Ricochet

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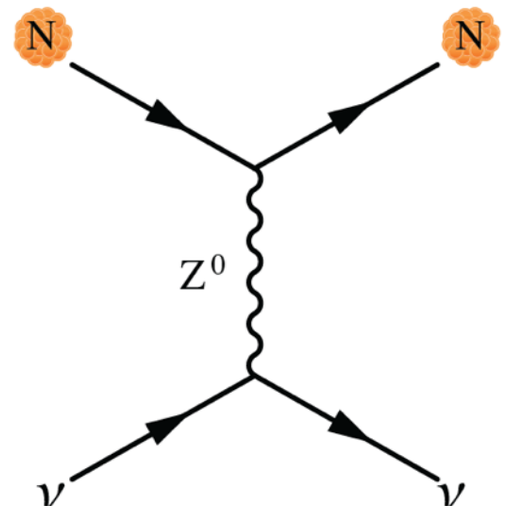
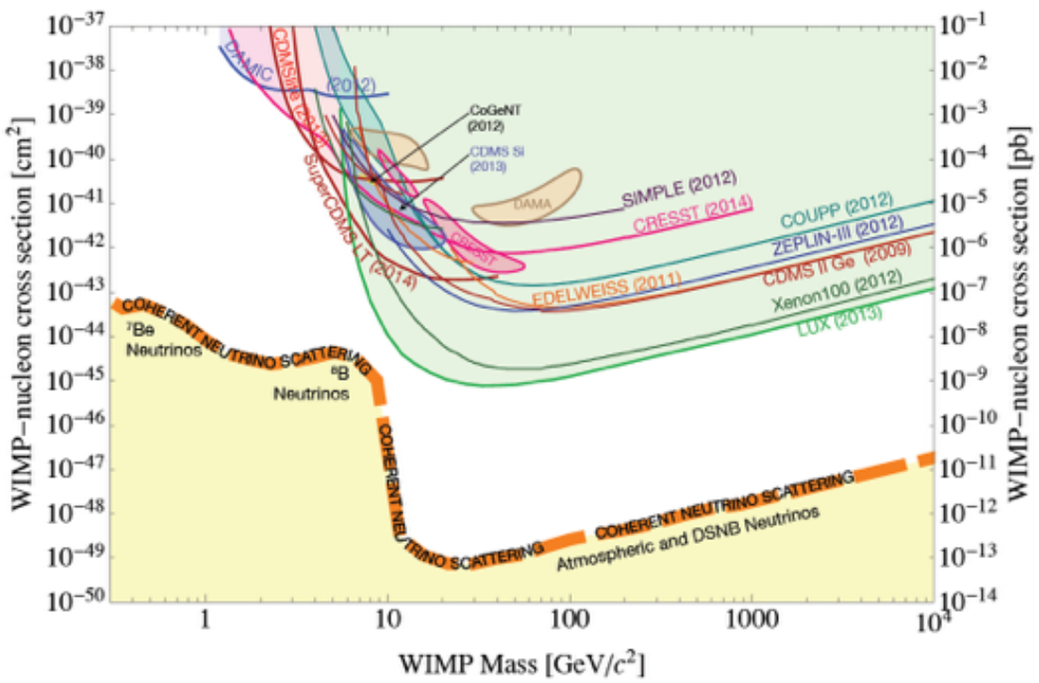
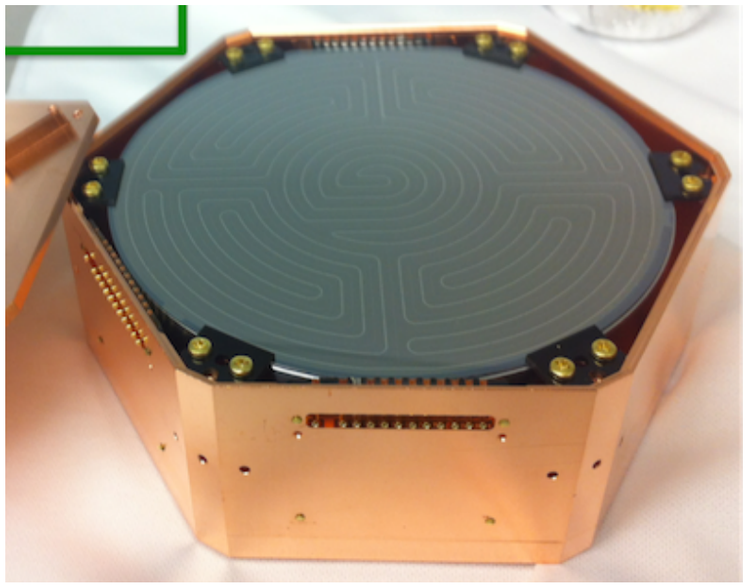
Coherent Neutrino Scattering

- Standard model process that hasn't been measured
    - Once measured can probe nuclear physics and neutrino physics
- Neutral Current iteration same for all flavored neutrinos
- Characterized by low energy recoils: more in the realm of dark matter physicists than neutrino physicists
- Background for Dark Matter Experiments
- Future of: Nuclear monitoring? Sterile Neutrino searches?





RICOCHET
A Coherent Neutrino Scattering Program



- Initial thoughts in arXiv: 1107.3512
- Operate a CDMS iZIP at lower temperatures to get <50 eV threshold, and look at phonon signals only (limited discrimination)
- Essentially the same way you'd look for a low mass WIMP, but focussing on neutrinos since CDMS-lite (iZIP at high voltage and enhanced Luke Phonons) is current path forward in WIMPs
- Mono-energetic neutrino sources like Ar-37 to do a sterile neutrino search (like SOX experiment evolving from

New Ricochet Idea

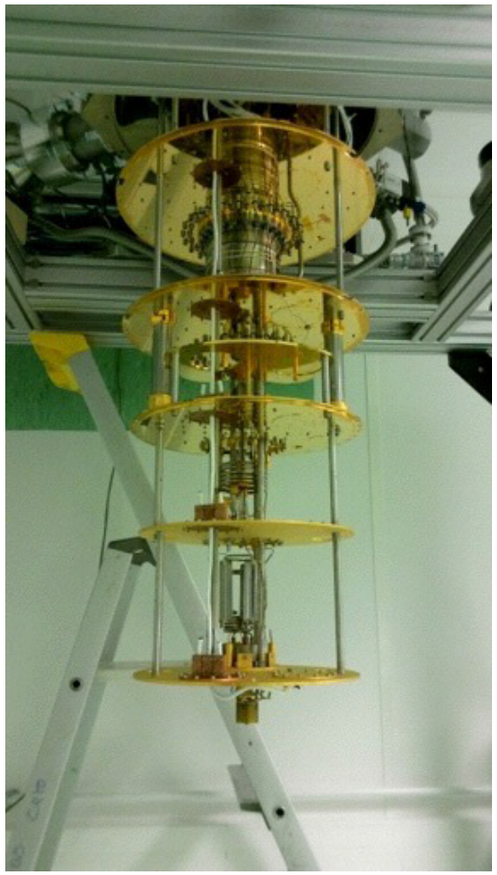
- With **J. Formaggio** at MIT, T. Figueroa at Northwestern/ FNAL, J. Billard in France, + a few others

- Instead of just looking at semiconductors (Si, Ge) as in CDMS, look to superconducting metals, especially Os, Zr, Sn, and Zn

- Less loss of signal if superconducting

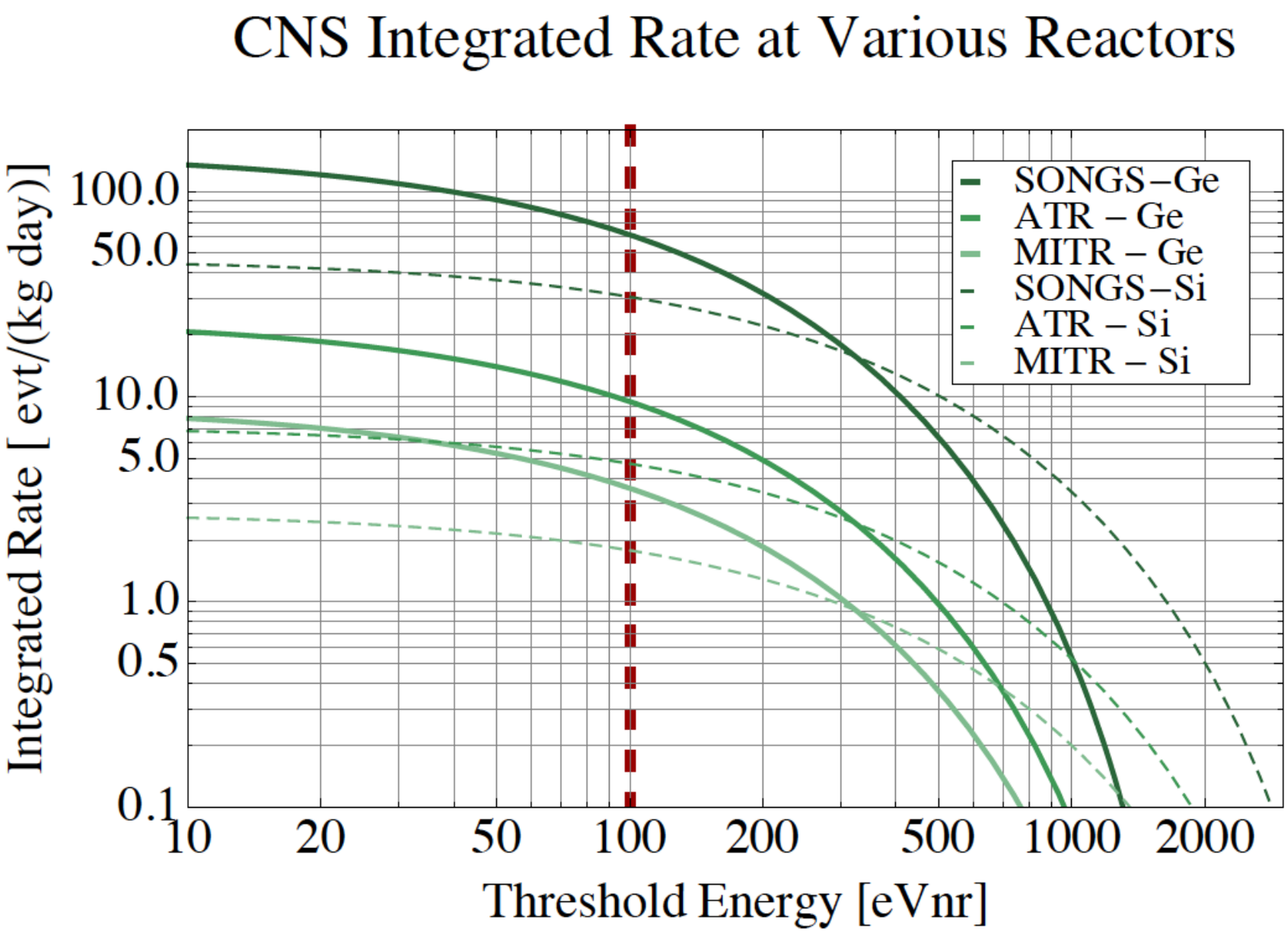
- Very new detector style; new R&D

Ricochet Plans



- New dilution refrigerator arriving at MIT this fall
- Start with a Si or Ge crystal from Edelweiss and a Zn crystal (not single crystal) from MIT
    - Zn needs Si then Au deposited then Au wire bonded to bolometer chip that will actually measure the phonons
    - Test in lab? With neutron calibration sources
- Move to room in MIT test reactor location to run with neutrinos
    - Need to understand reactor neutron backgrounds, as well as cosmic/ radioactive backgrounds

CvNS Signals

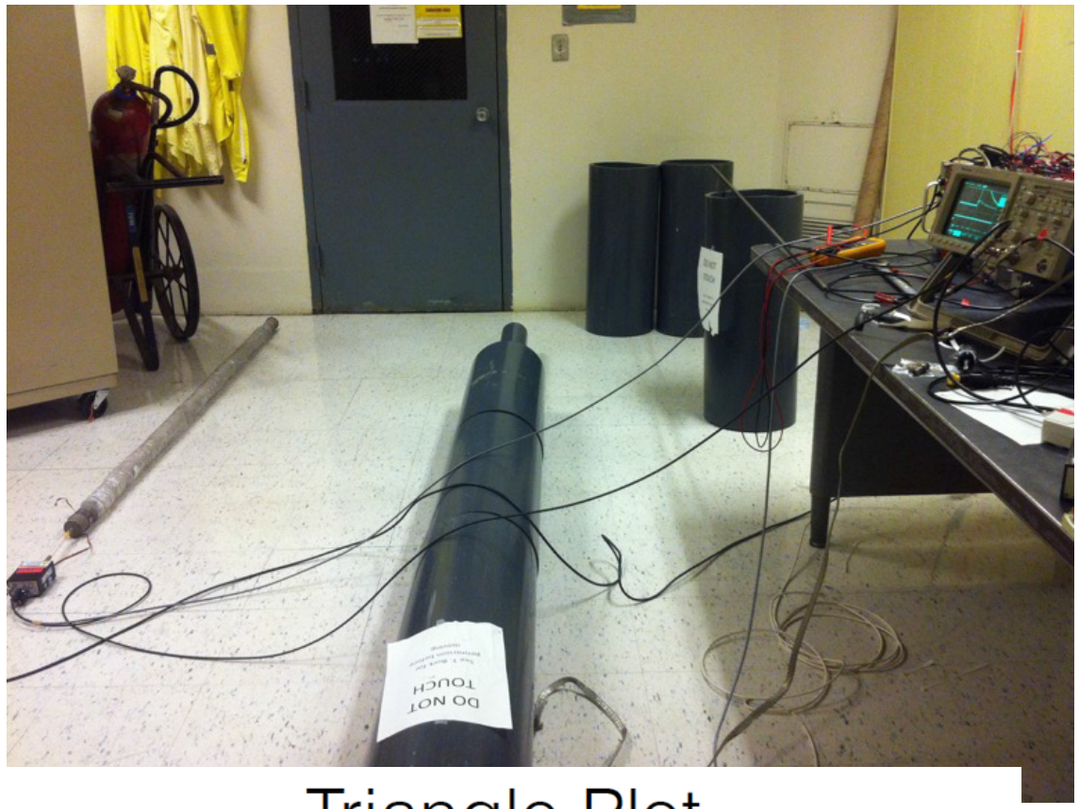


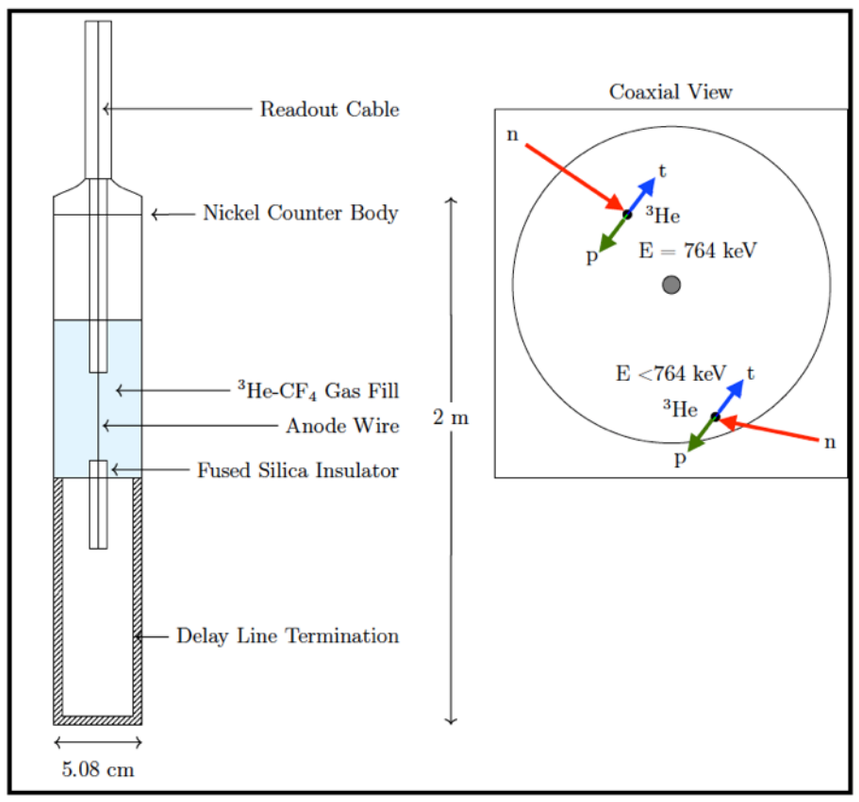
MITR

Power MW	5.5
Baseline m	7
Ge evt/kg/day	3.6
Si evt/kg/day	1.8

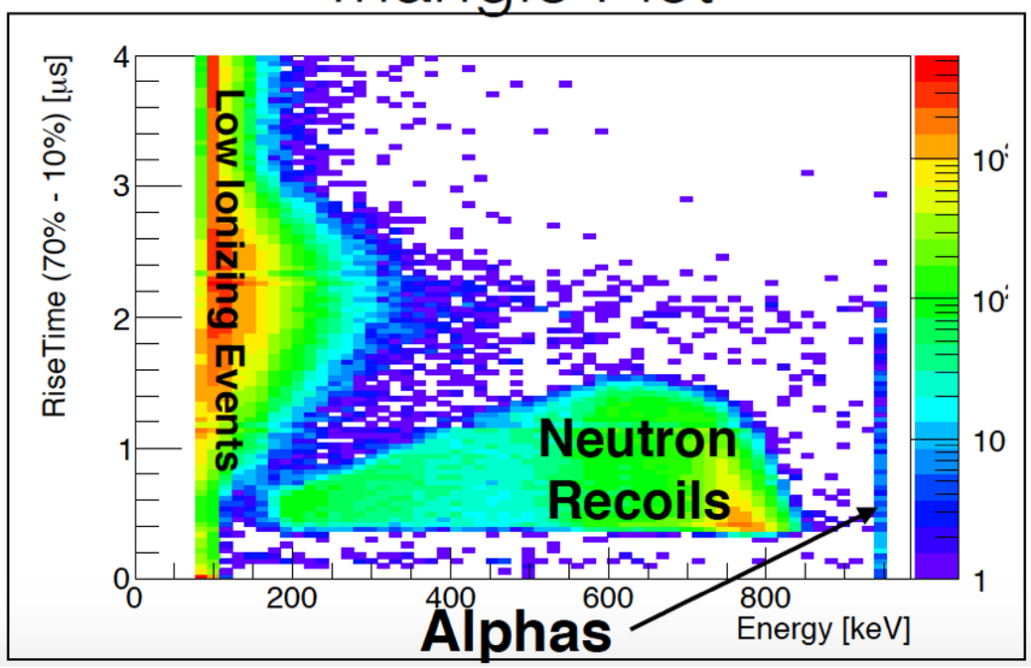
Reactor Neutrons

- Studied with a SNO NCD He3 neutron detector in the room near the reactor
- Need to convert data to a predict spectrum by matching to Monte Carlo simulations
- MIT ones off by factor of 50!

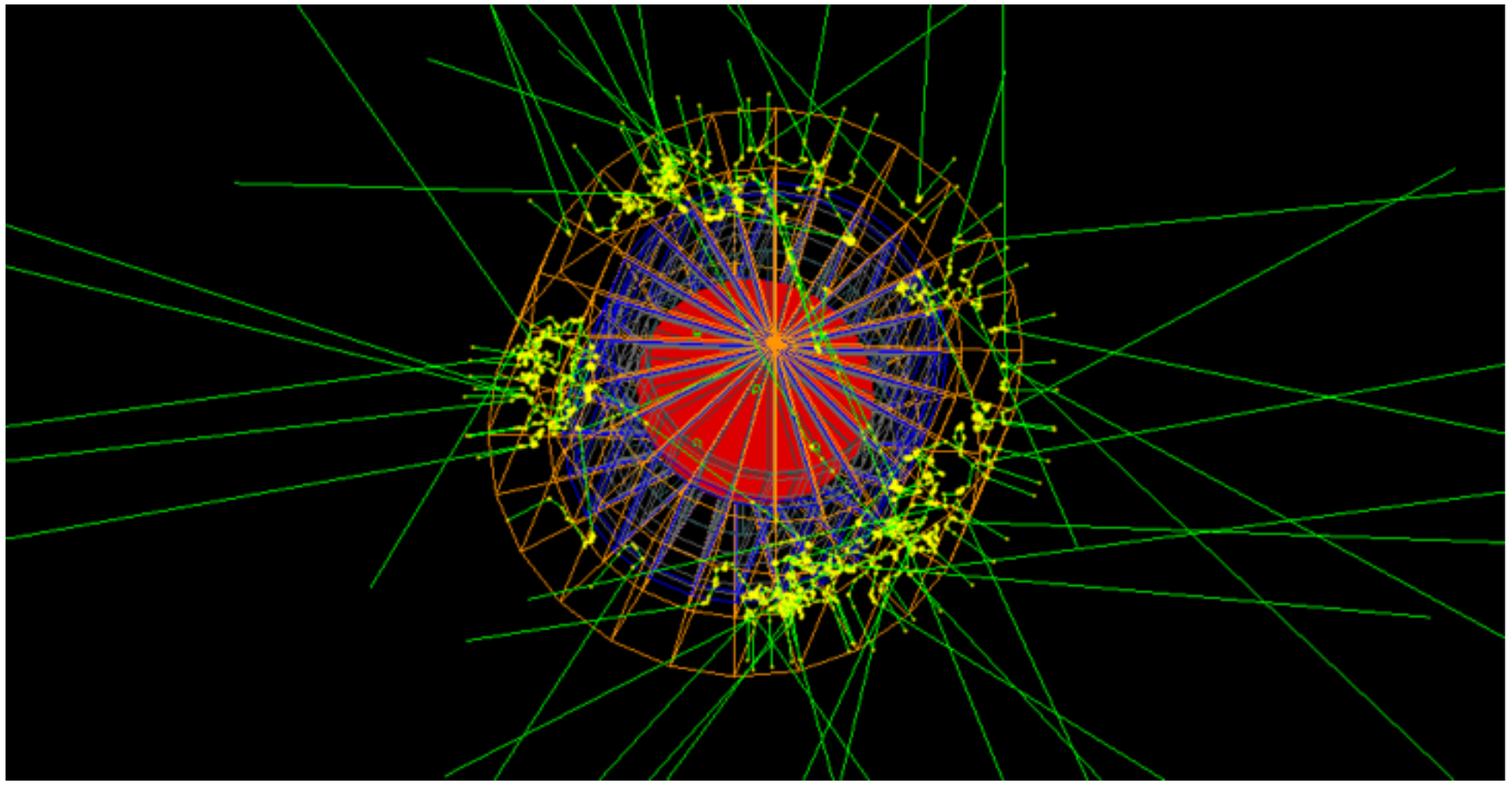




Triangle Plot



Other Backgrounds



- Study in Geant4 simulation with the Ricochet detectors
- Currently expect neutron backgrounds of ~200 /kg/day