

Cherenkov radiation and Cherenkov detectors in the Cherenkov laboratory

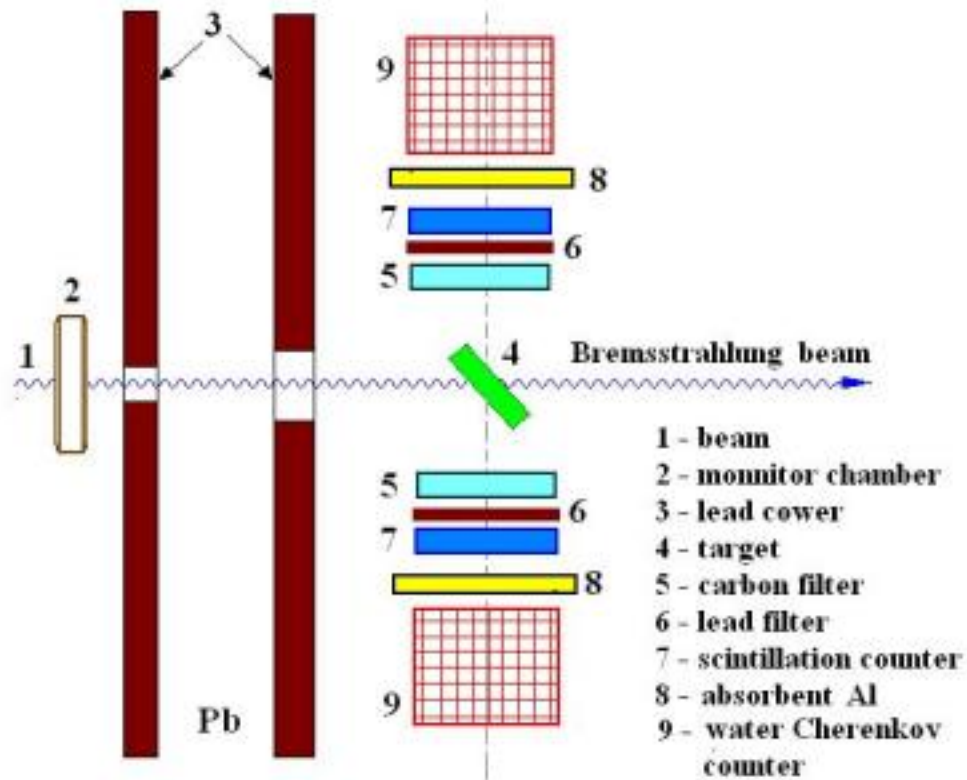
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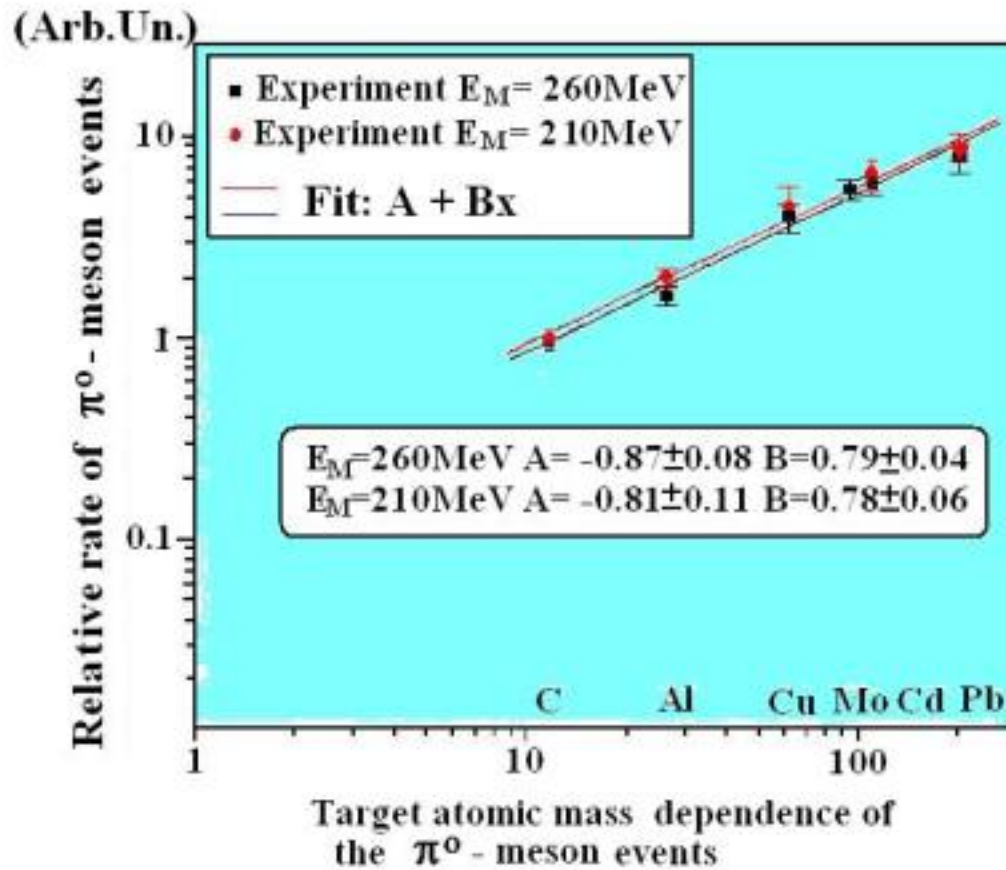
Report on the conference 23.06.2004 Moscow

1. Introduction
2. Water Cherenkov counters in the experiment on investigation of A-dependence of neutral pions photoproduction on the complex nuclei.
3. Total absorption Cherenkov counters (TACC) on the basis of led glas and heavy crystals.
4. TACC in the experiments on the extraction of the electron beam at Serpukhov accelerator.
5. TACC in the experiment on measuring of total photoabsorption cross section on the hydrogen and deuterium.
6. TACC in the tagging system with discrimination of the muon background.
7. TACC in the experiments on the synchrotron PAKHRA.
8. TACC in the experiments on the beam of high energy neutrons with spectrometer BIS-2.
9. Luminosity monitor of the detector H1 at the accelerator HERA.
10. Conclusion.

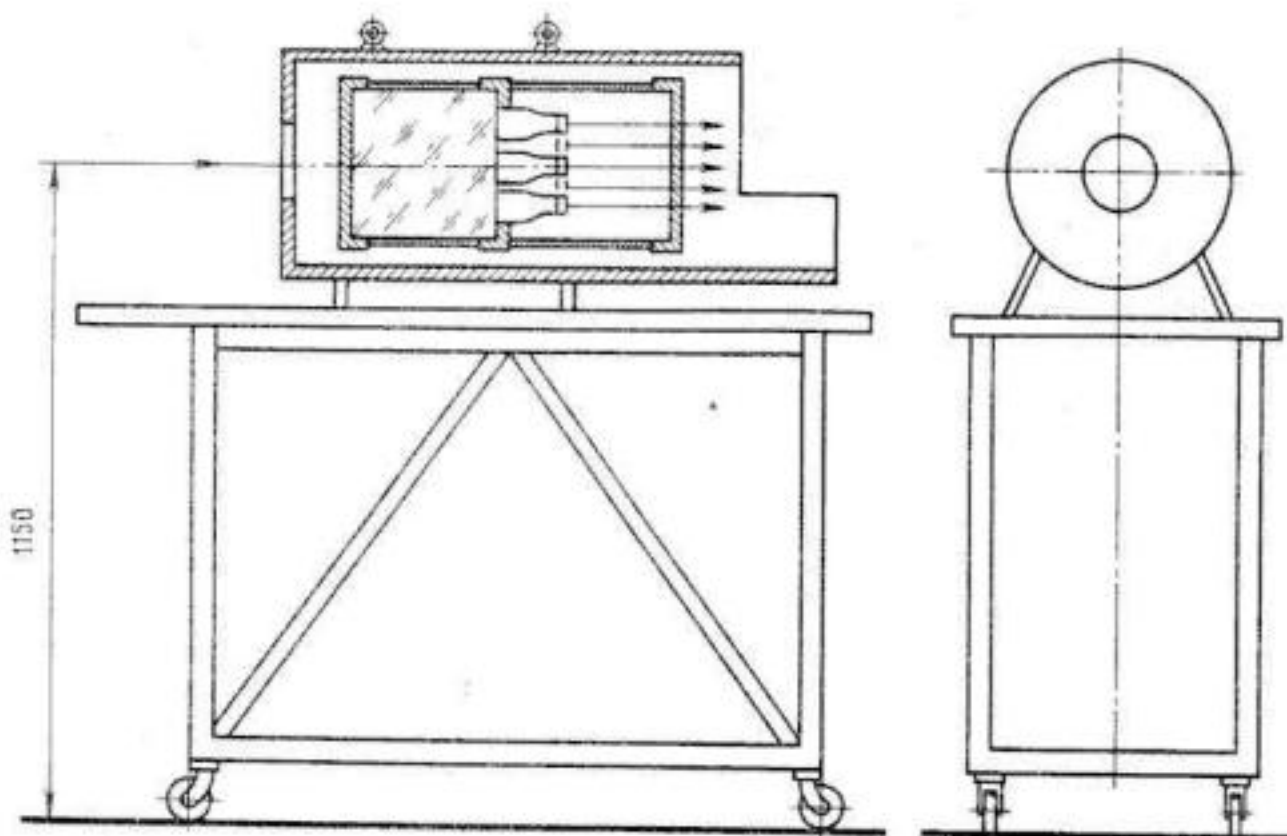
Experiment on the investigation of A – dependence of low energy neutral pions photoproduction



A – dependence of neutral pions yield for two values of maximum energy of the gamma beam

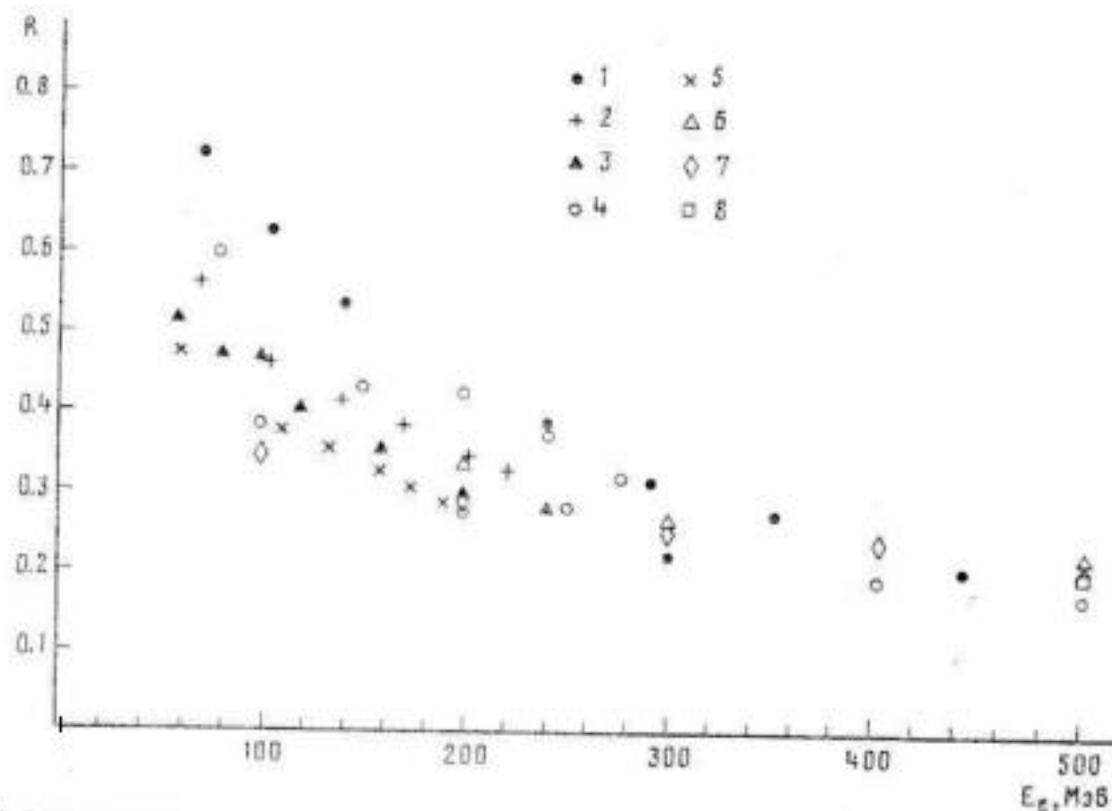


Total absorption Cherenkov counter (TACC) with led glass radiator



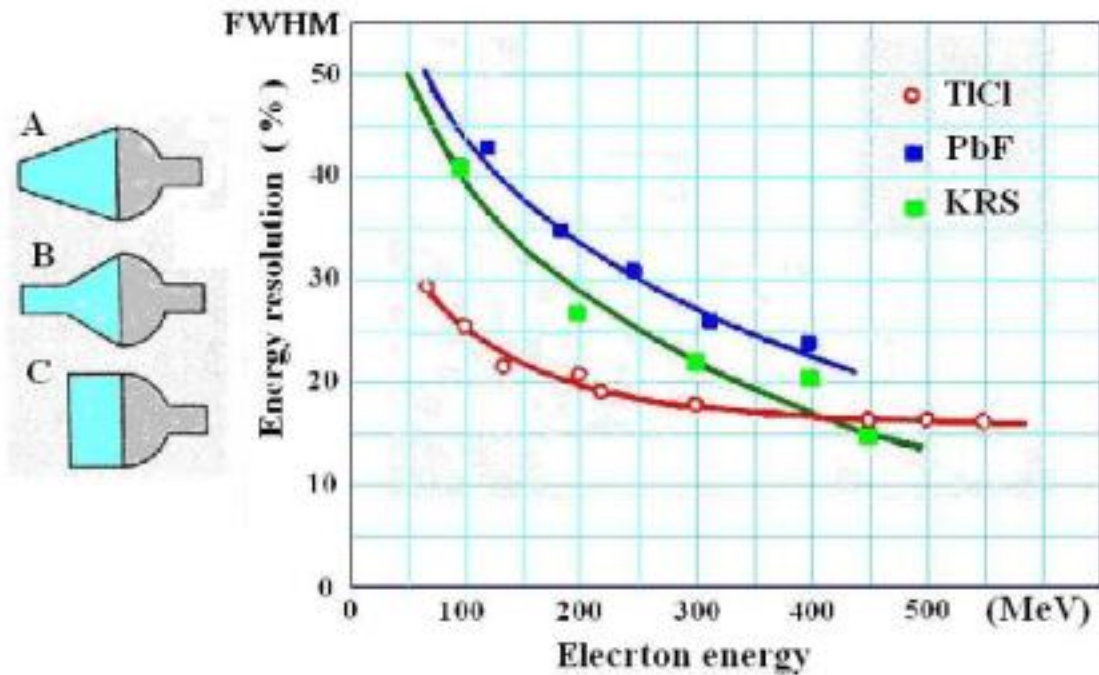
Р и с. 3 Конструкция ЧСП с радиатором из свинцового стекла цилиндрической формы

Energy dependence of the resolution of TACC with the led glass radiators

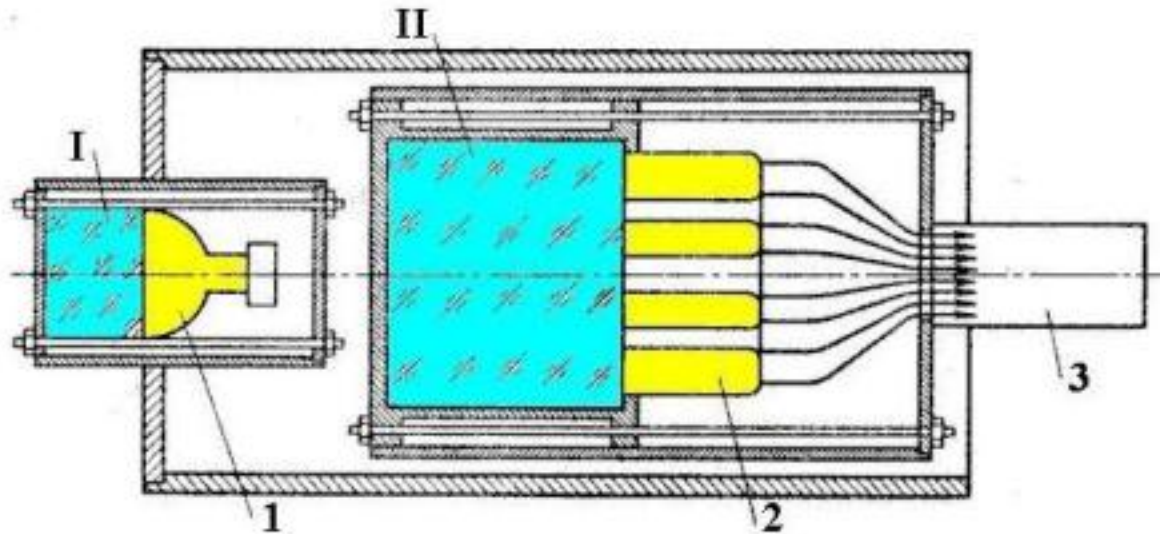


Р и с. 4 Энергетическая зависимость разрешения (полная ширина на половине высоты пика от m познергетических электронов) для ЧСПИ с радиаторами из свинцового стекла
 1 - ϕ 300, $h = 180$; 2 - ϕ 300, $h = 260$; 3 - ϕ 300, $h = 300$; 4 - [2];
 5 - [3]; 6 - [4]; 7 - [5]; 8 - [6]

Constructions of TACC with radiators from heavy crystals and the energy dependence of the energy resolution



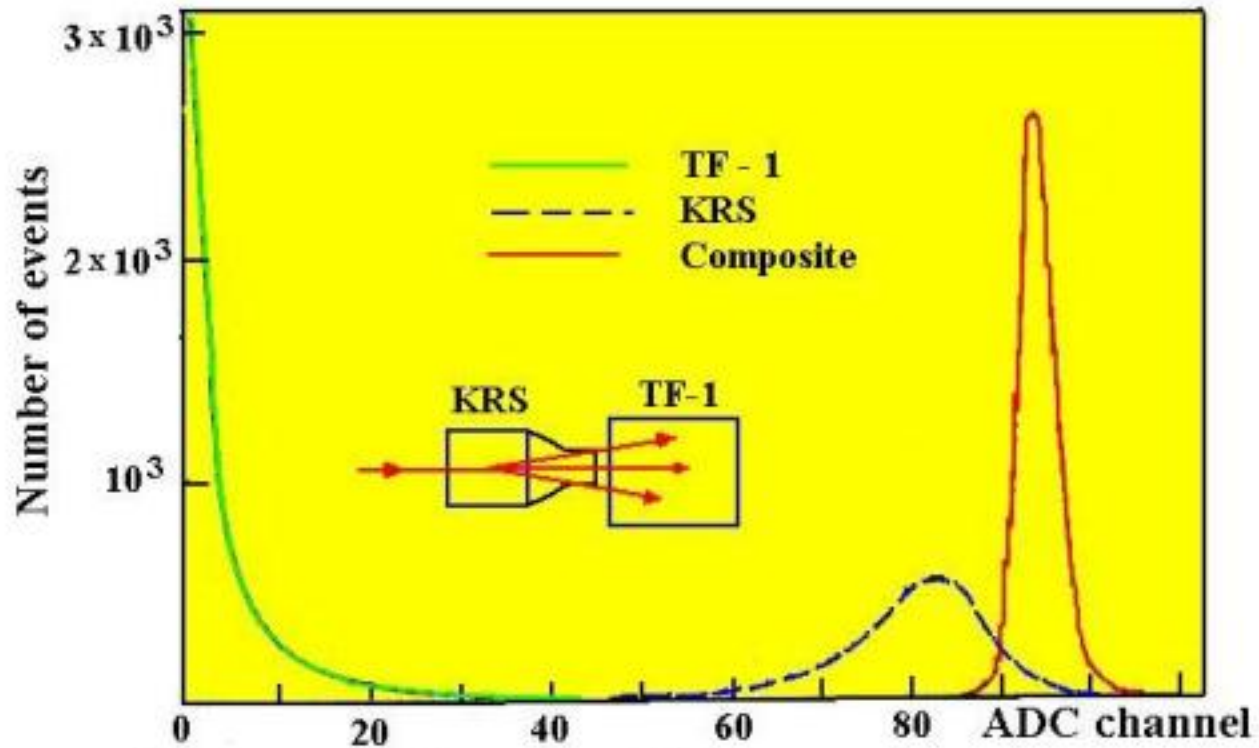
Composite TACC



Design of the composite spectrometer

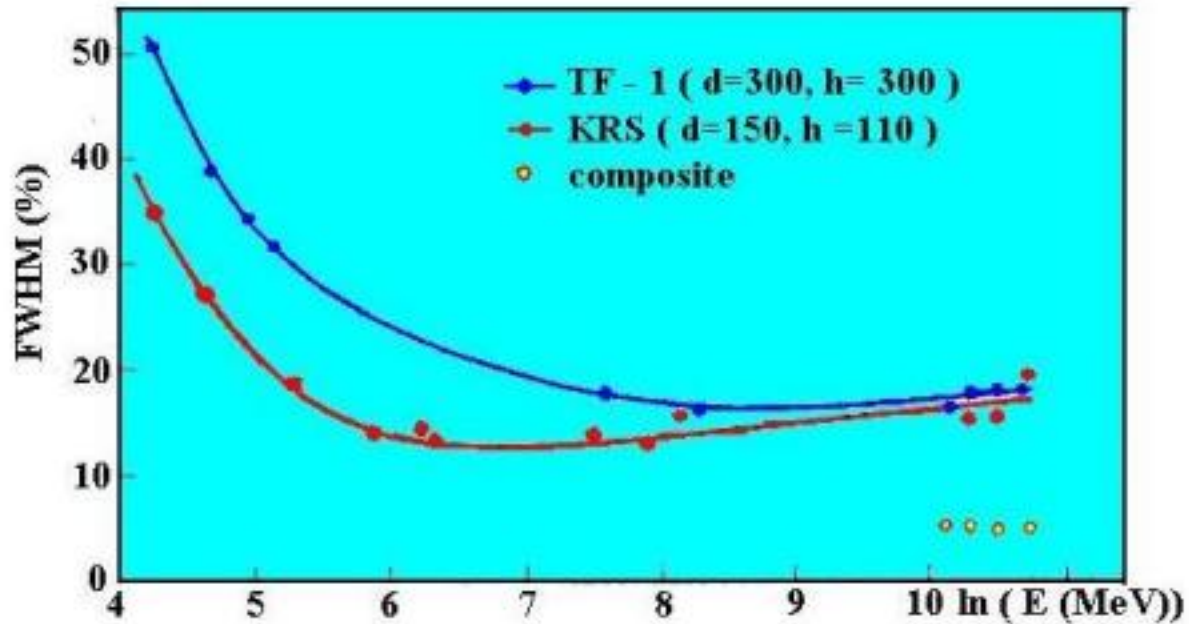
- I - crystal KRS-6, $d = 150$ mm, $h = 110$ mm**
- II - lead glass TF-1, $d = 300$ mm, $h = 300$ mm**
- 1 - photomultiplier FEU-49**
- 2 - photomultiplier FEU-52**
- 3 - front-end electronics**

Pulse height distributions from composite TACC



The energy spectra measured in the composite spectrometer and its two components (TF-1 and KRS)

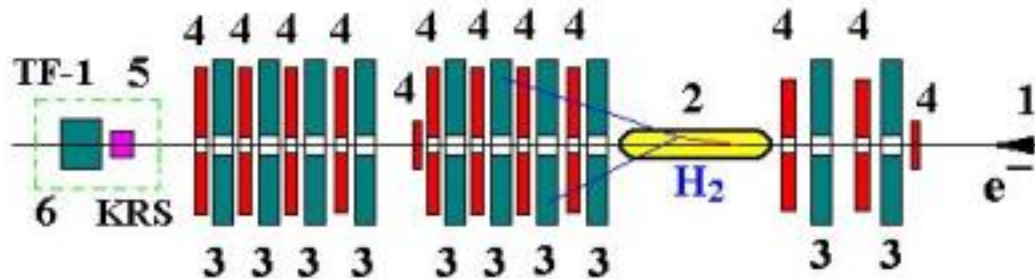
Energy resolution of composite TACC and its components



Energy resolution of the total absorption Cherenkov spectrometers with the different radiators together with energy resolution of the composite spectrometer.

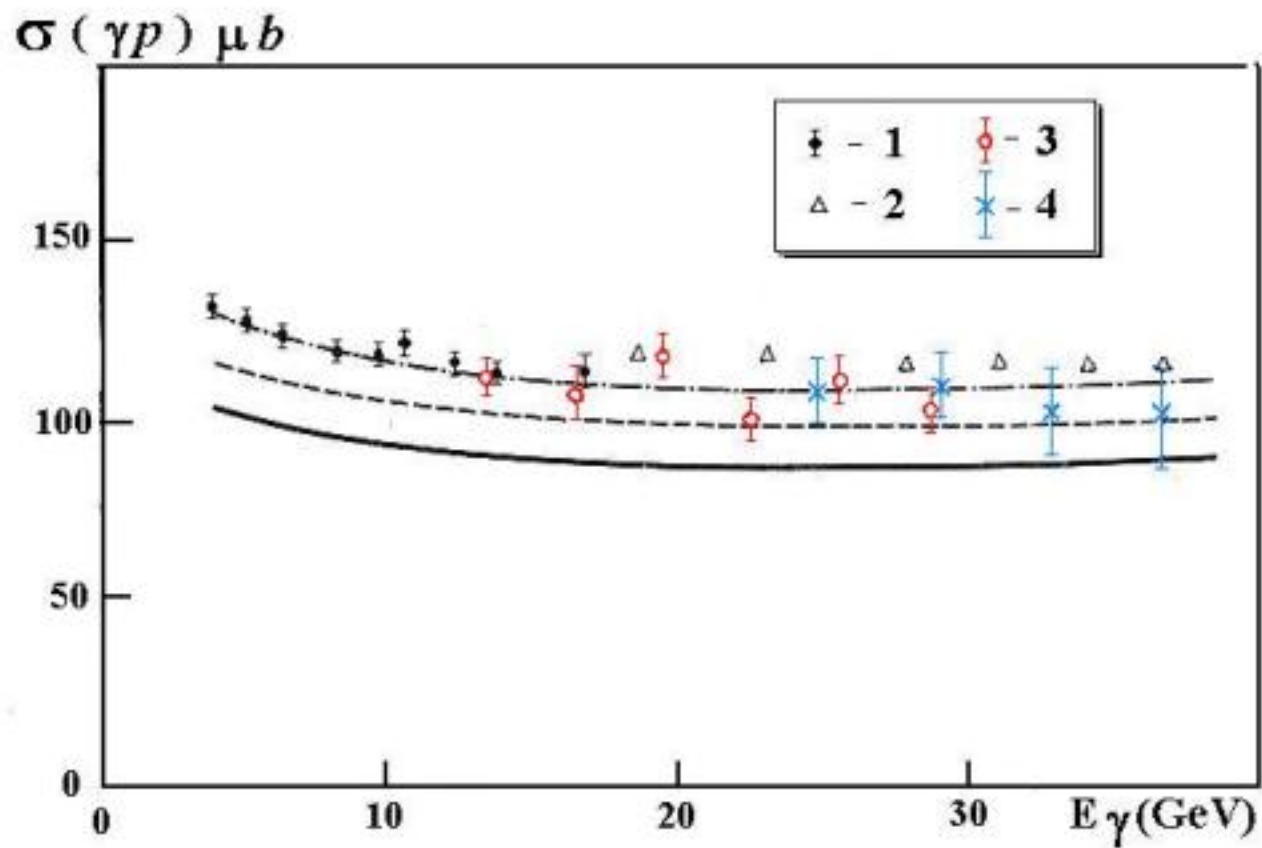
TACC in experiment on measurement the total cross section
at the energies 20 – 40 GeV

Layout of the experimental set up
on channel 2E of the Serpukhov accelerator

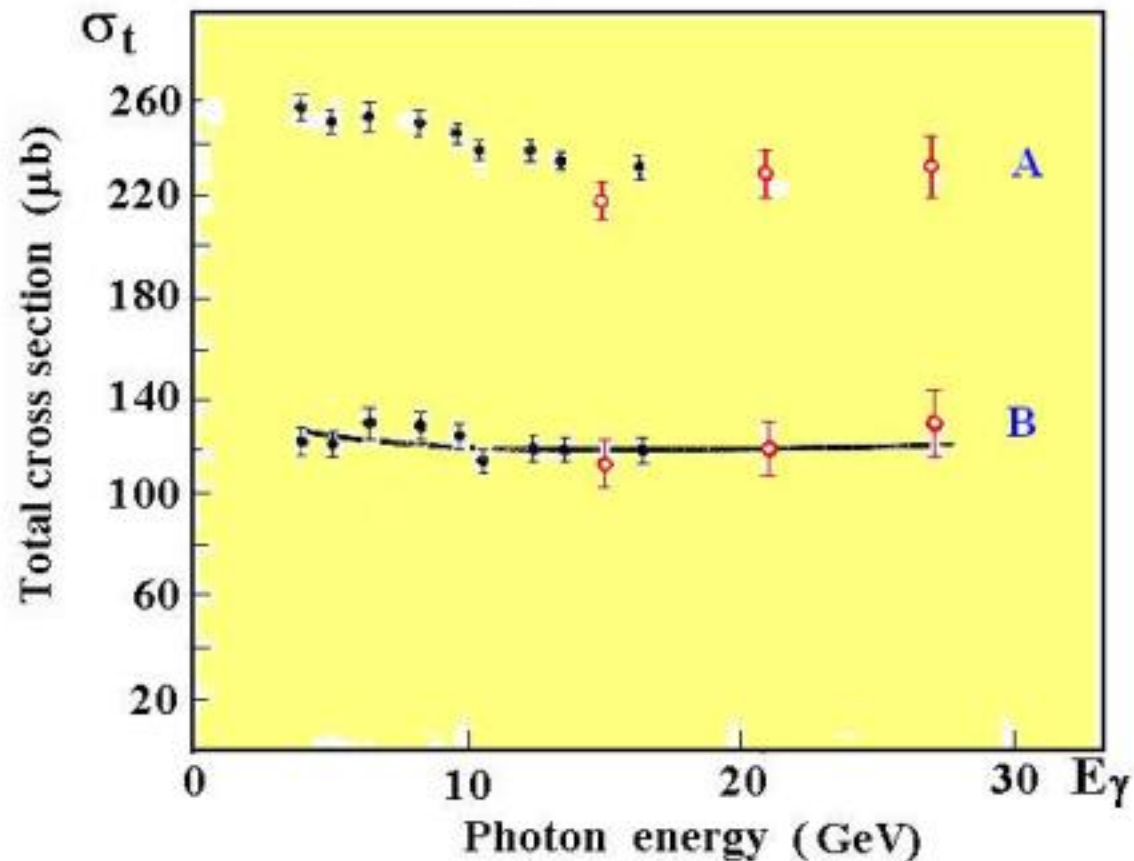


- 1 - the electron beam
- 2 - the hydrogen target
- 3 - the lead filter
- 4 - the scintillation counter
- 5 - the total absorption Cherenkov counter with radiator of heavy flint TF-1
- 6 - the total absorption Cherenkov counter with radiator of KRS-6 crystal
- 5 + 6 - the composite Cherenkov spectrometer

Total cross section of photoproduction of the hadrons from hydrogen



Total cross section for hadron photoproduction from deuterium

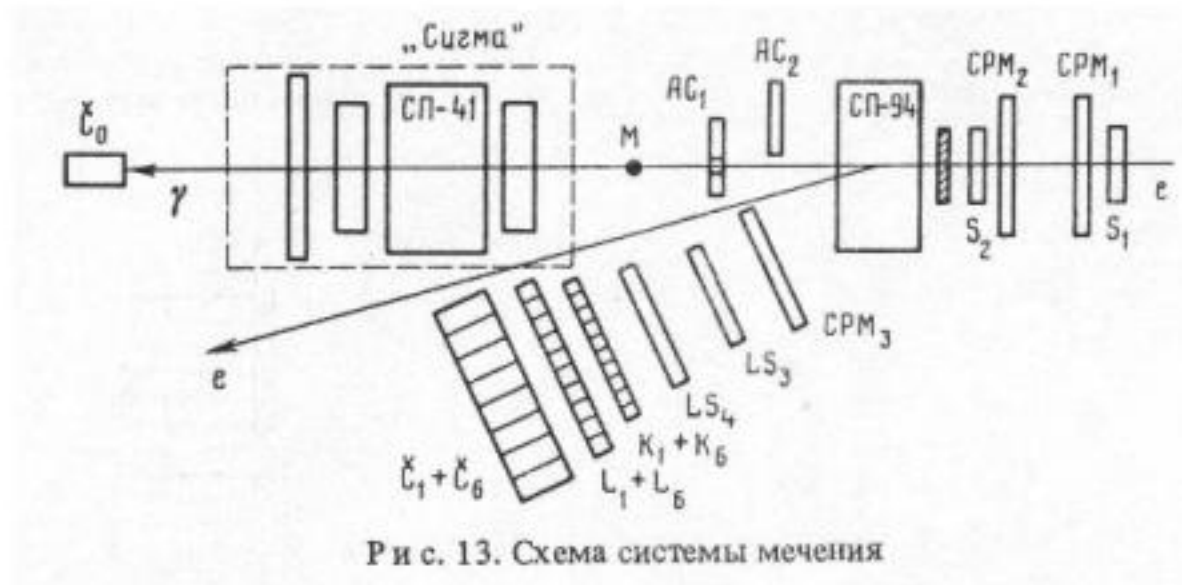


Total cross sections of hadronic absorption of the photons:

A - on deuterium, **B** - on neutron.

Open circles - the results of the experiment.

Tagging system with discrimination of the muon background

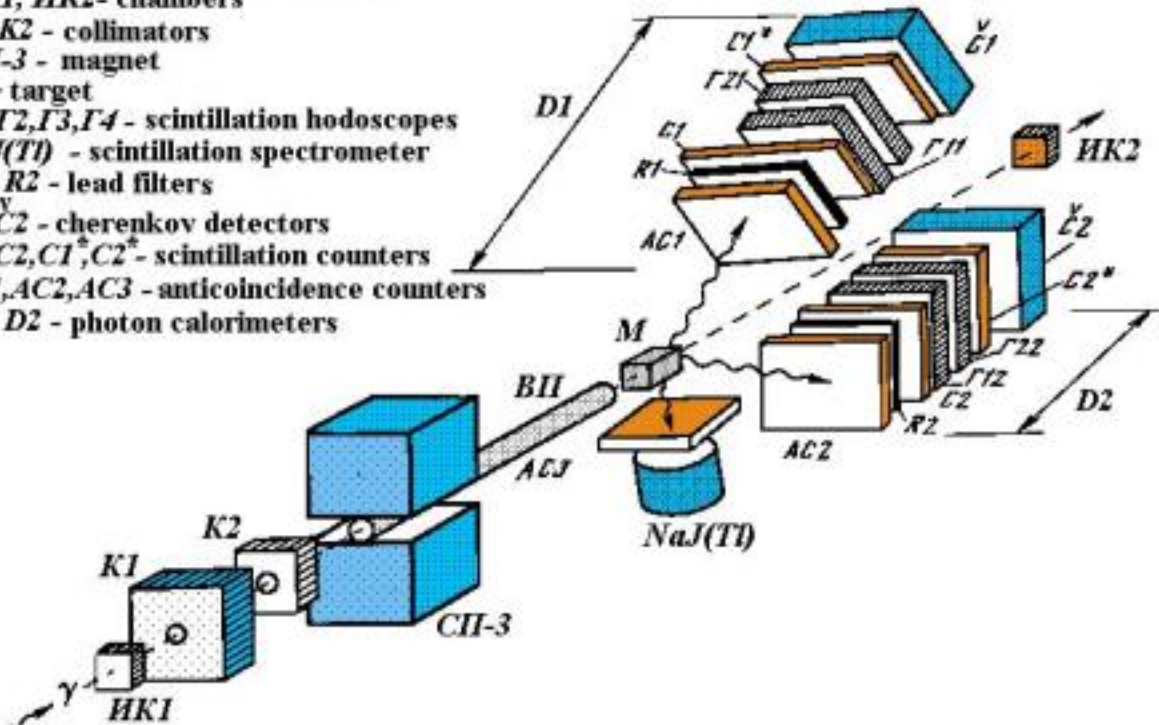


TACC in experiments with detector GAMMA

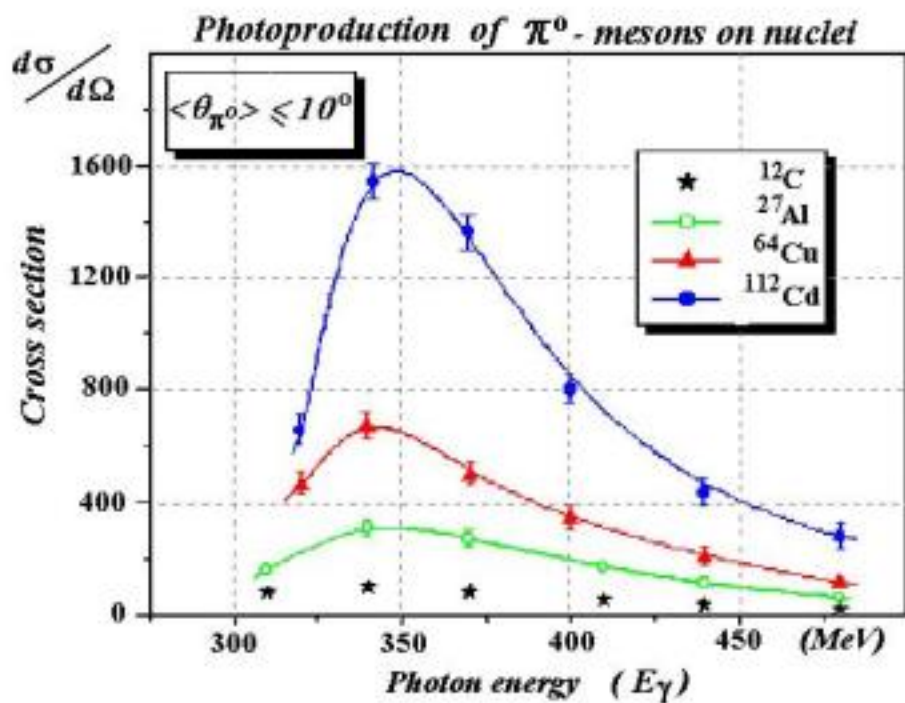
"Gamma" set up

- HK1, HK2* - chambers
- K1, K2* - collimators
- CH-3* - magnet
- M* - target
- Г1, Г2, Г3, Г4* - scintillation hodoscopes
- NaJ(Tl)* - scintillation spectrometer
- R1, R2* - lead filters
- Č1, Č2* - cherenkov detectors
- C1, C2, C1*, C2** - scintillation counters
- AC1, AC2, AC3* - anticoincidence counters
- D1, D2* - photon calorimeters

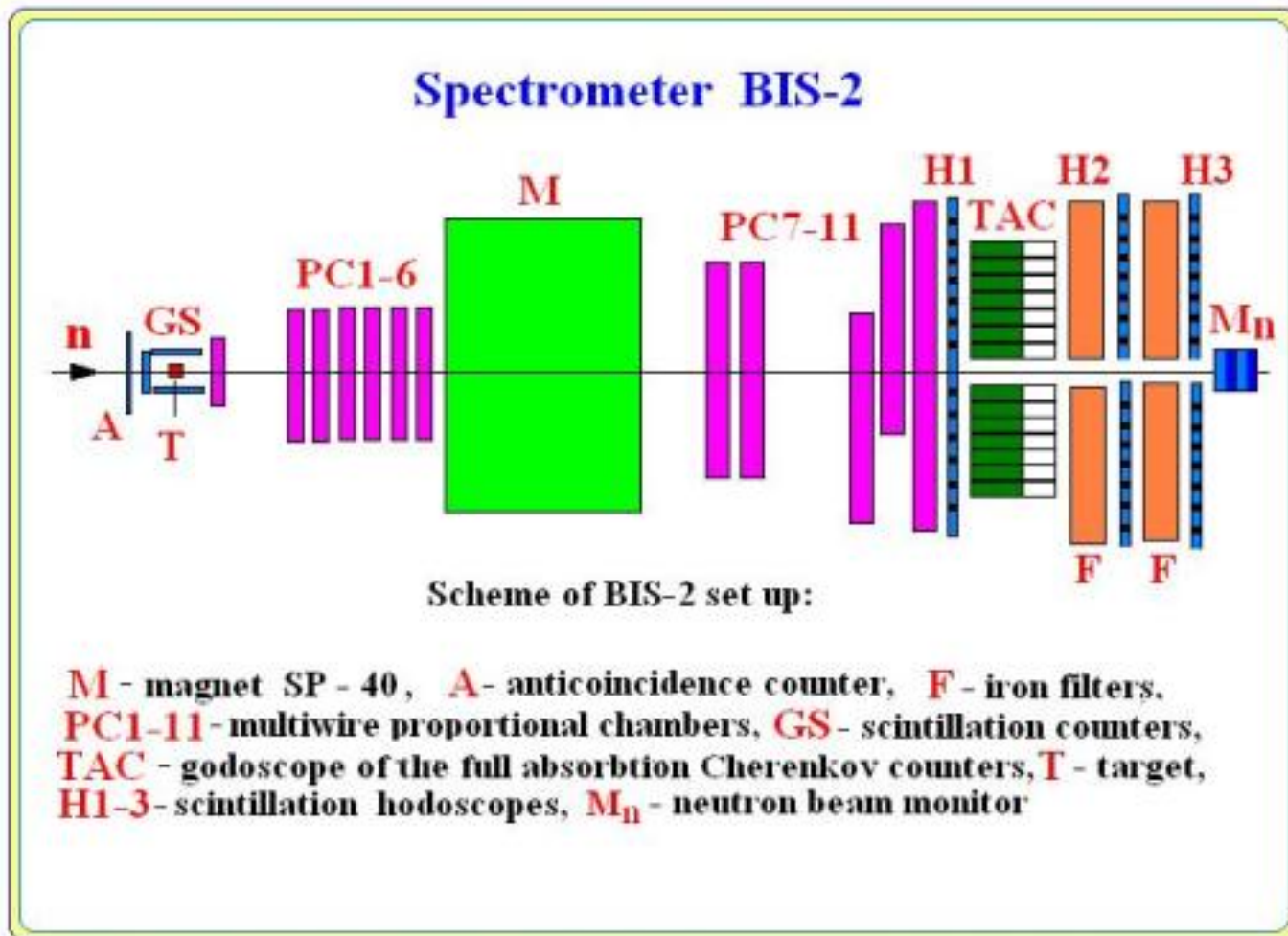
General layout of the detection scheme



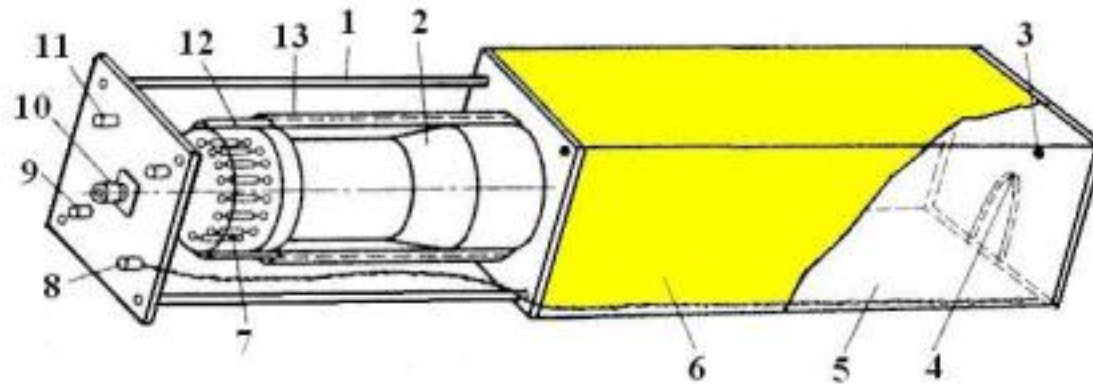
Cross section of neutral pions photoproduction from nuclei



TACC in the experiments with spectrometer BIS-2



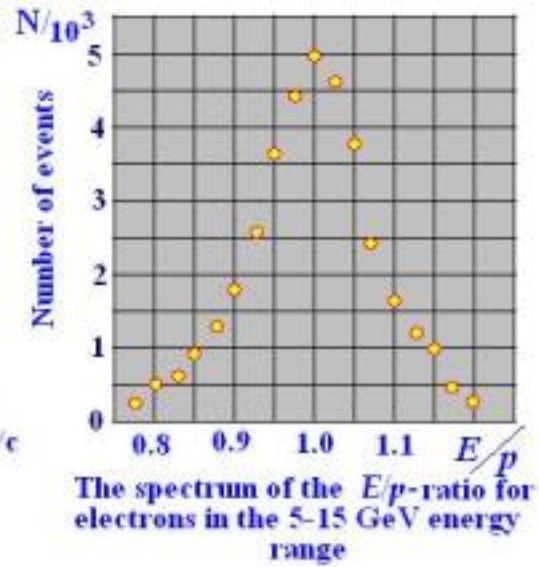
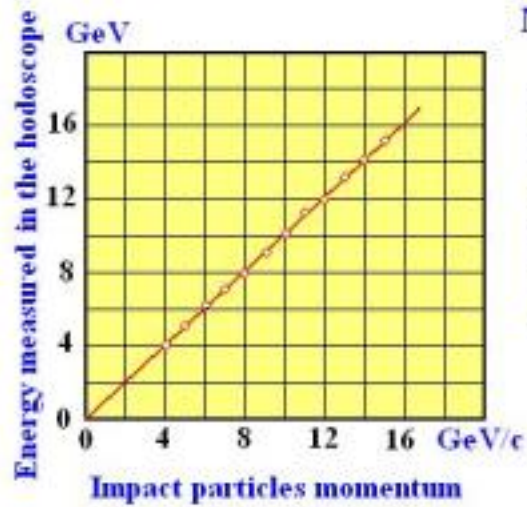
The element of TACC detector in spectrometer BIS-2

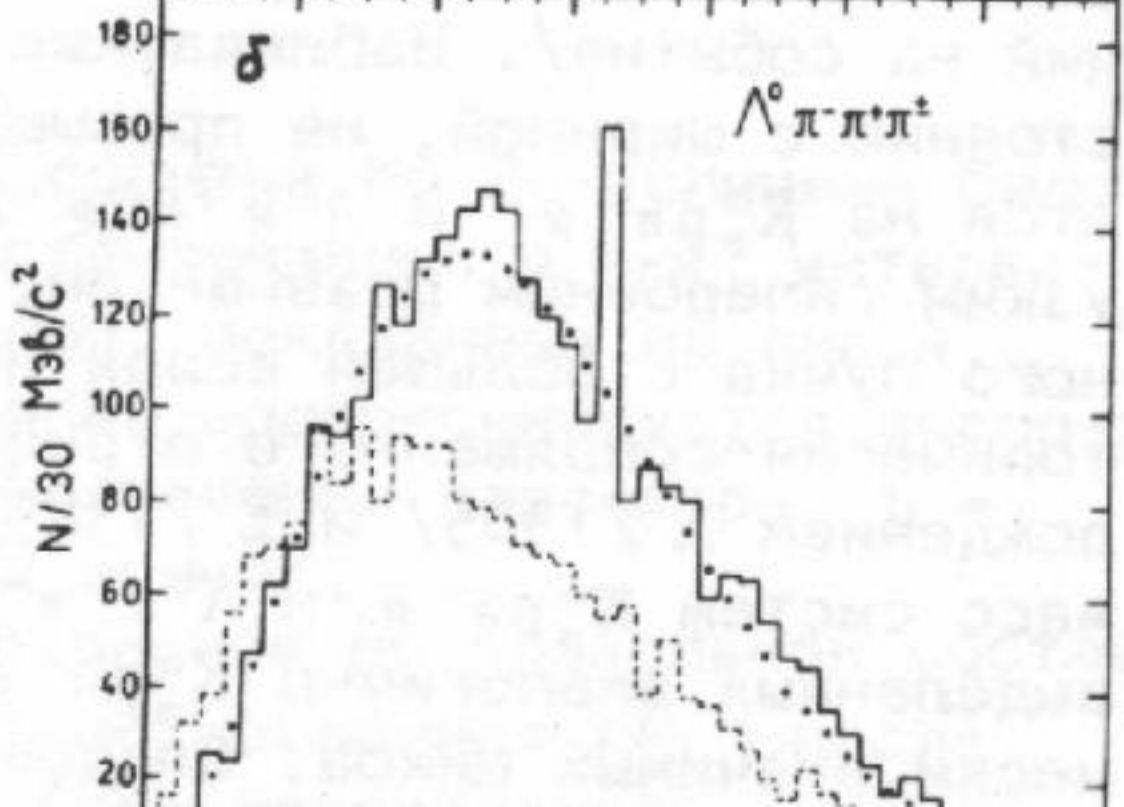
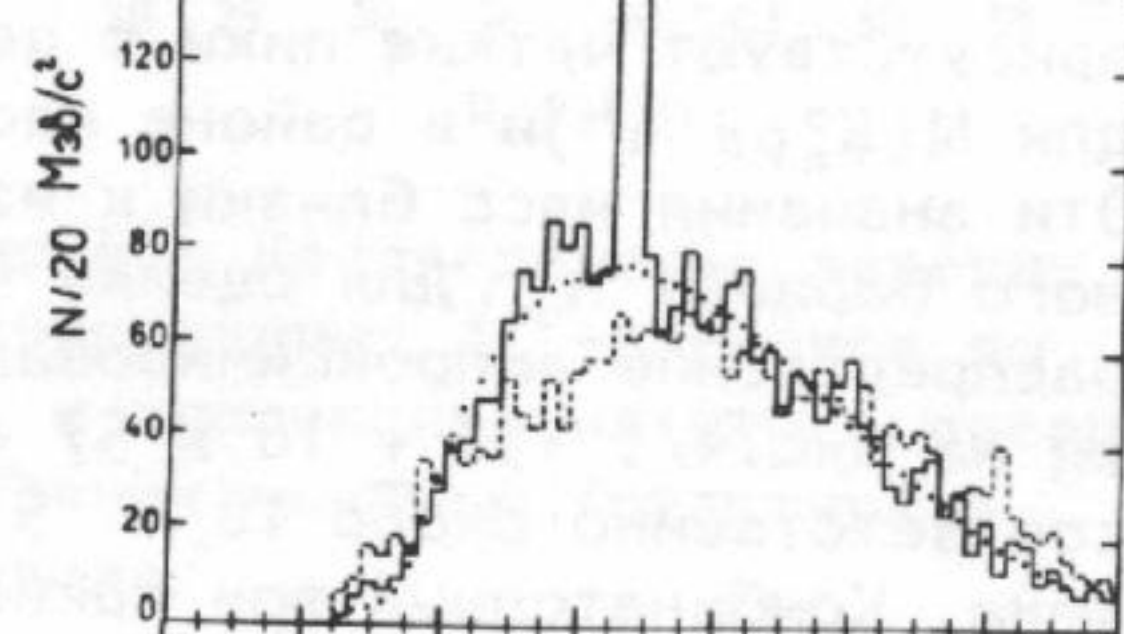


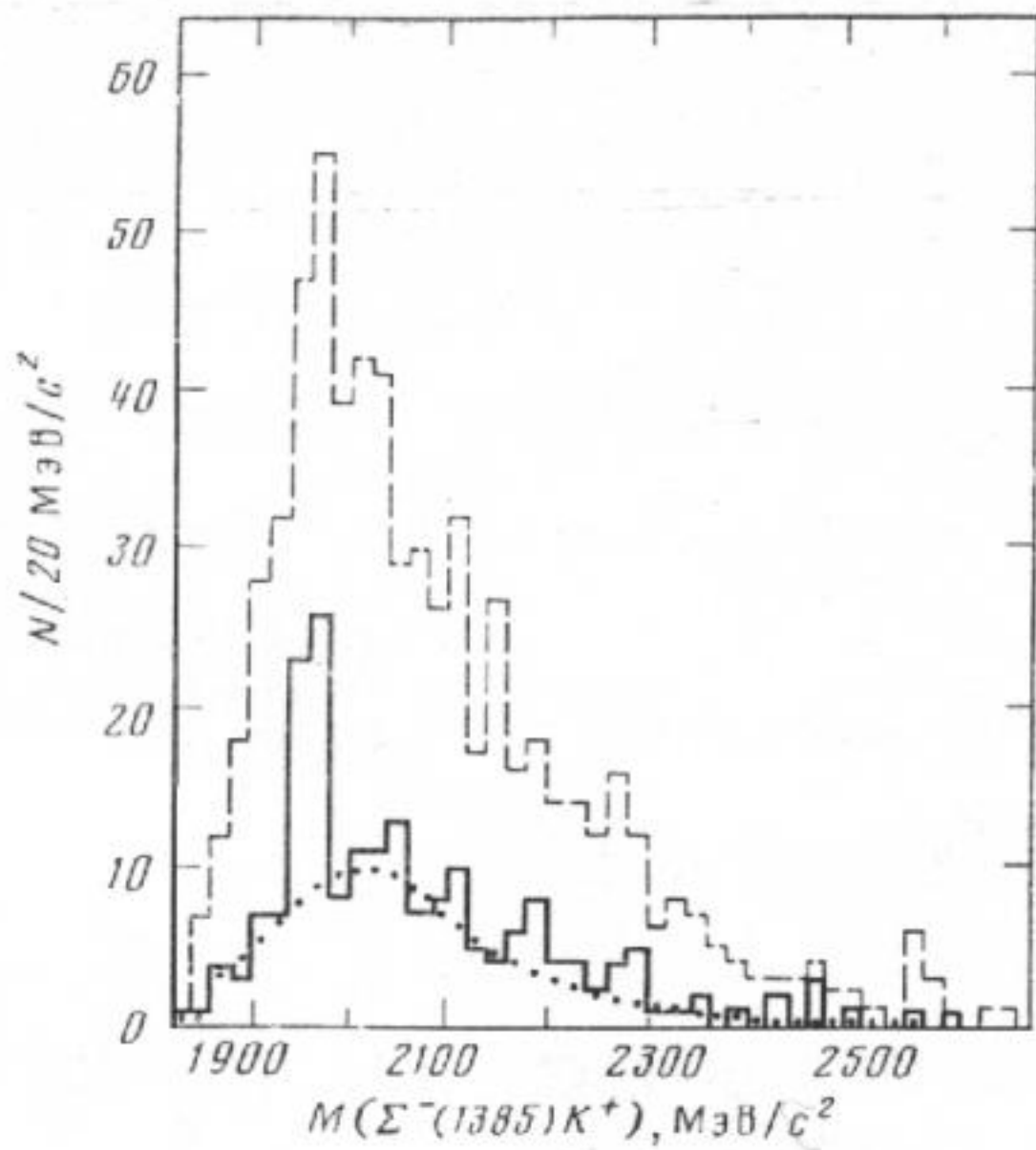
- 2 - photomultiplier FEU-110
- 3 - light diod
- 4 - fibres light guide
- 5 - lead glass radiator
- 6 - tension rod
- 7 - base for phptomultiplier

- 8 - power supply for light diod
- 9 - response from the last dinode
- 10 - HV power supply of PM
- 11 - HF response of PM
- 12 - light protection
- 13 - magnetic shielding

The results of the online calibration TACC in the BIS-2 spectrometer







Luminosity monitor on the H1 detector on the accelerator HERA

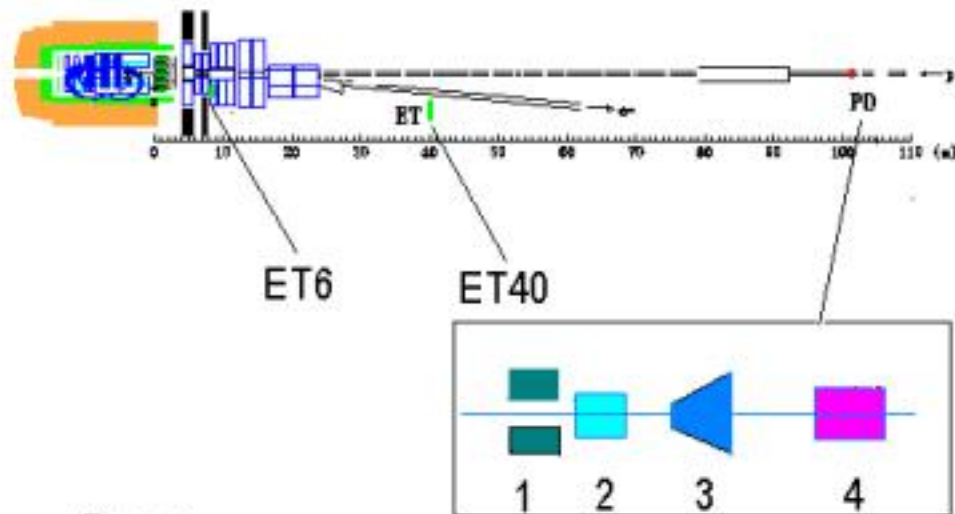
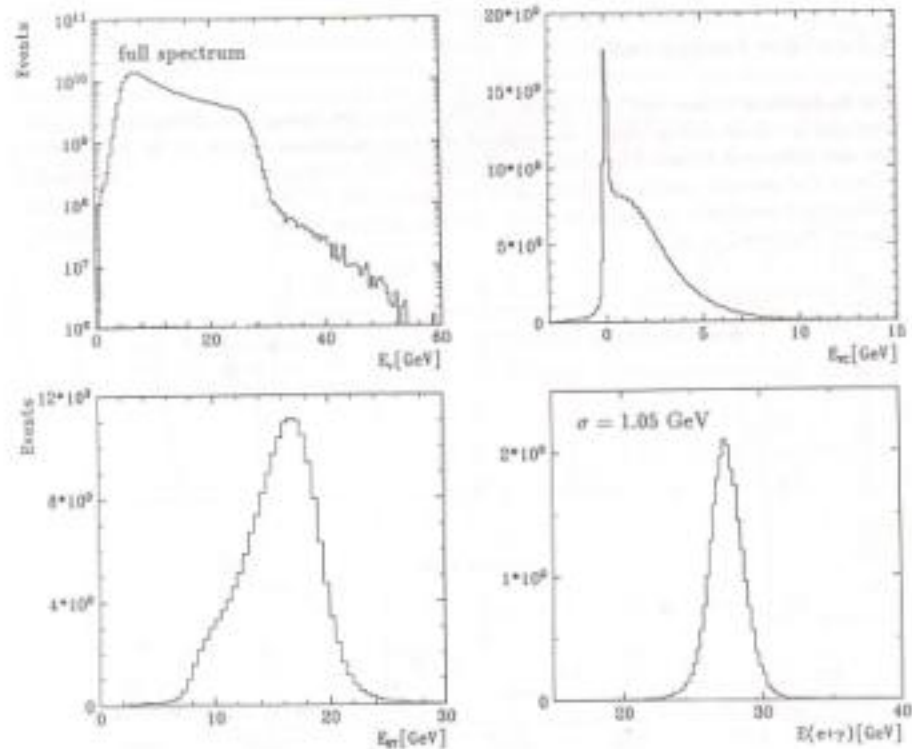


Рис. 2

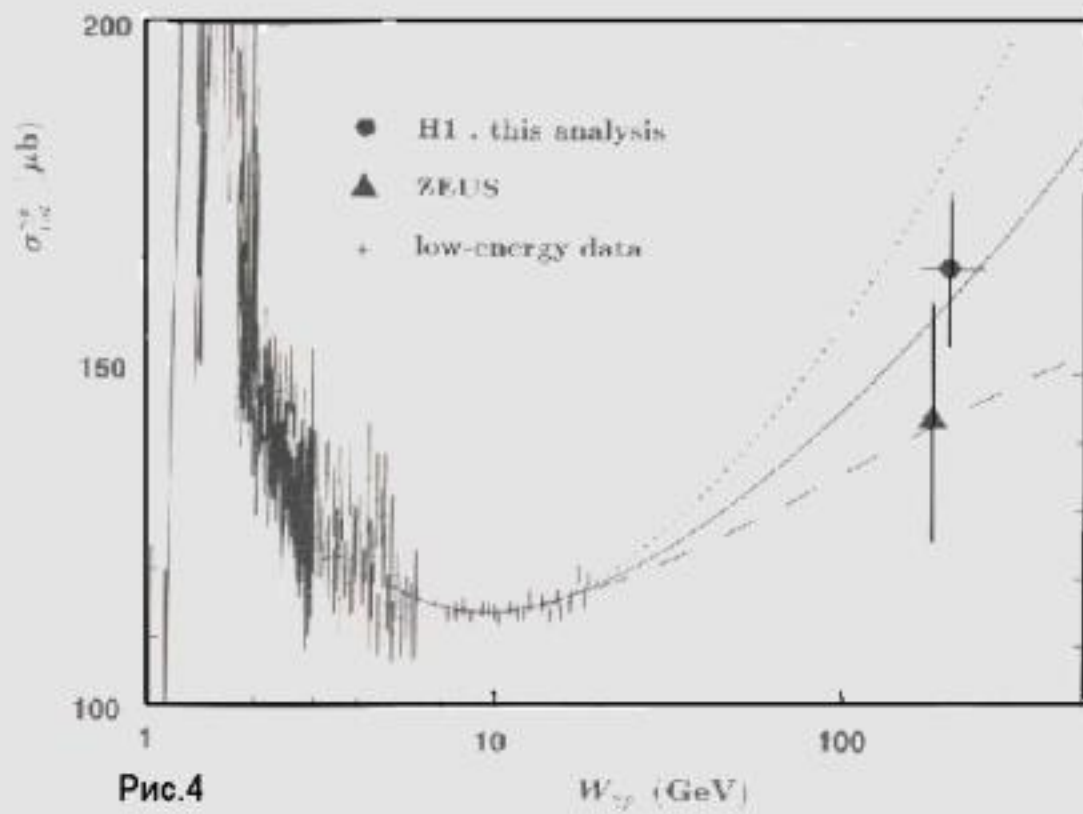
- 1 - Свинцовый коллиматор
- 2 - Бериллиевый фильтр
- 3 - Водяной вето-счетчик
- 4 - Счетчик фотонов

Pulse height spectra from the detectors of the luminosity monitor



The energy spectra at different Luminosity detectors for BH events.

Total cross section of the hadronic photoabsorption on the proton



Conclusion

The works, which have been made in the Cherenkov laboratory:

1. "On the possibility of separation the relativistic particles in the scintillation counters"

B.B. Govorkov Preprint LPI A-240, 1961

2. "A trap for cherenkov light from a wide beam of relativistic particles"

N.Z.Gogitidze, V.A.Tsarev and V.A.Chechin
NIM A248 (1986)186

- 3."Radiation hardness of heavy monocrystals KRS-15, NBW, PWO"
P.S.Baranov, A.S.Belousov et al Preprint LPI 53, 1999

P.A.Cherenkov and P.A.Zaitsev

