



TOTEM COLLABORATION – MoU for M&O CERN-RRB-2007-110

Memorandum of Understanding for Maintenance and Operation of the TOTEM Detector



Category A Headings for TOTEM M&O Costs Categorisation

Category A. M&O expenses that are shared by the entire collaboration.

Detector operation:

The sharing is based on the proportions of scientific staff in the collaboration holding PhD or equivalent qualifications who are entitled to be named as authors of scientific publications of the collaboration.

CERN	INFN	Finland	Estonia	Prague	US-NSF
28%	45%	11%	5%	3%	8%

Current number of authors : 62



Category A Headings for TOTEM M&O Costs Categorisation

Detector Operation

Gas systems
Gas consumption
Cooling systems & fluids
Moving/hydraulic systems
Detector safety systems
Shutdown activities
Technical support
UPS maintenance
Electronics pool rentals
Beam pipe & vacuum
Counting & control rooms
Power supplies
Cables and miscellaneous

Test-Beams, Calibrations

General operation
Common electronics
Electronics pool rentals
Gas systems&consumption

Online Computing

(with no recording media)

System management
Data storage, (tmp on disk)
Detector controls
Computers/processors
LANs
Software licenses
Desktops infrastructure

Core Computing

Distributed & central computing coordination
TOTEM environment installation and replication
Production mgm. and tools
Data mgm. and servers
Infrastructure and services
User support
Common prod. operations

Core Software

Software process and project management
Development environment
Quality assurance and testing procedures
Build workspace and Release management
Application framework doc. and maintenance
Interface with the machine, proton transport
Database applications
Integration of physics toolkits and analysis tools

Laboratory Operations

Assembly areas, clean rooms
Workshops
Laboratory instruments

Communications

GSM phones/on-call
Tele/video conference

Secretariat

Economat and assistance
Fax, photocopiers, printers
Printing and publication

General Services

Cooling & ventilation
Power distribution
Heavy transport
Cranes, cleaning
Cars
Survey
Storage space
Academic subsistence
Outreach



Category B Headings for TOTEM M&O Costs Categorisation

Category B. M&O expenses that are borne by part of the collaboration, i.e. by single institutes or groups of institutes, and their Funding Agencies. The headings in this category are defined with reference to the distribution of responsibilities amongst the various institutes for the construction of the detector.

Detector maintenance and repairs:

The sharing is based on the proportions of the original investment.

Sub-DETECTOR	Responsibilities					
	CERN	INFN	Helsinki	Estonia	Prague	NSF
Roman Pots						
Mechanics + Installation	85%				15%	
Si Detectors	73%					27%
Electronics	50%			5%		45%
T1 Detector						
CSC Detectors		100%				
Electronics		90%				10%
Supports + Services	90%	10%				
T2 Detector						
GEM Detectors			100%			
Electronics		100%				
Supports + Services	50%		50%			
DAQ						
Read-out Column		100%				
Detector Controls	25%	25%	25%			25%



Totem M&O Budget Request 2008

A: TOT DETECTORS OPERATION =	195K
A: TOT TEST-BEAM =	60K
A: TOT ONLINE =	50K
A: TOT CORE SOFTWARE =	90K
A: TOT CORE COMPUTING =	45K
A: TOT PHYSICS SOFTWARE =	16K

<u>A: TOTAL =</u>	<u>456K</u>
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B: TOT DETECTORS MAINTENANCE =	125K
B: TOT ONLINE =	50K

<u>B: TOTAL =</u>	<u>175K</u>
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TOTEM M&O TOTAL = 631K



The yearly M&O [cat.A] request for TOTEM is ~6% of the construction budget.

Reasons:

The detectors have to be removed and installed several times which needs more maintenance and technical work

The percentage fraction of repairs and exchanges is larger due to the hostile environment in the forward cones close to the LHC beams

Fractionally larger control and survey costs due to the close link to the machine

The maintenance and operation of the Core software and computing is not proportional to the cost of the experiment

TOTEM is now working to provide the RRB-SG with the detailed justifications for the cost of the individual items mentioned in the following slides.



Detector Operation. [Cat. A] (ref. M&O MoU Annex 9)

Detector Maintenance & Repairs. [Cat. B] (ref. M&O MoU Annex 10)

1. Roman-Pots

A: Maintenance cooling [24K]

A: Surveys geometry [7K]

A: Power supplies and cables [5K]

A: Calibration and alignment [12K]

A: Controls [30K]

B: Installation and removal [5K]

B: Maintenance silicon [15K]

B: Maintenance electronics [15K]

B: Mechanics, movements, vacuum equipment [20K]

A Technical support [7K]

A: SUBTOT ROMAN-POTS = 85K

B: SUBTOT ROMAN-POTS = 55K

A+B: ROMAN-POTS = 140K



Detector Operation. [Cat. A] (ref. M&O MoU Annex 9)

Detector Maintenance & Repairs. [Cat. B] (ref. M&O MoU Annex 10)

2. T1 Detector

A: Gas refill [5K]

A: Maintenance cooling [14K]

A: Surveys geometry [5K]

A: Power supplies [5K]

A: Re-cabling [6K]

A: Calibration and alignment [5K]

A: Controls [15K]

B: Installation and removal [5K]

B: Modifications / support [8K]

B: Maintenance electronics [15K]

B: Mechanics [12K]

A: Technical support [5K]

A: SUBTOT T1 = 60K

B: SUBTOT T1 = 40K

A+B: T1 = 100K



Detector Operation. [Cat. A] (ref. M&O MoU Annex 9)

Detector Maintenance & Repairs. [Cat. B] (ref. M&O MoU Annex 10)

3. T2 Detector

A: Gas refill [4K]

A: Maintenance cooling [8K]

A: Surveys geometry [5K]

A: Power supplies [4K]

A: Re-cabling [4K]

A: Calibration and alignment [5K]

A: Controls [15K]

B: Installation and removal [5K]

B: Modifications / support [5K]

B: Maintenance electronics [12K]

B: Mechanics [8K]

A: Technical support [5K]

A: SUBTOT T2 = 50K

B: SUBTOT T2 = 30K

A+B: T2 = 80K



Test-beam. Online DAQ operation. [Cat. A] (ref. M&O MoU Annex 9)

Maintenance of online DAQ. [Cat. B] (ref. M&O MoU Annex 10)

4. Test-beam

A: Electronics-pool items [30K]

A: Consumables [20K]

A: Infrastructure and cabling [10K]

A: SUBTOT TEST-BEAM = 60K

A+B: TEST-BEAM = 60K

5. On-line DAQ

A: Central Data Recording, cluster management. [50K]

B: Local DAQ (IP5), H8, lab system [50K]

A: SUBTOT ONLINE = 50K

B: SUBTOT ONLINE = 50K

A+B: ONLINE = 100K



Core Software. [Cat. A] (ref. M&O MoU Annex 9 and Annex 4.3)

6. Software

- A: Software process
- A: Project management
- A: Development environment & software repository
- A: Testing and QA
- A: Daily build/tagging/release procedures
- A: Application Framework / CMS
- A: Interface Machine
- A: DataBases
- A: Physics&Analysis toolkits

NOTE: All the FTE manpower is covered by the collaborating institutes. However, the collaboration needs to allocate travel money (such as for project and unpaid associates) for the collaborators who are going to fulfill the key roles described above, for a total of 55K in 2008. In addition, the collaboration wishes to exploit external IT expertise to maximize its effectiveness, given the short timescale in which the TOTEM software must reach full reliability (total 35K).

A: SUBTOT CORE SOFTWARE [TRAVEL] =	55K
A: SUBTOT CORE SOFTWARE [CONSULTANCY] =	35K
A+B: CORE SOFTWARE =	<u>90K</u>



Core Computing. [Cat, A] (ref. M&O MoU Annex 9 and Annex 4.3)

7. Computing

A: Coordination

A: Distributed and central installations

A: Productions

A: Data management

A: Infrastructure, WWW, desktops, computer accounts mgm.

NOTE: All the FTE manpower is covered by the collaborating institutes. However, the collaboration needs to allocate travel money (such as for unpaid and project associates) for the collaborators who are going to fulfill the key roles described above.

A: SUBTOT CORE COMPUTING =

45K

A+B: CORE COMPUTING =

45K



Physics (detector and analysis) software. [Cat. A] (ref. M&O MoU Annex 9 and Annex 4.4)
(TOTEM physicists expected to cover most of the costs).

8. Analysis&Detector software

A: Organization of expert review on detector performance and response

A: Organization of expert review on reconstruction

A: Organization of expert review on simulation

A: Organization of peer review on analysis physics observables

A: SUBTOT PHYSICS SOFTWARE = 16K

A+B: PHYSICS SOFTWARE = 16K



TOTEM looks forward to a discussion with the
SG to prepare better their requests for the
meeting in Nov/Dec 2007