Contribution ID: **148** Type: **Oral Presentation**

Compression of highly charged electron pulses for single shot femtosecond time-resolved electron diffraction experiments

Thursday, 14 July 2011 14:15 (15 minutes)

<p>Obtaining single shot electron diffraction patterns is highly desirable when dealing with samples that are either destroyed or display irreversible structural changes upon photo-excitation. Such single shot measurements demand highly charged pulses that contain in the order of 10<sup>

5</sup> – 10⁶ electrons. Maintaining femtosecond pulse duration in the presence of the inevitably large Coulomb forces inside such electron bunches is currently a major challenge in the field of ultrafast electron diffraction. One of the suggested solutions is to recompress the pulses. Conventional RF cavity compressors have been successfully constructed and implemented, but factors such as their bulkiness, high cost and difficulty of manufacturing constitute a limit to this approach. Here we present an alternative compressor concept based upon a radio frequency cavity shunted by a pair of gallium arsenide photoconductive semiconductor switches (PCSS). The PCSS's are triggered by two synchronous femtosecond laser pulses, resulting in a low jitter 5 GHz oscillation of the cavity. We report here results from our prototype device, which has achieved compression of an electron pulse containing 40 000e⁻/pulse from a 14ps down to a 500fs duration, as confirmed by measurements from our in-house developed femtosecond streak camera. We believe that our electron bunch compressor device will be easier to implement and much more cost effective than traditional RF cavities.

Level (Hons, MSc,
   PhD, other)?

PhD

Consider for a student
   award (Yes / No)?

Yes

Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?

No

Primary authors: Mr KASSIER, Gunther (Stellenbosch University); Mr ERASMUS, Nicolas (Stellenbosch University)

Co-authors: Prof. ROHWER, Erich (Stellenbosch University); Prof. SCHWOERER, Heinrich (Stellenbosch University); Ms BOSHOFF, Ilana (Stellenbosch University); Ms HAUPT, Kerstin (Stellenbosch University)

Presenter: Mr ERASMUS, Nicolas (Stellenbosch University)

Session Classification: LOS

Track Classification: Track C - Lasers, Optics and Spectroscopy