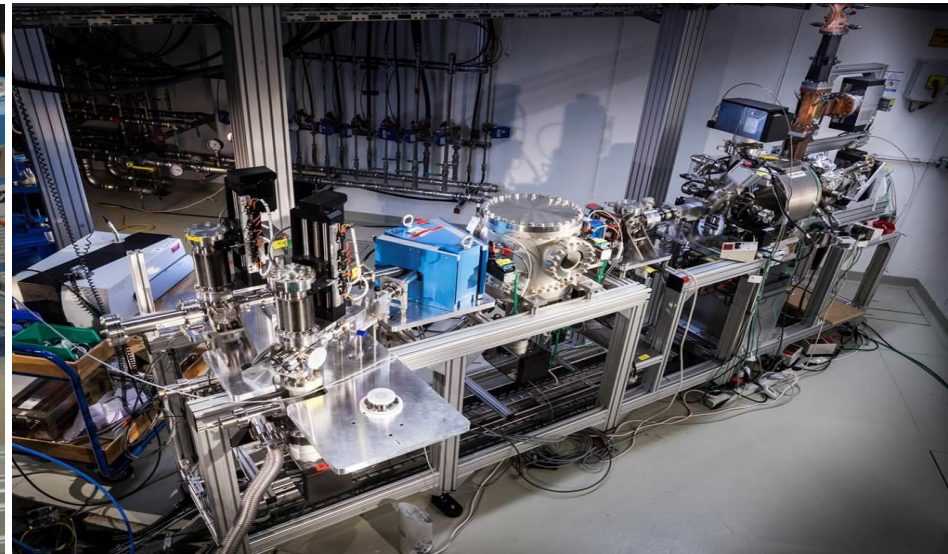
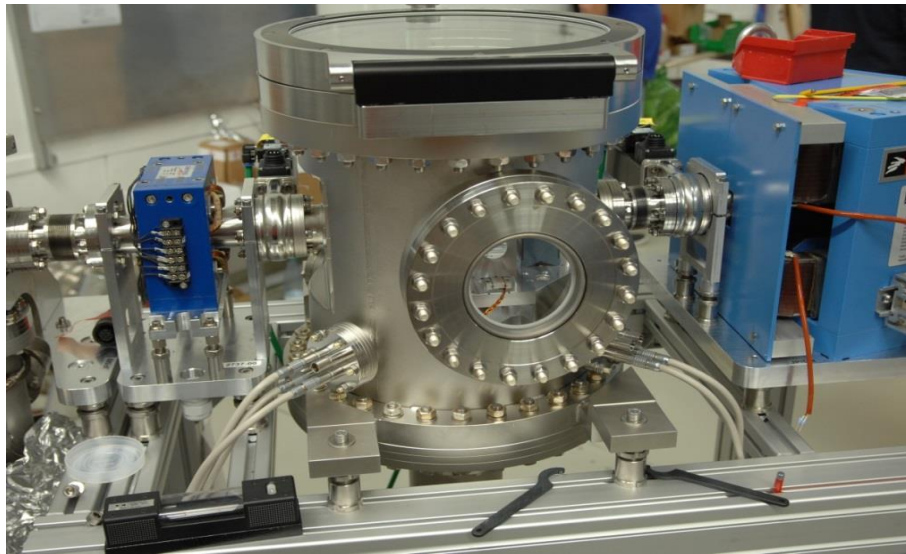


# Status of FLUTE

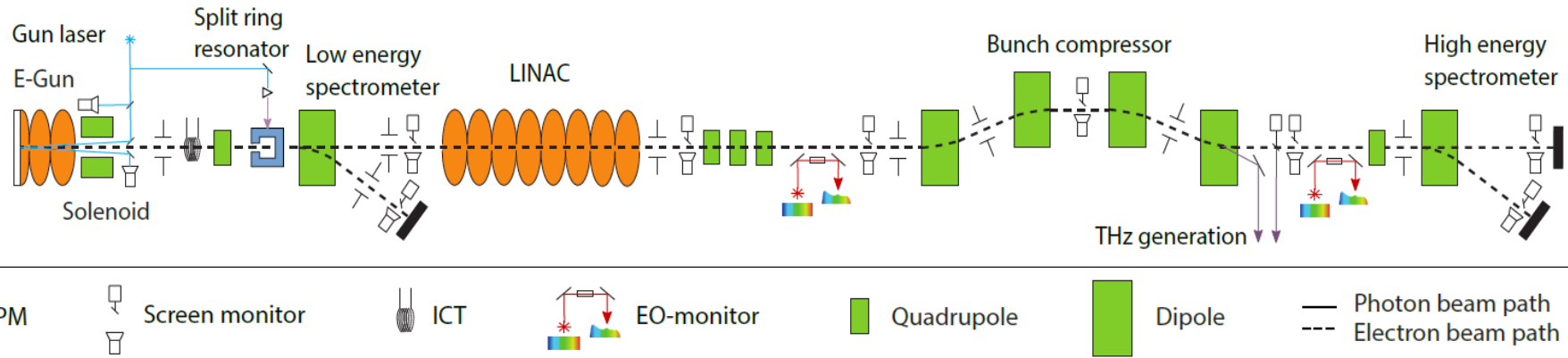
## FLUTE, a linac-based THz source at KIT

Minjie Yan for the FLUTE collaboration

Institute for Beam Physics and Technology (IBPT)



# FLUTE overview



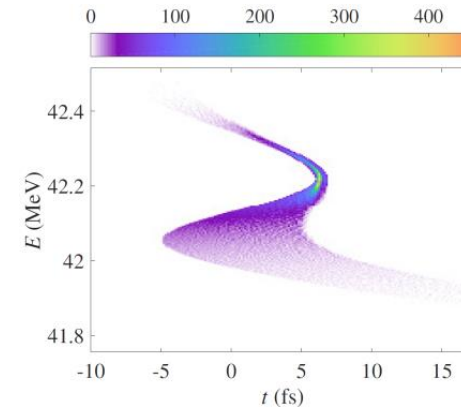
Final electron energy	~ 41	MeV
-----------------------	------	-----

Electron bunch charge	1 - 3000	pC
-----------------------	----------	----

Electron bunch length	~1 - 300	fs
-----------------------	----------	----

Pulse repetition rate	10	Hz
-----------------------	----	----

THz E-Field strength	up to 1.2	GV/m
----------------------	-----------	------



long. phase space:  
RMS bunch length 3.2 fs

# status report last year



# status report last year



now



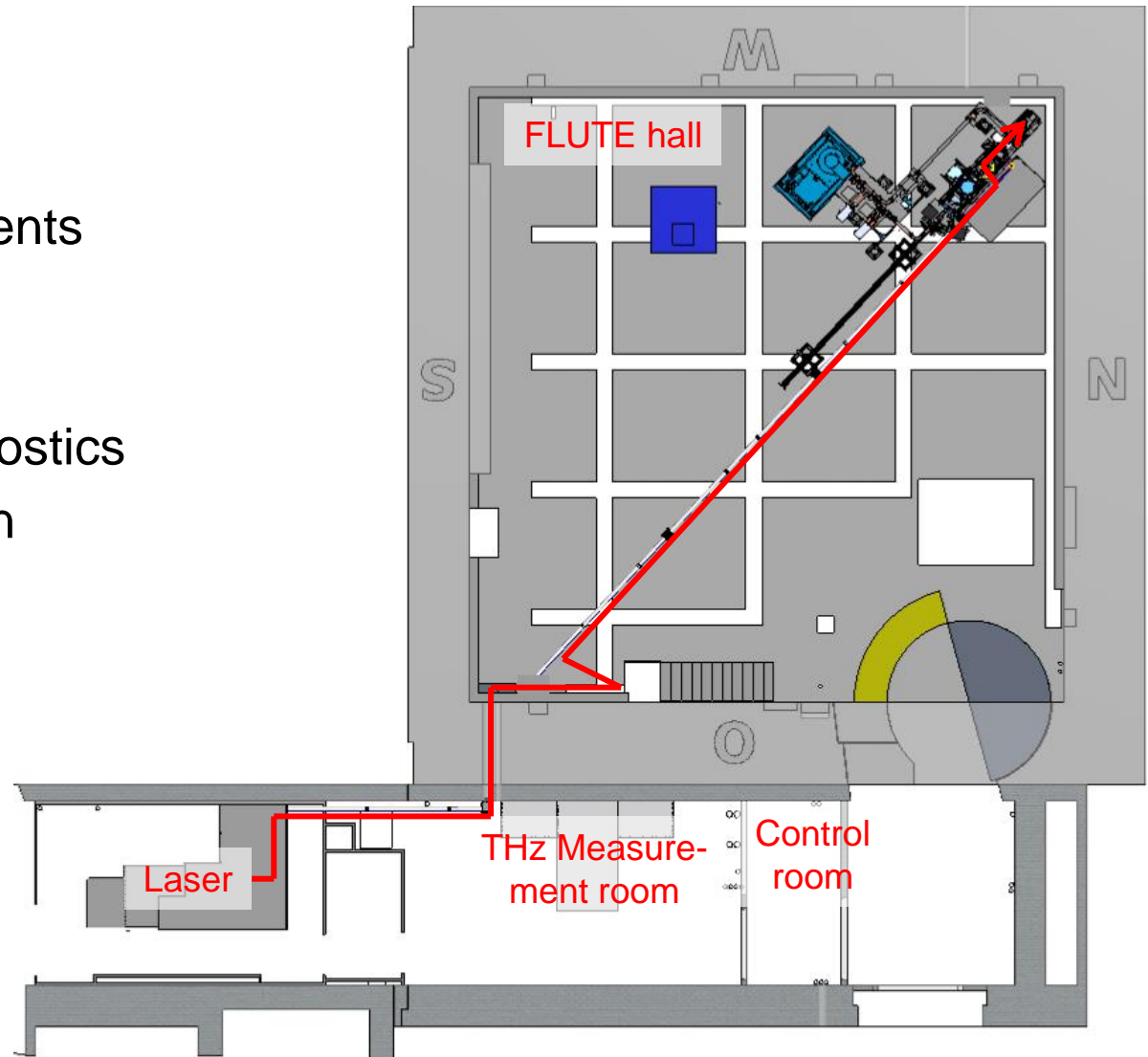
# Inauguration of FLUTE: 13.07.2017



[http://www.ibpt.kit.edu/news\\_2017\\_7\\_KIT\\_press\\_release\\_FLUTE\\_inauguration\\_presidents.php](http://www.ibpt.kit.edu/news_2017_7_KIT_press_release_FLUTE_inauguration_presidents.php)

# FLUTE Status: Phase I

- Vacuum components
- Laser
- RF
- Magnets & Diagnostics
- SRR collaboration



# Vacuum components status

- Assembly finished ✓
- Partially evacuated:  $< 10^{-8}$  mbar ✓

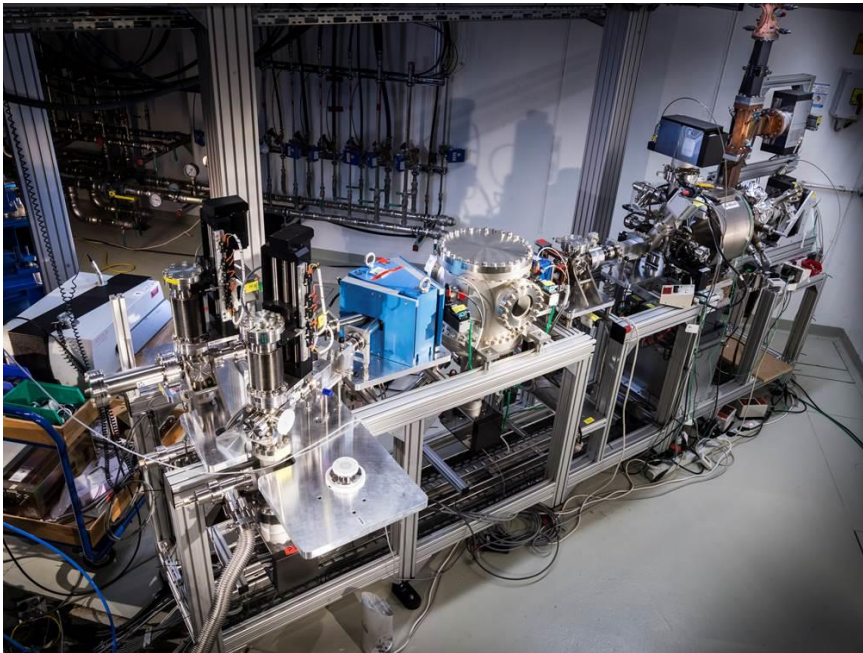
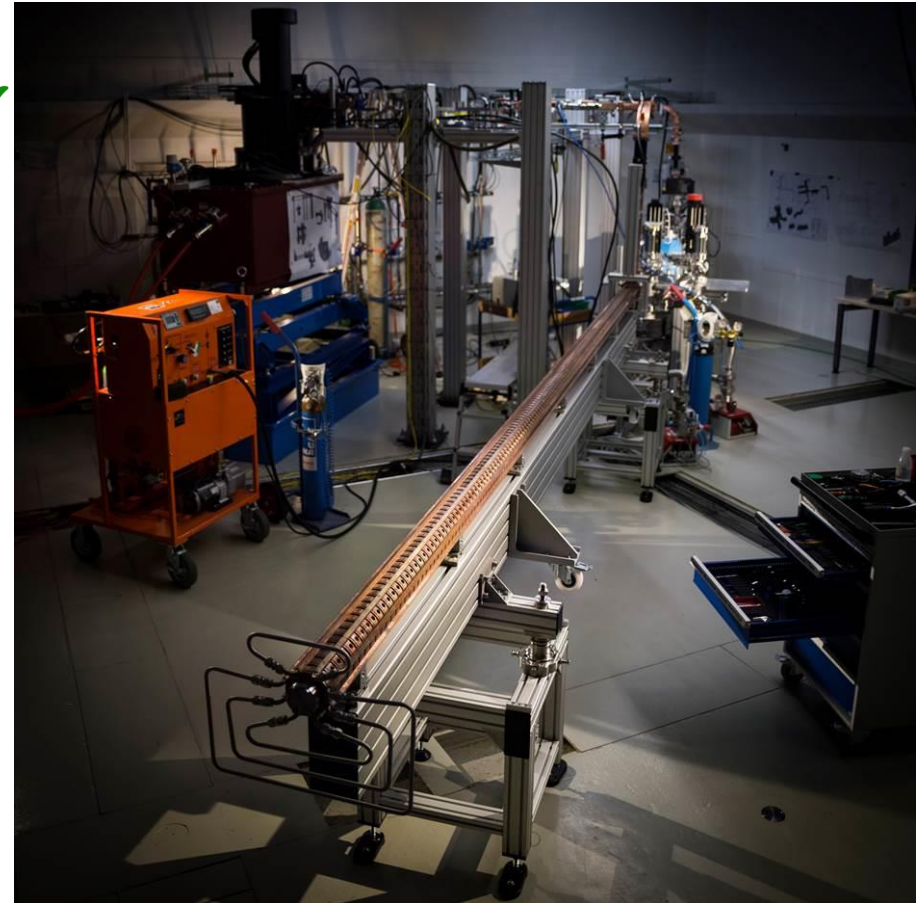


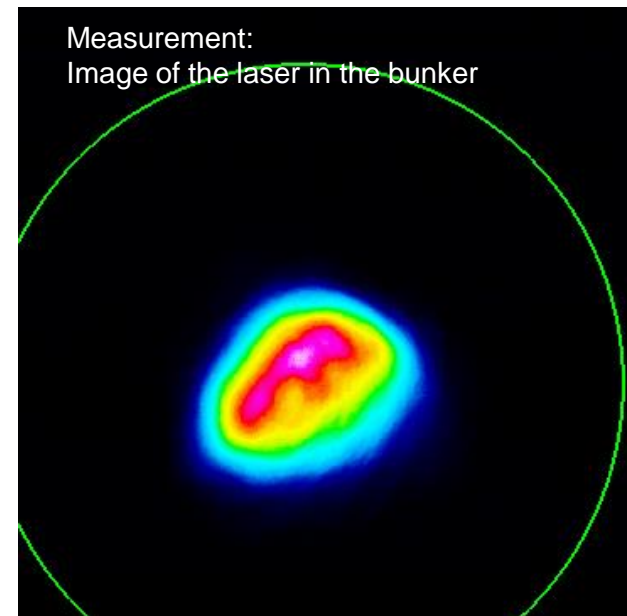
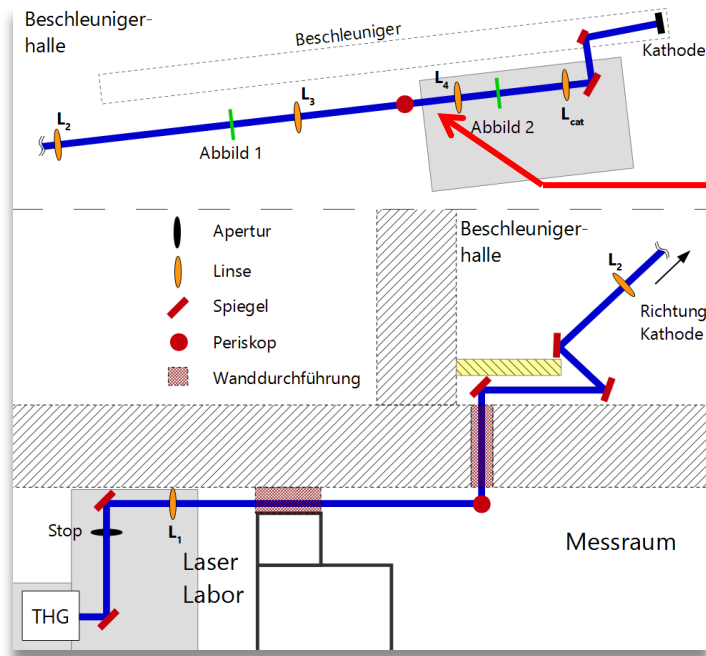
Photo: Laila Tkotz, KIT



Photos: Markus Breig, KIT

# Laser status 1/2

- Laser transport of the 800 nm over 35 m onto the optical table in the bunker ✓



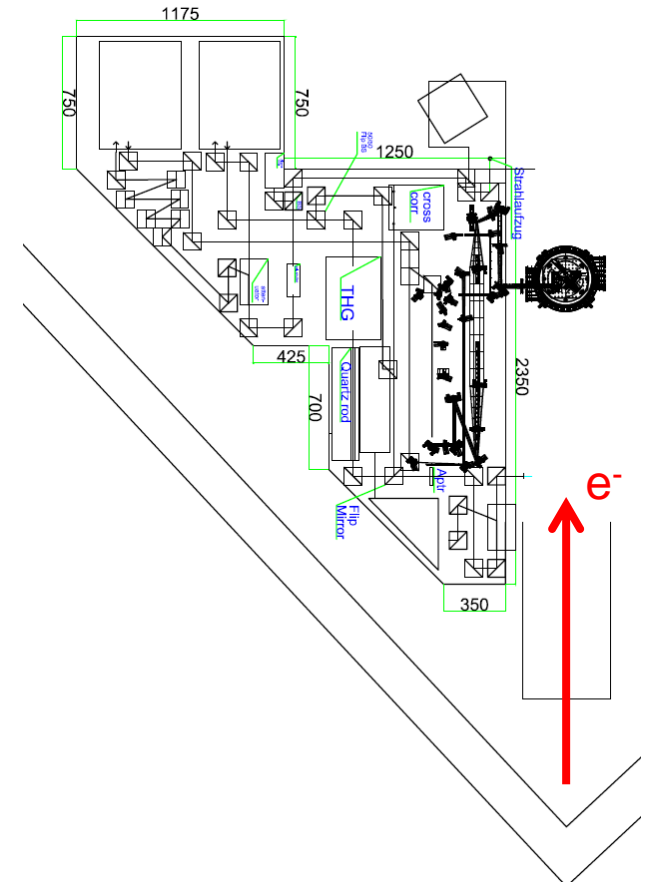
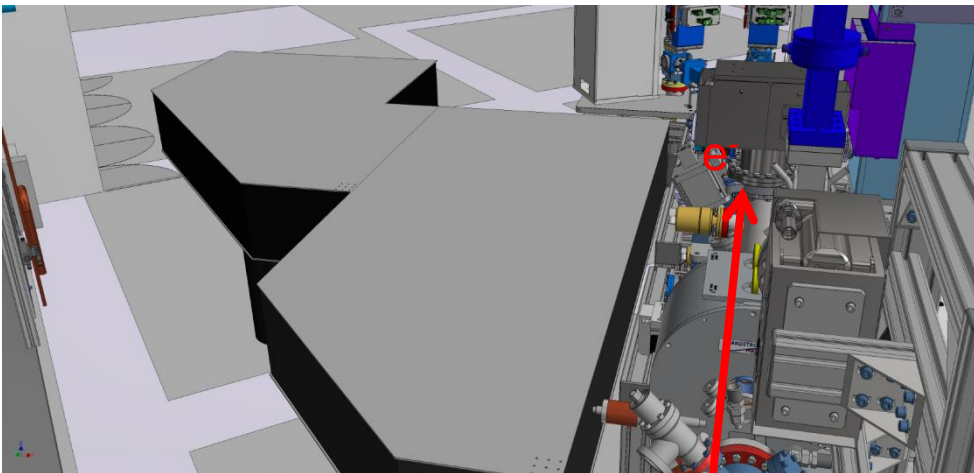
- Prealignment of the last in-vacuum mirror with the cathode using a laser tracker and an alignment laser almost finished ✓

Courtesy: M.J. Nasse, T. Schmelzer



# Laser status 2/2

- In progress:  
Purchase order of a larger, adapted optical table for gun and SRR

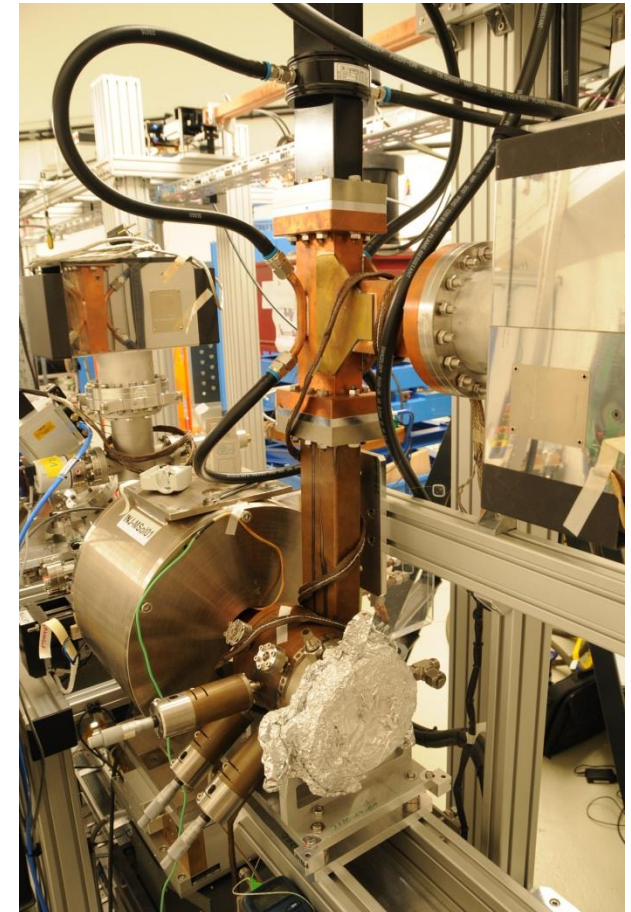
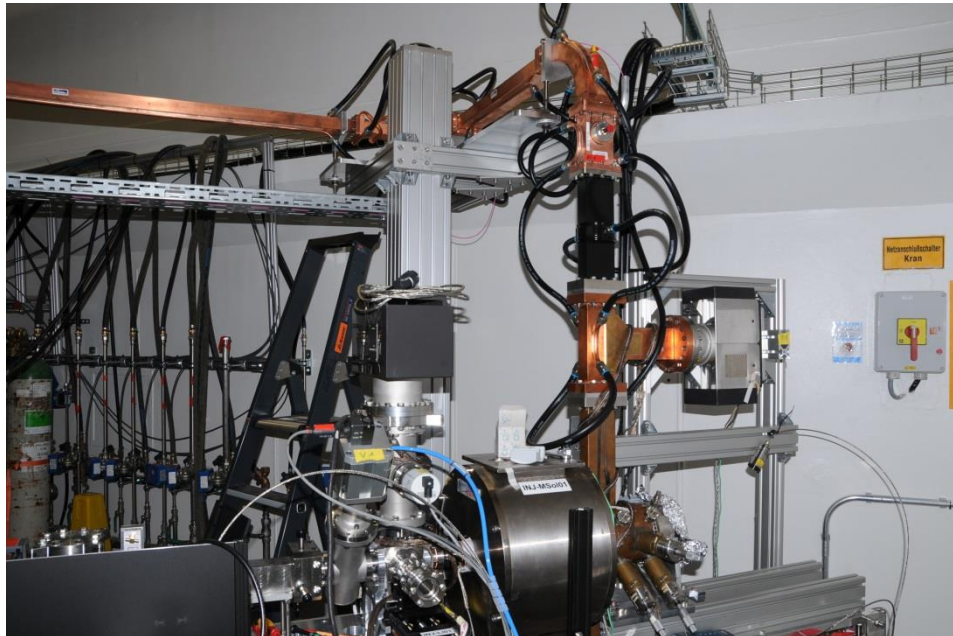


- Next step: THG on the table

Courtesy: M.J. Nasse, T. Schmelzer

# RF-system status 1/2

- All RF components assembled and tested ✓
- Klystron RF test finished ✓  
→ Klystron output ready for gun commissioning



Photos: Pawel Wesolowski, KIT

# RF-system status 2/2



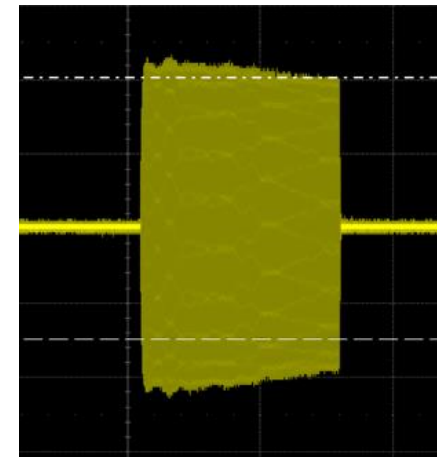
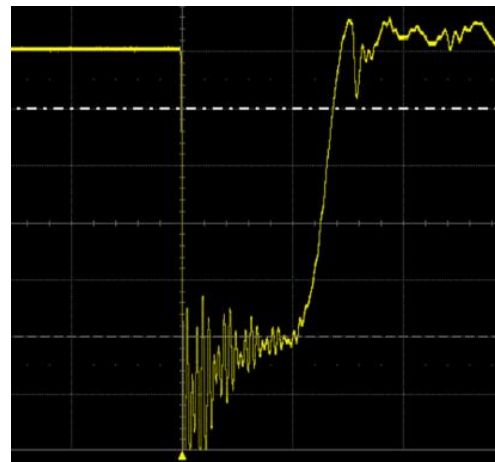
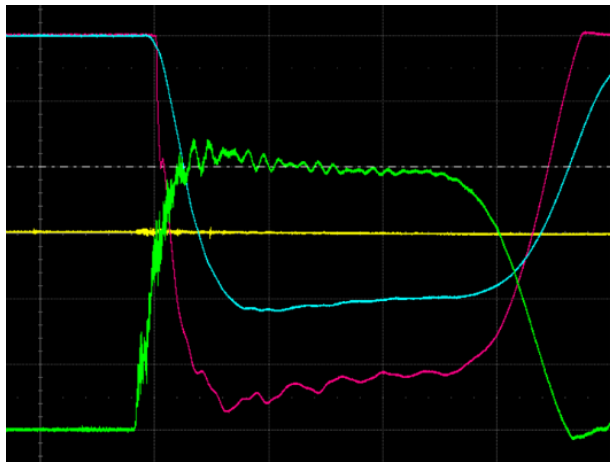
Power supply  
50 kV, 200 mA



Pulse forming network 525 nF,  
21.5 mH



Transformer tank 1:14.5  
and 45 MW klystron



Pulse envelope is 4.5 us (NO LLRF feedback loop)

Courtesy: N. Smale

	No.	Installation	EPICS integr.
<b>Magnets</b>			
Solenoid	1	✓	✓
Quadrupole	1	✓	✓
Dipole	1	(✓)	✓
Steerer	2	✓	✓
<b>Diagnostics</b>			
Screen station	2	✓	✓
ICT	1	✓	in progress
Faraday cup	1	✓	in progress
BPM	3	✓	in progress

# SRR collaboration 1/4

- THz streaking of the electron bunch for temporal diagnostics

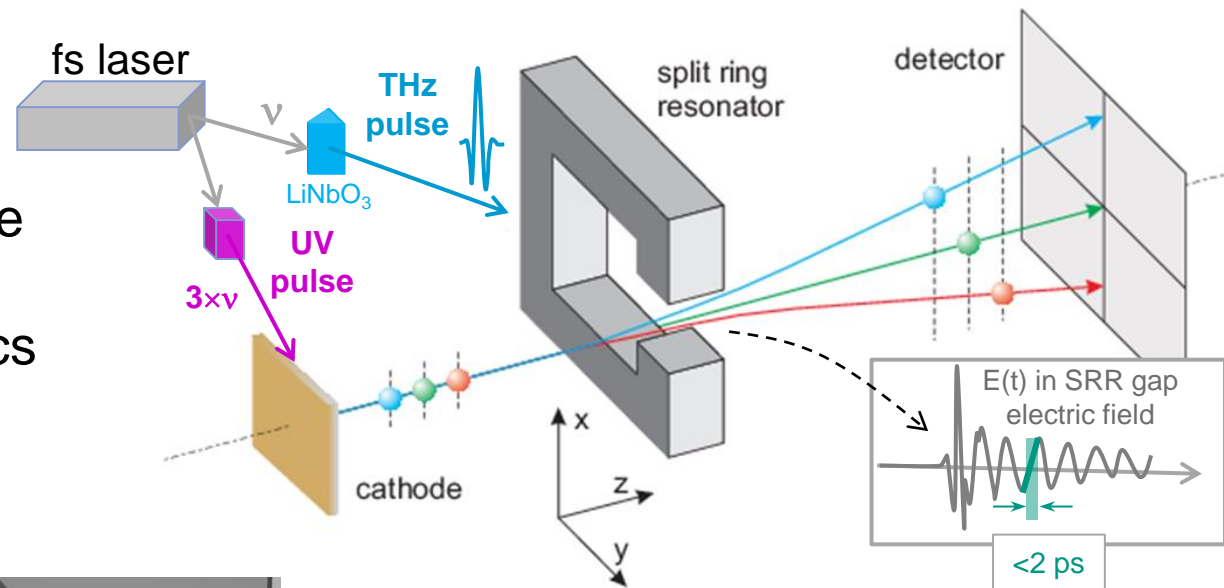
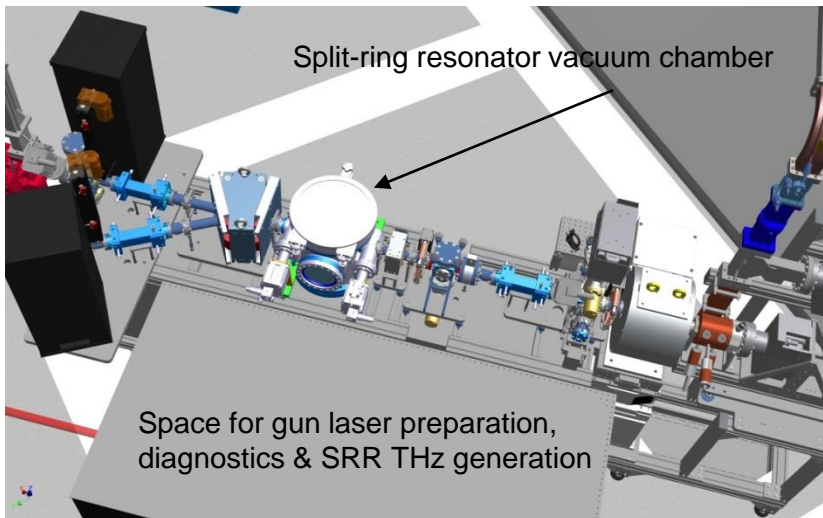


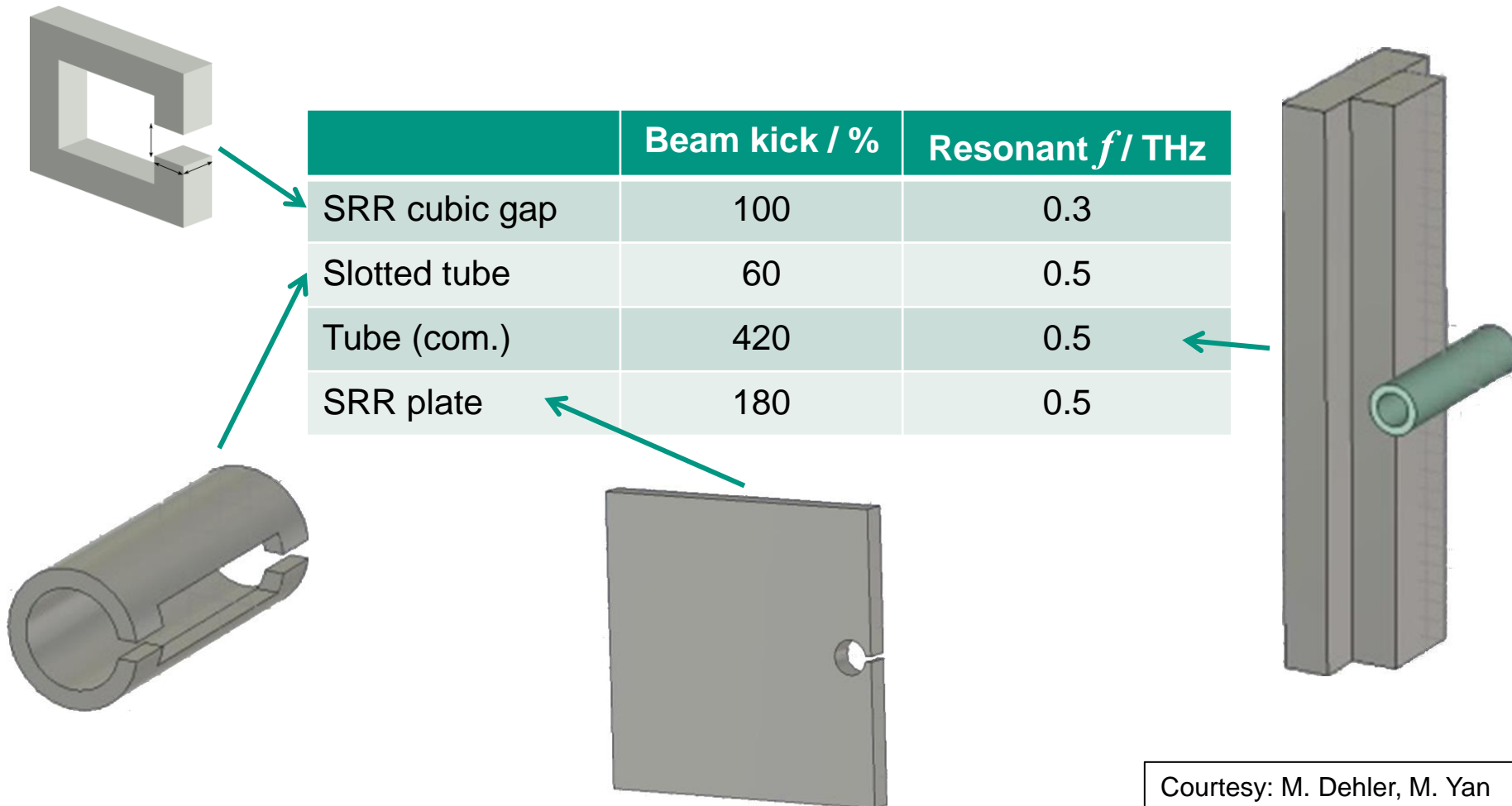
Image adapted from: J. Fabiańska et. al., Sci. Rep. 4, 5645 (2014)



- First experiment planned at FLUTE

# SRR collab. 2/4: Simulation results for various structures

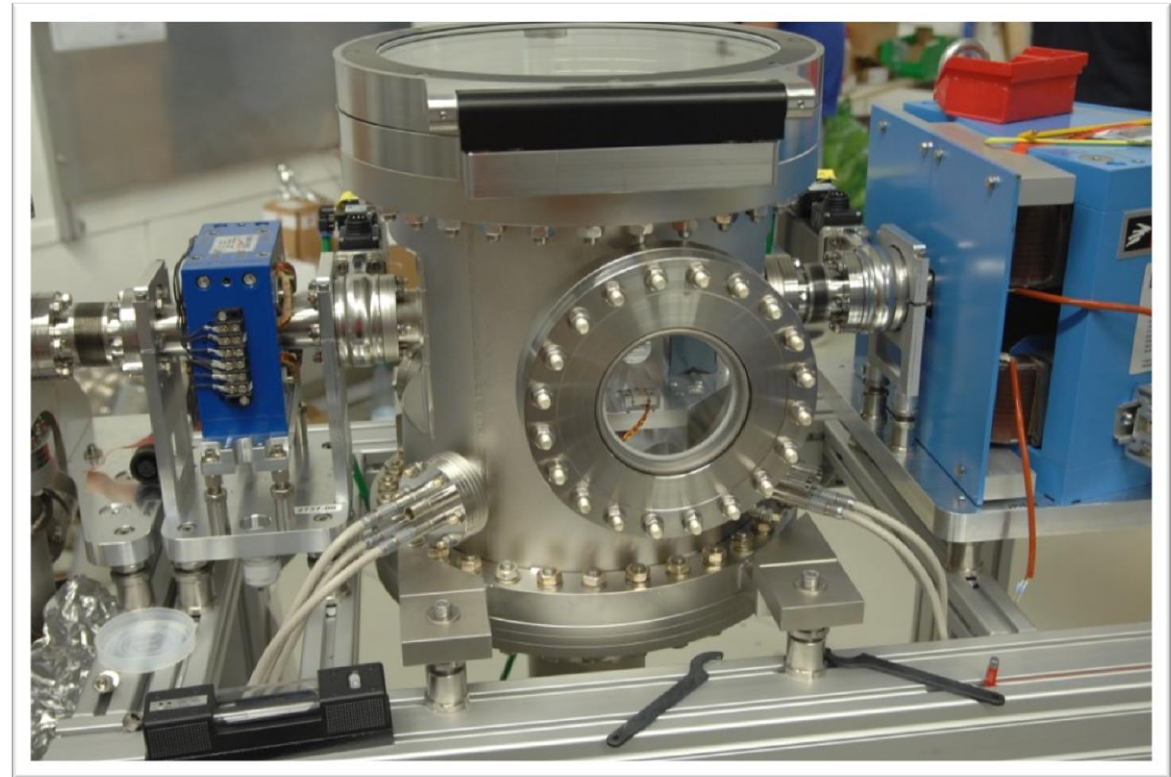
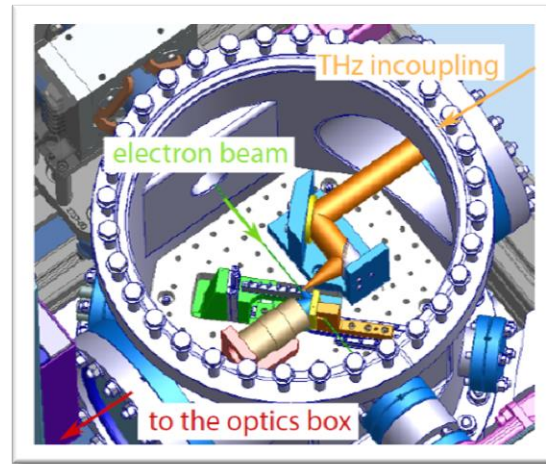
Beam “kick” normalized to SRR (typical ranges 1 to 10 keV / c)



Courtesy: M. Dehler, M. Yan

# SRR collab. 3/4: Task status PSI

- Vacuum chamber
  - Design at PSI
  - Manufacturing at PSI
  - Installation at KIT



# SRR collab. 4/4: Task status Uni Bern

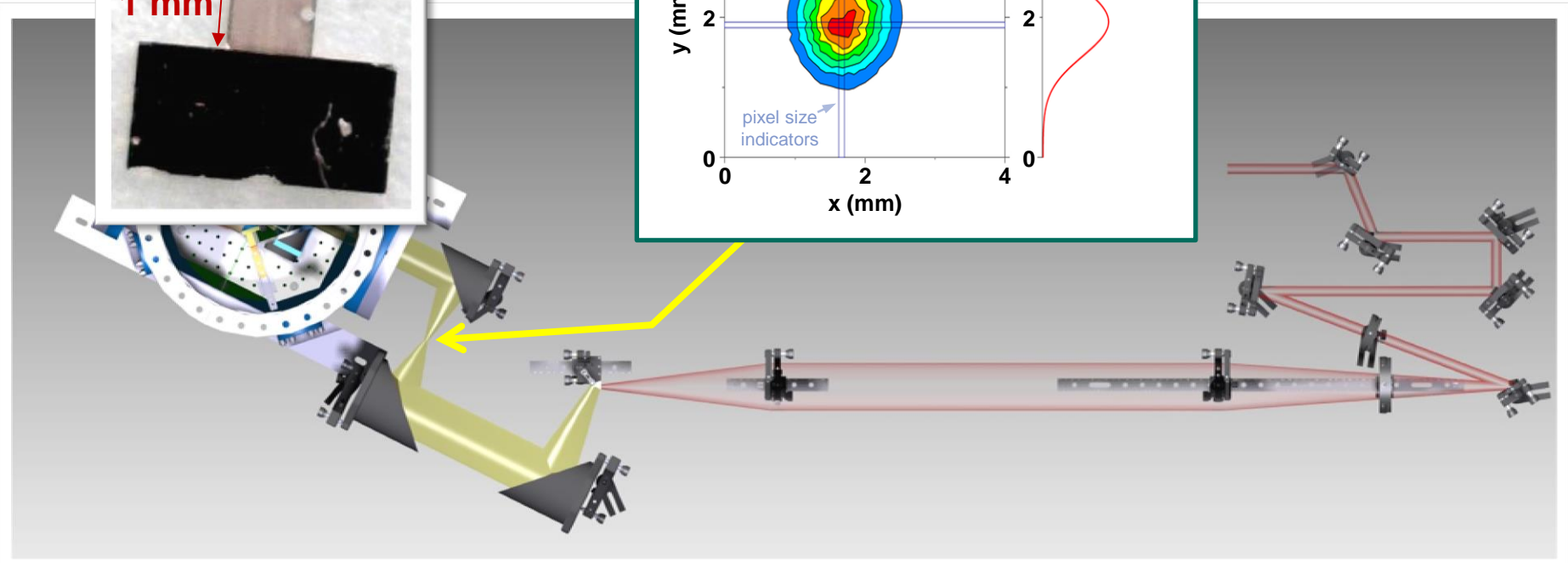
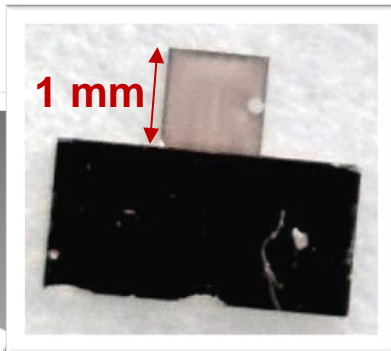
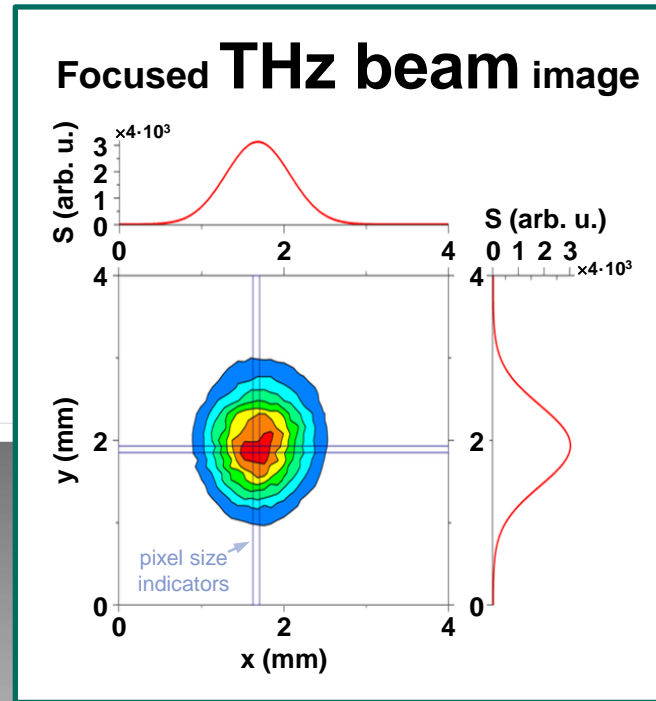
- THz generation
  - Design at Bern
  - Set-up & test at Bern
  - Installation at KIT
- SRR structures

*u<sup>b</sup>*

b  
UNIVERSITÄT  
BERN

Profile measured with  
**FLUTE laser at KIT**  
(laser lab)

Horizontal × Vertical FWHM  
0.92 mm × 1.15 mm (at 0.3 THz)





A big Thanks to our partners from the

## FLUTE collaboration:



■ R.W. Assmann, M. Felber, K. Flöttmann, M. Hoffmann, H. Schlarb



■ H.-H. Braun, M. Dehler, M. Divall, R. Ganter, N. Hiller, R. Ischebeck, M. Moser, L. Stingelin, V. Schlott, C. Vicario

... and others who are not in the photo



# Backup slides

# Progresses always accompanied by problems...

- Untight RF waveguide: MAX lab borrowed us some spare parts
- Cathode RF finger, cathode positioning
- Laser jumps suddenly to TEM11 mode

