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# Search for Gravitational Lenses in a Large Sample of Highly Luminous Quasars and Statistical Determination of Cosmological Parameters*

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## Foreword

We have presented at this conference results that have just been published in the June issue of the Astronomical Journal (see [SUR93.1]). Therefore, we only present hereafter a summary of this work as well some future plans.

**Abstract:**

Results on gravitational lensing statistics applied to a sample of 469 highly luminous quasars are reported. The objects were directly imaged, either from the ground (ESO, CFH) under optimal seeing conditions, or using the Hubble Space Telescope. We have derived values for the effectiveness parameter F of galaxies, modeled by means of singular isothermal spheres, to produce macro-lensed images of distant quasars, and upper limits on the density parameter $\Omega_L$ of compact objects with masses $\simeq 10^{10} - 10^{12}\ M_\odot$.

*Based on data collected at the European Southern Observatory (La Silla, Chile), with the Canada France Hawaii Telescope and with the Hubble Space Telescope.

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Adopting $H_0 = 50$ km/sec/Mpc, $\Omega_0 = 1$ and $\Lambda = 0$, we find that at the 99.7% confidence level, $0.005 < F < 0.478$ and that $\Omega_L < 0.02$. A critical discussion of these results is presented. Finally, comparing the efficiencies of ground-based and space instruments used to search for gravitational lens systems among highly luminous quasars, we conclude that for the near future, ground-based direct imaging characterized by a good dynamical range still constitutes the best observational strategy.

**Continuation of our investigations...**

Reduction and analysis of spectra obtained for several suspected gravitational lens candidates as well as direct CCD frames taken for several hundred additional HLQs are in progress. This will lead to a better estimate of the real number of gravitational lenses present in our sample and will also help in better constraining the values of the F and $\Omega_L$ parameters. New results will be soon reported.

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## DISCUSSION

**P. SCHNEIDER**: Your large range of the "strength parameter" F seems to be in conflict with the fairly well-constrained galaxy density obtained by Kochanek. Can you comment on the difference?

**J.-F. CLAESKENS**: I have not seen the paper by Kochanek you speak about, but our large interval for the allowed values of the parameter F stems from two main reasons. First, we have in our sample a quite large number of unconfirmed lens candidates (that is "optimistic" candidates). This number will decrease with new direct or spectroscopic observations of these candidates. The second reason is that we work with a 99.7% confidence level. This reduces random effects, but gives a not so well constrained interval value for the parameter F.

**F. HAMMER**: I just wonder to what extent the uncompleteness of the catalog you used can affect your results. Do you plan to extract a more (statistically) complete subsample or to do some new observations?

**J.-F. CLAESKENS**: The uncompleteness only stems from the rejection of lenses in the sample of quasar candidates. The magnification bias is evaluated independently for each observation and not for a flux limited sample. It is obvious that the larger the sample the more accurate the results.

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