Machine Development and Studies

FACET-II MD Template (Word)

2024 End-of-Run MD programs and final data collection

Programs to collect additional data, further push diagnostics and software for future development.

MD Item	Procedure Link	Machine Time	Responsible Party	Requirements	Details
Test LI17/LI18 PAU functionality for S20 energy feedback improvements		1 shift		Preferred beam to dump, requires EP01 micro	Attempt to recommission fast phase shifters (LI17 and LI18 PAU subboosters) previously used for EP01 energy feedback. Will need some crusty old crates revived and almost certainly a lot of sage SLC timing guru guidance.
Collect SYAG data with variable compressions		4 hours		Beam to dump	Data collection to interpret compression profile of SYAG with the goal of further calibrating that screen.
Improved BC20 BLEN vs L2 chirp		1 Shift		Beam to dump, more XTCAV juice	Recollect data for actual XTCAV bunch length over a chirp scan now that we have more streaking. Possibility for a 2 dimensional scan by repeating with variable L1 compression. Suggested to *not* recalibrate XTCAV during scans.
Injector LLRF firmware updates		1-3 days (passive)		TID readiness	Upgrade the LLRF firmware for 10-2, 10-3, and 10-4 to match newer versions deployed at 10-5 and LCLS XTCAV. Should be fairly quick to implement, but preferred to have at least a few days to monitor to make sure it works as expected.
Any outstanding RP surveys	FACETIISurveyPlan - signed (3).pdf	4 hours		Variable	Parts f (beam to heater screens) and maybe n (external surveys with beam to S20 collimators/notch) or others.
2 nC stability tests		1 shift		Beam to dump	Investigate emittance blow up at higher charge, see if this reproduces with single bunch now that we have consistently compressed beam at 1.6 nC.
PLIC indexing		10 minutes		Beam to dump	Generate losses in known locations to calibrate X xcale of PLIC (for known scope settings) in order to have a calibrated loss monitoring system.
Software commissioning		2-4h		Beam to dump	

2024 MD Planning & Priorities

Priority	MD Item	Procedure Link	Machine Time (shifts)	Responsible Party	Needed By	Prerequisites	Notes	Complete
3	Injector setup for 10deg off Schottky zero crossing		3	White		TCAV0 operational	Maybe investigate smaller laser spot	
3	Laser spot size variation					Discussion with Glen...		
4	Very low bunch charge setup					Laser spot size variation study		
3	Linac Ballistic Data		5					
3	S20 Ballistic Data					Good pencil beam config S20 Quad BBA, energy feedback		
3	Individual mechanical<>magnetic offsets in L2			Loney				
1	10-2 peak power		1	Kalsi, Loney			Move peak power detection from WVG FWD to cavity probe. Follow up with RF and TID to get the Software diagnostics built out.	Partial, watch & wait
1	S20 BBA		2	Kalsi	2/6/2024			
2-4	Notch Collimator recommissioning		1+2	Loney		Completion of RP Survey and Monitoring Plan parts N and Q	Current energy spread may not be compatible with clean cuts	
2	S20 matching studies /emittance in S20	S20 Emittance and Matching	1	Loney		Good pencil beam config, S20 Quad BBA, S20 launch feedback		

3	2nC running /instability investigation		2	Loney			FJD interested	
1	Two-bunch prep /setup	Two-bunch config development	8	Yocky, Majernik, Buschmann	4/2 - 4/3 2024		linked plan is for first ~2 shifts	
4	BLEN sensitivities	BLEN Sensitivities MD		Kalsi				
2	S20 BLEN			Kalsi				
2	Investigate orbit dependent matching into L2			Loney		BBA, working steering app	FJD notes similar issue in LCLS–likely eta from BC1	
1	Complete ORM	ORM Shift Plan		Loney		Analysis tools		Done?
2	Tuning IP with smaller beta*			Yocky				
1	Pencil beam config	Oct 13, 2022		Kalsi				
1	Flag beam config	Feb 2, 2024		Parker				
3	Learning data for MDL FF / Track hardware issues	Oct 6, 2022		Perez, Loney				
4	RF kicks			Kalsi				
4	Linac BBA (rechecks)	BBA Shift Plan		Loney				
3	Toroid ringing investigation	Sep 1, 2022		Kalsi				
4	Injector RF Standby triggering			Loney				
2	Automated Steering development			Buschmann, Cesar		good R measurements and ability to implement those into steering app		
2	L1 orbit stability study	Oct 6, 2022		Parker				
2	RF stability (jitter, jumps, and djrift)	Sep 15, 2022		Ripman				
3	PCAV 0 commissioning		2	Loney		Thing works		
2	TCAV3 commissioning		2			Thing works		
2	DC magnet stability	Sep 29, 2022		Parker				
2	TCAV0 study (sigz v. Sch. phase, etc.)	Oct 6, 2022 TCAV0 Shift Plan		Parker				Done?
1	Linac wakefield bump tuning exploration			Yocky,Kalsi				
	Laser heater TTO		1	Majernik	3/11/24			
3	Stability improvements to IN10 RF		2	Cesar	2/19/24		Implement in 10-5 first, then L0 stations, lastly 10-2	
1 ?	Longitudinal Feedback Debugging	shift plan draft	0.5	Buschmann		Stable beam to S20	Mainly forensic	
2	BC14 chicane exploration	shift plan draft	0.5 - 1	Buschmann		Stable beam to S20		
	Software development/testing							

Standby Machine Development (SMD)

MD Item	Procedure Link	Machine Time	Responsible Party	Required beam destination	Notes	Completed
Injector wire commissioning				TD11	Find wires, verify planes	
Compare injector wire emittances to 571 quad scan				TD11, IN10 561 wire	Sounds like the kind of task that will challenge your faith in our most reliable measurement	
Characterize BC11 Collimators						

Characterize BC14 energy offset						
Stagger L1 chirp	L1-chirp-stagger.txt (draft)	1-2h	Buschmann	TD11 initially, S20 after setup	want to characterize effect on longitudinal phase space, emittance growth in L2 and relationship with collimation of beam tails/losses in BC14	
S20 Configurator variable waist scans		2 shifts		Beam to dump	Measure IPWS1 sizes with fix X and variable Y, and through different waist shifts	
YOUR IDEAS HERE					Curious about something? Propose a study to get data about it!	

Past Completed MD Programs

MD Item	Procedure Link	Machine Time (shifts)	Responsible Party	Prerequisites	Results, notes	Completed
S20 BBA	Oct 13, 2022	2	Kalsi			x
S20 matching studies /emittance in S20	Sep 29, 2022 <link>	1	White	Good pencil beam config, S20 Quad BBA, S20 launch feedback		x
2nC running/instability investigation		2	Loney		FJD interested	x
Pencil beam config	Oct 13, 2022		Alsberg			x
Learning data for MDL FF / Track hardware issues	Oct 6, 2022		Alsberg			?
Linac BBA	BBA Shift Plan		Loney			x
Toroid ringing investigation	Sep 1, 2022		Alsberg			?
DC magnet stability	Sep 29, 2022		Parker			x
Linac wakefield bump tuning exploration			Yocky			?
Commissioning Laser Heater			Yocky*		Laser Heater Commissioning Task List	x
7-hole Cathode Alignment Procedure	7-hole alignment	<1	Loney			x
Simple 3nC Setup	3nC Setup	1-hour	Loney, Kalsi	Good Starting point at current charge configuration		x
SYAG energy calibration			Loney	Low energy spread	Average of 54.7 keV/um but lots of variation	3/8/2024
DL10 energy minimization vs bunch charge	E-log		Ops	TD11		2/13/24 Unoptimized SOL121
Injector bunch length vs bunch charge			Ops	TD11		4/7/2024
S20 beam density measurements	S20 beam density vs chrip		Ops	FACET dump		2/5/24 Plot 2/5/24 Data
S20 beam density measurements	S20 beam density vs chrip	2	Loney			2/5/2024
XTCAV calibration vs power				FACET dump		4/20/24 Data
XTCAV Resolution vs IP config			Loney	FACET dump	Compare different beta*s at nominal IPWS1, DSOTR, and possibly other locations/shifts	4/20/24
New phase scan GUI	commissioning notes (5/6/24)		Buschmann		tested in L0, L1 and L2-3. deployed to prod.	

Link to FACET-II Global Planning Airtable

Link to FACET-II PAMM Planning Airtable