QUESTIONS FROM EP SAFETY GROUP FROM JAMES DEVINE OCT. 15th 2020

MoEDAL-MAPP responses by James Pinfold

1) Shielding wall at the LHC end of UGC1 gallery.

Question: *Do you have a design/specification in mind for this wall, in terms of thickness, construction material/method? My default assumption would be a standard modular concrete block construction, but equally I know there are some more exotic solutions such as lead bricks and water filled barriers in a couple of locations at CERN. Also, in terms of the radiation calculations, is this something that you would do yourself or would you require support from the FLUKA teams at CERN?*

The main reason for this question is that if standard shielding concrete blocks are to be installed at the end of the gallery, then the CERN transport service will have requirements for the finished floor (flatness + loading) in order to handle and install them. These are likely to be the heaviest items to be transported into UGC1, and will thus set the parameters for a safe access and transport system to/from the LHCb shaft.

We have recently learned from the drawing LEP 1 drawing of TX84 and UGC1 and the adjacent LHC tunnel shown in Figure 1, that the UGC1 gallery is separated by a concrete wall 1.2m thick. This is substantially thicker than our supposition that this was simply a curtain wall of thickness 30 cm to 40cm.

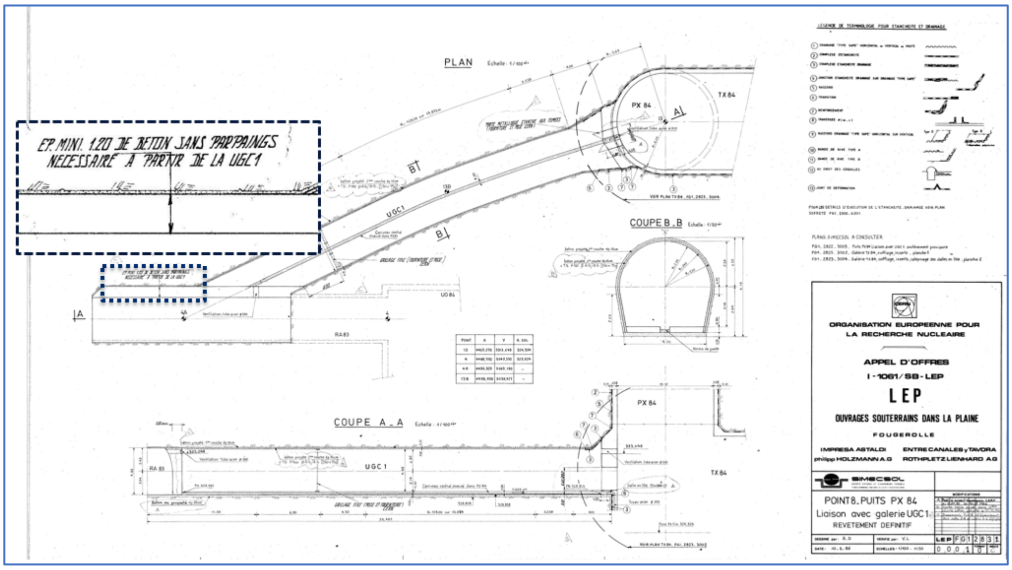

Figure 1 LEP drawing of the TX84/UGC1 region showing the wall between the LHC tunnel and the UGC1 gallery

Based on this Francesco Cerutti and Alessia Ciccotelli of the Beam-Machine Interaction section of the CERN Engineering Department prepared a preliminary report on estimates of beam induced backgrounds in the UGC1 gallery in the vicinity of the LHC tunnel, using the FLUKA Monte Carlo program. This report clearly indicates that we now longer need to enhance the thickness of the wall separating the UGC1 gallery from the LHC tunnel. Consequently, there is now no need to transport shielding blocks into the UGC1 gallery obviating the need for a finished floor.

2) Mu-Metal flame shield for PS scintillators

As mentioned by Manfred, we've already had a preliminary discussion on the subject of plastics with HSE. They confirmed that the existing derogation is valid as is, but that a new one would be required for the 3 tonnes of PS scintillator. I see from Page 17 of the TDR that this will be encased in a mu-metal flame shield, also weighing 3 tonnes. Is this the correct weight for the flame shield? If so do you have a plan in mind for installing it (for example a lifting rail in the cavern to suspend it during installation, or smaller sections bolted together)?

We are not sure where your quoted mass of 3 tonnes for the mu-metal shield comes from[1]. In any case, the TDR now gives a substantially smaller mass for the mu-metal shield of 287 kg. However, as can be seen from the drawing in Figure 2, the mu-metal shield will be assembled sheet by sheet. The largest sheets weigh only 5.3 kg.

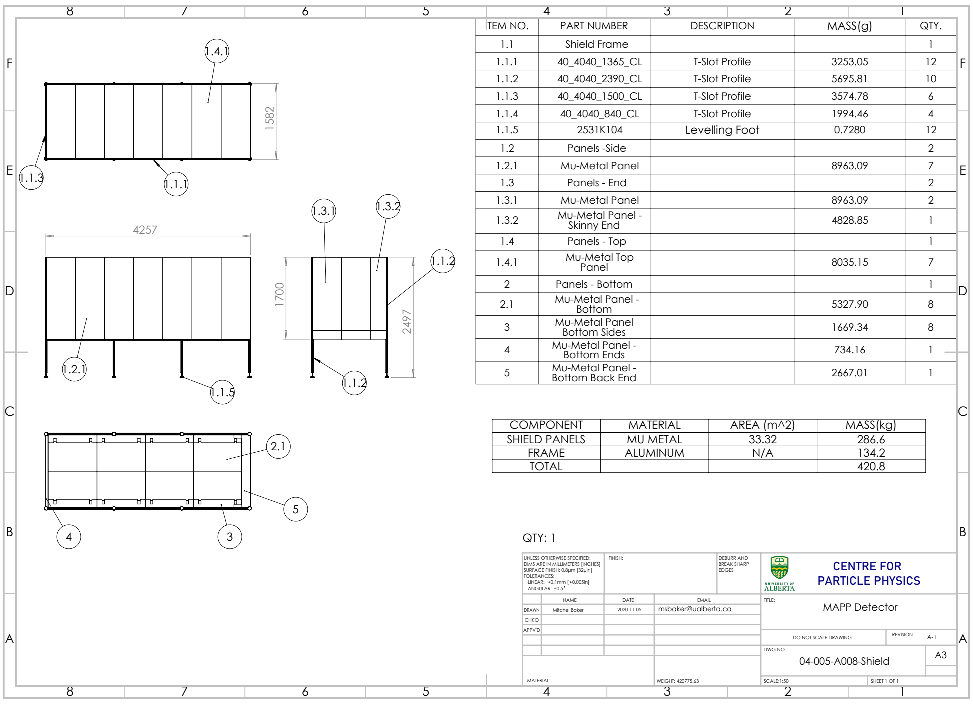

Figure 2 A drawing of the mu-metal shield for the MAP Phase-2 detector

3) Environmental conditions

We have also had a preliminary discussion with the cooling and ventilation team about the UGC1 gallery. At present there is no ventilation, and at the time of our inspection we found standing water and hydrocarbon infiltrations in the open drainage channel. At this stage we assume that at least a minimal ventilation system will be required in order to ensure a few air changes per hour in UGC1, and that a small design study will need to be performed as a precursor to installation. However, if there are any other environmental requirements (temperature or humidity control, even if limited), it would be prudent to specify them before any study is started. I note that you are asking for a maximum of 18.4kW electrical power (5x16A circuits), which could have quite an impact on the temperature in the cavern if you use it all, and on the scintillator side, I know that PS scintillators can be sensitive to environmental moisture.

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[1] Subsequently we found that this was a misunderstanding due to a type in an earlier version of TP supplied

To be clear, in our report we will set out that a design study has to be done for a ventilation system which satisfies the minimum safety criteria (air changes, possibly supervision of on/off state), if there are any other factors which are either essential or beneficial to the operation of the detector we will need you to define these for us.

The power supply and readout electronics is the only source of heat in the tunnel. Our estimates of the heat generated from these sources is 1220 W. We have issued a ticket requesting the name of the group that would assist us with the ventilation system design.

Finally, and more related to the detector construction than the safety of UGC1, I noted from the TDR that detector construction is already in progress. One of the equipment safety requirements that you may already be aware of is the need for halogen free cables, it's covered in IS23 (https://edms.cern.ch/document/335745/4). I just wanted to check that you are aware of this and it has been taken into account with any wiring that is being integrated into detector modules.

We have used halogen free cables throughout the power supply and electronics system.