

# OPLL circuit How to (2)

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## Input signal must be AC only (no DC is acceptable)

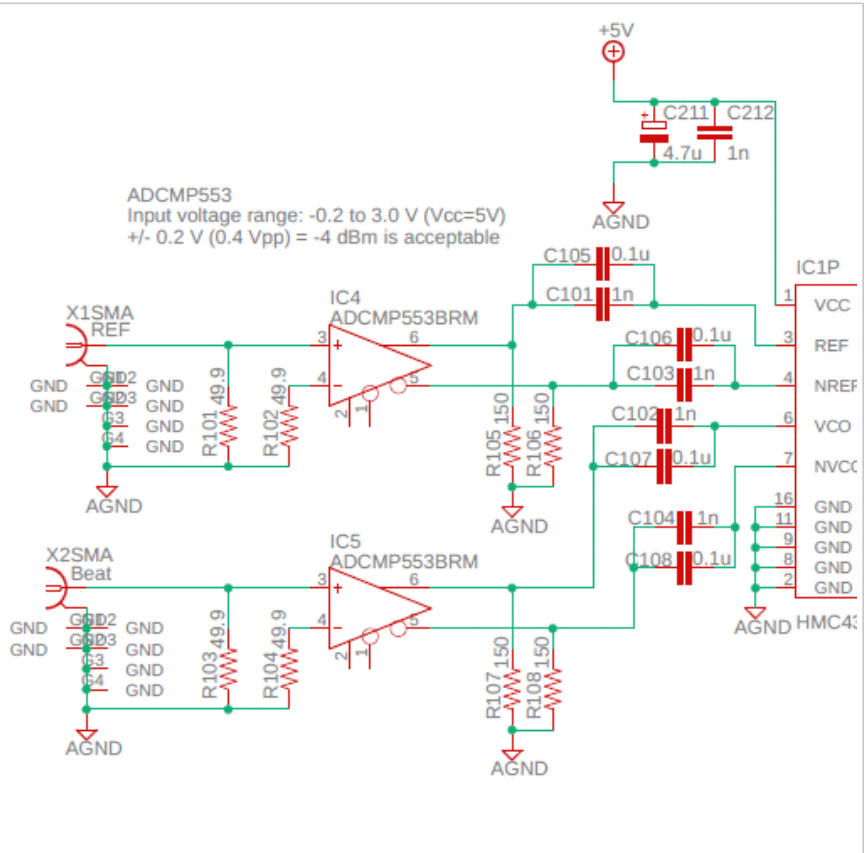
As written in the circuit schematic, the input signal level should be larger than  $-4 \text{ dBm}$  ( $0.4 \text{ Vpp}$ ).

If the beat signal is small, please use AC amplifier to obtain appropriate signal level.

The beat SNR of  $>30 \text{ dB}$  is better to obtain a good phase locking.  $25 \text{ dB}$  SNR may be OK but  $20 \text{ dB}$  may be insufficient.

Also the input sine wave should be AC only. No DC signal is acceptable. There are fast comparators in the input stage of the circuit (IC4 and IC5). The threshold of this comparator is  $0 \text{ V}$ , so the input sine wave should be AC signal only.

If the beat signal includes DC+AC (such as direct output from Photo Detector), you should remove DC by inserting capacitor.



## The 1st stage LPF cutoff frequency is 3.6 MHz

The present setting is sufficient for many purpose from my experience.

However, it is important to take into account this cutoff frequency when you design the feedback parameter. The open-loop phase is  $-45^\circ$  delayed at  $3.6 \text{ MHz}$ . So if you want to increase the feedback bandwidth (more than  $3 \text{ MHz}$ ), you should change LPF cutoff to higher frequency. On the other hand, if desired feedback bandwidth is not so wide, you don't need to change LPF setting.

Detail description:

In the present board, the cut-off frequency of low-pass filter (IC2, to obtain DC average of PFD's differential output) is set to be  $3.6 \text{ MHz}$  ( $1/2\pi \cdot \text{RNU} \cdot \text{C4}$  and  $1/2\pi \cdot \text{RND} \cdot \text{C5}$ ).

This would be a bit broad, so if you set the input frequency of PFD is  $10 \text{ MHz}$  or  $20 \text{ MHz}$  (this is a typical frequency for fiber comb), you'll observe oscillation in the output signal, i.e. the output DC signal is not perfectly DC. This won't be a problem for phase locking of lasers to comb.

