Project Director's Quarterly Progress Report – 1st Quarter FY 2004
U.S. Large Hadron Collider Construction Project

1. PROJECT IDENTIFIERS

Reporting Period:	Through December 31, 2003
Program Sponsors:	DOE High Energy Physics Division/NSF Physics Division
DOE/NSF Program Manager:	M. Pripstein, (301) 903-4115, moishe.pripstein@science.doe.gov
DOE/NSF Associate Program Manager:	M. Goldberg, (703) 306-1894, mgoldber@nsf.gov
Operations Office:	Chicago Operations Office/Fermi Area Office
DOE/NSF Federal Project Director:	P. Carolan, (630) 840-2227, pepin.carolan@ch.doe.gov

2. PROJECT DESCRIPTION

The Department of Energy (DOE) and the National Science Foundation (NSF) have signed agreements committing to collaboration in the construction of the Large Hadron Collider (LHC) at CERN (European Laboratory for Particle Physics) and two of its associated detectors. The U.S. fabrication effort will be carried out at, or under the supervision of, U.S. universities and national laboratories under the terms and conditions described in the International Collaboration Agreement (Agreement) and its Accelerator and Experiments Protocols. The U.S. LHC Construction Project is defined by the goods and services to be provided to CERN under the terms of the Agreement between DOE, NSF, and CERN. These goods and services include DOE contributions to the LHC accelerator, and DOE and NSF contributions to the ATLAS (A Toroidal LHC Apparatus) and CMS (Compact Muon Solenoid) experiments.

The DOE contribution to the LHC accelerator consists of items provided by DOE National Laboratories and CERN direct purchases from U.S. industrial firms. The scope of these contributions is addressed in the Accelerator Protocol and described in detail in an Implementing Arrangement between the collaborating DOE National Laboratories and CERN. The DOE and NSF contributions to the ATLAS and CMS detectors consist of items supplied by the collaborating U.S. universities and DOE National Laboratories. The scope of these contributions is addressed in the Experiments Protocol and described in detail in Memoranda of Understanding for collaboration on construction of each experiment.

The U.S. LHC Construction Project includes the U.S. ATLAS, U.S. CMS, and U.S. LHC Accelerator Construction projects. This report summarizes the overall status of the U.S. LHC Construction Project effort and includes more detailed status information on each sub-project. Additional information can be accessed at the following web sites:

U.S. LHC Project - http://doe-hep.hep.net/lhc.html
LHC Project - http://wwwlhc.cern.ch/ U.S. LHC Accelerator - http://www-td.fnal.gov/LHC/USLHC.html
ATLAS - http://atlasinfo.cern.ch/Atlas/Welcome.html U.S. ATLAS - http://www.usatlas.bnl.gov/
CMS - http://cmsinfo.cern.ch/Welcome.html U.S. CMS - http://uscms.fnal.gov/

3. PROJECT DIRECTOR'S NARRATIVE HIGHLIGHTS

The current list of DOE/NSF project reviews and status meetings is provided below:

U.S. LHC Construction Project	Event	Date
U.S. LHC Accelerator Project	DOE Status meeting	February 12, 2004
U.S. LHC Program/Project	Joint Oversight Group Meeting	March 29, 2004
U.S. CMS Detector Project	DOE/NSF Review	May 19, 2004
U.S. ATLAS Detector Project	DOE/NSF Review	May 20, 2004
U.S. LHC Accelerator Project	DOE Review	June tbd, 2004

The results of these activities are documented in formal reports and meeting notes. The U.S. CMS and ATLAS projects submit monthly reports and the U.S. LHC Accelerator project submits a quarterly report. Current performance data is summarized in the following tables:

Table 3.1, Schedule Performance Indices

	Planned Complete (BCWS/BAC)	Actual Complete (BCWP/BAC)	Schedule Performance (BCWP/BCWS)
U.S. ATLAS	85%	83%	98%
U.S. CMS	89%	83%	93%
U.S. LHC Accelerator	94%	91%	97%

Table 3.2, Contingency Status (in thousands of dollars)

	Total Project Cost (TPC)	Budget at Completion (BAC)	Contingency	Budgeted Cost of Work Performed (BCWP)	Remaining Work to be Performed (BAC-BCWP)	Contingency/ (BAC-BCWP)
US ATLAS	163,750	149,155	14,595	124,507	21,330	68%
US CMS	167,250	152,964	14,286	126,607	24,921	57%
US Accelerator	110,000	107,708	2,292	98,507	7,730	30%

Table 3.3, Cost & Schedule Performance (in thousands of dollars) Indices

	Cumulative Costs to Date					Costs at Completion		
	Budgeted Cost			Variance			Revised	
	Work Scheduled	Work Performed	Actual Cost	Schedule	Cost	Budgeted	Estimate	Variance
U.S. ATLAS	127,210	124,507	119,454	-2,703	5,053	163,750	163,750	0
U.S. CMS	136,606	126,607	114,907	-9,999	11,700	167,250	167,250	0
U.S. LHC Accelerator	101,071	98,507	99,718	-2,564	-1,211	110,000	110,000	0
CERN Invoices	48,619	48,619	48,619	0	0	90,000	90,000	0
U.S. LHC Total	413,506	398,240	383,481	-15,266	15,542	531,000	531,000	0

4. PROJECT DIRECTOR'S ASSESSMENT

The U.S. projects continue to meet their goals and are reliable and influential partners in the construction of the ATLAS and CMS detectors and the LHC machine.

Cost – Cost performance is good. The cumulative Cost Performance Index (CPI) for the total U.S. LHC Construction Project (U.S. ATLAS, U.S. CMS, and U.S. LHC Accelerator) is 1.05, which is slightly favorable overall. An area of cost concern is the U.S. LHC Accelerator Project contingency situation, where remaining contingency is relatively low based on the latest estimate to complete and project need based upon potenital risks. The Accelerator project is completing the last of the three Laboratory cost estimates for completion. These costs are incorporated into the baseline as effective budgets for completion, with emphasis on stringent project management to these costs at each Laboratory. Good project technical performance is important over the next few months, and should be accompanied by anticipated drops in contingency need as progress to completion is achieved.

U.S. CMS contingency remains healthy, and financial performance good. In coordination with CMS, additional scope been adopted within the Electromagnetic Calorimeter baseline to implement the new front-end electronics design that will achieve better detector technical performance. U.S. ATLAS financial performance has also been good, and contingency remains robust. U.S. ATLAS has confirmed with ATLAS a commitment to apply contingency toward detector installation. Contingency use is also anticipated for Liquid Argon calorimeter power supply production, although the U.S. has reached agreement with ATLAS that the full collaboration will share in the costs for this system.

Schedule – Schedule performance is measured by milestone completion and by earned value. The total U.S. LHC Construction Project schedule overall is slightly behind plans with a cumulative Schedule Performance Index (SPI) of 0.96, slightly improved from the previous Quarter and indicating no major slippages in schedule. The total U.S. LHC Construction Project is eighty-seven percent complete based on earned value against the baseline. The CERN schedule calls for first beams in April 2007. A period of beam commissioning will be followed by start of the LHC Physics Program in the latter half of 2007. The U.S. LHC Project completion baseline milestones remain as follows:

Critical Decision-4A: 97% complete, September 30, 2005 (Accelerator and Detector deliverables)
Critical Decision-4B: 100% complete, September 30, 2008 (final detector installation and technology procurements, dependent and closely coordinated with international detector and machine completion/start-up schedules)

The U.S. LHC Accelerator Project remains ahead of schedule for delivery of components to CERN by required installation dates, although float is minimal in some instances that are being carefully watched. Quadrupole production at Fermilab is back to previous production rates, prior to a quad failure and delays in CERN correctors that slowed production. The CERN corrector delivery problem appears solved, with regular deliveries and a small surplus now at Fermilab. U.S. CMS is updating its schedule to the latest approved CMS installation schedule. The U.S. CMS Silicon Tracker production schedule will be re-worked and reviewed, pending CMS resolution of a sensor quality and delivery issue with a vendor. U.S. ATLAS has updated the baseline schedule and float for each subsystem to reflect ATLAS required delivery dates. Both detector collaborations are prepared to mitigate schedule

delays (e.g. ATLAS barrel toroid, CMS solenoid magnet production) through revisions to detector installation and testing plans, e.g. plans for additional CMS surface testing of detector sub-systems or changes to ATLAS underground installation sequence. Both detector collaboration schedules continue to support and work toward meeting the April 2007 LHC turn-on date.

Technical - Good technical progress continues across the project, and we remain confident that the U.S. deliverables to CERN can be realized with the planned funding. The U.S. LHC Construction Project deliverables are accepted by CERN and approved by the DOE/NSF Joint Oversight Group. We expect to provide additional items to CERN, within the approved funding, should cost performance be favorable. Important achievements or milestones continue to be met. U.S. LHC Accelerator qaudrupole magnets are performing well in quench tests . U.S. CMS has made key contributions to the CMS Data Acquisition (DAQ) Technical Design Report, now complete. U.S. ATLAS has successfully led efforts to achieve approval to start production of Pixel electronics. Additional technical Project highlights are given in the report.

ISSUES

LHC Construction Completion— In December 2003 the LHC Cost and Schedule Review Committee Report was released. The committee noted significant progress in the dipole production rate, but recommended increased oversight of correction magnet vendors to enable the quadrupole production rate to improve. The committee recommended the magnet test plan be reviewed after July 2004 with the goal of achieving appropriate quality control tests consistent with the production and installation schedule. A delay in the availability and installation of QRL cryogenic line components in the LHC tunnel is a schedule concern. These delays will require a restructuring of the installation plan in mid-2004, and currently CERN is working with the contractor to re-schedule activities and advance the installation schedule. More information will be available once cryo-line installation is fully underway in Spring 2004. Overall, the committee expressed confidence that the demanding LHC machine technical performance requirements can be met without significant cost overrun or schedule delay, noting that the Spring 2007 schedule is still considered achievable.

ATLAS and CMS Resources– Both collaborations have presented updated financial plans to the detector Resource Review Boards (RRBs) in October, 2003. The updated plans address funding shortfalls previously identified, and the collaborations have had some success identifying funds and actions to significantly reduce those shortfalls. Additionally, costs of sub-detectors have been updated to cover the shortfalls through reducing redundancy, using existing contingencies, or further detector staging. In cases of detector staging, acceptability of physics impact is considered for initial physics running. The funding profiles present cash flow problems in some areas, which the collaborations are working with the funding agencies and RRBs to solve or minimize. There may be potential impact on overall detector installation schedules if the cash-flow situation cannot be successfully managed. The collaborations continue the process of firming up commitments internationally from those funding agencies that can provide additional resources (U.S. LHC construction funds are capped), a process likely to continue over the final years to completion. If successful, this process could allow the collaborations to gradually improve the expected performance and capability of the initial detectors to more fully exploit physics opportunities.

5. NARRATIVE SUMMARY

5.1 U.S. ATLAS CONSTRUCTION PROJECT

ATLAS International.- The LHC Committee (LHCC) met in November 2003 and January 2004 to monitor critical detector construction issues. Good progress was reported on installation work in the underground service and detector caverns (installation of feet, rails, trucks for calorimeter assembly, laying of cable trays all underway). Slow production of thermal shields for the Barrel Torroid (BT) have resulted in a 6 month delay to installation of the first BT coil. The corresponding cold test has been moved to May-Jun, 2004, with tile calorimeter installation moved earlier to help mitigate this delay. The LHCC considers schedule critical and will keep monitoring the progress. Other highlights follow:

- Integration of the solenoid magnet in the Liquid Argon barrel cryostat is starting, and good progress is seen on the calorimeters, including electromagnetic endcap wheels, forward calorimeter, hadronic endcap wheel assembly and tile calorimeter readout electronics production.
- Production of all muon chambers is advancing well, with three of four chamber types complete (CSC chambers), nearly complete (TGC chambers) or undergoing final outfitting at the required rate (MDT chambers); RPC chamber production is delayed but a reasonable plan is being implemented to recover delay.
- The LHCC recommended approval of the ATLAS High-Level Trigger Data Acquisition and Controls Technical Design Report, noting the schedule is also reasonable.

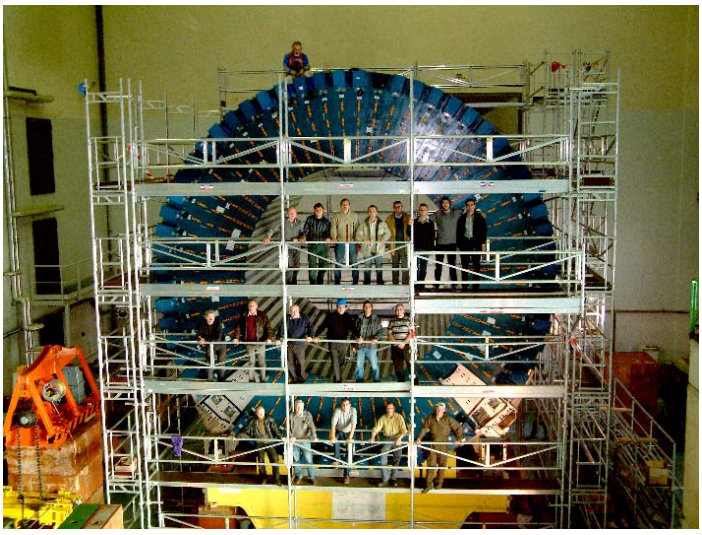
U.S. ATLAS - As of December 31, 2003 the project is 88% complete out of 90% planned, reflecting the most recent update of cost and schedule estimates (Estimate-To-Complete '03) for the remaining work to complete the baseline scope. There are no major technical issues- all U.S. ATLAS subsystems are now in production and detector components are being successfully delivered to CERN. Cost and Schedule performance is very good. Contingency planning, prioritization and allocation strategies are focused on ensuring that adequate contingency levels can be maintained through project completion. The current U.S. ATLAS schedule meets ATLAS needs. Forecast dates above have been revised to reflect the latest schedule estimates. Below are a few highlights of the U.S. ATLAS construction project:

- Silicon: The electronics Production Readiness Review for Pixels was passed in December and approval was given to proceed with production. Module assembly continued in production mode this quarter. Read out Driver (ROD) production part orders are being placed.
- TRT: Module production is complete and 62 modules are at CERN. The Barrel Support Structure (BSS) is beginning to be assembled at CERN. All ATMEL wafers have been delivered to CERN. Chip packaging is complete and production testing will start next quarter.
- Liquid Argon: Barrel cryostat welding is progressing well. Solenoid installation preparations are underway. BNL and the vendor are reviewing performance parameters and delivery schedule of the DC power supply prototype, needed before proceeding with the production phase. This is on the critical path for LAr Calorimeter electronics installation. The Forward Calorimeter is now ready for the insertion into the cryostat.

- Tile: Work continues on the pre-assembly of the barrel cylinder. It will be ready months before it is needed for installation. Argonne engineers and scientific staff made key contributions to the evaluation of the barrel cylinder survey data.
- Muon: MDT base chamber production continued on schedule at the BMC and Seattle chamber factories. Seattle is due to complete their portion next quarter. Electronic parts delivery was sufficient for all sites to make significant progress on chamber integration. Work continues at BNL on the assembly of the cathode panels and wire planes into completed CSC chambers. All CSC1 and CSC2 base chambers are completed and integration will start once electronics are completed.
- TriggerDAQ: Software tests, enchancements and discussions with users were done in preparation for the 2004 testbeam run. The preparations continued for baselining the system and assigning the U.S. responsibilities. The baselining is planned for next quarter.

Left- Preassembly of two of the three Forward Calorimeter modules has been completed by the University of Arizona.

Right- Tile Calorimeter Preassembly above ground has been completed for two of the three sections. Modules were built by ANL, with instrumentation by Michigan State. ANL engineers also made key contributions to surveying during pre-assembly at right. Next the Barrel TileCal will be installed in the Cavern.



5.2 U.S. CMS CONSTRUCTION PROJECT-

CMS International- The LHC Committee (LHCC) met in November, 2003 and January, 2004 to monitor critical detector construction issues. Although good progress is being made on the solenoid magnet, an additional (six week) delay was incurred due to a machining problem. This delay is being incorporated into the revised CMS schedule along with the previous 2-month delays in the magnet test and civil engineering, to be mitigated by limiting underground detector testing. Both the electromagnetic calorimeter (ECAL) barrel and Silicon Tracker production remain the most critical with respect to schedule, and the LHCC continues to monitor these closely.

- Manufacture of all 21 reinforced conductor lengths for the solenoid magnet is completed, an important CMS milestone; two of the five barrel modules have been successfully coupled, construction of the third module is nearly complete, and the rest are under construction.
- A revised workplan for production of ECAL crystals is under discussion, to resolve issues in order to accelerate production; potential additional producers are also being pursued.
- Good progress is noted on production of Silicon Tracker front-end hybrid electronics, which resumed production in November, 2003 and is no longer critical path; CERN is working to resolve issues with quality of production sensors, now a concern for the Silicon Tracker production schedule.

U.S. CMS - As of December 31, 2003, the overall U.S. CMS construction project was 83% complete vs. the scheduled 89% complete. Technical progress remains excellent, and the U.S. CMS construction project is on budget. There is no major schedule slippage, but delays exist in production of some subsystem electronics and components, particularly the calorimeter electronics and the silicon strip tracker. Silicon tracker module production is impacted by slow parts flow due to a component quality issue. CERN and CMS are making progress negotiating a resolution with the vendor, and the impact on the U.S. schedule will be evaluated in late March 2004. U.S. CMS has adopted the latest revised CMS schedule and U.S. CMS milestones have been updated to match the CMS v33.2 status.

- Endcap Muon (EMU): Production of Cathode Strip Chambers (CSCs) at Fermilab is now complete, and the Final Assembly and System Testing (FAST) sites are ending operations. Installation of the CSCs onto the CMS Endcap Yoke (YE) is proceeding well within the scheduled time. Production of off chamber electronics is ready to begin following a successful 25 nsec test beam run.
- Hadron Calorimeter (HCAL): The two Barrel HCAL (HB) half-barrels have been assembled at CERN for some time, and both endcap absorbers have been mounted and optics (scintillators and fibers) installed. An electronics system review was passed in early November after a test beam run with pre-production prototypes, and electronics procurement began in the first quarter of FY04.
- Trigger and Data Acquisition System (TriDAS): Full function prototypes of the muon trigger cards have been produced which exhibit much reduced trigger latency, and the calorimeter trigger is in production. Work on the Data Acquisition (DAQ) Technical Design Report (TDR) is complete. The U.S. groups have changed responsibility for purchases so as to advance the U.S. schedule for DAQ.

- Electromagnetic Calorimeter (ECAL): The U.S. contribution to ECAL has been altered to conform to the new 1/4-micron ECAL electronics, with U.S. groups now involved also in the optical data links and low voltage supplies for ECAL.
- Forward Pixels (FPix): The first 1/4-micron version of the readout chip (ROC) has been received and tested, and is largely successful. Since the U.S. CMS effort depends on ROC parts flow, this success bolsters the FPix schedule.
- Silicon Strip Tracker (SiTrk): Procurements of automation equipment at Fermilab and UC Santa Barbara are complete, and prototype modules, which exceed all specification, have been produced. All module components have entered production, but reliable parts flow remains an issue.

Above: Cathode Strip Chambers (CSCs) mounted on Endcap Yoke (YE) disks in the CMS surface assembly building at CERN. Production of 482 CSCs, including spares, is nearly complete. 150 of the CSCs were produced at Fermilab, with final assembly and testing conducted by University of Florida, and University of California (UCLA/Riverside) before delivery to CERN. Installation on YE is about 25% complete.

5.3 U.S LHC ACCELERATOR CONSTRUCTION PROJECT

LHC Accelerator- In December, 2003 the LHC Cost and Schedule Review Committee Report was released. The committee reviewed LHC cost and schedule progress and project management, focusing on: superconducting magnet fabrication and testing, QRL cryoline completion, and underground civil works at Point 5. The committee expressed confidence that the demanding LHC machine technical performance requirements can be met without significant cost overrun or schedule delay, noting that the Spring 2007 schedule is still considered achievable.

- LHC accelerator production progress can be tracked on the "LHC Dashboard" at, http://lhc-new-homepage.web.cern.ch/lhc-new-homepage/DashBoard/index.asp ; construction and delivery of main dipole magnets is progressing well; quadrupole production is on the "just-in-time" curve due to delays in delivery of needed corrector elements.
- CERN has taken delivery of 154 superconducting dipole magnets, enough for the first LHC octant; of eighty-five first tested, over half were better than required, and only six of the remaining dipoles require training to meet the nominal operating field.
- Installation of magnets in the LHC transfer line has begun, and a test of the handling system of the LHC cryomagnets was carried out in January in sector 1-2, involving the first cryodipole and short straight section (SSS) lowered into the LHC tunnel

U.S. LHC Accelerator - As of December 31, 2004, the overall project was 91% complete versus the scheduled plan of 94% complete. Overall technical progress remains good with all major items in production. Remaining contingency based on the EAC continues to be a concern that is being closely monitored and carefully managed by the project. The schedule of deliverables is slightly behind plans, but in advance of CERN requirements. Project highlights are listed below:

- [Fermilab] The inner triplet quadrupole magnet production is moving forward again with the successful test of the third Q2 quadrupole. The second Q2 quadrupole, which was unable to reach the operating field gradient of 205 T/m has been disassembled and its two cold masses separated. The good cold mass will be reused in a future Q2 assembly. A sufficient supply of corrector magnets was received from CERN to support production for the near future.
- [BNL] The fifth and final D1 dipole has been retested successfully and will be shipped to CERN. All nine D2 magnets have been tested, seven have had cryogenic feed piping assemblies installed, and one has been shipped to CERN. The first D3 dipole assembly is being assembled into its cryostat, and the other two are close behind. All three D4 magnets have been completed and await testing. Superconducting cable testing continues to be paced by the rate of sample deliveries from CERN: 163 samples were tested this quarter, 87 of them in December, a monthly high value.
- [LBNL] The cryogenic feedbox vendor is progressing well, being on schedule overall and ahead of schedule on small parts. The TAS beam absorbers have passed acceptance testing at CERN. Three TAN absorber assemblies are complete, the fourth is in the final stages of testing.

Above – Q2 quadrupole. Fabrication by Fermilab is completed and magnet is being moved to the Fermilab test facility.

Right – First BNL D2 dipole arriving at CERN.

Left- Distributed Cryogenic Feedbox (DFBX) helium vessel mounted to underside of top plate. Cylinders connecting the two pieces are chimneys for magnet and corrector power leads. LBNL is responsible for this component, being fabricated in industry.

CERN Direct Purchases - DOE reimburses CERN for their payments to qualified U.S. vendors [Reference U.S.-CERN Agreement and Accelerator Protocol].

Table 5.1, Status of DOE Contracts (in $000)*

Contract Item	Company (U.S. Supplier)	Contract Price	w/ options & escalation
Nb-Ti Alloy Bars; Ni Sheets	Wah Chang	44,300	55,382
Polyamide Insulation Film	Kaneka High Tech Materials	5,425	6,510
Superconducting Cable	Outokumpu-Advanced Superconductor	16,447	20,985
LHC BPMS Button Feedthroughs	Ceramaseal	898	1,003
Cryogenic Temperature Sensor	Lakeshore		
Cryogenic He Mass Flowmeters	(tbd-contract in process)	1,200	1,200
(tbd-contract in process)	(tbd-contract in process)	(tbd)	3,134
Totals		68,270	88,214

TOTAL Cumulative Payments from DOE to CERN (as of December 31, 2003): $ 48,619k

6. FINANCIAL/COST STATUS AND PLANS (as of December 31, 2003)

TOTAL PROJECT FUNDING PLAN (then year millions of dollars)†

Fiscal Year	FY96	FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	Total
Machine Funding Profiles (DOE)													
US LHC Accelerator	2.00	6.67	14.00	15.40	24.92	19.16	10.10	8.70	6.13	2.92	0.00	0.00	110
CERN Direct	0.00	0.00	0.00	8.09	8.29	8.08	11.20	13.40	23.20	17.74	0.00	0.00	90
Machine Total	2.00	6.67	14.00	23.49	33.21	27.24	21.30	22.10	29.33	20.66	0.00	0.00	200
Detector Funding Profiles (DOE and NSF)													
US ATLAS	1.70	3.71	10.05	25.63	28.43	26.77	23.16	24.71	8.99	5.49	3.24	1.88	163.75
DOE	1.70	3.71	10.05	9.00	16.49	14.48	10.51	17.42	8.99	5.49	3.24	1.88	102.95
NSF	0.00	0.00	0.00	16.63	11.94	12.29	12.65	7.29	0.00	0.00	0.00	0.00	60.80
US CMS	2.30	4.61	10.95	38.03	24.26	21.25	21.40	22.91	10.48	5.56	4.20	1.30	167.25
DOE	2.30	4.61	10.95	32.51	20.30	17.15	17.19	20.48	10.48	5.56	4.20	1.30	147.03
NSF	0.00	0.00	0.00	5.52	3.96	4.10	4.21	2.43	0.00	0.00	0.00	0.00	20.22
Detectors Total	4.00	8.32	21.00	63.66	52.69	48.02	44.56	47.62	19.47	11.05	7.44	3.18	

TOTAL DOE & NSF FUNDS, COSTS, & COMMITMENTS (cumulative $000)‡

U.S. LHC Construction Project	A = Funds Allocated	B = Estimate Actual Costs	C = Open Comittments	D= B+C Total	A–D =Funds Available
U.S. ATLAS	144,158	119,454	2,090	121,544	22,614
U.S. CMS	145,706	114,907	14,891	129,798	15,908
U.S. LHC Accelerator	104,850	99,718	0	99,718	5,132
CERN Direct Purchases	49,060	48,619	0	48,619	441
Total	443,774	382,698	16,981	399,679	44,095

* Total includes partial payment to Wah Chung in FY03, with remainder to be paid in FY04; Contracts with American Superconductor Corporation for HTS wire and Meggitt Safety Systems for semi-rigid co-axial cables will be approved and reported on in subsequent Quarters.

† The funding profile for the U.S. LHC Construction Project is extended through FY07, with no change in total funding, to address the impact of the CERN LHC schedule on U.S. project completion. This change was approved by the DOE Director, Office of Science through a U.S. LHC Project baseline change proposal.

‡ Based on financial reports from the U.S. LHC construction projects. NSF funding is provided after the beginning of the fiscal year and therefore it is necessary to carry-over funding into the subsequent fiscal years.

7. DOE/NSF COST BASELINES AT LEVEL 2 (in $000)

U.S. ATLAS Cost Baseline

WBS	Description	Previous	Change	Current
1.1	Silicon System	21,376	305	21,681
1.2	Transition Radiation Tracker	11,386	163	11,549
1.3	Liquid Argon Calorimeter	44,169	2,000	46,169
1.4	Tile Calorimeter	11,007	0	11,007
1.5	Muon Spectrometer	27,032	0	27,032
1.6	Trigger/Data Acquisition System	10,973	0	10,973
1.7	Common Projects	9,179	0	9,179
1.8	Education	286	0	286
1.9	Project Management	8,279	0	8,279
1.10	Technical Coordination	2,150	850	3,000
	Contingency	17,913	-3,318	14,595
	U.S. ATLAS Total Project Cost Baseline	163,750	0	163,750

U.S. CMS Cost Baseline

WBS	Description	Previous	Change	Current
1.1	Endcap Muon	40,814	82	40,896
1.2	Hadron Calorimeter	42,842	215	43,057
1.3	Trigger and Data Acquisition	14,635	74	14,709
1.4	Electromagnetic Calorimeter	11,859	117	11,976
1.5	Forward Pixels	7,362	374	7,736
1.6	Common Projects	23,349	0	23,349
1.7	Project Office	7,047	0	7,047
1.8	Silicon	3,620	574	4,194
	Contingency	15,722	-1,436	14,286
	U.S. CMS Total Project Cost Baseline	167,250	0	167,250

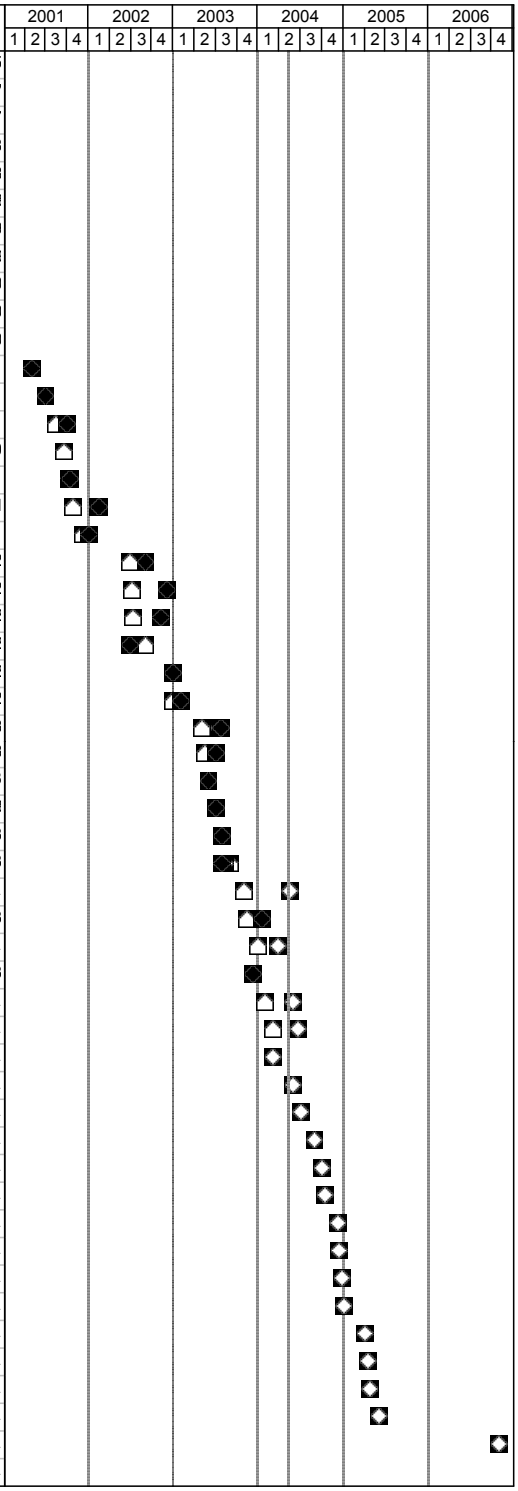
U.S. LHC Accelerator Cost Baseline

WBS	Description	Previous	Change	Current
1.1	Interaction Region Components	60,397	2,762	63,159
1.2	Radio Frequency Straight Section	16,120	-266	15,854
1.3	Superconducting Wire and Cable	13,091	-1,180	11,911
1.4	Accelerator Physics	3,359	0	3,359
1.5	Project Management	13,270	155	13,425
	Contingency	3,763	-1,471	2,292
	U.S. LHC Accelerator Total Project Cost Baseline	110,000	0	110,000

8. SCHEDULE STATUS AND PLANS

8.1 U.S. ATLAS Construction Project Milestones

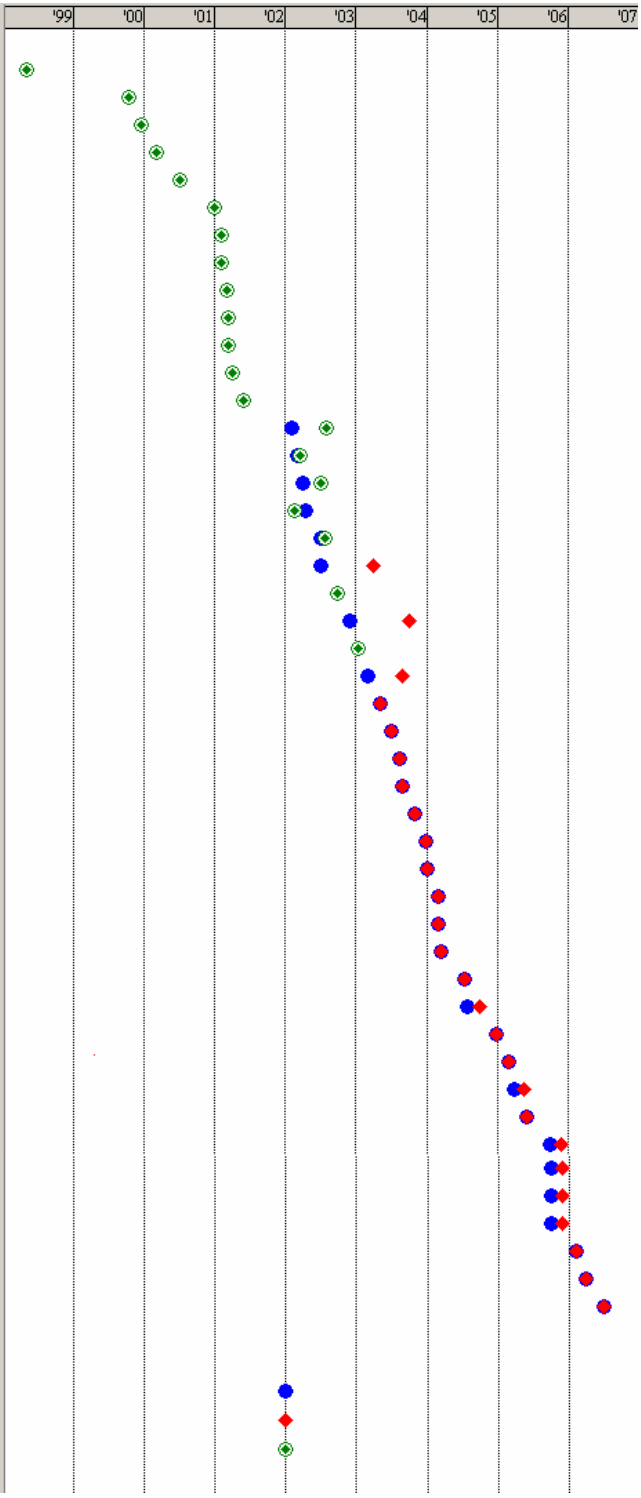
ID	Subsystem ID	Milestone	ETC03 Baseline	Forecast	Actual
1		Project Start (10/1/95)	Sun 10/1/95	Sun 10/1/95	Sun 10/1/95
2	Tile L2/1	Start Submodule Procurement	Mon 9/1/97	Mon 9/1/97	Mon 9/1/97
3	Tile L2/2	Technology Choice for F/E Electronics	Sat 11/15/97	Sat 11/15/97	Sat 11/15/97
4	LAr L2/1	Cryostat Contract Award	Fri 7/24/98	Wed 8/5/98	Wed 8/5/98
5	LAr L2/2	Barrel FTs Final Design Review	Wed 9/30/98	Fri 10/2/98	Fri 10/2/98
6	TRT L2/1	Final Design Complete	Thu 12/31/98	Mon 12/7/98	Mon 12/7/98
7	LAr L2/4	FCAL Mech Design Complete	Mon 12/14/98	Wed 12/15/99	Wed 12/15/99
8	Tile L2/3	Start Module Construction	Sat 5/1/99	Mon 9/20/99	Mon 9/20/99
9	TDAQ L2/1	Select Final LVL2 Architecture	Fri 12/31/99	Fri 3/31/00	Fri 3/31/00
10	LAr L2/3	Start Elec.'s Production (Preamps)	Fri 6/30/00	Fri 6/30/00	Fri 6/30/00
11	Muon L2/1	Start MDT Chambers Lines 1 & 3	Mon 7/17/00	Fri 9/15/00	Fri 9/15/00
12	Muon L2/6	Kinematic Mount Design Complete	Tue 1/30/01	Tue 1/30/01	Tue 1/30/01
13	Tile L2/4	Start Production of MBs	Sun 4/1/01	Fri 3/30/01	Fri 3/30/01
14	LAr L2/9	Cryostat Arrives at CERN	Tue 5/15/01	Mon 7/2/01	Mon 7/2/01
15	TRT L2/4	Select Final Elec Design	Fri 6/15/01	Wed 8/30/00	Wed 8/30/00
16	Sil L2/1	Start Full Silicon Strip Elec Production	Fri 7/6/01	Sun 7/15/01	Sun 7/15/01
17	Sil L2/6	Pixels '1st IBM Prototype Submitted'	Thu 7/26/01	Mon 11/12/01	Mon 11/12/01
18	Muon L2/2	Start CSC Chamber Production	Sat 9/1/01	Mon 10/1/01	Mon 10/1/01
19	LAr L2/6	Level 1 Trigger Final Design Complete	Sat 3/30/02	Thu 5/30/02	Fri 5/31/02
20	Muon L2/3	MDT Electronics ASD PRR	Mon 4/1/02	Sun 9/1/02	Fri 8/30/02
21	Sil L2/2	Start Full Strip Module Production	Fri 4/12/02	Mon 8/5/02	Mon 8/5/02
22	LAr L2/10	Barrel FTs Production Complete	Sat 6/1/02	Mon 3/25/02	Mon 3/25/02
23	LAr L2/8	MB System Production Complete	Mon 9/30/02	Mon 9/30/02	Mon 9/30/02
24	Tile L2/6	Module Construction Complete	Mon 9/30/02	Wed 10/30/02	Wed 10/30/02
25	Tile L2/7	All Modules Delivered to CERN	Fri 1/31/03	Fri 4/18/03	Fri 4/18/03
26	TRT L2/5	Start Production of ASICS	Mon 2/17/03	Tue 4/1/03	Tue 4/1/03
27	Tile L2/5	All Elec.'s Components Delivered to ATLA	Sat 3/1/03	Sat 3/1/03	Sat 3/1/03
28	TDAQ L2/2	LVL2 Trigger Design Complete	Mon 3/31/03	Mon 3/31/03	Mon 3/31/03
29	TDAQ L2/3	LVL2 Trigger Prototype Complete	Wed 4/30/03	Wed 4/30/03	Wed 4/30/03
30	Sil L2/3	ROD Design Complete	Fri 5/30/03	Thu 5/15/03	Wed 4/30/03
31	Muon L2/5	CSC IC Production Complete	Thu 7/31/03	Sat 2/14/04	NA
32	LAr L2/7	ROD Final Design Complete	Fri 8/15/03	Wed 10/15/03	Wed 10/15/03
33	Sil L2/7	Pixels 'Start IBM Production'	Thu 9/25/03	Mon 12/22/03	NA
34	Sil L2/8	Pixels 'Start IBM Outer Bare Module Prod'	Fri 9/5/03	Fri 9/5/03	Fri 9/5/03
35	Muon L2/10	MDT Elec.'s Mezz Production Complete	Fri 10/31/03	Mon 3/1/04	NA
36	LAr L2/11	FCAL-C Delivered to EC	Mon 12/1/03	Mon 3/15/04	NA
37	Muon L2/4	Final Design of Global Align Devices	Mon 12/1/03	Mon 12/1/03	NA
38	Sil L2/5	ROD Production/Testing Complete	Mon 3/1/04	Mon 3/1/04	NA
39	TRT L2/2	Module Production Complete (CUM 102)	Thu 4/1/04	Thu 4/1/04	NA
40	TDAQ L2/4	Start Production	Tue 6/1/04	Tue 6/1/04	NA
41	Muon L2/7	MDT Chambers (U.S.) Prod Compl (Qty. 2	Thu 7/1/04	Thu 7/1/04	NA
42	LAr L2/12	FCAL-A Delivered to EC	Thu 7/15/04	Thu 7/15/04	NA
43	TDAQ L2/5	Start Installation & Commissioning	Mon 9/6/04	Mon 9/6/04	NA
44	Sil L2/4	Compl Shipment of Silicon Strip Modules I	Tue 9/14/04	Tue 9/14/04	NA
45	Muon L2/8	Kinematic Mounts/Struts Production Comp	Mon 9/27/04	Mon 9/27/04	NA
46	Muon L2/9	CSC ROD Production Complete	Thu 9/30/04	Thu 9/30/04	NA
47	TRT L2/6	Installation Complete	Tue 1/4/05	Tue 1/4/05	NA
48	TRT L2/3	Barrel Construction Complete	Mon 1/17/05	Mon 1/17/05	NA
49	Sil L2/9	Pixels 'Disk System at CERN'	Fri 1/21/05	Fri 1/21/05	NA
50	Muon L2/12	Global Align System Final Delivery	Tue 3/1/05	Tue 3/1/05	NA
51	TDAQ L2/6	Production Complete	Mon 7/31/06	Mon 7/31/06	NA
52	TDAQ L2/7	Installation & Commissioning Complete	Fri 9/29/06	Fri 9/29/06	NA



8.2 U.S. CMS Construction Project Milestones

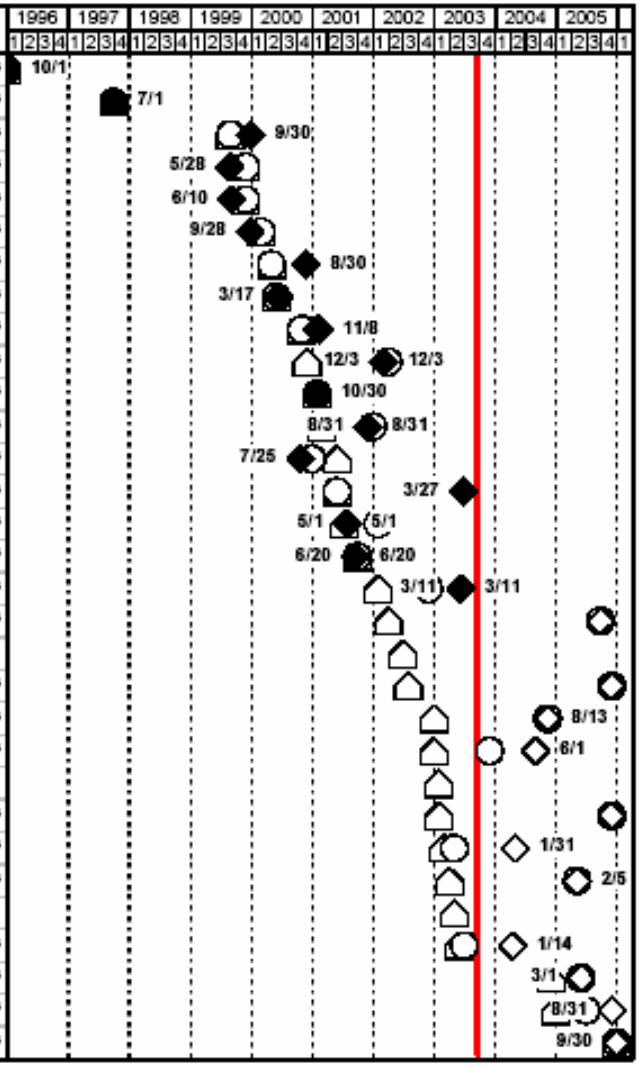
Below are shown agency Project manager milestones as compared to the baseline V33 CMS International milestones.

System	Level	Milestone
		Agency PM/Fermilab DD Milestones
HCAL	ML3*	HB: Start Optics Production
MUON	ML2*	Begin Assembly of Cathode Strip Chambers at FNAL
HCAL	ML3*	HB-1 Optical Assemblies 100% Complete
HCAL	ML2*	HB-1 Absorber Delivered to CERN
MUON	ML2*	Begin Mass Production of Electronics Boards
HCAL	ML2*	HB+1 Absorber Delivered to CERN
HCAL	ML1*	HB-1 End Module Assembly in SX5
SiTrkr	ML2*	Begin Sensor Module Construction (for M200)
HCAL	ML3*	HF: Start PMT Procurement
MUON	ML2*	Begin Mounting Electronics and Testing at UCLA/UF
CP	ML3*	End Assembly of YE+3
HCAL	ML3*	HB+1 Optical Assemblies 100% Complete
HCAL	ML3*	Start HPD Procurement
HCAL	ML2*	HF: PMT Tests 100% Complete
DAQ	ML1*	Submit DAQ Technical Design Report (TDR)
HCAL	ML3*	QIE ASIC Production Run Complete
HCAL	ML1*	End Assembly of HB+ (Barrel) in SX5
MUON	ML3*	70 ME23/2 CSC's Delivered from UC/UF to CERN
HCAL	ML2*	HCAL Front-End Electronics Production Complete
ECAL	ML-US*	All Lasers (3) Delivered & Installed at CERN
HCAL	ML2*	HCAL HPD Tests 100% Complete
ECAL	ML-US*	EB Front-End Electronics Production Launched
SiTrkr	ML2*	25% of Rods Complete
MUON	ML2*	All 148 ME23/2 CSC's Delivered from UC/UF to CERN
SiTrkr	ML3*	50% of Rods Completed
ECAL	ML3*	All APDs Delivered
FPIX	ML2*	Final Full Size ROC Submission (0.25micron)
DAQ	MS-US*	Start of Readout and EVB Commissioning
CP	US*	US CMS Common Project Commitment Complete
ECAL	ML-US*	Optical Link Delivery Complete
HCAL	ML3*	HCAL "Slice" Test II in SX5 Complete
TRIG	ML3*	CSC: Muon Port Card Production Test Complete
ECAL	ML2*	EB Front-End Electronics Production Complete
SiTrkr	ML2*	TOB Complete
CP	ML1*	UX Ready (Start Lowering Magnet Parts)
PO	US*	US CMS Project Office Construction Support Complet
TRIG	ML2*	Finish Trigger Installation
HCAL	ML1*	End Cabling and Test of HB- in UX5
FPIX	ML2*	First Butterfly Ready
MUON	ML1*	End UX inst/cabling/test of CSC stations on YE-
HCAL	ML1*	End Cabling and Test of HE-1 in UX5
ECAL	ML1*	End Inst., Test, & Debug. of EB (barrel) in UX5
SiTrkr	ML1*	End Installation and Cabling of SiTrkr in UX5
HCAL	ML1*	HF: Installation and Testing in UX5 Complete
DAQ	ML2*	DAQ.0: 25% Performance Installed
FPIX	ML2*	Pixel Tracker at SX5, Ready for Installation
	Notes	***MLx* Denotes Joint CMS & Agency PM/FNAL Dep Dir***
	-	***Baseline Milestone Symbol (CMS v33 Schedule)***
	-	***Projected Milestone Symbol***
	-	***Achieved Milestone Symbol***



8.3 U.S. LHC Accelerator Construction Project Milestones

Number	ID	Milestone	Original	Revised	Forecast	Actual	Variance
1-1		Project Start (10/1/95)	10/1/95	10/1/95	10/1/95	10/1/95	0 days
2-1.1-1	IR	Begin 1st Inner Triplet Quadrupole Model Magnet	7/1/97	7/1/97	7/1/97	7/1/97	0 days
2-1.3-2	SC	Complete Superconductor Test Facility Upgrades	6/1/99	6/1/99	9/30/99	9/30/99	87 days
2-1.3-1	SC	All Cable Production Support Equipment Delivered to CERN	9/1/99	9/1/99	5/28/99	5/28/99	-68 days
2-1.2-1	RF	Begin Assembly of 1st Dipole Model Magnet	9/1/99	9/1/99	6/10/99	6/10/99	-59 days
2-1.1-2	IR	Complete Inner Triplet Quadrupole Model Magnet Program Phase 1	12/1/99	12/1/99	9/28/99	9/28/99	-46 days
2-1.1-4	IR	Place Purchase Order for HTS Power Leads	2/1/00	2/1/00	8/30/00	8/30/00	151 days
2-1.1-3	IR	Complete Inner Triplet Quadrupole Model Magnet Program Phase 2	3/1/00	3/1/00	3/17/00	3/17/00	12 days
2-1.2-2	RF	Complete Dipole Model Magnet Program	8/1/00	8/1/00	11/8/00	11/8/00	71 days
2-1.2-3	RF	Begin RF Region Dipole Production Assembly	9/1/00	1/1/02	12/3/01	12/3/01	-21 days
2-1.1-5	IR	Begin Absorber Fabrication	11/1/00	11/1/00	10/30/00	10/30/00	-2 days
2-1.1-6	IR	Complete Inner Triplet Quadrupole Prototype Magnet Program	12/1/00	10/1/01	8/31/01	8/31/01	-21 days
2-1.1-7	IR	Begin Interaction Region Beam Separation Dipole Prod. Assembly	3/1/01	10/1/00	7/25/00	7/25/00	-49 days
2-1.1-8	IR	Begin Inner Triplet Feedbox Fabrication	3/1/01	3/1/01	3/27/03	3/27/03	540 days
2-1.1-9	IR	Begin Inner Triplet Quadrupole Production Assembly	4/15/01	11/1/01	5/1/01	5/1/01	-132 days
1-2		Decision on RF Region Quadrupoles	7/1/01	7/1/01	6/20/01	6/20/01	-8 days
2-1.1-10	IR	Complete 1st Inner Triplet Quadrupole Magnet	11/1/01	9/1/02	3/11/03	3/11/03	136 days
2-1.2-4	RF	Delivery of D3, D4 for IR4 right	1/1/02	6/24/05	6/24/05	NA	0 days
2-1.1-11	IR	Delivery of D2 for IR8 Left **DELETED**	4/1/02				
2-1.1-12	IR	Complete Inner Triplet Feedbox Fabrication	5/1/02	8/31/05	8/31/05	NA	0 days
2-1.1-13	IR	Delivery of All Inner Triplet System Components for IR8 Left (MQX,DFBX,D1,D2)	10/1/02	8/13/04	8/13/04	NA	0 days
2-1.2-5	RF	Complete RF Region Dipole Production Assembly	10/1/02	9/1/03	6/1/04	NA	196 days
2-1.1-14	IR	Delivery of D2 for IR5 Left **DELETED**	11/1/02				
2-1.2-6	RF	Delivery of D3, D4 for IR4 left	11/1/02	8/31/05	8/31/05	NA	0 days
2-1.1-15	IR	Complete Absorber Fabrication	12/1/02	2/1/03	1/31/04	NA	260 days
2-1.1-16	IR	Delivery of All Inner Triplet System Components for IR8 Right (MQX,DFBX,D1,D2	1/1/03	2/5/05	2/5/05	NA	0 days
2-1.1-17	IR	Delivery of D2 for IR8 Right**DELETED**	2/1/03				
2-1.1-18	IR	Complete Interaction Region Dipole Production Assembly	3/1/03	4/1/03	1/14/04	NA	206 days
2-1.1-30	IR	Complete Inner Triplet Quadrupole Production	9/1/04	3/1/05	3/1/05	NA	0 days
2-1.3-3	SC	Series Wire and Cable Testing Complete	10/1/04	3/31/05	8/31/05	NA	109 days
1-3		Project Completion (9/30/05)	9/30/05	9/30/05	9/30/05	NA	0 days



Original Baseline
Revised Baseline
Forecast
Actual
External Milestone
External Milestone
External Milestone
Deadline

9. TECHNICAL BASELINE STATUS

U.S. ATLAS Construction Project - No change. The U.S. ATLAS collaboration defined a list of initial deliverables representing the U.S. contribution to ATLAS. This list was originally approved by the JOG in March 1998. Deliverables are listed in an Appendix to the U.S. ATLAS Construction Project Management Plan. The JOG approved a revision to the U.S. ATLAS Construction Project Management Plan in February 2003, incorporating changes to implement a two-phased project completion matched to CERN plans.

U.S. CMS Construction Project - No change. The U.S. CMS collaboration defined a list of deliverables representing the U.S. contribution to CMS. This list was originally approved by the JOG in October 1998 and is referenced in the U.S. CMS Project Management Plan. The JOG approved a revision to the U.S. CMS Construction Project Management Plan in February 2003, incorporating changes to implement a two-phased project completion matched to CERN plans.

U.S. LHC Accelerator Construction Project - No change. U.S. LHC Accelerator Project - The U.S. deliverables to CERN are defined in the Implementing Arrangement (IA) to the Accelerator Protocol. The IA is an annex to the U.S. LHC Accelerator Project Management Plan. The IA was signed by the CERN and U.S. signatories in July 1998 and revised in May 2002 to update delivery dates to match CERN schedule and address a CERN-directed change on RF region lattice design impacting U.S. work.

CERN Direct Purchases - No change. CERN will procure from U.S. industrial firms supplies required to construct the LHC accelerator. These supplies will include superconducting alloy, cable, insulation, and other materials.

10. BASELINE CHANGE ACTIVITY

Baseline Control Level	Baseline Changes
Level 1, DOE/NSF Joint Oversight Group	No changes this quarter
Level 2, DOE/NSF Project Office	
U.S. ATLAS	Changes to the Level 2 cost, scope and schedule baseline.
U.S. CMS	Changes to the Level 2 cost, scope and schedule baseline.
U.S. LHC Accelerator	Changes to the Level 2 cost, scope and schedule baseline.

APPENDIX A - FUNDING BY INSTITUTION (in thousands of dollars), U.S. CMS

	FY 1998				FY 1999				FY 2000				FY 2001				FY 2002				FY 2003				
	DOE				DOE				DOE				DOE				DOE				DOE				Grand
Institution	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Total
FNAL	0	5,517	0	5,517	0	10,817	40	10,857	0	5,981	0	5,981	0	6,033	0	6,033		6,318	14	6,332		5,183	60	5,243	39,963
Fairfield	0	29	0	29	0	0	0	0	0	10	0	10	0	13	0	13		8		8		0		0	60
Maryland	90	65	0	155	0	132	131	263	0	250	0	250	0	189	0	189		1,361		1,361		239	1,025	1,264	3,482
Boston U.	0	32	0	32	31	111	0	142	0	132	0	132	0	88	0	88		222	1,130	1,352		261	1,514	1,775	3,521
Florida State	60	54	0	114	71	118	0	189	80	54	0	134	68	43	0	111	50	16		66	33	38		71	685
U. of Minnesota	60	95	0	155	161	452	0	613	141	202	0	343	153	401	0	554	85	305		390	9	751		760	2,815
U. of Iowa	77	62	0	139	20	5	0	25	0	453	0	453	0	843	0	843		48		48		150		150	1,658
U. of Rochester	127	1,159	0	1,286	262	485	0	747	441	253	0	694	464	143	0	607	358	162		520	262	86		348	4,202
Notre Dame	0	52	0	52	0	44	184	228	0	14	193	207	0	14	112	126		17	209	226			188	188	1,027
Purdue	38	135	0	173	49	166	0	215	0	175	0	175	0	89	0	89		377		377		201		201	1,230
U. of Miss.	46	100	0	146	68	91	0	159	69	108	0	236	0	235	0	235	34	109		143	24	54		78	997
U. of Florida	44	95	0	139	184	412	0	596	332	853	0	1,185	432	293	0	725	171	310		481	101	1,001		1,102	4,228
Ohio State U.	140	64	0	204	275	212	0	487	196	732	0	928	151	700	0	851	180	916		1,096	267	188		455	4,021
Carnegie Mellon	0	113	0	113	0	291	0	291	0	312	0	312	0	258	0	258		301		301		74		74	1,349
Rice	138	19	0	157	102	56	0	158	132	16	0	148	196	36	0	232	134	61		195	138	410		548	1,438
U. of Wisconsin	533	1,052	0	1,585	471	3,598	0	4,069	722	2,995	0	3,717	504	4,489	0	4,993	193	1,620	63	1,876	276	981	383	1,640	17,880
U.C. Davis	34	100	0	134	0	78	0	78	0	502	0	502	0	63	0	63		200		200		58		58	1,035
UCLA	150	87	0	237	249	173	0	422	244	391	0	635	347	546	42	935	284	496	43	823	179	675	32	886	3,938
U.C. Riverside	20	10	0	30	0	164	0	164	0	70	0	70	0	72	0	72		74		74		97		97	507
John Hopkins	0	29	0	29	0	0	70	70	0	0	40	40	0	0	5	5			7	7			90	90	241
Northwestern	0	59	0	59	5	26	0	31	0	114	0	114	0	39	0	39		33		33		297		297	573
Rutgers	0	13	0	13	0	0	34	34	0	2	140	142	0	0	101	101			127	127			151	151	568
Princeton	0	256	0	256	0	626	0	626	0	667	0	667	0	133	0	133		11		11		109		109	1,802
Caltech	0	148	0	148	0	458	0	458	0	367	0	367	0	452	0	452		116		116		174		174	1,715
U.C. San Diego	11	0	0	11	11	90	24	125	36	0	0	36	0	43	0	43		57		57		196	12	208	480
Northeastern	0	0	0	0	0	0	3,370	3,370	0	0	1,741	1,741	0	0	1,482	1,482			3,073	3,073			1,094	1,094	10,760
U. Ill.-Chicago	0	0	0	0	0	0	124	124	0	0	309	309	0	0	262	262			172	172			164	164	1,031
U. of Nebraska	0	0	0	0	0	0	24	24	0	0	2	2	0	0	100	100			7	7			0	0	133
MIT	0	37	0	37	15	67	0	82	0	78	0	78	0	87	0	87		58		58		375		375	717
Iowa State	0	0	0	0	0	0	19	19	0	356	0	356	0	29	0	29		177		177		71		71	652
Kansas State													0	66	0	66		28		28		44		44	138
LBL													0	554	0	554		543		543		102		102	1,199
Texas Tech													0	876	0	876		275		275		46		46	1,197
UC Santa Barbara													0	13	0	13		461		461		290		290	764
U. of Kansas													0	0	6	6			210	210			56	56	272
Florida Inst. Tech.																		60		60		262		262	322
Yale																						62		62	62
Subtotal	1,568	9,382	0	10,950	1,974	18,672	4,020	24,666	2,393	15,087	2,425	19,964	2,315	16,840	2,110	21,265	1,489	14,740	5,055	21,284	1,289	12,475	4,769	18,533	116,662

As of 1/5/04

APPENDIX B - FUNDING BY INSTITUTION (in thousands of dollars), U.S. ATLAS

	FY 2002				FY 2003				CUM Totals Thru FY 03				
									Prior Years	FY 98 Thru 03 Totals			
Institution	DOE Grant	Contract	NSF	Total	DOE Grant	Contract	NSF	Total	FY 96 -97	DOE Grant	Contract	NSF	Grand Total
ANL	-	771.1	-	771.1	-	690.9	-	690.9	444.0	-	5,886.5	-	6,330.5
BNL	-	5,207.9	-	5,207.9	-	10,992.0	-	10,992.0	1,741.0	-	38,144.2	-	39,885.2
LBNL		2,049.0		2,049.0		2,652.0		2,652.0	496.0	-	9,146.8	-	9,642.8
SUNY/Albany				-	25.4			25.4	20.0	143.4	-	-	163.4
U. of Arizona		376.7		376.7		515.4		515.4	249.0	1,809.4	1,145.0	-	3,203.4
Boston U.		295.0	276.7	571.7		-	347.8	347.8	156.0	963.7	631.0	624.5	2,375.2
Brandeis U.			405.9	405.9			663.2	663.2	189.0	265.0	45.0	2,871.4	3,370.4
U.C.Irvine	-	-	-	-	-	-	745.0	745.0	123.0	193.0	118.0	1,103.8	1,537.8
U.C. Santa Cruz			442.2	442.2			247.4	247.4	284.0	467.3	-	3,959.5	4,710.8
U. of Chicago			158.7	158.7			132.4	132.4	-	-	54.0	2,347.0	2,401.0
Duke U.			374.9	374.9			342.6	342.6	152.0	1,709.3	158.0	717.5	2,736.8
Hampton U.			204.1	204.1			274.3	274.3	-	-	-	1,900.0	1,900.0
Harvard			953.4	953.4			171.1	171.1	168.0	234.0	-	6,050.9	6,452.9
U. of Illinois	98.7			98.7	87.0			87.0	94.0	1,068.5	-	-	1,162.5
Indiana U.		361.0		361.0	-	494.3		494.3	148.0	1,415.0	1,568.8	-	3,131.8
MIT		388.0		388.0	-	300.6		300.6	47.0	679.1	925.6	-	1,651.7
Michigan State	-	-	-	-	-	-	544.3	544.3	-	-	35.0	1,331.6	1,366.6
Nevis/Columbia			3,566.9	3,566.9			4,444.4	4,444.4	-	-	675.0	16,594.5	17,269.5
U. of New Mex.		56.9		56.9		90.1		90.1	46.0	105.4	273.6	-	425.0
Northern Illinois				-	-			-	-	-	-	-	-
Ohio State U.	157.3			157.3	385.0			385.0	-	687.3	-	-	687.3
U. of Michigan	229.6		487.3	716.9	-		1,549.1	1,549.1	-	2,207.0	254.0	2,036.4	4,497.4
U. of Oklahoma			202.0	202.0	-		226.9	226.9	48.0	30.0	-	570.0	648.0
U. of Penn.			850.0	850.0	-		509.0	509.0	262.0	1,493.6	-	1,359.0	3,114.6
U. of Pittsburg		30.0	629.6	659.6			179.1	179.1	64.0	110.0	130.0	1,369.0	1,673.0
U. of Rochester			-	-	-		759.1	759.1	352.0	-	-	7,487.3	7,839.3
U.T. Arlington				-	-		263.8	263.8	149.0	50.0	82.0	1,551.7	1,832.7
S. Methodist		98.0		98.0	-	206.3	-	206.3	-	280.5	488.3	-	768.8
SUNY/Stony B.			88.6	88.6			(99.5)	(99.5)	-	27.0	-	2,496.9	2,523.9
Tufts University	10.9			10.9	8.6		-	8.6	61.0	109.5	-	-	170.5
U. Washington			737.4	737.4	-		633.9	633.9	-	-	-	3,305.7	3,305.7
U. of Wisconsin	377.2	-	-	377.2	968.4	-	-	968.4	157.0	3,781.2	-	-	3,938.2
Total	873.7	9,633.6	9,377.7	19,885.0	1,474.4	15,941.6	11,933.9	29,349.9	5,450.0	17,829.2	59,760.8	57,676.7	140,716.7