

2.4GHz蓝牙天线调试报告

2.4GHz Bluetooth ANT. report

测试项目与设备系统

Test and equipment system

测试项目 TEST

测试参数 Parameters of test

测试设备 equipment

1、S参数
(S parameter)

VSWR; Smith;

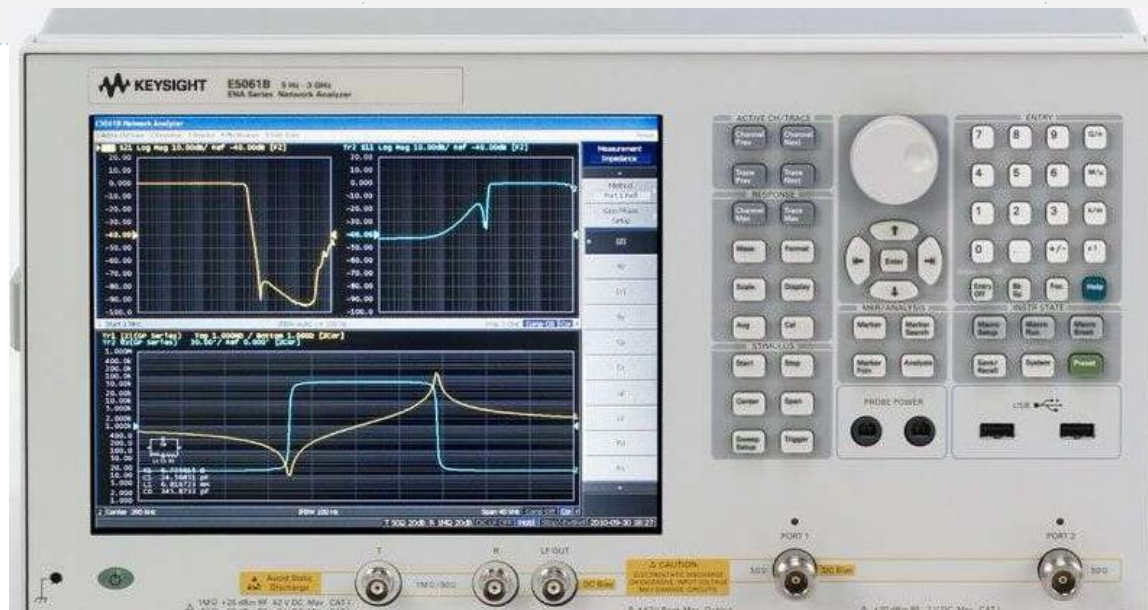
网络分析仪: Agilent 5071B

2、无缘测试
(Passive source)

Efficiency, gain test

综合测试仪: 网络分析仪: Agilent 5071B

微波暗室: 7*4*3 ETS Chamber



关键术语(Key Terms) :

VSWR:是电压驻波比的简称，指的是反射波波幅与入射波波幅的比值。当理想情况下阻抗完全匹配时，驻波比的值是1。在实际工程上，必然存在反射，此时的驻波比是大于1的，反射越大时驻波比也越大。因此对驻波比这个技术参数，数值越低越接近1越好。

Return Loss: 回波损耗RL指的是射频输入信号反射回来的功率与输入信号功率的比值。是以dB为单位，是一个负数。在理想情况下，天线与射频电路的阻抗完全匹配，完全没有反射功率，这时的回波损耗为无限小。但是在工程上阻抗不可能完全匹配，因此反射功率是一定存在的。最差的情况是输入功率完全被反射，此时回波损耗为0。因此对回波损耗这个技术参数，数值越低表示天线性能越好。

Effi: 效率指天线辐射出的功率（即有效地转换电磁波部分的功率）和输入到天线的功率之比。是恒小于100%的数值。

Gain: 天线增益是指：在输入功率相等的条件下，实际天线与理想的辐射单元在空间同一点处所产生的信号的功率密度之比，它定量地描述一个天线把输入功率集中辐射的程度。一般以dBi为单位。

Smith图: 阻抗圆图是指利用归一化阻抗与反射系数之间的一一对应关系，将归一化阻抗表示在反射系数复平面上的轨迹图。

TRP:即总辐射功率（Total Radiated Power），是移动台在三维空间上对有效辐射功率EIRP进行球面积分的积分值（球面平均值），它反映了移动台在所有方向上的发射特性。

TIS:即总全向灵敏度（Total Isotropic Sensitivity），是移动台在三维空间上对有效辐射接受灵敏度EIS进行球面积分的积分值（球面平均值），它反映了移动台在所有方向上的接收特性。

VSWR: short for voltage standing wave ratio, which refers to the ratio of reflected wave amplitude to incident wave amplitude. When the impedance is ideally perfectly matched, the value of the standing wave ratio is 1. In real. In international engineering, there must be reflection, and the standing wave ratio at this time is greater than 1, and the greater the reflection is, the greater the standing wave ratio is. Therefore, for the technical parameter of standing wave ratio, the lower the value, the closer to 1, the better.

Return Loss: Return loss RL refers to the ratio of the reflected power of the RF input signal to the power of the input signal. It's in dB and it's a negative number. In the ideal case, the antenna and the RF circuit impedance exactly match, there is no reflected power, then the return loss is infinitely small. But in engineering impedance can not be perfect. So the reflected power must exist. The worst case is that the input power is completely reflected, in which case the return loss is 0. Therefore, for the technical parameter of return loss, the lower the value is, the better the antenna performance is.

Effi: Efficiency refers to the ratio of the power radiated from the antenna (that is, the power that effectively converts the part of the electromagnetic wave) to the power input to the antenna. It's always less than 100%.

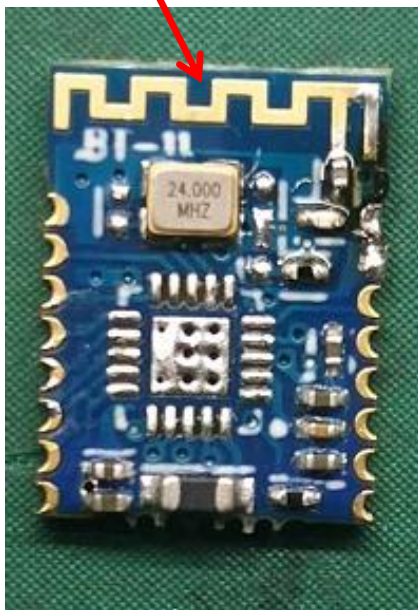
Gain: Antenna gain refers to the ratio of the power density of the signal generated by the actual antenna and the ideal radiation unit at the same point in space under the condition of equal input power. It quantitatively describes the degree to which an antenna concentrates the radiation of the input power. Generally, dBi is taken as the unit.

Smith diagram: Impedance circle diagram refers to the path diagram in the complex plane of reflection coefficient represented by the normalized impedance using the one-to-one correspondence between the normalized impedance and reflection coefficient.

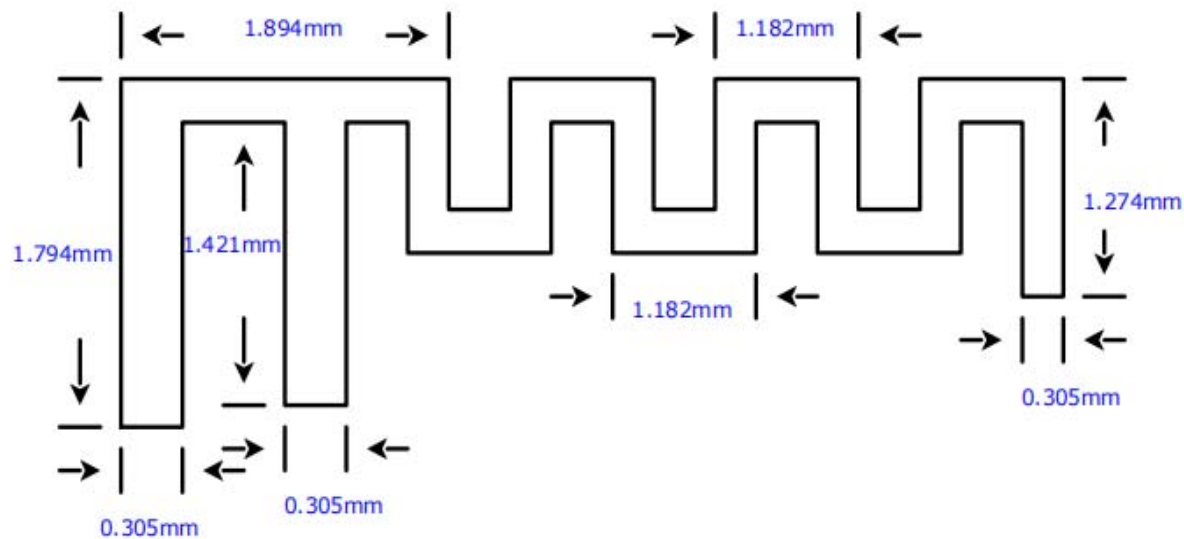
TRP: is the integral value of spherical integration of effective radiated power EIRP in three-dimensional space (spherical plane Mean), which reflects the transmitting characteristics of the mobile station in all directions.

TIS: It is the integral value (spherical average) of the spherical integration of the effective radiation receiving sensitivity EIS of the mobile station in three-dimensional space, which reflects the receiving characteristics of the mobile station in all directions.

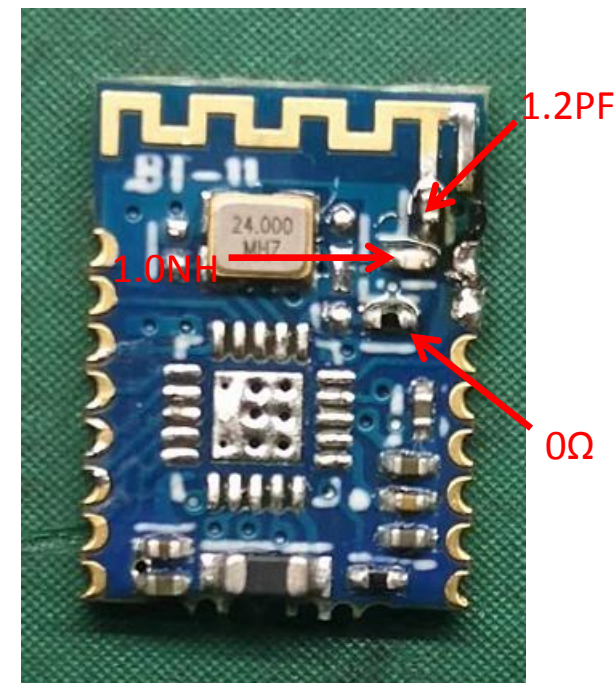
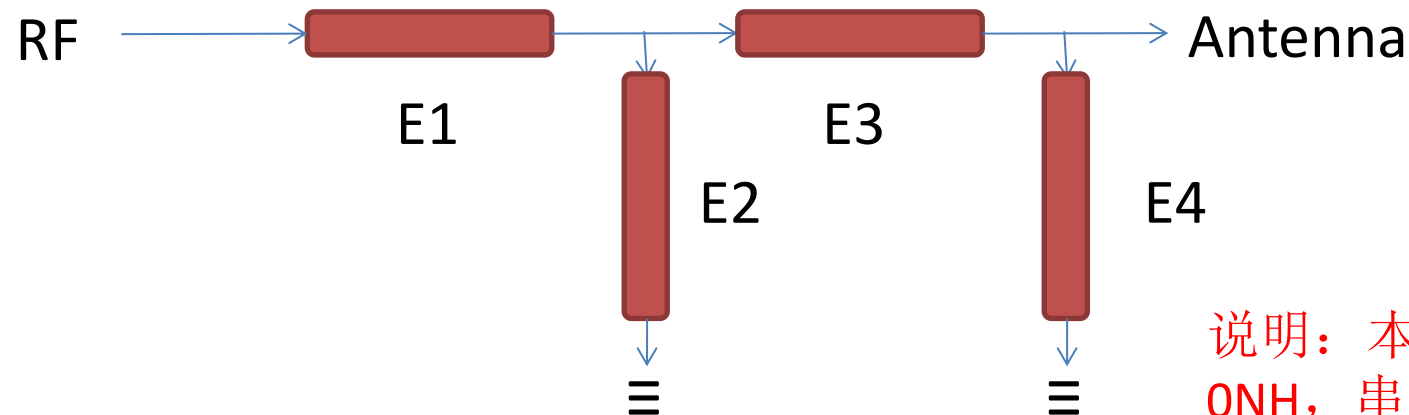
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PCB Antenna Dimension



E1	E2	E3	E4
0Ω	1.0NH	1.2PF	NA



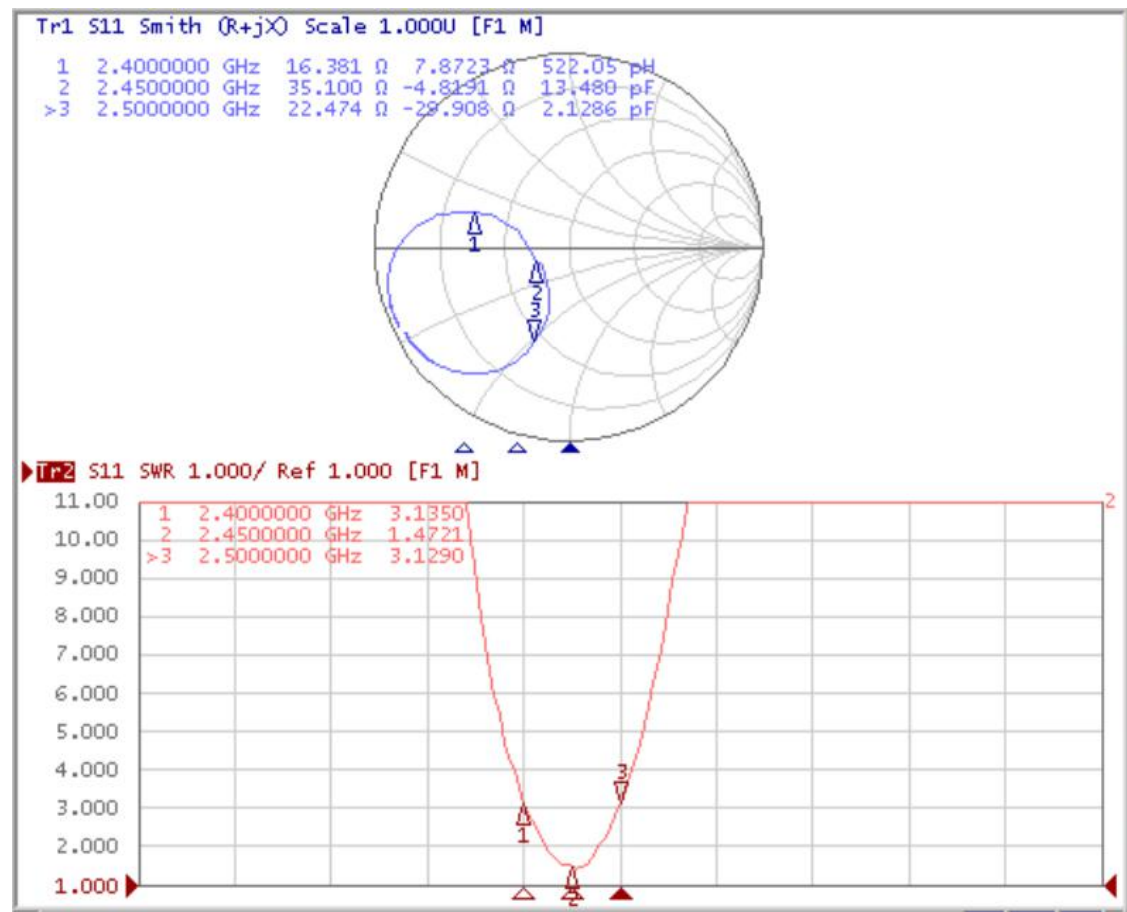
说明：本次调试在 π 型匹配第一个并位并联电感1.0NH，串位串联电容1.2PF。

Note: In this debugging, the first parallel inductance of π -type matching is 1.0NH, and the series capacitance is 1.2PF.

3.1-VSWR



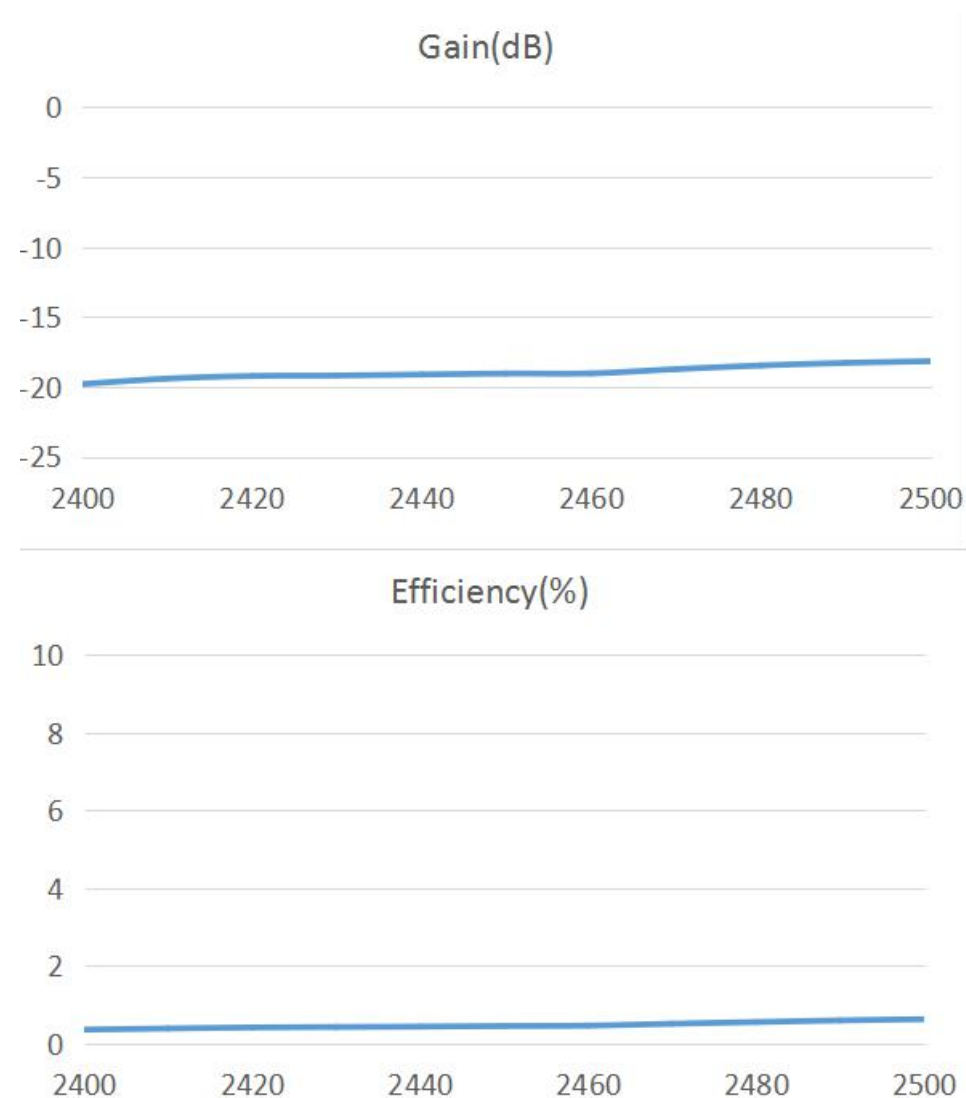
原始状态(The original state)



调试后状态(Post debug status)

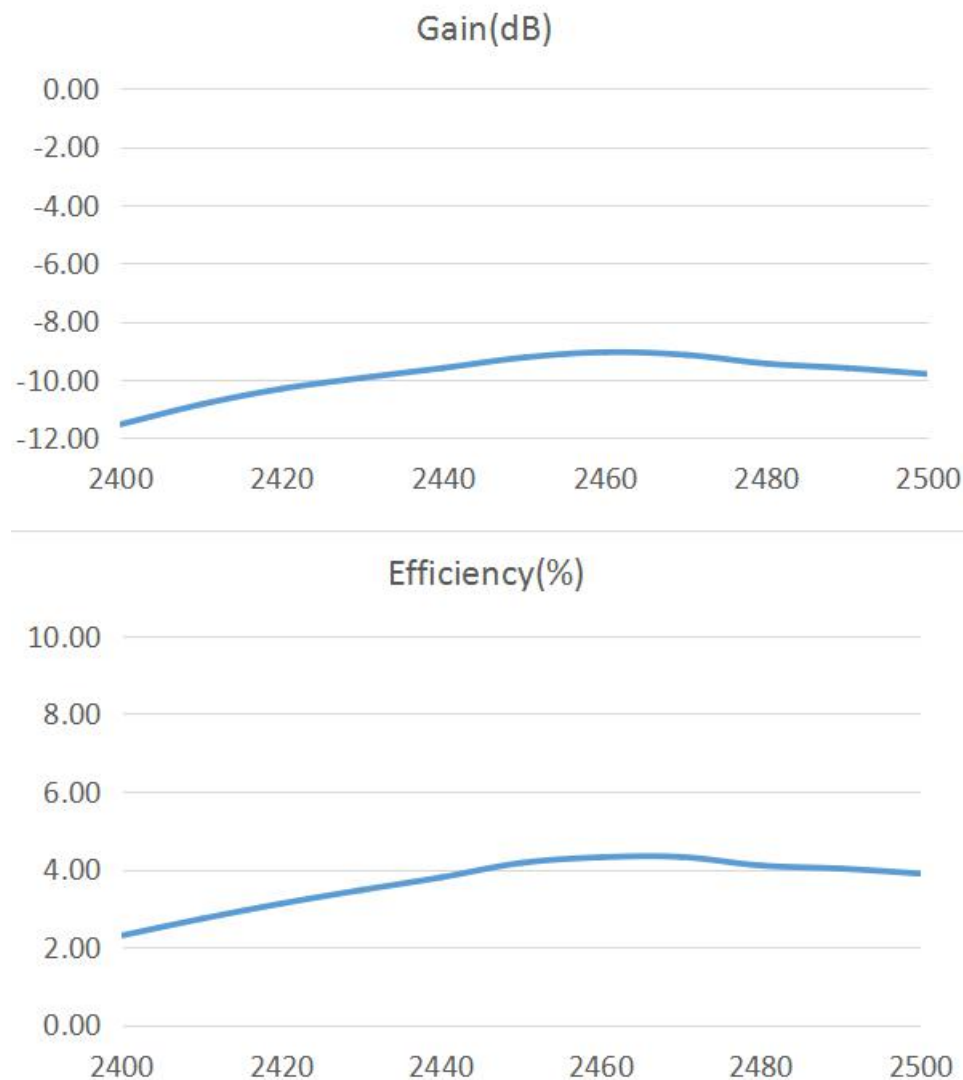
3.1效率、增益—原始状态 (Efficiency, gain - the original state)

Freq(MHz)	Gain(dB)	Efficiency(dB)	Efficiency(%)
2400	-19.78	-24.41	0.36
2410	-19.39	-24.06	0.39
2420	-19.21	-23.79	0.42
2430	-19.18	-23.67	0.43
2440	-19.10	-23.56	0.44
2450	-19.03	-23.41	0.46
2460	-19.02	-23.32	0.47
2470	-18.72	-22.89	0.51
2480	-18.46	-22.54	0.56
2490	-18.27	-22.22	0.60
2500	-18.15	-22.00	0.63

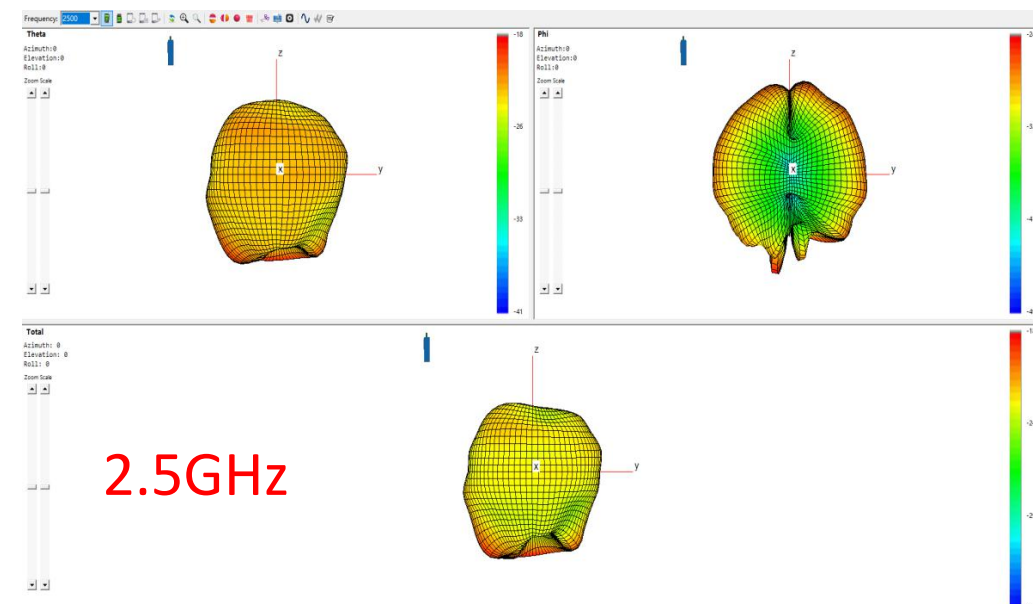
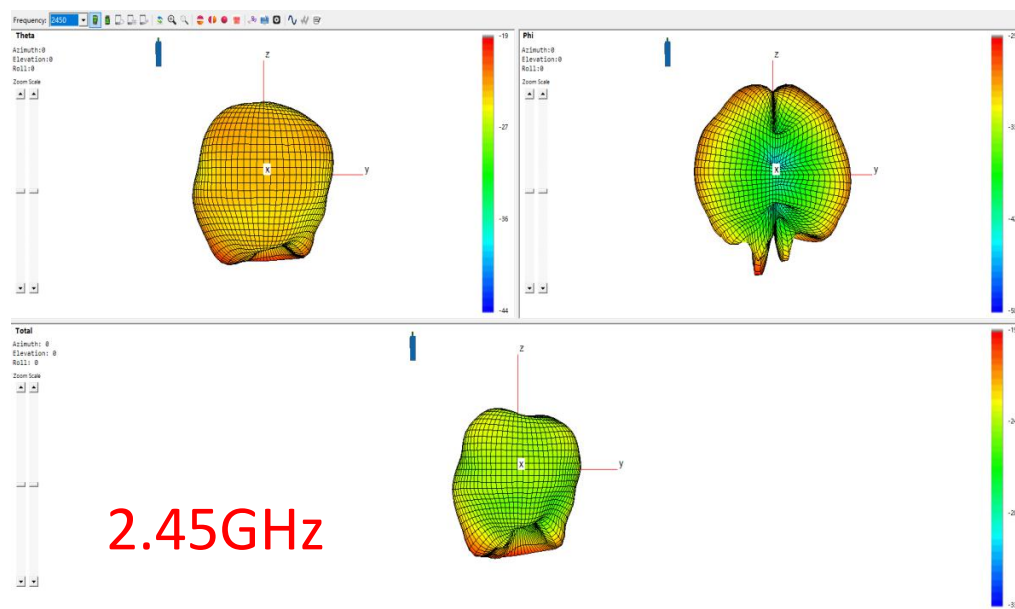
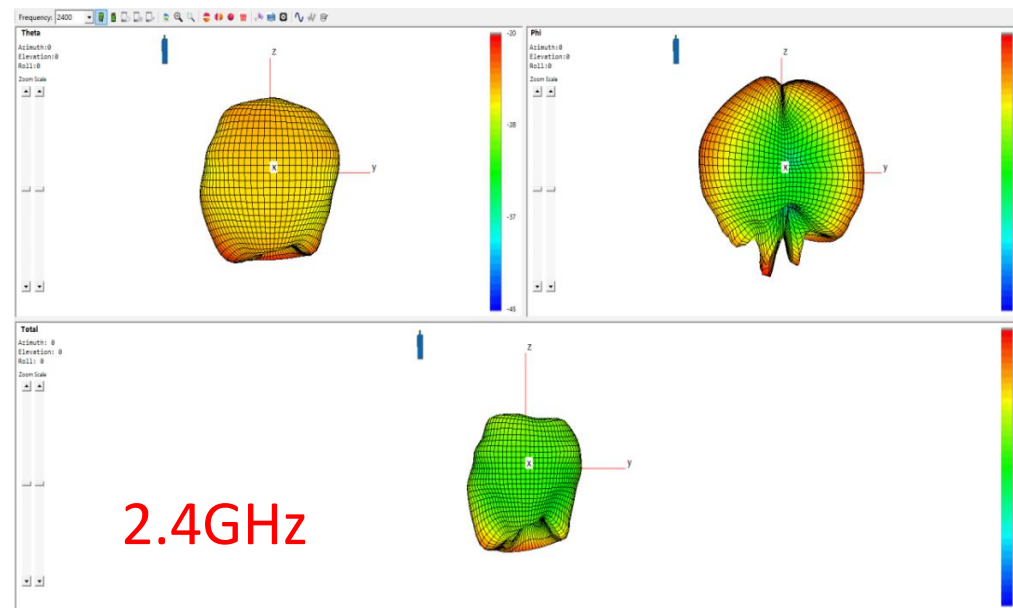


3.1-效率、增益—调试后状态 (Efficiency, gain - the original state)

Freq(MHz)	Gain(dB)	Efficiency(dB)	Efficiency(%)
2400	-11.53	-16.38	2.30
2410	-10.84	-15.64	2.73
2420	-10.30	-15.06	3.12
2430	-9.93	-14.60	3.47
2440	-9.59	-14.21	3.80
2450	-9.23	-13.80	4.17
2460	-9.05	-13.65	4.31
2470	-9.14	-13.64	4.32
2480	-9.44	-13.87	4.10
2490	-9.60	-13.96	4.02
2500	-9.80	-14.10	3.89

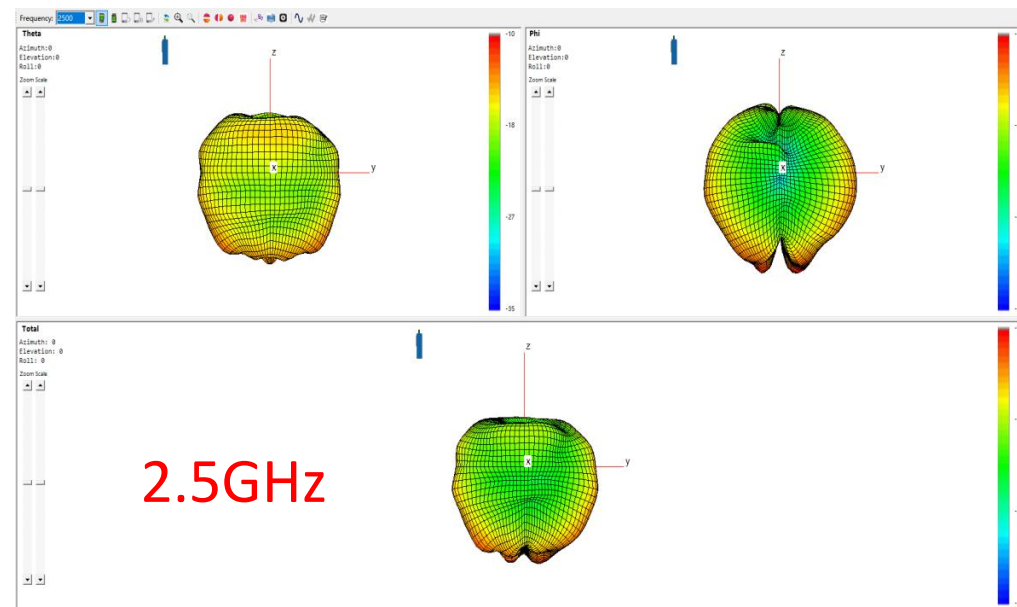
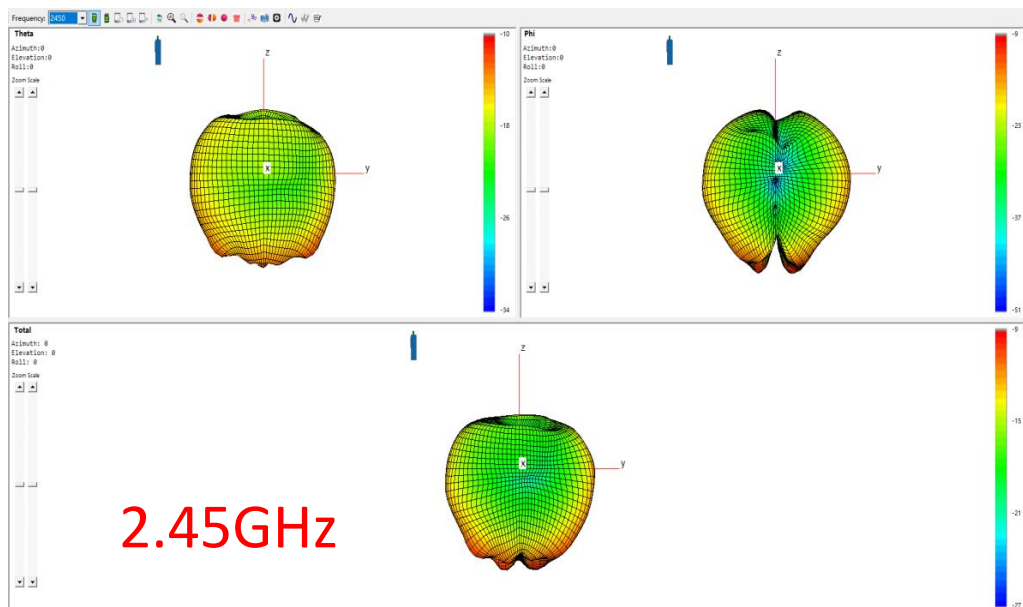
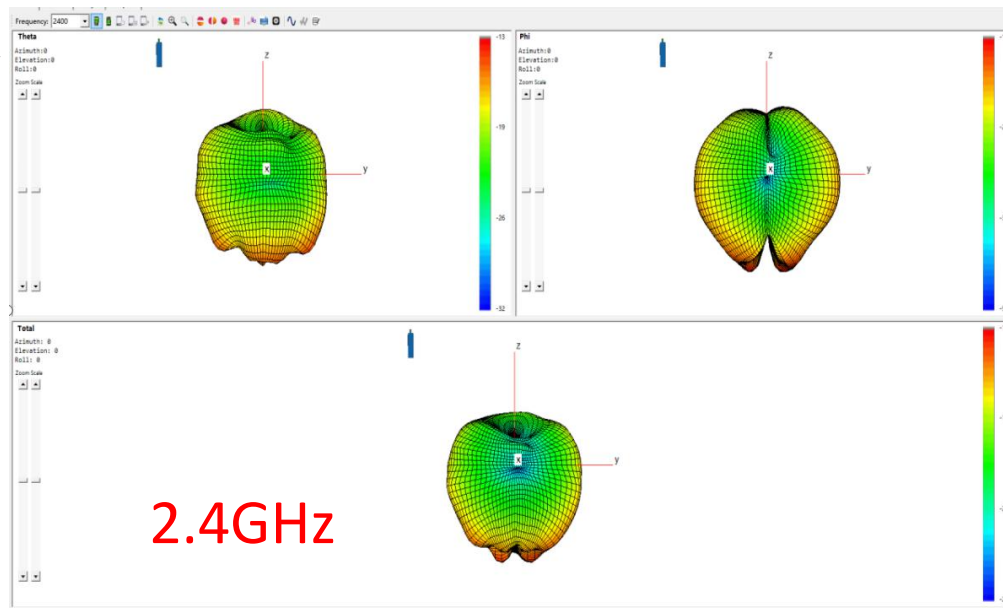


3.3-场型图—原始状态 Field Pattern Diagram - Original state



3.3-场型图—调试后状态

Field diagram
- Debug status



总结(Summary):

- 1、 以上为2.4GHz蓝牙板载天线调试数据；
The above is the debugging data of 2.4GHz Bluetooth on-board antenna;
- 2、 本次调试在 π 型匹配第一个并位并联电感1.0NH，串位串联电容1.2PF；
In this debugging, the first parallel parallel inductance 1.0NH and series capacitance are matched in π type 1.2PF;
- 3、 原始状态下天线频偏较严重，中心频率在5.1GHz左右，调试后的中心频率在2.45GHZ，且效率和增益均有一定提升；
In the original state, the antenna frequency deviation is serious, and the center frequency is about 5.1GHz, after debugging The center frequency is 2.45GHZ, and the efficiency and gain are improved to a certain extent.
- 4、 本次调试除了更改匹配参数未对板上器件进行修改
This debugging does not modify the devices on the board except changing the matching parameters;
- 5、 具体使用性能还需以实测为准。
The specific performance shall be subject to the actual measurement.

以上请客户考量，如有问题请联系，谢谢！

Please consider the above, if you have any questions, please contact, thank you!



THANKS FOR YOU