Radio Component Separation in Quasars

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1 Introduction

In *The Universe of Motion*,[1] the volume dealing with the astronomical applications of the *Reciprocal System* (RS), Larson gives a complete account of the explanation of the quasars and the related phenomena. He deduces that the redshift of the quasars has two components, z, that due to the recession and q, that due to the speed imparted by the galactic explosion that ejected the quasar. He relates these two components by the equation

$$q = 3.5\, z^{0.5} \tag{1}$$

In Chapter 22 of the work cited he adduces observational evidence supporting his inferences. Among the items he considers there is the observed separation of the radio emitting regions of the quasars. He observes: "The… angular separation of such large proportion of these radio components of quasars stands out as an observed fact for which conventional astronomical theory has no explanation."[2]

According to the RS, the explosion speed of the quasar is incapable of representation in the conventional three-dimensional spatial reference system since it exceeds unit speed (the speed of light), the limit of such reference system. However, under appropriate circumstances, the motion in the second dimension appears in the reference system with a direction perpendicular to the line of motion in the original dimension. An example is electromagnetism. In the case of quasars this direction is perpendicular to the line of sight.

2 Component Separation Data

In Table VI of his book,[2] Larson lists the quasar component separation data. These data are relisted in Table I below, with the redshift data added and in increasing order of the redshift. Larson states: "The recession speed in the second dimension is the same as in the dimension coincident with the reference system, but as observed it is reduced by the inter-regional ratio…"[3] Therefore, denoting the inter-regional ratio applicable by R, and the lateral separation by y, expressing it in the same units as those of the recession distance z, we have according to Larson

$$y = R\, z \tag{2}$$

However, as could be seen from the last column of Table I, the y/z values are not constant. Larson asserts: "… the observed separations vary, and are generally less than the calculated 33.8 seconds of arc." He attributes the variation in the values to the differences in the times elapsed since the explosion event in the several cases.

1 Larson, Dewey B., *The Universe of Motion*, North Pacific Publishers, Portland, OR, U. S. A., 1984.
2 *Ibid.*, p. 300.
3 *Ibid.*, p. 301.

Table 1: Quasar Redshifts and Component Separation Data

Designation	**Larson's classification**	**q**	**z**	**y/z (arcsecs)**
3C 27 3	II B	0.156	0.002	19.6
3C 249.1	I L	0.303	0.008	18.8
3C 275.1	I E	0.534	0.023	13.2
3C 261	I E	0.586	0.028	10.8
MSH 13-011	I L	0.596	0.030	7.8
3C 207	I E	0.650	0.034	6.7
3C 336	II B	0.866	0.061	21.7
3C 205				15.8
3C 288	II B	0.895	0.066	6.4
3C 208	II A	1.024	0.086	10.5
3C 204	II A	1.026	0.086	31.4
3C 181	II A	1.254	0.128	6.0
3C 268.4	II A	1.269	0.131	9.4
3C 280.1	II A	1.480	0.179	19.0
3C 432	II A	1.597	0.208	12.9

I want to demonstrate that the quasar component separation data listed in the Table indicate a relationship between the recession, z, and the component separation, y, stronger than is suggested by Larson. Class I quasars with q less than 1.0 and Class II quasars with q greater than 1.0 seem to show two distinct patterns: Regression analysis of the data on the first six quasars in Table I (all of which are Class I with q less than 1.0, with the sole exception of 3C 273) yields the following relationship

$$\frac{y}{z}=A-B\,z \tag{3}$$

with A = 21.44, B = 413.9 and the correlation coefficient = -0.98, which is highly significant.

As regarding the Class II quasars with q greater than 1.0 (excepting 3C 208), that is, the last five quasars in Table I, the following relationship shows up

$$\frac{y}{z}=C+\frac{D}{z^3} \tag{4}$$

with C = 8.8, D = 0.0124 and the correlation coefficient = 0.75, which is also fairly significant.

3 Discussion

Rewriting Equations (3) and (4) respectively as

$$y=A\,z-B\,z^2 \quad \mathit{for}\; q<1.0 \tag{5}$$

$$y=C\,z+\frac{D}{z^2} \quad \mathit{for}\; q>1.0 \tag{6}$$

and comparing them with Equation (2) it can readily be seen that in addition to the factor z, suggested by Larson, there is another factor z^2, that contributes to the lateral shift in the co-ordinate space.

Further it might be of interest to note that the following equalities hold good very nearly

$$B = A^2 ,\, D = \frac{1}{C^2} \tag{7}$$

Assuming tentatively their validity we obtain by regression analysis

$$y = 20.9\, z - (20.9\, z)^2 \quad \textit{for } q < 1.0 \tag{8}$$

with a correlation coefficient of 0.98, and

$$y = 8.96\, z + \frac{1}{(8.96\, z)^2} \quad \textit{for } q > 1.0 \tag{9}$$

with a correlation coefficient of 0.75.

Recalling that z is the recession speed we can see that the explanation for the z^2 component that occurs in these equations could be as follows. Larson shows that associated with a speed v (expressed in natural units) there is a shift in co-ordinate time amounting to v^2 (in natural units). For example, in the case of gravitation, effects like the excess perihelion shift of a planetary orbit or the deflection of a light beam grazing the sun's limb, are shown to be the result of this co-ordinate time component.

Now it can easily be seen that the second power expression in Equations (5) and (6) is a similar effect of shift in *co-ordinate space*, proportional to z^2. The speed imparted to the quasars on ejection is always greater than unity (in fact, this is what makes them the quasars), and in this speed range we would expect the shift to be in co-ordinate space rather than in co-ordinate time. This, therefore, shows up as the additional component in the lateral recession.

Further, for values of q, the explosion redshift, greater than unity, the relevant factor to be considered is not the speed but the *inverse* speed, due to the reversal of the space-time direction from the point of view of the conventional reference system. Hence the co-ordinate spatial shift is proportional to $1/z^2$.

We encounter similar state of affairs in the case of the formation of the planetary system of a star. The planets condense from what Larson calls the B component of Type I supernovae, a white dwarf moving in the intermediate speed range. Discussing the Bode's Law, Larson deduces[4] that the distances of the inner planets from the sun are related to the factor n^2, where n is the number of units of motion in time on the spatial side of the neutral point. The distances of the outer planets are related to the factor $1/n^2$ since they pertain to the temporal side of the neutral point of the motion in time.

On analysis we find that, for the inner planets, the following equation holds good with a correlation coefficient of 0.999

$$d = 0.868\, n - 0.1028\, n^2 \tag{10}$$

where d is the distance from the sun in AU, and n the number of units of motion in time. The regression equation for the outer planets (including the asteroids) comes out with a correlation coefficient of 0.999 to be

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4 *Ibid.*, pp. 98-99.

$$d = 0.1184\,n + \frac{76.28}{n^2} \tag{11}$$

The values of n are as follows: for Mercury 8, Venus 7.5, Earth 7, Mars 6, Asteroids 6 to 5, Jupiter 4, Saturn 3, Uranus 2, Neptune and Pluto 1.5.

4 Conclusions

1) Larson has shown that the lateral shift, y, of the radio components of the quasars is due to the speed in the second scalar dimension and is a constant (the inter-regional ratio) times z, the recession redshift.
2) We find that there is an additional shift in the co-ordinate space that is given by the following relationships

   $$y = A\,z - B\,z^2 \quad \text{for}\, q < 1.0$$
   $$y = Cz + \frac{d}{z^2} \quad \text{for}\, q > 1.0$$

   where q is the speed of the quasar in the explosion dimension, and A, B, C, D are constants.