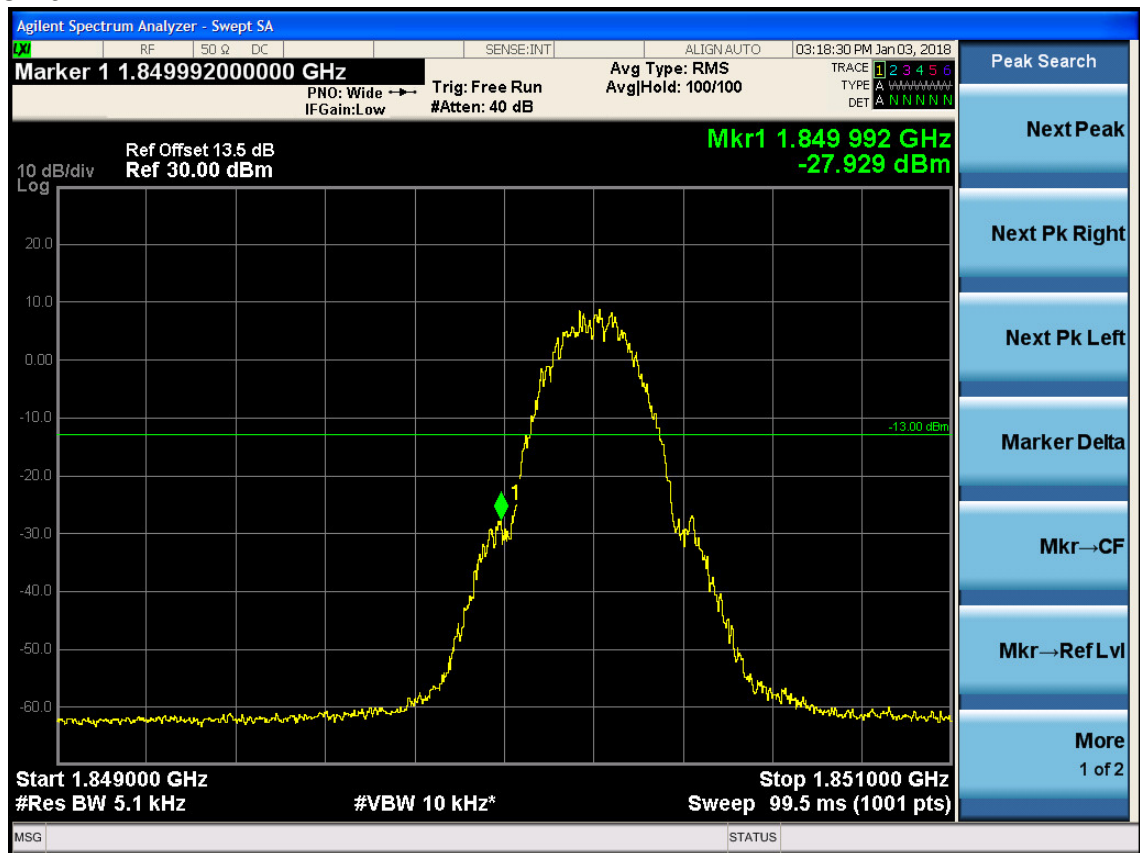
CH 251



PCS 1900MHz

TM 1

CH 512



CH 810

