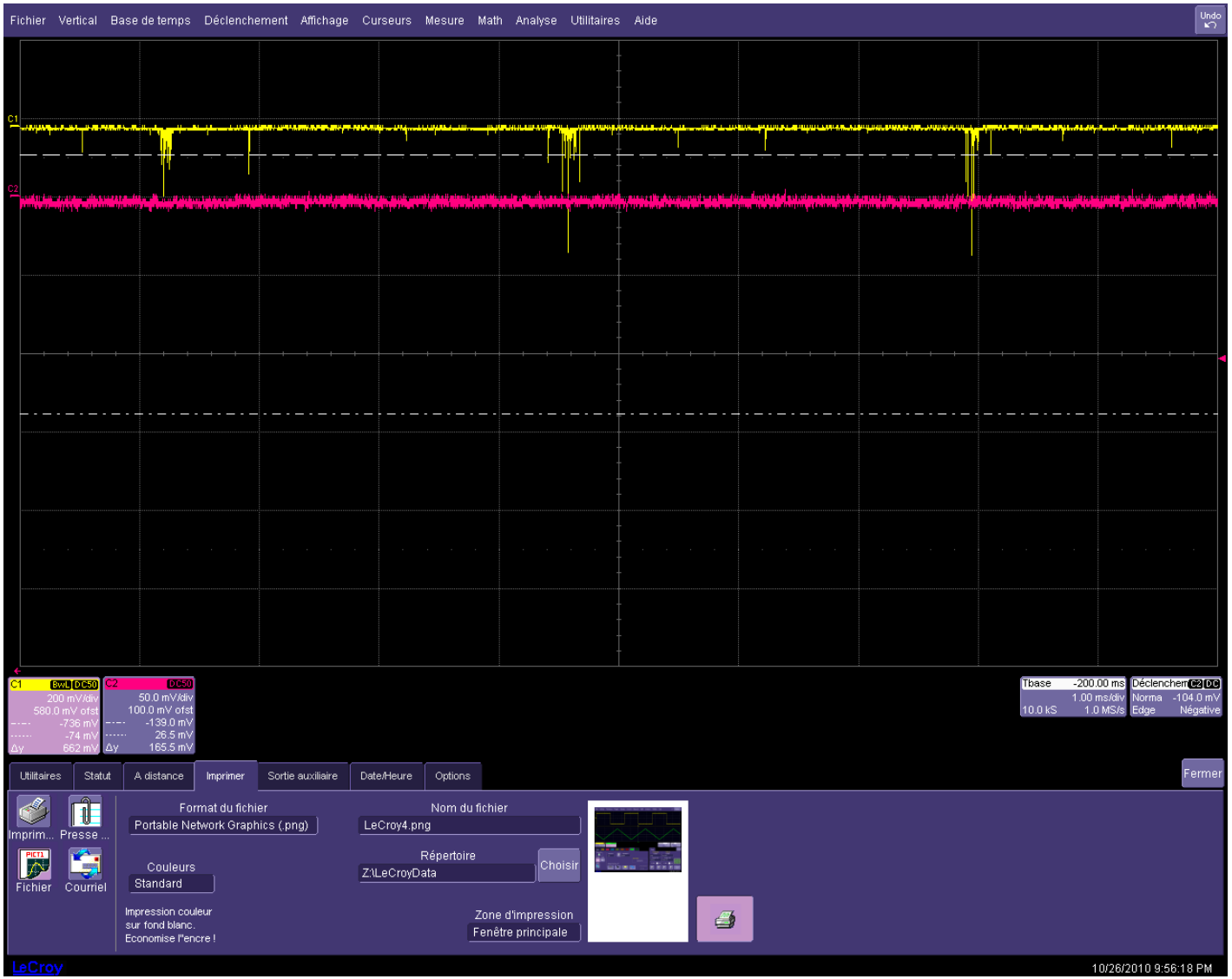
Mighty laser update

Didier JEHANNO
François LABAYE
Nicolas DELERUE
LAL, Orsay

Equipment status (26/10)

- We locked the laser cavity and the Fabry-Perot cavity during an access at the beginning of our shift on 26/10.
- However to search for Compton photons we unlocked the Fabry-Perot cavity so that the laser would scan the phase space naturally.
- Around 22h the laser cavity had drifted by ~150Hz.
- Power in the FP cavity: 1.7kW.
- ATF Status: Single bunch single train, 1.56Hz, 4.4 10^9 e-
- Injection timing has been modified earlier today.
- The cavity vertical position is controlled remotely by sending EPICS commands to the movers.
- Calorimeter: CsI biaised at -2.4kV

First signal

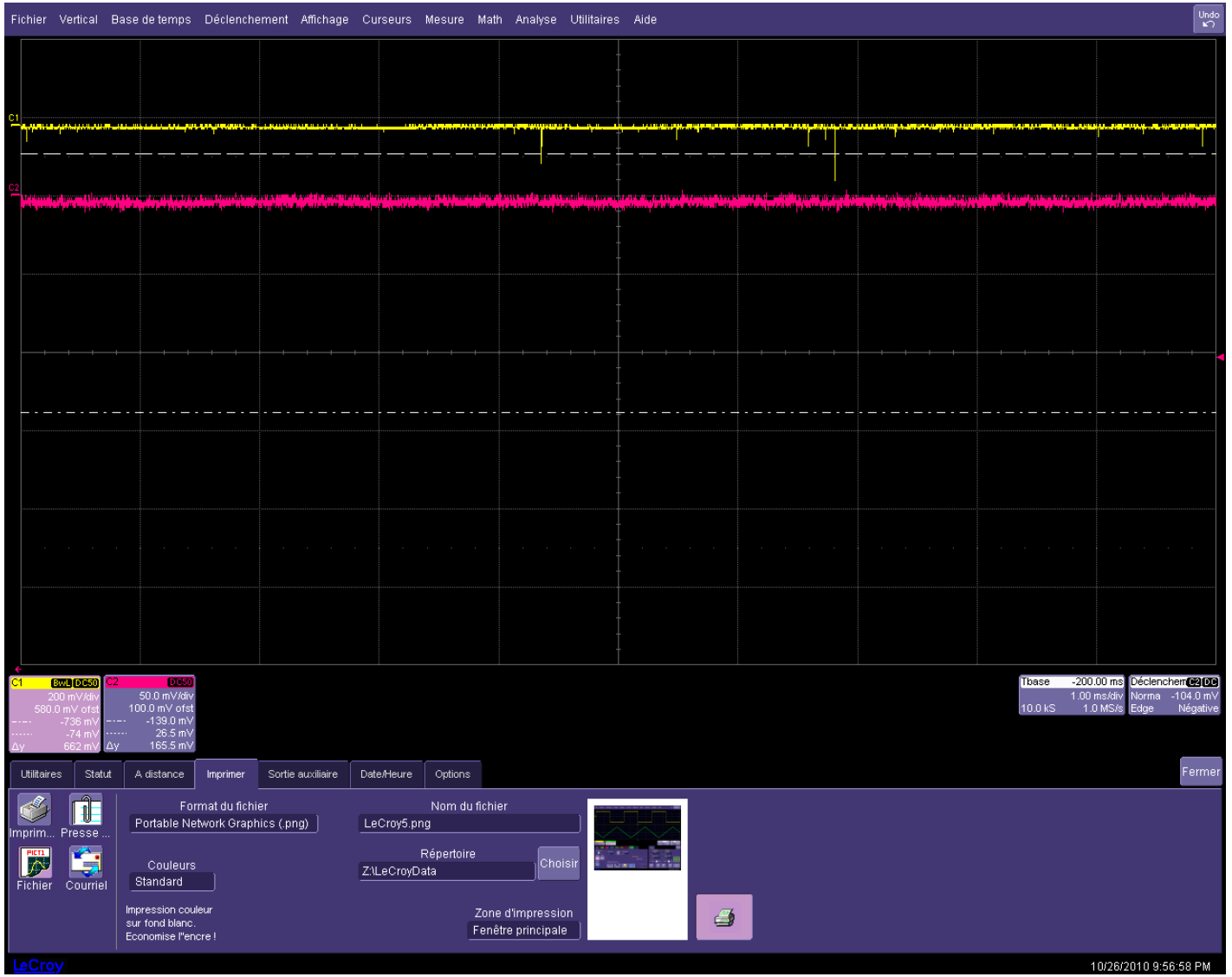


Vertically
Cavity position = 282um
Beam position = 270um

Scope trace:
Yellow=calorimeter
Red= Injection trigger

Note the peaks on the yellow trace.

Moving the cavity



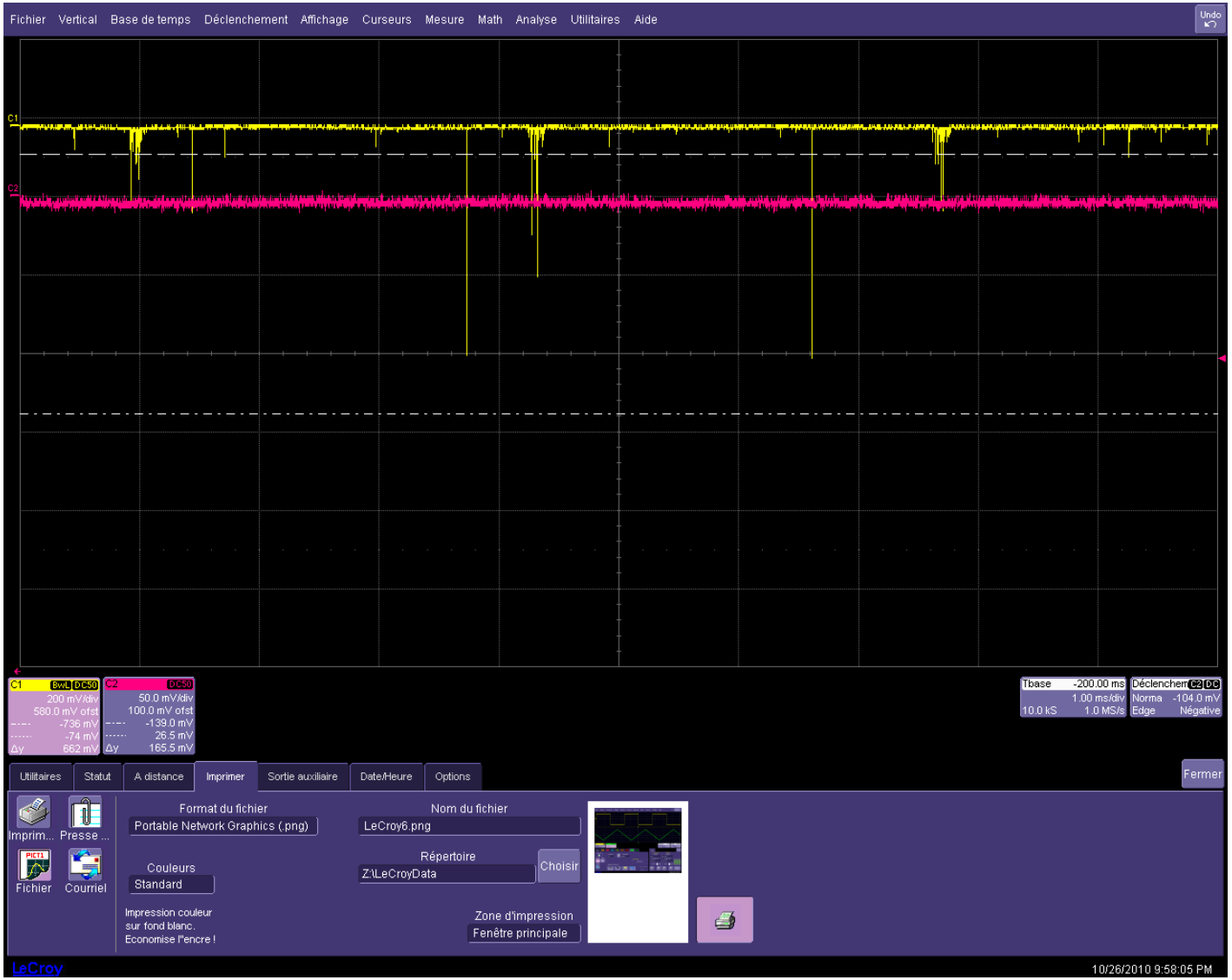
Cavity moved vertically by 80um.

Vertically
Cavity position = 206um
Beam position = 270um

Scope trace:
Yellow=calorimeter
Red= Injection trigger

Note that the big peaks on the yellow trace have disappeared.

Back to the original position



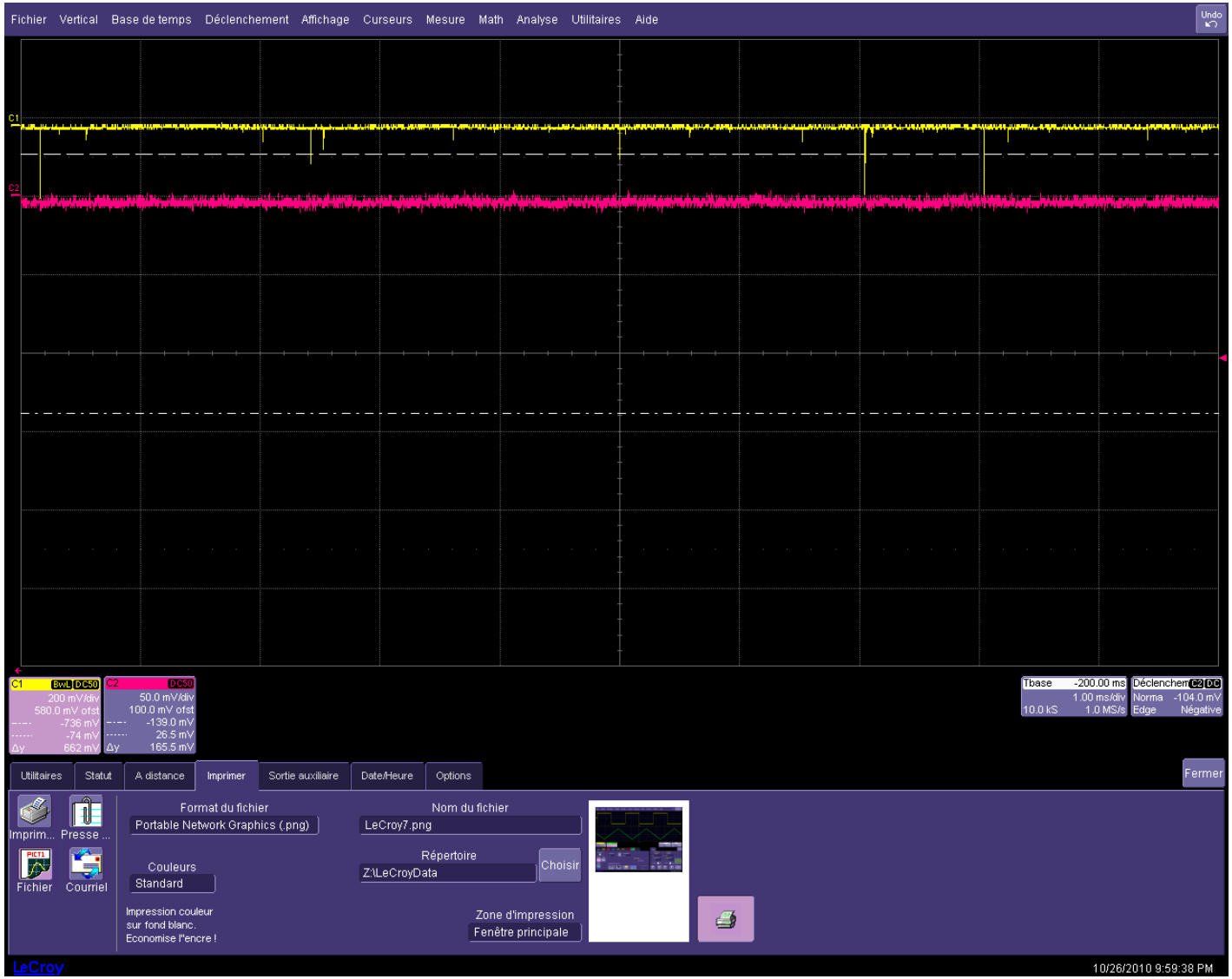
Cavity moved back by 80um.

Vertically
Cavity position = 282um
Beam position = 270um

Scope trace:
Yellow=calorimeter
Red= Injection trigger

Note that the big (wide) peaks on the yellow trace are also back.

Unlock the laser cavity



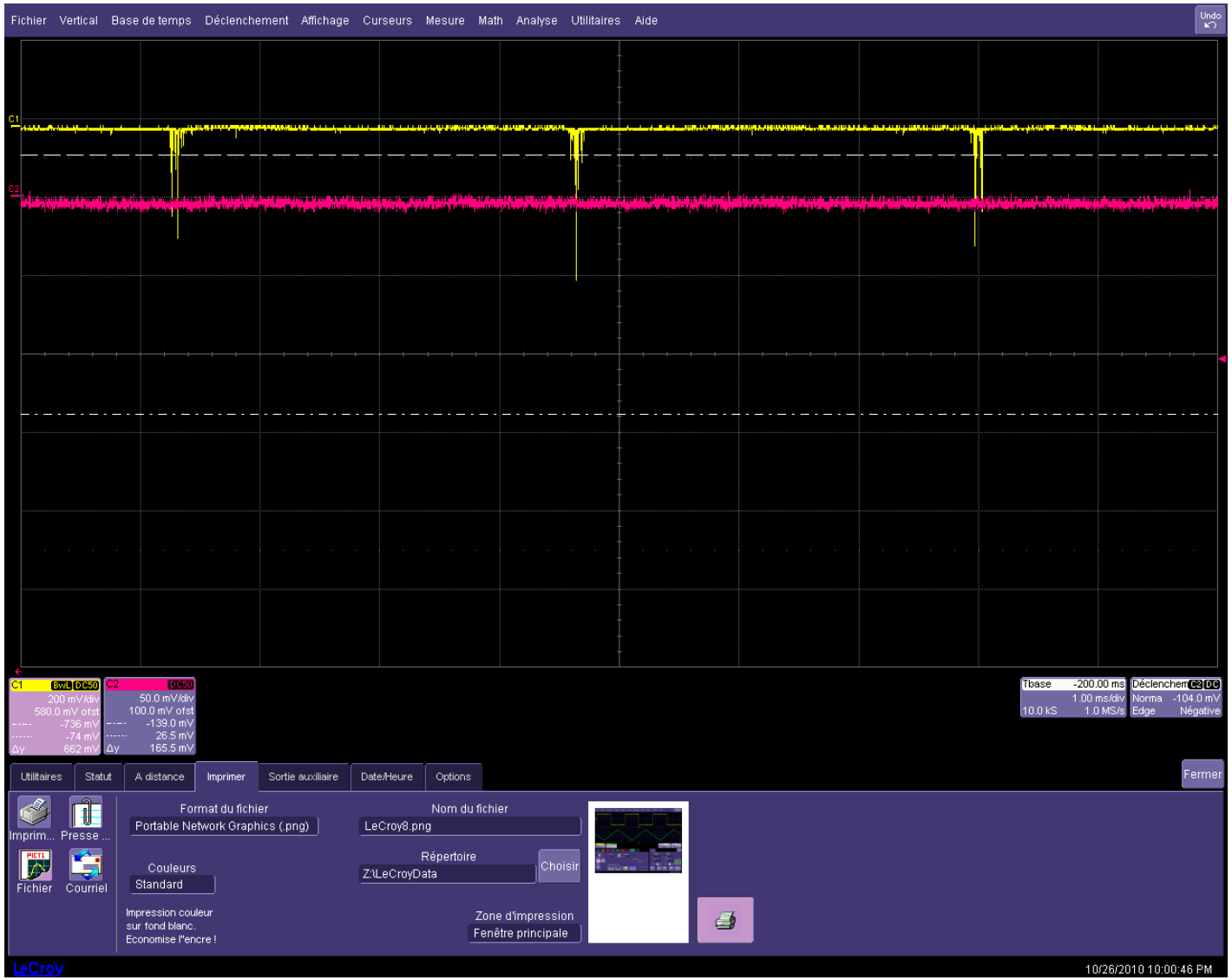
Laser cavity unlocked.

Vertically
Cavity position = 282um
Beam position = 270um

Scope trace:
Yellow=calorimeter
Red= Injection trigger

Note that the big peaks on the yellow trace are gone.

Re-lock the laser cavity



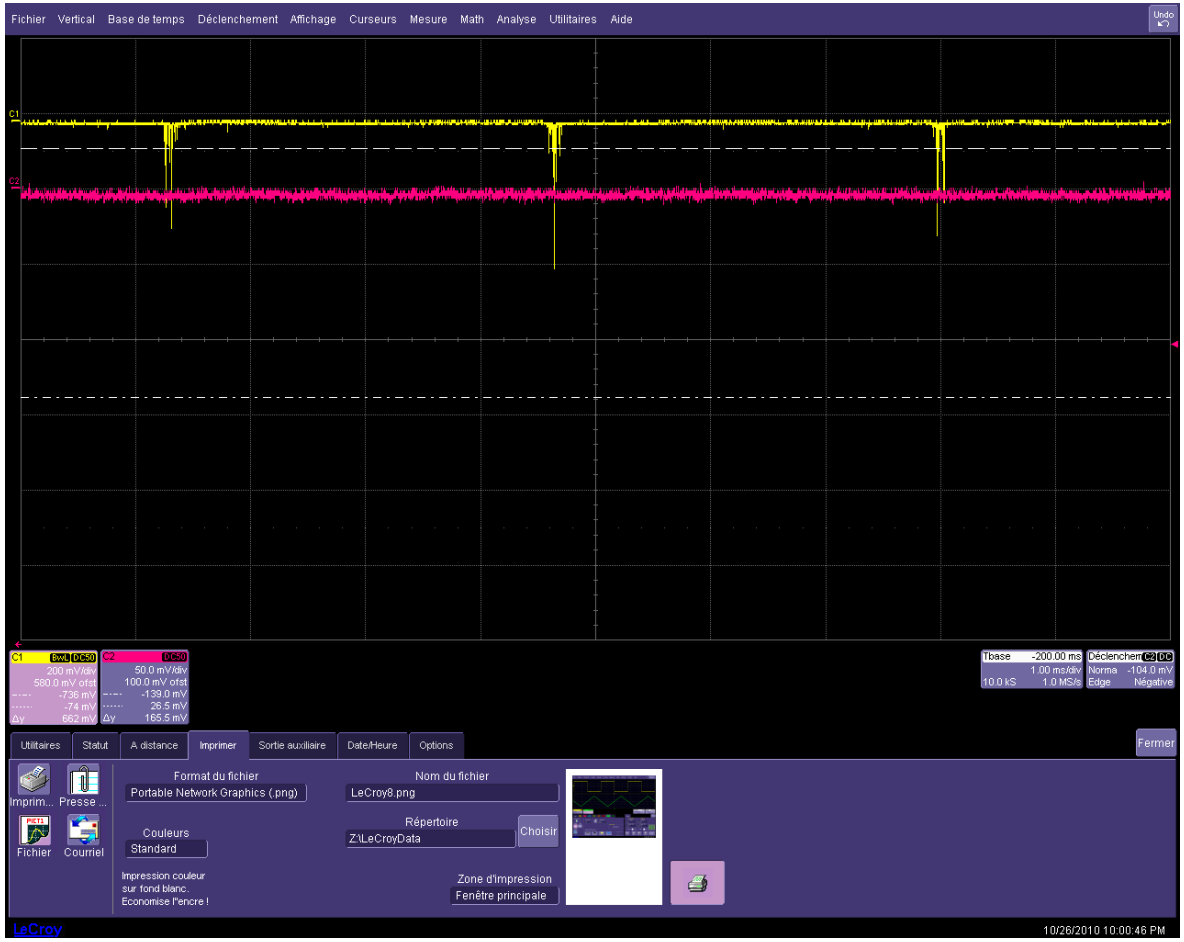
Laser cavity locked again.

Vertically
Cavity position = 282um
Beam position = 270um

Scope trace:
Yellow=calorimeter
Red= Injection trigger

Note that the big peaks on the yellow trace back again.

Signal frequency (1)



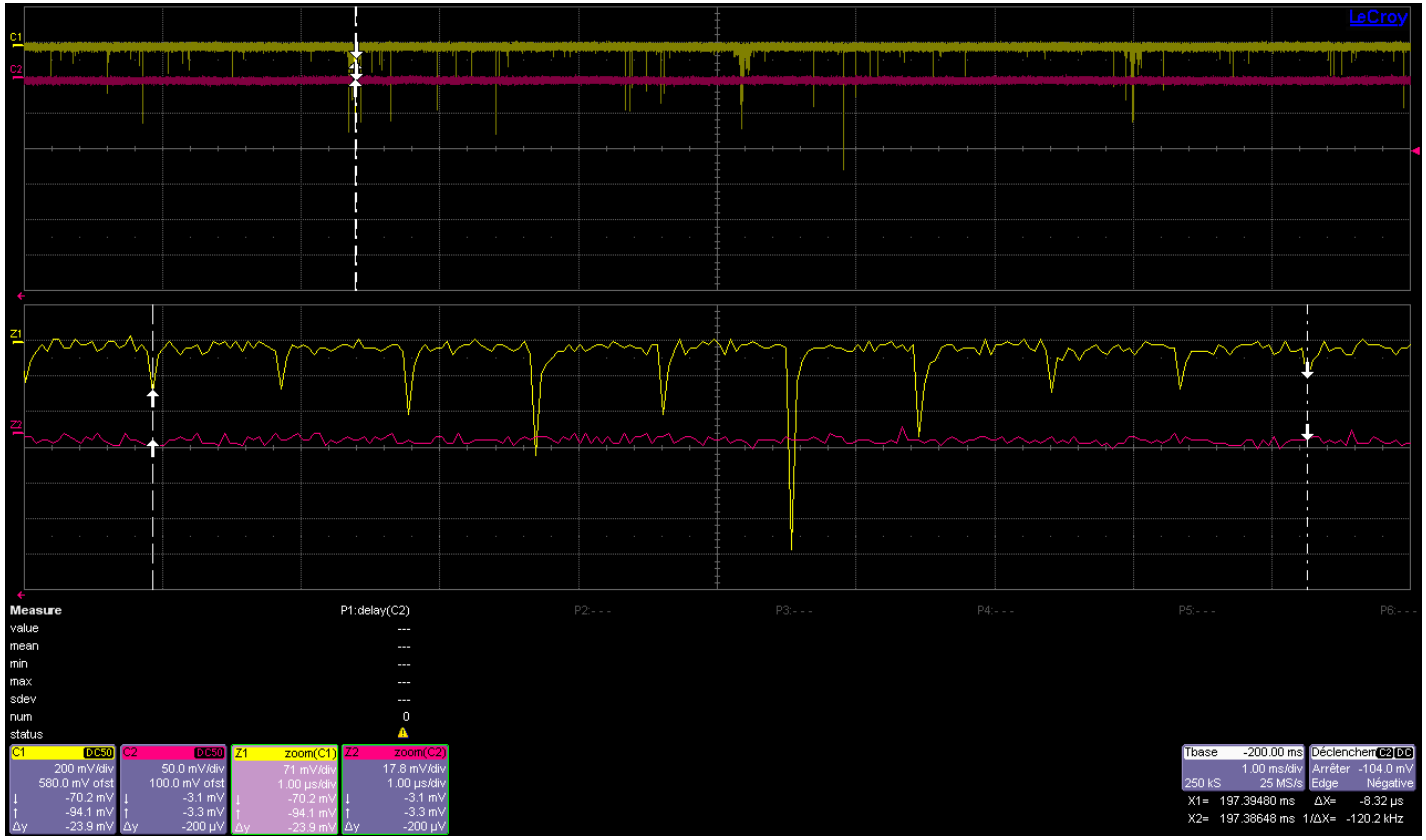
Laser cavity frequency:
178 497 222 Hz

ATF Frequency:
2x 178 497 373 Hz

Heterodyne:
163Hz

Signal observed:
~2x150Hz (corresponding to the even and odd turns).

Signal frequency (2)



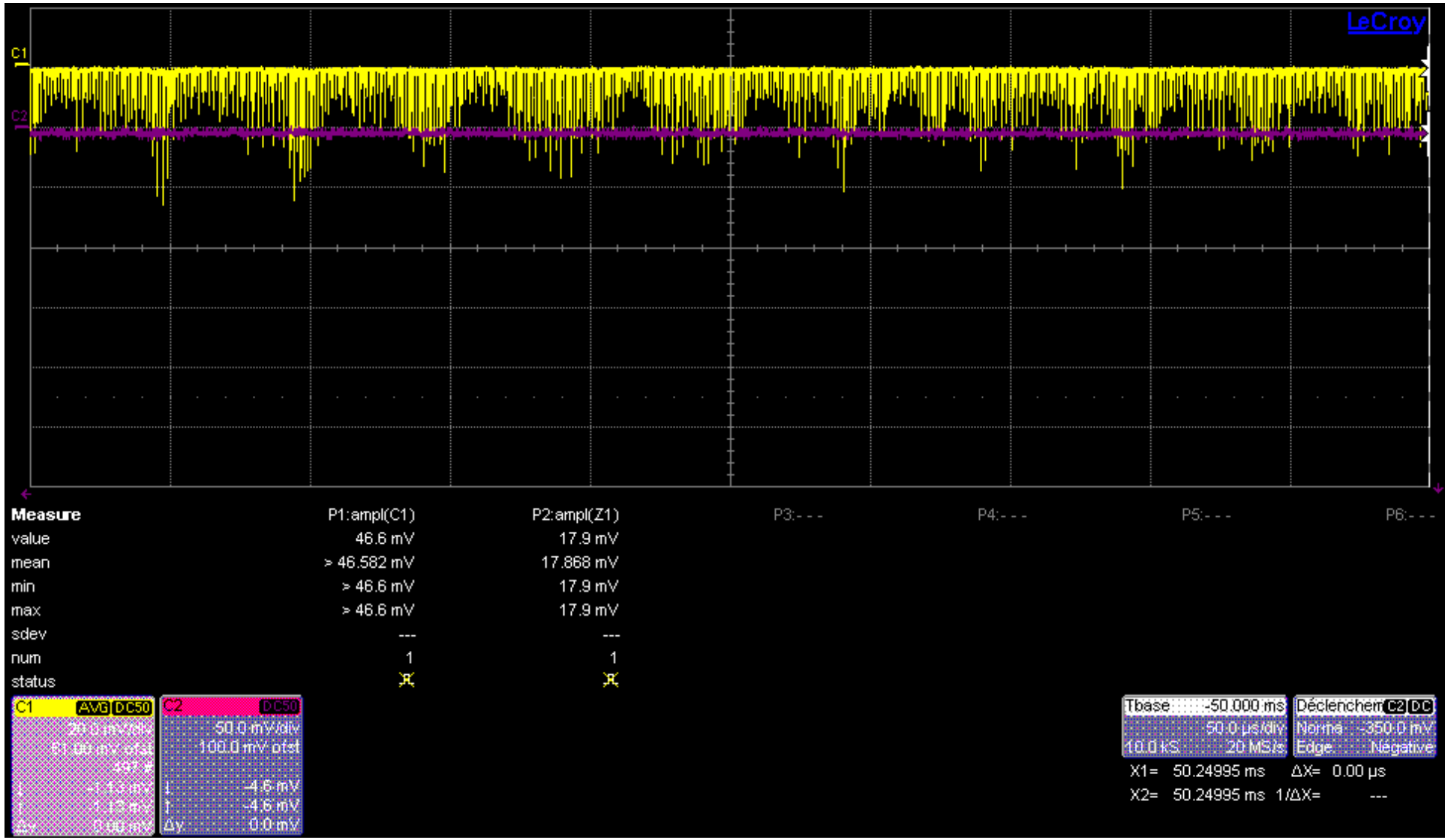
A zoom on one wide peak shows that it is made of several smaller peaks spaced by less than 1us. (measure: 8.32us/9=924ns)

A bunch that collides comes back in the same position after 2 revolutions, that is 924ns.

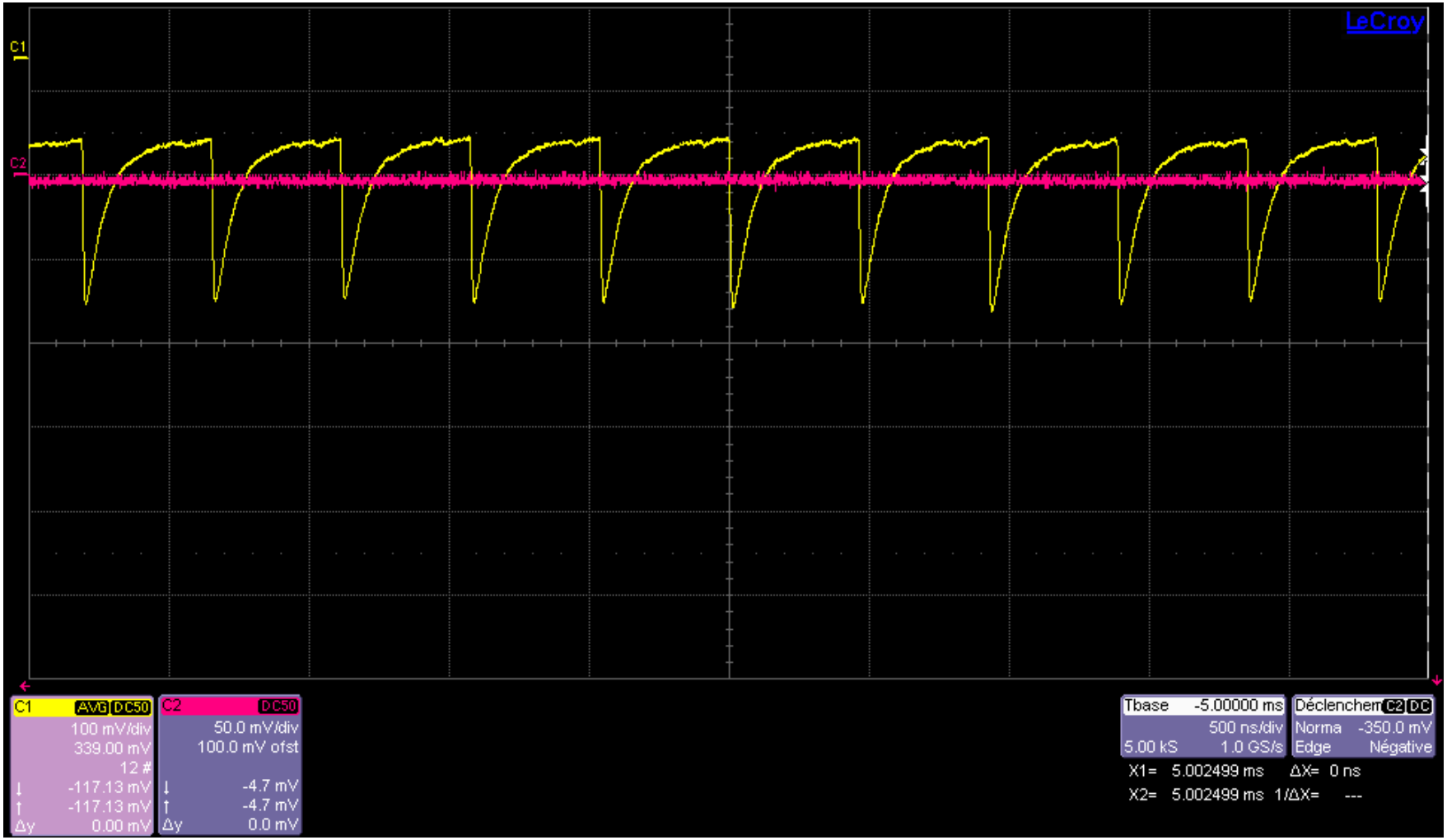
27 October

- We did an access during which we installed a quick fix to be able to adjust the laser cavity frequency remotely.
- Then we took data in single bunch mode.
- Procedure used:
  1) Move the FP cavity ~100Hz away from the ATF frequency
  2) Scan the cavity vertically (phase scan happens naturally)
  3) Once Comptons are found, lock the FP cavity on the ATF frequency
  4) Scan in phase

Fabry-Perot cavity locked



Compton frequency…



In single bunch mode we observed comptons on every turn… ????

Summary

- We have seen a signal on the calorimeter.
- This signal appears only in a narrow range of vertical cavity positions.
- This signal appears only when the laser cavity is locked.
- We conclude that this signal corresponds to the energetic photons produced when the laser in our cavity interacts with the electrons in the ATF.
- We have been able to lock our FP cavity on the ATF and produce comptons continuously for 4hours.