

Budget Request for ATLAS Construction and C&I Payments in 2003

1. Introduction

The budget request for the baseline (initial) ATLAS detector construction expenses in 2003 amount to 49.1 MCHF for new commitments and 76.4 MCHF for payments, respectively.

The 2003 budget request for additional funds towards detector construction completion, commissioning and integration of the ATLAS detector is 20.6 MCHF. These completion costs are over and above the construction cost ceiling of 475 MCHF defined in the construction MoU (RRB-D 98-44 rev.).

The ATLAS Management invites the RRB to approve the above draft budgets for ATLAS activities in 2003.

2. Baseline Construction Budget Request for 2003

The project has reached its peak payment year in 2002 and the overall construction of ATLAS detector is now more than half way through. As the production of the detector elements is either in full speed or nearing their completion, new commitments are made mainly for the sub-system read-out electronics. In the Common Projects, new commitments are made for the assembly of the Barrel Toroid and End Cap systems as well as for the overall detector support and shielding structures. The share of the Common Projects of the total commitments is 18.2 MCHF and 38.9 MCHF of the total payments, respectively.

2.1. Detector (sub-) system construction

In the Inner Detector, the production of pixel and ID-general support elements are gaining speed (new commitments: 4.2 MCHF, payments: 3.4 MCHF, including infrastructures). New commitments for the Transition Radiation Tracker (1.9 MCHF) cover the remaining detector elements and electronics production whereas payments (5.6 MCHF) are mostly for the procurement of front-end ASICs and end cap materials. In the Silicon Tracker, the production of sensors and electronics is in full speed. This results in commitments worth 4.4 MCHF and payments worth 7.5 MCHF, respectively.

The Liquid Argon Calorimeters have completed more than 80% of the construction effort and the various module productions are nearing completion. The remaining effort is related to read-out electronics. In 2003, new commitments worth 7.3 MCHF and payments worth 7.7 MCHF will be made.

The Tile Calorimeter module construction is now completed (no new commitments to be made). The remaining expenditure is for completing the module assembly work and electronics as well as the testing of the photomultiplier tubes, planned to amount to 0.2 MCHF.

In the Muon Instrumentation system the trigger and precision chambers and related electronics production is proceeding steadily. New commitments are planned at the level of 6.3 MCHF and payments at 6.9 MCHF. Expenses of some 2 MCHF are planned for read-out electronics and power supplies.

In the Trigger & Data Acquisition system, expenses for the level-1 trigger system will reach its peak in 2003. New commitments for 6.9 MCHF and payments worth 6.1 MCHF are planned for the production of electronics components. The level-1 trigger system is not part of the deferral plans and is vital for the baseline TDAQ architecture of ATLAS.

2.2. Common Projects

The payments for the construction of the Barrel Toroid (BT) within the Common Projects start to gradually reduce as the project enters into the assembly and integration phase. New commitments amount to 0.7 MCHF and payments to 8.1 MCHF. The main effort is focused on the engineering and technical inspection tasks as well as on the manufacturing of the warm structures. In the End Cap Toroids (ECT), new commitments are made for 2.4 MCHF and payments amount to 2.0 MCHF. Similarly to the BT work, engineering efforts as well as assembly tasks form the main part of the planned activities. For the assembly work of the magnet systems as well as for the related infrastructure including test facilities, new commitments are made for 1.6 MCHF and payments worth 10.0 MCHF, respectively. These activities include the proximity cryogenics, current leads and the test station power supply systems.

The integration work of the Barrel and End Cap C Liquid Argon Calorimeter Cryostats is in full speed at CERN. Most of the remaining effort focuses on the installation of related cryogenic systems and controls where new commitments and payments amount to 0.6 MCHF and 3.1 MCHF, respectively.

Large orders will be placed for the general detector infrastructure, comprising detector support structures, shielding and test areas. New commitments will amount to 12.9 MCHF and payments to 15.7 MCHF, respectively. In the present planning

these costs will be charged to the Common Fund. As before, it is hoped that large parts of these components will be provided as in-kind contributions.

A fraction of the commitments and payments for the Common Project items is already covered by in-kind contributions. At present, new commitments for in-kind contributions are planned at 2.5 MCHF and payments at 18.1 MCHF. According to the present plan, cash contributions to the Common Fund of the order of 19 MCHF are needed to honor contracts placed on the Common Fund.

Details of the budget estimates for 2003 by system/sub-detector and Funding Agencies are presented in Tables 1 to 3.

3. Completion and C&I Budget Request for 2003

The ATLAS Management presented to the RRB in April 2002 updated cost estimates to complete the construction of the initial ATLAS detector. These additional costs amount to 47 MCHF (Construction Completion Costs) and 21 MCHF (Commissioning and Integration or C&I Costs), up to the end of 2005. The nature of these costs were described in the document CERN-RRB-2002-025 (Strategy and Scenarios for Deferrals in ATLAS, Annex Table 1) and in CERN-RRB-2002-047 (C&I Scrutiny Group Report). In that meeting the RRB regarded these sums as justified and they were accepted.

The preliminary budget estimate for 2003 was presented in the document CERN-RRB-2002-023. It assumed that the initial detector is ready for a pilot run in April 2006 and low luminosity physics in autumn 2006. The impact of the revised schedule (start-up in 2007) in the revised budget estimates will have little impact on the 2003 completion payments.

3.1. Construction Completion Costs (Payments 14.8 MCHF)

New payments, over and above the authorized 475 MCHF CORE construction ceiling need to be made in 2003 amounting to 14.8 MCHF, of which 11.9 MCHF are for common items.

The major share of the over costs related to BT is represented by payments related to the BT engineering work, coil casings, warm structure, cryoring, tie rods and integration work. This amounts to 3.8 MCHF.

In the ECT, additional payments need to be made to cover expected cost over runs in the cryogenics and engineering work, including the effects of exchange rate movements. This amounts to 1.7 MCHF.

Additional efforts needed for the integration work of the LAr cryostat as well as control systems for the LAr cryogenics plant requires additional investments of 1.2 MCHF in 2003.

Over costs associated with the support and shielding structures are anticipated at 4.0 MCHF. For the missing infrastructure, additional CORE and uncovered funding associated with the deliverables, 1.1 MCHF is needed to keep the project on track.

For the (sub)systems part, 2.9 MCHF is for covering the initial funding shortfall in the LAr system (electronics, EM end cap components) and for tooling as well as assembly tasks for all systems (ID, LAr, TileCal, Muons).

Table 4 shows the proposed distribution of planned payments per Funding Agency in 2003, based on present CORE contributions. It is recognized that the available funds in the contributing Funding Agencies may differ from the calculated annual sharing in Table 4. Adjustments resulting from any missing contributions in 2002 will be made in the updated 2003 budget estimates in April 2003. Based on discussions with the Funding Agencies, contribution profiles have been developed for the completion plan (CERN-RRB-2002-114) and possible cash flow issues will be managed by using the agreed displacement mechanism within the overall ATLAS funds.

Contributions for common items will be requested mainly in cash, partial in-kind contributions can be negotiated.

3.2. Commissioning & Integration Costs (Payments 5.7MCHF)

By definition, C&I activities comprise tasks before 2006, taking place outside the ATLAS Pit, excluding test beam operations which are part of M&O. As explained in the document CERN-RRB-2002-047 (C&I SG Report), a large part of the C&I costs stem from technical strategies chosen early on in the project as well as from technical services now charged to the Collaboration. Additional technical manpower is needed to carry out integration tasks, this having been underestimated in the original CORE costing.

The C&I (A) activities in the year 2003 (planned payments: 2.8 MCHF) comprise general integration tasks carried out by the Technical Coordination which is responsible for providing heavy handling and crane operation services to the systems.

The necessary handling instrumentation for integration of the ID, Tiles and the Muon systems, represent a large share of the required resources for C&I (B) activities (planned payments: 2.9 MCHF). Laboratory operations in Building 185 for the Tile Calorimeter and activities in Building 2175 (so-called SR-building) for the ID represent a large share of C&I activities in 2003. Engineering designs are needed to finalize the manipulation sequences for the Tile Calorimeter and the Muons.

More details on planned payments are provided in Table 5.

The proposed sharing per Funding Agency, is provided in Table 6. The sharing of both C&I (A) and (B) are based on CORE contributions. It is recognized that the available funds in the contributing Funding Agencies may differ from the calculated annual sharing in Table 6. Adjustments resulting from any missing contributions in 2002 will be made in the updated 2003 budget estimates in April 2003. Based on discussions with the Funding Agencies, contribution profiles have been developed

for the completion plan (CERN-RRB-2002-114) and possible cash flow issues will be managed by using the agreed displacement mechanism within the overall ATLAS funds.

**Planned CORE Commitments for ATLAS Detector Construction during
2003 by Funding Agency
(in kCHF)**

Funding Agency	Inner Det.	LAr Cal.	Tile Cal.	muon cham.	trigger /DAQ	Common Projects	total
Armenia						12.5	13
Australia	480					0.0	480
Austria						12.5	13
Azerbaijan						12.5	13
Belarus						25.0	25
Brazil						12.5	13
Canada		145				2087.5	2233
China NSFC+MSTC				50		25.0	75
Czech Republic	190					312.5	503
Denmark					500	0.0	500
Finland						12.5	13
France IN2P3	585	800				75.0	1460
France CEA		205		825		212.5	1243
Georgia						12.5	13
Germany BMBF	1480	500		620	875	112.5	3588
Germany MPI	220	185		260		12.5	678
Greece				150		337.5	488
Israel				95	255	37.5	388
Italy	245			495	80	150.0	970
Japan	210			670	2000	1712.5	4593
Morocco		50				12.5	63
Netherlands	700					25.0	725
Norway	115					25.0	140
Poland	195					165.0	360
Portugal						12.5	13
Romania						150.0	150
Russia	400	215		715		4157.5	5488
JINR		10		795		312.5	1118
Slovak Republic		80				12.5	93
Slovenia						12.5	13
Spain	75	150				37.5	263
Sweden	545	460			430	2050.0	3485
Switzerland	735	640				0.0	1375
Taipei		55				400.0	455 *
Turkey						12.5	13
United Kingdom	1365				2335	3262.5	6963
US DOE+NSF	2055	2885		1435		812.5	7188
CERN	835	950		150	410	1562.5	3908
total sub-detector	10430	7330	0	6260	6885	18197.5	49103

* Sharing under negotiation

Table 1

Planned CORE Payments for ATLAS Detector Construction
during 2003 by Funding Agency
(in kCHF)

Funding Agency	Inner Det.	LAr Cal.	Tile Cal.	muon cham.	trigger /DAQ	Common Projects	total
Armenia						12.5	13
Australia	480					0.0	480
Austria						12.5	13
Azerbaijan						12.5	13
Belarus						25.0	25
Brazil			25			12.5	38
Canada		295				87.5	383
China NSFC+MSTC				50		225.0	275
Czech Republic	235		0			12.5	248
Denmark						0.0	0
Finland						12.5	13
France IN2P3	305	950				3760.0	5015
France CEA		205		825		212.5	1243
Georgia						12.5	13
Germany BMBF	1605	430		620	875	1097.5	4628
Germany MPI	360	210		265		762.5	1598
Greece			50	180		337.5	568
Israel				415	150	537.5	1103
Italy	245			495	80	1200.0	2020
Japan	135			670	2000	812.5	3618
Morocco		50				12.5	63
Netherlands	665					525.0	1190
Norway	295					25.0	320
Poland	130					25.0	155
Portugal						100.0	100
Romania						112.5	113
Russia	850	190		750		1837.5	3628
JINR	150	15		740		1162.5	2068
Slovak Republic		75				12.5	88
Slovenia	145					62.5	208
Spain	215	150	100			267.5	733
Sweden	1435	565			435	190.0	2625
Switzerland	1160	500				500.0	2160
Taipei	50	245				500.0	795
Turkey						12.5	13
United Kingdom	2115				2335	1162.5	5613
US DOE+NSF	3570	2885		1415		4862.5	12733
CERN	2385	965		470	270	9412.5	13503

from past Common Fund contributions

8952.0

total sub-detector

16530	7730	175	6895	6145	38879.5	76355
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* Sharing under negotiation

Table 2

Planned CORE Common Project Contributions
during 2003 by Funding Agency
(in kCHF)

Funding Agency	payments				new commitments needed		
	in-kind contrib.	cash contrib.	m.s. contrib.	total contrib.	in-kind contrib.	Common Fund	total contrib.
Armenia			12.5	13		12.5	13
Australia				0			0
Austria			12.5	13		12.5	13
Azerbaijan			12.5	13		12.5	13
Belarus			25.0	25		25.0	25
Brazil			12.5	13		12.5	13
Canada			87.5	88		2087.5	2088
China NSFC+MSTC	200		25.0	225		25.0	25
Czech Republic			12.5	13	300	12.5	313
Denmark				0			0
Finland			12.5	13		12.5	13
France IN2P3	750	2935	75.0	3760		75.0	75
France CEA		200	12.5	213		212.5	213
Georgia			12.5	13		12.5	13
Germany BMBF	985		112.5	1098		112.5	113
Germany MPI	750		12.5	763		12.5	13
Greece		300	37.5	338		337.5	338
Israel		500	37.5	538		37.5	38
Italy	1050		150.0	1200		150.0	150
Japan	500		312.5	813	500	1212.5	1713
Morocco			12.5	13		12.5	13
Netherlands	500		25.0	525		25.0	25
Norway			25.0	25		25.0	25
Poland			25.0	25	140	25.0	165
Portugal	88		12.5	100		12.5	13
Romania		100	12.5	113		150.0	150
Russia	1750		87.5	1838	570	3587.5	4158
JINR	850	300	12.5	1163		312.5	313
Slovak Republic			12.5	13		12.5	13
Slovenia		50	12.5	63		12.5	13
Spain	230		37.5	268		37.5	38
Sweden	60	80	50.0	190		2050.0	2050
Switzerland	500			500			0
Taipei		500		500		400.0	400
Turkey			12.5	13		12.5	13
United Kingdom		1000	162.5	1163		3262.5	3263
US DOE+NSF	450	4000	412.5	4863	400	412.5	813
CERN	9400		12.5	9413	550	1012.5	1563
Common Fund		8952		8952			
total	18063	18917	1900	38880	2460	15738	18198

Table 3

Proposed Sharing of Completion Cost Payments for ATLAS in 2003 by Funding Agency (kCHF)

10/1/2002

Funding Agency	Common items	System-specific items						TOTAL kCHF	
		Pixel	SCT	TRT	IDGen	LAr	TileC		Muon
Armenia	6	0	0	0	0	0	4	0	10
Australia	63	0	16	0	5	0	0	0	85
Austria	17	0	0	0	0	0	0	0	17
Azerbaijan	6	0	0	0	0	0	0	0	6
Belarus	12	0	0	0	0	0	0	0	12
Brazil	6	0	0	0	0	0	4	0	10
Canada	381	0	0	0	0	74	0	0	456
China NSFC+MSTC	23	0	0	0	0	3	0	1	27
Czech Republic	35	5	4	0	2	0	23	0	68
Denmark	81	0	0	6	3	0	0	0	90
Finland	0	0	0	0	0	0	0	0	0
France IN2P3	981	49	0	0	8	158	98	0	1294
France CEA	335	0	0	0	0	51	0	10	395
Georgia	6	0	0	0	0	0	0	0	6
Germany BMBF	819	103	40	0	29	28	0	11	1031
Germany MPI	190	0	20	0	6	16	0	4	236
Greece	40	0	0	0	0	0	0	4	45
Israel	121	0	0	0	0	0	0	11	132
Italy	1143	113	0	0	19	33	61	41	1409
Japan	808	0	81	0	25	0	0	30	944
Morocco	6	0	0	0	0	2	0	0	8
Netherlands	387	0	15	0	6	0	0	13	421
Norway	104	0	24	0	9	0	0	0	137
Poland	23	0	2	1	1	0	0	0	28
Portugal	52	0	0	0	0	0	47	0	99
Romania	17	0	0	0	0	0	14	0	31
Russia	462	0	2	18	12	41	51	12	599
JINR	133	0	0	2	2	6	37	8	187
Slovak Republic	12	0	0	0	0	3	0	0	14
Slovenia	40	0	10	0	3	0	0	0	53
Spain	248	0	14	0	4	20	92	0	379
Sweden	271	0	18	10	11	14	42	0	365
Switzerland	491	0	58	0	18	9	0	0	577
Taipei	75	11	6	0	4	6	0	0	102
Turkey	12	0	0	0	0	0	0	0	12
United Kingdom	866	0	146	0	49	0	0	0	1061
US DOE + NSF	2049	75	59	23	44	149	168	38	2606
CERN	1581	0	18	41	33	76	139	7	1896
total	11,900	355	535	100	295	690	780	190	14,845
		System-specific items						2,945	

Table 4

ATLAS C&I (A) and (B) Budget Estimates for 2003 (kCHF)

Item & Cost Driver (by RRB/LHCC SG Headings)	Category A	Category B	Item & Cost Driver (by RRB/LHCC SG Headings)
	C&I	C&I	
Detector related costs Magnet assembly in B180 (gas, controls) General integration tasks (TCn) Gen. Technical support Integration and survey	1,870	440	Mechanics & Gas & Cooling & Cryogenics Gases (ID, Tiles, Muons)
Secretariat	0	170	Standard electronics FE electronics (Muons)
Communications	0	120	Detector controls DCS replacements for ID
On-line computing	30	520	Areas SR-building operation (ID)
Test beams Magnet Cryo consumables	485	15	Communications GSM phones
Laboratory operations	0	210	Store items Store materials (metal sheet, cables, connectors, components) for LAr and ID
General services Heavy transport, crane operations	390	0	Sub-detector spares
TOTAL	2,775	1,475	(Excluding hired manpower for Category B)
Hired manpower at CERN (in kCHF)	incl. above	1010	
Institute manpower to be credited (in kCHF)		450	5 FTE's @ 91 kCHF/y for TileCal *
Institute manpower (in FTE)	0	48	
TOTAL C&I FOR A	2,775	2,935	TOTAL C&I FOR B

Notes:

1. Category A is charged to the entire Collaboration, B to the respective systems.

* Hired institute manpower from RF/JINR exceptionally credited at 91 kCHF/FTE

**Proposed Sharing of C-I Payments
for ATLAS in 2003 by Funding Agency (kCHF)**

10/3/2002

Funding Agency	Category A items	Category B items						TOTAL kCHF	
		Pixel	SCT	TRT	IDGen	LAr	TileC		Muon
Armenia	1	0	0	0	0	0	4	0	5
Australia	15	0	0	0	17	0	0	0	32
Austria	4	0	0	0	0	0	0	0	4
Azerbaijan	1	0	0	0	0	0	0	0	1
Belarus	3	0	0	0	0	0	0	0	3
Brazil	1	0	0	0	0	0	3	0	4
Canada	89	0	0	0	1	51	0	0	141
China NSFC+MSTC	5	0	0	0	0	2	0	5	12
Czech Republic	8	0	0	0	6	0	19	0	33
Denmark	19	0	0	1	11	0	0	0	31
Finland	0	0	0	0	0	0	0	0	0
France IN2P3	229	0	0	0	27	108	78	0	441
France CEA	78	0	0	0	0	34	0	33	146
Georgia	1	0	0	0	0	0	0	0	1
Germany BMBF	191	0	0	0	98	19	0	39	348
Germany MPI	44	0	0	0	21	11	0	13	89
Greece	9	0	0	0	0	0	0	15	24
Israel	28	0	0	0	0	0	0	39	67
Italy	266	0	0	0	63	22	48	142	542
Japan	188	0	0	0	85	0	0	104	377
Morocco	1	0	0	0	0	1	0	0	3
Netherlands	90	0	0	0	19	0	0	46	155
Norway	24	0	0	0	29	0	0	0	53
Poland	5	0	0	0	5	0	0	0	11
Portugal	12	0	0	0	0	0	37	0	49
Romania	4	0	0	0	0	0	11	0	15
Russia	108	0	0	4	42	28	41	41	264
JINR	31	0	0	0	6	4	29	27	98
Slovak Republic	3	0	0	0	0	2	0	0	5
Slovenia	9	0	0	0	10	0	0	0	20
Spain	58	0	0	0	15	14	73	0	160
Sweden	63	0	0	2	38	9	33	0	146
Switzerland	114	0	0	0	62	6	0	0	182
Taipei	17	0	0	0	12	4	0	0	34
Turkey	3	0	0	0	0	0	0	0	3
United Kingdom	202	0	0	0	164	0	0	0	366
US DOE + NSF	478	0	0	6	150	102	133	134	1002
CERN	369	0	0	10	112	52	111	23	676
total	2,775	0	0	25	995	470	620	660	5,545
		Category B items						2,770	
additional resources*						165			5,710

Notes:

*LAr budget for 2003 is 635 kCHF of which 165 kCHF is included in the Completion costs

Table 6