HXRSS Update for March 2021

Shan Liu
on behalf of the HXRSS commissioning team

FEL R&D meeting
Hamburg, 24.03.21
Beam time in March

KW09: 04.-05.03 +weekend → seeding at 7.5 keV

KW10: 11.-12.03 +weekend → seeding at 7.5 keV and 8 keV

KW11: 16.-17.03 → seeding at 10 keV

KW12: 25.-26.03 +weekend -> seeding at 7.5 keV
- heat load study at high repetition rate
- 2nd harmonic at 15 keV
Seeding @ 7.5 keV
Seeding with 2 chicanes @ 7.5 keV

XGM level: 600 uJ with 30 uJ background (C2 detuned)

However, optimum impinging energy to few tens uJ on C2
→ At lower photon energy, heat load increase
Achieved best performance so far @7.5 keV

- Seeding with C1+C2 helps:
  - It cleans the shoulders and keeps the impinging energy small
- XGM: **1mJ level** with about 140uJ background

![Graph showing performance details](image)
2\textsuperscript{nd} harmonic lasing @15 keV

- found signal from NHG at 15 keV with seeding and compared with SASE NHG
2nd harmonic lasing @15 keV

- Observed amplification of seeded signal at 15 keV with the first cells
Seeding @ 10 keV
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Initial Machine Condition

- 14 GeV, 250 pC @1.1 MHz
- Up to 2.6 mJ SASE @ 8keV from last week
- Up to 1.1 mJ SASE tuned (in 4 hours) @ 10 keV
- Naresh set-up HIREX @ 10 keV

20210316-11_06_04_waterflow.npz

SASE @ 10 keV
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Performance at 10 keV

- Seeding with 2\textsuperscript{nd} chicane
- above 1 mJ with \(<200\) uJ BG

0.38 eV/ pixel
Reminder: best performance so far @ 9 keV in 2020

- Averaged pulse energy 1.3 mJ (max. 850 uJ @ PAL) -> BG estimated by extracting crystal (<600 uJ)
- Peak intensity jitter ~33% (min. 40% @ PAL)
- Central energy jitter (0.15 eV) and FWHM (0.72 ± 0.15 eV)
- Statistics calculations are limited by the HIREX detector resolution (0.2 eV/ pixel)
Summary and future plans

- Seeding at 7.5 keV
  - seeding with 2 chicanes to above **1mJ level** with ~140uJ background (FWHM ~ 1.2 eV)

- Seeding at 10 keV
  - Seeding with 2nd chicane to above 1 mJ with <200 uJ BG (FWHM ~0.7 eV)

- Remaining user seeding point
  - 11 keV (to be tested)
  - 12.9 keV (tested last year)
Thank you!