ALICE

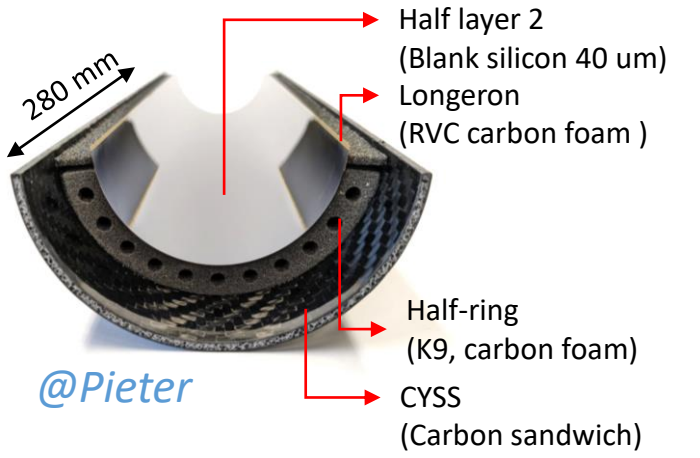
ITS3

Tuesday 13th June 2023

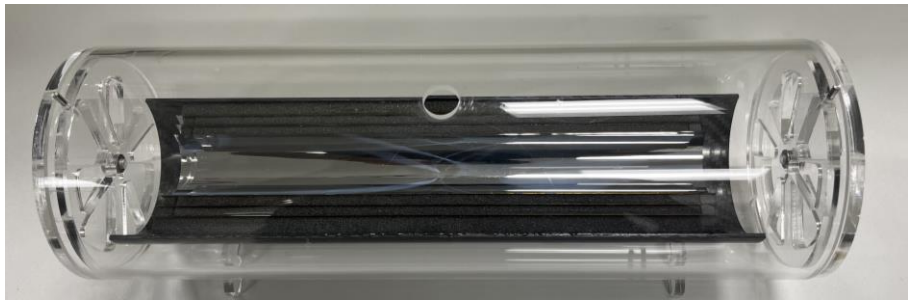
WP5 progress report

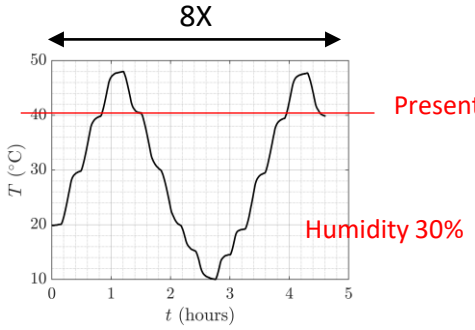
WP5 collaboration

Thermoelastic test : BBM5



@Pieter





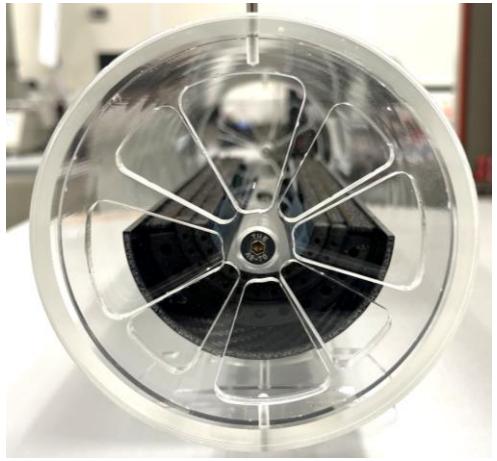
Present test max 40C started yesterday

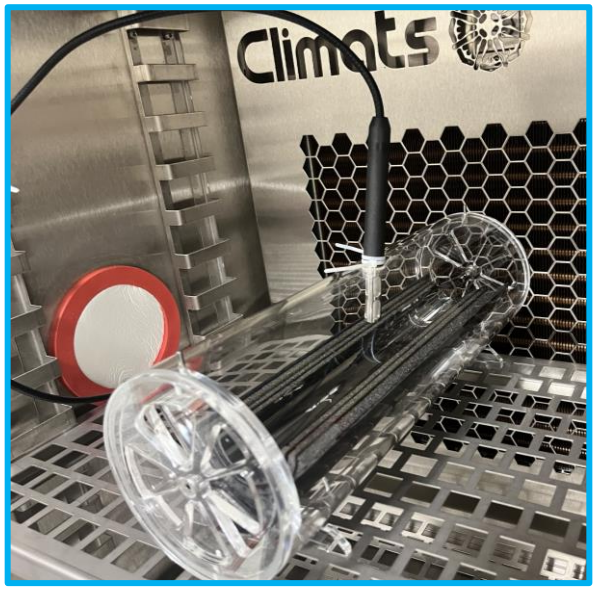
Humidity 30%

Example of a thermoelastic cycle

Climate chamber

@EP-DT QART lab, Alessandro



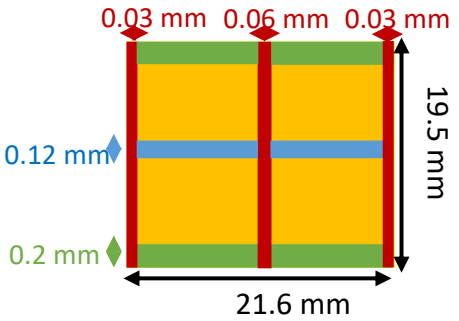


Thermal analysis: (updates) Simulation of the RSU

- Thermal analysis of the Repeated Sensor -stitching- Unit (RSU) to study local temperature gradients

@Aitor

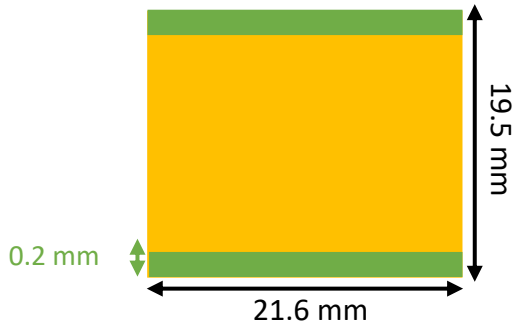
Power map of the RSU



Matrix, 15 - 30 mW/cm^2
Data backbone, 700 mW/cm^2
Periphery, 450 mW/cm^2
Biasing, 150 mW/cm^2

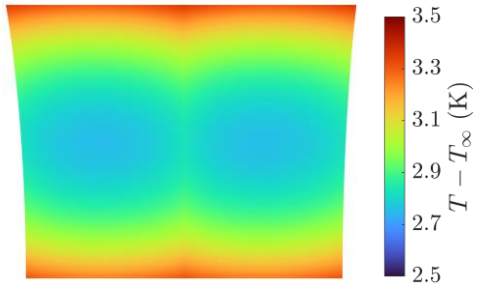
	Power density [mW cm^{-2}]		
	Expected 25 °C	Max 25 °C	Max 45 °C
Left End Cap (LEC)		791	
Active area (RSU)	28	44	62
Pixel matrix	15	32	51
Biasing	168	168	168
Readout peripheries	432	457	496
Data backbone	719	719	719

Simplified power map

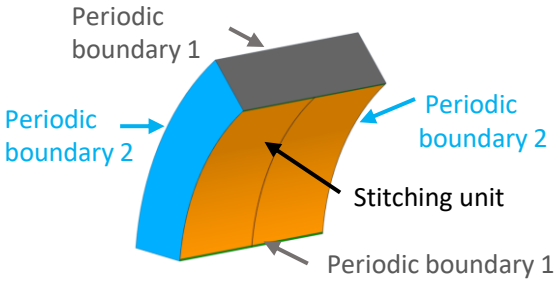


Matrix, 19.6 – 34.4 mW/cm^2
Periphery, 454 mW/cm^2

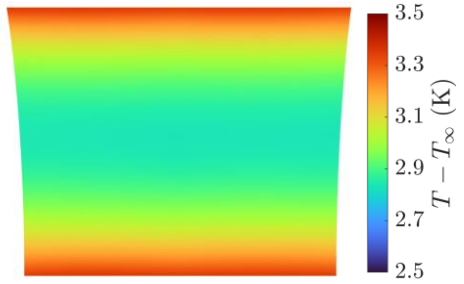
Temperature variation for
$q_m = 15$ mW/cm^2 and $v_\infty = 8$ m/s



Simulation geometry



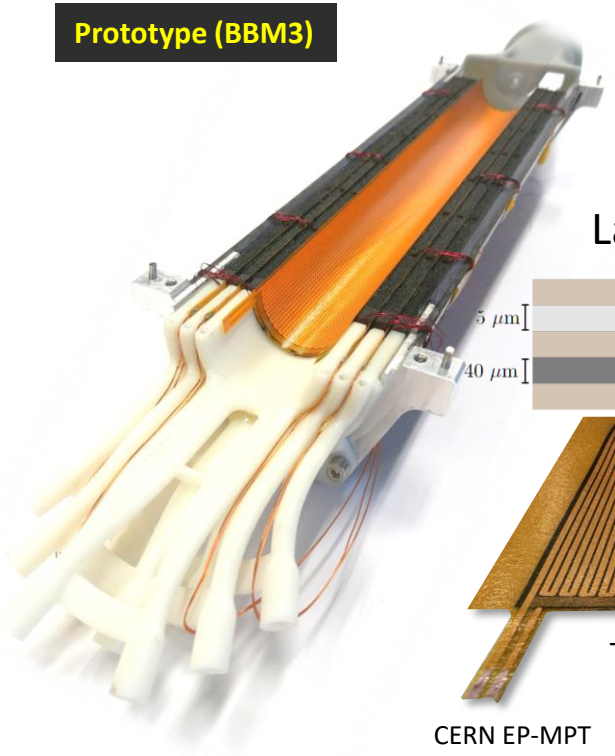
Temperature variation for
$q_m = 15$ mW/cm2 and $v_\infty = 8$ m/s



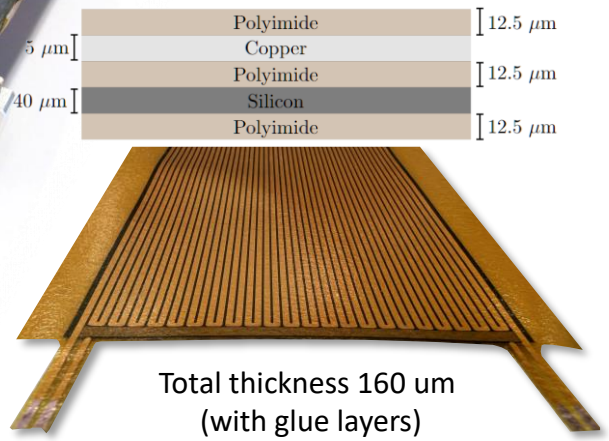
- Biasing not considered in the simulations
- Gradients of around 1 K around the peripheries → Need to be meshed separately
- **Negligible gradients in the data backbone → No need of meshing the data backbone and the biasing**
- **The power of the data backbone and biasing areas is uniformly added to both the matrix and the periphery of the RSU.**

Thermal test: BBM6 (new) - INFN bari

Prototype (BBM3)

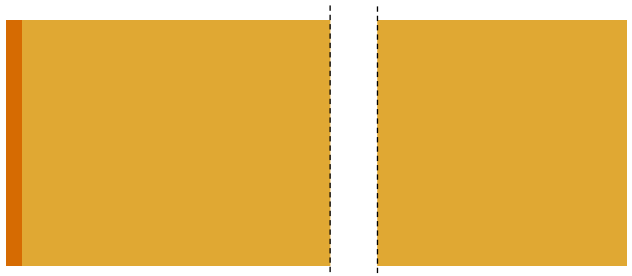


Layer stack-up



Total thickness 160 um
(with glue layers)

CERN EP-MPT



Endcap (max 2000 mW/cm^2)

Matrix (max 100 mW/cm^2)

	Power density [mW cm^{-2}]		
	Expected 25 °C	Max 25 °C	Max 45 °C
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Active area (RSU)	28	44	62
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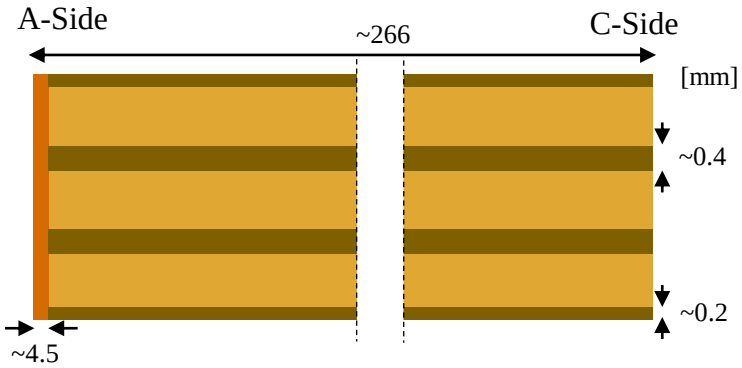
Power dissipation for new heaters



Power distribution:

- Endcap (>800 mW/cm^2)
- Pixel domain (>60 mW/cm^2)
- Periphery (>510 mW/cm^2)

Back-up

Thermal test: BBM6 (new) - INFN bari

Electrical connection