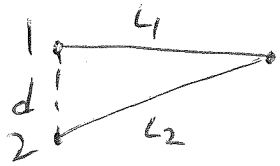
2. (6 points) Two point sources of EM radiation are located 1.00 μm apart and emit the same wavelength in phase with one another. For what range of wavelengths is it possible to find a point in space where the two waves destructively interfere (i.e., 180° out of phase)? Express your answer as an inequality.



$|\Delta L| \leq d$ (all values $-d \leq \Delta L \leq d$ are attainable)

180° destructive interference $\Rightarrow \frac{\Delta L}{\lambda} = \text{integer} + 1/2$

$\Rightarrow \frac{|\Delta L|}{\lambda} \geq 1/2$

$\Rightarrow \lambda \leq 2|\Delta L| \leq 2d = 2(1.00\mu m) = 2.00\mu m$.

If $\lambda \leq 2.00\mu m$, then $\Delta L = \lambda/2 \leq 1.00\mu m$ is attainable

$\Rightarrow \Delta\phi = 2\pi \frac{\Delta L}{\lambda} = \pi$ (180° out of phase)

If $\lambda > 2.00\mu m$, then $\frac{|\Delta L|}{\lambda} < \frac{1.00\mu m}{2.00\mu m} = \frac{1}{2}$ for all points so $\Delta\phi = \pi(2m+1)$ is not attainable.

$\boxed{\lambda \leq 2.00\mu m}$