FAINT REFERENCE CATALOGUES AROUND ICRF RADIO SOURCES FROM PHOTOGRAPHIC OBSERVATIONS

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ABSTRACT. A *by-product* of the method of photographic observations of the radio reference frame sources is the realization of astrometric fields around each QSO, with accuracy less than 100 mas. We present here some results derived from plates collected during a photographic campaign on 89 QSOs.

1. INTRODUCTION

The procedure of photographic observations applied to the optical link of the VLBI defined celestial reference frame was commonly carried out in two steps, which consists in obtaining two exposures of the QSO target field, thereby combining the capabilities of medium and long focus telescopes. Specifically, precise positions of anonymous stars from the larger field telescope are first reduced by using available astrometric catalogues (primary reference stars); then, they are employed as secondary reference positions for the reduction of the deeper, smaller field plates where the radio source is well visible but which cannot support a direct link to the primary reference stars due to their paucity and to their often saturated images. A *by-product* of this technique is the realization of astrometric fields around each QSO target, whose accuracy is typically in the range of 50 to 100 mas, and therefore suitable for a varieties of astrometric studies.

We briefly discuss here some very preliminary results derived from a small sample of plates from the ones collected during a photographic campaign on 89 QSOs carried out between 1986 and 1994. The observations were made mostly with the Torino astrometric reflector REOSC

(D= 105 cm, F= 9942 mm) and photographic refractor Morais (D= 38 cm, F= 6875 mm). All 350 plates were measured in Cagliari on the automatic ToCaMM (Torino Cagliari Measuring Machine) with an accuracy of about 1 μm per stellar image coordinate (Del Bò et al., 2000; Lattanzi et al. 2001). The ToCaMM machine is presently also used for testing results obtained with commercial scanners in the framework of the national project *Digitization of the Archives of Photographic Plates of Italian Astronomical Observatories* aimed to perform a 2yr program of selective digitization of plates (both images and spectra) present in the Italian photographic archives.

2. FIRST RESULTS AND REMARKS

Due to the limits of this paper, we will only give a first evaluation of the quality of the results. To test our software, we have considered more than 4,200 secondary stars around three radio sources (0716+714, 0839+187 and 1928+738). The number of plates available for each of the three sources varied from two to six. We have therefore compared the plate solutions of the stars in common for each source and calculated the standard deviation around the mean for each object; this resulted in an average positional error of less than 100 mas - about as good as one would expect. Such an error accounts for uncertainties coming from the characteristics of the exposure itself, the stability of the measuring process, and the ability to centroid the stellar image, but it includes also possible unmodelled sistematic residuals coming from the plate reduction.

Preliminary results (Bucciarelli et al, 2003) based on a sample of 20 radio sources have shown that the QSO's optical and radio positions are well in agreement within the stated formal errors; however, there is evidence that the proper modelling of a magnitude-dependent effect can in general improve the quality of the final results. With such a refined reduction procedure we expect to be able to get new astrometric positions for about 120,000 stars measured in the neighbourhood of about 90 QSO's. We note that all these stars belong to the GSC-I catalogue, from which the *anonymous* objects measured on our plates were originally extracted.

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3. REFERENCES

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