A waveguide-based microwave plasma system was built using a resonant cavity and a quartz tube. 2.45 GHz 850 W magnetron was used to obtain helium discharge without an igniter. The temporal images of discharge were recorded on microsecond time scales using an intensified charge-coupled device camera. The excitation temperature was calculated as 3385 K using the helium lines, which were obtained from emission spectrum of the discharge. The gas temperature was measured as 1208 K by a thermocouple.