



1. Introduction

The LCG Project has entered the last year of Phase 1. This is the seventh report on the resources of the LCG Project to the C-RRB. Concerning Phase 1 resources at CERN, it follows the same pattern as earlier reports to the C-RRB. The chapter on LCG Project Phase 2 resources is obviously growing in importance, as the start of Phase 2 is coming closer.

2. Update on Personnel Resources for LCG Phase 1 at CERN

Table 1 gives an overview of the externally funded LCG personnel at CERN and the externally funded experiment members participating in LCG application software projects. As in the last reports, the FTE numbers shown have been weighted according to the experience of the provided personnel. Students and Doctoral Students are counted at a 50% level, people with less than 2 years of professional experience at 85%, between 2 and 5 at 100%, with more than 5 years at 120%.

The cost column has been established in the following way: For personnel paid via accounts at CERN the actual cost figures are given. For people paid directly by funding agencies in their respective countries, standardised values are given: (50 kCHF per person-year for students and trainees, 120 kCHF per person-year for those at established engineer level). This approach is similar to that adopted for reporting established CORE costs for in-kind contributions to the detectors.

The C-RRB6 SUM column shows for comparison the total FTEs reported to the last C-RRB meeting in October 2004.

The overall sum of externally funded LCG personnel at CERN has climbed up again. The 8 additional fellows funded by INFN have started in February/March. Taipei and Germany have also increased their overall FTE numbers for Phase 1.

The overflow of Phase 1 personnel commitments into Phase 2 now stands at 26.8 FTE-years.

Table 1: Externally Funded LCG Personnel at CERN (status 15/3/2005)

Source of Funding	Personnel in FTE				SUM FTE	Cost kCHF	C-RRB6 SUM FTE
	2002	2003	2004	2005			
LCG Assoc. ¹	2.2	3.0	3.8	4.0	12.9	1560	11.1
France	2.6	5.9	5.4	4.6	18.5	2115	18.5
Germany ²	0.3	2.5	3.8	4.3	10.9	1335	10.2
Hungary	0.4	1.6	1.0	1.4	4.4	295	3.4
Israel	2.0	2.2	2.3	0.9	7.4	500	7.4
Italy-INFN ²	1.4	6.8	8.4	12.3	28.8	2661	22.4
Portugal		2.1	0.9	0.6	3.6	363	5.3
Russia		1.9	3.1	3.3	8.3	996	8.1
Spain ²	1.6	2.5	1.9	1.5	7.5	753	7.5
Sweden	0.6	1.1	1.5	1.2	4.4	255	4.4
Switzerland	0.5	1.8	1.6	1.2	5.1	612	5.1
Taipei ²	0.3	2.6	3.2	2.6	8.6	1035	6.0
UK-EP SRC	0.8	1.0	0.2		2.0	227	2.0
UK-PPARC	10.9	24.0	22.6	13.9	71.4	9770	71.1
UK-EXP	1.7	1.7	0.5	0.2	4.1	497	3.9
USA	6.0	6.1	5.9	1.9	20.0	2395	20.0
SUM	31.3	66.7	66.2	53.8	217.9	25368	206.3

India ³	0.6	8.0	10.0	10.0	28.6		
Russia ⁴		3.0	6.0	6.0	15.0		

Notes

1. The LCG Associates are paid from the materials funds, partially provided externally.
2. In addition to what is shown in this table, Germany, Italy, Spain and Taipei have committed personnel contributions extending into Phase 2. Germany: 5.8 FTE-years, Italy: 20.6 FTE-years, Spain: 0.2 FTE-years, Taipei: 0.2 FTE-years.
3. Effort provided in India, therefore not included in the totals.
4. Effort provided in Russia, therefore not included in the totals.

3. Update on Material Resources

Table 2 lists by source the funds for materials currently available or pledged. Having entered the last year of Phase 1, the “possible” contributions are not anymore included. Nevertheless, the overall sum of contributed materials (in cash or in kind) has again climbed above the 10 MCHF line and is 360 kCHF higher than at the last C-RRB. This is due to additional contributions by Italy and Sweden. The 150 kCHF increase of the UK-PPARC figure is the welcome result of savings on the personnel side of the UK funding. Transferring a number of PPARC funded people onto CERN funding at the end of their Phase 1 contracts lowered the cost of end of contract allowances.

Table 2: Summary of External Funding - Materials at CERN (status 15/3/2005)

Source of Funding	Materials in kCHF				SUM of Materials	Type of Funding ¹	C-RRB6 SUM Materials
	2002	2003	2004	2005			
Belgium		200	100	100	400	cash	400
Finland		50	50		100	cash	100
Germany	3742				3742	computing	3742
Italy-INFN		642	489	406	1537	cash	1378
Japan		190	101	100	391	in kind comp.	390
Spain		450	0	150	600	cash	600
Sweden		109	52		160	cash	109
Taipei		30			30	in kind comp.	30
UK-PPARC		1584		1271	2855	computing	2704
US-LHC			323		323	in kind comp.	323
Enterasys ²		85			85	in kind comp.	85
SUM comm.	3742	3340	1115	2027	10223		9861

Notes

1. cash - cash to be used for all LCG budgeted costs,
 computing - cash to be used exclusively for computing equipment,
 in-kind computing - provision of computing materials to be installed for LCG at CERN.
2. Enterasys delivers equipment for 10 Gbit LAN R&D. The amount shown is the value of the equipment that has been counted as a contribution to LCG.

4. Prototype and CC Preparation Expenditure 2001 – 2005

Table 3 lists the amounts spent by LCG at CERN for materials during 2001 - 2004 and the spending plans for 2005. This table shows the totals per year for the LCG prototype at CERN and the costs per year for preparing CERN's computer centre for Phase 2.

Table 3: LCG Materials Expenditure at CERN 2001 - 2005 (kCHF)

	2001	2002	2003	2004	2005	TOTAL	C-RRB6
PROTOTYPE	2472	3434	1074	2098	2720	11798	11642
PREPARING CC for PHASE 2	150	1665	2083	3371	2235	9504	9490
TOTAL PROTOTYPE OPERATION	2622	5099	3157	5469	4955	21302	21132

Overall spending in 2004 was 3% higher than originally planned. The planned total materials cost for LCG Phase 1 at CERN are now 21.3 MCHF, practically unchanged compared to the figures given in October 2004.

5. Materials Budget Evolution for LCG Phase 1 and Base Physics Computing

Table 4 shows the balance between the estimated costs and the committed funding of materials for physics computing at CERN.

Table 4: Costs and Funding for Physics Computing Materials at CERN in MCHF

Estimated Costs	2001	2002	2003	2004	2005	Totals	Totals C-RRB
Sum Physics Comp.	8.4	9.9	9.9	9.6	10.4	48.3	48.3
Base Physics	5.8	4.8	6.7	4.2	5.5	27.0	27.2
LCG Phase 1 at CERN	2.6	5.1	3.2	5.5	5.0	21.3	21.1
Funding							
Income per Year	8.5	9.9	10.9	9.4	9.6	48.3	47.9
Base Physics	5.8	4.8	6.9	5.4	5.0	28.0	27.9
Addn. CERN Funding	2.6	1.4	0.7	2.1	2.5	9.3	9.1
Special Income	0.0	0.0	0.0	0.8	0.0	0.8	0.9
External Income	0.0	3.7	3.3	1.1	2.0	10.2	9.9
Annual Balance	0.0	0.0	1.1	-0.2	-0.9		
Cumulative Balance	0.0	0.0	1.1	0.9	0.0		-0.5

For the first time since the start of the LCG Project this table shows a balanced budget at the end of 2005. The additional million CHF from CERN and the income from tape media sales, already mentioned on the last C-RRB, had the biggest impact. Tight budget control kept the total Estimated Cost equal to its value of last year. The increase in external funding, reported above, and a small increase in Additional CERN Funding provided enough income to eliminate the final deficit of half a million CHF, still shown in the last C-RRB of October 2004.

6. Regional Centre Resources for LHC Computing

The information in this chapter is based on the work of the Phase 2 Planning Group (P2P). Since the middle of last year P2P collects planning data for regional centres of the LHC Computing Grid. These data are preliminary and should in no way be interpreted as commitments of the involved Funding Agencies. Signing the Memorandum of Understanding for Collaboration in the Deployment and Exploitation of the LHC Computing Grid and its Annexes is the procedure to arrive at firm resource pledges for LCG. Nevertheless, presenting the data collected so far is hoped to give an impression of what can be assumed today about the size of computing resource pledges over the next years. A comparison with the requests of the experiments for the first full year of data taking (2008 for ATLAS, CMS, LHCb and 2009 for ALICE), should allow to judge, if current planning comes close to fulfilling the needs of the experiments, which were reviewed by the LHCC in January of 2005.

At CERN there will be the Tier 0 centre and additional compute resources, called now the CERN Analysis Facility (CAF), as the different requests from the experiments for its functionality exclude the original name of CERN Tier 1.

Table 5 gives an overview of the currently planned Tier 1 centres.

Table 5: Tier 1 Centres

<i>Centre</i>	<i>Experiments served with priority</i>			
	<i>ALICE</i>	<i>ATLAS</i>	<i>CMS</i>	<i>LHCb</i>
TRIUMF, Canada		X		
GridKA, Germany	X	X	X	X
CC_IN2P3, France	X	X	X	X
CNAF, Italy	X	X	X	X
NIKHEF/SARA, NL	X	X		X
Nordic Data Grid Facility	X	X		
ASCC, Taipei		X	X	
RAL, UK	X	X	X	X
BNL, US		X		
FNAL, US			X	
PIC, Spain		X	X	X

The list of planned Tier 2 centres contains still a number of candidate institutions needing confirmation and may well be still augmented by additional ones. Annex 2 of the draft MoU presented at this meeting lists now 104 institutions. A good number of them have joined together into Tier 2 Federations, so that the number of Tier 2s to be represented in the LCG Collaboration Board stands now at 39.

Very few Tier 2s have been able so far to announce plans for the size of their resources. This report will therefore not cover Tier 2 resources.

Table 6 shows the capacity planning in CERN's Tier 0 and CAF and in all external Tier 1 centres to the extent that these Tier 1 centres were able to provide the figures. The left part of the sub-tables for each centre shows the planned ramp-up of capacities until 2010. Years with a shaded background are not yet covered by approved budgets or indicate resources for which the budget situation has not been communicated.

The right part gives the declared split of the centre's capacity over the experiments for the first year of full data taking (2009 for ALICE, 2008 for the others). ASCC, Taipei has not yet communicated their split amongst ATLAS and CMS. The experiment columns give the percentage of the total external Tier 1 requirement of each experiment planned to be provided so far; the SUM column gives the percentage of the overall Tier 1 requirements of **all** experiments served by the centre.

The requirements of the experiments are taken from sub-table 6.15, representing the sum of requirements of the experiments from external Tier 1s (not including Tier 1 functionality of the CAF). These requirements have been reviewed by the LHCC in January 2005. The Tier 0 and CAF capacities are aligned to the requirements of the experiments. No percentage values are given nor required in this case.

Sub-table 6.14 summarises the current external Tier 1 capacity situation. The left part of this table sums up capacities, except nominal WAN bandwidth where summing up is not meaningful. The right part provides the split over experiments for the reference year. The experiment columns give the percentage of the total external Tier 1 requirement of each experiment planned to be provided so far; the SUM column gives the percentage of the overall Tier 1 requirements of **all** experiments currently planned to be available. Figures for the years 2009 and 2010 are obviously too small, as some centres have not yet announced their capacities for these years. Again, as one centre has not yet provided the split of its resources amongst experiments, the sum of the experiments is smaller than the overall capacity planned to be available.

Recalling that all these figures are preliminary and have to be validated by the Funding Agencies before signing the MoU, some comments on the content of the summary table are possible:

It is very satisfying to see that the planned CPU and tape capacity for the reference years is close to the request figures. The planned disk capacity is less than requested, mainly affecting ATLAS and CMS. It is hoped that the concerned centres and Funding Agencies can still react to this mismatch. Finally, it should be pointed out that the growth of computing capacities requested by the experiments after the reference years is much steeper than the capacity increase many of the Tier 1 centres have planned so far.

Table 6: LCG Tier 0, CAF and Tier 1 Resources

6.1	CERN Tier0	2004	2005	2006	2007	2008	2009	2010	Split 2008/9	ALICE	ATLAS	CMS	LHCb	SUM 2008/9
	CPU (kSI2K)			2500	5940	12270	14600	24210		3000	4100	4600	570	12270
	Disk (Tbytes)			400	548	1066	1126	1468		100	354	400	272	1126
	Tape (Tbytes)			2420	4660	11390	21670	33360		2300	6170	3800	500	12770
	Nominal WAN (Mbits/sec)	30000	60000	80000	100000	120000	140000	160000						

6.2	CERN Analysis Facility	2004	2005	2006	2007	2008	2009	2010	Split 2008/9	ALICE	ATLAS	CMS	LHCb	SUM 2008/9
	CPU (kSI2K)				3560	7840	17030	27390		4500	2820	4700	320	12340
	Disk (Tbytes)				2220	4147	6748	9493		1187	1418	1700	554	4859
	Tape (Tbytes)				1130	2190	5300	9770		1000	530	800	860	3190

6.3	Canada Tier1	2004	2005	2006	2007	2008	2009	2010	Split 2008/9	ALICE	ATLAS	CMS	LHCb	SUM 2008/9
	CPU (kSI2K)		180	600	1200	1800	2400		Offered		1800			1800
									% of Total		7%			7%
	Disk (Tbytes)		34	113	226	340	453		Offered		340			340
									% of Total		2%			2%
	Tape (Tbytes)		120	400	800	1200	1600		Offered		1200			1200
									% of Total		12%			12%
	Nominal WAN (Mbits/sec)					10000	10000	10000						

6.4	GridKa	2004	2005	2006	2007	2008	2009	2010	Split 2008/9	ALICE	ATLAS	CMS	LHCb	SUM 2008/9
	CPU (kSI2K)	330	530	1300	3020	8820	11580	14340	Offered	4020	3020	1450	1290	9780
									% of Total	29%	11%	10%	29%	16%
	Disk (Tbytes)	59	83	192	490	980	1430	1880	Offered	465	306	246	109	1126
									% of Total	7%	2%	3%	5%	3%
	Tape (Tbytes)	100	150	450	1400	3000	5800	8600	Offered	1900	1000	900	400	4200
									% of Total	30%	10%	7%	19%	13%
	Nominal WAN (Mbits/sec)	2000	10000	10000	10000	20000	20000	20000						

6.5	IN2P3 Lyon	2004	2005	2006	2007	2008	2009	2010	Split 2008/9	ALICE	ATLAS	CMS	LHCb	SUM 2008/9
	CPU (kSI2K)	247	410	1315	3398	7923	11579	17355	Offered	1804	3100	2300	1200	8404
									% of Total	13%	11%	15%	27%	14%
	Disk (Tbytes)	42	87	623	1710	4023	5472	7947	Offered	867	1770	960	658	4255
									% of Total	13%	11%	12%	27%	13%
	Tape (Tbytes)	136	177	565	1579	3681	6121	7973	Offered	786	1150	1400	555	3891
									% of Total	12%	12%	11%	26%	12%
	Nominal WAN (Mbits/sec)	2500	5000	10000	10000	10000	10000	10000						

6.6	INFN CNAF	2004	2005	2006	2007	2008	2009	2010	Split 2008/9	ALICE	ATLAS	CMS	LHCb	SUM 2008/9
	CPU (kSI2K)		1300	1800	2400	6300	10500	18000	Offered	2310	2016	2205	693	7224
									% of Total	17%	7%	15%	16%	12%
	Disk (Tbytes)		200	850	1500	3500	5600	9000	Offered	1232	1120	1225	385	3962
									% of Total	19%	7%	16%	16%	12%
	Tape (Tbytes)		460	850	1500	4000	6000	9500	Offered	1320	1280	1400	440	4440
									% of Total	21%	13%	11%	21%	14%
	Nominal WAN (Mbits/sec)		2000	5000	10000	20000	30000	40000						

6.7	NL Tier1	2004	2005	2006	2007	2008	2009	2010	Split 2008/9	ALICE	ATLAS	CMS	LHCb	SUM 2008/9
	CPU (kSI2K)	180	400	1160	2720	4720	7530	13510	Offered	2560	1340		1780	5680
									% of Total	18%	5%		40%	13%
	Disk (Tbytes)	9	350	700	1450	2900	5800		Offered	2050	1360		510	3920
									% of Total	32%	9%		21%	16%
	Tape (Tbytes)	10	300	600	1200	2300	4600		Offered	2500	900		200	3600
									% of Total	39%	9%		10%	19%
	Nominal WAN (Mbits/sec)	10000	10000	10000	100000	100000	100000	100000						

6.8	Nordic Tier1	2004	2005	2006	2007	2008	2009	2010	Split 2008/9	ALICE	ATLAS	CMS	LHCb	SUM 2008/9
	CPU (kSI2K)		300	600	1400	2800	3600	4600	Offered	1800	1400			3200
									% of Total	13%	5%			8%
	Disk (Tbytes)		60	140	400	1400	2600	4000	Offered	1300	700			2000
									% of Total	20%	5%			9%
	Tape (Tbytes)		60	140	400	1400	2600	4000	Offered	1300	700			2000
									% of Total	20%	7%			12%
	Nominal WAN (Mbits/sec)		1000	2000	5000	10000	20000	20000						

6.9	Taipei Tier1	2004	2005	2006	2007	2008	2009	2010	Split 2008/9	ALICE	ATLAS	CMS	LHCb	SUM 2008/9
	CPU (kSI2K)	166	500	850	1770	3320			Offered					3320
									% of Total					8%
	Disk (Tbytes)	24	75	200	350	500			Offered					500
									% of Total					2%
	Tape (Tbytes)	20	140	500	1000	2000			Offered					2000
									% of Total					9%
	Nominal WAN (Mbits/sec)	2400	2400	4800	10000	10000								

6.10	UK Tier1	2004	2005	2006	2007	2008	2009	2010	Split 2008/9	ALICE	ATLAS	CMS	LHCb	SUM 2008/9
	CPU (kSI2K)		651	980	1492	2712	4206	5857	Offered	84	1571	449	644	2748
									% of Total	1%	6%	3%	15%	6%
	Disk (Tbytes)		174	450	841	1484	2087	3020	Offered	46	887	227	343	1503
									% of Total	1%	6%	3%	14%	6%
	Tape (Tbytes)		250	664	1080	2074	3934	5710	Offered	46	1033	670	346	2095
									% of Total	1%	10%	5%	16%	8%
	Nominal WAN (Mbits/sec)	2500	10000	10000	10000	10000	10000	10000						

6.11	US-ATLAS Tier1	2004	2005	2006	2007	2008	2009	2010	Split 2008/9	ALICE	ATLAS	CMS	LHCb	SUM 2008/9
	CPU (kSI2K)	200	500	1125	2558	5300	9520	16266	Offered		5300			5300
									% of Total		20%			20%
	Disk (Tbytes)	84	225	525	1108	3093	4619	8374	Offered		3093			3093
									% of Total		20%			20%
	Tape (Tbytes)	57	168	300	603	2023	3707	6175	Offered		2023			2023
									% of Total		20%			20%
	Nominal WAN (Mbits/sec)	622	2488	2488	9952	19904	29856	39808						

6.12	US-CMS Tier1	2004	2005	2006	2007	2008	2009	2010	Split 2008/9	ALICE	ATLAS	CMS	LHCb	SUM 2008/9
	CPU (kSI2K)	82	167	728	1792	4256			Offered			4256		4256
									% of Total			28%		28%
	Disk (Tbytes)	46	65	100	700	1986			Offered			1986		1986
									% of Total			25%		25%
	Tape (Tbytes)			250	300	3224			Offered			3224		
									% of Total			25%		
	Nominal WAN (Mbits/sec)													

6.13	PIC, Barcelona	2004	2005	2006	2007	2008	2009	2010	Split 2008/9	ALICE	ATLAS	CMS	LHCb	SUM 2008/9
	CPU (kSI2K)					2000			Offered		850	850	300	2000
									% of Total		3%	6%	7%	4%
	Disk (Tbytes)					1160			Offered		500	500	160	1160
									% of Total		3%	6%	7%	5%
	Tape (Tbytes)					2320			Offered		1000	1000	320	2320
									% of Total		10%	8%	15%	9%
	Nominal WAN (Mbits/sec)													

6.14	Summary Tier1s	2004	2005	2006	2007	2008	2009	2010	Split 2008/9	ALICE	ATLAS	CMS	LHCb	SUM 2008/9
	CPU (kSI2K)	1205	4938	10458	21750	49951	60915	89928	Offered	12578	20397	11510	5907	53712
									Required	14000	27000	15000	4400	60400
									Balance	-10%	-24%	-23%	34%	-11%
	Disk (Tbytes)	264	1353	3893	8775	21366	28061	34221	Offered	5960	10076	5144	2165	23845
									Required	6500	15500	7800	2400	32200
									Balance	-8%	-35%	-34%	-10%	-26%
	Tape (Tbytes)	323	1825	4719	9862	27222	34362	41958	Offered	7852	10286	8594	2261	27769
									Required	6400	10000	12900	2100	31400
									Balance	23%	3%	-33%	8%	-12%

6.15	Requirements 2008/9	ALICE	ATLAS	CMS	LHCb	SUM
	CPU (kSI2K)	14000	27000	15000	4400	60400
	Disk (Tbytes)	6500	15500	7800	2400	32200
	Tape (Tbytes)	6400	10000	12900	2100	31400
	Number of T1s	6	10	7	6	n/a

7. Resources for LCG Phase 2 at CERN

Table 7 on the next page shows the cost and funding estimates for LCG Phase 2 at CERN

Including funding and expenditure figures for Phase 2 in the year 2005 needs an explanation. The material expenses of 1.5 MCHF covers the acquisition of network equipment included in the materials budget of Phase 2. This equipment has to be available in the computer centre early in 2006 and has therefore to be purchased in 2005.

The personnel expenditure of 2.0 MCHF in 2005 is the cost of the bridging effort from Phase 1 to Phase 2, already announced in the C-RRB of October 2004, and belongs logically to the overall cost of Phase 2.

Based on latest requirement and cost estimates the materials budget of Phase 2 is now expected to balance. Yet, the personnel budget still shows an uncovered expenditure of 15.7 MCHF.

It should be noted that INFN-Italy provides 16.8 FTE-years of fellows in addition to the personnel resources shown in Table 7. They add very welcome manpower to areas of the project, which could not be supported in the original program of work of LCG.

Table 7: Phase 2 Budget Forecast for 2005 to 2008

as at 15/3/2005

LHC Computing Funding and Expenditure (Materials and Personnel)

(all figures in MCHF)

	2005	2006	2007	2008	TOTAL	NOTES
Funding						
From CERN Budget						
- <i>Personnel</i>	0.0	13.2	13.7	12.9	39.8	
- Physics		11.3	12.0	12.2	35.5	1
- EGEE Phase 1 and 2		1.4	1.2	0.3	2.9	
- CC Operation		0.5	0.5	0.4	1.4	2
- <i>Materials</i>	1.5	24.9	26.3	26.4	79.1	3
- Physics Operations		4.5	4.4	4.5	13.4	
- LCG Project (Tier 0 + CAF))	1.5	20.4	21.9	21.9	65.7	
Contributions via Team Accounts						
- Personnel		0.8	0.2	0.0	1.1	4
- Material		0.1	0.1		0.3	5
In Kind Contributions						
- Personnel		1.0	0.9	0.8	2.7	
Total					0.0	
- Personnel	0.0	15.0	14.8	13.7	43.6	
- Materials	1.5	25.0	26.4	26.4	79.4	
Total	1.5	40.1	41.2	40.1	122.9	
Planned Expenditure						
- <i>Personnel</i>	2.0	20.3	20.3	16.7	59.3	6
- <i>Materials</i>	1.5	25.0	26.4	26.4	79.4	7
- Physics Operations		4.5	4.4	4.5	13.4	
- LCG Project (Tier 0 + CAF))	1.5	20.5	22.0	21.9	66.0	
Balance Personnel	-2.0	-5.3	-5.5	-2.9	-15.7	
Balance Materials	0.0	0.0	0.0	0.0	0.0	
Balance	-2.0	-5.3	-5.5	-2.9	-15.7	

Notes (explaining changes to October 2004 figures):

1. Indexation of CERN personnel budget (35.0 ? 35.5)
2. Cost of CC operation moved from materials to personnel budget.
3. Indexation of CERN materials budget (77.3 ? 79.1)
4. Corresponds to 9.7 FTE-years (Germany 5.8 (+2.3 since October), Italy 3.9). In addition, Italy provides 12.5 FTE-years to experiments and 4.3 FTE-years to support functions in IT, beyond the original program of work of LCG.
5. Materials money provided by Italy.
6. CC operations under personnel (57.6 ? 59), indexation (59.0 ? 59.8), adjustment from 150 kCHF per FTE-year to real salaries (59.8 ? 59.3)
7. CC operation moved to personnel budget (83.1 ? 81.7), indexation of physics operation (81.7 ? 82.0), re-costing of Tier 0+CAF (82.0 ? 79.4)