ESD

Lab Assignment 2

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Q1. What is the smallest change in input voltage that the ADC can detect?(+Vref =3.3 V)

Answer

Since we have 12-bit ADC in STM32F103RB, the maximum number of input voltages that can be detected it

2^12 = 4096 different values from 0 – 4095.

Since Vref = 3.3 V so the smalled change that can be detecte is

3.3/4096 = 0.8 milli Volts.

Answer = 0.8mV

Q2. What is the clock frequency of ADC ?

Answer

In the project, I have configured the crystal xTal as 8 MHz

This provides a PCLK2 or APB2 as 72 MHz

While programming the ADC we need to keep ADC Clock less than or equal to 14MHz. So programmed the ADC Pre-scalar divisor in RCC->CFGR |= (2 << 14) which enables a scalar divisor of 6

This gives ADC Clock = 72 MHz / 6 = 12 MHz

Answer = 12 MHz

Q3. Give the steps to program timer for 2 second delay generation with calculation

Answer

xTAL = 8 MHz => PCLK2/APB2 = 72 MHz

So if we put pre-scalar value = 7200 -1 we get

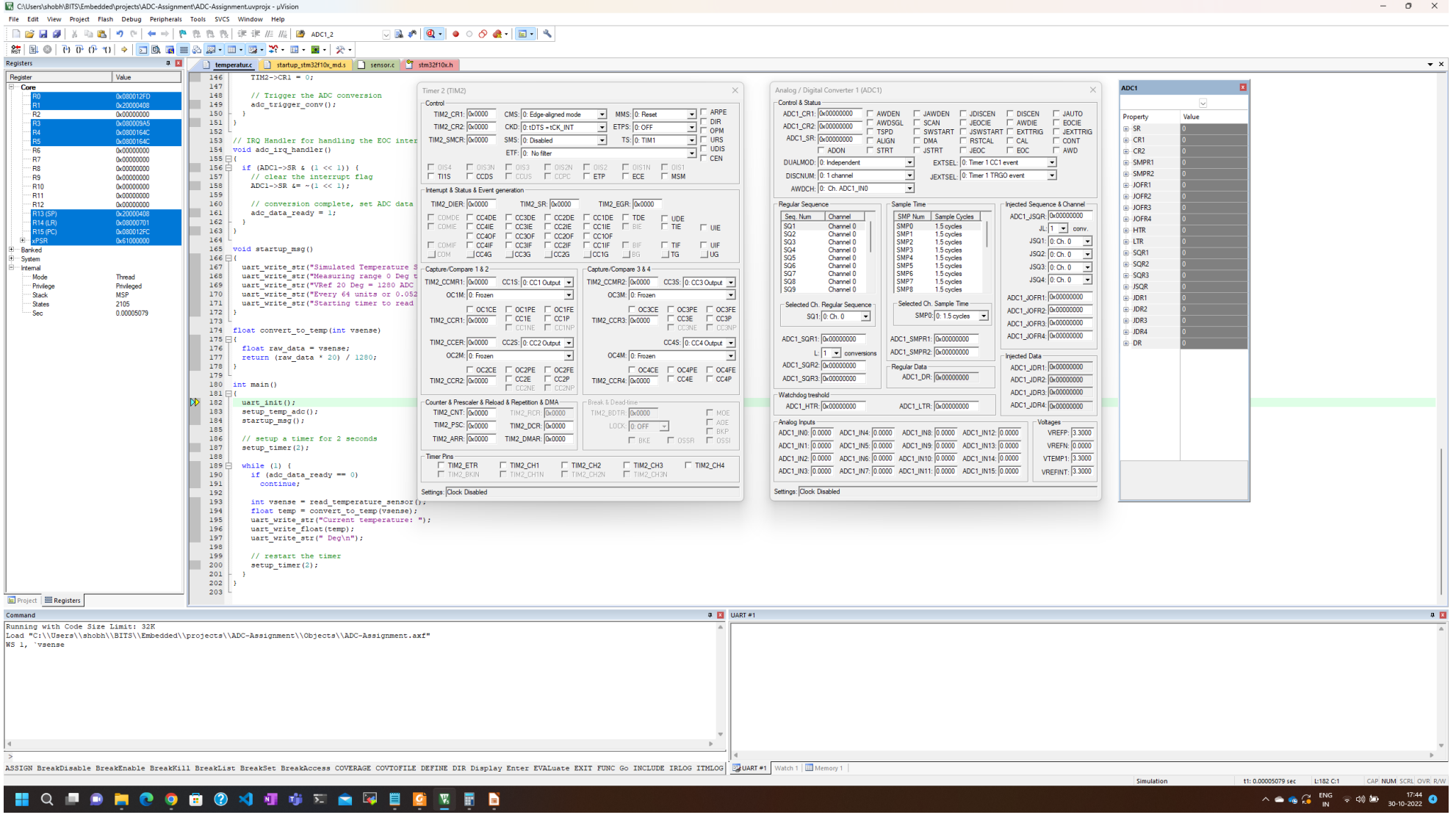
delay = (PSC + 1) / 72MHz = 7200/72000000 = 1/10000s = 0.1ms

Now to get the delay of 2 seconds we need to load ARR as

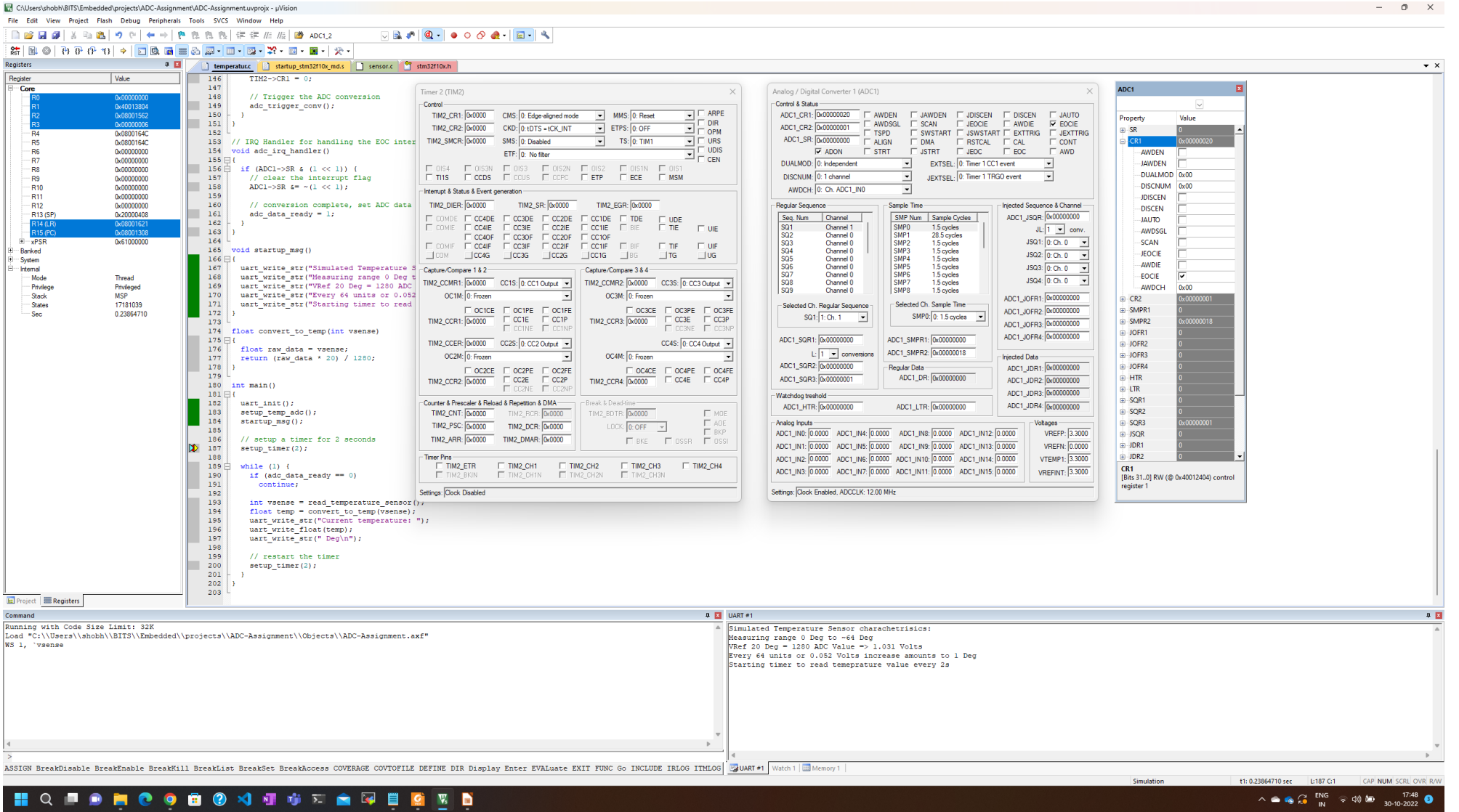
ARR + 1 = delay / PSC = 2000 / 0.1 = 20000

So ARR = 20000 – 1 = 19999

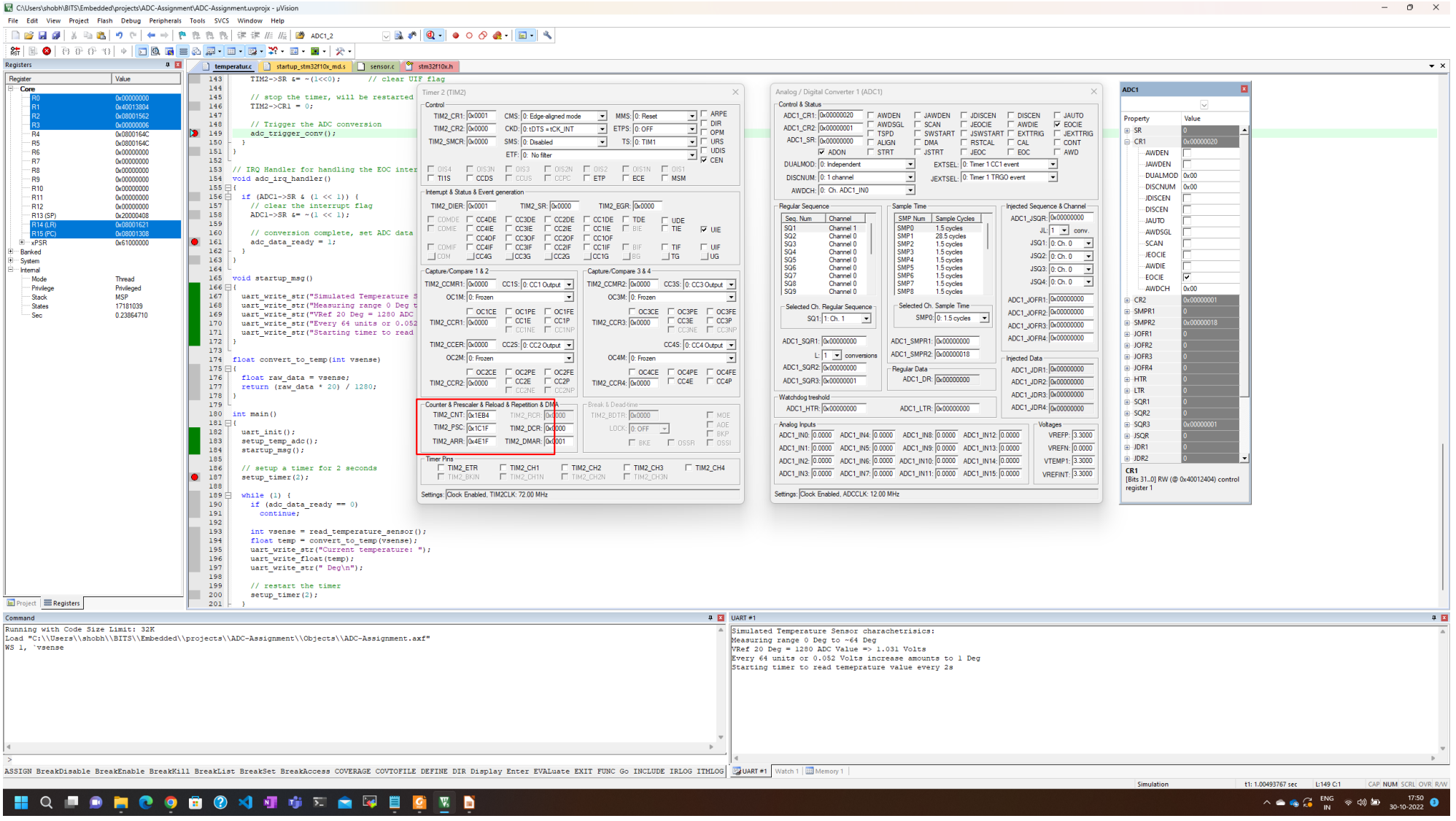
1. Initial Screen before start



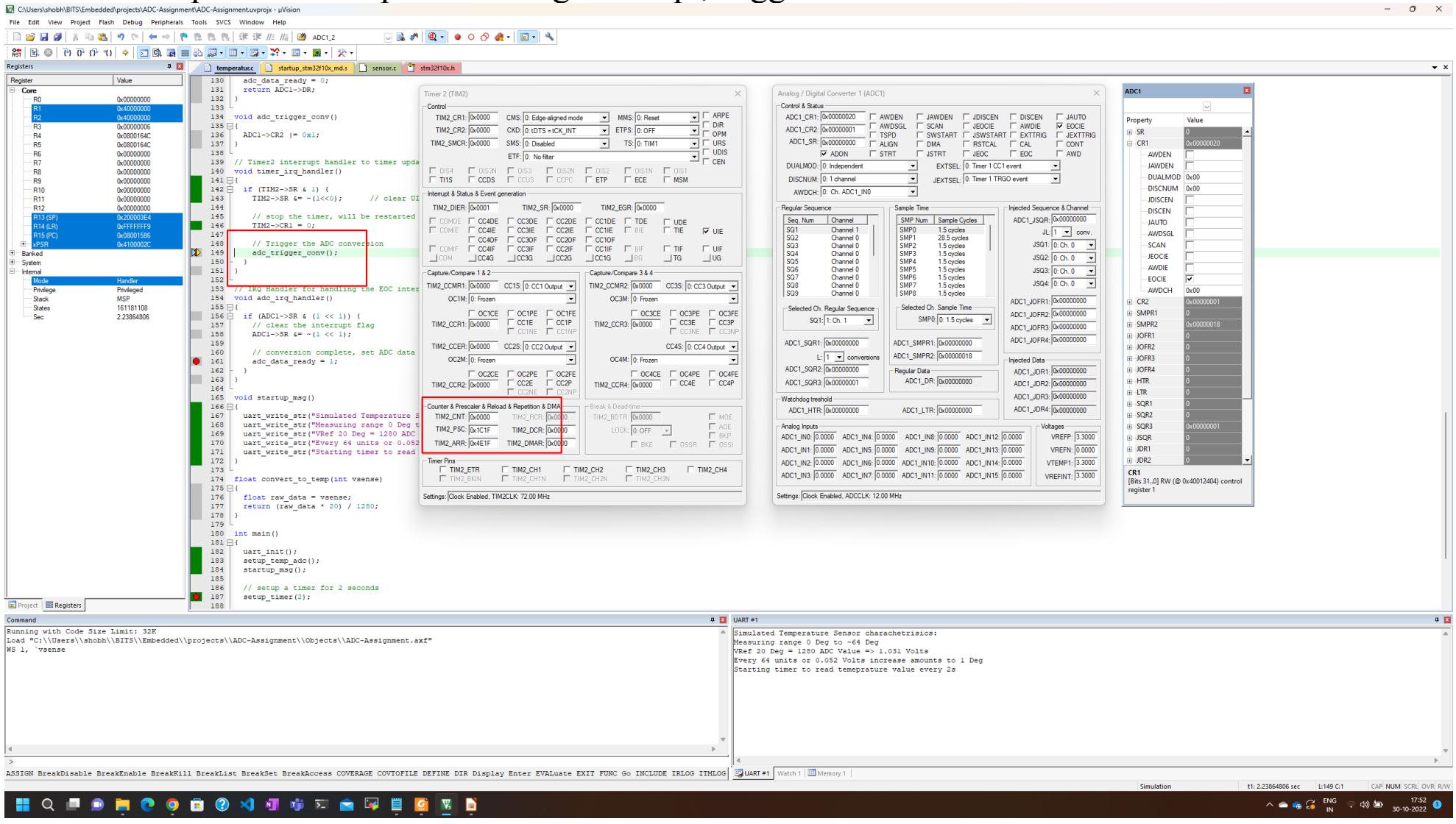
2. Sensor characteristics printed on UART



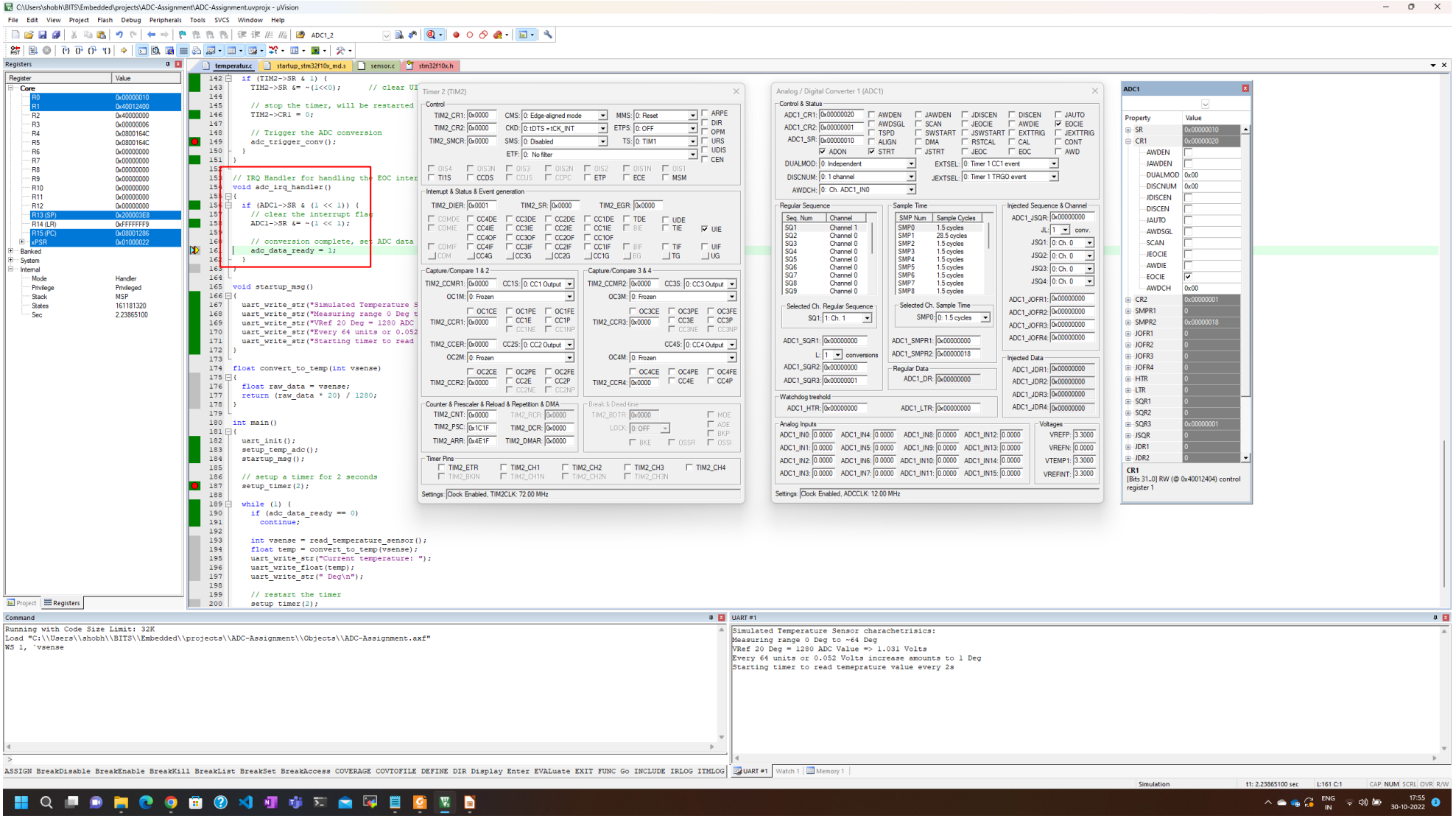
3. Timer Started



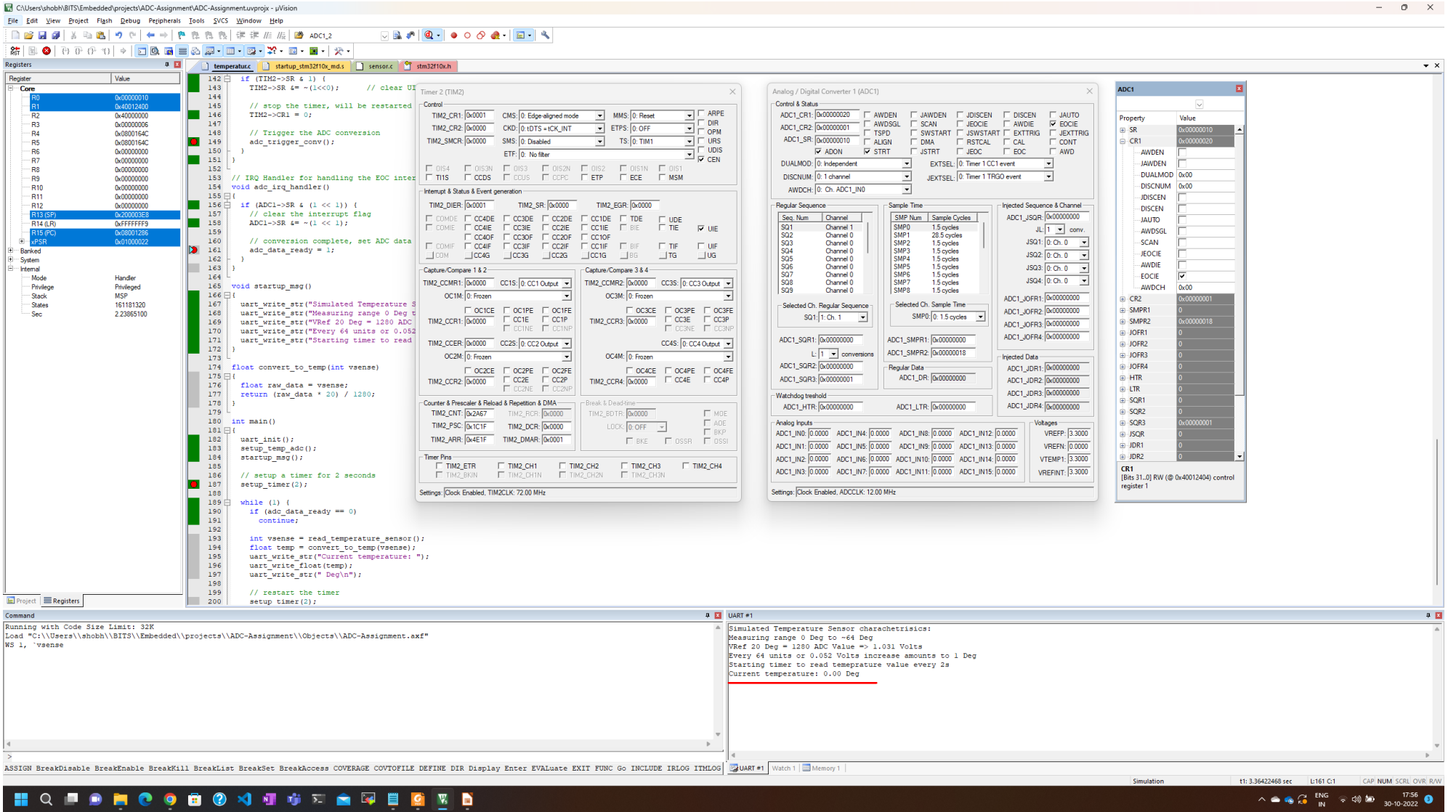
4. Timer Interrupt – Timer expired causing interrupt, trigger ADC conversion



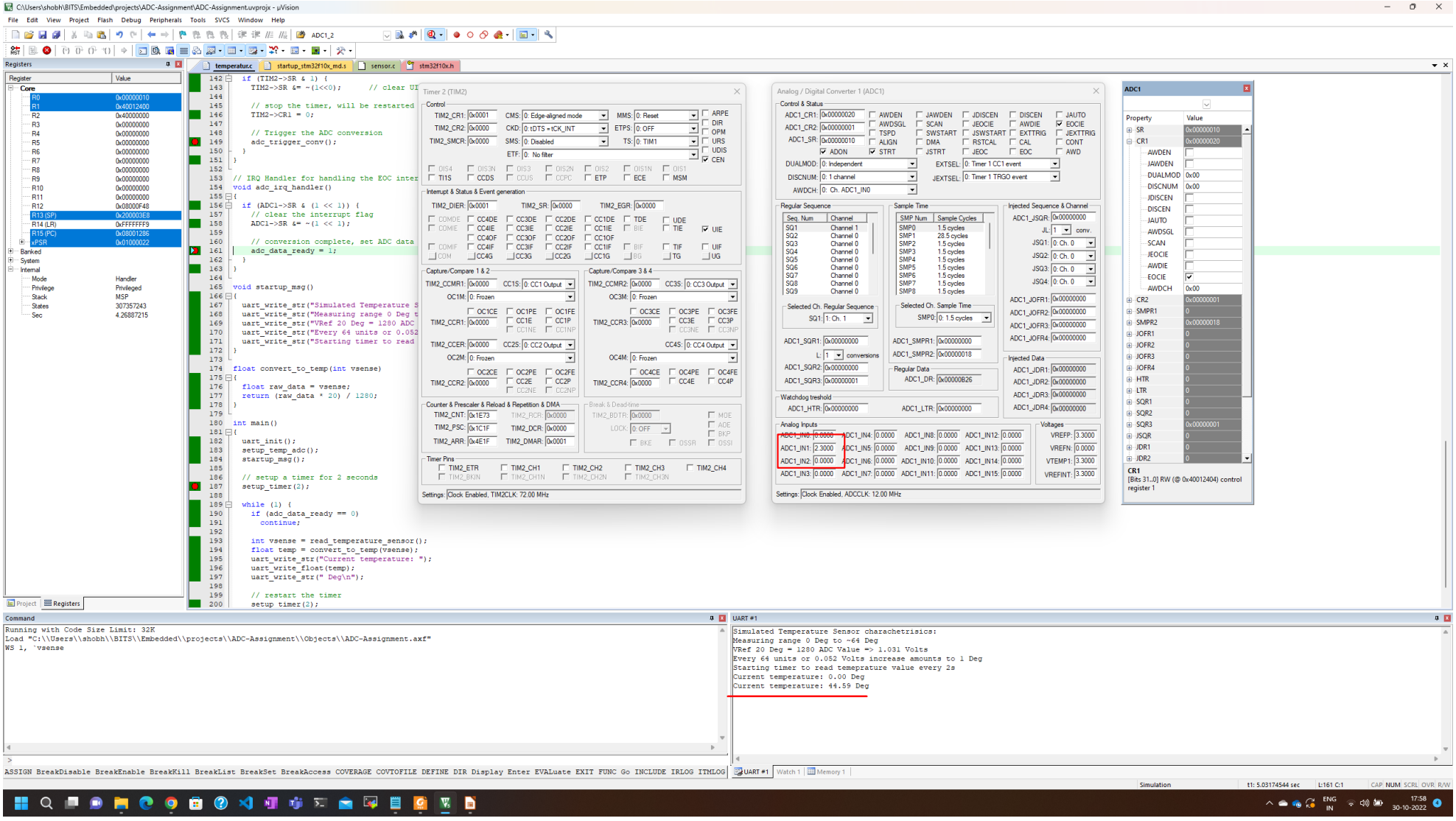
5. ADC Interrupt – ADC conversion completed. Mark data ready to be read



6. UART Prints the temperature reading



7. Change ADC1_IN1 value to 2.3 Volts, Read the new temperature value



8. Some more temperature readings