

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
HAYSTACK OBSERVATORY
 WESTFORD, MASSACHUSETTS 01886
 September 16, 2008

Telephone: 781-981-5407
 Fax: 781-981-0590

To: VSRT Group
 From: Alan E.E. Rogers
 Subject: Adding a ground screen to the direct TV dish

In memo #41 we looked at using a “deeper” dish for the ozone spectrometer to reduce the added noise from ground pick-up. The “Ridge” spectrometer used a KDS75S with f/d ratio of 0.5. The disadvantage of the KDS75S is that it is a larger dish and more difficult to mount.

An alternate approach is to extend the size of the direct TV dish as shown in figure 1 or to add a ground screen as shown in figure 2 along with the dimensions given in figure 3. “Y” factor measurements were made of various configurations and comparisons as shown in table 1.

Configuration	Signal	Comparison	Y (dB)	Comments
Direct TV dish	Antenna at 8°	Load	4.9	LNBF FSKU-V
+ extended section	Antenna at 8°	Load	5.3	
With ground screen	Antenna at 8°	Load	5.6	
With ground screen	Antenna at 45°	Load	6.6	
With ground screen	Antenna at 8°	Antenna at -10°	5.0	

Table 1 – Y factor measurements

These measurements are fairly well fit with the following parameters:

T_{load}	300 K	
T_{rec}	25 K	(0.36 dB N.F.)
$T_{atmos+spillover}$	65 K	At 8°
$T_{atmos+spillover}$	45 K	At 45°
Spillover reduction by screen	35 K	
Beam efficiency	90%	
T_{sys}	90 K	at 8° with ground screen



Figure 1.



Figure 2

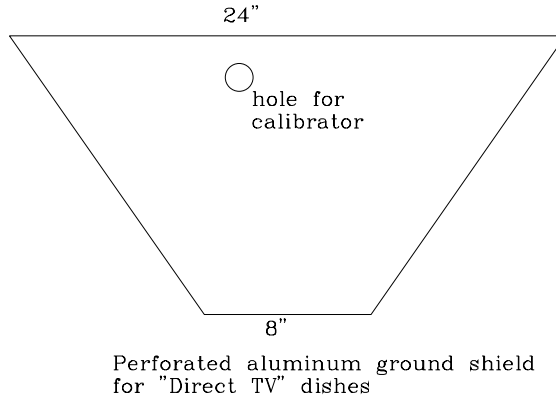


Figure 3. The ground screen had 1/8" diameter holes as perforation. Unfortunately this fine screen will most likely accumulate snow so tests were made with 1/4" x 3/4" diamond shaped perforations. The coarser screen only improved the "Y" factor by about 0.4 dB. An intermediate coarseness is required and further tests will be made in the winter.