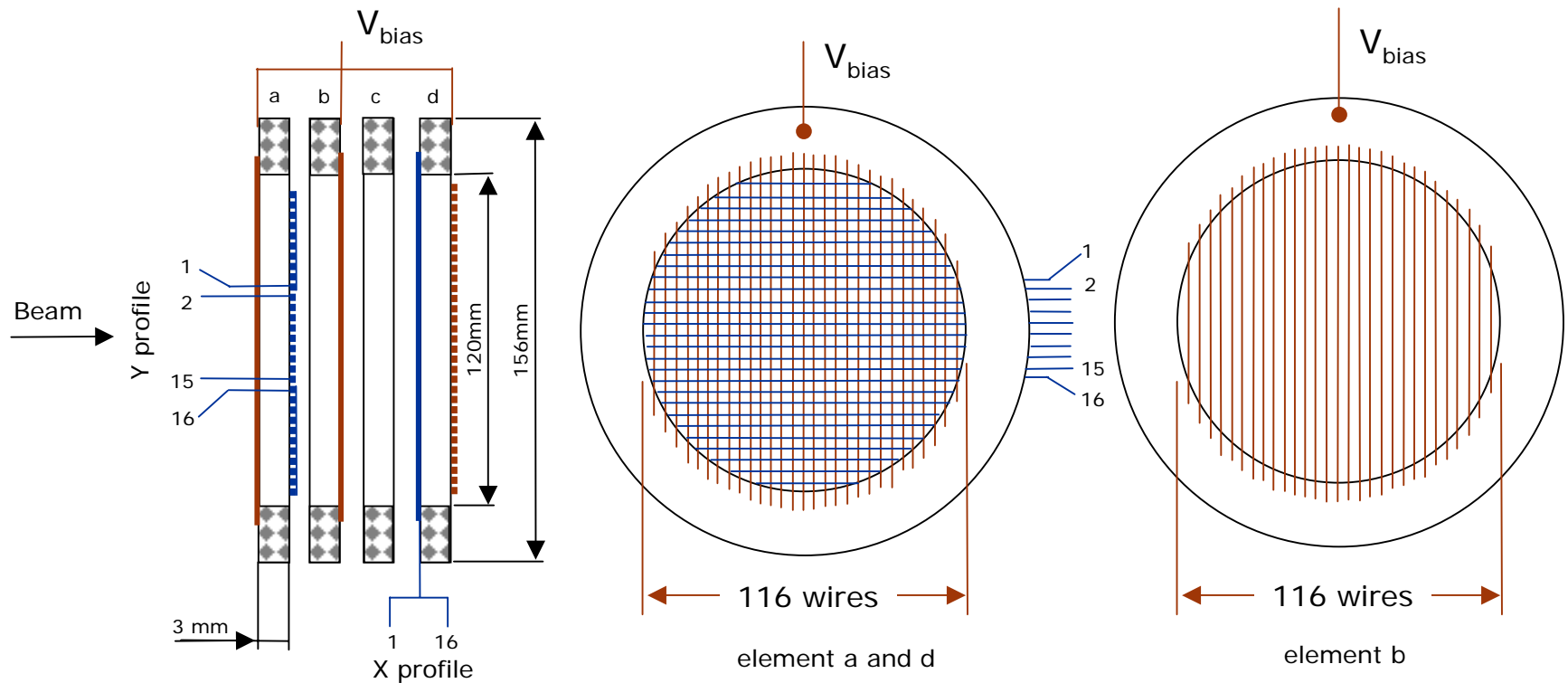


Use of multi wires chambers in air for profile measurements of intensive beams at IHEP (Protvino)

Years	Proton beam	Neutrino beams	Detector(s)	Results
1974 - 1982	Up to 2×10^{12} , 30 bunches, 5 μ s spill duration	ν_μ , <i>anti</i> - ν_μ focused beam; beam-dump	ITEP Spark Neutrino Detector	<ol style="list-style-type: none"> 1. μ-pairs in ν-interactions; 2. search for short-lived particles using nuclear emulsion; 3. $\sigma_{\text{tot}}(\nu N)$, quasi-elastic scattering, including limits on ν_μ-oscillation parameters, $\nu_\mu e$-scattering, etc. 4. prompt neutrinos (charm production in pFe-interactions)
1985 - 2003	Up to 1.4×10^{13} (booster), 29 bunches, 5 μ s spill duration	ν_μ , <i>anti</i> - ν_μ focused beam; beam-dump; short decay path	SKAT Bubble Chamber (up to 1990); JINR-IHEP Neutrino Calorimeter	<ol style="list-style-type: none"> 1. ν (<i>anti</i>-ν)-inclusive scattering, structure functions, ν_e-ν_μ universality, exclusive channels 2. prompt neutrinos 3. ν_e-oscillations with Neutrino Calorimeter

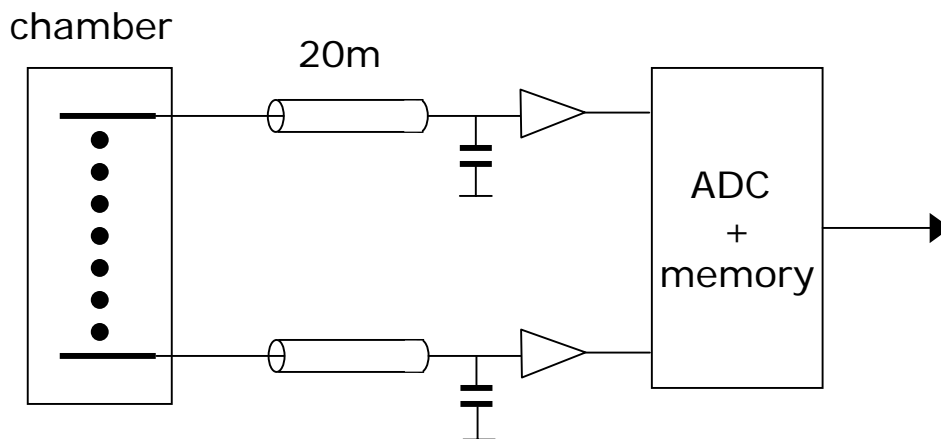
Mechanical construction of chamber (type A)



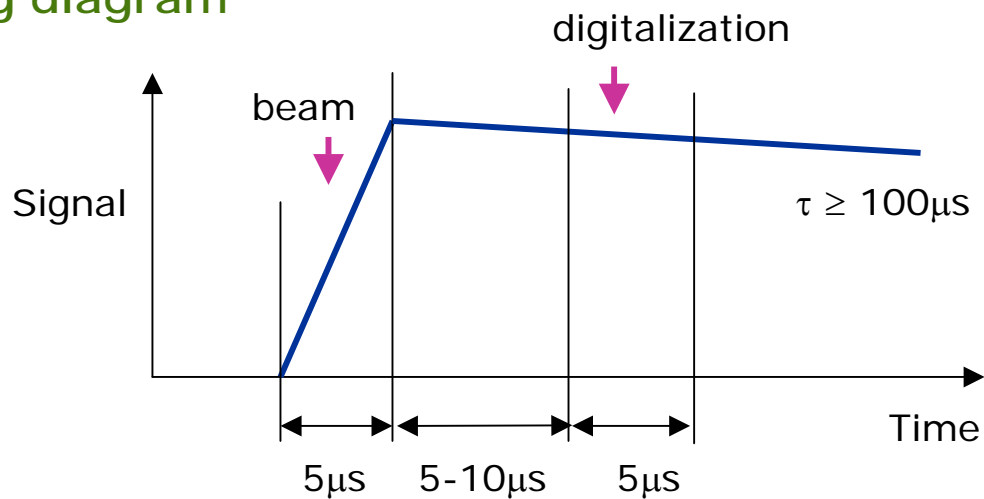
Main parameters of chamber A and B

		Chamber A	Chamber B
Signal electrode	Construction	14 central + 2x12 wires connected in parallel, 38mm working area	16 strips, 140mm working area
	Material	beryllium-bronze alloy	aluminum
	Size	wire of $\varnothing 200 \mu\text{m}$	40 μm x 8mm
	Distance between wires/strips	0.8mm	1mm
Bias plane		116 wires, 1mm step, beryllium-bronze alloy	116 wires, 1mm step, beryllium-bronze alloy
Distance between signal and bias plane		3mm	3mm

Schematic drawing



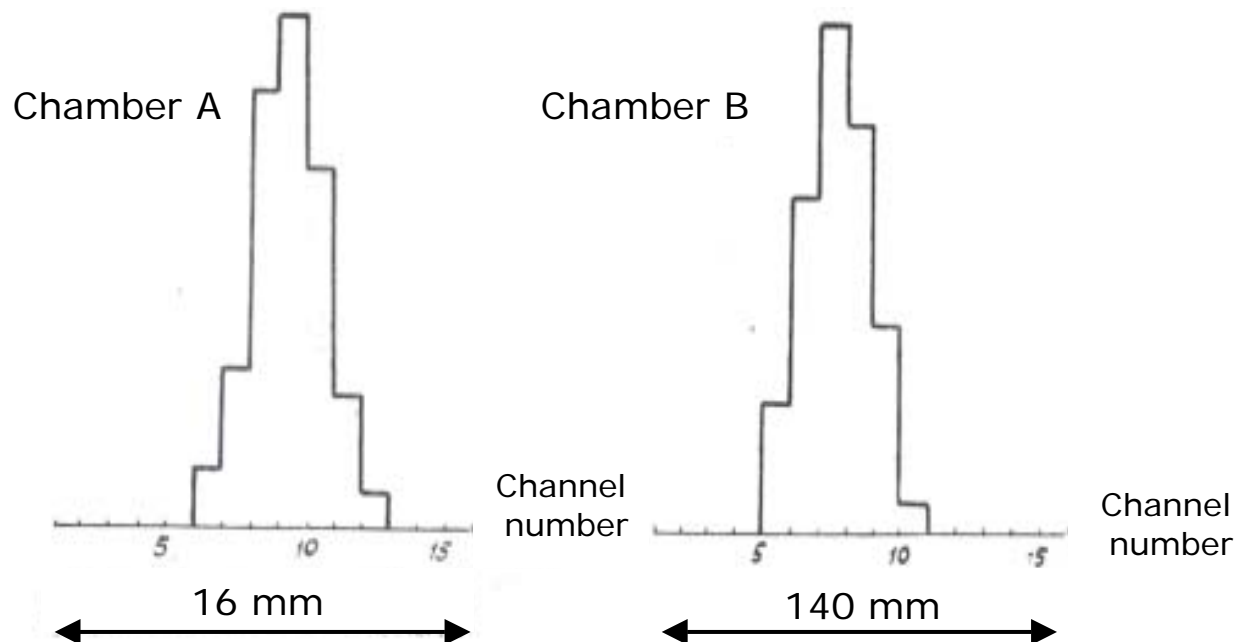
Timing diagram



Measurements (vacuum)

Originally the chambers were used inside of beam pipe under a pressure of $\sim 10^{-2}$ torr

Beam profiles



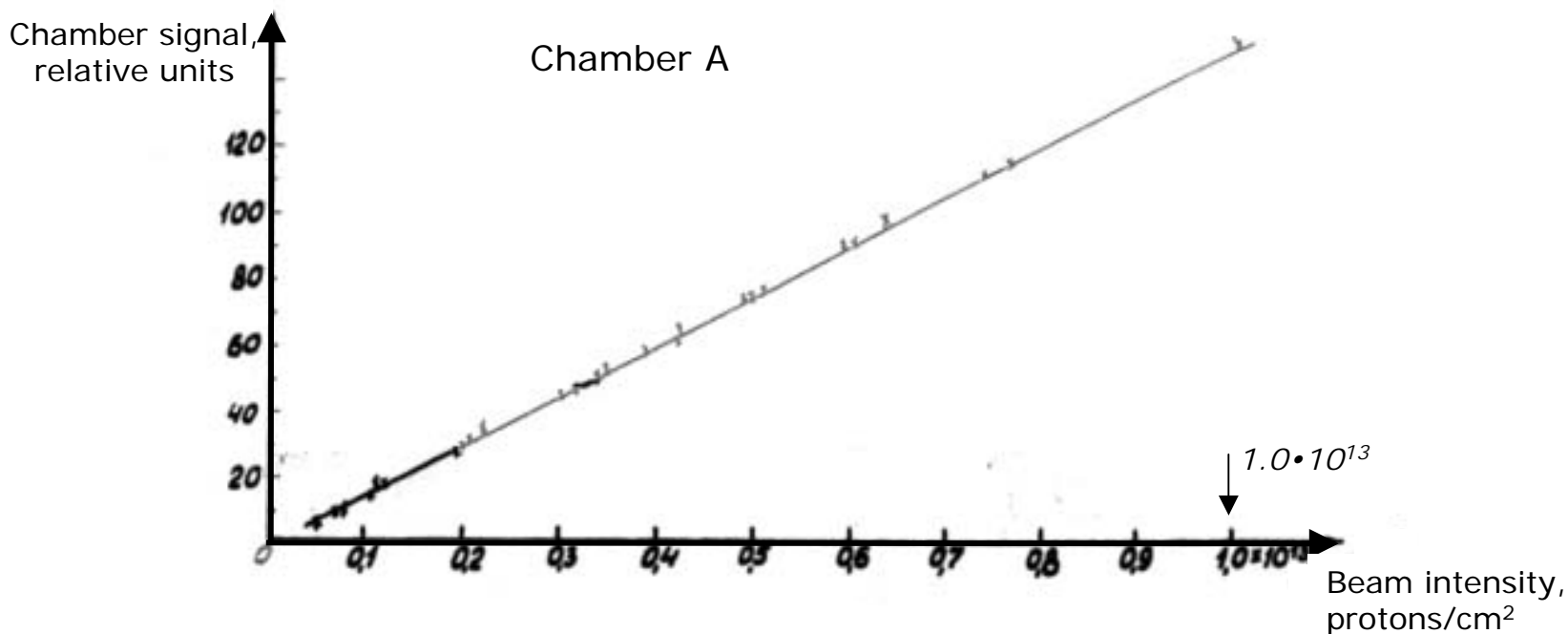
Beam profile for focused (chamber A) and wide beam (chamber B)

Number of δ -electrons

Number of \boxtimes -electrons per proton (measured with $V_{\text{bias}}=0$):
 chamber A – 0.03, chamber B – 0.01

Linearity

- ⊕ spill duration varied from 20 ns to 5 μ s
- ⊕ chamber signal is a sum of 14 central wires signals
- ⊕ intensity measured by BCT
- ⊕ $V_{\text{bias}} = 0$

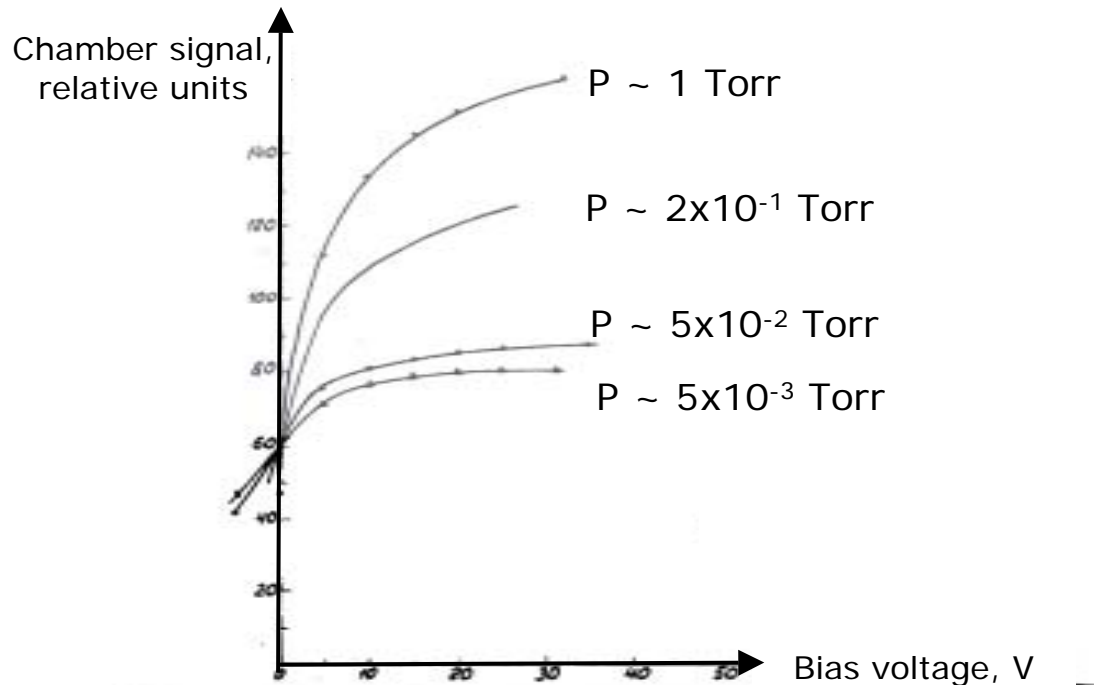


- ⊕ the same dependency was observed for chamber B too

Measurements (vacuum) - 3

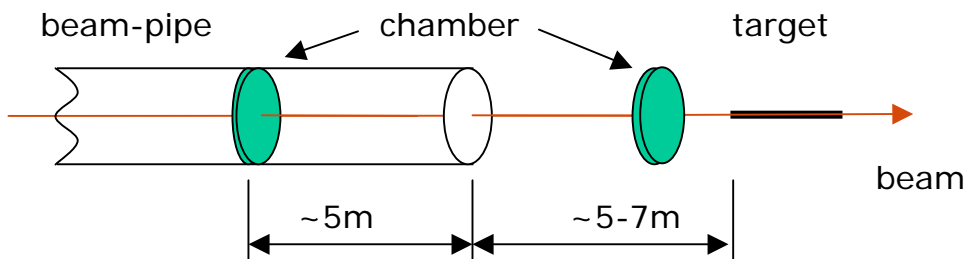
Dependence of signal on pressure and bias voltage

- ⊕ chamber signal is a sum of all wires signals



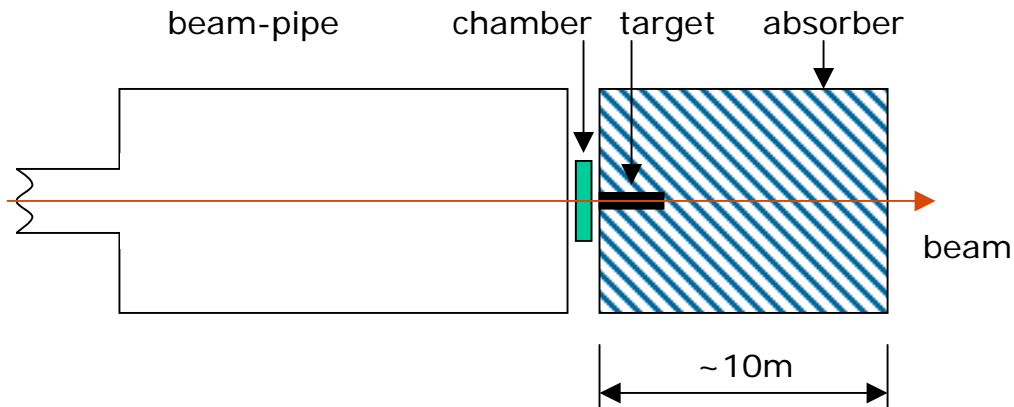
- ⊕ for $V_{\text{bias}}=0$ the signal is equal for all pressures
- ⊕ after first 1-2 years of use all chambers were operated with $V_{\text{bias}}=0$

Focused neutrino beam



1985 - 1994

Short decay path beam

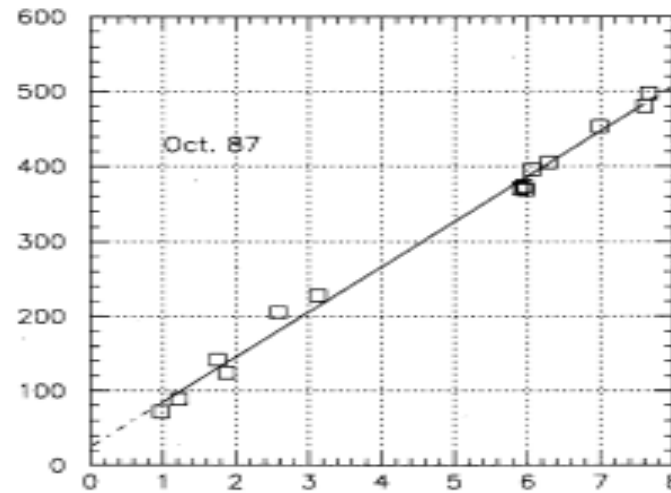


~ 1996

Measurements (air)

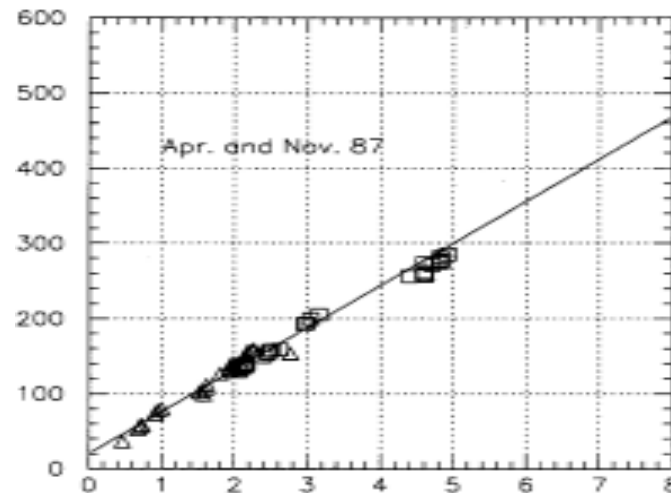
Linearity

Chamber signal,
relative units



Proton intensity in 10^{12} protons per spill (5 μ s)

Chamber signal,
relative units



Proton intensity in 10^{12} protons per spill (5 μ s)

The multi wires chambers were usefully used during many years in vacuum and air for profile measurements of intensive proton beams.