Radius Of Photon Orbit Of Charged Rotating Blackhole

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Abstract: This article describes the Einstein's mass energy equivalence relationship

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Introduction

According to Einstein's mass energy equivalence relationship: Mass of charged rotating blackhole is the measure of it's energy. Total energy assosiated with the charged rotating Blackhole is given by E=Mc^2

where M=Mass of charged rotating blackhole ,c=speed of light in vaccum(3*10^8m/s). As charged rotating blackhole also possess spin parameter given by the relation a=J/Mc where M=Mass of charged rotating blackhole,J=Angular momentum of this blackhole. By rearranging of equation a=J/Mc we get Mc=J/a.

Then the equation E=Mc^2 i.e E=(Mc)c i.e E= Jc/a,

where a= spin parameter of charged rotating blackhole.Photon sphere is a spherical region of space where gravity is strong enough that photons are forced to travel in orbits.Consider photon of relativistic mass"m"is moving in the photon orbit around this black hole.Then the gravitational force of rotating Black hole experienced by the photon is given byF=GMm/r^2 where G=Universal gravitational constant, M=Mass of of rotating blackhole,m= relativistic mass of photon,r = distance between charged rotating Black hole and photon(radius of photon orbit). Total energy assosiated with the charged rotating Blackhole is given by E=Mc^2 then the equation F=GMm/r^2 becomes F=GEm/r^2 c^2 .

As the total energy of rotating black hole is also given by E= Jc/a then the equation F=GEm/r^2 c^2 becomes F=GJcm/a r^2 c^2.Thus F=GJm/a r^2 c is obtained. gravitational field also surrounds this black hole ,then gravitational force of charged

rotating Black hole experienced by the photon moving in photon orbit can also be given by F=mI where I=gravitational field intensity of this black hole ,F= gravitational force of rotating Black hole experienced by the photon of mass 'm'moving in photon orbit. By equating F=mI and F=GJm/a r^2 c, we get the equation r^2=GJ/aIc,

where r=radius of photon orbit opf rotating black hole G= Universal gravitational constant, J=Angular momentum of rotating blackhole, a= spin parameter of rotating blackhole, I=gravitational field intensity,c=speed of light in vaccum. Electric potential of rotating charged blackhole is given by $\varphi_{E=QR/(R^2+(J/Mc)^2)}$,

where a=J/Mc,R=horizon radius,Q=charge on this blackhole,a=spin parameter of this black hole then $\varphi_{E=QR/(R^2+a^2)}$ is obtained. $a^2= (QR/\varphi_E - R^2)$ then $a= (QR/\varphi_E - R^2)^{1/2}$,

then the equation $r^2=GJ/aIc$ becomes $r^2=GJ/(QR/\varphi_E - R^2)^{1/2}Ic$.

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