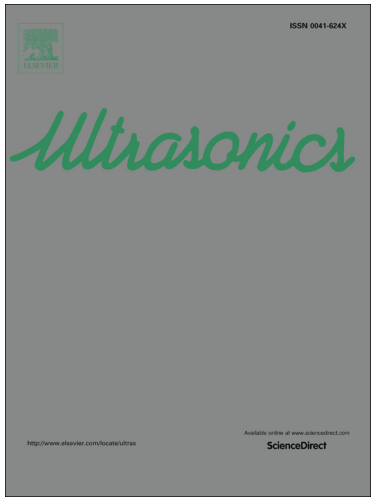

Colored Ultrafast Acoustics: from fundamentals to applications

Arnaud Devos

PII: S0041-624X(14)00040-7
DOI: http://dx.doi.org/10.1016/j.ultras.2014.02.009
Reference: ULTRAS 4768

To appear in: *Ultrasonics*

Please cite this article as: A. Devos, Colored Ultrafast Acoustics: from fundamentals to applications, *Ultrasonics* (2014), doi: http://dx.doi.org/10.1016/j.ultras.2014.02.009

Colored Ultrafast Acoustics: from fundamentals to applications

Arnaud Devos

IEMN UMR 8520, Dpt ISEN, 41 Bd Vauban, 59046 Lillle Cedex FRANCE

Abstract

The aim of this paper is to review the various laser-wavelength effects reported in the field of Ultrafast Acoustics (UA). First observed by chance in 1999, a wavelength change can indeed have a strong effect on the signal detected in UA. After the physical origin of the effect was clarified and from a systematic exploration we established that all the opto-acoustic mechanisms acting in UA are influenced by the laser-wavelength. From that we suggested original applications of UA to fundamental and applied physics. So emerged a new field, now referred as Colored Picosecond Acoustics or APiC.

Keywords: picosecond, phonon, hypersound, wavelength, color, photo-elastic, thin-film

1. Introduction

1.1. Subject definition and context

Ultrafast Acoustics (UA) or Picosecond Ultrasonics designates a technique which implements a sonar at nanoscale using ultrashort optical laser pulses. Unprecedented acoustic frequencies are reached this way, up to a few THz. From the experimental point of view, it is a full optical setup, acoustics taking place in the sample only. Acoustic emission and detection are realized by the laser. As such a laser can be tuned from a wavelength to another, one may wonder about the influence of the laser-wavelength on the measured signal.

A few years ago, we observes significant modifications in the response of some samples to a change in the laser-wavelength and then we understood that it can a play a crucial role in UA experiments. That's the reason why we