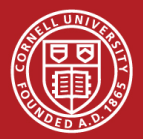


Cornell University
Laboratory for Elementary-Particle Physics

Followup on the ECLOUD Model for Electron Cloud Buildup in Longitudinal Magnetic Fields

and

First Model Results for the Time-Resolved Retarding Field Analyzer Measurements

Jim Crittenden (with thanks to Joe Calvey and Junki Makita)

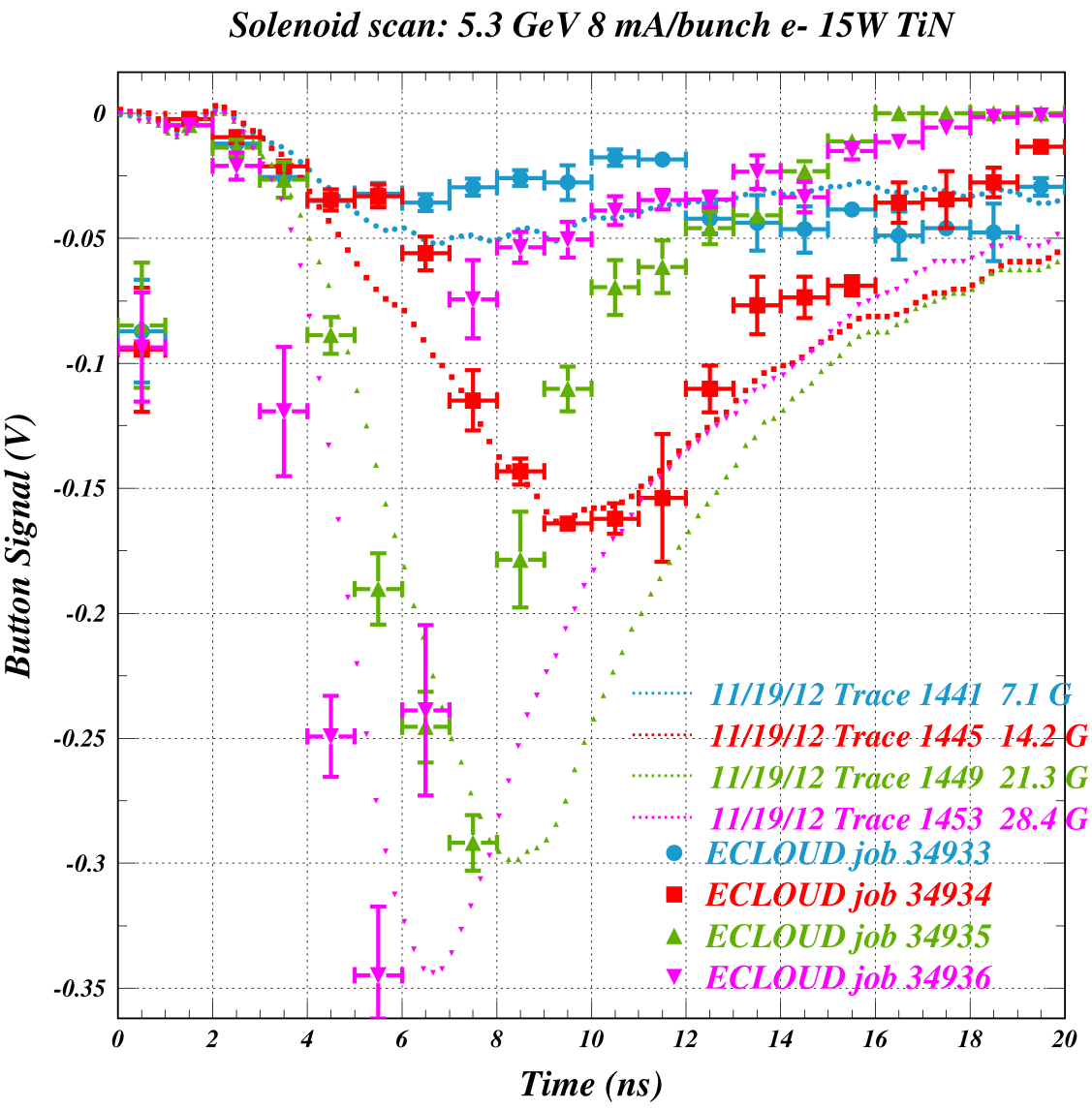
Cornell Laboratory for Accelerator-Based Sciences and Education

Electron Cloud Meeting

3 April 2013

Reminder of the Model Status Last Week

– Including SPU acceptance function for magnetic field –



5.3 GeV Electrons 8 mA/bunch
15W TiN-coated Al

<u>Progress over the past four weeks</u>

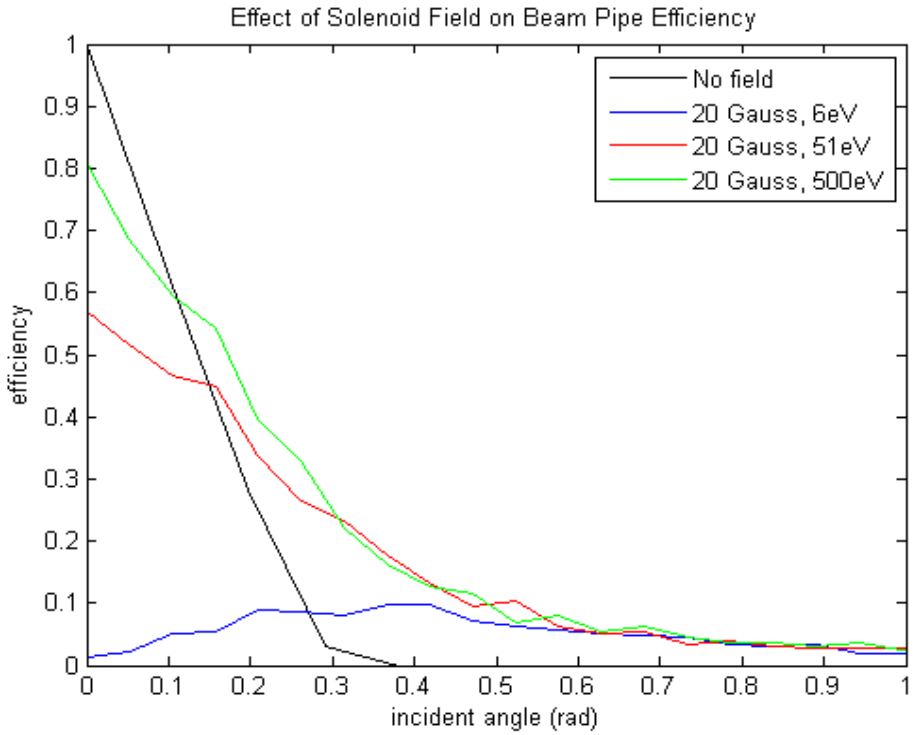
1) Signal shape for 14 G reproduces the measurement fairly well

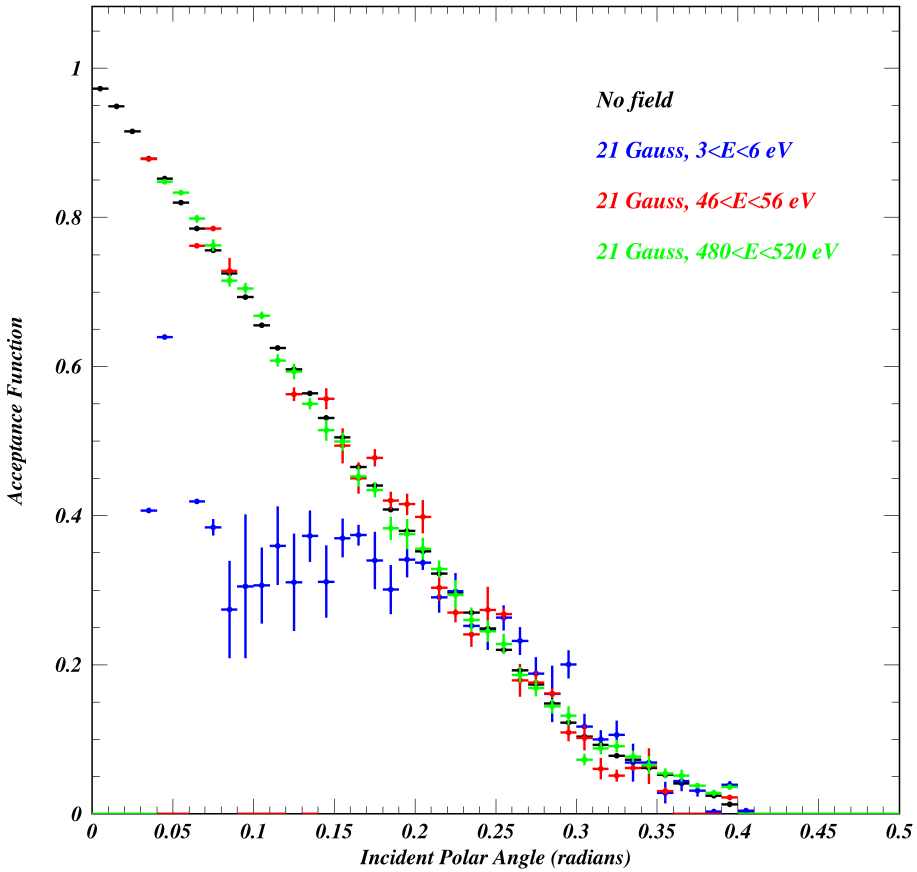
2) Timing of leading edge scales approximately correctly from 7 to 28 G

3) Signal size also better

The standard SEY model for TiN works quite well.

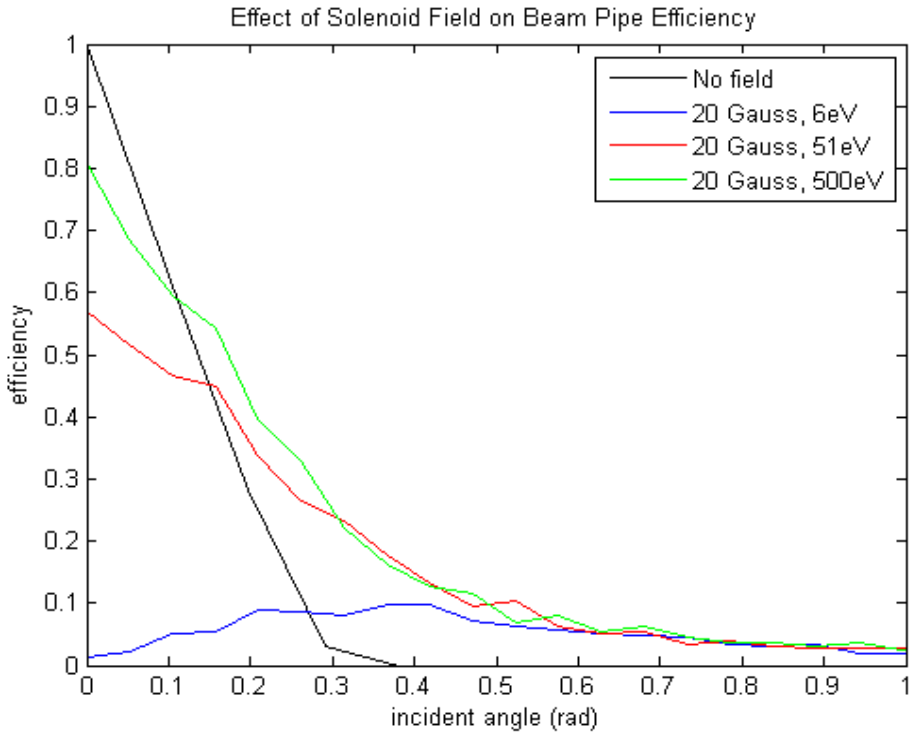
Comparison of the SPU acceptance function with Junki's standalone Monte Carlo model

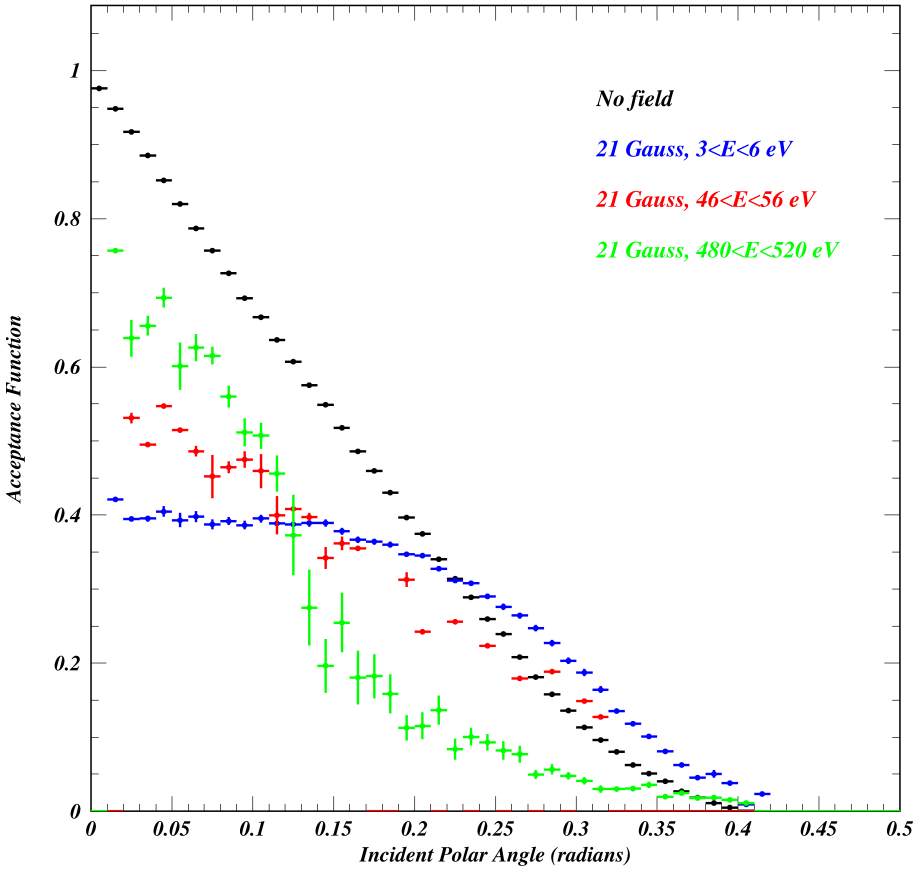




The ECLOUD acceptance model transitions to the field-free case at values of the cyclotron radii which are too small.

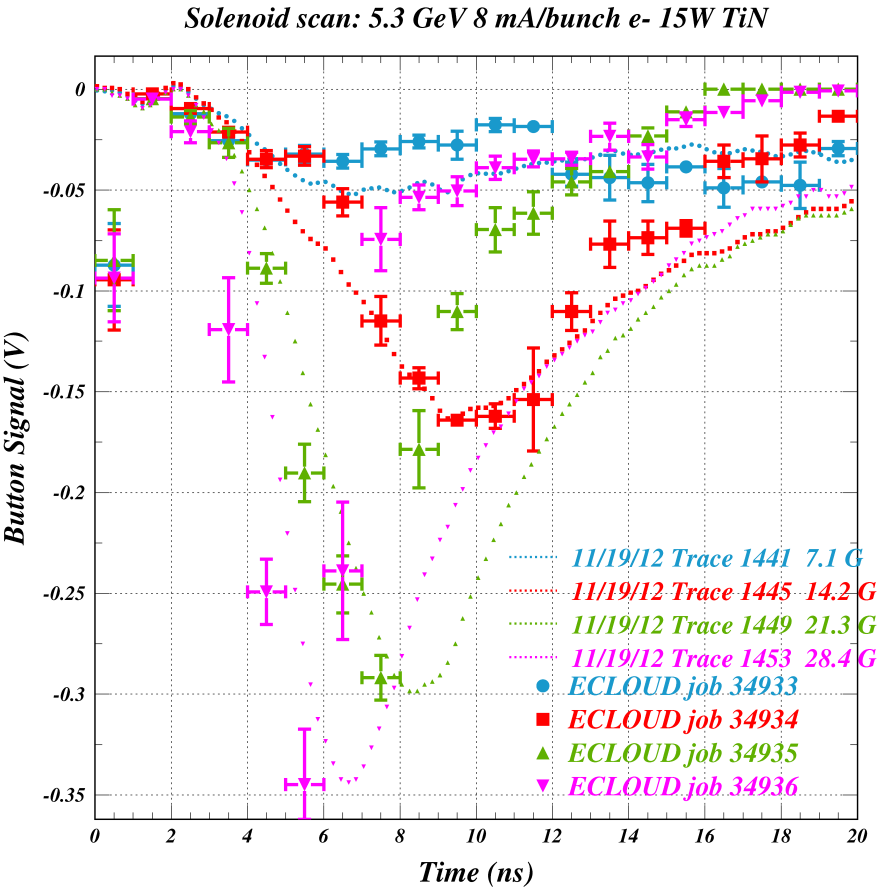
Retuned SPU acceptance model

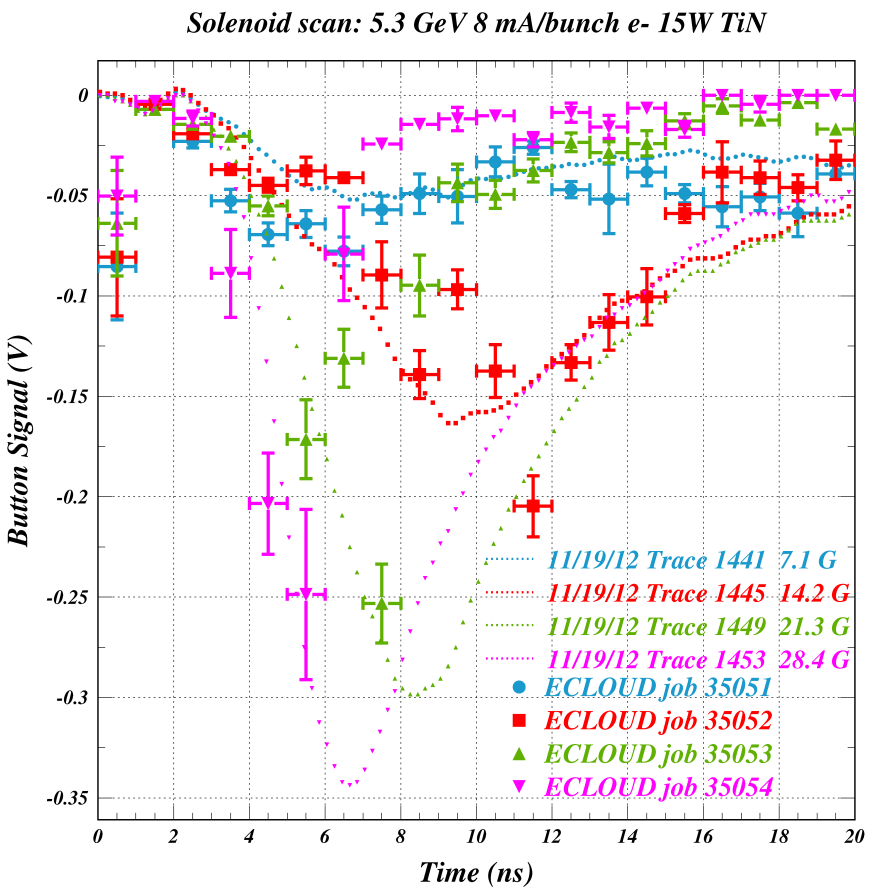




Transition to field-free case now at values for the cyclotron radii between 25 and 50 mm instead of 5 mm.
Need to remove hole secondaries from Junki's model for direct comparison.

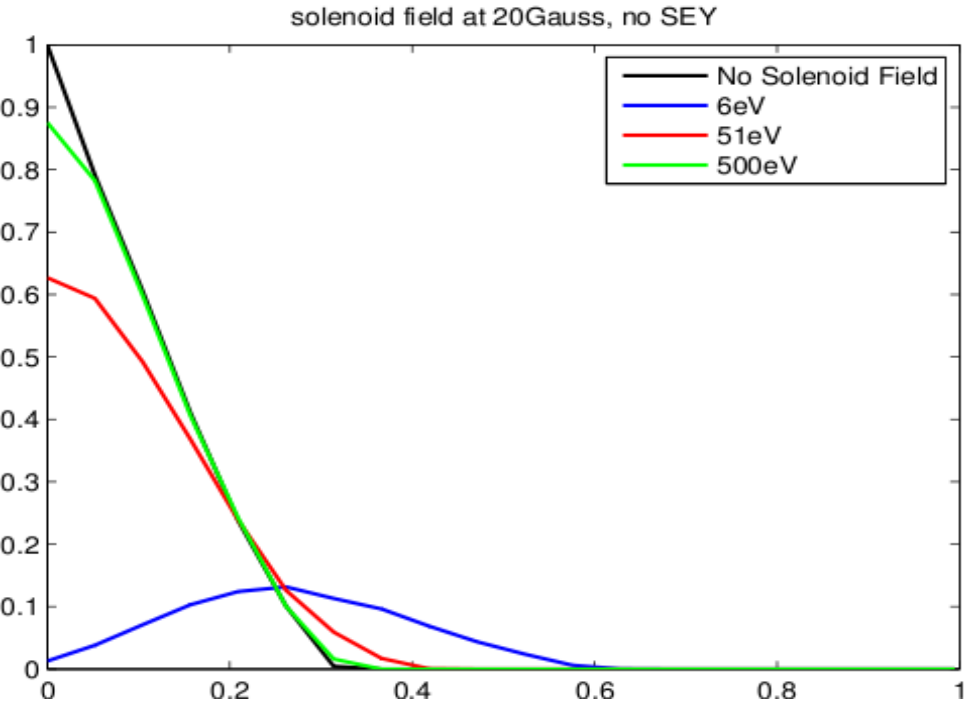
Present status with retuned SPU acceptance

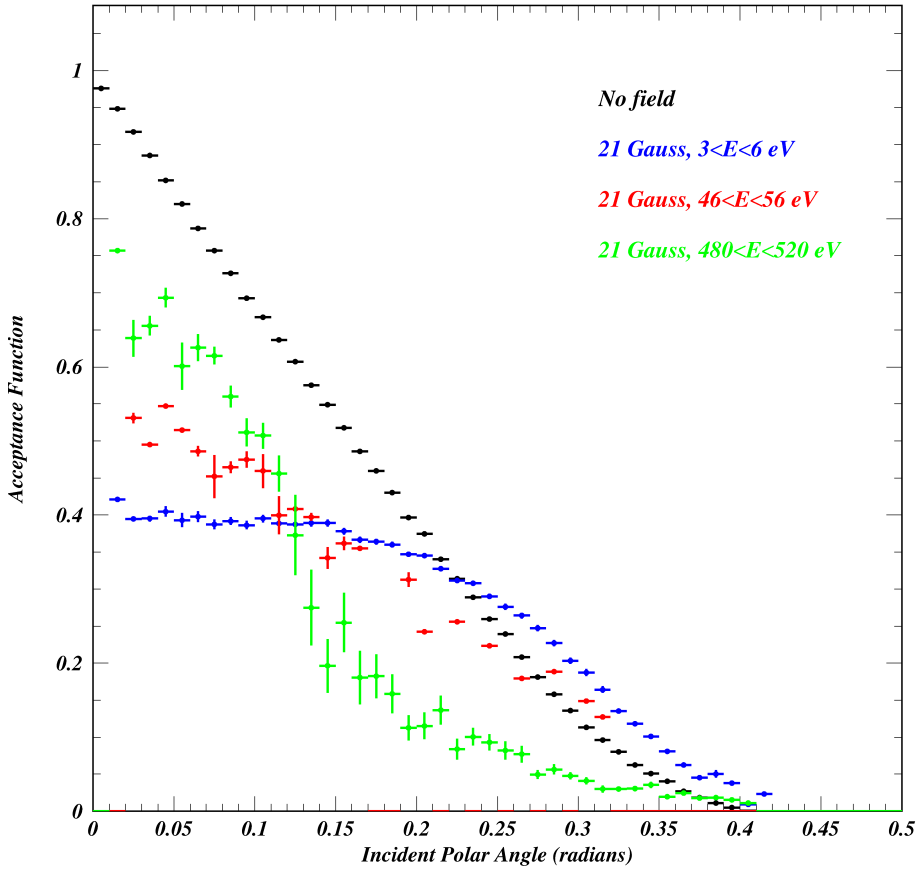




Overall acceptance smaller by roughly a factor of two.
Raised the photon rate by a factor of two to get this comparison.
The tails of the high-field signals remain poorly modeled.
Need a systematic study of the photoelectron energy distribution.

Effect of removing hole secondaries from Junki's model



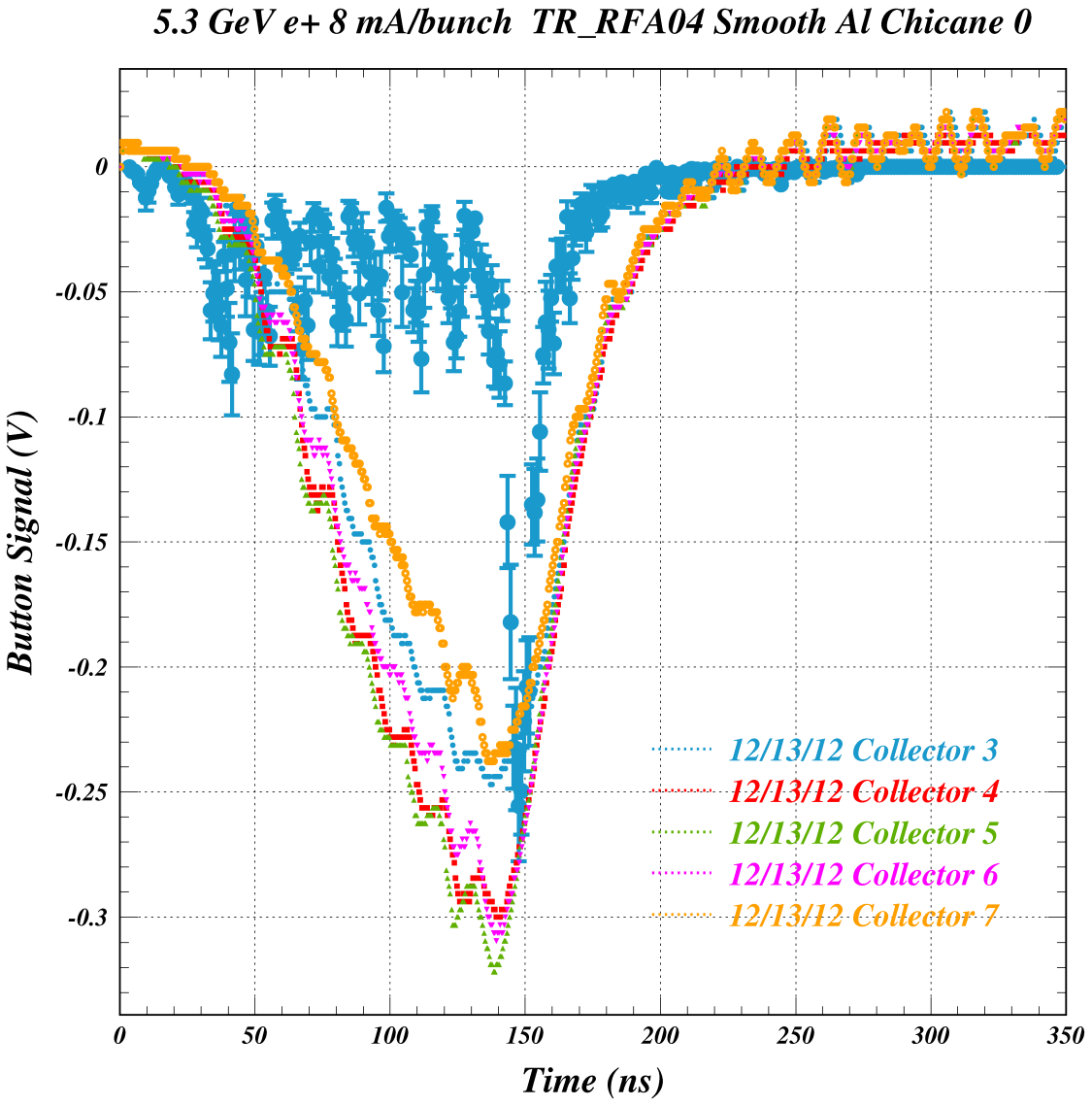


Some further tuning needed, including acceptance for more grazing incident angles for small cyclotron radii.

SPU and time-resolved RFA collector geometries

	Shielded pickups	Time-resolved RFAs
Number of holes	169	261
Hole diameter	0.76 mm	1.7 mm
Transparency	29.8%	15.4%
Hole depth	1.8 - 2.4 mm	5.0 - 7.5 mm
Tan Θ_{max}	0.32 - 0.42	0.23 - 0.34
Θ_{max}	18-23 degrees	13-19 degrees
Number of collectors	3	9
Collector pitch	14 mm	5.8 mm
Collector width	18 mm (round)	5.8 mm

First model of time-resolved RFA measurements



Synrad3D: RFA49W4

SEY model for Aluminum

5.3 GeV
14-ns spacing
10 e+ bunches
8 mA/bunch

Round beampipe 4.45 cm radius

Do we need an RC filter?