F&MM
Fragrant Mountain Microwave

Application Note

Turn-key Measurement

FM81 Serial Product's Technical Highlight

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Expand the Global Horizon of Innovation Invent the Future of Microwave Technology

Importance of Turn-key Solution in Advanced EM Testing & Measurement

Many customers understand the importance of measurement instrument, however, underestimate the measurement technologies. It is the latter, in practice, mostly determine the outcome of measurement, for reasons not limited to:

- Microwave and mm-wave measurement usually involve multiple instrument ranging from RF source, receivers, modules, servo systems, algorithms parameters, etc.;
- Different device under test (DUT) possess different specifications imposed from customer requirement, application environment, deployment conditions, etc.;
- Technician maybe not familiar with system level parameters tailored for optimal DUT specification;
- In R&D stage, many tests meant for identifying design failures, thus technologies adopted to clearly distinguish failures between DUTs and measurement system are vital to certain perspectives;
- During a product transiting from R&D to production stage, engineers and production manager maybe not familiar with quality control process and data management from massive production cycles;
- Because of serving multiple end-users, measurement technologies tend to be accumulated by testing system integrators, hence they would be able to identify current and future needs and design cost effective system;
- More and more intelligent systems such as 5G antennas, phased array systems, radar sensors, nowadays require on-line calibration measurement, thus interaction with DUTs become mainstream in measurement facilities.

For illustration purposes, let us take a Ka band satellite dish antenna for example. This is a narrow beam antenna that typically undertake indoor or outdoor measurement. The general measurement configuration using FM81 nearfield testing is shown in Fig 1.

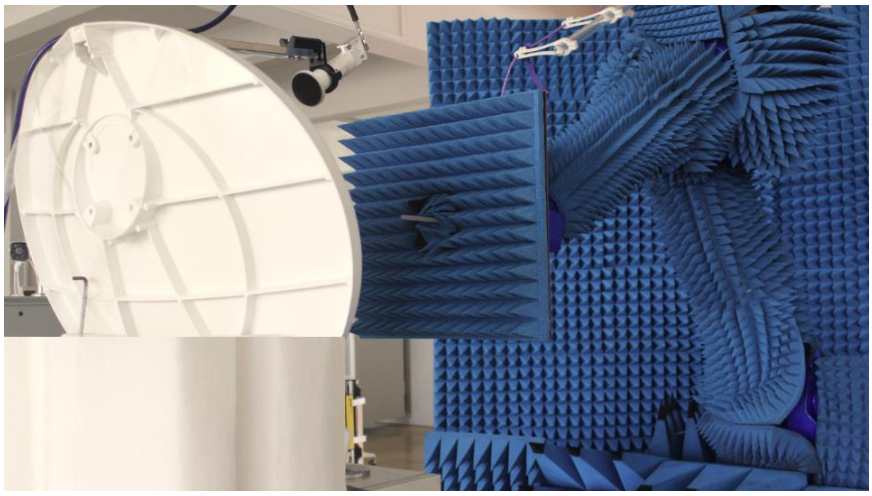

Fig. 1. Nearfield Range Measurement Setup for Satellite Dish Antenna

The general flowchart of turn-key process is given in Fig. 2 which involves hardware to software configurations. The major instrument or hardware involved given in column 2, and what we call measurement technologies are given in column 3.

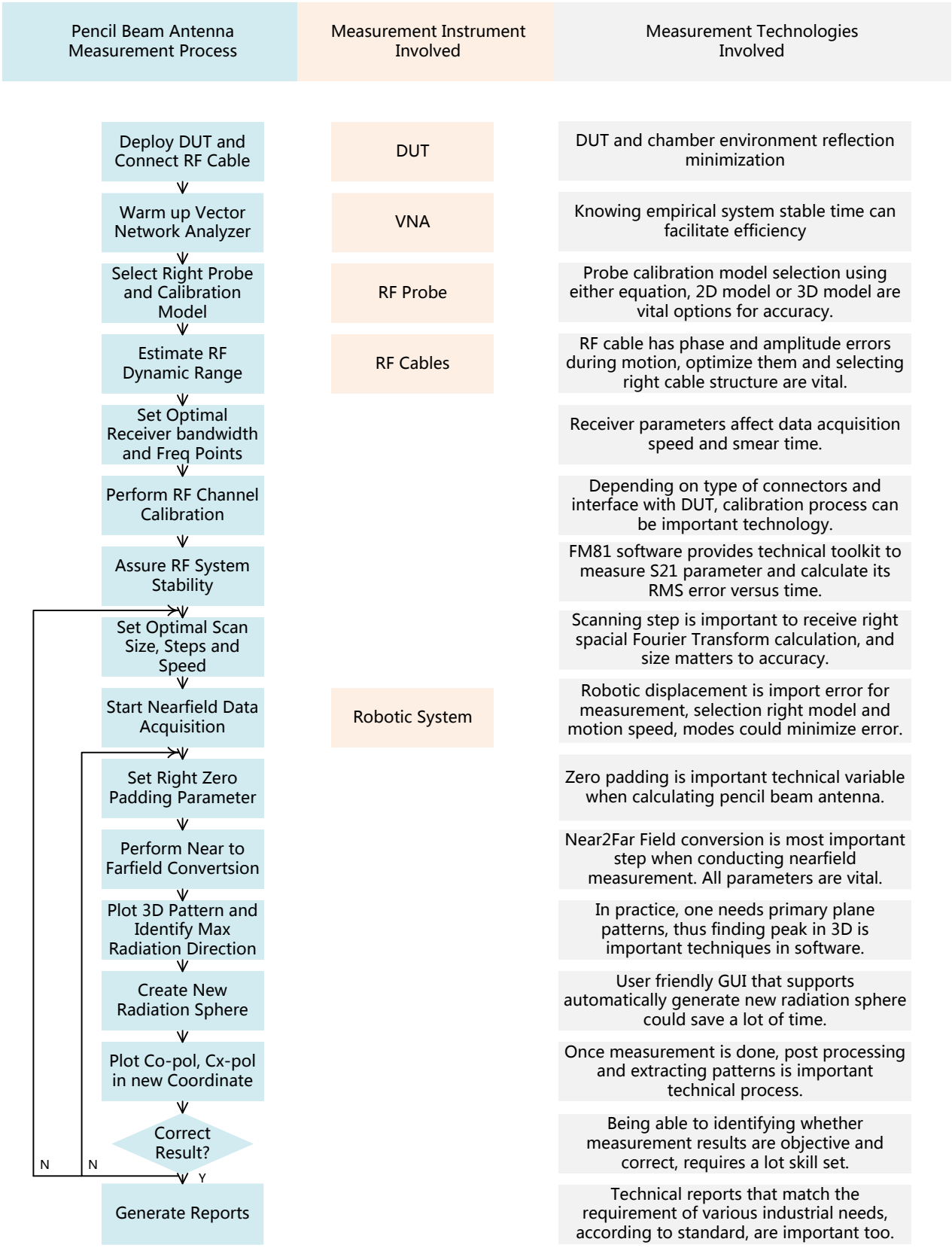

Fig. 2. Illustration of Measurement Technologies versus Measurement Instrument

One could clearly see the significant of measurement process and the technologies involved in each steps. This also explains why many testing laboratories may delivery quite different testing results while even using the same instrument. One cannot, certainly, treat microwave measurement as traditional Chinese chef, who can deliver quite different flavors of dishes by applying different process. Measurement and metrology experiment are such serious business that meant for recovering the true performance of a product, which mostly exists only one single solution. Turn-key measurement solution is one such professional means of approaching the ultimate truthfulness by minimizing all possible errors, and optimizing all possible freedoms.

Fig 3 shows one of the aforementioned processes control example for VNA stability analysis. It tracks the historic data and performs statistics analysis and tell if the RF system is stable enough to proceed for real measurement.

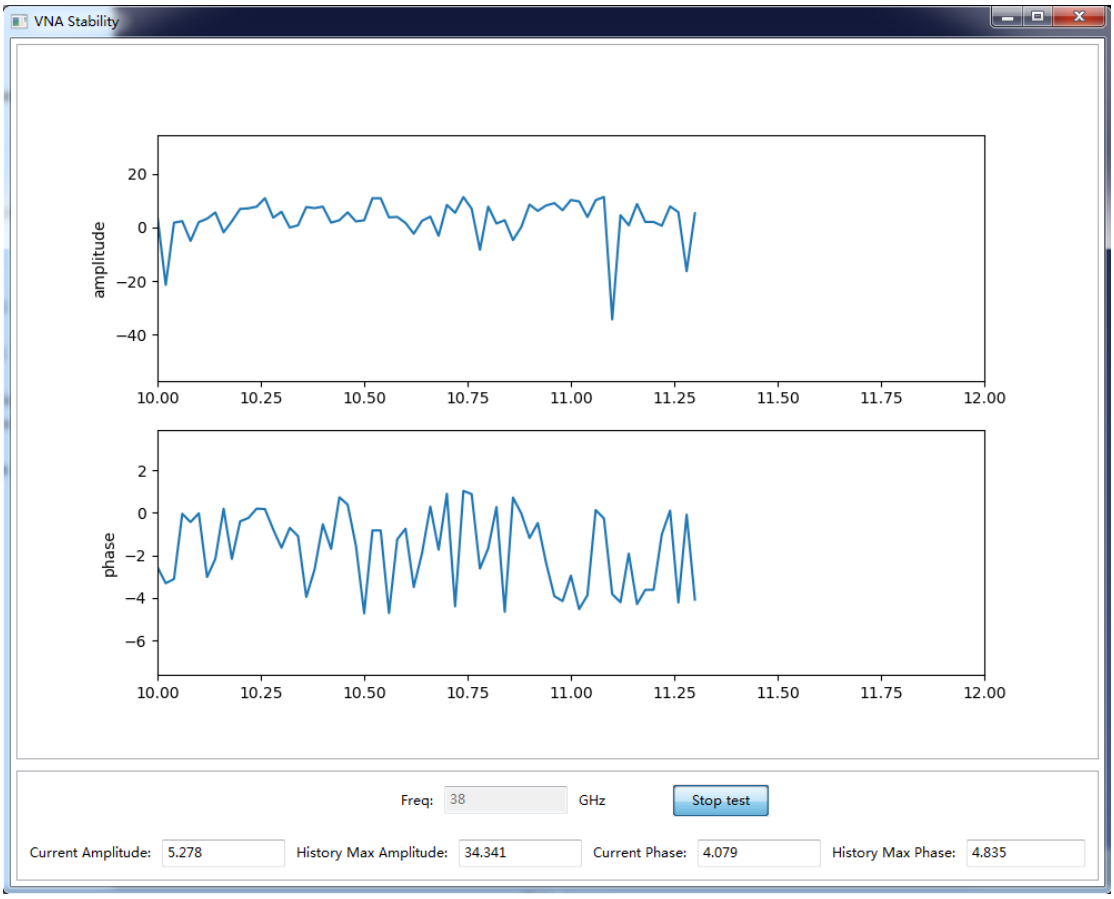

Fig. 3. Processes Control Example for VNA Stability Analysis

Fig 4 shows another example for visualizing the nearfield amplitude and phase data while the process is ongoing. It helps user to estimate the energy taper and estimate the optimal scanning truncation area.

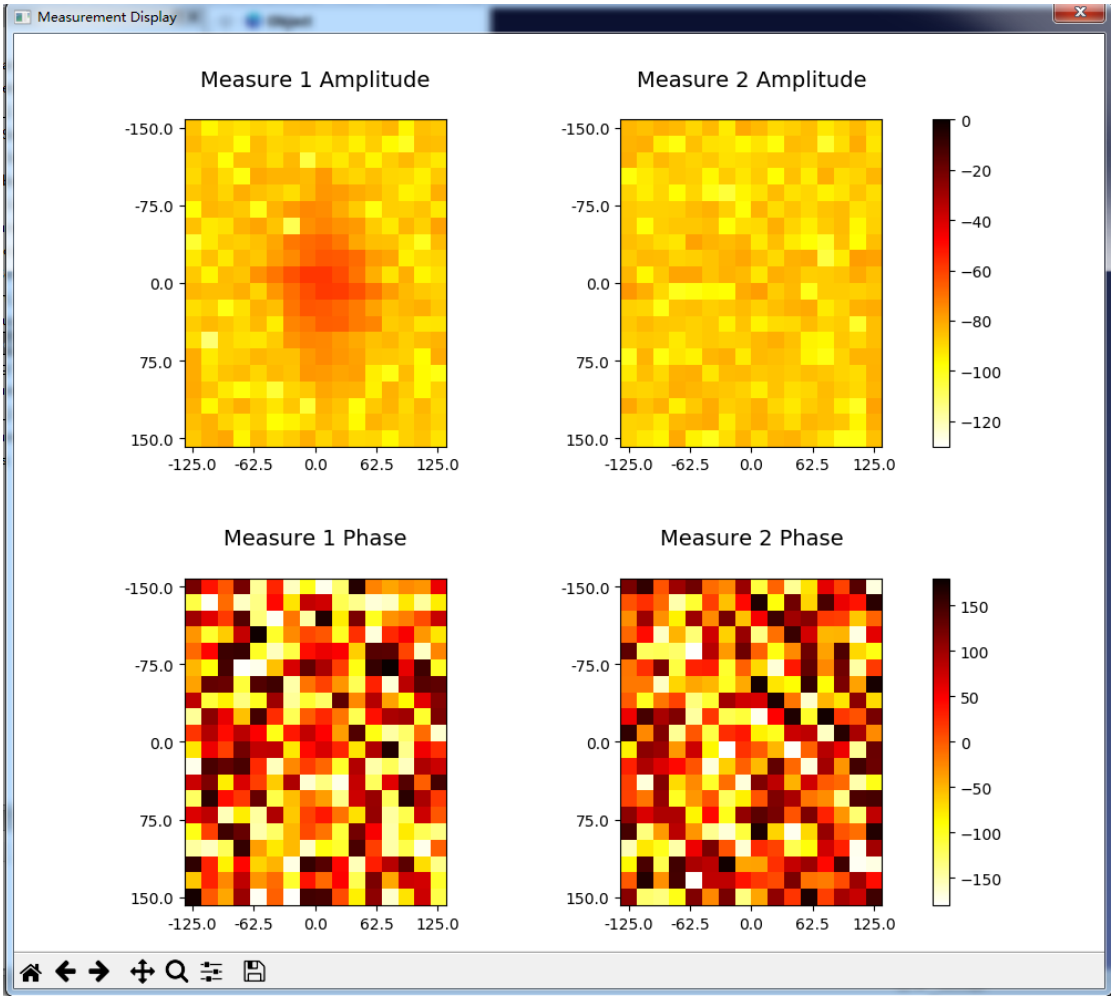

Fig. 4. Processes Control Example for Visualizing the Nearfield Data

To sum up, this document describes the importance of both measurement instrument and measurement technologies. Via realistic satellite dish antenna measurement process, we conclude that, under certain circumstances, measurement technologies can play even more vital role in the whole turn-key solutions.