Learning-GPIO_LED_BUTTON

Ce document résume mes observations suite à la programmation de la carte de développement : « Nucleo-L476RG ».

L’objectif est la maîtrise des GPIO pour commander une LED 2 ou un Bouton.

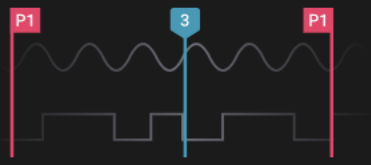
Première étape

Je fais un simple Toggle dans la boucle « While ».

Logic 2 [Logic - Connected] [Session 0]

File Edit Capture Measure View Help

Timing Markers



Click “+” to add Timing Markers

Measurements

M0 →	Δ10 µs
$N_{falling}$	10
N_{rising}	11
f_{min}	1 MHz
f_{max}	1 MHz
f_{mean}	1 MHz
T_{std}	0 s
D_{cycle}	46.667 %

Notes

Test Code "Learning-GPIO_LED_BUTTON"
First Step : Toggle in the "while" of the "main.c"

Session 0

1 µs

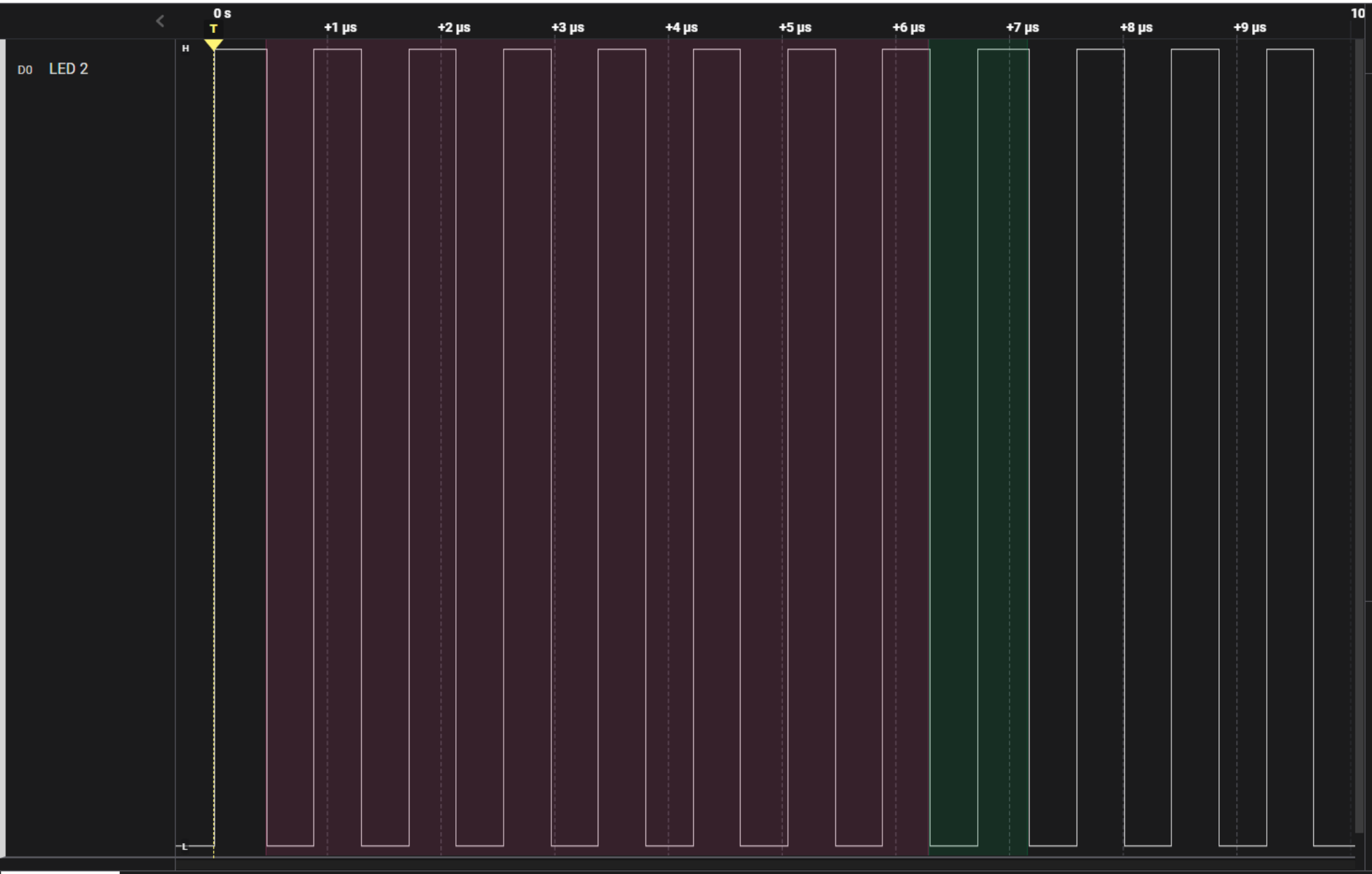
Taper ici pour

21°C

14:57
26/05/2023

Logic 2 [Logic - Connected] [Session 0]

File Edit Capture Measure View Help



Timing Markers

Measurements

M0	→	Δ5.833 µs
$N_{falling}$		8
N_{rising}		7
f_{min}		1.2 MHz
f_{max}		1.2 MHz
f_{mean}		1.2 MHz
T_{std}		0 s
D_{cycle}		50 %
M1	→	Δ875 ns
$N_{falling}$		2
N_{rising}		1
f_{min}		N/A
f_{max}		1.143 MHz
f_{mean}		1.143 MHz
T_{std}		N/A
D_{cycle}		52.381 %

Notes

Test Code "Learning-GPIO_LED_BUTTON"
Second Step : Test if difference between macro's writting

Session 0

1 µs

Taper ici pour

UV...

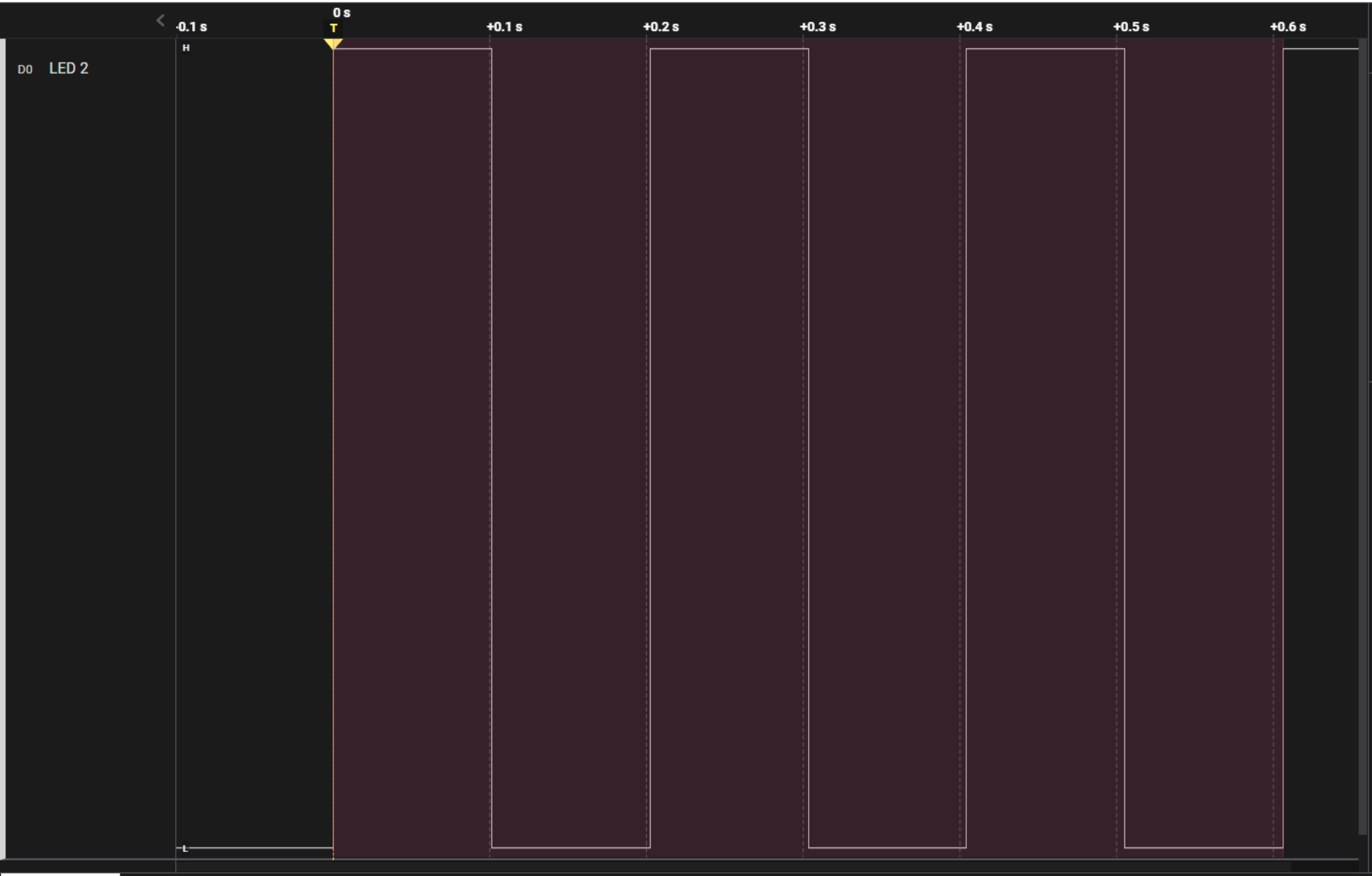
15:28
26/05/2023

Deuxième étape

Je fais un simple Toggle dans la boucle « While » avec une temporisation de 100 ms.

Logic 2 [Logic - Connected] [Session 0]

File Edit Capture Measure View Help



Timing Markers

Measurements

M0 →	Δ606.378042 ms
$N_{falling}$	3
N_{rising}	4
f_{min}	N/A
f_{max}	4.948 Hz
f_{mean}	4.947 Hz
T_{std}	16.879 µs
D_{cycle}	50.001 %

Notes

Test Code "Learning-GPIO_LED_BUTTON"
Third Step : Toggle each 100ms

Session 0

75 ms

Taper ici pour

21°C

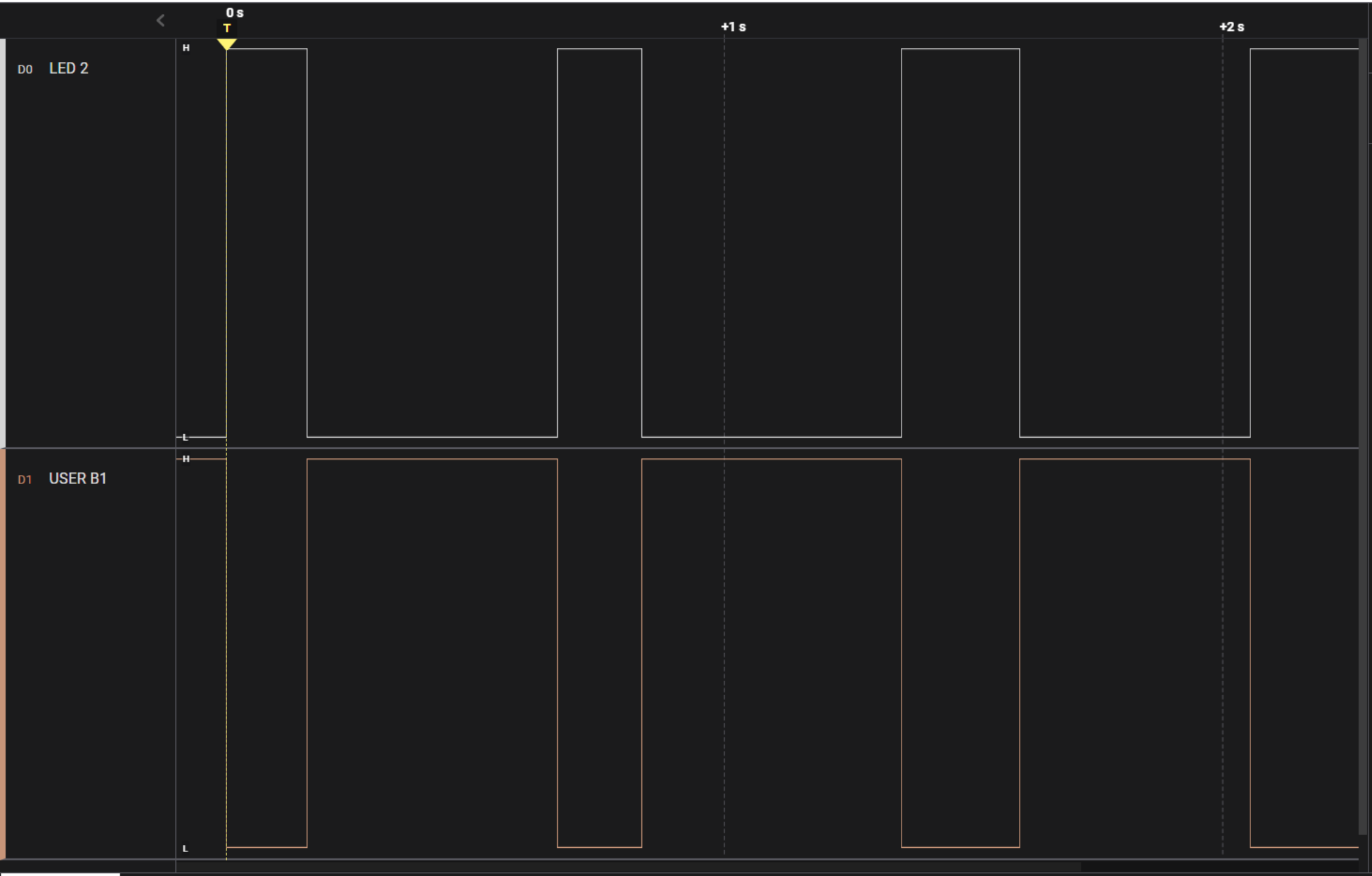
16:24
26/05/2023

Troisième étape

J’allume la LED 2 quand on appuie sur le Bouton B1. Ce code est dans la boucle « While ».

Logic 2 [Logic - Connected] [Session 0]

File Edit Capture Measure View Help



Timing Markers

Measurements

Notes

Test Code "Learning-GPIO_LED_BUTTON"
Fourth Step : Press the button to turn on the LED

Session 0

235 ms

Taper ici pour

21°C

15:52
26/05/2023

Quatrième étape (Polling)

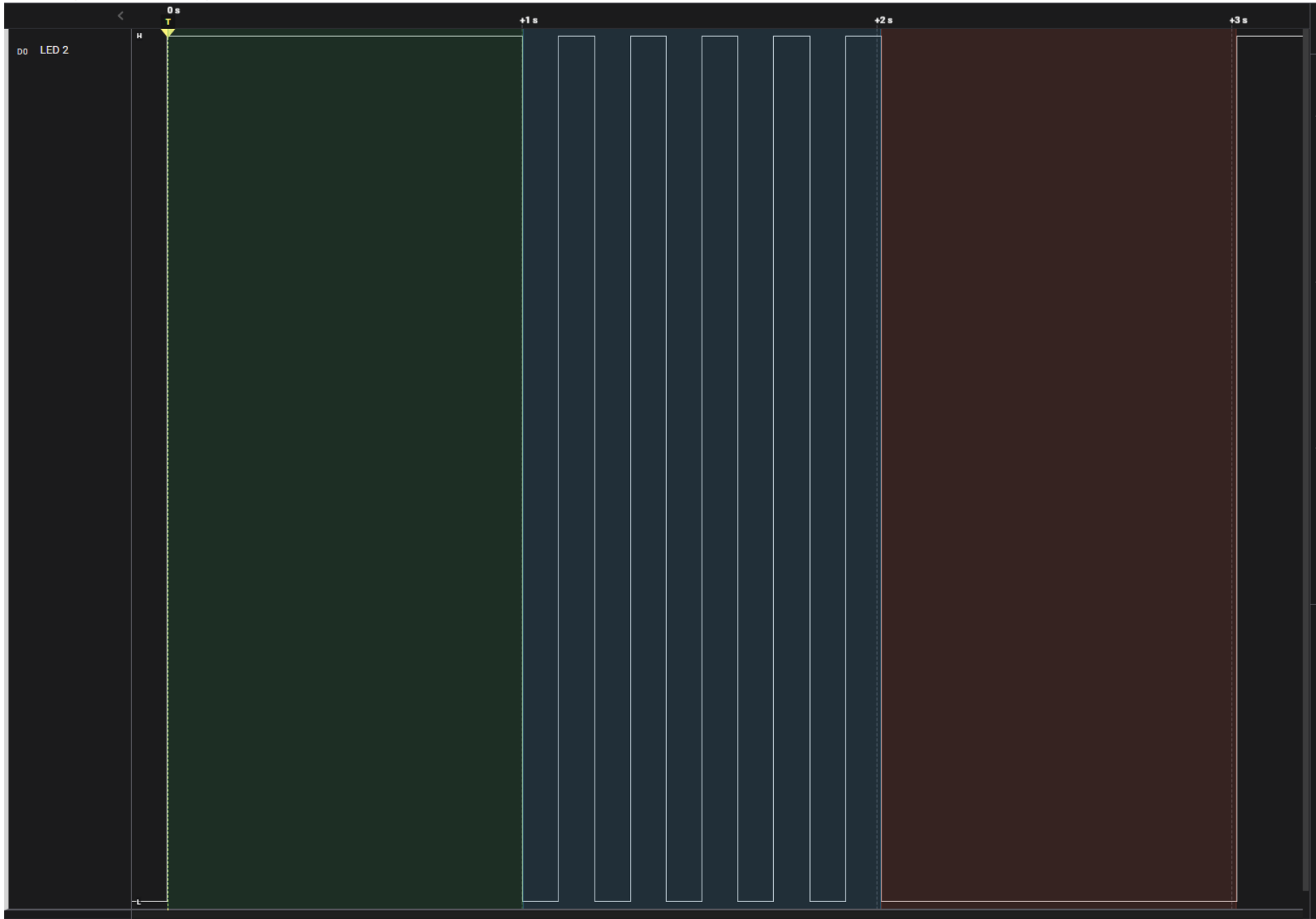
Toutes les 1 secondes, il y a un changement de mode.

Il y a 3 mode :

- *Eteint*
- *Allumé*
- *Chenillard*

Logic 2 [Logic - Connected] [Session 0]

File Edit Capture Measure View Help



Timing Markers

Measurements

M0 →	Δ1.001 706 000 s
$N_{falling}$	1
N_{rising}	1
f_{min}	N/A
f_{max}	N/A
f_{mean}	N/A
T_{std}	N/A
D_{cycle}	N/A
M1 →	Δ1.010 741 000 s
$N_{falling}$	6
N_{rising}	5
f_{min}	4.947 Hz
f_{max}	4.947 Hz
f_{mean}	4.947 Hz
T_{std}	6.907 µs
D_{cycle}	50 %
M2 →	Δ1.001 727 000 s
$N_{falling}$	1
N_{rising}	1
f_{min}	N/A
f_{max}	N/A
f_{mean}	N/A
T_{std}	N/A
D_{cycle}	N/A

Notes

Test Code "Learning-GPIO_LED_BUTTON"
Fifth Step : It's a 3-state machine linked together according to the choice of tempo (1 s)
state 0: LED2 is off during 1s
state 1: LED2 is on during 1s
state 2: LED2 toggle 10 times every 100ms

Session 0

240 ms

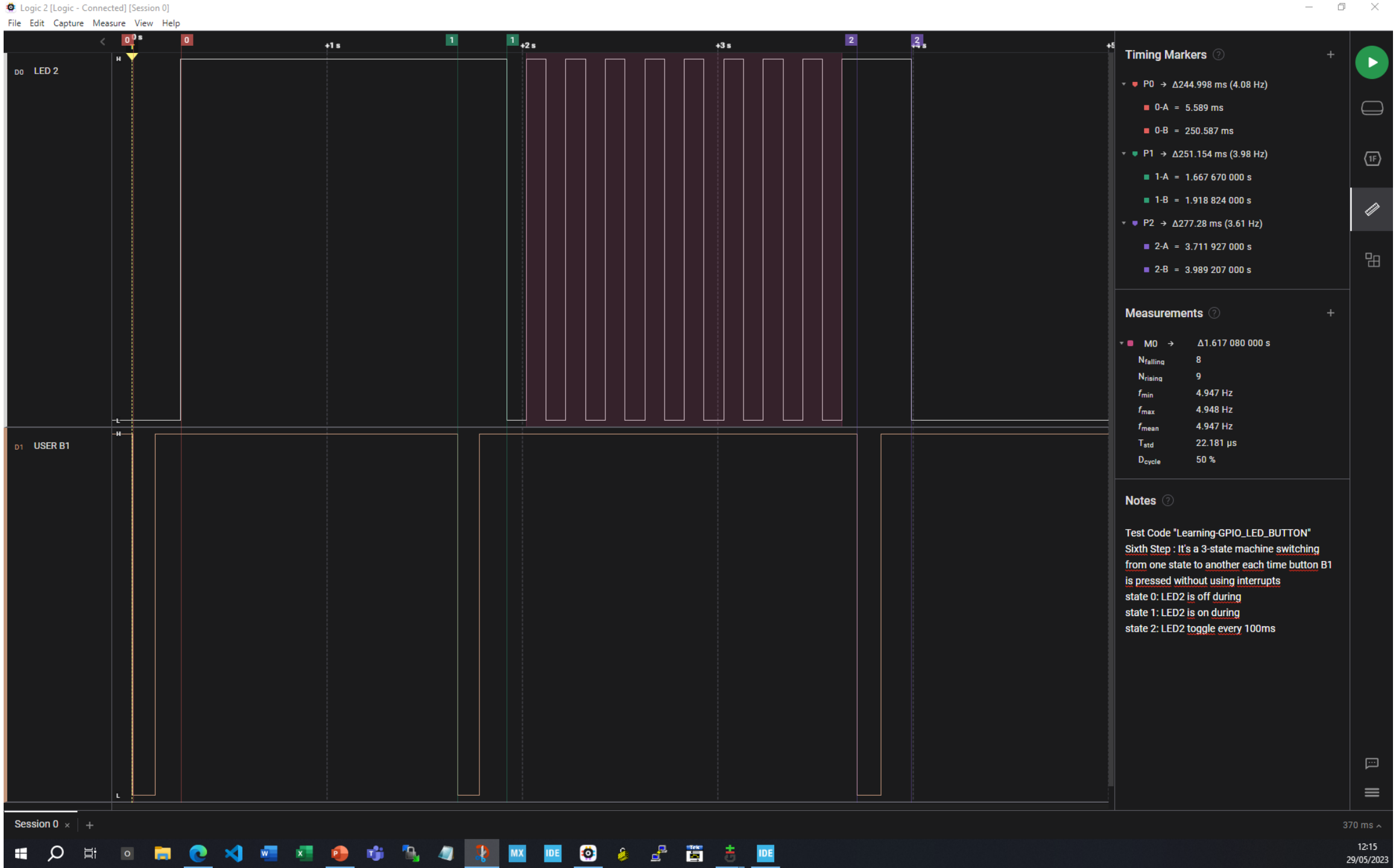
11:29
29/05/2023

Cinquième étape (Polling)

Chaque appui sur le bouton déclenche un changement de mode.

Il y a 3 mode :

- *Eteint*
- *Allumé*
- *Chenillard*

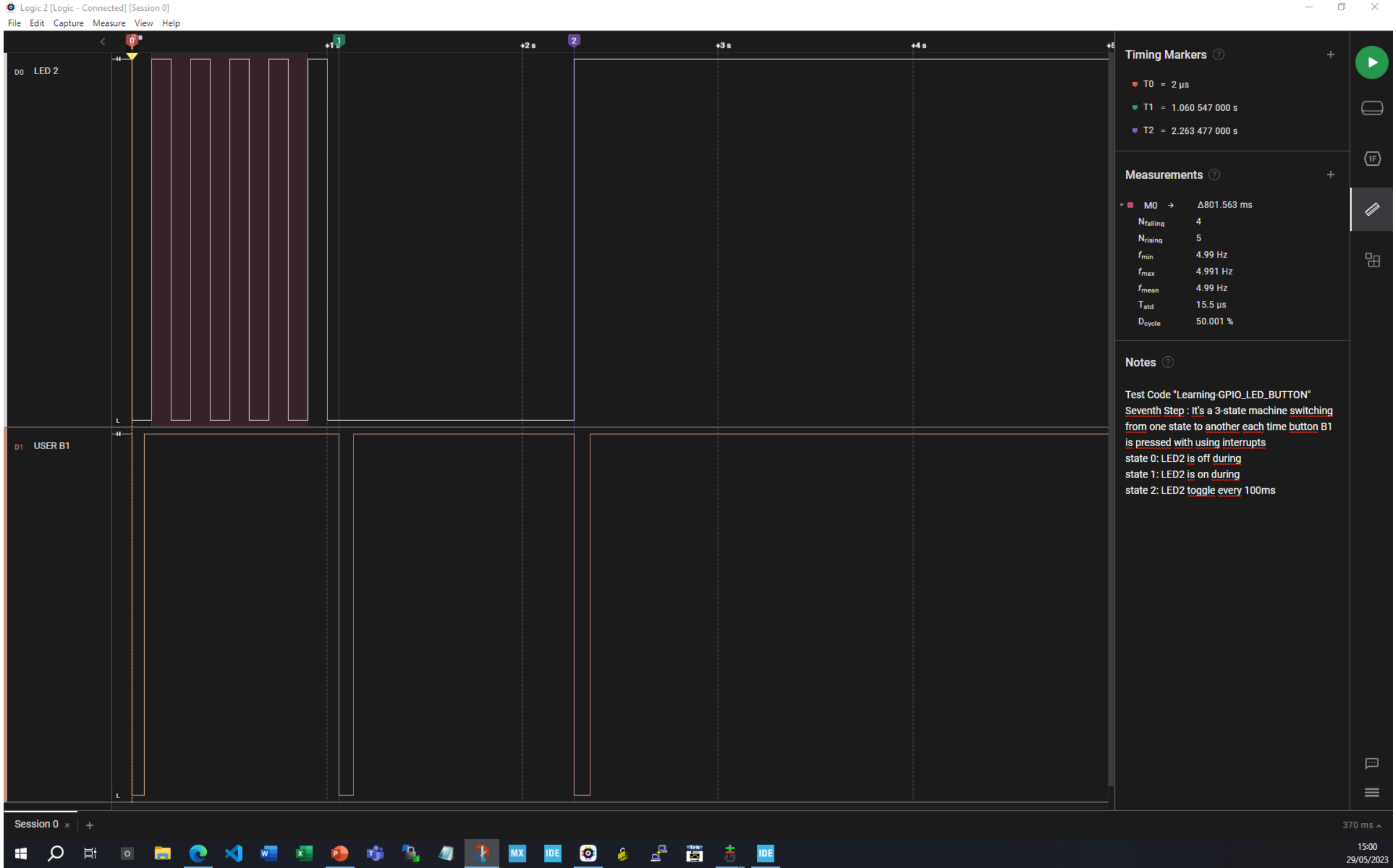

Logic 2 [Logic - Connected] [Session 0]
File Edit Capture Measure View Help
D0 LED 2
D1 USER B1
+1 s
+2 s
+3 s
Timing Markers
P0 → Δ244.998 ms (4.08 Hz)
0-A = 5.589 ms
0-B = 250.587 ms
P1 → Δ251.154 ms (3.98 Hz)
1-A = 1.667 670 000 s
1-B = 1.918 824 000 s
P2 → Δ277.28 ms (3.61 Hz)
2-A = 3.711 927 000 s
2-B = 3.989 207 000 s
Measurements
M0 → Δ1.617 080 000 s
N falling 8
N rising 9
f min 4.947 Hz
f max 4.948 Hz
f mean 4.947 Hz
T std 22.181 µs
D cycle 50 %
Notes
Test Code "Learning-GPIO_LED_BUTTON"
Sixth Step : It's a 3-state machine switching from one state to another each time button B1 is pressed without using interrupts
state 0: LED2 is off during
state 1: LED2 is on during
state 2: LED2 toggle every 100ms
Session 0
370 ms
12:15
29/05/2023

Sixième étape (Interruption)

Chaque appui sur le bouton déclenche un changement de mode.

Il y a 3 mode :

- *Eteint*
- *Allumé*
- *Chenillard*


Logic 2 [Logic - Connected] [Session 0]
File Edit Capture Measure View Help
D0 LED 2
D1 USER B1
+1 s
+2 s
+3 s
+4 s
Timing Markers
T0 = 2 µs
T1 = 1.060 547 000 s
T2 = 2.263 477 000 s
Measurements
M0 → Δ801.563 ms
N falling 4
N rising 5
f min 4.99 Hz
f max 4.991 Hz
f mean 4.99 Hz
T std 15.5 µs
D cycle 50.001 %
Notes
Test Code "Learning-GPIO_LED_BUTTON"
Seventh Step : It's a 3-state machine switching from one state to another each time button B1 is pressed with using interrupts
state 0: LED2 is off during
state 1: LED2 is on during
state 2: LED2 toggle every 100ms
Session 0
370 ms
15:00
29/05/2023

Conclusion

Grâce à ces exercices, j’ai appris à utiliser :

- Le logiciel Logic
- GPIO en mode sortie (LED 2)
- GPIO en mode entrée (Bouton B1)
- Interruption sur GPIO
- L’utilisation de la fonction HAL_Delay()