DOUBLE Beta DECAY

WHY? OBVIOUS!

HOW? NOT OBVIOUS!

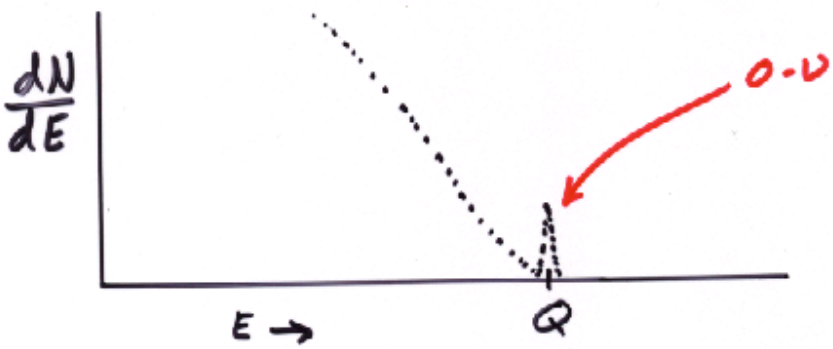
NOW: HEIDELBERG-MOSCOW, NEMO, ...

SOON? CUORICINO, MAJORANA, GENIUS...
EXO, ... CUORE ....

PERSPECTIVE:

- SEVERAL GOOD EXPERIMENTS NEEDED.
- THE DEFINITIVE EXPERIMENT WILL:
  - ✓ MEASURE BOTH 2-ν AND 0-ν
  - ✓ REJECT BACKGROUNDS TO LOW LEVEL
  - ✓ INCREASE SENSITIVITY $\ll 1$ eV

BOTH 2-ν & 0-ν



REJECT BACKGROUNDS

- EXCELLENT ENERGY RESOLUTION

+

- TOPOLOGY REQUIREMENTS

⟹ VISUALIZATION NEEDED

INCREASE SENSITIVITY

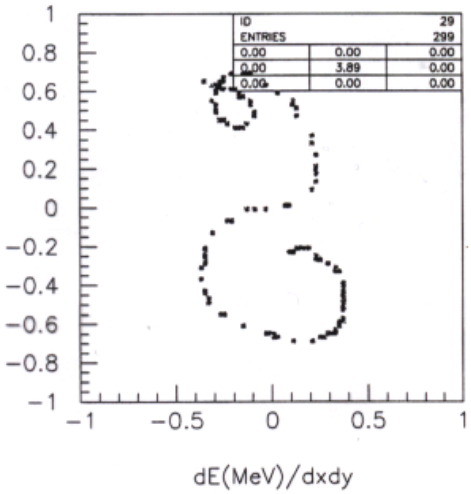
- DEVELOP TECHNIQUE THAT SCALES WELL:
  - 1000 Kg MAY BE NECESSARY!
- REJECT BACKGROUNDS EFFECTIVELY:
  - AVOID $T^{\frac{1}{2}}$ DEPENDENCE!

→ SOURCE = DETECTOR
DETECTOR = CONDENSED MATTER

TOPOLOGY:

ADD B-FIELD:

ADD MULTIPLE SCATTERING: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0.00 3.89 0.00
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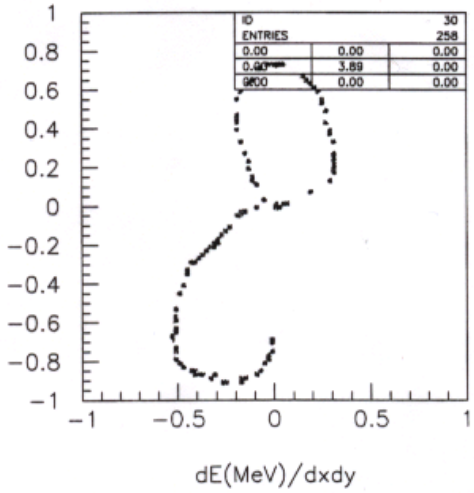
dE(MeV)/dxdy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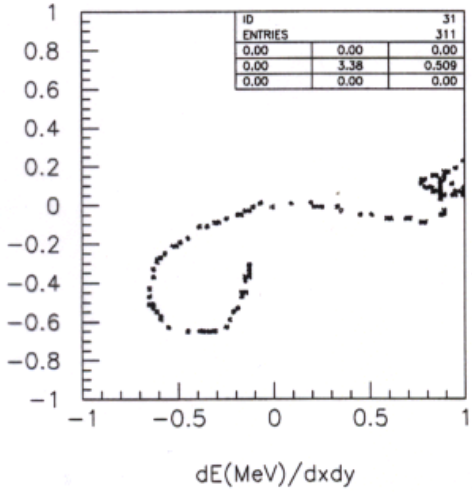
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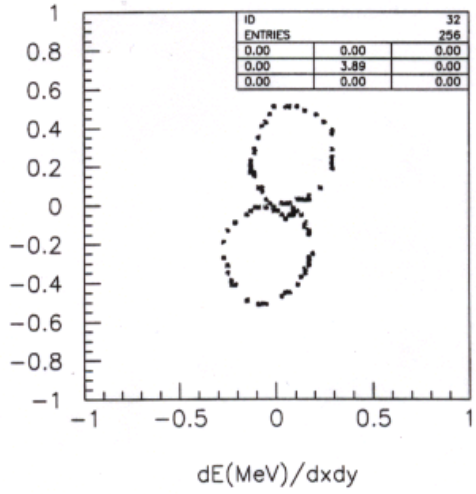
dE(MeV)/dxdy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dE(MeV)/dxdy

TECHNICAL APPROACH:

- USE Ca-LOADED INSULATING LIQUID
- DRIFT IONS TO STRIP PLANES
  - $V \sim 2$ CM/SECOND
  - $\sigma \sim 60\ \mu$ (2 CM DRIFT)
  - BASIC MODULE: ~ 1 LITER
    4 CM × 10 CM × 25 CM
    ⟹ GOOD SCALING BEHAVIOR

ISSUES:

- $^{48}Ca \sim 0.2\%$ NATURAL ABUNDANCE
- UNIQUE MOBILITY?
- LOW-NOISE, LOW BANDWIDTH ELECTRONICS?
- HIGH DRIFT FIELD: 5 KV/CM?
- EFFECTIVENESS OF TOPOLOGY?