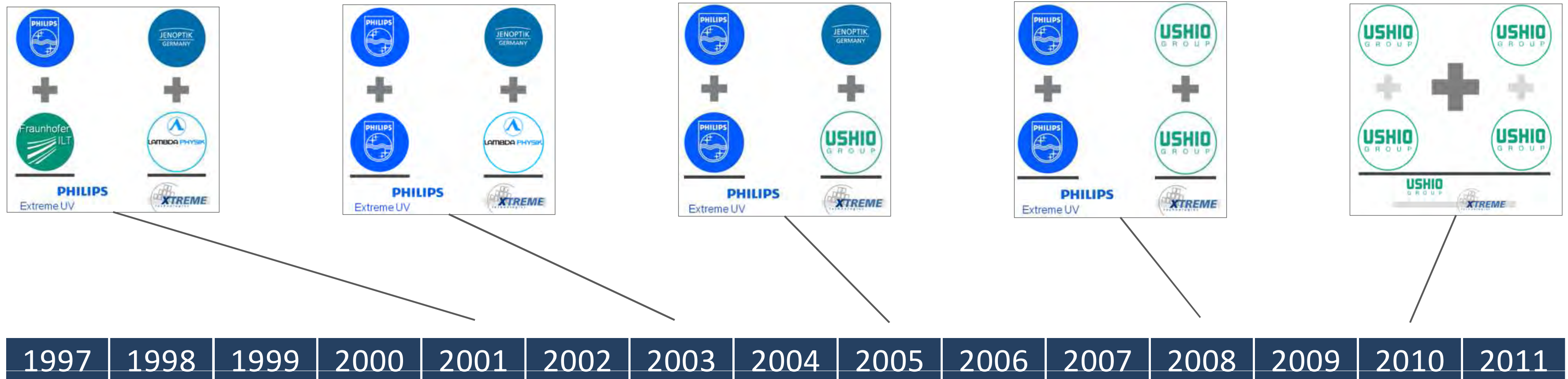
EUV: The Path To HVM

LDP Technology Status

July 2011

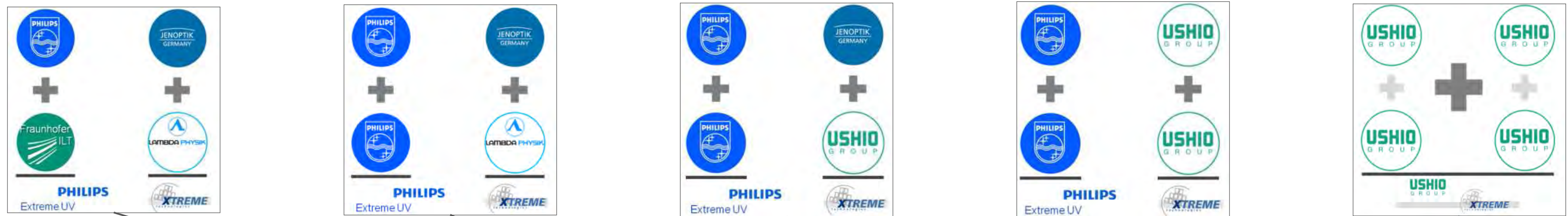
EUV Is Our History



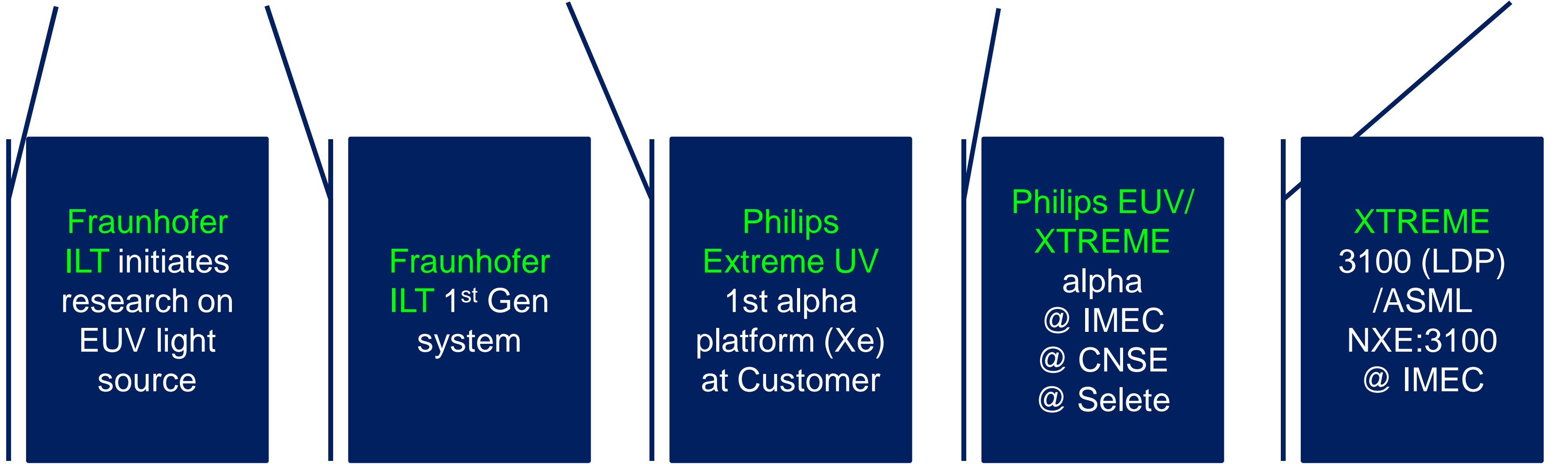
- With years of experience at LPP (Jenoptik) and DPP, XTREME has gained a deep understanding of the technological challenges

XTREME's Learning Edge

- Enabling HVM = Reaching technology maturity BEFORE the transition to HVM



1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011



Enabling EUV Lithography

Requirements for an EUV Source

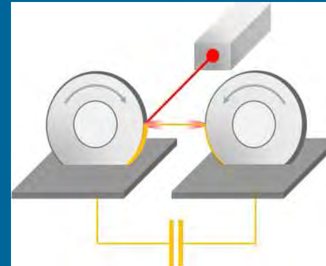
EUV SCANNER		**EUV Source**
Imaging		Clean Photon (& Spectral purity)
Yield - CD uniformity - Iso-Dense Bias		Stability (Dose, Timing …)
Maximum Throughput		Power
Effective Throughput		Duty Cycle and Availability

The Technology Concept: The Best Of Both Worlds

Laser-assisted Discharge Plasma

Traditional LPP

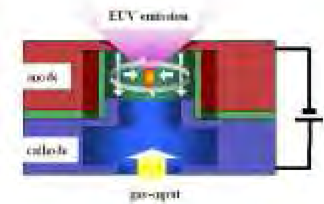
(LDP)



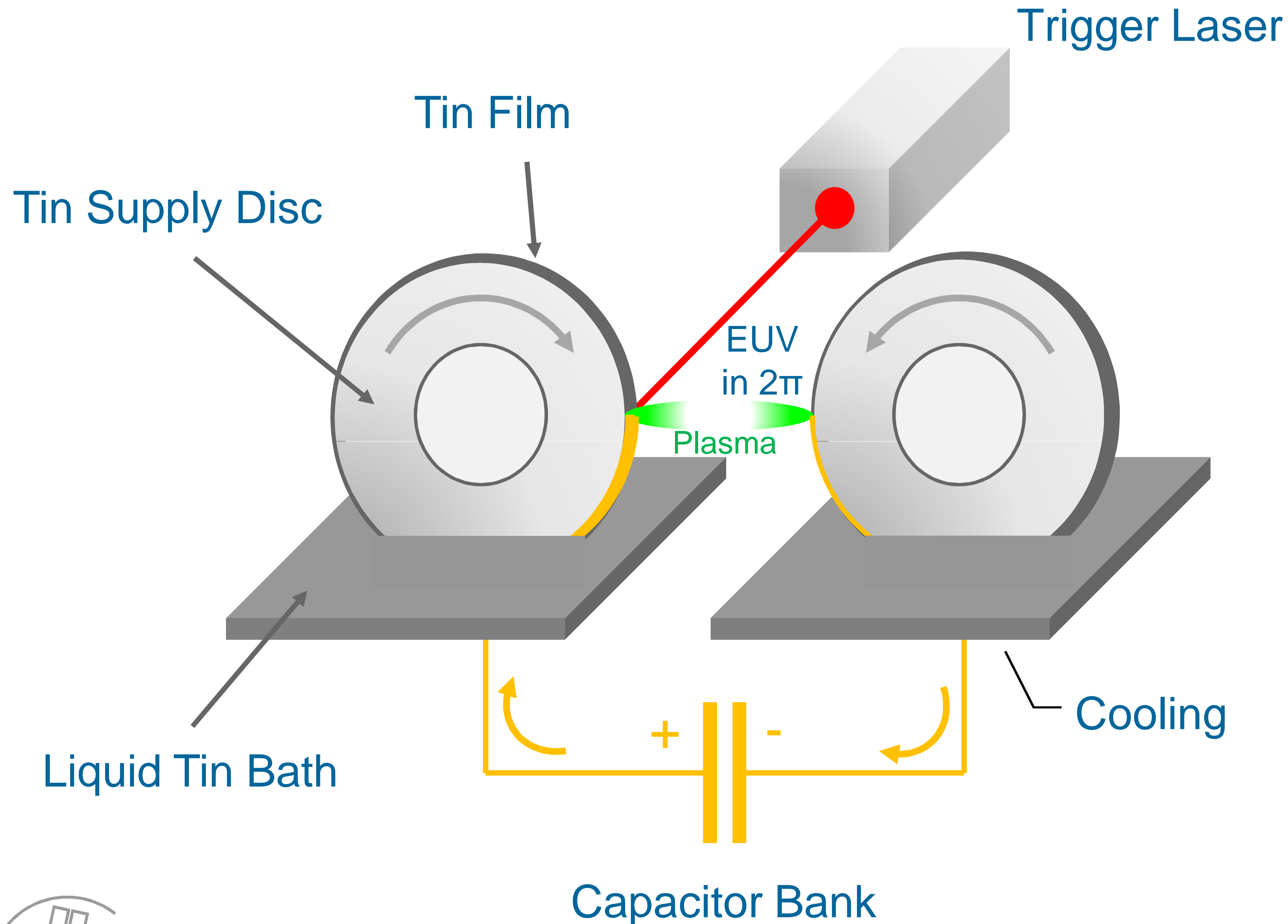
Stable

Scalable

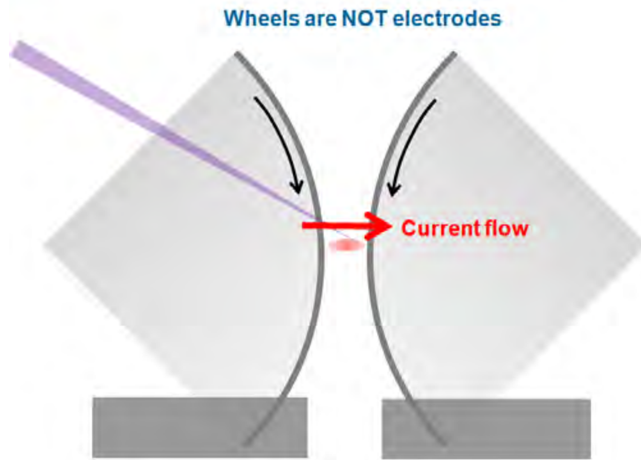
Traditional DPP



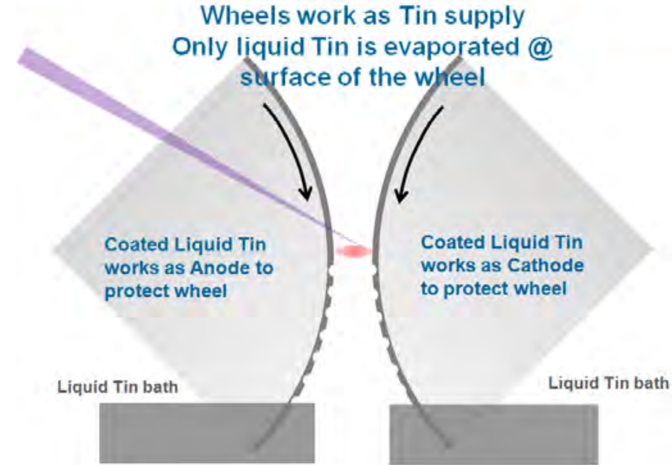
Laser-assisted Discharge Plasma (LDP) Technology Concept



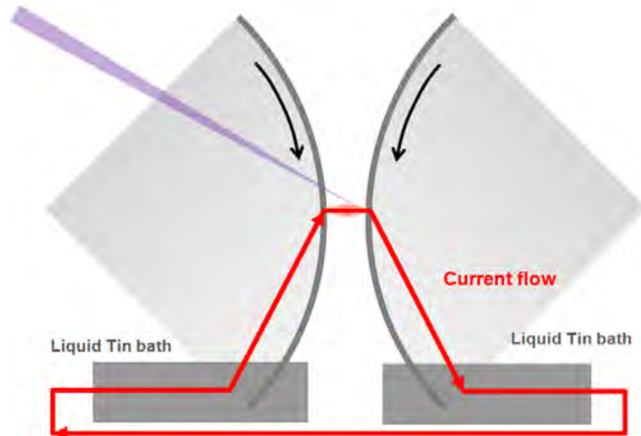
LDP Technology Concept – Tin Fulfills Multiple Roles



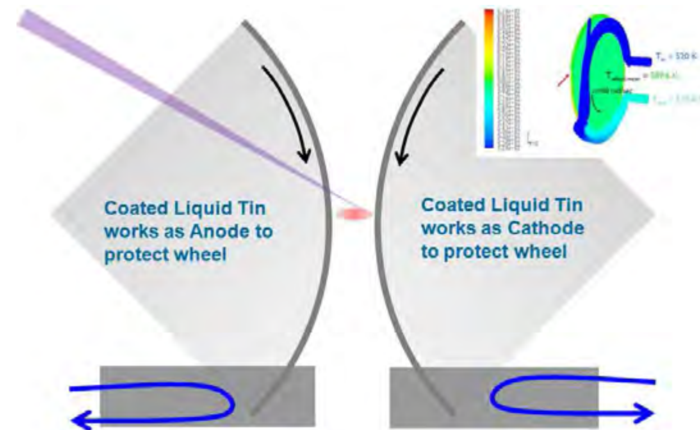
Tin as electrodes



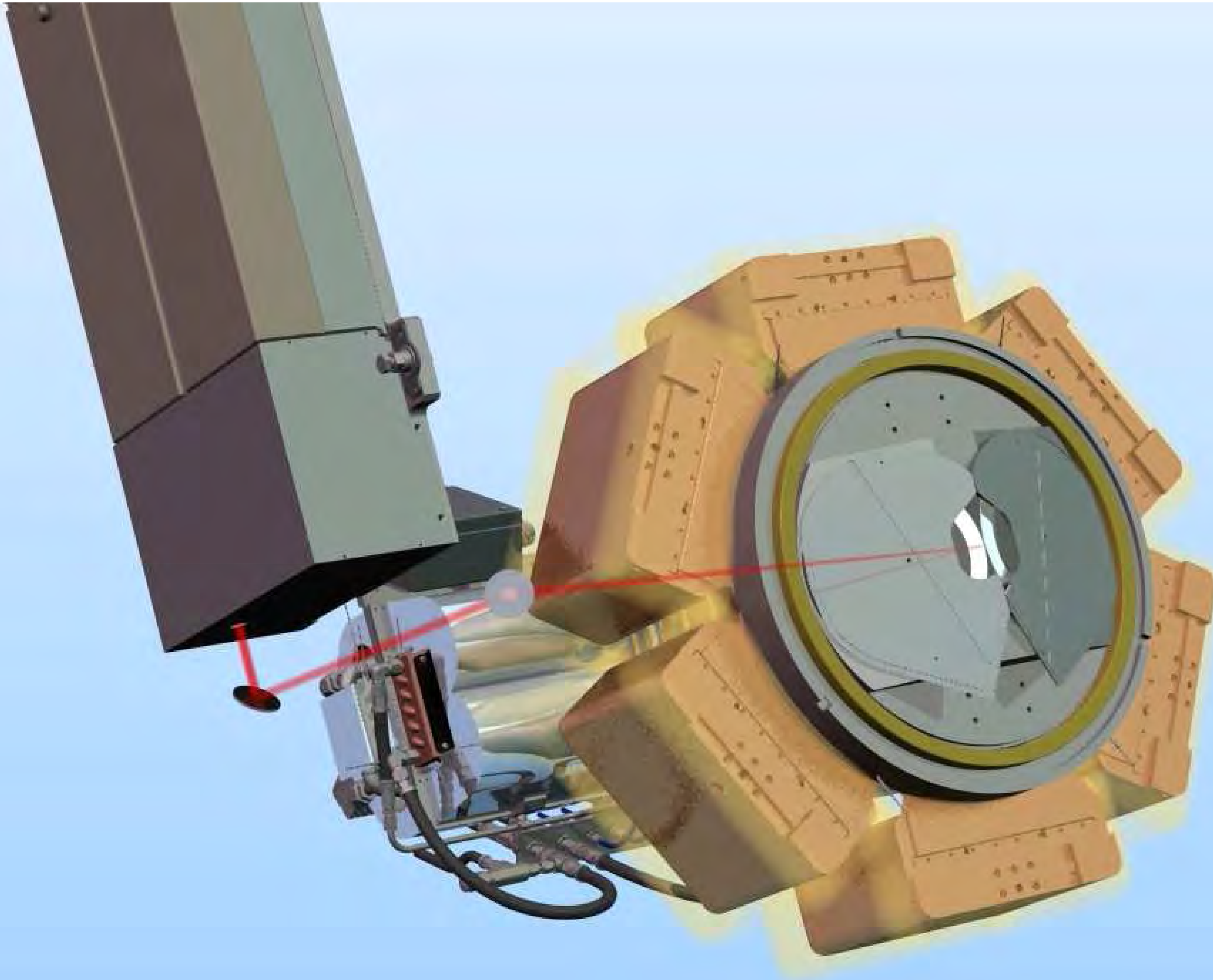
Tin as wheel protection

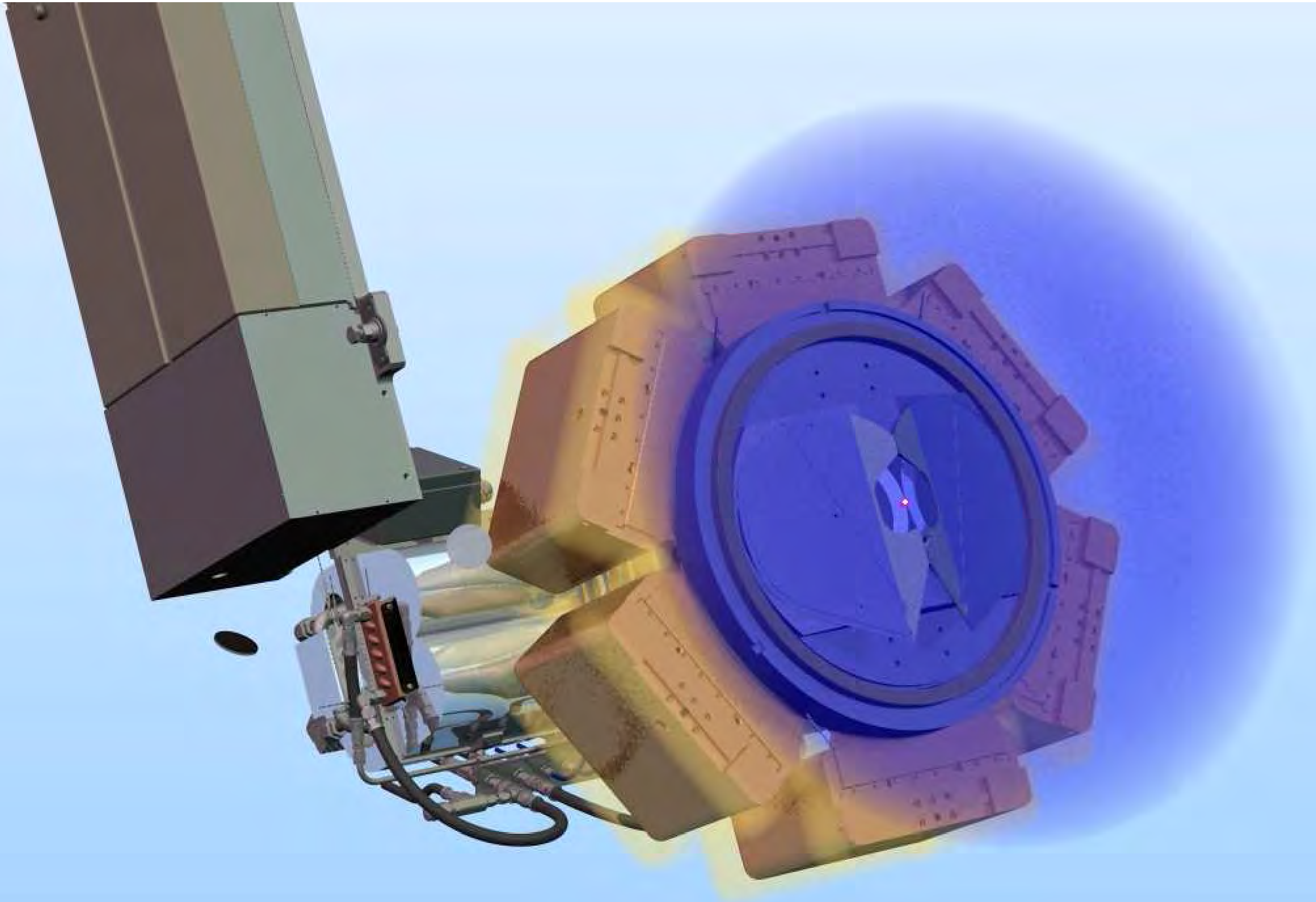


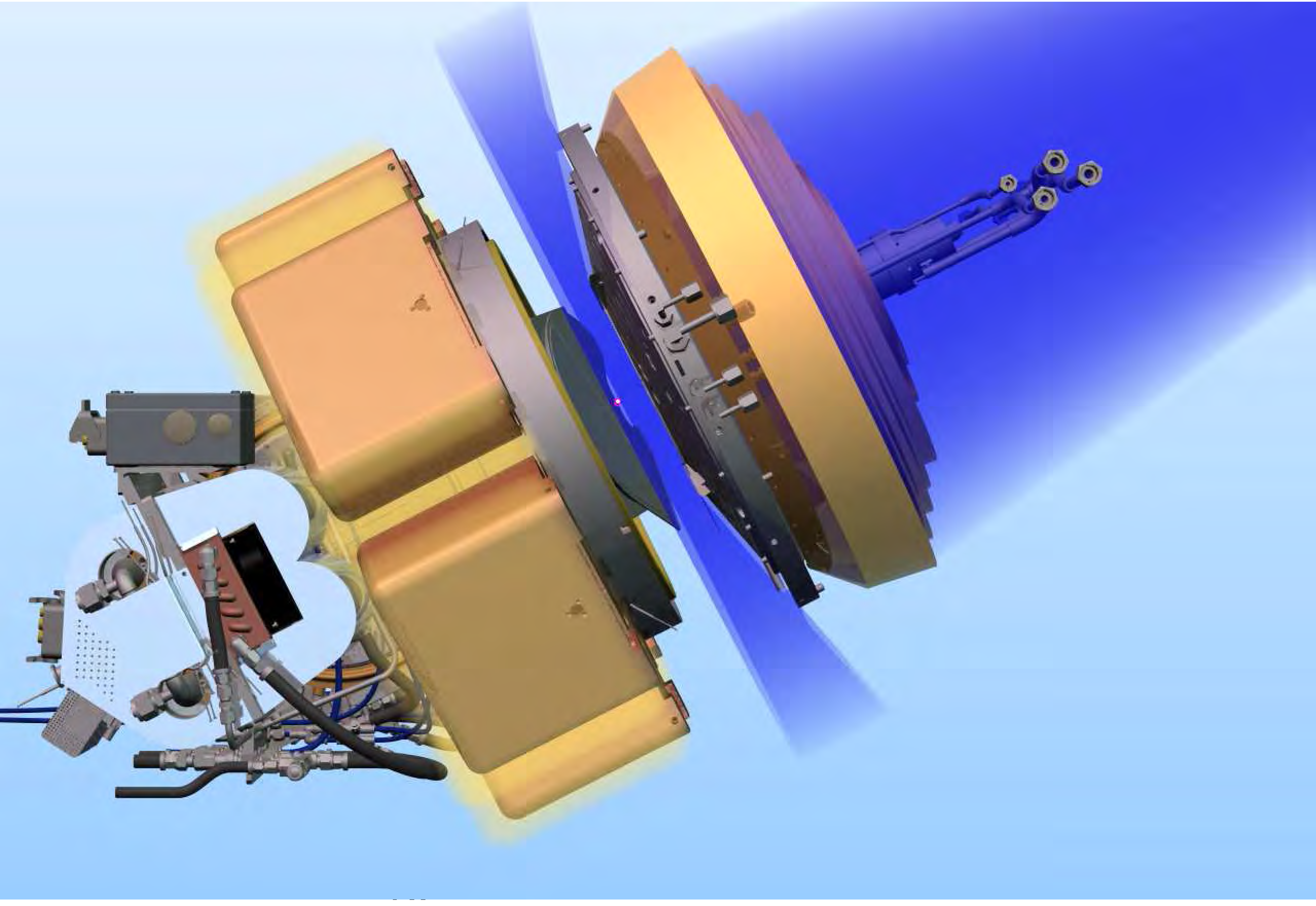
Tin as conductor



Tin as dynamic coolant

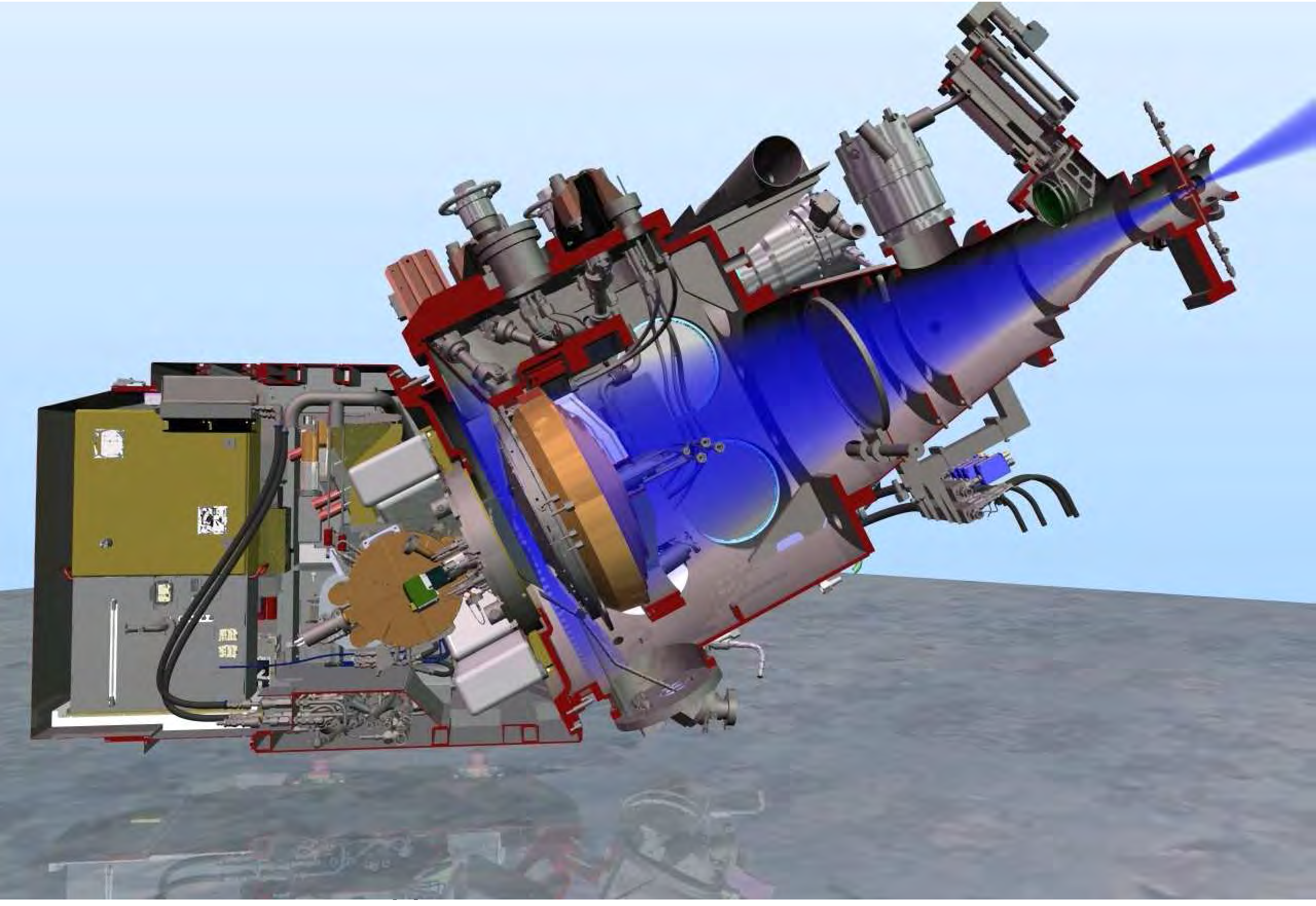




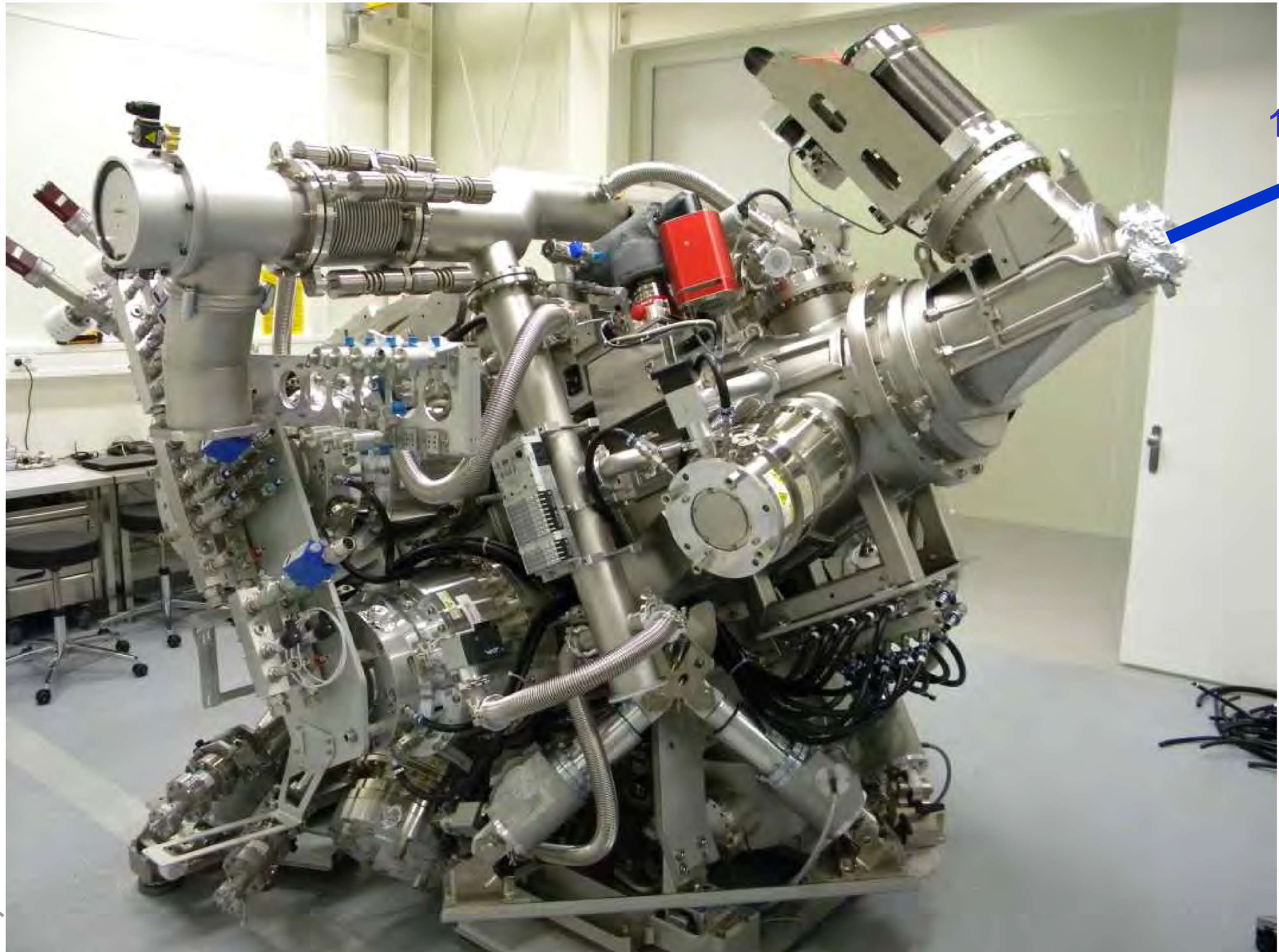


XTREME technologies

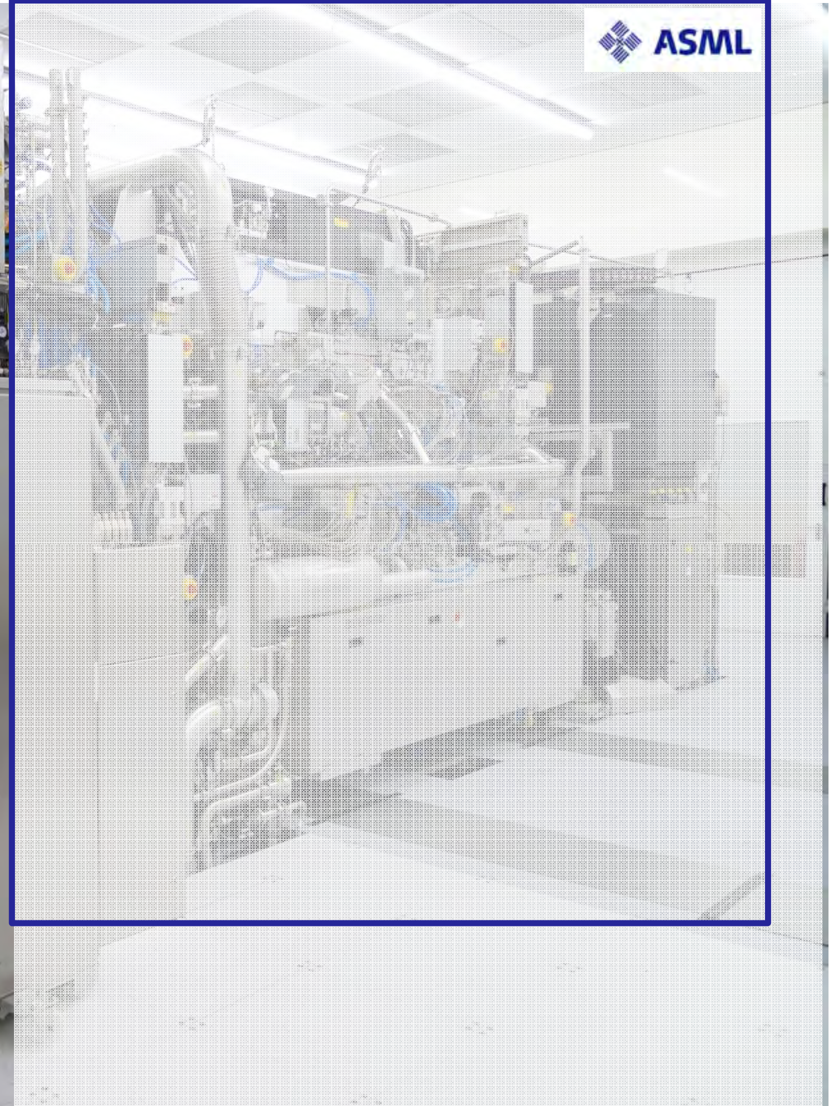
USHIO GROUP



From Technology To Product



Integrated with ASML NXE:3100

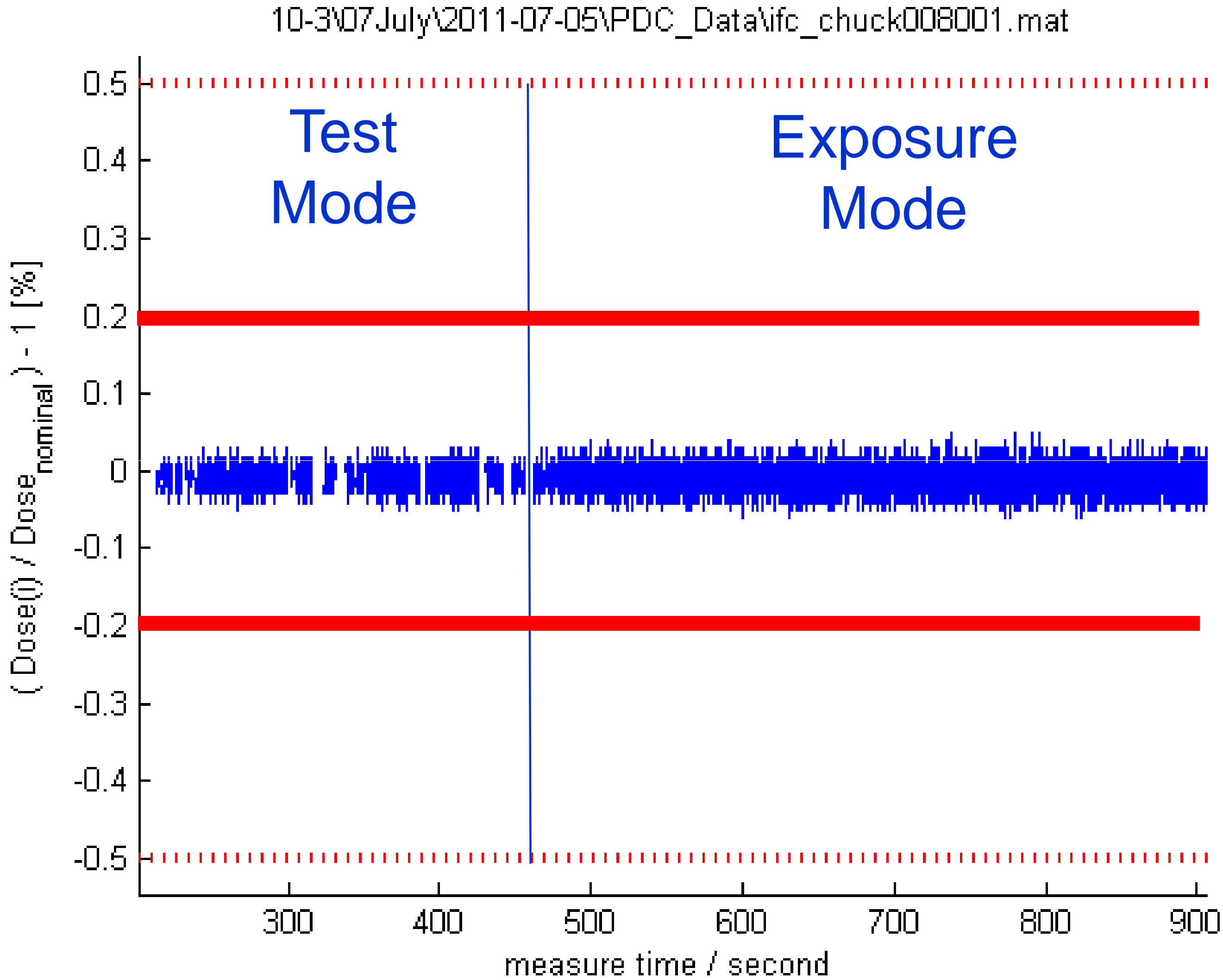


Now @ IMEC

© IMEC

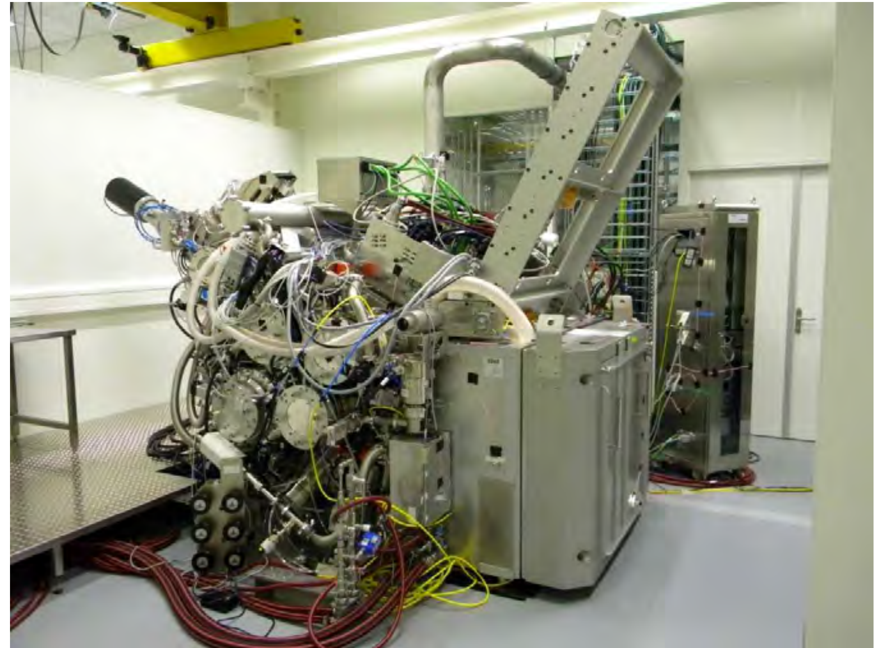
USHIO
GROUP

LDP Source Shows Good Dose Stability In Actual Operation



XTREME‘s Sources for NXE:3100 – Overview

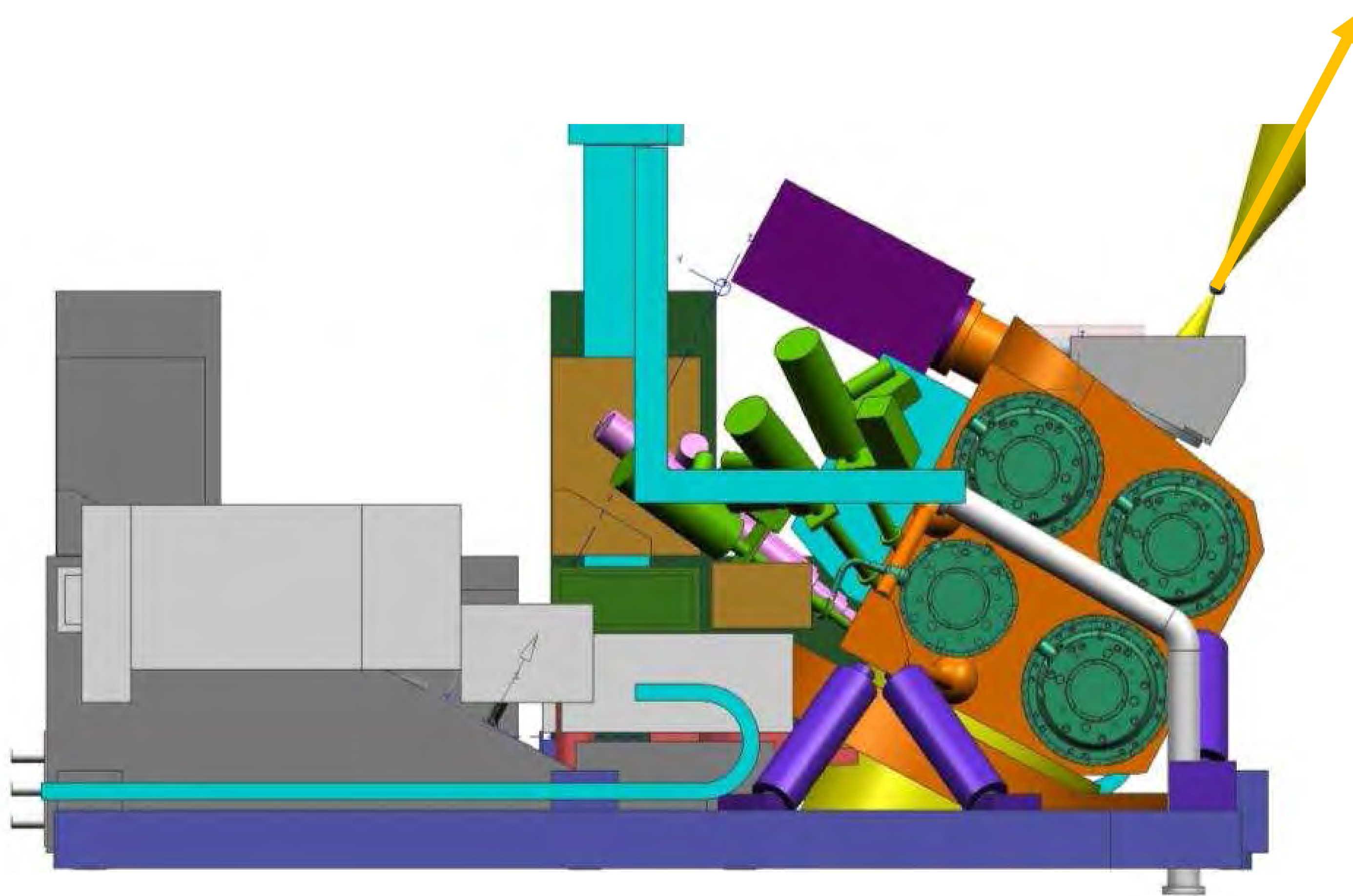
- XTREME has committed resources and multiple sources are in-house
  - 3 R&D sources (Aachen)
  - 2 product sources (Alsdorf)



- To enable EUV to transition to HVM, XTREME has also additional sources
  - For qualification x1 (Alsdorf)
  - For reliability testing x1 (Alsdorf)

Looking Forward ... HVM

- Next Gen source's architecture is finalized



Why LDP Will Be The Technology of Choice

- LDP uses **power more efficiently**
  - LDP converts wall-plug power directly into EUV plasma
- LDP is **smaller**
  - LDP architecture also takes up less space in cleanroom + subfab
- LDP keeps the lithography optics **cleaner**
  - LDP also prevents the contamination of the scanner and reticle
- LDP lithography **optics last longer**
  - LDP has proven debris mitigation technology for many years in Alpha phase

The Key Take-Aways

- **PROGRESS HAS BEEN MADE**
  - XTREME's 3100 source has been installed at Imec
- **THE DIRECTION IS CLEAR**
  - Power, stability, availability and predictability will converge to enable EUV to transition to HVM
- **THE CHALLENGES ARE IDENTIFIED**
  - There are still challenges ahead of us
  - The challenges are identified & plans have been developed
  - Focus Teams are in place to address those issues
- **WE BELIEVE LDP WILL BE THE TECHNOLOGY OF CHOICE**

XTREME technologies GmbH

USHIO GROUP