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Upgraded design and modeling of prototype of the lithium divertor module of KTM tokamak

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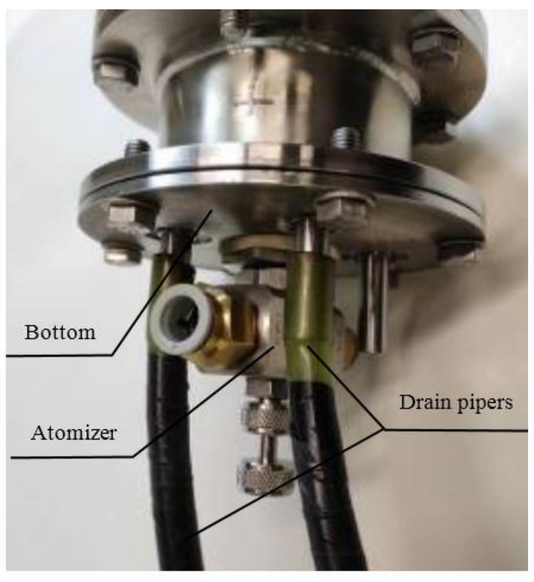
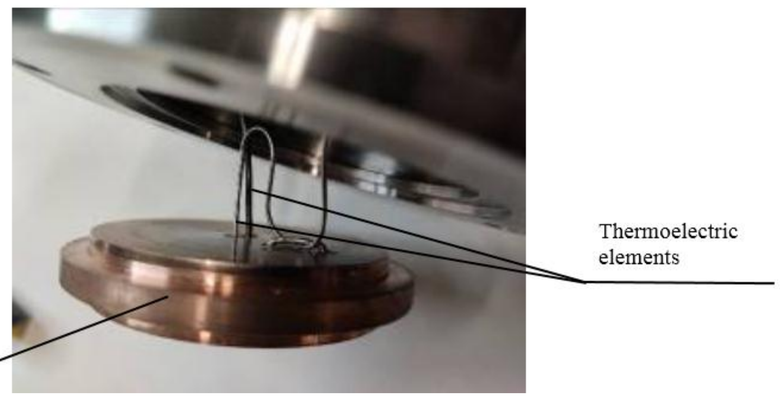
ABSTRACT

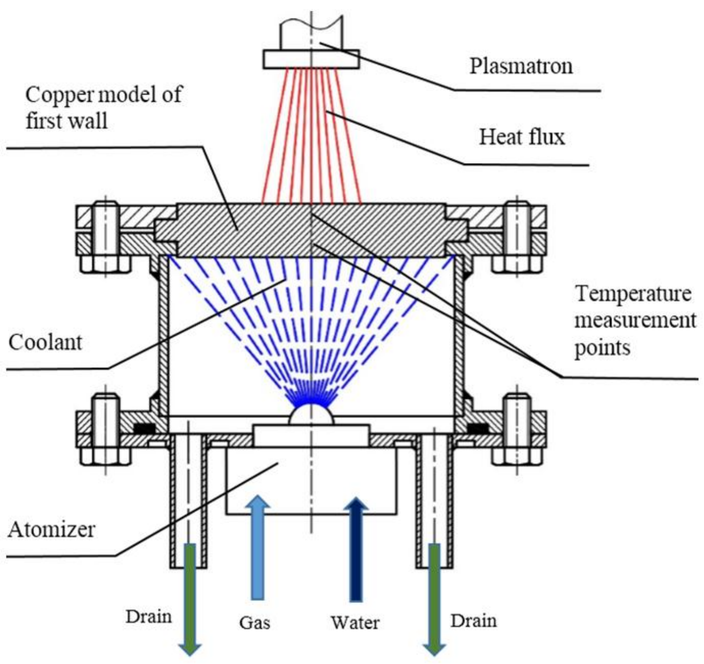
- The testing of stationary divertor modules based on a lithium capillary-porous structure is one of the directions of KTM’s studies.
- In this devices liquid lithium enclosed in a matrix of metal mesh (Mo, W-felt), which has hydraulic contact with the lithium tank (inside or outside the tokamak chamber) to renew the receiving surface will be contact with the tokamak plasma, and a finely dispersed water flow in the gas stream provide cooling receiving surface.
- The model on the basis of thick-walled copper of such a device for simulating the thermal distribution in the first wall was designed and manufactured.
- The model will be tested on a special installation based on plasmatron.
- First experiments were carried out, results are presented. The next stage of research will be completed in 2021.
- Upgraded design solution for the module of lithium divertor of KTM tokamak is presented.

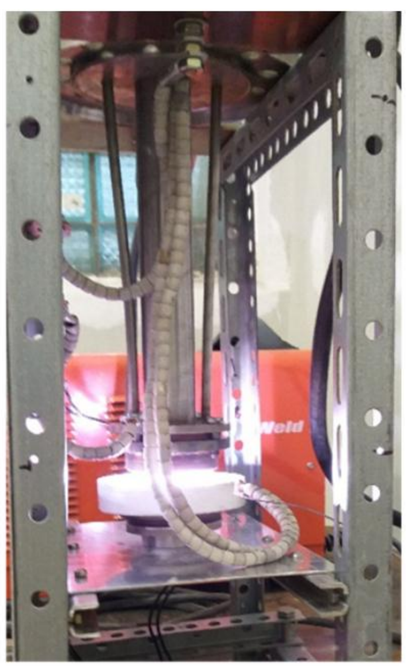
MODEL OF KTM’S LITHIUM DIVERTOR





SCHEME OF EXPERIMENT AND THE TEST INSTALLATION



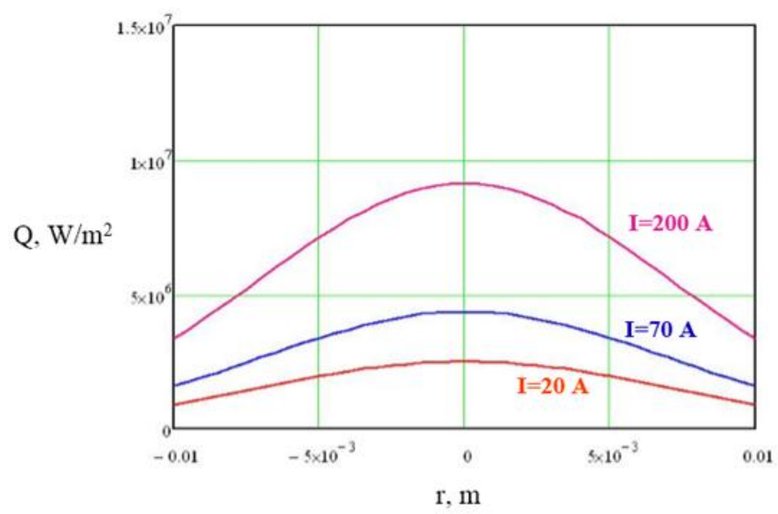


RESULTS OF THE FIRST EXPERIMENTS

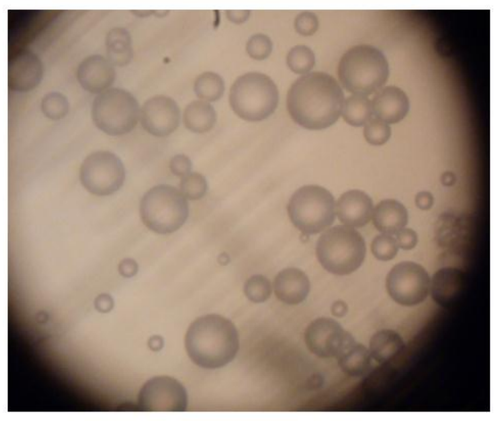
The tasks of the first stage of the experimental work were:

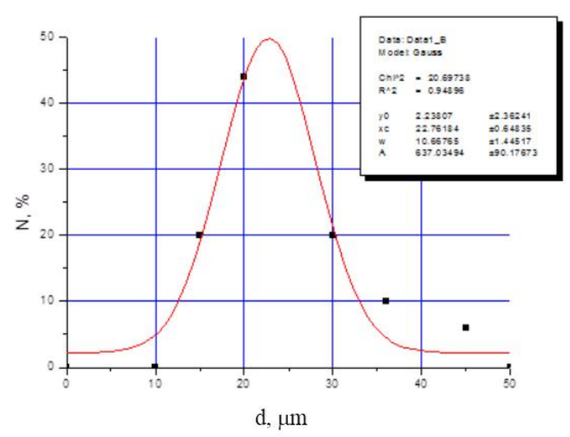
- Calibrating the heat source.
- Determining the size of the fine phase.
- Determining the optimal operating modes of the coolant component supply system.

Distribution of the heat flow’s power density over the heated object’s radius, depending on the current of the plasmatron



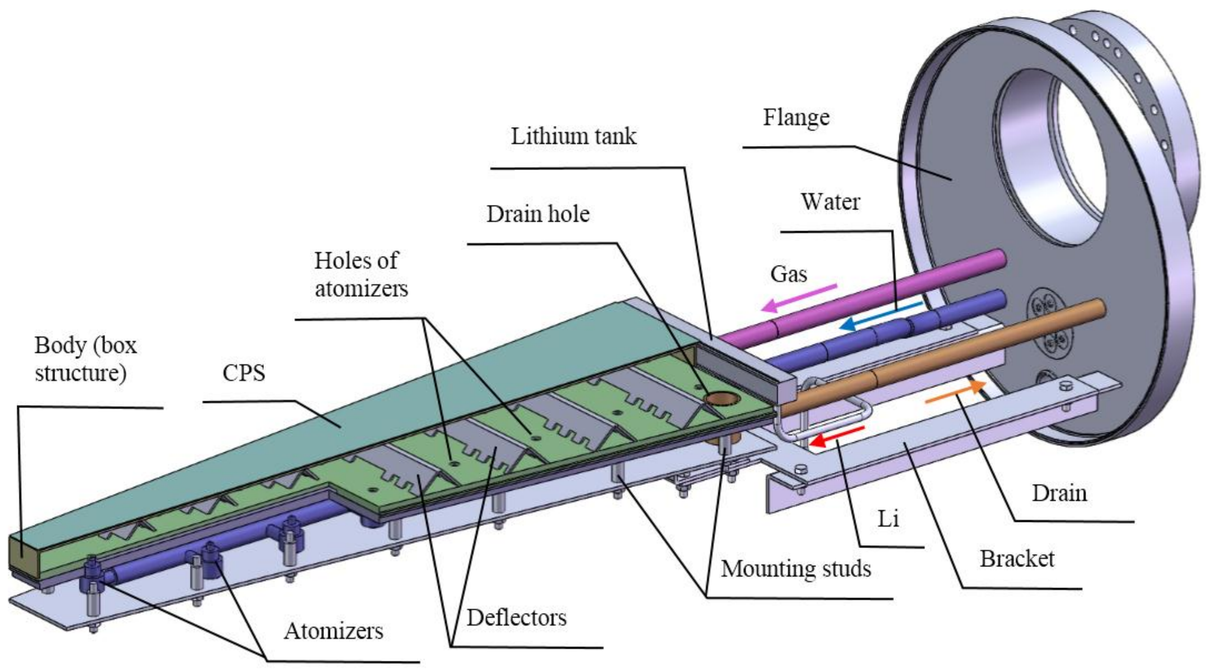
The view of the sprayed liquid’s droplets and their size distribution





Optimal mode of operation of the model’s atomizer at a heat flow of 5 MW/m^2 is achieved with the liquid phase flow rate of **22 l/h** at pressure of **1.5 atm** and the gas phase flow rate of **7 m^3/h** at a pressure of **3.2 atm**.

UPGRADED DESIGN SOLUTION FOR THE MODULE OF LITHIUM DIVERTOR OF KTM TOKAMAK



ACKNOWLEDGEMENTS

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