Near Field Measurements System From 0 to 100

Bofei Wang

We are living in an electric field world, mobile stations, WIFI routers are everywhere. And most of time people would like to get full signal to have the best experience. But some time high power radiation also is harmful for human's health. So how do the engineers to know the radiation, to ensure it is in a proper range both have good quality of service and not exceed health range? Measurement.

And now 5G is coming, more and more devices and will be used in the future, according to Ericsson's white book prediction, there will be 4.1 billion cellular IoT devices are connected in 2024. And many of these devices are deployed in a higher frequency broader band. So, one of the major differences of the 5G radios different with previous generations are the antennas, which called massive MIMO (Multiple In Multiple Out) antenna. For example, 128 small antennas will be arranged in one platform as a new antenna, in a more visualized way to understand it. This method provides more capacity for users. But to test this antenna can't use the traditional conducted way. Because the highly integrated antenna will be easily infected by the connections.

That's why we need test it over the air (OTA). For a regular antenna has near field and far field. In the near filed region has non-radiative part and radiative part. Usually we only concern the far field information for radio because we are using this region for communication.

Then there are 2 major ways to test it, one is far field measurement, which is directly and efficient method. Second is near field measurement, to calculate and convert the result to far field. From the field's name we can know near field has shorter distance than far field from antenna. Less space requirement means more flexible and money save.

Then my work is to build a near field measurement system to test 5G New Radio (NR). Use the devices already in the lab. And design a small suitable size of anechoic chamber (no electric wave reflection) for measurement. Then control scanning frame with code. And last calculate the near field data to far field.

It is harder than I thought. For example, there was a small probe needed in the measurement, I thought it will be a cheap component. But the cost is too much than beyond the budgets. Then, it took some time to find another way to cut it by us, saved a lot of money.

After those things. Finally, we build a near field measurement system which has basic function to measure the radiation patterns. Though it is not very accuracy but still could be a good tool for roughly pre-test for products.