AN OVERVIEW OF THE FIRST EXPERIMENTAL RESULTS WITH DIVERTOR CONFIGURATION DISCHARGES IN THE KTM TOKAMAK

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The KTM tokamak is the world's first tokamak designed for a wide range of first-wall material studies for future fusion reactors, including ITER. From a plasma physics perspective, it is also a highly interesting machine.

KTM is the first tokamak in the world with an aspect ratio of 2 and, according to current classifications, the largest spherical tokamak among operating machines.

The main features of KTM include its aspect ratio of 2, the presence of a transport sluice device, and a movable divertor. The transport sluice device and movable divertor enable the replacement of divertor samples without requiring depressurization of the vacuum chamber. The basic parameters of the KTM plasma are as follows: a plasma current of 750 kA, a divertor configuration with an elongation of k=1.7, a discharge duration of 5 seconds, and a triangularity of 0.1-0.2. The nominal toroidal magnetic field is 1 Tesla. The estimated heat loads on the diverter are expected to be 10-20 MW/m2 [1,2].

The ICRH system will be utilized for additional plasma heating. The total output ICRF power is 8 MW. The KTM's ICRF heating system will be the most powerful system to date ever used in spherical tokamaks.

The KTM facility is currently in the final stages of achieving its operational parameters. The facility has been consistently brought to the operating parameters of plasma discharges [3-5]. After achieving stable discharges with a plasma current of 500 kA in a limiter configuration and a duration of up to 2 seconds [5], experiments to obtain discharges in a divertor configuration were initiated.

As a result of the work conducted at the KTM tokamak, stable plasma discharges in a divertor configuration were achieved for the first time, with a plasma current of I_{pl}=500÷700 kA and an elongation of k_{95}=1.7. Figure 1 illustrates one of the characteristic plasma discharges obtained.

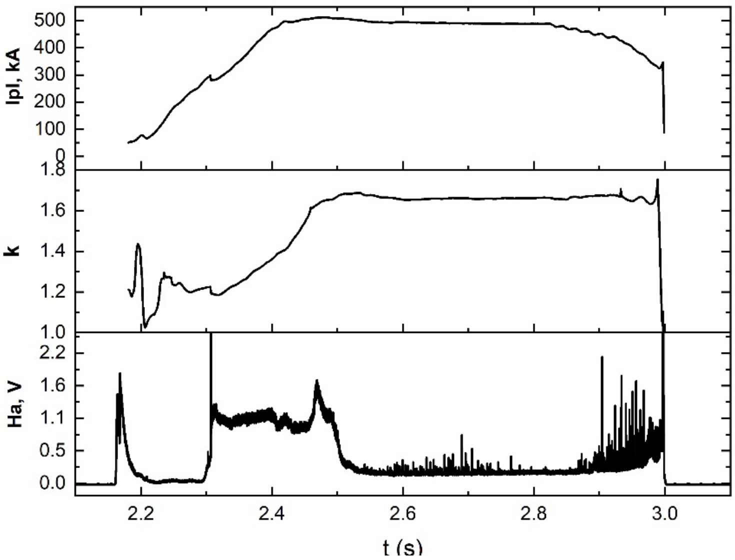
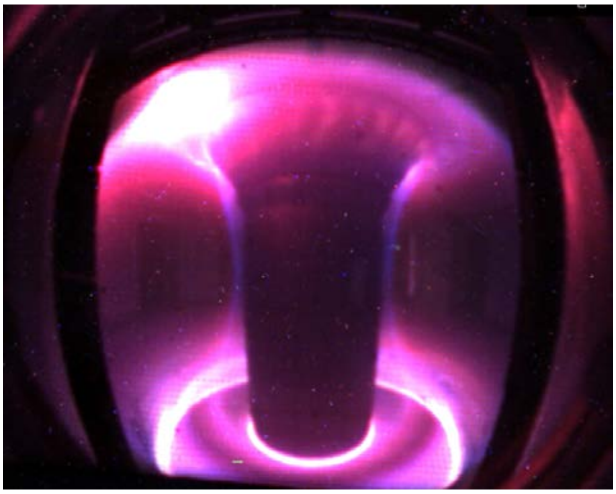
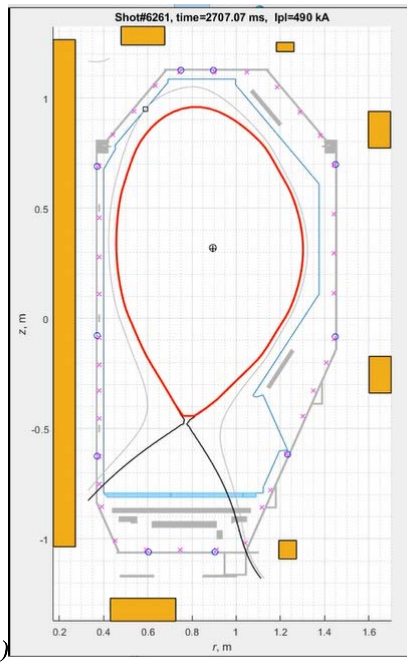


Fig. 1. Time evolution of plasma current in discharge №6261

Fig. 2 depicts an example of a video frame captured by a high-speed camera at the moment of reaching the current plateau, along with the corresponding reconstructed plasma shape at that time.



a)



b)

Fig. 2. Video frame captured by a high-speed camera (a) at the moment of reaching the current plateau, and the corresponding reconstructed plasma shape (b) in discharge No. 6261 at time t=2.707 seconds.

All experiments were conducted in the ohmic plasma heating mode, using hydrogen as the working gas. One notable feature of the discharges is the absence of any additional coatings (boronization, lithiumization) on the graphite wall. After reaching the limiting parameters of the plasma discharge under these conditions, boronization is planned.

Currently, the parameters of plasma discharges in the ohmic heating mode have been consistently increased and have approached nearly the nominal design value for the plasma current. During the experiments, data were obtained on the parameters of plasma discharges in the unique KTM tokamak facility.

This work presents the main recent experimental results on achieving an ohmic plasma discharge with a divertor configuration at the KTM tokamak, as well as the features and conditions for obtaining such discharges.

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