Summary of the presentations and minute of the brain storming cession

WP3:

- Introduction to Mechanical Integration and Error budgeting for the PACMAN project was made by Iordan Doytchinov. The precision engineering issues related to the mechanical integration and the assembly of MBQ magnet and MBQ and BPM integrations were outlined.
- Ms. Gomez presented the DMP company and their activities. DMP is a state of the art company which produces high precision components for different fields of industry and science like aerospace, military, particle accelerators etc.
- Mr. Garlasche introduced the challenges of the alignment of the collimators, one of the components the most exposed to the radiations of the beam.
- Peter Novotny explained why we want to use seismic sensors in the PACMAN project. And compared advantages and disadvantages of the current state of the art seismic sensors. He also introduced promising candidates which performance and resistance is currently tested.
- Dr Cougoulat introduced us to requirements of seismology to seismic instrumentation and showed us various instruments used in seismology covering the range of measurements extended in time.
- Dr. Janssens presented the different steps which have led to the design and testing of the nano-positioning prototype for the quadrupole magnet
- Using simulations, David summarised the performances requirements of the actuation stage for the nano-positioning of the magnet and described options to increase the range of this stage

More details about the WP3 PACMAN students:

Iordan's PhD topic: How to assemble the magnets to the highest accuracy: how to assemble the 4 parts to +-10µm, so that they work (the defects can add or subtract to each other and change the results), how to put the BPM on the magnet, and how to coordinate everything on the final bench so that they work together. Measurement of the position of the zero of the magnet with regards to the zero of the centre of the magnet -> error budget of the system: where do the uncertainties come from and what are their impact, how to overcome their impact or deal with them. At the moment, the subject is not well defined so it is reduced to the magnet, or to the uncertainties and how they propagate, to stop spreading and focus on only one point for Cranfield University to accept the subject. We have a final design of the magnet (we might change the inside but not the outside nor the size: ~80cm). It will have a frame, but we can maybe redesign it. The frame is attached to the magnet and aims at adding stiffness and reduce the resonances to improve the dynamical performances of the actuators.

Peter's part in the PACMAN project: Why do we want to use seismic sensor? The ground is always moving, and the bench can attenuate of amplify some frequencies of moves, we want to know which ones, and to see the correlation between electromagnetic measurements and ground motion. The frequencies of the seismic vibrations are low frequency, but the noise which Peter needs to measure is the technical noise, with higher frequencies. The sensor is doing nanometre and high resolution, but the measurements at higher frequencies are noisier. There are different types of sensors and one \might be easy to do change to fit the PACMAN project.

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David’s part in the PACMAN project: His focus is on a study on how to increase the range of the current ultra precise actuation stage for nanopositioning and alignment. The challenge is to conciliate simultaneously a very high stiffness (~1kN/um) required for robustness with respect to disturbance sources in order to comply with stability requirements of the magnets, the sub nanometric actuation resolution required to perform nanopositioning and a sufficient actuation range in order to (at least) compensate for thermal loads generating displacement larger than several hundreds of microns due to thermal expansion. David will study the possibility and the limitations related to a stroke increase in the millimetre range. In that perspective, the nanopositioning stage could possibly be used for alignment of the main beam quadrupoles (at least partially).