805 MHz cavity TiN_Mo button test
• Cavity commissioning started in the early November, 2007
  – Abnormally high radiation background was observed with chipmunk detectors, ~100-1000 times higher than usual
• Calibrations were done on Nov 28\textsuperscript{th}, 2007, with network analyzer
  – The signal on the scope actually needed to be multiplied by the scaling factor of 1.9 due to some connection problem on the 805MHz cavity RF pickup
• The problem was fixed in the early Dec. 2007
• Data were taken in Dec. 2007
S_{21}: The transmission coefficient from the RF input port on the waveguide to the 805MHz cavity RF Pickup 1: ~5.6dB's difference between the loss factor on the scope and the one we measured in May, 2007, means the actual signal is ~1.9 larger than the one we had seen on the oscilloscope.
Smith chart calibration: $S_{11}$ (WG reflection)
Up-limit of the on-axis accelerating gradient on button surface at various magnetic field

- Compared to bare Mo button, there is no significant improvement by TiN coating.
- There is a balance between the field emitters generated and destroyed by the RF field. We need to adjust the RF field very carefully to obtain the equilibrium; otherwise, either we cannot reach the highest gradient, or break down the cavity. Each time we kept the gradient stable for 5-10 minutes.
- The difference between the two curves of the TiN_Mo button is due to different surface conditions.
- Because the cavity had been subjected to the very high RF gradient up to 70MV/m due to the wrong calibration in Nov, while we open up the cavity to change the button, we need to take a close look at the TiN_Mo button surface to see if the TiN coating was seriously peeled off like in the last May. Otherwise, we don’t know if the results are accurate.
CENTER OF 805MHz cavity TO DETECTOR 16 (NaI crystal): 6629mm

CENTER OF 805MHz cavity TO DETECTOR 8 (smaller scintillator paddle): 5994MM

RD46 CHIPMUNK DETECTOR IS AT DOWNSTREAM BEHIND THE 805 MHz CAVITY
• Comparing the saturation points measured on the same day (the surface conditions are about same), e.g., on 12/12/07, based on the yellow, blue and purple curves, we can see that the magnetic field has almost no influence on the detectors because of the enough long distance between the cavity and detector. Saturation ~ 27MV/m cosmic background
No Saturation observed on yellow, blue and purple curves
• Very sensitive to accelerating gradient, $\sim E^{14}$. A small variation of accelerating gradient can introduce large change of radiation background.
• Therefore the signal cables from the RF pickups needs to be carefully calibrated.
Future plans

• Open up the cavity, check out the TiN_Mo button to see the surface condition, and install the TiN_Cu for the next run

• May need to recalibrate the signal transmission cable from both RF pickup 1 and 2 to make sure the calibration is accurate.