

Closeout Presentation: U.S. ATLAS
HL-LHC Upgrade Project
Director's Review of the NSF Scope:
EF Tracking

Review committee:

Sridhara Dasu (University of Wisconsin)

Georgia Karagiorgi (Columbia University)

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Charge Item (a): Examine the technical design, development plan and the schedule for the EFT system. Evaluate the maturity of the design and the realism of development plans

- Comments

- The baseline technical design (software/CPU-only option) is mature enough for the ATLAS collaboration to have made the decision to move away from the custom-hardware (HTT) option.
- Heterogenous (FPGA-Accel+CPU or GPU+CPU) options are also retained. The final design choice has not yet been made, therefore the level of maturity of the final design cannot be assessed at this time
- The development plan seems realistic to achieve sufficient maturity by the time of the hardware decision in October 2025

- Recommendations

- The team should consider highlighting up front, as context for the review, that “the ATLAS Collaboration has developed an advantageous solution to the EFT, which is that of L0 with commodity hardware in place of the HTT, and the US team are asking for support to proceed with this plan. This commodity hardware includes 3 options: CPU-only (baseline), CPU+FPGA, and CPU+GPU, and the US team is requesting support to proceed with CPU-only while investigating CPU+FPGA as a possibility”
- Further, it would be good to state that it would be possible to repurpose some of the work done in evaluation CPU+FPGA option to adapt to a potential CPU+GPU choice (How adaptable is the team to GPU vs FPGA accelerators? What fraction of FTE are specific to FPGA accelerators?)

Charge Item (b): Does the project team have the required skills to deliver the proposed technical scope within the baseline budget and schedule?

- Comments

- Yes, the project team has required skills for delivering the proposed technical scope for either the CPU-only or the CPU+FPGA option within the baseline budget and schedule, and includes experts on physics algorithm aspects independent of which implementation is selected
- The team has experience in FPGA acceleration and are already running evaluation test stands for the CPU+FPGA option
- An additional hire is planned, and it may be difficult to recruit new people given specific expertise required (high-demand skills)

- Recommendations

- The demonstration of required skills would be more clear if the proponents could list engineers in US ATLAS assigned to EF tracking and their roles on HTT vs CPU-only, vs CPU+FPGA, vs CPU+GPU. (slide 8 of Evans is ATLAS-wide)
- The new hire should be versatile enough to work on any of three options

Charge Item (c): Is the proposed agile management plan sound and can it be used to adequately track project progress?

- Comments

- The team have brought some of the agile management aspects into EVMS via the use of Jira for low-level task assessment. This seems to strike a reasonable balance between the requirements imposed by the EVMS framework and a well-defined interface for status entry.
- Use of JIRA doesn't appear to be a training-heavy endeavor; the team seems to be managing that well, at the level of institutional contacts, and this seems to be working well

- Recommendations

- None

Charge Item (d): Examine the budget for WBS 6.8.4. Is there a firm basis for the budget?

- Comments

- There seems to be a firm basis for the baseline/CPU-only option of the EFT budget
- Detailed cost calculation has not been carried out for FPGA option, but it has been estimated based on Task Force preliminary work, with a 50% cost savings assumption

- Recommendations

- It would be useful to provide more detailed calculations as backup for the CPU+FPGA and CPU+GPU options substantiating lower cost assumption
- Table 8 of Evans presentation should clarify that this is ATLAS-wide and includes scientific (uncosted) labor and that the baseline/CPU-only software work is already mostly done (to clarify 80 vs 14 FTE-yrs)
- On the same table (table 8 of Evans presentation), it would be useful to add a row clarifying the NSF EFT funded effort and M&S, which would also clarify the conservative approach of costing hardware based on software option and costing labor based on heterogeneous option
- It would be useful to provide tables in the spirit of that provided in slide 21 of Majewski presentation that split costs into M&S and labor.
- It might be useful to have a backup slide with summarized information on (the new) subawards

From Hal Evans presentation, slide 8:

	Custom-AM	Custom-FPGA	Heterogeneous	Software
CORE Cost	5.09 MCHF	3.30 MCHF	2.8 MCHF	3.42 MCHF
Power	0.59 MW	0.60 MW	0.91 MW	1.82 MW
Effort	130-140 FTE-yr		80 FTE-yr	14 FTE-yr

From Stephanie Majewski presentation, slide 21:

BCP #	Cost Impact	Major Changes / Risks Realized
1044	neutral	Interim 6.8.4 EF Tracking for FY22 (costs taken from 6.8.2)
1052	-\$7,143k	Interim 6.8.4 EF Tracking for FY23 (removed rest of 6.8.2)
1055	\$4,638k	Full plan for EF Tracking
TOTAL	-\$2.5M	

Charge Item (e): Discuss the risks that must be overcome, and the project's plans for risk mitigation. Especially discuss the ongoing demands on the time of personnel associated with EFT activity to support the ATLAS Phase-1 upgrade trigger.

- Comments

- The team seems to have taken the conservative approach of costing M&S for the CPU-only option (which represents a higher hardware cost possibility) and FTE for the CPU+FPGA option (higher FTE cost possibility). Yet, the risk associated with the potential need for additional FTE (just 6 FTE-months of additional effort) seems low
- It was difficult to assess from the presentation what risk existing Phase-1 upgrade commitments pose on EFT effort
- It was not clear that the uncertainty in firmware development effort was captured in the risk register

- Recommendations

- It would be useful to expand slide 25 in Majewski presentation to clarify commitments of personnel vs. time on Phase-1 upgrade and EFT, and to further have a plan in case any of the personnel have to devote more effort on Phase-1 upgrade work
- Some of the risks are anti-correlated, and this should be included in the risk model, if that is not already the case

From Stephanie Majewski presentation, slide 25:

6.8.4 EF Tracking			
Institute	On-project Personnel	FTE on this WBS	Phase-I responsibilities
Arizona	Kade Gigliotti	0.2-0.25	LAr LDPS
Arizona	Stephen Morrison	0.5	LAr LDPS
Arizona	Garrett Scott	0.2-0.25	LAr LDPS
Chicago	Raam Desami	0.5	gFEX
UC Irvine	Priya Sundararajan	0.5	none
Illinois	Casey Smith	0.25	none
NIU	TBD	0.5-1.0	none