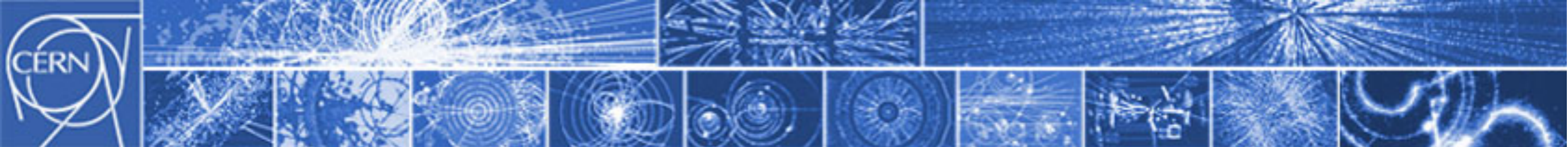# Minimising of the coherent oscillations at injection. using the fractional part of Tune as Input Parameter

- OASIS acquisitions allow to quantify coherent oscillations due to injection miss-steering

- Position is obtained from the sum and difference signal from a pick-up

- Position at a pickup location is measured turn-by-turn

- Assumption for the coherent oscillation: $x_n = x_{co} + A\cos(\mu_0 + 2\pi qn)$

- It can be rewritten as $x_n = x_{co} + C_s\cos(2\pi qn) + S_s\sin(2\pi qn)$ and the coefficents can be evaluated analytically using the tune q as an input parameter. (credits: C. Carli)
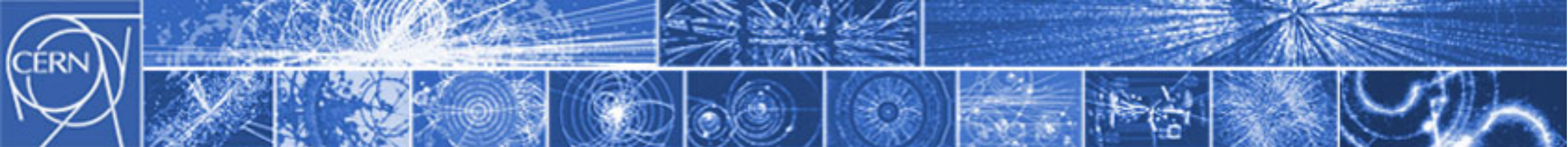
And you know what... it works !

Minimising of the coherent oscillations at injection. using the fractional part of Tune as Input Parameter

ELENA

- Coherent oscillations after injection can be analytically described and a compensation can be computed.

- H corrections using the injection septum and kicker

- V corrections are made using two orbit correctors in the injection line

- (credits: C. Carli)

And you know what… it works !
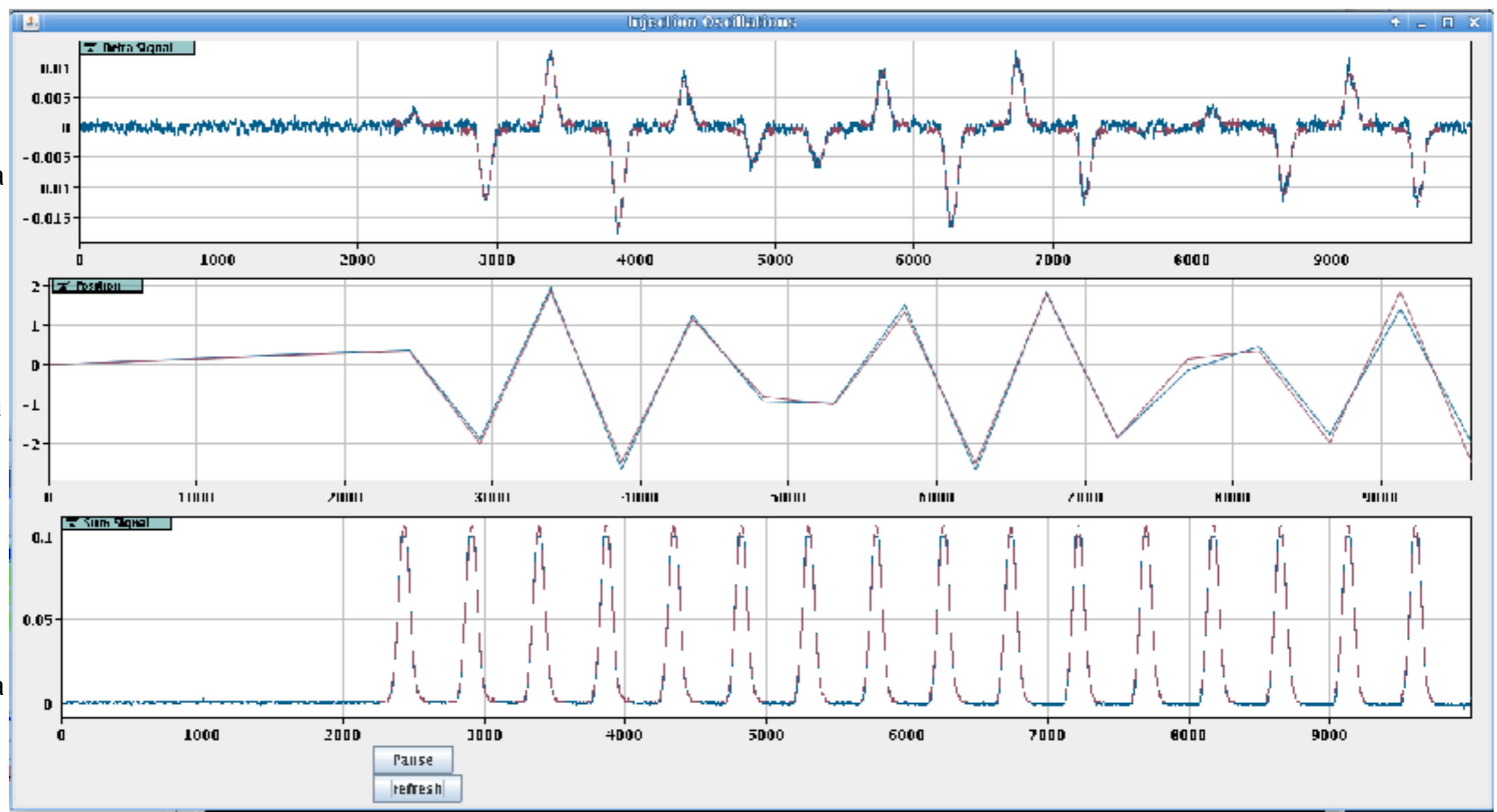
Before correction

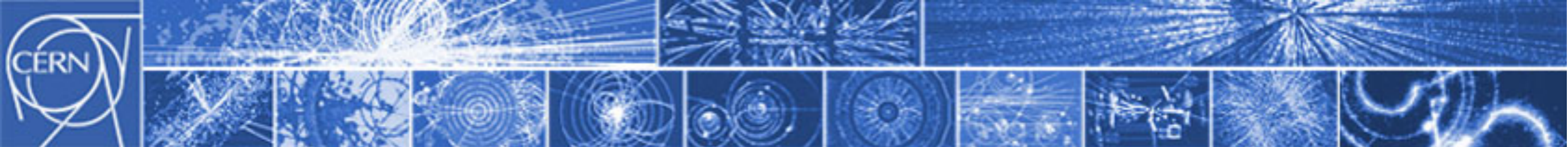**DELTA PICKUP**

Blue Plot : Real Data
Red Plot : Fitted Data

POSITION TURN BY TURN

Blue Plot : Real Data
Red Plot :
Reconstructed Data
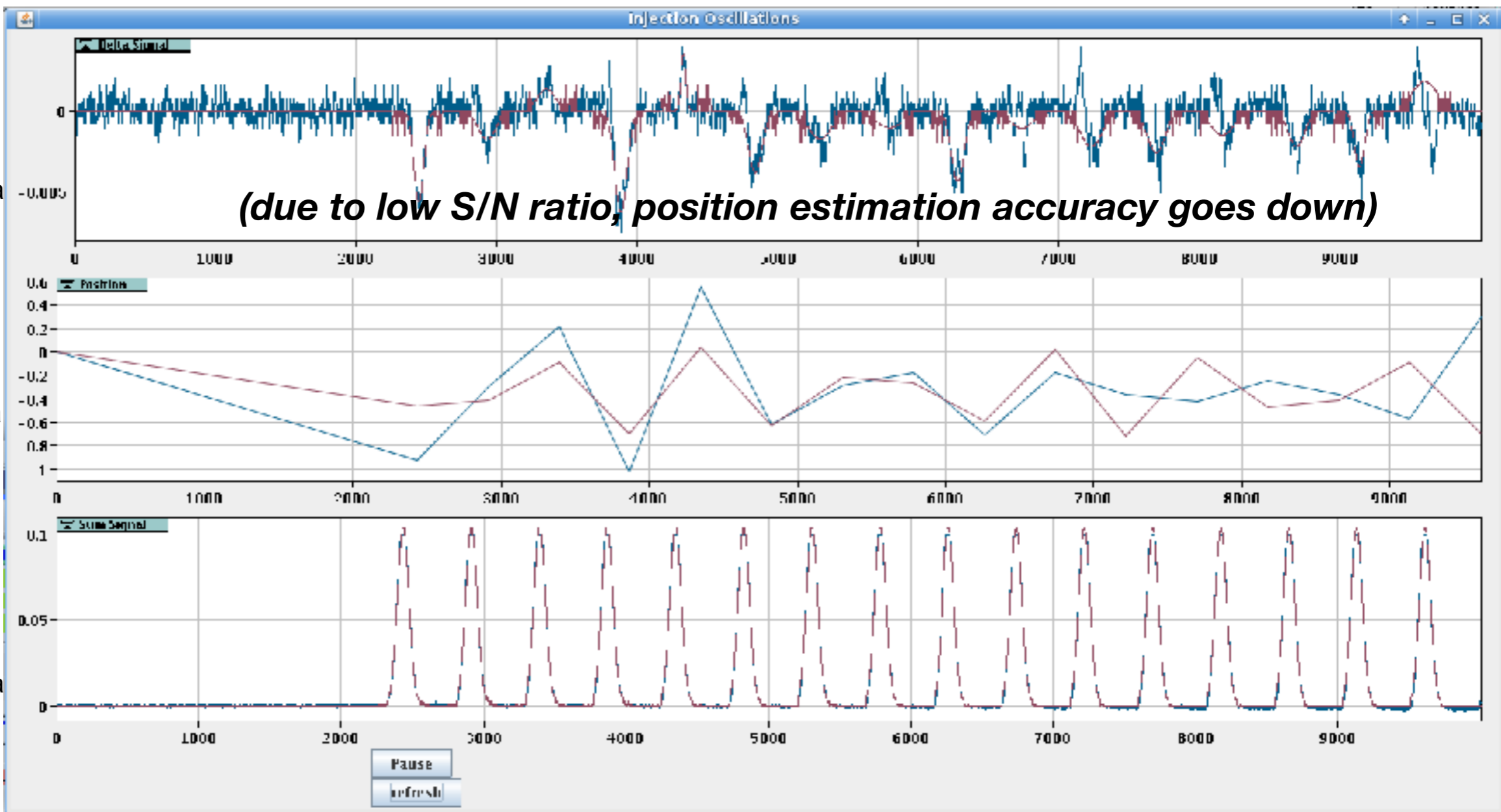
SUM PICKUP

Blue Plot : Real Data
Red Plot : Fitted Data

After Correction
Oscillations went from 5mm p-p to 0.6 p-p

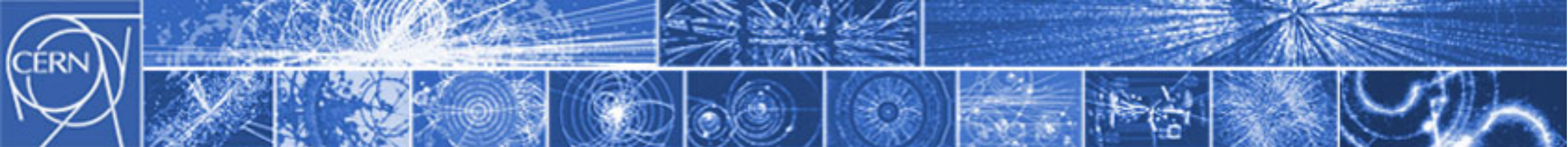**DELTA PICKUP**

Blue Plot : Real Data
Red Plot : Fitted Data

(due to low S/N ratio, position estimation accuracy goes down)

POSITION TURN BY TURN

Blue Plot : Real Data
Red Plot :
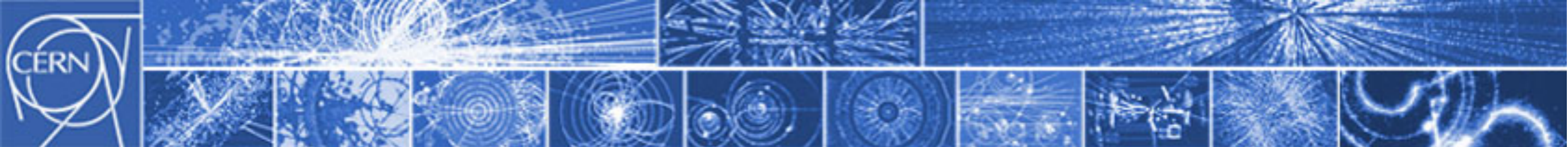Reconstructed Data

SUM PICKUP

Blue Plot : Real Data
Red Plot : Fitted Data
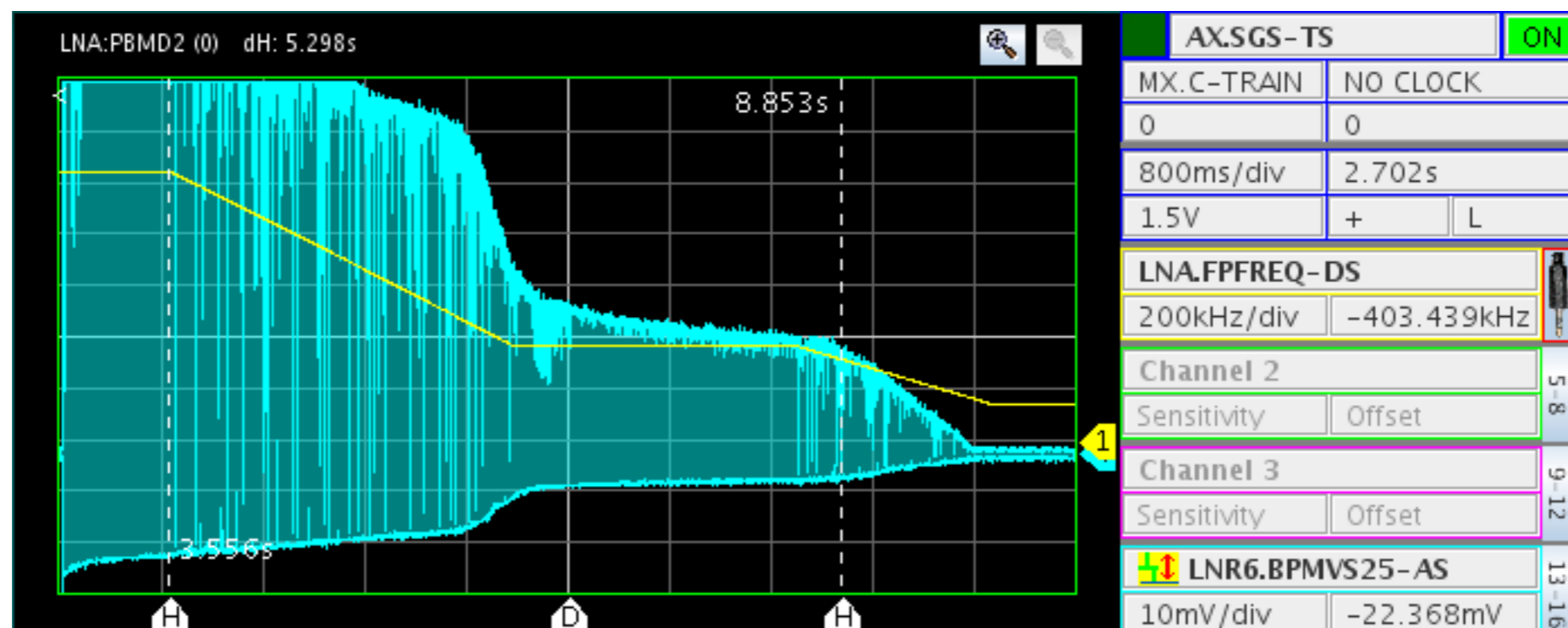
Can we improve further more ?
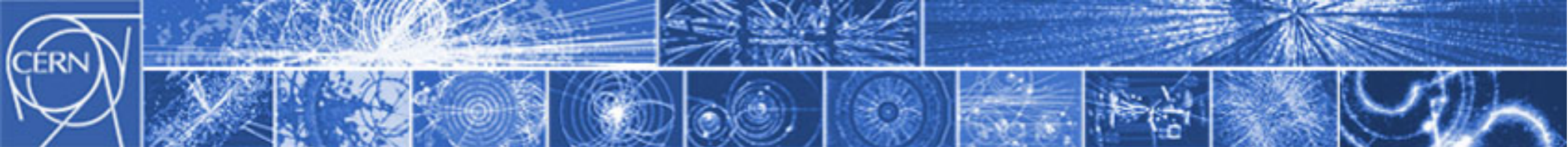
Less than a mm peak-to-peak residual coherent oscillations, residual blow-up due to mis-steering is not a concern any more.

With a small betatron function, a residual oscillation amplitude of less than 1 mm p-p, correspond to an increase of the rms emittance of less than 0.125 um.
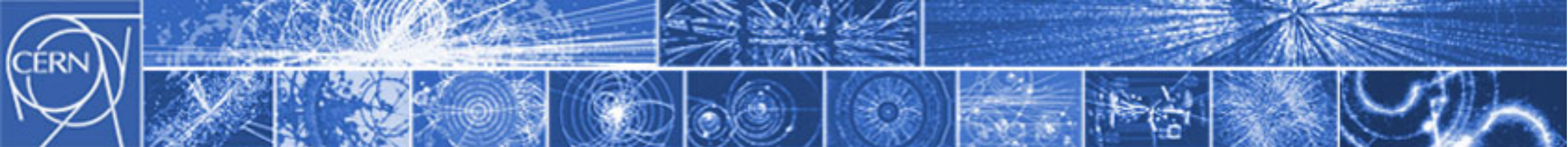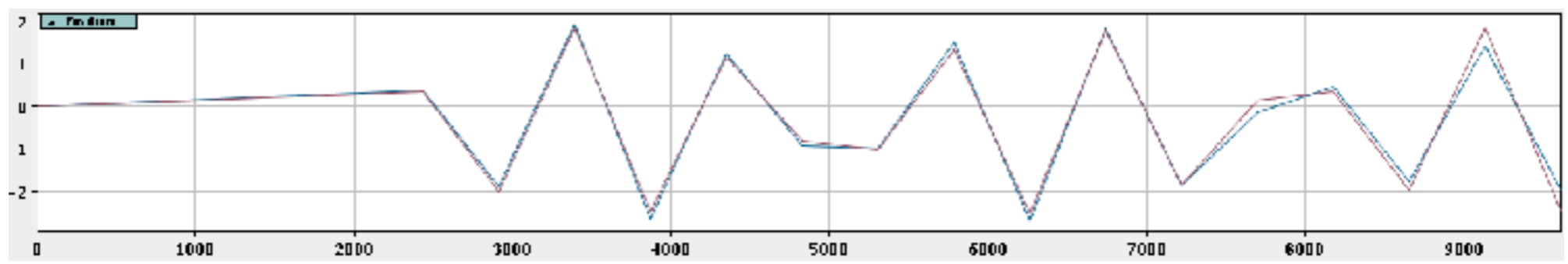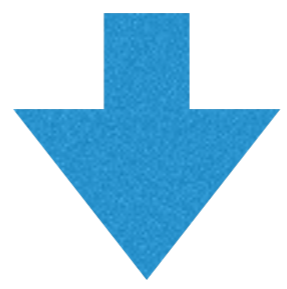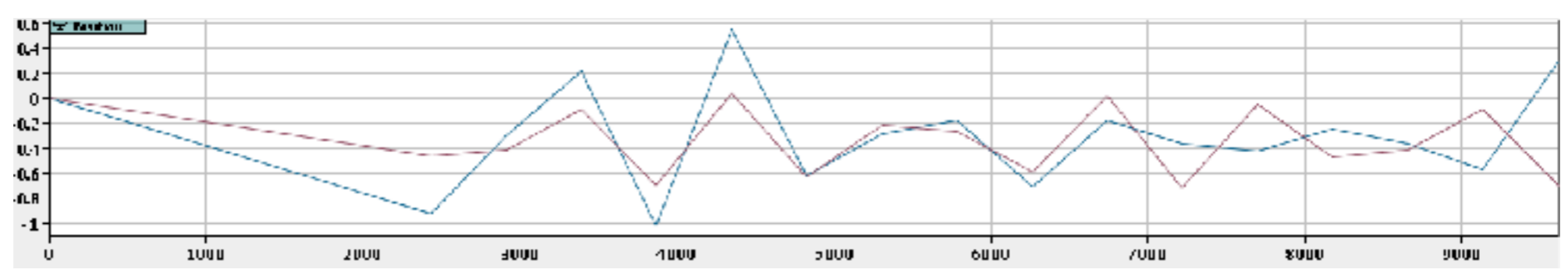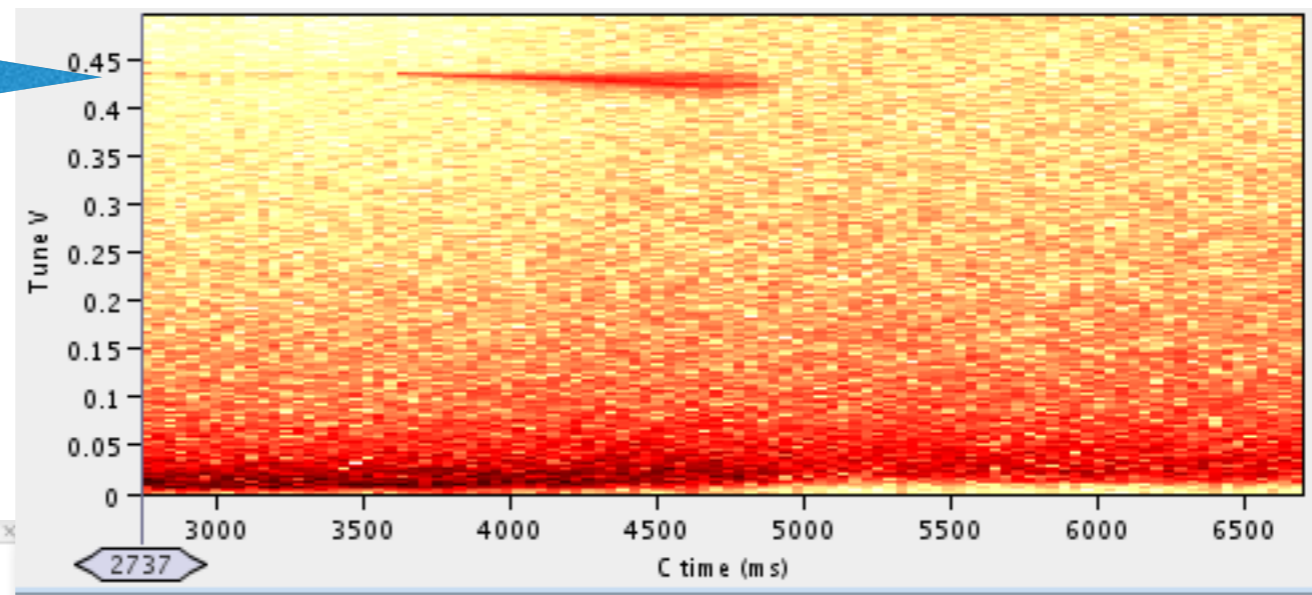
Effects on the Pbar Beam
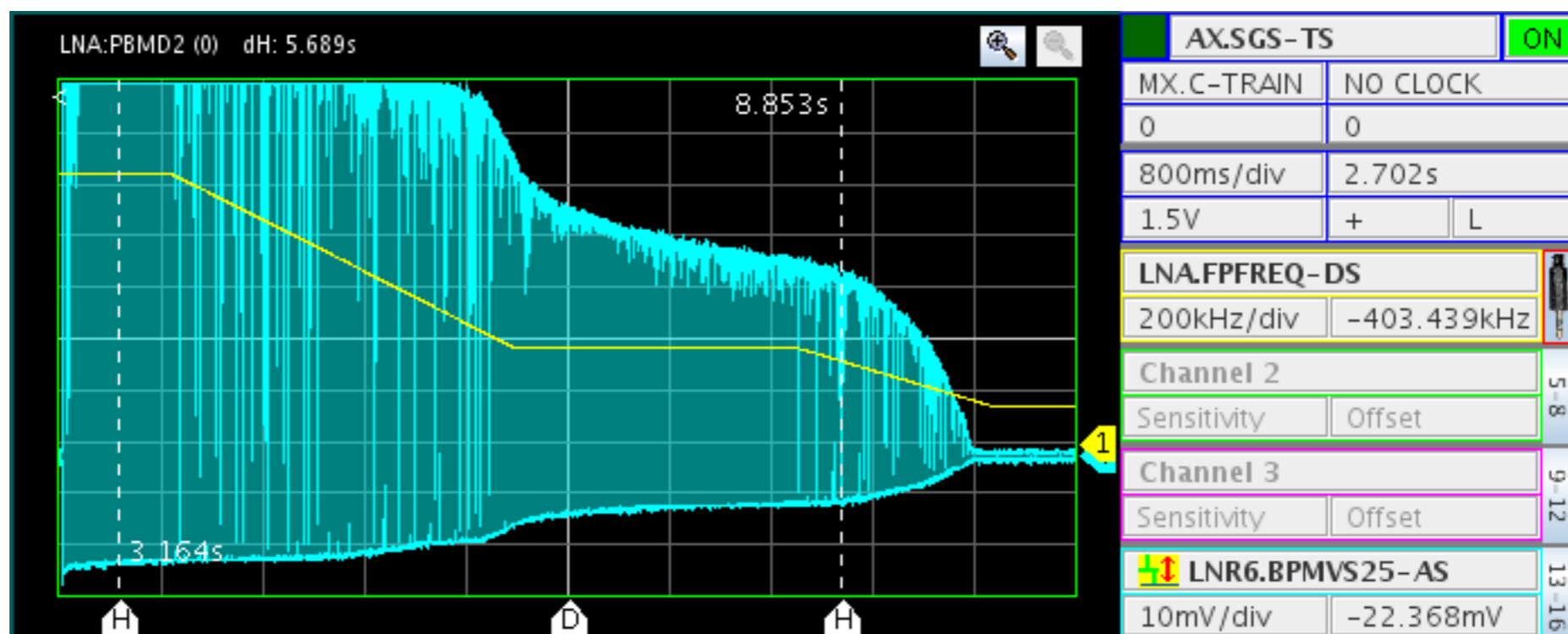
Using the same algorithme as a Tune estimator ?

Changing the Tune input parameter to best fit the turn by turn positions allows to estimate accurately q.

Using the same algorithme as a Tune estimator ?

Non destructive measurement, but it works only at injection