

Linear electron accelerator UELR-10-15S

Accelerator UELR-10-15S has following basic technical characteristics:

Electron energy *, MeV	10
Maximum beam power **, kW	15
Maximum pulse amplitude of the electron beam current, A	0.25
Pulse repetition rate, Hz	1, 3.06, 6.125, 12.5, 25, 50, 100, 200, 300
Electron beam pulse duration, msec	0,015
Maximum scanning length, mm	600
Maximum power consumption, kW	110
Homogeneity of doze along the scanning length on both sides of irradiated boxes ***, %	+/- 5%
Beam power stability, %	+/- 2,5%
Electron energy stability, %	+/- 2,5%
<p>The accelerator supplied from 3 phase networks 380/220 V, 50 Hz, with the isolated neutral, stability ± 5 %.</p> <p>The external water circuit of cooling (not included in the delivery kit) should dissipate power of 90 kW and provide following condition in the output:</p> <ul style="list-style-type: none"> - water temperature of cooling no more 25°C - water flow for 25°C - 120 l/mines 	

* Average energy of electrons after the output window of the accelerator is measured according to method ISO/ASTM 51649: 2005 (E) with use empirical ratio.

** The beam power is calculated as average electron energy multiply by electron beam average current output to atmosphere, measured by a beam stop.

*** Uniformity of irradiation field is measured by a set of plastic dosimeters placed on the irradiated box surface.

Features of our accelerator:

- high efficiency solid-state modulators for klystron and electron gun with DC voltage less 850V;
- continuous control of electron energy, scanning length and beam current during electron beam processing.

Accelerator has two solid-state modulators for the klystron and electron gun:

Basic parameters of the klystron modulator with pulse transformer:

Maximum pulse voltage amplitude, kV	130
Maximum pulse current amplitude, A	90
Pulse length on 75 %, micro seconds	19

Maximum pulse repetition rate, 1/sec	400
Maximum pulse voltage amplitude on the pulse transformer input, kV	6
Maximum pulse current amplitude on the pulse transformer input, A	2000

The klystron pulse transformer is loaded on the klystron TH2173F or VKS-8262F.

Basic parameters of the electron gun modulator with pulse transformer:

Output voltage range for the cathode of the triode electron gun, kV	48-53
Maximum load current, A	1
Output voltage range for the grid of the triode electron gun, kV	0-2
Pulse duration FWHM, microseconds	10 - 20
Maximum pulse repetition range, 1/s	400
Maximum pulse voltage amplitude on the pulse transformer input, kV	6

Both modulators are placed outside the radiation shielding and connected with pulse transformers located close to the section inside radiation shielding by 6 kV cables.

Delivered equipment:

Equipment name	Dimensions, mm			Mass, kg
	Length	Breadth	Height	
Irradiator (accelerating structure with beam scanning horn)	980	880	3600	750
Klystron with pulse transformer (without oil)	860	650	1500	590
Waveguide between klystron and section included circulator and RF window	~170			~100
Klystron modulator (without oil)	1450	600	2300	1050
Internal cooling system of the irradiator and klystron	1200	600	1900	300
Power supply rack №1 (of vacuum equipment)	600	600	1900	240
Power supply rack №2	600	600	2300	180
Control unit	800	400	1900	160
Main switchboard	1000	600	300	40
Backing pump	500	400	220	15

The customer should provide:

1. Transformer oil Mobilect 44 or Shell Diala D— 400 litres
2. Gas SF₆ – 1 balloon 10 l litres

3. External water cooling system which should dissipate power of 90 kW and provide following condition on the output:

- water temperature of cooling water $< 25^{\circ}\text{C}$
- water flow for 25°C - 120 l/min

During an operation of the accelerator periodic replacement of the klystron and the cathode of the electron gun is required. In our accelerator the klystron of TH2173F of Thales Electron Devices (France) or VKS-8262F of CPI (USA) are used. Cathode of own production. The guaranteed life time of the klystron and the cathode of 8000 hours. The price of TH2173F klystron was in 2015 — 78,500 EUR and VKS-8262F - 73,000 USD.



Irradiator and klystron with pulse transformer



Klystron modulator and power supply rack No2 with electron gun modulator, klystron driver and power supply units of the klystron electromagnet



Internal water cooling system

The price of the accelerator UELR-10-15S on the term of delivery FCA – St. Petersburg (Russia) included installation in India and 12 months warranty service is 1,480,000 USD.

Time of delivery is 12 months after 50% prepayment. Time of the installation and commissioning is 4 months.

Mikhail Demsky

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This offer is valid before December 31, 2016.