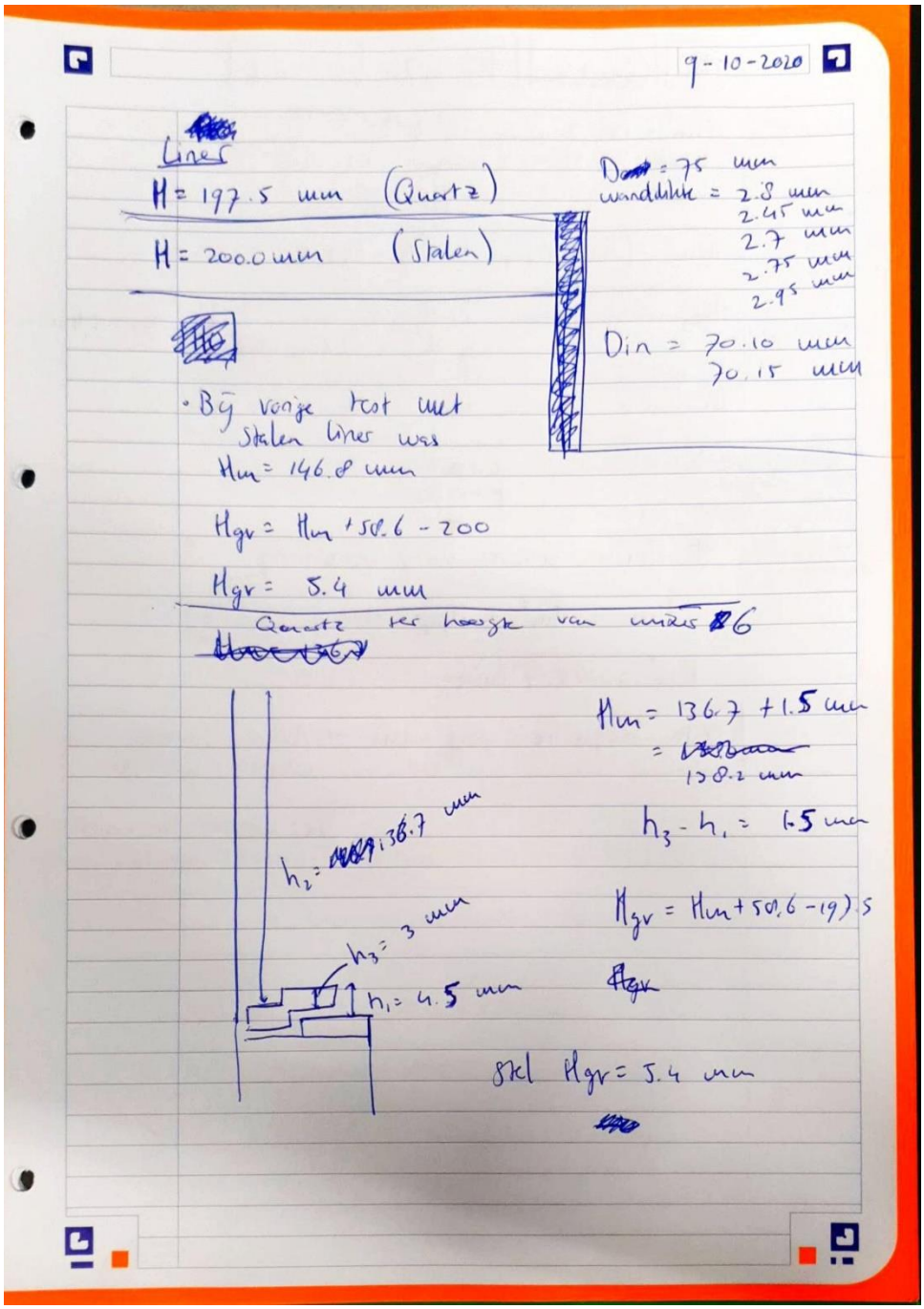
Quartz liner set 1: 2020 9 October - 31 December

Visualization of the flame of thescaled Flamesheet combustor with quartz liner

IMPORTANT NOTES:

- H_gap is assumed to be 1.5 mm throughout all experiments
- SCHUIFMAAT 1 was used to measure dimensions and distances

9 October 2020



HO | Quartz | $\phi = 0.70$ | test 1

$H_m^* = 136.7$ mm

$H_{gap} = 4.5 - 3 = 1.5$ mm

↳ dikte van ring

$H_{gv} = (H_m + H_{gap}) + 50.6 - 197.5$

Stalen liner: $H_{gap} \pm 0$ mm, $H_m = 146.0$ mm → $H_{gv} = 5.4$ mm

Dus voor Quartz liner: $H_{gv} = 5.4$ mm

- Aanzetten op $u = 2.5$ m/s, $\phi = 0.70$

H_m^* = gemeten vanaf binnenring

$H_m = H_m^* + H_{gap}$

$H_m^* = 142.4$ mm

! Data acquisitie gaat via → Nikon Camera Control Labview vastlopen.

Ex: movie in camera gehouden ipv downloaden

H50 Quartz

φ=0.70 test 1

D2 moet z[illegible]

- Cam0 : elapsed time = 101.6 s

75 ip[illegible]

- DSC_0001 : cam1 → renamed

T_u = 19.[illegible]
P_u = 102.[illegible]

- vergeten thermocouples aan te zetten
  - verkeerde temperatuur pressure en D2 contr[illegible]

~~H75 φ=0.60 Quartz~~

Hm* = 136.7 mm

- flashback rond $u_{u,FB}$ = 4.3 m/s
  dit is een groot verschil met eerder gevonden flashback velocity → test correct?
  → zie FB u[illegible]
- spiegel om er zijwaarts in te kijken → idee b[illegible]t → hapt[illegible] opperv[illegible]

H75 Quartz

φ=0.60 test 1

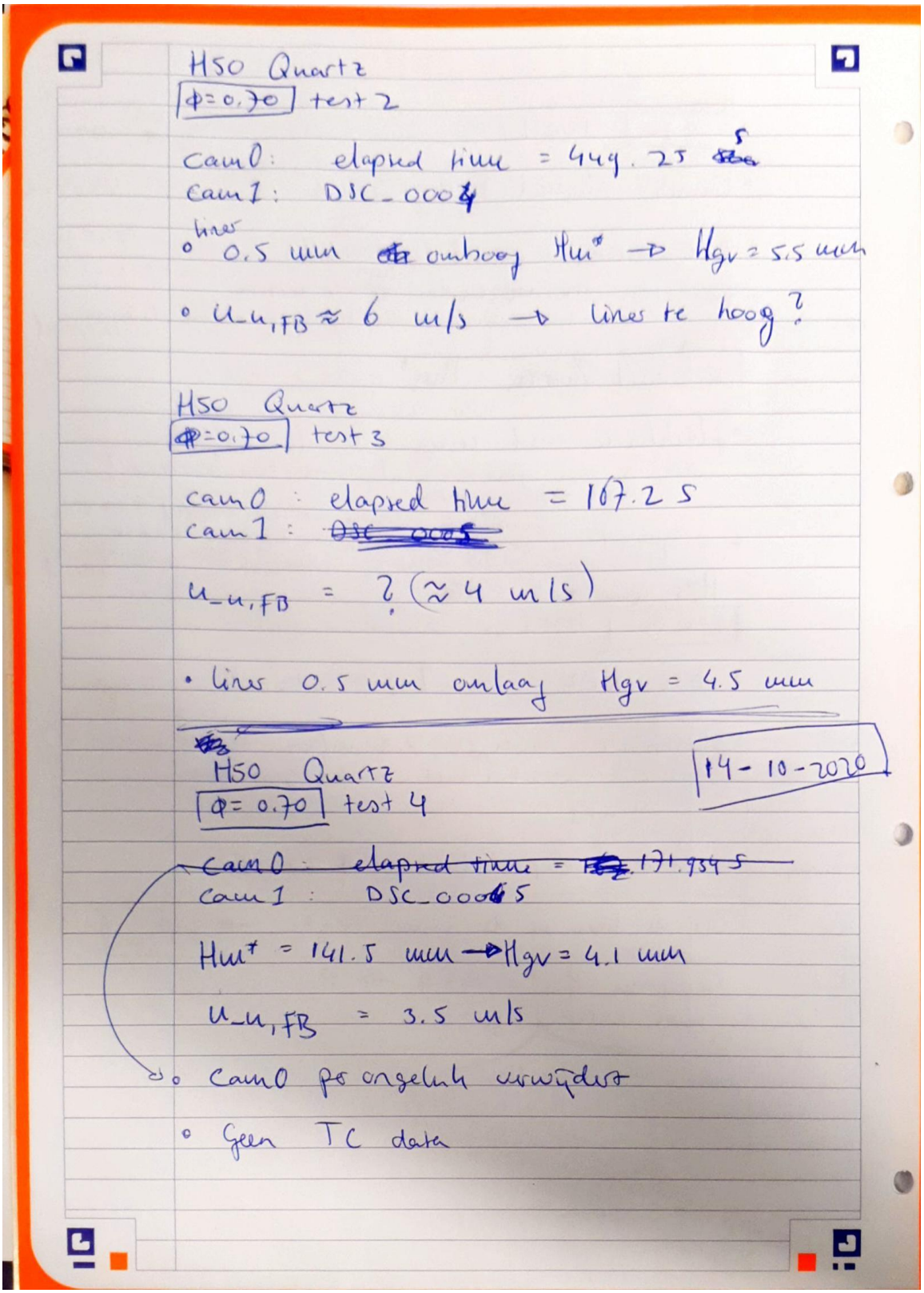
- DSC_0002 : cam1 → renamed
- flashback $u_{u,FB}$ ≈ 7.3 m/s → test corr[illegible]
  - groot verschil met eerder gevonden $u_{u,FB}$
- cam0 : elapsed time = 374.6 s

Zit de liner op de juiste hoogte → gap!

Gemeten Hm* = 142.4 → Hgv = 5.0 mm
was eerst Hgv = 5.4 mm

voor stalen liner

14 October 2020



H50 Quartz
$\phi = 0.70$ test 2

cam0: elapsed time = 449.25 s
cam1: DSC_0004

- lines 0.5 mm onboog H_{um} → H_{gv} = 5.5 mm
- $u_{-u,FB} \approx 6$ m/s → lines te hoog?

H50 Quartz
$\phi = 0.70$ test 3

cam0: elapsed time = 167.25
cam1: ~~DSC_0005~~

$u_{-u,FB}$ = ? (≈ 4 m/s)

- lines 0.5 mm onlaag H_{gv} = 4.5 mm

~~3~~
H50 Quartz
$\phi = 0.70$ test 4

14-10-2020

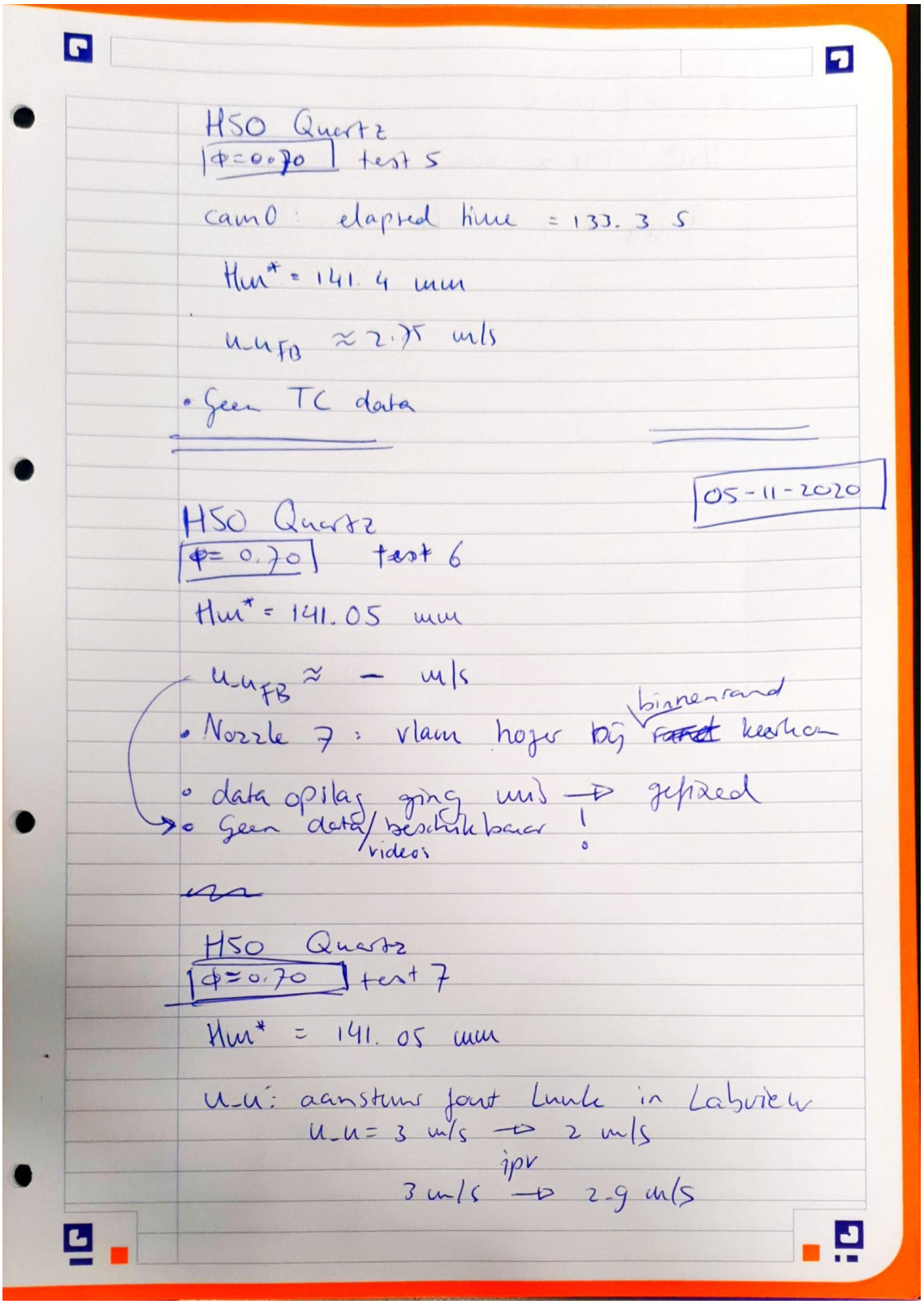
~~cam0: elapsed time = 171.954 s~~
cam1: DSC_0005

H_{um} = 141.5 mm → H_{gv} = 4.1 mm

$u_{-u,FB}$ = 3.5 m/s

- cam0 per ongeluk verwijderd
- Geen TC data

5 November 2020



H50 Quartz
$\phi = 0.70$ test 5

cam0 elapsed time = 133.3 s

$H_{LM}^* = 141.4$ mm

$u - u_{FB} \approx 2.75$ m/s

- Geen TC data

05-11-2020

H50 Quartz
$\phi = 0.70$ test 6

$H_{LM}^* = 141.05$ mm

$u - u_{FB} \approx -$ m/s

- Nozzle 7 : vlam hoger bij binnenrand ~~front~~ kleiner
- data opslag ging mis → gefixed
- Geen data/ beschikbaar ! videos

H50 Quartz
$\phi = 0.70$ test 7

$H_{LM}^* = 141.05$ mm

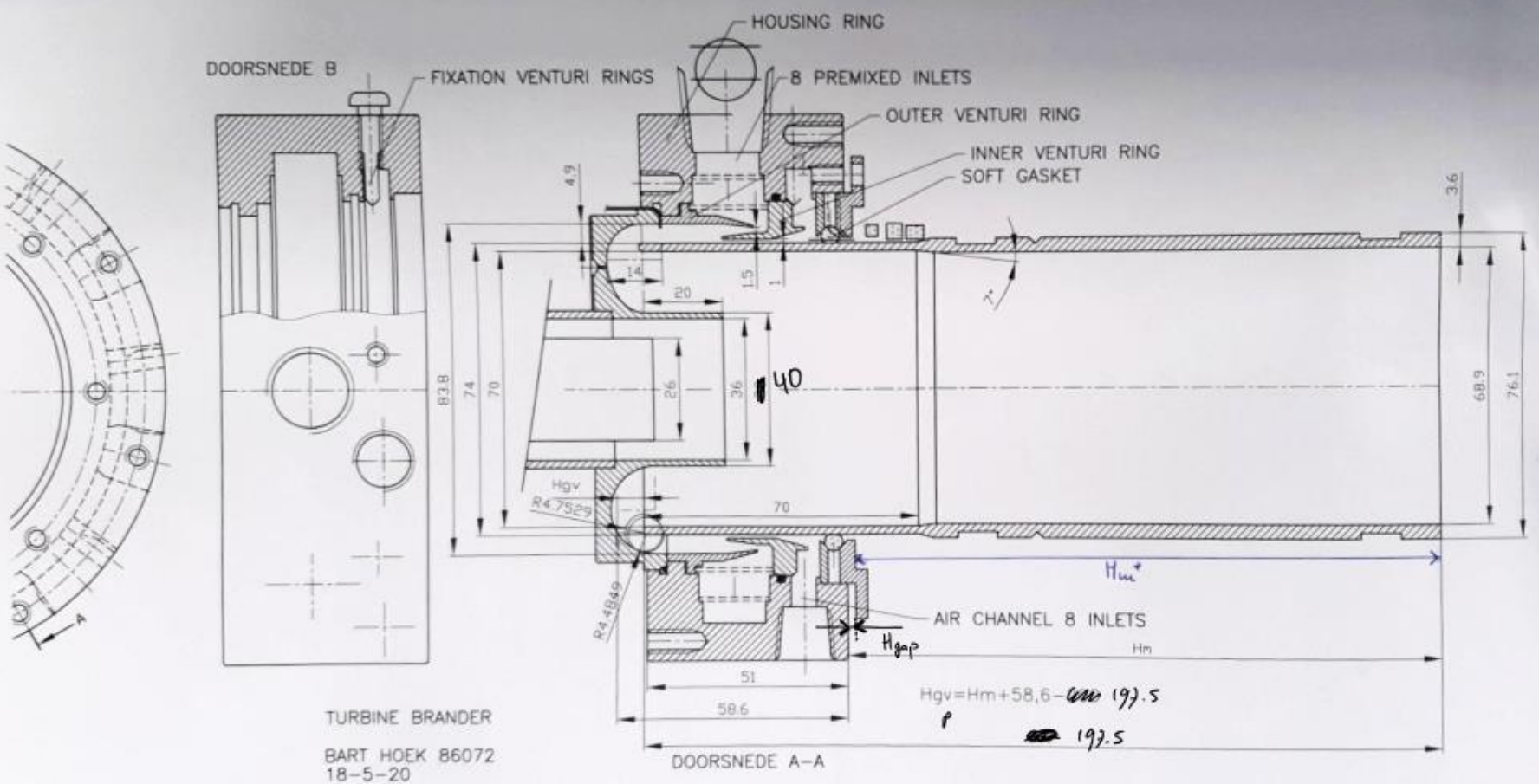
u-u: aanstuur joint Linux in Labview
u-u = 3 m/s → 2 m/s
ipv
3 m/s → 2.9 m/s

H50 Quartz

$\phi = 0.70$ test 9

$H_{mf}^* = 141.2$ mm

$u_{-4,FB}$ ~~x~~ 3.0 cm/s


DOORSNEDE B
FIXATION VENTURI RINGS
HOUSING RING
8 PREMIXED INLETS
OUTER VENTURI RING
INNER VENTURI RING
SOFT GASKET
AIR CHANNEL 8 INLETS
Hgap
Hm
Hm*
Hgv
Hgv=Hm+58,6-197.5
197.5
DOORSNEDE A-A
TURBINE BRANDER
BART HOEK 86072
18-5-20
MONTAGE AANDACHTSPUNTEN:
- KEERKOM ALLEEN AANDRUKKEN MET GELOSTE VENTURIKLEMSCHROEVEN

$Hm = Hm^{*} + Hgap$

10 November 2020

H2% = 0
Phi = 0.90
Liner: Quartz
Test 1

Notes

- Hm* = 141.3 mm (gemeten ter hoogte van mixer 6)
- Video cam0:
    - Afgekapt door insufficient free physical memory
    - Overbelicht -> stalen probe niet goed zichtbaar

H2% = 0
Phi = 0.90
Quartz
Test "fooling around"

Notes

- Hm* = 141.3 mm (gemeten ter hoogte van mixer 6)
- Geen video cam0 -> belichting checken met NI MAX

11 November 2020

H2% = 50
Phi = 0.70
Liner: Quartz
Test "fooling around"

Notes

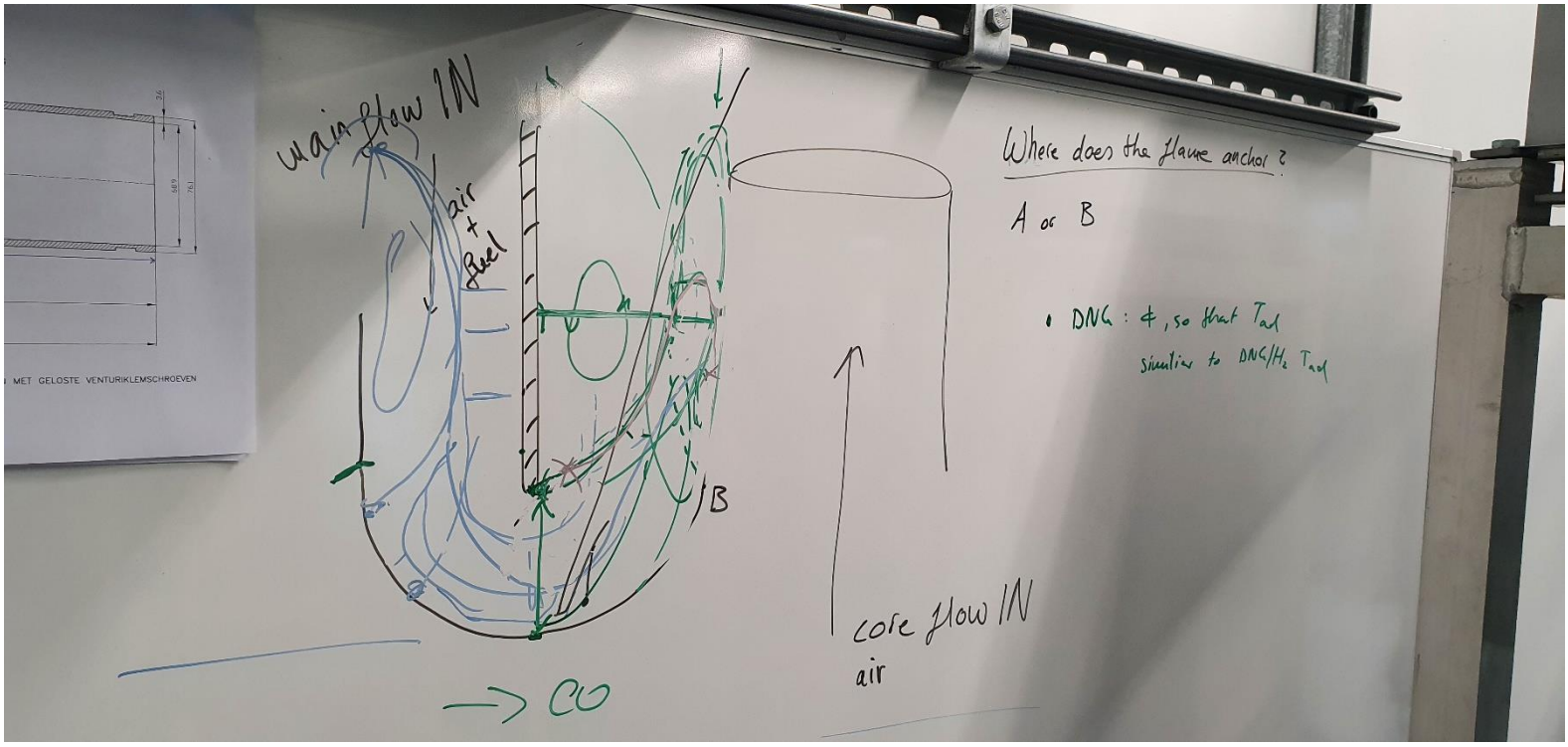
- IMPORTANT: WAYS TO SEE WHERE THE FLAME ANCHORS

12 November 2020

H2% = 40
Phi = 0.70
Liner: Quartz
Test "fooling around"

Notes

- Demo to Ivan Langella and Georg Eitelberg from the Aerospace Department (LR):
    - Discussion regarding position/ location of the flame



25 November 2020

H2% = 75
Phi = 0.70
Liner: Quartz
Test 1

Goal: Finding limits of combustor design regarding operating conditions

Notes

- Hm* = 141.4 mm
- No thermocouple data (not turned on -> mistake)

27 November 2020

H2% = 50
Phi = 0.70
Liner: Quartz
Test 9

Goal: Finding correct height of liner for flashback map

Notes

- Hm* = 141.2 mm
- $u_{FB} \approx 2.7\ ms^{-1}$
- Flame detection works during normal operation, but not during flashback (still visible on the other side of the quartz glass liner).
- Gap height not measured (H_gap)
-

H2% = 50
Phi = 0.70
Liner: Quartz
Test 10

Goal: Finding correct height of liner for flashback map

Notes

- Hm* = 142.5 mm
- Flashback occurred at higher velocity than test 9
- Gap height not measured (H_gap)

H2% = 50
Phi = 0.70
Liner: Quartz
Test 11

Goal: Finding correct height of liner for flashback map

Notes

- Hm* = 140.6 mm
- Gap height not measured (H_gap)

H2% = 50
Phi = 0.70
Liner: Quartz
Test 12

Goal: Finding correct height of liner for flashback map

Notes

- Hm* = 140.0 mm
- Gap height not measured (H_gap)
- Cam0 video not complete due to Matlab memory error (!)
- Flashback velocity lowest of all test (9, 10, 11), but restricted operating range

8 December 2020

H2% = 50
Phi = 0.50
Liner: Quartz
Test 1

Notes

- Hm* = 141.2 mm (gemeten ter hoogte van mixer 6)
- Check data cam0 and mfc

H2% = 50
Phi = 0.60
Liner: Quartz
Test 1

Notes

- Hm* = 141.2 mm (gemeten ter hoogte van mixer 6)

H2% = 50
Phi = 0.70
Liner: Quartz
Test 13

Notes

- Hm* = 141.2 mm (gemeten ter hoogte van mixer 6)

H2% = 50
Phi = 0.80
Liner: Quartz
Test 1

Notes

- Hm* = 141.45 mm (gemeten ter hoogte van mixer 6)

H2% = 50
Phi = 0.90
Liner: Quartz
Test 1

Notes

- Hm* = 141.25mm (gemeten ter hoogte van mixer 6)

H2% = 75
Phi = 0.35
Liner: Quartz
Test 1

Notes

- Hm* = 141.2 mm (gemeten ter hoogte van mixer 6)
- Flame not detected by UV sensor -> bypass UV sensor?

H2% = 75
Phi = 0.40
Liner: Quartz
Test 1

Notes

- Hm* = 141.2 mm (gemeten ter hoogte van mixer 6)
- Flame not detected by UV sensor -> bypass UV sensor?

H2% = 75
Phi = 0.50
Liner: Quartz
Test 1

Notes

- Hm* = 141.15 mm (gemeten ter hoogte van mixer 6)

H2% = 75
Phi = 0.60
Liner: Quartz
Test 2

Notes

- Hm* = 141.3 mm (gemeten ter hoogte van mixer 6)
- Flashback bij toenemende u_u ?!

H2% = 75
Phi = 0.60
Liner: Quartz
Test 3

Notes

- Hm* = 141.2 mm (gemeten ter hoogte van mixer 6)
- Flashback door opwarmen keerkom

H2% = 75
Phi = 0.60
Liner: Quartz
Test 4

Notes

- Hm* = 141.2 mm (gemeten ter hoogte van mixer 6)

H2% = 75
Phi = 0.70
Liner: Quartz
Test 2

Notes

- Hm* = 141.2 mm (gemeten ter hoogte van mixer 6)
- **Set parameters not achieved!**

H2% = 75
Phi = 0.70
Liner: Quartz
Test 3

Notes

- Hm* = 141.3 mm (gemeten ter hoogte van mixer 6)
- **Set parameters not achieved!**

9 December 2020

H2% = 75
Phi = 0.70
Liner: Quartz
Test 4

Notes

- Hm* = 141.10 mm (gemeten ter hoogte van mixer 6)
- **Set parameters not achieved!**

H2% = 75
Phi = 0.70
Liner: Quartz
Test 5

Notes

- Hm* = 141.15 mm (gemeten ter hoogte van mixer 6)
- **Set parameters not achieved!**

H2% = 100
Phi = 0.30
Liner: Quartz
Test 1

Notes

- Hm* = 141.15 mm (gemeten ter hoogte van mixer 6)
- Flame not detected -> UV sensor relocated

H2% = 100
Phi = 0.30
Liner: Quartz
Test 2

Notes

- Hm* = 141.2 mm (gemeten ter hoogte van mixer 6)
- $u_{FB} \approx 2.375\ ms^{-1}$

H2% = 100
Phi = 0.35
Liner: Quartz
Test 1

Notes

- Hm* = 141.2 mm (gemeten ter hoogte van mixer 6)
- $u_{FB} \approx 3.900\ ms^{-1}$

H2% = 100
Phi = 0.40
Liner: Quartz
Test 1

Notes

- Hm* = 141.15 mm (gemeten ter hoogte van mixer 6)
- Resonance -> "organ pipe"
- $u_{FB} \approx 6.500\ ms^{-1}$

H2% = 100
Phi = 0.45
Liner: Quartz
Test 1

Notes

- Hm* = 141.2 mm (gemeten ter hoogte van mixer 6)
- $u \approx 9.250\ ms^{-1}$-> Velocity to high?
- **Set parameters not achieved!**

H2% = 100
Phi = 0.45
Liner: Quartz
Test 2

Notes

- Hm* = 141.7 mm **[!]** (gemeten ter hoogte van mixer 6)
- Velocity to low?
- **Set parameters not achieved!**

10 December 2020

H2% = 100
Phi = 0.45
Liner: Quartz
Test 3

Notes

- Hm* = 141.25 mm (gemeten ter hoogte van mixer 6)
- Velocity to low?
- **Set parameters not achieved!**

H2% = 100
Phi = 0.45
Liner: Quartz
Test 4

Notes

- Hm* = 142.2 mm **[!]** (gemeten ter hoogte van mixer 6)
- **Set parameters not achieved!**

H2% = 100
Phi = 0.45
Liner: Quartz
Test 5

Notes

- Hm* = 141.1 mm (gemeten ter hoogte van mixer 6)
- Hm* = 141.5 mm (gemeten ter hoogte van mixer 2)
- **Set parameters not achieved!**

H2% = 100
Phi = 0.45
Liner: Quartz
Test 6

Notes

- Hm* = 140.9 mm (gemeten ter hoogte van mixer 6)
- **Set parameters not achieved!**

15 December 2020

H2% = 100
Phi = 0.45
Liner: Quartz
Test 7
Metalen opzetstuk op liner: Thermo-acoustische verschijnselen onderdrukken

Notes

- **Hm* niet gemeten (kan niet door metalen opzetstuk)**
- **Set parameters not achieved!**
- **Metalen opzetstuk levert niet het gewenste effect.**

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16 December 2020

Test case	Timer labview (first frame)	Trigger time labview cam1 txt file (start time)	Trigger time python cam0 txt file (start time)	Difference Labview timer and camX [s]	Average 1 [s]	Difference cam0 and cam1 (average) [s]	Files
NIKON 1	13:58:02.278	13:58:02.130	-	0.148	0.16033	1.20233	sync_test_2020-12-16_test1_cam1
NIKON 2	14:23:04.977	14:23:04.794	-	0.183	0.16033	1.20233	sync_test_2020-12-16_test2_cam1
NIKON 3	14:26:17.384	14:26:17.234	-	0.150	0.16033	1.20233	sync_test_2020-12-16_test3_cam1
ELP 1	14:11:23.928	-	14:11:25.059	-1.131	-1.042	1.20233	sync_test_2020-12-16_test1_cam0
ELP 2	14:16:47.673	-	14:16:48.684	-1.011	-1.042	1.20233	sync_test_2020-12-16_test2_cam0
ELP 3	14:21:39.189	-	14:21:40.173	-0.984	-1.042	1.20233	sync_test_2020-12-16_test3_cam0