

Research and Production Enterprise
«TORIY»



Production by TORIY

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MICROWAVE TUBES

MICROWAVE TUBES FOR LINEAR ACCELERATORS

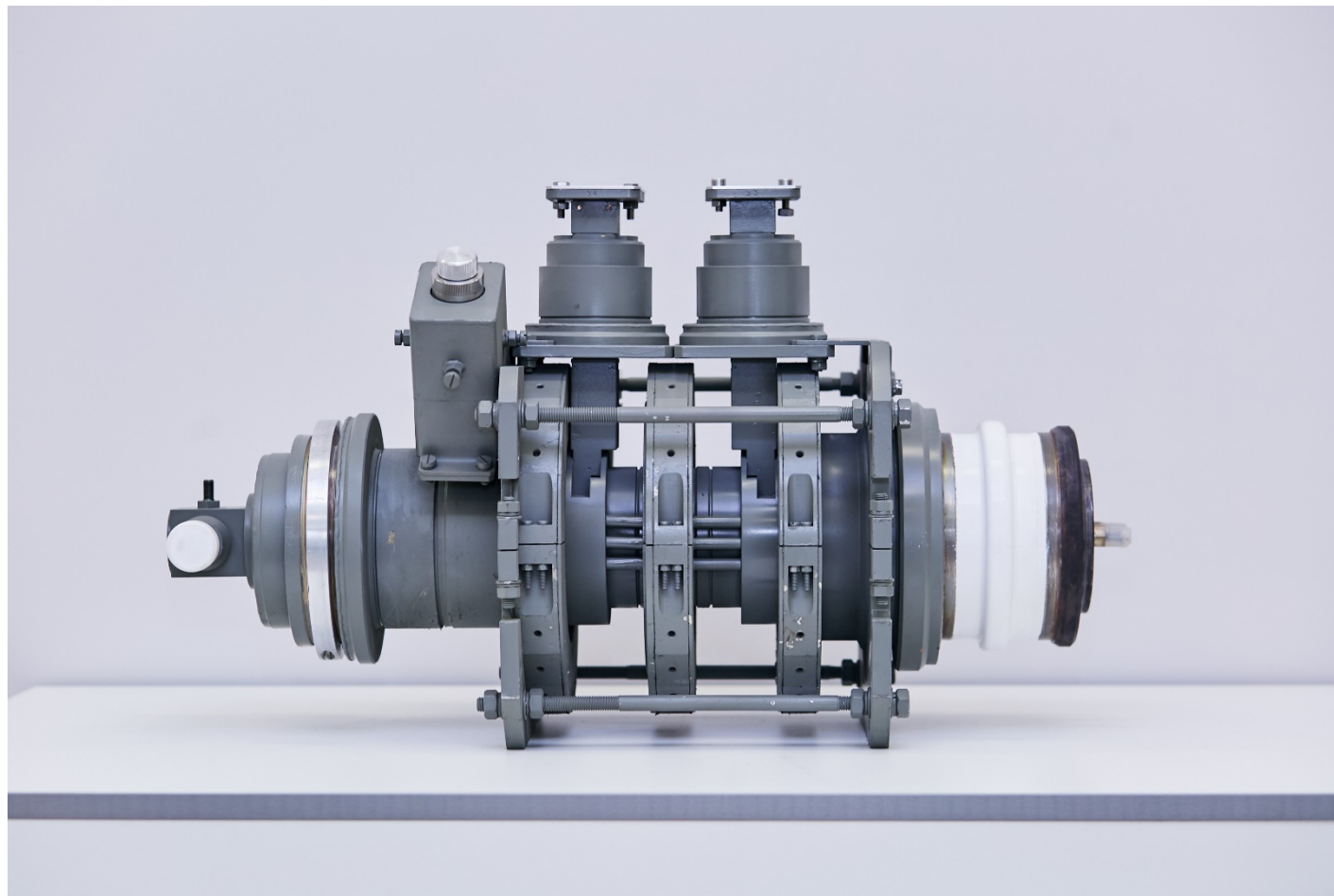


	Magnetron	CW klystron	Pulsed klystrons					
	MI-470	KU-399	KIU-40	KIU-111	KIU-147	KIU-168	KIU-268	KIU-273
Center frequency, MHz	1885	2450	991	2450	2450	2856	2856	5712
Output pulse power, MW	10	-	4.7	5	5	6	6	3,6
Output average / CW power, kW	30	25/50	70	5	25	5	25	10
Cathode voltage, kV	50	10/15	65	50	50	55	55	47
Number of electron beams	1	18	6	40				30
Focusing	solenoid	permanent magnets	solenoid	permanent magnets				

KLYSTRON KIU-273



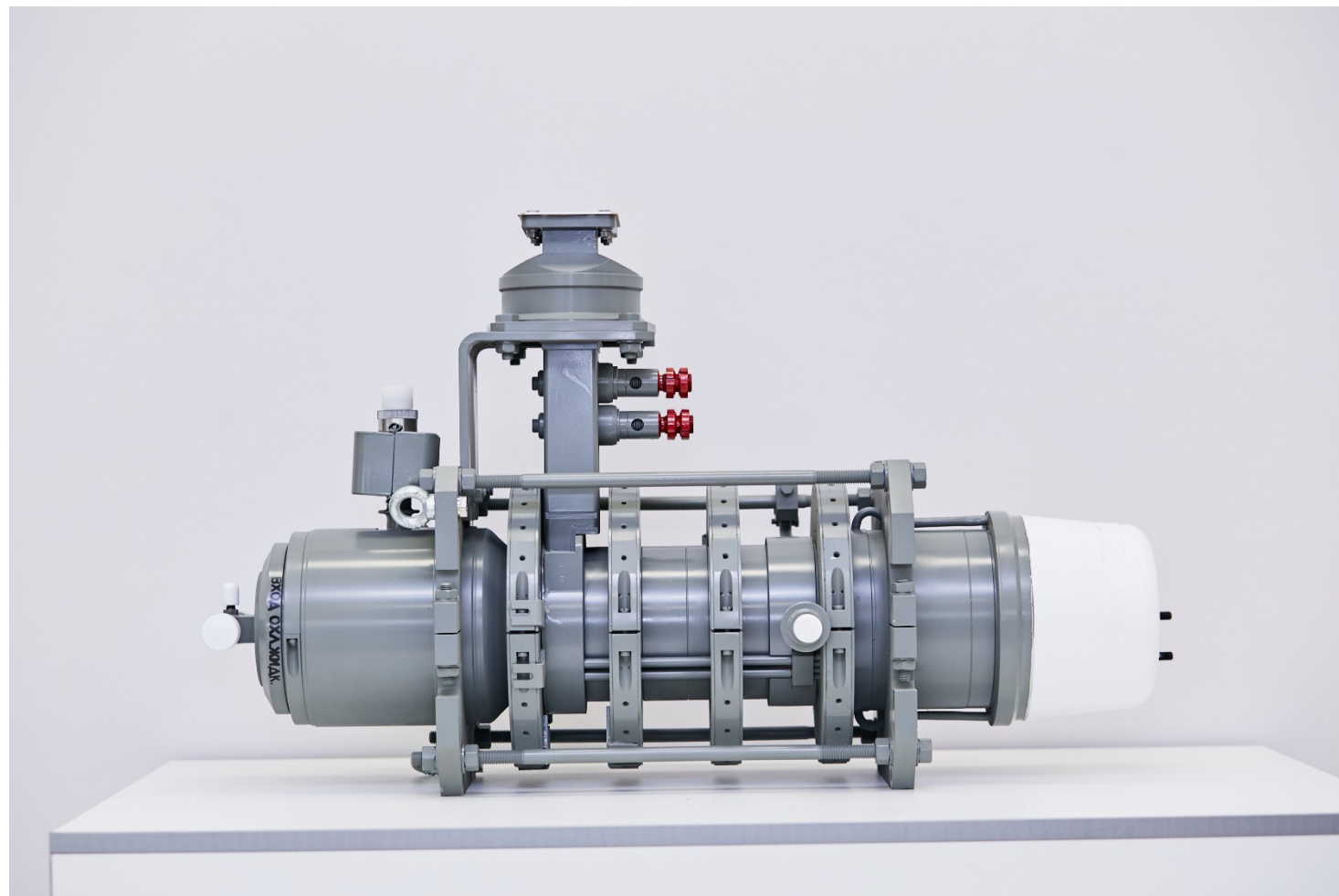
Center frequency, MHz	5712
Output pulse power, MW	1 - 3,6
Output average power, kW	10
Cathode voltage, kV	30 - 47
Number of electron beams	30
Focusing	permanent magnets
Weight, kg	50
Efficiency, %	55
Overall dimension, cm	53,8 x 32,5



KIU-111, KIU-147, KIU-168, KIU-268



Center frequency, MHz	2856
Output pulse power, MW	1 - 6
Output average power, kW	25
Cathode voltage, kV	30 - 55
Number of electron beams	40
Focusing	permanent magnets
Weight, kg	70
Efficiency, %	50
Overall dimension, cm	80,5 x 45,5



MAGNETRON MI-470



Center frequency, MHz	1885
Output pulse power, MW	10
Output average/CW power, kW	30
Cathode voltage, kV	55
Cathode current, A	150
Focusing	solenoid





ACCELERATORS

Together with
Laboratory of Electron Accelerators MSU Ltd

LINEAR ACCELERATORS DEVELOPED AND MANUFACTURED BY RPE "TORIY" AND BE IN SERVICE



	Electron accelerator model name	The operating organization	Country
1	У-003	The Institute of Physical Chemistry and Electrochemistry RAS (IMPB RAS)	Russia
2	У-003	Scientific-research Institute of technical physics and automation	Russia
3	У-003	Institute of nondestructive testing	Russia
4	УЭЛБ-10-10	Moscow Engineering Physics Institute	Russia
5	УЭЛБ-10-10	ZAO «INTEKH»	Russia
6	У-003	Open Joint-Stock Company ELECTROVIPRYAMITEL	Russia
7	У-003	Research Institute of Scientific Instruments (RISI)	Russia
8	УЭЛБ-10-10	"Research and Production Enterprise "TORIY"	Russia
9	УЭЛБ-10-10	"Research and Production Enterprise "TORIY"	Russia
10	УЭЛР-8-2Д	JSC Machine-Building Plant ZiO-Podolsk	Russia
11	УЭЛР-6-2Д	AEM-technology Joint-Stock Company	Russia
12	ЭЛУ-4	Institute of radiation problems	Azerbaijan
13	ЭЛУ-4	Scientific and Practical Materials Research Center	Belarus
14	У-003	Joint Institute of Solid State and Semiconductor	Belarus
15	УЭЛБ-10-10	State Scientific Institution "THE JOINT INSTITUTE FOR POWER AND NUCLEAR RESEARCH - SOSNY"	Belarus
16	У-003	Joint Institute for Nuclear Research	Ukraine
17	У-003	Institute of Nuclear Physics AS RUz	Uzbekistan
18	ЭЛУ-6	Institute of Applied Radiation Chemistry	Poland
19	УЭЛБ-10-10	Institute of Nuclear Chemistry and Technology	Poland
20	УЭЛБ-10-10	Institute of Nuclear Chemistry and Technology	Poland
21	ЭЛУ-6	The National Polytechnic School	Ecuador
22	У-003В	The Leibniz Institute of Surface Modification	Germany
23	УЭЛБ-10-10	Institute of Nuclear Physics and Chemistry, China Academy of Engineering Physics	China

Accelerate structures



АО «НПП «Торий»

LINEAR ACCELERATORS FOR RADIOGRAPHY (NDT)



Parameters	UELR-6-2D	UELR-8-2D	UELR-10-2D
Electron Energy, MeV	3 – 6	3 – 8	5 - 10
Dose Rate, Gy/min	1 – 10	1 – 15	10 – 40
Bremsstrahlung Radiation Field Assymetry, %, not more	5	5	5
Focal Spot Size, mm, not more	1	1	1
Form and Dimension of Operating Field at Distance 2 m, m	circle, $\varnothing 0,5$	circle, $\varnothing 0,5$	circle, $\varnothing 0,5$



LINEAR ACCELERATORS FOR RADIOGRAPHY (NDT)



Parameters	UELR-6-2D	UELR-8-2D	UELR-10-2D
Acceptable non-uniformity of Dose Rate within Operation Field, %	10	10	10
Maximum Permissible Duration of Single Exposition, min	<i>not limitation</i>	<i>not limitation</i>	<i>not limitation</i>
Minimal Interval between Expositions, min	1	1	1
Maximum Steel Thickness, mm	50 – 350	50 – 380	100 – 500



Manufactured over 18 accelerators in 2012 – 2019

ACCELERATORS FOR X-RAY INSPECTION SYSTEM

Together with Scantronic Systems



Electron Energy, MeV	6.0 / 3.5
Pulse Repetition Rate, Hz	2×200
Total Number of Detectors	2112
Scanning Height, m	up to 4.5
Penetration in Steel, mm	400
Wire Detection without Barrier, mm	Ø 0.8
Contrast Sensitivity, %	0.5

**Manufactured 25 accelerators
in 2018 – 2019**



ACCELERATORS FOR X-RAY INSPECTION SYSTEM

Together with Scantronic Systems

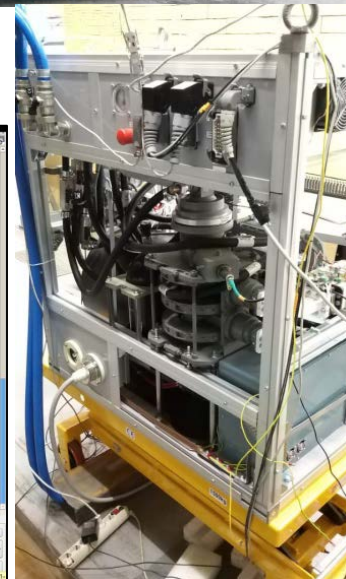
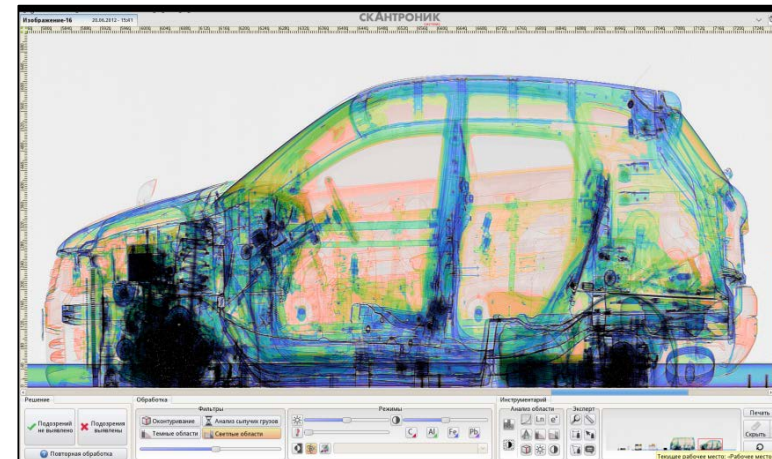


Mobile system



Rail system

Stationary system



LINEAR ACCELERATOR UELR-10-15 FOR STERILIZATION RUSSIA, TECLEOR



**Two accelerators
at the top and bottom**

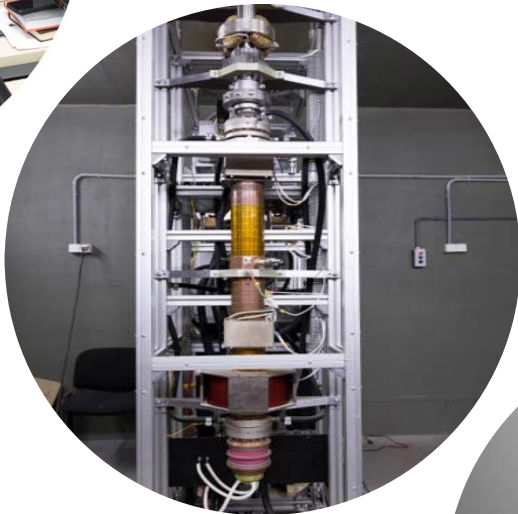


Beam Energy, MeV	5 – 10
Average Power, kW	1 – 15
Pulse Repetition Rate, Hz	up to 400
Scan Length, mm	400 – 600
Scan Frequency, Hz	1 – 30
Microwave Tube	KIU-268
Modulator	Solid State

NEW STERILIZATION CENTER IN RUSSIA, TECLEOR



Individual setting of energy modes for each product

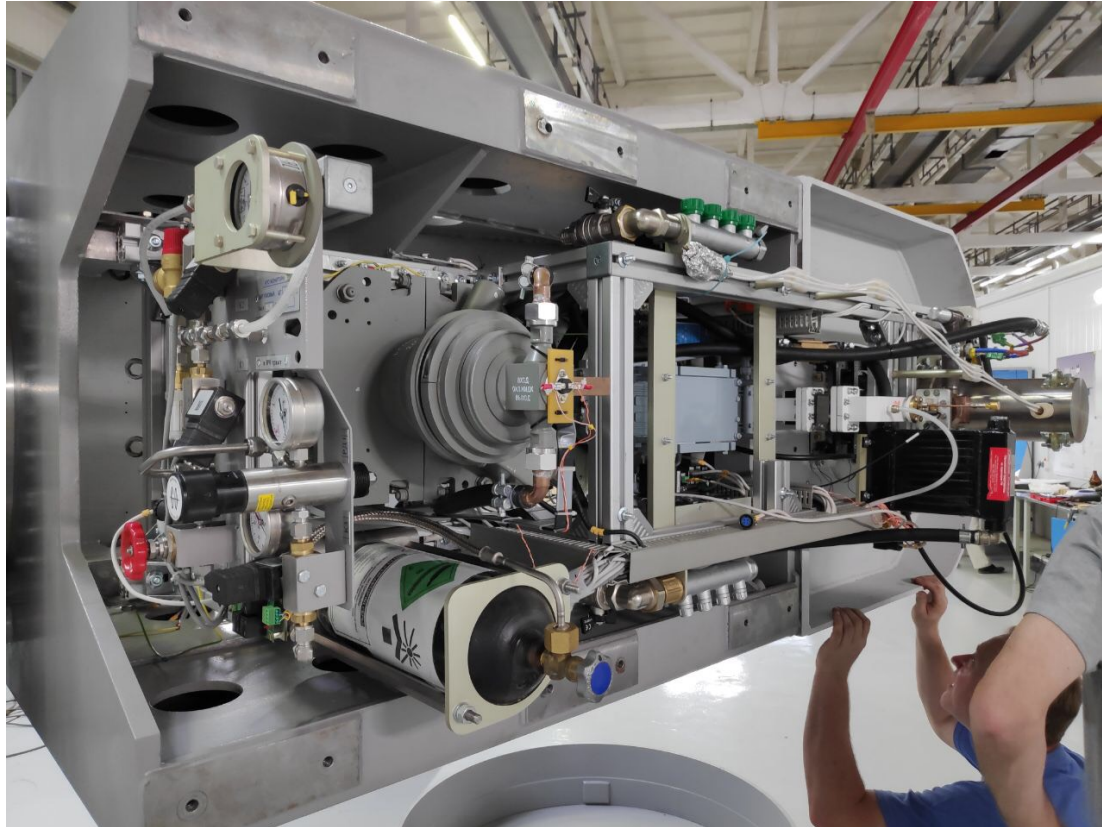


*New accelerator UELR-10-15
development and manufactory by "Toriy"*

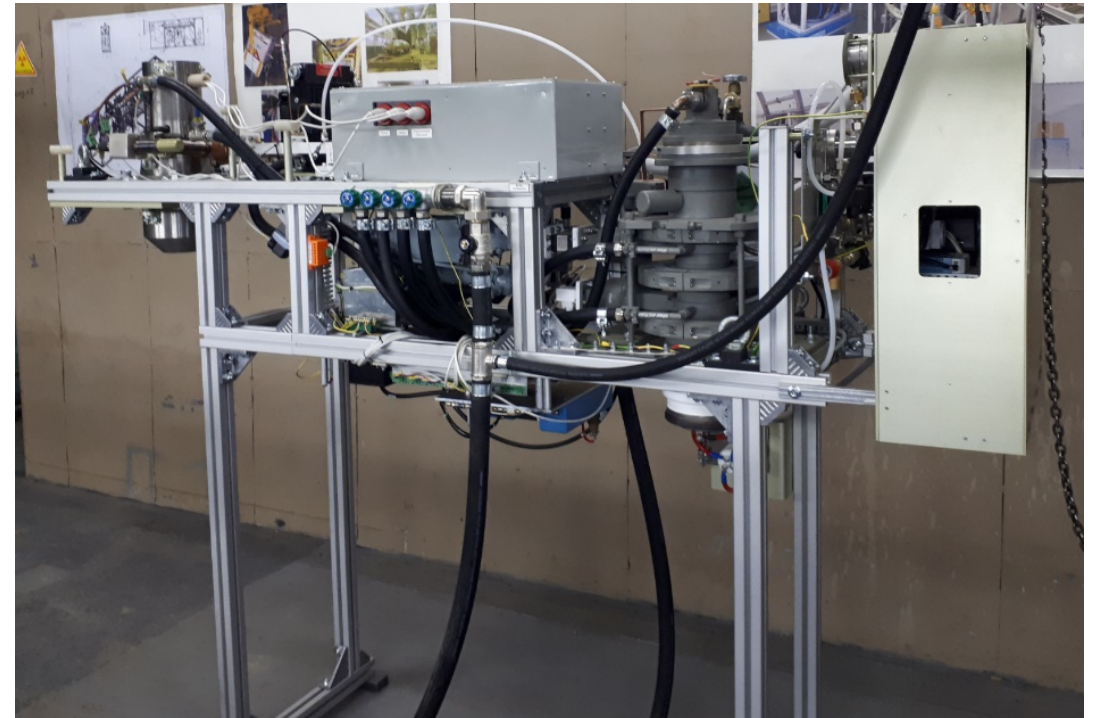


*Productivity 12 tons/hour,
30 000 tons/year
with one accelerator*

MOBILE LINEAR ACCELERATOR FOR MEDICINE



- ✓ *The mobile linear accelerator was developed in 2019*
- ✓ *The mobile linear accelerator successfully passed all the tests in August 2019 and showed all the required parameters*



MANUFACTURING CAPACITY



- ✓ *New accelerator factory*
- ✓ *5 test chambers*
- ✓ *Can be assembled in parallel with 6 accelerators*
- ✓ *Availability to manufacture up to 50 Accelerators per year*





Thank You!