

简易相噪比对板使用手册

Simple Phase noise compare board user manual

BG7TBL
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1. 概述 overview

该相位噪声比较仪采用倍频方法，将噪音进行放大。再输入频谱进行对比。可以比较信号的噪音大小。

This noise compare used frequency multiplier to amplifier the noise signal.compare with spectrum analyzer.

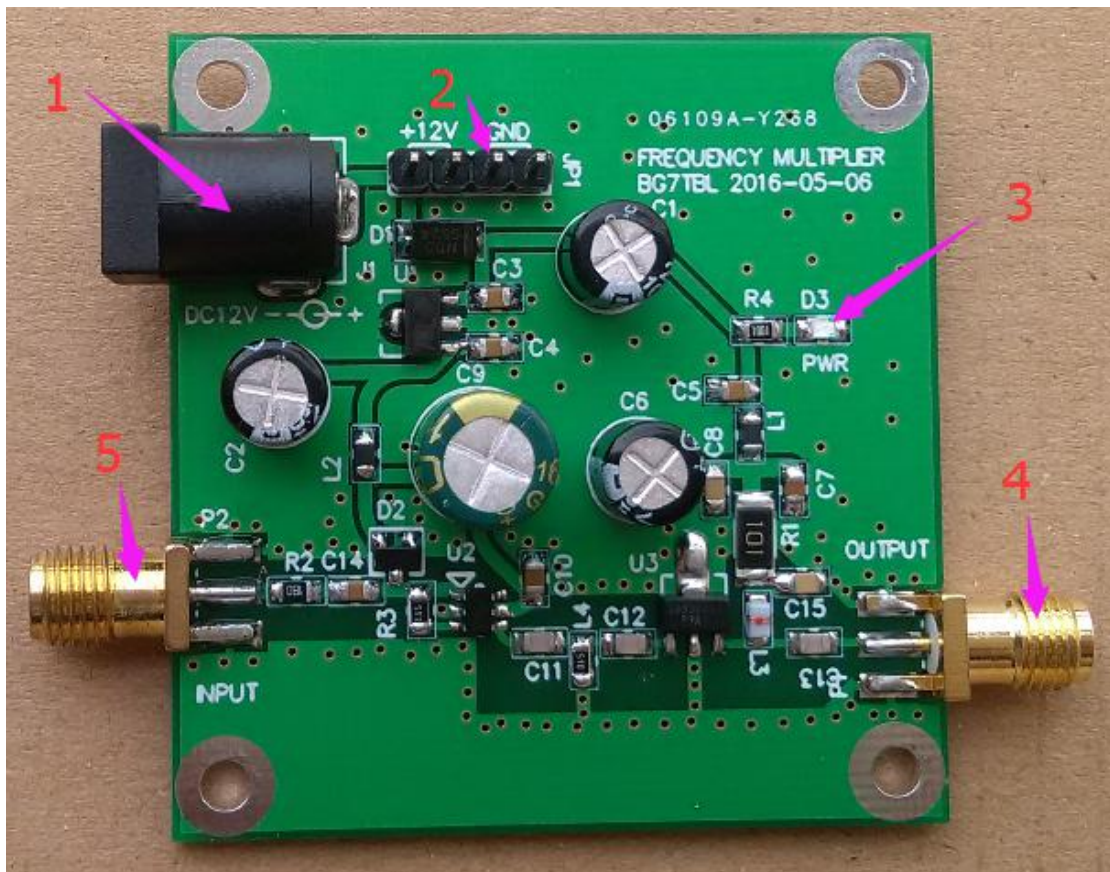
供电电压：11.5-12.5V power:11.5-12.5V

电流：小于 0.12A current:<0.12A

输入频率：1M-100M, input:1M-100M

输入信号强度：-10dbm--+10dbm,strength:-10dbm--+10dbm

2. 硬件连接以及注意事项 hardware connect and attention



1,12V 电源输入，接口 5.5/2.1,电压范围 11.5-12.5V，电流小于 0.12A；

Power input,socket 5.5 -2.1,voltage range 11.5-12.5V,current less than 0.12A

2,12V 电源输入，和 5.5/2.1 插座相连，方便用鳄鱼夹或者排线夹持供电；

Power input , connect with 5.5-2.1 socket,can used alligator clip or FPC cable connect.

3, 电源指示灯, 确认电源是否良好

Power induct,confirm power connect is good

4, 信号输出口, 接频谱分析仪

Signal output,connect spectrum analyzer

5, 信号输入口,

Signal output

输入信号强度和波形尽量一致, 输入信号强度最好在 0-10DBM 之间, 过大或者过小的信号都会导致信号的比对困难。

Input signal strength and waveform as consistent as possible, the input signal strength is between 0-10DBM, too large or too small signal will reduce the signal and noise rate .

3. 频谱设置 spectrum analyzer setting

峰值尽量在 3/4-1/1 的位置, 方便读图, 方便增加信噪比;

Spectrum peak should be at 3/4-1/1 position,easy to read,easy increase S/N.

中心频率尽量设置在合适的范围, 以可以比较清楚的对比噪音差异即可, 一般设置在 2G-2.7G;

Central frequency set the appropriate range, in order to be able to compare the noise difference can be quite clear, normal set at 2G-2.7G

频谱的 SPAN 一般设置在 100K, 如果对比不出区别, 可设置窄点 10K,5K,1K 均可。

Spectrum of the SPAN is generally set in the 100K, if the contrast is not different, you can set a narrow point 5K, 10K, 1K can be.

信号的顶部和底部距离越大越好 (信噪比高), 但是需要兼顾频率。测试频率越低, 信噪比越好, 但是噪音倍频次数过低, 可能无法对比好坏; 中心频率过高, 信噪比过低, 已经被系统噪音掩盖, 无法对比。

The top and bottom of the signal, the greater the better (signal to noise ratio), but need to take into account the frequency. The lower the test frequency, the better the signal to noise ratio, but the noise frequency is too low, may not be good or bad; the center frequency is too high, the signal to noise ratio is too low, has been covered by the system noise, can not be compared.

测试还要注意系统的噪音，设备应该尽量工作在低噪音状态，可以不用外接基准就不用外接基准。能输出适合的强信号就输出强信号。

Testing should also pay attention to the noise of the system, the equipment should be as far as possible in the low noise state, you can use the external reference without external reference. Can output the suitable strong signal to output the strong signal.

4. 对比图 spectrum picture compare

测试仪器 test equipment

LG SA 7270 频谱分析仪 LG SA 7270 spectrum analyzer

马可尼 2024 信号源 marconi 2024 signal generator

IFR 2031 信号源 IFR 2031 signal generator

CMU200 综测 CMU200 radio services monitor

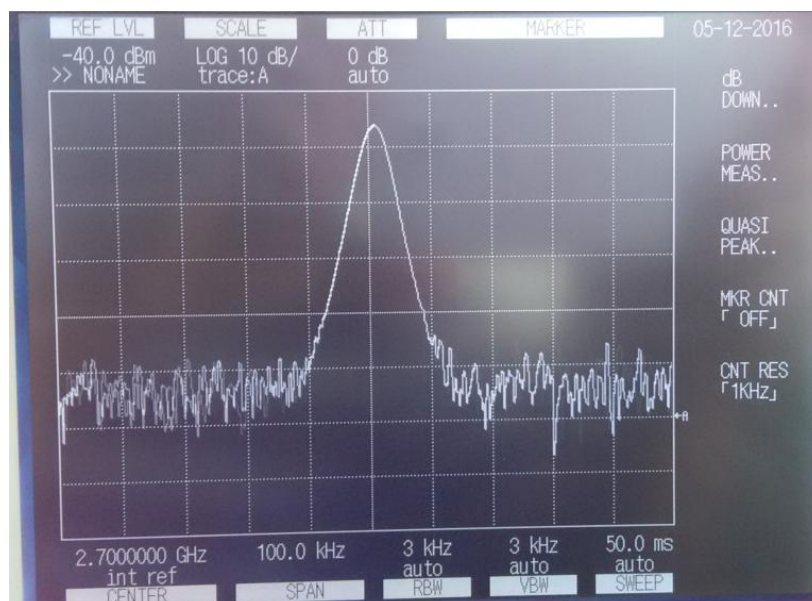
RIGOL 1022 函数信号源 RIGOL 1022 signal generator

倍频 IC frequency multiplier IC

4.1 10M 3DBM 信号对比 10M 3DBM compare

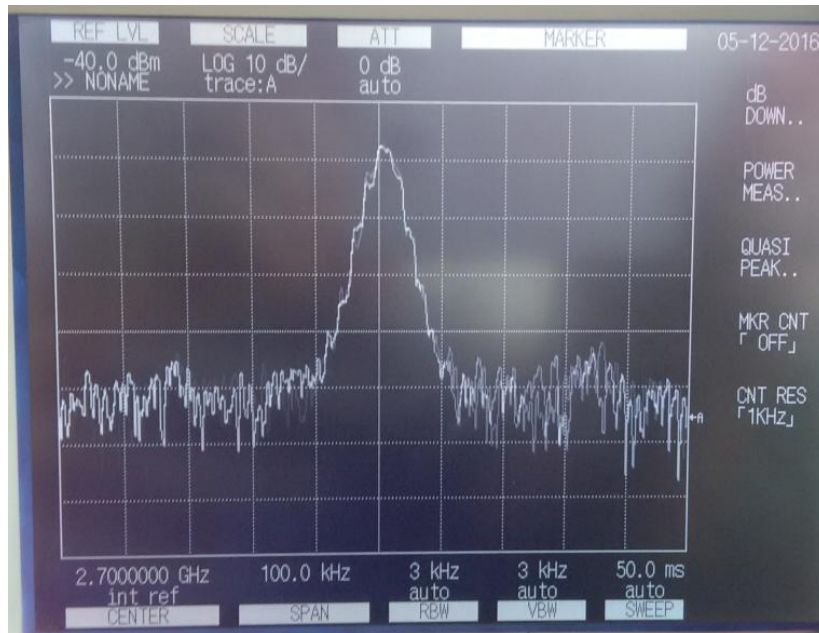
1, 马可尼 2024 信号源输出 10M 3DBM 不带调制信号

Marconi 2024 output

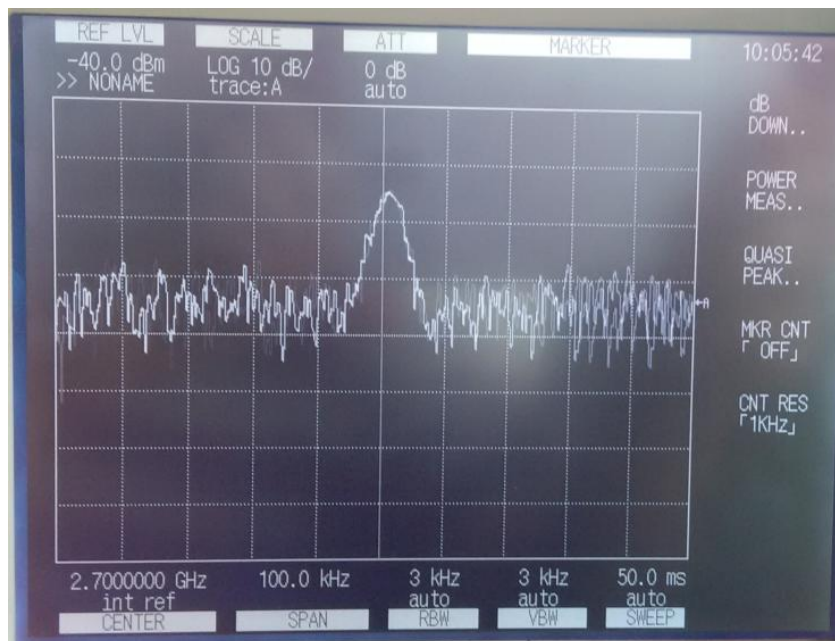


2, IFR2031 信号源输出 10M 3DBM 不带调制信号

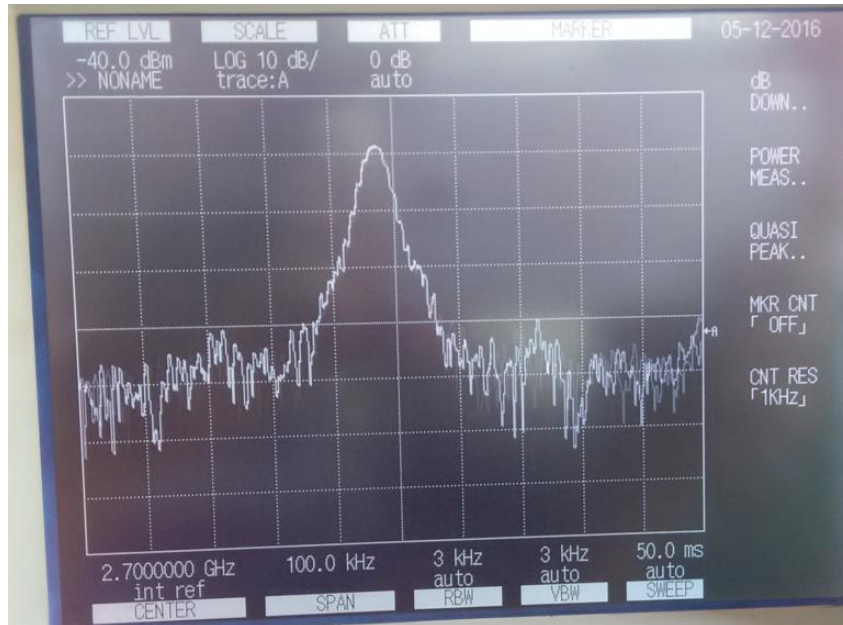
IFR2031



3, CMU200 综测 RF3 口输出的 10M 3DBM 信号
 CMU200 RF3 port



4, RIGOL 输出 10M 2.5Vpp 正弦波信号
 RIGOL 1022



1,2,3,4 张频谱图对比,

底噪, 1, -90DBM, 2, -89DBM, 3, -75DBM, 4, -87DBM 就底噪来说, 1 号最低, 3 号比较高, 4 号次之。

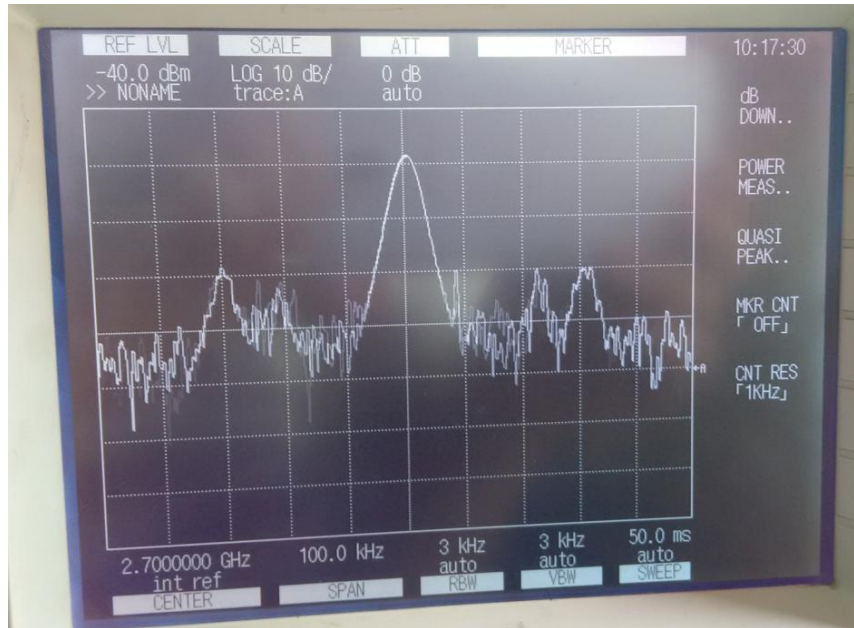
峰值曲线, 1 号最圆滑, 2 号应该带了调制, 3 号, 4 号都带调制了。

总结, 噪音水平好坏排列顺序, 1>2>4>3

Result noise level 1>2>4>3

测试过程中发现, 将 1, 马可尼 2024 信号源输出调到 9.999 999M, 噪音立刻变化, 比原来差了很多。而其他 3 台信号源均没有这个问题。初步估计 2024 信号源内部可能有问题。

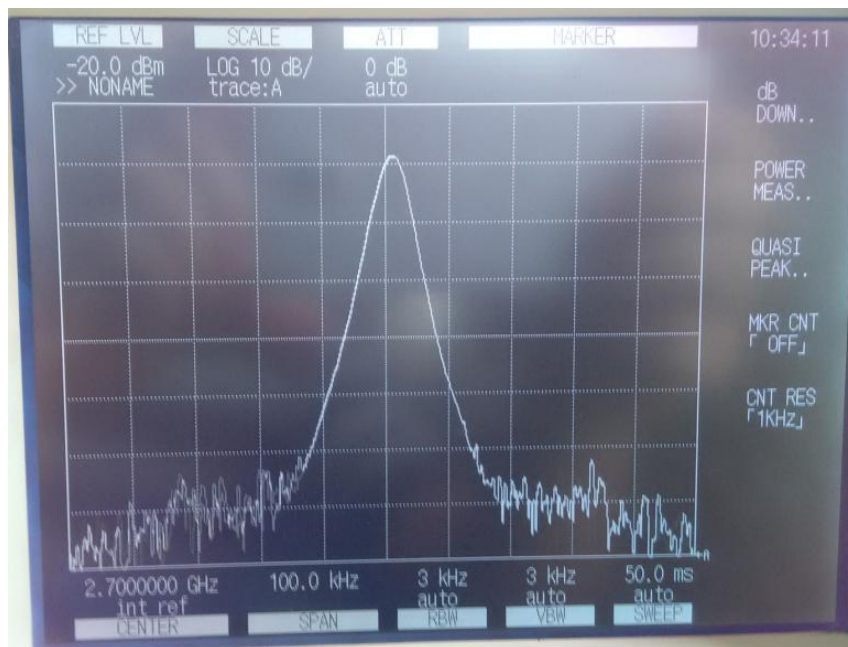
During the test, it was found that the 1, Marconi 2024 signal source output to 9.999 999M, the noise immediately changed, a lot worse than the original. And the other 3 signal sources are not the problem. There may be a problem in the initial estimate of the 2024 signal source.



4.2 100M 3DBM 信号对比 100M 3DBM compare

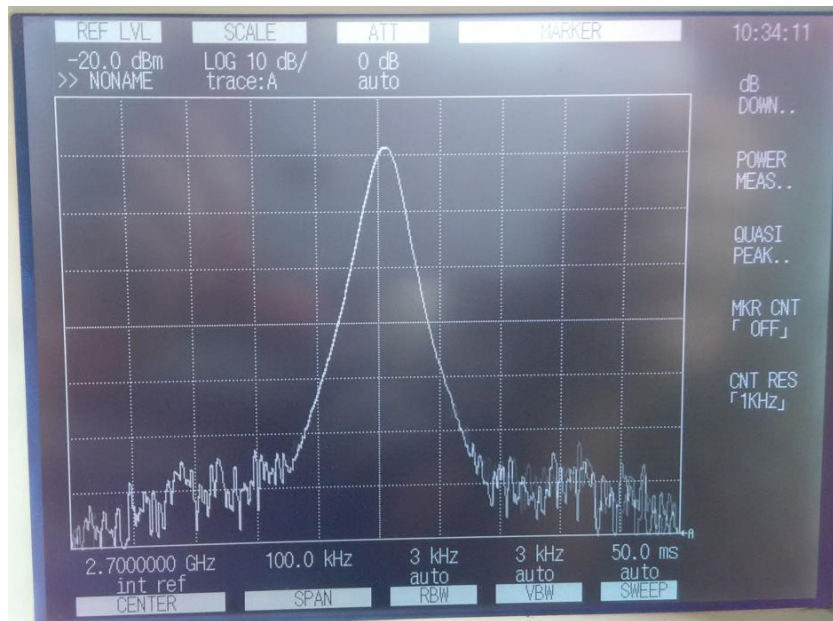
1, 马可尼 2024 输出 100M 3DBM

Marconi 2024



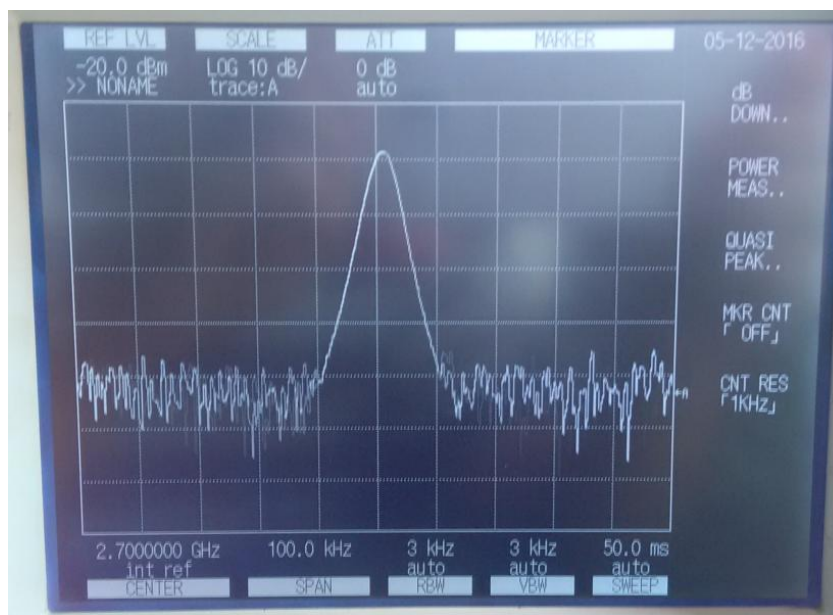
2, ifr2031 输出 100M 3DBM

IFR2031



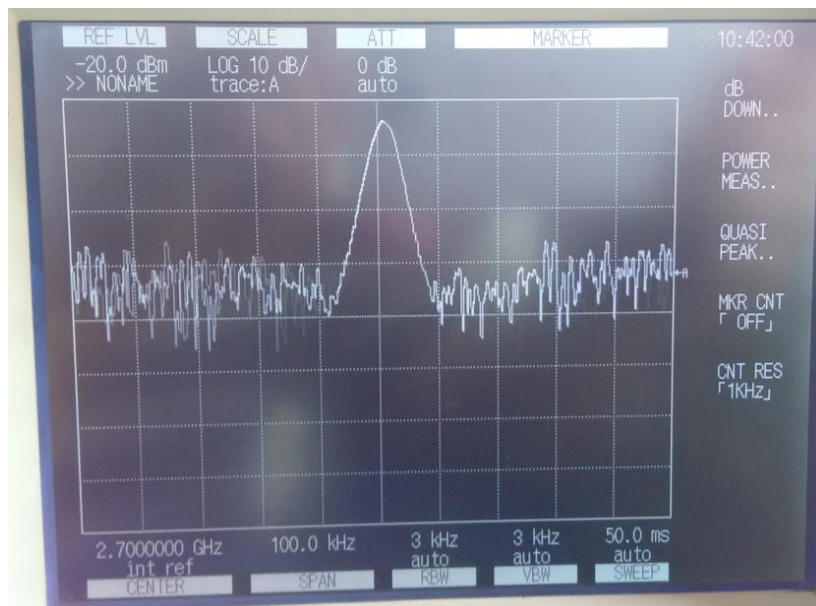
3, CMU200 输出 100M 3DBM

CMU200



4, 某 IC 倍频输出 100M 信号

ic



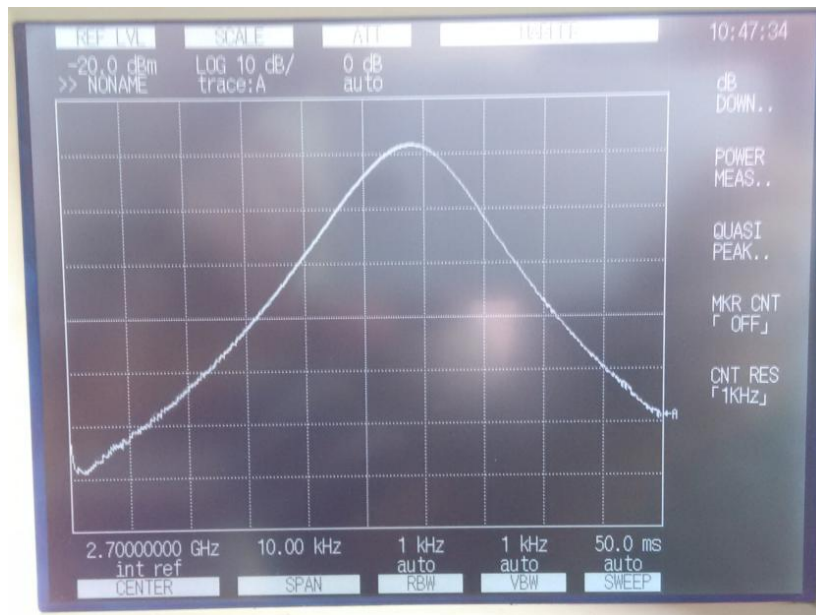
从对比可以看出，噪音好坏顺序为 $1=2>3>4$ ，其中 1,2 的噪音水平相当，4 的底噪比较高，内部噪音比较大。

From the comparison, we can see that the order of noise is $1=2>3>4$, and the noise level of the 1,2 is quite high, and the noise level of the 4 is relatively high, and the internal noise is relatively large.

将频谱设置为 SPAN=10K,再进行对比

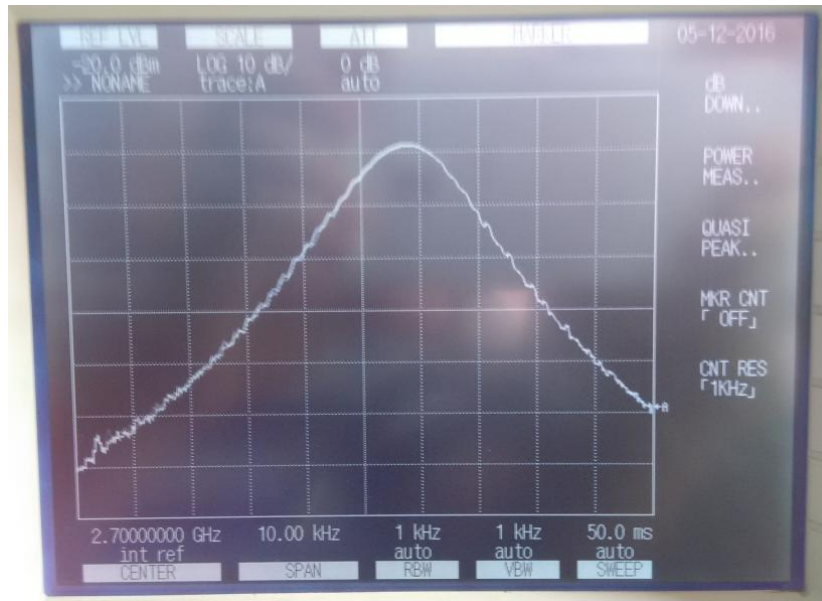
Setting SPAN=10K ,test。

1, 马可尼 2024 marconi 2024



2, IFR2031

IFR2031



结论：从频谱可以看出，2，的频谱有蚂蚁在爬，不够1的平滑，因此，可以判断，1的噪音比2的质量要好。

Conclusion: from the spectrum can be seen, 2, the spectrum of the ants in the climb, not 1 smooth, so that can be judged, 1 of the noise is better than 2 of the quality.