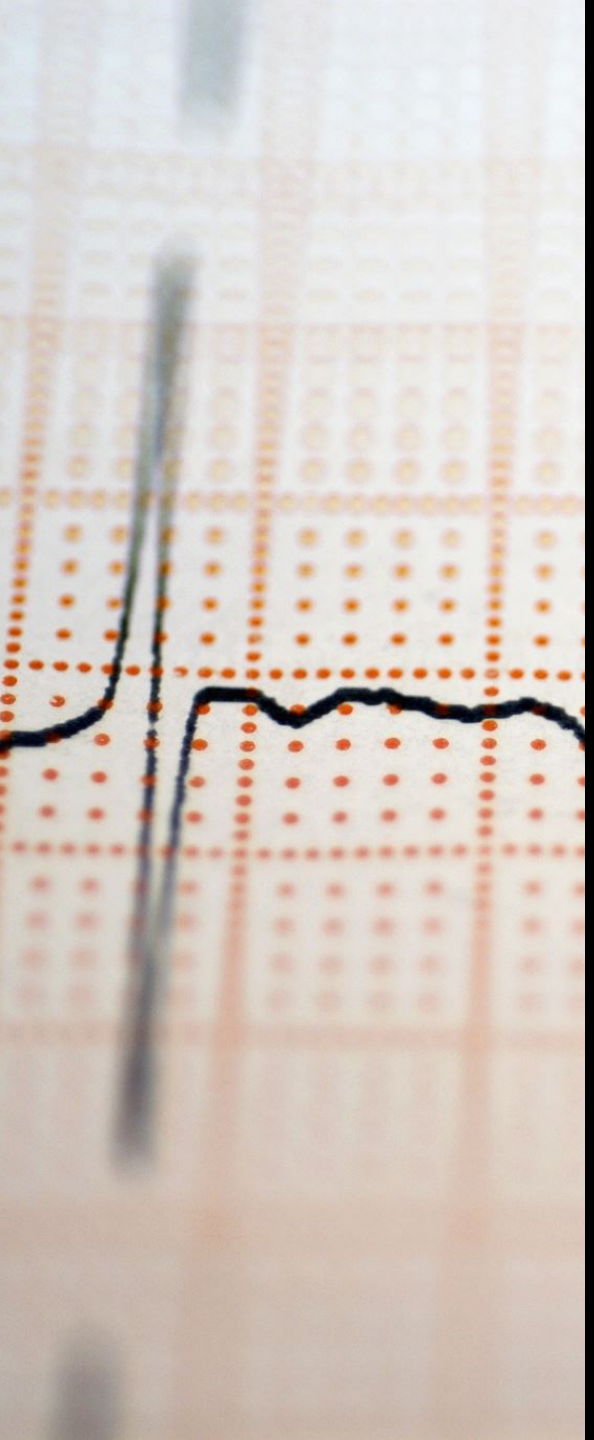


ECG STM32

Jose David Alvarado Moreno

Procesamiento de señales.

AGENDA

Características del sistema.

Entrada

- Sensor análogo XD-58C.
- Filtro antialiasing.

STM32

- NUCLEO-H7A3ZI-Q
- ADC y UART
- Filtro FIR y Moving averange

PC

- UART
- Visualización por matpltolib Python.

Entrada: Sensor de pulso cardiaco.

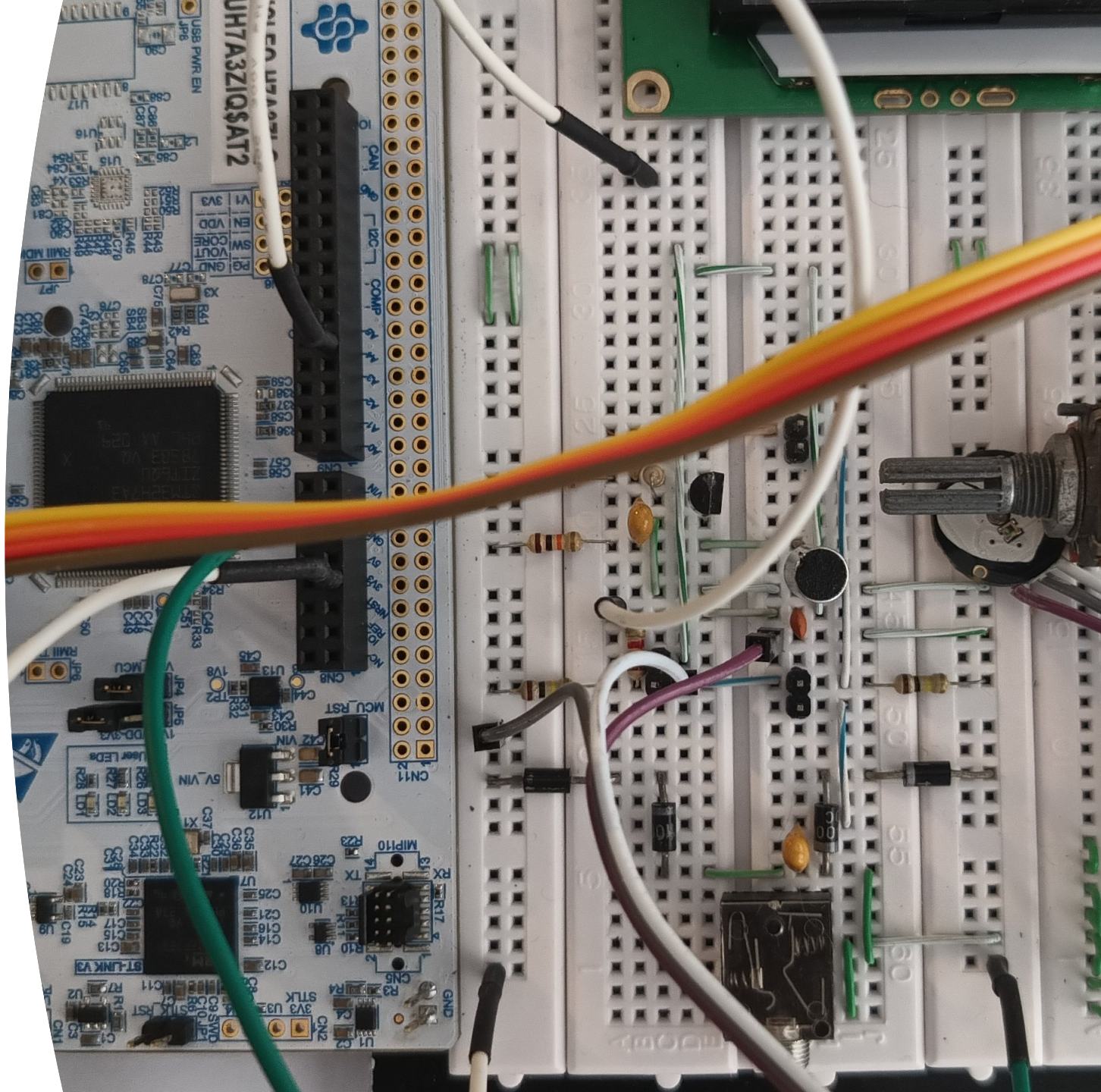
- Modelo: XD-58C
- Medición: Pulso cardíaco
- Voltaje de alimentación: 3.3V ~ 5V
- Corriente: 4 mA
- Longitud de Onda del led: 609 nm (nanómetros)

NUCLEO-H7A3ZI-Q

Frecuencia: 280MHz

ADC: 16 Bits

UART: 460800, 8 – bits.



NUCLEO-H7A3ZI-Q

ADC2 Mode and Configuration

Mode

IN0

Configuration

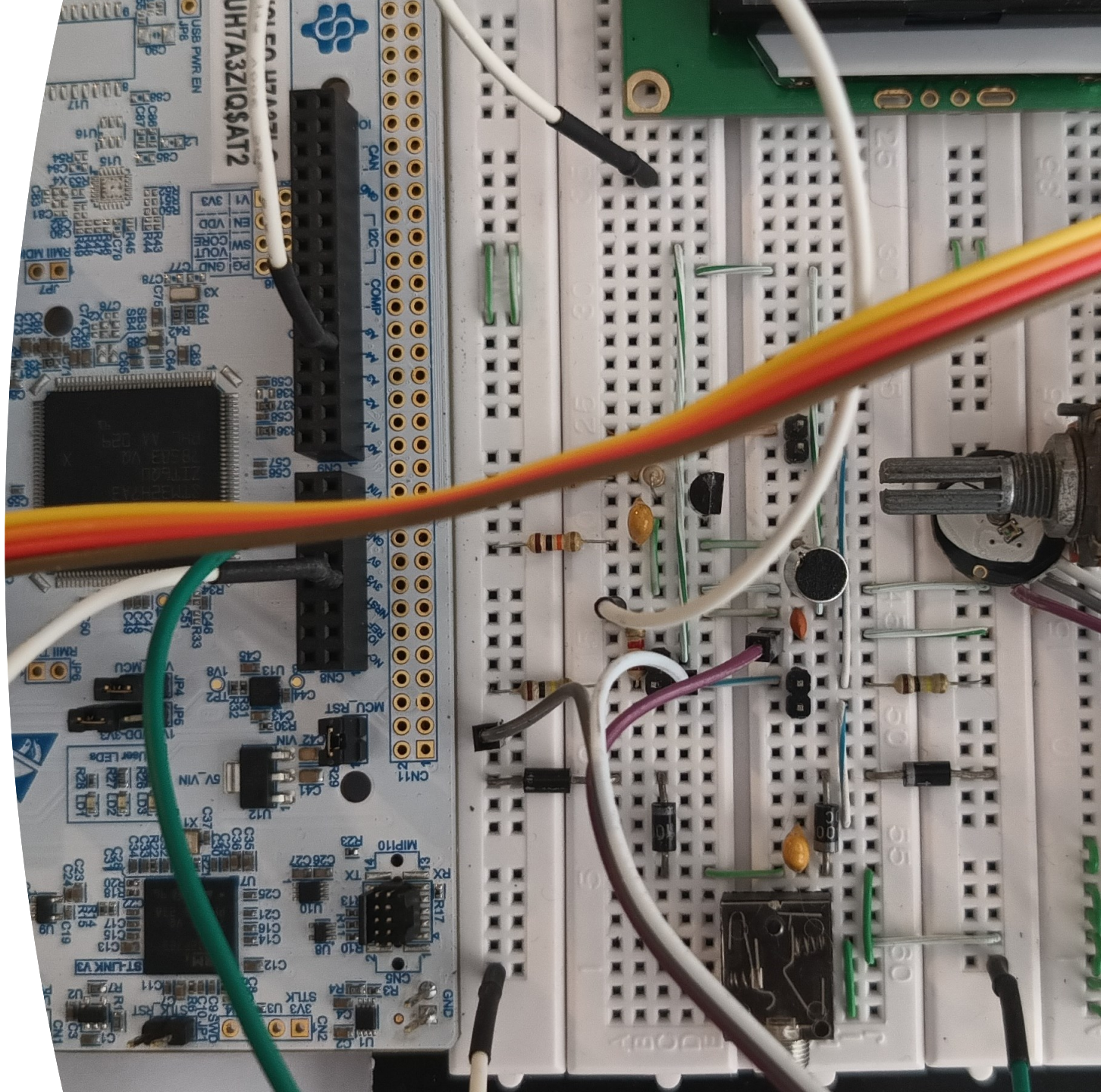
Reset Configuration

NVIC Settings | DMA Settings | GPIO Settings | Parameter Settings | User Constants

Configure the below parameters :

Search (Ctrl+F)

ADCs_Common_Settings	
Mode	Independent mode
ADC_Settings	
Clock Prescaler	Asynchronous clock mode divided by 1
Resolution	ADC 16-bit resolution
Scan Conversion Mode	Disabled
Continuous Conversion Mode	Disabled
Discontinuous Conversion Mode	Disabled
End Of Conversion Selection	End of single conversion
Overrun behaviour	Overrun data preserved
Left Bit Shift	No bit shift
Conversion Data Management Mode	Regular Conversion data stored in DR register o...
Low Power Auto Wait	Disabled
ADC_Regular_ConversionMode	
Enable Regular Conversions	Enable
Enable Regular Oversampling	Disable



NUCLEO-H7A3ZI-Q

USART3 Mode and Configuration

Mode

Mode: Asynchronous

Configuration

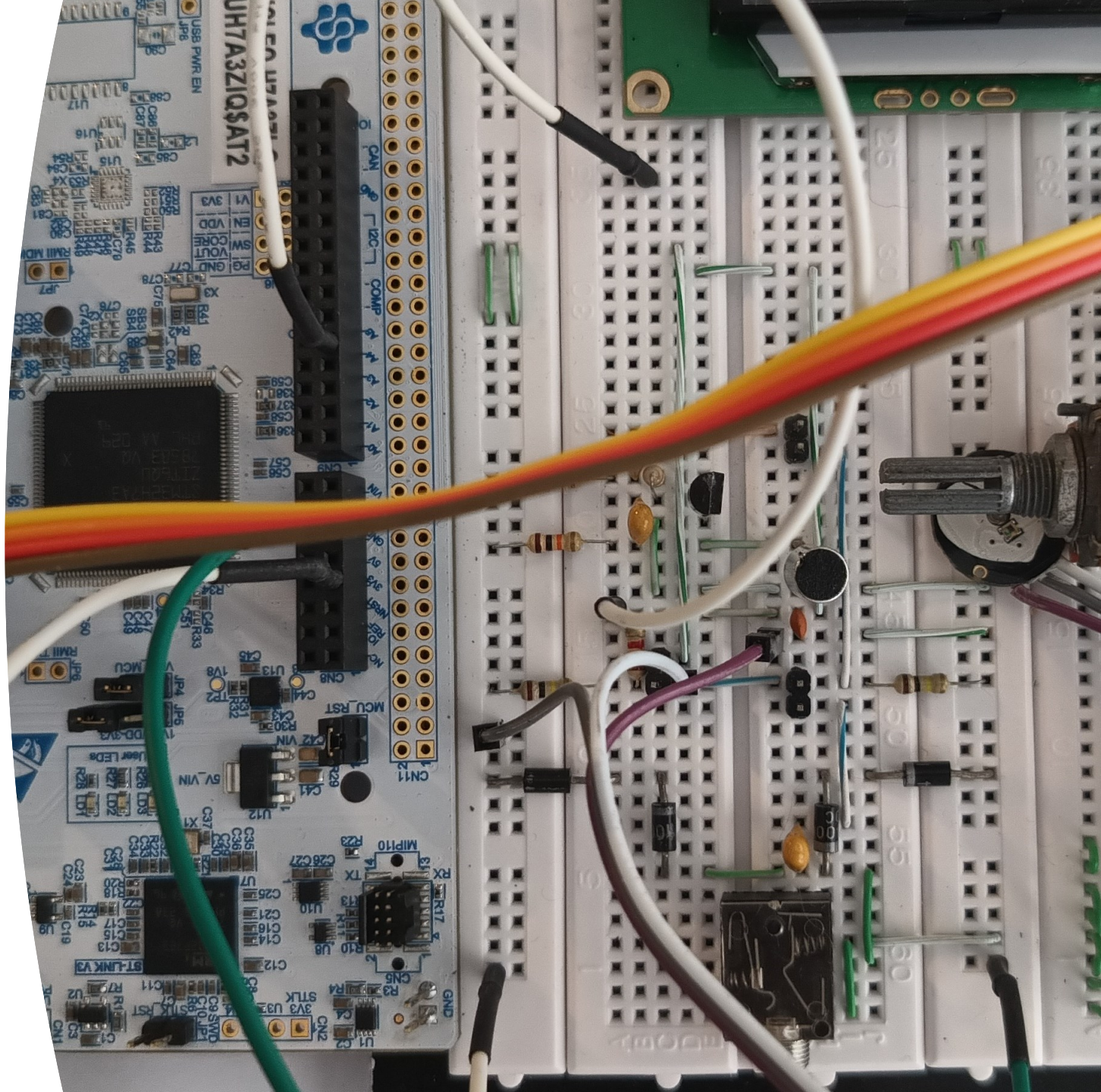
Reset Configuration

NVIC Settings | DMA Settings | GPIO Settings | Parameter Settings | User Constants

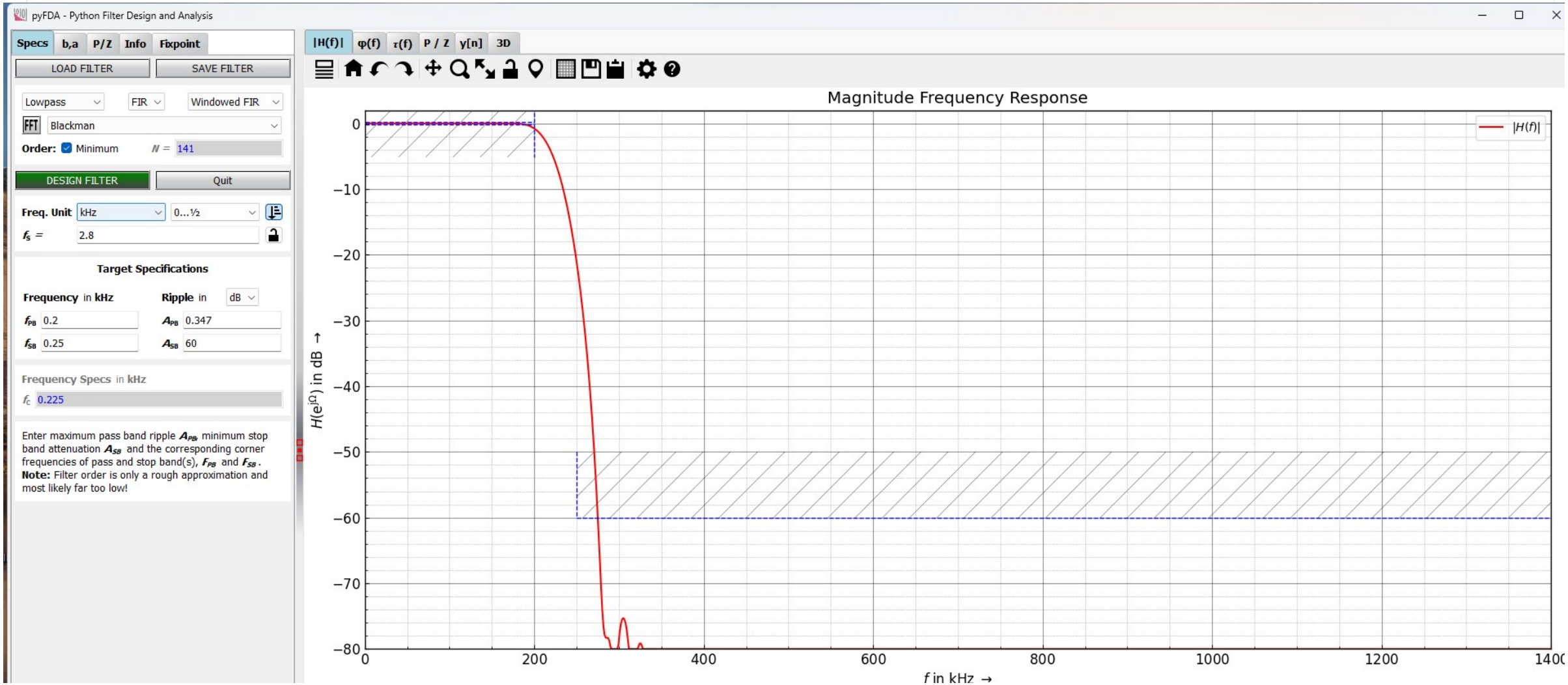
Configure the below parameters :

Search (Ctrl+F)

Basic Parameters	
Baud Rate	460800 Bits/s
Word Length	8 Bits (including Parity)
Parity	None
Stop Bits	1
Advanced Parameters	
Data Direction	Receive and Transmit
Over Sampling	16 Samples
Single Sample	Disable
ClockPrescaler	1
Fifo Mode	Disable
Txfifo Threshold	1 eighth full configuration
Rxfifo Threshold	1 eighth full configuration
Advanced Features	
Auto Baudrate	Disable
TX Pin Active Level Inversion	Disable



Diseño del Filtro FIR (pyFDA)



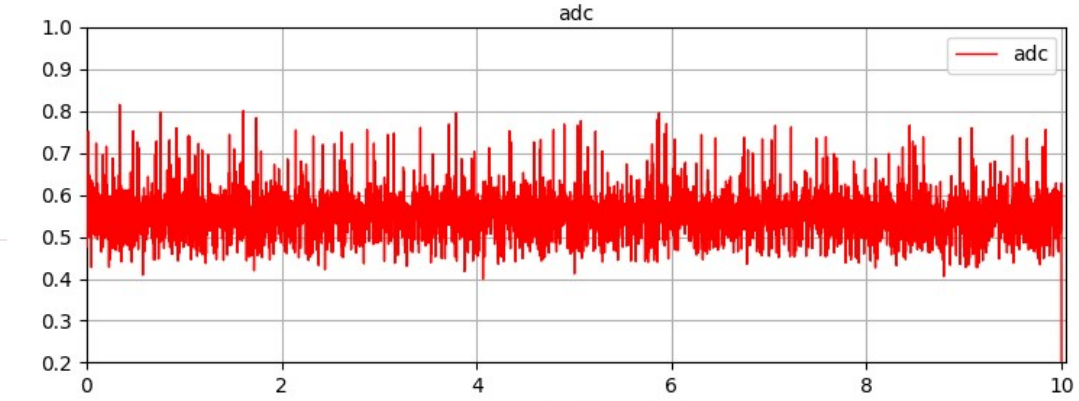
Implementación del Moving average

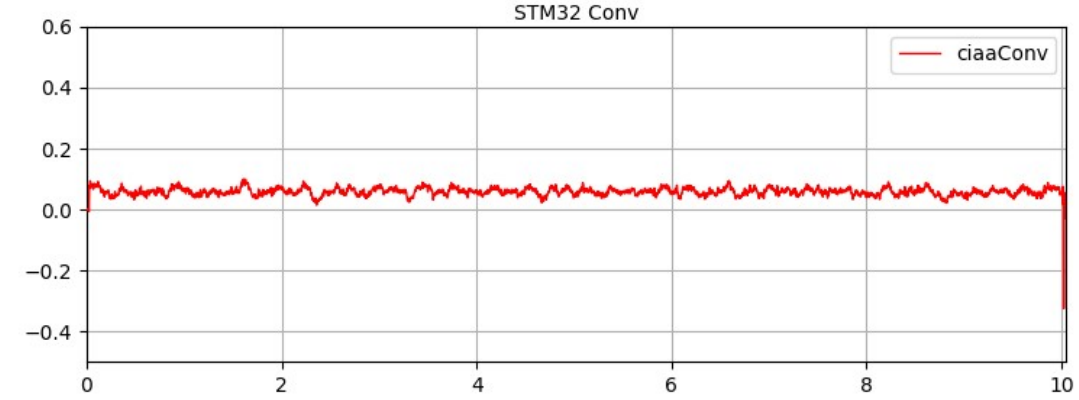
```
int k = 20 ; // Tamaño de la ventana
for (int i=0;i < k; i++)
{ adcm[0] =  adcm[0] + adc[i];}
adcm[0] = (int16_t )(adcm[0] / (k));
for (int i=1; i<(header.N-1) ; i++)
{
  adcm[i] = (int16_t)(adcm[i-1]+((adc[i+k]-adc[i-1])/(k)));
}
arm_conv_q15(adcm, header.N, h, h_LENGTH, y); // Filtro FIR
```

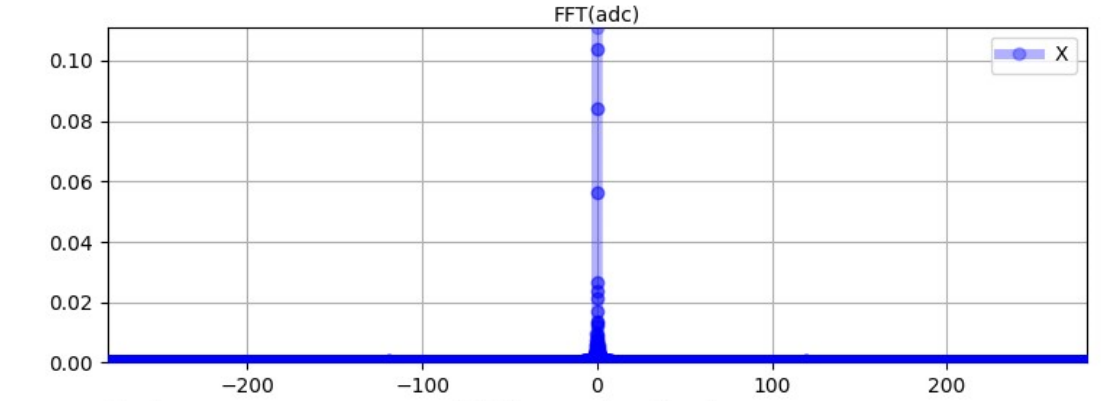
Tiempo de adquisición y trasmisión.

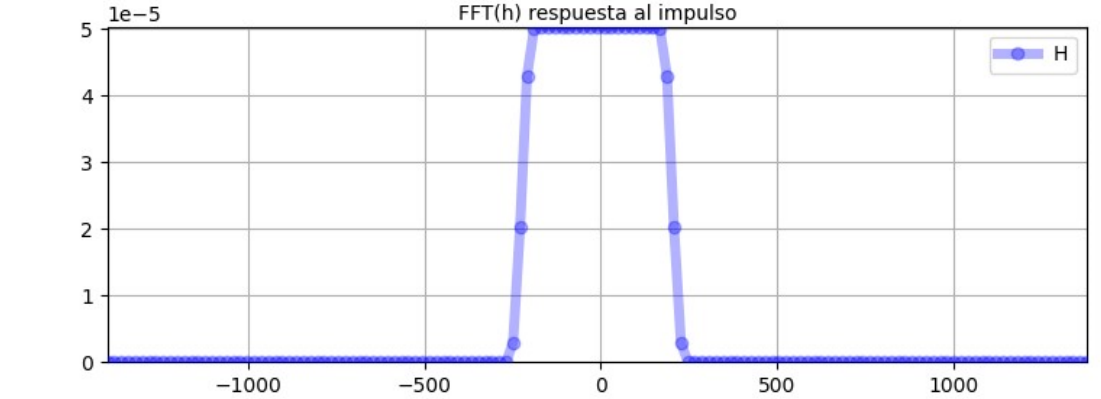
Visualización

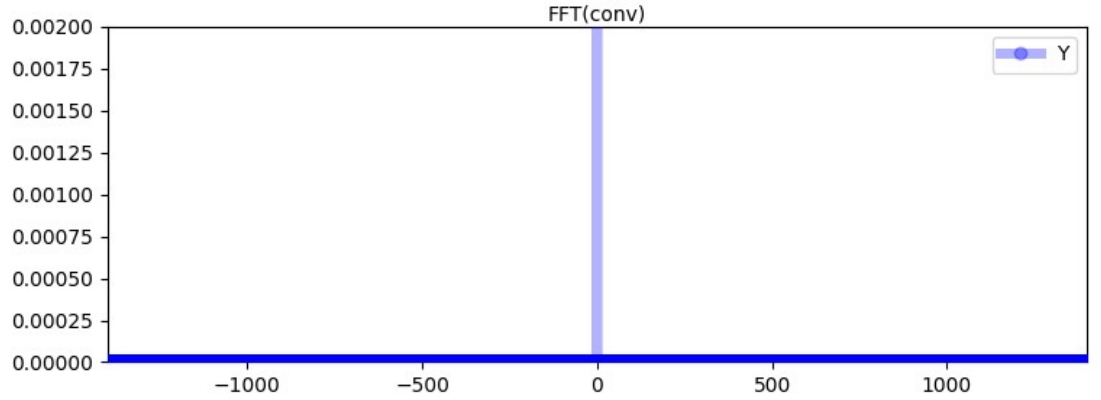
ECG STM32 NUCLEO-H7A3ZI











Visualización

ECG STM32 NUCLEO-H7A3ZI