

Preliminary Draft Budget for CMS Maintenance & Operations in the Year 2010

INTRODUCTION

This document summarizes the preliminary funding requirements for the payments that the CMS Collaboration plans to make in the year 2010 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).

Both M&O Cat. A and Cat. B costs have been last scrutinized by the RRB Scrutiny Group for M&O before the November 2008 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 2009.

The figures shown as "Payments expected in the year 2010" in the Summary Table (**Annex 2**) have not yet been reviewed by the RRB Scrutiny Group. Furthermore, various sharing percentages are based on the 2008 PhD count, which will change in the M&O Draft 2010 Budget submitted to the October 2009 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 2010 Budget, which will be submitted for approval to the RRB in October 2009 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 2010 in the M&O Draft Budget for the year 2009 (cf. CERN-RRB-2008-099), the present budget request is unchanged.

The total estimated cost for M&O-A in 2010 is 12'320 kCHF, excluding power costs.

The estimated manpower cost for A.9, Core Computing, in the year 2010 totals some 1'645 kCHF. 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 2013.

There are a few areas of concerns where the cost estimates are extremely likely to increase, e.g. gas consumption, collaborative tools and manpower. Due to the lack of more detailed information at this stage we have not changed yet the budget request.

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

M&O CATEGORY B

With respect to the forecast for the year 2010 in the M&O Draft Budget for the year 2009 (cf. CERN-RRB-2008-099), the present budget request has changed in the Tracker and HCAL areas.

The Tracker has reviewed the M&O-B material resources needs foreseen for 2010, based on actual experience with operation and maintenance of the detector after the installation of both its Strips and Pixel components. Also, actual observed failure rates of electronics modules have been used, while the old budget forecast had been based on assumed but as yet not verified rates of failures, expressed as a fixed percentage of the procurement costs.

The revised forecast is significantly lower than the previous one, e.g. 1825 kCHF vs. 2289 kCHF. The budget needs for 2011 and 2012 are estimated to be the same as for 2010, while for 2013 a further 20% reduction is envisioned.

HCAL has reviewed its foreseen expenses for 2010 M&O-B material resources, which is estimated to be 600 kCHF. Additional budget will be needed if it is decided to proceed with HPD replacements. All participating Funding Agencies contribute effort toward maintenance and operation of the detector as described in the Memoranda of Agreements (MoAs). Item B.2.01, Technical Manpower at CERN, is omitted from M&O-B as this effort is included in the MoAs.

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

Annex I.B gives the projected costs for M&O-B until 2012. Estimates for the year 2013 have been finalized for a few subdetectors, full information will be presented to the Scrutiny Group and included in the Budget Request in time for the October 2009 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 2010 by responsibility for all subsystems.

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.

SUMMARY

The numbers given in this document are summarized in **Annex 2**. It should be noted that funds paid in 2010, which will not have been committed during 2010, will be reported to the April 2011 RRB and will be carried forward.

ANNEXES

Preliminary Budget Requirements for M&O in 2010

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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-secr.web.cern.ch/cms-secr/people/signatures_MO2009.pdf
(Count closed on October 20, 2008)

Institute FA	Data	
	PhD #	PhD %
Austria	19	1.5%
Belgium-FNRS	20	1.5%
Belgium-FWO	14	1.1%
Brazil	15	1.1%
Bulgaria	7	0.5%
CERN	71	5.4%
China	8	0.6%
Colombia	2	0.2%
Croatia	6	0.5%
Cyprus	3	0.2%
Estonia	1	0.1%
Finland	16	1.2%
France-CEA	19	1.5%
France-IN2P3	46	3.5%
Germany-BMBF	60	4.6%
Germany-DESY	22	1.7%
Greece	13	1.0%
Hungary	8	0.6%
India	24	1.8%
Iran	4	0.3%
Ireland	2	0.2%
Italy	185	14.1%
Korea	12	0.9%
Mexico	4	0.3%
New Zealand	5	0.4%
Pakistan	3	0.2%
Poland	12	0.9%
Portugal	7	0.5%
RDMS-DMS	22	1.7%
RDMS-Russia	60	4.6%
Serbia	3	0.2%
Spain	37	2.8%
Switzerland-ETHZ	17	1.3%
Switzerland-PSI	11	0.8%
Switzerland-UNIV	5	0.4%
Taipei	18	1.4%
Turkey	16	1.2%
United Kingdom	60	4.6%
USA-DOE	345	26.4%
USA-DOE-NP	16	1.2%
USA-NSF	87	6.7%
USA-NSF-NP	3	0.2%
Grand Total	1,308	100.0%

ANNEX 2

M&O Cat. A and B Costs by Funding Agency Payments expected in the Year 2010 (kCHF)

Funding Agency	Category A	Category B	Total Category A+B	Total Invoiced
Austria	179.0	100.8	279.8	179.0
Belgium-FNRS	188.4	88.8	277.1	188.4
Belgium-FWO	131.9	119.8	251.7	131.9
Brazil	161.9		161.9	161.9
Bulgaria	65.9		65.9	65.9
CERN	668.7	574.0	1,242.7	668.7
China	86.4	15.7	102.1	86.4
Colombia	21.6		21.6	21.6
Croatia	64.8	25.6	90.4	64.8
Cyprus	32.4	16.5	48.9	32.4
Estonia	10.8		10.8	10.8
Finland	150.7	78.9	229.6	150.7
France-CEA	179.0	98.8	277.8	179.0
France-IN2P3	433.3	228.7	661.9	433.3
Germany-BMBF	565.1	307.5	872.6	565.1
Germany-DESY	207.2	31.0	238.2	207.2
Greece	122.4	76.0	198.5	122.4
Hungary	75.4		75.4	75.4
India	255.4	45.6	301.0	255.4
Iran	43.2		43.2	43.2
Ireland	21.6		21.6	21.6
Italy	1,742.5	1,151.4	2,893.9	1,742.5
Korea	129.5	31.4	160.9	129.5
Mexico	43.2		43.2	43.2
New Zealand	54.0		54.0	54.0
Pakistan	32.4	78.5	110.9	32.4
Poland	113.0	182.3	295.3	113.0
Portugal	65.9	34.3	100.2	65.9
RDMS-DMS	237.5		237.5	237.5
RDMS-Russia	593.8	57.5	651.3	593.8
Serbia	32.4	12.0	44.4	32.4
Spain	348.5	103.2	451.7	348.5
Switzerland-ETHZ	160.1	149.4	309.5	160.1
Switzerland-PSI	103.6	87.1	190.7	103.6
Switzerland-UNIV	47.1	53.6	100.7	47.1
Taipei	194.3	71.3	265.7	194.3
Turkey	172.7		172.7	172.7
United Kingdom	565.1	281.1	846.3	565.1
USA-DOE	3,692.8	1,369.2	5,062.0	3,692.8
USA-DOE-NP	171.3		171.3	171.3
USA-NSF	931.2	440.1	1,371.3	931.2
USA-NSF-NP	32.1		32.1	32.1
Grand Total	13,128	5,910	19,038	13,128

ANNEX A.1

M & O Cat. A

Budget Request for the Year 2010 (kCHF)

Maintenance & Operations (kCHF)				Year	
Group	Description	Ref.	Details	2010	
Maintenance & Operations	Detector related costs	A.1.01	Magnet	30	
		A.1.02	Magnet controls	142	
		A.1.03	Magnet power supply	40	
		A.1.04	Gas systems	260	
		A.1.05	Gas consumption	496	
		A.1.06	Cooling systems	220	
		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	80	
		A.1.11	Detector safety systems, BCM/BRM	180	
		A.1.12	Shutdown activities	410	
		A.1.13	General Technical support	600	
		A.1.14	UPS maintenance	80	
		A.1.16	Beam pipe & vacuum	240	
		A.1.17	Counting & control rooms	220	
		Detector related costs Total			
	Secretariat	A.2.01	Secretarial assistance		225
		A.2.02	Economat		15
		A.2.04	Printing and publication		50
	Secretariat Total				290
	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		896
		A.4.02	Data storage, (temporary on disk)		375
		A.4.03	Detector controls		130
		A.4.04	Computers/processors/LANs		3,281
		A.4.05	Software licenses		0
	On-line computing Total				4,682
	Test beams, calibration facilities	A.5.01	General operation		40
		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				95
	Laboratory operations	A.6.01	Assembly areas, clean rooms		20
		A.6.02	Workshops		250
	Laboratory operations Total				270
	General services	A.7.01	Cooling & ventilation		595
		A.7.03	Power distribution system		60
		A.7.04	Heavy transport		340
		A.7.05	Cranes		35
		A.7.06	Cars		30
		A.7.08	Survey		65
A.7.09		Storage space		50	
A.7.10		Common desktop infrastructure		40	
A.7.11		Reviewing & engineering		150	
A.7.12		Outreach		220	
General services Total				1,585	
Core Computing Infrastructure & Services	A.9.01	Central computing environment		458	
	A.9.02	Software process service		220	
	A.9.03	User support		202	
	A.9.04	Central production operations		695	
	A.9.05	Hardware		70	
Core Computing Infrastructure & Services Total				1,645	
Maintenance & Operations Total				12,320	
Power	Electricity	A.8.01	Power Consumption	1,800	
	Electricity Total			1,800	
Power Total				1,800	
Grand Total				14,120	

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	179.0		179.0
Belgium-FNRS	188.4		188.4
Belgium-FWO	131.9		131.9
Brazil	141.3	20.6	161.9
Bulgaria	65.9		65.9
CERN	668.7		668.7
China	75.4	11.0	86.4
Colombia	18.8	2.8	21.6
Croatia	56.5	8.3	64.8
Cyprus	28.3	4.1	32.4
Estonia	9.4	1.4	10.8
Finland	150.7		150.7
France-CEA	179.0		179.0
France-IN2P3	433.3		433.3
Germany-BMBF	565.1		565.1
Germany-DESY	207.2		207.2
Greece	122.4		122.4
Hungary	75.4		75.4
India	226.1	29.4	255.4
Iran	37.7	5.5	43.2
Ireland	18.8	2.8	21.6
Italy	1742.5		1742.5
Korea	113.0	16.5	129.5
Mexico	37.7	5.5	43.2
New Zealand	47.1	6.9	54.0
Pakistan	28.3	4.1	32.4
Poland	113.0		113.0
Portugal	65.9		65.9
RDMS-DMS	207.2	30.3	237.5
RDMS-Russia	565.1	28.7	593.8
Serbia	28.3	4.1	32.4
Spain	348.5		348.5
Switzerland-ETHZ	160.1		160.1
Switzerland-PSI	103.6		103.6
Switzerland-UNIV	47.1		47.1
Taipei	169.5	24.8	194.3
Turkey	150.7	22.0	172.7
United Kingdom	565.1		565.1
USA-DOE	3249.5	443.3	3692.8
USA-DOE-NP	150.7	20.6	171.3
USA-NSF	819.4	111.8	931.2
USA-NSF-NP	28.3	3.9	32.1
Grand Total	12,320	808	13,128

ANNEX B.1

M & O Cat. B

Budget Request for the Year 2010 (kCHF or FTE)

Year	2010
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Amount (kCHF/FTE)			Detector					Core Computing	Grand Total
Description	Ref.	Details	Tracker	ECAL	HCAL	Muon	Trigger		
Material Resources (kCHF)	B.1.01	Mechanics	30	28	90	7		154	
	B.1.02	Gas-system	30	5	2	20		57	
	B.1.03	Cryo-system			0			0	
	B.1.04	Cooling system	250	35	2	10		296	
	B.1.05	FE electronics	0	0	0	172		172	
	B.1.06	Standard electronics, PS (LV, HV)	350	215	0	185		750	
	B.1.07	Standard electronics, Crates	0	48	0	68		116	
	B.1.08	Standard electronics, RO Modules	200	167	0	245	490	1,102	
	B.1.09	Controls, (DCS, DSS)	80	100	0	134		314	
	B.1.10	Sub-Detector Spares	0	210	0	74		284	
	B.1.11	Areas	200	80	24	82		385	
	B.1.12	Communications	25	21	98	29		174	
	B.1.13	Store Items	60	60	31	49		200	
	B.1.14	Hired Manpower @CERN	600	465	354	286	200	1,905	
Material Resources (kCHF) Total			1,825	1,433	600	1,362	690	5,910	
Human Resources (FTE)	B.2.01	Technical Manpower @CERN	8	10	0	15	8	41	
	B.2.02	Core Computing Manpower @CMS						96	
Human Resources (FTE) Total			8	10	0	15	8	96	
								137	

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	4.9%				
Belgium-FWO	4.9%		5.2%		
Brazil					
Bulgaria					
CERN	12.3%	17.4%		4.1%	6.4%
China				1.2%	
Colombia					
Croatia		1.8%			
Cyprus		1.2%			
Estonia					
Finland	4.3%				
France-CEA		6.9%			
France-IN2P3	7.4%	6.5%			
Germany-BMBF	10.6%			8.4%	
Germany-DESY			5.2%		
Greece		3.1%	5.2%		
Hungary					
India		3.2%			
Iran					
Ireland					
Italy	25.6%	11.7%		37.4%	0.9%
Korea				2.3%	
Mexico					
New Zealand					
Pakistan				5.8%	
Poland					26.4%
Portugal		1.3%			2.2%
RDMS-DMS					
RDMS-Russia		4.0%			
Serbia		0.8%			
Spain				7.1%	0.9%
Switzerland-ETHZ	1.6%	8.4%			
Switzerland-PSI	4.2%	0.8%			
Switzerland-UNIV	2.9%				
Taipei		5.0%			
Turkey					
United Kingdom	5.6%	8.4%			8.6%
USA-DOE	10.7%	14.8%	63.9%	25.5%	33.4%
USA-DOE-NP					
USA-NSF	3.4%	4.8%	20.5%	8.2%	10.7%
USA-NSF-NP					
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%

ANNEX B.3

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

Estimated Costs Incurred in 2010 (kCHF)

Funding Agency	Tracker	ECAL	HCAL	Muon	Trigger	Total
Austria	28.7				72.2	100.8
Belgium-FNRS	88.8					88.8
Belgium-FWO	88.8		30.0			118.8
Brazil						
Bulgaria						
CERN	224.1	250.0		55.4	44.4	574.0
China				15.7		15.7
Colombia						
Croatia		25.6				25.6
Cyprus		16.5				16.5
Estonia						
Finland	78.9					78.9
France-CEA		98.8				98.8
France-IN2P3	135.4	93.3				228.7
Germany-BMBF	192.8			114.7		307.5
Germany-DESY			31.0			31.0
Greece		45.0	31.0			76.0
Hungary						
India		45.6				45.6
Iran						
Ireland						
Italy	468.0	167.5		510.0	5.9	1,151.4
Korea				31.4		31.4
Mexico						
New Zealand						
Pakistan				78.5		78.5
Poland					182.3	182.3
Portugal		19.2			15.1	34.3
RDMS-DMS						
RDMS-Russia		57.5				57.5
Serbia		12.0				12.0
Spain				97.3	5.9	103.2
Switzerland-ETHZ	29.4	120.0				149.4
Switzerland-PSI	76.1	11.0				87.1
Switzerland-UNIV	53.6					53.6
Taipei		71.3				71.3
Turkey						
United Kingdom	102.2	119.7			59.2	281.1
USA-DOE	195.4	211.9	385.4	347.5	230.8	1,371.0
USA-DOE-NP						
USA-NSF	62.8	68.1	125.1	111.7	74.2	441.9
USA-NSF-NP						
Grand Total	1,825	1,433	603	1,362	690	5,913

ANNEX I.A

M & O Cat. A Costs 2009-2013 (All Figures in kCHF)

Group	Description	Ref.	Details	Type (1)	All Amounts in kCHF				
					Year	2009	2010	2011	2012
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
		A.1.03	Magnet power supply	C	32	32	32	32	32
				O	20	20	20	20	20
		A.1.04	Gas systems	C	20	20	20	20	20
				O	210	210	210	210	210
		A.1.05	Gas consumption	C	50	50	50	50	50
				O	496	496	496	496	496
		A.1.06	Cooling systems	C	190	190	190	190	190
				O	30	30	30	30	30
		A.1.07	Cooling fluids(above -50°C)	C	220	220	220	220	220
		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	90	40	40	40	40
				O	50	50	50	50	50
		A.1.10	Moving/hydraulic systems	C	80	30	30	30	30
				O	50	50	50	50	50
	A.1.11	Detector safety systems, BCM/BRM	O	50	50	50	50	50	
			C	130	130	90	90	90	
	A.1.12	Shutdown activities	O	390	390	390	390	390	
			C	20	20	20	20	20	
	A.1.13	General Technical support	O	550	550	550	550	550	
			C	60	50	50	50	50	
	A.1.14	UPS maintenance	C	80	80	80	80	80	
	A.1.16	Beam pipe & vacuum	O	120	120	120	120	120	
			C	270	120	120	120	120	
	A.1.17	Counting & control rooms	O	120	120	120	120	120	
C			120	100	100	100	100		
Detector related costs Total					3,913	3,633	3,593	3,593	3,593
Secretariat	A.2.01	Secretarial assistance	O	225	225	225	225	225	
	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	290	290	290	290
Communications	A.3.01	GSM phones, on-call service	C	20	20	20	20	20	
	A.3.02	Collaborative tools	C	100	100	100	100	100	
Communications Total					120	120	120	120	120
On-line computing	A.4.01	System management	O	796	896	980	980	980	
	A.4.02	Data storage, (temporary on disk)	C	52	375	375	375	375	
	A.4.03	Detector controls	C	130	130	130	130	130	
	A.4.04	Computers/processors/LANs	C	1,422	3,281	2,467	2,770	2,770	
	A.4.05	Software licenses	C	0	0	0	0	0	
On-line computing Total					2,400	4,682	3,952	4,255	4,255
Test beams, calibration facilities	A.5.01	General operation	O	40	30	30	30	30	
	A.5.02	Common electronics	C	20	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					115	95	95	95	95
Laboratory operations	A.6.01	Assembly areas, clean rooms	C	20	20	20	20	20	
	A.6.02	Workshops	O	220	220	220	220	220	
			C	30	30	30	30	30	
Laboratory operations Total					270	270	270	270	270

All Amounts in kCHF					Year					
Group	Description	Ref.	Details	Type (1)	2009	2010	2011	2012	2013	
General services		A.7.01	Cooling & ventilation	O	326	326	326	326	326	
		A.7.03	Power distribution system	C	269	269	269	269	269	
		A.7.04	Heavy transport	O	60	60	60	60	60	
		A.7.05	Cranes	C	280	280	280	280	280	
		A.7.06	Cars	C	60	60	60	60	60	
		A.7.08	Survey	O	35	35	35	35	35	
		A.7.09	Storage space	C	30	30	30	30	30	
		A.7.10	Common desktop infrastructure	O	120	60	60	60	60	
		A.7.11	Reviewing & engineering	C	10	5	5	5	5	
		A.7.12	Outreach	O	50	50	50	50	50	
				C	170	170	170	170	170	
		General services Total				1,655	1,585	1,585	1,585	1,585
	Core Computing Infrastructure & Services		A.9.01	Central computing environment	O	458	458	458	458	458
		A.9.02	Software process service	O	220	220	220	220	220	
		A.9.03	User support	O	202	202	202	202	202	
		A.9.04	Central production operations	O	695	695	695	695	695	
		A.9.05	Hardware	C	70	70	70	70	70	
	Core Computing Infrastructure & Services Total				1,645	1,645	1,645	1,645	1,645	
Maintenance & Operations Total					10,408	12,320	11,550	11,853	11,853	
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					12,208	14,120	13,350	13,653	13,653	

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

ANNEX I.B

M& O Cat. B Costs 2009-2012 for all CMS Subdetectors

(Material Resources in kCHF, Human Resources in FTE)

Amount (kCHF/FTE)			Year			
Description	Detector	Subsystem	2009	2010	2011	2012
Material Resources	Tracker	Pixel	164	256	256	256
		SST	2,225	1,569	1,569	1,569
	Tracker Total		2,389	1,825	1,825	1,825
	ECAL		1,433	1,433	1,343	1,343
	HCAL		581	600	613	535
	Muon	Barrel Alignment	24	24	59	39
		Drift Tubes	478	478	478	478
		EMU	459	459	459	459
		Forward RPC	157	157	157	157
		LinkAlignment	16	16	39	19
		RPC Barrel	228	228	228	228
Muon Total		1,362	1,362	1,420	1,380	
Trigger		699	690	690	690	
Material Resources Total			6,464	5,910	5,891	5,773
Human Resources	Tracker	Pixel	2	2	2	2
		SST	6	6	6	6
	Tracker Total		8	8	8	8
	ECAL		10	10	10	10
	HCAL		0	0	0	0
	Muon	Barrel Alignment	1	1	1	1
		Drift Tubes	4	4	4	4
		EMU	5	5	5	5
		Forward RPC	2	2	2	2
		LinkAlignment	1	1	1	1
		RPC Barrel	2	2	2	2
Muon Total		15	15	15	15	
Trigger		8	8	8	8	
Core Computing		96	96	96	96	
Human Resources Total			137	137	137	137