FLASH
Free-Electron Laser
in Hamburg

FLASH Commissioning and Startup

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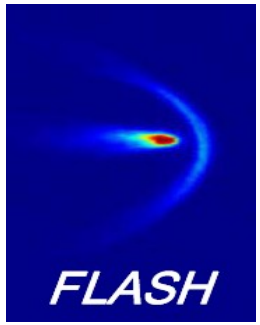

- Commissioning
- Startup
- Accelerator/FEL Studies

Main Commissioning Tasks

- Modules:
  - RF/LLRF
  - warm/cold coupler conditioning
  - cavity conditioning
- RF Gun
  - RF/LLRF
  - conditioning
  - laser/laser beamline
- Beam
  - in gun section, BBA
  - through modules: phasing, energy
  - 1 GeV optics
- SASE search (6.5 nm)

Commissioning meetings

- Commissioning meetings: Thursdays 14 h 24/200

19.04.2007 Laser + Laser beamline and RF-gun
- Laser + laser beamline: *S. Schreiber,* I. Will, M. Goerler, K. Klose, B. Polzin, B. Petrosyan, A. Aghababyan, …
- RF-gun: *K. Flöttmann,* S. Schreiber, J.-H. Han, M. Krasilnikov, B. Polzin, K. Klose
- Cathodes: *J.-H. Han,* S. Schreiber, D. Sertore, L. Monaco
- llrf RF-gun: *V. Ayvazyan,* W. Koprek, E. Vogel

10.05.2007 Modules (RF / LLRF) and klystrons / modulators
- cryo: *R. Lange,* K. Jensch et al
- coupler and module conditioning: *D. Kostin*
- waveguides: *V. Katalev, …*
- rf: *R. Kaiser,* N. Poggensee, I. Sandvoss, T. Grevsmühl
- llrf: *V. Ayvazyan* + M. Grecki, …

Commissioning meetings

- cont…

24.05.2007 Beam optics, magnets, SASE search, photon diagnostics

- Beam optics: *V. Balandin, N. Golubeva*, B. Faatz, E. Schneidmiller, M. Yurkov
- Magnets: *A. Hauberg*, H. Schlarb, P. Castro, S. Herb
- SASE search: B. Faatz, E. Schneidmiller, M. Yurkov, V. Kocharyan
- Photon diagnostics: *R. Treusch,* K. Tiedtke, S. Düsterer

31.05.2007 Diagnostics, controls, timing, synchronization, protection system

- Diagnostics: *N. Baboi*, D. Noelle, K. Honkavaara, H. Schlarb, F. Löhl, …
- Controls: *K. Rehlich*, O. Hensler, R. Kammering, …
- Timing and synchronization: *K. Rehlich, H. Weddig*, H. Schlarb, S. Schreiber, …
- Protection system: *L. Fröhlich*, M. Staack, M. Goerler, A. Hamdi, …

07.06.2007 Operator training and organization of operator work

- S. Schreiber, B. Faatz, P. Castro, M. Bieler, B. Holzer, U. Zobjack, K. Honkavaara, …

Tentative Schedule

July	27	2.Jul - 8.Jul	7	Commissioning	rf gun commissioning starts	
	28	9.Jul - 15.Jul	7		coupler warm conditioned	School holidays HH
	29	16.Jul - 22.Jul	7			School holidays HH/SH
	30	23.Jul - 29.Jul	7		cool down starts	School holidays HH/SH
August	31	30.Jul - 5.Aug	7		machine cold	School holidays HH/SH
	32	6.Aug - 12.Aug	7			School holidays HH/SH
	33	13.Aug - 19.Aug	2		beam up to dump	School holidays HH/SH
	34	20.Aug - 26.Aug	2		SASE 6 nm	School holidays HH/SH
Septembe	35	27.Aug - 2.Sep	2		SASE 6 nm	FEL 2007
	36	3.Sep - 9.Sep	4	Accelerator studies		
	37	10.Sep - 16.Sep	4			
	38	17.Sep - 23.Sep	4			
	39	24.Sep - 30.Sep	4			
October	40	1.Oct - 7.Oct	2	FEL studies		Dt Einheit 3-Oct
	41	8.Oct - 14.Oct	2			
	42	15.Oct - 21.Oct	2			School holidays HH/SH
	43	22.Oct - 28.Oct	2		SASE	School holidays HH/SH
November	44	29.Oct - 4.Nov	2		SASE	
	45	5.Nov - 11.Nov	2		SASE	
	46	12.Nov - 18.Nov	3		preparation user run	
	47	19.Nov - 25.Nov	1	User Run		
Decembe	48	26.Nov - 2.Dec	1			
	49	3.Dec - 9.Dec	1			
	50	10.Dec - 16.Dec	1			
	51	17.Dec - 23.Dec	1			School holidays HH
	52	24.Dec - 30.Dec	5	Maintenance		School holidays HH/SH
January	1	31.Dec - 6.Jan	5			School holidays HH/SH

preliminary

Commissioning Schedule

KW	Date		Item	Comment
24	11.06-17.06		**Laser:** test of new laser system, laser beamline	gun section must be in place
25	18.06-24.06		**Personnel Interlock test** (18.-19/20.06)	**Tunnel closed** during interlock test (2 or 3 days)
26	25.06-01.07		**prepare warm coupler processing**	Tunnel open day time, closed in nights
			Lasers operational, laser beam line, laser on virtual cathode	laser in gun requires scint. Cathode -> cathode box
			RF-gun diagnostics (cameras) commissioning	
27	02.07-08.07		**Magnet power supply tests**, Warm coupler processing, Start-up RF-gun	**Tunnel closed**, Solenoids required for Gun operation
28	09.07-15.07		Warm coupler processing, **Magnet tests**	**Tunnel closed**, Solenoids required, no ZZ
			Klystron 3 test – reflected power issue	with RF-gun in nominal operation
			RF-gun operation / conditioning (without beam) during nights	
29	16.07-22.07		**Final installations 300 K**, RF-gun operation (nights)	**Tunnel open** during daytime
			RF-gun, laser operation: set-up for beam operation	
			Beam based solenoid alignment	
			Dark current + collimator studies	
			Check current and polarity of all magnets	need a list of magnets, changes made etc
30	23.07-29.07		**Cool down modules**, RF gun operation, gun llrf	Beam in Gun mode
31	30.07-05.08		**Cool down modules**, rf gun operation	Beam in Gun mode, prepare beam to dump
			prepare rf to modules, prepare beam operation	

Accelerator/FEL Studies

Beamtime requests for FEL and accelerator studies Summer/Autumn 2007			
	shifts		**Weeks**
requested	**288**		**14.4**
requested plus commissioning and preparation user run	**405**		**20.3**
user	7	2%	0.4
FEL Studies	176	43%	8.8
user run preparation	14	3%	0.7
acc studies	82	20%	4.1
commissioning	127	31%	6.3

Beam Time requests

Category	Shifts
Commissioning issues: RF Gun, OTR, Emittance, phase calibration, BPMs	32
SASE recovery	42
Milestones: wavelength, long trains	18
Electron beam studies: rf gun, cathode, darkcurrent, OTR/WS, emittance, slice emittance, off-axis screens & SASE, BPM, BAM, tilt, THz, energy, BBA undulator, file sequencer, SR BC2	38
Instrumentation & Diagnostics: BPM, intratrain feedback, HOM, IR undulator, ORS, velocity bunching, material test stand	50
Photon beamlines: commissioning, spectrometer, XUV autocorrelator, damage XFEL optical elements, FIR VUV pump probe beamline	48
LLRF: downconverter, beamload compensation, field stability, new features, MIMO-LTI, radiation, piezo, transients, multicavity controller, vector sum, rf power calibration, operational issues, system ID, off crest, procedures, automation, new MO	60
	288

Shift Organization

- Machines in operation:
  - FLASH only -> 12-Aug-2007
  - FLASH, DORIS + pre accelerators 12-Aug-2007 -> end 2007
  - FLASH only Jan-2008 -> Jul-2008 (Doris: Sep 2008)
- We need at least 3 persons in the BKR, 4 required if Doris is in operation as well
- We need a ‘Schichtfuehrer’
  - is responsible for overall operation and safety issues
- People on shift are taken from the operators pool
- FLASH scientist fill the gaps – we need 1 FLASH expert/shift

Training

- We will have training sessions for inexperienced operators
- 1 inexperienced operator does training on the job

Control room

- There are plans to rearrange the BKR -> Bacher
- Input is welcome