



# LHC Computing Grid

## Status of Resources and Financial Plan

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[www.cern.ch/lcg](http://www.cern.ch/lcg)





# Introduction

- This report presents:
  - Some concluding remarks on LCG Phase 1 at CERN
  - A summary of computing capacities in WLCG regional centres
  - The progress in signing the WLCG MoU
  - The common resources of LCG Phase 2 at CERN
- Details can be looked up in:
  - The written report (CERN-RRB-2006-017)
  - In the WLCG MoU (CERN-C-RRB-2005-001/Rev.)
  - The LCG planning web pages:  
<http://lcg.web.cern.ch/LCG/planning/planning.html>
    - Under: Current WLCG MoU Documents





# Conclusion of LCG Phase 1

- Voluntary contributions to personnel and materials of LCG Phase 1 at CERN developed as predicted in October 2005.
  - Many thanks once more to all contributors!
- LCG materials expenditure at CERN in 2005 looks much less than shown at the last C-RRB (-1.8 MCHF).
  - Network equipment originally shown under Phase 1 is now accounted under Phase 2 (1.4 MCHF).
  - Air conditioning equipment for 0.4 MCHF could not yet be billed in 2005.



# Costs and Funding for Physics Computing Materials at CERN in MCHF

	2001	2002	2003	2004	2005	Totals	Totals C-RRB8
<b>Costs</b>							
Sum Physics Comp.	8.4	9.9	9.9	9.6	8.5	46.3	48.5
Base Physics	5.8	4.8	6.7	4.2	4.1	25.6	26.0
LCG Phase 1 at CERN	2.6	5.1	3.2	5.5	4.4	20.7	22.5
<b>Funding</b>							
Income per Year	8.5	9.9	10.9	9.4	8.2	46.9	48.5
Base Physics	5.8	4.8	6.9	5.4	4.1	27.0	27.9
Addn. CERN Funding	2.6	1.4	0.7	2.1	2.0	8.8	9.3
Special Income	0.0	0.0	0.0	0.8	0.3	1.1	1.1
External Income	0.0	3.7	3.3	1.1	1.8	10.0	10.3
<b>Annual Balance</b>	0.0	0.0	1.1	-0.2	-0.3		
<b>Cumulative Balance</b>	0.0	0.0	1.1	0.9	0.5		0.0

- The 0.5 MCHF balance will still grow to 0.8 MCHF after reception of the last contribution for 2005.
- But most of this positive balance is just the result of shifting payments into Phase 2 and not a real saving.





# Regional Centre Resources

- Since the last C-RRB Portugal entered the MoU tables as Tier-2 for ATLAS and CMS.
- The Finnish contribution to CMS is now shown as a new Tier-2 and not as part of the NDGF Tier-1.
- Multiple small changes led to many versions of the MoU tables from October to now.
- But the sum of Tier-1 and Tier-2 capacities changed less than 2‰.
  - Wonderful level of stability?
  - Terrible lack of growth?





# Tier1/2 Summary Table

Tier-1 Planning for 2008		ALICE	ATLAS	CMS	LHCb	SUM 2008
CPU - MSI2K	Offered	6.7	22.9	11.6	4.4	45.6
	TDR Requirements	12.3	24.0	15.2	4.4	55.9
	Balance	-46%	-5%	-24%	-0%	-18%
Disk - PBytes	Offered	2.7	12.5	5.5	2.2	22.9
	TDR Requirements	7.4	14.4	7.0	2.4	31.2
	Balance	-63%	-13%	-21%	-10%	-26%
Tape - PBytes	Offered	3.1	9.1	9.6	1.9	23.7
	TDR Requirements	6.9	9.0	16.7	2.1	34.7
	Balance	-55%	1%	-42%	-9%	-32%

Includes current planning for all Tier-1 centres

Tier-2 Planning for 2008		ALICE	ATLAS	CMS	LHCb	SUM 2008
CPU - MSI2K	Offered	5.6	20.1	18.3	4.4	48.4
	TDR Requirements	14.4	19.9	19.3	7.7	61.3
	Balance	-61%	1%	-5%	-42%	-21%
Disk - PBytes	Offered	1.5	6.3	4.8	0.8	13.4
	TDR Requirements	3.5	8.7	4.9	n/a	17.1
	Balance	-58%	-29%	-3%	n/a	-22%
# Tier-2 federations - included(expected)		15 (17)	24 (30)	25 (29)	11 (12)	40 (49)

- 40 Tier2 centres have their data included in above table.
- 9 more centres plan to join as soon as possible.





# Additional Tier2 Centres

- Slovenia and Ukraine joined the list.
- Universities of Freiburg and Wuppertal in Germany dropped out.
- Korea has started discussions to join this table.

<i>Institution</i>	<i>Experiments served with priority</i>			
	<i>ALICE</i>	<i>ATLAS</i>	<i>CMS</i>	<i>LHCb</i>
Austria, UIBK, Innsbruck		X		
Belgium, Belgian Tier-2 Federation - UA - UCL - ULB - UMH - VUB			X	
Brazil, Brazilian Tier-2 Federation - CBPF - UERJ - UFRJ - UNESP		X	X	X
Canada, Canada East Tier-2 Federation		X		
Canada, Canada West Tier-2 Federation		X		
Hungary, Hungarian Tier-2 Federation - KFKI, Budapest - SZTAKI, Budapest - Eotvos Univ., Budapest - Debrecen Univ.	X		X	
Israel, HEP-IL Federation - Technion, Haifa - Weizmann, Rehovot - Tel Aviv Univ.		X		
Slovenia, SiGNET Tier-2		X		
Ukraine, Ukrainian Tier-2 Federation - Kiev: BITP, IPS, IMBG, MAO, ICB, KNU - Kharkov: KhIPT, ISM, IRA, KhNU - Lvov: ICMP, LNU	X		X	





## Progress in Signing the WLCG MoU

- The number of signatures to collect from Funding Agencies with pledges in the current MoU is 30.
- The number of signed MoUs received is 18.
  - Including Italy (signing in three days)
- That means that we have at this moment signatures for 80% of the pledged capacities in 2008.
- There seems to be no indication that it will not be possible to collect the remaining signatures before October 2006.





# LCG Phase 2 Budget at CERN

- The table on the next slide shows the cost and funding estimates for LCG Phase 2 at CERN.
- Funds have been re-profiled over the years to fit better to the needs.
  - The personnel budget now shows fully its planned balance.
- The overall balance improved by 780 kCHF.
  - 500 kCHF have been received from cuts in the IT Department budget.
  - And PH Department could pay for their Additional LCG personnel in 2005 from its budget.

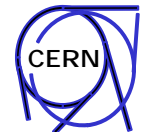


2005	2006	2007	2008	TOTAL
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<b>Funding</b>					
<b>From CERN Budget</b>					
- Personnel	1.510	16.985	18.189	16.338	53.022
- Physics	0.000	11.925	12.924	13.084	37.933
- IT		8.410	9.393	9.921	27.724
- PH		3.515	3.531	3.163	10.209
- Additional	1.510	5.060	5.265	3.254	15.089
- IT	1.160	3.825	4.004	2.342	11.331
- PH	0.350	1.235	1.261	0.912	3.758
- Materials	1.410	24.980	16.544	24.464	67.398
- Physics Operations		4.880	4.774	4.878	14.532
- IT		4.460	4.344	4.468	13.272
- PH		0.420	0.430	0.410	1.260
- Tier 0 and CERN Analysis Facility	1.410	20.100	11.770	19.586	52.866
<b>Contributions via Team Accounts*</b>					
- Personnel		1.810	1.670	1.130	4.610
- Material		0.950	0.130		1.080
<b>In-kind Contributions*</b>					
- Personnel		0.910	0.950	0.120	1.980
<b>Total</b>					
- Personnel	1.510	19.705	20.809	17.588	59.612
- Materials	1.410	25.930	16.674	24.464	68.478
<b>Total Funding</b>	<b>2.920</b>	<b>45.635</b>	<b>37.483</b>	<b>42.052</b>	<b>128.090</b>

<b>Planned Expenditure</b>					
- Personnel **	1.510	19.705	20.809	17.588	59.612
- Materials	1.410	25.930	25.680	29.380	82.400
- Physics Operations		4.880	4.780	4.880	14.540
- Tier 0 and CERN Analysis Facility	1.410	21.050	20.900	24.500	67.860
<b>Total Planned Expenditure</b>	<b>2.920</b>	<b>45.635</b>	<b>46.489</b>	<b>46.968</b>	<b>142.012</b>

<b>Balance Personnel</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>
<b>Balance Materials</b>	<b>0.000</b>	<b>0.000</b>	<b>-9.006</b>	<b>-4.916</b>	<b>-13.922</b>
<b>Balance</b>	<b>0.000</b>	<b>0.000</b>	<b>-9.006</b>	<b>-4.916</b>	<b>-13.922</b>





# Materials Budget LCG Phase 2 at CERN

- This table shows the materials budget in more detail.
- Infrastructure and Tier0 spending corresponds fully to the original profile.
- The CAF is costed to provide 80% of the requested capacity, but lacks 83% of its funding.

<b>Funding</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>TOTAL</b>
From CERN Budget					
- <i>Materials</i>		24.98	16.54	24.46	<b>67.40</b>
- Physics Operations		4.88	4.77	4.88	<b>14.53</b>
- Tier0 and CERN Analysis Facility	1.41	20.10	11.77	19.59	<b>52.87</b>
Contributions via Team Accounts					
- Material		0.95	0.13		<b>1.08</b>
<b>Total Materials Funding</b>	<b>1.41</b>	<b>25.93</b>	<b>16.67</b>	<b>24.46</b>	<b>68.48</b>

<b>Planned Expenditure</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>TOTAL</b>
- Physics Operations		4.88	4.77	4.88	<b>14.53</b>
- <i>Tier0 and CERN Analysis Facility</i>	1.41	21.05	20.90	24.51	<b>67.87</b>
- Basic Infrastructure		6.45	8.40	3.74	<b>18.59</b>
- Tier0	1.41	11.10	6.50	13.45	<b>32.46</b>
- CERN Analysis Facility		3.50	6.00	7.32	<b>16.82</b>
<b>Total Materials Expenditure</b>	<b>1.41</b>	<b>25.93</b>	<b>25.67</b>	<b>29.39</b>	<b>82.40</b>

<b>Balance</b>	<b>0.00</b>	<b>0.00</b>	<b>-9.00</b>	<b>-4.92</b>	<b>-13.92</b>
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