CARLO GAVAZZI

AMS 02
J-Crate Thermal Design.
NPSO-CGS meeting

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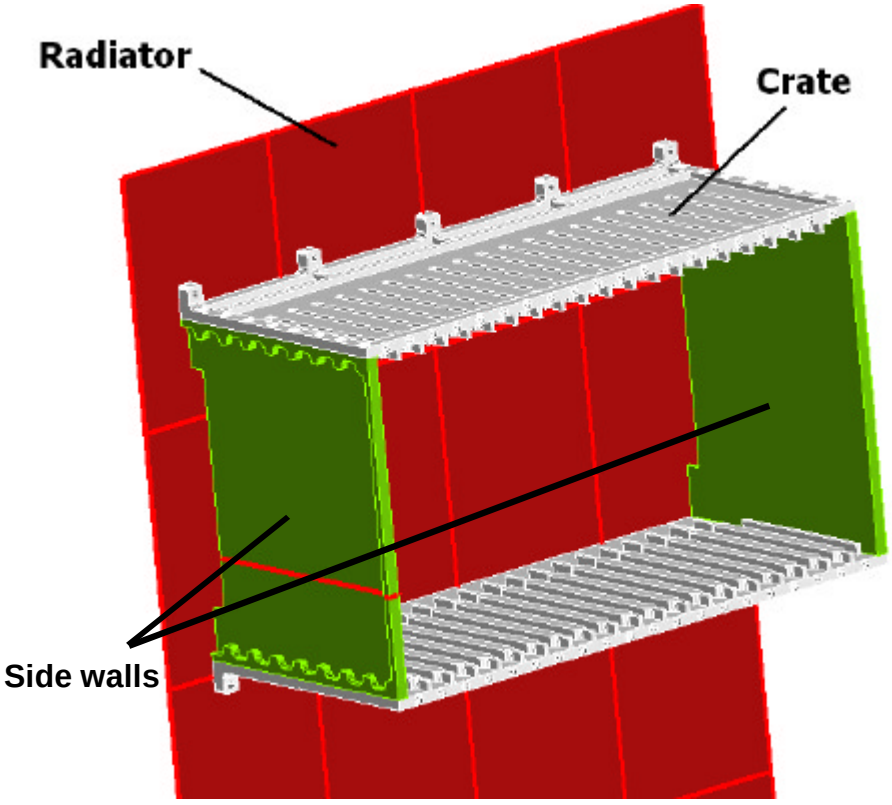
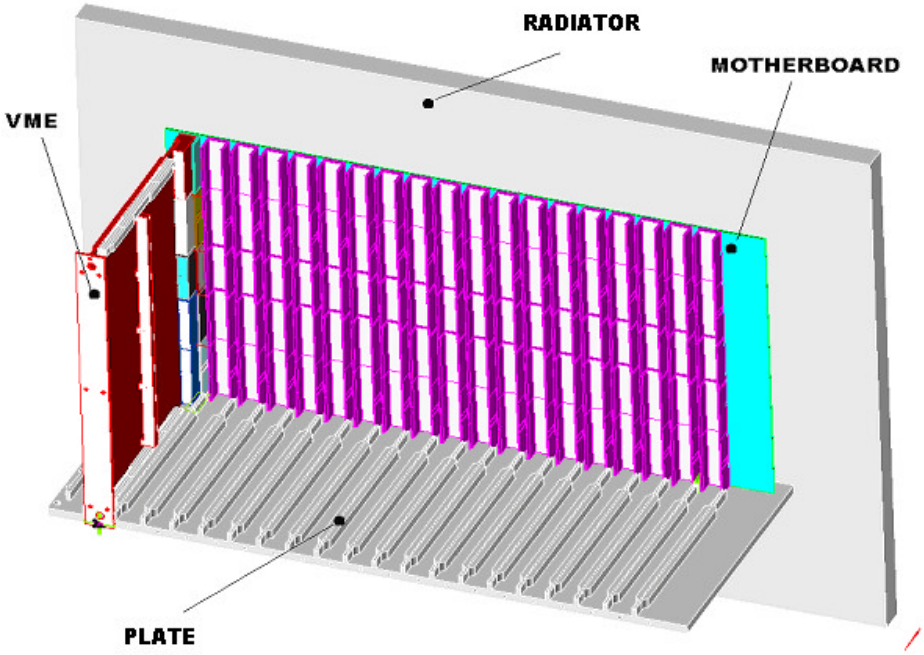
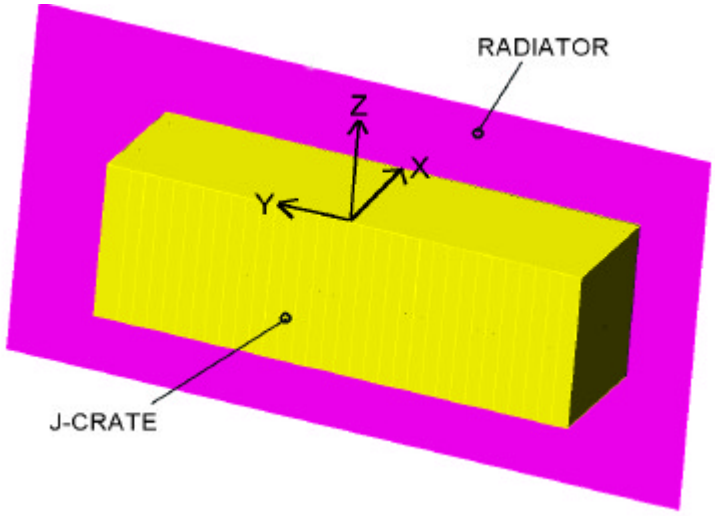
J crate



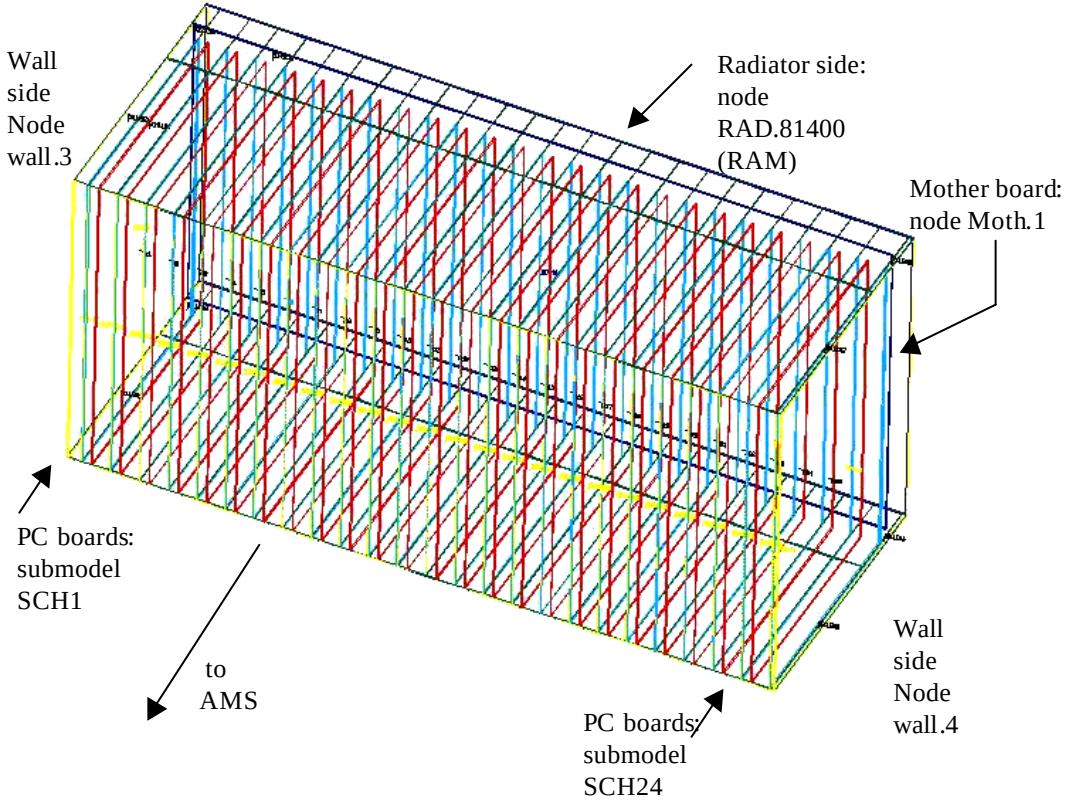


J crate coordinate system



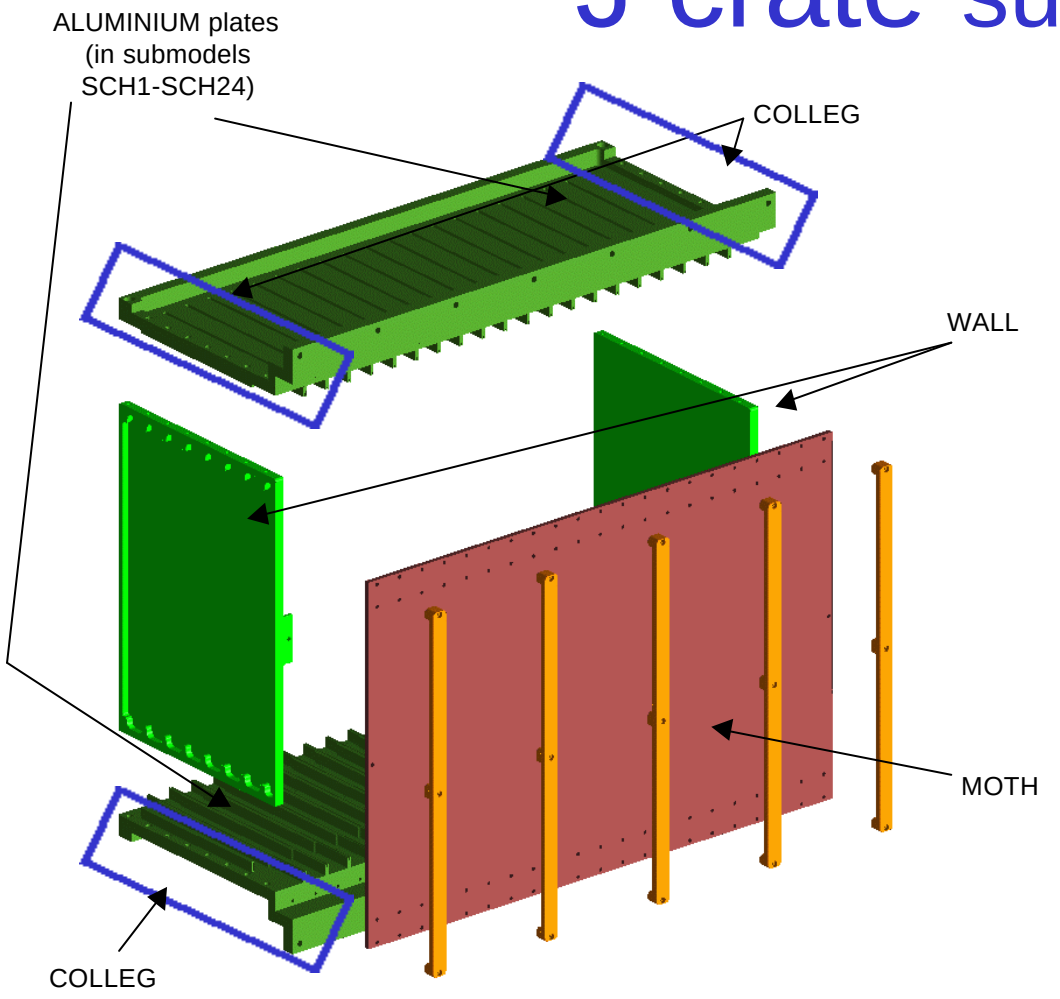
J crate local dimensions

X-SIZE= 192.8 mm
Y-SIZE= 500.96 mm
Z-SIZE= 232 mm



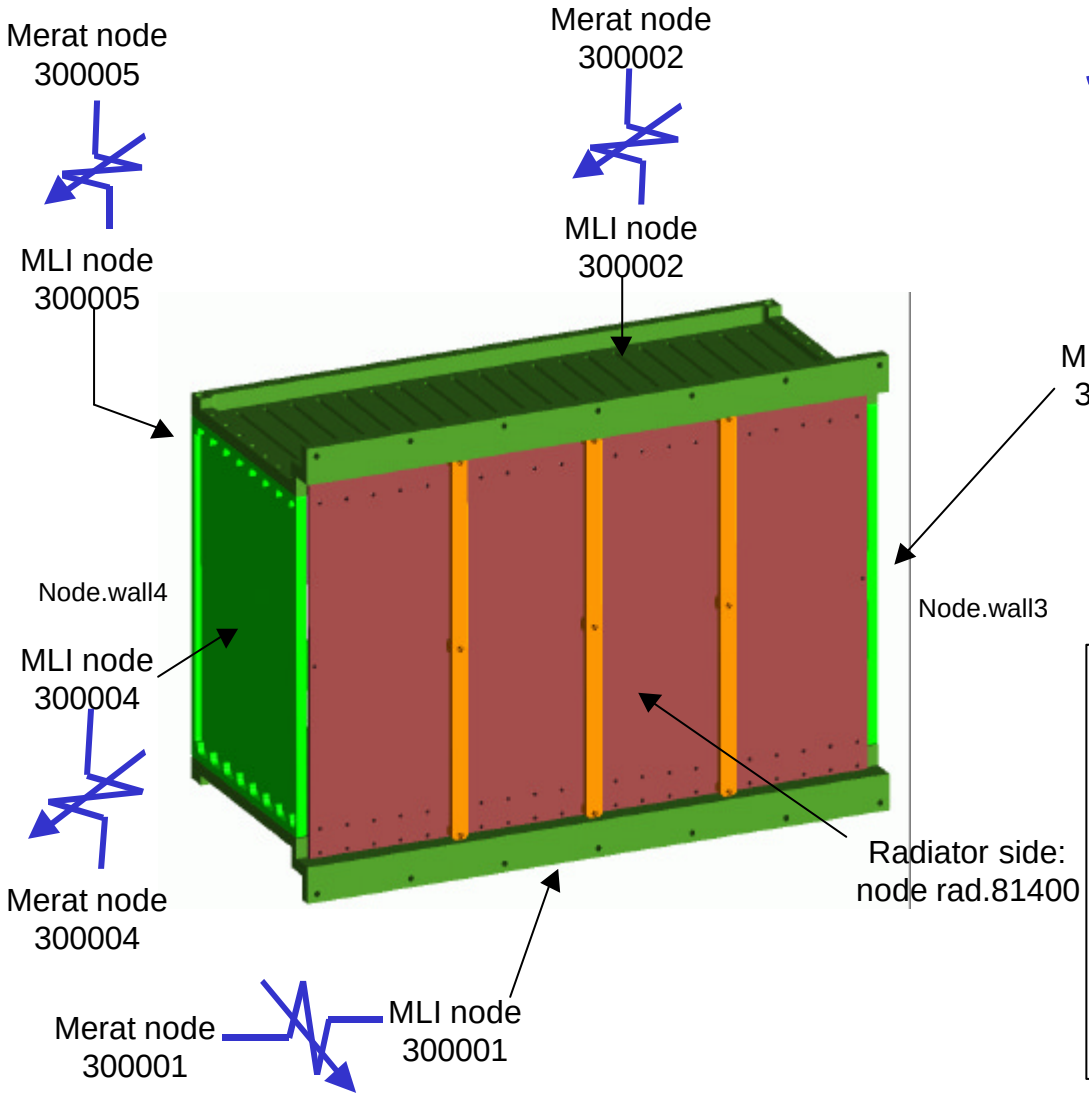
J crate RADCAD thermal model

J crate submodels



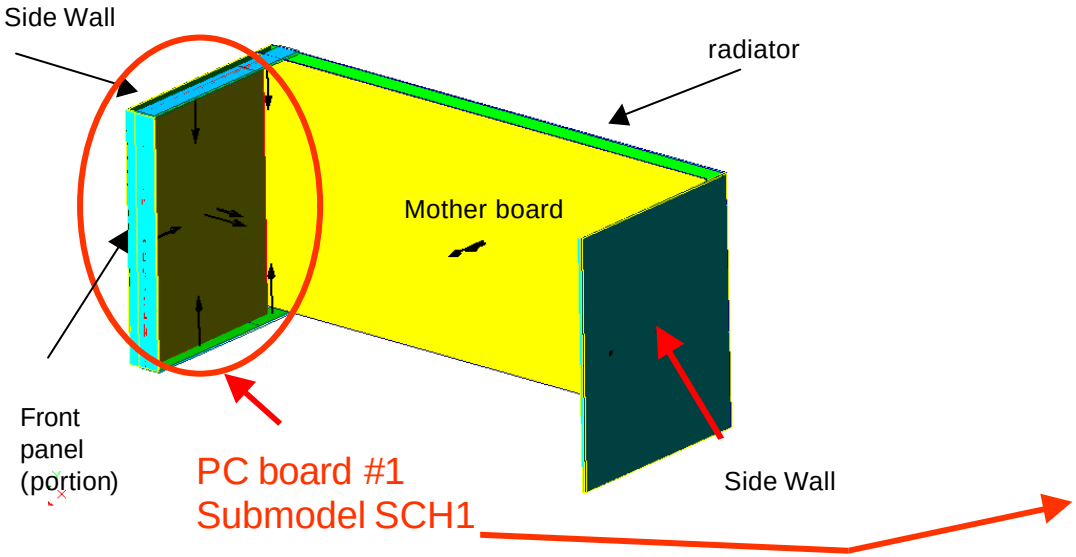
SUBMODEL NAME	DESCRIPTION	NODES NUMBER
SCH1-SCH24	represents a PC board and part of Aluminium	20 (for each PC board)
WALL	wall sides	4
MOTH	motherboard	1
P	magnetic shield	25
MLI	MLI	5
RAD	radiator	1
COLLEG	links between wall nodes and 1st and 24th PC	8
CASE19	merat nodes	5
OUTMOD	to format output data	0
Total node number		**529**

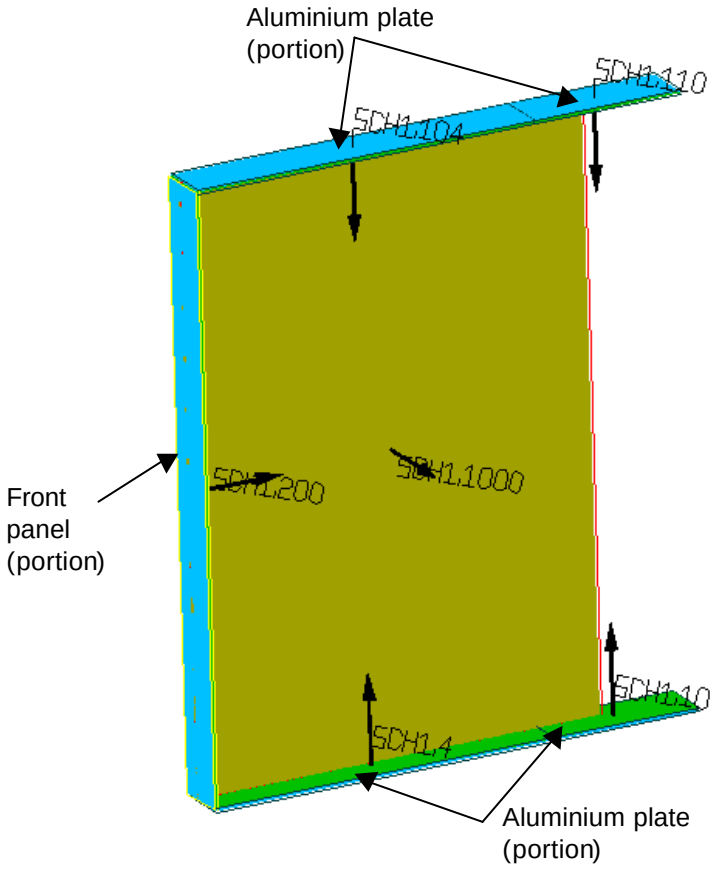
J crate I/F DATA



- thermal analysis has been performed using the method of interface data (MERAT data)
- environmental data, obtained from simulation of AMS general thermal model, have been applied to the J-crate detailed model
- analysis has been performed for orbital case beta=75°, yaw= -15°, pitch=-20°, roll=-15°

J crate boards level





Submodel SCH1 (PC board #1)

Node SCH1.1000: centre of card

Node SCH1.104: Aluminium plate (portion)

Node SCH1.110: Aluminium plate (portion)

Node SCH1.4: Aluminium plate (portion)

Node SCH1.10: Aluminium plate (portion)

J crate nodal breakdown (boards level)

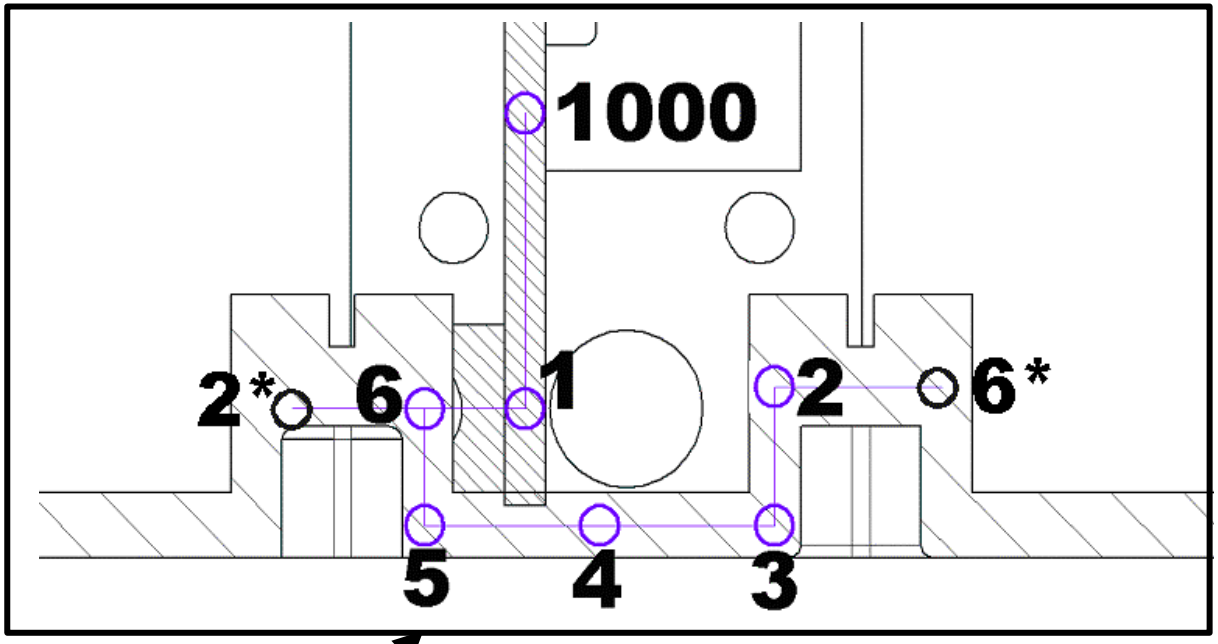
PC board #1 (lower part)

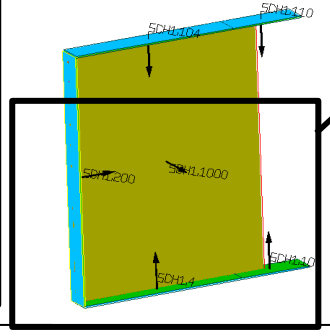
NODES:

- **1000**: centre of card
- **1**: lower edge of card.
- **6; 5; 4; 3; 2; 8; 10; 9**: lower aluminium plate grooves
- **2; 6**: card guides (interface to adjoining submodels)

CONDUCTORS:

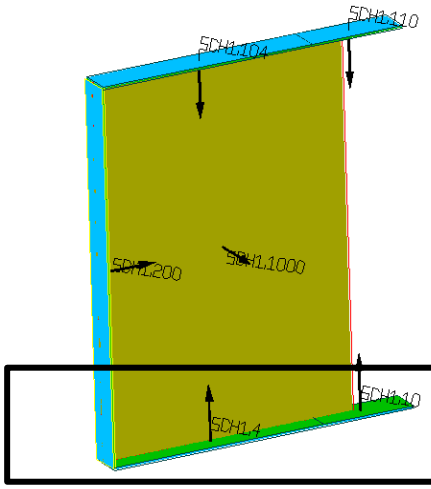
nodes	conductors
2-6	Aluminium plate
2-3	Aluminium plate
4-3	Aluminium plate
5-4	Aluminium plate
5-6	Aluminium plate
1-6	card retainer contact conductance
	board equivalent conductance

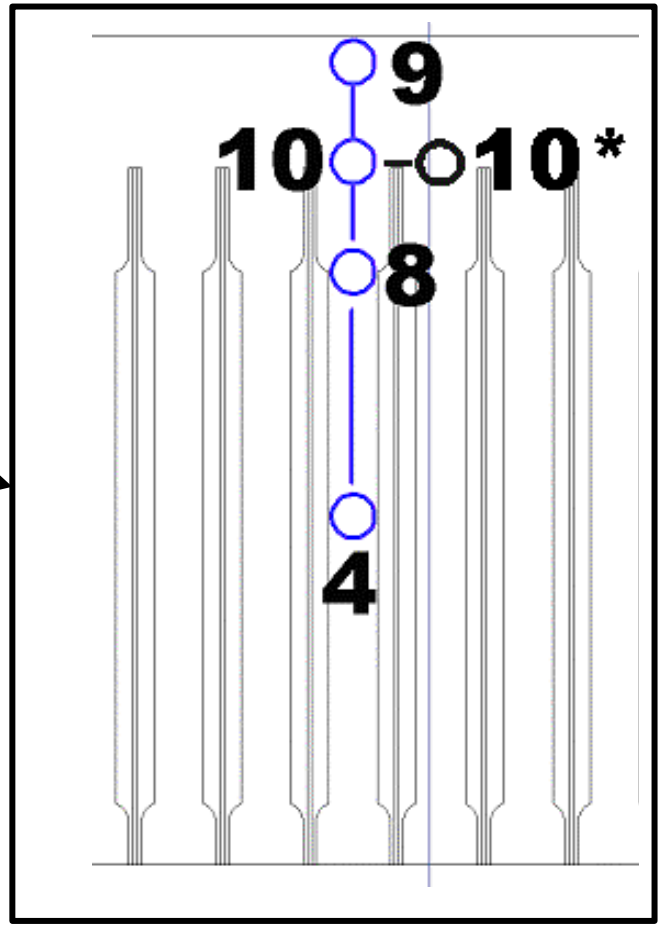




UPPER PART:
- 101: upper edge of card
- 106; 105; 104; 103; 102; 108; 110; 109: upper aluminium plate grooves
- 102; 106; card guides

J crate nodal breakdown (boards level)



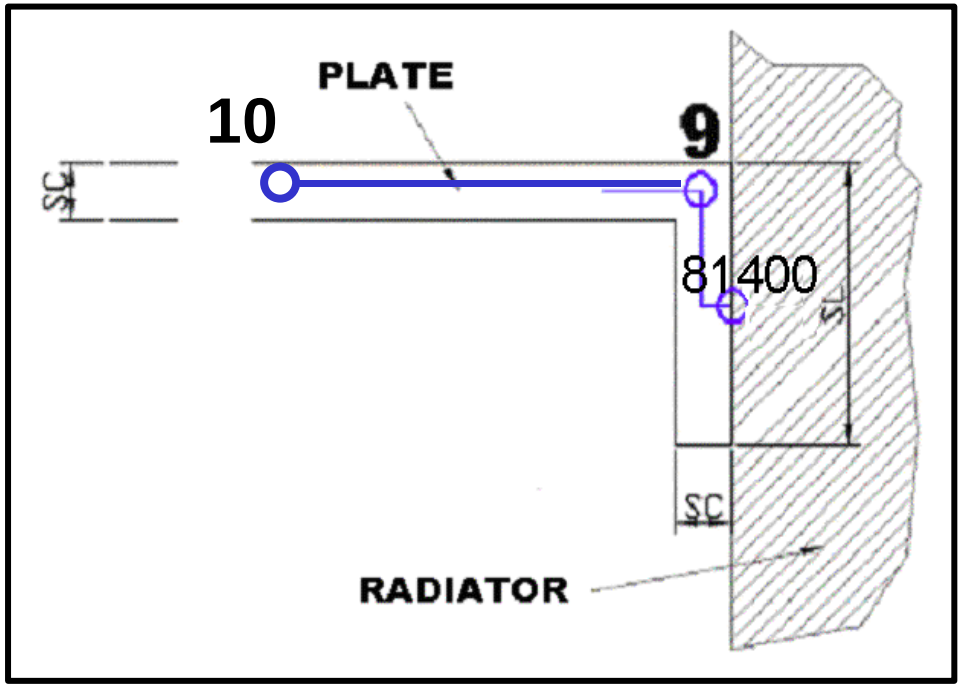


lower aluminium plate

- **4**: centre of groove
- **8**: connection between grooves
- **9**: L-shaped foot
- **10**: connection between grooves

All conductances determined by geometry

J crate nodal breakdown (aluminium plate)



aluminium plate

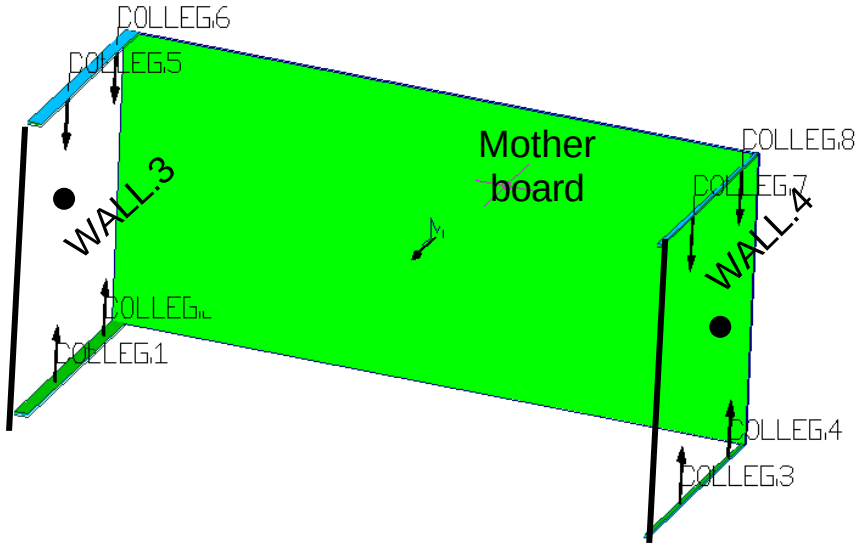
(thermal path from node in the middle of the board up to radiator)

- **9**: L-shaped foot
- **81400**: radiator node

conductance 9-81400: contact conductance improved by means of interface filler (CHO-THERM)

J crate nodal breakdown (submodel colleg)

- Upper and lower plates are connected also by a thermal path passing trough lateral walls.
- COLLEG is the submodel linking the first (last) board module and lateral walls.

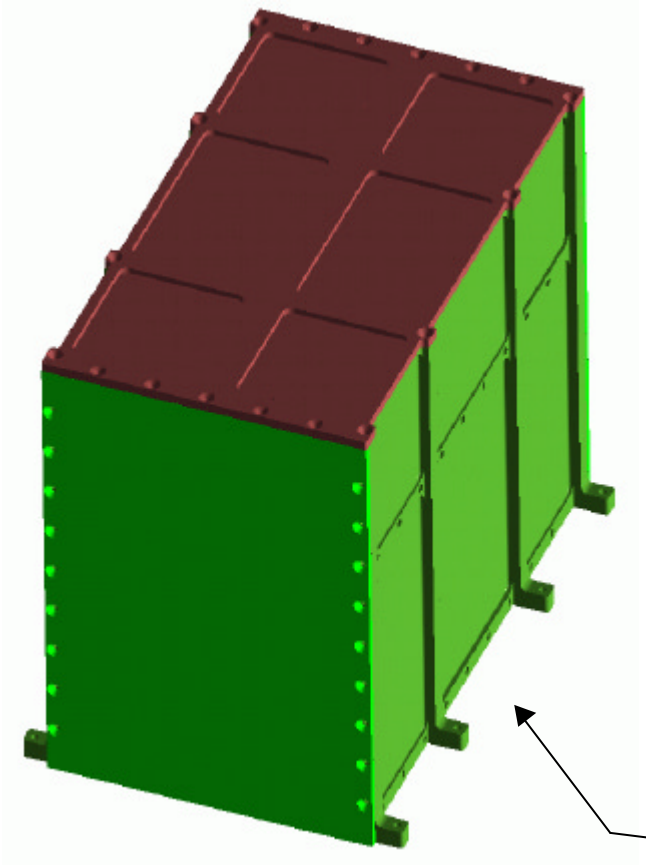


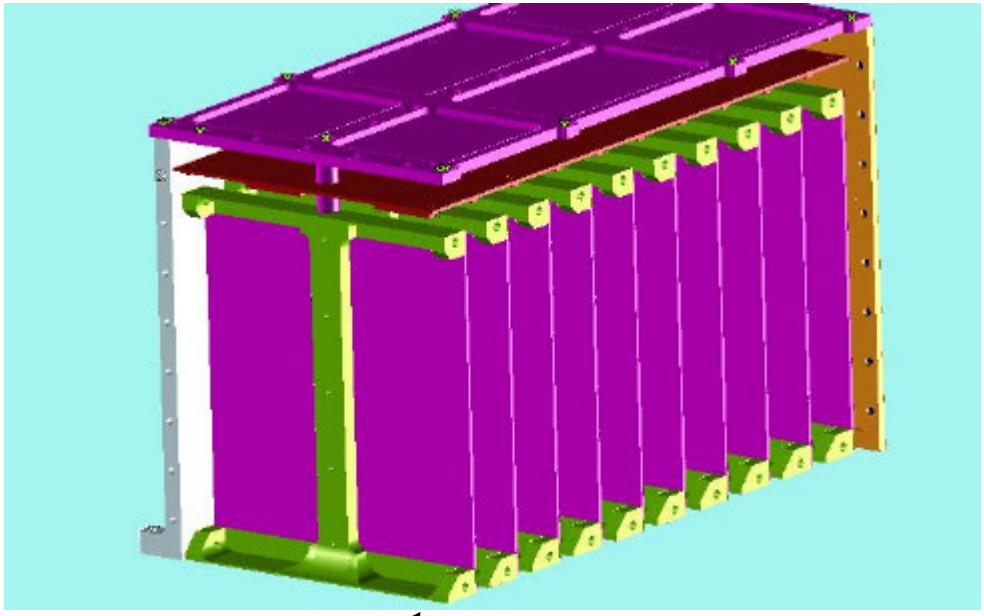
Submodel COLLEG

• nodes **COLLEG.1-8**: edge of aluminium plates

links to nodes :
WALL.3,
SCH1.10,SCH1.6,
SCH1.110, SCH1.106;
WALL.4,
SCH24.10,SCH24.6,
SCH24.110, SCH24.106;

JPD crate





Radiator side

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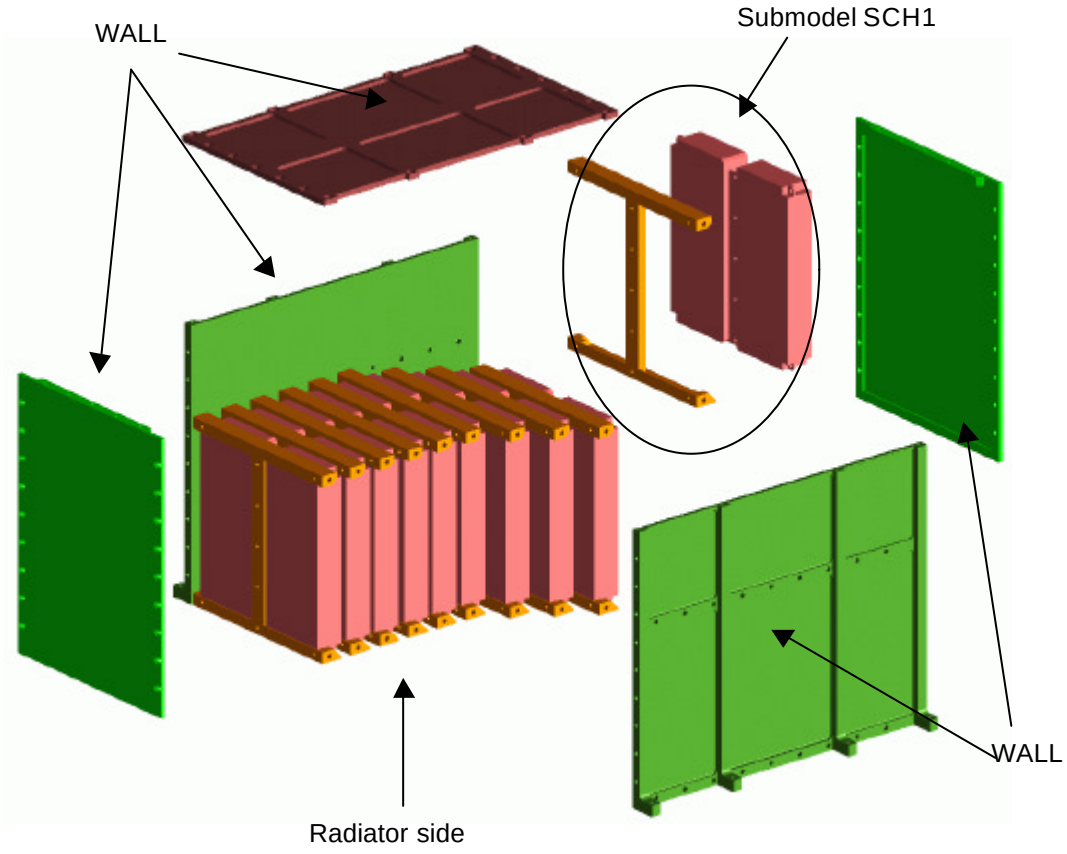
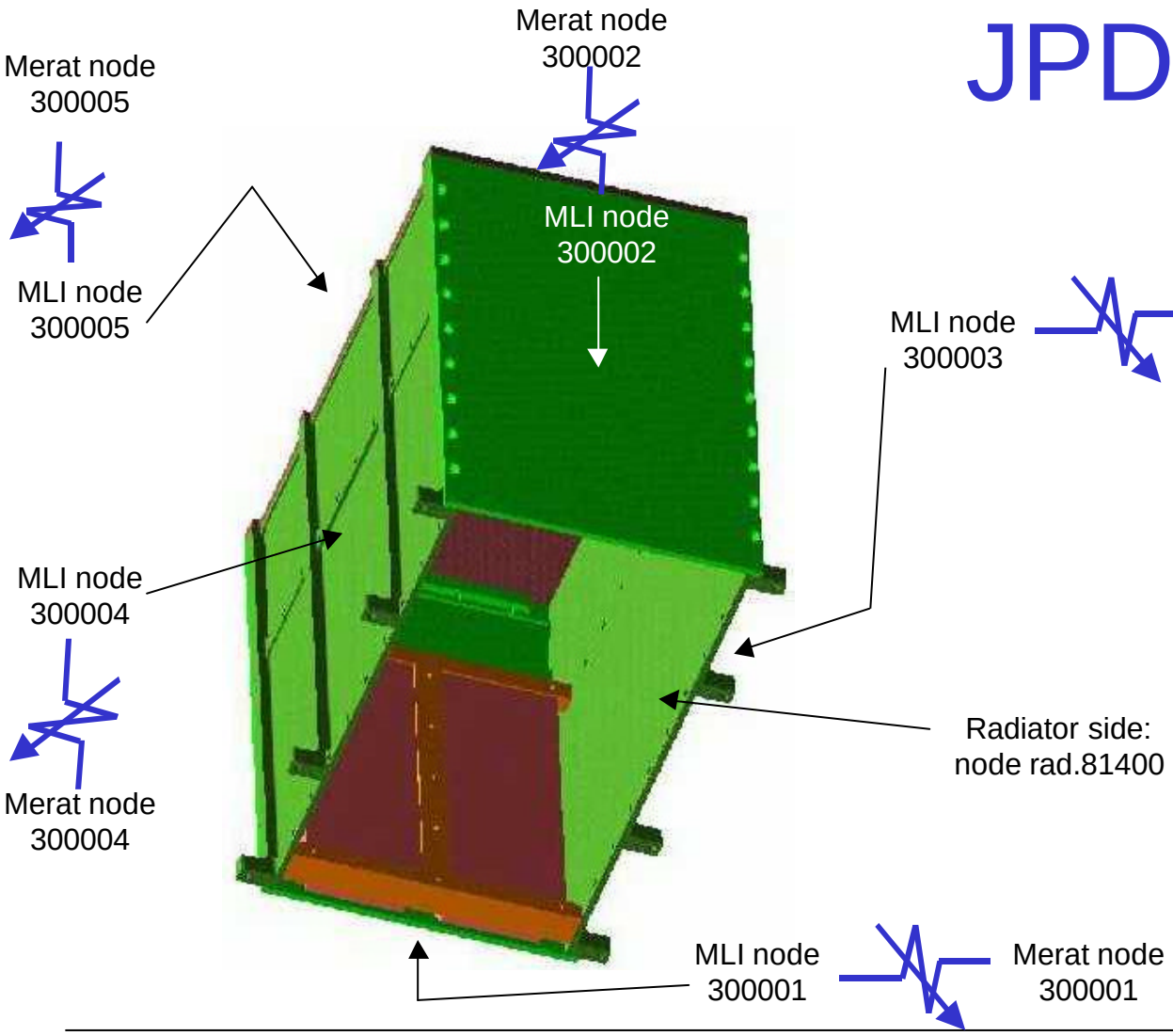
JPD crate submodels



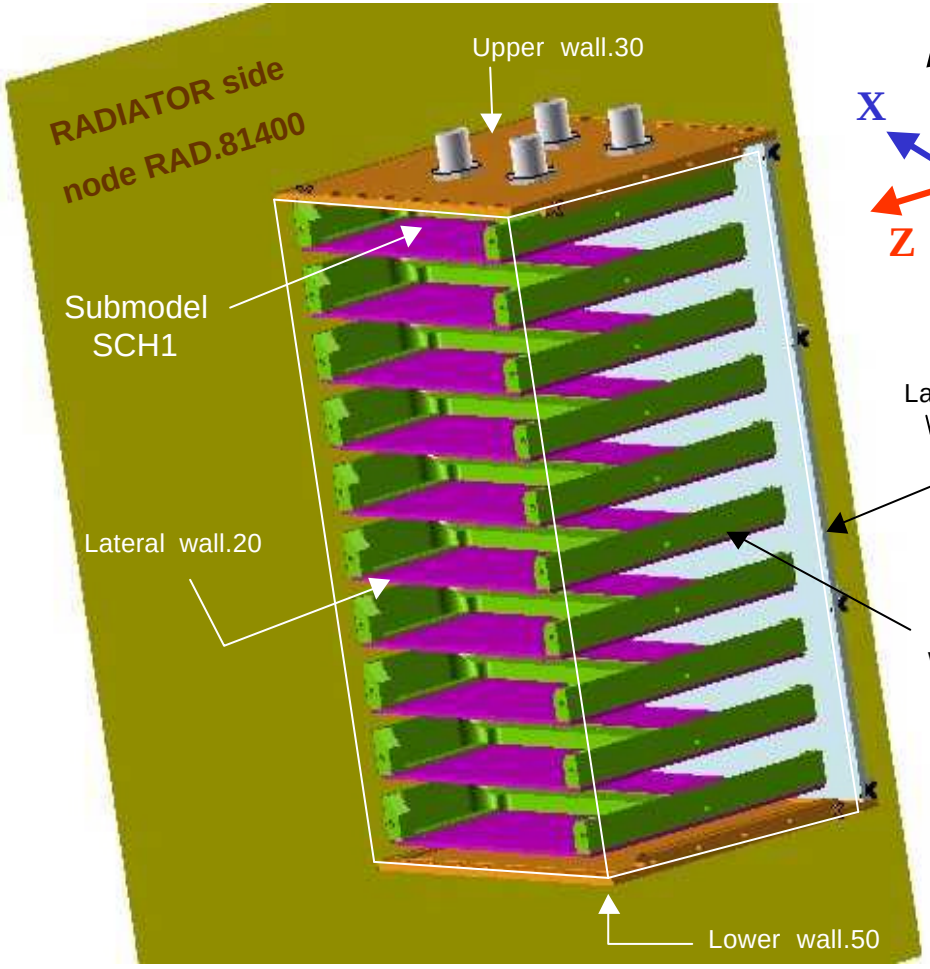
	DESCRIPTION	NODES NUMBER
SCH1-SCH12		12 (for each PC board)
WALL	wall sides	5
MLI	MLI	5
RAD	radiator	1
CASE19	merat nodes	5
OUTMOD	to format output data	0
Total node number		**160**

JPD crate I/F DATA



- thermal analysis has been performed using the method of interface data (MERAT data)
- environmental data, obtained from simulation of AMS general thermal model, have been applied to the JPD-crate detailed model
- analysis has been performed for orbital case beta=75°, yaw= -15°, pitch=-20°, roll=-15°

JPD crate nodal breakdown (submodel WALL and RAD)



Submodel WALL

NODES:

- **20,40:** lateral wall
- **30:** upper wall
- **50:** lower wall
- **10:** front wall

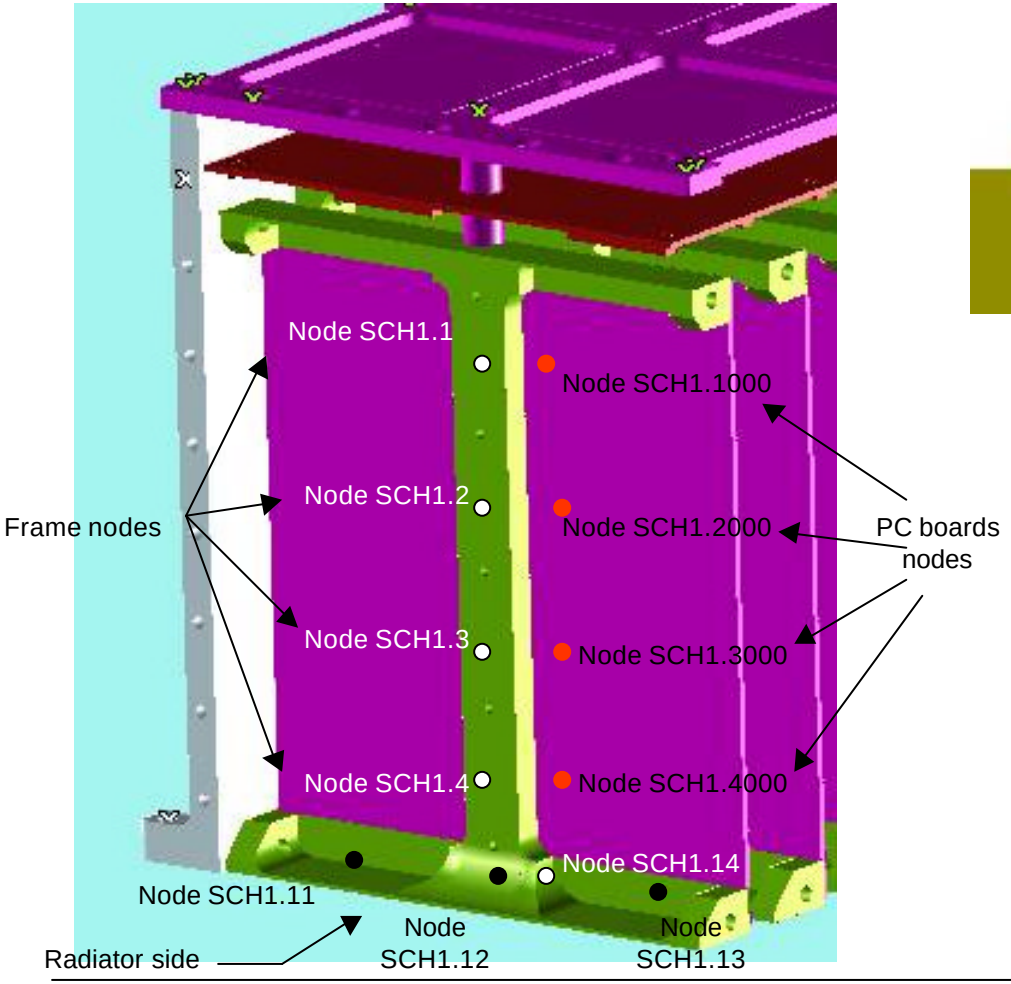
CONDUCTORS:

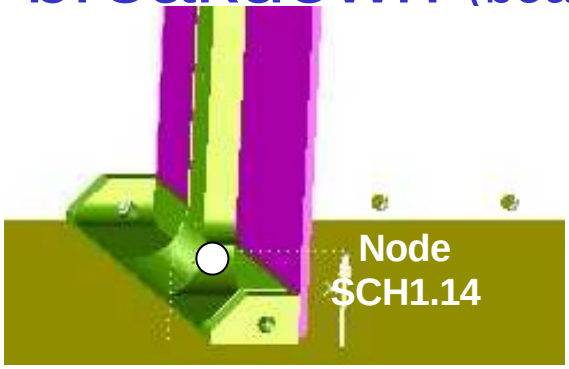
All conductances determined by geometry and contact conductances

JPD crate dimensions

X-SIZE=260 mm
Y-SIZE= 298 mm
Z-SIZE=176 mm

JPD crate nodal breakdown (board level)





Submodel SCH1: PC board #1

NODES:

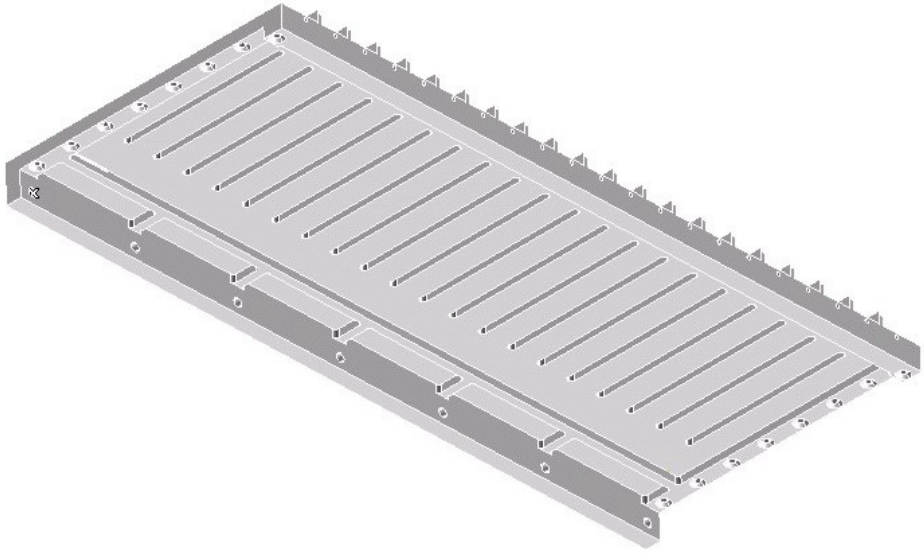
- **1000-4000:** PC boards
- **1-4:** frame nodes
- **11-14:** base frame nodes

CONDUCTORS:

NODES	CONDUCTORS
Board nodes(1000÷4000) to frame nodes (1÷4)	Contact conductance
Link through frame (node 1-2, 2-3, 3-4)	Aluminium frame
Link through frame (node 4-14; node 14-12; ;node 12-11; 12-13)	Aluminium frame
Frame to radiator(node 11-rad, 12-rad, 13-rad)	Contact conductance

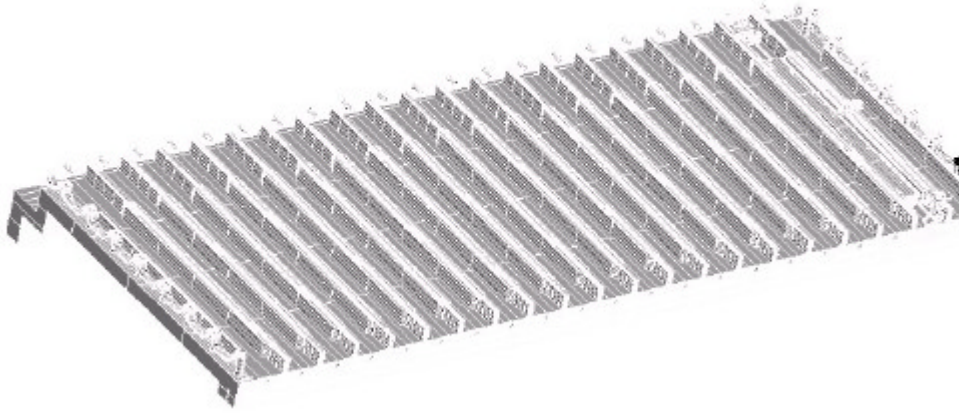
J crate plate old design

Top view

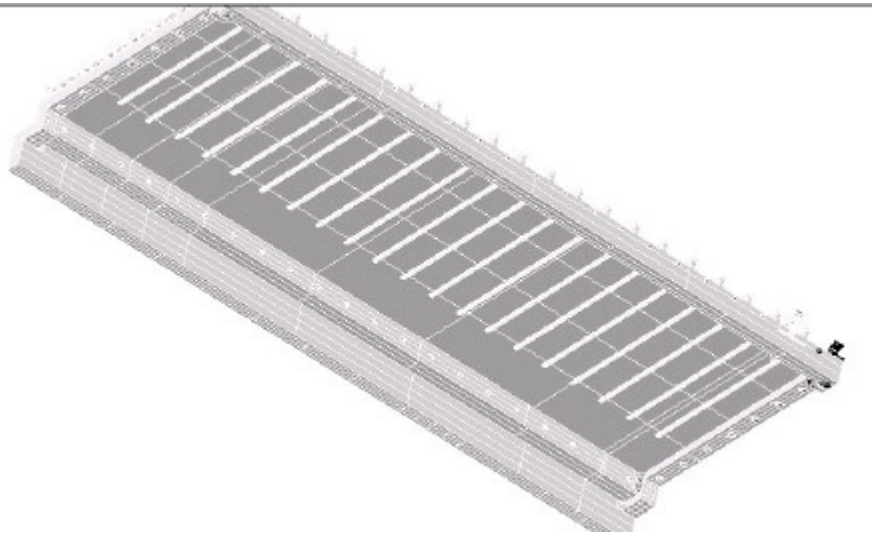


Bottom view

J crate plate new design



Top view



Bottom view