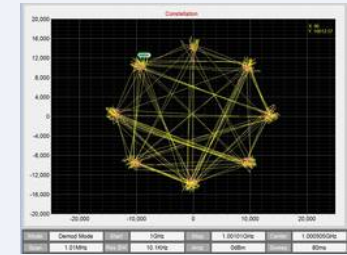
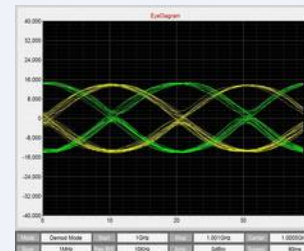
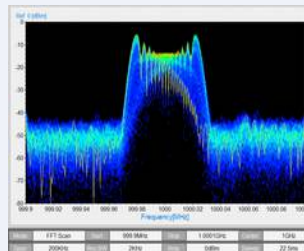
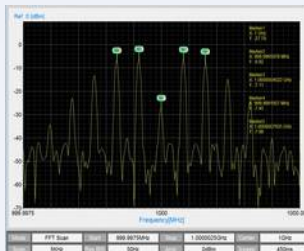
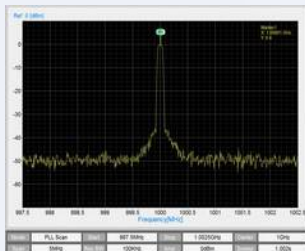




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Cell phone signal testing with VSA6G2A





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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	$450.6+0.2*(ARFCN-259)$	$460.6+0.2*(ARFCN-259)$
T-GSM-810	Dynamic	806.2 – 821.2	851.2 – 866.2
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) <i>Uarfcn</i>	Downlink High (MHz) <i>Uarfcn</i>	Uplink Low (MHz) <i>Uarfcn</i>	Uplink High (MHz) <i>Uarfcn</i>	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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LET frequency band

E-UTRA Band	Uplink Low (MHz)	Uplink High (MHz)	Downlink Low (MHz)	Downlink High (MHz)	Subset of band	Duplex spacing	Channel Bandwidth (MHz)
1 IMT	1920	1980	2110	2170	65	190 MHz	5,10,15,20
2 blocks A-F	1850	1910	1930	1990	25	80 MHz	1.4,3,5,10,15,20
3 DCS	1710	1785	1805	1880		95 MHz	1.4,3,5,10,15,20
4 AWS	1710	1755	2110	2155	66	400 MHz	1.4,3,5,10,15,20
5 GSM-850	824	849	869	894	26	45 MHz	1.4,3,5,10
7 IMT-E 2.6 GHz	2500	2570	2620	2690		120 MHz	5,10,15,20
8 E-GSM 900	925	960	880	915	35	45 MHz	1.4,3,5,10



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Measure Cell phone signal at air

1: VSA6G2A directly connected with cell phone band antenna.

2: Put antenna out of room with fixed location to pick cell phone based station signal from air.





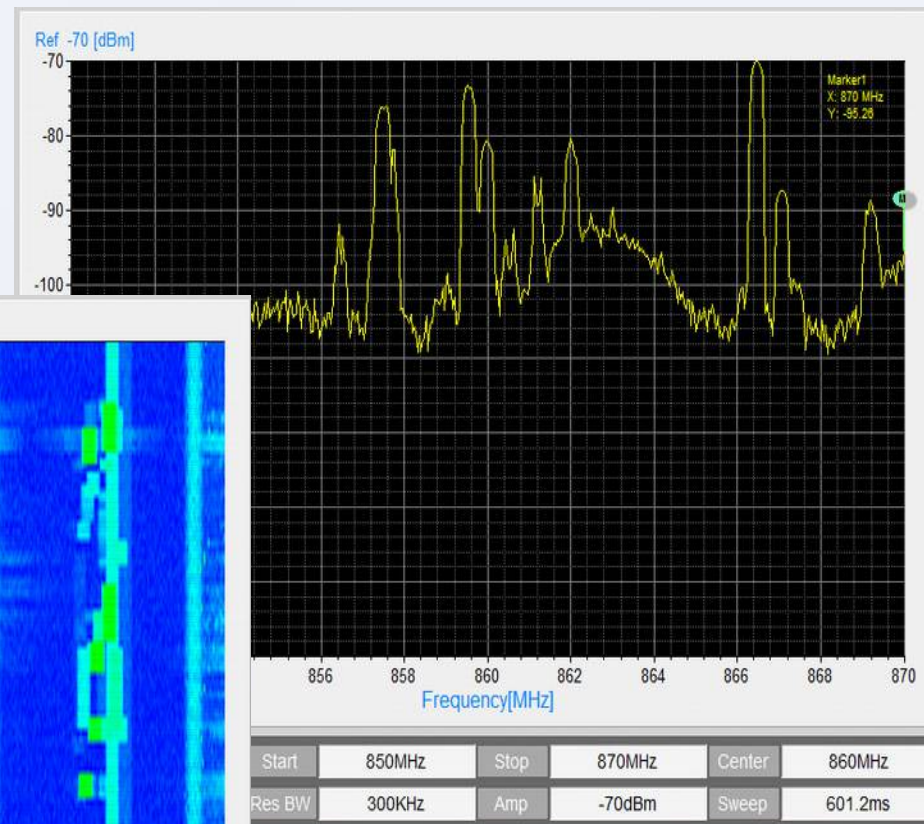
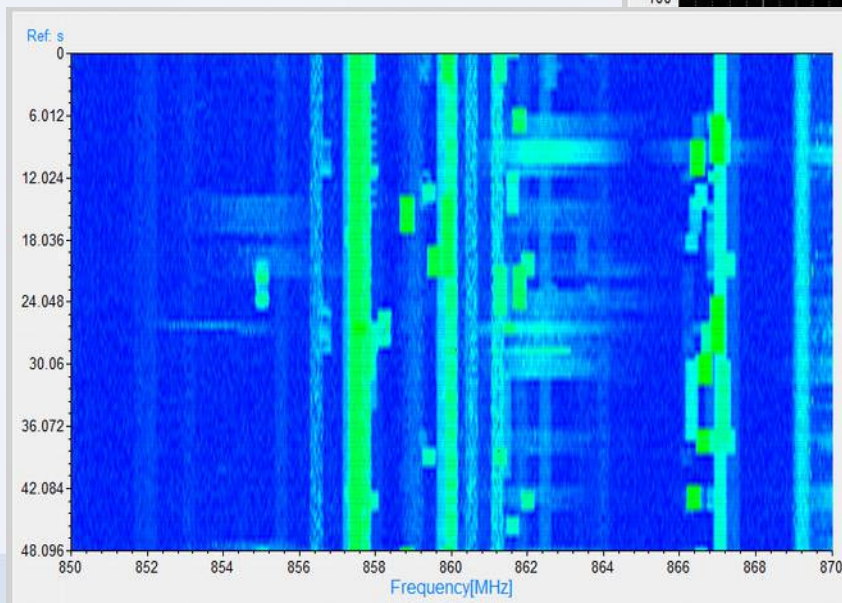
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Pick up GSM signal from the air

Set VSA6G2A frequency range from 850MHz to 870MHz to pick T-GSM 810 down link band. The current Waveform is shown the a lot of GSM signal spectrum.

Waterfall display is shown real timing slot of GSM signal.





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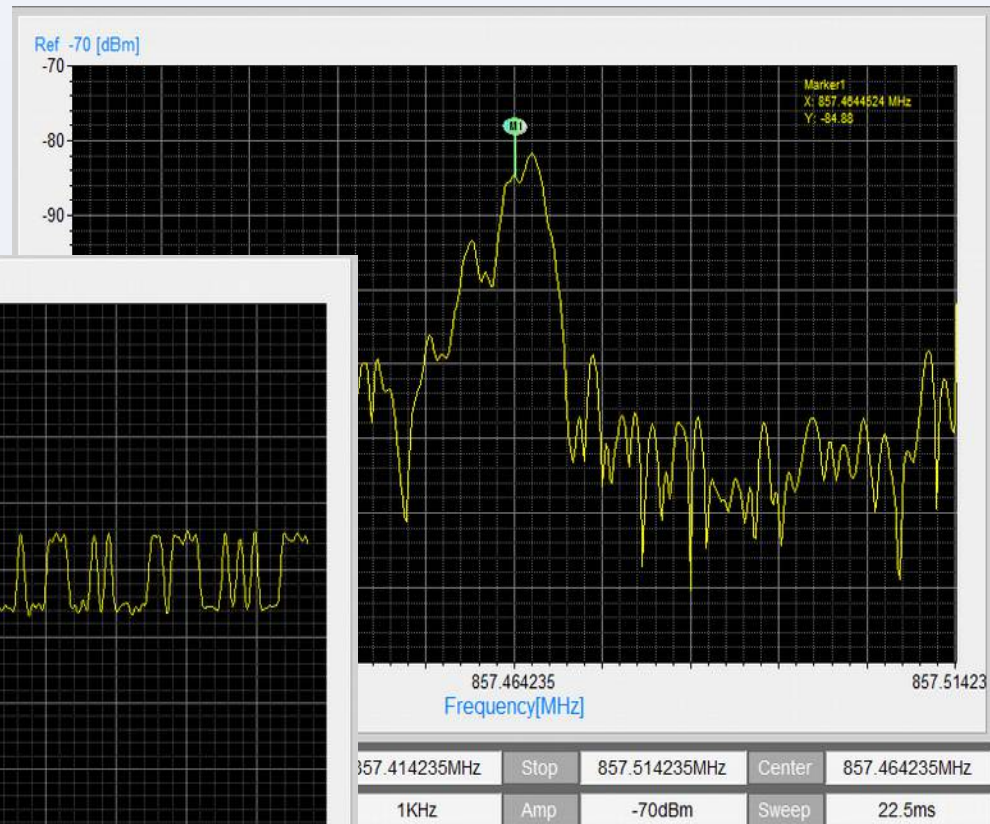
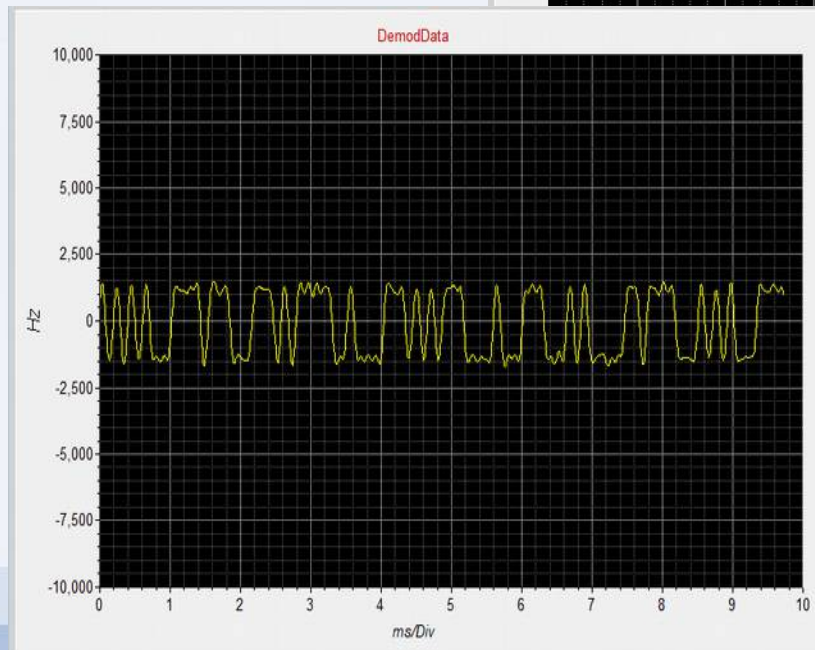
Pick up GSM signal from the air

Pick up one GSM signal, put it into center location by marker menu To center.

Open the Demo function TO FM.

GMSK timing waveform can be shown.

Some GSM ch will be working as data stream such as GPRS.





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Pick up 3G/LTE signal from the air

LTE band 5 downlink:

869MHz~894MHz

LTE signal at air will be:

869MHz ~874MHz

880MHz ~885MHz

Bandwidth for LTE is 5MHz

3G band 5 downlink:

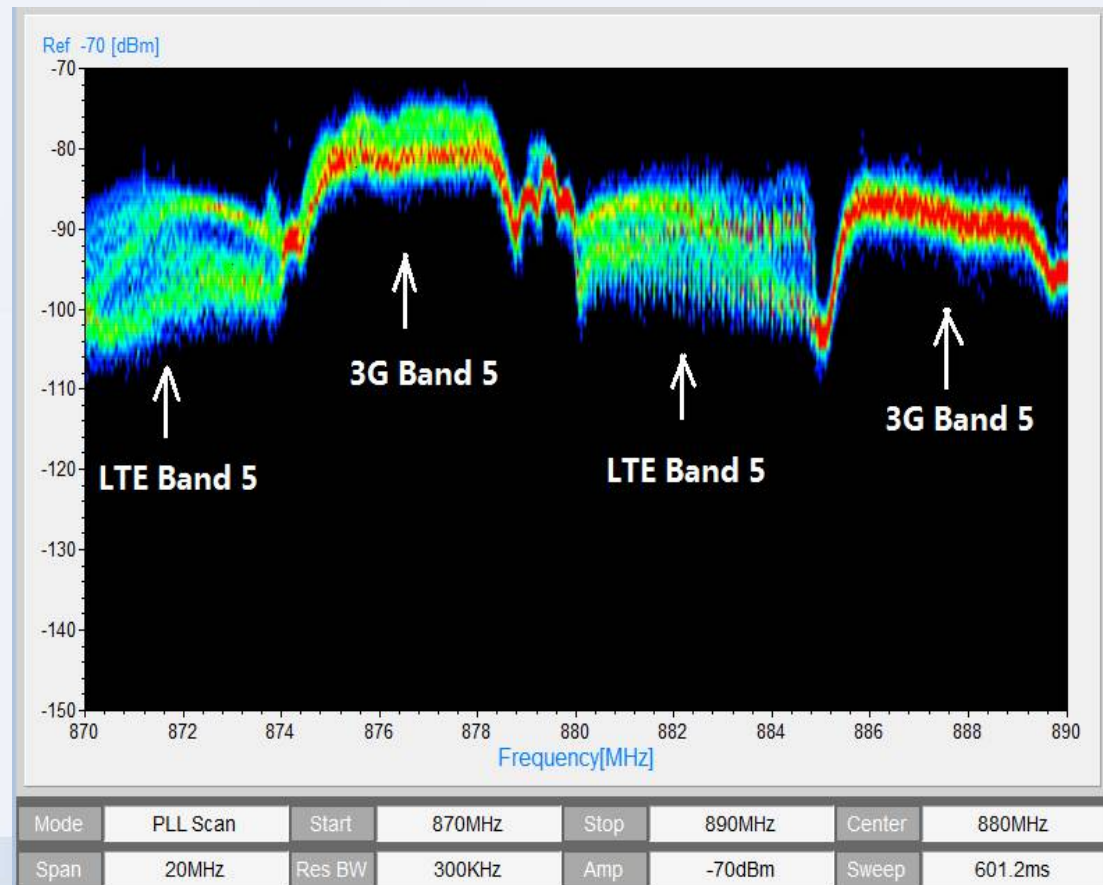
869MHz~894MHz

3G signal at air will be:

874.6MHz ~878.4MHz

885.6MHz ~889.4MHz

Bandwidth for 3G is 3.8MHz



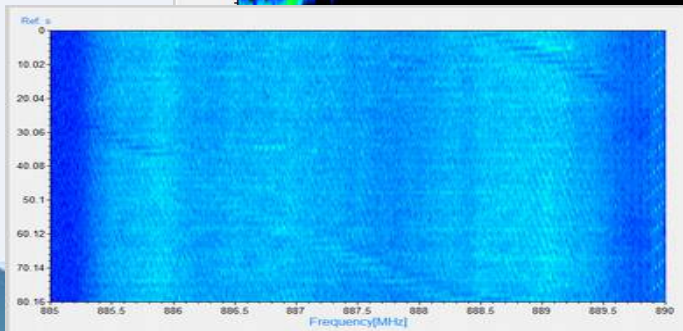
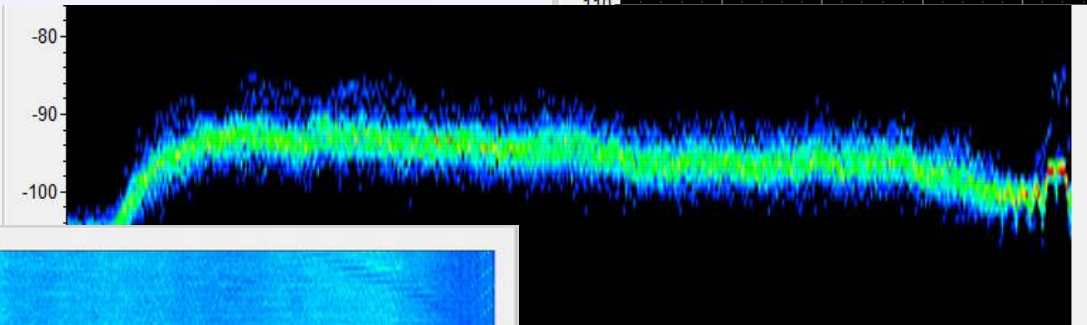
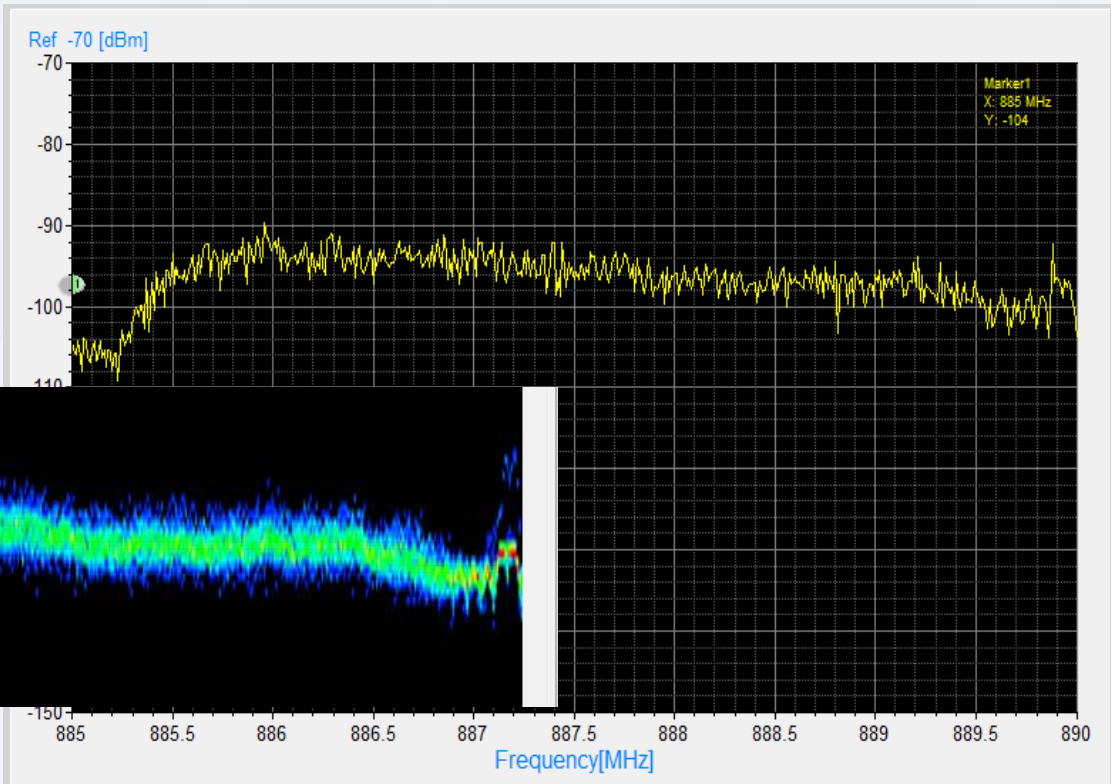


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Pick up 3G signal from the air

3G signal at air will be:
885.6MHz ~889.4MHz
Bandwidth for 3G is 3.8MHz
3G signal is WCDMA, it looks like noise, very smooth.



Mode	PLL Scan	Start	885MHz	Stop	890MHz	Center	887.5MHz
Span	5MHz	Res BW	100KHz	Amp	-70dBm	Sweep	1.002s



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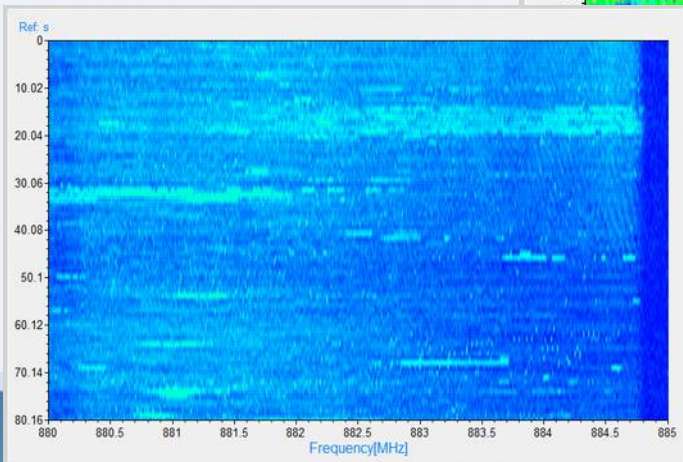
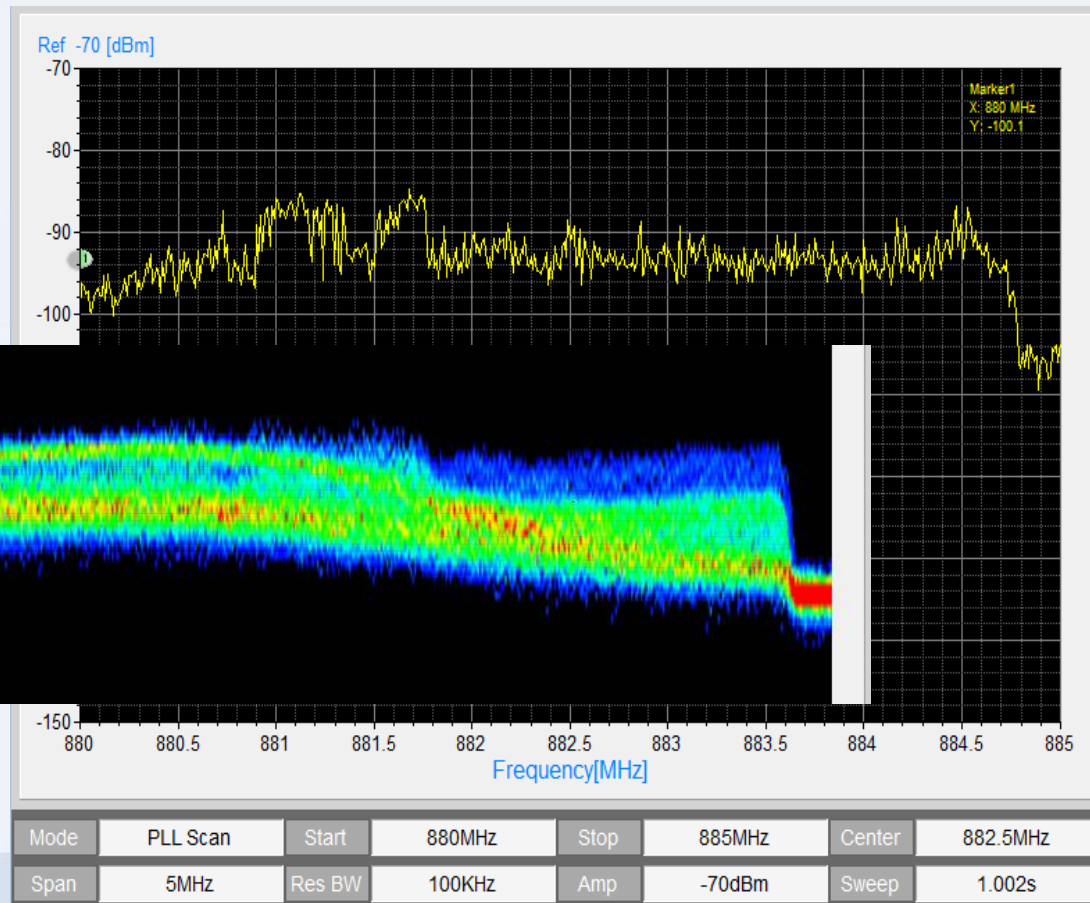
Pick up LTE signal from the air

LTE signal at air will be:

880MHz ~885MHz

Bandwidth for LTE is 5MHz

LET signal is OFDMA, there are a lot sub band, so that spectrum is not smooth, it will Jump with data.





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Cell phone radiation testing

Make cell call to cell phone,
Keep phone on talking.

VSA6G2A connect with whip
antenna to pick cell phone
up link signal





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Vincit Omnia Veritas

Cell phone radiation testing

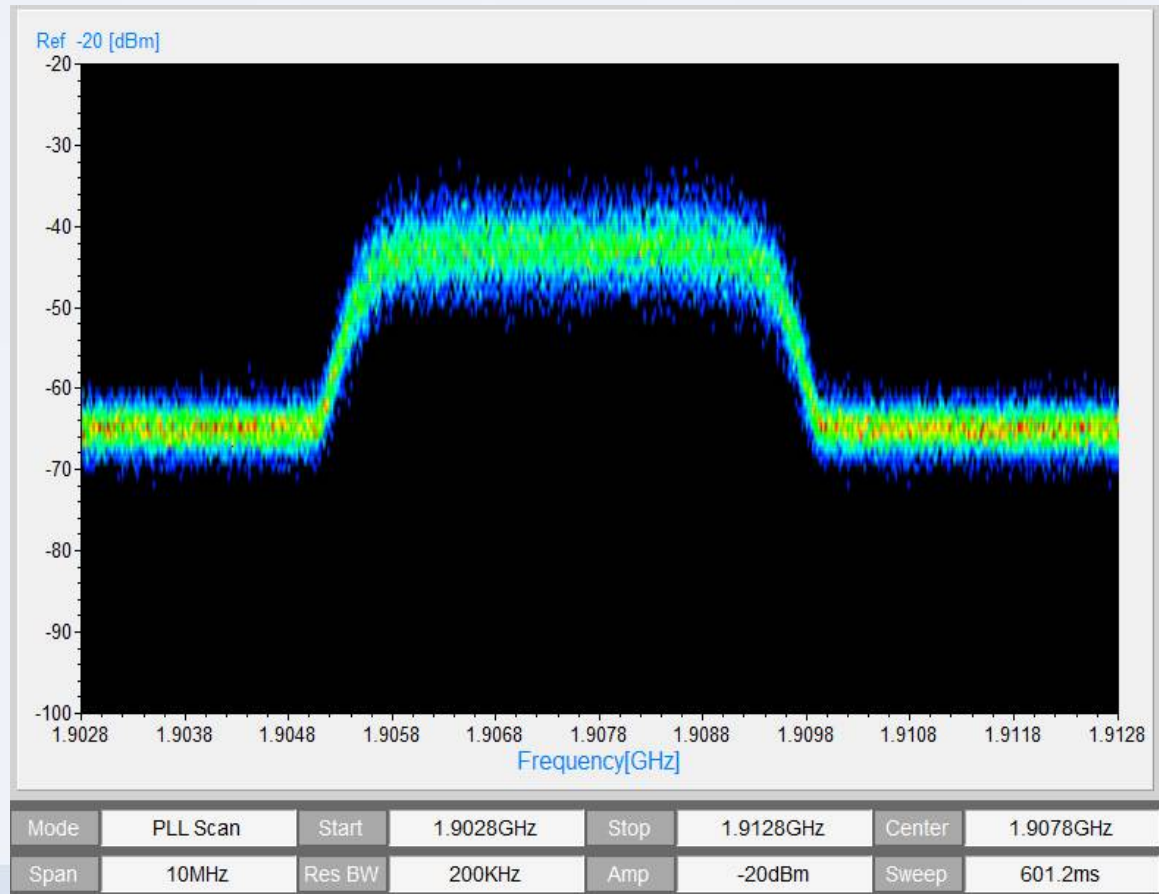
It is 3G signal.

Band 2, US PCS 1900

Band frequency range is

1905.6MHz~1909.4MHz

Bandwidth is 3.8MHz.





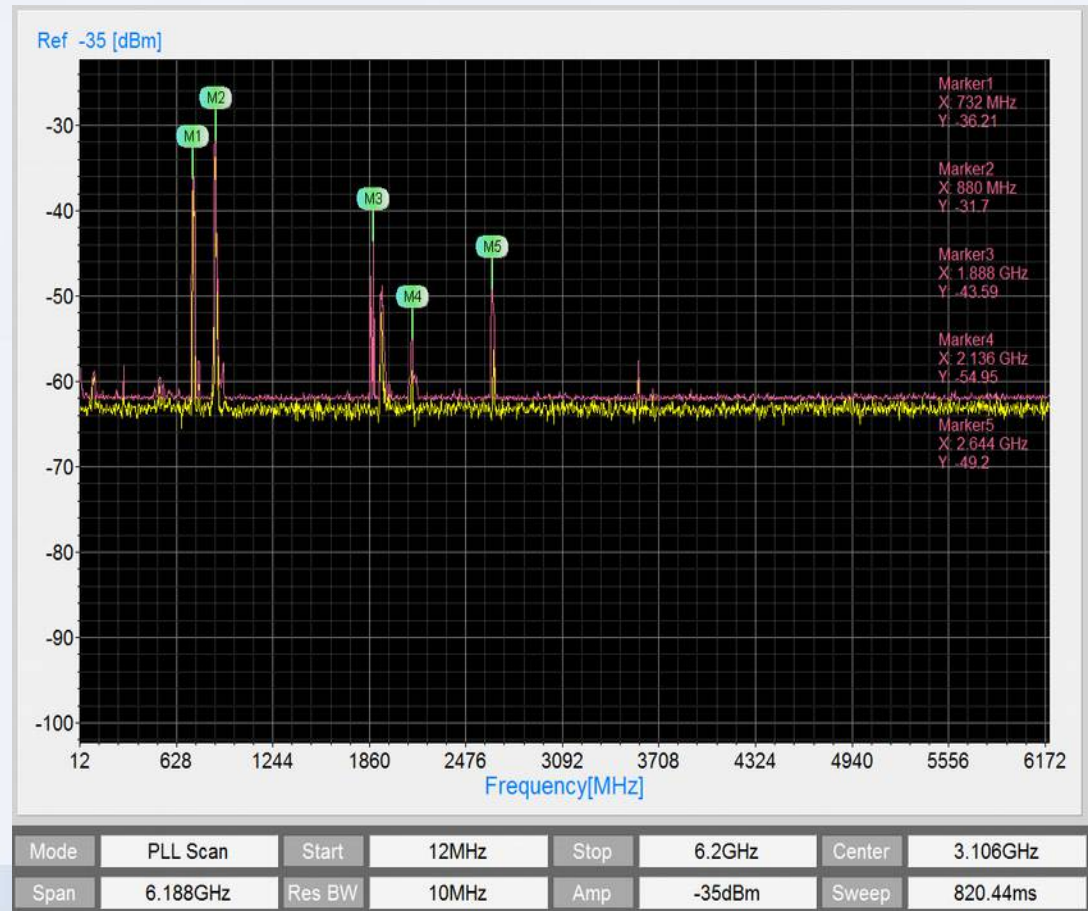
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Cell phone base station test

Drive to cell phone base station tower, put antenna at top of car. Using full SPAN to pick up cell phone Signal:

- 1: 732MHz, -36dBm, Band44
- 2: 880MHz, -31dBm, Band5
- 3: 1888MHz, -43dBm, Band35
- 4: 2136MHz, -55dBm, Band1
- 5: 2644MHz, -49dBm, Band7



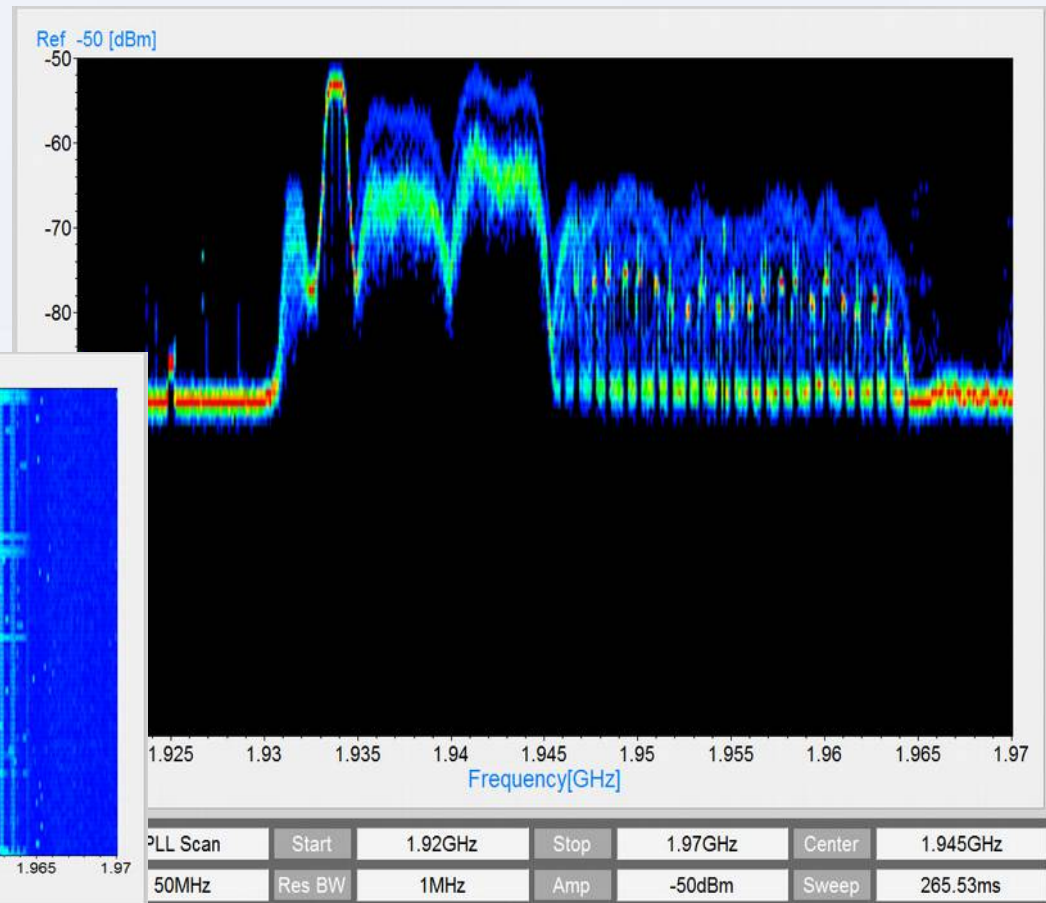
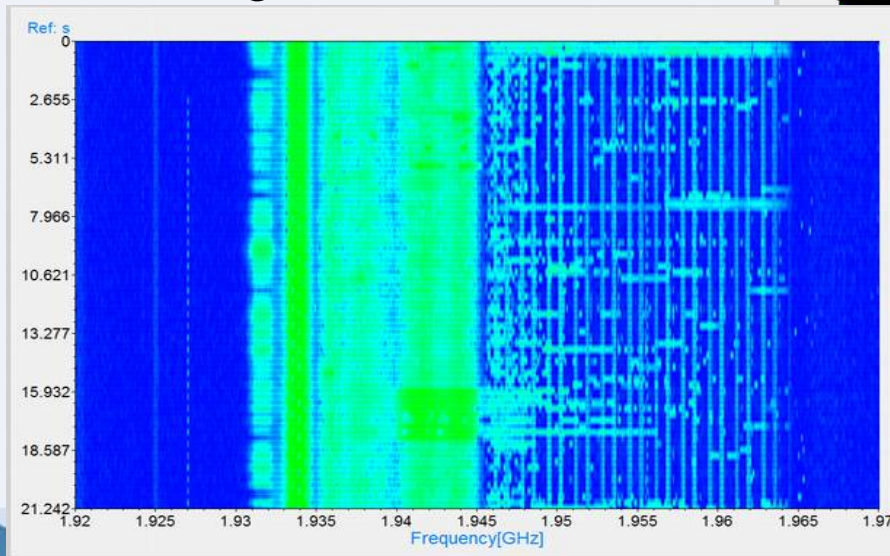


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Cell phone base station test

Base down link signal from
1.93G~1.965G Band 2,
combine 2G, 3G,4G signal.
4G LTE signal is more clear.



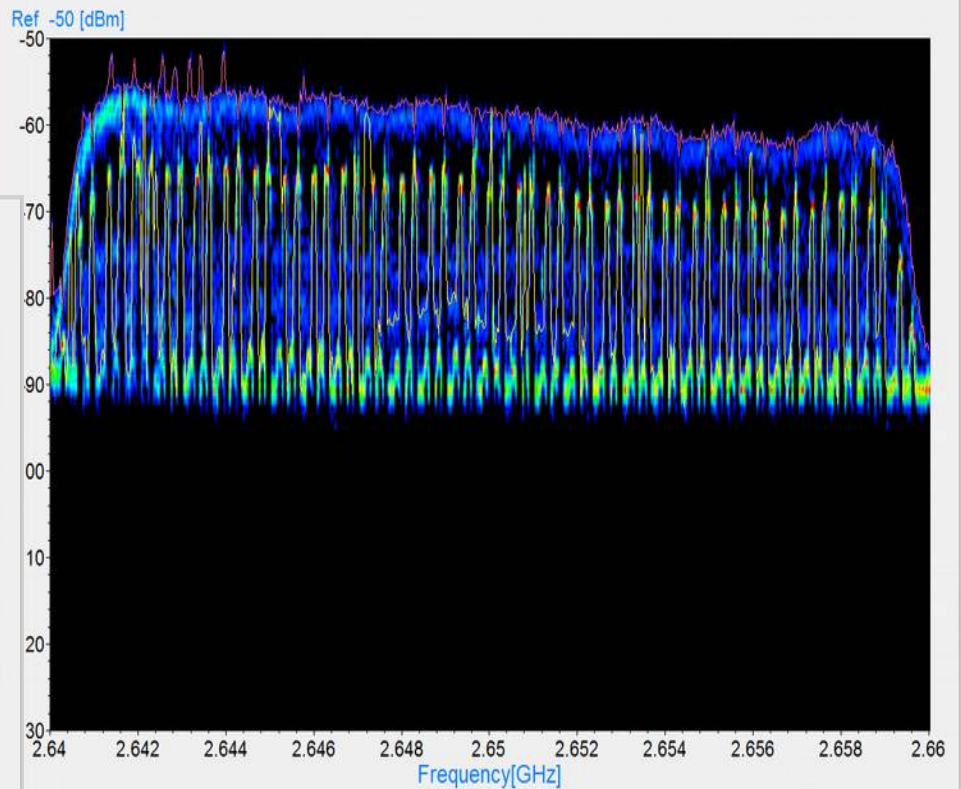
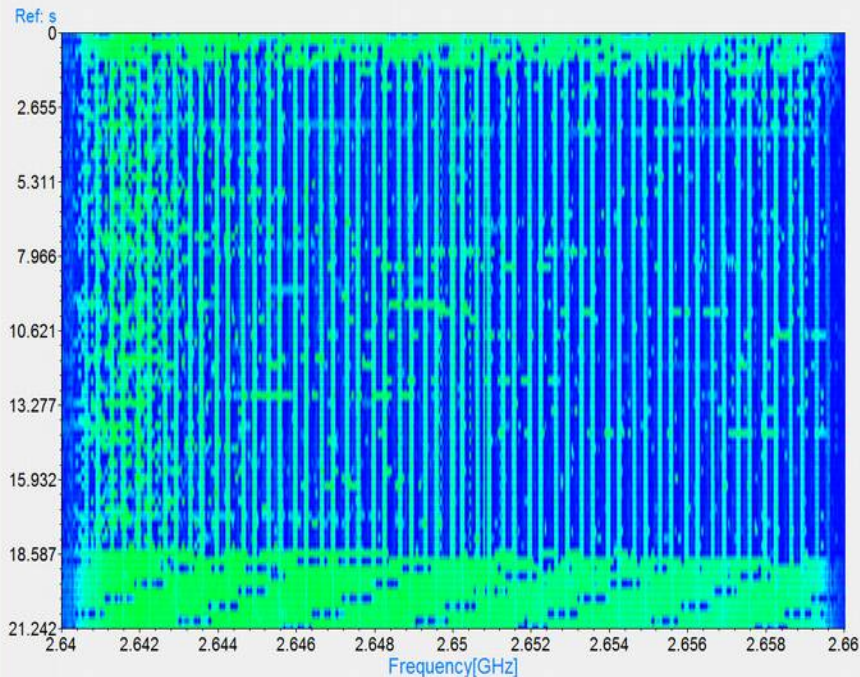


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Cell phone base station test

Pick up LTE section at Band 7
Waterfall can be shown the
more detail OFDM modulation



Mode	PLL Scan	Start	2.64GHz	Stop	2.66GHz	Center	2.65GHz
Span	20MHz	Res BW	1MHz	Amp	-50dBm	Sweep	265.53ms