

A kinetic model of the behavior of ions and electrons inside the apparatus designed to measure the recombination coefficient of  $\text{H}_3\text{O}^+$  was created. This kinetic model showed what the ideal initial conditions in the apparatus would be in order to study recombination of  $\text{H}_3\text{O}^+$  in stationary plasma afterglow. The program designed to fit the development of the  $\text{H}_3\text{O}^+$  concentration was also verified. The program was tested whether it would be able to fit the recombination coefficient with sufficient accuracy. This program was also tested on data that was artificially edited adding normally distributed noise. Furthermore, calibration measurements of the water source were performed, using cavity ring-down spectroscopy. This measurement verified whether we were able to get the required amount of water into the apparatus. The measurements were performed at three different pressures, at each of which we were able to receive enough water from the source to the apparatus so that the measurement could proceed well according to the kinetic model.