ATF2
priorities and schedule
comments for discussion

Andrei Seryi

ATF2 project Meeting, June 8-11, 2009

With revisions based on discussions in the morning of June 11

Goals & approach

- The eventual goals are clear – ~75nm, then ~37nm by ~end of 2010
- How to plan efforts to achieve the goals:
  - Dec 2008 approach: top-down milestones
- A lot of progress since then
- Now we know how system work and where more efforts are needed
  - Let's try different approach – identify systems that need to be upgraded or improved, estimate how much time and efforts it will take, prioritize and focus
  - Aim for end of 2009 as the point to reassess the progress

Top priorities & => upgrades

- 1) Need: reproducibility of ε and extraction conditions
  - => Implement feedbacks in DR (orbit, RF and longitudinal)
  - => Upgrade/replace EXT stripline electronics
- 2) Need: reliable and fast ε measurement & corrections and optics verification & correction to the IP
  - => FS upgrades, including better tuning/analysis automation
  - => Finalize C- & S-band BPM commissioning
  - => Implement multi-OTR
- 3) Need: make the interferometer mode of BSM work
  - => Many needed upgrades are planned by BSM team
  - => Laser transport from LW laser

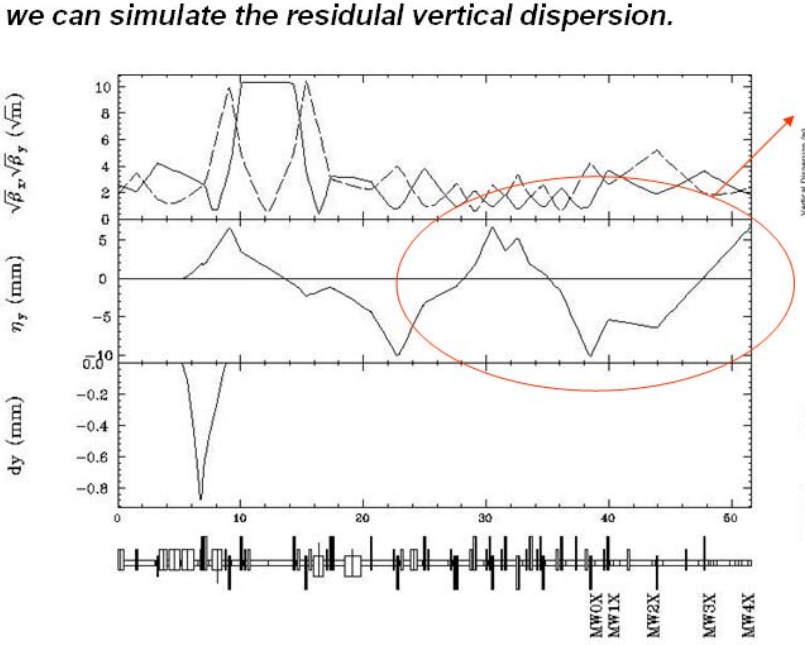
Slide added after discussion

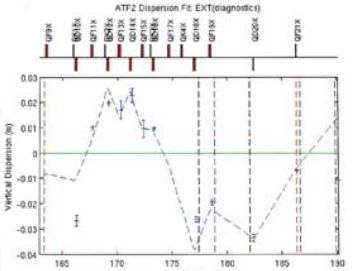
- It is suggested to add explicit goal to understand the source of vertical dispersion in EXT and the method of its correction
- Studies to start with simulation, this Summer
- There is a candidate for the source of vertical dispersion:
  rotation (few mrad) of septa or some distortion of their field
- The plan of mitigation is to be developed this Summer

Candidate of the incoming dispersion source

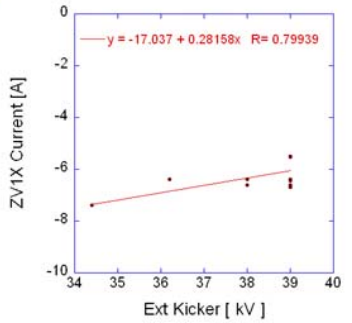
-ZV1X must be apply huge field to pass the beam.

-When we assumed the vertical kick at septum and ZV1X and ZV2X, we can simulate the residulal vertical dispersion.





Measured dispersion



Vertical kick at septum was smaller for higher kicker voltage

slide from Okugi-san

New upgrade initiatives

- The list of top priority upgrades listed on the previous page include new initiatives:
  - Multi-OTR system
  - New electronics for EXT stripline BPMs
  - DR feedbacks
  - LW laser transport to BSM
- There are more or less definite plans how to do that or tentative discussion in several cases
  - Multi-OTR: IFIC-SLAC joint design and proposal
  - New EXT BPM electronics: tentative initiative from SLAC, using LCLS BPM electronics design
  - DR feedbacks: possibly SLAC/SPEAR-3 and Cornell colleagues may be interested?
  - LW laser transport: UK team plus Univ. of Tokyo team
- Volunteers (institutions and individuals) are needed

Activities for Summer & Autumn 09

- Assume we find the way to proceed with high priority upgrades, then there will be a lot of activity this Summer:
- Summer
  - Upgrade of control system and V-system servers
  - Upgrades of FS with more EPICS channels (DR RF, etc) & automation
  - Upgrades of BSM
  - New laser transport from LW laser to BSM
  - Final fix of C-band BPM timing
  - Connection of S-band BPM electronics
- Autumn
  - Upgrade all DR BPMs with new electronics
  - Install new electronics for EXT stripline BPMs
  - Implement DR orbit and possibly other feedback
  - Install multi-OTR system

Present schedule for Autumn-Winter 09

9 2009

Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

10 2009

Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

11 2009

Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

12 2009

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27	28	29	30	31		

- With many improvements and upgrades made during Summer 09, the first October run may be consumed entirely just for check-outs of systems
- However, check-outs of most of the systems may require just 1 day of beam time
  - after that one may have a week or so without beam, for final fixes
- It will be beneficial to have very short (1-2) days pilot runs before the main runs, for check-outs
- To avoid stressing the personnel and the supporting company, these check-out runs can use just the day shifts
- Let's see how schedule could change, if we use this approach (next slide):

Possible Schedule for Autumn-Winter 09

- indicate system check-out beam run with just day shift

Upgraded V-system servers checkout with beam

Check-outs of C and S-band BPMs
BSM checkout

Normal 3 shifts per day run

Check-out new EXT BPMs
Check-out new DR BPMs

Normal 3 shifts per day run

Check-out LW laser to BSM
Check-out multi OTRs

Normal 3 shifts per day run

This is a concept.
Exact location of check-out runs on the calendar need to be optimized, together with the whole schedule

Upgrades and our resources

- Assume we defined the most important upgrades and adjusted schedule such that we can benefit most from the upgrades
- We still need to assign (in cases where it is not clear) responsible teams to make things happen
- If resources or schedule interference are an issue, we would need to assign priorities and plan accordingly
- Focusing on urgent high priority upgrades require refocusing of efforts and funds
- Need to present and get TB's moral support for the high priority list

Summer 09 activities & priorities

Activity	Priority in 2009	Responsible	Chek-out beam run needed	Ready by (in 2009)	Priority in 2010
V-sys server upgrades	VH	KEK	Yes	Sep	VH
FS upgrades & tuning/analysis automation	VH	FS team	Yes	Oct	VH
FD alignment	VH	KEK	No	Sep	VH
BSM planned upgrades	VH	Univ. Tokyo +	Yes	Sep	VH
BSM + LW laser upgrade	VH	Univ. Tokyo + UK + KEK	Yes	Oct	VH
Finalize C- & S-band BPM hardware	VH	UK+KEK	Yes	Oct	VH
Multi-OTR	H	IFIC+SLAC+KEK	Yes	Nov	VH
EXT stipline BPM electronics upgrade	VH	SLAC+KEK (TBC)	Yes	Nov	VH
DR Ecotec BPM upgrades	H	FNAL+KEK	Yes	Nov	VH
DR orbit feedbacks	H	SLAC+KEK (TBC)	Yes	Nov	VH
Monalisa tests	M	Oxford+KEK	No	Nov	VH
Hydrostatic Level System (HLS) in ATF2	M	SLAC+KEK	No	Nov	VH
HLS in DR=>EXT	H	SLAC+KEK	No	Nov	VH
Practical experinece with PM Q in beamline	M	Kyoto Univ+KEK	No		M
Test of PMQ in FD place	L	Kyoto Univ+KEK	No		L

The priority assessment reflects goal of end of 2009. The systems that have M priority in 2009, may have very high priority from the point of view of eventual end of 2010 goal. Therefore, they should be pursued in 2009 as long as there is not interference for schedule and human resources.

Goals from TDP R&D plan report

Table 3.4: TD Phase Beam Test Facilities Deliverables and Schedule.

Test Facility	Deliverable	Date
Optics and stabilisation demonstrations:		
ATF	Generation of 2 pm-rad low emittance beam	2009
ATF-2	Demonstration of compact Final Focus optics (design demagnification, resulting in a nominal 35 nm beam size at focal point).	2010
	Demonstration of prototype SC and PM final doublet magnets	2012
	Stabilisation of 35 nm beam over various time scales.	2012

- The rational of selecting 2009 as a goal for 2pm appear to me as not entirely justifiable. I conveyed this to PMs and several TB members
- There was an earlier goal of 1pm, that was changed to 2pm in recent edition, but the date remained
- The 2pm goal in 2009, if taken literally, could offset the priority and make it harder to make progress on ATF2 goals in Autumn-early Winter of 2009
- However if 2pm goal is made concurrent to the beam size goal, then the DR and FF activities will help each other

Suggestions for presentation to TB

- List of our priorities
- Consequent list of upgrade projects, ranked by priority
- Our approach to beam schedule, with additional short check-out runs
- Present for discussion the option to make the 2pm ε goal concurrent with ATF2 beam size goal, so that the activities help each other
- Get moral support from TB for the above
- Continue our collaborative work accordingly

Appendix: LCLS stipline BPMs

STRIPLINE BEAM POSITION MONITORS FOR LCLS

E. Medvedko, R. Johnson, S. Smith, R. Akre, D. Anderson, J. Olsen, T. Straumann, A .Young
Stanford Linear Accelerator Center, Menlo Park, CA, 94025

Table 1: Requirements for the LCLS BPM system

Parameter	Value	Comments
Dynamic Range	0.08 – 8 nC	40 dB
Resolution @ 0.2 nC	5 μm	
Stability	5 μm per hour	

Two rather different lengths of stripline pickups are used in LCLS: the typical linac BPM strips are 10 cm long, while the striplines intended to provide higher resolution for the linac-to-undulator section have 50 cm long striplines. Due to the difference in frequency response of the two type of striplines we construct BPM processors at two different frequencies, 140 MHz and 200 MHz. Bandpass filters define a bandwidth of 7 MHz at the operating frequency, either 140 MHz or 200 MHz.

Online Calibration

The BPM processor continuously self-calibrates between beam pulses. The AFE transmits short (~260 ns) tone-bursts at the processor frequency alternately on one of the striplines on each of the BPM axes (typically the Y^+ and the X^- striplines). The ratio of amplitudes of the

Abstract

The Linac Coherent Light Source (LCLS) must deliver a high quality electron beam to an undulator for production of coherent X-ray radiation. High resolution beam position monitoring is required to accomplish this task. Critical specifications are a dynamic range of 0.08-8.0 nC with 5 micron resolution at 200 pC in a stripline pickup of 1 inch diameter. Processor electronics were designed, based on band-pass filtering the signals followed by direct digitization of the resulting pulse train. The processor consists of Analog Front-End (AFE) and Analog-to-Digital Converter (ADC) boards, packed into 19-in rack mount chassis, 1U high. The AFE board has a very low input noise, approximately 3 micro V rms in a 7 MHz bandwidth centered at either of two frequencies, 140 or 200 MHz, depending on the length of the stripline BPM used. The maximum gain is 34 dB with programmable attenuation of up to 46 dB in 1 dB steps. An on-board pulser sends a short calibration tone burst to the striplines to perform calibration between beam pulses. The ADC board has four 16-bit digitizers with a sampling frequency of 120 MHz. For the LCLS injector 22 prototypes of the processors were built and installed in 2007. Measured resolution at 200 pC is typically 3-5 microns. A production run of 53 improved processors are currently being installed and commissioned.

Comment, added after discussion

- For new EXT stripline BPM electronics that is suggested to be replaced by LCLS electronics, need to understand, with help of SLAC colleagues
  - how kicker noise and signal pedestals affect the self calibration (which in LCLS done in between pulses, but for ATF there is no kicker pedestal between pulses)
  - how sensitivity is affected by the length of ATF EXT striplines, which are 4cm long in comparison with 10cm of LCLS