

Femtosecond Project Risk Registry

Risk #	Name	Owner	If	Then	Latest Risk Timeframe	Risk Handling Approach					Total PI Score	Overview of Risk Handling Plan	Risk Retired
						Cost	Impact Sched	Perfor	Probability				
23	Radiation safety (regulatory approval)	Robin	DOE approval processes for FSAD change take too long.	operation in true top-off mode might be delayed.	Operation	L	H	H	M		0.825	Went through one round of FSAD changes last year. Alerted DOE to more changes are coming. Will involve them early in the review process.	
10	Availability of skilled control engineers	Timossi	If we loose important people to retirement or other reasons	then it might take significant time to find skilled replacement.	Commissioning	M	H	L	M		0.525		
14	Increased heat load on beamline components	Duarte	Since the peak power is increase by 25% and the power density by more than that,	some components might have problems with the increase heat load.	Operation	M	L	H	M		0.525	Deal with potential problems ahead of time! Here is a list of some of the potential problems: Bend Magnet Front end clamped Photon stops. These should definitely all be replaced and is something that we have been doing after we first noticed damage to the stops installed on beam line 5.3. This is something that should be budgeted for before there is a current increase. I don't have a good estimate yet for the price it is less than \$2k per stop and the tech time to swap them out hopefully in 2 day shutdowns (I need to get with Dan about this). The main issue with these items is that they were/are somewhat R&D (ish) items based on materials who's behavior is now well characterized in the application in which we are using them. Just because we now know that something is currently working fine we don't know the real safety factor is, or how close they could be to failure. BL5.0 Carbon Filter recently replaced the failure prone radiatively cooled unit with the clamped HOPG unit designed to handle the higher power loading of the new insertion device. The design is as conservative and w Beryllium window failure. There are assorted BL 5.0 has the most failure prone Be window	
28	Project Management/Impact of competing priorities	Robin	If operations, safety concerns, other projects demand too much time of people involved in this project,	then significant schedule overruns can occur.	Commissioning	M	H	L	M		0.525	Close coordination with ALS management. Keep track of progress and conflicts on individual team members time.	
32	Reliability of BR fast kickers	Stover	Equipment breaks, some of the hardware is very specialized (Balun) and could take significant time to replace,	Therefore, significant downtime could occur in case of equipment failure. Since systems will be operating at higher currents/voltages/forces, since will be somewhat more likely in top-off.	Operation	L	M	H	M		0.525	Balun transformers Five spare 2 (left handed) 3 (right handed) Very difficult to fabricate - should learn how to build spares Stock of specialized hardware - tubes, charge lines, capacitors, special electronic parts, subsystem cards Verify we enough of these critical spares: Operational hardware interface old KSI charging power supplies In schedule to develop this interface	

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9	Large number of controls tasks and limited staff	Timossi	We know we can control everything but it's hard to predict accurately how long it will take for the software development and especially the testing. The large number of booster magnet supplies that are being moved from ILC to IOC control for topoff will require significant testing time that cant be done early.	The time to develop control software for the new digital supplies and the new RF transmitter will not be known really until the specifications are complete.	Commissioning	L	H	L	M	0.45	We can mitigate this risk by getting early access to the interface hardware for these items.		
24	Tracking results for injection losses might not be as simple as hoped	Robin	If the conditions under which injected beam could propagate down beamlines are not as simple as thought.	extensive and time consuming simulations might be necessary, delaying the radiation safety review.	FSAD change appro	L	H	L	M	0.45	Acceptance	Discuss approach extensively, learn from other light sources, use multiple people from accelerator physics.	
25	Effectiveness of scraper/collimator system	Steier	If the collimators are not as efficient in localizing beam losses as expected,	then radiation levels on the floor might be the dominating concern, determining how small we can make the vertical emittance.	Operation	L	L	H	M	0.45		Install full system of collimators ahead of time. Conduct intensive measurements and simulations to understand performance of system.	
35	Availability of experienced staff for pulsed magnets in the future	Stover	We spend a large amount of time to relearn the details of the existing pulsed magnet systems. Documentation from building the ALS was poor and many people from back then that we asked did not quite remember. If we lose the current knowledge again or we do not have sufficient tech help in the future	then the recovery from system faults could take very long and preventive maintenance might not be completed when necessary.	Operations	L	L	H	M	0.45		These are high voltage pulse power systems which degrade over time. Will need and experience pulse power engineer and technical staff to properly maintain over the years	
22	Project management/Personnel retiring	Steier	Key personnel decides to retire or is too busy with other duties,	schedule slippage might occur and technical risk increases	Commissioning	M	M	M	M	0.3			
18	AC power restraint for booster bend magnet supply	Fahmie	My only serious concern is whether the new Booster Bend Power Supply will function within its AC power restraints. The design is toward that end and our rough calculations say that it will be OK.	There are two ways to fail. The power supply may draw too much peak current and the breaker will trip, or the breaker trips at less than its stated threshold.	Commissioning	H	H	H	L	0.24		If the peak current is too high, we might play with the shape of the ramp and/or consult with the manufacturer, if the breaker trips below its settings we replace/re-adjust the breaker.	
19	Relative tracking of QF/QD and bend magnet	Fahmie	The other power supplies do not share the power restraint but there is a lesser concern that the QD/QF supplies track properly with the Bend PS. If they do not track correctly	then the beam could be lost and it could be much more difficult or even impossible to operate the booster reliably.	Commissioning	H	H	H	L	0.24		Specifications were written very carefully with tight specs on the tracking. All 3 main power supplies will be purchased at the same vendor and use the same controls hardware (waveform generator). The controls and diagnostics will be flexible enough to correct for most problems.	

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29	Short installation shutdown time	Rossi	Since the time for the installation shutdown will be very limited, good planning is essential.	However, small problems could mean significant delays to restart.	Commissioning	M	M	L	M	0.225	Plan schedule well in advance. Make sure work is planned and executed safely.		
4	Foreign orders for windows ceramics and assembly	Baptiste	The purchase of both the RF window ceramic blanks and the window assembly fabrication are foreign orders that must be justified to purchasing and placed sequentially. The delay of foreign orders under the new purchasing policies in the proposed UC contract is unknown. If procurement process is overly complicated	then significant schedule slippage for this very long lead term item might occur.	Installation	L	M	L	M	0.15	The newly manufactured windows are not absolutely necessary to start RF operation with higher power. Instead one of the spare storage ring windows can be used. They are not all in perfect shape, but would do as a temporary solution in the booster.		
6	Cost impact of new LBNL electrical safety regulations	Baptiste	The specification for the xmtr, in its final form, will have included numerous current LBNL specific electrical safety requirements. It is understood that several sections of LBNL Electrical chapter are in the process of changing making it difficult if not impossible to include in our specification. These specific safety requirements were not discussed during the budgetary quote process and it is likely that the increase in electrical safety scope will result in an increase in the cost of the xmtr.	Therefore an increase in cost compared to the budgetary quotes might occur.	Purchase	M	L	L	M	0.15	Many of our safety requirements are addressed in the existing commercial xmtr design. To mitigate some of these costs we can supply the LBNL ground hooks, fuses, etc and thus reduce some of their non-recurring engineering costs.		
12	Cost estimate might lack enough detail/contingency	Timossi	Because of time pressure with review and CDR completion, cost estimate had to be done quickly and without full knowledge of the final design of all other subsystems. If the complexity has been underestimated in some areas	then the contingency (of 33% across the controls section) might not be sufficient.	Operation	M	L	L	M	0.15	Watch cost in the controls area very closely. Concentrate on essential tasks and keep high level applications and some other non-essential pieces as scope contingency.		

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3	Controls specification for transmitter	Baptiste	Transmitter control system interface, programming and high level operator application(s) specification needs to be completely developed and specified for two options (external PLC with embedded PLC/u-controller or EPICS/IOC) so that the xmtr specification can be finished, reviewed and sent out for bid. If the specifications do not get completed in time or are done poorly	then schedule sliipage can occur and significant additional controls work can be necessary.	Commissioning	M	H	M	L	0.12	Had extensive set of meetings between controls, electrical engineering, physics and operations group members. Final set of specifications was reviewed by some people external to the group. Universally agreed on controls approach.	
30	Short commissioning time	Steier	Because of the pressure to come back on quickly, we plan to have very little time allocated for tests of systems and commissioning. In this very compressed schedule (which is possible) some significant problems could cause significant delays.	Restart for users could be delayed (weeks?) or performance and reliability could be reduced.	Operation	M	M	H	L	0.12	Test systems as well in advance as possible. Have enough manpower and knowledge on hand to solve problems.	
33	Reliability of SR/BR thin and thick septa	Stover	Equipment breaks.	Therefore, significant downtime could occur in case of equipment failure. Since systems will be operating at higher currents/voltages/forces, since will be somewhat more likely in top-off.	Operation	M	M	H	L	0.12	Conduct short lifetime tests of spare magnets and new pulsers. Completed spare magnets and are developing (for the first time) swap out plan. Are striving to have a proven and written procedure for swapping out SR thin and thick septum magnets Have a proven and written procedure for swapping out SR thin and thick spare pulse driver Operational hardware interface old KSI charging power supplies In schedule to develop this interface Design New interface electronics needed for monitoring of voltage and current Existing system not accurate enough Stock of specialized hardware - SCRs, capacitors, special electronic parts, subsystem cards Verify we enough of these critical spares for all pulse systems	
34	Reliability of SR bump magnets and pulsers	Stover	Even though they will be used at the same voltage and current as so far (and slightly higher bumper of total shots)	the BR bumps and/or pulsers could still break.	Operations	M	M	H	L	0.12	Have a proven and written procedure for swapping out spare pulse drivers Operational hardware interface old KSI charging power supplies In schedule to develop this interface Design New interface/alarm electronics needed for monitoring of voltage and current Existing system not accurate enough Stock of specialized hardware - SCRs, capacitors, special electronic parts, subsystem cards	

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27	Reliability of new radiation interlock systems	Mueller	If the many new systems being put in are not reliable enough,	the reliability of machine operation might be impacted by false trips (especially beamline monitors).	Operation	M	L	H	L	0.105	Test systems extensively.		
31	Reliability of BR bump magnets	Stover	Equipment breaks,	Therefore, significant downtime could occur in case of equipment failure. Since systems will be operating at higher currents/voltages/forces, since will be somewhat more likely in top-off.	Operation	L	M	H	L	0.105	Verify that we have spares of existing charging power supplies and that they're still made Stock of specialized hardware - SCRs, capacitors, special electronic parts, subsystem cards Verify we enough of these critical spares for all pulse systems		
8	RF installtion schedule risk	Baptiste	If one or more of the RF system component procurements or the control system development are delayed by purchasing, vendor delivery difficulties, or unforeseen technical difficulties,	then the installation schedule is obviously at risk.	Installation	L	H	L	L	0.09	At this point in time it is too early to identify specific problems other than those listed above. Every effort will be made to expedite all procurements, to track manufacturing milestones and to develop cost and time effective solutions to any technical problems that may arise.		
11	Impact of operations duties of controls group	Timossi	The control group's primary responsibility is to respond to operational problems of the ALS. It's conceivable that a significant problem with the accelerator could require suspension of tasks	that may, at some point, be on the critical path for toppoff.	Installation	L	H	L	L	0.09	Constantly evaluate workload on controls group. Prioritize every task. Supply help from physics group and electrical engineering for operations problems wherever appropriate.		
16	Risk of insufficient booster tune measurement diagnostics	Sannibale	Since several of the beam diagnostics upgrades were put into the delayed scope, there is a risk that the existent systems might prove insufficient, including the booster tune measurement.	In that case commissioning might be more time consuming and reliability in operation might be worse....	Operation	L	L	H	L	0.09	Learn capabilities of existing systems beforehand. Fully characterize current booster before shutdown.		
17	Potentially insufficient booster orbit measurement capability.	Sannibale	Similarly like the tune measurement, the cost for an improved orbit measurement was put into the delayed scope. If the current system turns out to be not fully usable	then commissioning might be more difficult and recovery from problems during operations might be slower.	Operation	L	L	H	L	0.09	Repair and study current orbit measurement system. Characterize booster well before shutdown. If necessary spend limited amount of money for very targeted upgrade.		
5	Potentially foreign IOT purchase	Baptiste	IOT purchase could be from a foreign manufacturer that would require justification to purchasing. The delay of foreign orders under the new purchasing policies in the proposed UC contract is unknown. If procurement process is overly complicated	then significant schedule slippage for this very long lead term item might occur.	Installation	L	L	L	M	0.075	Inform purchasing as early as possible. Look at purchasing delays as an integral part to any purchase/delivery time and evaluate as part of whom to award contract to.		

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13	Staffing availability in mechanical design/engineering	Duarte	No appropriate staff is available	then there might be schedule delays or cost variabilities (due to use of other personnel).	Fabrication	L	L	L	M	0.075			
21	Timing system	Fahmie	I see no obvious risk areas with the timing system mods though we need to decide how the overall system will be expected to work. If this decision is not made in time,	schedule delays might occur and potentially complicated solutions might be necessary to make individual subsystems work together.	Commissioning	M	M	L	L	0.045		Get all groups together to define operations modes. Fix in definition document. Start on timing system design early enough.	
2	Sequencing of transmitter and HVPS purchase	Baptiste		Sequencing the purchase of the HVPS after the awarding of the xmtr contract may cause the delivery of the HVPS to come after the xmtr delivery delaying the acceptance testing of the xmtr on site by ~4 weeks and ultimately the controls group work.	purchase	L	M	L	L	0.03		It is possible to get back 2 weeks of this time if we have installation info from HVPS manufacturer allowing us to do much of the installation work for the HVPS ahead of its arrival. The xmtr order is likely to take longer to deliver especially if the EPICS/IOC control system is chosen, which will shift the focus back on the xmtr order. At least one xmtr manufacturer has said that they will be able to bid on the hvps as well, so the xmtr/HVPS can be delivered as a complete system. Delivery unknown on this possibility.	
7	Uncertainty over control system waveform generator for RF amplitude control	Baptiste	The programmable RF profile generator to date is largely undefined. Is it an external commercial piece of equipment? Is it to be included in the xmtr low level RF or in the xmtr's PLC? Is it part of the control system? If these questions are not defined in time,	then the uncertainty might lead to cost increase and schedule slippage.	Commissioning	L	M	L	L	0.03		As in above item, a series of meetings was held in addition to close communication between the lead subsystem engineers. An agreement of how to proceed was reached so that RFQ for transmitter could be completed in time.	
15	Risk of bunch cleaning in booster	Sannibale	Fairly complex process, new to the ALS, therefore if we do not plan correctly	then we might have problems with reliability of bunch cleaning.	Operation	L	L	M	L	0.03		Most of the proposed new and upgraded beam diagnostic systems (DS) for the ALS top-off upgrade project were driven by the requirement of performing bunch "cleaning" in the ALS booster. For funds limitation, this capability has been postponed together with the related DS to a second phase of the project. For this reason, there is no risk associated with most of the DS. However, requirements to be able to perform cleaning will be evaluated in all purchases and the design of other systems, so as to be able to retrofit cleaning in the booster later.	
26	Radiation damage close to scrapers/collimators	Steier	If we do not shield the collimators locally well enough and the dose rates there are high,	then equipment in the surrounding might fail (water sensors, electronics, magnet coils, ...)	Operation	L	L	M	L	0.03		Carry out dosimetry measurements before top-off shutdown. Install local shielding well in advance. Optimize shielding according to measurements. Potentially add lead shielding to waterflow sensors.	

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1	Sequencing of IOT and transmitter purchase	Baptiste	Even though I have asked for the xmtr to be capable of accepting any of the 3 IOTs available, we will choose either the standard option IOT or select an option/kit for a different IOT at the time the xmtr order is placed. If the order of the IOT is delayed,	there could be a schedule delay for the transmitter purchase.	purchase	L	L	L	L	0.015		The delivery time for the IOT is 2-4 weeks less than that of the xmtr. My task is to ensure that the order for the tube is placed immediately after awarding xmtr contract and that the manufacturer expedites this order. The xmtr order can potentially take longer to deliver especially if the EPICS/IOC control system is chosen, which will shift the focus back on the xmtr order.	
20	BTS magnets	Fahmie	I see no obvious risk areas with the BTS magnets, they are quite straight forward.			L	L	L	L	0.015			