

Preliminary Draft Budget for CMS Maintenance & Operations in the Year 2014

INTRODUCTION

This document summarizes the preliminary funding requirements for the payments that the CMS Collaboration plans to make in the year 2014 in order to maintain and operate the already constructed detectors and Collaboration-wide facilities (M&O Cat. A).

In addition we present 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 2012 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 2013.

The figures shown as "Payments expected in the year 2014" in the Summary Table (**Annex 2**) have undergone preliminary review by the RRB Scrutiny Group. The various sharing percentages are based on the 2012 PhD count, which will change in the M&O Draft 2014 Budget submitted to the October 2013 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 2014 Budget, which will be submitted for approval to the RRB in October 2013 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 to the RRB in October 2012 for the year 2014 given in the document 'Draft Budget for CMS M&O in the year 2013 (CERN-RRB-2012-101)' there are only slight changes proposed in the present budget request.

The total estimated cost for M&O-A in 2014 is 13'676 kCHF, excluding power costs (15'426 kCHF with power costs).

The only change with regard to the projection for 2014 presented in the October 2012 RRB meeting is in the area of Communications (budget line A.3.02) where an increase of 20 kCHF is requested for a total allocation of 120 kCHF. This was already discussed with the RRB Scrutiny Group in the course of 2012 and is related to the implementation of the CMS Communications Strategy. The precise need for these additional resources is for the maintenance of the CMS web pages for which no stable support exists at the moment and which are crucial to the effective transmission of information within the Collaboration.

For the category of A.9, 'Core Computing Infrastructure and Services', as in past years, the CMS Collaboration strongly prefers to receive contributions directly from the Institutes/Funding Agencies rather than hiring personnel.

Overall expenditures over the past three years have been fully in line with the total allocation although not always corresponding to the annual budget. For the current Long Shutdown 1 (LS1) activities span the years 2013-14 and the combined budget for these two years matches the estimated total LS1 expenditures. However, the annual costs in 2013 are likely to substantially exceed those in 2014, due to the concentration of activity in the first 18 months of the shutdown. A crude estimate suggests that some 60% of the total will be spent during 2013 and the remaining 40% during 2014. Credit arrangements through CERN should enable this spending profile to be accommodated.

Annex I.A gives the projected costs for M&O-A until the year 2017. This updated budget request will be discussed with the RRB Scrutiny Group prior to the October 2013 RRB meeting.

M&O CATEGORY B

With respect to the forecast for the year 2013 given in the document 'Draft Budget for CMS M&O in the year 2013 (CERN-RRB-2012-101)' the present budget request has changed in the areas of Tracker, HCAL, ECAL and Muon. As compared to that figure the budget request for 2014 has increased slightly from 5'983 kCHF to 6'097 kCHF.

The total M&O-B budget request for 2014 is higher by 182 kCHF as compared to the 2013 budget of 5'915 kCHF. This is mainly due to maintenance and repair work necessary in sub-detectors during LS1.

The Tracker budget has been decreased from 1'600 kCHF to 1'515 kCHF due to modifying the plans for some work and removing them from the 2014 schedule as well as using some of the cash reserves from previous years.

The ECAL budget has decreased from 1'120 kCHF to 1'020 kCHF due to a redistribution of funds.

The HCAL budget has increased from 1'020 k CHF to 1'333 k CHF to include unforeseen

costs for additional LS1 manpower and Clock Control Module (CCM) refurbishment not included in the 2013 budget previously reported to the RRB, which would be spread over the period 2013-2014. The budget level is expected to drop significantly after LS1.

The Muon-CSC budget has decreased slightly from 911 kCHF to 895 kCHF due to a revised cost estimate.

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

A formal scrutiny of the CMS M&O-B budget has been put in place for 2011, following the October 2010 RRB. A similar approach will be adopted by CMS as in the past two years. This consists of an internal scrutiny of the CMS Subsystem M&O-B budgets by specially constituted Internal Scrutiny Groups (ISG) and by the CMS Finance Board.

Annex I.B gives the projected costs for M&O-B until 2017. Complete information will be presented to the Scrutiny Group and included in the Budget Request in time for the October 2013 RRB meeting.

SUMMARY

The numbers given in this document are summarized in **Annex 2**. It should be noted that funds paid in 2014, which will not have been committed during 2013, will be reported to the April 2015 RRB and will be carried forward.

ANNEXES

Budget Requirements for M&O in 2014

Annex 1 : PhD Scientists per Funding Agency

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

Annex A.1 : M&O Cat. A Budget Request 2014

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

Annex B.1 : M&O Cat. B Budget Request 2014

Annex B.2 : M&O Cat. B Budget Sharing 2014 by Funding Agency and Subsystem

Annex B.3 : M&O Cat. B Estimated Costs Incurred in 2014 by Funding Agency and Subsystem

Annex I.A : Foreseen Cat. Costs 2013-2017

Annex I.B : Foreseen Cat. B Costs 2013-2017

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](http://cms.cern.ch/iCMS/jsp/page.jsp?mode=cms&action=url&urlkey=CMS_DOCOFF)
 (Count closed on September 26, 2012)

Institute FA	Data	
	PhD #	PhD %
Austria	19	1.4%
Belgium-FNRS	25	1.8%
Belgium-FWO	21	1.5%
Brazil	22	1.6%
Bulgaria	9	0.6%
CERN	78	5.6%
China	10	0.7%
Colombia	3	0.2%
Croatia	7	0.5%
Cyprus	6	0.4%
Egypt	3	0.2%
Estonia	3	0.2%
Finland	13	0.9%
France-CEA	16	1.2%
France-IN2P3	48	3.5%
Germany-BMBF	61	4.4%
Germany-DESY	40	2.9%
Greece	19	1.4%
Hungary	10	0.7%
India	35	2.5%
Iran	8	0.6%
Italy	173	12.5%
Korea	20	1.4%
Lithuania	2	0.1%
Mexico	10	0.7%
New Zealand	2	0.1%
Pakistan	3	0.2%
Poland	16	1.2%
Portugal	7	0.5%
RDMS-DMS	22	1.6%
RDMS-Russia	60	4.3%
Serbia	2	0.1%
Spain	46	3.3%
Switzerland-ETHZ	21	1.5%
Switzerland-PSI	8	0.6%
Switzerland-UNIV	5	0.4%
Taipei	19	1.4%
Thailand	2	0.1%
Turkey	24	1.7%
United Kingdom	52	3.7%
USA-DOE	319	23.0%
USA-DOE-NP	26	1.9%
USA-NSF	80	5.8%
USA-NSF-NP	14	1.0%
Grand Total	1,389	100.0%

ANNEX 2

M&O Cat. A and B Costs by Funding Agency Payments expected in the Year 2014 (kCHF)

Funding Agency	Category A	Category B	Total Category A+B	Total Invoiced
Austria	187.1	264.0	451.1	187.1
Belgium-FNRS	246.1	106.4	352.6	246.1
Belgium-FWO	206.8	102.5	309.3	206.8
Brazil	244.3	0.5	244.8	244.3
Bulgaria	88.6	51.3	139.9	88.6
CERN	768.0	482.8	1,250.8	768.0
China	111.1	18.3	129.4	111.1
Colombia	33.3	22.0	55.3	33.3
Croatia	77.7	19.9	97.6	77.7
Cyprus	66.6	30.4	97.1	66.6
Egypt	33.3	11.0	44.3	33.3
Estonia	33.3	10.0	43.4	33.3
Finland	128.0	28.0	156.0	128.0
France-CEA	157.5	74.5	232.0	157.5
France-IN2P3	472.6	154.2	626.8	472.6
Germany-BMBF	600.6	245.3	845.9	600.6
Germany-DESY	393.8	81.9	475.7	393.8
Greece	187.1	48.1	235.2	187.1
Hungary	98.5	10.7	109.2	98.5
India	383.8	186.9	570.7	383.8
Iran	88.8	16.8	105.6	88.8
Italy	1,703.3	851.0	2,554.4	1,703.3
Korea	222.1	62.5	284.7	222.1
Lithuania	22.2		22.2	22.2
Mexico	111.1		111.1	111.1
New Zealand	22.2		22.2	22.2
Pakistan	33.3	22.0	55.3	33.3
Poland	157.5	5.3	162.8	157.5
Portugal	68.9	10.2	79.2	68.9
RDMS-DMS	244.3	17.9	262.2	244.3
RDMS-Russia	617.0	206.4	823.4	617.0
Serbia	22.2	9.9	32.1	22.2
Spain	452.9	102.8	555.7	452.9
Switzerland-ETHZ	206.8	100.5	307.2	206.8
Switzerland-PSI	78.8	22.7	101.5	78.8
Switzerland-UNIV	49.2	11.4	60.6	49.2
Taipei	211.0	71.0	282.0	211.0
Thailand	22.2		22.2	22.2
Turkey	266.5	1.9	268.5	266.5
United Kingdom	512.0	201.0	713.0	512.0
USA-DOE	3,516.1	1,791.3	5,307.4	3,516.1
USA-DOE-NP	286.6	19.8	306.4	286.6
USA-NSF	881.8	623.4	1,505.2	881.8
USA-NSF-NP	154.3		154.3	154.3
Grand Total	14,469	6,097	20,566	14,469

ANNEX A.1

M & O Cat. A

Budget Request for the Year 2014 (kCHF)

Maintenance & Operations (kCHF)				Year	
Group	Description	Ref.	Details	2014	
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	500	
		A.1.06	Cooling systems	310	
		A.1.07	Cooling fluids(above -50°C)	160	
		A.1.08	External cryogenics	375	
		A.1.09	Cryogenic fluids (below -50°C)	60	
		A.1.10	Moving /hydraulic systems	265	
		A.1.11	Detector safety systems, BCM/BRM	200	
		A.1.12	Shutdown activities	632	
		A.1.13	General Technical support	833	
		A.1.14	UPS maintenance	80	
		A.1.15	Power supply maintenana	85	
		A.1.16	Beam pipe & vacuum	178	
		A.1.17	Counting & control rooms	152	
		A.1.18	Safety	290	
	Detector related costs Total				4,592
	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		120
	Communications Total				140
	On-line computing	A.4.01	System management		980
		A.4.02	Data storage, (temporary on disk)		0
		A.4.03	Detector controls		0
		A.4.04	Computers /processors/LANs		2,918
		A.4.05	Software licenses		0
	On-line computing Total				3,898
	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		165
		A.6.02	Workshops		413
	Laboratory operations Total				578
	General services	A.7.01	Cooling & ventilation		595
A.7.03		Power distribution system		60	
A.7.04		Heavy transport		374	
A.7.05		Cranes		193	
A.7.06		Cars		42	
A.7.08		Survey		157	
A.7.09		Storage space		50	
A.7.10		Common desktop infrastructure		40	
A.7.11		Reviewing & engineering		379	
A.7.12		Outreach		222	
General services Total				2,111	
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				13,676	
Power	Electricity	A.8.01	Power Consumption	1,750	
	Electricity Total			1,750	
Power Total				1,750	
Grand Total				15,426	

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	187.1		187.1
Belgium-FNRS	246.1		246.1
Belgium-FWO	206.8		206.8
Brazil	216.6	27.7	244.3
Bulgaria	88.6		88.6
CERN	768.0		768.0
China	98.5	12.6	111.1
Colombia	29.5	3.8	33.3
Croatia	68.9	8.8	77.7
Cyprus	59.1	7.6	66.6
Egypt	29.5	3.8	33.3
Estonia	29.5	3.8	33.3
Finland	128.0		128.0
France-CEA	157.5		157.5
France-IN2P3	472.6		472.6
Germany-BMBF	600.6		600.6
Germany-DESY	393.8		393.8
Greece	187.1		187.1
Hungary	98.5		98.5
India	344.6	39.2	383.8
Iran	78.8	10.1	88.8
Italy	1703.3		1703.3
Korea	196.9	25.2	222.1
Lithuania	19.7	2.5	22.2
Mexico	98.5	12.6	111.1
New Zealand	19.7	2.5	22.2
Pakistan	29.5	3.8	33.3
Poland	157.5		157.5
Portugal	68.9		68.9
RDMS-DMS	216.6	27.7	244.3
RDMS-Russia	590.7	26.3	617.0
Serbia	19.7	2.5	22.2
Spain	452.9		452.9
Switzerland-ETHZ	206.8		206.8
Switzerland-PSI	78.8		78.8
Switzerland-UNIV	49.2		49.2
Taipei	187.1	23.9	211.0
Thailand	19.7	2.5	22.2
Turkey	236.3	30.2	266.5
United Kingdom	512.0		512.0
USA-DOE	3140.8	375.3	3516.1
USA-DOE-NP	256.0	30.6	286.6
USA-NSF	787.7	94.1	881.8
USA-NSF-NP	137.8	16.5	154.3
Grand Total	13,676	794	14,469

ANNEX B.1**M & O Cat. B****Budget Request for the Year 2014 (kCHF or FTE)**

Year	2014
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Amount (kCHF / FTE)		Detector							Grand Total
Description	Ref.	Details	Tracker	ECAL	HCAL	Muon	Trigger	Core Computing	
Material Resources (kCHF)	B.1.01	Mechanics	40	10	0	20			70
	B.1.02	Gas-system	120	5	0	20			145
	B.1.03	Cryo-system		5	0	0			5
	B.1.04	Cooling system	135	50	10	0			195
	B.1.05	FE electronics		0	157	46			203
	B.1.06	Standard electronics, PS (LV, HV)	0	80	7	97			184
	B.1.07	Standard electronics, Crates		20	37	70			127
	B.1.08	Standard electronics, RO Modules	155	50	102	91	234		632
	B.1.09	Controls, (DCS, DSS)	80	50	55	72			257
	B.1.10	Sub-Detector Spares	0	0	37	22			59
	B.1.11	Areas	55	50	62	50			217
	B.1.12	Communications	90	10	28	30	15		173
	B.1.13	Store Items	50	50	27	58			185
	B.1.14	Hired Manpower @CERN	790	640	811	1,234	170		3,645
Material Resources (kCHF) Total			1,515	1,020	1,333	1,810	419		6,097
Human Resources (FTE)	B.2.01	Technical Manpower @CERN	0	0	0	0	0		0
	B.2.02	Core Computing Manpower @CMS (FTE)						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	4.1%				49.7%
Belgium-FNRS	7.0%				
Belgium-FWO	2.6%		0.9%	2.8%	
Brazil			0.0%		
Bulgaria				2.8%	
CERN	10.0%	24.5%		3.5%	5.0%
China				1.0%	
Colombia				1.2%	
Croatia		2.0%			
Cyprus	0.4%	2.5%			
Egypt				0.6%	
Estonia				0.6%	
Finland	1.8%				
France-CEA		7.4%			
France-IN2P3	5.9%	6.4%			
Germany-BMBF	8.9%			6.1%	
Germany-DESY	1.4%		4.6%		
Greece		4.4%			2.4%
Hungary	0.4%			0.3%	
India		3.5%	9.1%	1.4%	
Iran	1.1%				
Italy	22.4%	11.3%		20.9%	1.5%
Korea				2.6%	
Lithuania					
Mexico					
New Zealand					
Pakistan				1.2%	
Poland					1.5%
Portugal		0.5%			1.5%
RDMS-DMS			0.1%	0.9%	
RDMS-Russia		3.9%	0.2%	9.3%	
Serbia		1.0%			
Spain	0.7%			4.5%	1.5%
Switzerland-ETHZ	1.3%	5.9%		0.9%	
Switzerland-PSI	1.5%				
Switzerland-UNIV	0.8%				
Taipei	0.8%	5.9%			
Thailand					
Turkey			0.1%		
United Kingdom	5.9%	6.9%			12.6%
USA-DOE	15.0%	10.5%	67.3%	25.2%	24.3%
USA-DOE-NP	0.6%		0.7%		
USA-NSF	7.5%	3.3%	16.9%	14.0%	
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 2014 (kCHF)

Funding Agency	Tracker	ECAL	HCAL	Muon	Trigger	Total
Austria	61.6				208.3	269.9
Belgium-FNRS	106.4					106.4
Belgium-FWO	39.2		12.0	51.3		102.5
Brazil			0.5			0.5
Bulgaria				51.3		51.3
CERN	151.2	250.0		64.0	21.0	486.2
China				18.3		18.3
Colombia				22.0		22.0
Croatia		20.1				20.1
Cyprus	5.6	25.2				30.8
Egypt				11.0		11.0
Estonia				10.0		10.0
Finland	28.0					28.0
France-CEA		75.5				75.5
France-IN2P3	89.6	65.4				155.0
Germany-BMBF	134.4			110.9		245.3
Germany-DESY	21.1		60.8			81.9
Greece		45.3			10.0	55.3
Hungary	5.7			5.0		10.7
India		35.2	121.5	25.7		182.4
Iran	16.8					16.8
Italy	339.1	115.8		377.5	6.3	838.7
Korea				47.6		47.6
Lithuania						
Mexico						
New Zealand						
Pakistan				22.0		22.0
Poland					6.3	6.3
Portugal		5.0			6.3	11.3
RDMS-DMS			1.0	16.9		17.9
RDMS-Russia		40.3	3.2	168.4		211.9
Serbia		10.1				10.1
Spain	11.2			82.1	6.3	99.6
Switzerland-ETHZ	19.9	60.4		16.0		96.3
Switzerland-PSI	22.7					22.7
Switzerland-UNIV	11.4					11.4
Taipei	11.4	60.4				71.8
Thailand						
Turkey			1.9			1.9
United Kingdom	89.6	70.5			52.7	212.8
USA-DOE	227.2	107.1	897.0	455.4	101.8	1,788.5
USA-DOE-NP	9.8		10.0			19.8
USA-NSF	113.0	33.8	225.2	254.2		626.3
USA-NSF-NP						
Grand Total	1,515	1,020	1,333	1,810	419	6,097

ANNEX I.A

M & O Cat. A Costs 2013-2017 (All Figures in kCHF)

All Amounts in kCHF				Year							
Group	Description	Ref.	Details	Type (1)	2013	2014	2015	2016	2017		
Maintenance & Operations	Detector related costs	A.1.01	Magnet	C	30	30	30	30	30		
		A.1.02	Magnet controls	C	110	110	110	110	110		
		A.1.03	Magnet power supply	O	21	21	21	21	21		
		A.1.04	Gas systems	C	20	20	20	20	20		
		A.1.05	Gas consumption	O	210	210	210	210	210		
		A.1.06	Cooling systems	C	50	50	50	50	50		
		A.1.07	Cooling fluids(above -50°C)	O	476	280	196	196	196		
		A.1.08	External cryogenics	C	75	30	30	30	30		
		A.1.09	Cryogenic fluids (below -50°C)	O	240	160	160	160	160		
		A.1.10	Moving/hydraulic systems	C	345	345	345	345	345		
		A.1.11	Detector safety systems, BCM/BRM	O	30	30	30	30	30		
		A.1.12	Shutdown activities	C	80	80	80	80	80		
		A.1.13	General Technical support	O	120	120	120	120	120		
		A.1.14	UPS maintenance	C	612	612	258	258	258		
		A.1.15	Power supply maintenance	O	20	20	20	20	20		
		A.1.16	Beam pipe & vacuum	C	783	783	494	494	494		
		A.1.17	Counting & control rooms	O	50	50	50	50	50		
		A.1.18	Safety	C	80	80	80	80	80		
Detector related costs Total					4,905	4,592	3,786	3,786	3,786		
Maintenance & Operations	Secretariat	A.2.01	Secretarial assistance	O	292	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					357	297	297	297	297		
Maintenance & Operations	Communications	A.3.01	GSM phones; on-call service	C	20	20	20	20	20		
		A.3.02	Collaborative tools	O	0	0	0	0	0		
Communications Total					100	120	120	120	120		
Maintenance & Operations	On-line computing	A.4.01	System management	O	120	140	140	140	140		
		A.4.02	Data storage, (temporary on disk)	C	980	980	980	980	980		
		A.4.03	Detector controls	C	0	0	0	0	0		
		A.4.04	Computers/processors/LANs	C	0	0	0	0	0		
		A.4.05	Software licenses	C	1,900	2,918	2,918	2,900	2,659		
On-line computing Total					2,880	3,898	3,898	3,880	3,639		
Maintenance & Operations	Test beams, calibration facilities	A.5.01	General operation	O	31	31	31	31	31		
		A.5.02	Common electronics	C	10	10	10	10	10		
		A.5.03	Electronics pool rentals	C	15	15	15	15	15		
		A.5.04	Gas systems	C	20	20	20	20	20		
		A.5.05	Gas consumption	C	10	10	10	10	10		
Test beams, calibration facilities Total					96	96	96	96	96		
Maintenance & Operations	Laboratory operations	A.6.01	Assembly areas, clean rooms	O	500	145	145	145	145		
		A.6.02	Workshops	C	100	20	20	20	20		
				O	478	383	289	289	289		
Laboratory operations Total					30	30	30	30	30		
Maintenance & Operations	General services	A.7.01	Cooling & ventilation	O	1,108	578	484	484	484		
		A.7.03	Power distribution system	C	326	326	326	326	326		
		A.7.04	Heavy transport	O	269	269	269	269	269		
		A.7.05	Cranes	C	60	60	60	60	60		
		A.7.06	Cars	C	314	314	237	237	237		
		A.7.08	Survey	O	60	60	60	60	60		
		A.7.09	Storage space	C	287	193	35	35	35		
		A.7.10	Common desktop infrastructure	C	49	42	30	30	30		
		A.7.11	Reviewing & engineering	O	152	152	152	152	152		
		A.7.12	Outreach	C	5	5	5	5	5		
		General services Total					60	50	50	50	50
		Maintenance & Operations	Core Computing Infrastructure & Services	A.9.01	Central computing environment	O	60	40	40	40	40
A.9.02	Software process service			O	396	379	350	350	350		
A.9.03	User support			O	52	52	52	52	52		
A.9.04	Central production operations			O	170	170	170	170	170		
A.9.05	Hardware			C	70	70	70	70	70		
Core Computing Infrastructure & Services Total					2,359	2,111	1,835	1,835	1,835		
Maintenance & Operations Total					13,789	13,676	12,500	12,482	12,241		
Power	Electricity				1,650	1,750	1,800	1,800	1,800		
	Power Total				1,650	1,750	1,800	1,800	1,800		
Grand Total					15,439	15,426	14,300	14,282	14,041		

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

ANNEX I.B

M& O Cat. B Costs 2013-2017 for all CMS Subdetectors

(Material Resources in kCHF, Human Resources in FTE)

Amount (kCHF/FTE)			Year					
Description	Detector	Subsystem	2013	2014	2015	2016	2017	
Material Resources	Tracker	Pixel	295	280	185	185	185	
		SST	1,285	1,235	1,195	1,195	1,245	
	Tracker Total		1,580	1,515	1,380	1,380	1,430	
	ECAL		1,020	1,020	1,020	1,020	1,020	
	HCAL		1,072	1,333	1,046	1,046	1,046	
	Muon	Barrel Alignment	Drift Tubes	53	53	53	53	53
			EMU	481	483	388	438	408
			LinkAlignment	911	895	905	915	925
			RPC	16	16	16	16	16
			RPC	363	363	254	254	254
	Muon Total		1,824	1,810	1,616	1,676	1,656	
Trigger		419	419	419	419	419		
Material Resources Total			5,915	6,097	5,481	5,541	5,571	
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	0	
	Muon	Barrel Alignment	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
			RPC	0	0	0	0	0
Muon Total		0	0	0	0	0		
Trigger		0	0	0	0	0		
Core Computing		8	8	8	8	8		
Human Resources Total			8	8	8	8	8	