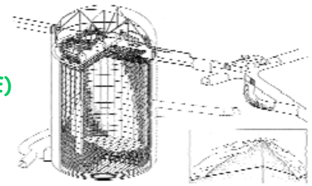
Previous Lecture

- Finish ^{60}Co parity experiment
- Neutrino detection
  - inverse β^- decay
  - Radiochemical detectors
    (Homestake, Gallex, GNO, SAGE)
    [see Kleinknecht, Sect. 8.8]



Lecture Content

- Approx. lecture content
  1. PP intro
  2. PP intro.
     Feynman diagrams; strong/e.m./weak
  3. ν props 1:, baryon and lepton numbers; no. neutrino generations
  4. ν props 2: ν existence
     Examples of decay/production
  5. Neutrino mass
     Fermi-Kurie plot
     Phase space kinematics/4-momentum
  6. Parity and CP violation… (why so important in lepton sector?)
     Wu et al., 60Co experiment
  7. Detection & observation
     Liquid, solid, bubble chamber
     "Direct" methods
  8. Atmospheric neutrinos
     Cerenkov effect
     SuperKamiokande
  9. Neutrino oscillations and mixing
     Possible solutions to solar/atm. ν problems
  10. Current and future experiments
      SK, SNO, KAMLAND, CHOOZ
      MINOS, miniBOONE,..
      NDBD (NEMO, etc.)
      JPARC, νF,
  11. Implications for cosmology
      Open vs. closed scenarios. various m_ν regions
      ν as DM candidate?
      Subject outlook (JPARC, MICE, Neutrino Factory, …)

Today

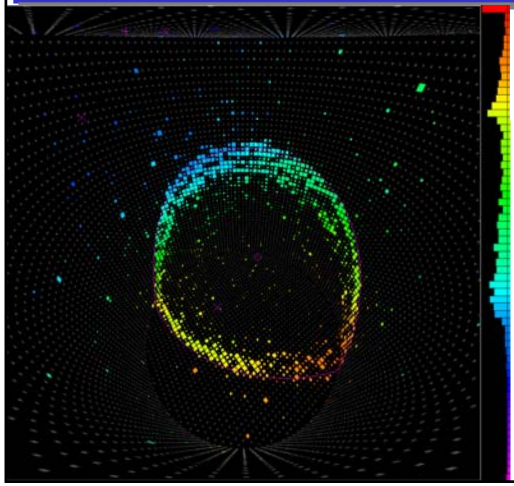
- Cerenkov detectors
  - See e.g. Perkins Sect. 2.4.6, 4th Edition
- Early Super-K atmospheric neutrino results

Super-Kamiokande

Kamioka Observatory, ICRR (Institute for Cosmic Ray Research), The University of Tokyo

- 1000m below surface
- 41.4m (h) x 39.3 (d)
- mass: 50 000 tonnes
  pure H_2O (32k/18k inner/outer)
- 11 200 x 50cm PMT
- Cerenkov detector

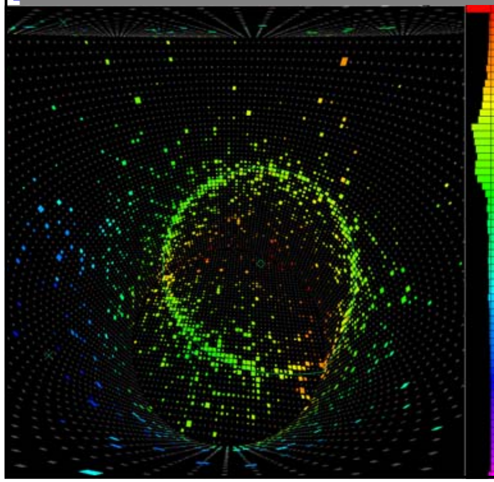
Super-Kamiokande Cerenkov Images



603 MeV muon

sharply defined ring edge

Super-Kamiokande Cerenkov Images



492 MeV electron

ragged ring edge

- because electrons produce e.m. showers