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# Visual Benefit of the Combined Correction of Spherical and Chromatic Aberrations

**S. Manzanera[1], P. Piers[2], H. Weeber[2] and P. Artal[1]**

[1]Laboratorio de Optica, Universidad de Murcia, Murcia, Spain
[2]AMO, Groningen, The Netherlands

**Commerical Relationships: S. Manzanera**, AMO Groningen, F; **P. Piers**, AMO Groningen, E; **H. Weeber**, AMO Groningen, E; **P. Artal**, AMO Groningen, F.

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## Abstract

**Purpose:**To explore the visual benefit of correcting spherical aberration (SA) and longitudinal chromatic aberration (LCA) for potential implementations in new types of IOLs. We used an instrument permitting visual testing in white light with the correction of SA and LCA either isolated or in combination.

**Methods:**The LCA of the eye was corrected by means of a diffractive element. The performance of this device as a chromatic corrector was first measured using a white-light wave-front sensor (Manzanera et al., ARVO'05). The SA was controlled by a set of aspheric phase plates in combination with a membrane deformable mirror. The average value of LCA and the SA found in pseudophakic patients (0.149 µm for a 4.8 mm pupil) were either corrected or induced. A visual channel in the system allows for measuring visual acuity and the contrast sensitivity at 6 c/deg in three subjects and for the four different conditions resulting from the combination of the presence or absence of LCA and SA.

**Results:**A statistically significant improvement in visual performance was found when either LCA or SA eyes were corrected separately. For the specific SA value, the benefit of correcting this aberration is higher than that of correcting the LCA. The combined correction of LCA and SA provides the best visual performance: around a 40 % improvement as compared with the normal case.

**Conclusions:**The simultaneous correction of chromatic and spherical aberration increases the visual performance measured under normal white-light conditions. This result suggests the potential visual

benefit of a new type of aspheric and achromatic IOL.

**Keywords:** contrast sensitivity • aging: visual performance