VSRT MEMO #045

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To: VSRT Group
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Subject: System noise in Ozone spectrometer

The noise performance of the ozone spectrometer is measured by placing an absorber over the feed and measuring the increase in total power. The "Y" factor or ratio between the absorber in place and with the absorber removed is

$$\left(T_{LNA}+T_{amb}\right)\Big/\left(T_{LNA}+T_{atmos}+T_{CMB}+T_{spill}\right)$$

where T_{LNA} = LNA noise ~0.3 dB ~ 20K
T_{amp} = air temperature ~ 300K
T_{atmos} = temperature due to atmosphere absorption at 11.072 GHz 8˚ elevation depends on weather ~ 35 K.
T_{CMB} = Cosmic Microwave Background 3K
T_{spill} = feed spill-over ~40 K

Using the numbers above we expect

$$Y=\left(20+300\right)\Big/\left(20+35+3+40\right)\simeq 5.1\,dB$$

In practice the Y factor of the "Ridge" system in the Moran building is 4.6±0.3 dB and the "CHS" system is 4.0±0.3 dB. The "Ridge" system uses a 75 cm dish (KDS75S) with F/D of 0.5 while the CHS is a 46 cm dish with F/D of 0.59. The deeper dish with smaller F/D ratio offers some advantage in a reduced spillover.