Search for Flavor Changing Neutral Current (FCNC) at LHC with tagged neutrino beam directed along Lake Geneva

Ágnes Fülöp (ELTE), Zoltán Gilián (ELTE) and György Vesztergombi (KFKI-RMKI)

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LETTERE AL NUOVO CIMENTO VOL. 25, N. 9 30 Giugno 1979

http://www.springerlink.com/content/a63n430lj346487n/

Tagging Direct Neutrinos. A First Step to Neutrino Tagging.

B. PONTECORVO

Laboratory of Nuclear Problems, Joint Institute for Nuclear Research - Dubna, USSR

(ricevuto l'1 Giugno 1979)

As it is well known, high-energy neutrino investigations are performed by using neutrino beams from π and K decays ($\pi \to \mu\nu$, $K \to \mu\nu$), that is by letting the pions and the kaons decay over a large distance (the so-called decay length).

The possibility of using tagged-neutrino beams in high-energy experiments must have occurred to many people. In tagged-neutrino experiments it should be required that the observed event due to the interaction of the neutrino in the neutrino detector would properly coincide in time with the act of neutrino creation ($\pi \to \mu\nu$, $K \to e\nu\pi, \ldots$). Of course, in tagged-neutrino experiments the properties of neutrino beams (type, direction and energy) will be much better known than in the experiments performed so far. The main difficulty in designing such a facility is that the effective neutrino source (which is also the source of the charged particles to be detected in coincidence with the neutrino event) has a length equal to the decay length (of the order of hundreds of metres). In spite of the difficulties it seems that sooner or later such facilities will be available at various high-energy accelerators. Naturally such a « maximum » programme would provide an extremely useful facility.

Since the main difficulty in designing a tagged-neutrino facility is connected with the (large) scale of the decay length involved, let us turn our attention to such neutrino experiments, in which the decay length is deliberately shortened, that is to « beam dump » experiments. In such experiments direct neutrinos are looked for, that is neutrinos which are neither produced in pion nor in kaon decays.

In the present note I am suggesting a relatively simple device, a sort of « minimum » neutrino tagging programme, which could be put to work without very serious difficulties in beam dump experiments.

Direct neutrino experiments have been proposed [1,2] a long time ago and were even performed at a very low level of sensitivity [3]. At the Neutrino-75 Conference

(1) M. SCHWARTZ: *Rep. Prog. Phys.*, **27**, 75 (1965).
(2) B. PONTECORVO: *Proceedings of the XV International Conference on High-Energy Physics* (Kiev, 1970), p. 687.
(3) See, *e.g.*, D. FRYBERGER *et al.*: quoted in *Science News*, **100**, 252 (1971).

Unknowns are only the momenta: $P_{K_L}, P_{\pi}, P_{\mu}, P_{\nu}$

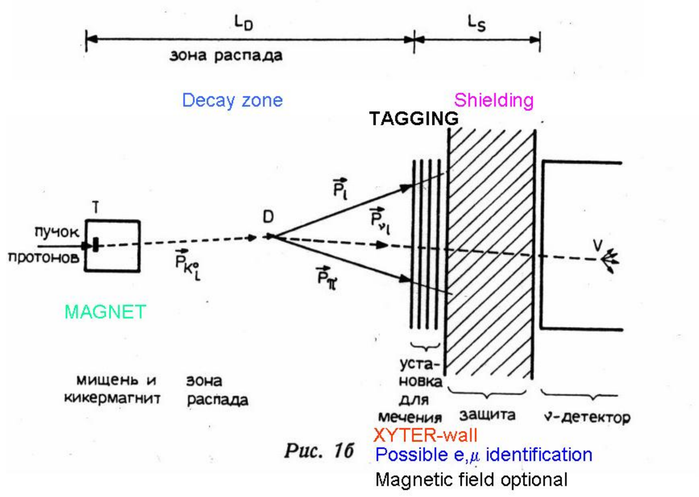


Рис. 16

Acta Physica Academiae Scientiarum Hungaricae 51, 1981

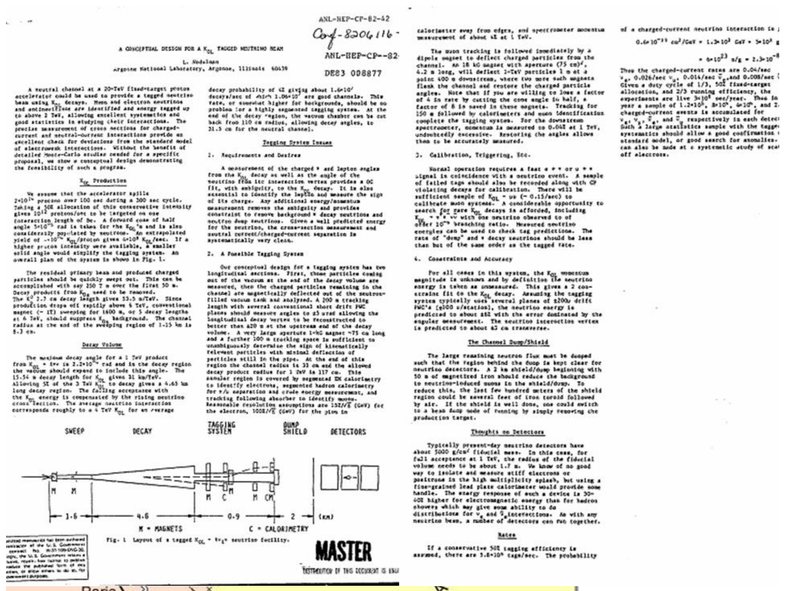
НЕКОТОРЫЕ СООБРАЖЕНИЯ О ПУЧКАХ МЕЧЕНЫХ НЕЙТРИНО

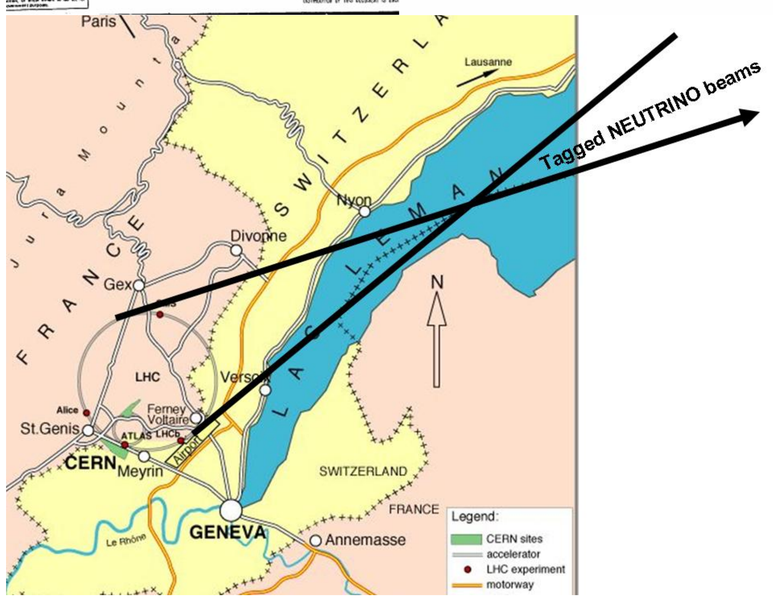
Г. ВЕСТЕРГОМБИ и Д. КИШ

ЦЕНТРАЛЬНЫЙ ИНСТИТУТ ФИЗИЧЕСКИХ ИССЛЕДОВАНИЙ
1525 БУДАПЕШТ, ВЕНГРИЯ

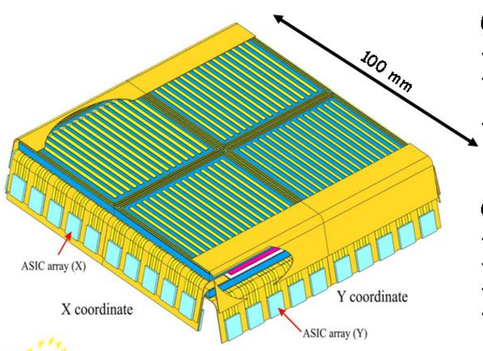
(Поступило 12. V. 1981)

Proposal for UNK, Serpukhov





DETNI-A ^{157}Gd/Si Detector Module



Goals
- 10^8 n/sec in 100 cm^2
- with 2 views, 2 hit/strip: 400 MHz strip hit rate
- with 5 Byte/hit: 2 GByte/sec data

Consequences
- 128 channel ASIC
- 20 chip/module
- 20 MHz/chip
- 100 MByte/chip

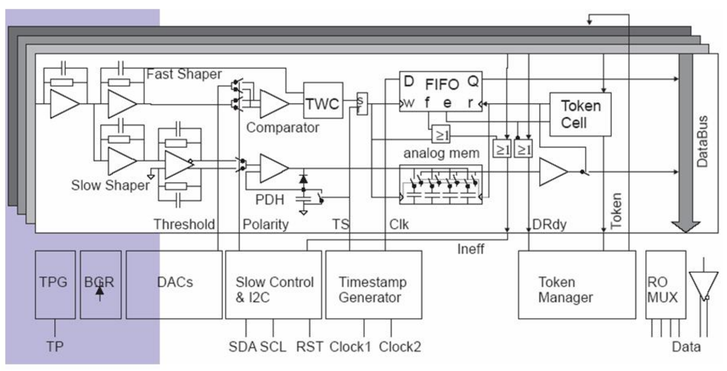
slide courtesy C.J.Schmidt

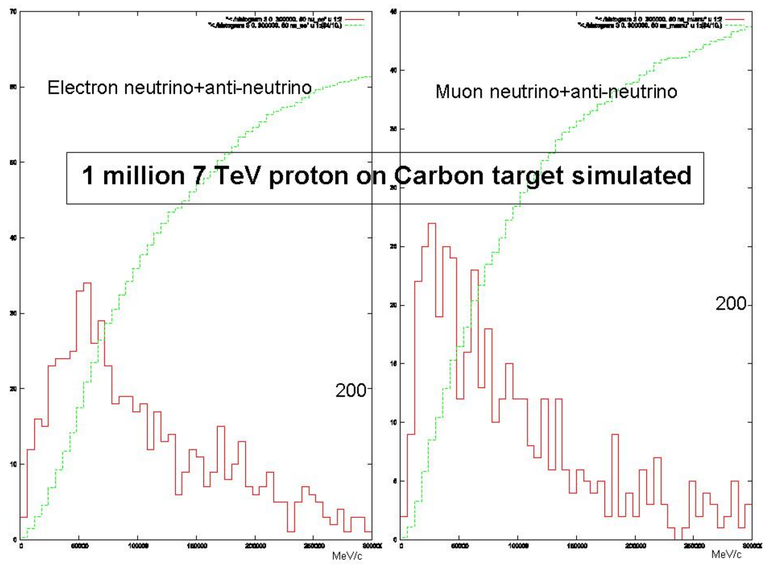
Understanding Data Acquisition System for N-XYTER

www.gsi.de/documents/DOC-2007-Aug-28-2.ppt

- Measurement of time, energy and position
- Data acquisition speed ~ 1Gbps
- Input Clock ~ 250MHz
- Input channels ~ 1024 or higher
- Data - 8-bit parallel after flash ADC
- ADC – Flash type 8-bit (MAX-106 600MSPS)
- Time stamp, channel-ID and status signals 32 bit(8-bit parallel x 4 packet)

N-XYTER Block Schematic





CHARM II results with GLASS absorber

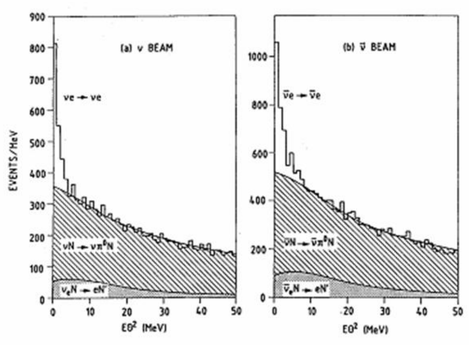


Figure 3 Distribution of selected events as a function of $E\theta^2$. (a) in the neutrino, (b) in the antineutrino beam. The background reactions $\nu_e N \to eN'$ and $\nu N \to \nu\pi^0 N$ are shown separately.

The possibility is studied that high energy neutrinos originating from Klong decays produced in 7 TeV proton-nucleus interacions could be tagged by Silicon detector equipped with extremely fast electronics.

The tagged neutrino beam could be directed along the Lake Geneva which could serve as a super multi-kilotonn Cerenkov detector.

The aim would be the study neutrino-electron scattering with identified electronic and muonic neutrinos with known energy.

One could distinguish with high precision the single particle final states whether it contains electron or muon.

Due to the exact timing the cosmic ray background is expected to be negligible.

The nonzero muon/electron ratio would indicate directly the existence and the size of FCNC. The accuracy is dominated by the number of 7 TeV protons on the Klong generating target, therefore the building of Super-LHC would be largely preferable.