martians.ipynb

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[7]:
```
import numpy as np
```

1. Reduction of intensity due to Rayleigh scattering:

[35]:
```
x = 150e3 # atmospheric depth in meters
n = 1.0003 # index of refraction
N = 3e19*100**3 # atmospheric density in mol per meter cubed
lam = 450e-9 # wavelength in meters

beta = 32*np.pi**3*(n-1)**2/(3*N*lam**4)

I0 = 1.0 # initial intensity

I = I0 * np.exp(-beta*x)
I
```

[35]:
```
0.026530776201707518
```

2. Angular size of Mars at opposition in steradians

[48]:
```
d = 62e6 # distance to Mars in km
R = 3389 # radius of Mars in km

Omega_mars = 2*np.pi*(1-np.sqrt(d**2-R**2)/d)
Omega_mars
```

[48]:
```
9.386628434947786e-09
```

3. Angular size of beam in steradians

[52]:
```
theta = 1.5/1000 # beam divergence in rad

Omega_beam = np.pi*(theta/2)**2
Omega_beam
```

[52]:
```
1.7671458676442586e-06
```

4. Intensity of laser beam on Martian surface in Watts/km^2

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