DESIGN SPECIFICATION
Part Number: MF20116

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DESIGN	**INTERNAL ANTENNA**
MODEL / TYPE	**SM-A245M/DSN / MAIN1 INTENNA**
KYOCERA AVX P/N	**MF20116**
SEC CODE	**GH42-06967A**
CUSTOMER	**SAMSUNG ELECTRONICS CO., LTD.**
SUPPLIER	**KYOCERA AVX INC.**

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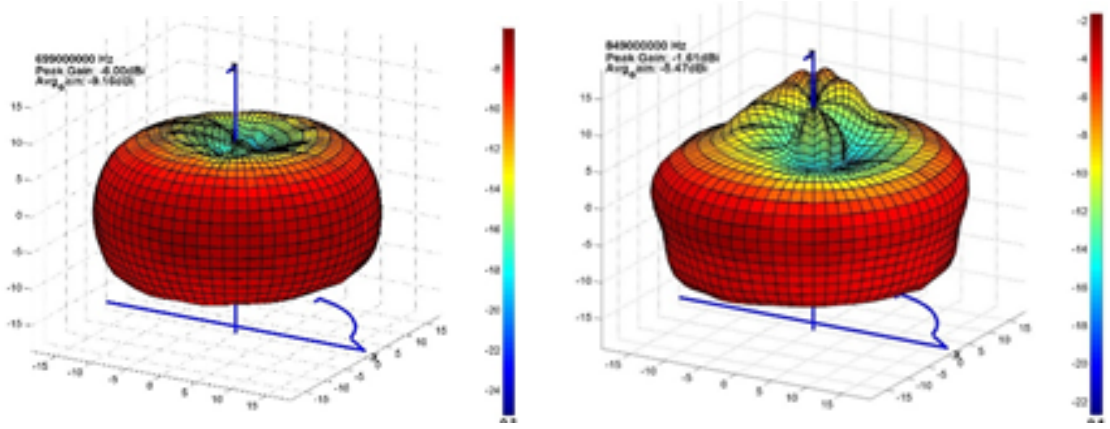
1. SM-A245M/DSN Phone MAIN1 INTENNA



<Phone mounted typical measurements>

Frequency	Efficiency	Average Gain			Max Gain		
		Ver	Hor	Total	Ver	Hor	Total
699,000,000 Hz	12.1 %	-20.8 dBi	-9.5 dBi	-9.2 dBi	-14.6 dBi	-6.6 dBi	-6.0 dBi
703,000,000 Hz	12.8 %	-20.5 dBi	-9.2 dBi	-8.9 dBi	-14.6 dBi	-6.3 dBi	-5.7 dBi
704,000,000 Hz	13.2 %	-20.6 dBi	-9.1 dBi	-8.8 dBi	-14.9 dBi	-6.2 dBi	-5.7 dBi
707,500,000 Hz	15.0 %	-19.7 dBi	-8.5 dBi	-8.2 dBi	-14.3 dBi	-5.5 dBi	-5.0 dBi
710,000,000 Hz	15.8 %	-19.5 dBi	-8.3 dBi	-8.0 dBi	-14.2 dBi	-5.3 dBi	-4.8 dBi
716,000,000 Hz	15.7 %	-19.3 dBi	-8.4 dBi	-8.0 dBi	-14.1 dBi	-5.2 dBi	-4.7 dBi
725,500,000 Hz	14.8 %	-19.1 dBi	-8.7 dBi	-8.3 dBi	-13.7 dBi	-5.3 dBi	-4.9 dBi
729,000,000 Hz	15.0 %	-18.9 dBi	-8.6 dBi	-8.2 dBi	-13.5 dBi	-5.2 dBi	-4.8 dBi
734,000,000 Hz	13.4 %	-19.3 dBi	-9.1 dBi	-8.7 dBi	-14.0 dBi	-5.7 dBi	-5.2 dBi
737,500,000 Hz	12.6 %	-19.5 dBi	-9.4 dBi	-9.0 dBi	-14.2 dBi	-5.9 dBi	-5.5 dBi
740,000,000 Hz	12.1 %	-19.6 dBi	-9.6 dBi	-9.2 dBi	-14.3 dBi	-6.0 dBi	-5.7 dBi
746,000,000 Hz	12.4 %	-19.7 dBi	-9.5 dBi	-9.1 dBi	-14.7 dBi	-5.7 dBi	-5.5 dBi
748,000,000 Hz	16.4 %	-19.4 dBi	-8.2 dBi	-7.8 dBi	-14.4 dBi	-4.9 dBi	-4.7 dBi

751,000,000 Hz	16.9 %	-19.2 dBi	-8.1 dBi	-7.7 dBi	-14.2 dBi	-4.6 dBi	-4.4 dBi
756,000,000 Hz	18.0 %	-18.8 dBi	-7.8 dBi	-7.4 dBi	-13.6 dBi	-4.2 dBi	-3.9 dBi
758,000,000 Hz	11.3 %	-19.8 dBi	-9.9 dBi	-9.5 dBi	-13.5 dBi	-5.7 dBi	-5.5 dBi
777,000,000 Hz	18.7 %	-18.5 dBi	-7.6 dBi	-7.3 dBi	-10.6 dBi	-3.3 dBi	-3.1 dBi
780,500,000 Hz	7.6 %	-21.8 dBi	-11.6 dBi	-11.2 dBi	-13.1 dBi	-6.9 dBi	-6.7 dBi
782,000,000 Hz	19.4 %	-18.4 dBi	-7.4 dBi	-7.1 dBi	-10.1 dBi	-3.0 dBi	-2.9 dBi
787,000,000 Hz	22.4 %	-18.0 dBi	-6.8 dBi	-6.5 dBi	-9.4 dBi	-2.4 dBi	-2.3 dBi
803,000,000 Hz	12.8 %	-20.7 dBi	-9.2 dBi	-8.9 dBi	-11.8 dBi	-4.7 dBi	-4.6 dBi
814,000,000 Hz	24.5 %	-17.9 dBi	-6.4 dBi	-6.1 dBi	-9.6 dBi	-2.2 dBi	-2.0 dBi
824,000,000 Hz	31.6 %	-16.7 dBi	-5.3 dBi	-5.0 dBi	-8.7 dBi	-1.1 dBi	-1.0 dBi
831,500,000 Hz	27.5 %	-17.4 dBi	-5.9 dBi	-5.6 dBi	-9.5 dBi	-1.5 dBi	-1.4 dBi
836,500,000 Hz	27.2 %	-17.3 dBi	-6.0 dBi	-5.7 dBi	-9.5 dBi	-1.5 dBi	-1.4 dBi
849,000,000 Hz	28.4 %	-17.2 dBi	-5.8 dBi	-5.5 dBi	-9.5 dBi	-1.6 dBi	-1.6 dBi
859,000,000 Hz	15.2 %	-18.6 dBi	-8.6 dBi	-8.2 dBi	-11.2 dBi	-4.1 dBi	-4.1 dBi
869,000,000 Hz	13.5 %	-18.3 dBi	-9.2 dBi	-8.7 dBi	-11.4 dBi	-4.5 dBi	-4.4 dBi
876,500,000 Hz	13.2 %	-18.1 dBi	-9.3 dBi	-8.8 dBi	-11.7 dBi	-5.2 dBi	-5.0 dBi
881,500,000 Hz	11.6 %	-18.4 dBi	-9.9 dBi	-9.4 dBi	-12.1 dBi	-6.0 dBi	-5.6 dBi
894,000,000 Hz	9.9 %	-17.6 dBi	-10.9 dBi	-10.0 dBi	-11.5 dBi	-6.0 dBi	-5.7 dBi

Main1 /2

2. TEST METHOD

2.1. Measurement information

Measurement: KYOCERA AVX Ant Lab
Address : 306, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Republic of Korea (16675)
Equipment: KSS Chamber, E5071B Network Analyzer

*KSS Chamber
The Test Systems is the ideal choice for developers of wireless devices and components as well as operators wanting to verify their suppliers' wireless devices. Over-The-Air (OTA) measurements reflect the true performance of the device and ensure that the tested product performs as intended once released to the market. The patented design creates a rich and isotropic multipath environment inside the chamber allowing for fast, easy and realistic performance measurements on SISO as well as MIMO devices like LTE and WLAN. The RTS is capable of performing passive measurements like antenna efficiency, diversity and MIMO gain as well as active measurements like TRP, TIS and Throughput (TPUT).

* **Test Equipment list**

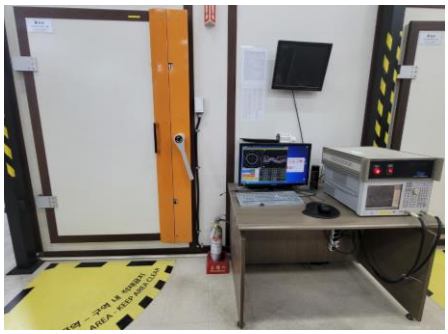
Description	Manufacturer	Model	S/N	Cal Date
Network Analyzer	Agilent	E5071B	MY42403625	2022-05-12

Test dates : 2022.12.08 ~ 2022.12.12

Names of test personnel : Ikhyun Cho, Signature:

2.2. Return Loss & VSWR Test

The VSWR measurement of antennas assembled into a fully operating SM-A245F Phone is measured on the Network Analyzer. The Phone is set up with a 50 Ohm coaxial cable connected to the 50 Ohm point. Calibration is done at the end of the 50 Ohm coaxial cable connection. The other end of the 50 Ohm coaxial cable is connected to a network analyzer. The phone is positioned on a non-conductive table for free space measurements.



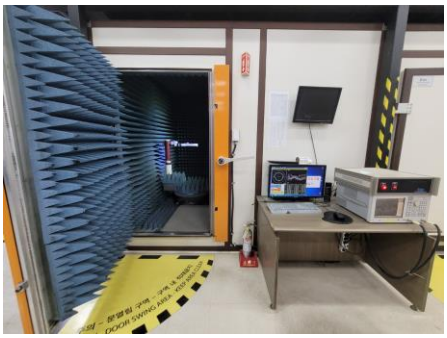


Figure 1: Testing with network analyzer

2.3. Return Loss & VSWR Test

Antenna Lab has a system that can measure VSWR using KSS chamber and E5071B network analyzer. In order to measure the VSWR of each antenna, the lab connects the coaxial cable to the point in contact with the antenna on the Sub board. The VSWR is measured through the coaxial cable connected in the set. At this time, SM-A245F is assembled in the same state as the user environment.

2.4. Radiation Pattern Test

Antennas tested for Gain and Efficiency must be assembled into the enclosure and tested in the fully assembled and operating SM-A245F Phone. The antenna is tested in free space in the anechoic chamber in the H, E1 and, E2 planes. The radiation patterns are measured at the center of transmit and receive bands.

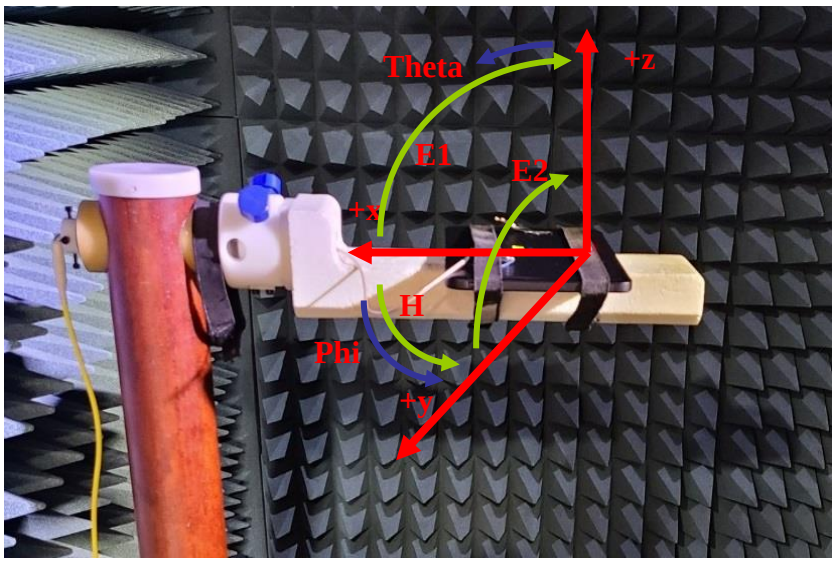


Figure 4: Geometry for SM-A245F for Radiation patterns.

2.5. Test Method (Manufacturing)

All measurements are done with SM-A245F fully assembled. Measure in consideration of the customer's usage environment. Use a fully shielded chamber environment to prevent any noise-induced errors. Typically, the electrical properties of the antenna are measured using a jig that can hold the set.