# E - 21

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## Contents

# 1 Tube

- Group: 8;
- Length: 48cm;
- External diameter: 15mm;
- Thickness: 1,85mm;
- Objective: study the anti-resonance light guidance phenomena.

# 2 1st pulling

- There isn't a 1st pulling for this sample.;
- It is drawn directly to a fiber.

# 3 2nd pulling

| Temperature [°C] | Time [min] |
|---|---|
| 120 | 30 |
| 150 | 30 |
| 170 | 30 |
| 190 | 5 |
| 200 | 2 |

Table 1: Temperature ramping for the 2nd pullng.

- The fiber snapped while pulling the band D;
- It happened since this sample is a capillar and has a very thin wall, so given very low resistence to the fiber during the process of fabrication;
- An overview of the whole pulling is shown in Fig. 1;
- Fine bands: A and C;
- Transition bands: B and D.

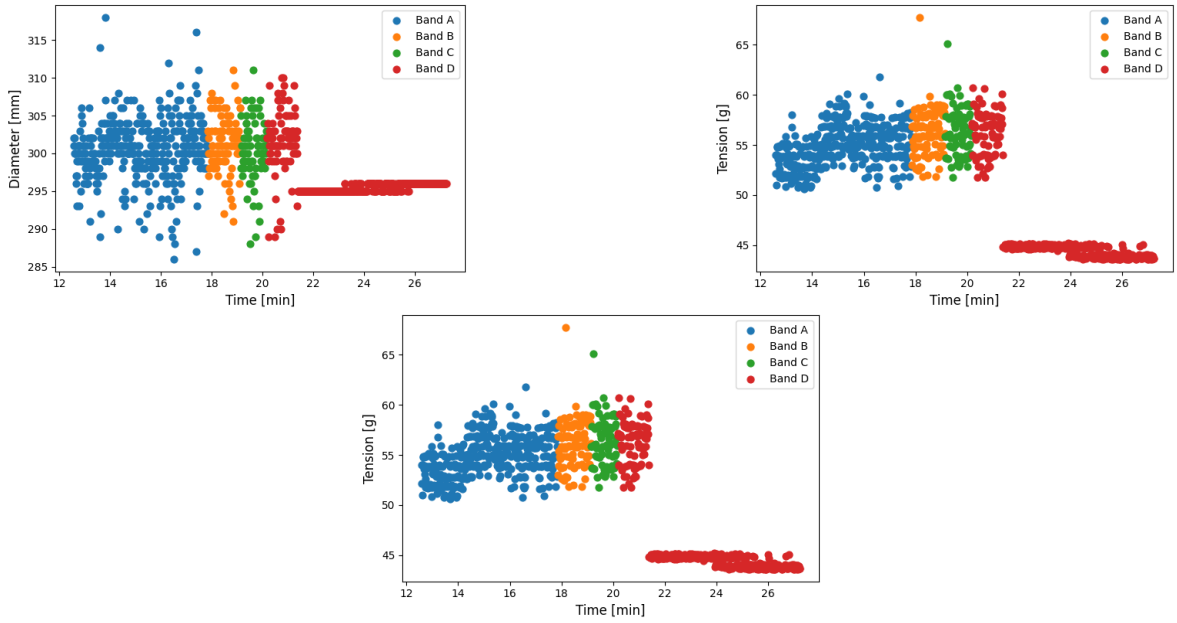
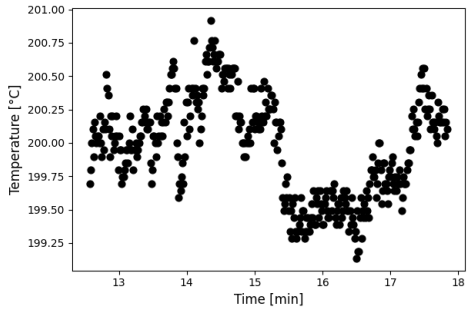
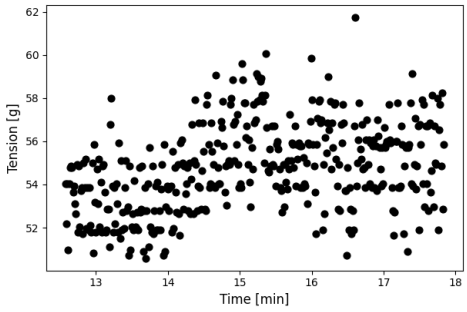



Figure 1: Comparison between the bands.

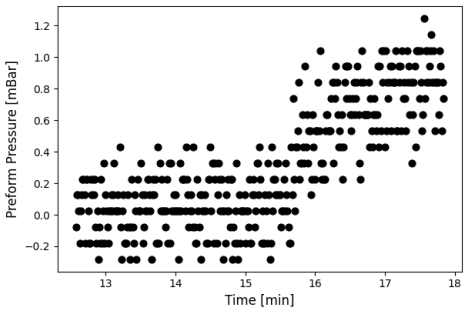
## 3.1 Band A




(a) Temperature.

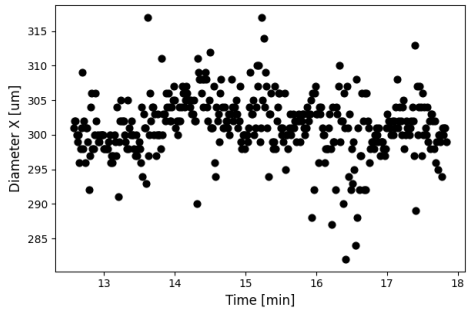



(b) Tension.

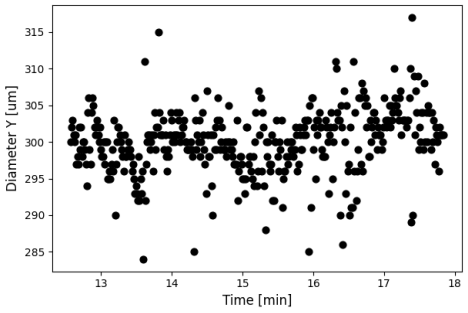



(c) Pressure.

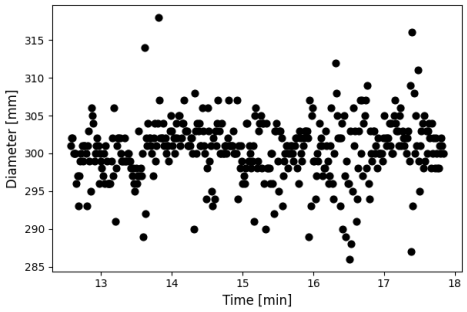
Figure 2: Intensive parameters.




(a) Diameter in X.

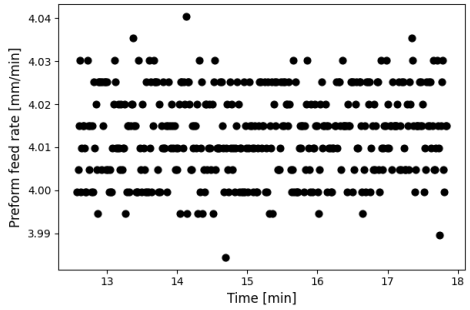



(b) Diameter in Y.

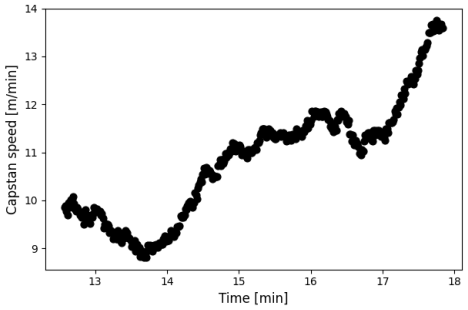



(c) Mean diameter.

Figure 3: Diameters.




(a) Feed speed.



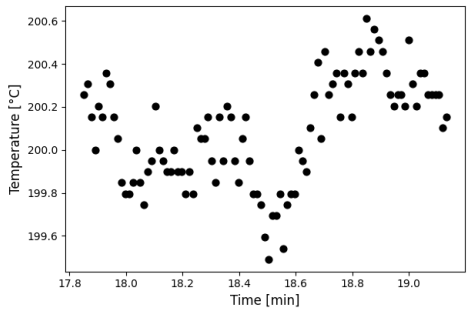

(b) Capstan speed.

Figure 4: Speeds.

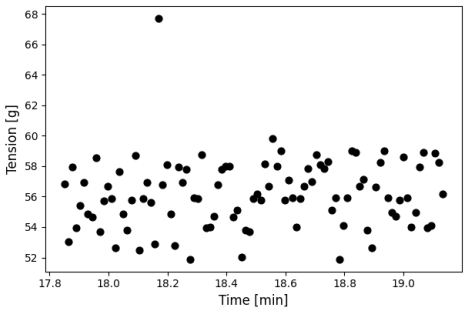
| Parameter | Mean | Standard deviation |
|---|---|---|
| Temperature [°C] | 199,97 | 0,38 |
| Tension [g] | 54,76 | 2,02 |
| Pression [mbar] | 0,31 | 0,38 |
| Diameter [um] | 300,51 | 4,03 |

- The diameter stabilized in $300\mu m$;
- No pressure was applied inside the fiber.

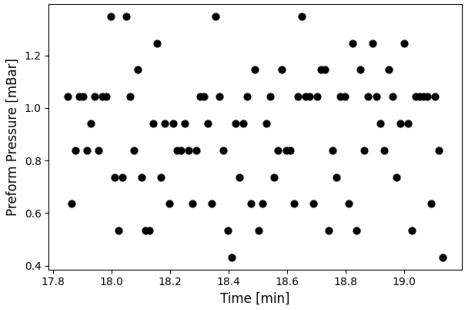
## 3.2 Band B




(a) Temperature.

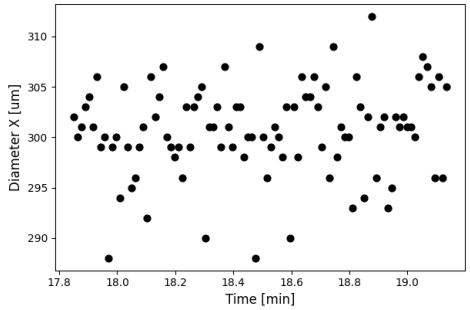



(b) Tension.

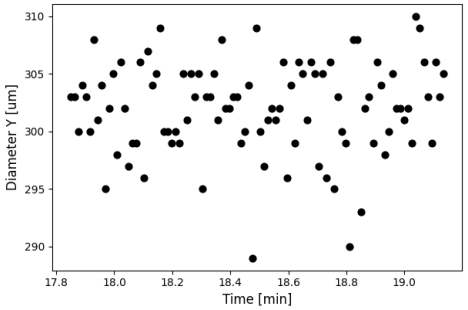



(c) Pressure.

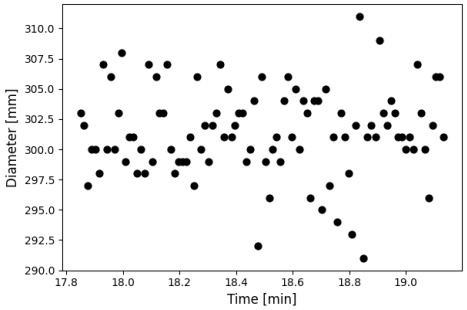
Figure 5: Intensive parameters.




(a) Diameter in X.

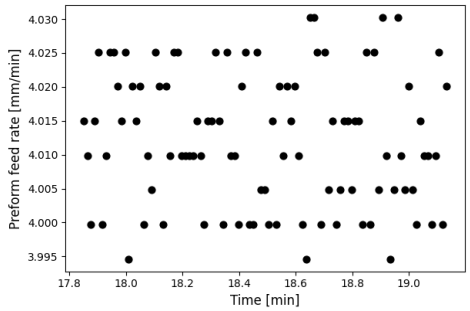



(b) Diameter in Y.

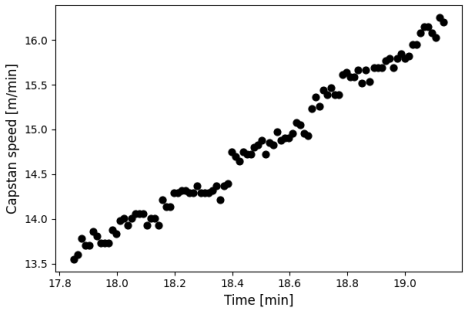



(c) Mean diameter.

Figure 6: Diameters.




(a) Feed speed.



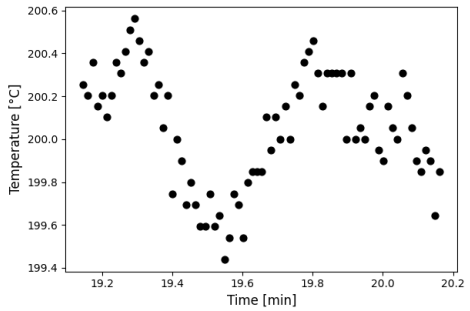

(b) Capstan speed.

Figure 7: Speeds.

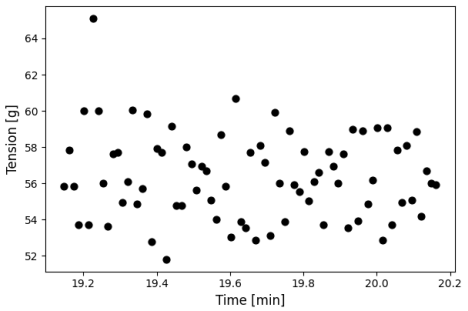
| Parameters | Mean | Standard deviation |
|---|---|---|
| Temperature [°C] | 200,09 | 0,25 |
| Tension [g] | 56,18 | 2,28 |
| Pressure [mbar] | 0,90 | 0,22 |
| Diameter [um] | 301,40 | 3,62 |

- Transition band;
- I applied pressure of $1mbar$;
- I waited for the diameter and pressure stabilize to change to the next band.

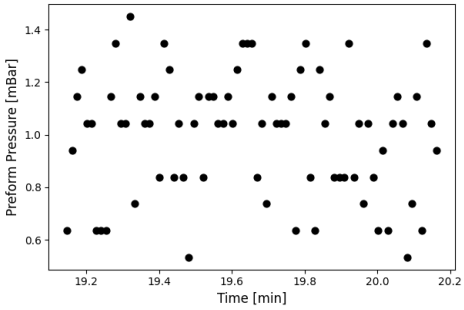
## 3.3 Band C




(a) Temperature.

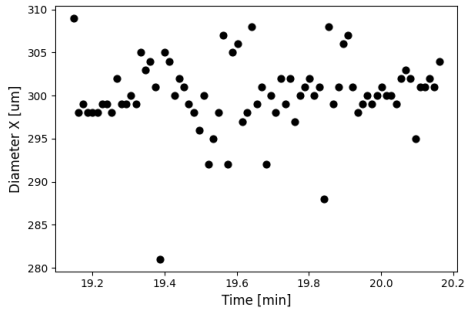



(b) Tension.

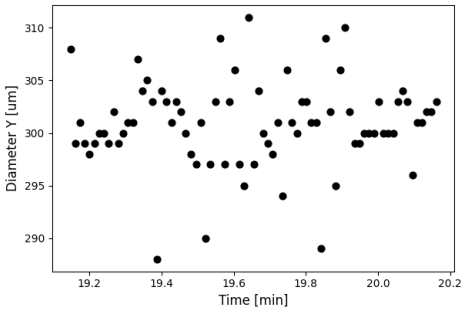



(c) Pressure.

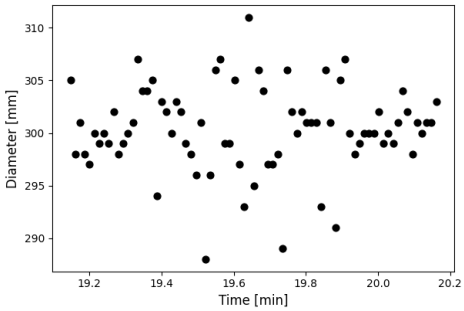
Figure 8: Intensive parameters.




(a) Diameter in X.

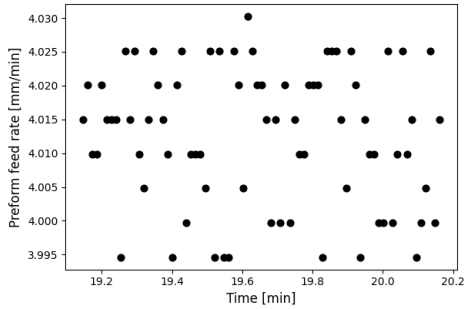



(b) Diameter in Y.

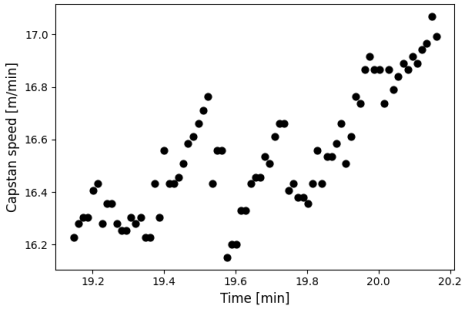



(c) Mean diameter.

Figure 9: Diameters.




(a) Feed speed.



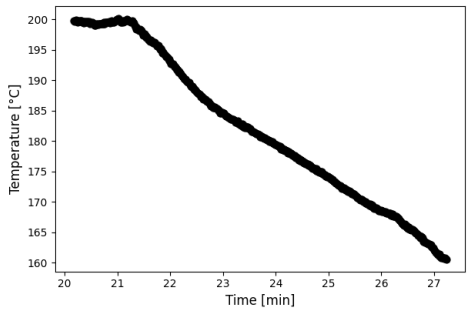

(b) Capstan speed.

Figure 10: Speeds.

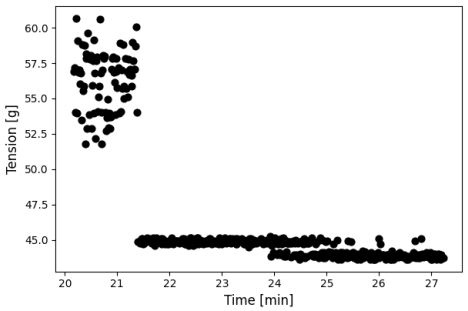
| Parameter | Mean | Standard deviation |
|---|---|---|
| Temperature [°C] | 200,05 | 0,27 |
| Tension [g] | 56,39 | 2,36 |
| Pressure [mbar] | 1,00 | 0,23 |
| Diameter [um] | 300,34 | 4,04 |

- Diameter stabilized in $300\mu$;
- The pressure stabilized in $1mbar$.

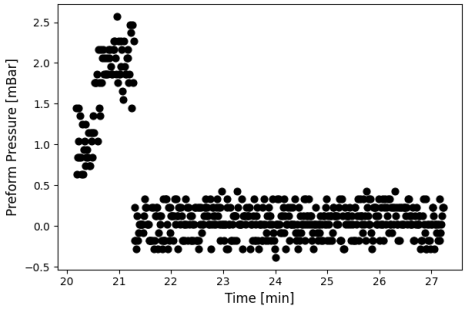
## 3.4 Band D




(a) Temperature.

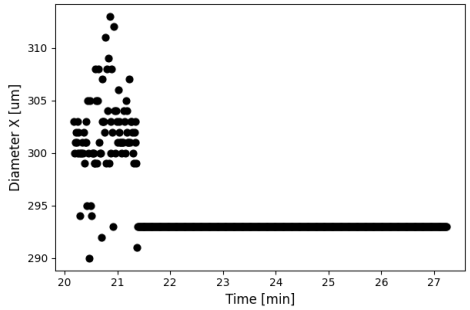



(b) Tension.

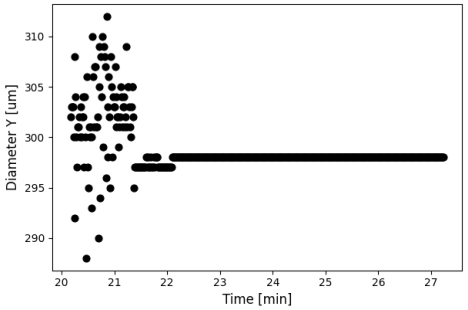



(c) Pressure.

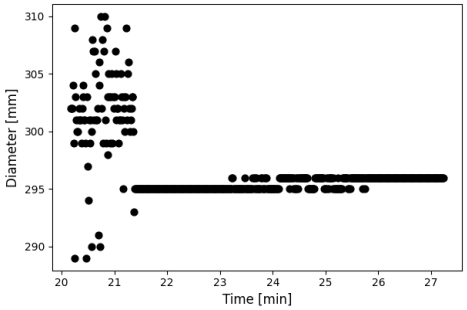
Figure 11: Intensive parameters.




(a) Diameter in X.

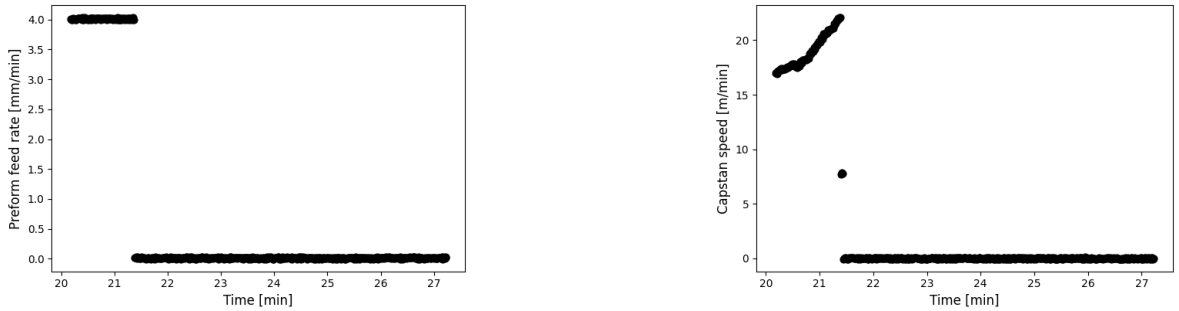



(b) Diameter in Y.




(c) Mean diameter.

Figure 12: Diameters.




(a) Feed speed.

(b) Capstan speed.

Figure 13: Speeds.

- Transition band;
- I applied pressure of $2mbar$;
- I got a few meters of fiber;
- It snapped after the pressure achieved $2,5mbar$ due to the pressure pump variation;
- It is clear form the tension graphic the fiber snapped between minutes 21 and 22;
- Right before the snapping, the fiber started to make a noise while passing through the capstan system;
- It happenend since the fiber was too fragile after expanding by the $N_2$ gas pressure.