

STAR experiment at RHIC

The STAR experiment at RHIC, Brookhaven Laboratory, USA, studies hadronic matter under extreme conditions of density and temperature. Up to 2005, the STAR group of Subatech has been involved in construction and software aspects of a Silicon Strip Detector (SSD), in two particle correlations, and in strange particle analysis. In 2005 the SSD took first data with full acceptance. We summarize in the following the main developments in the group, from 2006 to 2008, in chronological order:

2006 overview: the Subatech group consisted by one Prof. (S.Kabana) and one PhD student (J. Bouchet). We had no senior person to be on site at BNL for the SSD, during the 2006 p+p run. In 2006 we therefore concentrated our efforts in the calibration of SSD in the Cu+Cu data taken in 2005. J. Bouchet was sent to BNL to work in collaboration with the reconstruction group. Subatech's responsibility was the SSD calibration and Monte Carlo. These efforts, lead to the successful calibration of SSD in the Cu+Cu data. J.Bouchet has been named software coordinator of SSD.

STAR convenors required from us studies on a preliminary candidate for a new N_0 or $\Xi_0 \rightarrow \Lambda K_0^0$ state, found in 2001 data. This work was given to 2 master students (preliminary results). The candidate was found also in 2004 data (master A.Ghoulam). Furthermore, the search for the isospin partner $N^+ \rightarrow \Lambda K^+$ resulted in a possible candidate at nearby mass (master H.Ricaud). While these results are very promising, much more work (rather at PhD level) is needed to complete the required studies.

In fall 2006 a new student (A.Geromitsos) started a co-tutelle PhD Thesis with BNL, to work on heavy flavour and the SSD. He was sent for the first half of co-tutelle to BNL, with co-supervisor J. Dunlop, physics coordinator of STAR in 2006, and deputy spokesperson at present.

2007 overview: the Subatech group consisted by one Prof. and two students (J.B., A.G.). The students both participated in the SSD run of spring 2007. The senior support of SSD run on site was assured by LBNL, BNL and Strasbourg (J.Baudot, D.Bonnet). We concentrated on the SSD calibration task. Two master students from TU Warsaw have been sent to BNL during the 2007 run as part of the Warsaw-Nantes collaboration (J.Plebanek and R.Pieniazek). J.Bouchet and the 2 polish students assured the calibration of SSD in Au+Au 2007 data, which succeeded quite fast, within 2007.

It was found (J.B.) that the efficiency of the SSD in the reconstructed data can be as low as 50% depending on wafer. We therefore concentrated efforts of A.Geromitsos in 2007 on a new SSD Cluster Finder, to enhance the SSD efficiency, which shows promising results. A.Geromitsos started also heavy flavour (D0) analysis in Cu+Cu data. In summer 2007, the SSD has been taken out of STAR, and was later transferred to Subatech, for reparations and the upgrade. J Bouchet defended successfully his Thesis in oct. 2007, and took a post doc at Kent State University (STAR).

2008 overview: the Subatech group consists of one Prof., one post doc (R Sahoo) and one student (A.G.). We work on D0 analysis and electron-D0 correlations, allowing to disentangle beauty and charm contributions. The microvertexing techniques are still under 'quality assurance tests'. The SSD detector tests in 2008 were successful, retaining all modules 95% working. (S. Bouviere, Ch. Renard). A capacitor problem causing current leakage was identified and will be repaired.

Work on two particle correlations (p-p, p-pbar, pbar-pbar) with supervisor B.Erasmus and co-supervisor J.Pluta from TU Warsaw (co-tutelle PhD Thesis, H.Zbroszczyk), has been completed, leading to new important insights on source size in Au+Au collisions at RHIC. H. Zbroszczyk defended successfully her Thesis in 2008, and took a permanent position in TU Warsaw (STAR, ALICE).

Future plans: Our primary project for the next 1-2 years is heavy flavour (e-D0 and D0) analysis using microvertexing methods in Cu+Cu and Au+Au collisions. This project will help disentangle charm/beauty contribution and resolve the jet quenching puzzle at RHIC. The project on new particle searches can reach publication stage, with one PhD Thesis. The SSD will be part of the future STAR Heavy Flavour Tracker (~run 2011). The SSD efficiency can be significantly enhanced by the new cluster finder. An electronics upgrade of SSD under way by our expert engineers in Subatech, will allow higher event rates to be taken by the SSD, integrating it well into the new STAR trigger upgrade.

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