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| **Project Name:** | **sPHENIX Hadronic Calorimeter** | **Date Issued:** | **12/09/2022** |
| **WBS/Control Account Number:** | **WBS 1.4** | | |
| **Control Account Manager Name (CAM):** | **John Lajoie** | | |
| **Control Account Title:** | **HCal** | | |

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| **Purpose:** |
| The purpose of this form is to document acknowledgement by authorized Control Account Manager and Project Manager that work has been completed as defined in the WBS Dictionary for the above Control Account and the corresponding system KPPs (defined in PEP/PMP) are met.  By answering YES to the following questions, you acknowledge all work has been completed and reconciles with the WBS Dictionary. Sign, date and return this form to Project Controls attention Chris Herbst, Bldg 490.  If NO is checked, please use the space below to provide details on all required modifications (additions and deletions) to the WBS Dictionary. Sign, date and return this form to Project Management Center (attention Chris Herbst, Bldg 490.) |

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| **Scope Baseline:** |
| WBS Dictionary (as per latest baseline): The Hadronic Calorimeter (HCAL) For The sPHENIX Experiment At RHIC  The HCal is comprised of an Outer HCal, which sits outside the coil and cryostat of the sPHENIX superconducting magnet, and an Inner HCal support structure, which sits inside the same coil and cryostat.  The Outer HCal is organized into 32 sectors, each of which spans 11.25 degrees of azimuth. Each sector covers pseudorapidity from -1.1 to 1.1. Three sectors have a cut-out in the steel absorber near the helium chimney of the superconducting magnet. The sectors are made of 11 layers of steel with ten gaps into which scintillating tiles can be placed. The scintillating tiles come in 24 shapes, are symmetric about the 90 degree azimuthal point, and are readout via wavelength-shifting fibers (WLS) embedded into machined grooves in the scintillator. The WLS fibers couple to Silicon PhotoMultipliers (SiPMs) that are in turn coupled to readout electronics listed under WBS 1.5. The WLS fibers from five tiles neighboring azimuth and at the same pseudorapidity are grouped to form one readout tower with its own SiPMs. Each of the 32 sectors thus has 48 readout towers. This results in 1536 OuterHCal towers total. The Silicon photomultipliers in turn are read out by associated custom-designed fast front-end electronics with their associated low-voltage power, bias voltage for the silicon photomultipliers, cabling, control electronics, and digitizing electronics; this equipment is included under WBS 1.5 Calorimeter Electronics.  The Inner HCal is comprised of 32sectors of a similar geometry as the Outer HCal but made from aluminum instead of steel. The Inner HCal includes End-Rings to support the 32 sectors as an ensemble. These End-Rings include features used in turn to support other detectors placed radially inside the Inner HCal. The Inner HCal includes provision to allow instrumenting the aluminum absorber. |
| System KPPs (Objective and Threshold; as per latest baseline)  Live channels:  Threshold: ≥90% live channels based on LED, cosmics  Objective: ≥95% live channels based on LED, cosmics  Precalibration:  Threshold: Each sector w/ an absolute energy precalibration of ≤ 20% RMS  Objective: Same |

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| **KPPs achieved:** |
| Explain the KPPs achieved and how it is demonstrated. (Attach test results/ reports where applicable)  (See attached file) All KPPs are complete. |

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| **Cost Baseline:** | | | | | | | | |
| Control Account Baseline Cost: $4,099,592 | | | | | | | | |
| Control Account Actual Cost: $4,159,790 | | | | | | | | |
| Control Account CPI: 0.99 | | | | | | | | |
| Estimate to Complete: $0 | | | | | | | | |
| Summary of cost overrun/ underrun:  The CV is -$60,198, or 0.146% of the baseline cost.  There are some $167K of unpaid invoices which will reduce the CV to about -$227K and the CPI to 0.95. The work for these invoices is all complete. | | | | | | | | |
| **Questions: [*Check Yes or No]*** | | | | | | | |
| 1. Is all work scope for this Control Account complete (all activities per the project baseline attached to this form) | | | | | | | |
|  | Yes | | |  | | No | [If NO, indicate required actions in the below table] |
| 2. Does the WBS Dictionary accurately represent the work completed? | | | | | | | |
|  | Yes | |  | | No | | [If NO, explain in the below table] |
| 3. Any scope (affecting system KPPs) removed from project baseline after necessary approvals? | | | | | | | |
|  | Yes |  | | | No | | [If NO, reference the baseline change document in the table below] |
| 4. Any scope (not affecting the system KPPs) removed from project baseline after necessary approvals? | | | | | | | |
|  | Yes |  | | | No | | [If NO, reference the baseline change document in the table below] |

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| **Notes and Required Actions:** |
| 1. Activities required to complete all work in this Control Account, with expected finish dates: All activities are complete. |
| 1. WBS Dictionary requires the following changes: None |
| 1. The following scope (affecting system KPPs) has been removed from project baseline (Note: Prior approval required, refer baseline change documentation): None |
| 1. The following scope (not affecting system KPPs) has been removed from project baseline (Note: Prior approval required, refer baseline change documentation): None |

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| **Acknowledgements:** | | | | |
| I acknowledge all work is complete as defined in the WBS Dictionary and the system KPPs have been met for this Control Account.  Any remaining cost on this Control Account has been estimated thoroughly and documented in this report. | | | | |
| **Acknowledgement by CAM** | |  | **Acknowledgement by Project Manager** | |
| **CAM Name:** | **John Lajoie** | **Project Manager:** | **Glenn R. Young** |
| **Signature:** | **A picture containing night sky  Description automatically generated** | **Signature:** |  |
| **Date:** | **12/9/2022** | **Date:** | **12/9/2022** |

Attachments:

1. P6 baseline
2. Current working file (with baseline attached)
3. Test results/ reports (if applicable)