

# Variation of Wavefront Aberration of Eye Over Days

A.W. Dreher, J. Wei, S.T. Lai and N. Gomez

Ophthonix Inc, San Diego, CA

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## Abstract

**Purpose:** Our objective is to determine the magnitude of the wave aberration variations over time, especially the high order, and whether this variation is sufficiently large to negate the usefulness of static cancellation (non-adaptive optic) methods to achieve improved vision.

**Methods:** Five (5) male subjects, age from 33 to 45, participated in the study. All measurements were performed using a new grating-based wavefront sensor (Ophthonix, Inc., San Diego, CA). The data were collected over a 5-day period. For all subjects, the right eyes were measured with non-dilated pupil and data were analyzed at 4 mm diameter zone. There were two sessions each day, one in the morning, one in the afternoon, for a total of 10 sessions for each subject. Subject's vision was first auto-refracted using the wavefront sensor and a corrective lens is inserted in the line of sight. Subjects were instructed to maintain fixation at a wall picture throughout the measurement.

**Results:** The mean of the individual total RMS wave front errors of 5 subjects ranges from 0.25 microns to 5.16 microns (SD from 0 to 0.17 microns). The mean magnitude of the high order RMS component varies from 0.07 to 0.25 microns (SD from 0 to 0.03  $\mu\text{m}$ ). One-way ANOVA test indicates that for each subject there is no significant difference in wave aberrations among measurements in the morning, afternoon, or in different days (total RMS:  $F = 0.002$  and  $\alpha = 1$ ; high order RMS:  $F = 0.041$  and  $\alpha = 1$ ; spherical equivalent:  $F = 0.002$  and  $\alpha = 1$ ).

**Conclusions:** The low order RMS wavefront error fluctuates more than the high order. However, both the low and high order fluctuations are sufficiently small, and static cancellation of high order aberrations can be effective