Minutes of the SAIP Nuclear, Particle and Radiation Physics Specialist Group Meeting: University of Limpopo; Thursday 2008-07-10

1. **Opening and attendance**
   Richard Newman welcomed everybody to the meeting (he was standing in for the specialist group chair Greg Hillhouse, who sent his apologies) & the attendance register was circulated. Simon Connell also passed on apologies from Peter Bosta, who was nominated as a plenary speaker, but could not make it. Richard Newman then read out the Terms of Reference for the Specialist Group (see SG webpage).
2. **Items for discussion under general (see 10)**
   - Simon Connell's letter to all SAIP Specialist Group Heads re. NIASA.
   - The SA-CERN agreement.
3. **Minutes of Previous Meeting**
   - No minutes were available.
4. **Matters arising from the Minutes**
   - See item 3.
5. **Statistics for the 2008 conference**
   - There were 28 oral presentations, 4 each of which were from PhD and MSc postgraduates, respectively, as well as 3 from scientists from the Flerov Laboratory for Nuclear Reactions (FLNR) of the Joint Institute for Nuclear Research (JINR) at Dubna.
   - There were 8 poster presentations.
6. **Student Prizes**
   - Best PhD presentation : Mr P L Masiteng (University of the Western Cape).
   - Runner-up PhD presentation : Mr S S Ntshangase (University of Cape Town).
   - Best MSc presentation : Mr G Adera (University of Stellenbosch).
   - Runner-up MSc presentation : Ms S P Bvumbi (University of the Western Cape).
   - Best Poster presentation : Mr J A Swartz (University of Stellenbosch).

   Both Bio-teknik and the SAIP supplied monetary reward for the prize-winners.

7. **Reports by the committee members**

Future Projects: R Bark, J Carter

Report (Rob Bark)

One of the possible future directions for nuclear physics research is to exploit radioactive beams to produce exotic nuclei. The possibilities for the production of radioactive beams at iThemba LABS were presented in a talk at SAIP07. They can be broadly classified under two techniques, Projectile Fragmentation (PF) and Isotope Separation OnLine (ISOL). The former technique typically requires relativistic beam energies while the latter technique requires two accelerators. At iThemba LABS, the installation of the GTS ECR ion-source will allow beams of up to A~40 to reach energies of up to 30~40 MeV/A, allowing some light exotic beams to be produced.

For ISOL beams, the possibility of a second accelerator at iThemba has been raised in discussions with NECSA, in connection with commercial isotope production. These discussions are still at a preliminary stage, but the new accelerator could deliver a high-intensity proton beam of 70 MeV, which could be split and used in two separate beamlines, one for isotope production and one for physics use. The second beam could form the driver for an ISOL system while the SSC would fulfil the role of post-accelerator.

A possibility would be the fissioning of uranium to produce neutron rich isotopes. An ion-source would then need to be developed to extract the desired radioactive beam species. A promising method to selectively ionize the species of interest with high efficiency is to use laser ionization. This technique would need some development but sufficient expertise exists in South Africa to do so.

iThemba LABS has contacted Professors Heinrich Schwoerer and Erich Rohwer of the University of Stellenbosch (US) for advice on laser ionization. A current interest at US is the use of lasers to *accelerate* ions, with the iThemba LABS site being ideal for this purpose. Because of the mutual interest in lasers and accelerators, a workshop on "Lasers and Accelerators" has been planned for January 2009. Two speakers have been invited to give lectures on laser ionization, Dr Iain Moore from the University of Jyväskylä and Dr Ulli Köster from ISOLDE at CERN. The next stage would be to build a demonstration laser ionization source, using existing beams from the SSC.

In a separate development, the SA-CERN Programme has proposed travel money for use of South African researchers for visits to the REX-ISOLDE radioactive beam facility.

Outreach : GJ Arendse [iThemba LABS]

Report

The activities related to the promotion of Nuclear Physics amongst learners, teachers, students and the general public has for the biggest part of the year been driven by individuals linked to the national facilities and universities without real input from the "liaisson officer". To this extent a (very succesful) summer school was held which was organized by staff at iThemba Gauteng and Wits. I have however had the opportunity to accompany students to Dubna in Russia, where I had limited input into what "we would like to get out of the exercise". The students did however get the opportunity to give short presentations on their experiences during the week. I have recently (1 January) joined iThemba LABS as Manager of their Science and Technology Awareness Programme. I have since my appointment presented an overview of the activities at iThemba LABS to learners who attended the science week in Stellenbosch. We have also had a learner from Rondebosch High who spent three days jobshadowing staff at iTL (physics, medical radiation, isotopes and materials research). The interaction with learners and teachers are on-going and will definitely pick up in the near future.

International Liaison: Z Buthelezi [iThemba LABS]

Report

The "newly" established SA-CERN programme: this is a huge initiative driven by SA scientist involved in CERN (European Center for Nuclear Research situated between Switzerland and France) projects e.g. ALICE, ATLAS, ISOLDE, etc. The programme which includes scientists from iThemba LABS, UCT, WITS, Rhodes University and UKZN is funded by DST. The funds will will enable scientists (and students, where applicable) to travel to CERN to partake in experiments and to attend collaboration meetings as well. There are many opportunities within this programme for both scientists and students alike. For more info contact Prof Jean Cleymans (chair), Jean.Cleymans@uct.ac.za or the secratary, Dr SV Fortsch (fortsch@tlabs.ac.za).

I would like to bring your attention to a training possibility in beam instrumentation for postgraduate students or young scientist (at MSc, PhD and/or Post doc level) which was advertised by Dr Anne Dabrowski (CERN Fellow working on a CLIC project). This is a European initiative (DiTANET: DIagnostic Techniques for future particle Accelerators, http://www.kip.uni-heidelberg.de/DITANET/) to encourage education in Novel instrumentation, funded through the Marie Curie fellowship program. Dr Anne Dabrowski is a former UCT graduate who holds a prestigious fellow position at CERN. Her group (CLIC: Compact Linear Collider is a future electron-positron collider proposed at CERN to explore energy regions beyonds those reached by current particle accelerators) are opening 3 positions for "early stage researcher" and she'll be co-supoervising one of the positions. This is a great opportunity for someone whose at MSc, PhD level and has interest in Accelerator Physics and associated fields.

8. Nuclear physics schools

- The JINR Winter School of 2007

  23 Students from across South Africa attended the Joint Institute for Nuclear Research (JINR) Winter Practice in Dubna, Russia from 9 to 19 December 2007. This visit was as a result of the Memorandum of Understanding (MOU) signed between South Africa and the JINR in October 2005, in Moscow. The JINR is an international organization that was established in 1956. It consists of eighteen member countries and 71 partnering institutions in 45 countries mostly from central and Eastern Europe. It is also one of the foremost nuclear research establishments in the world and is credited, for example, with the discovery of several new elements of the periodical table. Contacts between South African researchers and those based in the Russian Federation date back to the late nineties. The MOU designates South Africa, through the Department of Science and Technology (DST), an associate member of the JINR. South Africa's financial contribution covers its membership fee as well as support for joint projects with JINR. In 2006 an amount of $ 1 250 000 was earmarked for the collaboration and the DST has delegated the National Research Foundation (NRF) to administer the funds for future projects. The aim of the Winter Practice was to give its participants an idea of JINR fields of research and offer them a possibility to meet JINR research teams. Students worked on research projects at JINR facilities and attended lecture courses delivered by leading JINR scientists. Over the weekend they enjoyed social excursions to Sergiev Posad, the centre of the Russian Orthodox Church. as well as Moscow.

- The iThemba LABS School on Nuclear and Particle Physics (27/1/08 to 3/2/08) :

[report by Elias Sideras-Haddad, Chairman iThemba School 2008]

The 2008 iThemba School in Nuclear and Particle Physics organised by iThemba LABS Gauteng was held at the Skukuza Auditorium within the Kruger National Park from Sunday 27.01.08 to Sunday 03.02.08. A total of 62 students from various universities (North-West, Zululand, Wits, UCT, Nelson Mandela, Fort Hare, UWC, Pretoria and Stellenbosch) attended the School. The student audience was made up from about 25% B.Sc. level, 25% B.Sc. Honours and about 50% of postgraduate students (M.Sc. + Ph.D.). The interest and enthusiasm shown by the students for the School went well beyond the expectation of its organizers. The well selected and prepared material by the lecturers and sophistication in teaching style took the students aback. The School acted as an eye-opener for the students and motivated those to get involved in high standards postgraduate research studies.

- Inaugural mini-symposium on gamma spectroscopy

The inaugural mini-symposium on gamma spectroscopy was held on the afternoons of Wednesday and Thursday (23 and 24 April 2008), in the auditorium at iThemba LABS. There were informal presentations on some "hot" topics related to the present and future gamma spectroscopy research at iThemba LABS. Dr. Elena Lawrie (iThemba LABS) was the symposium organizer.

- Symposium : From EARTH to the Moon

An afternoon mini-symposium surrounding topics related to the Earth AntineutRino TomograpHy (EARTH) project was be held at iThemba LABS (iTL) on Friday, 29 February 2008 in the iTL auditorium. EARTH is an ambitious international research programme with the aim of mapping the location of the radiogenic heat sources in the Earth's interior. The programme in South Africa is a collaboration of the three Cape universities and iThemba LABS. Presently a detector is being built with which the feasibility of such a project will be tested. After testing at iTL, further tests will be carried out using antineutrinos at Koeberg. This also signals a potential spin-off of the project, namely the monitoring and safeguarding of nuclear power reactors. Dr. Ricky Smit (iThemba LABS) was the organizer.

- The workshop on Lasers and Accelerators, STIAS (12/1/09 to 16//1/09)
- The 20th Chris Engerlbrecht Summer School in Theoretical Physics : Nuclei and Nucleonic Systems, NiTheP at STIAS (19/1/09 to 28/1/09)
- The JINR Winter School of 2009
- The Science at Synchrotrons workshop, DST (9/2/09 to 13/2/09)
- The next iThemba LABS School on Nuclear and Particle Physics : venue and dates to be fixed

9. Report from the Director of iThemba LABS

Kobus Lawrie presented the report on behalf of Zeblon Vilakazi :

This past year has been characterised by major challenges which iThemba LABS (and users) have had to contend with. Paramount of these is the power/energy crisis and its impact on beam availability for physics research.

- iThemba LABS' management was thus put in a position in which decisions had to be made; which - to this end - has meant that a new/revised schedule for physics was arrived at. This was part of iThemba LABS playing a role in reducing the baseline load demand on the grid (recall that iThemba LABS is considered a Large Power user (LPU) drawing close to 5.4 MW!). Proton therapy is now conducted on one weekend per month instead of on Monday and Friday mornings. On all other weekends the energy change for Physics beam will commence at 06:00 on Friday morning with beam on target expected at ~12:00. If there is a need for iThemba LABS to reduce average power consumption (voluntary load shedding) the accelerators will be switched off on Monday morning. However Physics will be able to continue until 12:00 on Mondays if the demand on the National Grid allows it.

- Positive news relate to the fact that we have had a bumper year with isotope production reaching an all-time high of R12.5m!

- The SA-CERN programme (headquartered at iThemba LABS) and chaired by Prof Cleymans (UCT) is a major South African initiative of a disparate consortium of researchers to leverage resources for access to world leading facilities. The programme consists of the following member institutes: iThemba LABS-UCT (ALICE); UJ-Wits (ATLAS); UKZN-Wits (ISOLDE) and Rhodes (nuclear and HEP phenomenology). A business plan has been submitted to DST and a governance structure is now finalised. The SAIP president will be kept abreast of the details of the programme.

- Development of ECR ion sources: The ECR ion source from the Hahn-Meitner Institute should be able to deliver beam by the end of August. The final components for the second new ECR source will be delivered within the next month, after which installation will commence.

- iThemba LABS Summer School: A very successful summer school was held at the Kruger National Park (Skukuza Camp) in January 2008. Following from the recommendations of last years' committee - the school has now been renamed iThemba Summer School in Nuclear and Particle Physics. The organisation and management was done by iThemba LABS under the chairmanship of Prof Haddad with Dr Machi providing institutional support. The school was - once again - a resounding success.

- Dubna agreement: The programme is now in its third year. Areas of success can now be noted. Dr Simon Mullins who is the DST linkman will give all details of the programme thus far. Suffice it to say that several joint experiments between iThemba LABS and Dubna were conducted. Furthermore, areas of mutually beneficial programmes between iThemba LABS and JINR are being explored.

In addition, Kobus Lawrie advised that the finances of iThemba LABS were presently constrained, despite Rob Bark's successful NEP DDAQ application (funded to the tune of R1.8M) and two new NEP submissions (in addition to the iThemba LABS-Gauteng AMS application). The NRF infrastructure audit resulted in only an additional ~R30M, of which R10-11M would be available to iThemba LABS; half of this sum would have to be spent on new batteries for the UPS. There was also the possibility of a new, fast(er) internet connection. Discussions were underway with NiTheP concerning a possible joint appointment. Terms of Reference for the Programme Advisory Committee (PAC) were being drawn up by the Director's Council. There were also discussions between iThemba LABS management and NECSA on a possible joint venture.

10. Election of new SG Committee members

The following members were elected :

Chairperson: S M Mullins [iThemba LABS]

Secretary: N Jacobs [University of Stellenbosch/Military Academy

Future Projects: R A Bark [iThemba LABS], J Carter [University of the Witwatersrand]

Industrial Liaison : S H Connell [University of Johannesburg]

Outreach : GJ Arendse [University of Stellenbosch]

International Liaison: S Karataglidis [Rhodes University]

Student representative: J Diener [University of Stellenbosch]

Webmaster: M. Dalton [University of the Witwatersrand]

11. General

- NIASA : Nuclear Industries Association of South Africa. Simon Connell advised that in the order of R200B is expected to be spent on nuclear energy development over the next 10 years, of which at least 30% is to be spent on nuclear power initiatives. This offers the possible participation of all specialist groups and requires the drawing up of a science-oriented proposal, rather than just focusing on training alone. He would like a mandate for the NIASA "process" from the broader SA physics community and would like all specialist group members to investigate the NIASA website http://www.niasa.co.za . Ricky Smit reported that the iThemba LABS User-Committee wrote to NIASA in an attempt to secure increased capital funding for the laboratory. John Sharpey-Schafer advised that all aspects of nuclear power generation should be on the agenda . He nominated Simon Connell to convene and co-ordinate a committee of wide representation to liase between the SAIP, NIASA and the nuclear industry. The outcome was that the committee will consist of

Prof. Simon Connell (UJ) (chairperson), Prof John Sharpey-Schafer (UWC/UZ), Dr Richard Newman (iThemba LABS), Thifwe (Daphney) Singo (UCT/iThemba LABS) and Sifiso Ntshangase (UCT/iThemba LABS). It was also suggested that Prof. Robbie Lindsay (UWC) and Dr Nandi Mumba (NWU-Mafikeng) be approached to serve on the committee.

- SA-CERN : Jean Cleymans reported that there are 4 groups within the SA-CERN programme, namely
    (a) ATLAS, co-ordinated by Simon Connell
    (b) ALICE, involving UCT and iThemba LABS
    (c) REX-ISOLDE, fronted by Krish Bharuth-Ram
    (d) Theory; headed by Steve Karataglidis

  Following a management board meeting of ALICE, it was agreed that the UCT involvement with now be broadened to that of UCT-iThemba LABS. First beam was expected by the end of the week, with all going according to plan.

12. Closure