Minutes of the 33rd Collimation Upgrade Specification Meeting 24th of January 2014

Participants: C. Adorisio (CA), A. Bertarelli (AB), R. Bruce (RB), F. Carra (FC), P. Gradassi (PG), E. Krzyzak (EK), A. Lechner (AL), A. Marsili (AM) (scientific secretary), A. Ryazanov (AR) (NRC KI), G. Valentino (GV).
Remote: R. J. Barlow (RJB) (Huddersfield University), S. Gibson (SG), M. Kitzmatel (MK), R. Kwee (RK), T. Markiewicz (TM) (SLAC), L. Nevay (LN) (RHUL), N. Sammut (NS), J. Stadlmann (JS), M. Tomut (MT).

Indico event here.

1 Outcome of EuCARD2 kickoff meeting (A. Bertarelli)

Slides are available in pdf and pptx.

1.1 Summary of the presentation

AB gave a summary of the kick-off meeting of EuCARD2 (Enhanced European Coordination for Accelerator Research & Development), as part of the WP11. The main goal presented here is the development of novelty materials facing the new challenges of HL-LHC, in particular metal matrix composites.

The most promising materials are Copper Diamond and Molybdenum Graphite. AB described these materials with their advantages and drawbacks. In particular, Molybdenum Graphite can be coated in pure Molybdenum, hence increasing its electrical conductivity and decreasing its contribution to the impedance. With the addition of carbon fibers, the material shows great thermal conductivity and good mechanical strength. These outstanding properties are due to graphene planes present in the material. These materials are produced in collaboration with Brevetti Bizz (Verona, Italy).

Then, AB presented the different tasks and deliverables that are part of WP11. The first milestone is the completion of the irradiation of the first material samples. The other objective include the production of test benches, and eventually a collimator prototype by 2016. Most of these deadlines are far away in time; however, they include a lot of intermediate steps. The time line is consequently described as very aggressive.

AB presented the kick-off meeting, and the associated indico event and web page. WP11 was also represented at the European workshop WAMAS (Workshop on Advanced Materials and Surfaces).

The next tasks in line were described in more details. This includes Research and Development of novel material, their characterization and physio-mechanical testing, and different irradiation campaigns. They will take place in GSI, at HiRadMat2 (CERN), and at BNL and Kurchatov. The possibility to perform micro analysis of MoGR at Kurchatov must be checked [**Action: SR, AB, AR**]. AB specified that a major issue is the scalability of these result for higher energies (7 TeV) .

In conclusion, WP11 is up and running with and ambitious program aiming at the development of novel advanced materials for the next generation of collimators. Its challenging goals mean that the contributions from all partners are essential.

1.2 Discussion

SR suggested to MT that visits from CERN people, either students or staff, can be organised to help with the irradiation tests. MT agreed, and added that long beam times have been booked, which should give enough time to anyone interested to clear all the safety and health formalities. AR inquired about the flux at the irradiation bench. MT answered that at low Energy (Bragg peak), the flux can reach 10^{10} particles/s, in short peaks ($\simeq 100\,\mu$s). At higher energies, the flux would be lower. AR asked about the temperature of the samples. MT answered that the samples are cooled by the holder and don't reach high temperatures: this is monitored by an IR camera. AR suggested to bring Nikolai Mokhov in the collaboration, since he did simulations of fluences and displacement per atom.

AL asked about tests of the Molybdenum coating in HiRadMat. AB answered that Guillaume is currently performing some tests, but also that Molybdenum has a very high melting temperature, so the basic material is already very good for the considered use. The thickness of coating presented here is just an example of what can be done (thick coating in this case) but is fully controllable. FLUKA simulations show that the material isn't melting in the considered use. The thickness of the Molybdenum layer on MoGR jaw must still be defined [**Action: team**]

AR pointed out that the materials are only characterized by scanning microscopy and not transmission microscopy, which could help understanding the micro-structure. He added that KI has the tools and can help with this. Both AB and SR agreed that this is a good point.

SR concluded that even though not all partners have important budgets, they can also contribute by workforce.

2 Update on RHUL tracking studies (L. Nevay)

Slides are available in pdf and pptx.

2.1 Summary of the presentation

LN gave a short summary of the current status of the BDSIM tool, following what was presented at the annual meeting in Daresbury. All elements, including multipoles, are implemented in tracking. The simplecticity is already achieved for quadrupoles.

The next developments will include implementing a symplectic routine for other elements, and using a generic geometry for machine (for elements & collimators). The geometry conversion software is ongoing. Then, the tracking will be validated with respect to SixTrack, and comparative tracking studies can be performed, using the lattices for standard and HiLumi LHC. The basic Twiss parameters must be compared for nominal and ATS optics: BDSIM against MADX [**action: LN**]

2.2 Discussion

SR stated that he has no knowledge of the amount of work necessary to achieve simplecticity, but that it might be very high. He recommended to try and evaluate this amount of work.

LN asked if there would be any benefit in the 3D modelisation of the collimator jaw. AL answered that seeing the very low impact parameters, a simple block is a good enough model. SG specified that they were considering a particle only grazing the jaw and exiting it, which would survive and should be tracked. SR answered that it is the case in SixTrack: such particle is kept and tracked.