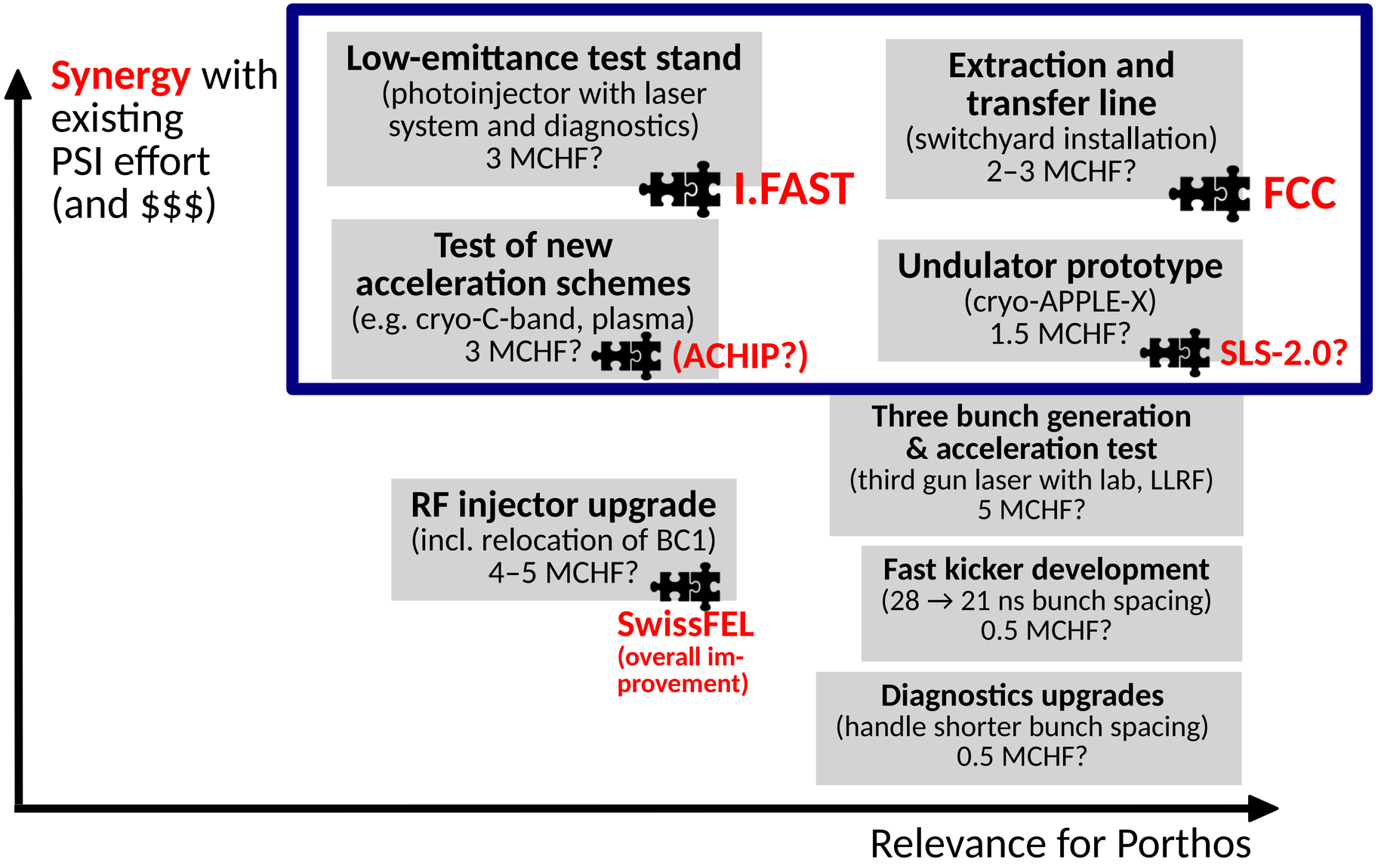
Porthos preproject: possible elements

- Assume ~ 10 MCHF for pre-project:
  → 2 large items plus 1 –2 smaller items?
- What are our priorities?
- Additional funding sources?



TEST OF NEW ACCELERATION SCHEMES

- Opportunities for international collaborations

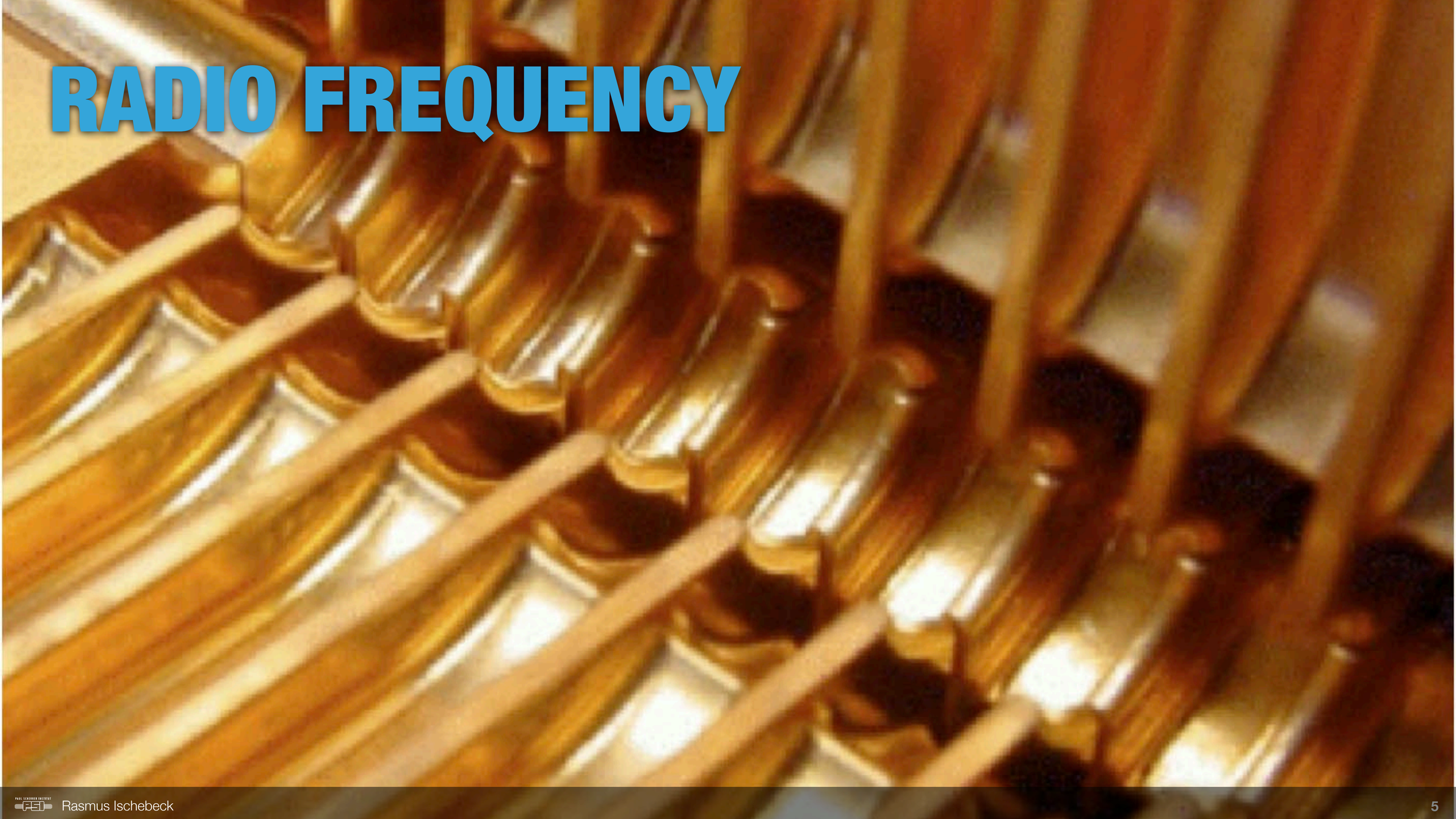
TEST OF NEW ACCELERATION SCHEMES

- Opportunities for collaborations with other PSI divisions

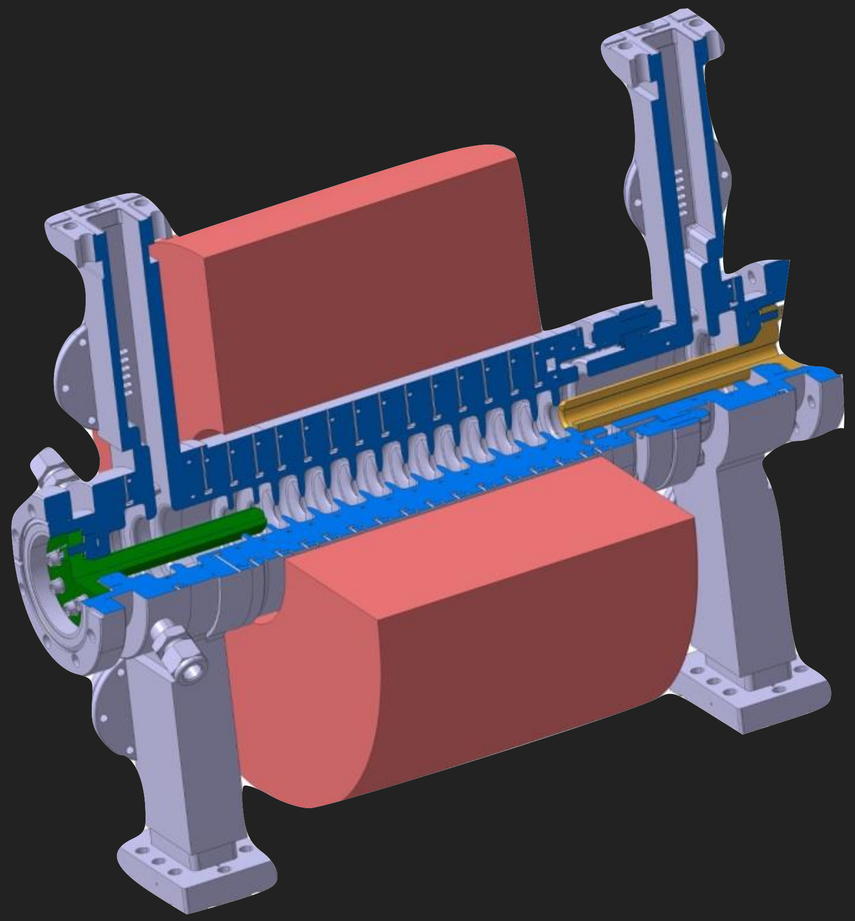
OPPORTUNITIES

- Radio frequency
- Plasma accelerators
- Dielectric laser accelerators
- Applications

RADIO FREQUENCY



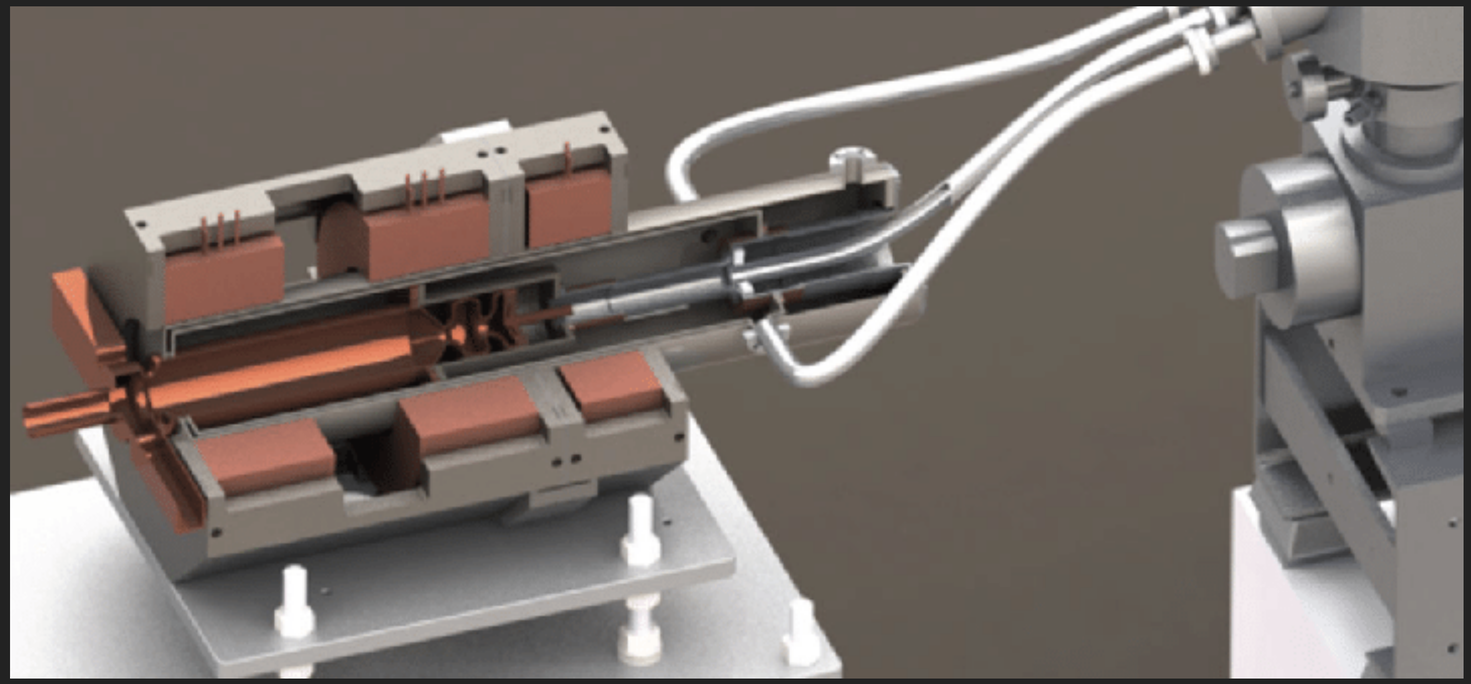
iFAST C-BAND GUN



- M. Schaer et al. PR AB 19, 072001, 2016
- See Simona’s presentation

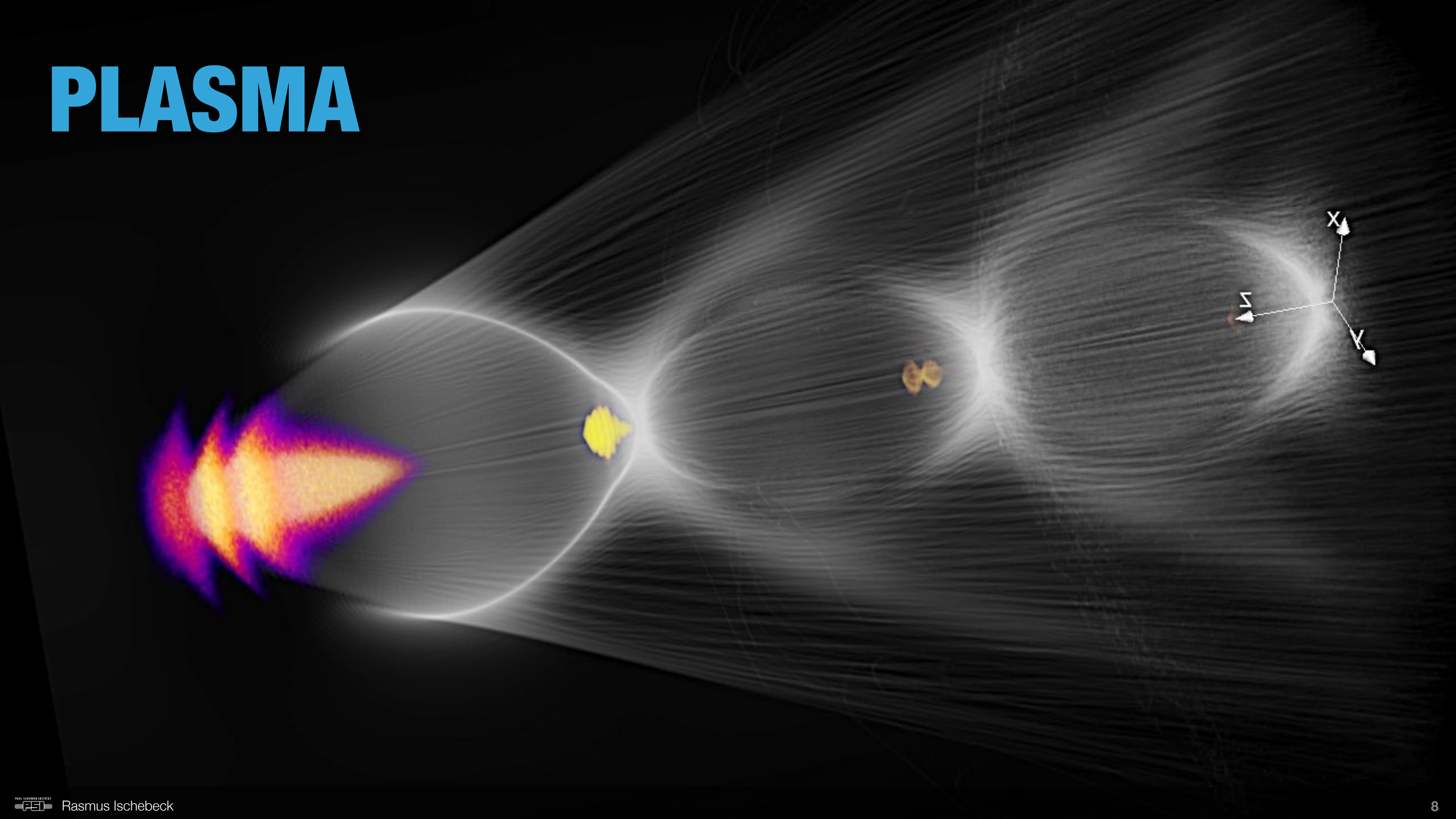
CRYO-COOLED RADIO FREQUENCY STRUCTURES

- Significant effort in cooling a normal-conducting structure to 27 K
- Effort may be justified to achieve lower emittance in the gun



- Rosenzweig et al., Phys. Rev. Accel. Beams **22**, 023403

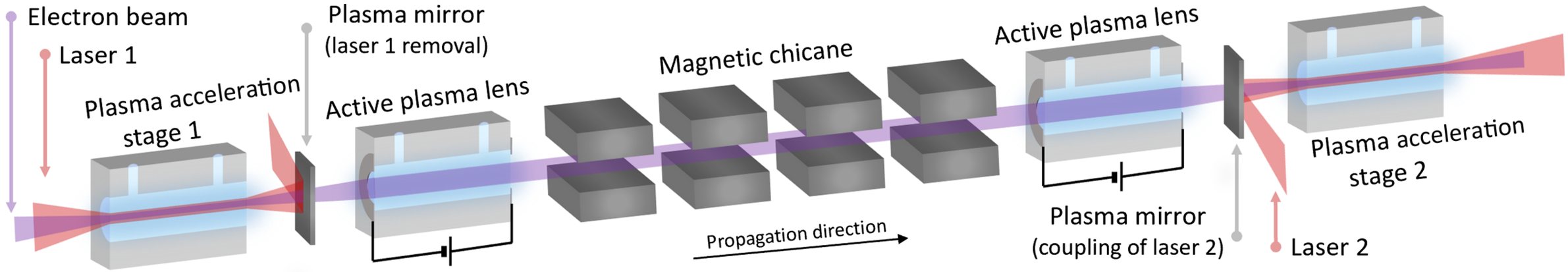
PLASMA

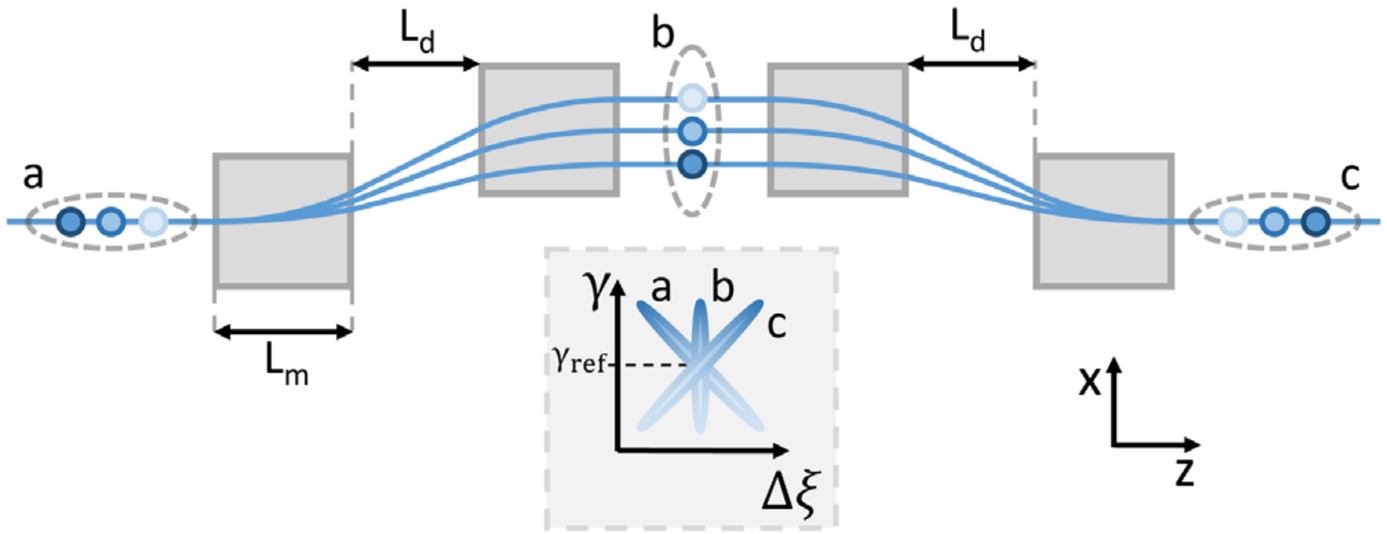


PLASMA WAKEFIELD ACCELERATORS

- Building a competitive plasma wakefield accelerator: significant effort
- Opportunities to collaborate with EuPRAXIA:
  - Electron and X-ray instrumentation
  - Beam dynamics simulations
  - Longitudinal phase space manipulation

ENERGY SPREAD CONTROL FOR PLASMA WAKEFIELD ACCELERATORS

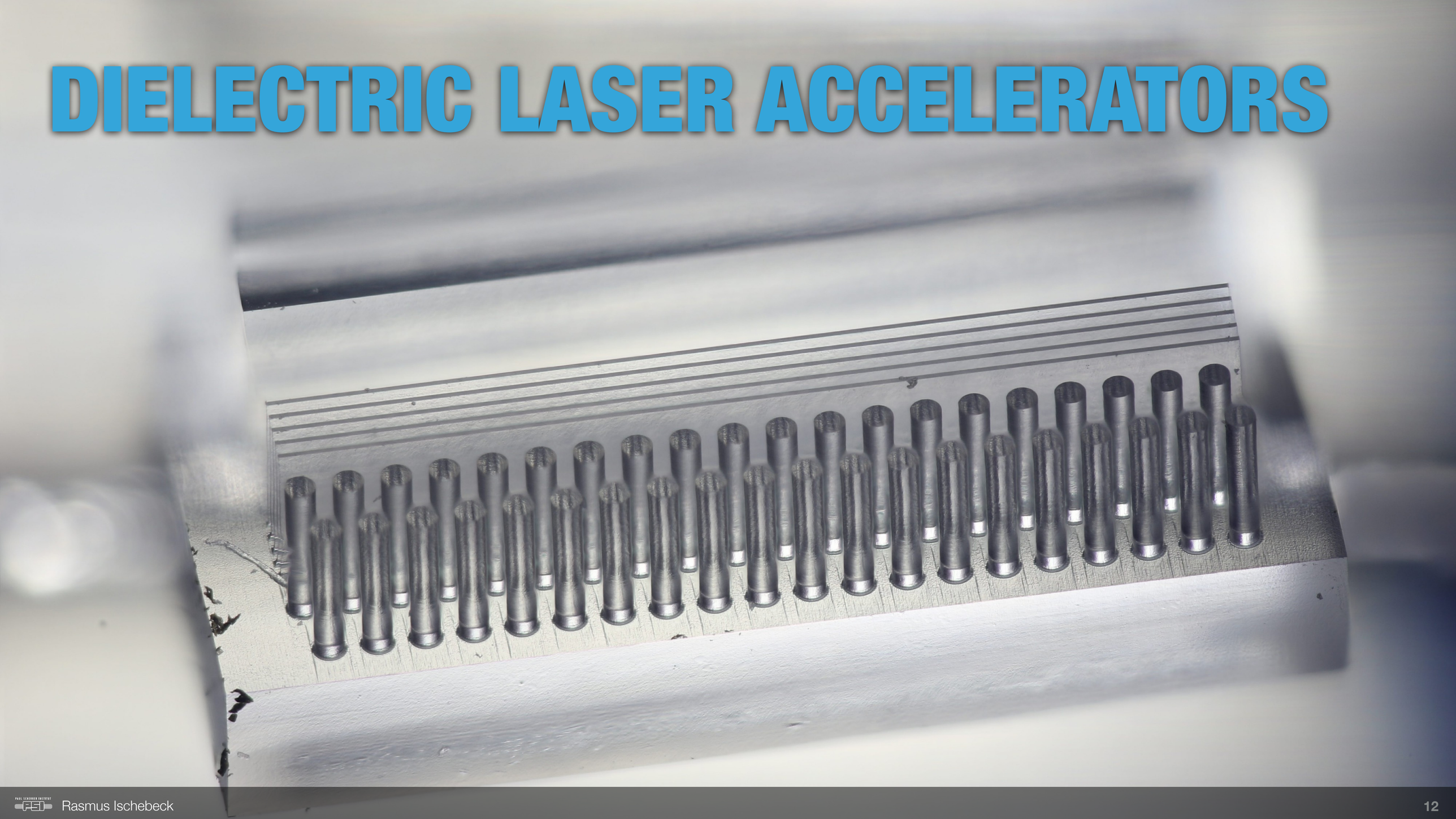




Pousa et al., PRL **123**, 054801 (2019)

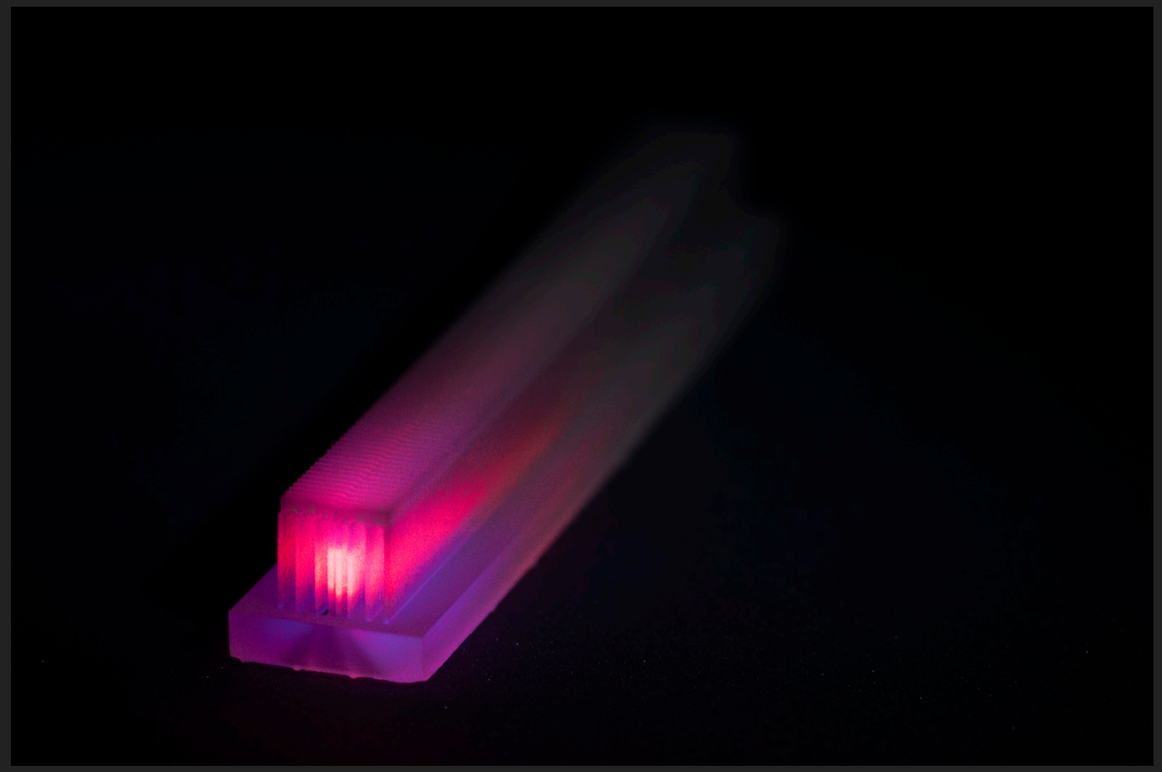
CHICANE IN SWISSFEL

DIELECTRIC LASER ACCELERATORS

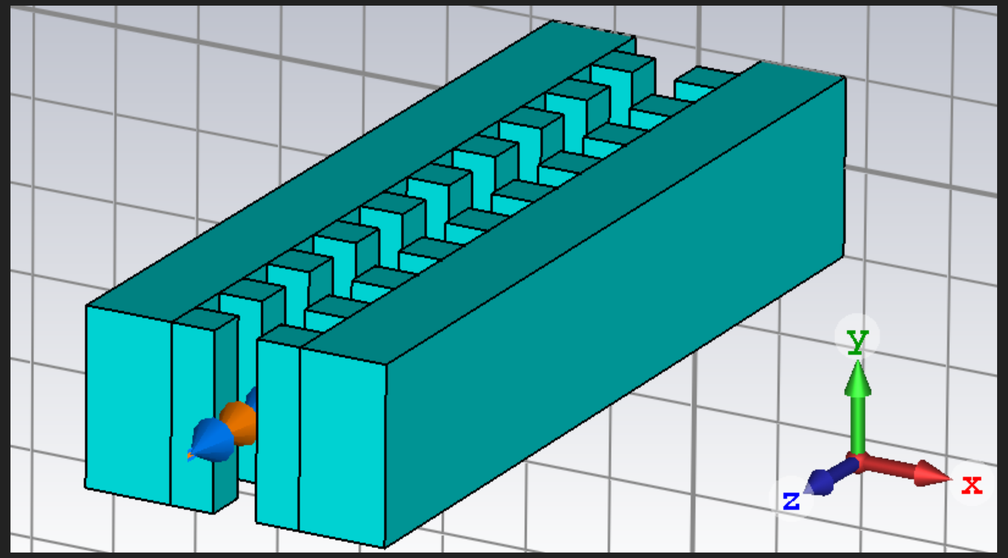


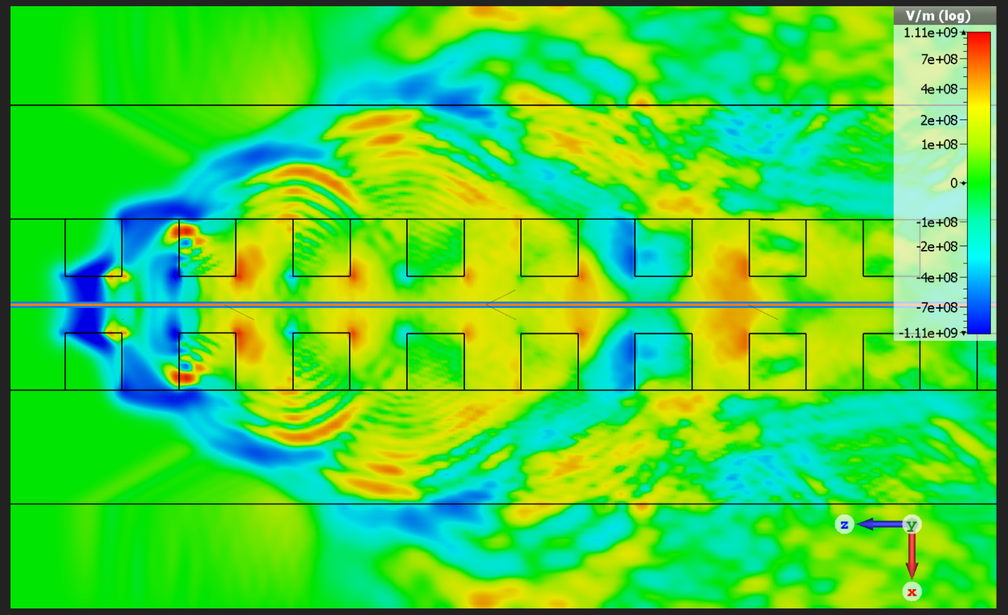
DIELECTRIC LASER ACCELERATORS

- Possibilities to test dielectric structures at PSI:
  - Beam-driven structures for beam shaping and radiation generation
  - Laser-driven structures require a synchronized laser

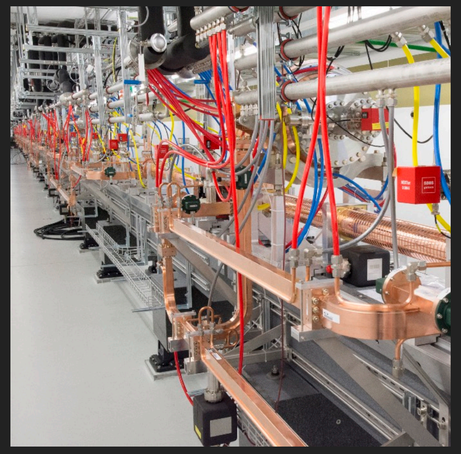
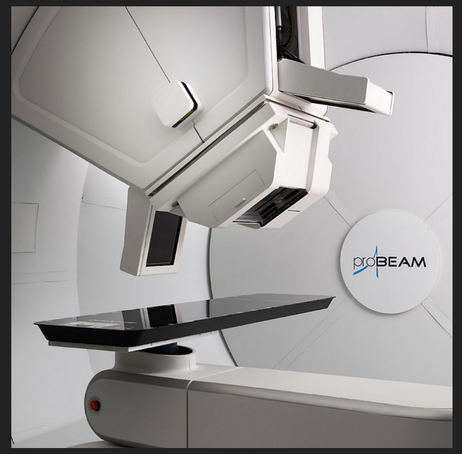


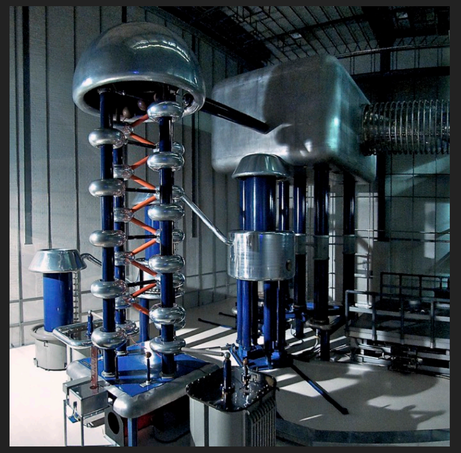
WAKE FIELDS

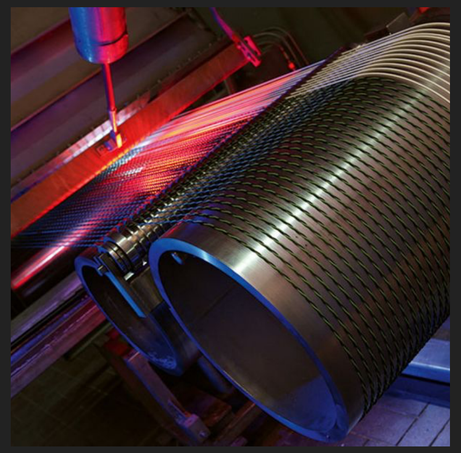

Y
X
Z


V/m (log)
1.11e+09
7e+08
4e+08
2e+08
1e+08
0
-1e+08
-2e+08
-4e+08
-7e+08
-1.11e+09
z
y
x

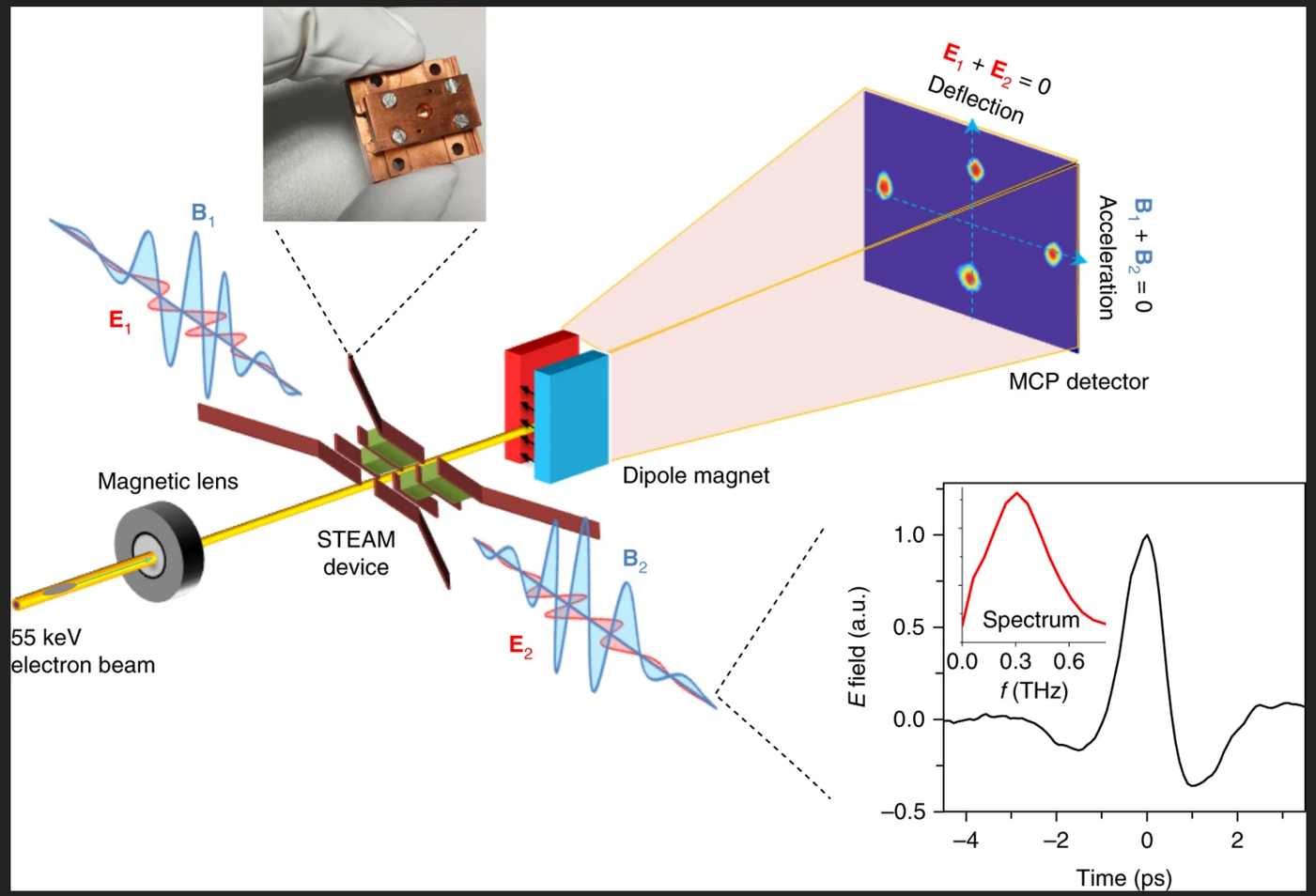
APPLICATIONS OF TECHNOLOGIES AND BEAMS

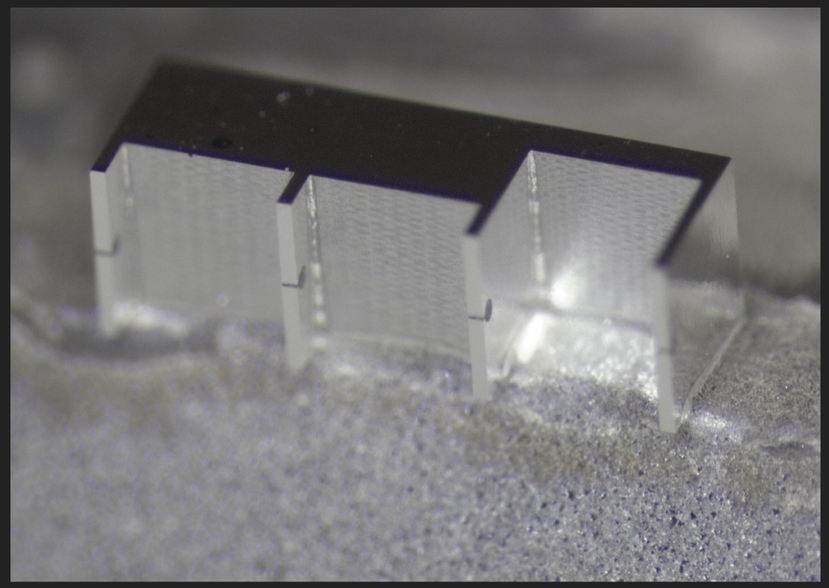


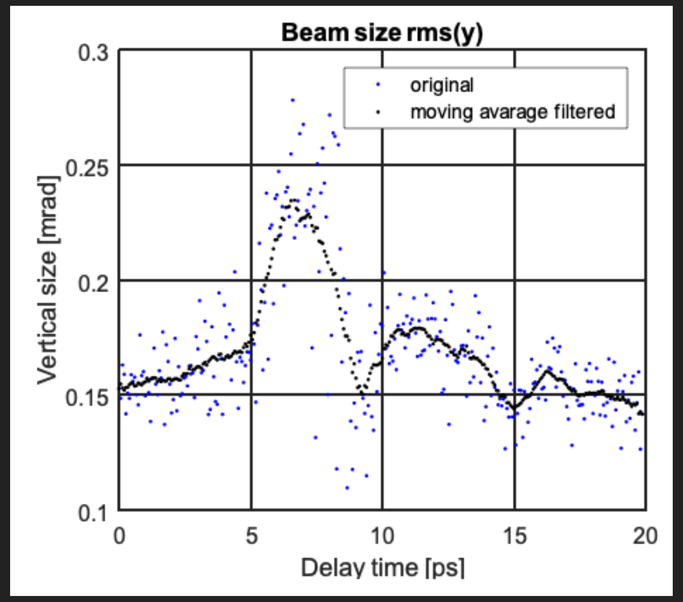
LASER / THz BUNCH LENGTH DIAGNOSTICS



- Zhang et al., Nature Photon **12**, 336–342 (2018).

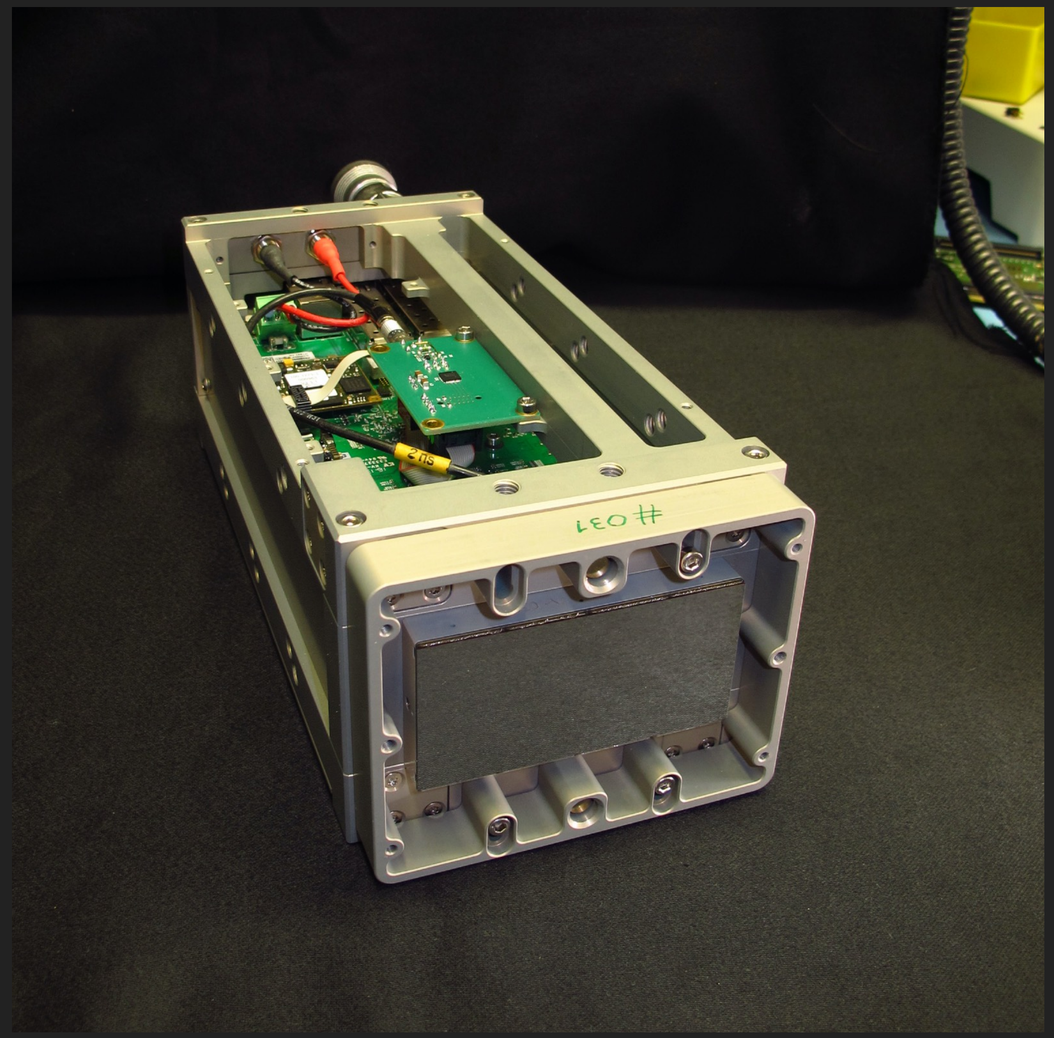
LASER / THz BUNCH LENGTH DIAGNOSTICS



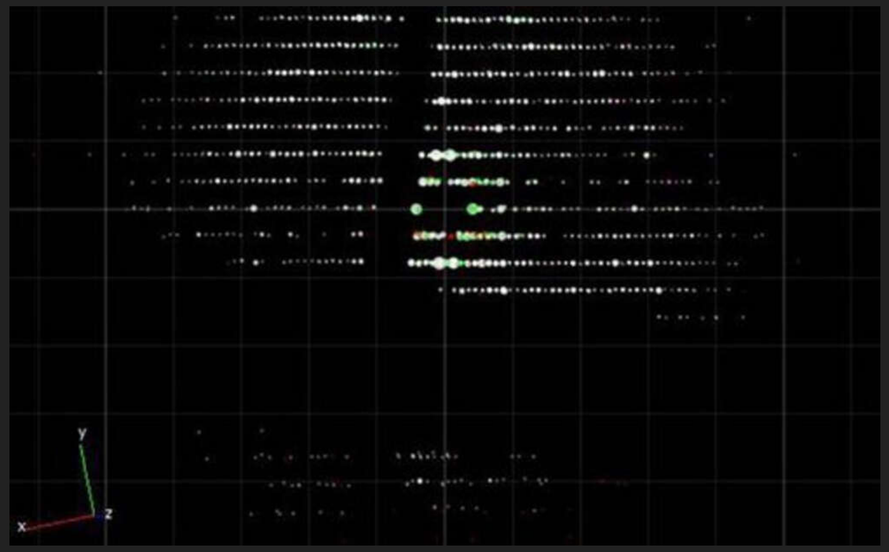


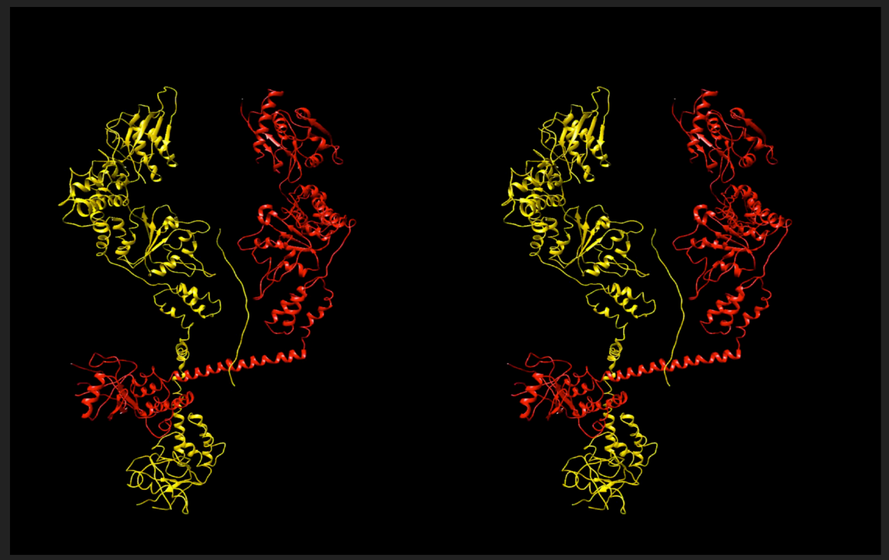
DETECTOR DEVELOPMENT

- Direct electron detection

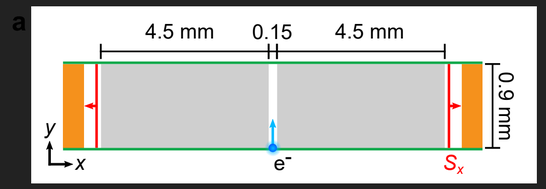


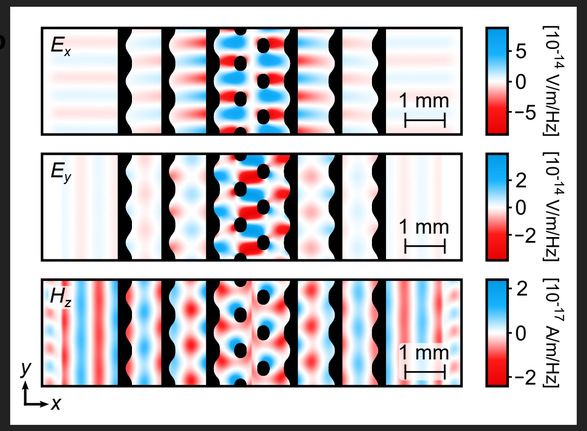
ELECTRON DIFFRACTION

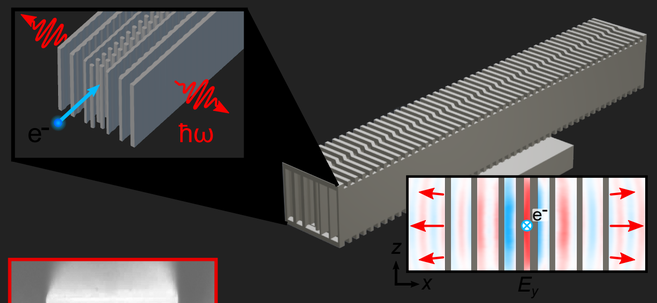


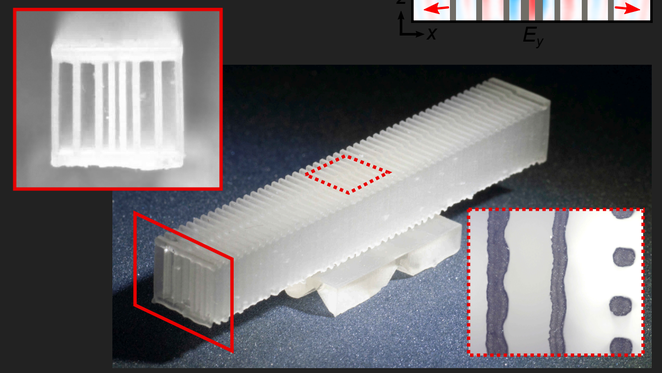


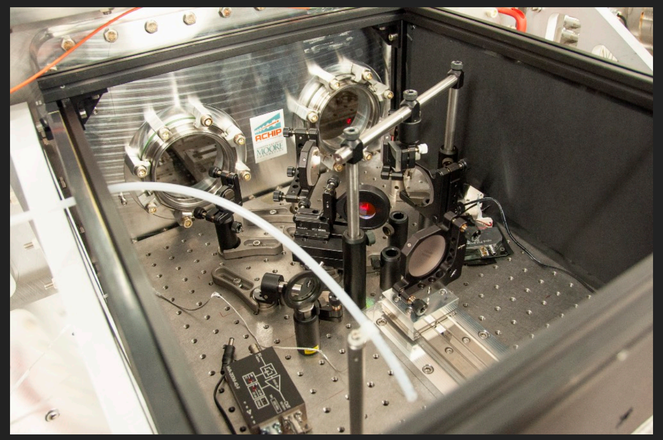
TERAHERTZ GENERATION



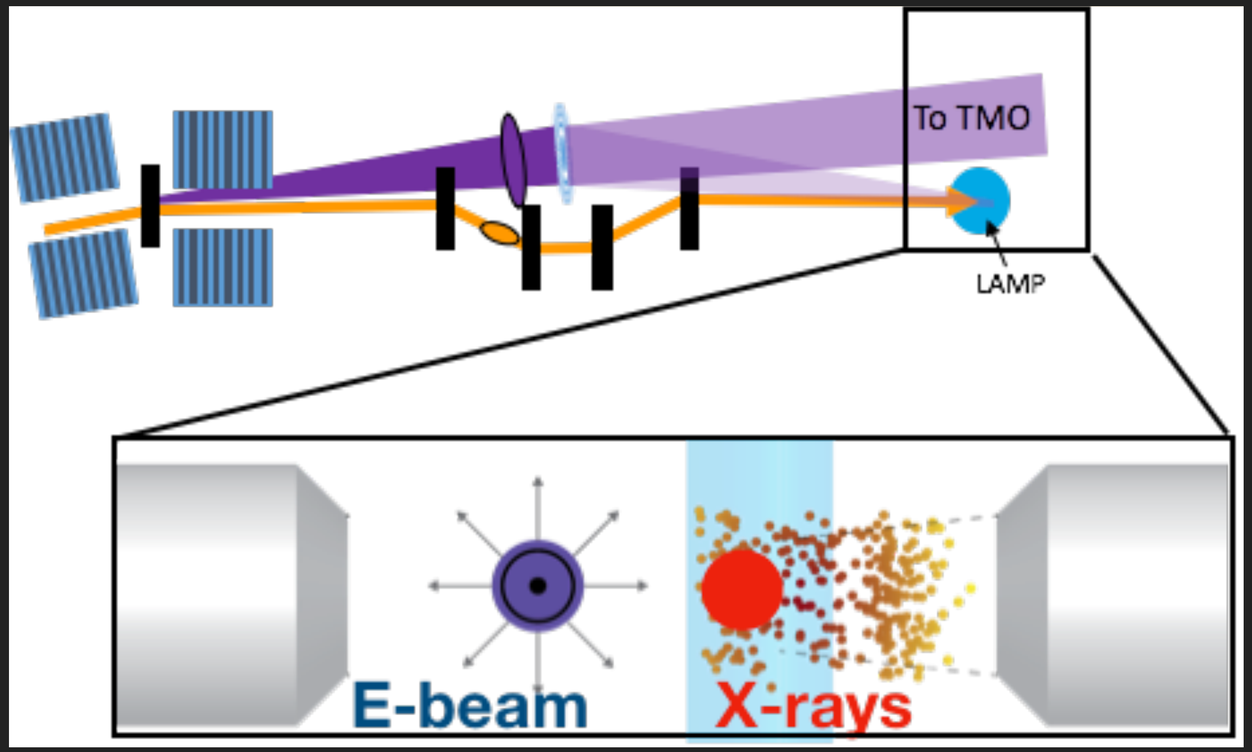








THz FIELDS FROM ELECTRON BEAM



- Gas-phase experiments using the beam directly
- D. Caesar, A. Marinelli
- X-Ray Generation in a Plasma / Hard X-Ray Seeding