Annex 8.1

Update of the ATLAS Detector funding by Funding Agency

(CORE MoU, in 1995 ATLAS MCHF)

revision December 31, 2007

Funding Agency	Inner Det.	LAr Cal.	Tile Cal.	Muon cham.	Trigger/ DAQ/con.	Common Projects	Total
Argentina						0.3	**0.3**
Armenia			0.1			0.1	**0.2**
Australia	1.4					1.1	**2.5**
Austria					0.3	0.3	**0.6**
Azerbaijan						0.1	**0.1**
Belarus						0.2	**0.2**
Brazil			0.1			0.1	**0.2**
Canada	0.1	8.4				6.6	**15.1**
Chile						0.1	**0.1**
China NSFC+MSTC		0.3		0.3		0.4	**1.0**
Colombia						0.1	**0.1**
Czech Republic	0.5		0.5			0.6	**1.6**
Denmark	0.9				1.0	1.4	**3.3**
Finland						0.1	**0.1**
France IN2P3	2.1	17.8	2.1			17.0	**39.0**
France CEA*		5.7		2.2		5.8	**13.7**
Georgia						0.1	**0.1**
Germany BMBF	7.9	3.2		2.5	4.7	14.2	**32.5**
Germany DESY							**0.0**
Germany MPI	1.7	1.6		0.9		3.3	**7.5**
Greece				1.0		0.7	**1.7**
Israel				2.5	0.4	2.1	**5.0**
Italy	5.0	3.7	1.3	9.3	5.9	19.8	**45.0**
Japan	6.8			6.8	4.5	14.0	**32.1**
Morocco		0.2				0.1	**0.3**
Netherlands	1.8			3.0	0.9	6.7	**12.4**
Norway	2.4					1.8	**4.2**
Poland	0.4				0.2	0.4	**1.0**
Portugal			1.0		0.3	0.9	**2.2**
Romania			0.3			0.3	**0.6**
Russia	3.4	4.7	1.1	3.5		8.0	**20.7**
JINR	0.5	0.7	0.8	1.0	0.1	2.3	**5.4**
Serbia						0.3	**0.3**
Slovak Republic		0.3				0.2	**0.5**
Slovenia	0.8					0.7	**1.5**
Spain	1.2	2.3	2.0			4.3	**9.8**
Sweden	3.1	1.5	0.9		0.6	4.7	**10.8**
Switzerland	4.9	1.1			4.0	8.5	**18.5**
Taipei	1.0	0.7				1.3	**3.0**
Turkey					0.2	0.2	**0.4**
United Kingdom	13.1				5.9	15.0	**34.0**
US DOE + NSF	12.0	16.9	3.6	8.8	4.0	35.5	**80.8**
CERN	9.0	8.6	3.0	1.5	11.5	27.4	**61.0**
Total	80.0	77.7	16.8	43.3	44.5	207.1	**469.4**
Rev. CORE detector cost	78.5	80.0	15.2	42.5	45.9	208.7	**470.8**
Total - cost	1.5	-2.3	1.6	0.8	-1.4	-1.6	-1.4

Comment: A number of Funding Agencies have indicated possible additional contributions to the Common Projects

* This contribution by CEA does not include a special contribution of 1MCHF concerning engineering of the barrel toroid, to be considered as an advance on any possible future contributions

Obtain data from TSP and reconstruct tracks
(Australia, CERN, Cracow, Prague, Germany, Japan, NIKHEF, Norway, Russia, Ljubljana, Geneva, UK, Uppsala, Valencia) ---> 1999

Prototype Off-detector Electronics
(Geneva, UK, USA) ---> 1999

Multi-module system tests
(Australia, CERN, Cracow, Prague, Germany, Japan, NIKHEF, Norway, Russia, Ljubljana, Geneva, UK, Uppsala, USA, Valencia) ---> 1999

Distribution of commitments to detector construction

The costs listed indicate the value of the commitment to deliverables in 1995 kCHF according to the ATLAS cost document, CORE version 7, dated 31 January, 1998; the dates indicate the time the delivery is requested according to the construction schedule.

- Procurement of Silicon Detectors including testing, monitoring radiation tolerance and delivery to module assembly centres (1/99 - 2/02)
  Barrel detector (8550 kCHF)
  Japan (57%), Norway (18%), UK (25%)
  Forward detector (7090 kCHF)
  Germany (41%), Geneva (29%), UK (26%), Valencia (7%)

- Procurement of Frontend ASICs, including testing, monitoring radiation tolerance and delivery to module assembly centres
  (5890 kCHF; 1/99 - 2/01)
  CERN (5.9%), Norway (2.8%), Geneva (4.5%), UK (25.7%), Uppsala (6.6%), USA (50.0%), Valencia (4.5%)

- Supply of Frontend system components and testing (385 kCHF; 1/99 - 2/01)
  CERN (24.5%), Norway (11.5%), Geneva (18.5%), Uppsala (27.0%), Valencia (18.5%)

- Supply of bridging and digital circuits (1195 kCHF; 1/99 - 4/01)
  UK (100%)

- Procurement of Hybrids including population with SMD components, assembly of ASICs to Hybrids including wirebonding, testing and 'burn-in' (1/99 - 2/02)
  Barrel detector (2080 kCHF)
  Japan (27%), Uppsala (18%), UK (25%), USA (30%)
  Forward detector (1860 kCHF)
  CERN (9%), Germany (30%), Geneva (22%), NIKHEF (4%), Russia (4%), UK (27%), Valencia (9%)

- Supply of module components and testing (3/99 - 4/02)
  Barrel detector (1110 kCHF)
  Japan (27%), Norway (9%), Uppsala (9%), UK (25%), USA (30%)
  Forward detector (1070 kCHF)
  Australia (5%), Germany (34%), NIKHEF (5%), Geneva (25%), UK(27%), Valencia (9%)

- Assembly of Modules at cluster sites and testing prior to delivery to the pre-assembly sites:

barrel module 1:	*Norway, Uppsala (9%)*
barrel module 2:	*UK (13%)*
barrel module 3:	*Japan (14%)*
barrel module 4:	*USA (15%)*
forward module 1:	*Australia, CERN, Cracow, Prague, Ljubljana, Geneva, Moscow (15%)*
forward module 2:	*Prague, Germany, NIKHEF, Protvino (17%)*
forward module 3:	*UK, Valencia (17%)*

- Assembly of Data-links (optohybrids, optical links, off-detector driver/receiver) including testing and delivering to pre-assembly sites
  (2620 kCHF; 3/99 - 3/01)
  CERN (15.8%), Japan (17.6%), Norway (4.5%), Ljubljana (7.7%), UK (45.6%), Uppsala (4.5%), Valencia (4.4%)

- Supply of low mass cables and patchpanels and connectors including testing and delivering to pre-assembly/final assembly sites
  (1455 kCHF; 3/99 - 3/01)
  Germany (19.8%), Ljubljana (43.7%), Geneva (11.5%), UK (25.0%)

- Supply of Off-detector Electronics including crates, power supplies
  (1510 kCHF; 10/99 - 3/04)
  UK (25.0%), USA (75.0%)

- Supply of Low Voltage Power supplies
  (1470 kCHF; 10/99 - 3/04)
  Australia (31.0%), Prague (20.4%), Geneva (28.6%), UK (20.0%)

- Supply of Detector Bias
  (1005 kCHF; 10/99 - 3/04)
  CERN (13.8%), Cracow (19.9%), Germany (46.3%), UK (20.0%)

- Supply of External Cables
  (2015 kCHF; 10/99 - 3/04)
  Australia (31.0%), CERN (16.7%), Germany (23.9%), Geneva (12.8%), not covered (15.6%)

- Provide the temperature, coolant and current monitoring devices and the SCT specific DCS hardware and software
(415 kCHF; 1/99 - 2/01)
Uppsala (100%), Russia

- Provide CF cylinder structure, mechanical fixtures, brackets, local cooling, cable harnesses and assemble modules to cylinders
(2590 kCHF; 9/99 - 12/02)
CERN (1.3%), Japan (25.0%), Norway (3.7%), Geneva (40.0%), UK (30%)

- Provide Space Frame, CF disks, mechanical fixtures, local cooling cable harnesses, and assemble modules to disks
(2485 kCHF; 9/99 - 12/02)
Australia (10.4%), CERN (0.4%), NIKHEF (47.3%), Russia (4.2%), UK (37.7%)

C. Transition Radiation Tracker (TRT)

Institutes participating:

Denmark:	Copenhagen		
Poland:	Cracow		
Russia:	Moscow FIAN	Moscow MEPhI	Moscow SU
	Petersburg NPI		
JINR			
Sweden:	Lund		
US:	Ann Arbor	Duke	Hampton
	Indiana	Philadelphia	
CERN			

Milestones:

Barrel module 0	December	1998
End-cap module 0	December	1998
Initial production milestone (1/8 of barrel modules, at least 2 end-cap wheels and pre-production electronics ready)	June	2000
Start procurement of front-end ASICs	June	2000
Barrel construction complete	December	2002
End-cap construction complete	February	2003

- hedgehog boards (80 kCHF)
  (Freiburg, Munich LMU, Munich MPI) (100%)

- patch panels (30 kCHF)
  JINR (100%)

EOL: - mechanics, transport (1020 kCHF)
  Protvino (100%)

- hedgehog boards (80 kCHF)
  (Freiburg, Munich LMU, Munich MPI) (100%)

- patch panels (35 kCHF)
  JINR (100%)

MDT electronics and gas system

The dates (month/year) indicate the completion of the production of the subsystems.

- On-chamber electronics and R/O cards; 9/00 (2435 kCHF)
  (Boston, Harvard) (100%)

- TDCs for drift time readout; 9/00 (1415 kCHF)
  (KEK, Tokyo UAT) (100%)

- Off-chamber readout electronics (RODs); 6/03 (1680 kCHF)
  (Freiburg, Munich LMU, Munich MPI) (20%), Nijmegen (41%), Saclay (33%), JINR (6%)

- High voltage power supply system; 1/03 (1850 kCHF)
  (Frascati, Pavia, Roma I) (84%),
  (Freiburg, Munich LMU, Munich MPI) (16%)

- Low voltage power supply system; 1/03 (170 kCHF)
  (Frascati, Pavia, Roma I) (100%)

- MDT gas system; 6/03 (900 kCHF)
  CERN (78%), (Freiburg, Munich LMU, Munich MPI) (22%)

RPC gas system
- conceptual design
  Lecce, Roma II (100%)

- technical design
  CERN, Lecce

- gas system fabrication; 6/03 (350 kCHF)
  Italian RPC Groups (100%)

D. Thin Gap Chambers (TGC)

The construction of the TGCs is scheduled to start in the first quarter of 1999 and to be finished in the third quarter of 2003.

- TGC chamber construction, assembly and transport (3390 kCHF)
  Israel (63%), Japan (37%)

- TGC chamber installation (170 kCHF)
  Japan (100%)

- Front-end electronics (1500 kCHF)
  Japan (100%)

- Low voltage (100 kCHF)
  Israel (5%), Japan (95%)

- High voltage (400 kCHF)
  Israel (5%), Japan (95%)

- TGC gas system; 6/03 (500 kCHF)
  Israel (15%), Japan (85%)

E. Muon Systems Instrumentation

Alignment

Barrel chamber alignment, 9/98–9/03
- in-plane alignment, RASNIK read-out (390 kCHF)
  NIKHEF (100%)
- axial-praxial alignment, bar system (665 kCHF)
  Saclay (100%)
- projective alignment (55 kCHF)
  NIKHEF (65%), Saclay (35%)

End-cap chamber alignment, 9/98–9/03
- in-plane alignment (210 kCHF)
  Boston Muon Consortium (100%)
- bar-chamber connections (270 kCHF)
  Saclay (100%)
- alignment sensors (580 kCHF)
  Boston Muon Consortium (28%),
  (Freiburg, Munich LMU, Munich MPI) (31%), Saclay (41%)
- bar system (120 kCHF)
  Boston Muon Consortium (50%),
  (Freiburg, Munich LMU, Munich MPI) (50%)
- RASNIK read-out (240 kCHF)
  Boston Muon Consortium (46%), NIKHEF (12%), Saclay (42%)

General Infrastructure Items

- B-field and temperature measurement system construction; 9/98–9/03 (600 kCHF)
  NIKHEF (45%), Saclay (55%)

- Installation tools; 6/03 (400 kCHF)
  CERN (100%)

- Supports for MDT chambers; 3/03 (2400 kCHF)
  Brookhaven (25%), CERN (12%), JINR (29%), Frascati (17%),
  (Freiburg, Munich LMU, Munich MPI) (17%)

- Support for CSC chambers; 6/03 (80 kCHF)
  Brookhaven (41%), Petersburg NPI (59%)

- TGC support frames (440 kCHF)
  Israel (20%), Japan (80%)

- Support structure for TGCs; 3/03 (500 kCHF)
  Israel (26%), Japan (74%)

- MDT infrastructure (110 kCHF)
  CERN (100%)

- TGC infrastructure (945 kCHF)
  Israel (11%), Japan (89%)

- Calorimeter trigger processor (7640 kCHF, Dec. 2002)
  Birmingham, London QMW, RAL (48.7%); Heidelberg, Mainz (38.1%); Stockholm U (7.8%), not covered (5.4%)
- Muon trigger processor for RPC system (2605 kCHF, Dec. 2002)
  Lecce, Naples, Rome I, Rome II (100%)
- Muon trigger processor for TGC system (3340 kCHF, Dec. 2002)
  KEK, Kobe, Kyoto, Shinshu, Tokyo ICEPP, Tokyo MU (90.5%); Haifa, Tel Aviv, Weizmann (9.5%)
- Muon central trigger processor (675 kCHF, Dec. 2002)
  CERN (100%)
- Central trigger processor (535 kCHF, Dec. 2002)
  CERN (100%)
- TTC distribution backbone (1310 kCHF, Dec. 2002)
  CERN (100%)

B. Level-2 Trigger

Institutes participating:

Austria:	Innsbruck		
Czech Republic:	Prague AS & CU		
Denmark:	Copenhagen		
France/CEA:	Saclay		
Germany:	Mannheim		
Italy:	Genova	Lecce	Rome I
Israel:	Haifa	Tel Aviv	Weizmann
Netherlands:	NIKHEF		
Poland:	Cracow		
Russia:	Moscow SU		
United Kingdom:	Edinburgh	Liverpool	London RHBNC
	London UCL	Manchester	RAL
US:	Argonne	UC Irvine	Michigan SU
	Wisconsin		
CERN			

Development work still to be completed:

Pilot project to study level-2 trigger architecture and technology options	---> *Dec. 2000*
Study of integration of level-2 trigger with DAQ/EF	---> *Dec. 2000*
Detailed specification of level-2 trigger system	---> *Dec. 2001*

Development work still to be completed:

Completion of DAQ / Event Filter prototype "-1", a system which provides the full functionality from the readout link to data recording --> *Dec 1998*

Assessment of the DAQ / Event Filter prototype "-1" system, including real-life utilisation --> *Dec 1999*

Integration studies of DAQ / Event Filter and LVL2 --> *Dec 2000*

Detailed specification of final system integrated with LVL2 --> *Dec 2001*

Distribution of Commitments to System Construction

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Detailed design, prototyping and construction

- DAQ Readout (including readout buffers, local DAQ and interfaces to other systems) (9275 kCHF excluding Common Project items, Dec 2003)
  Argonne, Michigan SU, UC Irvine, Wisconsin (7.3%); Bern, Geneva (18.3%); CERN (21.5%); Copenhagen NBI (5.4%); Edinburgh, Liverpool, London RHBNC, London UCL, Manchester, RAL, Sheffield (11.5%); Pavia, Udine (11.9%); Ankara, Istanbul (1.3%); NIKHEF (2.7%); Saclay (20.5%)

- Event Builder (3710 kCHF, Dec 2003)
  Bern, Geneva (32.3%); CERN (27%); KEK, Nagasaki (27%); Saclay (17.5%)

- Event Filter and Back-End DAQ (5675 kCHF excluding Common Project items, Dec 2003)
  Bern, Geneva (19.4%); CERN (24.6%); Pavia, Udine (22.9%); Innsbruck (5.3%); Ankara, Istanbul (0.5%); JINR (1.8%); KEK, Nagasaki (8.8%); Lisbon (5.3%); Mainz (13.6%); NIKHEF (1.3%)

System Integration (manpower only, Dec 2003)

Development work still to be completed:

Development of an object-oriented simulation toolkit GEANT4 (RD44)
(Annecy, Berkeley, Brookhaven, CERN, Fukui, Hiroshima IT, KEK, Kobe, Kyoto U, Moskow FIAN, Naruto, Orsay, Protvino, Shinshu, Tokyo UAT, Vancouver, Valencia)

---> 1999

Study and development of event storage in an object-oriented database (RD45)
(Argonne, CERN, Hiroshima IT, KEK, Orsay, Portugal, NIKHEF, Protvino, Tufts)

---> 1999

Distribution of Commitments

The costs listed indicate the value of the commitment to deliverables in 1995 kCHF according to the ATLAS cost document, CORE version 7, dated 31 January, 1998.

Event buffer and link to the computer centre

All equipment needs to be installed at the experimental area by the end of 2004.

- Disk buffer holding the raw data accumulated in 24 hours (600 kCHF)
  CERN (25%), not covered (75%)

- Database server system including software (1800 kCHF)
  CERN (50%), not covered (50%)

- Networking hardware connecting to the computer centre (450 kCHF)
  CERN (100%)

- Monitoring equipment (150 kCHF)
  not covered (100%)

Common Projects

The ATLAS Collaboration Board has decided to execute the following parts of the detector (at a total estimated cost of 208.7 MCHF) as Common Projects:

item		estimated cost (in MCHF)
A1	Barrel Toroid Magnet	111.7
A2	End-cap Toroid Magnets (2)	
A3	Solenoid	10.9
A4	Common Magnet Infrastructure	14.2
B1	LAr Barrel Cryostat	12.3
B2	LAr End-cap cryostats (2)	10.1
B3	Common LAr Cryogenic Plant	14.1
C	Trigger/DAQ/Controls Processors	7.2
D1	Radiation Shielding	4.9
D2	Detector Infrastructure	23.3

A MAGNETS

A1 Barrel Toroid

Milestones:

Completion of winding machine for B0	July	1998
Delivery of conductor for B0	August	1998
Completion of B0 test station at CERN	July	1999
Delivery of B0 to CERN	September	1999
Start coil winding of first BT coil	October	1999
50% of conductor delivered	January	2000
Start testing first BT coil at CERN	March	2001
Complete winding of 8th BT coil	September	2001
Complete delivery of warm structure	July	2002
Start installation of BT in cavern	January	2003

Work to be executed :

design, specifications, market surveys and preparation of tendering documents under contract with CEA/Saclay

8m prototype coil executed as in-kind contribution by CEA/Saclay and INFN/LASA

A2 End-cap Toroids

Milestones:

Complete cryostat scale model	June	1998
Delivery of first conductor batch	April	2000
Complete first vacuum vessel	April	2001
Finish coil winding	October	2002
Start tests of ECTs on surface	April	2003
Start installation of ECTs in cavern	November	2004

Work to be executed :

design, specifications, market surveys and preparation of tendering documents under contract with RAL

A3 Solenoid

Milestones:

Complete delivery of conductor	October	1998
Complete coil winding	March	1999
Test of solenoid	December	2000
Delivery of solenoid to CERN	January	2002
Test of solenoid in cryostat at CERN	July	2003

Work to be executed :

design, specifications, market surveys and preparation of tendering documents and construction executed by KEK as Japanese in-kind contribution

A4 Magnet Cryogenic Plant

Milestones:

Cryogenic plant installed	August	2003
Magnet power systems installed	August	2003