

Hugo Day  
CERN  
Geneve 23  
CH-1211, Suisse

Dear Sir/Madam,

I am applying for the position of Marie Curie Early Stage Researcher under the oPAC network. I am currently completing a PhD at Manchester University on placement at CERN in the area of accelerator physics. The thesis is entitled "Measurements and Simulations of Impedance Reduction Techniques in Particle Accelerators", expected to be defended in January 2013.

The project entailed studying the application of impedance reduction methods to a variety of accelerator components, primarily focusing on collimators and transmission line kicker magnets. In particular these devices are contributors to the majority of transverse impedance in the LHC and subject to substantial beam-induced heating respectively. Measurements of the devices were taken using a coaxial wire technique to measure the beam coupling impedance in both the longitudinal and transverse planes. As part of learning and developing this method a new technique for obtaining the quadrupolar/constant transverse impedance of asymmetric structures was developed and used in measurements of the LHC injection kicker magnet. This work involved verifying a new measurement technique using computational simulations of the measurement technique. I then lead an effort to measure the beam coupling impedance of one of the LHC injection kicker magnets, the aim being to both test this new measuring technique and to acquire detailed measurements of a significant contributor to the beam impedance of the LHC. This involved organising laboratory time with a number of departments, and communicating across a multi-cultural/multi-lingual team the aim and design of the measurement setup.

These measurements and simulations were used to analyse the beam coupling impedance of the injection kickers, to identify which parts of the kicker magnet were the significant contributors to the beam coupling impedance. Once identified, I investigated how these components altered the impedance profile, and as this was understood, how the limitations on their modification due to operational needs or other electrical or mechanical requirements. In particular, electrical breakdown between screen conductors and along the ceramic beam screen strongly affected the alterations to optimise the screen design from an impedance point of view. Following recommendations from my work a magnet was upgraded to include 19 screen conductors. This drastically reduced the observed heating, and subsequently a more long term solution was proposed for installation during long shutdown 1.

In addition, I carried out a study of the location of power loss in ferrite damped cavities using computational simulations, due to the heavy use of this material in the LHC and the very high beam current experienced during physics runs. I identified the evolution of heat deposition in the cavity and the ferrite as the resonant modes were more strongly damped, and the quantity of ferrite necessary to achieve optimal reduction in the beam impedance. I also contributed to the impedance studies of the phase 2 collimation upgrade, studying the optimal jaw material for the phase 2

secondary collimators, and comparing the beam-induced heating experienced between two RF systems.

My research interests encompass all aspects of collective effects within particle accelerators, in addition to beam dynamics, beam instrumentation and RF systems. I have a strong interest in the experimental side of accelerator physics, and am comfortable working on both a computational and theoretical problems. In addition I am interested in exploring new activities in different area - I feel that it is the challenge that is of interest, wherever and in whatever form it may lie.

I take great pleasure in conveying my enthusiasm for science and technology to the public and to students, and have volunteered as an official CERN guide and conferencier since November 2010 in this regard. Where possible I partake in outreach activities to the general public, acting as a "Science Busker" in the 2009 Manchester Science Festival. Similarly I enjoy experiencing and learning about other cultures and experiences in the work place. Understanding between differing opinions can help us work better and with more insight.

I believe I can contribute to the oPAC network with my experience, and attach my resume to this letter with further details of my academic/employment history. I look forward to receiving more information about the positions available.

Thank you for your time,

Hugo Day