Analysis Summary

V. Blackmore

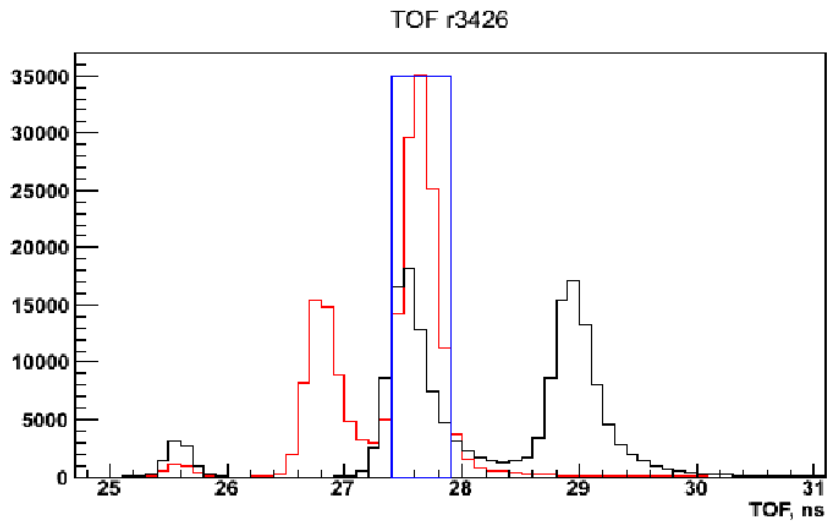
CM32, RAL, 10/02/12

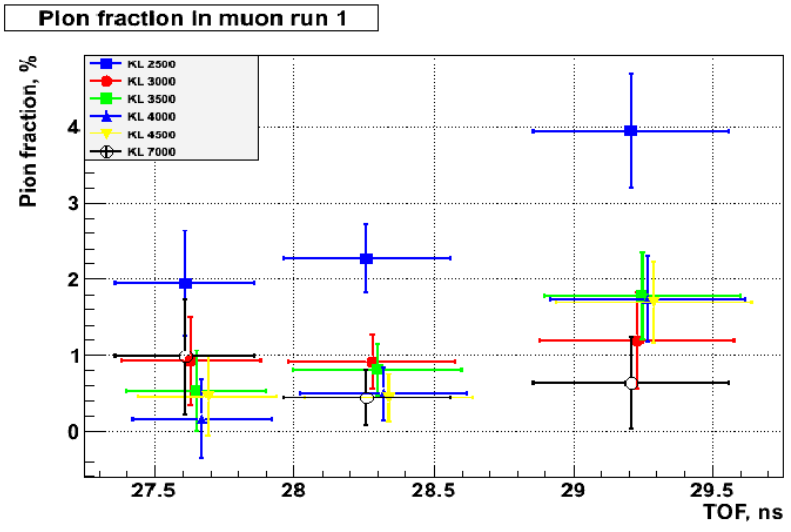
π-μ Beam Contamination

- Developed two techniques for determining the amount of π-contamination in our μ beam.
  - The Time-of-Flight (TOF) of muons and pions can coincide in different runs. Compare the overlap between muon and pion peaks in pion runs:

$$N = N\mu + N\pi$$
$$N_{cut} = K\mu * N\mu + K\pi * N\pi$$

Determine: $^{N\mu}/_{N}$ and $^{N\pi}/_{N}$

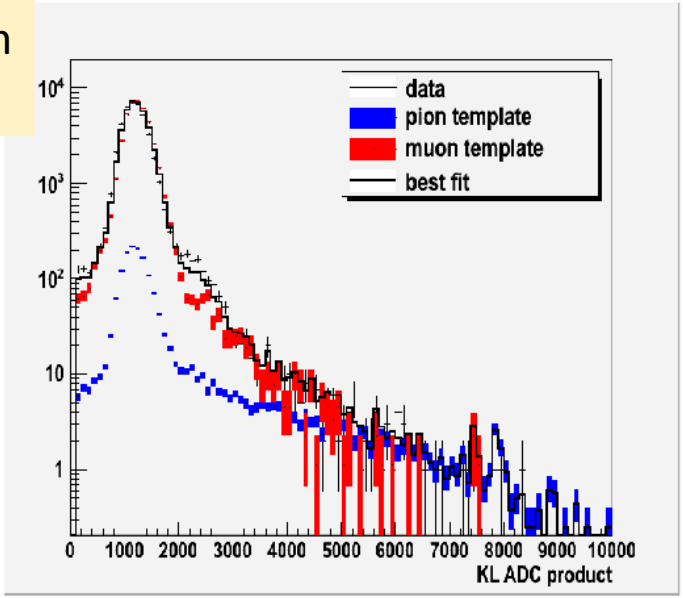


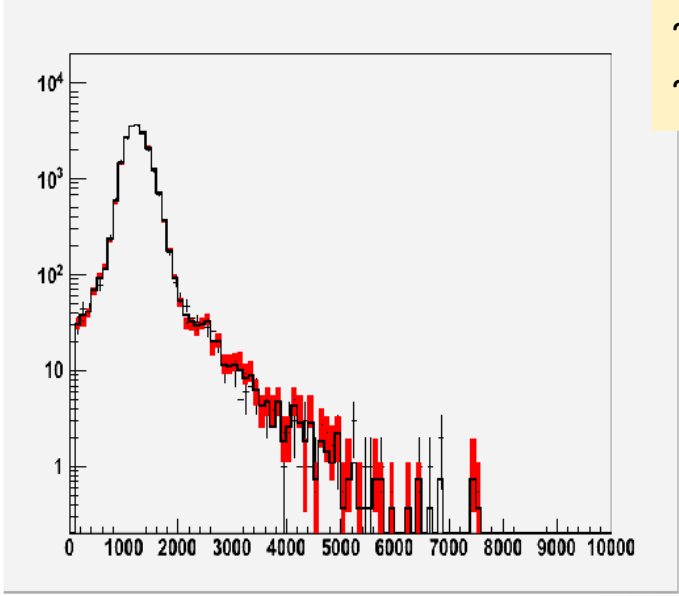


π-μ Beam Contamination

- Developed two techniques for determining the amount of π-contamination in our μ beam.
  - Or: extract templates for muons and pions in fixed TOF windows <u>from the pion runs</u>.
  - Fit the fraction of muons and pions <u>in muon runs</u> within the same TOF window.

~96% m
~4% p



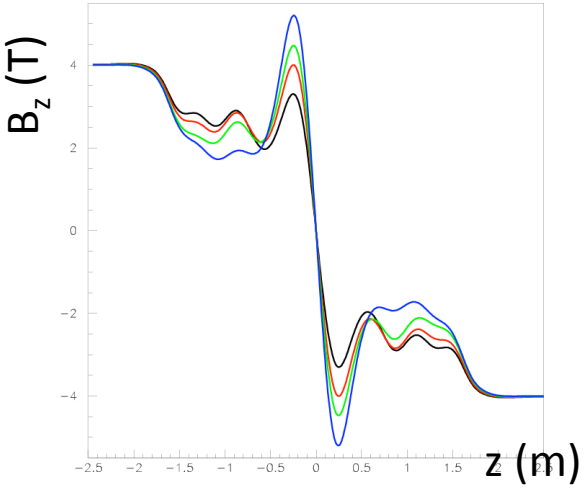


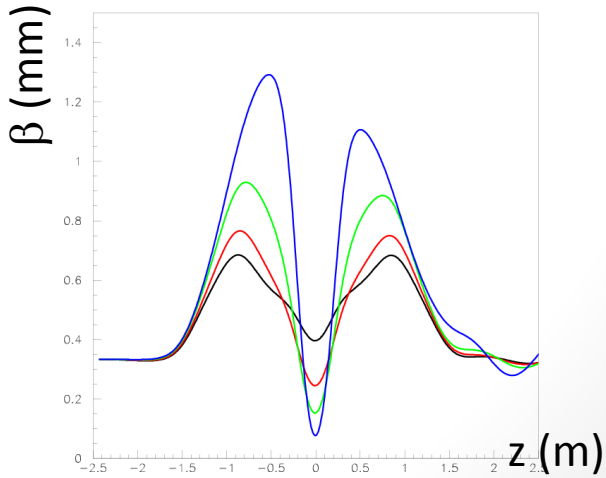
~100% m
~0% p

<u>Very promising technique!</u>

The Optics of Step IV

- MICE Note 88 revival (U. Bravar, 2004)
  - Optics solutions for MICE Steps IV, V and VI for 'old' coil parameters. Much has changed re: coil parameters.
  - Solutions are compatible with coil limitations, are periodic (can be extended to future steps), and are scalable.
- Tested the various TRD-based Step IV configurations in MAUS, making sure there is a match.
- Next, rematching Step IV using the as-built coil dimensions.

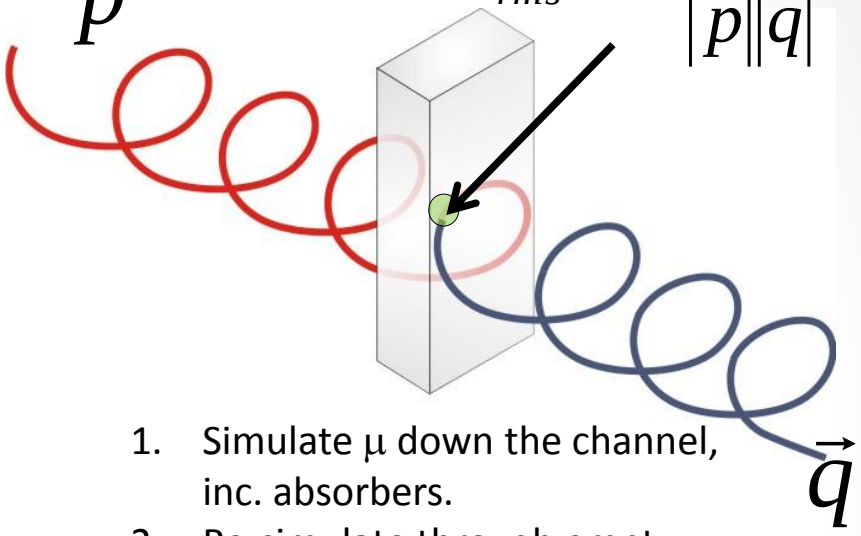




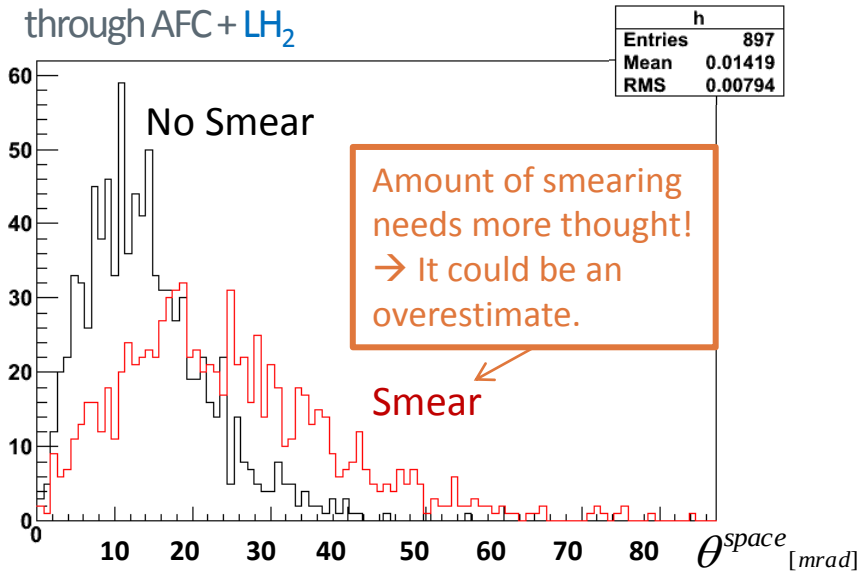
Multiple Scattering and the MICE Tracker

T. Carlisle

$$\cos\theta_{rms}^{space} = \frac{\vec{p}.\vec{q}}{|p||q|}$$



Scattering angle measured in tracker through AFC + LH_2



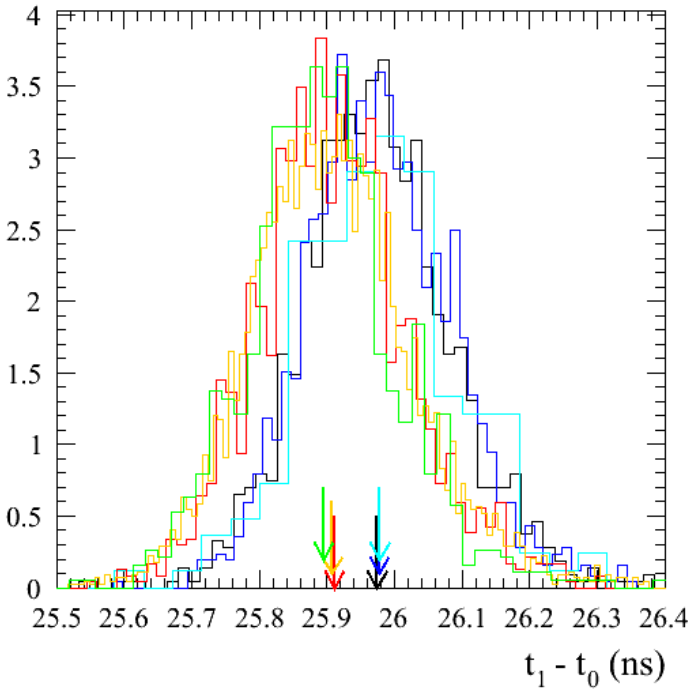
	θ_{rms}^{space} [mrad]			
	No Smear	**Smear**	**PDG**	**Paraxial beam**
No AFC	1.04e-9	3.01e-4		
AFC (windows)	7.55e-5	3.84e-4		
LH_2	2.6e-4	7.8e-4	6.6e-4	2.37e-4
LiH	4.6e-4	7.7e-4	1.15e-3	6.39e-4

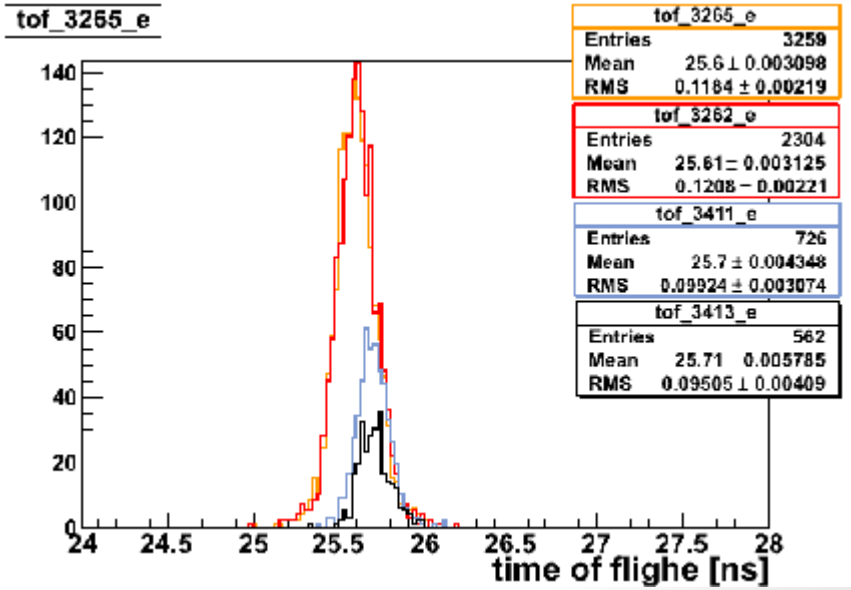
1. Simulate μ down the channel, inc. absorbers.
2. Re-simulate through empty channel: Upstream to downstream, downstream to upstream.
3. Calc. angle between them → scattering angle.
4. Do this with and without smearing the 'tracker' reconstruction.
5. Can measure multiple scattering with the tracker.

e^+e^- Puzzle

- The problem: TOF between e^+ and e^- is different.
- Investigated in Dec. run.
- Variation in the number of particle triggers/spill introduces a difference in the measured TOF of e^+ and e^- (~100ps) despite identical beamline settings.
- Now this is a “rate effect” problem!

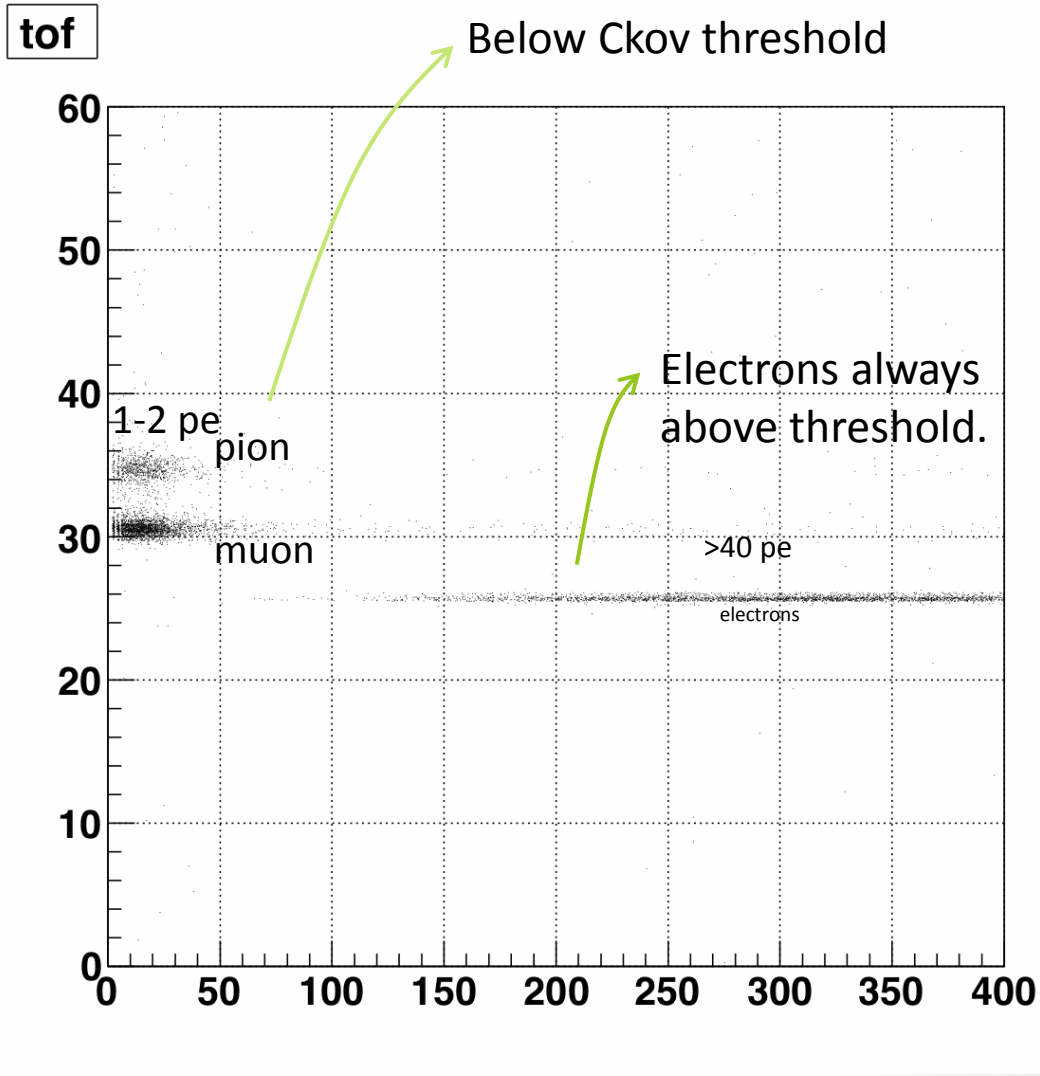
The problem →





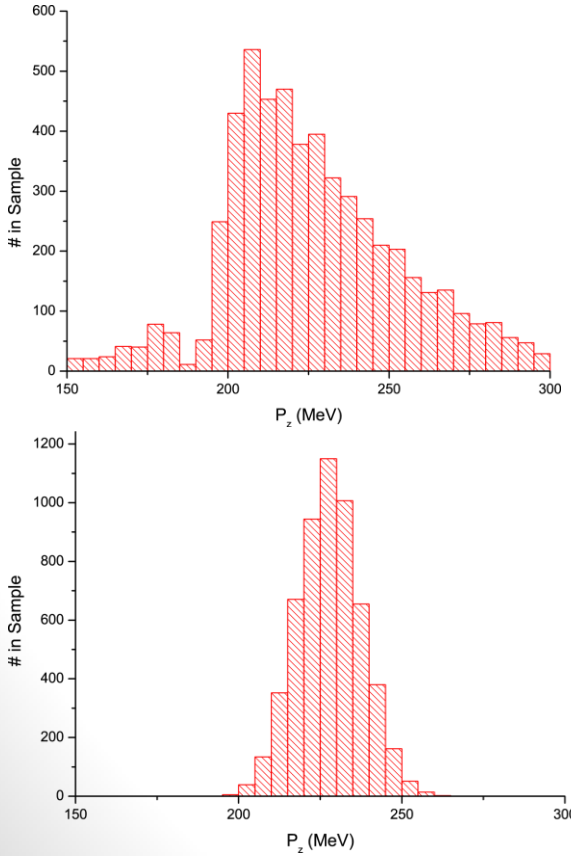
CKOV

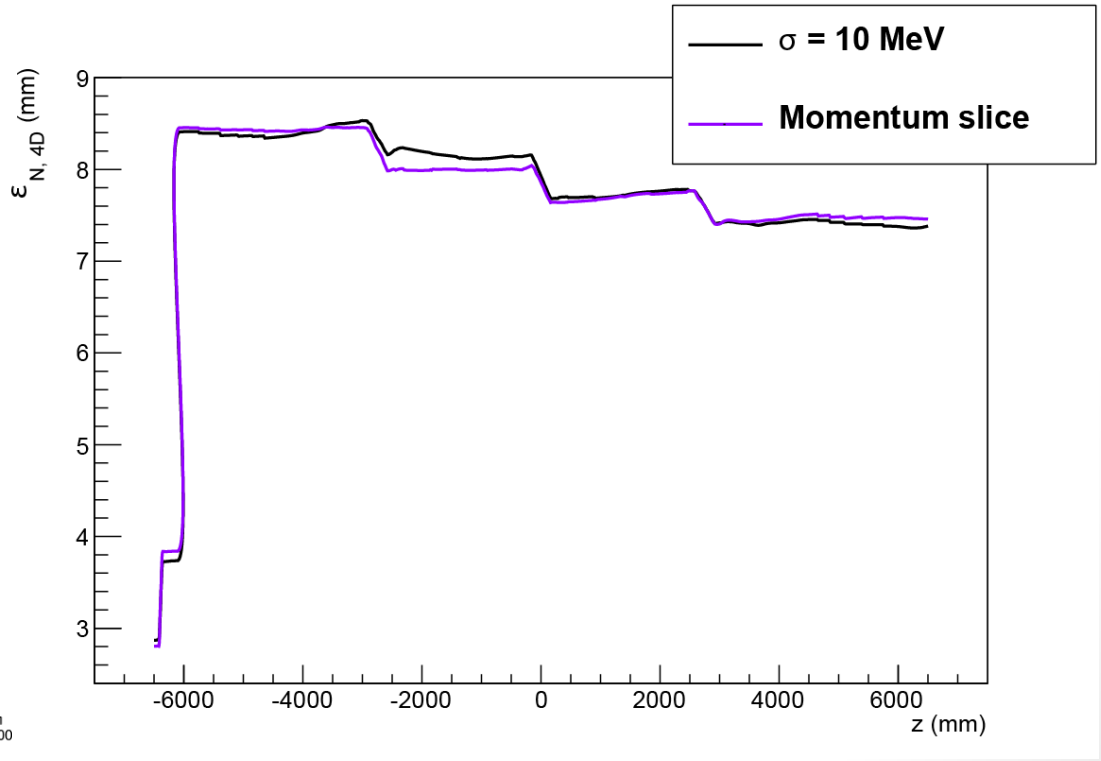
- MAUS CKOV software is taking shape.
- Dec. run processed soon.
- Particles are well-separated in time distribution
  - Currently, momentum cuts made ‘by eye’
- Looking promising!



Step I Beams

- Simulations of Step I (*i.e.* real muons!) through cooling channel show cooling.
- Lots of work to do studying the beam behaviour.





Analysis Group Summary

- Analysis Group was rebooted in Nov.
  - Fortnightly meetings (everyone is welcome!)
  - Many topics since November: *Online reconstruction, run plans, CKOV performance, e^+e^- puzzle, $\pi-\mu$ separation, magnetic fields analysis, optics, multiple scattering in Steps IV & V, particle rates through the EMR, Step I beams, TOF pulse height* – many analysis topics!
- Already have some excellent results (Bogomilov) and some very promising avenues to chase for Step IV (Bravar, Carlisle).
- Plus we can all rest easy knowing our electrons/positrons aren't disobeying relativity (Karadzhov)!
- Many more topics being explored.
- <u>Watch this space.</u>