

# FACET Summary      Mar 30 - Apr 5

- Sat 30<sup>th</sup>
  - Continue tuning up Linac and developing optics for Li20. Module problem in the EP01 micro caused some disruption for a couple of hrs. North Damping Ring RF starts to trip an upstream 480V breaker. Lower the beam voltage to prevent this (from 1 MeV to ~900). Not understood.
  - Investigation of quad misalignment in Li11 and Li12. Ballistic data taken and bowtie plots taken. Continue optics studies in Li20.
  - Find that dispersion measurement scans trip the beam on backgrounds. Perhaps misaligned laser mirror is causing extra background?
  - Sitewide power dip trips off LCLS, SPEAR and FACET. Source of dip was offsite. Recovery takes a few hrs.
  - Achieve sub 30x30 um spot size with low beta optics.
  
- Sun 31<sup>st</sup>
  - Continue work on moving the IP waist between experimental setups. Waist order is: E-202 (fast magnetic switching), E-200 (MIP-plasma wake-field acceleration), E-201 (dielectric tubes), E-203 (Smith-Purcell). Moved from MIP to E-203 and had some issues with OTR signal so moved back to E-201 waist and used OTR there. Spot size seems big (65x65) but camera may be out of focus.
  - Used Li20 sextupole movers to optimize spot size.
  - We have excessive jitter on the NRTL compressor klystron. Ranging thyratron helps but jitter is still worse than it should be.
  - Phased klystrons in Li12-Li16, Li19. Worse cases of drift between 5-10 deg.
  - Emittance in Li18 very poor (~20x3) want (5x0.5). Start correcting orbit in Li11. After tuning the Linac orbit, emittances are shown below with good improvement in Li18 (time 15:47):

	EMITX	BMAGX	EMITX*B MAGX	EMITY	BMAGY	EMITY*B MAGY	AGE (hrs)
<b>LI02</b>	2.656	1.032	2.741	0.205	1.132	0.233	9.096
<b>LI04</b>	2.489	1.069	2.661	0.232	1.227	0.285	0.345
<b>LI11</b>	3.426	1.111	3.807	0.596	1.052	0.627	8.74
<b>LI18</b>	5.508	1.171	6.451	1.156	1.13	1.307	0.221

  - Further work on Linac orbit improves emittances even more but orbit is not very flat (both shown on next page).

# FACET Summary Mar 30 - Apr 5 (pg 2)

- Sun 31<sup>st</sup>
  - Wire scans at 3179 (WS1) measure a beam spot that is ~29x27 um.
  - Emittance Sunday evening (23:00) after more Linac orbit tuning.

EMITX	EMITX	BMAGX	EMITX*B MAGX	EMITY	BMAGY	EMITY*B MAGY	AGE (hrs)
<b>LI02</b>	2.656	1.032	2.741	0.205	1.132	0.233	16.46
<b>LI04</b>	2.489	1.069	2.661	0.232	1.227	0.285	7.708
<b>LI11</b>	3.158	1.126	3.557	0.377	1.017	0.384	4.034
<b>LI18</b>	5.508	1.171	6.451	1.396	1.154	1.612	7.584

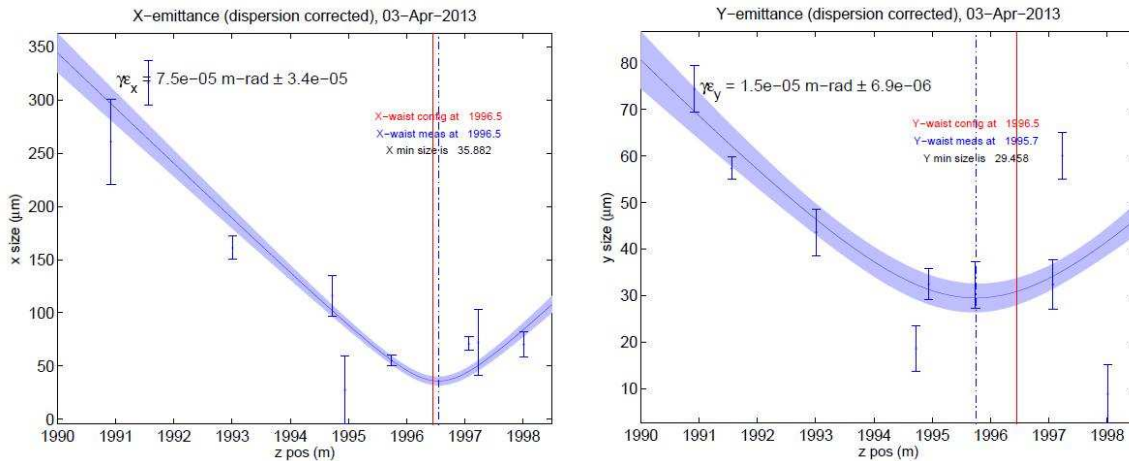
- Mon 1<sup>st</sup>
  - Phased Li18 and Li19 klystrons. Discovered that last IP wire scan was yesterday afternoon when 30x30 was seen. WS measurement now (~9am) has ~35x100. Y has severely degraded. Bunch length seems to be fairly steady at ~35 um. Tested new phase ramp feedback code and commissioned feedback. Access at 17:00 to about 19:30 to fix a THz aperture iris and remove the misaligned laser mirror. Access over at 19:00 but VVS-1B does not come back on. Breaker for VVS needs to be replaced and then VVS must be PPS recertified. No beam until after midnight.
- Tue 2<sup>nd</sup>
  - Beam back about 01:00. Emittances measured and WS1 spot size measured at 02:30. Spot size at WS1 44x42 um. Bunch length ~30 um.

	EMITX	BMAGX	EMITX*B MAGX	EMITY	BMAGY	EMITY*B MAGY	AGE (hrs)
<b>LI02</b>	2.696	1.039	2.802	0.313	1.047	0.328	1.85
<b>LI04</b>	2.701	2.104	5.684	0.228	1.187	0.271	1.445
<b>LI11</b>	3.674	1.081	3.972	0.352	1.006	0.355	1.059
<b>LI18</b>	5.332	1.036	5.524	1.335	1.031	1.377	0.902

- Phased klystrons in Li2-Li10. Set up for users. E202 will use waist at WS1(3179) and E201 will use waist optimized at KOTR. E203 uses same waist as E201. Moved the waist to E201 IP (KOTR) and tuned up spot sizes. Found beam positions on IP2A and IIP2B for laser alignment to use in tomorrow's PAMM. E203 tried to calibrate motion of grating up to beam. Found some backlash in motion with post analysis.

# FACET Summary Mar 30 - Apr 5 (pg 3)

- Wed 3<sup>rd</sup>
  - E201 setup complete and E203 measurements taken. Using 4 wire scanners (WS1,2,3,4) and 5 OTR screen shots (USOTR, IPOTR, DSOTR, IP2A, and IP2B) a plot of the waist with calculated emittances can be made.



- Hope to make this measurement more automatic but will take some work.
- PAMM
- Recovery
- Thu 4<sup>th</sup>
  - Found beam hitting E201 mirror although status said mirror was retracted. With mirror completely in then beam passes through hole in mirror. Leave in for now. TCAV software development making bunch length measurement easier, quicker and hopefully most stable. Effort is to leave as much of the XTCAV on as possible to minimize drift. Setup waist at WS2 just upstream of E201 experiment. Implemented new feedback to help stabilize Linac phase ramp (temperature compensating) which should help stabilize bunch length. NRTL compressor still has excessive jitter from values seen 2 weeks ago.
- Fri 5<sup>th</sup>
  - Continue setup for experimenters tonight. Spot size at WS2 is about 28x38 um with bunch length of about 40 um. Spot sizes degraded when the IP dispersion was reduced. Loaded in the config saved from last Tuesday for the E201 experiment. This put the waist at the E201 IP but it makes it a little more difficult to tune on spot size as there is no wire scanner at this location. WS2 is upstream and WS3 is downstream of the E201 IP so these are used estimate the spot size at E201. Delivered beam to E201 late evening.