it was possible to determine how good our pulse shaping setup is working. In this experiment we used one Ti:sapphire laser oscillator which delivery pulse with 23 fs, 40 nm bandwidth, central wavelength at 800 nm, 5 nJ per pulse and 80 MHz repetition rate. We simulated and measured FROG traces for different applied spectral phase functions. Basically, we played with step and sinusoidal spectral phase functions with different amplitude and periods. Such spectral phase function is very good for calibration since its produces a well-known and interesting pulse structure in the time and spectral domain.

[11/05/10 - P150]
Non-linear spectrometry of n2 in Cr:GSGG,
Renato Antonio Cruz, Tomaz Catunda, *Instituto de Física de São Carlos / USP* ■ Refraction index changes caused by polarizability changes induced in rare-earth ions doped laser materials have been widely investigated for several applications, such as laser-beam combining, and self-Q switching [1, 2]. However, there is still some discussion, and even a controversy, regarding the exact origin of these effects and on the values found in literature. In the crystal $Cr^{3+} : GSGG$, unlike what happens with the Ruby, the energy difference between the metaestable (^2E) and the upper $(^4T_2)$ levels is small enough ($50cm^{-1}$[3]) to increase thermally the population of the upper level at room temperature, which has motivated the investigation of this crystal at low temperatures in this study. Thus, the Z-scan technique was used to obtain the non-linear refractive index and the polarizability difference between the excited and ground states of the ion at three different temperatures (about 295, 77, and 4 K). However, considering the experimental uncertainty (30%), no polarizability difference was observed between 295 and 4 K. We have found the imaginary part of the refractive index of the crystal $n_2 = 0.1\ 10^{-9} cm^2/W$ at 295 K and at 457 nm, which is nearly two orders of magnitude smaller than the real part. At 488 nm (295 K), our measurement of polarizability difference ($4\ 10^{-25} cm^3$) was about 4 times larger that Weaver e Payne's value [3], using the degenerate wave mixing technique.
[1] S. M. Lima and T. Catunda, Physical Review Letters 99 (2007) [2] J. Margerie, R. Moncorge, and P. Nagtegaele, Physical Review B 74 (2006) [3] S. C. Weaver and S. A. Payne, Physical Review B 40 (1989) 10727.

[11/05/10 - P151]
Z-scan in near and far-field,
Anderson Silva Chaves, Tomaz Catunda, *IFSC-USP* ■ Nonlinear refractive index n_2 and Kerr constant γ are key parameters of the third-order nonlinearity of nonlinear optical materials. Among numerous techniques for the measurement of nonlinear refraction, the Z-scan method proposed by Sheik-Bahae et al. in 1989 is a simple, sensitive, single-beam method that uses the principle of spatial beam distortion to measure both the real and the imaginary parts of complex nonlinear refractive indices and their signs. In this technique the sample is scanned along the optical axis (designated the Z direction) in the focal region of a single focused laser beam, and the intensity transmitted through an aperture in the far field is recorded. For a purely refractive nonlinearity, the amplitude of the transmitted intensity changes as a function of the samples position because the nonlinear medium acts as a positive lens (for $n_2 > 0$) or a negative lens (for $n_2 < 0$). In 1992 the same authors have introduced a dual-wavelength (two-color) extension of this technique for measuring the nondegenerate susceptibility of a material at the probe laser frequency ω_p due to the presence of a pump laser beam at frequency ω_e . Now, the intensity of probe beam transmitted through an aperture is recorded. In this work, based on Fresnel-Kirchhoff diffraction theory, a diffraction model of nonlinear optical media interacting with a Gaussian beam has been set up that can interpret analytically the single beam and two-color Z-scan for a small nonlinear phase shift to both near- and far-field situations considering the aperture size in detectors plane. The purpose of this work is to optimize the experimental set-up in order to improve the sensitivity and viability of two-color measurements.

[11/05/10 - P152]
Nonlinear index refraction of HAp solution using Z-scan technique,
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■ The hydroxyapatite $(Ca_{10}(PO_4)_6(OH)_2)$ or HAp is one of the most biocompatible ceramics because it is similar to the mineral constituents of human hard tissue. Because of fast and precise femtosecond laser ablation there are some studies of their effect on HAp used for biomedical applications. The nonlinear optical properties of HAp have not been established in literature. Therefore, the measurements of these optical parameters are important when the material is irradiated with ultrashort laser pulse. There are many techniques for measuring nonlinear optical parameter. Among of then, the Z-scan technique is one of the most useful methods for studying nonlinear optical properties of materials, because its experimental arrangement simplicity and allows determination of real and imaginary part of the third-order susceptibility $(\chi^{(3)})$. The Z-scan technique consisting in translate a sample along of axis propagation (z direction) passing through the focus of a focused Gaussian laser beam. The sample of passing focus produces along the direction of translation profile intensity that varies with the position, since the radius of a Gaussian beam varies with the position z. The aim of this study is to obtain the nonlinear refraction index of HAp. It was used a Ti:Sapphire chirped-pulsed amplification laser system. The pulses were centered at 800 nm with 40 fs of pulse width and 1 kHz repetition rate. These pulses created multiple self-focusing (or self-defocusing) during propagation and were focused by a