

Accelerators at Los Alamos Today

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Outline

- **The history of accelerators at Los Alamos – a brief summary**
- **Major facilities at Los Alamos today**
 - LANSCE
 - DARHT
- **Near-term initiatives**

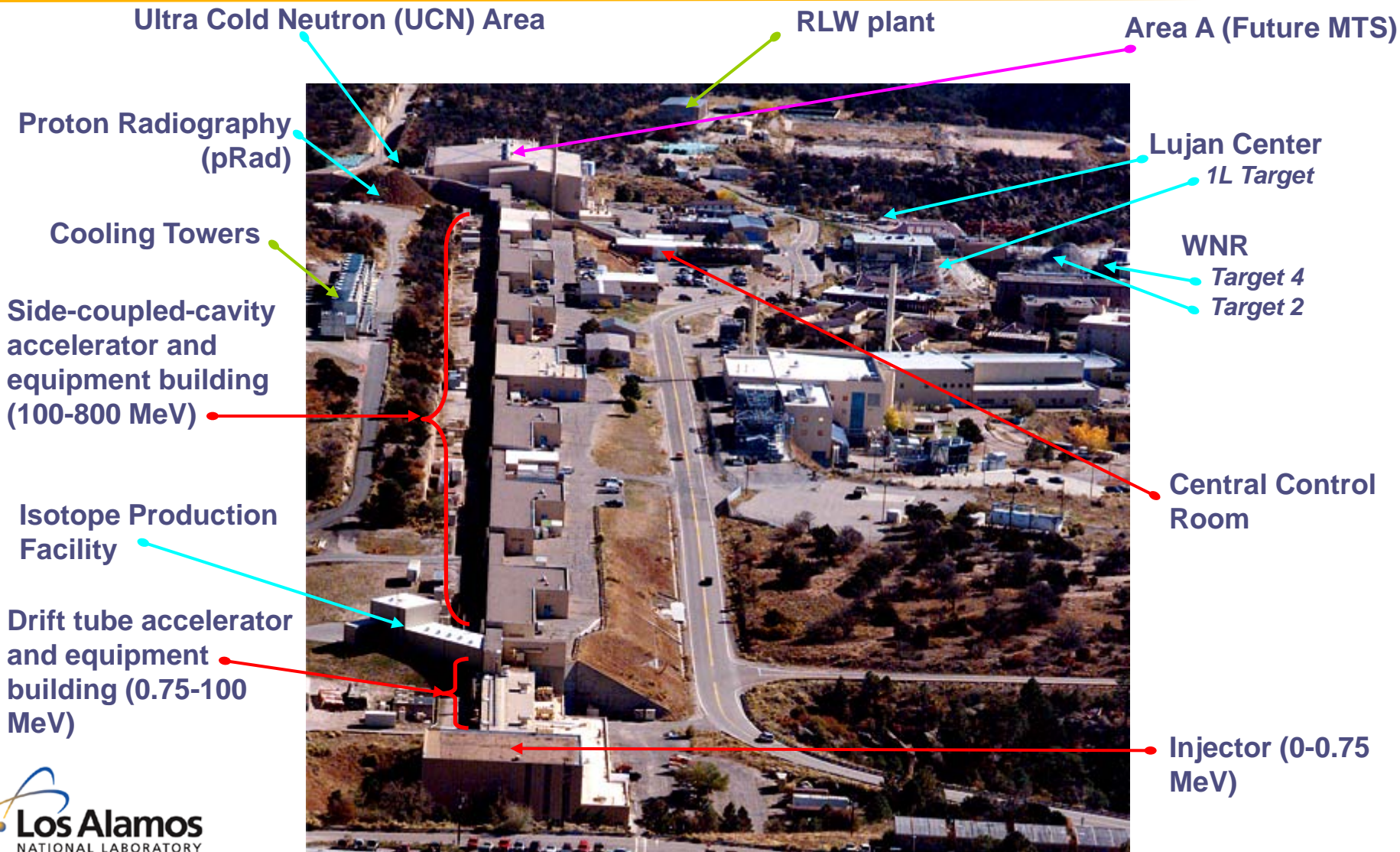
Selected highlights from the rich history of Los Alamos contributions to the field of accelerator technology (1)

- **Early-generation low-energy proton and electron accelerators were important to the Laboratory mission**
 - **Cockcroft-Walton and Tandem proton and light ion machines for nuclear physics measurements**
 - **PHERMEX – “Pulsed High Energy Radiation Machine Emitting X-Rays” for dense object radiography**
- **The invention of the side-coupled cavity room-temperature rf accelerating structure at Los Alamos led to the design and construction of LAMPF, now called LANSCE – the world’s first 1MW-class accelerator that has accelerated almost 1.4 moles of protons**
- **The development of Proton Storage Ring technology for linac pulse compression to generate intense neutron pulses**

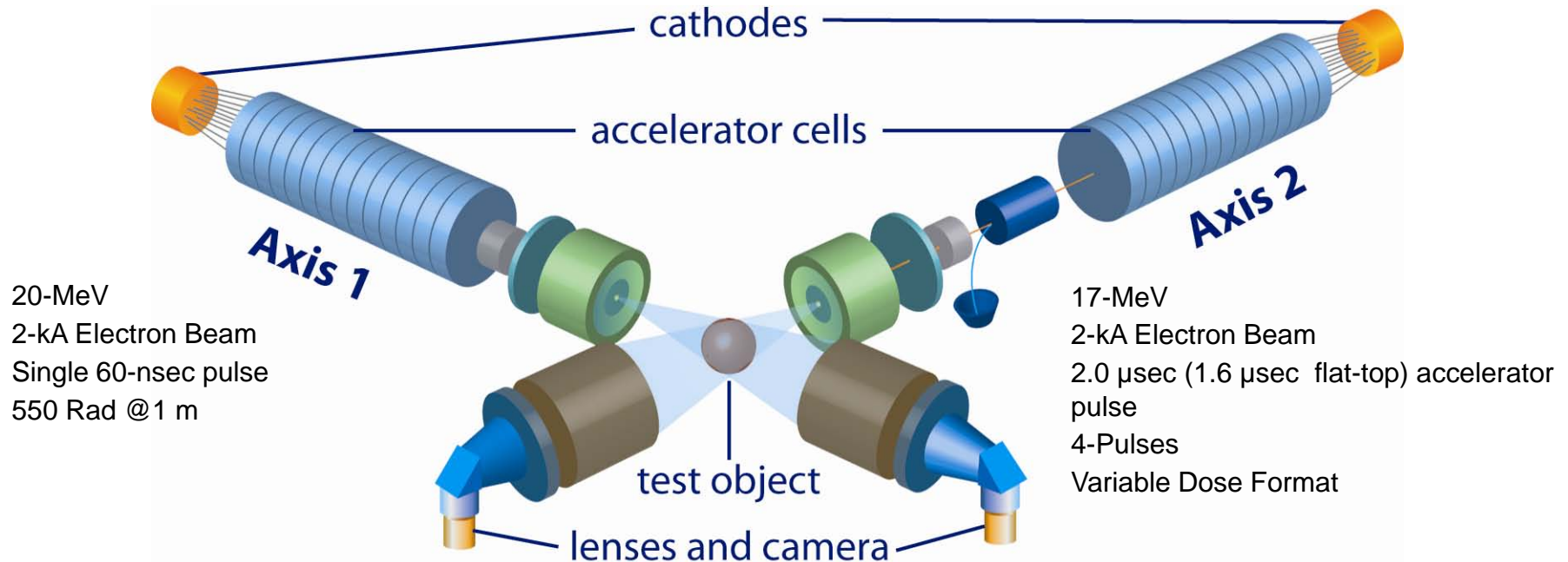
Selected highlights from the rich history of Los Alamos contributions to the field of accelerator technology (2)

- **Los Alamos was a key incubator for EPICS (Experimental Physics and Industrial Control System) and jointly with Argonne established the EPICS collaborative community**
- **First lasing using a compressed electron beam, and first measurements of longitudinal and transverse wakefields and their effects on lasing**
- **Invention of the FEL photoinjector and first lasing with a photoinjector**
- **The development of DARHT – Dual Axis Radiographic Hydrotest Facility – with two orthogonal high-intensity pulsed electron beam induction accelerators for dense object radiography**

The LANSCE accelerator provides uniquely flexible time-structured beams from 100 to 800 MeV that serve >20 active experimental stations



Electron beams from DARHT's two accelerators produce x-rays for dense-object radiography



■ Designed to meet programmatic radiography requirements:

- High beam energy and current
- High X-ray dose
- Small beam spot size and short pulse
- High resolution images

Los Alamos is undertaking a number of near-term initiatives in accelerator science and technology

- The LANSCE Life Extension Project will revitalize the core accelerator systems of the LANSCE Linac
 - New 201.25 MHz final power amplifier technology
 - New 805 MHz klystrons
 - New Low Level RF controls
 - New non-interceptive Beam Position and Phase measurement system
 - Modernize the accelerator control system
 - Modernize water and resonance control systems for the Drift Tube Linac
- A substantial role in the Office of Naval Research high power (100kW) free electron laser innovative prototype
 - Leverages substantial installed equipment from the prototype RFQ from the Accelerator Production of Tritium project
- Ongoing development efforts to improve charge-per-pulse for the H- beams at LANSCE to enhance neutron production and proton radiography
- Strengthen innovation in high-gradient laser-induced ion acceleration
- Re-establish LANSCE 1MW-class operation to support the planned Material Test Station

