Alignment system, effect of not ∞ stiffness

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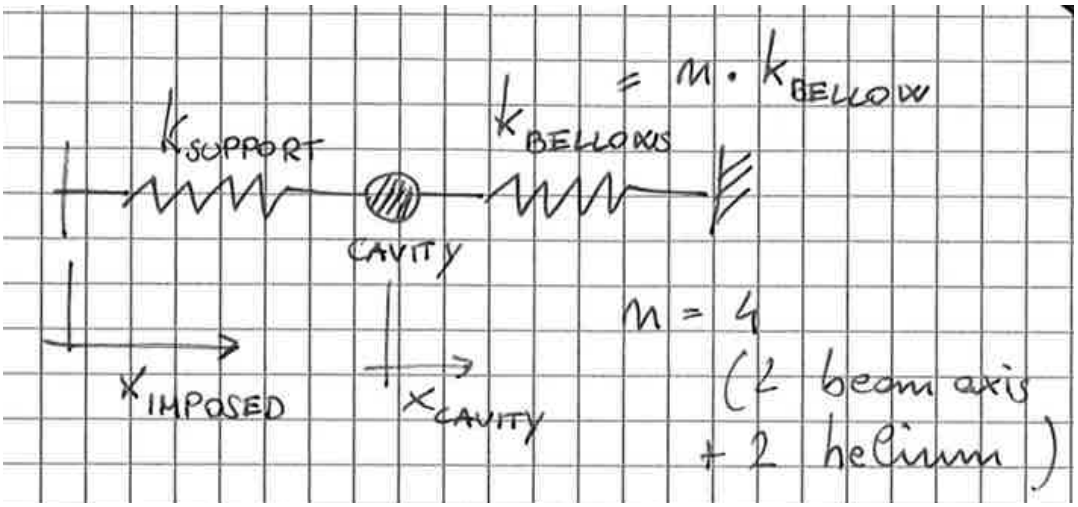
Settings

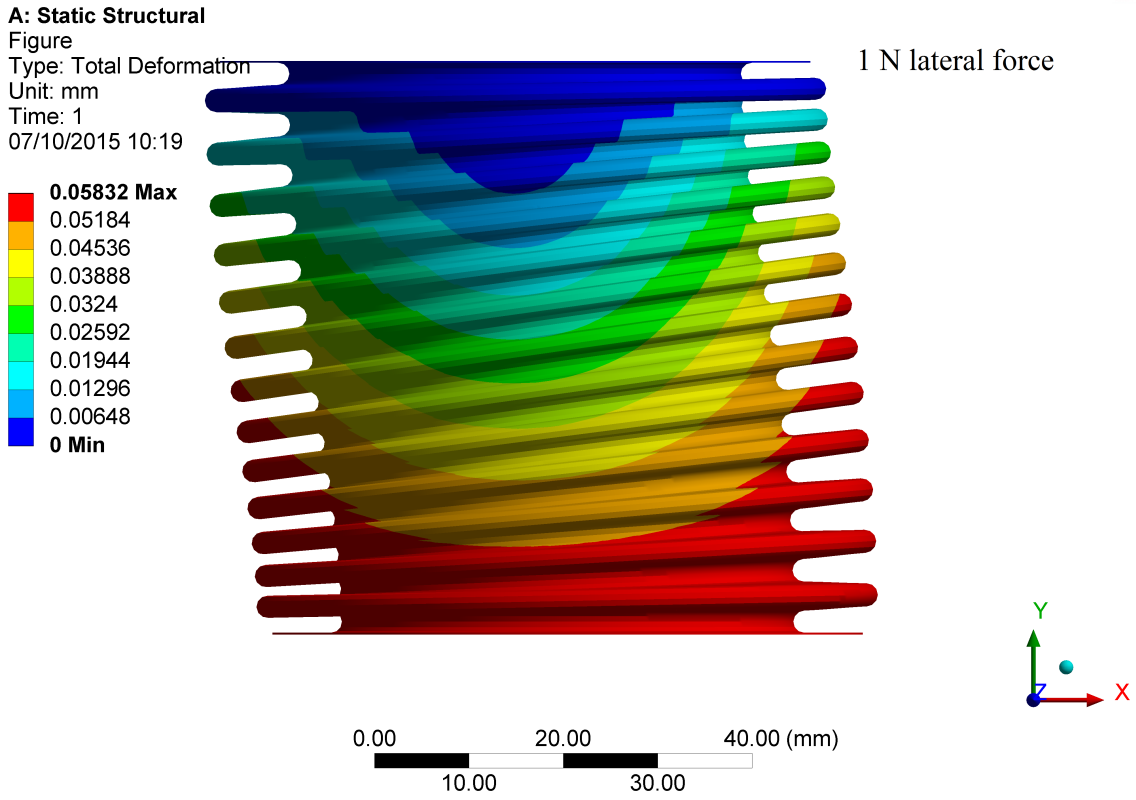
Mathematica

In[21]:=
```
SetOptions[FourierTransform, FourierParameters → {1, -1}];
SetOptions[InverseFourierTransform, FourierParameters → {1, -1}];
SetOptions[Plot, Axes → False, Frame → True, ImageSize → {500, 400},
  GridLines → Automatic, AspectRatio → Full, PlotRange → All,
  BaseStyle → {FontFamily → "TimesNewRoman", FontSize → 18, FontWeight → Bold}];
SetOptions[LogLogPlot, Axes → False, Frame → True, ImageSize → {500, 400},
  GridLines → Automatic, AspectRatio → Full, PlotRange → All,
  BaseStyle → {FontFamily → "TimesNewRoman", FontSize → 18, FontWeight → Bold}];
SetOptions[ListPlot, Axes → False, Joined → True, GridLines → Automatic,
  Frame → True, ImageSize → {600, 500}, AspectRatio → Full, PlotRange → All,
  BaseStyle → {FontFamily → "TimesNewRoman", FontSize → 18, FontWeight → Bold},
  InterpolationOrder → 3];
```

Translation



The lateral stiffness is not available on catalog (depends on the number of waves). The first kb is an estimation from the angular stiffness, the second comes from an FE calculation (but not on the actual bellows).



In[41]:=
```
ks = 680 000;
% "N/m"
nb = 30.;
Lb = 0.02;
kb = 2 × 2 (2 × 180) / (Lb Lb nb π);
% "N/m"
kb = 2 / 0.00005832;
% "N/m"
```

Out[42]= 680 000 N/m

Out[46]= 38 197.2 N/m

Out[48]= 34 293.6 N/m

4 bellows: 2 helium, 2 beam axis (HOM and pickup?)
Check factor 2 in kb (see different constraints in a beam)

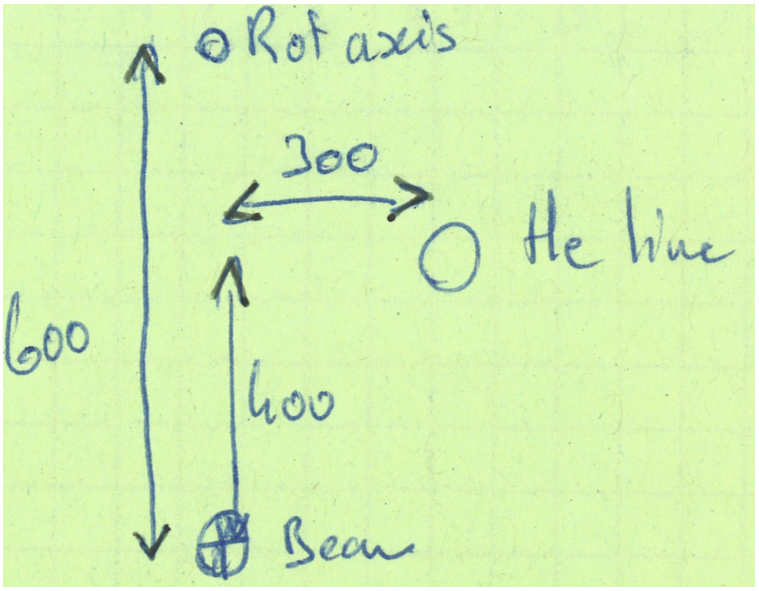
In[34]:=
$$Rk = \frac{ks}{4\,kb + ks}$$

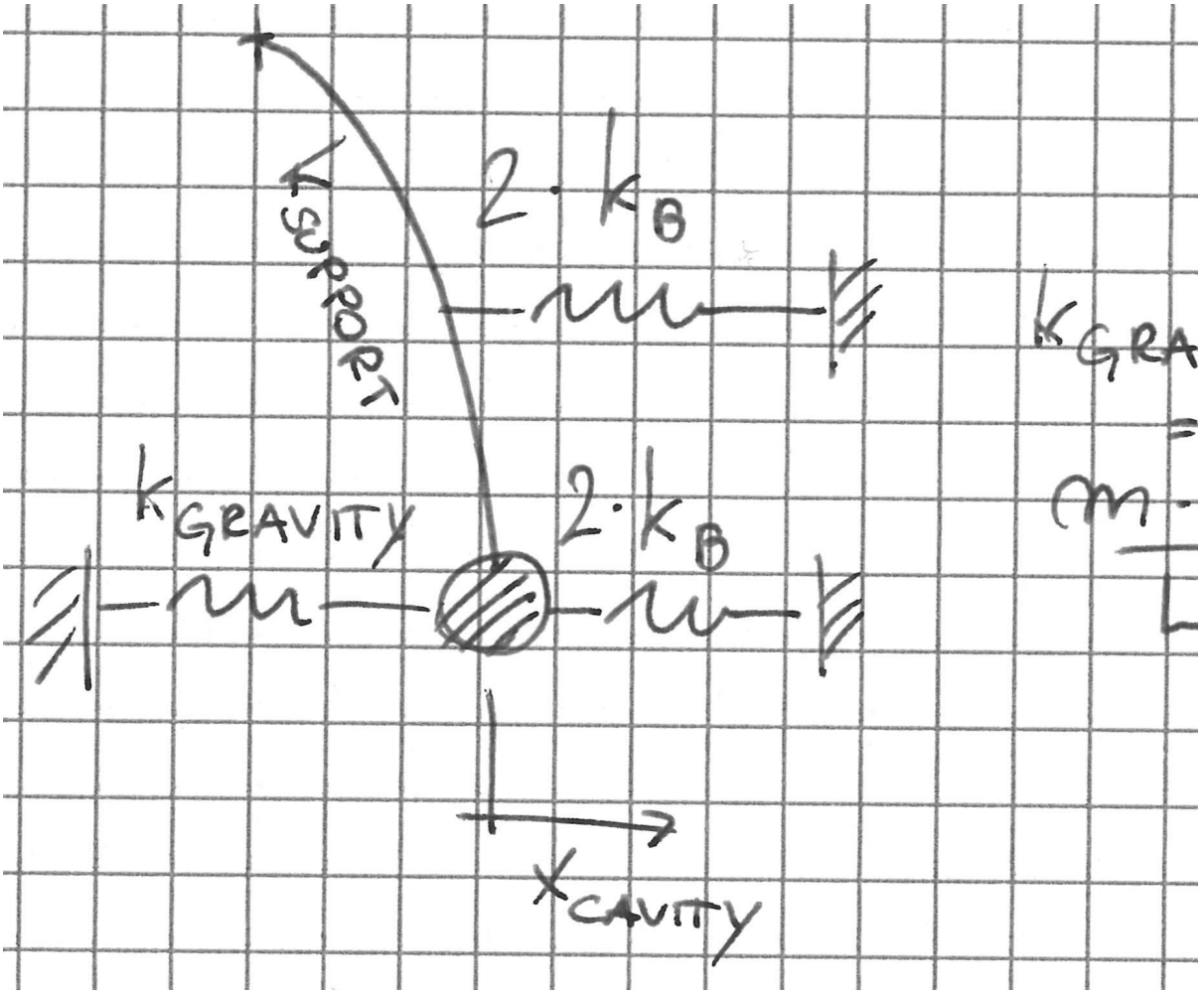
Out[34]= 0.832136

In[35]:=
```
100 (1 - Rk) "%"
```

Out[35]= 16.7864 %

Rotation





In[36]:=
```
m = 300;
L = 0.6;
kg = m 9.806 / L;
```

4 bellows: 2 helium, 2 beam axis (HOM and pickup?)

In[39]:=
$$Rk = \frac{ks}{2\,kb + \frac{200}{600}\,2\,kb + ks + kg}$$

Out[39]= 0.875891

In[40]:= `100 (1 - Rk) "%"`

Out[40]= 12.4109 %