PSI Center for Accelerator Science and Engineering

# Controlling FEL bandwidth at SwissFEL using a dielectric wakefield structure

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Introduction

SwissFEL's two dielectric dechirpers each consist of two flat metal plates coated with Al_2O_3 dielectric. We used electric fields generated as the beam passes through the dechirpers to manipulate the beam's energy spread and control the FEL bandwidth.
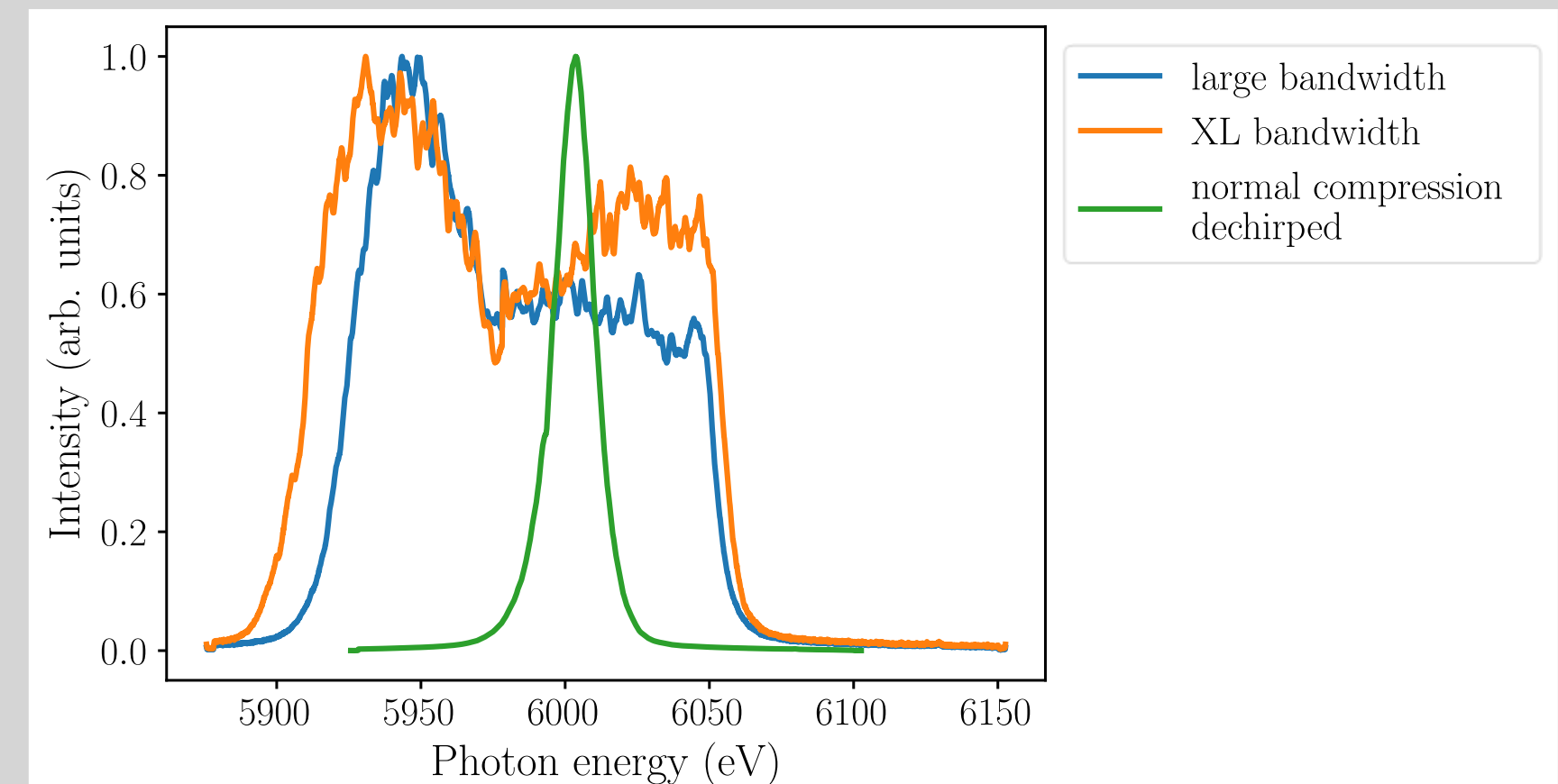
400 µm

electron beam

2a
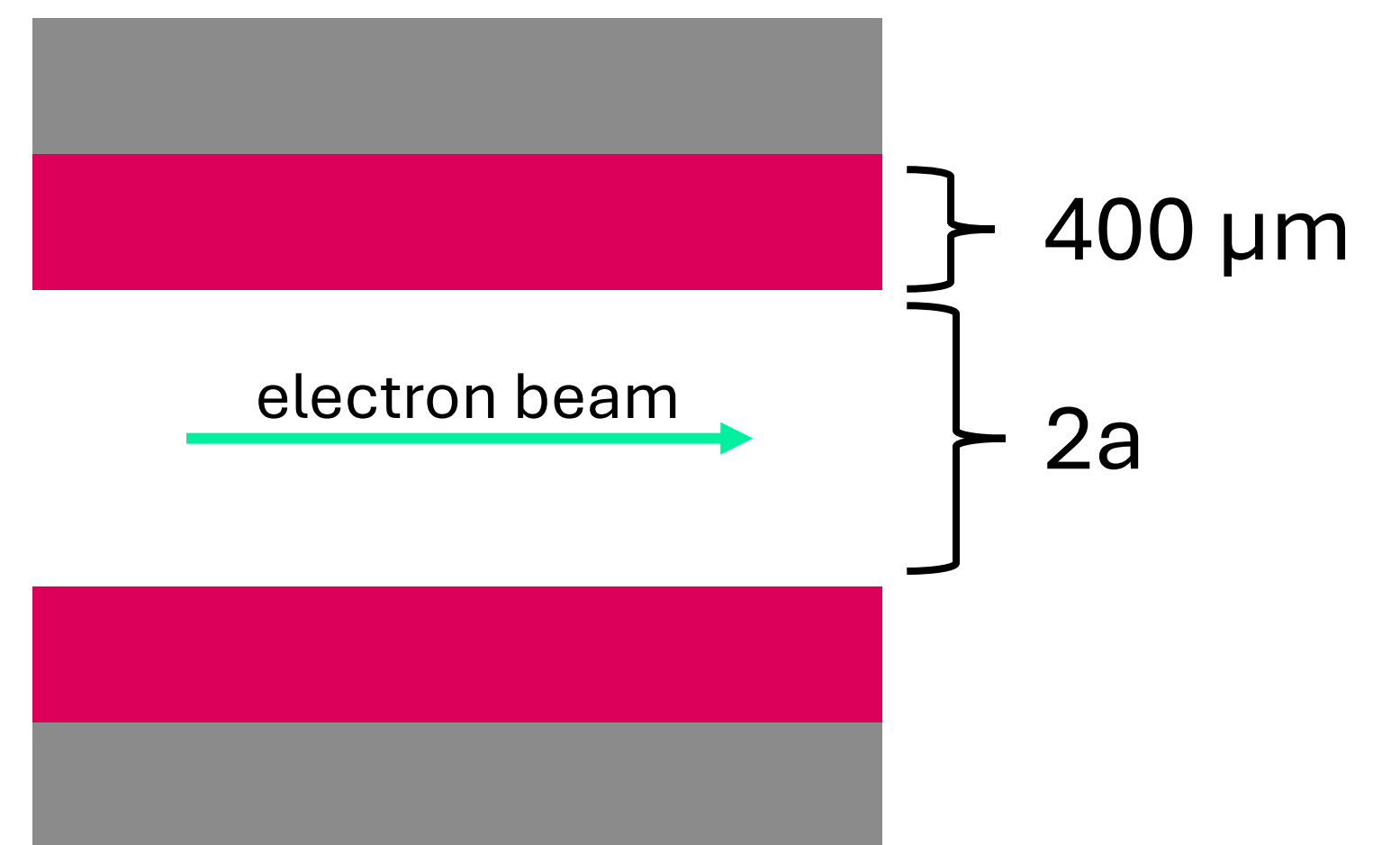
Main findings
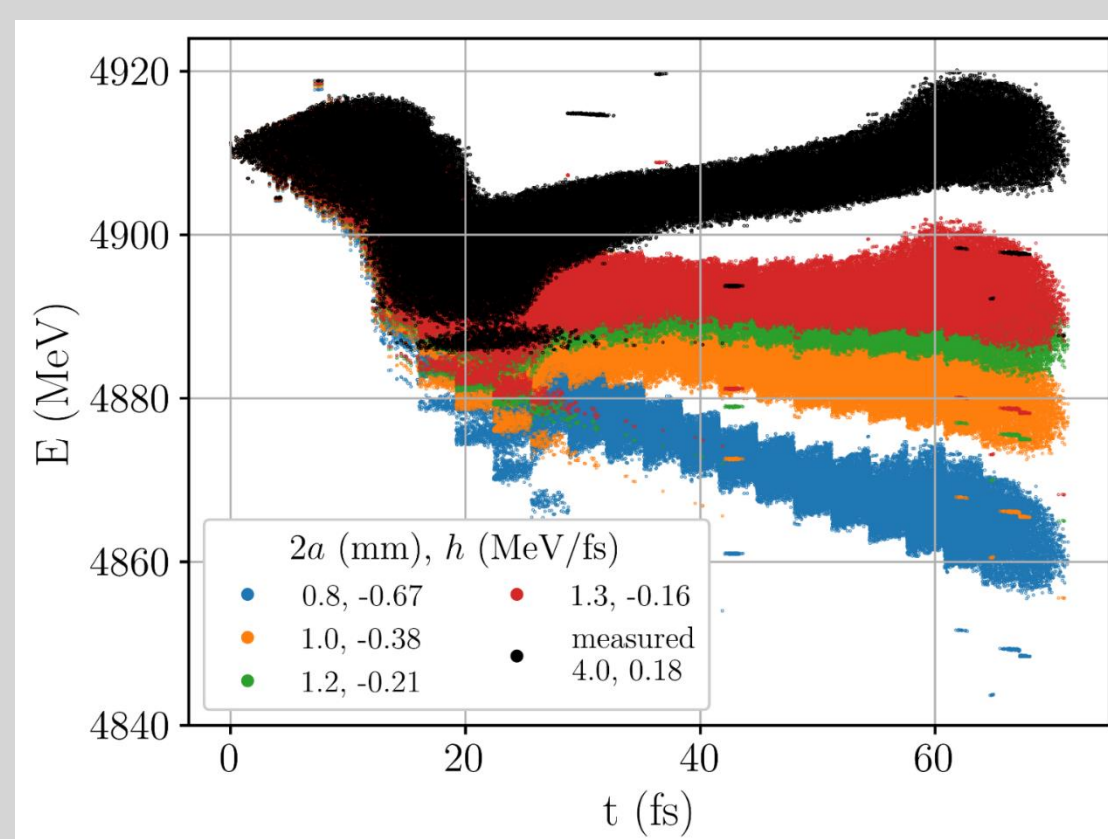
Decreasing FEL bandwidth
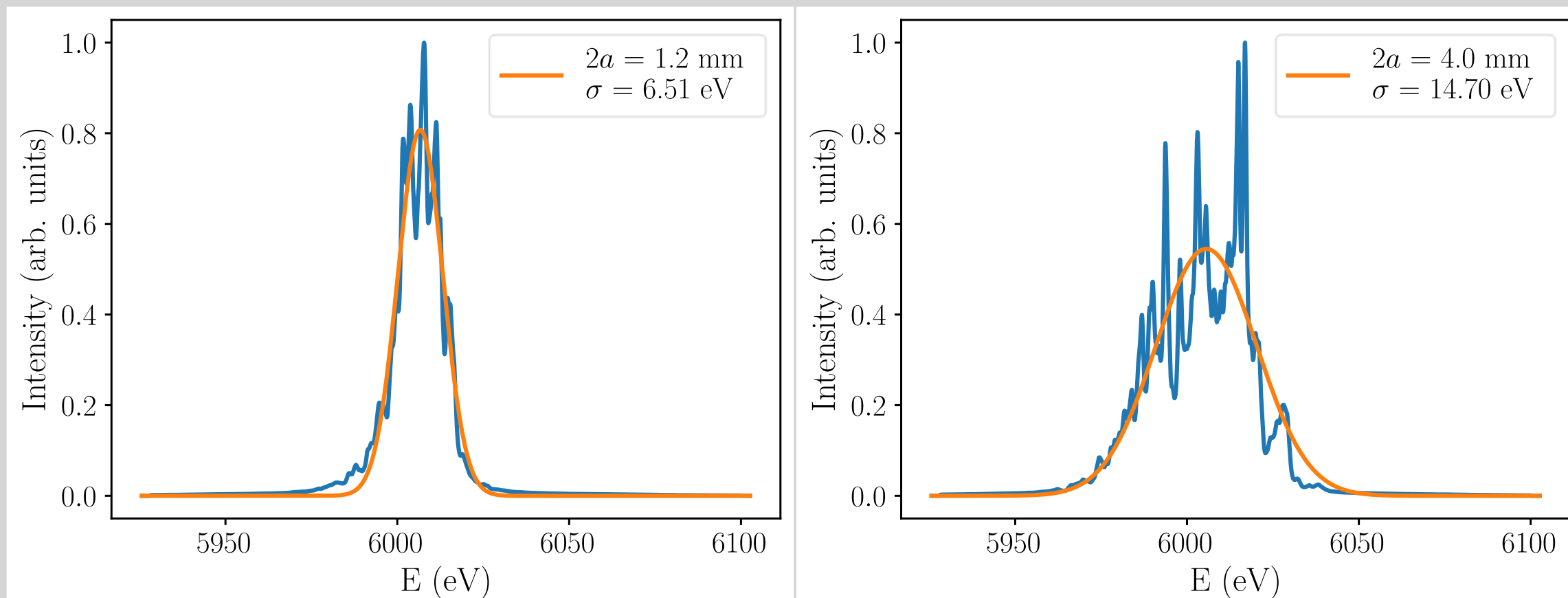
The FEL bandwidth decreases when the structure gap decreases.
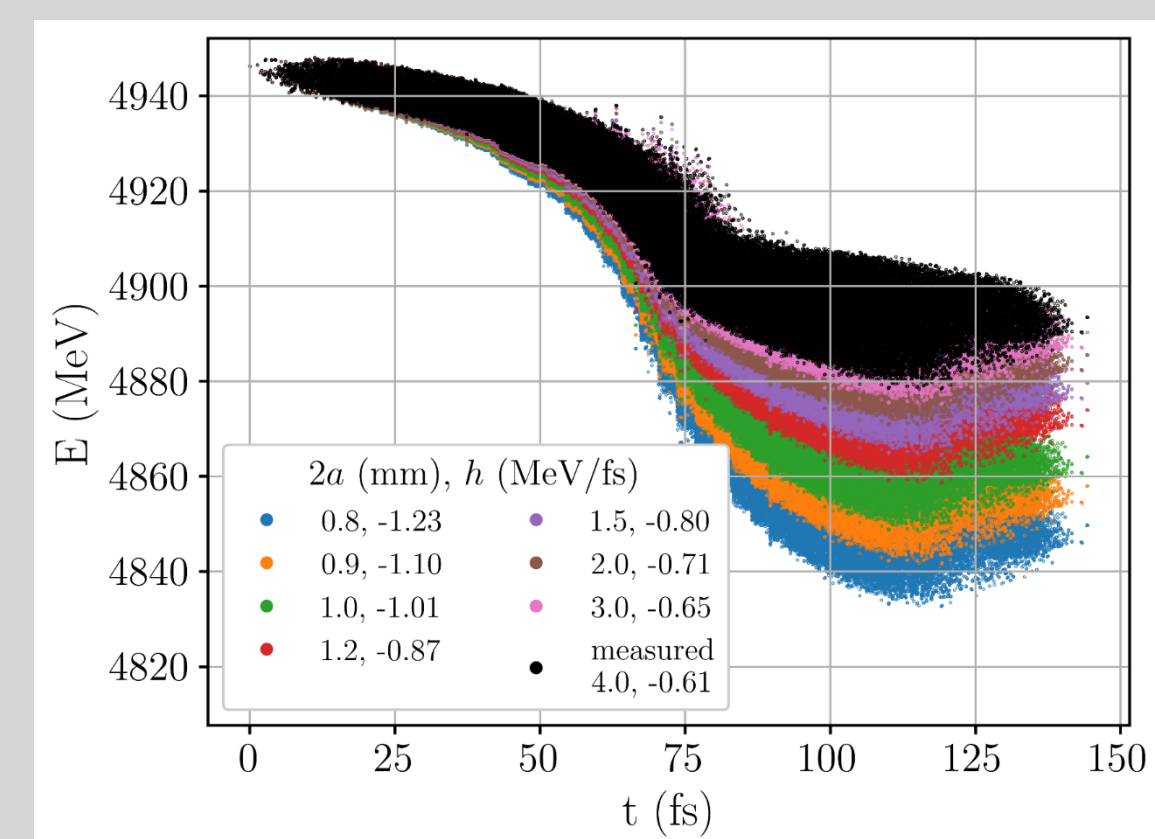
Increasing FEL bandwidth

Sending overcompressed beam through the dechirpers increases the FEL bandwidth.

3. The beam with modified energy spread lases, producing a different FEL spectrum than without dechirper effect.
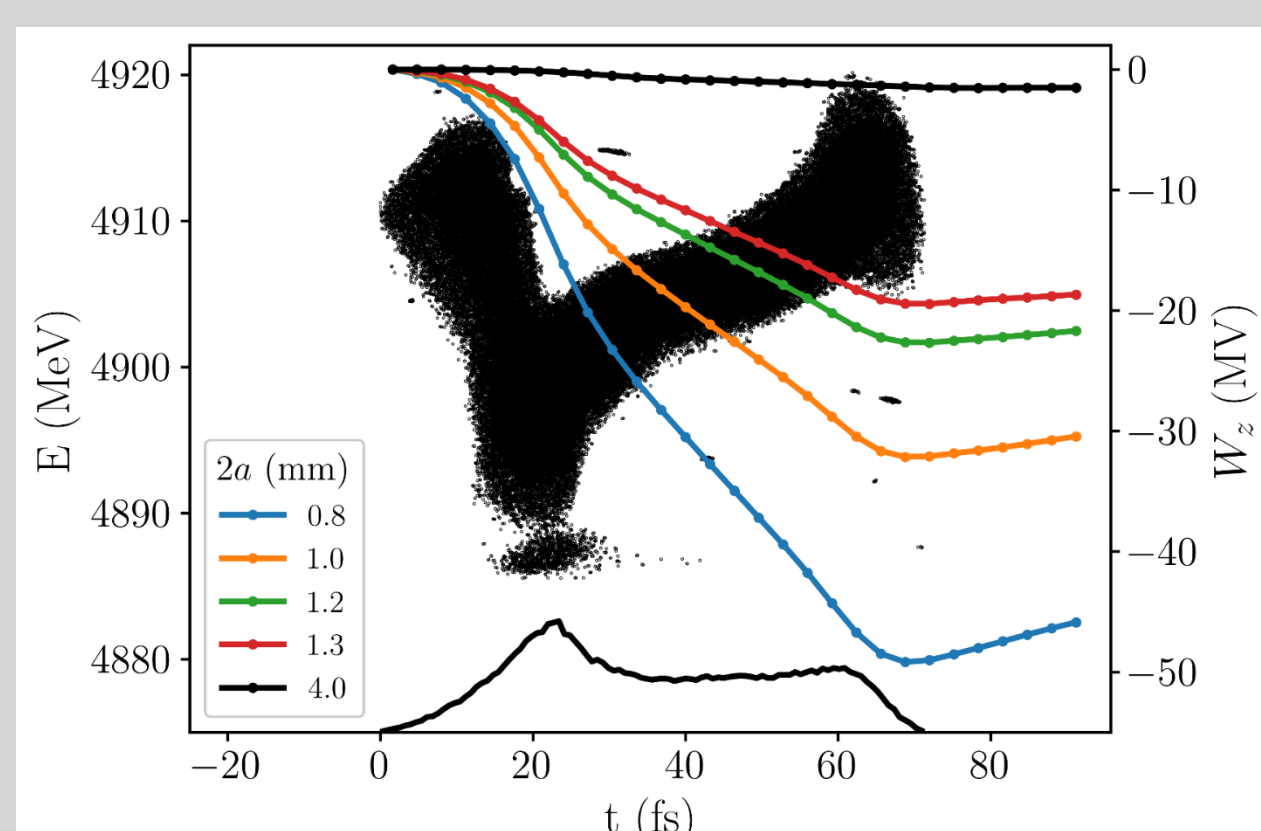

The energy spread of the beam **decreases**. For gaps smaller than ~1.2 mm, the tail loses energy such that the beam's energy spread increases.
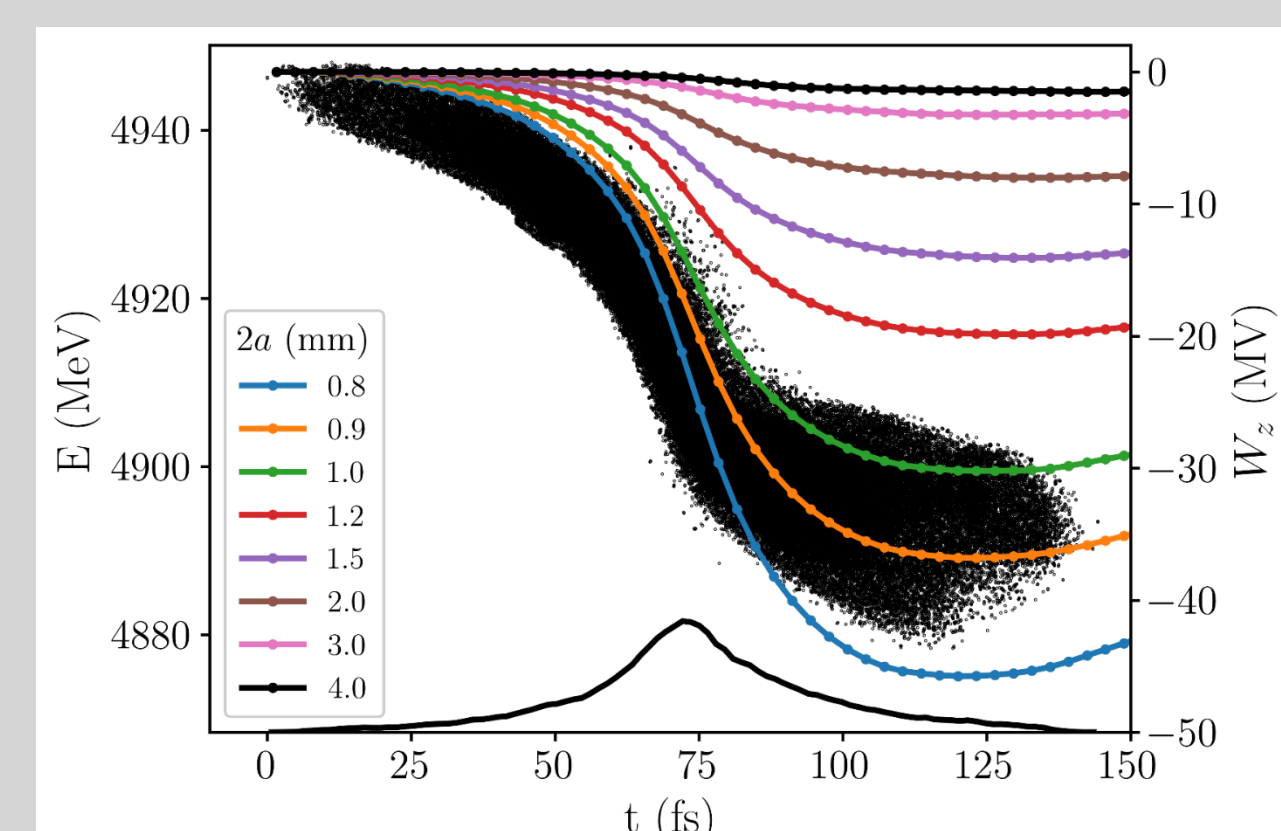

The energy spread of the beam **increases**.

2. The wake potentials cause particles in the tail of the beam to lose energy.

Particle energy **increases** towards the tail of the bunch.

Particle energy **decreases** towards the tail of the bunch.

1. The beam interacts with the dielectric dechirpers, producing wakefields. The coloured curves show wake potentials for different structure gaps.