Metal Jet in a High Magnetic Field

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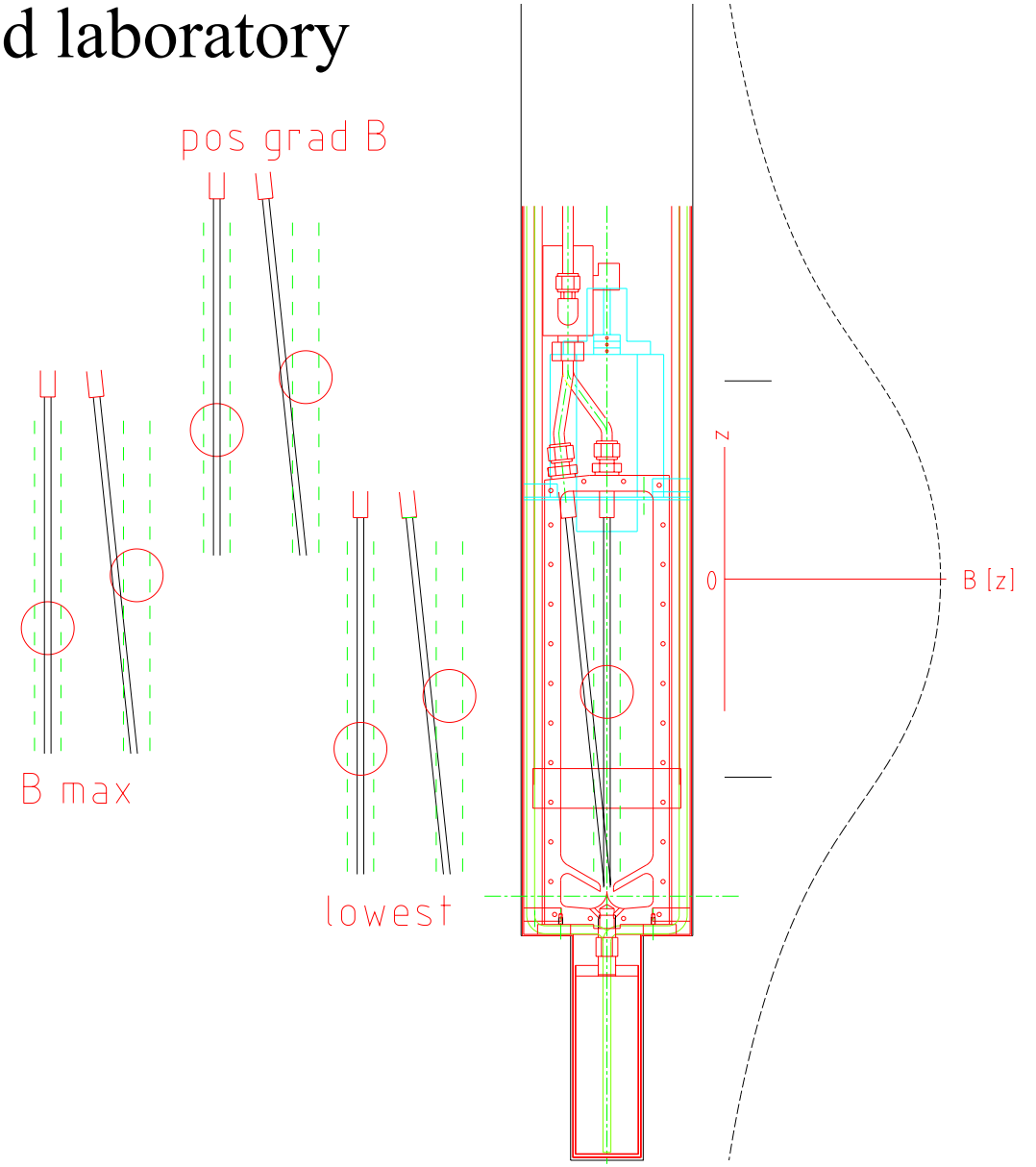
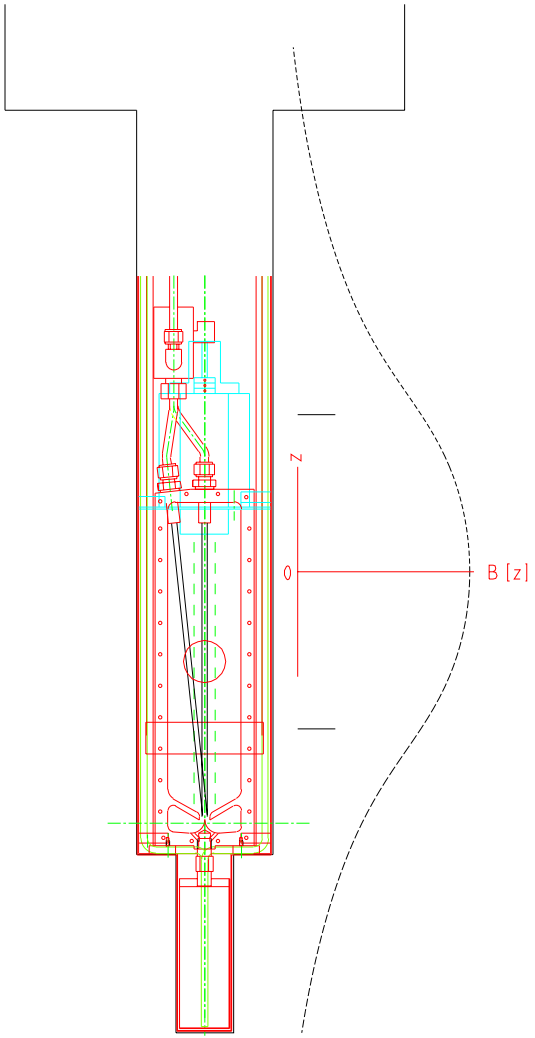
videoconference, targetry session

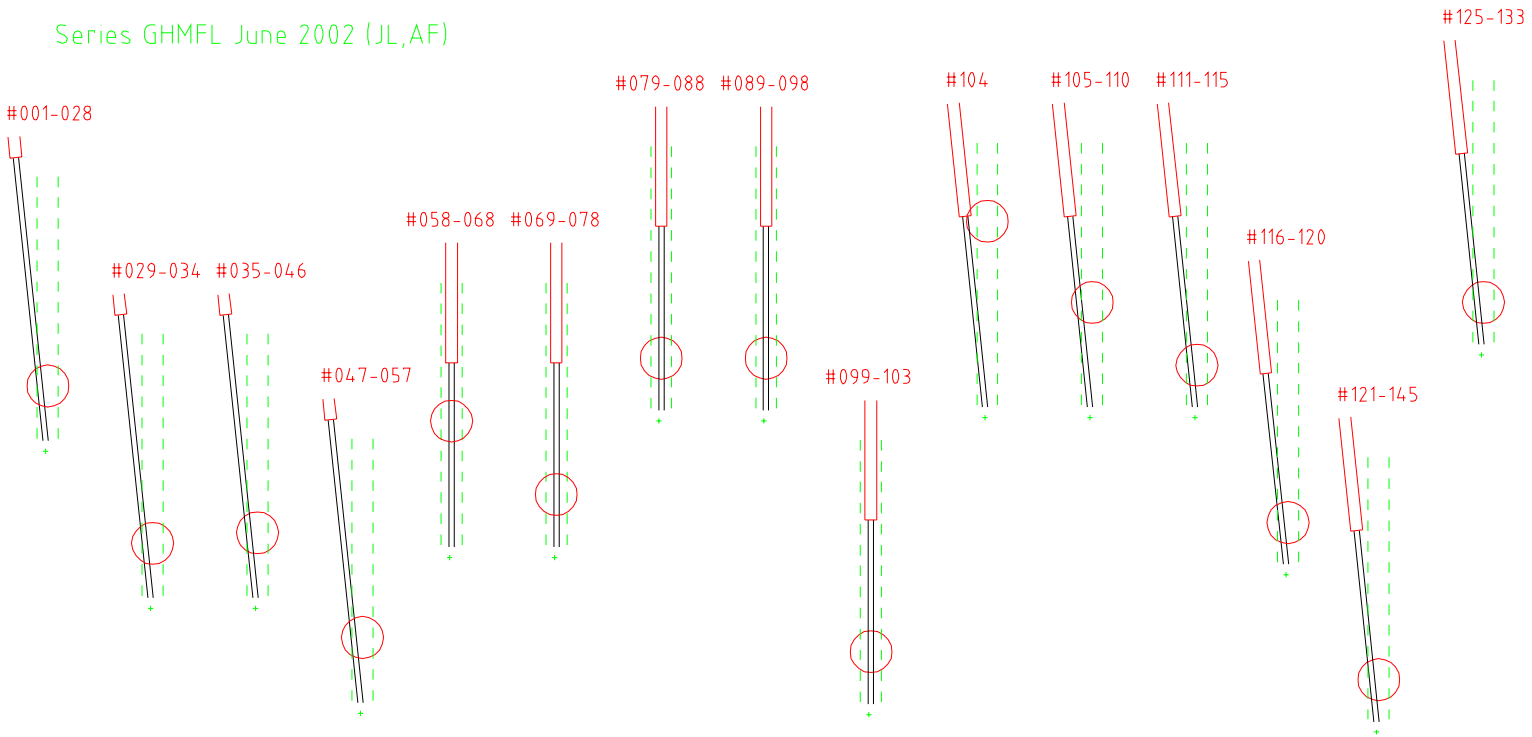
Grenoble High Magnetic Field laboratory (setup)

- mercury jet
- d_{nozzle}=4 mm
- colinear/inclined injection
- $v_{jet} \leq 12$ m/s
- B-field up to 20 Tesla



Setup Arrangement





Observation area

Calibration grid

nozzle

Ideal mercury jet

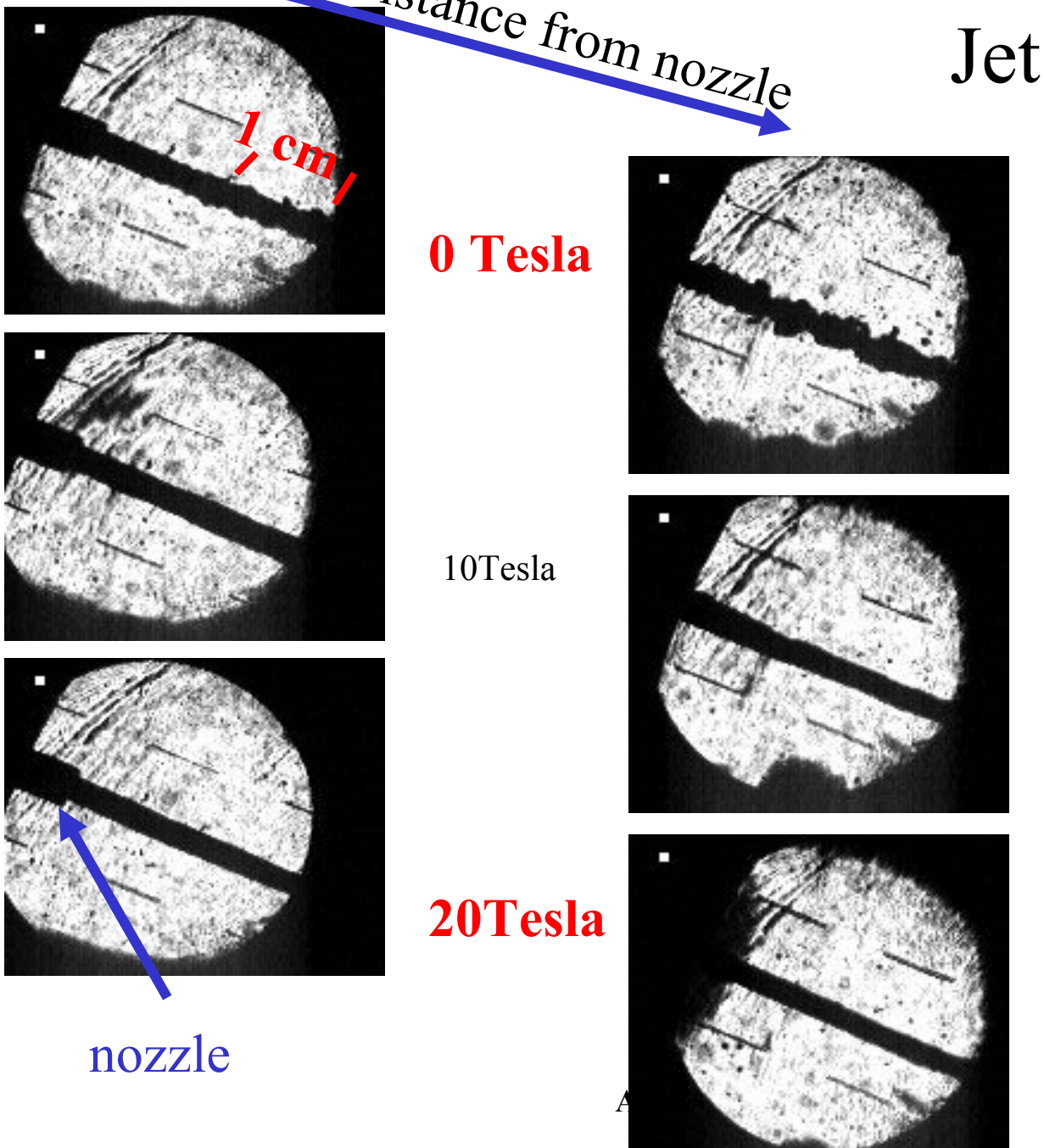
We only look at data from 4.Akt, June 2002, 20 Tesla solenoid

A.Fabich, CERN

In/Output variables

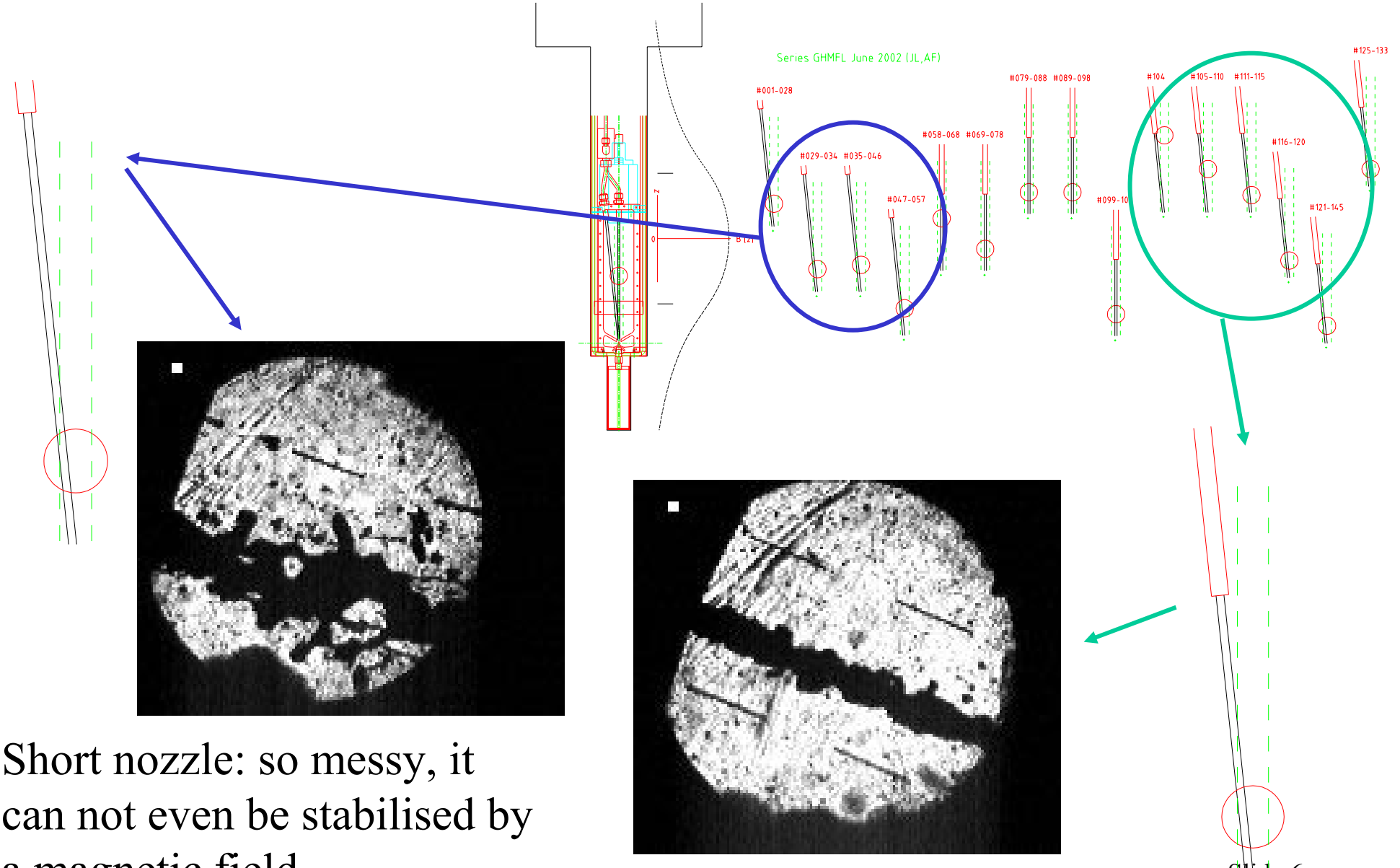
- B-field ≤ 20 Tesla
- Driving pressure ≤ 75 bar
- Nozzle position
- Nozzle type 0º/6º (short/long)
- Observation distance ≤ 20 cm
- Jet/surface velocity
- Jet inclination
- Jet offset
- Jet width

Jet traverses B_{max}



This **qualitative behaviour** can be observed **in all events**.

Long/Short nozzle at B=0



Short nozzle: so messy, it can not even be stabilised by a magnetic field.

Qualitative observation:

- jet are smoothed by the magnetic field
- tip gets like a torpedo
- jet gets very stable

Can we put this into numbers?

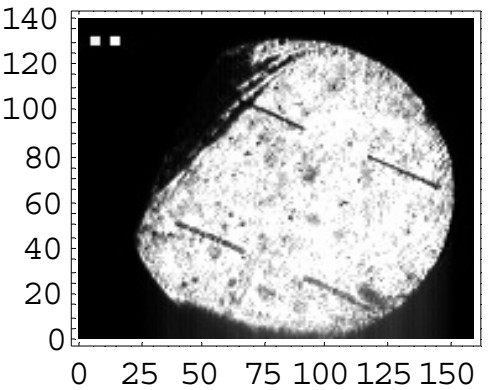
Digital Image Processing

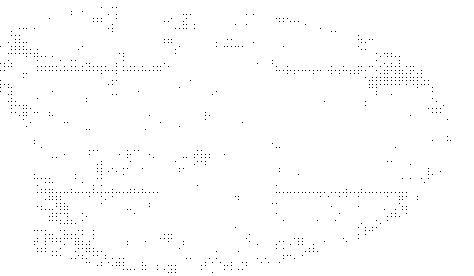
- Using Mathematica (lasts forever, but it works)

- Look at the few examples on the next pages

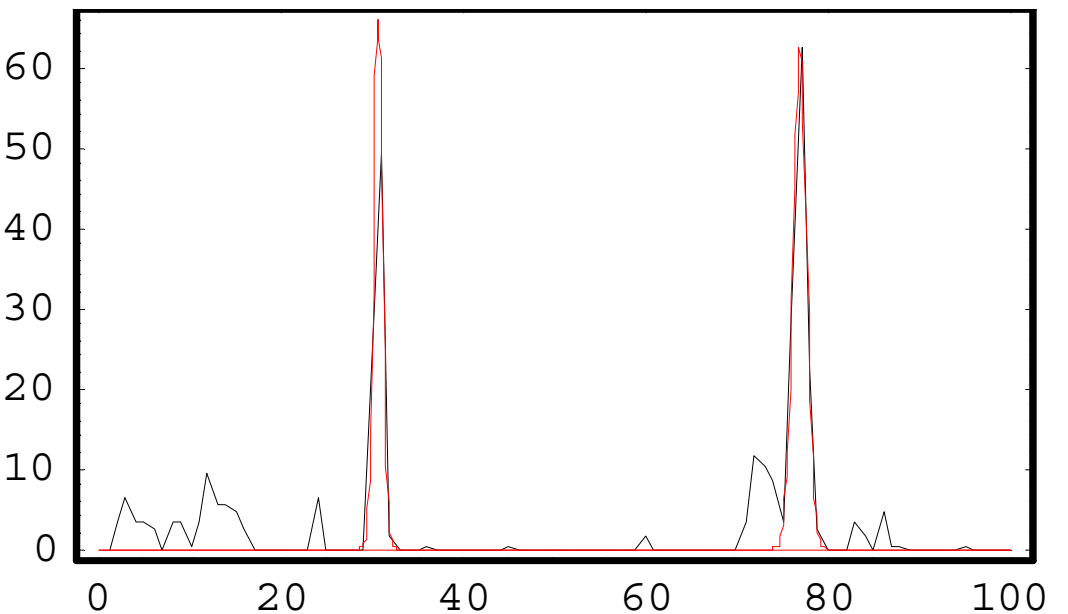
Calibration

From the original picture the position of the grid lines is extracted $\Longrightarrow$

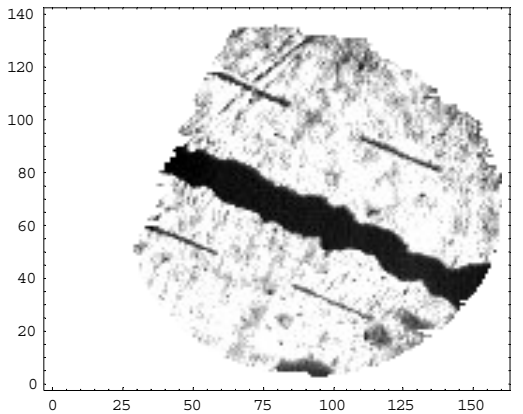


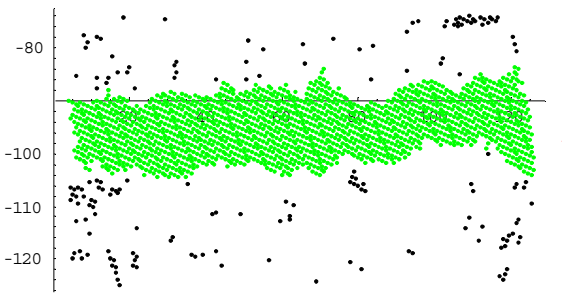


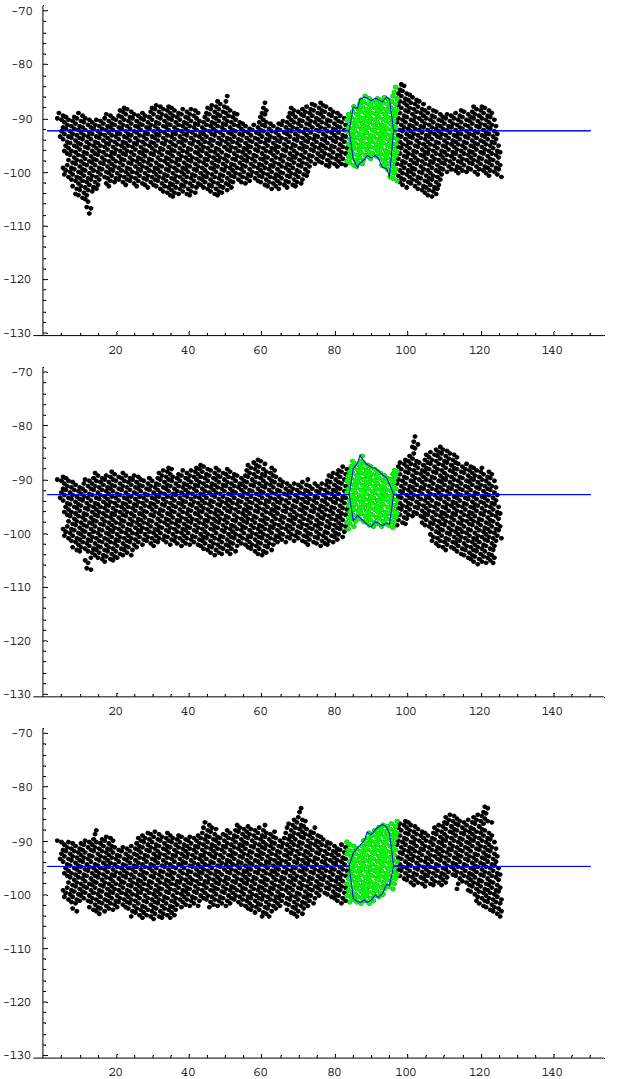
Resolution $\Delta x \approx 0.33$ mm



Jet Shape

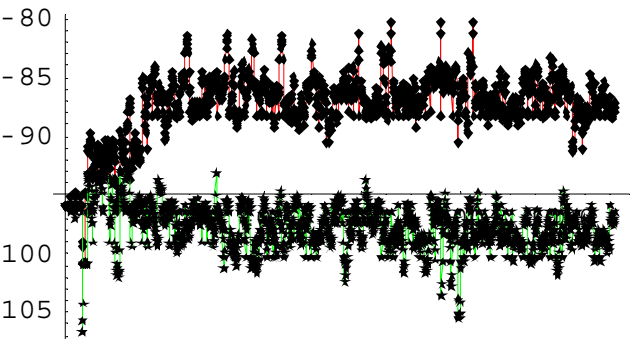

140
120
100
80
60
40
20
0
0
25
50
75
100
125
150


-80
-100
-110
-120

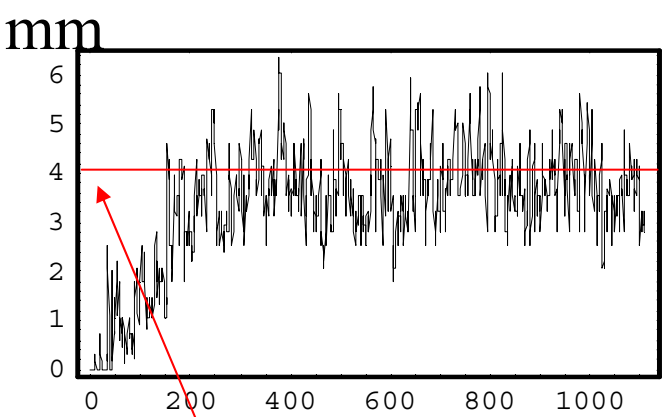

-70
-80
-90
-100
-110
-120
-130
20
40
60
80
100
120
140

Typical Final Output

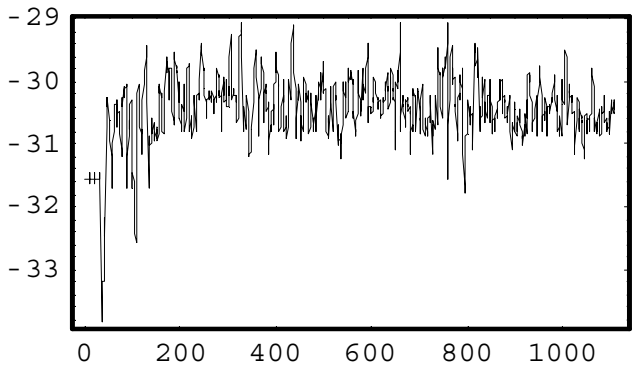
Event 092



Upper/Lower border of jet



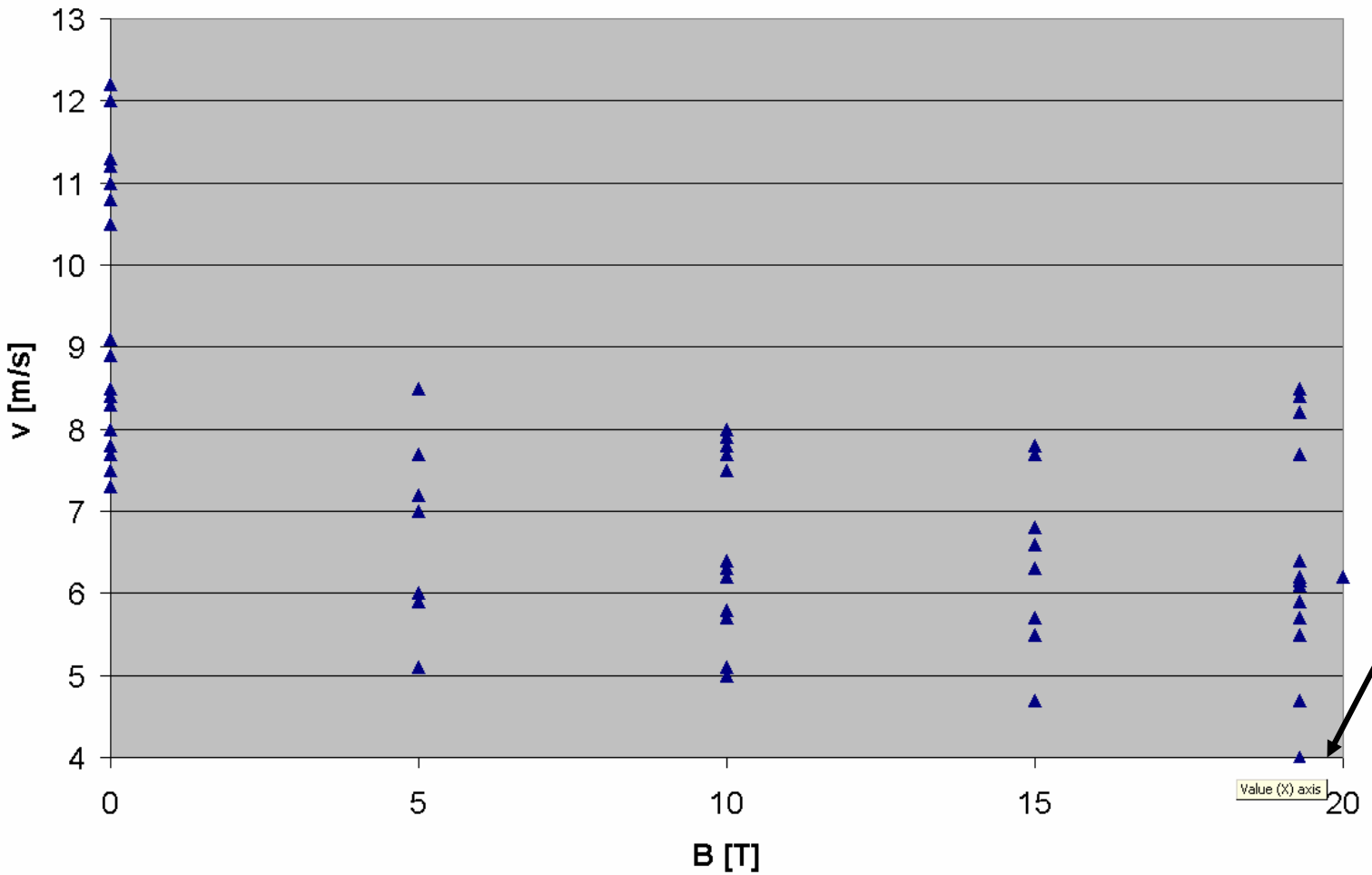
width of jet



offset of jet

Tip velocity

Manually measured: reliable, but without error bar



Error microsoft ☺

- As I could not prepare all data in time, we will see each other in two weeks from now
- Then we have look together at the final data