IFIN-HH Contribution to the CBM Experiment at LHC
(RONIPALICE)

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CBM Collaboration: https://fair-center.eu/for-users/experiments/cbm.html
Project web page: http://niham.nipne.ro/RO-FAIR_CBM_20.html

**Main objectives of the CBM Experiment/Collaboration:**

The experimental exploration of the expected rich structure of the phase diagram of strongly interacting matter predicted by QCD is one of the most challenging tasks of our days.
The Compressed Baryonic Matter (CBM) experiment at FAIR (Facility for Anti protons and Ion Research) in Darmstadt will play a unique role in the exploration of the QCD phase diagram in the region of high net-baryon density. The experiment is designed to run at unprecedented interaction rates accessible at SIS100.

**Main objectives of the Romanian participation in CBM Experiment:**

Our group is involved in the CBM Collaboration from its very first days, with essential contributions up to now in developing a new generation of high counting rate TRD (Transition Radiation Detector) and RPC (Resistive Plate Counter) detectors, frontend electronics and different versions of free running mode DAQ. These results are included in the CBM-ToF TDR (Technical Design Report), in the meantime accomplished and positively evaluated. An Addendum to the CBM-TRD TDR was sent for evaluation. As a natural consequence, our group will be involved in the assembling and testing of the most challenging regions of these two sub-detectors, i.e. small polar angles. However, the final solution foreseen as production readiness prototypes still require some R&D activity especially related to radiation hardness for detectors and associated electronics and in-beam tests in mCBM (mini-CBM) configuration at SIS18 – GSI, Darmstadt, where close to real conditions could be accessed. In parallel, the new frontend FASP-CHIP and CBM-DAQ compatible interface, designed and built by us will be tested. Based on the experience and results obtained by our group at lower and higher energies within FOPI and ALICE collaborations, respectively, we will use the advantage of TRD and ToF sub-detectors of the CBM experiment for which development and construction we had already and will have essential contributions, and focus our physics program on multi-differential studies of collective type phenomena within $\sqrt{s_{NN}}$ =2−4.9 A·GeV energy range with the aim to understand the fundamental properties of QCD in the corresponding region of the phase diagram.

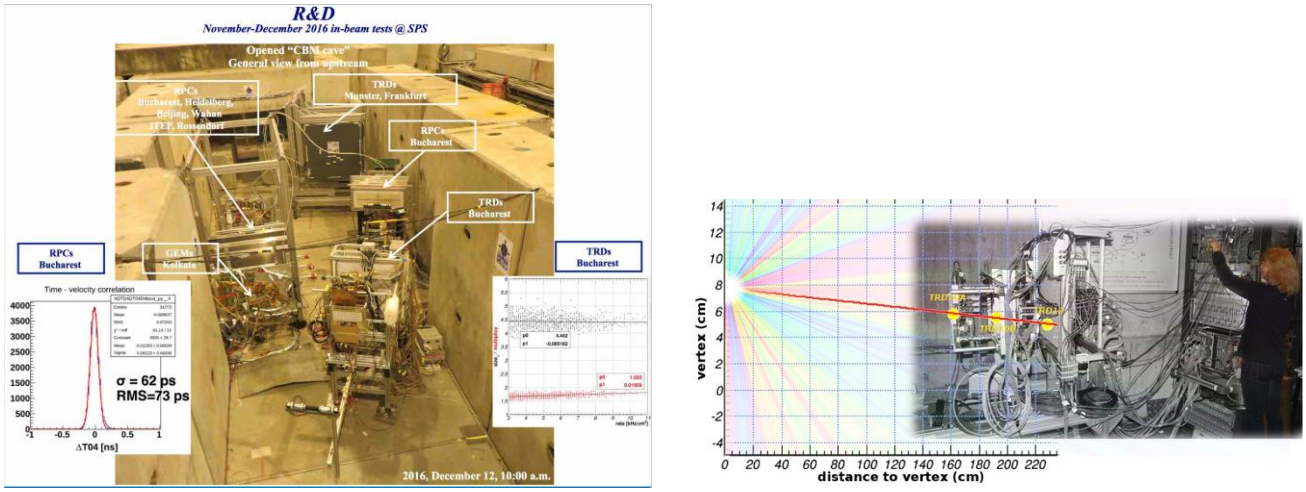


Fig.1: Left - in-beam tests at SPS-CERN-time resolution of MSMGRPC developed by us;
Right - tracking performance using 2D-TRD developed by us.

Fig.2: Left - RPC test laboratory of Hadron Physics Department;
Right - TRD test laboratory of Hadron Physics Department.

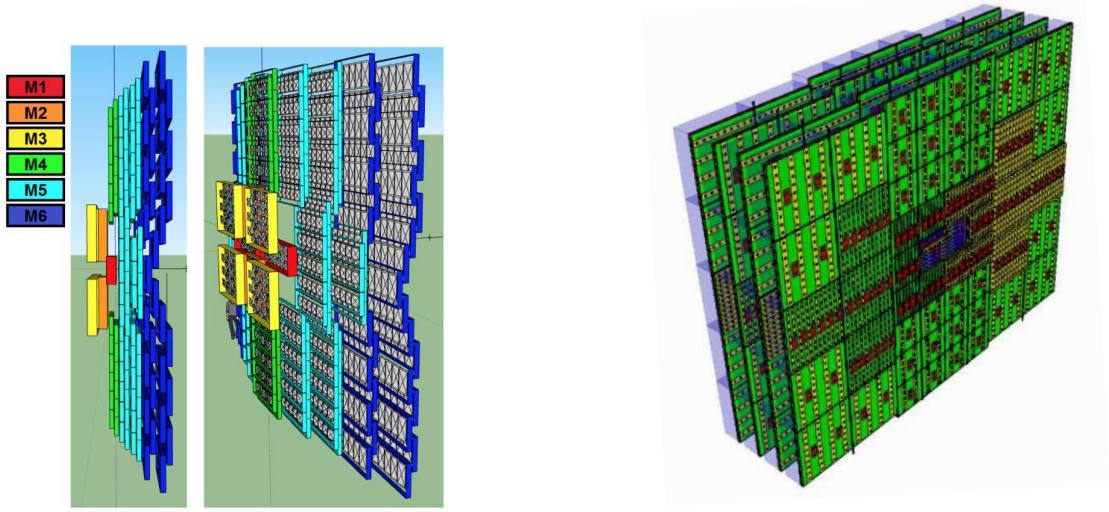


Fig.3: Left: Inner zone of the CBM-ToF (red, orange and yellow colours) based on MSMGRPC developed by us which will be assembled and tested in HPD;
Right - Inner zone of the CBM-TRD (red, orange and yellow colours based on two dimensional position sensitive TRD developed by us which will be assembled and tested in HPD

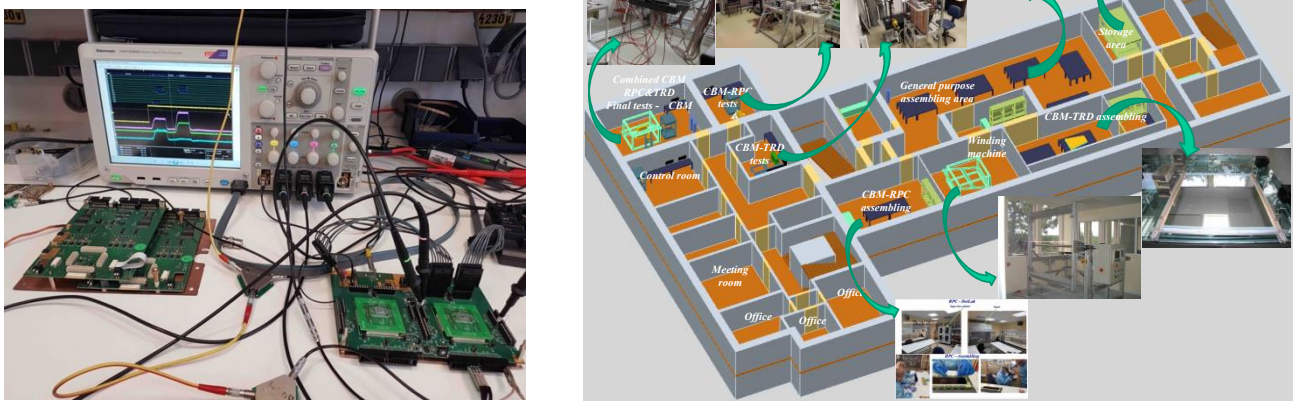


Fig.4: Left: Frontend Electronics and DAQ - designed and tested in HPD for CBM TRD-2D;
Right - Structure of the Detector Laboratories area, properly equipped, used for assembling and tests of ALICE TRD and TPC-ROCs and which will be used for assembling and tests of the most demanding zones of the CBM-ToF and TRD subdetectors.