38 Hawking Force

A stationary, massive object is assumed to impose a "force" upon surrounding space. The force may be called the "Hawking force" as it is associated with Hawking temperature. This force may be represented as a vector.

If one condition applies, and if the components are suitably defined, then the components will give the definition of Hawking temperature and length contraction.

The Force Vector;

A vector of force ($\boldsymbol{F_H}$) may be associated with a massive object; $\boldsymbol{F_H} = F_1\boldsymbol{e_1} + F_2\boldsymbol{e_2} + F_3\boldsymbol{e_3}$

Where; $\boldsymbol{e_1}$, $\boldsymbol{e_2}$, $\boldsymbol{e_3}$ are direction vectors (unit vectors)

F_1 , F_2 , F_3 are scalar components of force

The vector has a magnitude; $|\boldsymbol{F_H}| = F_4$

The components are related to magnitude; $F_{n1}^2 + F_{n2}^2 + F_{n3}^2 = F_{n4}^2$

A sub-component (F_{n5}) is also related; $F_5^2 = F_1^2 + F_2^2 = F_4^2 - F_3^2$

Component Geometry;

Components and the sub-component have angular geometry;

$F_1 = F_5\text{Cos}(A_1)$ and; $F_2 = F_5\text{Sin}(A_1)$

$F_5 = F_4\text{Cos}(A_2)$ and; $F_3 = F_4\text{Sin}(A_2)$

The Radiant Condition;

A condition is required for emission; $A_1 = A_2$

The Force Equation;

From the condition; $A_1 = A_2$

$\text{Sin}(A_1) = \text{Sin}(A_2)$

$F_2/F_5 = F_3/F_4$

The scalar force equation may be written as;

$F_2F_4 = F_3F_5$

Definitions of Force;

Components of force may be defined as;

$$F_1 = mv_1c/r_S$$

$$F_2 = mc^2/r$$

$$F_3 = ½hc/n^2λ^2$$

$$F_4 = k_BT_4/r$$

$$F_5 = mc^2/r_S$$

Where; n is a quantum number (integer)

h is the Plank constant

c is the light constant

k_B is the Boltzmann constant

λ is wavelength of radiation

m is the mass of the object

r is radial distance from the center of the object

r_S is the Schwarzschild radius; $r_S = 2Gm/c^2$

G is the gravitational constant

T_4 is Hawking temperature

v_1 is average vibrational velocity

The Radiance Equation;

The scalar force equation is; $F_2F_4 = F_3F_5$

Definitions give; $(mc^2/r)(k_BT_4/r) = (½hc/n^2λ^2)(mc^2/r_S)$

$$k_BT_4 = (hc/2n^2λ^2)(r^2/r_S)$$

The quantization rule states that only an integer number of waves may be imposed upon a circumference; $nλ = 2πr$

giving; $k_BT_4 = (hc/8π^2r^2)(r^2/r_S)$

$$T_4 = hc/8π^2k_Br_S$$

Reduced Plank constant (ђ); $T_4 = ђc/4\pi k_B r_S$

The Schwarzschild radius is; $r_S = 2Gm/c^2$

Giving Hawking temperature; $T_4 = ђc^3/8\pi k_B Gm$

Length contraction;

From vector geometry; $\mathrm{Cos}(A_1) = F_1/F_5 = (mv_1c/r_S)/(mc^2/r_S) = v_1/c$

$\mathrm{Sin}(A_1) = F_2/F_5 = (mc^2/r)/(mc^2/r_S) = r/r_S$

Geometry gives; $\mathrm{Cos}^2(A_1) + \mathrm{Sin}^2(A_1) = 1$

$r/r_S = (1 - v_1^2/c^2)^{½}$

$r_S = \gamma r$

Where; γ is the Lorentz factor

Conclusion;

A stationary, massive object is assumed to impose a “force” upon surrounding space. The force may be called the “Hawking force” as the magnitude is associated with Hawking temperature.