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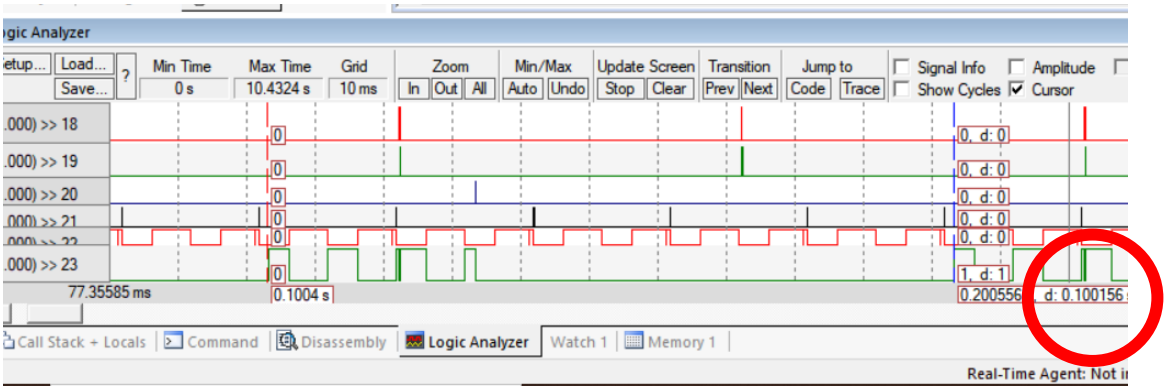
EDF Schedular application report

Table of Contents

System Parameters Using Logic Analyzer

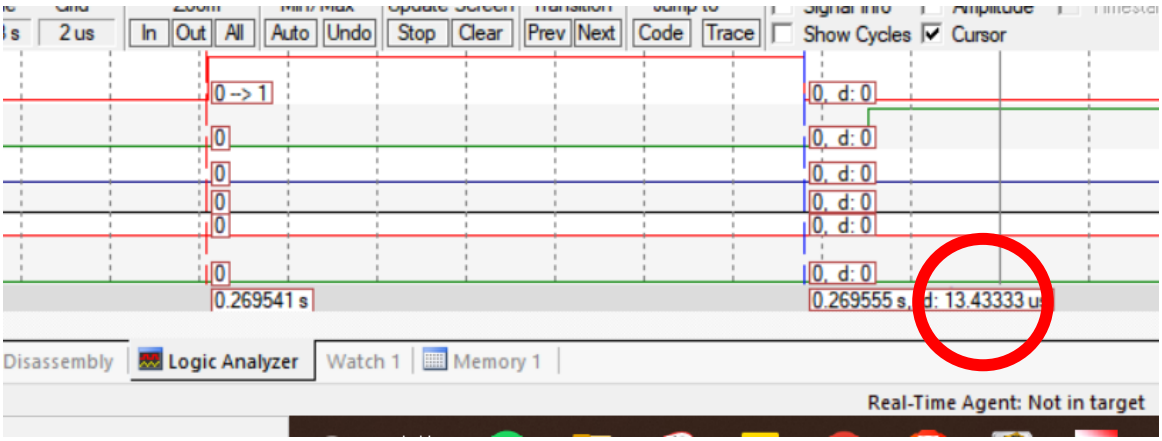
HyperPeriod

Total hyper period is 100 ms



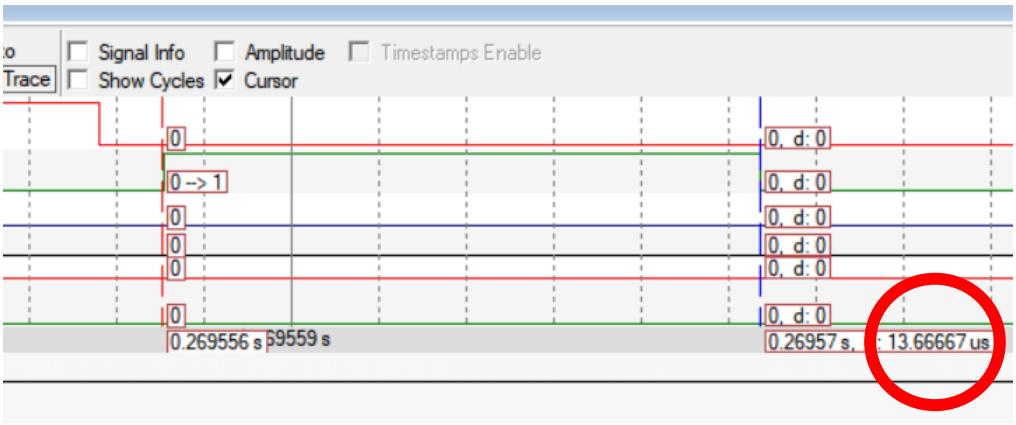
Task 1

Execution Time = 0.0134 ms



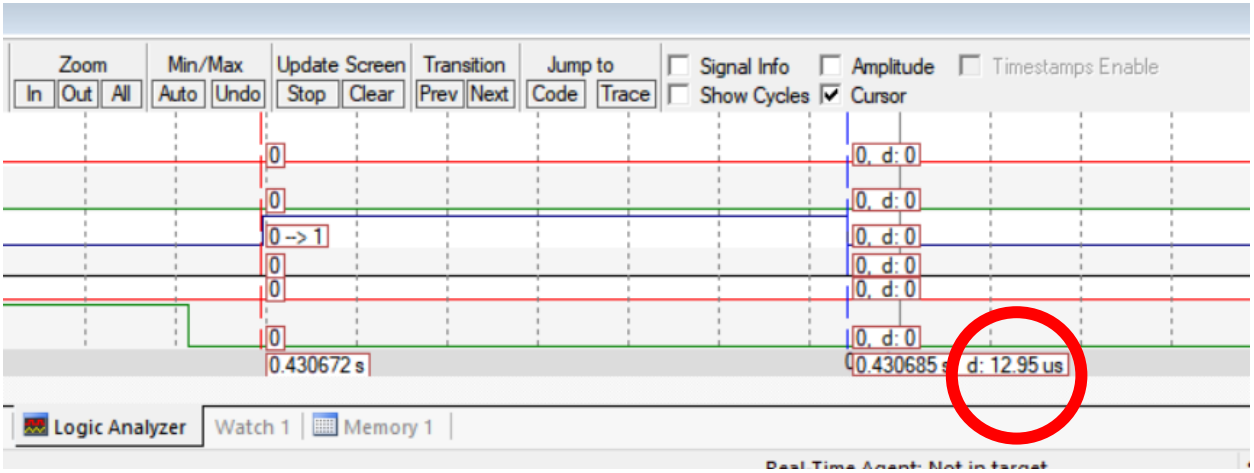
Task 2

Execution Time = 0.01367 ms



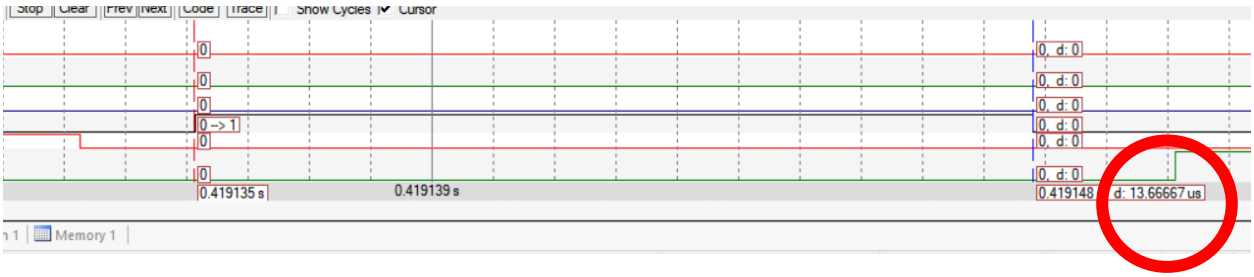
Task 3

Execution Time = 0.01295 ms



Task 4

Execution Time = 0.01367 ms

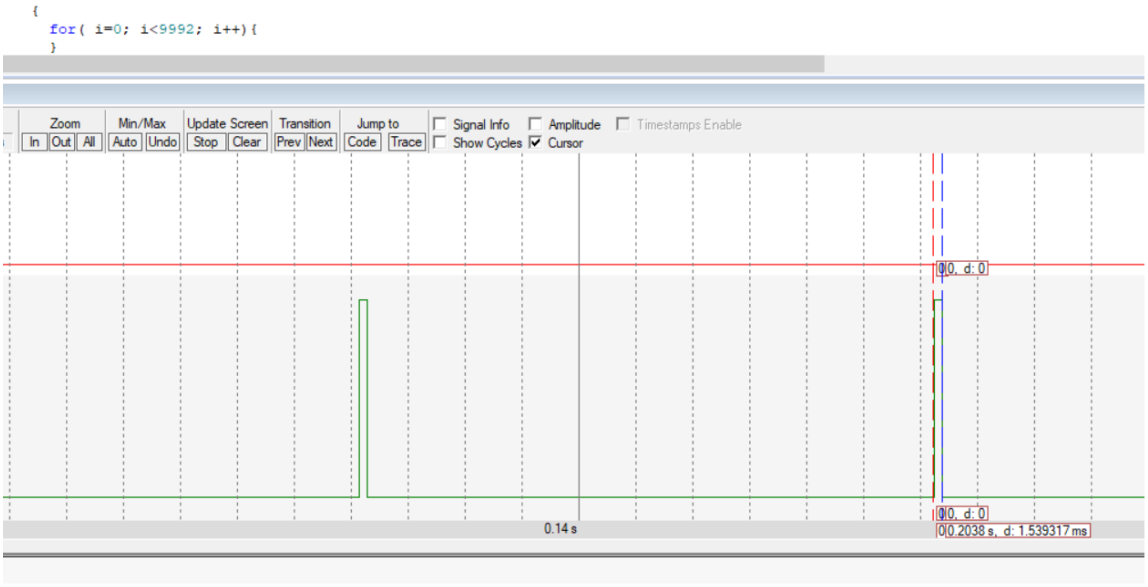


Task 5 and Task 6

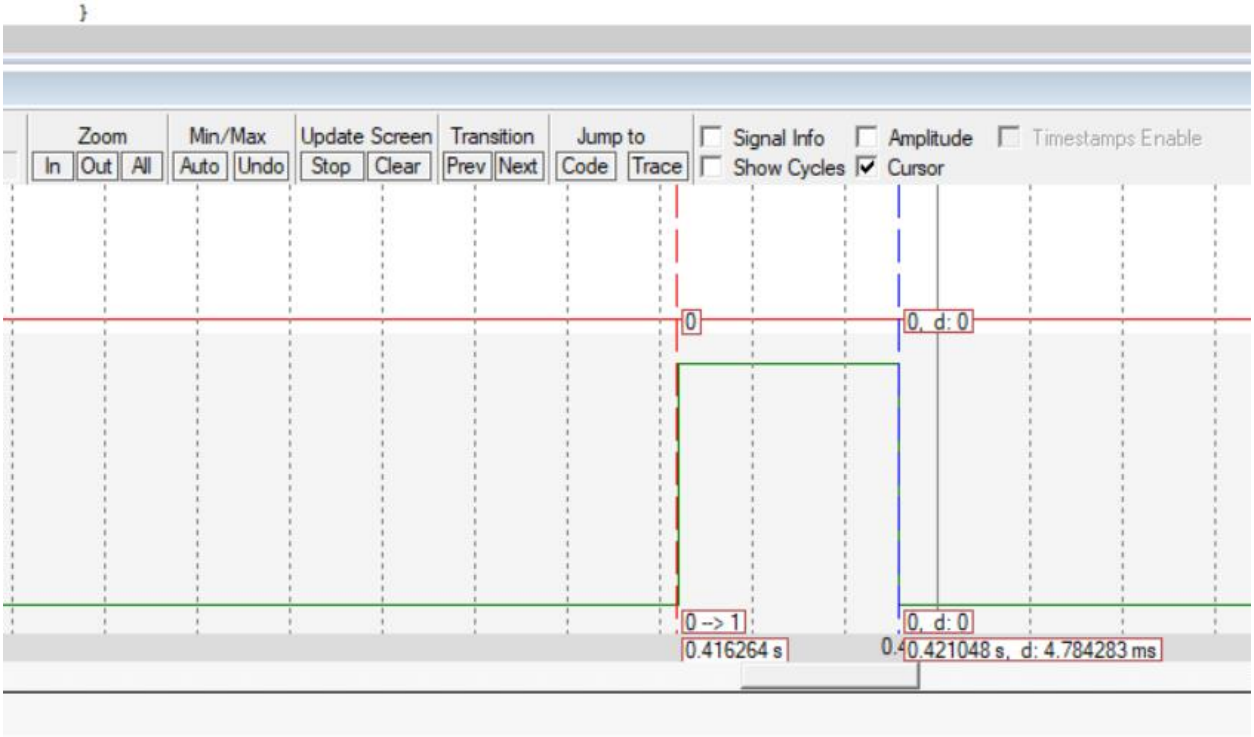
Task 5

Task 5 is required to be 5 ms in execution time

Trials to get exactly 5ms by changing the number of loops in the (for loop) and observing the logic analyser :



```
{
  for( i=0; i<35500; i++){
  }
```



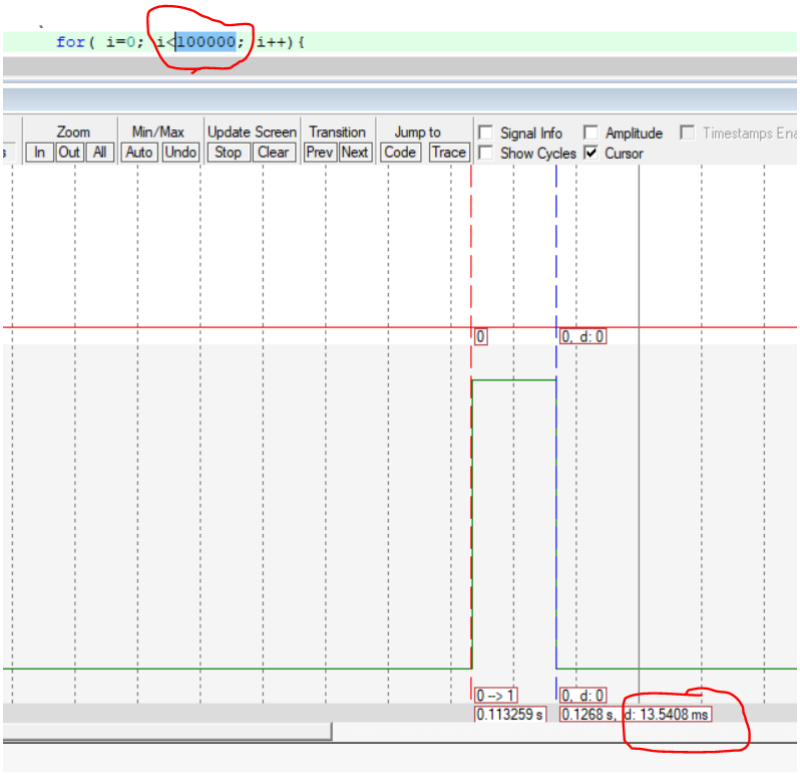

```
{
  for( i=0; i<37000; i++){
  }
```

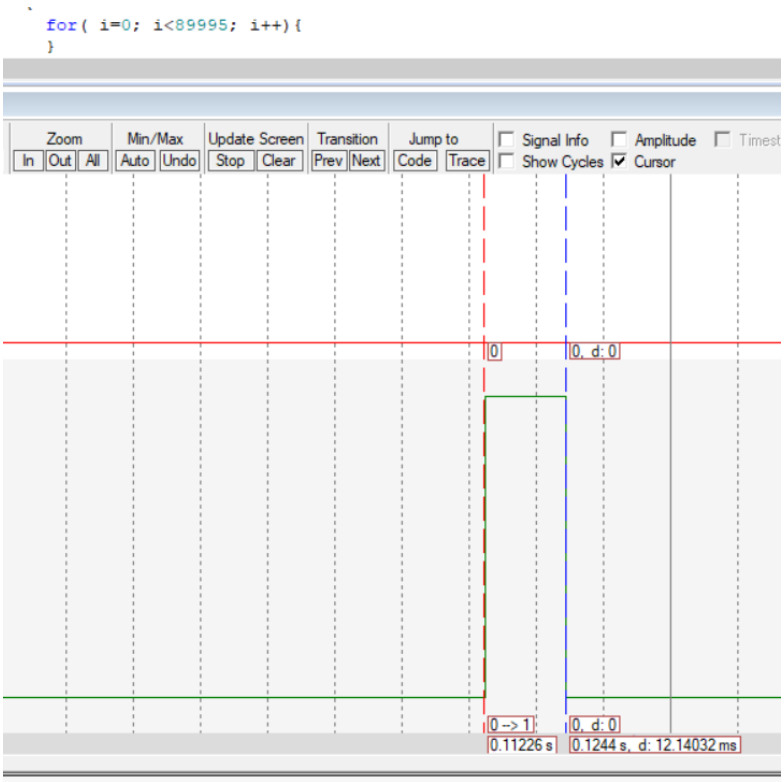
5ms occurs at a for loop that loops about 37000 times

Task 6

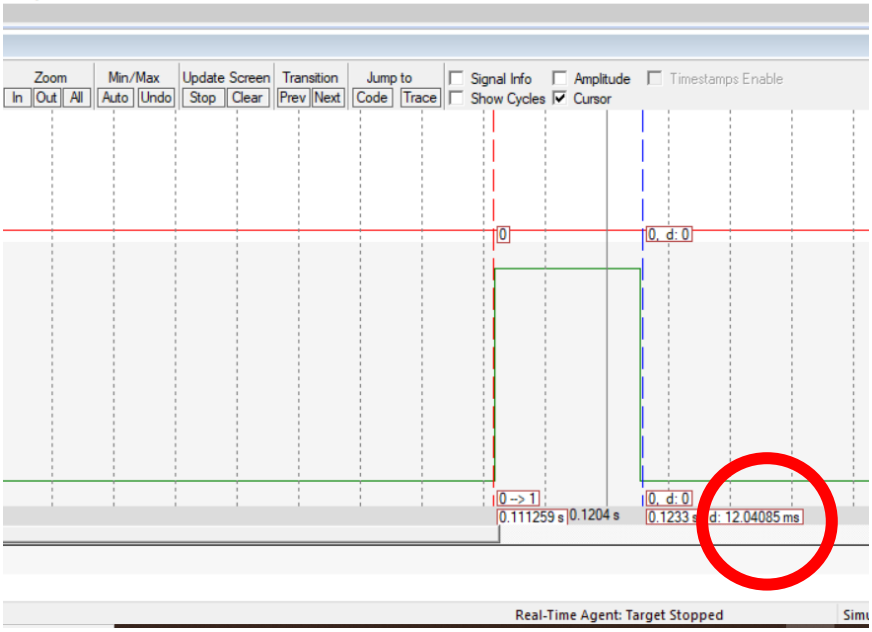
Task 6 is required to be 12 ms

Trials to get exactly 5ms by changing the number of loops in the (for loop) and observing the logic analyzer





```
for( ;; )
{
  for( i=0; i<87995; i++){
  }
```

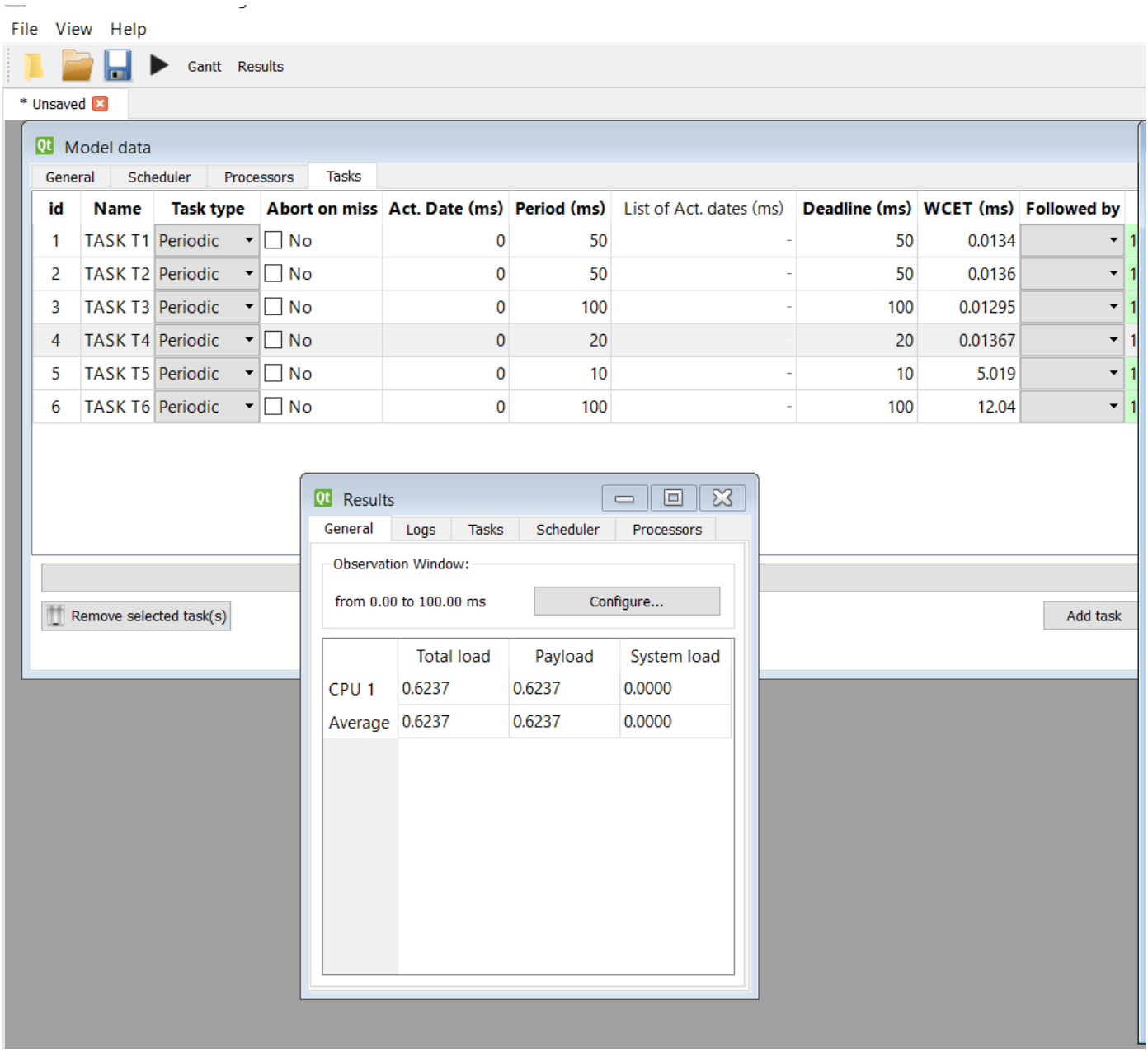


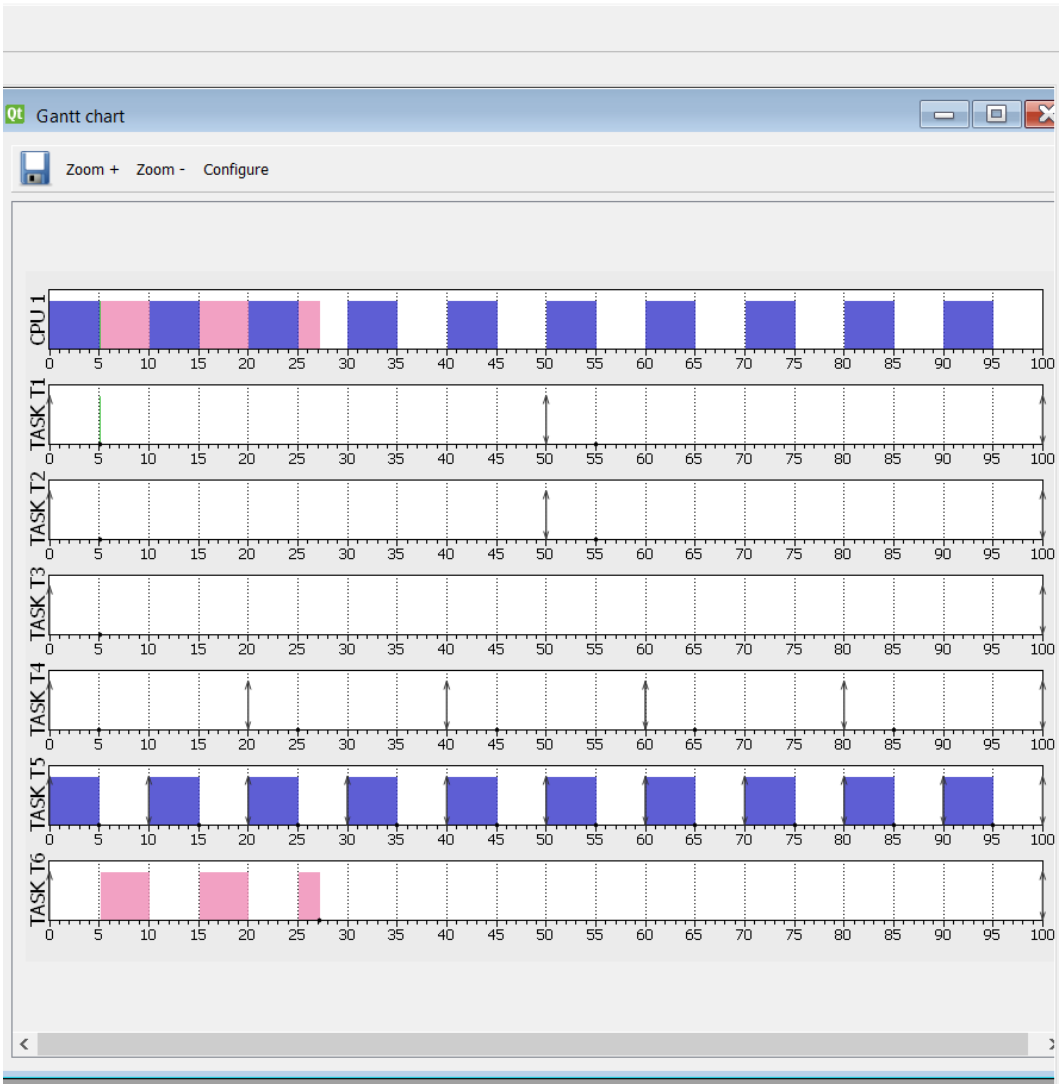
5ms occurs at a for loop that loops about 87995 times

Calculations and implementation

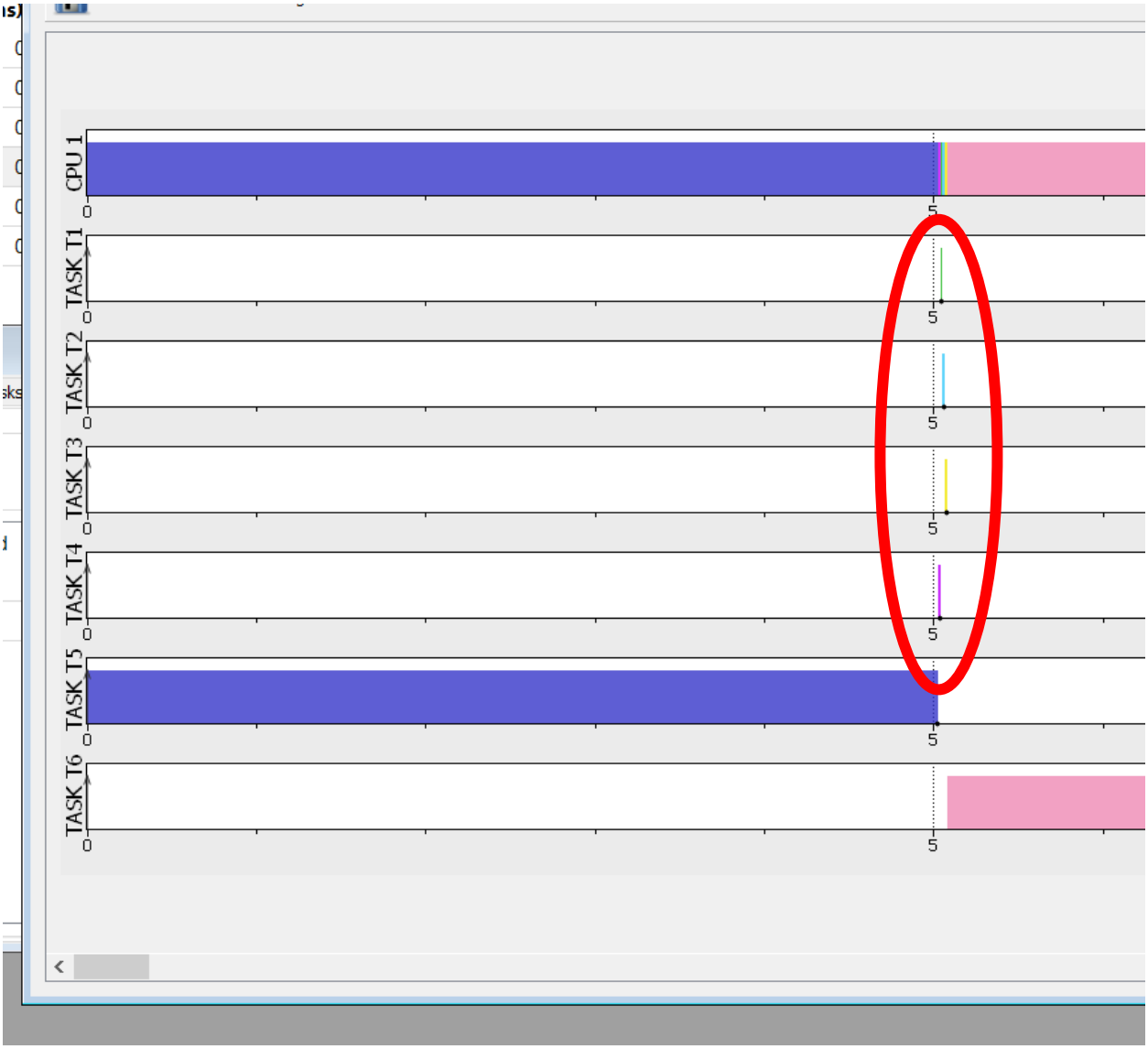
CPU Load

CPU Load Calculated be simso application





It is noticed that tasks 1, 2, 3, and 4 are not visible and that's because they have a very small execution time compared to tasks 5 and 6



We can see them after extremely zooming in

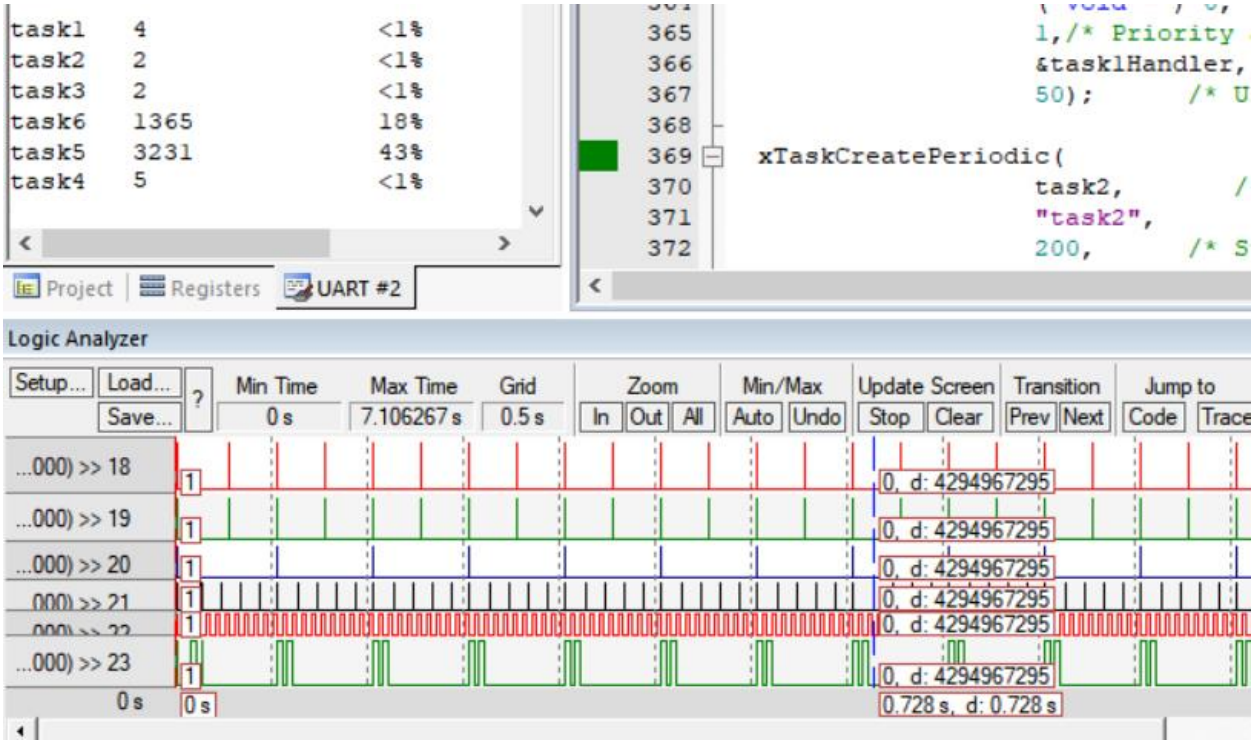
CPU Load By Calculations

U = (0.0134/50) + 0.0136/50) + (0.01295/100) + (0.01367/20) + (5.019/10) + (12.04/100) = **0.6237** = **62.37%**

0.6237 < 1

CPU Load By FreeRTOS APIs

```
329 void task7( void * pvParameters ){    //CPU Load
330
331
332     int i=0;
333       TickType_t xLastWakeTime;
334     const TickType_t xFrequency = 20;
335      xLastWakeTime = xTaskGetTickCount();
336
337     vTaskSetApplicationTaskTag(NULL, (void *) 7 );
338
339     for( ;; )
340     {
341       vTaskGetRunTimeStats(temp_buffer);
342       vSerialPutString(NULL,temp_buffer, 190);
343       vSerialPutString(NULL,NEW_LINE, 4);
344
345       vTaskDelayUntil( &xLastWakeTime, xFrequency );
346     }
347 }
348
```



System Schedulability

URM

Number of tasks = 6

U = 0.6237

URM = 3*(2^(1/3) - 1) = **0.7798**

U < URM

Then the system is schedulable

Time Demand Analysis

$$w_i(t) = e_i + \sum_{k=1}^{i-1} \left\lceil \frac{t}{p_k} \right\rceil e_k \quad for\ 0 < t \leq p_i$$

W = Worst response time
E = Execution time
P = Periodicity
T = Time instance

Task 5 has the highest priority as it has the lowest periodicity (10ms)

W1(1) = 5 W1(2) = 5 all the way to W1(10) = 5

Task 4 has the second highest priority (20ms)

W2(1) = 5+0.01367=5.01367 all the way to W2(10) = 5.01367

W2(11) = 10 + 0.01367 = 10.01367 to W2(20) = 10.01367

Task 1

W3(1) = 5.01367+0.0134=5.02707 to W3(10) = 5.02707

W3(11) = 10.02707 to W3(20) = 10.02707

W3(21) = 10.02707+5.01367=15.04074 to W3(30) = 15.04074

W3(31) = 20.04074 to W3(40) = 20.04074

W3(41)= 20.04074+5.01367=25.05441 to W3(50) = 25.05441

Task 2

W4(1) = 5.01367+0.0136=5.02727	to W4(10) = 5.02727
W4(11) = 10.02727	to W4(20) = 10.02727
W4(21) = 10.02727+5.01367=15.04094	to W4(30) = 15.04094
W4(31) = 20.04094	to W4(40) = 20.04094
W4(41)= 20.04094+5.01367=25.05461	to W4(50) = 25.05461

Task 3

W5(1) = 5.02707	to W5(10) = 5.02707
W5(11) = 10.02707	to W5(20) = 10.02707
W5(21) = 10.02707+5.01367=15.04074	to W5(30) = 15.04074
W5(31) = 20.04074	to W5(40) = 20.04074
W5(41)= 20.04074+5.01367=25.05441	to W5(50) = 25.05441
W5(51) =30.06808	to W5(60) = 30.06808
W5(61) =35.08175	to W5(70) = 35.08175
W5(71) =40.09542	to W5(80) = 40.09542
W5(81) = 45.10909	to W5(90) = 45.10909
W5(91)= 50.12276	to W5(100) = 50.12276

Task 6

W6(1) = 17.1	to W6(10) = 17.1
W6(11) = 22.1	to W6(20) = 22.1
W6(21) = 27.1557	to W6(30) = 27.1557
W6(31) = 32.1558	to W6(40) = 32.1558
W6(41)=42.243	to W6(50) = 42.243
W6(51) =47.298	to W6(60) = 47.298

W6(61) =52.298 to W6(70) = 52.298

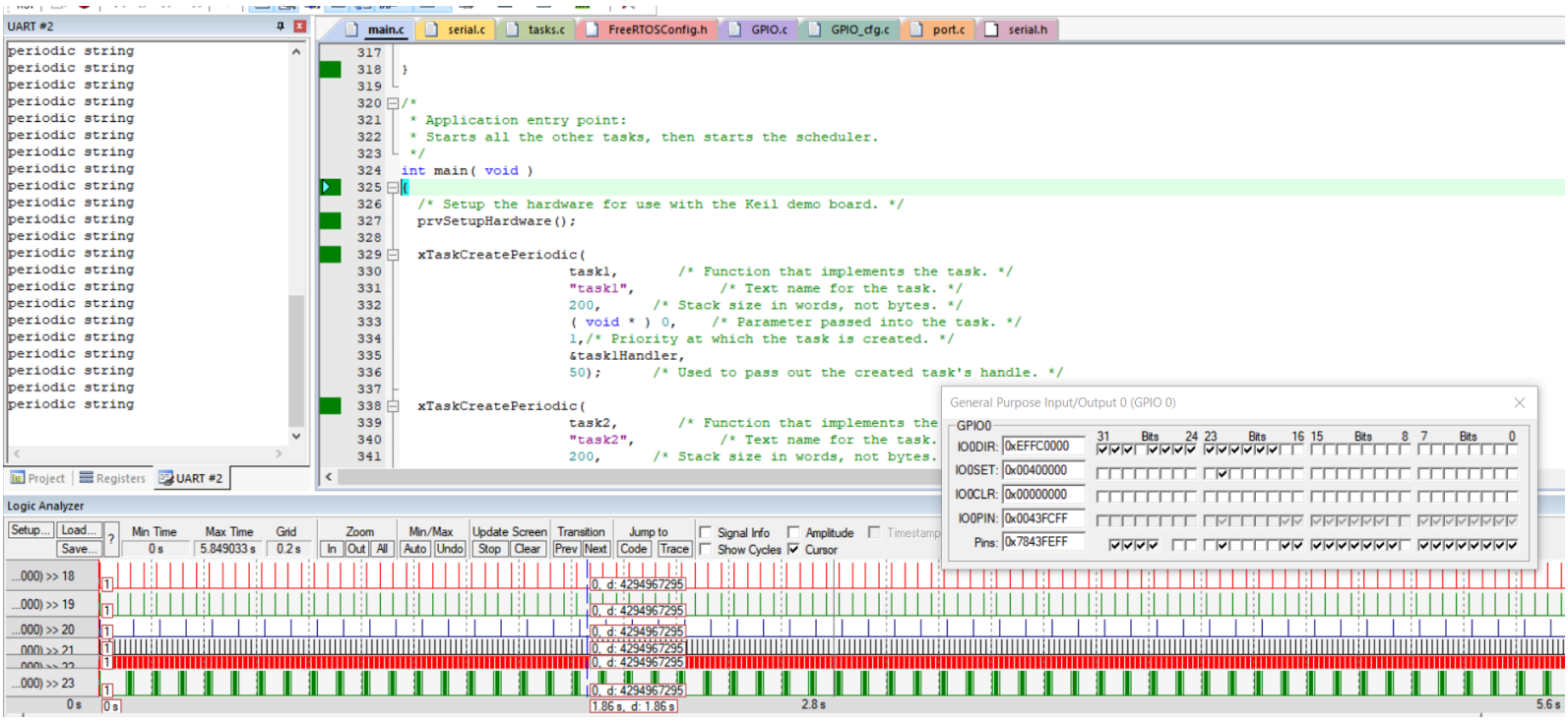
W6(71) =52.298 to W6(80) = 52.298

W6(81) = 57.353 to W6(90) = 57.353

W6(91)= 62.353 to W6(100) = 62.353

They are all schedulable as there are no tasks missing their deadlines

Overview of the system running



Conclusions

- System is verified to be schedulable with the mentioned 6 tasks using:
  - CPU Load analysis
  - Time demand analysis
  - URM
- It could be loaded with even more tasks up to a certain point