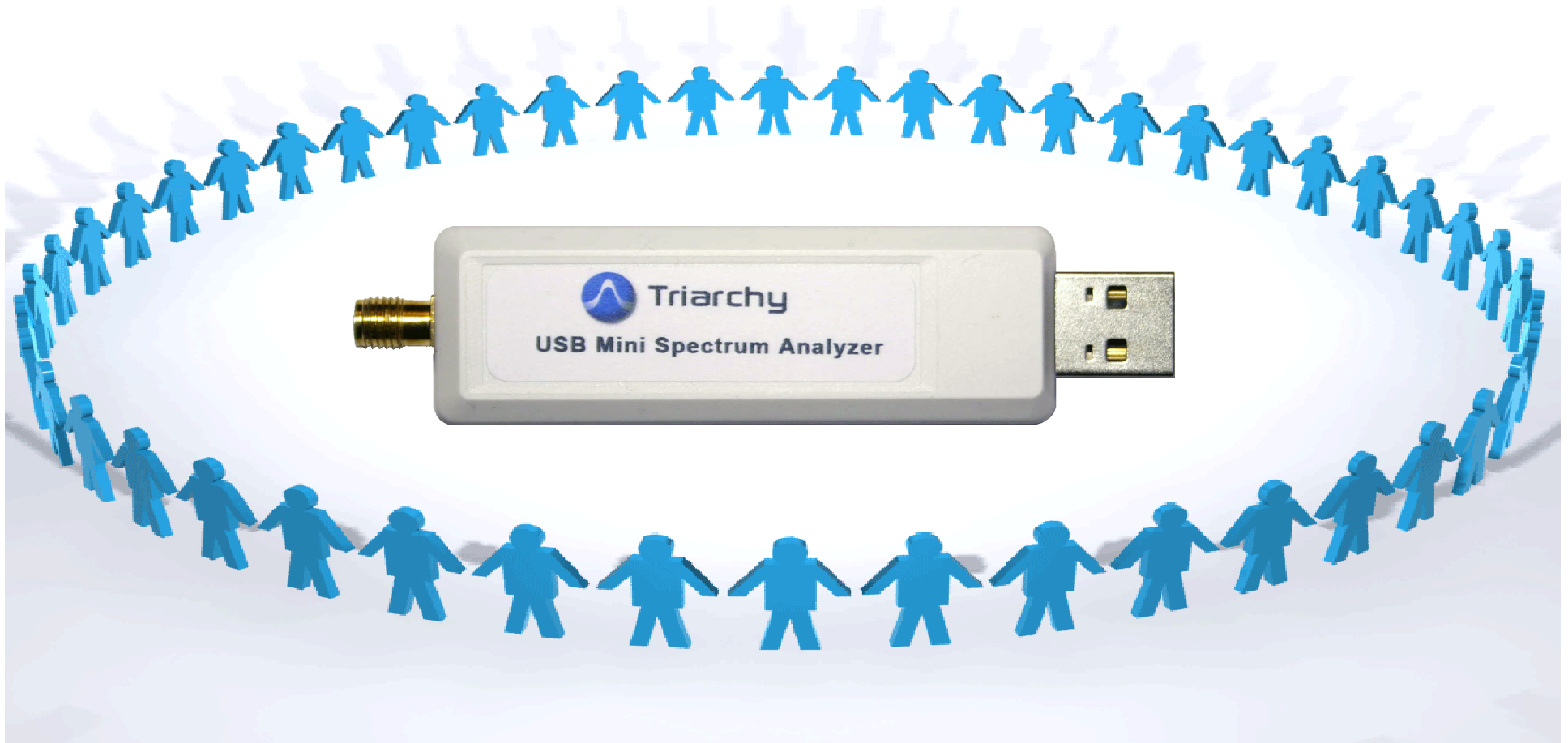




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Mobile phone signal testing with TSA5G35





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GSM channel frequencies (ARFCN)

Frequency Band	ARFCN Range	Uplink Frequency (MHz)	Downlink Frequency (MHz)
P-GSM 900	1..124	$890+0.2*ARFCN$	$935+0.2*ARFCN$
E-GSM 900	0..124 975..1023	$890+0.2*ARFCN$ $890+0.2*(ARFCN-1024)$	$935+0.2*ARFCN$ $935+0.2*(ARFCN-1024)$
DCS 1800	512..885	$1710.2+0.2*(ARFCN-512)$	$1805.2+0.2*(ARFCN-512)$
PCS 1900	512..810	$1850.2+0.2*(ARFCN-512)$	$1930.2+0.2*(ARFCN-512)$
R-GSM 900	0..124 955..1023	$890+0.2*ARFCN$ $890+0.2*(ARFCN-1024)$	$935+0.2*ARFCN$ $935+0.2*(ARFCN-1024)$
GSM 450	259..293	$450.6+0.2*(ARFCN-259)$	$460.6+0.2*(ARFCN-259)$
GSM 480	306..340	$479+0.2*(ARFCN-306)$	$489+0.2*(ARFCN-306)$
GSM 850	128..251	$824.2+0.2*(ARFCN-128)$	$869.2+0.2*(ARFCN-128)$
GSM 750	438..511	$747.2+0.2*(ARFCN-438)$	$777.2+0.2*(ARFCN-438)$



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3G channel frequencies (UARFCN)

Band	Downlink Low (MHz) UARfcn	Downlink High (MHz) UARfcn	Uplink Low (MHz) UARfcn	Uplink High (MHz) UARfcn	Bandwidth (MHz)	Duplex spacing	Equivalent GSM band
1 2.1 GHz	2110 10562	2170 10838	1920 9612	1980 9888	60	190 MHz	
2 US PCS 1900	1930 9662	1990 9938	1850 9262	1910 9538	60	80 MHz	14
3 DCS 1800	1805 1162	1880 1513	1710 937	1785 1288	75	95 MHz	13
4 AWS	2110 1537	2155 1738	1710 1312	1755 1513	45	400 MHz	
5 GSM 850	869 4357	894 4458	824 4132	849 4233	25	45 MHz	8
6 800	875 4387	885 4413	830 4162	840 4188	10	45 MHz	
7 2.6 GHz	2620 2237	2690 2563	2500 2012	2570 2338	70	120 MHz	
8 GSM 900	925 2937	960 3088	880 2712	915 2863	35	45 MHz	10

UARFCN = 5 x center Frequency of CH (MHz).



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Cell phone module conductive testing

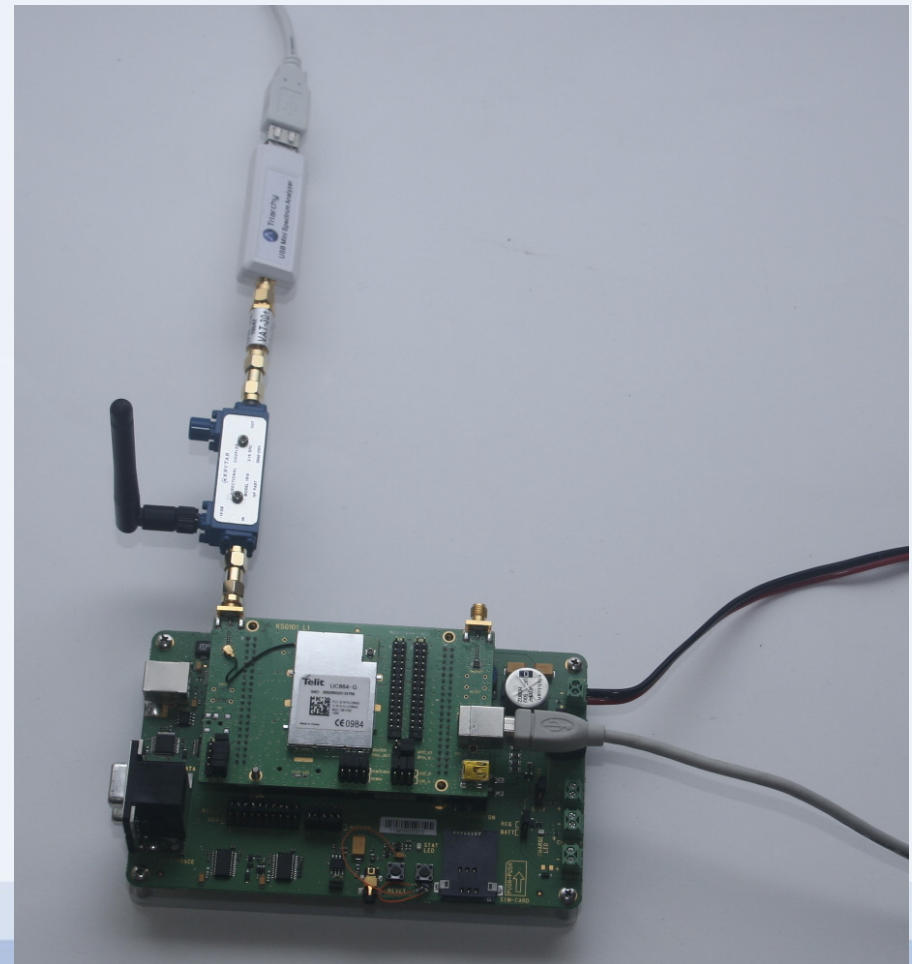
1: Using direction coupler to connect with both TSA5G35 and Telit UC864-G EVK2

2: The 30 dB external attenuator shall be connected.

3: send AT command through the USB terminal.

AT+COPS=0,0,,0 → GSM mode

AT+COPS=0,0,,2 → 3G mode





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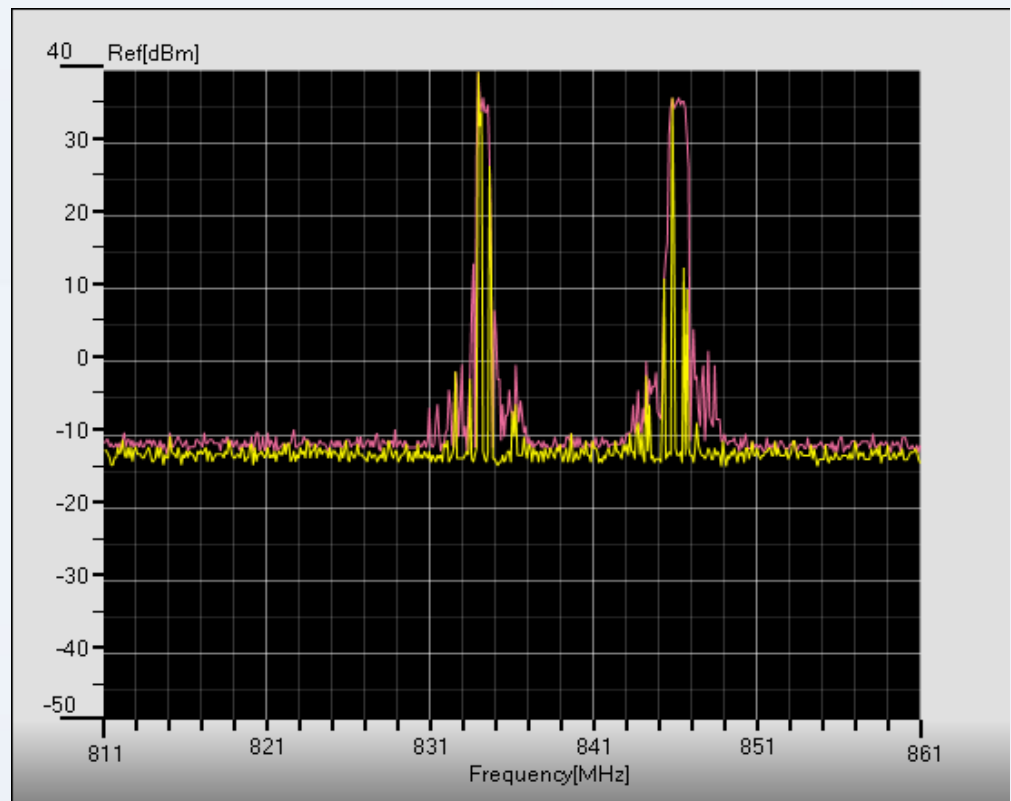
Cell phone module conductive testing (GSM mode)

The TSA5G35 parameter setting will be:

Parameter Setting

Center-Freq(MHz)	836	Stop	
Span(MHz)	50		
Amplitude(dBm)	30		<input checked="" type="checkbox"/> External ATT(30dB)
Sweep Time	x4 (Burst Mode)		

The SPAN will cover the GSM850 uplink band, make phone call and look for the working channels.





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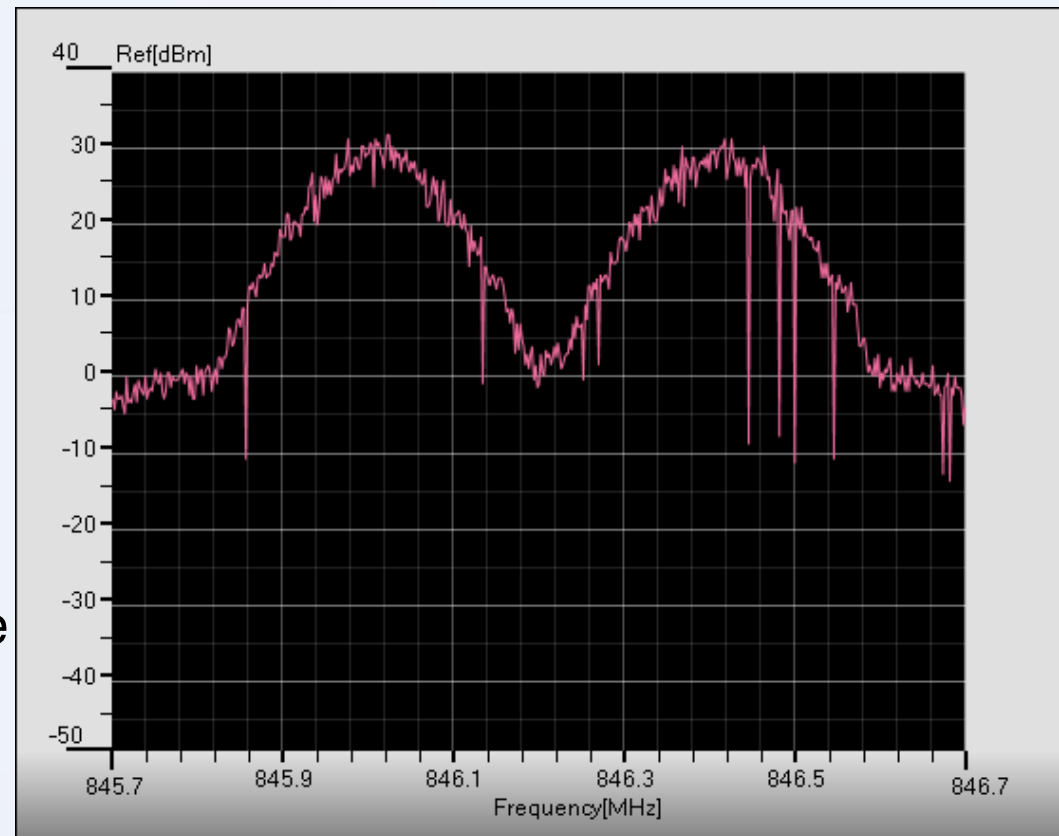
Cell phone module conductive testing (GSM mode)

The TSA5G35 parameter setting will be:

Parameter Setting

Center-Freq(MHz)	826.2	Start	
Span(MHz)	1		
Amplitude(dBm)	30		<input checked="" type="checkbox"/> External ATT(30dB)
Sweep Time	x8 (Burst Mode)		

Set span to 1MHz to look for the detail the spectrum of GSM,
F1=846MHz (ARFCN=237)
F2=846.4MHz (ARFCN=239)





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Cell phone module conductive testing (GSM mode)

Center frequency: 846.01MHz

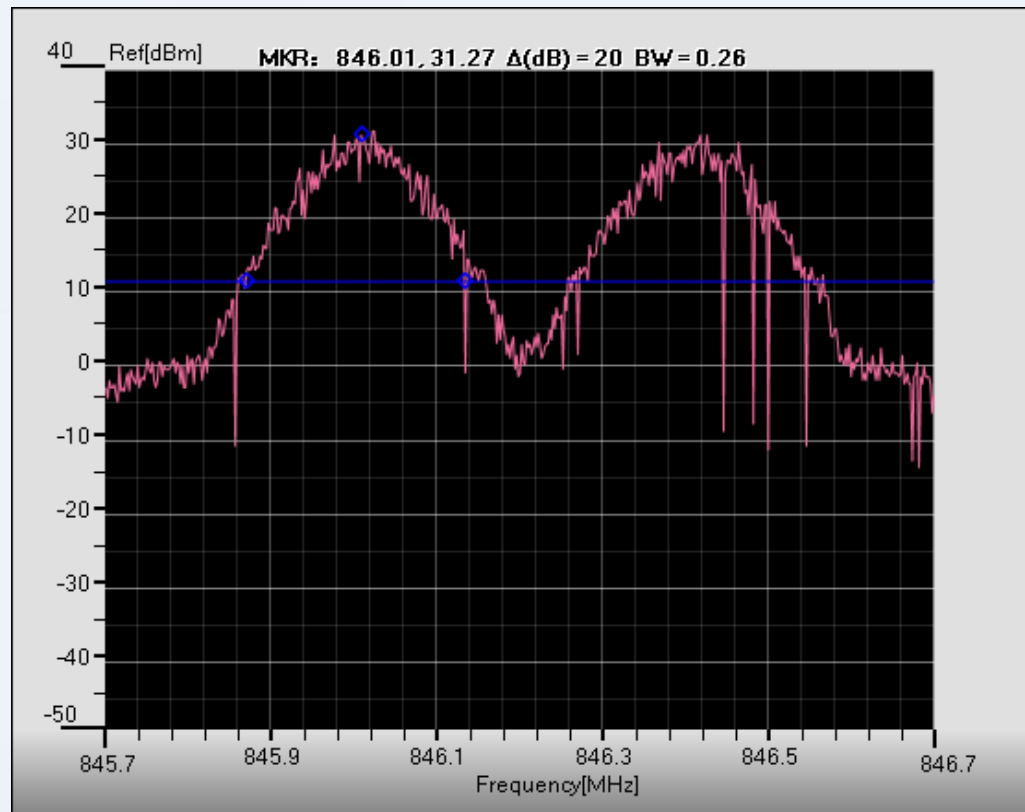
Make level : 31.27dBm

BW: 260 KHz@20dBc

BW: 140KHz@6dBc

Because the RBW (50KHz) is smaller than signal BW, the real signal power will be larger the mark level.

The Cell phone module output power is around 33~35dBm range.



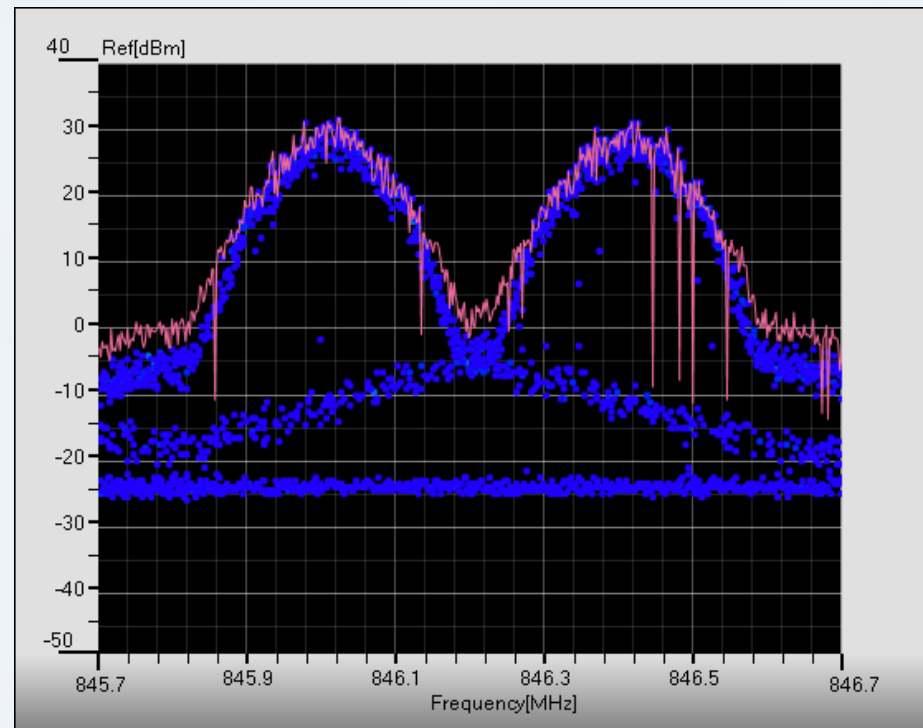
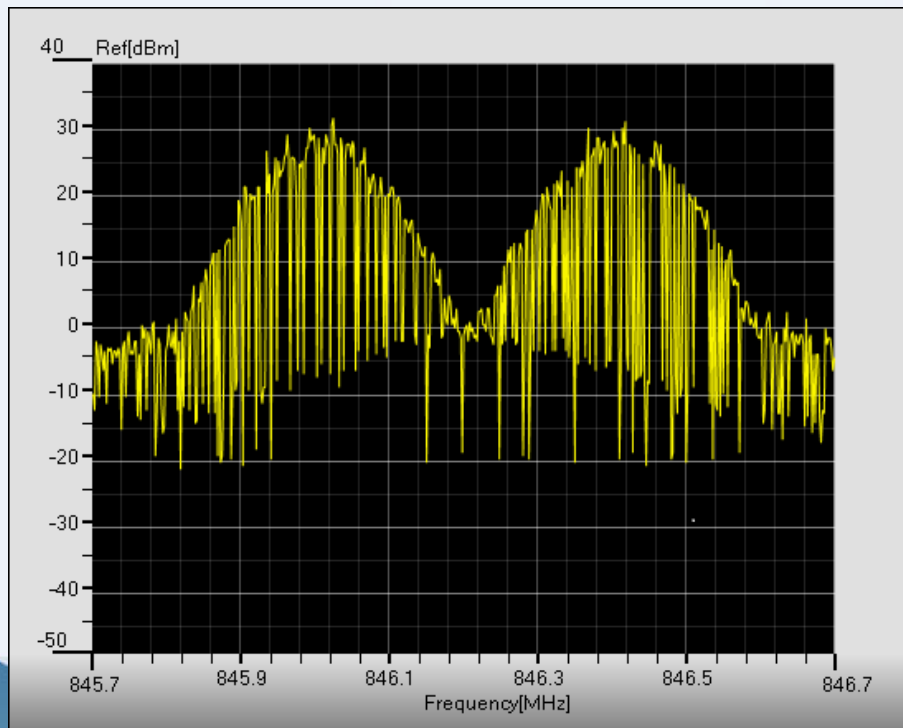


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Cell phone module conductive testing (GSM mode)

Current display at x8 sweep time, if the sweep time is reduce, the waveform will miss more information



After several frames scanning, the MAX and density will shown the clean the spectrum waveform



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Cell phone module conductive testing (3G mode)

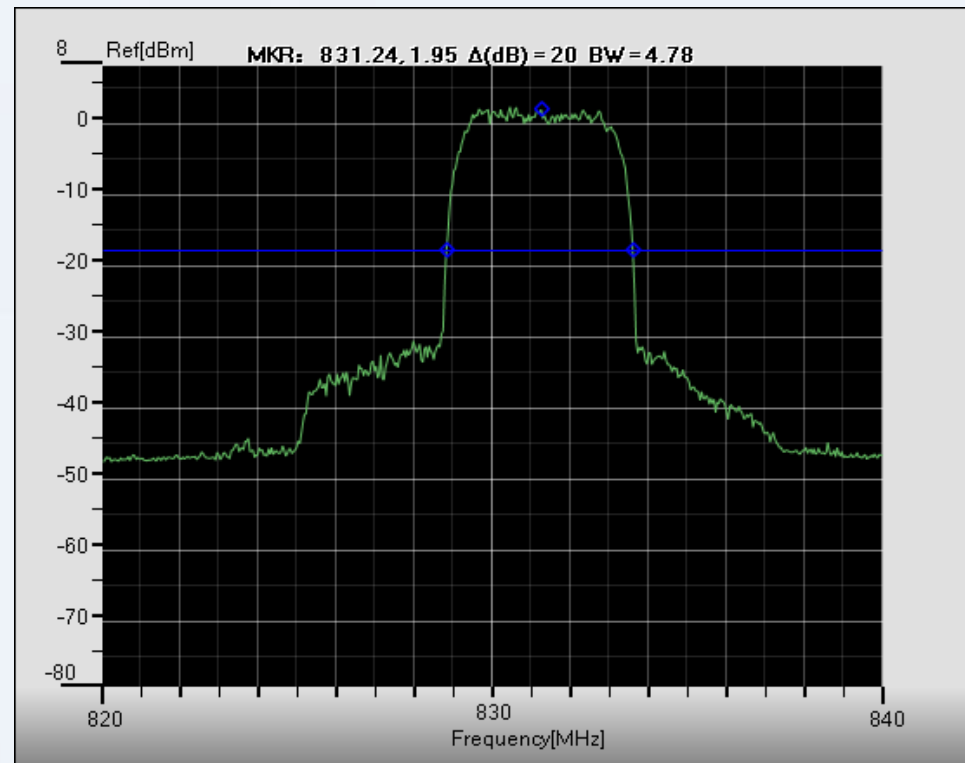
The TSA5G35 parameter setting will be:

Parameter Setting	
Center-Freq(MHz)	830
Span(MHz)	20
Amplitude(dBm)	0 <input checked="" type="checkbox"/> External ATT(30dB)
Sweep Time	x2 (Burst Mode)

Start

Measured frequency is 431.24MHz, CH frequency shall be 831.2MHz, UARFCN=4156.
BW=4.78MHz@20dBc

BW=4MHz@6dBc



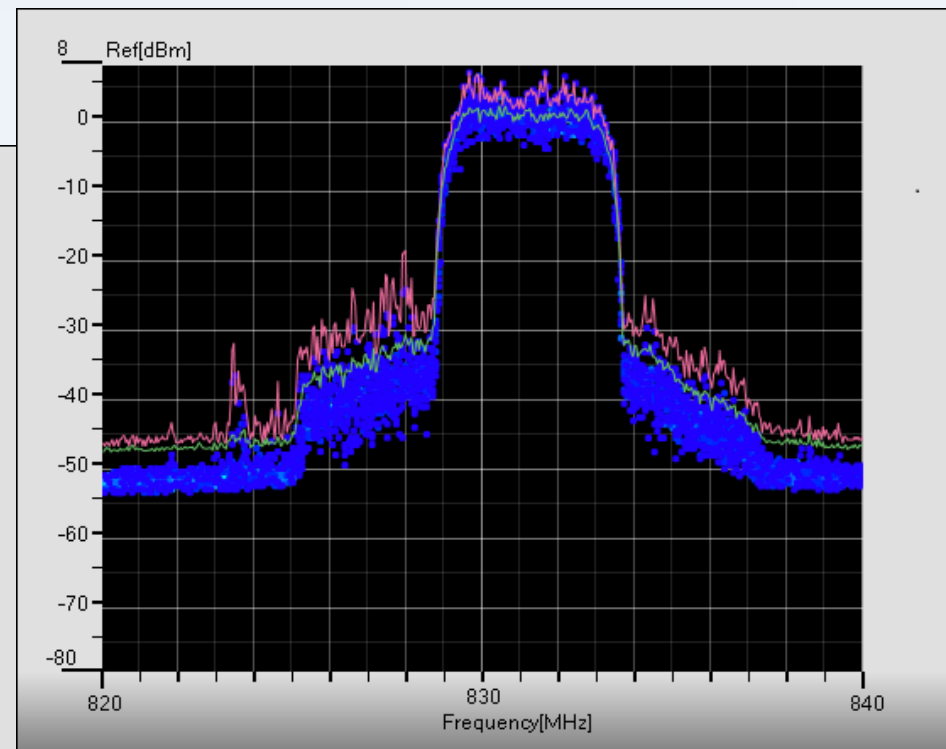
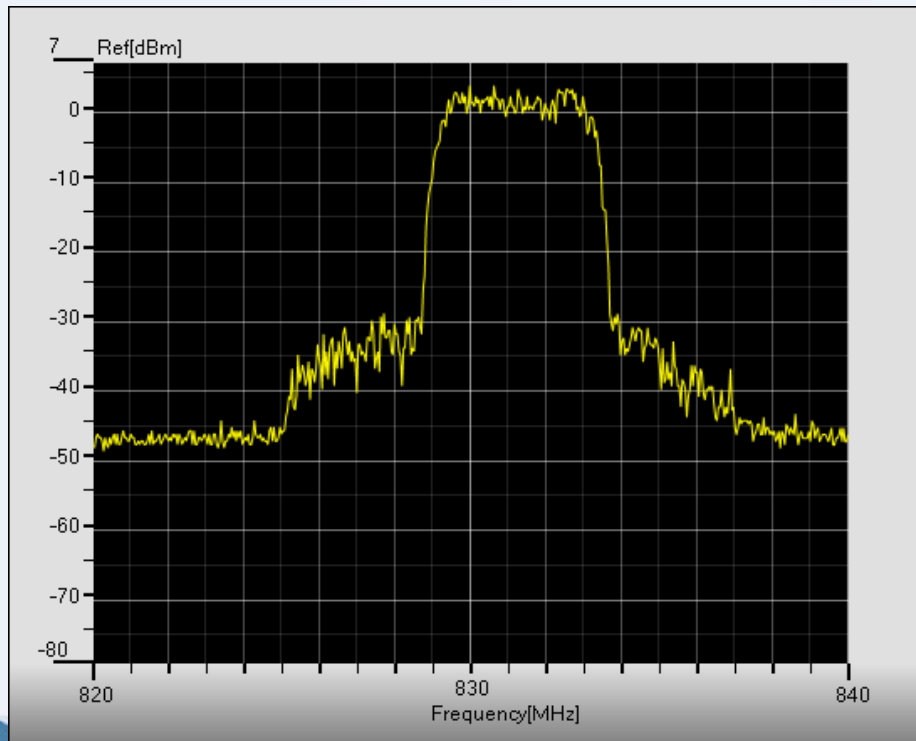


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Cell phone module conductive testing (3G mode)

Current display



MAX, AVE and Density display

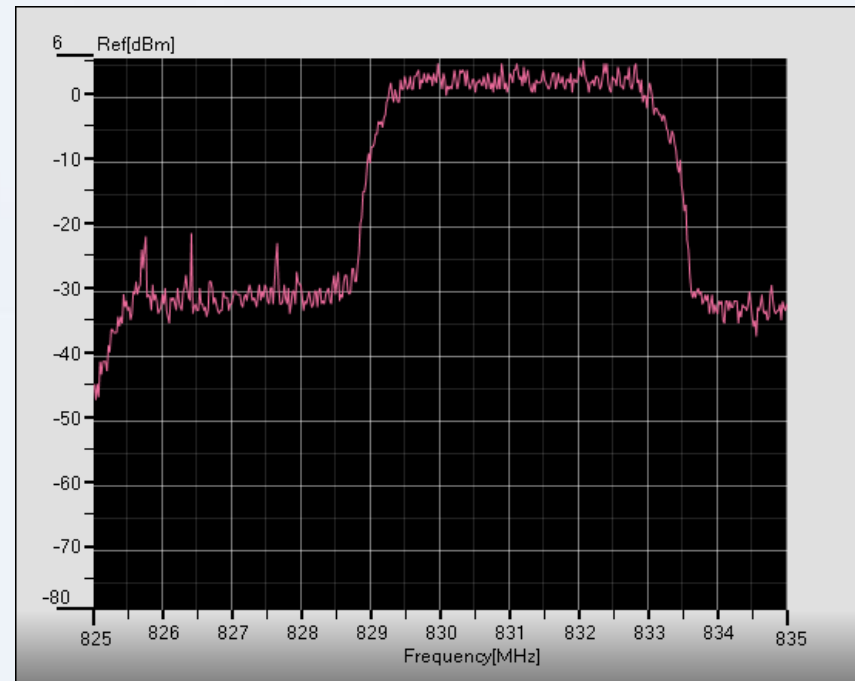
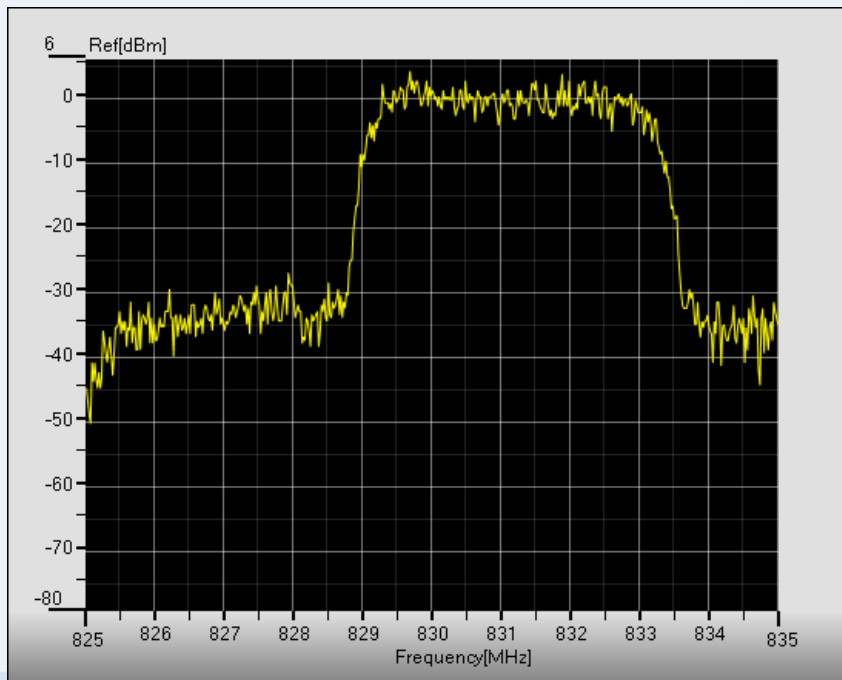


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Cell phone module conductive testing (3G mode)

Change the SPAN to
10MHz and test again



MAX display



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Cell phone radiation testing (GSM mode)

The TSA5G35 parameter setting will be:

Parameter Setting	
Center-Freq(MHz)	1888.7
Span(MHz)	1
Amplitude(dBm)	30
Sweep Time	x8 (Burst Mode)

External ATT(30dB)

Start

Both antenna distance will be 0.1 meter. TSA5G35 will use USB cable to connect with computer





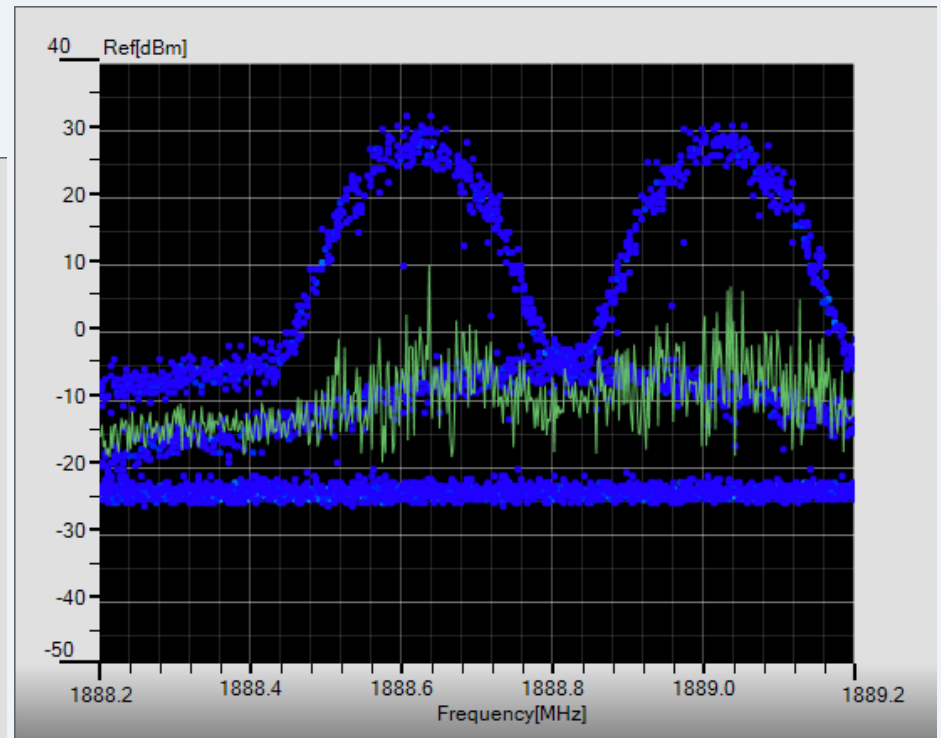
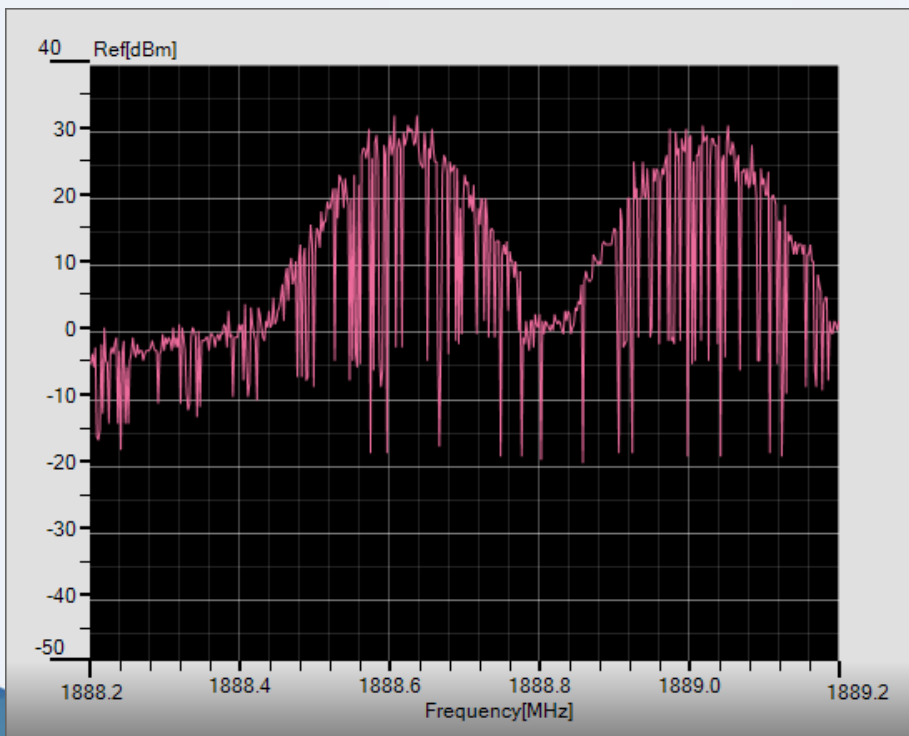
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Cell phone radiation testing (GSM mode)

F1=1888.6MHz, ARFCN=704

F2=1889MHz, ARFCN=706



AVE and Density display

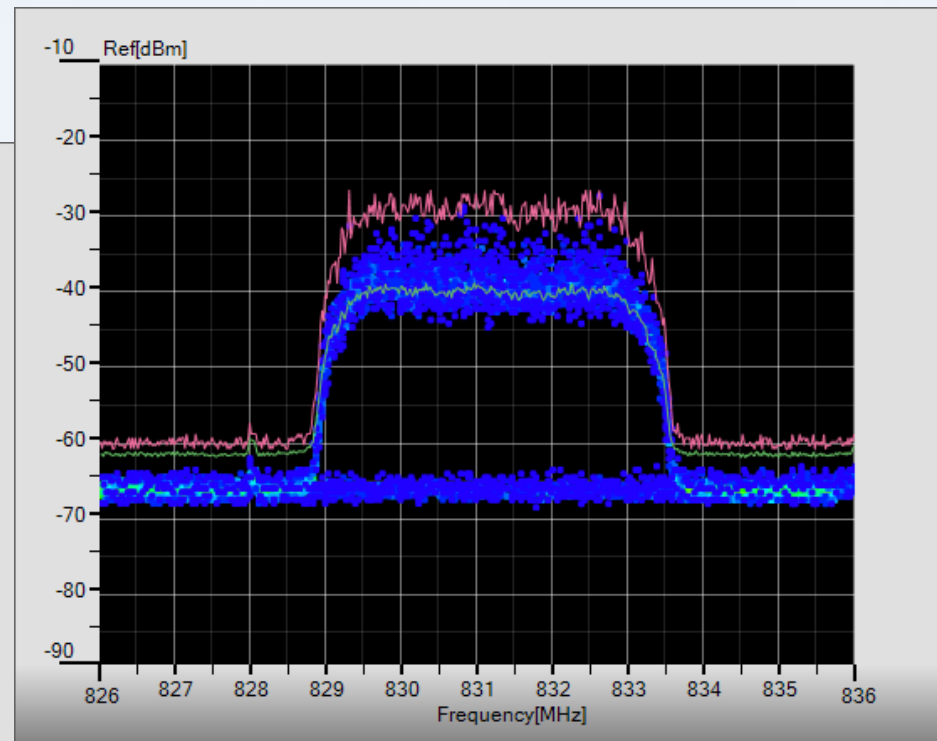
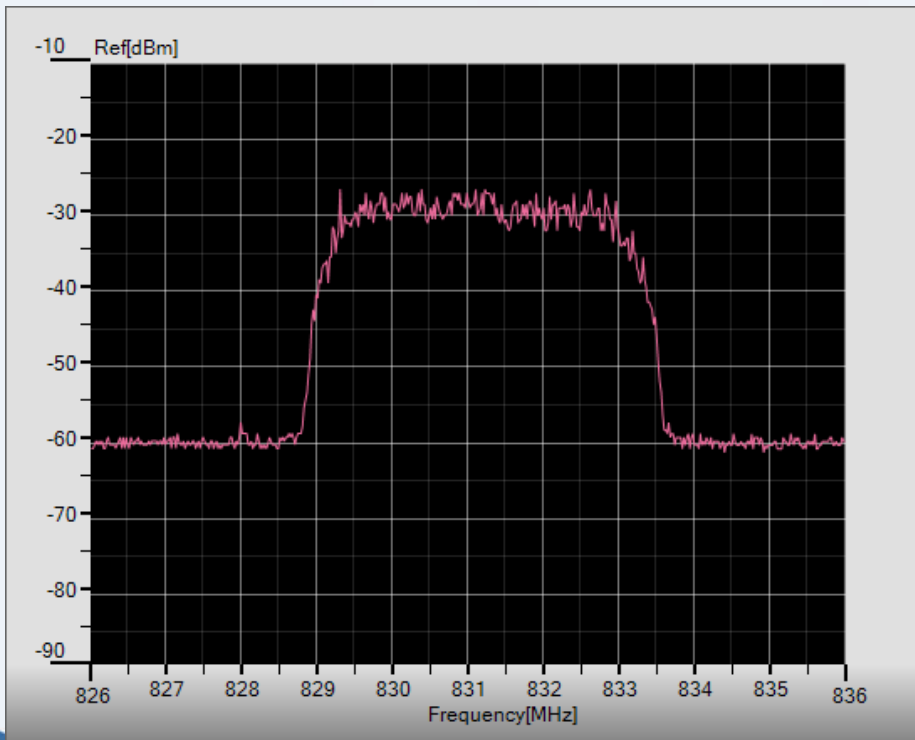


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Cell phone radiation testing (3G mode)

F1=831.2MHz, UARFCN=4156



AVE,MAX and Density display



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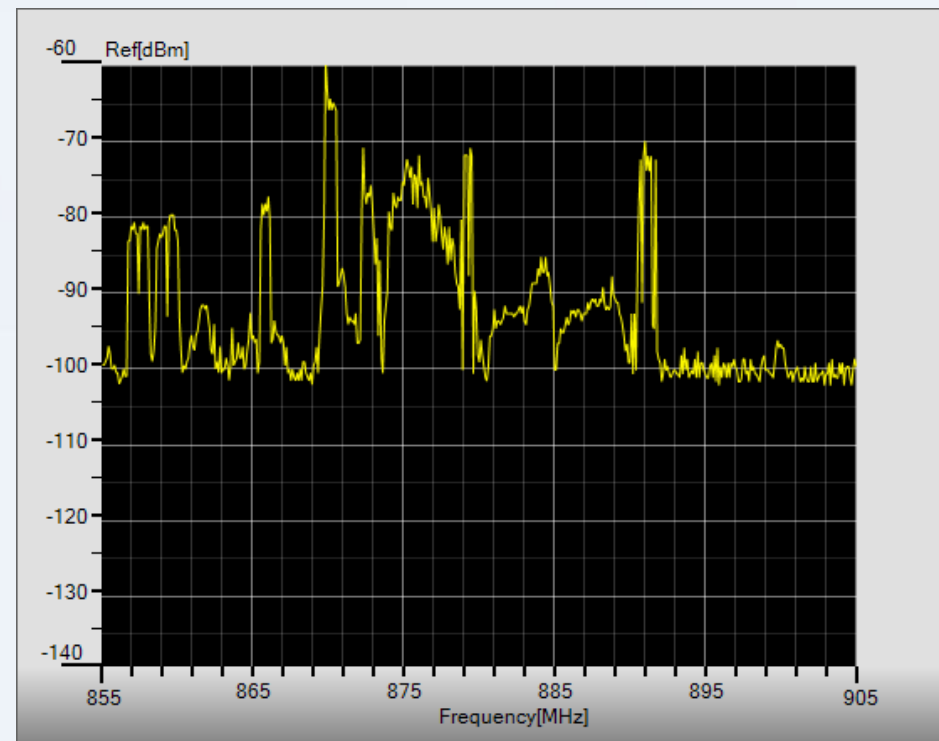
Base station radiation testing

The TSA5G35 parameter setting will be:

Parameter Setting	
Center-Freq(MHz)	880
Span(MHz)	50
Amplitude(dBm)	-60 <input type="checkbox"/> External ATT(30dB)
Sweep Time	x8 (Burst Mode)

Start

Set SPAN to cover the uplink band of GSM850. Set Amplitude to minimum level. The base station can be detected.



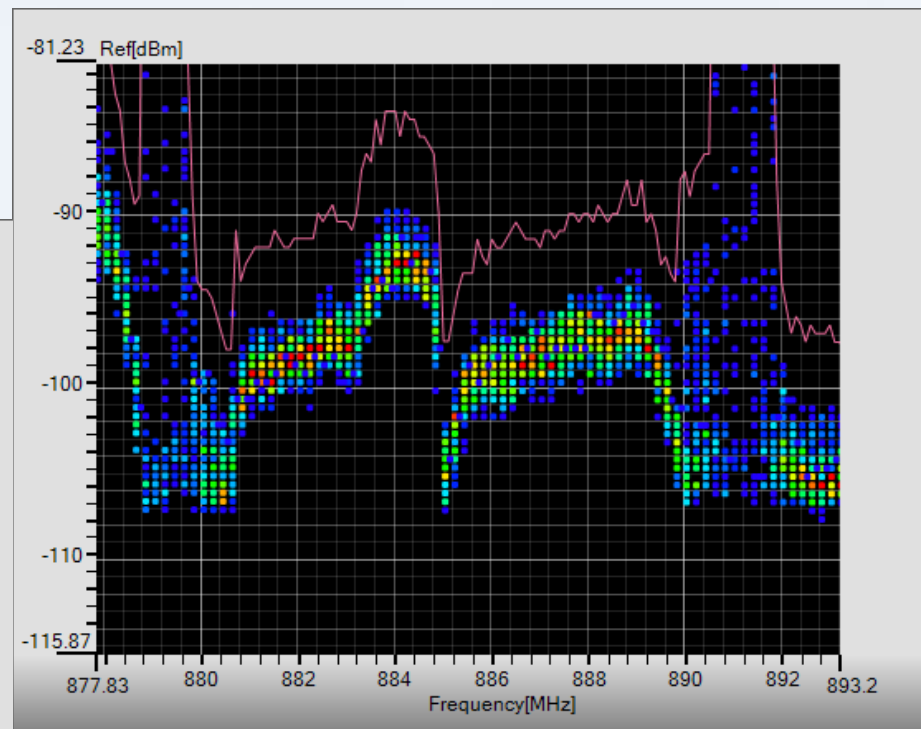
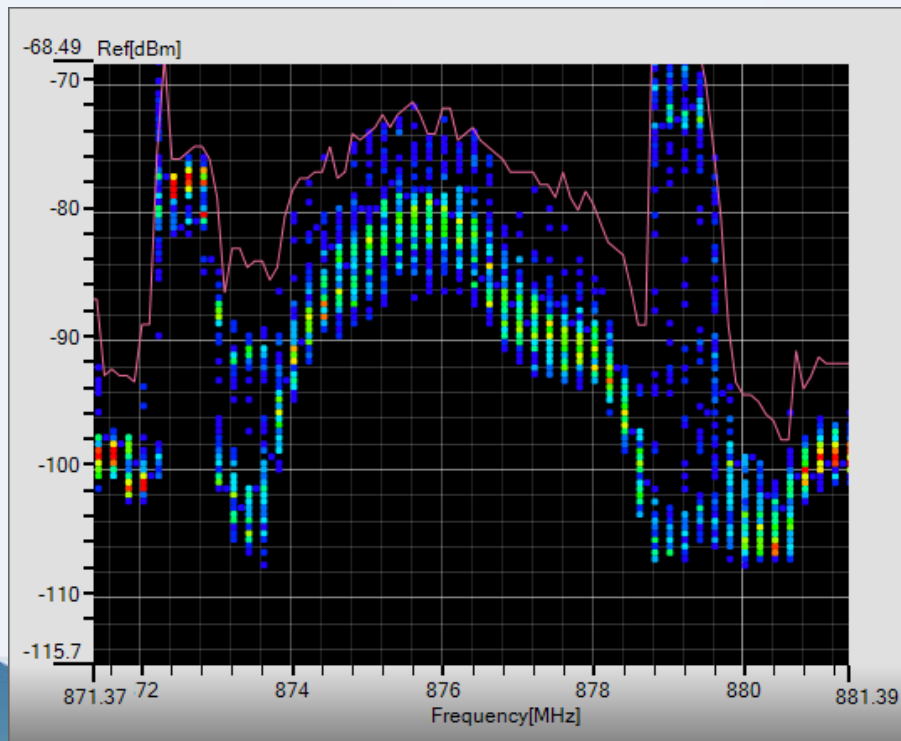


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Base station radiation testing

Display by Zooming, 3G band can be shown: F1=876MHz, UARFCN=4380



F2=882.6MHz UARFCN=4413

F3=887.6MHz UARFCN=4438

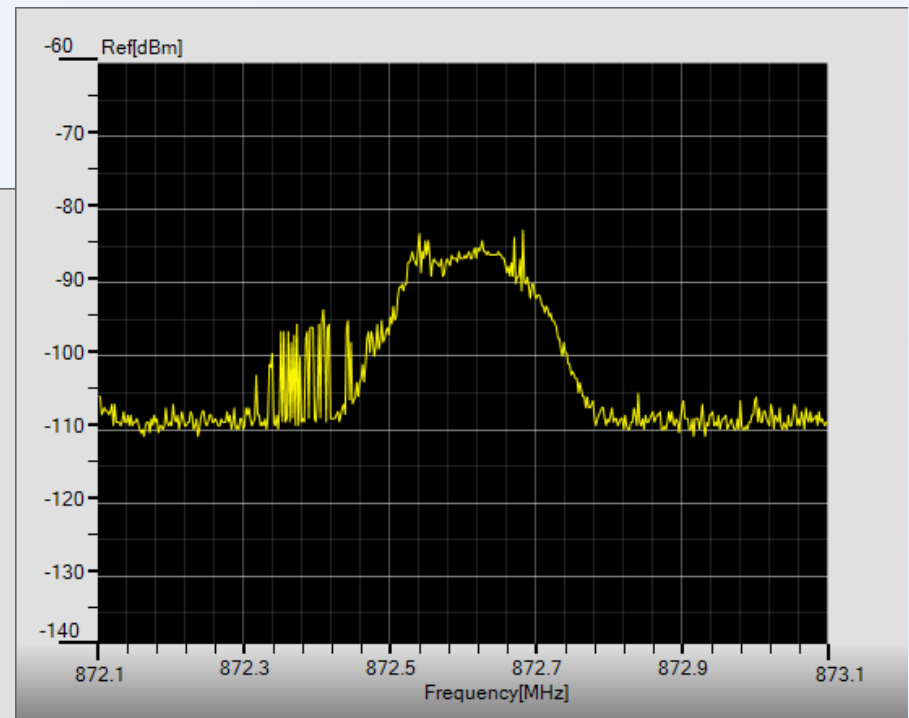
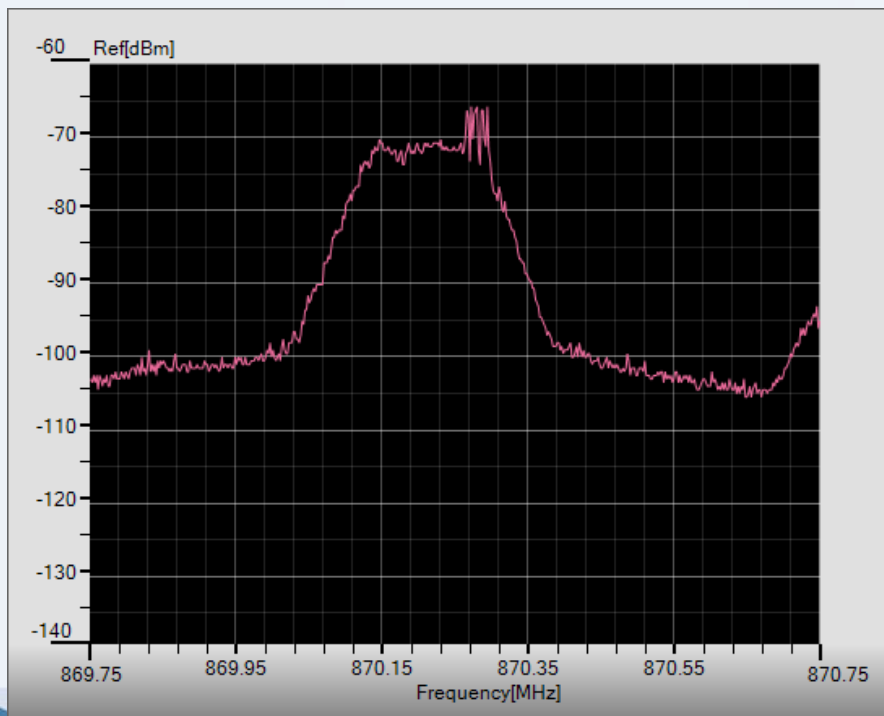


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Base station radiation testing

GSM channels of down link:
F1=870.2MHz, ARFCN=133



F2=872.6MHz ARFCN=145