A Progress Report on the CPS(VMDP)-to-Waveguide transition.

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Summary

1. Transition Schemes

The CPS-to-Waveguide transition using quasi-Yagi antenna is proposed. The figure (Fig.1.2.3) shows the schematic of the transition. The quasi-Yagi antenna consists of the dipole antenna fed by CPS, a director element and a ground metal block as a reflector. The antenna is patterned on the same substrate (InP) of VMDP and sits in the E-plane of the waveguide to excite waveguide dominant mode. The waveguide can be manufactured with two split blocks. The bottom block is milled half way to incorporate the ground plane of CPS. This block at the same time mechanically supports the substrate.

2. Simulation

The simulation is carried out by HFSS. In the simulation, the photodiode is modeled as a single line source located 0.05mm away from the end of CPS line. (Fig.2) The radiation boundary box is implemented to simulate the CPS open end. (Fig.1)

The simulation results are shown in Fig.4. The insertion loss of the transition is smaller than -1dB for the entire W-band. The optimization of the antenna has been performed and further improvement can be made with more optimization.

3. Bias Feeding

We propose a scheme for bias feeding of VMDP as shown in Fig. 5. Both CPS lines are bond-wired. In order to have insertion loss of less than –15dB from one end of the wire bond to another end in entire W-band, Series IV simulation predicts we need to have 1.4mm long wire of 25.4um diameter.

4. Future Plan

We need to look into alternative parameters of the design, in case VMDP has to be longer than the current design where VMDP is 0.7mm long and expected to accommodate 3-5 photodiodes. Because of the even mode resonance of CPS line the length of VMDP cannot be freely chosen under the current design.

Please contact Noriaki (kaneda@ee.ucle.edu) if you have questions and suggestions regarding with the transition.

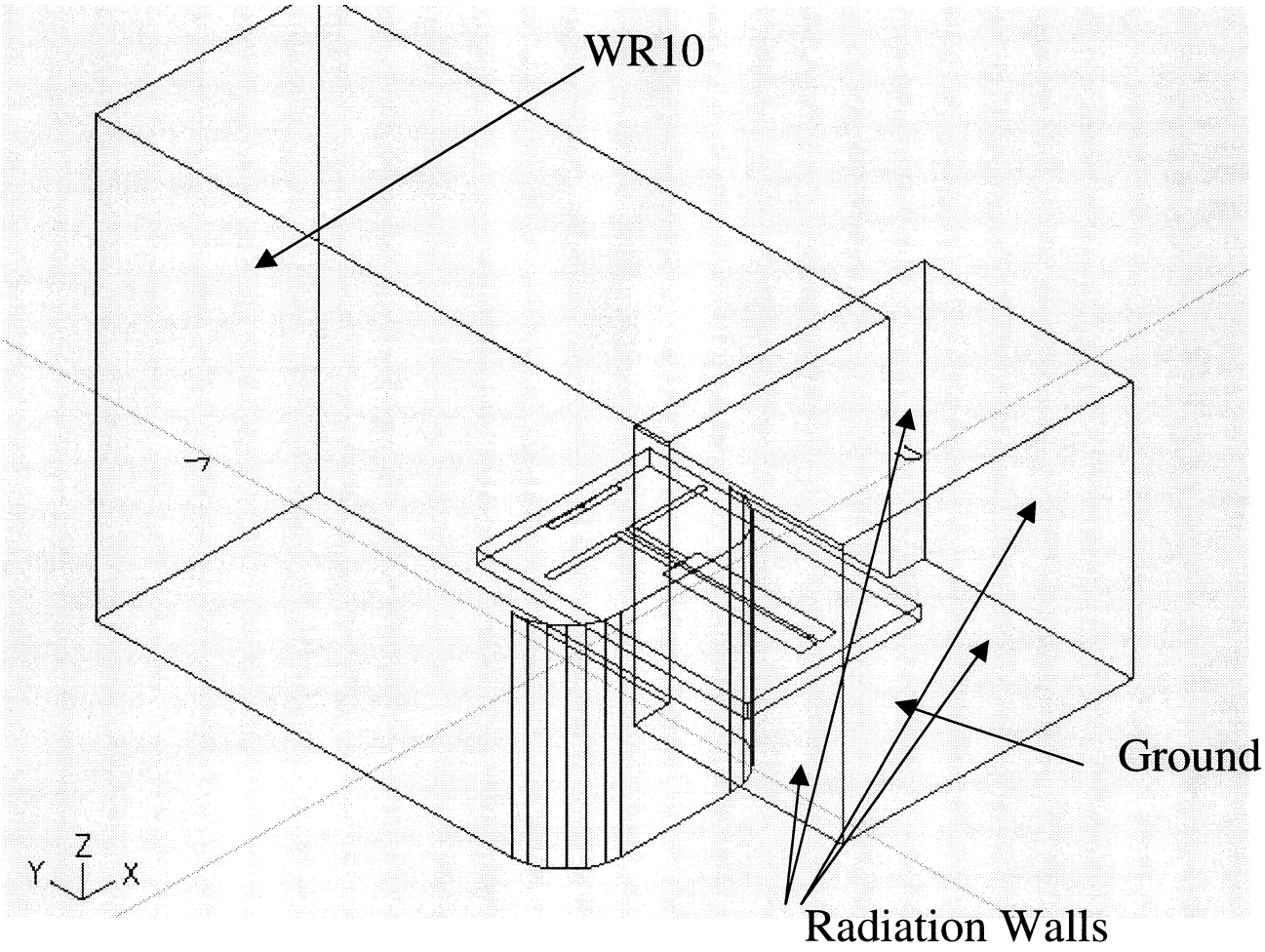

Fig.1 3D schematic of the transition

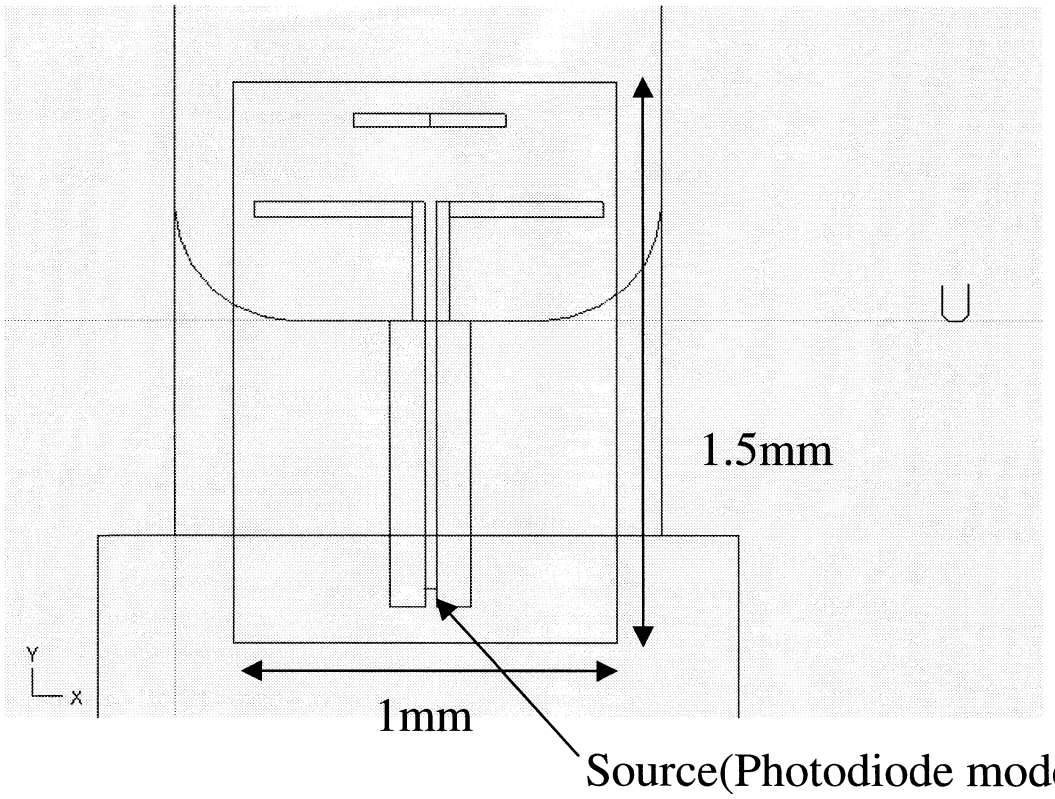

Fig.2 Top view

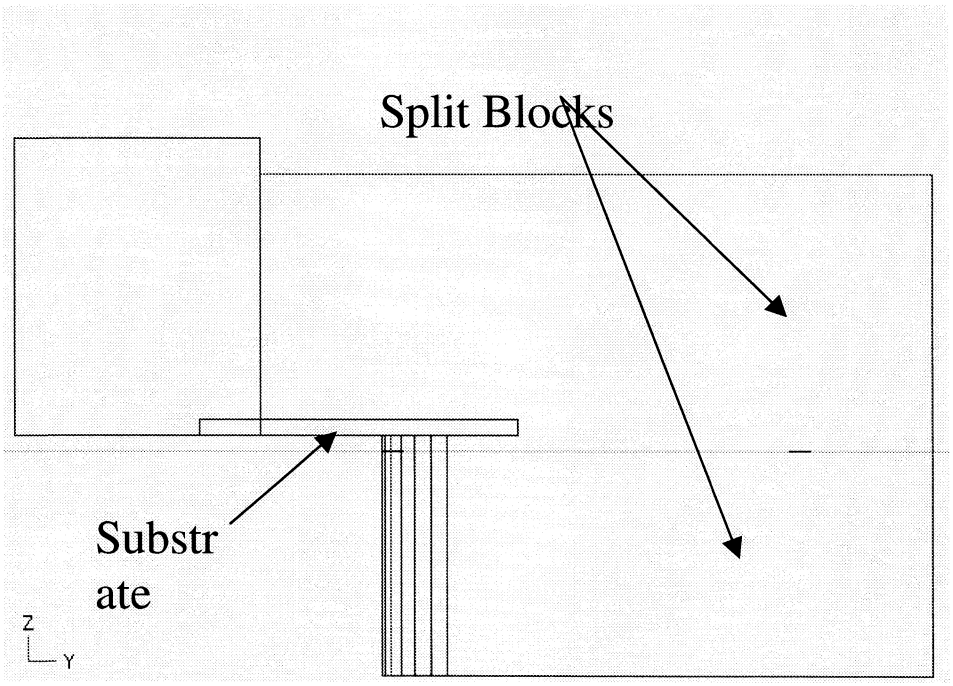

Fig.3 Side View

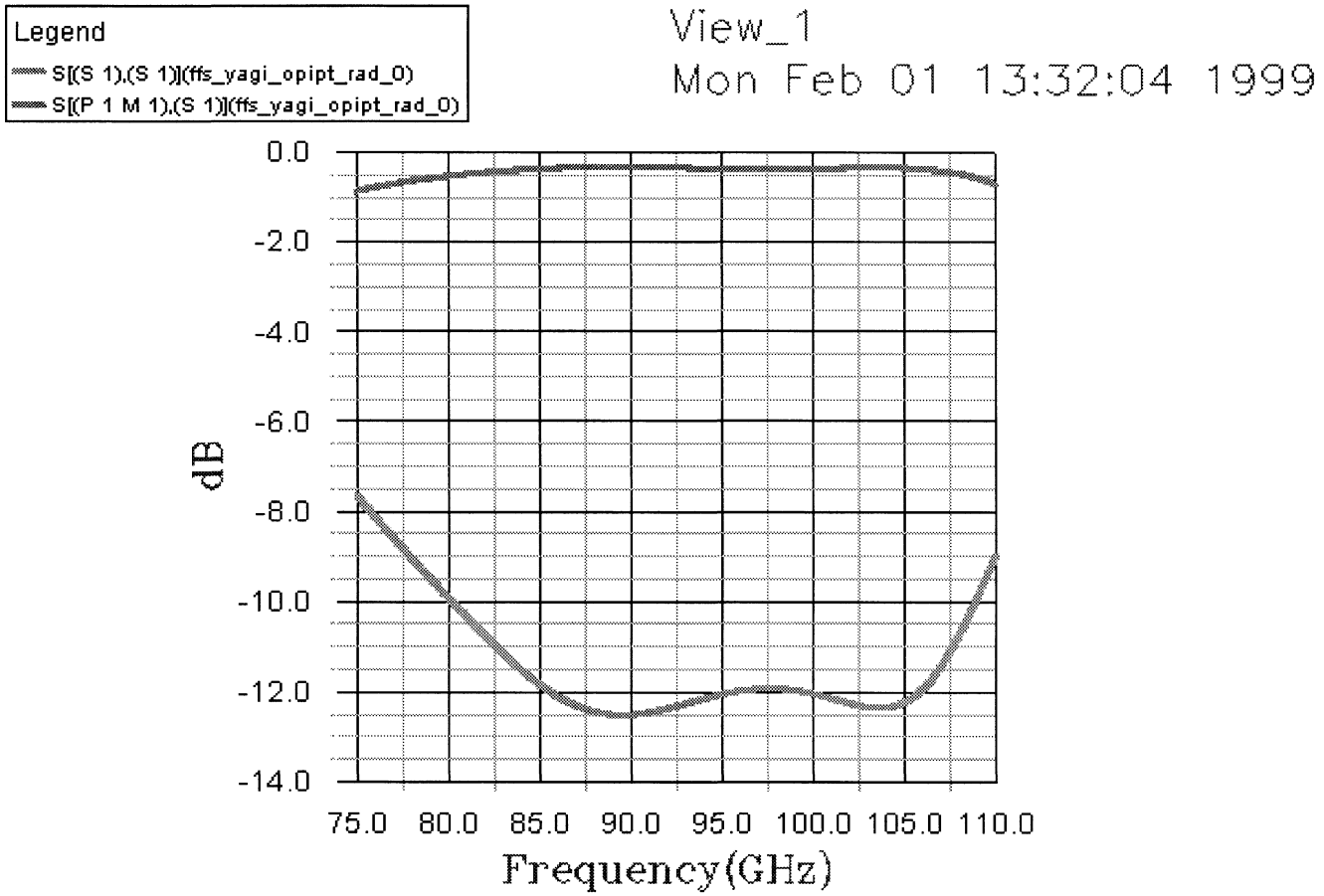

Fig.4 Simulation Results

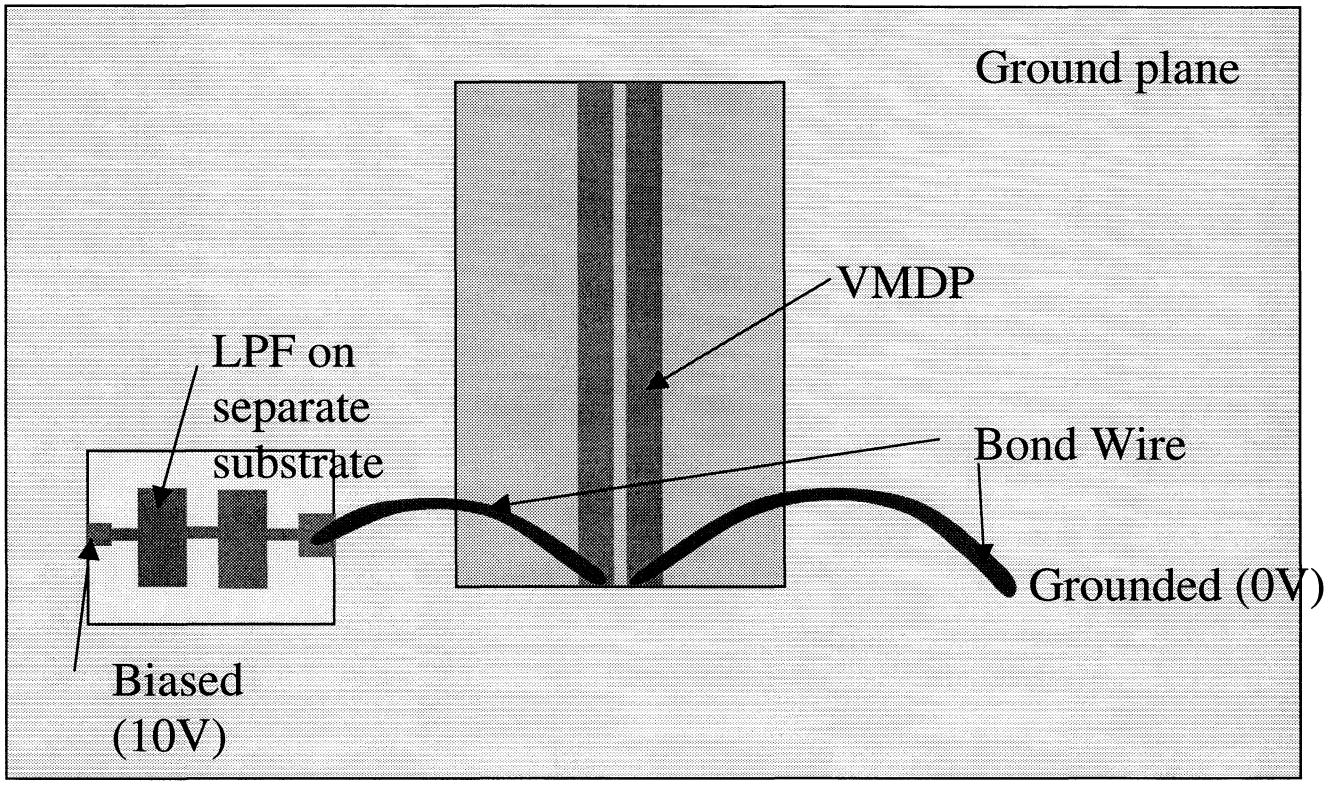

Fig.5 Schematic for biasing