$$\sin(\phi t) \xrightarrow{2} \sin^2(\phi t) = 1 - \cos(2\phi t)$$

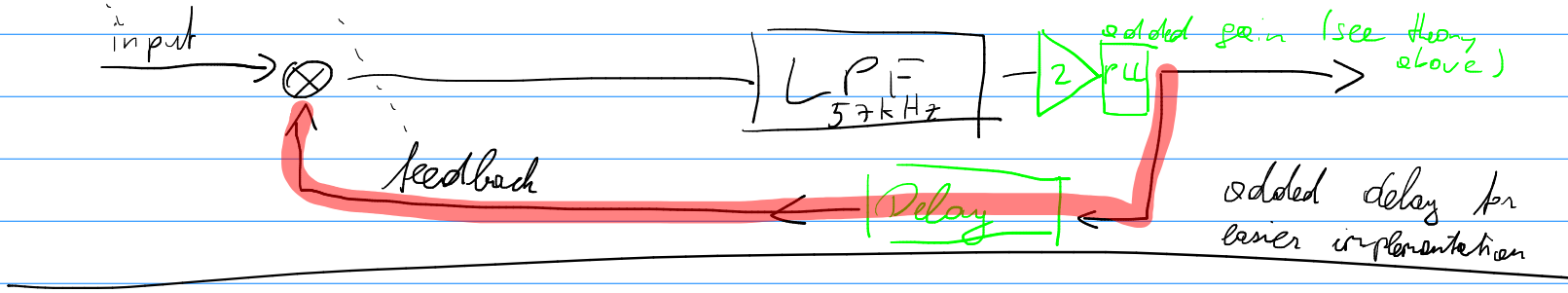
$$\sin(\varphi t)\cdot\sin(\phi t) = \frac{1}{2}\left(\cos((\phi-\varphi)t) - \cos((\phi+\varphi)t)\right)$$

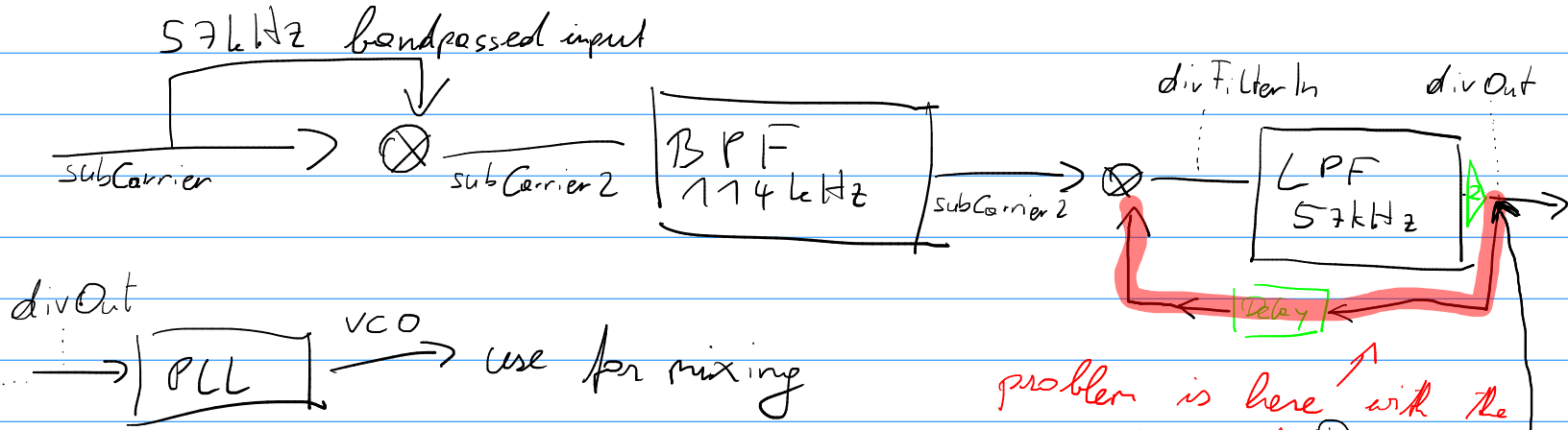
$$\sin(\omega t)\cdot\sin\left(\frac{\omega}{2}t\right) = \frac{1}{2}\cos^2\left(\frac{\omega t}{2}\right) + \frac{1}{2}\cos\left(\frac{\omega t}{2}\right) + \frac{3}{2}\sin^2\left(\frac{\omega t}{2}\right)\cdot\cos\left(\frac{\omega t}{2}\right)$$

input — feedback

beware!

filter this part in the frequency divider!



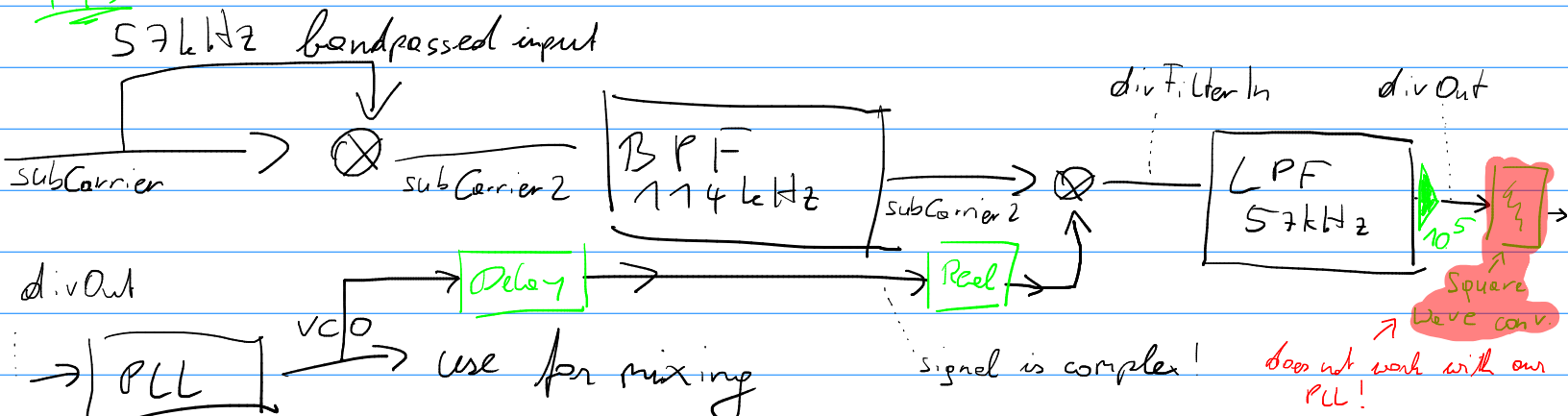


problem is here with the feedback! (*)

(*) signal gets uncontrollably smaller due to the feedback

:) fix: add another PLL

FIX:



.) new idea: use digital (divisor = 2) frequency divider instead of analog

easy !