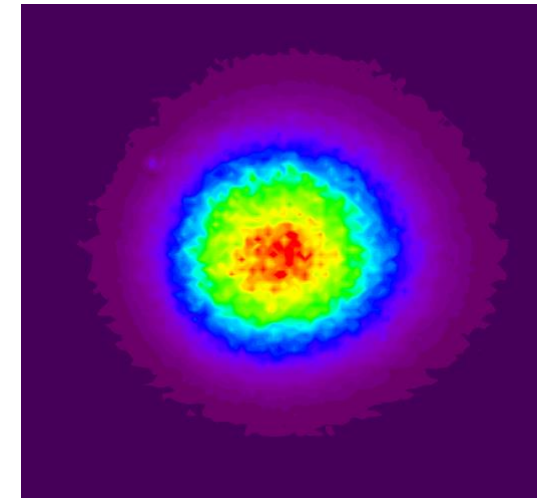
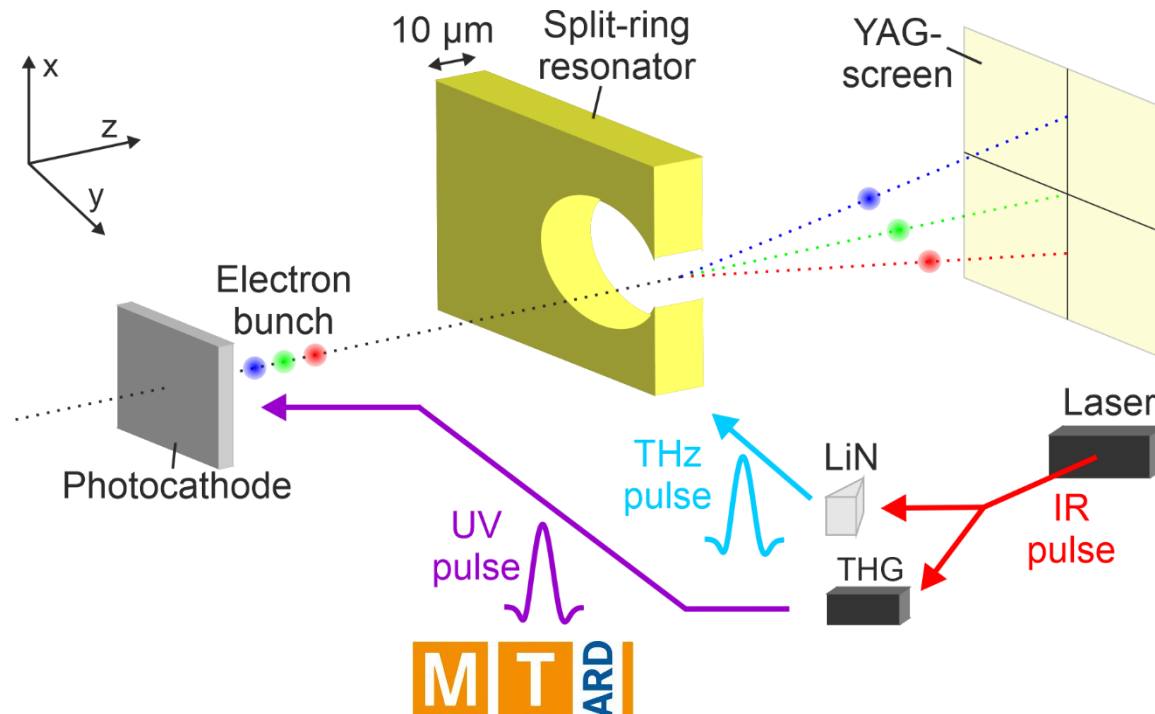
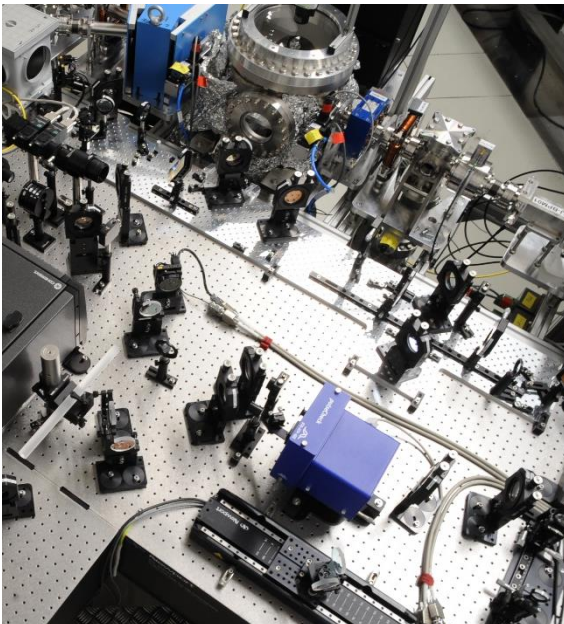


Latest developments in the split-ring resonator experiment at FLUTE

M. Nabinger, M.J. Nasse, T. Schmelzer, N. Smale, J. Schäfer, B. Härer, G. Niehues, S. Funkner, E. Bründermann, R. Ruprecht, A.-S. Müller (KIT, Karlsruhe, Germany)

R. Ischebeck, M. Dehler, M. Moser, V. Schlott (PSI, Villigen, Switzerland)

Z. Ollmann, M. Hayati, T. Feurer (University of Berne, Berne, Switzerland)



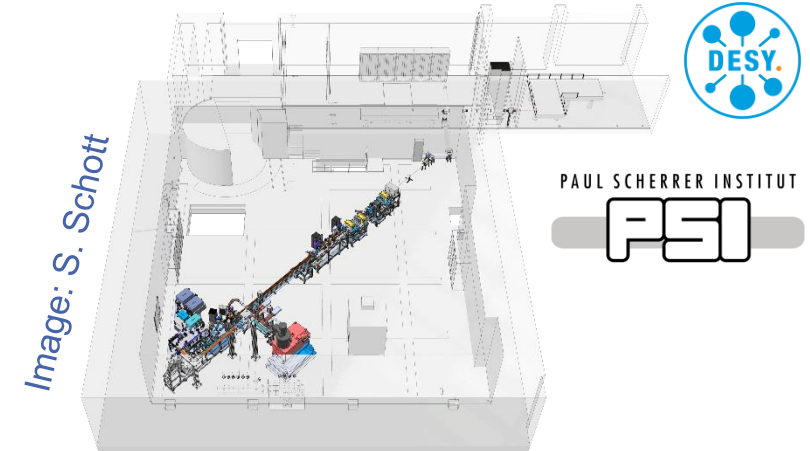
FLUTE: Accelerator test facility at KIT

■ FLUTE (Ferninfrarot Linac- Und Test-Experiment)

- Test facility for accelerator physics within ARD
- Experiments with THz radiation

■ R&D topics

- Serve as a test bench for new beam diagnostic methods and tools
- Systematic bunch compression and THz generation studies
- Develop single shot fs diagnostics
- Synchronization on a femtosecond level



Final electron energy	~ 41	MeV
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Electron bunch charge	0.001 - 3	nC
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Electron bunch length	1 - 300	fs
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Pulse repetition rate	10	Hz
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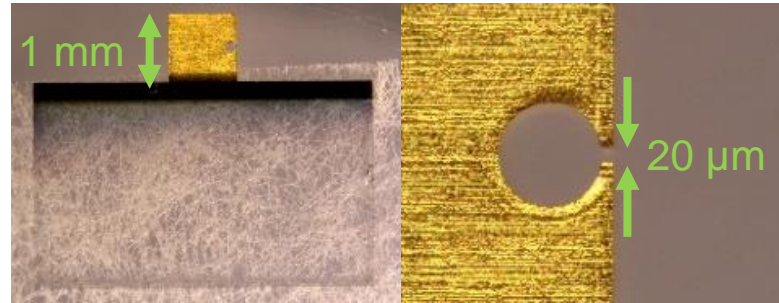
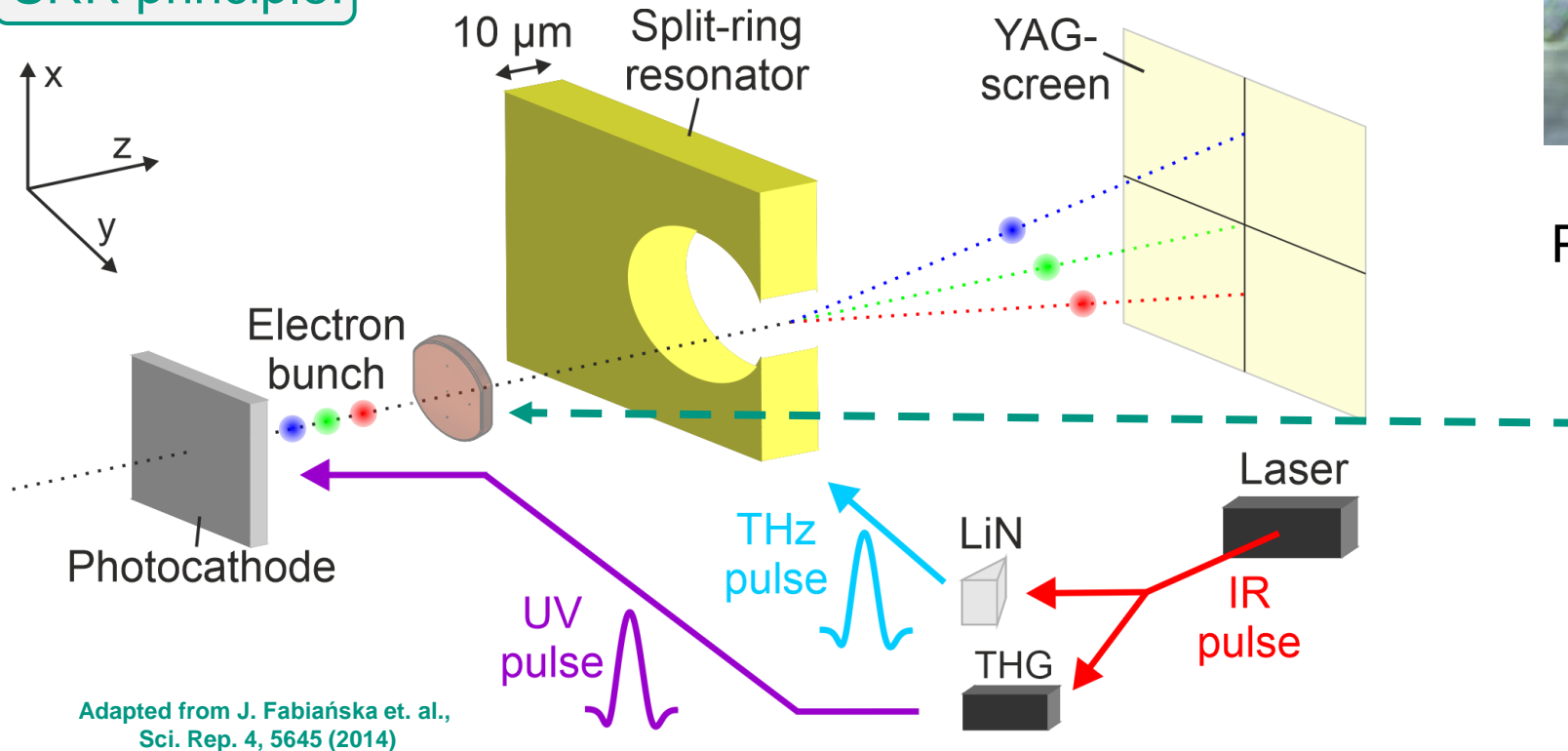
THz E-Field strength	up to 1.2	GV/m
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www.ibpt.kit.edu/flute

Split-ring resonator (SRR) experiment - principle

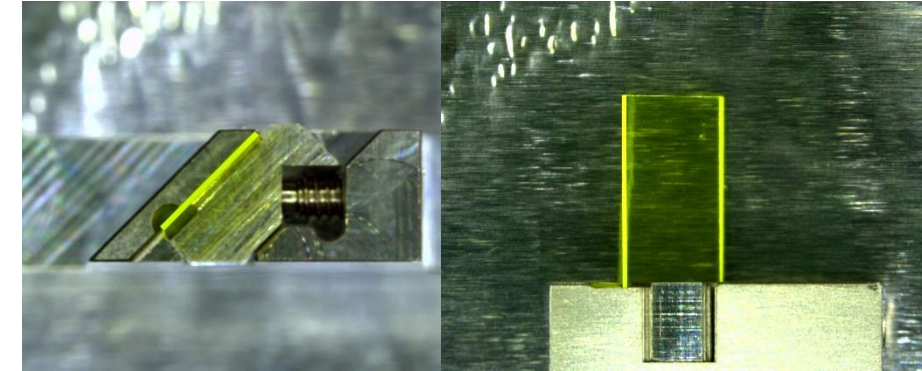
Experimental goal:
Measurement of longitudinal bunch profile on a fs scale

SRR principle:



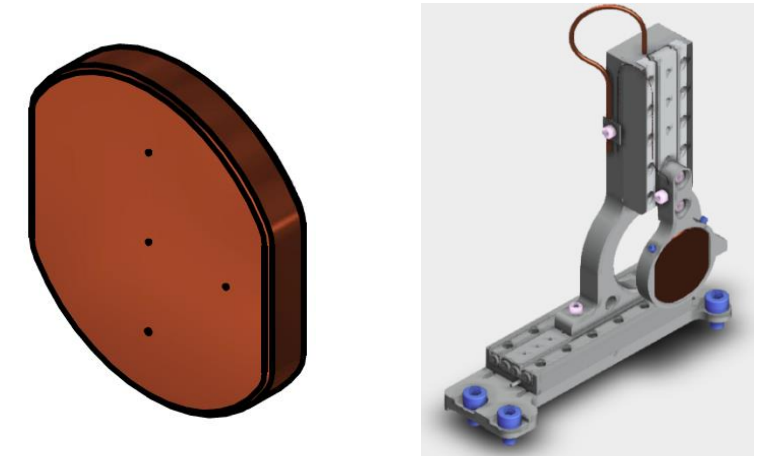
Courtesy: M. J. Nasse

New holder for SRR and YAG-screen:



Courtesy: T. Borkowski

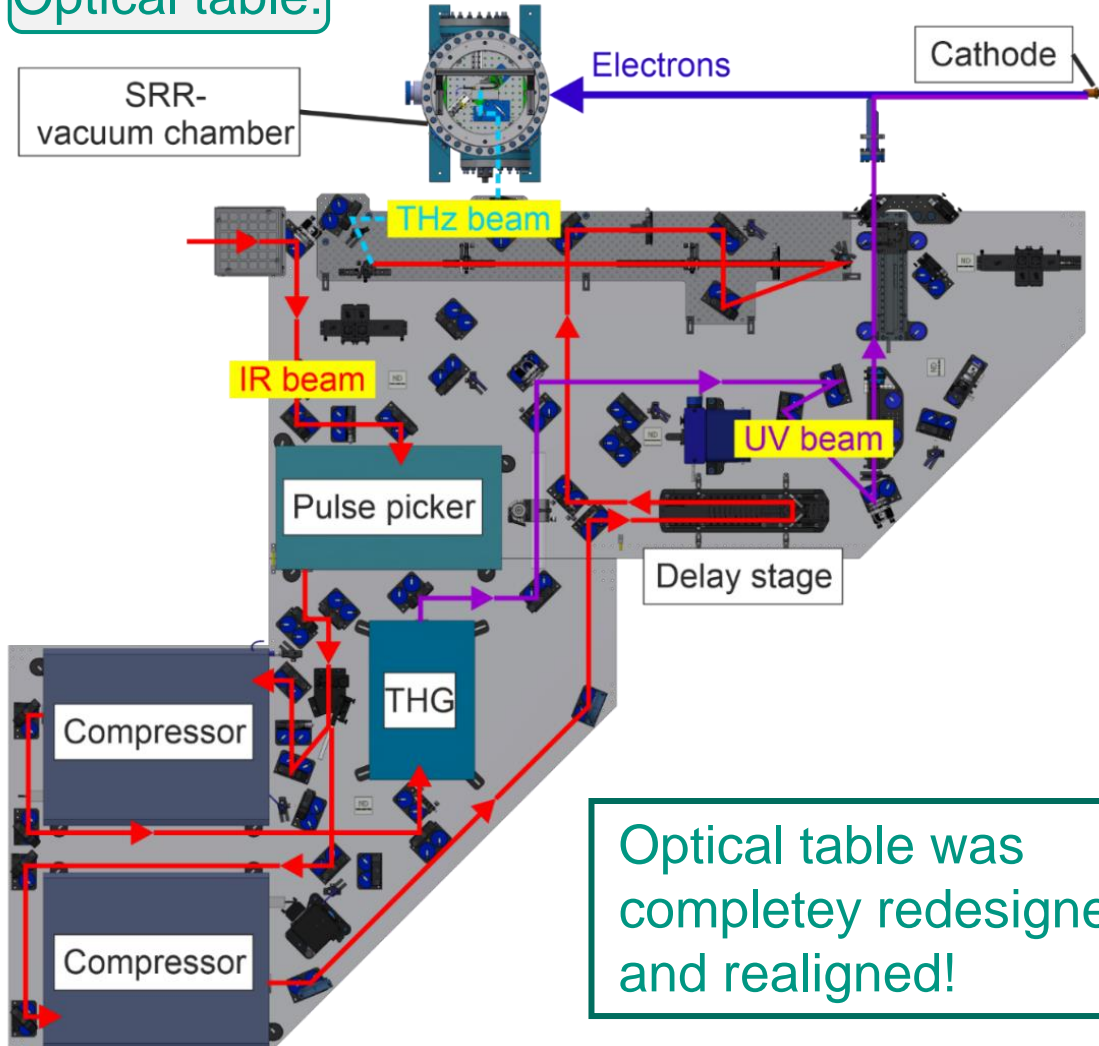
Planned Pinhole/aperture for e-beam:



Courtesy: S. Schott

SRR experiment – optical table

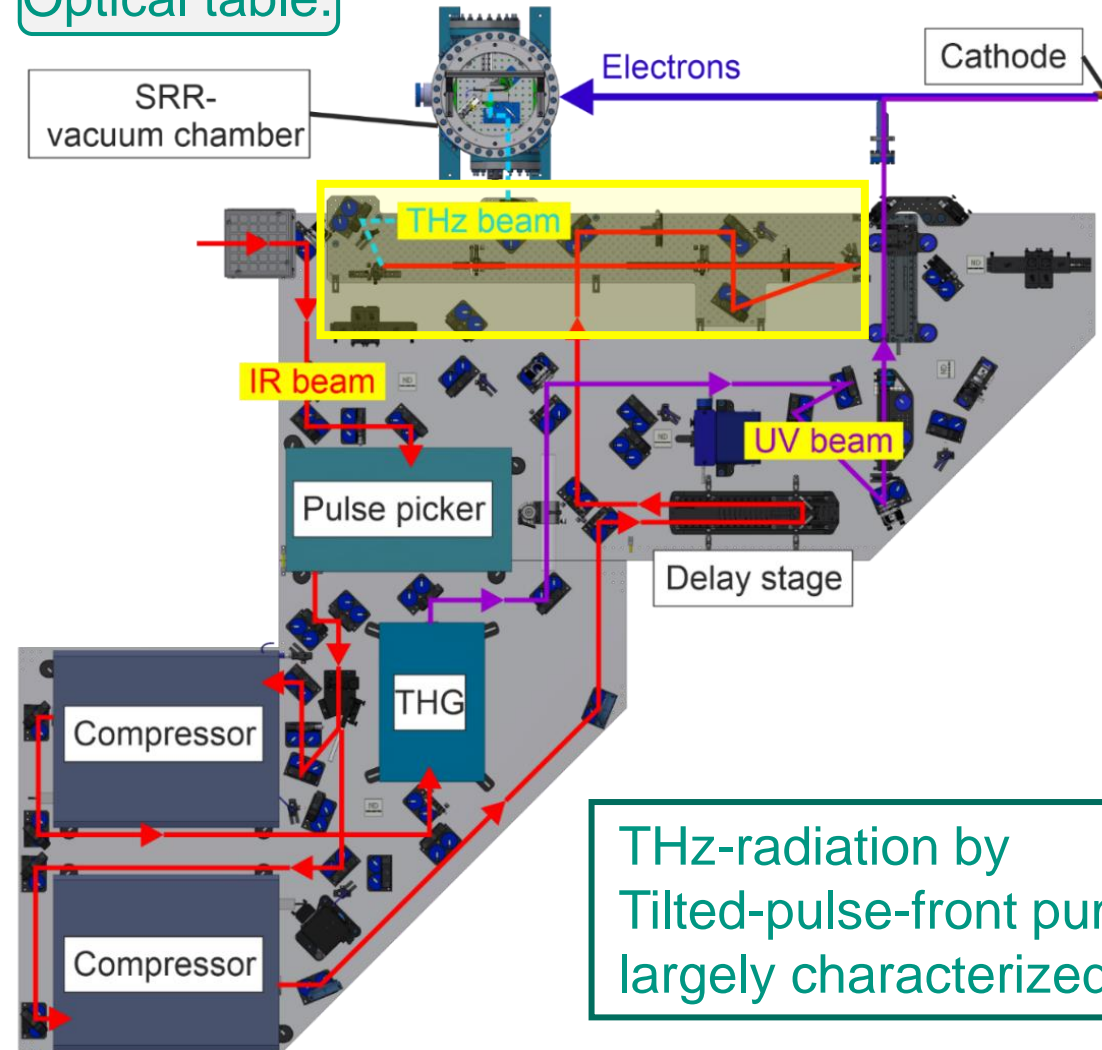
Optical table:



Optical table was
completely redesigned
and realigned!

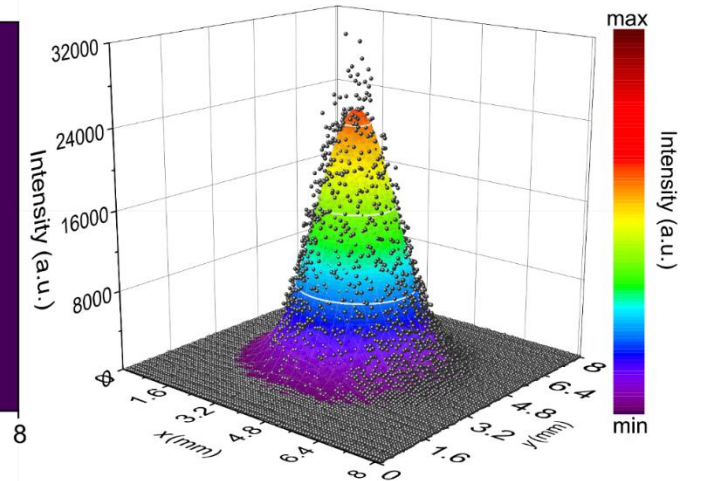
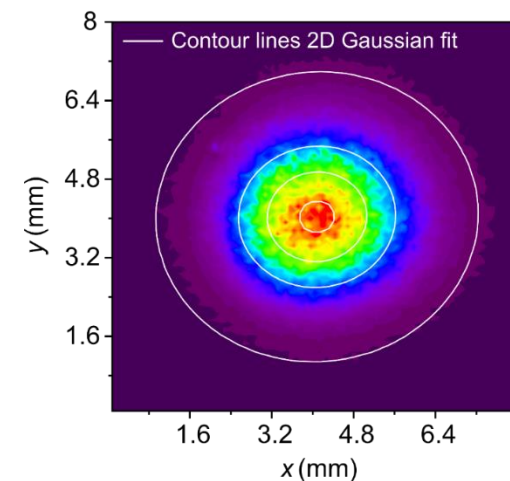
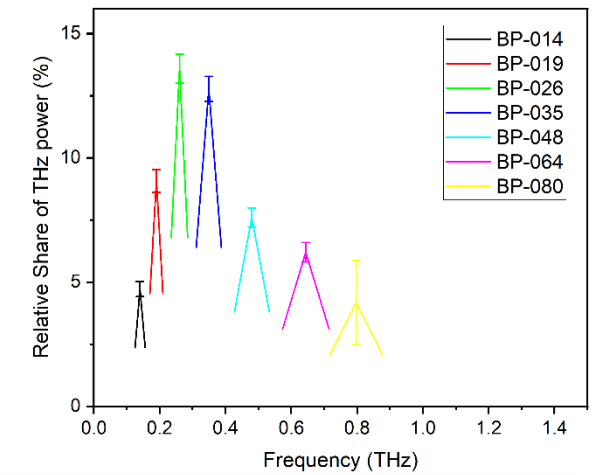
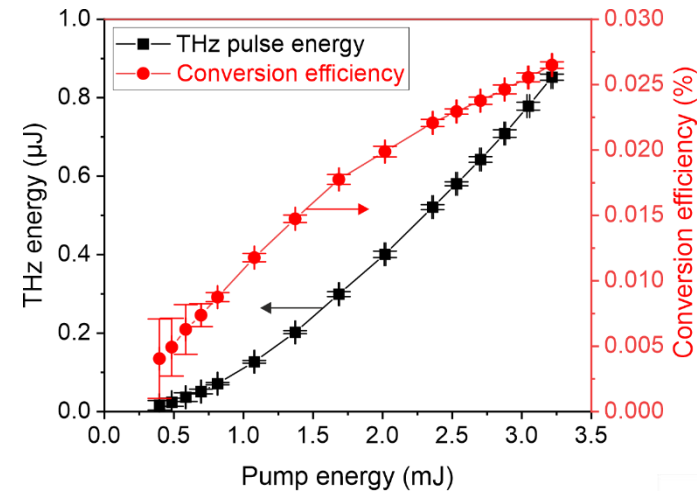
SRR experiment – optical table and laser-based THz generation

Optical table:



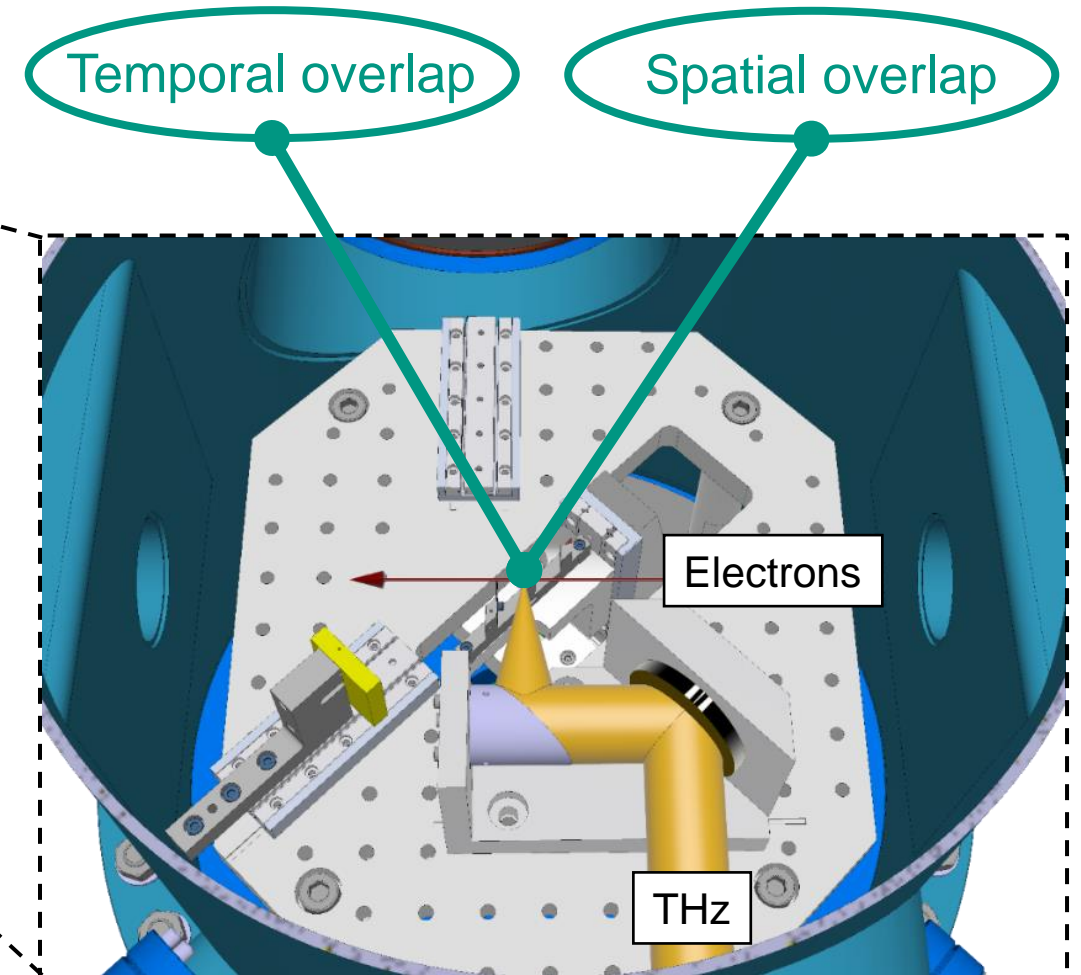
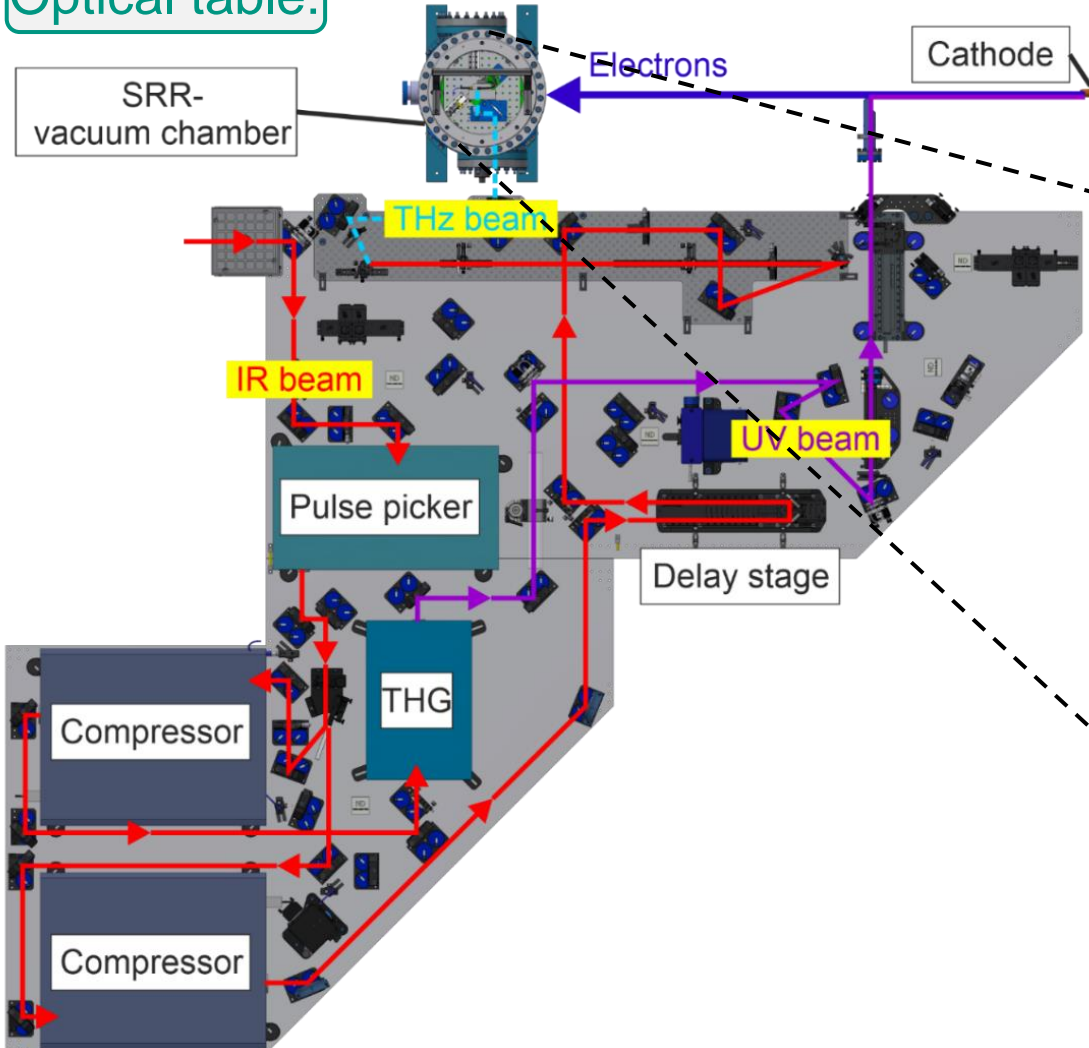
THz-radiation by
Tilted-pulse-front pumping
largely characterized!

THz generation:



SRR experiment – optical table and vacuum chamber

Optical table:

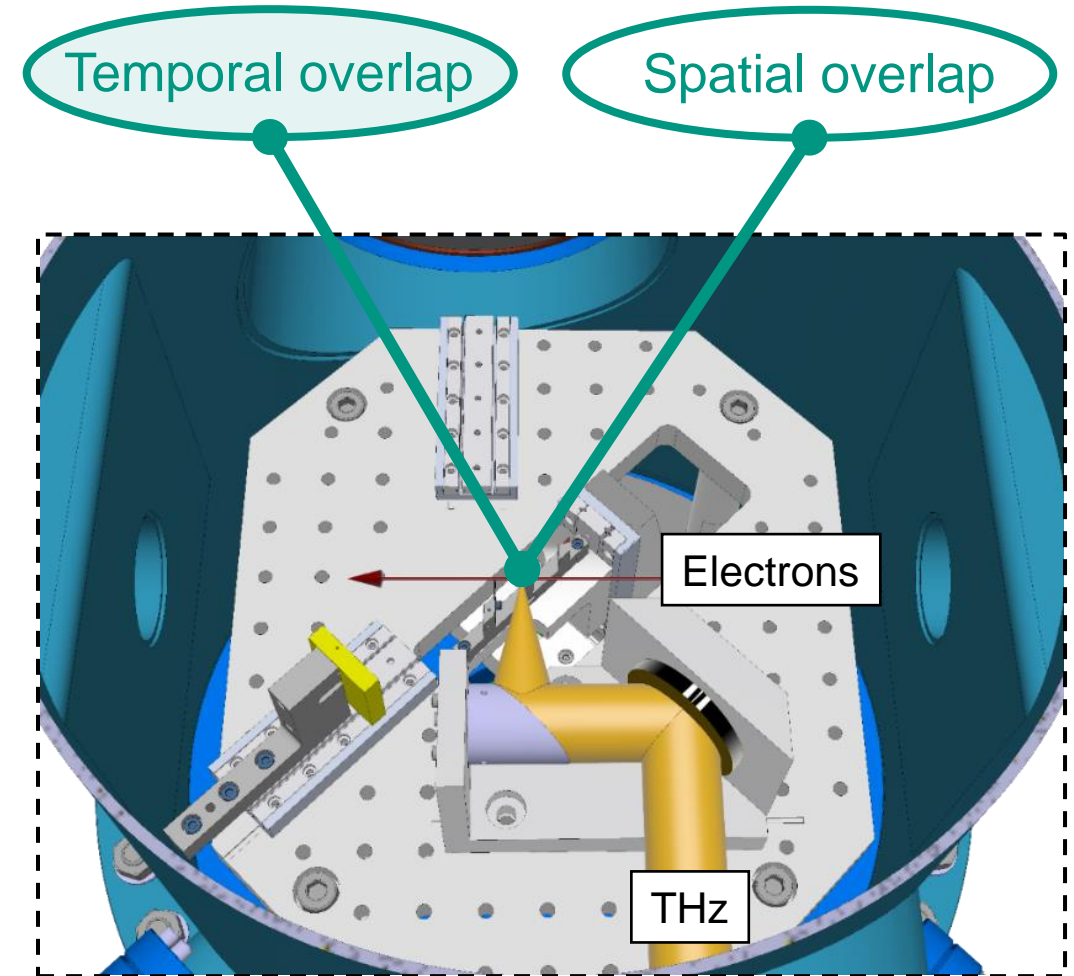
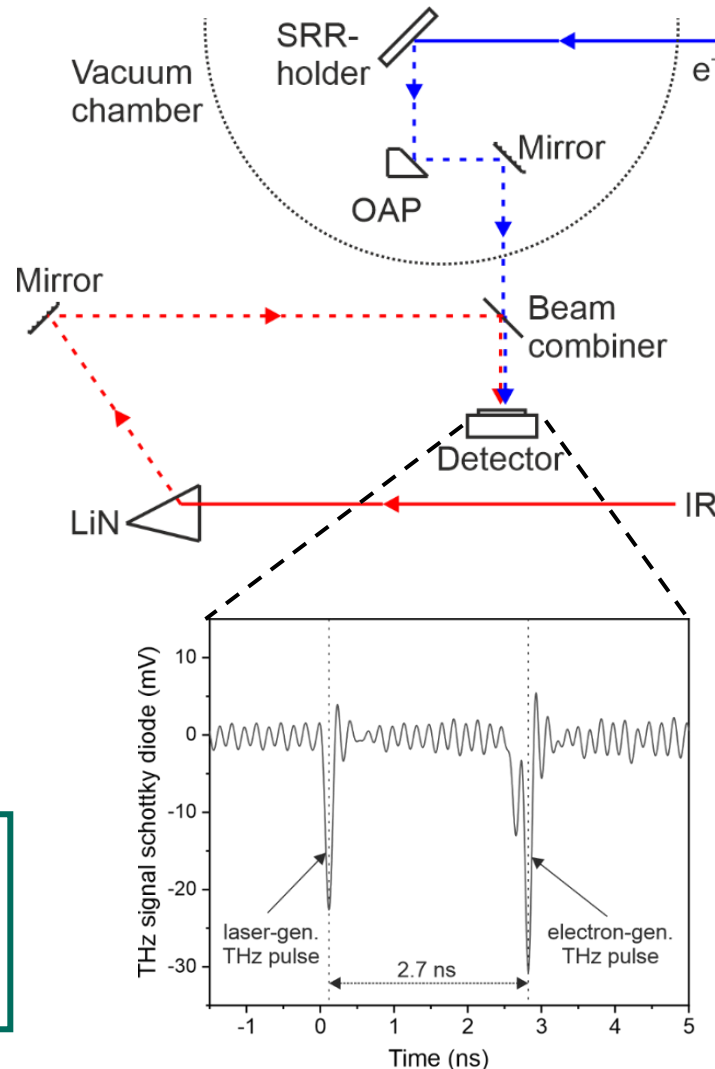


Courtesy: S. Schott

SRR experiment – temporal overlap

- Both beams for photoinjection & THz generation have to match for **temporal overlap** at the SRR
- First electron-generated THz radiation at FLUTE!

➔ **Temporal overlap experimentally preadjusted!**



Courtesy: S. Schott

Matthias Nabinger

Doctoral researcher

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Thank you for your attention!

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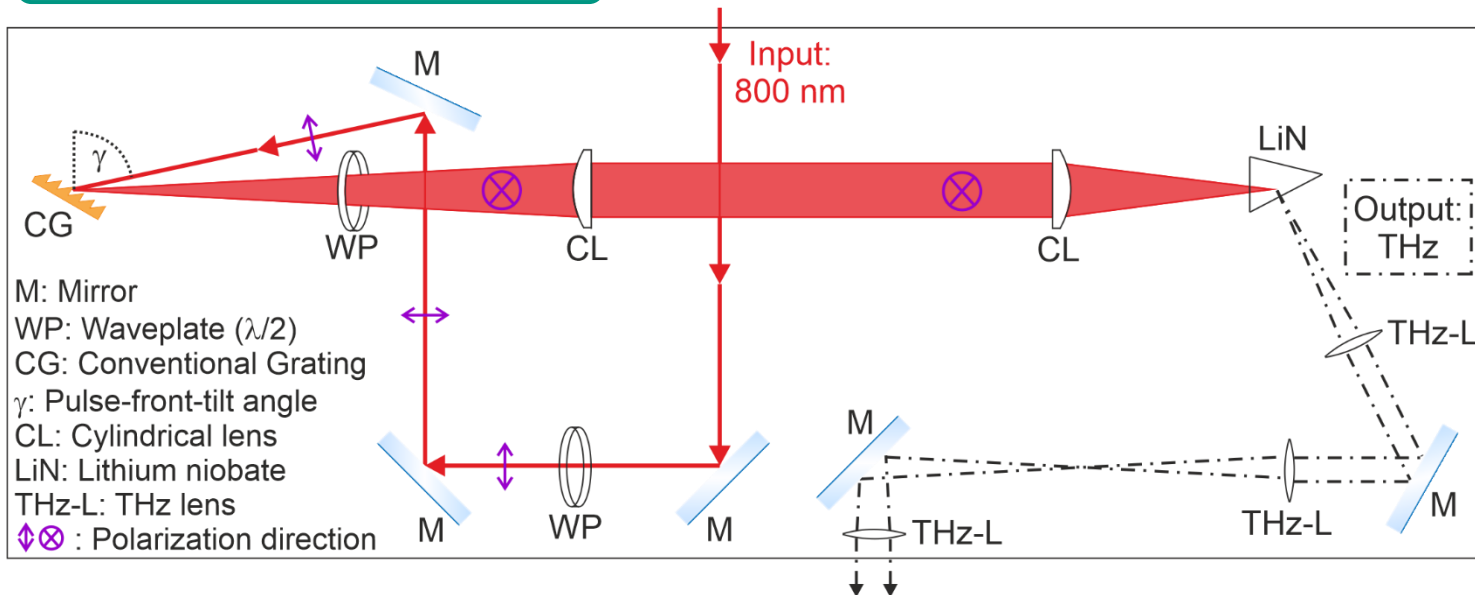
Tilted-pulse-front (TPF) pumping

- Efficient way of **optical rectification** for the generation of intense THz pulses

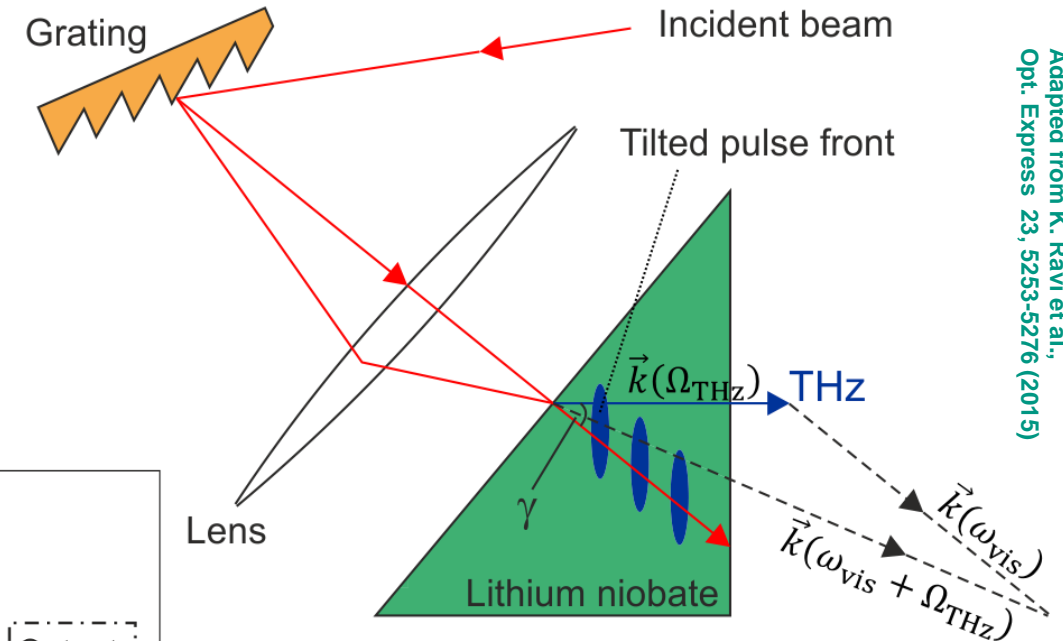
- Most commonly used material: LiNbO_3 (Lithium niobate)

➔ TPF pumping approach for obtaining phase matching

TPF pumping THz setup:



TPF pumping principle:



Adapted from K. Ravi et al.,
Opt. Express 23, 5253-5276 (2015)

Phase matching condition:

$$v_{\text{THz}}^{\text{ph}} = v_{\text{Vis}}^{\text{gr}} \cdot \cos \gamma$$