



Project Management

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Cost and Schedule Review

January 22, 2021

Institutions

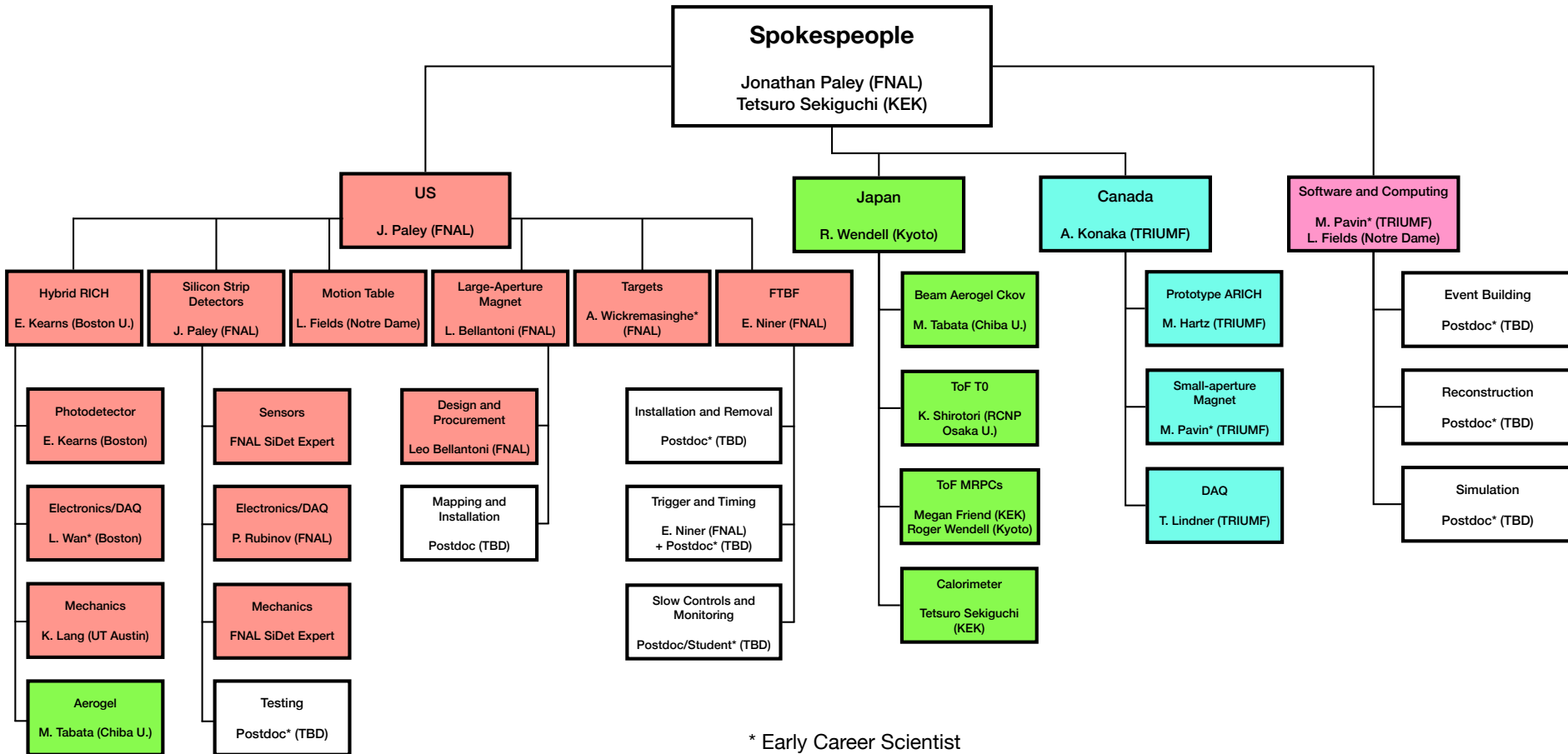


THE UNIVERSITY OF WINNIPEG



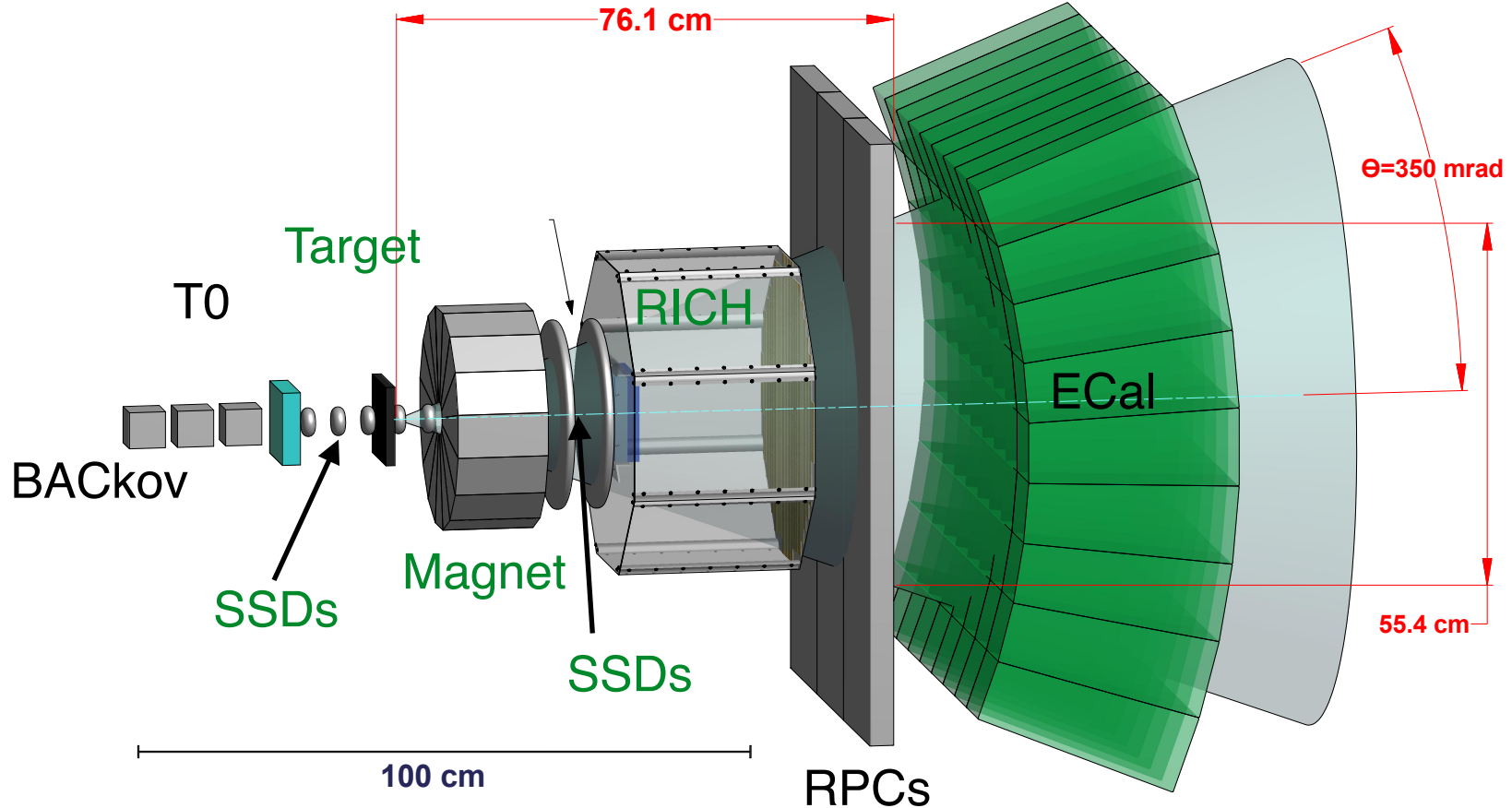
- 9 postdocs (6 from US institutions), 5 students so far.
- Cincinnati, Notre Dame, Boston and UT Austin all joined within the past 18 months.
- **We continue to grow:** Houston and IIT Hyderabad (India) have expressed interest in joining.

Collaboration and Project Structure



- Postdocs playing many important roles for the Project; will continue playing a critical part in the data collection and analysis.
- Many opportunities for students to work closely with scientists and engineers.

International Contributions

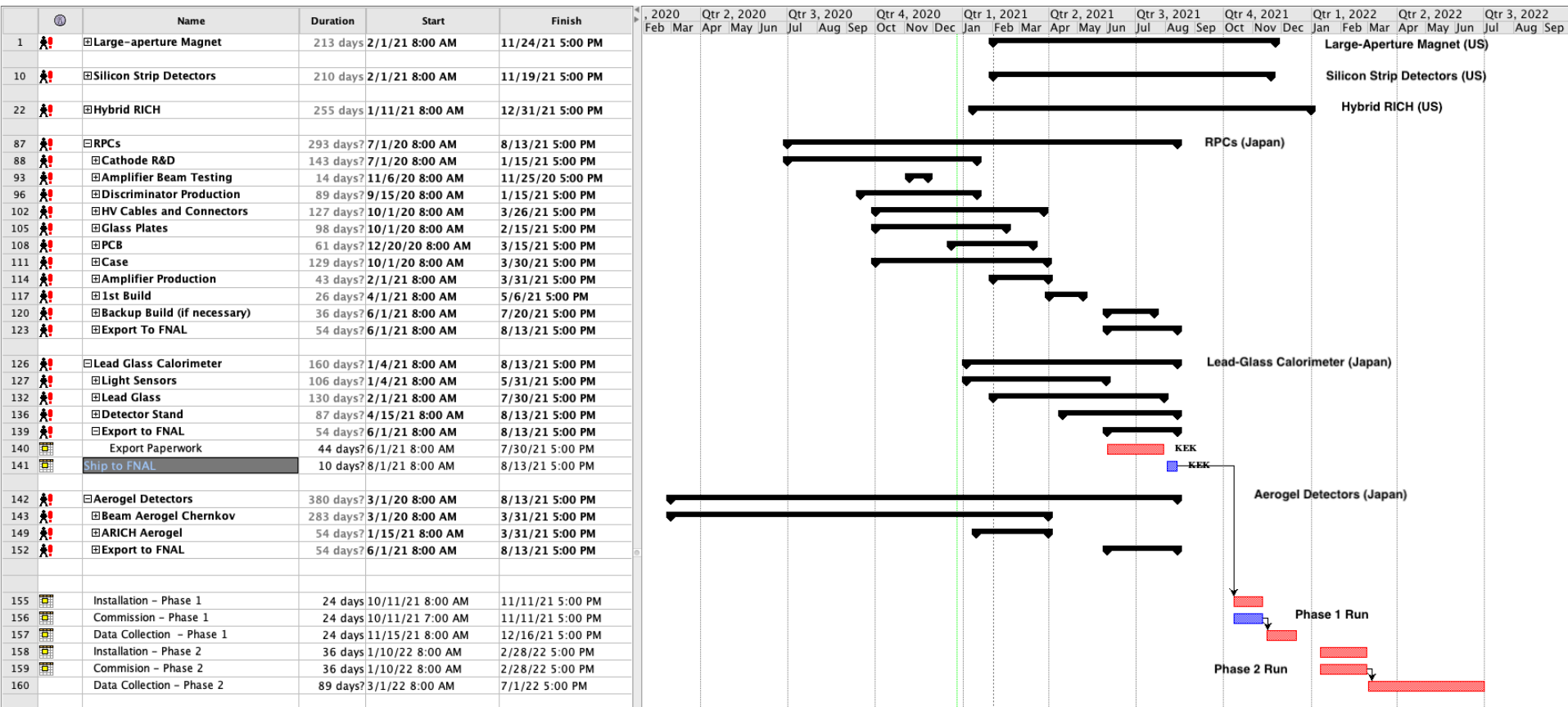


- International partners already committed to funding critical contributions:
 - Canadian contributions (small acceptance magnet and RICH) are already available.
 - Japanese contributions for Phases 1 and 2 will be available by August.
- **US contributions are needed to execute Phases 2-4.**

International Contributions - Impact on Schedule

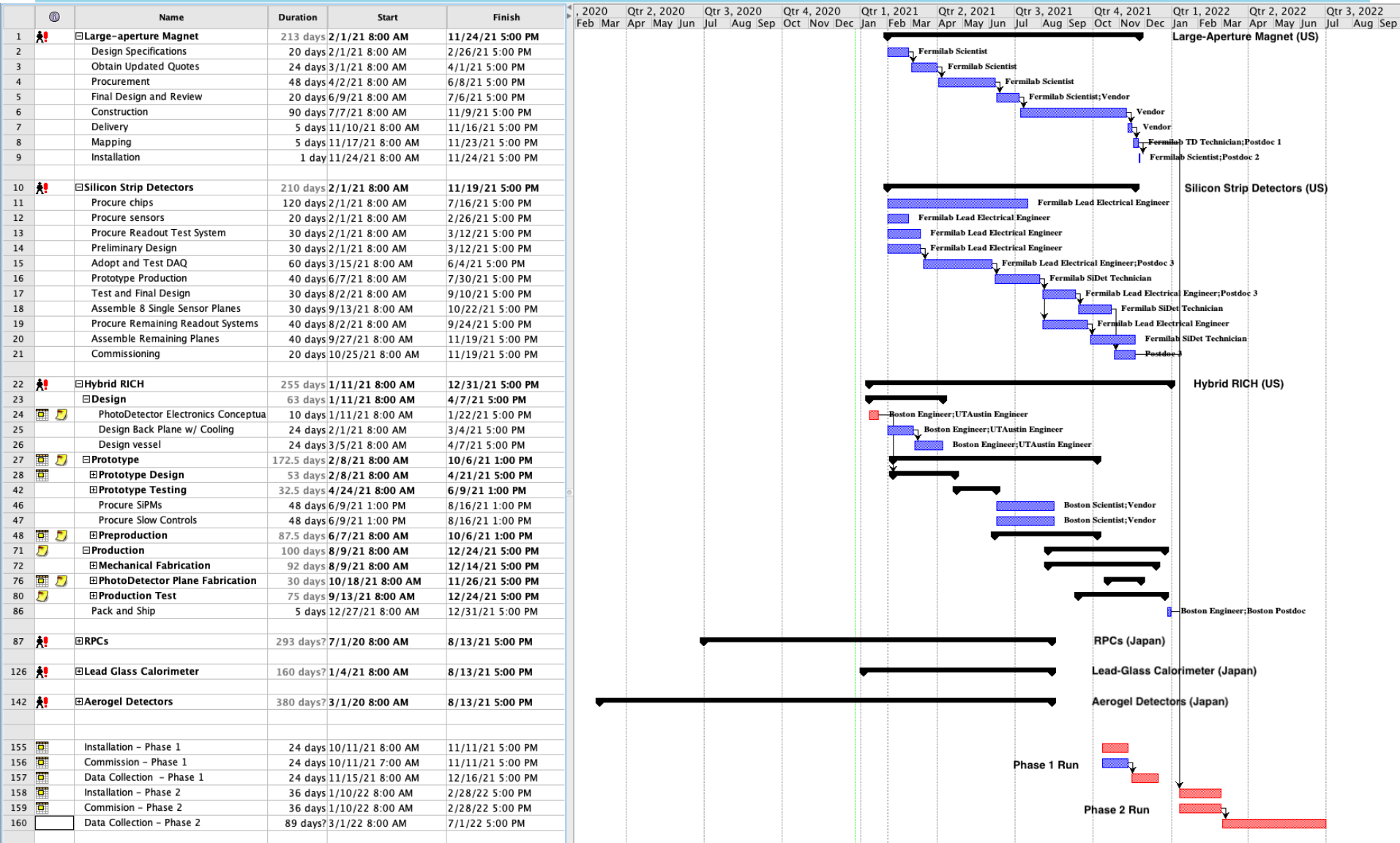
- Canadian and Japanese institutions have funding to actively participate in EMPHATIC through 2022.
- Japanese funding could get extended through 2023.
- Canadian funding for hardware contributions for EMPHATIC Phase 1 has already been spent
 - Canadian institutions are particularly eager to see Phase 1 happen this year, which will have been a 1.5 year delay.
 - The groups will begin to move on to other experiments and tasks in 2022 and may lose key personnel by the end of 2021.
- The Project schedule is designed to achieve our physics goals for Phases 1 and 2 before summer of 2023.
 - Flexibility: Phase 1 can be done with either the FTBF SSDs or new SSDs from this Project.
 - FTBF SSDs: experiment is constrained to MT6.1a with tight schedule constraints for the run.
 - New SSDs: experiment can move to MT6.2d with open schedule
 - Schedule float: We have built in several extra months for Phase 2 detector commissioning.
- **Nevertheless, funding is needed ASAP in order to achieve the goals above.**

Schedule for Japanese Contributions

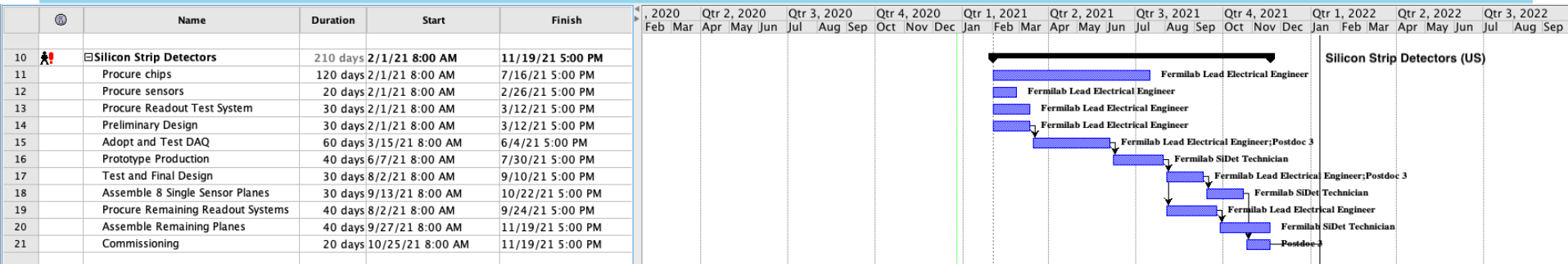


- Small-acceptance detectors were already available in March 2020 for original Phase 1.
- Detectors arriving later in summer 2021 are large-acceptance and some have improvements.

Schedule for US Contributions



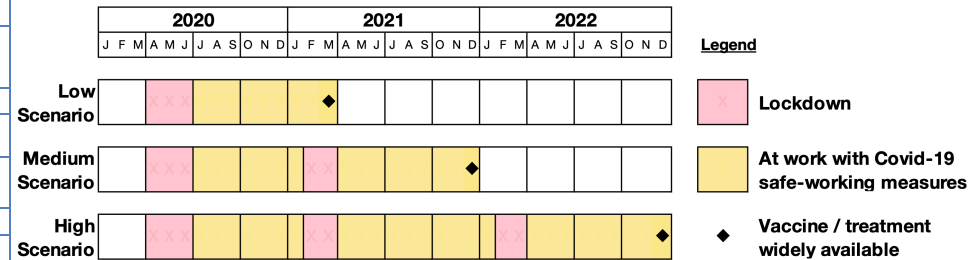
Cost and Schedule for SSDs



- Cost (\$375k) is driven by M&S, however engineering and assembly labor are significant.
- Milestones:
 - **Procurement of all components.**
 - **Preliminary design** by Fermilab electrical and mechanical engineers.
 - **Adopt AliVATA software and Test DAQ.**
 - **Produce and test prototype.**
 - **Final design** based on feedback from prototype tests.
 - **Assemble single-sensor planes** for Phase 1.
 - **Assemble remaining large-area planes.**
 - **Commissioning.**
- Relies on significant scientific effort, in particular for testing and DAQ development.

COVID Risks

Low impact scenario (optimistic, best case)	Medium impact scenario (realistic, best guess)	High impact scenario (pessimistic, worst case)
Authorities respond effectively, build up medical capabilities, and support the economy.	Authorities responses are only somewhat effective.	Authorities are ineffective, fail to build up medical capabilities, and fail to support the economy.
Preventative measures (e.g. physical distancing) effectively prevent major resurgences.	Preventative measures are moderately effective, but one resurgence occurs.	Preventative measures are not effective, and two resurgences occur.
One lockdown is sufficient.	Two lockdowns are needed.	Three lockdowns are needed.
Virus does not mutate (much).	Virus mutations are moderate.	Virus mutates to be significantly more contagious or deadly.
A treatment or vaccine is available in early 2021.	A treatment or vaccine is available at the end of 2021.	A treatment or vaccine is not available before the end of 2022.
Low number of deaths.	Moderate number of deaths.	High number of deaths.
Jobs losses are moderate, and economy recovers quickly.	Significant job losses and economic recession.	Numerous job losses and economic depression.
No major secondary risks occur.	Secondary risks are moderate.	Major secondary risks, e.g. social unrest or international disputes.



- Fermilab has produced a document “Covid-19 Scenarios for Fermilab Projects” ([PPP-doc-2104](#)).
- This Project follows the “Medium impact scenario” (best-guess at this time).
- We therefore assume that critical experts will be able to work at Fermilab under Covid-19 safe-working measures.
- We follow the Lab’s medium risk scenario. If high-risk scenario occurs, we will have a schedule delay, but no standing army costs to the *Project*. Collaboration has concerns how this will impact early-career scientists.

Summary

- EMPHATIC is widely recognized as a very useful experiment within the Neutrino community - evidenced by the active participation of a large number of people within the community and the growth of the collaboration over the past 18 months.
- Many opportunities for early-career scientists for hardware and leadership experience.
- EMPHATIC is an international collaboration with significant in-kind contributions already or soon-to-be in-hand.
- Funding is needed ASAP in order to begin the critical design and testing work for the SSDs and RICH.
- Project schedule is aggressive, and there is risk that durations of testing components will take longer than anticipated, or that Covid will cause further delays.
 - We have built in several months of float in the schedule through Phase 2 to compensate for this possibility.
 - Funding for additional single-sensor detectors will significantly reduce schedule concerns, since we will be able to move into an unoccupied space at MTest.
- Project costs have been reviewed, and we feel confident in our budget.