

Special Interest
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- **DITANET
Conference in
Seville –
Nov 9.-11. 2011**

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Future Looks Bright for Accelerator-based Research and Diagnostics

In the present climate of continuing economic problems and funding uncertainties, recent news about new accelerator-based scientific infrastructures were highly welcomed by the particle accelerator community and facility users from around the world:

With the approval of the SuperB factory by the Italian government, as well as additional accelerators at CERN, the HIE-ISOLDE facility and the low energy storage ring ELENA that shall take antimatter research to a new level, the road seems

paved for continuing research at the cutting edge.

The recently updated ESFRI roadmap further underlines the importance of particle accelerators for essentially every scientific discipline; and beam instrumentation being at the very heart of all these facilities.

Clearly, these important infrastructures will only be able to demonstrate their full potential if a full set of beam diagnostics will be available to measure all important beam parameters with high precision and resolution.

Many of the DITANET projects already make important contributions to these new infrastructures, as new methods for monitoring low emittance beams, detectors for exotic beams and instrumentation for antimatter beams at some tens of keV beam energy are being developed.

I hope you enjoy this newsletter which provides an update on DITANET's broad research and training program.



Carsten P. Welsch, Coordinator

DITANET International Conference ABSTRACT SUBMISSION OPEN!

Abstract submission for the DITANET International Conference on Accelerator Instrumentation and Beam Diagnostics is now open and needs to be made through the conference web site. The deadline for abstract submission is **15th of August !**. The number of places is limited so please register early to avoid disappointment.

The conference will be hosted by the University of Seville/Centro Nacional de Aceleradores (CNA) and will provide ample opportunities for critical discussions of research outcomes, exchange of knowledge and for meeting friends from the diagnostics community.

A limited number of scholarships will be made available for researchers from outside the network. Application details and more detailed information can be found at:

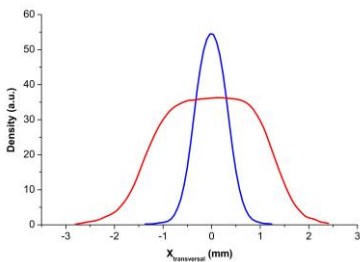
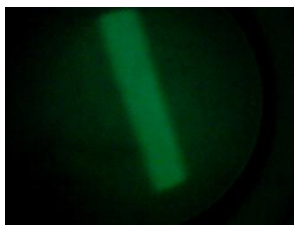
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News from DITANET Partners

University of Liverpool (M. Putignano)

First Measurements with the Gas Jet-based Beam Profile Monitor



The diagnostics test stand installation, assembled and commissioned in the QUASAR Group at the Cockcroft Institute/UK, has now started full operation, collecting first data for the neutral beam scanner transverse profile monitor.

This installation is a flexible, multipurpose device, initially commissioned for the testing of a supersonic gas jet-based beam profile monitor, but designed with the integration of an atomic physics experiment in mind to measure ionization cross sections at the level of fully differential cross sections, as well as experiments into gas density and velocity measurement via interferometric techniques.

The installation consists of the main detector chamber, equipped with an MCP detector, coupled to a phosphor screen and a dedicated imaging camera.

It includes an ion extraction system, a precision valve for finely varying the background pressure and a 5 keV electron gun. The detector chamber is now connected to the gas-jet generation chamber, which houses variable nozzles and skimmer apertures for the collimation of the jet, and an electronically controlled pulsed valve for pulsed jet operation.

The setup can also be used as a residual gas monitor, imaging the

transverse profile of the beam of interest via interaction with the background gas.

Measurements have been taken in this quarter to demonstrate this mode of operation.

Two measured beam profiles as imaged on the phosphor screen beyond the MCP detector are shown to the left with the plot below showing the corresponding transverse profiles obtained by integrating the light yield from the phosphor screen along the longitudinal direction of beam travel.



DITANET Prize 2011

Applications are now invited for the DITANET Prize 2011. The Network will award a 1,000 € cash prize for an outstanding contribution to the field of

beam instrumentation for particle accelerators by a researcher in the first 5 years of their professional career. The deadline for applications is **31/10/2011**

Full information on the application process can be found on the DITANET web site.

www.liv.ac.uk/ditanet

News from DITANET Partners (Continued...)

INFN-LNS (P. Finocchiaro)

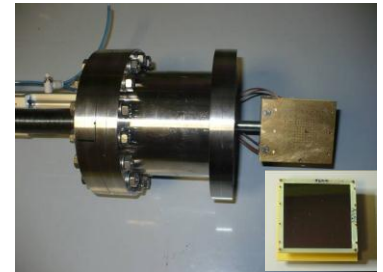
Beam Diagnostics for Radioactive Ion Beams at LNS-INFN



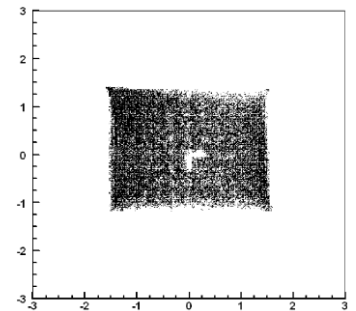
At INFN-LNS an efficient beam diagnostics for low intensity radioactive beams has been installed, with $I < 10^6$ particles per second, a range that doesn't allow using standard devices such as Faraday cups, quartz screens, harps, etc. The full diagnostics has been recently deployed for the radioactive ion beams produced by means of the in-flight technique with the FRIBs facility, allowing to improve the beam transport by more than a factor 10. More than 20 devices have been installed in the diagnostics points along the LNS beam line, allowing control of the main parameters of the beam in real time, in particular the intensity and the 2-dimensional transversal beam profiles, with sensitivity down to the single particle. Such a diagnostic system has allowed optimizing the transport efficiency from the production target through the whole beam line down to the final detector, thus maximizing the beam intensity onto the final experimental target. In each diagnostic point two devices have been installed, each one moved by means of its pneumatic actuator, avoiding the risk of collision between them by means of an anti-collision system.

A device consists of a plastic scintillator BC408 ($\tau_{\text{decay}} = 2.1 \text{ ns}$, $5 \times 5 \times 1 \text{ cm}^3$) coupled to a Hamamatsu R1924A photo multiplier. This detector is fast enough to count the beam particles, thus providing the measurement of the beam intensity. The second device consists of a position sensitive silicon detector (PSSD), capable of measuring the X-Y coordinates for each beam particle with a resolution below 2mm, therefore allowing a quick reconstruction of the transversal beam profile that is watched at on a monitor in real time by the accelerator crew. For all the devices parameters such as gain, discrimination threshold, etc, can be easily managed from the accelerator console. A VME data acquisition system collects all the signals (more than 80) coming from the detectors, allowing to measure particle by particle both the energy released in the detector and its arriving time. For the PMT based device, an on-board electronics in every diagnostics point features a discriminator to cut out the noise from the real beam pulses. The output of such a discriminator is used for rate counting and for time of flight measurements.

This electronics also implements a charge integrator that, by means of a suitable shaping time, allows to measure the energy loss and thus to build the energy loss (ΔE) vs. time of flight (ToF) plot, useful for the identification of the isotopes present in the beam. Concerning the PSSD based device, five signals are collected by each device, four corner anode electrodes for the position reconstruction and one back cathode for the energy/timing parameter. These signals are suitably preamplified, amplified and digitized. The shape distortion that typically affects the response of such devices has been corrected by means of an algorithm developed by us, which is fast enough to guarantee a real time image of the beam profile. The devices have been successfully operated with beams accelerated by the LNS Tandem Cyclotron, with energies ranging from a few MeV up to 55 MeV/A. In the figure the PSSD device is shown, with a 2mm brass mask used to provide a spatial reference. The second figure shows a beam profile, where the small L-shaped hole around the mask center can be seen.



PSSD mounted on a pneumatic actuator. The brass mask is 2mm thick.





News from DITANET Partners *(Continued...)*

TMD Technologies *(H. Smith)* **New Products**

New system for Airport Surveillance Radar

At the heart of this new ASR is TMD's PTX7610 50 kW transmitter and a brand new receiver/exciter and signal processor combination. By working with other sub-systems and systems manufacturers, we are able to offer a fully integrated suite to provide controllers with accurate and reliable radar data. We anticipate that an important market area for these new systems may be in mitigating the effects of wind farms on existing ATC radars.



S-Band 50 kW transmitter PTX7610, incorporating high reliability travelling wave tube

These two units have particularly low noise performance and include linearisers; this ensures good linearity, resulting in high useable carrier powers.

In common with all TMD's microwave tube based MPMs, the units are efficient, lightweight and reliable compared with solid state alternatives. Further MPM products are being developed and will be announced in due course.

For further information and datasheets, please refer to TMD's website www.tmd.co.uk, or contact Guy Howard, Sales Manager for Military Communications;

guy.howard@tmd.co.uk

Expansion in Small Tubes

Contrary to predictions in some quarters that microwave tubes are a dying breed, over the past 5 years TMD's Tube Division has shown an impressive record for new product development.

This has mainly been in the area of high power ring loop Ku band TWTs

for missile seeker applications, a good example being our Ku band 1 kW 25% duty PT6789 "super tube". More recent developments have included:

- A dual mode Ku band tube for an application which required switching between two power levels; this tube also incorporated a triple depressed collector for increased efficiency
- A Ku band ring loop tube for a TMD MPM, designed for an airborne approach radar.

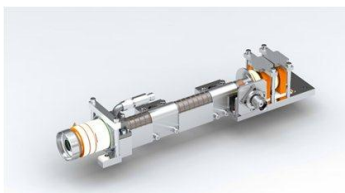
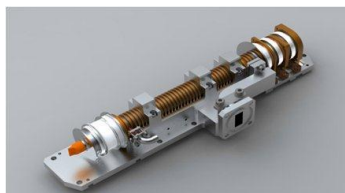
The second example is significant because until recently, most of TMD's MPMs had incorporated outsourced mini tubes. Following this successful development it is now our intention than more of TMD's MPMs will incorporate our own tubes, particularly for radar applications.

New MPMs for Military Communications

TMD is pleased to announce the introduction of two new MPMs (microwave power modules) designed specifically for military data links on UAV platforms.

These products have evolved from TMD's existing range of MPMs for radar and EW.

The PTX8208 and PTX8209 units cover the frequency bands 7.9-8.4 GHz and 13.75-14.5 GHz at output powers of 100 and 110 W respectively.





Recent Events

Topical Workshop on Ultra-High Brightness Electron Sources

Cockcroft Institute, Warrington/UK

A Topical Workshop on 'Ultra-High Brightness Electron Sources' was held at the Cockcroft Institute, Daresbury Science and Innovation Campus, in the UK from 29th June to 1st July 2011. The workshop was jointly organised by the Cockcroft Institute, Diamond Light Source Ltd., the John Adams Institute, the Institute of Physics, STFC Accelerator Science and Technology Centre and DITANET.

The workshop was attended by 47 participants from 16 different institutes around the world. Its primary purpose was to explore the possibility of generating electron beams with fs-range

bunches whose emittance is at least one order of magnitude lower than the current state-of-the-art.

The scope of subjects covered in the workshop programme included the complete range of processes involved in the production of electron bunches, starting with electron emission from traditional and novel electron sources, primary acceleration of electrons in the gun, transportation and manipulation of space-charge-dominated beams, and the use of diagnostics in their characterisation. Another crucial aspect of this workshop was to discuss problems encountered in the simulation of the beam dynamics.

The workshop brought together several internationally leading experts and less experienced researchers working on these issues. Common areas of interest, ways to advance the current technological limits by fostering and encouraging collaboration were discussed within a fruitful atmosphere.

A tour of the ALICE, EMMA and photo injector development facilities complemented the broad workshop program.

All talks given at the workshop are available at

<https://indico.cern.ch/conferenceDisplay.py?confId=145063>





Forthcoming Events

Topical Workshop on High Intensity Proton Beam Diagnostics

*Massy, France
26th and 27th September 2011*

A DITANET Topical Workshop on 'High Intensity Proton Beam Diagnostics' will be hosted by CEA Saclay/France, on September 26th and 27th 2011.

This workshop will discuss all important aspects for the diagnostics of high intensity proton beams.

This includes challenges related to the high beam power, space charge effects and their impact on transverse beam profile and emittance measurement, the diagnostics of low β beams and concepts to deal with high background radiation levels.

Dedicated round table discussion sessions and tutorials on 'hot topics' will complement the workshop program.

Details can be found at:

www.liv.ac.uk/ditanet

Topical Workshop on Technology Transfer

*Solkan, Slovenia
29th and 30th September 2011*

A DITANET Topical Workshop "Technology Transfer" will be held on September 29th and 30th 2011. It will be hosted by Associate Partners Information Technologies, Solkan/Slovenia.

It will be co-organized with i-tech's annual Libera Workshop which discusses beam stability issues from the injection point to the end station. During the two days, single pass BPMs in both linacs and transfer lines,

eBPMs in storage rings and photon BPMs found e.g. in beam lines will be discussed with a focus on fast global orbit feedback, beam loss monitoring, as well as challenges linked to timing and synchronization.

This will be complemented by discussions on ways to transfer technology from the academic to the industry sector and important legal aspects that arise in this frame.

The workshop addresses new starters as well as experts working on electron and hadron synchrotrons, as well as on FELs and ERLs.

Speakers have been carefully selected from the international Libera user community and in-house experts.

Details can be found at:

www.liv.ac.uk/ditanet



Position Vacancies

IFIN-HH, Romania

Horia Hulubei National Institute of Physics and Nuclear Engineering (IFIN-HH), Romania has a position vacancy for several months of training at both, the Early Stage or Experienced Researcher level.

During their stay at the institute, the successful applicant will work on the

development of a 'Zero Time Detector' for future particle accelerators and be based in Romania. In addition, they will have access to the very broad training program DITANET provides.

Further information can be obtained from the scientist in charge, Dr. Horia Petrascu (hpetr@nipne.ro)

Details on the Marie Curie eligibility rules and an outline of the project can be found on the network's homepage under \projects.



CERN, Switzerland: Cryogenics, Accelerators and Targets for HIE-ISOLDE

New Junior and Senior Fellowship positions open for HIE-ISOLDE

Eight junior fellowships of three-year duration for early stage researchers are now open in the framework of the CATHI project (Cryogenics, Accelerators and Targets for HIE-ISOLDE). In some cases it will be possible to

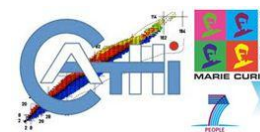
be registered into a PhD program in parallel to the fellowship.

Three additional positions for so-called experienced researchers (Postdocs) of two-year duration are also open.

Details on the open positions and the application procedure can be found at

<https://hr-recruit.web.cern.ch/hr-recruit/special/CATHI.asp>

Specific questions can be directed to yacine.kadi@cern.ch



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Examples of Recent Publications

- J. Egberts, et al., ‘Detailed Experimental Characterization of an Ionization Profile Monitor’. Proc. DIPAC, Hamburg/Germany (2011)
- R. Singh, et al., ‘Tune Measurements with High Intensity Beams at SIS-18’, Proc. DIPAC, Hamburg/Germany (2011)
- M. Olvegård, et al., ‘Performance of Parabolic and Diffusive OTR Screens at the CLIC TEST Facility 3’, Proc. DIPAC, Hamburg/Germany (2011)

DITANET Events 2011	
September 26 th & 27 th	Topical Workshop on High Intensity Proton Beam Diagnostics, Massy/France
September 29 th & 30 th	Topical Workshop on Technology Transfer Solkan/ Slovenia
October 31 st	Deadline for applications for annual DITANET Prize
November 7 th – 8 th	Topical Workshop on Detector Technologies Seville/Spain
November 9 th – 11 th	DITANET Conference on Beam Diagnostics Seville/Spain
Other Interesting Events in 2011 and 2012	
September 4 th - 9 th	2 nd IPAC Conference, San Sebastian/Spain
April 15 th – 19 th 2012	Beam Instrumentation Workshop, Newport News/USA
May 20 th – 25 th 2012	3 rd IPAC Conference, New Orleans/USA

NOTICE BOARD

DEADLINE FOR THE NEXT NEWSLETTER
23rd September 2011

About DITANET

The development of novel Diagnostic Techniques for future particle Accelerators is the goal of the European Network (DITANET) which is installed within the Marie Curie ITN scheme. Several major research centers, leading universities, and partners from industry are developing beyond-state-of-the-art diagnostic techniques for future accelerator facilities, whilst jointly training students and young researchers within this unique European structure.

This project is funded by the European Commission as part of the FP7 Marie Curie Actions under contract number PITN-GA-2008-215080.

