Update on the Status of Civil Engineering and CMS Magnet

(A. Hervé CERN/EP, RRB13, 23 October 2001)

Content

Civil Engineering Status

An important Milestone has been passed with the completion of the ‘Pillar Wall’.

However it took longer than expected due to the low quality of the molasse.

At the present time the underground works are expected to be 12 months late in total however, from now on, work to be done are more conventional and the schedule is more firm.

Yoke Status

All five Barrel Rings have been completed
at Point 5 and measured by photogrammetry.

The outer vacuum tank has been reinforced
by rings and the internal reinforcement
has been removed.

The inner vacuum tank has been repaired and delivered in July 2001.

The 3 disks of the first Endcap have been assembled.

The second Endcap is just being delivered to CERN.

Coil Status

For the conductor large procurements have been organized through Institutes:

- Strands	Fermilab
- Pure aluminium	Fermilab (Completed)
- Aluminium alloy	Fermilab (Completed)
- Cabling	ETH Zürich
- Coextrusion	ETH Zürich
- EB Reinforcement	ETH Zürich

IGC deliveries

The first two articles delivered by IGC proved to cable badly.
These two articles have been rejected.

Fermilab has canceled the contract with IGC.

OKSC deliveries

Outokumpu will now deliver all strands.

12 articles (out of 21) have been delivered and all deliveries satisfy the specification, and cable easily.

At Brugg 10 good cables have been produced for CMS.

However 2 cables have been lost without convincing reasons, and thus we expect that we may loose another two.

The next cabling campaign is foreseen for 29 October to produce 3 additional cables.

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Seven good inserts have been produced
at Cortaillod.

Next extrusion campaign is foreseen on 19 November
to produce 3 additional inserts.

The first real length of
2.6 km composite conductor
has been produced on 5 & 6 September at Techmeta.

We are still checking this length
before proceeding with the next production.

The winding machine has been
commissioned in June/July 2001
using dummy conductor produced at Techmeta.

The prototype will be wound
starting in November using
the first real conductor length.

The swiveling platform produced by Hanjung, Pusan (Korea), for KODEL has been delivered beginning of October 2001.

Adaptation of Yoke for CMS integration

Several modifications and tooling have to be added
to the yoke to make it fully compatible with subdetectors.

For example ‘Neutron Shielding’ to protect muon chambers
was not originally foreseen and
is being procured and added now.

Yoke has also to be modified
to house systems that will not fit
in the ‘compact’ environment of CMS.

Progress in integration has shown that cables and cooling pipes must cross the magnet feet.

Holes are being added in the feet in the surface hall using contract manpower.

Cabling is being looked at in detail
in the ‘Engineering Center’,
which has handled successfully
all integration tasks of CMS since 96.

The maintenance concept of CMS
requires opening the yoke elements.

To do that safely for the subdetectors,
we have been adding non-negligible tooling
that was certainly not
foreseen with this complexity.

Schedule

Short-term activities are to produce
more lengths of conductor
and produce the winding prototype.

Metallic structures to cover the yoke have been
recently ordered in Great Britain for 1 MCHF,
and first tests of cryogenics
will now start in June 2002 in the surface hall.

The longer-term schedule is now clear.

The delay of the magnet (10 months w.r.t TDR)
is in the shadow of the known
Civil Engineering delay.

CMS schedule v31 has been slightly adapted to cope with present CE delay, and thus plans up to the magnet test mid 2004 are firm and well understood.

Austin Ball will come back on the implications for commissioning the subdetectors in order to present a ‘nearly complete’detector for the 1st physics run in August 2006.

Cost Estimate & Budget

Today 86% of the Magnet budget is committed,
that is 104 MCHF.

A ‘Cost to Complete’ exercise has been carried out
in the framework of the MAG review.

Due to the problems with the cabling machine
we have lost two cables with no good explanation.

We are now assuming that we may lose two other cables.

Improvements to the winding machine and the mandrels
have also been budgeted.

As the available reserve has been used previously
for more conductor test lengths and to
allow for a more complex heavy lifting operation,
the budget had to be increased to 124.1 MCHF
(up from the original 121.9 MCHF in 1995 prices).

Clearly all resources foreseen by the MOUs will be needed
and it is known that 1 MCHF contribution is in doubt.

In addition, during the ‘Cost to Complete’ exercise,
all dedicated tooling, needed to make the yoke adapted
to an easy maintenance of the subdetectors,
has been estimated to 2 MCHF.

These 2 MCHF have been classified as
‘Commissioning & Integration’ cost.

Conclusions

- The assembly of the Barrel Yoke is completed.
- The first Endcap Yoke is assembled, the second is delivered.
- The first length of real conductor (2.6 km) has been produced.
- The winding machine has been commissioned.
- The winding prototype will be started soon using real conductor.

- Present schedule of the magnet is 10 months late with respect to the original schedule in the TDR.
- This delay is in the shadow of the underground Civil Engineering delay (12 months).
- Civil Engineering works are now considered to be more conventional operations.
- The CMS schedule is thus now more firm and v31 has been adapted to allow for the first physics run in August 2006.

- A ‘Cost to Complete’ exercise has been carried out for the Magnet Project and presented to the MAG Committee.
- At this occasion the Magnet Budget has been increased to 124.1 MCHF, an increase of 2.2 MCHF w.r.t the original budget of 121.9 MCHF in 1995 prices.
- All resources foreseen in MoU will be needed, and 1 MCHF has been identified as in doubt.
- In the framework of the ‘Cost to Complete’ 2 MCHF of tooling, needed to make the yoke ‘friendly’ for an easy maintenance of the subdetectors, have identified and classified as ‘Commissioning & Integration’ cost.