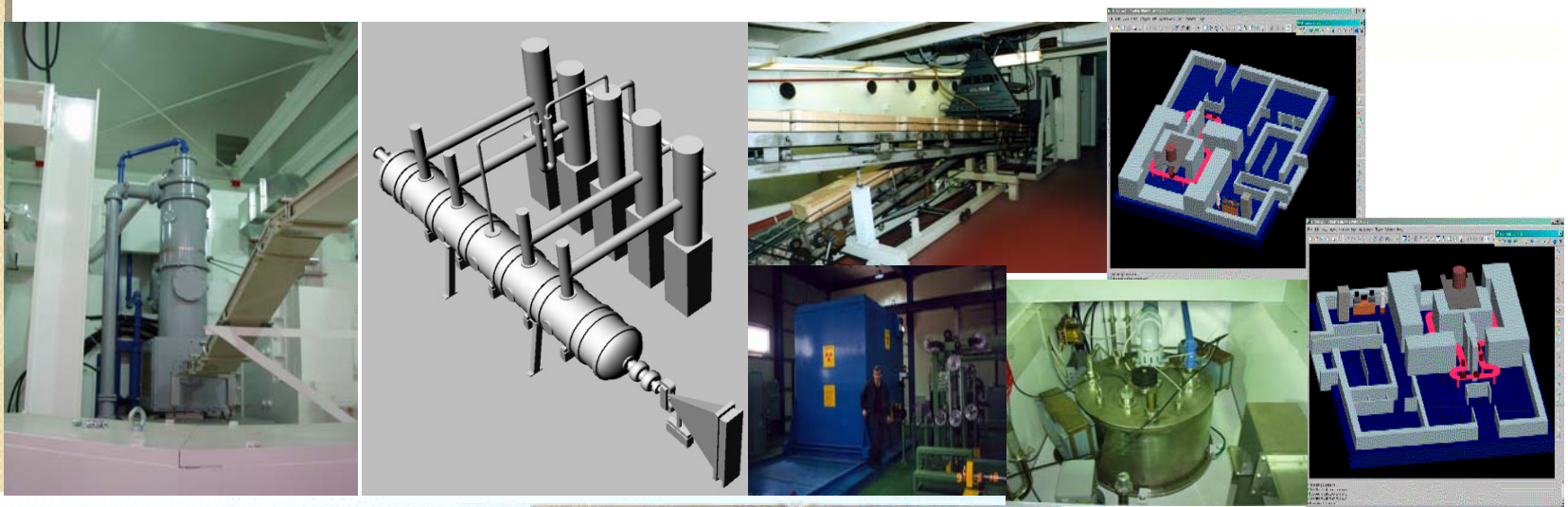
Industrial RF electron accelerators ILU

Laboratory #14

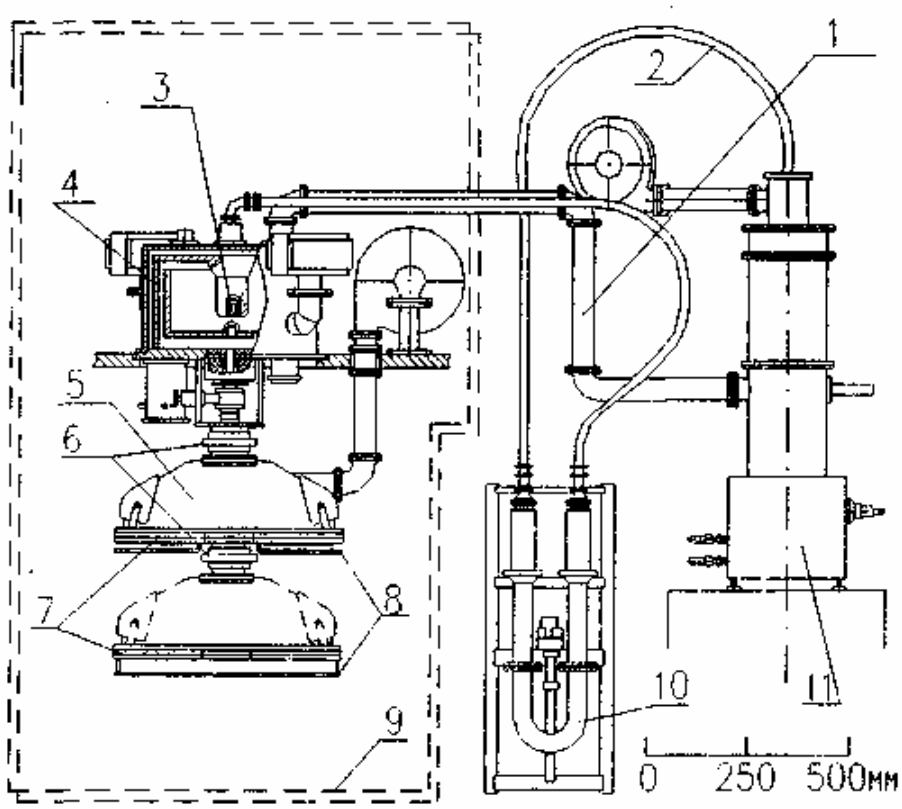
Budker INP, Novosibirsk, Russia



ILU Accelerators

Parameters	ILU-6	ILU-8	ILU-10	ILU-14
Electron Energy	1.7-2.5 MeV	0.8-1 MeV	4-5 MeV	7.5 – 10 MeV
Beam Power	20 kW	20 kW	50 kW	100 kW
Local Shield Weight		76 t		

ILU-8 in Local Shield



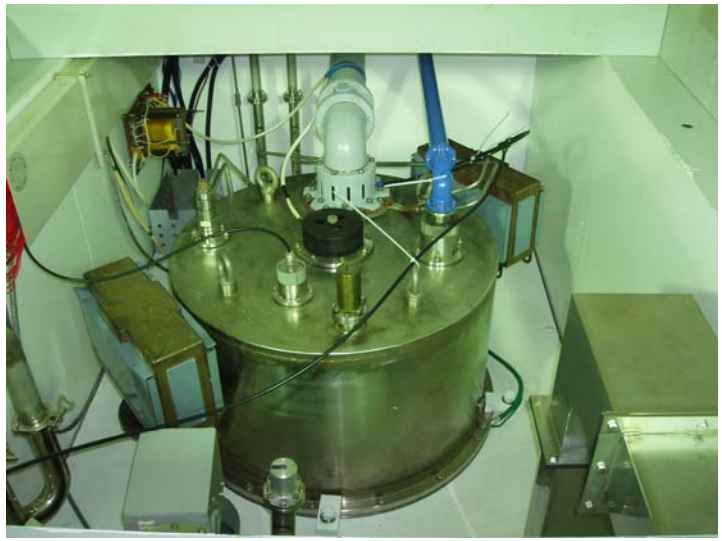
Main features of ILU accelerators

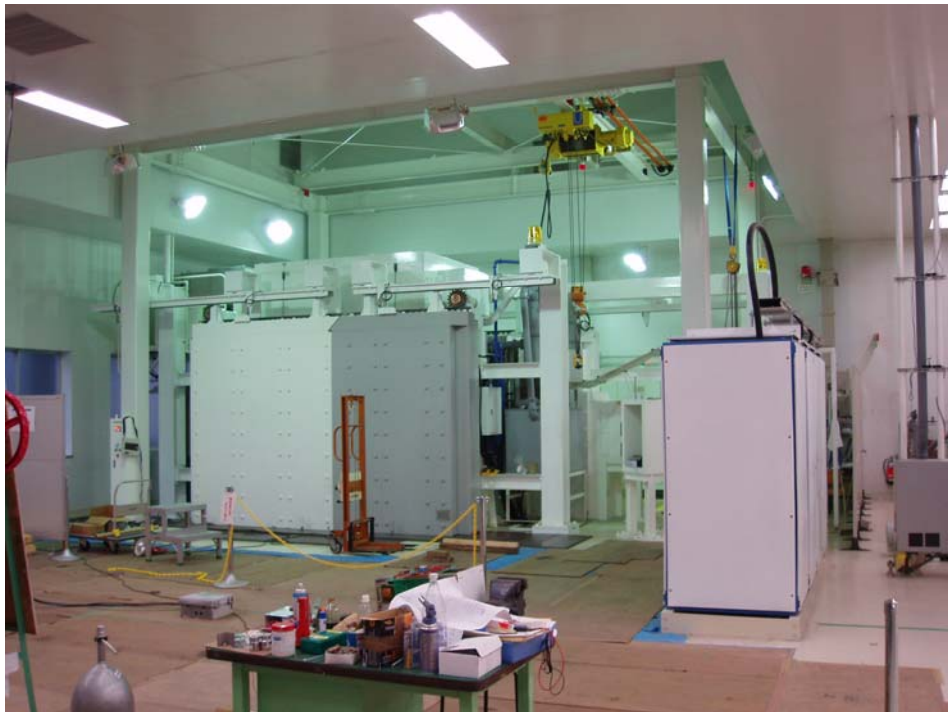
- Compact
- Self-excitation
- No insulation and gas systems
- Pulse
- GI-50

- Energy 0.8-1 MeV
- Av. Current 0-20 mA
- Pulse current 0-500 mA

- Pulse duration 800 mks
- Pulse repetition 1-50 Hz
- RF frequency 175 MHz
- Dim D800x800 mm

ILU-8 in Local Shield in Japan,2005



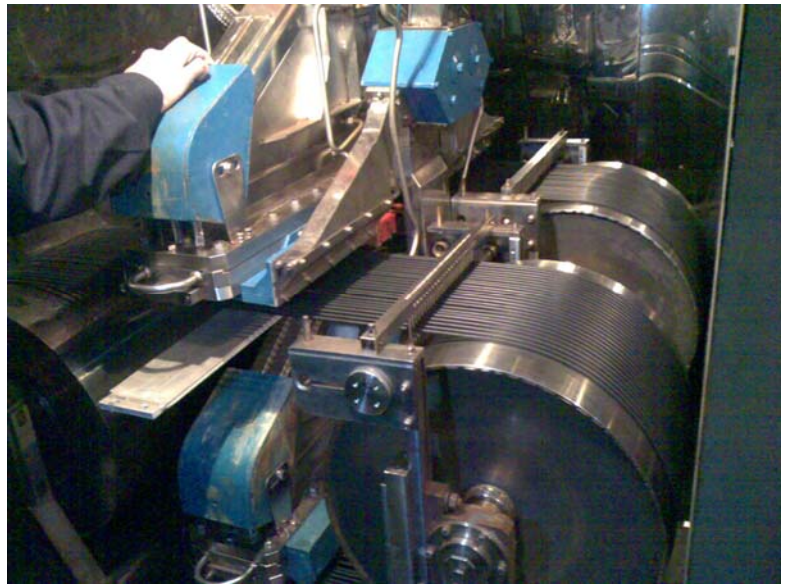


- Energy 0.8-1 MeV

Accelerator ILU-8 in local shielding

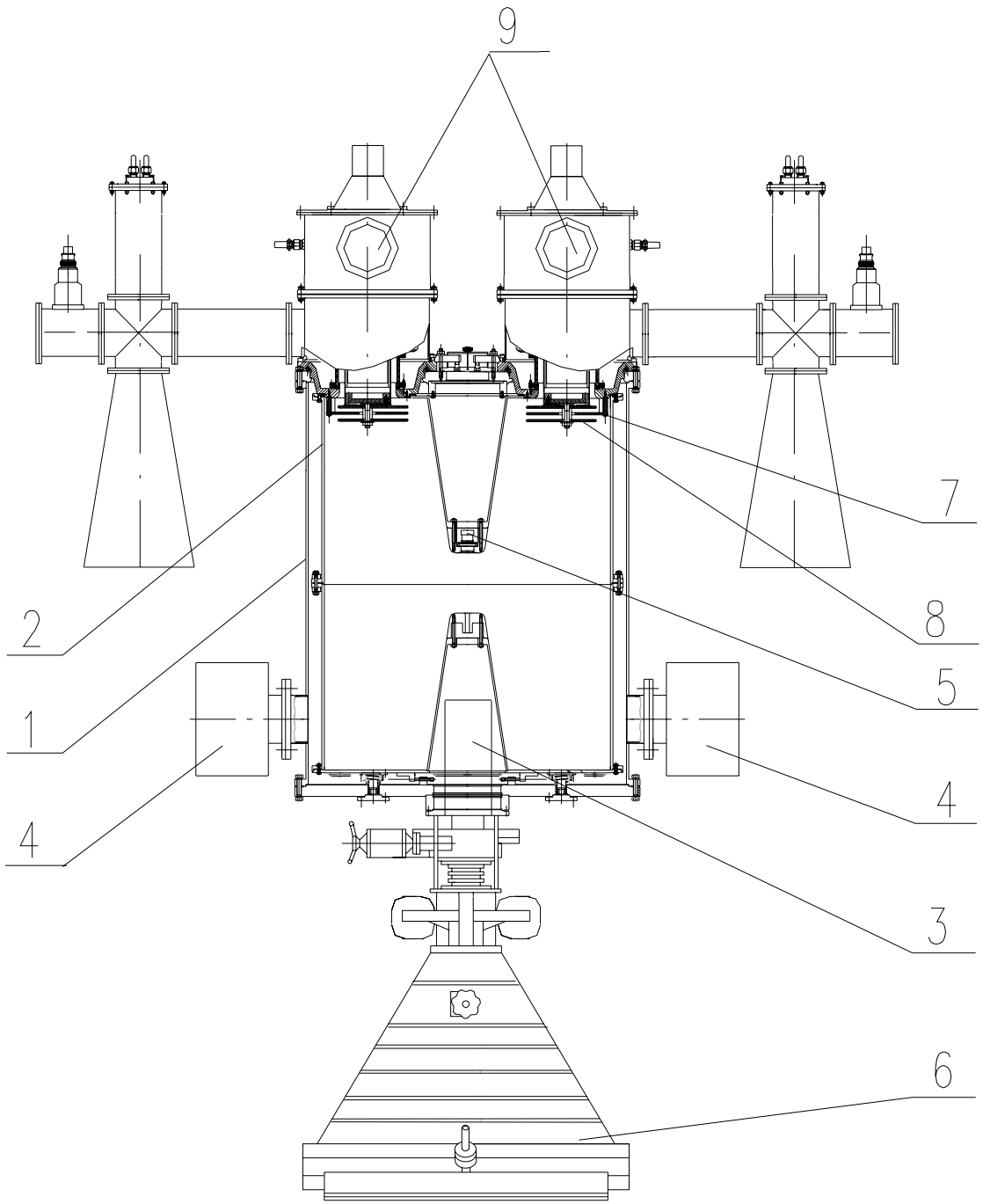
Korea, Suwon 1997

Russia, Cheboksary, 2010



ILU-10

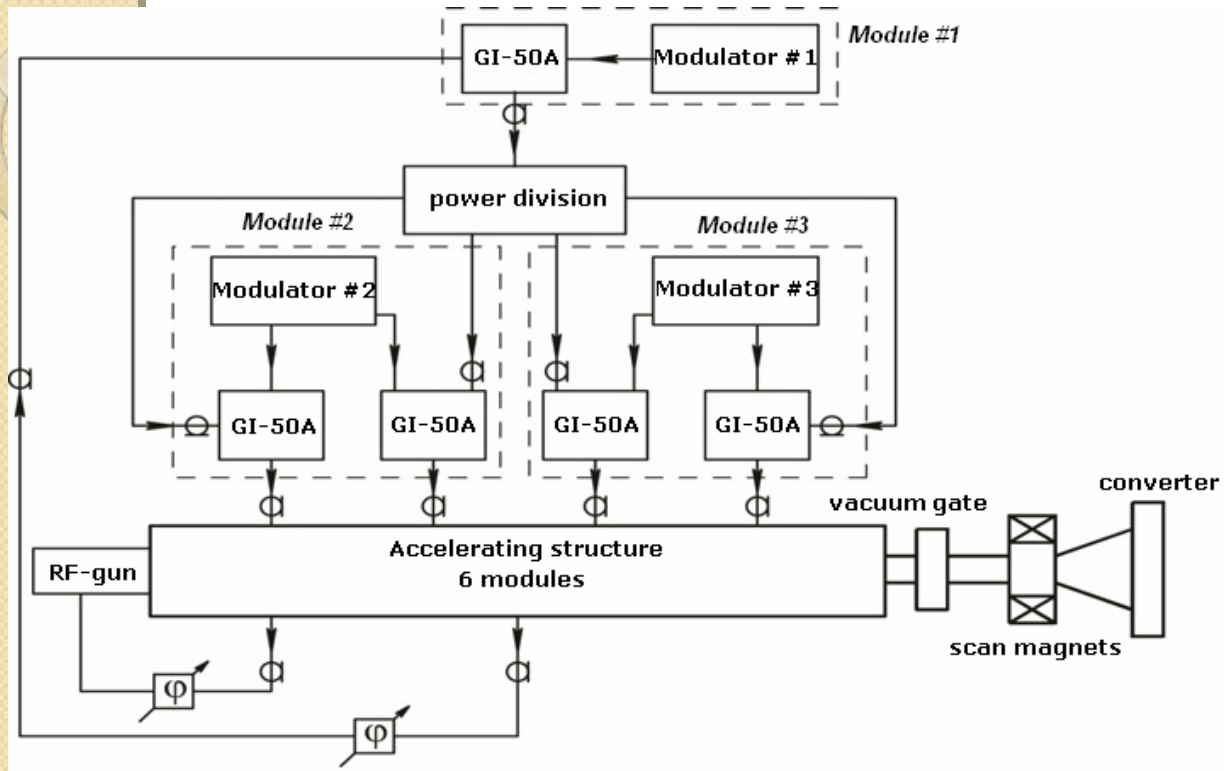
- Energy 4-5 MeV
- Av. Current 0-10 mA
- Pulse current 0-400 mA
- Pulse duration 500 mks
- Pulse repetition 1-50 Hz
- RF frequency 115 MHz
- Dim. D1280x1480 mm

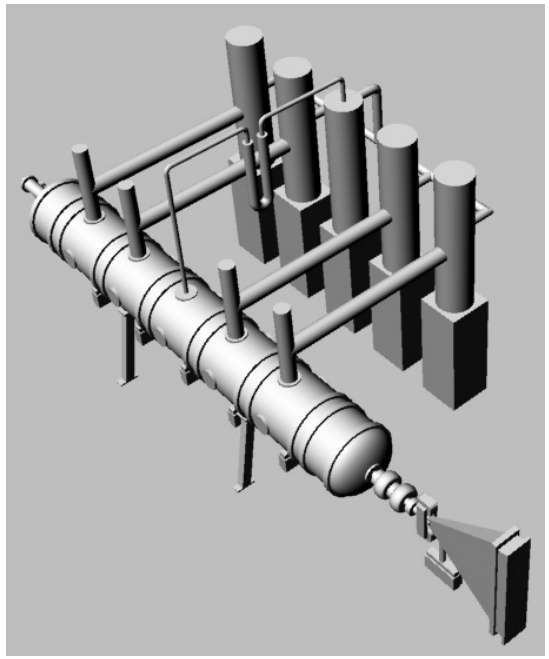


ILU-10 in Poland, RadPol SA, 2008

- Energy 5 MeV
- Beam power 50 kW
- Treatment of polymer pipes
- Treatment of cables
- Movable accelerator between two conveyors.

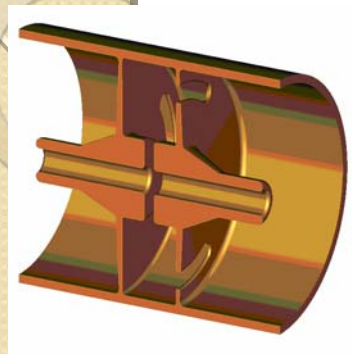
ILU-14 accelerator

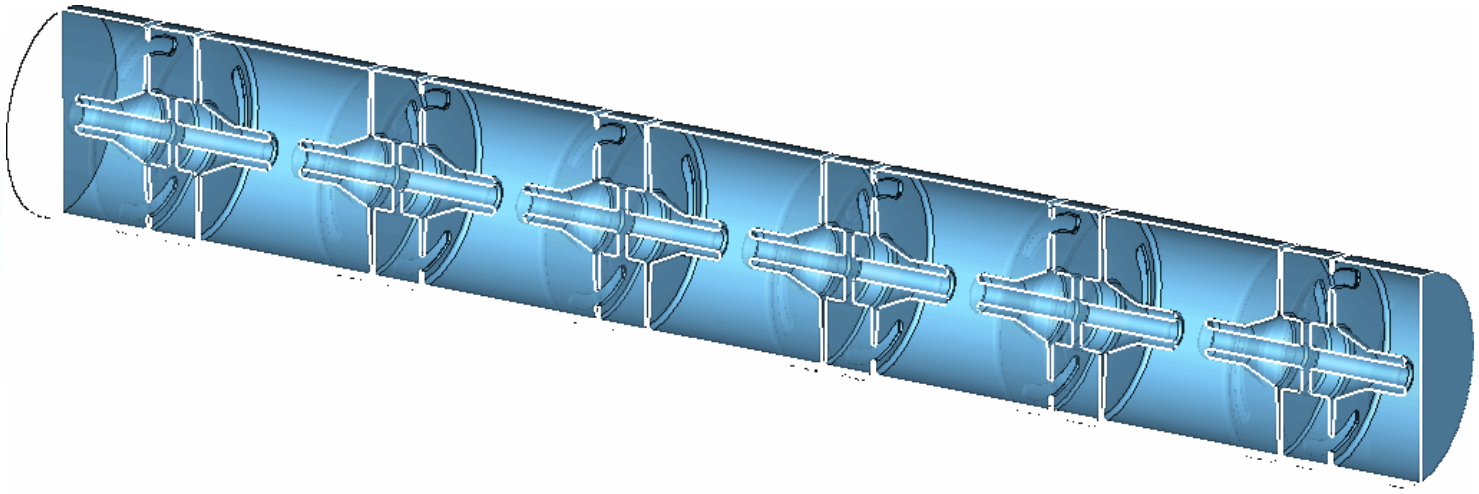


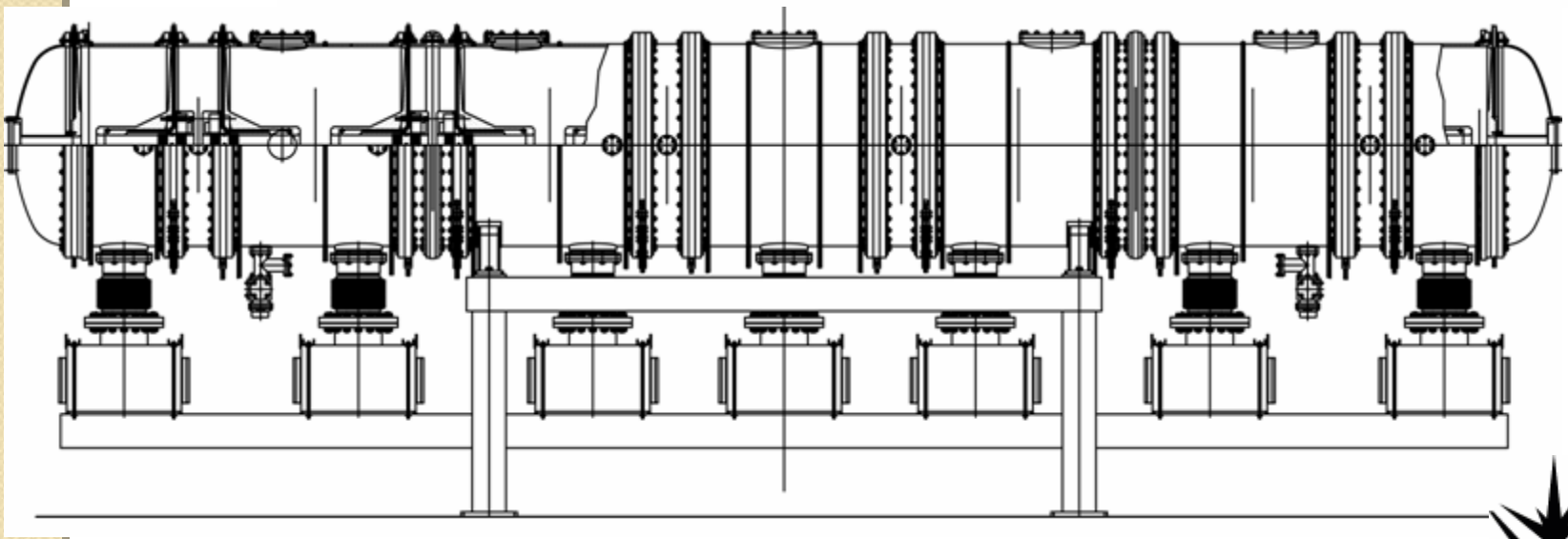


Operating frequency, MHz	*176*	*Full efficiency, %*	*26*
Electron energy, MeV	*7,5-10*	*Modulator pulse duration, μs*	*500*
Average beam power, kW	*100*	*Repetition rate, Hz*	*Up to 50*

Accelerating structure

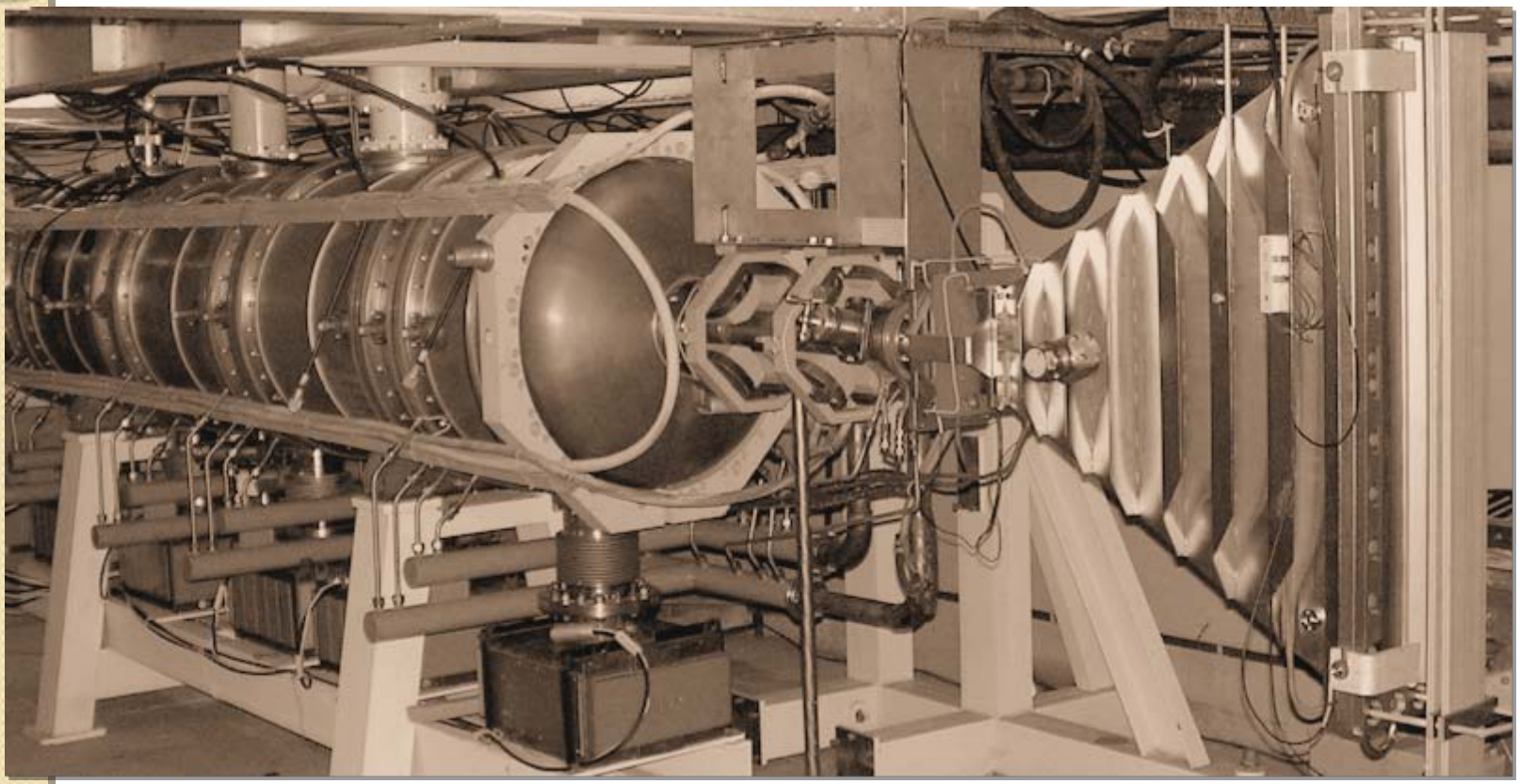






Budker INP ILU-14

7,5-10 MeV, 100 kW



4-sided irradiation

- Beam extraction device for 4-sided irradiation

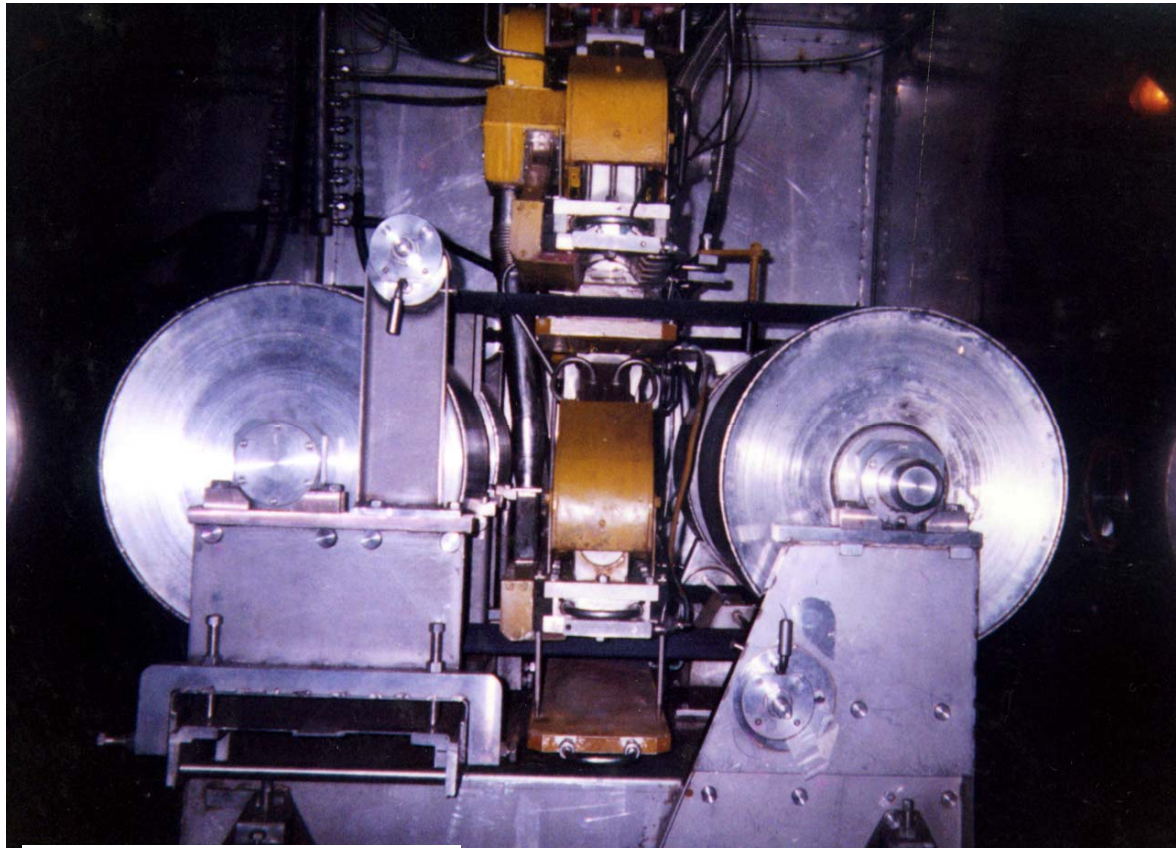
allows to increase

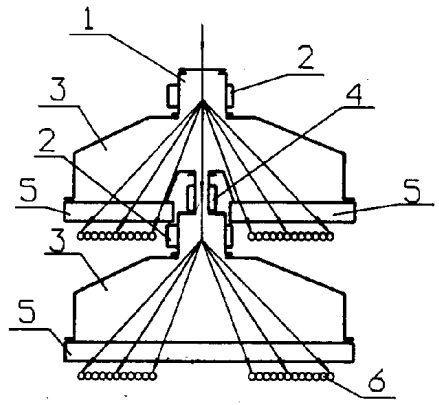
beam usage efficiency

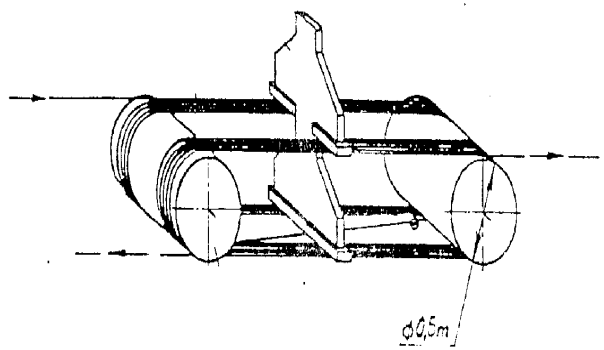
comparing with

2 sided irradiation

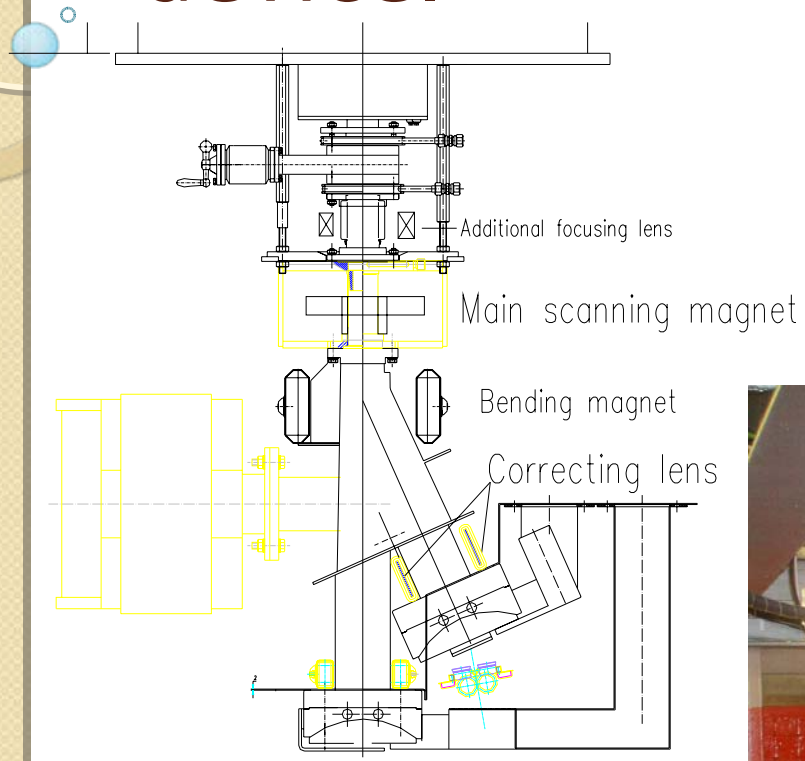
- No cable twist



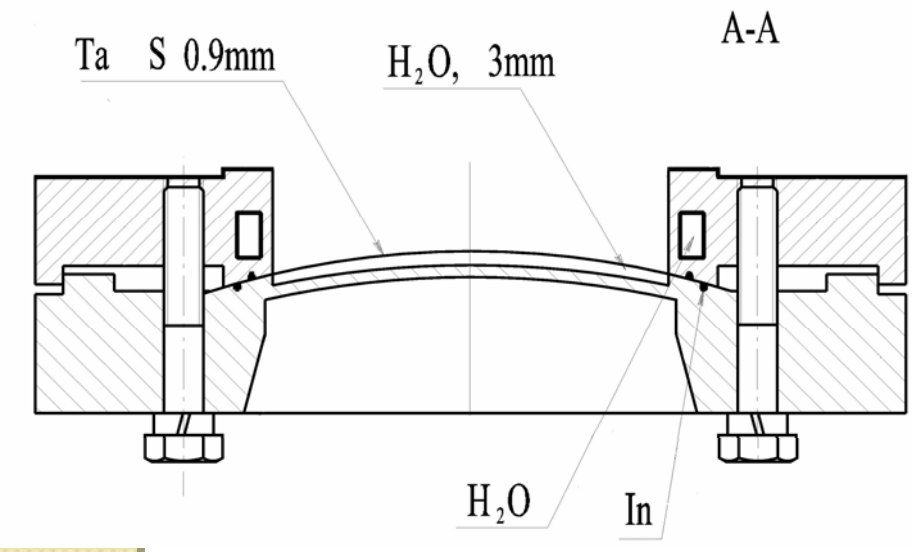


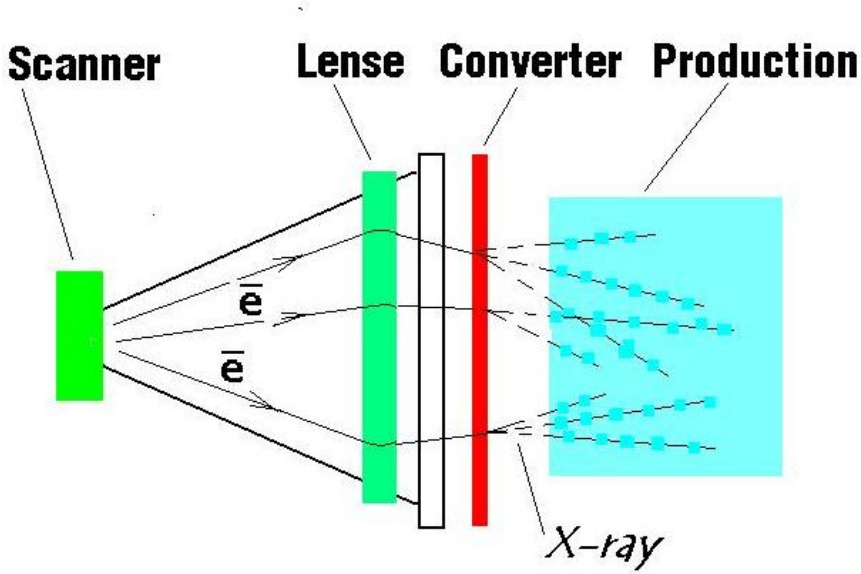


2-windowed beam extraction device.



X-ray converter





Conversion rate X/ray/Ebeam power

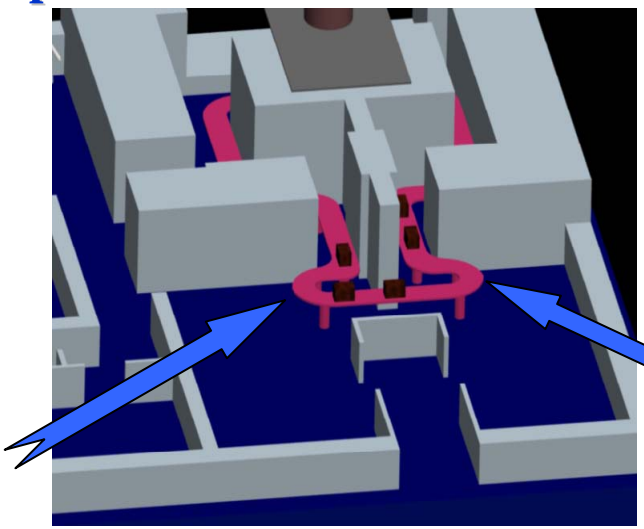
E(MeV)	Ta thickness	60 deg	360 deg
7.5	0.9	13,2%	16,9 %
5	0,7	8,3%	12%

Thermo
-shrinkable tubes treated on ILU-6 accelerator in RadPol (Poland)

Large sockets

Growing market of sterilization medical goods in BINP service center

Sterilization plant based on ILU accelerator in Sibiria (Russia) from 2008.



Unload zone

Load zone

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PNT
PARK OF NUCLEAR TECHNOLOGIES

Парк Ядерных Технологий

- Sterilization plant based on ILU-10 accelerator in Park of Nuclear Technology in Kazakhstan (Running in 2012)

ЯДРОЛЫҚ ТЕХНОЛОГИЯЛАР ПАРКІ

PNT

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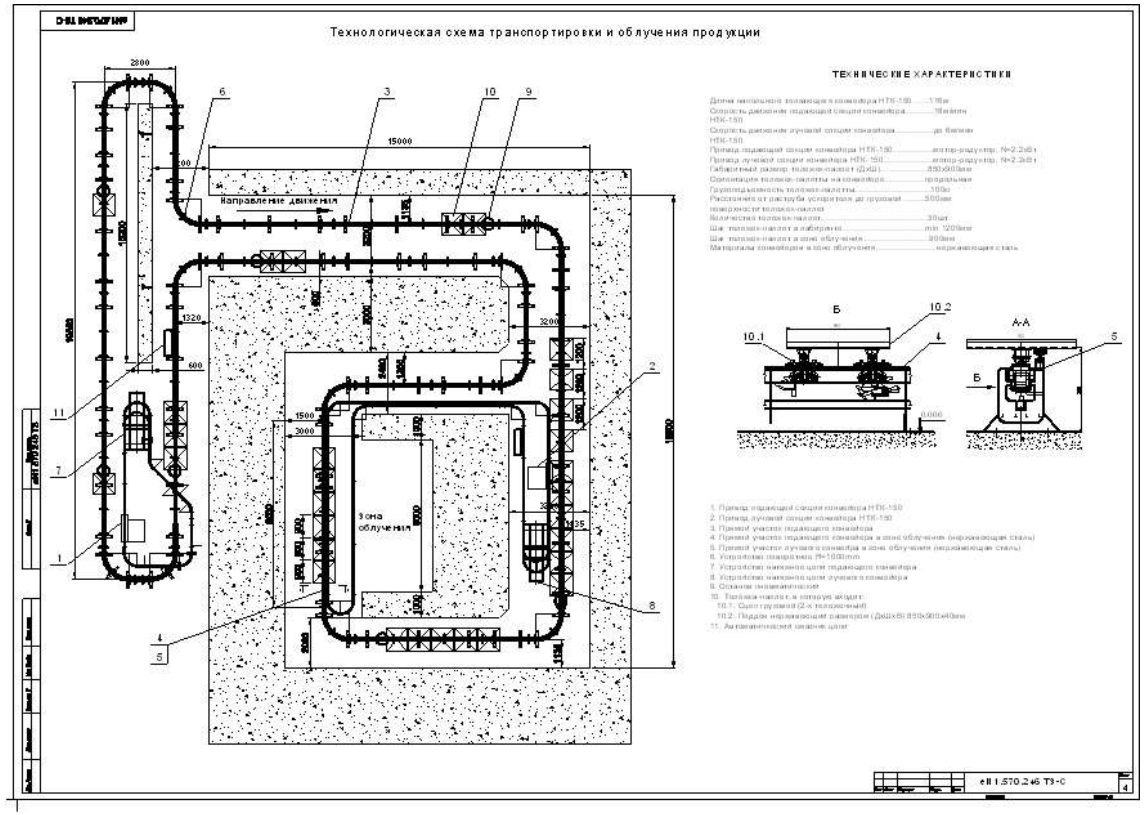


Sterilization plant based 2 accelerators

	ILU-10 RF-accelerator	ULR-10-12 Linak accelerator	Σ
Energy/penetration	5 MeV/ 4g/cm2	10 MeV/ 8g/cm2	Up to 8 g/cm2
Power/Productivity	50 kW/ 4500kg/h	12 kW/ 1100kg/h	Up to 5600 kg/h
Production	Surgical sets and clothes	cotton wool, bandages	All

- Reliable
- Efficiency of beam using
- X-ray mode
- Wide range of packs

Список стерилизационных комплексов на основе ускорителей ИЛУ.

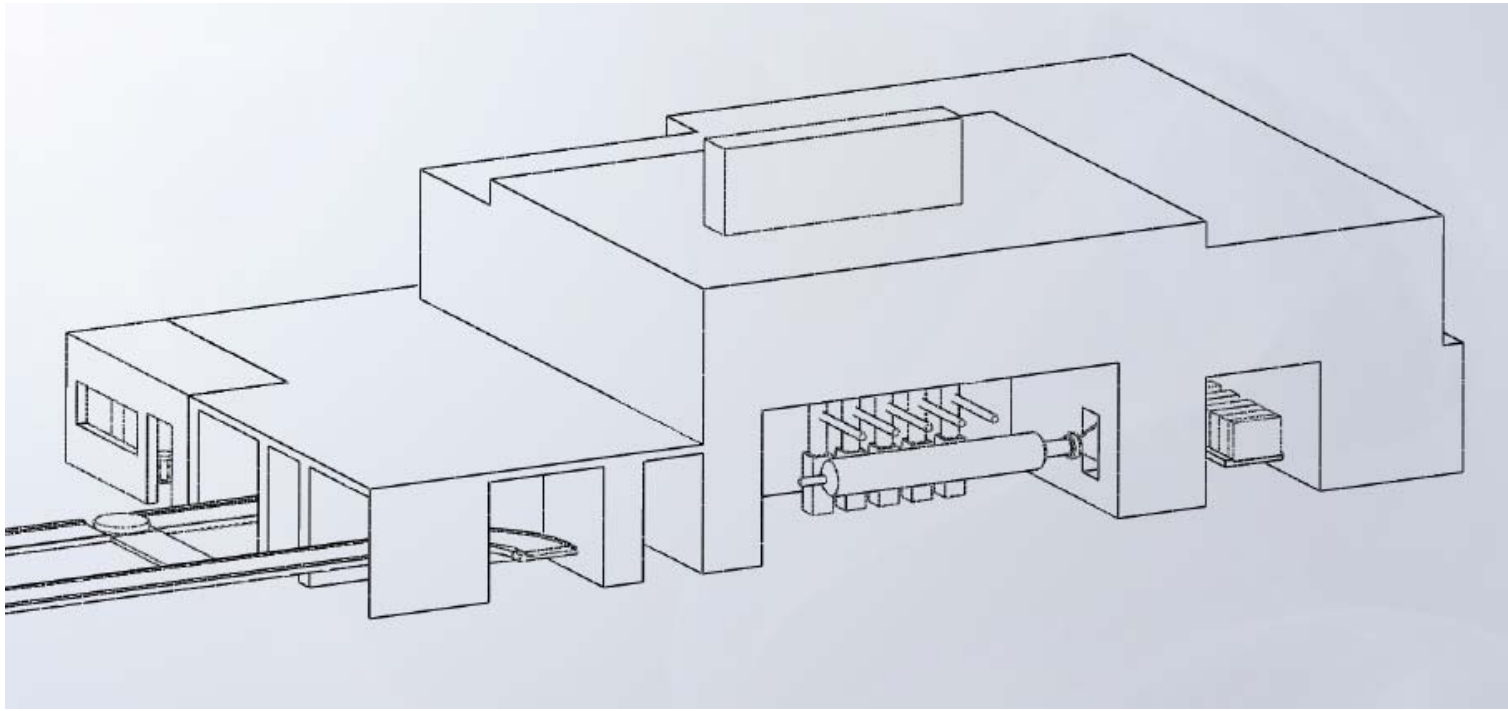
Компания	Город	Ускоритель	Ввод в эксплуатацию
Аксион	Ижевск	ИЛУ-6	1996
ИЯФ	Новосибирск	ИЛУ-10	2001, 2013(реконструкция)
Эвалар	Бийск	ИЛУ-6	2007
СЦФБ	Новосибирск	ИЛУ-10 2 шт.	2012
ПЯТ	Казахстан	ИЛУ-10	2012
ИЯФ НЯЦ	Казахстан, Алма-Аты	ИЛУ-10	2013
ФМБЦ	Москва	ИЛУ-14	2012 (?)
ОИК	Старая Купавна	ИЛУ-10+УЛР-10-12+Со-60	2014

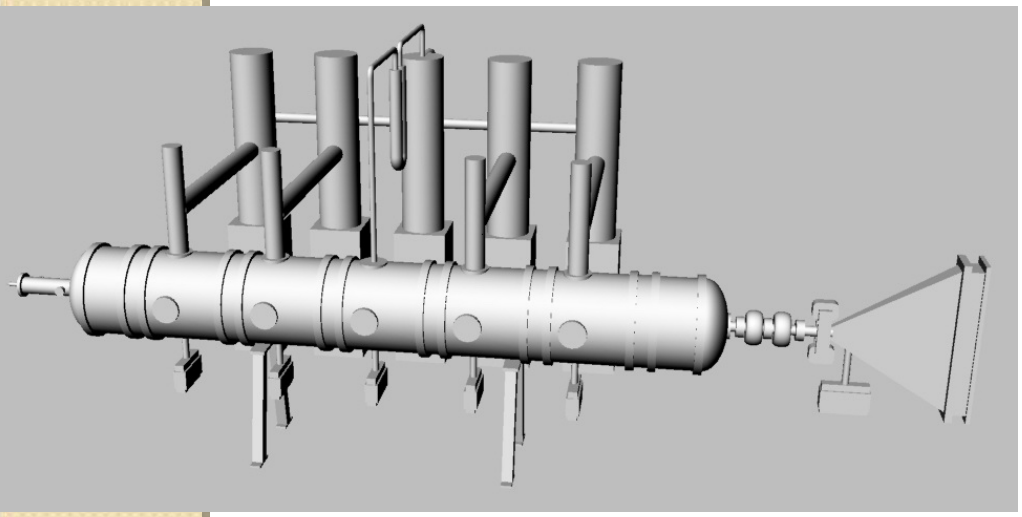
Using of single use medical goods makes new big radiation market – decontamination of medical waste. Only radiation method allows decontaminate multiuse containers with waste without de-sealing.

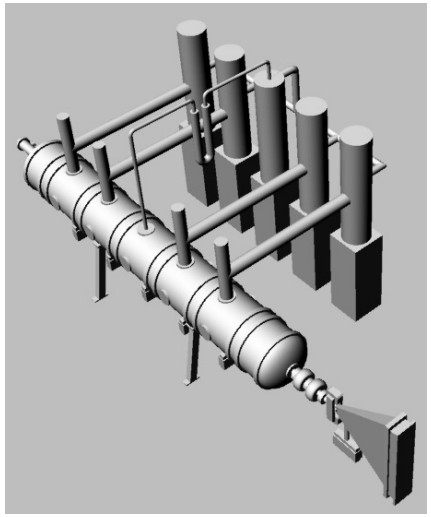
ILU-14 on pilot plant for irradiation medical waste.

Moscow. Start of operation in 2012.

Project of center radiation pasteurization of food based on ILU-14.







ILU Accelerators on the map

Thank you for your attention