A SPECTRAL STUDY OF MARKARIAN 297

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ABSTRACT. The results of a spectral study of the galaxy Mr 297 with the 6-m telescope are presented.Estimations of mass and heavy element abundance for some knots in galaxy are made. Chemical composition of these knots is close to the normal one.

1. INTRODUCTION

The galaxy Mr 297 (NGC 6052=UGC 10182 = ARP 209 = VV 86) was included in the list of the objects with superassociations (Sahakian,Khachikian,1975) and attracted great attention of many astronomers for the past two decades. It has been included in the list of clumpy irregular galaxies too (Casini et al.,1979). Taniguchi and Tamura (1981) made a spectrophotometric study of clump "b" ("k1" in our designation).Spectral UV observations have allowed Benvenuti et al(1982) to make a conclusion that some clumps emit at 1550 A 100 times more than 30 Dor and contain up to o,7x 10^5 early stars.

2. OBSERVATIONS AND MASS ESTIMATION.

Fig.1a presents a direct plate of Mr.297 obtained with the 60cm telescope of SAO USSR without a filter with an exposure of 45 minutes.The figure shows the spectrograph slit position angles (PA) and the observed knots.

The photographic spectra (in PA=96° and 94°) have been obtained with the 6-m telescope prime focus diffraction spectrograph and Image-tube (dispersions 65 and 100 A/mm) within 3700-7000 AA. On the spectra with PA=94° k2 and k1 knots of Mr 297 show rotation.

More detailed spectra were obtained in April 1986

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with PA=114° and 4° . We used the panoramic photon counting system (512x512) with a dispersion of 1.6 A/channel, within 6100-7000 AA. The spectrum with PA=114° near H_α is presented in Fig.1b.

At the same time the spectra of the knots k1, k2, k3, k4 and k5 were obtained with the 6-m telescope 1024-channel scanner with a dispersion of 1.7 A/channel within 3700-7000 AA.

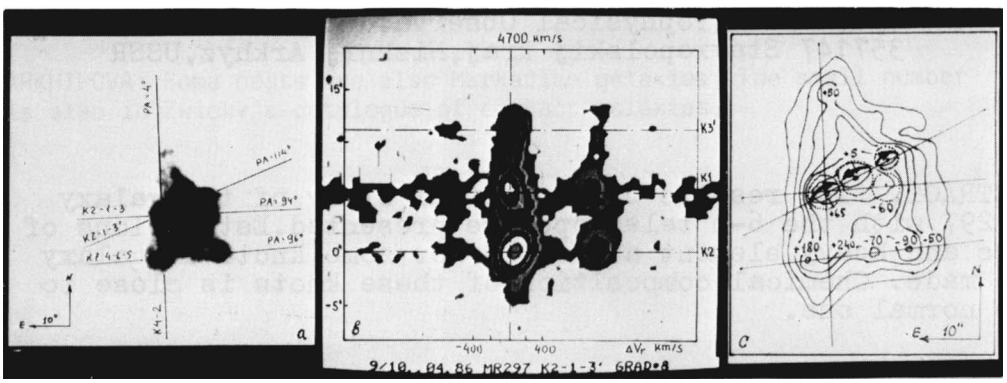

Figure 1. a - A direct plate of Mr 297 (slit positions, PA, knots); b - The spectrum of k1, k2, and k3 (PA=114°) near H_α; c - Relative velocities of some knots and the rotation directions of k1, k2 and k3 .

The velocities of some knots relative to the radial velocity of the system V=4700 km/s and the rotation direction of the three central knots are shown in Fig. 1c. The velocity of Mr 297 was assumed to be the mean velocity of the three greatest central knots (k1, k2 and k3): V = 4700+32 km/s, r = 63Mnc if H_o = 75km/s Mpc).The rough estimation of the rotational velocity V(rot) with the radius R of the knots provides the mass estimation of the condensations:

$$M(\ k1\ ) = 2.0 \times 10^9\ M_\odot,\ (R=0.7\ \text{kpc}, V(\text{rot})=110\ \text{km/s});$$

$$M(\ k2\ ) = 3.1 \times 10^9\ M_\odot,\ (R=0.7\ \text{kpc}, V(\text{rot})=140\ \text{km/s});$$

$$M(\ k3\ ) = 2.2 \times 10^8\ M_\odot,\ (R=0.5\ \text{kpc}, V(\text{rot})=43\ \text{km/s}).$$

The velocity dispersions for these knots obtained from the FWHI of emission lines and corrected for the instrumental ones are within the limits 80-130 km/s.

3. ELEMENT ABUNDANCES.

In Table 1 the total element abundances for the studied knots (Burenkov,1986) and also similar data for the Sun, planetary nebulae (Aller,1983), averages for HII regions in 6774, SMC andLMC (Talent,1982) and for nuclear region and superassociation of Mr 35 (Burenkov,Khachikian,1986) are presented.

Table 1. Total relative abundances X/H = 12 + Lg(X/H).

Object	O/H	N/H	S/H	Ne/H	He/H	Reference
MR 297 k1	8.85	7.57	7.24		11.29:	
Mr 297 k2	8.58	7.05	6.88	8.45:	11.11	
MR 297 k3	8.76	7.49	7.13		11.05	
MR 297 k4	8.58	7.44	7.10	7.73	11.08	
MR 297 k5	8.58	7.41	7.26	< 8.29:	11.23:	
MR 297 k6	8.58	7.06	6.96		11.21:	
MR 297 k7	8.60	7.33	7.23	8.22	11.10	
Sun	8.87	7.96	7.23	8.05	11.0	Aller,(1983)
plan.nebul.	8.64	8.26	7.00	8.03	11.04	Aller,(1983)
<N6744 HII>	8.44	7.34	6.75	7.80	10.96	Talent,(1982)
<SMC>	8.02	6.48	6.40	7.29	10.90	- " -
<LMC>	8.49	6.95	7.20	7.80	10.94	- " -
Mr 35 SA	8.19	6.80	6.43	7.70	11.14	Burenkov
Mr 35 core	8.48	7.05	6.63	7.81	10.94	Khachikian, (1986)

4. CONCLUSION.

Rotation of at least three knots in Mr 297, k1, k2 and k3 is observed. The masses of k1, k2, k3 are within 2×10^8 - 3×10^9 $M_\odot$. Judging by the direct plate of the galaxy the number of such massive knots can not exceed 5. However, the indicative mass is $M_i = 1.88\times10^{11}$ $M_\odot$ and from the radio data presented by Gordon and Gottesman (1981) the gas mass is $M_H = 1.18\times10^{10}$ $M_\odot$. The element abundances in the majority of Mr 297 knots is close to the normal one.

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