\[ \delta E = 500 \text{ keV} \]
\[ E_{\text{rms}} = 150 \text{ keV} \]

non linear !!!

~ 3.5 MeV

rms energy spread
3D Calculation
Emod = 250 keV
JAN 2014

periodic SC solver
(in test)
Application: SK problem

250 keV
X_0202p00000

periodic
~ 1E6 particles

non-periodic
20E6 particles

1d

3d
Application: SK problem

250 keV

X_0202p00000

1d periodic
\sim 1E6 particles

3d non-periodic
20E6 particles

same range, same (plot) density
Trickle Heating in LCLS

- Laser
- 50 cm
- After LH
- Tilted microbunches
12.2 m in LCLS

**beta functions**

**long. phase space**

**energy distribution**

**top view**

**rms energy vs beamline coordinate**
15.7 m in LCLS

beta functions

long. phase space

ergy distribution
top view

rms energy vs beamline coordinate
17.2 m

beta functions

long. phase space

energy distribution

rms energy vs beamline coordinate

8 keV → 11 keV

in LCLS
Trickle Heating in LCLS

r.m.s. energy /eV

8 keV → 11 keV

normalized energy distribution

beamline coordinate

z = 19.1 m
Trickle Heating in LCLS

- rms energy /eV
- normalized energy distribution

beamline coordinate

z = 50.1 m
FEB 2014
FLASH1 study case 1 (CHG)

- **Electron beam:**
  - Beam energy: 700 MeV
  - Charge: 0.5 nC
  - Compression: none
  - Longitudinal phase space distribution: linear, no chirp
  - Minimum uncorrelated energy spread
- **Laser beam:**
  - Wavelength: 267 nm
  - Pulse duration: 40 fs (FWHM)
  - Pulse energy: up to 200 μJ
  - Beam size at modulator: 1 mm (FWHM)

- Use ORS1 as modulator (tuned to 270nm)
- Use C1 as bunching chicane R56 variable from 0 to 200 μm
- ORS2 and sFLASH1-3 off
- Use sFLASH4 as radiator
- Extract radiation at C3 into spectrometer
- E-beam into mini dump (LOLA on)
$R56 = 100 \, \mu m$

162.3 m
R56 = 100 µm

166.5 m

long. phase space

current / A (one period)

bunching
R56 = 100 \mu m

long. phase space

current / A (one period)

bunching
R56 = 100 µm

190.5 m

long. phase space

current / A (one period)

bunching
$R_{56} = 141 \, \mu m$

166.5 m

184.5 m

long. phase space

current / A

bunching

long. phase space

current / A

bunching
R56 = 160 µm

166.5 m

184.5 m
$R_{56} = 180 \, \mu m$

166.5 m

184.5 m