1-5)

Each ship emits light of wavelength 200 nm.

A sees B’s emission at 180 nm

B sees C’s emission at 165 nm.

First, we need to find the velocities of the ships. We already have the Doppler relationship for receding sources.

$$β=\frac{λ^{2}-λ\_{o}^{2}}{λ^{2}+λ\_{o}^{2}}$$

For B as seen from A,

$$β\_{B, A}=\frac{180^{2}-200^{2}}{180^{2}+200^{2}}= -0.105 .$$

The negative sign indicated that B is approaching A, or vice versa.

For C as seen by B,

$$β\_{C, B}=\frac{165^{2}-200^{2}}{165^{2}+200^{2}}= -0.190 .$$

The negative sign indicated that C is approaching B, or vice versa.

Now, find the speed of C as seen by A:

$β\_{C,A}= \frac{β\_{C,B}+ β\_{B,A}}{1+β\_{C,B} β\_{B,A}}=\frac{-0.190+(-0.105)}{1+(-0.190)(-0.105)}= -0.289 $.

Then,

$$λ=λ\_{o} \left(\frac{1+β}{1-β}\right)^{1/2}=200 \left(\frac{1+(-0.289)}{1-(-0.289)}\right)^{1/2}=149 nm .$$