

Memorandum of Understanding

for Collaboration in the Construction of the TOTEM Detector

between

The EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH, hereinafter
referred to as "CERN", Geneva, as the Host Laboratory

on the one hand,

and

an Institute/Funding Agency of the TOTEM Collaboration

on the other hand.

Preamble

- (a) A group of Institutes from CERN Member and non-Member States and CERN have agreed to collaborate to form the TOTEM Collaboration (**Annex 1**). This Collaboration has proposed to CERN an experiment to study the Total Cross Section, Elastic Scattering and Diffraction Dissociation at the Large Hadron Collider (LHC). These Institutes have secured the support of their Funding Agencies to enable them to participate in the TOTEM Collaboration.
- (b) Agreement to establish this Collaboration is effected through identical Memoranda of Understanding (MoU) between each Institute or Funding Agency, as appropriate, in the Collaboration and CERN, as the Host Laboratory. These MoUs collectively define the Collaboration and its objectives, and the rights and obligations of the collaborating Institutes.
- (c) On the basis of a Technical Proposal submitted in March 1999 (CERN/LHCC 99-7, LHCC/P5), a Technical Design Report (TDR) submitted in January 2004 (CERN/LHCC-2004-002/TDR 1), its Addendum submitted in June 2004 (CERN/LHCC-2004-020/TDR 1/Add.1) and a detailed review of the scientific merits, the technological feasibility and estimates of the needed resources, the LHCC Committee (LHCC) recommended approval of the technical design of the experiment to the CERN Research Board (CERN/LHCC 2004-024), subject to a set of agreed milestones (CERN/LHCC 2004-022/G78). A Cost Evaluation submitted in June 2004 (CERN/LHCC 2004-013/G73) has been performed by the LHCC Cost Review Committee (CORE).
- (d) Based on the recommendation by the LHCC and in agreement with the list of milestones, the CERN Research Board approved the technical design of TOTEM (CERN/DG/Research Board 2004-361). Final approval of the experiment is subject to the funding agreement set out in the MoUs.
- (e) Before proceeding to the final construction phase, each sub-detector will be subjected to a technical, financial, and manpower review by the LHCC based on the Technical Design Reports.
- (f) The TOTEM experiment will be placed on both sides of the CMS interaction region and will work in close collaboration with the CMS experiment. A Memorandum of Agreement (MoA) between TOTEM and CMS will define their interactions regarding the infrastructure, trigger and readout, and data analysis. A common CMS/TOTEM TDR will be presented to the LHCC in 2006, describing the diffractive physics programme that can be addressed at various luminosities with the complete CMS/TOTEM detector.
- (g) A Resources Review Board (RRB) has been constituted which comprises the representatives of all TOTEM Funding Agencies (**Annex 2**) and the managements of CERN and the TOTEM Collaboration. It is chaired by the CERN Chief Scientific Officer.

The role of the RRB includes:

- reaching agreement on the Memorandum of Understanding;
- monitoring the Common Projects and the use of the Common Funds;
- monitoring the general financial and manpower support;
- reaching agreement on a maintenance and operation procedure and monitoring its functioning;
- endorsing the annual construction and maintenance and operation budgets of the detector.

The Collaboration management reports regularly to the RRB on technical, managerial, financial and administrative matters, and on the composition of the Collaboration.

- (h) This MoU is not legally binding, but the Institutes and Funding Agencies recognize that the success of the Collaboration depends on all its members adhering to its provisions. Any default will be dealt with, in the first instance, by the Collaboration and if necessary then by the RRB.

Article 1: Parties to this MoU

- 1.1 The Parties are all the Institutes of the Collaboration as listed in **Annex 1** and their Funding Agencies, and CERN as the Host Laboratory. **Annex 2** lists the Funding Agencies and their duly authorized representatives. The Funding Agency may be an Institute or an established institution acting on behalf of one or more Institutes.
- 1.2 The collaborating Institute(s) and the TOTEM Collaboration will hereinafter be referred to as "Institute(s)" and "Collaboration", respectively.

Article 2: Purpose of this MoU

- 2.1 This MoU defines the construction phase of the TOTEM detector. Its purpose is to define the programme of work to be carried out for this phase and the distribution of charges and responsibilities among the Parties for the execution of this work. It further sets out organizational, managerial and financial guidelines to be followed by the Collaboration.
- 2.2 The construction phase comprises the engineering design, final prototyping, construction, calibration, transportation, assembly, installation and commissioning of the elements which will be part of the TOTEM detector in the LHC tunnel and in the underground experimental area.
- 2.3 The TOTEM project is executed in the normal framework of the CERN scientific programme, approved by the CERN Council, and subject to the bilateral Agreements and Protocols between CERN and non-Member States.

- 2.4 In case of conflict between such Agreements or Protocols and the present MoU, the former shall prevail.

Article 3: Duration of this MoU and its Extension

- 3.1 This MoU is valid for the construction period of the TOTEM detector, from 1 October 2005 to a date not earlier than 30 September 2008. The actual termination date will be set by the RRB no later than 30 June 2007.
- 3.2 This MoU may be extended at any time by mutual agreement of the Parties.
- 3.3 Any Funding Agency may withdraw its support from the Collaboration by giving not less than eighteen months notice in writing to the Collaboration and the Director-General of CERN. In such an event, reasonable compensation to the Collaboration will be negotiated through CERN and confirmed by the RRB.
- 3.4 Any Institute may withdraw from the Collaboration according to the procedures agreed by the Collaboration, the conditions as set out in the current document "General Conditions Applicable to Experiments Performed at CERN" (**Annex 10**) and by giving notice in writing to its Funding Agency.

Article 4: The TOTEM Detector and Collaboration

- 4.1 The detector for the TOTEM experiment is described in detail in the Technical Proposal submitted to the LHCC in March 1999, in the Technical Design Report (TDR) submitted in January 2004 (CERN-LHCC-2004-002, TOTEM-TDR-001) and its Addendum, submitted in June 2004 (CERN-LHCC-2004-020, TOTEM-TDR-001-Add1). It consists of a number of sub-detector units as listed in **Annex 3**.
- 4.2 The names of the scientists participating in the Collaboration are listed in **Annex 4** by Country and by Institute.
- 4.3 The management structure of the Collaboration is defined in **Annex 5.1**. Persons currently holding management positions are given in **Annex 5.2**.
- 4.4 The technical participation of the Institutes in detector construction is set out in **Annex 6**.
- 4.5 **Annex 7** gives an overview of the foreseen construction schedule.
- 4.6 Following the recommendations of the LHC Cost Review Committee (CORE) the manpower and financial resources needed for the TOTEM experiment are grouped into three headings:
- 4.6.1 R&D work on the various detector elements;
- 4.6.2 costs for infrastructure in the Institutes, and costs for personnel, travel, etc. of the Institutes as arising from their participation in the Collaboration;

4.6.3 engineering design, final prototyping, construction, calibration, transportation, assembly, installation and commissioning costs for the complete detector.

The resources needed for work under the headings 4.6.1 and 4.6.2 are the responsibility of the Institutes supported by their respective Funding Agencies. These resources are neither accounted for in detector construction costs, nor monitored centrally by the Collaboration.

The resources needed for work under the heading 4.6.3 cover the costs of the detector construction. These costs have been evaluated by the Collaboration and verified by CORE. Only these costs are monitored centrally by the Collaboration.

- 4.7 Any Institute that wishes to join the Collaboration during the period of validity of this MoU will be expected to make an appropriate contribution to the funding of the detector construction including the Common Projects. This will be negotiated by the Collaboration and endorsed by the RRB. In the event that the detector construction is already fully funded, the new Institute will have to make a special contribution which will be negotiated by the Collaboration and endorsed by the RRB.
- 4.8 The individual sub-detector CORE costs, expressed in Swiss Francs, are contained in the TOTEM Cost Evaluation dated 6 July 2004 (CERN/LHCC 2004-013/G-073).
- 4.9 Unless explicitly mentioned, all cost figures in this MoU are expressed in 2004 Swiss Francs based on estimates valid on 1 July 2004. The calculated CERN index for materials cost variations (investments) will be used for cost monitoring purposes throughout the lifetime of the project.

Article 5: Programme of Work for the Construction Phase of the TOTEM Detector and Sharing of Responsibilities for its Execution

- 5.1 The total construction work for the detector is divided into:
- 5.1.1 Sub-detector construction, which will be the responsibility of individual Institutes, or groups of Institutes, and
 - 5.1.2 Common Projects comprising those elements of the detector construction which the Collaboration has agreed are to be provided at the common expense of the Collaboration; see Article 6.
- 5.2 **Annex 8.1** shows the total overall summary of the estimated values of the deliverables, by Funding Agency and sub-detector, to which the Funding Agencies are committed and for which they have foreseen the appropriate funding. **Annex 8.2** gives the projected spending profile.

- 5.3 The Institutes, supported by their Funding Agencies, will make their best efforts to design, produce final prototypes, construct, calibrate, transport, assemble, install and commission all the deliverables listed in **Annex 8.1** within the limits of their funding.

In the event of cost overruns, these will first be brought, by the Institute(s) concerned, to the attention of the Collaboration and then to the RRB if solutions have not been found. The Collaboration will propose ways of accommodating such overruns including descoping or staging if other ways cannot be found, and seek the endorsement of the RRB.

Article 6: Common Projects

- 6.1 **Annex 9** lists the Common Projects, together with their estimated costs and the current level of contributions from each Funding Agency.

- 6.2 Contributions to the Common Projects will be made in two ways:

6.2.1 By taking responsibility for a Common Project item or parts of it, in agreement with the Collaboration Board and endorsed by the RRB. This option is referred to as “in-kind contribution”.

6.2.2 By cash payments to a dedicated Common Fund, which has been established for the Common Projects through a dedicated account at CERN. The Common Fund will be managed and operated by the TOTEM Resource Coordinator, taking advice from the TOTEM Management together with the CERN Finance Division. All Common Fund operations will be monitored by the RRB and reported to the Collaboration Board. The Common Fund will be maintained and managed in the currency of the CERN Budget.

- 6.3 The contributions to the Common Projects listed in Annex 9 are due in proportion to the number of authors per Institute. Institutes may contribute more to Common Projects than the amount calculated by this method. A minimum annual cash contribution of 6 kCHF is required from each Institute.

The TOTEM Management may recommend to the RRB to update the level of contribution, for example due to a major change in the level of participation of an Institute or due to an Institute joining or leaving the Collaboration.

- 6.4 Contracts for Common Projects will be placed by CERN in accordance with document “Financial Guidelines for LHC Collaborations” (CERN/FC/3796, as modified by CERN/FC/3796 Rev.).

- 6.5 The provision of offline computing infrastructure will be addressed in an Addendum to the Memorandum of Understanding for Collaboration in the Deployment and Exploitation of the LHC Computing Grid¹. The development of detector-specific software (such as that for simulation, reconstruction and analysis) and the software for physics analysis is considered to be an integral part of the research activities of the scientists in the TOTEM Collaboration and is therefore not subject to any Memorandum of Understanding.
- 6.6 The responsibilities for the maintenance and operation of the TOTEM detector will be laid down in a separate Memorandum of Understanding on maintenance and operation procedures. This will be prepared by the Collaboration together with CERN, in consultation with the RRB, to be signed by the Parties. The M&O MoU will also address all aspects of the experiment-specific Core Computing not covered by Article 6.5 above, in particular the contributions from the TOTEM Collaboration to the TOTEM Core Computing development, maintenance and support, in recognition of the ongoing development effort required during the life of the Collaboration.

Article 7: Obligations of CERN as the Host Laboratory and of the Institutes

- 7.1 The general obligations of CERN as Host Laboratory and of the Institutes are contained in the “General Conditions Applicable to Experiments Performed at CERN”. This document is regarded as an integral part of this MoU and is attached as **Annex 10**.
- 7.2 All equipment brought to the CERN site must comply with CERN’s safety regulations. If relevant, the design, test criteria and testing of equipment should be discussed well in advance with CERN’s safety officials. All equipment brought to CERN must be accessible for inspection by the Group Leader in Matters of Safety.

Article 8: Rights and Benefits of Institutes

- 8.1 The Institutes participating in the Collaboration are entitled to join the operational phase of the project and to participate in the scientific exploitation of the data acquired. Further details are set out in the “General Conditions Applicable to Experiments Performed at CERN”.

Article 9: Administrative and Financial Provisions

- 9.1 General financial matters and purchasing rules and procedures for the LHC experiments, including the rules which apply for Common Fund operations, are dealt with in accordance with the “Financial Guidelines for the LHC Collaborations” (CERN/FC/3796 as modified by CERN/FC/3796 Rev.).

¹ CERN-C-RRB-2005-01/Rev.

- 9.2 Under the provisions of the CERN basic Convention dated 1st of July 1953, revised on 17 January 1971, any Institute's staff and property located at CERN shall be subject to the authority of the CERN Director-General and shall comply with the CERN regulations.

Article 10: Amendments

- 10.1 This MoU may be amended at any time with the agreement of the Parties. Any such amendments will be subject to the prior agreement of the RRB.

Article 11: Disputes

- 11.1 Any dispute between Funding Agencies shall be resolved by negotiation or, failing that, by arbitration through the President of the CERN Council, who may, at his or her discretion, adopt any form of arbitration process. Any dispute between a Funding Agency and CERN will be resolved using standard CERN procedures for the resolution of such disputes. Any dispute between Institutes will be resolved according to Collaboration procedures.

Article 12: Annexes

- 12.1 All the Annexes are an integral part of this MoU. They are understood to be the planning basis for the construction of the TOTEM detector.

ANNEXES

- Annex 1: Institutes in the TOTEM Collaboration and the names of their Contact Persons
- Annex 2: List of Funding Agencies and their Representatives
- Annex 3: Sub-detector Structure of the TOTEM Experiment
- Annex 4: Current Participants in the TOTEM Collaboration by Country and Institute
- Annex 5: The Organizational Structure of the TOTEM Collaboration
 - 5.1: The Management Structure of the TOTEM Collaboration
 - 5.2: Persons currently holding Management and other senior positions within the TOTEM Collaboration
- Annex 6: Overview of the Technical Participation of Institutes in Detector Construction
- Annex 7: TOTEM Construction Schedule
- Annex 8: Summary Table of the Contributions by Funding Agency and Sub-detector, including Common Projects
 - 8.1: TOTEM Overall Summary
 - 8.2: Projected Spending Profile
- Annex 9: Sharing and Spending Profile of Common Projects
- Annex 10: General Conditions for Experiments Performed at CERN

The European Organisation for Nuclear Research (CERN)

and

declare that they agree on the present Memorandum of Understanding for the TOTEM Experiment.

Done in

Done in Geneva

on _____

on _____

For

For CERN

Jos Engelen

Chief Scientific Officer

Annex 1 : Institutes in the TOTEM Collaboration and the names of their Contact Persons

Country	Town	Institute	Representative
	Geneva	CERN, European Laboratory for Particle Physics	Ernst Radermacher
Czech Republic	Prague	Institute of Physics, Academy of Sciences of the Czech Republic	Vojtech Kundrat
Estonia	Tallinn	Estonian Academy of Sciences	Endel Lippmaa
Finland	Helsinki	Helsinki Institute of Physics (HIP) and the Department of Physical Sciences, University of Helsinki	Risto Orava
Italy	Bari	INFN Sezione di Bari and Dipartimento Interateneo di Fisica dell'Università e del Politecnico di Bari	Maria Gabriella Catanesi
	Genoa	INFN Sezione di Genova and Università di Genova	Maurizio Lo Vetere
	Pisa/Siena	INFN Sezione di Pisa and Università di Siena	Stefano Lami
Poland	Plock/Warsaw	Warsaw University of Technology, Fac. of Civil Engineering, Mechanics and Petrochemistry, Plock Campus	Janusz Kempa
United Kingdom	Uxbridge	Brunel University, Electronic and Computer Engineering Dept.	Cinzia Da Vià
USA	Cleveland, OH	Case Western Reserve University, Dept. of Physics	Cyrus Taylor
	University Park, PA	Penn State University, Dept. of Physics	Jim Whitmore

Annex 2 : List of Funding Agencies and their Representatives

Country	Agency	Place	Represented by
	CERN	Geneva	Jos Engelen
Czech Republic	Institute of Physics, Academy of Sciences of the Czech Republic	Prague	Karel Jungwirth
	Academy of Sciences of the Czech Republic, Committee for Collaboration of the Czech Republic with CERN	Prague	Jiri Niederle
Estonia	Estonian Academy of Sciences	Tallinn	R. Willems
Finland	Helsinki Institute of Physics (HIP)	Helsinki	Dan-Olof Riska
Italy	INFN	Rome	Roberto Petronzio
Poland	Warsaw University of Technology	Plock/Warsaw	Janusz Kempa
United Kingdom	Brunel University	Uxbridge	Stephen Watts
USA	NSF	Washington	Jim Whitmore

Annex 3 : Sub-detector Structure of the TOTEM Experiment

1	ROMAN POTS
	1. Roman Pot mechanics
	2. Movement
	3. Beam position monitor
	4. Detector mechanics
	5. Silicon sensors
	6. Cooling
	7. Electronics
	8. Power supplies and cables
	9. Miscellaneous
2	T1-CSC
	1. 70 CSC Detectors
	2. Electronics
	3. Power supplies and cables
	4. Supports and services
3	T2-GEM
	1. 50 GEM Detectors
	2. Electronics
	3. Power supplies and cables
4	TEST SETUP
	1. Cables, power supplies and infrastructure
	2. Electronics DAQ and computing
	3. Pool rental & Consumables
5	DAQ EVENT BUILDER
	1. Readout column
	2. Readout builder column
	3. Online PC & storage

Annex 4 : Current Participants in the TOTEM Collaboration by Country and Institute

CERN

CERN, European Laboratory for Particle Physics:

G. Anelli, G. Antchev, P. Aspell, M. Deile, E. Dimovasili, K. Eggert, F. Haug, P. Jarron, D. Macina, H. Niewiadomski¹, E. Noschis², M. Oriunno, E. Radermacher, L. Ropelewski, G. Ruggiero, S. Saramad, F. Sauli, W. Snoeys

Czech Republic

Prague, Institute of Physics, Academy of Sciences of the Czech Republic (AS CR):

J. Kaspar, V. Kunderat, M. Lokajicek, J. Smotlacha

Estonia

Tallinn, Estonian Academy of Sciences

E. Lippmaa, A. Rummel, A. Trummal

Finland

Helsinki, Helsinki Institute of Physics (HIP) and Department of Physical Sciences, University of Helsinki:

E. Brücken, J. Heino, F. Garcia, T. Hilden, J. Kalliopuska, K. Kurvinen, R. Lauhakangas, J. Lippmaa, J. Lämsä³, F. Oljemark, R. Orava, K. Österberg, H. Saarikko, N. van Remortel

Italy

Bari, INFN Sezione di Bari and Dipartimento Interateneo di Fisica dell'Università e del Politecnico di Bari:

V. Berardi, M. Calicchio, M.G. Catanesi, E. Radicioni

Genoa, INFN Sezione di Genova and Università di Genova:

A. Arena, M. Bozzo, A. Buzzo, S. Cerchi, S. Cuneo, F. Ferro, M. Lo Vetere, M. Macri, S. Minutoli, A. Morelli, P. Musico, M. Negri, E. Robutti, A. Santroni, G. Sette

Pisa/Siena, INFN Sezione di Pisa and Università di Siena:

U. Bottigli, M.A. Ciocci, S. Lami, G. Latino, M. Meucci, E. Oliveri, R. Paoletti, G. Sanguinetti, A. Scribano, F. Spinella, A. Stamerra, N. Turini

Poland

Plock/Warsaw, Warsaw University of Technology, Fac. of Civil Engineering, Mechanics and Petrochemistry, Plock Campus

J. Kempa, E. Mulas

United Kingdom

Uxbridge, Brunel University, Electronic and Computer Engineering Dept.:

C. Da Vià, J. Hasi, A. Kok, S. Watts

USA

Cleveland, OH, Case Western Reserve University, Dept. of Physics:

V. Avati, C. Taylor

University Park, PA, Penn State University, Dept. of Physics:

F. Torp, J. Whitmore

¹also at Electronic and Computer Engineering Dept., Brunel University, Uxbridge (UK)

²also at Helsinki Institute of Physics, Helsinki (Finland)

³also at Iowa State University, Ames, IA (USA)

Annex 5 : The Organizational Structure of the TOTEM Collaboration

5.1 The Management Structure of the TOTEM Collaboration

1. Concerning all scientific and technical matters, in particular the definition, construction and operation of the detector, the Collaboration is governed by the **TOTEM Collaboration Board (CB)**. This board is composed of one representative from each collaborating institution, with voting rights; and the Spokesperson, the Deputy-Spokesperson and the Technical Coordinator as ex-officio members, without voting rights. The CB elects the **Chairperson of the CB** from among the Members of the Collaboration. On request of the Chairperson, other coordinators can be invited to attend (without voting rights).
2. All scientific and technical issues are discussed in the **Plenary Meeting** before any major decisions are taken by the CB.
3. Concerning all resource and legal matters, the Collaboration is monitored by the **TOTEM Resource Review Board (RRB)**. This board is composed of representatives of each Funding Agency, with voting rights, and ex-officio members of the TOTEM Management and CERN Management, without voting rights. The RRB is chaired by CERN's Chief Scientific Officer.
4. The Project Leaders of the sub-detectors listed in **Annex 3** and the Coordinators listed in **Annex 5.2** are ratified by the Collaboration Board on proposal by the Spokesperson.
5. The **Spokesperson** represents the Collaboration to the outside and leads the Collaboration in all day-to-day matters. He/she is appointed by the CB following the rules in the TOTEM Collaboration Governance document.
6. The **Resource Coordinator** oversees the resource planning of the TOTEM project and will typically deal with budget planning, manpower planning, Memoranda of Understanding and the Common Fund. He/she is appointed by the CB in consultation with the CERN Management.
7. The **Technical Coordinator** has the responsibility to oversee all technical aspects of the detector construction. In particular, he/she ensures the integration of all sub-detectors into the complete detector and directly monitors the Common Projects. He/she is appointed by the CB in consultation with the CERN Management.
8. The Group Leader in Matters of Safety (**GLIMOS**) is responsible to the CERN Management for all matters of safety concerning TOTEM personnel, work and equipment on the CERN premises. He/she is appointed by the CERN Management in consultation with the TOTEM Management.

The list of persons presently holding management and other senior positions is presented in **Annex 5.2**.

5.2 Persons currently holding Management and other senior positions within the TOTEM Collaboration

Spokesperson	Karsten Eggert
Deputy	Maurizio Lo Vetere
Collaboration Board Chairperson	Angelo Scribano

Resource Coordinator	Karsten Eggert
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Technical Coordinator	Ernst Radermacher
Deputy & Integration Coordinator	Marco Oriunno

Physics Coordinator	Risto Orava
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Electronics Coordinator	Walter Snoeys
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DAQ Coordinator	Emilio Radicioni
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Software Coordinator	Valentina Avati
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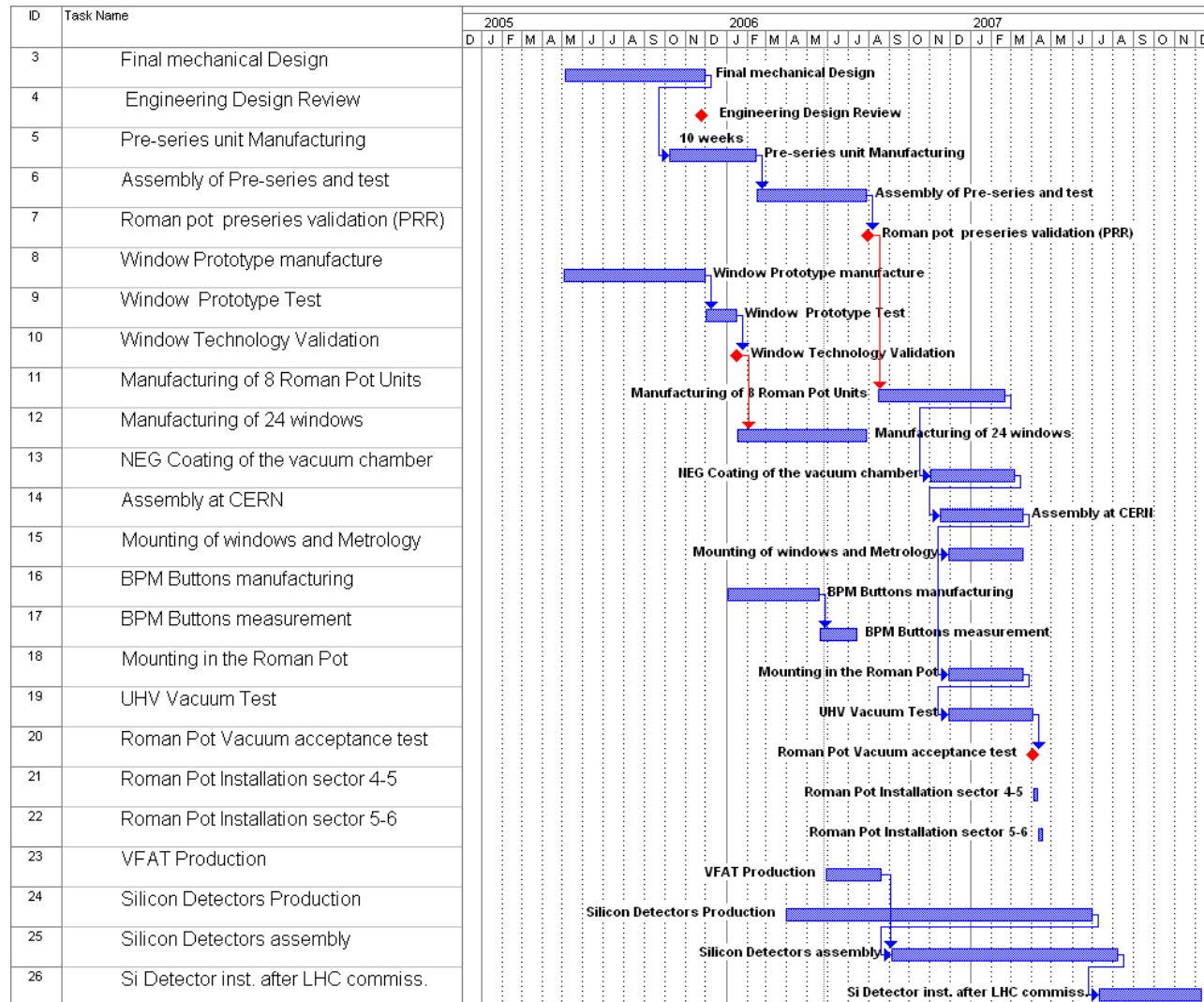
Project Leaders	
Roman Pot Project	Ernst Radermacher & Gennaro Ruggiero
T1 Project	Saverio Minutoli & Enrico Robutti
T2 Project	Kari Kurvinen & Leszek Ropelewski
Level 1 Trigger	Nicola Turini
Test Beam	Mario Deile

Annex 6 : Overview of the Technical Participation of Institutes in Detector Construction

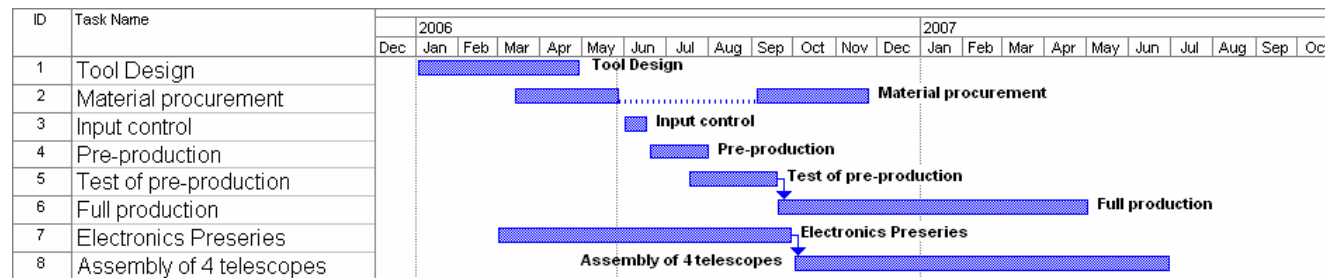
Sub-DETECTOR	Responsibilities										
	Brunel	CERN	Helsinki	INFN (Bari)	INFN (Genoa)	INFN (Pisa)	Warsaw	EAS (Tallinn)	Prague	USA (Penn St.)	USA (CWRU)
Roman Pots											
Mechanics		x							x		
Si-Detectors		x									
FE electronics for Si-Det.		x			x		x			x	
Support and installation		x							x		
Proton Trigger		x		x		x				x	x
T1 Detector											
CSC Detectors					x						
CSC FE electronics		x			x						
Support and installation		x			x						
Inelastic Trigger				x	x	x					
T2 Detector											
GEM Detectors		x	x								
GEM FE electronics		x	x			x				x	x
Support and installation		x	x								
Inelastic Trigger		x		x		x					
DAQ		x		x				x			
Test Setup	x	x	x	x	x	x	x	x	x	x	x
Large Size GEM Prototypes					x	x				x	x

Annex 7 : TOTEM Construction Schedule

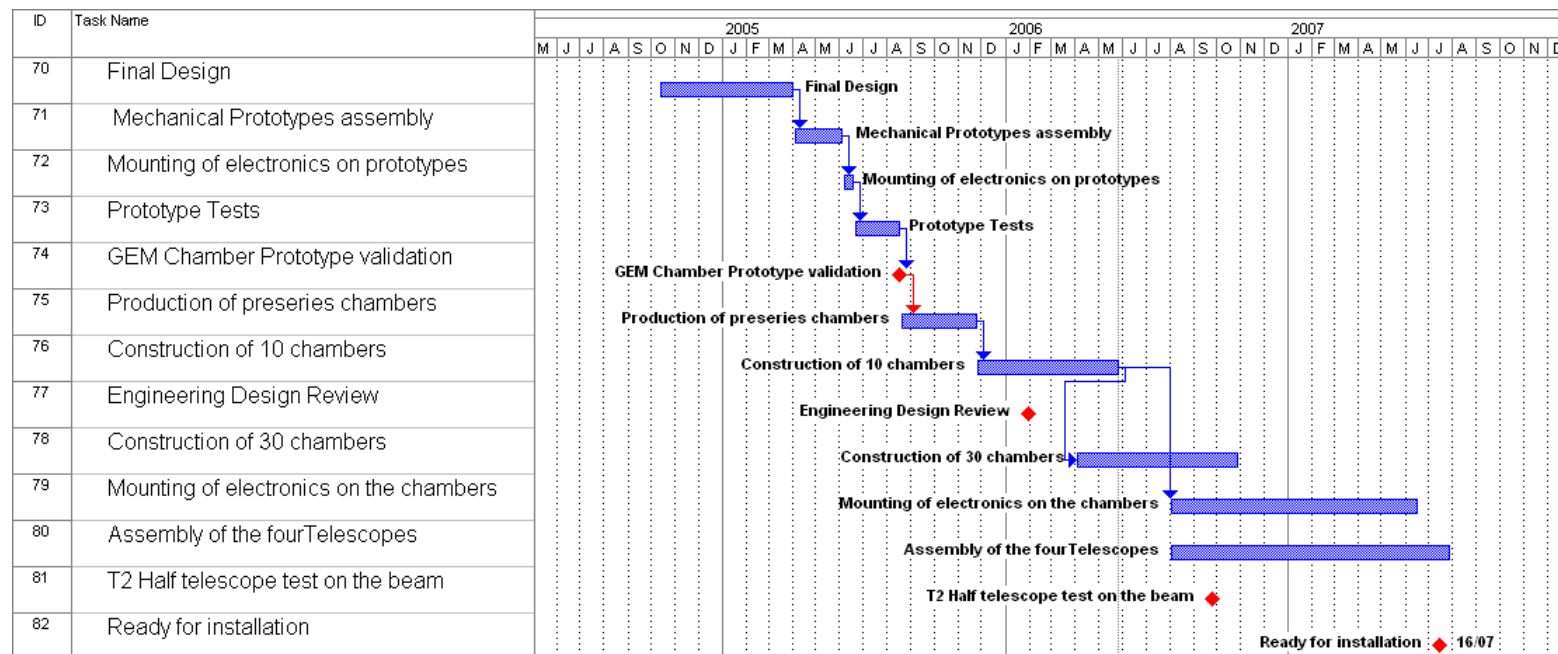
Roman Pots



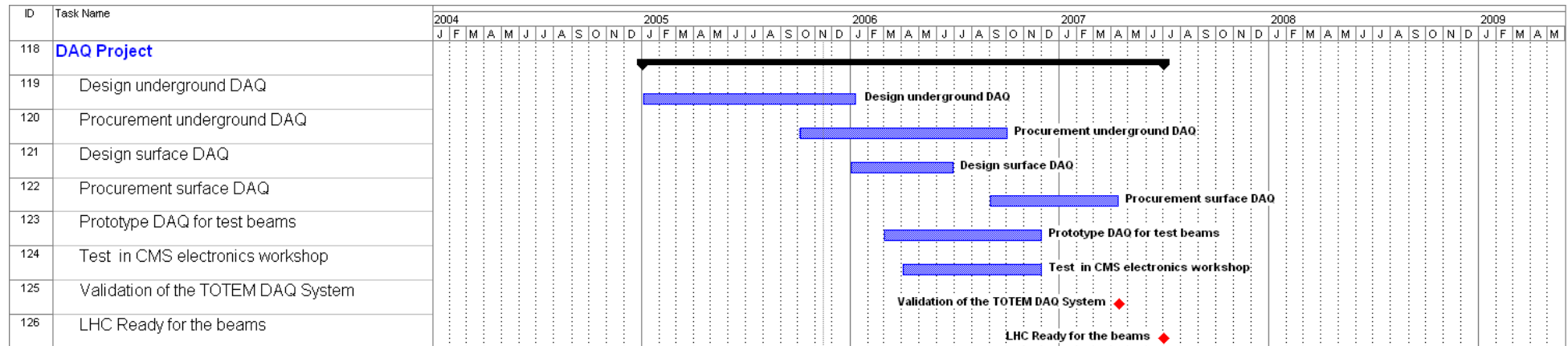
T1



T2



DAQ



Annex 8 : Summary Table of the Contributions by Funding Agency and Sub-detector, including Common Projects

8.1 TOTEM Overall Summary (kCHF)

		CERN	INFN	Finland	Brunel	Estonia	Prague	Warsaw	NSF	C. Projects
1	ROMAN POTS	2476								
	1. Roman Pot mechanics	651	456				195			
	2. Movement	204	204							
	3. Beam position monitor	171	169				2			
	4. Detector mechanics	133	133							
	5. Silicon sensors	228	110		55				63	
	6. Cooling	209	209							
	7. Electronics	554	175			40			324	15
	8. Power supplies and cables	287	160					127		
	9. Miscellaneous	40	40							
2	T1-CSC	1820								
	1. 70 CSC Detectors	627		627						
	2. Electronics	666	73	509					70	15
	3. Power supplies and cables	159	119	40						0
	4. Supports and services	369	249	50						70
3	T2-GEM	1303								
	1. 50 GEM Detectors	434		434						
	2. Electronics	533		518					0	15
	3. Power supplies and cables	138		138						
	4. Supports and services	199		90						109
4	TEST SETUP	150								
	1. Cables, power supplies and infrastructure	40								40
	2. Electronics DAQ and computing	70								70
	3. Pool rental & Consumables	40								40
5	DAQ EVENT BUILDER	720								
	1. Readout column	170	0	170		0			0	
	2. Link into CMS DAQ*	500	500	0					0	
	3. Online PC & storage	50		33					0	17
	TOTAL TOTEM	6470	2095	2085	524	55	40	197	127	457
			500*							390

* 5.2 will be staged

8.2 Projected Spending Profile (kCHF)

The figures for the year 2005 are as spent.

	Total cost [kCHF]	2005	2006	2007
CERN	2,095	460	1,395	241
INFN	2,085	285	1,200	600
Finland	524	130	394	-
Prague	197	70	70	57
Warsaw	127	-	50	77
Estonia	40	-	20	20
NSF	457	113	260	85
Brunel	55	55	-	-
C. Fund	390	-	195	195
Total	5,970	1,113	3,583	1,275
Staged CERN contribution	500			
Grand Total	6,470			

Annex 9 : Sharing and Spending Profile of the Common Projects (kCHF)

The TOTEM Collaboration has decided to consider a number of items as Common Projects (cf. Article 5.1 and Annex 8.1) to be financed either by cash contributions to the Common Fund or by in-kind contributions (cf. Article 6.2):

COMMON PROJECTS				
	#authors	2006	2007	Total
CERN	17	25.5	25.5	51
INFN	30	28	28	56
Finland	14	40.5	40.5	81
Prague	4	6	6	12
NSF	4	60	60	120
Brunel	4	6	6	12
EAS	3	23	23	46
Warsaw	2	6	6	12
		195	195	390

Annex 10 : General Conditions for Experiments Performed at CERN

ORGANISATION EUROPEENNE POUR LA RECHERCHE NUCLEAIRE

CERN EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

GENERAL CONDITIONS

APPLICABLE TO

EXPERIMENTS PERFORMED AT CERN

14 April 2000

General Conditions applicable to Experiments Performed at CERN

14 April 2000

GENERAL CONDITIONS

applicable to

Experiments Performed at CERN

The mission of the European Organization for Nuclear Research (CERN) is to sponsor international scientific research in high-energy physics.

This document sets out the rules and procedures concerning organisational, managerial and financial matters, which apply to all Universities and Research Institutions in connection with their participation in an experiment at CERN.

This document also addresses CERN's role as that of a Host Laboratory, to be distinguished from CERN's scientific responsibility as a member of an experiment Collaboration.

1. SCOPE OF APPLICATION

- 1.1. The General Conditions apply to experiments carried out at CERN by the combined efforts of several Universities and Research Institutions.
- 1.2. These experiments require approval by the CERN Research Board and the Director-General after consideration of written proposals submitted to the appropriate experiments committees, taking into account scientific interest, technical feasibility and the constraints imposed by available resources.
- 1.3. The General Conditions do not apply to "Recognised Experiments", the definition of which was decided by the CERN Research Board (CERN/DG/RB 99-285). The conditions applicable to such experiments are decided by the Research Board on a case-by-case basis and any individual members of these experiments who become registered as CERN users are subject to the rules in operation on the CERN site governing this category of personnel.

2. PARTIES AND THEIR REPRESENTATION

- 2.1. The Parties concerned include:
 - CERN as Host Laboratory, hereinafter referred to as "***CERN as Host***" (or simply "CERN") - in this connection, the "***CERN site***" refers to all parts of CERN's fenced-in territory and all of its underground works,
 - the Institutions responsible for the research teams taking part in the experiments and forming ***the Collaborating Institutions***, hereinafter collectively referred to as the ***Collaboration***. CERN may be a Collaborating Institution as well as Host Laboratory.
- 2.2. Each Party shall have a Representative:
 - CERN as Host shall be represented by a ***Director of Research***, acting on behalf of the Director-General.

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- The Collaboration shall be represented by a duly appointed ***Spokesperson***, who represents the Collaboration to the outside and who co-ordinates its work. Where the Spokesperson is not stationed permanently at CERN, the Collaboration shall appoint in addition a ***Contactperson*** at CERN.
- In its relations with CERN, each Collaborating Institution taking part in the experiment shall be represented by a **team member** appointed by the relevant Institution and/or a **member** of the relevant **Funding Agency**.

2.3. All Parties shall assume responsibility for ensuring that all members of their teams comply with these General Conditions.

3. BASIC DOCUMENTS GOVERNING THE COLLABORATION

3.1. The following documents shall constitute the formal basis for experiments performed at CERN:

- 3.1.1. the ***EXPERIMENTAL PROPOSAL***, after its approval by the CERN Research Board;
- 3.1.2. ***TECHNICAL DESIGN REPORTS***, where appropriate;
- 3.1.3. a ***MEMORANDUM OF UNDERSTANDING***, which sets out the detailed arrangements and provisions specific to the experiment and which must be agreed and signed by CERN as Host and by the Collaborating Institutions and/or Funding Agencies; special agreements or protocols of relevance may be appended to the Memorandum of Understanding;
- 3.1.4. the present ***GENERAL CONDITIONS***, which the Parties accept by signing the Memorandum of Understanding, except as otherwise specified therein.

Contents of the Memorandum of Understanding

3.2. As a guide, the essential parts of the Memorandum of Understanding are the following:

- a) a list of the Collaborating Institutions and/or the Funding Agencies, responsible for the teams in the Collaboration;
- b) details of the persons with specific responsibilities in the experiment;
- c)
 - the definition of the obligations of the Parties with respect to the construction of the detector and the auxiliary equipment;
 - a breakdown of the funding requirements for the main items of the detector and of the auxiliary equipment, together with the contributions of the Parties;
 - a timetable for the construction and installation of the equipment to be provided for the experiment;
- d) the obligations of the Parties concerning the installation, operation and maintenance of the detector and auxiliary equipment, unless they are specified in a separate Maintenance and Operation agreement;
- e) a mechanism for the resolution of disputes amongst the Parties;

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- f) an explicit reference to the General Conditions (in particular 6.7, 6.8 and 6.13), which the Parties accept unless otherwise specified in the Memorandum of Understanding; moreover, references should be made to the specific agreements and protocols relevant to the experiment.

4. ORGANISATION OF THE COLLABORATION

Internal autonomy and co-ordination with CERN

- 4.1. In its internal relations, the Collaboration is free to take such organisational decisions as deemed necessary. However, in preparing and performing the experiment, the Collaboration shall take into account the rules in force on the CERN site. In particular, financial arrangements between CERN and the Collaboration shall be subject to the Financial and Administrative Provisions for Visiting Teams currently in force.

Co-ordination in matters of safety

- 4.2. The Leader of the CERN Division with responsibility for the physics programme to which the experiment belongs shall appoint a Group Leader in Matters of Safety (GLIMOS) on the proposal of the Spokesperson of the Collaboration. The rights and obligations of the GLIMOS are defined in the document "Safety Policy at CERN SAPOCO/42".

Finance Review Committee/Resources Review Board

Initial Decision

- 4.3. For experiments involving large capital investments, a Finance Review Committee (FRC) or a Resources Review Board (RRB) may be set up in agreement with all the Parties concerned.

Membership

- 4.4. The FRC/RRB will consist of one representative of each Funding Agency or Collaborating Institution, and the Managements of CERN and the Collaboration. It will be chaired by the appropriate Director of Research.

Terms of reference

- 4.5. The role of the FRC/RRB includes:
- reaching agreement on the Memorandum of Understanding;
 - monitoring the Common Projects and the use of the Common Funds;
 - monitoring the general financial and manpower support;
 - approving a maintenance and operation procedure and monitoring its functioning;
 - approving the annual construction and maintenance & operation budgets.
- 4.6. The Collaboration Management reports to the FRC/RRB on technical, managerial, financial and administrative matters, and on the composition of the Collaboration.

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5. CERN'S OBLIGATIONS AS HOST LABORATORY

- 5.1. CERN is the Host Laboratory for the Collaboration. The provisions of this Section concern its obligations as Host.

PRINCIPLES

Installation

- 5.2. CERN will agree to the installation of the detector, its auxiliary equipment and counting rooms in the appropriate experimental area, provided that they satisfy CERN safety standards.

Duration

- 5.3. CERN will agree to keep the detector on-site during the data taking for the experimental programme approved by its Research Board.

Network Connections

- 5.4. CERN agrees that computers and peripherals belonging to the Collaboration, which are needed for the operation of the detector and its auxiliary equipment, may be connected to the CERN Computer network, provided they conform to its compatibility standards.

Insurance²

- *Property*

- 5.5. The items belonging to the Collaboration and the Collaborating Institutions, once they have been officially accepted on the CERN site, shall be insured at CERN's expense and under the conditions and within the limits set out in the relevant insurance policy against the risks of fire, explosion, natural disaster and water damage.

- *Third Party Liability*

- 5.6. Any third party liability of the Collaboration, the Collaborating Institutions and their personnel arising from the experiment shall be insured at CERN's expense under the conditions and within the limits set out in the relevant insurance policy.

- *Limitation of coverage*

- 5.7. However, CERN's insurance coverage is effective only above specified amounts of excess. Any amount not covered by CERN's insurance policies shall be for the account of the Collaboration. CERN shall not be liable for any loss or damage arising from or in connection with the experiment.

Social insurance

- 5.8. Independently of the foregoing provisions, social insurance cover for the experimental teams shall remain the responsibility of the employer institutions concerned.

² CERN's insurance policies are currently under review and it is intended that new insurance policies will come into effect on 1 January 2003. CERN does not warrant that the new insurance policies will continue to cover the risks set out in clauses 5.5 and 5.6 and accepts no liability in this connection.

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SERVICES

User Support and Users Office

- 5.9. CERN will provide access to its services, as described in the document “CERN User’s Guide”. The Users Office will provide assistance, if required, on questions concerning access to the services provided by CERN.

Standard Services

- 5.10. CERN will generally provide, for the duration of the experiment, free of charge and within the limits and general constraints imposed by the available resources and schedules of accelerators, the standard services and facilities listed below:

Particle beams and equipment

- a) particle beams and related shielding, monitoring equipment and standard communication with the accelerator control rooms;
- b) beam time allocation and scheduling, following the recommendations of the relevant Experiment Committee;
- c) test beam time for testing prototypes and calibrating final detector elements, subject to the normal scheduling and allocation procedures;

Space

- d) floor space in the experimental area(s) for the experimental detector and its auxiliary equipment;
- e) laboratory and hall space for construction, testing and assembly of equipment;
- f) temporary, short-term storage place for spare parts, handling and assembly tools, detector and auxiliary equipment that is awaiting installation or removal. CERN reserves the right to charge longer term storage of the above items to the Collaborating Institutions;
- g) office space, equipped with standard furniture and infrastructure facilities including network connections, telephones and electricity;

Supplies and installations at the experiment

- h) assistance with the installation and removal of the detector and its auxiliary equipment, such as the provision of crane and rigging services, geometrical survey and alignment, transport of equipment on and between the parts of the CERN site, as well as inside the experimental areas;
- i) mechanical infrastructure, local infrastructure for the supply of mains electricity, raw cooling water, compressed air and standard connections to the CERN communication network;

Computing

- j) central computing resources for the Collaboration for the duration of the experiment in amounts to be decided by the normal CERN allocation procedures;

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Transport of persons

- k) basic transportation for personnel between the main parts of the CERN site;

Safety services

- l) access to its safety services for advice, inspection and control, and first aid or other emergency help;

Administrative services

- m) access to its administrative services to help the Collaboration in financial matters, in accordance with the CERN Financial Rules and in particular with those applying to Visiting Teams.

Special Services

- 5.11. A variety of services other than those specified above may be provided to the Collaborating Institutions on request, subject to the availability of resources. Such services will be charged to the Collaborating Institutions according to the rules currently in force at CERN.

Special Equipment

- 5.12. Any additional infrastructure equipment to be provided by CERN shall be explicitly mentioned in the Memorandum of Understanding. The respective obligations of CERN and of the Collaborating Institutions with regard to the construction, operation and maintenance of this equipment shall also be specified therein or in the Maintenance and Operation agreement, where this is a separate document.

6. OBLIGATIONS OF THE COLLABORATING INSTITUTIONS

Basic Obligations

- 6.1. The team members and property of Collaborating Institutions shall, while located on the CERN site, be subject to the authority of the Director-General of CERN and shall comply with the regulations in force on the Organization's site. Each Collaborating Institution shall nominate a Team Leader who is responsible, among other things, for ensuring that all members of the team (paid academic, research, technical and administrative staff and registered students) are aware of the regulations and obligations, and of the need to comply with them at all times while on the CERN site.

Medical surveillance and certificates

- 6.2. Each Collaborating Institution sending team members to CERN shall remain responsible as employer for the medical surveillance of its team members and, in the case of team members who are to work in conditions deemed to constitute special risks (e.g. radiation controlled areas), shall supply a certificate of medical fitness on first arrival at CERN.

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Safety briefings and inspections

- 6.3. Collaborating Institutions shall participate in safety meetings and studies of their experiment, and shall accept the right of the CERN safety personnel to carry out safety inspections as well as other safety measures set out in the document "Safety Policy at CERN - SAPOCO/42".

Supply of equipment

- 6.4. The Collaborating Institutions shall make available on the CERN site, according to an agreed timetable and in working order, the equipment that they have undertaken to supply and to commission. The Spokesperson shall inform the appropriate Director of Research of any significant failure to meet the agreed schedule. For experiments with FRCs or RRBs, these bodies will monitor such matters.

Ownership status

- 6.5. The delivery of items to the CERN site, or the handling of such items there, will not affect the property rights relevant to those items, unless otherwise formally agreed with the owner. On the other hand, the ownership of equipment no longer required by the Collaboration can, subject to formal mutual agreement, be transferred to CERN, where this is in the mutual interest of CERN and the Collaboration concerned.

Ownership inventory

- 6.6. As a condition of coverage by CERN's Insurance, each Collaborating Institution must provide CERN with a list of the property it installs on the CERN site. All equipment delivered to the CERN sites must be properly documented to indicate its ownership status, handling requirements and any potential hazards that it may pose. It shall keep the list up to date and, where necessary, inform CERN of any modifications to it.

Transport of equipment

- 6.7. Each Collaborating Institution supplying equipment shall be responsible for its delivery to and removal from the CERN site.

Installation and dismantling of equipment

- 6.8. The Collaboration is collectively responsible for the installation and dismantling of the equipment supplied by the Collaborating Institutions, in common or individually.

Operation and maintenance costs of equipment

- 6.9. The Collaborating Institutions shall be collectively responsible for the operation and maintenance of the equipment supplied by them, and for providing the resources necessary to carry out the experimental programme. The resources needed to operate and maintain the infrastructure and other equipment supplied by CERN as Host shall be provided by CERN.

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Assignment of equipment

- 6.10. Any Party providing equipment undertakes to continue to make it available to the Collaboration at CERN until the experiment is officially declared to have been completed (see 8.2 below).

Early removal of equipment

- 6.11. If equipment provided by a Collaborating Institution is, in the opinion of the Collaboration, no longer required, the Parties may agree to and request its removal from the CERN site under the responsibility of the Institution concerned.

Release of space

- 6.12. Space allocated for construction and assembly should be released when these activities have been terminated. CERN reserves the right to change the space allocation during the lifetime of the experiment. As soon as the experiment is declared to have been completed (see 8.2 below), all space used by the Collaboration, including office and laboratory space, and the space used for testing and running the experiment, will be made available to CERN for reallocation.

Removal of equipment

- 6.13. Equipment associated with an experiment shall be removed from the CERN site within six months following a request from the CERN Division Leader concerned.

7. INTELLECTUAL PROPERTY

Free use of knowledge and data

- 7.1. CERN is bound by its Convention to publish or otherwise make generally available the results of its experimental and theoretical work. In addition, subject to clause 7.2 hereunder, each Collaborating Institution and CERN as the Host Laboratory is entitled to use for its own purposes any data and knowledge arising from the preparation or execution of the experiment.

Matters for prior agreement

- 7.2. Title to any patentable invention or any know-how arising from the preparation or execution of the experiment is vested in the Collaborating Institution(s) which is/are its author(s), who shall decide on the taking of measures, at its/their own expense, to protect such invention or know-how and who shall grant each Collaborating Institution and CERN a free, perpetual and irrevocable license to use such invention or know-how for its own purposes. Such license does not include the right to sub-license.

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8. FINAL PROVISIONS

Modifications and formal amendments

- 8.1. The Collaboration shall reach agreement on any modification or addition to the experiment that affects the terms of the Memorandum of Understanding and shall inform CERN of such changes. Where the changes constitute a substantial change to the experiment, they will be submitted to the appropriate committee for approval and acceptance by CERN. In cases where the Collaboration has an FRC/RRB, the latter bodies must also approve any such changes. Major modifications shall be approved as formal amendments to the Memorandum of Understanding and signed by the representatives of all the Parties.

Duration of applicability of the Memorandum of Understanding

- 8.2. Unless the duration of applicability is specified in the Memorandum of Understanding, the terms and conditions of the Memorandum of Understanding will apply until the appropriate CERN Research Director, in agreement with the Spokesperson, declares the experiment to have been completed, dismantled and the arrangements for its disposal agreed.

Observance of the Memorandum of Understanding

- 8.3. The Memorandum of Understanding formalises the agreement reached between all the Parties on the experiment, who will do their best to adhere to its provisions. Any default under its provisions will be dealt with by the Collaboration, in consultation with the CERN Management.

Relevant documents

- 8.4. The following documents are fully applicable in the execution of the Memorandum of Understanding:
- the CERN Users' Guide,
 - the Safety Guide for CERN experiments,
 - the Safety Policy at CERN - SAPOCO/42,
 - Financial Guidelines for the LHC Collaborations (CERN/FC/3796) - for the LHC experiments only,
 - Financial and Administrative Provisions for Visiting Teams.

ACCU

- 8.5. The Advisory Committee of CERN Users (ACCU) promotes links between CERN Management and the User Community and advises CERN Users on the working conditions and the arrangements for technical support.