

Fluid Dynamics investigation of the CROME ROMULUS project

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 EN Engineering Department

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of the
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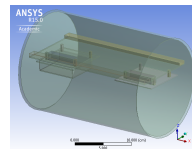
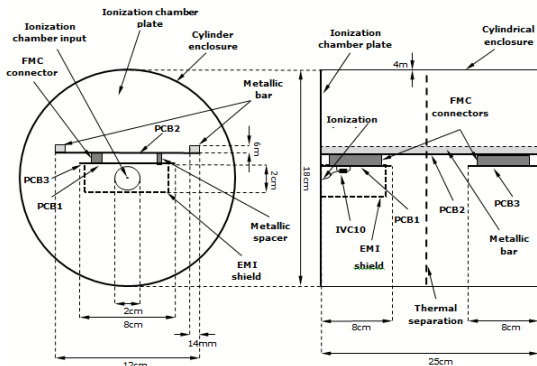
Geometry

Numerical
model

First results

Insulation
sensitivity

Possible
validation



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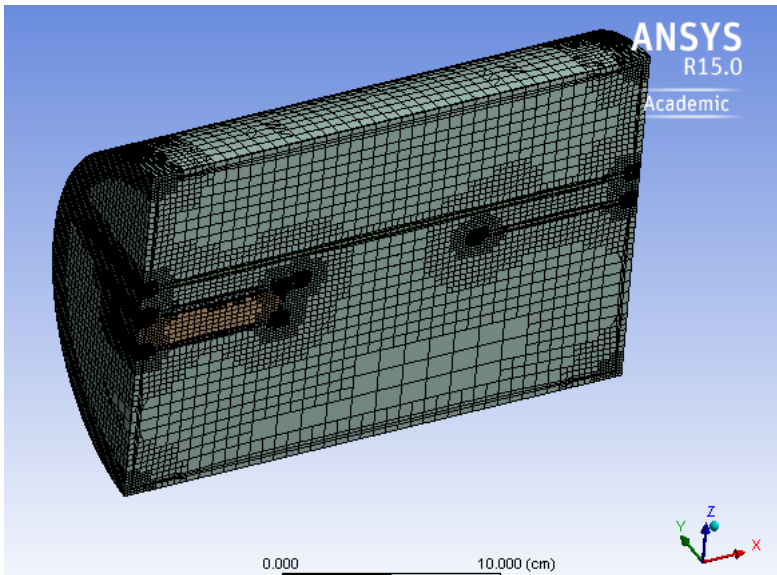
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- o Fixed external temperature (-15, 25, 55 °C)
- o 3 internal volumetric heat sources (PCBs)
- o Changed orientation
- o Inner insulation wall
- o Steady state solver with SIMPLE pressure velocity coupling, second order upwind differencing for the discretization terms.
- o Natural convection with Boussinesq approximation
- o Radiation with DOF model

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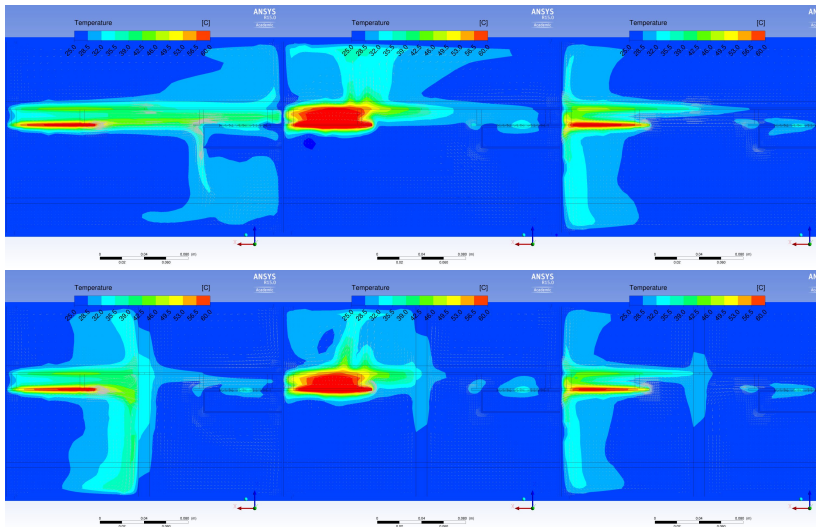
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External temperature [C]	Direction of gravity	Middle insulation	Max emi temperature [C]	Max chamber temperature (1) [C]	Max chamber temperature (3) [C]	
-15	x+	no	-3.3	26.0		
		yes	-6.9	-4.6	26.1	
	x-	no	-7.2	26.6		
		yes	-7.4	-8.6	24.4	
	z+	no	-6.2	-6.2	-13.1	
		yes	-6.7	-6.7	-7.2	40.5
25	x+	no	35.7	61.9		
		yes	32.5	33.8	61.2	
	x-	no	32.3	62.4		
		yes	32.1	31.0	59.7	
	z+	no	33.3	76.3		
		yes	32.7	32.2	72.6	
55	x+	no	64.9	88.8		
		yes	62.0	62.8	87.8	
	x-	no	61.9	89.2		
		yes	61.7	60.7	86.2	
	z+	no	62.9	100.9		
		yes	62.2	61.8	96.7	

Table 3 Maximum observed temperatures in the fluid regions with natural convection

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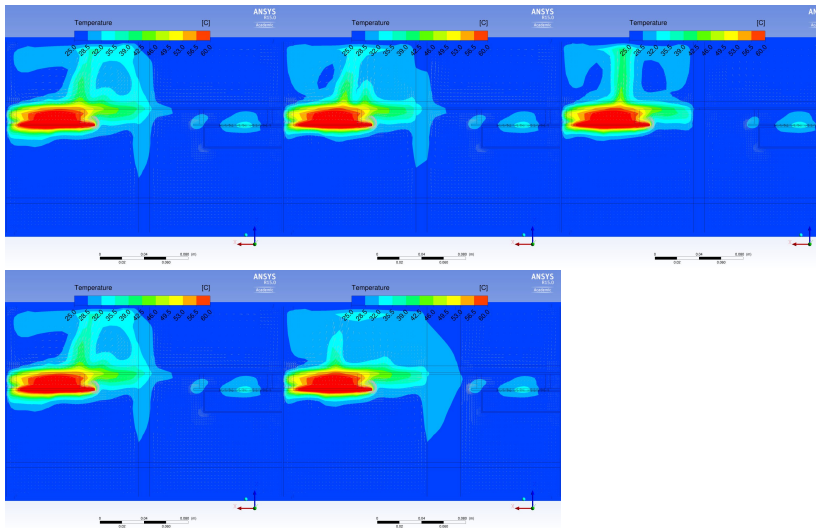
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External temperature [C]	Direction of gravity	Middle insulation	Width of insulation [mm]	Conductivity [W/m/K]	Max emi temperature [C]	Max chamber temperature (1) [C]	Max chamber temperature (3) [C]
25	Z+	yes	10	0.03	32.7	32.6	72.8
				0.5	32.7	32.2	72.6
				5	32.6	32.2	72.6
			30	0.03	32.7	32.2	72.9

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Thank you for your attention!