

OMEGA EP Status and Use Planning



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**47th Annual Meeting of the
American Physical Society
Division of Plasma Physics
Denver, CO
24–28 October 2005**

Summary

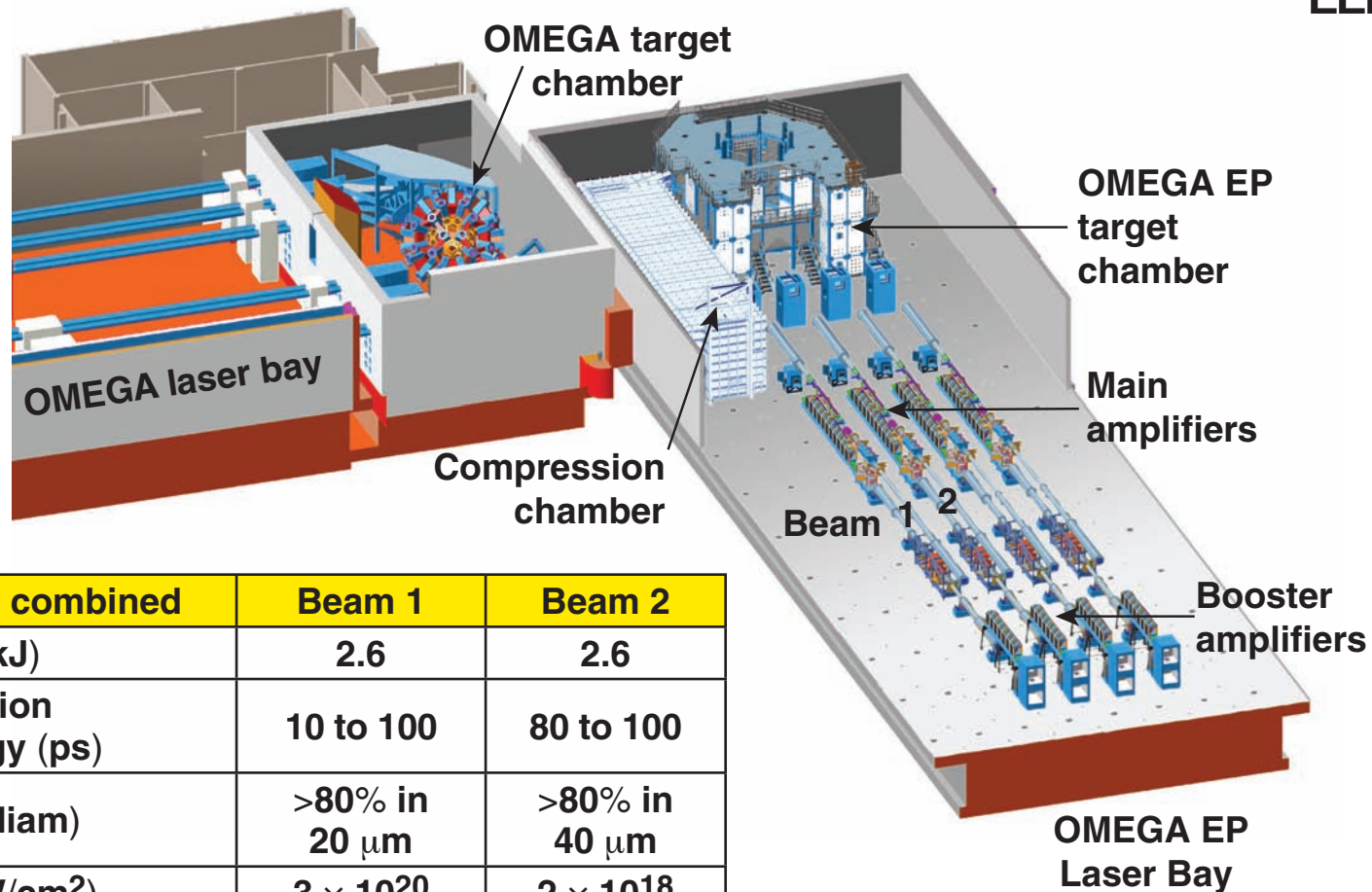
OMEGA EP will be a flexible high-energy-density research facility



- The OMEGA EP Laser Facility is currently under construction adjacent to the OMEGA Laser System.
- It has a variety of configurations.
 - up to four 10-ns, 6.5-kJ_{UV} beams to the OMEGA EP target chamber
 - a combination of two to three UV beams with one to two high-energy petawatt (HEPW) beams (2.6 kJ_{IR} each) to the OMEGA EP target chamber
 - two HEPW beams to the OMEGA target chamber
- An OMEGA EP use plan is under development.
 - define diagnostic and operational requirements
 - define user access plans

The OMEGA EP HEPW beams will be completed in FY07, the two long-pulse-only beams in FY08.

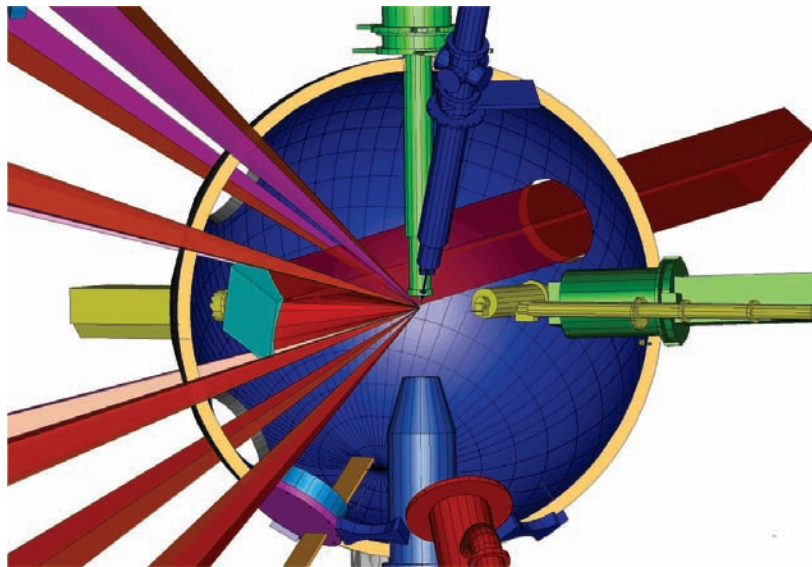
Short-pulse OMEGA EP beams can be directed either to OMEGA or new OMEGA EP target chamber



Short pulse combined	Beam 1	Beam 2
IR energy (kJ)	2.6	2.6
Pulse duration at full energy (ps)	10 to 100	80 to 100
Focusing (diam)	>80% in 20 μm	>80% in 40 μm
Intensity (W/cm^2)	3×10^{20}	2×10^{18}

- Each beam duration can be as short as 1 ps at reduced energy (grating damage and B-integral)
- Beam 2 can produce 2.6 kJ in 10 ps when propagating on a separate path

OMEGA EP can deliver up to four long pulse UV beams with up to 6.5 kJ each to the OMEGA EP target chamber



- The four long-pulse (1 to 10 ns), UV beams are focused with a f/8.5 lens and come in at 23° to the target normal (no unconverted light).
- OMEGA EP can also be configured as two or three long-pulse UV beams with one or two short-pulse, IR beams.

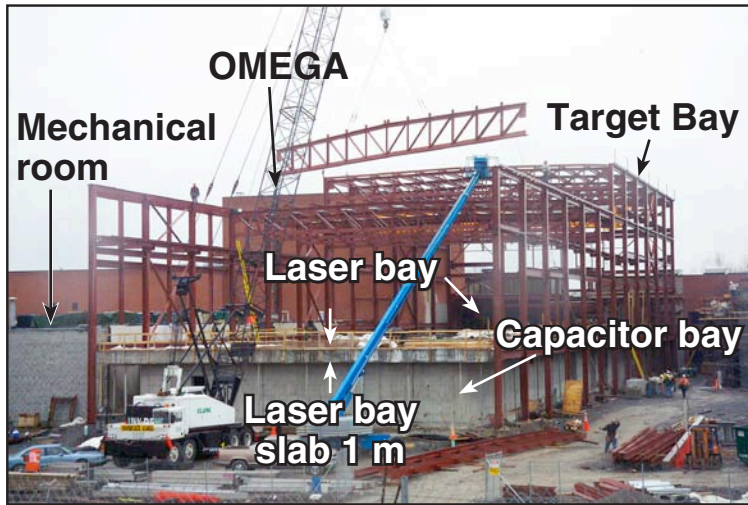
	Per beam		
Square pulse width (ns)	1.0	4.0	10.0
Potential UV on target (kJ)	2.5	4.8	6.5
Potential intensity (1-mm spot) (W/cm ²)	3×10^{14}	1.5×10^{14}	8×10^{13}

With four beams, the long-pulse energy is greater than 25-kJ UV in 10 ns.

The OMEGA EP building was completed in February 2005



April 2004



January 2005



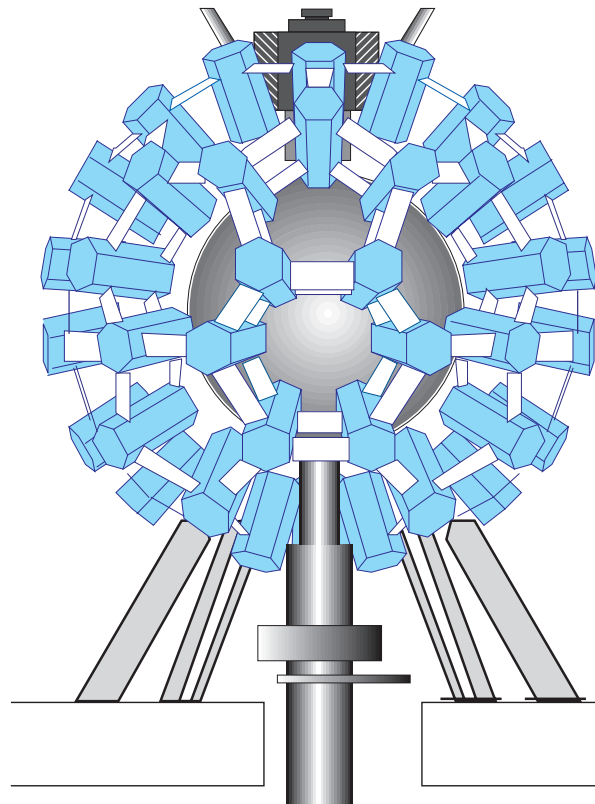
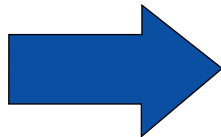
OMEGA EP Laser Bay



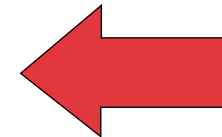
OMEGA/OMEGA EP will have a variety of configurations (I)

Backlighting OMEGA experiments and fast ignition in the OMEGA target chamber

30 kJ_{UV}, 60 beam
OMEGA laser system

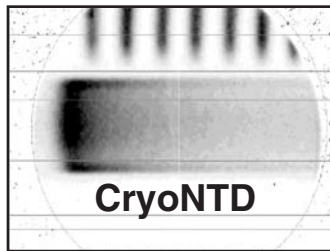


10 ps, 2.6 kJ, and 100 ps;
2.6 kJ (co-propagating)



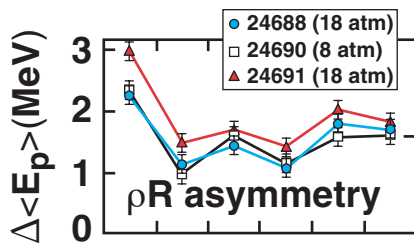
Ports H9 and H7 will be replaced to bring
the OMEGA EP beam to OMEGA (TIM 2 goes away)

Integrated cryogenic DD FI experiments will validate/compare both channeling and cone concepts on a single facility



CryoNTD

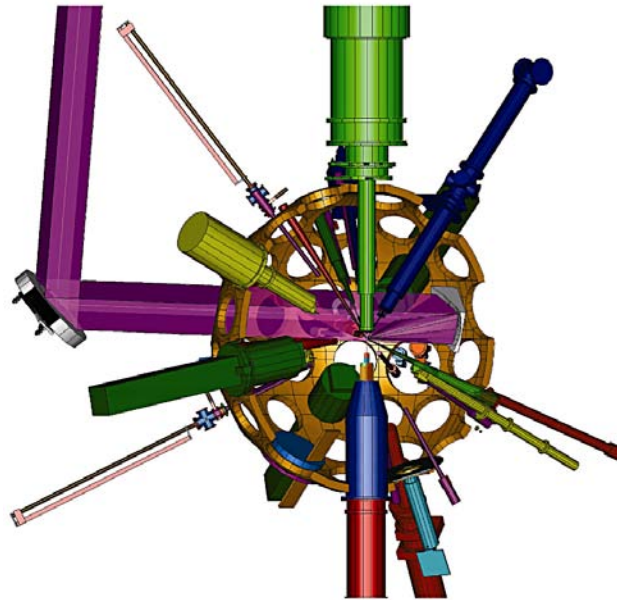
Neutronics



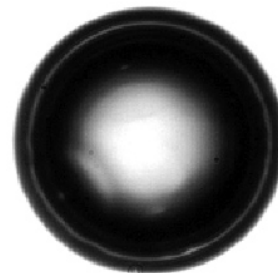
Charged-particle spectroscopy



Cone targets

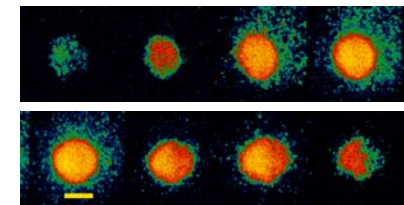


Petawatt beam - OMEGA EP

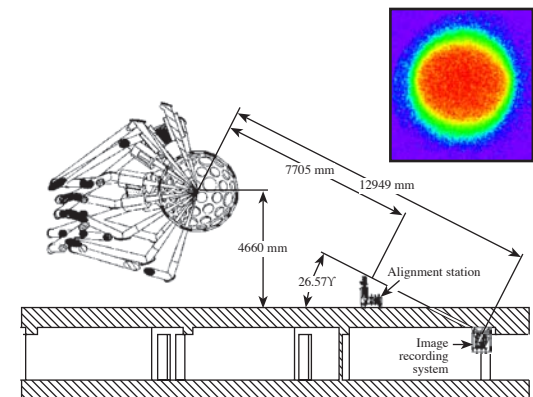


Direct-drive DD and DT cryo capsules

- High throughput
- Proven diagnostics
- Proven cryogenics

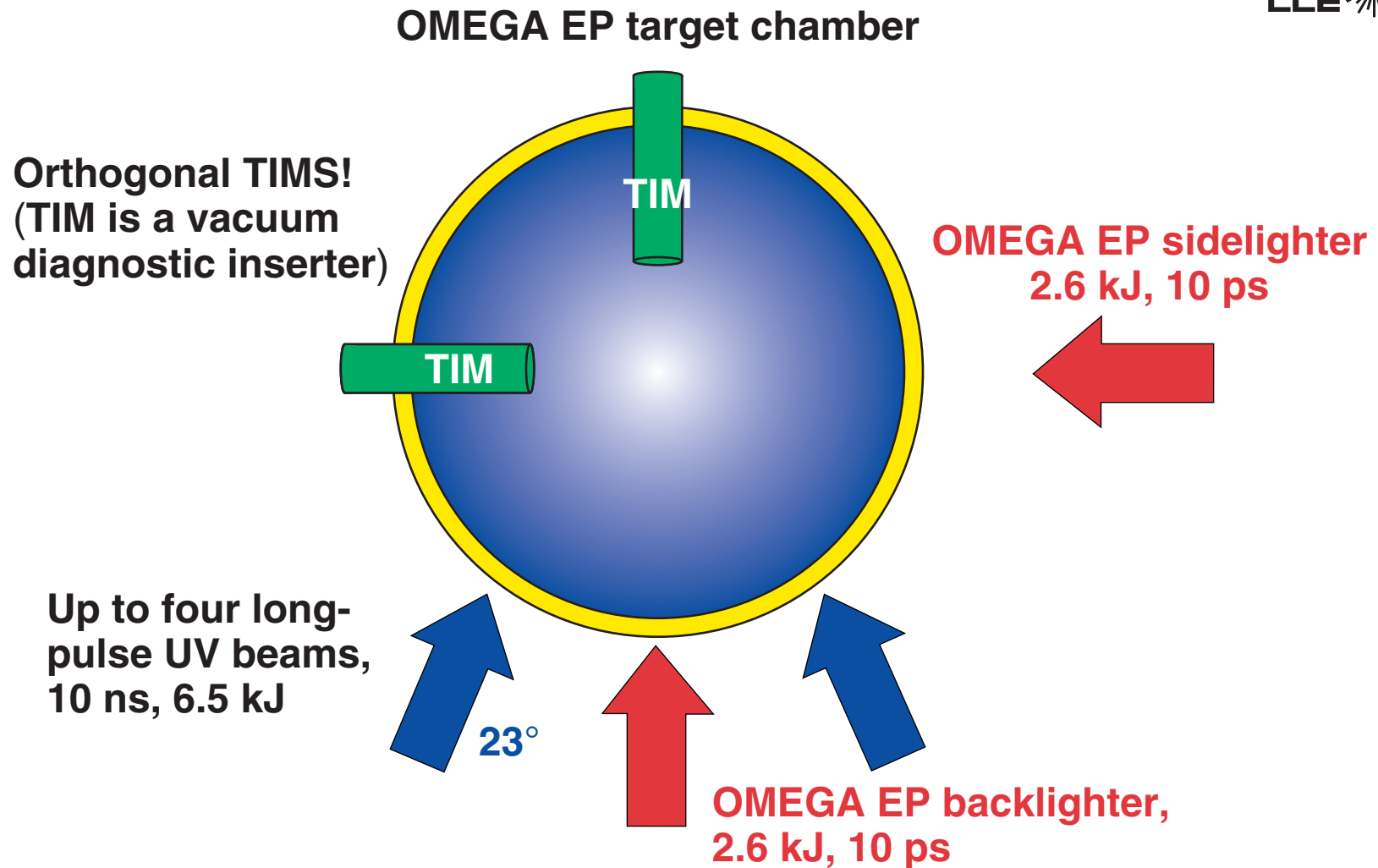


X-ray imaging



Neutron imaging

OMEGA EP will have a variety of stand-alone configurations



Simultaneous sidelighting or backlighting will be possible—two long pulse UV beams still available

OMEGA EP will have a shot rate of two hours or less



- **There will be approximately 500 shots per year with OMEGA EP**
 - **~75% of the shots to the OMEGA EP chamber**
- **Baseline configuration includes**
 - **23° long pulse beams in the OMEGA EP chamber**
 - **3 TIMs, including one at 90° and one at 180°**
 - **compatibility with OMEGA diagnostics**
 - **x-ray pinhole cameras**
 - **target positioner**
- **Future plans/possible upgrades**
 - **planar cryogenic target handling**
 - **VISAR/ASBO at 180°**
 - **48° ports (2ω or 3ω) for halfraums**
 - **3 additional TIMS**

OMEGA EP use planning will determine the priorities of future capabilities.

An OMEGA EP Use Plan Workshop will be held 24–26 January 2006 at LLE



- The OMEGA EP Use Plan will define
 - the expected operating parameters and availability,
 - the avenues for non-LLE users to obtain access, and
 - initial experimental campaigns and capabilities.
- An informal discussion of OMEGA EP use will be held Thursday, 27 October at 1800 in Governor's Square 9
- On 24–26 January 2005, we will hold an OMEGA EP Use Plan Workshop in Rochester.
 - Anyone interested in using OMEGA EP is invited to attend.
 - Potential users will have ~15 min slots to discuss possible experiments and other issues.
- If you are interested in attending, please contact*

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