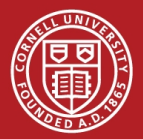


Cornell University
Laboratory for Elementary-Particle Physics

Time-Resolved Retarding Field Analyzer Measurements & Modeling:

-- SEY Mitigation Effectiveness of Grooves in Uncoated Aluminum --

-- Recent Measurements of Cloud Buildup with Dipole Field

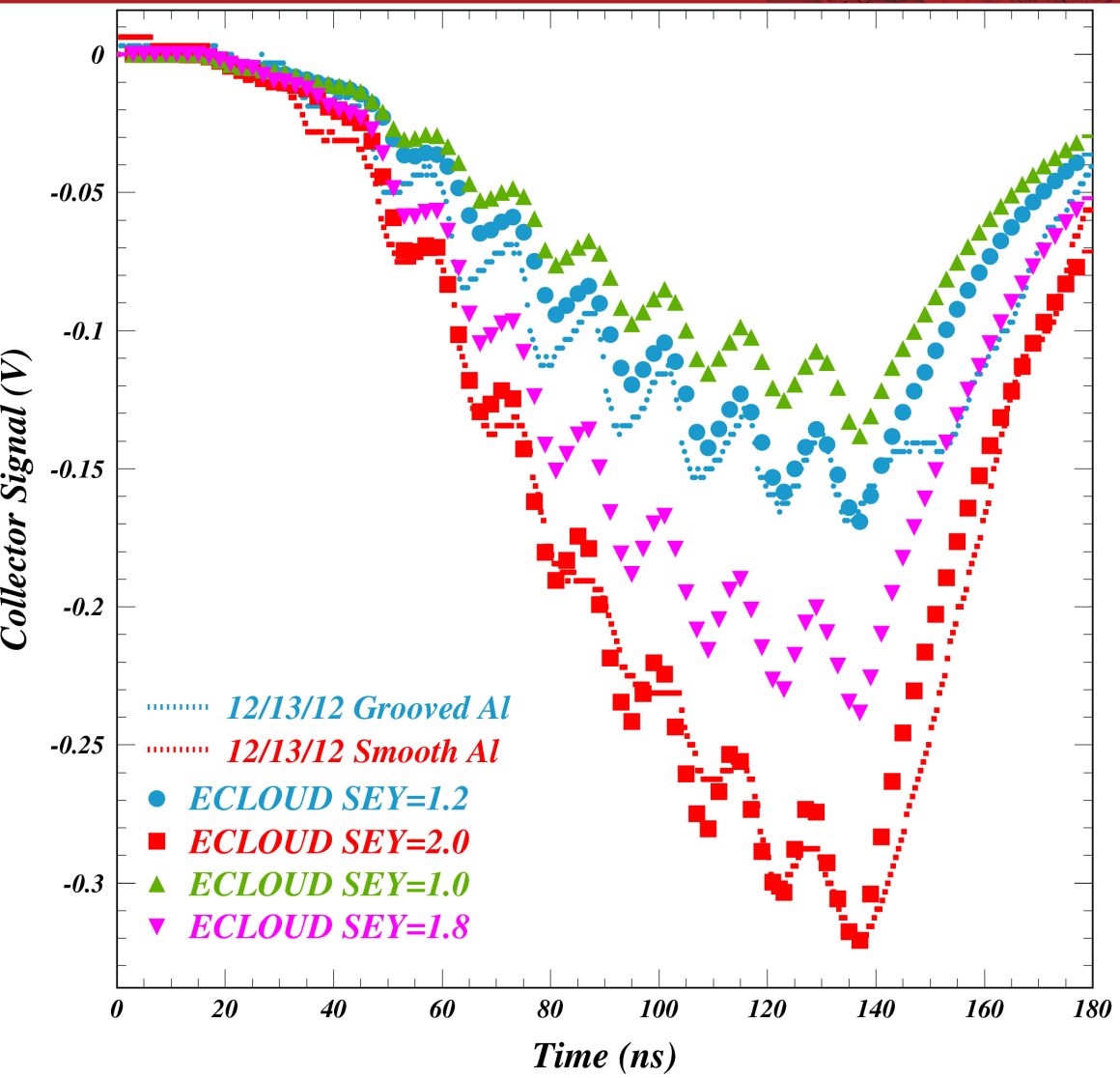
Jim Crittenden

Cornell Laboratory for Accelerator-Based Sciences and Education

Electron Cloud Meeting

24 April 2013

Updated figure for effectiveness of grooves



5.3 GeV e+ 10 bunch train 8mA/bunch

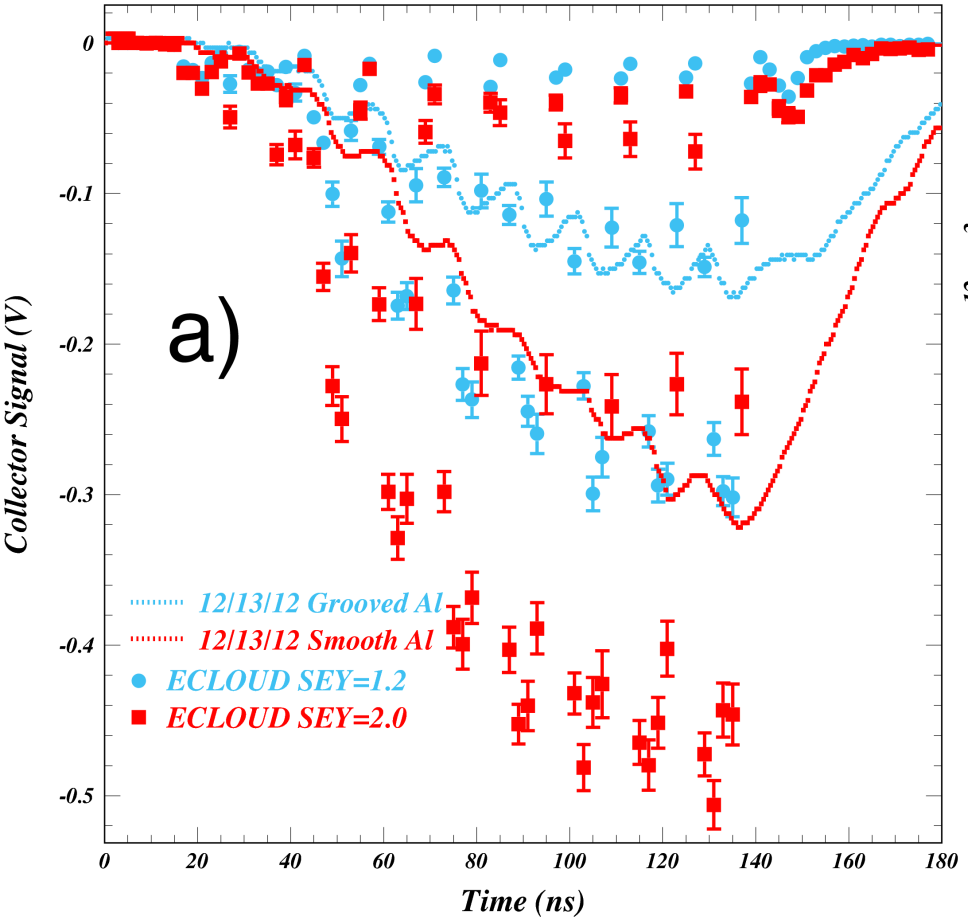
In contrast to the modeling studies for the shielded pickup data with SEY-mitigating coatings, the photoelectron production model is unchanged in the time-resolved RFA experiments, since the photoelectron production is predominantly at the primary photon impact point on the outside of the vacuum chamber.

This example comparison shows the sensitivity to the peak secondary yield to be better than 10%.

This determination of the effective SEY value for grooves should instruct our upcoming publication on the electron cloud buildup analysis for the ILC damping ring. However, in that design we recommend TiN-coated grooves.

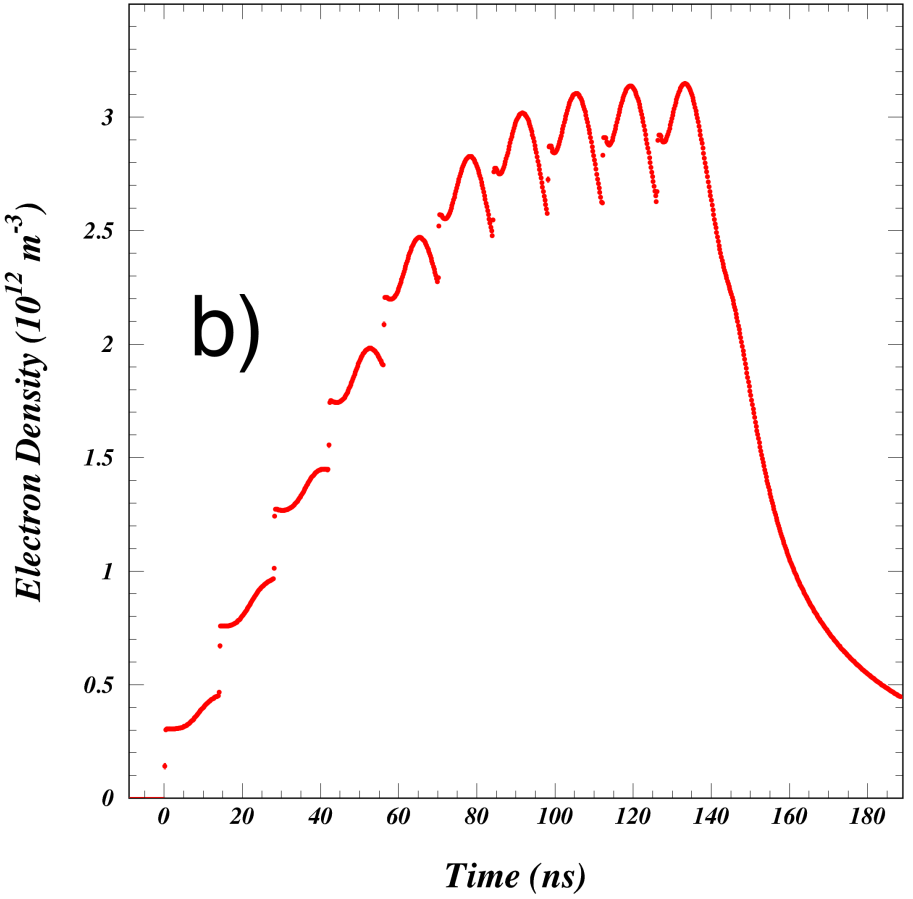
More cloud buildup information

Before RC time constant



Dramatic signal fluctuations are smoothed out by the TR-RFA time resolution

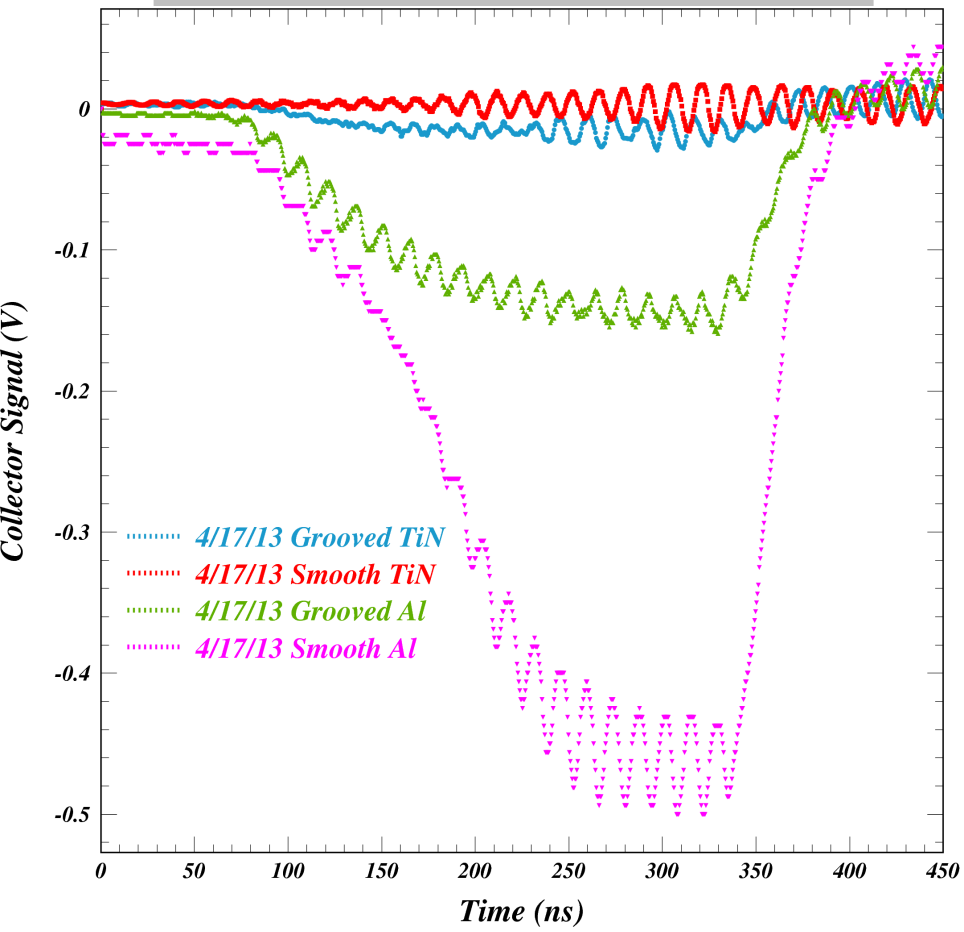
Cloud density



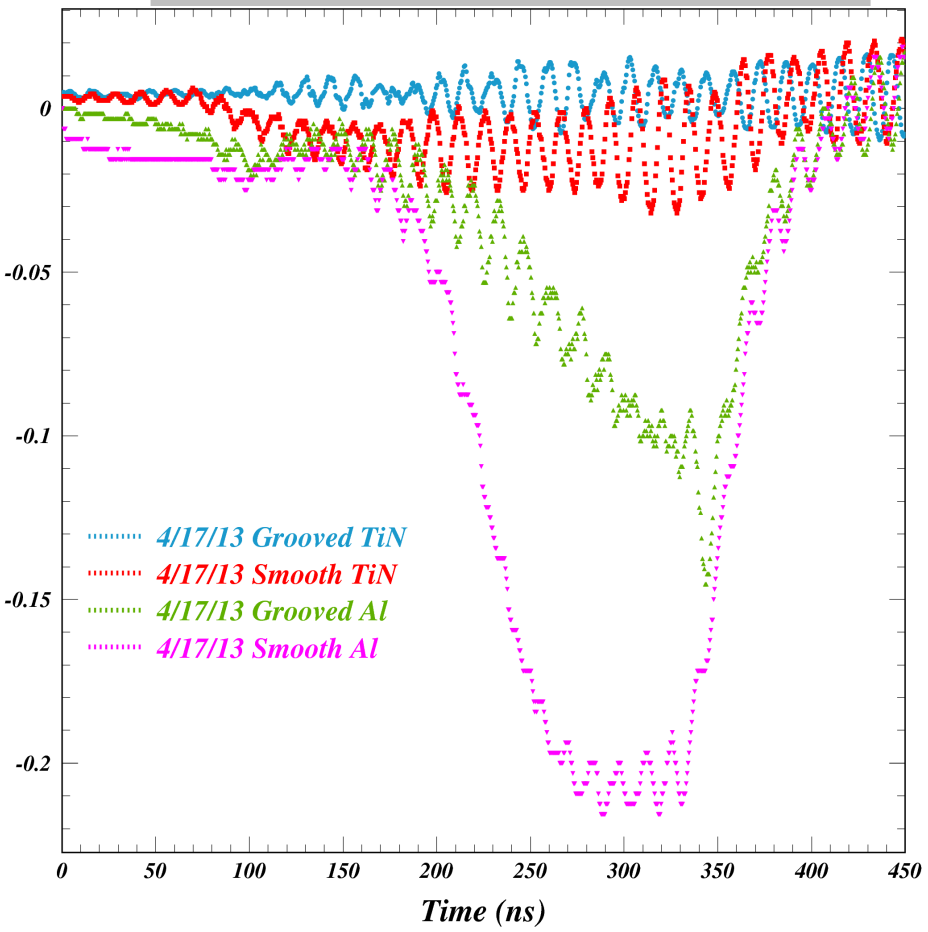
Cloud increases and decreases between bunch passages. Saturates at 3e12 e/m^3.

Compare Al and TiN with and without grooves

0 Gauss



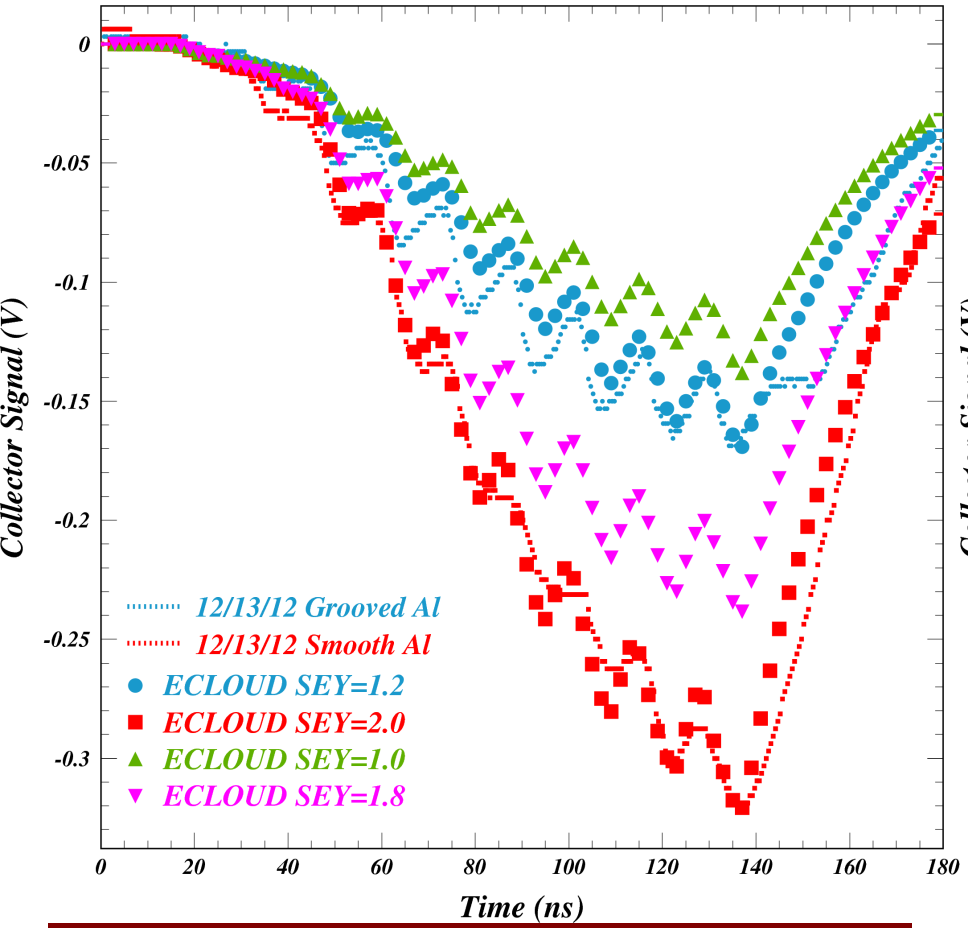
810 Gauss



In spite of beam noise and ringing, the reduction of cloud with TiN grooves is clear.

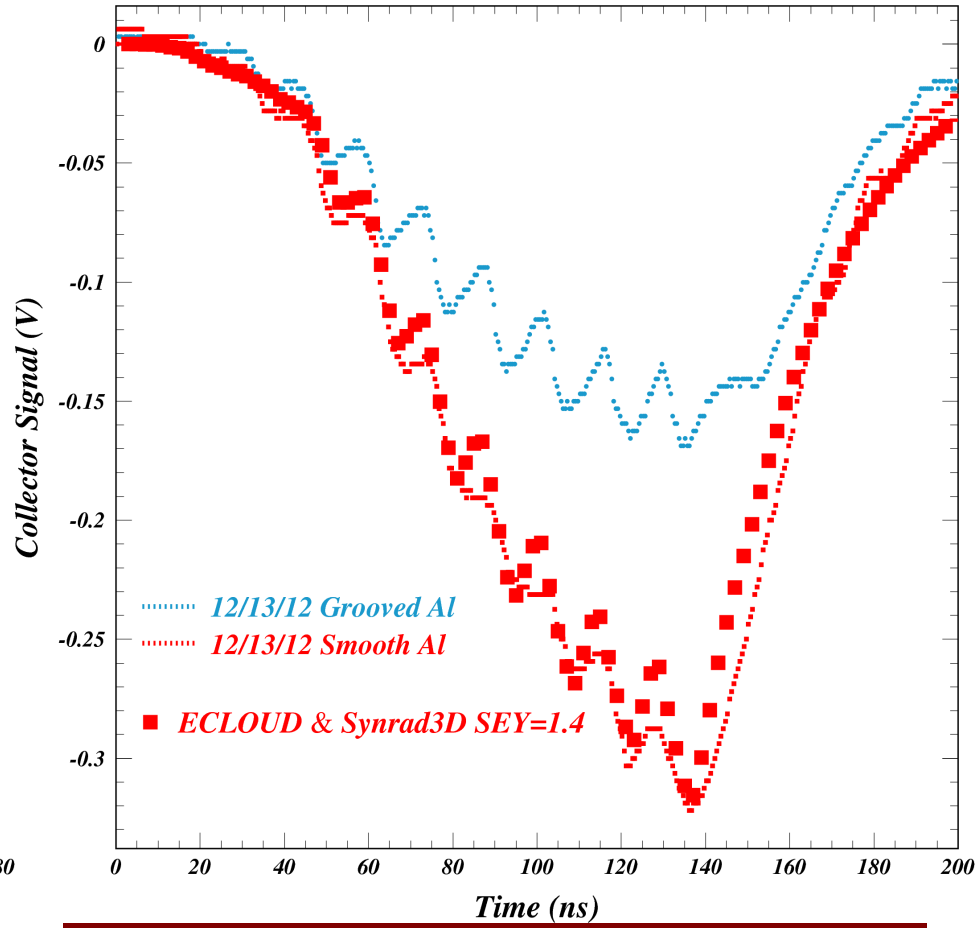
The return of Synrad3D !

Reflectivity 0%



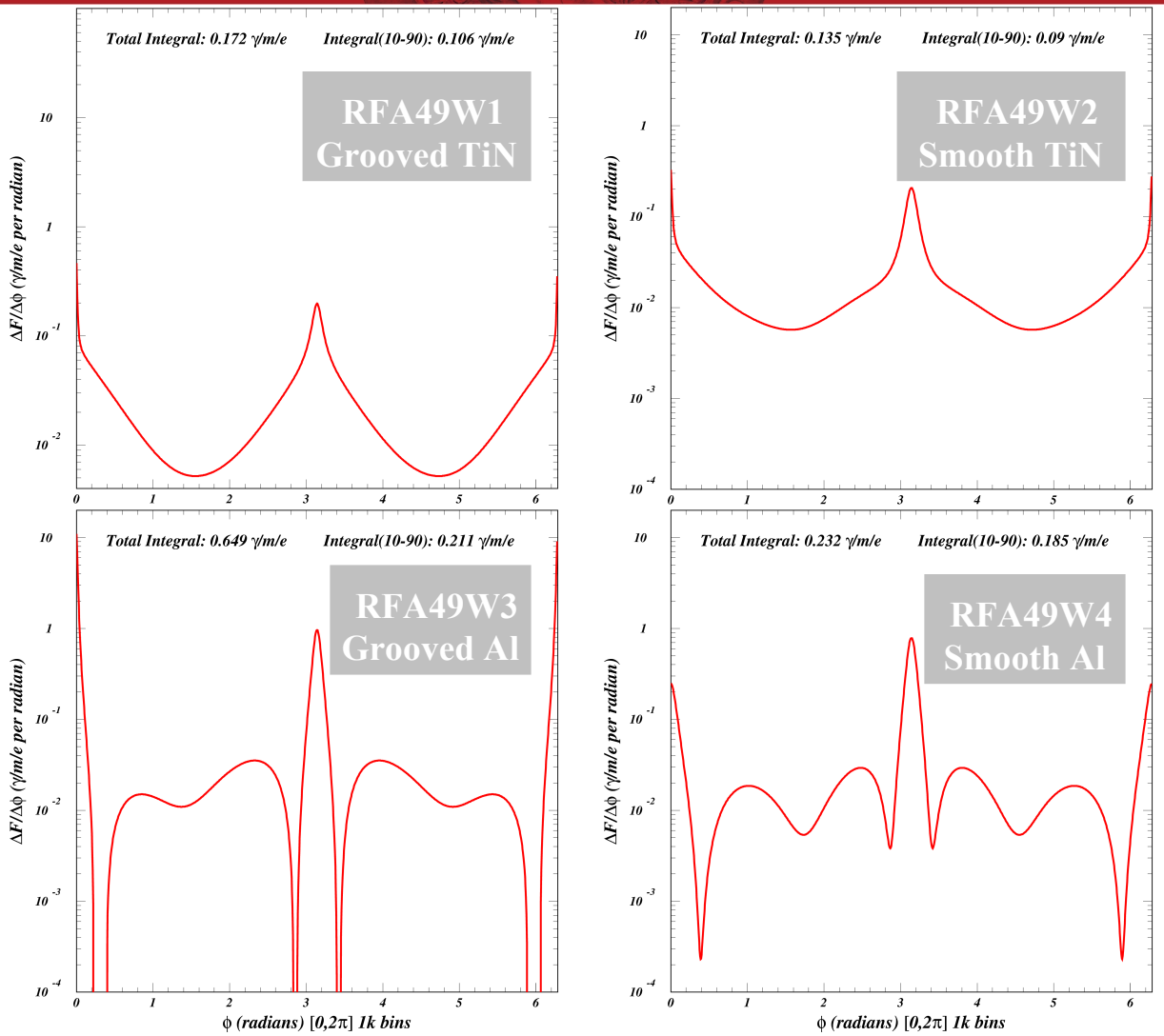
0.015 p.e./m/e
$\delta_{ts} = 1.8, \delta_{red} = 0.2, \delta_{el} = 0.4$

Synrad3D RFA49W4



0.232 γ/m/e QE=6.5% (0.015 p.e./m/e)
$\delta_{ts} = 1.4, \delta_{red} = 0.2, \delta_{el} = 0.4$

Synrad3D photon rates in L3 RFA 1-4



Synrad3D calculates quite different photon rates and distributions in the four TR-RFA chambers.