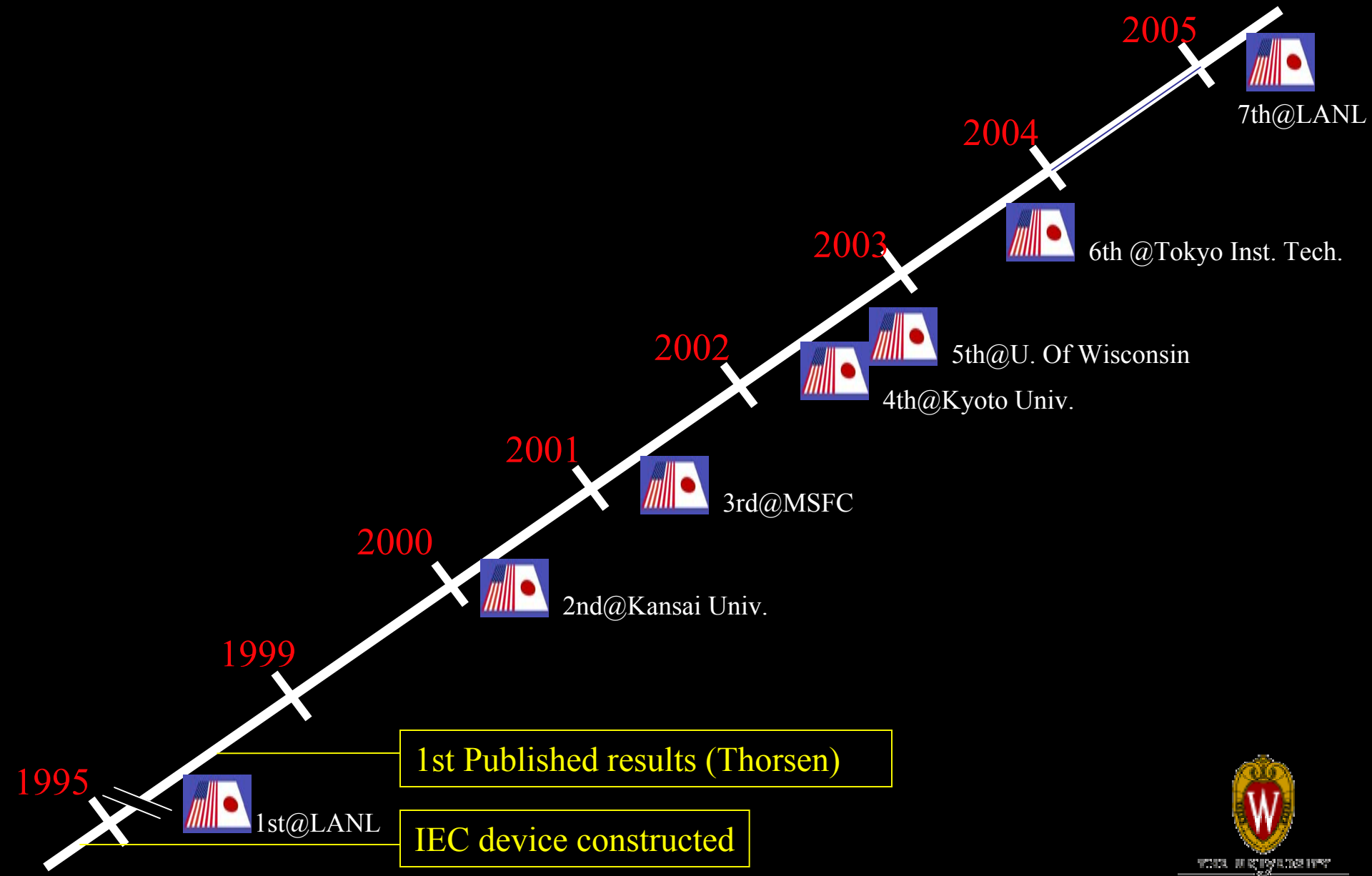
A Decade of IEC Research at the University of Wisconsin

R.P. Ashley

E.C. Alderson, D.R. Boris, R.C. Giar, G.L. Kulcinski, G.R. Piefer, R.F. Radel, T.E. Radel, J.F. Santarius, and A.L. Wehmeyer

University of Wisconsin-Madison, Fusion Technology Institute
1500 Engineering Drive
Madison WI 53706
(608) 265-3098

UW IEC History Timeline



Thorsen et. al. Begin UW IEC Work in 1994

1st Paper published in 1997

Convergence, electrostatic potential, and density measurements in a spherically convergent ion focus

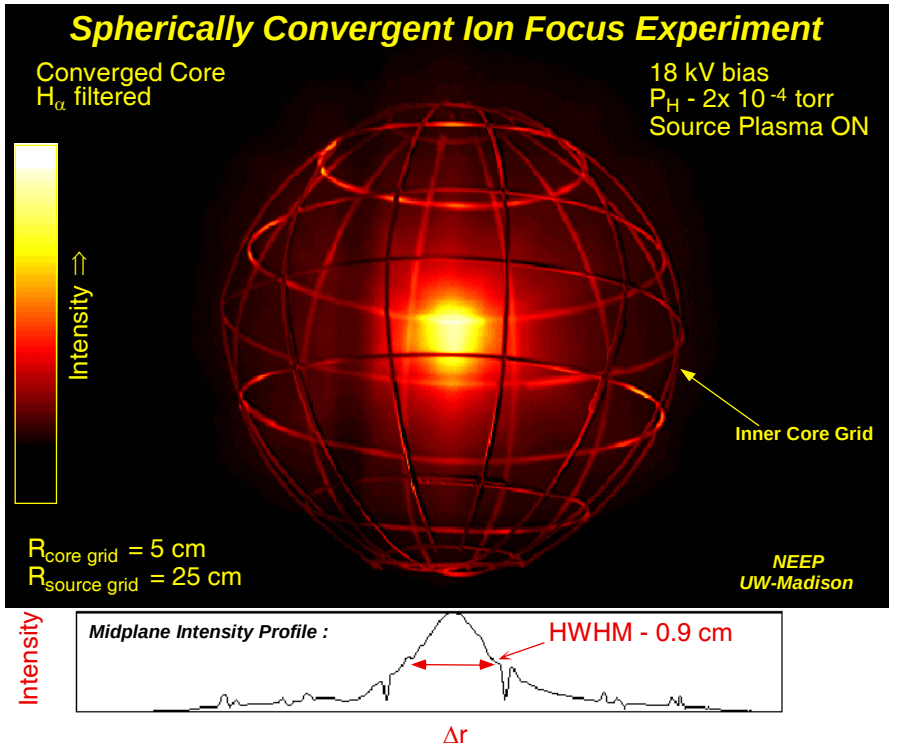
T. A. Thorson,[a] R. D. Durst, R. J. Fonck, and L. P. Wainwright
University of Wisconsin—Madison, 1500 Engineering Drive, Madison, Wisconsin 53706

Phys. Plasmas **4** (1), January 1997

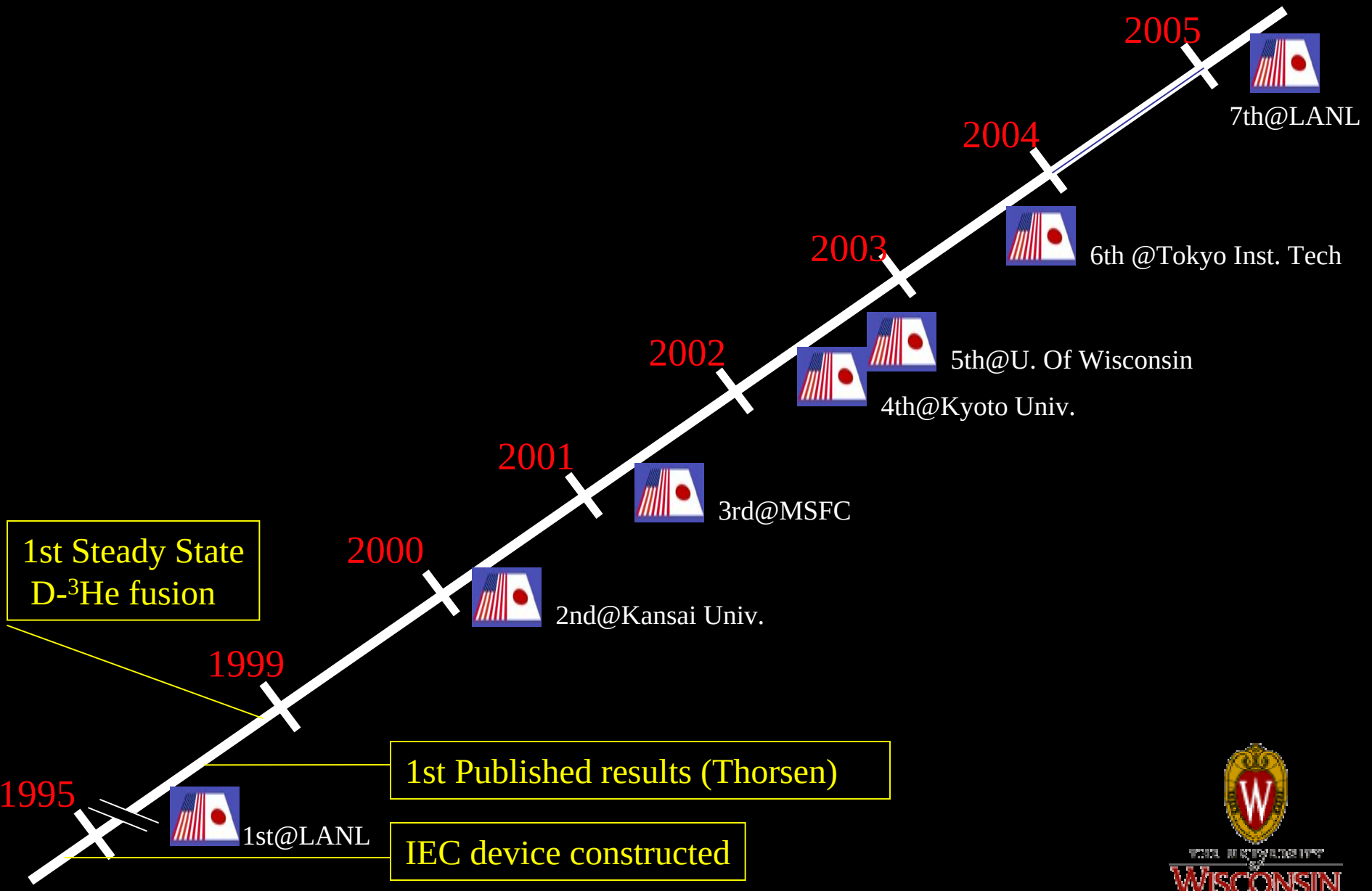
FUSION REACTIVITY CHARACTERIZATION OF A SPHERICALLY CONVERGENT ION FOCUS

T.A. THORSON, R.D. DURST, R.J. FONCK, A.C. SONTAG
University of Wisconsin-Madison,

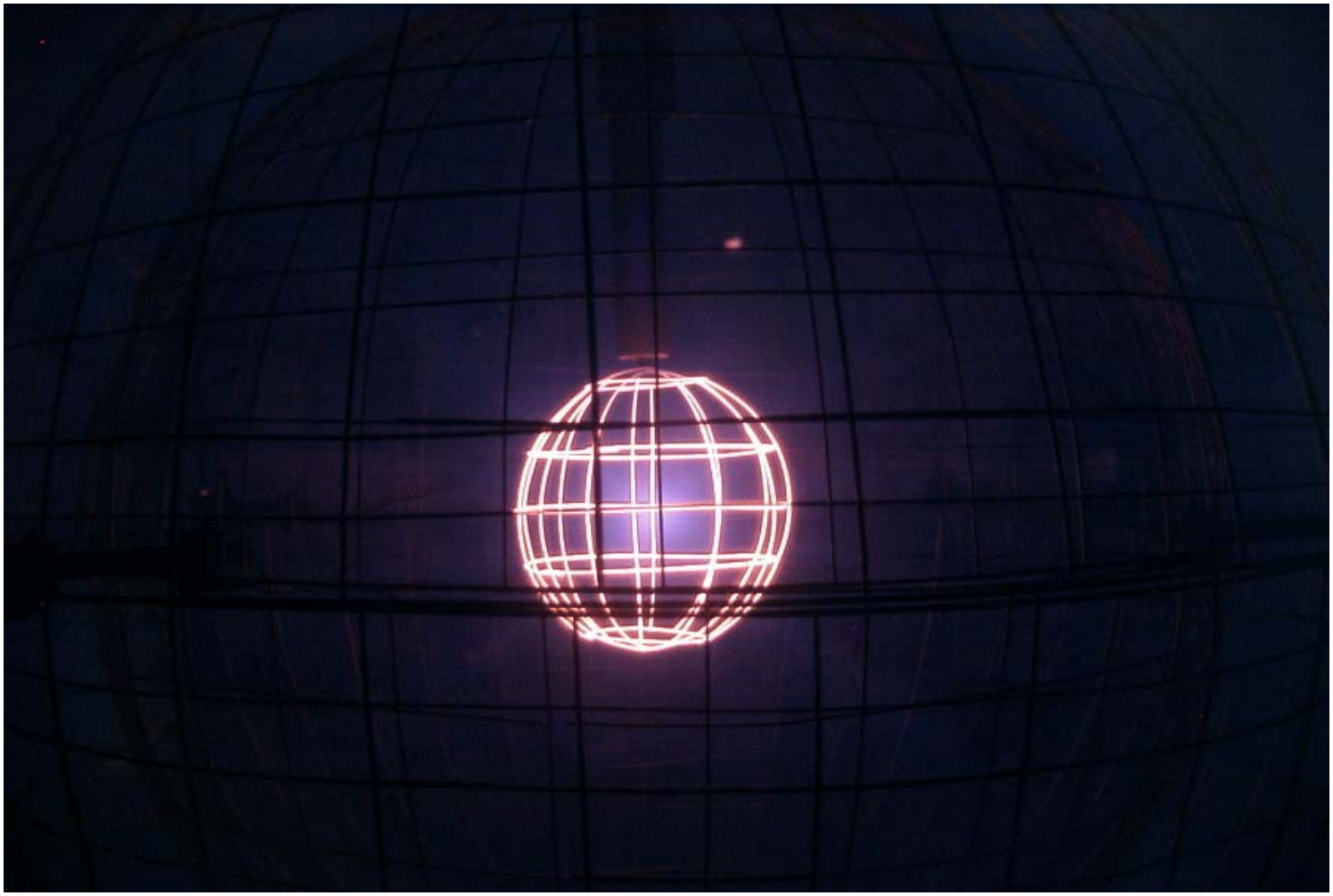
NUCLEAR FUSION, Vol. 38, No. 4 (1998)



UW IEC History Timeline



1st Steady State D-^{3}He Fusion Produced on 25 Oct 1998



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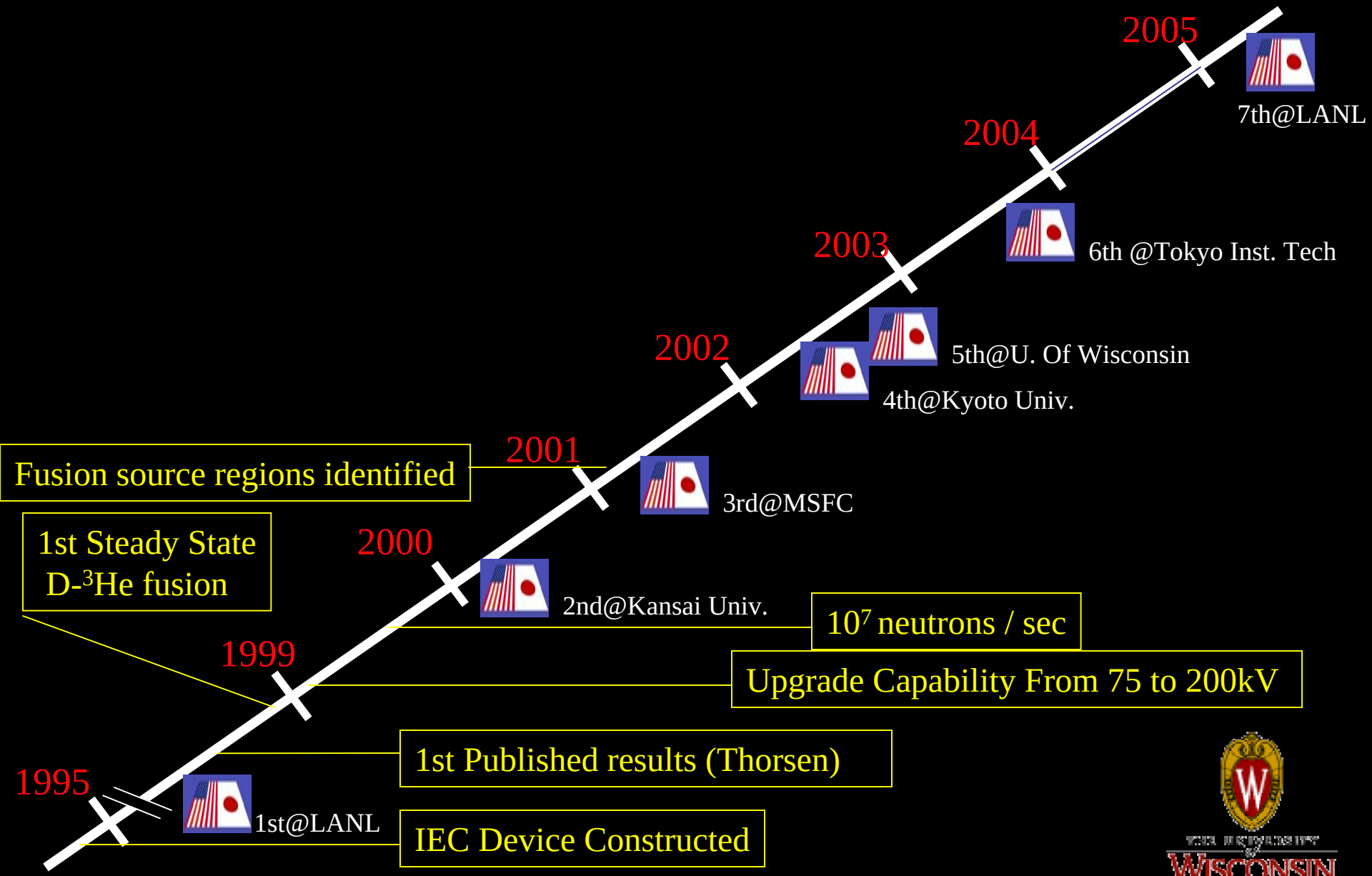
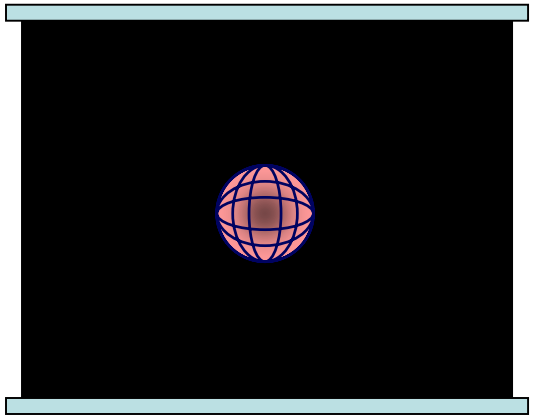


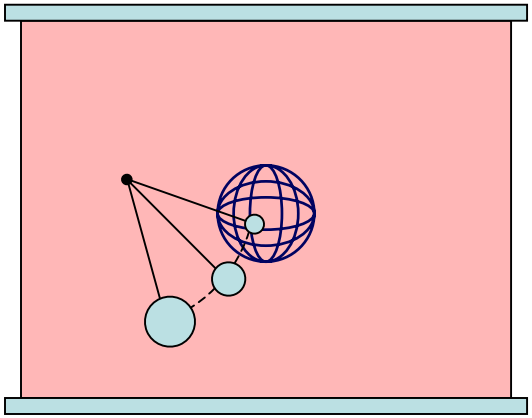
Three Sources of Fusion Reactions in an IEC Device Were Identified Using a Variable Size Eclipse Disk

Converged Core



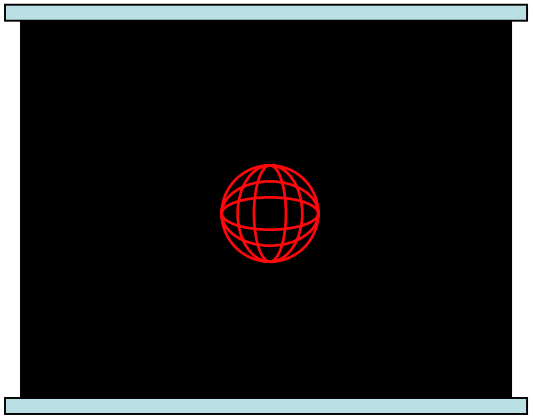
Fusion Occurs
Inside the Cathode

Charge Exchange



Fusion Occurs Throughout
Entire Volume of the Chamber

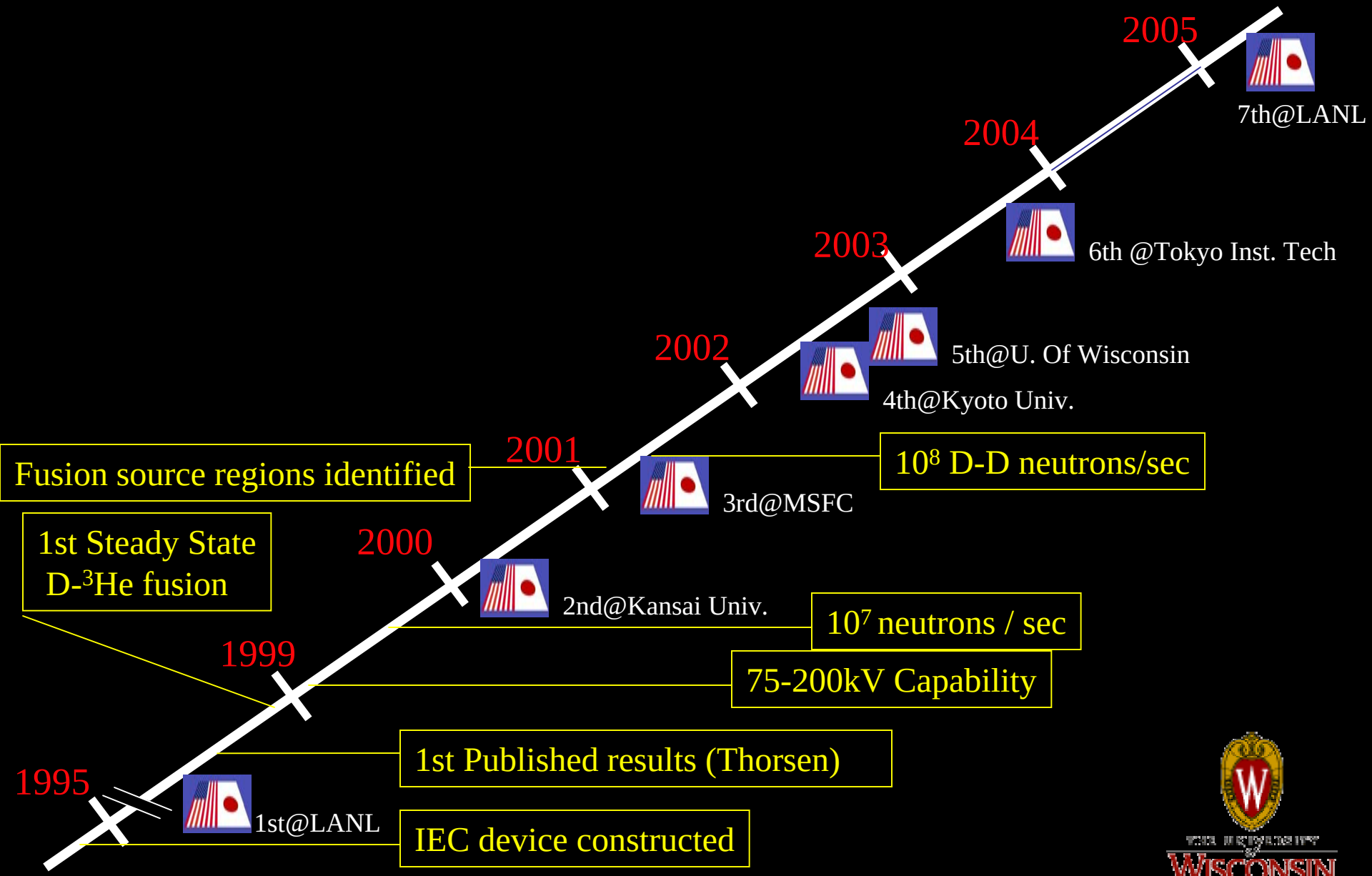
Embedded Ion



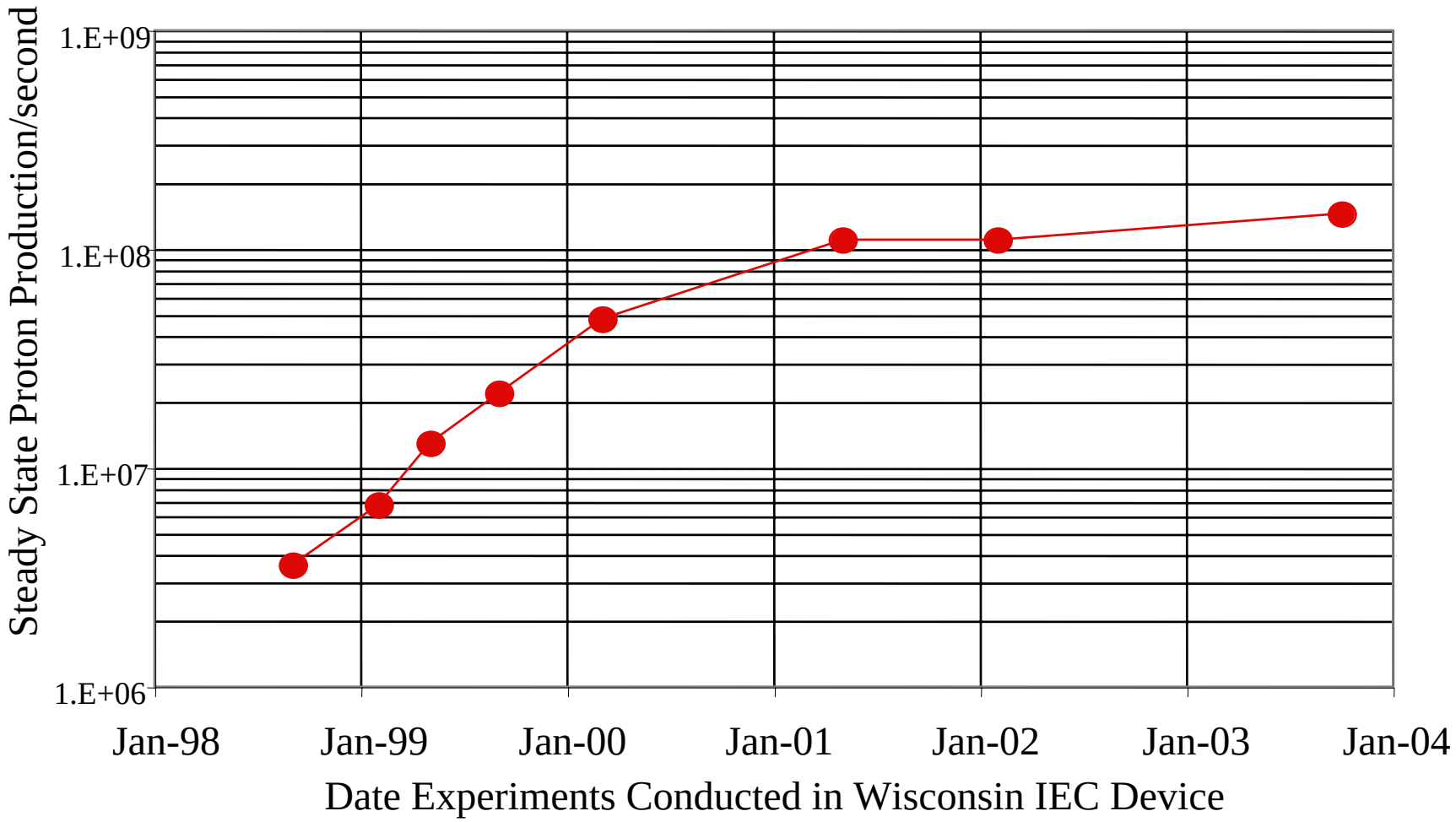
Fusion Occurs on the Surface
of the Cathode Grid Wires

- All three sources can be present at the same time
- Fraction depends on voltage, fuel, pressure, and past history

UW IEC History Timeline



Steady State D-D Neutron Records



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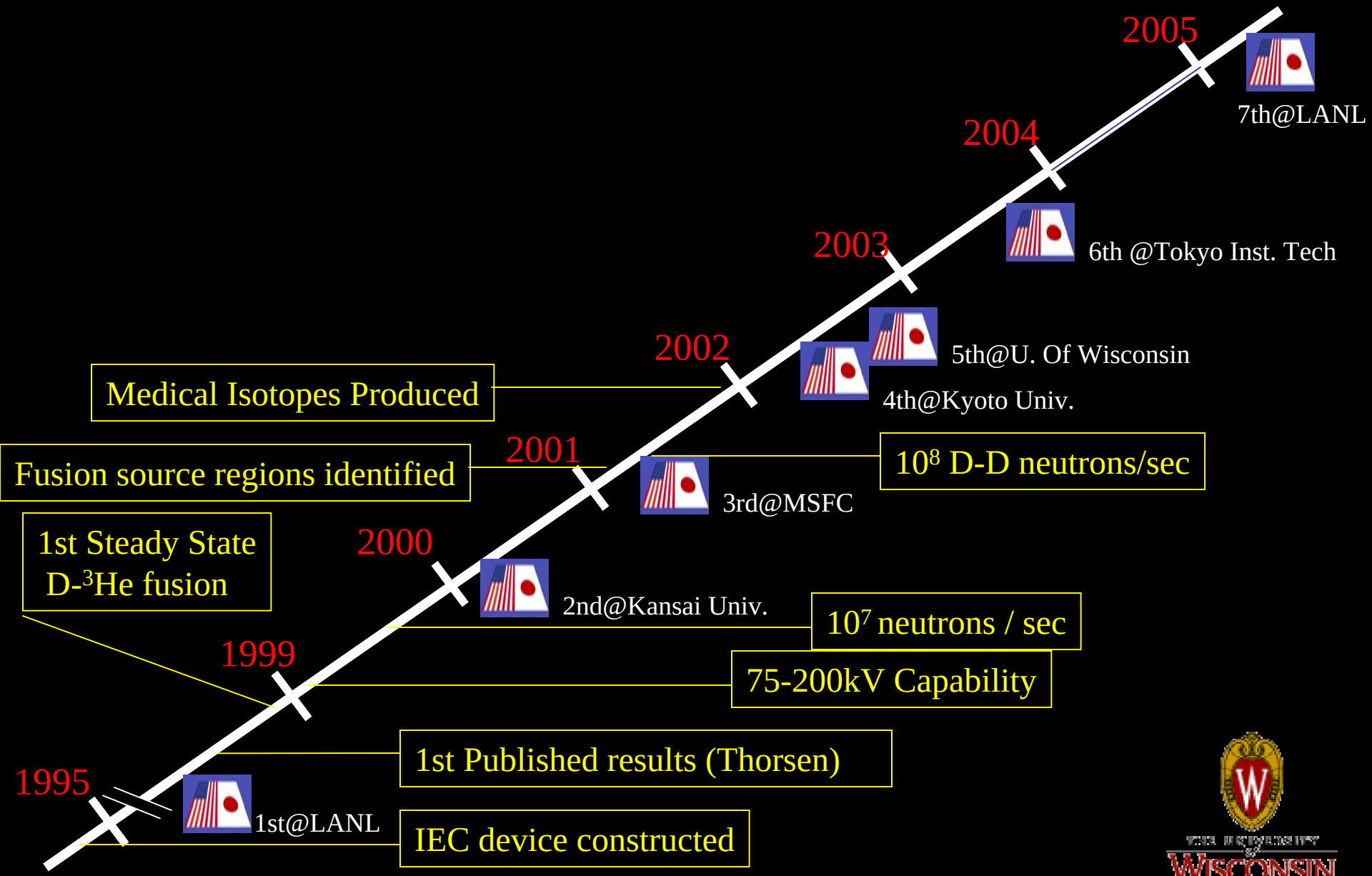
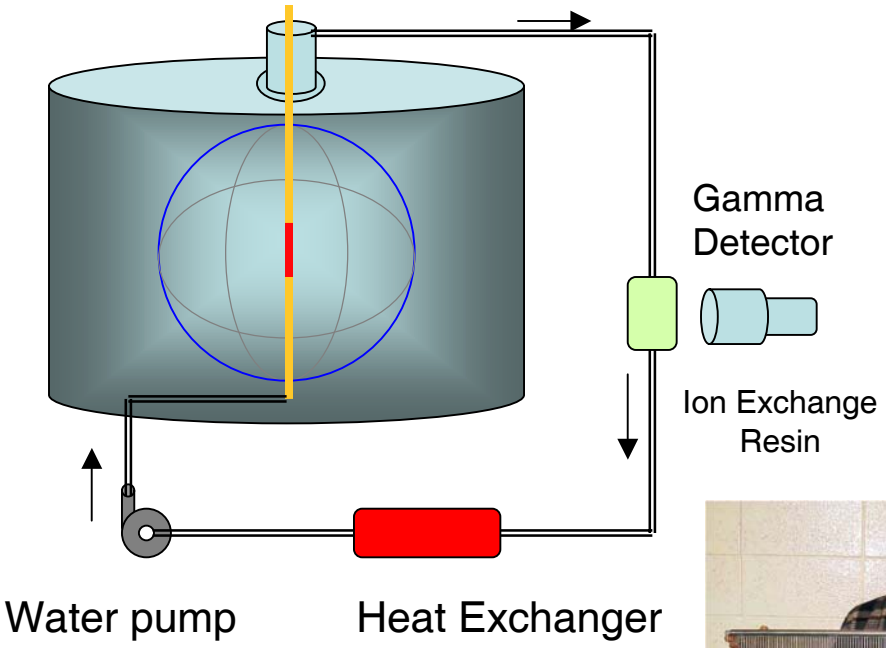
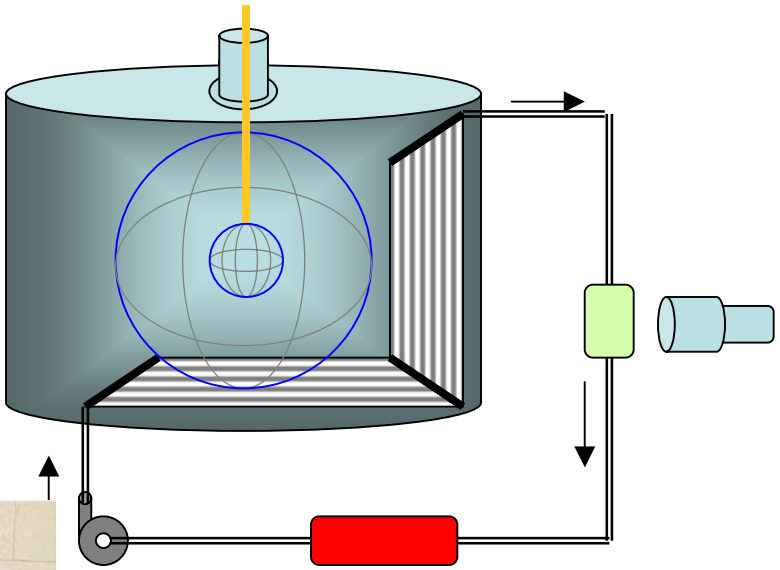


^{94m}Tc & ^{13}N Medical Isotopes Produced With D-^{3}He Protons

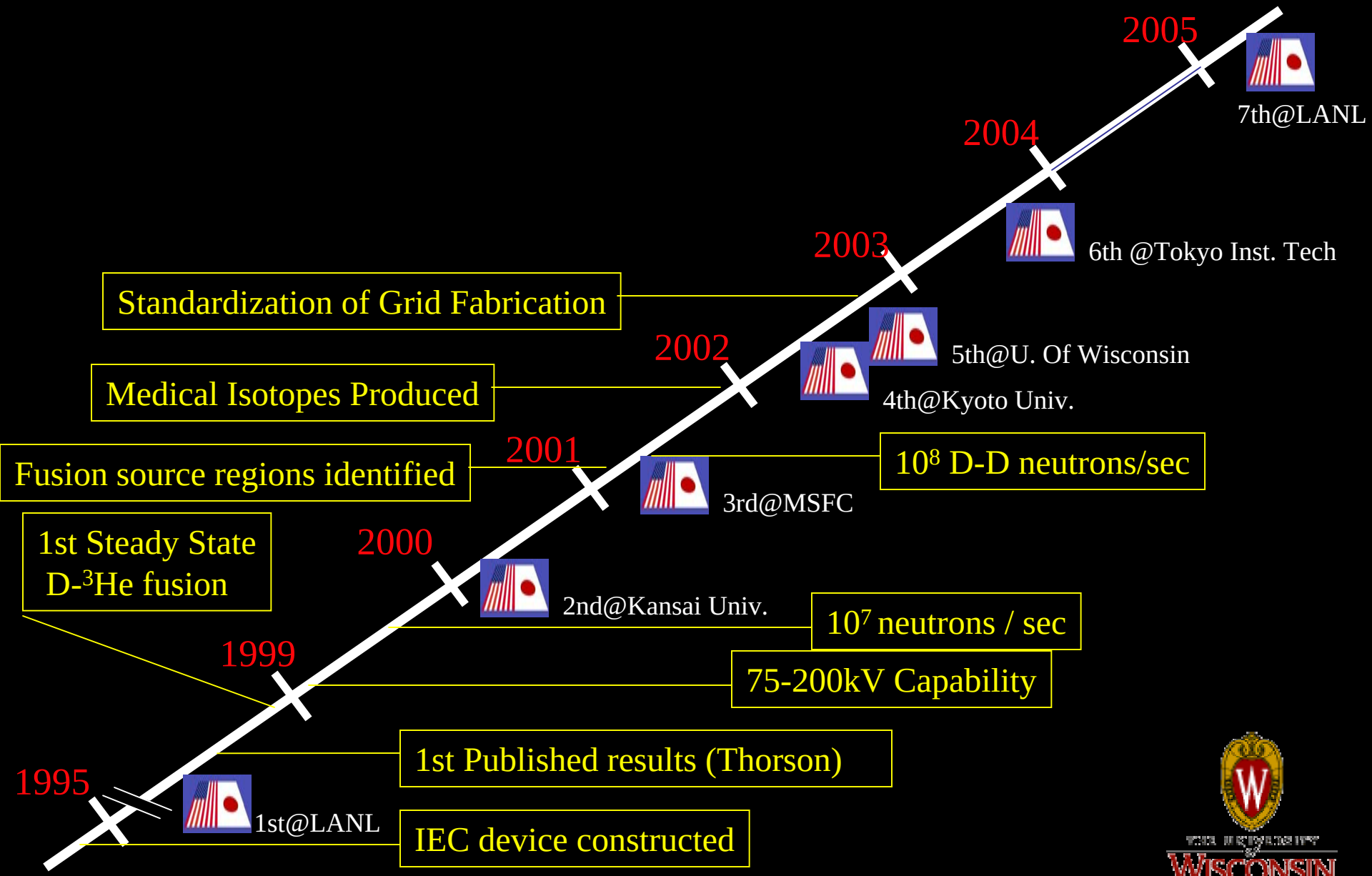
Water Cooled Cathode Target for ^{13}N



Water Cooled Wall Target for ^{13}N

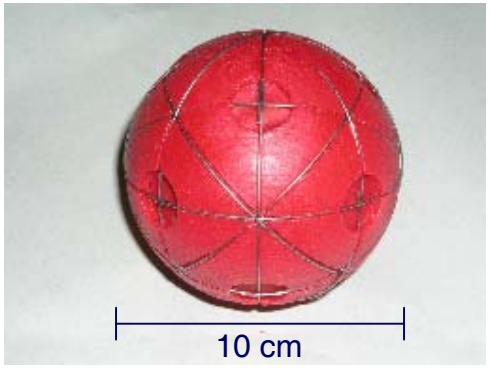


UW IEC History Timeline



Grid Fabrication System

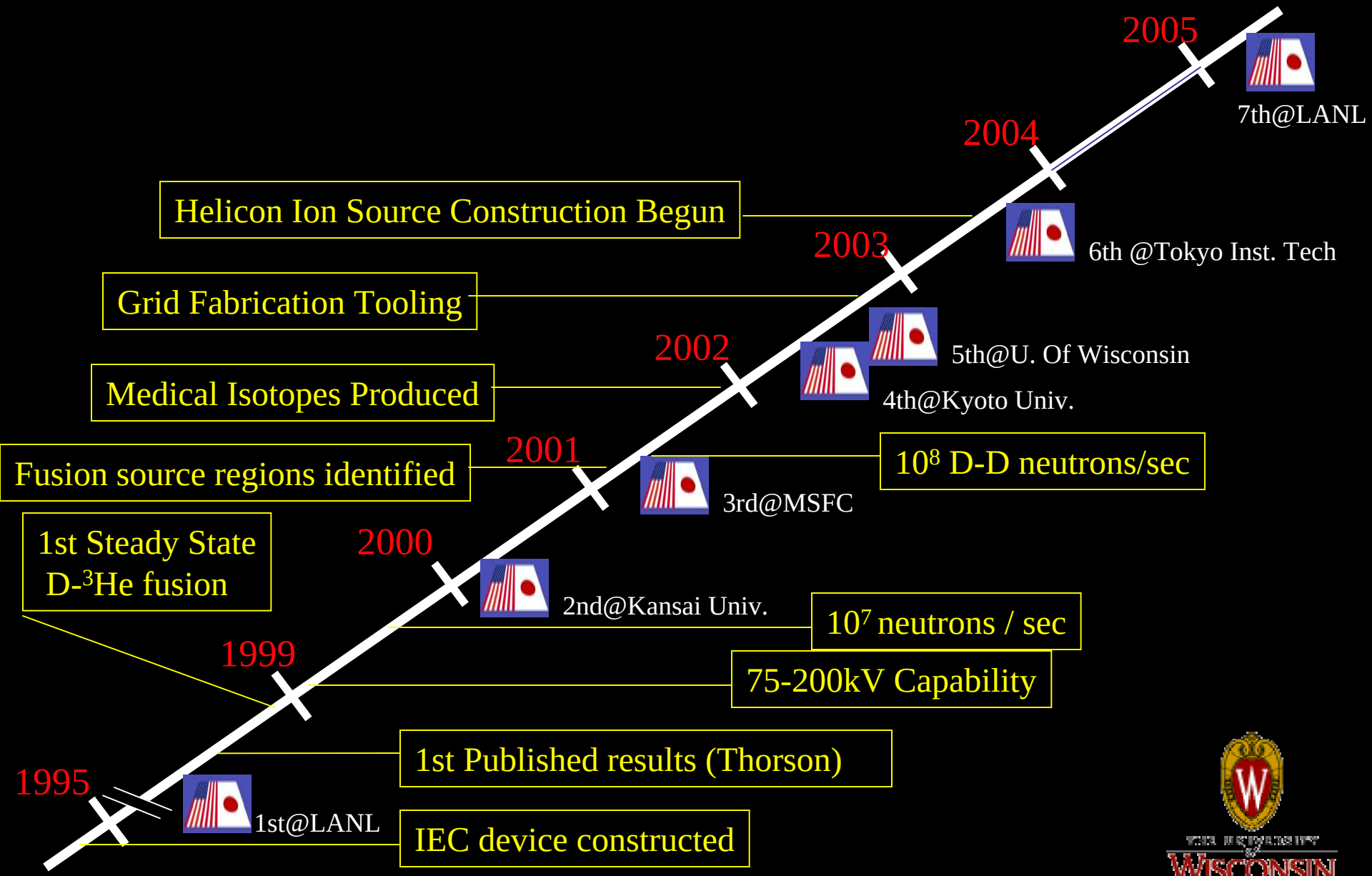
1. Mold produced from prototype



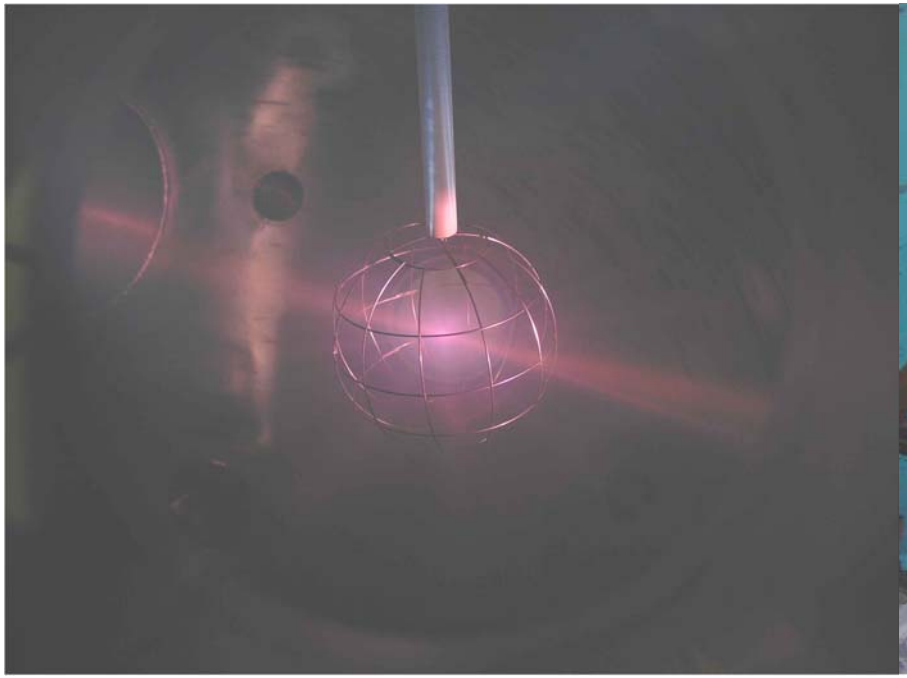
2. Wires wound around wax form

3. Finished grid cathode

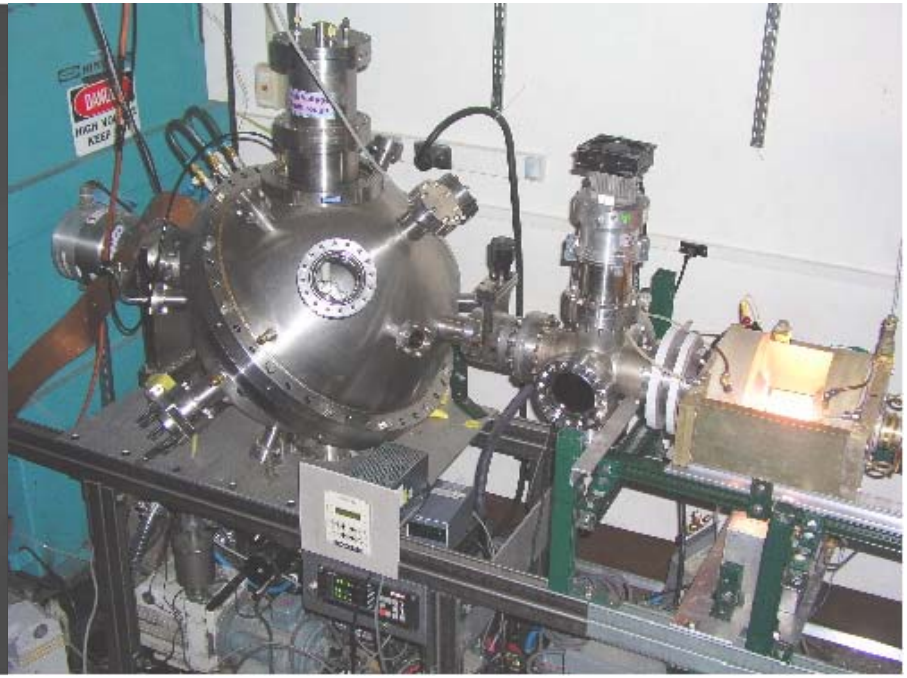
UW IEC History Timeline



Ion Gun Constructed to Study Converged Core Operation

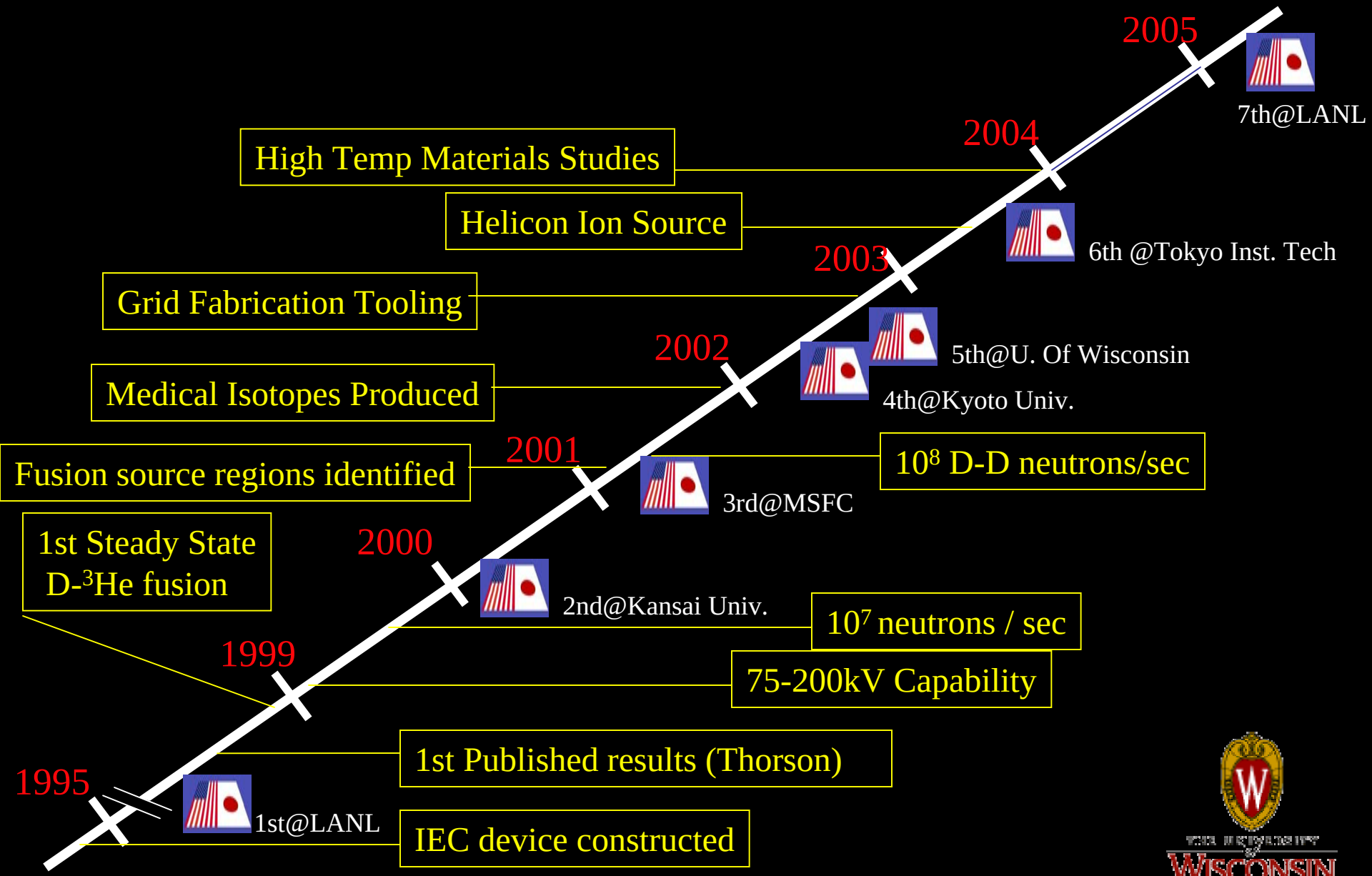


$^{4}He^{+}$ Beam Injected at 30 kV



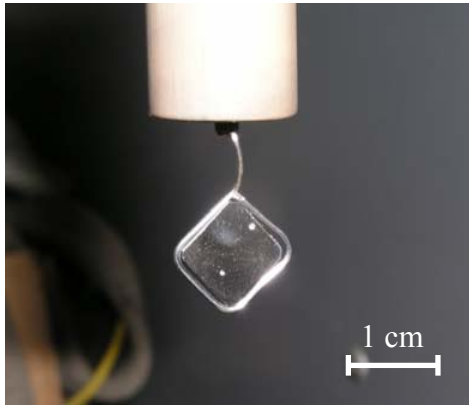
Helicon Source Coupled to IEC Chamber

UW IEC History Timeline

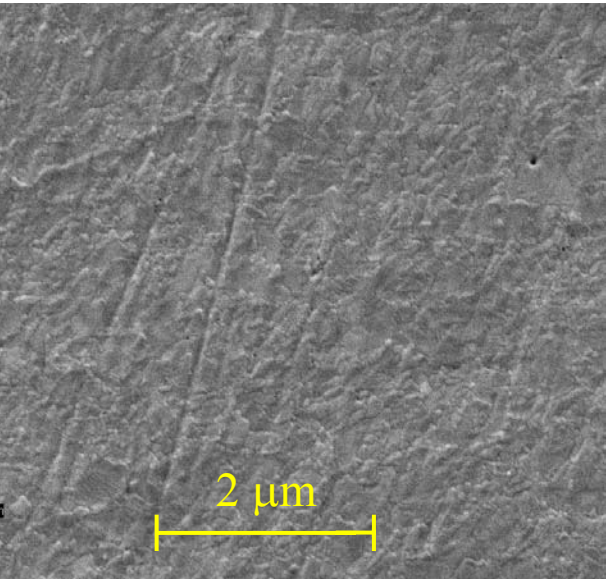


UW-IEC Has Been Used to Irradiate Tungsten Samples With D & He

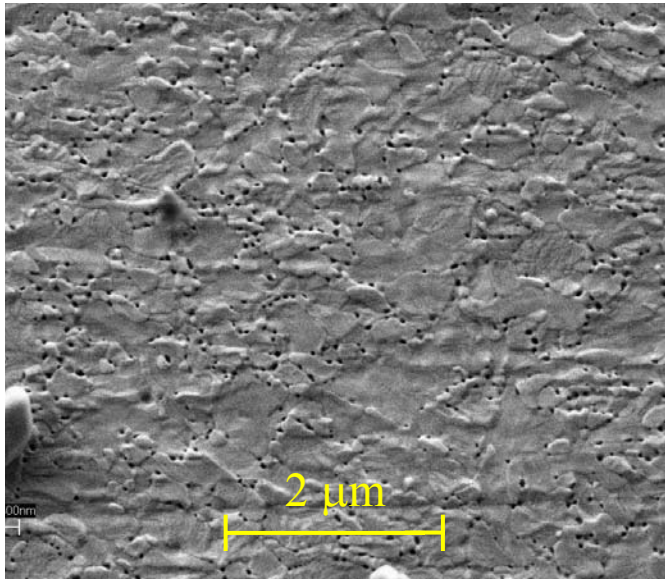
- Polycrystalline
- Single Crystal
- Tungsten “Foam”
- 800-1200 C



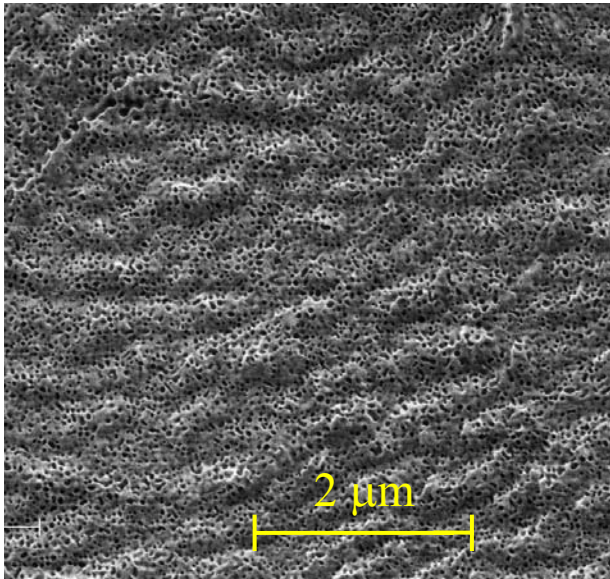
As Received



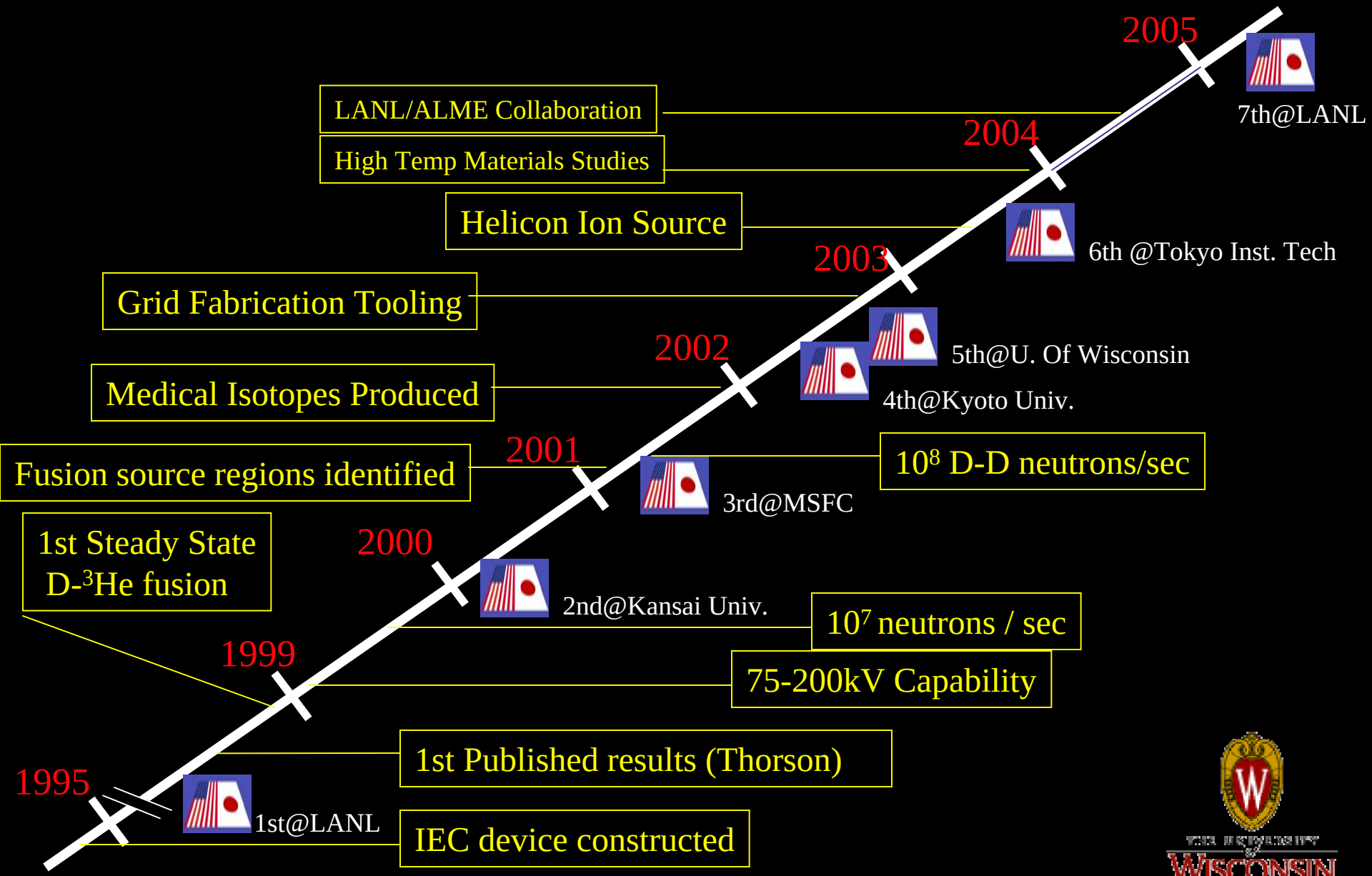
$1x10^{18}$ He /cm^2, 850 °C



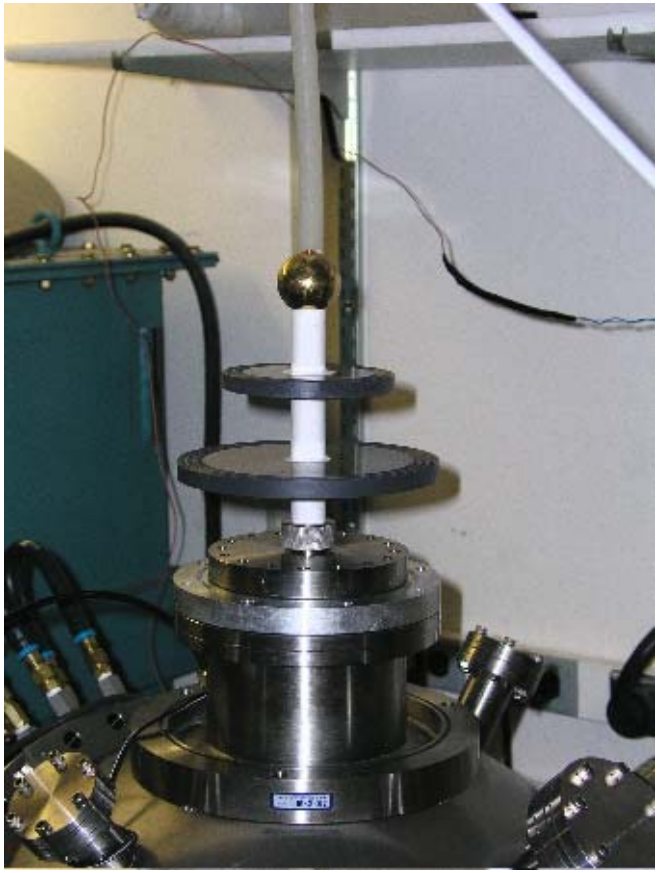
$1x10^{19}$ He /cm^2, 850 °C



UW IEC History Timeline



Stalk and Grid Fabrication For Other IEC Groups



Stalk under high voltage test

A Happy Customer

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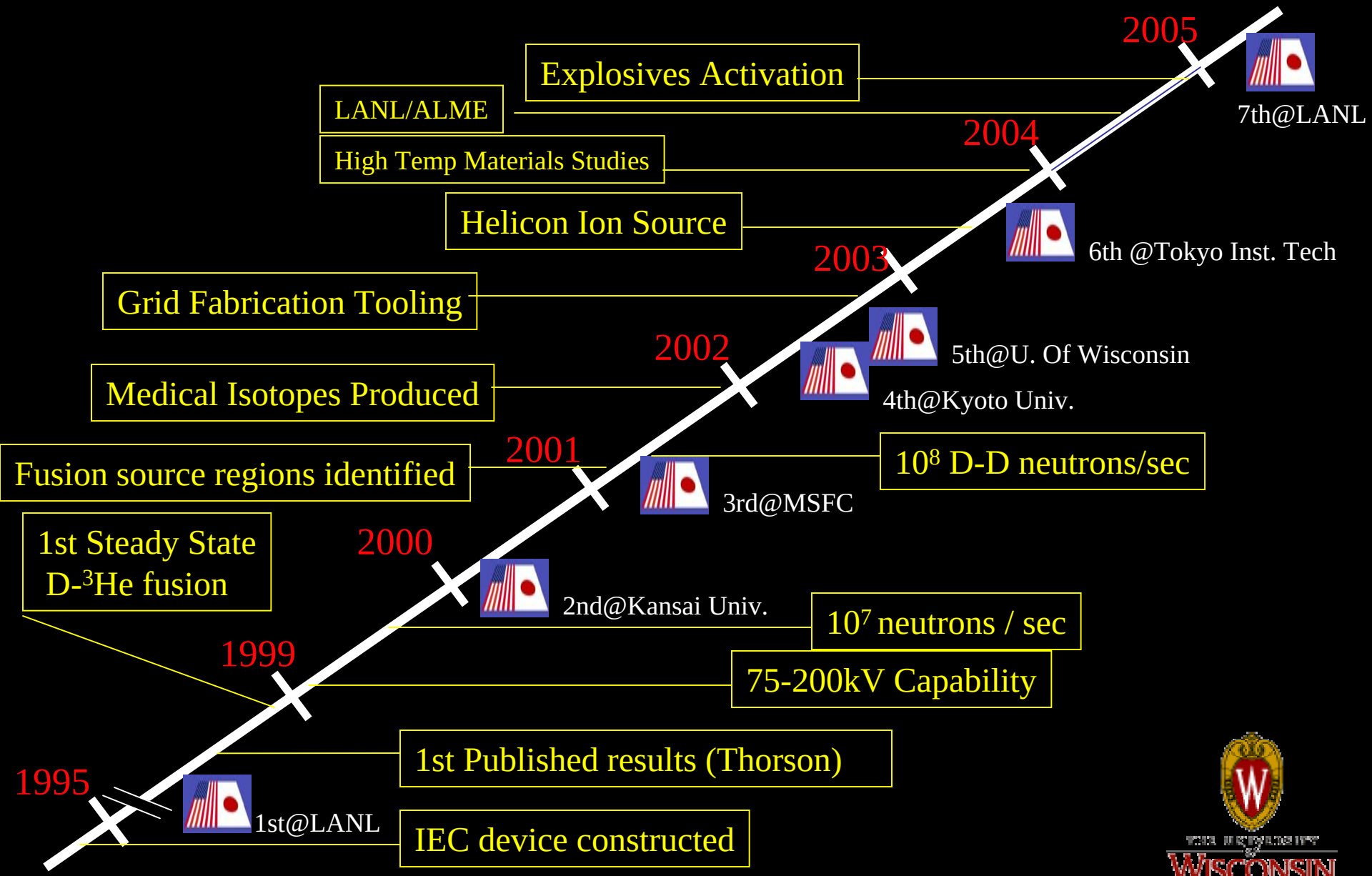
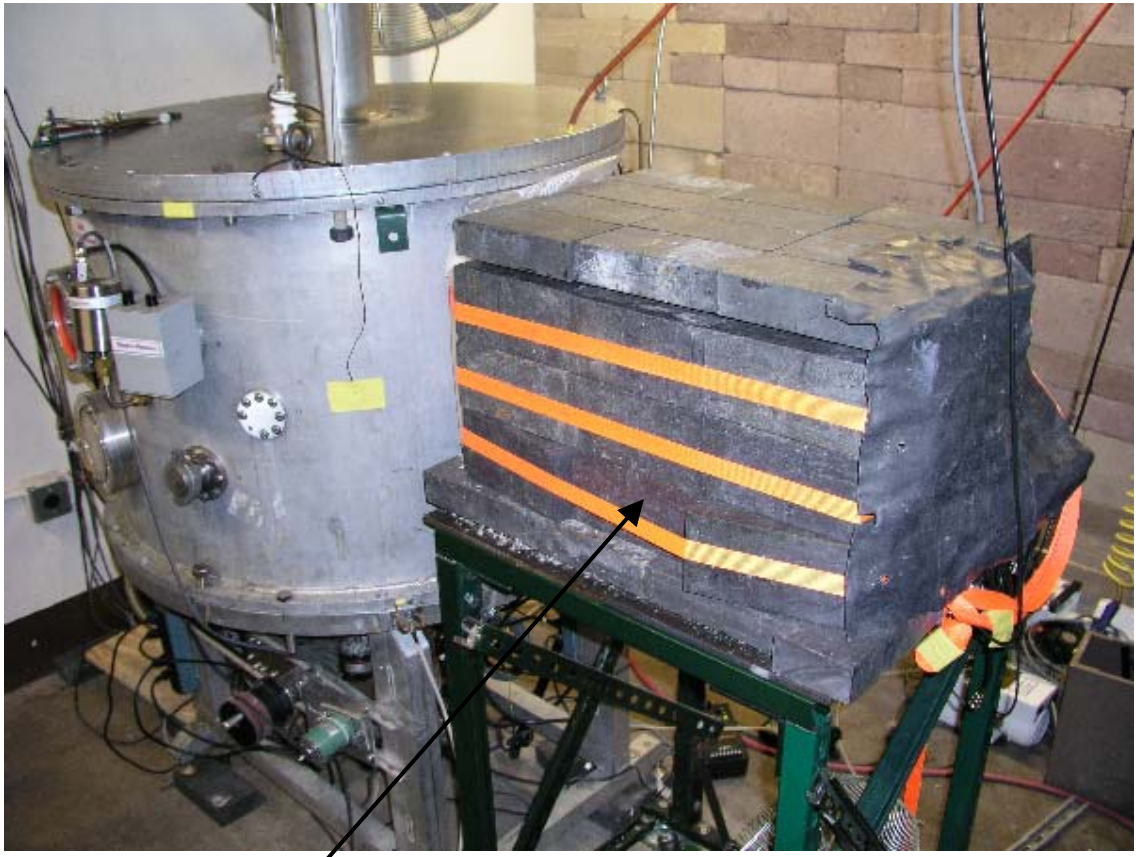


Neutron Activation of Explosives Explored



Explosives Containment and Detection Assembly

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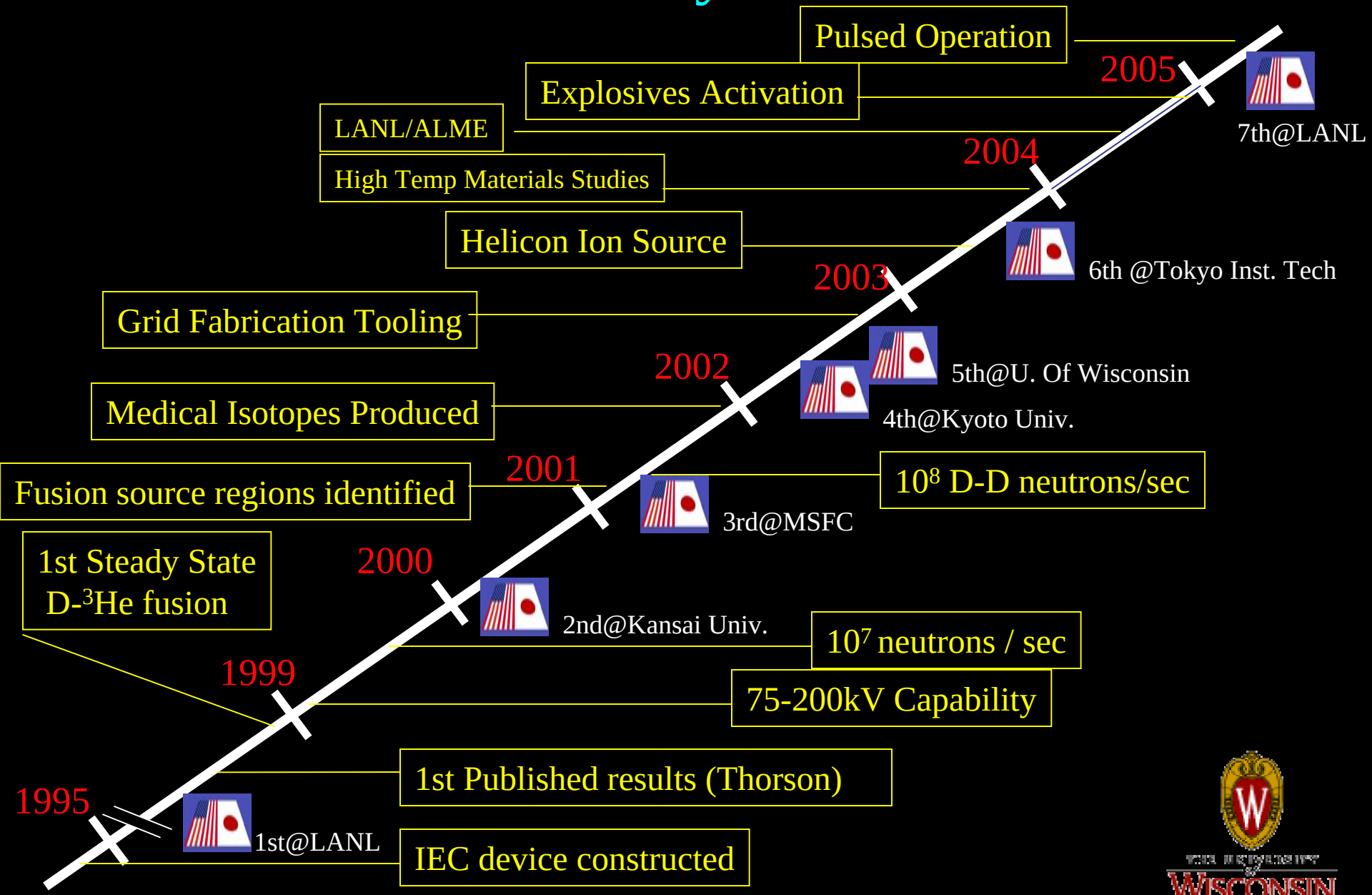
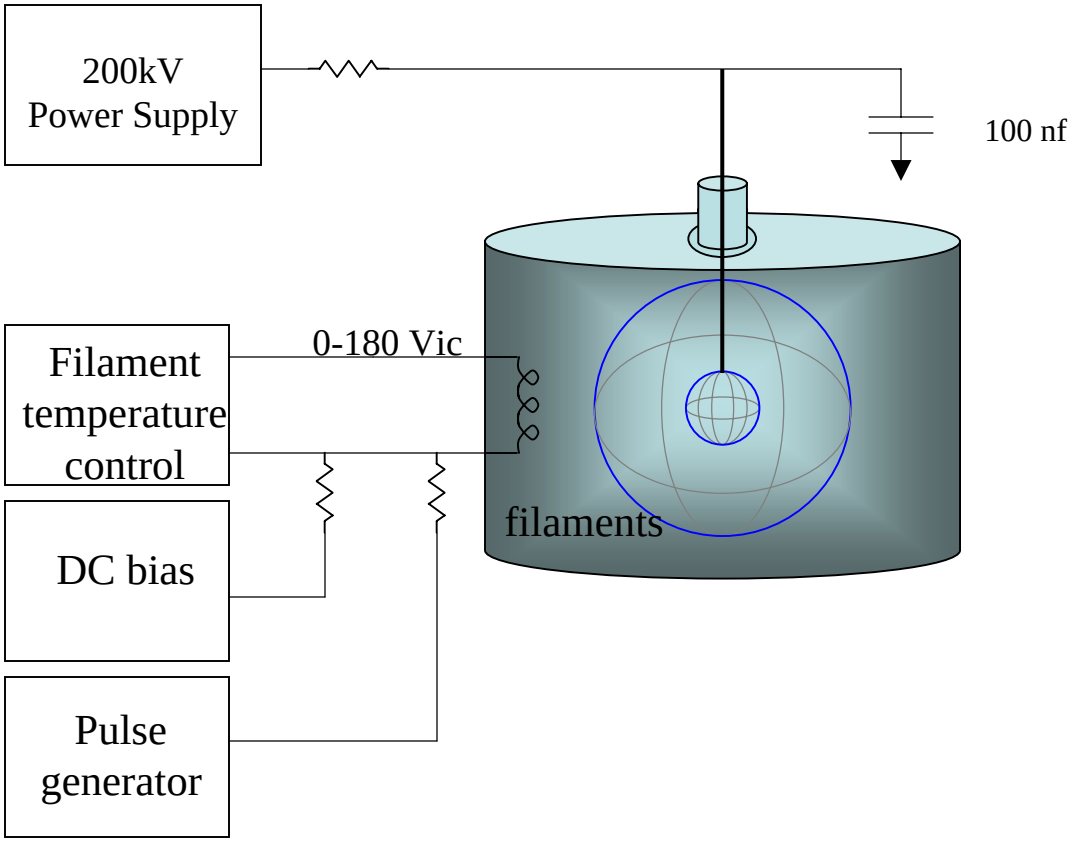
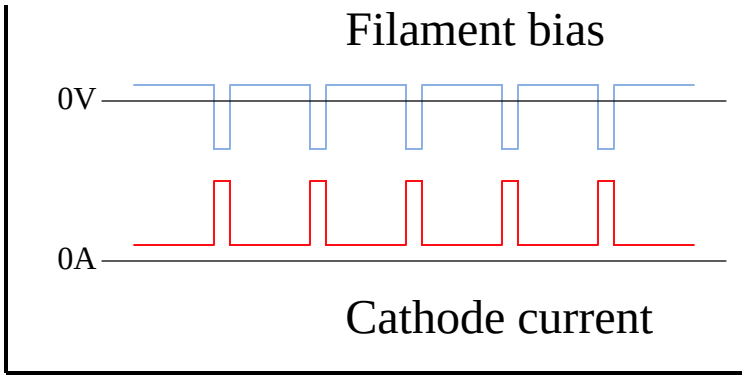
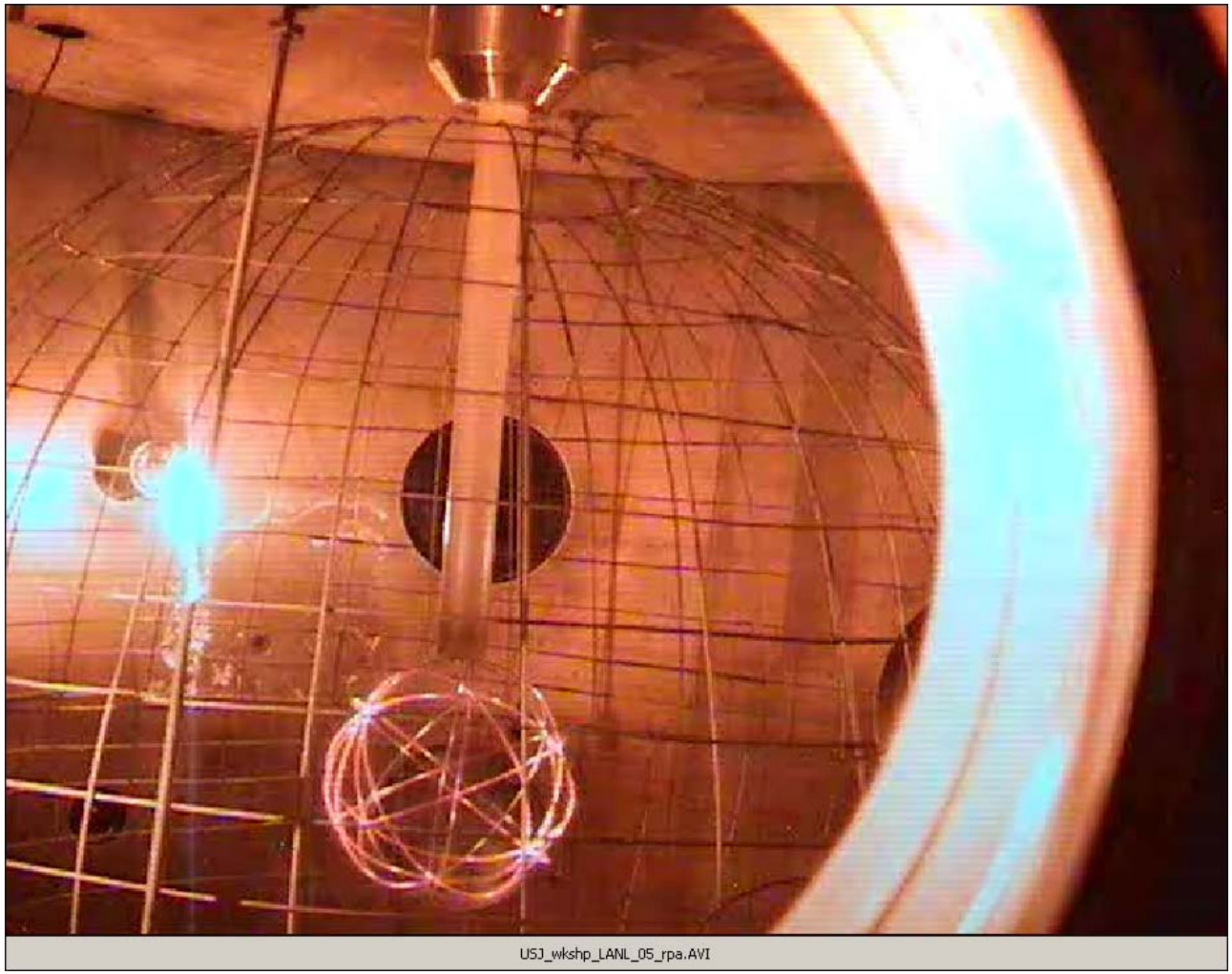


Pulsed Operation of the Ion Source Has Been Demonstrated

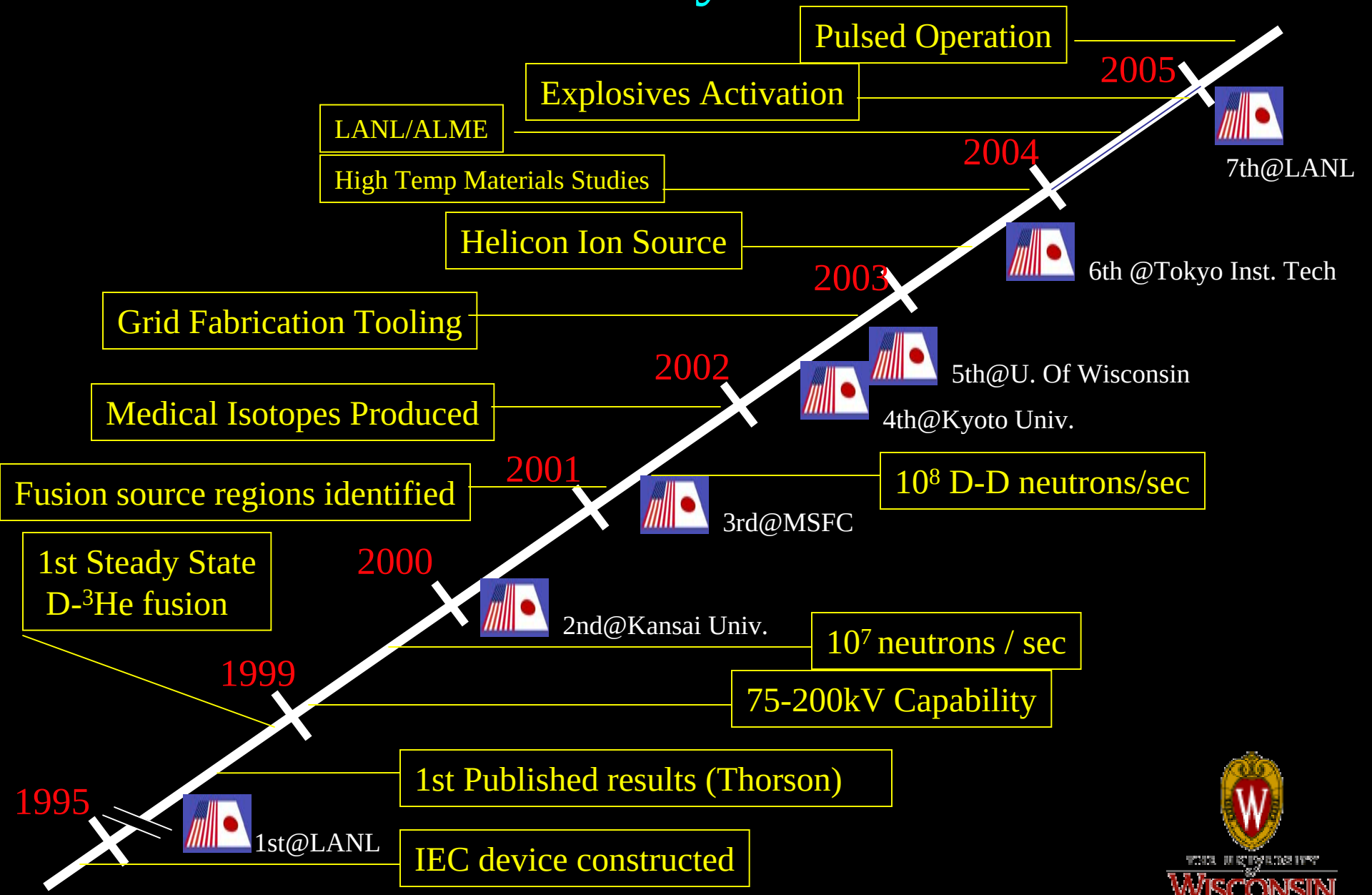




Pulsing at 1 Hz Shows Plasma and Grid Wire Response



UW IEC History Timeline



Upcoming Talks on IEC Activities At The University of Wisconsin

- Atomic Physics Effects on IEC Ion Radial Flow
  - Gil Emmert (Monday, 3:45 Pm)
- Helicon Ion Source
  - Greg Piefer (Tuesday, 8:30 Am)
- Neutron Activation of Explosives
  - Alex Wehmeyer (Tuesday, 9:30 Am)
- Implantation of Fusion First Wall Materials
  - Ross Radel (Tuesday, 10:45 Am)

Questions?