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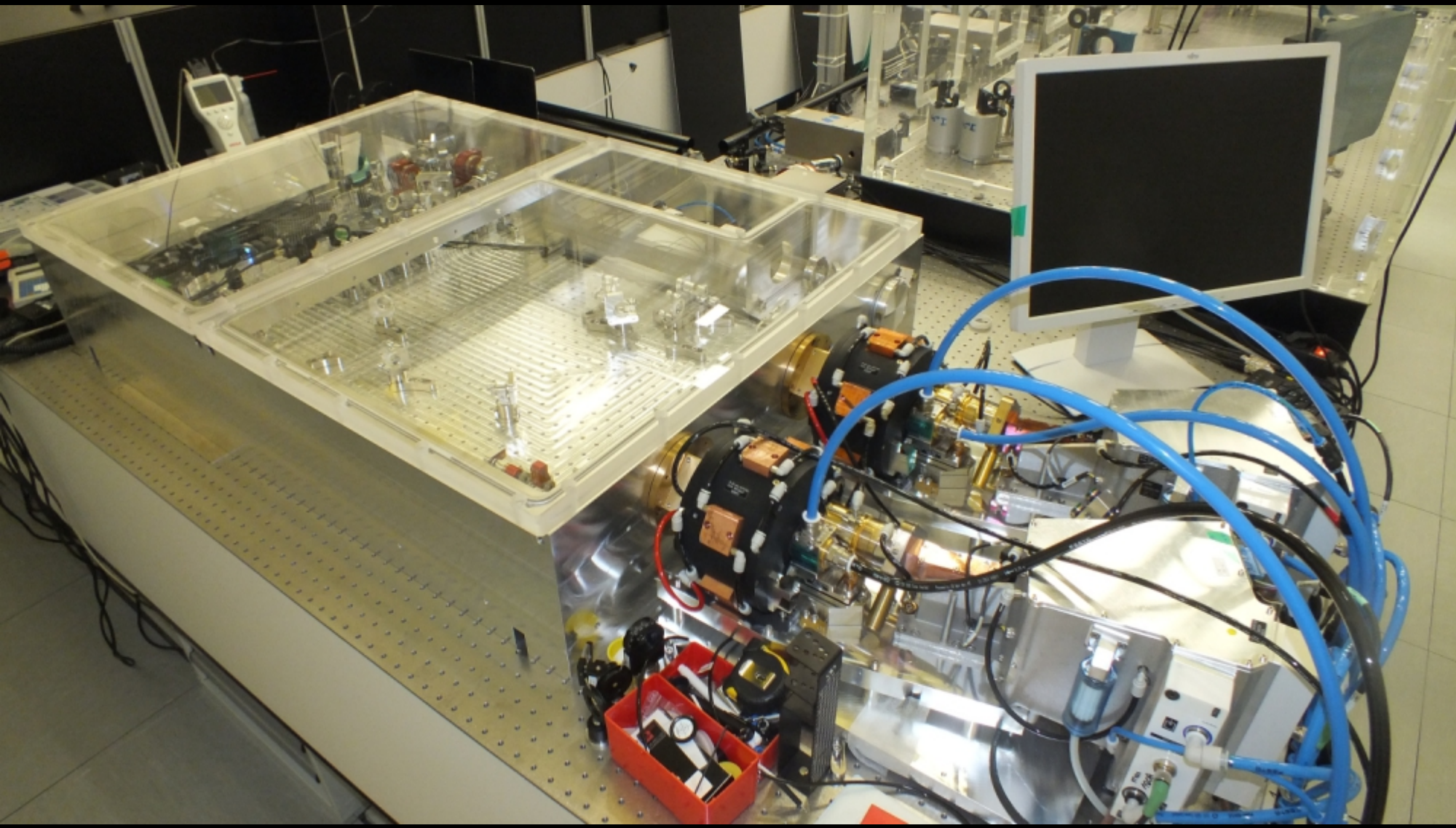
The LASER: from the basics to extreme light-matter interaction

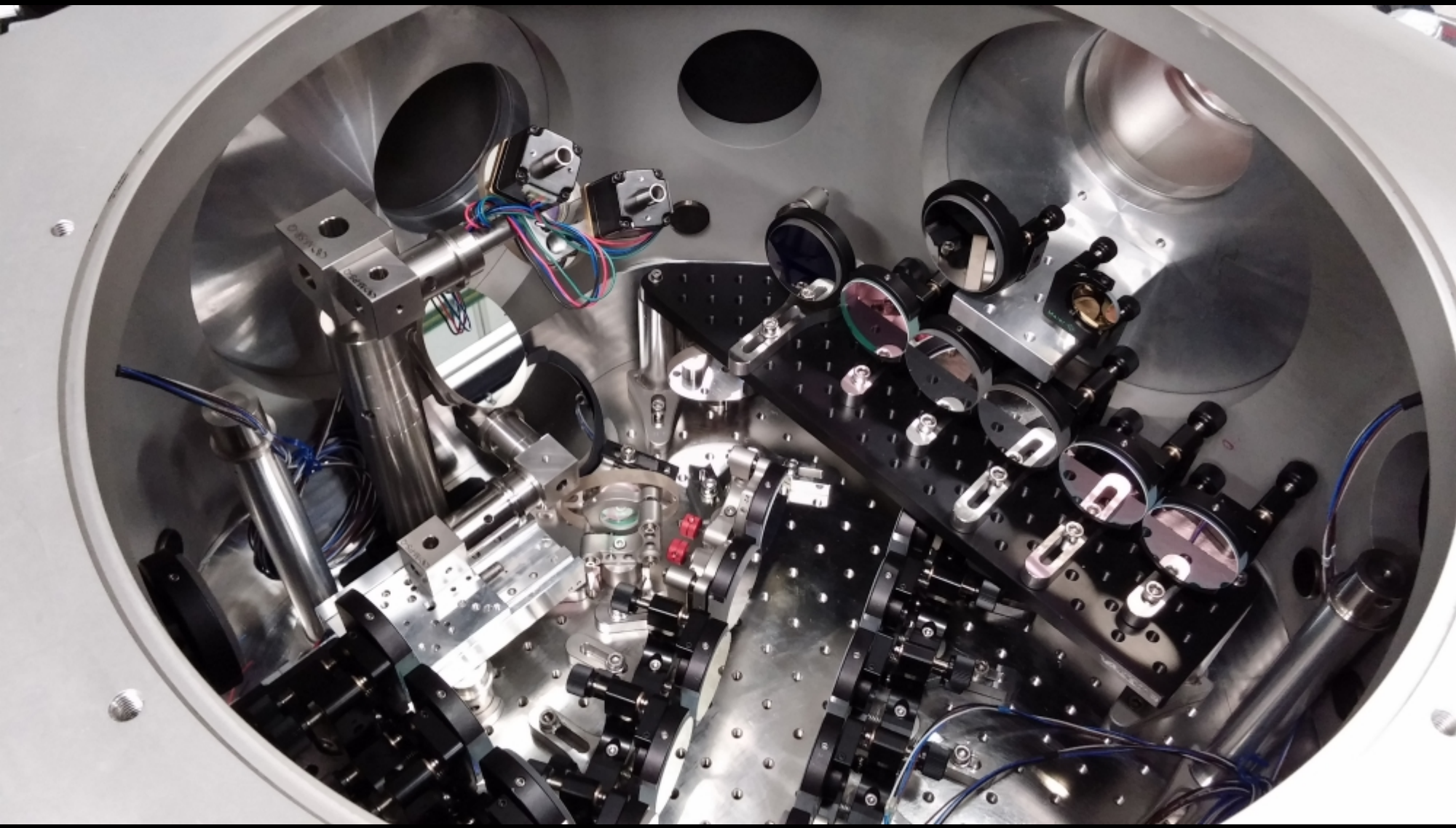
Since its discovery half a century ago, the laser has enabled the investigation of numerous physical, chemical and biological phenomena, which before then had not been accessible by other light sources. In addition, laser technology has become constantly present in our everyday lives. The field of laser development continues to represent a very active field of research with the aim of developing light sources with extreme properties. In the present talk starting from the basics we will demonstrate the special properties of laser light in some experiments. We will then provide an insight into ultrahigh-intensity, ultra-short laser technology and its application in high-power laser-matter interaction.

A few important publications:

1. T. Nubbemeyer,..., Zs. Major et al.: 1 kW, 200 mJ picosecond thin-disk laser system in Optics Letters 42, 1381 (2017)
2. M. Ueffing,..., Zs. Major et al.: Direct regenerative amplification of femtosecond pulses to the multi mJ level in Optics Letters 41, 3840 (2016)
3. C. Wandt, ..., Zs. Major et al., Development of a Joule-class Yb:YAG amplifier and its implementation in a CPA system generating 1 TW pulses, Laser & Photonics Reviews 8 (2014), 875
4. H. Fattahi,..., Zs. Major et al.: Third-generation femtosecond technology in Optica 1, 45 (2014)
5. A. A. Voronin,..., Zs. Major et al.: Pulse compression to subcycle field waveforms with split-dispersion cascaded hollow fibers in Optics Letters 38, 4354 (2013)
6. C. Skrobol, ..., Zs. Major et al., Broadband amplification by picosecond OPCPA in DKDP pumped at 515 nm, Opt. Exp. 20 (2012), 4619
7. S. Klingebiel,..., Zs. Major et al.: Experimental and theoretical investigation of timing jitter inside a stretcher-compressor setup in Optics Express 20, 3443 (2012)

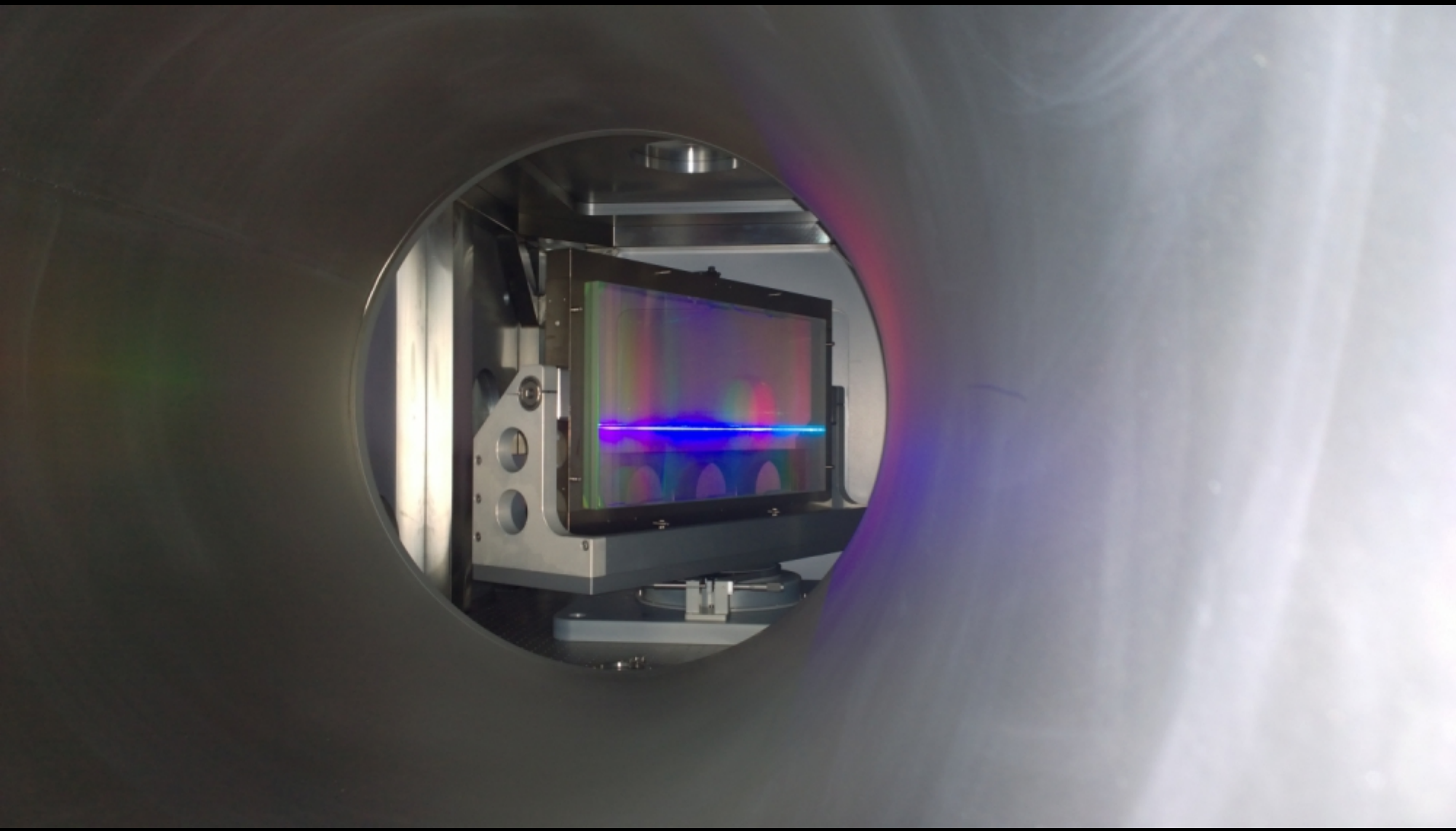


High power thin-disk laser amplifier



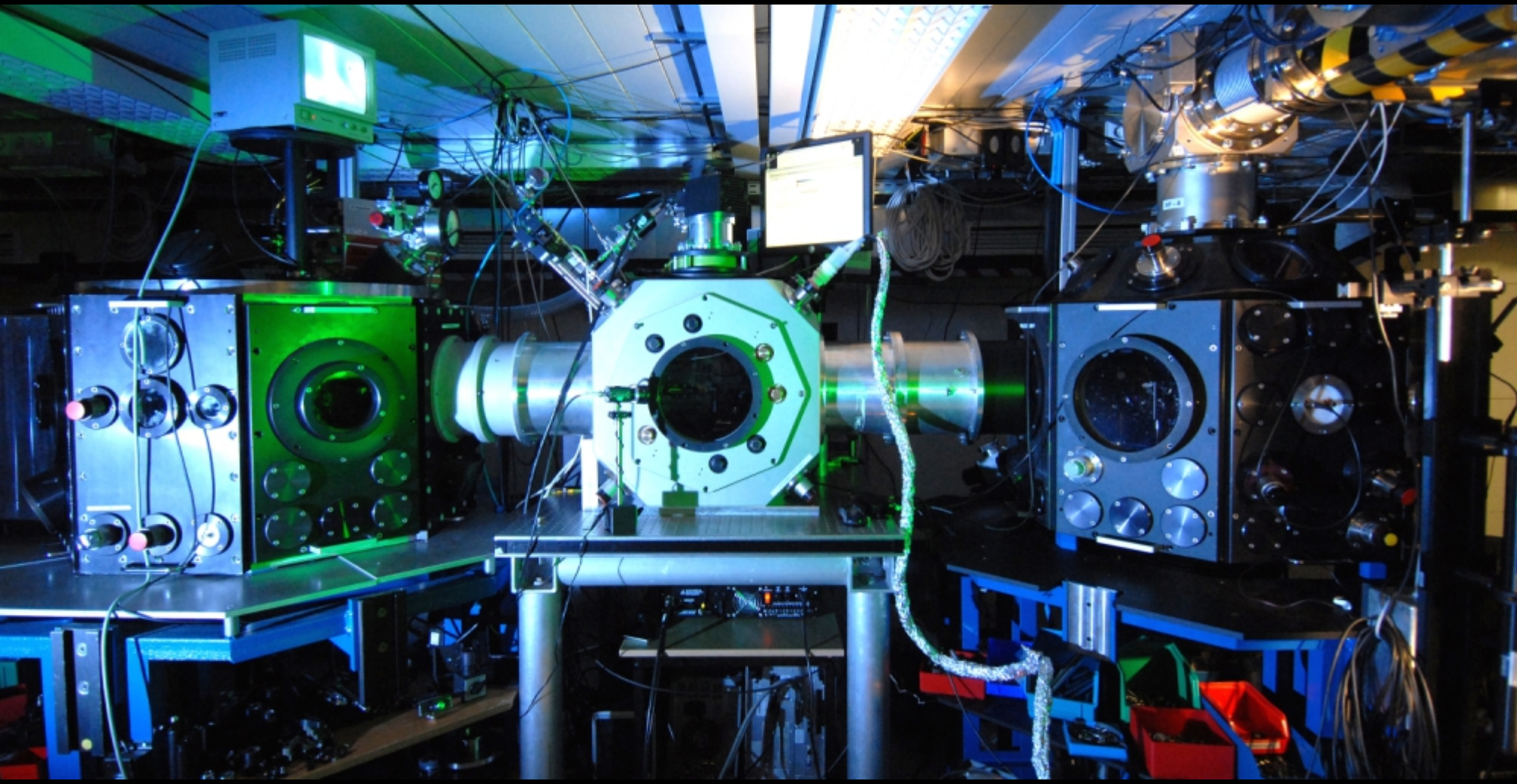
Chirped-mirror compressor

Ti:Sapphire laser amplifier



Large compressor grating


White-light generation by self-phase modulation
ßSoft



Experimental chamber for laser-driven relativistic electron acceleration

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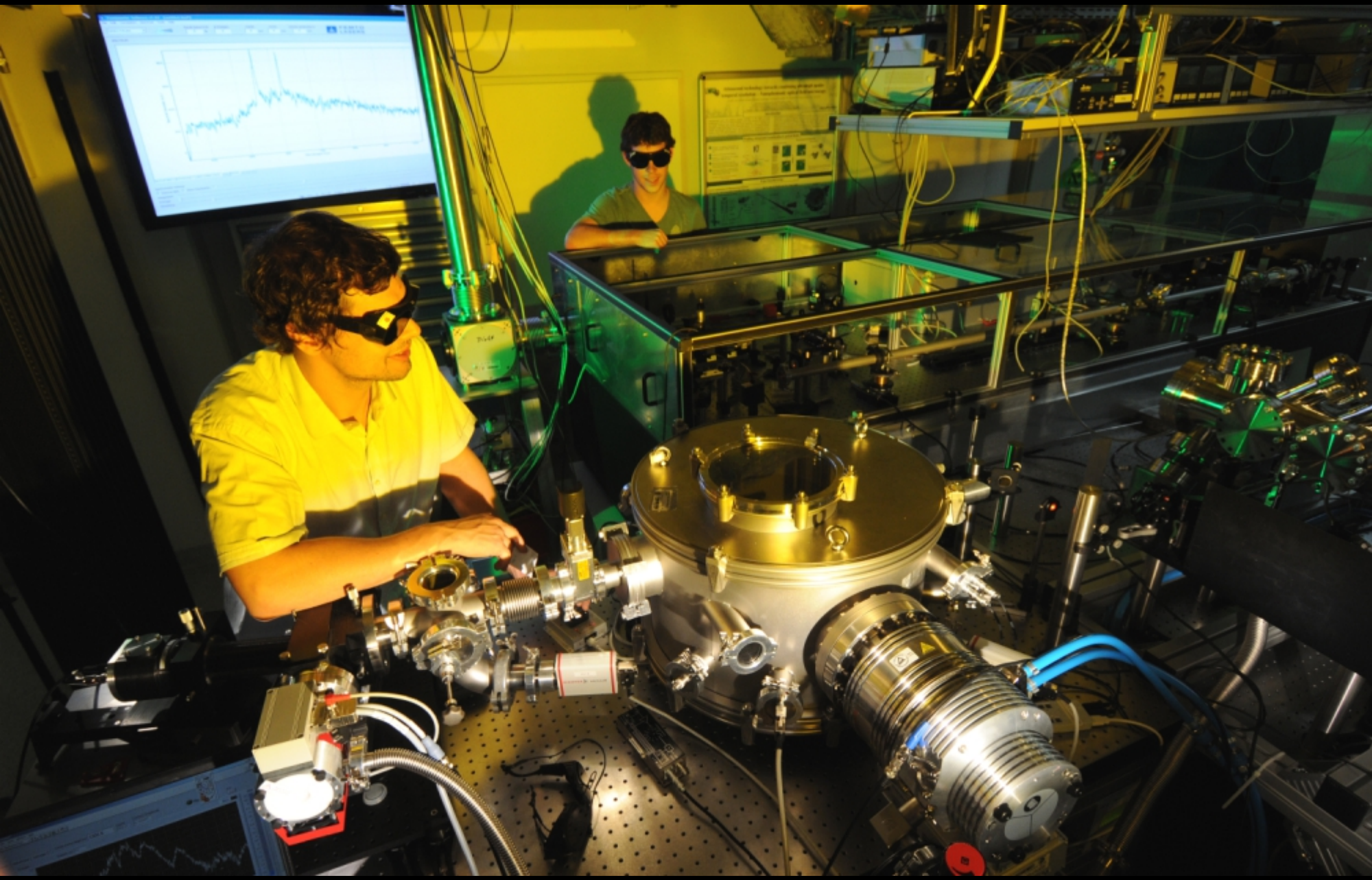
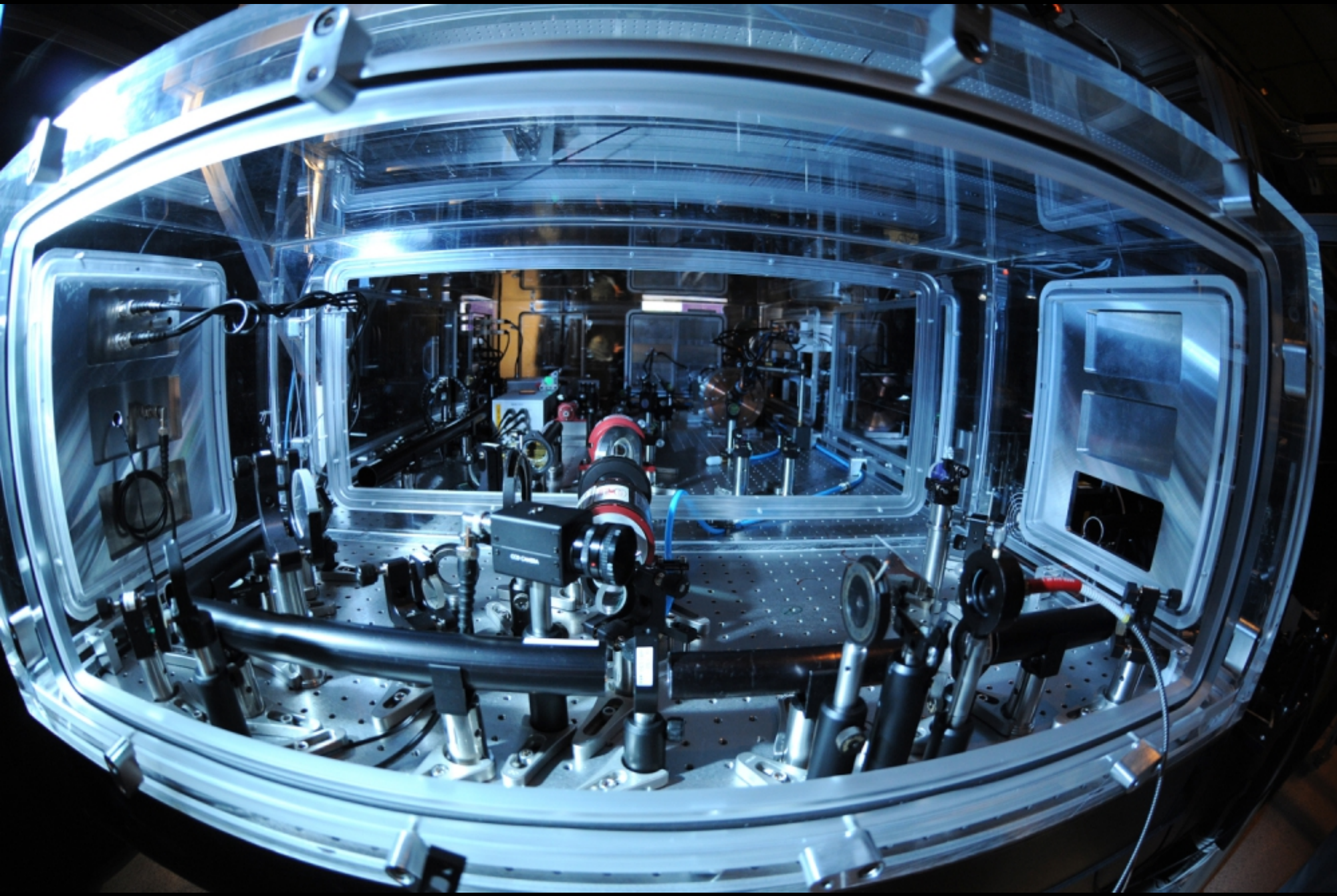


Attosecond laboratory



Thin-disk Yb:YAG laser amplifier

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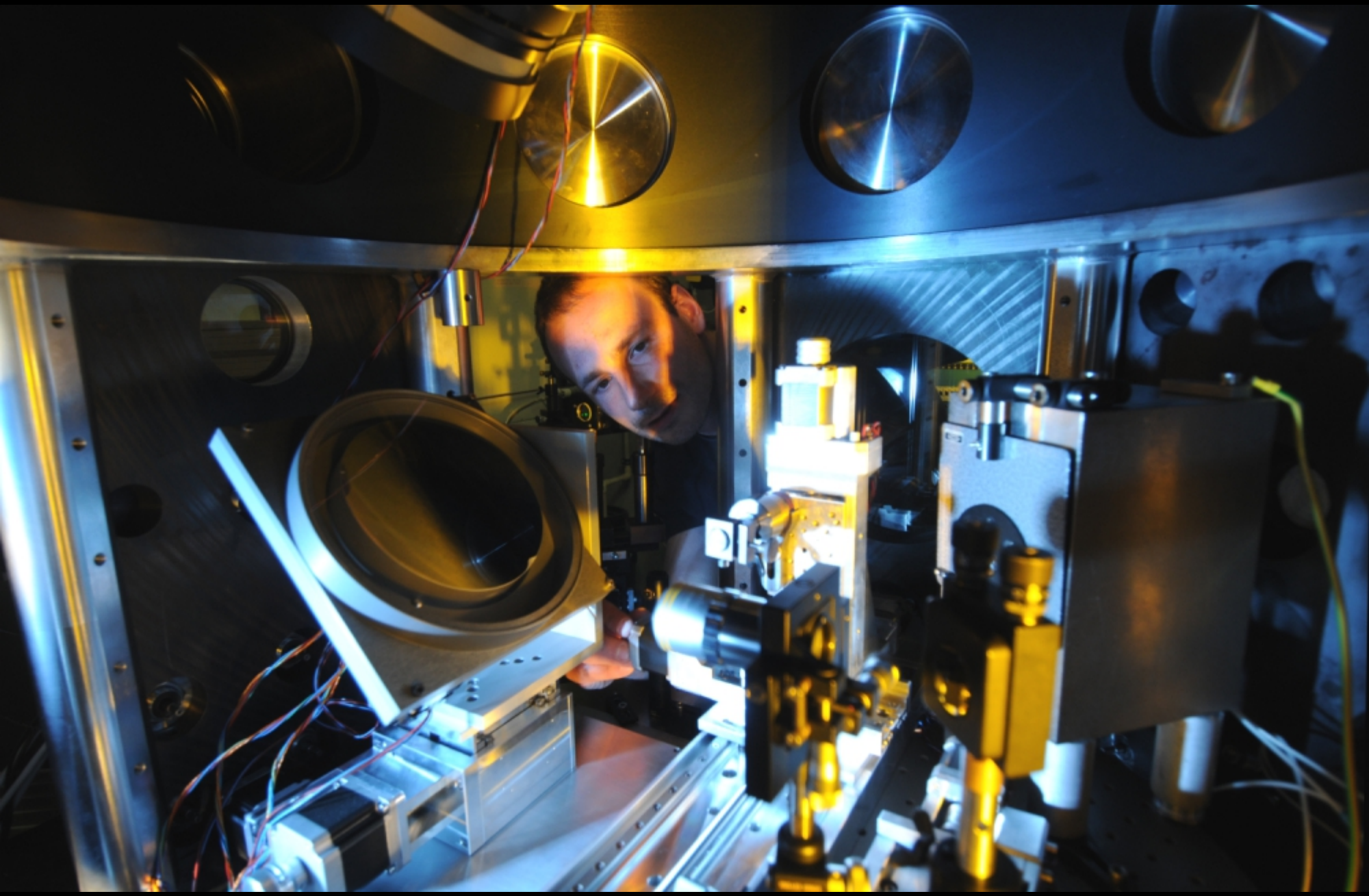
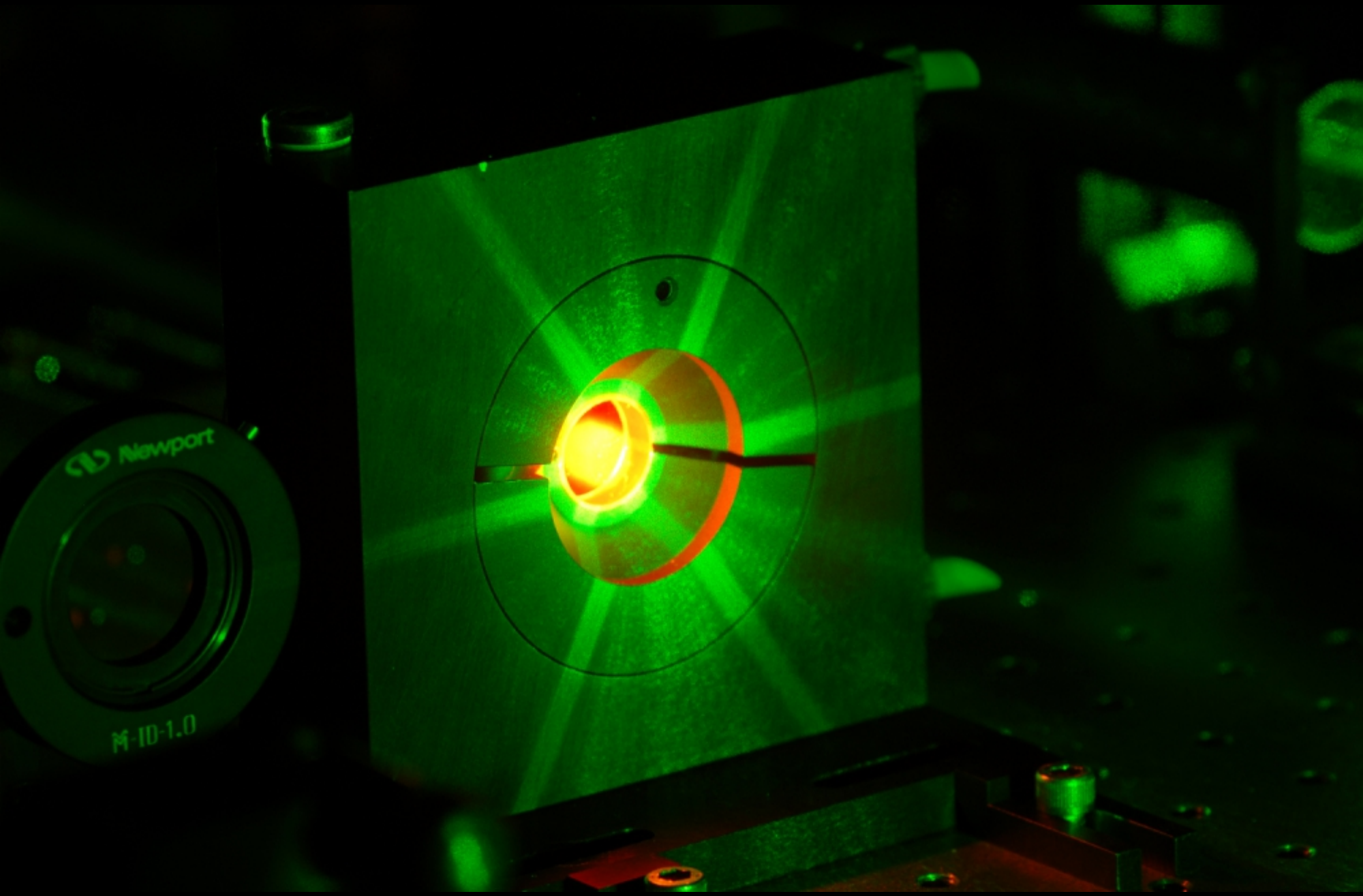
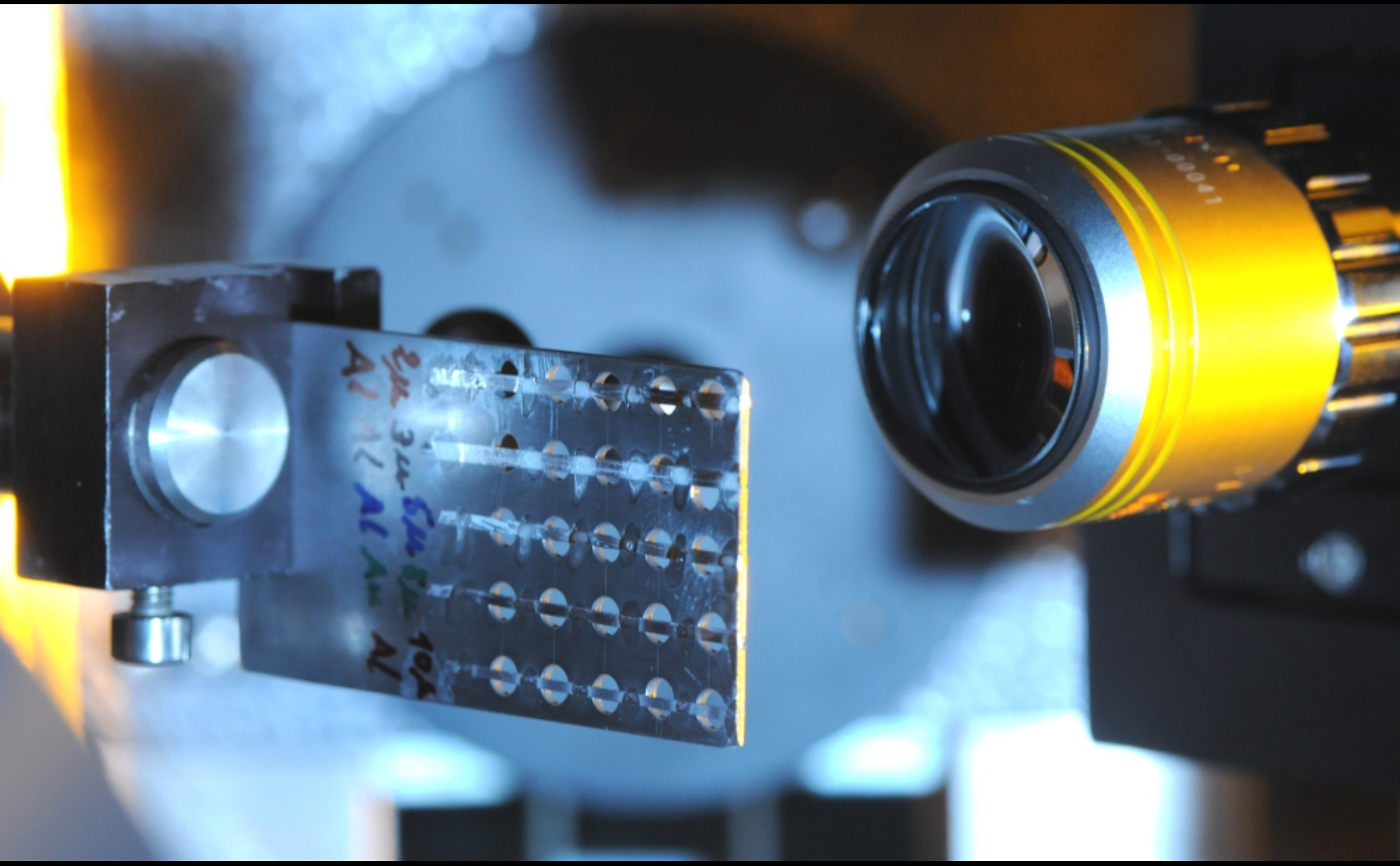


Laser-driven ion acceleration



Ti:Sapphire laser crystal

Mirror wheel of multipass amplifier setup



Target for laser-driven ion acceleration