

Minutes of the BM@N DAC meeting on January 25, 2022 by video

Present: H.H. Gutbrod, Itzhak Tserruya, Karl-Heinz Hiller, Peter Hristov, Hans Rudolph Schmidt, Peter Senger, Vladimir Kekelidze, Alexander Sorin, Mikhail Kapishin, Anna Maksymchuk, Bogdan Topko, Alexandr Zinchenko, Dmitrii Dementiev and members of the BM@N Team.

Speaker Anna Maksymchuk (JINR): Status of the BM@N upgrade and preparation for the heavy ion run

Speaker Bogdan Topko (JINR): The forward silicon detectors, beam tracker, beam profile meters for the heavy ion run

Speaker Alexandr Zinchenko (JINR): Simulation and feasibility studies for the upgraded BM@N set-up

Speaker Dmitrii Denmentiev (JINR): Status of the Silicon Tracking System development

Anna Maksymchuk presented the status of the BM@N detector upgrade.

Discussion on questions raised by DAC members:

- DAC questions the need for the Pb shielding around the beam pipe inside the trigger Barrel detector (additional absorption material); BMN -> Pb shielding is needed according the Kr run experience and simulations
- DAC proposes to increase the beam intensity to collect more data with Xe beam -> BMN: it is possible to increase of the Xe beam intensity from assumed 250 kHz up to 1 MHz (limited by the rate capacity of the PMT beam flux counters), DAC proposal to use a thin, possibly segmented target to reduce pileup / separate secondary interactions; BMN team plans to use 1mm CsI target for Xe beam (closest to Xe in atomic numbers, mono-isotopes, 1.14% of interactions)
- DAC questions the use of CsI as target material in the first Xe runs. Cesium is of mass 133 and Iodine has mass 127 . The idea of being close to a symmetric system of beam and target nucleus is not as important as to have a well defined geometry in the collision. Later on, once one is fully understanding the system, especially the trigger efficiency, one can go even to deformed target nuclei.

- DAC sees the need for a good separation of He4 from deuterons and is satisfied that this is possible already now and realized in Ar data using dE/dx in GEMs .
- DAC requests to see the acceptance plot versus p_t in order to see better the physics acceptance.
- DAC suggests that all O-rings needed in the experiment should be available in stock at NICA.
- DAC suggests to keep an eye on the vacuum tightness of the multi-pin connectors in vacuum boxes housing the beam detectors.
- DAC suggest to implement already now in the beam line support structures for the pumps possible further upgrade of the present rotational pumps to Turbo molecular pumps.

Bogdan Topko presented the status of the forward silicon detectors, beam tracker, beam profile meters for the heavy ion run

- DAC: Is it possible to use dE/dx in the forward silicon tracker and the GEM tracker for particle identification? The dE/dx information combined with the ToF information could provide an effective electron identification.
BMN: dE/dx identification in forward silicon is limited by the dynamic range of the FEE electronics of +/- 30 fC. The possibility will be studied on Xe data.
- Higher electron equivalent noise is observed in ASICs from one batch to another. Some defected ASICs are found. It requires multi-step process of detector to ASIC assembly and cross tests.
- The DAC is pleased to see the beam line control in hands of the NICA team, with access to the signals of the beam detectors of BM@N.

Alexander Zinchenko presented a talk on Simulation and feasibility studies for the upgraded BM@N set-up

DAC raised a question about the transition from the simplified to the detailed geometry in the simulation and event reconstruction. BMN team plans to implement real detector material as well as the beam pipe into the track fitting procedure in order to simulate the background from secondary interactions.

Dmitrii Denmentiev presented the Status of the Silicon Tracking System development

DAC asked questions to fig. 16: STS group carried out tests assuming 20 μ s latency between interactions which is too much for a beam intensity of few MHz . BMN answers that this is the latency of the 3d level trigger.

Discussion on the connection of the carbon vacuum beam pipe and the STS detector box: STS team: an air gap between the sleeve inside the STS box and the beam pipe could be filled with condense water if the cooling temperature is below the dew point. From other side the tight/hard connection of the STS detector box and the carbon vacuum beam pipe could damage the beam pipe. The DAC encourages BMN to search for alternative solutions.

General discussion: the next DAC meeting is foreseen in June 2022 after the BMN heavy ion run. The performance of the detector and the beam should be reviewed at the meeting. The results of the SRC run should also be presented.

In summary, the DAC appreciates very much the great progress in the BM@N project, despite the difficulties due to Covid time. The DAC is pleased to see the realization of earlier recommendations, such as the installation of a vacuum beam line all the way from the Nuclotron up to and through the BM@N set-up, and the planning of a separate location for the SRC experiment. Much work remains to be done but problems are well recognized and identified.

The DAC is looking forward to a very successful heavy ion run of BM@N in Spring of 2022. The DAC encourages the BM@N collaboration to make rapid progress in the finalization of the STS and shares with the team the hope for a speedy delivery of missing components and electronics.