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Computational Modeling of External Impact on Electronic Devices

Alexander Shalumov

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Dr. Alexander Shalumov is the General Director of the research institute “ASONIKA”. Dr. Shalumov has received several prestigious national awards in science technology and is recognized as a leader in the field of information technology and automated systems in Russia. He has more than 300 publications, including 10 books. During the last 10 years he was the supervisor of 20 PhD works.

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What is ASONIKA?

ASONIKA is an automated software system for simulation of electronic devices for harmonic and random vibrations, single and multiple impacts, linear acceleration and acoustic noise, and stationary and non-stationary thermal effects. The program calculates the number of cycles to failure under mechanical loads, as well as, under cyclic thermal effects.

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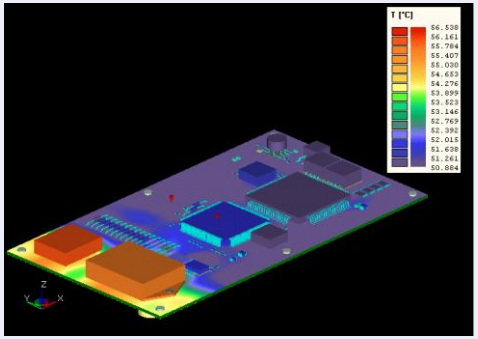

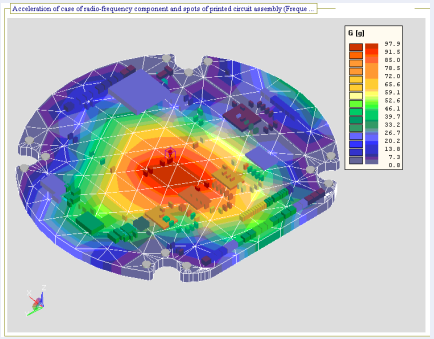

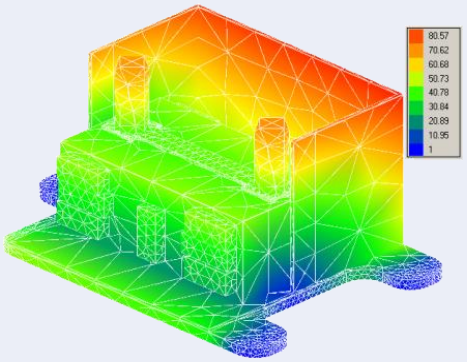

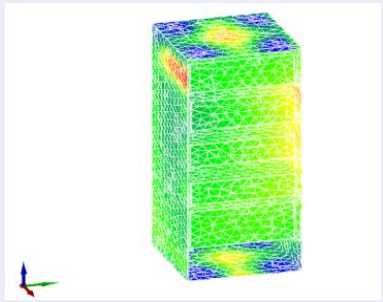

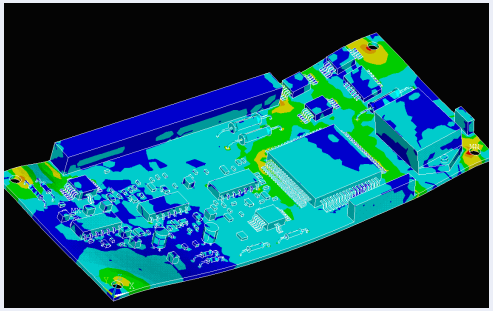

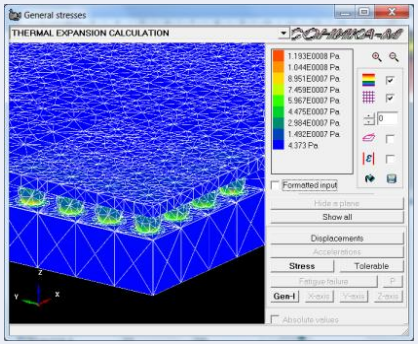

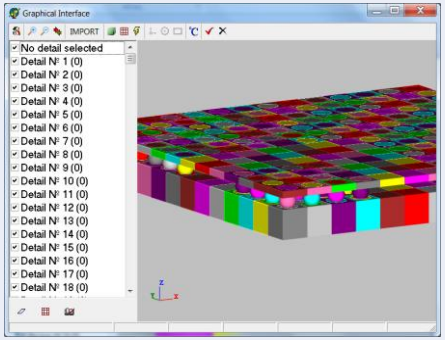

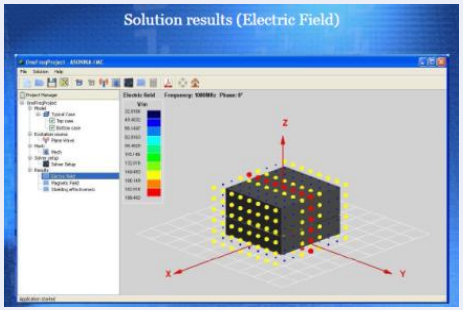

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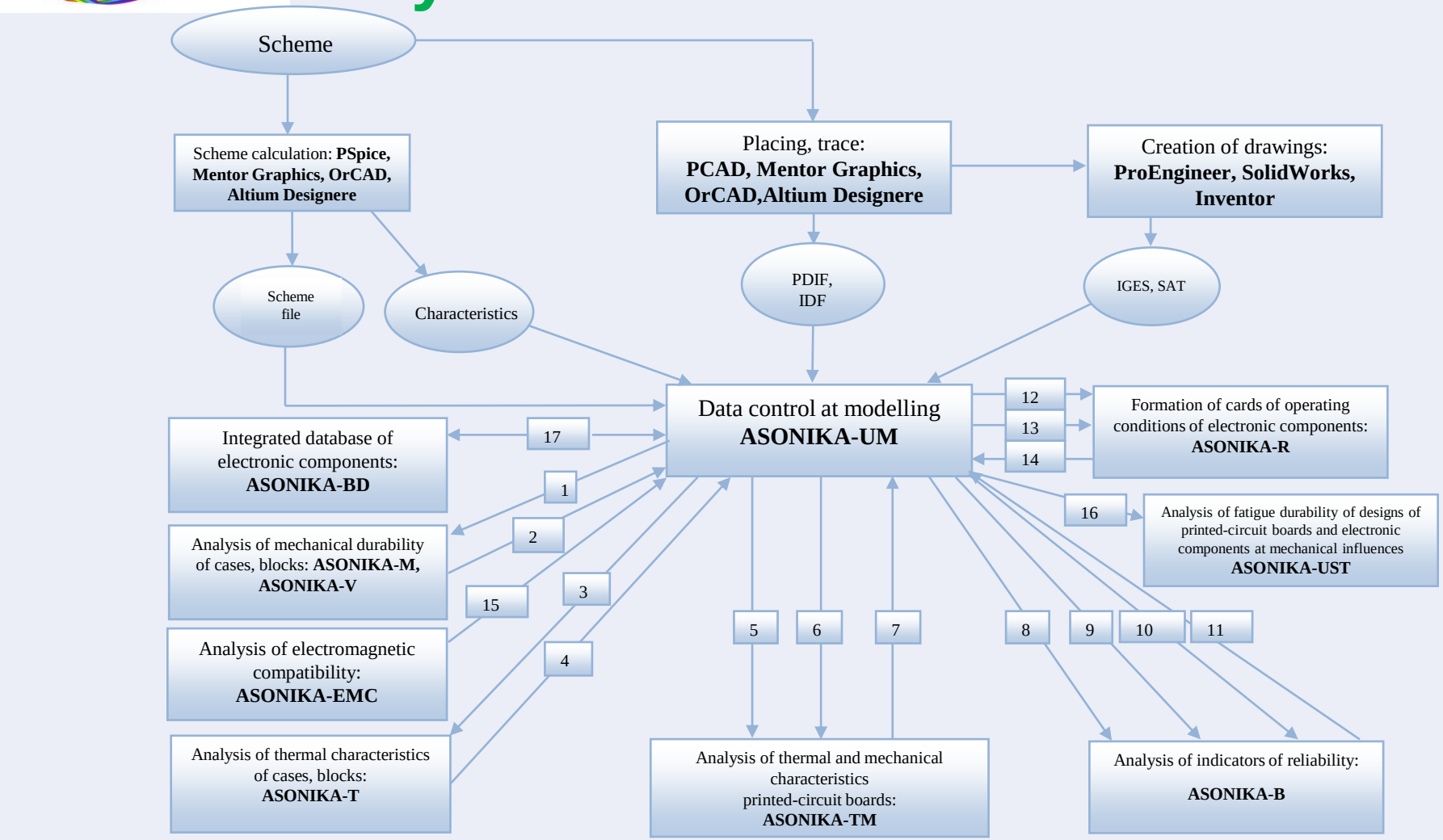
System ASONIKA structure



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Why ASONIKA is unique?

1. ASONIKA has reliable physical models and databases of the required properties of all materials and components.
2. ASONIKA has simple intuitive interfaces that are easy to use by designers for rapid modeling.
3. ASONIKA considers features of properties of the materials applied in electronics, for example, their nonlinear properties.
4. ASONIKA is compatible with popular CAD systems and formats: PCAD, Mentor Graphics, OrCAD, Altium Designerer.
5. ASONIKA has been used by Russian companies and universities for more than 35 years.

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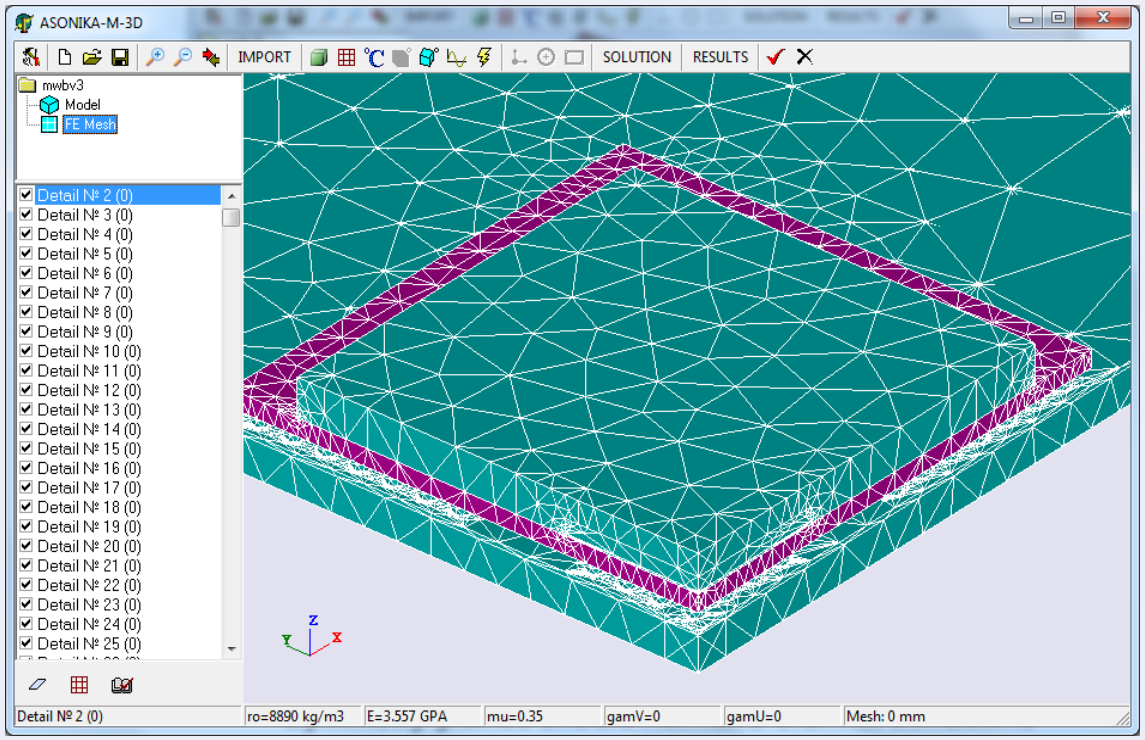
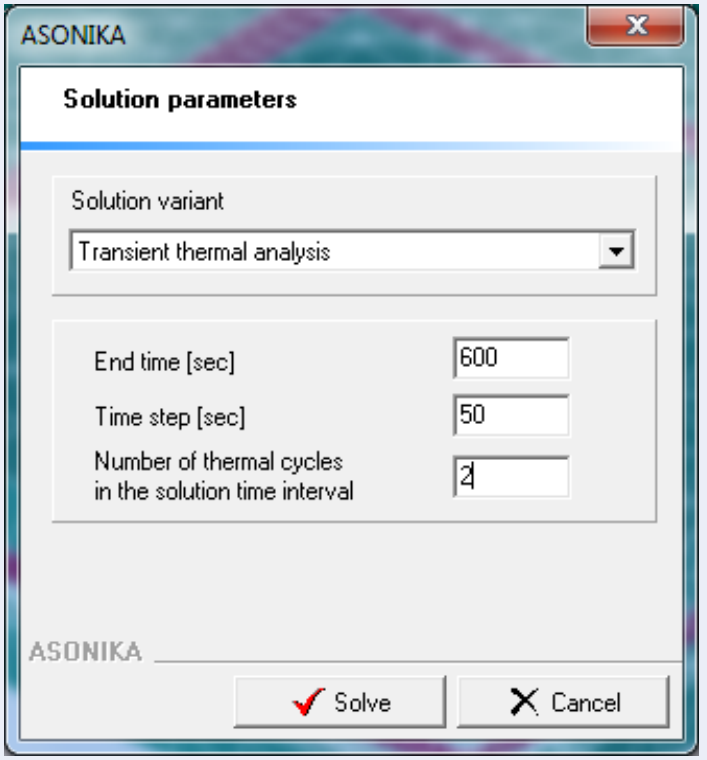
Transient thermal + fatigue analysis in ASONIKA

Run automatic FE mesh generation procedure





Specify the end time of the analysis, the time integration step and the number of thermal cycles contained in the solution interval

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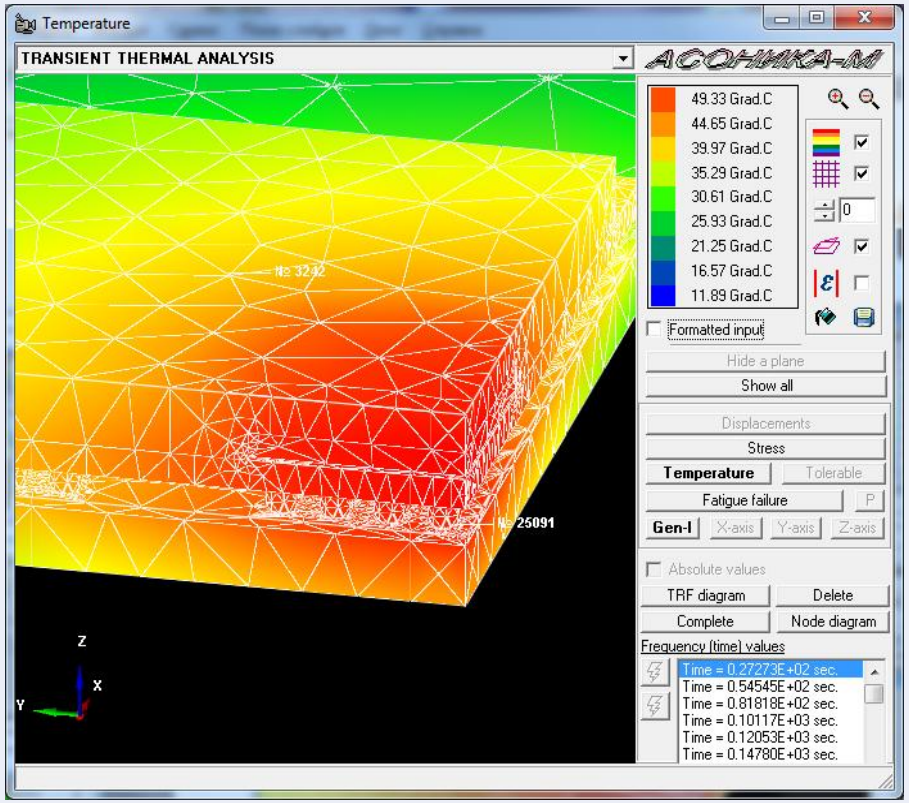
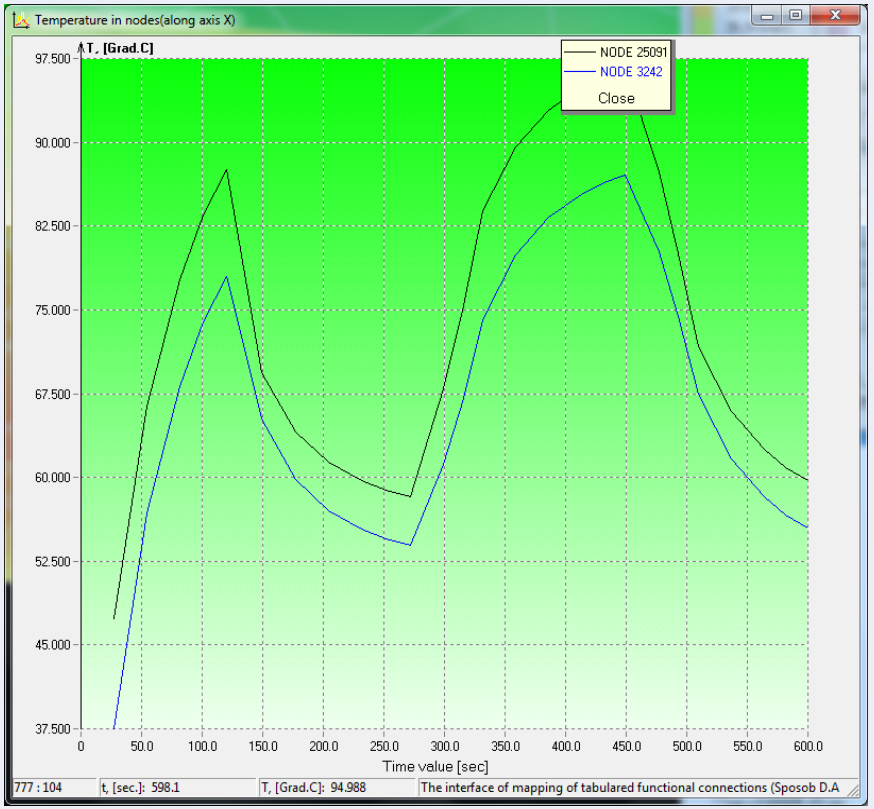
Temperature – time curve at nodes





Two arbitrary nodes were selected

Temperature vs time curves for two nodes

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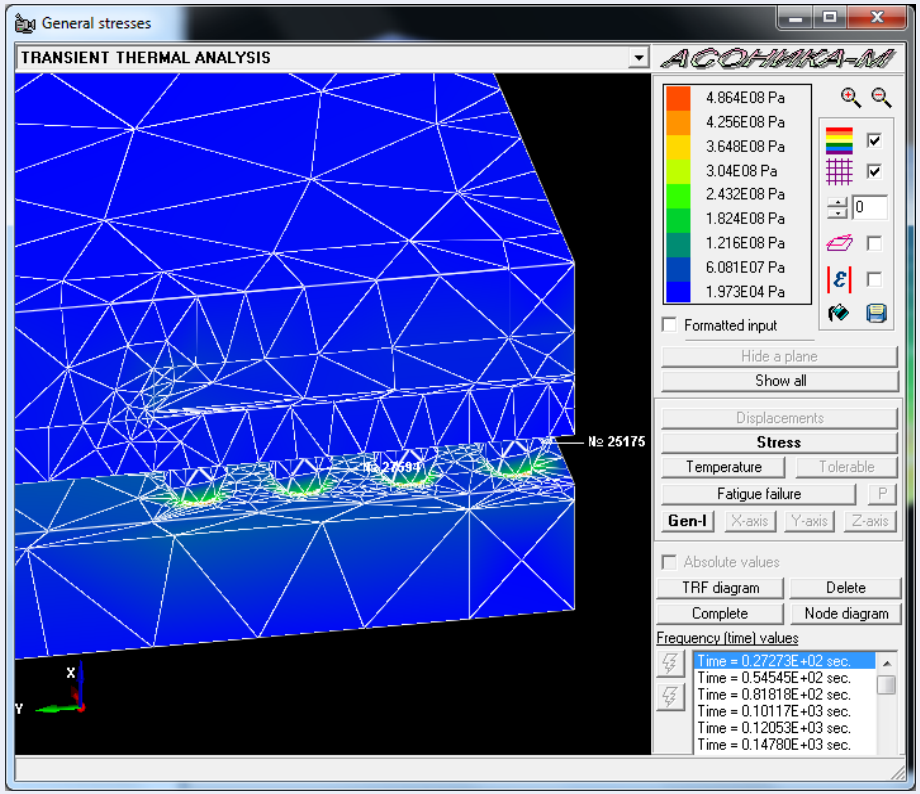
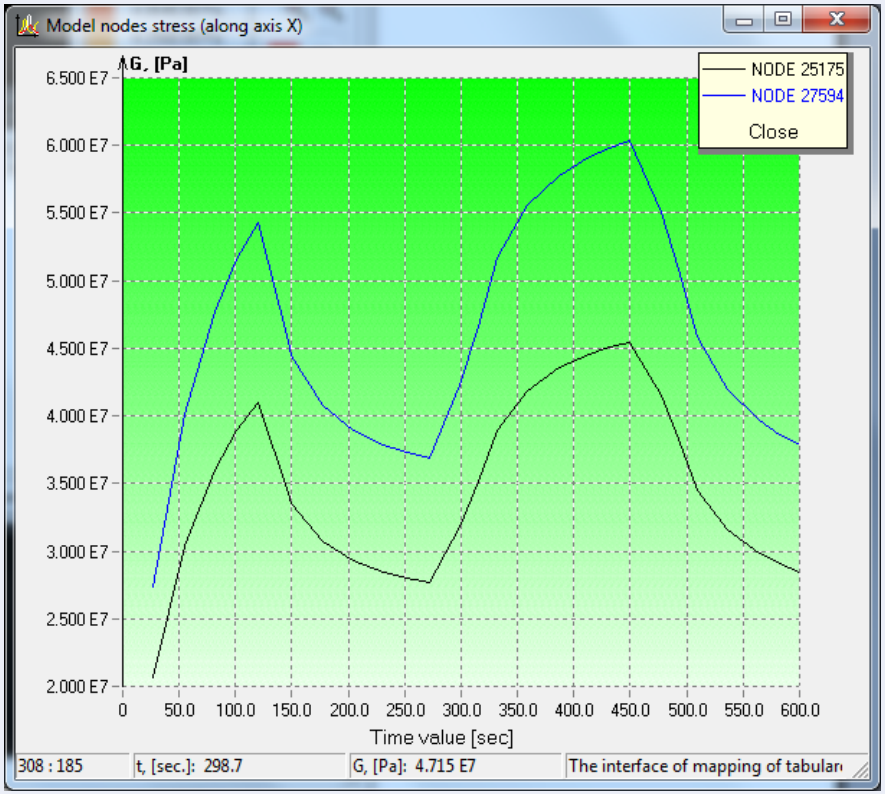
Stress-time curve





Two arbitrary nodes were selected

Stress vs time curves for two nodes

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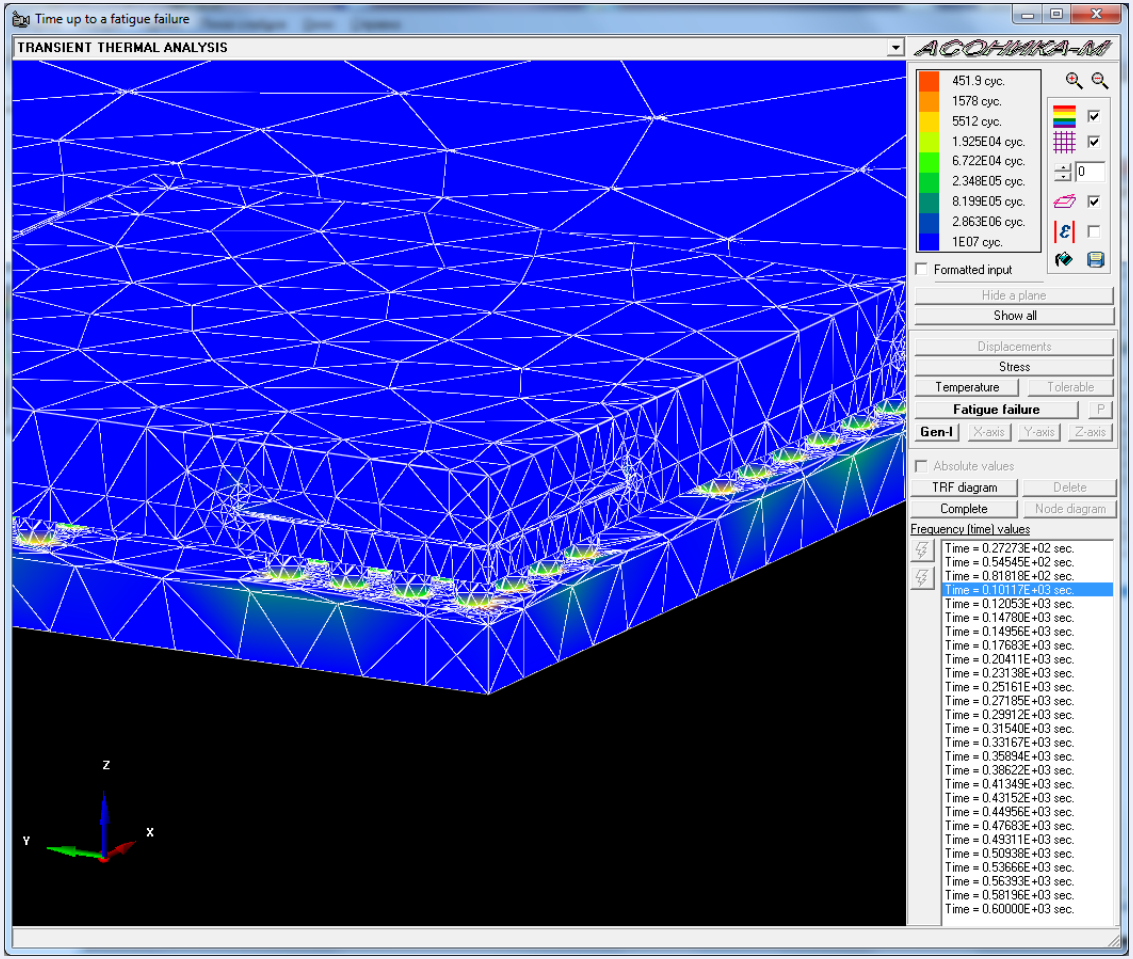
Fatigue plot



Plot shows minimum fatigue life (451.9 thermal cycles) in solder balls

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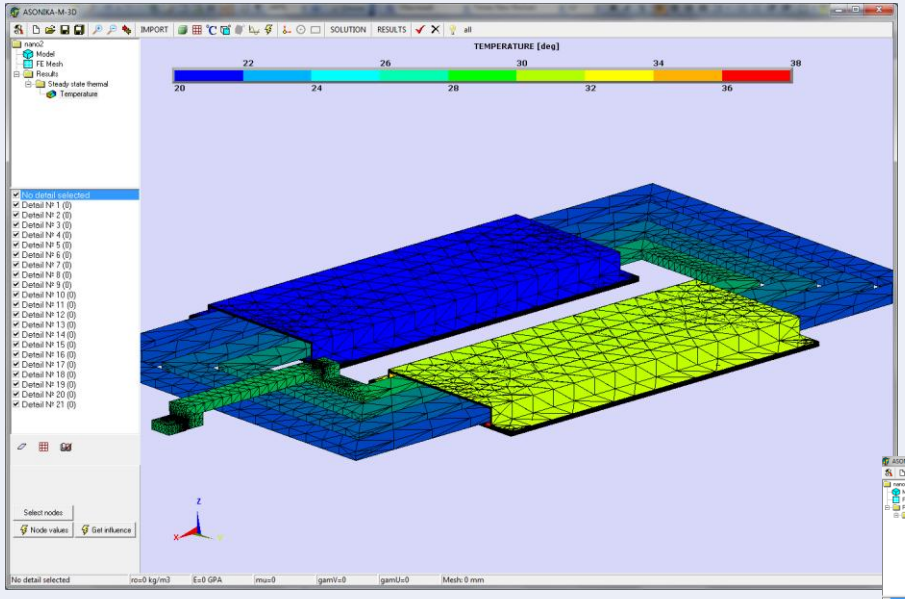
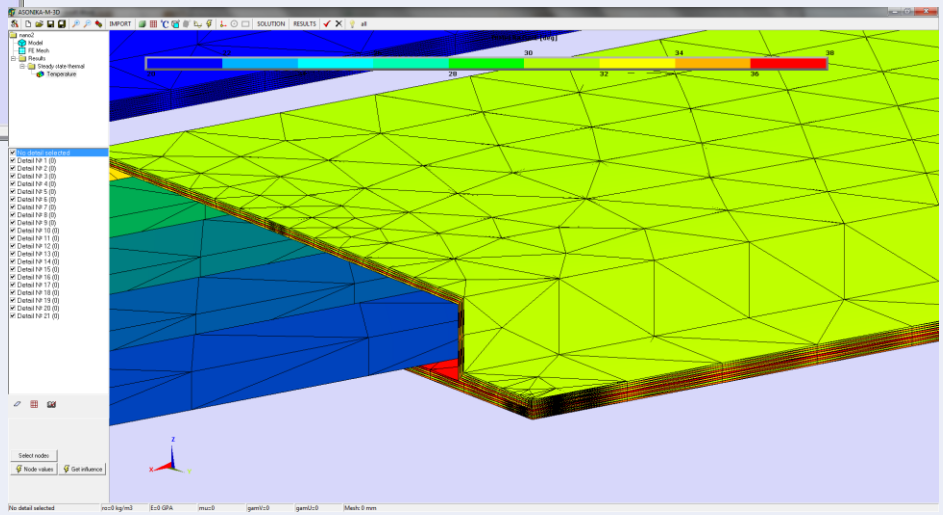
25 nanometer





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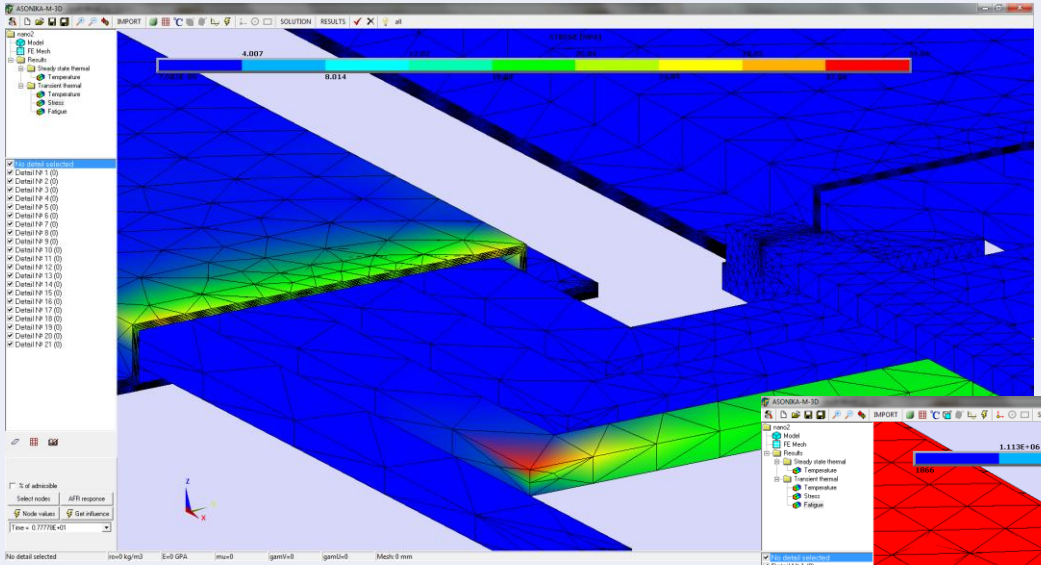
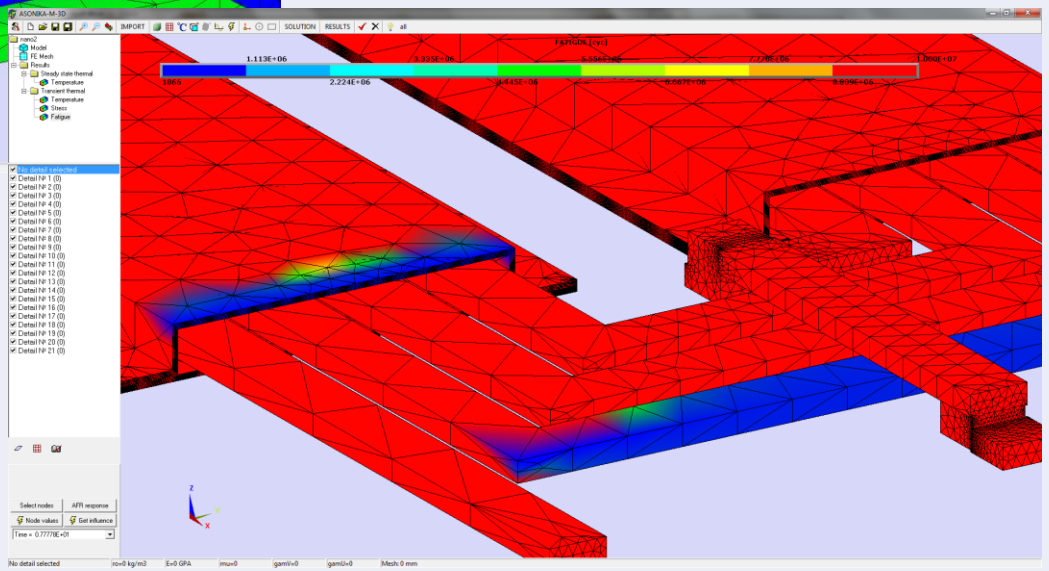
25 nanometer





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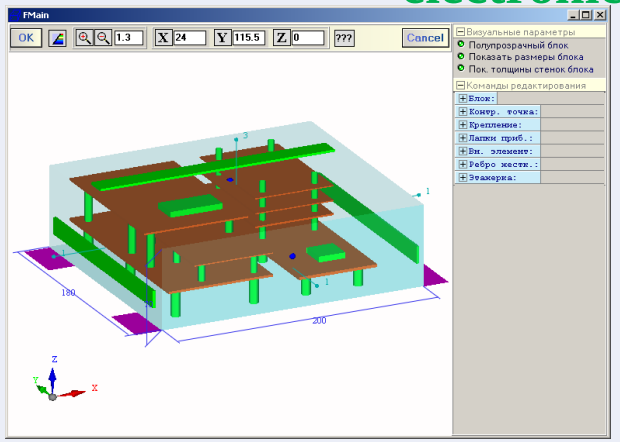
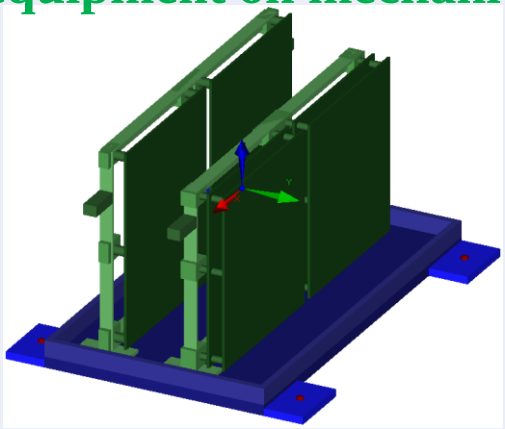
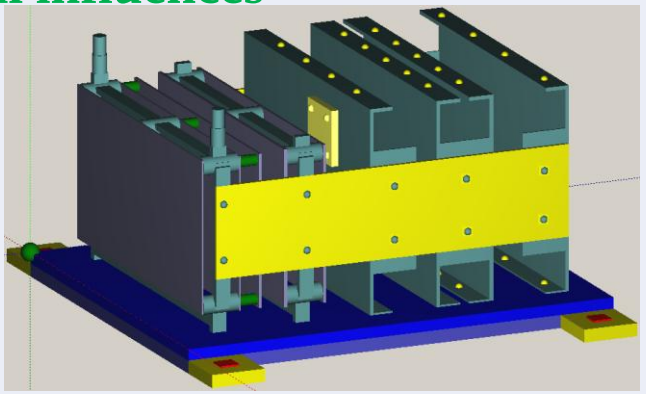
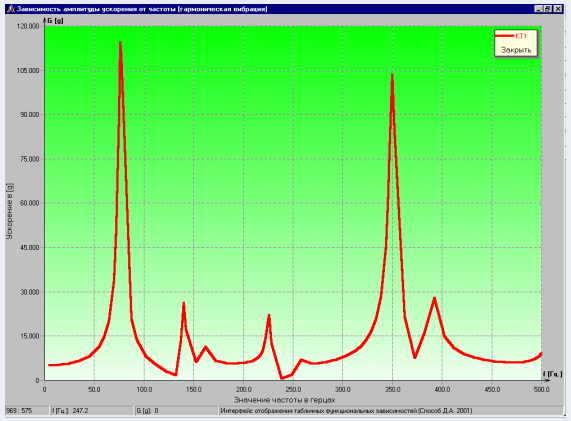
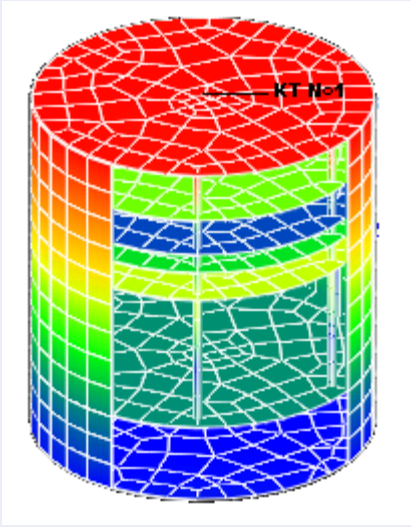
Subsystem of the analysis of volumetric constructions of electronic equipment on mechanical influences

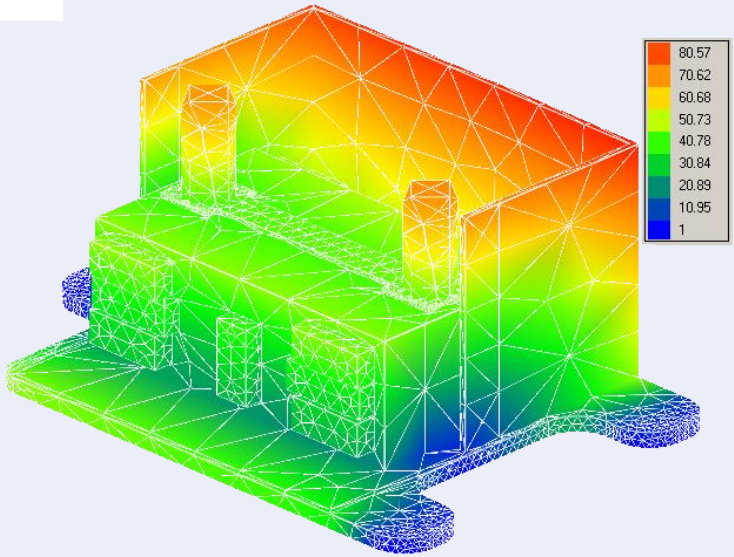












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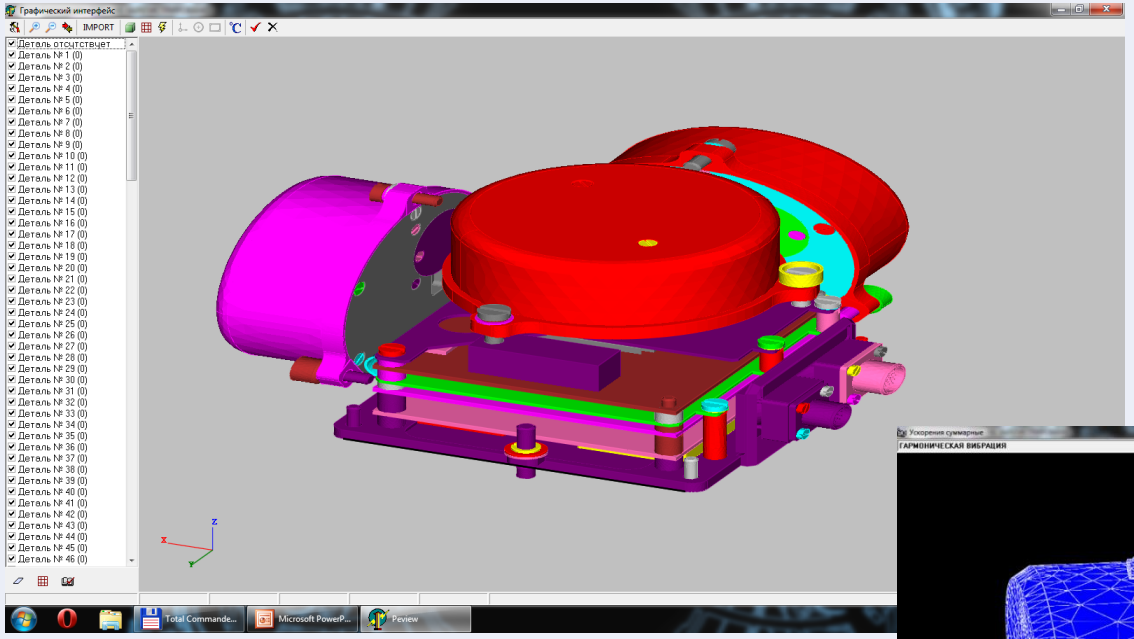

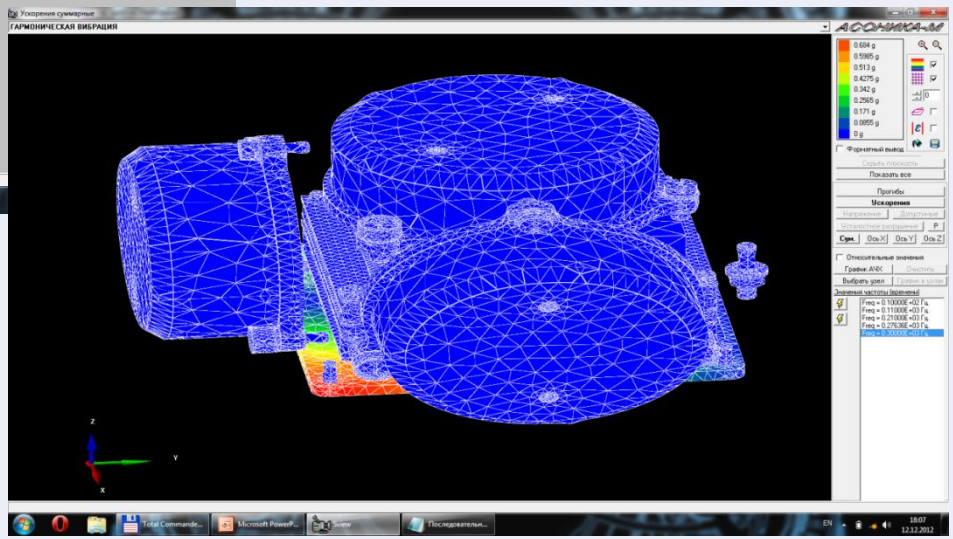

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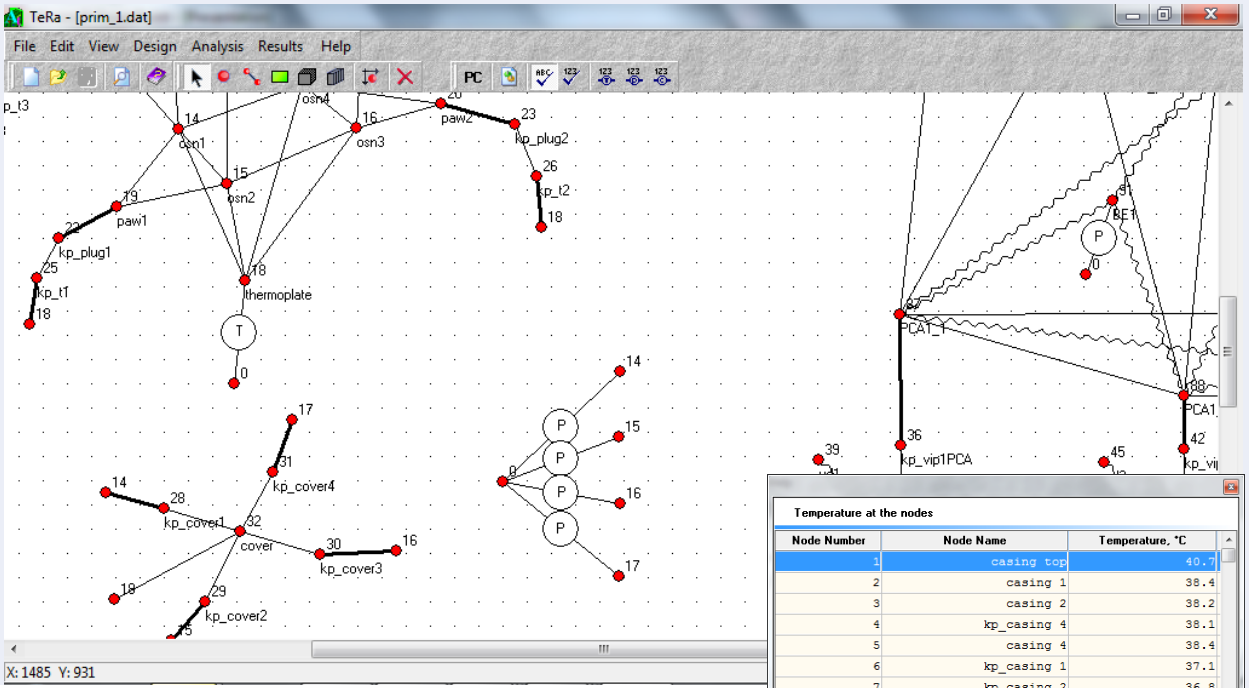
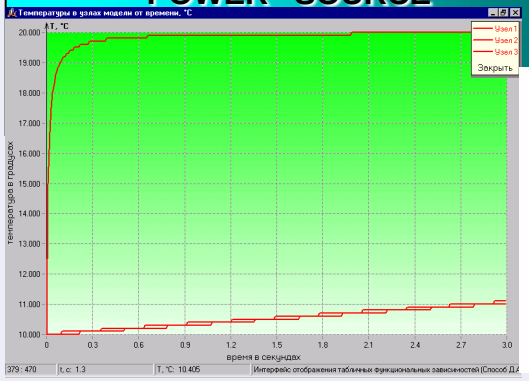
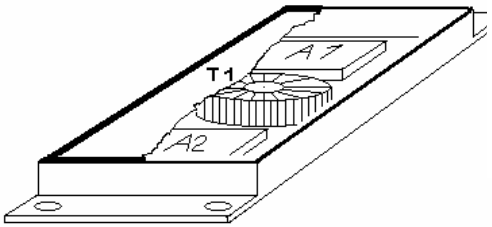
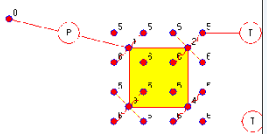
Subsystem of the analysis of thermal processes

- CONDUCTION
- CONTACT HEAT EXCHANGE
- RADIATION
- DUSTING
- CARRY OF HEAT
- NATURAL CONVECTION
- CONVECTION IN AN AIR PASSAGE
- COMPLEX HEAT DISSIPATION
- THERMAL RESISTANCE
- POWER SOURCE









Temperature at the nodes

Node Number	Node Name	Temperature, °C
1	casing top	40.7
2	casing 1	38.4
3	casing 2	38.2
4	kp_casing 4	38.1
5	casing 4	38.4
6	kp_casing 1	37.1
7	kp_casing 2	36.8
8	kp_casing 3	36.6
9	kp_casing 4	37.2
10	kp_osn1	37
11	kp_osn2	36.7
12	kp_osn3	36.5
13	kp_osn4	37.2
14	osn1	36.1
15	osn2	36.3
16	osn3	36.1
17	osn4	36.3
18	thermoplate	35
19	paw1	35.7

OK Save...

ASONIKA-V –

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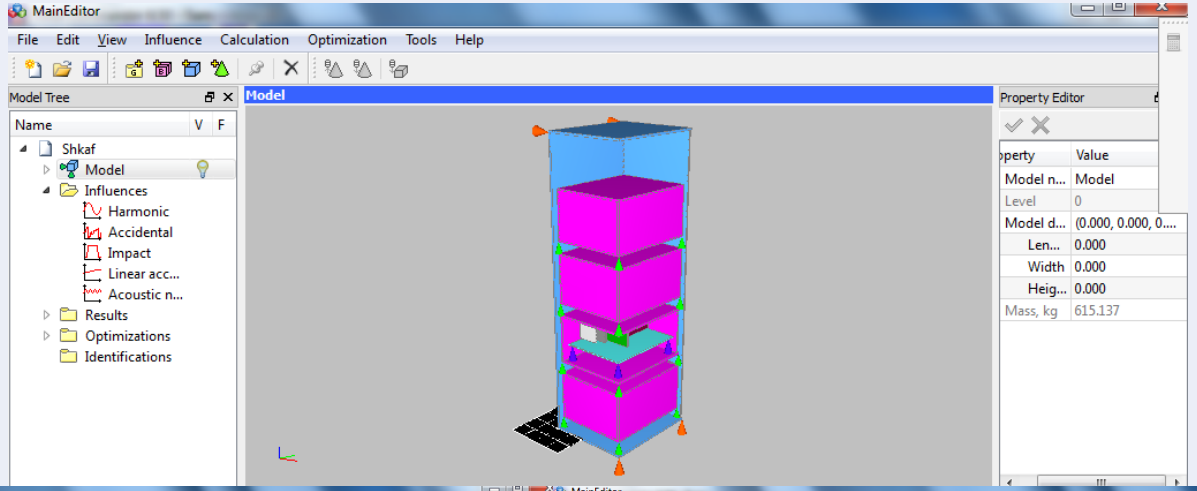
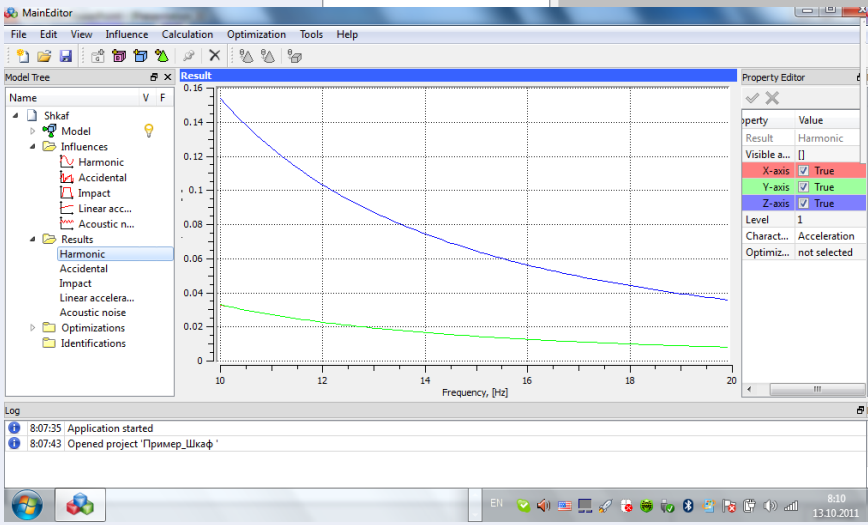
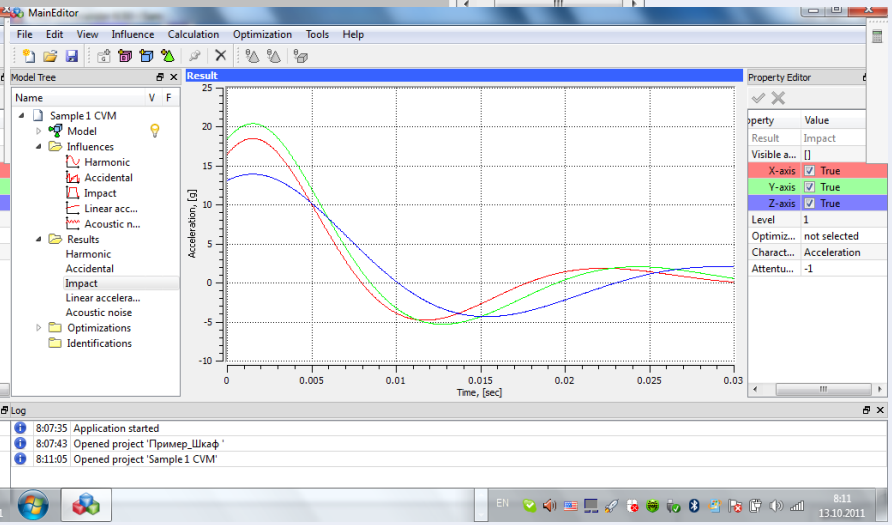
Subsystem of the analysis and maintenance of stability to mechanical influences of electronic equipment, established on vibration isolators

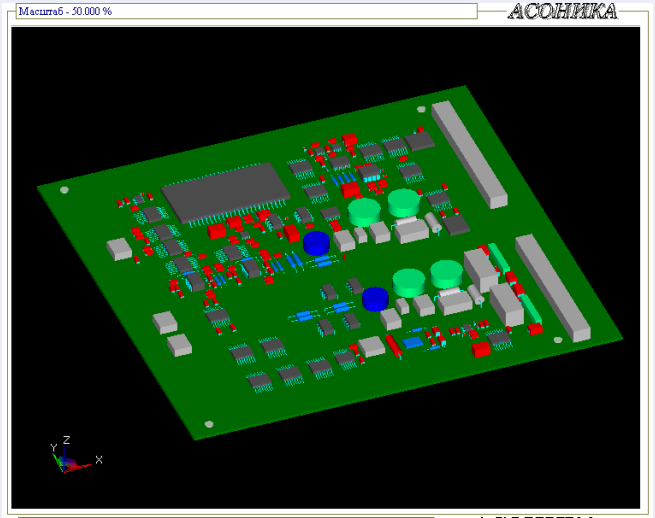


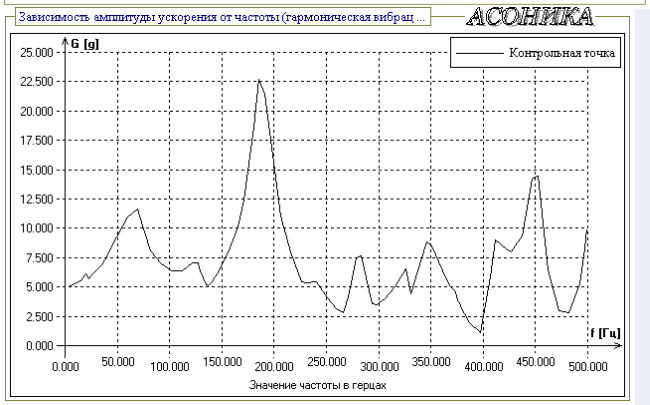


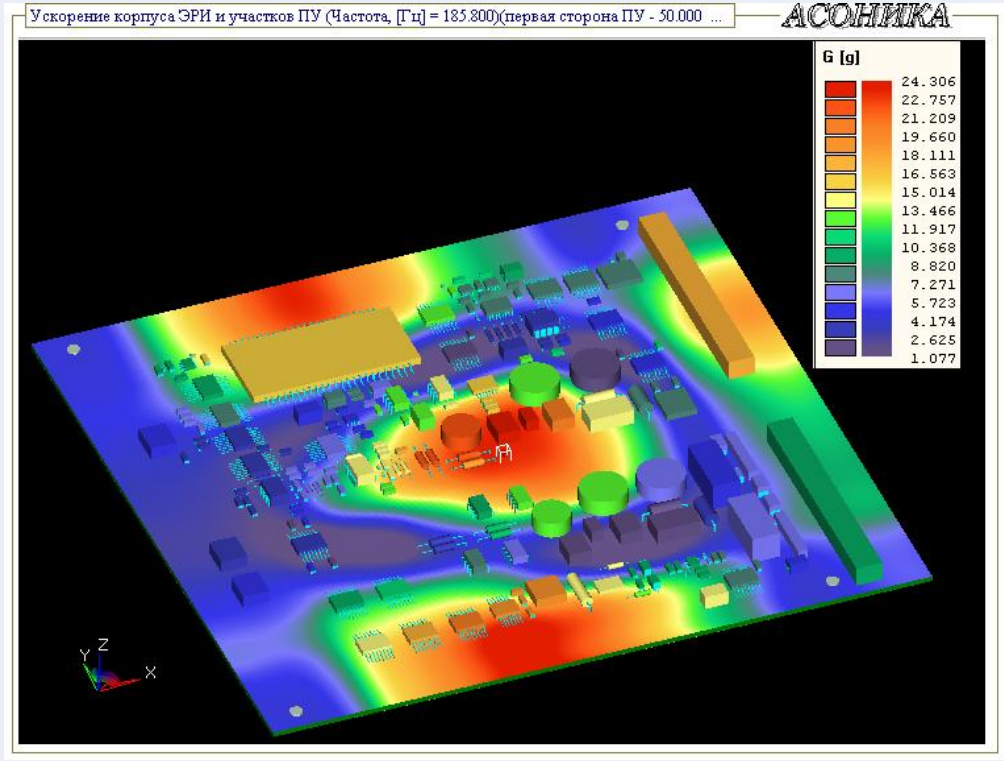


ASONIKA-TM www.asonika.com

Subsystem of the analysis of constructions of printed-circuit boards on thermal and mechanical influences







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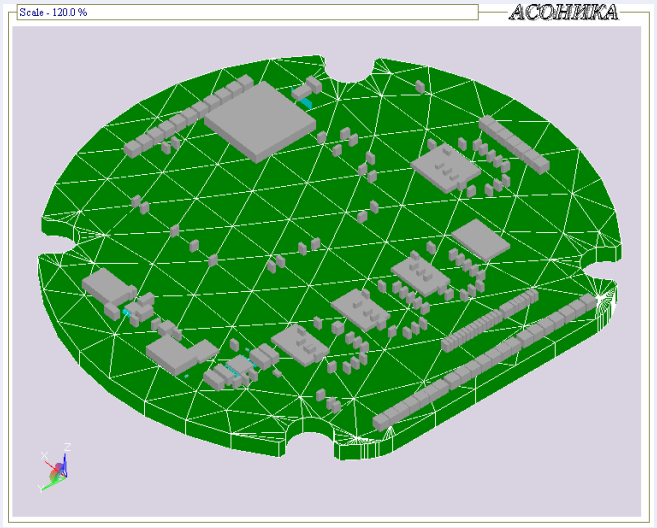
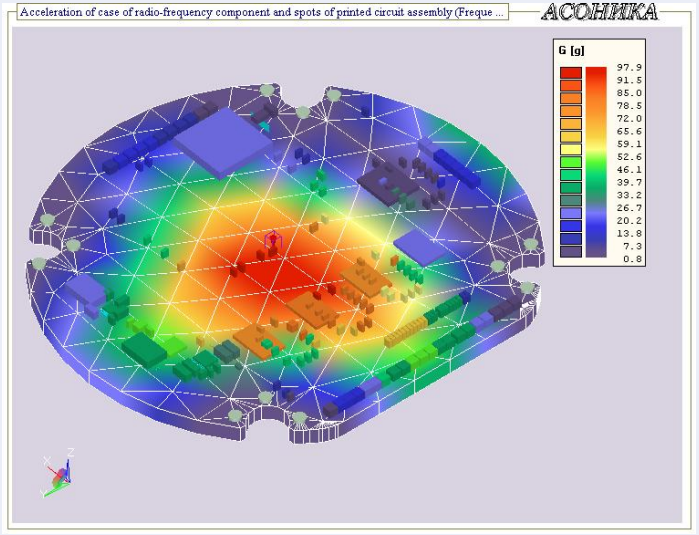
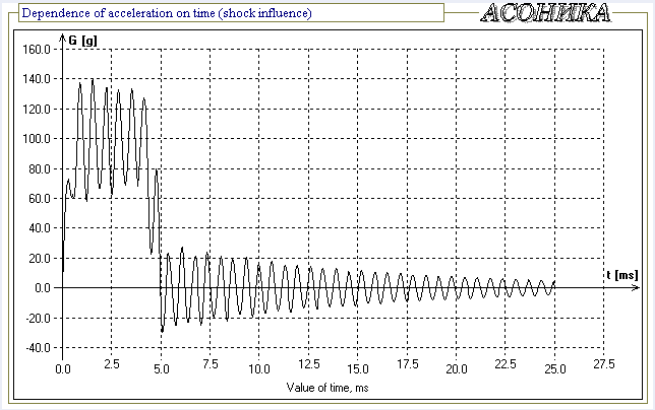
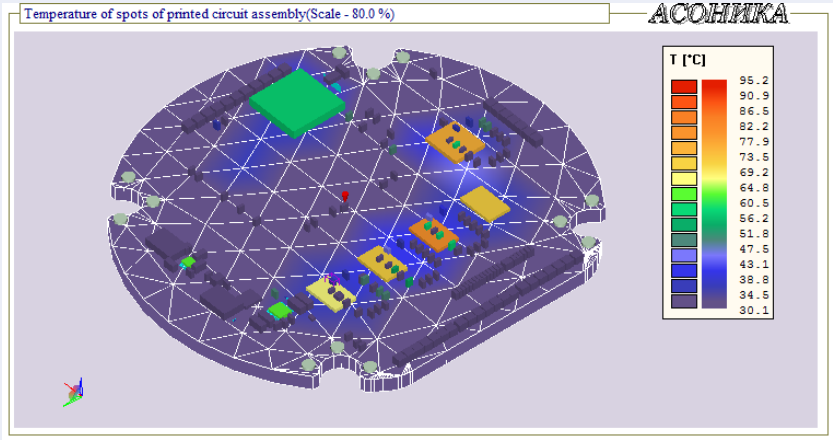
MENTOR GRAPHICS - ASONIKA-TM









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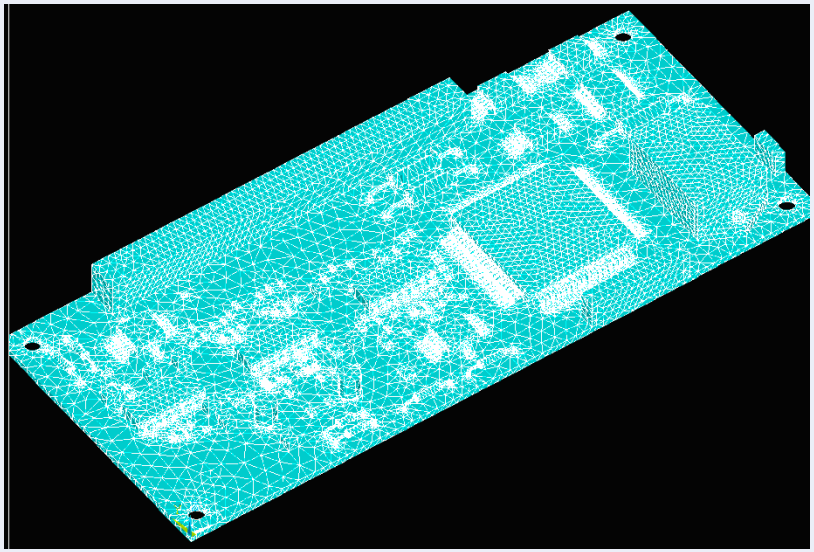
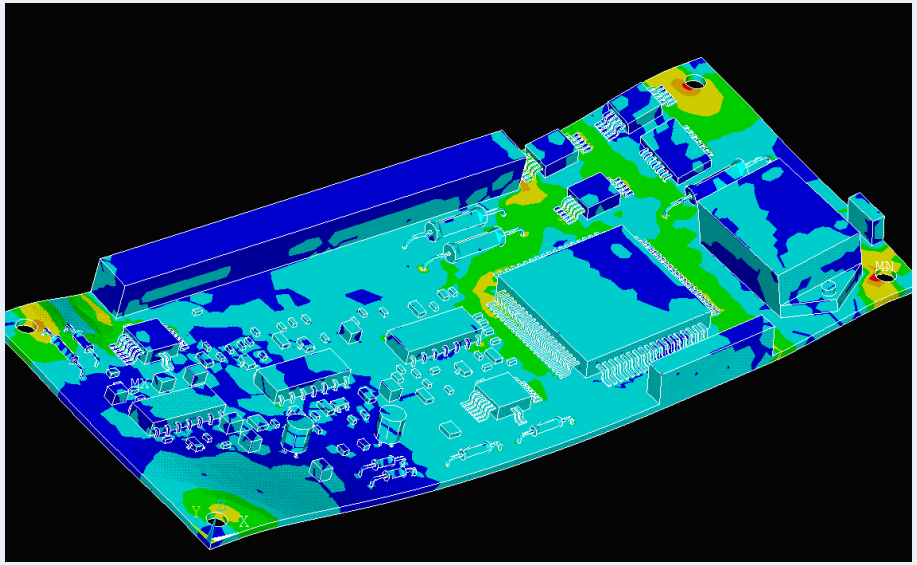
ASONIKA - UST

Analysis of fatigue durability of designs of printed-circuit boards and electronic components at mechanical influences





ASONIKA - EMC

Electromagnetic compatibility subsystem

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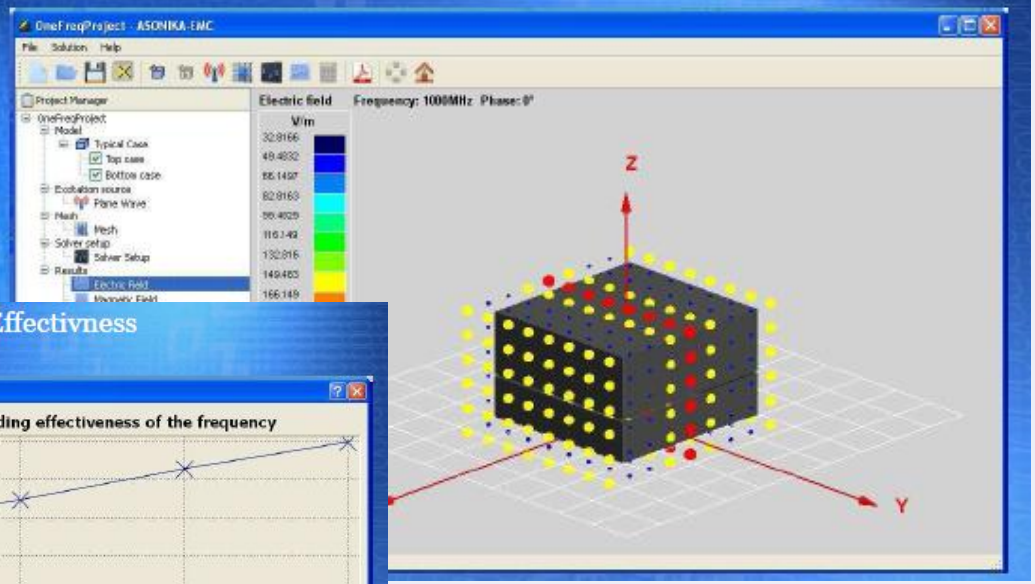
Example of use ASONIKA-EMC

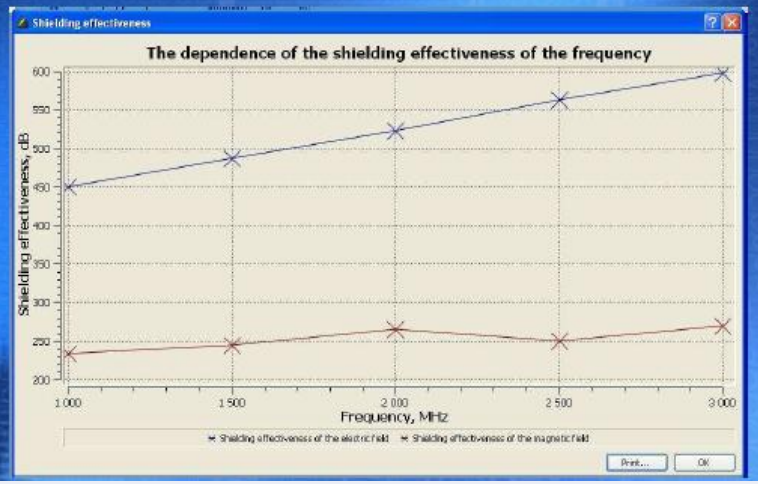
This is an electronic device, which is a hollow rectangular box, consist two halves separated by dielectric gasket. Need to find the effectiveness of shielding of the electric field in the frequency range from 1000 to 3000 MHz.

Excitation: Incident Plane Wave (Eo = 200 V/m) propagating along the gasket. Enclosure dimensions: 200x180x130 mm, gasket height 2 mm wall thickness 2 mm, wall material - aluminum.

Solution results (Electric Field)



Shielding Effectivness



ASONIKA-B

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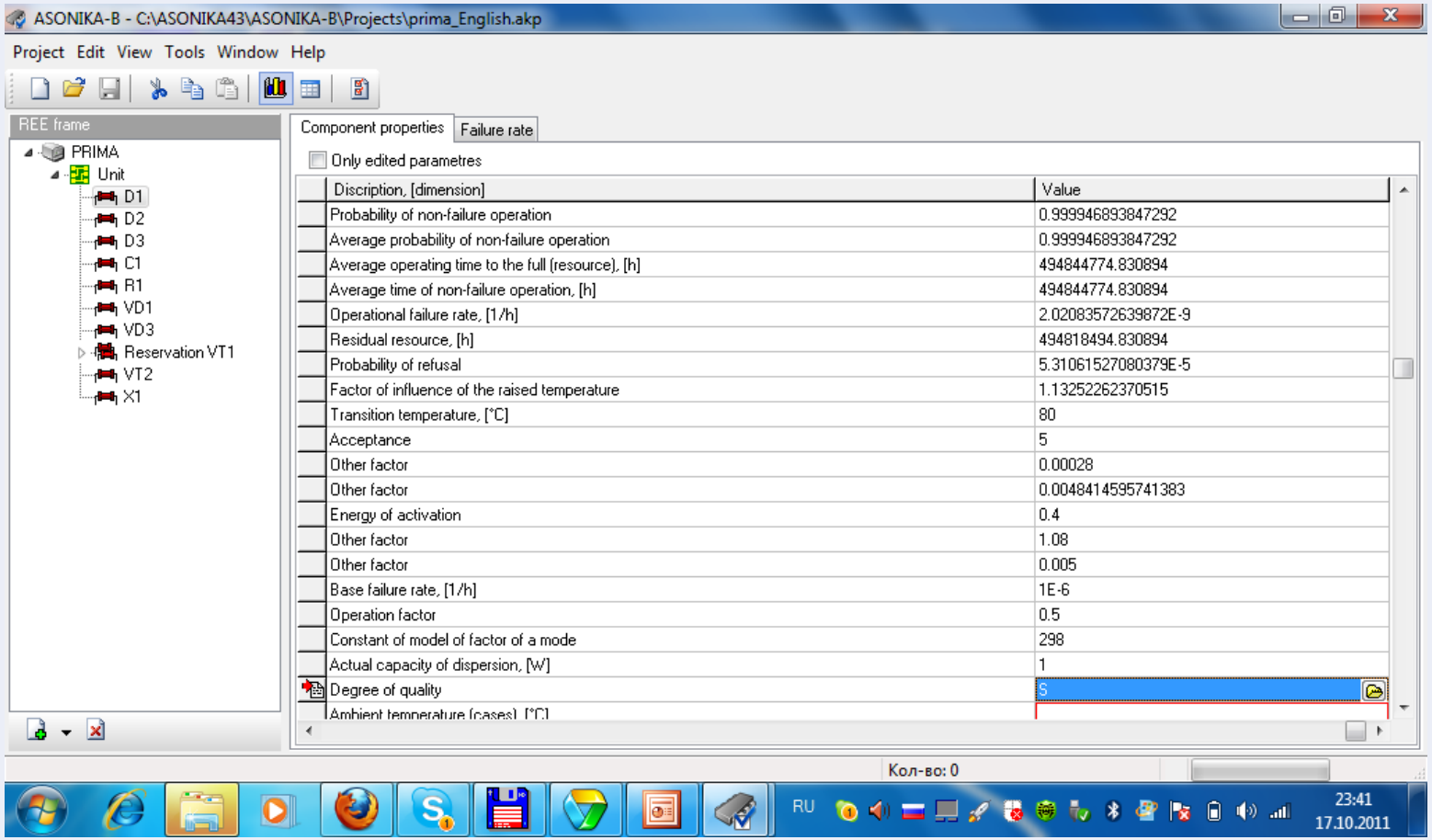
Subsystem of the analysis of parameters of reliability taking into account actual operational modes



Integrated database of electronic components: **ASONIKA-BD**

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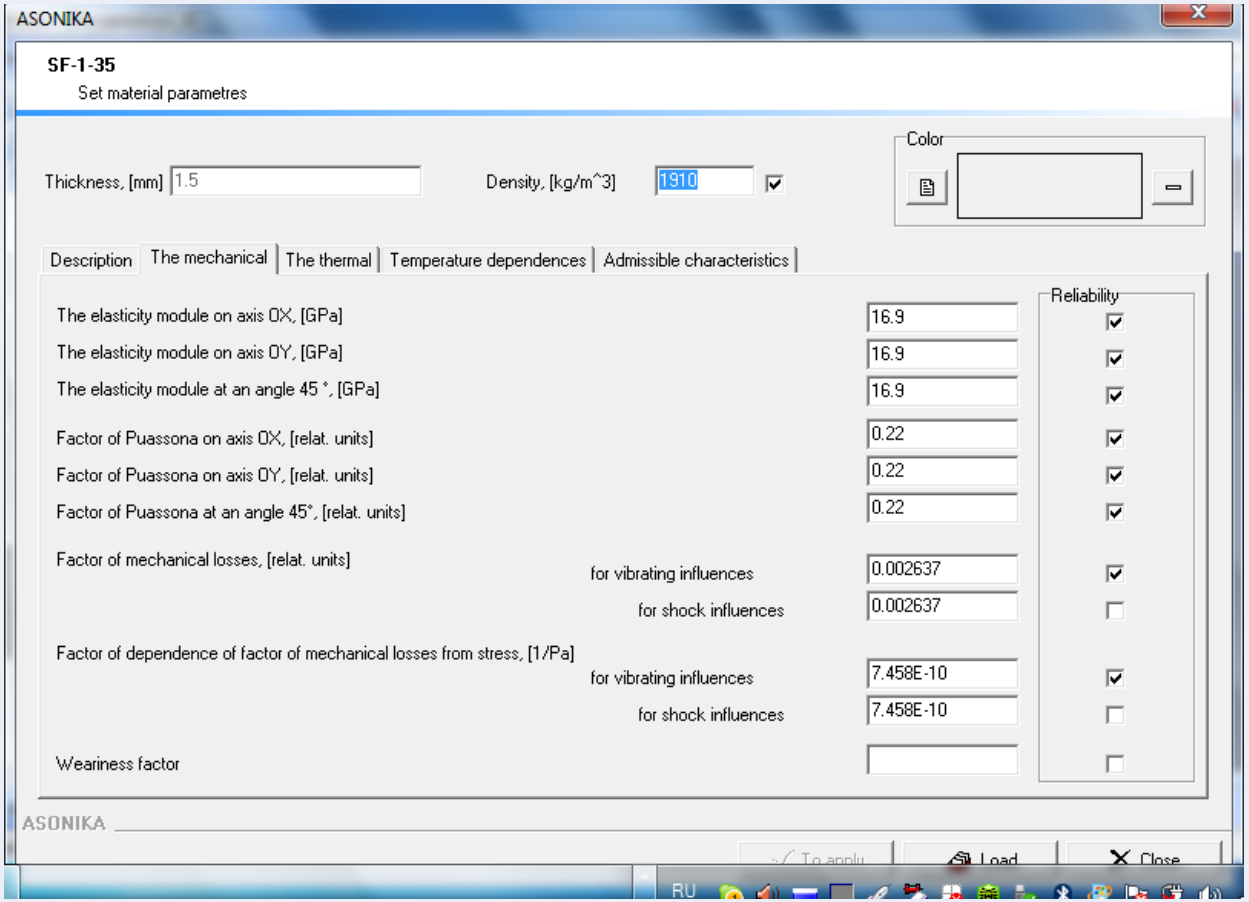

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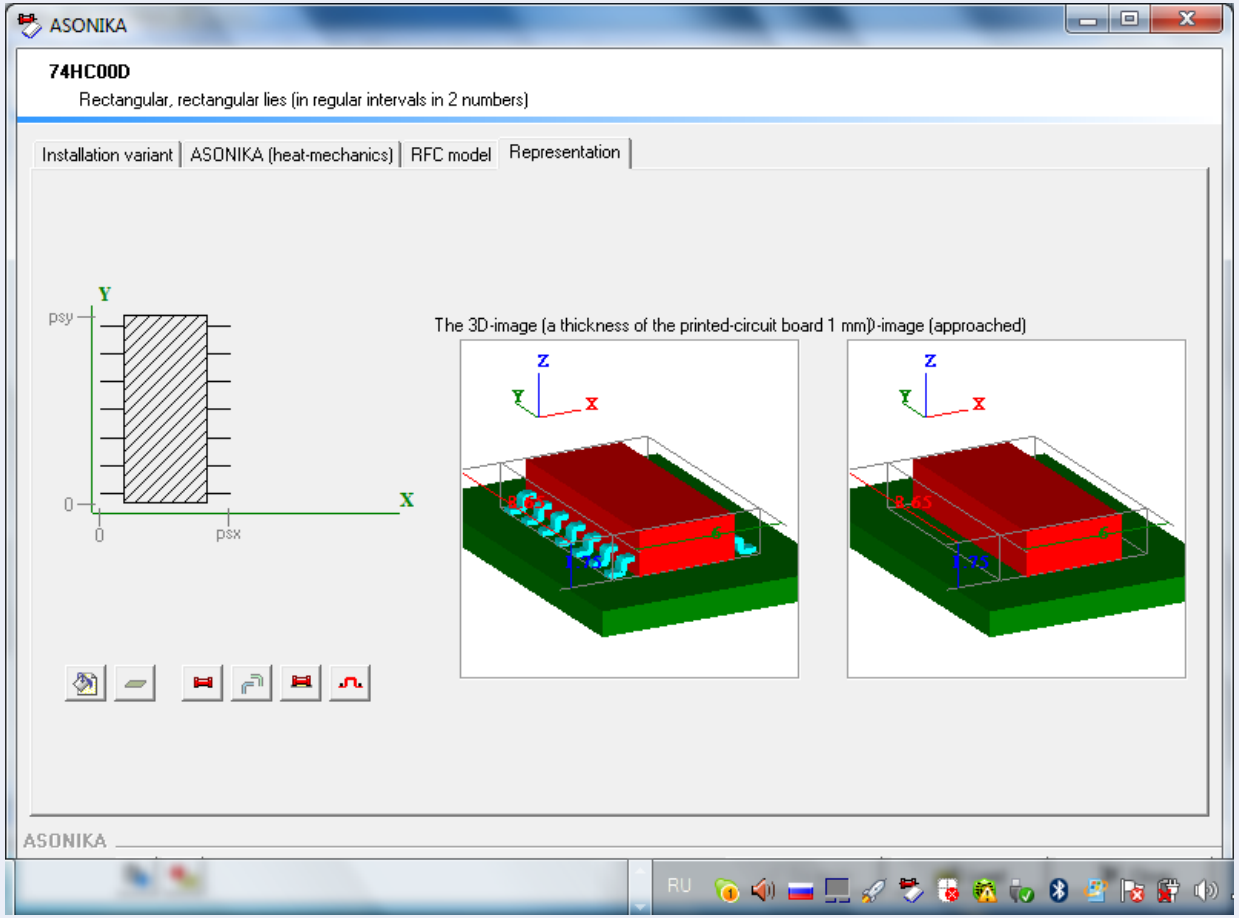

ASONIKA - UM

Subsystem of modeling management during engineering

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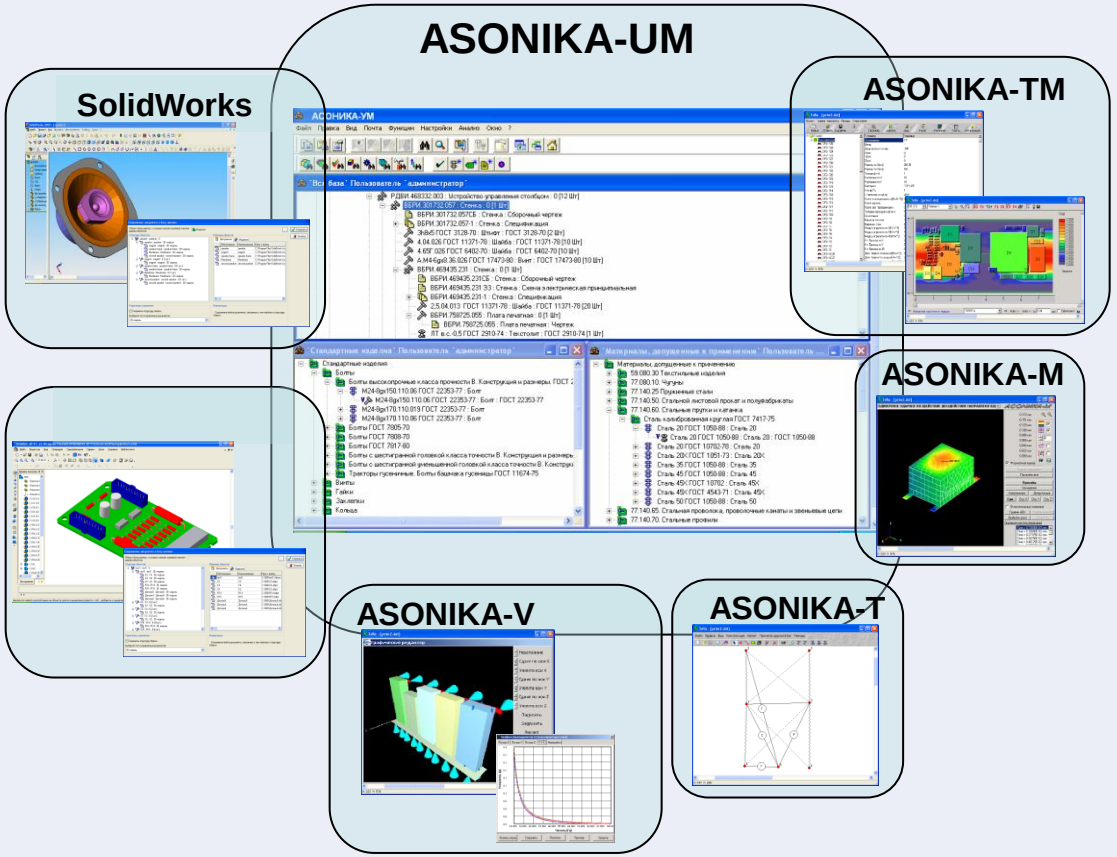

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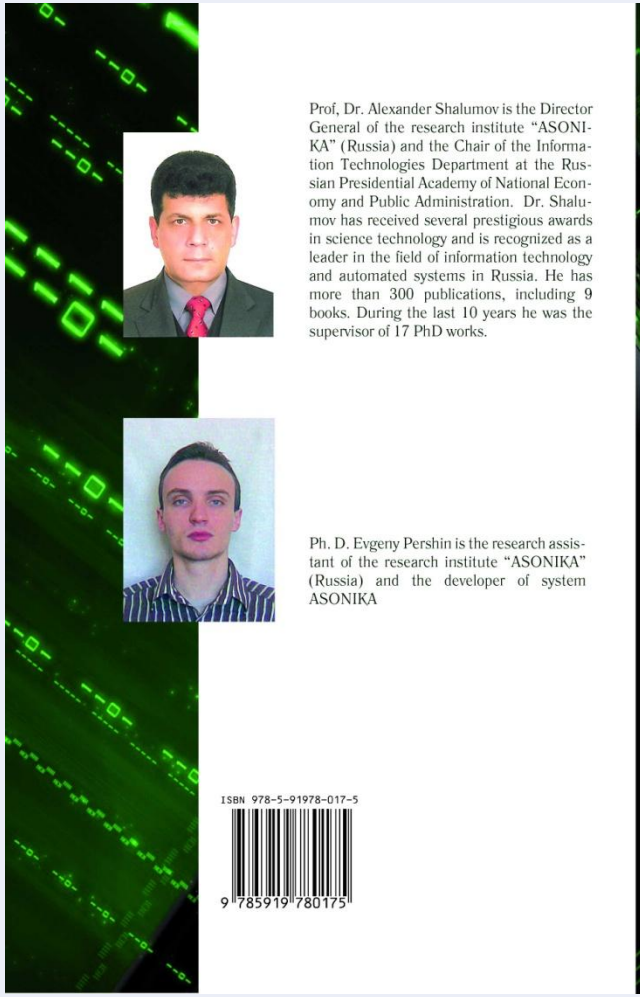

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Thank you for attention!

Contact Information

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