

**Wellcome to the 2nd Day
of FLASH2020+ Start to
End Simulation
Workshop**

FLASH2020+

FLASH2020+ Start to End Simulation Workshop

Introduction and overview

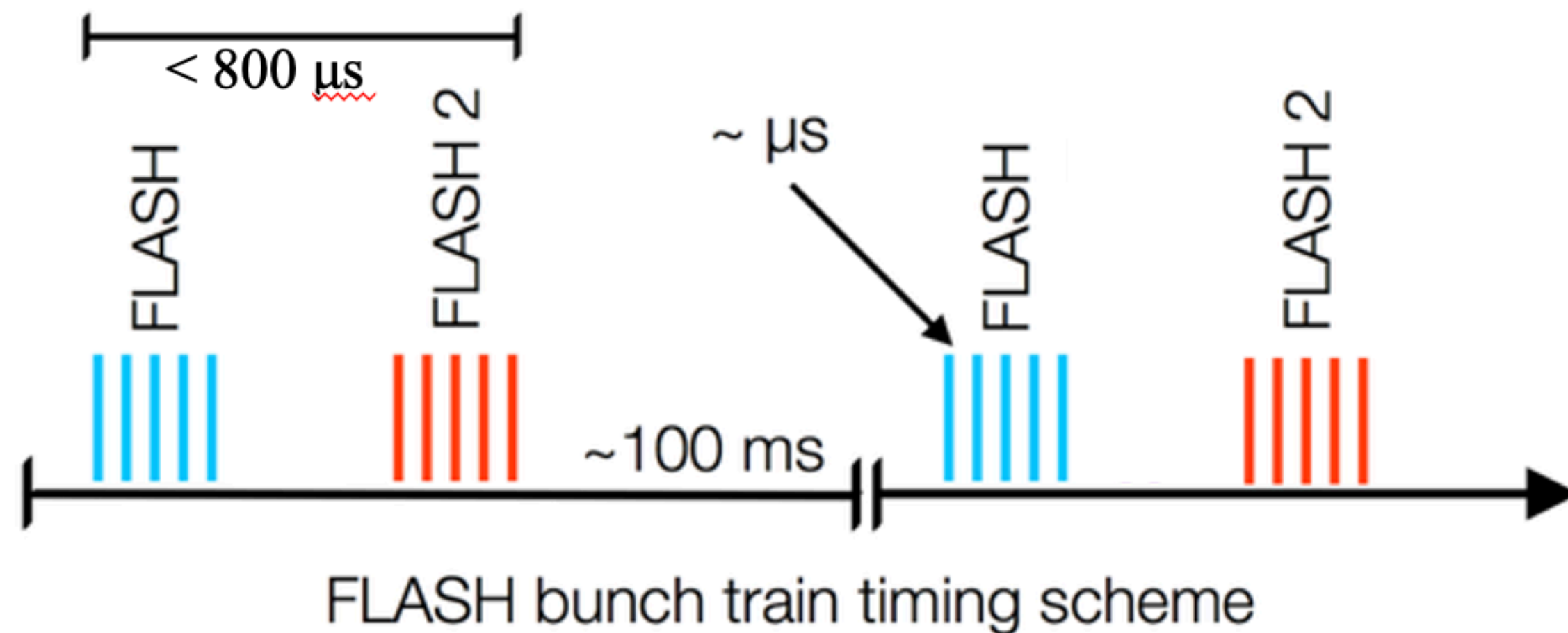
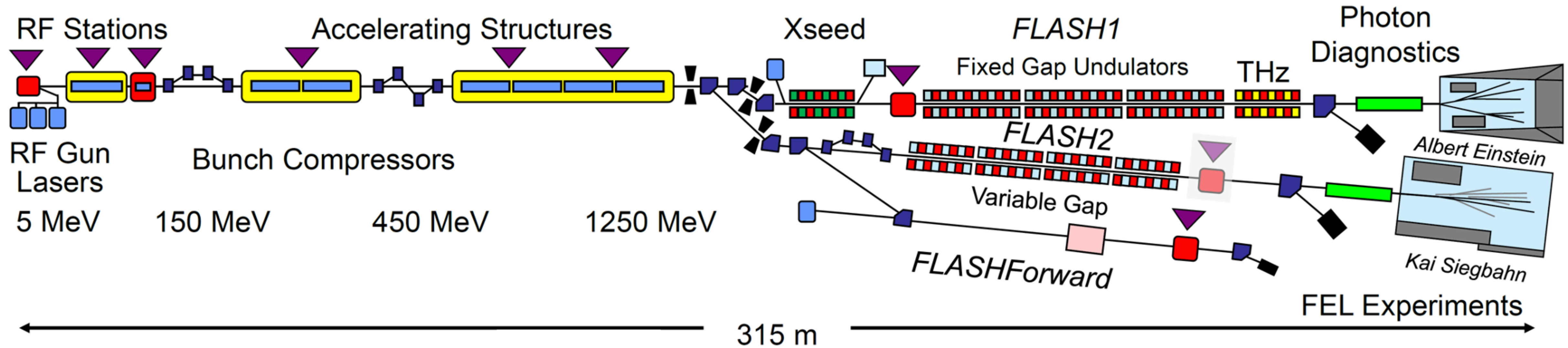
Pardis Niknejadi

On behalf of FLASH2020+ team

Hamburg, 16.12.2021

The free-electron laser user facility FLASH

SRF linac, two FEL beamlines, 8 experimental stations – 2 accelerator R&D experiments (Xseed & FFWD)



- 7500 h beam operation p.a., 4500 h user exp.
- Superconducting linac @ 1MHz burst
- Intra pulse pattern can be addressed separately for each beamline
- Fixed gap undulators at FLASH1 require dedicated setup and tuning for each wavelength

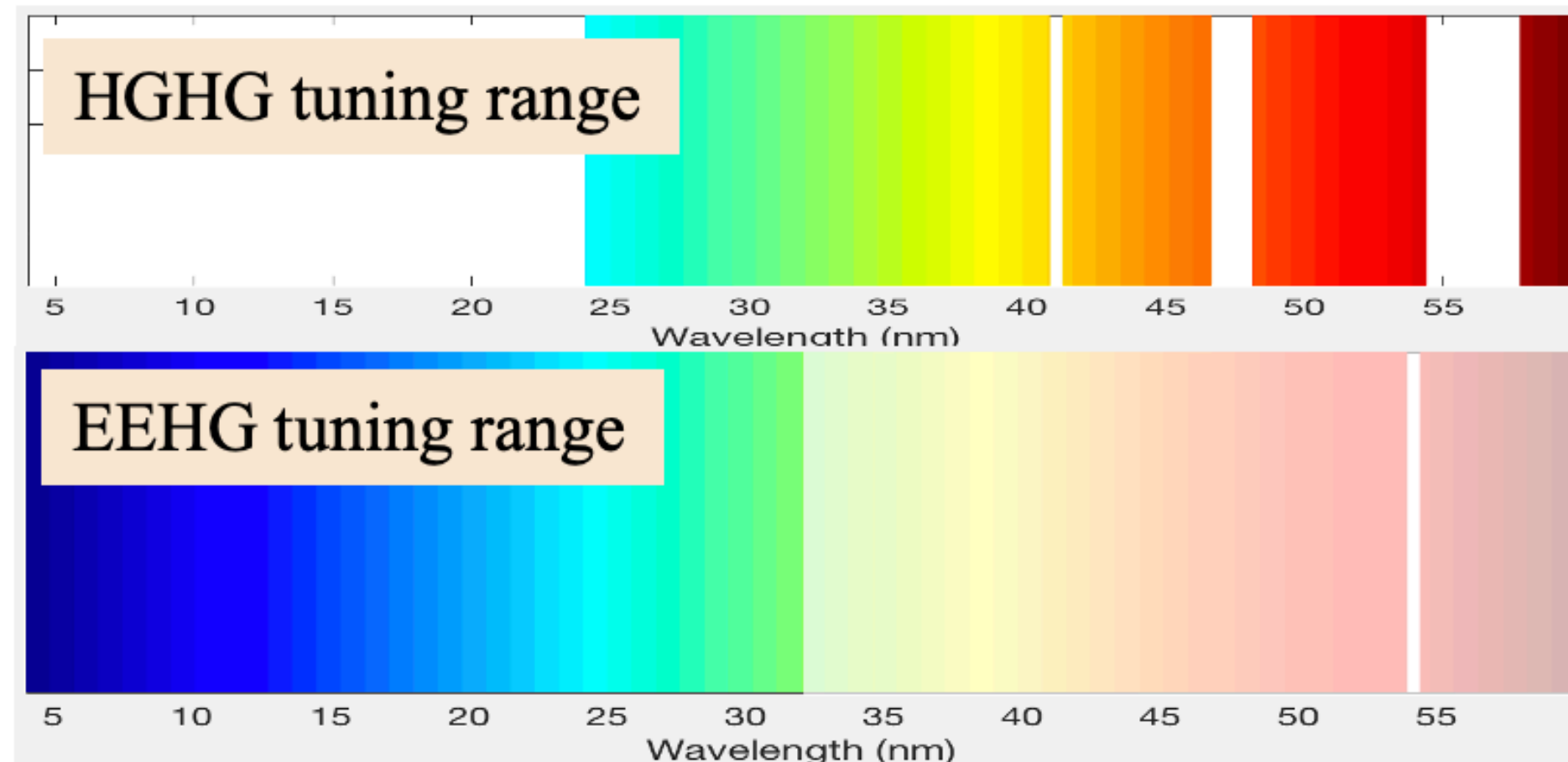
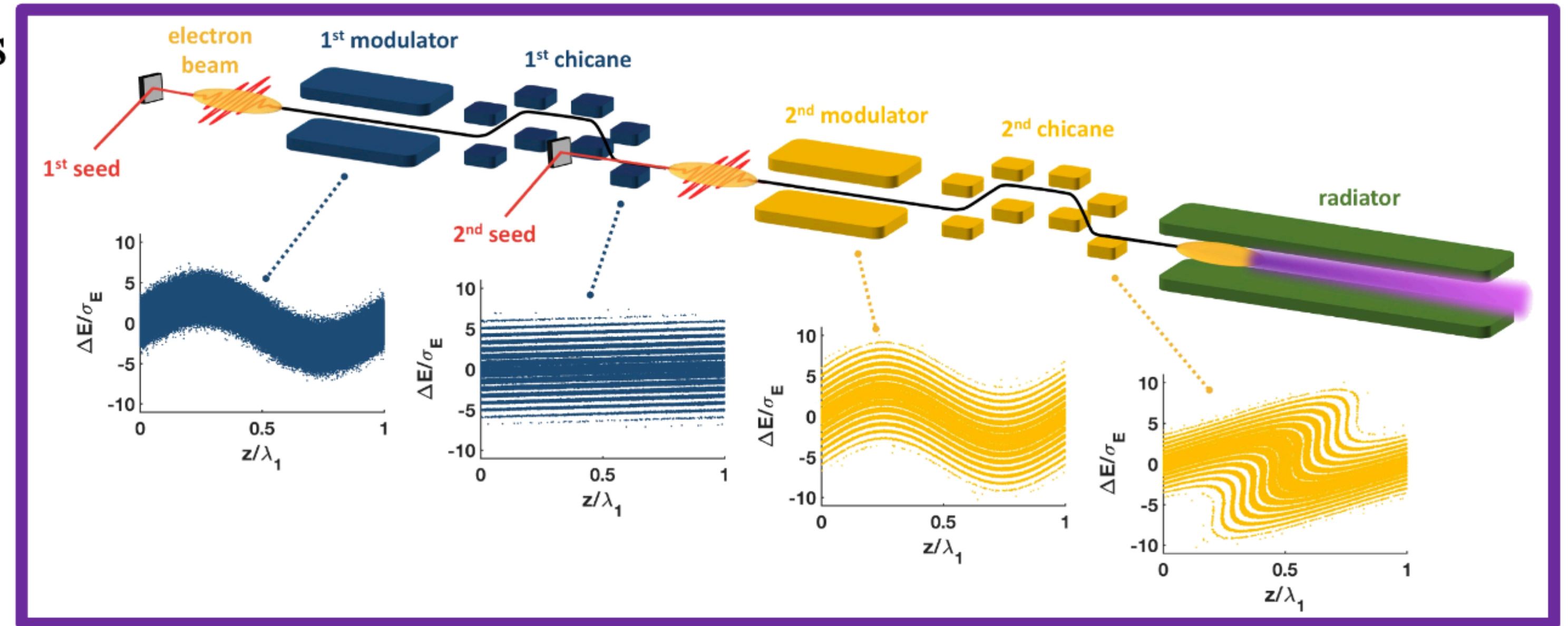
FLASH2020+ project: Seeding in FLASH1

1 MHz coherent pulses in soft-X-ray

Reaching **4 nm** seeding with UV seed lasers is possible with Echo Enabled Harmonic Generation (EEHG).

Successful seeding relies on **high quality** e-beam and seed lasers:

- electron bunch preparation
- R&D for optimal lasers



Fully coherent pulses tens of fs long with **variable wavelength (60 – 4 nm)** and polarization at **high repetition rate**.

Tunable seed lasers:

Seed 1: ~343 nm, 100 MW, 500 fs

Seed 2: 297-317 nm, 300 MW, 50 fs

Goals and General prerequisites for the start to end simulations

Goals, Prerequisites, Current Progress

Goals

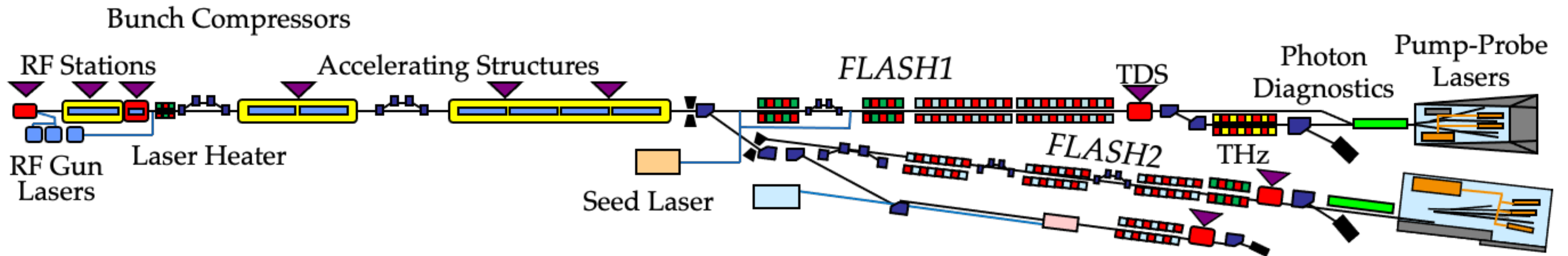
- Model the FLASH2020+ as realistically as possible
- Prepare and provide tools for future studies

Prerequisites

- Close collaborations between different working packages/people
- Computing and storage resources
- Handshaking between different codes and integrating different processes

FLASH2020+ Start to End Simulations

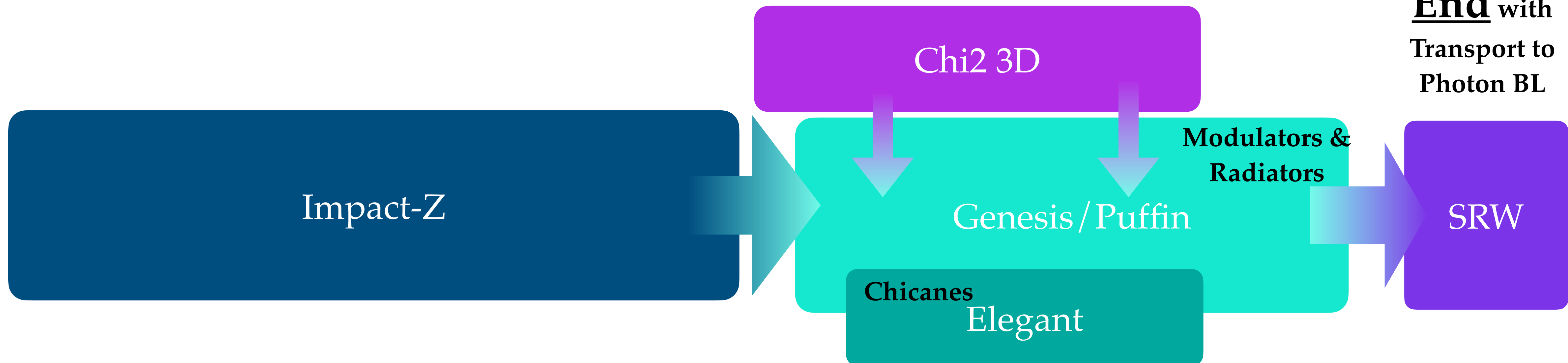
Initial approach



Start with a realistically modeled beam from the Gun

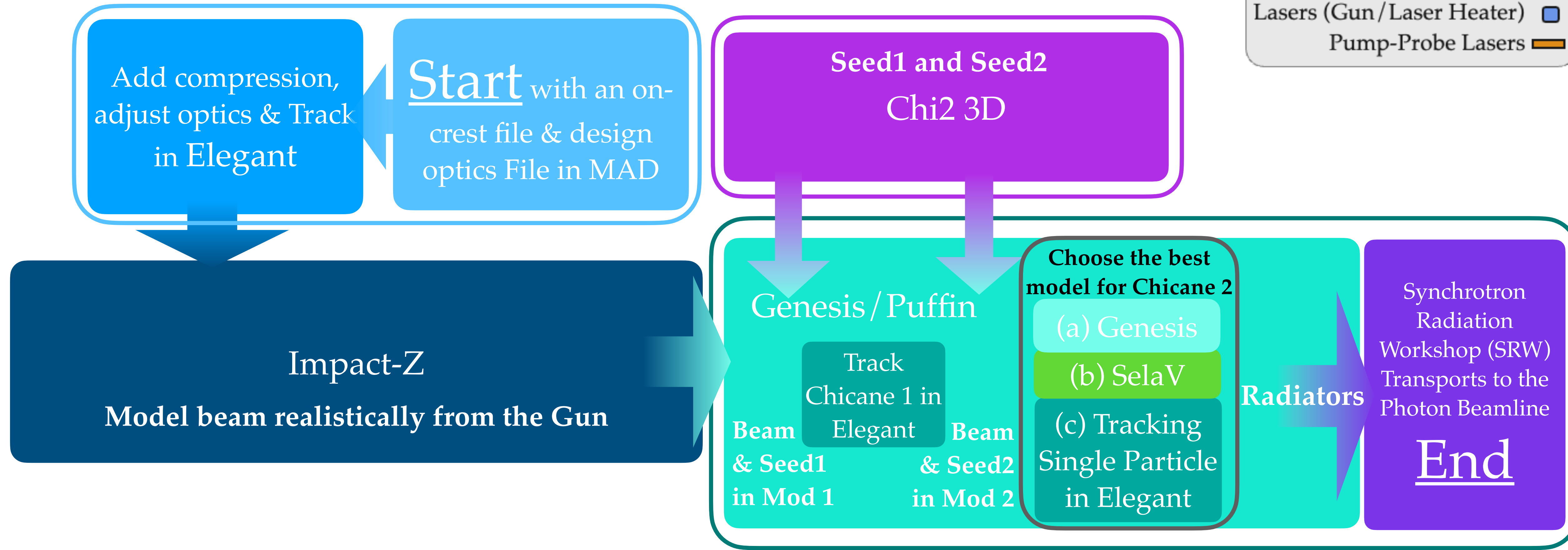
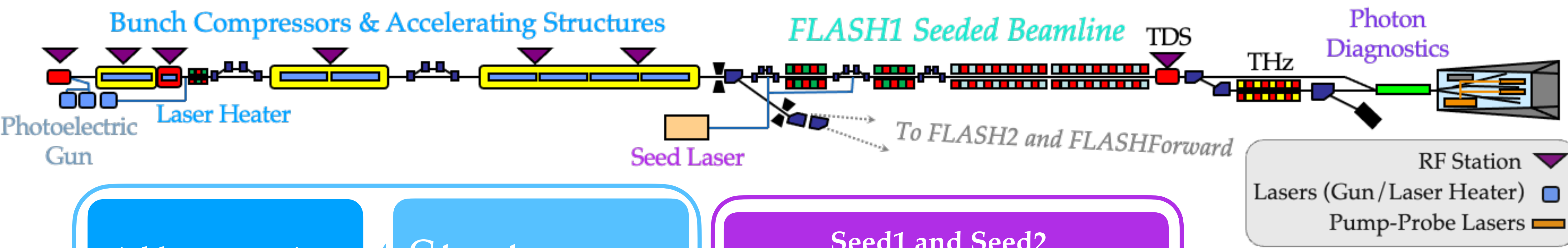
Seed1 and Seed2

End with
Transport to
Photon BL



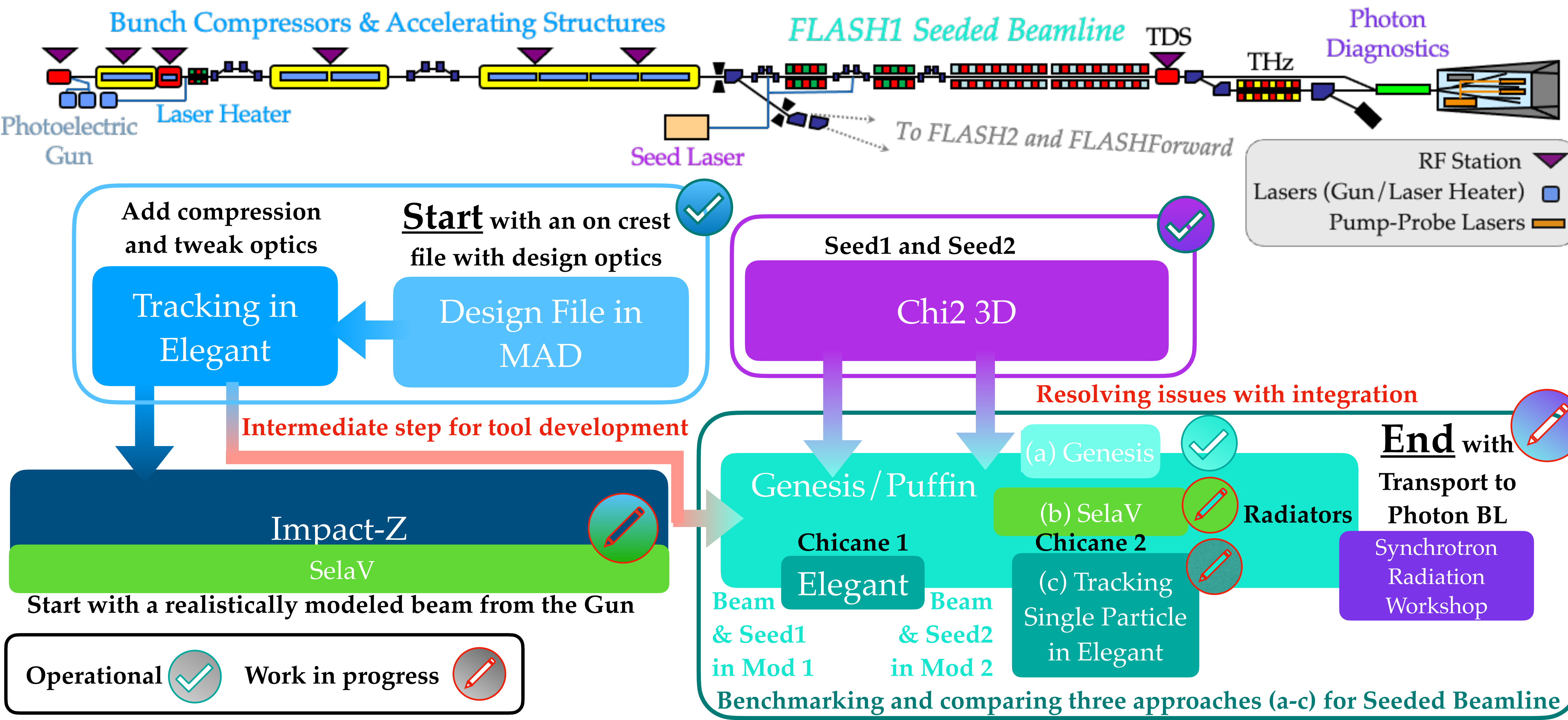
FLASH2020+ Start to End Simulations and Categories

The Planned structure for S2E simulations and incorporating different categories



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



Updates on the start to end simulations

Current Progress

Progress

- Computing resources has been acquired; storage space is requested and partially acquired
- Handshaking between some of the codes is operational (especially those with in the same category).
- The focus is on handshaking between the categories.
- Aiming to have the first example early next year

Goal of the workshop

- Share the current progress and plans with experts, colleagues and collaborators
- Get feedback on how to move forward
- Establish a framework that benefits other and/or future projects

Agenda

Speaker	Title
16/12 09:30-12:30	
Pardis Niknejadi	Introduction and Overview
Martin Dohlus	“Calculation of Microbunching in Linacs with Bunch Compression Systems”
Philipp Amstutz	“Overview and Status of Linac Simulations with SelaV”
Eugenio Ferrari	“A friendly introduction to Genesis1.3 V4”
16/12 14:00-16:00	
Tino Lang	“FLASH2020+ seeding laser SLASH - Start-to-End simulation using chi3D”
Sven Ackermann	“Using realistic fields from Chi3D in GENESIS 1.3”
Dmitrii Samoilenko	"First results of ELEGANT simulations for the laser heater"
Pardis Niknejadi	Wrap up
17/12 11:00-14:00	
Pardis Niknejadi	“Introduction to Puffin”
Dmitrii Samoilenko	"Setting up ELEGANT lattice for S2E simulations"
Mihai Pop	“Bridging Elegant to Genesis simulations with a pseudo-one4one approach”
Fabian Pannek/ Mihai Pop	“EEHG Working Points in GENESIS and ELEGANT”
Pardis Niknejadi	Summary

Format and Highlights

Format

- 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 (have a 20/25 min talk with 10/5 min for questions)
- Discussion time at the end of each session

Highlights of this morning session

- Starting with realistic or semi-realistic beam in the linac
- Introduction to Genesis

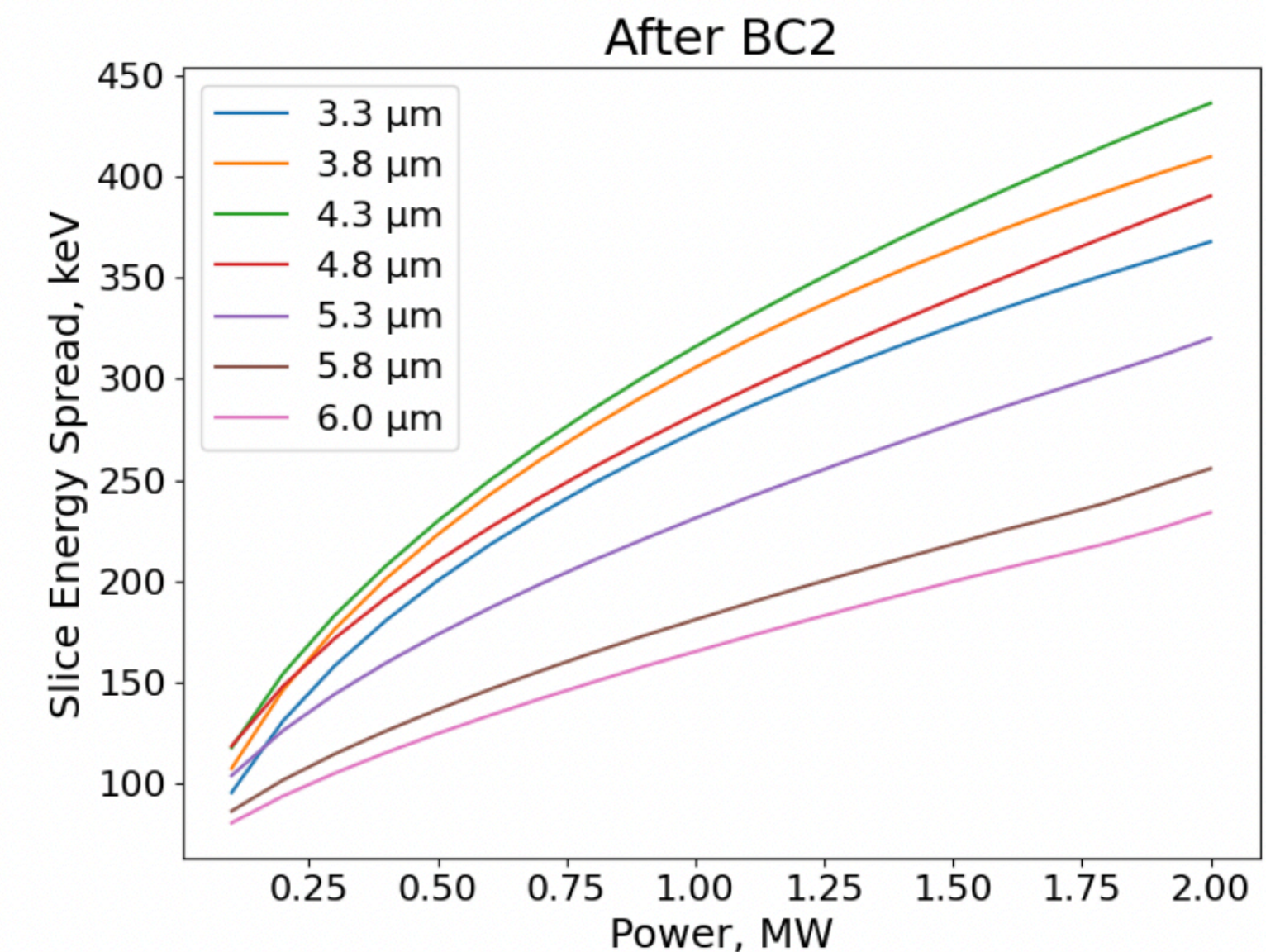
Format and Highlights

Highlights of this afternoon session

- Introduction to Chi2 3D and using its output as an input field for Genesis
- Initial tracking simulations for the laser heater

Highlights of tomorrow session

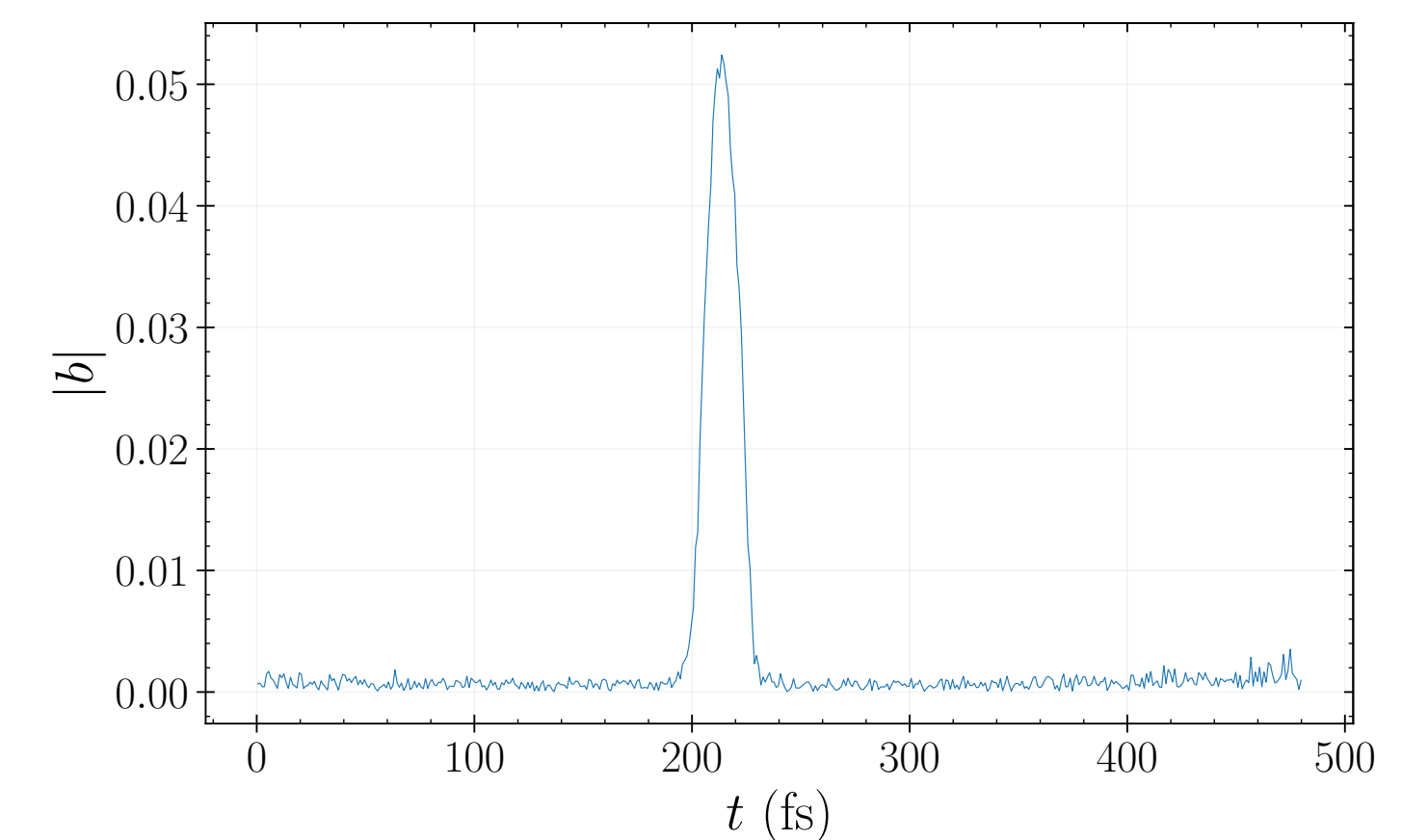
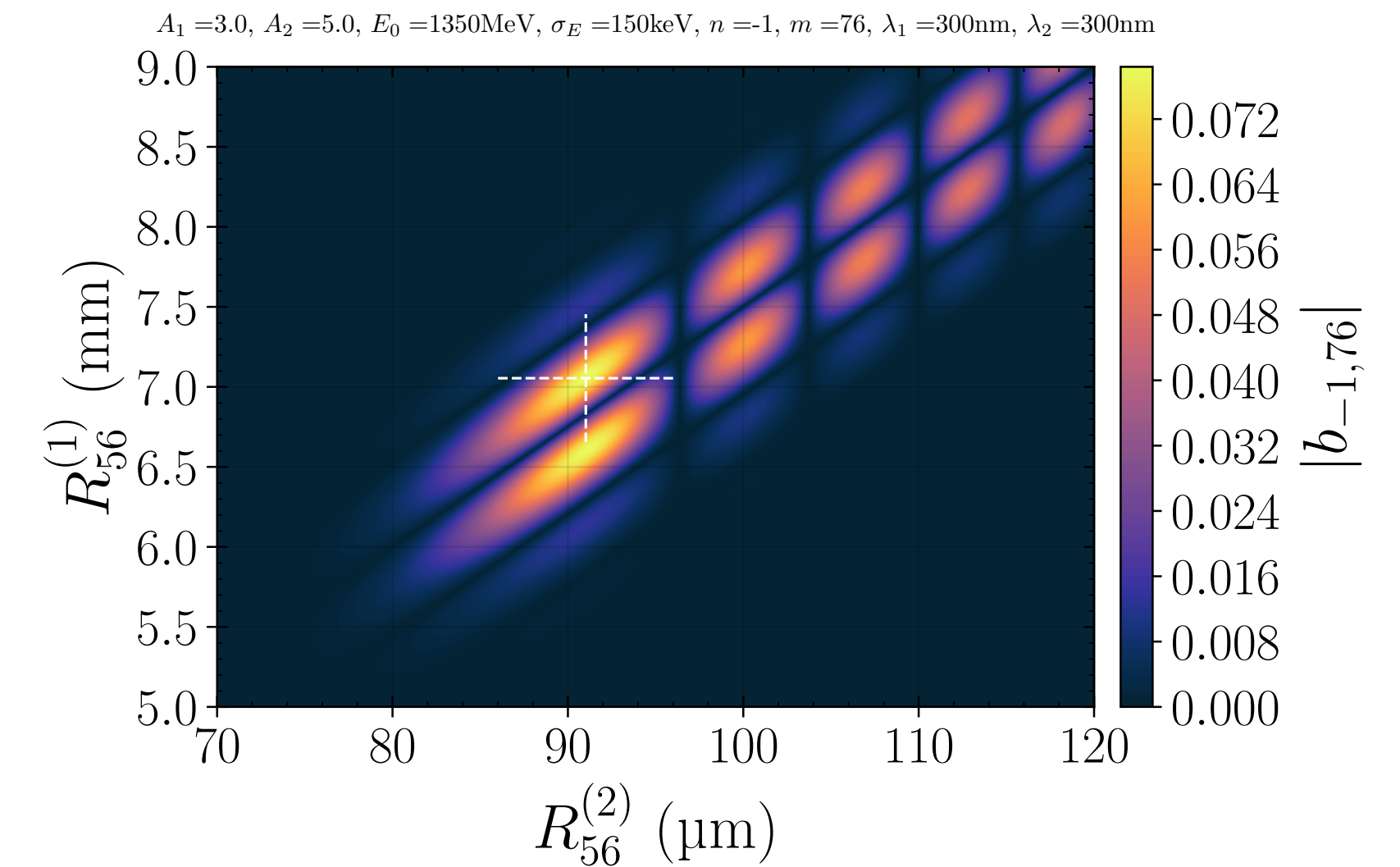
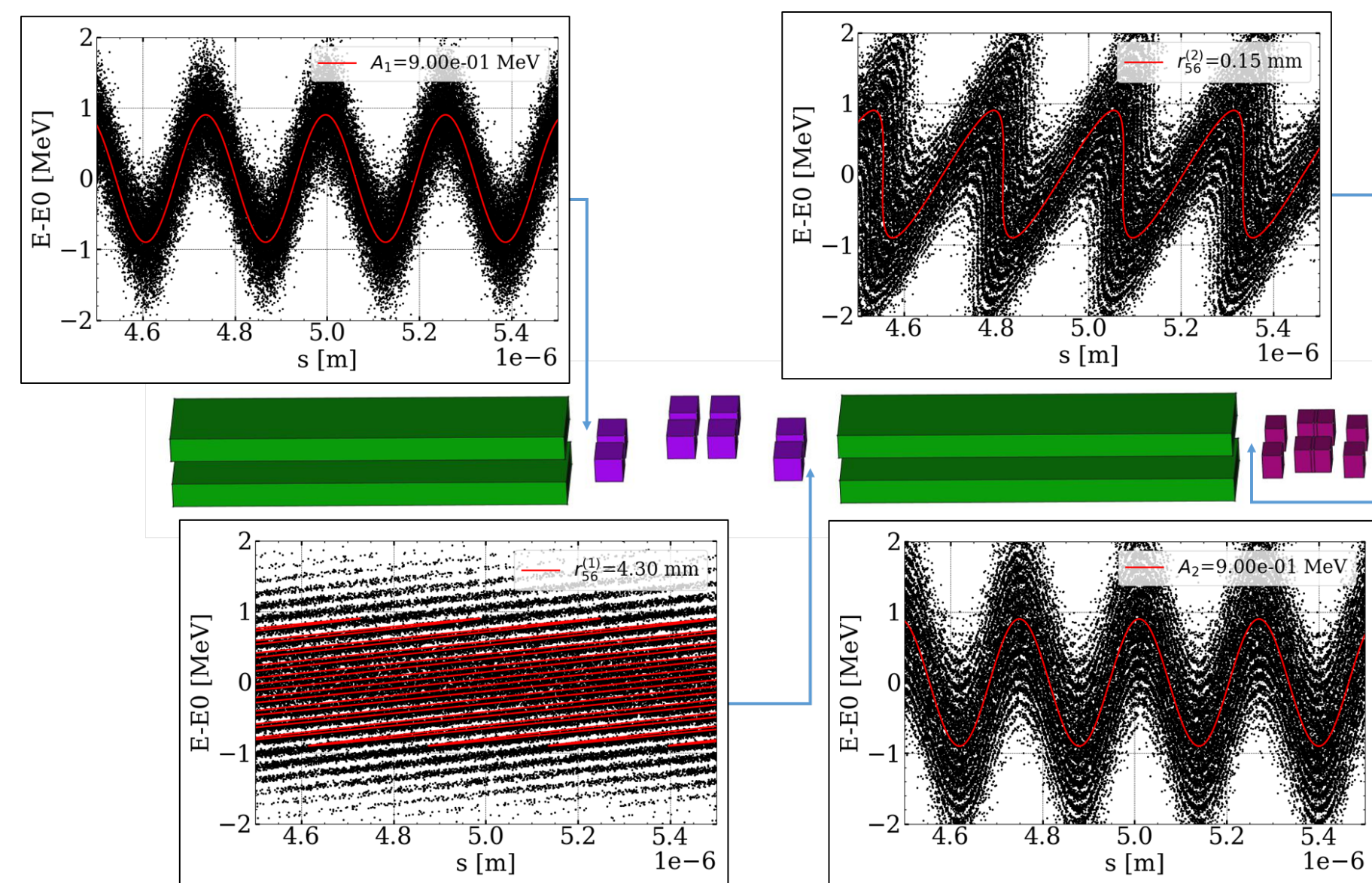
- Introduction to Puffin
- Pseudo-one4one approach, Mad2Elegant,
- And more



EEHG Working Points in GENESIS and ELEGANT

- Fabian Pannek, Mihai Pop

- parameter space reduction based on analytical formulas
- transfer of working points to GENESIS and ELEGANT
- evaluation of energy modulation and dispersion
- optimization of bunching



Let's start