

WBS L2	WBS L3	WBS L4	WBS L5	WBS L6	WBS Name	Dictionary Definition
1.01					<b>PROJECT MANAGEMENT</b>	Project Management For All sPHENIX WBS Items From 1.2 To 1.7 And Including All Project Stages From Conceptual Design To PD-4 Approval.
1.01	1.01.01				<b>Management Overview</b>	Key PD Dates, As Well As Budget And Spending Authorization Dates For sPHENIX. Includes Planned Schedule For Preparation Of sPHENIX Reviews And Holds The Overall MIE Project Schedule Contingency.
1.01	1.01.02				<b>Labor by FY</b>	This Task Includes All Scientific, Engineering, Technical And Support Staff Efforts To Plan And Supervise All Aspects Of The Assembly, Integration And Installation Of The sPHENIX Defined In WBS 1.2 Through WBS 1.7 Work Statement: Tasks To Be Performed By The Project Management Team Include: 1) The Oversight And Management Of The Design, Construction, Installation And Commissioning Of sPHENIX . 2) Preparation For DOE And BNL Reviews Including PD Reviews, DOE Annual Review, Safety Reviews, Readiness Reviews, Etc. 3)Preparation And Submission Of All Reports And Documentation Required By DOE And BNL Including Conceptual And Technical Design Reports, Earned Value Reports, ES&H Plans, Procurement Plans, Etc. 4) Monitoring The Activities Of All WBS Tasks Through The Level2 Managers To Assure Assure Adherence To The Technical, Budget And Schedule Plan Of The sPHENIX Project. 5)Work With The Level2 Managers To Monitor All Vendor Activity To Assure Compliance With Technical, Budget And Schedule Specs.
1.01	1.01.03				<b>Management Travel</b>	Travel To Facilitate Activities Included In WBS 1.01.01 And 1.01.02
1.02					<b>TPC</b>	The Time Preojction Chamber For The sPHENIX Experiment At RHIC.
1.02	1.02.01				<b>TPC Mechanics</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Identity Components For The TPC Prototype Version 1 &2, Perform R&D, Design And Construct The Elements Of These Prototypes And The Final TPC Including The HV System. Work Statement: Provide Prototypes: v1 & v2 Field Cage Prototype; v1 & v2 Module Prototyping, Including Gas Enclosure, Common Module Mechanics, Module Prototype, v2 Field Cage Modifications, Site Prep For Production Factories.
1.02	1.02.01	1.02.01.01			<b>TPC v1 Field Cage Prototype</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Identity Components For The TPC Field Cage Prototype Version 1, Perform R&D, Design And Construct The Elements Of This Prototype.Work Statement: Provide Prototype: Field Cage V1 Prototype.
1.02	1.02.01	1.02.01.02			<b>TPC v2 Field Cage</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Identity Components For The TPC Field Cage Prototype Version 2, Perform R&D, Design And Construct The Elements Of This Prototype. Work Statement: Provide Prototype: Field Cage v2 Prototype.
1.02	1.02.01	1.02.01.03			<b>TPC Final Field Cage</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Identity Components For The TPC Final Field Cage, Perform Necessary Modification To The v2 Field Cage. Work Statement: Provide Prototypes: Modify v2 Field Cage Prototype And Testing, Including Procuring Parts That Have Been Developed During Prototyping.
1.02	1.02.01	1.02.01.04			<b>TPC v1 Modules</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Identity Components For The GEM Readout Module Prototype Version 1, Design And Construct The Elements Of This Prototype. Work Statement: Provide GEM Readout Module v1 Prototype And Material/Equipment To Produce The Modules.
1.02	1.02.01	1.02.01.04	1.02.01.04.01		<b>TPC v1 Module Gas Enclosure</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Identity Components For The Gas Enclosure Of A Readout Module Prototype Version 1. Work Statement: Provide Gas Enclosure For A Readout Module v1 Prototype And Material/Equipment To Produce The Enclosure. This Will Be Re-Used For The v2 Protyope Step Of The Mechanics.

1.02	1.02.01	1.02.01.04	1.02.01.04.02		<b>TPC v1 Module Common Mechanics</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Identity Components For The Common Mechanics Of A Readout Module Prototype Version 1, Design And Construct The Elements Of This Prototype. Work Statement: Provide Common Mechanics For A Readout Module v1 Prototype And Material/Equipment To Produce The Common Mechanics.
1.02	1.02.01	1.02.01.04	1.02.01.04.03		<b>TPC v1a Module Prototype</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Identity Components For The Readout Module Prototype Version 1a, Design And Construct The Elements Of This Prototype. Work Statement: Provide A Readout Module v1a Prototype And Material/Equipment To Produce The Readout Module.
1.02	1.02.01	1.02.01.04	1.02.01.04.04		<b>TPC v1b Module Prototype</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Identity Components For The Readout Module Prototype Version 1b, Design And Construct The Elements Of This Prototype. Work Statement: Provide A Readout Module v1b Prototype And Material/Equipment To Produce The Readout Module.
1.02	1.02.01	1.02.01.05			<b>TPC v2 Modules</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Identity Components For The Gem Readout Module Prototype Version 2, Design And Construct The Elements Of This Prototype. Work Statement: Provide Gem Readout Module v2 Prototype And Material/Equipment To Produce The Modules.
1.02	1.02.01	1.02.01.05	1.02.01.05.01		<b>Not used</b>	Not Used
1.02	1.02.01	1.02.01.05	1.02.01.05.02		<b>TPC v2 Module Common Mechanics</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Identity Components For The Common Mechanics Of A Readout Module Prototype Version 2, Design And Construct The Elements Of This Prototype. Work Statement: Provide Common Mechanics For A Readout Module v2 Prototype And Material/Equipment To Produce The Common Mechanics.
1.02	1.02.01	1.02.01.05	1.02.01.05.03		<b>TPC v2a Module Prototype</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Identity Components For The Readout Module Prototype Version 2a, Design And Construct The Elements Of This Prototype. Work Statement: Provide A Readout Module v2a Prototype And Material/Equipment To Produce The Readout Module.
1.02	1.02.01	1.02.01.06			<b>TPC Production GEM Acquisition</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Acquire Components For The GEM Foils And Produce These Foils, Including The Training Of A Technician Dedicated To The Production Of sPHENIX GEM Foils. Work Statement: Provide All Parts And Manpower To Produce The Final GEM Foils.
1.02	1.02.01	1.02.01.07			<b>TPC High Voltage System</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Identity Components For The High Voltage Supply System For The GEM Readout Modules And Central Membrane. It Contains The Tasks To Procure The Elements Of These Items. Work Statement: Provide All Parts To Produce A High Voltage Supply System For The TPC.
1.02	1.02.01	1.02.01.08			<b>TPC Assembly</b>	Technical Scope: Assembly Of Final TPC. Work Statement: Assemble All Parts And Produce The Final TPC.
1.02	1.02.02				<b>TPC R1 Modules</b>	Technical Scope: Provide All Necessary Steps For The Pre-/Final Production Of R1 Readout Modules. Work Statement: Prepare Factory, Procure And Assemble Material/Equipment For The Pre-/Final Production Of R1 Readout Modules, Produce And Test Modules
1.02	1.02.02	1.02.02.01			<b>TPC R1 Module Factory Preparation</b>	Technical Scope: Make Production Sites Ready For Producing R1 Readout Modules. Work Statement: Procure Material/Equipment And Install It At The R1 Factory Sites.
1.02	1.02.02	1.02.02.02			<b>TPC R1 Pre-Production Module</b>	Technical Scope: Design, Procure, And Assemble All Needed Parts For Producing R1 Pre-Production Readout Modules Including Testing. Work Statement: Identify And Procure And Assemble Material/Equipment For The R1 Pre-Production Modules And Test Modules
1.02	1.02.02	1.02.02.03			<b>TPC R1 Module Production</b>	Technical Scope: Procure, Assemble And Test All Needed Parts For Final Production Of R1 Readout Modules. Work Statement: Procure And Assemble Material/Equipment For The Final Production Of R1 Readout Modules. Produce And Test Modules
1.02	1.02.02	1.02.02.04			<b>TPC R1 Module Production Procure Contracted Labor and M&amp;S</b>	Technical Scope: Procure Services of Experienced Technician(s) Skilled in GEM Module Assembly. Work Scope: Place Contract with Wayne State U for Labor of Technician(s) Experienced in GEM Module Assembly

1.02	1.02.03				<b>TPC R2 Modules</b>	Technical Scope: Provide All Necessary Steps For The Pre-/Final Production Of R2 Readout Modules. Work Statement: Prepare Factory, Procure And Assemble Material/Equipment For The Pre-/Final Production Of R2 Readout Modules, Produce And Test Modules
1.02	1.02.03	1.02.03.01			<b>TPC R2 Module Factory Preparation</b>	Technical Scope: Make Production Sites Ready For Producing R2 Readout Modules. Work Statement: Procure Material/Equipment And Install It At The R2 Factory Sites.
1.02	1.02.03	1.02.03.02			<b>TPC R2 Pre-Production Module</b>	Technical Scope: Design, Procure, And Assemble All Needed Parts For Producing R2 Pre-Production Readout Modules Including Testing. Work Statement: Identify And Procure And Assemble Material/Equipment For The R2 Pre-Production Modules And Test Modules
1.02	1.02.03	1.02.03.03			<b>TPC R2 Module Production</b>	Technical Scope: Procure, Assemble And Test All Needed Parts For Final Production Of R2 Readout Modules. Work Statement: Procure And Assemble Material/Equipment For The Final Production Of R2 Readout Modules, Produce And Test Modules
1.02	1.02.04				<b>TPC R3 Modules</b>	Technical Scope: Provide All Necessary Steps For The Pre-/Final Production Of R3 Readout Modules. Work Statement: Prepare Factory, Procure And Assemble Material/Equipment For The Pre-/Final Production Of R3 Readout Modules, Produce And Test Modules
1.02	1.02.04	1.02.04.01			<b>TPC R3 Module Factory Preparation</b>	Technical Scope: Make Production Sites Ready For Producing R3 Readout Modules. Work Statement: Procure Material/Equipment And Install It At The R3 Factory Sites.
1.02	1.02.04	1.02.04.02			<b>TPC R3 Pre-Production Module</b>	Technical Scope: Design, Procure, And Assemble All Needed Parts For Producing R3 Pre-Production Readout Modules Including Testing. Work Statement: Identify And Procure And Assemble Material/Equipment For The R3 Pre-Production Modules And Test Modules
1.02	1.02.04	1.02.04.03			<b>TPC R3 Module Production</b>	Technical Scope: Procure, Assemble And Test All Needed Parts For Final Production Of R3 Readout Modules. Work Statement: Procure And Assemble Material/Equipment For The Final Production Of R3 Readout Modules, Produce And Test Modules
1.02	1.02.05				<b>TPC FEE</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Identify Components For The Pre-Production And Production Of The TPC Frontend Electronics (FEE). Work Statement: Provide Material/Equipment To Produce And Test The FEE For The TPC.
1.02	1.02.05	1.02.05.01			<b>TPC FEE Prototype v1</b>	Technical Scope: Contains All Tasks Which Are Required To Design, Procure, Fabricate And Assemble Components For FEE Prototype v1. Work Statement: Provide Material/Equipment To Produce And Test The FEE Prototype v1 For The TPC.
1.02	1.02.05	1.02.05.02			<b>TPC FEE Prototype v2 (Pre-Production)</b>	Technical Scope: Contains All Tasks Which Are Required To Design, Procure, Fabricate And Assemble Components For The Prototype v2 (Pre-Production) FEE. Work Statement: Provide Material/Equipment To Produce And Test The Prototype v2 (Pre-Production) FEE For The TPC.
1.02	1.02.05	1.02.05.03			<b>SAMPA Chip 80 nsec</b>	Technical Scope: Contains All Tasks To Modify And Test The SAMPA Chip For 80Ns Operation. Work Statement: Provide Resources To Perform Design Modifications, And Then Fabricate And Evaluate SAMPA Chip With 80nsec Shaping
1.02	1.02.05	1.02.05.04			<b>TPC FEE Production</b>	Technical Scope: Contains All Tasks Which Are Required To Procure, Fabricate And Assemble Components For FEE Production And Perform QA Testing. Work Statement: Provide Material/Equipment To Produce And Test The Production FEE For The TPC.
1.02	1.02.06				<b>TPC DAM</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Identify Components For The Production Of The TPC Data Acquisition Modules (DAM). Work Statement: Provide Material/Equipment To Evaluate, Produce And Test The DAM For The TPC.
1.02	1.02.06	1.02.06.01			<b>TPC DAM Evaluation -- FELIX 1.5</b>	Technical Scope: Contains All Tasks Which Are Required To Evaluate The DAM With The Prototype v1 (Felix 1.5 System). Work Statement: Design, Develop, And Measure DAM Prototype v1 (Felix 1.5) Properties .
1.02	1.02.06	1.02.06.02			<b>TPC DAM Evaluation -- FELIX 2.0</b>	Technical Scope: Contains All Tasks Which Are Required To Evaluate The DAM With The Prototype v2 (Felix 2.0 System). Work Statement: Procure, Develop, And Measure DAM Prototype v2 (Felix 2.0) Properties.
1.02	1.02.06	1.02.06.03			<b>TPC DAM Production</b>	Technical Scope: Contains All Tasks Which Are Required To Produce The DAM For The TPC. Work Statement: Procure All Parts And Perform QA Testing For The Final TPC DAM.

1.02	1.02.07				<b>TPC Support Systems</b>	Technical Scope: Contains All Tasks Which Are Required To Provide Necessary Support Systems For The TPC: Laser, Gas, Cooling System. Work Statement: Provide All Parts To Support TPC Operation Via The Laser, Gas And Cooling Support Systems.
1.02	1.02.07	1.02.07.01			<b>TPC Laser System</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Identity Components For The TPC Laser Calibration System And Procure And Construct The Elements Of The System. Work Statement: Provide All Parts To Produce The Laser Calibration System And Assemble/Install/Test All Parts.
1.02	1.02.07	1.02.07.02			<b>TPC Gas System</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Identity Components For The TPC Gas System And Procure And Construct The Elements Of The System. Work Statement: Provide All Parts To Produce The Gas System And Assemble/Install/Test All Parts.
1.02	1.02.07	1.02.07.03			<b>TPC Cooling System</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Identity Components For The TPC Cooling System And Procure And Construct The Elements Of The System. Work Statement: Provide All Parts To Produce The Cooling System And Assemble/Install/Test All Parts.
1.03					<b>EMCAL</b>	The Electromagnetic Calorimeter (EMCAL) For The sPHENIX Experiment At RHIC
1.03	1.03.01				<b>EMCAL Block Fabrication</b>	Production Of Tungsten Powder/Epoxy/Scintillating Fiber Absorber Blocks For EMCAL Prototypes And Final Detector. Includes Assembling Fiber Arrays, Casting The Blocks, And Machining To Design Dimensions. There Are 24 Shapes Of Blocks Required To Incorporate The Tilt Required As A Function Of The Polar Angle Of A Block's Installed Position In sPHENIX..
1.03	1.03.01	1.03.01.01			<b>EMCAL Prototype V2.1 Block Production</b>	Produce 12 Tungsten Powder/Epoxy/Scintillating Fiber Absorber Blocks For v2.1 Prototype
1.03	1.03.01	1.03.01.02			<b>EMCAL Preproduction Prototype Block Production</b>	Produce 96 Tungsten Powder/Epoxy/Scintillating Fiber Absorber Blocks For The Pre-Production Prototype
1.03	1.03.01	1.03.01.02	1.03.01.02.01		<b>Order Material for preproduction prototype Sector 0</b>	Procure Materials Necessary To Produce Preproduction Prototype, Including: Scintillating Fiber, Tungsten Powder, Screens, Epoxy, For Sector 0
1.03	1.03.01	1.03.01.02	1.03.01.02.02		<b>Fabricate blocks for preproduction prototype Sector 0</b>	Fabricate (Cast And Machine) 96 EMCAL Blocks For Sector 0. Four Blocks Of Each Of The 24 Required Shapes, All For Sector 0
1.03	1.03.01	1.03.01.02	1.03.01.02.03		<b>Pack and ship preproduction blocks to BNL Sector 0</b>	Securely Pack And Ship Finished, Dimensioned Blocks For Sector 0 To BNL For Assembly Into Prototype.
1.03	1.03.01	1.03.01.02	1.03.01.02.04		<b>Order Material for EMCAL Block Preproduction</b>	Order Material For EMCAL Preproduction Blocks For Sectors 1-12. There Are 96 Blocks Per Sector And 12 Sectors, For 1152 Blocks.
1.03	1.03.01	1.03.01.02	1.03.01.02.05		<b>Fabricate EMCAL Prepro Blocks Sectors 1-12</b>	Fabricate EMCAL Preproduction Blocks For Sectors 1-12
1.03	1.03.01	1.03.01.02	1.03.01.02.06		<b>Pack and ship EMCAL Blocks for Prepro Sectors 1-12 to BNL</b>	Pack And Ship EMCAL Preproduction Blocks For Sectors 1-12 To BNL
1.03	1.03.01	1.03.01.03			<b>EMCAL Final Block Production</b>	Produce 72*52=3744 Tungsten Powder/Epoxy/Scintillating Fiber Absorber Blocks For Sectors 13-64 For The Final sPHENIX EMCALorimeter
1.03	1.03.01	1.03.01.03	1.03.01.03.01		<b>Order Material for EMCAL Final Block Production</b>	Order Material For EMCAL Production Blocks For Sectors 13-64. There Are 96*0.75=72 Blocks Per Sector And 52 Sectors, For 3744 Blocks. The Factor (0.75=72/96) Accounts For Limited Polar Angle Coverage For These 52 Sectors.
1.03	1.03.01	1.03.01.03	1.03.01.03.02		<b>Fabricate final blocks</b>	Fabricate (Cast And Machine) 52*72=3744 EMCAL Blocks For 52 Sectors. There are 4*52=208 Blocks Of Each Shape.
1.03	1.03.01	1.03.01.03	1.03.01.03.03		<b>Pack and ship final blocks to BNL</b>	Securely Pack And Ship Finished, Dimensioned Blocks To BNL For Assembly Into Sectors 13-64.
1.03	1.03.01	1.03.01.04			<b>EMCAL Block Fabrication Procurement</b>	Establish contract with U Illinois Urbana-Champaign for Labor of Experienced Senior Technician, Technicians, and Students for EMCAL Block Preparation, Assembly, and Fabrication, and For Necessary Supporting M&S

1.03	1.03.02				<b>EMCAL Module Fabrication and Sector Assembly</b>	Assembly Of EMCAL Blocks Into "Modules" Of 1 Block Each, And Then Assembly Of Modules Into Sectors (Sectors 1-12 have 96 Modules, Sectors 13-64 have 72 Modules). Sectors Are The Assembled Calorimeter Unit That Contains The Blocks, Electronics, And Cooling. Sixty-Four Finished Sectors Will Be Assembled Into The Final sPHENIX Electromagnetic Calorimeter In The Experimental Hall.
1.03	1.03.02	1.03.02.01			<b>Set up Module Fabrication, Sector Assembly and Test area</b>	Set Up And Organize Space And Furnishing For Module And Sector Production Work. This Includes Areas For Receiving/Unpacking, Preparation And Storage Of Blocks, Assembly Of Modules, Assembly Of Sectors, Testing Of Assembled Sectors, And Storage Of 64 Completed Sectors Prior To Installation. Equipment Necessary To Move ~900Lb Sectors.
1.03	1.03.02	1.03.02.02			<b>EMCAL Module Fabrication</b>	Assembly Of EMCAL Absorber Blocks, Received From U Illinois at Urbana-Champaign (UIUC), Into Modules Of 1 Block each. This Includes Preparation Of The Blocks: Attaching Light Guides, Reflectors, and Optical Sensors PCBs To Each Block.
1.03	1.03.02	1.03.02.02	1.03.02.02.01		<b>EMCAL Prototype v2.1 Module Fabrication</b>	Assembly Of The 12 Delivered Prototype v2.1 EMCAL Blocks, After The Addition Of The Lightguides, Reflectors, Optical Sensors, And Mounting Hardware, Into "Modules" Of 1 Block Each.
1.03	1.03.02	1.03.02.02	1.03.02.02.02		<b>EMCAL Preprod Sector 0, 1-12 Module Fabrication</b>	Assembly Of The 96 Delivered EMCAL Blocks, After The Addition Of The Lightguides, Reflectors, and Optical Sensors PCBs, Into 96 "Modules" For Sector 0. Assembly Of The 1152 Delivered EMCAL Blocks, After The Addition Of The Lightguides, Reflectors, and Optical Sensors PCBs, Into 1152 "Modules" For Sectors 1-12.
1.03	1.03.02	1.03.02.02	1.03.02.02.03		<b>EMCAL Final Module Fabrication</b>	Assembly Of The 3744 Delivered EMCAL Blocks, After The Addition Of The Lightguides, Reflectors, and Optical Sensors PCBs, Into 3744 "Modules" For Sectors 13-64
1.03	1.03.02	1.03.02.03			<b>EMCAL Sector Assembly</b>	Assembly Of EMCAL Sectors: Installation Of Modules Into Sector Boxes, Including Epoxying Modules To Sawteeth on Backplane, Installation Of Readout Electronics, Cabling, And Cooling. This BoE Covers The Effort For Construction Of The EMCAL Sectors. 64 Sectors Are Required, 32 "North" configuration and 32 "South" configuration.. The Sectors Are Stainless Steel Sheet Metal Construction Connected To A Strongback And Are Supported By 22 Bearing Blocks Mounted To Two Rails. Each 150 cm Long Sector Includes 5 Sheet Metal Sides, A Machined Strongback, 8 machined Aluminum "Sawteeth" Module Positioning Parts, 22 Bearing Spacer Blocks. All Material Is Aluminum or 300-Series Stainless Steel. Each Sector Requires Machining For Dozens Of Fasteners And Floating Nuts.
1.03	1.03.02	1.03.02.03	1.03.02.03.01		<b>EMCAL Prototype v2.1 Sector Assembly</b>	Assembly Of 16 Modules Into The Detector Housing for the v2.1 EMCAL Prototype. Includes The Addition Of The Readout Electronics And Cooling.
1.03	1.03.02	1.03.02.03	1.03.02.03.02		<b>EMCAL Preproduction Sector Assembly and Testing</b>	Assembly Of 96 Modules Into A Sector Enclosure, The Addition Of Readout Electronics, And Cooling For Sector 0. Testing Will Include Checking LED Signals, Thermal Stability, Electronic Functionality, Cosmic Ray Testing. Assembly Of 1152 Modules Into Sector Enclosures, The Addition Of Readout Electronics, And Cooling For Sectors 1-12. Testing Will Include Checking LED Signals, Thermal Stability, Electronic Functionality, Cosmic Ray Testing.
1.03	1.03.02	1.03.02.03	1.03.02.03.03		<b>EMCAL Final Production Sector Assembly</b>	Production Assembly Of 72 Modules per Sector Into 52 Sector Enclosures, The Addition Of Readout Electronics, And Cooling For Sectors 13-64. Testing Will Include Checking LED Signals, Thermal Stability, Electronic Functionality, and Cosmic Ray Testing.
1.04					<b>HCAL</b>	The Hadronic Calorimeter (HCAL) For The sPHENIX Experiment At RHIC
1.04	1.04.01				<b>Inner HCAL Support Structure &amp; Support Rings</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Design And Procure The Support Structure of the Inner Hadronic Calorimeter (Inner HCAL) And The Support (End) Rings for the Inner HCal. Work Statement: Design And Procure The Support Structure And The Support (End) Rings for the Inner HCAL
1.04	1.04.02				<b>Outer HCAL Sector Mechanical Structure</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Identity Components For The Outer HCAL Mechanical Structure Including Splice Plates And Lifting Fixture, And Design And Construct These Mechanical Elements Of The Outer Hadronic Calorimeter Mechanical Structure. Work Statement: Provide Splice Plates And Lifting Fixture For The Outer Hadronic Calorimeter Mechanical Structure.



1.04	1.04.03				<b>Outer HCAL Procure Scintillating Tiles</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Design And Manufacture The Outer Hadronic Calorimeter Scintillating Tile Assemblies And Their LED/Calibration Fiber System. Work Statement: Provide Scintillating Tiles For The Outer Hadronic Calorimeter And Provide The LED/Calibration Fiber System
1.04	1.04.04				<b>Outer HCAL Sector Assembly And Testing</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Prototype And Test The Outer HCAL v2.0 And v2.1 Prototypes And Then Assemble The Outer Hadronic Calorimeter Sectors And Test Them. Work Statement: Prototype And Test Outer HCAL Design. Provide Tested Outer Calorimeter Sectors, Ready For Installation Into sPHENIX
1.04	1.04.04	1.04.04.01			<b>Outer HCAL Sector Assembly and Testing - Preproduction</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Prototype And Test The Outer HCAL v2.0 And v2.1 Prototypes. Work Statement: Prototype And Test Outer HCAL Design. Procure Supporting Student Labor from Georgia State U.
1.04	1.04.04	1.04.04.02			<b>Outer HCAL Sector Assembly and Testing - Production</b>	Technical Scope: This Item Contains All Tasks Which Are Required To Assemble The Outer Hadronic Calorimeter Sectors And Test Them. Work Statement: Provide Tested Outer Calorimeter Sectors, Ready For Installation Into sPHENIX. Procure Supporting Student Labor from Georgia State U.
1.05					<b>CALORIMETER ELECTRONICS</b>	The Calorimeter Electronics For The sPHENIX Experiment At RHIC
1.05	1.05.01				<b>SiPMs</b>	This Work Package Covers The Procurement And Q/A Testing Of The Preproduction And Production Optical Sensors For The EMCAL And HCAL Detectors.
1.05	1.05.02				<b>Calorimeter Front End Electronics</b>	This Covers The Design, Fabrication And Q/A Testing Of The Preproduction And Production Calorimeter Front End Electronics.
1.05	1.05.02	1.05.02.01			<b>EMCAL Electronics: Preproduction</b>	The Work Package Covers The Design, Layout, Fabrication And Q/A Testing Of The EMCAL Preproduction Prototype Electronics. It Will Deliver A Total Of 384 Channels Of EMCAL Frontend Electronics For The Sector 0 Preproduction And 4608 Channels For The Sector 1-12 Preproduction Modules.
1.05	1.05.02	1.05.02.02			<b>EMCAL Electronics: Production</b>	The Work Package Covers The Design, Layout, Fabrication And Q/A Testing Of The EMCAL Production Electronics. It Will Deliver A Total Of 14976 Channels Of EMCAL Frontend Electronics For Sectors 13-64, Allowing For The Reduced Polar Angle Coverage Of These Sectors Of The EMCAL.
1.05	1.05.02	1.05.02.03			<b>HCAL Electronics: Preproduction</b>	The Work Package Covers The Design, Layout, Fabrication And Q/A Testing Of The HCAL Preproduction Prototype Electronics. It Will Deliver A Total Of 288 Channels Of HCAL Frontend Electronics, Covering 6 Sectors Of 48 Channels Each.
1.05	1.05.02	1.05.02.04			<b>HCAL Electronics: Production</b>	The Work Package Covers The Design, Layout, Fabrication And Q/A Testing Of The HCAL Production Electronics. It Will Deliver A Total Of 1248 Channels Of HCAL Frontend Electronics Covering 26 Sectors Of 48 Channels Each.
1.05	1.05.02	1.05.02.05			<b>Calorimeter Front End Electronics Procure Contracted Labor and M&amp;S</b>	This Work Package Covers the Procurement of Student and Technician Labor as well as Required Supporting M&S at U Michigan for Testing SiPMs and EMCAL Electronics Modules, and Includes Establishing the Necessary Contract with U Michigan to Accomplish This
1.05	1.05.03				<b>Calorimeter Digitizer System</b>	This Covers The Design, Fabrication And Q/A Testing Of The Preproduction And Production Calorimeter Digitizer Electronics.
1.05	1.05.03	1.05.03.01			<b>Calorimeter Digitizer: Preproduction Prototype</b>	This Work Package Covers The Final Design, Layout And Fabrication For The Preproduction Digitizers Needed For The sPHENIX EMCAL And HCAL Detectors. The EMCAL Requires A Total Of 364 Channels, Covering One Sector, And The HCAL Requires A Total Of 48 Channels, Covering One HCAL Sector, From The First Half-Crate Fabrication. EMCAL Obtains Another 4224 Channels From The 7-Crate Fabrication For The EMCAL Preproduction Sectors 1-12 (WBS 1.3.2.3.2)
1.05	1.05.03	1.05.03.02			<b>Calorimeter Digitizers: Production</b>	This Work Package Covers The Final Design, Layout And Fabrication For The Production Digitizers Needed For The sPHENIX EMCAL And HCAL Detectors. The EMCAL Requires A Total Of 19584 Channels, And The HCAL Requires A Total Of 1536 Channels. The Digitizer System Consists Of The 64 Channel ADC Digitizer Boards, XMIT Boards, Controller Boards, Clock Master Boards, Trigger Transmitter Modules, Crates, Associated Power Supplies, And Patch Fibers From The Digitizer Crates To The Local Patch Panel In The 1008 Interaction Region.

1.06					<b>DAQ/TRIGGER</b>	The Data Acquisition And Trigger System For The sPHENIX Experiment At RHIC
1.06	1.06.01				<b>DAQ</b>	This Work Package Covers The Development Cycles Of The Data Acquisition (DAQ) System, From Design To Final Commissioning
1.06	1.06.01	1.06.01.01			<b>DAQ Design</b>	This Work Package Covers The Initial Design Of The Data Acquisition System, Functions, And High-Level Components And Boards.
1.06	1.06.01	1.06.01.02			<b>DAQ Prototype</b>	This Work Package Delivers The First Prototype Of The DAQ System That Demonstrates The Proper Functioning Of The System. We Expect This Prototype To Be Usable For Test Beams And Other Related R&D Efforts.
1.06	1.06.01	1.06.01.03			<b>DAQ Production</b>	This Work Package Covers The Final Production And Installation Of The DAQ System.
1.06	1.06.02				<b>Local Level 1 Trigger (LL1)</b>	This Work Package Covers The Development Cycles Of The Local Level 1 Trigger System, From Design To Final Commissioning. This Trigger Forms Higher-Level Trigger Signals From Individual Detectors, Such As The EMCAL, And Passes Them On To The Global Level 1 System. Due To The Complexity Of This System, We Foresee 2 Prototype Stages Here.
1.06	1.06.02	1.06.02.01			<b>LL1 Trigger Design</b>	This Work Package Covers The Design Of The Local Level 1 Trigger System, Selection Of Hardware Platforms To Use, And A Tentative Selection Of Boards To Use
1.06	1.06.02	1.06.02.02			<b>LL1 Trigger Prototype v1</b>	This Work Package Covers The First Prototype Of The Local Level 1 Trigger System. This Is Considered A Proof-Of-Principle That The Design From 1.6.2.1 Is Viable, And Will Be Used To Determine Required Changes, If Any.
1.06	1.06.02	1.06.02.03			<b>LL1 Trigger Preproduction Prototype</b>	This Work Package Covers The Preproduction Version The Local Level 1 Trigger System, Which Implements The Changes Derived From 1.6.2.2. This Will Be The Final Check That The System Performs As Designed.
1.06	1.06.02	1.06.02.04			<b>LL1 Trigger Production</b>	This Work Package Covers The Production, Installation, And Commissioning Of The Local Level 1 Trigger System.
1.06	1.06.03				<b>Global Level 1 Trigger (GL1)</b>	This Work Package Covers The Development Cycles Of The Global Level 1 (GL1) System, From Design To Final Commissioning. The GL1 Manages The Triggering And Busy States Of The Detector, And Receives, In Addition To The Minimum Bias Information, The Outputs Of The Local Level 1 Triggers.
1.06	1.06.03	1.06.03.01			<b>GL1 Trigger Design</b>	This Work Package Covers The Design Of The Global Level 1 System. We Will Select The Hardware Components, And Design The Software And Firmware Components.
1.06	1.06.03	1.06.03.02			<b>GL1 Trigger Prototype</b>	This Work Package Covers The Prototype Of The GL1 System. This Will Demonstrate The Viability And Proper Functioning Of The Design, And Show Any Problems In The Initial Design, Which Will Then Be Addressed.
1.06	1.06.03	1.06.03.03			<b>GL1 Trigger Production</b>	This Work Package Covers The Final Production, Installation, And Commissioning Of The GL1 System.
1.06	1.06.04				<b>Timing System</b>	This Work Package Covers The Development Cycles Of The Timing System , From Design To Final Commissioning. The Timing System Communicates The Accelerator Clock To The Front-End, And Also Communicates Which Beam Crossings Have Been Selected For Readout.
1.06	1.06.04	1.06.04.01			<b>Timing System Design</b>	This Work Package Covers The Design Of The Timing System . Several Decisions About Re-Designing Boards Will Have To Be Taken, And Other Boards Will Need To Be Selected.
1.06	1.06.04	1.06.04.02			<b>Timing System Prototype</b>	This Work Package Covers The Prototype The Timing System . We Expect This To Be Usable For The Subset Of The Installed Detector System, And Aid In The Commissioning Of The Detector System.
1.06	1.06.04	1.06.04.03			<b>Timing System Production</b>	This Work Package Covers The Final Production, Installation, And Commissioning Of The Timing System .

1.07					<b>MIN BIAS TRIGGER DETECTOR</b>	The Minimum Bias Trigger Detector (MBD) For The sPHENIX Experiment At RHIC. There are Four Work Packages. The First Will Test Existing PHENIX MBD Photomultiplier Tubes (PMTs) With Laser And In Magnetic Field To Understand Their Parameters For Operation In sPHENIX As The Photosensor For The MBD. The Second Will Develop A Discriminator/Shaper Prototype Board That Will Stretch The PMT Pulses In Time To Be Optimized For The Sampling Frequency Of The sPHENIX 60 MHz ADC Digitizers. The Board Will Create A Fast Discriminator Circuit Capable Of Satisfying The sPHENIX Min Bias Trigger Requirements. The Third Will Purchase The Front-End Electronics for the MBD And Test Them With Full MBD In The Lab Using A Calibration System To Make Sure All Channels Are Working To Full Potential. The Fourth Will Bench Test The Electronics For The MBD To Certify They Are Ready For Installation.
<b>WBS L2</b>	<b>WBS L3</b>	<b>WBS L4</b>	<b>WBS L5</b>		<b>WBS Name</b>	<b>Dictionary Definition</b>
2.01					<b>INFRASTRUCTURE/FACILITY MANAGEMENT</b>	Management for the Magnet, Cradle/Carriage, Infrastructure, Facility and Installation Work For sPHENIX
2.01	2.01.01				<b>Infrastructure/Facility Overview</b>	Key RHIC Run Dates, which influence the Installation Schedule as well as the Infrastructure Work schedule
2.01	2.01.02				<b>Magnet Management and Technical Oversight</b>	Provide Oversight And Management For All Of WBS 2.2 sPHENIX Magnet, including all Magnet Support Systems including Cryogenic Systems and Power Supply, and Magnet Mapping
2.01	2.01.03				<b>Carriage and Structural Component Management</b>	Provide Oversight And Management for All Of WBS 2.3 Cradle Carriage, including the Cradle Carriage, Inner Detector Supports, Barrel Steel, End Caps/Pole Tips, and CC Bridge, Mid Platforms and Access
2.01	2.01.04				<b>Infrastructure Management</b>	Provide Oversight And Management For All Of WBS 2.4 Infrastructure, including Detector Support Systems And Facility Support Systems
2.01	2.01.05				<b>Installation Management</b>	Provide Oversight And Management For All Of WBS 2.5 Installation, including Subsequent Commissioning Work
2.02					<b>SC MAGNET</b>	The Superconducting Magnet For The sPHENIX Experiment At RHIC
2.02	2.02.01				<b>Safety Reviews, Cooldown, Power Tests</b>	Reviews and Commissioning Tasks for the sPHENIX Magnet
2.02	2.02.01	2.02.01.01			<b>Safety Reviews</b>	Various Laboratory Safety Reviews Before The Superconducting Magnet Can Be Operated In 1008 Including Electrical And Cryogenic Hazards.
2.02	2.02.01	2.02.01.02			<b>Cooldown &amp; Power Tests</b>	This Work Package Covers Mainly The Cryogenic Commissioning Operational Processes Plus Initial Power Tests



2.02	2.02.02				<b>Magnet Transport &amp; Assembly</b> The Costs Associated With This Item Are For Both Labor And Materials. The Labor Is The Effort By Engineers, Technicians And Other Personnel Associated With The Preparation Of The Magnet , Valve Box Extension And Valve Box For Shipment From Building 912 To The Experimental Hall, And Reassembly Of The Valve Box And Valve Box Extension To The Magnet In The Experimental Hall As Described In The Infrastructure Design WBS Dictionary Entry. Material Costs Are For Consumables Used In The Installation Of Valve Box And Valve Box Extension To The Magnet. All Labor And Material Estimates For This Are Based On Engineering Estimates. This Item Includes All Tasks Required For Disassembly Of The Valve Box From The Magnet, Preparation Of The Magnet, Valve Box Extension And Valve Box For Shipment From Building 912 To The Experimental Hall, And Installation Of The Valve Box And Valve Box Extension To The Magnet As Described In The Infrastructure Design WBS Dictionary Entry. The Efforts Required To Complete This WBS Item Are Described For The Various Subtasks As Follows:  Magnet System Installation - This Task Encompasses Disassembly Of The Valve Box From The Magnet In Building 912, Preparation Of Magnet And Valve Box For Transport To The Experimental Hall, Reassembly Of The Valve Box And Valve Box Extension To The Magnet In The Experimental Hall, And In Situ Inspections Of The Magnet.  Deliverable: Magnet As Installed And Aligned To Calorimeter, Connected To The Valve Box And Valve Box Extension, And Ready To Be Connected To Cryogenic Service Lines And Powered After Upper Calorimeter Installation.
2.02	2.02.03				<b>Magnet Cryogenic Systems</b> The Cryogenic Systems For The sPHENIX Magnet
2.02	2.02.03	2.02.03.01			<b>Helium System: 1008BColdbox, Transferlines, &amp; IR8 Coldbox</b> Three Major Pieces Of Cryogenic Equipment Are Procured, Installed, And Connected To Auxiliary Systems, Utilities, And Infrastructure And Connected To Control Systems And Tested And Ready For Commissioning Of Magnet. 1. RHIC Interfacebox: The Valve Box /Interface Cryostat Will Contain Cryogenic Control Valves, Reliefs, And Instrumentation And Will Interface Both To The RHIC Cryo Distribution System With A Set Of Fields Joints And With Item 2 Helium Transfer System 2. Helium Transfer System: This Vacuum Jacketed Transfer Line Piping System Will Transport The Cryogen Between The RHIC Interface Box To The Solenoid's Side Interface Box Cryostat, Item 3. 3. This Is The Side Cryostat On The Solenoid Platform For The 4.5K Helium System And LN2 Cooling System. It Will Include The LN2 Precooling Heat-Exchangers, The Liquid Helium Reservoir, And Control Valves In A Cryostat On The Platform Next To The Solenoid Valve-Box.

2.02	2.02.03	2.02.03.01	2.02.03.01.01		<b>Engineering and Design</b>	<p>Process Engineering: To Determine All Operating Configurations Required For Normal 4.5K Operation With RHIC Cryogenic System, And The 80K System For Summer Shutdown Operations, Along With Operations In The Assembly Hall. Defines And Calculate All Steady State, Cooldown And Warmup Process Requirements For The Various Modes/Configurations. Perform Pressure Drop Calculation For All Operating Modes To Size Piping. Developed Detailed System Design And Piping And Instrumentation Diagrams. Size Heat-Exchangers/Boilers, Heaters, Control Valves And Trims. Size Relief Devices Based On Normal Operating Modes And Failure Cases. Define Control Logic Requirements. Define Instrumentation Requirements. Perform ODH Analysis For The Project.</p> <p>Mechanical Engineering: Prepare SOW And Technical Specifications Documents To Manufacture The Equipment Per ASME BPVC Sect 8 Div1 And Per ASME B31.3 Piping Code.</p> <p>Perform Pipe Stress Analysis, Piping Support Analysis For Piping Interface Tie-Ins To RHIC Cryo Distribution Lines At The Interconnect With The RHIC Interface Valvebox Per ASME B31.3 Piping Code.</p> <p>Engineering And Drawings Packages For The Field Joint Work Interface Tie-Ins To RHIC Cryolines</p> <p>A. Pipe Stress Analyses  B. Relief Calculations  C. Drawings Package With Weld Map And BOM</p>
2.02	2.02.03	2.02.03.01	2.02.03.01.02		<b>Design/Drafting</b>	<p>General Arrangement Layout For The Entire Cryogenic System Starting In 1008 To The Cryo Equipment At The Solenoid's Platform.</p> <p>Envelope Drawings Will Be Made For This System To Be Issued For The Procurement Package Of This System.</p> <p>Overall Detail Piping Dwgs For Interface Piping Tie-Ins To The RHIC Cryolines.</p> <p>Drawing Package For The Piping Supports For This System's three Components. This Will Be For The Piping Supports To Hold The Helium Transfer Lines System That Is Between The RHIC Interface Box And The Cryo Equipment Coldbox At The Solenoid.</p>
2.02	2.02.03	2.02.03.01	2.02.03.01.03		<b>Procurement</b>	<p>Issue RFP Package For Bid.</p> <p>Evaluate Bid With Technical Evaluation Panel.</p> <p>Award Contract.</p>
2.02	2.02.03	2.02.03.01	2.02.03.01.04		<b>Vendor Manufacturing - Helium System: 1008B Coldbox, Transferlines, &amp; IR8 Coldbox</b>	<p>Manage And Interface With Vendors During The Procurement Cycle, Hold Design Reviews, Review Vendor QA Plan, Witness Hold Points, And Manage And Update Schedule With Vendor.</p>
2.02	2.02.03	2.02.03.01	2.02.03.01.04	2.02.03.01.04.01	<b>Vendor Engineering and Design</b>	<p>Vendor work under Contract to Perform Engineering and Design Work for Helium Interface, Including Design Reviews, Final Drawing Approval, and Procurement of Long-Lead Components, plus BNL Work to Conduct the Reviews and Approve Procurements</p>
2.02	2.02.03	2.02.03.01	2.02.03.01.04	2.02.03.01.04.02	<b>Vendor Fabrication</b>	<p>Vendor work under Contract to Manufacture the Helium Interface and Ship it to BNL, and BNL Work to Conduct Materials Approvals, Perform Holdpoint Reviews and Receipt Inspection.</p>
2.02	2.02.03	2.02.03.01	2.02.03.01.05		<b>Delivery and receiving</b>	<p>This Includes Rigging, Truck Unloading And Inspection Of The Cryogenic Components.</p>
2.02	2.02.03	2.02.03.01	2.02.03.01.06		<b>Installation</b>	<p>Manage/Supervise Installation Of The Equipment. Coordinate With Various Groups During The Installation. Perform Pressure And Leak Check And Test, And Check Out Equipment Along With Control System In Operation.</p>

2.02	2.02.03	2.02.03.02			<b>LN2 supply transfer line system</b>	Level 1 And Level 2 Engineer And Designer Labor Spent On Engineering, Design, Oversight And Managing Of These Engineering And Design Activities For The Cryogenic Equipment And Its Subsystems To Be Procured For The LN2 Supply Transfer Line System. Includes Design Documents And Drawings, Specification And SOW'S, Engineering Analyses, Presentations, Reports, Budgeting, And Preparation Of Procurement Bid Package. Procurement Of The Equipment: Execute RFQ/RFP, And Procurement Of This System. Manage And Interface With Vendors During The Procurement Cycle, Update Schedule Based On Procurement Progress. Prepare And Hold Review With Laboratory'S LESHG-PSSC Safety Review. Fabrication Of The Equipment By Vendor, Interface With Vendor And Hold Design Reviews As Called Out In SOW. Review Vendor QA Plan. Do Vendor Visits As Required To Witness Hold Points. Installation And Testing Of The Equipment By BNL Staff/Subcontractors. Manage And Interface With Staff And Subcontractors To Install The Equipment.
2.02	2.02.03	2.02.03.02	2.02.03.02.01		<b>Engineering and Design, LN2 supply transfer line system</b>	Process Engineering: To Determine Requirements For The LN2 Supply System, Design Pressures, Temperature, Flow/Usage Rate, Pipe Sizing, And Relief Requirements And Control Logic Requirements. Mechanical Engineering: Prepare SOW And Technical Specifications Documents To Manufacture The Equipment Per ASME B31.3 Piping Code. Piping Support System To Support The LN2 Transfer Line System Between The LN2 Storage The Platform Cryostat At The Solenoid.
2.02	2.02.03	2.02.03.02	2.02.03.02.02		<b>Design/Drafting, LN2 supply transfer line system</b>	General Arrangement Layout From The LN2 Supply Line And Overall Detail Piping Dwgs For Interface Piping Tie-Ins To LN2 Storage Dewar At 1008. Drawing Package For Procurement Of The LN2 Supply System.
2.02	2.02.03	2.02.03.02	2.02.03.02.03		<b>Procurement, LN2 supply transfer line system</b>	Issue RFQ Package For Bid. Evaluate Bids. Award Contract.
2.02	2.02.03	2.02.03.02	2.02.03.02.04		<b>Fabrication at Vendor, LN2 supply transfer line system</b>	Manage And Interface With Vendors During The Procurement Cycle, Hold Design Reviews, Review Vendor QA Plan, Witness Hold Points, And Manage And Update Schedule With Vendor.
2.02	2.02.03	2.02.03.02	2.02.03.02.04	2.02.03.02.04.01	<b>Vendor Engineering and Design</b>	Vendor work under Contract to Perform Engineering and Design Work for LN2 Supply Transfer Line System, Including Design Reviews, Final Drawing Approval, and Procurement of Long-Lead Components, plus BNL Work to Conduct the Reviews and Approve Procurements
2.02	2.02.03	2.02.03.02	2.02.03.02.04	2.02.03.02.04.02	<b>Vendor Fabrication</b>	Vendor work under Contract to Manufacture the LN2 Supply Transfer Line System and Ship it to BNL, and BNL Work to Conduct Materials Approvals, Perform Holdpoint Reviews and Receipt Inspection.
2.02	2.02.03	2.02.03.02	2.02.03.02.05		<b>Delivery and receiving, LN2 supply transfer line system</b>	This Includes Rigging, Truck Unloading And Inspection.
2.02	2.02.03	2.02.03.02	2.02.03.02.06		<b>Installation, LN2 supply transfer line system</b>	Manage/Supervise Installation Of The Equipment. Coordinate With Various Groups During The Installation. Perform Pressure And Leak Check And Test And Check Out Equipment Along With Control System Operation.
2.02	2.02.03	2.02.03.03			<b>Warm Piping System</b>	This Item Includes All Tasks Required To Finalize Engineering Of The Warm Piping Systems, Vent Piping Systems, Specify Valves, And Piping Supports Per ASME B31.3 Piping Code, To Produce A Final Drawing Package For Field Construction Of The Warm Piping, Relief Piping, And Vents Systems Including Piping Supports, And To Procure The Piping, Warm Valves, Relief Systems, Piping Supports, Other Miscellaneous Utility Requirements. It Also Includes Preparation Of The Quality Documents For The Installation/Fabrication Phase.
2.02	2.02.03	2.02.03.03	2.02.03.03.01		<b>Engineering and Design, Warm Piping System</b>	Perform Mechanical Engineering Calculations And Pipe Stress Calculation For The Warm Piping, Relief Piping, And Vents Systems As Well As The Piping Supports For This System.

2.02	2.02.03	2.02.03.03	2.02.03.03.02		<b>Design/Drafting, Warm Piping System</b>	Produce A General Arrangement Layout Drawing, Final Detailed Drawing Package For Field Construction Of The Warm Piping, The Relief Piping, And The Vents Systems Including Piping Supports.
2.02	2.02.03	2.02.03.03	2.02.03.03.02	2.02.03.03.02.01	<b>Warm Piping tie in to WR header</b>	Perform Analyses and Prepare Detailed Drawing Package and Weld Map for the Tie-in of the Warm Piping to the Warm Return Header
2.02	2.02.03	2.02.03.03	2.02.03.03.02	2.02.03.03.02.02	<b>Warm Piping tie in bldg 1010B compressor</b>	Perform Analyses and Prepare Detailed Drawing Package and Weld Map for the Tie-in of the Warm Piping to the Compressor in Building 1010B
2.02	2.02.03	2.02.03.03	2.02.03.03.02	2.02.03.03.02.03	<b>GN2 Vent Line from platform coldbox</b>	Perform Analyses and Prepare Detailed Drawing Package and Weld Map for the Gas-phase N2 Vent Line from the Platform Coldbox
2.02	2.02.03	2.02.03.03	2.02.03.03.02	2.02.03.03.02.04	<b>Warm Piping for summer 80K hold helium compressor loop</b>	Perform Analyses and Prepare Detailed Drawing Package and Weld Map for the Tie-in of the Warm Piping to the Summer 80K Hold Helium Compressor Loop (Current Leads Warm Piping)
2.02	2.02.03	2.02.03.03	2.02.03.03.03		<b>Procurement of materials, Warm Piping System</b>	Execute RFQ/RFP, And Procurement Of These Subsystems, Raw Materials And/Or Components. Manage And Interface With Vendors During The Procurement Cycle, And Update Schedule Based On Procurement Progress.
2.02	2.02.03	2.02.03.03	2.02.03.03.04		<b>Installation: Warm Piping systems</b>	Install The Warm Piping, Relief Piping, And Vents Systems Including Its Piping Supports. Inspect, Pressure Test And Leak Test The Piping System.
2.02	2.02.03	2.02.03.04			<b>Cryo Controls Hardware</b>	This Item Includes All Tasks Required To Engineer And Specify Equipment For The Control System Hardware And To Procure The Equipment, Build The Control Racks And Procure Or Build Other Control Panels / Junction Boxes. Procure The Cables Required Between The Racks And The Cryo Equipment And Interface, And Layout The Cable Trays. Complete The I/O Check Out And Test The Hardware Working With The Software.
2.02	2.02.03	2.02.03.04	2.02.03.04.01		<b>Engineering and Design</b>	Project Engineering & Management Execute Procurement Of These Components And Subsystems. Manage And Interface With Vendors During The Procurement Cycle, Update Schedule Based On Procurement Progress. Procure Instruments And Controllers/Conditioners, PLC And PLC Chassis Hardware, Power Supplies, Racks And Rack Components, Multi-Conductor Cables, Heater Controls Panels, And Junction Box Panels.  Controls And Instrumentation Engineering Develop Instrumentation List, I/O List, Wiring Diagrams For Rack And Junction Boxes. Develop Specifications For Heater Control Panels, Instrumentation, And Electrical Power Panels.
2.02	2.02.03	2.02.03.04	2.02.03.04.02		<b>Procurement</b>	Purchase The Various Hardware Components.
2.02	2.02.03	2.02.03.04	2.02.03.04.03		<b>Installation: Cryo controls hardware</b>	Install Cable Trays And Pull Cables. Install Racks, Junction Boxes, Cables, Instruments, And Wire-Up Racks I/O To Instruments, Control Panels, And Control Valves. Perform I/O Testing And Check-Out, Shakedown Between Rack And Instruments, And The End-To-End Check Out Between Software And Instruments/ Equipment.
2.02	2.02.03	2.02.03.05			<b>Cryo Controls Software</b>	This Item Includes All Tasks Required To Specify, Engineer, Program, And Test The Controls Software Required To Control The Cryogenic System For This Project. The Efforts Required To Complete This WBS Item Are Described For The Various Subtasks As Follows: Execute Engineering/Development, And Deployment And Testing Of The Control Software For This Project's Cryogenic System.
2.02	2.02.04				<b>Magnet Power Supplies/Controls/Quench Protection</b>	The Power Supply And SC Magnet Quench Detection Systems For The sPHENIX Magnet
2.02	2.02.04	2.02.04.01			<b>AC/DC Power Distribution</b>	This Covers The AC And DC Power Distribution Including Its Design, Procurement And Installation.

2.02	2.02.04	2.02.04.01	2.02.04.01.01		<b>Design AC/DC Power Distribution</b>	1. Design Of AC Power Distribution Includes: A. Evaluation Of Present AC Distribution. B. Addition Of New Switch Gear, And Disconnect Switches, If Necessary. C. Selection Of Cables And Interconnects. 2. Design Of DC Distribution Includes: A. Selection Of Cables And Interconnects. B. Connections Between The Power Supply, Energy Dump Resistor, And The Magnet. 3. Design Of Cable Tray System For: A. AC Power Distribution. B. DC Power Distribution. C. Signal Interconnects Including The Power Supply And The Quench Detector.
2.02	2.02.04	2.02.04.01	2.02.04.01.02		<b>Procure PS System Connections</b>	Procurement Of The Cables, Interconnects, Cable Tray.
2.02	2.02.04	2.02.04.01	2.02.04.01.03		<b>Install PS AC/DC Cabling</b>	Installation Of The Cable Tray, AC Power Distribution, DC Power Distribution, And Signal Cables.
2.02	2.02.04	2.02.04.02			<b>Power Supply</b>	The Includes Installing, Connecting And Testing The Existing Power Supply.
2.02	2.02.04	2.02.04.02	2.02.04.02.01		<b>Install Power Supply</b>	1. The Power Supply Will Be Moved To Its Final Location. 2. The AC Power Will Be Connected. 3. The DC Cabling Between The Power Supply, The Dump Resistor, And The Magnet Will Be Connected. 4. The Signal Cables Between The Power Supply, The Control System, The Energy Dump Resistor, And The Quench Detector Will Be Connected. 5. The Power Supply Will Be Tested.
2.02	2.02.04	2.02.04.03			<b>Quench Detector</b>	The Includes Installing, Connecting And Testing The Quench Detector. The Dump Resistor Exists And Is Installed With The Power Supply (WBS 2.2.4.2)
2.02	2.02.04	2.02.04.03	2.02.04.03.01		<b>Design Quench Detector System Connections</b>	This Is To Design The Interconnections Of The Quench Detector System (Which Has Already Been Used And Tested In The High-Field Test Of The SC Magnet At BNL) So That It Can Be Used In Building 1008.
2.02	2.02.04	2.02.04.03	2.02.04.03.02		<b>Procure Quench Detector System Connections</b>	Procurement Of The Signal Cables And Interconnects For The Quench Detector And Installation Of The Cables.
2.02	2.02.04	2.02.04.03	2.02.04.03.02	2.02.04.03.02.01	<b>Install Quench Detector</b>	Disconnect, Move, Re-Install and Test the Quench Detector for the SC Magnet, and Provide Documentation For It
2.02	2.02.05				<b>Magnet Field Measurements</b>	The Magnetic Field Measurement For The sPHENIX Magnet
2.02	2.02.05	2.02.05.01			<b>Magnet Field Measurements Engineering and Design, Field Studies and Stress Analysis</b>	Calculate the magnetic field of the solenoid coil and flux return with 2D and 3D models, and assess the perturbation of the field by magnetic materials inside the solenoid. Calculate stresses on magnetic components due to eddy currents in a quench. Calculate other magnetic forces and effects as necessary.
2.02	2.02.05	2.02.05.02			<b>Magnet Field Measurements Equipment Purchase and Fabrication</b>	Design and construct field monitoring equipment to be used during sPHENIX operation. Select the probes, design readout hardware, test and calibrate the probes.
2.02	2.02.05	2.02.05.03			<b>Magnet Field Measurements Installation and Test, Post-Test Field Studies and Stress Analysis</b>	Measure the field within the tracking volume after final installation of the solenoid into the flux return with an array of probes. The field mapping equipment and analysis are to be contracted to an outside group which will provide their own mapping equipment and analysis and deliver a 3D measured map of the field in the tracking volume which can be compared to the calculated field map in 2.02.05.01.



2.03					<b>CARRIAGE AND STRUCTURAL COMPONENTS</b>	<p>WBS 2.03 Includes The Design, Fabrication And Assembly Of The sPHENIX Carriage and Detector Support Systems, As Well as The Barrel Steel That Forms The SC Magnet Return Yoke, Organized As Follows:</p> <p>WBS 2.03.01. Cradle Carriage</p> <p>WBS 2.03.02. Internal Detector Structural Supports. Includes The Structural Support Mounting And Positional Alignment Features For The Inner HCAL/EMCAL, Superconducting Solenoid, TPC, INTT, MVTX And Min Bias Detector (MBD) Subsystems</p> <p>WBS 2.03.03. Flux Return Barrel Steel</p> <p>WBS 2.03.04. End Caps/Pole Tips Steel</p> <p>WBS 2.03.05 Upper (Bridge), Intermediate And Lower Carriage Work Platforms And Access (Stairs)</p>
2.03	2.03.01				<b>Cradle Carriage</b>	<p>Technical Scope:</p> <p>This Work Package Includes All Scientific, Engineering And Technical Staff Efforts To Analyze The Requirements For An Integrated Support ("Cradle Carriage") System, Which Will Support All Of The sPHENIX Experimental Detector Subsystems And The Effort Required To Fully Design The System. The Analyses Required To Determine The Components And Equipment Needed, The Design, Procurement And Acceptance Of Such Equipment The Work Includes The Cradle Carriage Itself, The Drive and Alignment System, Any Needed Seismic Restraints, And Any Needed Track Modifications. Reviews Of These Analyses Are Also In The Scope Of This Work Package.</p> <p>Work Statement:</p> <p>This Work Package Includes The Following Tasks:</p> <ol style="list-style-type: none"> <li>1. Evaluate The Requirements For The Structural Integrity, Accuracy, Stability And Repeatability For The Carriage With Respect To The Direct Support Of The Outer HCAL And The Indirect Support Of The Other Detector And Support Subsystems.</li> <li>2. Prepare Appropriate Drawings And Related Documentation</li> <li>3. Review The Design; Make Appropriate Modifications Per Review Recommendations</li> <li>4. Procure Equipment Needed To Implement This Design.</li> <li>5. Prepare The Equipment For Delivery To Building 1008, The sPHENIX Complex, Ready To Be Installed.</li> </ol>

2.03	2.03.02				<b>Inner Detector Rings and Interface to Mechanical Structural Supports</b>	<p>Technical Scope:</p> <p>This Work Package Includes All Scientific, Engineering And Technical Staff Efforts To Analyze The Requirements For An Integrated Support System Which Will Support All Of The sPHENIX Experimental Detector Subsystems Not Directly Supported By The Cradle Carriage And The Effort Required To Fully Design The System. The Analyses Required To Determine The Components And Equipment Needed, The Design, Procurement And Acceptance Of Such Equipment And Reviews Of These Analyses Are Also In The Scope Of This Work Package.</p> <p>Work Statement:</p> <p>This Work Package Includes The Following Tasks:</p> <ol style="list-style-type: none"> <li>1. Evaluate The Requirements For The Structural Integrity, Accuaracy, Stability And Repeatability For The Carriage With Respect To The Support Of The sPHENIX Superconducting Solenoid Magnet, And Inner Detector Subsystems (Inner HCAL , EMCAL, TPC, INTT, MVTX And Min Bias (MBD)) And Inner Detector Subsystem Utilities Support.</li> <li>2. Prepare Appropriate Drawings And Related Documentation</li> <li>3. Review The Design; Make Appropriate Modifications Per Review Recommendations</li> <li>4. Procure Equipment Needed To Implement This Design. This includes OHCAL Large Support Rings, beampipe supports, and internal supports for SC Magnet coil, IHCAL, EMCAL (as needed), TPC, INTT, MVTX and MBD.</li> <li>5. Prepare The Equipment For Delivery To Building 1008, The sPHENIX Complex, Ready To Be Installed.</li> </ol>
2.03	2.03.03				<b>Barrel Steel</b>	<p>Technical Scope:</p> <p>This Work Package Includes All Scientific, Engineering And Technical Staff Efforts To Analyze The Requirements For The Steel For The Barrel Part Of The SC Magnet Yoke. This Steel Serves A Second Purpose As The Absorber Material For The Outer HCAL. Design And Analyses, Procurement Etc., For The Equipment And Components Which Comprise The Barrel Steel, Lifting Fixtures And Supports For It, And Acceptance Testing Tooling Are Also In The Scope Of The Work Package.</p> <p>Work Statement:</p> <p>This Work Package Includes The Following Tasks:</p> <ol style="list-style-type: none"> <li>1. Evaluate The Requirements For The Barrel Steel, Lifting Fixtures And Supports, And Acceptance Testing Tooling</li> <li>2. Prepare Appropriate Drawings And Related Documentation</li> <li>3. Review The Design; Make Appropriate Modifications Per Review Recommendations Including Safety Considerations</li> <li>4. Procure Equipment Needed To Implement This Design. Manage The Vendor Contract For The Steel, Including Site Visits, Design Reviews, Reivew Of QA Plan, Inspection, And Reception Measurement And Testing.</li> <li>5. Prepare The Equipment For Delivery To Building 1008, The sPHENIX Complex, Ready To Be Installed.</li> </ol>

2.03	2.03.04			<b>End Caps/ Pole Tips</b>	<p>Technical Scope:</p> <p>This Work Package Includes All Scientific, Engineering And Technical Staff Efforts To Analyze The Requirements For The End Caps And Pole Tips Of The sPHENIX SC Magnet And Perform Safety Analyses Needed. Design And Analyses, Procurement Etc., For The Equipment And Components Which Comprise The End Caps And Pole Tips Are Also In The Scope Of This Work Package.</p> <p>Work Statement:</p> <p>This Work Package Includes The Following Tasks:</p> <ol style="list-style-type: none"> <li>1. Evaluate The Requirements For The End Caps And Pole Tips Of The sPHENIX SC Magnet And Perform Safety Analyses Needed.</li> <li>2. Prepare Appropriate Drawings And Related Documentation</li> <li>3. Review The Design; Make Appropriate Modifications Per Review Recommendations</li> <li>4. Procure Equipment Needed To Implement This Design.</li> <li>5. Prepare The Equipment For Delivery To Building 1008, The sPHENIX Complex, Ready To Be Installed.</li> </ol>
2.03	2.03.05			<b>CC Bridge, Mid Platforms and Access</b>	<p>Technical Scope:</p> <p>This Work Package Includes All Scientific, Engineering And Technical Staff Efforts To Analyze The Requirements For The Work Platforms And Access To These Work Platforms On The sPHENIX Cradle Carriage. Design And Analyses, Procurement Etc., For The Equipment And Components Which Comprise The Work Platforms And Access Are Also In The Scope Of This Work Package.</p> <p>Work Statement:</p> <p>This Work Package Includes The Following Tasks:</p> <ol style="list-style-type: none"> <li>1. Evaluate The Requirements For The Safe, Efficient And Effective Allocation Of Space For Magnet Cryogenics, Electrical And Control Equipment, Electronic Power, Monitoring And Service Racks And Patch Panels, Access And Egress And All Other Related Concerns.</li> <li>2. Prepare Appropriate Drawings And Related Documentation</li> <li>3. Review The Design; Make Appropriate Modifications Per Review Recommendations</li> <li>4. Procure Equipment Needed To Implement This Design.</li> <li>5. Prepare The Equipment For Delivery To Building 1008, The sPHENIX Complex, Ready To Be Installed.</li> </ol>
<b>INFRASTRUCTURE</b>					The Infrastructure For sPHENIX
2.04	2.04.01			<b>Infrastructure Detector Support Systems</b>	WBS 2.4.1 Is The Control Account For All Infrastructure Required To Support Operation Of The sPHENIX Detector Systems. This Includes Work To Prepare: Line Power Distribution, Cabling/Fiber Optics, Racks, Gas And Cooling Systems, Safety Systems, Gas Mixing House And Pad, Rack Room Modifications, And Control And Office Room Modifications.

2.04	2.04.01	2.04.01.01			<b>Line Electric Power Distribution</b>	<p>Technical Scope:  This Work Package Encompasses All Scientific, Engineering And Technical Staff Efforts To Plan And Supervise All Aspects Of The sPHENIX Line Electrical Requirements And Distribution Of Line Electricity To All Subsystems.</p> <p>Work Statement:  This Work Package Includes The Following Tasks:</p> <ol style="list-style-type: none"> <li>1. Evaluate The Existing Facility Electric Power Distribution System At Building 1008A To Adequately Supply sPHENIX Experimental Equipment. Perform A Load Flow And Short Circuit Analysis Starting From The 13.8kV/480V Substation 8A To The 480VAC Bus DP, Through To The 208VAC Bus DPA And Ending At The 208VAC Distribution Panels In The Intersection Region (IR).</li> <li>2. Perform An Arc Flash Calculation.</li> <li>3. Modify The Above System, As Required, Including But Not Limited To, Transformers, Circuit Breakers, Power Quality Instruments/Equipment To Facilitate Remote Monitoring &amp; Control, Cables, And Transient Voltage Surge Suppression (TVSS).</li> <li>4. Review The Design; Perform And Address Results Of Safety Reviews</li> <li>5. Procure Equipment Needed To Implement This Design.</li> <li>6. Prepare The Equipment For Delivery To Building 1008, The sPHENIX Complex, Ready To Be Installed</li> </ol>
2.04	2.04.01	2.04.01.02			<b>Detector Support Services Systems (including Cables, Fibers, Cable Trays)</b>	<p>Technical Scope:  This Work Package Encompasses All Scientific, Engineering And Technical Staff Efforts To Plan And Supervise All Aspects Of The Specification And Design Of Detector Support Services Including Cable Routing And Management, Fibers, Cooling Lines, Routing and Cable Manangement Of Monitoring And Control Lines, Etc., Including Cable Trays, Mounting Hardware Etc., Dry Air, N2 And Shop Air. Also Included In This Work Package Are Signal Lines (Fiber/Cable) Between On Carriage Racks And Rack Room Electronics.</p> <p>Work Statement:  This Work Package Includes The Following Tasks:</p> <ol style="list-style-type: none"> <li>1. Analyze Design Detector Support Services Systems Requirements</li> <li>2. Create Layout/Schematic Drawings &amp; Design, Specification Control Documents, Assembly &amp; Detail Drawings For Design Detector Support Services Systems</li> <li>3. Review Design Detector Support Services Systems Design/Safety, Address Action Items</li> <li>4. Prepare Detector Support Services Systems Components Procurement Package(s)</li> <li>5. Evaluate &amp; Process Detector Support Services Systems Components Bids</li> <li>6. Procure &amp; Deliver Detector Support Services Systems Components (Leadtime And Fabrication Included)</li> <li>7. Perform Detector Support Services Systems Components Acceptance</li> </ol>

2.04	2.04.01	2.04.01.03			<b>Detector Electronics Racks and Rack generic support systems</b>	<p>Technical Scope:</p> <p>This Work Package Encompasses All Scientific, Engineering And Technical Staff Efforts To Plan And Supervise All Aspects Of The Specification And Design Of Detector On Carriage Racks And Generic Control Safety Power Distribution.</p> <p>Work Statement:</p> <p>This Work Package Includes The Following Tasks:</p> <ol style="list-style-type: none"> <li>1. Design Individual Electronics Racks To House The Electronics Chassis For The sPHENIX Detector Subsystems.</li> <li>2. Design The Internal Rack Cooling Systems Consisting Of Water Piping, Heat Exchangers And Fan Trays .</li> <li>3. Design The Internal Rack Supervisory Control &amp; Data Aquisition System (SCADA) Including Safety Monitoring &amp; Alarms.</li> <li>4. Review The Design</li> <li>5. Procure Equipment Needed To Implement This Design.</li> <li>6. Prepare The Equipment For Delivery To Building 1008, The sPHENIX Complex, Ready To Be Installed</li> </ol>
2.04	2.04.01	2.04.01.04			<b>Detector Gas and Cooling Services Systems</b>	<p>Technical Scope:</p> <p>This Work Package Encompasses All Scientific, Engineering And Technical Staff Efforts To Plan And Supervise All Aspects Of The Specification And Design Of Detector Gas And Cooling Services Including Pipe/Tube Routing And Off Detector Distribution Panels, Control And Monitoring Cables And Cable Management. Generic Cooling And Gas Services- E.g. Dry Air, Dry N2- Are Included In This Work Package.</p> <p>Work Statement:</p> <p>This Work Package Includes The Following Tasks:</p> <ol style="list-style-type: none"> <li>1. Analyze Detector Gas And Cooling Services Systems Requirements</li> <li>2. Create Layout/Schematic Drawings &amp; Design, Specification Control Documents, Assembly &amp; Detail Drawings For Detector Gas And Cooling Services Systems</li> <li>3. Review Detector Gas And Cooling Services Systems Design/Safety; Address Action Items</li> <li>4. Prepare Detector Gas And Cooling Services Systems Components Procurement Package(s)</li> <li>5. Evaluate &amp; Process Detector Gas And Cooling Services Systems Components Bids</li> <li>6. Procure &amp; Deliver Detector Gas And Cooling Services Systems Components (Leadtime And Fabrication Included)</li> <li>7. Perform Detector Gas And Cooling Services Systems Components Acceptance</li> </ol>



2.04	2.04.01	2.04.01.05			<b>Detector Safety Subsystems</b>	<p>Technical Scope:</p> <p>This Work Package Encompasses All Scientific, Engineering And Technical Staff Efforts To Plan And Supervise All Aspects Of The Specification And Design Of Safety Systems For The Detectors, Racks And Generic Control Safety Power Distribution.</p> <p>Work Statement:</p> <p>This Work Package Includes The Following Tasks:</p> <ol style="list-style-type: none"> <li>1. Analyze Detector Safety Subsystems Requirements.</li> <li>2. Design The Safety System And Needed Control Documents</li> <li>3. Determine Needed Components</li> <li>4. Review The Design, Perform And Address Issues From Safety And Operational Reviews Of System</li> <li>5. Procure Equipment Needed To Implement This Design.</li> <li>6. Prepare The Equipment For Delivery To Building 1008, The sPHENIX Complex, Ready To Be Installed.</li> </ol>
2.04	2.04.01	2.04.01.06			<b>Gas Mixing House &amp; Gas Pad Components</b>	<p>Technical Scope:</p> <p>This Work Package Encompasses All Scientific, Engineering And Technical Staff Efforts To Plan And Supervise All Aspects Of The Specification And Design Of Gas Mixing House &amp; Gas Pad Components Required To Support The sPHENIX Upgrade.</p> <p>Work Statement:</p> <p>This Work Package Includes The Following Tasks:</p> <ol style="list-style-type: none"> <li>1. Analyze Gas Mixing House &amp; Gas Pad Components Requirements</li> <li>2. Create Gas Mixing House &amp; Gas Pad Components Schematic Design And Specification Control Documents</li> <li>3. Review Gas Mixing House &amp; Gas Pad Components Design/Safety; Adress Action Items</li> <li>4. Prepare Gas Mixing House &amp; Gas Pad Components Procurement Package(s)</li> <li>5. Evaluate &amp; Process Gas Mixing House &amp; Gas Pad Components Bids</li> <li>6. Procure &amp; Deliver Gas Mixing House &amp; Gas Pad Components (Leadtime And Fabrication Included)</li> <li>7. Perform Gas Mixing House &amp; Gas Pad Components Acceptance</li> <li>8. Gas Mixing House &amp; Gas Pad Components Ready For Installation</li> </ol>

2.04	2.04.01	2.04.01.07			<b>Rack Room Modifications</b>	<p>Technical Scope:</p> <p>This Work Package Encompasses All Scientific, Engineering And Technical Staff Efforts To Plan And Supervise All Aspects Of The Specification And Design Of Rack Room Racks And Generic Rack Room Equipment Required To Support The sPHENIX Upgrade.</p> <p>Work Statement:</p> <p>This Work Package Includes The Following Tasks:</p> <ol style="list-style-type: none"> <li>1 Evaluate The Existing PHENIX Rack Room At Building 1008 To Accommodate New Electronics Racks And Components Necessary To Support The sPHENIX Experiment.</li> <li>2. Design Modifications Or Replacements, As Required For The Installation Of Equipment.</li> <li>3. Procure The Necessary Equipment To Upgrade The Existing Rack Room.</li> <li>4. Deliver All Components And Equipment To sPHENIX Complex At Building 1008 For Installation</li> </ol>
2.04	2.04.01	2.04.01.08			<b>Control Room and Offices Modifications</b>	<p>Technical Scope:</p> <p>This Work Package Encompasses All Scientific, Engineering And Technical Staff Efforts To Plan And Supervise All Aspects Of The Specification And Design Of The Control Room And Office Modificaitons Required To Support The sPHENIX Upgrade.</p> <p>Work Statement:</p> <p>This Work Package Includes The Following Tasks:</p> <ol style="list-style-type: none"> <li>1 Evaluate The Existing PHENIX Control Room And Office Complex At Building 1008 To Accommodate New Computing, Electronics And Other Support Equipment Necessary To Support The sPHENIX Experiment, Including The Monitoring And Control Of The sPHENIX Experiment From Outside The Shielded Area Of RHIC.</li> <li>2. Design Modifications Or Replacements, As Required For The Installation Of Equipment.</li> <li>3. Procure The Necessary Equipment To Upgrade The Existing Control Room And Office Complex.</li> <li>4. Prepare All Components And Equipment For Delivery To The sPHENIX Complex At Building 1008 Ready To Be Installed</li> </ol>
2.04	2.04.02				<b>Infrastructure Facility Support Systems</b>	<p>WBS 2.4.2 Is The Control Account For All Scientific, Engineering And Technical Staff Efforts To Plan And Supervise All Aspects Of The Design, Fabrication And Assembly Of The sPHENIX Infrastructure Components Associated With sPHENIX Facility Support Systems, Safety Systems And Non-IR Infrastructure Including The Following Work Packages as detailed below in the relevant Level 4 WBS:</p> <ol style="list-style-type: none"> <li>1. Magnet Cryo, Electrical &amp; Control Structural Support In IR</li> <li>2. Beampipe/Vacuum</li> <li>3. IR HVAC</li> <li>4. IR Electronics Cooling Water Distribution System</li> <li>5. IR/AH Safety Subsystems Components</li> <li>6. Assembly Hall Modifications</li> </ol> <p>Work Statement:</p> <p>The Actual Installation Of These Components And Equipment Will Take Place At The sPHENIX Experiment Complex At Building 1008 And Is Covered In The sPHENIX 2.5 Control Account.</p>

2.04	2.04.02	2.04.02.01			<b>Magnet Cryo, Electrical &amp; Control Structural Support in IR</b>	<p>Technical Scope: This Work Package Encompasses All Scientific, Engineering And Technical Staff Efforts To Plan And Supervise All Aspects Of The sPHENIX Magnet Cryogenics, Electrical And Control Structural Supports.</p> <p>Work Statement: This Work Package Includes The Following Tasks:</p> <ol style="list-style-type: none"> <li>1. Design An Integrated Support Conceptual Design For Cryogenic Piping And Controls Wiring For The sPHENIX Magnet Contained Inside The Building 1008 Intersection Region (IR), Perform And Address Issues From Safety Reviews.</li> <li>2. Create Fabrication Drawings For Supports And Related Components.</li> <li>3. Procure Parts</li> <li>4. Prepare For Delivery To sPHENIX Complex At Building 1008 For Installation</li> </ol> <p>Notes: - The Approximate 25 Meter Path Will Route From The West Wall Of The IR To The Magnet Valve Box Which Contains The Refrigerated Helium Gas And Control Wiring Connection Points. - All Cryo Lines, Magnet Power And Monitoring Cables And Related Equipment Are Not Included Here. Those Items Are Part Of WBS 2.2</p>
2.04	2.04.02	2.04.02.02			<b>Beampipe/Vacuum</b>	<p>Technical Scope: This Work Package Encompasses All Scientific, Engineering And Technical Staff Efforts To Plan And Supervise All Aspects Of The sPHENIX Beampipe And Vacuum Equipment.</p> <p>Work Statement: This Work Package Includes The Following Tasks:</p> <ol style="list-style-type: none"> <li>1. Evaluate The Beampipe And Vacuum Needs For The sPHENIX Detector</li> <li>2. Design Beampipe Sections And Beampipe Supports And Create Appropriate Drawings Required To Meet The Specifications In 1. Perform And Address Issues From Safety Reviews</li> <li>3. Procure The Beampipe Components.</li> <li>4. Prepare For Delivey To sPHENIX Complex At Building 1008 For Installation</li> </ol>
2.04	2.04.02	2.04.02.03			<b>IR HVAC</b>	<p>Technical Scope: This Work Package Encompasses All Scientific, Engineering And Technical Staff Efforts To Plan And Supervise All Aspects Of The sPHENIX IR HVAC Equipment Requirements.</p> <p>Work Statement: This Work Package Includes The Following Tasks:</p> <ol style="list-style-type: none"> <li>1 Evaluate The Existing PHENIX IR HVAC System For Adequate Cooling Of The New sPHENIX Detector.</li> <li>2. Design Modifications Or Replacements, As Required For Air Handlers, Heaters, Ductwork And Refrigerant Piping, Etc.,Perform And Address Issues From Safety Reviews</li> <li>3. Procure The Necessary Equipment To Upgrade The Existing HVAC Temperature And Humidity Control System</li> <li>4. Deliver All Components And Equipment To sPHENIX Complex At Building 1008 For Installation</li> </ol>

2.04	2.04.02	2.04.02.04			<b>IR Electronics Cooling Water Distribution System</b>	<p>Technical Scope:</p> <p>This Work Package Encompasses All Scientific, Engineering And Technical Staff Efforts To Plan And Supervise All Aspects Of The sPHENIX IR Electronics Cooling Water Distribution Equipment Up To Headers/manifold On The Cradle/Carriage Base.</p> <p>Work Statement:</p> <p>This Work Package Includes The Following Tasks:</p> <ol style="list-style-type: none"> <li>1 Evaluate The Existing PHENIX Electronics Cooling Water System To Adequately Cool The sPHENIX Detector.</li> <li>2. Design Modifications Or Replacements, As Required For Pumps, Supply &amp; Return Piping And Heat Exchangers, Perform And Address Issues From Safety Reviews.</li> <li>3. Procure The Necessary Equipment To Upgrade The Existing Temperature, Pressure And Flow Control System.</li> <li>4. Prepare For Delivery Of All Components And Equipment To sPHENIX Complex At Building 1008 For Installation</li> </ol>
2.04	2.04.02	2.04.02.05			<b>IR/AH Safety Subsystems</b>	<p>Technical Scope:</p> <p>This Work Package Encompasses All Scientific, Engineering And Technical Staff Efforts To Plan And Supervise All Aspects Of The Specification And Design Of The Off-Detector/Carriage Safety Subsystems Including In Related SMCS, ODH, Fire, Smoke And Radiation Safety Systems. (Note Detector Safety Subsystems Are Covered In Work Package WBS 2.4.1.5.)</p> <p>Work Statement:</p> <p>This Work Package Includes The Following Tasks:</p> <ol style="list-style-type: none"> <li>1 Design The Individual Off Detector "Safety Monitor And Control Systems" (SMCS) To Protect The sPHENIX Subsystems From Faults.</li> <li>2. Design The New ODH Detection System For Personnel Protection From A Magnet Quench, Perform And Address Issues From Safety Reviews.</li> <li>3. Procure The Necessary Equipment To Upgrade The Existing On-Detector SMCS Control System And New ODH System.</li> <li>4. Prepare For Delivery Of All Components And Equipment To sPHENIX Complex At Building 1008 For Installation</li> </ol>

2.04	2.04.02	2.04.02.06			<b>Assembly Hall and Interaction Region Modifications</b>	<p>Technical Scope:</p> <p>This Work Package Encompasses All Scientific, Engineering And Technical Staff Efforts To Plan And Supervise All Aspects Of The Specification And Design Of Assembly Hall Generic Equipment/Infrastructure Required To Support The sPHENIX Upgrade. There are specific sets of activities included to analyze the Existing Steel Track System in both the Interaction Region and the Assembly Hall, and to Design, Prepare and Construct the Needed Modifications to the Track System, including Adding Re-Bar and Concrete Encasement of the Interaction Region Tracks and the Assembly Hall Tracks</p> <p>Work Statement:</p> <p>This Work Package Includes The Following Tasks:</p> <ol style="list-style-type: none"> <li>1. Analyze Assembly Hall Requirements</li> <li>2. Create Assembly Hall Modifications Schematic Design And Specification Control Documents</li> <li>3. Review Assembly Hall Modifications For Design/Safety; Address Action Items, Perform And Address Issues From Safety Reviews</li> <li>4. Prepare Assembly Hall Modifications Procurement Package(s)</li> <li>5. Evaluate &amp; Process Assembly Hall Modifications Bids</li> <li>6. Procure &amp; Deliver Assembly Hall Modifications (Leadtime And Fabrication Included)</li> <li>7. Perform Assembly Hall Modifications Acceptance</li> </ol>
2.05					<b>INTEGRATION AND INSTALLATION</b>	<p>Support For The sPHENIX Experiment At RHIC Including Integration Documentation, Technical Coordination, Installation, Tooling, Fixtures And Subsystem Installation WBS 2.05 Is The Control Account For All Scientific, Engineering And Technical Staff Efforts To Plan, Execute And Supervise All Aspects Of The Assembly, Integration And Installation Of The sPHENIX Infrastructure Components (Defined By WBS 2.03 and 2.04), Completed And Tested Detector Subsystem Modules And Electronics For The sPHENIX MIE (Defined By WBS 1.02 Though 1.07), sPHENIX Superconducting Solenoid Magnet (Defined By WBS 2.02) And Parallel Detector Projects To Be Installed In sPHENIX (Defined By WBS 3.01 And 3.02).</p> <p>Work Statement:</p> <p>This Control Account Includes The Planning For All Installation. The Actual Installation And Commissioning Of These Components Will Take Place At The sPHENIX Experiment Complex At Building 1008. There Are 12 Work Packages Included In This Control Account.</p>



2.05	2.05.01				<p><b>Subsystem Interface &amp; Integration Plan</b></p>	<p>Technical Scope:  This Work Package Includes All Scientific, Engineering And Technical Staff Efforts To Plan And Supervise All Aspects Of The Final Assembly, Integration And Installation Of The sPHENIX Infrastructure Components (Defined By WBS 2.03 and 2.04), Completed And Tested Detector Subsystem Modules And Electronics (Defined By WBS 1.02 Though 1.07), sPHENIX Superconducting Solenoid Magnet (Defined By WBS 2.02), And Parallel Detector Projects To Be Installed In sPHENIX (Defined By WBS 3.01 And 3.02).</p> <p>Work Statement:  This Work Package Includes The Preparation, Creation And Review Of The Following Written And Controlled Documents:</p> <ol style="list-style-type: none"> <li>1. Subsystem Interface &amp; Integration Plan - Plan To Describe And Define All Interfaces Between WBS Subsystems., Including Detector Mechanical Interfaces, Electrical Interfaces, Conduits And Cable Routing Management, Space Allocation, Cooling (Water And Air), Detector Cryogenic, Inserting, Drying, Etc. Gas Supply Routing And Interfaces.</li> <li>2. Subsystem Initial And Final Envelope Drawings - Drawings To Globally And Locally (For Each Detector Subsystem) Define Space Allocation For Detector Subsystems, Infrastructure, Support Services And Potential Future Additions.</li> <li>3. Cable And Services Management Plans - Overall Plan For Routing Electrical And Optical, Power, Signal, Control And Monitoring Cables Between Detectors To Control Racks, Front End Modules, Patch Panels, Data Acquisition, Etc.</li> <li>4. Survey Plan - Overall Plan For Alignment And Positioning Of Overall Detector Relative To Nominal Beam Orbit, Individual Detector Subsystems To The Overall Detector, And Internal Alignment And Positioning Of Detector Subsystem Internal Components To The Subsystem Overall Alignment.</li> </ol> <p>After Review Of Each Of The Items In This Work Package, Satisfaction Of All Action Items Coming Out Of The Reviews Corresponds To Successful Completion Of The Work Package.</p>
2.05	2.05.02				<p><b>Infrastructure Installation</b></p>	<p>Technical Scope:  This Work Package Includes All Scientific, Engineering And Technical Staff Efforts To Install Infrastructure Components And Equipment In Support Of The sPHENIX Detectors At 1008.</p> <p>Work Statement:  The Specific Infrastructure Installation Tasks Detailed In This Work Package Are:</p> <ol style="list-style-type: none"> <li>1. Line Electric Power Distribution Installation</li> <li>2. Magnet Cryogenic And Electrical Supply Services Structural Support And Cable/Cryo Fluids Lines Management And Installation.</li> <li>3. Beampipe/Vacuum Equipment Installation</li> <li>4. IR HVAC Equipment Installation</li> <li>5. On-Detector And Off-Detector Safety Subsystems Installation</li> <li>6. Detector Support Services Systems Installations (Signal, Power And Monitoring Cable And Fiber, Services Management And Structural Support, Etc.)</li> <li>7. Electronics Racks Installation (Including Patch Panels)</li> <li>8. Gas And Cooling System Equipment And Services Installation. (Including Source, Distribution Monitoring And Control Systems)</li> <li>9. Non-IR Infrastructure Installation. (Including Gas Pad, Gas Mixing House, Control Room, Rackroom, Assembly Areas And Offices Components And Equipment)</li> </ol>

2.05	2.05.03				<b>Cradle Carriage Assembly/Installation</b>	<p>Technical Scope:  This Work Package Includes All Scientific, Engineering And Technical Staff Efforts To Assemble And Install Cradle Carriage Components In The sPHENIX Assembly Hall (AH) At Building 1008.</p> <p>Work Statement:  The Specific Assembly And Installation Tasks Detailed In This Work Package Are:</p> <ol style="list-style-type: none"> <li>1. Design Cradle Carriage Integration/Installation Tooling/Fixtures</li> <li>2. Fabricate/Procure Cradle Carriage Integration/Installation Tooling/Fixtures</li> <li>3. Prepare Cradle Carriage Integration/Installation Tooling/Fixtures/Procedures Documentation</li> <li>4. Review sPHENIX Cradle Carriage Integration/Installation Tooling/Fixtures/Procedures Safety/Certification/Address Action Items</li> <li>5. Assemble Cradle Carriage Base, Cradle Carriage Alignment And Carriage Roller Supports (These Components Procurement, Fabrication, Pre-Assembly, Acceptance Testing And Delivery To 1008 A H Covered In WBS 2.03 Work Packages)</li> <li>6. Assemble HCAL Cradle Onto Base</li> <li>7. Install Magnet Mounting Feet</li> <li>8. Install Platforms &amp; Access</li> <li>9. Install Pole Tips</li> </ol> <p>Although These Tasks Are Included In A Single Work Package, These Tasks Are Interlaced With Installation Tasks For The Various Detector Subsystems That This Carriage Cradle Supports, Directly Or Indirectly.</p>
2.05	2.05.04				<b>Outer Hcal Installation</b>	<p>Technical Scope:  This Work Package Includes All Scientific, Engineering And Technical Staff Efforts To Assemble And Install The sPHENIX Outer Hadronic Calorimeter (Outer HCAL) Sectors In The sPHENIX Assembly Hall (AH) At Building 1008.</p> <p>Work Statement:  The Specific Assembly And Installation Tasks Detailed In This Work Package Are:</p> <ol style="list-style-type: none"> <li>1. Design Outer HCAL Integration/Installation Tooling/Fixtures</li> <li>2. Fabricate/Procure Outer HCAL Integration/Installation Tooling/Fixtures</li> <li>3. Prepare Outer HCAL Integration/Installation Tooling/Fixtures Procedures</li> <li>4. Review Outer HCAL Integration/Installation Tooling/Fixtures/Procedures Safety/Certification And Address Action Items</li> <li>5. Transport Assembled Outer HCAL Sectors To AH (Partial Shipment)</li> <li>6. Install Partial (13 sectors) Outer HCAL For SC Magnet Install  Note: At This Point The SC Magnet Is Installed; See WBS 2.05.05)</li> <li>7. Transport Remainder Of Outer HCAL Sectors To AH</li> <li>8. Install Remainder (19 sectors) Of Outer HCAL Sectors</li> <li>9. Align/Survey Outer HCAL To SC Magnet Centerline</li> <li>10. Install Outer HCAL Cables And Services</li> <li>11. Review Outer HCAL For Operational Readiness (ORR)/ Address Action Items</li> <li>12. Check out the Installed Outer HCAL</li> </ol>

2.05	2.05.05				<p><b>SC Magnet Installation</b></p>	<p>Technical Scope:  This Work Package Includes All Scientific, Engineering And Technical Staff Efforts To Assemble And Install The sPHENIX Superconducting Solenoid Magnet Components In The sPHENIX Assembly Hall (AH) At Building 1008.</p> <p>Work Statement:  The Specific Assembly And Installation Tasks Detailed In This Work Package Are:</p> <ol style="list-style-type: none"> <li>1. Design SC Magnet Integration/Installation Tooling/Fixtures/Procedures</li> <li>2. Fabricate/Procure SC Magnet Integration/Installation Tooling/Fixtures</li> <li>3. Prepare SC Magnet Integration/Installation Procedures</li> <li>4. Review sPHENIX SC Magnet Integration/Installation Tooling/Fixtures/Procedures Safety/Certification/ Address Action Items</li> <li>5. Transport Sc Magnet And Services From 912 To AH</li> <li>6. Install SC Magnet On Cradle Carriage</li> <li>7. Align/Survey SC Magnet To Cradle Carriage</li> <li>8. Prep SC Magnet For Run (Cryo)</li> <li>9. Prep SC Magnet For Run (Electric)</li> <li>10. Review SC Magnet For Operational Readiness (ORR)/Address Action Items</li> </ol>
2.05	2.05.06				<p><b>Inner HCAL Installation</b></p>	<p>Technical Scope:  This Work Package Includes All Scientific, Engineering And Technical Staff Efforts To Assemble And Install The sPHENIX Inner Hadronic Calorimeter (Inner HCAL) Sectors In The sPHENIX Assembly Hall (AH) At Building 1008.</p> <p>Work Statement:  The Specific Assembly And Installation Tasks Detailed In This Work Package Are:</p> <ol style="list-style-type: none"> <li>1. Design Inner HCAL Integration/Installation Tooling/Fixtures</li> <li>2. Fabricate/Procure Inner HCAL Integration/Installation Tooling/Fixtures</li> <li>3. Prepare Inner HCAL Integration/Installation Tooling/Fixtures Procedures</li> <li>4. Review Inner HCAL Integration/Installation Tooling/Fixtures/Procedures Safety/Certification/Address Action Items</li> <li>5. Transport Assembled Inner HCAL Sectors To AH</li> <li>6. Install Inner HCAL Assembly Insertion Fixture</li> <li>7. Install Inner HCAL Assembly On Insertion Fixture</li> <li>8. Install 1st Inner HCAL Support Ring</li> <li>9. Install Inner HCAL</li> <li>10. Install 2nd Inner HCAL Support Ring</li> <li>11. Align/Survey Inner HCAL To SC Magnet Centerline</li> <li>12. Install Inner HCAL Cables And Services</li> <li>13. Review Inner HCAL For Operational Readiness (ORR) And Address Action Items</li> <li>14. Check out the Installed Inner HCAL</li> </ol>

2.05	2.05.07				<p><b>EMCAL Installation</b></p>	<p>Technical Scope:  This Work Package Includes All Scientific, Engineering And Technical Staff Efforts To Install The sPHENIX Electromagnetic Calorimeter (EMCAL) Components In The sPHENIX Assembly Hall (AH) At Building 1008.</p> <p>Work Statement:  The Specific Assembly And Installation Tasks Detailed In This Work Package Are:</p> <ol style="list-style-type: none"> <li>1. Design EMCAL Integration/Installation Tooling/Fixtures</li> <li>2. Fabricate/Procure EMCAL Integration/Installation Tooling/Fixtures</li> <li>3. Prepare EMCAL Integration/Installation Tooling/Fixtures Procedures</li> <li>4. Review EMCAL Integration/Installation Tooling/Fixtures/Procedures Safety/Certification; Address Action Items</li> <li>5. Transport Assembled EMCAL Sectors To AH</li> <li>6. Install EMCAL Sectors</li> <li>7. Align/Survey EMCAL To SC Magnet Centerline</li> <li>8. Install EMCAL Cables And Services</li> <li>9. Review EMCAL For Operational Readiness (ORR) And Address Action Items</li> <li>10. Check out the Installed EMCAL</li> </ol>
2.05	2.05.08				<p><b>TPC Installation</b></p>	<p>Technical Scope:  This Work Package Includes All Scientific, Engineering And Technical Staff Efforts To Install The sPHENIX Time Projection Chamber (TPC) Components In The sPHENIX Intersection Region (IR) At Building 1008.</p> <p>Work Statement:  The Specific Assembly And Installation Tasks Detailed In This Work Package Are:</p> <ol style="list-style-type: none"> <li>1. Design TPC Integration/Installation Tooling/Fixtures</li> <li>2. Fabricate/Procure TPC Integration/Installation Tooling/Fixtures</li> <li>3. Prepare TPC Integration/Installation Tooling/Fixtures Procedures</li> <li>4. Review TPC Integration/Installation Tooling/Fixtures/Procedures Safety/Certification; Address Action Items</li> <li>5. Transport Assembled TPC Components To AH and thence to IR</li> <li>6. Install TPC Support</li> <li>7. Install TPC (Mechanical)</li> <li>8. Align/Survey TPC To SC Magnet Centerline</li> <li>9. Install TPC Cables And Services</li> <li>10. Review TPC For Operational Readiness (ORR); Address Action Items</li> <li>11. Check Out the Installed TPC</li> </ol>

2.05	2.05.09				<b>INTT Installation</b>	<p>Technical Scope:  This Work Package Includes All Scientific, Engineering And Technical Staff Efforts To Install The sPHENIX Intermediate Silicon Strip Tracker (INTT) Components In The sPHENIX Intersection Region (IR) At Building 1008.</p> <p>Work Statement:  The Specific Assembly And Installation Tasks Detailed In This Work Package Are:</p> <ol style="list-style-type: none"> <li>1. Design INTT Integration/Installation Tooling/Fixtures</li> <li>2. Fabricate/Procure INTT Integration/Installation Tooling/Fixtures</li> <li>3. Prepare INTT Integration/Installation Tooling/Fixtures Procedures</li> <li>4. Review INTT Integration/Installation Tooling/Fixtures/Procedures Safety/Certification; Address Action Items</li> <li>5. Transport Assembled INTT Components To AH and thence to IR</li> <li>6. Install INTT Support</li> <li>7. Install INTT (Mechanical)</li> <li>8. Align/Survey INTT To SC Magnet Centerline</li> <li>9. Install INTT Cables And Services</li> <li>10. Review INTT For Operational Readiness (ORR); Address Action Items</li> <li>11. Check Out The Installed INTT</li> </ol>
2.05	2.05.10				<b>MVTX Installation</b>	<p>Technical Scope:  This Work Package Includes All Scientific, Engineering And Technical Staff Efforts To Install The sPHENIX Monolithic Active Pixel Vertex Detector (MVTX) Components In The sPHENIX Intersection Region (IR) At Building 1008.</p> <p>Work Statement:  The Specific Assembly And Installation Tasks Detailed In This Work Package Are:</p> <ol style="list-style-type: none"> <li>1. Design MVTX Integration/Installation Tooling/Fixtures</li> <li>2. Fabricate/Procure MVTX Integration/Installation Tooling/Fixtures</li> <li>3. Prepare MVTX Integration/Installation Tooling/Fixtures Procedures</li> <li>4. Review MVTX Integration/Installation Tooling/Fixtures/Procedures Safety/Certification; Address Action Items</li> <li>5. Transport Assembled MVTX Sections To AH and thence to IR</li> <li>6. Install MVTX Support</li> <li>7. Install MVTX (Mechanical)</li> <li>8. Align/Survey MVTX To SC Magnet Centerline</li> <li>9. Install MVTX Cables And Services and Readout Items</li> <li>10. Review MVTX For Operational Readiness (ORR); Address Action Items</li> <li>11. Check Out The Installed MVTX</li> </ol>
2.05	2.05.11				<b>Min Bias Installation</b>	<p>Technical Scope:  This Work Package Includes All Scientific, Engineering And Technical Staff Efforts To Install The sPHENIX Minimum Bias Tracker (Min Bias) Components In The sPHENIX Intersection Region (IR) At Building 1008.</p> <p>Work Statement:  The Specific Assembly And Installation Tasks Detailed In This Work Package Are:</p> <ol style="list-style-type: none"> <li>1. Design Min Bias Integration/Installation Tooling/Fixtures</li> <li>2. Fabricate/Procure Min Bias Integration/Installation Tooling/Fixtures</li> <li>3. Prepare Min Bias Integration/Installation Tooling/Fixtures Procedures</li> <li>4. Review Min Bias Integration/Installation Tooling/Fixtures/Procedures Safety/Certification; Address Action Items</li> <li>5. Transport Assembled Min Bias Sections To AH and thence to IR</li> <li>6. Install Min Bias Support</li> <li>7. Install Min Bias (Mechanical)</li> <li>8. Align/Survey Min Bias To SC Magnet Centerline</li> <li>9. Install Min Bias Cables And Services</li> <li>10. Review Min Bias For Operational Readiness (ORR); Address Action Items</li> <li>11. Check Out The Installed Min Bias</li> </ol>

2.05	2.05.12				<b>Full Detector Installation</b>	<p>Technical Scope: This Work Package Includes All Scientific, Engineering And Technical Staff Efforts To Move The sPHENIX Support Carriage With The Larger Detector Components Installed, Align The Carriage Cradle To The Beam Line, Then, After Any Of The Inner Detectors Not Previously Installed Are Installed, Commission The Full Detector And Make It Ready For sPHENIX Run 1.</p> <p>Work Statement: The Specific Assembly And Installation Tasks Detailed In This Work Package Are:</p> <ol style="list-style-type: none"><li>1. Move Full sPHENIX To IR</li><li>2. Align Full sPHENIX To Nominal Beamline And Intersection Point (IP)</li><li>3. Perform Full System Check out</li><li>4. Review The Full sPHENIX Detector For Operational Readiness (ORR)/Address Action Items</li></ol>
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