# REVIEW: RFMAX RFID POWER MAPPER

5.07.15

**Description**

The RFMax Power Mapper is a compact tool to determine the radiation pattern for an installed UHF RFID transceiver system.
The device measures 3 x 4 x 1.5 inch (including the antenna) and weighs about 2 ounces.
It uses a linear (small whip) antenna. This antenna is mounted on a standard SMA female bulkhead connector and can be removed. When removed, the height of the device goes down from 4 inches to 2.75 inches.
The instrument is equipped with a toggle switch which adds 12dB attenuation when activated, which is to be used for measurements in near vicinity to a reader antenna, to prevent the meter from pegging out.
The instrument is based on an analog moving-coil meter. The whole system derives its power from the RF field, meaning no batteries are necessary.

**Test results**

Firstly, the instrument was tested with a standard 9dBic antenna fed by a 1 watt PEP RFID reader.
The mapper shows the boundaries of the field well, although an actual RFID tag reads a bit farther than the minimum meter indication. As long as the user is aware of this phenomenon, this is a good tool to get a quick impression of the functionality and proper operation of an RFID reader installation.
Also, the tool turned out to be very helpful in determining the circularity of the antenna pattern; by rotating it around its axis while being held at antenna bore sight, this works very well.
As it turns out, the sensitivity of the instrument does not change much from 850 to 930 MHz, so it can be used for both ETSI and FCC installations without the need for re-calibration.

Of course, for an instrument working according the principle of a passive RF detector, it makes a difference in sensitivity whether the reader transmitter is modulated or not (the latter defined as constant-wave), as the instrument does not have a peak-hold function; it only records the average amplitude of the transmitted signal. To be more specific; the lower the transmitted duty-cycle of the emitted signal is, the lower the indication on the instrument will be with all other things being equal. So if one wants to comparative measurements and/or more absolute measurements, the RFID reader transmitter should be switched to constant-wave operation when mapping the field with this device.

As a second test, the 12dB attenuator was activated, and the results compared against a 12dB decrease in actual transmitted field strength (with the meter attenuator off). This showed us that the 12dB attenuator indeed corresponds reasonably well with a 12dB step in attenuation (within 2dB accuracy which is very good for a low-cost tool like this)

As a third test, we also tested the detector output to monitor the detected envelope wave form on an oscilloscope. As it turns out, the detector can follow the modulation transitions without a problem, so the output signal is a good representation of the actual transmitted signal AM envelope.

Although we have not tested this yet, the SMA connector on this device would also allow for actual power measurements directly on the coaxial port of an RFID reader, on condition this would be done in combination with an additional RF attenuator. In this way, actual reader output power could be measured, assuming a one-time calibration would be done in the lab first for this instrument. This method could be a good alternative for taking an expensive power meter out on the road (like a Bird 43 and the like) .

**To summarize:**

We have found the RFMax power mapper to be an excellent and convenient tool when doing RFID reader installations; it fulfills all promises. This instrument should be a standard part of any RFID installer's tool box.