ALICE RRB-MI 2001-10
28.09 2001

A L I C E

Minutes of the 10th RESOURCES REVIEW BOARD Meeting

(Held at CERN on 24th April 2001)

Present:
Europe:
R. Mauger (Ministry of Science and Technology, Zagreb), G. Paic;
F. Suransky (Ministry of Industry and Trade, Praha), M. Sumbera;
J. Dines Hansen (NSRC, Københaun), H. Bøggild;
J. Keinonen (University of Helsinki, Helsinki);
J. Feltesse (CEA-Saclay, Gif sur Yvette), P. Brossier, F. Staley;
D. Guerreau (IN2P3, Paris), J.Y. Gossiord;
J. Richter (BMBF, Bonn), D. Muller, R. Stock;
G. Vesztergombi (KFKI-RMKI, Budapest);
L. Ricatti, S. Serci (INFN, Roma), G. Ricco;
G. van Middelkoop (NIKHEF, Amsterdam), A.J. Van Rijn;
S. Irgens-Jensen (Research Council, Oslo);
J. Królikowski (State Committee for Scientific Research, Warsaw), M. Kowalski;
I. Maxim (Institute of Atomic Physics, Bucharest), M. Ciolacu;
V.I. Savrin (Ministry of Science and Technologies, Moscow);
A.N. Sissakian (Dubna), A.S. Vodopianov;
A. Sitarova (Ministry of Education of the Slovak Republic, Bratislava), K. Safarik;
L. Gidefeldt (Natural Science Research Council, Stockholm);
G. M. Zinoviev (Ministry for Science and Technology, Kiev);
I.F. Corbett (PPARC, Swindon), J. Kinson.

Asia:
S. Bhave (Department of Atomic Energy, Mumbai), Y. Viyogi.

CERN:
R.J. Cashmore (chairman), E.M. Rimmer (secretary),
V.G. Goggi, H.F. Hoffmann, A.J. Naudi, E. Tsesmelis, E. van Hove.

ALICE:
J. Schukraft, F. Carminetti, C. Fabjan, P. Giubellino, J. de Groot, H.H. Gutbrod,
L. Leistam.

Plenary Session

1. Welcome *(R.J. Cashmore, Director for Collider Programmes)*

The Chairman, R.J. Cashmore, welcomed RRB delegates of ALICE, ATLAS, CMS and LHCb. He announced that, having failed to take place at the last meeting, visits to ATLAS and CMS areas are scheduled during the present meeting. He also asked delegates to fill out a questionnaire concerning the use of e-mail and the Web for LHC RRB business.

2. Status of the LHC *(L. Maiani, Director General)*

Professor Maiani started with an artist's impression of the LHC machine *in situ.* Reporting on progress in underground/overground civil engineering, he highlighted the impressive work at the ATLAS and CMS areas. Excavation and lining of the ATLAS vault is nearing completion, after which excavation will begin of the cavern itself, a 6-storey-deep hole below the vault. At CMS, a huge reinforced central pillar is being constructed to support the roof before excavation of the two adjacent caverns can start.

The DG showed a picture and training curve of the first superconducting dipole ready for installation, one of pre-series of 30 dipoles per firm ordered last year. The magnet experienced its first quench just below the nominal field of 8.3 Tesla, reaching the ultimate field of 9 Tesla without a further quench. The DG expressed the wish that the remaining 1235 dipoles should be equally well behaved.

Following discussions between those responsible for the experiments and for the machine, the LHC commissioning schedule has been brought into line with the current status:

April – August 2004	first octant test
March 2005	last dipole delivered
end 2005	ring closed and cold
February 2006	first circulating beams
April 2006	1 month pilot run with collisions
May – July 2006	shutdown
August 2006 – February 2007	7 months of p-p collisions at $L > 2 \times 10^{33}$
April 2007	6 weeks of Pb-Pb collisions

The DG remarked that the revised schedule is not so different from the one drawn up in 1996 when difficulties such as the adverse geology and pillar excavation in the CMS area were as yet unknown. He also noted that not having winter shutdowns in 2005 and 2006 will affect CERN's electricity contracts.

A realistic cost-to-completion estimate for the machine should be possible by the end of the year, after some big contracts for dipole assembly have been adjudicated in September. The DG concluded by pointing out that costs for LHC computing and

detector Maintenance and Operation, to be discussed at this and at the October RRB meetings, should also be fairly well known by the end of 2001.

3. Maintenance and Operation *(R.J. Cashmore)*

Cashmore opened by reminding delegates of his presentation on M&O at the October 2000 RRB meeting. This had been followed by several bilateral conversations and a paper *(RRB-D 2001-04)* had been distributed in preparation for detailed discussions at the current meeting.

He drew attention to the scale of LHC experiments, which, taken together, are some 4 times bigger than the LEP experiments in capital investment, the number of people involved and M&O costs**.** During 2000, a CERN Working Group on M&O had collated input from the experiments, from LEP physicists and from CERN experts to prepare preliminary cost estimates for the years up to 2007.

The main principles concerning M&O cost sharing were developed by the CERN Management and presented to the Scientific Policy Committee in March 2001. The SPC expressed its general support for an approach that would: follow the best practices used at LEP, HERA etc.; aim for uniformity and transparency; establish total costs including core manpower; share general costs by established scientific author; leave sub-detector maintenance with the constructors; allow payment in cash and in kind but with a minimum cash contribution; take into account contributions that Member States and some non-Member States have made to building the LHC machine. These basic principles should be discussed during these current RRBs so that a draft MoU for M&O from 2003 onwards can be prepared for October. Interim arrangements for 2002 will have to be agreed in October, as substantial M&O costs are already being incurred.

Cashmore then listed the cost categories; A for common operations, Common Fund items and collaboration-wide services, B for maintenance of items provided by sub-sets of the collaboration, and C for items that are the responsibility of host laboratory. ICFA guidelines, signed MoUs for LHC detector construction and CERN's General Conditions for Experiments had been taken into account when categorising cost items. In essence, CERN must provide safe, bare experimental caverns and ancillary buildings, and the collaborations must cover costs incurred because detectors are installed.

Cashmore emphasised that present cost estimates are not yet reliable for several reasons. All items must be examined for completeness, correctness and categorisation and a clear definition must be given for each one so that costs can be correctly estimated and double counting avoided. The collaborations must bring their cost estimates in line with the 2006 machine start-up schedule and refine them, if necessary, to fit the tighter item definitions. In particular, sub-detector maintenance costs need careful revision. That having been done, scrutiny groups with some members nominated by the RRBs must examine the final estimates to assure the RRBs that they are reasonable.

The preliminary total M&O cost estimates are some 18MCHF in 2002 rising to 65MCHF in 2007. These numbers reduce to 13MCHF and 44MCHF respectively after subtracting category B costs and CERN's C and A costs.

Cashmore reported a widespread preference for sharing A costs by qualified scientific authors of publications or Technical Design Reports, that is, based on exploitation of the detector. If B costs are based on retaining responsibility for sub-systems, cost sharing details will be left to the collaboration. However, these sub-systems are highly complex, and responsibilities and commitments will have to be clearly reported to the RRBs. A common recovery plan should be envisaged in case of a major disaster, an issue that is linked to CERN's Insurance policy, presently under review.

Addressing the fact all Member States and some non-Member States have contributed to building LHC, Cashmore mentioned the idea of rebates, whereby CERN pays a fraction of the A costs of Agencies and Institutes belonging to those States. The SPC had been enthusiastic about this suggestion. The level of the payments and the formulae by which they would be apportioned would require endorsement by the CERN Council.

Cashmore then described the proposed procedure for dealing with M&O costs. In April of year N-1, the RRBs would be given preliminary estimates of A and B costs for year N and a forward look for N+1, N+2 and N+3. They would also receive the final accounts of A costs and final reports of B costs for year N-2. In October of year N-1, the RRBs would be given scrutinised estimates for A and B costs for the years N, N+1, N+2 and N+3. They would approve final allocations for A costs and note final arrangements for B costs for year N.

Cashmore expressed his hope that the current RRBs would discuss arrangements for handling M&O in 2002 and agree that draft M&O MoUs be prepared for examination in October. Final versions of the MoUs could then be presented for approval to the RRBs in April 2002 and thereafter circulated for signature.

In conclusion, Cashmore stated that M&O is an important issue for commissioning and exploiting LHC detectors. Serious costs are already being incurred and it is becoming urgent that CERN, the collaborations and the RRBs establish formal arrangements for handling these costs, to guarantee the success of the LHC experiments.

Discussion

I.F. Corbett (GB) pointed out the considerable overlap between the experiments on issues of both M&O and LHC computing. He asked whether the October meetings could be organised to take account of that and optimise the use of what will be a very limited amount of time. Cashmore agreed, adding that it is important to best use the time before as well as at the October meetings.

4. The LHC Computing Review (*S. Bethke, Steering Committee Chairman, LHC Computing Review)*

Computing Review Steering Group Report (RRB-D 2001-03) is available at http://lhc-computing-review-public.web.cern.ch

LHC computing is a vital prerequisite for the success of the experiments and a potential source of spin-offs yet unimagined. Bethke explained that LHC offline computing was not included in detector MoUs because of severe uncertainties in extrapolating more than 5 years ahead in this rapidly developing field. It is now both appropriate and necessary to finalise LHC computing plans, start serious prototyping and secure the resources needed for timely completion.

The LHC Computing Review was conducted by three independent panels reporting to a Steering Committee: a WorldWide Analysis / Computing Model panel (chaired by D. Linglin, CC-IN2P3/CNRS), a Software Project panel (M. Kasemann, FNAL) and a Management & Resources panel (M. Calvetti, INFN Florence). Membership encompassed representatives of the four experiments and CERN IT Division, and experts from around the world.

LHC computing is an unprecedented challenge for the HEP and IT communities, as Bethke illustrated with statistics that included total annual storage requirements of 7 PBs (7x10^15) for raw data and 3.2 PBs for simulated data. Each year, Tier0+Tier1+Tier2 centres (see later) will need a total tape storage capacity equivalent to 40 million CD-ROMs and disk storage equivalent to 140 thousand 75 GB disks. Their combined CPU capacity will equal that of 360 thousand of today's PCs with a total Tier0<=>Tier1 WAN bandwidth of 5000 Mbps to serve the four experiments. The Review accepted the scale of these resource requirements estimated by the experiments.

The World Wide Analysis / Computing Model panel recommended adopting the distributed, hierarchical model developed by MONARC, a collaborative effort on MOdels of Networked Analysis at Regional Centres. This model consists of a Tier0 centre at CERN, to store all raw data and perform some reconstruction, connected to several regional/supranational Tier1 centres for analysis, Monte Carlo generation and the like (one Tier1 centre being at CERN). Each experiment will require the resources of about five Tier1 centres plus a larger number of similar but smaller national/intranational Tier2 centres. The Panel assumed that institutional Tier3 facilities and end-user Tier4 workstations will anyway be available and so did not cost them. GRID technology was recognised as suitable for the transparent and efficient use of these distributed resources, and the need was identified for affordable networking at 1.5 - 3 Gbps per experiment by 2006.

The Software Project Panel called for joint efforts and common projects between the experiments and CERN-IT, with support for widely used packages. A matrix showing who is developing/maintaining/using which software packages illustrated the varying popularity and vulnerability of these products. Data challenges of increasing size and

complexity were seen as essential steps in developing production software and CERN was asked to back the transition to OO programming. Areas of concern were the limited maturity of planning and resource estimates, insufficient development and support of simulation packages, and inadequate support for and evolution of analysis tools.

The Management & Resources panel underlined that current cost estimates are based on evolutions forecast by the PASTA committee, the technology tracking team for processors, memory, storage and architectures set up by IT Division and the LHC Computing Board. This foresees logarithmic increases in capacity/performance and decreases in unit cost with time for computer hardware, trends that are currently observed but not guaranteed to continue. The hardware costs of the initial Tier0+Tier1+Tier2 centres are estimated at 240 MCHF, a third of which is for the CERN-based Tier0+Tier1 pair. These numbers will have to be reviewed every couple of years because of uncertainties in the actual performance of the LHC machine, the detectors, triggers, backgrounds and so on. Assuming that LHC starts up in 2006 and reaches design luminosity in 2007, the investment will have to be equally spread through 2005, 2006 and 2007.

A major concern is the chronic understaffing of the teams producing core software (which is everything except physics codes and GRID middleware). Shortfalls range from 28 FTEs already in 2000, reaching 42.5 FTEs in 2002 and slightly falling to 35.5 in 2005, a problem that must be addressed by the collaborating institutes. In the same context, the Review found the planned reduction of CERN-IT staff to be incompatible with providing CERN-based LHC computing and software support.

Estimates for Maintenance and Operation of the LHC computing system are based on rolling replacement within a constant budget. About 30% of the initial investment would be needed each year, namely some 80 MCHF world wide, a sum which would include the steady evolution of capacity. Bethke noted that a similar approach at LEP had given an increase in computing capacity of a factor of 1,000 during the 15 or so years between 1985 and switch-off.

To develop the final LHC computing system, a common prototype must be set-up as joint project between the experiments and CERN-IT with the participation of some major Tier1 and Tier2 centres. By 2003/4, the prototype should reach about half the complexity (not capacity) of one LHC experiment. The estimated cost of the prototype, about 18 MCHF, is not included in the initial investment costs and so an agreement is urgently needed on how to construct and finance it.

The Review strongly recommended setting up an LHC Software and Computing Steering Committee (SC2) composed of the highest level of computing management in the experiments, CERN-IT and regional centres, to steer the development and deployment of the entire system. The SC2 should establish Technical Assessment Groups (TAGs) to launch specific tasks and projects.

Each collaboration must prepare an MoU for LHC computing that defines the overall required funding and agreed responsibilities. As an interim measure, IMoU's or software agreements should be in place by end of 2001 if possible.

The Review has shown the enormity of the LHC computing challenge and Bethke reiterated the non-negligible chance of spin-offs. It has underlined the crucial importance of proper funding, planned development and timely realisation of the entire LHC offline computing system, and its later maintenance and operation. As Bethke had earlier remarked, without adequate and appropriate computing facilities, the LHC machine and its detectors will be of little use.

Discussion

Asked by S. Bhave (IN) whether cost sharing had been addressed, Bethke replied that the Review had considered costs but not their sharing. Some countries are already setting up Tier1 centres and it will be the RRBs' job to discuss cost distribution as well as how to finance connections to countries with only small national facilities. G. Wormser (FR) remarked that the Review had done a good job defining a common hardware infrastructure. He asked whether, to mitigate the lack of manpower, there is a schedule for choosing between the several software options still open and what role CERN-IT will be able to play in the decision process. Bethke acknowledged the importance of these remarks, adding that software choices had been one of the most difficult issues faced by the Review. An attempt to streamline the use of packages had not had much success because most experiments have already invested considerable development effort based on particular packages. While many packages are used by several experiments, some are used by only one or two and Bethke concluded by saying that common attempts at streamlining had been started and must continue.

ALICE Resources Review Board Meeting

1. Introduction *(R.J. Cashmore, Director for Collider Programmes)*

The Chairman, R.J. Cashmore, welcomed delegates and noted two important developments since the last meeting, the update of the LHC start-up schedule and the publication of the LHC Computing Review Report.

2. Approval of the minutes of the 9th Meeting

The Minutes were **approved** without comment.

8. Discussion of Computing Review report *(RRB-D 2001-03)*

(Item taken out of sequence; no point 7 on distributed agenda)

Cashmore opened by summarising the discussions that had already taken place in the other 3 RRBs. Firstly, the importance of LHC computing to the experimental programme is now widely recognised and it is understood that the necessary resources must be provided, both centrally at CERN and in the experiments. There is strong support for an integrated approach, with CERN taking the lead in preparing a plan incorporating the experiments, CERN-IT, CERN's Tier0/Tier1 and external Tier 1 centres; a preliminary paper will be presented to the CERN June Council. It is essential that the needs of countries and FAs of different sizes be taken into account, so that everyone can participate. The proposed Software Computing and Steering Committee SC2 should be set up as soon as possible to move the entire project forward.

Several technology cycles will occur before ALICE will be analysing real physics data, so decisions must not be taken too early. Nonetheless, LHC computing will be highly complex and it is important to start prototyping now to develop and test out ideas. The most urgent need is to find the missing software engineers. CERN has underlined this by opening 10 IT posts for central GRID-type software production. It is hoped that other institutes will make similar efforts to reach the estimated 40 or so software professionals required centrally.

H.F. Hoffmann (CERN Director for Scientific Computing) stressed again the immediate need for expert manpower to create the core software, centrally and in the experiments, and to develop the grid-wide organising 'middleware'. The first prototyping phase should involve as many partners as possible; ALICE may have different candidates from the rest of the particle physics community. It is likely that prototyping will be covered by IMoUs or Co-operation Agreements whereas the second phase, starting around 2003/2004, will require MoUs covering the construction and long-term M&O of the final system.

J. Dines-Hansen (DK) asked whether participants have to be at CERN and in the same experiment. Hoffman replied that some people will have to be at CERN but if participants work remotely perhaps there should be at least two of them together. He added that the SC2 will be looking to maximise the amount of common software and so it should not be necessary for collaborators to belong to a single experiment.

F. Carminati (ALICE) then outlined the Collaboration's views on LHC Computing (in a presentation co-authored with P. Vande Vyvre). ALICE, like the pp experiments, will record some 4.7 PB of data per year at an average bandwidth of 800MB/s.
Estimated data collection figures are:

Beam	*Annual run*	*Event rate*	*Event size*	*Bandwidth to storage*
Heavy ions HI	6 weeks ~10^6 s	50Hz	25MB	1.25GB/s
Low luminosity pp	10^7 s	100Hz	1MB	100MB/s

Various strategies are being considered to reduce the uncertainty in these estimates, possibly as large as x2. It is due to uncertainties in HI event multiplicities and in pp event pileup.

To develop its DAQ and off-line computing, ALICE has focussed on the early use of prototypes in realistic conditions, using data challenges to assess technologies and integration issues. The transition to an OO computing framework is complete, and the development and use of the final software has started. The whole collaboration is involved through a flexible software release cycle and with continuous feedback from the users.

ALICE concurs with the Computing Review's recognition of the importance, size, cost and complexity of LHC computing. The collaboration strongly supports common projects between IT and the experiments and the timely setting up of the SC2. High-priority items for ALICE are staffing, prototyping and data challenges, and software support.

ALICE is missing 5-6 people in the offline core team (17 needed). Temporary effort provided by Project Associates has been very beneficial but requests to the institutes to provide people have not met with much success yet. CERN as a collaborating institute must provide extra core software effort both in EP (in the experiment) and IT.

CERN will clearly have to assume responsibility for developing its Tier 0/Tier 1 facilities. GRID computing prototyping should reach a total size of ~1/2 the complexity of one experiment by 2004 and must include outside partners to be realistic. It must be the priority activity of IT division. ALICE has revised its data challenge plans following the new machine schedule. Based on increasing bandwidth, results are still far from the design goals and the schedule is tight, but much is learned from each data challenge and none can be skipped.

To regain the momentum built up during the Review, ALICE would like the SC2 to start as soon as possible to steer prototyping, Tier0/Tier1 development, the World Computing Model, mass storage and data management, and support from CERN-IT. ALICE

particularly needs CERN-IT support for the ROOT analysis programme and FLUKA Monte Carlo package. Failing this, the ALICE off-line core team will have to be enlarged.

ALICE would appreciate guidance in preparing software agreements; should they be IMoUs or co-operation agreements? Obviously a CERN-LHC-wide agreement is needed for prototyping, but the format of experiment-specific agreements should be the same for all four experiments.

Carminati concluded that speculative R&D is over and large-scale development has to begin. Costs and risks must be minimised by sharing resources, obtaining proper central support, co-ordinating efforts through the SC2 and learning from extensive prototyping. In all of this, MoUs (or the equivalent) are an important element

Hoffmann commented that the experiments must provide partners for prototyping and Carminati said that ALICE is already trying to identify the early players. He added that the experiments want to be involved in deliberations and planning preparations as early as possible. Cashmore invited FAs with views and visions on how computing resources can be identified and supplied to contact Hoffmann, the Director-General or himself.

3. Status of the experiment *(Spokesperson J. Schukraft)*

(ALICE RRB-D 2001-54; (ALICE RRB-Tr 2001-54)

Starting with the status of the Collaboration, Schukraft announced that the University of Zagreb, Croatia, is applying to join ALICE and that Croatia is considering increasing its CORE contribution. The Ukraine may increasing its participation (crystals for PHOS) and has granted additional funding of ~50 kCHF in 2001 for a feasibility study.

Concerning US participation, ALICE is mentioned in the recent long-range plan of the Nuclear Science Advisory Committee NSAC. Several labs and institutes are interested (LBL, Oak Ridge, BNL, Ohio SU, Texas, …) and a proposal will be made for US participation in ALICE towards the end of the year. Currently prospects look promising.

C. Fabjan became Technical Co-ordinator 1st April, and discussions are underway on new mandates and compositions for the Management and Technical Boards.

The MoU now has 24 signatures covering 93% of the funding; China, Greece, JINR, Mexico, Romania have not yet signed.

Important calendar events are:

LHCC Comprehensive Review	January 2001
Muon arm TDR addendum	submitted December 2000 presented to LHCC March 2001
Outstanding documents	
TRD TDR	mid 2001

TOF TDR addendum	2nd half 2001
Computing Technical Proposal	2nd half 2001
Physics Performance Report	shifted into 2002 physics workshop added end 2001

Major procurements are:

Muon Dipole	Coil(1.4 MSF)	CfT ended Jan. contract ~ May
	Yoke(1.2 MSF)	contract with JINR to FC in June
Inner Tracking System ITS	Silicon Drift Detector (1.4 MSF)	MS ended April CfT out ~ June
	Silicon Strip Detector (3.7 MSF)	MS ended March CfT out ~ May
TPC	Field Cage (~1 MSF)	CfT in, too expensive; new assembly scheme, new CfT out April

various smaller items
…

To reflect the new machine schedule, ALICE rebaselined its milestones early 2001 and made them consistent for all projects with TDRs during 1998-2001.

Schukraft then presented the status of the sub-systems; main points are:

Silicon Pixel Detector	The ALICE1LHCb Pixel Chip, which had caused some concern, has proved to be functional to ALICE specs. The deep sub-micron technology is being taken up by other LHC experiments.
Silicon Strip Detector	This will be a big order ~ 5 MCHF and a large number of prototypes have been produced with many more invited for market survey. 4 were shown from Eurisys (STAR), Canberra, IRST (IT) and the Ukraine.
Silicon Strip Detector support	About 40 of the 120 carbon ladders needed have been built in St. Petersburg, Russia. Production should finish next spring but there are funding problems for 2002. Maybe they can be solved via ISTC/INTAS.
TPC Field Cage	The outcome of the Call for Tender was too expensive and so the production scheme was changed to stay within budget and a new tender is under way. This introduced a 5-month delay but some speed up is possible and the Field Cage will be ready for chamber installation in autumn 2003.
TPC R/O chamber	Two inner sector R/O chambers have been tested and start of production is imminent, firstly at GSI, later in Bratislava.
TPC FEE	The TPC front-end electronics is very complicated but considerable progress has been made since R&D started in 1998. Already some compacting has been done and discussions currently address integrating many chips into one single chip to solve problems of packing and

	density.
TOF	A large-scale multi-gap RPC prototype was built end 2000. R&D is ongoing to fix operational and design parameters, and to assess ageing and rate capability. Results are needed in time for the TOF addendum late 2001
RICH	A prototype is working perfectly at STAR, evidenced by some impressive results shown of Au-Au collisions at RHIC.
PbW04 crystal production	There is now a second factory in Russia that has grown ~ 100 crystals and cut ~ 10. The transfer of cutting technology from CMS is going very smoothly.
Muon Arm	The original design of the muon stations was changed to reduce dead zones. The Al frames were more or less eliminated and the gap size was decreased. This increased the efficiency (7%) and the granularity for coping with higher backgrounds. Other modifications have allowed 'mass production' of Stations 3-5, shared between several labs in France, Italy and Russia, whereas production of Stations 1-2 at IPN, Orsay and VECC, Calcutta is more 'artisanal'.
ALICE Data Challenge III	This took place in spring 2001 and was a big success with significant improvements on throughput, reliability and scalability. It represented about 10% of the final ALICE DAQ system, comprising ~ 40 CPU's, 12 tape stations, 6 switches, and online and offline software. The system already meets the nominal requirements of ATLAS/CMS/LHCb though still a factor 10 below ALICE's needs (1.2 GB/s, 5000 TB/year).

Schukraft showed pictures of the excavations for TPC assembly in the surface hall at Pit 2 and of progress with dismantling L3; the big support tube of L3 will be extracted within a few weeks.

In concluding, he noted that, with ALICE entering the production phase, constant monitoring and optimisation will be needed to stay on schedule and within budget.

4. Report from the LHCC *(LHCC Scientific Secretary E. Tsesmelis) (ALICE RRB-D 2001-55, ALICE RRB-Tr 2001-55)*

The presentation covered LHCC sessions in November 2000, January 2001 and March 2001. The main item was the first LHCC Comprehensive Review of ALICE on 29-30 January 2001. All areas from inner detectors through test beams to schedules and costs were examined and the LHCC considered that ALICE has made very significant progress. Given adequate resources, the LHCC expects ALICE to have a working detector installed by mid-2005, with further assembly and commissioning in time for pp and heavy ion physics in 2006. The Collaboration intends to keep to this schedule.

Most detector technologies and associated electronics have successfully passed the R&D phase. Some sub-systems are in construction with others approaching this stage.

However, critical path items identified were the dipole magnet, fabrication and assembly of the TPC field cage and production of the Dimuon Forward Spectrometer absorber. ALICE is making dedicated efforts to address these difficulties and recover as much delay as possible. Tendering is in progress for the dipole magnet and preparation of the L3 magnet for ALICE is underway.

The LHCC finds progress on the Inner Tracking System satisfactory. At the March LHCC, there was a preliminary evaluation of the Addendum to the Dimuon Forward Spectrometer TDR and a formal recommendation to the Research Board is expected in May. The LHCC is currently evaluating the performance and ageing properties of RPCs in all LHC experiments (part of ALICE's Dimuon Forward Spectrometer) and its conclusions will also be made at the May session.

The status of ALICE TDRs is:

	Submission	*Approval Research Board*
RICH HMPID	August 1998	November 1998
Photon Spectrometer	March 1999	June 1999
Zero Degree Calorimeter	March 1999	June 1999
Inner Tracking System	June 1999	September 1999
Muon Arm	August 1999	November 1999
Addendum to Muon Arm TDR	December 2000	Expected June 2001
Photon Multiplicity Detector	September 1999	February 2000
Time Projection Chamber	January 2000	April 2000
Time-of-Flight	February 2000	June 2000
Addendum to TOF TDR	Late 2001	
Transition Radiation Detector	Sept 2001	
Computing TP	Late 2001	
Trigger / DAQ TP	2002	

The LHCC noted that only conceptual designs exist for the T0 and Forward Multiplicity Detector trigger detectors, the CASTOR forward calorimeter and the V0 veto detector. The Committee asked for a report in November 2001 documenting changes to the Photon Multiplicity Detector and the impact on the physics.

The LHCC is currently reviewing the data management and computing requirements of the experiments. The Committee puts fulfilment of these requirements on an equal footing with the successful construction of the LHC machine and the detectors for the success of the LHC physics programme. It will present its conclusions in May 2001.

The RHIC program and the theoretical aspects of the physics will be presented at the LHCC open session in May. Cashmore added that the first session of the HI physics workshop planned at CERN will be during the week of October 8th. The workshop will run for some 6 months and a Yellow Report will be published.

5. Financial matters *(CERN Finance Division Leader, A.J. Naudi)*

Status of collaboration accounts (ALICE RRB-D 2001-52)

Updating the distributed document, a number of FAs have since paid Membership fees: DE-Heidelberg Uni.Kirchhoff, IT-INFN (also a cash contribution of 855 kCHF), UK-Birmingham. Outstanding payments have now been made by HR-Zagreb (plus a cash contribution of 30 kCHF), DK-Copenhagen, DE-Darmstadt, Heidelberg, Munster and Frankfurt, IN-Calcutta, Saha and VECC, SK-Bratislava and Kosice, SE-Lund.

Payments remain more or less unchanged but outstanding commitments have increased and Naudi urged those FAs with payments still outstanding to make them as soon as possible. Cashmore also encouraged FAs to make their Common Fund payments whenever possible to help avoid cash flow problems and keep ALICE on schedule. J. De Groot (ALICE Resource Co-ordinator) said he would discuss the 90 kCHF outstanding from Russia in his presentation.

Summary of market surveys & tenders (ALICE RRB-D 2001-53)

An update on IT-2924/EP (Al conductor for muon arm dipole magnet) and details of a new invitation to tender IT-2999/EP (composite panels for the TPC field cage cylinders) can be found in the attached document *ATLAS RRB-D 2001-53.1*. De Groot pointed out an error in *ALICE RRB-D 2001-53*: the firm SIGMAPHI is French not German.

At the next RRB Naudi will present the findings of CERN's External Auditors, the Tribunal de Cuentas (ES), appointed by Council, who will submit their report toward the end of May.

6. Budget matters *(Resources Co-ordinator J. De Groot)*

Report on 2000 CORE expenses & Update on 2001 CORE expenses (ALICE RRB-D 2001-56, ALICE RRB-Tr 2001-56)

Full details of commitments and expenditures by sub-system and by FA are in the distributed documents.

The 2000 Budget figures, in kCHF, as approved at the RRB meeting in October 1999 and as reached are:

Subdetector	*Comms.*	*Exps.*	*Funding Agencies*
Common Projects	40	40	Russia
DAQ/Trigger	80	80	UK
Forward detectors	200	200	Greece
HMPID	800	100	CERN, Italy
ITS-CMA	186	186	Italy, Russia
Muon Arm	4,798	1,834	CERN, France CEA, France IN2P3, India, Italy, Russia, JINR
PHOS	590	590	Norway, Russia

PPC-TOF	14	14	Russia
Si Drift	1,455	375	Czech Republic, Finland, Italy, Ukraine
Si Pixel	525	525	CERN, Italy
Si Strip	1,944	1,269	France IN2P3, Italy, Netherlands, Ukraine
TPC	2,200	1,000	CERN, Germany-BWFT, Germany-GSI, Sweden
ZDC	175	88	Italy
Totals approved	***13,007***	***6,301***	
Totals reached	***7,330***	***2,579***	(including cash contributions into Common Fund)

The reduction between approved figures and those reached were mainly because of delayed production of Si Strip detector electronic chips pending evaluation of the radiation environment, delayed commitment for the constructing the muon magnet, and the fact that tendering for the TPC Field Cage will only finish in 2001. De Groot reported that the cumulative expenditure was 5,383 kCHF at the end of 2000.

The RRB **tacitly endorsed** the 2000 budget figures for ALICE.

For 2001, there are no major changes to the 2001 Budget figures, in kCHF, as approved at the October 2000 RRB meeting:

System	**Comm.**	**Exp.**	**Funding Agency (ies)**
Pixel	940	940	CERN, Italy, Slovak Republic
Drift	1,911	860	Czech Republic, Finland, Italy
Strip	4,181	1,774	CERN, France IN2P3, Italy, Netherlands
ITS-CMA	20	20	Russia
TPC	4,000	4,000	CERN, Germany, Slovak Republic, Sweden
HMPID	698	698	CERN, Italy
PHOS	500	500	Norway, Poland, Russia
Forward	642	642	Denmark, Greece, Italy, India
Muons	4,289	3,294	CERN, France CEA, France IN2P3, France SUBATECH, Italy, India, JINR, Russia
Trigger	100	100	United Kingdom
Common Projects	440	440	CERN, Russia
Common Fund 1	884	884	CERN, Italy
Common Fund 2	315	315	All
Grand Total	**18,920**	**14,467**	

De Groot reminded FAs that each institute is required to make an annual cash contribution of 5 kCHF to the ALICE Common Fund. CF contributions can be received at any time and FAs may wish to even out their spending profiles by making early payments. In 2001 expected CF commitments and expenditures are 1,180 kCHF and 980 kCHF respectively.

Estimates for 2002 CORE expenses
(ALICE RRB-D 2001-57, ALICE RRB-Tr 2001-57)

In making these preliminary estimates it is assumed that all detectors will have TDRs approved in 2001 and will be in production stage in 2002. Final and detailed numbers will be submitted for approval to the October RRB meeting.

System	Total (kCHF)	Funding Agency(ies)
Pixel	828.20	CERN, Italy, Slovak Republic
Drift	1,303.00	Czech Republic, Italy, Ukraine
Strip	3,190.00	CERN, Finland, France IN2P3, France SUBATECH, Italy, Netherlands, Ukraine
ITS-CMA	228.00	Italy, Russia
TPC	3,911.00	CERN, Denmark, Germany BMBF, Germany GSI, Poland, Slovak Republic, Croatia
TRD	1,331.00	Germany BMBF, Germany GSI
TOF	30.00	Russia
HMPID	362.00	CERN, Italy, Russia
PHOS	554.00	France SUBATECH, Russia
Forward	491.00	Denmark, Italy, India, Russia
Muons	3,830.00	CERN, France CEA, France IN2P3, France SUBATECH, Italy, JINR, Russia
Trigger	100.00	United Kingdom
Infrastr.	536.00	CERN
CP	30.00	Russia
Grand Total	***16,724.20***	

ALICE has started to examine its cost profile, including central funds and those managed by the collaborators. Results show that 2002 and 2003 will be peak spending years for ALICE construction and that spending will continue into 2006/7 essentially for DAQ and offline computing to profit from favourable price/performance evolution in these domains.

Cashmore said that it is important that the RRBs and ALICE management have clear views of spending profiles and incoming money flow. These, together will milestone monitoring, will allow progress to be tracked and potential problems to be seen sooner rather than later.

Proposal to resolve Russian Debt to Common Fund **(not submitted to the RRB in written form)**

The Russian debt to the Common Fund for 1998 and 1999 is 90 kCHF (= 2 years x 9 institutes x 5 kCHF). In 1999, ALICE combined the Russian institutes into two groups, one headed by Kurchatov, one by Sarov; the 2000 cash contributions of the two groups have been paid.

The October 2000 RRB accepted the Removal of the L3 Central Support Tube as a joint CERN – Russia in-kind contribution to the Common Projects (CERN 145 kCHF, Russia 75 kCHF). De Groot stressed that this 220 kCHF price tag is competitive, based on a (slightly updated) offer by Franc-Comtoise Industrie for 852 kFRF dated February 2000 and that the alternative to the in-kind offer is such a contract, paid in cash.

It is proposed that the 75 kCHF in-kind contribution of Sarov be counted against the 90 kCHF debt, with the remaining 15 kCHF paid by Kurchatov and Sarov. This proposal does not change the overall obligation of Russia towards ALICE Common Projects.

Cashmore was positive towards the proposal, commenting that it would be good if ALICE could remove this old problem from the pending list and remarking that the complete obligation is unaltered and the outstanding 15 kCHF must be paid.

The RRB **tacitly accepted** this proposal to resolve the Russian debt to ALICE.

9. Discussion of M&O paper *(RRB-D 2001-04)*

As for LHC computing, Cashmore started by summarising discussions during the three earlier RRBs and with many individuals, FAs, the SPC, and so on. The task is to identify the total and real costs of running the LHC experiments and to find a fair way of apportioning them. It is obvious that, compared with LEP, M&O costs are significantly higher and there is a real difference in the MS/NMS mix (although perhaps more for the other experiments than for ALICE). The aim is to establish a transparent and uniform way to handle M&O costs across the four collaborations. He noted the view that M&O costs should be payable in cash or in-kind, but with a minimum cash contribution from each institute.

Cashmore said that the list of cost items in the distributed document is far from perfect and that the estimates provided by the collaborations are very preliminary indeed. The list of items must be re-examined, item definitions must be sharpened, and estimated costs must be true operating costs and not construction costs. To tighten up the items, Cashmore will establish a small group consisting of the 4 resource co-ordinators and 3 or 4 people knowledgeable about CERN operations. The final list and definitions will be submitted to the RRBs for discussion.

The cost figures presented in the M&O paper must then be revised by the collaborations in view of the tighter definitions and the new LHC start-up date of 2006. Cashmore wants so-called scrutiny groups to examine the revised cost figures and guarantee their integrity to the RRBs. Scrutiny groups should have 3 or 4 members nominated by the RRBs for each experiment, and 3 or 4 nominated by CERN common to all experiments to provide uniformity. Cashmore asked delegates to send names to him by **11th May**. This interim procedure is necessary as the October RRBs will have to address M&O funding for 2002. The formal procedure for setting up scrutiny groups will be defined in the MoU.

CERN and the experiments will prepare a draft M&O MoU for discussion in October. This is a tight time scale and Cashmore asked delegates to send any input to him by **25th May**. Clearly common RRB discussions are needed before October and 2 or 3 dates in September will be proposed, hopefully allowing all delegates to attend on at least one day.

Cashmore then reviewed the cost categories. C-costs are those to be paid by CERN according to internationally agreed guidelines for the operation of host laboratories. A-costs relate to the general running of the experiment and preference has emerged for splitting them by the number of qualified scientific authors of papers and TDRs (not engineers and students), that is, in direct relation to scientific benefits. B-costs cover maintenance and operation of the sub-detectors and it has been widely suggested that the institutes and FAs involved should retain control of them, maybe following more closely sharing by capital investment.

FAs have also made it clear that they need to know more about rebates on A-type costs, proposed in recognition of contributions made by Member States and some Non-Member States to the machine construction. This issue has to be taken up by the CERN Directorate and agreed sums must appear in CERN's budget and forward plans.

S. Bhave (IN) remarked that ALICE M&O estimates are much higher than CMS: 9% of the total cost compared with 5%. Cashmore said that was a very valid point and that cross comparison will be one of the important jobs of the scrutiny groups, hence the idea of having some common members. De Groot remarked that ALICE is inheriting the L3 magnet (valued at some 50 MCHF in current prices) and a large infrastructure, with needs for repair as well as M&O. Also, ALICE's DAQ computing needs are about the same as those of the other experiments and therefore relatively expensive compared with the total cost of the detector. Schukraft said that ALICE shares the concern of FAs over M&O costs and will work hard to keep them as low as possible. He added that ALICE's 2 warm magnets are non-typical and will consume more power than superconducting counterparts.

Bhave raised the issue of A-cost sharing by scientists rather than costbook, quoting numbers derived from a CMS internal document which showed that some 23 out of 29 FAs would benefit from sharing by costbook. She suggested that a mixed algorithm would be fairer. Cashmore reflected that internal CMS numbers were perhaps not strictly appropriate for discussion by the present meeting. He added that anomalies in the spread of A-costs might well be balanced by the spread of B-costs, and that the final A-scheme will have to be agreed between CERN and all of the RRBs. Bhave then asked about how in-kind versus cash payments would appear in the MoU. Cashmore said that the main text of the MoU will not contain numbers (these will be in Annexes) but will define processes for presenting, monitoring and approving M&O costs, on a 4-year basis. For example, if the process had already started, in April 2001 the RRBs would receive preliminary M&O estimates for 2002 and a forward look for 2003, 2004 and 2005. In October 2001, the experiments would confirm their 2002 figures and indicate whether or not manpower

would be needed. If not, in-kind contributions would not be possible during the coming year.

Cashmore concluded by noting that additional money is needed for computing, detector completion (for ATLAS and CMS) and M&O. Given that resources are limited, the RRBs, the experiments and CERN need a full and simultaneous view of the sums to be able to set priorities.

10. Summary and future activities *(R. Cashmore)*

ALICE has made considerable progress since the last RRB and the outcome of its first LHCC Comprehensive Review was broadly successful. The ALICE management is now developing a clear view of the entire project. As in the other experiments, at this stage difficulties begin to emerge and milestones, a spending profile and expected cash flow figures are vital in helping ALICE and the RRB to solve them. He thanked the present meeting for its helpful and healthy discussions on computing and M&O.

11. Dates of next meeting

October 22/23

The format of the October meeting may be recast to include plenary discussions of generic items. For 2002 and beyond, it must be decided whether a 2-day format is sufficient to allow the RRBs to conduct their business satisfactorily.

Cashmore informed delegates that an LHC Symposium on physics and detectors, aimed at young physicists, will be held in Sardinia, **25th – 27th October 2001**.

12. Any Other Business

This was the last RRB meeting for I.F. Corbett and G. van Middelkoop and the Chairman thanked them both for their very valuable contributions. The meeting expressed its appreciation with a round of applause.