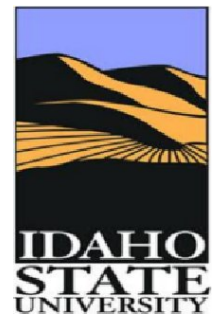
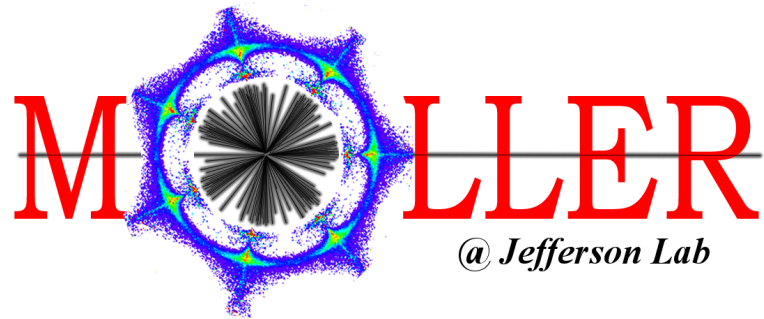


Hall Infrastructure and Integration (EC Report)

Dustin McNulty
Idaho State University
mcnulty@jlab.org

October 4, 2019



Hall Infrastructure and Integration

Outline

- Review the current P6 baseline budget with emphasis on changes since April and costing work still remaining
- WBS now has 5 subsystems:
 - **Management**-- Project period: 01-Apr-2020 to 22-Dec-2023
 - **Cryogenic Transfer Lines** for high power targets-- Removed from budget
 - **2MVA (Power upgrade)** for toroids-- Dependency
 - **Incoming Beamline Mods** to fit apparatus-- Under review
 - **Particle Shielding**-- No change
 - **Integration:** Cables, Detector Supports, and Hall Mods

Hall I & I P6 Summary (as of Aug 29, 2019)

| WBS Path | Activity ID | MOI BOE | Activity Name | Start | Finish | Planned Duration | Planned Labor Units | Planned Labor Cost | Planned NL Units | Planned NL Cost | Planned Material Cost | Planned Total Cost | Total Float |
|---|-------------|---------|---------------|-----------|-----------|------------------|---------------------|--------------------|------------------|-----------------|-----------------------|--------------------|-------------|
| MOLLER-10.1.06 Hall A Infrastructure and Integration | | | | 01-Apr-20 | 29-May-25 | 1282d | 22347 | \$2,102,896 | 0 | \$0 | \$4,491,233 | \$6,594,129 | 333d |

- Planned durations are days and labor units are hours
- Total Planned Cost is currently \$6.6M for this subsystem: \$2.2M for infrastructure and \$4.4M for integration
- Total Cost includes 22,347 hours labor (\$2.1M) plus \$4.5M in materials
- Contingency rates for various activities not included in P6
- Several areas of cost reductions identified at last meeting have been applied
- Still some potential upcoming changes related to beamline mods, detector supports, and hall mods

Hall I & I Project Management

| WBS Path | Activity ID | MOI BOE | Activity Name | Start | Finish | Planned Duration | Planned Labor Units | Planned Labor Cost | Planned NL Units | Planned NL Cost | Planned Material Cost | Planned Total Cost | Total Float |
|----------|--|---------|--|-----------|-----------|------------------|---------------------|--------------------|------------------|-----------------|-----------------------|--------------------|-------------|
| | MOLLER-10.1.06.01 Infrastructure and Integration Management | | | 01-Apr-20 | 22-Dec-23 | 930d | 1650 | \$216,330 | 0 | \$0 | \$0 | \$216,330 | 561d |
| | 10601005 | | Infrastructure and Integration Management (FY20) | 01-Apr-20 | 30-Sep-20 | 128d | 220 | \$27,280 | 0 | \$0 | \$0 | \$27,280 | 561d |
| | 10601010 | | Infrastructure and Integration Management (FY21) | 01-Oct-20 | 30-Sep-21 | 248d | 440 | \$56,197 | 0 | \$0 | \$0 | \$56,197 | 561d |
| | 10601015 | | Infrastructure and Integration Management (FY22) | 01-Oct-21 | 30-Sep-22 | 249d | 440 | \$57,882 | 0 | \$0 | \$0 | \$57,882 | 561d |
| | 10601020 | | Infrastructure and Integration Management (FY23) | 03-Oct-22 | 29-Sep-23 | 247d | 440 | \$59,620 | 0 | \$0 | \$0 | \$59,620 | 561d |
| | 10601025 | | Infrastructure and Integration Management (FY24) | 02-Oct-23 | 22-Dec-23 | 58d | 110 | \$15,352 | 0 | \$0 | \$0 | \$15,352 | 561d |

- Total Planned Management Cost is \$216k
- Broken down over the ~4 year project period from 4/2020 – 12/2023
- 930 day duration with 1650 hours planned labor

Infrastructure: 5kW Cryogenic Transfer Lines

| WBS Path | Activity ID | Activity Name | Start | Finish | Planned Duration | Planned Labor Units | Planned Labor Cost | Planned Nonlabor Cost | Planned Material Cost | Planned Total Cost |
|---|-------------|--|-----------|-----------|------------------|---------------------|--------------------|-----------------------|-----------------------|--------------------|
| MOLLER-1.1.06.02 5 kW Cryogenic Transfer Lines | | | 02-Oct-20 | 01-Dec-23 | 157.20 | 320.65 | \$1,305,189 | \$0 | \$358,290 | \$1,663,480 |
| 1.06.02 | 10602000 | Design Transfer Line and End Boxes | 02-Oct-20 | 27-May-21 | 32.00 | 114.10 | \$525,496 | \$0 | \$0 | \$525,496 |
| 1.06.02 | 10602005 | Procure Transfer Lines and End Boxes Materials | 04-Jan-22 | 18-Aug-22 | 32.00 | 0.00 | \$0 | \$0 | \$358,290 | \$358,290 |
| 1.06.02 | 10602010 | Fabrication of Transfer Lines and End Boxes | 19-Aug-22 | 14-Apr-23 | 32.00 | 153.90 | \$604,014 | \$0 | \$0 | \$604,014 |
| 1.06.02 | 10602015 | Installation of Transfer Lines and End Boxes | 17-Apr-23 | 01-Dec-23 | 32.00 | 52.65 | \$175,680 | \$0 | \$0 | \$175,680 |
| 1.06.02 | 1060603040 | 5 Kw Transfer Line Complete | | 01-Dec-23 | 0.00 | 0.00 | \$0 | \$0 | \$0 | \$0 |

- Budget includes full cost needed for all new cryo lines from new ESR2 to Hall as well as new lines inside Hall.
- Present planned duration is 157 weeks with 321 weeks labor: \$1.3M
- Total Planned Cost is \$1.66M including \$358k in materials
- Cryogenics group recently determined that ESR lines to Hall can be reused for ESR2 -- representing significant (1/2 to 1/3) cost reduction for this budget

Infrastructure: 2MVA and Incoming Beamline Mods

| WBS Path | Activity ID | MOI BOE | Activity Name | Start | Finish | Planned Duration | Planned Labor Units | Planned Labor Cost | Planned NL Units | Planned NL Cost | Planned Material Cost | Planned Total Cost | Total Float |
|----------|---|---------|---|------------|-----------|------------------|---------------------|--------------------|------------------|-----------------|-----------------------|--------------------|-------------|
| | MOLLER-10.1.06.03 2 MVA to Hall A | | | 01-Jun-20 | 23-Dec-20 | 144d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 0d |
| | 10603000 | | Vendor to Install 2 MVA for Hall A (Dependency) | 01-Jun-20* | 23-Dec-20 | 144d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 0d |
| | MOLLER-10.1.06.04 Incoming Beam Line Modifications | | | 02-Oct-20 | 25-Mar-24 | 860d | 2985 | \$289,331 | 0 | \$0 | \$218,300 | \$507,631 | 626d |
| | 10604000 | EJ | Design Incoming Beamline Modifications | 02-Oct-20 | 01-Apr-21 | 120d | 1600 | \$171,158 | 0 | \$0 | \$0 | \$171,158 | 1306d |
| | 10604002 | PE | Prepared Incoming Beamline Modifications Materials Procurement Pa | 05-Apr-21 | 09-Apr-21 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1338d |
| | 10604005 | EJ | Vendor effort Incoming Beamline Modifications Materials (LOOK FOR | 13-Apr-21 | 10-May-21 | 20d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1338d |
| | 10604006 | EJ | ACCEPT: Incoming Beamline Modifications Materials | 11-May-21 | 11-May-21 | 1d | 0 | \$0 | 0 | \$0 | \$218,300 | \$218,300 | 1338d |
| | 10604010 | PE | Survey and Alignment (To Establish Hall NET) | 03-Jul-23 | 31-Aug-23 | 43d | 404 | \$38,608 | 0 | \$0 | \$0 | \$38,608 | 746d |
| | 10604015 | PE | Installation of Components and Vacuum | 01-Sep-23 | 26-Sep-23 | 17d | 150 | \$12,044 | 0 | \$0 | \$0 | \$12,044 | 746d |
| | 10604020 | | Prepare for I&C Deinstallation | 03-Jul-23 | 26-Sep-23 | 60d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 626d |
| | 10604025 | PE | Relocate I&C | 27-Sep-23 | 25-Mar-24 | 120d | 524 | \$42,754 | 0 | \$0 | \$0 | \$42,754 | 626d |
| | 10604030 | PE | Relocate Machine Protection | 27-Feb-24 | 25-Mar-24 | 20d | 179 | \$15,001 | 0 | \$0 | \$0 | \$15,001 | 626d |
| | 10604035 | PE | Relocate DC Power | 27-Feb-24 | 25-Mar-24 | 20d | 120 | \$8,960 | 0 | \$0 | \$0 | \$8,960 | 626d |

- Cost of 2MVA for Hall A (dependency) is absorbed by Physics Division
 - Work will take place May – Dec 2020; Jason Willoughby will lead the project
- Total cost of Incoming Beamline Mods is now \$0.5M: roughly split between ~3k hours of labor costs--mostly design time—and \$220k of materials

Infrastructure: Incoming Beamline Mod Activities

*Required in order to make room for the target, spec, and detectors

| WBS Path | Activity ID | MOI BOE | Activity Name | Start | Finish | Planned Duration | Planned Labor Units | Planned Labor Cost | Planned NL Units | Planned NL Cost | Planned Material Cost | Planned Total Cost | Total Float |
|---|-------------|---------|---|-----------|-----------|------------------|---------------------|--------------------|------------------|-----------------|-----------------------|--------------------|-------------|
| MOLLER-10.1.06.04 Incoming Beam Line Modifications | | | | 02-Oct-20 | 25-Mar-24 | 860d | 2985 | \$289,331 | 0 | \$0 | \$218,300 | \$507,631 | 626d |
| 10604000 | EJ | | Design Incoming Beamline Modifications | 02-Oct-20 | 01-Apr-21 | 120d | 1600 | \$171,158 | 0 | \$0 | \$0 | \$171,158 | 1306d |
| 10604002 | PE | | Prepared Incoming Beamline Modifications Materials Procurement Pa | 05-Apr-21 | 09-Apr-21 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1338d |
| 10604005 | EJ | | Vendor effort Incoming Beamline Modifications Materials (LOOK FOR | 13-Apr-21 | 10-May-21 | 20d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1338d |
| 10604006 | EJ | | ACCEPT: Incoming Beamline Modifications Materials | 11-May-21 | 11-May-21 | 1d | 0 | \$0 | 0 | \$0 | \$218,300 | \$218,300 | 1338d |
| 10604010 | PE | | Survey and Alignment (To Establish Hall NET) | 03-Jul-23 | 31-Aug-23 | 43d | 404 | \$38,608 | 0 | \$0 | \$0 | \$38,608 | 746d |
| 10604015 | PE | | Installation of Components and Vacuum | 01-Sep-23 | 26-Sep-23 | 17d | 150 | \$12,044 | 0 | \$0 | \$0 | \$12,044 | 746d |
| 10604020 | | | Prepare for I&C Deinstallation | 03-Jul-23 | 26-Sep-23 | 60d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 626d |
| 10604025 | PE | | Relocate I&C | 27-Sep-23 | 25-Mar-24 | 120d | 524 | \$42,754 | 0 | \$0 | \$0 | \$42,754 | 626d |
| 10604030 | PE | | Relocate Machine Protection | 27-Feb-24 | 25-Mar-24 | 20d | 179 | \$15,001 | 0 | \$0 | \$0 | \$15,001 | 626d |
| 10604035 | PE | | Relocate DC Power | 27-Feb-24 | 25-Mar-24 | 20d | 120 | \$8,960 | 0 | \$0 | \$0 | \$8,960 | 626d |

Under Review

- Several activities involved:
 - Mechanical Engineering Design
 - Survey and alignment: standard element and beamline survey work
 - Installation of vacuum components: Remove, move, install and pumpdown/leakcheck
 - Relocate Inst. & Ctrl, MPS, and DC power hardware and related racks cables, electronics
- Additional needed work and costing still under review (Mark & Jay's talk)
 - No Moller pol. move; new raster (other pot of \$) , locations: BPMs and quad and correctors
 - Blue balcony (frame holding various hall utilities) modifications needed for new pivot loc.

Infrastructure: Particle Shielding (Aug 29, 2019)

| WBS Path | Activity ID | MOI BOE | Activity Name | Start | Finish | Planned Duration | Planned Labor Units | Planned Labor Cost | Planned NL Units | Planned NL Cost | Planned Material Cost | Planned Total Cost | Total Float |
|----------|---|---------|---|-----------|-----------|------------------|---------------------|--------------------|------------------|-----------------|-----------------------|--------------------|-------------|
| | MOLLER-10.1.06.05 Particle Shielding | | | 02-Oct-20 | 22-Nov-23 | 781d | 1448 | \$145,482 | 0 | \$0 | \$1,308,000 | \$1,453,482 | 705d |
| | 10605000 | EJ | Design Particle Shielding | 02-Oct-20 | 04-Feb-21 | 80d | 1120 | \$105,682 | 0 | \$0 | \$0 | \$105,682 | 1298d |
| | 10605002 | PE | Prepare Particle Shielding Installation Procurement Package | 08-Feb-21 | 12-Feb-21 | 5d | 8 | \$782 | 0 | \$0 | \$0 | \$782 | 1298d |
| | 10605005 | PE | Vendor effort Particle Shielding Installation | 03-Jul-23 | 21-Nov-23 | 100d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 705d |
| | 10605006 | PE | ACCEPT: Particle Shielding Installation | 22-Nov-23 | 22-Nov-23 | 1d | 0 | \$0 | 0 | \$0 | \$1,308,000 | \$1,308,000 | 705d |
| | 10605010 | PE | SOTR Oversight | 03-Jul-23 | 21-Nov-23 | 100d | 320 | \$39,018 | 0 | \$0 | \$0 | \$39,018 | 706d |

- This budget goes with latest plan presented by Ciprian. Uses less plastic and steel and more concrete for cost savings
- The new breakdown includes planned material costs for:
 - Target enclosure
 - Col 1 and 2 shielding
 - Col4 shielding and Pb shadow wall
- Planned total cost is ~\$1.5M with \$1.3M in material costs
 - Could still potentially reduce costs by reducing sky-shine shield

Integration: Cables

| WBS Path | Activity ID | MOI BOE | Activity Name | Start | Finish | Planned Duration | Planned Labor Units | Planned Labor Cost | Planned NL Units | Planned NL Cost | Planned Material Cost | Planned Total Cost | Total Float |
|---|-------------|---------|---|-----------|-----------|------------------|---------------------|--------------------|------------------|-----------------|-----------------------|--------------------|-------------|
| MOLLER-10.1.06.06 Integration of MOLLER Subsystems | | | | 02-Oct-20 | 29-May-25 | 1153d | 16264 | \$1,451,753 | 0 | \$0 | \$2,964,933 | \$4,416,686 | 333d |
| MOLLER-10.1.06.06.01 Cables | | | | 04-Jan-22 | 26-Sep-23 | 434d | 968 | \$79,680 | 0 | \$0 | \$1,054,149 | \$1,133,829 | 746d |
| 1060601000 | | | Write Specification for Signal Cabling | 04-Jan-22 | 15-Feb-22 | 30d | 8 | \$1,005 | 0 | \$0 | \$0 | \$1,005 | 1012d |
| 1060601002 | PE | | Prepared Signal Cables Procurement Package | 17-Feb-22 | 23-Feb-22 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1012d |
| 1060601005 | VQ | | Vendor effort Signal Cables | 25-Feb-22 | 03-Jun-22 | 70d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1012d |
| 1060601006 | VQ | | ACCEPT: Signal Cables | 06-Jun-22 | 06-Jun-22 | 1d | 0 | \$0 | 0 | \$0 | \$549,091 | \$549,091 | 1012d |
| 1060601010 | EJ | | Installation of Signal Cabling | 03-Jul-23 | 26-Sep-23 | 60d | 160 | \$11,915 | 0 | \$0 | \$0 | \$11,915 | 746d |
| 1060601015 | EG | | Write Specification for LV Cabling | 04-Jan-22 | 25-Jan-22 | 15d | 40 | \$5,023 | 0 | \$0 | \$0 | \$5,023 | 1042d |
| 1060601017 | EG | | Prepared LV Cables Procurement Package | 27-Jan-22 | 02-Feb-22 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1042d |
| 1060601020 | VQ | | Vendor effort LV Cables | 04-Feb-22 | 12-May-22 | 70d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1042d |
| 1060601021 | VQ | | ACCEPT: LV Cables | 13-May-22 | 13-May-22 | 1d | 0 | \$0 | 0 | \$0 | \$57,320 | \$57,320 | 1042d |
| 1060601025 | EJ | | Installation of LV Cabling | 03-Jul-23 | 05-Sep-23 | 45d | 160 | \$11,915 | 0 | \$0 | \$0 | \$11,915 | 761d |
| 1060601030 | EG | | Write Specification for LV Power Supplies | 04-Jan-22 | 25-Jan-22 | 15d | 40 | \$5,023 | 0 | \$0 | \$0 | \$5,023 | 1042d |
| 1060601032 | EG | | Prepared LV Power Supplies Cables Procurement Package | 27-Jan-22 | 02-Feb-22 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1042d |
| 1060601035 | VQ | | Vendor effort LV Power Supplies Cables | 04-Feb-22 | 12-May-22 | 70d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1042d |
| 1060601036 | VQ | | ACCEPT: LV Power Supplies Cables | 13-May-22 | 13-May-22 | 1d | 0 | \$0 | 0 | \$0 | \$65,254 | \$65,254 | 1042d |
| 1060601040 | EJ | | Installation of LV Power Supplies | 03-Jul-23 | 05-Sep-23 | 45d | 160 | \$11,915 | 0 | \$0 | \$0 | \$11,915 | 761d |
| 1060601045 | EG | | Write Specification for HV System and Cabling | 04-Jan-22 | 10-Jan-22 | 5d | 40 | \$5,023 | 0 | \$0 | \$0 | \$5,023 | 1057d |
| 1060601047 | EG | | Prepared HV System Procurement Package | 12-Jan-22 | 19-Jan-22 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1067d |
| 1060601050 | VQ | | Vendor effort HV System | 21-Jan-22 | 14-Apr-22 | 60d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1067d |
| 1060601051 | VQ | | ACCEPT: HV System | 15-Apr-22 | 15-Apr-22 | 1d | 0 | \$0 | 0 | \$0 | \$189,555 | \$189,555 | 1067d |
| 1060601060 | EG | | Installation of HV System and cabling | 03-Jul-23 | 28-Aug-23 | 40d | 320 | \$23,830 | 0 | \$0 | \$0 | \$23,830 | 766d |
| 1060601066 | EG | | Prepared HV Cabling Procurement Package | 12-Jan-22 | 19-Jan-22 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1057d |
| 1060601069 | VQ | | Vendor effort HV Cabling | 21-Jan-22 | 28-Apr-22 | 70d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1057d |
| 1060601070 | VQ | | ACCEPT:HV Cabling | 29-Apr-22 | 29-Apr-22 | 1d | 0 | \$0 | 0 | \$0 | \$192,930 | \$192,930 | 1057d |

- Total planned cost for cables is \$1.1M dominated by \$1M in materials
- Signal Cables:
 - 400 runs each of RG58 and RG108A/U 78Ω BNC Twinax: 604 requested =>196* spares (for other dets)
 - Each run consists of 4 cables: 60" to PreAmp; 600" to PatchPanel; 320ft to PatchPanel; 600" to ADC*
 - Planning for premade cables*: Total cost from web quote is \$679k + \$49k* (bulkhead conn.) + \$7.5k (trays)
 - Cost savings of \$225k since last review by reusing 100 m RG58 signal cables from SBS.

Integration: Cables

| WBS Path | Activity ID | MOI BOE | Activity Name | Start | Finish | Planned Duration | Planned Labor Units | Planned Labor Cost | Planned NL Units | Planned NL Cost | Planned Material Cost | Planned Total Cost | Total Float |
|---|-------------|---------|---|-----------|-----------|------------------|---------------------|--------------------|------------------|-----------------|-----------------------|--------------------|-------------|
| MOLLER-10.1.06.06 Integration of MOLLER Subsystems | | | | 02-Oct-20 | 29-May-25 | 1153d | 16264 | \$1,451,753 | 0 | \$0 | \$2,964,933 | \$4,416,686 | 333d |
| MOLLER-10.1.06.06.01 Cables | | | | 04-Jan-22 | 26-Sep-23 | 434d | 968 | \$79,680 | 0 | \$0 | \$1,054,149 | \$1,133,829 | 746d |
| 1060601000 | | | Write Specification for Signal Cabling | 04-Jan-22 | 15-Feb-22 | 30d | 8 | \$1,005 | 0 | \$0 | \$0 | \$1,005 | 1012d |
| 1060601002 | PE | | Prepared Signal Cables Procurement Package | 17-Feb-22 | 23-Feb-22 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1012d |
| 1060601005 | VQ | | Vendor effort Signal Cables | 25-Feb-22 | 03-Jun-22 | 70d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1012d |
| 1060601006 | VQ | | ACCEPT: Signal Cables | 06-Jun-22 | 06-Jun-22 | 1d | 0 | \$0 | 0 | \$0 | \$549,091 | \$549,091 | 1012d |
| 1060601010 | EJ | | Installation of Signal Cabling | 03-Jul-23 | 26-Sep-23 | 60d | 160 | \$11,915 | 0 | \$0 | \$0 | \$11,915 | 746d |
| 1060601015 | EG | | Write Specification for LV Cabling | 04-Jan-22 | 25-Jan-22 | 15d | 40 | \$5,023 | 0 | \$0 | \$0 | \$5,023 | 1042d |
| 1060601017 | EG | | Prepared LV Cables Procurement Package | 27-Jan-22 | 02-Feb-22 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1042d |
| 1060601020 | VQ | | Vendor effort LV Cables | 04-Feb-22 | 12-May-22 | 70d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1042d |
| 1060601021 | VQ | | ACCEPT: LV Cables | 13-May-22 | 13-May-22 | 1d | 0 | \$0 | 0 | \$0 | \$57,320 | \$57,320 | 1042d |
| 1060601025 | EJ | | Installation of LV Cabling | 03-Jul-23 | 05-Sep-23 | 45d | 160 | \$11,915 | 0 | \$0 | \$0 | \$11,915 | 761d |
| 1060601030 | EG | | Write Specification for LV Power Supplies | 04-Jan-22 | 25-Jan-22 | 15d | 40 | \$5,023 | 0 | \$0 | \$0 | \$5,023 | 1042d |
| 1060601032 | EG | | Prepared LV Power Supplies Cables Procurement Package | 27-Jan-22 | 02-Feb-22 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1042d |
| 1060601035 | VQ | | Vendor effort LV Power Supplies Cables | 04-Feb-22 | 12-May-22 | 70d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1042d |
| 1060601036 | VQ | | ACCEPT: LV Power Supplies Cables | 13-May-22 | 13-May-22 | 1d | 0 | \$0 | 0 | \$0 | \$65,254 | \$65,254 | 1042d |
| 1060601040 | EJ | | Installation of LV Power Supplies | 03-Jul-23 | 05-Sep-23 | 45d | 160 | \$11,915 | 0 | \$0 | \$0 | \$11,915 | 761d |
| 1060601045 | EG | | Write Specification for HV System and Cabling | 04-Jan-22 | 10-Jan-22 | 5d | 40 | \$5,023 | 0 | \$0 | \$0 | \$5,023 | 1057d |
| 1060601047 | EG | | Prepared HV System Procurement Package | 12-Jan-22 | 19-Jan-22 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1067d |
| 1060601050 | VQ | | Vendor effort HV System | 21-Jan-22 | 14-Apr-22 | 60d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1067d |
| 1060601051 | VQ | | ACCEPT: HV System | 15-Apr-22 | 15-Apr-22 | 1d | 0 | \$0 | 0 | \$0 | \$189,555 | \$189,555 | 1067d |
| 1060601060 | EG | | Installation of HV System and cabling | 03-Jul-23 | 28-Aug-23 | 40d | 320 | \$23,830 | 0 | \$0 | \$0 | \$23,830 | 766d |
| 1060601066 | EG | | Prepared HV Cabling Procurement Package | 12-Jan-22 | 19-Jan-22 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1057d |
| 1060601069 | VQ | | Vendor effort HV Cabling | 21-Jan-22 | 28-Apr-22 | 70d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1057d |
| 1060601070 | VQ | | ACCEPT:HV Cabling | 29-Apr-22 | 29-Apr-22 | 1d | 0 | \$0 | 0 | \$0 | \$192,930 | \$192,930 | 1057d |

- HV System: Total Cost is \$190k
 - Three CAEN SY4527A (2 + 1 spare): power and control mainframes -- \$28k + \$5k (control software)
 - Six CAEN A4533: 1200W power units (two for each mainframe + 2 spares) -- \$11.8k
 - 19 CAEN A1535N: 24ch -3.5kV/3mA Common Return Board -- \$115k
- HV Cables (and breakout): Total Cost is \$193k
 - 384 SHV to SHV 600" RG8A/U (enough for 16 cards, 24 ch each): \$190/cable => \$73k (standard cables)
 - HV breakout cost is \$70.5k (involves a lot of expensive connectors, pins; multi-conductor HV cables (16 100m), SHV connectors, breakout boxes, labor)
 - More cable trays: three at \$5k each plus \$5k in supports: total here is \$20k + \$12k labor

Integration: Detector Support Structure

| WBS Path | Activity ID | MOI BOE | Activity Name | Start | Finish | Planned Duration | Planned Labor Units | Planned Labor Cost | Planned NL Units | Planned NL Cost | Planned Material Cost | Planned Total Cost | Total Float |
|---|-------------|---------|---|-----------|-----------|------------------|---------------------|--------------------|------------------|-----------------|-----------------------|--------------------|-------------|
| MOLLER-10.1.06.06.02 Detector Support Structures | | | | 02-Oct-20 | 05-Dec-24 | 1038d | 8848 | \$736,183 | 0 | \$0 | \$1,043,064 | \$1,779,247 | 448d |
| 1060602000 | PE | | Design/Specify Electronics Huts | 04-Jan-22 | 15-Feb-22 | 30d | 240 | \$22,189 | 0 | \$0 | \$0 | \$22,189 | 1022d |
| 1060602002 | PE | | Prepared detector support structures Concrete Procurement Packag | 17-Feb-22 | 23-Feb-22 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1082d |
| 1060602005 | PE | | Vendor effort detector support structures Concrete | 03-Jul-23 | 26-Sep-23 | 60d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 745d |
| 1060602006 | PE | | ACCEPT: detector support structures Concrete | 27-Sep-23 | 27-Sep-23 | 1d | 0 | \$0 | 0 | \$0 | \$43,660 | \$43,660 | 745d |
| 1060602008 | PE | | Prepared detector support structures Install Breaker Panels and Rack | 17-Feb-22 | 23-Feb-22 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1062d |
| 1060602010 | PE | | Vendor effort detector support structures Install Breaker Panels and F | 03-Jul-23 | 24-Oct-23 | 80d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 725d |
| 1060602011 | PE | | ACCEPT: detector support structures Install Breaker Panels and Rad | 25-Oct-23 | 25-Oct-23 | 1d | 0 | \$0 | 0 | \$0 | \$82,600 | \$82,600 | 725d |
| 1060602013 | EG | | Prepared detector support structures Instrumentation Hardware Proc | 17-Feb-22 | 23-Feb-22 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1022d |
| 1060602015 | PE | | Vendor effort detector support structures Instrumentation Hardware | 25-Feb-22 | 24-Mar-22 | 20d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1022d |
| 1060602016 | PE | | ACCEPT: detector support structures Instrumentation Hardware | 25-Mar-22 | 25-Mar-22 | 1d | 0 | \$0 | 0 | \$0 | \$17,700 | \$17,700 | 1022d |
| 1060602020 | PE | | Install Instrumentation into Huts | 03-Jul-23 | 21-Nov-23 | 100d | 1920 | \$167,544 | 0 | \$0 | \$0 | \$167,544 | 706d |
| 1060602025 | EJ | | Design Main Detector Integration | 02-Oct-20 | 27-May-21 | 160d | 1680 | \$146,942 | 0 | \$0 | \$0 | \$146,942 | 854d |
| 1060602027 | PE | | Prepared detector support structures integration Procurement Packag | 01-Jun-21 | 07-Jun-21 | 5d | 8 | \$782 | 0 | \$0 | \$0 | \$782 | 854d |
| 1060602030 | EJ | | Vendor effort detector support structures integration (100K for Install | 03-Jul-23 | 20-May-24 | 220d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 341d |
| 1060602031 | EJ | | ACCEPT: detector support structures integration | 21-May-24 | 21-May-24 | 1d | 0 | \$0 | 0 | \$0 | \$806,883 | \$806,883 | 341d |
| 1060602035 | EJ | | Install Main Detector | 22-May-24 | 08-Nov-24 | 120d | 2520 | \$191,297 | 0 | \$0 | \$0 | \$191,297 | 341d |
| 1060602040 | EJ | | Design Ferris Wheel Support | 02-Oct-20 | 12-Nov-20 | 30d | 520 | \$40,244 | 0 | \$0 | \$0 | \$40,244 | 1124d |
| 1060602042 | PE | | Prepared detector support structures Ferris Wheel Supports Procure | 16-Nov-20 | 20-Nov-20 | 5d | 8 | \$782 | 0 | \$0 | \$0 | \$782 | 1124d |
| 1060602045 | EJ | | Vendor effort detector support structures Ferris Wheel Supports | 24-Nov-20 | 26-Apr-21 | 100d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1124d |
| 1060602046 | EJ | | ACCEPT: detector support structures Ferris Wheel Supports | 27-Apr-21 | 27-Apr-21 | 1d | 0 | \$0 | 0 | \$0 | \$48,521 | \$48,521 | 1124d |
| 1060602050 | EJ | | Install Ferris Wheel | 03-Jul-23 | 28-Aug-23 | 40d | 1040 | \$87,115 | 0 | \$0 | \$0 | \$87,115 | 582d |
| 1060602055 | EJ | | Design Beam Monitoring Hardware | 02-Oct-20 | 12-Nov-20 | 30d | 600 | \$53,858 | 0 | \$0 | \$0 | \$53,858 | 1184d |
| 1060602057 | PE | | Prepared detector support structures Beam Monitoring Hardware Prc | 16-Nov-20 | 20-Nov-20 | 5d | 8 | \$782 | 0 | \$0 | \$0 | \$782 | 1184d |
| 1060602060 | PE | | Vendor effort detector support structures Beam Monitoring Hardware | 24-Nov-20 | 26-Apr-21 | 100d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1184d |
| 1060602061 | PE | | ACCEPT: detector support structures Beam Monitoring Hardware | 27-Apr-21 | 27-Apr-21 | 1d | 0 | \$0 | 0 | \$0 | \$43,700 | \$43,700 | 1184d |
| 1060602065 | EJ | | Install Beam Monitoring Hardware | 03-Jul-23 | 28-Aug-23 | 40d | 280 | \$22,229 | 0 | \$0 | \$0 | \$22,229 | 642d |
| 1060602070 | | | Detector Installation Complete | | 05-Dec-24 | 0d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 324d |

- Total planned cost is ~\$1.8M; \$700k in labor and \$1M for materials
- Largest single line item is Structure Support Materials at \$800k:
 - Main and Aux detectors support structures - they hold individual detector channels in position around beam pipe — \$148k
 - Main and Aux detectors Pb shielding – \$240k* (potential savings here since Pb donut absorber is much larger than planned)
 - Beam line (from tracking detectors to beam dump alcove) — \$100k
 - Main and Aux detectors floor positioning systems (floor plates, jacks, Hilman rollers, mounts) — \$338k

Integration: Detector Support Structure

| WBS Path | Activity ID | MOI BOE | Activity Name | Start | Finish | Planned Duration | Planned Labor Units | Planned Labor Cost | Planned NL Units | Planned NL Cost | Planned Material Cost | Planned Total Cost | Total Float |
|---|-------------|---------|---|-----------|-----------|------------------|---------------------|--------------------|------------------|-----------------|-----------------------|--------------------|-------------|
| MOLLER-10.1.06.06.02 Detector Support Structures | | | | 02-Oct-20 | 05-Dec-24 | 1038d | 8848 | \$736,183 | 0 | \$0 | \$1,043,064 | \$1,779,247 | 448d |
| 1060602000 | PE | | Design/Specify Electronics Huts | 04-Jan-22 | 15-Feb-22 | 30d | 240 | \$22,189 | 0 | \$0 | \$0 | \$22,189 | 1022d |
| 1060602002 | PE | | Prepared detector support structures Concrete Procurement Package | 17-Feb-22 | 23-Feb-22 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1082d |
| 1060602005 | PE | | Vendor effort detector support structures Concrete | 03-Jul-23 | 26-Sep-23 | 60d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 745d |
| 1060602006 | PE | | ACCEPT: detector support structures Concrete | 27-Sep-23 | 27-Sep-23 | 1d | 0 | \$0 | 0 | \$0 | \$43,660 | \$43,660 | 745d |
| 1060602008 | PE | | Prepared detector support structures Install Breaker Panels and Rack | 17-Feb-22 | 23-Feb-22 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1062d |
| 1060602010 | PE | | Vendor effort detector support structures Install Breaker Panels and F | 03-Jul-23 | 24-Oct-23 | 80d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 725d |
| 1060602011 | PE | | ACCEPT: detector support structures Install Breaker Panels and Rad | 25-Oct-23 | 25-Oct-23 | 1d | 0 | \$0 | 0 | \$0 | \$82,600 | \$82,600 | 725d |
| 1060602013 | EG | | Prepared detector support structures Instrumentation Hardware Proc | 17-Feb-22 | 23-Feb-22 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1022d |
| 1060602015 | PE | | Vendor effort detector support structures Instrumentation Hardware | 25-Feb-22 | 24-Mar-22 | 20d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1022d |
| 1060602016 | PE | | ACCEPT: detector support structures Instrumentation Hardware | 25-Mar-22 | 25-Mar-22 | 1d | 0 | \$0 | 0 | \$0 | \$17,700 | \$17,700 | 1022d |
| 1060602020 | PE | | Install Instrumentation into Huts | 03-Jul-23 | 21-Nov-23 | 100d | 1920 | \$167,544 | 0 | \$0 | \$0 | \$167,544 | 706d |
| 1060602025 | EJ | | Design Main Detector Integration | 02-Oct-20 | 27-May-21 | 160d | 1680 | \$146,942 | 0 | \$0 | \$0 | \$146,942 | 854d |
| 1060602027 | PE | | Prepared detector support structures integration Procurement Package | 01-Jun-21 | 07-Jun-21 | 5d | 8 | \$782 | 0 | \$0 | \$0 | \$782 | 854d |
| 1060602030 | EJ | | Vendor effort detector support structures integration (100K for Install | 03-Jul-23 | 20-May-24 | 220d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 341d |
| 1060602031 | EJ | | ACCEPT: detector support structures integration | 21-May-24 | 21-May-24 | 1d | 0 | \$0 | 0 | \$0 | \$806,883 | \$806,883 | 341d |
| 1060602035 | EJ | | Install Main Detector | 22-May-24 | 08-Nov-24 | 120d | 2520 | \$191,297 | 0 | \$0 | \$0 | \$191,297 | 341d |
| 1060602040 | EJ | | Design Ferris Wheel Support | 02-Oct-20 | 12-Nov-20 | 30d | 520 | \$40,244 | 0 | \$0 | \$0 | \$40,244 | 1124d |
| 1060602042 | PE | | Prepared detector support structures Ferris Wheel Supports Procure | 16-Nov-20 | 20-Nov-20 | 5d | 8 | \$782 | 0 | \$0 | \$0 | \$782 | 1124d |
| 1060602045 | EJ | | Vendor effort detector support structures Ferris Wheel Supports | 24-Nov-20 | 26-Apr-21 | 100d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1124d |
| 1060602046 | EJ | | ACCEPT: detector support structures Ferris Wheel Supports | 27-Apr-21 | 27-Apr-21 | 1d | 0 | \$0 | 0 | \$0 | \$48,521 | \$48,521 | 1124d |
| 1060602050 | EJ | | Install Ferris Wheel | 03-Jul-23 | 28-Aug-23 | 40d | 1040 | \$87,115 | 0 | \$0 | \$0 | \$87,115 | 582d |
| 1060602055 | EJ | | Design Beam Monitoring Hardware | 02-Oct-20 | 12-Nov-20 | 30d | 600 | \$53,858 | 0 | \$0 | \$0 | \$53,858 | 1184d |
| 1060602057 | PE | | Prepared detector support structures Beam Monitoring Hardware Proc | 16-Nov-20 | 20-Nov-20 | 5d | 8 | \$782 | 0 | \$0 | \$0 | \$782 | 1184d |
| 1060602060 | PE | | Vendor effort detector support structures Beam Monitoring Hardware | 24-Nov-20 | 26-Apr-21 | 100d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1184d |
| 1060602061 | PE | | ACCEPT: detector support structures Beam Monitoring Hardware | 27-Apr-21 | 27-Apr-21 | 1d | 0 | \$0 | 0 | \$0 | \$43,700 | \$43,700 | 1184d |
| 1060602065 | EJ | | Install Beam Monitoring Hardware | 03-Jul-23 | 28-Aug-23 | 40d | 280 | \$22,229 | 0 | \$0 | \$0 | \$22,229 | 642d |
| 1060602070 | | | Detector Installation Complete | | 05-Dec-24 | 0d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 324d |

- Other major material costs include:
 - \$40k materials for GEM Ferris wheel supports
 - \$145k* for two shielding bunkers: \$44k in concrete, \$83k in panels + racks, and \$18k in hardware
 - \$44k for beam monitoring hardware (Mark's request)

Integration: Detector Support Structure

| WBS Path | Activity ID | MOI BOE | Activity Name | Start | Finish | Planned Duration | Planned Labor Units | Planned Labor Cost | Planned NL Units | Planned NL Cost | Planned Material Cost | Planned Total Cost | Total Float |
|---|-------------|---------|---|-----------|-----------|------------------|---------------------|--------------------|------------------|-----------------|-----------------------|--------------------|-------------|
| MOLLER-10.1.06.06.02 Detector Support Structures | | | | 02-Oct-20 | 05-Dec-24 | 1038d | 8848 | \$736,183 | 0 | \$0 | \$1,043,064 | \$1,779,247 | 448d |
| 1060602000 | PE | | Design/Specify Electronics Huts | 04-Jan-22 | 15-Feb-22 | 30d | 240 | \$22,189 | 0 | \$0 | \$0 | \$22,189 | 1022d |
| 1060602002 | PE | | Prepared detector support structures Concrete Procurement Package | 17-Feb-22 | 23-Feb-22 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1082d |
| 1060602005 | PE | | Vendor effort detector support structures Concrete | 03-Jul-23 | 26-Sep-23 | 60d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 745d |
| 1060602006 | PE | | ACCEPT: detector support structures Concrete | 27-Sep-23 | 27-Sep-23 | 1d | 0 | \$0 | 0 | \$0 | \$43,660 | \$43,660 | 745d |
| 1060602008 | PE | | Prepared detector support structures Install Breaker Panels and Rack | 17-Feb-22 | 23-Feb-22 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1062d |
| 1060602010 | PE | | Vendor effort detector support structures Install Breaker Panels and F | 03-Jul-23 | 24-Oct-23 | 80d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 725d |
| 1060602011 | PE | | ACCEPT: detector support structures Install Breaker Panels and Rad | 25-Oct-23 | 25-Oct-23 | 1d | 0 | \$0 | 0 | \$0 | \$82,600 | \$82,600 | 725d |
| 1060602013 | EG | | Prepared detector support structures Instrumentation Hardware Proc | 17-Feb-22 | 23-Feb-22 | 5d | 8 | \$806 | 0 | \$0 | \$0 | \$806 | 1022d |
| 1060602015 | PE | | Vendor effort detector support structures Instrumentation Hardware | 25-Feb-22 | 24-Mar-22 | 20d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1022d |
| 1060602016 | PE | | ACCEPT: detector support structures Instrumentation Hardware | 25-Mar-22 | 25-Mar-22 | 1d | 0 | \$0 | 0 | \$0 | \$17,700 | \$17,700 | 1022d |
| 1060602020 | PE | | Install Instrumentation into Huts | 03-Jul-23 | 21-Nov-23 | 100d | 1920 | \$167,544 | 0 | \$0 | \$0 | \$167,544 | 706d |
| 1060602025 | EJ | | Design Main Detector Integration | 02-Oct-20 | 27-May-21 | 160d | 1680 | \$146,942 | 0 | \$0 | \$0 | \$146,942 | 854d |
| 1060602027 | PE | | Prepared detector support structures integration Procurement Packag | 01-Jun-21 | 07-Jun-21 | 5d | 8 | \$782 | 0 | \$0 | \$0 | \$782 | 854d |
| 1060602030 | EJ | | Vendor effort detector support structures integration (100K for Install | 03-Jul-23 | 20-May-24 | 220d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 341d |
| 1060602031 | EJ | | ACCEPT: detector support structures integration | 21-May-24 | 21-May-24 | 1d | 0 | \$0 | 0 | \$0 | \$806,883 | \$806,883 | 341d |
| 1060602035 | EJ | | Install Main Detector | 22-May-24 | 08-Nov-24 | 120d | 2520 | \$191,297 | 0 | \$0 | \$0 | \$191,297 | 341d |
| 1060602040 | EJ | | Design Ferris Wheel Support | 02-Oct-20 | 12-Nov-20 | 30d | 520 | \$40,244 | 0 | \$0 | \$0 | \$40,244 | 1124d |
| 1060602042 | PE | | Prepared detector support structures Ferris Wheel Supports Procure | 16-Nov-20 | 20-Nov-20 | 5d | 8 | \$782 | 0 | \$0 | \$0 | \$782 | 1124d |
| 1060602045 | EJ | | Vendor effort detector support structures Ferris Wheel Supports | 24-Nov-20 | 26-Apr-21 | 100d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1124d |
| 1060602046 | EJ | | ACCEPT: detector support structures Ferris Wheel Supports | 27-Apr-21 | 27-Apr-21 | 1d | 0 | \$0 | 0 | \$0 | \$48,521 | \$48,521 | 1124d |
| 1060602050 | EJ | | Install Ferris Wheel | 03-Jul-23 | 28-Aug-23 | 40d | 1040 | \$87,115 | 0 | \$0 | \$0 | \$87,115 | 582d |
| 1060602055 | EJ | | Design Beam Monitoring Hardware | 02-Oct-20 | 12-Nov-20 | 30d | 600 | \$53,858 | 0 | \$0 | \$0 | \$53,858 | 1184d |
| 1060602057 | PE | | Prepared detector support structures Beam Monitoring Hardware Prc | 16-Nov-20 | 20-Nov-20 | 5d | 8 | \$782 | 0 | \$0 | \$0 | \$782 | 1184d |
| 1060602060 | PE | | Vendor effort detector support structures Beam Monitoring Hardware | 24-Nov-20 | 26-Apr-21 | 100d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 1184d |
| 1060602061 | PE | | ACCEPT: detector support structures Beam Monitoring Hardware | 27-Apr-21 | 27-Apr-21 | 1d | 0 | \$0 | 0 | \$0 | \$43,700 | \$43,700 | 1184d |
| 1060602065 | EJ | | Install Beam Monitoring Hardware | 03-Jul-23 | 28-Aug-23 | 40d | 280 | \$22,229 | 0 | \$0 | \$0 | \$22,229 | 642d |
| 1060602070 | | | Detector Installation Complete | | 05-Dec-24 | 0d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 324d |

- Total planned labor costs: \$740k
 - \$147k for Main Detector Integration Design: 1680 hrs planned labor
 - \$191k for installation of Main Detector
 - \$167k for installation of instrumentation into shield bunkers
 - \$127k for Ferris wheel support design and installation
 - \$54k for designing beam monitoring hardware

Integration: Hall Mods and Installation

| WBS Path | Activity ID | MOI BOE | Activity Name | Start | Finish | Planned Duration | Planned Labor Units | Planned Labor Cost | Planned NL Units | Planned NL Cost | Planned Material Cost | Planned Total Cost | Total Float |
|----------|---|---------|--|-----------|-----------|------------------|---------------------|--------------------|------------------|-----------------|-----------------------|--------------------|-------------|
| | MOLLER-10.1.06.06.03 Hall Modifications and Installation | | | 03-Jul-23 | 29-May-25 | 473d | 6448 | \$635,890 | 0 | \$0 | \$867,720 | \$1,503,610 | 209d |
| | 1060603000 | PE | Remove resistive Q1 magnets | 03-Jul-23 | 24-Jul-23 | 15d | 160 | \$14,016 | 0 | \$0 | \$0 | \$14,016 | 209d |
| | 1060603005 | EJ | Remove SC Q2 magnets | 25-Jul-23 | 05-Sep-23 | 30d | 280 | \$24,997 | 0 | \$0 | \$0 | \$24,997 | 209d |
| | 1060603010 | PE | Modify(blue) utility platform | 06-Sep-23 | 05-Feb-24 | 100d | 1120 | \$92,493 | 0 | \$0 | \$0 | \$92,493 | 209d |
| | 1060603015 | EG | Restructure pivot and HRS links | 06-Feb-24 | 19-Sep-24 | 160d | 2960 | \$247,926 | 0 | \$0 | \$0 | \$247,926 | 209d |
| | 1060603020 | EJ | Install Platforms and Utilities | 20-Sep-24 | 24-Jan-25 | 80d | 1280 | \$115,730 | 0 | \$0 | \$0 | \$115,730 | 209d |
| | 1060603022 | PE | Prepare Hall Modifications Materials Procurement Package | 28-Jan-25 | 03-Feb-25 | 5d | 8 | \$830 | 0 | \$0 | \$0 | \$830 | 209d |
| | 1060603025 | EJ | Vendor effort Hall Modifications Materials | 05-Feb-25 | 28-May-25 | 80d | 0 | \$0 | 0 | \$0 | \$0 | \$0 | 209d |
| | 1060603026 | EJ | ACCEPT: Hall Modifications Materials | 29-May-25 | 29-May-25 | 1d | 0 | \$0 | 0 | \$0 | \$867,720 | \$867,720 | 209d |
| | 1060603030 | EJ | Engineering Oversight | 03-Jul-23 | 24-Jan-25 | 385d | 640 | \$139,898 | 0 | \$0 | \$0 | \$139,898 | 297d |

- Total planned cost is \$1.5M: \$635k in planned labor and \$865k in materials
- Planned material costs associated with activities:
 - Remove resistive Q1 magnets — \$148k
 - Remove SC Q2 magnets — \$32k
 - Modify (blue) utility platform — \$276k
 - Restructure pivot and HRS links — \$350k (Possible saving depending what is done with old pivot area?)
 - Platforms and utilities — \$210k
- Planned labor costs are itemized in table

Summary

- Hall I & I subsystem total is at \$6.6M
- There could still be potential (small) cost reductions:
 - Pb donut absorber, shielding bunkers? sky-shine shield?
 - More savings in cables?: HV lengths, pre- vs house-made
 - Savings from removing possible overlap in costing with other WBS systems: e.g. Detector WBS and Ferris wheel costs
- Could also be potential cost additions or reductions from systems still under review:
 - Incoming beamline Mods: new raster, ideal BPM locations...
 - Detector support structure; Hall Mods; EJ costing & cont.
- Recent work on detector support structure design will be presented in the next talk