Contribution ID: **17** Type: **not specified**

Impact of wavefront aberrations in ultrafast nonlinear optics

Tuesday, 3 September 2013 14:00 (40 minutes)

Abstract content
(Max 300 words)
Special Chars

Ultraintense femtosecond lasers have become workhorses in disciplines as materials microprocessing, particle acceleration or spectroscopy. Due to the optics inside the cavity and the high-peak-power, wavefront aberrations (WA) are present, degrading the beam quality. The accurate WA measurement and control is therefore essential to get diffraction limit conditions and achieve high peak intensities. In this contribution we present the phase characterization along the chain of a femtosecond laser.

On the other hand, many of their applications originate from the nonlinearities they induce. However, nonlinear processes usually yield significant phase distortions. The effects of WA for experiments in the field of nonlinear optics are also analyzed:

Second-harmonic generation (SHG)
SHG of aberrated pulses is studied in terms of focusability, spatial chirp, beam quality and WA. At high intensities, a phase shift, proportional to the pump beam profile, is induced by the SHG. It is found that in general WAs lead to spatio-spectral coupling and degrade the SH focusability, although under particular conditions they can compensate for the induced phase shift.

Supercontinuum generation (SCG)
We show that diffractive lenses exhibiting strong chromatic aberration can be used for spectral shaping of SCG with femtosecond pulses, obtaining tunable SC pulses and extending the cut-off frequency.

Filamentation
Nowadays, filamentation is commonly used for obtaining shorter pulses. The main constraint of this scheme originates from the existence of an upper energy limit for single filamentation. We demonstrate that astigmatic focusing allows for an increase in the multi-filamentation threshold, consequently improving post-compression.

Electron generation
WA analysis is applied to optimize the experimental setup for electron acceleration in gases and solids. In the first case, it allows for an accurate control of the density of the gas and its dynamics under different experimental conditions, and in the latter it is used as input for a propagation simulation code.

Primary author: Dr BORREGO-VARILLAS, Rocío (Universitat Jaume I, Universidad de Salamanca)

Co-authors: Dr ALONSO, Benjamín (Universidad de Salamnca); Dr ROMERO, Carolina (Centro de Láseres Pulsados (CLPU)); Mr VALLE, Francisco (Centro de Láseres Pulsados (CLPU)); Dr R. VÁZQUEZ DE ALDANA, Javier (Universidad de Salamancaq); Dr BUENO, Juan M. (Universidad de Murcia); Prof. ROSO, Luis (Centro de Láseres Pulsados (CLPU)); Dr MENDOZA-YERO, Omel (Universitat Jaume I); Dr SOLA, Íñigo (Universidad de Salamanca)

Presenter: Dr BORREGO-VARILLAS, Rocío (Universitat Jaume I, Universidad de Salamanca)

Session Classification: Session III: Wavefront Sensing Techniques

Track Classification: Oral Presentation