# Example 5

## Propagation of a Beam of Light in the radial-direction of Sirius from the Gravitational Radius of Sirius until the Earth

with the speed of light $c = \frac{1}{\sqrt{\epsilon0\,\mu0}}$

within a Radial Gravitational Field G1 oriented in the radial-direction of Sirius with accelleration G1 = g[r] , resulting in Gravitational Redshift $\nu_{Grav-1}$ (GRS) caused by the: Gravitational Field of Sirius.

There are **two** kinds of Redshift
caused by the gravitational field of the sun.

1) $Redshift_1$ caused by the Gravitational Field within the ***fusion core*** of the sun(this is the area where the emitted light of the sun has been created). This has been calculated in Example 3
2) $Redshift_2$ caused by the Gravitational Field outside the fusion core of the sun. This will be calculated in Example 4

The total RedShift caused by the Gravitational Field of the sun is the sum of $Redshift_1 + Redshift_2$

Book : ***Rising of the James Webb Space Telescope and its Fundamental Blindnes*** : Page 46,

Equation (73)
Example of a Spherical Beam of Light ,
propagating in the radial – direction (r – direction)

with the speed of light $c = \frac{1}{\sqrt{\epsilon0\,\mu0}}$.

The input for the Electric Field Intensity {E (x, y, z,) = ev }
and the Magnetic Field Intensity {H (x, y, z,) = mv} have been

substituted in the Field Equation for the Electromagnetic Field within a constant gravitational field with accelleration g in the z – direction. (***Book Equation 73, page 46***).

$$-\frac{1}{c^2}\frac{\partial(\bar{E}\times\bar{H})}{\partial t}+\varepsilon_0\,\bar{E}\,(\nabla.\bar{E})-\varepsilon_0\,\bar{E}\times(\nabla\times\bar{E})+\mu_0\,\bar{H}\,(\nabla.\bar{H})-\mu_0\,\bar{H}\times(\nabla\times\bar{H})+\frac{1}{2}\left(\varepsilon^2\mu\left(\bar{E}.\bar{E}\right)+\varepsilon\,\mu^2\left(\bar{H}.\bar{H}\right)\right)\bar{g}=0 \quad \text{Equation (73)}$$

Which can be written as :

$$\text{term1} = -\frac{1}{c^2}\frac{\partial(\bar{E}\times\bar{H})}{\partial t}$$

$$\text{term 2} = \varepsilon_0\,\bar{E}\,(\nabla.\bar{E})$$

$$\text{term3} = -\varepsilon_0\,\bar{E}\times(\nabla\times\bar{E})$$

$$\text{term4} = \mu_0\,\bar{H}\,(\nabla.\bar{H})$$

$$\text{term5} = -\mu_0\,\bar{H}\times(\nabla\times\bar{H})$$

$$\text{term6} = -\frac{1}{2}\left(\varepsilon^2\mu\left(\bar{E}.\bar{E}\right)+\varepsilon\,\mu^2\left(\bar{H}.\bar{H}\right)\right)\bar{g}$$

Equation (73) equals :

$$\text{term1} + \text{term2} + \text{term3} + \text{term4} + \text{term5} + \text{term6} = 0$$

```
In[ ]:= ϵ0 =.
In[ ]:= μ0 =.
In[ ]:= x =.
In[ ]:= y =.
```

```
In[•]:= z =.

In[•]:= t =.

In[•]:= Get["VectorAnalysis`"]

   General: VectorAnalysis` is now obsolete. The legacy version being loaded may conflict with
      current functionality. See the Compatibility Guide for updating information.

In[•]:= Get["Calculus`DSolve`"]

   Get: Cannot open Calculus`DSolve`.

Out[•]= $Failed

In[•]:= InverseFunctions → True

Out[•]= InverseFunctions → True

In[•]:= Needs["DifferentialEquations`NDSolveProblems`"]

In[•]:= Needs["DifferentialEquations`NDSolveUtilities`"]

In[•]:= Needs["DifferentialEquations`InterpolatingFunctionAnatomy`"]

In[•]:= Get["Calculus`DSolveIntegrals`"]

   Get: Cannot open Calculus`DSolveIntegrals`.

Out[•]= $Failed

In[•]:= SetCoordinates[Cartesian[x, y, z]]

Out[•]= Cartesian[x, y, z]

In[•]:= G1 = .

In[•]:= ϵ0 = .

In[•]:= μ0 =.

In[•]:= fg = .

In[•]:= Msun = .
```

The light being emitted by the sun has been created
by ***nuclear fusion** in the core of **the the sun***.
Outside the ***Gravitational Radius*** of the Sun,
(the distance of the center of the sun where the gravitational
accelleration of the sun changes from increasing into decreasing) ,
the generated light will propagate with the speed of light :

$$c = \frac{1}{\sqrt{\epsilon 0\, \mu 0}}$$

oppositely directed towards the
gravitational accelleration outside the
sun. The gravitational accelleration
outside the sun will increase proportional to :

$$g2[r] = K2 \frac{1}{r^2} = \frac{f_g M_{Sun}}{4\pi} \frac{1}{r^2}$$

within a ***Radial Gravitational Field*** g[r] oriented
in the radial –
direction of the ***Sun*** with ***accelleration*** g[r] resulting in the
Gravitational Redshift caused by
the ***Gravitational Field outside the Sun***.

The ***Gravitational Intensity Shift*** for the light emitted by the
sun equals according the Book : ***Page 64, Equation (111)***

$$I_{NGR} = e^{-\frac{K2\, \epsilon 0\, \mu 0}{z}}$$

Instead of Spherical Coordinates (r, $\theta$, $\varphi$) for the light
emitted Spherically within the sun, for the far field
(within a small area like the dimensions of a Space Telescope),
Cartesian Coordinates (x, y, z) are being used.

In[•]:= $\epsilon 0 = .$

In[•]:= $\mu 0 =.$

In[•]:= fg = .

In[•]:= Msun = .

In[•]:= K1 = .

In[•]:= K2 = .

In[•]:= $h[z] = K3\, e^{-\frac{K2\,\epsilon 0\,\mu 0}{2 z}}$

Out[•]= $e^{-\frac{K2\,\epsilon 0\,\mu 0}{2 z}}\, K3$

In[•]:= $ev = \{h[z] \times g[(t - z\sqrt{\epsilon 0}\,\sqrt{\mu 0})], 0, 0\}$

Out[•]= $\{e^{-\frac{K2\,\epsilon 0\,\mu 0}{2 z}}\, K3\, g[t - z\sqrt{\epsilon 0}\,\sqrt{\mu 0}], 0, 0\}$

In[•]:= mv = (1/Sqrt[$\mu$0]) * Sqrt[$\epsilon$0] *
$\{0, h[z] \times g[(t - z\sqrt{\epsilon 0}\,\sqrt{\mu 0})], 0\}$

Out[•]= $\left\{0, \frac{e^{-\frac{K2\,\epsilon 0\,\mu 0}{2 z}}\, K3\,\sqrt{\epsilon 0}\, g[t - z\sqrt{\epsilon 0}\,\sqrt{\mu 0}]}{\sqrt{\mu 0}}, 0\right\}$

In[•]:= $g2 = \left\{0, 0, \frac{-K2}{z^2}\right\}$

Out[•]= $\left\{0, 0, -\frac{K2}{z^2}\right\}$

In[•]:= $Intensity = \frac{1}{2}\left(\epsilon 0\,(Dot[ev, ev]) + \mu 0\,(Dot[mv, mv])\right)$

Out[•]= $\frac{1}{2} 1 \left(e^{-\frac{K2\,\epsilon 0\,\mu 0}{z}}\, K3^2\, \epsilon 0\, g[t - z\sqrt{\epsilon 0}\,\sqrt{\mu 0}]^2 + e^{-\frac{K2\,\epsilon 0\,\mu 0}{z}}\, K3^2\, g[t - z\sqrt{\epsilon 0}\,\sqrt{\mu 0}]^2\, \epsilon 0\right)$

In[•]:= FullSimplify[%]

Out[•]= $\frac{e^{-\frac{K2\,\epsilon 0\,\mu 0}{z}}\, K3^2\, g[t - z\sqrt{\epsilon 0}\,\sqrt{\mu 0}]^2\, 1\, (\epsilon 0 + \epsilon 0)}{2}$

In[•]:= Div[ev]

Out[•]= 0

In[•]:= Div[mv]

Out[•]= 0

In[•]:= FullSimplify[%]

Out[•]= 0

In[ ]:= term1a = D[Cross[ev, mv], t]

Out[ ]= $\left\{0,\ 0,\ \frac{2\, e^{-\frac{K2\, \epsilon 0\, \mu 0}{z}}\, K3^2\, \sqrt{\epsilon 0}\, g\left[t - z\, \sqrt{\epsilon 0}\, \sqrt{\mu 0}\right] g'\left[t - z\, \sqrt{\epsilon 0}\, \sqrt{\mu 0}\right]}{\sqrt{\mu 0}}\right\}$

$$\text{term1} = -\frac{1}{c^2}\frac{\partial(\overline{E} \times \overline{H})}{\partial t}$$

In[ ]:= term1 = ((−ϵ0)∗μ0)∗D[Cross[ev, mv], t]

Out[ ]= $\left\{0,\ 0,\ -2\, e^{-\frac{K2\, \epsilon 0\, \mu 0}{z}}\, K3^2\, \epsilon 0^{3/2}\, \sqrt{\mu 0}\, g\left[t - z\, \sqrt{\epsilon 0}\, \sqrt{\mu 0}\right] g'\left[t - z\, \sqrt{\epsilon 0}\, \sqrt{\mu 0}\right]\right\}$

$$\text{term2} = \varepsilon_0\, \overline{E}\, (\nabla . \overline{E})$$

In[ ]:= term2 = ϵ0∗ev∗Div[ev]

Out[ ]= {0, 0, 0}

$$\text{term3} = -\varepsilon_0\, \overline{E} \times (\nabla \times \overline{E})$$

In[ ]:= term3 = (−ϵ0)∗Cross[ev, Curl[ev]]

Out[ ]= $\left\{0,\ 0,\ -\epsilon 0 \left(\frac{e^{-\frac{K2\, \epsilon 0\, \mu 0}{z}}\, K2\, K3^2\, \epsilon 0\, \mu 0\, g\left[t - z\, \sqrt{\epsilon 0}\, \sqrt{\mu 0}\right]^2}{2\, z^2} - e^{-\frac{K2\, \epsilon 0\, \mu 0}{z}}\, K3^2\, \sqrt{\epsilon 0}\, \sqrt{\mu 0}\, g\left[t - z\, \sqrt{\epsilon 0}\, \sqrt{\mu 0}\right] g'\left[t - z\, \sqrt{\epsilon 0}\, \sqrt{\mu 0}\right]\right)\right\}$

$$\text{term4} = \mu_0\, \overline{H}\, (\nabla . \overline{H})$$

In[ ]:= term4 = μ0∗mv∗Div[mv]

Out[ ]= {0, 0, 0}

$$\text{term5} = -\mu_0\, \overline{H} \times (\nabla \times \overline{H})$$

In[ ]:= term5 = (−μ0)∗Cross[mv, Curl[mv]]

Out[ ]= $\left\{0,\ 0,\ -\mu 0 \left(\frac{e^{-\frac{K2\, \epsilon 0\, \mu 0}{z}}\, K2\, K3^2\, \epsilon 0^2\, g\left[t - z\, \sqrt{\epsilon 0}\, \sqrt{\mu 0}\right]^2}{2\, z^2} - \frac{e^{-\frac{K2\, \epsilon 0\, \mu 0}{z}}\, K3^2\, \epsilon 0^{3/2}\, g\left[t - z\, \sqrt{\epsilon 0}\, \sqrt{\mu 0}\right] g'\left[t - z\, \sqrt{\epsilon 0}\, \sqrt{\mu 0}\right]}{\sqrt{\mu 0}}\right)\right\}$

$$\text{term6} = -\frac{1}{2}\left(\varepsilon^2\mu\left(\overline{E}\cdot\overline{E}\right) + \varepsilon\,\mu^2\left(\overline{H}\cdot\overline{H}\right)\right)\overline{g}$$

In[ ]:= term6 = $-\left(\frac{\epsilon0^2\,\mu0}{2}\,\text{Dot[ev, ev]} + \frac{\epsilon0\,\mu0^2}{2}\,\text{Dot[mv, mv]}\right)$g2

Out[ ]= $\left\{0,\,0,\,\frac{e^{-\frac{K2\,\epsilon0\,\mu0}{z}}\,K2\,K3^2\,\epsilon0^2\,\mu0\,g\left[t - z\sqrt{\epsilon0}\,\sqrt{\mu0}\right]^2}{z^2}\right\}$

In[ ]:= vergelijking = term1 + term2 + term3 + term4 + term5 + term6

Out[ ]= $\left\{0,\,0,\,\frac{e^{-\frac{K2\,\epsilon0\,\mu0}{z}}\,K2\,K3^2\,\epsilon0^2\,\mu0\,g\left[t - z\sqrt{\epsilon0}\,\sqrt{\mu0}\right]^2}{z^2} - 2\,e^{-\frac{K2\,\epsilon0\,\mu0}{z}}\,K3^2\,\epsilon0^{3/2}\sqrt{\mu0}\,g\left[t - z\sqrt{\epsilon0}\,\sqrt{\mu0}\right]g'\left[t - z\sqrt{\epsilon0}\,\sqrt{\mu0}\right] - \mu0\left(\frac{e^{-\frac{K2\,\epsilon0\,\mu0}{z}}\,K2\,K3^2\,\epsilon0^2\,g\left[t - z\sqrt{\epsilon0}\,\sqrt{\mu0}\right]^2}{2\,z^2} - \frac{e^{-\frac{K2\,\epsilon0\,\mu0}{z}}\,K3^2\,\epsilon0^{3/2}\,g\left[t - z\sqrt{\epsilon0}\,\sqrt{\mu0}\right]g'\left[t - z\sqrt{\epsilon0}\,\sqrt{\mu0}\right]}{\sqrt{\mu0}}\right) - \epsilon0\left(\frac{e^{-\frac{K2\,\epsilon0\,\mu0}{z}}\,K2\,K3^2\,\epsilon0\,\mu0\,g\left[t - z\sqrt{\epsilon0}\,\sqrt{\mu0}\right]^2}{2\,z^2} - e^{-\frac{K2\,\epsilon0\,\mu0}{z}}\,K3^2\sqrt{\epsilon0}\,\sqrt{\mu0}\,g\left[t - z\sqrt{\epsilon0}\,\sqrt{\mu0}\right]g'\left[t - z\sqrt{\epsilon0}\,\sqrt{\mu0}\right]\right)\right\}$

In[ ]:=

# The electromagnetic force density in the x - direction equals :

In[ ]:= xvergelijking = term1[[1]] + term2[[1]] + term3[[1]] + term4[[1]] + term5[[1]] + term6[[1]]

Out[ ]= 0

In[ ]:= FullSimplify[%]

Out[ ]= 0

In[ ]:= xvergelijking1 = %

Out[ ]= 0

In[ ]:=

# The electromagnetic force density in the y - direction equals :

In[ ]:= yvergelijking = term1[[2]] + term2[[2]] + term3[[2]] + term4[[2]] + term5[[2]] + term6[[2]]

Out[ ]= 0

In[ ]:= FullSimplify[%]

Out[ ]= 0

In[ ]:= yvergelijking1 = %

Out[ ]= 0

# The electromagnetic force density in the z - direction equals :

In[ ]:= zvergelijking = term1⟦3⟧ + term2⟦3⟧ + term3⟦3⟧ + term4⟦3⟧ + term5⟦3⟧ + term6⟦3⟧

Out[ ]=
$$\frac{e^{-\frac{K2\,\epsilon 0\,\mu 0}{z}}\,K2\,K3^2\,\epsilon 0^2\,\mu 0\,g\left[t - z\sqrt{\epsilon 0}\sqrt{\mu 0}\right]^2}{z^2} - 2\,e^{-\frac{K2\,\epsilon 0\,\mu 0}{z}}\,K3^2\,\epsilon 0^{3/2}\sqrt{\mu 0}\,g\left[t - z\sqrt{\epsilon 0}\sqrt{\mu 0}\right]\,g'\left[t - z\sqrt{\epsilon 0}\sqrt{\mu 0}\right] - \mu 0\left(\frac{e^{-\frac{K2\,\epsilon 0\,\mu 0}{z}}\,K2\,K3^2\,\epsilon 0^2\,g\left[t - z\sqrt{\epsilon 0}\sqrt{\mu 0}\right]^2}{2\,z^2} - \frac{e^{-\frac{K2\,\epsilon 0\,\mu 0}{z}}\,K3^2\,\epsilon 0^{3/2}\,g\left[t - z\sqrt{\epsilon 0}\sqrt{\mu 0}\right]\,g'\left[t - z\sqrt{\epsilon 0}\sqrt{\mu 0}\right]}{\sqrt{\mu 0}}\right) - \epsilon 0\left(\frac{e^{-\frac{K2\,\epsilon 0\,\mu 0}{z}}\,K2\,K3^2\,\epsilon 0\,\mu 0\,g\left[t - z\sqrt{\epsilon 0}\sqrt{\mu 0}\right]^2}{2\,z^2} - e^{-\frac{K2\,\epsilon 0\,\mu 0}{z}}\,K3^2\sqrt{\epsilon 0}\sqrt{\mu 0}\,g\left[t - z\sqrt{\epsilon 0}\sqrt{\mu 0}\right]\,g'\left[t - z\sqrt{\epsilon 0}\sqrt{\mu 0}\right]\right)$$

In[ ]:= FullSimplify[%]

Out[ ]= 0

In[ ]:= zvergelijking1 = %

Out[ ]= 0

Results for the electromagentic force densities in resp x-direction, y-direction, z-direction:

In[ ]:= xvergelijking1

Out[ ]= 0

In[ ]:= yvergelijking1

Out[ ]= 0

In[ ]:=

Out[ ]= 0

# According the force-density equations in the x-direction, y-direction and z-direction, the resulting electromagnetic force density equals zero in every direction. This represents the solution for equation

(73) on page 47.
It follows from the mathematical solution for the electromagnetic field:

$$\text{ev} = e^{-\frac{K2\ \epsilon0\,\mu0}{z}}\ g\left[e^{-\frac{K2\ \epsilon0\,\mu0}{2z}}\left(t - z\sqrt{\epsilon0}\ \sqrt{\mu0}\right)\right]$$

that the intensity increases with the value:

$$\text{Intensity} = \frac{1}{2}\left(\epsilon0\,(\text{Dot}[\text{ev},\ \text{ev}]) + \mu0\,(\text{Dot}[\text{mv},\ \text{mv}])\right) =$$

$$= e^{-\frac{K2\ \epsilon0\,\mu0}{z}}\ \epsilon0\ g\left[e^{-\frac{K2\ \epsilon0\,\mu0}{2z}}\left(t - z\sqrt{\epsilon0}\ \sqrt{\mu0}\right)\right]^2$$

The Electromagnetic Energy Intensity is proportional to: $e^{-\frac{K2\ \epsilon0\,\mu0}{z}}$ along the
distance z in the direction opposite to the z-direction of the gravitational field.

The frequency is proportional to the energy density (***book: Equation 98 Page 55***) and the wavelength is inversely proportional to the energy. The speed of light remains constant in a gravitational field.

Within a Gravitational Field $\frac{K2}{z^2}$ The observed Cosmological Redshift will be:

$$\omega_{\text{NLGR}} = \omega_0\ e^{-\frac{K2\ \epsilon0\,\mu0}{z}}\ \sqrt{\frac{1 + \frac{v}{c}}{1 - \frac{v}{c}}}$$

The term $\left(\frac{\Delta\omega}{\omega} = e^{-\frac{K2\ \epsilon0\,\mu0}{z}}\right)$

has been presented in generally as a ***GRS*** Redshift comparable with the Doppler Shift
generated by a velocity $v_{\text{Doppler}}$ :

$$v_{\text{Doppler}} = c \, \frac{\Delta\omega}{\omega} \, [\text{m } s^{-1}] = c \, e^{-\frac{K2 \, \epsilon 0 \, \mu 0}{z}}$$

There are two types of ***GRS*** generated by the sun.

1) GRS generated inside the sun where the gravitational field is proportional to the radial distance z

g[z] = K1 z with the Solution:

$$v_{\text{Doppler}-1} = c \, \frac{\Delta\omega}{\omega} \, [\text{m } s^{-1}] = c \, e^{-\frac{1}{4} K1 \, z^2 \, \mu_0 \, \varepsilon_0}$$

(***book, page 64, Equation (111)***)

2) GRS generated outside the sun where the gravitational field is proportional
to the radial distance $\frac{1}{z^2}$
g[z] = K2 $\frac{1}{z^2}$ with the Solution:

$$v_{\text{Doppler}-2} = c \, \frac{\Delta\omega}{\omega} \, [\text{m } s^{-1}] = c \, e^{-\frac{K2 \, \epsilon 0 \, \mu 0}{z}}$$

(***book, page 64, Equation (111)***)

In[ ]:= Intensity = $-\frac{1}{2}$ (ϵ0 (Dot[ev, ev]) + μ0 (Dot[mv, mv]))

Out[ ]= $-\frac{1}{2} 1 \left( e^{-\frac{K2 \, \epsilon 0 \, \mu 0}{z}} K3^2 \, \epsilon 0 \, g\left[t - z \sqrt{\epsilon 0} \sqrt{\mu 0}\right]^2 + e^{-\frac{K2 \, \epsilon 0 \, \mu 0}{z}} K3^2 \, g\left[t - z \sqrt{\epsilon 0} \sqrt{\mu 0}\right]^2 \epsilon 0 \right)$

In[ ]:= FullSimplify[%]

Out[ ]= $-\frac{e^{-\frac{K2 \, \epsilon 0 \, \mu 0}{z}} K3^2 \, g\left[t - z \sqrt{\epsilon 0} \sqrt{\mu 0}\right]^2 1 \, (\epsilon 0 + \epsilon 0)}{2}$

2) GRS generated outside the sun where the gravitational field is proportional
to the radial distance $\frac{1}{z^2}$
g[z] = K2 $\frac{1}{z^2}$ with the Solution:

$$v_{\text{Doppler}-2} = c \, \frac{\Delta\omega}{\omega} \, [\text{m } s^{-1}] = c \, e^{-\frac{K2 \, \epsilon 0 \, \mu 0}{z}}$$

(***book, page 64, Equation (111)***)

$$v_{\text{Doppler}-1} = c\,\frac{\Delta\omega}{\omega}\,[\text{m}\,s^{-1}] = c\,e^{-\frac{K2\,\epsilon 0\,\mu 0}{z2}} - c\,e^{-\frac{K2\,\epsilon 0\,\mu 0}{z1}}$$

With:

$z_1 =$ Radius of the sun

$z_2 =$ Distance between the sun and the Earth

In[∘]:= $c = 3\times 10^{8}$

Out[∘]= 300 000 000

In[∘]:= $\epsilon 0 = 8.85\times 10^{-12}$

Out[∘]= $8.85\times 10^{-12}$

In[∘]:= $\mu 0 = 4\,\pi\,10^{-7}$

Out[∘]= $\frac{\pi}{2\,500\,000}$

In[∘]:= $fg = 6.67428\times 10^{-11}$

Out[∘]= $6.67428\times 10^{-11}$

In[∘]:= $Msun = 1.98892\;10^{30}$

Out[∘]= $1.98892\times 10^{30}$

In[∘]:= MSiriusB = 1.018 Msun

Out[∘]= $2.02472\times 10^{30}$

In[∘]:= $R_{Sun} = 69\,634\,000$

Out[∘]= 69 634 000

In[∘]:= $R_{SiriusB} = 1.711\,R_{Sun}$

Out[∘]= $1.19144\times 10^{8}$

In[∘]:= $Lightyear = 9.461\times 10^{15}$

Out[∘]= $9.461\times 10^{15}$

In[∘]:= z2 = 8.611 Lightyear

Out[∘]= $8.14687\times 10^{16}$

In[∘]:= $K2 = \frac{fg\;MSiriusB}{4\,\pi}$

Out[∘]= $1.07537\times 10^{19}$

In[∘]:= $z1 = 0.0063875\,R_{Sun}$

Out[∘]= 444 787.

The distance between Sirius and Earth equals z2

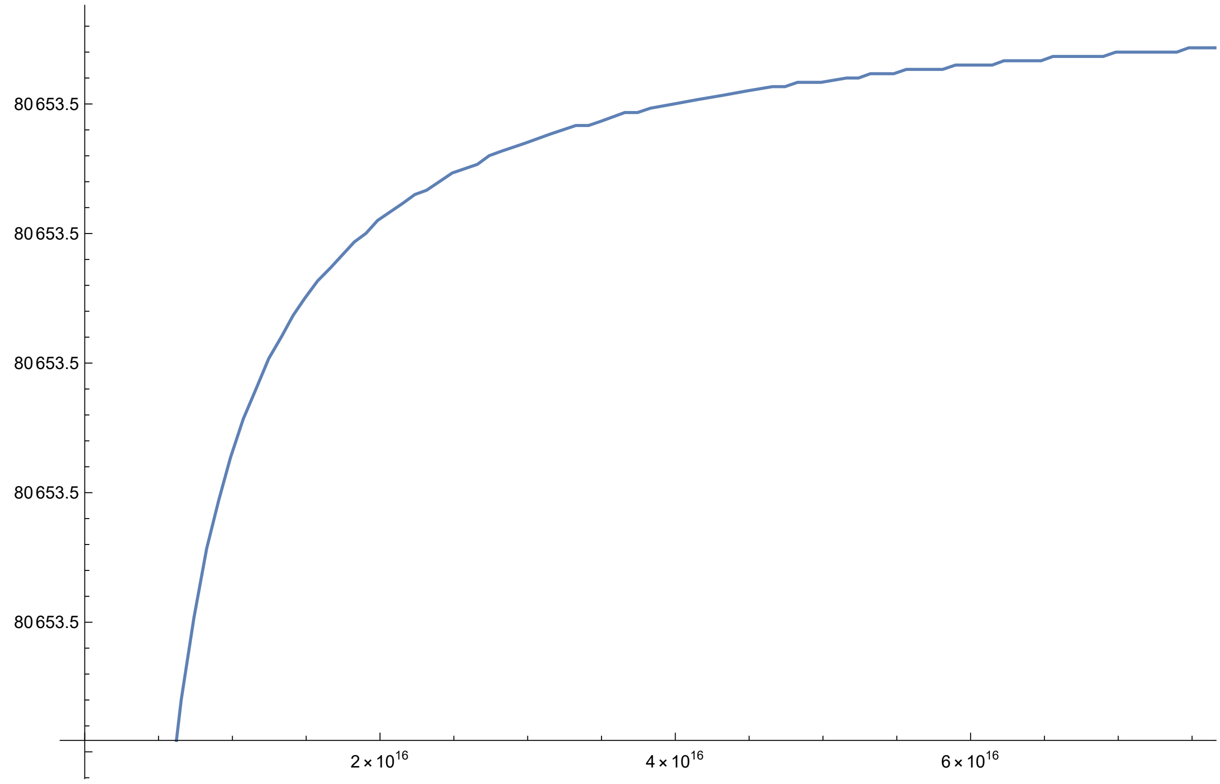
In[ ]:= z2 = 8.611 Lightyear

Out[ ]= $8.14687 \times 10^{16}$

# The Gravitational RedShift from the “Intense Emitting Radiation Radius z1” of Sirius has been presented below :

In[ ]:= $\text{Plot}\left[c\left(e^{-\frac{K2\ \epsilon0\ \mu0}{z}} - e^{-\frac{K2\ \epsilon0\ \mu0}{z1}}\right), \{z, z1, z2\}\right]$

Out[ ]=




In[ ]:= $v_{Doppler} = c\left(e^{-\frac{K2\ \epsilon0\ \mu0}{z2}} - e^{-\frac{K2\ \epsilon0\ \mu0}{z1}}\right)$

Out[ ]= 80 653.5

The calculated value of 80.653 k[m/s] for the Gravitaional Redshift for Sirius corresponds

to the measured average value for the ***GRS*** for Sirius of = 80.65 + /−0.77 km/s.

published in :

***The gravitational redshift of Sirius B***