# Period Of Rotation Of Rotating Blackhole

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**Abstract:** The Rotational Kinetic Energy of Rotating Black Hole is given by $\mathbf{E_k = J^2/2\,I}$ ……….(1). Here **I** = Moment of Inertia of this Black Hole, **J** = Angular momentum of this Black Hole. Spin parameter of rotating Black Hole is given by $\mathbf{a = J/MC}$……. (2). Here **M** = Mass of this Black Hole, **J** = Angular momentum of this Black Hole. Thus, (1) becomes $\mathbf{E_k = a^2\,M^2\,C^2/2\,I}$……. (3).

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The Rotational Kinetic Energy of Rotating Black Hole is given by

$$\mathbf{E_k = J^2/2\,I} \text{ ……….(1)}$$

Here **I** = Moment of Inertia of this Black Hole, **J** = Angular momentum of this Black Hole.

Spin parameter of rotating Black Hole is given by

$$\mathbf{a = J/MC} \text{……. (2)}$$

Here **M** = Mass of this Black Hole, **J** = Angular momentum of this Black Hole .

Thus, (1) becomes $\mathbf{E_k = a^2\,M^2\,C^2/2\,I}$……. (3)

Assuming the shape of rotating Black Hole to be spherical then **MI** about an axis passing through the Diameter is given by $\mathbf{I = 2/5\,MR^2}$

Here **R** = Radius of this Black Hole, **I**= moment of inertia of this blackhole.

Thus, (3) becomes $\mathbf{E_k = 5a^2\,M^2\,C^2/4\,MR^2}$

$$\mathbf{E_k = 5a^2\,M^2\,C^2/4R^2} \text{……. (4)}$$

Rotational Kinetic Energy of rotating Black Hole is given by $\mathbf{E_k = 1/2\,I\,\omega^2}$

Here $\boldsymbol{\omega}$ =angular velocity of this blackhole

$$\mathbf{E_k = MR^2\,\omega^2/5} \text{……. (5)}$$

By Comparison of (4) & (5) we get

$$\mathbf{\omega = 5aC/2\,R^2} \text{ ……. (6)}$$

Angular velocity of rotating blackhole is given by **$\omega = 2\pi/T$**

Here **T=**Time period of rotation of this blackhole

Thus (6) becomes **$T=4\pi R^2/5aC$** ...........(7)

Assuming the area of rotating black hole is given by **$A_B=4\pi R^2$**

Thus (7) becomes **$T=A_B/5aC$**

Here **T=** Time period of rotation of this blackhole, **$A_B$**=Area of this blackhole**,a=**Spin parameter of this blackhole, **C** =speed of light in vaccum.

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