Wellcome to the 3rd FLASH2020+ Start to End Simulation Workshop

FLASH2020+

FLASH2020+ Start to End Simulation Workshop

Introduction and overview

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On behalf of FLASH2020+ team

Hamburg, December 6th, 2022

HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

DESY.

Goals and General prerequisites for the start to end simulations

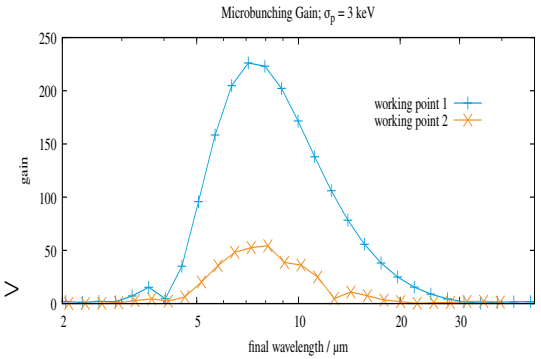
Goals

- Model the FLASH2020+ as realistically as possible
- Prepare and provide tools for future studies

Prerequisites

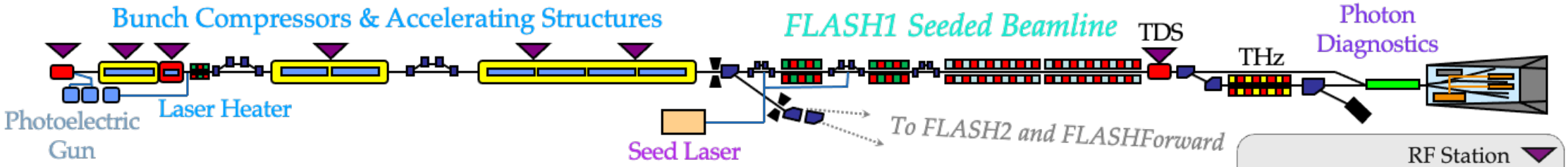
- Close Collaborations Between different working packages/people
- Computing and storage resources
- Handshaking between different codes and integrating different processes
- In depth understanding of numerical artifact in different approaches

Simulations in SelaV for 2 different working points >>



FLASH2020+ Start to End Simulations and Categories

The Planned structure for S2E simulations and incorporating different categories



Add compression, adjust optics & Track in Elegant

Start with an on-crest file & design optics File in MAD

Seed1 and Seed2
Chi2 3D

Impact-Z
Model beam realistically from the Gun

Genesis/Puffin

Track Chicane 1 in Elegant

Beam & Seed1 in Mod 1

Beam & Seed2 in Mod 2

Choose the best model for Chicane 2

(a) Genesis

(b) SelaV

(c) Tracking Single Particle in Elegant

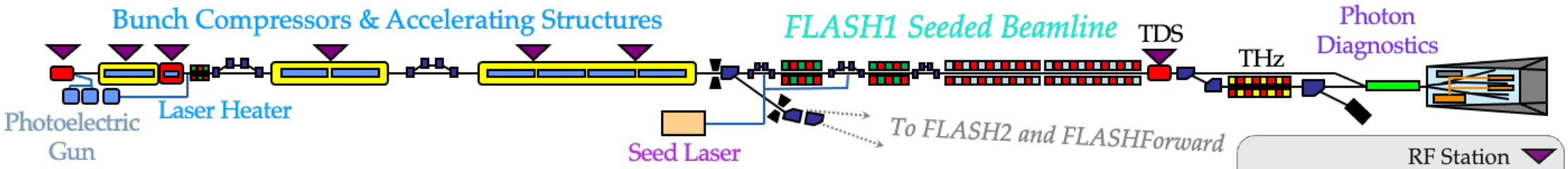
Radiators

Synchrotron Radiation Workshop (SRW) Transports to the Photon Beamline

End

FLASH2020+ Start to End Simulations and Categories

The Current Statues: Focus is on Benchmarking and handshaking between the 3 Categories to produce the first example of reliable S2E



Add compression and tweak optics

Start with an on crest file with design optics

Tracking in Elegant

Design File in MAD

Seed1 and Seed2

Chi2 3D

Intermediate step for tool development

Resolving issues with integration

Impact-Z

SelaV

Start with a realistically modeled beam from the Gun

Genesis/Puffin

(a) Genesis

(b) SelaV

Radiators

Chicane 1

Elegant

Chicane 2

(c) Tracking Single Particle in Elegant

Beam & Seed1 in Mod 1

Beam & Seed2 in Mod 2

End with Transport to Photon BL

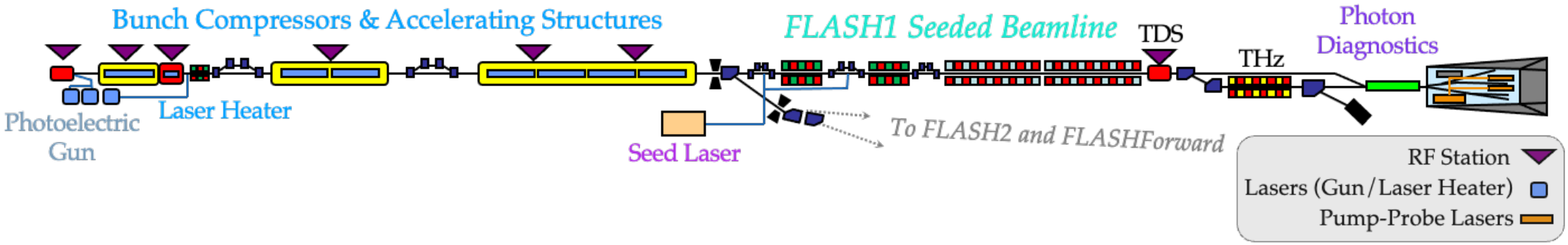
Synchrotron Radiation Workshop

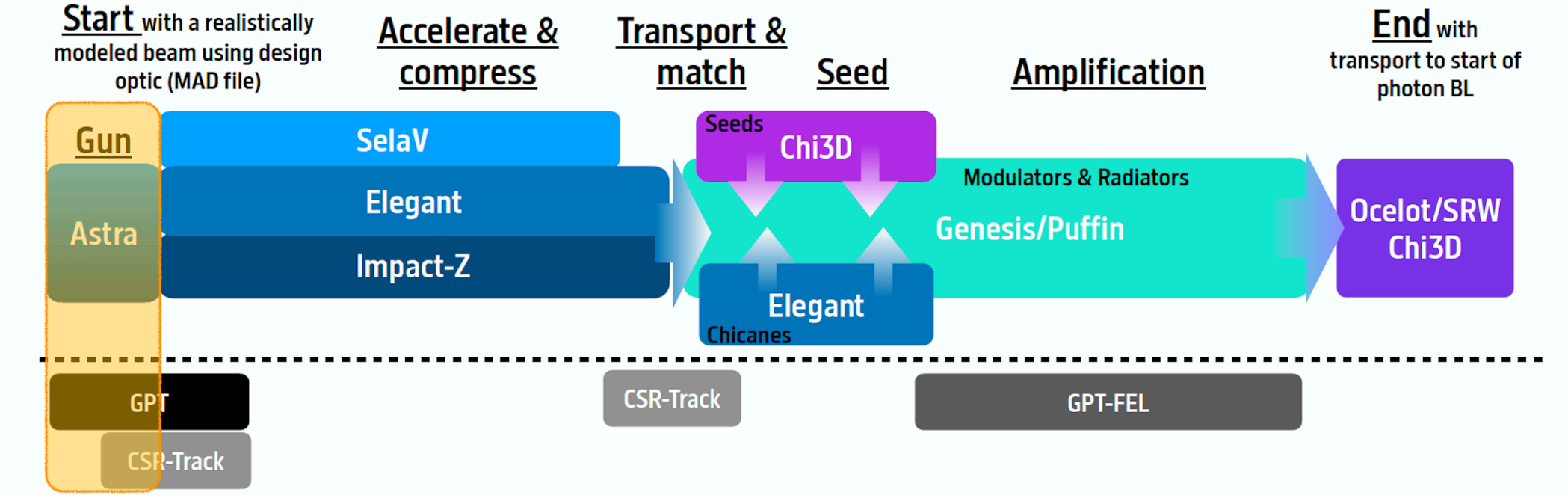
Benchmarking and comparing three approaches (a-c) for Seeded Beamline

Operational **Work in progress**

FLASH2020+ Start to End Simulations

Final main working flow and a few additional planned benchmarking





Updates on the start to end simulations

Current Progress

Progress

- Computing resources and storage space has been acquired through Forschungszentrum Jülich
  - one more renewal application will be submitted for May 2023-April 2024
- Handshaking between most of the codes have been written tested and debugged
  - In some instances with have memory bottleneck however the large memory partition of Jülich (with 192 GiB) is currently sufficient
- The focus in the past month has been on understanding and eliminating effects of numerical artifact induced in the accelerator section
  - Postpone new gun simulations
- Aiming to complete core study simulations in the first two months of 2023

Main Goals of the workshop

- Share the current progress and plans with experts, colleagues and collaborators
- Get feedback on our plans for the next few months
- Get suggestions for the next workshop (in June 2023)

Agenda

Wednesday 7/12/2022	
	Hands on session (electron beam)
09:00 - 09:30	- Coffee and Breakfast
09:30 - 11:30	- Introduction and Hands on Session with SelaV
12:00 - 13:00	Lunch (CSSB)
	Discussion and Studies for Core FLASH2020+ Simulation
13:30 - 14:00	- Summary of Studies for Electron Beam
14:00 - 14:30	- (Very) Recent Results and Comparison for the Laser Heater Setup
14:30 - 15:00	- Coffee Break
15:00 - 15:20	- Short Tutorial (working with large date)
15:20 - 15:50	- Studies of EEHG and HGHG
15:50 - 16:00	- Q&A
19:00:-20:30	Meeting at Christmas market (Take Number 3 around 6 to meet at Jungfernstieg)

Agenda

Thursday 8/12/2022	
	Hands on Session (Laser Beam)
09:00 - 09:30	- Coffee & Breakfast
09:30 - 11:30	- Introduction and Hands on Session with Chi-3D
12:00 - 13:00	Lunch (CSSB)
	Discussion of Laser and Lasing studies: THz Simulation for FLASH & FLASH2020+
13:30 -14:00	- THz Simulation for FLASH and plans for FLASH2020+
14:00 - 14:30	- Summary of simulations for a few advance modes of operation at FLASH2020+
14:30 - 15:00	- Coffee Break
15:00 - 15:30	- THz and Advance Mode Discussion
15:30 - 16:00	- Recap of the 3rd S2E simulation Workshop and Final Discussion

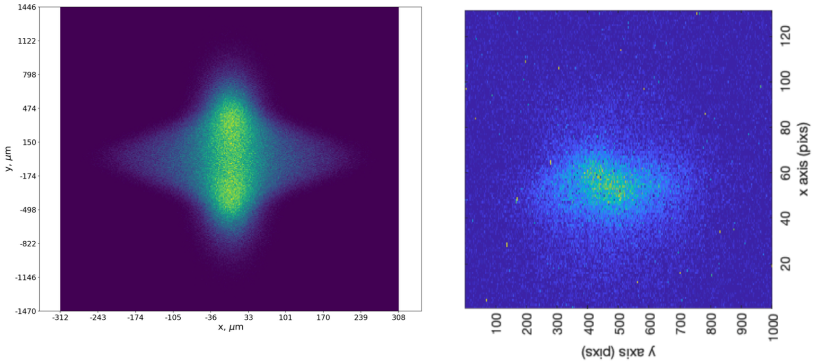
Some of the Highlights

Tomorrow

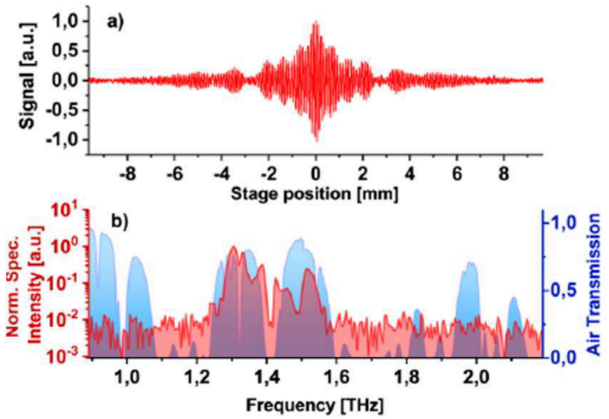
- Benchmarking simulations with Experiment

Thursday

- Simulations beyond the radiator (THz)



D. Samoilenko: Simulation and Experimental data from beam heating



R. Pan et al. Photon diagnostics at the FLASH THz beamline. In: Journal of Synchrotron Radiation 26.3 (2019), pp. 700–707. ISSN: 16005775. DOI: 10.1107/S1600577519003412.

System check:
If you plan to join the hands-on session (in person or virtually)

Format of the workshop

Format of the Morning Sessions and Tutorials

- 30 min to 1hr introduction of the simulation tools
  - Including a description of what we will try to simulate during the hands-on session
  - An hour to work on your own
- Discussion time at the end of each session

Format the Talks (Speaker's choice)

- 30 min for the talk and question
  - Speakers will indicate if they prefer to have the questions during the talks (short discussions) or at the end
  - Or have a 20/25 min talk with 10/5 min for questions
- Discussion time at the end of each session and after the last talk on Thursday

Questions?

System Check