

HIGH RESOLUTION IMAGING LENS

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ABSTRACT. A short description of the designing of a high resolution imaging lens dedicated to geometrical measurements is given in this report.

1. INTRODUCTION

In this report we describe the main aspects of the designing of a high resolution imaging lens dedicated to the measurement of geometrical parameters.

2. OPTICAL DESIGN

The use of a high resolution lens presents many advantages in those industrial fields where high precision is required.

The imaging lens we designed was dedicated to observe a Field of View (FOV) of 18.5mm in diameter illuminated in white light (450nm-650nm).

The designing was performed starting from a classical layout of a double Gauss. Glasses with middle and high refractive index were chosen to better correct the geometrical aberrations. The chromatism has been corrected by selecting glasses with different Abbe numbers. Also the distortion was corrected during the optical design reaching a maximum value of $1\mu\text{m}$ at the edge of the FOV.

In fig. 1 the layout of the system is given, while in fig. 2 the polichromatic spot diagram is reported. The MTF curves are reported in fig. 3. The distortion curves are reported in fig. 4 with the field curvature.

The objective has an effective focal length of 33.3mm working with a speed F/3.7, as better summarised in the following Table I.

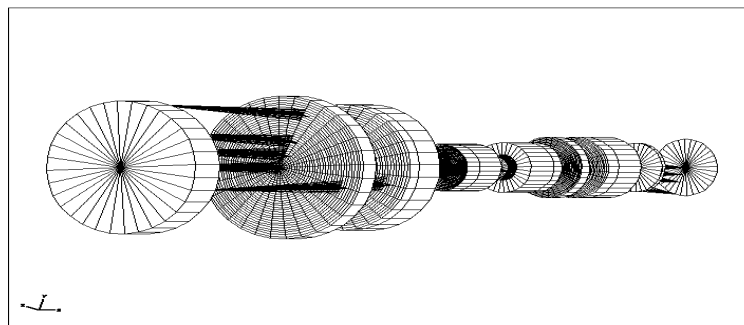


Fig. 1: Optical layout of the high resolution imaging lens (the objective is composed by ten lenses). The overall length was a constraint given by the customer.

TABLE 1. Main optical specifications of the imaging lens

<i>Parameter</i>	<i>value</i>
Focal Length	33.3mm
Spectral range	450nm-650nm
Speed F/	3.7
Max. distorsion	1 μ m

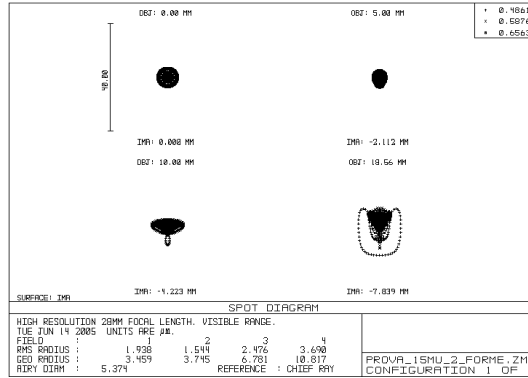


Fig. 2: Polichromatic spot diagram of the imaging lens.

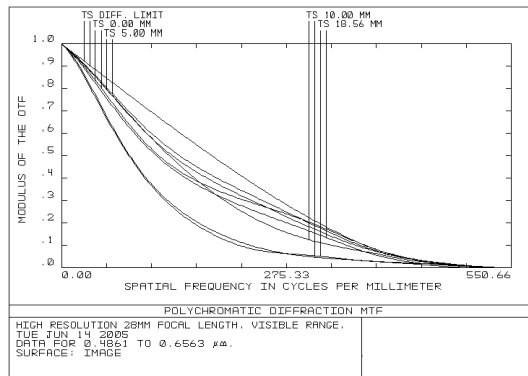


Fig. 3: Polichromatic MTF curves of the imaging lens.

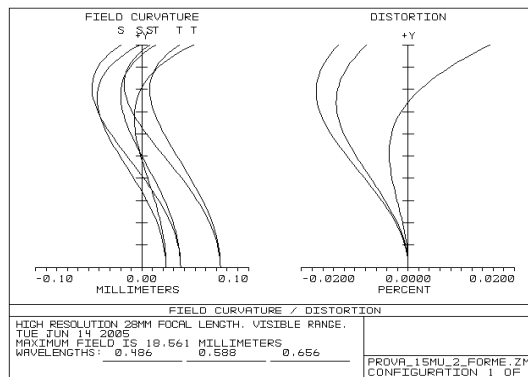


Fig. 4: Distorsion curves of the imaging lens.