

Figure 32 – Isolation between cellular antenna and ISM antenna

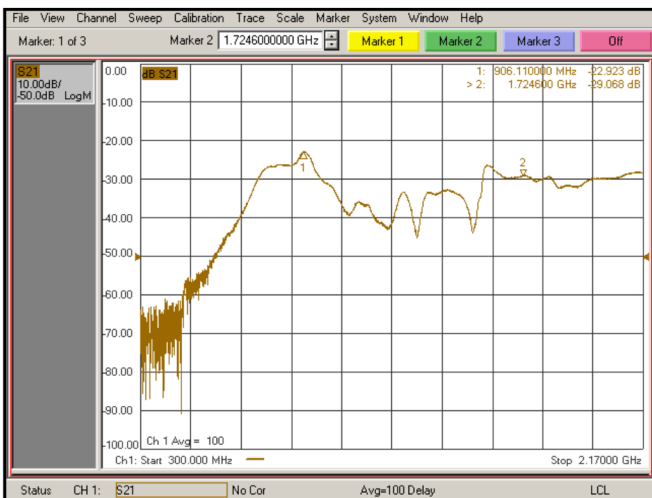


Figure 33 – Isolation between cellular antenna and GPS antenna

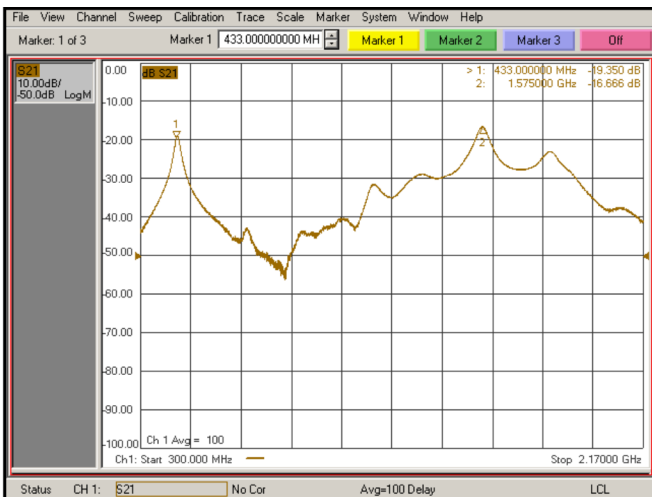


Figure 34 – Isolation between ISM antenna and GPS antenna

The minimum isolation required between any two antennas is 10dB. The minimum isolation measured between any two antennas is 16dB.

### 4.3 Radiation Pattern: 2D Far-Field Cuts



Figure 35 – Test setup in Satimo’s SG64 antenna range

#### 4.3.1 Cellular

**Removed OLD Cellular Antenna Data**

## Removed OLD Cellular Antenna Data

### 4.3.2 ISM

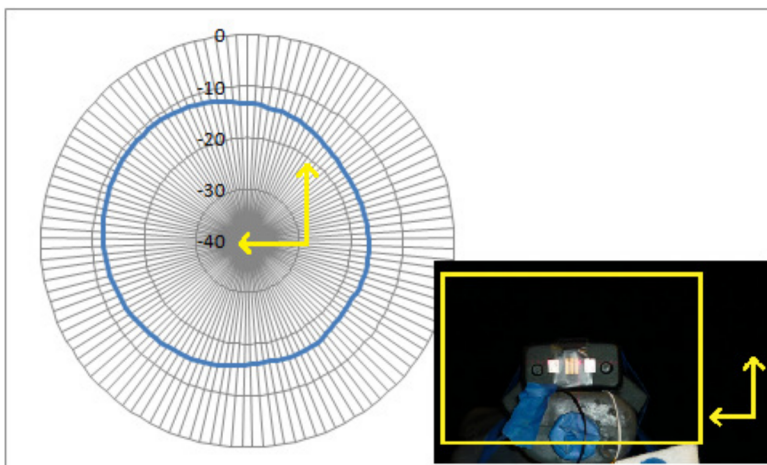


Figure 39 – Phi=0°

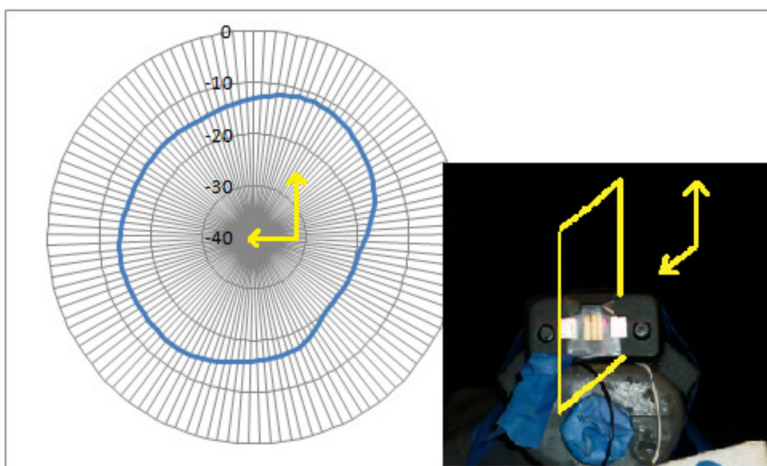


Figure 40 – Phi=90°

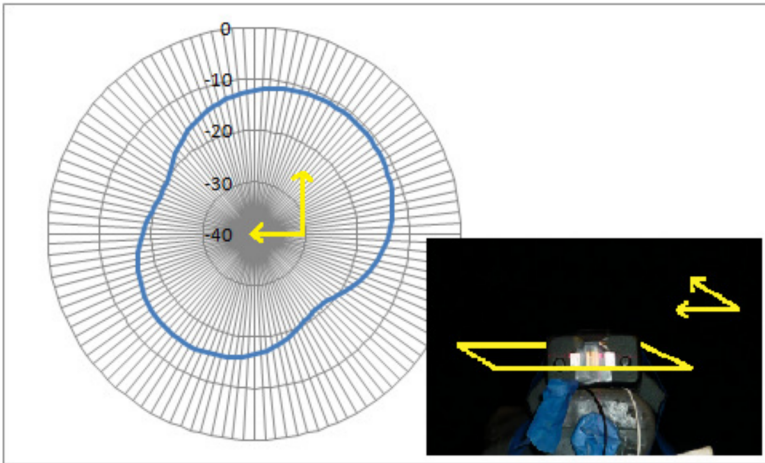


Figure 41 – Theta=90°

## 4.4 Antenna Efficiency

### 4.4.1 Cellular

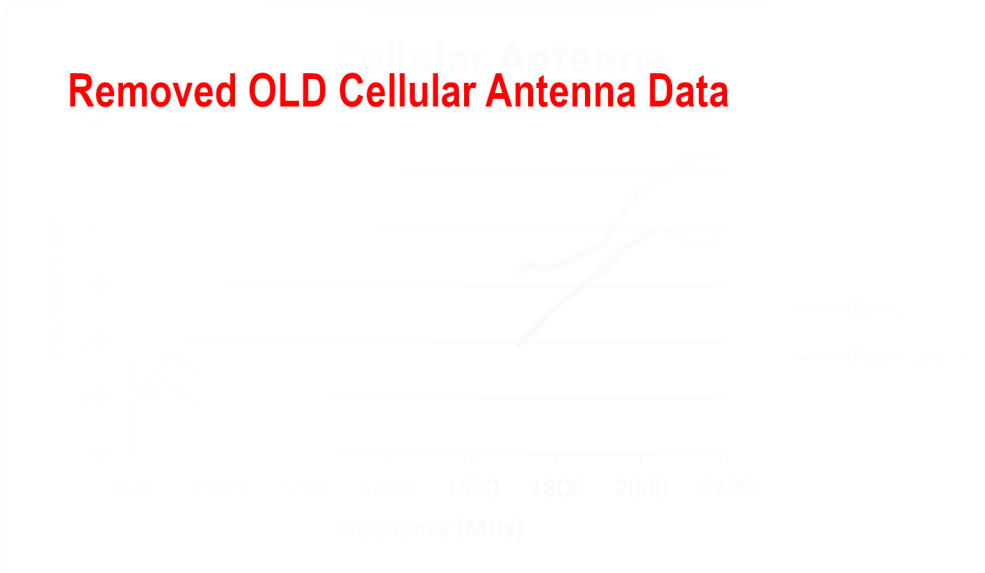


Figure 42 – Cellular antenna efficiency

The cellular antenna meets the average efficiency requirements on each band.

## 4.4.2 ISM

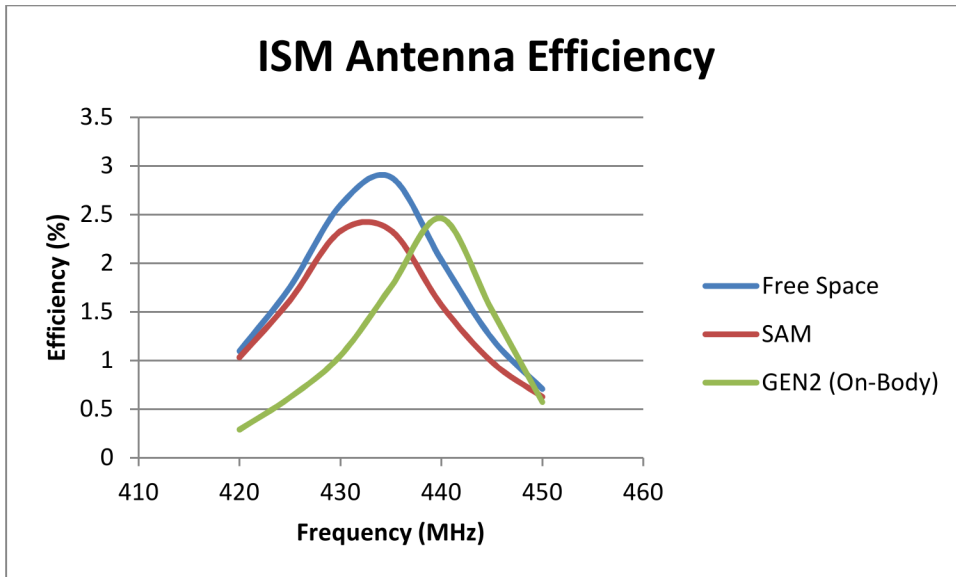


Figure 43 – ISM antenna efficiency

The ISM antenna efficiency is below the requirement of 5%. However, it has very similar performance to the legacy antenna on the GEN2 device. The ISM antenna efficiency has reduced by 3dB from the prototypes to the device integration. The reduction in efficiency is most likely due to the following factors.

1. PCB ground plane was reduced during the design phase
2. Rigid-flex PCB and charger PCB were not included in the prototype measurement

Note: Impedance matching networks and efficiencies will change slightly from the alpha unit to the production unit. This is due to the following.

- Changes are being made to each PCB within the 3M Electronic Ankle Bracelet Monitoring device.
- Alpha antennas were constructed with stamped metal and copper tape. Final antennas will be stamped metal only.

## Appendix A: Acronyms

1xEV-DO	1 times Enhanced Voice – Data Optimized (3G)
1xRTT	1 times Radio Transmission Technology (2.5G)
3GPP	3 <sup>rd</sup> Generation Partnership Project
ADC	Analog-to-Digital Converter
BLE	Bluetooth Low Energy
BT	Bluetooth
CCF	CDMA Certification Forum
CDMA	Code Division Multiple Access
CTIA	Cellular Telecommunications Industry Association
DUT	Device Under Test
EEPROM	Electrically Erasable Programmable Read-Only Memory
EGPRS	Enhanced General Packet Radio Service (2.75G)
EMC	Electromagnetic Compliance
EMI	Electromagnetic Interference
FCC	Federal Communications Commission
FW	Firmware
GCF	Global Certification Forum
GPRS	General Packet Radio Service (2.5G)
GPS	Global Positioning System
GSM	Global System for Mobile (2G)
HSPA	High-Speed Packet Access (3.5G)
HSPA+	Evolved High-Speed Packet Access (3.75G)
HW	Hardware
IC	Integrated Circuit
I <sup>2</sup> C	Inter-Integrated Circuit
JTAG	Joint Test Action Group
LDO	Low-Dropout Regulator
LNA	Low Noise Amplifier
LTE	Long-term Evolution (4G LTE)
NFC	Near-Field Communication
OTA	Over-the-Air
PCB	Printed Circuit Board
PCBA	Printed Circuit Board Assembly
PTCRB	Provides certification framework for GSM, UMTS, and LTE mobile devices
PTH	Plated Through-Hole
RF	Radio Frequency
SAM	Standard Anthropomorphic Mannequin
SIM	Subscriber Identity Module
SPI	Serial Peripheral Interface
SW	Software
TRP	Total Radiated Power
RSE	Radiated Spurious Emissions
RSIC	Radiated Sensitivity – Intermediate Channel
SIM	Subscriber Identity Module
SMT	Surface Mount
TIS	Total Isotropic Sensitivity
UART	Universal Asynchronous Receiver/Transmitter
UMTS	Universal Mobile Telecommunications System (3G)
USB	Universal Serial Bus