THE FK4 ORIENTATION PARAMETERS DERIVED FROM PHOTOGRAPHIC AND VLBI OBSERVATIONS OF RADIO / OPTICAL OBJECTS

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ABSTRACT. The photographic and VLBI positions of 59 quasars are used for determination of the FK4 orientation parameters with respect to the radioastrometrical system (RAS).

The difference $\Delta\alpha \cos\delta$ and $\Delta\delta$ between the equatorial coordinates of the quasars in RAS and FK4 in the sense (R – O) may be presented as functions of the mutual orientation parameters as follows:

$$\Delta\alpha \cos\delta = -a \sin\delta \cos\alpha - b \sin\delta \sin\alpha + c \cos\delta \quad (1)$$
$$\Delta\delta = -b \cos\alpha + a \sin\alpha + d \quad (2)$$

where

$$a = i \cos\omega,\ b = i \sin\omega,\ c = d \cot\varepsilon + \Omega - \omega\ , \quad (3)$$

and where i is the mutual inclination of the FK4 and RAS equators, d is the constant correction to declinations in the FK4 system, ω and Ω are the longitudes of the point of intersection of the FK4 and RAS equators, and ε is the mutual inclination of the equator and ecliptic.

There have been selected 59 quasars with the coordinate differences (R – O) for RA and declination both less than the three-sigma value of the internal error of the optical positions, estimated as $0''.20$. These data are presented in Table 2. The results of separate solutions of the systems (1) and (2) obtained by the least-squares method and weighted values of twice-determined parameters are presented in Table 1.

Substitution of the weighted values for a, b, c and d in (3) will yield the orientation parameters of the FK4 coordinate system with respect to the RAS:

$$i = +0''.09 \pm 0''.04, \quad d = +0''.08 \pm 0''.03, \quad \Omega - \omega = -0''.15 \pm 0''.08\ .$$

Then using these values we can obtain the correction of the RAS equinox with respect to the one of the FK4:

$$A = \Omega - \omega + i \sin\omega \cot\varepsilon\ =\ -0''.26 \pm 0''.10\ .$$

Due to the non-uniform distribution of the considered quasars, it has not been possible to apply a more complicated expansion by spherical functions. We should notice that the external error of residuals (R – O), equal to $0''.28$, is larger than the internal error $0''.20$ — which suggests something

J. H. Lieske and V. K. Abalakin (eds.), Inertial Coordinate System on the Sky, 85–86.

about the presence of local errors of the reference star coordinates.

Table 1. Parameters of Equations (1) and (2) in arcsec

Equations	*a*	*b*	*c*	*d*
(1)	+0.08 ± .11	-0.19 ± .11	+0.03 ± .03	
(2)	+0.07 ± .04	-0.03 ± .03		+0.08 ± .03
weighted	+0.05 ± .04	-0.05 ± .03	+0.03 ± .03	+0.08 ± .03

Table 2. Differences (R – O) of coordinates in units of 0\.''01

IAU number	Δα × cosδ	Δδ	Ref.	IAU number	Δα × cosδ	Δδ	Ref.	IAU number	Δα × cosδ	Δδ	Ref
0003-066	00	-20	1	0738+313	21	25	3	1328+307	50	-02	K
0106+013	36	-04	K	0823+033	00	20	1	1354-152	-40	20	1
0112-017	00	40	1	0851+202	00	35	3	1354+195	21	07	3
0119+041	-20	00	1	0859-140	20	-40	1	1510-089	-04	-48	2
0133+476	06	08	3	0906+015	40	20	1	1546+027	20	00	1
0135-247	40	10	1	0919-260	00	-40	1	1730-130	-45	39	2
0138-097	-20	50	1	0923+392	28	11	3	1741-038	51	-14	2
0153+744	-26	09	3	0941-080	-50	-20	1	1908-202	-30	10	1
0202-172	40	00	1	0952+179	-13	-29	K	1928+738	21	04	3
0319+121	47	-12	K	1015-314	-10	-59	1	1936-155	-40	10	1
0332-403	-34	-07	2	1104-445	-13	46	2	1958-179	00	-30	1
0420-015	06	-03	2	1145-071	-10	-50	1	2106-413	00	40	1
0438-436	-12	43	2	1148-001	15	-16	2	2203-188	00	-40	1
0440-004	-36	07	2	1219+285	02	18	3	2210-257	-20	-20	1
0457-024	10	-30	1	1226+023	37	04	3	2216-038	-20	10	1
0528-250	00	20	1	1237-101	50	-20	1	2245-328	30	-30	1
0552+398	42	-34	K	1243-072	-30	-50	1	2318+049	00	20	1
0642+449	51	05	K	1245-197	20	-10	1	2329-162	-10	50	1
0723-008	40	20	1	1302-102	20	00	1	2345-167	24	37	2
0736+178	53	00	K	1313-333	22	-27	2				

Notes: 1. The reference *K* marks unpublished results by I. Kumkova.
2. For the references *K*, and *3* the radio coordinates are taken into *[4]*.

References

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