

ОТДЕЛ ТРЕКОВЫХ ДЕТЕКТОРОВ ОФВЭ ТИЯФ

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26 декабря 2007 г.

Состав отдела

Научных сотрудников	- 4 чел.
Ведущих инженеров	- 3 чел.
Старших инженеров	- 1 чел.
Рабочих	- 5 чел.
Студентов	- 2 чел.

Основные направления работы ОТД в 2007 г.

1. Проект TOTEM.

2. Исследование процессов развития старения и стриммерных разрядов в детекторах частиц, работающих в пучках высокой интенсивности.

3. Детектор тепловых нейтронов

4. Эксперимент В.В.Сумачева.

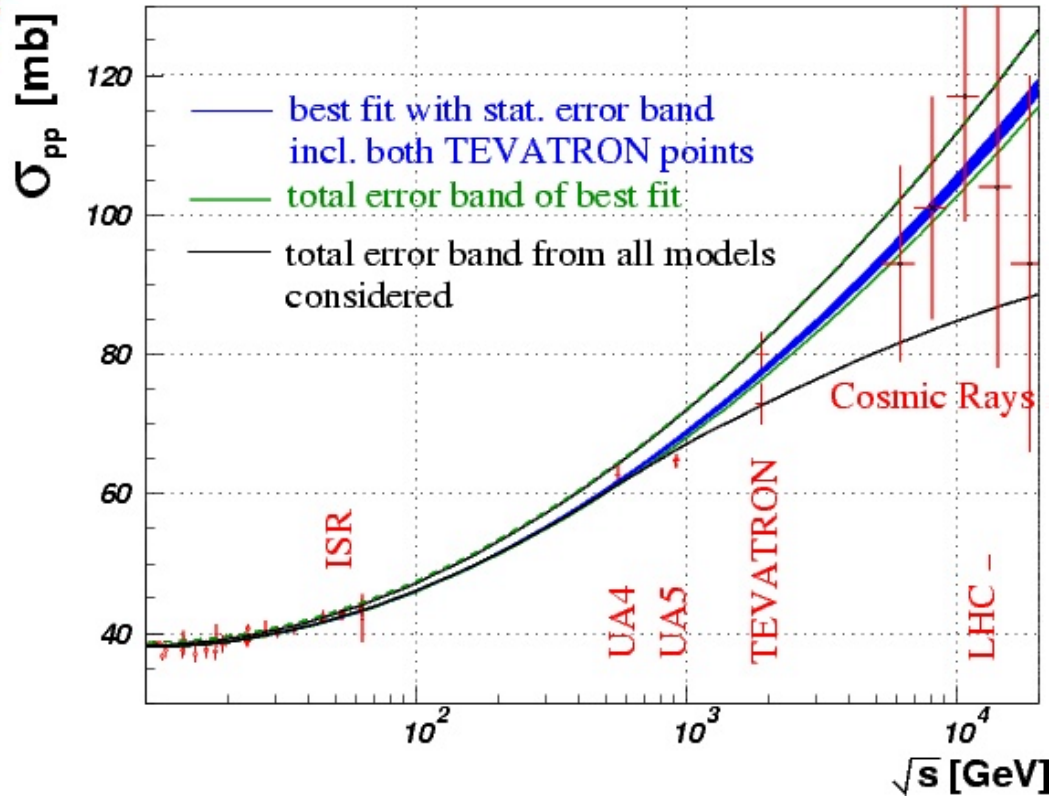


TOTEM

1. Measurement of the total pp cross-section.
2. Study of elastic proton scattering over a wide range in momentum transfer up to $(-t) \approx 10\text{GeV}^2$
3. Measurement of the inelastic pp interaction in the forward region.



TOTEM Physics: Total p-p Cross-Section



- Current models predictions: 90-130 mb
- Aim of TOTEM: **~1%** accuracy

Prediction for LHC

$$\sigma_{tot} = 111.5 \pm 1.2 \begin{matrix} +4.1 \\ -2.1 \end{matrix} \text{ mb}$$

$$L\sigma_{tot}^2 = \frac{16\pi}{1+\rho^2} \times \left. \frac{dN}{dt} \right|_{t=0}$$

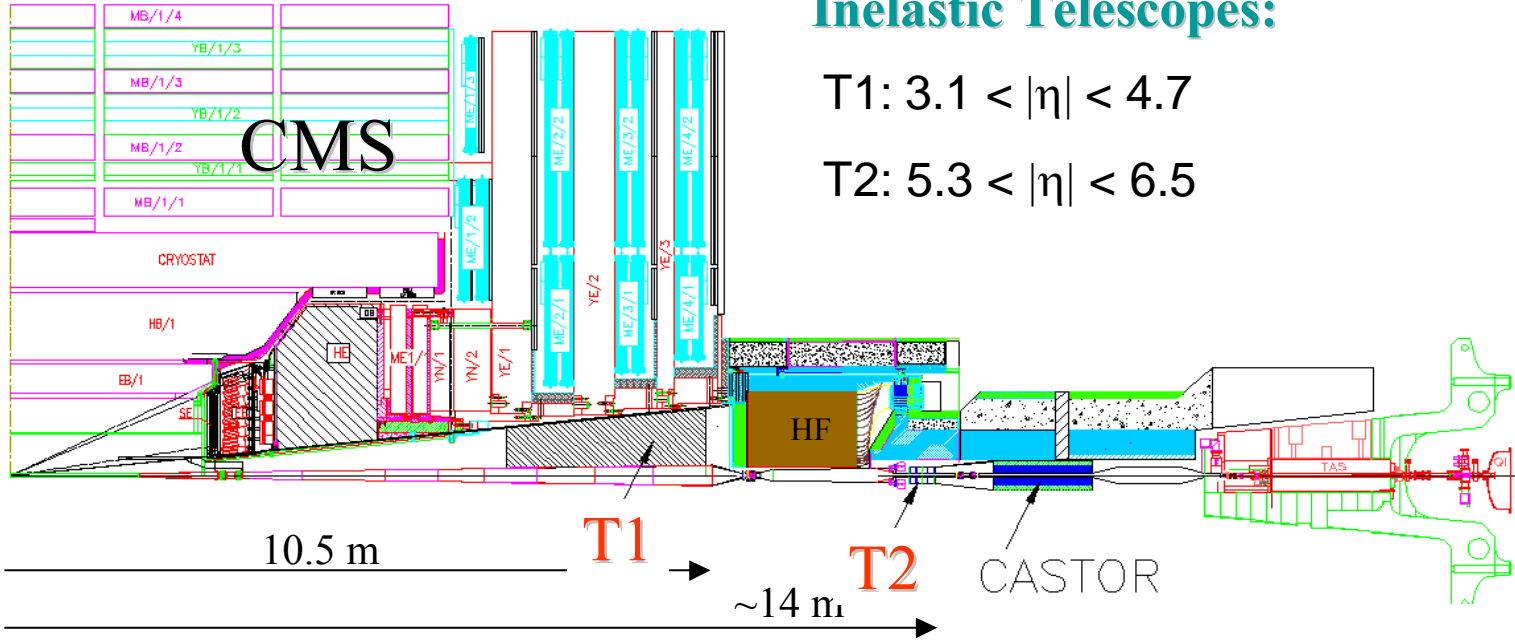
$$L\sigma_{tot} = N_{elastic} + N_{inelastic}$$

Optical Theorem \rightarrow

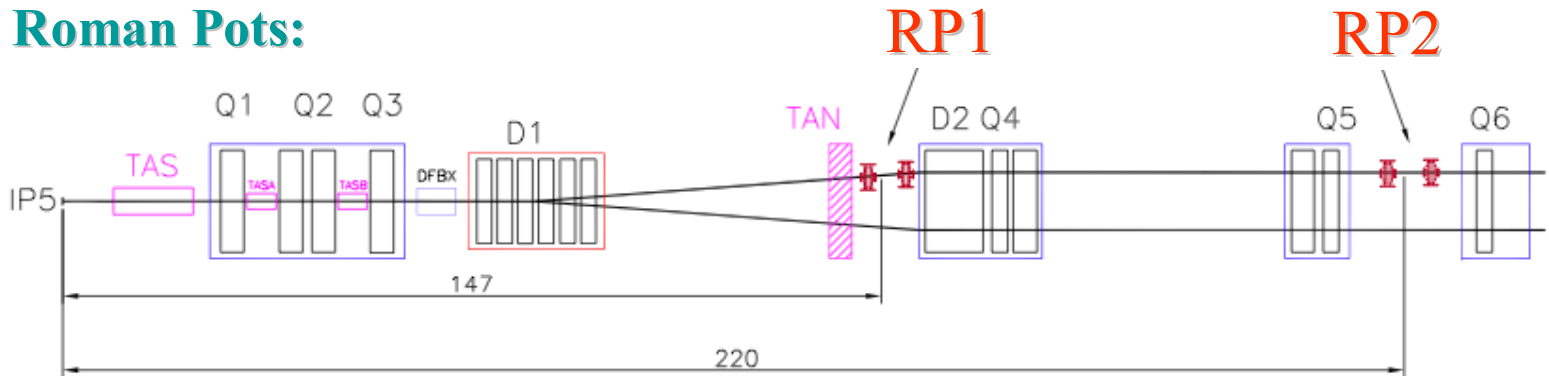
$$\sigma_{tot} = \frac{16\pi}{1+\rho^2} \times \frac{(dN/dt)|_{t=0}}{N_{el} + N_{inel}}$$



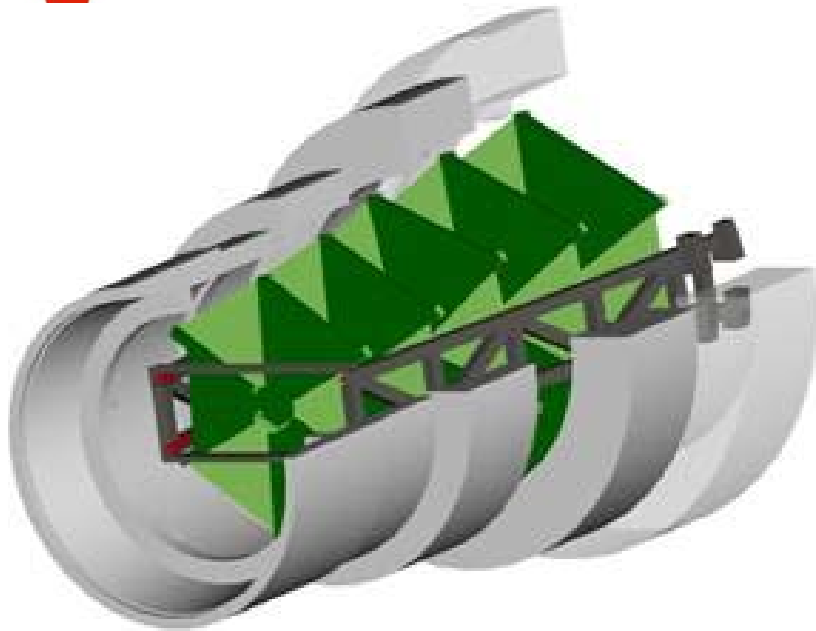
The TOTEM Detectors



Roman Pots:

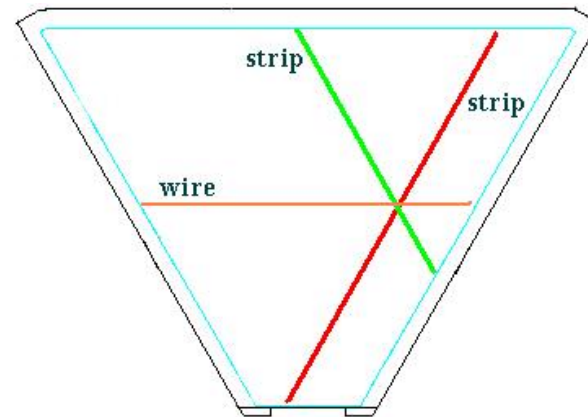


General Structure and Chamber Design



- Two symmetric arms, each with five planes of multi-wire proportional chambers with cathode strip read-out (CSC)

- split in two half-arms, independently sliding on the support structure



- Each plane made up of 6 independent trapezoidal CSC:
 - overlapping edges to have complete azimuthal coverage;
 - planes slightly rotated with respect to each other

Total number of wires per half-arm: ~ 2500

Total number of strips (both views) per half-arm: ~ 4050

Chamber production at PNPI

Wiring

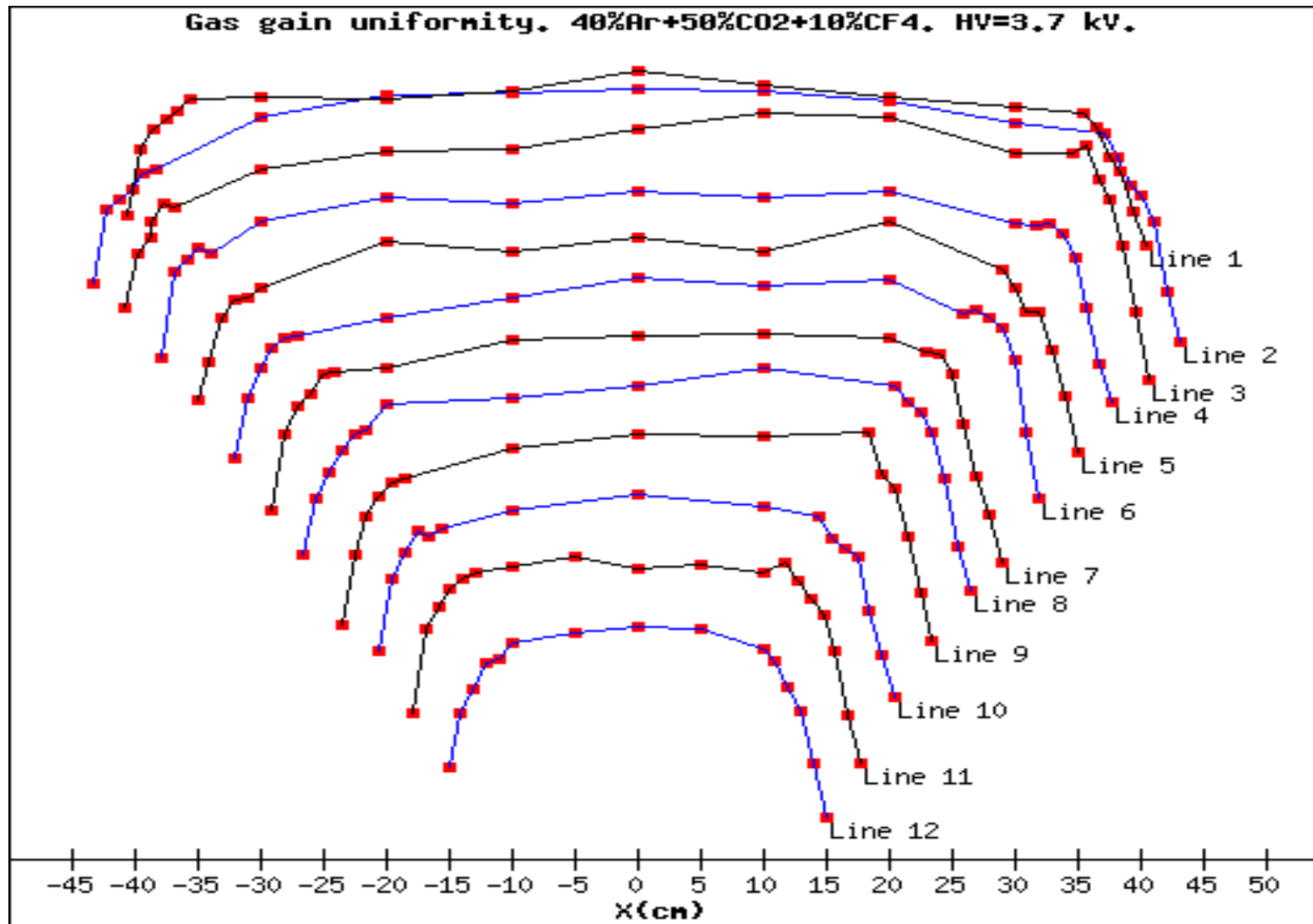


Chamber production at PNPI

Test set-up with temporary sealed chamber

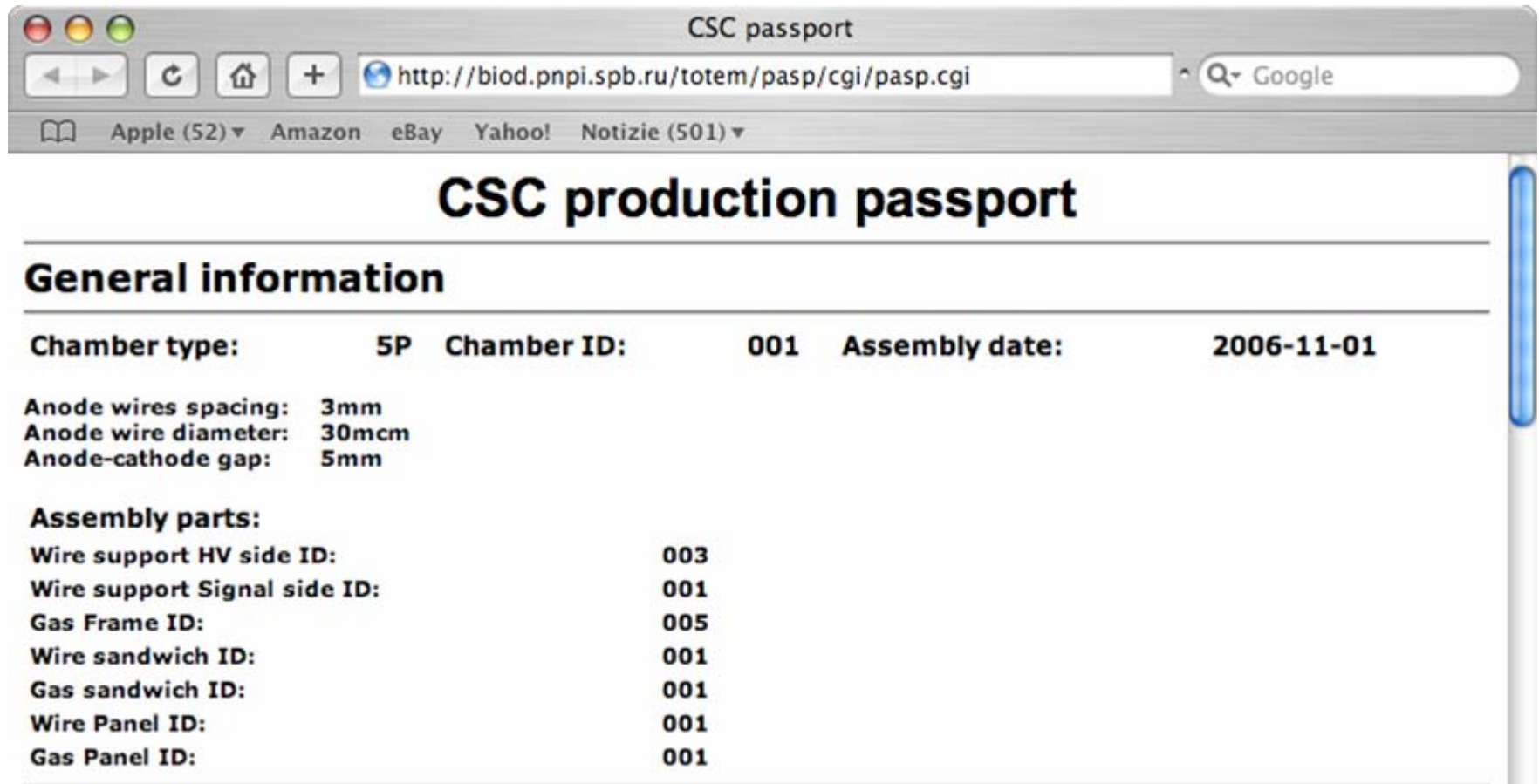


CSC gas gain uniformity



Production database

- All results of quality controls and measurements for each chamber are stored in a database. Data will be made available through a web interface: [example page](#) (in the works)



CSC passport

http://biop.pnpi.spb.ru/totem/pasp/cgi/pasp.cgi

Apple (52) Amazon eBay Yahoo! Notizie (501)

CSC production passport

General information

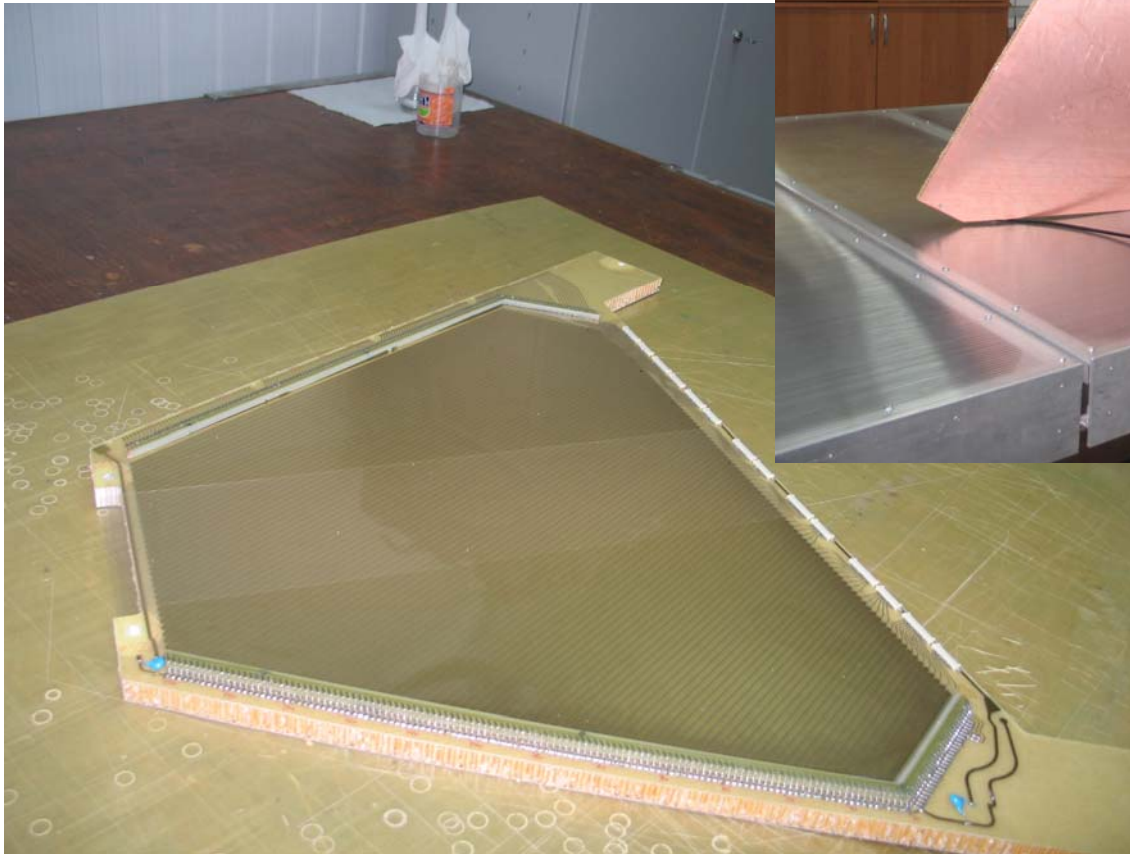
Chamber type:	5P	Chamber ID:	001	Assembly date:	2006-11-01
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Anode wires spacing: 3mm
Anode wire diameter: 30mcm
Anode-cathode gap: 5mm

Assembly parts:

Wire support HV side ID:	003
Wire support Signal side ID:	001
Gas Frame ID:	005
Wire sandwich ID:	001
Gas sandwich ID:	001
Wire Panel ID:	001
Gas Panel ID:	001

CSC production status



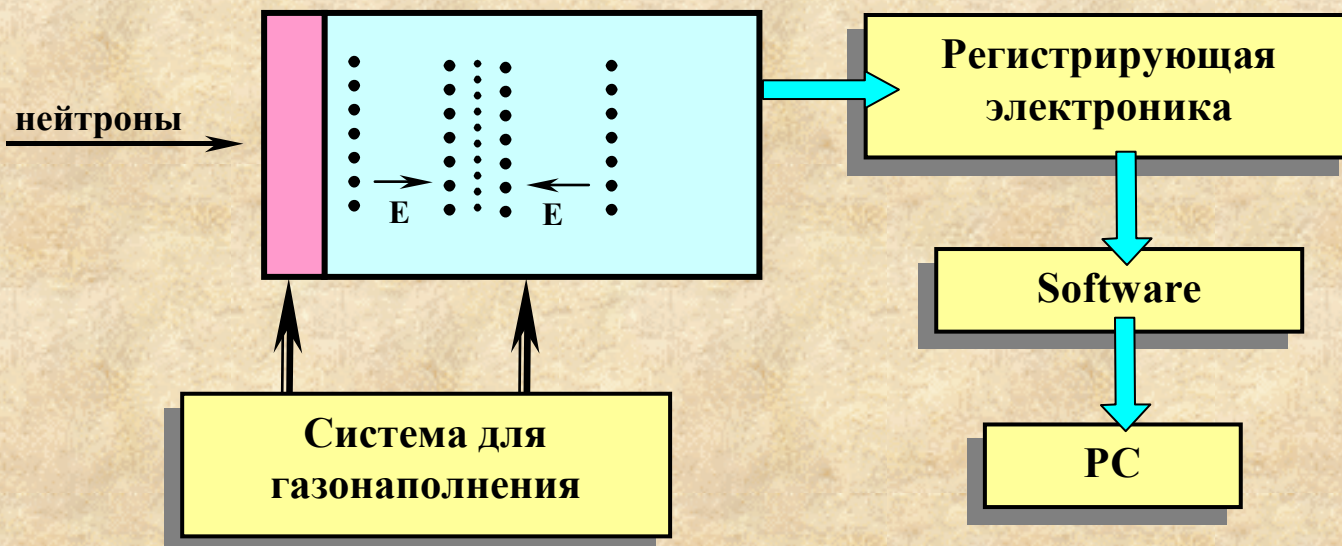
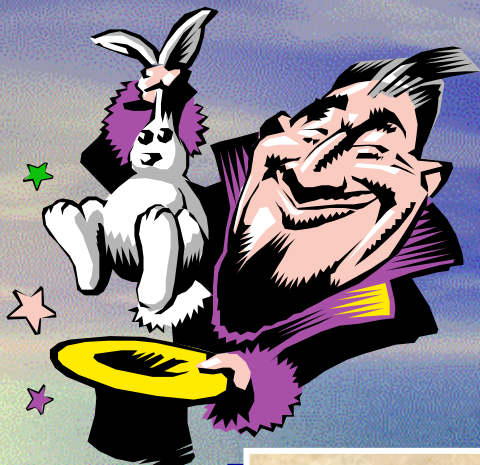
**Состояние дел с обязательствами ПИЯФ
в проекте TOTEM**

34 CSC уже находятся в ЦЕРНе.

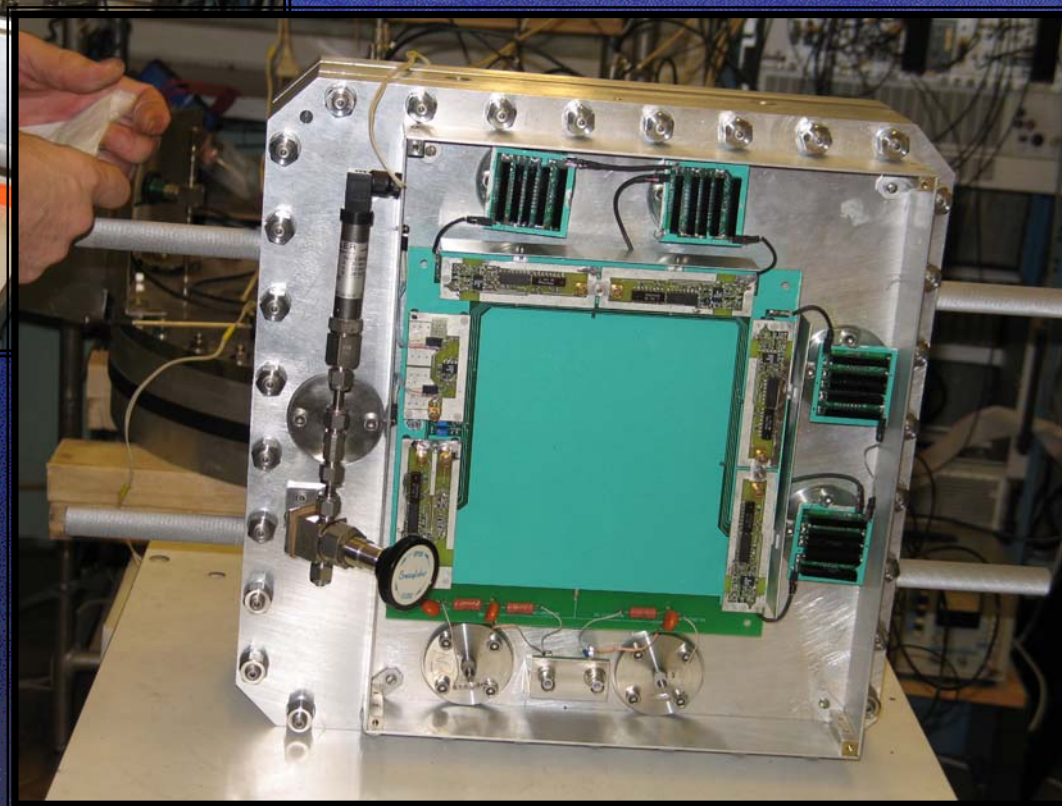
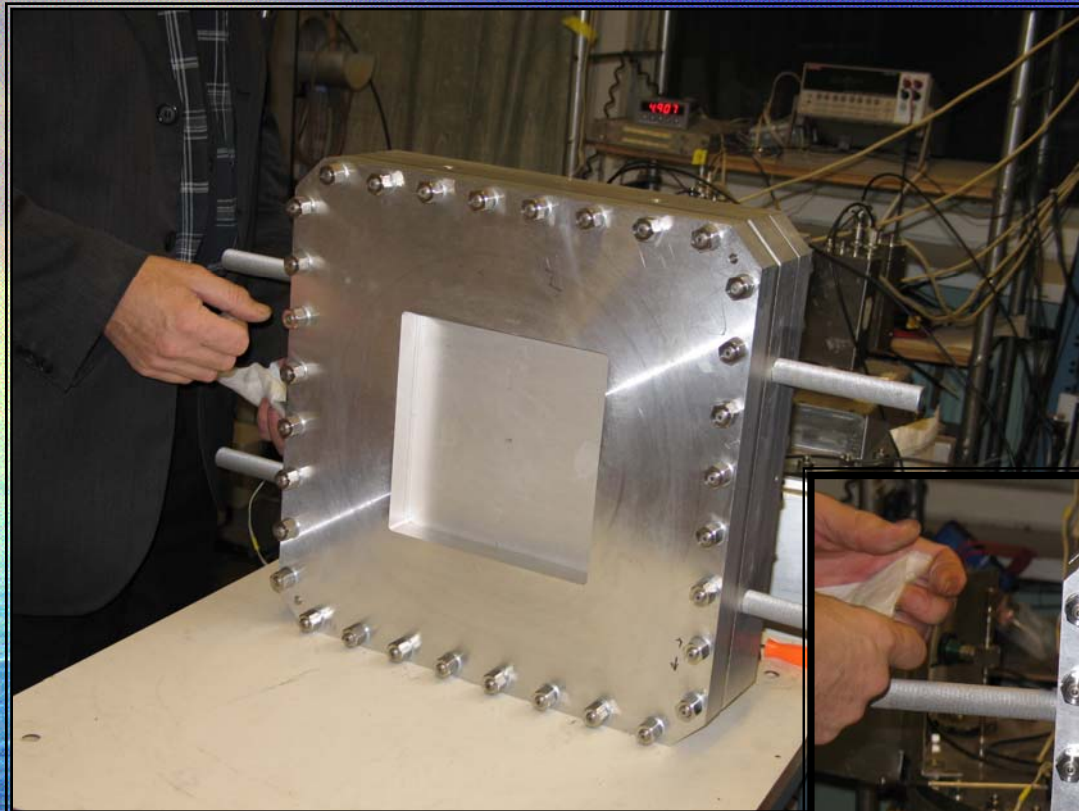
36 CSC еще надо будет сделать в 2008 году.

Монтаж и установка телескопа T1 намечена на май-июнь 2008 года.

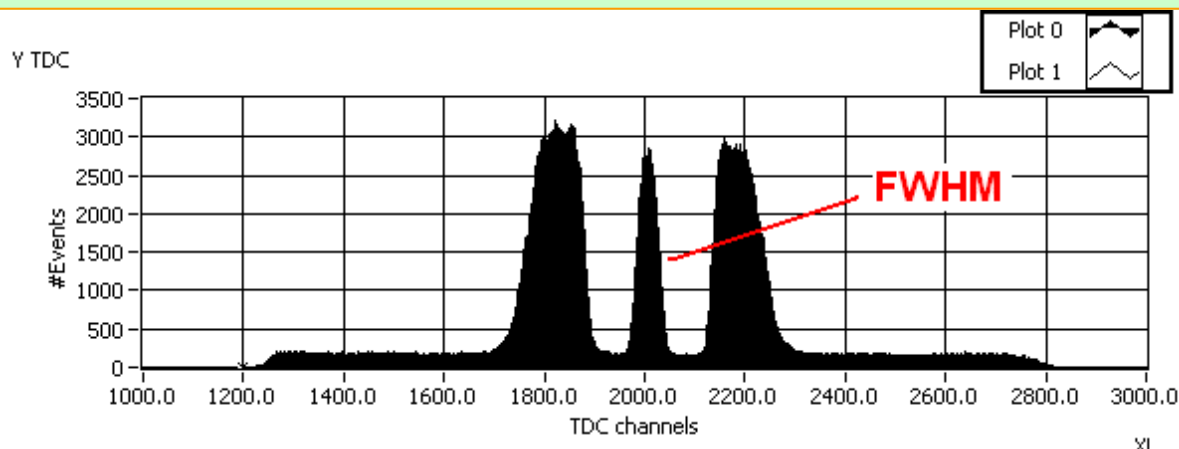
Нейтронный детектор.



**Рабочий экземпляр
детектора тепловых
нейтронов**

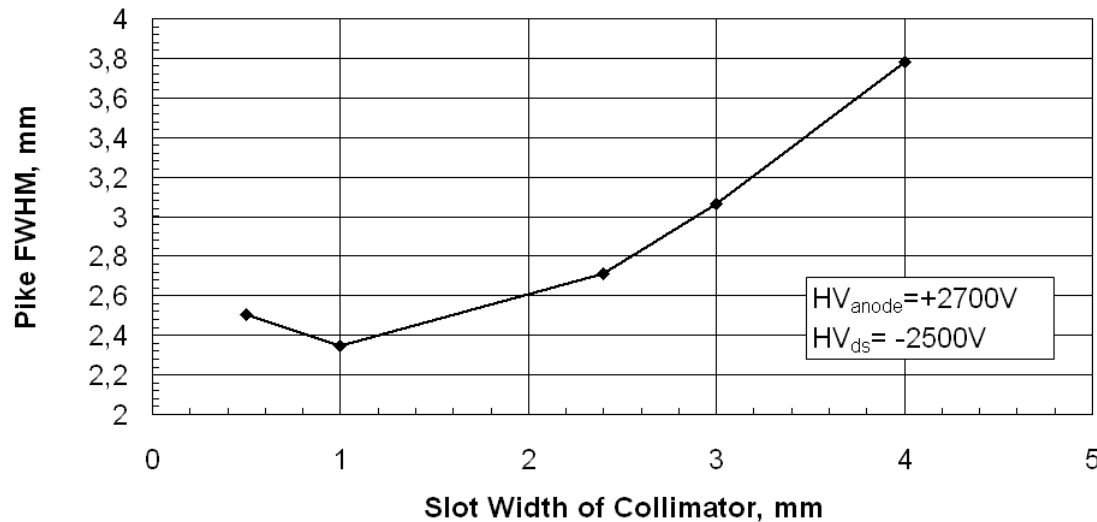


Position resolution measurement (one point)



The pike in the fine resolution axis obtained by narrow (4mm) thermal neutron beam.

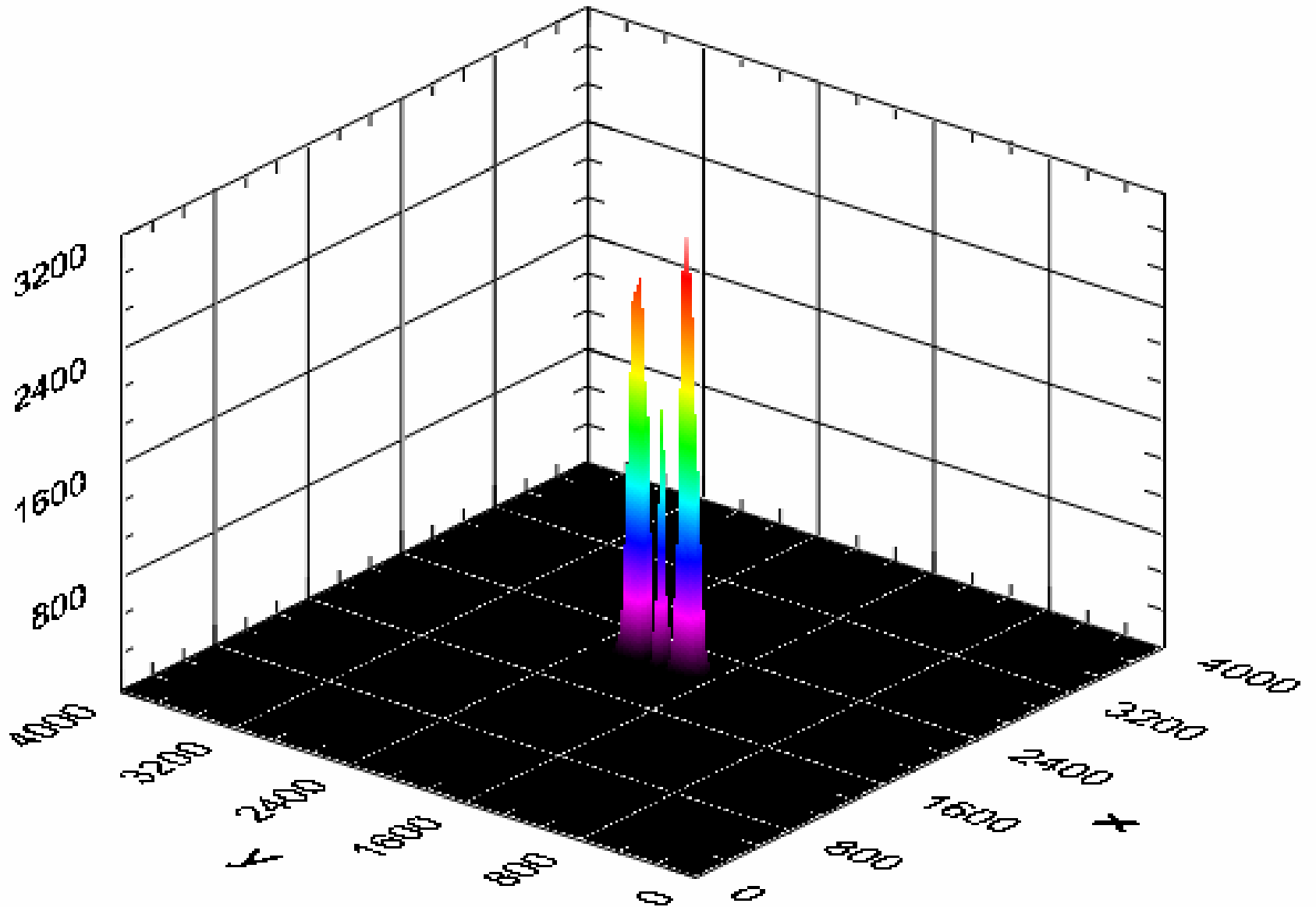
Neutron detector position resolution
(in the fine resolution axis)



The neutron pike width stay constant after 2.4mm-collimator.

So,

FWHM is about 2.5mm

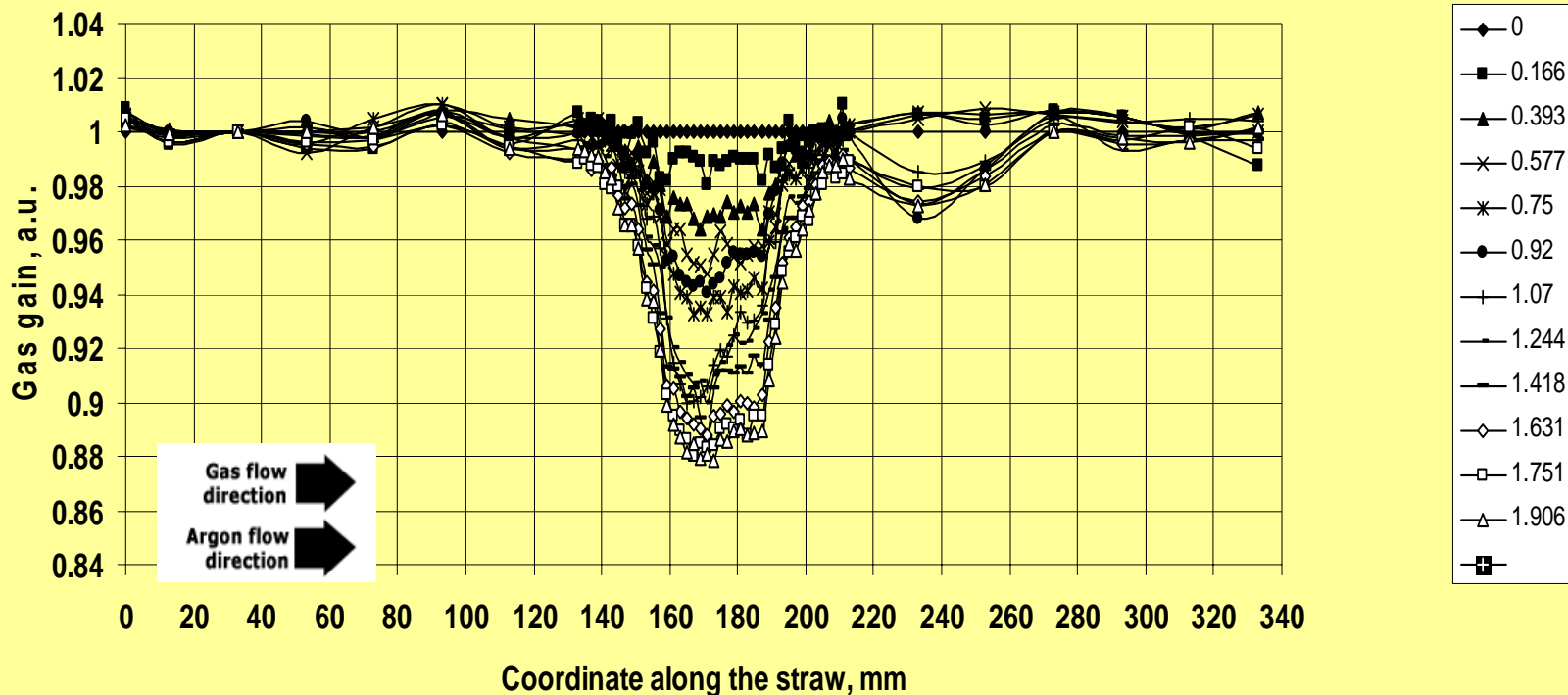


**Старение детекторов частиц
в интенсивных
радиационных полях**

Task 34. Relative gas gain distribution along the straw for different accumulated dose.

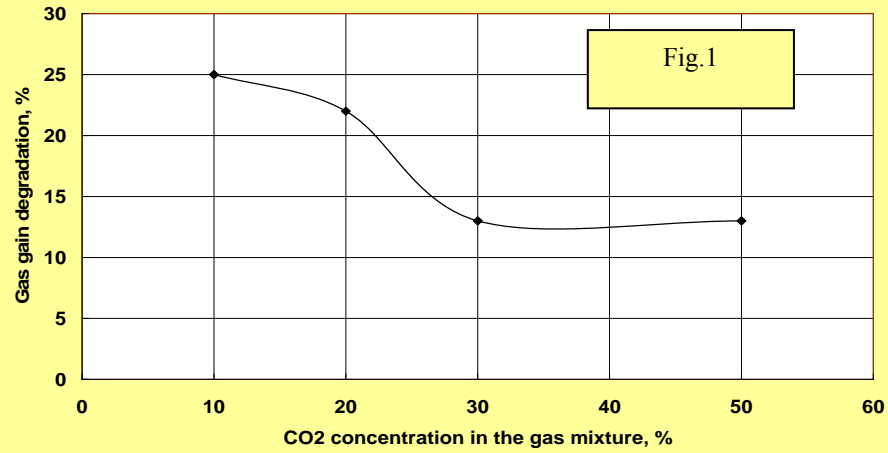
Ar+20% CO₂+10% CF₄, Wire diameter - 35mcm, FWHM=34mm, Right straw, HV=1687 V

14.12.05 - 27.12.05

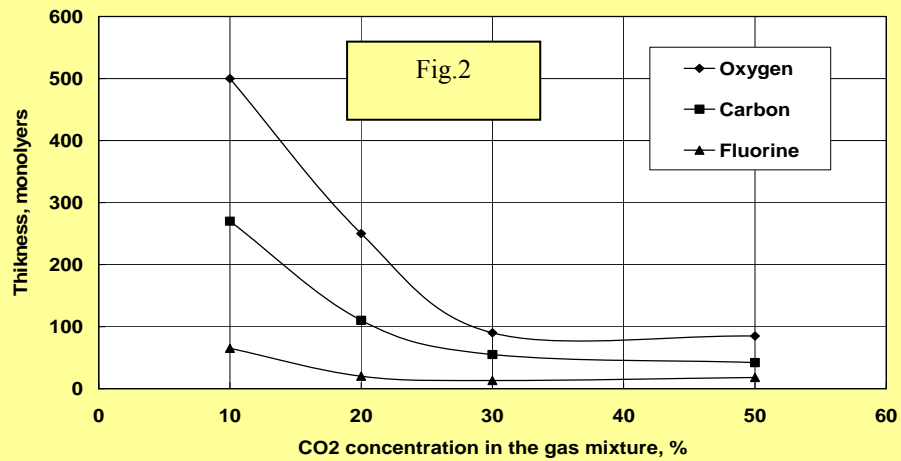


M/Mref norm. at Run00 & X=33mm

Gas gain degradation after the charge accumulation of 1.7 C/cm for different concentration of CO₂ in the gas mixture Ar+CO₂+10%CF₄. Gas gain is 100000.



Element's amount accumulated by anode wire after the charge accumulation of 1.7 C/cm for different concentration of CO₂ in the gas mixture Ar+CO₂+10%CF₄. Gas gain is 100000.



Применение метода Ядерных Реакций для исследования содержания фтора при исследовании старения детекторов частиц

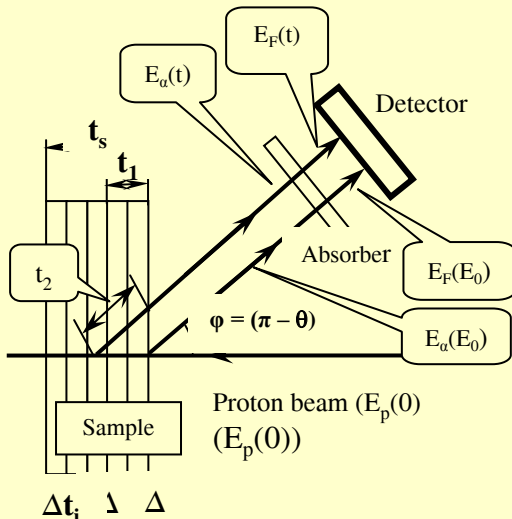
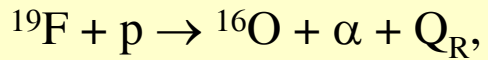


Fig. 1. Schematics and nomenclature for the (p,α) nuclear reaction process in sample.



$$E_p = 1,25 \text{ MeV}; \quad E_\alpha = 7 \text{ MeV}.$$

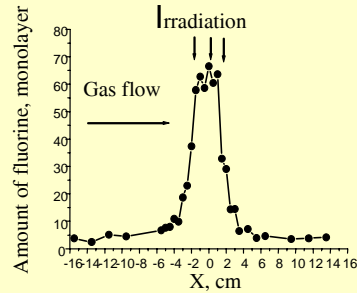


Fig. 2. The distribution of fluorine content along the wire. The element content of 1 monolayer is equal to 10^{15} at/cm².

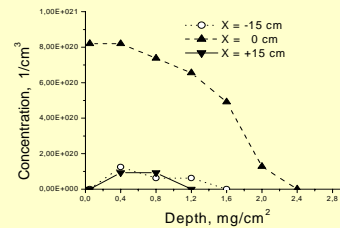


Fig. 3. The distribution of fluorine concentrations as a function of depth into the gold layer for different points along the wire.

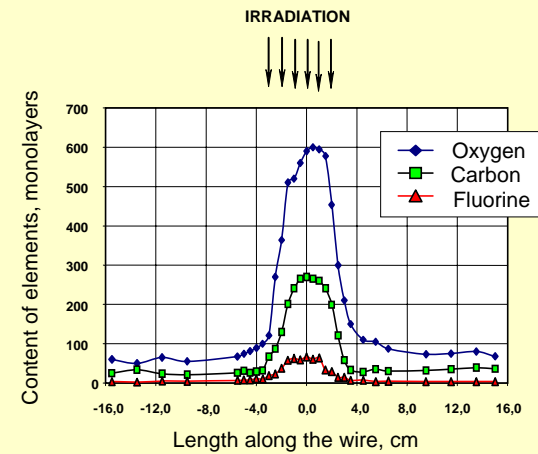


Fig.4. Distribution of element concentration along the wire.

Метод Ядерных Реакций позволил нам
впервые в мире измерить количественное
распределение как вдоль проволочки,
так и в ее глубину для

всех легких элементов,

содержащихся в газовых смесях,
применяемых в детекторах частиц.

Мы располагаем новым методом.

Ключевые публикации 2008 года.

- 1. Application of Nuclear Reaction Analysis for the fluorine content measurements under the aging investigations of gas-filled particle detectors,** Nucl. Instr. and Meth. A 581 (2007) 167-170.
- 2. Two-dimensional detector of thermal neutrons,** Nucl. Instr. and Meth. A 581 (2007)123-127.
- 3. Исследование старения газоразрядных детекторов частиц методом ядерных реакций,** Известия РАН, серия физическая, 2007, том 71, №9,1360-1366.



ОФВЭ, с Новым 2008 годом.

**Нам 44 года - это время
МОЛОДОСТИ И СИЛЫ.**

