

## Design and Measurement Results of Microwave Absorbers in Schottky Pickup for Recycler and Tevatron

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This rf note describes the design and rf measurement results of microwave absorbers in Schottky pickups for Recycler and Tevatron. Shown in Figure 1 is a schematic drawing of a Schottky pickup consisting of a beam pipe and slotted waveguide on top and bottom. Beam pipe in Schottky pickup has rectangular cross section: 4.3 inch (width) x 2.953 inch (height.) Microwave absorbers (TT2-111R from Trans-Tech Inc.) are placed in both ends of the beam pipe to prevent unwanted microwave signal from reflecting back to the pickup area of the beam pipe or traveling from outside of the beam pipe into the pickup area (or vice versa.) Most absorbers are placed on the narrow sides (2.953 inch) of the beam pipe and provide adequate absorption. Shown in Figure 2 is a schematic drawing of the location and thickness of these absorbers. This note presents design and simulation results of these side absorbers.

In addition to these side absorbers, 4 pieces of absorbers (2.870"x2.300"x0.100") are placed on top (2 pieces) and bottom (2 pieces) of the beam pipe (near the places of these side absorbers) to add more absorption (~ -4 db). These absorbers are not shown in Figure 2. Detail of these top and bottom absorbers can be found in mechanical drawings (ME326569, ME326570.)

The following are design features of side absorbers:

1. Absorbers are placed inside the beam pipe to get maximum absorption (instead of being flush with inner surface of the beam pipe.)
2. To simplify the mechanical engineering, beam pipe width is abruptly changed (step change) from 4.3 inch to 4.7 inch instead of a tapered transition section that is traditionally used for minimizing reflection of microwave power.
3. However the feature 1 and 2 usually cause larger reflection. Therefore absorbers with different thickness are combined to get both high absorption and very low reflection.

Shown in Figure 3 are simulation results using HFSS software (Ansoft Inc.) Note in the simulation, port 1 is at the normal beam pipe (4.300 inch wide, without absorber) side and port 2 is at the outside of the beam pipe. This means that S11 in Figure 3 represents how much signal is reflected back to the pickup area of the beam pipe while it travels from pickup area toward the outside of the beam pipe and S22 represents how much signal is reflected back if a signal travels from outside into the beam pipe.

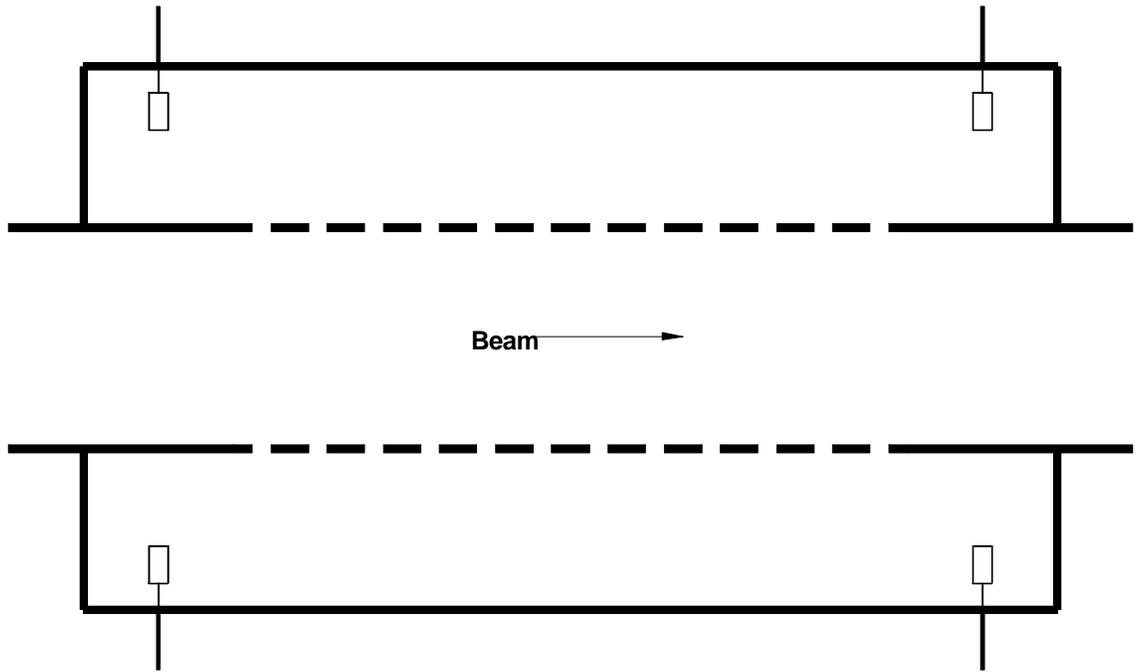


Figure 1. Schematic drawing of Schottky pickup

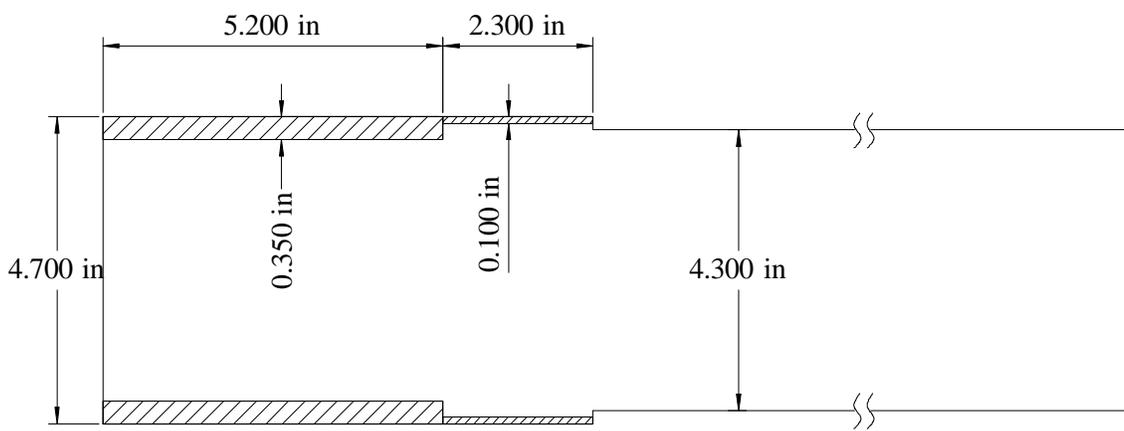
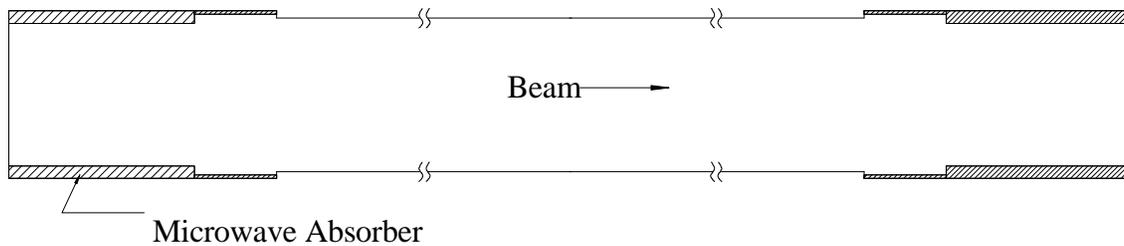


Figure 2. Absorbers in beam pipe (top: overall view, bottom: enlarged view of left end)

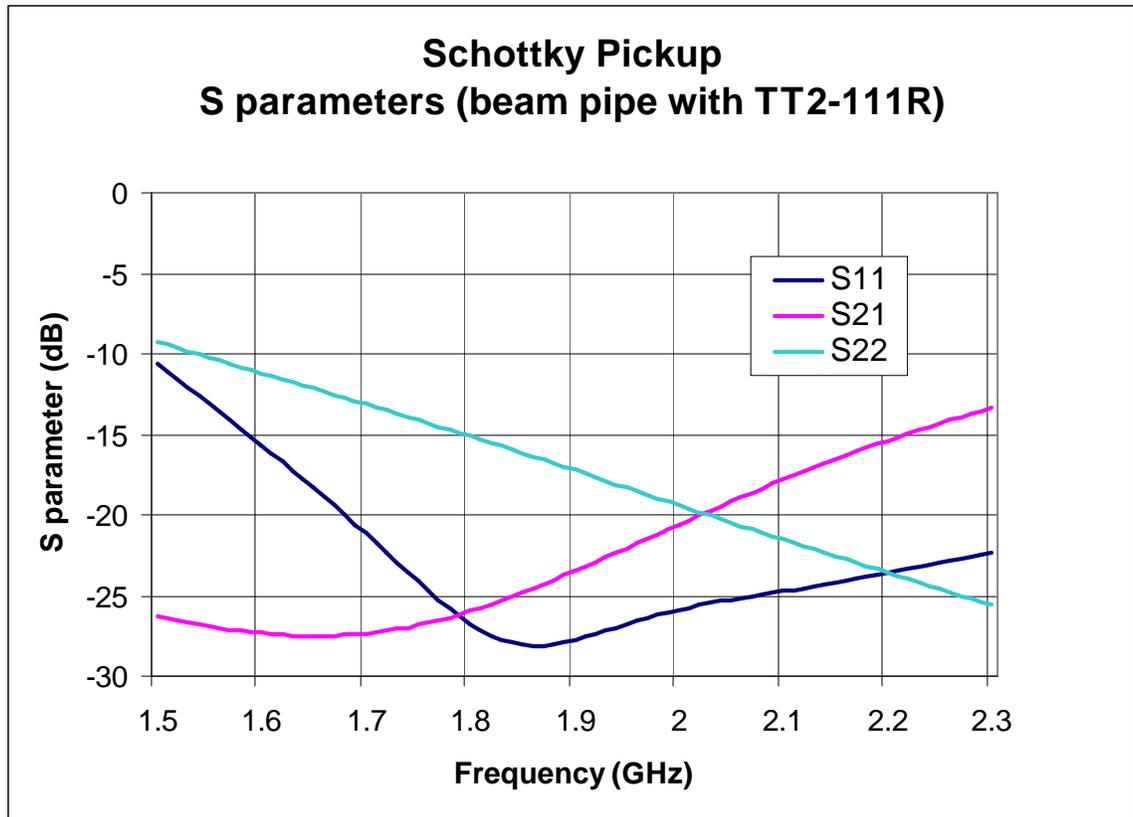


Figure 3. Reflection and Transmission at the end of beam pipe

Note: Port 1 is at normal beam pipe (without absorber) side. Port 2 is at outside of beam pipe.