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Rhodamine Fluorescence Sensor Development

Introduction

Project goal

Design a Rhodamine fluorescence sensor

Project criteria

The Fluorescence sensor will be used to detect Rhodamine dye in seawater. it will be equipped in

The sensor we designed should be in low cost, low power consumption and small in form.

Design prototype

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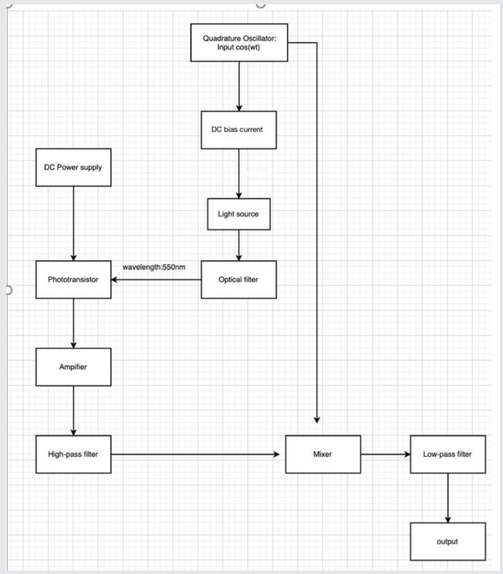
- Circuit Design
- Optic Design
- PCB Design

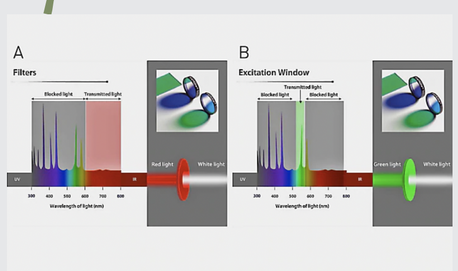
Sensor Design

Circuit Design



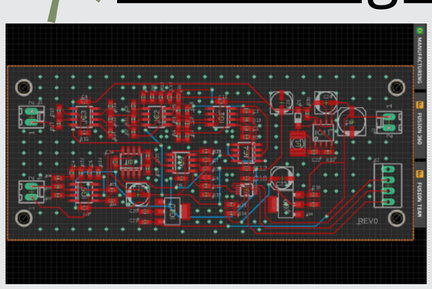
The signal generated by quadrature oscillator go through DC bias current and LED. If the signal doesn't go though DC bias, the led will not be drives. the DC bias current is to increase all voltage higher than zero. Photo-transistor receives the light and turn it to digital signal and the amplifier amplify this digital signal .The high pass filter reduce the noises due to sunlight. The digital signal and the original signal generated by oscillator multiply, and the output

Optic Design



Our case we would like to choose a green colour Roscolux plastic filter to achieve our purpose just like the diagrams shown below we block the wavelength we do not need just let the wavelength around 558nm pass. So that we can reduce the impact of daylight on our experiments.

PCB Design



Regarding the PCB part, our group used the software Eagle to draw the circuit diagram we had done into the PCB file, as shown in the figure. We also made circuit changes during the drawing such as adding LDO Low-Dropout Regulator in the lower right corner to change the voltage of IC2 from 5V to 3.3V. Then Buck-Boost Inverting converters are added in the upper right corner to achieve a single supply of 7.4V power

Conclusion

During the project, we finished the optical design, circuit design and PCB layout. For optical design, to avoid the disturb from sunlight and water pressure we find a cylindrical pressure vessel to put our PCB board in. For circuit design, we used Quadrature Oscillator, voltage follower, amplifier, Low-pass, and High-pass filter in our circuit. To find out how to build the Quadrature Oscillator circuit, we did a lot of research and we found that we solved the problem by building a circuit diagram for Quadrature Oscillator or using a chip such as AD9833. To filter noise, we learnt the difference between Butterworth filter and Chebyshev filter. We basically drew the PCB file of the detector we did our design according to our own Gantt Chart and sent it to CERC for printing, then achieve the purpose for rhodamine detecting.

Reference

Beacher, James (n.d.) LEDs for Fluorescence Microscopy
Retrieved from http://www.coolled.com/wp-content/uploads/2014/06/Biophotonics-Article-Feb08.pdf

figure in optic design
Retrieved from Thermo Fisher Scientific. (n.d.) Overview of Filters and Light Sources