CERN-RRB-2017-091

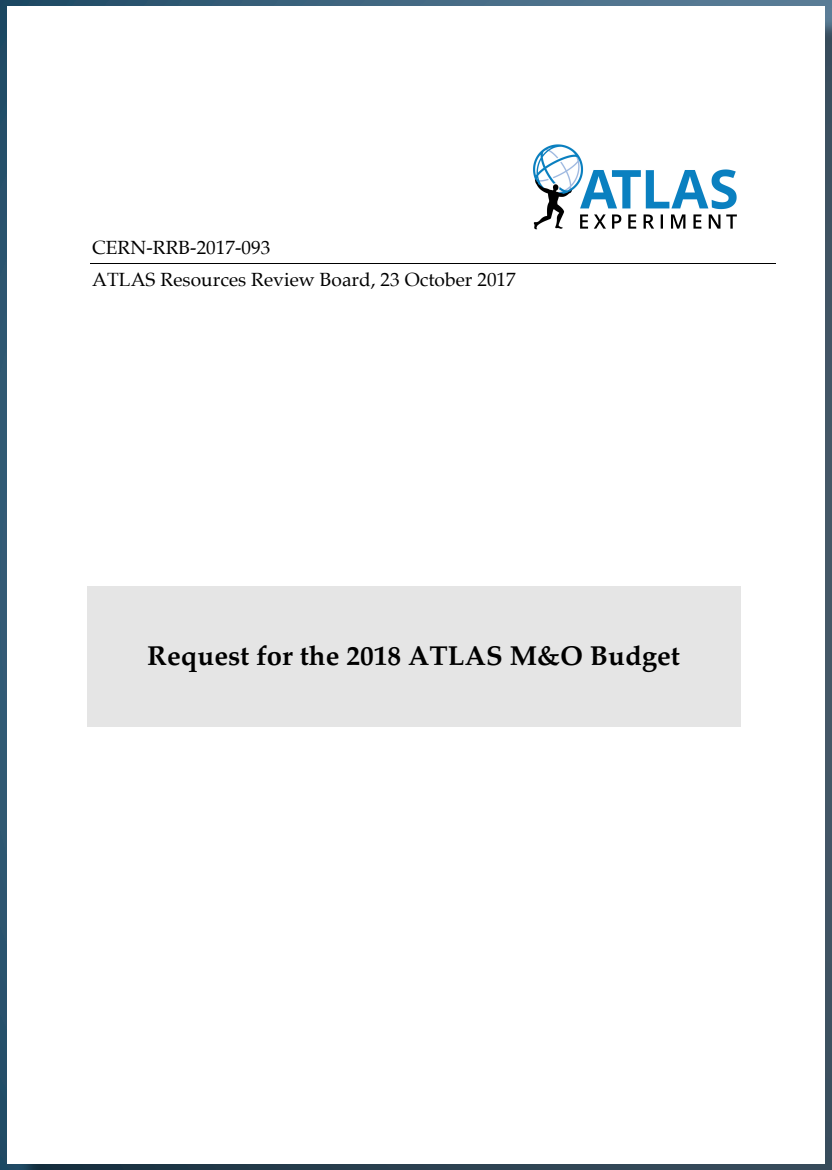
# STATUS OF ATLAS RESOURCES

Fido Dittus

RRB presentation, 23 October 2017

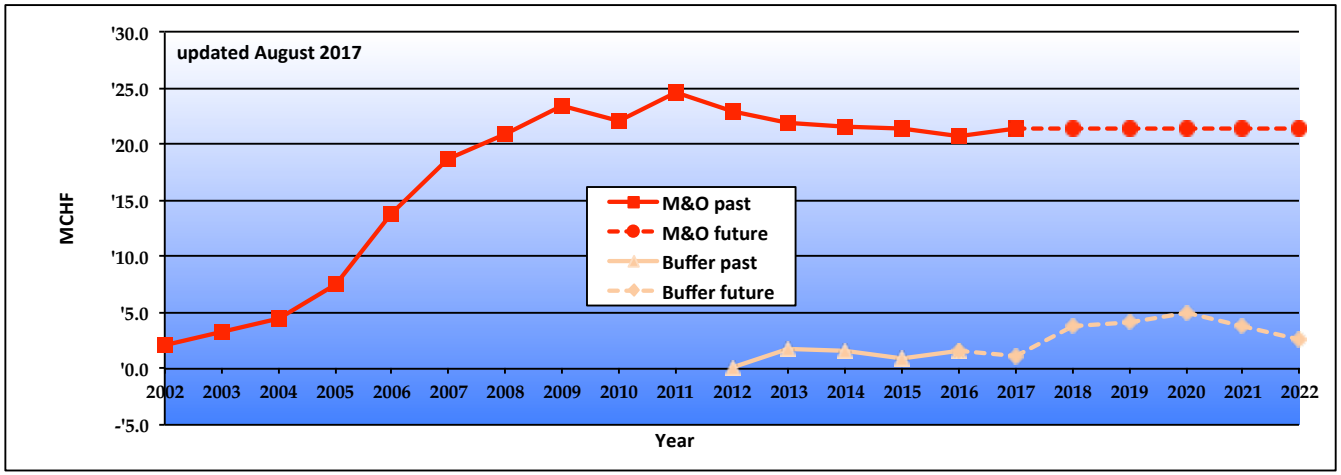
# Outline

| RRB Doc. Reference | Title |
|---|---|
| CERN-RRB-2017-093 | Request for the 2018 ATLAS M&O Budget |
| CERN-RRB-2017-092 | ATLAS Upgrade Status Report 2017 – 2018 |
| CERN-RRB-2017-058 | Common Items for the Phase-II Upgrade of the ATLAS Detector (Addendum #17 to the ATLAS Construction MoU) |




- M&O A+B Evolution
- Sharing of the 2018 ATLAS M&O Budget

# M&O A+B Evolution (kCHF)




| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category A | 1.2 | 2.5 | 3.7 | 5.5 | 9.4 | 11.7 | 14.1 | 16.4 | 16.7 | 18.4 | 17.9 | 16.8 | 16.6 | 16.8 | 16.2 | 16.6 | 16.6 | 16.6 | 16.8 | 16.8 | 16.8 |
| Category B | 0.9 | 0.9 | 0.8 | 2.0 | 4.4 | 7.0 | 6.9 | 7.0 | 5.5 | 6.1 | 5.2 | 5.1 | 5.0 | 4.6 | 4.6 | 4.8 | 4.8 | 4.8 | 4.6 | 4.6 | 4.6 |
| **Total (A+B)** | **2.1** | **3.3** | **4.5** | **7.5** | **13.8** | **18.7** | **21.0** | **23.4** | **22.2** | **24.6** | **23.0** | **21.9** | **21.6** | **21.4** | **20.8** | **21.4** | **21.4** | **21.4** | **21.4** | **21.4** | **21.4** |
| **TDAQ buffer account cumulative cash balance** | | | | | | | | | | | **0.14** | **1.73** | **1.63** | **0.99** | **1.65** | **1.14** | **3.73** | **4.19** | **4.97** | **3.89** | **2.56** |

The M&O A+B budget is kept flat at 21.4 MCHF with the help of the TDAQ buffer.

In spring, an order for HLT processors worth 2.2 MCHF was cancelled because the supplier was unable to deliver the hardware at the contractually agreed prices. Meanwhile, a new order has been placed with first deliveries due in December.

ATLAS is very grateful for the processors on loan from CERN-IT.

| | approved | | | | requested | projected | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| **Detector related costs** | **6'817** | **4'835** | **5'196** | **5'361** | **5'220** | **5'240** | **5'381** | **5'041** | **5'041** |
| Magnet | 220 | 220 | 220 | 220 | 220 | 220 | 220 | 220 | 220 |
| Magnet controls | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 |
| Magnet power supply | 138 | 138 | 118 | 118 | 67 | 67 | 67 | 67 | 67 |
| Gas systems | 249 | 189 | 189 | 239 | 339 | 339 | 339 | 339 | 339 |
| Gas consumption | 1'150 | 1'150 | 1'150 | 1'150 | 1'150 | 970 | 1'060 | 1'150 | 1'150 |
| Cooling systems | 395 | 395 | 505 | 615 | 660 | 520 | 520 | 520 | 520 |
| Cooling fluids(above –50°C) | 80 | 80 | 80 | 110 | 110 | 80 | 80 | 80 | 80 |
| External cryogenics | 485 | 485 | 485 | 485 | 485 | 485 | 485 | 485 | 485 |
| Cryogenic fluids (below –50°C) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Moving/hydraulic systems | 90 | 90 | 90 | 90 | 140 | 90 | 90 | 90 | 90 |
| Detector safety systems | 180 | 210 | 240 | 240 | 240 | 240 | 360 | 240 | 240 |
| Shutdown activities | 760 | 510 | 510 | 640 | 510 | 810 | 760 | 510 | 510 |
| General Technical support | 1'190 | 368 | 359 | 399 | 359 | 419 | 400 | 390 | 390 |
| UPS maintenance | 100 | 100 | 100 | 50 | 50 | 100 | 100 | 50 | 50 |
| Electronics pool rentals | 0 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Beam pipe & vacuum | 960 | 60 | 310 | 165 | 50 | 60 | 60 | 60 | 60 |
| Counting & control rooms | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 |
| Safety | 420 | 420 | 420 | 420 | 420 | 420 | 420 | 420 | 420 |
| **Secretariat** | **420** | **420** | **420** | **420** | **460** | **460** | **460** | **460** | **460** |
| Secretarial assistance | 300 | 300 | 300 | 300 | 340 | 340 | 340 | 340 | 340 |
| Economat | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Printing and publication | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| **Collaborative tools** | **220** | **180** | **180** | **180** | **180** | **220** | **220** | **180** | **180** |
| GSM phones; on-call service | 50 | 10 | 10 | 10 | 10 | 50 | 50 | 10 | 10 |
| Collaborative tools | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 |
| **Core computing (infrastructure)** | **2'128** | **2'354** | **2'309** | **2'354** | **2'354** | **2'354** | **2'354** | **2'354** | **2'354** |
| Central computing environment | 181 | 272 | 272 | 272 | 272 | 272 | 272 | 272 | 272 |
| User support | 363 | 363 | 363 | 363 | 363 | 363 | 363 | 363 | 363 |
| Software process service | 418 | 554 | 509 | 509 | 509 | 509 | 509 | 509 | 509 |
| Database support | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 |
| Central production operations | 816 | 816 | 816 | 861 | 861 | 861 | 861 | 861 | 861 |
| Hardware | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| **On-line computing** | **2'384** | **5'287** | **4'371** | **4'485** | **4'191** | **3'356** | **3'582** | **4'869** | **4'962** |
| System management | 1'240 | 1'240 | 1'240 | 1'240 | 1'240 | 1'240 | 1'240 | 1'240 | 1'240 |
| Data storage, (temporary on disk) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Detector controls | 30 | 30 | 70 | 120 | 220 | 220 | 120 | 120 | 120 |
| Computers/processors/LANs | 954 | 3'719 | 2'718 | 2'494 | 2'417 | 1'480 | 1'888 | 2'427 | 3'302 |
| Software licenses | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 |
| Common desktop infrastructure | 90 | 228 | 273 | 561 | 244 | 346 | 264 | 1'012 | 230 |
| **Test beams, calibration facilities** | **770** | **245** | **260** | **260** | **660** | **860** | **660** | **335** | **260** |
| General operation | 40 | 40 | 55 | 55 | 55 | 55 | 55 | 55 | 55 |
| Common electronics | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| Electronics pool rentals | 45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gas systems | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gas consumption | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| External cryogenics | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Modifications | 640 | 160 | 160 | 160 | 560 | 760 | 560 | 235 | 160 |
| **Laboratory operations** | **105** | **105** | **90** | **90** | **90** | **90** | **90** | **90** | **90** |
| Assembly areas, clean rooms, active storage areas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Workshops | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Laboratory instruments | 55 | 55 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| **General services** | **1'576** | **1'219** | **1'219** | **1'267** | **1'249** | **1'808** | **1'808** | **1'287** | **1'249** |
| Cooling & ventilation | 344 | 344 | 344 | 344 | 344 | 344 | 344 | 344 | 344 |
| Power distribution system | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 |
| Heavy transport | 60 | 60 | 60 | 60 | 60 | 200 | 200 | 60 | 60 |
| Cranes | 460 | 222 | 222 | 240 | 222 | 522 | 522 | 240 | 222 |
| Cars | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Survey | 210 | 91 | 91 | 121 | 121 | 210 | 210 | 121 | 121 |
| Storage space | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Common desktop infrastructure | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Technical Expertise | 130 | 130 | 130 | 130 | 130 | 160 | 160 | 150 | 130 |
| Outreach | 245 | 245 | 245 | 245 | 245 | 245 | 245 | 245 | 245 |
| **TOTALS without power** | **14'420** | **14'645** | **14'045** | **14'418** | **14'404** | **14'388** | **14'555** | **14'616** | **14'596** |
| Power | 2'200 | 2'200 | 2'200 | 2'200 | 2'200 | 2'200 | 2'200 | 2'200 | 2'200 |
| **GRAND TOTALS** | **16'620** | **16'845** | **16'245** | **16'618** | **16'604** | **16'588** | **16'755** | **16'816** | **16'796** |

# Request for the 2018 M&O A Budget

**16.6 MCHF, including full energy**

Cost drivers by activity:

1. Technical services 8.5 MCHF
   incl. Energy (not invoiced to MS) 2.2 MCHF
2. On-line Computing 4.1 MCHF
   incl. TDAQ hw replacements 2.6 MCHF
   to be deposited in the buffer
3. Core computing (24.5 FTE) 2.4 MCHF
4. Magnet & Cryogenics 1.6 MCHF

*Note: points 1-4 above make overlapping contributions to the table on the left.*

# Request for the 2018 M&O B Budget

**Details of the ATLAS 2018 M&O-B Budget (kCHF)**

| Item & Cost Driver | Pixel | SCT | TRT | IDGen | LAr | TileC | Muon | FD | TDAQ | Comp. | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mechanics | | | | | | 10 | 40 | 10 | 0 | | 60 |
| Gas systems | | | 20 | | | 8 | 0 | 0 | 0 | | 28 |
| Cryo-systems | | | | | | | 0 | 0 | 0 | | 0 |
| Cooling system | | | | | 5 | 3 | 5 | 1 | 0 | | 14 |
| FE electronics | | | | | 40 | 60 | 0 | 2 | 0 | | 102 |
| Std. electronics (PS, crates, RO mod) | 230 | 285 | 190 | 45 | 175 | 170 | 220 | 33 | 51 | | 1'399 |
| Controls (DCS, DSS) | 10 | 20 | 10 | 5 | 35 | 15 | 60 | 7 | 0 | | 162 |
| Sub-detector spares | | | | | | 75 | 0 | 12 | 0 | | 87 |
| Areas (System tests, laboratory ops.) | 90 | 20 | 30 | 120 | 10 | 50 | 95 | 24 | 0 | | 439 |
| Communications | 1 | 5 | | 8 | 5 | 5 | 10 | 3 | 0 | | 37 |
| Store items | 24 | 30 | 30 | 80 | 10 | 20 | 20 | 18 | 0 | | 232 |
| TOTAL (excl. hired manpower at CERN) | 355 | 360 | 280 | 258 | 280 | 416 | 450 | 110 | 51 | | 2'560 |
| Hired Manpower at CERN (kCHF) | 200 | 277 | 265 | 315 | 390 | 188 | 380 | 301 | 0 | | 2'316 |
| Institute manpower, OTP class 3 (FTE) | 30 | 24 | 27 | 30 | 37 | 28 | 50 | 33 | 0 | 138 | 397 |
| Reduction based on surplus from prev. years (see text) | | | | | -80 | | | | | | -80 |
| TOTAL M&O-B to be invoiced to FAs | 555 | 637 | 545 | 573 | 590 | 604 | 830 | 411 | 51 | | 4'796 |

**ATLAS M&O-B budgets 2014–2022 (kCHF)**

| | approved | | | | requested | projected | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *2014* | *2015* | *2016* | *2017* | *2018* | *2019* | *2020* | *2021* | *2022* |
| PIX | 610 | 655 | 555 | 555 | 555 | 555 | 555 | 555 | 555 |
| SCT | 637 | 637 | 517 | 637 | 637 | 637 | 637 | 637 | 637 |
| TRT | 545 | 545 | 545 | 545 | 545 | 545 | 545 | 545 | 545 |
| IDGen | 673 | 623 | 573 | 573 | 573 | 723 | 623 | 573 | 573 |
| LAr | 1'051 | 700 | 630 | 610 | 590 | 615 | 645 | 610 | 630 |
| TileC | 647 | 604 | 544 | 604 | 604 | 647 | 647 | 604 | 604 |
| Muons | 570 | 570 | 800 | 830 | 830 | 800 | 700 | 600 | 600 |
| FD | 297 | 219 | 331 | 431 | 411 | 239 | 242 | 288 | 288 |
| TDAQ | 0 | 0 | 0 | 0 | 51 | 51 | 51 | 172 | 172 |
| TOTALS | 5'030 | 4'553 | 4'495 | 4'785 | 4'796 | 4'812 | 4'645 | 4'584 | 4'604 |

**4.8 MCHF Total**

Cost drivers by activity:

1. Mechanics — 0.1 MCHF
   incl. cooling & gas systems
2. Electronics — 1.6 MCHF
3. Areas, stores, spares — 0.8 MCHF
4. Technical support — 2.3 MCHF
5. Institute manpower for class 3 operation tasks — 397 FTE
   incl. for core computing — 138 FTE

# Request for the 2018 M&O B Budget

**Details of the ATLAS 2018 M&O-B Budget (kCHF)**

| Item & Cost Driver | Pixel | SCT | TRT | IDGen | LAr | TileC | Muon | FD | TDAQ | Comp. | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mechanics | | | | | | 10 | 40 | 10 | 0 | | 60 |
| Gas systems | | | 20 | | | 8 | 0 | 0 | 0 | | 28 |
| Cryo-systems | | | | | | | 0 | 0 | 0 | | 0 |
| Cooling system | | | | | 5 | 3 | 5 | 1 | 0 | | 14 |
| FE electronics | | | | | 40 | 60 | 0 | 2 | 0 | | 102 |
| Std. electronics (PS, crates, RO mod) | 230 | 285 | 190 | 45 | 175 | 170 | 220 | 33 | 51 | | 1'399 |
| Controls (DCS, DSS) | 10 | 20 | 10 | 5 | 35 | 15 | 60 | 7 | 0 | | 162 |
| Sub-detector spares | | | | | | 75 | 0 | 12 | 0 | | 87 |
| Areas (System tests, laboratory ops.) | 90 | 20 | 30 | 120 | 10 | 50 | 95 | 24 | 0 | | 439 |
| Communications | 1 | 5 | | 8 | 5 | 5 | 10 | 3 | 0 | | 37 |
| Store items | 24 | 30 | 30 | 80 | 10 | 20 | 20 | 18 | 0 | | 232 |
| TOTAL (excl. hired manpower at CERN) | 355 | 360 | 280 | 258 | 280 | 416 | 450 | 110 | 51 | | 2'560 |
| Hired Manpower at CERN (kCHF) | 200 | 277 | 265 | 315 | 390 | 188 | 380 | 301 | 0 | | 2'316 |
| Institute manpower, OTP class 3 (FTE) | 30 | 24 | 27 | 30 | 37 | 28 | 50 | 33 | 0 | 138 | 397 |
| Reduction based on surplus from prev. years (see text) | | | | | -80 | | | | | | -80 |
| TOTAL M&O-B to be invoiced to FAs | 555 | 637 | 545 | 573 | 590 | 604 | 830 | 411 | 51 | | 4'796 |

**ATLAS M&O-B budgets 2014–2022 (kCHF)**

| | approved | | | | requested | projected | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *2014* | *2015* | *2016* | *2017* | *2018* | *2019* | *2020* | *2021* | *2022* |
| PIX | 610 | 655 | 555 | 555 | 555 | 555 | 555 | 555 | 555 |
| SCT | 637 | 637 | 517 | 637 | 637 | 637 | 637 | 637 | 637 |
| TRT | 545 | 545 | 545 | 545 | 545 | 545 | 545 | 545 | 545 |
| IDGen | 673 | 623 | 573 | 573 | 573 | 723 | 623 | 573 | 573 |
| LAr | 1'051 | 700 | 630 | 610 | 590 | 615 | 645 | 610 | 630 |
| TileC | 647 | 604 | 544 | 604 | 604 | 647 | 647 | 604 | 604 |
| Muons | 570 | 570 | 800 | 830 | 830 | 800 | 700 | 600 | 600 |
| FD | 297 | 219 | 331 | 431 | 411 | 239 | 242 | 288 | 288 |
| TDAQ | 0 | 0 | 0 | 0 | 51 | 51 | 51 | 172 | 172 |
| TOTALS | 5'030 | 4'553 | 4'495 | 4'785 | 4'796 | 4'812 | 4'645 | 4'584 | 4'604 |

## Note:

1. In agreement with the RRB Scrutiny Group, TDAQ has now been added as a system with an M&O-B budget (for FTK and other custom-built trigger electronics).
2. The LAr and Tile Calorimeter Phase-I upgrade projects are not expected to give rise to relevant increases of the M&O-B budgets of their parent systems.
3. However, the M&O-B budget of the Muon Spectrometer is expected to increase once the related Phase-I upgrade projects (NSW and BIS78) are being completed.
   - To be added to future projections next year
4. The Scrutiny Group already accepted the concept of including 40% of the Muon power supply replacement costs in M&O-B.

# M&O A in-kind contributions

- CORE computing tasks (809 kCHF)
  - The following Funding Agencies offer in-kind contributions for these tasks: China (0.2 FTE), IN2P3 (0.9 FTE), CEA (0.2 FTE), BMBF (1.5 FTE), Italy (1.6 FTE), Russia (0.6 FTE), UK (0.7 FTE), US DOE HEP (2.8 FTE) and US NSF HEP (0.6 FTE). The average cost is 89kCHF/FTE.
- General operations support (184 kCHF)
  - Additional in-kind contributions for operations support are offered by US DOE HEP (166 kCHF) and US NSF HEP (18 kCHF).

## Proposed Sharing of M&O Contributions for ATLAS in 2018 by Funding Agency (kCHF)

| Funding Agency | Authors M&O-A | Category A items budgeted | adjusted[1] | in-kind | invoiced[2] | Cat. B budgeted[3] | Total A + B invoiced[4] |
|---|---|---|---|---|---|---|---|
| Argentina | 6 | 53 | 53 | | 53 | 3 | 56 |
| Armenia | 0 | 0 | 0 | | 0 | 0 | 0 |
| Australia | 15 | 133 | 133 | | 133 | 47 | 180 |
| Austria | 3 | 27 | 23 | | 23 | 9 | 32 |
| Azerbaijan | 1 | 9 | 9 | | 9 | 0 | 9 |
| Belarus | 2 | 18 | 18 | | 18 | 1 | 19 |
| Brazil | 14 | 124 | 124 | | 124 | 6 | 130 |
| Canada | 65 | 575 | 564 | | 564 | 202 | 766 |
| Chile | 10 | 89 | 89 | | 89 | 4 | 93 |
| China NSFC+MSTC | 48 | 425 | 425 | 18 | 407 | 21 | 428 |
| Colombia | 4 | 35 | 35 | | 35 | 2 | 37 |
| Czech Republic | 39 | 345 | 299 | | 299 | 17 | 316 |
| Denmark | 11 | 97 | 84 | | 84 | 34 | 118 |
| France IN2P3 | 114 | 1'009 | 875 | 80 | 795 | 354 | 1'149 |
| France CEA | 24 | 212 | 184 | 20 | 164 | 74 | 238 |
| Georgia | 6 | 53 | 53 | | 53 | 3 | 56 |
| Germany BMBF | 153 | 1'354 | 1'175 | 130 | 1'045 | 475 | 1'520 |
| Germany DESY | 37 | 327 | 284 | | 284 | 115 | 399 |
| Germany MPI | 21 | 186 | 161 | | 161 | 65 | 226 |
| Greece | 15 | 133 | 115 | | 115 | 7 | 122 |
| Hong Kong | 10 | 89 | 89 | | 89 | 31 | 120 |
| Israel | 29 | 257 | 223 | | 223 | 13 | 236 |
| Italy | 169 | 1'496 | 1'298 | 144 | 1'154 | 525 | 1'679 |
| Japan | 76 | 673 | 661 | | 661 | 236 | 897 |
| Morocco | 11 | 97 | 97 | | 97 | 5 | 102 |
| Netherlands | 24 | 212 | 184 | | 184 | 74 | 258 |
| Norway | 16 | 142 | 123 | | 123 | 50 | 173 |
| Poland | 29 | 257 | 223 | | 223 | 13 | 236 |
| Portugal | 15 | 133 | 115 | | 115 | 7 | 122 |
| Romania | 16 | 142 | 123 | | 123 | 7 | 130 |
| Russia | 64 | 566 | 494 | 54 | 440 | 28 | 468 |
| JINR | 26 | 230 | 230 | | 230 | 11 | 241 |
| Serbia | 5 | 44 | 38 | | 38 | 2 | 40 |
| Slovak Republic | 10 | 89 | 77 | | 77 | 4 | 81 |
| Slovenia | 8 | 71 | 61 | | 61 | 4 | 65 |
| South Africa | 9 | 80 | 80 | | 80 | 4 | 84 |
| Spain | 49 | 434 | 376 | | 376 | 152 | 528 |
| Sweden | 30 | 266 | 230 | | 230 | 93 | 323 |
| Switzerland | 25 | 221 | 192 | | 192 | 78 | 270 |
| Taipei | 8 | 71 | 71 | | 71 | 3 | 74 |
| Turkey | 11 | 97 | 84 | | 84 | 5 | 89 |
| United Kingdom | 191 | 1'690 | 1'467 | 62 | 1'405 | 593 | 1'998 |
| US DOE HEP | 274 | 2'425 | 2'393 | 412 | 1'981 | 851 | 2'832 |
| US NSF HEP | 65 | 575 | 575 | 73 | 502 | 202 | 704 |
| US DOE NP | 6 | 53 | 53 | | 53 | 19 | 72 |
| US NSF NP | 4 | 35 | 35 | | 35 | 12 | 47 |
| CERN | 102 | 903 | 783 | | 783 | 317 | 1'100 |
| Other [5] | 6 | 53 | 50 | | 50 | 18 | 68 |
| Total | 1'876 | 16'604 | 15'128 | 993 | 14'135 | 4'796 | 18'931 |

**Notes:**
Based on qualified authors with PhD or equivalent from September 9, 2017 shown in the leftmost column
[1] Includes energy cost adjustments
[2] After accounting for energy cost corrections, in-kind contributions and other adjustments
[3] See Table 2 for the detailed breakdown by System and Funding Agency
[4] Expected cash contributions by Funding Agencies (Sum of Cat. A invoiced + Cat. B budgeted )
[5] Authors with M&O shares paid from different sources other than their natural Funding Agency

**Table 1**

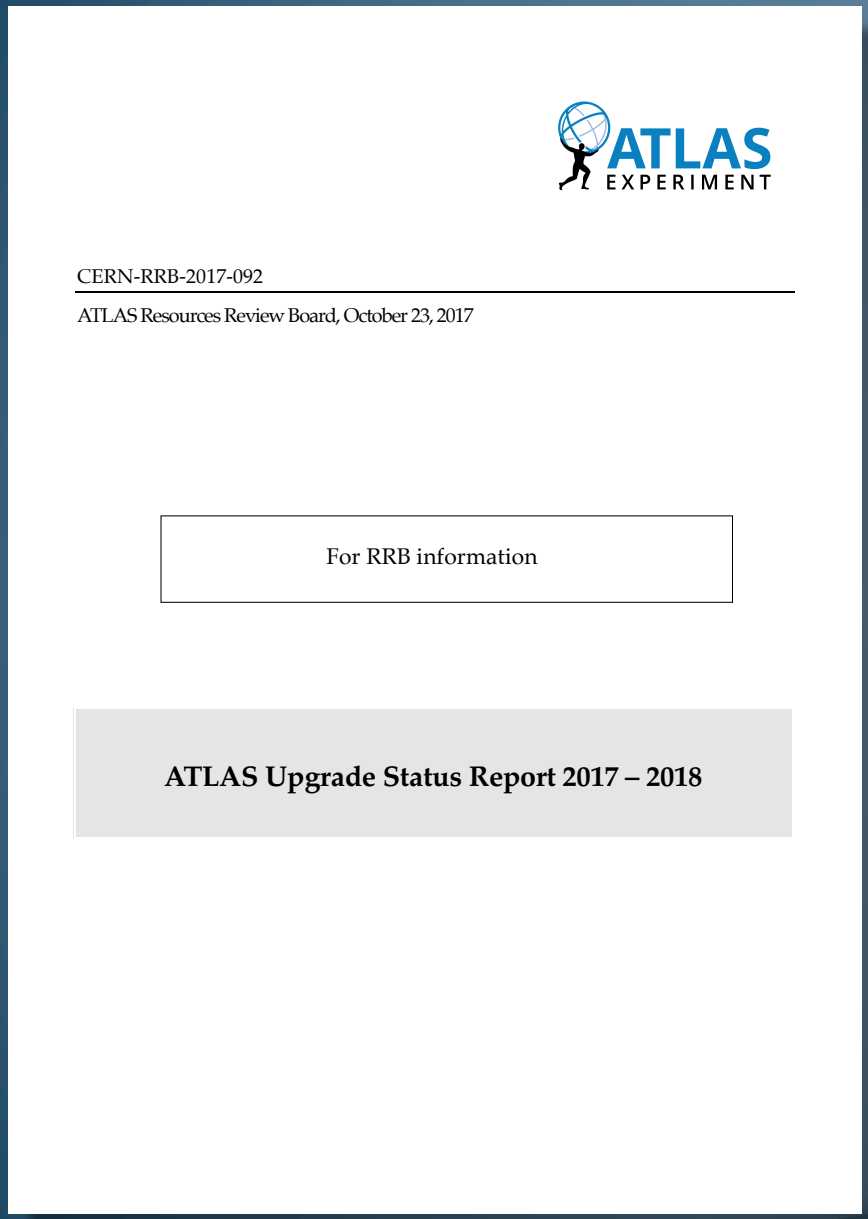


## Proposed Sharing of System-specific M&O-B Contributions for ATLAS in 2018 by Funding Agency (kCHF)

| Funding Agency | Category-B items budgeted: Pixel | SCT | TRT | IDGen | LAr | TileC | Muon | FD | TDAQ | Total | Comp. B (FTE) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Argentina | | | | | | | 3 | | | 3 | 0 |
| Armenia | | | | | | | | | | | 0 |
| Australia | | 29 | | 17 | | | | | 1 | 47 | 1 |
| Austria | | 1 | 1 | | 2 | | 5 | | | 9 | 0 |
| Azerbaijan | | | | | | | | | | | 0 |
| Belarus | | | | | | | 1 | | | 1 | 0 |
| Brazil | | | | | | 6 | | | | 6 | 1 |
| Canada | | | 9 | 2 | 172 | | | 19 | | 202 | 5 |
| Chile | | | | | | | 4 | | | 4 | 1 |
| China NSFC+MSTC | | | | | 4 | | 17 | | | 21 | 4 |
| Colombia | | | | | | | 2 | | | 2 | 0 |
| Czech Republic | 2 | 2 | | 1 | | 4 | | 8 | | 17 | 3 |
| Denmark | | | 29 | 4 | | | | | 1 | 34 | 1 |
| France IN2P3 | 64 | | | 12 | 121 | 101 | | 56 | | 354 | 8 |
| France CEA | | | | | 40 | | 34 | | | 74 | 2 |
| Georgia | | | | | 1 | | 2 | | | 3 | 0 |
| Germany BMBF | 144 | 57 | | 49 | 43 | | 99 | 75 | 8 | 475 | 11 |
| Germany DESY | | | | | 35 | | 31 | 49 | | 115 | 3 |
| Germany MPI | | 20 | | 9 | 18 | | 18 | | | 65 | 2 |
| Greece | | | | | | | 7 | | | 7 | 1 |
| Hong Kong | | | | | | | 31 | | | 31 | 1 |
| Israel | | | | | | | 11 | | 2 | 13 | 2 |
| Italy | 164 | | | 60 | 36 | 44 | 141 | 75 | 5 | 525 | 12 |
| Japan | 5 | 87 | | 33 | | | 107 | | 4 | 236 | 6 |
| Morocco | | | | | 5 | | | | | 5 | 1 |
| Netherlands | | 16 | | 7 | | | 49 | | 2 | 74 | 2 |
| Norway | | 28 | | 22 | | | | | | 50 | 1 |
| Poland | | 1 | 6 | 1 | | | | 5 | | 13 | 2 |
| Portugal | | | | | | 4 | | 3 | | 7 | 1 |
| Romania | | | | | | 7 | | | | 7 | 1 |
| Russia | | | 12 | 3 | 3 | 6 | 4 | | | 28 | 5 |
| JINR | | | 2 | 1 | 1 | 5 | 2 | | | 11 | 2 |
| Serbia | | | | | 2 | | | | | 2 | 0 |
| Slovak Republic | | | | | 4 | | | | | 4 | 1 |
| Slovenia | | 2 | | 2 | | | | | | 4 | 1 |
| South Africa | | | | | | 4 | | | | 4 | 1 |
| Spain | | 20 | | 31 | 15 | 86 | | | | 152 | 4 |
| Sweden | | 4 | 33 | 7 | 4 | 18 | | 27 | | 93 | 2 |
| Switzerland | 52 | | | 24 | | | | | 2 | 78 | 2 |
| Taipei | 1 | 1 | | | 1 | | | | | 3 | 1 |
| Turkey | | | 5 | | | | | | | 5 | 1 |
| United Kingdom | 30 | 369 | | 186 | | | | | 8 | 593 | 14 |
| US DOE HEP | 56 | | 245 | 78 | 72 | 218 | 177 | | 5 | 851 | 20 |
| US NSF HEP | 15 | | 61 | 13 | 11 | 45 | 48 | | 9 | 202 | 5 |
| US DOE NP | | | | | | | | 19 | | 19 | 0 |
| US NSF NP | | | | | | | | 12 | | 12 | 0 |
| CERN | 22 | | 142 | 11 | | 56 | 19 | 63 | 4 | 317 | 7 |
| Other | | | | | | | 18 | | | 18 | 0 |
| Total | 555 | 637 | 545 | 573 | 590 | 604 | 830 | 411 | 51 | 4'796 | 138 |

**Notes:**
Based on authors, modulated by CORE contributions
Core computing in Category B (Comp. B) is expressed in Full-Time-Equivalents (FTE). Figure 0 refers to an effort <0.

**Table 2**




- **Phase-I Status**
  - Progress report on Phase-I upgrade projects
  - Phase-I "Money Matrix" (no change since April)
  - CORE Values of Phase-I deliverables expected to be realized in 2017 and in 2018
- **Phase-II Progress**

| Funding Agency | nSW | LAr-E | TileC | FTK | TDAQ | SMALL PROJECTS | Total |
|---|---|---|---|---|---|---|---|
| Argentina | | | | | 50 | | 50 |
| Armenia | | | | | | | |
| Australia | | | | 160 | | | 160 |
| Austria | | | | | | | |
| Azerbaijan | | | | | | | |
| Belarus | | | 4 | | | | 4 |
| Brazil | | 100 | | | 80 | | 180 |
| Canada | 900 | 229 | | | | 33 | 1'162 |
| Chile | 334 | | | | | | 334 |
| China NSFC+MSTC | 733 | | | | | 121 | 854 |
| Colombia | | | | | 100 | | 100 |
| Czech Republic | | | 50 | | | 184 | 234 |
| Denmark | | | | | 170 | | 170 |
| France IN2P3 | | 1'588 | | | | | 1'588 |
| France CEA | 970 | 777 | | | | | 1'747 |
| Georgia | | | 32 | | | | 32 |
| Germany BMBF | 1'225 | 384 | | 125 | 1'556 | 113 | 3'402 |
| Germany DESY | | | | 124 | | | 124 |
| Germany MPI | | | | | | 676 | 676 |
| Greece | 300 | | | | | | 300 |
| Hong Kong | | | | | | | |
| Israel | 1'004 | | | | 403 | | 1'407 |
| Italy | 1'017 | 293 | | 1'181 | 37 | 110 | 2'638 |
| Japan | 375 | 538 | | 243 | 600 | | 1'756 |
| Morocco | | | | | | | |
| Netherlands | 148 | | | | 550 | | 698 |
| Norway | | | | | | 32 | 32 |
| Poland | | | | | 100 | 128 | 227 |
| Portugal | | | 45 | | 30 | 3 | 78 |
| Romania | 150 | | 32 | | 102 | | 284 |
| Russia | 382 | 192 | 50 | | 100 | 246 | 970 |
| JINR | 120 | 99 | 50 | | | | 269 |
| Serbia | | | | | | | |
| Slovak Republic | | | 32 | | | | 32 |
| Slovenia | | | | | | | |
| South Africa | 100 | | 30 | | | | 130 |
| Spain | | | 32 | | | 146 | 178 |
| Sweden | | | | | 50 | | 50 |
| Switzerland | | | | 360 | | 336 | 696 |
| Taipei | 156 | | | | | | 156 |
| Turkey | | | | | | | |
| United Kingdom | | | | | 1'664 | | 1'664 |
| US DOE+NSF | 2'551 | 2'548 | | 1'818 | 1'236 | 206 | 8'359 |
| CERN | 818 | 843 | 43 | | 757 | 250 | 2'711 |
| Other | | | | 24† | | 95‡ | 119 |
| Total | 11'283 | 7'590 | 400 | 4'035 | 7'585 | 2'680 | 33'573 |

Notes:
1. The CORE sharing of NSW, LAr-E, TileC, FTK and TDAQ are defined in their respective MoUs
† EU FP7 IAPP Grant 324318
‡ Remaining uncovered costs of the AFP project

Table 1

# Phase-I Status

☞ The sharing of the CORE costs, defined in the MoUs, is summarized here in the Phase-I "Money Matrix".

| Phase-I Upgrade TDRs and MOUs | |
|---|---|
| CERN-LHCC-2013-006<br>CERN-RRB-2014-050 | Construction of the ATLAS New Small Wheel (NSW) Sub-Detector |
| CERN-LHCC-2013-017<br>CERN-RRB-2014-051<br>CERN-RRB-2015-064 | Upgrade of the Liquid Argon Calorimeter Trigger electronics |
| CERN-RRB-2014-052 | Upgrade of the ATLAS Tile Calorimeter |
| CERN-LHCC-2013-007<br>CERN-RRB-2014-053<br>CERN-RRB-2015-001 | Construction of the FTK Sub-System |
| CERN-LHCC-2013-018<br>CERN-RRB-2014-054 | Upgrade of the Trigger and Data Acquisition System |
| CERN-LHCC-2015-009 | ATLAS Forward Proton TDR |

# Phase-I Progress

**CORE Values of ATLAS Phase-I Upgrade Deliverables expected to be realized in 2017 by Funding Agency**

| Funding Agency | nSW | LAr-E | TileC | FTK | TDAQ | SMALL PROJECTS | Total |
|---|---|---|---|---|---|---|---|
| Argentina | | | | | 50 | | 50 |
| Armenia | | | | | | | |
| Australia | | | | 83 | | | 83 |
| Austria | | | | | | | |
| Azerbaijan | | | | | | | |
| Belarus | | | 4 | | | | 4 |
| Brazil | | 96 | | | | | 96 |
| Canada | 380 | 126 | | | | 10 | 516 |
| Chile | 80 | | | | | | 80 |
| China NSFC+MSTC | 63 | | | | | 41 | 104 |
| Colombia | | | | | 100 | | 100 |
| Czech Republic | | | 50 | | | | 50 |
| Denmark | | | | | 35 | | 35 |
| France IN2P3 | | 424 | | | | | 424 |
| France CEA | 466 | 156 | | | | | 622 |
| Georgia | | | 16 | | | | 16 |
| Germany BMBF | 885 | 62 | | 13 | 72 | | 1'032 |
| Germany DESY | | | | | | | |
| Germany MPI | | | | | | 160 | 160 |
| Greece | 136 | | | | | | 136 |
| Hong Kong | | | | | | | |
| Israel | 370 | | | | 40 | | 410 |
| Italy | 412 | 29 | | 416 | | | 857 |
| Japan | 104 | 113 | | 15 | 325 | | 557 |
| Morocco | | | | | | | |
| Netherlands | 91 | | | | | | 91 |
| Norway | | | | | | 3 | 3 |
| Poland | | | | | | 25 | 25 |
| Portugal | | | 15 | | | 3 | 18 |
| Romania | 30 | | | | | | 30 |
| Russia | 79 | 5 | 50 | | | 50 | 184 |
| JINR | 47 | 16 | 50 | | | | 113 |
| Serbia | | | | | | | |
| Slovak Republic | | | 16 | | | | 16 |
| Slovenia | | | | | | | |
| South Africa | 15 | | 30 | | | | 45 |
| Spain | | | 32 | | | 15 | 47 |
| Sweden | | | | | | | |
| Switzerland | | | | 140 | | | 140 |
| Taipei | 36 | | | | | | 36 |
| Turkey | | | | | | | |
| United Kingdom | | | | | 51 | | 51 |
| US DOE+NSF | 403 | 628 | | 969 | 691 | 22 | 2'713 |
| CERN | 367 | 20 | 20 | | | 17 | 424 |
| Other | | | | 24† | | 95‡ | 119 |
| Common Fund | 1'100 | | | | | | 1'100 |
| Total | 5'064 | 1'674 | 283 | 1'660 | 1'364 | 442 | 10'487 |

Notes:
1. These numbers represent CORE values (in 2013 CORE CHF) for items expected to be delivered in 2017
† EU FP7 IAPP Grant 324318
‡ Remaining uncovered costs of the AFP project

- See CERN-RRB-2017-092 and the presentation by Ludovico Pontecorvo for detailed, up-to-date information.
- All Phase-I projects have made substantial progress since the last RRB.

☞ Expect to realize substantial CORE values in 2017 (and 2018 →next slide).

- The New Small Wheel project is still highly critical
  - Top ATLAS priority, full attention by ATLAS management;
  - According to the new, detailed schedule (1500 items), installation in LS2 may still be possible – just!
  - Additional manpower to be found to support integration in parallel to chamber construction;
  - CORE over-costs to be wrapped up comprehensively in 2019 – 20.

# Phase-I Progress

**CORE Values of ATLAS Phase-I Upgrade Deliverables expected to be realized in 2017 by Funding Agency**

| Funding Agency | nSW | LAr-E | TileC | FTK | TDAQ | SMALL PROJECTS | Total |
|---|---|---|---|---|---|---|---|
| Argentina | | | | | 50 | | 50 |
| Armenia | | | | | | | |
| Australia | | | | 83 | | | 83 |
| Austria | | | | | | | |
| Azerbaijan | | | | | | | |
| Belarus | | | 4 | | | | 4 |
| Brazil | | 96 | | | | | 96 |
| Canada | 380 | 126 | | | | 10 | 516 |
| Chile | 80 | | | | | | 80 |
| China NSFC+MSTC | 63 | | | | | 41 | 104 |
| Colombia | | | | | 100 | | 100 |
| Czech Republic | | | 50 | | | | 50 |
| Denmark | | | | | 35 | | 35 |
| France IN2P3 | | 424 | | | | | 424 |
| France CEA | 466 | 156 | | | | | 622 |
| Georgia | | | 16 | | | | 16 |
| Germany BMBF | 885 | 62 | | 13 | 72 | | 1'032 |
| Germany DESY | | | | | | | |
| Germany MPI | | | | | | 160 | 160 |
| Greece | 136 | | | | | | 136 |
| Hong Kong | | | | | | | |
| Israel | 370 | | | | 40 | | 410 |
| Italy | 412 | 29 | | 416 | | | 857 |
| Japan | 104 | 113 | | 15 | 325 | | 557 |
| Morocco | | | | | | | |
| Netherlands | 91 | | | | | | 91 |
| Norway | | | | | | 3 | 3 |
| Poland | | | | | | 25 | 25 |
| Portugal | | | 15 | | | 3 | 18 |
| Romania | 30 | | | | | | 30 |
| Russia | 79 | 5 | 50 | | | 50 | 184 |
| JINR | 47 | 16 | 50 | | | | 113 |
| Serbia | | | | | | | |
| Slovak Republic | | | 16 | | | | 16 |
| Slovenia | | | | | | | |
| South Africa | 15 | | 30 | | | | 45 |
| Spain | | | 32 | | | 15 | 47 |
| Sweden | | | | | | | |
| Switzerland | | | | 140 | | | 140 |
| Taipei | 36 | | | | | | 36 |
| Turkey | | | | | | | |
| United Kingdom | | | | | 51 | | 51 |
| US DOE+NSF | 403 | 628 | | 969 | 691 | 22 | 2'713 |
| CERN | 367 | 20 | 20 | | | 17 | 424 |
| Other | | | | 24† | | 95‡ | 119 |
| Common Fund | 1'100 | | | | | | 1'100 |
| Total | 5'064 | 1'674 | 283 | 1'660 | 1'364 | 442 | 10'487 |

Notes:
1. These numbers represent CORE values (in 2013 CORE CHF) for items expected to be delivered in 2017
† EU FP7 IAPP Grant 324318
‡ Remaining uncovered costs of the AFP project

**CORE Values of ATLAS Phase-I Upgrade Deliverables expected to be realized in 2018 by Funding Agency**

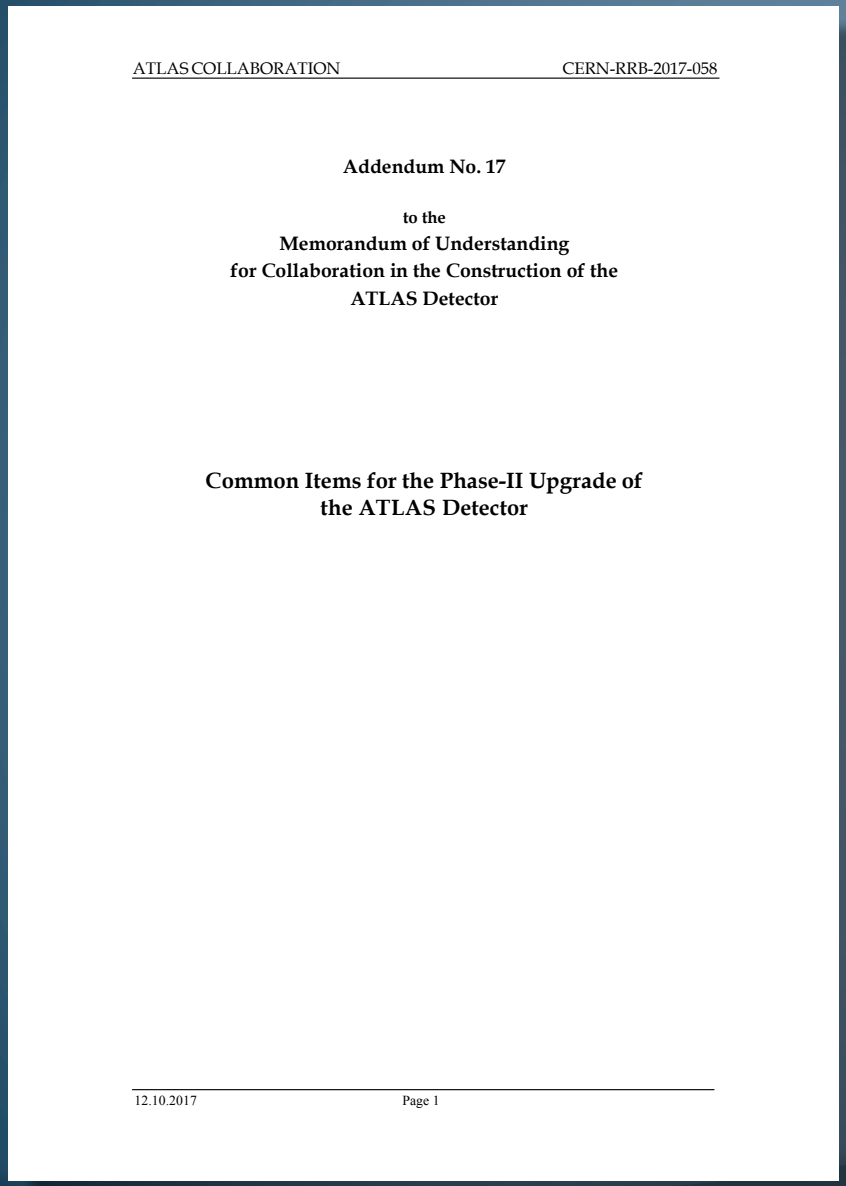
| Funding Agency | nSW | LAr-E | TileC | FTK | TDAQ | SMALL PROJECTS | Total |
|---|---|---|---|---|---|---|---|
| Argentina | | | | | | | |
| Armenia | | | | | | | |
| Australia | | | | | | | |
| Austria | | | | | | | |
| Azerbaijan | | | | | | | |
| Belarus | | | | | | | |
| Brazil | | | | | | | |
| Canada | 282 | 92 | | | | | 374 |
| Chile | 60 | | | | | | 60 |
| China NSFC+MSTC | 476 | | | | | 80 | 556 |
| Colombia | | | | | | | |
| Czech Republic | | | | | | | |
| Denmark | | | | | 35 | | 35 |
| France IN2P3 | | 1'022 | | | | | 1'022 |
| France CEA | 429 | 621 | | | | | 1'050 |
| Georgia | | | 16 | | | | 16 |
| Germany BMBF | 264 | 313 | | | 680 | | 1'257 |
| Germany DESY | | | | | | | |
| Germany MPI | | | | | | 145 | 145 |
| Greece | 156 | | | | | | 156 |
| Hong Kong | | | | | | | |
| Israel | 382 | | | | 230 | | 612 |
| Italy | 540 | 262 | | 442 | 37 | 90 | 1'371 |
| Japan | 212 | 411 | | | 45 | | 668 |
| Morocco | | | | | | | |
| Netherlands | 20 | | | | 526 | | 546 |
| Norway | | | | | | | |
| Poland | | | | | 100 | | 100 |
| Portugal | | | 30 | | | | 30 |
| Romania | 120 | | | | 67 | | 187 |
| Russia | 118 | 180 | | | 100 | 50 | 448 |
| JINR | 43 | 83 | | | | | 126 |
| Serbia | | | | | | | |
| Slovak Republic | | | 16 | | | | 16 |
| Slovenia | | | | | | | |
| South Africa | 75 | | | | | | 75 |
| Spain | | | | | | | |
| Sweden | | | | | 50 | | 50 |
| Switzerland | | | | 100 | | | 100 |
| Taipei | 120 | | | | | | 120 |
| Turkey | | | | | | | |
| United Kingdom | | | | | 1'509 | | 1'509 |
| US DOE+NSF | 1'931 | 1'544 | | 114 | 273 | 16 | 3'878 |
| CERN | 226 | 794 | 23 | | 630 | | 1'673 |
| Other (*) | | | | | | | |
| Common Fund | 1'150 | | | | | | 1'150 |
| Total | 6'604 | 5'324 | 85 | 656 | 4'282 | 381 | 17'331 |

Notes:
1. These numbers represent CORE values (in 2013 CORE CHF) for items expected to be delivered in 2018
(*) EU FP7 IAPP Grant 324318

# Phase-II Progress

- ITk-strip detector TDR approved by the CERN Research Board in June 2017
- All five remaining TDRs in different stages of preparation and review
- More details in CERN-RRB-2017-092 and in the presentation by Karl Jakobs earlier in this session
- Confidential Money matrix provided to chairs of RRB, LHCC, UCG
  - To be made available to the Funding Agencies in April 2018
  - See presentations by Eckhard Elsen and Francesco Forti in the RRB Plenary session
- Aiming for MoUs by Q4 2018

# Phase-II Common Fund



ATLAS COLLABORATION CERN-RRB-2017-058

**Addendum No. 17**

**to the**
**Memorandum of Understanding**
**for Collaboration in the Construction of the**
**ATLAS Detector**

**Common Items for the Phase-II Upgrade of the ATLAS Detector**

12.10.2017 Page 1

## CERN-RRB-2017-058

- Draft presented to RRB already in April this year
- Final version now available
- Total cost = 24.420 MCHF
- Flat funding profile over 9 years, 2018–2026
  ➠ 2.713 MCHF/year

# Phase-II Common Fund



**ANNEX 4: Sharing of the 2018 Phase-II Upgrade Common Fund budget by Funding Agency**

In accordance with Article 4.4, the total budget for the Phase-II Upgrade Common Fund of 24'420 kCHF (Annex 3) is spread flat over 9 years, from 2018 to 2026. The budget to be shared among the Funding Agencies during this period is thus 2'713.3 kCHF/year. The sharing is calculated year-by-year in the same way as for M&O-A (Article 4.5): the contributions from the Funding Agencies for year *n* will be calculated in proportion to the number of scientific authors counted for M&O on September 9 in year *n-1*.

The table below shows the 2018 contributions by Funding Agency thus obtained on the basis of the M&O author count snapshot taken on 09.09.2017:

| Funding Agency | M&O author counts on 09/09/2017 | | Common Fund Contribution [kCHF] |
|---|---|---|---|
| Argentina | 6 | 0.32% | 8.7 |
| Armenia | 0 | 0.00% | - |
| Australia | 15 | 0.80% | 21.7 |
| Austria | 3 | 0.16% | 4.3 |
| Azerbaijan | 1 | 0.05% | 1.4 |
| Belarus | 2 | 0.11% | 2.9 |
| Brazil | 14 | 0.75% | 20.2 |
| Canada | 65 | 3.46% | 94.0 |
| Chile | 10 | 0.53% | 14.5 |
| China NSFC+MSTC | 48 | 2.56% | 69.4 |
| Colombia | 4 | 0.21% | 5.8 |
| Czech Republic | 39 | 2.08% | 56.4 |
| Denmark | 11 | 0.59% | 15.9 |
| France IN2P3 | 114 | 6.08% | 164.9 |
| France CEA | 24 | 1.28% | 34.7 |
| Georgia | 6 | 0.32% | 8.7 |
| Germany BMBF | 153 | 8.16% | 221.3 |
| Germany DESY | 37 | 1.97% | 53.5 |
| Germany MPI | 21 | 1.12% | 30.4 |
| Greece | 15 | 0.80% | 21.7 |
| Hong Kong | 10 | 0.53% | 14.5 |
| Israel | 29 | 1.55% | 41.9 |
| Italy | 169 | 9.01% | 244.4 |
| Japan | 76 | 4.05% | 109.9 |
| Morocco | 11 | 0.59% | 15.9 |
| Netherlands | 24 | 1.28% | 34.7 |
| Norway | 16 | 0.85% | 23.1 |
| Poland | 29 | 1.55% | 41.9 |
| Portugal | 15 | 0.80% | 21.7 |
| Romania | 16 | 0.85% | 23.1 |
| Russia | 64 | 3.41% | 92.6 |
| JINR | 26 | 1.39% | 37.6 |
| Serbia | 5 | 0.27% | 7.2 |
| Slovak Republic | 10 | 0.53% | 14.5 |
| Slovenia | 8 | 0.43% | 11.6 |
| South Africa | 9 | 0.48% | 13.0 |
| Spain | 49 | 2.61% | 70.9 |
| Sweden | 30 | 1.60% | 43.4 |
| Switzerland | 25 | 1.33% | 36.2 |
| Taipei | 8 | 0.43% | 11.6 |
| Turkey | 11 | 0.59% | 15.9 |
| United Kingdom | 191 | 10.18% | 276.3 |
| US DOE HEP | 274 | 14.61% | 396.3 |
| US NSF HEP | 65 | 3.46% | 94.0 |
| US DOE NP | 6 | 0.32% | 8.7 |
| US NSF NP | 4 | 0.21% | 5.8 |
| CERN | 102 | 5.44% | 147.5 |
| Other | 6 | 0.32% | 8.7 |
| **Total** | **1876** | **100.00%** | **2'713.3** |



## CERN-RRB-2017-058

- Draft presented to RRB already in April this year
- Final version now available
- Total cost = 24.420 MCHF
- Flat funding profile over 9 years, 2018–2026
  ➠ 2.713 MCHF/year

☜ To be shared year-by-year exactly like M&O;
the sharing by FA in 2018 is detailed in Annex 4.

# Phase-II Common Fund



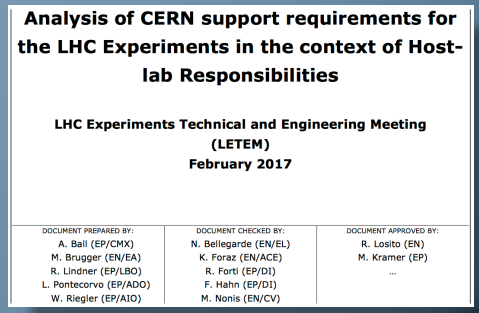
**ANNEX 3: Breakdown and cost estimates of Phase-II Upgrade Common Items**

A detailed work breakdown structure (WBS) has been developed to understand the needs for support and additional infrastructure of the ATLAS Phase-II upgrade projects as well as possible. The table below shows the first two levels of the WBS, together with the corresponding cost estimates. Some more details about the main cost drivers can be found in Annex 5.

| WBS | Description | kCHF |
|---|---|---|
| **7** | **Common Items** | **24'420** |
| **7.1** | **Project Management** | **-** |
| 7.1.1 | Global Project Plan | - |
| 7.1.2 | Installation schedule | - |
| 7.1.3 | Resources & Costing | - |
| 7.1.4 | Management tools | - |
| 7.1.5 | Documentation Web service | - |
| 7.1.6 | Quality Assurance | - |
| **7.2** | **Experiment Layout** | **4'775** |
| 7.2.1 | Mechanical Interfaces & Envelopes | - |
| 7.2.2 | Decommissioning | 260 |
| 7.2.3 | Shut Down configurations | 485 |
| 7.2.4 | Cabling | 3'490 |
| 7.2.5 | Infrastructure Integration | 540 |
| **7.3** | **System interfaces & Facilities** | **9'583** |
| 7.3.1 | Detector F/E DAQ | - |
| 7.3.2 | Detector DCS interface | - |
| 7.3.3 | Control Network | 100 |
| 7.3.4 | Cooling & Ventilation | 2'400 |
| 7.3.5 | Detector Cooling | 2'355 |
| 7.3.6 | Gas systems | 100 |
| 7.3.7 | Electrical network | 4'628 |
| **7.4** | **Common Electronics** | **3'207** |
| 7.4.1 | Front-Ends electronics | - |
| 7.4.2 | Power distribution | 614 |
| 7.4.3 | Central DCS | 767 |
| 7.4.4 | Central DSS | 561 |
| 7.4.5 | Modular electronics | 170 |
| 7.4.6 | Rack infrastructure | 1'095 |
| **7.5** | **Safety** | **2'112** |
| 7.5.1 | Fire Detection and extiction systems | 1'021 |
| 7.5.2 | Radioprotection management | 740 |
| 7.5.3 | Work environment/conditions | 301 |
| 7.5.4 | General safety infrastructure | 50 |
| **7.6** | **Machine Interfaces** | **1'155** |
| 7.6.1 | HL-LHC liaison | - |
| 7.6.2 | ATLAS simulations | - |
| 7.6.3 | Forward detectors | 60 |
| 7.6.4 | Machine Interface definition | 1'095 |
| **7.7** | **System Support** | **2'872** |
| 7.7.1 | New Small Wheel | - |
| 7.7.2 | Muons MDT & RPC | 2'102 |
| 7.7.3 | BW and EO | 36 |
| 7.7.4 | BIS7/8 | - |
| 7.7.5 | ITK | 518 |
| 7.7.6 | LAR & TileCal | 129 |
| 7.7.7 | HGTD | 87 |
| **7.8** | **Shielding** | **516** |
| 7.8.1 | SX1 shielding (fast neutrons) | 488 |
| 7.8.2 | Additional shielding | 28 |
| 7.8.3 | NID | - |
| **7.9** | **Surface facilities** | **200** |
| 7.9.1 | Storage | - |
| 7.9.2 | SR1 extension | - |
| 7.9.3 | B180 labs | - |
| 7.9.4 | Workshop | - |
| 7.9.5 | BB5 | - |
| 7.9.6 | SDX1 | 200 |



- ATLAS Common Fund – WHY?
  - needed to pay for detector-specific infrastructure
  - All FAs have to contribute !
- CERN Host Lab responsibilities
  - see the *General Conditions for Experiments at CERN*
  - provision of general infrastructure and services



**Analysis of CERN support requirements for the LHC Experiments in the context of Host-lab Responsibilities**

**LHC Experiments Technical and Engineering Meeting (LETEM)**
**February 2017**

| DOCUMENT PREPARED BY: | DOCUMENT CHECKED BY: | DOCUMENT APPROVED BY: |
|---|---|---|
| A. Ball (EP/CMX) | N. Bellegarde (EN/EL) | R. Losito (EN) |
| M. Brugger (EN/EA) | K. Foraz (EN/ACE) | M. Kramer (EP) |
| R. Lindner (EP/LBO) | R. Forti (EP/DI) | ... |
| L. Pontecorvo (EP/ADO) | F. Hahn (EP/DI) | |
| W. Riegler (EP/AIO) | M. Nonis (EN/CV) | |

- supported by CERN departmental resources, incl. the consolidation budget at the disposal of the ATLAS Technical Coordinator

# Phase-II Common Fund

| 7 | Common Items | 24'420 |
|---|---|---|
| **7.1** | **Project Management** | **-** |
| 7.1.1 | Global Project Plan | - |
| 7.1.2 | Installation schedule | - |
| 7.1.3 | Resources & Costing | - |
| 7.1.4 | Management tools | - |
| 7.1.5 | Documentation Web service | - |
| 7.1.6 | Quality Assurance | - |
| **7.2** | **Experiment Layout** | **4'775** |
| 7.2.1 | Mechanical Interfaces & Envelopes | - |
| 7.2.2 | Decommissioning | 260 |
| 7.2.3 | Shut Down configurations | 485 |
| 7.2.4 | Cabling | 3'490 |
| 7.2.5 | Infrastructure Integration | 540 |
| **7.3** | **System interfaces & Facilities** | **9'583** |
| 7.3.1 | Detector F/E DAQ | - |
| 7.3.2 | Detector DCS interface | - |
| 7.3.3 | Control Network | 100 |
| 7.3.4 | Cooling & Ventilation | 2'400 |
| 7.3.5 | Detector Cooling | 2'355 |
| 7.3.6 | Gas systems | 100 |
| 7.3.7 | Electrical network | 4'628 |
| **7.4** | **Common Electronics** | **3'207** |
| 7.4.1 | Front-Ends electronics | - |
| 7.4.2 | Power distribution | 614 |
| 7.4.3 | Central DCS | 767 |
| 7.4.4 | Central DSS | 561 |
| 7.4.5 | Modular electronics | 170 |
| 7.4.6 | Rack infrastructure | 1'095 |
| **7.5** | **Safety** | **2'112** |
| 7.5.1 | Fire Detection and extiction systems | 1'021 |
| 7.5.2 | Radioprotection management | 740 |
| 7.5.3 | Work environment/conditions | 301 |
| 7.5.4 | General safety infrastructure | 50 |
| **7.6** | **Machine Interfaces** | **1'155** |
| 7.6.1 | HL-LHC liaison | - |
| 7.6.2 | ATLAS simulations | - |
| 7.6.3 | Forward detectors | 60 |
| 7.6.4 | Machine  Interface definition | 1'095 |
| **7.7** | **System Support** | **2'872** |
| 7.7.1 | New Small Wheel | - |
| 7.7.2 | Muons MDT & RPC | 2'102 |
| 7.7.3 | BW and EO | 36 |
| 7.7.4 | BIS7/8 | - |
| 7.7.5 | ITK | 518 |
| 7.7.6 | LAR & TileCal | 129 |
| 7.7.7 | HGTD | 87 |
| **7.8** | **Shielding** | **516** |
| 7.8.1 | SX1 shielding (fast neutrons) | 488 |
| 7.8.2 | Additional shielding | 28 |
| 7.8.3 | NJD | - |
| **7.9** | **Surface facilities** | **200** |
| 7.9.1 | Storage | - |
| 7.9.2 | SR1 extension | - |
| 7.9.3 | B180 labs | - |
| 7.9.4 | Workshop | - |
| 7.9.5 | BB5 | - |
| 7.9.6 | SDX1 | 200 |

- A detailed work breakdown structure (WBS) has been developed to understand the needs of the ATLAS Phase-II upgrade projects for support and additional infrastructure as best as possible.

# Phase-II Common Fund



**ANNEX 5: Summary of the main cost drivers**

The relatively large increase of 7 MCHF of the Common Item costs with respect to the Scoping Document (CERN-LHCC-2015-020, LHC-G-166) is due mainly to the much better understanding of the needs of the upgraded detector for:

- Electrical Infrastructure
- Cooling and Ventilation and Detector Cooling
- Cabling
- Rack Infrastructure

The main cost drivers in these four areas are briefly discussed in the following.

**Electrical infrastructure**

The total cost of this WBS item is **4628 kCHF** as detailed in the table below.

| WBS Code | Element | Contact Person | Upgrade Total CORE Cost [kCHF] |
|---|---|---|---|
| 7 | Common Items (Technical Coordination) | | |
| 7.3.7 | Electrical network | W. Iwanski | 4628 |
| 7.3.7.1 | Normal Power (SDX1) | | 460 |
| 7.3.7.2 | New Diesel UPS (SDX1) | | 1992 |
| 7.3.7.3 | New bc UPS SX1 (USA15/UX15) | | 1125 |
| 7.3.7.4 | Normal UPS (US15) | | 175 |
| 7.3.7.5 | bc UPS (US15) | | 190 |
| 7.3.7.6 | New Diesel Surface | | 278 |
| 7.3.7.7 | Normal Power (USA15/UX15) | | 194 |
| 7.3.7.8 | bc UPS USA15 | | 214 |

A detailed study has been performed to quantify the needs of the upgraded detector in terms of electrical power, classifying the needs by type (uninterrupted or normal power) and the location where the power is needed (surface or service caverns). The result is that an additional 1.8 MW are needed in the underground caverns for the powering and read-out of the detectors (the main contributors are the ITk, LAr Read-out and TDAQ). On the surface, an additional 1.2 MW are needed for the upgraded HLT farm and for the primary chiller for the CO2 detector cooling plant used by the ITk. The costs for these new installations have been evaluated with the CERN EN-EL group who will be the main supplier for these improvements. The cost estimates are based on the costs of similar installations at the time of the original construction of ATLAS, which have been escalated to account for the increased costs of material and labour today.

**Cooling and Ventilation**

The upgraded ATLAS detector will consume substantially more electrical power in the underground caverns (about 1.8 MW as discussed above). To cope with this additional power dissipation, a corresponding increase in the capacity of the cooling and ventilation systems is required.

The present cooling tower circuit at Point 1 has a remaining margin of 9 MW. However, to access this additional capacity, the temperature difference between the supply and return water must be increased. The chilled water system has only 300 kW of margin. The mixed water circuit has 1 MW of margin, which can only be accessed if the electronics in the racks can be operated at higher temperature (by increasing the difference between the water temperature at the rack output compared to the rack input).



- A detailed work breakdown structure (WBS) has been developed to understand the needs of the ATLAS Phase-II upgrade projects for support and additional infrastructure as best as possible.
- More details about the main cost drivers can be found in Annex 5.

# The ATLAS management, supported by the ATLAS Executive and Collaboration Boards, kindly invites the RRB to

- approve the requested 2018 M&O-A and M&O-B budgets, and their sharing by Funding Agency;
- take note of the progress in the ATLAS Phase-I Upgrade projects, and the CORE deliverables projected to be realized in 2017 and 2018;
- endorse Addendum #17 to the Construction MoU about the Phase-II Common Fund, thus allowing to collect signatures and first contributions from the Funding Agencies in 2018.

**!! THANK YOU FOR SUPPORTING ATLAS !!**