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Checking the possibility of The Milky Way images discovery in quasar catalogues

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We have checked the possibility of our galaxy The Milky Way images discovery in quasar catalogues, that was suggested in the work of S. J. Weatherley, S. J. Warren1, S. M. Croom and co-authors based on the hypothesis of multi-connectedness of the space with the existence of the symmetric lattice of the surrounding sectors around our sector, that contain the counterparts of our galaxy. In the original work was determined 7 pairs of the antipode quasars which can be interpreted as the our galaxy images, but it was noted that when researching the angles between the axes of these quasars pairs no marks of the lattice structure of the surrounding spatial sectors were discovered.

We have demonstrated that there are grounds for existence of pairs of antipode quasars that are in fact pairs of images of the same object, which are not related to the idea of multi-connectedness of space. We have defined 7 pairs of antipode quasars, 5 of which can be interpreted as the images of our galaxy from the perspective of the modified cosmological model. We have identified them as pairs of images of the same object by luminosity magnitudes profiles.

We have shown that out of 7 pairs described in the original work no more than 4 pairs can be the images of our galaxy.

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1. Introduction

In the work [1] a hypothesis [2] was checked, that our Universe can be multi-connected and that our galaxy The Milky Way is located in one of the sectors of the multi-connected space surrounded by a spatial lattice of other sectors, and in every of them, as authors assume [1], there is a counterpart of our galaxy. As the size of our spatial sector is assumed to be close to the visibility horizon size – several billion light years, the light of these galaxies that authors [1] call "ghosts" of our galaxy, can be perceived by the Earth observer as a light of the distant quasars.

As the lattice of the spatial sectors is supposed to be symmetrical, such quasars – ghost images of our galaxy – can be located in the opposite areas of the celestial sphere. Having searched the quasars satisfying these criteria in 3 catalogues containing the data about 75 thousand of quasars, 7 pairs of antipode quasars were defined that are interpreted by the authors as possible pairs of our galaxy images. However, the authors note that the study of the angles between the axes of these pairs did not lead to discovery of any signs of lattice structure of the surrounding spatial sectors.

In the work [3] it is demonstrated that there are grounds for existence of antipode quasar pairs that are the pairs of images of the same object, and they are not related to the idea of multi-connectedness of the space.

These grounds follow from the fact that cosmological model of The Big Bang has a deep inner contradiction [4],[5], which is eliminated when we use metrics that considers the dependency of the scale factor on time, i.e. non-zero value of its differential which plays a great role when we obtain an expression for the time component of the metric tensor. It leads to the change of the time component of the metric tensor and formation on its basis of a modified cosmological model that describes the Universe with significantly different development dynamics – closed at any matter density and infinite in time. It eliminates the restrictions in time proper to The Big Bang model and shows a possibility to observe the signals that came to the observer around all closed Universe.

To check this possibility, we have analyzed in the work [3] the data of the most distant observed objects – quasars, while searching the attributes of the central symmetry in their location, as the signals that came from one source by two arches of the big circle of the closed Universe can seem to be the signals from two sources located in the opposite points of the celestial sphere.

Out of data massif of the catalogue SDSS-DR5 (2007), that contains the data of 77 thousand of quasars [6], we have selected the pairs of antipode quasars with deviation from strictly opposite location no more than 0,1 degrees. For their identification as pairs of images of the same object we have chosen the most accessible method of analysis – comparison of luminosity magnitudes profiles in the ranges **u,g,r,i,z** (from 300 to 1000 nm). Comparison of the distribution of Pearson correlation coefficient for the profiles of the pairs of antipode quasars and a similar distribution for the random pairs has shown that the percentage of antipode quasar pairs with high correlation coefficients (R_{xy}>0.98) is significantly bigger than for the massif of random pairs. Artificially drawn disruption of the central symmetry has shown that this effect disappears when one of the pair members shifts toward the increase or the decrease of right ascension (RA) by more than 0,05 degrees, which proves its not random nature.

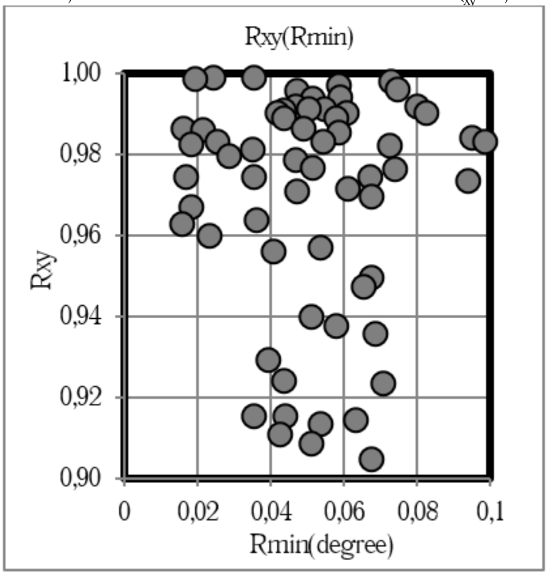
This way, in the work [3] was statistically proved the existence of the centrally symmetrical quasar pairs with the identical individual characteristics (luminosity magnitude profiles), which can be interpreted as the pairs of images of the same object, .

To check the presented in [1] idea that it is possible to discover the images of our galaxy in the quasars catalogues, we find it viable to use the approach suggested in [1] using the search of the antipode quasars in addition to the method of their identification as pairs of images of the same object [3] by luminosity magnitudes profiles in the ranges **u,g,r,i,z**.

2. Selection of the antipode quasars pairs with identical magnitudes

The described earlier massif of pairs of antipode quasars of SDSS- DR5 catalogue with the deviation from strictly opposite location (Rmin) no more than by 0,1 degree, obtained by method [3], contains 1189 pairs of quasars with redshifts differences 0<dZ<4,5. Their identification as pairs of images of the same object by luminosity magnitude profiles in the ranges **u,g,r,i,z** is possible only at small dZ. Excluding pairs with dZ>0,1, we obtain massif containing 101 pair of quasars with Rmin<0,1 degree (360 arcsec) and dZ<0,1. For luminosity magnitude profiles of every element of this massif we calculate the Pearson correlation coefficient (Rxy).

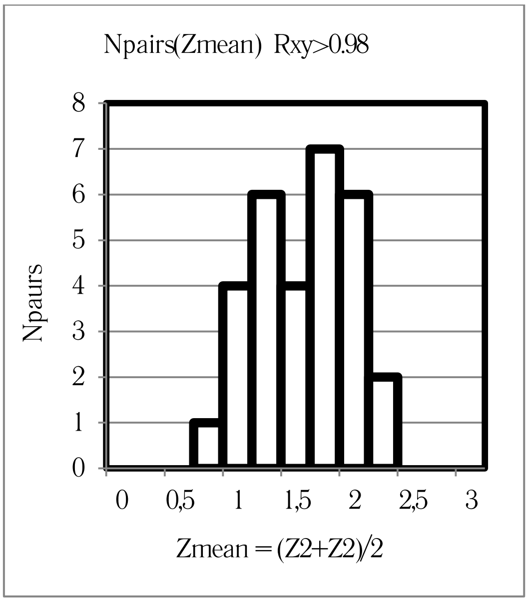
Out of the described earlier result of the work [3] it follows that the percentage of the pairs of antipode quasars appears to be higher than for the random pairs at bigger values of the correlation coefficient (R_{xy}>0,98). This conclusion is confirmed by the distribution of the pairs of the massif on Picture 1. Part of the massif R_{xy}>0,9, presented on it, contains 62 pairs of quasars, 30 of which are localized in the area R_{xy}>0,98.



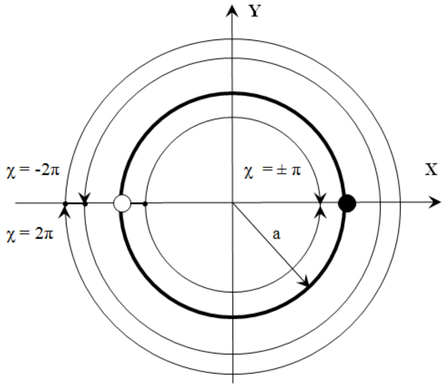
Picture 1. **Distribution of the pairs of antipode quasars with high values of Pearson correlation coefficients (R_{xy}>0,9).**

On the Picture 2 there is a diagram of the distribution of pairs from the massif R_{xy}>0,98 on the mean redshift values Z mean = (Z1+Z2)/2. Redshifts lay in the wide range 0,75<Zmean<2,25, which from the point of view of the modified model bear evidence of the suppressing influence of the random component.

As mentioned above, the modified cosmological model, free of the inner contradiction of The Big Bang model [4], describes the Universe, closed independently of the average matter density. The cross-section of the closed Universe (2-dimensional section of 4-dimensional hypersphere) is shown on the Picture 3.



Picture 2. **Diagram of the distribution of pairs of massif Rmin <0,1 градуса, dZ < 0,1 and R_{xy}>0,98 (N = 30) by average values of the pairs redshifts Z mean = (Z1+Z2)/2.**



Picture 3. **2-dimensional section of 4-dimensional space of the closed Universe – hypersphere with the radius "a".** Angular coordinate χ characterizes the remoteness of the objects. White circle marks the location of the observer; black circle is the point of the hypersphere (χ = ±π) most distant from him. Angles χ = ±2π correspond to the signals of the objects located near the observer and reaching him after the complete rotation around the hypersphere.

The surface of the hypersphere representing our 3-dimentional space is shown as a bold circle with a radius equal to the scale factor (radius "a") value. Two little circles on it represent the options of the location of observed objects. White – for location of The Milky Way and surrounding galaxies. Black – for location of the galaxies and quasars located in the most distant from us area of the hypersphere. The angular coordinate χ shows the distance to the object. In the modified cosmological model it is related to the object's redshift by an expression [7]:

$$\chi(Z) = [((Z+1)/\alpha_0)^2 - 1)]^{1/2} - [(1/\alpha_0)^2 - 1)]^{1/2}. \qquad (1)$$

where α_0 – a relative value of the scale factor at our time.

Picture 3 demonstrates that in the closed Universe the antipode objects with close value of Z can be located only in the areas marked by white and black little circles, i.e. the area near the observer and the area opposite the observer.

According to the results of the analysis of the dependencies of quasars and galaxies luminosity on redshift, performed in the work [7] the value of χ = 2π, i.e. full rotation of the signal radiated by the object around the hypersphere correspond to $Z_{2\pi} \approx 2$. The later work [8] which checked the assumption that inhomogeneity of the correlation of the antisymmetric component of the temperature deviation of the microwave background and quasars redshifts may be related to the tangential velocities of the big masses of the protomatter, which in some areas could have led to significant shifts of the original distributions of the matter in relation to the objects formed out of it later (quasars), allowed to more precisely specify this value because the sought correlation mostly manifested at $Z_{2\pi} \approx$ 1,87-1,90. So, $Z_{\pi} \approx$ 0,9–0,95.

Let us note that by the formula (1) these values correspond to $\alpha_0 \approx 0{,}3$. This value allows to evaluate [4] the average matter density ($\Omega \approx 0{,}1$), related with α by an expression:

$$\alpha = [\Omega/(\Omega+1)]^{1/2}; \qquad (2)$$

and hypersphere radius (scale factor), related to Ω by an expression:

$$a = 2a_0\alpha = (c/H)\Omega^{1/2}/(\Omega+1). \qquad (3)$$

At (c/H) = 13.9 billion light years we obtain the value of the hypersphere "a" radius ≈ 4.0 billion light years.

From Picture 3 and mentioned earlier values Z_{π} and $Z_{2\pi}$ it follows that the pairs of antipode quasars with small values of dZ in the closed Universe should be situated near the narrow ranges of the redshifts. But the distribution close to homogenous, shown on the Picture 2, contradicts this conclusion. One of the reasons of it can be a high noise component.

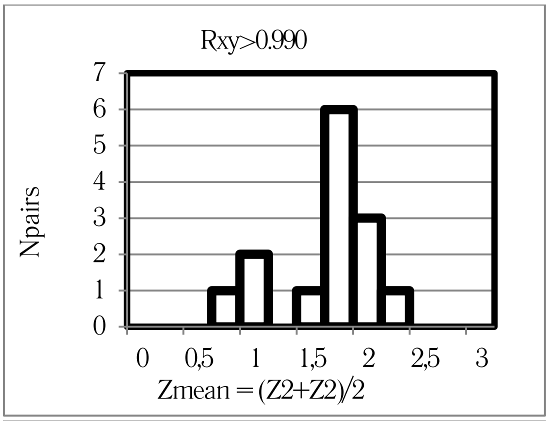
Assuming that the restriction of the analysis by the massif of pairs with characteristics: (Rmin<0,1 degree, dZ<0,1, R_{xy}>0,98) appeared to be not enough to exclude the influence of the random component, we continue to narrow down the range of characteristics, first of all Pearson correlation coefficient. On the Picture 4 we show the similar to Picture 2 diagrams of the distribution by average values of the redshifts of pairs of the massif (Rmin <0,1 degree, dZ < 0,1) for R_{xy}>0,990 (N = 14) and for R_{xy}>0,995 (N = 7).

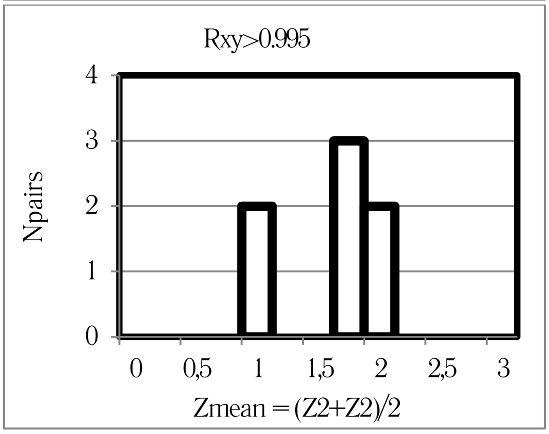
We can see that stiffening of the profiles correlation requirements with approximation of the correlation coefficient to 1 led to the decreasing the value of the distribution in the redshifts area between 1 and 2, and then to the complete exclusion of all pairs from the massif except those which values Z_{mean} lay in the narrow ranges Z_{mean} ≈ 0,75-1 (N=2) and Z_{mean} ≈ 1,75-2 (N=5), which completely corresponds to the forecast of the modified model.

3. Characteristics of the selected pairs of antipode quasars

Characteristics of 7 pairs of quasars, corresponding to R_{xy}>0,995 (Picture 4, on the right) are presented in the Table 1 (except values of magnitudes, presented separately in the Table 2).

The criteria required for the study of the quasars pair as a pair of our galaxy images are the values of their redshifts, corresponding at most to the full rotation of the light around the hypersphere (by the demonstrated earlier data of the modified model $Z_{2\pi}$≈ 1,87-1,90) and minimal value of their difference dZ.





Picture 4. **Diagram of the distribution by the average values of the redshifts of the pairs from the massif** Rmin <0,1 degree, dZ < 0,1 for R_{xy}>0,990 (N = 14) and R_{xy}>0,995 (N = 7).

Table 1. **Characteristics of antipode pairs of quasars**, corresponding to Rmin <0,1 градуса, dZ < 0,1, R_{xy}>0,995 (see Picture 4).

#	Recno SDSS DR5	RAJ2000	DEJ2000	Z	Recno SDSS DR5	RAJ2000	DEJ2000	Z	Rmin (deg)	R_xy	dZ	Zmean = (Z1+Z2)/2
1	36644	170,545369	-1,190959	1,7655	76045	350,519842	1,165527	1,7877	0,036	0,998	0,022	1,78
2	72556	320,145253	-0,517725	1,4812	20999	140,12116	0,522697	1,5564	0,025	0,998	0,075	1,52
3	59061	221,643974	0,559218	1,6818	6402	41,635648	-0,57757	1,7226	0,020	0,998	0,041	1,70
4	18663	135,851884	-0,674547	1,597	72226	315,833825	0,745636	1,5841	0,073	0,998	0,013	1,59
5	41230	179,535277	-0,931288	0,9326	77343	359,48803	0,966444	0,8555	0,059	0,997	0,077	0,89
6	49545	198,522535	1,262863	0,7801	2783	18,491402	-1,194399	0,7533	0,075	0,996	0,027	0,77
7	45315	188,044572	0,505399	1,8253	1182	8,028737	-0,460515	1,9046	0,048	0,995	0,079	1,86

Table 2. **Magnitudes of the Table 1 quasars.**

#	Recno SDSS DR5	umag	gmag	rmag	imag	zmag	Recno SDSS DR5	umag	gmag	rmag	imag	zmag	R_xy
1	36644	19,666	19,44	19,284	18,956	18,837	76045	20,455	20,156	20,01	19,59	19,499	0,998
2	72556	17,914	17,63	17,46	17,259	17,181	20999	20,354	19,936	19,619	19,231	19,135	0,998
3	59061	20,114	19,963	19,953	19,685	19,653	6402	20,638	20,37	20,373	19,953	19,94	0,998
4	18663	19,732	19,449	19,33	19,113	19,067	72226	20,337	20,001	19,79	19,505	19,487	0,998
5	41230	19,401	19,189	18,962	18,912	18,758	77343	20,881	20,492	20,133	20,05	19,685	0,997
6	49545	19,076	18,601	18,454	18,408	18,216	2783	19,295	18,73	18,483	18,462	18,121	0,996
7	45315	19,777	19,506	19,327	19,048	18,965	1182	20,803	20,401	19,971	19,641	19,446	0,995

These criteria mostly correspond with pair #1 (Z_{mean} = 1,78; dZ = 0,022).

Characteristics of the pairs of antipode quasars, found in the work [1] as possible pairs of images of The Milky Way are presented for comparison in the Table 3.

Table 3. **Characteristics of the pairs of antipode quasars, found in the work [1] as possible pairs of images of The Milky Way**

#	Z1	Z2	Zmean	dZ	Deviation from opposition	
					(")	(deg)
1	0,588	0,626	0,61	0,038	99	0,028
2	2,080	2,080	2,08	0,000	129	0,036
3	1,332	1,340	1,34	0,008	27	0,008
4	1,874	1,905	1,89	0,031	60	0,017
5	2,000	1,971	1,99	0,029	95	0,026
6	1,347	1,350	1,35	0,003	84	0,023
7	1,743	1,724	1,73	0,019	74	0,021

4. Conclusion

The review of the presented in the work [1] idea that it is possible to discover the images of our galaxy The Milky Way in the quasars catalogues by searching the pairs of antipode quasars from the point of view of the cosmological model that eliminates the inner contradiction of The Big Bang model and describes the Universe closed, not depending on the average matter density and unrestricted in time, confirms that it is possible to observe the images of our galaxy as antipode quasars pairs.

Except mentioned in the work [1] necessity to choose the pairs of quasars with minimal values of redshifts difference (dZ<0,04), a significant criterion appears to be the value of the redshift, which according to the data of the modified model should lay in the range close to $Z_{2\pi} \approx$ 1,87-1,90.

In this work we have searched the pairs of antipode quasars which could be seen as possible images of our galaxy by using the suggested earlier method of identification of the quasar pairs as pairs of images of the same object by the luminosity magnitudes profiles in the ranges **u,g,r,i,z**. We demonstrated that the restriction of the requirements to the correlation of their luminosity profiles with approximation of Pearson correlation coefficient to 1, has led to the exclusion from the study of all pairs except those having $Z_{mean} \approx$ 0,75-1 and those having $Z_{mean} \approx$ 1,75-2, which corresponds to the forecast of the modified cosmological model and allows to search for quasars that can be the images of our galaxy among pairs with the range $Z_{mean} \approx$ 1,75-2.

Based on this criterion, out of 7 pairs of the antipode quasars, discovered in the work [1] and reviewed as possible images of our galaxy, the pairs ## 1,3,6 should be excluded. It would be interesting to check the remaining 4 pairs, each of them corresponds to the criteria reviewed earlier by the redshifts values and their difference, by using the method of their identification as pairs of images of the same object by luminosity magnitudes profiles in the **u,g,r,i,z**. But unfortunately the data of such or similar check is not presented in this work.

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