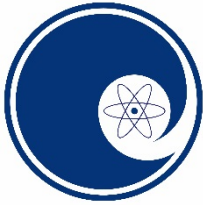


NIOWAVE
www.niowaveinc.com

Commercialization of Superconducting Electron Linacs

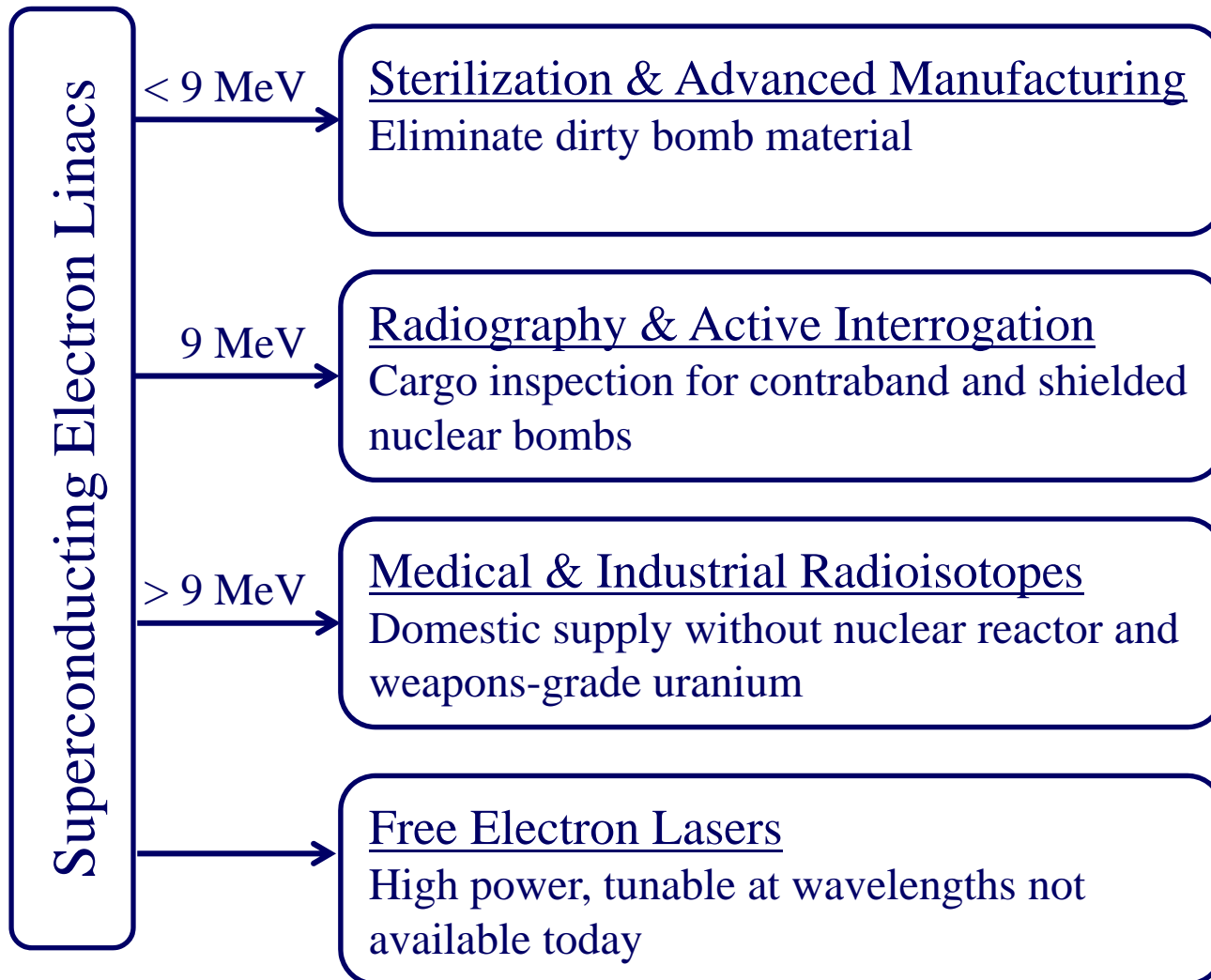
Niowave, Inc.
Lansing, Michigan

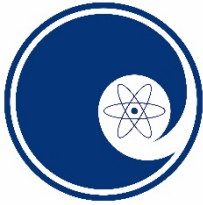
May 2018



Niowave's Commercial Markets

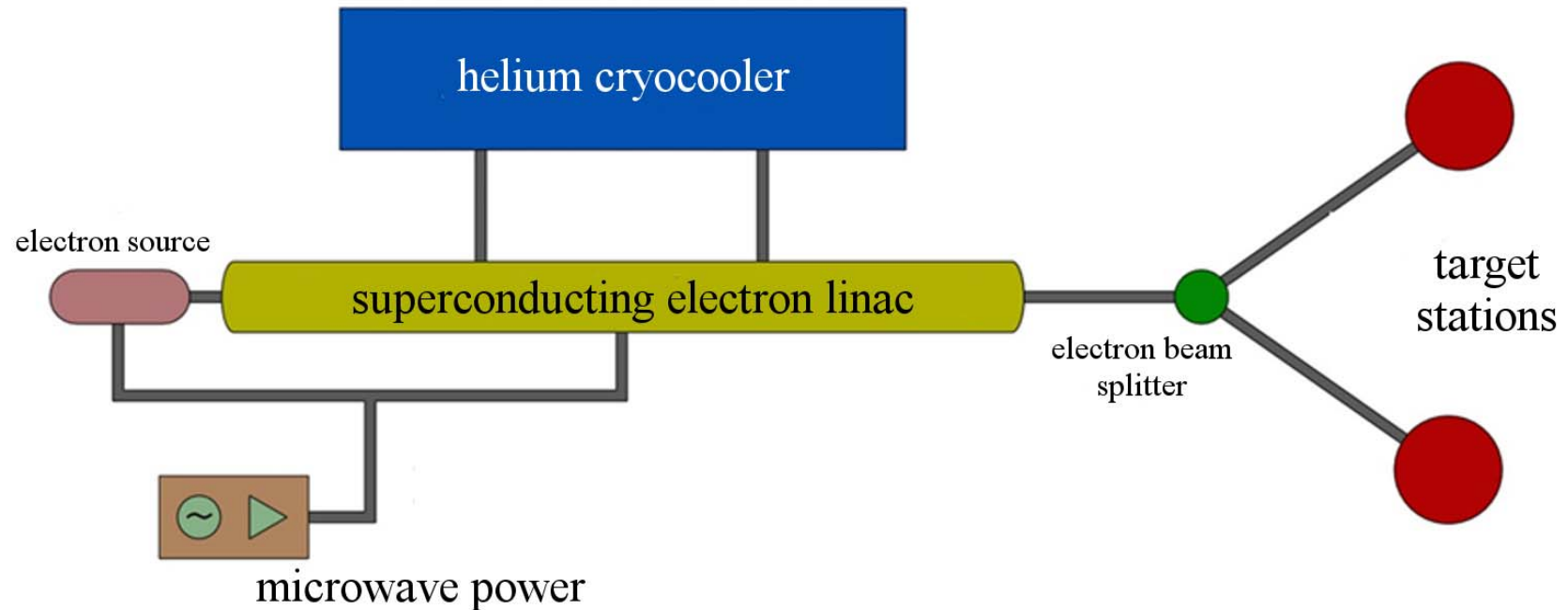
NIOWAVE
www.niowaveinc.com





Superconducting Linac Facility

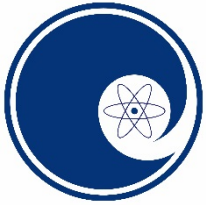
NIOWAVE
www.niowaveinc.com



Turn-key Systems

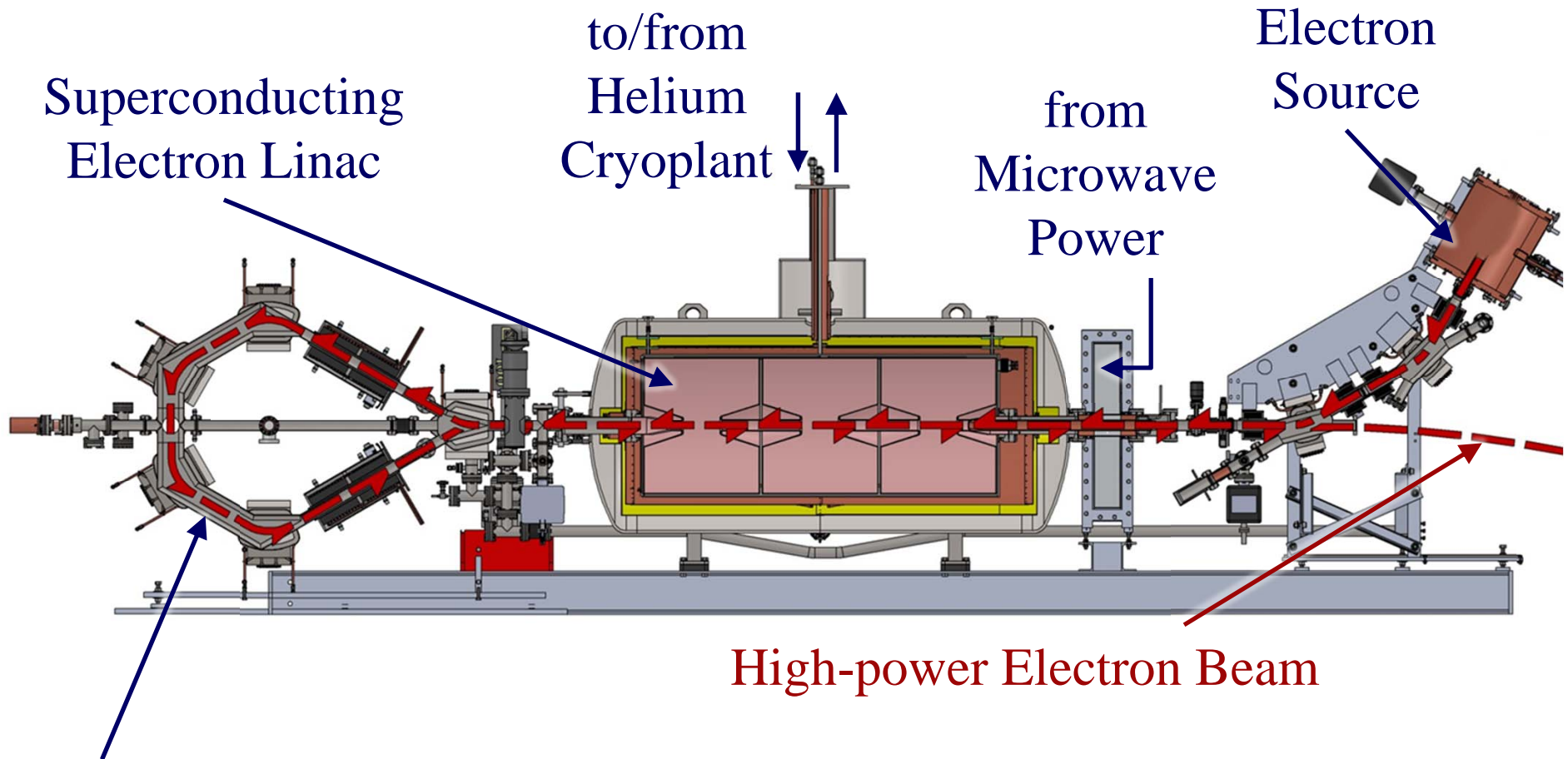
- Superconducting Linac
- Helium Cryoplant
- Microwave Power
- End Station
- Licensing

Beam Energy	~9 MeV
Average Beam Power	10-100 kW
Duty Cycle	10-100%
Closed-loop Cooling Capacity	40-110 W @ 4 K

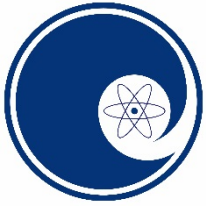


Superconducting Electron Linac

NIOWAVE
www.niowaveinc.com



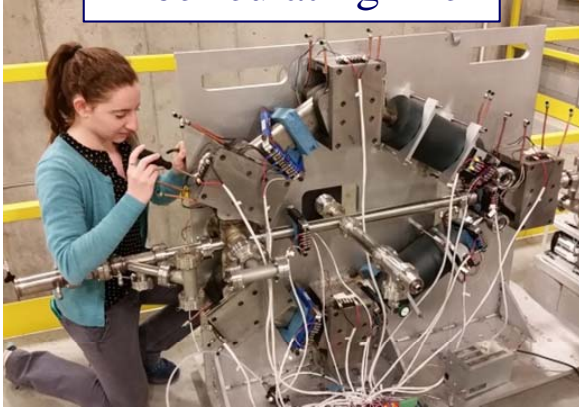
In this design, a magnetic arc (at left) brings the beam through the accelerator a second time, reducing costs for the cryomodule and refrigerator.



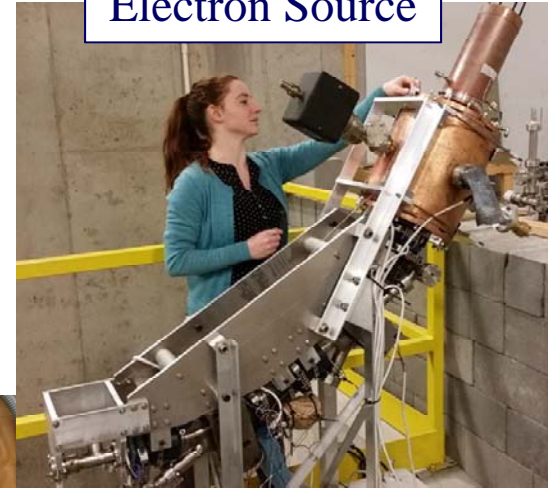
Linac Subsystems [2]

NIOWAVE
www.niowaveinc.com

Recirculating Arc

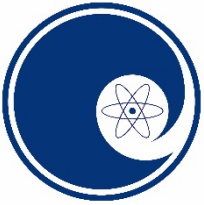


Electron Source



Superconducting
Cryomodule





Linac Subsystems [3]

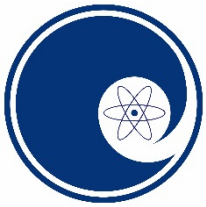
NIOWAVE
www.niowaveinc.com



Solid-state and
tetrode RF
amplifiers
(up to 60 kW)



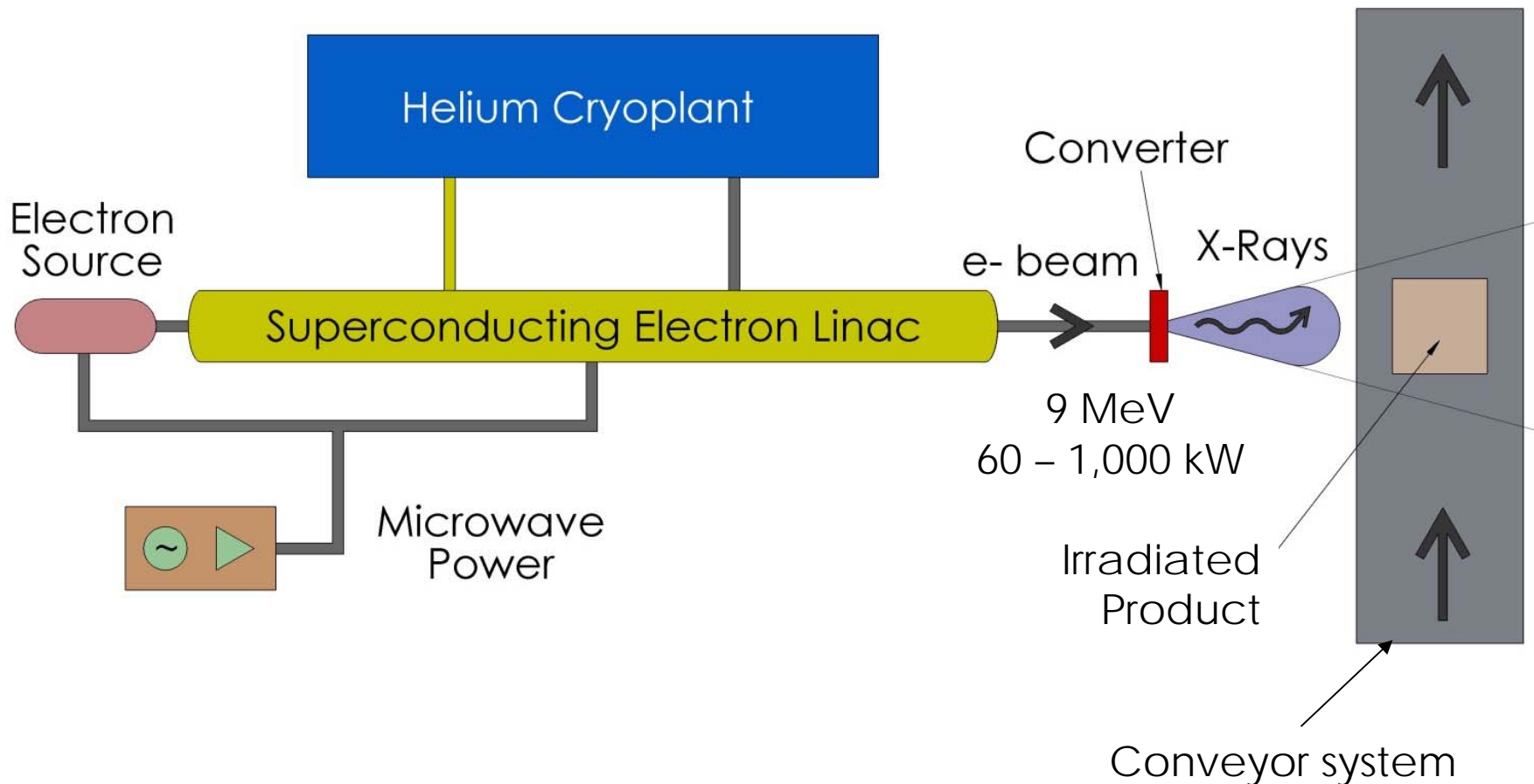
Commercial 4 K refrigerators
(rugged piston-based systems,
110 W cryogenic capacity)

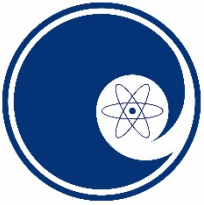


High-throughput Sterilization

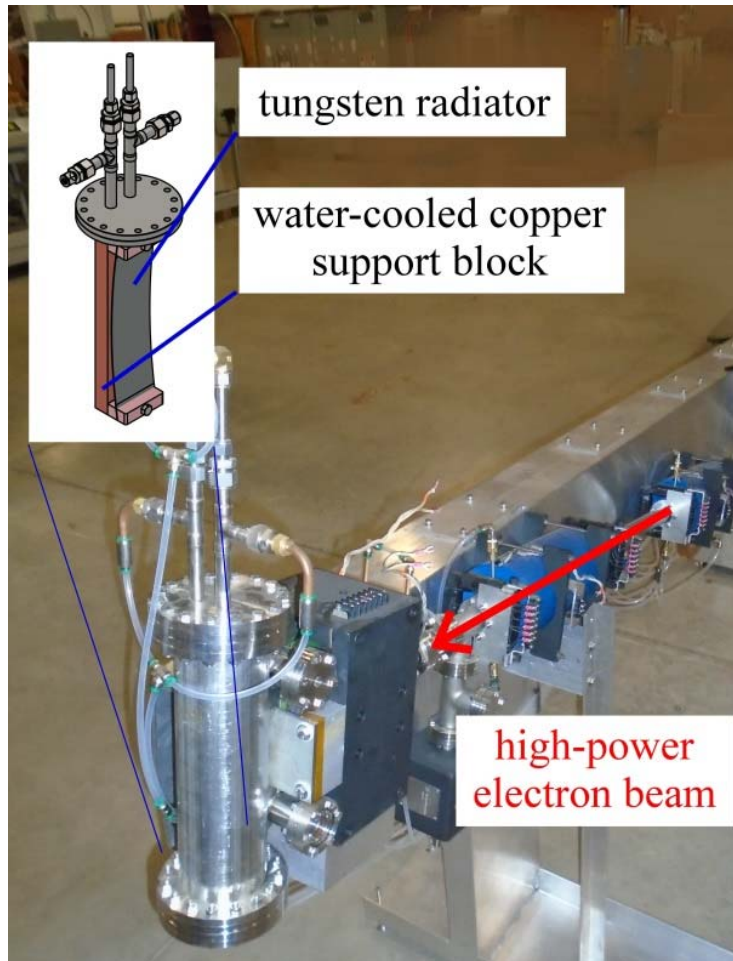
NIOWAVE
www.niowaveinc.com

Accelerator-based sterilization eliminates security risk of Co-60 facilities.

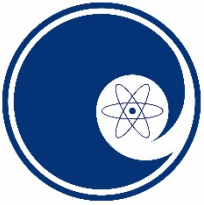




X-ray Targets

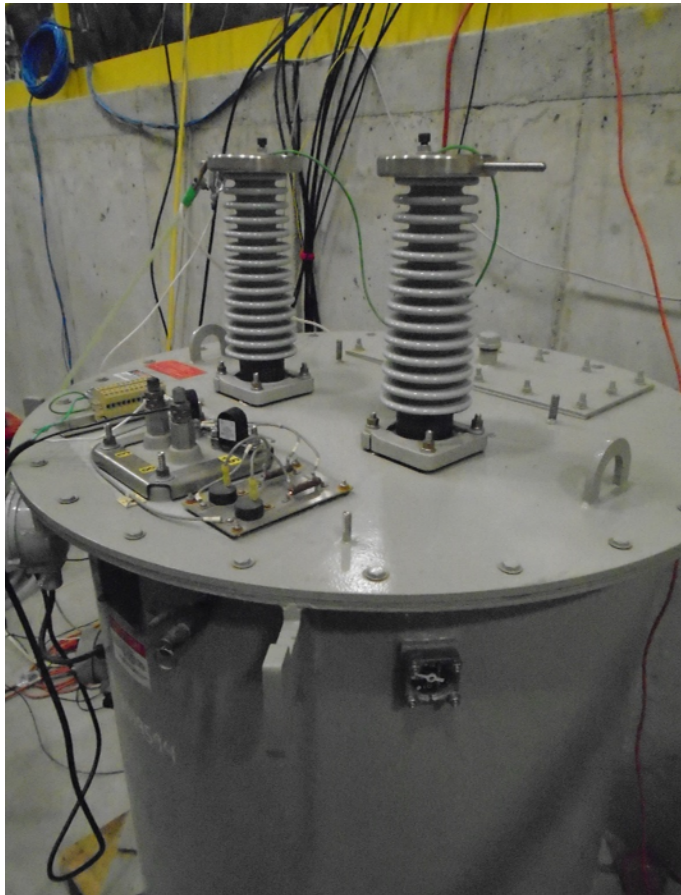


X-ray production targets include water-cooled tungsten (up to 10 kW), and liquid metal target (<10 kW)



High-current Source

NIOWAVE
www.niowaveinc.com



For municipal solid waste treatment requiring ampere-class beams (for MW beam power), Niowave is developing a high-current electron gun (above) that draws power directly from the grid through standard distribution transformers (left). Currently runs at 0.1 amps.