



#### Pellet target report

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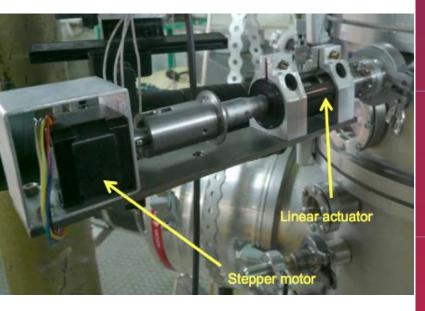
#### Main status

- 1. Continue R&D for TDR
- 2. Preparation of the TDR

### Current activities of young colleagues

- 1. Operation and study of the adjustment system.
- 2. 3D design of the Pellet target
- 3. Simulation of temperature distribution inside the target

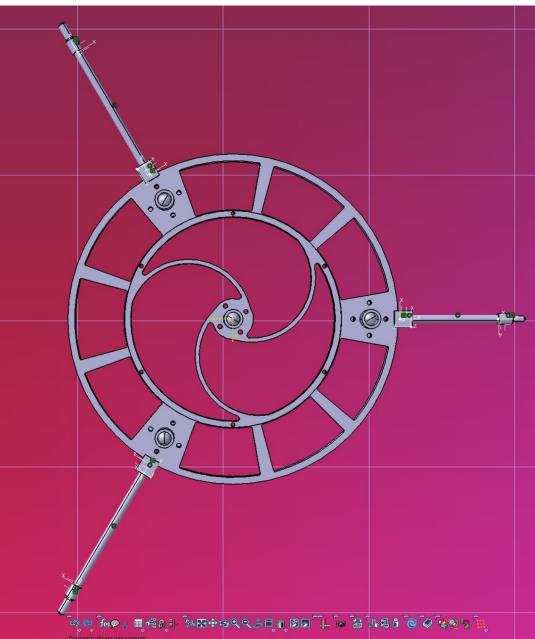
#### Adjustment system elements



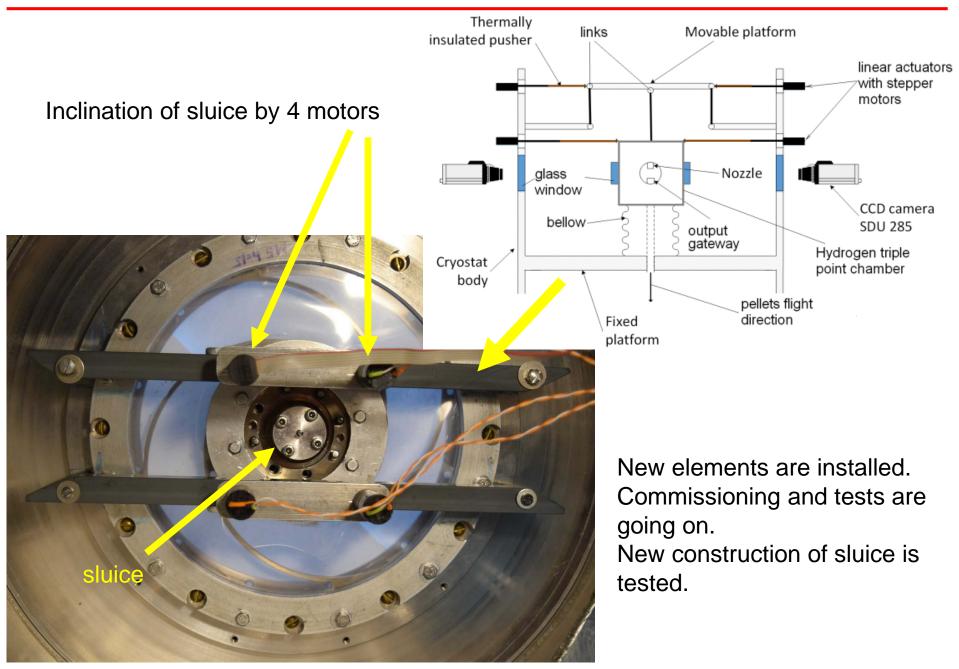
operated via **L-CARD E14-140** controller for four axes:

- 4 stepper motors

- Tested with L-Card controller and Delphi prog.

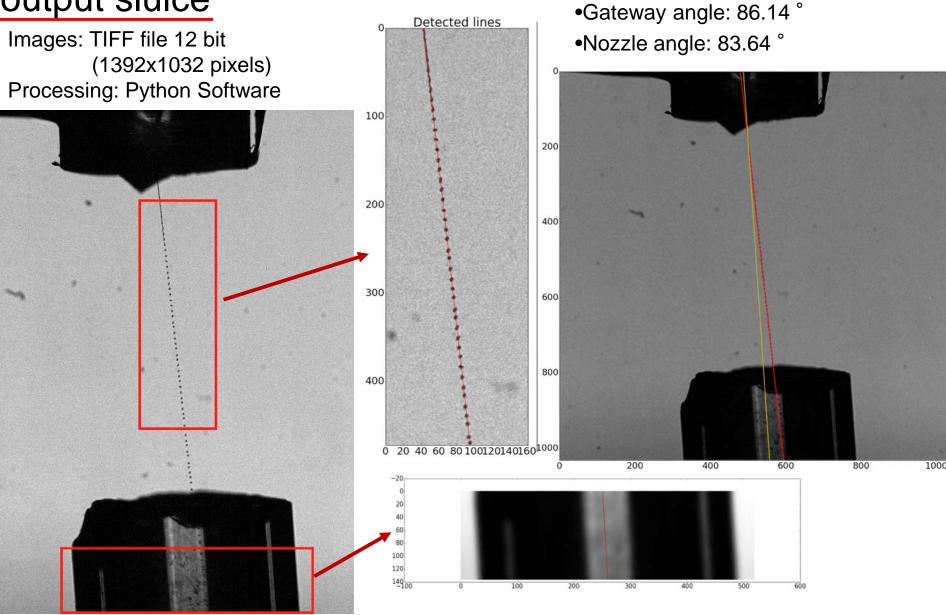


#### Development of the adjustment system



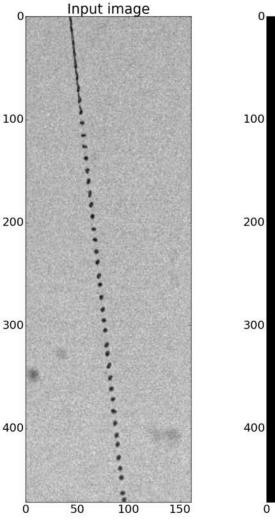
#### Visualization of the nozzle axis deviation relative to the

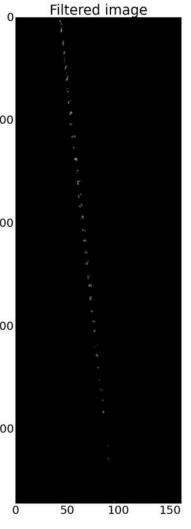
#### output sluice

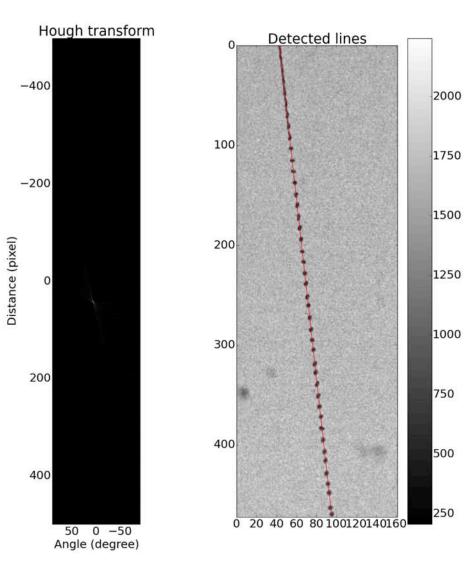


#### Search for a straight line of hydrogen droplets.

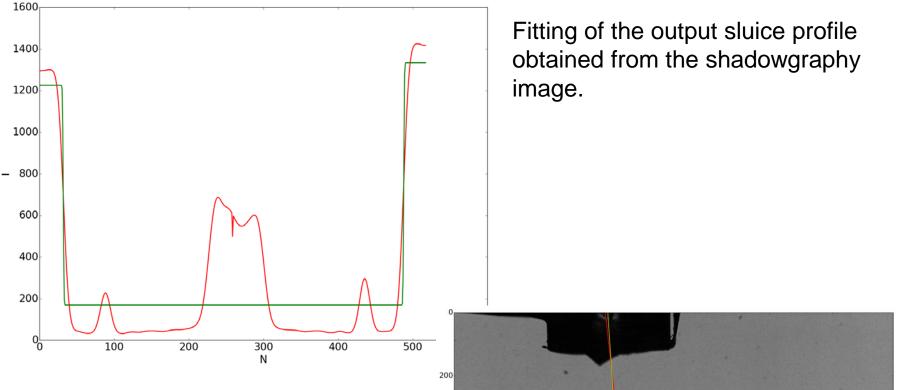
The Hough transform algorithm for the program search of droplets jet position



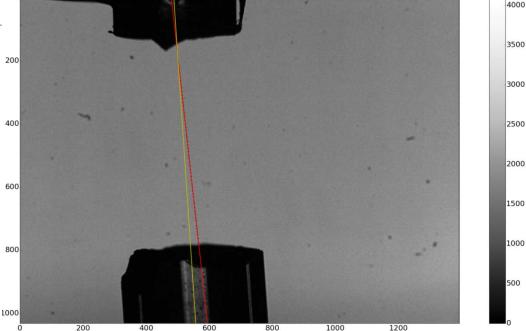


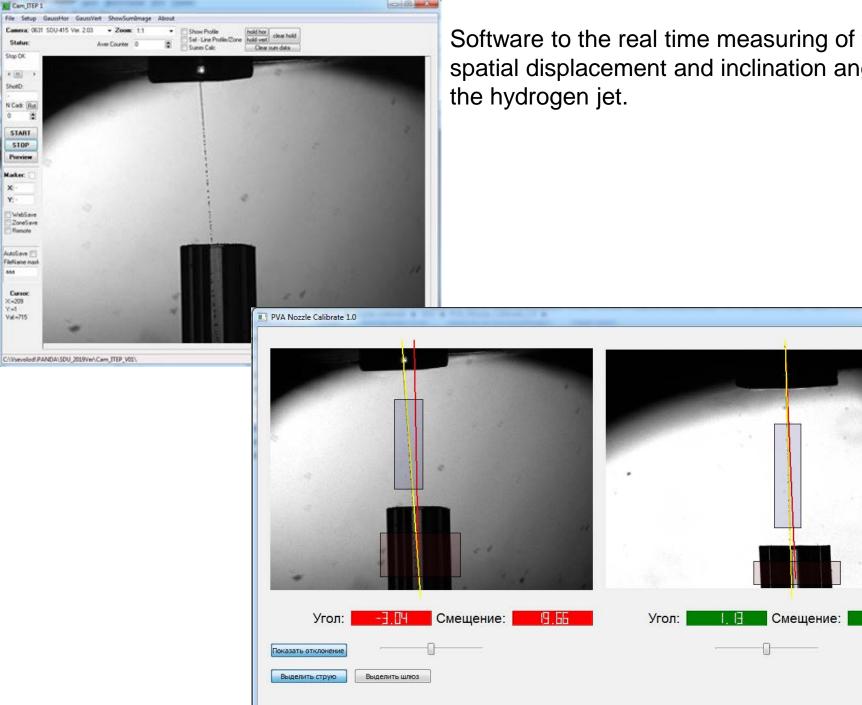


#### Search of the sluice axis



The result of visualization of the nozzle <sup>400</sup> axis deviation relative to the output sluice of the triple point chamber (sluice <sup>600</sup> rotation angle relative to the vertical axis is 3.86°, nozzle rotation angle is <sup>800</sup> 6.36°).





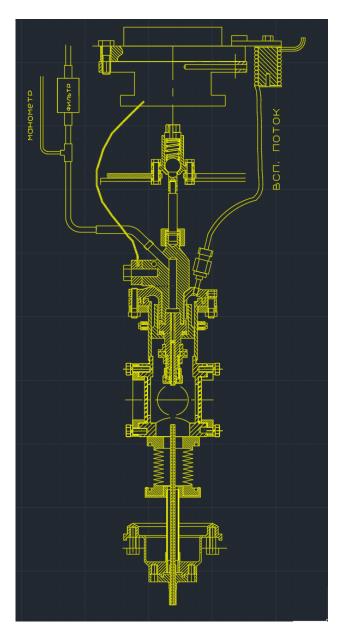
Software to the real time measuring of the spatial displacement and inclination angle of

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#### Tasks

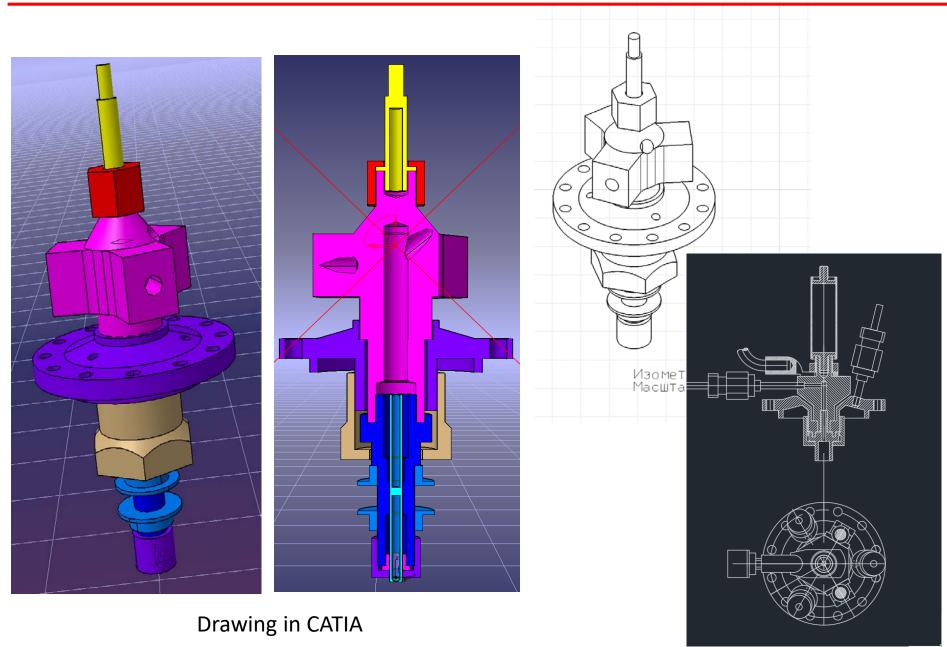
- Development and optimization of the construction of a pellet target for the PANDA experiment using the CATIA software package
- ✓ Using of 3D design of a pellet target to select a construction with an optimal distribution of heat and mass flows.
- Presentation of 3D construction of a pellet target for Technical Design Report.

## Liquid formation unit



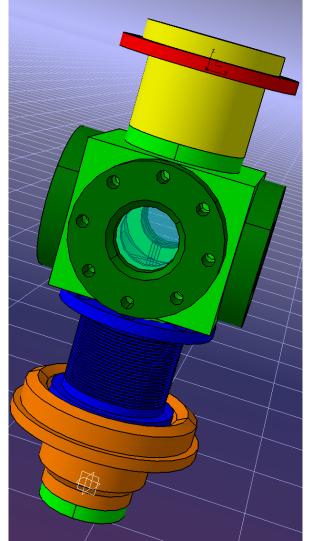


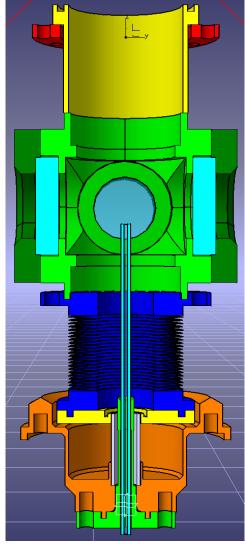
#### Cooler condenser and nozzle



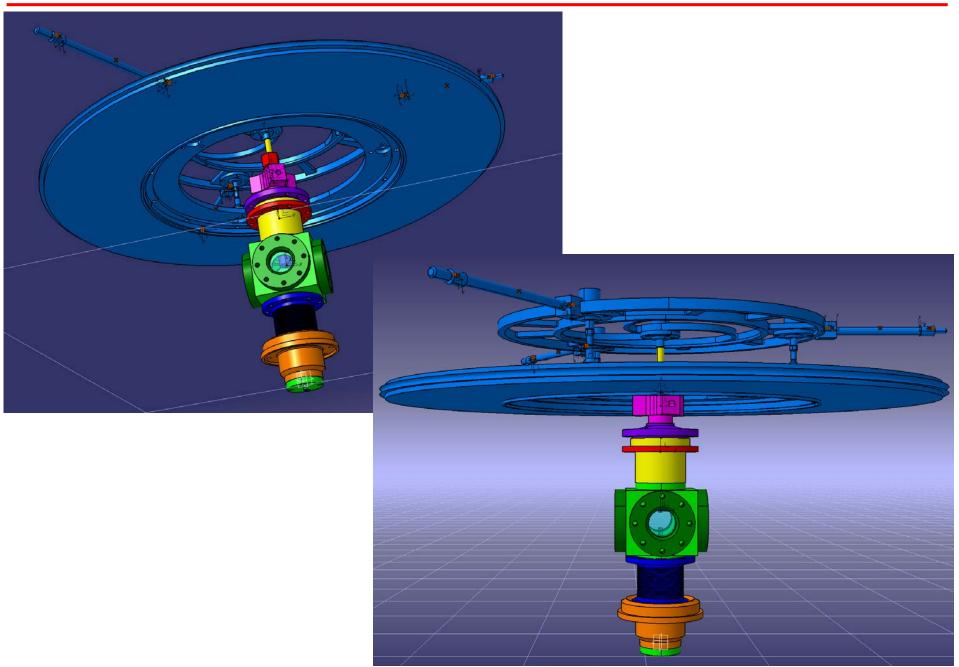
#### Triple Point chamber and sluice unit







#### Current result



# Study of heat transfer in the triple point chamber of the Pellet target

#### Issues:

1) Make sure that program calculations coincide with the experimental data

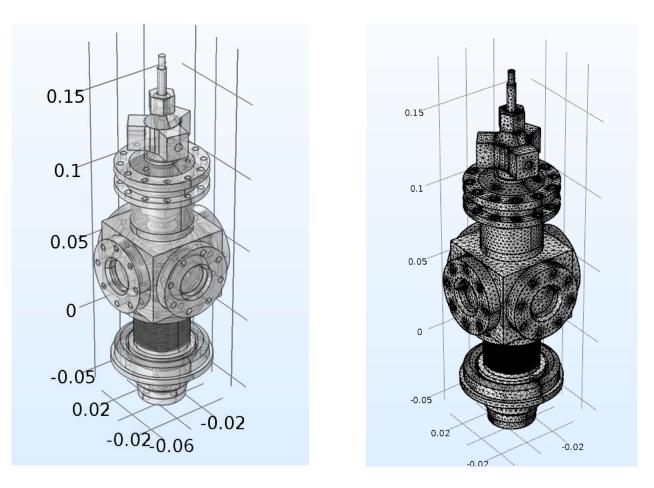
2) Build an existing picture of the temperature distribution in the triple point chamber

3) Evaluate the effect of convection of the main and additional flows

4) Evaluate the effect of radiation from the walls

5) Design optimization to achieve the required temperature during operational in normal mode

#### The object of the work

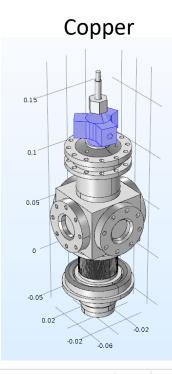


characteristics of the Assembly chamber of the triple point
Domains: 28. Faces: 1013. Edges: 2201. Points: 1384. CAD objects: 28.

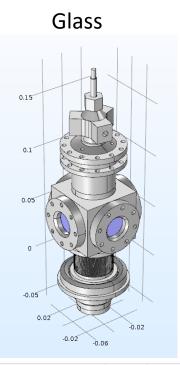
#### Material characterization

Steel

**	Property	Name	Value	Unit	
$\checkmark$	Heat capacity at constant pres	Ср	475[J/(k	J/(kg·K)	
$\checkmark$	Density	rho	no 7850[kg		
$\checkmark$	Thermal conductivity	k	44.5[W/	W/(m•	
	Relative permeability	mur	1	1	
	Electrical conductivity	sigma	4.032e6[	S/m	
	Coefficient of thermal expansi	alpha	12.3e-6[	1/K	
	Relative permittivity	epsilonr	1	1	
	Young's modulus	E	205e9[Pa]	Pa	
	Poisson's ratio	nu	0.28	1	

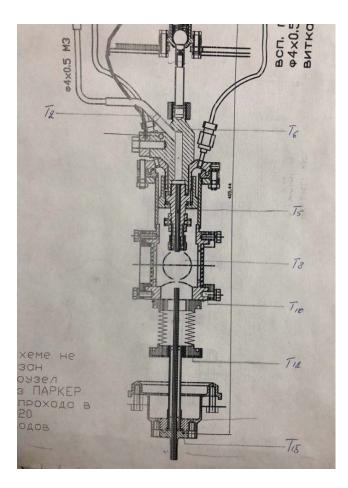


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	Property	Name	Value	Unit
$\checkmark$	Heat capacity at constant pres	Ср	385[J/(k	J/(kg·K)
$\checkmark$	Density	rho	8960[kg	kg/m³
$\checkmark$	Thermal conductivity	k	400[W/(	W/(m·
	Relative permeability	mur	1	1
	Electrical conductivity	sigma	5.998e7[	S/m
	Coefficient of thermal expansi	alpha	17e-6[1/	1/K
	Relative permittivity	epsilonr	1	1
	Young's modulus	E	110e9[Pa]	Pa
	Poisson's ratio	nu	0.35	1
	Reference resistivity	rho0	1.72e-8[	Ω∙m
	Resistivity temperature coeffic	alpha	0.0039[1	1/K
	Reference temperature	Tref	298[K]	К



**	Property	Name	Value	Unit	
$\checkmark$	Density	rho	2210[kg	kg/m³	
	Thermal conductivity	k	1.4[W/(	W/(m·	
	Heat capacity at constant pres	Ср	730[J/(k	J/(kg⋅K)	
	Relative permeability	mur	1	1	
	Electrical conductivity	sigma	1e-14[S/	S/m	
	Relative permittivity	epsilonr	4.2	1	
	Refractive index, real part	n	1.5	1	
	Refractive index, imaginary part	ki	0	1	

#### Initial temperature data

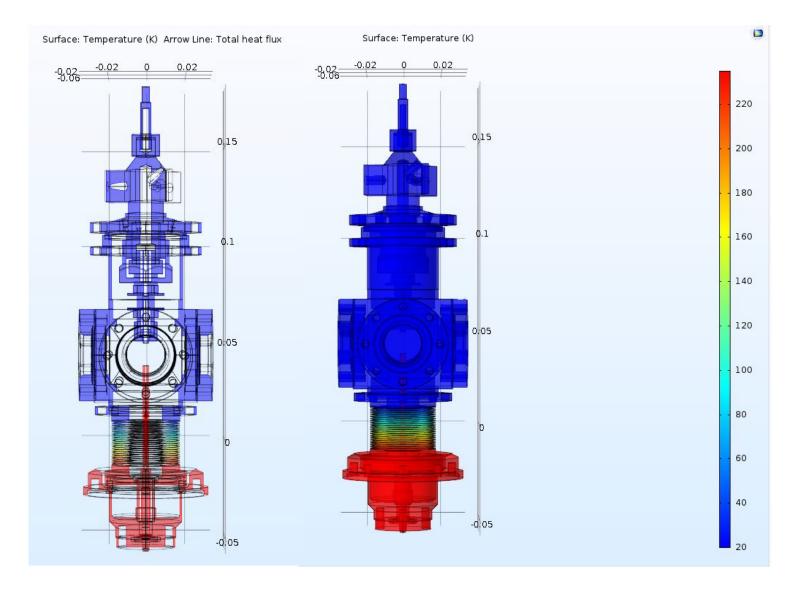


sensor layout diagram

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#### experimental data from the test 14-19

#### Calculation result



#### Results

- 1) The first test results of the program were obtained.
- 2) The great potential of this software is visible if you sort out some of the nuances.
- 3) The ability to visualize almost any physical process occurring inside the target