

Comparative Analysis of Various Heatsink Technologies in Forced Ventilation

AAVID THERMALLOY in cooperation with
Applied Thermal Technologies - India

www.aavidthermalloy.com

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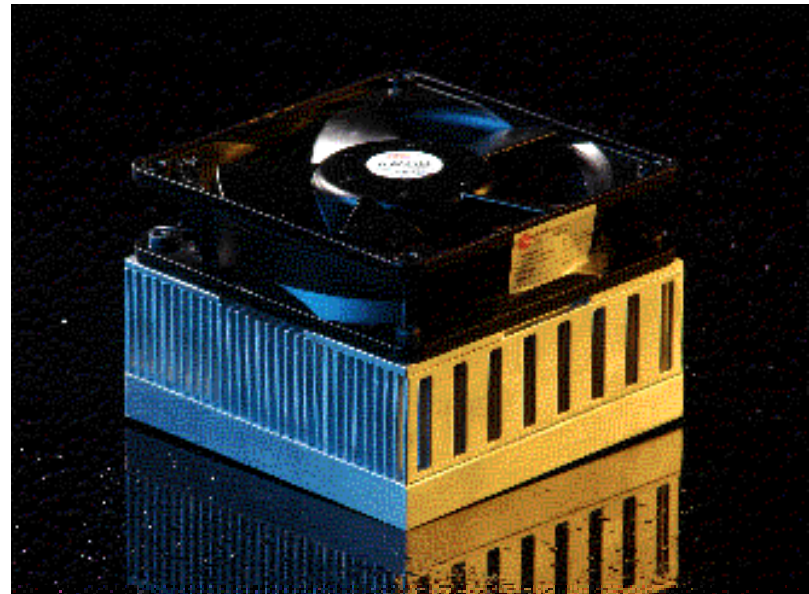


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Objective

- ❑ To do a comparative study of the performance of various heatsink models and cross cut patterns in forced ventilation and test them
- ❑ Heat sink under study: 150x160x63 mm dimensions with 500 W uniformly dissipated on the base.
- ❑ Traditional Bonded fins and Mechanically Pressed fins:
 - Pressed Extruded fins
 - Pressed Sheet fins
 - Bonded Sheet fins
- ❑ Brazedfins - no X-cuts:
 - Traditional Axial Flow
 - Impingement
- ❑ Brazedgain™ 1516 HBG with X-cuts:
 - Standard Model
 - New Model with X-cuts on 6 side fins only



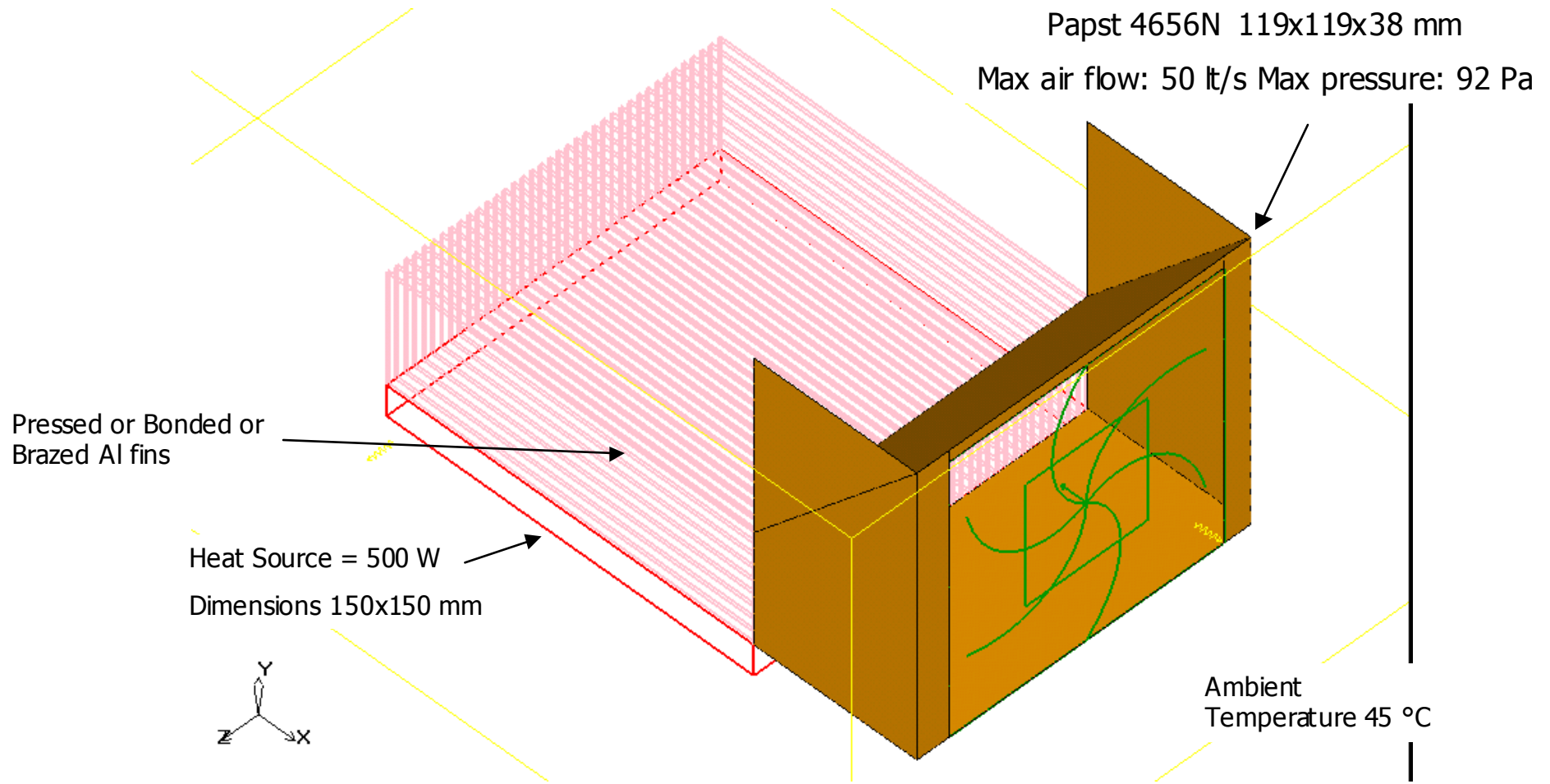
Traditional Axial Flow

No cross-cuts

Fan used for all simulations and tests:

Papst 4656N 119x119x38 mm

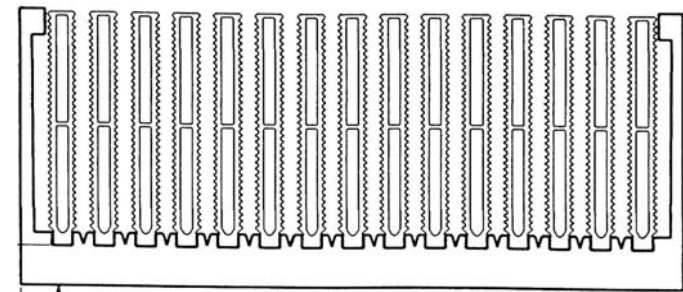
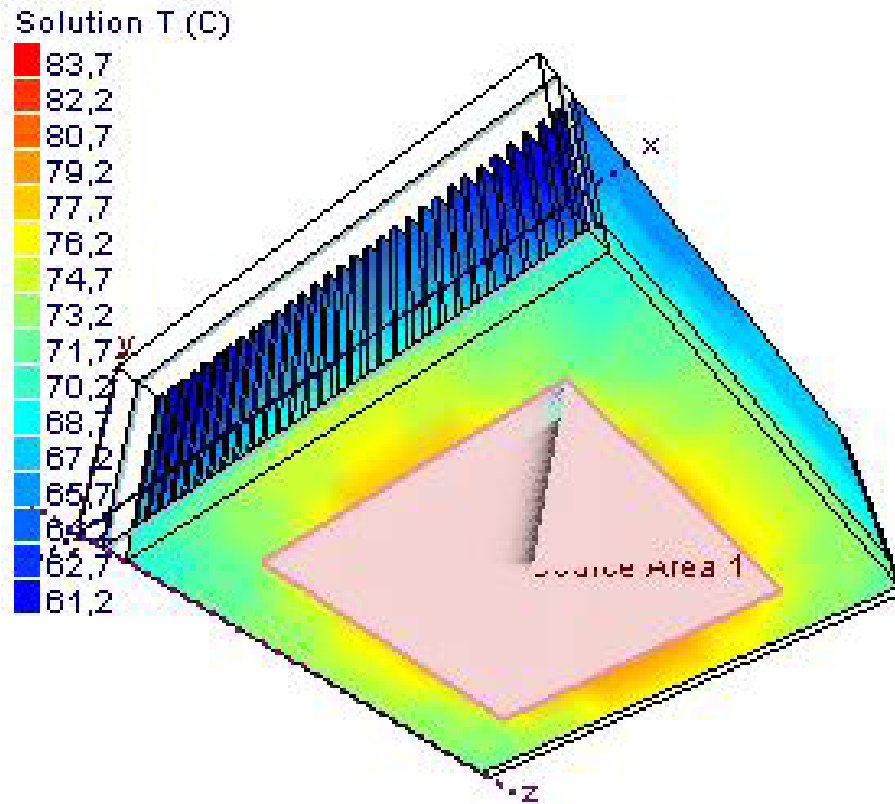
Max air flow: 50 lt/s Max pressure: 92 Pa



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PRESSED HOLLOW FINS BASE TEMPERATURE



DIMENSIONS: 200 x 200 x 84 mm

WEIGHT: 3.95 kg

Air speed: 2.3 m/s

Rth: 0.077 °C/W



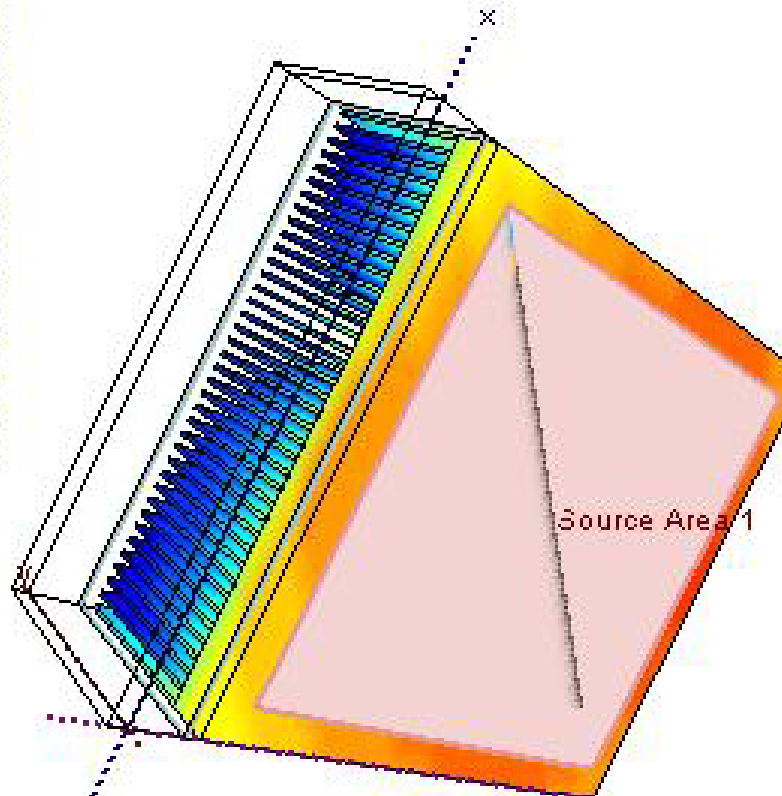
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PRESSED SHEET FINS BASE TEMPERATURE

Solution T (C)

83,8
82,9
81,9
80,9
79,9
78,9
78,0
77,0
76,0
75,0
74,0
73,1
72,1
71,1
70,1
69,1



DIMENSIONS: 150.5 x 160 x 63 mm

WEIGHT: 1.88 kg

Air speed: 3.5 m/s

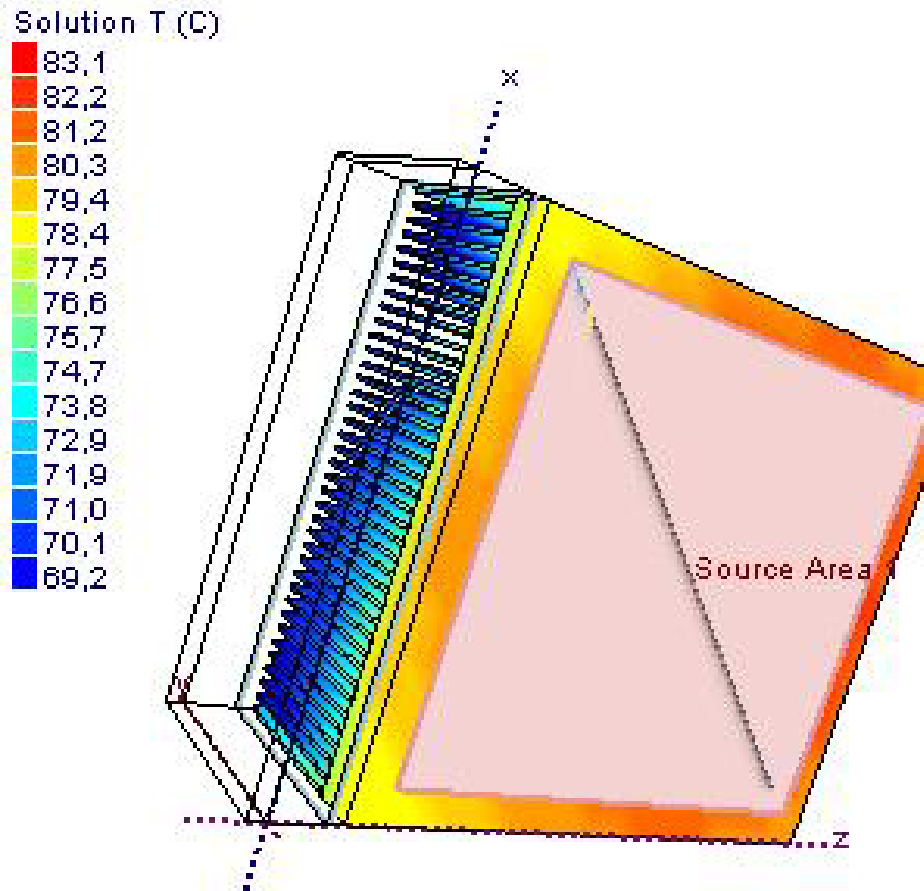
Rth: 0.077 °C/W



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BONDED SHEET FINS BASE TEMPERATURE



DIMENSIONS: 150.5 x 160 x 63 mm

WEIGHT: 1.88 kg

Air speed: 3.5 m/s

Rth: 0.076 °C/W

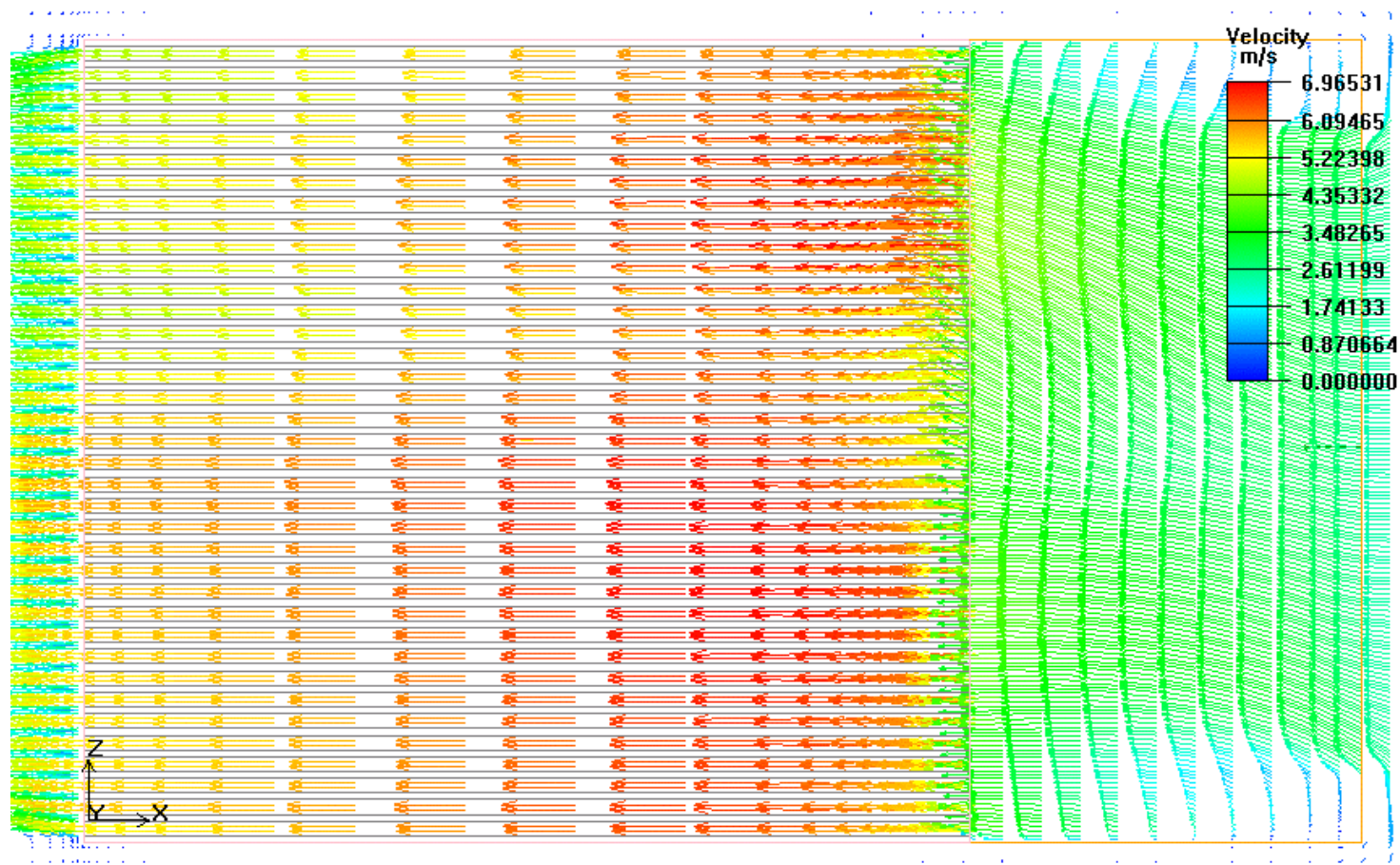


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BRAZEDFIN

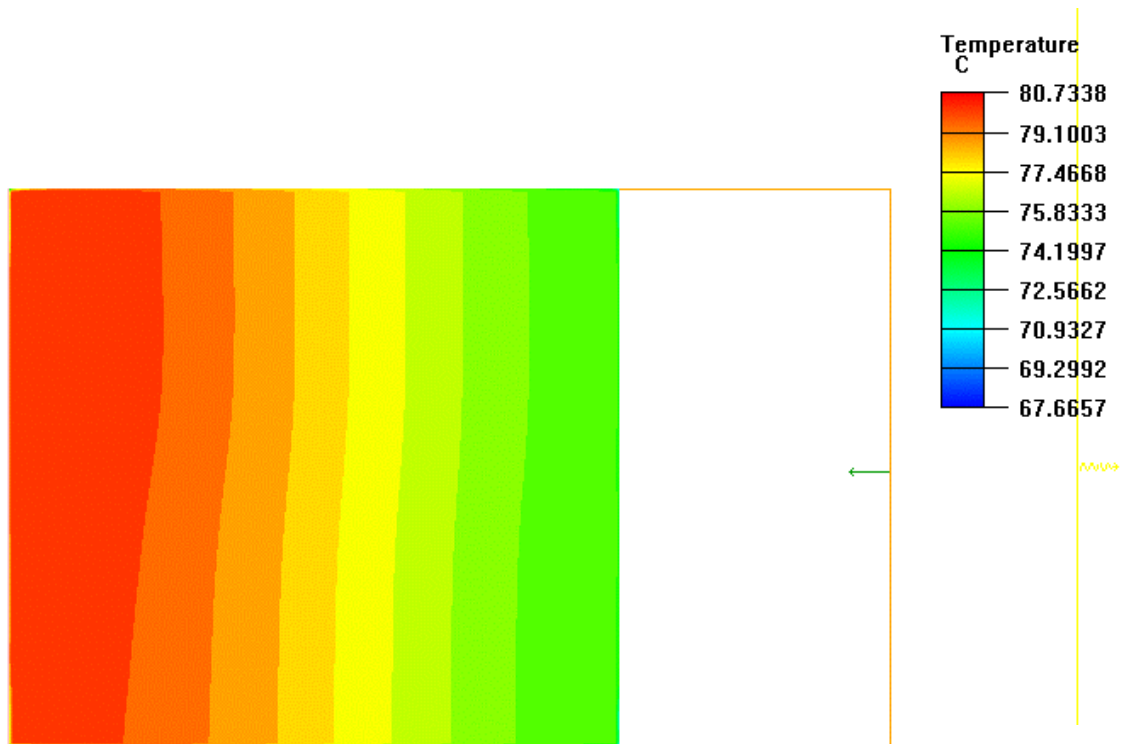
VELOCITY DIST. AT 15 MM ABOVE BASE



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BRAZEDFIN BASE TEMPERATURE



DIMENSIONS: 150.5 x 160 x 63 mm

WEIGHT: 1.88 kg

Air speed: 3.5 m/s

Rth: 0.072 °C/W

→x

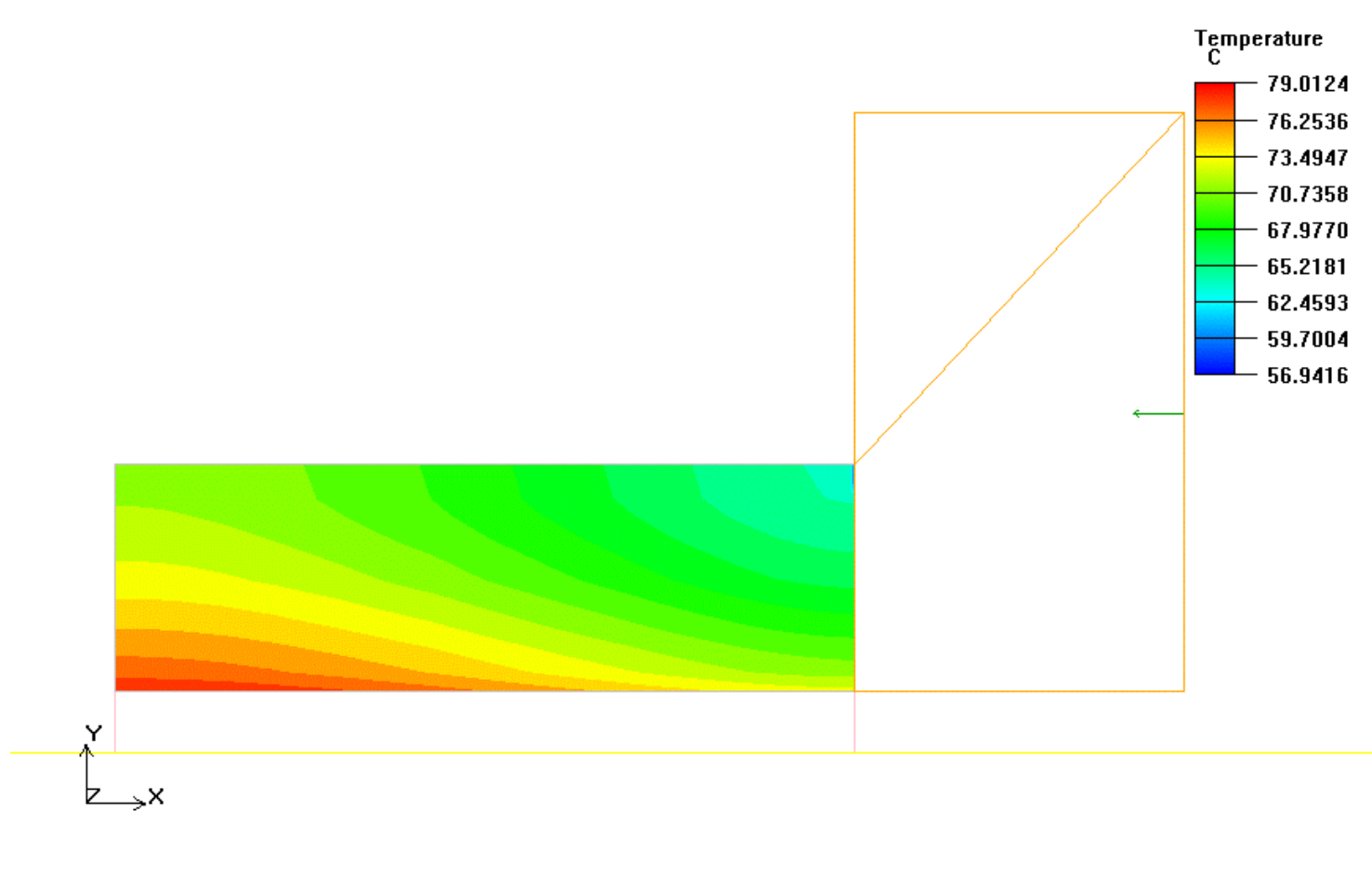


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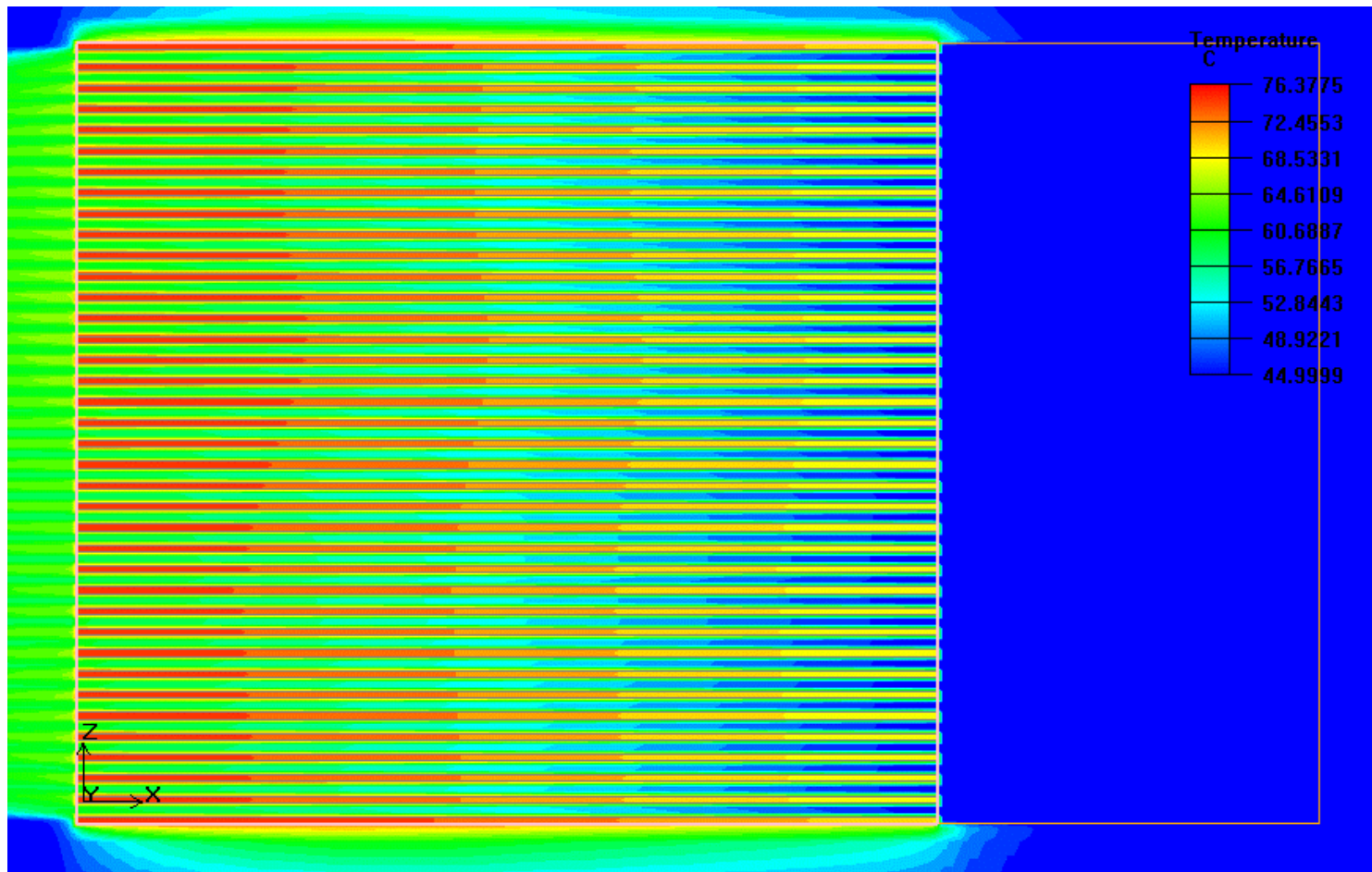
BRAZEDFIN

6TH FIN TEMPERATURE



BRAZEDFIN

TEMPERATURE AT 15 MM ABOVE BASE

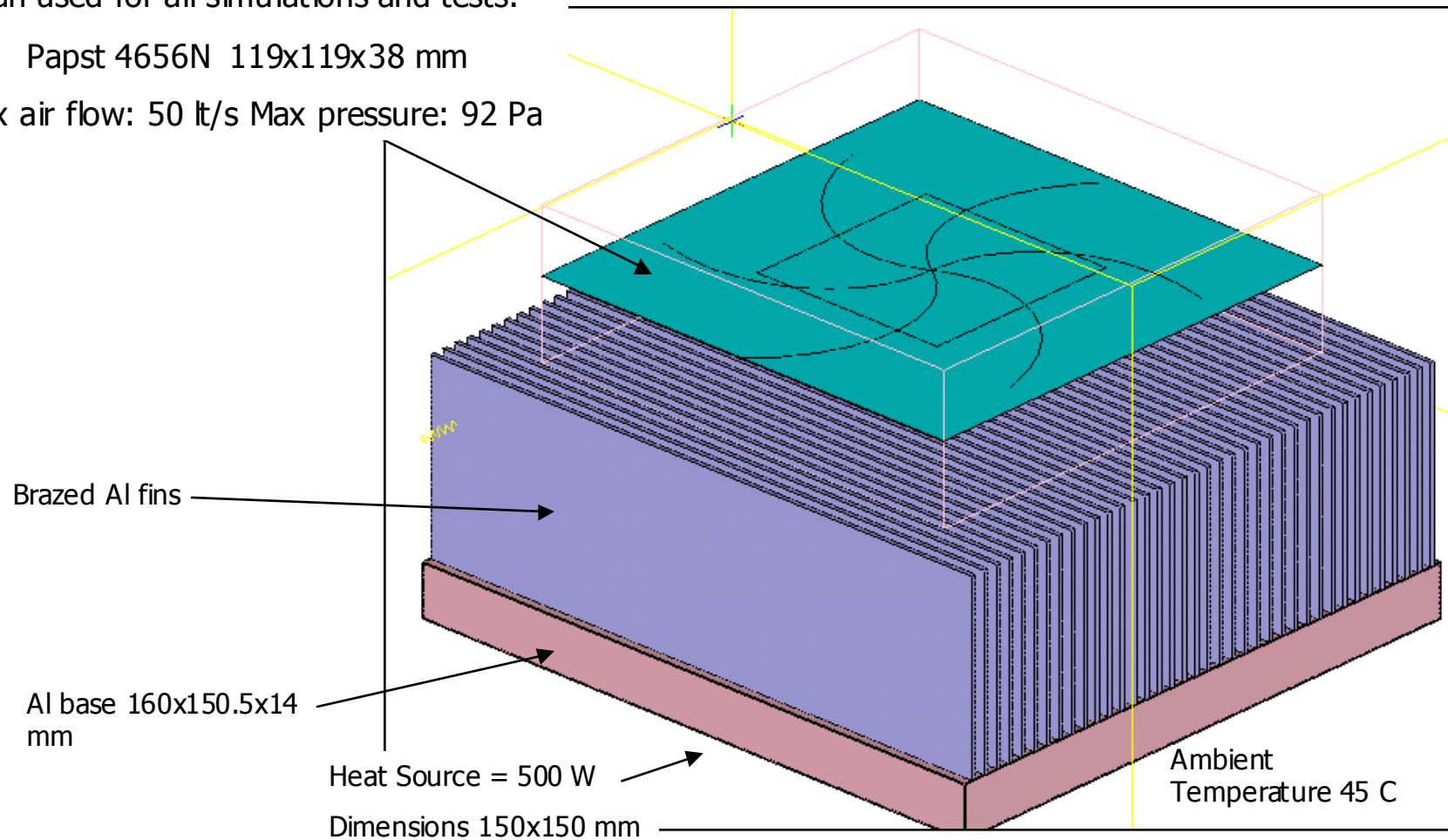


BRAZEDGAIN no X-cuts **HBG1516**

Fan used for all simulations and tests:

Papst 4656N 119x119x38 mm

Max air flow: 50 lt/s Max pressure: 92 Pa

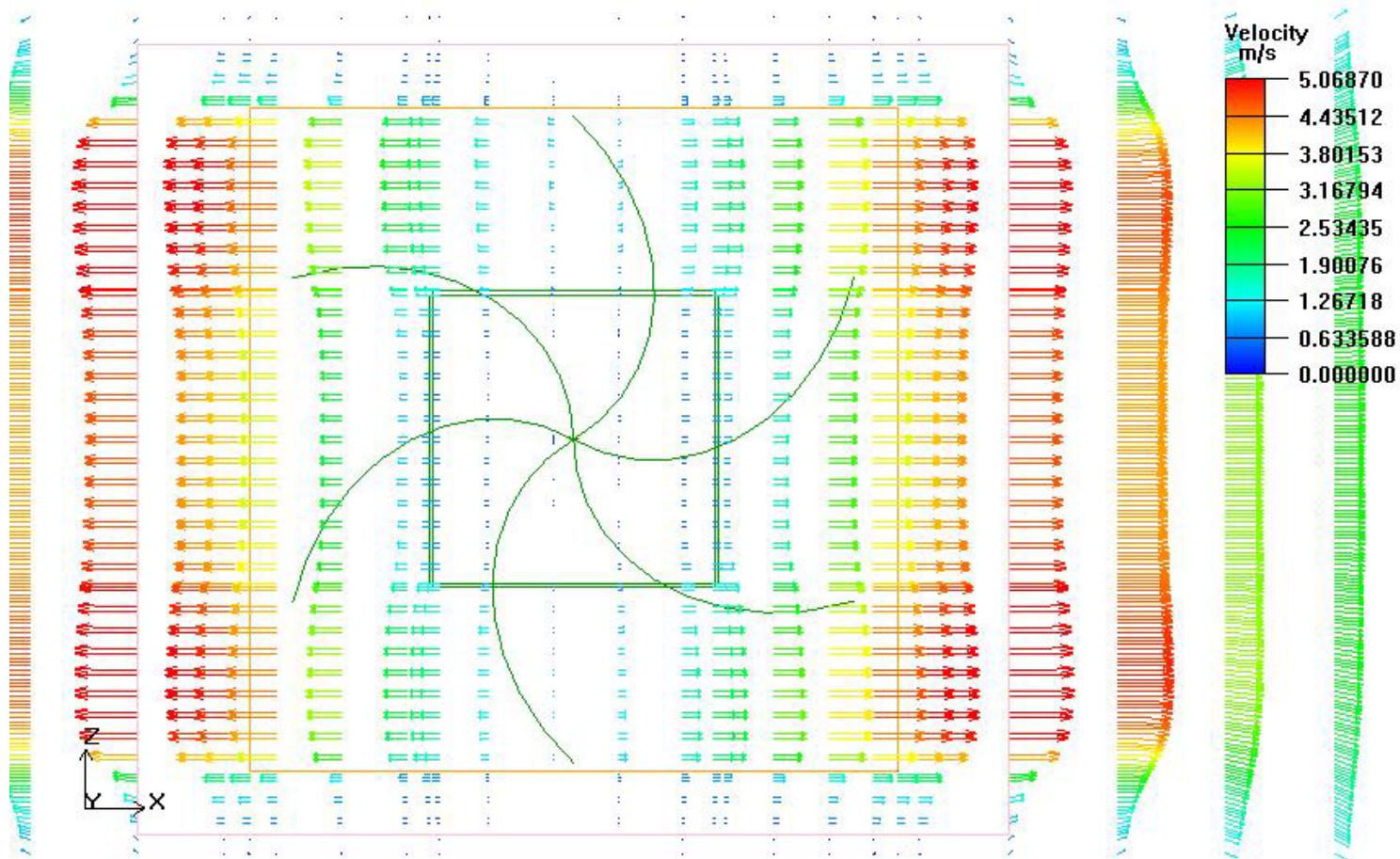


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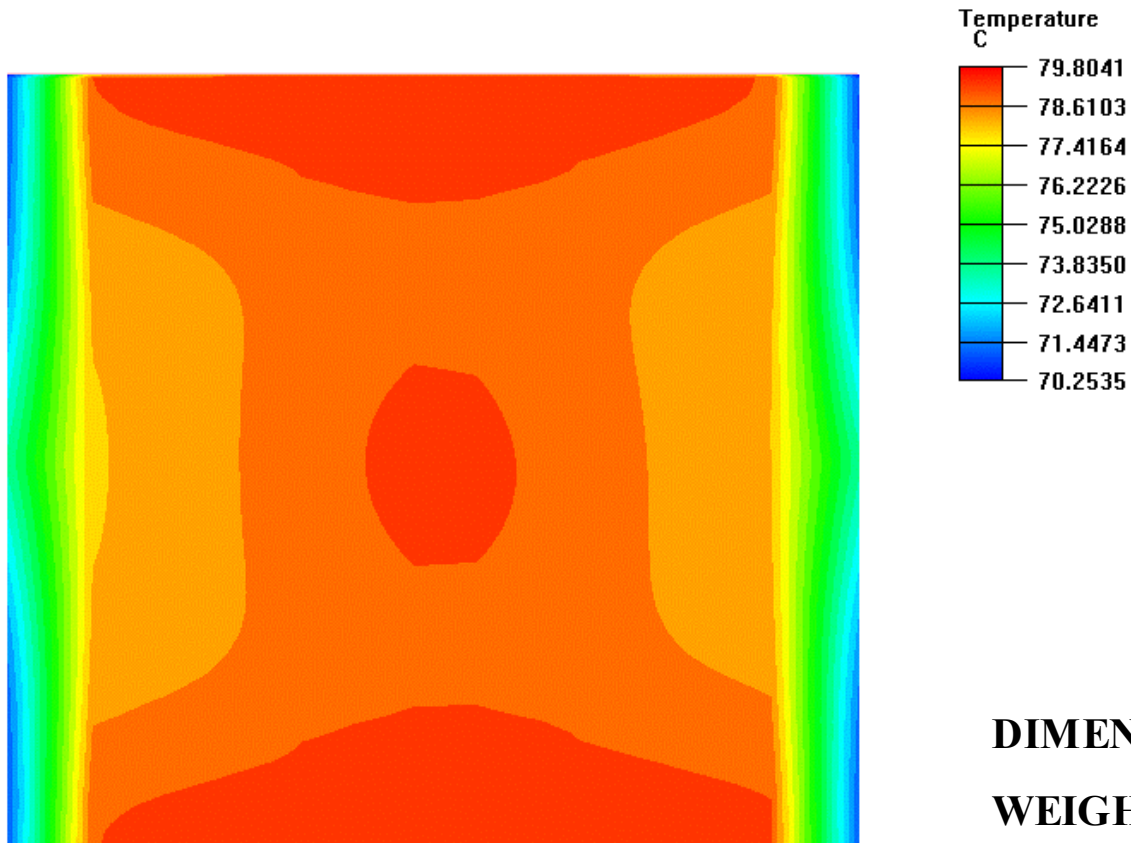
BRAZEDGAIN no X-cuts

Velocity 15mm above base



BRAZEDGAIN no X-cuts

BASE TEMPERATURE



DIMENSIONS: 150.5 x 160 x 63 mm

WEIGHT: 1.88 kg

Air speed: 3.8 m/s

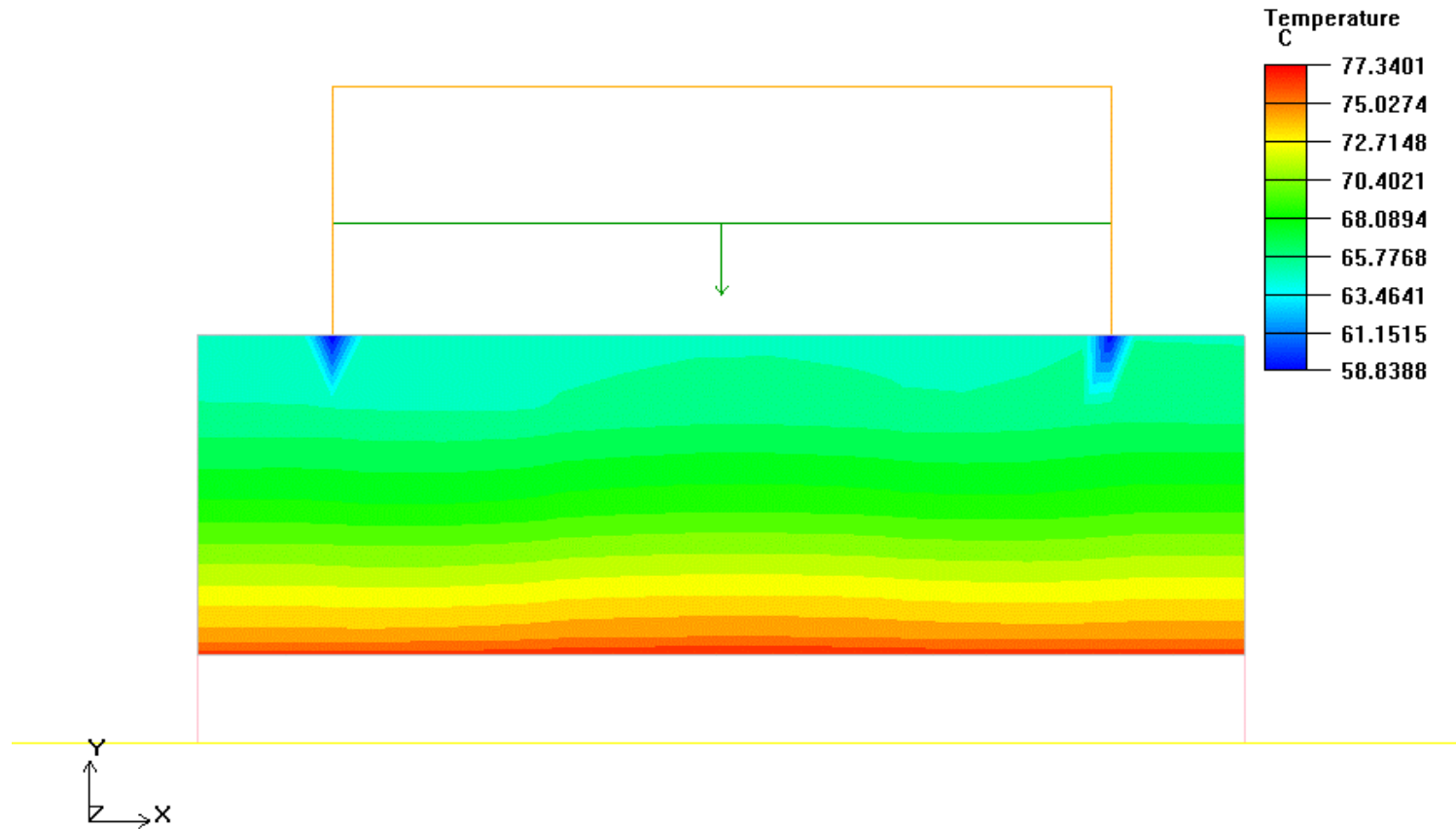
Rth: 0.070 °C/W



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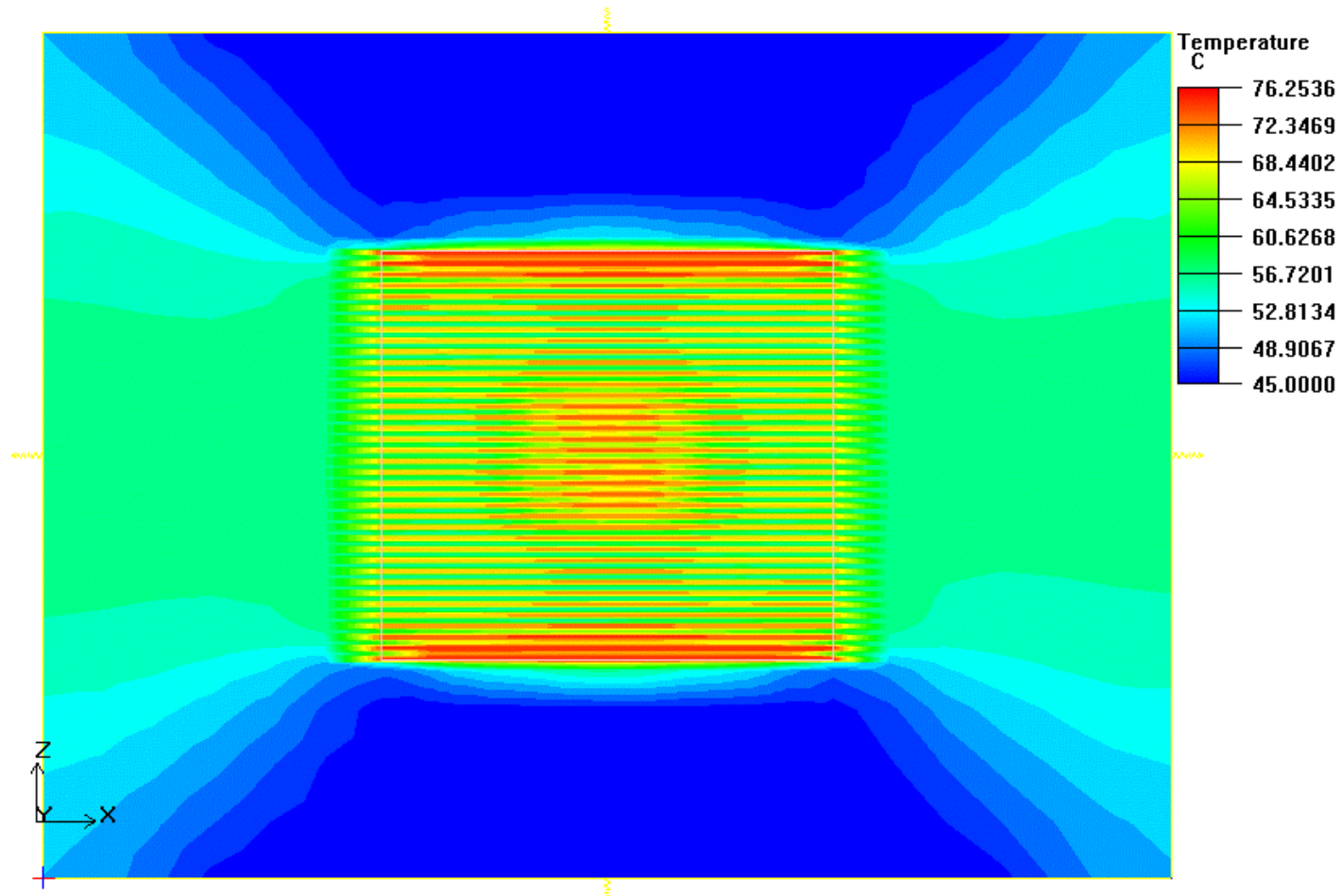
with APPLIED Thermal Technologies - INDIA

BRAZEDGAIN no X-cuts 6TH FIN TEMPERATURE



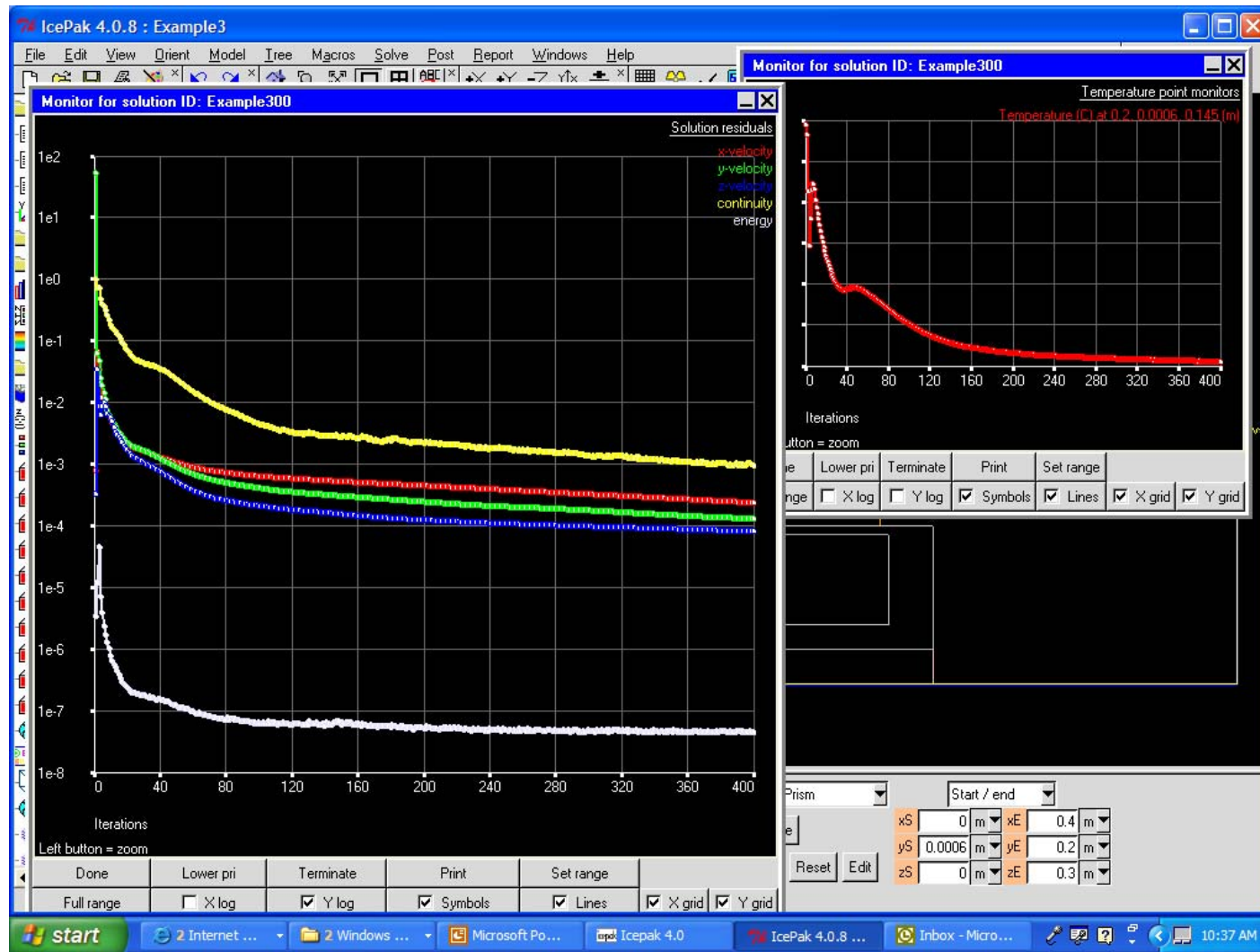
BRAZEDGAIN no X-cuts

TEMPERATURE AT 15 MM ABOVE BASE



BRAZEDGAIN no X-cuts

Convergence



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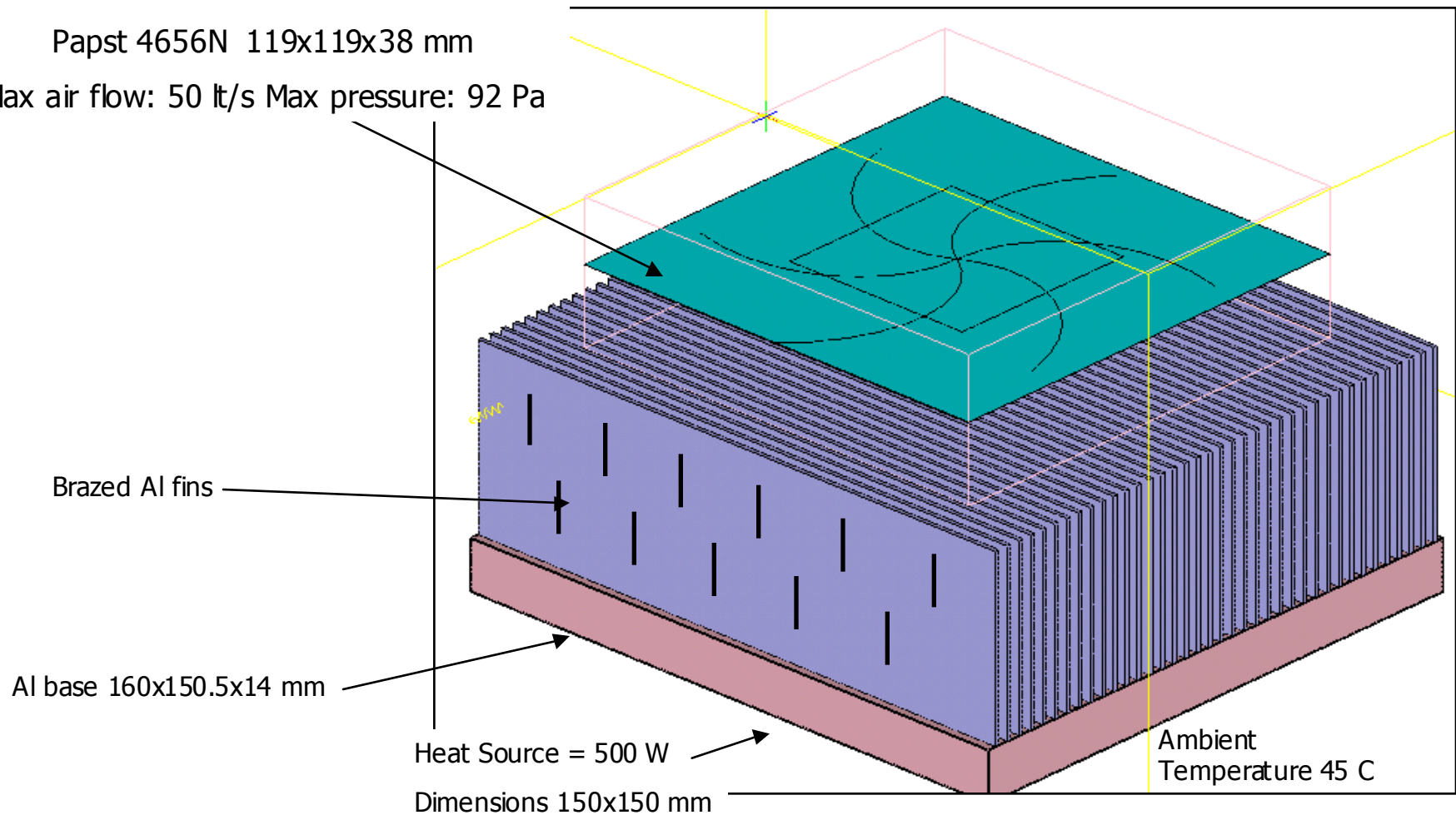
with APPLIED Thermal Technologies - INDIA

BRAZEDGAIN

Fan used for all simulations and tests:

Papst 4656N 119x119x38 mm

Max air flow: 50 lt/s Max pressure: 92 Pa

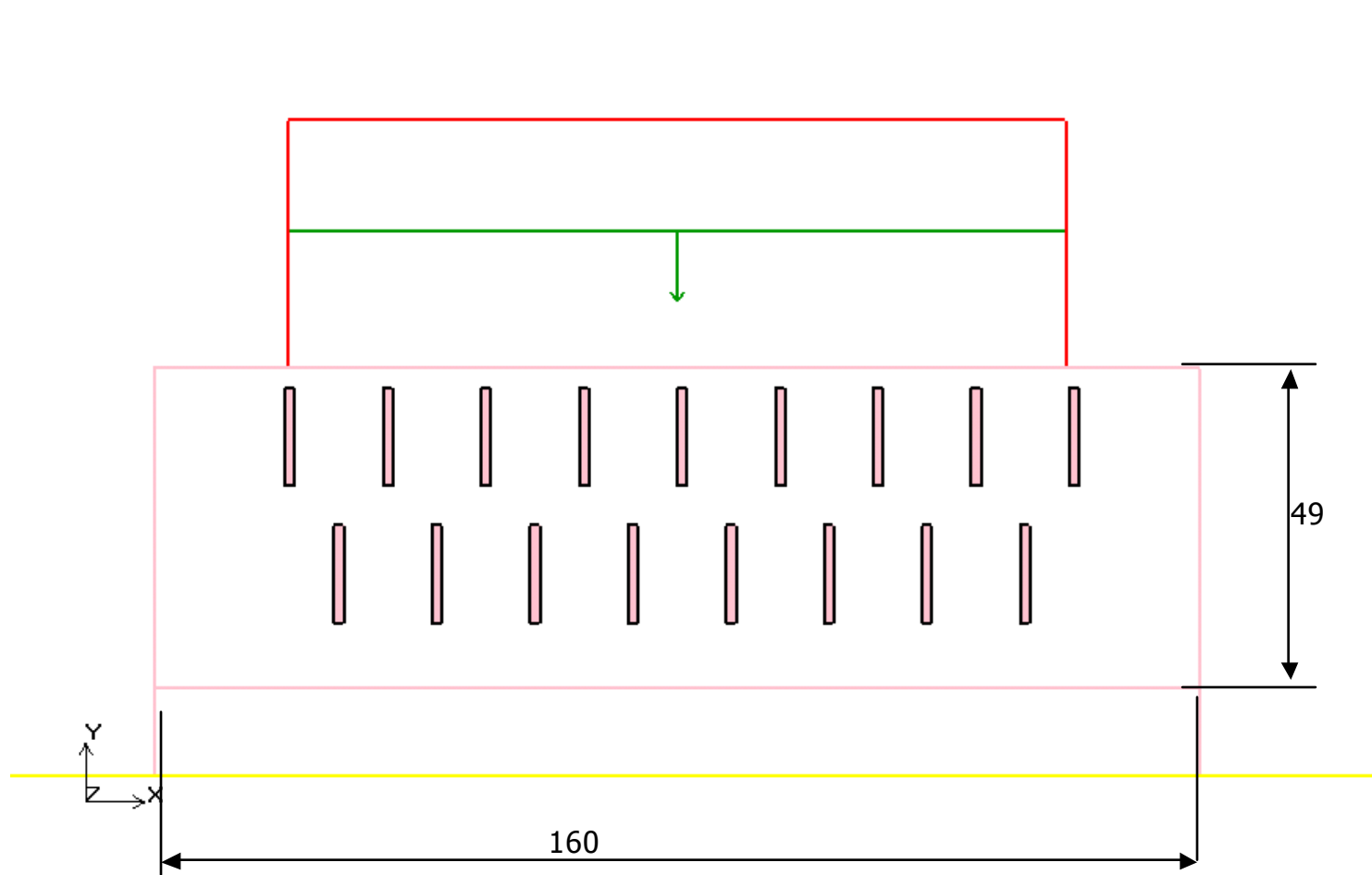


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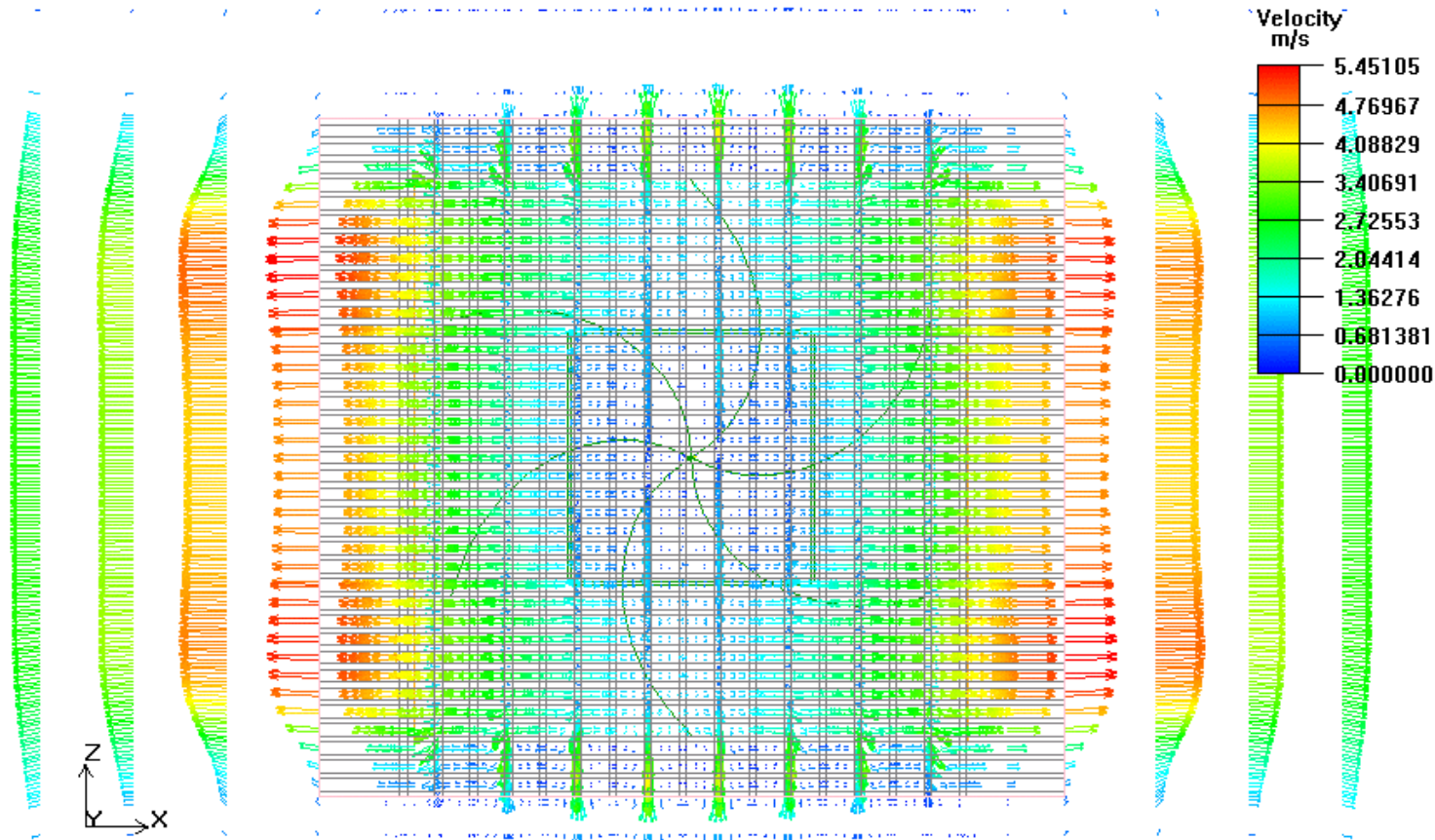
BRAZEDGAIN

HBG1516 with Standard X-cuts



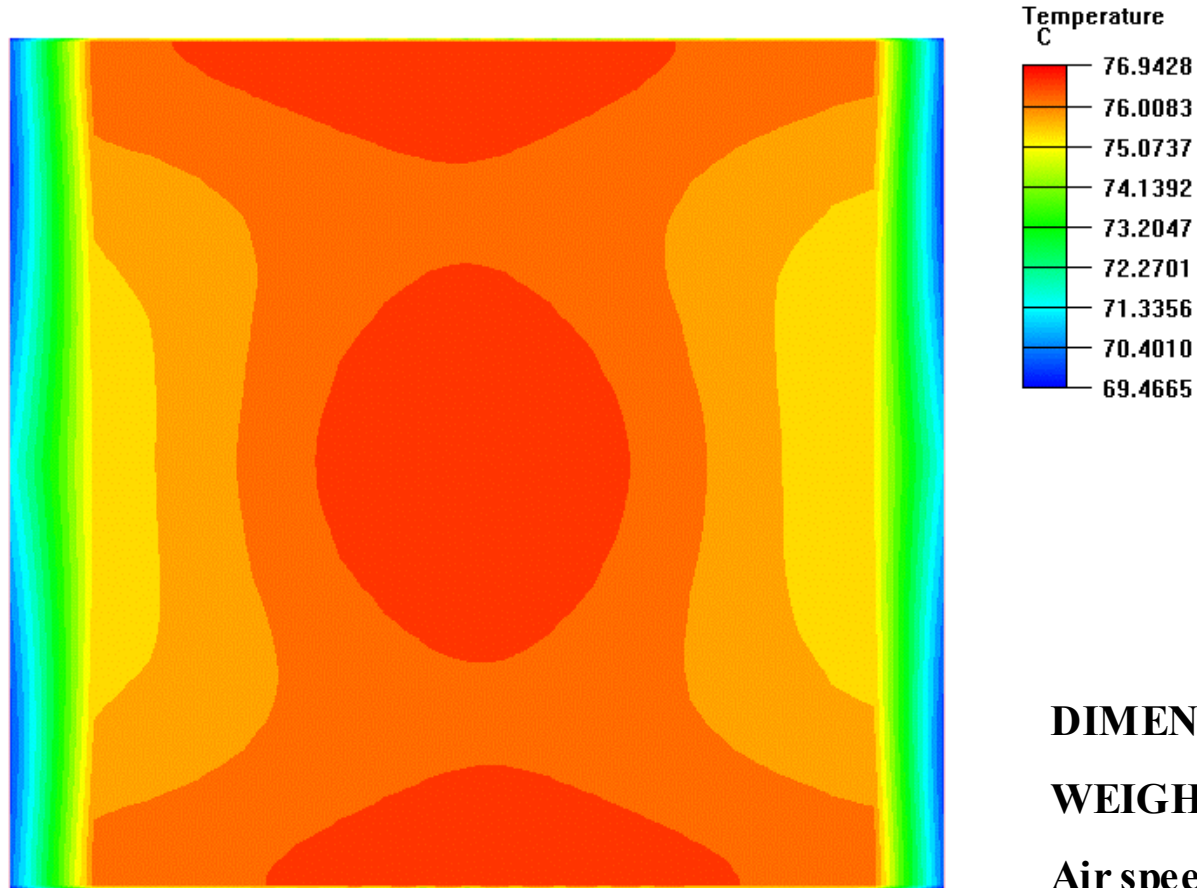
BRAZEDGAIN Standard

Velocity 15mm above base



BRAZEDGAIN Standard

Temperature of the heat sink base



DIMENSIONS: 150.5 x 160 x 63 mm

WEIGHT: 1.88 kg

Air speed: 3.9 m/s

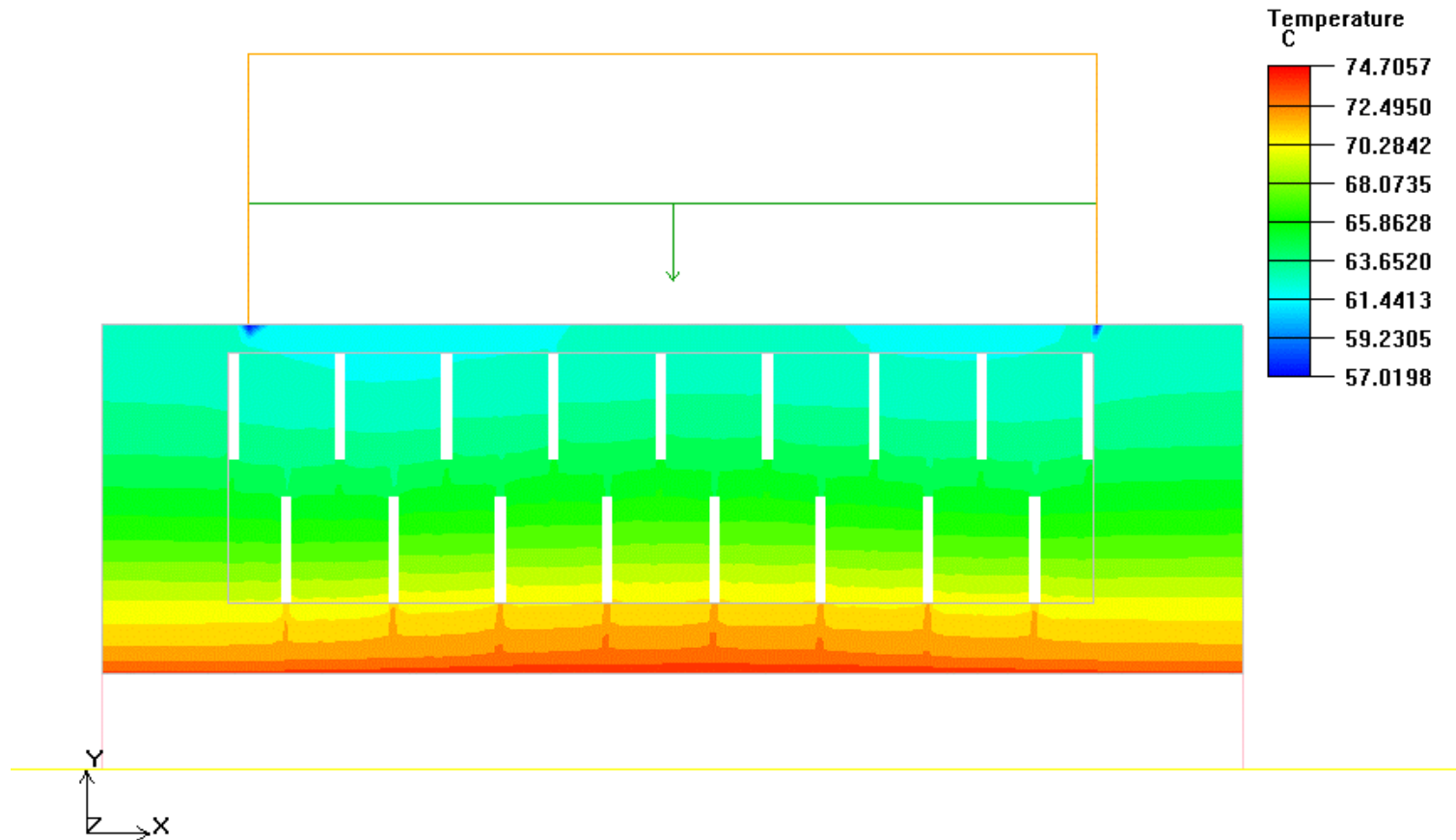
Rth: 0.064 °C/W



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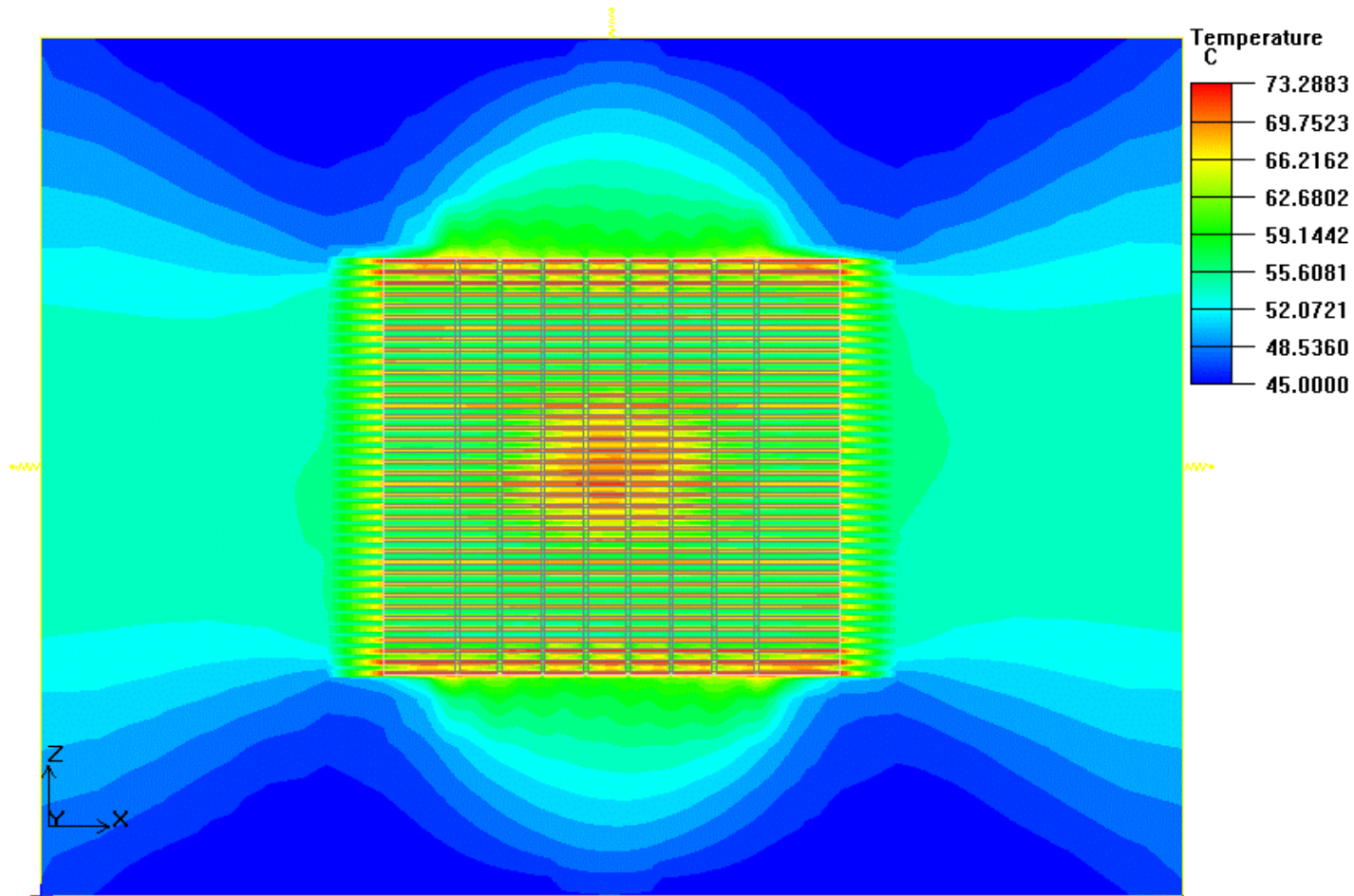
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BRAZEDGAIN Standard Temperature of 6th fin

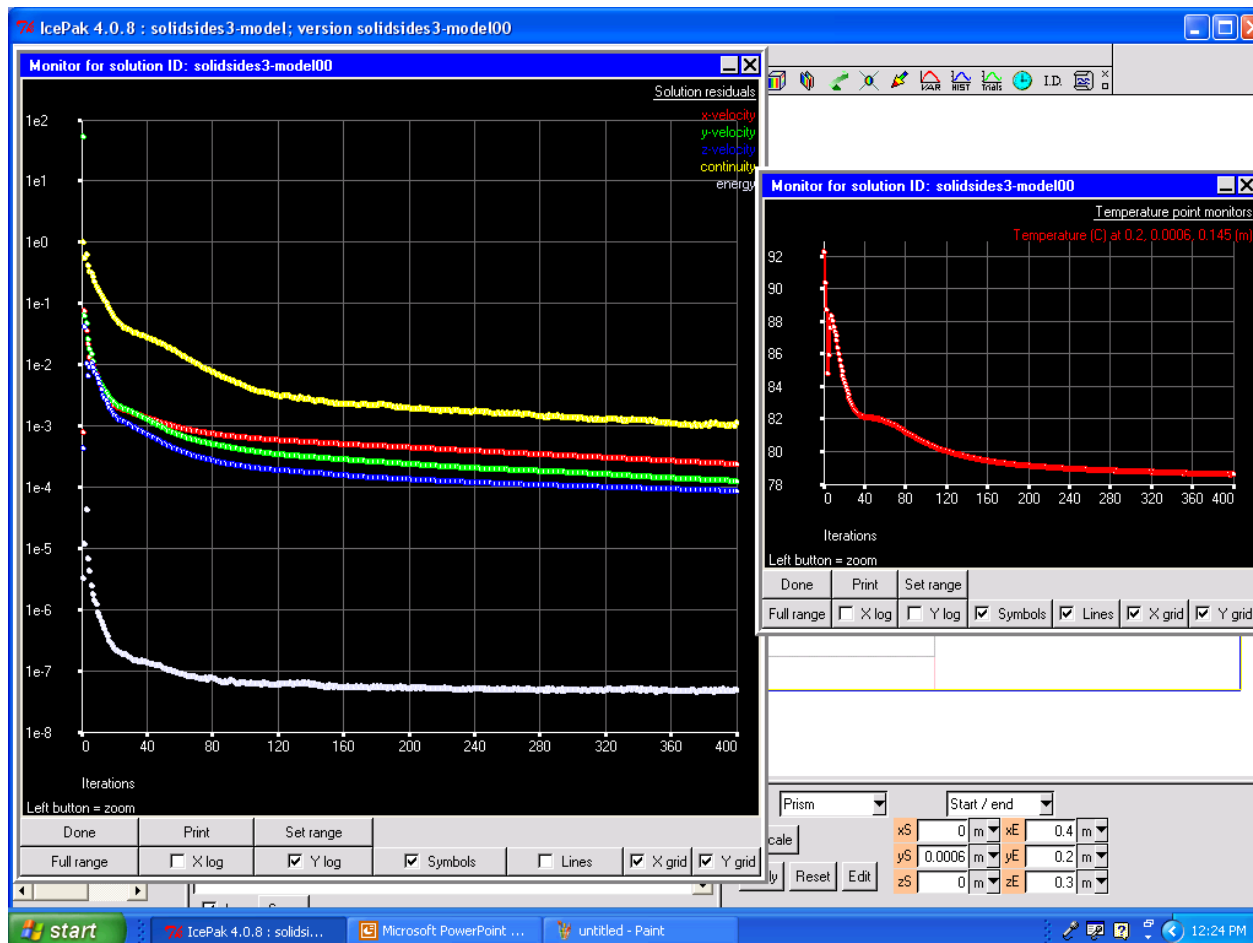


BRAZEDGAIN Standard

Temperature 15mm above base



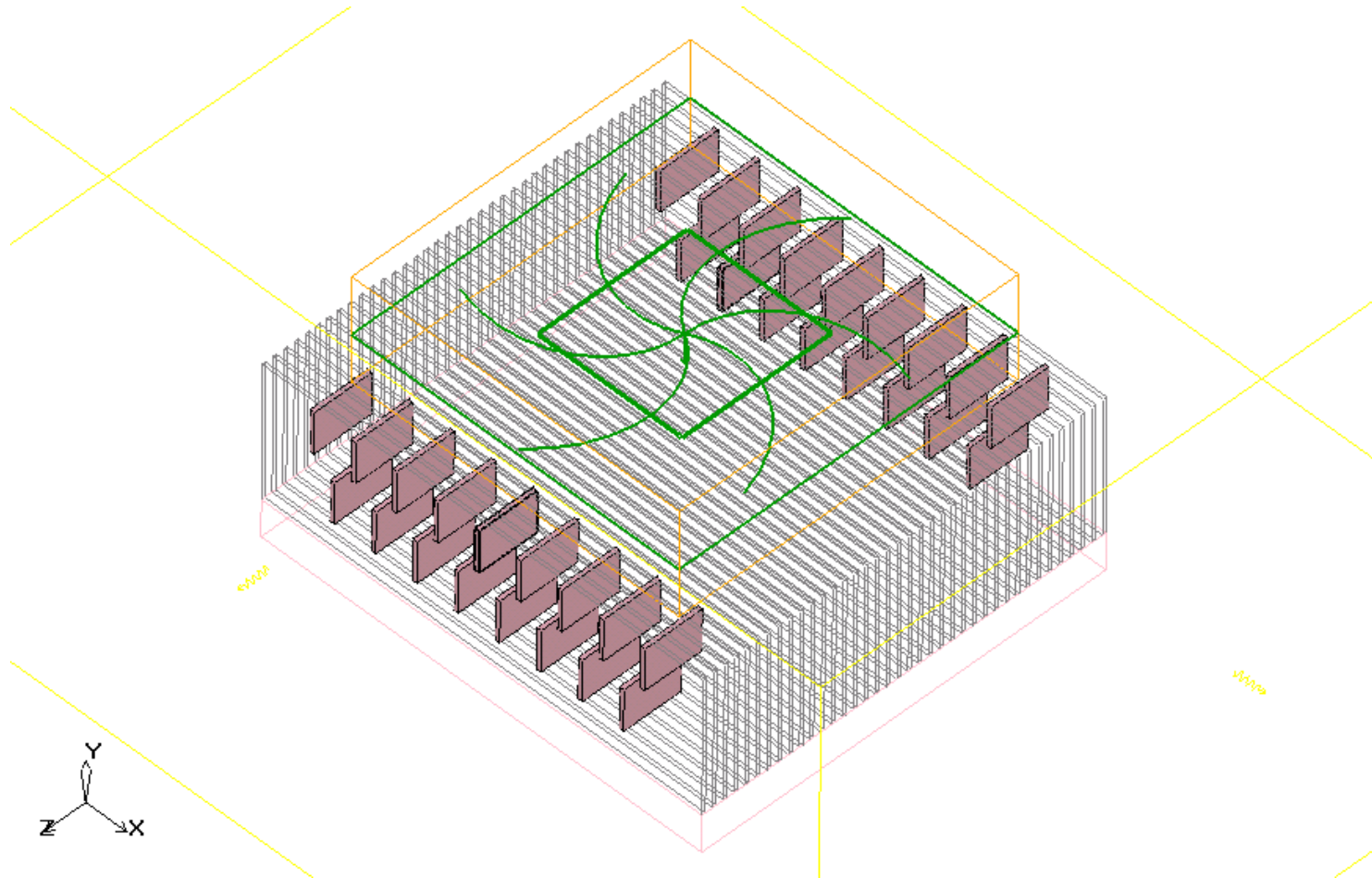
BRAZEDGAIN Standard Convergence Plot



NEW BRAZEDGAIN

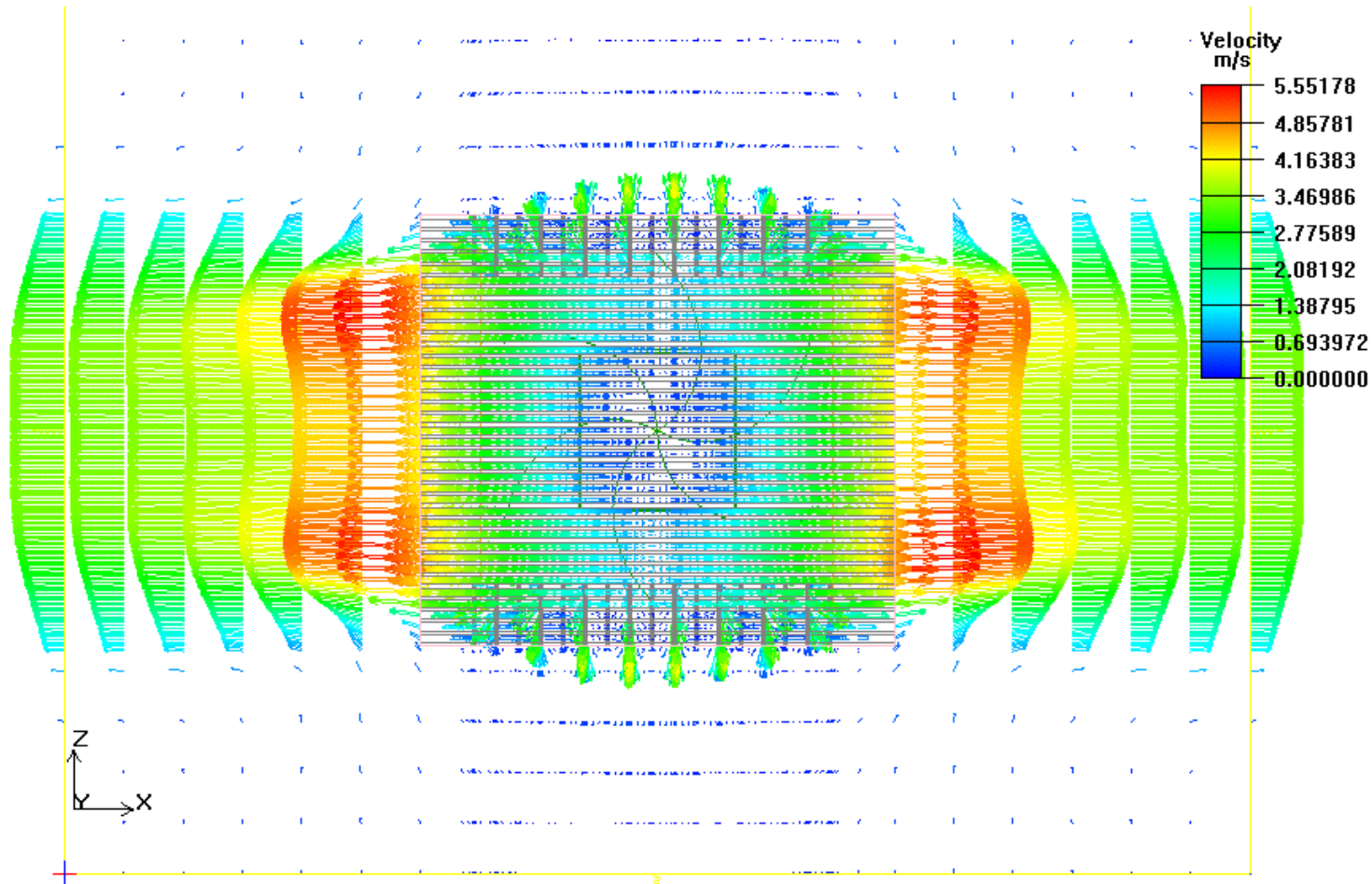
HBG1516 with X-cuts

Only on last 6 fins on both sides



NEW BRAZEDGAIN

Velocity 15mm above base

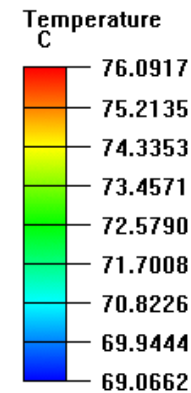
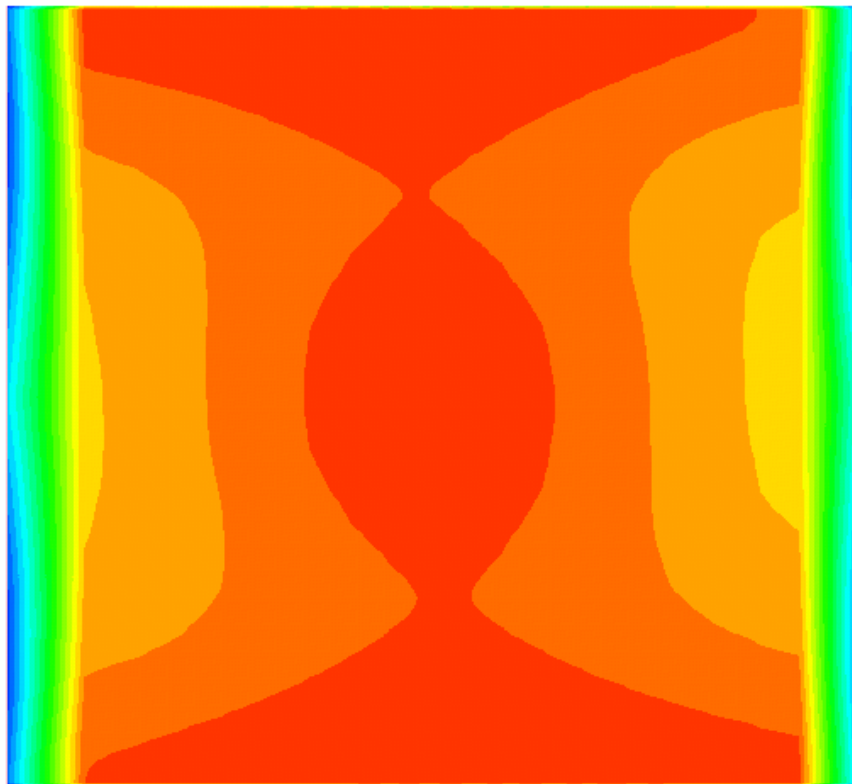


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NEW BRAZEDGAIN

Temperature of the heat sink base



DIMENSIONS: 150.5 x 160 x 63 mm

WEIGHT: 1.88 kg

Air speed: 3.5 m/s

Rth: 0.062 °C/W

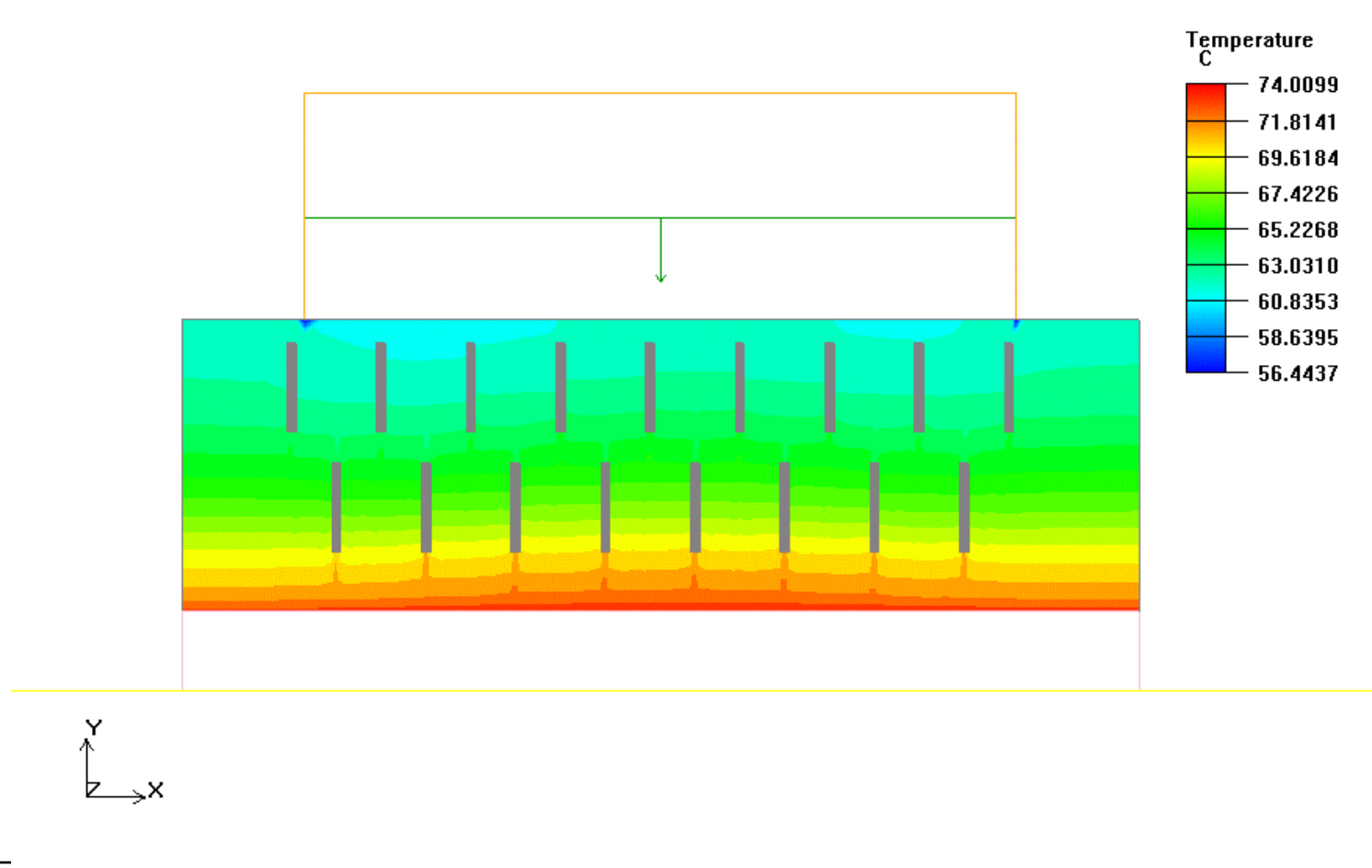


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NEW BRAZEDGAIN

Temperature of 6th fin

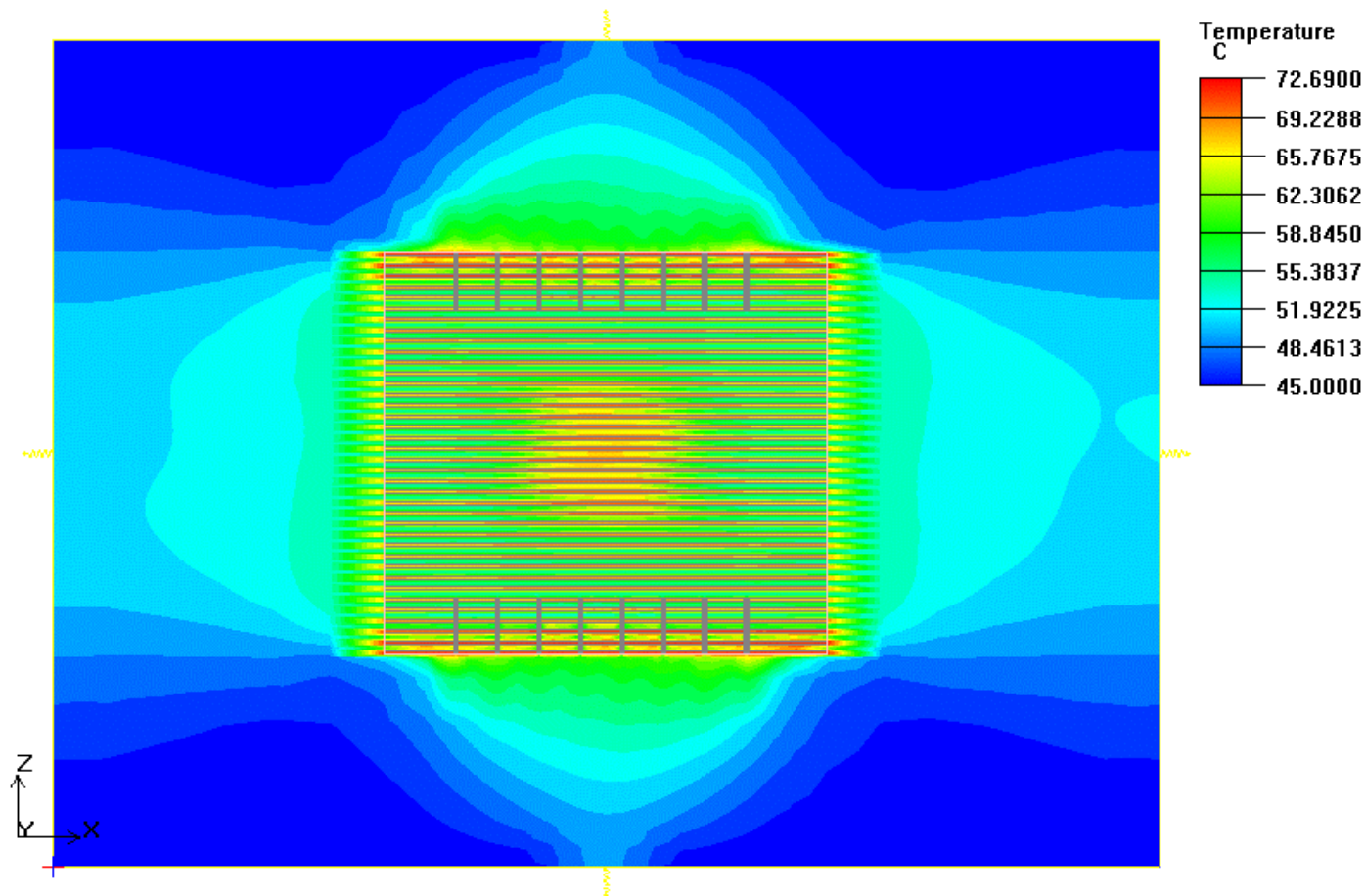


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NEW BRAZEDGAIN

Temperature 15mm above base





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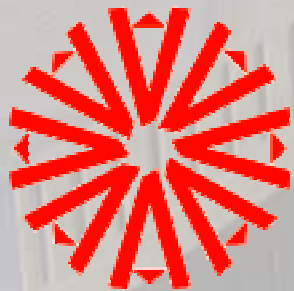
Summary Results

Ambient air: 45 °C
500 W dissipated
on 150² mm

All the heatsinks, except the first, are 150x160x63 mm. They have been tested with the same fan 119x38 mm	Max Base Temp °C	Max ΔT Sink – Air °C	Rth °C/kW	Efficiency %	Fan flow rate (lt/s)	Rth * Vol °C dm ³ / kW	Rth * Weight °C kg / kW
Pressed hollow fins 200x200x84	83.7	38.7	77.4	- 8,2	38,1	260	302
Pressed sheet fins	83.8	38.8	77.6	- 8.5	29.4	117	139
Bonded sheet fins	83.1	38.1	76.2	- 6.5	29.4	115	136
Brazed fins	80.74	35.74	71.5	0	29.4	108	128
BRAZEDGAIN no X-cuts	79.80	34.80	69.6	+ 2.7	30.7	105	124
BRAZEDGAIN Standard	76.94	31.94	63.9	+ 11.9	31.3	96	114
NEW BRAZEDGAIN	76.09	31.09	62.2	+ 15.0	31.5	94	111

Conclusion

- ❑ Aavid Thermalloy New Brazed Technology, together with the patented solution of fan impingement and X-cut fins, offers:
- ❑ A thermal performance from 15 to 25% better than traditional technologies
- ❑ Up to 300 % of improvement, in terms of thermal performances, dimensions and weight, for high power concentrations
- ❑ BrazedGain is the difference from an impossible to a realistic design



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ONE COOL IDEA AFTER ANOTHER