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Optimization of Plasma Parameters for Etching of Superconducting Radio Frequency Cavity surfaces in an Ar/Cl_2 RF plasma JANARDAN UPADHYAY, SVETOZAR POPOVIC, LEPSHA VUSKOVIC, Old Dominion University, LARRY PHILLIPS, ANNE-MARIE VALENTE- FELICIANO, Thomas Jefferson National Accelerator Facility — Superconducting radio frequency cavities of bulk Niobium are integral components of the particle accelerators based on superconducting technology. The impurities, surface defects, and surface roughness are the main obstacles for a better RF performance of these cavities. At present, we study RF plasma in Ar/Cl_2 atmosphere for plasma etching to prepare the inner surface of such cavities. We describe the electro-optical probe for radiation and particle diagnostics of the discharge. Multiple electro-optical probes for simultaneous measurements of the plasma properties at different points inside the cavity are being developed. The variation of spatial distribution of plasma properties with frequency and power of the RF power supply are measured. The optimized frequency and power regime suitable for etching of elliptically shaped single cell cavities will be selected. The etching results for samples placed on the cavity contour will be presented.

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