

# **S11 measurements of the standard dipole**

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ASU

A standard dipole antenna set was purchased from Com-power corporation. The kit has 4 baluns that cover a frequency of 30 MHz to 1GHz. The following S11 measurements were made in two different sites in Tempe.

## 1.) SDFC - Football field at ASU

The antenna was assembled by connecting the metal arms extending to 5.7m to the Balun1 (30-65MHz). The dipole was placed directly on the ground as shown in the figure below. The VNA was placed 50 ft from the dipole and a 50m cable was used to make the measurement. The VNA and the cable were calibrated with the female EDGES cal-kit in-situ. Three S11 measurements were made by placing the antenna in different orientations as shown in figure2.



*Figure1: Measurement set up of the dipole on the ground at the SDFC field. The other end of the coax is connected to a VNA.*

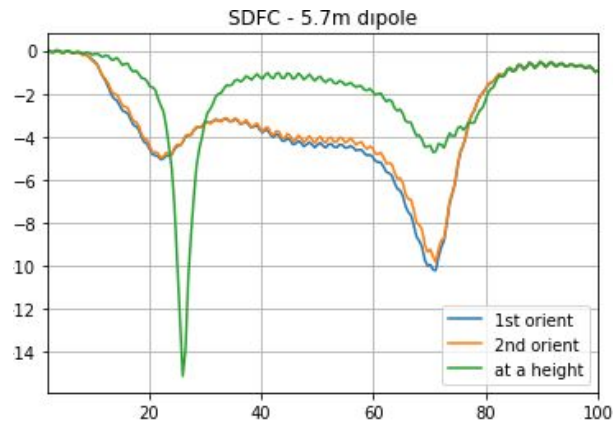


Figure2:  $S_{11}$ (dB) vs Frequency of the 5.7m dipole placed in two orthogonal orientations(blue, orange) and when lifted off the ground.

This measurement was repeated by changing the length of the dipole to 2.9m.

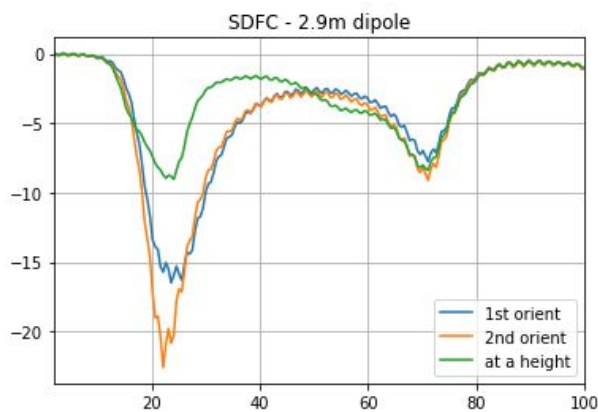


Figure2:  $S_{11}$ (dB) vs Frequency of the 2.9m dipole placed in two orthogonal orientations(blue, orange) and when lifted off the ground.

## 2.) Unused land in the Gilbert area

The same procedure was carried out as before.  $S_{11}$  measurements were taken with dipole lengths of 5.7m, 2.9m and 1.5m. At 1.5m, which corresponds to a resonant frequency of 100MHz, another measurement was done by changing the balun that was sensitive from 65-12MHz.

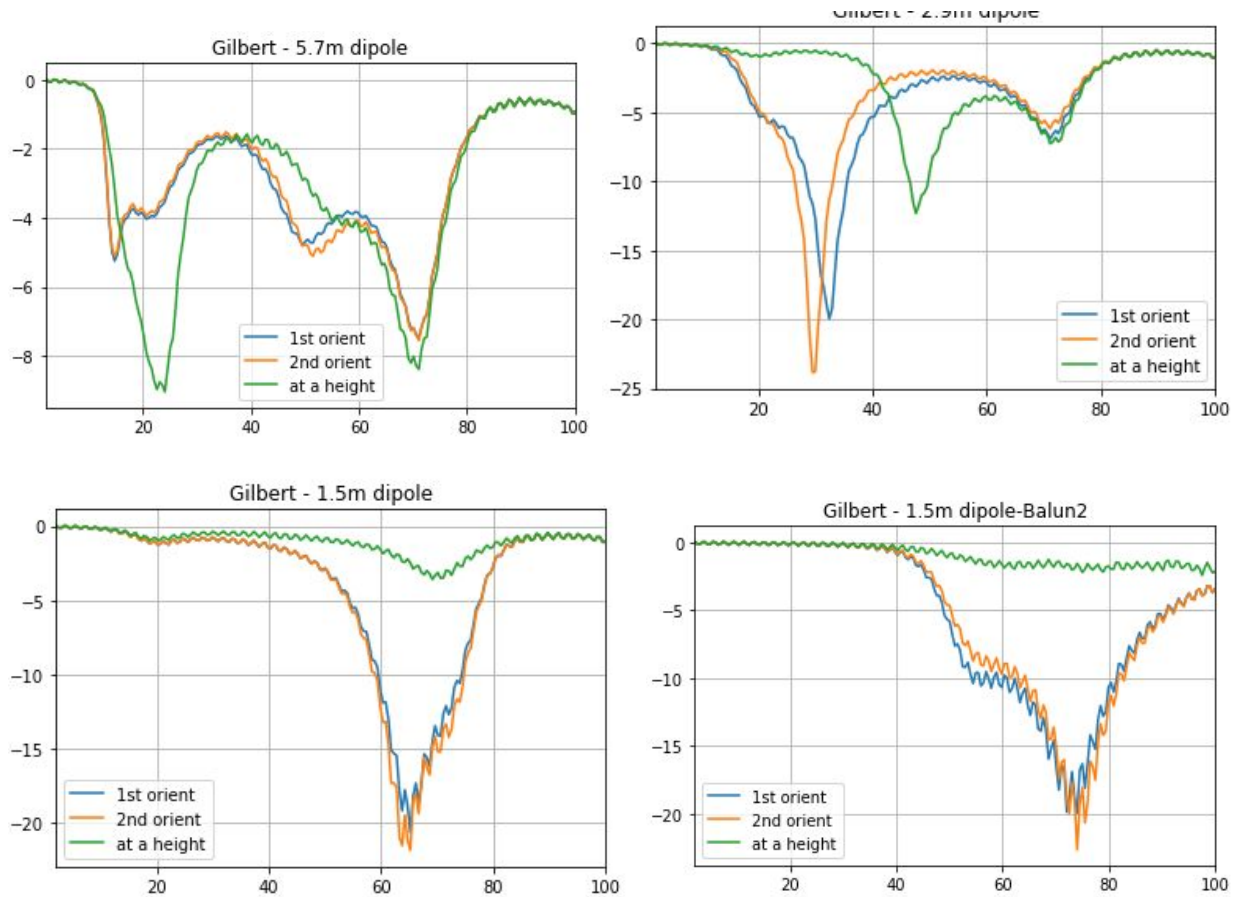


Figure2: S11(dB) vs Frequency of the 5.7m, 2.9m & 1.5m dipoles placed in two orthogonal orientations(blue, orange) and when lifted off the ground.

### Notes:

- The cable reflections are observed in the S11 measurements even though we calibrated it out.
- For the 2.9m dipole we expect a resonance around ~ 26 MHz and that is observed.
- For the 5.7m dipole the resonance is expected around 51MHz and it is noted in the Gilbert measurement but not in the SDFC measurement?
- In all the measurements and antenna orientations, a resonance is seen at ~65-70MHz. Could that correspond to the Balun?