**Force exerted by gravitational radiation emitted from binary system**

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Two objects orbiting eachother in highly elliptical orbit about their center of mass comprises binary system.This system losses mass by emitting gravitational wave . These gravitational waves carry or transport energy in the form of gravitational radiation. Gravitational waves are radiated by objects whose motion involves acceleration, provided that the motion is not perfectly spherically [symmetric](http://en.wikipedia.org/wiki/Symmetric) (like a spinning, expanding or contracting sphere) or cylindrically symmetric (like a spinning disk).

The rate of flow of energy from the binary system through gravitational radiation

P = - dE/dt(1)

Here **P**= Power of the gravitational radiation , **dE** be the energy change of the binary system with respect to time **dt** ,- ve sign indicates rate of energy loss of binary system in the form of gravitational radiation

Power of gravitational radiation can be given by

Suppose that the two masses are **m1** and **m2**, and they are separated by a distance **r.** The power given off (radiated) by this system is:

(2)



Here **G** = universal gravitational constant , **C** = speed of light in vaccum.

Gravitational radiation robs the orbiting bodies of energy. As the energy of the orbit reduces, the distance between the bodies decreases, and they rotate more rapidly. The rate of decrease of distance between the bodies versus time is given by:

(3)



Multiplying the equation (2) by 2 we get

2P = - [64 G^4/C^5 \*(m1m2) (m1+m2)/r^3] \*Gm1m2/r^2(4)

From (3) we get

2P = dr/dt \*Gm1m2/r^2 (5)

Newton's law of universal gravitation states that “Every massive particle in the universe attracts every other massive particle with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between them “.

Gravitational force between the two objects orbiting each other in highly elliptical orbits given by

Fg= Gm1 m2 /r^2(6) Here **Fg** = Gravitational force between two objects orbiting each other ,**G** = Universal gravitational constant , **r** = Distance between masses **m1** and **m2** respectively.

Thus (5) becomes 2P = dr/dt \* Fg(7)

From (1) we know P = - dE/dt

Then the equation (7) becomes **Fg = - 2dE/dr** (8)

**dE** be small change in energy of binary system with respect to small change in **dr** , **-** ve sign indicates rate of energy loss of binary system with orbital decay .

The lifetime of an orbit is given by: (9)



Let us multiply (9) by 4 we get

4t/r = 5C^5 r^ 3 / 64 G^3 \*(m1m2) (m1+m2) (10)

Since - dt/dr **=** 5C^5 r^ 3 / 64 G^3 \*(m1m2) (m1+m2 )

4t/r = - dt/dr (11)

dr = - dt\* r/ 4t (12)

Thus the (8) becomes

Fg = - 2dE\*4t /-dt \*r (13)

here r = Distance between masses **m1** and **m2** respectively , **t** = lifetime of an orbit .

From (1) we know dE/dt **= -** P

Then (13) becomes Fg = -8Pt / r (14)

P= - Fg r/8t (15)

# Determination of the Photon Force and Pressure

[Reissig, Sergej](http://adsabs.harvard.edu/cgi-bin/author_form?author=Reissig,+S&fullauthor=Reissig,%20Sergej&charset=UTF-8&db_key=PHY)

The 35th Meeting of the Division of Atomic, Molecular and Optical Physics, May 25-29, 2004, Tuscon, AZ. MEETING ID: DAMOP04, abstract #D1.102

In [1] the formula for the practical determination of the power of a light particle was derived: P = hf^2 (W) (1). For the praxis it is very usefully to define the forces and pressure of the electromagnetic or high temperature heat radiation. The use of the impulse equation F = fracdPdt = fracd(mc)dt (2) together with the Einstein formula for E = mc^2 leads to the following relationship: F = frac1cfracd(mc^2 )dt = frac1cfracdEdt (3) In [1] was shown: - fracdEdt = P (4). With the use the eq. (1), (3), (4) the force value could be finally determinated: | F | = frachf^2 c or | F | = frachcλ ^2 = fracEλ [N]. The pressure of the photon could be calculated with using of the force value and effective area: p = fracFA [Pa]. References 1. About the calculation of the photon power. S. Reissig, APS four corners meeting, Arizona, 2003 -www.eps.org/aps/meet/4CF03/baps/abs/S150020.html

E=F λ

According to Planck’s theory of radiation

Energy associated with radiation can be given by

E=h*f*

Thus the equationE=F λbecomes F=h*f* / λ

Then the equation (1) becomesP=FC (16)

Here **P=** Power of radiation, **F**= Force exerted by radiation ,**C**= speed of light in vaccum , **h** = planck’sconstant , ***f* =** frequencyof radiation , **λ =** wavelength of radiation .

Gravitational radiation also carries energy along its motion .It possess wavelength and exerts force .

Hence the equation (16) applies to Gravitational radiation also .

Then (15) becomes F= - Fg r/8tC (17)

Gravitational potential energy of the binary system can be given by

U = - Fg r (18)

Thus the equation (17) becomes **F= U/ 8t**C (19)

Here F= force exerted by gravitational radiation ,U= Gravitational potential energy of the binary system emitting gravitational radiation, t = lifetime of an orbit ,C=Speed of light in vaccum

**References**

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