

OPERATING FROM THE CCC (CERN CONTROL CENTRE)

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Abstract

In light of the recent (18/12/2003) decision to build the new CERN Control Centre (CCC) by expanding the existing PCR (Preveessin Control Room), this paper will review briefly the reasons for providing a single Control Centre for all CERN's accelerators and outline the specific issues raised, for Accelerator Operation, by the choice of modifying the PCR rather than building a new Centre on the Meyrin site.

INTRODUCTION

The CCC will be the LHC control room; however, all CERN's other Accelerator programs will also have to be run from the same CCC. In addition, LHC performance will depend critically on the performance and stability of the existing injector chain, which will be run from the CCC. Several talks at this workshop have been dedicated to LHC Operation, this talk will cover the wider range of issues related to operating all CERN's Accelerators from the CCC.

In the past there have been many suggestions to unify the control of all CERN's Accelerators in a single control centre. During the recent restructuring of the PS & SL Division into the AB Department, this issue was again raised, this time with the LHC in mind. It became clear in 2002 that a single control room would be needed for all Accelerators in the LHC era. The main reasons being:-

- Increased efficiency and flexibility of having people doing similar jobs working together
- The roles of the different Operations crew are clearly interdependent
- LHC will rely heavily on the performance of its injectors: PSB determines the beam emittance, PS determines the bunch spacing and the SPS the filling pattern of the bunches in the LHC.
- The control of emittance, bunch intensity, and ghost bunches etc will all be of essential for the LHC performance.
- LHC Operation will have to be done in parallel with CNGS, nTOF, AD, ISOLDE, NORTH HALL and EAST HALL. This will lead to many rapidly changing machine cycles etc which can be most efficiently controlled by a single OP crew in a single control room
- Finally there is clearly a motivational issue that all the staff working on all aspects of LHC (e.g. injectors, cryogenics, cooling ventilation etc) will feel more motivated and concerned by the success of the machine if they are all working together towards a common goal.

However, it became clear towards the end of 2002 that the optimum place for such a Control Room would be the Meyrin site. For reasons of proximity to the LHC injectors and smaller CERN machines, and as a central focal point for CERN. It was not possible to modify the present MCR and a number of other alternatives were considered late in 2002, the extension to building 513 and the present Microcosm. However, neither of these options was possible. Therefore a clear recommendation was made to house the CCC in a new building on the Meyrin site.

Early in 2003 the Operation of the LHC cryogenics were included in the studies as the Accelerator and Cryogenics experts felt that the accelerator and in particular LHC technical services should be run from the same place. This led to the inclusion of the LHC cryogenics and the technical services presently run from the TCR in the final design.

As a result it was proposed to build a CERN Control Centre for all Accelerators, LHC Cryogenics and the Accelerator related activities of the present TCR.

At the same time a proposal was being made to bring the "Globe of Innovation" to CERN. It will be impossible to visit the LHC tunnel for safety reasons, so the proponents of the "Globe" wanted to build a showpiece control room for the LHC with the "Globe" installation. Several layouts were proposed with the CCC inside, underneath and finally beside the "Globe". A working group was set-up to define the requirements of the CCC and estimate a price for its construction. The price tag was in the order of 15 MCHF for a CCC built next to the "Globe of Innovation" opposite the main entrance to the Meyrin site. This group studied many of the ergonomic and practical aspects of such a building. In addition they proposed that the CCC should be ready for use for the Accelerator start-up early in 2006. Although no official approval was forthcoming the group continued to work towards this date, until in November 2003 all work on the project was stopped. This left a situation where CERN was building the LHC with no plan for a Control Room for the machine!! As a result and in response to a request from AB, AT & TS Departments, the new DG decided to build the CCC by enlarging the present PCR. This building would have the same facilities as the CCC integrated into the "Globe of Innovation", but came with an estimated price tag of 8.1 MCHF instead of 18 MCHF.

The rest of this presentation will cover the consequences of this decision.

CCC REQUIREMENTS

The basic requirements for the CCC have already been elaborated for the previous project; however, some

modifications have been necessary due to the change of location.

Ergonomics

A single room of 600 m² is needed for upto 11 Operations staff on shift. There will be many more people working in the CCC during busy periods. LHC commissioning. During the accelerator shutdowns, the CCC will still be staffed by the Technical Services Operators and the Cryogenics Operators. In these periods only 2 to 4 people will be present. Clearly this wide range dictates a number of constraints etc for the internal layout of the room. In addition, the different teams working in the CCC, several Accelerator Operations teams, a Technical Services team and the Cryogenics team will have well-defined and different roles. These teams need to be able to work independently with a minimum of interference, but still communicate easily with each other.

The layout of the CCC must be adapted to meet these requirements and a modular design is being considered where consoles can be easily moved to reconfigure the room for different phases of Operation.

Lighting is always an issue in any Control Room and the CCC will not be an exception. External windows are essential to allow daylight to enter, but neither the daylight nor the internal lighting must cause problems viewing screens, fixed displays or console data.

Finally the CCC must be a pleasant place in which to work with sufficient facilities for long-term 24hr/day 7 day/week use.

The two teams of control room design consultants that were engaged for the “Globe of Innovation” CCC are continuing to work on the new CCC and their input shows that the ergonomic constraints can be met. Their input is vital to the success of the project

Office Space

Since the new CCC will be built on a CERN site, there is a less pressing need for office space close to the Control Room. However, the amount of office space on the Preveessin is still limited and there will be a big demand for office space close to the CCC

Meeting rooms

We should plan on having a big (50 people) meeting room, suitable for ABOC and scheduled meetings in the LHC era in the CCC building and a smaller meeting room for the multitude of smaller more impromptu Operations related discussions that will occur around the Control Room itself.

Visitors

The issue of visitors is less of a worry in the new CCC, but it is still a consideration. We have to take account of CERN guided visits, which will need visual access to the CCC and VIP visits, which will need physical access to the CCC. However, we no longer have to worry about the

large number of casual visitors, who will just wander by to see what is happening!! This is clearly a big advantage for the site at Preveessin. The CCC will still be a showpiece for the CERN, but the flow of visitors will be much less than was planned for the “Globe of Innovation” and will be limited to official organised groups.

By using the PCR as the base for the CCC, we have been promised a CCC with all the facilities foreseen in the “Globe of Innovation” CCC, but with a saving of 10 MCHF. This is a control room for the next 25 years, therefore we should make sure that we “get it right” and not compromise on our requirements simply to meet the 8.1 MCHF price tag.

POSITIVE ASPECTS

The first clear advantage of the Preveessin choice is that the CCC will no longer be linked to the “Globe of Innovation”. This clearly frees us to build the best control room for CERN and make sure that it is well adapted for visitors, rather than building a visitors centre, from which we can try to control CERN’s Accelerators.

The security of the CCC will be much better as it will be inside the secured perimeter of the CERN Preveessin site. This was a major concern for the “Globe of Innovation” CCC as it would have been a high profile, much publicised centre, built off the CERN site. In the past there have been two cases of unwanted intruders arriving in the MCR. With all its attached publicity the “Globe of Innovation” CCC would have made an inviting target for such unwanted attention!

Clearly there is more office space available than in the previous project. However, this may still not be sufficient.

The CCC will be more accessible for Preveessin-based staff, but less accessible for Meyrin-based staff.

By choosing the PCR as the site for the CCC, many technical services, electricity, water, communications and network infrastructure are already available. Indeed the existing PCR will constitute some 50% of the new CCC. This clearly results in the major financial savings and simplifies the project.

OTHER ASPECTS

The issue of the distance of the CCC from the smaller accelerators in the CERN accelerator chain will be treated in a following talk (Far from the MCR). There will clearly be technical issues involved here that will need to be solved, as any interventions on the hardware of the Meyrin machines by the CCC Operators will take longer. As an example, for the LINAC2, the increased downtime if CCC Operators no longer make manual resets of LINAC equipment has been estimated at 16 hours out of 4800 hours of operation.

However, the geographical issues that need to be resolved look more complex to me. Again using the LINAC team as an example: the equipment specialists, system experts and accelerator physicists want to remain

close to their equipment. However, the OP group must have frequent contact with them in the CCC. Therefore OP will push very strongly to move them all to Preveessin. But many equipment groups will want to have the experts stay on the Meyrin site, close to their equipment. Similar arguments apply to the question of machine start-ups and MD's: Clearly these must all be done from the CCC with a very close collaboration between the Accelerator Operators and the specialists/accelerator physicists as is the case for the MCR and the PCR today. Therefore these same specialists/accelerator physicists will also need to be close to the CCC.

However, is it possible to move 200 AB staff to the Preveessin site? We must not forget that the present TCR and Cryogenics Operations will have similar demands for office space at Preveessin. Therefore, the issue of office space is far from resolved

SCHEDULE & DATES

SPS Operation is schedule to stop at the beginning of November 2004. Therefore the existing PCR and its facilities cannot be modified until after this date. The restart of the accelerators in 2006, after the long shutdown, is defined by the LHC sector test, which is scheduled for May 2006. This requires beam circulating in the SPS by the beginning of April 2006, which in turn will require beam in the PS by the beginning of March 2006. This implies that the accelerator hardware tests will have to start in February 2006. Therefore the CCC must be operational and ready for use by the beginning of February 2006. This is only 24 months and 1 week from today!!! Even more worrying is that inside this 24 month slot, there is only a 14 month break when the PCR is not needed by Operations.

OPEN ISSUES

For the LHC hardware commissioning in 2005, will there be any need for the PCR to function as a control room? Even if the answer is NO, the PCR is still used for the computer servers that will form the basis of the LHC control network. These servers will be needed for LHC hardware commissioning in 2005. Therefore a solution away from the PCR has to be found.

If the CCC is not ready in February 2006, there will be no control room for the LHC sector test or, indeed for any kind of Accelerator operation! PS/PSB etc can still be run from the MCR, provided the Access systems and the hardwired radiation alarms etc have not been displaced. For the SPS, no obvious back-up solution exists. One needs to be found!

CONCLUSIONS

Finally, we have a clear decision and a mandate to build not only the LHC control room but a show-piece control centre for CERN for the next 25 years. We must make sure that we get the design and facilities right first time as it will be expensive and time consuming to modify them afterwards.

The chosen site has advantages: not linked to Globe, less visitors, site security, availability of technical infrastructure etc. There are also a number of challenges created by the choice, distance from the smaller accelerators and contact of CCC staff with specialists etc. The schedule is very tight and we need to define a back-up solution for the SPS and the LHC Operation in 2006 in case of significant delays, greater than a few weeks, in the project.

However, I am convinced that the CCC is an essential part of the drive to make the LHC work. Now we have the money and the go ahead to build it. The rest is up to us.