

Full EDGES simulation

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This report summarizes the simulations carried out for the EDGES antenna with all its components including the shield, top cap and balun. Up until now all the antenna simulations were done on the simplified model - blades over a ground plane with the feed point in between the blades. This is shown below:

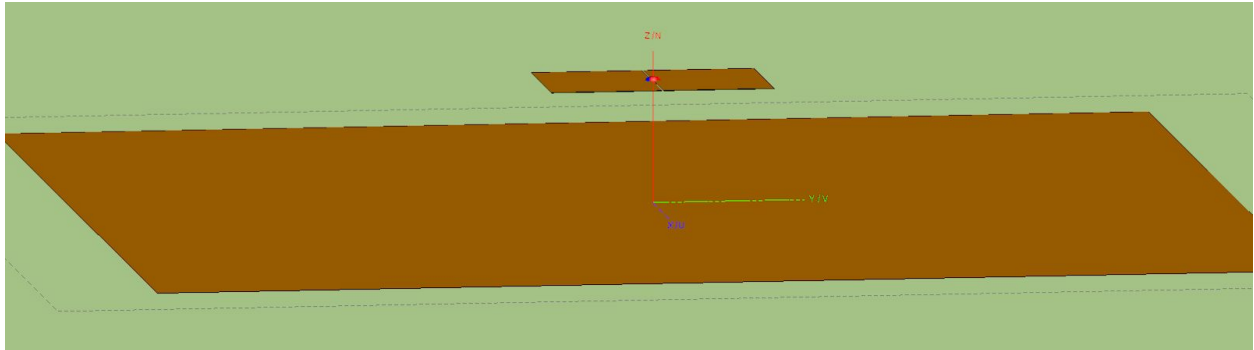


Fig1: FEKO model of the simplified version of the EDGES antenna

The S11 of this model doesn't capture the actual S11 of the antenna that was measured in the field, as shown below:

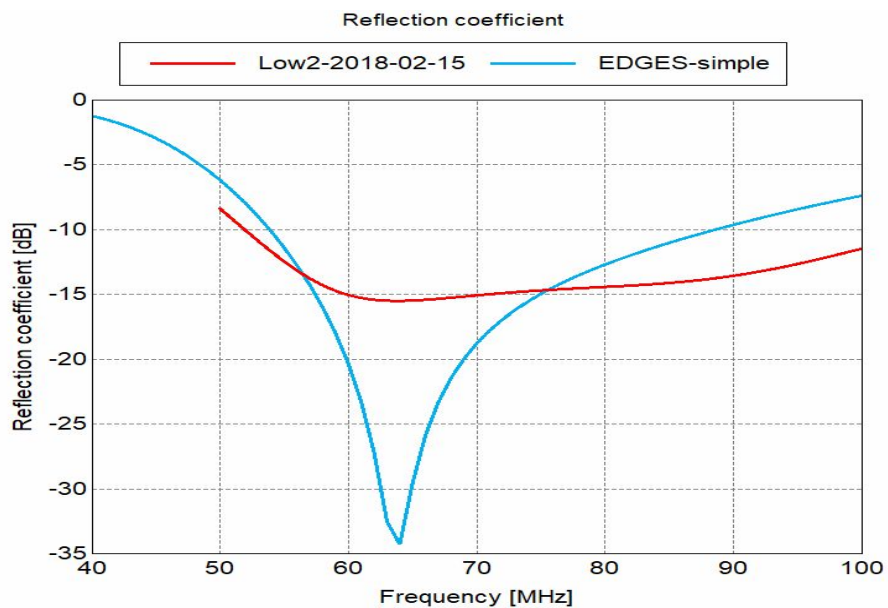
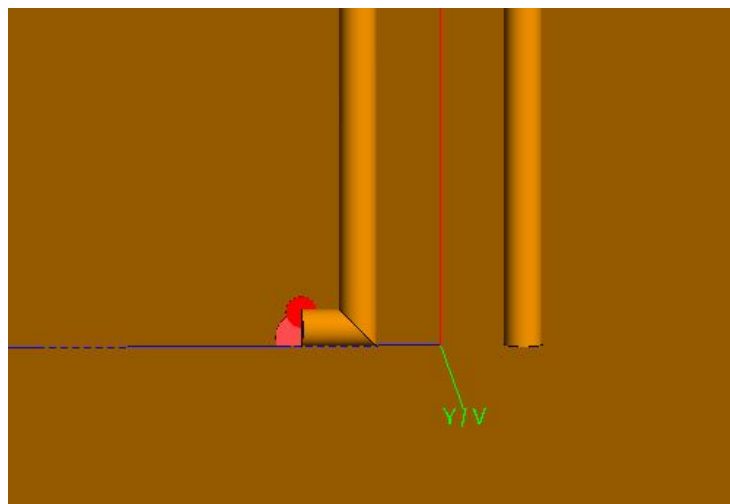
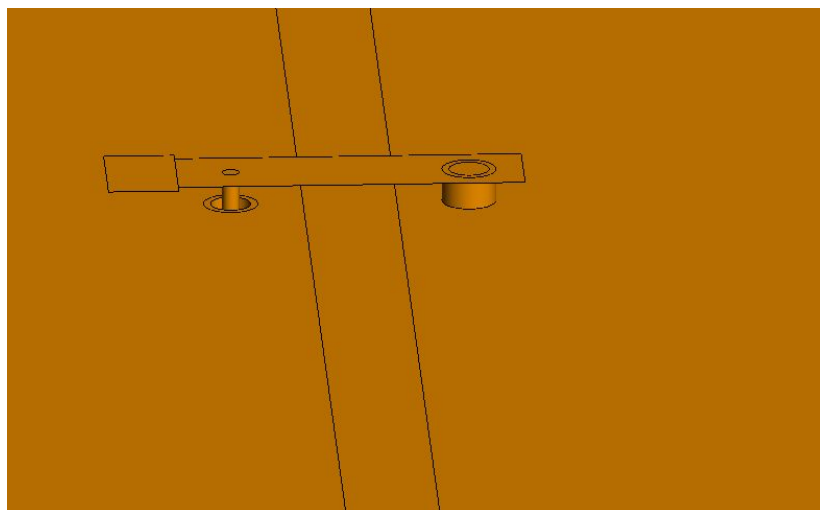
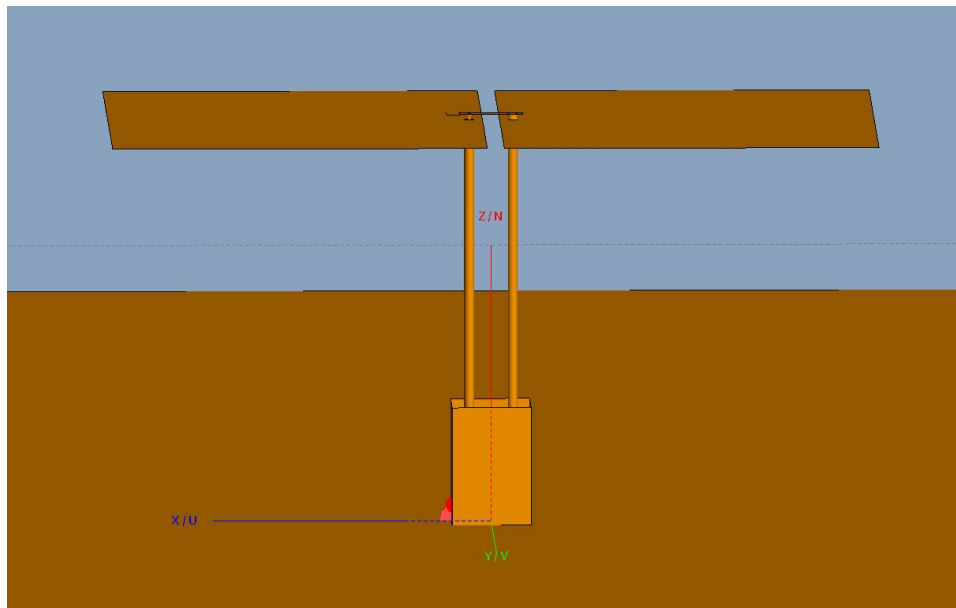


Fig2 : S11 of the simplified EDGES antenna obtained with FEKO compared to the S11 measured in the field.

The complete antenna was simulated as shown below and the S11 was obtained.



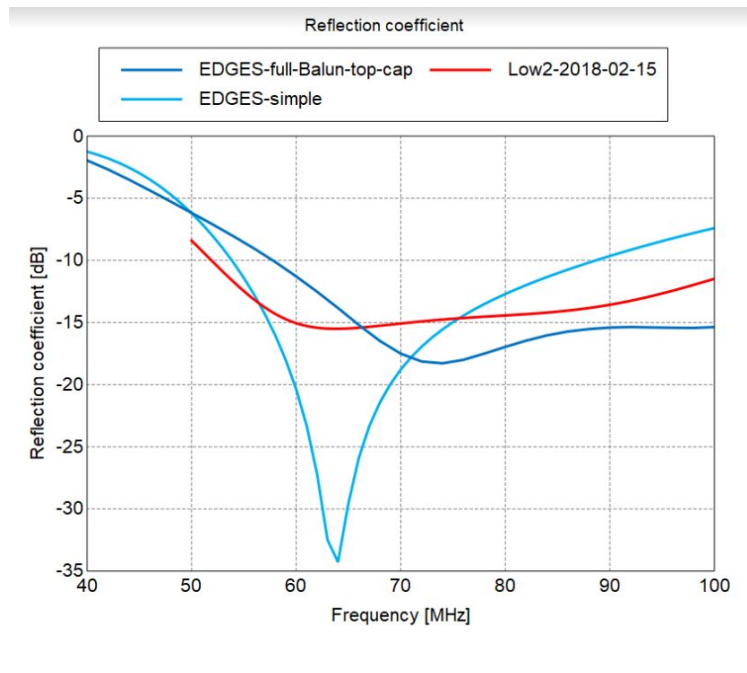
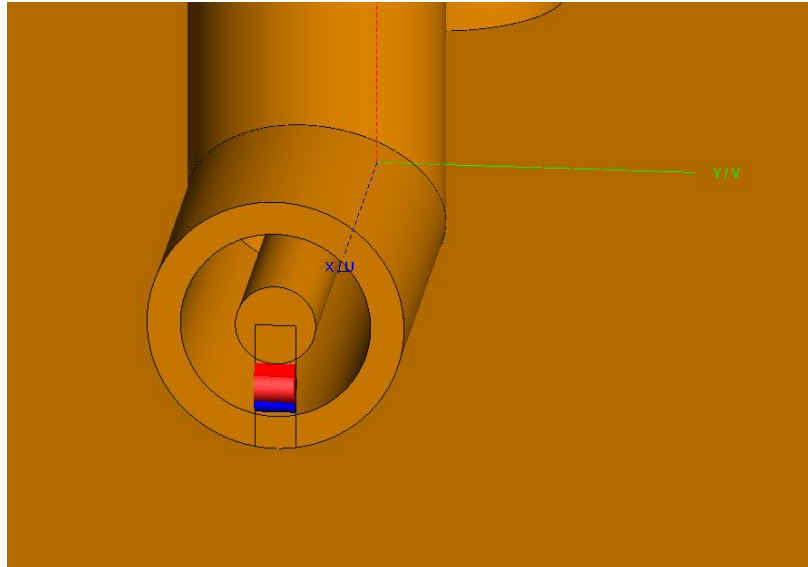


Fig3: The S11 of the antenna that was simulated above is also plotted along with the data and the simple model. Even though it deviates from the actual measurement. It is better than the simplified model.

On receiving suggestions from Alan, I simulated the feed point to be between the tube and the top cap as shown below and resimulated the structure to obtain the S11.

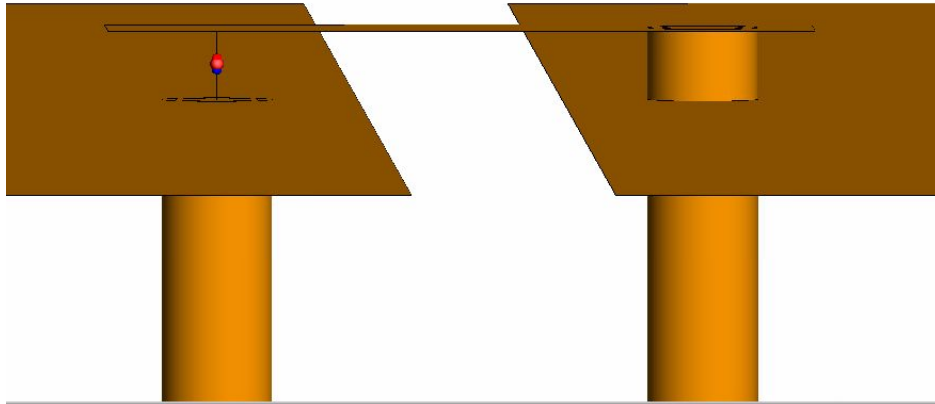


Fig4: A snap shot of the model where the feed point was given between the topcap and one of the panels.

I also tried another model of the antenna which I thought was closer to what is placed in the field. Following pictures show how the model was drawn.

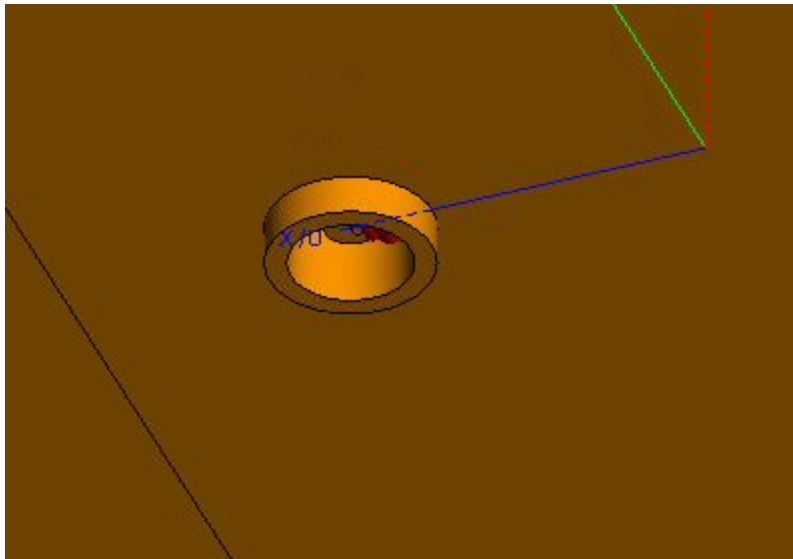
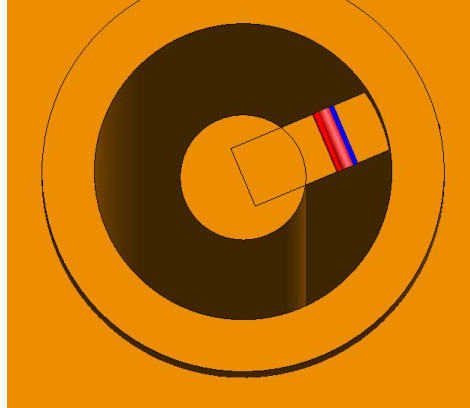


Fig5: A snapshot of the model where the field point was given similar to what is found in the field. The tube pierces through the ground plane and extends into the ground for 2 in. The inner rod stops 0.25 in from the end (so 1.75in into the ground). The port is defined between the rod and the outer tube at the point where the rod stops.



The S11 of the last two trials are plotted along with field measurement below:

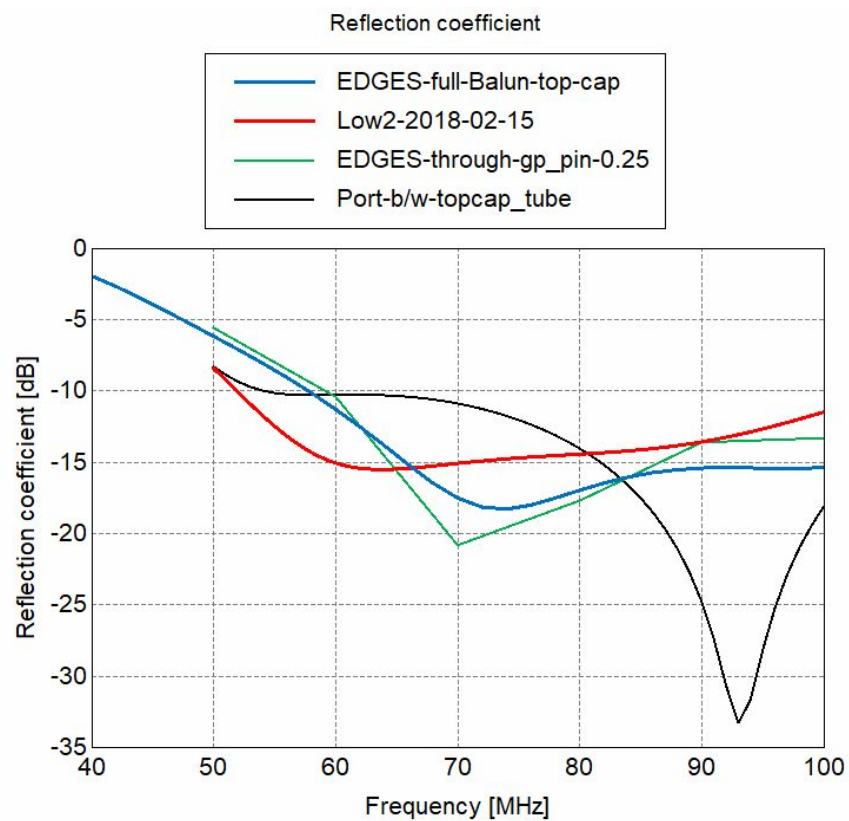


Fig6: The S11 of the data(red), the complete model where the feed was given to the bent pipe above the ground(blue), model where the feed was given between top cap and panel as per Alan's suggestion(black) and the last model where the tube goes through the GP and feed is given between the rod and tube(green).