Summary of Expenditure for CMS Construction for the Period from 1995 to 2007

INTRODUCTION

From 1995 to 1997, the CMS Collaboration worked on R&D, design, prototyping and pre-industrialization as required to accomplish the set "Milestones" and to submit the Technical Design Reports; this period was covered by the Interim Memorandum of Understanding.

In 1998, once the CMS Memorandum of Understanding for the Construction (MoU) had been signed by most of the CMS Funding Agencies, the detector construction started, apart from Tracker and Trigger/DAQ.

An amendment to the MoU was presented to the October 2000 RRB for the Tracker, and approved. By the end of 2000, the Tracker construction started. The Technical Design Report (TDR) for the Trigger was submitted in December 2000 and its construction started soon after.

The TDR for the Data Acquisition was submitted in December 2002 and its construction started as soon as the TDR was approved by the LHCC (May 2003).

The Cost to Complete of CMS has evolved since October 2000 and the RRB has been kept informed of the changes. The cost estimates used in the following tables are the ones presented to this board in April 2005. The funding figures used in the following tables are based on the latest available information for the MoU, CtC and CtC2 with Steps 1, 2 and 3 being kept separate, as presented in the CMS Status Report (cf. CERN-RRB-2008-025).

By the end of 2007, the total commitments reported reach almost 100% of the current cost estimate while payments total to 96%.

This document only contains expenditure for items listed in the CMS Cost Estimate Version 9 breakdown, that is the reference for the CMS MoU. The cost estimate figures are presented at **current prices**. For ease of comparison with the values of deliverables shown in the MoU, payments and commitments in expenditure statements are detailed to the same level as for the MoU (Level 3 of Cost Estimate). Note that all expenditure in the present report, as for past reports, is shown at **current prices**.

The expenditure compiled in this document has been gathered from a large number of participating institutes, which manage their budgets according to their own policy of making commitments. In this report “commitment” is understood as the total amount for which commercial contracts or any other legally binding documents were signed. Some institutes prefer to report payments only, in which case “commitments” are assumed to be equal to the reported “payments”. This implies that whilst all payments figures are precise in this report, the total level of financial commitments is likely to be larger than that shown herein.

1. COMMITMENTS

A detailed overview of all the financial commitments (expenditure) for items or activities covered by the CMS Memorandum of Understanding is compiled in **Annex 1.**

Annex 1.A gives the summary of the commitments by Funding Agency to each subdetector.

Annex 1.B further shows the individual commitments made by the different Funding Agencies/institutes for procurements through their institutes ("payments to contracts") or for "in-kind contributions", as well as their total commitments (including payments to the Common Funds).

1.1 Magnet, Offline Computing and Commissioning & Integration (Common Funds)

Magnet: The remaining open commitments in 2007 mainly concerned the rental of the 2000t crane for the lowering of CMS (so called "heavy lifting" contract with VSL, Switzerland).

Offline: Offline Computing provides a central service, servers and software for the entire CMS Collaboration.

C&I: No new commitments were taken.

1.2 Sub-detectors and Infrastructure

Tracker: for the Pixel Detector and Strip Tracker, all procurements have been largely completed by the end of 2007 together with the corresponding commitments and payments, with the exception of the large cooling plant, used both for the Tracker and Pre-shower detectors.

The cooling plant in question suffered a serious failure due to a manufacturing fault as it was being commissioned. This failure has resulted in substantial extra costs due to the contamination of the (C_6F_{14}) cooling fluid, and significant design changes will be required to avoid similar failures in the future.

Electromagnetic Calorimeter (ECAL): the new 2007 commitments concerned mainly the Endcap crystals, most in the frame of the "Cost to Complete 2". The other noticeable commitments relate to the Barrel Electronics (some last components, assembly and installation), and the outer electronics of the Endcaps.

Only a few commitments remain to be done after 2007, concerning mainly the Assembly and Installation of the Endcaps and of the Preshower.

Hadron Calorimeter (HCAL): total commitments for HCAL by the end of 2007 include essentially all mechanics, optics, photodetector, front-end and readout electronics costs. Only some small installation and cabling costs remain.

Muon Detector: the total commitments are now 100% of the funding available. Major 2007 commitments cover:

- Drift Tubes final gas analysis system,
- readjustment of HV and LV commitments, and cabling expenses,
- Barrel Resistive Plate Chamber procurements electronics and installation,
- Muon system alignment.

Trigger and Data Acquisition: the CMS Trigger/DAQ project is proceeding on schedule according to the CMS planning.

In 2007, the final construction of the RPC trigger hardware was undertaken.

The purchase of Filter Farm PCs was pursued in 2007.

Infrastructure: the total commitments are now 100% of the funding available. No further commitments are expected.

2. PAYMENTS

A detailed overview of all payments for items or activities covered by the CMS MoU is given in **Annex 2**.

Annex 2.A gives the summary of the payments by Funding Agency to each subdetector.

In addition to the origin of payments to the Common Funds, **Annex 2.B** also shows the payments made by the Funding Agencies/Institutes for procurements through their institutes to Common Projects as well as their total payments (including the payments to the Common Funds).

2.1 Magnet, Offline Computing and Commissioning & Integration (Common Funds)

Magnet: the final payments mostly concerned the payments for the "heavy lifting crane" contract as well as the final payments related to the Protocol of collaboration with CEA Saclay.

Smaller payments were related to the update of the re-assembling and the control system.

Offline: the major payments made in 2007 were in the areas indicated in the commitments section above.

C&I: Only payments for carried over commitments were executed in 2007.

2.2 Sub-detectors and Infrastructure

Tracker: for the Pixel Detector and Strip Tracker, all procurements have been substantially completed by the end of 2007 together with the corresponding commitments and payments, with the exception of the large cooling plant, used both for the Tracker and Pre-shower detectors.

Electromagnetic Calorimeter (ECAL): in 2007, the payments were still dominated by the Crystals, with an amount of 11 MCHF, close to the 2006 value. The other lines are much lower: with 1.7 MCHF, the Barrel Electronics (components and assembly/ installation) is the only line over 0.5 MCHF. The total of the 2007 payments is of the order of 14 MCHF.

Hadron Calorimeter (HCAL): in 2007 the largest payments were for installation and cabling.

Muon Detector: the major payments made in 2007 were in the areas indicated in the commitments section above.

Second endcap has been lowered into underground cavern. For ME1/1, commissioning of all chambers in the underground cavern is in the progress.

For the Forward RPC's, no major payments took place.

The Barrel RPC has been completed and is now in the integration phase.

Trigger/Data Acquisition: the 2007 payments arose from works initiated during the same year and detailed in the Commitments section above.

Infrastructure: payments for infrastructure have followed the rhythm of the installation of CMS and shift in payments is related with the slippage of installation activities. The payments have also been related to the completion of the installation of services underground. In particular, the installation of racks and the electrical distribution in the USC continued in 2007.

3. SUMMARY AND COMPARISON WITH THE COST ESTIMATES

A detailed overview of the expenditure (commitments and payments) is compared with the current cost estimate in **Annex 3.** This shows that almost 100% of the latest cost estimate has been committed (Step 1 and Step 2 included).

4. PLURI-ANNUAL COMMITMENTS AND PAYMENTS

Annex 4 and **Annex 5** show the pluri-annual evolution of Commitments and Payments, respectively. The bars (left axis) depict annual data and the curves show cumulative data. Note that the figure given for the year 2008 is the budget as approved by the October 2007 RRB (cf. CERN-RRB-2007-081) plus payments authorized in previous years.

The figure given for the year 2009 is the one from the document Preliminary Draft Budget for 2009 (cf. CERN-RRB-2008-028).

Annex 4 indicates that the commitments for the CMS construction are now finished.

Annex 5 is also in good agreement with last year forecast, most of the difference being due to the acceleration of the construction schedule.

ANNEXES

The structure of the Annexes is the same as last year.

The summary tables give an overview of the total expenditures by Funding Agency (Annexes 1.A and 2.A) as well as an overview of payments to all Common Funds.

Full details by Sub-detector and Funding Agency are available in Annexes 1.B and 2.B.

Annex 1 : Tables - Total Accrued Commitments by Item and Funding Agency.

- **Annex 1.**A: Summary of CMS Commitments
- **Annex 1.**B: Detailed CMS Subdetectors Commitments

Annex 2 : Tables - Total Accrued Payments by Item and Funding Agency

- **Annex 2.**A: Summary of CMS Payments
- **Annex 2.**B: Detailed CMS Subdetectors Payments

Annex 3 : Table - Summary and Comparison with Cost Estimates

Annex 4 : Plot - Annual and Pluri-Annual Commitments

Annex 5 : Plot - Annual and Pluri-Annual Payment

ANNEX 1.A

Summary Commitments vs. Funding 1995-2007 (in kCHF)

Year	2007

Commitments		Contributing	Funding Agency																																		Grand Total
Type	System	Austria	Belgium	Bulgaria	CERN	China	Croatia	Cyprus	Estonia	Finland	France-CEA	France-IN2P3	Germany	Greece	Hungary	India	Iran	Italy	Korea	Pakistan	Poland	Portugal	RDMS-DMS	RDMS-Russia	Serbia	Spain	Switzerland-ETHZ	Switzerland-PSI	Switzerland-Universities	Taipei	Turkey	United Kingdom	USA-DOE	USA-NSF	
Expense	1. Magnet	1,241	1,645		16,908	1,215	104	226	112	1,770	3,447	6,300	5,441	1,480	368	1,200		17,300	815	625	940	730				2,140	25,785	2,610		866	368	2,857	26,527	2,852	125,872
	2. Tracker	1,809	4,388		18,961					3,280		7,960	8,803					24,327										3,601	2,499			3,150	3,975	1,023	83,775
	3. ECAL				37,383		200	381			2,828	9,250		1,122		1,113		5,102				1,101	80	5,221	56		45,939	1,720		1,396		4,328	6,201	4,257	127,677
	4. HCAL														500	2,500	510						5,715	5,701							690		27,536	7,601	50,753
	5. Muon Detector	43		600	2,229	3,340							6,193		55			20,605	400	1,186			1,000	3,810		5,519							24,395	2,112	71,487
	6. Trigger-DAQ	1,105			3,950					989	852			2,016	90				200		1,756	309				33	2,000	500				1,252	9,748		24,800
	7. Offline Computing	100	100		200					100		200	200	100				500								100	600	70				200		1,130	3,600
	8. Infrastructure				25,312												700							1,476											27,487
	9. Commissioning & Integration		40		12,267	500							543												400								2,080		15,830
Expense Total		4,298	6,173	600	117,209	5,055	304	607	112	6,139	7,127	23,710	21,181	4,718	1,013	4,813	1,210	67,834	1,415	1,811	2,696	2,139	6,795	16,208	456	7,792	74,325	8,501	2,499	2,262	1,058	11,787	100,462	18,975	531,283
Funding		4,775	6,170	600	103,500	5,115	329	706	112	6,170	7,732	23,700	20,809	5,000	1,058	5,200	1,210	67,927	1,962	2,824	3,000	2,440	6,795	15,928	450	7,800	75,500	8,500	2,700	2,740	1,058	13,018	100,435	18,554	523,816

ANNEX 1.B

Total Commitments 1995-2007 (in kCHF)

Year	2007
System	1. Magnet

Commitments

Type	Subsystem	Item	CF	Funding Agency: Contributing																												Contributing Total
				Austria	Belgium	CERN	China	Croatia	Cyprus	Estonia	Finland	France-CEA	France-IN2P3	Germany	Greece	Hungary	India	Italy	Korea	Pakistan	Poland	Portugal	Spain	Switzerland-ETHZ	Switzerland-PSI	Taipei	Turkey	United Kingdom	USA-DOE	USA-NSF	
Expense	1.0. Magnet Common Fund	1.0.1 MoU		1,100	1,500	15,760		80	26	90	1,480	1,760	6,000	1,886	1,480	310	900			940	423	1,790		500	730	310	2,650			39,715
		1.0.2 CtC		141	145	1,006		24		16	290		300	290		58	300				100	350			136	58	207			3,421
		1.0.3 CtC2005								6																						6
	1.0. Magnet Common Fund Total			1,241	1,645	16,766		104	26	112	1,770	1,760	6,300	2,176	1,480	368	1,200			940	523	2,140		500	866	368	2,857			43,142
	1.1. Barrel Yoke and Vacuum Tank	1.1.01 Barrel Rings and Vacuum Tank	5,505					200						2,163									9,084	2,110				7,615	2,852	24,023
		1.1.02 High Tension Bolts	241																												
		1.1.03 Hydraulic Tensioners	28																												
		1.1.04.A Support Feet - Outer - Material (Plates)																					338								338
		1.1.04.B Support Feet - Outer - Material (Welding)	100																												
		1.1.05 Support Feet - Outer - Transport to Karachi	30																												
		1.1.06 Support Feet - Outer - Manufacture																	625												625
		1.1.07 Support Feet - Outer - Transport to CERN	62																												
		1.1.08.A Manufacture Follow-up	461			2																									2
		1.1.08.B Photogrammetry and Survey																													
		1.1.09 Moving Beams	379																												
		1.1.10 Jacks and Air Pad System	262											1,103																	1,103
		1.1.11 Grease Pad Systems	140																		207										207
		1.1.12 Hydraulic Rotator	275																												
		1.1.13 Drilling Machine	822																												
		1.1.14 Rails	19																												
		1.1.15 Assembly on Surface	2,208																												
		1.1.16 Rigs and Scaffolds	147																												
		1.1.17 Ancillaries and Coupling Devices	111																												
		1.1.18 Design and Follow-up	171																												
	1.1. Barrel Yoke and Vacuum Tank Total		10,959			2		200						3,265					625		207		9,422	2,110				7,615	2,852	26,298
	1.2. Endcap Yokes	1.2.01.A KHI Contract (6 disks, 2 noses and ancillaries)	625																									8,209		8,209
		1.2.01.B FCI Contract (assembly of disks on surface)																										803		803
		1.2.02 Superbolts																										868		868
		1.2.03 HE Supports	101																											
		1.2.04 Design and Follow-up																										932		932
		1.2.05.A Carts Weldments (In-kind from China)					1,215																							1,215
		1.2.05.B Carts Weldments (payment from Common Fund)	170																											
		1.2.07 Ancillaries and Coupling Devices	153																									142		142
		1.2.09 Engineering, Supervision, Quality Control	35																									829		829
		1.2.10 Manufacture Follow-up	8																									12		12
		1.2.11 Support System	275																											
	1.2. Endcap Yokes Total		1,366				1,215																					11,795		13,010

Commitments

Type	Subsystem	Item	CF	Funding Agency	Contributing																														Contributing Total
					Austria	Belgium	CERN	China	Croatia	Cyprus	Estonia	Finland	France-CEA	France-IN2P3	Germany	Greece	Hungary	India	Italy	Korea	Pakistan	Poland	Portugal	Spain	Switzerland-ETHZ	Switzerland-PSI	Taipei	Turkey	United Kingdom	USA-DOE	USA-NSF	
	1.3. Coil	1.3.01.A Superconducting Strands	6																											4,036					4,036
		1.3.01.C Cabling Strands into Rutherford Cable	1																						978										978
		1.3.01.D Pure Aluminium (99.998 %)	11																											1,255					1,255
		1.3.01.E Co-extrusion of Insert	42																						3,474										3,474
		1.3.01.F Strands for Tests and Prototypes																							322										322
		1.3.02.A Alloy for Reinforcement	198				19																							1,072					1,091
		1.3.02.B EB Welding Reinforcement	123				17																		7,657										7,674
		1.3.03 Conductor - Quality Assurance	432				2																		3,932										3,934
		1.3.04 Module Assembly, Swiveling Tooling	383																17,300	815															18,115
		1.3.05 Process Qualification and QA Winding	320				97																												97
		1.3.06 Thermal Shields	737																																
		1.3.07 Cold Supports	838																																
		1.3.08 He Circuits	871																																
		1.3.09 Cold Mass Instrumentation	223																																
		1.3.10 Vacuum System	257																																
		1.3.11 Power Supply and Bus Bar	1,692																																
		1.3.12 Dump Resistor	660																																
		1.3.13 Magnet Safety System	376																																
		1.3.14 Magnet Control System	111																																
		1.3.15 He Refrigeration External Plant	8,996																																
		1.3.16 Components Testing	545				5																												5
		1.3.17 Coil Assembly	961																																
		1.3.18 Coil Surface Tests	340																																
		1.3.19 Studies and Supervision	12,219										1,687																						1,687
		1.3.20 Consumables	246																																
		1.3.21 Coil Transfer into Underground Cavern	866																																
		1.3.22 Implantation and Integration	207																																
	1.3. Coil Total		31,661				139						1,687						17,300	815					16,363					6,363					42,668
	1.4. Magnet Installation	1.4.01 2'200 t Crane Rental	2,551																																
		1.4.02 Rigging Equipment	341																																
		1.4.03 SX Infrastructure	357																																
		1.4.05 Field Mapping	15																											755					755
	1.4. Magnet Installation Total		3,264																											755					755
Expense Total			47,251		1,241	1,645	16,908	1,215	104	226	112	1,770	3,447	6,300	5,441	1,480	368	1,200	17,300	815	625	940	730	2,140	25,785	2,610	866	368	2,857	26,527	2,852				125,872
Funding					1,515	1,645	16,908	1,215	129	235	112	1,770	3,447	6,300	5,440	1,480	368	1,000	17,300	815	625	940	730	2,140	25,000	2,610	866	368	2,857	26,527	2,852				125,194

Year	2007
System	2. Tracker

Commitments

Type	Subsystem	Item	CF	Funding Agency	Austria	Belgium	CERN	Finland	France-IN2P3	Germany	Italy	Switzerland-PSI	Switzerland-Universities	United Kingdom	USA-DOE	USA-NSF	Contributing Total
Expense	2.1. Pixel Detectors	2.1.01 Detectors (incl. Pre-series)										92	775		215	100	1,182
		2.1.02 Electronics (include. Engineering)			170							1,832	1,064		1,235	135	4,436
		2.1.03 Module Mechanics										1,203			380		1,583
		2.1.04 Support Structures & Assembly										120			230		350
		2.1.05 Monitoring										26			50		76
		2.1.06 Service Systems										328	160		215		703
	2.1. Pixel Detectors Total				170							3,601	1,999		2,325	235	8,330
	2.2. Silicon Detectors	2.2.01 Procurement of Sensors			1,047	1,205	5,361	534	3,174	3,313	7,361						21,995
		2.2.02 Capton					194			326	90						610
		2.2.03 Frames				1,563				225							1,788
		2.2.04 Pitch Adapters				776	686		26								1,488
		2.2.05 FE Hybrid					506		1,535	10						49	2,100
		2.2.07 Tooling and Box				41			55		18						114
		2.2.08 Interconnect Board					451			475	461					100	1,488
		2.2.09 Module Preseries			49	304			75	349	400						1,177
	2.2. Silicon Detectors Total				1,096	3,888	7,199	534	4,865	4,698	8,330					149	30,760
	2.3. Electronics for Si Detectors	2.3.01 Module Electronics					342	32			1,213			1,101			2,688
		2.3.02 Analogue Link					4,193		1,424	1,165	4,740			500			12,022
		2.3.03 Digital Link					0			130							130
		2.3.04 Analogue Optohybrid			543						235						778
		2.3.05 Digital Optohybrid					80										80
		2.3.06 FED				233	1,504	814	917	110	51		500	1,549	355	639	6,672
		2.3.08 FEC					135										135
	2.3. Electronics for Si Detectors Total				543	233	6,254	846	2,341	1,405	6,239		500	3,150	355	639	22,505
	2.4. Power Supplies for Si Detectors	2.4.01 Power Supplies					493				5,139						5,632
		2.4.02 Cables (installed)					286	208		34	1,817				987		3,331
	2.4. Power Supplies for Si Detectors Total						778	208		34	6,956				987		8,963
	2.5. Mech. Struct. & Cooling for Si Detectors	2.5.01 Inner Barrel									1,236						1,236
		2.5.02 Inner Endcap									462						462
		2.5.03 Outer Barrel					195	472									667
		2.5.04 Outer Barrel Rods						1,220									1,220
		2.5.05 Endcaps							520	709							1,229
		2.5.06 Endcaps Petals				167				848							1,014
		2.5.07 General Cooling					2,367				405						2,772
		2.5.08 Integration (st, ts, etc.)					1,314			138							1,453
	2.5. Mech. Struct. & Cooling for Si Detectors Total					167	3,876	1,692	520	1,695	2,103						10,052
	2.6. Monitoring for Si Detectors	2.6.01 Position Monitoring Systems					23			413							436
		2.6.02 Temperature Control					362										362
	2.6. Monitoring for Si Detectors Total						385			413							798
	2.7. Data Acquisition for Si Detectors	2.7.01 Test Stands				100			234	558	285						1,177
	2.7. Data Acquisition for Si Detectors Total					100			234	558	285						1,177
	2.8. Installation of Si Detectors	2.8.01 Installation Manpower					468				414						882
	2.8. Installation of Si Detectors Total						468				414						882
	2.9. Integration Facilities	2.9.01 Clean Room	1,395												308		308
		2.9.02 Integration Manpower	873														
	2.9. Integration Facilities Total		2,268												308		308
Expense Total			2,268	1,809	4,388	18,961	3,280	7,960	8,803	24,327	3,601	2,499	3,150	3,975	1,023		83,775
Funding				1,810	4,385	17,700	3,280	7,950	8,820	24,300	3,600	2,500	2,700	4,018	990		82,053

Year	2007
System	3. ECAL

Commitments

Type	Subsystem	Item	CERN	Croatia	Cyprus	France-CEA	France-IN2P3	Greece	India	Italy	Portugal	RDMS-DMS	RDMS-Russia	Serbia	Switzerland-ETHZ	Switzerland-PSI	Taipei	United Kingdom	USA-DOE	USA-NSF	Contributing Total
			Contributing	Funding Agency																	
Expense	3.1. Barrel	3.1.1 Crystals	30,924		5		250			987					24,350			1,304			57,820
		3.1.2 Electronics	467	200	231	413	3,151			1,874	812			44	5,050	1,720			4,407	4,202	22,571
		3.1.3 Mechanics	1,404				3,162			2,241					3,057						9,865
		3.1.4 Assembly and Installation	1,425			121									2,672						4,218
		3.1.5 Monitoring				1,700													837		2,537
	3.1. Barrel Total		34,221	200	236	2,234	6,563			5,102	812			44	35,129	1,720		1,304	5,244	4,202	97,011
	3.2. Endcaps	3.2.1 Crystals	844				1,500		500				1,958		9,100			72			13,973
		3.2.2 Electronics	124		145	31	1,187				289		19	12	1,309			1,046	958	54	5,174
		3.2.3 Mechanics											2,331					1,906			4,237
		3.2.4 Assembly and Installation													401						401
		3.2.5 Monitoring				562							13								575
		3.2.6 Preshower	2,194					1,122	613			80	900				1,396				6,305
	3.2. Endcaps Total		3,162		145	593	2,687	1,122	1,113		289	80	5,221	12	10,810		1,396	3,024	958	54	30,666
Expense Total			37,383	200	381	2,828	9,250	1,122	1,113	5,102	1,101	80	5,221	56	45,939	1,720	1,396	4,328	6,201	4,257	127,677
Funding			22,700	200	471	3,121	9,250	1,360	1,700	5,900	1,315	80	4,941	50	47,900	1,720	1,874	5,211	6,201	4,090	118,084

Year	2007
System	4. HCAL

Commitments

Type	Subsystem	Item	Hungary	India	Iran	RDMS-DMS	RDMS-Russia	Turkey	USA-DOE	USA-NSF	Contributing Total
			Contributing Funding Agency								
Expense	4.1. Barrel	4.1.01 Mechanics							12,323	81	12,404
		4.1.02 Optics							2,417	194	2,611
		4.1.03 Read-out Boxes							536	121	656
		4.1.04 Photodetectors							498	1,692	2,190
		4.1.05 Front-end Electronics							1,590	571	2,161
		4.1.06 Calibration Systems							362	11	373
		4.1.07 Trigger/DAQ Electronics							1,087	799	1,886
		4.1.08 Voltage Supply Systems							238	240	478
		4.1.09 Detector Control Systems							250	58	308
		4.1.10 Pre-production Prototypes							2,204	63	2,267
	4.1. Barrel Total								21,505	3,829	25,334
	4.2. Outer Barrel	4.2.01 Mechanics		481							481
		4.2.02 Optics		1,761					34	14	1,809
		4.2.03 Read-out Boxes							138	139	278
		4.2.04 Photodetectors		98					176		274
		4.2.05 Front-end Electronics							24	225	249
		4.2.06 Calibration Systems							49		49
		4.2.07 Trigger/DAQ Electronics							255	271	526
		4.2.08 Voltage Supply Systems							28	104	132
		4.2.09 Detector Control Systems							2	38	39
		4.2.10 Pre-production Prototypes		160					8	5	173
	4.2. Outer Barrel Total			2,500					713	797	4,010
	4.3. Endcap	4.3.01 Mechanics				5,240	2,732		91	1,311	9,373
		4.3.02 Optics				150	624		406	170	1,349
		4.3.03 Read-out Boxes							125	96	221
		4.3.04 Photodetectors							105		105
		4.3.05 Front-end Electronics							12	221	233
		4.3.06 Calibration Systems							261		261
		4.3.07 Trigger/DAQ Electronics							152	473	626
		4.3.08 Voltage Supply Systems							30	130	160
		4.3.09 Detector Control Systems								38	38
		4.3.10 Pre-production Prototypes				325	200		35	4	564
	4.3. Endcap Total					5,715	3,556		1,217	2,442	12,930
	4.5. Forward	4.5.01 Mechanics	9		510		1,856	677	10	20	3,082
		4.5.02 Optics	477						2,048		2,525
		4.5.03 Read-out Boxes							93		93
		4.5.04 Photodetectors							791		791
		4.5.05 Front-end Electronics							104	243	347
		4.5.06 Calibration Systems					59		316		375
		4.5.07 Trigger/DAQ Electronics							110	233	342
		4.5.08 Voltage Supply Systems							126		126
		4.5.09 Detector Control Systems							32	38	70
		4.5.10 Pre-production Prototypes	14				230	13	469		726
	4.5. Forward Total		500		510		2,145	690	4,100	533	8,479
Expense Total			500	2,500	510	5,715	5,701	690	27,536	7,601	50,753
Funding			500	2,500	510	5,715	5,701	690	26,698	7,380	49,694

Year	2007
System	5. Muon Detector

Commitments

Type	Subsystem	Item	CF	Contributing Funding Agency: Austria	Bulgaria	CERN	China	Germany	Hungary	Italy	Korea	Pakistan	RDMS-DMS	RDMS-Russia	Spain	USA-DOE	USA-NSF	Contributing Total
Expense	5.1. Barrel Drifttubes	5.1.1 Detectors and Components						2,576		5,909					1,972			10,457
		5.1.2 Electronics				853	800	2,773		7,846					1,989			14,261
		5.1.3 Mechanical Structure and Supports					350	191		521					152			1,214
		5.1.4 Assembly and Installation						94		287					108			489
		5.1.6 Service Systems				315		560		299					105			1,279
	5.1. Barrel Drifttubes Total					1,168	1,150	6,193		14,862					4,326			27,699
	5.2. Forward ME 1/1	5.2.1 Detectors and Components											80	1,685				1,765
		5.2.2 Electronics											700	160		1,781	600	3,241
		5.2.3 Mechanical Structure, Supports												210				210
		5.2.4 Assembly and Installation											170	155				325
		5.2.5 Monitoring											50					50
		5.2.6 Service Systems												100				100
	5.2. Forward ME 1/1 Total												1,000	2,310		1,781	600	5,691
	5.3. Endcap CSC	5.3.1 Detectors and Components					1,500							1,500		8,855		11,855
		5.3.2 Electronics														11,361	674	12,034
		5.3.3 Mechanical Structure and Supports														430		430
		5.3.4 Assembly and Installation														260		260
		5.3.5 Monitoring														323		323
		5.3.6 Service Systems														1,183		1,183
	5.3. Endcap CSC Total						1,500							1,500		22,411	674	26,085
	5.4. Barrel RPC	5.4.1 Detectors and Components			600		320			2,932								3,852
		5.4.2 Electronics								1,968								1,968
		5.4.3 Mechanical Structure and Supports								100								100
		5.4.4 Assembly and Installation					20			40								60
		5.4.5 Monitoring								130								130
		5.4.6 Service Systems	410							573								573
	5.4. Barrel RPC Total		410		600		340			5,743								6,683
	5.5. Forward RPC	5.5.1 Detectors and Components	613				350				400	190						940
		5.5.2 Electronics	10								0	876						876
		5.5.3 Mechanical Structure and Supports									0							0
		5.5.4 Assembly and Installation	321									120						120
		5.5.6 Service Systems	597															
	5.5. Forward RPC Total		1,541				350				400	1,186						1,936
	5.6. Alignment	5.6.1 Barrel		43		1,060			55									1,158
		5.6.2 Forward													78	203	838	1,119
		5.6.3 Link													1,115			1,115
	5.6. Alignment Total			43		1,060			55						1,193	203	838	3,393
Expense Total			1,951	43	600	2,229	3,340	6,193	55	20,605	400	1,186	1,000	3,810	5,519	24,395	2,112	71,487
Funding			1,485	50	600	2,300	3,100	5,806	100	19,827	500	2,050	1,000	3,810	5,560	24,395	2,112	71,210

Year	2007
System	6. Trigger-DAQ

Commitments

Type	Subsystem	Item	CF	Funding Agency: Austria	CERN	Finland	France-CEA	Greece	Hungary	Italy	Korea	Poland	Portugal	Spain	Switzerland-ETHZ	Switzerland-PSI	United Kingdom	USA-DOE	Contributing Total
Expense	6.1. Trigger	6.1.1 Calorimeter Trigger											309				802	4,382	5,492
		6.1.2 CSC Trigger																1,683	1,683
		6.1.3 DT Trigger		706										33					739
		6.1.4 RPC Trigger				989						1,756							2,744
		6.1.5 Global Trigger		400															400
	6.1. Trigger Total			1,105		989						1,756	309	33			802	6,065	11,058
	6.2. Data Acquisition	6.2.1 Event Filter	2,000				852	1,991	90		200				1,390	350			4,873
		6.2.2 Readout Builder			905											150		510	1,565
		6.2.3 Data to Surface			1,417										610		450	2,573	5,050
		6.2.4 Detector Controls			259														259
		6.2.5 Preseries			403			25										600	1,028
		6.2.6 DAQ Integration			966														966
	6.2. Data Acquisition Total		2,000		3,950		852	2,016	90		200				2,000	500	450	3,683	13,741
Expense Total			2,000	1,105	3,950	989	852	2,016	90		200	1,756	309	33	2,000	500	1,252	9,748	24,800
Funding				1,300	7,470	1,020	840	2,060	90	100	500	2,060	255		2,000	500	2,050	10,515	30,760

Year	2007
System	7. Offline Computing

Commitments

Type	Subsystem	Item	CF	Contributing Funding Agency: Austria	Belgium	CERN	Finland	France-IN2P3	Germany	Greece	Italy	Spain	Switzerland-ETHZ	Switzerland-PSI	United Kingdom	USA-NSF	Contributing Total
Expense	7.0. Offline Common Fund	7.0.1 MoU		100	100	200	100	200	200	100	500	100	496		200	1,130	3,426
	7.0. Offline Common Fund Total			100	100	200	100	200	200	100	500	100	496		200	1,130	3,426
	7.1. Offline Infrastructure	7.1.1 File Servers	743											35			35
		7.1.2 Information Servers	139														
		7.1.3 Computing Power	191										104	35			139
		7.1.4 Spares	21														
		7.1.5 System Assembly	109														
		7.1.6 Software Licenses	83														
		7.1.7 System Management	856														
	7.1. Offline Infrastructure Total		2,141										104	70			174
Expense Total			2,141	100	100	200	100	200	200	100	500	100	600	70	200	1,130	3,600
Funding				100	100	200	100	200	200	100	500	100	600	70	200	1,130	3,600

Year	2007
System	8. Infrastructure

Commitments

Type	Subsystem	Item	Contributing: CERN	Contributing: Iran	Contributing: RDMS-Russia	Funding Agency	Contributing Total
Expense	8.1. Access and Survey	8.1.1 Gangways, Stairs	1,788				1,788
		8.1.2 Structures on Yoke	1,363				1,363
		8.1.3 Personnel Access Equipment	1,327				1,327
		8.1.4 General Survey	606				606
	8.1. Access and Survey Total		5,085				5,085
	8.2. General Installation	8.2.1 Counting Room Structures	631				631
		8.2.2 Racks with Cooling	836				836
		8.2.3 Electrical Distribution from Outlets	2,790				2,790
		8.2.4 Gas Systems and Primary Distribution Racks	1,863				1,863
		8.2.5 Beam Pipe	624				624
		8.2.6 Cable Trays to Counting Rooms	412				412
		8.2.7 Control Room and Cabling to Surface	93				93
		8.2.8 General Piping	914				914
	8.2. General Installation Total		8,164				8,164
	8.3. Cooling and Ventilation	8.3.1 Detector Cooling Plant	3,893				3,893
		8.3.2 Detector Specific Ventilation	205				205
		8.3.3 Detector Primary Cooling System	884				884
	8.3. Cooling and Ventilation Total		4,982				4,982
	8.4. Safety	8.4.1 Safety Installations	847				847
		8.4.2 Safety Equipment Control	371				371
		8.4.3 Hard-wired Safety System	98				98
		8.4.4 Inertion System	354				354
	8.4. Safety Total		1,669				1,669
	8.5. Fixed Cranes	8.5.1 80 ton /100 m	857				857
		8.5.2 80 ton /100 m Double Beam System	1,706				1,706
		8.5.3 20 ton Crane	219				219
		8.5.4 3 ton Lift	271				271
	8.5. Fixed Cranes Total		3,054				3,054
	8.6. Shielding Systems	8.6.1 Rotating Shielding	646		1,476		2,121
		8.6.2 Vertical 400 ton Lifting System	604				604
		8.6.3 Mechanics and Shielding for Forward HCAL	1,109	700			1,809
	8.6. Shielding Systems Total		2,359	700	1,476		4,534
Expense Total			25,312	700	1,476		27,487
Funding			23,955	700	1,476		26,131

Year	2007
System	9. Commissioning & Integration

Commitments

Type	Subsystem	Item	CF	Funding Agency: Contributing											Contributing Total
				Belgium	CERN	China	France-CEA	Germany	Korea	Portugal	RDMS-Russia	Serbia	Switzerland-Universities	USA-DOE	
Expense	9.0. C&I Common Fund	9.0.1 CtC		40	12,267			543							12,850
	9.0. C&I Common Fund Total			40	12,267			543							12,850
	9.1. Additional facilities for Commissioning on surface	9.1.01 Mixed Water Cooling	1,959												
		9.1.02 Gas Distribution	449												
		9.1.03 Control Room	207												
		9.1.04 Smoke Detection	442												
		9.1.05 LV System (1 generator)	400											780	780
		9.1.06 20t lifting equipment	253												
		9.1.07 Extra Electric & Optical Cabling	1,390												
		9.1.08 Common Electronics	481												
		9.1.09 Pre-cabling, pre-testing & related facilities	2,037												
		9.1.10 Basic DSS for Equipment Protection	331												
		9.1.11 Semi-clean areas	205												
	9.1. Additional facilities for Commissioning on surface Total		8,154											780	780
	9.2. Detector Installation, Opening and Access Facilities	9.2.01 Installation and access tooling	1,238												
		9.2.02 Dummy End Flanges (EB, EE, SE)	246												
		9.2.03 Magnet Closing System	899									400			400
		9.2.04 Control for Magnet and Magnet Power Supply	123												
		9.2.05 Beampipe Vacuum Tooling & Support Structure	175												
		9.2.06 Floor Plates for UXC	94			500									500
		9.2.07 Cherry Pickers & Access Platforms	352												
	9.2. Detector Installation, Opening and Access Facilities Total		3,126			500						400			900
	9.3. General Services	9.3.01 Workshops	583												
		9.3.02 Heavy Transport	1,039												
		9.3.03 Survey	212												
		9.3.04 Storage Infrastructure	675												
		9.3.05 Extra Engineering for Integration of Magnet & Detectors	1,489												
		9.3.06 Technical Support Team	4,551											1,300	1,300
	9.3. General Services Total		8,550											1,300	1,300
Expense Total			19,831	40	12,267	500		543				400		2,080	15,830
Funding				40	12,267	800	324	543	147	140		400	200	2,080	16,941

ANNEX 2.A

Summary Payments vs Funding 1995-2007 (kCHF)

Year	2007

Payments		Contributing	Funding Agency																																		Grand Total
Type	System	Austria	Belgium	Bulgaria	CERN	China	Croatia	Cyprus	Estonia	Finland	France-CEA	France-IN2P3	Germany	Greece	Hungary	India	Iran	Italy	Korea	Pakistan	Poland	Portugal	RDMS-DMS	RDMS-Russia	Serbia	Spain	Switzerland-ETHZ	Switzerland-PSI	Switzerland-Universities	Taipei	Turkey	United Kingdom	USA-DOE	USA-NSF	
Expense	1. Magnet	1,241	1,645		16,908	1,215	104	226	112	1,770	2,590	6,300	5,441	1,480	368	1,200		17,300	815	625	940	730				2,140	24,570	2,610		866	368	2,857	26,527	2,852	123,800
	2. Tracker	1,809	4,388		18,961					3,280		7,960	8,803					24,327										3,601	2,499			3,150	3,975	1,023	83,775
	3. ECAL				37,383		200	381			2,828	8,643		942		738		5,102				1,101	80	5,221	56		35,387	1,720		1,396		4,328	6,201	4,257	115,964
	4. HCAL														500	2,500	510						5,715	5,701							690		27,469	7,541	50,625
	5. Muon Detector	43		600	2,229	3,340							6,193		55			20,605	400	1,186			1,000	3,810		5,519							24,395	2,112	71,487
	6. Trigger-DAQ	1,105			3,950					989	852			25	90						1,756	309				33	2,000	500				1,252	9,748		22,609
	7. Offline Computing	100	100		200					100		200	200	100				500								100	600	70				200		1,130	3,600
	8. Infrastructure				25,312												700							1,476											27,487
	9. Commissioning & Integration		40		12,267	500							543												400								2,080		15,830
Expense Total		4,298	6,173	600	117,209	5,055	304	607	112	6,139	6,270	23,103	21,181	2,548	1,013	4,438	1,210	67,834	1,215	1,811	2,696	2,139	6,795	16,208	456	7,792	62,557	8,501	2,499	2,262	1,058	11,787	100,395	18,915	515,178
Funding		4,775	6,170	600	103,500	5,115	329	706	112	6,170	7,732	23,700	20,809	5,000	1,058	5,200	1,210	67,927	1,962	2,824	3,000	2,440	6,795	15,928	450	7,800	75,500	8,500	2,700	2,740	1,058	13,018	100,435	18,554	523,816

ANNEX 2.A

Summary of Payments to Common Funds 1995-2007 (kCHF)

Year	2007

Payments

Type	Subsystem	Item	Contributing Funding Agency																							Contributing Total	DAQ Staging
			Austria	Belgium	CERN	Croatia	Cyprus	Estonia	Finland	France-CEA	France-IN2P3	Germany	Greece	Hungary	India	Italy	Poland	Portugal	Spain	Switzerland-ETHZ	Switzerland-PSI	Taipei	Turkey	United Kingdom	USA-NSF		
Expense	0.0. Other Common Funds Income	0.0. Other Common Funds Income																									
	0.0. Other Common Funds Income Total																										
	1.0. Magnet Common Fund	1.0.1 MoU	1,100	1,500	15,760	80	26	90	1,480	1,760	6,000	1,886	1,480	310	900		940	423	1,790		500	730	310	2,650		39,715	
		1.0.2 CtC	141	145	1,006	24		16	290		300	290		58	300			100	350			136	58	207		3,421	
		1.0.3 CtC2005						6																		6	
	1.0. Magnet Common Fund Total		1,241	1,645	16,766	104	26	112	1,770	1,760	6,300	2,176	1,480	368	1,200		940	523	2,140		500	866	368	2,857		43,142	
	6.0. DAQ Common Fund	6.0.1 DAQ Staging																									2,000
	6.0. DAQ Common Fund Total																										2,000
	7.0. Offline Common Fund	7.0.1 MoU	100	100	200				100		200	200	100			500			100	496				200	1,130	3,426	
	7.0. Offline Common Fund Total		100	100	200				100		200	200	100			500			100	496				200	1,130	3,426	
	9.0. C&I Common Fund	9.0.1 CtC		40	12,267							543														12,850	
	9.0. C&I Common Fund Total			40	12,267							543														12,850	
Expense Total			1,341	1,785	29,233	104	26	112	1,870	1,760	6,500	2,919	1,580	368	1,200	500	940	523	2,240	496	500	866	368	3,057	1,130	59,418	2,000

ANNEX 2.B

Total Payments 1995-2007 (kCHF)

Year	2007
System	1. Magnet

Payments			CF	Contributing Funding Agency																										Contributing Total
Type	Subsystem	Item		Austria	Belgium	CERN	China	Croatia	Cyprus	Estonia	Finland	France-CEA	France-IN2P3	Germany	Greece	Hungary	India	Italy	Korea	Pakistan	Poland	Portugal	Spain	Switzerland-ETHZ	Switzerland-PSI	Taipei	Turkey	United Kingdom	USA-DOE	USA-NSF	
Expense	1.0. Magnet Common Fund	1.0.1 MoU		1,100	1,500	15,760		80	26	90	1,480	1,760	6,000	1,886	1,480	310	900				940	423	1,790		500	730	310	2,650			39,715
		1.0.2 CtC		141	145	1,006		24		16	290		300	290		58	300					100	350			136	58	207			3,421
		1.0.3 CtC2005								6																					6
	1.0. Magnet Common Fund Total			1,241	1,645	16,766		104	26	112	1,770	1,760	6,300	2,176	1,480	368	1,200				940	523	2,140		500	866	368	2,857			43,142
	1.1. Barrel Yoke and Vacuum Tank	1.1.01 Barrel Rings and Vacuum Tank	5,505						200					2,163										8,154	2,110				7,615	2,852	23,093
		1.1.02 High Tension Bolts	241																												
		1.1.03 Hydraulic Tensioners	28																												
		1.1.04.A Support Feet - Outer - Material (Plates)																						338							338
		1.1.04.B Support Feet - Outer - Material (Welding)	100																												
		1.1.05 Support Feet - Outer - Transport to Karachi	30																												
		1.1.06 Support Feet - Outer - Manufacture																		625											625
		1.1.07 Support Feet - Outer - Transport to CERN	62																												
		1.1.08.A Manufacture Follow-up	461			2																									2
		1.1.08.B Photogrammetry and Survey																													
		1.1.09 Moving Beams	379																												
		1.1.10 Jacks and Air Pad System	262											1,103																	1,103
		1.1.11 Grease Pad Systems	140																			207									207
		1.1.12 Hydraulic Rotator	275																												
		1.1.13 Drilling Machine	822																												
		1.1.14 Rails	19																												
		1.1.15 Assembly on Surface	2,208																												
		1.1.16 Rigs and Scaffolds	147																												
		1.1.17 Ancillaries and Coupling Devices	111																												
		1.1.18 Design and Follow-up	171																												
	1.1. Barrel Yoke and Vacuum Tank Total		10,959			2			200					3,265						625		207		8,492	2,110				7,615	2,852	25,368
	1.2. Endcap Yokes	1.2.01.A KHI Contract (6 disks, 2 noses and ancillaries)	625																									8,209			8,209
		1.2.01.B FCI Contract (assembly of disks on surface)																										803			803
		1.2.02 Superbolts																										868			868
		1.2.03 HE Supports	101																												
		1.2.04 Design and Follow-up																										932			932
		1.2.05.A Carts Weldments (In-kind from China)					1,215																								1,215
		1.2.05.B Carts Weldments (payment from Common Fund)	170																												
		1.2.07 Ancillaries and Coupling Devices	153																									142			142
		1.2.09 Engineering, Supervision, Quality Control	35																									829			829
		1.2.10 Manufacture Follow-up	8																									12			12
		1.2.11 Support System	275																												
	1.2. Endcap Yokes Total		1,366				1,215																					11,795			13,010

Payments

Type	Subsystem	Item	CF	Contributing Funding Agency	Austria	Belgium	CERN	China	Croatia	Cyprus	Estonia	Finland	France-CEA	France-IN2P3	Germany	Greece	Hungary	India	Italy	Korea	Pakistan	Poland	Portugal	Spain	Switzerland-ETHZ	Switzerland-PSI	Taipei	Turkey	United Kingdom	USA-DOE	USA-NSF	Contributing Total
	1.3. Coil	1.3.01.A Superconducting Strands	6																										4,036			4,036
		1.3.01.C Cabling Strands into Rutherford Cable	1																						978							978
		1.3.01.D Pure Aluminium (99.998 %)	11																										1,255			1,255
		1.3.01.E Co-extrusion of Insert	42																						3,474							3,474
		1.3.01.F Strands for Tests and Prototypes																							322							322
		1.3.02.A Alloy for Reinforcement	198				19																						1,072			1,091
		1.3.02.B EB Welding Reinforcement	123				17																		7,372							7,389
		1.3.03 Conductor - Quality Assurance	432				2																		3,932							3,934
		1.3.04 Module Assembly, Swiveling Tooling	383																17,300	815												18,115
		1.3.05 Process Qualification and QA Winding	320				97																									97
		1.3.06 Thermal Shields	737																													
		1.3.07 Cold Supports	838																													
		1.3.08 He Circuits	871																													
		1.3.09 Cold Mass Instrumentation	223																													
		1.3.10 Vacuum System	257																													
		1.3.11 Power Supply and Bus Bar	1,668																													
		1.3.12 Dump Resistor	660																													
		1.3.13 Magnet Safety System	376																													
		1.3.14 Magnet Control System	111																													
		1.3.15 He Refrigeration External Plant	7,813																													
		1.3.16 Components Testing	545				5																									5
		1.3.17 Coil Assembly	961																													
		1.3.18 Coil Surface Tests	340																													
		1.3.19 Studies and Supervision	12,219										830																			830
		1.3.20 Consumables	246																													
		1.3.21 Coil Transfer into Underground Cavern	758																													
		1.3.22 Implantation and Integration	207																													
	1.3. Coil Total		30,346				139						830						17,300	815					16,078				6,363			41,525
	1.4. Magnet Installation	1.4.01 2'200 t Crane Rental	2,410																													
		1.4.02 Rigging Equipment	341																													
		1.4.03 SX Infrastructure	357																													
		1.4.05 Field Mapping	15																										755			755
	1.4. Magnet Installation Total		3,123																										755			755
Expense Total			45,795		1,241	1,645	16,908	1,215	104	226	112	1,770	2,590	6,300	5,441	1,480	368	1,200	17,300	815	625	940	730	2,140	24,570	2,610	866	368	2,857	26,527	2,852	123,800
Funding					1,515	1,645	16,908	1,215	129	235	112	1,770	3,447	6,300	5,440	1,480	368	1,000	17,300	815	625	940	730	2,140	25,000	2,610	866	368	2,857	26,527	2,852	125,194

Year	2007
System	2. Tracker

Payments

Type	Subsystem	Item	CF	Funding Agency Contributing												Contributing Total
				Austria	Belgium	CERN	Finland	France-IN2P3	Germany	Italy	Switzerland-PSI	Switzerland-Universities	United Kingdom	USA-DOE	USA-NSF	
Expense	2.1. Pixel Detectors	2.1.01 Detectors (incl. Pre-series)									92	775		215	100	1,182
		2.1.02 Electronics (include. Engineering)		170							1,832	1,064		1,235	135	4,436
		2.1.03 Module Mechanics									1,203			380		1,583
		2.1.04 Support Structures & Assembly									120			230		350
		2.1.05 Monitoring									26			50		76
		2.1.06 Service Systems									328	160		215		703
	2.1. Pixel Detectors Total			170							3,601	1,999		2,325	235	8,330
	2.2. Silicon Detectors	2.2.01 Procurement of Sensors		1,047	1,205	5,361	534	3,174	3,313	7,361						21,995
		2.2.02 Capton				194			326	90						610
		2.2.03 Frames			1,563				225							1,788
		2.2.04 Pitch Adapters			776	686		26								1,488
		2.2.05 FE Hybrid				506		1,535	10						49	2,100
		2.2.07 Tooling and Box			41			55		18						114
		2.2.08 Interconnect Board				451			475	461					100	1,488
		2.2.09 Module Preseries		49	304			75	349	400						1,177
	2.2. Silicon Detectors Total			1,096	3,888	7,199	534	4,865	4,698	8,330					149	30,760
	2.3. Electronics for Si Detectors	2.3.01 Module Electronics				342	32			1,213			1,101			2,688
		2.3.02 Analogue Link				4,193		1,424	1,165	4,740			500			12,022
		2.3.03 Digital Link				0			130							130
		2.3.04 Analogue Optohybrid		543						235						778
		2.3.05 Digital Optohybrid				80										80
		2.3.06 FED			233	1,504	814	917	110	51		500	1,549	355	639	6,672
		2.3.08 FEC				135										135
	2.3. Electronics for Si Detectors Total			543	233	6,254	846	2,341	1,405	6,239		500	3,150	355	639	22,505
	2.4. Power Supplies for Si Detectors	2.4.01 Power Supplies				493				5,139						5,632
		2.4.02 Cables (installed)				286	208		34	1,817				987		3,331
	2.4. Power Supplies for Si Detectors Total					778	208		34	6,956				987		8,963
	2.5. Mech. Struct. & Cooling for Si Detectors	2.5.01 Inner Barrel								1,236						1,236
		2.5.02 Inner Endcap								462						462
		2.5.03 Outer Barrel				195	472									667
		2.5.04 Outer Barrel Rods					1,220									1,220
		2.5.05 Endcaps						520	709							1,229
		2.5.06 Endcaps Petals			167				848							1,014
		2.5.07 General Cooling				2,367				405						2,772
		2.5.08 Integration (st, ts, etc.)				1,314			138							1,453
	2.5. Mech. Struct. & Cooling for Si Detectors Total				167	3,876	1,692	520	1,695	2,103						10,052
	2.6. Monitoring for Si Detectors	2.6.01 Position Monitoring Systems				23			413							436
		2.6.02 Temperature Control				362										362
	2.6. Monitoring for Si Detectors Total					385			413							798
	2.7. Data Acquisition for Si Detectors	2.7.01 Test Stands			100			234	558	285						1,177
	2.7. Data Acquisition for Si Detectors Total				100			234	558	285						1,177
	2.8. Installation of Si Detectors	2.8.01 Installation Manpower				468				414						882
	2.8. Installation of Si Detectors Total					468				414						882
	2.9. Integration Facilities	2.9.01 Clean Room	1,395											308		308
		2.9.02 Integration Manpower	873													
	2.9. Integration Facilities Total		2,268											308		308
Expense Total			2,268	1,809	4,388	18,961	3,280	7,960	8,803	24,327	3,601	2,499	3,150	3,975	1,023	83,775
Funding				1,810	4,385	17,700	3,280	7,950	8,820	24,300	3,600	2,500	2,700	4,018	990	82,053

Year	2007
System	3. ECAL

Payments

Type	Subsystem	Item	CERN	Croatia	Cyprus	France-CEA	France-IN2P3	Greece	India	Italy	Portugal	RDMS-DMS	RDMS-Russia	Serbia	Switzerland-ETHZ	Switzerland-PSI	Taipei	United Kingdom	USA-DOE	USA-NSF	Contributing Total
			Contributing	Funding Agency																	
Expense	3.1. Barrel	3.1.1 Crystals	30,924		5		250			987					21,141			1,304			54,611
		3.1.2 Electronics	467	200	231	413	3,151			1,874	812			44	5,050	1,720			4,407	4,202	22,571
		3.1.3 Mechanics	1,404				3,162			2,241					3,057						9,865
		3.1.4 Assembly and Installation	1,425			121									2,672						4,218
		3.1.5 Monitoring				1,700													837		2,537
	3.1. Barrel Total		34,221	200	236	2,234	6,563			5,102	812			44	31,920	1,720		1,304	5,244	4,202	93,802
	3.2. Endcaps	3.2.1 Crystals	844				1,500		125				1,958		1,757			72			6,255
		3.2.2 Electronics	124		145	31	580				289		19	12	1,309			1,046	958	54	4,567
		3.2.3 Mechanics											2,331					1,906			4,237
		3.2.4 Assembly and Installation													401						401
		3.2.5 Monitoring				562							13								575
		3.2.6 Preshower	2,194					942	613			80	900				1,396				6,125
	3.2. Endcaps Total		3,162		145	593	2,080	942	738		289	80	5,221	12	3,467		1,396	3,024	958	54	22,161
Expense Total			37,383	200	381	2,828	8,643	942	738	5,102	1,101	80	5,221	56	35,387	1,720	1,396	4,328	6,201	4,257	115,964
Funding			22,700	200	471	3,121	9,250	1,360	1,700	5,900	1,315	80	4,941	50	47,900	1,720	1,874	5,211	6,201	4,090	118,084

Year	2007
System	4. HCAL

Payments

Type	Subsystem	Item	Contributing: Hungary	Funding Agency: India	Iran	RDMS-DMS	RDMS-Russia	Turkey	USA-DOE	USA-NSF	Contributing Total
Expense	4.1. Barrel	4.1.01 Mechanics							12,323	81	12,404
		4.1.02 Optics							2,417	194	2,611
		4.1.03 Read-out Boxes							536	121	656
		4.1.04 Photodetectors							498	1,692	2,190
		4.1.05 Front-end Electronics							1,578	516	2,094
		4.1.06 Calibration Systems							362	11	373
		4.1.07 Trigger/DAQ Electronics							1,083	799	1,882
		4.1.08 Voltage Supply Systems							197	240	437
		4.1.09 Detector Control Systems							250	58	308
		4.1.10 Pre-production Prototypes							2,204	63	2,267
	4.1. Barrel Total								21,447	3,774	25,222
	4.2. Outer Barrel	4.2.01 Mechanics		481							481
		4.2.02 Optics		1,761					34	14	1,809
		4.2.03 Read-out Boxes							138	139	278
		4.2.04 Photodetectors		98					176		274
		4.2.05 Front-end Electronics							24	225	249
		4.2.06 Calibration Systems							49		49
		4.2.07 Trigger/DAQ Electronics							255	271	526
		4.2.08 Voltage Supply Systems							28	101	129
		4.2.09 Detector Control Systems							2	38	39
		4.2.10 Pre-production Prototypes		160					8	5	173
	4.2. Outer Barrel Total			2,500					713	794	4,007
	4.3. Endcap	4.3.01 Mechanics				5,240	2,732		91	1,311	9,373
		4.3.02 Optics				150	624		406	170	1,349
		4.3.03 Read-out Boxes							125	96	221
		4.3.04 Photodetectors							105		105
		4.3.05 Front-end Electronics							12	221	233
		4.3.06 Calibration Systems							261		261
		4.3.07 Trigger/DAQ Electronics							148	473	621
		4.3.08 Voltage Supply Systems							30	127	158
		4.3.09 Detector Control Systems								38	38
		4.3.10 Pre-production Prototypes				325	200		35	4	564
	4.3. Endcap Total					5,715	3,556		1,213	2,439	12,923
	4.5. Forward	4.5.01 Mechanics	9		510		1,856	677	10	20	3,082
		4.5.02 Optics	477						2,048		2,525
		4.5.03 Read-out Boxes							93		93
		4.5.04 Photodetectors							791		791
		4.5.05 Front-end Electronics							104	243	347
		4.5.06 Calibration Systems					59		316		375
		4.5.07 Trigger/DAQ Electronics							105	233	338
		4.5.08 Voltage Supply Systems							126		126
		4.5.09 Detector Control Systems							32	38	70
		4.5.10 Pre-production Prototypes	14				230	13	468		726
	4.5. Forward Total		500		510		2,145	690	4,096	533	8,474
Expense Total			500	2,500	510	5,715	5,701	690	27,469	7,541	50,625
Funding			500	2,500	510	5,715	5,701	690	26,698	7,380	49,694

Year	2007
System	5. Muon Detector

Payments

Type	Subsystem	Item	CF	Funding Agency	Contributing													Contributing Total
				Austria	Bulgaria	CERN	China	Germany	Hungary	Italy	Korea	Pakistan	RDMS-DMS	RDMS-Russia	Spain	USA-DOE	USA-NSF	
Expense	5.1. Barrel Drifttubes	5.1.1 Detectors and Components						2,576		5,909					1,972			10,457
		5.1.2 Electronics				853	800	2,773		7,846					1,989			14,261
		5.1.3 Mechanical Structure and Supports					350	191		521					152			1,214
		5.1.4 Assembly and Installation						94		287					108			489
		5.1.6 Service Systems				315		560		299					105			1,279
	5.1. Barrel Drifttubes Total					1,168	1,150	6,193		14,862					4,326			27,699
	5.2. Forward ME 1/1	5.2.1 Detectors and Components											80	1,685				1,765
		5.2.2 Electronics											700	160		1,781	600	3,241
		5.2.3 Mechanical Structure, Supports												210				210
		5.2.4 Assembly and Installation											170	155				325
		5.2.5 Monitoring											50					50
		5.2.6 Service Systems												100				100
	5.2. Forward ME 1/1 Total												1,000	2,310		1,781	600	5,691
	5.3. Endcap CSC	5.3.1 Detectors and Components					1,500							1,500		8,855		11,855
		5.3.2 Electronics														11,361	674	12,034
		5.3.3 Mechanical Structure and Supports														430		430
		5.3.4 Assembly and Installation														260		260
		5.3.5 Monitoring														323		323
		5.3.6 Service Systems														1,183		1,183
	5.3. Endcap CSC Total						1,500							1,500		22,411	674	26,085
	5.4. Barrel RPC	5.4.1 Detectors and Components			600		320			2,932								3,852
		5.4.2 Electronics								1,968								1,968
		5.4.3 Mechanical Structure and Supports								100								100
		5.4.4 Assembly and Installation					20			40								60
		5.4.5 Monitoring								130								130
		5.4.6 Service Systems	410							573								573
	5.4. Barrel RPC Total		410		600		340			5,743								6,683
	5.5. Forward RPC	5.5.1 Detectors and Components	613				350				400	190						940
		5.5.2 Electronics	10								0	876						876
		5.5.3 Mechanical Structure and Supports									0							0
		5.5.4 Assembly and Installation	321									120						120
		5.5.6 Service Systems	597															
	5.5. Forward RPC Total		1,541				350				400	1,186						1,936
	5.6. Alignment	5.6.1 Barrel		43		1,060			55									1,158
		5.6.2 Forward													78	203	838	1,119
		5.6.3 Link													1,115			1,115
	5.6. Alignment Total			43		1,060			55						1,193	203	838	3,393
Expense Total			1,951	43	600	2,229	3,340	6,193	55	20,605	400	1,186	1,000	3,810	5,519	24,395	2,112	71,487
Funding			1,485	50	600	2,300	3,100	5,806	100	19,827	500	2,050	1,000	3,810	5,560	24,395	2,112	71,210

Year	2007
System	6. Trigger-DAQ

Payments

Type	Subsystem	Item	CF	Austria	CERN	Finland	France-CEA	Greece	Hungary	Italy	Korea	Poland	Portugal	Spain	Switzerland-ETHZ	Switzerland-PSI	United Kingdom	USA-DOE	Contributing Total
				Funding Agency															
				Contributing															
Expense	6.1. Trigger	6.1.1 Calorimeter Trigger											309				802	4,382	5,492
		6.1.2 CSC Trigger																1,683	1,683
		6.1.3 DT Trigger		706										33					739
		6.1.4 RPC Trigger				989						1,756							2,744
		6.1.5 Global Trigger		400															400
	6.1. Trigger Total			1,105		989						1,756	309	33			802	6,065	11,058
	6.2. Data Acquisition	6.2.1 Event Filter	2,000				852		90						1,390	350			2,682
		6.2.2 Readout Builder			905											150		510	1,565
		6.2.3 Data to Surface			1,417										610		450	2,573	5,050
		6.2.4 Detector Controls			259														259
		6.2.5 Preseries			403			25										600	1,028
		6.2.6 DAQ Integration			966														966
	6.2. Data Acquisition Total		2,000		3,950		852	25	90						2,000	500	450	3,683	11,551
Expense Total			2,000	1,105	3,950	989	852	25	90			1,756	309	33	2,000	500	1,252	9,748	22,609
Funding				1,300	7,470	1,020	840	2,060	90	100	500	2,060	255		2,000	500	2,050	10,515	30,760

Year	2007
System	7. Offline Computing

Payments

Type	Subsystem	Item	CF	Contributing Funding Agency	Austria	Belgium	CERN	Finland	France-IN2P3	Germany	Greece	Italy	Spain	Switzerland-ETHZ	Switzerland-PSI	United Kingdom	USA-NSF	Contributing Total
Expense	7.0. Offline Common Fund	7.0.1 MoU			100	100	200	100	200	200	100	500	100	496		200	1,130	3,426
	7.0. Offline Common Fund Total				100	100	200	100	200	200	100	500	100	496		200	1,130	3,426
	7.1. Offline Infrastructure	7.1.1 File Servers	743												35			35
		7.1.2 Information Servers	139															
		7.1.3 Computing Power	191											104	35			139
		7.1.4 Spares	21															
		7.1.5 System Assembly	109															
		7.1.6 Software Licenses	83															
		7.1.7 System Management	856															
	7.1. Offline Infrastructure Total		2,141											104	70			174
Expense Total			2,141		100	100	200	100	200	200	100	500	100	600	70	200	1,130	3,600
Funding					100	100	200	100	200	200	100	500	100	600	70	200	1,130	3,600

Year	2007
System	8. Infrastructure

Payments

Type	Subsystem	Item	Contributing: CERN	Contributing: Iran	Contributing: RDMS-Russia	Contributing Total
Expense	8.1. Access and Survey	8.1.1 Gangways, Stairs	1,788			1,788
		8.1.2 Structures on Yoke	1,363			1,363
		8.1.3 Personnel Access Equipment	1,327			1,327
		8.1.4 General Survey	606			606
	8.1. Access and Survey Total		5,085			5,085
	8.2. General Installation	8.2.1 Counting Room Structures	631			631
		8.2.2 Racks with Cooling	836			836
		8.2.3 Electrical Distribution from Outlets	2,790			2,790
		8.2.4 Gas Systems and Primary Distribution Racks	1,863			1,863
		8.2.5 Beam Pipe	624			624
		8.2.6 Cable Trays to Counting Rooms	412			412
		8.2.7 Control Room and Cabling to Surface	93			93
		8.2.8 General Piping	914			914
	8.2. General Installation Total		8,164			8,164
	8.3. Cooling and Ventilation	8.3.1 Detector Cooling Plant	3,893			3,893
		8.3.2 Detector Specific Ventilation	205			205
		8.3.3 Detector Primary Cooling System	884			884
	8.3. Cooling and Ventilation Total		4,982			4,982
	8.4. Safety	8.4.1 Safety Installations	847			847
		8.4.2 Safety Equipment Control	371			371
		8.4.3 Hard-wired Safety System	98			98
		8.4.4 Inertion System	354			354
	8.4. Safety Total		1,669			1,669
	8.5. Fixed Cranes	8.5.1 80 ton /100 m	857			857
		8.5.2 80 ton /100 m Double Beam System	1,706			1,706
		8.5.3 20 ton Crane	219			219
		8.5.4 3 ton Lift	271			271
	8.5. Fixed Cranes Total		3,054			3,054
	8.6. Shielding Systems	8.6.1 Rotating Shielding	646		1,476	2,121
		8.6.2 Vertical 400 ton Lifting System	604			604
		8.6.3 Mechanics and Shielding for Forward HCAL	1,109	700		1,809
	8.6. Shielding Systems Total		2,359	700	1,476	4,534
Expense Total			25,312	700	1,476	27,487
Funding			23,955	700	1,476	26,131

Year	2007
System	9. Commissioning & Integration

Payments

Type	Subsystem	Item	CF	Funding Agency										Contributing Total
				Contributing										
				Belgium	CERN	China	France-CEA	Germany	Korea	Portugal	Serbia	Switzerland-Universities	USA-DOE	
Expense	9.0. C&I Common Fund	9.0.1 CtC		40	12,267			543						12,850
	9.0. C&I Common Fund Total			40	12,267			543						12,850
	9.1. Additional facilities for Commissioning on surface	9.1.01 Mixed Water Cooling	1,959											
		9.1.02 Gas Distribution	271											
		9.1.03 Control Room	113											
		9.1.04 Smoke Detection	442											
		9.1.05 LV System (1 generator)	340										780	780
		9.1.06 20t lifting equipment	253											
		9.1.07 Extra Electric & Optical Cabling	1,239											
		9.1.08 Common Electronics	421											
		9.1.09 Pre-cabling, pre-testing & related facilities	2,037											
		9.1.10 Basic DSS for Equipment Protection	233											
		9.1.11 Semi-clean areas	131											
	9.1. Additional facilities for Commissioning on surface Total		7,440										780	780
	9.2. Detector Installation, Opening and Access Facilities	9.2.01 Installation and access tooling	773											
		9.2.02 Dummy End Flanges (EB, EE, SE)	244											
		9.2.03 Magnet Closing System	822								400			400
		9.2.04 Control for Magnet and Magnet Power Supply	42											
		9.2.05 Beampipe Vacuum Tooling & Support Structure	122											
		9.2.06 Floor Plates for UXC	89			500								500
		9.2.07 Cherry Pickers & Access Platforms	262											
	9.2. Detector Installation, Opening and Access Facilities Total		2,353			500					400			900
	9.3. General Services	9.3.01 Workshops	576											
		9.3.02 Heavy Transport	1,018											
		9.3.03 Survey	212											
		9.3.04 Storage Infrastructure	605											
		9.3.05 Extra Engineering for Integration of Magnet & Detectors	1,412											
		9.3.06 Technical Support Team	3,447										1,300	1,300
	9.3. General Services Total		7,270										1,300	1,300
Expense Total			17,063	40	12,267	500		543			400		2,080	15,830
Funding				40	12,267	800	324	543	147	140	400	200	2,080	16,941

ANNEX 3

Summary and Comparison with Cost Estimates (kCHF)
Expenditure 1995-2007

Year	2007

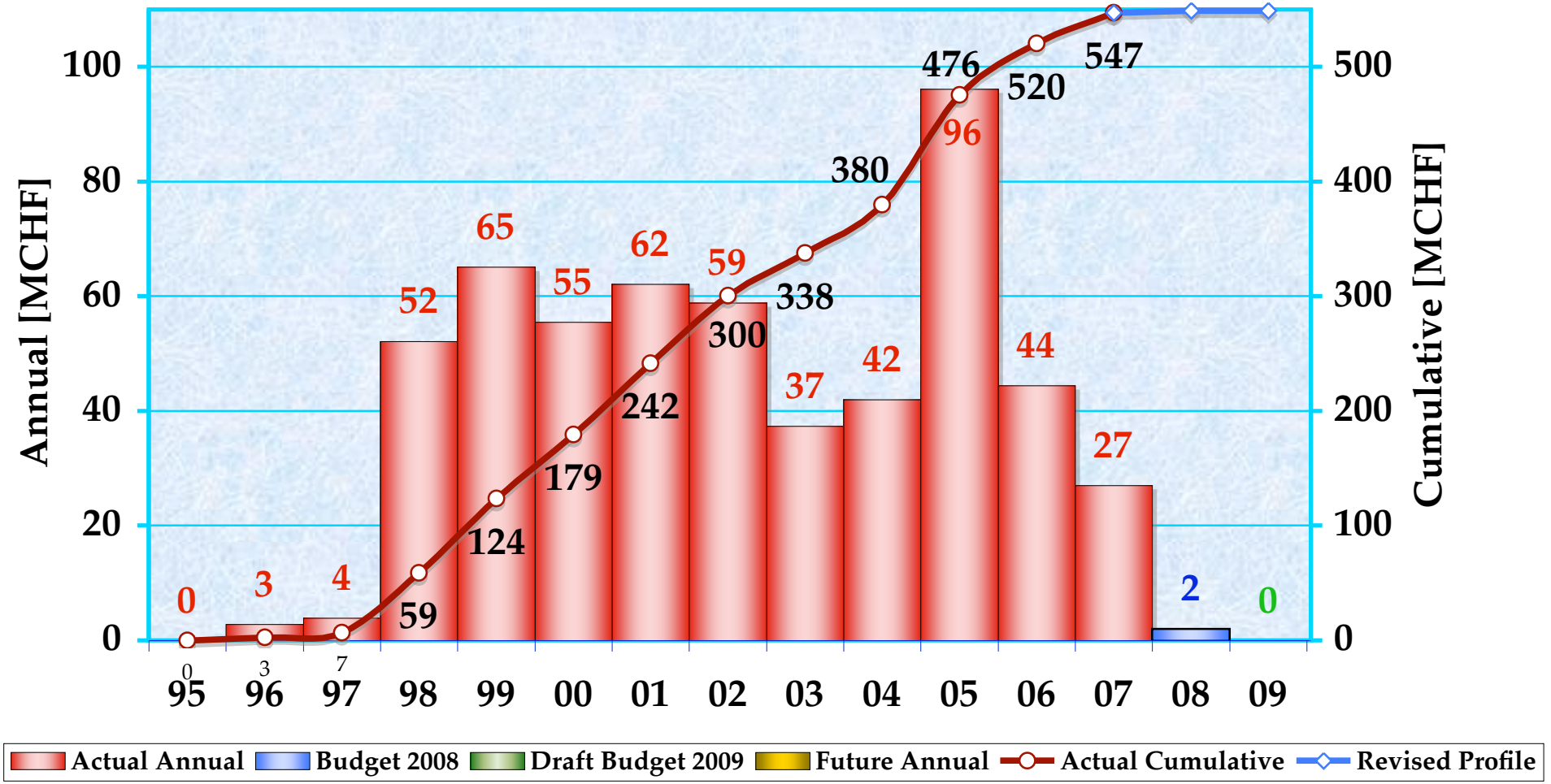
System	Subsystem	Cost Estimate	Payments	Payment %	Commitments	Commitment %
1. Magnet	1.1. Barrel Yoke and Vacuum Tank	34,433	36,328	106%	37,258	108%
	1.2. Endcap Yokes	14,615	14,376	98%	14,376	98%
	1.3. Coil	70,873	71,871	101%	74,328	105%
	1.4. Magnet Installation	6,820	3,878	57%	4,019	59%
1. Magnet Total		126,741	126,453	100%	129,981	103%
2. Tracker	2.1. Pixel Detectors	8,240	8,330	101%	8,330	101%
	2.2. Silicon Detectors	29,284	30,760	105%	30,760	105%
	2.3. Electronics for Si Detectors	21,578	22,505	104%	22,505	104%
	2.4. Power Supplies for Si Detectors	8,600	8,963	104%	8,963	104%
	2.5. Mech. Struct. & Cooling for Si Detectors	9,936	10,052	101%	10,052	101%
	2.6. Monitoring for Si Detectors	950	798	84%	798	84%
	2.7. Data Acquisition for Si Detectors	1,680	1,177	70%	1,177	70%
	2.8. Installation of Si Detectors	1,000	882	88%	882	88%
	2.9. Integration Facilities		2,576		2,576	
2. Tracker Total		81,268	86,043	106%	86,043	106%
3. ECAL	3.1. Barrel	91,962	93,802	102%	97,011	105%
	3.2. Endcaps	37,797	22,161	59%	30,666	81%
3. ECAL Total		129,759	115,964	89%	127,677	98%
4. HCAL	4.1. Barrel	24,166	25,222	104%	25,334	105%
	4.2. Outer Barrel	4,118	4,007	97%	4,010	97%
	4.3. Endcap	12,897	12,923	100%	12,930	100%
	4.5. Forward	8,514	8,474	100%	8,479	100%
4. HCAL Total		49,695	50,625	102%	50,753	102%
5. Muon Detector	5.1. Barrel Drifttubes	26,545	27,699	104%	27,699	104%
	5.2. Forward ME 1/1	5,691	5,691	100%	5,691	100%
	5.3. Endcap CSC	26,085	26,085	100%	26,085	100%
	5.4. Barrel RPC	6,910	7,093	103%	7,093	103%
	5.5. Forward RPC	3,995	3,477	87%	3,477	87%
	5.6. Alignment	3,729	3,393	91%	3,393	91%
5. Muon Detector Total		72,955	73,438	101%	73,438	101%
6. Trigger-DAQ	6.1. Trigger	11,847	11,058	93%	11,058	93%
	6.2. Data Acquisition	25,372	13,551	53%	15,741	62%
6. Trigger-DAQ Total		37,219	24,609	66%	26,800	72%
7. Offline Computing	7.1. Offline Infrastructure	3,600	2,315	64%	2,315	64%
7. Offline Computing Total		3,600	2,315	64%	2,315	64%
8. Infrastructure	8.1. Access and Survey	2,765	5,085	184%	5,085	184%
	8.2. General Installation	12,330	8,164	66%	8,164	66%
	8.3. Cooling and Ventilation	4,200	4,982	119%	4,982	119%
	8.4. Safety	1,700	1,669	98%	1,669	98%
	8.5. Fixed Cranes	3,180	3,054	96%	3,054	96%
	8.6. Shielding Systems	4,530	4,534	100%	4,534	100%
8. Infrastructure Total		28,705	27,487	96%	27,487	96%
9. Commissioning & Integration	9.1. Additional facilities for Commissioning on surface	8,934	8,220	92%	8,934	100%
	9.2. Detector Installation, Opening and Access Facilities	4,164	3,253	78%	4,026	97%
	9.3. General Services	6,900	8,570	124%	9,850	143%
9. Commissioning & Integration Total		19,998	20,043	100%	22,811	114%
Grand Total		549,940	526,978	96%	547,305	100%

Notes

1. Magnet, 7. Offline Computing, 9. Commissioning & Integration	Reflects Payments and Commitments from the Common Fund and thus differs from the total amounts paid by the Funding Agencies to the Common Fund
2. Tracker	Includes payments made from 1 staged DAQ slice
5. Muon Detector	Payments and Commitments include the Common Fund loan and thus differ from the total amounts paid by the Funding Agencies to the Muons detector
6. Trigger-DAQ	Includes payments for 1 staged DAQ slice
Cost Estimates	As reported to April 2007 RRB, CERN-RRB-2007-023

ANNEX 4

Commitments for CMS Construction



ANNEX 5

Payments for CMS Construction