OBSERVATIONS AT THE 60 cm ASV TELESCOPE AND THE LINK FUTURE GAIA CRF - ICRF

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1. Introduction

The Gaia mission is cornerstone of European Space Agency (ESA). It was launched at the end of 2013. The Gaia is going to map repeatedly, during its 5-year lifetime, over one billion stars (the objects of entire Galaxy with apparent V magnitude between 5.6 and 20) and more than 500 000 quasars (QSOs). It will be a large amount of astronomical data. The Gaia is going to revolutionize our knowledge of the Milky Way. It is the first space-based astrometry mission after the Hipparcos. So, the Gaia is the next step of European pioneering high-accuracy astrometry.

The main goal of Gaia mission is to make a dense QSO-based Gaia Celestial Reference Frame (Gaia CRF). To do that it is necessary the link between future Gaia CRF and International Celestial Reference Frame (ICRF) with high accuracy. It is very important task, and for now only about 10% of the ICRF objects are good enough for mentioned link because: some sources are not bright enough in optical domain of wavelengths, some objects have significant extended radio emission, etc. (Bourda et al. 2010, 2011; Taris et al. 2013). It is of importance to find and check other sources. They are weak extragalactic radio sources (ERS) with bright optical counterparts. So, it is of our interest to observe and investigate these objects. The astrometric data (the coordinates of objects, on the first place) are in line with the displacements of optical photocenter of objects; it is a result of astrophysical processes of sources. Because of it, we need to investigate the variations of the light curves of mentioned objects.

Fig.1. The 60 cm ASV telescope

Fig.2. The 2 m NAOR telescope

2. Instruments and results

In collaboration with Bulgarian colleagues, we are using the Rozhen telescope D/F=2m/16m (National Astronomical Observatory - NAO, Bulgarian Academy of Sciences - BAS) for investigation of morphology of ICRF objects interested for Gaia astrometry. And the ASV (Astronomical Station Vidojevica) of Astronomical Observatory in Belgrade - AOB D/F=60cm/600cm telescope is useful for photometry investigation. Of course, there are other telescopes for mentioned subjects. The main information of these two telescopes are:

1. ASV (AOB)	λ=21.º5	CCD camera - Apogee Alta U42
Cassegrain	φ=43.º1	2048x2048 pixels, scale=0."46
60cm/600cm	h=1150m	13.5x13.5μm pixel size, FoV=15.'8x15.'8
2. Rozhen (NAO BAS)	24.7	VersArray 1300B
Ritchey-Chrétien	41.7	1340x1300, 0.26
200/1600	1730	20x20, 5.6x5.6

The information of the first column are: site,telescope and D[cm]/F[cm]. In the second column, the geographic coordinates (longitude - λ, latitude - φ) and altitude (h) of site are presented. The FoV is field of view.
The 60 cm ASV telescope is presented in Fig.1, and 2 m Rozhen one in Fig.2. In the near future, a new 1.4 m telescope will be installed at ASV in the frame of Belissima project (http://belissima.aob.rs).

One of us (GD) defined a joint research project "Observations of ICRF radio–sources visible in optical domain", in the frame of bilateral cooperation between Serbian Academy of Sciences and Arts and BAS, which partly deals with Gaia CRF-ICRF link investigation; this 3-year project started in 2014 and its obvious benefits are in using the telescopes of both countries for mentioned task.

The 60cm ASV telescope was used for optical observations of 47 objects, mostly QSOs, and photometry investigation (for the link Gaia CRF - ICRF) since mid-2013. Until now, near all objects were observed (some of them few times) and we did it in the B, V and R bends. Here, we present some preliminary photometric results of object BL 1722+119; in Fig. 3, one of our observations with 60cm ASV is presented (exp.=120s, R filter, July 9th 2014). The standard bias, dark and flat-fielded corrections were done (also, hot/bad pixels were removed). The comparison stars were used via http://www.lsw.uni-heidelberg.de/projects/extragalactic/charts/;C2,C3 and C4 (see Fig. 4), but C1 was saturated in V and R filters, in B there is not input magnitude data, and three CCD images per filter were measured (calculated magnitude is the average value with st. error). Our photometry data are:

		Magnitude (standard error)				
Filter	JD	1722+119	C1	C2	C3	C4
B	2456483.48651	-	-	-	-	-
V	2456483.48129	15.32(.02)	-	13.218(.005)	14.100(.006)	15.667(.008)
R	2456483.49204	14.87(.01)	-	12.625(.005)	13.623(.005)	15.153(.007)

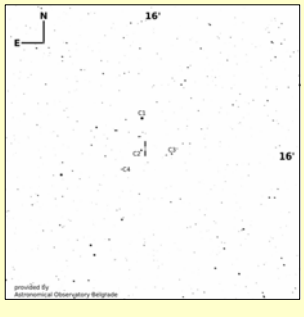

Fig.3. The BL object 1722+119, the 60cm ASV

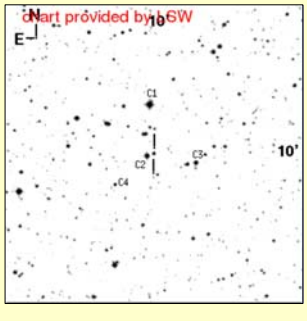

Fig.4. The comparison stars around 1722+119

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3. References

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