




Application Note 

Turn-key Measurement

FM57 Serial Product's Technical Highlight

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 testing system is shown in Fig 1, which imply similar philosophy to FM57 products.

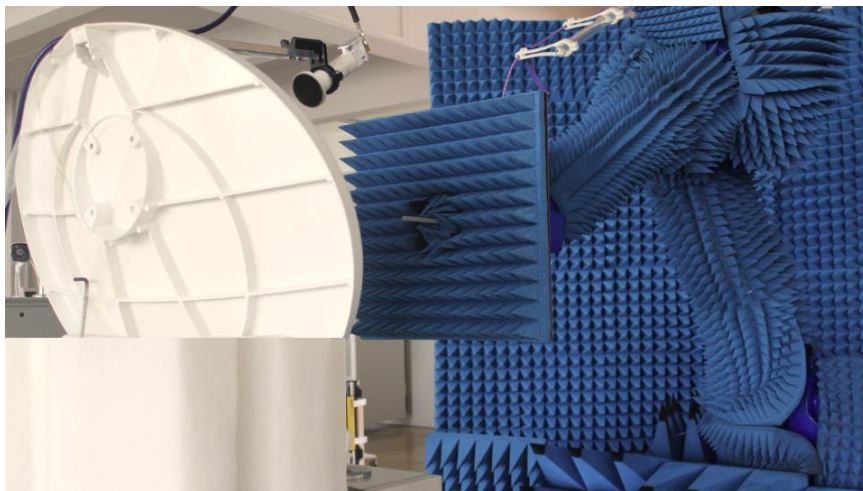


Fig. 1. Nearfield Range Measurement Setup for Satellite Dish Antenna

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.

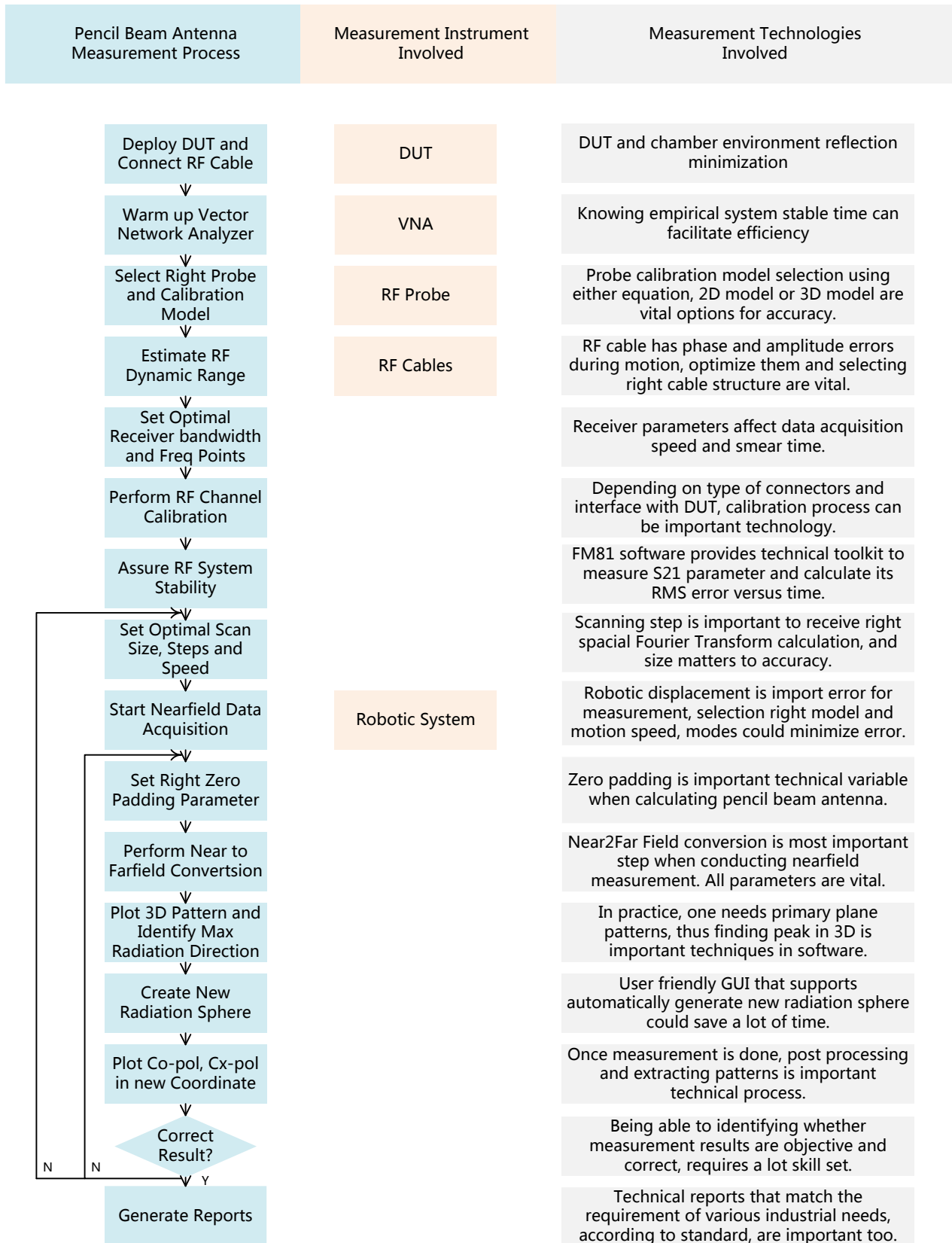


Fig. 2. Illustration of Measurement Technologies versus Measurement Instrument

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.

To take a few FM57 related applications for example, Fig 3 is a general setup for radome measurement using FM57 system. During our experiment, in order to achieve accurate data, surrounding EM environment, position distance, angular accuracies and proper selection of RF components all play certain roles. Proper manipulation of those freedoms is what we called turn-key measurement process. The process itself sometimes plays more significant role than the accuracy of single instrumentations.

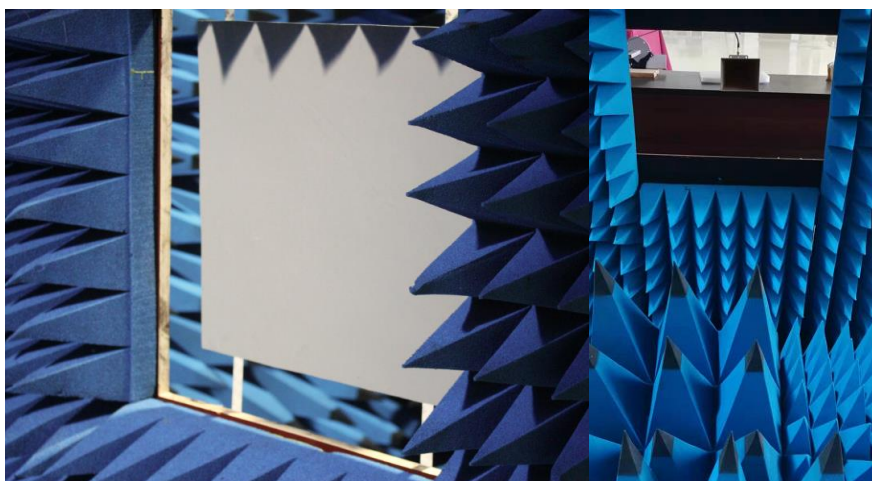


Fig. 3. Radome Measurement using FM57 Product

Fig 4 shows another example for FM57 applications. Absorbers as important RF materials are widely adopted for anechoic chambers, however, most commercial absorber has only performance data below 40GHz. FM57 is widely used in mm-wave automobile radar measurement, where optimal system performance around 77GHz is usually desirable. To build a turn-key measurement solution for it, studying the performance of absorbers at this frequency is an important technical process. Fig. 4 gives our measurement onsite photo for characterizing different sizes of absorbers at this frequency. Knowing absorbers offers our engineers richer knowledge to optimize the FM57 chamber and surrounding environment, which ultimately results in more rigorous turn-key solution for our customers.

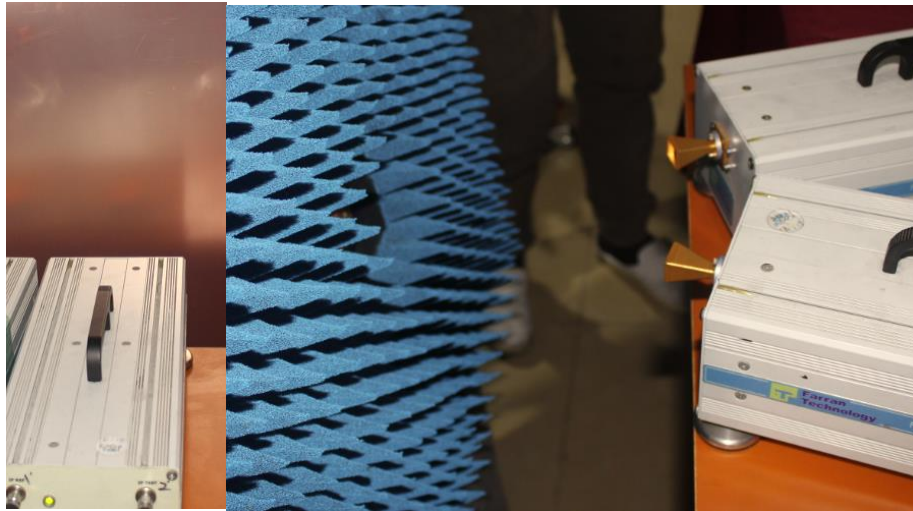


Fig. 4. Study of Absorber Impact for 60- 90GHz Reflections

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.