

Lab 4: Additional Lab Report Questions

Your answers to the following questions will be used to assess your understanding of the principles behind the Costas Loop. Therefore, in addition to all other questions asked in Lab 4, please answer the following in your lab report.

4.x Draw a block diagram of a Costas Loop, and label all signals in the block diagram. (Tip: Express the outputs of the phase shifters as $\cos(\omega_c t + \theta)$ and $\sin(\omega_c t + \theta)$, which have the required 90 degree phase difference.)

4.y Explain how the Costas Loop determines the phase error between the VCO and the carrier of the incoming DSBSC signal. (You should be able to see this in your block diagram in (4.x), with the use of some trig identities.)

4.z Explain how the VCO implements negative phase feedback, i.e. how it corrects the phase error between the VCO and the incoming DSBSC carrier in order to drive the phase error to zero.