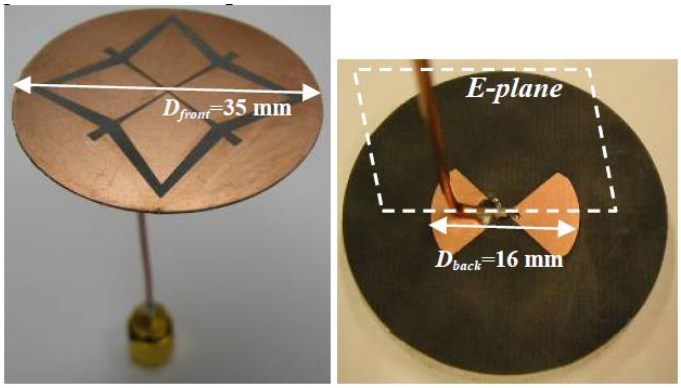
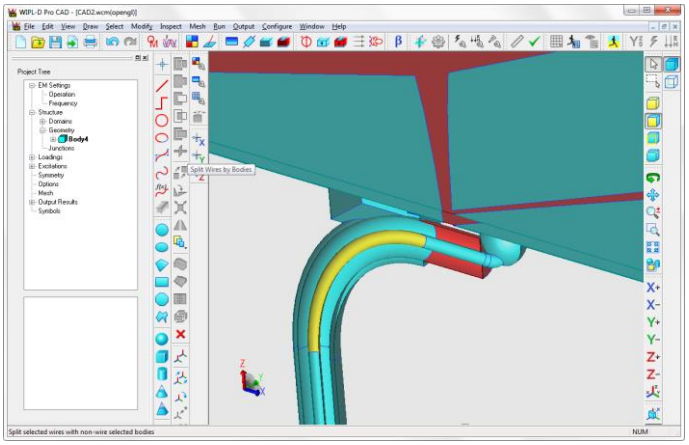
Crossed Exponentially Tapered Slots Antenna (XETS)
- CAD Model Import and Simulation -



XETS antenna (pictures taken from [1])

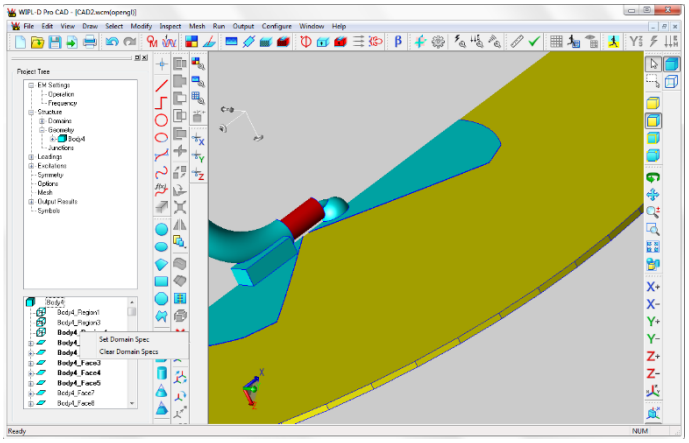
Antenna geometry description (STEP file) and measured results were obtained from the authors of papers [1,2]. The file is imported in a single click. The result is a project consisting of several parts as described in the original file, defined as all metallic elements. During import, WIPL-D Pro CAD offers variety of advanced tools for automated healing. By using only one Boolean union operation, we turn the whole model into a single body ready for material assignment and meshing.

The inside structure of the model can be investigated by using cutting planes, or transparency/hide commands over parts of the model.

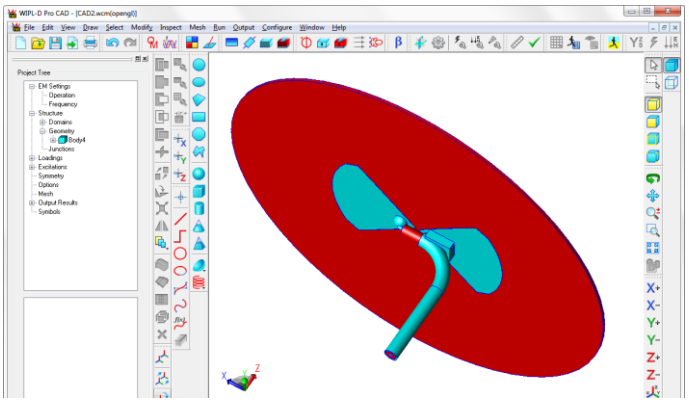


Investigating the inside of the model

In fact, it is necessary to assign materials on just two regions (substrate and coaxial line dielectric) which is done by a few mouse-clicks. All the faces in the model automatically adjust their material specification according to the regions they belong to.

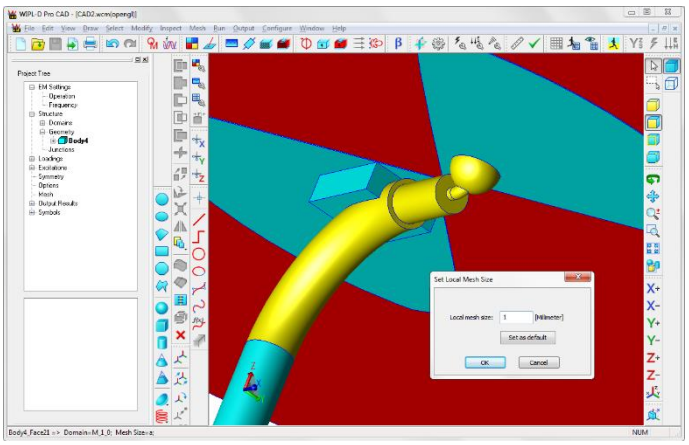


Domain assignment to substrate



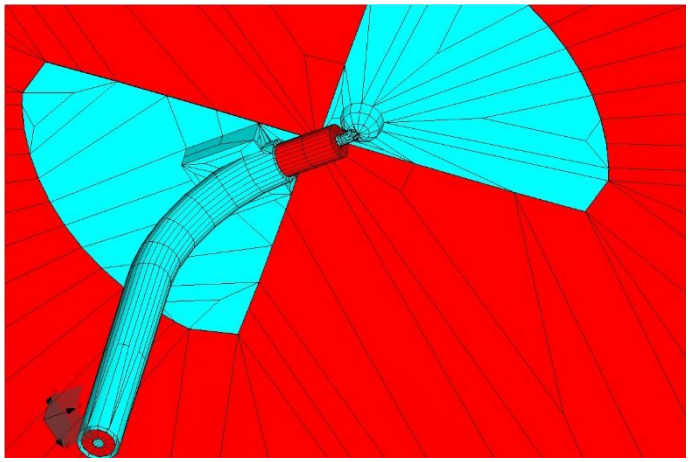
Model after domains assignment, cyan – metallic, red – dielectric surfaces

There are several meshing algorithms available in the program. For this model, we have used the default in-house algorithm and specified local mesh size on parts of the model where this is needed. The coaxial feed is made of three coaxial surfaces very close to each other so the mesh needs to be fine in this part to follow the geometry precisely.

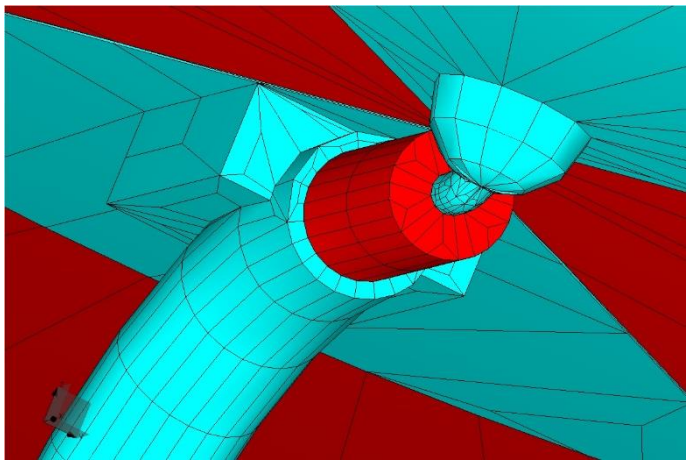


Setting local mesh size

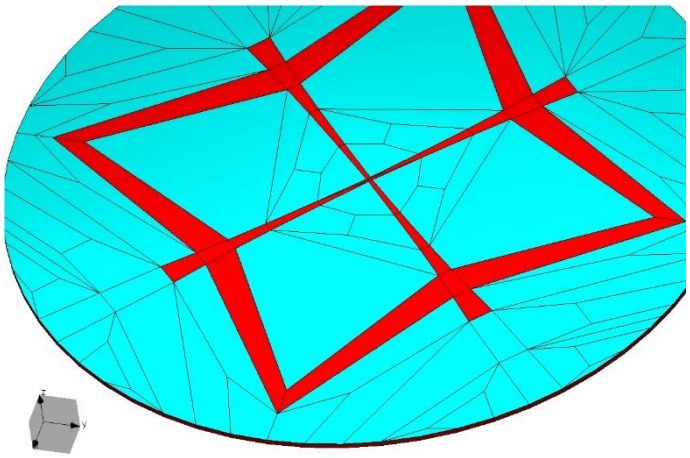
The automatic meshing process takes just a couple seconds, and results in an excellent all-quad mesh.



All-quad mesh of XETS model



Feeding part mesh (zoom in)

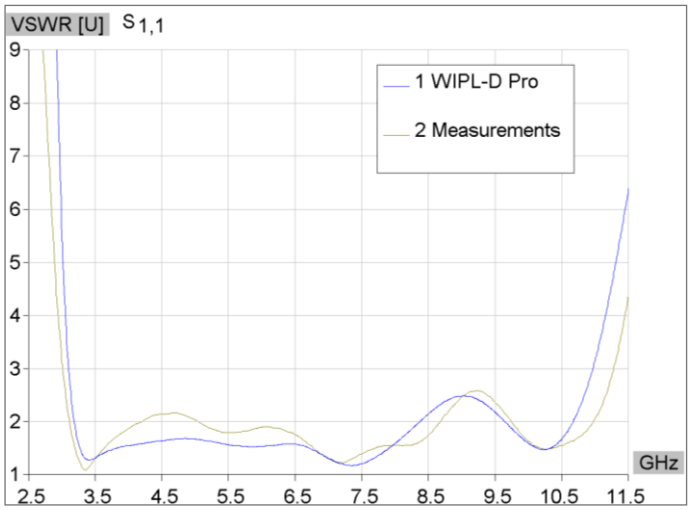


Upper side of substrate mesh (zoom in)

Automatic mesh algorithm of WIPL-D Pro CAD is very fast, controllable and can be used to approximate very complex geometries. The usage of the mesher is quite easy since there is only a few control parameters to adjust. On the other hand, vast majority of models can be meshed with the default parameters, at first-pass.

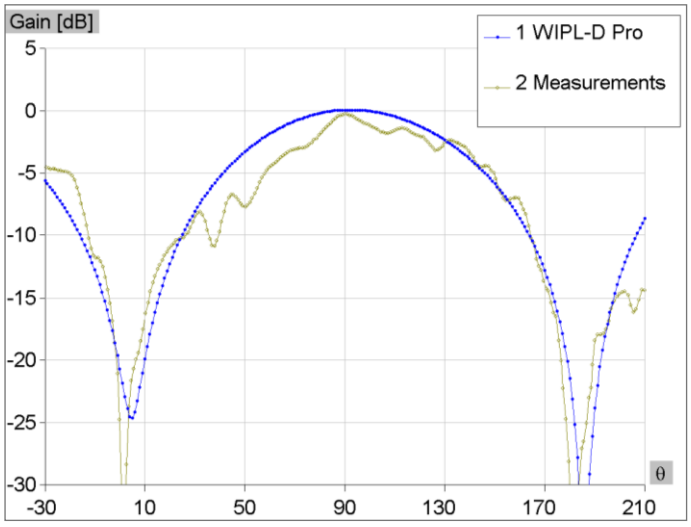
Simulation Results

The antenna has been simulated according to instructions from [1]. The results for VSWR show excellent agreement with the measured results, in the range of interest – intended application (3.1-10.6 GHz).



VSWR overlay in range 2.5-11.5 GHz

The radiation pattern has been calculated at 4 GHz and displayed in the following diagram. The diagram is centered around theta=90°, since it corresponds to measurement results around theta=0° (due to different spherical coordinate systems).



|E| [dB] in E plane 4 GHz

References

[1] Jorge R. Costa, Carla R. Medeiros, and Carlos A. Fernandes, “Compact Printed Tapered Slot Antenna for UWB,” EuCAP, Berlin, Germany, March 2009.

[2] Jorge R. Costa, Carla R. Medeiros, and Carlos A. Fernandes, “Performance of a Crossed Exponentially Tapered Slot Antenna for UWB Systems,” IEEE Transactions on Antennas and Propagation, Vol. 57, No. 5, pp. 1345-1352, May 2009.