

Summary of Expenditure for CMS Maintenance & Operations for the Year 2005

INTRODUCTION

This document summarizes the expenditure that the CMS Collaboration has made in 2005 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 fourth report that the CMS Collaboration presents on M&O Expenditures and the third year we report the M&O Cat. B. The budget request for M&O in 2005 was made in October 2004 (cf. CERN-RRB-2004-128).

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

An overview of income versus budget can be found in the Financial Report (cf. CERN-RRB-2006-023).

The M&O 2005 approved budget totaled to 3'835 kCHF, of which 250 kCHF was for the Energy consumption.

We note that for 2005 some 320 kCHF, out of the planned and invoiced contributions of 3'692 kCHF, are still outstanding (8.7%).

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.

Due to the lack of sufficient funding in the M&O accounts during most of 2005, many expenses incurred in M&O were guaranteed by the Magnet and C&I Common Fund and later moved to M&O when funds have become available. This has been done exceptionally to guarantee smooth operations for the CMS Collaboration.

- **Expenses**

In the area A.1, Detector related costs, we note that gas and cryogenic fluids consumptions has been higher than expected: commissioning of muon chambers had a faster ramp-up than expected and an unexpected problem in the external cryogenic (oil pollution detected in September/October) account for these variations.

An increase in cost for the Secretarial support has led to a small overspending of the corresponding A.2 area.

The other areas show expenses at or below budget, leading to global underspending without Power of less than 5%, with Power being just on budget.

The delay in the magnet test, is mostly responsible for this underspending.

- **Outstanding commitments**

The total amount of open commitments at the end of the year totaled some 103 kCHF.

Of these, some 49 kCHF are due to goods and/or services delivered before the end of the year. The remaining 54 kCHF are for goods to be delivered during 2006, mostly for cryogenic and areas operations.

In addition to the open commitments reported above, we have service agreements in many areas with various service providers inside CERN. These should also be considered as commitments of the CMS Collaboration and the most important ones are in the following areas: A.1.02 Magnet controls, A.1.04 Gas systems, A.1.08 External cryogenics, A.1.13 General Technical support, A.1.14 UPS maintenance, A.2.01 Secretarial assistance, A.4.01 System management, A.7.01 Cooling and ventilation, A.7.03 Power distribution system, A.7.04 Heavy transport, A.7.09 Storage space.

These service agreements represented for the year 2005 a budget of 1.5 MCHF and actual expenses of 1.4 MCHF.

2.2 M&O-B by sub-detector

- **Tracker**

The Silicon Strip Tracker (SST) budget for year 2005 was 1750 kCHF, out of which 380 kCHF were already anticipated in 2004 by the funding agencies. All contributions were made available as expected. Most of the budget (85%) was devoted to the procurement of spare components: silicon sensors, front-end hybrids, components for the optical link and FED boards. The rest was used for the area allocated to the SST integration (electronics, cooling, cabling, network).

The Pixel detector was not yet in a phase requiring M&O-B costs.

- **ECAL**

The total 2005 M&O B requests for the Electromagnetic Calorimeter of CMS were 978 kCHF. Contributions to these expenses were made either by placing orders directly or by cash contributions through the ECAL M&O B account. The total amount has been 976 kCHF.

The main expenses have concerned the cooling system (B.1.04), the hired manpower at CERN (B.1.14), the calibration lasers (B.1.09), the Front End electronics spares bought in advance (B.1.05) and the H4 Test Area (B.1.11), used in 2005 with cosmic rays. The

purchases of spares for the various parts have been, in most cases, reported in the lines of these parts; so, the line B.1.10 "Sub-detector Spares" amounts to much less than planned.

- **HCAL**

HCAL 2005 M&O-B activities included procurement of spare photodetector and read-out electronics modules, commissioning of the electronics installed on HB and HE in SX5, calibration studies using radioactive source, LED and laser calibrations, synchronization and timing studies carried out with the trigger group, vertical slice cosmic ray running in SX5, and preparations for the 2006 magnet test/cosmic challenge.

- **Muons**

For the Muon Barrel Drift Tubes, Barrel RPCs, Barrel Alignment and Link Alignment the requested budget of 1117 kCHF was used in line with the original request. The budget request for DTs comprised a substantial fraction of subdetector spares, which had to be bought already during the construction phase. The rest was spent as foreseen, mainly on areas, store items and gas supply, and hired or technical manpower. The M&O-B sharing between the Funding Agencies took into account both the overall responsibilities and the specific responsibilities for the spares, and the different Funding Agencies contributed as expected.

- **Trigger**

Spares for the Trigger components have been purchased during 2005.

ANNEXES

Annex 1: M&O Cat. A Expenditures vs. Budget in 2005

ANNEX 1

M & O Cat. A Expenditure vs. Budget in 2005

Year	2005
System	A. M&O-A

				kCHF	
Type		Subsystem	Item	Budget	Payments
Expense	M&O Without Power	A.1. Detector related costs	A.1.01 Magnet	20	23
			A.1.02 Magnet controls	102	102
			A.1.03 Magnet power supply	60	50
			A.1.04 Gas systems	80	79
			A.1.05 Gas consumption	100	125
			A.1.06 Cooling systems	100	85
			A.1.07 Cooling fluids(above -50°C)	15	12
			A.1.08 External cryogenics	400	400
			A.1.09 Cryogenic fluids (below -50°C)	30	53
			A.1.10 Moving/hydraulic systems	170	167
			A.1.11 Detector safety systems	40	40
			A.1.12 Shutdown activities		
			A.1.13 General Technical support	245	245
			A.1.14 UPS maintenance	40	5
			A.1.15 Electronics pool rentals		
			A.1.16 Beam pipe & vacuum		
			A.1.17 Counting & control rooms	100	85
		<i>A.1. Detector related costs Total</i>		1,502	1,471
		A.2. Secretariat	A.2.01 Secretarial assistance	140	177
			A.2.02 Economat	15	7
			A.2.04 Printing and publication	50	26
		<i>A.2. Secretariat Total</i>		205	210
		A.3. Communications	A.3.01 GSM phones; on-call service	20	3
			A.3.02 Automatic call-back		
		<i>A.3. Communications Total</i>		20	3
		A.4. On-line computing	A.4.01 System management	151	124
			A.4.02 Data storage, (temporary on disk)	20	
			A.4.03 Detector controls	90	25
			A.4.04 Computers/processors/LANs	590	617
			A.4.05 Software licenses		
		<i>A.4. On-line computing Total</i>		851	766
		A.5. Test beams, calibration facilities	A.5.01 General operation	25	25
			A.5.02 Common electronics	10	10
			A.5.03 Electronics pool rentals	30	30
			A.5.04 Gas systems	5	5
			A.5.05 Gas consumption	2	2
			A.5.06 External cryogenics		
		<i>A.5. Test beams, calibration facilities Total</i>		72	72
		A.6. Laboratory operations	A.6.01 Assembly areas, clean rooms	30	25
			A.6.02 Workshops	190	194
			A.6.03 Laboratory instruments		
		<i>A.6. Laboratory operations Total</i>		220	219
		A.7. General services	A.7.01 Cooling & ventilation	140	140
			A.7.03 Power distribution system	20	20
			A.7.04 Heavy transport	120	122
			A.7.05 Cranes	40	17
			A.7.06 Cars	30	35
			A.7.08 Survey	60	60
			A.7.09 Storage space	70	54
			A.7.10 Common desktop infrastructure	45	39
			A.7.11 Reviewing & Engineering	130	125
			A.7.12 Outreach	60	60
		<i>A.7. General services Total</i>		715	672
		<i>M&O Without Power Total</i>		3,585	3,414
		<i>Power</i>		250	250
		<i>Expense Total</i>		3,835	3,664
		<i>Income</i>		3,835	3,515
		<i>Yearly Balance</i>			(150)