FEKO & HFSS beam comparison

Nivedita Mahesh
ASU
The FEKO simulation was carried out for the lowband system between 40 - 100 MHz.
No balun or shield structure was used.
The ground was assumed to be PEC to infinity.

The top graph is gain versus Freq at theta = 0 & phi=0
The bottom graph shows the change in absolute gain at every MHz for all values of theta
The HFSS simulation was carried out for the lowband system between 40 - 100 MHz.
No balun or shield structure was used.
The ground was assumed to be PEC to infinity.
The default FEM solver was used. This requires a bounding box. Which was set to $\lambda/4$ of the largest wavelength.

- The top graph is gain versus Freq at $\theta = 0$ & $\phi=0$
- The bottom graph shows the change in absolute gain at every MHz for all values of theta
The HFSS simulation was carried out for the lowband system between 40 - 100 MHz.

No balun or shield structure was used.

The ground was assumed to be PEC to infinity.

The Integral Equation solver was used. This is similar to the MOM solver of FEKO.

The top graph is gain versus Freq at theta = 0 & phi=0. The second plot is at theta=35 & phi=0.

This solver results can result in non-physical variation between frequencies.

The bottom graph shows the change in absolute gain at every MHz for all values of theta at phi=90. Left is directly from the simulation. Right is a 7th order polynomial fit in frequency.
Real ground - FEKO & HFSS-IE

- The structure of the antenna is kept same as before.
- The ground plane is now a 10m X 10m PEC and below is soil with $\varepsilon_r = 3.5$ and $\sigma = 2 \times 10^{-2}$ S/m.

- The top figure shows the gain derivative plots for the beam obtained using FEKO simulations
- The bottom plot shows the gain derivative plots for the beam obtained by fitting a 7th order polynomial fit in frequency to the HFSS-IE simulations
Residues to beam fitting from real ground simulations - HFSS-IE

- HFSS-IE beam was convolved with a sky model. The skymodel used is the Haslam map scaled to 75 MHz with spectral index of -2.5.
- The data was averaged over 2 hour intervals. And a 5 term polynomial was fitted over the range 50-98 MHz and residues are indicated. Also calculated and shown in the plots is the freq RMS of the residues over 50-98 MHz.
- Shown below are two plots of residues obtained with the same beam patterns. The left plot corresponds to the results from my code and the right shows Alan's results.
Residues to beam fitting from real ground simulations - FEKO

- FEKO beam was convolved with a sky model. The skymodel used is the Haslam map scaled to 75 MHz with spectral index of -2.5.
- The data was averaged over 2 hour intervals. And a 5 term polynomial was fitted over the range 50-98 MHz and residues are indicated. Also calculated and shown in the plots is the freq RMS of the residues over 50-98 MHz.
- Shown below are two plots of residues obtained with the same beam patterns. The left plot corresponds to the results from my code and the right shows Alan’s results.