14.11.2014 Meeting with Julien Mekki and a brief discussion with R. Setnescu and B.Teissandier

Executive summary:

- We shall wait for Mauro's plan of the C6K hydrolysis study. In the meantime, or shortly after, the bottle design should be finalized. According to Michele Battistin, they can be made at the EN-CV workshop.
- Respectively, I will put on hold the request for making them at the PH-DT gas workshop (Roberto Guida).
- I will inform J.Mekki that we shall not irradiate our samples during the current CHARM run, because the TE-VSC-SCC group will not have time to perform the chemical analysis analysis shortly after the irradiation.
- Because of the circulation, the "diluted" total dose in the SciFi application will be insignificant (several Gy) and its effect will be below the measurable level. The chemical study (hydrolysis, rectification) has a higher relevance than the radiological study.

Weeting with J.Mekki, at CHARM

- **November-December 2014** – first run of the new CHARM mixed irradiation facility. End – 14.12.2014. Next run will be in May 2015, with the re-start of the SPS.
- CHARM is using the PS 24 GeV proton beam at the site of the former DIRAC experiment in Building 157. The irradiation field represents a mix of neutrons and charged hadrons, essentially penetrating. There are three targets (Cu, Al, Al with cavities), to vary the intensity. The spectra, like in the previous IRRAD-4 facility, will resemble those in the LHC tunnel/caverns
- The spectra, the intensity and the neutrons/charged mix strongly depend on the location within the CHARM active (target) area, Fig. 1. The fraction of neutrons increases towards the back of the area, Fig. 2. In the backward-most locations (R1), the field is dominated by neutrons, but the fluence is very low, ~10^8 /(cm^2 h).
- CHARM is primarily intended for irradiations of electronics. **The doses** shown in Fig. 2 are calculated for Si (silicon) targets. The doses in other materials have to be scaled accordingly. (NB: *dE/dX* per cm^2/g is practically the same for Si (1.664) and fluorocarbons, e.g. Teflon: 1.671, so no need to re-scale)
- Users have to describe the **requirements on the dose and neutrons/charged** mix in the irradiation requests. The appropriate positions for the irradiated objects are decided by the CHARM specialists (J.Mekki…)
- Our containers are considered quite **small objects** for CHARM. They will be irradiated in the parasitic mode, therefore the requests will be presumably fulfilled on a short

notice. For example, if we had the containers ready right now, they could be irradiated in the coming run.

- **After the irradiation**, the objects will be kept for at least 2 months in the buffer zone. If immediate analysis is needed, it should be performed in that zone. In our case, I think that the irradiated fluid can be transferred from the SS containers to neutral glass bottles.
- The irradiation **request forms** are filled from the CHARM website http://charm.web.cern.ch/charm/test.php
  The "intervention" date/time is indicated approximately. The access to the zone, if needed, can be requested via EDH (Access type "IRRADS", #6).
- In our case, we know that the SiPMs are going to get the total D= 100 Gy and total fluence of 10^{12} neq/cm^2. The cooling pipes will be located next to SiPMs, so we can assume the same level of irradiation. However, the dose will be strongly diluted by circulation: the total volume of the cooling tubes next to the SiPMs is ~2 l, while the total estimated cooling system volume (TDR) is ~200 l. Thus, **the expected dose for the coolant** will be O(1 Gy). This renders the radiological study for the SciFi application essentially unnecessary.
- **Bottom line**: J.M. will evaluate our request, if we decide to irradiate in Nov-Dec 2014.

Discussion with R.Setnescu and B. Teissandier on 14.11.2014

- PG detouched (cut) the bottom of the A05 container and returned it to Benoit
- Benoit informed about Mauro Taborelli's decision to restrict the initial C6K study to its hydrolysis properties. The proposal is under preparation (but with a low priority).
- This study will be performed by the TE-VSC-SCC group, with their facilities and materials (we shall have to provide samples of pure Novec 649)
- PG expressed a full support of this proposal.
- In case of irradiation, the samples have to be analysed right after the required dose is received, to avoid secondary effects due to the container. This excludes the irradiation in the near term, because Radu and Benoit are currently very busy.
- New sample containers: Benoit estimates that 6-8 bottles of type "B2" (700 ml, maybe smaller, with a flange and a separate valve) will be enough. Cleaning of the material before and after the bottle assembly can be done under Mauro's control at CERN, at the facility external to TE-VSC.
- Benoit commented on my questions and remarks about the bottle construction. The valve should be of the needle type (*metal-metal type*, eg. Gyrolock SCEM 40.40.40.210.8, 190 CHF/pc), the flange (required, for example, for putting the metal strips inside the bottle) should have *metal-metal seal*, not polymer.
- It might be possible to re-use the old valves (TBC, how about flanges??)

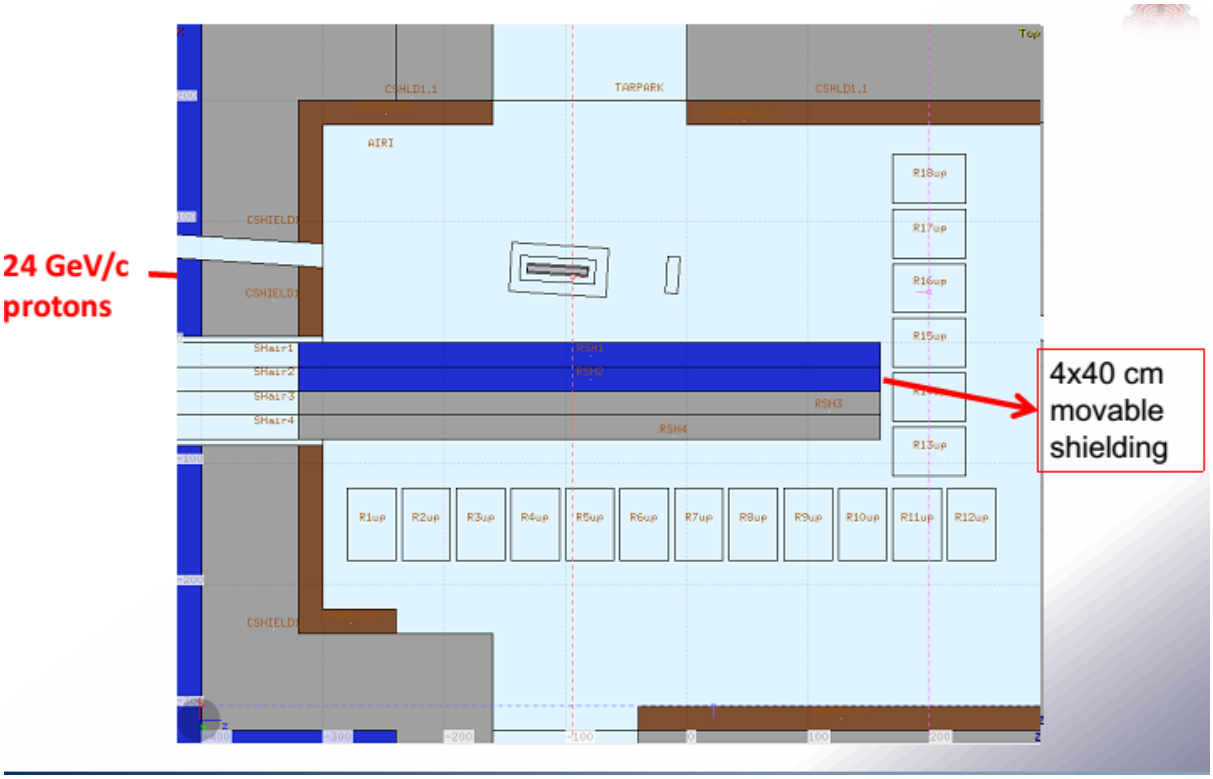

Fig.2 Positions for irradiated objects in CHARM

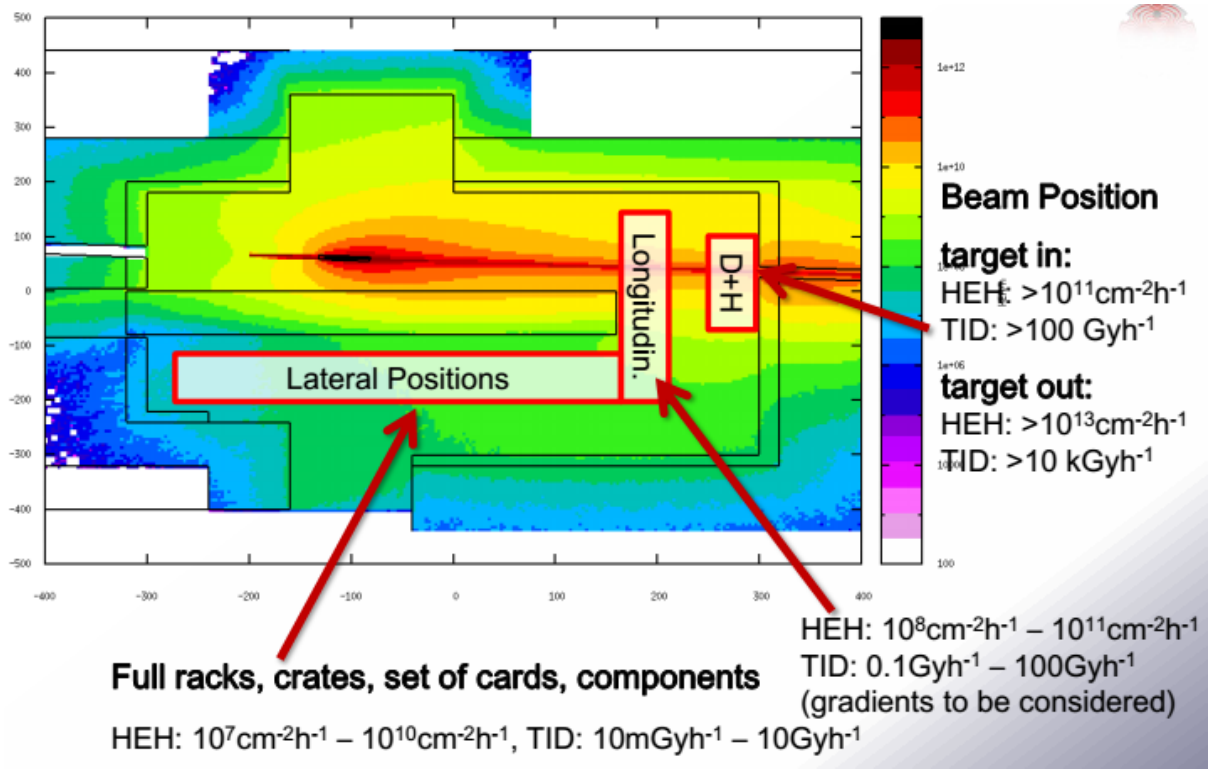

Fig. 2 CHARM intensity at different positions