A set of near-field probes is an essential tool for troubleshooting EMI issues. Tekbox Digital Solutions has recently introduced a kit containing a set of three H-field, one E-field probe, and either a 20 or 40 dB gain broadband preamplifier. All this is included in a laser-engraved wooden box - a very nice touch. The probes may also be ordered without the preamplifier. I had a chance to try them out and compare with some similar probes.

**What’s In The Box?**

The kit includes three H-field probes (0.5, 1, and 2 cm in diameter), and one E-field probe with a 0.5 cm long probe (Figure 1). All appear to be built around a multi-layer PC board and are covered with a rubberized coating for insulation. All include a rather large rubber handle and are connected via an SMB coaxial connector. This type connector seems to be the norm for most of the newest near-field probes I’ve seen. While not as common as the SMA or BNC connectors, the advantage they hold is that they simply snap onto the coax cable, so are very quick to change one probe for another. The other advantage is that they allow rotation of the probe while following cables or PC board traces.

The kit also includes either a 20 or 40 dB gain broadband preamplifier that covers 3 to 3000 MHz and can take up to +10 dBm input safely. This would be useful for boosting the signal level from the probes - especially for the smaller-diameter probes, which are not as sensitive. The kit also includes all the connecting cables required for the probes and preamplifier. The instructions are complete and include typical frequency response plots. The review kit also included the TBWA2 20 dB gain preamplifier, which I felt would be more useful than the 40 dB gain model.
One thing I like is that the probes are flat, so they’ll fit between closely-spaced daughter boards or in other tight spaces. The larger two sizes seldom require a preamplifier, but the smallest one with 0.5 cm diameter loop will likely need a boost.
Preamplifier Gain Measurement

I measured the gain and flatness of the 20 dB preamplifier (Figure 3) and found it to be reasonably flat and approximately 20 dB, but gradually decreasing 2-3 dB at 1.5 GHz (the limit of my measurement).

![Figure 3](image)

*Figure 3 - The gain of the preamplifier measured 20 dB, gradually decreasing 2-3 dB at 1.5 GHz (the limit of my measurement).*

Probe Comparison

Next, I compared four recent H-field probe designs (Figure 4). These included the larger-sized probes from Rohde & Schwarz, Com-Power, Beehive Electronics, and Tekbox. I didn’t bother making a direct comparison of the other probes, but believe they should all measure similarly compared to each other as these larger probes.
Figure 4 - Comparison of the larger Tekbox H-field probe with competing products. Pictured are (top to bottom) the Rohde & Schwarz, Com-Power, Tekbox, and Beehive Electronics probes. All measured very similarly (Figure 5).

Figure 5 - A comparison of three probes measuring the same emission source. The frequency is 10 MHz to 1.5 GHz. Plots are: Beehive (yellow), Rohde & Schwarz (violet), and Tekbox (aqua).

The Beehive and Rohde & Schwarz probes measured about the same up to 300 MHz, then the Beehive lost some sensitivity from 300 to 700 MHz. The Tekbox probe was not quite as sensitive at the frequencies below 100 MHz, but seemed to match the Rohde & Schwarz probe pretty well elsewhere. All the probes tested should work fine for general troubleshooting. The Com-Power probe was not compared for this review.
Summary

While I’m going to have to get used to the large handles, the probes work well and seem about as sensitive as competitive products. The flat form factor allows the probe to reach into tight spaces. The 20 dB preamplifier I tested was reasonably flat and ought to work well for general troubleshooting. Absolute accuracy in the probe or preamplifier is not that important, as most troubleshooting requires relative comparisons. The set of four probes alone is $199. The probes and either 20 or 40 dB gain preamplifier set is $329. They are available from the Tekbox web store (linked from their site or in the U.S., from Saelig Electronics (link below). Recommended.

References

Tekbox Digital Solutions

Saelig Electronics

Wyatt, Advanced troubleshooting setups with the Rigol DSA815

Wyatt, Troubleshooting EMI on your bench top