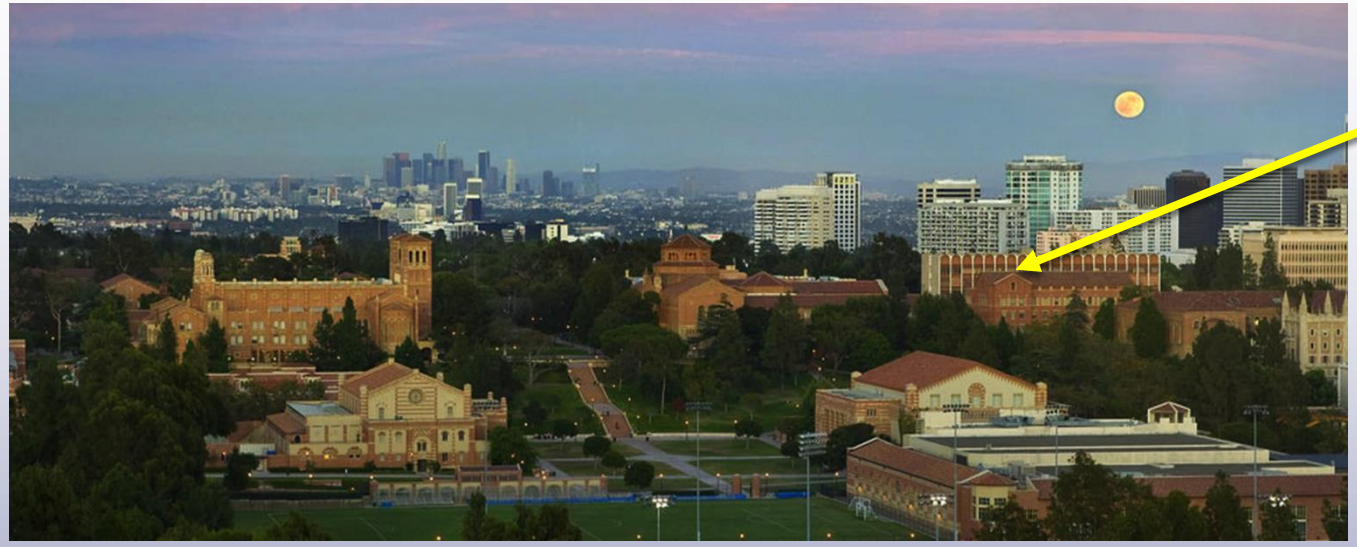
Experience supplying precision accelerator components: Radiabeam

Salime Boucher

President

RadiaBeam Technologies, LLC

In the beginning…



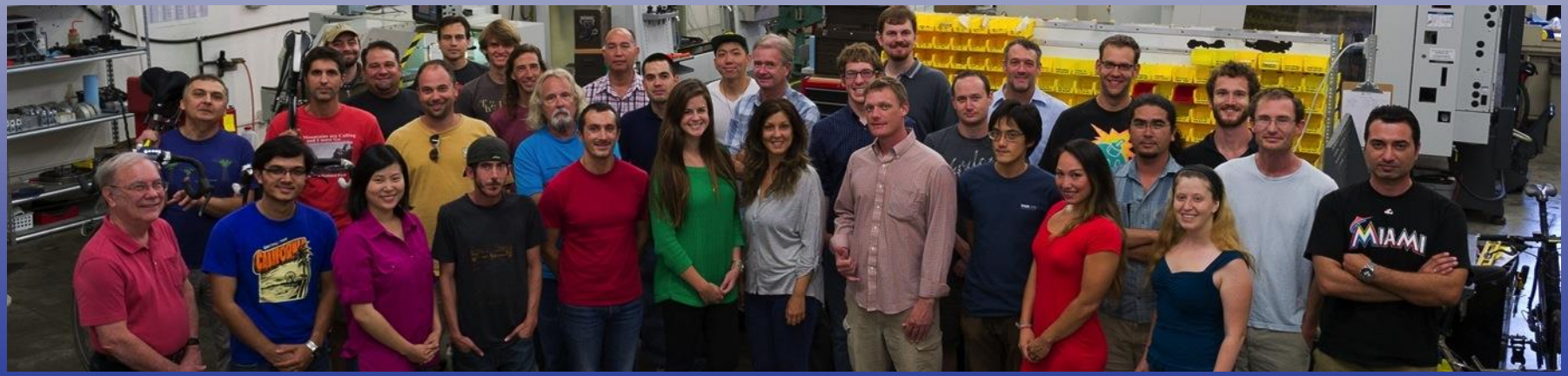
UCLA Knudsen Hall

UCLA Physics Machine Shop

PBPL ca. 2000

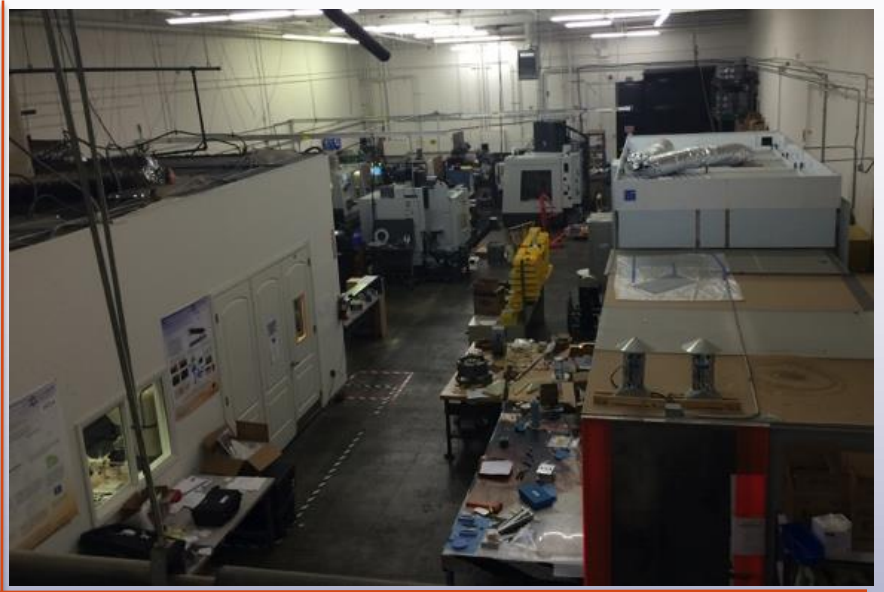
RadiaBeam Today

- RadiaBeam has two missions:
  1. To manufacture high quality, cost-optimized accelerator systems and components
  2. To develop novel accelerator technologies and applications
- Currently **46 employees** and growing
  - Consists of PhD Scientists (10), Engineers (18), Machinists (8), Technicians (6), and Administrative (4)
- We do our own design, engineering, and manufacturing



Facilities

- Machine shop (clean and regular)
- Assembly area
- RF, magnetic measurement and optics labs

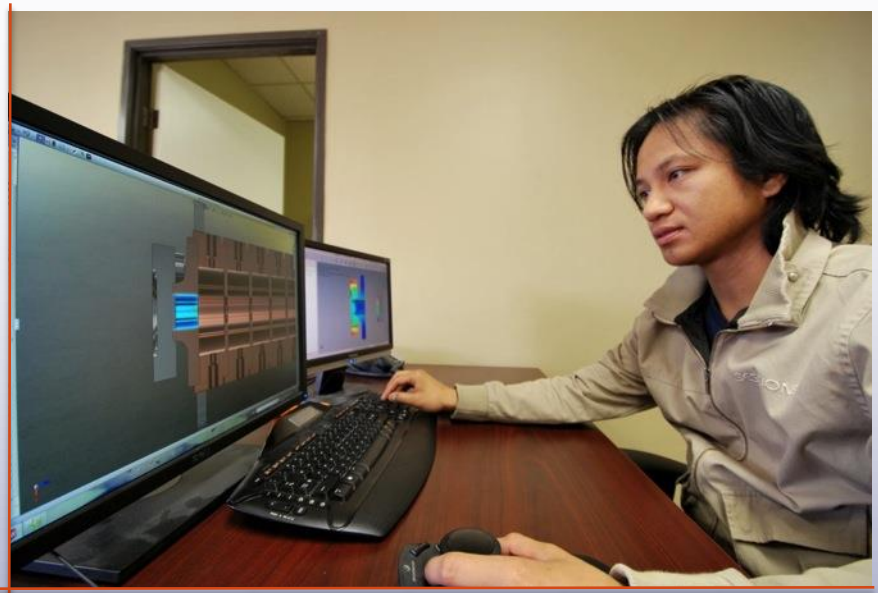


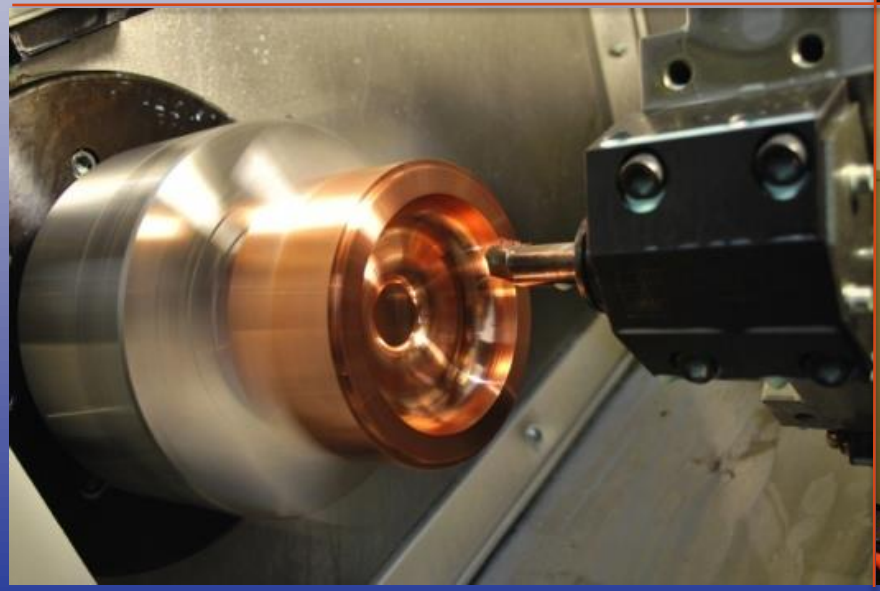
Facilities

- Hot test cell (up to 9 MeV)
- Clean room
- Chemical processing room
- RF test area

Capabilities

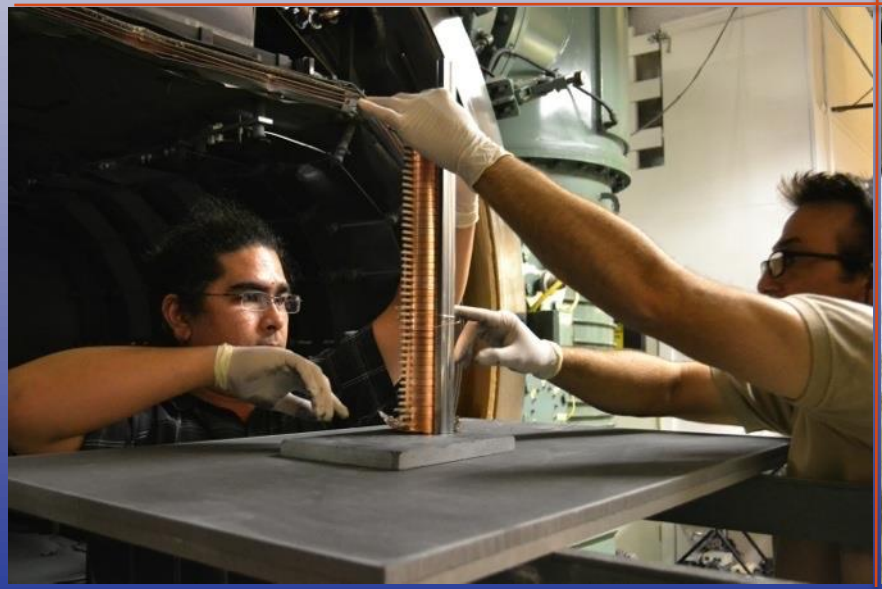
- Physics design/simulations
- Mechanical engineering
- CAM Programming
- Prototyping, Production
- QA (with CMM)

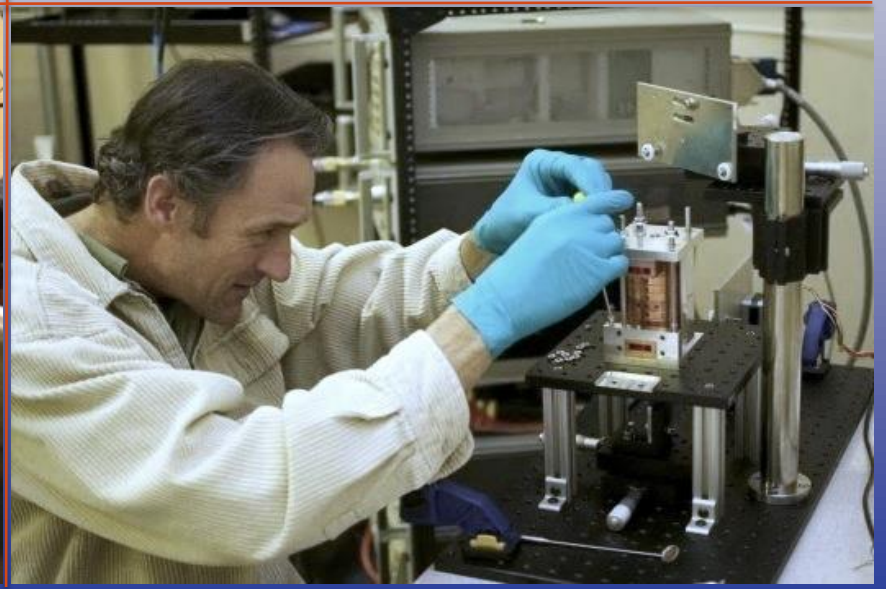




Capabilities

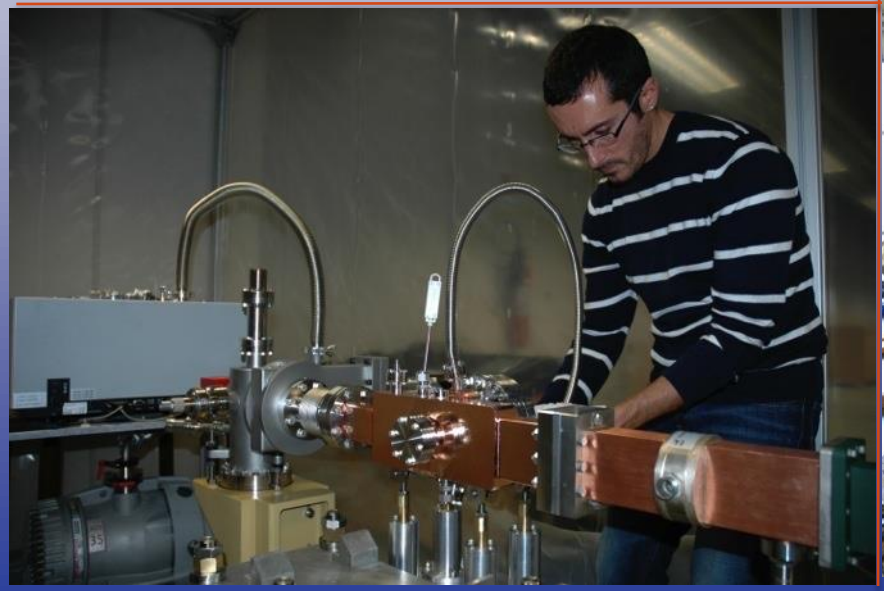
- RF design and engineering
- Machining
- RF surface processing
- Cold testing, cell sorting, tuning
- Brazing





Capabilities

- System integration (RF components, electronics, controls)
- Factory Acceptance Testing
- Installation & Service

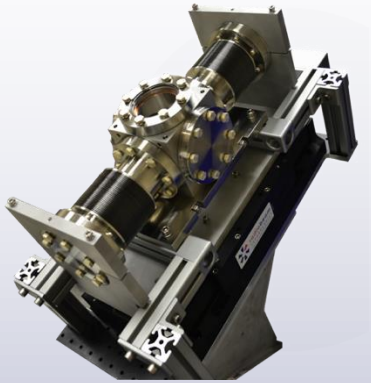


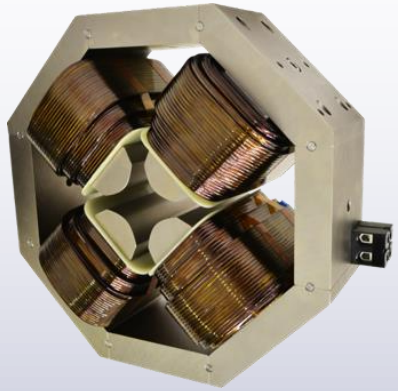
Capabilities

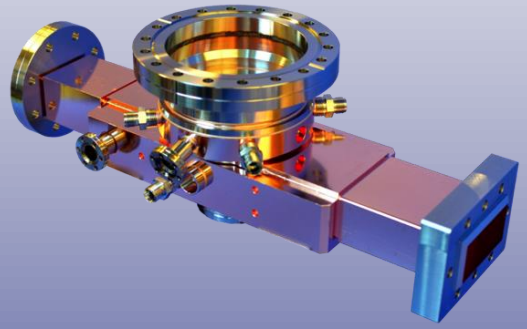
- EMs and PMs
- Magnetic design and engineering
- Coil winding and testing
- Magnetic testing/alignment

Products

- Magnetic optics & systems
  - Electromagnets
  - Permanent magnets
  - Systems (final focus, spectrometers)
- Diagnostics
  - Beam profile monitors
  - Bunch length monitors
  - Charge, emittance, etc.
- RF structures
  - Accelerating structures
  - RF guns/photoinjectors
  - Transverse deflectors
- Linac Systems
  - Non-Destructive Testing/Security
  - Space electronics testing
  - R&D applications



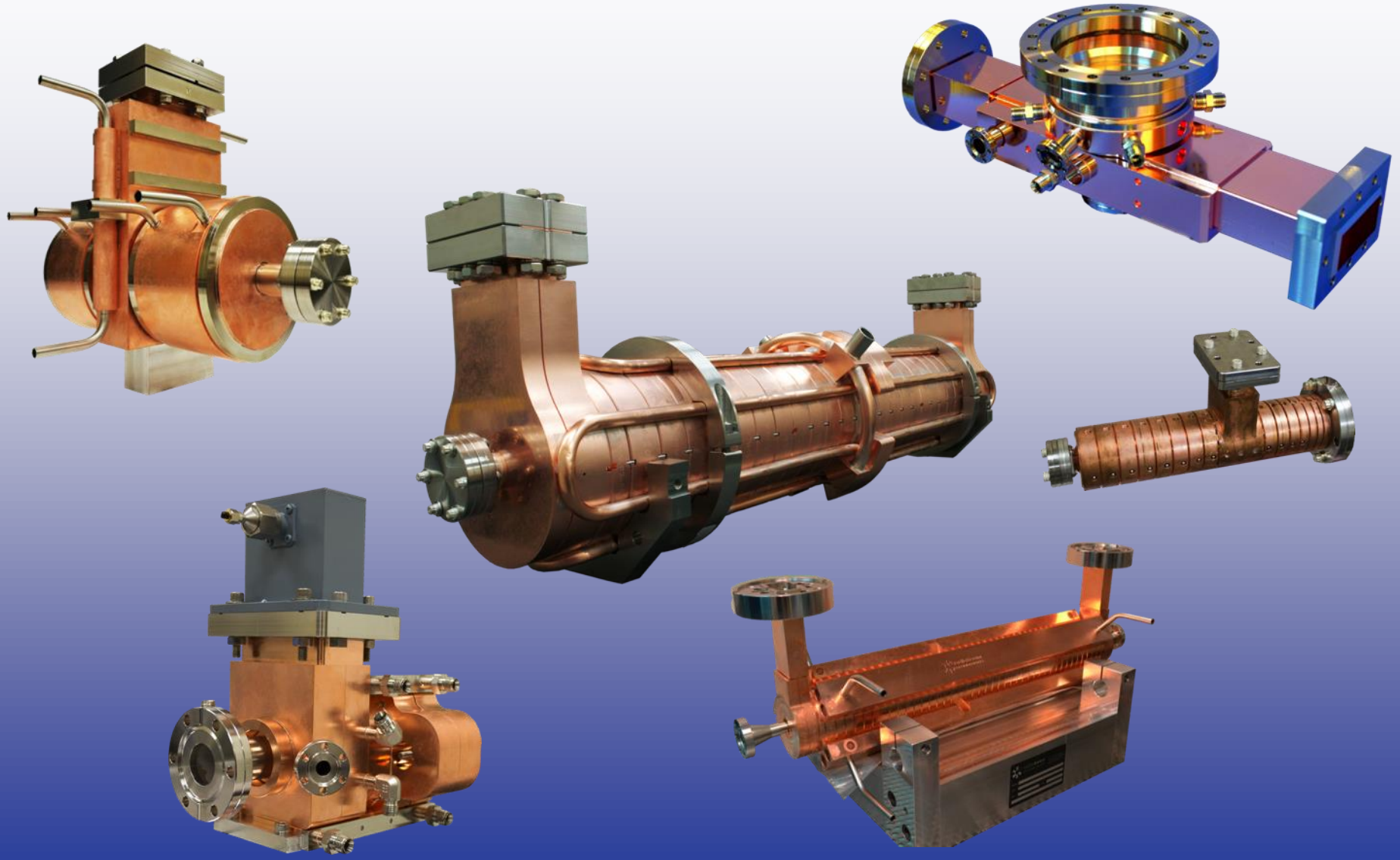




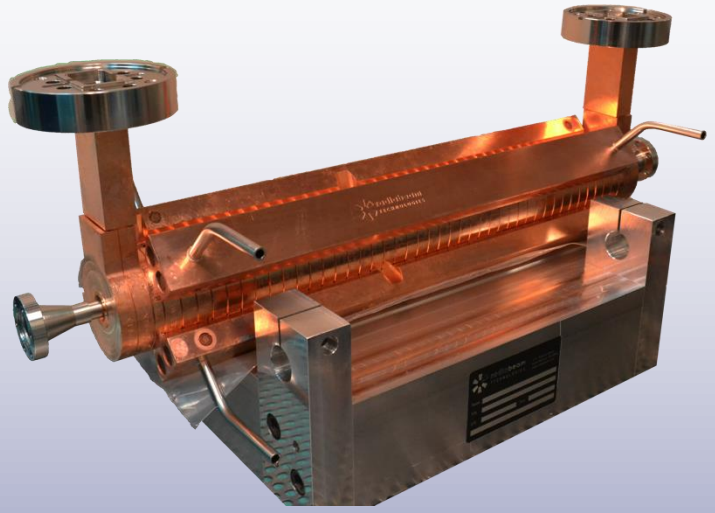
Customers

radiabeam TECHNOLOGIES

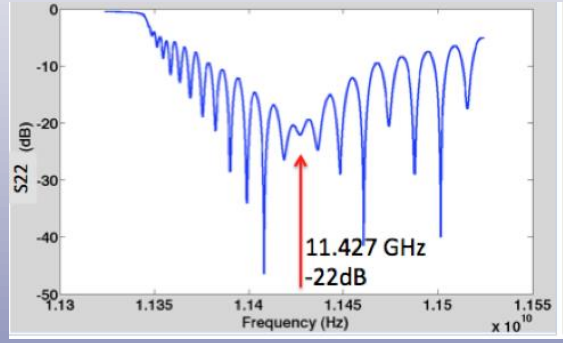
RF Structures

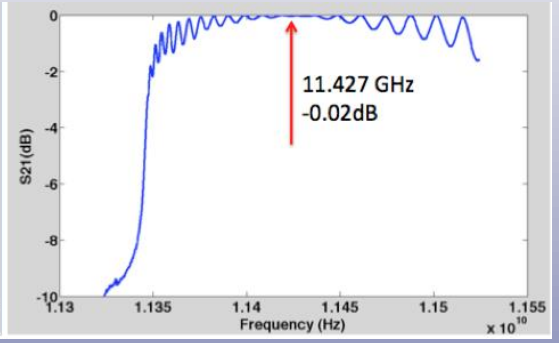


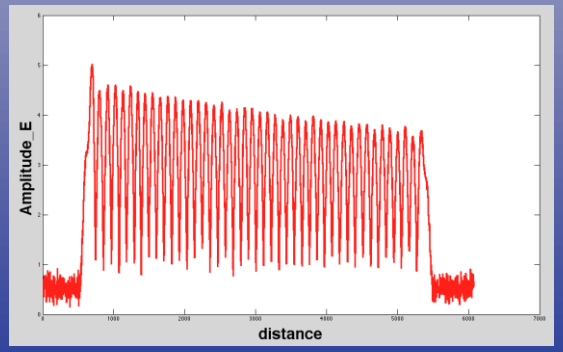
X-band Transverse Deflecting Cavity

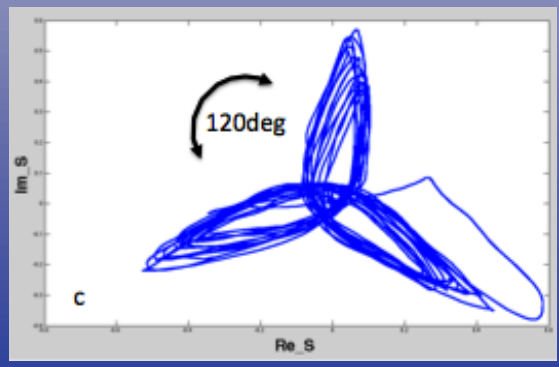


2π/3-mode frequency	11.424 GHz
Deflection Kick	8.5 kV/m/W$^{1/2}$
Attenuation	0.66 m^{-1}
Group velocity	0.027 c
Length	45 cm
Max. input peak power	20 MW
Peak deflecting voltage	38 MV/m



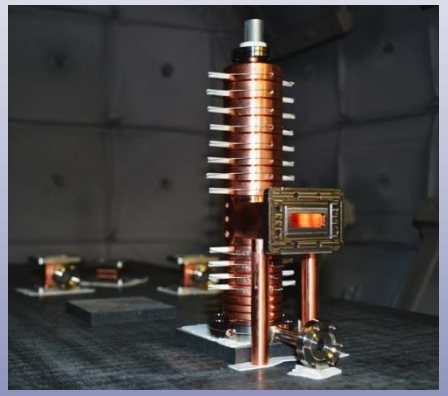


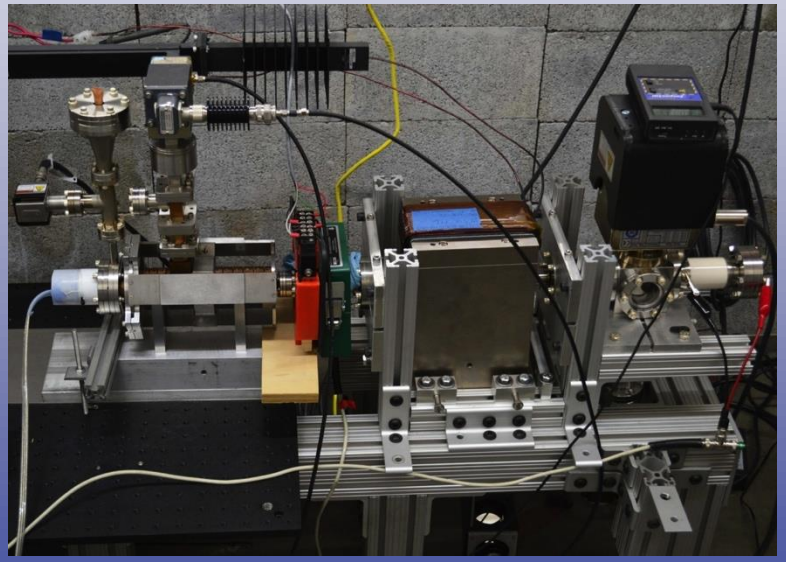




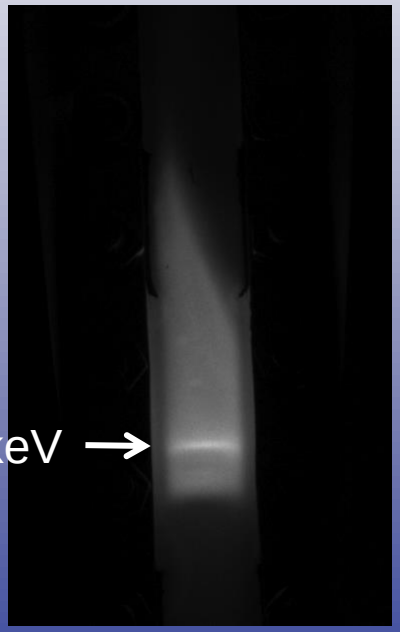
“MicroLinac”

radiabeam TECHNOLOGIES

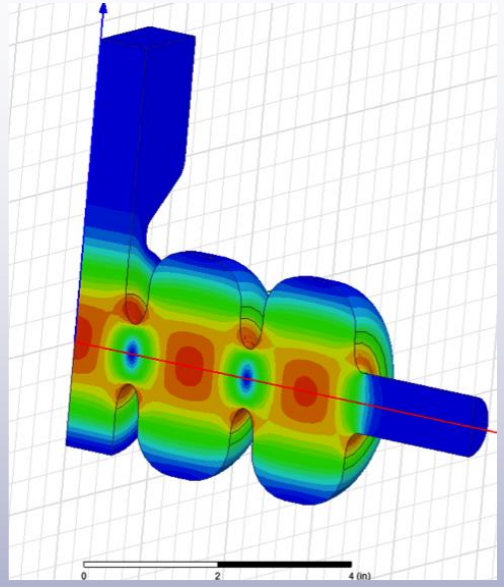


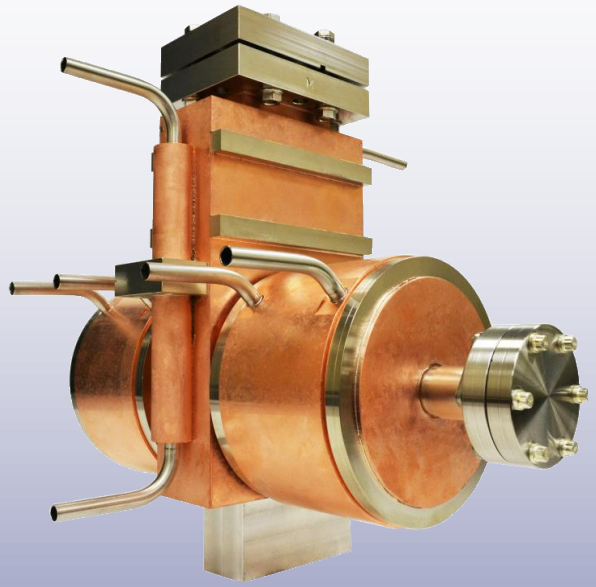


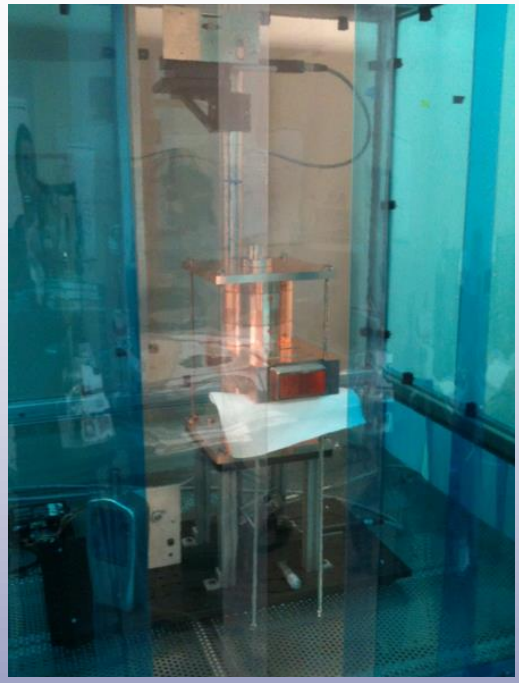
520 keV →

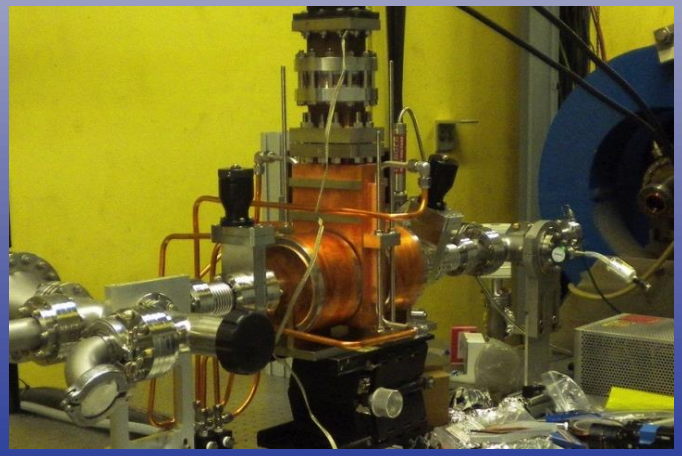


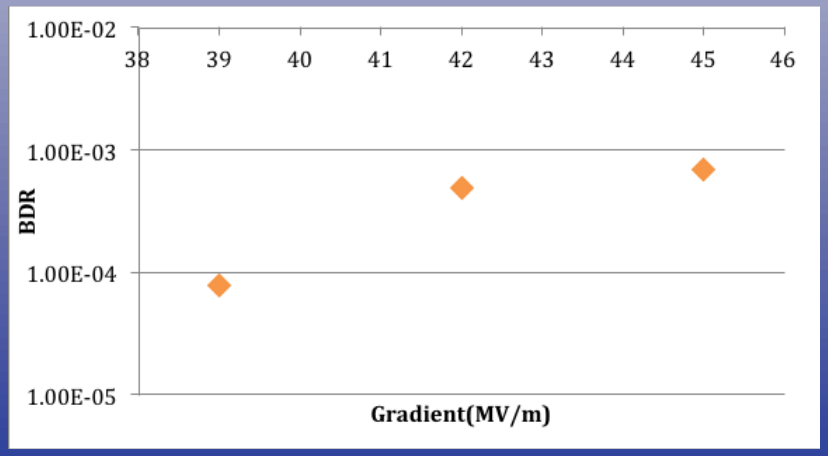
High Gradient S-band Structure



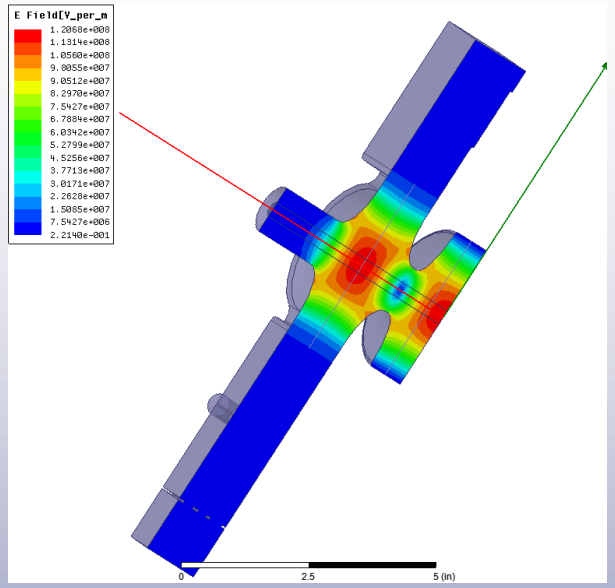


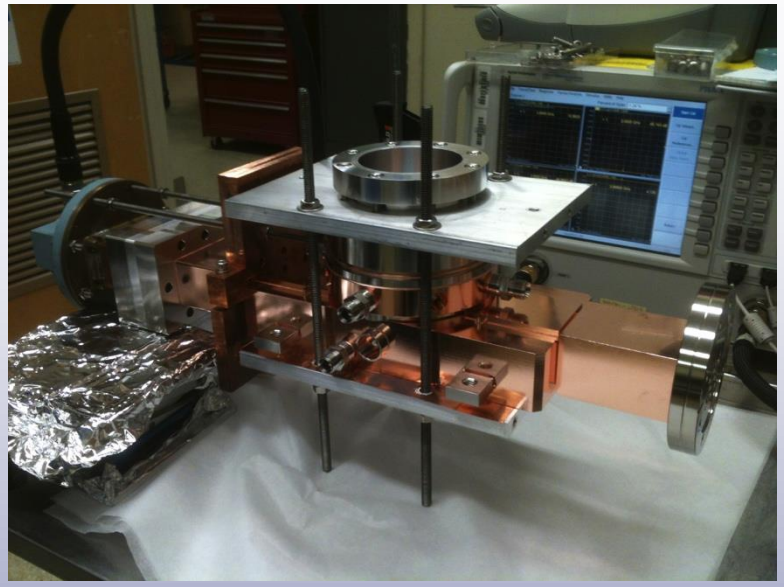


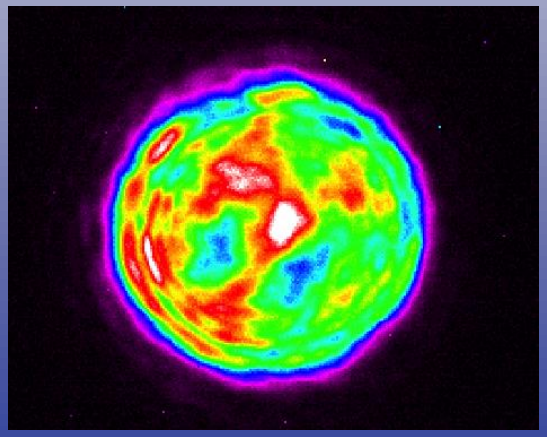


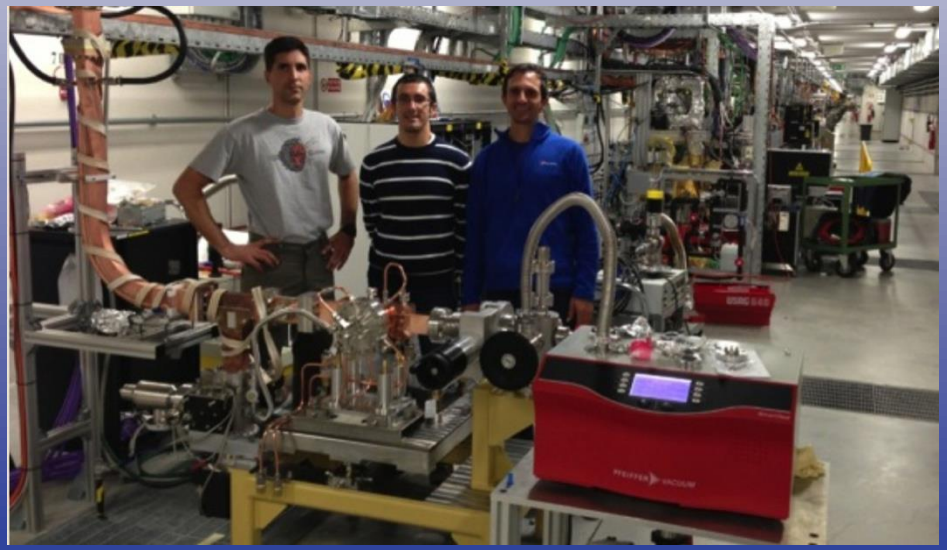


Photoinjector Gun



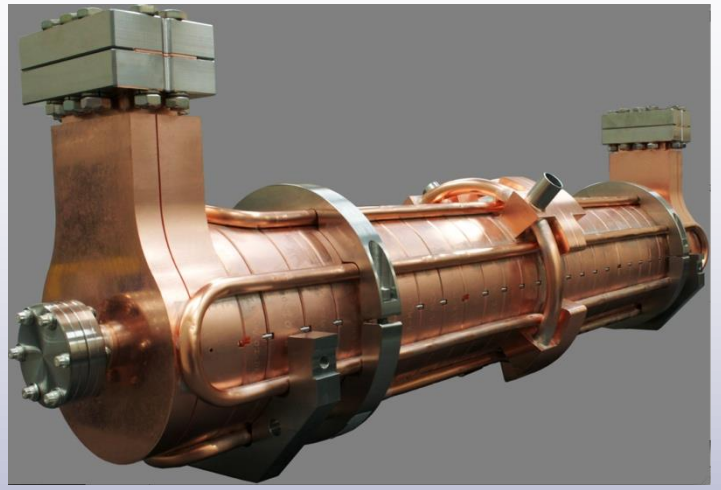


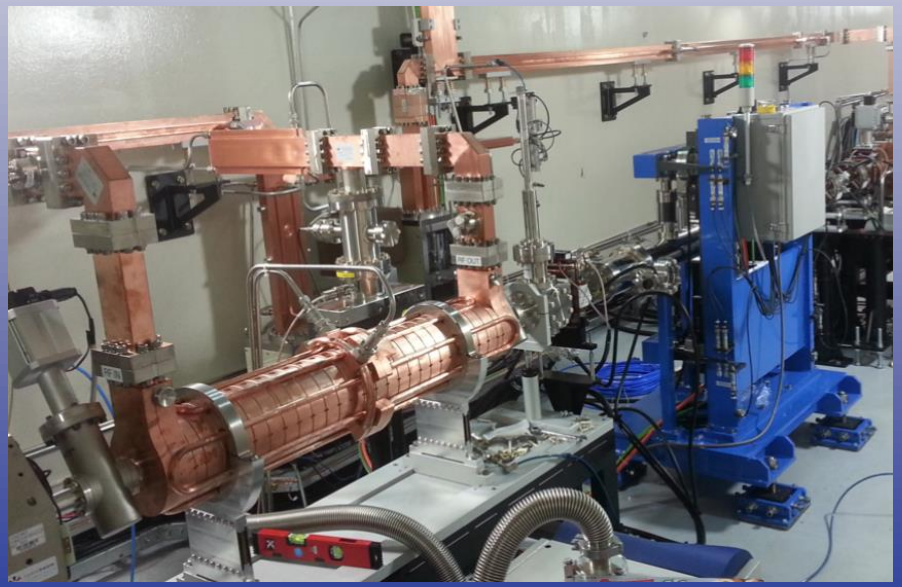


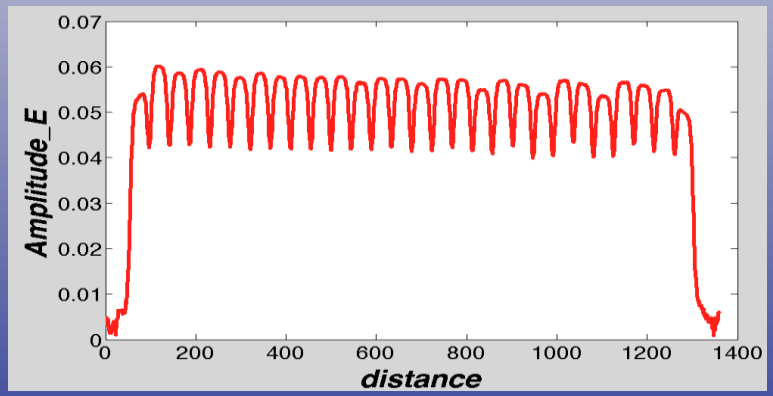


S-band Transverse Deflector

$2\pi/3$-mode frequency f	2.856 GHz
Transverse Shunt Impedance r_T	28.7 MΩ/m
Unloaded Q	13400
Attenuation α	0.15 m^{-1}
Group velocity v_g	0.014 c
Kick/√Power	2.7 MV/√MW
Length	1 m

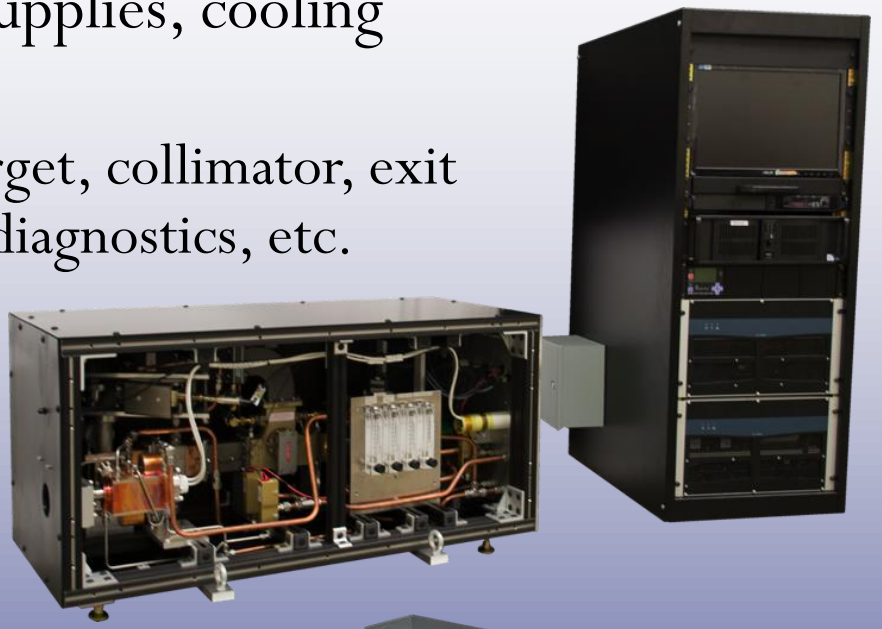


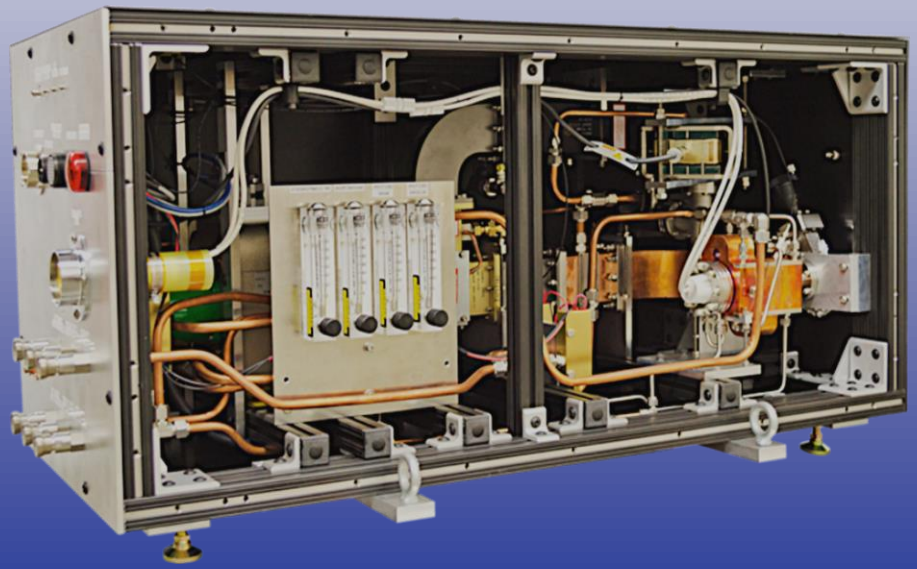


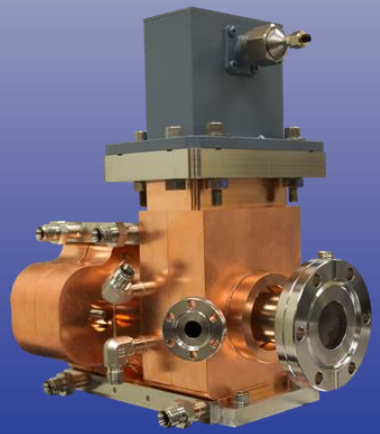


Linac Systems

- Designed specifically for customer's application
- Integrated with RF source, power supplies, cooling system, vacuum pumps, etc.
  - Can also be combines with X-ray target, collimator, exit window, scan/defocusing magnets, diagnostics, etc.
- Installation and service available

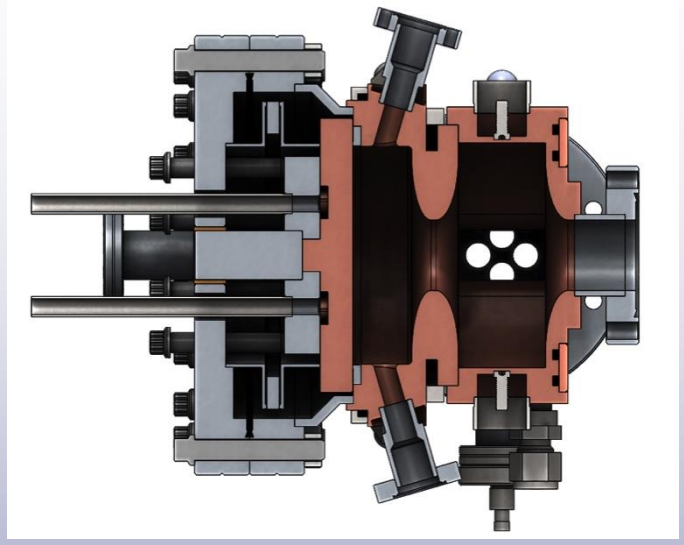


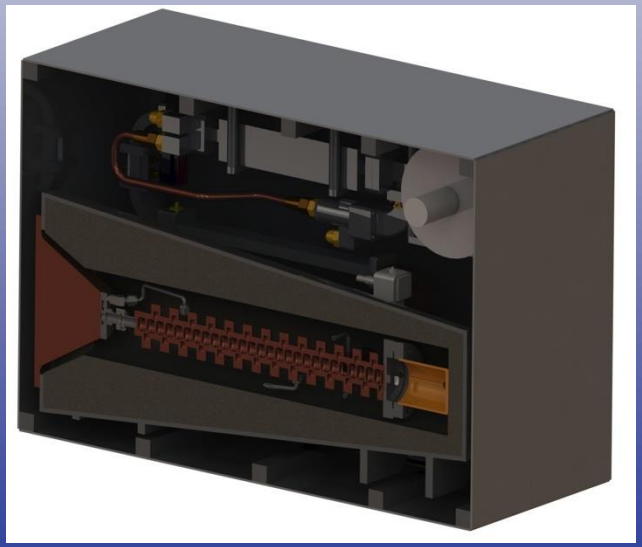




Ongoing/Future projects

- X-band waveguides for BNL ATF
- 100 Hz Photoinjector gun for STAR
- Injector system for FEL at RRCAT
- X-band linac for mobile cargo screening
- S-band high duty cycle linac for rail cargo screening





Summary

- RadiaBeam Technologies is a vertically integrated manufacturer of accelerator systems and components
- We have in-house capability from design, to fabrication, to testing
- Capabilities developed specifically for high-gradient RF structures
- We are dynamic and flexible: we like to do new things!
- ***Founded by accelerator physicists, for accelerator physicists***

Thank you!

www.radiabeam.com,
info@radiabeam.com