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Vincit Omnia Veritas

# 手机信号测试





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

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

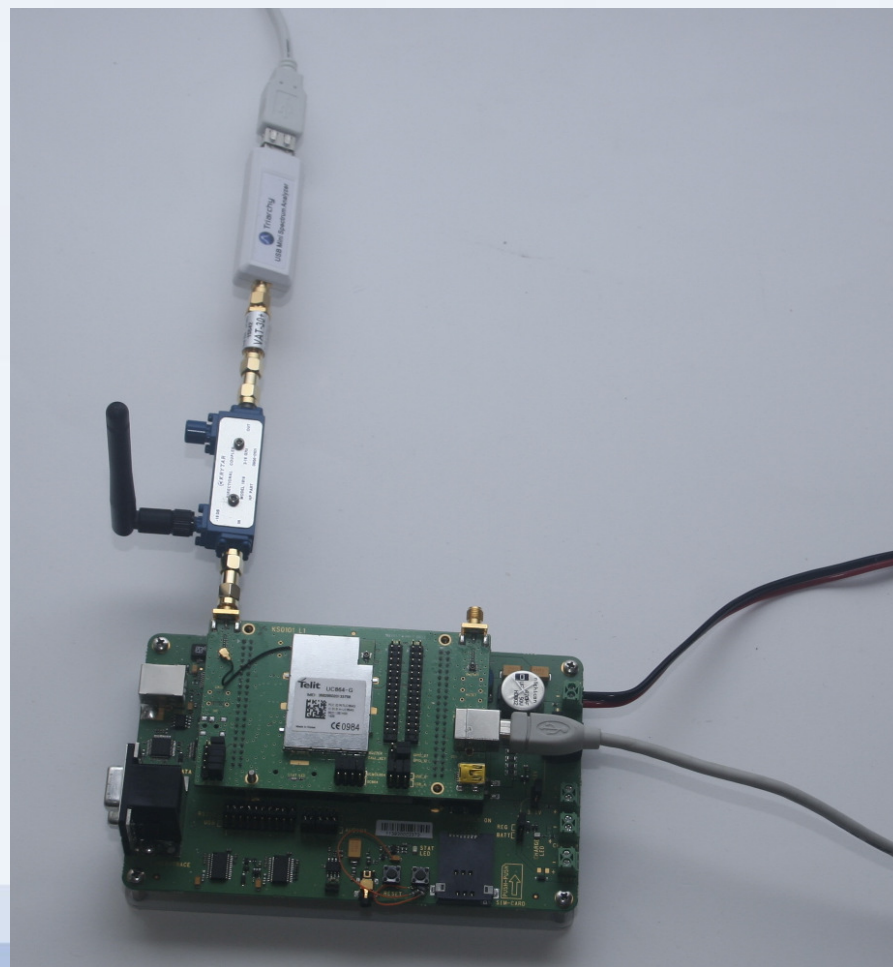


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## 手机模块接入测试

- 1:使用方向耦合器连TSA5G35和Telit UC864-G EVK2
- 2: 连接**30dB**外部衰减器
- 3: 通过**USB**终端发送AT命令AT  
+COPS=0,0,,0 → GSM mode  
AT+COPS=0,0,,2 → 3G mode





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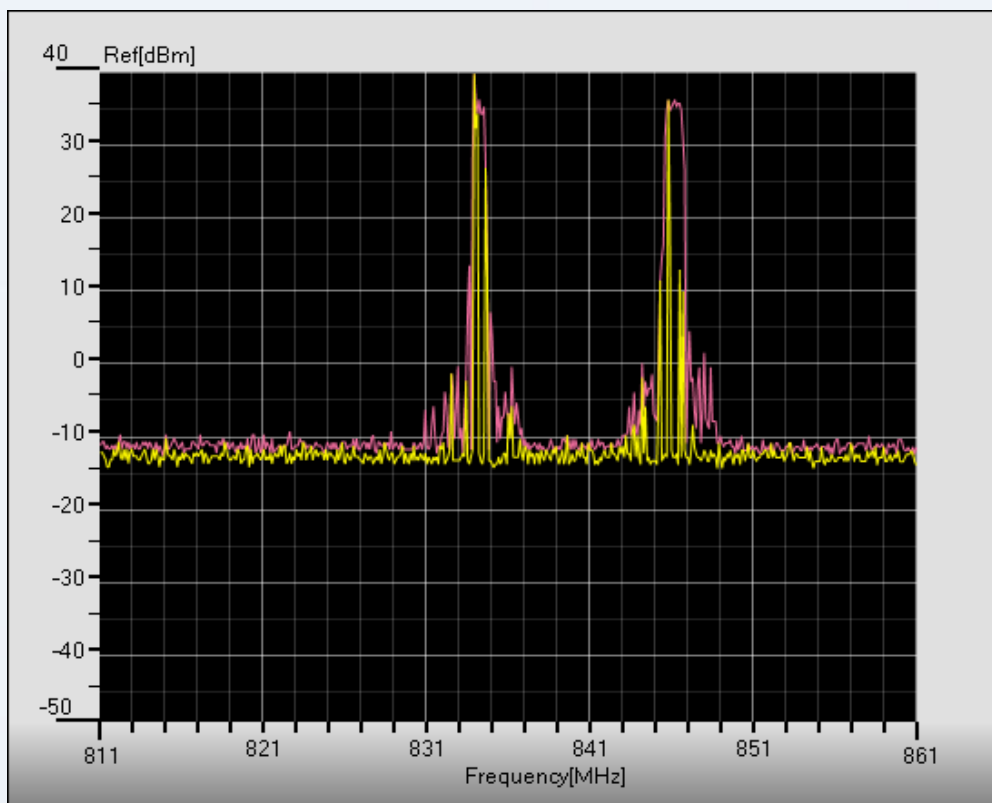
## 手机模块接入测试(GSM 模式)

TSA5G35参数设定:

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)		

SPAN将覆盖GSM850上行链路，拨打电话并寻找工作信道。





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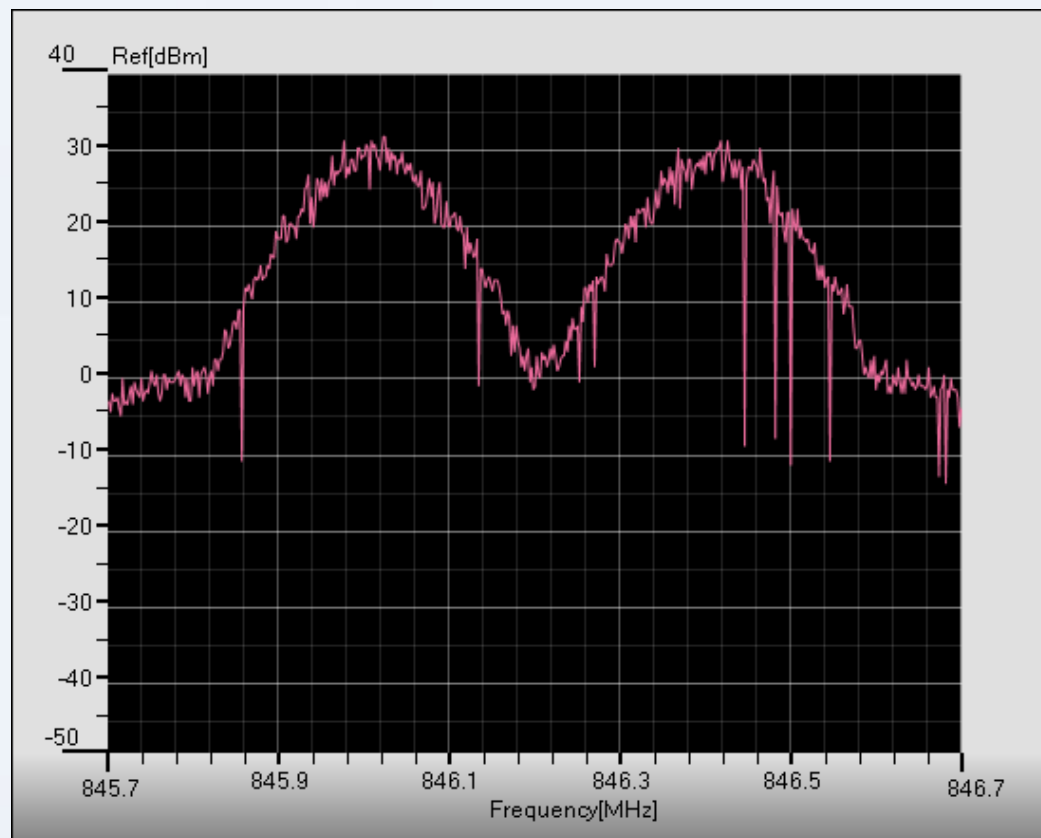
## 手机模块接入测试(GSM mode)

TSA5G35参数设定:

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)		

将SPAN设置为1MHz以查看  
GSM的频谱, F1=846MHz  
(ARFCN=237) F2=846.4MHz  
(ARFCN=239)





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## 手机模块接入测试 (GSM mode)

Center frequency: 846.01MHz

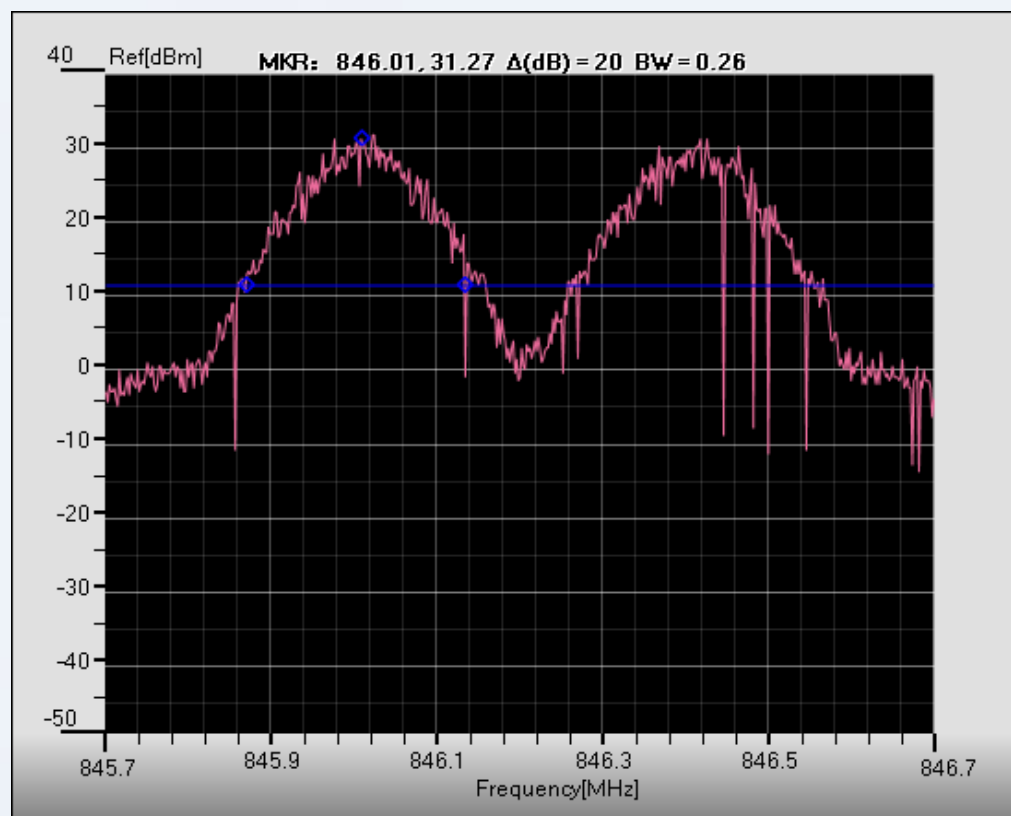
Make level : 31.27dBm

BW: 260 KHz@20dBc

BW: 140KHz@6dBc

因为RBW(50KHz)小于信号  
BW，真正的信号功率将会比标  
记电平大。

手机模块输出功率约33-35dBm  
范围



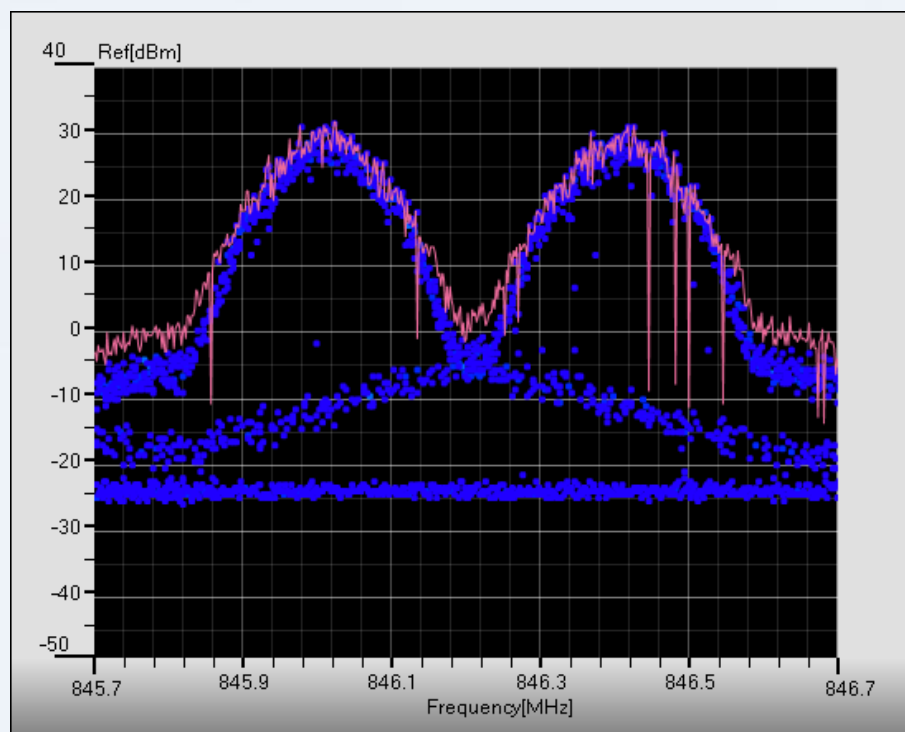
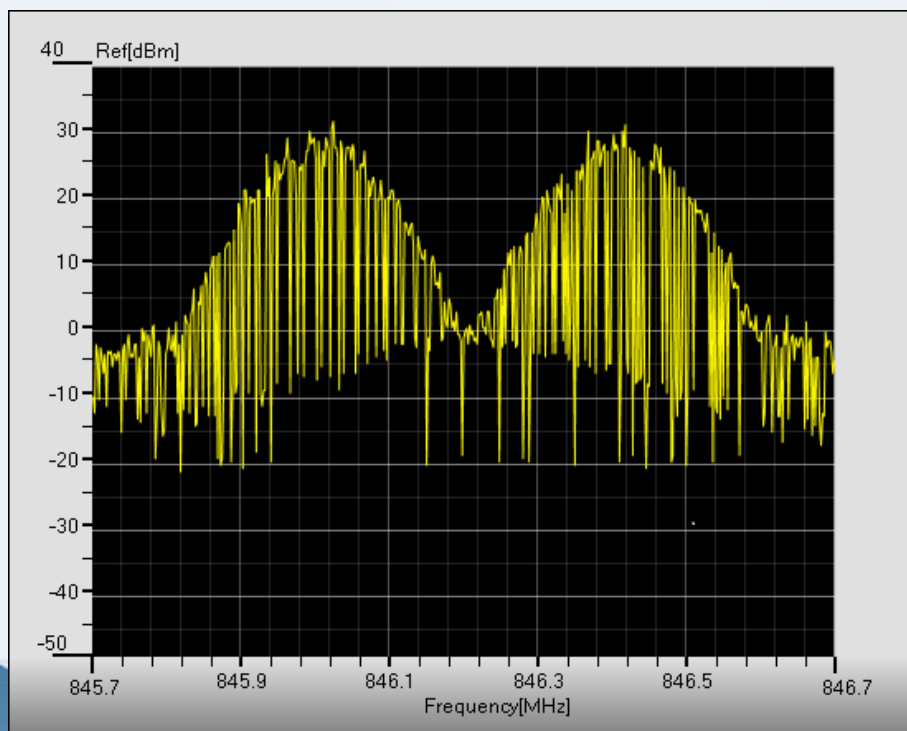


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## 手机模块接入测试(GSM mode)

当前显示的是x8扫描时间，如果扫描时间减少，波形会丢失更多信息。



经过几帧扫描后，最大和密度将显示出清晰的频谱波形。





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## 手机模块接入测试 (3G mode)

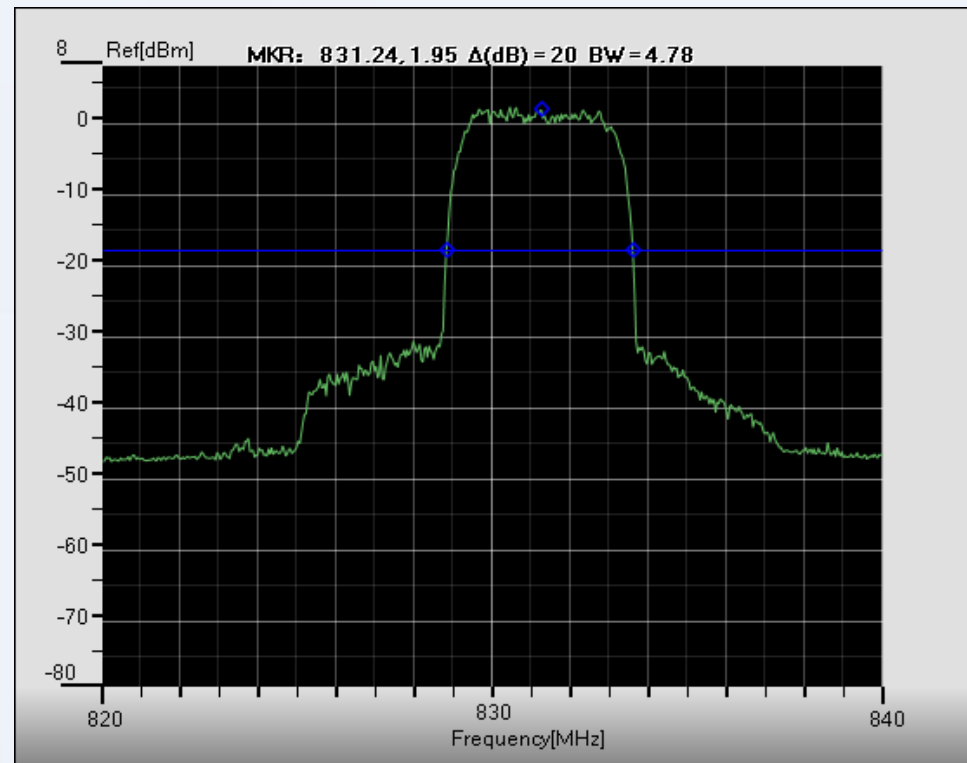
TSA5G35 参数设置:

Parameter Setting

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

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

BW=4MHz@6dBc



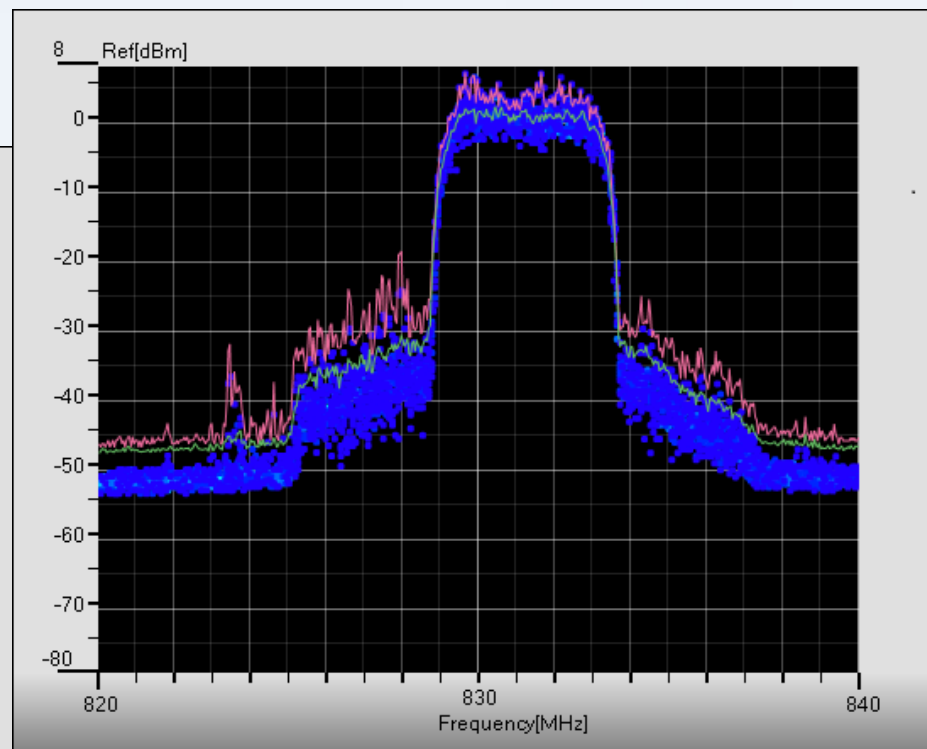
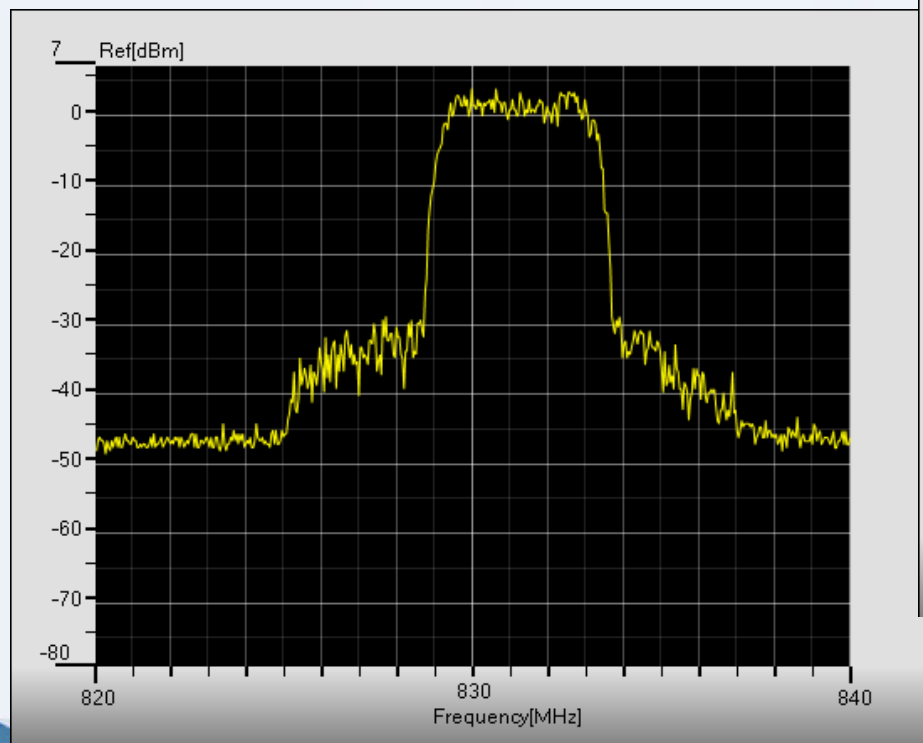


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## 手机模块接入测试(3G mode)

当前显示



显示最大值、平均值和能量密度

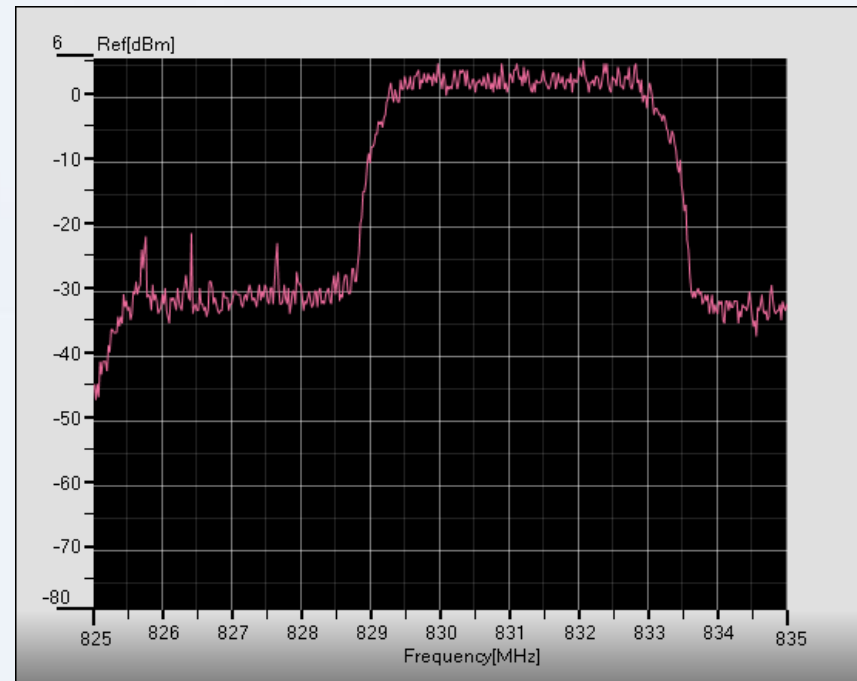
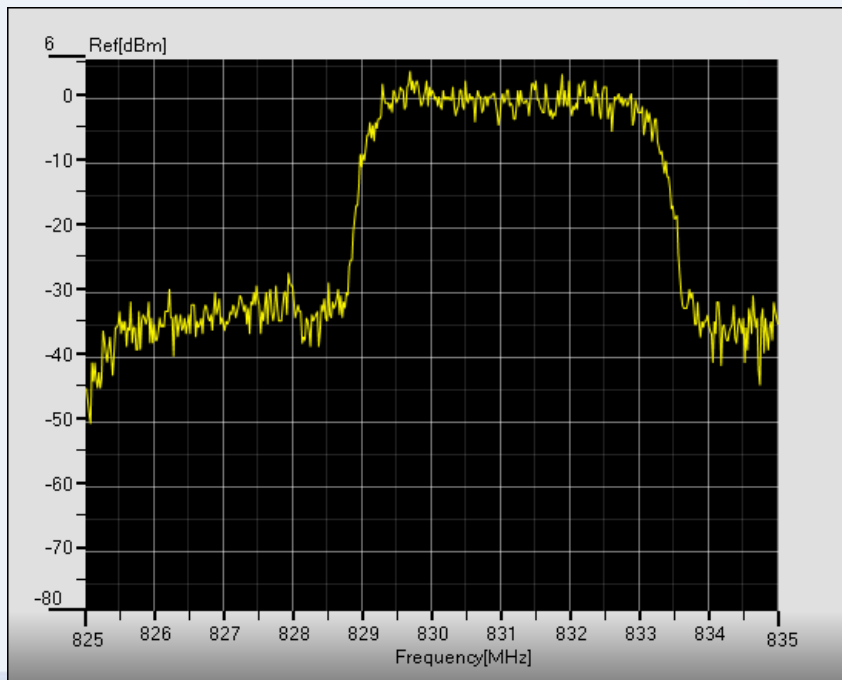


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## 手机模块接入测试 (3G mode)

改变SPAN 到10MHz  
再测试



显示最大值

Wifi signal testing with TSA5G35



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## 手机模块接入测试 (GSM mode)

TSA5G35 参数设置:

Parameter Setting	
Center-Freq(MHz)	1888.7
Span(MHz)	1
Amplitude(dBm)	30
Sweep Time	x8 (Burst Mode)
<input checked="" type="checkbox"/> External ATT(30dB)	
<b>Start</b>	

两个天线的距离是0.1米  
TSA5G35使用USB线与计算机连接





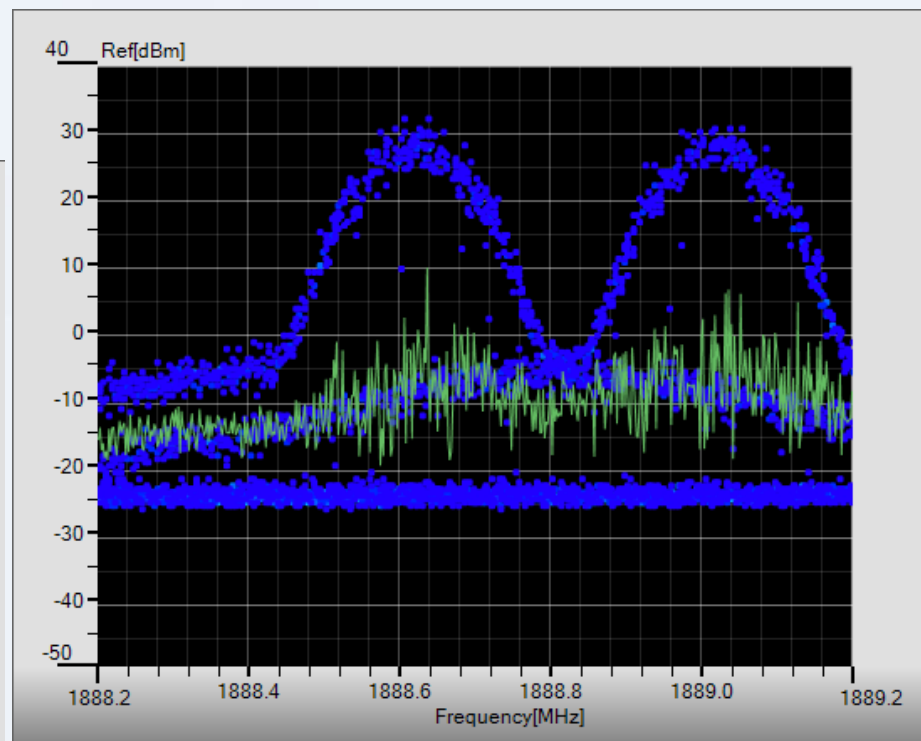
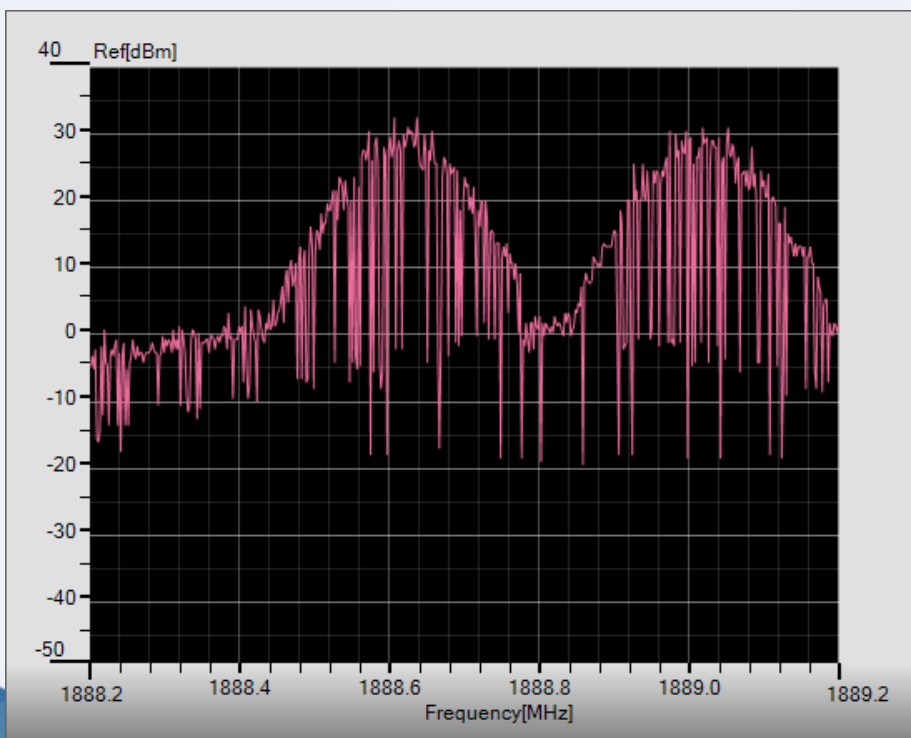
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## 手机模块接入测试 (GSM mode)

F1=1888.6MHz, ARFCN=704

F2=1889MHz, ARFCN=706



显示平均值和密度值

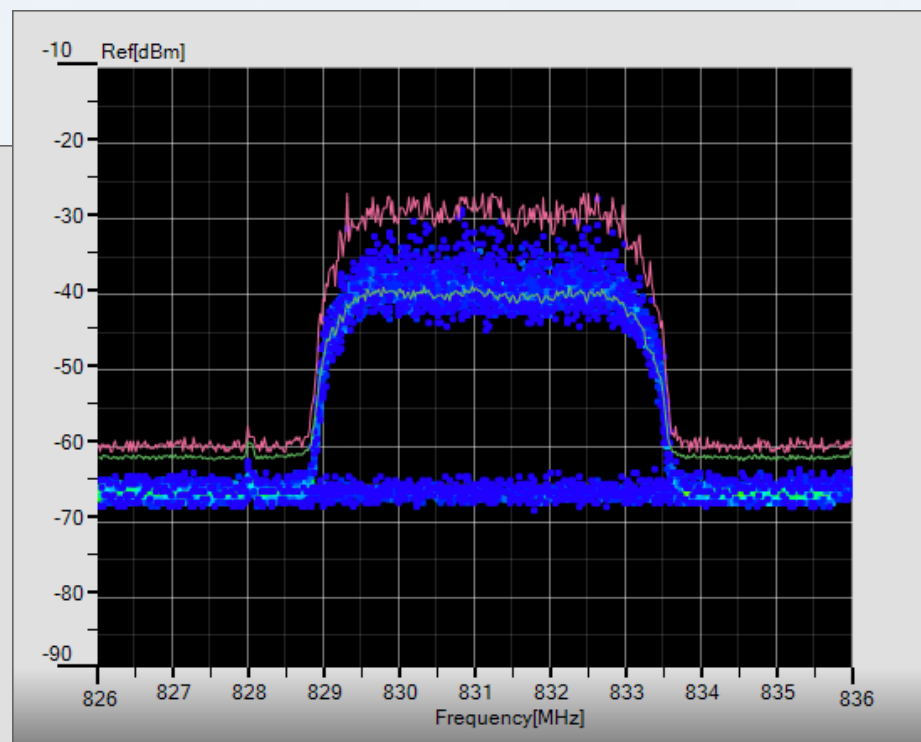
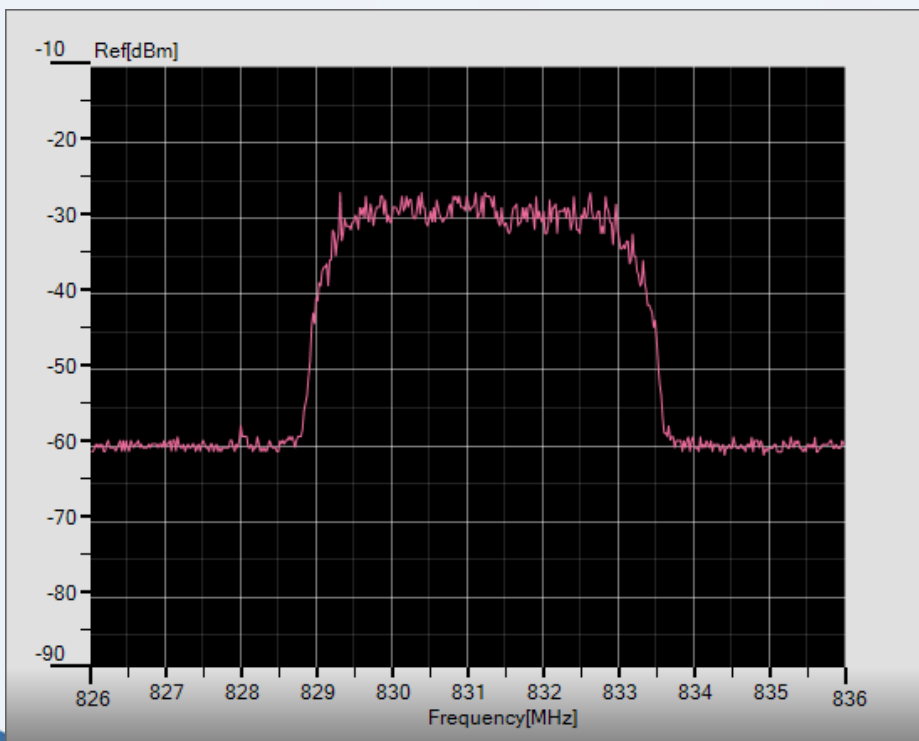


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## 蜂窝电话辐射测试 (3G 模式)

F1=831.2MHz, UARFCN=4156



显示平均值、最大值和密度值



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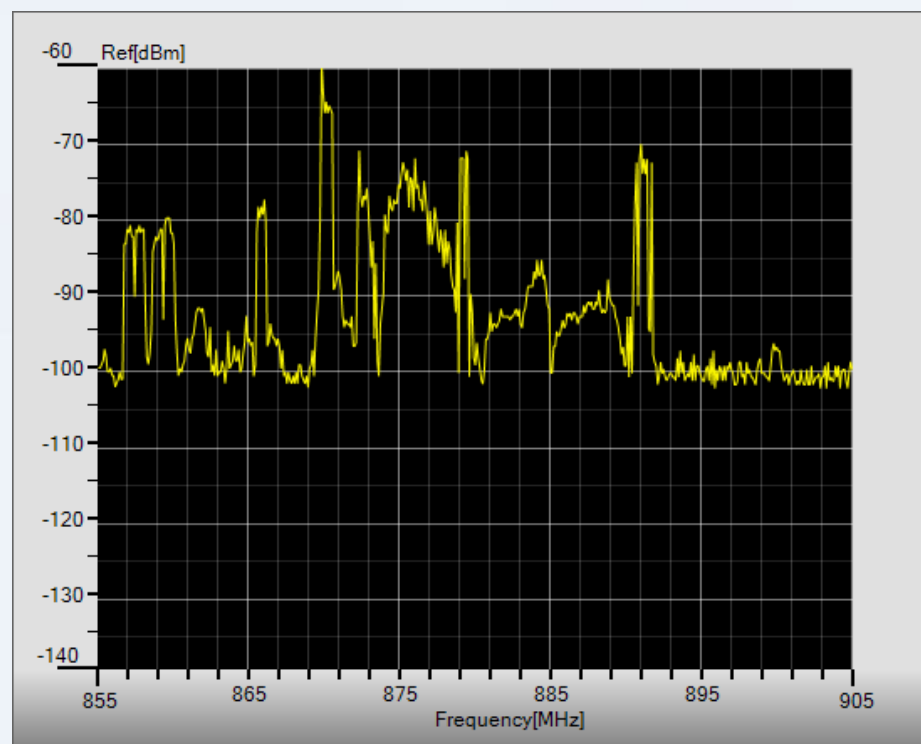
## 基站辐射测试

TSA5G35 参数设置:

Parameter Setting

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

设置SPAN覆盖GSM850的上行波段，将幅度设置为最小值，可以监测到基站信号。



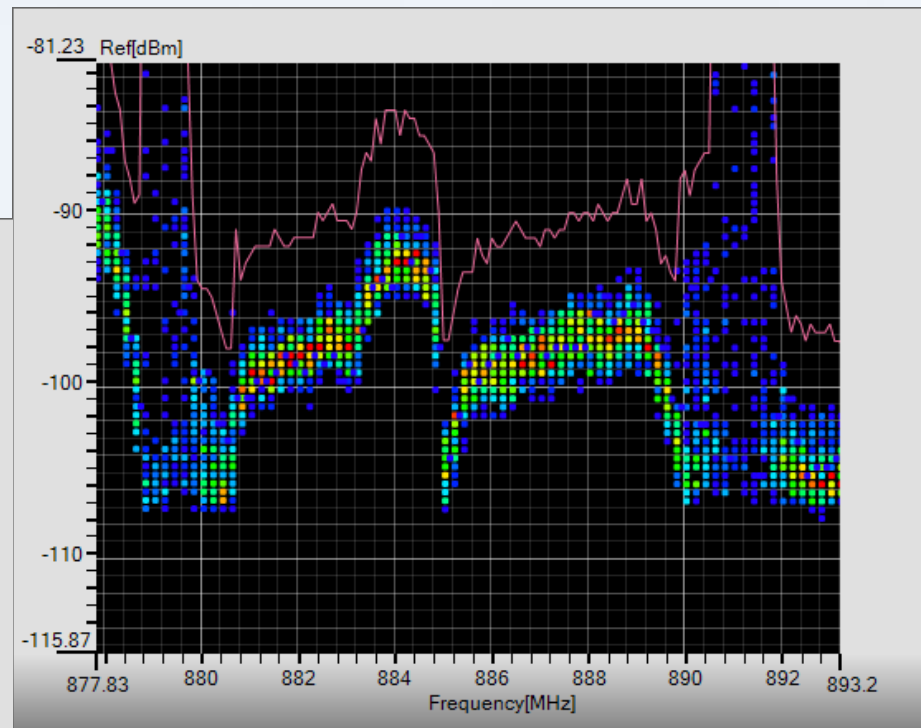
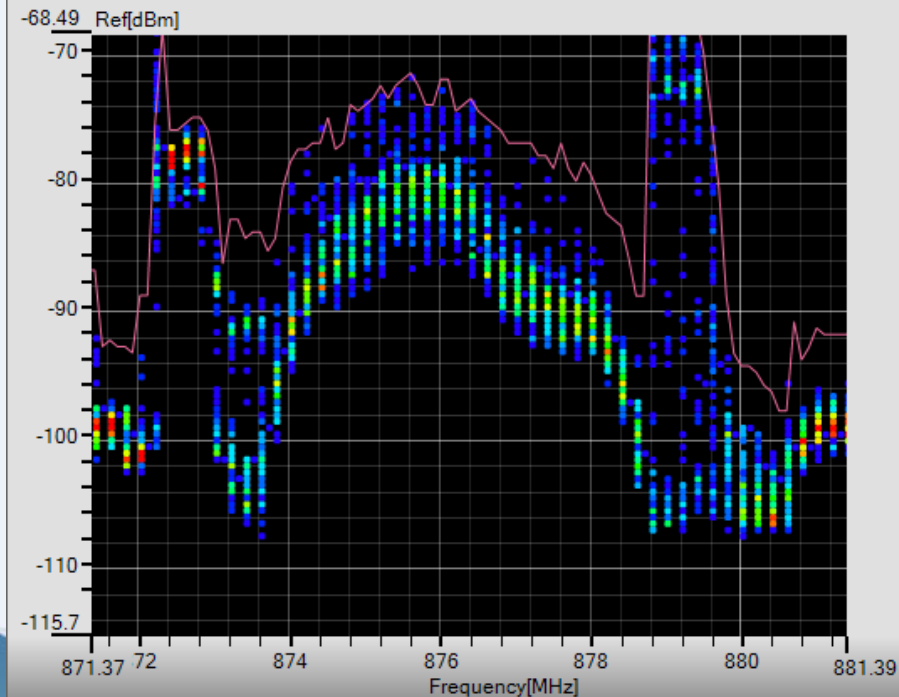


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## 基站辐射测试

通过缩放，3G频段可以被显示：  
F1=876MHz, UARFCN=4380



F2=882.6MHz UARFCN=4413  
F3=887.6MHz UARFCN=4438



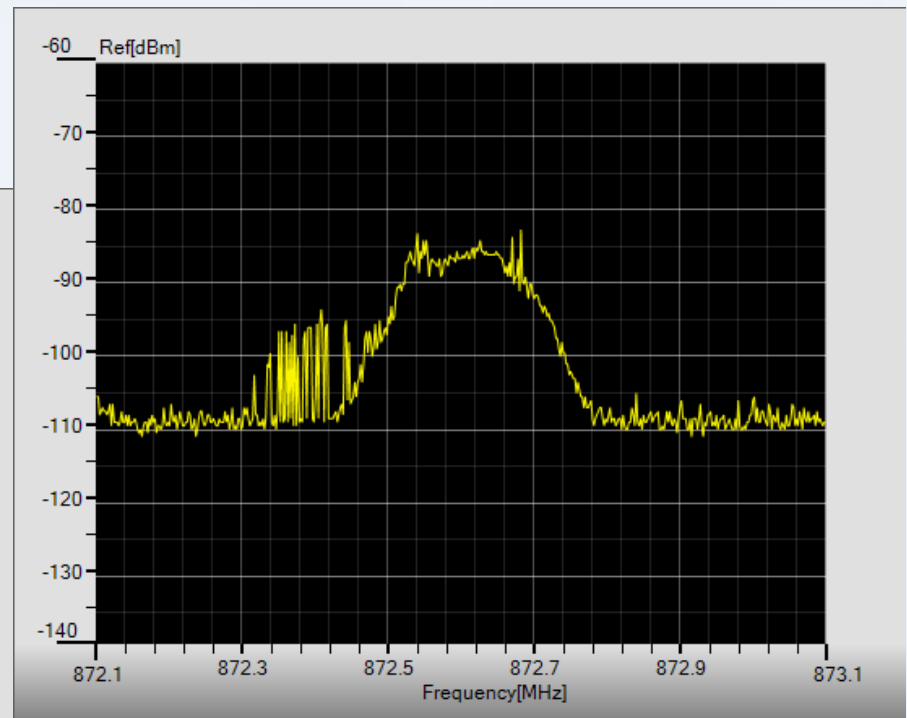
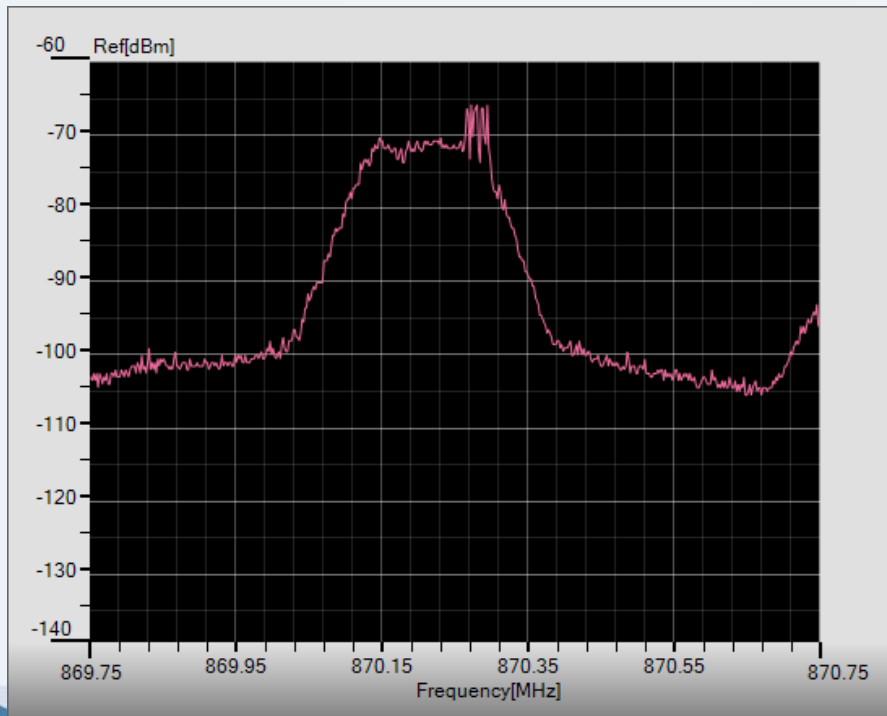


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## 基站辐射测试

下行链路的GSM信道：  
F1=870.2MHz, ARFCN=133



F2=872.6MHz ARFCN=145