4. CONCLUSIONS

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CONCLUDING REMARKS

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We are now at the end of a long symposium which lasted five (but not all full) days. The objective was first to review the best present achievements of astrometry and to present projects for a much more advanced astrometry in terms of precision attained versus the number of stars and limiting magnitudes. The word sub-milliarcsecond astrometry was intentionaly vague. It has rightly been often understood as designating a range of precisions of the order of a few tens microarcseconds.

The possibility of getting such precisions – and in some cases for tens of millions – stars was presented and at least eight space projects were described, from USA, Japan, Russia and Western Europe. These projects are based upon different designs, but have at least one common feature: the use of CCD receivers either by a direct view of images formed in the focal plane or by the analysis of some interferometric pattern. They belong essentially to two classes of astrometry. One – like Hipparcos/Tycho – are survey instruments intended to scan the entire sky. The other is designed – like the HST astrometric capabilities – to analyse single objects or at least identified small fields. The possible applications of these instruments are of course quite different.

But nowadays – independent of financial or political arguments which have unfortunately often the highest weight – no project can be approved unless there is a strong scientific case behind it. The various sessions of this symposium showed how many applications of very precise astrometry exist in all domains of astronomy and astrophysics. We have heard some examples, they will be published in the proceedings of this symposium and it is not my intention to present them again, something that I would do much worse than the speakers. What I would like to do, is only to highlight some conclusions that I believe come out of these presentations.

First of all, let me say that the presentations of techniques used and of instruments in existence, or in construction, for ground-based observations

E. Høg and P. K. Seidelmann (eds.),
Astronomical and Astrophysical Objectives of Sub-Milliarcsecond Optical Astrometry, 409–432.

were very useful. They are previews of future astrometry in space as well as on the ground. Clearly, sub-milliarcsecond astrometry is not reserved to space. Actually it already exists on ground. VLBI is the best example, and it was striking to learn that already now, apparent motions of some radio-sources have been obtained with a formal error of 2.5 μas/year, so that such motions were revealed for many sources. It is even more striking to hear that the continuation of this program could ultimately reach conclusions that have been obtained by the satellite COBE. In the same class of presently achieved sub-milliarcsecond precision or their equivalent are the timing of pulsars and the monitoring of Earth's rotation. In all these cases, the interpretation needs careful analyses in the framework of General Relativity.

But even in the optical domain, the achievements of the Mark III or the French I2T interferometers show that sub-milliarcsecond accuracies are already available in very small field astrometry and imaging of stellar discs. For similar accuracies in astrometry, the future USNO optical astrometric interferometer and its extension for the measurement of stellar diameters and binary systems will introduce the Earth based observations in the middle of the sub-milliarcsecond domain. I believe that these progresses are fundamental for astrometry which cannot be based only on prospective but rare space programs. Earth based astrometry must strongly engage in these techniques – or find new ones – which will allow this kind of precision. Another very important job for ground-based astrometry is to extend, although with less precision, the existing catalogues to fainter objects, first up to magnitude 15-17 and later more. The GSC2 is such a program that should be strongly supported. A recommendation in this direction has been prepared and will be submitted to you for approval (see resolution B7 in annex).

But, as was shown yesterday, this is not enough. The preparation of survey-type astrometric missions or the astronomical and astrophysical exploitation of such missions necessitate the knowledge of many other stellar parameters. Radial-velocities have been mentioned several times, but also good and well calibrated photometry, good a priori positions, spectral types and classes, as would for instance be provided by a survey analogous to the Sloan survey, but dedicated to stars rather than to extragalactic objects. Automation and computing facilities could make such a program quite feasible.

We have been delighted to see the first astrometric results of HST and the progress report on Hipparcos and Tycho which shows that this mission is giving results significantly beyond the nominal 2 milliarcsecond objective. The Hipparcos catalogue will become, once linked to the extragalactic reference frame, the optical extension of the new IAU reference frame. A

working group sponsored by five of the commissions which organized the present symposium, has made the first step towards the definition of this extragalactic reference frame. Rather than present it to the five commission meetings, it seemed to us that the result could be presented to you and that we shall ask you, under the form of a recommendation, to allow the work to continue in order to be completed for the next General Assembly (see recommendation B6).

Let us now turn towards the scientific applications of very accurate astrometry. The situation is different in the various domains of astronomy, so let us consider them one by one.

Let us first consider stellar astrophysics. In order to model either the atmosphere or the interior, one needs to know all, or the majority, of the following physical parameters: mass, luminosity, radius, effective temperature, surface gravity, and helium and metal contents. Clearly, astrometry cannot provide all of that. Of course, there exist relations between some of these parameters, but there still remains the necessity of highly accurate photometric and spectroscopic observations. The new astroseismology will also add information. It also results from some of the presentations, that the theories themselves, particularly the theory of stellar interiors and evolution, are far from being in a satisfactory stage and much work has to be done to catch up with the improving precision of astrometry.

Concerning the stellar interiors, the evolution of stars, and consequently the age determinations, the theoretical problems are still big – in particular the evaluation of the overshooting parameter which is the position of the transition between radiative and convection zones within a star – and the knowledge of the primordial helium content is fundamental. The discussion of this quantity, as a function of metal content, passes through the main-sequence fitting as a function of metallicity. This means that one has to place main-sequence stars exactly in the HR diagram and this requires the improvement of luminosities, and hence of the parallaxes.

Another parameter of importance is the radius of the star. Very few radii are known and, if they are, it is with an insufficient accuracy, so that they do not provide the additional parameter which would simplify the a priori theoretical constraints used in the models. Here, we need at the same time an accuracy of 1% parallax determinations and 1% in apparent radius determinations, which call for 10 μas interferometric precision – quite reasonable goals for new interferometers and sub-milliarcsecond global astrometry.

Calls for significantly better parallaxes than those provided by Hipparcos were heard on behalf of studies of various classes of low luminosity stars. They are necessary in determining surface gravities and checking spectroscopic estimates of other atmospheric parameters. This includes studies of

the later stages of stellar evolution and the evolution of population II stars. Clearly these are not all the needs. It is just as true for population I and for many other stellar types or evolutionary stages which were not presented here. I am sure that one would have heard the same type of arguments.

The problem of masses is different. Most of the direct determinations with a significantly good accuracy (of the order of 1%) are obtained for eclipsing binaries. Very accurate orbits of spectroscopic detached binaries should soon permit to obtain a similar precision provided that accurate radial velocities of the components are obtained. There is a challenge to double star observers to fill up the mass-luminosity relation as a function of metallicity and to extend it to stars with masses smaller than the solar mass. At present, stellar masses are generally evaluated from equations involving different stellar parameters, and hence are model dependent which may present important biases.

So, for stellar astrophysics, accurate astrometry is one, but not the only domain which controls progress. Hipparcos will provide enough good data to trigger more studies and observations that would lead to advances in this domain. The prospect of significantly better accuracies for a large number of stars should be accompanied by similar prospects in getting other parameters. This means, in particular, more very high resolution spectroscopy and obtaining bolometric, rather than current magnitudes. Astrophysical needs have been the major reason that led to the decision to make Hipparcos. Now the prospects of sub-milliarcsecond astrometry, together, I believe, with the on-coming astroseismology, should be a trigger to new developments in stellar physics.

The outcome of the papers dealing with dynamics of clusters, the Galaxy, and the Magellanic clouds, is much simpler. Proper motions and parallaxes are used directly without complicated relations with other parameters. Only the need of more radial velocities was stressed. Here, the more precise the better could be the motto. If one wishes to study a significantly large number of open clusters, 10 microarcsecond, and often 1 microarcsecond, precision are sought for parallaxes. This kind of accuracy would allow the determination of a great variety of HR diagrams to calibrate variations in luminosity as a function of age and metallicity and get detailed stellar evolution tracks. Several clusters will be spatially resolved so that, with proper motions and radial velocities, three dimensional dynamical studies can be made. In dynamical models of the Galaxy, one should be able to distinguish between cylindrical and spherical models and test the extension, the shape and the mass of the halo. The problem of the existence and distribution of the missing mass is at stake. The most accurate data towards the centre of the Galaxy should provide clues about the existence of a bar and other irregularities, such as the dynamical effect of clumps. They

also should determine the motions of the globular clusters, possibly over the whole life of the Galaxy. Similar precisions of a few microarcseconds per year are needed for studying the motions of and within the Magellanic clouds. All these studies also imply that this accuracy is obtained for stars of magnitude 15-16.

The problem of the cosmic distance scale is still open, since various determinations of the Hubble constant are still spread in the 50 to 100 km/s/Mpc interval. If Hipparcos could, by its observations of Cepheids and some RRLyrae, reduce the uncertainty to 10-20%, better accuracies would certainly permit a calibration of these stars as a function of chemical composition and greatly reduce the uncertainty of this very important cosmological parameter.

Observations of the effects of gravitational lensing are also an objective of very accurate astrometry. Although it is difficult to predict what are the stars to observe, extensive astrometric surveys could identify optical couples of stars which may produce observable light deviations.

In the domains of solar system research and reference frames, the increase of accuracy of astrometric observations poses a number of new problems. Millisecond pulsar timings, as well as direct observations of minor planets, will permit drastic improvements in the determination of the solar system reference frame and help to compare the dynamical reference system to the extragalactic reference system, bringing an important result for the understanding of the various reference frames in General Relativity theory.

In conclusion, in any astronomical domain in which some parameter is subject to astrometric observations, there is a possibility of progress, provided that some level of accuracy is obtained. In comparison with the present situation illustrated by HST, Hipparcos and the existing optical interferometers, a gain of two orders of magnitude in precision and number of stars will produce remarkable new science. This is the main lesson of this symposium, a lesson publicized by resolution B8.

The speakers, the authors of posters and all the attendance of this symposium are thanked for their contributions, for all the efforts they have made to prepare their presentations, to discuss the matters of interest or to participate to the discussions. I would like to thank particularly Prof. Høg and Dr Seidelmann who are now taking the burden of publishing the proceedings of this meeting, the members of the Scientific Organizing Committee who helped me to set up this meeting, and the Dutch National and Local Organizing committees for providing these very nice meeting facilities.

GENERAL DISCUSSION

A general discussion was opened by P.K. Seidelmann who prepared a number of questions to which some answers were given. They are summarised below :

1 - *Can we get better accuracy from the ground ?*

Good prospects to reach a few microarcseconds exist in very small field interferometry. Progress in conventional large field and global astrometric techniques is probably marginal.

2 - *Future for photographic astrometry*

Despite difficulties in getting plates and their cost, photography has the advantage of long term availability for new measurements and reduction. It also is the best tool for relative astrometry for wide fields of a few degree range. It also permits more accurate colour calibration.

On the other hand, CCD astrometry with its high quantum efficiency and dynamic range, especially with the scan technique and mosaics of CCD chips, permit a survey of faint magnitudes, allowing a densification of existing catalogues up to magnitude 20 or so. Precisions of 30-40 mas are possible.

In conclusion, it seems that both techniques have a future at least until the next generation of global space astrometry projects.

3 - *Future for meridian circles*

They need to have a new mission. They could be the intermediaries between the Hipparcos/Tycho catalogues and the CCD densification. New design may be necessary.

4 - *Is it more important to go fainter than more accurate ?*

Both are very important and should be sought. Actually we need both at the same time and also additional wavelengths.

5 - *Future star catalogue requirements*

There is a great need, in addition to better and more extensive astrometric catalogues, for large surveys of different astrophysical quantities.

6 - *Maintenance plan for the extragalactic reference frame*

It should include not only densification and improvement of accuracies, but also the study and analysis of the source structures (imaging to better than 1 mas resolution). One should also test the quality of Hipparcos proper motions of radio stars, especially in the Southern hemisphere. This problem is addressed in the conclusions of the IAU working group on reference frames.

RECOMMENDATIONS

The symposium has adopted three recommendations which were in due course approved as resolutions by the 22nd General Assembly of the IAU. We give here these resolutions as adopted by the General Assembly after some slight amendments.

Resolution B6 on the working group on reference frames

The General Assembly of the IAU upon the advice of the participants of symposium 166

considering

that an IAU working group on reference frames consisting of members of Commissions 4, 8, 19, 24 and 31, the International Earth Rotation Service (IERS) and other pertinent experts has been formed to produce a list of candidate extragalactic radio-sources for defining the new conventional reference frame and secondary sources that may later be added or replace some of the primary sources,

noting

that a list of sources which defines the conventional reference frame together with a list of candidate sources which may, at some future date, be added or replace the defining sources has been made

adopts

this list of defining sources as the first stage in the definition of the new reference frame, and

requests

that the working group on reference frames be continued and its membership be reviewed by Commissions 4, 8, 19, 24 and 31 and the IERS to

1. specify the positions of the radio sources on the list,

2. determine the relationship of this frame to an optical frame defined by stars, and

3. recommend to the XXIIIrd General Assembly (1997) that a way be found to organize the work for the maintenance and evolution of this frame and its extension to other frames at other wavelengths.

The list, consisting of 606 objects is given in the annex.

Resolution B7 on the second generation of STScI Guide Star Catalog

The General Assembly of the IAU upon the advice of the participants of symposium 166 on *Astronomical and astrophysical objectives of sub-milliarcsecond optical astrometry*, meeting at the occasion of the 22nd IAU General Assembly in The Hague, 15-19 August 1994 :

taking into account
the immense importance to the entire astronomical community of the STScI's Guide Star Catalog (GSC);

taking into account
the expected characteristics of the proposed GSC-II project;

taking into account
foreseen implications of the availability of the GSC-II for countless applications in ground-based and space-based astrometry over the next decades;

taking into account
the anticipated distribution of compressed second generation plate scans to the astronomical community; and

taking into account
the scientific technical competence at the STScI, the availability of the plate material and digitizing facilities, and the team's willingness to undertake the GSC-II project

urges
the Executive Committee of the IAU to approach NASA and other relevant national and international funding agencies to do their utmost to ensure the necessary funding for timely completion of the second generation plate scanning and the construction of the GSC-II at STScI, and urges the international community to engage in broadening the support and in pursing derivative collaborative projects.

Resolution B8 on the need to develop optical sub-milliarcsecond astrometry

The General Assembly of the IAU

considering

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that the symposium 166 has discussed the many aspects of solar system, galactic and extragalactic astronomy and astrophysics requiring high accuracy optical astrometry,

1. emphasizes the strong need for sub-milliarcsecond accuracy astrometric data for very large numbers of stars,

2. notes that satellite options have been proposed, orders of magnitude more accurate and productive than the very successful Hipparcos/Tycho mission.

3. urges the space agencies to study the possibilities of sub-milliarcsecond optical astrometry with the aim to develop optimal projects as soon as possible, taking advantage of the present high level of expertise and dedication.

ANNEX TO RESOLUTION B6

List of extragalactic objects identified as sources which define the new conventional celestial reference frame together with candidate sources which may, at some future date, be added or replace the defining sources

- d : defining sources
- c : additional sources
- o : optical objects

TABLE 1. Sources

	Name			R.A.			Dec.	Alias
d	0003-066	0	6	13.89	-6	23	35.3	PKS 0003-066
d	0007+106	0	10	31.01	10	58	29.5	IIIZW2, PKS 0007+106
d	0007+171	0	10	33.99	17	24	18.8	4C+17.04
d	0008-264	0	11	1.25	-26	12	33.4	PKS 0008-264
d	0010+405	0	13	31.13	40	51	37.1	B3 0010+406
d	0013-005	0	16	11.09	0	-15	12.5	PKS 0013-005
d	0014+813	0	17	8.48	81	35	8.1	S5 0014+81
d	0016+731	0	19	45.79	73	27	30.0	S5 0016+73
d	0019+058	0	22	32.44	6	8	4.3	PKS 0019+058

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	Name			R.A.			Dec.	Alias
d	0026+346	0	29	14.24	34	56	32.2	OB343, S4 0026+34
d	0039+230	0	42	4.55	23	20	1.1	PKS 0039+230
d	0047-579	0	49	59.47	-57	38	27.3	PKS 0047-579
d	0048-097	0	50	41.32	-9	29	5.2	PKS 0048-097
d	0056-572	0	58	46.58	-56	59	11.5	PKS 0056-572
d	0056-001	0	59	5.51	0	6	51.6	4C-00.06
d	0059+581	1	2	45.76	58	24	11.1	
d	0104-408	1	6	45.11	-40	34	20.0	
d	0106+013	1	8	38.77	1	35	0.3	4C+01.02
d	0109+224	1	12	5.82	22	44	38.8	
d	0111+021	1	13	43.14	2	22	17.3	
d	0112-017	1	15	17.10	-1	27	4.6	PKS 0112-014
d	0113-118	1	16	12.52	-11	36	15.4	PKS 0113-118
d	0119+115	1	21	41.59	11	49	50.4	PKS 0119+115
d	0119+041	1	21	56.86	4	22	24.7	IRAS F01177+
d	0123+257	1	26	42.79	25	59	1.3	
d	0131-522	1	33	5.76	-52	0	4.0	PKS 0131-522
d	0133+476	1	36	58.59	47	51	29.1	
d	0135-247	1	37	38.35	-24	30	53.9	
d	0134+329	1	37	41.30	33	9	35.1	3C48, 4C+39.25
d	0146+056	1	49	22.37	5	55	53.6	PKS 0146+056
d	0148+274	1	51	27.15	27	44	41.8	
d	0149+218	1	52	18.06	22	7	7.7	PKS 0149+218
d	0150-334	1	53	10.12	-33	10	25.9	PKS 0150-334
d	0153+744	1	57	34.96	74	42	43.2	
d	0159+723	2	3	33.38	72	32	53.7	
d	0201+113	2	3	46.66	11	34	45.4	PKS 0201+113
d	0202+149	2	4	50.41	15	14	11.0	4C+15.05
d	0202-172	2	4	57.67	-17	1	19.8	PKS 0202-172
d	0202+319	2	5	4.93	32	12	30.1	B2 0202+31
d	0208-512	2	10	46.20	-51	1	1.9	PKS 0208-512
d	0212+735	2	17	30.81	73	49	32.6	S5 0212+73
d	0215+015	2	17	48.95	1	44	49.7	
d	0219+428	2	22	39.61	43	2	7.8	
d	0220-349	2	22	56.40	-34	41	28.7	PKS 0220-349
d	0221+067	2	24	28.43	6	59	23.3	
d	0224+671	2	28	50.05	67	21	3.0	4C+67.05
d	0230-790	2	29	34.95	-78	47	45.6	PKS 0230-790
d	0229+131	2	31	45.89	13	22	54.7	4C+13.14
d	0234+285	2	37	52.41	28	48	9.0	4C+28.07

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	Name		R.A.			Dec.	Alias
d	0235+164	2	38	38.93	16	36	59.3	PKS 0235+164
d	0237+040	2	39	51.26	4	16	21.4	PKS 0237+040
d	0238-084	2	41	4.80	-8	15	20.8	NGC1052, PKS 0238-084
d	0239+108	2	42	29.17	11	1	0.7	PKS 0239+108
d	0248+430	2	51	34.54	43	15	15.8	S4 0248+43
d	0252-549	2	53	29.18	-54	41	51.4	PKS 0252-549
d	0256+075	2	59	27.08	7	47	39.6	
d	0259+121	3	2	30.55	12	18	56.7	
d	0300+470	3	3	35.24	47	16	16.3	OE400, 4C+47.08
d	0302-623	3	3	50.63	-62	11	25.6	PKS 0302-623
d	0302+625	3	6	42.66	62	43	2.0	
d	0306+102	3	9	3.62	10	29	16.3	OE110
d	0308-611	3	9	56.10	-60	58	39.1	PKS 0308-611
d	0312-770	3	11	55.25	-76	51	50.9	PKS 0312-770
d	0309+411	3	13	1.96	41	20	1.2	
d	0319+121	3	21	53.10	12	21	13.9	PKS 0319+121
d	0326+279	3	29	57.67	27	56	15.5	0326+277
d	0332-403	3	34	13.65	-40	8	25.4	PKS 0332-403
d	0333+321	3	36	30.11	32	18	29.3	NRAO140, 4C+32.14
d	0336-019	3	39	30.94	-1	46	35.8	CTA26, PKS 0336-019
d	0338-214	3	40	35.61	-21	19	31.2	PKS 0338-214
d	0341+158	3	44	23.17	15	59	43.4	
d	0342+147	3	45	6.42	14	53	49.6	
d	0400+258	4	3	5.59	26	0	1.5	PKS 0400+258
d	0402-362	4	3	53.75	-36	5	1.9	PKS 0402-362
d	0405+305	4	8	20.38	30	32	30.5	
d	0406-127	4	9	5.77	-12	38	48.1	
d	0406+121	4	9	22.01	12	17	39.8	PKS 0406+121
d	0414-189	4	16	36.54	-18	51	8.3	PKS 0414-189
d	0420-014	4	23	15.80	-1	20	33.1	PKS 0420-014
d	0420+417	4	23	56.01	41	50	2.7	
d	0422-380	4	24	42.24	-37	56	20.8	
d	0422+004	4	24	46.84	0	36	6.3	OF038, PKS 0422+004
d	0423+051	4	26	36.60	5	18	19.9	PKS 0423+051
d	0425+048	4	27	47.57	4	57	8.3	
d	0426-380	4	28	40.42	-37	56	19.6	PKS 0426-380
d	0434-188	4	37	1.48	-18	44	48.6	PKS 0434-188
d	0437-454	4	39	0.85	-45	22	22.6	
d	0438-436	4	40	17.18	-43	33	8.6	PKS 0438-436
d	0440-003	4	42	38.66	0	-17	43.4	NRAO190, PKS 0440-003

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	Name			R.A.			Dec.	Alias
d	0440+345	4	43	31.63	34	41	6.7	
d	0446+112	4	49	7.67	11	21	28.6	
d	0454-810	4	50	5.44	-81	1	2.2	PKS 0454-810
d	0451-282	4	53	14.65	-28	7	37.3	PKS 0451-282
d	0454-234	4	57	3.18	-23	24	52.0	
d	0457+024	4	59	52.05	2	29	31.2	PKS 0457+024
d	0458-020	5	1	12.81	-1	59	14.3	4C-02.19
d	0458+138	5	1	45.27	13	56	7.2	
d	0459+060	5	2	15.45	6	9	7.5	
d	0500+019	5	3	21.20	2	3	4.7	
d	0502+049	5	5	23.18	4	59	42.7	
d	0506-612	5	6	43.99	-61	9	41.0	PKS 0506-612
d	0454+844	5	8	42.36	84	32	4.5	S5 0454+84
d	0506+101	5	9	27.46	10	11	44.6	
d	0507+179	5	10	2.37	18	0	41.6	PKS 0507+179
d	0511-220	5	13	49.11	-21	59	16.1	PKS 0511-220
d	0516-621	5	16	44.93	-62	7	5.4	
d	0518+165	5	21	9.89	16	38	22.0	3C138, 4C+16.12
d	0522-611	5	22	34.43	-61	7	57.1	PKS 0522-611
d	0521-365	5	22	57.98	-36	27	30.9	PKS 0521-365
d	0530-727	5	29	30.04	-72	45	28.5	PKS 0530-727
d	0528-250	5	30	7.96	-25	3	29.9	PKS 0528-250
d	0528+134	5	30	56.42	13	31	55.1	PKS 0528+134
d	0537-441	5	38	50.36	-44	5	8.9	PKS 0537-441
d	0537-158	5	39	32.01	-15	50	30.3	PKS 0537-158
d	0536+145	5	39	42.37	14	33	45.6	
d	0537-286	5	39	54.28	-28	39	56.0	PKS 0537-286
d	0539-057	5	41	38.08	-5	41	49.4	PKS 0539-057
d	0538+498	5	42	36.14	49	51	7.2	3C147, 4C+49.14
d	0544+273	5	47	34.15	27	21	56.8	
d	0552+398	5	55	30.81	39	48	49.2	B2 0552+39A
d	0556+238	5	59	32.03	23	53	53.9	
d	0600+177	6	3	9.13	17	42	16.8	
d	0605-085	6	7	59.70	-8	34	50.0	PKS 0605-085
d	0607-157	6	9	40.95	-15	42	40.7	PKS 0607-157
d	0609+607	6	14	23.87	60	46	21.8	
d	0615+820	6	26	3.00	82	2	25.6	S5 0615+82
d	0629-418	6	31	12.00	-41	54	26.9	PKS 0629-418
d	0637-752	6	35	46.51	-75	16	16.8	PKS 0637-752
d	0637-337	6	39	20.90	-33	46	0.1	PKS 0637-337

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	Name			R.A.			Dec.	Alias
d	0636+680	6	42	4.26	67	58	35.6	S4 0636+68
d	0624+214	6	45	24.10	21	21	51.2	3C166, 4C+21.21
d	0642+449	6	46	32.03	44	51	16.6	B3 0642+449
d	0646-306	6	48	14.10	-30	44	19.7	PKS 0646-306
d	0650+371	6	53	58.28	37	5	40.6	S4 0650+37
d	0657+172	7	0	1.53	17	9	21.7	
d	0707+476	7	10	46.10	47	32	11.1	B3 0707+476
d	0711+356	7	14	24.82	35	34	39.8	
d	0716+714	7	21	53.45	71	20	36.4	S5 0716+71
d	0722+145	7	25	16.81	14	25	13.7	4C+14.23
d	0723-008	7	25	50.64	0	-54	56.5	PKS 0723-008
d	0718+792	7	26	11.73	79	11	31.0	
d	0727-115	7	30	19.11	-11	41	12.6	PKS 0727-115
d	0733-174	7	35	45.81	-17	35	48.5	PKS 0733-174
d	0735+178	7	38	7.39	17	42	19.0	OI158, PKS 0735+178
d	0738-674	7	38	56.50	-67	35	50.8	PKS 0738-674
d	0736+017	7	39	18.03	1	37	4.6	PKS 0736+017
d	0738+313	7	41	10.70	31	12	0.2	B2 0738+31
d	0743-673	7	43	31.61	-67	26	25.5	PKS 0743-673
d	0742+103	7	45	33.06	10	11	12.7	PKS 0742+103
d	0743-006	7	45	54.08	0	-44	17.5	4C-00.28
d	0743+259	7	46	25.87	25	49	2.1	
d	0745+241	7	48	36.11	24	0	24.1	PKS 0745+241
d	0748+126	7	50	52.05	12	31	4.8	PKS 0748+126
d	0749+540	7	53	1.38	53	52	59.6	4C+54.15
d	0754+100	7	57	6.64	9	56	34.9	PKS 0754+100
d	0805-077	8	8	15.54	-7	51	9.9	PKS 0805-077
d	0804+499	8	8	39.67	49	50	36.5	S4 0804+49
d	0805+410	8	8	56.65	40	52	44.9	B3 0805+410
d	0808+019	8	11	26.71	1	46	52.2	PKS 0808+019
d	0812+367	8	15	25.94	36	35	15.1	B2 0812+36
d	0814+425	8	18	16.00	42	22	45.4	S4 0814+42
d	0820+560	8	24	47.24	55	52	42.7	4CP56.16A
d	0821+394	8	24	55.48	39	16	41.9	4C+39.23
d	0823-500	8	25	26.87	-50	10	38.5	PKS 0823-500
d	0823+033	8	25	50.34	3	9	24.5	PKS 0823+033
d	0823-223	8	26	1.57	-22	30	27.2	PKS 0823-223
d	0826-373	8	28	4.78	-37	31	6.3	PKS 0826-373
d	0827+243	8	30	52.09	24	10	59.8	B2 0827+24
d	0829+046	8	31	48.88	4	29	39.1	PKS 0829+046

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	Name	R.A.			Dec.			Alias
d	0828+493	8	32	23.22	49	13	21.0	S4 0828+49
d	0831+557	8	34	54.90	55	34	21.1	4C+55.16
d	0834-201	8	36	39.22	-20	16	59.5	PKS 0834-201
d	0833+585	8	37	22.41	58	25	1.8	S4 0833+585
d	0836+710	8	41	24.36	70	53	42.2	4C+71.07
d	0839+187	8	42	5.09	18	35	41.0	PKS 0839+187
d	0851+202	8	54	48.87	20	6	30.6	OJ287, PKS 0851+202
d	0859-140	9	2	16.83	-14	15	30.9	PKS 0859-140
d	0859+470	9	3	3.99	46	51	4.1	4C+47.29
d	0906+015	9	9	10.09	1	21	35.6	4C+01.24
d	0912+029	9	14	37.91	2	45	59.2	PKS 0912+029
d	0912+297	9	15	52.40	29	33	24.0	B2 0912+29
d	0917+449	9	20	58.46	44	41	54.0	S4 0917+44
d	0917+624	9	21	36.23	62	15	52.2	S5 0917+62
d	0920-397	9	22	46.42	-39	59	35.1	PKS 0920-397
d	0923+392	9	27	3.01	39	2	20.9	4C39.25, 4C+39.25
d	0925-203	9	27	51.82	-20	34	51.2	PKS 0925-203
d	0945+408	9	48	55.34	40	39	44.6	4C+40.24
d	0953+254	9	56	49.88	25	15	16.1	OK290, VRO 25.09.08
d	0955+476	9	58	19.67	47	25	7.8	B3 0955+476
d	0955+326	9	58	20.95	32	24	2.2	3C232, 4C+32
d	0954+658	9	58	47.24	65	33	54.8	S4 0945+65
d	1004+141	10	7	41.50	13	56	29.6	PKS 1004+141
d	1011+250	10	13	53.43	24	49	16.4	B2 1011+25
d	1012+232	10	14	47.07	23	1	16.6	4C+23.24
d	1020+400	10	23	11.57	39	48	15.4	B3 1020+400
d	1021-006	10	24	29.59	0	-52	55.5	PKS 1021-006
d	1022+194	10	24	44.81	19	12	20.4	4C+19.34
d	1030+415	10	33	3.71	41	16	6.2	VRO 10.41.03
d	1032-199	10	35	2.16	-20	11	34.4	PKS 1032-199
d	1034-293	10	37	16.08	-29	34	2.8	PKS 1034-293
d	1038+064	10	41	17.16	6	10	16.9	4C+06.41
d	1038+528	10	41	46.78	52	33	28.2	
d	1040+123	10	42	44.60	12	3	31.3	3C245, 4C+12.37
d	1039+811	10	44	23.06	80	54	39.4	S5 1039+811
d	1042+071	10	44	55.91	6	55	38.3	PKS 1042+071
d	1044+719	10	48	27.62	71	43	35.9	
d	1048-313	10	51	4.78	-31	38	14.3	PKS 1048-313
d	1049+215	10	51	48.79	21	19	52.3	4C+21.28
d	1053+704	10	56	53.62	70	11	45.9	

	Name	R.A.			Dec.			Alias
d	1053+815	10	58	11.53	81	14	32.7	
d	1055+018	10	58	29.61	1	33	58.8	4C+01.28
d	1057-797	10	58	43.31	-80	3	54.2	PKS 1057-797
d	1101-536	11	3	52.22	-53	57	0.7	PKS 1101-536
d	1104-445	11	7	8.69	-44	49	7.6	PKS 1104-445
d	1105-680	11	7	12.69	-68	20	50.7	PKS 1105-680
d	1111+149	11	13	58.69	14	42	27.0	4C-00.43
d	1116-462	11	18	26.96	-46	34	15.0	PKS 1116-462
d	1116+128	11	18	57.30	12	34	41.7	4C+12.39
d	1123+264	11	25	53.71	26	10	20.0	PKS 1123+264
d	1124-186	11	27	4.39	-18	57	17.4	PKS 1124-186
d	1127-145	11	30	7.05	-14	49	27.4	PKS 1127-145
d	1128+385	11	30	53.28	38	15	18.6	B3 1128+385
d	1130+009	11	33	20.06	0	40	52.8	PKS 1130+009
d	1143-245	11	46	8.10	-24	47	32.9	PKS 1143-245
d	1144+402	11	46	58.30	39	58	34.3	B3 1144+402
d	1144-379	11	47	1.37	-38	12	11.0	PKS 1144-379
d	1145-071	11	47	51.55	-7	24	41.1	PKS 1145-071
d	1148-001	11	50	43.87	0	-23	54.2	4C-00.47
d	1148-671	11	51	13.43	-67	28	11.1	PKS 1148-671
d	1150+812	11	53	12.50	80	58	29.2	S5 1150+812
d	1150+497	11	53	24.47	49	31	8.8	4C+49.22
d	1155+251	11	58	25.79	24	50	18.0	
d	1156-094	11	59	12.71	-9	40	52.0	PKS 1156-094
d	1156+295	11	59	31.83	29	14	43.8	4C+29.45
d	1213+350	12	15	55.60	34	48	15.2	4C+35.28
d	1215+303	12	17	52.08	30	7	0.6	B2 1215+30
d	1216+487	12	19	6.41	48	29	56.2	S4 1216+48
d	1219+285	12	21	31.69	28	13	58.5	W Com
d	1219+044	12	22	22.55	4	13	15.8	4C+04.42
d	1221+809	12	23	40.49	80	40	4.3	
d	1222+037	12	24	52.42	3	30	50.3	4C+03.23
d	1226+373	12	28	47.42	37	6	12.1	
d	1228+126	12	30	49.42	12	23	28.1	3C274, M87, Virgo A
d	1236+077	12	39	24.59	7	30	17.2	PKS 1236+077
d	1236-684	12	39	46.65	-68	45	30.9	PKS 1236-684
d	1243-072	12	46	4.23	-7	30	46.6	PKS 1243-072
d	1244-255	12	46	46.80	-25	47	49.3	PKS 1244-255
d	1252+119	12	54	38.26	11	41	5.9	PKS 1252+119

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	Name	R.A.			Dec.			Alias
d	1251-713	12	54	59.92	-71	38	18.4	PKS 1251-713
d	1253-055	12	56	11.17	-5	47	21.5	3C279, 4C-05.55
d	1255-316	12	57	59.06	-31	55	16.8	PKS 1255-316
d	1257+145	13	0	20.92	14	17	18.5	PKS 1257+145
d	1302-102	13	5	33.01	-10	33	19.4	PKS 1302-102
d	1308+326	13	10	28.66	32	20	43.8	AU CVn
d	1313-333	13	16	7.99	-33	38	59.2	PKS 1313-333
d	1315+346	13	17	36.49	34	25	15.9	OP326, B2 1315+34A
d	1324+224	13	27	00.86	22	10	50.2	
d	1334-127	13	37	39.78	-12	57	24.7	PKS 1334-127
d	1338+381	13	40	22.95	37	54	43.8	
d	1342+662	13	43	45.96	66	2	25.8	
d	1342+663	13	44	8.68	66	6	11.7	
d	1347+539	13	49	34.66	53	41	17.0	1347+53, 4C+53.28
d	1349-439	13	52	56.53	-44	12	40.4	PKS 1349-439
d	1351-018	13	54	6.90	-2	6	3.2	PKS 1351-018
d	1354+195	13	57	4.44	19	19	7.4	4C+19.44
d	1354-152	13	57	11.24	-15	27	28.8	PKS 1354-152
d	1357+769	13	57	55.37	76	43	21.1	
d	1402-012	14	4	45.90	-1	30	21.9	PKS 1402-012
d	1402+044	14	5	1.12	4	15	35.8	PKS 1402+044
d	1404+286	14	7	00.39	28	27	14.7	OQ208, MRK 668
d	1406-076	14	8	56.48	-7	52	26.7	PKS 1406-076
d	1413+135	14	15	58.82	13	20	23.7	PKS 1413+135
d	1416+067	14	19	8.18	6	28	34.8	3C298
d	1418+546	14	19	46.60	54	23	14.8	S4 1418+54
d	1424-418	14	27	56.30	-42	6	19.4	PKS 1424-418
d	1430-178	14	32	57.69	-18	1	35.2	PKS 1430-178
d	1435+638	14	36	45.80	63	36	37.9	S4 1435+63
d	1435-218	14	38	9.47	-22	4	54.7	PKS 1435-218
d	1442+101	14	45	16.47	9	58	36.1	OQ172, PKS 1442+101
d	1443-162	14	45	53.38	-16	29	1.6	PKS 1443-162
d	1445-161	14	48	15.05	-16	20	24.5	PKS 1445-161
d	1448+762	14	48	28.78	76	1	11.6	
d	1451-375	14	54	27.41	-37	47	33.1	PKS 1451-375
d	1451-400	14	54	32.91	-40	12	32.5	PKS 1451-400
d	1458+718	14	59	7.58	71	40	19.9	3C309.1, 4C+71.15
d	1459+480	15	0	48.65	47	51	15.5	1459+48
d	1502+106	15	4	24.98	10	29	39.2	PKS 1502+106
d	1502+036	15	5	6.48	3	26	30.8	PKS 1502+036

	Name	R.A.			Dec.			Alias
d	1504+377	15	6	9.53	37	30	51.1	B3 1504+377
d	1504-166	15	7	4.79	-16	52	30.3	PKS 1504-166
d	1510-089	15	12	50.53	-9	5	59.8	PKS 1510-089
d	1511-100	15	13	44.89	-10	12	0.3	PKS 1511-100
d	1514+197	15	16	56.80	19	32	13.0	PKS 1514+197
d	1514-241	15	17	41.81	-24	22	19.5	AP Lib
d	1519-273	15	22	37.68	-27	30	10.8	PKS 1519-273
d	1532+016	15	34	52.45	1	31	4.2	PKS 1532+016
d	1538+149	15	40	49.49	14	47	45.9	4C+14.60
d	1547+507	15	49	17.47	50	38	5.8	
d	1546+027	15	49	29.44	2	37	1.2	PKS 1546+027
d	1548+056	15	50	35.27	5	27	10.5	4C+05.45
d	1549-790	15	56	58.87	-79	14	4.3	PKS 1549-790
d	1555+001	15	57	51.43	0	-1	50.4	PKS 1555+001
d	1600+335	16	2	7.26	33	26	53.1	
d	1604-333	16	7	34.76	-33	31	8.9	PKS 1604-333
d	1606+106	16	8	46.20	10	29	7.8	4C+10.45
d	1611+343	16	13	41.06	34	12	47.9	
d	1614+051	16	16	37.56	4	59	32.7	PKS 1614+051
d	1610-771	16	17	49.28	-77	17	18.5	PKS 1610-771
d	1616+063	16	19	3.69	6	13	2.2	PKS 1616+063
d	1619-680	16	24	18.44	-68	9	12.5	PKS 1619-680
d	1624+416	16	25	57.67	41	34	40.6	4C+41.32
d	1622-297	16	26	6.02	-29	51	27.0	PKS 1622-297
d	1633+382	16	35	15.49	38	8	4.5	
d	1637+574	16	38	13.46	57	20	24.0	S4 1637+57
d	1638+398	16	40	29.63	39	46	46.0	NRAO512
d	1642+690	16	42	7.85	68	56	39.8	4C+69.21
d	1641+399	16	42	58.81	39	48	37.0	3C345, 4C+39.48
d	1647-296	16	50	39.54	-29	43	47.0	PKS 1647-296
d	1652+398	16	53	52.22	39	45	36.6	DA426, 4C+39.49
d	1656+348	16	58	1.42	34	43	28.4	
d	1655+077	16	58	9.01	7	41	27.5	PKS 1655+077
d	1656+053	16	58	33.45	5	15	16.4	PKS 1656+053
d	1657-261	17	0	53.15	-26	10	51.7	PKS 1657-261
d	1705+456	17	7	17.75	45	36	10.6	4C+45.34
d	1705+018	17	7	34.42	1	48	45.7	PKS 1705+018
d	1706-174	17	9	34.35	-17	28	53.4	
d	1717+178	17	19	13.05	17	45	6.4	PKS 1717+178

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	Name			R.A.			Dec.	Alias
d	1718-649	17	23	41.03	-65	0	36.6	NGC 6328
d	1726+455	17	27	27.65	45	30	39.7	B3 1726+455
d	1727+502	17	28	18.62	50	13	10.5	IIZW77
d	1725+044	17	28	24.95	4	27	4.9	PKS 1725+044
d	1730-130	17	33	2.71	-13	4	49.5	NRAO530, PKS 1730-132
d	1732+389	17	34	20.58	38	57	51.4	B3 1732+389
d	1738+476	17	39	57.13	47	37	58.4	S4 1738+47
d	1739+522	17	40	36.98	52	11	43.4	4C+51.37
d	1741-038	17	43	58.86	-3	50	4.6	PKS 1741-038
d	1743+173	17	45	35.21	17	20	1.4	PKS 1743+173
d	1745+624	17	46	14.03	62	26	54.7	4C+62.29
d	1749+701	17	48	32.84	70	5	50.8	S5 1749+70
d	1749+096	17	51	32.82	9	39	0.7	OT081, 4C+09.57
d	1751+441	17	53	22.65	44	9	45.7	S4 1751+44
d	1751+288	17	53	42.47	28	48	4.9	
d	1803+784	18	0	45.69	78	28	4.0	S5 1803+78
d	1800+440	18	1	32.32	44	4	21.9	B3 1800+440
d	1807+698	18	6	50.68	69	49	28.1	3C371
d	1815-553	18	19	45.40	-55	21	20.7	PKS 1815-553
d	1821+107	18	24	2.86	10	44	23.8	PKS 1821+107
d	1823+568	18	24	7.07	56	51	1.5	4C+56.27
d	1830+285	18	32	50.19	28	33	36.0	4C+28.45
d	1831-711	18	37	28.71	-71	8	43.6	PKS 1831-711
d	1845+797	18	42	8.99	79	46	17.1	3C390.3, 4C+79.18
d	1842+681	18	42	33.64	68	9	25.2	
d	1849+670	18	49	16.07	67	5	41.7	S4 1849+67
d	1856+736	18	54	57.30	73	51	19.9	
d	1901+319	19	2	55.94	31	59	41.7	3C395, 4C+31.52, 19
d	1908-201	19	11	9.65	-20	6	55.1	PKS 1908-201
d	1903-802	19	12	40.02	-80	10	5.9	PKS 1903-802
d	1920-211	19	23	32.19	-21	4	33.3	
d	1921-293	19	24	51.06	-29	14	30.1	OV236, PKS 1921-293
d	1923+210	19	25	59.61	21	6	26.2	PKS 1923+210
d	1928+738	19	27	48.50	73	58	1.6	4C+73.18
d	1925-610	19	30	6.16	-60	56	9.2	PKS 1925-610
d	1929+226	19	31	24.92	22	43	31.3	
d	1932+204	19	35	10.47	20	31	54.2	
d	1933-400	19	37	16.22	-39	58	1.6	PKS 1933-400
d	1936-155	19	39	26.66	-15	25	43.1	PKS 1936-155
d	1937-101	19	39	57.26	-10	2	41.5	PKS 1937-101

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	Name			R.A.			Dec.	Alias
d	1935-692	19	40	25.53	-69	7	57.0	PKS 1935-692
d	1951+355	19	53	30.88	35	37	59.4	
d	1950-613	19	55	10.77	-61	15	19.1	PKS 1950-613
d	1954+513	19	55	42.74	51	31	48.5	PKS 1954+513
d	1954-388	19	57	59.82	-38	45	6.4	PKS 1954-388
d	1958-179	20	0	57.09	-17	48	57.7	OV198, PKS 1958-179
d	2000-330	20	3	24.12	-32	51	45.1	PKS 2000-330
d	2007+777	20	5	31.00	77	52	43.2	S5 2007+77
d	2005-489	20	9	25.39	-48	49	53.7	PKS 2005-489
d	2011-067	20	11	14.22	-6	44	3.6	OW-015
d	2008-159	20	11	15.71	-15	46	40.3	PKS 2008-159
d	2017+743	20	17	13.08	74	40	48.0	4C+74.25
d	2021+317	20	23	19.02	31	53	2.3	4C+31.56
d	2030+547	20	31	47.96	54	55	3.1	4C+54.42
d	2029+121	20	31	54.99	12	19	41.3	PKS 2029+121
d	2037+511	20	38	37.04	51	19	12.7	3C418, 4C+51.42
d	2051+745	20	51	33.74	74	41	40.5	
d	2052-474	20	56	16.36	-47	14	47.6	PKS 2052-474
d	2059+034	21	1	38.83	3	41	31.3	PKS 2059+034
d	2059-786	21	5	44.96	-78	25	34.5	PKS 2059-786
d	2106-413	21	9	33.19	-41	10	20.6	PKS 2106-413
d	2113+293	21	15	29.41	29	33	38.4	
d	2109-811	21	16	30.84	-80	53	55.2	PKS 2109-811
d	2126-158	21	29	12.18	-15	38	41.0	PKS 2126-158
d	2128-123	21	31	35.26	-12	7	4.8	PKS 2128-123
d	2131-021	21	34	10.31	-1	53	17.2	4C-02.81
d	2136+141	21	39	1.31	14	23	36.0	PKS 2136+141
d	2143-156	21	46	22.98	-15	25	43.9	PKS 2143-156
d	2144+092	21	47	10.16	9	29	46.7	PKS 2144+092
d	2142-758	21	47	12.73	-75	36	13.2	PKS 2142-758
d	2145+067	21	48	5.46	6	57	38.6	4C+06.69
d	2149+056	21	51	37.88	5	52	13.0	PKS 2149+056
d	2149-307	21	51	55.52	-30	27	53.7	PKS 2149-306
d	2146-783	21	52	3.15	-78	7	6.6	PKS 2146-783
d	2150+173	21	52	24.82	17	34	37.8	PKS 2150+173
d	2152-699	21	57	5.98	-69	41	23.7	
d	2155-152	21	58	6.28	-15	1	9.3	PKS 2155-152
d	2200+420	22	2	43.29	42	16	40.0	VR422201, BL Lac
d	2201+315	22	3	14.98	31	45	38.3	4C+31.63
d	2204-540	22	7	43.73	-53	46	33.8	PKS 2204-540

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	Name			R.A.			Dec.	Alias
d	2209+236	22	12	5.97	23	55	40.5	PKS 2209+236
d	2216-038	22	18	52.04	-3	35	36.9	4C-03.79
d	2223-052	22	25	47.26	-4	57	1.4	3C446, 4C-05.92
d	2227-088	22	29	40.08	-8	32	54.4	PKS 2227-088
d	2229+695	22	30	36.47	69	46	28.1	2229+69
d	2227-399	22	30	40.28	-39	42	52.1	PKS 2227-399
d	2230+114	22	32	36.41	11	43	50.9	CTA102, 4C+11.69
d	2232-488	22	35	13.24	-48	35	58.8	PKS 2232-488
d	2234+282	22	36	22.47	28	28	57.4	B2 2234+28A
d	2233-148	22	36	34.09	-14	33	22.2	PKS 2233-148
d	2243-123	22	46	18.23	-12	6	51.3	PKS 2243-123
d	2245-328	22	48	38.69	-32	35	52.2	PKS 2245-328
d	2252-089	22	55	4.24	-8	44	4.0	PKS 2252-089
d	2253+417	22	55	36.71	42	2	52.5	B3 2253+417
d	2254+024	22	57	17.56	2	43	17.5	PKS 2254+024
d	2254+074	22	57	17.30	7	43	12.3	PKS 2254+074
d	2255-282	22	58	5.96	-27	58	21.3	PKS 2255-282
d	2311-452	23	14	9.38	-44	55	49.2	PKS 2311-452
d	2312-319	23	14	48.50	-31	38	39.5	PKS 2312-319
d	2318+049	23	20	44.86	5	13	49.9	PKS 2318+049
d	2319+272	23	21	59.86	27	32	46.4	4C+27.50
d	2320-035	23	23	31.95	-3	17	5.0	PKS 2320-035
d	2326-477	23	29	17.70	-47	30	19.1	PKS 2326-477
d	2328+107	23	30	40.85	11	0	18.7	4C+10.73
d	2329-384	23	31	59.48	-38	11	47.7	PKS 2329-384
d	2331-240	23	33	55.24	-23	43	40.7	PKS 2331-240
d	2335-027	23	37	57.34	-2	30	57.6	PKS 2335-027
d	2344+092	23	46	36.84	9	30	45.5	
d	2345-167	23	48	2.61	-16	31	12.0	PKS 2345-167
d	2351+456	23	54	21.68	45	53	4.2	4C+45.51
d	2351-154	23	54	30.19	-15	13	11.2	PKS 2351-154
d	2353-686	23	56	00.68	-68	20	3.5	PKS 2353-686
d	2355-534	23	57	53.27	-53	11	13.7	PKS 2355-534
d	2355-106	23	58	10.88	-10	20	8.6	PKS 2355-106
c	0002-478	0	4	35.66	-47	36	19.6	PKS 0002-478
c	0003+380	0	5	57.18	38	20	15.1	4C+38.02
c	0008-421	0	10	52.52	-41	53	10.8	PKS 0008-421
c	0022-423	0	24	42.99	-42	2	4.0	PKS 0022-423
c	0108+388	1	11	37.32	39	6	28.1	
c	0116+319	1	19	35.00	32	10	50.1	4C31.04

	Name	R.A.			Dec.			Alias
c	0118-272	1	20	31.66	-27	1	24.7	PKS 0118-272
c	0138-097	1	41	25.83	-9	28	43.7	PKS 0138-097
c	0153-410	1	55	37.06	-40	48	42.4	
c	0202-765	2	2	13.69	-76	20	3.1	PKS 0202-765
c	0237-027	2	39	45.47	-2	34	40.9	
c	0241+622	2	44	57.70	62	28	6.5	
c	0252-712	2	52	46.16	-71	4	35.3	
c	0317+188	3	19	51.26	19	1	31.3	
c	0334-546	3	35	53.92	-54	30	25.1	PKS 0334-546
c	0334+014	3	37	17.11	1	37	22.8	
c	0355-483	3	57	21.92	-48	12	15.2	PKS 0355-483
c	0355+508	3	59	29.75	50	57	50.2	NRAO150, 4C+50.11
c	0400-319	4	2	21.27	-31	47	25.9	
c	0403-132	4	5	34.00	-13	8	13.7	PKS 0403-132
c	0405-385	4	6	59.04	-38	26	28.0	PKS 0405-385
c	0405-123	4	7	48.43	-12	11	36.7	
c	0407-658	4	8	20.38	-65	45	9.1	PKS 0407-658
c	0431-512	4	32	21.18	-51	9	25.2	PKS 0431-512
c	0503-608	5	4	1.70	-60	49	52.5	PKS 0503-608
c	0517-726	5	16	37.72	-72	37	7.5	
c	0529+075	5	32	39.00	7	32	43.3	
c	0611+131	6	13	57.69	13	6	45.4	
c	0614-349	6	16	35.98	-34	56	16.6	PKS 0614-349
c	0615-365	6	17	32.32	-36	34	14.8	PKS 0615-365
c	0622-441	6	23	31.79	-44	13	2.5	PKS 0622-441
c	0647-475	6	48	48.45	-47	34	27.2	PKS 0647-475
c	0648-165	6	50	24.58	-16	37	39.7	PKS 0648-165
c	0700-465	7	1	34.55	-46	34	36.6	PKS 0700-465
c	0736-332	7	38	16.95	-33	22	12.8	PKS 0736-332
c	0809-493	8	11	8.80	-49	29	43.5	PKS 0809-493
c	0818-128	8	20	57.45	-12	58	59.2	PKS 0818-128
c	0842-754	8	41	27.04	-75	40	27.9	PKS 0842-754
c	0850+581	8	54	42.00	57	57	29.9	4C+58.17
c	0936-853	9	30	32.57	-85	33	59.7	PKS 0936-853
c	0952+179	9	54	56.82	17	43	31.2	0952+172, PKS 0952+179
c	0959-443	10	1	59.91	-44	38	0.6	PKS 0959-443
c	1038+529	10	41	48.90	52	33	55.6	
c	1045-188	10	48	6.62	-19	9	35.7	PKS 1045-188
c	1101-325	11	3	31.53	-32	51	16.7	PKS 1101-325
c	1117+146	11	20	27.81	14	20	55.0	4C+14.41

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	Name			R.A.			Dec.	Alias
c	1128-047	11	31	30.52	-5	0	19.7	PKS 1128-047
c	1147+245	11	50	19.21	24	17	53.8	B2 1147+24
c	1206-399	12	9	35.24	-40	16	13.1	PKS 1206-399
c	1213-172	12	15	46.75	-17	31	45.4	PKS 1213-172
c	1215-457	12	18	6.25	-46	0	29.0	PKS 1215-457
c	1221-829	12	24	54.38	-83	13	10.1	PKS 1221-829
c	1234-504	12	37	15.24	-50	46	23.2	
c	1307+121	13	9	33.93	11	54	24.6	4C+12.46
c	1320-446	13	23	4.25	-44	52	33.8	PKS 1320-446
c	1328+307	13	31	8.29	30	30	33.0	3C286,4C+30.26
c	1334-649	13	37	52.44	-65	9	24.9	PKS 1334-649
c	1409+218	14	11	54.86	21	34	23.4	
c	1417+273	14	19	59.30	27	6	25.6	4C+27.28
c	1420+326	14	22	30.38	32	23	10.4	B2 1420+32
c	1424+240	14	27	0.39	23	48	0.0	PKS 1424+240
c	1432+200	14	34	39.79	19	52	0.7	PKS 1432+200
c	1433+304	14	35	35.40	30	12	24.5	
c	1540-828	15	50	59.14	-82	58	6.8	PKS 1540-828
c	1555-140	15	58	21.95	-14	9	59.1	
c	1656+477	16	58	2.78	47	37	49.2	S4 1656+47
c	1733-565	17	37	35.77	-56	34	3.2	PKS 1733-565
c	1740-517	17	44	25.45	-51	44	43.8	PKS 1740-517
c	1748-253	17	51	51.26	-25	24	0.1	
c	1758-651	18	3	23.50	-65	7	36.8	PKS 1758-651
c	1814-637	18	19	35.00	-63	45	48.2	PKS 1814-637
c	1817-254	18	20	57.85	-25	28	12.6	
c	1829-718	18	35	37.20	-71	49	58.2	PKS 1827-718
c	1936-623	19	41	21.77	-62	11	21.1	PKS 1936-623
c	1943+228	19	46	6.25	23	0	4.4	
c	1955+335	19	57	40.55	33	38	27.9	
c	2005+403	20	7	44.95	40	29	48.6	
c	2023+336	20	25	10.84	33	43	0.2	
c	2037-253	20	40	8.77	-25	7	46.7	PKS 2037-253
c	2048+312	20	50	51.13	31	27	27.4	CL4
c	2054-377	20	57	41.60	-37	34	3.0	PKS 2054-377
c	2058-425	21	1	59.11	-42	19	16.2	PKS 2058-425
c	2115-305	21	18	10.60	-30	19	11.6	PKS 2115-305
c	2155-304	21	58	52.06	-30	13	32.1	PKS 2155-304
c	2210-257	22	13	2.50	-25	29	30.1	PKS 2210-257

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	Name	R.A.			Dec.			Alias
c	2211-388	22	14	38.57	-38	35	45.0	PKS 2211-388
c	2259-374	23	2	23.89	-37	18	6.8	PKS 2259-374
c	2300-307	23	3	5.82	-30	30	11.5	PKS 2300-307
c	2320+506	23	22	25.98	50	57	52.0	
c	2325-150	23	27	47.96	-14	47	55.8	PKS 2325-150
c	2329-162	23	31	38.65	-15	56	57.0	PKS 2329-162
c	2333-528	23	36	12.14	-52	36	22.0	PKS 233-528
o	0019+000	0	22	25.43	0	14	56.1	4C+00.02
o	0024+348	0	26	41.73	35	8	42.3	OB338
o	0036-216	0	38	29.90	-21	20	5.0	PKS 0036-216
o	0218+357	2	21	5.47	35	56	13.7	
o	0218+35A	2	21	5.47	35	56	13.7	
o	0218+35B	2	21	5.47	35	56	14.1	
o	0237-233	2	40	8.17	-23	9	15.7	
o	0250+178	2	53	34.88	18	5	42.5	
o	0316+413	3	19	48.16	41	30	42.1	3C84,PerA,NGC1275
o	0335-122	3	37	55.56	-12	4	12.5	
o	0336-017	3	39	0.80	-1	33	7.0	
o	0411+054	4	14	37.59	5	34	46.2	
o	0420-625	4	20	56.13	-62	23	39.7	
o	0428+205	4	31	3.76	20	37	34.3	
o	0430+052	4	33	11.10	5	21	15.6	3C120, BW Tau
o	0434+299	4	38	4.91	30	4	32.4	
o	0454-463	4	55	51.27	-46	15	58.1	
o	0515-674	5	15	37.54	-67	21	27.8	
o	0537-692	5	36	57.06	-69	13	24.7	
o	0558-504	5	59	46.82	-50	26	52.6	PKS 0558-504
o	0629+104	6	32	15.33	10	22	2.2	4C+10.20
o	0710+439	7	13	38.16	43	49	17.2	S4 0710+43
o	0727-365	7	29	5.39	-36	39	45.1	
o	0902+343	9	5	30.11	34	7	57.2	B2 0902+34
o	0919-260	9	21	29.35	-26	18	43.4	PKS 0919-260
o	0941-080	9	43	36.95	-8	19	30.9	PKS 0941-080
o	0954+556	9	57	38.17	55	22	58.0	4C+55.17
o	1031+567	10	35	7.04	56	28	46.8	S4 1031+56
o	1226+023	12	29	6.70	2	3	8.6	3C273B,4C+02.32
o	1245-197	12	48	23.90	-19	59	18.7	PKS 1245-197
o	1323+321	13	26	16.51	31	54	9.5	
o	1328+254	13	30	37.69	25	9	11.0	4C+25.43
o	1329-665	13	32	37.55	-66	46	50.1	

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	Name			R.A.			Dec.	Alias
o	1345+125	13	47	33.36	12	17	24.2	4C+12.50
o	1352-104	13	52	6.84	-10	26	21.3	PKS 1352-104
o	1355-416	13	59	0.18	-41	52	52.6	PKS 1355-416
o	1421-490	14	24	32.30	-49	13	49.0	PKS 1421-178
o	1511+238	15	13	40.19	23	38	35.2	4C+23.41
o	1607+268	16	9	13.32	26	41	29.0	CTD93, PKS 1607+268
o	1622-253	16	25	46.89	-25	27	38.3	PKS 1622-253
o	1634+628	16	34	33.80	62	45	35.9	3C343, 4C+62.26
o	1637+626	16	38	28.20	62	34	44.3	3C343.1, 4C+63.27
o	1709-342	17	13	9.91	-34	18	28.9	
o	1710-269	17	13	31.25	-26	58	52.3	
o	1710-323	17	13	50.79	-32	26	12.0	
o	1714-336	17	17	36.00	-33	42	8.2	
o	1741-312	17	44	23.58	-31	16	36.0	
o	1756-663	18	1	18.08	-66	23	1.0	PKS 1756-663
o	1813-241	18	16	49.60	-24	5	59.2	
o	1826+796	18	23	14.11	79	38	49.0	
o	1827-360	18	30	58.88	-36	2	30.2	PKS 1827-360
o	1829-106	18	32	20.84	-10	35	11.3	
o	1830-211	18	33	39.90	-21	3	40.0	PKS 1830-210
o	1830-21A	18	33	39.89	-21	3	40.7	
o	1830-21B	18	33	39.94	-21	3	40.0	
o	1848+333	18	50	4.79	33	21	45.8	
o	1855+031	18	58	2.34	3	13	16.4	
o	1934+207	19	36	48.02	20	51	36.8	
o	1934-638	19	39	25.03	-63	42	45.6	PKS 1934-638
o	1947+079	19	50	5.54	8	7	14.0	PKS 1947+079
o	2021+614	20	22	6.68	61	36	58.8	S4 2021+61
o	2027+383	20	28	54.11	38	32	47.7	
o	2044-168	20	47	19.66	-16	39	5.8	PKS 2044-168
o	2100+468	21	2	17.04	47	2	16.2	
o	2121+053	21	23	44.52	5	35	22.1	OX036,PKS 2121+053
o	2128+048	21	30	32.88	5	2	17.5	PKS 2128+048
o	2134+004	21	36	38.59	0	41	54.2	
o	2251+158	22	53	57.75	16	8	53.6	3C454.3, 4C+15.76
o	2310-417	23	12	55.61	-41	26	56.1	PKS 2310-417
o	2314+038	23	16	35.09	4	5	19.8	2314+03, 4C+03.57
o	2322-411	23	25	3.42	-40	51	30.1	PKS 2322-411
o	2337+264	23	40	29.03	26	41	56.8	
o	2352+495	23	55	9.46	49	50	8.3	S4 2352+49