F&M
Fragrant Mountain Microwave

Measurement System

FM57 Product Brochure

Commercial Radar and Antenna Testing System in Chamber

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

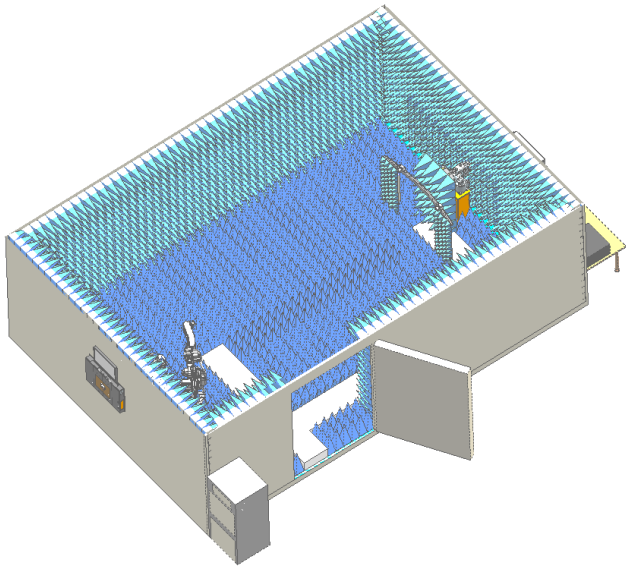
Doc.fm81brochure

Part 1 – FM57 Product Introduction

The product' s primary function is to effectively and automatically perform electromagnetic testing, analysis and QC verification for either R&D or mass production purposes in chamber environment. It supports 2-220GHz wireless measurement using innovative farfield technologies. Unlike traditional instrument, this product offers 6 degrees of coordinate calibration between the measurement system and device under test, benefiting from the robotic, laser, or machine vision technologies. Various experiment can be carried out in the chamber environment within relatively short period of time. This yields more accurate results and insight view of products than traditional methodologies.

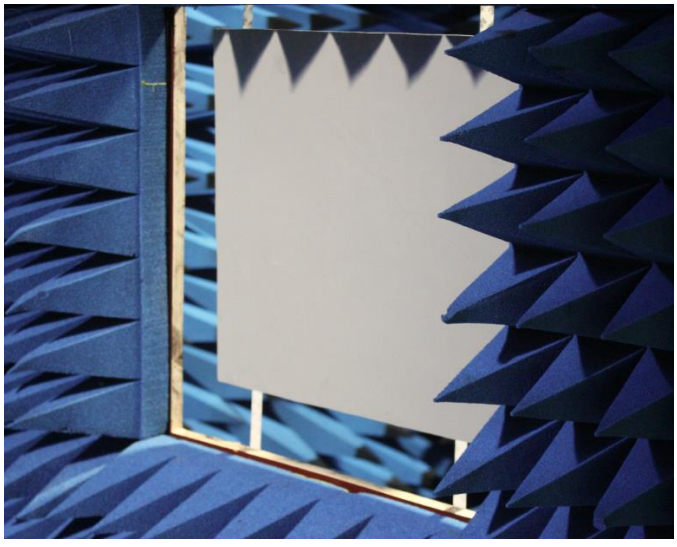
More specifically for emerging commercial radar industry, the product contains a proprietary software and a proprietary system positioning stations. The software allows user single clicking to configure device under test information and multiple configuration information of robotic system and Radar/DUT systems using manufacture embedded database, perform automatic system calibration, fully automatic measurement and QC report generation based on given customer specification. The product can seamlessly integrate with popular MES cloud platform which facilitates measurement during commercial radar system massive production.

- **Example in Automobile Radar Manufacture Industry**



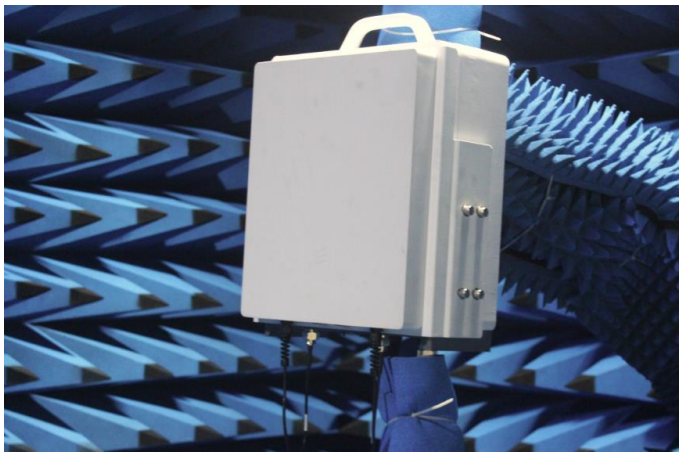
FM57 product could perform measurement and calibration of 24G/77G/79G/90GHz automobile radars during R&D and production phases. It could characterize either passive components like radar antennas, radiation elements and fully integrated radar products. The the latter, it could seamlessly interact with device under test to achieve automatic target angular calibration, ERIP pattern measurement, radar simulation, target angular resolution tests etc. We have various accessories to ease of customer' s product measurement, vehicular sensor placement and so on. One can also use FM57 product to measure regular antennas such as GPS, Wi-Fi etc for the automobile industry.

- **Example in Aerospace and Satellite Communications**



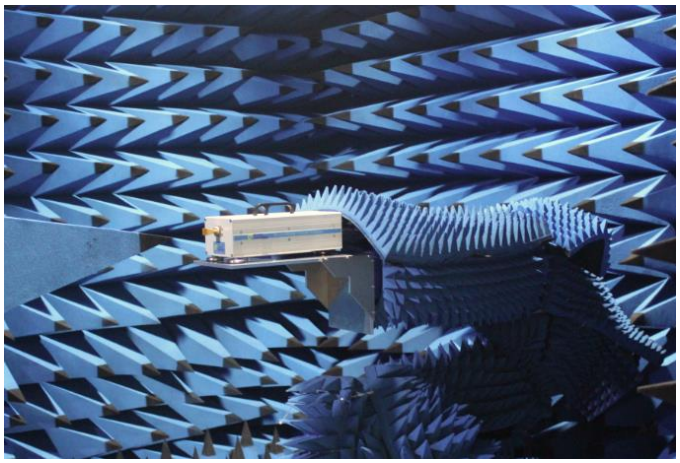
FM57 product could be well adapted in the aerospace and satellite industry to characterize the Beidou/GPS antennas, feeders for satellite dish antennas, VSAT RF components, Satcom on the move (SOTM) device, radome materials etc. For certain advanced space RF system, antennas parameters could play vital role in achieve optimal system, the 6-degree coordinate alignment feature in FM57 could greatly increase the measurement accuracy and efficiency. FM57 software allows one click configuration between switching testing modes, which is very important for many applications, where both passive and active parameters matter, such as radiation patterns, gain, EIRP, sensitivity, noise etc.

- **Example in Mobile Communication Industry**



Many products such as small base station, 4G/5G radio, mobile antennas, and radiation elements could be measured using FM57 system. With advert of electrical tilt, and multiple beams in the 4G/5G systems, being able to precisely shifting the beam toward line of sight direction can be critical practice, where classical rotary table may find cumbersome in both accuracy and efficiency. FM57 adopts software system that not only mimic all motion freedoms of classical servo systems, but also provide customized rotation reference to device under test coordinates.

- **Example in Education and Research Institute**



FM57 could be used in measurement and metrology laboratories for educational and research purposes. For instance, our customer adopts FM57 in absorber characterization for automobile radar systems, and study the radiation parameters for 77GHz antennas in farfield configuration. Other research topics range but not limited to, GPS gain and pattern measurement, radome insertion loss, absorber model extraction, gain extrapolation measurement, PCB loss tangent study for mm-wave antennas, etc. In educational environment, one can also use our laser and robotic 3D scanning systems to create academic experiments.

Part 2 – Product Competiveness

Many testing and measurement service providers focus on instrumentation technologies that fulfill their direct customer requirement. This is especially true for large corporations that demand a single product to meet all its direct customer needs, preferably aiming at volume production. For corporation like F&MM, we not only focus on markets of direct customer, but also we emphasize on our customer' s customer' s requirement. This brought us a lot of out of box thinking and imposed more interdisciplinary technologies in product development process. This product, which won fair appreciation from our loyal automobile radar manufacture customers, reflects the strength undertaken in existing passive antenna and emerging active radar testing market. The product itself is no longer an instrumentation for data acquisition, but rather an integrated turn-key platform that tells if product actually pass or fail, at the meantime, seemly establish data traceability from system integrator perspective. From our customer perspective, it is our product vision that possibly shortened the gap between R&D and massive production process of a newly demanded sensing product.

Table 1: FM57 Product Compared with Classical Technologies According our Empirical Experience

	Figure of Merits	Classical System	Classical Result	F&MM System	F&MM Results
1	3D Position Accuracy	<=0.5mm	Fair	<=0.1mm	Superior
2	6 Axis System Pointing Error	<=0.5deg	Fair	<=0.1 deg	Superior

3	Phase Center Displacement	Difficult to Adjust	Inferior	Easy to Adjust	Superior
4	Typical Axis of Motion	3-4 Axis	Good	6+ Axis	Superior
5	Self-calibration Capability	No	Inferior	Yes	Superior
6	Automatic Loading Efficiency	Possible	Superior	Possible	Superior
7	Colliding Axis	Semi-auto	Good	Full-auto	Superior
8	Radar Simulator Control	Possible	Superior	Possible	Superior
9	Angular Resolution Error	Fair	Good	Small	Superior
10	DUT Database Management	No	Inferior	Yes	Superior
11	QC Check Capability	Semi-auto	Good	Full-auto	Superior
12	Turn-key RD Capability	Partial	Good	Full	Superior
13	Customized RF Capability	Partial	Good	Full	Superior
14	System Simulation and Analysis Capability	Partial	Good	Full	Superior

Table 1 is a general comparison reference table with existing technologies according our empirical experience. Note this meant for casting the perspectives our R&D engineers have considered. The assessment rating results meant for extracting some highlight characteristics between FM57 and existing methodologies. For detailed rating philosophy, please feel free to reach us for further discussion.

Table 2 is a general comparison reference table with one domestic and one oversea competitors. Please note F&MM possess over 8 patents on FM57 related technologies. This table only meant for casting the perspectives we considered during product innovation. The assessment rating results meant for extracting some highlight characteristics between FM81 and existing players. For detailed rating philosophy, please feel free to reach us for further discussion.

Part 3 – Product Selection

FM57 has three categories of products to ease of product selection for various customer segmentations: Educational, Industrial and Aero types; and three standard sizes in S-Model, M-Model, and L-Model. Please refer to Product Selection Guide for detailed specifications.

Part 4 – How to Buy

Contact our regional sale representatives or reach us directly.
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Table 2: Most Similar Product Competiveness with Domestic and Oversea Players

#	Product Aspects	One Domestic Player	One Oversea Player	F&MM
1	Proven robotic measurement technologies adopted in Chinese industries	Fair	Good	Good
2	Ease of upgrading from Sub6Ghz, Ku, Ka, to E-band and 220GHz applications	Fair	Fair	Good
3	Compliance to ETSI/FCC/ANETEL/IC/APMC/IEEE/etc International Standards	Fair	Fair	Good
4	Full Documentation/Toolkit/Service in both Chinese and English	Fair	Fair	Good
5	Typical Business Model Competiveness	Subsystem	Subsystem, Turn key	Subsystem, Turn key
6	Designers Background	System Integrator, Servo systems, Software	System Integrator, Embedded System, Software, Component Designer	System Integrator, Embedded System, Software, Component Designer
7	Algorithms, Level of Research Capability	Fair	Good	Good
8	Field and RF Simulation Capability	Fair	Good	Good
9	RF Quality Diagnosis and Error Correction Efficiency	Fair	Fair	Good
10	Quality Control Process	Fair	Good	Good
11	Motion, Motor Systems	Low/mid Hybrid Brand	Top Brand	Top Brand
12	Servo, Encoder System, Drivers	Low/mid Hybrid Brand	Top Brand	Top Brand
13	Precision Parts Requiring Years of Stability	Commercial Grade	Industrial/Mil Grade	Industrial/Mil Grade
14	Surface Treatment	Fair	Good	Good
15	Electronic System Environmental Stability	Fair	Good	Good
16	Process Control during Design/Manufacture	Fair	Good	Good
17	Customer Core Value Orientation	Deliver @minimum cost	Deliver what specs require	Deliver what specs and what exceeds customer expectation
18	Life Cycle Support Orientation	Short	Long	Long
19	Cost	Low	High	Mid
20	Local Support Capability	Fair	Fair	Good