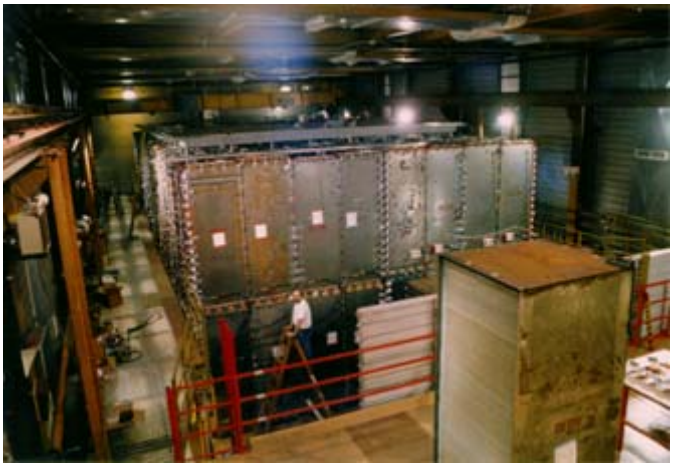
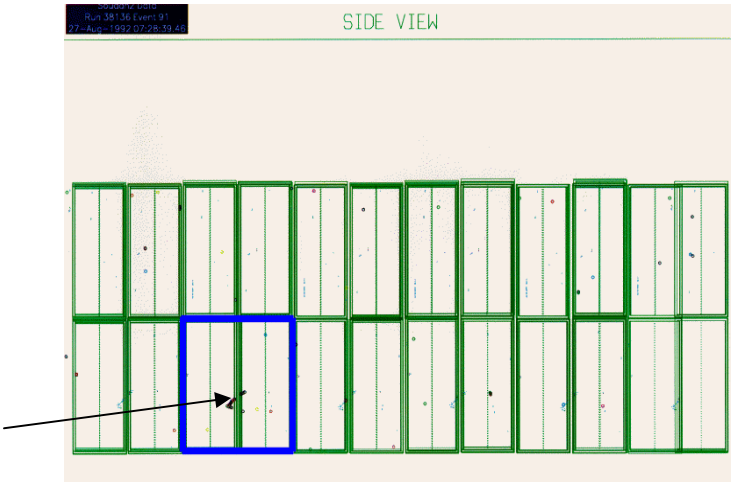
SOUDAN II

SOUDAN II - looking for one thing and finding another! This US/UK experiment was designed in Oxford to search for proton decay. The "background" from atmospheric neutrino interactions turned out to be the interesting signal.

A view in the mine of the iron calorimeter modules, significant parts of which were made in Oxford.



An example of a muon neutrino interacting in the detector to give a muon and proton.



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The atmospheric neutrino flavor ratio from a 3.9 fiducial kiloton-year exposure of Soudan 2

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We report a measurement of the atmospheric neutrino flavor ratio, R, using a sample of quasi-elastic neutrino interactions occurring in an iron medium. The flavor ratio (tracks/showers) of atmospheric neutrinos in a 3.9 fiducial kiloton-year exposure of Soudan 2 is 0.64 ± 0.11 (stat) ± 0.06 (syst.) of that expected. Important aspects of our main analysis have been checked by carrying out two independent, alternative analyses: one is based upon automated scanning, the other uses a multivariate approach for background subtraction. Similar results are found by all three approaches.

An important publication confirming atmospheric neutrino oscillations - other experiments use water Cherenkov detectors. The ratio of flavour content, experiment over theory, R is not consistent with unity.

An analysis of an event shape parameter showing that the data require significantly fewer events from muon neutrinos than from electron neutrinos.

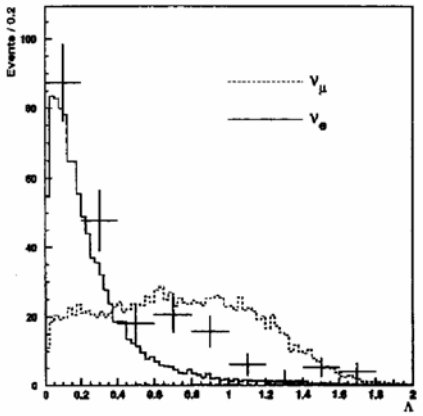

Fig. 4. Distributions of A for ν_μ (dashed histogram) and ν_e (solid histogram) Monte Carlo events which survive event selection cuts. All events produced by the given neutrino flavor (charged and neutral current) are included. Background corrected GOLD data are shown as crosses. The deficit of ν_μ-like events relative to ν_e-like events in the data is clearly evident.