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RELATIVISTIC GRAVITATIONAL FORCE BETWEEN BLACK HOLES AND VISIBLE PART OF ELECTROMAGNETIC SPECTRUM IN AGN

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ABSTRACT

In the present paper, we have applied the model for the relativistic gravitational force of super massive spinning black holes trapping the electromagnetic spectrum of visible region towards itin AGN as proposed by Mahto et al. (2023) and concluded that this force attains the maximum values for the lower masses and minimum value for higher masses. The spinning velocity is mainly responsible to increase or decrease the relativistic gravitational force of black holes.

Keywords: Spinning Velocity, Relativistic Gravitational Force and AGN

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1. INTRODUCTION

The universal laws of gravitation states as all the bodies in the universe attract to each other. This force of attraction is called gravitational force depending upon the product of their masses and distance between them (**Newton, 1687)**. On the other hand, in 1915, Einstein gave the generalised theory of gravitation as per general relativity for which the Newton's law of gravitation holds good for certain limitations**(Bergmann, 1969)**. The gravitational force between the black holes and light particles has been studied in XRBs **(Mahto et. al, 2013**) and analysed this force in the AGN **(Nadeem, 2013).** The relativistic gravitational force of spinning black holes and light particles passing near the event horizon coming from outer source of light in the universe in XRBs has been discussed **(Mahto et. al, 2023**).

The present work studies the same model to discuss the same features for relativistic gravitational force of spinning black holes of AGN and light particles passing near the event horizon coming from outer source of light in the universe as discussed for black holes of XRBs by Mahto et al.(2023).

2. THEORETICAL TREATMENT

The gravitational force between spinning black holes and light particles in XRBs is given by the following equation **(Mahto et al. 2013).**

$$F = \frac{hc^3}{GM\lambda} \quad (1)$$

The relativistic gravitational force between the black holes and light particles in XRBs is given by the following equation **(Mahto et al. 2023).**This is obtained by applying relativistic effect using variation of mass with velocity**(Bergmann 1969)** and spinning velocity **(Reich 2013)** on equation (1).

$$F_{rel} = \frac{hc^3}{GM_0\lambda}\left(1 - \frac{v^2}{2c^2}\right) \quad (2)$$

In the present work, we have applied this model for AGN black holes for all components of visible part of the electromagnetic spectrum**(Mahto et al. 2023)**.

For convenience, putting G = h= 1 **(Narayan 2005)**in the equation (1), we have

$$F_{rel} = \frac{1}{M_0\lambda}\left(1 - \frac{v^2}{2c^2}\right) \quad (3)$$

The equation (3) provides us the relativistic gravitational force acting between the black holes and the light particles passing near the event horizon of black holes. This equation belongs to four terms called the rest mass of black holes, the wavelength of light waves of visible part of spectrum, spinning velocity of black holes and velocity of light denoted by the symbols M_0, λ, v and c respectively. We know that the visible part of electromagnetic spectrum consists of seven colors like violet, Indigo, blue, green, yellow, orange and red. These all colors have their own wavelengths differing to each other. Here we have calculated the relativistic gravitational force for each part of visible spectrum using equitation (3) and listed them in following tables.

3. TABLE

Table:1.

Relativistic gravitational force of spinning black holes of wavelength (4.00×10^{-7}) of violet color in AGN

S. N.	(%) speed of black holes	Speed of black holes (m/s)	$F_{rel} = \frac{1}{M_0\lambda}\left(1 - \frac{v^2}{2c^2}\right)$			
			For M=10^6 M⊙ $\frac{1}{M_0\lambda} = 125\times10^{-32}$	For M=10^7 M⊙ $\frac{1}{M_0\lambda} = 12.5\times10^{-32}$	For M=10^8 M⊙ $\frac{1}{M_0\lambda} = 1.25\times10^{-32}$	For M=10^9M⊙ $\frac{1}{M_0\lambda} = 0.125\times10^{-32}$
1.	50	1.50×10^8	109.37×10^{-32}	10.93×10^{-32}	1.093×10^{-32}	0.1093×10^{-32}
2.	55	1.65×10^8	106.09×10^{-32}	10.60×10^{-32}	1.060×10^{-32}	0.1060×10^{-32}
3.	60	1.80×10^8	102.50×10^{-32}	10.25×10^{-32}	1.025×10^{-32}	0.1025×10^{-32}
4.	65	1.95×10^8	98.59×10^{-32}	9.85×10^{-32}	0.985×10^{-32}	0.0985×10^{-32}
5.	70	2.10×10^8	94.37×10^{-32}	9.43×10^{-32}	0.943×10^{-32}	0.0943×10^{-32}
6.	75	2.25×10^8	89.84×10^{-32}	8.98×10^{-32}	0.898×10^{-32}	0.0898×10^{-32}
7.	80	2.40×10^8	85.00×10^{-32}	8.50×10^{-32}	0.850×10^{-32}	0.0850×10^{-32}
8.	85	2.55×10^8	79.84×10^{-32}	7.98×10^{-32}	0.798×10^{-32}	0.0798×10^{-32}
9.	90	2.70×10^8	74.37×10^{-32}	7.43×10^{-32}	0.743×10^{-32}	0.0743×10^{-32}
10.	95	2.85×10^8	68.59×10^{-32}	6.85×10^{-32}	0.685×10^{-32}	0.0685×10^{-32}
11.	99	2.97×10^8	63.74×10^{-32}	6.37×10^{-32}	0.637×10^{-32}	0.0637×10^{-32}

Table 2.

Relativistic gravitational force of spinning black holes of wavelength (4.50 x 10^{-7}) of blue color in AGN

S. N.	(%) speed of black holes	Speed of black holes (m/s)	$F_{rel} = \frac{1}{M_0\lambda}\left(1-\frac{v^2}{2c^2}\right)$			
			For M=10^6 M⊙ $\frac{1}{M_0\lambda}=111\times10^{-32}$	For M=10^7 M⊙ $\frac{1}{M_0\lambda}=11.1\times10^{-32}$	For M=10^8 M⊙ $\frac{1}{M_0\lambda}=1.11\times10^{-32}$	For M=10^9M⊙ $\frac{1}{M_0\lambda}=0.111\times10^{-32}$
1.	50	1.50×10^8	97.125 x 10^{-32}	9.712 x 10^{-32}	0.9712 x 10^{-32}	0.0971 x 10^{-32}
2.	55	1.65×10^8	94.211 x 10^{-32}	9.421 x 10^{-32}	0.9421 x 10^{-32}	0.0942 x 10^{-32}
3.	60	1.80×10^8	90.200 x 10^{-32}	9.020 x 10^{-32}	0.9020 x 10^{-32}	0.0902 x 10^{-32}
4.	65	1.95×10^8	87.510 x 10^{-32}	8.751 x 10^{-32}	0.8751 x 10^{-32}	0.0875 x 10^{-32}
5.	70	2.10×10^8	83.805 x 10^{-32}	8.380 x 10^{-32}	0.8380 x 10^{-32}	0.0838 x 10^{-32}
6.	75	2.25×10^8	79.781 x 10^{-32}	7.978 x 10^{-32}	0.7978 x 10^{-32}	0.0797 x 10^{-32}
7.	80	2.40×10^8	75.480 x 10^{-32}	7.548 x 10^{-32}	0.7548 x 10^{-32}	0.0754 x 10^{-32}
8.	85	2.55×10^8	70.901 x 10^{-32}	7.090 x 10^{-32}	0.7090 x 10^{-32}	0.0709 x 10^{-32}
9.	90	2.70×10^8	66.045 x 10^{-32}	6.604 x 10^{-32}	0.6604 x 10^{-32}	0.0660 x 10^{-32}
10.	95	2.85×10^8	60.911 x 10^{-32}	6.091 x 10^{-32}	0.6091 x 10^{-32}	0.0609 x 10^{-32}
11.	99	2.97×10^8	56.604 x 10^{-32}	5.660 x 10^{-32}	0.5660 x 10^{-32}	0.0566 x 10^{-32}

Table 3.

Relativistic gravitational force of spinning black holes of wavelength (5.00 x 10^{-7}) of Cyan color in AGN

S. N.	(%) speed of black holes	Speed of black holes (m/s)	$F_{rel} = \frac{1}{M_0\lambda}\left(1-\frac{v^2}{2c^2}\right)$			
			For M=10^6 M⊙ $\frac{1}{M_0\lambda}=100\times10^{-32}$	For M=10^7 M⊙ $\frac{1}{M_0\lambda}=10\times10^{-32}$	For M=10^8 M⊙ $\frac{1}{M_0\lambda}=1\times10^{-32}$	For M=10^9M⊙ $\frac{1}{M_0\lambda}=0.111\times10^{-32}$
1.	50	1.50×10^8	87.500 x 10^{-32}	8.750 x 10^{-32}	0.8750 x 10^{-32}	0.08750
2.	55	1.65×10^8	84.875 x 10^{-32}	8.487 x 10^{-32}	0.8487 x 10^{-32}	0.08487
3.	60	1.80×10^8	82.000 x 10^{-32}	8.200 x 10^{-32}	0.8200 x 10^{-32}	0.08200 x 10^{-32}
4.	65	1.95×10^8	78.875 x 10^{-32}	7.887 x 10^{-32}	0.7887 x 10^{-32}	0.07887 x 10^{-32}
5.	70	2.10×10^8	75.500 x 10^{-32}	7.550 x 10^{-32}	0.7550 x 10^{-32}	0.07550 x 10^{-32}
6.	75	2.25×10^8	71.875 x 10^{-32}	7.187 x 10^{-32}	0.7187 x 10^{-32}	0.07187 x 10^{-32}
7.	80	2.40×10^8	68.000 x 10^{-32}	6.800 x 10^{-32}	0.6800 x 10^{-32}	0.06800 x 10^{-32}
8.	85	2.55×10^8	63.875 x 10^{-32}	6.387 x 10^{-32}	0.6387 x 10^{-32}	0.06387 x 10^{-32}
9.	90	2.70×10^8	59.500 x 10^{-32}	5.950 x 10^{-32}	0.5950 x 10^{-32}	0.05950 x 10^{-32}
10.	95	2.85×10^8	54.875 x 10^{-32}	5.487 x 10^{-32}	0.5487 x 10^{-32}	0.05487 x 10^{-32}
11.	99	2.97×10^8	50.995 x 10^{-32}	5.099 x 10^{-32}	0.5099 x 10^{-32}	0.05099 x 10^{-32}

Table 4.

Relativistic gravitational force of spinning black holes of wavelength (5.50 x 10^{-7}) of Green color in AGN

S. N.	(%) speed of black holes	Speed of black holes (m/s)	$F_{rel} = \frac{1}{M_0\lambda}\left(1-\frac{v^2}{2c^2}\right)$			
			For M=10^6 M⊙ $\frac{1}{M_0\lambda} = 90\times10^{-32}$	For M=10^7 M⊙ $\frac{1}{M_0\lambda} = 9.0\times10^{-32}$	For M=10^8 M⊙ $\frac{1}{M_0\lambda} = 0.90\times10^{-32}$	For M=10^9M⊙ $\frac{1}{M_0\lambda} = 0.090\times10^{-32}$
1.	50	1.50×10^8	78.750 x 10^{-32}	7.8750 x 10^{-32}	0.78750 x 10^{-32}	0.07875 x 10^{-32}
2.	55	1.65×10^8	76.387 x 10^{-32}	7.6387 x 10^{-32}	0.76387 x 10^{-32}	0.07638 x 10^{-32}
3.	60	1.80×10^8	73.900 x 10^{-32}	7.3900 x 10^{-32}	0.73900 x 10^{-32}	0.07390 x 10^{-32}
4.	65	1.95×10^8	70.987 x 10^{-32}	7.0987 x 10^{-32}	0.70987 x 10^{-32}	0.07098 x 10^{-32}
5.	70	2.10×10^8	67.950 x 10^{-32}	6.7950 x 10^{-32}	0.67950 x 10^{-32}	0.06795 x 10^{-32}
6.	75	2.25×10^8	64.687 x 10^{-32}	6.4687 x 10^{-32}	0.64687 x 10^{-32}	0.06468 x 10^{-32}
7.	80	2.40×10^8	61.200 x 10^{-32}	6.1200 x 10^{-32}	0.61200 x 10^{-32}	0.06120 x 10^{-32}
8.	85	2.55×10^8	57.487 x 10^{-32}	5.7487 x 10^{-32}	0.57487 x 10^{-32}	0.05748 x 10^{-32}
9.	90	2.70×10^8	53.550 x 10^{-32}	5.3550 x 10^{-32}	0.53550 x 10^{-32}	0.05355 x 10^{-32}
10.	95	2.85×10^8	49.387 x 10^{-32}	4.9387 x 10^{-32}	0.49387 x 10^{-32}	0.04938 x 10^{-32}
11.	99	2.97×10^8	45.895 x 10^{-32}	4.5895 x 10^{-32}	0.45895 x 10^{-32}	0.04589 x 10^{-32}

Table 5.

Relativistic gravitational force of spinning black holes of wavelength (5.80 x 10^{-7}) of Yellow color in AGN.

S. N.	(%) speed of black holes	Speed of black holes (m/s)	$F_{rel} = \frac{1}{M_0\lambda}\left(1-\frac{v^2}{2c^2}\right)$			
			For M=10^6 M⊙ $\frac{1}{M_0\lambda} = 86\times10^{-32}$	For M=10^7 M⊙ $\frac{1}{M_0\lambda} = 8.6\times10^{-32}$	For M=10^8 M⊙ $\frac{1}{M_0\lambda} = 0.86\times10^{-32}$	For M=10^9M⊙ $\frac{1}{M_0\lambda} = 0.086\times10^{-32}$
1.	50	1.50×10^8	75.250 x 10^{-32}	7.5250 x 10^{-32}	0.75250 x 10^{-32}	0.07525 x 10^{-32}
2.	55	1.65×10^8	72.992 x 10^{-32}	7.2992 x 10^{-32}	0.702992 x 10^{-32}	0.07029 x 10^{-32}
3.	60	1.80×10^8	70.520 x 10^{-32}	7.0520 x 10^{-32}	0.70520 x 10^{-32}	0.07052 x 10^{-32}
4.	65	1.95×10^8	67.632 x 10^{-32}	6.7632 x 10^{-32}	0.67632 x 10^{-32}	0.06763 x 10^{-32}
5.	70	2.10×10^8	64.930 x 10^{-32}	6.4930 x 10^{-32}	0.64930 x 10^{-32}	0.06493 x 10^{-32}
6.	75	2.25×10^8	61.812 x 10^{-32}	6.1812 x 10^{-32}	0.61812 x 10^{-32}	0.06181 x 10^{-32}
7.	80	2.40×10^8	58.480 x 10^{-32}	5.8480 x 10^{-32}	0.58480 x 10^{-32}	0.05848 x 10^{-32}
8.	85	2.55×10^8	54.932 x 10^{-32}	5.4932 x 10^{-32}	0.54932 x 10^{-32}	0.05493 x 10^{-32}
9.	90	2.70×10^8	51.170 x 10^{-32}	5.1170 x 10^{-32}	0.51170 x 10^{-32}	0.05117 x 10^{-32}
10.	95	2.85×10^8	47.192 x 10^{-32}	4.7192 x 10^{-32}	0.47192 x 10^{-32}	0.04719 x 10^{-32}
11.	99	2.97×10^8	43.853 x 10^{-32}	4.3853 x 10^{-32}	0.43853 x 10^{-32}	0.04385 x 10^{-32}

Table 6.

Relativistic gravitational force of spinning black holes of wavelength (6.00 x 10^{-7}) of Orange color in AGN

S. N.	(%) speed of black holes	Speed of black holes (m/s)	$F_{rel} = \frac{1}{M_0\lambda}\left(1-\frac{v^2}{2c^2}\right)$			
			For M=10^6 M⊙ $\frac{1}{M_0\lambda}=83\times10^{-32}$	For M=10^7 M⊙ $\frac{1}{M_0\lambda}=8.3\times10^{-32}$	For M=10^8 M⊙ $\frac{1}{M_0\lambda}=0.83\times10^{-32}$	For M=10^9M⊙ $\frac{1}{M_0\lambda}=0.083\times10^{-32}$
1.	50	1.50×10^8	72.625 x 10^{-32}	7.2625 x 10^{-32}	0.72625 x 10^{-32}	0.07262 x 10^{-32}
2.	55	1.65×10^8	70.446 x 10^{-32}	7.0446 x 10^{-32}	0.70446 x 10^{-32}	0.07044 x 10^{-32}
3.	60	1.80×10^8	68.060 x 10^{-32}	6.8060 x 10^{-32}	0.68060 x 10^{-32}	0.06806 x 10^{-32}
4.	65	1.95×10^8	65.466 x 10^{-32}	6.5466 x 10^{-32}	0.65466 x 10^{-32}	0.06546 x 10^{-32}
5.	70	2.10×10^8	62.665 x 10^{-32}	6.2665 x 10^{-32}	0.62665 x 10^{-32}	0.06266 x 10^{-32}
6.	75	2.25×10^8	59.656 x 10^{-32}	5.9656 x 10^{-32}	0.59656 x 10^{-32}	0.05965 x 10^{-32}
7.	80	2.40×10^8	56.440 x 10^{-32}	5.6440 x 10^{-32}	0.56440 x 10^{-32}	0.05644 x 10^{-32}
8.	85	2.55×10^8	53-016 x 10^{-32}	5.3016 x 10^{-32}	0.53016 x 10^{-32}	0.05301 x 10^{-32}
9.	90	2.70×10^8	49.385 x 10^{-32}	4.9385 x 10^{-32}	0.49385 x 10^{-32}	0.04938 x 10^{-32}
10.	95	2.85×10^8	45.546 x 10^{-32}	4.5546 x 10^{-32}	0.45546 x 10^{-32}	0.04554 x 10^{-32}
11.	99	2.97×10^8	42.325 x 10^{-32}	4.2325 x 10^{-32}	0.42325 x 10^{-32}	0.42325 x 10^{-32}

Table 7.

Relativistic gravitational force of spinning black holes of wavelength (7.00 x 10^{-7}) of Red color in AGN

S. N.	(%) speed of black holes	Speed of black holes (m/s)	$F_{rel} = \frac{1}{M_0\lambda}\left(1-\frac{v^2}{2c^2}\right)$			
			For M=10^6 M⊙ $\frac{1}{M_0\lambda}=71\times10^{-32}$	For M=10^7 M⊙ $\frac{1}{M_0\lambda}=7.1\times10^{-32}$	For M=10^8 M⊙ $\frac{1}{M_0\lambda}=0.71\times10^{-32}$	For M=10^9M⊙ $\frac{1}{M_0\lambda}=0.071\times10^{-32}$
1.	50	1.50×10^8	62.125 x 10^{-32}	6.2125 x 10^{-32}	0.62125 x 10^{-32}	0.06212 x 10^{-32}
2.	55	1.65×10^8	60.261 x 10^{-32}	6.0261 x 10^{-32}	0.60261 x 10^{-32}	0.06026 x 10^{-32}
3.	60	1.80×10^8	58.220 x 10^{-32}	5.8220 x 10^{-32}	0.58220 x 10^{-32}	0.05822 x 10^{-32}
4.	65	1.95×10^8	56.001 x 10^{-32}	5.6001 x 10^{-32}	0.56001 x 10^{-32}	0.05600 x 10^{-32}
5.	70	2.10×10^8	53.605 x 10^{-32}	5.3605 x 10^{-32}	0.53605 x 10^{-32}	0.05360 x 10^{-32}
6.	75	2.25×10^8	51.031 x 10^{-32}	5.1031 x 10^{-32}	0.51031 x 10^{-32}	0.05103 x 10^{-32}
7.	80	2.40×10^8	48.280 x 10^{-32}	4.8280 x 10^{-32}	0.48280 x 10^{-32}	0.04828 x 10^{-32}
8.	85	2.55×10^8	45.351 x 10^{-32}	4.5351 x 10^{-32}	0.45351 x 10^{-32}	0.04535 x 10^{-32}
9.	90	2.70×10^8	42.245 x 10^{-32}	4.2245 x 10^{-32}	0.42245 x 10^{-32}	0.04224 x 10^{-32}
10.	95	2.85×10^8	38.961 x 10^{-32}	3.8961 x 10^{-32}	0.38961 x 10^{-32}	0.03896 x 10^{-32}
11.	99	2.97×10^8	36.206 x 10^{-32}	3.6206 x 10^{-32}	0.36206 x 10^{-32}	0.03620 x 10^{-32}

4. FIGURE

Figure 1

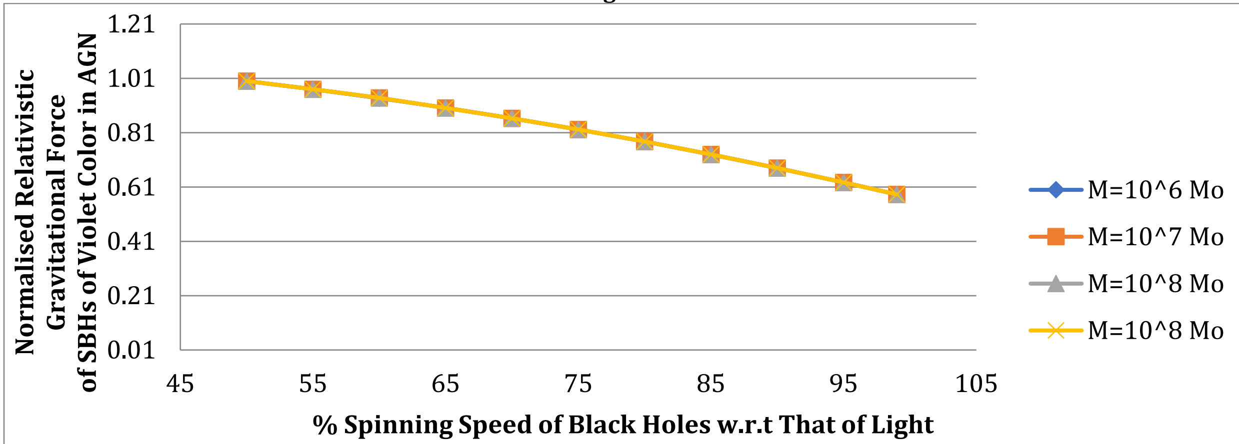

Fig. 1: Variation of Normalised Gravitational Force of SBHs of Violet Color vs Its % Spinning Speed

Figure 2

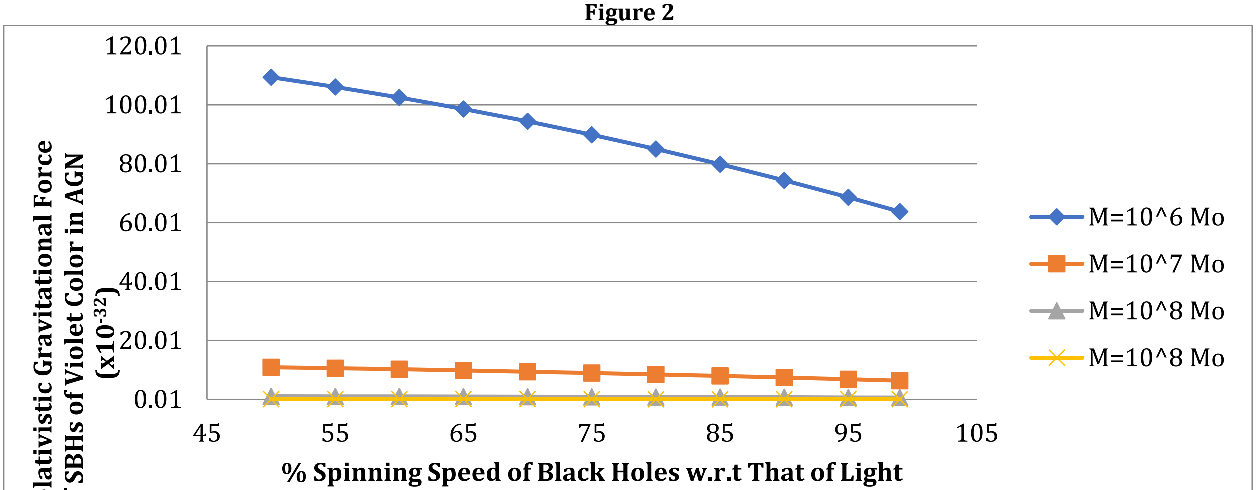

Fig. 2: Variation of Gravitational Force of SBHs of Violet Color vs Its % Spinning Speed

Figure 3

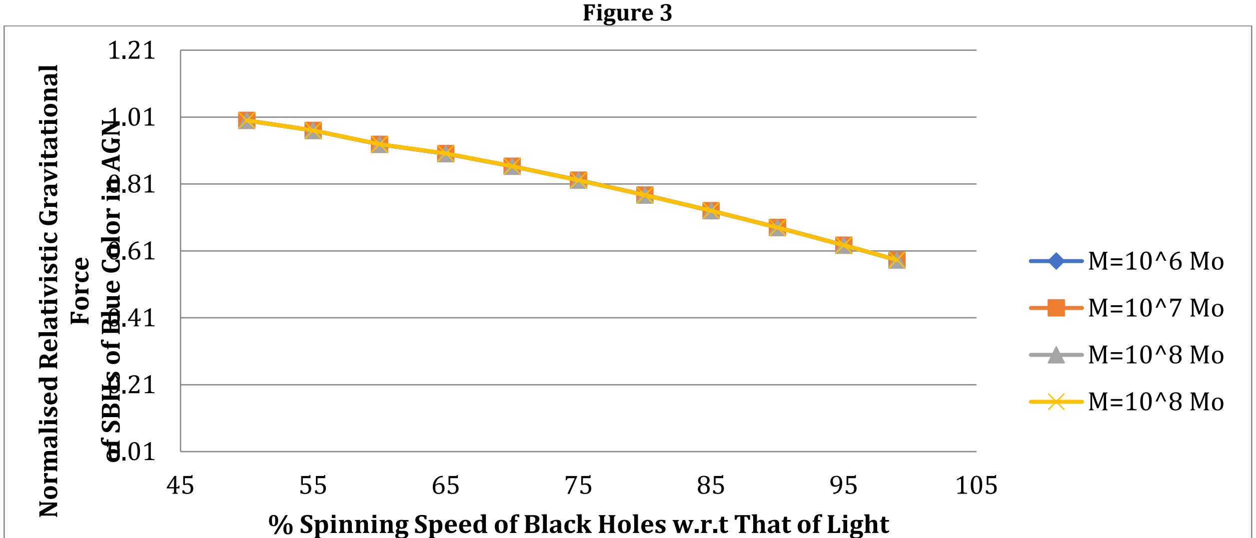

Fig. 3: Variation of Normalised Gravitational Force of SBHs of Blue Color vs Its % Spinning Speed

Figure 4

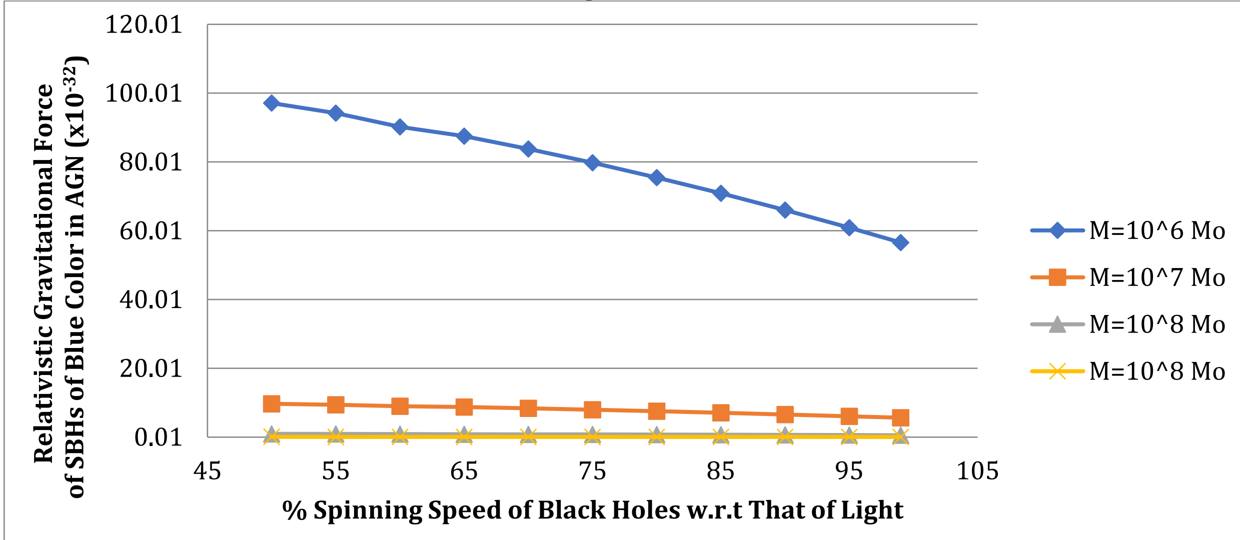

Fig. 4: Variation of Gravitational Force of SBHs of Blue Color vs Its % Spinning Speed

Figure 5

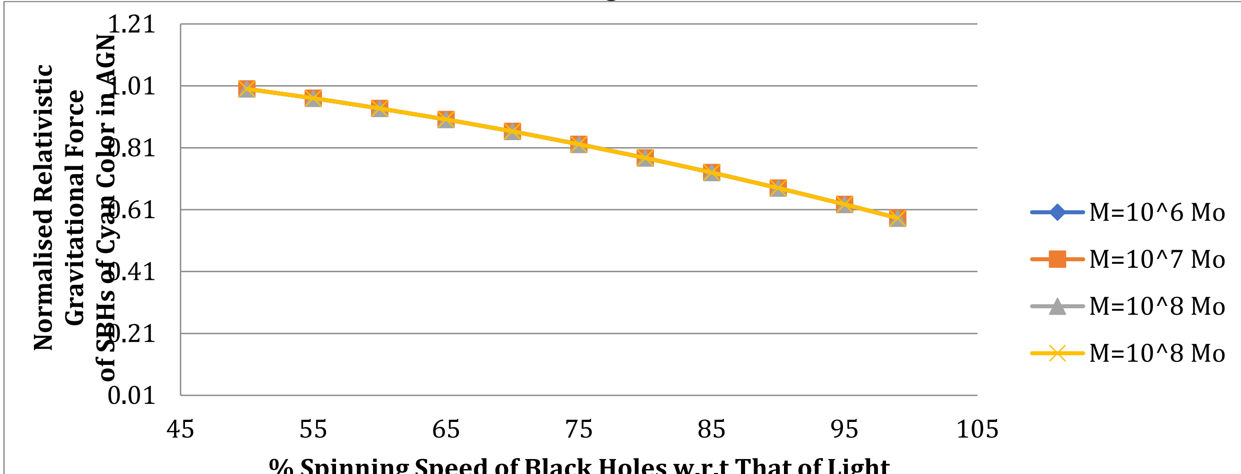

Fig. 5: Variation of Normalised Gravitational Force of SBHs of Cyan Color vs Its % Spinning Speed

Figure 6

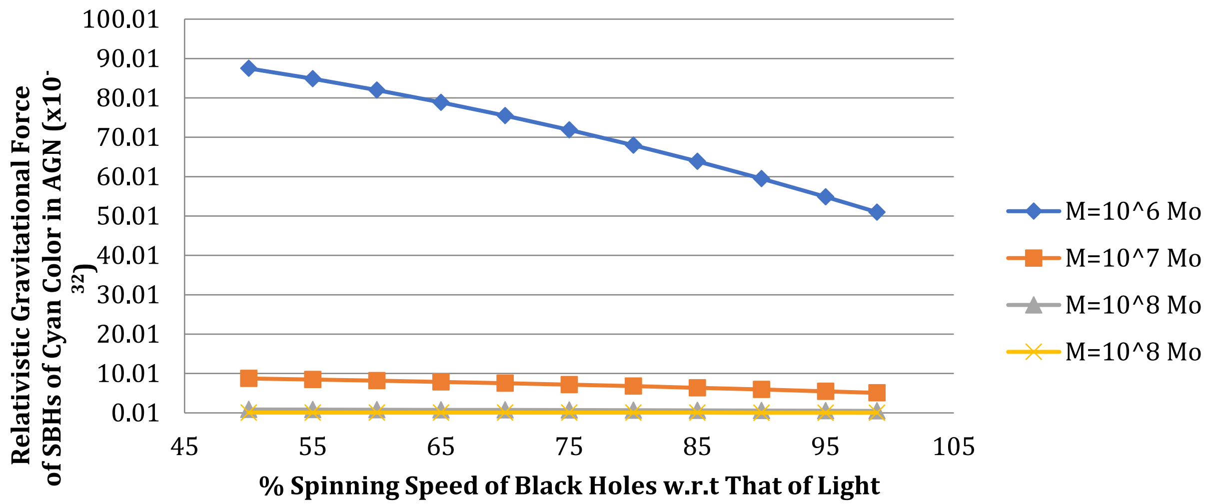

Fig. 6: Variation of Gravitational Force of SBHs of Cyan Color vs Its % Spinning Speed

Figure 7

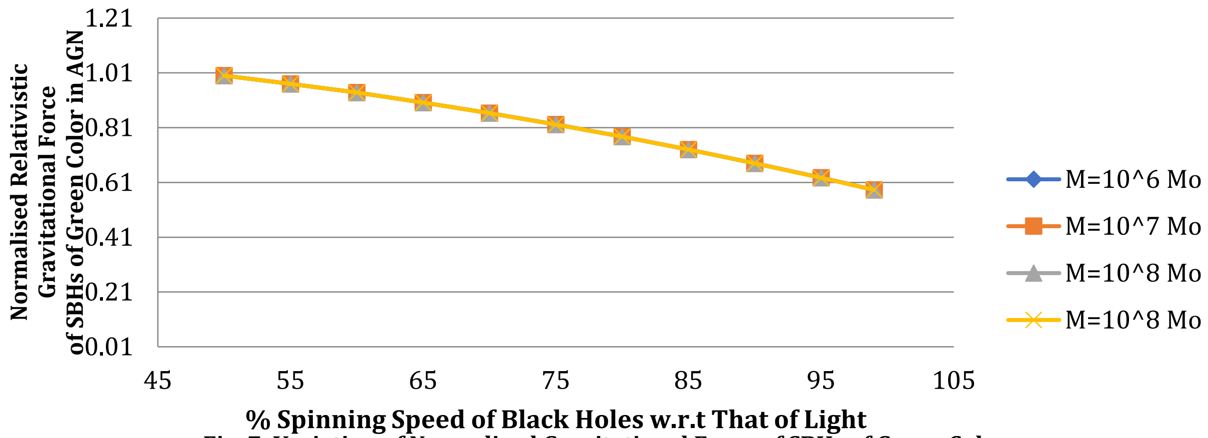

Fig. 7: Variation of Normalised Gravitational Force of SBHs of Green Color vs Its % Spinning Speed

Figure 8

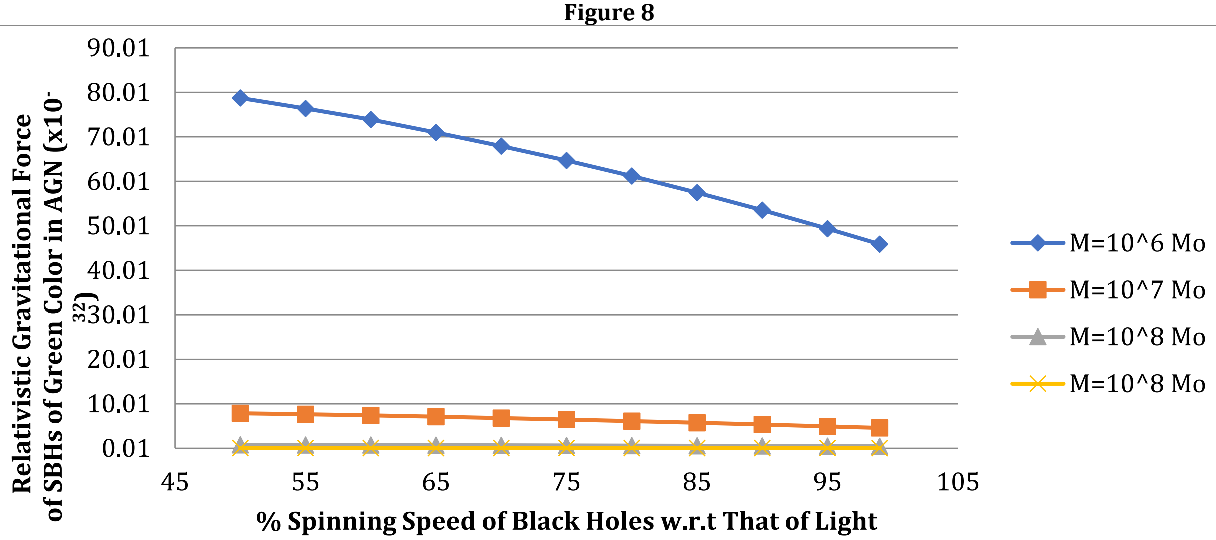

Fig. 8: Variation of Gravitational Force of SBHs of Green Color vs Its % Spinning Speed

Figure 9

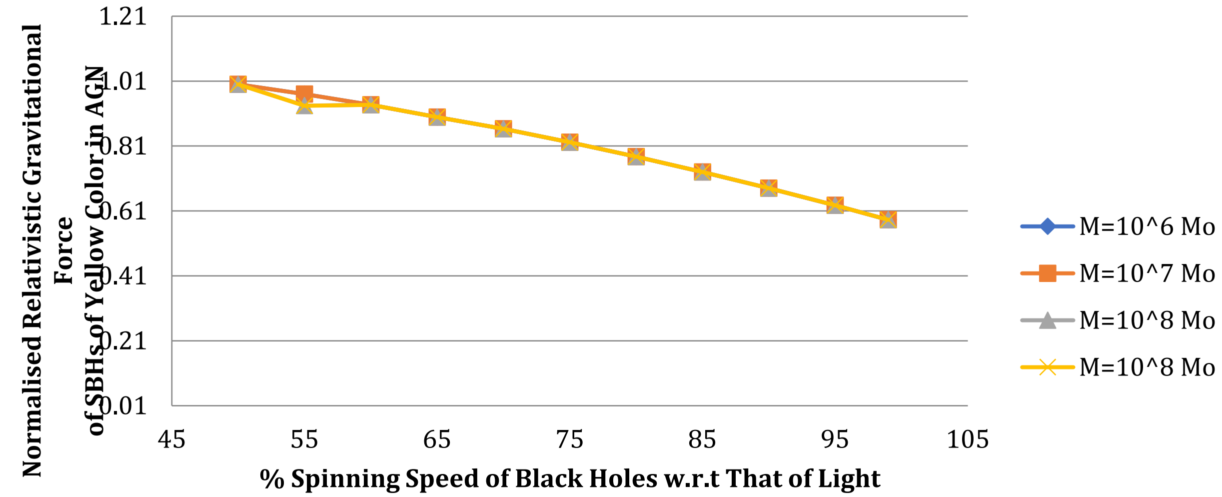

Fig. 9: Variation of Normalised Gravitational Force of SBHs of Yellow Color vs Its % Spinning Speed

Figure 10

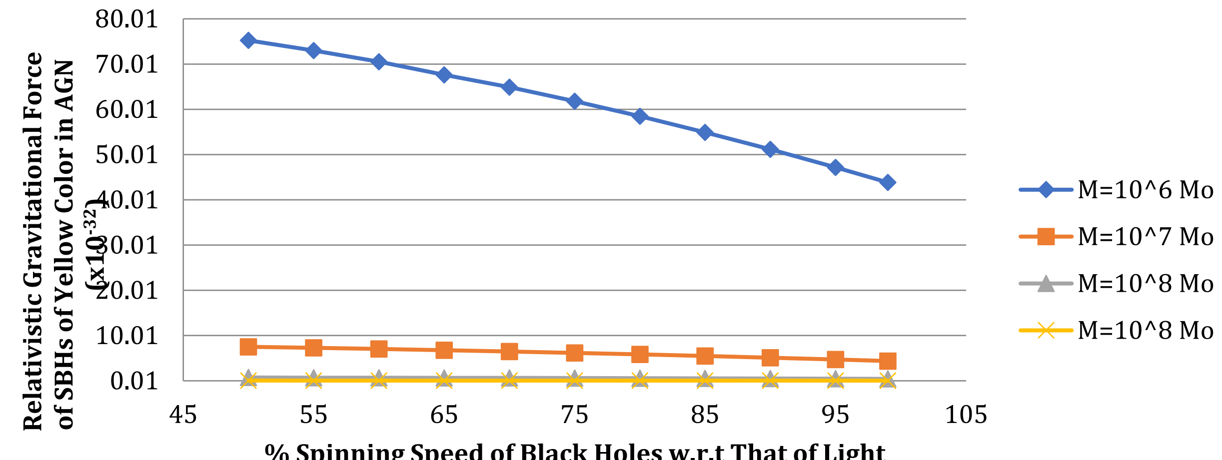

Fig. 10: Variation of Gravitational Force of SBHs of Yellow Color vs Its % Spinning Speed

Figure 11

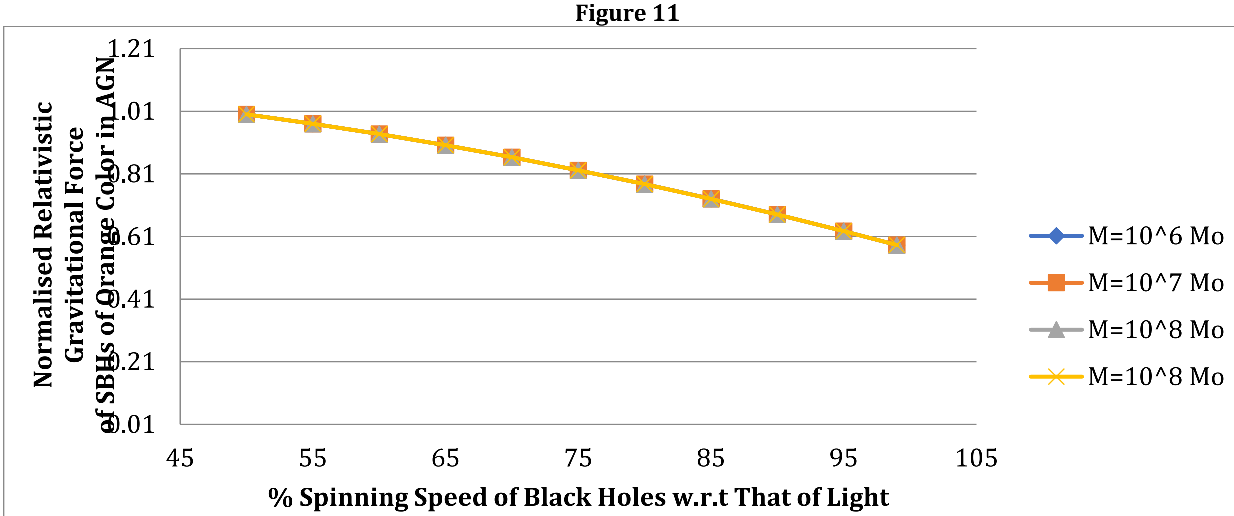

Fig. 11: Variation of Normalised Gravitational Force of SBHs of Orange Color vs Its % Spinning Speed

Figure 12

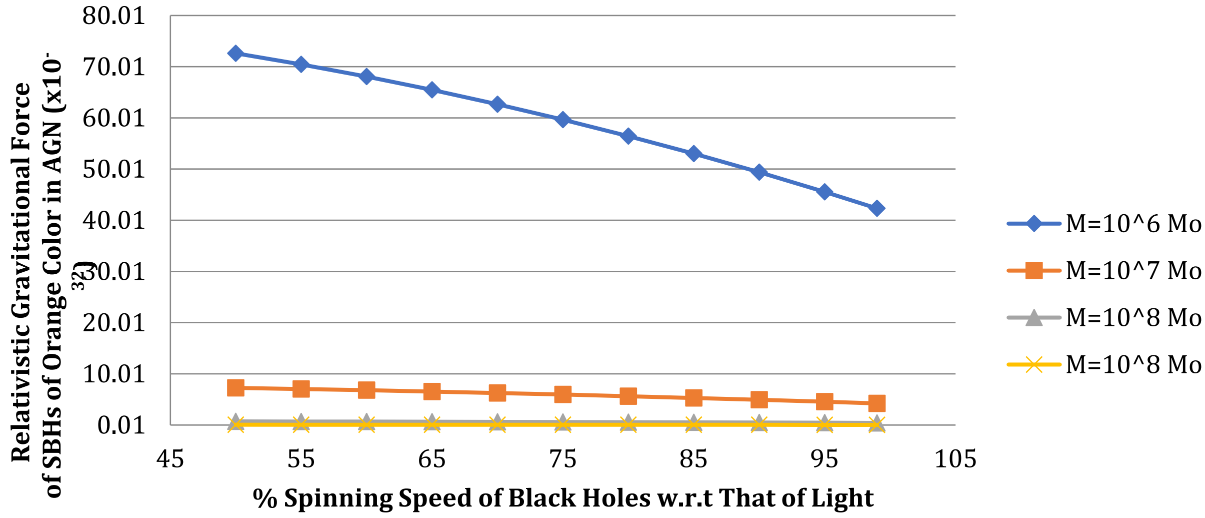

Fig. 12: Variation of Gravitational Force of SBHs of Orange Color vs Its % Spinning Speed

Figure 13

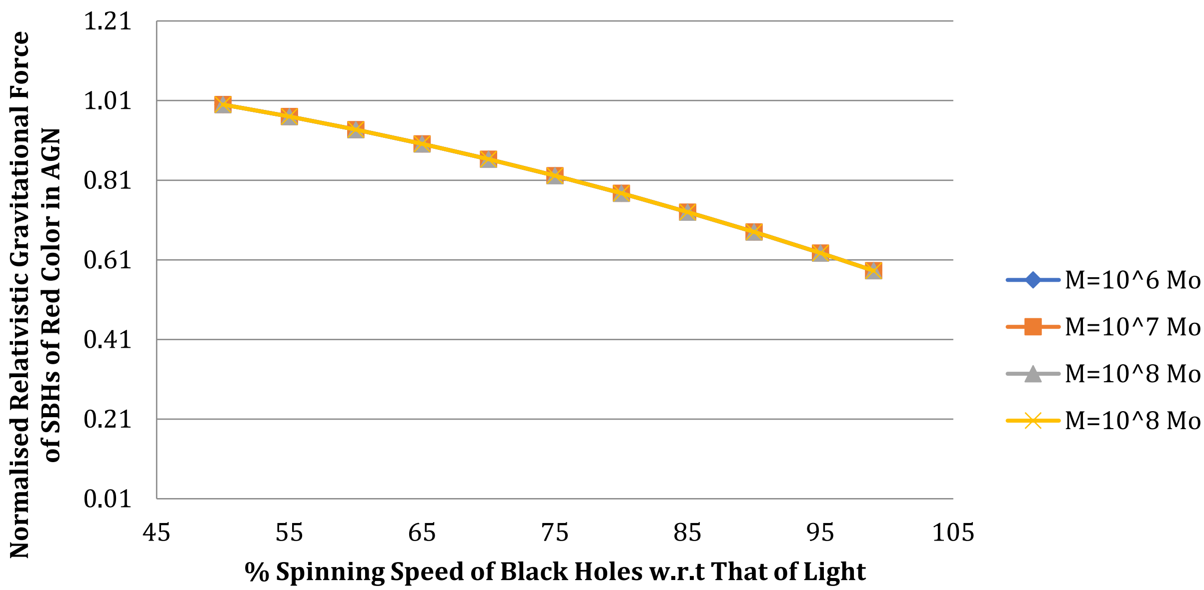

Fig. 13: Variation of Normalised Gravitational Force of SBHs of Red Color vs Its % Spinning Speed

Figure 14

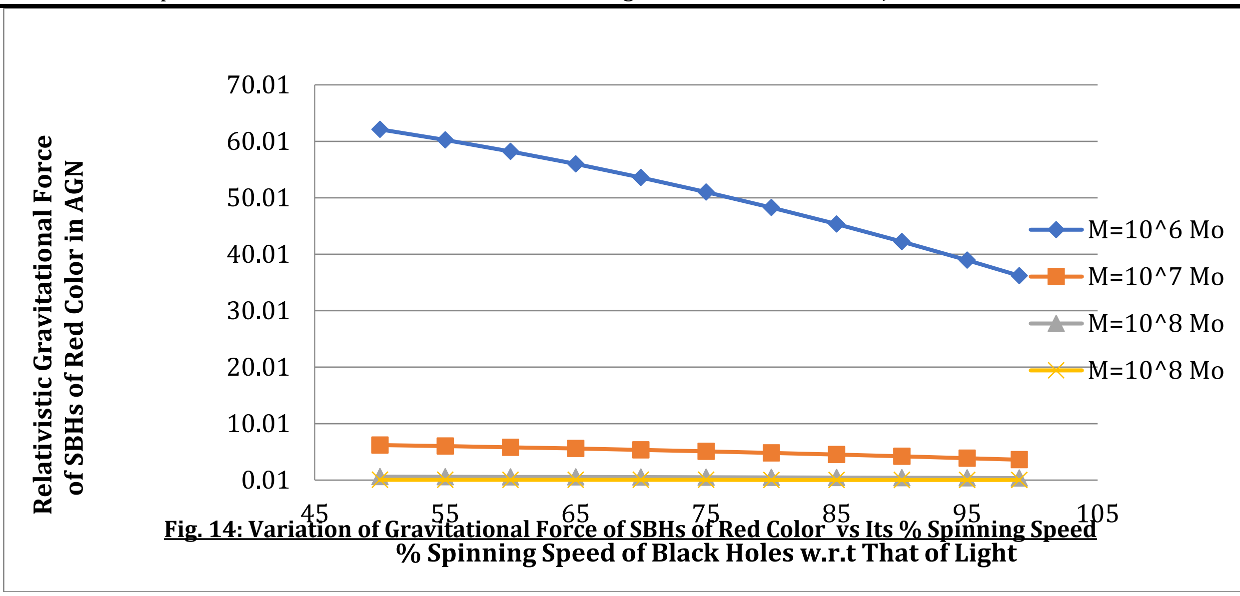

Fig. 14: Variation of Gravitational Force of SBHs of Red Color vs Its % Spinning Speed

5. RESULT AND DISCUSSION

The present work is concerned with the study of the same model for the relativistic gravitational force of spinning black holes of AGN and light particles passing near the event horizon coming from outer source of light in the universe as discussed for black holes of XRBs by Mahto et al.(2023) represented by the equation $F = \frac{hc^3}{GM_0\lambda}\left(1 - \frac{v^2}{c^2}\right)$. This model is applied for the different test of black holes of AGN and spinning velocity ranging from 50%-99.99% of speed of light and wavelengths of the visible part of electromagnetic spectrum to obtain the relativistic gravitational forces.

In the present work, we have plotted two types of graphs for each part of visible spectrum in which first is for the variation of normalized values of relativistic gravitational force and we see that all the lines for different masses coincide showing the same nature of variations and also follows the same character and second graph is for normal values of relativistic gravitational forces for different masses by different colors. The figures 1 & 2, 3 & 4, 5 & 6, 7 & 8, 9 & 10, 11 & 12, 13 & 14 represent the plots for violet, blue, cyan, green, yellow, orange and red colors for normalized values and normal values of relativistic gravitational forces respectively.

The electromagnetic spectrum consists of so many radiations like γ rays, x-rays, ultraviolet rays, visible rays, infra-red rays, microwave rays and Hawking radiations. For the visibility of objects, only visible part of spectrum plays role and there is no role of other radiations and hence only visible part of spectrum is applied in the present work. We applied the model for the masses like $10^6 M_\odot$, $10^7 M_\odot$, $10^8 M_\odot$ and $10^9\ M_\odot$ existing in the ACN with all the wavelengths of visible part of spectrum consists of violet, blue, cyan, green, yellow, orange and red colors. The observation of tables as well as figures from 1 to 14, it is clear that the red color is trapped by black holes less than to that of other components of visible part of electromagnetic spectrum.

The Hawking and γ radiations have the longest and shortest wavelengths respectively. Due to this reason, the Hawking radiation experiences the least gravitational forces than other radiations and able to escape from black holes, which is experimentally verified during the detection of gravitational waves from the binary black holes for which the Noble Prize was awarded.

6. CONCLUSIONS

(1) The radiations of shorter wavelength are more attracted towards the black holes than that of longer wavelength.
(2) XRBs black holes have more relativistic gravitational force to that of the AGN black holes.
(3) Super massive black holes have lesser relativistic gravitational force to that of Massive black holes.

CONFLICT OF INTERESTS

None.

ACKNOWLEDGMENTS

None.

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