Preliminary Draft Budget for CMS Maintenance & Operations in the Year 2012

INTRODUCTION

This document summarizes the preliminary funding requirements for the payments that the CMS Collaboration plans to make in the year 2012 in order to maintain and operate the already constructed detectors and Collaboration-wide facilities (M&O Cat. A).

In addition we present also estimates for the Sub-detectors maintenance and operations expenses (M&O Cat. B).

Both M&O Cat. A and Cat. B costs have been last scrutinized by the RRB Scrutiny Group for M&O before the October 2010 RRB. The Annexes presented here are based on the latest available figures.

The Cat. A costs are invoiced by CERN on behalf of the CMS Collaboration.

The Cat. B costs will be invoiced only upon request of each Sub-detector and only for a small fraction of the total presented here.

The sharing of the costs is preliminary and given for information only. The exact sharing will be available after the PhD list is updated in September 2011.

The figures shown as "Payments expected in the year 2012" in the Summary Table (**Annex 2**) have been reviewed by the RRB Scrutiny Group. Furthermore, various sharing percentages are based on the 2010 PhD count, which will change in the M&O Draft 2012 Budget submitted to the October 2011 RRB.

This document is meant to give timely information to the CMS Resources Review Board (RRB) and to provide input for further discussions with the CMS Funding Agencies to prepare the M&O Draft 2012 Budget, which will be submitted for approval to the RRB in October 2011 after scrutiny by the Scrutiny Group.

Timely and early payments for this budget are necessary due to the operational nature of the costs presented here.

M&O CATEGORY A

With respect to the forecast presented in October 2010 for the year 2012 given in the document 'Draft Budget for CMS M&O in the year 2011 (CERN-RRB-2010-108)' there are a number of changes proposed in the present budget request.

The total estimated cost for M&O-A in 2012 is 14'933 kCHF, excluding power costs.

These costs are slightly higher than the 14'760 kCHF in the budgetary projection for 2012 presented at the October 2010 RRB. There are some differences in individual budget lines. Most of these are a result of applying the Operational Model agreed with the RRB Scrutiny Group in 2010, which differentiates M&O costs between a running and a shutdown year. Because of the revised LHC schedule, according to which 2012 will be a running year and not shutdown (as foreseen at the time of the October 2010 RRB) some costs have been revised accordingly. This concerns the following budget lines: A.1.5, A.1.7, A.1.12, A.1.13, A.1.17, A.6.02 and A.7.04. Based on actual operational experience some modifications have been applied to budget lines A.1.05, Gas consumption and A.1.7, Cooling fluids (above -50°C) where, in accordance with consumption levels over past years, allocations of respectively 600 kCHF and 220 kCHF are requested. Further analysis of expenditures during the course of 2011 might result in additional modifications to the Operational Model.

An increase of 93 kCHF is requested for budget line A.1.10, Moving/hydraulic systems to cover the cost of retaining a technician specialized in hydraulics and moving of heavy objects. Based on experience during 2010, this technician will be needed to maintain and operate the existing systems and to commission various consolidation work as well as preparing for the arrival of YE4 during 2012.

An increase is requested for budget lines A.1.11, Detector Safety Systems and A.1.18, Safety as was already indicated in the course of discussions during the October 2010 RRB meeting. This is dictated by the increasing need to ensure adequate safety measures both in the area of detector protection as well as personal safety. The allocations requested are respectively 200 kCHF in A.1.11 and 300 kCHF in A.1.18, which is also in line with what was agreed for other LHC experiments.

A.3.02, Collaborative Tools, has been reduced to zero for the year 2012 as recommended by the RRB Scrutiny Group. This is based on the assumption that any eventual related costs would be fully covered by CERN.

All items under A.4, On-line Computing, have not been changed following the recommendations of the Working Group established by the Chair of the RRB. These cost projections will be further reviewed with the RRB Scrutiny Group prior to the October 2011 RRB.

An increase of 93 kCHF is requested for budget line A.6.02, Workshops to cover the cost of retaining a machinist/specialist welder to cope with the foreseen needs based on experience during 2010. A large number of minor modifications to infrastructure underground are pending. Since most items are aluminum or stainless steel due to magnetic field, a specialist welder is necessary.

An increase of 31 kCHF is requested for budget line A.7.04, Heavy transport to cover the cost of an additional crane driver/rigger to cope with the foreseen needs during the 2011-2012 technical stop based on experience of 2010-2011 and during the current year.

In budget line A.7.08 Survey, an increase of 90 kCHF is requested from 67 kCHF to 157 kCHF to cover the cost of an additional post of Survey Engineer, which, following an internal analysis, is considered as necessary for the maintenance and operation of the detector.

For this particular category and as for the current year, the CMS Collaboration strongly prefers to receive contributions directly from the Institutes/Funding Agencies rather than hiring personnel.

Annex I.A gives the projected costs for M&O-A until 2015. This updated budget request will be discussed with the RRB Scrutiny Group prior to the October RRB.

M&O CATEGORY B

With respect to the forecast for the year 2012 given in the document 'Draft Budget for CMS M&O in the year 2011 (CERN-RRB-2010-108)' the present budget request has changed in the areas of Tracker, HCAL, Muon and Trigger. Item B.2.01, Technical Manpower at CERN, is omitted from all Subsystem M&O-B since this effort is included in the Experiment Services and Pledges system (ESP) in accordance with the Memorandum of Agreement, as was already signaled at the October 2010 RRB.

The total M&O-B budget request for 2012 has increased as compared to the 2011 level of 6'418 kCHF and amounts 6'791 kCHF.

The updated budget request will be discussed with the RRB Scrutiny Group.

A formal scrutiny of the CMS M&O-B budget has been proposed at the October 2010 RRB and this will be implemented following the April 2011 RRB meeting. As presented to the October 2010 RRB, an internal scrutiny of the CMS Subsystem M&O-B budgets has already been put in place following the recommendations of a Task Force established by the CMS Finance Board.

As was mentioned in the CMS 2011 Draft Budget Report (CERN-RRB-2010-108) significant changes have been made in the accounting of manpower in the M&O-B Budget. The CMS Finance Board is carrying out further analysis of this matter. Most of the manpower is reported either in the M&O-A or M&O-B budgets. However, it should be noted that additional manpower resources are provided by some Funding Agencies, which are not covered by the above budgetary tables. They should be recognized as vital to the functioning of the CMS Experiment. These resources are mainly provided in the area of DAQ and Computing. In the DAQ area the US contributes 5 FTEs, which is complemented by 10 FTEs provided by CERN.

Annex I.B gives the projected costs for M&O-B until 2015. Complete information will be presented to the Scrutiny Group and included in the Budget Request in time for the October 2011 RRB meeting.

SUMMARY

The numbers given in this document are summarized in **Annex 2**. It should be noted that funds paid in 2012, which will not have been committed during 2012, will be reported to the April 2013 RRB and will be carried forward.

ANNEXES

Budget Requirements for M&O in 2012

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Annex 2 : M&O Cat. A and B Costs by Funding Agency

Annex A.1 : M&O Cat. A Budget Request 2012

Annex A.2 : M&O Cat. A by Funding Agency

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Annex I.A : Foreseen Cat. A Costs 2011-2015

Annex I.B : Foreseen Cat. B Costs 2011-2015

ANNEX 1

PhD Scientists per Funding Agency Based on the Annually Revised Annex 13 of the M&O MoU

The List of Names is Available at http://cms.cern.ch/iCMS/jsp/page.jsp?mode=cms&action=url&urlkey=CMS_DOCOFF (Count closed on September 29, 2010)

	Data	
Institute FA	PhD #	PhD %
Austria	22	1.6%
Belgium-FNRS	16	1.2%
Belgium-FWO	16	1.2%
Brazil	17	1.2%
Bulgaria	8	0.6%
CERN	80	5.8%
China	10	0.7%
Colombia	3	0.2%
Croatia	7	0.5%
Cyprus	5	0.4%
Egypt	3	0.2%
Estonia	4	0.3%
Finland	14	1.0%
France-CEA	15	1.1%
France-IN2P3	53	3.8%
Germany-BMBF	60	4.3%
Germany-DESY	39	2.8%
Greece	15	1.1%
Hungary	10	0.7%
India	29	2.1%
Iran	6	0.4%
Ireland		0.0%
Italy	173	12.5%
Korea	21	1.5%
Mexico	11	0.8%
New Zealand	2	0.1%
Pakistan	2	0.1%
Poland	15	1.1%
Portugal	7	0.5%
RDMS-DMS	21	1.5%
RDMS-Russia	61	4.4%
Serbia	3	0.2%
Spain	49	3.5%
Switzerland-ETHZ	19	1.4%
Switzerland-PSI	10	0.7%
Switzerland-UNIV	9	0.6%
Taipei	15	1.1%
Turkey	18	1.3%
United Kingdom	56	4.0%
USA-DOE	355	25.6%
USA-DOE-NP	22	1.6%
USA-NSF	83	6.0%
USA-NSF-NP	2	0.1%
Grand Total	1,386	100.0%

ANNEX 2

M&O Cat. A and B Costs by Funding Agency

Payments expected in the Year 2012 (kCHF)

Funding Agency	Category A	Category B	Total Category A+B	Total Invoiced
Austria	237.0	115.1	352.2	237.0
Belgium-FNRS	172.4	76.0	248.4	172.4
Belgium-FWO	172.4	96.0	268.3	172.4
Brazil	205.2	230.0	435.2	205.2
Bulgaria	86.2	40.4	126.5	86.2
CERN	861.9	552.1	1,414.0	861.9
China	120.7	6.7	127.5	120.7
Colombia	36.2	6.7	42.9	36.2
Croatia	84.5	22.2	106.7	84.5
Cyprus	60.4	24.2	84.5	60.4
Egypt	36.2	10.1	46.3	36.2
Estonia	48.3		48.3	48.3
Finland	150.8	48.5	199.3	150.8
France-CEA	161.6	83.3	244.9	161.6
France-IN2P3	571.0	207.2	778.2	571.0
Germany-BMBF	646.4	277.0	923.4	646.4
Germany-DESY	420.2	99.2	519.4	420.2
Greece	161.6	65.5	227.1	161.6
Hungary	107.7	2.9	110.7	107.7
India	345.9	206.7	552.6	345.9
Iran	72.4	7.8	80.3	72.4
Ireland				
Italy	1,863.9	846.6	2,710.4	1,863.9
Korea	253.5	40.4	293.9	253.5
Mexico	132.8		132.8	132.8
New Zealand	24.1		24.1	24.1
Pakistan	24.1	20.2	44.3	24.1
Poland	161.6	191.6	353.2	161.6
Portugal	75.4	39.2	114.6	75.4
RDMS-DMS	253.5	20.1	273.6	253.5
RDMS-Russia	684.7	239.5	924.3	684.7
Serbia	36.2	16.7	52.9	36.2
Spain	527.9	112.3	640.3	527.9
Switzerland-ETHZ	204.7	73.2	277.9	204.7
Switzerland-PSI	107.7	58.7	166.4	107.7
Switzerland-UNIV	97.0	41.6	138.5	97.0
Taipei	181.1	39.8	220.9	181.1
Turkey	217.3		217.3	217.3
United Kingdom	603.3	230.7	834.1	603.3
USA-DOE	4,255.2	1,876.6	6,131.8	4,255.2
USA-DOE-NP	263.7	10.0	273.7	263.7
USA-NSF	994.9	756.4	1,751.3	994.9
USA-NSF-NP	24.0		24.0	24.0
Grand Total	**15,746**	**6,791**	**22,537**	**15,746**

ANNEX A.1

M & O Cat. A

Budget Request for the Year 2012 (kCHF)

Maintenance & Operations (kCHF)				Year
Group	Description	Ref.	Details	2012
Maintenance & Operations	Detector related costs	A.1.01	Magnet	30
		A.1.02	Magnet controls	142
		A.1.03	Magnet power supply	41
		A.1.04	Gas systems	260
		A.1.05	Gas consumption	600
		A.1.06	Cooling systems	226
		A.1.07	Cooling fluids(above –50°C)	220
		A.1.08	External cryogenics	375
		A.1.09	Cryogenic fluids (below –50°C)	40
		A.1.10	Moving/hydraulic systems	175
		A.1.11	Detector safety systems, BCM/BRM	200
		A.1.12	Shutdown activities	278
		A.1.13	General Technical support	544
		A.1.14	UPS maintenance	80
		A.1.16	Beam pipe & vacuum	150
		A.1.17	Counting & control rooms	152
		A.1.18	Safety	300
	Detector related costs Total			3,811
	Secretariat	A.2.01	Secretarial assistance	232
		A.2.02	Economat	15
		A.2.04	Printing and publication	50
	Secretariat Total			297
	Communications	A.3.01	GSM phones; on-call service	20
		A.3.02	Collaborative tools	100
	Communications Total			120
	On-line computing	A.4.01	System management	980
		A.4.02	Data storage, (temporary on disk)	385
		A.4.03	Detector controls	130
		A.4.04	Computers/processors/LANs	4,396
		A.4.05	Software licenses	0
	On-line computing Total			5,891
	Test beams, calibration facilities	A.5.01	General operation	41
		A.5.02	Common electronics	15
		A.5.03	Electronics pool rentals	20
		A.5.04	Gas systems	10
		A.5.05	Gas consumption	10
	Test beams, calibration facilities Total			96
	Laboratory operations	A.6.01	Assembly areas, clean rooms	600
		A.6.02	Workshops	319
	Laboratory operations Total			919
	General services	A.7.01	Cooling & ventilation	595
		A.7.03	Power distribution system	60
		A.7.04	Heavy transport	297
		A.7.05	Cranes	35
		A.7.06	Cars	30
		A.7.08	Survey	157
		A.7.09	Storage space	50
		A.7.10	Common desktop infrastructure	40
		A.7.11	Reviewing & engineering	350
		A.7.12	Outreach	222
	General services Total			1,835
	Core Computing Infrastructure & Services	A.9.01	Central computing environment	562
		A.9.02	Software process service	317
		A.9.03	User support	208
		A.9.04	Central production operations	806
		A.9.05	Hardware	70
	Core Computing Infrastructure & Services Total			1,964
Maintenance & Operations Total				14,933
Power	Electricity	A.8.01	Power Consumption	1,800
	Electricity Total			1,800
Power Total				1,800
Grand Total				16,733

ANNEX A.2

M & O Cat. A by Funding Agency

All Figures in kCHF

Funding Agency	Category A without Power Bill	Power Billed	Category A
Austria	237.0		237.0
Belgium-FNRS	172.4		172.4
Belgium-FWO	172.4		172.4
Brazil	183.2	22.1	205.2
Bulgaria	86.2		86.2
CERN	861.9		861.9
China	107.7	13.0	120.7
Colombia	32.3	3.9	36.2
Croatia	75.4	9.1	84.5
Cyprus	53.9	6.5	60.4
Egypt	32.3	3.9	36.2
Estonia	43.1	5.2	48.3
Finland	150.8		150.8
France-CEA	161.6		161.6
France-IN2P3	571.0		571.0
Germany-BMBF	646.4		646.4
Germany-DESY	420.2		420.2
Greece	161.6		161.6
Hungary	107.7		107.7
India	312.4	33.5	345.9
Iran	64.6	7.8	72.4
Ireland			
Italy	1863.9		1863.9
Korea	226.3	27.3	253.5
Mexico	118.5	14.3	132.8
New Zealand	21.5	2.6	24.1
Pakistan	21.5	2.6	24.1
Poland	161.6		161.6
Portugal	75.4		75.4
RDMS-DMS	226.3	27.3	253.5
RDMS-Russia	657.2	27.5	684.7
Serbia	32.3	3.9	36.2
Spain	527.9		527.9
Switzerland-ETHZ	204.7		204.7
Switzerland-PSI	107.7		107.7
Switzerland-UNIV	97.0		97.0
Taipei	161.6	19.5	181.1
Turkey	193.9	23.4	217.3
United Kingdom	603.3		603.3
USA-DOE	3824.7	430.5	4255.2
USA-DOE-NP	237.0	26.7	263.7
USA-NSF	894.2	100.6	994.9
USA-NSF-NP	21.5	2.4	24.0
Grand Total	**14,933**	**813**	**15,746**

ANNEX B.1

M & O Cat. B

Budget Request for the Year 2012 (kCHF or FTE)

Year	(All)

Amount (kCHF/FTE)			Detector						
Description	Ref.	Details	Tracker	ECAL	HCAL	Muon	Trigger	Core Computing	Grand Total
Material Resources (kCHF)	B.1.01	Mechanics	40	25	5	10			80
	B.1.02	Gas-system	60	15	0	20			95
	B.1.03	Cryo-system			0	0			0
	B.1.04	Cooling system	250	90	0	0			340
	B.1.05	FE electronics		0	565	56			621
	B.1.06	Standard electronics, PS (LV, HV)	110	100	32	128			370
	B.1.07	Standard electronics, Crates		40	61	70			171
	B.1.08	Standard electronics, RO Modules	100	155	25	92	490		862
	B.1.09	Controls, (DCS, DSS)	140	85	27	21			273
	B.1.10	Sub-Detector Spares	0	0	58	24			82
	B.1.11	Areas	90	100	7	89			286
	B.1.12	Communications	30	10	49	43			132
	B.1.13	Store Items	50	50	4	41			145
	B.1.14	Hired Manpower @CERN	720	470	608	1,291	245		3,334
Material Resources (kCHF) Total			1,590	1,140	1,441	1,885	735		6,791
Human Resources (FTE)	B.2.01	Technical Manpower @CERN	0	0	0	0	0		0
	B.2.02	Core Computing Manpower @CMS						8	8
Human Resources (FTE) Total			0	0	0	0	0	8	8

ANNEX B.2

M&O Cat. B Cost Sharing by Funding Agency and Subsystem

Funding Agency	Tracker	ECAL	HCAL	Muon	Trigger
Austria	2.5%				10.3%
Belgium-FNRS	4.8%				
Belgium-FWO	3.9%			1.8%	
Brazil			16.0%		
Bulgaria				2.1%	
CERN	12.7%	22.0%		2.8%	6.4%
China				0.4%	
Colombia				0.4%	
Croatia		1.9%			
Cyprus	0.1%	1.9%			
Egypt				0.5%	
Estonia					
Finland	3.0%				
France-CEA		7.3%			
France-IN2P3	6.1%	9.6%			
Germany-BMBF	10.2%			6.1%	
Germany-DESY	0.5%		6.3%		
Greece		4.9%			1.4%
Hungary	0.2%				
India		3.9%	10.3%	0.7%	
Iran	0.5%				
Ireland					
Italy	20.8%	11.3%		20.1%	0.8%
Korea				2.1%	
Mexico					
New Zealand					
Pakistan				1.1%	
Poland					26.1%
Portugal		2.0%			2.2%
RDMS-DMS				1.1%	
RDMS-Russia		3.5%		10.6%	
Serbia		1.5%			
Spain	0.4%			5.3%	0.8%
Switzerland-ETHZ	1.5%	4.4%			
Switzerland-PSI	3.3%	0.5%			
Switzerland-UNIV	2.6%				
Taipei	0.1%	3.4%			
Turkey					
United Kingdom	5.0%	7.8%			8.5%
USA-DOE	16.5%	10.7%	49.3%	28.8%	32.3%
USA-DOE-NP			0.7%		
USA-NSF	5.2%	3.4%	17.3%	16.0%	11.3%
USA-NSF-NP					
Grand Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

All subsystems sharing by responsibility

ANNEX B.3

M&O Cat. B Costs by Funding Agency and Subsystem

Estimated Costs Incurred in 2012 (kCHF)

Funding Agency	Tracker	ECAL	HCAL	Muon	Trigger	Total
Austria	39.3				75.8	115.1
Belgium-FNRS	76.0					76.0
Belgium-FWO	62.3			33.6		96.0
Brazil			230.0			230.0
Bulgaria				40.4		40.4
CERN	202.1	250.3		53.0	46.7	552.1
China				6.7		6.7
Colombia				6.7		6.7
Croatia		22.2				22.2
Cyprus	2.0	22.2				24.2
Egypt				10.1		10.1
Estonia						
Finland	48.5					48.5
France-CEA		83.3				83.3
France-IN2P3	97.4	109.8				207.2
Germany-BMBF	162.3			114.7		277.0
Germany-DESY	7.8		91.4			99.2
Greece		55.5			10.0	65.5
Hungary	2.9					2.9
India		44.4	148.8	13.5		206.7
Iran	7.8					7.8
Ireland						
Italy	331.5	129.3		379.5	6.2	846.6
Korea				40.4		40.4
Mexico						
New Zealand						
Pakistan				20.2		20.2
Poland					191.6	191.6
Portugal		23.3			15.9	39.2
RDMS-DMS				20.1		20.1
RDMS-Russia		39.4		200.2		239.5
Serbia		16.7				16.7
Spain	5.9			100.3	6.2	112.3
Switzerland-ETHZ	23.2	50.0				73.2
Switzerland-PSI	53.1	5.6				58.7
Switzerland-UNIV	41.6					41.6
Taipei	1.0	38.9				39.8
Turkey						
United Kingdom	79.7	88.8			62.2	230.7
USA-DOE	262.9	121.9	711.0	543.4	237.3	1,876.6
USA-DOE-NP			10.0			10.0
USA-NSF	82.8	38.5	249.7	302.3	83.1	756.4
USA-NSF-NP						
Grand Total	**1,590**	**1,140**	**1,441**	**1,885**	**735**	**6,791**

ANNEX I.A

M & O Cat. A Costs 2011-2015

(All Figures in kCHF)

All Amounts in kCHF					Year				
Group	Description	Ref.	Details	Type (1)	2011	2012	2013	2014	2015
Maintenance & Operations	Detector related costs	A.1.01	Magnet	C	30	30	30	30	30
		A.1.02	Magnet controls	O	110	110	110	110	110
				C	32	32	32	32	32
		A.1.03	Magnet power supply	O	21	21	21	21	21
				C	20	20	20	20	20
		A.1.04	Gas systems	O	210	210	210	210	210
				C	50	50	50	50	50
		A.1.05	Gas consumption	C	550	600	600	600	600
		A.1.06	Cooling systems	O	281	196	196	196	196
				C	50	30	30	30	30
		A.1.07	Cooling fluids(above –50°C)	C	220	220	160	160	160
		A.1.08	External cryogenics	O	345	345	345	345	345
				C	30	30	30	30	30
		A.1.09	Cryogenic fluids (below –50°C)	C	40	40	40	40	40
		A.1.10	Moving/hydraulic systems	O	169	145	145	145	145
				C	30	30	30	30	30
		A.1.11	Detector safety systems, BCM/BRM	O	201	80	80	80	80
				C	90	120	120	120	120
		A.1.12	Shutdown activities	O	659	258	258	258	258
				C	20	20	20	20	20
		A.1.13	General Technical support	O	590	494	494	494	494
				C	50	50	50	50	50
		A.1.14	UPS maintenance	C	80	80	80	80	80
		A.1.16	Beam pipe & vacuum	O	61	30	30	30	30
				C	120	120	120	120	120
		A.1.17	Counting & control rooms	O	52	52	52	52	52
				C	100	100	100	100	100
		A.1.18	Safety	C	100	300	300	300	300
	Detector related costs Total				4,310	3,811	3,751	3,751	3,751
	Secretariat	A.2.01	Secretarial assistance	O	232	232	232	232	232
		A.2.02	Economat	C	15	15	15	15	15
		A.2.04	Printing and publication	C	50	50	50	50	50
	Secretariat Total				297	297	297	297	297
	Communications	A.3.01	GSM phones; on-call service	C	20	20	20	20	20
		A.3.02	Collaborative tools	O	162	0	0	0	0
				C	100	100	100	100	100
	Communications Total				282	120	120	120	120
	On-line computing	A.4.01	System management	O	938	980	980	980	980
		A.4.02	Data storage, (temporary on disk)	C	461	385	452	352	461
		A.4.03	Detector controls	C	130	130	130	130	130
		A.4.04	Computers/processors/LANs	C	1,314	4,396	2,648	1,504	1,978
		A.4.05	Software licenses	C	0	0	0	0	0
	On-line computing Total				2,843	5,891	4,210	2,966	3,549
	Test beams, calibration facilities	A.5.01	General operation	O	31	31	31	31	31
				C	10	10	10	10	10
		A.5.02	Common electronics	C	15	15	15	15	15
		A.5.03	Electronics pool rentals	C	20	20	20	20	20
		A.5.04	Gas systems	C	10	10	10	10	10
		A.5.05	Gas consumption	C	10	10	10	10	10
	Test beams, calibration facilities Total				96	96	96	96	96
	Laboratory operations	A.6.01	Assembly areas, clean rooms	O	500	500	500	0	0
				C	100	100	100	20	20
		A.6.02	Workshops	O	263	289	289	289	289
				C	30	30	30	30	30
	Laboratory operations Total				893	919	919	339	339

All Amounts in kCHF					Year				
Group	Description	Ref.	Details	Type (1)	2011	2012	2013	2014	2015
	General services	A.7.01	Cooling & ventilation	O	326	326	326	326	326
				C	269	269	269	269	269
		A.7.03	Power distribution system	C	60	60	60	60	60
		A.7.04	Heavy transport	O	296	237	237	237	237
				C	60	60	60	60	60
		A.7.05	Cranes	C	57	35	35	35	35
		A.7.06	Cars	C	41	30	30	30	30
		A.7.08	Survey	O	94	152	152	152	152
				C	5	5	5	5	5
		A.7.09	Storage space	C	50	50	50	50	50
		A.7.10	Common desktop infrastructure	C	40	40	40	40	40
		A.7.11	Reviewing & engineering	O	350	350	350	350	350
		A.7.12	Outreach	O	52	52	52	52	52
				C	170	170	170	170	170
	General services Total				1,870	1,835	1,835	1,835	1,835
	Core Computing Infrastructure & Services	A.9.01	Central computing environment	O	562	562	562	562	562
		A.9.02	Software process service	O	317	317	317	317	317
		A.9.03	User support	O	208	208	208	208	208
		A.9.04	Central production operations	O	806	806	806	806	806
		A.9.05	Hardware	C	70	70	70	70	70
	Core Computing Infrastructure & Services Total				1,964	1,964	1,964	1,964	1,964
Maintenance & Operations Total					12,553	14,933	13,192	11,368	11,951
Power	Electricity				1,800	1,800	1,800	1,800	1,800
Power Total					1,800	1,800	1,800	1,800	1,800
Grand Total					14,353	16,733	14,992	13,168	13,751

(1) O=Operation, manpower intensive
C=Consumables

ANNEX I.B

M& O Cat. B Costs 2011-2015 for all CMS Subdetectors

(Material Resources in kCHF, Human Resources in FTE)

Amount (kCHF/FTE)			Year				
Description	Detector	Subsystem	2011	2012	2013	2014	2015
Material Resources	Tracker	Pixel	190	285	285	280	265
		SST	1,545	1,305	1,305	1,290	1,235
	Tracker Total		1,735	1,590	1,590	1,570	1,500
	ECAL		1,140	1,140	1,140	1,140	1,140
	HCAL		902	1,441	987	987	891
	Muon	Barrel Alignment	93	53	53	53	53
		Drift Tubes	484	478	481	483	483
		EMU	1,066	1,066	1,066	1,066	1,066
		LinkAlignment	39	19	19	19	19
		RPC	269	269	352	352	264
	Muon Total		1,951	1,885	1,971	1,973	1,885
	Trigger		690	735	735	740	740
Material Resources Total			6,418	6,791	6,423	6,410	6,156
Human Resources	Tracker	Pixel	0	0	0	0	0
		SST	0	0	0	0	0
	Tracker Total		0	0	0	0	0
	ECAL		0	0	0	0	0
	HCAL		0	0	0		0
	Muon	Barrel Alignment	0	0	0	0	0
		Drift Tubes	0	0	0	0	0
		EMU	0	0	0	0	0
		LinkAlignment	0	0	0	0	0
		RPC	0	0	0	0	0
	Muon Total		0	0	0	0	0
	Trigger		8	0	0	0	0
	Core Computing		8	8	8	8	8
Human Resources Total			16	8	8	8	8