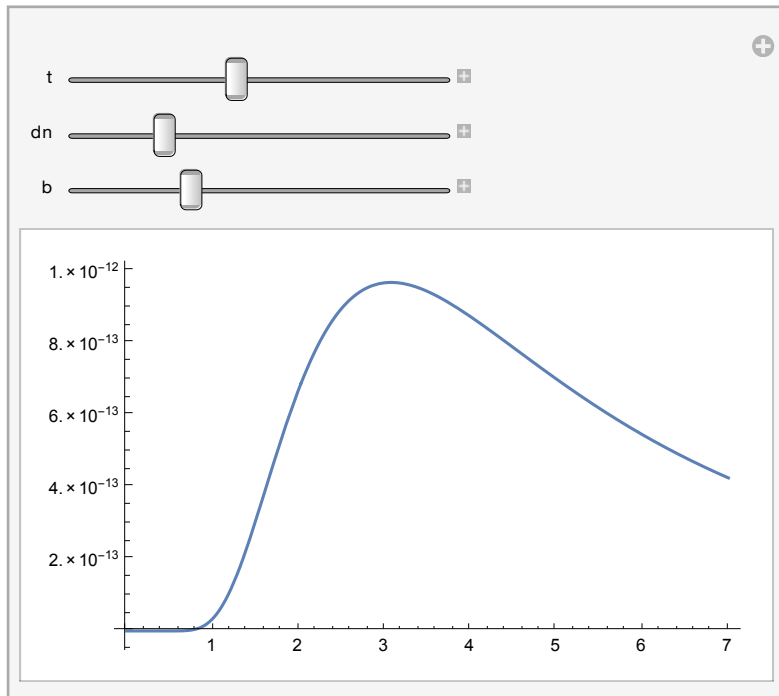


Dust Modeling Function

In[1]:= `dust[x_, t_, dn_, b_] := $\left(\frac{dn}{x^4} \frac{1}{E^{\frac{1.4388 \cdot 10^4}{t \cdot x}} - 1} \right) * x^b$`

In[2]:= `Manipulate[Plot[dust[x, t, dn, b], {x, 0, 7}], {{t, 1300}, 1, 3000, 1},
{ {dn, 2.2 * 10^-9}, 0, 1 * 10^-8, 1 * 10^-10}, {{b, .3}, 0, 1, .01}]`

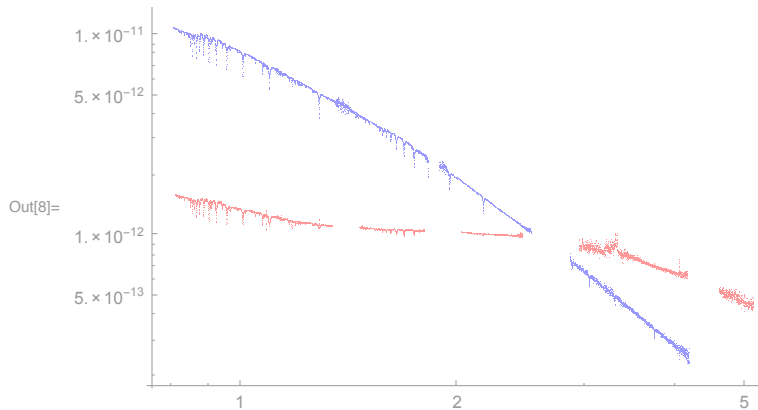
Out[2]=



Import Data

```
listTarget = Import["/Path/to/the/target/star/data.csv"];
listStandard = Import["/Path/to/the/standard/star/data.csv"];
```

```
ListLogLogPlot[{listTarget, listStandard},
  PlotStyle → {Red, Blue}, PlotRange → All]
```

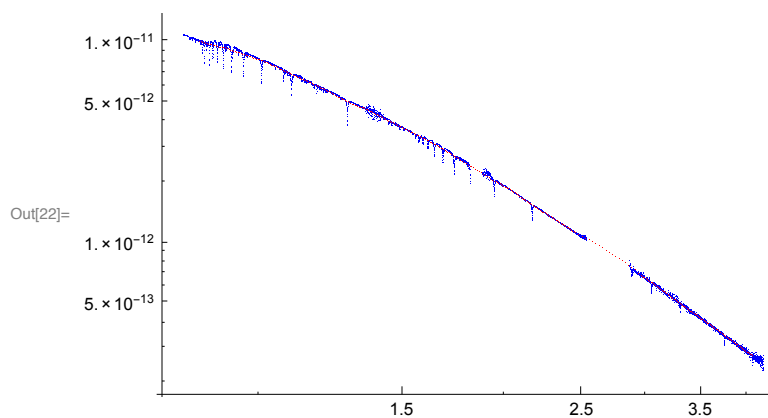


Create the standard model

Smooth the standard data

```
In[16]:= sdata = Drop[listStandard, {1, Length[listStandard], 2}];
sdata = Drop[sdata, {1, Length[sdata], 2}];
sdata = Drop[sdata, {1, Length[sdata], 2}];
sdata = Drop[sdata, {1, Length[sdata], 2}];
Length[sdata]
sdata = MovingAverage[sdata, 20];
ListLogLogPlot[{listStandard, sdata}, PlotStyle → {Blue, Red}]
```

Out[20]= 397



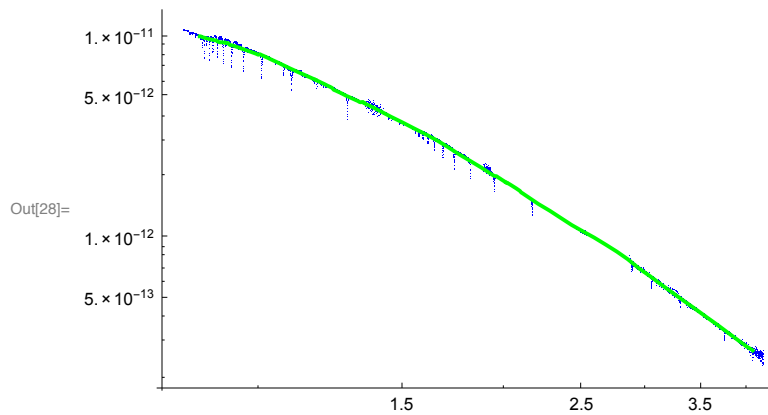
Create the interpolating

```

In[23]:= Clear[standardFunction]
standardFunction = Interpolation[sdata]
xmin = standardFunction["Domain"][[1, 1]];
xmax = standardFunction["Domain"][[1, 2]];
sfPlot =
  LogLogPlot[standardFunction[x], {x, xmin, xmax}, PlotStyle -> {Thick, Green}];
Show[ListLogLogPlot[{listStandard, sdata}, PlotStyle -> {Blue, Red}], sfPlot]

```

Out[24]= InterpolatingFunction[  Domain: {{0.843, 4.05}}
Output: scalar]



Create the target model

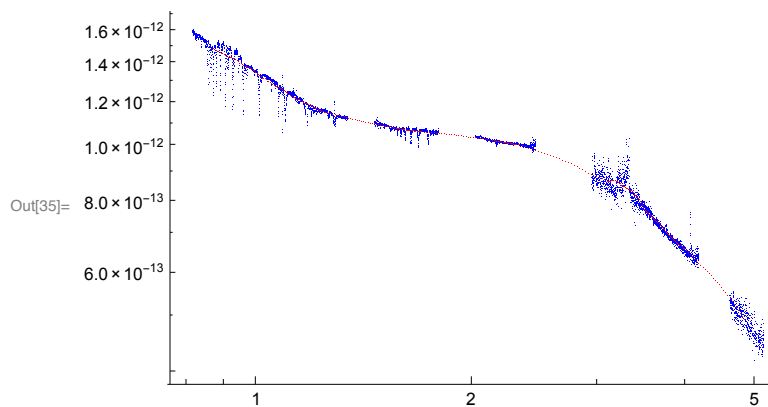
Smooth the target data

```

In[29]:= tdata = Drop[listTarget, {1, Length[listTarget], 2}];
tdata = Drop[tdata, {1, Length[tdata], 2}];
tdata = Drop[tdata, {1, Length[tdata], 2}];
tdata = Drop[tdata, {1, Length[tdata], 2}];
Length[tdata]
tdata = MovingAverage[tdata, 30];
p1 = ListLogLogPlot[{listTarget, tdata}, PlotStyle -> {Blue, Red}]

```

Out[33]= 355



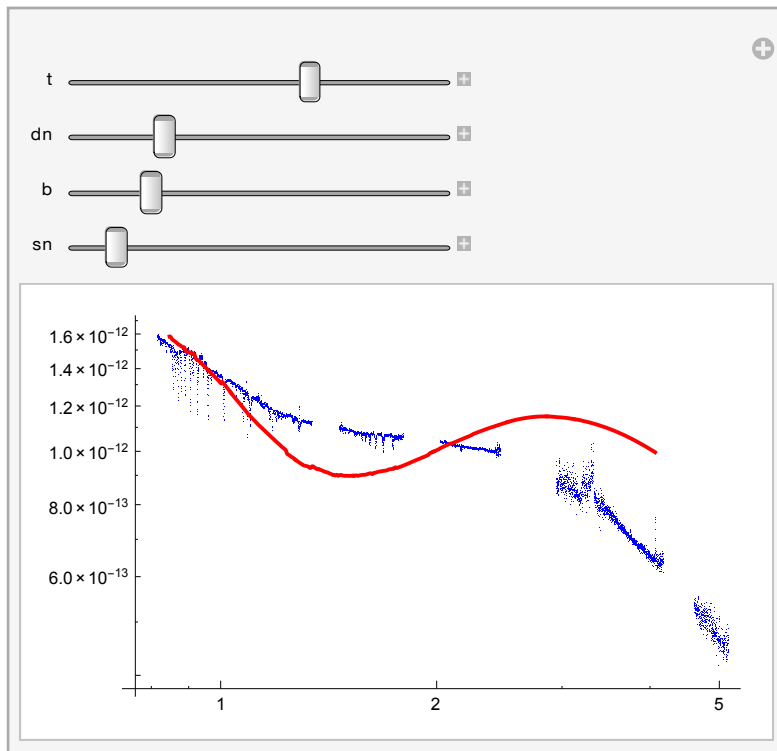
Create the function to fit

```
In[36]:= model[x_, t_, dn_, b_, sn_] := (standardFunction[x] * sn) + dust[x, t, dn, b];
model[1, 1300, 2.2 * 10-9, .3, .15] // N (*Test*)
```

Out[37]= 1.26236×10^{-12}

```
In[38]:= Manipulate[
  plot1 = LogLogPlot[model[x, t, dn, b, sn],
    {x, xmin, xmax}, PlotStyle → {Red, Thick}, PlotRange → All];
  plot2 = ListLogLogPlot[listTarget, PlotStyle → Blue, PlotRange → All];
  Show[plot2, plot1, PlotRange → All],
  {{t, 1300}, 1, 2000, 1}, {{dn, 2.2 * 10-9}, 0, 1.0 * 10-8, 0.1 * 10-10},
  {{b, .37}, 0, 2, .01}, {{sn, .158}, 0, 2, .001}]
```

Out[38]=



Trim data to keep in range. Without constraints

```
In[46]:= dropAmount = 26;
data = Drop[Drop[tdata, dropAmount], -dropAmount];

fit = FindFit[data, model[x, t, dn, b, sn],
  {{t, 1836}, {dn, 4.0 * 10^-10}, {b, 0.65}, {sn, 0.142}}, x]

plot1 = LogLogPlot[model[x, t, dn, b, sn] /. fit,
  {x, xmin, xmax}, PlotStyle -> {Red, Thick}, PlotRange -> All];
plot2 = ListLogLogPlot[listTarget, PlotStyle -> Blue, PlotRange -> All];
plot3 = ListLogLogPlot[tdata, PlotStyle -> Green, PlotRange -> All];
Show[plot2, plot3, plot1, PlotRange -> All]
```

```
Out[48]= {t -> 1835.21, dn -> 3.70962 * 10^-10, b -> 0.701215, sn -> 0.149287}
```

