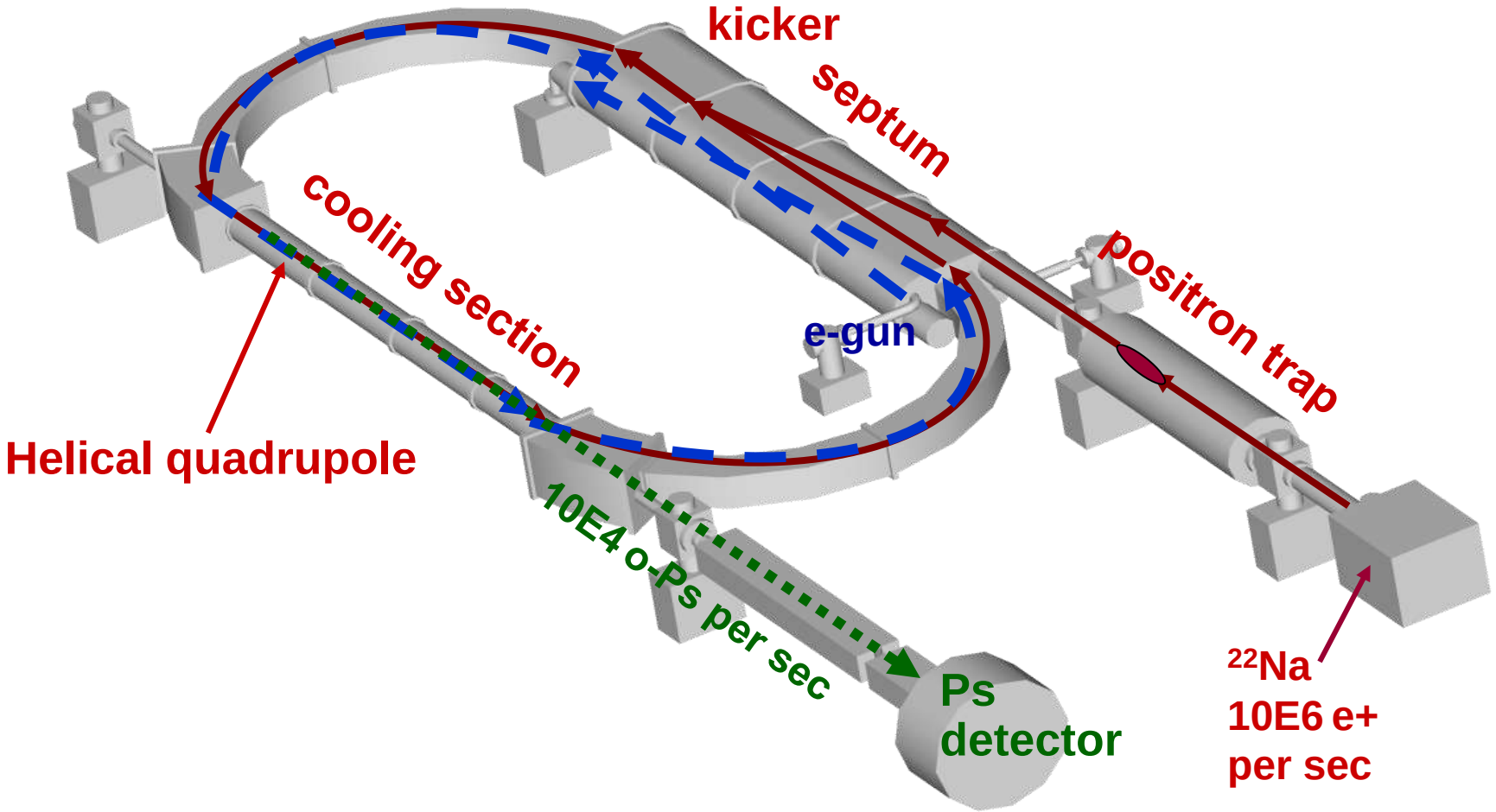
Advance in the LEPTA project

V.Ahmanova, M.Eseev, A.Kobets, V.Lokhmatov, I.Meshkov, V.Pavlov, A.Rudakov, A.A.Sidorin, S.Yakovenko

JINR, Dubna

Contents:

1. LEPTA facility



1. LEPTA facility

Transfer channel

e^+ trap

e^+ source

Septum solenoids

Ps

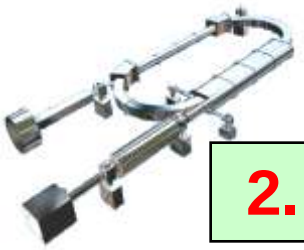
e^- gun

Collector

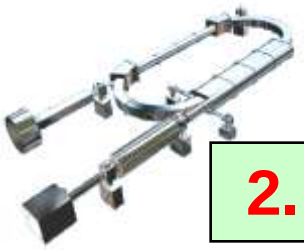
Straight section

1. LEPTA facility

Circumference , m	17.2
Positron energy, keV	10.0
Revolution time, ns	300
Longitudinal magnetic field, G	400
Average radius of the toroidal magnets, m	1.45
Helical quadrupole gradient, G/cm	10.0
Positron beam radius, cm	0.5
Number of positrons in the ring	$1 \cdot 10^{8}$
Residual gas pressure, Torr	$< 1 \cdot 10^{-10}$
Positronium beam parameters	
Intensity, atom/s	$1 \cdot 10^{4}$
Angular spread, mrad	1
Velocity spread	$1 \cdot 10^{-4}$
Beam diameter at the exit of the ring, cm	1.1



2. Improvements of The Magnetic System and Results



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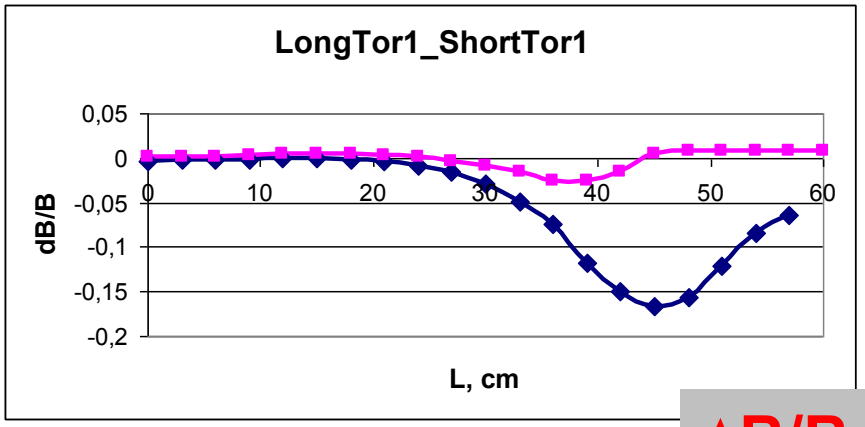
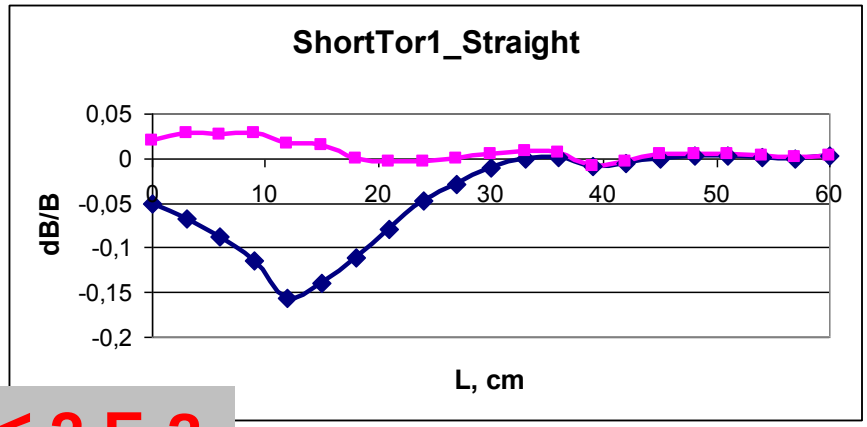
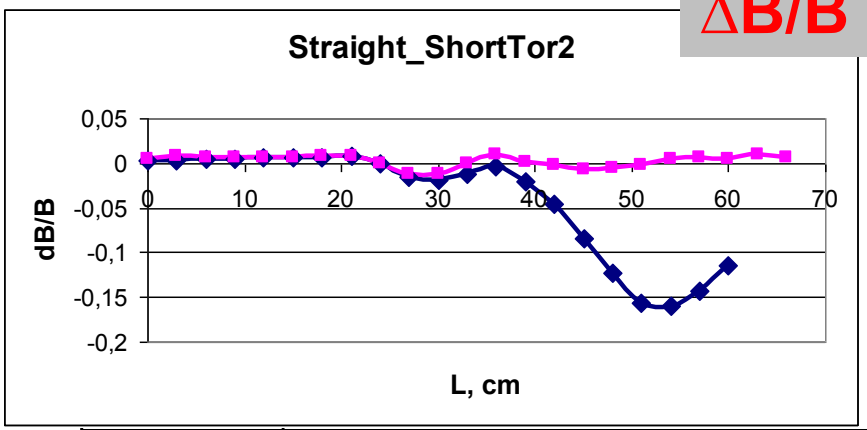
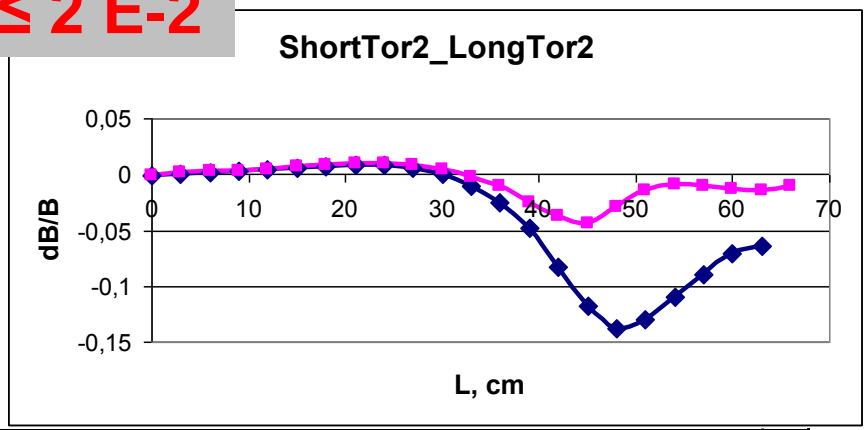
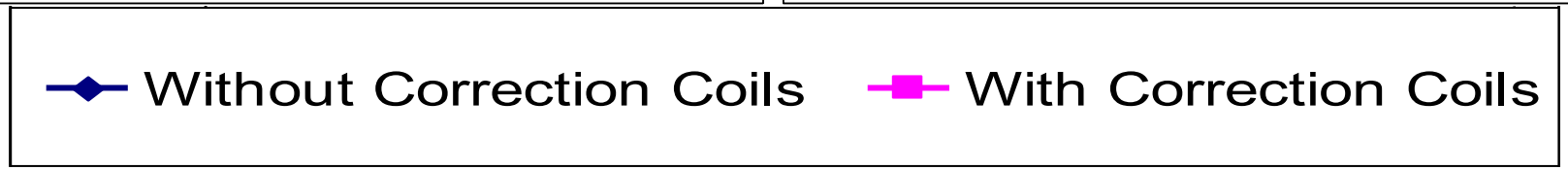




$\Delta B/B \leq 2$ E-2







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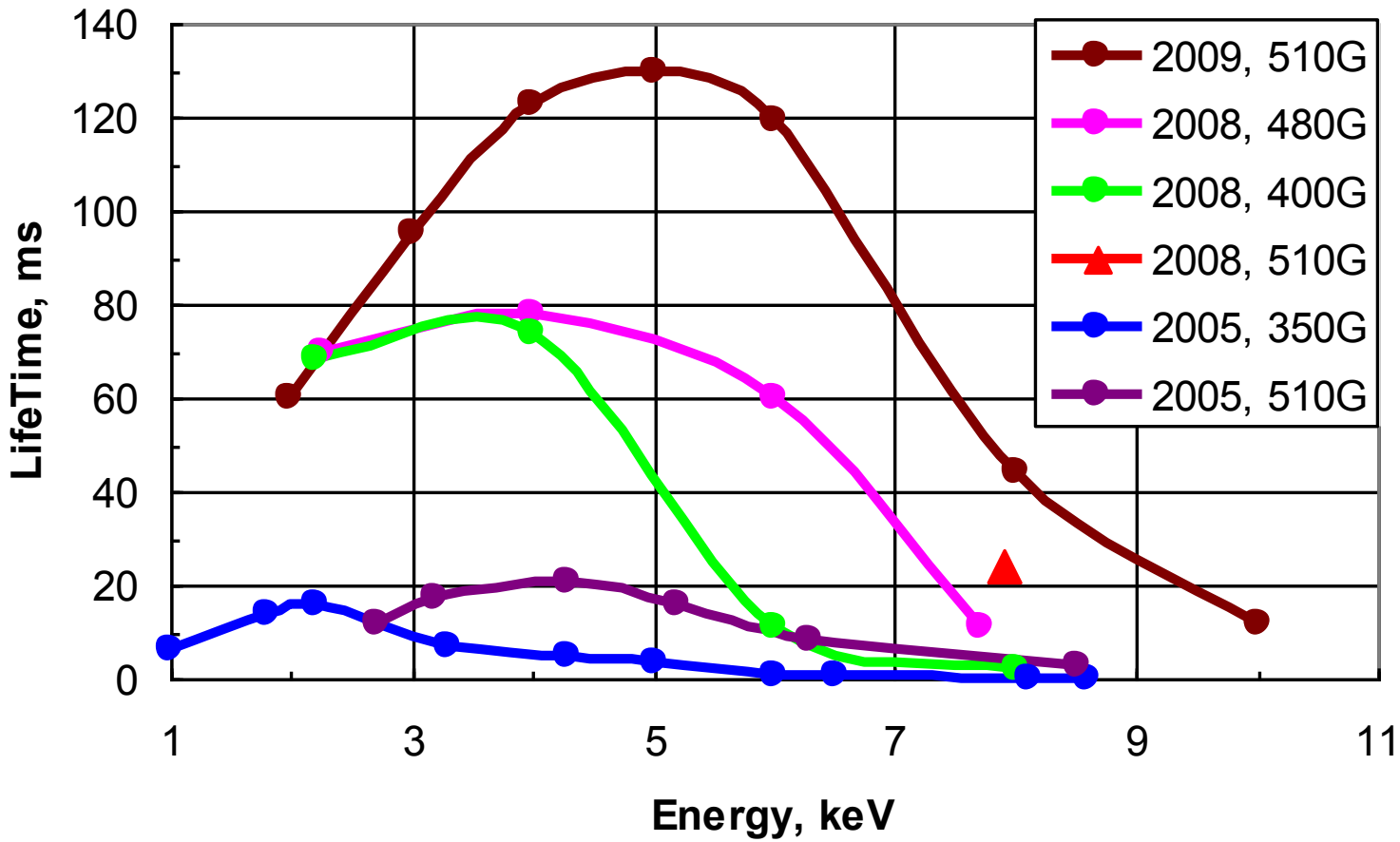

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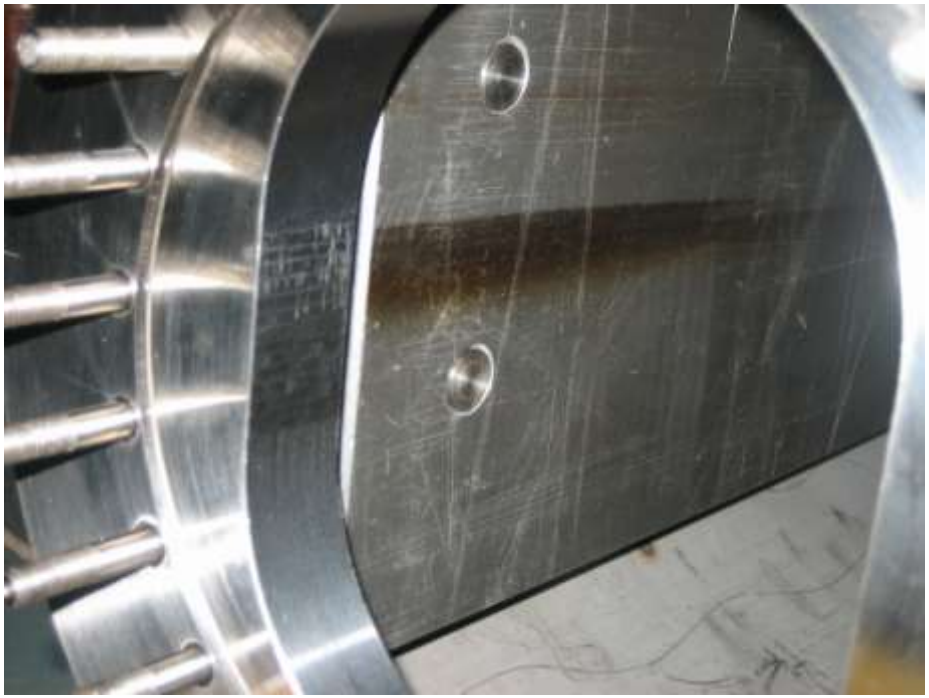
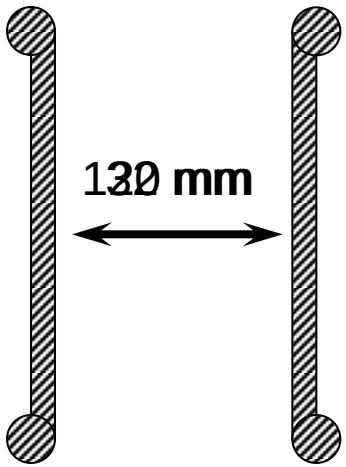


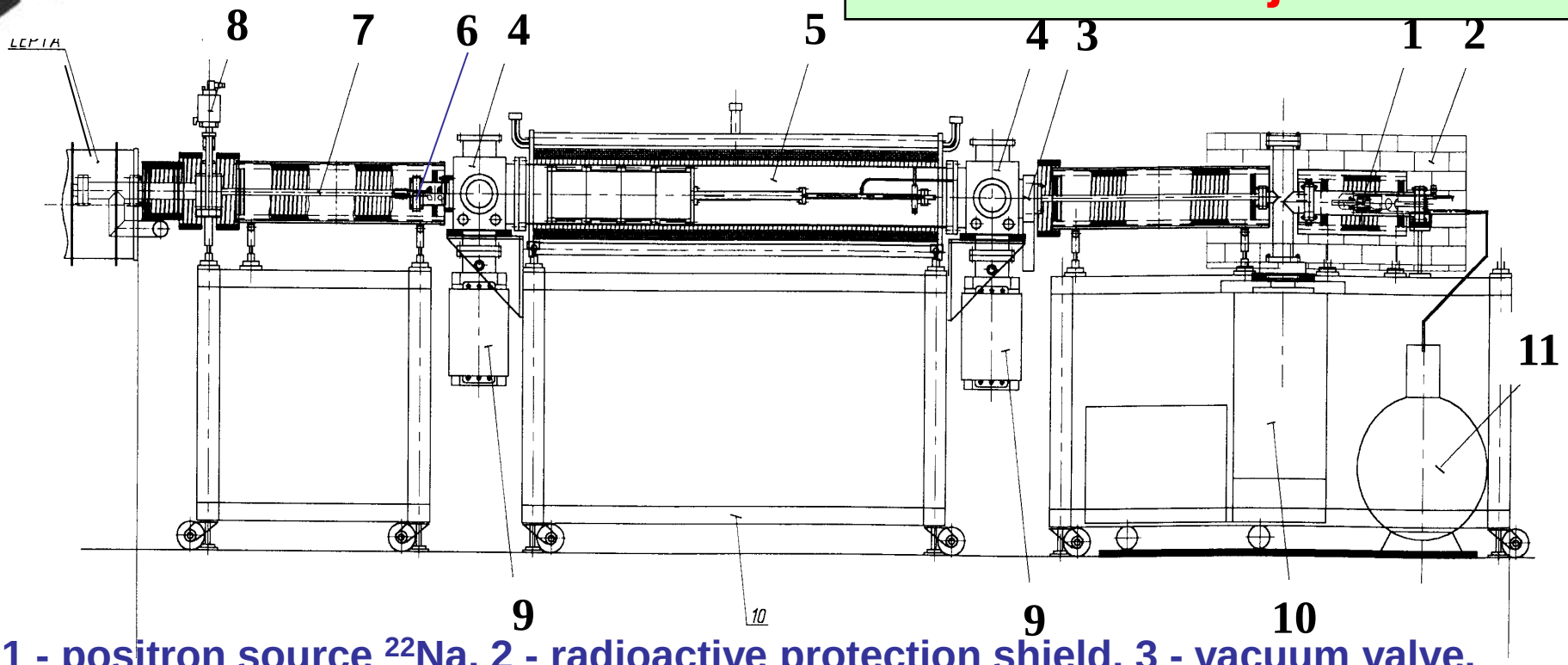


3. Electron cooling system commissioning

Collector preparation for mounting

Ee, keV	Current		
	Ie, mA	ΔIe, uA	ΔIe/Ie
3	20	230	0,011
5	50	290	0,006
7	64	620	0,01
8,7	105	430	0,004

4. Positron injector test



1 - positron source ^{22}Na, 2 - radioactive protection shield, 3 - vacuum valve,

4 - vacuum chamber for pumping out and diagnostic tools, 5 -positron trap,

6 - vacuum isolator, 7 - positron vacuum channel,

8 - vacuum “shutter” (fast valve), 9 - ion pump, 10 - turbo pump, 11 - He vessel.

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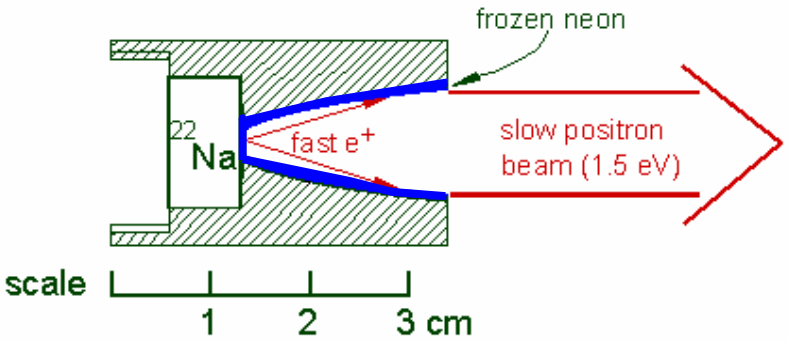
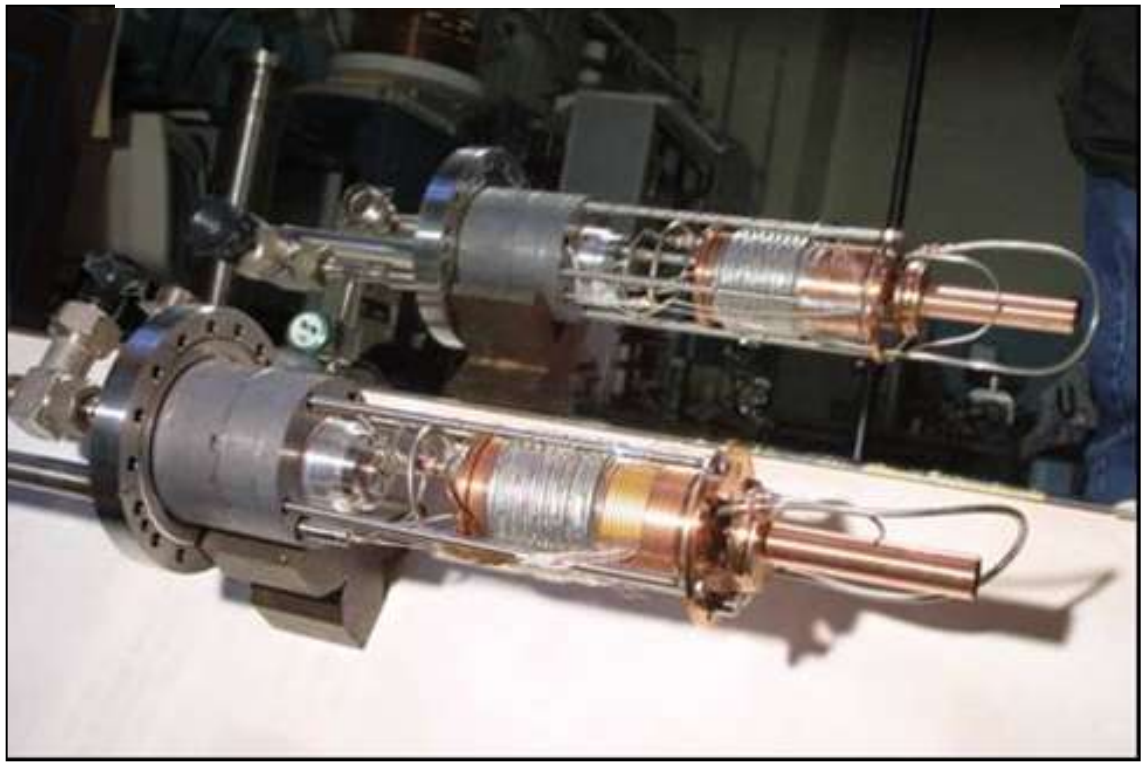
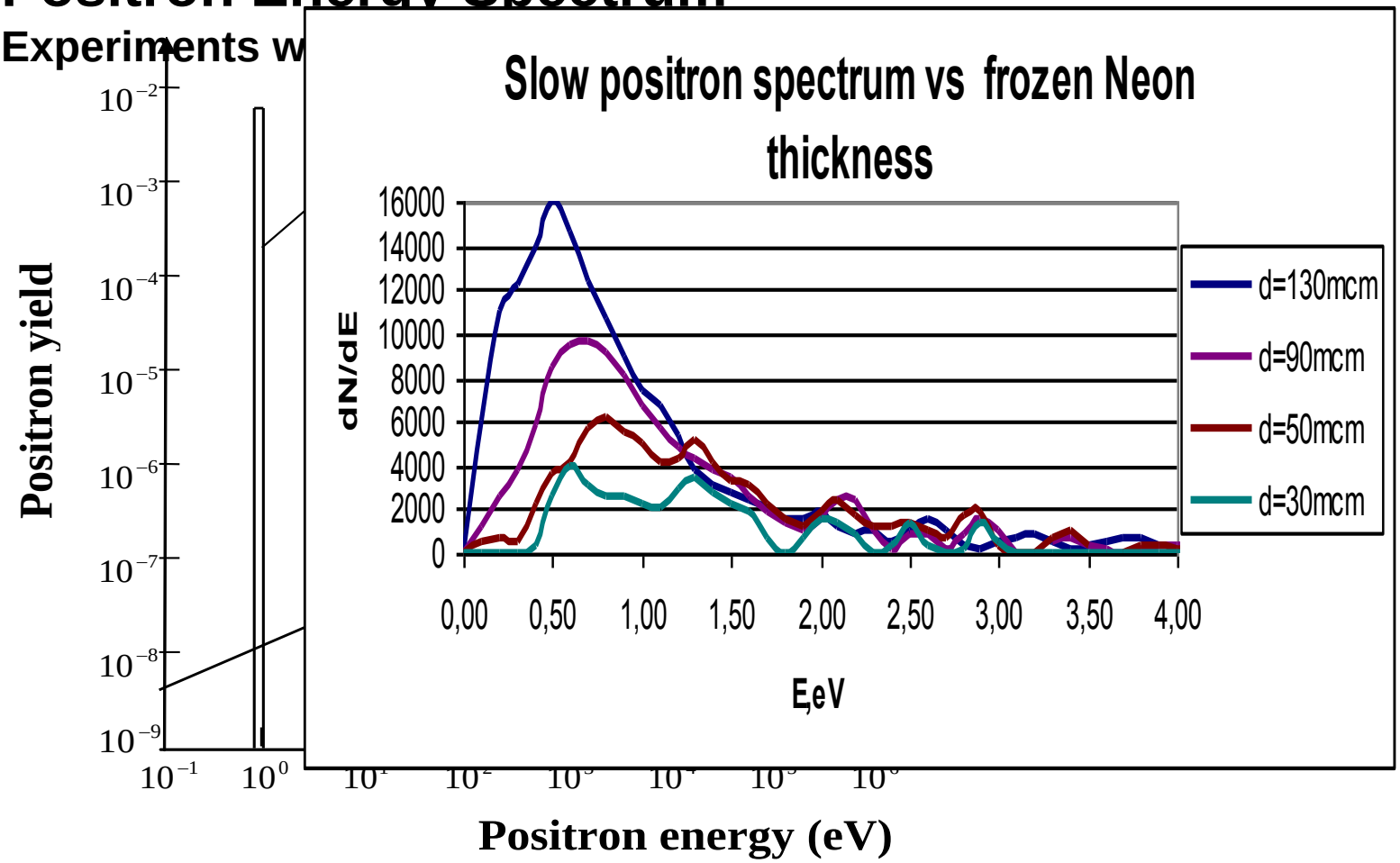




4. Positron injector test

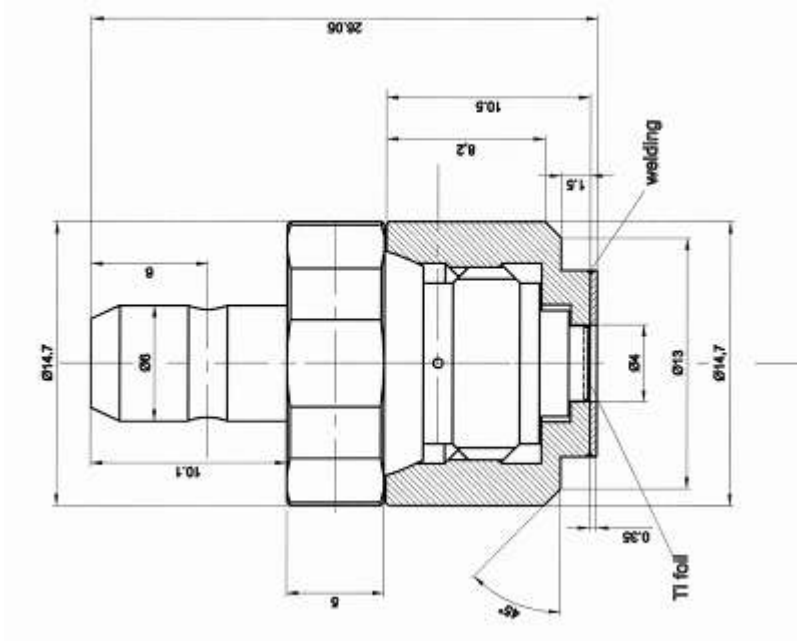
Positron Energy Spectrum

Experiments w



4. Positron injector test

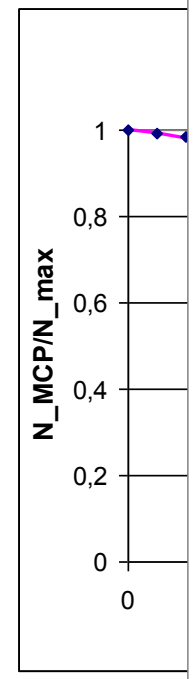
New positron source from South African Republic



New positron source activity of 25 mCi for LEPTA facility has been donated by iThemba LABS (SRA)

Positron Energy Spectrum

Experiments with ^{22}Na source of 200 MBq activity donated by iThemba Labs



Fitting
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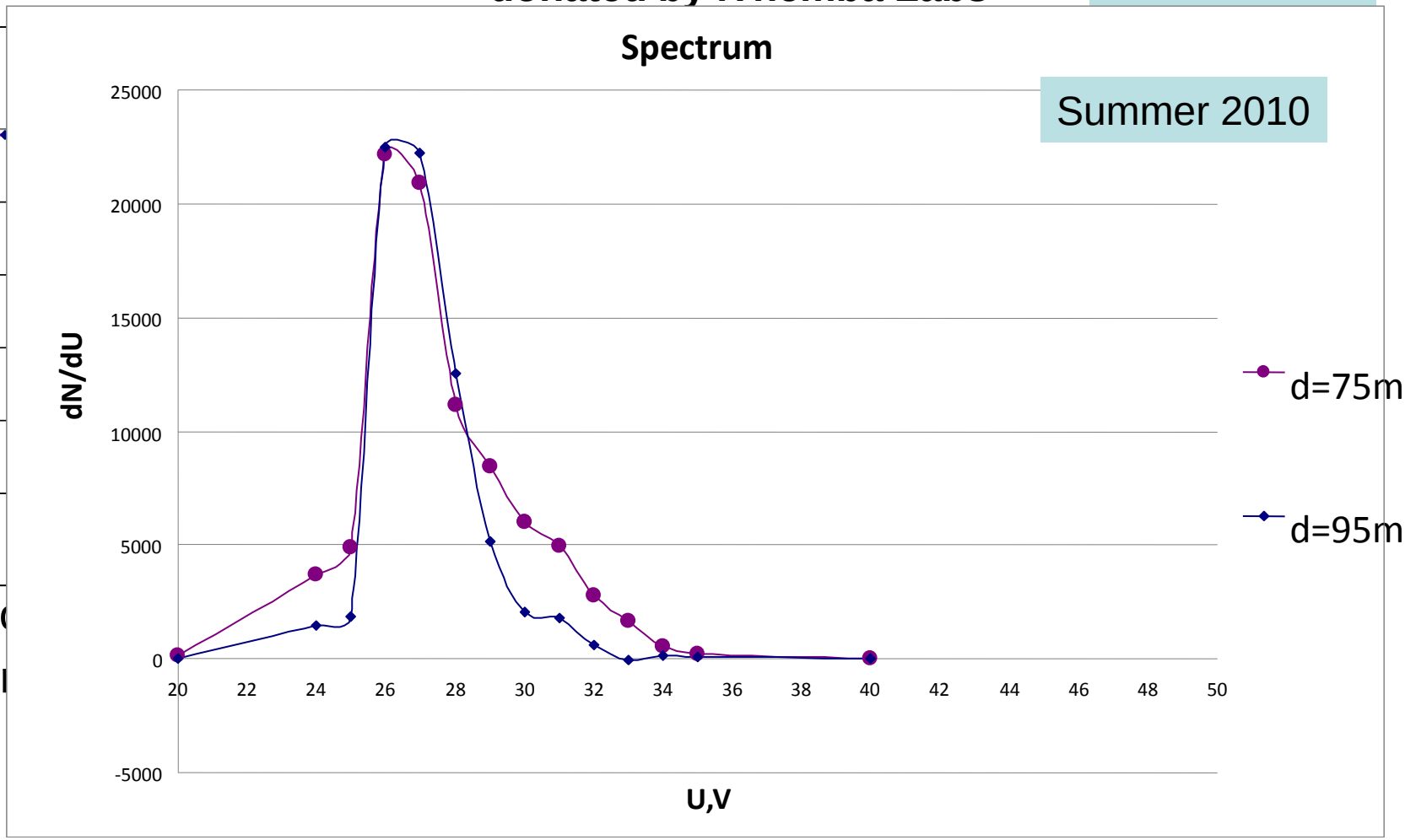

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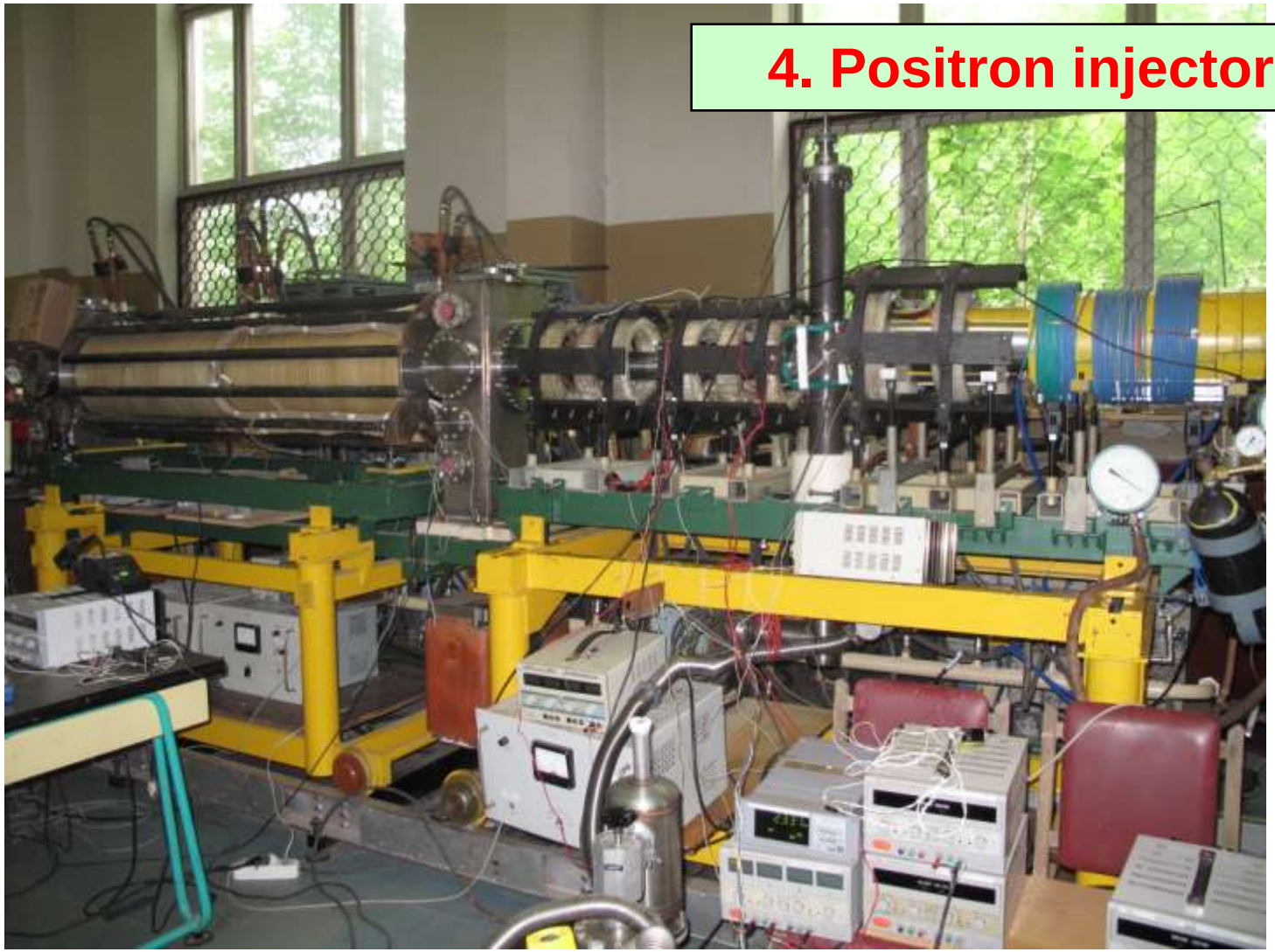

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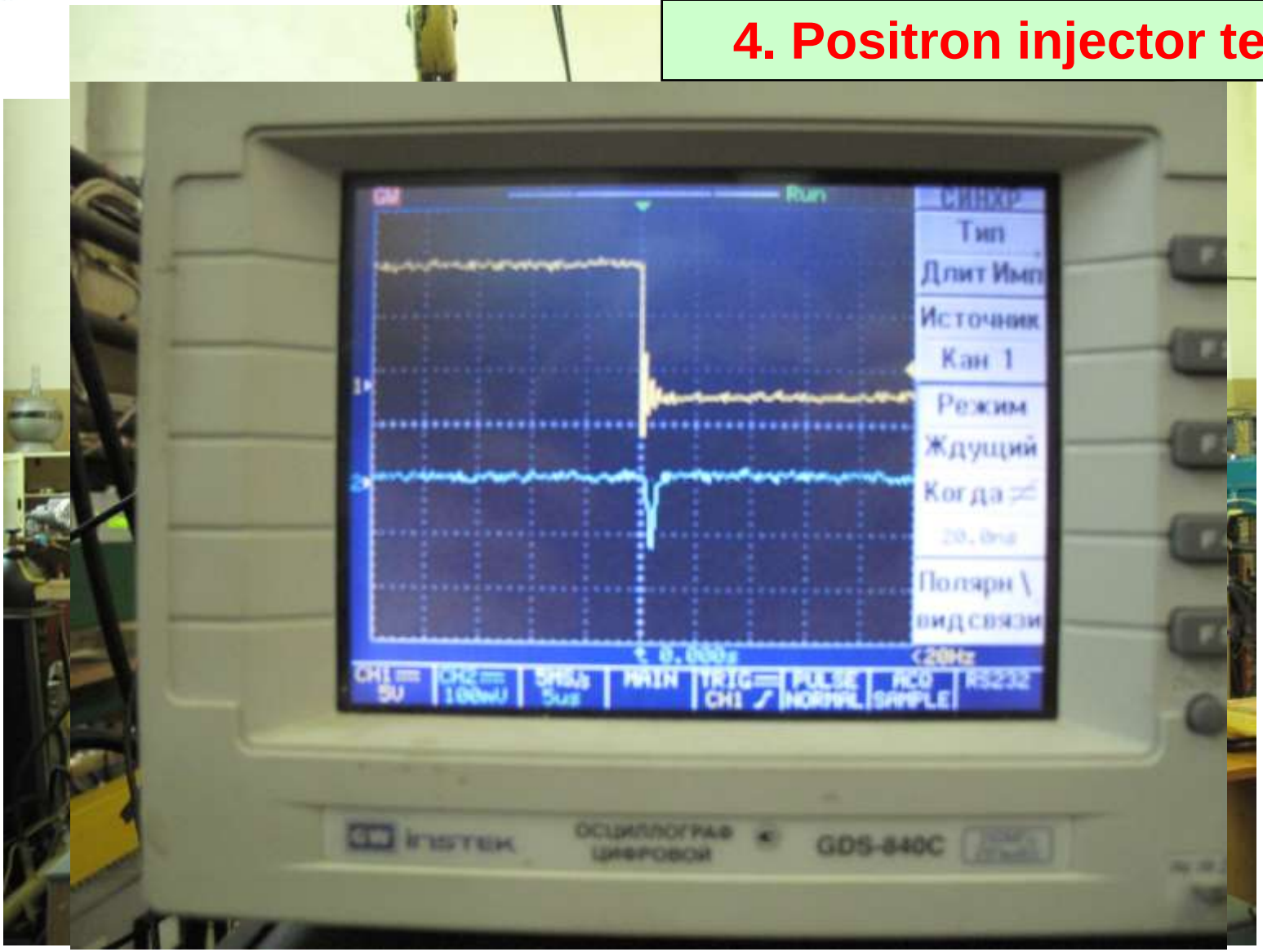

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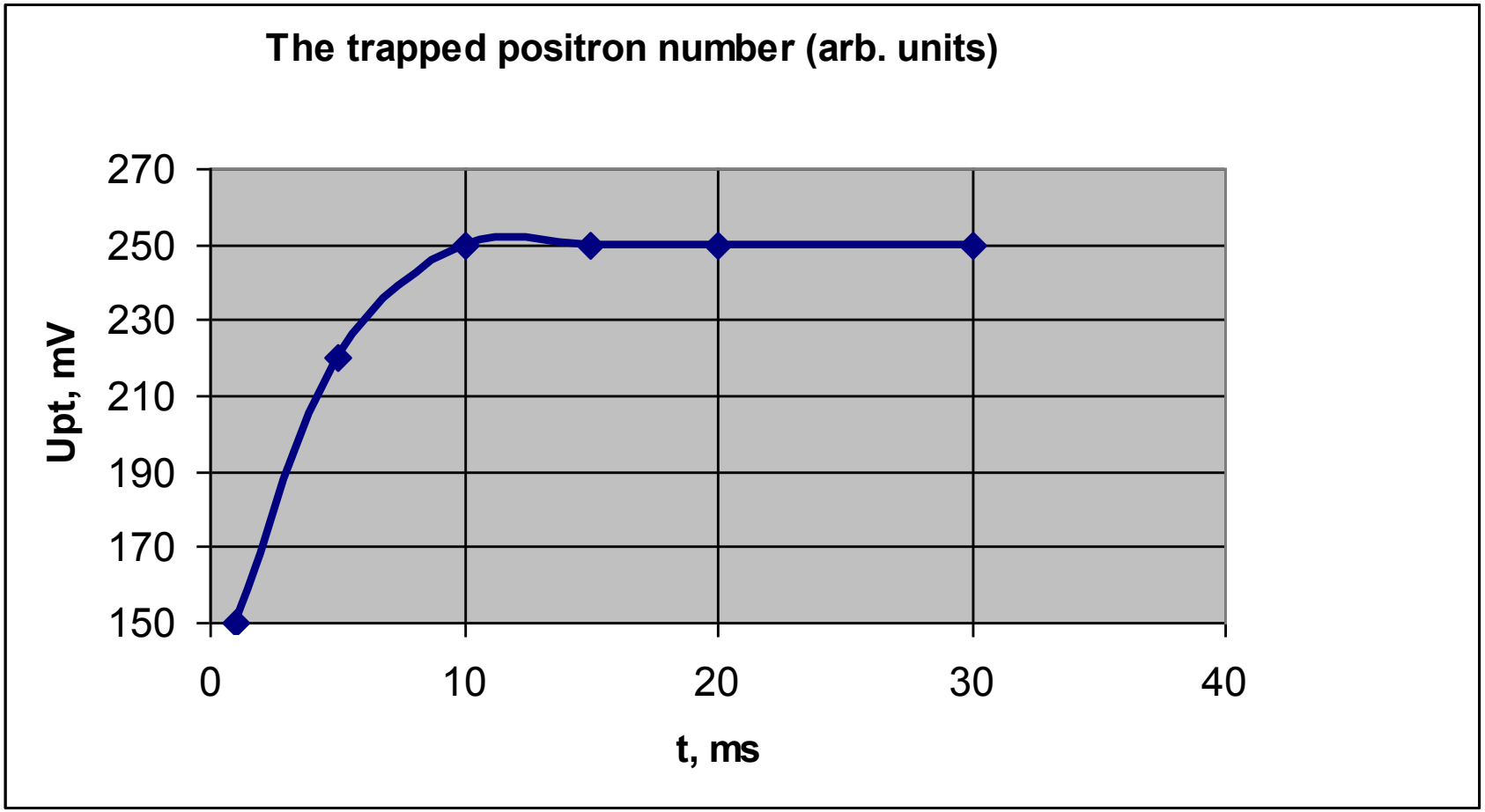
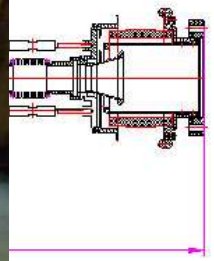


4. Positron injector test

Parameter	Design	Achieved
Length, *m*	6,2	
Positron injection energy, *keV*	≤ 10.0	
Longitudinal magnetic field, *G*	400	
Longitudinal magnetic field in the trap, *G*	1500	
Residual gas pressure, *Torr*	$1 \cdot 10^{-9}$	$1 \cdot 10^{-8}$
Beam radius, *cm*	0.5	
Accumulation time, *s*	100	80
Injection pulse duration, ns	300	
Number of positrons in injection pulse	$1 \cdot 10^{8}$	$2 \cdot 10^{8}$
Positron momentum spread	$1 \cdot 10^{-4}$	
Low energy positron flux from 22Na source, s^{-1}	$1 \cdot 10^{6}$	$2 \cdot 10^{5}$

5. Nearest plans

Transfer channel



Thank you for attention!