

RF-Thermo-Structural study of CLIC Accelerating Structures

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23.10.2019

TD26_R05_CC

- A first parameter sweep for consistency check

$T_{\text{inlet}} = 27 \text{ degC}$

$T_{\text{amb}} = 28 \text{ degC}$

$P_{\text{rf}} = 2.1 \text{ kW}$

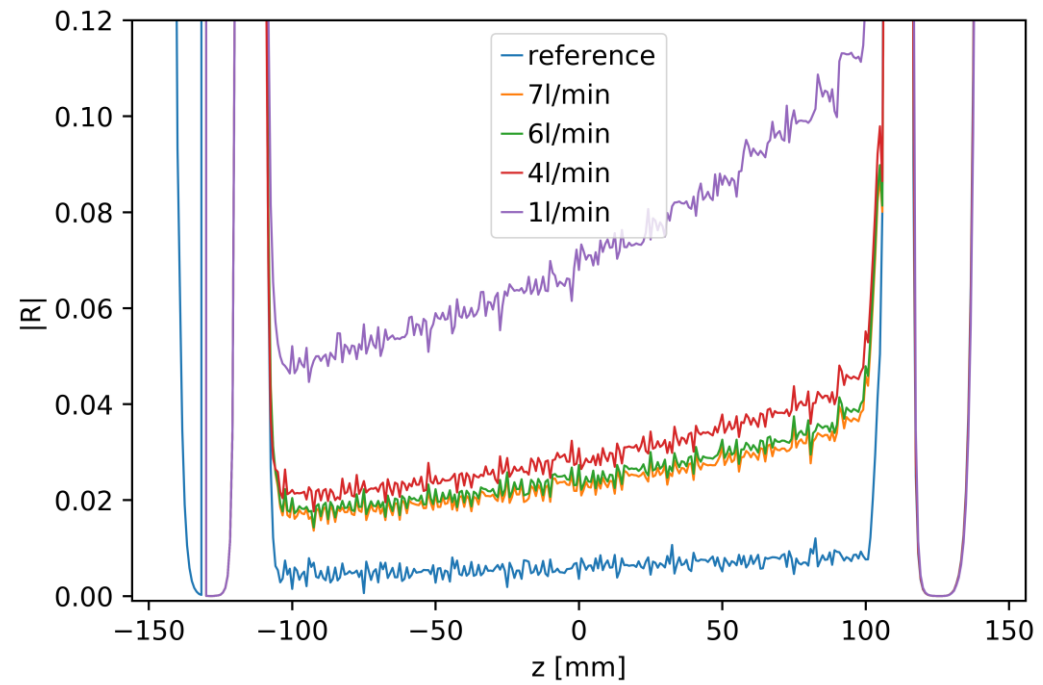
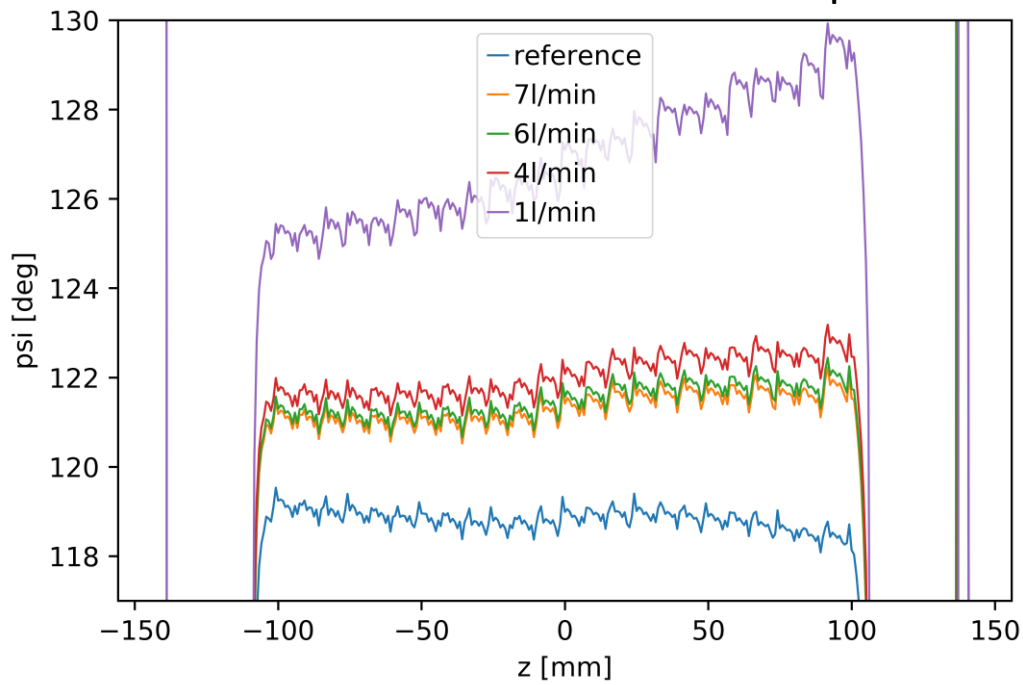
$D_{\text{pipe}} = 8 \text{ mm}$

$h_{\text{CuAir}} = 5 \text{ W/m}^2/\text{K}$

Qvol	[l/min]	1	4	6	7
T	[degC]	73	45.8	42.4	41.5
TOutlet	[degC]	44.1	31.4	29.9	29.5
Re	[1e4]	0.44	1.37	1.99	2.3
hCuWater	[1e4W/m ² /K]	0.22	0.72	1.01	1.15
S11 [dB]	[dB]	-22.6	-41.7	-36.1	-35.1

Reference: S11 = -47dB

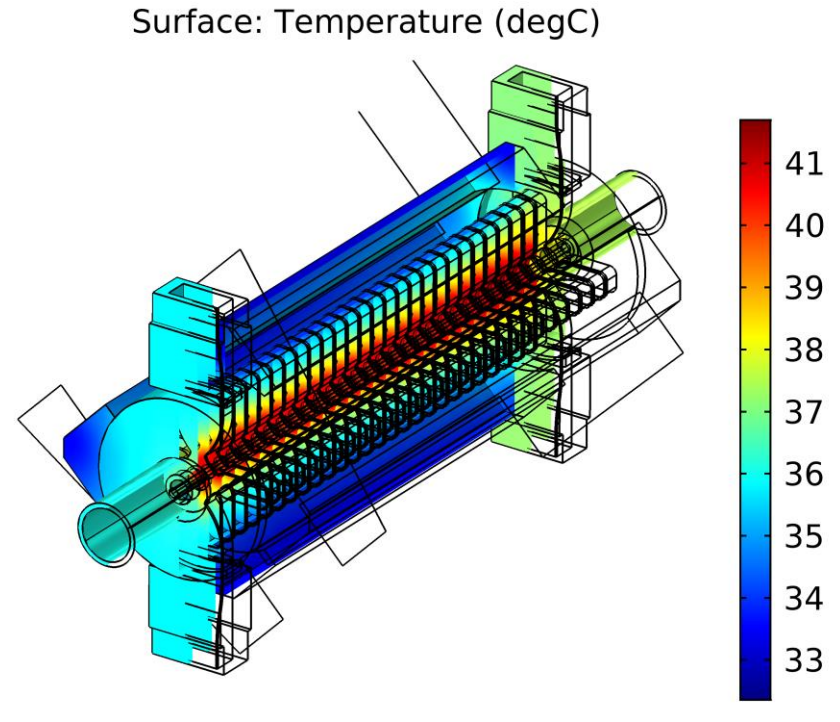
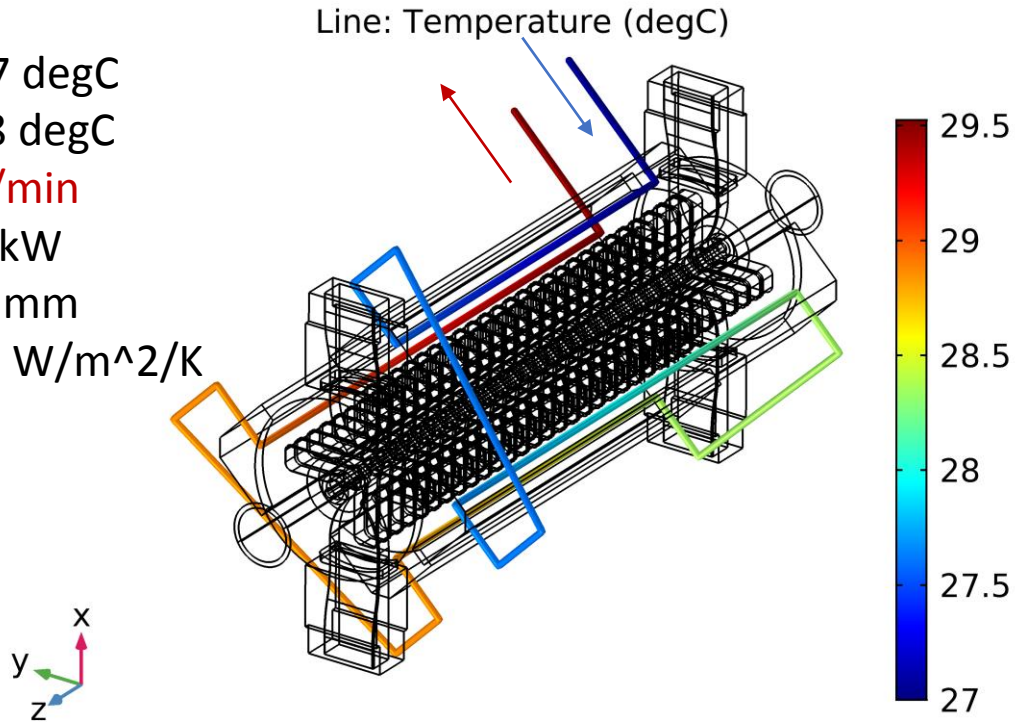
Cell to cell phase advance and internal reflections



TD26_R05_CC

- A first parameter sweep for consistency check

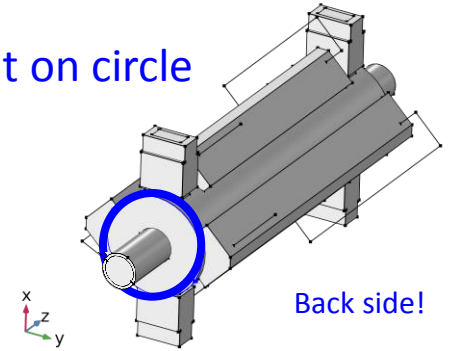
$T_{\text{inlet}} = 27 \text{ degC}$
 $T_{\text{amb}} = 28 \text{ degC}$
 $Q_{\text{vol}} = 7 \text{ l/min}$
 $P_{\text{rf}} = 2.1 \text{ kW}$
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TD26_R05_CC - Temperature

- A first parameter sweep for consistency check

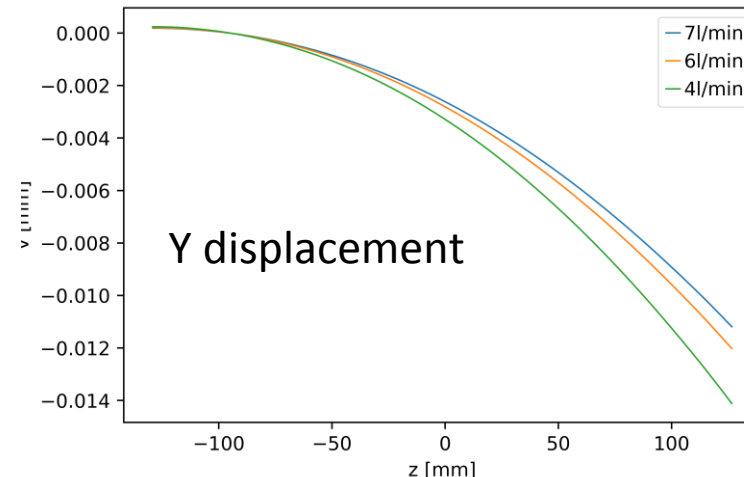
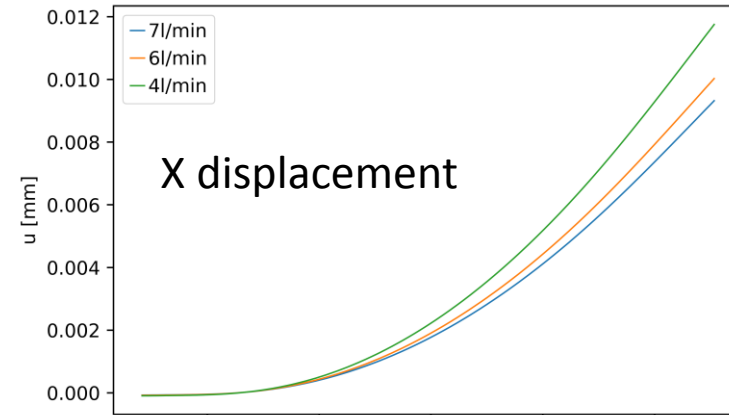
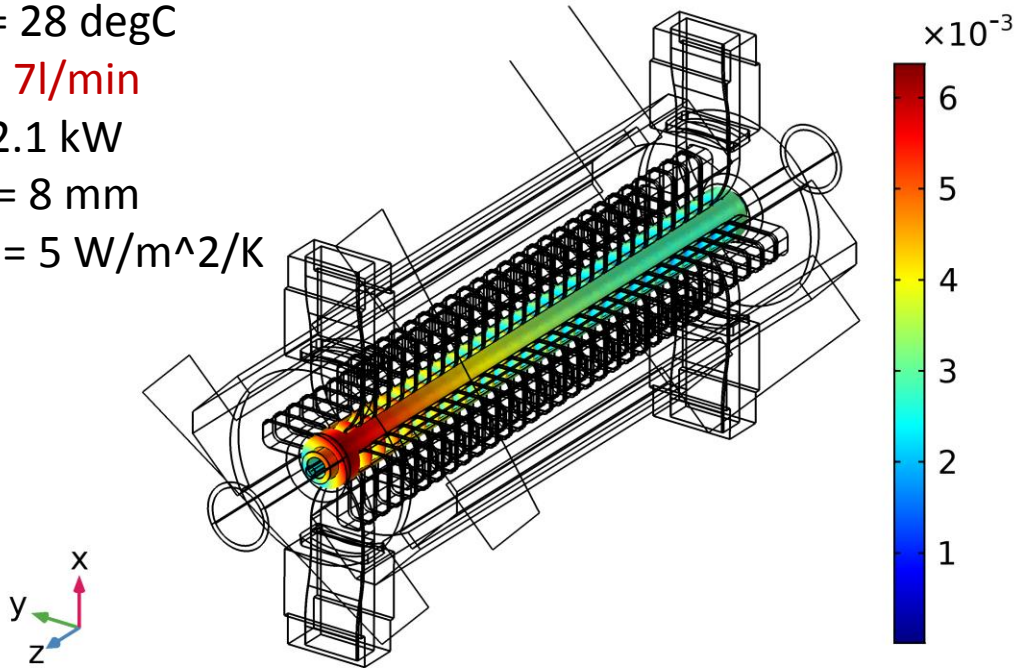
Constraint on circle
 $dz = 0$
 $d\phi = 0$



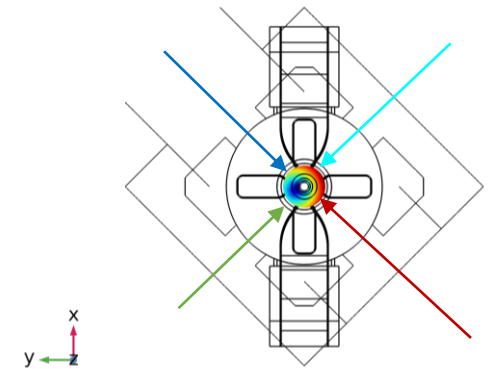
Radial displacement of the center

Volume: $\sqrt{u^2 + v^2}$ (mm)

$T_{inlet} = 27 \text{ degC}$
 $T_{amb} = 28 \text{ degC}$
 $Q_{vol} = 7 \text{ l/min}$
 $P_{rf} = 2.1 \text{ kW}$
 $D_{pipe} = 8 \text{ mm}$
 $h_{CuAir} = 5 \text{ W/m}^2/\text{K}$

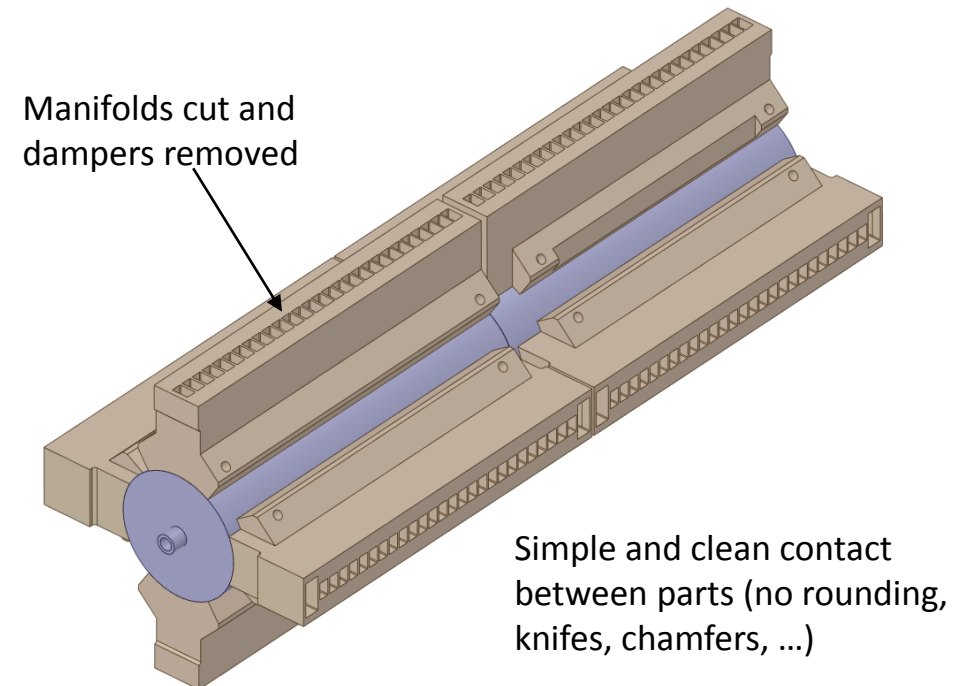
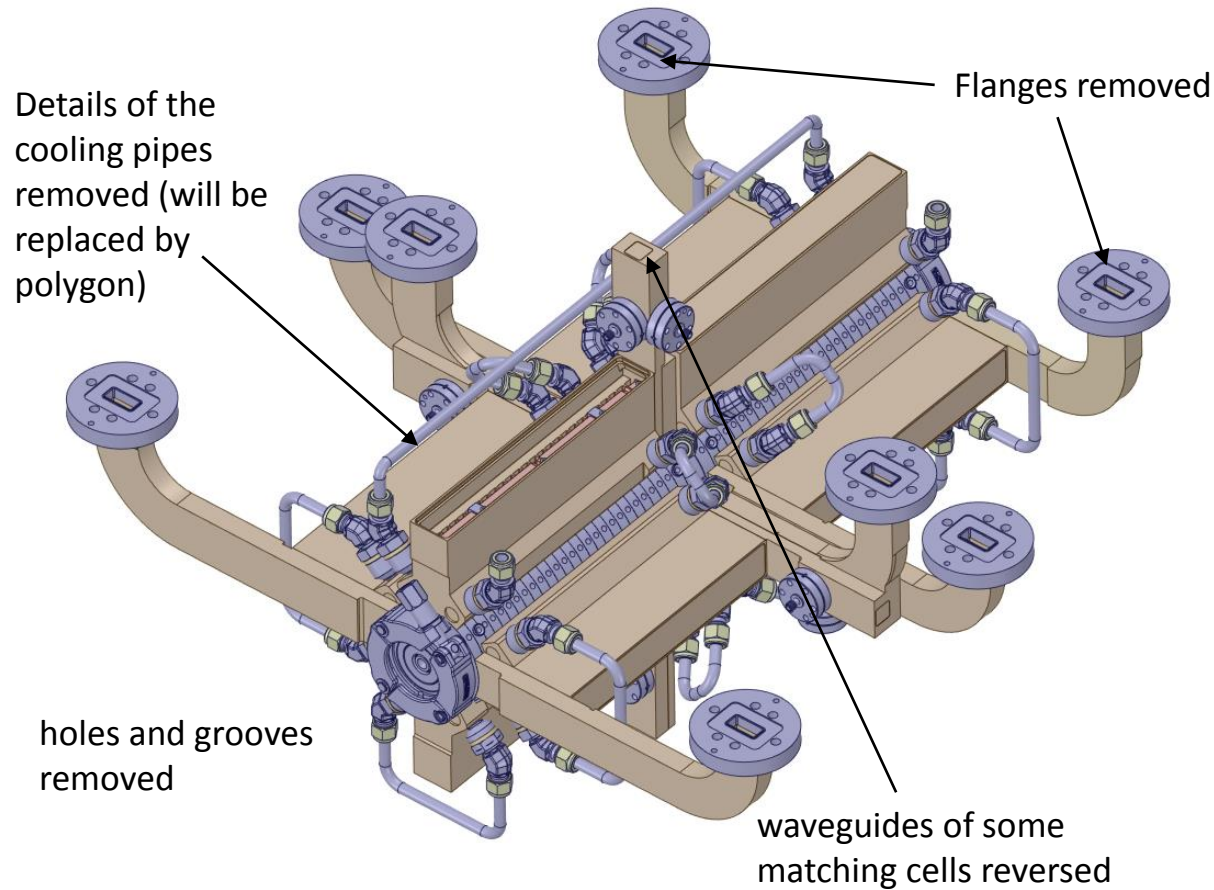


Sum of 4 probe lines



Super Structure (2 x TD26_R05_CC)

- Model simplification without healing



Super Structure (2 x TD26_R05_CC)

Pressure:

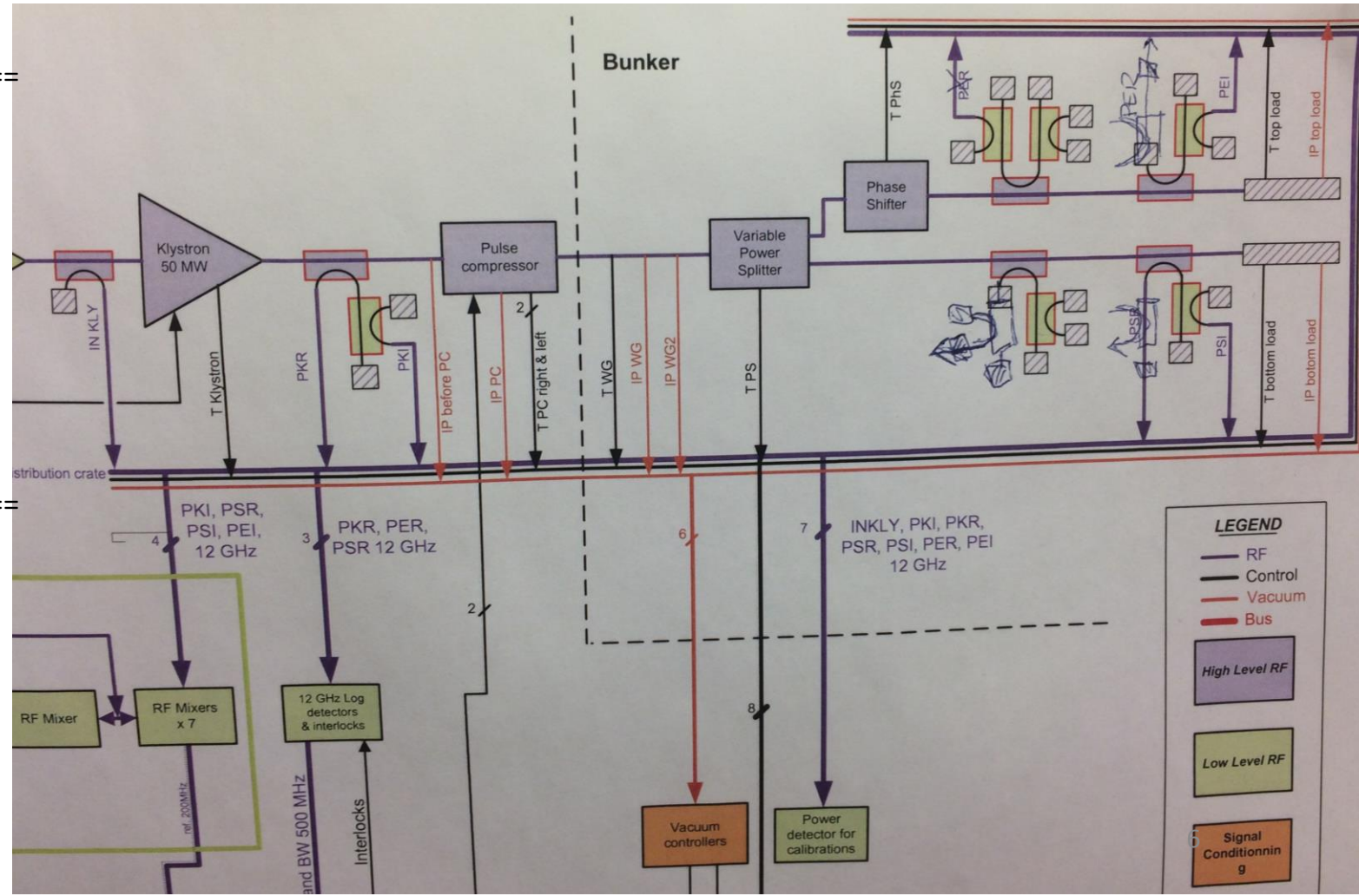
- =====
- CC
- Before BOC
- BOC
- WG Bunker
- Before PS
- Beam axis
- Load 1
- Load 2
- Structure 1
- Structure 2
- Gauge Before BOC
- Gauge BOC
- Gauge Before PS
- Gauge Beam axis
- Gauge Load 1
- Gauge Load 2

Temperature:

- =====
- CC
- Bunker WG
- Power Splitter
- BOC
- Structure A
- Load 2
- Load 1
- Structure B

Additional Information:

- =====
- Repetition rate
- Pulse Count



Super Structure (2 x TD26_R05_CC)

Pressure:

=====

CC
 Before BOC
 BOC
 WG Bunker
 Before PS
 Beam axis
 Load 1
 Load 2
 Structure 1
 Structure 2
 Gauge Before BOC
 Gauge BOC
 Gauge Before PS
 Gauge Beam axis
 Gauge Load 1
 Gauge Load 2

Temperature:

=====

CC
 Bunker WG
 Power Splitter
 BOC
 Structure A
 Load 2
 Load 1
 Structure B

Additional Information:

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Repetition rate
 Pulse Count

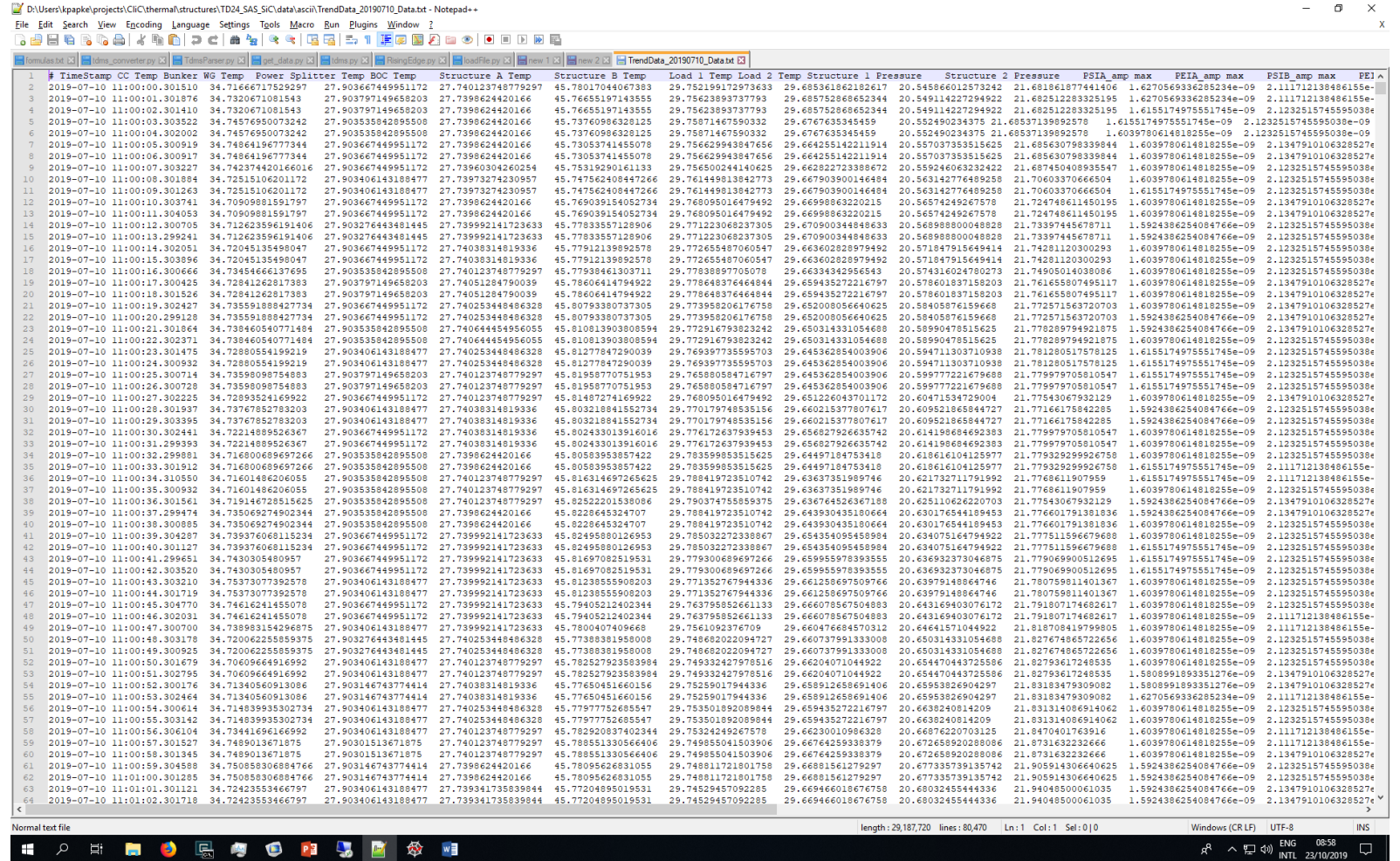
Comparison with Alex Setup on Xbox3

Sensor	DAQ channel name
Line 3	
water Tin	Load 1 In Temp
water Tout	Load 1 Out Temp
flow	Structure 3 Flow Pressure
RF power in	1PSI_amp max
RF power out	1PEI_amp max
Line 4	
water Tin	PC2_Left Temp
water Tout	PC2_Right Temp
flow	Structure 4 Flow Pressure
RF power in	2PSI_amp max
RF power out	4PEI_amp max
General	
Reflected power	PSR_amp
Repetition rate	Repetition rate

$$P = c_p * \dot{m} * (T_{out} - T_{in})$$

Super Structure (2 x TD26_R05_CC)

- Conversion of xbox2 measurement data into plain ASCII files or python binary files using a python script



State and next steps

- Super structure simplified and ready for simulation setup
- Conversion of xbox super structure data into plain ASCII files/ python binary files done
- Measurement data from super structure applied on single TD26_R05_CC
- Phase adjustment by frequency tuning (standing waves become probably more pronounced)
- Different cooling schemes (→ Henri)