```
(%i1)  kill(all);
(%o0)  done
```

1 Eq.(1)

```
(%i1)  ds2: c^2*dt^2-dr^2-r^2*dphi_1^2;
(ds2)  -dphi_1^2 r^2+c^2 dt^2-dr^2

(%i2)  dphi_1: dphi+omega*dt;
(dphi_1)  dt ω+dphi
```

2 Eq.(4)

```
(%i3)  ds2_a: ev(ds2);
(ds2_a)  -(dt ω+dphi)^2 r^2+c^2 dt^2-dr^2
```

3 Eq.(6)

```
(%i4)  ds2_b: (1-v^2/c^2)*(c^2*dt^2-2*r^2*Omega*dphi*dt)-(dr^2+r^2*dphi^2);
(ds2_b)  (c^2 dt^2-2 Ω dphi dt r^2) (1-v^2/c^2)-dphi^2 r^2-dr^2

(%i5)  Omega: omega*(1-v^2/c^2)^-1;
(Omega)  ω/(1-v^2/c^2)

(%i6)  ev(ds2_b);
(%o6)  (1-v^2/c^2) (c^2 dt^2-2 dphi dt ω r^2/(1-v^2/c^2))-dphi^2 r^2-dr^2

(%i7)  d: ratsimp(ev(ds2_a)-ev(ds2_b));
(d)  dt^2 v^2-dt^2 ω^2 r^2
```

3.1 with definition of omega from (8):

```
(%i8)  ev(d, [v=omega*r]);
(%o8)  0
```

4 Einstein Metrics

```
(%i9)  Delta_phi: 2*%pi*(1/sqrt(m(r,t)-v^2/c^2)-1);
(Delta_phi)  2 π (1/sqrt(m(r, t)-v^2/c^2)-1)

(%i11)  c: 1; v:0.5;
(c)  1
(v)  0.5
```

Flat space

```
(%i13)  m(r,t):=1;
        D_phi_1: ev(Delta_phi);
(%o12)  m(r, t):=1
(D_phi_1)  0.3094010767585034 π
```

Schwarzschild

```
(%i15)  m(r,t):=1-1/r;
        D_phi_2: ev(Delta_phi);
(%o14)  m(r, t):=1-1/r
(D_phi_2)  2 π (1/sqrt(0.75-1/r)-1)
```

Kerr-Newman and Reissner-Nordstrom

```
(%i17)  m(r,t):=1-1/r+1/r^2;
        D_phi_3: ev(Delta_phi);
```

(%o16) $$m(r,t):=1-\frac{1}{r}+\frac{1}{r^2}$$

(D_phi_3) $$2\pi\left(\frac{1}{\sqrt{-\frac{1}{r}+\frac{1}{r^2}+0.75}}-1\right)$$

Einstein-Rosen, Reissner-Weyl

```
(%i19)  m(r,t):=1-1/r-1/r^2;
        D_phi_4: ev(Delta_phi);
```

(%o18) $$m(r,t):=1-\frac{1}{r}+\frac{-1}{r^2}$$

(D_phi_4) $$2\pi\left(\frac{1}{\sqrt{-\frac{1}{r}-\frac{1}{r^2}+0.75}}-1\right)$$

Static de-Sitter

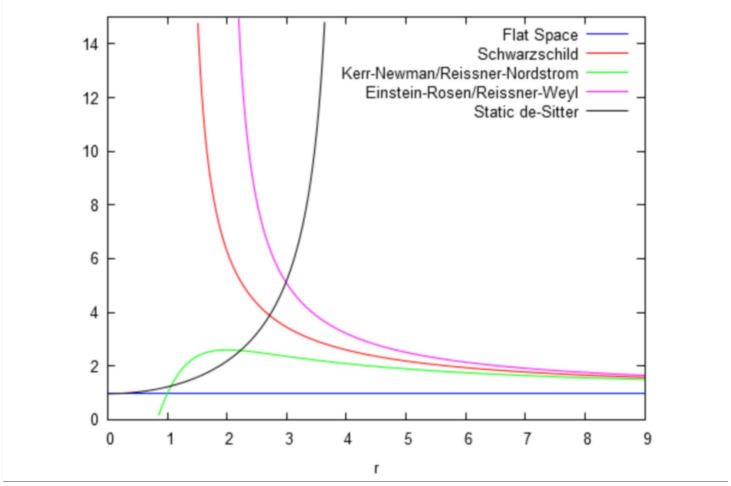
```
(%i21)  m(r,t):=1-0.05*r^2;
        D_phi_5: ev(Delta_phi);
```

(%o20) $$m(r,t):=1-0.05\,r^2$$

(D_phi_5) $$2\pi\left(\frac{1}{\sqrt{0.75-0.05\,r^2}}-1\right)$$

```
(%i22)  wxplot2d([D_phi_1,D_phi_2,D_phi_3,D_phi_4,D_phi_5], [r,0.,9], [y,0,15],
        [legend, "Flat Space", "Schwarzschild",
            "Kerr-Newman/Reissner-Nordstrom", "Einstein-Rosen/Reissner-Weyl",
            "Static de-Sitter"])$
 plot2d: expression evaluates to non-numeric value somewhere in plottin
g range.
plot2d: some values were clipped.
plot2d: expression evaluates to non-numeric value somewhere in plo
tting range.
plot2d: some values were clipped.
plot2d: expression evaluates to non-numeric
 value somewhere in plotting range.
plot2d: some values were clipped.
plot2d: expression evaluates to non-numeric value somewhere i
n plotting range.
plot2d: some values were clipped.
```

(%t22)



```
(%i23)  plot2d([D_phi_1,D_phi_2,D_phi_3,D_phi_4,D_phi_5], [r,0.,9], [y,0,15],
        [legend, "Flat Space", "Schwarzschild",
            "Kerr-Newman/Reissner-Nordstrom", "Einstein-Rosen/Reissner-Weyl",
            "Static de-Sitter"],
            [gnuplot_term, "png linewidth 2 font 'Arial' 16 size 800,600"],
            [gnuplot_out_file, "D:/Doc/Artikel-Eck/ECE-Theorie/Paper408/Fig1.png"])$
 plot2d: expression evaluates to non-numeric value somewhere in plot
ting range.
plot2d: some values were clipped.
plot2d: expression evaluates to non-numeric value somewhere in plotting range.
plot2d: some values were clipped.
plot2d: expression evaluates to non-numeri
c value somewhere in plotting range.
plot2d: some values were clipped.
plot2d: expression evaluates to non-numeric value somewhere in plotting range.
plot2d: some values were clipped.
```