Close-Field Antenna – ARF TEST

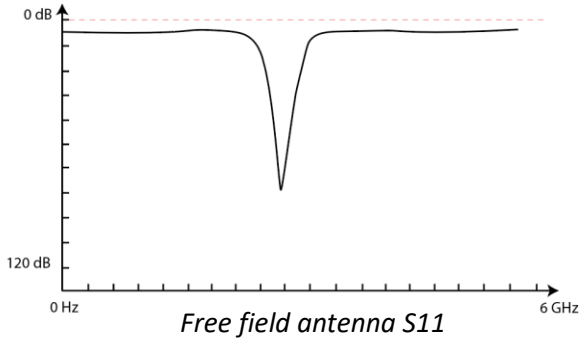
What is a “Close-Field” Antenna?

A close-field antenna, also called coupler, is an antenna which can be placed close from other objects, and which is not dependent from its environment. This means that you can easily integrate the antenna near the device under test, to ensure good measurement, low attenuation, and big stability.

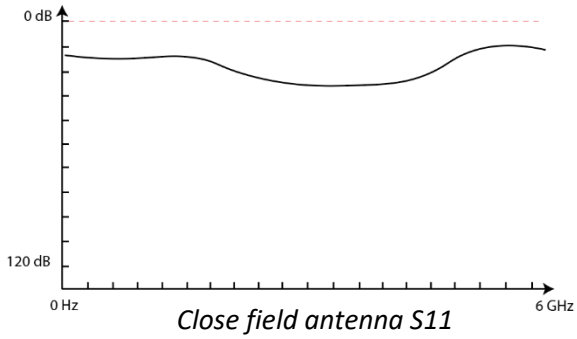
How does it work?

The close-field antenna is not tuned on a specific frequency or even on several frequencies as wide band antennas. That is why you cannot untuned it by approaching another object even metallic one.

Return Loss comparison between classic antenna and close field antenna.



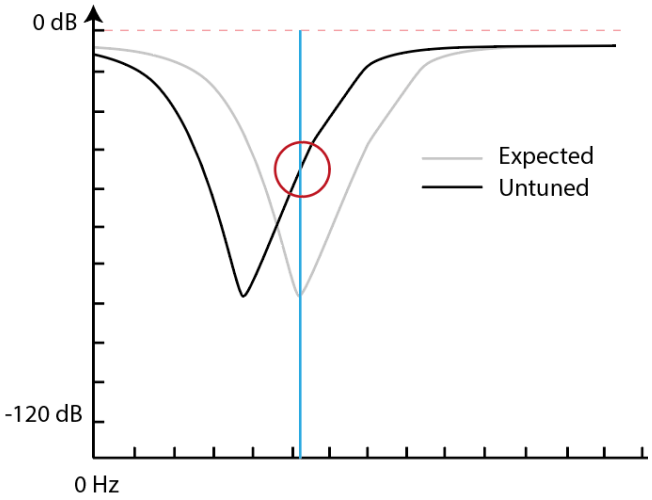
Free field antenna S11



Close field antenna S11

Why measurement stability is better?

The close field antenna purpose is to test radiofrequency products in test fixture and in faraday boxes. In this kind of environment with a free field antenna, the measurement is touchy because if the antenna is even a bit untuned, your measure frequency will be on the slope:



This way, the measurement stability is not good because of the slope, for any small displacement or vibration the measurement variation can be about more or less 10 dB or even more, which make the production very hard to sustain. Also, each time you need to replace the antenna, or the antenna moved during maintenance you need to stop production for several hours to remake radiofrequency calibration.

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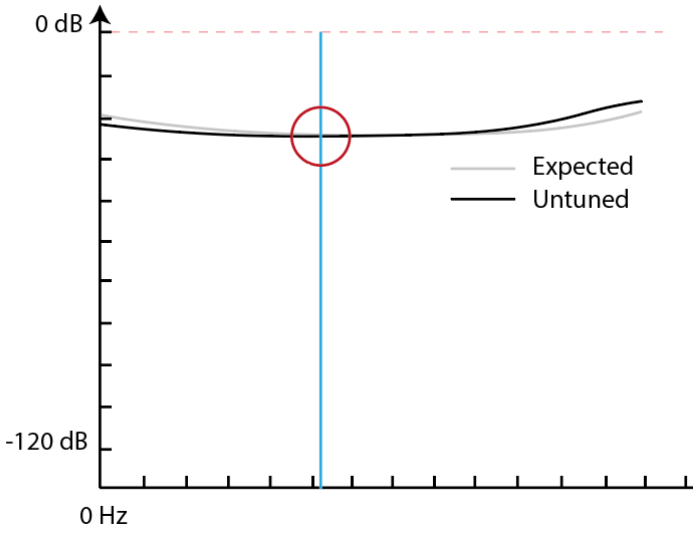
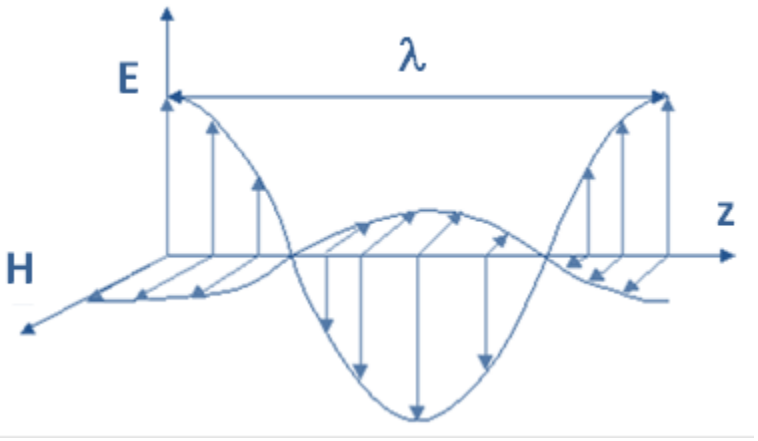


Since the close-field antenna is not tuned on a specific frequency, the variation caused by displacement, environment, metallic object around does not impact the measurement since the transmitting power remain within few dB.

Noise and reflection

A classic free-field antenna reach distance is important (several meters), which increase the odds to pick up parasite frequencies. Also, once you put it inside a faraday box you risk creating a lot of reflections, which can cause disruption for the DUT at least or kill your antenna efficiency at worst.



Indeed, an antenna's field is composed of vector fields, to illustrate the worst case if the reflection is λ/2 out of phase, the antenna's field will be completely cancelled, as if the antenna doesn't work at all.

On the opposite, the close-field antenna has a very short reach distance (up to 5 centimeters), this way you do not pick up parasite frequency easily and above all you limit hardly reflections on the faraday box edge.

➔ **<u>This does not mean that you can use it without faraday box, the disruptions from around still applies.</u>**

A good analogy is the audio signal:

The free-field antenna is like a common speaker / microphone, while close-field antenna is like a headset speaker / microphone.

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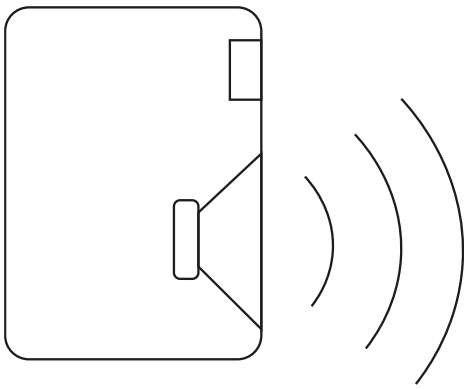


- Wide diffusion.
- Everyone hears.
- Sound quality depend on the noise around.
- If the room resonates you get distortions.
- If too much noise around, you need to amplify the signal.

- Short diffusion.
- Only the user hears.
- No more sound when taken out.
- Sound quality is not affected by the noise around.
- The environment does not matter.

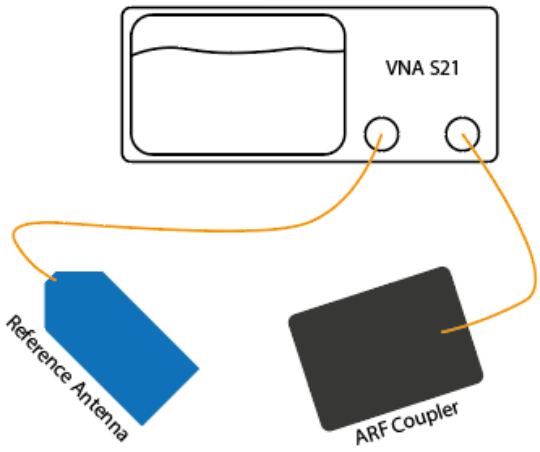
No need to amplify signal.

A common problem in radiofrequency measurement is when the signal power is too low, and you need to amplify it. Amplifying is not a problem when the signal is clean and pure, but when the signal is noisy you will amplify the noise as much as the signal itself.

With the close-field antenna since the reaching distance is short, the noise is significantly reduced, and the DUT's signal is very well captured. On average the measurement you'll get will imply 15 to 20 dB attenuation, which means that you don't need to amplify the signal, even you might need to attenuate it. Of course, these values are conditioned by the quality of the antenna you're testing.

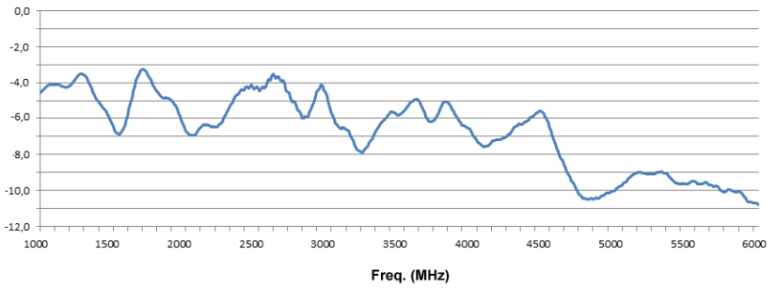
Our different close-field antennas.

First here is the testing method:



Reference Antenna: OmniLOG_70600

Antenna coupling loss:



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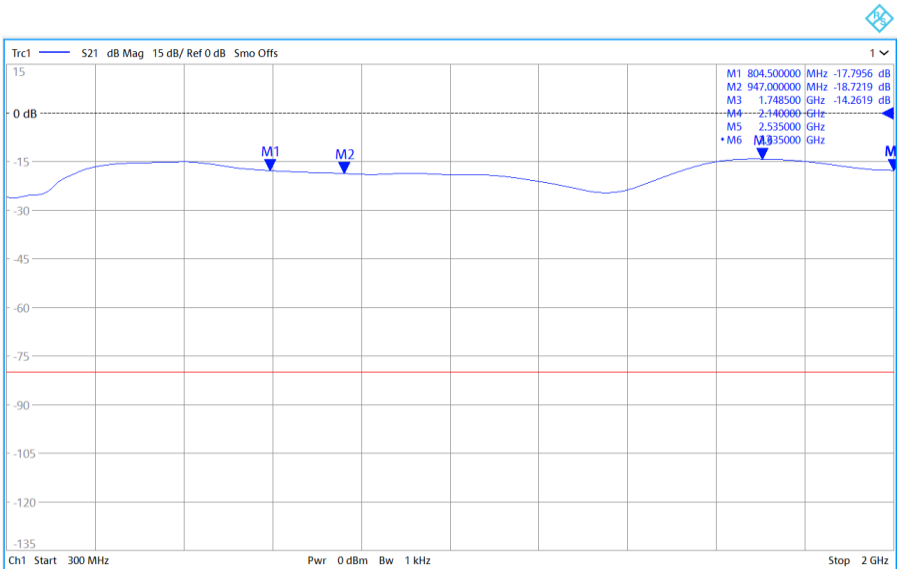
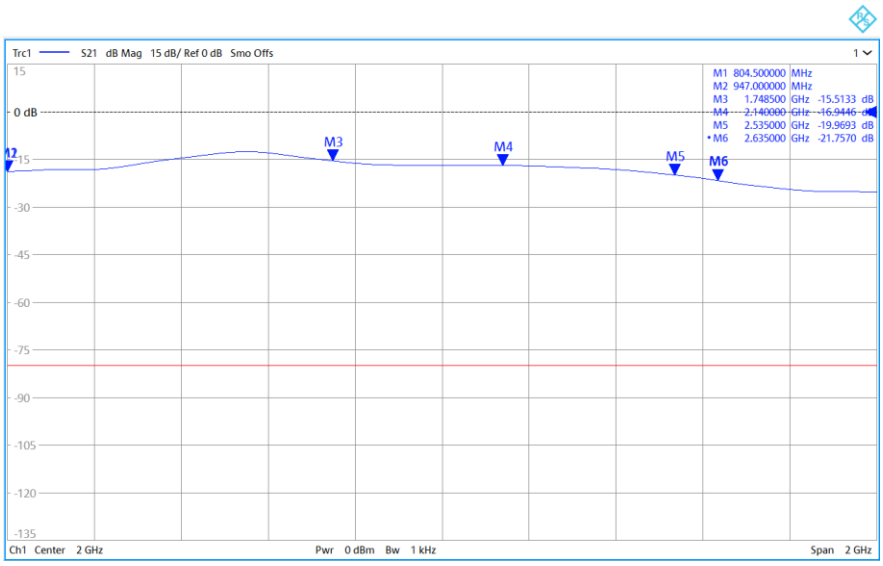
The Low Frequency coupler (Ref: ARF-LF Coupler)

From 300MHz to 2GHz, easy to use for 433MHz, 868MHz, GSM…



The 1 to 3 coupler (Ref: ARF-1.3 Coupler)

From 1Ghz to 3GHz, easy to use for 1600MHz, 1800MHz, GNSS, WiFi2.4…



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The WI-FI coupler (Ref: ARF-WIFI Coupler)

For 2.4GHz protocol, WiFi2.4, IoT…

The Wide Band coupler (Ref: ARF-WB Coupler)

From 1GHz to 6GHz, works well for WiFi2.4 & WiFi5.5