Summary of Expenditure
for CMS Maintenance & Operations
for the Year 2008

INTRODUCTION

This document summarizes the expenditure that the CMS Collaboration has made in 2008 in order to maintain and operate the already constructed detectors and Collaboration-wide facilities (M&O Cat. A) as well as expenses made directly by the subdetectors communities to maintain their respective subdetectors (M&O Cat. B).

In line with the Expenditure Report for Construction, we present the income received in a manner similar to Common Funds and we report the payments classified following the Scrutiny Group's classification.

This is the seventh report that the CMS Collaboration presents on M&O Expenditures and the sixth year we report the M&O Cat. B. The budget request for M&O in 2008 was made in October 2007 (cf. CERN-RRB-2007-083).

Commitments are not detailed in this report owing to the very nature of M&O: long-term commitments should be rare and they will be commented upon in the text in the event they occur.

Most of the Funding Agencies have by now signed the M&O MoU.

1. INCOME

The M&O 2008 approved budget totalled to 10'159 kCHF plus 1'800 kCHF for the Energy consumption.

The actual invoiced amount was 10'984 kCHF.

We note that for 2008 some 186 kCHF, out of the invoiced contributions of 10'984 kCHF, are still outstanding to date (1.7%).

2. PAYMENTS

2.1 M&O-A

An overview of expenditure versus budget is shown in the Annex 1.

The expenses classification presented here follows the categories established by the Scrutiny Group.

- ### Expenses

In the areas A.1.05, Gas Consumption, there is a large overspend: 909 kCHF to be compared to a budget of 450 kCHF. This is due to the late commissioning of the gas recycling system and to an underestimation of the gas consumption.

The rest of the activities in A.1., Detector Related Costs, show some variance with the budget but it is overall slightly under budget, leading to an overspend of less than 200 kCHF despite the above mentioned gas consumption.

The rest of the M&O-A activities show a slight underspend: globally the M&O-A expenditure totals 9'999 kCHF compared to a budget of 10'159 kCHF.

For the Core Computing area, we received in-kind contributions from Italy and USA-DoE and USA-NSF.

- ### Outstanding commitments

The total amount of open commitments at the end of the year totalled some 719 kCHF of which just over 50% are related to industrial support contracts for 2009. The remainder are for consumables and goods to be delivered this year.

2.2   M&O-B by sub-detector

- ### Tracker

The expenses incurred, either as cash via Tracker Team accounts, or directly by collaborating Institutes for purchase of materials and/or services, amounted to 1,729 kCHF (90% of the requested budget). The major categories of expenses were Hired Manpower, the procurement - still not completed - of spares for the Power Supply system, contributions to Areas, and expenses for the Cooling Systems, which was defective and is completely being revised this year. Although globally the money spent was very close to the total requested, there were differences for individual items, the most significant differences involving Read-out electronics and the Cooling system. Hired Manpower and Mechanics, drew more funds than originally anticipated.

A total of 1,583 kCHF (83% of the requested budget) were contributed cash by the Funding Agencies (the difference between cash expenses and cash income, 144 kCHF, was accommodated by a positive balance carry forward from the previous year 2007). Further contributions to the maintenance and operation of the Tracker, to the complete coverage of the requested budget, were provided in-kind. Overall, there has thus not been a funding problem in 2008 and the arrangements with individual Agencies and Institutes generally worked as expected.

The Tracker does not plan to change its cost sharing scheme for 2010, but it is following closely the debate started in the CMS Finance Board about possible new policies for the future.

- ## ECAL

The total 2008 M&O B requests related to the Material Resources for the Electromagnetic Calorimeter of CMS amount to 1'433 kCHF. Contributions to these expenses were made either by placing orders directly or by additional cash contributions to the ECAL M&O B account. The total amount received has been 1'451 kCHF (101% of the Draft Budget).

The main expenses have been related to the Hired Manpower at CERN (B.1.14) and to the first payment for crystals of the spare 37th Super Module (B.1.10).

For the Human Resources, the contributions provided have been of 19 Staff years, mainly used for the end of the construction and installation of the End Caps and for the construction of the Preshower.

- ## HCAL

The final component of HCAL was lowered to the collision hall early in 2008. HCAL installation was completed, and all HCAL components were commissioned. HCAL participated fully in the CRUZET (cosmic run at zero tesla) and CRAFT (cosmic run at four tesla) runs during the year. In addition to operations, test beam studies of SiPMs (silicon photomultipliers) were conducted. All participating Funding Agencies contributed to these activities.

Major expenses in 2008 included operating expenses and the cost of technical manpower at CERN.

- ## Muons

For the Muon Barrel Drift Tubes and Barrel Alignment and Link Alignment the requested budget was used in line with the original request. During 2008 expenditures were mainly on the completion of all the HV-LV spare units purchase and on hired manpower. We also started paying repair of out of warranty HV-LV units, which had to be repaired.

The M&O-B sharing between the Funding Agencies took into account the overall responsibilities and the different Funding Agencies contributed as expected.

- ## Trigger

Purchases of spares for the Trigger components have continued during 2008. This is expected to be completed during 2009. The Funding Agencies contributed to these purchases as expected.

ANNEXES

Annex 1 :   M&O Cat. A Expenditures vs. Budget in 2008

ANNEX 1

M & O Cat. A Expenditure vs. Budget in 2008

Year	2008
System	A. M&O-A

Type		Subsystem	Item	Budget	Payments
				kCHF	
Expense	M&O-A w/o Power	A.1. Detector related costs	A.1.01 Magnet	40	37
			A.1.02 Magnet controls	142	132
			A.1.03 Magnet power supply	50	47
			A.1.04 Gas systems	210	200
			A.1.05 Gas consumption	450	909
			A.1.06 Cooling systems	220	280
			A.1.07 Cooling fluids(above –50°C)	200	223
			A.1.08 External cryogenics	375	192
			A.1.09 Cryogenic fluids (below –50°C)	140	23
			A.1.10 Moving/hydraulic systems	80	115
			A.1.11 Detector safety systems	205	322
			A.1.12 Shutdown activities	410	478
			A.1.13 General Technical support	610	645
			A.1.14 UPS maintenance	80	
			A.1.15 Electronics pool rentals		
			A.1.16 Beam pipe & vacuum	240	31
			A.1.17 Counting & control rooms	240	233
		A.1. Detector related costs Total		3,692	3,870
		A.2. Secretariat	A.2.01 Secretarial assistance	225	237
			A.2.02 Economat	15	14
			A.2.04 Printing and publication	100	26
		A.2. Secretariat Total		340	277
		A.3. Communications	A.3.01 GSM phones; on-call service	20	20
			A.3.02 Automatic call-back	100	131
		A.3. Communications Total		120	151
		A.4. On-line computing	A.4.01 System management	536	456
			A.4.02 Data storage, (temporary on disk)	32	41
			A.4.03 Detector controls	130	120
			A.4.04 Computers/processors/LANs	1,843	1,696
			A.4.05 Software licenses		
		A.4. On-line computing Total		2,541	2,313
		A.5. Test beams, calibration facilities	A.5.01 General operation	60	94
			A.5.02 Common electronics	15	15
			A.5.03 Electronics pool rentals	20	39
			A.5.04 Gas systems	10	16
			A.5.05 Gas consumption	10	16
			A.5.06 External cryogenics		
		A.5. Test beams, calibration facilities Total		115	180
		A.6. Laboratory operations	A.6.01 Assembly areas, clean rooms	20	91
			A.6.02 Workshops	250	220
			A.6.03 Laboratory instruments		
		A.6. Laboratory operations Total		270	311
		A.7. General services	A.7.01 Cooling & ventilation	510	499
			A.7.03 Power distribution system	60	101
			A.7.04 Heavy transport	460	358
			A.7.05 Cranes	35	35
			A.7.06 Cars	30	30
			A.7.08 Survey	195	196
			A.7.09 Storage space	50	88
			A.7.10 Common desktop infrastructure	50	50
			A.7.11 Reviewing & Engineering	60	60
			A.7.12 Outreach	220	231
		A.7. General services Total		1,670	1,649
		A.9. Core Computing Infrastructure & Serv	A.9.01 Central computing environment	378	375
			A.9.02 Software process service	176	86
			A.9.03 User support	150	135
			A.9.04 Central production operations	607	579
			A.9.05 Hardware	100	73
		A.9. Core Computing Infrastructure & Services Total		1,411	1,247
	M&O-A w/o Power Total			10,159	9,999
	Power			1,800	729
Expense Total				11,959	10,728
Income				10,983	10,759