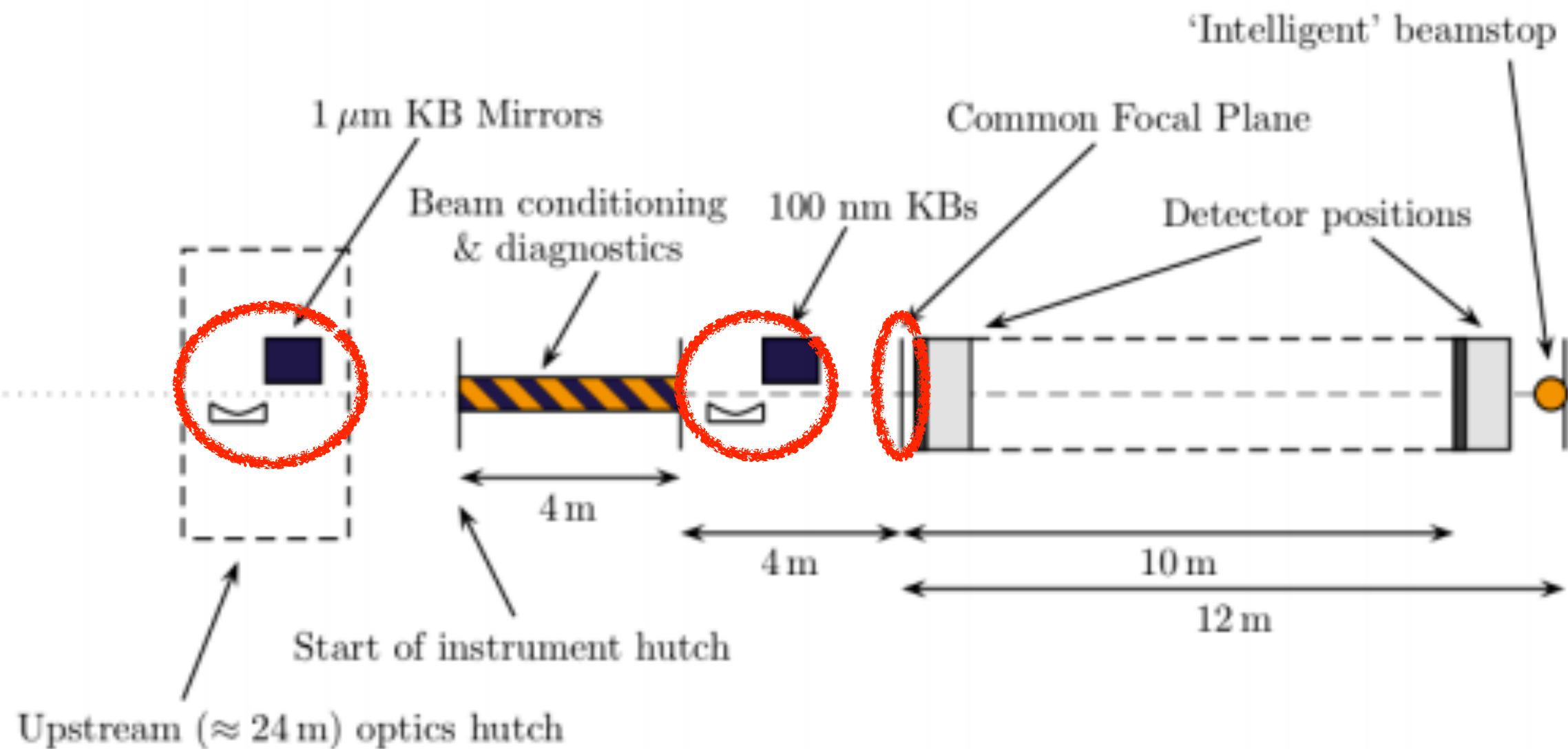
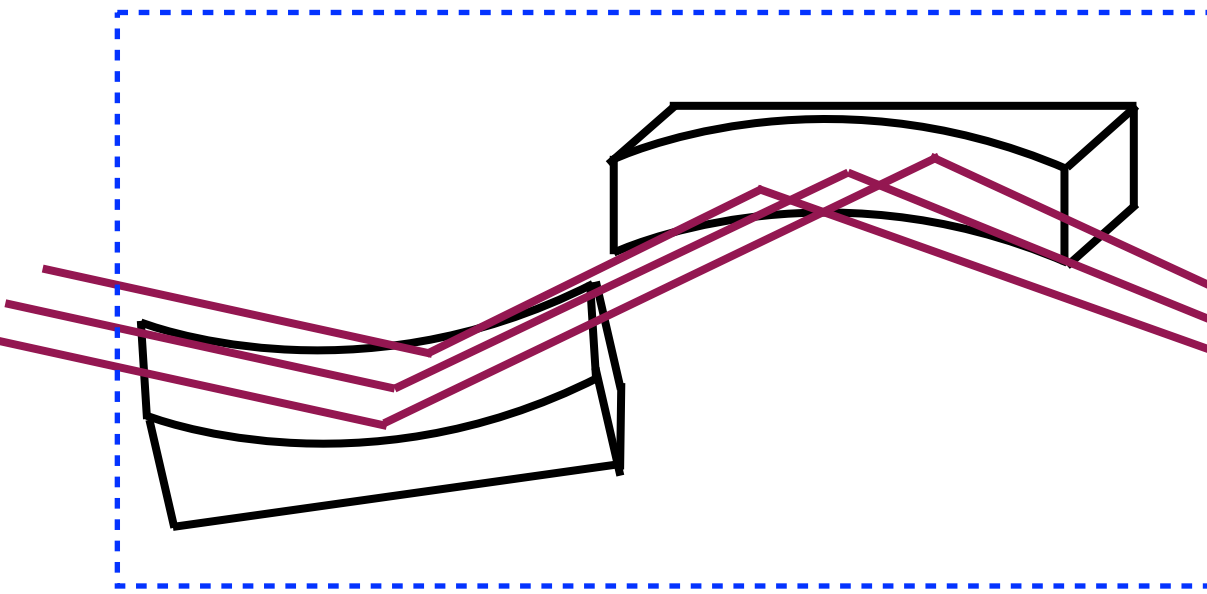


Thermal Stability of the SPB Hutch



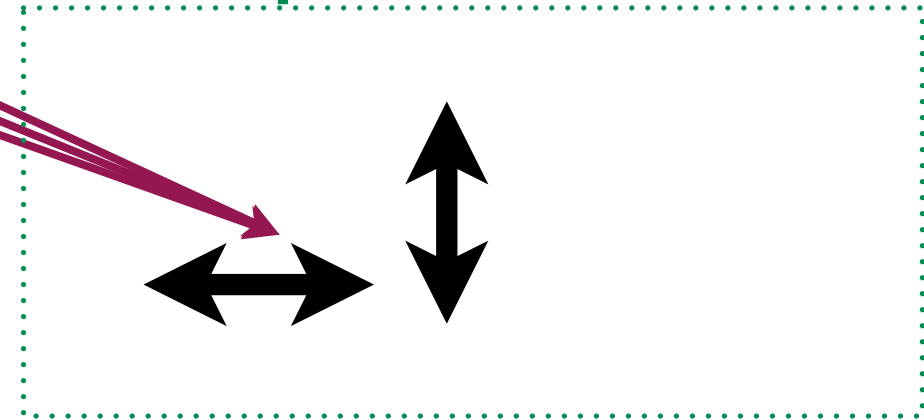
The worry over time dependent temperature gradients

KB Chamber



The beam spot should not drift less than the size of the focal volume.

Sample Chamber



Longitudinal drift for
1 μm KB

ΔT $^{\circ}\text{C}$	ΔL μm
1.0	202.8
0.2	40.6
0.1	20.3

Transverse drift for
both KBs

ΔT $^{\circ}\text{C}$	ΔL μm
1.0	25.4
0.2	5.1
0.1	2.5

Note: Time independent temperature gradients and time dependent changes that do not change temperature gradients are fine. It is a relative/positional change in temperature that causes misalignment. (I.E. a shift in the position of the KBs that changes the focus in the sample chamber causes concern.)

Sources of Heat

• Detectors:	12 kW	NOTE: There will be heat sources that we have not considered. A factor of 2-3 in the total power may be prudent.
• Motors:	2.5 kW to 15 kW	
• Vacuum Pumps:	17.7 kW	
• Lighting:	1.4 kW	
• People:	1.2 kW	
• Additional Equipment:	13.8 kW	
Total:	61.1 kW	

Q: How much of this load can be reduced by water cooling and other means?

Q: How much of this load is constant?

Q: How much of this load is variable?