Memorandum of Understanding

for Collaboration in the Construction of the CMS Detector

between

The EUROPEAN ORGANISATION FOR NUCLEAR RESEARCH,

hereinafter referred to as CERN, Geneva, as the Host Laboratory

on the one hand,

and

an Institution/Funding Agency of the CMS Collaboration

on the other hand.

Preamble

(a) A group of Institutes from CERN Member and non-Member States, and CERN, has agreed to collaborate to form the CMS Collaboration (Annex 1). This Collaboration has proposed to CERN an experiment to study particle interactions at the highest possible energies and luminosities to be reached with the Large Hadron Collider (LHC). These Institutes have secured the support of their Funding Agencies to enable them to participate in the CMS Collaboration.

(b) Agreement to this Collaboration is effected through identical Memoranda of Understanding (hereafter referred to as MoU) between each Funding Agency or Institute, as appropriate, in the Collaboration and CERN, as the Host Laboratory. These MoUs 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 December 1994 (CERN/LHCC/94-38) and a detailed review of the scientific merits, the technological feasibility and estimates of the needed resources, the LHC Committee (LHCC) recommended approval of the experiment to the CERN Research Board, subject to a set of milestones to be met by the experiment in its initial phase (CERN/LHCC 95-76).

(d) Based on the recommendation by the LHCC and in agreement with the list of milestones, the Research Board recommended to the Director General of CERN to approve the project, together with plans, including milestones, leading to the sub-detector Technical Design Reports.

(e) The Director General accepted the Research Board recommendation and approved the project to build the detector for the CMS experiment within a cost ceiling not exceeding 475 MCHF (in 1995 prices).

(f) Before proceeding to the final construction phase, each sub-detector (cf. Article 4.1) will be subjected to a technical, financial, and manpower review (CERN/DG/RB 95-234) by the LHCC based on the Technical Design Reports. This process will be completed during 1997 and 1998 for most of the sub-systems.

(g) A Resources Review Board (RRB) has been constituted which comprises the representatives of all CMS Funding Agencies and the managements of CERN and the CMS Collaboration. It is chaired by the CERN Director of Research.

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

(h) These Memoranda of Understanding replace the existing Interim Memoranda of Understanding (IMoU) which were valid for the period 1 January 1995 to 31 December 1997.

(i) 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 shall be all the collaborating institutes 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 Funding Agencies.

1.2 The collaborating institute(s) and the CMS 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 CMS 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 sets out organisational, managerial and financial guidelines to be followed by the Collaboration.

2.2 The construction phase comprises the engineering design, final prototyping, preproduction, construction, calibration, transportation, assembly, installation and commissioning of the elements which will be part of the CMS detector in the experimental area.

2.3 The CMS 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 Agreements or Protocols and the present MoU, the former prevails.

Article 3 : Duration of this MoU and its Extensions

3.1 This MoU is valid for the construction period of the CMS detector, from 1 January 1998 to a date not earlier than 31 December 2005. The actual termination date will be set by the RRB no later than 31 December 2003.

3.2 This MoU may be extended at any time by mutual agreement of its Parties, or by their appointed successors.

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 for Experiments Performed at CERN", (cf. Art. 7.1 of this MoU), and by giving notice in writing to its Funding Agency.

Article 4 : The CMS Detector and Collaboration

4.1 The detector for the CMS experiment has been described in the Technical Proposal submitted to the LHCC in December 1994 and in the subsequent sub-detector Technical Design Reports. It consists of a number of sub-detector units as listed in **Annex 3.**

4.2 The names of the scientists presently participating in the Collaboration are listed in **Annex 4** by country and by Institute.

4.3 The current federal management structure of the Collaboration is described in the attached CMS Constitution (**Annex 5)**.

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 construction schedule.

4.6 Following the recommendations of the LHCC Cost Review Committee (CORE) the manpower and financial resources needed for the CMS 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 arising from their participation in the Collaboration;

4.6.3 engineering design, final prototyping, preproduction, construction, calibration, transportation, assembly, and installation 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 CMS Cost Review Estimate, Version 9, dated 15 April 1998.

4.9 Unless explicitly mentioned otherwise, all cost figures are expressed in 1995 Swiss Francs based on estimates valid on 15 April 1998. 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 CMS Detector and Sharing of Responsibilities for its Execution

5.1 The total construction work for the detector, which includes the work executed under the terms of the IMoU, 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, cf. Article 6.

5.2 **Annex 8** shows the value 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.

5.3 **Annexes 9.1 to 9.8** list, by sub-detector, the deliverables to be provided by the Institutes, the estimated costs of these deliverables (Annexes 9.nA) and the assigned funding vs. the estimated costs (Annexes 9.nB).

5.4 **Annex 10** lists, by Funding Agency, the Institutes they support and their funding for these Institutes to provide their deliverables to the sub-detectors.

5.5 The Institutes, supported by their Funding Agencies, will make their best efforts to design, to produce final prototypes, to preproduce, to construct, to calibrate, to transport, to assemble, to install and commission all the deliverables listed in Annexes 9.1 to 9.8, within the limits of their funding.

5.6 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 within the overall cost ceiling of the CMS detector, including descoping or staging if other ways cannot be found, and seek the endorsement of the RRB.

Article 6 : Common Projects

6.1 Contributions to the Common Projects will be made in three ways :

6.1.1 by taking responsibility to supply a Common Project item or parts of it, in agreement with the CMS Finance Board and endorsed by the RRB. This option is referred to as "in-kind contribution";

6.1.2 by payment of invoices for procurement contracts for Common Project items which were placed by one or more Institutes or Funding Agencies following agreement by the CMS Finance Board. This option is referred to as "payments to contracts";

6.1.3 by cash payments to a dedicated Common Fund which will be established for the Common Projects through dedicated accounts at CERN. The Common Fund will be managed and operated by the CMS Resource Manager, taking advice from the CMS Finance Board and the Common Project Managers, together with the CERN Finance Division.

All Common Project operations will be monitored by the RRB. The Common Fund will be maintained and managed in the currency of the CERN Budget.

6.2 Contributions to the Common Projects are due in proportion to the funding of the CMS detector construction as set out in Annex 8.

The CMS Finance Board may also recommend to the RRB to update the level of contribution to the Common Projects, 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.

6.3 The value of contributions to the Common Projects, provided in accordance with Articles 6.1.1 and 6.1.2, will be established:

6.3.1 as the price quoted in the lowest technically acceptable bid, obtained through international, competitive tendering, or

6.3.2 as the lowest cost estimate obtained through an international price inquiry, subject to the agreement of the CMS Finance Board, or

6.3.3 in exceptional cases where paragraphs 6.3.1 or 6.3.2 are not applicable, by assessment of the CMS Finance Board.

6.4 Contracts for Common Projects will be placed either by CERN in accordance with document "Financial Guidelines for LHC Collaborations" (CERN/FC/3796), or by other Institutes, in accordance with their own purchasing rules and regulations.

6.5 The responsibilities for the maintenance and operation of the CMS detector will be laid down in a separate MoU on maintenance and operation procedures. This will be prepared by the Collaboration together with CERN, in consultation with the RRB and will be signed by all the Parties.

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 Institutions are contained in the current document "General Conditions for Experiments Performed at CERN". This document is regarded as an integral part of this MoU and is attached as **Annex 11**.

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 current document "General Conditions for 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).

9.2 Under the provisions of the CERN basic Convention dated 1st of July 1953 and 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 by mutual agreement of its signatories or of their appointed successors. 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 resolving 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 CMS detector.

ANNEXES

Annex 1 :

Institutes in the Collaboration and Names of Their Contact Persons

Annex 2 :

List of Funding Agencies and Their Representatives

Annex 3 :

Sub-detector Structure of the CMS Detector

Annex 4 :

Current Participants in the Collaboration by Country and Institute

Annex 5 :

The CMS Constitution

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Overview of the Technical Participation of Institutes in Detector Construction

Annex 7 :

CMS Construction Schedule

Annex 8 :

(A) Summary Table of Contributions

(B) The Match of Cost and Funding

Annex 9.1 to 9.8 :

(A) Deliverables to be Provided by the Institutes for the Individual Sub-detectors (including Estimated Costs)

(B) Deliverables and Assigned Funding for the Individual Sub-detectors by Funding Agency (including Estimated Costs)

Annex 10 :

Funding assigned by the Funding Agencies to Their Institutes for the Deliverables and the Common Projects

Annex 11:

General Conditions for Experiments Performed at CERN.

The European Organization for Nuclear Research (CERN)

and

_____

declare that they agree on this Memorandum of Understanding for the CMS Experiment.

Done in Geneva, Switzerland

on _____

For CERN

_____

Lorenzo Foà
Director of Research

Done in _____

on _____

For _____

_____

ANNEX 1

Institutes in the Collaboration and Names of Their Contact Persons

Country	Code	Institute	Contact Person
Armenia	AR1	Yerevan Physics Institute, Yerevan	Albert M. Sirunyan
Austria	AT1	Institut für Hochenergiephysik der ÖAW, Wien	Claudia-Elisabeth Wulz
Belarus	BY1	Byelorussian State University, Minsk	Nikolaï Shumeiko
	BY2	Research Institute for Nuclear Problems, Minsk	
	BY3	National Centre for Particle and High Energy Physics, Minsk	
	BY4	Research Institute of Applied Physical Problems, Minsk	
Belgium	BE1	Université Catholique de Louvain, Louvain-la-Neuve	Ghislain Gregoire
	BE2	Université de Mons-Hainaut, Mons	Philippe Herquet
	BE3	Université Libre de Bruxelles, Brussels	Catherine Vander Velde
	BE4	Universiteit Antwerpen (UIA), Antwerpen	Frans Verbeure
	BE5	Vrije Universiteit Brussel, Brussels	Walter Van Doninck
Bulgaria	BG1	Institute for Nuclear Research and Nuclear Energy, BAS, Sofia	Vladimir Genchev
	BG2	University of Sofia, Sofia	Leander Litov
[CERN]	CERN	CERN, European Laboratory for Particle Physics, Geneva, Switzerland	Tejinder Virdee
China	CN1	Institute of High Energy Physics, Beijing	Weiguo Li
	CN2	University for Science and Technology of China, Hefei, Anhui	Zuhe Bian
	CN3	Peking University, Beijing	Yanlin Ye
Croatia	CR1	Technical University of Split, Split	Josip Tudoric-Ghemo
	CR2	University of Split, Split	Mile Dzelalija
Cyprus	CY1	University of Cyprus, Nicosia	Panos A. Razis
Estonia	EE1	Institute of Chemical Physics and Biophysics, Tallinn	Endel Lippmaa
Finland	FI1	Department of Physics, University of Helsinki, Helsinki	Jorma Tuominiemi
	FI2	Helsinki Institute of Physics, Helsinki	
	FI3	Department of Physics, University of Jyväskylä, Jyväskylä	
	FI4	Digital and Computer Systems Lab., Tampere Univ. of Technology, Tampere	Jarkko Niittylahti
	FI5	Dept. of Physics & Microelectronics Instrumentation Lab., Univ. of Oulu, Oulu	Tuure Tuuva
	FI6	Laboratory of Advanced Energy Systems, Helsinki Univ. of Techn., Helsinki	Pertti Aarnio
France	FR1	LPNHE, Ecole Polytechnique, IN2P3-CNRS, Palaiseau	Jean Badier
	FR2	Lab. d'Annecy-le-Vieux de Phys. des Particules, IN2P3-CNRS, Annecy-le-Vieux	Jean-Pierre Peigneux
	FR3	DSM/DAPNIA, CEA/Saclay, Gif-sur-Yvette	John Rander
	FR4	IReS Strasbourg, IN2P3-CNRS-ULP, LEPSI Strasbourg, UHA Mulhouse	Jean-Marie Brom
	FR5	Institut de Physique Nucléaire de Lyon, IN2P3-CNRS, Univ. Lyon I, Villeurbanne	Gérard Smadja
Georgia	GE1	High Energy Physics Institute, Tbilisi State University, Tbilisi	Ramazi Kvatadze
	GE2	Institute of Physics Academy of Science, Tbilisi	Vladimir Roinishvili
Germany	DE1	Humboldt-Universität zu Berlin, Berlin	Thomas Hebbeker
	DE2	Institut für Experimentelle Kernphysik, Karlsruhe	Thomas Müller
	DE3	RWTH, I. Physikalisches Institut, Aachen	Demetrios Pandoulas
	DE4	RWTH, III. Physikalisches Institut A, Aachen	Siegfried Bethke
	DE5	RWTH, III. Physikalisches Institut B, Aachen	Günter Flügge
Greece	GR1	Institute of Nuclear Physics "Demokritos", Attiki	Anna Vayaki
	GR2	University of Athens, Athens	Leonidas Resvanis
	GR3	University of Ioánnina, Ioánnina	Frixos Triantis
Hungary	HU1	KFKI Research Institute for Particle and Nuclear Physics, Budapest	Gyorgy Vesztergombi
	HU2	Kossuth Lajos University, Debrecen	Laszlo Baksay
	HU3	Institute of Nuclear Research ATOMKI, Debrecen	Jozsef Molnar
India	IN1	Bhabha Atomic Research Centre, Mumbai	Sushil Kumar Kataria
	IN2	Institute of Physics, Bhubaneswar	Durga P. Mahapatra
	IN3	Panjab University, Chandigarh	J.M. Kohli
	IN4	Tata Institute of Fundamental Research - EHEP, Mumbai	Som N. Ganguli
	IN5	Tata Institute of Fundamental Research - HECR, Mumbai	V.S. Narasimham
	IN6	University of Delhi South Campus, New Delhi	R. K. Shivpuri
Italy	IT01	Università di Bari, Politecnico di Bari e Sezione dell' INFN, Bari	Giuseppe Iaselli
	IT02	Università di Bologna e Sezione dell' INFN, Bologna	Antonio Rossi
	IT03	Università di Catania e Sezione dell' INFN, Catania	Renato Potenza
	IT04	Università di Firenze e Sezione dell' INFN, Firenze	Ettore Focardi
	IT05	Università di Genova e Sezione dell' INFN, Genova	Pasquale Fabbricatore
	IT06	Università di Padova e Sezione dell' INFN, Padova	Gianni Zumerle
	IT07	Università di Pavia e Sezione dell' INFN, Pavia	Sergio P. Ratti
	IT08	Università di Perugia e Sezione dell' INFN, Perugia	Giancarlo Mantovani
	IT09	Università di Pisa e Sezione dell' INFN, Pisa	Rino Castaldi
	IT10	Università di Roma I e Sezione dell' INFN, Roma	Marcella Diemoz
	IT11	Università di Torino e Sezione dell'INFN, Torino	Cristiana Peroni

Country	Code	Institute	Contact Person
Korea	KR01	Chonnam National University, Kwangju	Jae Yool Kim
	KR02	Dongshin University, Naju	
	KR03	Seonam University, Namwon	
	KR04	Wonkwang University, Iksan	
	KR05	Gyeongsang National University, Jinju	Sungkeun Park
	KR06	Korea University, Seoul	
	KR07	Cheju National University, Cheju	June-Tak Rhee
	KR08	Chungbuk National University, Chongju	
	KR09	Kangwon National University, Chunchon	
	KR10	Kon-Kuk University, Seoul	
	KR11	Seoul National University of Education, Seoul	
	KR12	Pohang University of Science and Technology, Pohang	Dongchul Son
	KR13	Kyungpook National University, Taegu	
	KR14	Kangnung National University, Kangnung	Do Won Kim
Pakistan	PK1	Quaid-I-Azam University, Islamabad	Hafeez R. Hoorani
	PK2	Ghulam Ishaq Khan Institute of Engineering Sciences and Techn., Topi [1]	Jamil Ahmad
Poland	PL1	Institute of Experimental Physics, Warsaw	Jan Krolikowski
	PL2	Soltan Institute for Nuclear Studies, Warsaw	Maciej Gorski
Portugal	PT1	Laboratório de Instrumentação e Física Experimental de Partículas, Lisboa	Joao Varela
Russia	RU1	Budker Institute for Nuclear Physics, SB RAS, Novosibirsk	Alex Bondar
	RU2	Institute for High Energy Physics, Protvino	Nicolai E. Tyurin
	RU3	Institute for Nuclear Research, RAS, Moscow	Viktor Matveev
	RU4	Institute for Theoretical and Experimental Physics, Moscow	Vladimir Gavrilov
	RU5	Moscow State University, Institute for Nuclear Physics, Moscow	Ludmila Sarycheva
	RU6	P.N. Lebedev Physical Institute, RAS, Moscow	Sergei Rusakov
	RU7	Petersburg Nuclear Physics Institute, RAS, St Petersburg	Alexei Vorobyov
[JINR]	JINR	Joint Institute for Nuclear Research, Dubna	Igor Golutvin
Slovak Republic	SK1	Slovak University of Technology, Bratislava	Jozef Lipka
Spain	SP1	Centro de Investigaciones Energéticas Medioambientales y Tecnólogicas, Madrid	Manuel Aguilar-Benitez
	SP2	Universidad Autónoma de Madrid, Madrid	Teresa Rodrigo
	SP3	Universidad de Oviedo, Oviedo	Teresa Rodrigo
	SP4	Instituto de Física de Cantabria (IFCA), CSIC-Univ. de Cantabria, Santander	Teresa Rodrigo
Switzerland	SW1	Institut für Teilchenphysik, Eidgenössische Technische Hochschule (ETH), Zürich	Hans Hofer
	SW2	Paul Scherrer Institut, Villigen	Hans Christian Walter
	SW3	Universität Basel, Basel	Ludwig Tauscher
	SW4	Universität Zürich, Zürich	Claude Amsler
Turkey	TR1	Cukurova University, Adana	Gulsen Onengut
	TR2	Middle East Technical University, Ankara	Perihan Tolun
Ukraine	UR1	Institute of Single Crystals of National Academy of Science, Kharkov	Pavel V. Sorokin
	UR2	National Scientific Center, Kharkov Inst. of Physics and Technology, Kharkov	
	UR3	Kharkov State University, Kharkov	
United Kingdom	UK1	Brunel University, Uxbridge	Stephen J. Watts
	UK2	Imperial College, University of London, London	Geoffrey Hall
	UK3	Rutherford Appleton Laboratory, Didcot	Robert M. Brown
	UK4	University of Bristol, Bristol	Greg P. Heath
USA	US01	University of Alabama, Tuscaloosa, Alabama	Laszlo Baksay
	US02	Boston University, Boston, Massachusetts	Lawrence Sulak
	US03	University of California at Davis, Davis, California	Winston Ko
	US04	University of California at Los Angeles, Los Angeles, California	Katsushi Arisaka
	US05	University of California, Riverside, California	John G. Layter
	US06	University of California San Diego, La Jolla, California	James G. Branson
	US07	California Institute of Technology, Pasadena, California	Harvey Newman
	US08	Carnegie Mellon University, Pittsburgh, Pennsylvania	Thomas Ferguson
	US09	Fairfield University, Fairfield, Connecticut	David R. Winn
	US10	Fermi National Accelerator Laboratory, Batavia, Illinois	Dan Green
	US11	University of Florida, Gainesville, Florida	Guenakh Mitselmakher
	US12	Florida State University-HEPG, Tallahassee, Florida	Vasken Hagopian
	US13	Florida State University-SCRI, Tallahassee, Florida	Martyn Corden
	US14	University of Illinois at Chicago, (UIC) Chicago, Illinois	Mark Adams
	US15	The University of Iowa, Iowa City, Iowa	Yasar Onel
	US16	Iowa State University, Ames, Iowa	E. Walter Anderson
	US17	Johns Hopkins University, Baltimore, Maryland	Chih-Yung Chien
	US18	Lawrence Livermore National Laboratory, Livermore, California	Craig R. Wuest
	US19	Los Alamos National Laboratory, Los Alamos, New Mexico	Hans Ziock
	US20	University of Maryland, College Park, Maryland	Andris Skuja
	US21	Massachusetts Institute of Technology, Cambridge, Massachusetts	Paraskevas Sphicas
	US22	University of Minnesota, Minneapolis, Minnesota	Roger Rusack
	US23	University of Mississippi, Oxford, Mississippi	Jim Reidy
	US24	University of Nebraska-Lincoln, Lincoln, Nebraska	Gregory R. Snow
	US25	Northeastern University, Boston, Massachusetts	Steve Reucroft
	US26	Northwestern University, Evanston, Illinois	Bruno Gobbi
	US27	University of Notre Dame, Notre Dame, Indiana	Randal Ruchti
	US28	The Ohio State University, Columbus, Ohio	Ta-Yung Ling
	US29	Princeton University, Princeton, New Jersey	Pierre Piroué
	US30	Purdue University, West Lafayette, Indiana	Virgil E. Barnes
	US31	Rice University, Houston, Texas	David Adams
	US32	University of Rochester, Rochester, New York	Arie Bodek
	US33	Rutgers, the State University of New Jersey, Piscataway, New Jersey	Steve Schnetzer
	US34	University of Texas at Dallas, Richardson, Texas	Ervin J. Fenyves
	US35	Texas Tech University, Lubbock, Texas	Richard Wigmans
	US36	Virginia Polytechnic Institute and State University, Blacksburg, Virginia	Luke Mo
	US37	University of Wisconsin, Madison, Wisconsin	Wesley Smith
Uzbekistan	UZ1	Institute for Nuclear Physics of the Uzbekistan Academy of Sciences, Ulugbek	Bekhzad S. Yuldashev

[1] Subject to approval by the CMS Collaboration Board

ANNEX 2

List of CMS Funding Agencies and Their Representatives

Austria		Federal Ministry of Science and Transport	Vienna	H. Schacher, H. Borns
Belgium		Fonds voor Wetenschappelijk Onderzoek (FWO)	Brussels	J. Traest, J. Lemonne
		Fonds National de la Recherche Scientifique (FNRS)	Brussels	M.J. Simoen, J. Sacton
[CERN]		European Laboratory for Particle Physics	Geneva	V.G. Goggi
China		Chinese Acadamy of Sciences (CAS)	Beijing	X. Zhu
		National Natural Science Foundation (NNSF)	Beijing	C. Zhang
Croatia		Ministry of Science and Technology	Zagreb	I. Kostovic
Cyprus		University of Cyprus	Nicosia	N. Vakis
Estonia		Estonian Academy of Sciences	Tallinn	E. Lippmaa
Finland		Helsinki Institute of Physics (HIP)	Helsinki	E. Byckling
France		Commissariat à l'Energie Atomique (CEA) - Saclay	Gif-sur-Yvette	C. Cesarsky
		Institut National de Physique Nucléaire et de Physique des Particules (IN2P3-CNRS)	Paris	C. Détraz
Germany		Bundesministerium für Bildung, Wissenschaft, Forschung und Technologie (BMBF)	Bonn	H. Schunck
Greece		General Secretariat for Research and Technology	Athens	E. Floratos
Hungary		National Committee for Technological Development	Budapest	L. Nyiri
India		Department of Atomic Energy	Mumbai	R. Chidambaram
Italy		Istituto Nazionale di Fisica Nucleare (INFN)	Rome	L. Maiani
Korea		NN	Seoul	NN
Pakistan		Pakistan Atomic Energy Commission	Islamabad	M. Ahmad
Poland		State Commission for Scientific Research	Warsaw	J.K. Frackowiak
Portugal		Instituto Cooperação Científica e Técnica Internacional (ICCTI)	Lisbon	A. Trigo Abreu
RDMS	Russia	Ministry of Science and Technologies of Russian Federation	Moscow	G.V. Kozlov
	DMS (*)	Joint Institute for Nuclear Research (JINR)	Dubna	A.N. Sissakian
Spain		Oficina de Ciencia y Tecnologia	Madrid	F. Aldana
Switzerland		Rat der Eidgenössischen Technischen Hochschulen ETH Zürich Universities Basel and Zürich	Zürich Zürich	S. Bieri O. Kübler
		Paul Scherrer Institut (PSI)	Villigen	M.K. Eberle
Turkey		Scientific and Technical Research Council (TÜBITAK)	Ankara	D. Ulku
United Kingdom		Particle Physics and Astronomy Research Council (PPARC)	Swindon	I.F. Corbett
USA		US Department of Energy (DOE)	Washington	J.R. O'Fallon
		National Science Foundation (NSF)	Washington	M. Goldberg

(*) Dubna Member States (DMS)
Armenia, Belarus, Bulgaria, Georgia, Slovak Republic, Ukraine, Uzbekistan

ANNEX 3

Sub-detector Structure of the CMS Detector

The CMS detector is structured into the following sub-detector units which are used throughout this document:

Sub-detector	Sub-system
1. Magnet (Common Project)	1.1 Barrel Yoke and Vacuum Tank 1.2 Endcap Yokes 1.3 Coil 1.4 Magnet Installation
2. Tracker	2.1 Pixel Detector 2.2 Silicon Detector 2.3 MSGC Detector 2.4 General Mechanical Infrastructure
3. ECAL	3.1 Barrel 3.2 Endcaps
4. HCAL	4.1 Barrel 4.2 Outer Barrel 4.3 Endcap 4.4 Outer Endcap 4.5 Forward
5. Muon Detector	5.1 Barrel Drifttubes 5.2 Forward ME 1/1 5.3 Endcap CSC 5.4 Barrel RPC 5.5 Forward RPC 5.6 Alignment
6. Trigger/DAQ	6.1 Trigger 6.2 Data Acquisition 6.3 Detector Controls
7. Offline Computing (Common Project)	7.1 Offline Infrastructure
8. Infrastructure	8.1 Access and Survey 8.2 General Installation 8.3 Cooling and Ventilation 8.4 Safety 8.5 Fixed Cranes 8.6 Shielding Systems

ANNEX 4

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* Subject to approval by the CMS Collaboration Board

ANNEX 5

THE CMS CONSTITUTION

Ref : CMS/D-CB/1996-1

13 September 1996

Amended on April 23, 1998

ANNEX 6

Overview of the Technical Participation of Institutes in Detector Construction

			TRACKER				ECAL		HCAL					MUONS						T/DAQ		
Country	Code	Institute	2.1 Pixel Detector	2.2 Silicon Detector	2.3 MSGC Detector	2.4 Gen. Mech. Infrast.	3.1 Barrel	3.2 Endcaps	4.1 Barrel	4.2 Outer Barrel	4.3 Endcap	4.4 Outer Endcap	4.5 Forward	5.1 Barrel Drifttubes	5.2 Forward ME 1/1	5.3 Endcap CSC	5.4 Barrel RPC	5.5 Forward RPC	5.6 Alignment	6.1 Trigger	6.2 Data Acquisition	6.3 Detector Controls
Armenia	AR1	Yerevan Physics Institute, Yerevan						•			•											
Austria	AT1	Institut für Hochenergiephysik der ÖAW, Wien	•	•										•					•	•	•	
Belarus	BY1	Byelorussian State University, Minsk						•			•											
	BY2	Research Institute for Nuclear Problems, Minsk					•	•														
	BY3	National Centre for Particle and High Energy Physics, Minsk						•			•				•							
	BY4	Research Institute of Applied Physical Problems, Minsk						•														
Belgium	BE1	Université Catholique de Louvain, Louvain-la-Neuve			•																	
	BE2	Université de Mons-Hainaut, Mons			•																	
	BE3	Université Libre de Bruxelles, Brussels			•																	
	BE4	Universiteit Antwerpen (UIA), Antwerpen			•																	
	BE5	Vrije Universiteit Brussel, Brussels			•																	
Bulgaria	BG1	Institute for Nuclear Research and Nuclear Energy, BAS, Sofia									•				•							
	BG2	University of Sofia, Sofia									•				•							
[CERN]	CERN	CERN, European Laboratory for Particle Physics, Geneva, Switzerland		•	•	•	•	•						•					•	•	•	•
China	CN1	Institute of High Energy Physics, Beijing							•					•		•	•					
	CN2	University for Science and Technology of China, Hefei, Anhui					•	•														
	CN3	Peking University, Beijing															•					
Croatia	CR1	Technical University of Split, Split					•															
	CR2	University of Split, Split					•															
Cyprus	CY1	University of Cyprus, Nicosia					•															
Estonia	EE1	Institute of Chemical Physics and Biophysics, Tallinn			•																	
Finland	FI1	Department of Physics, University of Helsinki, Helsinki		•																•		
	FI2	Helsinki Institute of Physics, Helsinki		•	•	•														•		
	FI3	Department of Physics, University of Jyväskylä, Jyväskylä		•																		
	FI4	Digital and Computer Systems Lab., Tampere Univ. of Technology, Tampere																		•		
	FI5	Dept. of Physics & Microelectronics Instrumentation Lab., Univ. of Oulu, Oulu		•		•																
	FI6	Laboratory of Advanced Energy Systems, Helsinki Univ. of Techn., Helsinki [1]																				
France	FR1	LPNHE, Ecole Polytechnique, IN2P3-CNRS, Palaiseau					•															
	FR2	Lab. d'Annecy-le-Vieux de Phys. des Particules, IN2P3-CNRS, Annecy-le-Vieux					•															
	FR3	DSM/DAPNIA, CEA/Saclay, Gif-sur-Yvette					•	•													•	
	FR4	IReS Strasbourg, IN2P3-CNRS-ULP, LEPSI Strasbourg, UHA Mulhouse			•																	
	FR5	Institut de Physique Nucléaire de Lyon, IN2P3-CNRS, Univ. Lyon I, Villeurbanne			•		•															
Georgia	GE1	High Energy Physics Institute, Tbilisi State University, Tbilisi						•			•											
	GE2	Institute of Physics Academy of Science, Tbilisi									•											
Germany	DE1	Humboldt-Universität zu Berlin, Berlin		•																		
	DE2	Institut für Experimentelle Kernphysik, Karlsruhe			•																	
	DE3	RWTH, I. Physikalisches Institut, Aachen		•	•																	
	DE4	RWTH, III. Physikalisches Institut A, Aachen												•								
	DE5	RWTH, III. Physikalisches Institut B, Aachen			•																	
Greece	GR1	Institute of Nuclear Physics "Demokritos", Attiki						•												•	•	
	GR2	University of Athens, Athens																		•	•	
	GR3	University of Ioánnina, Ioánnina						•												•	•	
Hungary	HU1	KFKI Research Institute for Particle and Nuclear Physics, Budapest											•								•	
	HU2	Kossuth Lajos University, Debrecen																	•			
	HU3	Institute of Nuclear Research ATOMKI, Debrecen											•									
India	IN1	Bhabha Atomic Research Centre, Mumbai						•		•												
	IN2	Institute of Physics, Bhubaneswar								•												
	IN3	Panjab University, Chandigarh		•						•												
	IN4	Tata Institute of Fundamental Research - EHEP, Mumbai		•						•												
	IN5	Tata Institute of Fundamental Research - HECR, Mumbai		•						•												
	IN6	University of Delhi South Campus, New Delhi						•														
Italy	IT01	Università di Bari, Politecnico di Bari e Sezione dell' INFN, Bari		•													•			•		
	IT02	Università di Bologna e Sezione dell' INFN, Bologna												•								
	IT03	Università di Catania e Sezione dell' INFN, Catania		•																		
	IT04	Università di Firenze e Sezione dell' INFN, Firenze		•																		
	IT05	Università di Genova e Sezione dell' INFN, Genova [2]																				
	IT06	Università di Padova e Sezione dell' INFN, Padova		•										•							•	
	IT07	Università di Pavia e Sezione dell' INFN, Pavia															•					
	IT08	Università di Perugia e Sezione dell' INFN, Perugia		•																		
	IT09	Università di Pisa e Sezione dell' INFN, Pisa		•	•																	
	IT10	Università di Roma I e Sezione dell' INFN, Roma					•															
	IT11	Università di Torino e Sezione dell'INFN, Torino												•							•	

[1] Participation in Offline Computing

[2] Participation in the Magnet

			TRACKING				ECAL		HCAL					MUONS						T/DAQ		
Country	**Code**	**Institute**	2.1 Pixel Detector	2.2 Silicon Detector	2.3 MSGC Detector	2.4 Gen. Mech. Infrast.	3.1 Barrel	3.2 Endcaps	4.1 Barrel	4.2 Outer Barrel	4.3 Endcap	4.4 Outer Endcap	4.5 Forward	5.1 Barrel Drifttubes	5.2 Forward ME 1/1	5.3 Endcap CSC	5.4 Barrel RPC	5.5 Forward RPC	5.6 Alignment	6.1 Trigger	6.2 Data Acquisition	6.3 Detector Controls
Korea	KR01	Chonnam National University, Kwangju																•		•		
	KR02	Dongshin University, Naju																•		•		
	KR03	Seonam University, Namwon																•		•		
	KR04	Wonkwang University, Iksan																•		•		
	KR05	Gyeongsang National University, Jinju																•		•		
	KR06	Korea University, Seoul																•		•		
	KR07	Cheju National University, Cheju																•		•		
	KR08	Chungbuk National University, Chongju																•		•		
	KR09	Kangwon National University, Chunchon																•		•		
	KR10	Kon-Kuk University, Seoul																•		•		
	KR11	Seoul National University of Education, Seoul																•		•		
	KR12	Pohang University of Science and Technology, Pohang															•			•		
	KR13	Kyungpook National University, Taegu															•			•		
	KR14	Kangnung National University, Kangnung															•			•		
Pakistan	PK1	Quaid-I-Azam University, Islamabad [3]																				
	PK2	Ghulam Ishaq Khan Institute of Engineering Sciences and Techn., Topi [3], [4]																				
Poland	PL1	Institute of Experimental Physics, Warsaw																		•		
	PL2	Soltan Institute for Nuclear Studies, Warsaw																		•		
Portugal	PT1	Laboratório de Instrumentação e Física Experimental de Partículas, Lisboa					•	•												•		
Russia	RU1	Budker Institute for Nuclear Physics, SB RAS, Novosibirsk			•																	
	RU2	Institute for High Energy Physics, Protvino						•			•											
	RU3	Institute for Nuclear Research, RAS, Moscow						•			•											
	RU4	Institute for Theoretical and Experimental Physics, Moscow											•									
	RU5	Moscow State University, Institute for Nuclear Physics, Moscow						•					•									
	RU6	P.N. Lebedev Physical Institute, RAS, Moscow						•														
	RU7	Petersburg Nuclear Physics Institute, RAS, St Petersburg						•								•						
[JINR]	JINR	Joint Institute for Nuclear Research, Dubna						•			•				•							
Slovak Republic	SK1	Slovak University of Technology, Bratislava													•							
Spain	SP1	Centro de Investigaciones Energéticas Medioambientales y Tecnólogicas, Madrid											•	•					•			
	SP2	Universidad Autónoma de Madrid, Madrid [3]																				
	SP3	Universidad de Oviedo, Oviedo																	•			
	SP4	Instituto de Física de Cantabria (IFCA), CSIC-Univ. de Cantabria, Santander																	•			
Switzerland	SW1	Institut für Teilchenphysik, Eidgenössische Technische Hochschule (ETH), Zürich	•	•			•	•													•	
	SW2	Paul Scherrer Institut, Villigen	•				•														•	
	SW3	Universität Basel, Basel	•	•																		
	SW4	Universität Zürich, Zürich	•		•																	
Turkey	TR1	Cukurova University, Adana											•									
	TR2	Middle East Technical University, Ankara											•									
Ukraine	UR1	Institute of Single Crystals of National Academy of Science, Kharkov									•											
	UR2	National Scientific Center, Kharkov Inst. of Physics and Technology, Kharkov									•											
	UR3	Kharkov State University, Kharkov									•											
United Kingdom	UK1	Brunel University, Uxbridge		•				•														
	UK2	Imperial College, University of London, London		•	•			•														
	UK3	Rutherford Appleton Laboratory, Didcot		•	•			•													•	
	UK4	University of Bristol, Bristol						•												•		
USA	US01	University of Alabama, Tuscaloosa, Alabama													•							
	US02	Boston University, Boston, Massachusetts							•	•	•	•	•									
	US03	University of California at Davis, Davis, California	•													•				•		
	US04	University of California at Los Angeles, Los Angeles, California														•				•	•	
	US05	University of California, Riverside, California														•						
	US06	University of California San Diego, La Jolla, California																			•	
	US07	California Institute of Technology, Pasadena, California					•															
	US08	Carnegie Mellon University, Pittsburgh, Pennsylvania														•				•		
	US09	Fairfield University, Fairfield, Connecticut											•									
	US10	Fermi National Accelerator Laboratory, Batavia, Illinois [5]	•	•					•	•	•	•	•			•			•		•	
	US11	University of Florida, Gainesville, Florida														•				•		
	US12	Florida State University-HEPG, Tallahassee, Florida							•	•	•	•	•									
	US13	Florida State University-SCRI, Tallahassee, Florida	•																			
	US14	University of Illinois at Chicago, (UIC) Chicago, Illinois							•	•	•	•										
	US15	The University of Iowa, Iowa City, Iowa							•	•	•	•	•									
	US16	Iowa State University, Ames, Iowa											•								•	
	US17	Johns Hopkins University, Baltimore, Maryland	•																			
	US18	Lawrence Livermore National Laboratory, Livermore, California [6]																				
	US19	Los Alamos National Laboratory, Los Alamos, New Mexico [6]																				
	US20	University of Maryland, College Park, Maryland							•	•	•	•										
	US21	Massachusetts Institute of Technology, Cambridge, Massachusetts																		•	•	
	US22	University of Minnesota, Minneapolis, Minnesota					•		•	•	•	•										
	US23	University of Mississippi, Oxford, Mississippi	•						•	•	•	•										
	US24	University of Nebraska-Lincoln, Lincoln, Nebraska											•									
	US25	Northeastern University, Boston, Massachusetts					•												•			
	US26	Northwestern University, Evanston, Illinois	•	•																		
	US27	University of Notre Dame, Notre Dame, Indiana							•	•	•	•										
	US28	The Ohio State University, Columbus, Ohio													•	•				•		
	US29	Princeton University, Princeton, New Jersey					•															
	US30	Purdue University, West Lafayette, Indiana	•						•	•	•	•	•		•	•						
	US31	Rice University, Houston, Texas														•				•		
	US32	University of Rochester, Rochester, New York		•					•	•	•	•										
	US33	Rutgers, the State University of New Jersey, Piscataway, New Jersey	•																			
	US34	University of Texas at Dallas, Richardson, Texas													•							
	US35	Texas Tech University, Lubbock, Texas	•	•									•									
	US36	Virginia Polytechnic Institute and State University, Blacksburg, Virginia							•	•	•	•										
	US37	University of Wisconsin, Madison, Wisconsin														•				•		
Uzbekistan	UZ1	Institute for Nuclear Physics of the Uzbekistan Academy of Sciences, Ulugbek									•											

[3] Participation in Offline Computing

[4] Subject to approval by the CMS Collaboration Board

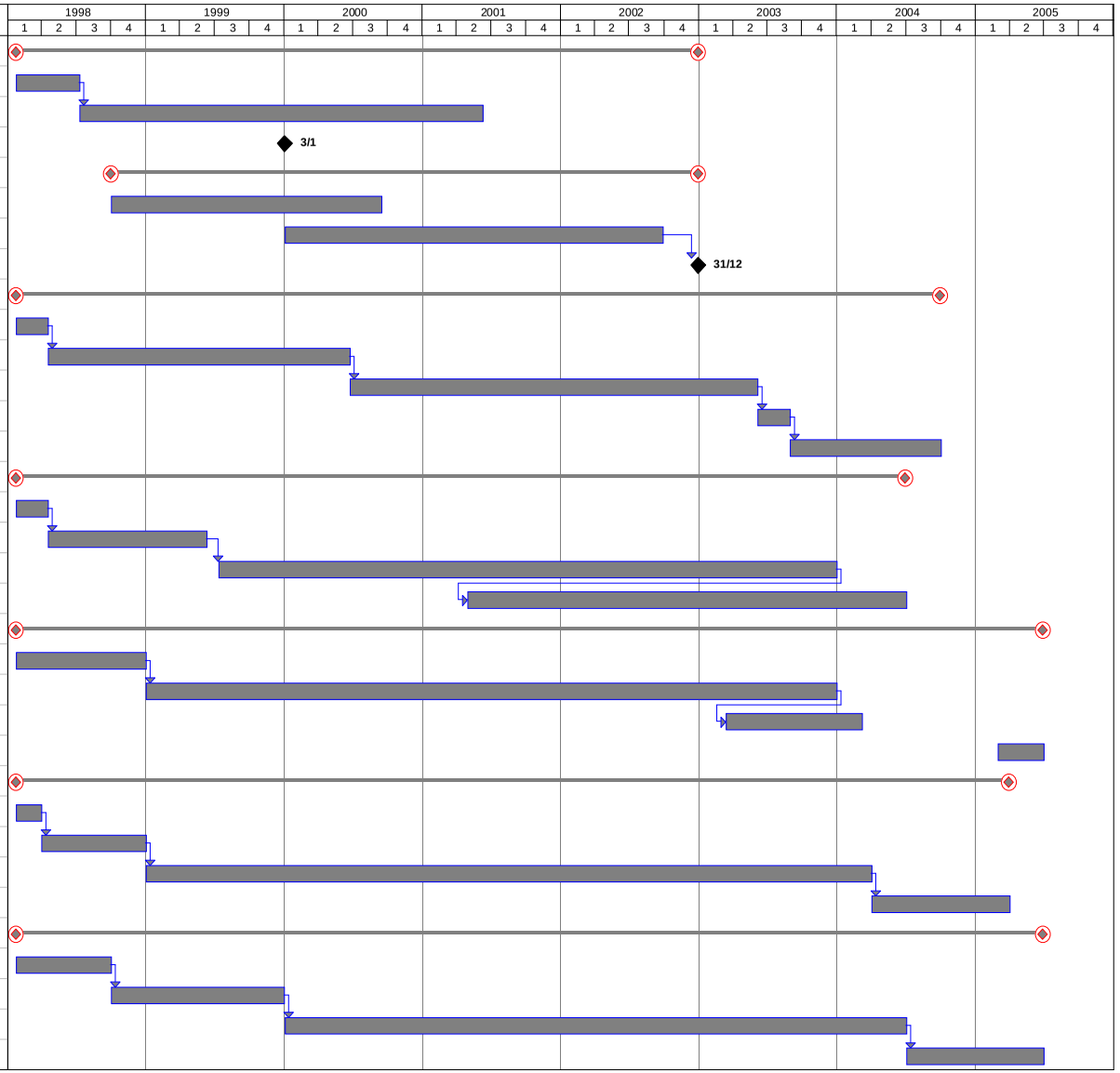
[5] It is intended to use the FNAL Silicon Facility for the Tracker Silicon Detector

[6] Participation to be defined

ANNEX 7

CMS Construction Schedule

ID	Task Name	Start	Finish
1	**Civil Engineering**	**23/1/98**	**31/12/02**
2	Design of buildings	23/1/98	9/7/98
3	Fabrication of buildings	10/7/98	7/6/01
4	Surface hall SX, first phase ready	3/1/00	3/1/00
5	Underground	**1/10/98**	**31/12/02**
6	first phase	1/10/98	13/9/00
7	second phase	3/1/00	27/9/02
8	hall ready	31/12/02	31/12/02
9	**Magnet**	**23/1/98**	**30/9/04**
10	Design and prototyping	23/1/98	16/4/98
11	Construction	17/4/98	22/6/00
12	Assembly	23/6/00	5/6/03
13	Test	6/6/03	28/8/03
14	Installation	29/8/03	30/9/04
15	**Muon System**	**23/1/98**	**30/6/04**
16	Design and prototyping	23/1/98	16/4/98
17	Preproduction	17/4/98	10/6/99
18	Procurement and production	13/7/99	30/12/03
19	Installation	1/5/01	30/6/04
20	**HCAL**	**23/1/98**	**30/6/05**
21	Preproduction	23/1/98	31/12/98
22	Procurement and production	1/1/99	31/12/03
23	Installation HB/HE	13/3/03	5/3/04
24	Installation HF	1/3/05	30/6/05
25	**ECAL**	**23/1/98**	**31/3/05**
26	Design and prototyping	23/1/98	31/3/98
27	Preproduction	1/4/98	31/12/98
28	Procurement and production	1/1/99	31/3/04
29	Installation	1/4/04	31/3/05
30	**Central Tracking System**	**23/1/98**	**30/6/05**
31	Design and prototyping	23/1/98	30/9/98
32	Preproduction	1/10/98	31/12/99
33	Procurement and production	3/1/00	30/6/04
34	Installation	1/7/04	30/6/05



ANNEX 8 A

Summary Table of Contributions (kCHF)

(by Funding Agency and Sub-detector, including Common Projects)

		1. Magnet (Common Project)	2. Tracker	3. Electromagnetic Calorimeter	4. Hadron Calorimeter	5. Muon Detector	6. Trigger/Data Acquisition	7. Offline Computing (Common Project)	8. Infrastructure	Totals Subdetectors	Totals Common Projects & Infrastructure	Totals Estimated Value
Austria		1,100	1,350			100	1,250	100		2,700	1,200	3,900
Belgium		1,480	3,420					100		3,420	1,580	5,000
CERN		15,900	16,900	13,200		2,300	12,970	200	23,730	45,370	39,830	85,200
China	**CAS**	935				2,565				2,565	935	3,500
	NNSF	265				735				735	265	1,000
Croatia		80		200						200	80	280
Cyprus		200		400						400	200	600
Estonia		90									90	90
Finland		1,480	2,400				1,020	100		3,420	1,580	5,000
France	**CEA**	1,760		3,000			840			3,840	1,760	5,600
	IN2P3	6,000	6,750	6,750				200		13,500	6,200	19,700
Germany		5,150	7,250			4,400		200		11,650	5,350	17,000
Greece		1,480		1,360			2,060	100		3,420	1,580	5,000
Hungary		310			500	100	90			690	310	1,000
India [1]		900	600	1,000	1,300					2,900	900	3,800
Italy		16,800	19,500	3,600		14,500	100	500		37,700	17,300	55,000
Korea		2,270				3,950	1,000			4,950	2,270	7,220
Pakistan		1,000									1,000	1,000
Poland		940					2,060			2,060	940	3,000
Portugal		630		1,115			255			1,370	630	2,000
RDMS	**Russia**	1,700	1,050	3,450	6,500	4,300			3,500	15,300	5,200	20,500
	Dubna Member States			400	4,600	1,400				6,400		6,400
Spain		1,790				4,110		100		4,110	1,890	6,000
Switzerland	**ETHZ/Universities**	25,000	4,900	42,500			5,500	600		52,900	25,600	78,500
	PSI	2,610	3,600	1,720			500	70		5,820	2,680	8,500
Turkey		310			690					690	310	1,000
United Kingdom		2,650	2,700	2,700			850	200		6,250	2,850	9,100
USA	**DOE**	26,960	1,480	3,965	23,720	22,635	8,750	1,000		60,550	27,960	88,510
	NSF	3,600	990	2,015	3,710	890	765	130		8,370	3,730	12,100
Estimated Value of Contributions		123,390	72,890	87,375	41,020	61,985	38,010	3,600	27,230	301,280	154,220	455,500
Estimated Cost (with Phase I Tracker)		121,925	74,095	85,430	41,775	60,800	37,525	3,600	27,230	299,625	152,755	452,380
Balance of Contributions vs Cost		1,465	-1,205	1,945	-755	1,185	485			1,655	1,465	3,120
Estimated Cost (with Phase II Tracker)		121,925	87,385	85,430	41,775	60,800	37,525	3,600	27,230	312,915	152,755	465,670

[1] The total contribution from India will be 5'000 kCHF.
A list of additional HCAL deliverables for a total estimated value of 1'200 kCHF to be provided by India is under preparation.
This MoU will be amended by this list once an agreement is reached on these deliverables and on India's contribution to Common Projects.

ANNEX 8 B

THE MATCH OF COST AND FUNDING

The Baseline CMS Detector for high luminosity operation that is described in the Technical Design Reports (TDRs) [1], is estimated to cost 465.7 MCHF. This estimate (Cost Estimate Version 9) has been reviewed and accepted by the LHCC Cost Review Committee (CORE) for the approved TDRs.

The total expected funding is 454.7 MCHF and the missing funds affect only the Tracker. The Tracker Technical Design Report therefore describes two "Phases" :

Phase I :

This Phase defines a Tracker with a complete Pixel system but a reduced number of Silicon and MSGC detector planes, and is estimated to cost 74.1 MCHF. This design does not compromise the physics goals of the initial stages of LHC operation. The Phase I Tracker can be built with the presently expected funding.

Phase II :

This Phase defines a fully equipped Tracker that is estimated to cost 87.4 MCHF. The Collaboration is actively seeking participants from new Institutes.

This MoU covers the construction of the complete detector, except for the Tracker where only the Phase I is covered.

At the time of signature of this MoU, it is estimated that the global uncertainty on the detector cost and funding is less than 10%. Scenarios exist to adapt the scope of deliverables to the available funding, without compromising the physics goals defined for the initial stages of LHC operation.

[1] The Magnet Project, Technical Design Report, CERN-LHCC 97-10, CMS TDR 1, 2 May 1997
The Hadron Calorimeter Project, Technical Design Report, CERN-LHCC 97-31, CMS TDR 2, 20 June 1997
The Muon Project, Technical Design Report, CERN-LHCC 97-32, CMS TDR 3, 15 December 1997
The Electromagnetic Calorimeter Project, Technical Design Report, CERN-LHCC 97-33, CMS TDR 4, 15 December 1997
The Tracker Project, Technical Design Report, CERN-LHCC 98-6, CMS TDR 5, 15 April 1998

ANNEX 9.1 A

Deliverables to be provided by the Institutes for the individual Sub-detectors
(including Estimated Costs)

MAGNET (Common Project)

Ref	Deliverables	Cost Estimate	Packages
1.1.01	Barrel Rings and Vacuum Tank	23,325	Package A : Steel, Machining, Connecting Beams, Connecting Straps, Support Feet YB0, Material for Outer Support Feet, Vacuum Tank and Tooling, Trial Assembly and Tooling, Transport to CERN. Participants : Cyprus, Germany, RDMS-Russia, Switzerland (ETHZ and PSI) and USA
1.1.02	High Tension Bolts	455	
1.1.03	Hydraulic Tensioners	360	
1.1.04	Support Feet - Outer - Material	240	
1.1.05	Support Feet - Outer - Transport to Karachi	50	
1.1.06	Support Feet - Outer - Manufacture	625	
1.1.07	Support Feet - Outer - Transport to CERN	50	
1.1.08	Manufacture Follow-up	100	
1.1.09	Moving Beams	300	
1.1.10	Jacks and Air Pad System	780	
1.1.11	Grease Pad Systems	300	
1.1.12	Hydraulic Rotator	300	In-kind Contribution from Pakistan
1.1.13	Drilling Machine	500	
1.1.14	Rails	300	
1.1.15	Assembly on Surface	2,200	
1.1.16	Rigs and Scaffolds	300	
1.1.17	Ancillaries and Coupling Devices	320	
1.1.18	Design and Follow-up	720	
1.1	**Barrel Yoke and Vacuum Tank**	**31,225**	
1.2.01	Endcap Disks	16,000	Package B : Steel, Machining, Assembly Tools, Super-bolts, Design and Follow-up, Transport to CERN, Assembly at CERN. Participants : USA
1.2.02	Superbolts	600	
1.2.03	HE Supports	200	
1.2.04	Design and Follow-up	1,200	
1.2.05	Carts Weldments	1,200	
1.2.06	Transport of Carts to CERN	30	In-kind Contribution from China
1.2.07	Ancillaries and Coupling Devices	970	
1.2.08	Support System	1,000	
1.2	**Endcap Yokes**	**21,200**	
1.3.01	Conductor - Insert	8,470	Package C : Insert, Reinforcement, Quality Assurance. Participants : Switzerland (ETHZ) and CERN
1.3.02	Conductor - Reinforcement	7,400	
1.3.03	Conductor - Quality Assurance	1,000	
1.3.04	Module Assembly, Swiveling Tooling	14,500	
1.3.05	Process Qualification and QA Winding	800	Package D : Winding Machine, Winding Operation, External Winding Cylinders. Participants : Italy
1.3.06	Thermal Shields	2,600	
1.3.07	Cold Supports	1,100	
1.3.08	He Circuits	900	
1.3.09	Cold Mass Instrumentation	600	
1.3.10	Vacuum System	500	
1.3.11	Power Supply and Bus Bar	900	
1.3.12	Dump Resistor	300	In-kind Contribution from Russia
1.3.13	Magnet Safety System	500	
1.3.14	Magnet Control System	800	
1.3.15	He Refrigeration External Plant	6,450	
1.3.16	Components Testing	900	
1.3.17	Coil Assembly	1,000	
1.3.18	Coil Surface Tests	1,500	
1.3.19	Studies and Supervision	9,495	
1.3.20	Consumables	1,080	
1.3.21	Coil Transfer into Underground Cavern	2,900	
1.3.22	Implantation and Integration	1,000	
1.3	**Coil**	**64,695**	
1.4.01	2'200 t Crane Rental	2,800	
1.4.02	Rigging Equipment	700	
1.4.03	SX Infrastructure	350	
1.4.04	Winch System	600	
1.4.05	Field Mapping	350	
1.4	**Magnet Installation**	**4,800**	
1.	**Magnet**	**121,925**	

ANNEX 9.1 B

MAGNET

(Common Project)

Outline of Procurement Policy

The CMS Magnet is a Common Project to be financed by all Institutes through their respective funding agencies. Financial contributions to the construction of the Magnet can be made in three different ways, namely as in-kind contributions (for special cases), or as direct payments to contracts, or as payments to the CMS Common Fund (cf. Art. 6.1).

The construction cost of the CMS Magnet is broken down into four major items: (1) the Barrel Yoke and Vacuum Tank, (2) the Endcap Yokes, (3) the Superconducting Coil and (4) the Installation. Each of these major items is again composed of several large systems. The Collaboration has grouped individual procurements, as defined in the CMS Cost Estimate, into several "Packages". These consist of contracts placed by one or more Institutes or Funding Agencies for groups of items as defined in Annex 9.1 A.

Technical aspects of any procurement are under the direct responsibility of the CMS Magnet Project Manager.

1. Payments to Contracts

At present the CMS Collaboration has defined five "Packages".

the Barrel Yoke and Vacuum Tank,
the Endcap Yokes,
the Superconductor,
the Coil Winding, and
Major Procurements which will be made through CERN.

2. Procurements from the Magnet Common Fund

All items which are not being supplied as an in-kind contribution or as a payment to contracts will be procured through CERN and paid from the Magnet Common Fund.

3. In-kind Contributions

The CMS Collaboration has reached an agreement (CERN-Protocol No. 004/EP) with the Pakistan Atomic Energy Commission to supply steel supports for the four outer rings of the CMS Magnet Barrel Yoke (ref. Annex 9.1 A, 1.1.06). Similar agreements with the Chinese Academy of Science concerning the supply of support structures for the three pairs of endcap disks, (ref. Annex 9.1 A, 1.2.05) and with Russia concerning the supply of the dump resistor (ref. Annex 9.1 A, 1.3.12) are under discussion.

ANNEX 9.2 A

Deliverables to be provided by the Institutes for the individual Sub-detectors
(including Estimated Costs)

TRACKER

Ref	Deliverables	Cost Estimate (Phase II)	Cost Estimate (Phase I)	Institutes
2.1.1	Detectors (incl. Pre-series)	965	965	SW1 SW2 SW3 SW4 US17
2.1.2	Electronics (incl. Engineering)	5,020	5,020	AT1 SW1 SW2 SW3 SW4 US03 US10 US13 US17 US23 US26 US33 US35
2.1.3	Module Mechanics	1,010	1,010	SW1 SW2 SW3 SW4 US10 US13 US26 US35
2.1.4	Support Structures and Assembly	480	480	SW1 SW2 SW3 SW4 US03 US10 US26 US30
2.1.5	Monitoring	110	110	SW1 SW2 SW3 SW4 US03 US23
2.1.6	Service Systems	655	655	SW1 SW2 SW3 SW4 US23
2.1	**Pixel Detector**	**8,240**	**8,240**	**AT1 SW1 SW2 SW3 SW4 US03 US10 US13 US17 US23 US26 US30 US33 US35**
2.2.1	Detectors (incl. Pre-series)	10,845	8,825	AT1 CERN DE1 DE3 FI1 FI2 FI3 FI5 IN3 IN4 IN5 IT01 IT03 IT04 IT06 IT08 IT09 SW1 SW3 US10 US26 US32 US35
2.2.2	Electronics (incl. Engineering)	15,605	12,790	AT1 CERN DE1 DE3 IN3 IN4 IN5 IT01 IT03 IT04 IT06 IT08 IT09 SW1 SW3 UK1 UK2 UK3
2.2.3	Module Mechanics	1,120	880	AT1 CERN DE1 DE3 IN3 IN4 IN5 IT01 IT03 IT04 IT06 IT08 IT09 SW1 SW3
2.2.4	Support Structures and Assembly	2,400	2,320	CERN DE1 DE3 IT09
2.2.5	Monitoring	400	400	DE1 DE3
2.2.6	Service Systems	120	120	CERN
2.2	**Silicon Detector**	**30,490**	**25,335**	**AT1 CERN DE1 DE3 FI1 FI2 FI3 FI5 IN3 IN4 IN5 IT01 IT03 IT04 IT06 IT08 IT09 SW1 SW3 UK1 UK2 UK3 US10 US26 US32 US35**
2.3.1	Detectors (incl. Pre-series)	13,465	10,755	BE1 BE2 BE3 BE4 BE5 CERN DE2 DE3 DE5 FR4 FR5 IT09 RU1 SW4
2.3.2	Electronics (incl. Engineering)	24,310	19,225	BE1 BE2 BE3 BE4 BE5 CERN DE2 DE3 DE5 FR4 FR5 IT09 RU1 SW4 UK2 UK3
2.3.3	Module Mechanics	1,940	1,630	BE1 BE2 BE3 BE4 BE5 CERN DE2 DE3 DE5 FI2 FR4 FR5 RU1
2.3.4	Support Structures and Assembly	2,640	2,605	BE1 BE2 BE3 BE4 BE5 CERN DE2 DE3 DE5 FI2 FR4 FR5 IT09 SW4
2.3.5	Monitoring	100	100	CERN DE2 DE3 DE5
2.3.6	Service Systems	120	120	BE1 BE2 BE3 BE4 BE5 CERN DE2 DE3 DE5 EE1 FR4 FR5 IT09 RU1
2.3	**MSGC Detector**	**42,570**	**34,435**	**BE1 BE2 BE3 BE4 BE5 CERN DE2 DE3 DE5 EE1 FI2 FR4 FR5 IT09 RU1 SW4 UK2 UK3**
2.4.1	Overall Support	2,100	2,100	CERN
2.4.2	Overall Alignment	800	800	CERN FI2 FI5
2.4.3	Service Systems	3,185	3,185	CERN
2.4	**General Mechanical Infrastr.**	**6,085**	**6,085**	**CERN FI2 FI5**
2.	**Tracker**	**87,385**	**74,095**	**AT1 BE1 BE2 BE3 BE4 BE5 CERN DE1 DE2 DE3 DE5 EE1 FI1 FI2 FI3 FI5 FR4 FR5 IN3 IN4 IN5 IT01 IT03 IT04 IT06 IT08 IT09 RU1 SW1 SW2 SW3 SW4 UK1 UK2 UK3 US03 US10 US13 US17 US23 US26 US30 US32 US33 US35**

See Annex 1 for the abbreviations of the names of Institutes

ANNEX 9.2 B

Deliverables and Assigned Funding for the individual Sub-detectors by Funding Agency
(including Estimated Costs)

TRACKER

Cost Estimate Reference	Deliverables	Estimated Cost (Phase II)	Austria	Belgium	CERN	Finland	France-IN2P3	Germany	India	Italy	RDMS-Russia	Switzerland		United Kingdom	USA		Totals Assigned Funding	Estimated Cost (Phase I)	Balance of Funding vs Cost of Phase I	Balance of Funding vs Cost of Phase II
												ETHZ/Universities	PSI		DOE	NSF				
2.1.1	Detectors (incl. Pre-series)	965										240	410			315	965	965		
2.1.2	Electronics (incl. Engineering)	5,020	170									1,030	2,250		695	675	4,820	5,020	-200	
2.1.3	Module Mechanics	1,010										260	460		290		1,010	1,010		
2.1.4	Support Structures and Assembly	480										110	140		230		480	480		
2.1.5	Monitoring	110											60		50		110	110		
2.1.6	Service Systems	655										160	280		215		655	655		
2.1	**Pixel Detector**	**8,240**	**170**									**1,800**	**3,600**		**1,480**	**990**	**8,040**	**8,240**	**-200**	**-200**
2.2.1	Detectors (incl. Pre-series)	10,845	440		1,800	200		650	450	4,400		900					8,840	8,825	15	
2.2.2	Electronics (incl. Engineering)	15,605	570		2,700			850	100	5,900		1,100		1,500			12,720	12,790	-70	
2.2.3	Module Mechanics	1,120	170		175			150	50	200		100					845	880	-35	
2.2.4	Support Structures and Assembly	2,400			720			150		1,100							1,970	2,320	-350	
2.2.5	Monitoring	400						200									200	400	-200	
2.2.6	Service Systems	120			120												120	120		
2.2	**Silicon Detector**	**30,490**	**1,180**		**5,515**	**200**		**2,000**	**600**	**11,600**		**2,100**		**1,500**			**24,695**	**25,335**	**-640**	**-5,795**
2.3.1	Detectors (incl. Pre-series)	13,465		590	1,335		2,530	1,525		3,590	630	370					10,570	10,755	-185	
2.3.2	Electronics (incl. Engineering)	24,310		2,635	3,375		3,920	2,910		4,300	320	590		1,200			19,250	19,225	25	
2.3.3	Module Mechanics	1,940		35	270	800	50	340			95						1,590	1,630	-40	
2.3.4	Support Structures and Assembly	2,640		155	620	1,200	230	395				40					2,640	2,605	35	
2.3.5	Monitoring	100			50			50									100	100		
2.3.6	Service Systems	120		5	50		20	30		10	5						120	120		
2.3	**MSGC Detector**	**42,570**		**3,420**	**5,700**	**2,000**	**6,750**	**5,250**		**7,900**	**1,050**	**1,000**		**1,200**			**34,270**	**34,435**	**-165**	**-8,300**
2.4.1	Overall Support	2,100			2,100												2,100	2,100		
2.4.2	Overall Alignment	800			600	200											800	800		
2.4.3	Service Systems	3,185			2,985												2,985	3,185	-200	
2.4	**General Mechanical Infrastr.**	**6,085**			**5,685**	**200**											**5,885**	**6,085**	**-200**	**-200**
2.	**Tracker**	**87,385**	**1,350**	**3,420**	**16,900**	**2,400**	**6,750**	**7,250**	**600**	**19,500**	**1,050**	**4,900**	**3,600**	**2,700**	**1,480**	**990**	**72,890**	**74,095**	**-1,205**	**-14,495**

ANNEX 9.3 A

Deliverables to be provided by the Institutes for the individual Sub-detectors
(including Estimated Costs)

ELECTROMAGNETIC CALORIMETER

Ref	Deliverables	Cost Estimate	Institutes
3.1.1	Crystals	22,195	BY2 CERN CN2 CY1 FR2 IT10 SW1
3.1.2	Electronics	23,780	CERN CR1 CR2 CY1 FR1 FR2 FR3 FR5 IT10 PT1 SW1 SW2 US22 US25 US29
3.1.3	Mechanics	8,315	CERN FR1 FR5 IT10 SW1
3.1.4	Assembly and Installation	5,700	CERN FR3 SW1
3.1.5	Monitoring	1,660	FR3 US07
3.1	**Barrel**	**61,650**	**BY2 CERN CN2 CR1 CR2 CY1 FR1 FR2 FR3 FR5 IT10 PT1 SW1 SW2 US07 US22 US25 US29**
3.2.1	Crystals	7,695	BY1 BY3 CERN CN2 RU2 RU3 RU5 SW1 UK1 UK2 UK3 UK4
3.2.2	Electronics	7,680	PT1 RU2 RU3 RU6 RU7 SW1 UK1 UK2 UK3 UK4
3.2.3	Mechanics	1,530	RU2 RU3 UK1 UK2 UK3 UK4
3.2.4	Assembly and Installation	970	RU2 RU3 UK1 UK2 UK3 UK4
3.2.5	Monitoring	500	FR3 RU2
3.2.6	Preshower	5,400	AR1 BY1 BY2 BY3 BY4 CERN GE1 GR1 GR3 IN1 IN6 JINR
3.2	**Endcaps**	**23,780**	**AR1 BY1 BY2 BY3 BY4 CERN CN2 FR3 GE1 GR1 GR3 IN1 IN6 JINR PT1 RU2 RU3 RU5 RU6 RU7 SW1 UK1 UK2 UK3 UK4**
3.	**ECAL**	**85,430**	**AR1 BY1 BY2 BY3 BY4 CERN CN2 CR1 CR2 CY1 FR1 FR2 FR3 FR5 GE1 GR1 GR3 IN1 IN6 IT10 JINR PT1 RU2 RU3 RU5 RU6 RU7 SW1 SW2 UK1 UK2 UK3 UK4 US07 US22 US25 US29**

See Annex 1 for the abbreviations of the names of Institutes

ANNEX 9.3 B

Deliverables and Assigned Funding for the individual Sub-detectors by Funding Agency
(including Estimated Costs)

ELECTROMAGNETIC CALORIMETER

Cost Estimate Reference	Deliverables	CERN	Croatia	Cyprus	France		Greece	India	Italy	Portugal	RDMS		Switzerland		United Kingdom	USA		Totals Assigned Funding	Estimated Cost	Balance of Funding vs. Cost
					CEA	IN2P3					Russia	Dubna Member States	ETHZ/Universities	PSI		DOE	NSF			
3.1.1	Crystals	5,400		50		250			650				16,000					22,350	22,195	155
3.1.2	Electronics	1,500	200	350	700	4,010			1,250	710			8,000	1,720		3,455	2,015	23,910	23,780	130
3.1.3	Mechanics	1,100				2,490			1,700				3,050					8,340	8,315	25
3.1.4	Assembly and Installation	1,500			500								3,850					5,850	5,700	150
3.1.5	Monitoring				1,300											510		1,810	1,660	150
3.1	**Barrel**	**9,500**	**200**	**400**	**2,500**	**6,750**			**3,600**	**710**			**30,900**	**1,720**		**3,965**	**2,015**	**62,260**	**61,650**	**610**
3.2.1	Crystals	1,000									50		6,250		400			7,700	7,695	5
3.2.2	Electronics									405	1,000		5,350		950			7,705	7,680	25
3.2.3	Mechanics										1,430				800			2,230	1,530	700
3.2.4	Assembly and Installation										200				550			750	970	-220
3.2.5	Monitoring				500						20							520	500	20
3.2.6	Preshower	2,700					1,360	1,000			750	400						6,210	5,400	810
3.2	**Endcaps**	**3,700**			**500**		**1,360**	**1,000**		**405**	**3,450**	**400**	**11,600**		**2,700**			**25,115**	**23,780**	**1,335**
3.	**ECAL**	**13,200**	**200**	**400**	**3,000**	**6,750**	**1,360**	**1,000**	**3,600**	**1,115**	**3,450**	**400**	**42,500**	**1,720**	**2,700**	**3,965**	**2,015**	**87,375**	**85,430**	**1,945**

ANNEX 9.4 A

Deliverables to be provided by the Institutes for the individual Sub-detectors
(including Estimated Costs)

HADRON CALORIMETER

Ref	Deliverables	Cost Estimate (Phase II)	Institutes
4.1.01	Mechanics	10,850	US10 US20 US23 US32
4.1.02	Optics	2,030	CN1 US10 US12 US14 US23 US27 US30 US32
4.1.03	Read-out Boxes	360	US10 US12 US14 US22 US23 US27
4.1.04	Photodetectors	1,030	US10 US22 US27 US30 US36
4.1.05	Front-end Electronics	1,640	US02 US10 US14 US22 US30
4.1.06	Calibration Systems	480	US10 US12 US15 US30 US32
4.1.07	Trigger/DAQ Electronics	445	US02 US10 US14 US20
4.1.08	Voltage Supply Systems	440	US10 US20
4.1.09	Detector Control Systems	210	US02 US10 US20 US27 US30
4.1.10	Pre-production Prototypes	1,525	US10 US12 US14 US15 US20 US22 US23 US27 US30 US32
4.1	**Barrel**	**19,015**	**CN1 US02 US10 US12 US14 US15 US20 US22 US23 US27 US30 US32 US36**
4.2.01	Mechanics	100	IN1 IN2 IN3 IN4 IN5 US10
4.2.02	Optics	1,285	IN1 IN2 IN3 IN4 IN5 US10 US14 US23 US27 US32
4.2.03	Read-out Boxes	300	US10 US14 US22 US23 US27
4.2.04	Photodetectors	495	US10 US22 US27 US36
4.2.05	Front-end Electronics	500	US02 US10 US22
4.2.06	Calibration Systems	65	US10 US12 US15 US30
4.2.07	Trigger/DAQ Electronics	185	US02 US10 US20
4.2.08	Voltage Supply Systems	110	US10 US20
4.2.09	Detector Control Systems	140	US02 US10 US20 US27
4.2.10	Pre-production Prototypes	165	IN1 IN2 IN3 IN4 IN5 US10 US12 US14 US15 US22 US23 US27 US32
4.2	**Outer Barrel**	**3,340**	**IN1 IN2 IN3 IN4 IN5 US02 US10 US12 US14 US15 US20 US22 US23 US27 US30 US32 US36**
4.3.01	Mechanics	8,295	BG1 BG2 BY1 BY3 JINR UZ1
4.3.02	Optics	875	AR1 GE1 GE2 JINR RU2 RU3 UR1 UR2 UR3 US14 US23 US27 US30 US32
4.3.03	Read-out Boxes	320	US10 US14 US22 US23 US27
4.3.04	Photodetectors	450	US10 US22 US27 US30 US36
4.3.05	Front-end Electronics	680	US02 US10 US22 US30
4.3.06	Calibration Systems	210	RU2 US10 US12 US15 US30
4.3.07	Trigger/DAQ Electronics	265	US02 US10 US20
4.3.08	Voltage Supply Systems	205	US10 US20
4.3.09	Detector Control Systems	145	US02 US10 US20 US27 US30
4.3.10	Pre-production Prototypes	535	AR1 BG1 BG2 BY3 JINR RU2 RU3 UR2 UR3 US10 US12 US14 US15 US22 US23 US27 US30 US32
4.3	**Endcap**	**11,990**	**AR1 BG1 BG2 BY1 BY3 GE1 GE2 JINR RU2 RU3 UR1 UR2 UR3 US02 US10 US12 US14 US15 US20 US22 US23 US27 US30 US32 US36 UZ1**
4.4.01	Mechanics	65	US10 US20
4.4.02	Optics	180	US12 US14 US20 US23 US27 US32
4.4.03	Read-out Boxes	0	US10 US14 US22 US23 US27
4.4.04	Photodetectors	95	US10 US22 US27 US36
4.4.05	Front-end Electronics	210	US02 US10 US22
4.4.06	Calibration Systems	25	US10 US12 US15 US30
4.4.07	Trigger/DAQ Electronics	90	US02 US10 US20
4.4.08	Voltage Supply Systems	0	US10 US20
4.4.09	Detector Control Systems	70	US02 US10 US20 US27
4.4.10	Pre-production Prototypes	0	US10 US12 US14 US15 US22 US23 US27 US30 US32
4.4	**Outer Endcap**	**730**	**US02 US10 US12 US14 US15 US20 US22 US23 US27 US30 US32 US36**
4.5.01	Mechanics	1,675	HU1 HU3 RU4 RU5 US15
4.5.02	Optics	2,255	HU1 HU3 RU4 RU5 TR1 TR2 US15
4.5.03	Read-out Boxes	75	US09 US15
4.5.04	Photodetectors	670	US09 US15
4.5.05	Front-end Electronics	580	US02 US10
4.5.06	Calibration Systems	350	RU4 RU5 US09 US10 US12 US15 US16 US30
4.5.07	Trigger/DAQ Electronics	235	US02 US10 US15 US16
4.5.08	Voltage Supply Systems	310	US09 US10
4.5.09	Detector Control Systems	120	HU1 HU3 SP1 TR1 TR2 US02 US10 US16
4.5.10	Pre-production Prototypes	295	HU1 RU4 RU5 SP1 TR1 TR2 US02 US09 US10 US12 US15 US16 US30 US35
4.5.11	Luminosity Monitor	130	US24
4.5	**Forward**	**6,700**	**HU1 HU3 RU4 RU5 SP1 TR1 TR2 US02 US09 US10 US12 US15 US16 US24 US30 US35**
4.	**HCAL**	**41,775**	**AR1 BG1 BG2 BY1 BY3 CN1 GE1 GE2 HU1 HU3 IN1 IN2 IN3 IN4 IN5 JINR RU2 RU3 RU4 RU5 SP1 TR1 TR2 UR1 UR2 UR3 US02 US09 US10 US12 US14 US15 US16 US20 US22 US23 US24 US27 US30 US32 US35 US36 UZ1**

See Annex 1 for the abbreviations of the names of Institutes

ANNEX 9.4 B

Deliverables and Assigned Funding for the individual Sub-detectors by Funding Agency
(including Estimated Costs)

HADRON CALORIMETER

Cost Estimate Reference	Deliverables	Hungary	India [1]	RDMS		Turkey	USA		Totals Assigned Funding	Estimated Cost	Balance of Funding vs Cost
				Russia	Dubna Member States		DOE	NSF			
4.1.01	Mechanics						10,850		10,850	10,850	
4.1.02	Optics						1,590	440	2,030	2,030	
4.1.03	Read-out Boxes							360	360	360	
4.1.04	Photodetectors						130	895	1,025	1,030	-5
4.1.05	Front-end Electronics						1,645		1,645	1,640	5
4.1.06	Calibration Systems						480		480	480	
4.1.07	Trigger/DAQ Electronics						445		445	445	
4.1.08	Voltage Supply Systems						440		440	440	
4.1.09	Detector Control Systems						210		210	210	
4.1.10	Pre-production Prototypes						1,505	25	1,530	1,525	5
4.1	**Barrel**						**17,295**	**1,720**	**19,015**	**19,015**	
4.2.01	Mechanics		95						95	100	-5
4.2.02	Optics		1,045				240		1,285	1,285	
4.2.03	Read-out Boxes							300	300	300	
4.2.04	Photodetectors							490	490	495	-5
4.2.05	Front-end Electronics						500		500	500	
4.2.06	Calibration Systems						65		65	65	
4.2.07	Trigger/DAQ Electronics						185		185	185	
4.2.08	Voltage Supply Systems						110		110	110	
4.2.09	Detector Control Systems						140		140	140	
4.2.10	Pre-production Prototypes		160					5	165	165	
4.2	**Outer Barrel**		**1,300**				**1,240**	**795**	**3,335**	**3,340**	**-5**
4.3.01	Mechanics			4,020	4,275				8,295	8,295	
4.3.02	Optics			280			415	180	875	875	
4.3.03	Read-out Boxes							320	320	320	
4.3.04	Photodetectors							455	455	450	5
4.3.05	Front-end Electronics						680		680	680	
4.3.06	Calibration Systems						210		210	210	
4.3.07	Trigger/DAQ Electronics						270		270	265	5
4.3.08	Voltage Supply Systems						205		205	205	
4.3.09	Detector Control Systems						145		145	145	
4.3.10	Pre-production Prototypes			200	325			10	535	535	
4.3	**Endcap**			**4,500**	**4,600**		**1,925**	**965**	**11,990**	**11,990**	
4.4.01	Mechanics						65		65	65	
4.4.02	Optics						175		175	180	-5
4.4.03	Read-out Boxes										
4.4.04	Photodetectors						95		95	95	
4.4.05	Front-end Electronics						110	100	210	210	
4.4.06	Calibration Systems						25		25	25	
4.4.07	Trigger/DAQ Electronics						90		90	90	
4.4.08	Voltage Supply Systems										
4.4.09	Detector Control Systems						70		70	70	
4.4.10	Pre-production Prototypes										
4.4	**Outer Endcap**						**630**	**100**	**730**	**730**	
4.5.01	Mechanics			1,675			45		1,720	1,675	45
4.5.02	Optics	410		70		670	270		1,420	2,255	-835
4.5.03	Read-out Boxes						75		75	75	
4.5.04	Photodetectors						670		670	670	
4.5.05	Front-end Electronics						580		580	580	
4.5.06	Calibration Systems			90			290		380	350	30
4.5.07	Trigger/DAQ Electronics						235		235	235	
4.5.08	Voltage Supply Systems						310		310	310	
4.5.09	Detector Control Systems	65				15	40		120	120	
4.5.10	Pre-production Prototypes	25		165		5	115		310	295	15
4.5.11	Luminosity Monitor							130	130	130	
4.5	**Forward**	**500**		**2,000**		**690**	**2,630**	**130**	**5,950**	**6,700**	**-750**
4.	**HCAL**	**500**	**1,300**	**6,500**	**4,600**	**690**	**23,720**	**3,710**	**41,020**	**41,775**	**-755**

[1] The total contribution from India will be 5'000 kCHF.
A list of additional HCAL deliverables for a total estimated value of 1'200 kCHF to be provided by India is under preparation.
This MoU will be amended by this list once an agreement is reached on these deliverables and on India's contribution to Common Projects.

ANNEX 9.5 A

Deliverables to be provided by the Institutes for the individual Sub-detectors
(including Estimated Costs)

MUON DETECTOR

Ref	Deliverables	Cost Estimate	Institutes
5.1.1	Detectors and Components	8,630	AT1 CN1 DE4 IT02 IT06 IT11 SP1
5.1.2	Electronics	11,610	CERN CN1 DE4 IT02 IT06 IT11 SP1
5.1.3	Mechanical Structure and Supports	500	DE4 IT02 IT06 IT11 SP1
5.1.4	Assembly and Installation	700	DE4 IT02 IT06 IT11 SP1
5.1.5	Monitoring	465	DE4 IT02 IT06 IT11
5.1.6	Service Systems	400	CERN DE4 IT02 IT06 IT11
5.1	**Barrel Drifttubes**	**22,300**	**AT1 CERN CN1 DE4 IT02 IT06 IT11 SP1**
5.2.1	Detectors and Components	1,765	JINR
5.2.2	Electronics	2,270	BG1 BG2 BY3 JINR SK1 US01 US28 US30 US34
5.2.3	Mechanical Structure, Supports	210	BY3 JINR SK1
5.2.4	Assembly and Installation	330	BY3 JINR SK1
5.2.5	Monitoring	50	BG1 BG2 JINR
5.2.6	Service Systems	100	BY3 JINR SK1
5.2	**Forward ME 1/1**	**4,720**	**BG1 BG2 BY3 JINR SK1 US01 US28 US30 US34**
5.3.1	Detectors and Components	10,805	CN1 RU7 US03 US04 US05 US08 US10 US11 US37
5.3.2	Electronics	11,425	RU7 US03 US04 US08 US28 US30 US31
5.3.3	Mechanical Structure and Supports	490	US37
5.3.4	Assembly and Installation	230	CN1 RU7 US04 US10 US11 US37
5.3.5	Monitoring	35	US04 US10 US37
5.3.6	Service Systems	650	US10 US37
5.3	**Endcap CSC**	**23,635**	**CN1 RU7 US03 US04 US05 US08 US10 US11 US28 US30 US31 US37**
5.4.1	Detectors and Components	2,245	CN1 CN3 IT01 IT07 KR12 KR13 KR14
5.4.2	Electronics	1,400	CN1 CN3 IT01 IT07 KR12 KR13 KR14
5.4.3	Mechanical Structure and Supports	210	CN1 CN3 KR12 KR13 KR14
5.4.4	Assembly and Installation	340	CN1 CN3 IT01 IT07 KR12 KR13 KR14
5.4.5	Monitoring	60	CN1 CN3 IT01 IT07
5.4.6	Service Systems	120	CN1 CN3 IT01 IT07 KR12 KR13 KR14
5.4	**Barrel RPC**	**4,380**	**CN1 CN3 IT01 IT07 KR12 KR13 KR14**
5.5.1	Detectors and Components	940	KR01 KR02 KR03 KR04 KR05 KR06 KR07 KR08 KR09 KR10 KR11
5.5.2	Electronics	1,085	KR01 KR02 KR03 KR04 KR05 KR06 KR07 KR08 KR09 KR10 KR11
5.5.3	Mechanical Structure and Supports	150	KR01 KR02 KR03 KR04 KR05 KR06 KR07 KR08 KR09 KR10 KR11
5.5.4	Assembly and Installation	240	KR01 KR02 KR03 KR04 KR05 KR06 KR07 KR08 KR09 KR10 KR11
5.5.5	Monitoring	40	KR01 KR02 KR03 KR04 KR05 KR06 KR07 KR08 KR09 KR10 KR11
5.5.6	Service Systems	120	KR01 KR02 KR03 KR04 KR05 KR06 KR07 KR08 KR09 KR10 KR11
5.5	**Forward RPC**	**2,575**	**KR01 KR02 KR03 KR04 KR05 KR06 KR07 KR08 KR09 KR10 KR11**
5.6.1	Barrel	1,300	AT1 CERN HU2
5.6.2	Forward	885	US10 US25
5.6.3	Link	1,005	SP1 SP3 SP4
5.6	**Alignment**	**3,190**	**AT1 CERN HU2 SP1 SP3 SP4 US10 US25**
5.	**Muon Detector**	**60,800**	**AT1 BG1 BG2 BY3 CERN CN1 CN3 DE4 HU2 IT01 IT02 IT06 IT07 IT11 JINR KR01 KR02 KR03 KR04 KR05 KR06 KR07 KR08 KR09 KR10 KR11 KR12 KR13 KR14 RU7 SK1 SP1 SP3 SP4 US01 US03 US04 US05 US08 US10 US11 US25 US28 US30 US31 US34 US37**

See Annex 1 for the abbreviations of the names of Institutes

ANNEX 9.5 B

Deliverables and Assigned Funding for the individual Sub-detectors by Funding Agency
(including Estimated Costs)

MUON DETECTOR

Cost Estimate Reference	Deliverables	Austria	CERN	China		Germany	Hungary	Italy	Korea	RDMS		Spain	USA		Totals Assigned Funding	Estimated Cost	Balance of Funding vs Cost
				CAS	NNSF					Russia	Dubna Member States		USA-DOE	USA-NSF			
5.1.1	Detectors and Components	50		465		2,050		4,130				1,815			8,510	8,630	-120
5.1.2	Electronics		1,050	1,100		1,800		6,610				1,050			11,610	11,610	
5.1.3	Mechanical Structure and Supports					80		150				80			310	500	-190
5.1.4	Assembly and Installation					230		390				100			720	700	20
5.1.5	Monitoring					190		270							460	465	-5
5.1.6	Service Systems		300			50		50							400	400	
5.1	**Barrel Drifttubes**	**50**	**1,350**	**1,565**		**4,400**		**11,600**				**3,045**			**22,010**	**22,300**	**-290**
5.2.1	Detectors and Components									1,755					1,755	1,765	-10
5.2.2	Electronics									1,110	1,150				2,260	2,270	-10
5.2.3	Mechanical Structure, Supports									110	100				210	210	
5.2.4	Assembly and Installation									275	50				325	330	-5
5.2.5	Monitoring										50				50	50	
5.2.6	Service Systems									50	50				100	100	
5.2	**Forward ME 1/1**									**3,300**	**1,400**				**4,700**	**4,720**	**-20**
5.3.1	Detectors and Components			1,000						1,000			9,805		11,805	10,805	1,000
5.3.2	Electronics												11,425		11,425	11,425	
5.3.3	Mechanical Structure and Supports												490		490	490	
5.3.4	Assembly and Installation												230		230	230	
5.3.5	Monitoring												35		35	35	
5.3.6	Service Systems												650		650	650	
5.3	**Endcap CSC**			**1,000**						**1,000**			**22,635**		**24,635**	**23,635**	**1,000**
5.4.1	Detectors and Components				170			1,950	250						2,370	2,245	125
5.4.2	Electronics				170			750	600						1,520	1,400	120
5.4.3	Mechanical Structure and Supports				170				210						380	210	170
5.4.4	Assembly and Installation				170			40	295						505	340	165
5.4.5	Monitoring				25			60							85	60	25
5.4.6	Service Systems				30			100	20						150	120	30
5.4	**Barrel RPC**				**735**			**2,900**	**1,375**						**5,010**	**4,380**	**630**
5.5.1	Detectors and Components								940						940	940	
5.5.2	Electronics								1,085						1,085	1,085	
5.5.3	Mechanical Structure and Supports								150						150	150	
5.5.4	Assembly and Installation								240						240	240	
5.5.5	Monitoring								40						40	40	
5.5.6	Service Systems								120						120	120	
5.5	**Forward RPC**								**2,575**						**2,575**	**2,575**	
5.6.1	Barrel	50	950				100								1,100	1,300	-200
5.6.2	Forward													890	890	885	5
5.6.3	Link											1,065			1,065	1,005	60
5.6	**Alignment**	**50**	**950**				**100**					**1,065**		**890**	**3,055**	**3,190**	**-135**
5.	**Muon Detector**	**100**	**2,300**	**2,565**	**735**	**4,400**	**100**	**14,500**	**3,950**	**4,300**	**1,400**	**4,110**	**22,635**	**890**	**61,985**	**60,800**	**1,185**

ANNEX 9.6 A

Deliverables to be provided by the Institutes for the individual Sub-detectors
(including Estimated Costs)

TRIGGER AND DATA ACQUISITION

Ref	Deliverables	Cost Estimate	Institutes
6.1.1	Calorimeter Trigger	5,225	FI1 FI2 FI4 PT1 UK4 US37
6.1.2	CSC Trigger	1,100	US03 US04 US08 US11 US21 US28 US31
6.1.3	DT Trigger	780	AT1
6.1.4	RPC Trigger	3,695	FI1 FI2 FI4 IT01 KR01 KR02 KR03 KR04 KR05 KR06 KR07 KR08 KR09 KR10 KR11 PL1 PL2
6.1.5	Global Trigger	1,340	AT1 CERN GR1 GR2 GR3
6.1	**Trigger**	**12,140**	**AT1 CERN FI1 FI2 FI4 GR1 GR2 GR3 IT01 KR01 KR02 KR03 KR04 KR05 KR06 KR07 KR08 KR09 KR10 KR11 PL1 PL2 PT1 UK4 US03 US04 US08 US11 US21 US28 US31 US37**
6.2.1	Read-out Unit	5,560	CERN GR1 GR2 GR3 IT06 IT11 SW1 SW2 UK3
6.2.2	Filter Unit	10,640	AT1 CERN FR3 HU1 SW1 SW2 US04 US06 US10 US16 US21
6.2.3	Event Builder	5,320	CERN SW1 US10 US21
6.2.4	DAQ Integration	1,530	CERN IT06
6.2	**Data Acquisition**	**23,045**	**AT1 CERN FR3 GR1 GR2 GR3 HU1 IT06 IT11 SW1 SW2 UK3 US04 US06 US10 US16 US21**
6.3.1	Detector Controls	2,340	CERN
6.3	**Detector Controls**	**2,340**	**CERN**
6.	**Trigger/DAQ**	**37,525**	**AT1 CERN FI1 FI2 FI4 FR3 GR1 GR2 GR3 HU1 IT01 IT06 IT11 KR01 KR02 KR03 KR04 KR05 KR06 KR07 KR08 KR09 KR10 KR11 PL1 PL2 PT1 SW1 SW2 UK3 UK4 US03 US04 US06 US08 US10 US11 US16 US21 US28 US31 US37**

See Annex 1 for the abbreviations of the names of Institutes

ANNEX 9.6 B

Deliverables and Assigned Funding for the individual Sub-detectors by Funding Agency
(including Estimated Costs)

TRIGGER AND DATA ACQUISITION

Cost Estimate Reference	Deliverables	Austria	CERN	Finland	France-CEA	Greece	Hungary	Italy	Korea	Poland	Portugal	Switzerland		United Kingdom	USA		Assigned Funding	Estimated Cost	Balance of Funding vs Cost
												ETHZ/Universities	PSI		DOE	NSF			
6.1.1	Calorimeter Trigger			520							255			400	4,050		5,225	5,225	
6.1.2	CSC Trigger														1,100		1,100	1,100	
6.1.3	DT Trigger	780															780	780	
6.1.4	RPC Trigger			500				100	1,000	2,060							3,660	3,695	-35
6.1.5	Global Trigger	440	200			700											1,340	1,340	
6.1	**Trigger**	**1,220**	**200**	**1,020**		**700**		**100**	**1,000**	**2,060**	**255**			**400**	**5,150**		**12,105**	**12,140**	**-35**
6.2.1	Read-out Unit		2,120			1,360						1,390	350	450			5,670	5,560	110
6.2.2	Filter Unit	30	2,775		840		90					2,865	150		3,425	765	10,940	10,640	300
6.2.3	Event Builder		4,000									1,245			175		5,420	5,320	100
6.2.4	DAQ Integration		1,530														1,530	1,530	
6.2	**Data Acquisition**	**30**	**10,425**		**840**	**1,360**	**90**					**5,500**	**500**	**450**	**3,600**	**765**	**23,560**	**23,045**	**515**
6.3.1	Detector Controls		2,345														2,345	2,340	5
6.3	**Detector Controls**		2,345														2,345	2,340	5
6.	**Trigger/DAQ**	**1,250**	**12,970**	**1,020**	**840**	**2,060**	**90**	**100**	**1,000**	**2,060**	**255**	**5,500**	**500**	**850**	**8,750**	**765**	**38,010**	**37,525**	**485**

ANNEX 9.7 A

Deliverables to be provided by the Institutes for the individual Sub-detectors
(including Estimated Costs)

OFFLINE COMPUTING (Common Project)

Ref	Deliverables	Cost Estimate	Details of the Deliverables
7.1.1	File Servers	800	Prototype object database and mass storage systems
7.1.2	Information Servers	400	World-Wide-Web information and documentation systems
7.1.3	Computing Power	600	Prototype reconstruction, analysis and graphical event display systems
7.1.4	Spares	200	Hardware items to support the maintenance of the systems
7.1.5	System Assembly	100	Infrastructure for network connectivity, etc.
7.1.6	Software Licenses	800	Collaboration-wide licensing for CMS-specific software development
7.1.7	System Management	700	Manpower-related support for software and hardware activities
7.1	**Offline Infrastructure**	**3,600**	
7.	**Offline Computing**	**3,600**	

ANNEX 9.7 B

OFFLINE COMPUTING

(Common Project)

Definition and Requirements

The Institutes will participate in the cooperative development, operation and utilisation of the experiment's offline computing and software systems. The CMS Computing Technical Proposal [1] describes the computing environment with CERN as the principal centre and a small number of major regional centres.

1. Computing and Networking Systems

It is proposed to construct small prototypes several years before start-up and to commence a ramp-up of major facilities from 2003. The cost of the analysis and the development of the analysis system will be shared between CERN as the host and the Institutes. A few major regional centres are foreseen, each roughly 10-20% of the CERN computing centre's capacity.

2. Software System

Both the detector specific software, and the core software that forms the framework within which the analysis of the data will be carried out, will be developed in collaboration between the Institutes and CERN as the host using new software and database technologies. The core software team at CERN will coordinate the design and development of the software. A peak manpower requirement of approximately 30 software professionals will be reached three years in advance of data taking.

3. Funding Commitments during the Construction Phase

The funding requirement for Offline Computing is 3.6 MCHF. This will cover servers and development systems as described in the Cost Estimate. Major equipment for data storage, processing, physics analysis, and networks will be required by 2005 and is not covered by the Common Project. The costs are described in the Report to the LHCC on the Computing Technical Proposals of ATLAS and CMS [2]. Desktop systems are the responsibility of the Institutes.

4. CERN's Role

CERN as the host has commitments for central coordination of the software used in common with other experiments, for the running of the CMS central computing, and coordination of the regional centres. It will support desktop equipment, servers and data storage and provide central computing facilities and networking systems.

CERN's role in CMS includes the coordination of the software development, provision of a software and document repository and support of development tools.

References:

[1] The Compact Muon Solenoid Computing Technical Proposal, CERN / LHCC 96-45, 19 December 1996

[2] Report to the LHCC on the Computing Technical Proposals of ATLAS and CMS, D. Boutigny, M. Kasemann, T. Naumann and S. Wolbers, CERN / LHCC 97-41, 5 June 1997

ANNEX 9.8

Deliverables to be provided by the Institutes for the individual Sub-detectors
(including Estimated Costs)

INFRASTRUCTURE

Contributions by CERN (23730 kCHF) and by Russia (3500 kCHF)

Ref	Deliverables	Cost Estimate
8.1.1	Gangways, Stairs	1,600
8.1.2	Structures on Yoke	1,000
8.1.3	Personnel Access Equipment	400
8.1.4	General Survey	900
8.1	**Access and Survey**	**3,900**
8.2.1	Counting Room Structures	1,000
8.2.2	Racks with Cooling	1,400
8.2.3	Electrical Distribution from Outlets	1,500
8.2.4	Gas Systems and Primary Distribution Racks	3,300
8.2.5	Beam Pipe	500
8.2.6	Cable Trays to Counting Rooms	900
8.2.7	Control Room and Cabling to Surface	600
8.2.8	General Piping	1,000
8.2	**General Installation**	**10,200**
8.3.1	Detector Cooling Plant	1,400
8.3.2	Detector Specific Ventilation	500
8.3.3	Detector Primary Cooling System	1,700
8.3	**Cooling and Ventilation**	**3,600**
8.4.1	Safety Installations	1,050
8.4.2	Safety Equipment Control	350
8.4.3	Hard-wired Safety System	500
8.4.4	Inertion System	400
8.4	**Safety**	**2,300**
8.5.1	80 ton /100 m	1,100
8.5.2	80 ton /100 m Double Beam System	1,125
8.5.3	20 ton Crane	705
8.5.4	3 ton Lift	300
8.5	**Fixed Cranes**	**3,230**
8.6.1	Rotating Shielding	1,500
8.6.2	Vertical 400 ton Lifting System	500
8.6.3	Mechanics and Shielding for Forward HCAL	2,000
8.6	**Shielding Systems**	**4,000**
8.	**Infrastructure**	**27,230**

In-kind contributions from Russia for a total "western value" of 3'500 kCHF

Deliverables :
Racks for at total value of 400 kCHF plus items for the Rotating Shielding and the Mechanics and Shielding of HF for a total value of 3'100 kCHF

ANNEX 10

Contributions by Funding Agency

(Estimated Value {kCHF} of the Deliverables to be provided, or Assigned Funds {kCHF} to provide these Deliverables)

10.1 ARMENIA

Funded through RDMS-Dubna Member States (cf. 10.26)

Institutes supported (cf. Annex 1)
AR1

10.2 AUSTRIA

Estimated value of deliverables : 3'900 kCHF

Institutes supported (cf. Annex 1)
AT1

Ref.	Institutes	Deliverables	Assigned
1.	Austria	Magnet	1,100
2.1.2	AT1	Tracker : Pixel Detector : Electronics (incl. Engineering) Fabrication and testing of pixel electronics	170
2.2.1	AT1	Tracker : Silicon Detector : Detectors (incl. Pre-series) Purchase of silicon detectors	440
2.2.2	AT1	Tracker : Silicon Detector : Electronics (incl. Engineering) Purchase of components of the electronics chain for silicon detectors	570
2.2.3	AT1	Tracker : Silicon Detector : Module Mechanics Engineering and manufacture of silicon detector modules in a Regional Centre	170
5.1.1	AT1	Muon Detector : Barrel Drifttubes : Detectors and Components Mechanical parts for the DT chambers	50
5.6.1	AT1	Muon Detector : Alignment : Barrel Mechanical parts for the Barrel alignment	50
6.1.3	AT1	Trigger/DAQ : Trigger : DT Trigger Regional muon trigger (sector processor cards)	780
6.1.5	AT1	Trigger/DAQ : Trigger : Global Trigger Global trigger processor	440
6.2.2	AT1	Trigger/DAQ : Data Acquisition : Filter Unit Event filter CPU	30
7.	Austria	Offline Computing	100
		Total Assigned Funding	**3,900**

10.3 BELARUS

Funded through RDMS-Dubna Member States (cf. 10.26)

Institutes supported (cf. Annex 1)
BY1 BY2 BY3 BY4

10.4 BELGIUM

Estimated value of deliverables : 5'000 kCHF

Institutes supported (cf. Annex 1)
BE1 BE2 BE3 BE4 BE5

Ref.	Institutes	Deliverables	Assigned
1.	Belgium	Magnet	1,480
2.3.1	BE1 BE2 BE3 BE4 BE5	Tracker : MSGC Detector : Detectors (incl. Pre-series) Purchase and tests of MSGC Endcap detectors	590
2.3.2	BE1 BE2 BE3 BE4 BE5	Tracker : MSGC Detector : Electronics (incl. Engineering) Purchase of components of the electronic chain for MSGC Endcap detectors	2,635
2.3.3	BE1 BE2 BE3 BE4 BE5	Tracker : MSGC Detector : Module Mechanics Engineering of MSCG Endcap detector modules	35
2.3.4	BE1 BE2 BE3 BE4 BE5	Tracker : MSGC Detector : Support Structures and Assembly Engineering, procurement of MSGC Endcap support structures, mounting of MSGC Endcap modules on the support structures	155
2.3.6	BE1 BE2 BE3 BE4 BE5	Tracker : MSGC Detector : Service Systems Cables, gas and cooling from MSGC Endcap detector to patch-panel	5
7.	Belgium	Offline Computing	100
		Total Assigned Funding	**5,000**

10.5 BULGARIA

Funded through RDMS-Dubna Member States (cf. 10.26)

Institutes supported (cf. Annex 1)
BG1 BG2

10.6 [CERN]

Estimated value of deliverables : 85'200 kCHF

Institutes supported (cf. Annex 1)
CERN

Ref.	Institutes	Deliverables	Assigned
1.	CERN	Magnet	15,900
2.2.1	CERN	Tracker : Silicon Detector : Detectors (incl. Pre-series) Purchase of silicon detectors	1,800
2.2.2	CERN	Tracker : Silicon Detector : Electronics (incl. Engineering) Purchase of components of the electronics chain for silicon detectors	2,700
2.2.3	CERN	Tracker : Silicon Detector : Module Mechanics Engineering and manufacture of Silicon Detector modules at CERN's Regional Centre	175
2.2.4	CERN	Tracker : Silicon Detector : Support Structures and Assembly Engineering, procurement of Silicon Endcap support structures, mounting of silicon modules on the support structures	720
2.2.6	CERN	Tracker : Silicon Detector : Service Systems Cables and cooling from Silicon Barrel and Endcap Detector to patch-panel	120
2.3.1	CERN	Tracker : MSGC Detector : Detectors (incl. Pre-series) Purchase and tests of MSGC Barrel detectors	1,335
2.3.2	CERN	Tracker : MSGC Detector : Electronics (incl. Engineering) Purchase of components of the electronics chain for MSGC Barrel detectors	3,375
2.3.3	CERN	Tracker : MSGC Detector : Module Mechanics Engineering of MSGC Barrel detector modules	270
2.3.4	CERN	Tracker : MSGC Detector : Support Structures and Assembly Engineering, procurement of MSCG Barrel support structures, mounting of MSGC Barrel Detector modules on the support structures	620
2.3.5	CERN	Tracker : MSGC Detector : Monitoring Participation in Slow Controls and purchase of sensors	50
2.3.6	CERN	Tracker : MSGC Detector : Service Systems Cables, gas and cooling from MSGC Barrel detector to patch-panel	50
2.4.1	CERN	Tracker : General Mechanical Infrastr. : Overall Support Procurement of complete support system (CST, endflanges, brackets, beam-pipe support)	2,100
2.4.2	CERN	Tracker : General Mechanical Infrastr. : Overall Alignment Procurement of part of the Overall Alignment system	600
2.4.3	CERN	Tracker : General Mechanical Infrastr. : Service Systems High-voltage and low-voltage cables, gas and cooling distribution from patch-panel to general services	2,985
3.1.1	CERN	ECAL : Barrel : Crystals Purchase of crystals, assembly of crystals into modules in CERN's Regional Centre	5,400
3.1.2	CERN	ECAL : Barrel : Electronics Purchase of upper level read-out electronics	1,500
3.1.3	CERN	ECAL : Barrel : Mechanics Participation in the procurement of "Super-modules" and tooling	1,100
3.1.4	CERN	ECAL : Barrel : Assembly and Installation Assembly of modules into "Super-modules" and cooling system	1,500
3.2.1	CERN	ECAL : Endcaps : Crystals Purchase of crystals and characterization of crystals	1,000
3.2.6	CERN	ECAL : Endcaps : Preshower Responsibility to provide the full electronics	2,700
5.1.2	CERN	Muon Detector : Barrel Drifttubes : Electronics Procurement of electronics components (TDCs)	1,050
5.1.6	CERN	Muon Detector : Barrel Drifttubes : Service Systems Participation in gas and cooling sytems	300
5.6.1	CERN	Muon Detector : Alignment : Barrel Participation in the design and manufacture of the alignment system	950
6.1.5	CERN	Trigger/DAQ : Trigger : Global Trigger Participation in TTC procurement (about 1/6 of full scope)	200
6.2.1	CERN	Trigger/DAQ : Data Acquisition : Read-out Unit Procurement of about 1/3 of all read-out units	2,120
6.2.2	CERN	Trigger/DAQ : Data Acquisition : Filter Unit Participation in the procurement of filter farm nodes (about 50 %)	2,775
6.2.3	CERN	Trigger/DAQ : Data Acquisition : Event Builder Participation the procurement (about 2/3 of full scope)	4,000
6.2.4	CERN	Trigger/DAQ : Data Acquisition : DAQ Integration Responsibility to provide on-line software, integration and the delivery of the run-control system	1,530
6.3.1	CERN	Trigger/DAQ : Detector Controls : Detector Controls Delivery of the general CMS-wide detector controls (complete responsibility)	2,345
7.	CERN	Offline Computing	200
8.	CERN	Infrastructure Full responsibility, except for the contributions covered by Russia, cf. 10.25	23,730
		Total Assigned Funding	**85,200**

10.7 CHINA-CAS

Estimated value of deliverables : 3'500 kCHF

Institutes supported (cf. Annex 1)
CN1 CN2

Ref.	Institutes	Deliverables	Assigned
1.	China-CAS	Magnet (In-kind contribution : Endcap supports, cf. 10.8 and Annex 9.1)	935
5.1.1	CN1	Muon Detector : Barrel Drifttubes : Detectors and Components Procurement of parts for the drift chambers	465
5.1.2	CN1	Muon Detector : Barrel Drifttubes : Electronics Assembly of electronics boards (read-out and high-voltage)	1,100
5.3.1	CN1	Muon Detector : Endcap CSC : Detectors and Components Prototyping, tooling, assembly, testing and transport to CERN of the ME 1/2, and ME 1/3 chambers. Critical tooling, chamber parts and electronics will be provided to IHEP from US_CMS	1,000
		Total Assigned Funding	**3,500**

10.8 CHINA-NSFC

Estimated value of deliverables : 1'000 kCHF

Institutes supported (cf. Annex 1)
CN1 CN3

Ref.	Institutes	Deliverables	Assigned
1.	China-NSFC	Magnet (In-kind contribution : Endcap supports, cf. 10.7 and Annex 9.1)	265
5.4.1	CN1 CN3	Muon Detector : Barrel RPC : Detectors and Components Participation in the design, and manufacture of RPC detector components	170
5.4.2	CN1 CN3	Muon Detector : Barrel RPC : Electronics Participation in the design, manufacture, testing and shipment of RPC front-end boards	170
5.4.3	CN1 CN3	Muon Detector : Barrel RPC : Mechanical Structure and Supports Manufacture of components and transport to CERN	170
5.4.4	CN1 CN3	Muon Detector : Barrel RPC : Assembly and Installation Participation in the design and production of tools for installation	170
5.4.5	CN1 CN3	Muon Detector : Barrel RPC : Monitoring Design and procurement of Slow Controls system	25
5.4.6	CN1 CN3	Muon Detector : Barrel RPC : Service Systems Participation in the design and procurement of the gas distribution and cooling systems	30
		Total Assigned Funding	**1,000**

10.9 CROATIA

Estimated value of deliverables : 280 kCHF

Institutes supported (cf. Annex 1)
CR1 CR2

Ref.	Institutes	Deliverables	Assigned
1.	Croatia	Magnet	80
3.1.2	CR1 CR2	ECAL : Barrel : Electronics Testing of crystals and APDs	200
		Total Assigned Funding	**280**

10.10 CYPRUS

Estimated value of deliverables : 600 kCHF

Institutes supported (cf. Annex 1)
CY1

Ref.	Institutes	Deliverables	Assigned
1.	Cyprus	Magnet (Participation in Package A, cf. Annex 9.1)	200
3.1.1	CY1	ECAL : Barrel : Crystals Purchase of crystals	50
3.1.2	CY1	ECAL : Barrel : Electronics Procurement of APDs and front-end read-out testing	350
		Total Assigned Funding	**600**

10.11 ESTONIA

Estimated value of deliverables : 90 kCHF

Institutes supported (cf. Annex 1)
EE1

Ref.	Institutes	Deliverables	Assigned
1.	Estonia	Magnet	90
2.3.6	EE1	Tracker : MSGC Detector : Service Systems Contribution to be defined	
		Total Assigned Funding	**90**

10.12 FINLAND

Estimated value of deliverables : 5'000 kCHF

Institutes supported (cf. Annex 1)
FI1 FI2 FI3 FI4 FI5 FI6

Ref.	Institutes	Deliverables	Assigned
1.	Finland	Magnet	1,480
2.2.1	FI1 FI2 FI3 FI5	Tracker : Silicon Detector : Detectors (incl. Pre-series) Purchase of silicon detectors	200
2.3.3	FI2	Tracker : MSGC Detector : Module Mechanics Manufacture and assembly of the carbon fibre structure of the "Rods"	800
2.3.4	FI2	Tracker : MSGC Detector : Support Structures and Assembly Manufacture, assembly and transportation of the MSGC Barrel wheel (4 disks and the cylinders)	1,200
2.4.2	FI2	Tracker : General Mechanical Infrastr. : Overall Alignment Procurement of part of the Overall Alignment system	200
6.1.1	FI1 FI2 FI4	Trigger/DAQ : Trigger : Calorimeter Trigger Contribution to the trigger data communication means	520
6.1.4	FI1 FI2 FI4	Trigger/DAQ : Trigger : RPC Trigger Contribution to the trigger data communication means	500
7.	Finland	Offline Computing	100
		Total Assigned Funding	**5,000**

10.13 FRANCE-CEA

Estimated value of deliverables : 5'600 kCHF

Institutes supported (cf. Annex 1)
FR3

Ref.	Institutes	Deliverables	Assigned
1.	France-CEA	Magnet	1,760
3.1.2	FR3	ECAL : Barrel : Electronics Services, supplies and electronics for monitoring and calibration	700
3.1.4	FR3	ECAL : Barrel : Assembly and Installation Assembly tools for monitoring on "Super-modules"	500
3.1.5	FR3	ECAL : Barrel : Monitoring Light distribution monitoring, from counting room to crystals (excluding switch)	1,300
3.2.5	FR3	ECAL : Endcaps : Monitoring Light distribution monitoring system (as for the Barrel)	500
6.2.2	FR3	Trigger/DAQ : Data Acquisition : Filter Unit CPU for calibration, trigger events filtering	840
		Total Assigned Funding	**5,600**

10.14 FRANCE-IN2P3

Estimated value of deliverables : 19'700 kCHF

Institutes supported (cf. Annex 1)
FR1 FR2 FR4 FR5

Ref.	Institutes	Deliverables	Assigned
1.	France-IN2P3	Magnet	6,000
2.3.1	FR4 FR5	Tracker : MSGC Detector : Detectors (incl. Pre-series) Purchase and tests of MSGC Endcap detectors	2,530
2.3.2	FR4 FR5	Tracker : MSGC Detector : Electronics (incl. Engineering) Purchase of components of the electronics chain for MSGC detectors, including engineering runs for MSGC ASICs	3,920
2.3.3	FR4 FR5	Tracker : MSGC Detector : Module Mechanics Assembly and tests of MSGC Endcap detector modules including mechanical elements	50
2.3.4	FR4 FR5	Tracker : MSGC Detector : Support Structures and Assembly Participation in the assembly and installation of MSGC Endcap detector modules	230
2.3.6	FR4 FR5	Tracker : MSGC Detector : Service Systems Small parts of services	20
3.1.1	FR2	ECAL : Barrel : Crystals ACCOS prototype	250
3.1.2	FR1 FR2 FR5	ECAL : Barrel : Electronics Capsules without APD, Preamplifier, circuits board, connectors and mechanics, electrical test pulse and primitives	4,010
3.1.3	FR1 FR5	ECAL : Barrel : Mechanics Capsules mechanics, submodules	2,490
7.	France-IN2P3	Offline Computing	200
		Total Assigned Funding	**19,700**

10.15 GEORGIA

Funded through RDMS-Dubna Member States (cf. 10.26)

Institutes supported (cf. Annex 1)
GE1 GE2

10.16 GERMANY

Estimated value of deliverables : 17'000 kCHF

Institutes supported (cf. Annex 1)
DE1 DE2 DE3 DE4 DE5

Ref.	Institutes	Deliverables	Assigned
1.	Germany	Magnet (Participation in Package A, cf. Annex 9.1)	5,150
2.2.1	DE1 DE3	Tracker : Silicon Detector : Detectors (incl. Pre-series) Purchase of silicon detectors	650
2.2.2	DE1 DE3	Tracker : Silicon Detector : Electronics (incl. Engineering) Purchase of read-out electronics for Silicon Detector modules	850
2.2.3	DE1 DE3	Tracker : Silicon Detector : Module Mechanics Frames and engineering of Silicon Detector modules, assembly and tests of these modules in a Regional Centre	150
2.2.4	DE1 DE3	Tracker : Silicon Detector : Support Structures and Assembly Mounting of silicon modules on the support structures	150
2.2.5	DE1 DE3	Tracker : Silicon Detector : Monitoring Participation in Slow Control and purchase of sensors	200
2.3.1	DE2 DE3 DE5	Tracker : MSGC Detector : Detectors (incl. Pre-series) Purchase of MSGC Endcap detector substrates	1,525
2.3.2	DE2 DE3 DE5	Tracker : MSGC Detector : Electronics (incl. Engineering) Purchase of read-out electronics for MSGC Endcap detector modules	2,910
2.3.3	DE2 DE3 DE5	Tracker : MSGC Detector : Module Mechanics Purchase of frames and assembly of MSGC Endcap detector modules	340
2.3.4	DE2 DE3 DE5	Tracker : MSGC Detector : Support Structures and Assembly Engineering, procurement of MSGC Endcap support structures, mounting of MSGC Endcap modules on the support structures	395
2.3.5	DE2 DE3 DE5	Tracker : MSGC Detector : Monitoring Participation in Slow Controls and purchase of sensors	50
2.3.6	DE2 DE3 DE5	Tracker : MSGC Detector : Service Systems Cables, gas and cooling for MSGC Endcap detector	30
5.1.1	DE4	Muon Detector : Barrel Drifttubes : Detectors and Components Construction and assembly of barrel muon chambers, including the construction of special tooling (about 25 % of full score)	2,050
5.1.2	DE4	Muon Detector : Barrel Drifttubes : Electronics Purchase and installation of electronics: mainly front-end electronics for assembled chambers, read-out and cables	1,800
5.1.3	DE4	Muon Detector : Barrel Drifttubes : Mechanical Structure and Supports Production of chamber supports	80
5.1.4	DE4	Muon Detector : Barrel Drifttubes : Assembly and Installation Transport of chambers and materials to CERN	230
5.1.5	DE4	Muon Detector : Barrel Drifttubes : Monitoring Slow Control monitor system	190
5.1.6	DE4	Muon Detector : Barrel Drifttubes : Service Systems Gas and cooling distribution system	50
7.	Germany	Offline Computing	200
		Total Assigned Funding	**17,000**

10.17 GREECE

Estimated value of deliverables : 5'000 kCHF

Institutes supported (cf. Annex 1)
GR1 GR2 GR3

Ref.	Institutes	Deliverables	Assigned
1.	Greece	Magnet	1,480
3.2.6	GR1 GR3	ECAL : Endcaps : Preshower Silicon detectors, electronics, prototype, mechanics	1,360
6.1.5	GR1 GR2 GR3	Trigger/DAQ : Trigger : Global Trigger Procurement of trigger throttle system	700
6.2.1	GR1 GR2 GR3	Trigger/DAQ : Data Acquisition : Read-out Unit Procurement of read-out unit modules (25%) and crates (80%)	1,360
7.	Greece	Offline Computing	100
		Total Assigned Funding	**5,000**

10.18 HUNGARY

Estimated value of deliverables : 1'000 kCHF

Institutes supported (cf. Annex 1)
HU1 HU2 HU3

Ref.	Institutes	Deliverables	Assigned
1.	Hungary	Magnet	310
4.5.02	HU1 HU3	HCAL : Forward : Optics Tooling, optical mechanics, assembly and joints between fibre and multipliers and shipment to CERN	410
4.5.09	HU1 HU3	HCAL : Forward : Detector Control Systems Mounting and procurement of about 50 % of all components	65
4.5.10	HU1	HCAL : Forward : Pre-production Prototypes Procurement of some tooling	25
5.6.1	HU2	Muon Detector : Alignment : Barrel Procurement of camera box	100
6.2.2	HU1	Trigger/DAQ : Data Acquisition : Filter Unit Participation in the 2nd level trigger	90
		Total Assigned Funding	**1,000**

10.19 INDIA

Estimated value of deliverables : 3'800 kCHF [1]

Institutes supported (cf. Annex 1)
IN1 IN2 IN3 IN4 IN5 IN6

Ref.	Institutes	Deliverables	Assigned
1.	India	Magnet	900
2.2.1	IN3 IN4 IN5	Tracker : Silicon Detector : Detectors (incl. Pre-series) Purchase and tests of Silicon detectors	450
2.2.2	IN3 IN4 IN5	Tracker : Silicon Detector : Electronics (incl. Engineering) Purchase of components of the electronics chain for Silicon detectors	100
2.2.3	IN3 IN4 IN5	Tracker : Silicon Detector : Module Mechanics Engineering of Silicon detector modules	50
3.2.6	IN1 IN6	ECAL : Endcaps : Preshower Participation in detector units	1,000
4.2.01	IN1 IN2 IN3 IN4 IN5	HCAL : Outer Barrel : Mechanics Delivery of complete system	95
4.2.02	IN1 IN2 IN3 IN4 IN5	HCAL : Outer Barrel : Optics Purchase of materials, machining of megatile trays and scintillators, assembly and shipping	1,045
4.2.10	IN1 IN2 IN3 IN4 IN5	HCAL : Outer Barrel : Pre-production Prototypes Delivery of complete system	160
		Total Assigned Funding	**3,800**

[1] The total contribution from India will be 5'000 kCHF.
A list of additional HCAL deliverables for a total estimated value of 1'200 kCHF to be provided by India is under preparation.
This MoU will be amended by this list once an agreement is reached on these deliverables and on India's contribution to Common Projects.

10.20 ITALY

Estimated value of deliverables : 55'000 kCHF

Institutes supported (cf. Annex 1)
IT01 IT02 IT03 IT04 IT05 IT06 IT07 IT08 IT09 IT10 IT11

Ref.	Institutes	Deliverables	Assigned
1.	Italy	Magnet (including full responsibility for Package D, cf. Annex 9.1)	16,800
2.2.1	IT01 IT03 IT04 IT06 IT08 IT09	Tracker : Silicon Detector : Detectors (incl. Pre-series) Purchase of silicon detectors	4,400
2.2.2	IT01 IT03 IT04 IT06 IT08 IT09	Tracker : Silicon Detector : Electronics (incl. Engineering) Purchase of components of the electronics chain for silicon detectors	5,900
2.2.3	IT01 IT03 IT04 IT06 IT08 IT09	Tracker : Silicon Detector : Module Mechanics Engineering and manufacture of Silicon Detector modules at the Regional Centres in Bari-Catania, Firenze-Padova, Perugia and Pisa	200
2.2.4	IT09	Tracker : Silicon Detector : Support Structures and Assembly Engineering, procurement of Silicon Barrel support structures, mounting of silicon modules on the support structures	1,100
2.3.1	IT09	Tracker : MSGC Detector : Detectors (incl. Pre-series) Purchase and tests of MSGC Barrel detectors	3,590
2.3.2	IT09	Tracker : MSGC Detector : Electronics (incl. Engineering) Purchase of components of the electronics chain for MSGC Barrel detectors	4,300
2.3.6	IT09	Tracker : MSGC Detector : Service Systems Cables, gas and cooling from MSGC Barrel detectors to patch-panel	10
3.1.1	IT10	ECAL : Barrel : Crystals Transport tools and jigs, crystal control system, assembly of modules (50 %)	650
3.1.2	IT10	ECAL : Barrel : Electronics High-voltage power supplies, services controls	1,250
3.1.3	IT10	ECAL : Barrel : Mechanics Procurement of modules	1,700
5.1.1	IT02 IT06 IT11	Muon Detector : Barrel Drifttubes : Detectors and Components Assembly of chambers for 50 % of wires, purchase and setting up of tools, purchase and production of materials and parts, responsibility for electrodes assembly	4,130
5.1.2	IT02 IT06 IT11	Muon Detector : Barrel Drifttubes : Electronics Purchase, assembly, test and installation of front-end, read-out, trigger, high-voltage, low-voltage, engineering	6,610
5.1.3	IT02 IT06 IT11	Muon Detector : Barrel Drifttubes : Mechanical Structure and Supports Chamber supports	150
5.1.4	IT02 IT06 IT11	Muon Detector : Barrel Drifttubes : Assembly and Installation Transportation of chambers and parts, cabling	390
5.1.5	IT02 IT06 IT11	Muon Detector : Barrel Drifttubes : Monitoring Contribution to master and chamber controls	270
5.1.6	IT02 IT06 IT11	Muon Detector : Barrel Drifttubes : Service Systems Participation in the purchase of gas distribution and cooling systems	50
5.4.1	IT01 IT07	Muon Detector : Barrel RPC : Detectors and Components Participation in the purchase and testing of RPC chambers	1,950
5.4.2	IT01 IT07	Muon Detector : Barrel RPC : Electronics Purchase of front-end boards, test and quality control	750
5.4.4	IT01	Muon Detector : Barrel RPC : Assembly and Installation Transport of chambers to CERN	40
5.4.5	IT07	Muon Detector : Barrel RPC : Monitoring Slow Control system	60
5.4.6	IT07	Muon Detector : Barrel RPC : Service Systems Participation in the purchase of gas distribution and cooling systems	100
6.1.4	IT01	Trigger/DAQ : Trigger : RPC Trigger Sorting electronics for the RPC Trigger	100
7.	Italy	Offline Computing	500
		Total Assigned Funding	**55,000**

Note for Italy :

The responsibilities of Italy related to the Tracker are subject to the approval of the Tracker TDR and relative only to the Phase I.

10.21 KOREA

Estimated value of deliverables : 7'220 kCHF

Institutes supported (cf. Annex 1)
KR01 KR02 KR03 KR04 KR05 KR06 KR07 KR08 KR09 KR10 KR11 KR12 KR13 KR14

Ref.	Institutes	Deliverables	Assigned
1.	Korea	Magnet	2,270
5.4.1	KR12 KR13 KR14	Muon Detector : Barrel RPC : Detectors and Components Participation in the purchase and testing of RPCs	250
5.4.2	KR12 KR13 KR14	Muon Detector : Barrel RPC : Electronics Purchase of front-end boards, participation in high-voltage and low-voltage systems	600
5.4.3	KR12 KR13 KR14	Muon Detector : Barrel RPC : Mechanical Structure and Supports Construction of the complete system	210
5.4.4	KR12 KR13 KR14	Muon Detector : Barrel RPC : Assembly and Installation Shipment of chambers to CERN and installation tools	295
5.4.6	KR12 KR13 KR14	Muon Detector : Barrel RPC : Service Systems Participation in gas and cooling systems	20
5.5.1	KR01 KR02 KR03 KR04 KR05 KR06 KR07 KR08 KR09 KR10 KR11	Muon Detector : Forward RPC : Detectors and Components Construction of the complete system	940
5.5.2	KR01 KR02 KR03 KR04 KR05 KR06 KR07 KR08 KR09 KR10 KR11	Muon Detector : Forward RPC : Electronics Construction of the complete system	1,085
5.5.3	KR01 KR02 KR03 KR04 KR05 KR06 KR07 KR08 KR09 KR10 KR11	Muon Detector : Forward RPC : Mechanical Structure and Supports Construction of the complete system	150
5.5.4	KR01 KR02 KR03 KR04 KR05 KR06 KR07 KR08 KR09 KR10 KR11	Muon Detector : Forward RPC : Assembly and Installation Construction of the complete system	240
5.5.5	KR01 KR02 KR03 KR04 KR05 KR06 KR07 KR08 KR09 KR10 KR11	Muon Detector : Forward RPC : Monitoring Construction of the complete system	40
5.5.6	KR01 KR02 KR03 KR04 KR05 KR06 KR07 KR08 KR09 KR10 KR11	Muon Detector : Forward RPC : Service Systems Construction of the complete system	120
6.1.4	KR01 KR02 KR03 KR04 KR05 KR06 KR07 KR08 KR09 KR10 KR11	Trigger/DAQ : Trigger : RPC Trigger Participation in the construction of data transmission hardware	1,000
		Total Assigned Funding	**7,220**

10.22 PAKISTAN

Estimated value of deliverables : 1'000 kCHF

Institutes supported (cf. Annex 1)
PK1 PK2

Ref.	Institutes	Deliverables	Assigned
1.	Pakistan	Magnet (In-kind contribution : Barrel Yoke outer support feet, cf. Annex 9.1)	1,000
		Total Assigned Funding	**1,000**

10.23 POLAND

Estimated value of deliverables : 3'000 kCHF

Institutes supported (cf. Annex 1)
PL1 PL2

Ref.	Institutes	Deliverables	Assigned
1.	Poland	Magnet	940
6.1.4	PL1 PL2	Trigger/DAQ : Trigger : RPC Trigger Pattern comparator, trigger processor and data transmission hardware	2,060
		Total Assigned Funding	**3,000**

10.24 PORTUGAL

Estimated value of deliverables : 2'000 kCHF

Institutes supported (cf. Annex 1)
PT1

Ref.	Institutes	Deliverables	Assigned
1.	Portugal	Magnet	630
3.1.2	PT1	ECAL : Barrel : Electronics Responsibility to provide trigger and upper-level read-out electronics	710
3.2.2	PT1	ECAL : Endcaps : Electronics Responsibility to provide trigger and upper-level read-out electronics	405
6.1.1	PT1	Trigger/DAQ : Trigger : Calorimeter Trigger Responsibility to provide the control and read-out system	255
		Total Assigned Funding	**2,000**

10.25 RDMS-RUSSIA

Estimated value of deliverables : 20'500 kCHF

Institutes supported (cf. Annex 1)
RU1 RU2 RU3 RU4 RU5 RU6 RU7 JINR

Ref.	Institutes	Deliverables	Assigned
1.	RDMS-Russia	Magnet (1.4 MCHF for Package A, plus 0.3 MCHF for item 1.3.12, cf. Annex 9.1)	1,700
2.3.1	RU1	Tracker : MSGC Detector : Detectors (incl. Pre-series) Purchase and tests of of MSGC Endcap detectors	630
2.3.2	RU1	Tracker : MSGC Detector : Electronics (incl. Engineering) Purchase of components of the electronics chain for MSCG Endcap detectors	320
2.3.3	RU1	Tracker : MSGC Detector : Module Mechanics Engineering of MSGC Endcap detector modules	95
2.3.6	RU1	Tracker : MSGC Detector : Service Systems Cables, gas and cooling from MSCG Endcap detectors to patch-panels	5
3.2.1	RU2 RU3 RU5	ECAL : Endcaps : Crystals Purchase of crystals	50
3.2.2	RU2 RU3 RU6 RU7	ECAL : Endcaps : Electronics Purchase of VPT	1,000
3.2.3	RU2 RU3	ECAL : Endcaps : Mechanics Manufacture of alveolars and support structures	1,430
3.2.4	RU2 RU3	ECAL : Endcaps : Assembly and Installation Installation of "Dee" and installation into the detector	200
3.2.5	RU2	ECAL : Endcaps : Monitoring Purchase of optical connectors and cables	20
3.2.6	JINR	ECAL : Endcaps : Preshower Purchase of silicon detectors	750
4.3.01	JINR	HCAL : Endcap : Mechanics Purchase of materials and assembly	4,020
4.3.02	RU2 RU3	HCAL : Endcap : Optics Purchase of materials, machining of megatile trays and scintillators, assembly and shipping	280
4.3.10	RU2 RU3	HCAL : Endcap : Pre-production Prototypes Purchase of scintillators, fibres, machining, assembly	200
4.5.01	RU4 RU5	HCAL : Forward : Mechanics Responsibility to provide the complete system	1,675
4.5.02	RU4 RU5	HCAL : Forward : Optics Purchase of part of quartz fibres	70
4.5.06	RU4 RU5	HCAL : Forward : Calibration Systems Purchase of components of LED monitoring system and for radiation monitors	90
4.5.10	RU4 RU5	HCAL : Forward : Pre-production Prototypes Purchase of components for pre-production prototypes	165
5.2.1	JINR	Muon Detector : Forward ME 1/1 : Detectors and Components Responsibility to provide the complete system	1,755
5.2.2	JINR	Muon Detector : Forward ME 1/1 : Electronics Purchase of materials and components, assembly of electronics parts, test and calibration stations	1,110
5.2.3	JINR	Muon Detector : Forward ME 1/1 : Mechanical Structure, Supports Production chamber supports and installation devices	110
5.2.4	JINR	Muon Detector : Forward ME 1/1 : Assembly and Installation Assembly of chambers, transportation and installation into the detector	275
5.2.6	JINR	Muon Detector : Forward ME 1/1 : Service Systems Production of gas distribution and cooling system	50
5.3.1	RU7	Muon Detector : Endcap CSC : Detectors and Components Prototyping, tooling, assembly, testing and transport to CERN of the ME 2/1, ME 3/1 and ME 4/1 chambers. Critical tooling, chamber parts and electronics will be provided to PNPI from US_CMS	1,000
8.	RDMS-Russia	Infrastructure In-kind contributions to mechanics and shielding for HF and racks	3,500
		Total Assigned Funding	**20,500**

10.26 RDMS-Dubna Member States

Estimated value of deliverables : 6'400 kCHF

Institutes supported (cf. Annex 1)
AR1 BG1 BG2 BY1 BY2 BY3 BY4 GE1 GE2 JINR SK1 UR1 UR2 UR3 UZ1

Ref.	Institutes	Deliverables	Assigned
3.2.6	AR1 BY1 BY3 BY4 JINR	ECAL : Endcaps : Preshower Manufacture of part of mechanics and tooling	400
4.3.01	BG1 BG2 BY1 BY3 JINR UZ1	HCAL : Endcap : Mechanics Purchase of materials, machining, control assembly, transportation, assembly at CERN	4,275
4.3.10	AR1 BY1 BY3 BG1 BG2 JINR UR2 UR3	HCAL : Endcap : Pre-production Prototypes Purchase of materials, machining, assembly	325
5.2.2	BY3 BG1 BG2 JINR SK1	Muon Detector : Forward ME 1/1 : Electronics Procurement of front-end chips, printed circuit boards, complete high- and low-voltage systems, test and calibration stations	1,150
5.2.3	BY3 JINR SK1	Muon Detector : Forward ME 1/1 : Mechanical Structure, Supports Production of chamber supports and installation devices	100
5.2.4	BY3 JINR SK1	Muon Detector : Forward ME 1/1 : Assembly and Installation Assembly of chambers, transportation and installation in the detector	50
5.2.5	BG1 BG2 JINR	Muon Detector : Forward ME 1/1 : Monitoring Responsibility to provide the complete Slow Control system	50
5.2.6	BY3 JINR SK1	Muon Detector : Forward ME 1/1 : Service Systems Production of gas distribution and cooling system	50
		Total Assigned Funding	**6,400**

10.27 SLOVAK REPUBLIC

Funded through RDMS-Dubna Member States (cf. 10.26)

Institutes supported (cf. Annex 1)
SK1

10.28 SPAIN

Estimated value of deliverables : 6'000 kCHF

Institutes supported (cf. Annex 1)
SP1 SP2 SP3 SP4

Ref.	Institutes	Deliverables	Assigned
1.	Spain	Magnet	1,790
5.1.1	SP1	Muon Detector : Barrel Drifttubes : Detectors and Components Assembly of chambers corresponding to about 25 % of the total number of wires, setting up special tools, purchase and production of materials and parts	1,815
5.1.2	SP1	Muon Detector : Barrel Drifttubes : Electronics Purchase, assembly and installation of front-end, read-out and high-voltage electronics	1,050
5.1.3	SP1	Muon Detector : Barrel Drifttubes : Mechanical Structure and Supports Chamber supports	80
5.1.4	SP1	Muon Detector : Barrel Drifttubes : Assembly and Installation Transportation of chambers and parts	100
5.6.3	SP1 SP4	Muon Detector : Alignment : Link Complete link alignment system	1,065
7.		Offline Computing	100
		Total Assigned Funding	**6,000**

10.29 SWITZERLAND-ETHZ/Universities

Estimated value of deliverables : 78'500 kCHF

Institutes supported (cf. Annex 1)
SW1 SW3 SW4

Ref.	Institutes	Deliverables	Assigned
1.	ETH Zürich	Magnet (Participation in Packages A and C, cf. Annex 9.1)	25,000
2.1.1	SW1 SW3 SW4	Tracker : Pixel Detector : Detectors (incl. Pre-series) Purchase and testing of Pixel Barrel sensors	240
2.1.2	SW1 SW3 SW4	Tracker : Pixel Detector : Electronics (incl. Engineering) Purchase and testing of Pixel electronics	1,030
2.1.3	SW1 SW3 SW4	Tracker : Pixel Detector : Module Mechanics Bump bonding and assembly of Barrel modules	260
2.1.4	SW1 SW3 SW4	Tracker : Pixel Detector : Support Structures and Assembly Construction of half-shells and assembly of Barrel modules	110
2.1.6	SW1 SW3 SW4	Tracker : Pixel Detector : Service Systems Cables and cooling system for Pixel detector	160
2.2.1	SW1 SW3	Tracker : Silicon Detector : Detectors (incl. Pre-series) Purchase of silicon detectors	900
2.2.2	SW1 SW3	Tracker : Silicon Detector : Electronics (incl. Engineering) Purchase of components of the electronics chain for silicon detectors	1,100
2.2.3	SW1 SW3	Tracker : Silicon Detector : Module Mechanics Engineering of Silicon Detector modules	100
2.3.1	SW4	Tracker : MSGC Detector : Detectors (incl. Pre-series) Purchase and tests of MSGC Forward detectors	370
2.3.2	SW4	Tracker : MSGC Detector : Electronics (incl. Engineering) Purchase of components of the electronics chain for MSGC Forward detectors	590
2.3.4	SW4	Tracker : MSGC Detector : Support Structures and Assembly Engineering, procurement of MSGC Forward support structure, mounting of MSGC Forward modules on the support structures	40
3.1.1	SW1	ECAL : Barrel : Crystals Purchase of crystals, uniformization set-up, crystal control system, radiation test set-up	16,000
3.1.2	SW1	ECAL : Barrel : Electronics Front-end read-out and upper-level read-out system	8,000
3.1.3	SW1	ECAL : Barrel : Mechanics Procurement of modules and sub-modules	3,050
3.1.4	SW1	ECAL : Barrel : Assembly and Installation Tools and mounting of platforms	3,850
3.2.1	SW1	ECAL : Endcaps : Crystals Purchase of crystals, uniformization set-up, crystal control system, radiation test set-up	6,250
3.2.2	SW1	ECAL : Endcaps : Electronics Front-end read-out and upper-level read-out system	5,350
6.2.1	SW1	Trigger/DAQ : Data Acquisition : Read-out Unit Delivery of read-out units	1,390
6.2.2	SW1	Trigger/DAQ : Data Acquisition : Filter Unit Delivery of filter farm nodes	2,865
6.2.3	SW1	Trigger/DAQ : Data Acquisition : Event Builder Delivery of event builder switch	1,245
7.	ETH Zürich	Offline Computing	600
		Total Assigned Funding	**78,500**

Note for Switzerland-ETHZ/Universities :

The funding period for equipment to be procured with funds supplied by ETH and the Swiss Universities extends beyond the year 2005.

10.30 SWITZERLAND-PSI

Estimated value of deliverables : 8'500 kCHF

Institutes supported (cf. Annex 1)
SW2

Ref.	Institutes	Deliverables	Assigned
1.	Switzerland-PSI	Magnet (Participation in Package A, cf. Annex 9.1)	2,610
2.1.1	SW2	Tracker : Pixel Detector : Detectors (incl. Pre-series) Purchase and testing of Pixel Barrel sensors	410
2.1.2	SW2	Tracker : Pixel Detector : Electronics (incl. Engineering) Purchase and testing of Pixel electronics	2,250
2.1.3	SW2	Tracker : Pixel Detector : Module Mechanics Bump bonding and assembly of Barrel modules	460
2.1.4	SW2	Tracker : Pixel Detector : Support Structures and Assembly Construction of half-shells and assembly of Barrel modules	140
2.1.5	SW2	Tracker : Pixel Detector : Monitoring Temperature and radiation monitoring	60
2.1.6	SW2	Tracker : Pixel Detector : Service Systems Cables and cooling system for Pixel detector, insertion tooling	280
3.1.2	SW2	ECAL : Barrel : Electronics Purchase and quality control of APDs	1,720
6.2.1	SW2	Trigger/DAQ : Data Acquisition : Read-out Unit Participation in purchase of read-out modules	350
6.2.2	SW2	Trigger/DAQ : Data Acquisition : Filter Unit Participation in purchase of CPU	150
7.	Switzerland-PSI	Offline Computing	70
		Total Assigned Funding	**8,500**

Note for Switzerland-PSI :

The funds provided by PSI include those required after 2005 for the Pixel Detector.

10.31 TURKEY

Estimated value of deliverables : 1'000 kCHF

Institutes supported (cf. Annex 1)
TR1 TR2

Ref.	Institutes	Deliverables	Assigned
1.	Turkey	Magnet	310
4.5.02	TR1 TR2	HCAL : Forward : Optics Production of components for optics system (about 30 %)	670
4.5.09	TR1 TR2	HCAL : Forward : Detector Control Systems Delivery of components (about 12 %)	15
4.5.10	TR1 TR2	HCAL : Forward : Pre-production Prototypes Delivery of some components	5
		Total Assigned Funding	**1,000**

10.32 UKRAINE

Funded through RDMS-Dubna Member States (cf. 10.26)

Institutes supported (cf. Annex 1)
UR1 UR2 UR3

10.33 UNITED KINGDOM

Estimated value of deliverables : 9'100 kCHF

Institutes supported (cf. Annex 1)
UK1 UK2 UK3 UK4

Ref.	Institutes	Deliverables	Assigned
1.	United Kingdom	Magnet	2,650
2.2.2	UK1 UK2 UK3	Tracker : Silicon Detector : Electronics (incl. Engineering) Design, develop and procure part of the front-end driver units and part of APV6 front-end chips	1,500
2.3.2	UK1 UK2 UK3	Tracker : MSGC Detector : Electronics (incl. Engineering) Design, develop and procure part of the front-end driver units and part of APV6 front-end chips	1,200
3.2.1	UK1 UK2 UK3 UK4	ECAL : Endcaps : Crystals Set up a Regional Centre for the construction of "Super Crystals" equipped with the necessary jigs, tooling, crystal measuring system, and data base software and hardware	400
3.2.2	UK1 UK2 UK3 UK4	ECAL : Endcaps : Electronics Develop, prototype and contribute to the procurement of vacuum photo-triodes. Design and procure "Super Crystal" circuit boards and connectors	950
3.2.3	UK1 UK2 UK3 UK4	ECAL : Endcaps : Mechanics Design and procure "Super Crystal" inserts, housings, interface plates and seatings	800
3.2.4	UK1 UK2 UK3 UK4	ECAL : Endcaps : Assembly and Installation Assemble and test the "Super Crystals" required to equip three "Dees"	550
6.1.1	UK4	Trigger/DAQ : Trigger : Calorimeter Trigger Design, prototype and construct the Global Calorimeter Trigger, together with the associated ancillary equipment	400
6.2.1	UK3	Trigger/DAQ : Data Acquisition : Read-out Unit Contribute to the procurement of read-out control units	450
7.	United Kingdom	Offline Computing	200
		Total Assigned Funding	**9,100**

Note for United Kingdom :

The definition of the ECAL Endcap deliverables is subject to the following qualifying remarks. The project is still under development.

In particular further work is required to establish the maximum size of crystal that can be supplied by the producers, leading to a substantial uncertainty in the number of channels required.

Furthermore, the division of responsibilities between the UK groups and the groups from RDMS engaged in the ECAL Endcap project is still under discussion.

The UK will make its best efforts to deliver the items listed above but cannot guarantee to do so in view of the above and other uncertainties.

10.34 UNITED STATES-DOE

Estimated value of deliverables : 88'510 kCHF

Institutes supported (cf. Annex 1)
US01 US02 US03 US04 US05 US06 US07 US08 US09 US10 US11 US12 US13 US15 US16 US18 US19 US20 US21 US22 US23 US26 US28 US29 US30 US31 US32 US34 US35 US37

Ref.	Institutes	Deliverables	Assigned
1.	US-DOE	Magnet (Participation in Packages A and B, cf. Annex 9.1)	26,960
2.1.2	US03	Tracker : Pixel Detector : Electronics (incl. Engineering) Purchase and testing of Pixel electronics	695
2.1.3	US10 US13 US26 US35	Tracker : Pixel Detector : Module Mechanics Bump bonding and assembly of Endcap modules	290
2.1.4	US03 US10 US26 US30	Tracker : Pixel Detector : Support Structures and Assembly Construction of half-disks and assembly of Endcap modules	230
2.1.5	US03 US23	Tracker : Pixel Detector : Monitoring Temperature and radiation monitoring	50
2.1.6	US23	Tracker : Pixel Detector : Service Systems Cables and cooling system for Pixel detector	215
3.1.2	US25 US22 US29	ECAL : Barrel : Electronics Purchase and quality control of APDs	3,455
3.1.5	US07	ECAL : Barrel : Monitoring Light injection system	510
4.1.01	US10 US20 US23 US32	HCAL : Barrel : Mechanics Delivery of complete system	10,850
4.1.02	US10 US12 US23 US30 US32	HCAL : Barrel : Optics Procurement of components for optics system (about 3/4 of full scope)	1,590
4.1.04	US10 US22 US30	HCAL : Barrel : Photodetectors Procurement of photodetectors (about 1/8 of full scope)	130
4.1.05	US02 US09 US10 US22 US30	HCAL : Barrel : Front-end Electronics Delivery of complete system	1,645
4.1.06	US10 US12 US15 US30 US32	HCAL : Barrel : Calibration Systems Delivery of complete system	480
4.1.07	US02 US10 US20	HCAL : Barrel : Trigger/DAQ Electronics Delivery of complete system	445
4.1.08	US10 US20	HCAL : Barrel : Voltage Supply Systems Delivery of complete system	440
4.1.09	US02 US10 US20 US30	HCAL : Barrel : Detector Control Systems Delivery of complete system	210
4.1.10	US10 US12 US15 US20 US22 US23 US30 US32	HCAL : Barrel : Pre-production Prototypes Delivery of complete system	1,505
4.2.02	US10 US23 US32	HCAL : Outer Barrel : Optics Procurement of components for optics system (about 1/5 of full scope)	240
4.2.05	US02 US10 US22	HCAL : Outer Barrel : Front-end Electronics Delivery of complete system	500
4.2.06	US10 US12 US15 US30	HCAL : Outer Barrel : Calibration Systems Delivery of complete system	65
4.2.07	US02 US10 US20	HCAL : Outer Barrel : Trigger/DAQ Electronics Delivery of complete system	185
4.2.08	US10 US20	HCAL : Outer Barrel : Voltage Supply Systems Delivery of complete system	110
4.2.09	US02 US10 US20	HCAL : Outer Barrel : Detector Control Systems Delivery of complete system	140
4.3.02	US23 US30 US32	HCAL : Endcap : Optics Procurement of components for optics system (about 1/2 of full scope)	415
4.3.05	US02 US10 US22 US30	HCAL : Endcap : Front-end Electronics Delivery of complete system	680
4.3.06	US10 US12 US15 US30	HCAL : Endcap : Calibration Systems Delivery of complete system	210
4.3.07	US02 US10 US20	HCAL : Endcap : Trigger/DAQ Electronics Delivery of complete system	270
4.3.08	US10 US20	HCAL : Endcap : Voltage Supply Systems Delivery of complete system	205
4.3.09	US02 US10 US20 US30	HCAL : Endcap : Detector Control Systems Delivery of complete system	145

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4.4.01	US10 US20	HCAL : Outer Endcap : Mechanics Delivery of complete system	65
4.4.02	US12 US20 US23 US32	HCAL : Outer Endcap : Optics Delivery of complete system	175
4.4.04	US10 US22	HCAL : Outer Endcap : Photodetectors Delivery of complete system	95
4.4.05	US02 US10 US22	HCAL : Outer Endcap : Front-end Electronics Delivery of 1/2 of complete system	110
4.4.06	US10 US12 US15 US30	HCAL : Outer Endcap : Calibration Systems Delivery of complete system	25
4.4.07	US02 US10 US20	HCAL : Outer Endcap : Trigger/DAQ Electronics Delivery of complete system	90
4.4.09	US02 US10 US20	HCAL : Outer Endcap : Detector Control Systems Delivery of complete system	70
4.5.01	US15	HCAL : Forward : Mechanics Procurement of back-planes tooling, production and shipping	45
4.5.02	US15	HCAL : Forward : Optics Procurement of components for optics system (about 1/8 of full scope)	270
4.5.03	US09 US15	HCAL : Forward : Read-out Boxes Delivery of complete system	75
4.5.04	US09 US15	HCAL : Forward : Photodetectors Delivery of complete system	670
4.5.05	US02 US10	HCAL : Forward : Front-end Electronics Delivery of complete system	580
4.5.06	US09 US10 US12 US15 US16 US30	HCAL : Forward : Calibration Systems Delivery of components (about 85 % of full scope)	290
4.5.07	US02 US10 US15 US16	HCAL : Forward : Trigger/DAQ Electronics Delivery of complete system	235
4.5.08	US09 US10	HCAL : Forward : Voltage Supply Systems Delivery of complete system	310
4.5.09	US02 US10 US16	HCAL : Forward : Detector Control Systems Delivery of components (about 1/3 of full scope)	40
4.5.10	US02 US09 US10 US12 US15 US16 US30 US35	HCAL : Forward : Pre-production Prototypes Delivery of components (about 2/5 of full scope)	115
5.3.1	US03 US04 US05 US08 US10 US11 US37	Muon Detector : Endcap CSC : Detectors and Components Delivery of complete system in collaboration with CN1 and RU7	9,805
5.3.2	US03 US04 US08 US28 US31	Muon Detector : Endcap CSC : Electronics Delivery of complete system	11,425
5.3.3	US37	Muon Detector : Endcap CSC : Mechanical Structure and Supports Delivery of complete system	490
5.3.4	US04 US10 US11 US37	Muon Detector : Endcap CSC : Assembly and Installation Delivery of complete system	230
5.3.5	US04 US10 US37	Muon Detector : Endcap CSC : Monitoring Delivery of complete system	35
5.3.6	US10 US37	Muon Detector : Endcap CSC : Service Systems Delivery of complete system	650
6.1.1	US37	Trigger/DAQ : Trigger : Calorimeter Trigger Calorimeter regional trigger	4,050
6.1.2	US03 US04 US08 US11 US21 US28 US31	Trigger/DAQ : Trigger : CSC Trigger Delivery of complete system	1,100
6.2.2	US06 US10 US16 US21	Trigger/DAQ : Data Acquisition : Filter Unit Delivery of FUI, FUM, FUO and crates (complete system)	3,425
6.2.3	US10 US21	Trigger/DAQ : Data Acquisition : Event Builder Delivery of event manager	175
7.	USA-DOE	Offline Computing	1,000
		Total Assigned Funding	**88,510**

Note for United States-DOE :

This table describes the US contributions to the full scope high luminosity CMS detector. An initial detector with Cost Book value for the US reduced by about 10 % has been discussed with and approved by CMS management.

It is this reduced set of deliverables to which the US is committed. If cost performance allows, the US deliverables will be revised towards the goal of high-luminosity performance.

10.35 UNITED STATES-NSF

Estimated value of deliverables : 12'100 kCHF

Institutes supported (cf. Annex 1)
US04 US06 US14 US17 US24 US25 US27 US33 US36

Ref.	Institutes	Deliverables	Assigned
1.	USA-NSF	Magnet (Participation in Packages A and B, cf. Annex 9.1)	3,600
2.1.1	US17	Tracker : Pixel Detector : Detectors (incl. Pre-series) Puchase and testing of Pixel Endcap sensors	315
2.1.2	US17 US33	Tracker : Pixel Detector : Electronics (incl. Engineering) Purchase and testing of Pixel electronics	675
3.1.2	US25	ECAL : Barrel : Electronics Purchase and quality control of APDs	2,015
4.1.02	US14 US27	HCAL : Barrel : Optics Delivery of components (about 1/5 of full scope)	440
4.1.03	US14 US27	HCAL : Barrel : Read-out Boxes Delivery of complete system	360
4.1.04	US27 US36	HCAL : Barrel : Photodetectors Delivery of components (about 90 % of full scope)	895
4.1.10	US14 US27	HCAL : Barrel : Pre-production Prototypes Delivery of special components	25
4.2.03	US14 US27	HCAL : Outer Barrel : Read-out Boxes Delivery of complete system	300
4.2.04	US27 US36	HCAL : Outer Barrel : Photodetectors Delivery of complete system	490
4.2.10	US14 US27	HCAL : Outer Barrel : Pre-production Prototypes Delivery of complete system	5
4.3.02	US14 US27	HCAL : Endcap : Optics Procurement of components for optics system (about 1/5 of full scope)	180
4.3.03	US14 US27	HCAL : Endcap : Read-out Boxes Delivery of complete system	320
4.3.04	US27 US36	HCAL : Endcap : Photodetectors Delivery of complete system	455
4.3.10	US14 US27	HCAL : Endcap : Pre-production Prototypes Delivery of special components	10
4.4.05	US14 US27	HCAL : Outer Endcap : Front-end Electronics Delivery of 1/2 of complete system	100
4.5.11	US24	HCAL : Forward : Luminosity Monitor Delivery of complete system	130
5.6.2	US10 US25	Muon Detector : Alignment : Forward Delivery of complete system	890
6.2.2	US04 US06	Trigger/DAQ : Data Acquisition : Filter Unit Delivery of FUS	765
7.	USA-NSF	Offline Computing	130
		Total Assigned Funding	**12,100**

Note for United States-NSF :

This table describes the US contributions to the full scope high luminosity CMS detector. An initial detector with Cost Book value for the US reduced by about 10 % has been discussed with and approved by CMS management.

It is this reduced set of deliverables to which the US is committed. If cost performance allows, the US deliverables will be revised towards the goal of high-luminosity performance.

10.36 UZBEKISTAN

Funded through RDMS-Dubna Member States (cf. 10.26)

Institutes supported (cf. Annex 1)
UZ1

ANNEX 11

GENERAL CONDITIONS FOR EXPERIMENTS PERFORMED AT CERN

25 April 1989

(Enclosed)

25 April, 1989

GENERAL CONDITIONS

for experiments performed at CERN

The mission of the European Organization for Nuclear Research (CERN) is to sponsor international scientific research in high-energy physics. When running an experiment at CERN, the Universities and Research Institutions need to be informed of the rules and procedures concerning organizational, managerial and fmancial matters.

The role of CERN as that of a Host Laboratory, to be distinguished from the scientific responsibility in an experiment which lies with the collaboration, is addressed in the present document.

1. SCOPE OF APPLICATION

1.1. The General Conditions apply to experiments that are carried out at CERN by the combined efforts of several Universities and Research Institutions.

1.2. These experiments have to be approved by the CERN Research Board after consideration of written proposals submitted to the appropriate experiments committees; both scientific interest and the constraints imposed by available resources are taken into account.

2. PARTIES AND THEIR REPRESENTATION

2.1. The Parties concerned include:

- CERN, in its role as Host Laboratory, hereinafter referred to as ***"CERN as Host"*** (or simply "CERN"),
- the Institutions responsible for the research teams taking part in the experiments and forming ***the Collaboration,*** hereinafter collectively referred to as the Collaborating Institutions,
- where CERN research teams take part in the experiments, CERN like any other ***Collaborating Institution.***

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

2.3. All Parties make an obligation of their own to ensure compliance of the General Conditions by their staff.

3. CONSTITUTIVE DOCUMENTS

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

3.1.1. the ***EXPERIMENTAL PROPOSAL,*** after its approval by the CERN Research Board;

3.1.2. 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 the Collaborating Institutions; special agreements or protocols of relevance may be appended to the Memorandum of Understanding;

3.1.3. the present ***GENERAL CONDITIONS,*** which the Parties accept by signing the Memorandum of Understanding, unless they agree on derogations therefrom, specified in the Memorandum of Understanding.

Contents of the Memorandum of Understanding

3.2. As a guidance, 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) a mention of the persons carrying specific responsibilities for 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 approximate requirements for manpower and money for the main items of the detector and of the auxiliary equipment, together with the contributions of the Parties;

- a timetable for the construction of the equipment to be provided for the eperiment;

d) the obligations of the Parties concerning the installation, operation and maintenance of the detector and auxiliary equipment;

e) an explicit reference to the General Conditions which the Parties accept, unless other-wise specified in the Memorandum of Understanding; moreover, explicit references must be made to the special agreements and protocols relevant to the experiment.

4. ORGANIZATION OF THE COLLABORATION

Internal autonomy and coordination with CERN

4.1. In its internal relations, the Collaboration is free to take such organizational decisions as deemed necessary. However, in preparing and realizing the experiment, the Collaboration shall take into account the rules in force on the sites of CERN.

Co-ordination in matters of safety

4.2. The Spokesperson of the Collaboration shall appoint, with the agreement of CERN, a Group Leader in Matters of Safety (GLIMOS). The rights and obligations of the GLIMOS are defined in the document "*Safety Policy at CERN - SAPOCO/42*". For practical reasons, a GLIMOS must normally be present at CERN.

Finance Review Committee

- ***Initial Decision***

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

- ***Membership***

4.4. The FRC will be chaired by the appropriate Director of Research and will also include as members one representative of each Funding Agency or of the Collaborating Institution duly entitled, together with the Spokesperson of the Collaboration.

- ***Terms of Reference***

4.5. The task of the FRC will be to monitor the financial aspects of the experiment as detailed in the Memorandum of Understanding. It is recalled that financial arrangements between CERN and the Collaboration are subject to the rules currently in force for visiting teams at CERN.

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 agrees to the installation of the detector, its auxiliary equipment and counting rooms in the appropriate experimental area, provided they satisfy CERN safety standards.

Duration

5.3. CERN agrees to keep the detector on site at least until the data taking for the experimental programme approved by its Research Board has been completed.

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 with its compatibility standards.

Insurances

- ***concerning property***

5.5. The items belonging to the Collaboration and the Collaborating Institutions, once they have been officially accepted on the CERN sites, will be insured at CERN's expense against the risks of fire, explosion, elemental power and water damage.

- ***in case of civil liability***

5.6. The civil liability of the Collaboration, the Collaborating Institutions and their staff on the CERN sites will be covered, in case of damage caused to third persons and property, by the CERN operational risk insurance scheme.

- ***and their limits***

5.7. However, the CERN insurance coverage is effective only above certain franchise sums which, in case of damage, will be charged to the Collaboration.

Social insurance

5.8. Independently of the foregoing provisions, the social insurance for the experimental teams remains normally the responsibility of the employer institutions concerned.

SERVICES

User Support Services and Users Office

5.9. CERN will provide access to its services, as described in the document "*User Support Services at CERN*" and under the conditions stated therein.

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 lirnits 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 communi-cation 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, its auxiliary equipment and the counting and control rooms;

e) laboratory and hall space for construction, testing and assembly of equipment;

f) storage place for spare parts, handling and assembly tools, detector and auxiliary equipment awaiting installation or removal;

g) office space, equipped with standard furniture and infrastructure facilities like terminal lines, telephones and electricity;

- ***Supplies and installations at the experiment***

h) help with the installation and removal of the detector and its auxiliary equipment, including the provision of crane and rigging services, geometrical survey and alignment, transport of equipment on and between the Laboratory sites, as well as inside the experimental areas;

i) basic infrastructure, such as counting houses, local air conditioning and cryogenics in amounts to be specified in the Memorandum of Understanding;

j) local supply of electricity, water, compressed air and standard terminal lines connected to the CERN communication network;

- ***Computing***

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

- ***Transport of persons***

l) basic transportation for personnel between CERN sites;

- ***Safety services***

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

- ***Administrative services***

n) access to its administrative services to help the Collaboration to purchase the necessary items for the experimental programme, in accordance with the CERN Financial Rules.

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 as to its construction, operation and maintenance shall be specified therein.

6. OBLIGATIONS OF THE COLLABORATING INSTITUTIONS

Basic Obligations

6.1. Any staff and property of Collaborating Institutions located at CERN will, while retaining their status in respect to their home institution, come under the authority of the Director-General of CERN and shall comply with the relevant regulations in force on the sites of the Organization.

Medical surveillance and certificates

6.2. Each Collaborating Institution sending staff to CERN remains responsible as employer for the medical surveillance of its staff and, in the case of staff who will work in places which are considered as presenting special risk conditions (e.g. radiation controlled areas), shall supply a certificate of medical aptitude on first arrival at CERN.

Safety briefings and inspections

6.3. For safety reasons, Collaborating Institutions shall participate in safety meetings and studies of their experiment and accept the right of the CERN services 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 sites, according to an agreed time table and in working order, the equipment which 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.

Transport of equipment

6.5. Each Collaborating Institution supplying equipment shall be responsible for its delivery to and removal from the CERN sites.

Ownership status

6.6. The delivery of items to the CERN site, or the handling of such items there, will not affect rights of property 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, under formal mutual agreement, be transferred to CERN, should it be mutually advantageous to do so.

Ownership inventory

6.7. As condition of application of the CERN insurances, each Collaborating Institution must provide CERN with a list of the property which it installs on the CERN site. It shall keep the said list up to date and, where necessary, inform CERN of any modifications to it.

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, the contribution of CERN as host being limited in principle to the assistance detailed in paragraph 5.10 i) above.

Operation, maintenance and costs of equipment

6.9. The Collaboration is collectively responsible for the operation and maintenance of the equipment supplied by the Collaborating Institutions, 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 will be provided by CERN.

Assignment of equipment

6.10. In order not to affect adversely CERN's experimental programme and schedules, any Party providing equipment undertakes to leave it at CERN at the disposal of the Collaboration until the experiment is officially declared complete (see 8.2 below).

Early removal of equipment

6.11. On the other hand, 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 sites under the responsibility of the said Institution and with the assistance of CERN.

Release of space

6.12. As soon as the experiment is declared complete (see 8.2 below), the 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 and storage of equipment

6.13. If requested by CERN, equipment associated with the experiment shall be removed from the CERN sites within a maximum of two years after completion of the experiment. Storage for such period must be approved by the Division Leader concerned.

7. INTELLECTUAL PROPERTY

Free use of knowledge and data

7.1. In the context of the experimental programme, each Party shall be entitled to use for its own purposes any acquired knowledge, whether patentable or not, as well as any expertise developed during the manufacture of the components. All data obtained from experi-mental runs are made accessible to all Collaborating Institutions.

Matters for prior agreement

7.2. If a patentable invention or a new virtually profitable technique is developed by one of the Parties in the context of the experiment, the others shall be informed thereof as soon as possible in order to decide on the appropriate ownership, before further steps are taken; it is understood that every Party shall be entitled to a free utilization license as provided for under paragraph 7.1. above. Pending such decision, the Parties will refrain from action that would prejudice patent-taking or licensing.

8. FINAL PROVISIONS

Modifications and formal amendments

8.1. The Collaboration will settle and duly announce to CERN any modification or addition to the experiment which affects the terms of the Memorandum of Understanding. Major modifications shall be approved as formal amendments to the Memorandum of Understanding and consequently be accepted and signed by the representatives of the Parties.

Duration of the applicability of the Memorandum of Understanding

8.2. The terms and conditions of the Memorandum of Understanding will apply until the experiment is declared complete by the appropriate CERN Research Director in agreement with the Spokesperson.

Observance of the Memorandum of Understanding

8.3. The Memorandum of Understanding formalizes the agreement reached between all the Parties on the experiment and constitutes therefore the code of conduct which the Parties have accepted to follow with their best efforts.

Relevant documents

8.4. The following basic documents should be known by the members of the Collaboration taking part in experiments at CERN:

- the CERN Users' Guide,
- the User Support Services at CERN,
- the Safety Guide for CERN experiments,
- the Safety Policy at CERN - SAPOCO/42.

ACCU

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