PITZ Run Coordination

2022 (Week 48/49)

THz / FLASH RT Run

M. Krasilnikov
24.11.2022

Run weeks 48/49 planning

Status 22.11.2022

Week 48	Mon Nov-28	Tue Nov-29	Wed Nov-30	Thu Dec-01	Fri Dec-02	Sat Dec-03	Sun Dec-04
Morn. 7:00 to 15:30	mirror56 Vashchenko Visit Ministry of science	Vashchenko Setups / tests for TUV	TUV Vashchenko Oppelt Cathode exchange to #695.1	Richard THz (3nC)	Richard GUEST	Vashchenko Liebel THz (seeding, GG)	Vashchenko Richard
Late 15:00 to 23:30	Startup Krasilnikov Dark current, QE, QE--map #693.1	Hoffmann Mohanty	Hoffmann Condition., dark current, QE, QE--map #695.1	or / and Hoffmann Beam preparation & Dosimetry	Krasilnikov BC comm. (EK+AL) Lotfi	Li Lotfi or / and	Li Georgiev
Night 23:00 to 7:30	Li Seupts for TUV	Li Dmitriiev	Dmitriiev	Dmitriiev	Aftab Dmitriiev	Beam preparation Hoffmann & Amirkhanyan Dosimetry mod laser	Hoffmann & Amirkhanyan

Week 49	Mon Dec-05	Tue Dec-06	Wed Dec-07	Thu Dec-08	Fri Dec-09	Sat Dec-10	Sun Dec-11
Morn. 7:00 to 15:30	Richard Aftab	Richard Grebinyk	Aftab Grebinyk	Li Grebinyk	Hoffmann Oppelt	Hoffmann Liebel Gun5.1 Cond.	Richard Mohanty
Late 15:00 to 23:30	Vashchenko Lotfi	Krasilnikov Liebel FLASH-RT	Gross Lotfi	Gross Lotfi	Krasilnikov Lotfi	Krasilnikov Lotfi	Krasilnikov Kongmon
Night 23:00 to 7:30	Li Dmitriiev	Vashchenko Dmitriiev	Richard Vashchenko	Richard Vashchenko	Gross Grebinyk	Gross FLASH-RT Grebinyk	Gross Grebinyk

Startup:

1. Check list
2. QE-map (cath, VM) after mirror56 check (GV)
3. E-meter → OK
4. Photodiode at trolley→?
5. …

FLASH-RT:

1. Charite (Sarcoma organoids)→Jan
2. HZDR (Zebrafish)→?
3. Chemistry/Biology/Biochemistry (AG)
4. Dosimetry (gafchromic films) (FR)
5. Water phantom from Daresbury

THz:

1. 3nC fine tuning (XKL, MK)
2. Seeded FEL (GG)
3. BC commissioning (EK+AL)

Other studies:

1. Gun5 conditioning status check, mini-BDR studies, gamma-detectors in the coupler (MK)
2. LPS?
3. Emittance methodic?
4. New BPM calibration (DD, MK)
5. New FC calibration → done?
6. Chicane.BPM1 tuning/calibration (MK, DD)
7. Beam trajectory (DD)

Seeded FEL by modulated beam

G. Georgiev

The time plan is iterative – points 1 and 2 will repeat for any settings with spikes, point 0 is intended at program start, but can be returned to.

0. Electron beam shaping (search for spikes) – **1 to 3 shifts**
    a. After at least one case with spikes found, move to point 1
1. Manual beam transport (round beam, steering free quads) – **1 shift or less**
2. Optimization and THz measurement – **1 shift per point**
    a. Over 200 optimizer iterations (100 iteration ~ 1 hour)
    b. Include booster/solenoid tuning and 200+ iterations
    c. Measure gain curve (1 hour)
    d. Save results, transport
3. Return to point 1 for next settings or point 0 to search.
    • Or continue with SASE baseline
    • Or finish program

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Night 23:00 to 7:30	Li Setups for TUV	Li Dmitriiev		Aftab Dmitriiev	Aftab Dmitriiev	Hoffmann Amirkhanyan	unmod laser Hoffmann Beam for Dosimetry

Week 49	Mon Dec-05	Tue Dec-06	Wed Dec-07	Thu Dec-08	Fri Dec-09	Sat Dec-10	Sun Dec-11
Morn. 7:00 to 15:30	Richard Aftab	Richard Grebinyk	Aftab Grebinyk	Li Grebinyk	Hoffmann Oppelt Gun5.1 Cond.	Hoffmann Liebel FLASH-RT Or Gun5.1 conditioning?	Richard Mohanty
Late 15:00 to 23:30	Vashchenko Lotfi	Krasilnikov Liebel FLASH-RT	Gross Lotfi	Gross Lotfi Cathode exchange? Gun5.1 Cond?	Krasilnikov Cathode exchange to #695.1	Krasilnikov Lotfi	Krasilnikov Kongmon
Night 23:00 to 7:30	Li Dmitriiev	Vashchenko FLASH-RT	Richard Vashchenko		Gross Grebinyk	Gross FLASH-RT Grebinyk	Gross Grebinyk

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7. Beam trajectory (DD)

Setups for TUV

1. 1nC → THz (undulator through), 17MeV
2. 1nC (same) → tunnel 1 dump,

Preparatory run for TÜV

Radiation stress test

1. Test-1: Tunnel #1
   - Gun:
     - 650us (1ms?)
     - 6.3MWg? (or highest stable),
     - MMMG
   - Laser:
     - 600 pulses (see next slide)
     - BSA~3.5mm(?)
   - CDC-booster:
     - 650us
     - 3MW (or highest stable)
     - MMMG
   - E-beam:
     - 1nC (4nC?)
     - focusing
     - transport to the beam dump (tunnel #1)
   - Record / monitoring:
     - BPMs
     - Screens
   - Measure radiation vs NoP
2. Test-2: Tunnel #2 with 100pC (transport/matching from THz?)
3. Test-3: Tunnel #2 with 2nC (1nC?) (transport/matching from THz?)

Pre-conditions:

- HV pulse length (RF1, RF2) adjusted
- RF2: FB start: now at 99us → put back to the beginning?
- Enable long pulse trains with MBI laser

19.05.2021 06:37, T. Weilbach, Radiation tests after wall installation

1) Set beam energy to ~22MeV/c (GUN SP 58.5, Booster SP 18.5)
2) Set bunch charge to **1nC**
3) **Transport** beam to beam dump, use BPMs to measure charge along the beam line, focus beam with Q9/10 into PST section (e.g. PST.Scr2) use PST.Quads to focus beam at HIGH2.Scr2.
4) Center beam on beam dump using HIGH2.BPM1
5) Monitor beam charge with Low.ICT signal
6) Measure radiation vs NoP
7) Insert slits at EMSY1/2/3 and measure radiation (?)

FLASH RT wish list to beam adjustments (run weeks 48/49

A.Grebinyk

- Boundary condition: Anna, Felix, Matthias, Frank, Xiangkun mostly not available in KW48 (attending FRPT conference)

- Beam scattering and dark current test until nothing to see on films:
  with films only at
  conventional: 5 x 10^{-2} Gy/s with 75 Gy
  UHDR: 10^{6} Gy/s with 75 Gy; 10^{11} Gy/s with 1.5 Gy
  → 2 to 6 shifts (best during day, when engineers are available)

- Preparation for irradiation of Charité samples in Jan 2023 (2 mL tube, the holder height is adjusted):
  Beam transport? → 1 shift
  test with films and tubes with water → 3 to 5 shifts
  if ok, test with cells → 1 to 2 shifts (in KW49)

- Dose deposition measurements with the Daresbury water phantom:
  with big dosimetry films only. Setup has to be built and commissioned before

- Biological effects of PITZ beam with HZDR (preparation of exp. with zebrafish embryos):
  beam transport and dosimetry → 1 to 2 shifts

Biological effects of PITZ beam

Cell survival after irradiation (A. Grebinyk)

1 mL in
2 mL tube

h: 11 mm
w: 10.5 mm

3 samples: 2 sarcoma (S1 and S2) and fibroblasts (F1)
Dose: 0, 2, 4, 8, 16 Gy
Dose rate: for conventional 5 x 10^{-2} Gy/s
for UHDR: 70 and 10^{6} Gy/s

for 20th and 21st of January

1 day:

	1	2	3	4	5	6	7	8	9
1	10 Gy S1	10 Gy S2	8 Gy S1	8 Gy S2	4 Gy S1	4 Gy S2	2 Gy S2	2 Gy S1	0 Gy S1+2
	5 x 10^{-2} Gy/s								
2	10 Gy S1	10 Gy S2	8 Gy S1	8 Gy S2	4 Gy S1	4 Gy S2	2 Gy S2	2 Gy S1	0 Gy S1+2
	70 Gy/s								
3	10 Gy S1	10 Gy S2	8 Gy S1	8 Gy S2	4 Gy S1	4 Gy S2	2 Gy S2	2 Gy S1	0 Gy S1+2
	10^{6} Gy/s								

2 day:

	1	2	3	4	5	6	7	8	9
1	10 Gy F1	8 Gy F1	4 Gy F1	2 Gy F1	0 Gy F1				
	5 x 10^{-2} Gy/s								
2	10 Gy F1	8 Gy F1	4 Gy F1	2 Gy F1	0 Gy F1				
	70 Gy/s								
3	10 Gy F1	8 Gy F1	4 Gy F1	2 Gy F1	0 Gy F1				
	10^{6} Gy/s								