

# **PITZ measurement program 2016**

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# Measurement program 2016

#	Task	Coordinator	Duration (shifts)	Meas. Program	Remark	
1	Dark current monitoring		30min-1h	+	6.5MW, 200us, 1% + DCM?	Ongoing
2	Resonance temperature monitoring	YR	30min-1h	+	4MW, 400us, 1%	Ongoing
3	Laser BL alignment	MG	2d?	+		Done
4	Laser BBA	YR	1-2 shifts	+	LBL aligned	Done
5	Solenoid BBA	MK	3-4 shifts	+	u-mover works	Done*
6	Longitudinal momentum characterization (maxPz, MMMG vs. peak RF power gun)	MK	5-6 shifts	+		Done
7	Emission studies (+charge profile of pulse train → nose in the bunch charge train)	MK, YC	4-5shift+	?	Request from FLASH (S. Schreiber), ?Right after the cathode insertion?	Started
8	Dummy plasma cell (window foil) stress tests	MG	5d+	+	6MW, 100pulses, booster→nominal	Done
9	E-beam asymmetry studies	Igl, MK	?	?		Done*
10	$\delta E$ : LPS, slice energy spread characterization	MK, J. Zhu		+/-	Request from HH (M. Dohlus, J. Zhu), TDS	
11	BPM commissioning	MK,FT	3-4+	+/-	E-beam, Q~0.5-1nC	Ongoing
12	Projected emittance studies			?	(53MV/m vs. 60MV/m)x(FTvs.Gauss)+TDS	
13	Slice emittance studies	HH		?	TDS	
14	Plasma experiment	MG		?	TDS	
15	Plasma TR	GL			TDS	
16	3DElla commissioning	TR, JG		?		
17	TDS commissioning/characterization?	HH		?		Done?
18	CDS booster studies (dark current)	I.Rybn., Igl		+	no e-beam needed, CDS IL works	Done?
19	Commissioning of res. temp. tool	YR	3 shifts	+		Done?
20	THz related experiments: 4nC	PB	8 shifts	+	EMSY1-3, all screens, TDS, HEDA1,2 (long laser – FT of Gauss)	
21	THz related experiments: short bunches	PB	3 shifts	+	TDS available, BSA=3.0mm → homogeneity	

# Run weeks 33-34

**S - Overall stability check**

**PE - Projected emittance studies**

**SE - Slice emittance studies**

**FR – Fast recovery (6.5MW x 650us)**

**PL – Tests for plasma cell**

**THz – 4nC beam measurements**

**Emi – Emission studies**

to do:	Measurements						
Week 32	Mon Aug-08	Tue Aug-09	Wed Aug-10	Thu Aug-11	Fri Aug-12	Sat Aug-13	Sun Aug-14
Morn. 07:00 to 15:30	Renier Kalantaryan	Renier Loisch	Huck Loisch	Huck Lishilin	Gross Lishilin	Gross Saisa-Ard	Gross Saisa-Ard
Late 15:00 to 23:30	Rublack Huck	Rublack Saisa-Ard	Renier Rublack	Renier Rublack	Boonpompras Rublack	Boonpompras Li	Boonpompras Li
Night 23:00 to 07:30	Good Lishilin	Good Lishilin	Good Kalantaryan	Good Kalantaryan	Good Zhao	Good Qian	Good Qian
Resp. Phys							
Laser	Rublack	Rublack	Good	Good	Gross	Gross	Gross
RF	Koehler	Koehler	Koehler	Koehler	Koehler	Koehler	Koehler
Vaku.	Philipp	Philipp	Philipp	Philipp	Philipp	Philipp	Philipp
Contr.	Kalantaryan	Kalantaryan	Kalantaryan	Kalantaryan	Kalantaryan	Kalantaryan	Kalantaryan
Electr.	Schultze	Schultze	Schultze	Schultze	Schultze	Schultze	Schultze
Infrast.	Tomow	Tomow	Tomow	Tomow	Tomow	Tomow	Tomow
SSB	Rublack	Rublack	Huck	Huck	Gross	Gross	Gross
Schichtabsich	Qian	Qian	Li	Li	Chen	Renier	Renier

Issued on 03-Aug-2016

A gray field means the status has changed since the last version

to do:	Measurements						
Week 33	Mon Aug-15	Tue Aug-16	Wed Aug-17	Thu Aug-18	Fri Aug-19	Sat Aug-20	Sun Aug-21
Morn. 07:00 to 15:30	Krasilnikov Chen	Krasilnikov Chen	Krasilnikov Qian	Krasilnikov Qian	Krasilnikov Li	Krasilnikov Li	Krasilnikov Li
Late 15:00 to 23:30	Gross Saisa-Ard	Gross Saisa-Ard	Stephan Chen	Stephan Chen	Stephan Qian	Stephan Qian	Stephan Qian
Night 23:00 to 07:30	Boonpompras Li	Boonpompras Li	Gross Saisa-Ard	Gross Saisa-Ard	Isaev Chen	Isaev Chen	Isaev Chen
Resp. Phys							
Laser	Gross	Gross	Gross	Gross	Krasilnikov	Krasilnikov	Krasilnikov
RF	Jachmann	Jachmann	Jachmann	Jachmann	Jachmann	Jachmann	Jachmann
Vaku.	Philipp	Philipp	Philipp	Philipp	Philipp	Philipp	Philipp
Contr.	Melkunyan	Melkunyan	Melkunyan	Melkunyan	Melkunyan	Melkunyan	Melkunyan
Electr.	Tonisch	Tonisch	Tonisch	Tonisch	Tonisch	Tonisch	Tonisch
Infrast.	Hoffmann	Hoffmann	Hoffmann	Hoffmann	Hoffmann	Hoffmann	Hoffmann
SSB	Krasilnikov	Krasilnikov	Krasilnikov	Krasilnikov	Krasilnikov	Krasilnikov	Krasilnikov
Schichtabsich	Zhao	Zhao	Kalantaryan	Kalantaryan	Lishilin	Lishilin	Saisa-Ard

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## S - Overall stability check

- S1. Check all timing settings (after MO manipulations) → shift + FT
- S2. Check laser BBA → shift
- S3. Gun phase and amplitude (uTCA) → YR
- S4. Laser pointing and energy jitter → shift (+laser experts)
- S5. Beam-based gun phase → phase scan and charge jitter
- S6. Beam-based gun amplitude → e-beam at MMMG in LEDA
- S7. E-beam energy jitter in HEDA1 at various gun and booster phases
- S8. TDS stability with e-beam → H.Huck

For gun , booster and TDS WCS stability → shift + J. Schultze

# Emittance

## PE - Projected emittance studies

11ps Gaussian, 500pC, 60MV/m

	$P_{\text{boo}}=3.5\text{MW}$	$P_{\text{boo}}=2.5\text{MW}$	$P_{\text{boo}}=1.5\text{MW?}$
BSA=1.2mm	+	+*	
BSA=1.1mm	started		
?BSA=1.0mm			

NB: trajectory+steering free!

Also: 5MW (53MV/m)?

## SE – Slice emittance studies

11ps Gaussian, 500pC, 60MV/m

The best PE setup?

# THz – 4nC beam measurements

## Optimizations of 4 nC Electron Beams for High-gain THz FEL (PB)

### Prerequisites

- > Commissioning of EMSY1, EMSY2 and EMSY3, also defining acceptance area (on the video client) for the slit scanning by each EMSY.
- > Script for quadrupole gradient settings.
- > Definitive procedures of TDS+HEDA2 measurements and analyses
- > -Optimized transverse laser profile for BSA of 3.5 mm

### Required Machine Parameters

- > *Laser* - Flattop profile (or long Gaussian if necessary), longest temporal length
- > *Gun* - RF pulse duration  $\geq 200$  us
- > - RF power in the gun of 6.5 MW
- > *Booster* - RF pulse duration  $\geq 200$  us
  - RF power in the booster of  $\sim 3.0$  MW (for 22 MeV/c beam momentum)
  - RF power in the booster of  $\sim 2.0$  MW (for 15 MeV/c beam momentum)

### Required Beam Diagnostics

- > *All ICTs*  $\rightarrow$  bunch charge measurements
- > *All YAG Screens + cameras*  $\rightarrow$  beam transverse profile measurements
- > *LEDA, HEDA1*  $\rightarrow$  beam momentum measurements
- > *3 EMSYs: High1.Scr1&4, High1.Scr3&5 and High2.Scr1&2*  $\rightarrow$  emittance measurements and beam transport and matching
- > *TDS + HEDA2*  $\rightarrow$  Current profile, bunch length, longitudinal phase space, slice emittance and slice energy spread

### Experimental Procedures

- 4nC generation (0.25 shifts)*
- Emittance Optimizations (0.75 shifts)*
- Longitudinal Profiles measurements (1 shift)*
- Beam transport and matching (2 shifts)*
- Repeat measurement starting from B1 with power in the booster of 2 MW (for 15 MeV/c beam momentum) (4 shifts)*

## Other studies

- > **PL – Tests for plasma cell**: Request from M. Gross: 1-2 shifts for focusing studies at HIGH1.Scr1 (+Foil?)
  
- > **FR – Fast recovery (6.5MW x 650us)** → If O. Hensler available

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Late 15:00 to 23:30	Rublack	Rublack <b>FR?</b>	Rublack <b>FR?</b>	Rublack <b>FR?</b>	Boonpompras Rublack	Boonpompras Li	Boonpompras Li	Late 15:00 to 23:30	Gross Saisa-Ard	Gross Saisa-Ard
Night 23:00 to 07:30	Lishilin	Good Lishilin	Good Kalantaryan	Good Kalantaryan	Good Zhao	Good Qian	Good Qian	Night 23:00 to 07:30	Boonpompras Li	Boonpompras Li
Resp. Phys								Resp. Phys		
Laser	Rublack	Rublack	Good	Good	Gross	Gross	Gross	Laser	Gross	Gross
RF	Koehler	Koehler	Koehler	Koehler	Koehler	Koehler	Koehler	RF	Jachmann	Jachmann
Vaku.	Philipp	Philipp	Philipp	Philipp	Philipp	Philipp	Philipp	Vaku.	Rueger	Rueger
Contr.	Kalantaryan	Kalantaryan	Kalantaryan	Kalantaryan	Kalantaryan	Kalantaryan	Kalantaryan	Contr.	Melkumyan	Melkumyan
Electr.	Schultze	Schultze	Schultze	Schultze	Schultze	Schultze	Schultze	Electr.	Tonisch	Tonisch
Infrast.	Tornow	Tornow	Tornow	Tornow	Tornow	Tornow	Tornow	Infrast.	Hoffmann	Hoffmann
SSB	Rublack	Rublack	Huck	Huck	Gross	Gross	Gross	SSB	Krasilnikov	Krasilnikov
Schichtabsich	Qian	Qian	Li	Li	Chen	Renier	Renier	Schichtabsich	Zhao	Zhao