Preliminary Draft Budget for CMS Maintenance & Operations in the Year 2011

INTRODUCTION

This document summarizes the preliminary funding requirements for the payments that the CMS Collaboration plans to make in the year 2011 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 subdetectors maintenance and operations expenses (M&O Cat. B).

The M&O costs have been last scrutinized by the RRB Scrutiny Group in February 2010. 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 2010.

The figures shown as "Payments expected in the year 2011" in the Summary Table (**Annex 2**) have been reviewed by the RRB Scrutiny Group. Furthermore, various sharing percentages are based on the 2009 PhD count, which will change in the M&O Draft 2011 Budget submitted to the October 2010 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 2011 Budget, which will be submitted for approval to the RRB in October 2010 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 for the year 2011 in the M&O Draft Budget for the year 2010 (cf. CERN-RRB-2009-111) there are a number of changes proposed in the present budget request.

The total estimated cost for M&O-A in 2011 is 15'320 kCHF, excluding power costs.

As indicated during the October 2009 RRB, over the past years no indexation has been applied on manpower costs despite a 3% increase. This would be requested for the 2011 budget.

A.1.06, Cooling Systems, requires a one-time increase in order to cover the cost of the emergency replacement of bushings during the end of year shutdown 2009/2010 to avoid the risk of further leaks of the cooling system on the detector. The cost of this repair work, for which no budgetary provision was made, is estimated to be 1'200 kCHF.

A.3.02, Collaborative Tools, has been increased for the year 2010 by 250 kCHF to cover the operations costs of the EVO system or an alternative collaborative tool solution. The actual invoiced amount, which CMS paid in 2009 was 323 kCHF and a similar charge is expected for 2010 and 2011. Therefore, an additional 73 kCHF is requested to cover the missing amount.

A.4.01, System Management, requires an increase of 88 kCHF to cover the cost of a Database Administrator to support CMS on-line databases. The RRB has been informed of this during the October 2009 meeting.

All other items under A.4. have not been changed. These are being reviewed by the Collaboration to establish a replacement plan compatible with the LHC schedule. The plan will be discussed with the RRB Scrutiny Group prior to the October 2010 RRB.

A.6.01, Assembly Areas, Clean Rooms, has been reviewed with the Scrutiny Group in February 2010. This line has been kept as it had been presented at the October 2009 RRB, as the proposed amount was considered fully justified and necessary for the operation of CMS.

A.7.11, Reviewing & Engineering, has also been presented at the October 2009 RRB with an increase of 200 kCHF following the recognized need for a DAQ-equipped Electronics and Electrical Integration Centre. This is part of the project mentioned above (under A.6.01) and has also been approved by the Scrutiny Group in February 2010.

The estimated manpower cost for A.9, Core Computing, in the year 2011 totals some 2'064 kCHF. This includes a request for an increase of the allocation required to cover the cost of 4 FTEs corresponding to new positions considered as a necessary minimum to comply with the present computing plan and with requirements coming from the 2010-2011 run.

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 2014. 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 2011 in the M&O Draft Budget for the year 2010 (cf. CERN-RRB-2009-111), the present budget request has changed in the HCAL, ECAL, Tracker and Muon areas. Item B.2.01, Technical Manpower at CERN, is omitted from the HCAL, ECAL and Tracker M&O-B as this effort is included in the MoAs.

The ECAL budget request has decreased from 1'343 kCHF to 1'140 kCHF. The Tracker budget request has decreased from 1'825 kCHF to 1'735 kCHF. The Muon budget request has decreased from 1'530 kCHF to 1'435 kCHF. The HCAL budget request has increased by 421 kCHF to a total of 912 kCHF. The estimated costs in 2010 for the HO SiPMs and ZDC crane, which are not included in the 2010 budget, are reported in the HCAL 2011 budget.

The updated budget request will be presented to the RRB Scrutiny Group.

Annex I.B gives the projected costs for M&O-B until 2013. Complete information will be presented to the Scrutiny Group and included in the Budget Request in time for the October 2010 RRB meeting.

M&O CATEGORY B SHARING

Material Resources

The CMS Collaboration will continue to share its M&O Cat. B costs for the year 2011 by responsibility for all subsystems.

The CMS Finance Board has set up a Task Force to study the M&O-B cost sharing mechanism. This Task Force has carried out an in-depth analysis of the currently applied schemes in the different CMS sub-systems. The main objective of this exercise is to propose an efficient and equitable system in which all CMS Funding Agencies participate in a fair way in the costs of sub-detector maintenance and operation. Each subsystem will be required to have in place a budgetary process with periodic reporting to the Finance Board in order to ensure transparency and a coherent practice within the CMS Collaboration.

Technical manpower

The technical manpower required at CERN from the Institutes (item B.2.01 in Annex B.1) will be shared by responsibility for all subsystems.

One of the main objectives of the above-mentioned Task Force is to ensure common guidelines for the accounting of manpower in the different subsystems.

SUMMARY

The numbers given in this document are summarized in **Annex 2**. It should be noted that funds paid in 2011, which will not have been committed during 2011, will be reported to the April 2012 RRB and will be carried forward.

ANNEXES

Budget Requirements for M&O in 2011

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Annex I.B : Foreseen Cat. B Costs 2011-2014

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 30, 2009)

	Data	
Institute FA	PhD #	PhD %
Austria	21	1.5%
Belgium-FNRS	16	1.2%
Belgium-FWO	19	1.4%
Brazil	17	1.2%
Bulgaria	8	0.6%
CERN	75	5.5%
China	9	0.7%
Colombia	3	0.2%
Croatia	7	0.5%
Cyprus	3	0.2%
Estonia	5	0.4%
Finland	16	1.2%
France-CEA	17	1.2%
France-IN2P3	46	3.4%
Germany-BMBF	56	4.1%
Germany-DESY	34	2.5%
Greece	13	1.0%
Hungary	10	0.7%
India	25	1.8%
Iran	5	0.4%
Ireland	1	0.1%
Italy	180	13.2%
Korea	18	1.3%
Mexico	11	0.8%
New Zealand	3	0.2%
Pakistan	3	0.2%
Poland	12	0.9%
Portugal	8	0.6%
RDMS-DMS	20	1.5%
RDMS-Russia	59	4.3%
Serbia	3	0.2%
Spain	40	2.9%
Switzerland-ETHZ	17	1.2%
Switzerland-PSI	11	0.8%
Switzerland-UNIV	7	0.5%
Taipei	15	1.1%
Turkey	17	1.2%
United Kingdom	57	4.2%
USA-DOE	365	26.7%
USA-DOE-NP	20	1.5%
USA-NSF	92	6.7%
USA-NSF-NP	3	0.2%
Grand Total	1,367	100.0%

ANNEX 2

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

Payments expected in the Year 2011 (kCHF)

Funding Agency	Category A	Category B	Total Category A+B	Total Invoiced
Austria	235.4	100.4	335.8	235.4
Belgium-FNRS	179.3	87.4	266.7	179.3
Belgium-FWO	212.9	169.5	382.4	212.9
Brazil	212.9		212.9	212.9
Bulgaria	89.7	41.7	131.3	89.7
CERN	840.5	533.9	1,374.5	840.5
China	112.7	15.6	128.3	112.7
Colombia	37.6	10.4	48.0	37.6
Croatia	87.7	20.0	107.7	87.7
Cyprus	37.6	20.0	57.6	37.6
Estonia	62.6		62.6	62.6
Finland	179.3	77.7	257.0	179.3
France-CEA	190.5	85.0	275.5	190.5
France-IN2P3	515.5	223.3	738.8	515.5
Germany-BMBF	627.6	280.7	908.3	627.6
Germany-DESY	381.0	30.0	411.0	381.0
Greece	145.7	80.0	225.7	145.7
Hungary	112.1		112.1	112.1
India	309.4	204.3	513.7	309.4
Iran	62.6		62.6	62.6
Ireland	12.5		12.5	12.5
Italy	2,017.3	947.7	2,965.0	2,017.3
Korea	225.4	88.5	314.0	225.4
Mexico	137.8		137.8	137.8
New Zealand	37.6		37.6	37.6
Pakistan	37.6	15.6	53.2	37.6
Poland	134.5	182.3	316.8	134.5
Portugal	89.7	39.1	128.8	89.7
RDMS-DMS	250.5		250.5	250.5
RDMS-Russia	688.2	55.7	743.9	688.2
Serbia	37.6	15.0	52.6	37.6
Spain	448.3	82.8	531.1	448.3
Switzerland-ETHZ	190.5	81.8	272.3	190.5
Switzerland-PSI	123.3	61.5	184.8	123.3
Switzerland-UNIV	78.5	39.8	118.2	78.5
Taipei	187.9	40.0	227.9	187.9
Turkey	212.9		212.9	212.9
United Kingdom	638.8	254.9	893.7	638.8
USA-DOE	4,539.4	1,362.1	5,901.5	4,539.4
USA-DOE-NP	248.7	53.0	301.7	248.7
USA-NSF	1,144.2	431.3	1,575.5	1,144.2
USA-NSF-NP	37.3		37.3	37.3
Grand Total	**16,151**	**5,731**	**21,882**	**16,151**

ANNEX A.1

M & O Cat. A

Budget Request for the Year 2011 (kCHF)

Maintenance & Operations (kCHF)				Year
Group	Description	Ref.	Details	2011
Maintenance & Operations	Detector related costs	A.1.01	Magnet	30
		A.1.02	Magnet controls	145
		A.1.03	Magnet power supply	41
		A.1.04	Gas systems	266
		A.1.05	Gas consumption	496
		A.1.06	Cooling systems	1,420
		A.1.07	Cooling fluids(above –50°C)	220
		A.1.08	External cryogenics	385
		A.1.09	Cryogenic fluids (below –50°C)	40
		A.1.10	Moving/hydraulic systems	82
		A.1.11	Detector safety systems, BCM/BRM	142
		A.1.12	Shutdown activities	422
		A.1.13	General Technical support	617
		A.1.14	UPS maintenance	80
		A.1.16	Beam pipe & vacuum	244
		A.1.17	Counting & control rooms	224
	Detector related costs Total			4,852
	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	423
	Communications Total			443
	On-line computing	A.4.01	System management	1,054
		A.4.02	Data storage, (temporary on disk)	461
		A.4.03	Detector controls	130
		A.4.04	Computers/processors/LANs	3,262
		A.4.05	Software licenses	0
	On-line computing Total			4,907
	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	257
	Laboratory operations Total			857
	General services	A.7.01	Cooling & ventilation	605
		A.7.03	Power distribution system	60
		A.7.04	Heavy transport	348
		A.7.05	Cranes	35
		A.7.06	Cars	30
		A.7.08	Survey	67
		A.7.09	Storage space	50
		A.7.10	Common desktop infrastructure	40
		A.7.11	Reviewing & engineering	350
		A.7.12	Outreach	220
	General services Total			1,805
	Core Computing Infrastructure & Services	A.9.01	Central computing environment	560
		A.9.02	Software process service	315
		A.9.03	User support	296
		A.9.04	Central production operations	804
		A.9.05	Hardware	90
	Core Computing Infrastructure & Services Total			2,064
Maintenance & Operations Total				15,320
Power	Electricity	A.8.01	Power Consumption	1,800
	Electricity Total			1,800
Power Total				1,800
Grand Total				17,120

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	235.4		235.4
Belgium-FNRS	179.3		179.3
Belgium-FWO	212.9		212.9
Brazil	190.5	22.4	212.9
Bulgaria	89.7		89.7
CERN	840.5		840.5
China	100.9	11.9	112.7
Colombia	33.6	4.0	37.6
Croatia	78.5	9.2	87.7
Cyprus	33.6	4.0	37.6
Estonia	56.0	6.6	62.6
Finland	179.3		179.3
France-CEA	190.5		190.5
France-IN2P3	515.5		515.5
Germany-BMBF	627.6		627.6
Germany-DESY	381.0		381.0
Greece	145.7		145.7
Hungary	112.1		112.1
India	280.2	29.3	309.4
Iran	56.0	6.6	62.6
Ireland	11.2	1.3	12.5
Italy	2017.3		2017.3
Korea	201.7	23.7	225.4
Mexico	123.3	14.5	137.8
New Zealand	33.6	4.0	37.6
Pakistan	33.6	4.0	37.6
Poland	134.5		134.5
Portugal	89.7		89.7
RDMS-DMS	224.1	26.3	250.5
RDMS-Russia	661.2	27.0	688.2
Serbia	33.6	4.0	37.6
Spain	448.3		448.3
Switzerland-ETHZ	190.5		190.5
Switzerland-PSI	123.3		123.3
Switzerland-UNIV	78.5		78.5
Taipei	168.1	19.8	187.9
Turkey	190.5	22.4	212.9
United Kingdom	638.8		638.8
USA-DOE	4090.6	448.8	4539.4
USA-DOE-NP	224.1	24.6	248.7
USA-NSF	1031.1	113.1	1144.2
USA-NSF-NP	33.6	3.7	37.3
Grand Total	**15,320**	**831**	**16,151**

ANNEX B.1

M & O Cat. B

Budget Request for the Year 2011 (kCHF or FTE)

Year	2011

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	133	5			203
	B.1.02	Gas-system	115	15	2	25			157
	B.1.03	Cryo-system			0	0			0
	B.1.04	Cooling system	250	90	0	5			345
	B.1.05	FE electronics		0	284	36			320
	B.1.06	Standard electronics, PS (LV, HV)	330	100	16	114			560
	B.1.07	Standard electronics, Crates		40	37	81			158
	B.1.08	Standard electronics, RO Modules	90	155	6	136	490		877
	B.1.09	Controls, (DCS, DSS)	110	85	27	44			266
	B.1.10	Sub-Detector Spares	0	0	1	58			59
	B.1.11	Areas	100	100	0	89			289
	B.1.12	Communications	20	10	82	20			132
	B.1.13	Store Items	60	50	15	66			191
	B.1.14	Hired Manpower @CERN	620	470	311	575	200		2,176
Material Resources (kCHF) Total			1,735	1,140	912	1,254	690		5,731
Human Resources (FTE)	B.2.01	Technical Manpower @CERN	0	0	0	11	8		19
	B.2.02	Core Computing Manpower @CMS						96	96
Human Resources (FTE) Total			0	0	0	11	8	96	115

ANNEX B.2

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

Funding Agency	Tracker	ECAL	HCAL	Muon	Trigger
Austria	1.6%				10.5%
Belgium-FNRS	5.0%				
Belgium-FWO	5.0%		3.3%	4.2%	
Brazil					
Bulgaria				3.3%	
CERN	12.7%	21.9%		1.5%	6.4%
China				1.2%	
Colombia				0.8%	
Croatia		1.8%			
Cyprus		1.8%			
Estonia					
Finland	4.5%				
France-CEA		7.5%			
France-IN2P3	7.7%	7.9%			
Germany-BMBF	10.9%			7.2%	
Germany-DESY			3.3%		
Greece		4.4%	3.3%		
Hungary					
India		3.9%	16.3%	0.8%	
Iran					
Ireland					
Italy	26.6%	11.6%		27.8%	0.9%
Korea				7.1%	
Mexico					
New Zealand					
Pakistan				1.2%	
Poland					26.4%
Portugal		2.1%			2.2%
RDMS-DMS					
RDMS-Russia		4.9%			
Serbia		1.3%			
Spain				6.1%	0.9%
Switzerland-ETHZ	1.3%	5.3%			
Switzerland-PSI	3.3%	0.4%			
Switzerland-UNIV	2.3%				
Taipei		3.5%			
Turkey					
United Kingdom	5.8%	8.3%			8.6%
USA-DOE	10.1%	10.1%	51.6%	29.4%	33.6%
USA-DOE-NP			5.8%		
USA-NSF	3.2%	3.3%	16.4%	9.3%	10.6%
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 2011 (kCHF)

Funding Agency	Tracker	ECAL	HCAL	Muon	Trigger	Total
Austria	28.3				72.2	100.4
Belgium-FNRS	87.4					87.4
Belgium-FWO	87.4		30.0	52.1		169.5
Brazil						
Bulgaria				41.7		41.7
CERN	220.7	250.0		18.8	44.4	533.9
China				15.6		15.6
Colombia				10.4		10.4
Croatia		20.0				20.0
Cyprus		20.0				20.0
Estonia						
Finland	77.7					77.7
France-CEA		85.0				85.0
France-IN2P3	133.3	90.0				223.3
Germany-BMBF	189.8			90.9		280.7
Germany-DESY			30.0			30.0
Greece		50.0	30.0			80.0
Hungary						
India		45.0	148.9	10.4		204.3
Iran						
Ireland						
Italy	460.9	132.3		348.6	5.9	947.7
Korea				88.5		88.5
Mexico						
New Zealand						
Pakistan				15.6		15.6
Poland					182.3	182.3
Portugal		24.0			15.1	39.1
RDMS-DMS						
RDMS-Russia		55.7				55.7
Serbia		15.0				15.0
Spain				76.9	5.9	82.8
Switzerland-ETHZ	21.8	60.0				81.8
Switzerland-PSI	56.5	5.0				61.5
Switzerland-UNIV	39.8					39.8
Taipei		40.0				40.0
Turkey						
United Kingdom	100.6	95.0			59.2	254.9
USA-DOE	175.4	115.5	470.9	368.6	231.7	1,362.1
USA-DOE-NP			53.0			53.0
USA-NSF	55.4	37.1	149.3	116.4	73.2	431.3
USA-NSF-NP						
Grand Total	**1,735**	**1,140**	**912**	**1,254**	**690**	**5,731**

ANNEX I.A

M & O Cat. A Costs 2010-2014

(All Figures in kCHF)

All Amounts in kCHF					Year				
Group	Description	Ref.	Details	Type (1)	2010	2011	2012	2013	2014
Maintenance & Operations	Detector related costs	A.1.01	Magnet	C	30	30	30	30	30
		A.1.02	Magnet controls	O	110	113	113	113	113
				C	32	32	32	32	32
		A.1.03	Magnet power supply	O	20	21	21	21	21
				C	20	20	20	20	20
		A.1.04	Gas systems	O	210	216	216	216	216
				C	50	50	50	50	50
		A.1.05	Gas consumption	C	496	496	496	496	496
		A.1.06	Cooling systems	O	190	1,370	196	196	196
				C	30	50	30	30	30
		A.1.07	Cooling fluids(above –50°C)	C	220	220	220	220	220
		A.1.08	External cryogenics	O	345	355	355	355	355
				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	50	52	52	52	52
				C	30	30	30	30	30
		A.1.11	Detector safety systems, BCM/BRM	O	50	52	52	52	52
				C	130	90	90	90	90
		A.1.12	Shutdown activities	O	390	402	402	402	402
				C	20	20	20	20	20
		A.1.13	General Technical support	O	550	567	567	567	567
				C	50	50	50	50	50
		A.1.14	UPS maintenance	C	80	80	80	80	80
		A.1.16	Beam pipe & vacuum	O	120	124	124	124	124
				C	120	120	120	120	120
		A.1.17	Counting & control rooms	O	120	124	124	124	124
				C	100	100	100	100	100
	Detector related costs Total				3,633	4,852	3,657	3,657	3,657
	Secretariat	A.2.01	Secretarial assistance	O	225	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				290	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	250	323	323	323	323
				C	100	100	100	100	100
	Communications Total				370	443	443	443	443
	On-line computing	A.4.01	System management	O	846	1,054	1,054	1,054	1,054
		A.4.02	Data storage, (temporary on disk)	C	282	461	385	452	375
		A.4.03	Detector controls	C	130	130	130	130	130
		A.4.04	Computers/processors/LANs	C	1,985	3,262	4,022	3,819	3,547
		A.4.05	Software licenses	C	0	0	0	0	0
	On-line computing Total				3,243	4,907	5,591	5,455	5,106
	Test beams, calibration facilities	A.5.01	General operation	O	30	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	
		A.5.05	Gas consumption	C	10	10	10	10	10
	Test beams, calibration facilities Total				95	96	96	96	86
	Laboratory operations	A.6.01	Assembly areas, clean rooms	O	500	500	500	500	500
				C	100	100	100	100	100
		A.6.02	Workshops	O	220	227	227	227	227
				C	30	30	30	30	30
	Laboratory operations Total				850	857	857	857	857

All Amounts in kCHF					Year				
Group	Description	Ref.	Details	Type (1)	2010	2011	2012	2013	2014
	General services	A.7.01	Cooling & ventilation	O	326	336	336	336	336
				C	269	269	269	269	269
		A.7.03	Power distribution system	C	60	60	60	60	60
		A.7.04	Heavy transport	O	280	288	288	288	288
				C	60	60	60	60	60
		A.7.05	Cranes	C	35	35	35	35	35
		A.7.06	Cars	C	30	30	30	30	30
		A.7.08	Survey	O	60	62	62	62	62
				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	50	50	50	50	50
				C	170	170	170	170	170
	General services Total				1,785	1,805	1,805	1,805	1,805
	Core Computing Infrastructure & Servic	A.9.01	Central computing environment	O	458	560	560	560	560
		A.9.02	Software process service	O	220	315	315	315	315
		A.9.03	User support	O	202	296	296	296	296
		A.9.04	Central production operations	O	695	804	804	804	804
		A.9.05	Hardware	C	70	90	90	90	90
	Core Computing Infrastructure & Services Total				1,645	2,064	2,064	2,064	2,064
Maintenance & Operations Total					11,911	15,320	14,810	14,674	14,315
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					13,711	17,120	16,610	16,474	16,115

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

ANNEX I.B

M& O Cat. B Costs 2010-2013 for all CMS Subdetectors

(Material Resources in kCHF, Human Resources in FTE)

Amount (kCHF/FTE)			Year			
Description	Detector	Subsystem	2010	2011	2012	2013
Material Resources	Tracker	Pixel	256	190	190	190
		SST	1,569	1,545	1,545	1,545
	Tracker Total		1,825	1,735	1,735	1,735
	ECAL		1,433	1,140	1,140	1,140
	HCAL		482	912	710	710
	Muon	Barrel Alignment	24	59	39	39
		Drift Tubes	484	484	484	484
		EMU	620	525	525	525
		LinkAlignment	16	39	19	19
		RPC	459	147	147	147
	Muon Total		1,603	1,254	1,214	1,214
	Trigger		690	690	690	690
Material Resources Total			6,033	5,731	5,489	5,489
Human Resources	Tracker	Pixel	2	0	0	0
		SST	6	0	0	0
	Tracker Total		8	0	0	0
	ECAL		10	0	0	0
	HCAL		0	0	0	0
	Muon	Barrel Alignment	1	1	1	1
		Drift Tubes	0	0	0	0
		EMU	5	5	5	5
		LinkAlignment	1	1	1	1
		RPC	0	4	4	4
	Muon Total		7	11	11	11
	Trigger		8	8	8	8
	Core Computing		96	96	96	96
Human Resources Total			129	115	115	115