

## **Report of the LHC M&O Scrutiny Group for the October 2009 RRB**

### Membership of the RRB M&O Scrutiny Group for 2009

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### 1. Composition of the Scrutiny Group

Five new members have been appointed to the Group for the 2009 scrutiny process. Gabriele Cosmo (CERN) replaces Sascha Schmeling as an active CERN member although Sascha Schmeling continues to act as the secretary of the Group. Paul Dauncey (Imperial College London) took over from George Lafferty as the representative of the UK. Bernd Löhner (DESY) replaces Joachim Mnich as the German member and took over the chair of the Group. Gerhard Mallot (CERN) succeeds Jasper Kirkby (CERN) and Michał Turała (Cracow) joins as a delegate from a small member state. The Group regained its nominal number of members for this year's process.

### 2. Scrutiny process

The first meeting of the RRB M&O Scrutiny Group (SG) took place on 4 and 5 May 2009. Organisational matters were discussed and the chairman reported on a meeting of himself and the scientific secretary of the Group with Sergio Bertolucci, the DRC. At this first meeting the Resource Coordinators (RCs) of the five experiments, ALICE, ATLAS, CMS, LHCb and TOTEM, met with the SG and reviewed the figures for the amounts spent in the past and proposed to be spent in the future. During the summer months, the SG members conducted several face-to-face meetings with RCs and other representatives of the experiments as well as telephone conferences to scrutinize in detail the budget requests of the experiments for the year 2010 and thereafter. It was agreed that the deadline for the agreement on the final numbers for the 2010 budget requests was 15 August 2009. After that date the scrutinizers of each experiment summarized the scrutiny process and the final numbers in reports. These reports were discussed by all SG members at their second meeting on 31 August to 1 September 2009. The RCs and other representatives of the five experiments gave additional explanations of their budget requests for 2010 and beyond and the final numbers were agreed upon between the experiments and the SG members. The efficient work of the Group was made possible by the well appreciated co-

operation of the RCs and other representatives of the experiments and by the quality of the delivered information. In some cases, however, the effectiveness of the scrutiny process could have been increased by earlier delivery of material in advance of meetings, although this possibility is made more challenging by the compressed schedule resulting from the advanced date of the Autumn RRB meeting.

The experiments have essentially completed their construction in 2008 and 2009 and went through an extended period of stable operation although without beams in the LHC. This resulted in a considerable gain of experience in running the experiments and lead to the discovery of necessary improvements and additions which are reflected in the budget requests for 2010 and further on. Some of the cost estimates are still preliminary, in particular for the operation of detector components whose material consumption and maintenance needs are determined to a great extent by the behaviour of those components under beam operation, such as e.g. gas consumptions, beam pipe bake-outs etc.

Some experiments proposed extensions of the detector or the experiment's infrastructure which had been deferred until after the completion of the construction. These activities will start now from 2010 onwards.

Table 1 gives a summary of the proposals for M&O Cat A budgets of 2010.

Experiment	Total (excluding power costs)	Total (including power cost)	Percentage of M&O A cost without power compared to cost of construction ( as of end 2008)
<b>ALICE</b>	4978	7209	2.6%
<b>ATLAS</b>	13842	16662	2.3%
<b>CMS</b>	11911	13711	2.3%
<b>LHCb</b>	2512	2589	3.3%
<b>TOTEM</b>	448	448	6.1%

**Table 1: M&O Cat A estimates for 2010 (in kCHF).**

### 3. ALICE

#### *Closing report for 2008*

ALICE submitted the closing report for their 2008 M&O A budget to the RRB on April 29. The total cost (spent plus committed) amounted to 5088 kCHF for M&O A including power costs for Non-Member States. This number also contains 506 kCHF which were already committed in 2007 and actually spent in 2008. The actual costs have to be compared to the budgeted costs including power costs of 5266 kCHF.

### ***Budget request for M&O Category A in 2010***

Table 2 shows the proposed budget for ALICE in 2010 and the projections until 2013 including power costs.

ALICE	2010	2011	2012	2013	2014
[kCHF]	7,209	7,400	7,500	7,500	-----

**Table 2: ALICE M&O A budget proposal for 2010 and projections until 2013.**

The projected M&O A budget for 2010 is 7209 kCHF whereof 2231 kCHF are power costs. The ALICE Collaboration provided the SG with a detailed level-2 listing of all planned expenditures under M&O A. In two meetings between SG members, the ALICE Resource Coordinator and Technical Coordinator, the SG has examined in detail all level-2 budget requests. In these meetings and via email exchanges, all issues were discussed and a consensus was reached on the final numbers. The SG members have appreciated the effort by the ALICE Resource Coordinator to attribute the expenditures to the correct items, in particular for operational manpower. This has been very useful for optimization of the budgets up to 2013.

The operational model of ALICE for the gas consumption lists a best case and a worst case scenario. The ALICE Collaboration agreed with the SG to use the average of these two scenarios for the M&O A budget requests. The SG discussed with care the operational and material costs for the level-2 items “Shutdown Activities”, “General Technical Support”, and “Laboratory Operations and Workshops”. The on-line computer replacements are the level-2 item with the highest cost and the shutdown activities represent the second largest cost lines. A sum of minor activities contributes 100 kCHF. The repair of damaged floor rails is estimated to cost 20 kCHF. A bridge structure to support the MiniFrame when the lower support will have to be removed is planned which costs 30 kCHF. The biggest single item is the construction of a temporary support of the inner detector to ease a necessary access to the inner beam-pipe region. This support is expected to shorten an otherwise two months access by 2-3 weeks. The ALICE Collaboration provided the SG with detailed technical information on the project. Finally, the SG endorsed the requests for the shutdown activities. The secretaries’ costs have been reviewed. All ALICE secretaries are provided by the administration of the CERN PH department. ALICE now has three secretaries and the PH department pays half the cost for them.

Gas consumption costs, determined by refreshment and leakage rates, were reviewed on the basis of a detailed breakdown provided by ALICE. Consumption is expected to decrease from 365 kCHF in 2008 to 332 kCHF in 2009 and to 320 kCHF from 2010 onwards. However, the increasing cost of Xenon may pose a problem in the future. The experience gained in 2009 with a reduced number of TRD modules will allow ALICE to present better estimates for 2011 and beyond.

A description of the manpower requirements for shutdown activities was provided. The SG endorses ALICE's request for 150 kCHF for consumables for the years 2009 and 2010 (still missing detector parts will be installed) but requests a reduction to 100 kCHF for the years 2011 and 2012. It is recognized that these figures may be renegotiated according to experience.

ALICE asks for an additional 70 kCHF for 0.5 FTE for database management. This is a new request arising apparently from insufficient support from IT department. After considerable discussion and given that ALICE does need this database support and there seems to be no prospect of IT providing it, the SG endorsed the request.

The ALICE Collaboration pointed out that the experiment operates with partly very old equipment. Necessary repairs may turn up unexpectedly and will lead to additional requests for the M&O A budget. The repair of floor rails, mentioned above, is such an example.

No other significant issues were identified.

The SG recommends the approval of the requested ALICE M&O Cat A budget for 2010.

## 4. ATLAS

### *Closing report for 2008*

ATLAS submitted their closing report for the 2008 M&O A budget to the RRB on 28 April 2009. The total cost (spent plus committed) amounted to 13,166 kCHF for M&O A including 719 kCHF power costs for Non-Member States. This number also contains 340 kCHF commitments to the future. The actual costs have to be compared to the budgeted costs, including NMS part of the power, of 12,628 kCHF. This constitutes an overspend of about 4% which occurred mainly for the M&O A level-2 items "Detector Related Costs" and "General Services". Unforeseen costs have been caused by the early shutdown in 2008 due to the LHC schedule.

The ATLAS M&O B closing report for 2008 was also submitted to the RRB meeting on 28 April 2009. The sum of M&O B expenditures in 2008 for all subsystems was 6,821 kCHF. This has to be compared to the 2008 M&O B budget of 6,866 kCHF. The overall expenditures are well balanced against the budget. This happens because a large overspend for sub-detector spares (755 kCHF budgeted versus 2,456 kCHF spent) and standard electronics (1,951 kCHF spent versus 755 kCHF budgeted) is compensated by savings for the items cooling, FE electronics (nothing spent but 1,005 kCHF budgeted) and hired manpower from CERN (1,746 kCHF spent versus 2,072 kCHF budgeted).

### *Budget request for M&O Category A in 2010*

Table 3 shows the proposed budget for ATLAS in 2010 and the projections until 2014 including full power costs.

ATLAS	2010	2011	2012	2013	2014
[kCHF]	16661	19976	18866	19971	19006

**Table 3: ATLAS M&O A budget proposal for 2010 and projections until 2014.**

The proposed M&O A budget for the year 2010 has been carefully investigated in four meetings between members of the SG and the ATLAS Resource Coordinator and Technical Coordinator. The requested budget for 2010 is similar to the one for 2009. From 2011 on, a significant rise is proposed. Major contributions to this rise are due to planned modifications to the detector. After several years of operation, the inner layer of the Pixel detector is planned to be exchanged because of expected radiation damage. This layer is one of the most powerful tools to detect the decays of particles containing b-quarks. The replacement is therefore called Insertable B-Layer (IBL). The total cost of the IBL is estimated to amount to about 9.5 MCHF. It is proposed to be financed by 4.065 kCHF from the M&O A budget and 5,480 kCHF from the M&O B budget. In addition, 1,200 kCHF new project money will be contributed from institutions which joined this project. In the M&O A budget plans the following amounts for the IBL are foreseen:

M&O A Contribution to IBL	2010	2011	2012	2013	2014
[kCHF]	180	940	1,050	995	900

**Table 4: ATLAS M&O A contributions to the IBL.**

Included in the IBL project are modifications of the beam pipe and new tools for the removal and reinstallation of the beam pipe in its highly activated environment. The proposed IBL M&O A contribution in 2010 is planned for these beam-pipe activities. The SG endorses the request for the IBL in 2010. However, the IBL is not yet a formal project of the ATLAS Collaboration. Therefore, the SG recommends that the RRB review the IBL M&O A budget after the IBL project will have been evaluated and approved by the LHCC with a written report to the RRB.

The cooling of the Inner Tracking Detector is provided by an evaporative cooling plant. After about three years of operation with LHC beams, the silicon detectors are expected to have received an amount of radiation that will require permanent cooling below about  $-25^{\circ}$  C. ATLAS reports that the compressors of this plant have to be replaced to guarantee a continuous and reliable cooling. The total costs of this replacement are estimated to amount to 1,600 kCHF. The following M&O A contributions are planned for the replacement of the compressors:

M&O A Contribution to compressor replacement	2010	2011	2012	2013	2014
[kCHF]	420	380	410	370	20

**Table 5: ATLAS M&O A contributions to the replacement of compressors.**

The technical solution of the new compressor system is being worked out and is expected to be available by the end of 2009. Because a technical solution does not exist presently the SG recommends that the RRB review the contributions of the compressor replacement to the ATLAS M&O A budget after this project has been evaluated and approved by the LHCC with a written report to the RRB.

Under discussion in the ATLAS Collaboration is an upgrade of the system of distribution racks for the Inner Detector coolant fluid. ATLAS reports that the present system will not allow to cool the detector down to a sufficiently low temperature as required after three years of operation with LHC beams. An upgrade is estimated to cost about 1,400 kCHF. The amount is not yet included in the M&O A budget proposal for the years 2010 to 2014. It is likely that it will be requested in the future. It may also be necessary to replace the heaters of the Inner Tracking Detector. A decision is expected by mid 2010. The costs are estimated to be 550 kCHF. They are not included in the budget proposals for 2010 to 2014. When budget requests will be made for the upgrade of the distribution racks and the replacement of heaters the SG recommends that before approval by the RRB the technical solutions will be evaluated and approved by the LHCC with a written report to the RRB.

The compressors for the magnet cooling system are old. They are considered a possible single point of failure. They will be upgraded to higher performance and one spare compressor will be installed. The total costs of 1,200 kCHF are proposed to be financed by redirecting the budgeted contribution of 320 kCHF per year, originally intended for liquid nitrogen to provide supplemental cooling for the magnets, to this project because this level of supplemental cooling is not needed.

The ATLAS Collaboration requests two additional FTEs for core computing. One is for the replacement of a person in the IT department who will leave. The IT department will replace this person but only for the non-detector specific part of the present task. The second FTE is needed for the support of the 'Production and Analysis' (PanDa) servers which have been moved from BNL to CERN. The envisaged cost for the two FTEs is 181 kCHF per year. An additional FTE is requested from the ATLAS Collaboration by the IT department for the service of ATLAS on-line database servers and ATLAS has (reluctantly) budgeted 160 kCHF for this 2010.

The ATLAS Collaborations proposes a onetime 3% indexing of the cost for personnel being paid from the M&O A budget through CERN. This amounts to 49 kCHF in the 2010 M&O A budget request.

The use of the EVO system as a collaborative tool or an alternative system is not yet clarified. The ATLAS Collaboration has made a provision of 200 kCHF per year for the M&O budgets from 2010 onwards.

The Scrutiny Group of the RRB recommends the approval of the ATLAS M&O A proposal for 2010 under the conditions cited above regarding the IBL project and the compressor replacement for the Inner Tracking Detector cooling.

***Budget request for M&O Category B in 2010***

The ATLAS Collaboration conducts its own internal scrutiny for the M&O Cat B budgets for each of the subsystems and provides reports to the Scrutiny Group. The M&O Cat B budget request for 2010 is 5,501 kCHF. This is considerably lower than the requested amount of 6,976 kCHF for 2009. In 2009, the replacement of front-end electronics and photomultipliers caused a peak in the expenditures. From 2010 to 2014 the proposed M&O B budgets are also smaller relative to available projections provided last year. The reduction can partly be attributed to the proposal to move major parts of the IBL project and the Inner Tracking Detector cooling to the M&O A category. Table 6 shows the proposed amounts for the M&O B budgets of the detector components.

ATLAS M&O B	2010	2011	2012	2013	2014
Inner Detector	2,875	3,325	3,525	3,125	2,325
Liquid Argon	1,321	1,136	936	936	936
Tile Calorimeter	605	605	555	550	550
Muons	700	700	700	700	700
Total	5,501	5,766	5,716	5,311	4,511

**Table 6: ATLAS M&O B budget proposals.**

The budget for the Liquid Argon Calorimeter contains the replacement of Low Voltage Power Supplies (LVPS). Regular failures of optical transmitters (OTx) are being observed. The origin of these failures is not understood presently. The costs of eventually necessary corrective actions are considered in the proposed budget for 2010 with 330 kCHF. The Tile Calorimeter proposes a relatively flat budget through 2014. Not considered in this budget is the replacement of LVPS which might become necessary. The price of the present LVPS system was about 1,600 kCHF.

The SG devoted most of one of the meetings with the ATLAS representatives to the detailed review of the proposed M&O B costs. The requests are considered reasonable.

The SG recommends the approval the ATLAS M&O B proposal for 2010.

## 5. CMS

### *Closing report for 2008*

CMS submitted their closing report for 2008 M&O A budget to the RRB on 27 April 2009. The actual costs amounted to 10,728 kCHF for Category A (including power costs of 729 kCHF paid by Non-Member States). Contained in this sum are commitments of 719 kCHF for future years. The actual expenditures have to be compared to the budgeted M&O A costs of 11,959 kCHF. The largest overspend in a level-2 item is for Gas Consumption, 909 kCHF spend vs. 450 kCHF budgeted. This is due to the late commissioning of the gas recycling system and to an underestimation of the gas consumption. It is approximately balanced by savings on other items so that the actual costs without power amount to 9,999 kCHF compared to a budget of 10,159 kCHF.

### *Budget request for M&O Category A in 2010*

Table 7 shows the proposed M&O A budget for CMS in 2010 and the projections until 2013 including power costs.

CMS	2010	2011	2012	2013	2014
[kCHF]	13,711	15,261	15,945	15,309	-----

**Table 7: CMS M&O A budget proposal for 2010 and projections until 2013.**

The proposed budget for the year 2010 has been carefully scrutinized in two meetings between members of the SG and the CMS Resource Manager and the Technical Coordinator. The request for 2010 without power costs is 11,911 kCHF. This is higher than the corresponding number for 2009 of 10,408 kCHF by about 14%. For the years 2011 to 2013 the amount proposed is again higher than for 2010. The budget increases are partly generated by hardware purchases for on-line computing. The CMS Collaboration also foresees a yearly contribution of 250 kCHF from 2010 on for the EVO system or an alternative solution. Significant contributions to the budget increases are generated by three other projects: the CMS Operation Support Centre, the Engineering Integration Centre (ENIC), and the Electronic and Electrical Integration Centre (ELIC). These are partly new projects as well as the continuation of existing ones with the aim of concentrating necessary services for the operation of the CMS detector in only two locations.

The CMS Operation Support Centre (OSC) is to be built on the surface of the SX5 building where previously the surface assembly of the detector was performed, in the “green barrack”, the former OPAL experiment control room, which has recently been used as a control room for surface magnet tests, and in another barrack which has been used as the office quarters for the

last 8 years and need refurbishing. The SX5 will host Swiss Class C radiation laboratories for detector components which have to be worked on and which will also serve as a buffer zone for temporary storage of equipment removed from UXC during shutdowns. In addition a semi-clean area for the gas-ionization chambers of the muon system will be installed. Another area is reserved for logistics, transport and arrivals. For the TOTEM Experiment, a separate storage and transport zone will be provided at the cost of CMS. Finally, as part of the outreach activities, a visitor centre overlooking the SX5 areas will be built. The creation of the CMS Operation Support Centre will extend over several years in four phases. In phase 1, the basic facilities are planned to be completed within the year 2010. In phase 2, the subsystem laboratories will be completed in SX5. In phase 3, the offices, the conference rooms, and subsystem control-rooms, and the visitor centre will be installed in the two barracks. In phase 4 detector-specific shielding working areas and handling tooling for activated objects will be installed. The funding of the CMS Operation Support Centre is proposed to be split between contributions from CERN, from the M&O A budget, and from the M&O B budget. The total costs are about 2,900 kCHF. CERN is expected to contribute 1,425 kCHF, from the M&O A budget 1,164 kCHF are foreseen and from the M&O B budget 310 kCHF. The spending profile of the M&O A contributions over the years 2010 to 2013 is shown in table 8.

The Engineering Integration Centre (ENIC) exists already in building 904 on the Preveessin site. Its operation was funded in the past as part of the Cost to Completion. From 2010, it is proposed to be supported via the M&O A budget. Its future tasks will be: the assistance of the CMS Technical Coordination Team for maintenance, consolidation, and upgrade projects; ensuring the coherence with Electronic and Electrical Integration; provision of support and advice for short and medium term visiting engineers; maintenance and documentation of the as-built CAD model of CMS as well as consolidation and upgrade activities; interfacing technical information from collaborators with the CATIA CAD package used and required by CERN; distribution of the as-built model in several standard CAD formats; maintenance and development of the Equipment Management Database (EMD), in particular the tracking of all equipment in UXC which have been exposed to beam and require radiological screening. The total costs of the projected Engineering Integration Centre are shared between CERN, collaborating institutes, upgrade funds, and M&O A. The sum of the proposed funds from M&O A for the next four years amount to 1,008 kCHF. The spending profile for the requested M&O A contribution is shown in table 8.

The Electronic and Electrical Integration Centre (ELIC) is complementary to the Engineering Integration Centre and will be located also in building 904. It provides test-beds for burn-in of equipment to be installed or re-installed at point 5. A Trigger/DAQ facility is needed to validate Trigger or DAQ chain modifications before installation at point 5. This facility needs a 5% slice of the whole chain. Major parts of the facility can be provided from units recuperated from point 5 as a result of the regular replacement program. The total costs for this project are expected to be shared between CERN, M&O A, and M&O C contributions. The M&O A contribution for the next four years amounts to 948 kCHF. The spending profile for the requested M&O A contribution is shown in table 8.

M&O A	2010	2011	2012	2013	Sum
OSC	499	390	155	120	1164
ENIC	317	237	237	217	1008
ELIC	445	167.5	167.5	167.5	947.5
SUM	1261	794.5	559.5	504.5	3119.5

**Table 8: Proposed spending profiles of the M&O A contributions to the CMS Operation Support Centre, the Engineering Integration Centre, and the Electronic and Electrical Integration Centre in kCHF.**

The SG received information as detailed as level-2 on the CMS Operation Support Centre, the Engineering Integration Centre, and the Electronic Engineering Centre. The planned projects appear to be reasonable and justified. The costs for the CMS Operation Support Centre, the Engineering Integration Centre, and the Electronic Integration Centre appear in the level-2 budget proposals under the items “Assembly areas, clean rooms” (A.6.01) and “Reviewing and Engineering” (A.7.11). The proposed M&O A budget and the projections contain contributions of 20 kCHF (A.6.01) and 150 kCHF (A.7.11) already requested in 2009 plus additional contributions for the discussed projects. The latter are evenly distributed over the next four years, namely yearly 580 kCHF in A.6.01 and 200 kCHF in A.7.11.

The detailed information for these additional requests was delivered only on 1 September 2009 during the autumn meeting of the SG. As a result, the SG was not able to scrutinize these proposed contributions, for a total amount of 780 kCHF, expected from the M&O A budget for 2010. CMS will need a basic version of the CMS Operation Support Centre latest for the next shutdown after beam operation of LHC has started. The work at SX5 must start as early as possible.

The Scrutiny Group recommends the approval of the CMS M&O A budget for 2010 with the remarks of the previous paragraph to be taken into account.

## 6. LHCb

### *Closing report for 2008*

LHCb submitted their closing report for 2008 M&O A budget to the RRB on 19 April 2009. The actual costs amounted to 2,281 kCHF for Category A (including power costs of 41 kCHF paid by Non-Member States). This lies below the budgeted costs of 2,386 kCHF. The main contributions to the actual costs were detector related (1,076 kCHF), on-line computing 533 kCHF), and general services (340 kCHF) costs.

### ***Budget request for M&O Category A in 2010***

Table 9 shows the proposed M&O A budget for LHCb in 2010 and the projections until 2013.

LHCb	2010	2011	2012	2013	2014
[kCHF]	2,512	2,560	2,590	2,615	-----

**Table 9: LHCb M&O A budget proposal for 2010 and projections until 2013.**

The proposed M&O A budget for 2010 is approximately equal to the one in 2009. The projection until 2013 is almost flat. A major contribution to the costs is the procurement of processors for on-line computing. The LHCb operational model remains to buy processors “just in time”. The M&O A profile is nevertheless kept almost flat for this item. Due to the latest change in the LHC schedule, it is clear that purchase will be further delayed. The LHCb Collaboration asks to stay with a flat budget but be allowed to keep the underspend of 200 kCHF for later purchases. The SG endorses this request. The budget for on-line computing personnel remains constant at 400 kCHF although one person of this team became CERN staff. The freed money will be used to cover the cost of a data-base administrator requested from LHCb by the IT department. The VELO replacement is considered a replacement of radiation damaged components to be funded with the same sharing as in M&O A at the level of 100 kCHF per year between 2009 and 2013 inclusive. The VELO contributions are not included in the M&O A budget numbers in this report. In the costs for Communications, an amount of 40 kCHF is included to cover the costs of EVO or any future replacement. The LHCb M&O A budget is almost constant but indexed for inflation using the numbers from the Finance Committee.

The proposed M&O A budget was discussed in detail at a meeting of the Resource Coordinator of LHCb with members of the SG. Satisfactory answers were received to all raised questions. The SG considers the request in the 2010 budget to be justified.

The SG recommends the approval of the requested LHCb M&O A budget for 2010.

## **7. TOTEM**

### ***Closing report for 2008***

TOTEM submitted their closing report for 2008 M&O A budget to the RRB on 19 April 2009. The actual costs amounted to 381 kCHF for Category A. No Power costs arise for the TOTEM experiment. The actual costs are below the budget of 463 kCHF. The difference originates from small differences in many items. This is partly caused by the late arrival of the money in 2008

and hence by the late start of the spending. It is not a real saving, the money is being spent in 2009 for the respective items.

***Budget request for M&O Category A in 2010***

Table 10 shows the proposed M&O A budget for TOTEM in 2010 and the projections until 2012.

TOTEM	2010	2011	2012
[kCHF]	448	440	440

**Table 10: TOTEM M&O A budget proposal for 2010 and projections until 2012.**

The TOTEM Collaboration has provided the SG with an operational model. The TOTEM power consumption is taken into account within the CMS budget. Operation and consumables for the cooling are handled via contracts with EN-CV. Operation and consumables for the gas system are managed via contracts with DT. The necessary resources for computing are provided through the infrastructure allocated by the IT department at CERN. TOTEM foresees to be operational from the LHC start up. It will request special optics configurations.

The working model for the secretariat with 0.5 FTE has proven not to be successful. A full time position is now allocated. The TOTEM Collaboration does not plan to use EVO for communication, no budget is foreseen for EVO. In the framework of the CMS Operation Support Centre, a storage and repair area is foreseen for TOTEM. The costs are included in the CMS budget proposal.

The SG recommends the approval of the TOTEM M&O A budget for 2010.

**8. Collaborative Tools**

The discussions of members of the SG with representatives of the LHC experiments and the CERN IT department were dominated by the questions about the EVO services or an alternative solution. The LHC experiments have been confronted with the request to pay for the service provided through the EVO system (see also discussion under M&O C). The EVO system has been developed and is being operated by CALTECH. It was funded in the past by DOE and NSF. This support has been stopped and CALTECH started to charge users of the EVO system for this service. The costs are evaluated according to the “real usage” which is defined as: number of meetings times duration of meeting times number of participants connected to EVO. According to this definition, the user community at CERN received in 2008 about 70% of the total EVO service provided by CALTECH and the CERN IT department has been charged for the period January-December 2009 an amount of 590 kUS\$. The IT department distributed these costs to

the users at CERN as given in table 11.

User community	Real Usage	Charge
CMS	51.617%	304,540.3\$
ATLAS	31.165%	183,873.5\$
ALICE	8.765%	51,713.5\$
LHCb	5.843%	34,473.7\$
WLCG	1.967%	11,605.3\$
NA49	0.448%	2,643.2\$
EGEE	0.195%	1,150.5\$

**Table 11: Costs for the EVO system for users of the CERN community.**

The LHC experiments, except TOTEM, have included equivalent costs in their M&O A budget request for 2010. The SG endorses these requests although it is not clear from the MoUs that this collaborative tool is a pure M&O A item. It is, however, of the opinion that this is only an emergency action in the present situation. The SG recommends that in the future necessary payments should be made on the basis of a clear funding model for video conferencing and other collaborative tools which has to be agreed upon between the CERN management and the funding agencies.

## 9. Service Level Agreements

The SG reviewed the Service Level Agreements (SLAs) of the LHC experiments. The SLAs for electrical distribution systems and cooling & ventilation need to be updated. The last version dates back to 2007. Since then, new contracts have been signed.

The ATLAS Collaboration reported that costs for safety monitoring & access will increase because during the gas-sniffer maintenance in 2011 the pumps have to be replaced and in 2014 the smoke detectors will have to be exchanged following a 6 years cycle. A SLA for WEB casting has been completed.

The CMS Collaboration noted that a SLA for the Access System has not yet been produced.

The ALICE Collaboration announced an increase in cost for the gas-sniffer maintenance as for ATLAS. A SLA for on-line data base management is under preparation.

## 10. M&O Cat C

The SG has been asked to consider the M&O C contributions by the host laboratory. The SG has no well defined mandate for this activity and understands its task mainly as a discussion with the LHC experiments about their needs and what they expect to be provided through M&O C by CERN.

As in the previous year, there is general concern among the Resource Coordinators that the experiments are increasingly being asked to pay for items and services which they believe to be host laboratory responsibilities (M&O C). The Category C items are defined in the M&O MoUs as: safety& radiation protection, INB compliance, disposal of radioactive waste, access systems, “gerant de site”, flood control, insurance (CERN standard), cleaning, office space. The initial Category C cost estimates have been drawn up in 2001 for the period 2002 to 2007. In discussions with the SG, the LHC experiments expressed their opinions that an accord based on either a Service Level Agreement or a Memorandum of Understanding for the provision of Category C services should be developed and agreed upon between the CERN management and the LHC experiments. It was agreed that ATLAS will serve as a test case for developing such an accord. More detailed definitions of existing headings are required and new headings may need to be incorporated, e.g. video conferencing. Category C cost estimates need to be evaluated and projected for the years 2009 to 2013 and a mid-term plan should be fixed for funding the services.

## 11. Other Issues

The present model for hardware replacement in the on-line computing sector of the LHC experiments foresees an exchange of the processors every three years. This agreement is quite old by now. In discussions of the SG with the Resource Coordinators of the experiments and also between the Chair of the SG and the DRC, Sergio Bertolucci, the validity of this model was questioned. It was agreed that after the LHC experiments have gained some experience with beam operation and data taking the model will be reviewed. Sergio Bertolucci will convene a meeting with representatives of the LHC experiments around summer of 2010 for this purpose. The outcome of this meeting may change the projections of the M&O A budgets for on-line computing.

Getting in-kind contributions from institutions under defined “collaboration task”, when they can be defined in isolation and their interfaces well controlled, could be the right solution to save money and have skilled people for the experiment, demonstrating also strong involvement of the collaborating partners.

## 12. Composition of the Scrutiny Group in 2010

For 2010, the composition of the Scrutiny Group may change little or not at all. Sascha Schmeling (CERN), the secretary of the SG, will continue this task in 2010. Emmanuel Tsemelis (CERN) also agreed to continue as a member of the SG, although he served already for many years. The Italian delegate, Giovanni Batignani, reached the end of his term. At present, it is still possible that he may continue as a member of the SG.

## 13. Summary

The SG has carefully scrutinized the budget requests of the five LHC experiments, examining in detail many of the line items. The Scrutiny Group took note of Category B estimates where available, but looked in more detail at the Category B budget request for ATLAS.

**The RRB Scrutiny Group recommends approval by the RRB of the 2010 estimates for the M&O budgets for ALICE, ATLAS, CMS, LHCb and TOTEM. At the same time it draws the attention of the RRB to remarks concerning some of the ATLAS and CMS projects.**

### **Acknowledgments**

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