

# FACET Summary      May 4 - 10

- Sat 4<sup>th</sup>
  - NRTL bend magnet string again ground faults and this is finally tracked down to the same magnet with a main coil to trim coil short. Fixed in the morning. Start trying to turn things back on and find a problem with flow switch for K01. This requires another access as the switch is in the tunnel. Try again to turn things on during swing shift. First beam on swing shift. Discover very large X emittance in LI02. Also, we see orbit jitter and have an unexplained PLIC (radiation trip monitor) near or at the 2-9 kicker and stopper.
- Sun 5<sup>th</sup>
  - Continued to try to diagnose above problems. A great deal of data was taken in order to study these problems. The orbit jitter again subsided and that allowed us to concentrate on the other two outstanding problems. The PLIC trip at 2-9 was traced to a mistiming of the kicker magnet and was quickly fixed. The rest of the day was devoted to trying to understand the emittance growth. It was decided that there must be a bad magnet in the NRTL and access was set in the evening to try to study the problem. Magnet resistances were measured and a careful inspection was made of all the bussing.
- Mon 6<sup>th</sup>
  - DRIP still in access all day and a measurement of all the quadrupole coils was implemented. The polarity and voltage drops were all measured with a small local lab power supply. At the same time, analysis of the data taken the day before was being done. In the evening, a general discussion over the data taken and the measurements made in the tunnel finally revealed the source of the problem of large emittance. A quadrupole trim winding had been disconnected last Tuesday in order to investigate possible sources of orbit jitter. This trim winding had been reconnected up backwards. However it looked correct because it matched the connection pattern of all of the other trim windings in the NRTL. It turned out that this particular magnet needs a backwards winding in order for the lattice to correctly cancel the local dispersion. This was finally understood by seeing correction signs for this magnet in the modeling code as well as in the dispersion correction knobs for this region. A difficult problem finally understood. We also found an intermittent short to ground in a wire from the power supply to this winding. The bad wire was replaced. The trim winding was then reconnected the way it was and the accelerator was closed up for beam. We then found that VVS1B would not turn on. This supply powers the front end klystrons. A breaker in the VVS needed to be repaired/replaced and in order to fix this supply the first 10 supplies out of a total of 15 supplies had to be turned off. This would turn off the LCLS program which was running. The LCLS user finished at about midnight and the electricians came in Tues. morning.

# FACET Summary      May 4 - 10 (pg 2)

- Tue 7<sup>th</sup>
  - The breaker in VVS1b was replaced with a breaker in VVS04 which is not being used. Beam in the accelerator by 9am. Initial emittance measurements came out with reasonable numbers. Large emittance problem solved. Quadrupoles in LI01 (blowtorch quads) tripped off and needed to be reset. Vacuum spike in the positron vault caused valves to go in. Fault cleared but will be investigated during PAMM. NRTL compressor has jitter. Klystron ranged. North injector kicker timing jump and was reset.
  
- Wed 8<sup>th</sup>
  - Linac tuning continues. Overall emittance values not too bad. Sub harmonic booster #2 goes to half value. Still able to deliver beam to FACET dump for radiation test just before PAMM.
  - PAMM. PAMM recovery. SHB#2 fixed during PAMM. Large vacuum burst in the positron vault closes valves in the e+ extraction line. Traced to a bad pump. Vacuum ok right now but pump will need to be replaced.
  - Recovery of beam on swing shift and tuning produces reasonable emittances.
  
- Thu 9<sup>th</sup>
  - Linac tuning continues and klystron phases are checked.

**07:57    FACET Emittance Measurements - 20.35 GeV, 2.08e+10 Nel, 99022 arb (YARMAX)**

	EMITX	BMAGX	EMITX*BMAGX	EMITY	BMAGY	EMITY*BMAGY	AGE (hrs)
LI02	3.826	1.174	4.492	0.208	1.020	0.213	0.001
LI04	3.469	1.163	4.035	0.331	1.296	0.429	7.398
LI11	4.680	1.062	4.971	1.027	1.217	1.251	6.324
LI18	10.09	1.174	11.85	1.106	1.778	1.968	3.766

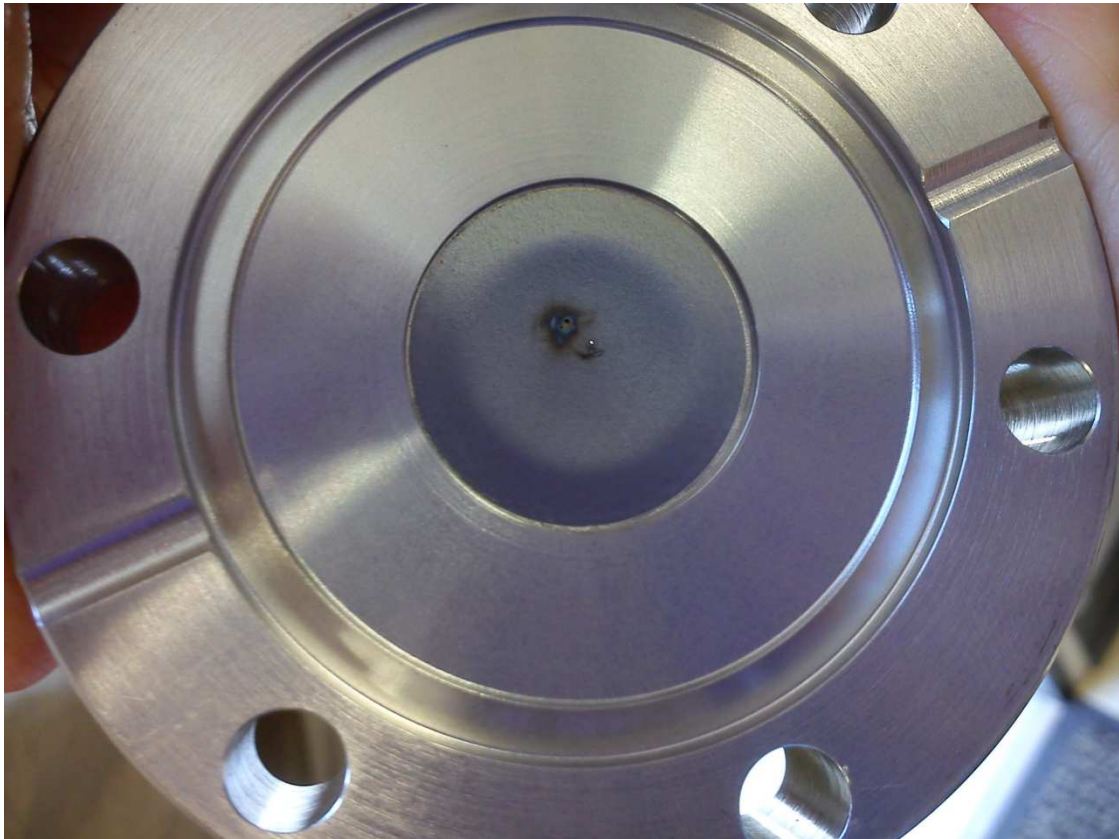
- Trouble with the wires at the WS2 location in the IP. This is where the waist is located. Access during the day to fix the wire scanner. Emittances improve over the day and are stable. Discover the beam will ionize He.

**17:00    FACET Emittance Measurements - 20.35 GeV, 1.99e+10 Nel, 101900 arb (YARMAX)**

	EMITX	BMAGX	EMITX*BMAGX	EMITY	BMAGY	EMITY*BMAGY	AGE(hrs)
LI02	4.038	1.132	4.572	0.224	1.110	0.249	1.442
LI04	3.273	1.282	4.197	0.139	1.019	0.142	4.920
LI11	4.076	1.208	4.924	0.699	1.079	0.755	1.079
LI18	7.515	1.287	9.673	2.364	1.598	3.778	0.291

## FACET Summary      May 4 - 10 (pg 3)

- Fri 10<sup>th</sup>
  - Find a pressure leak in the plasma chamber vacuum region. The buffer gas is He and there is a pressure rise in the downstream Kraken chamber. Suspect a crack in the 75  $\mu\text{m}$  thick downstream Be window. Access to vent and replace the Be window. Exchange complete by end of day shift. Machine recovery good with emittances the same as before the access.



- Picture of the Be window. There are several marks. The bright spot is the location of the hole. A light is shining through from the other side. Machine recovery again is good with IP spots sizes at the WS2 of 33x26  $\mu\text{m}$  by 18:00.
- E200 data taken all night.