

Towards fracture toughness measurements of MPA CVD diamond in nuclear fusion devices

G. Aiello¹, P. Estebanez², B. Gorr¹, A. Meier¹, S. Schreck¹, T. Scherer¹, D. Strauss¹, C. Wild³, E. Woerner³

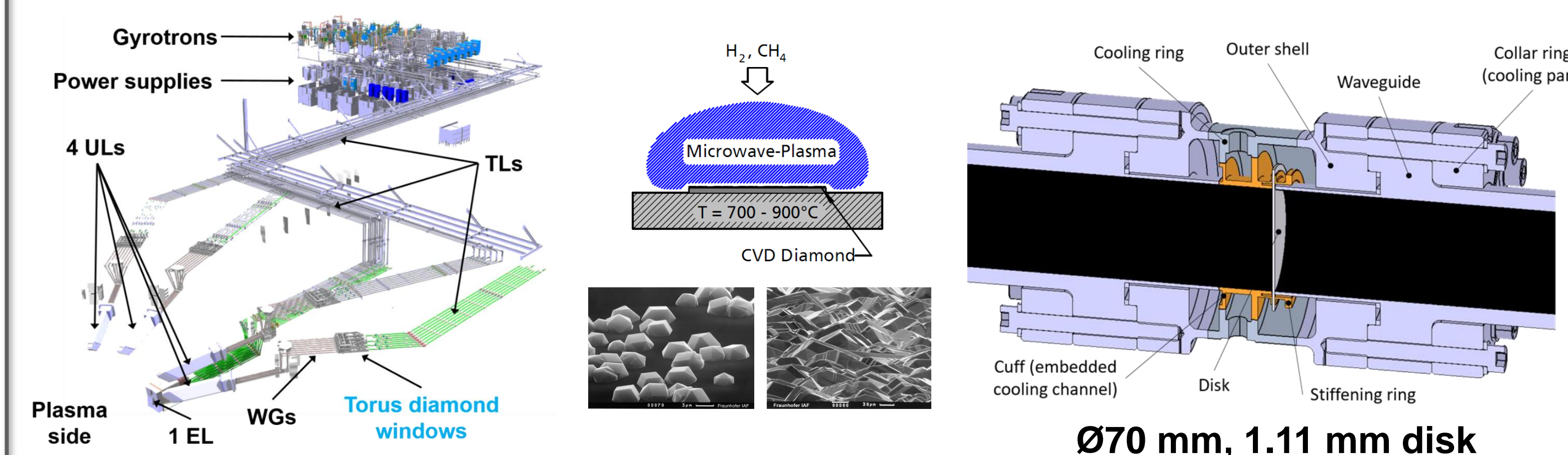
¹Karlsruhe Institute of Technology (KIT), Institute for Applied Materials, 76131 Karlsruhe, Germany

²Fusion for Energy, 08019 Barcelona, Spain

³Diamond Materials GmbH & Co. KG, 79108 Freiburg, Germany

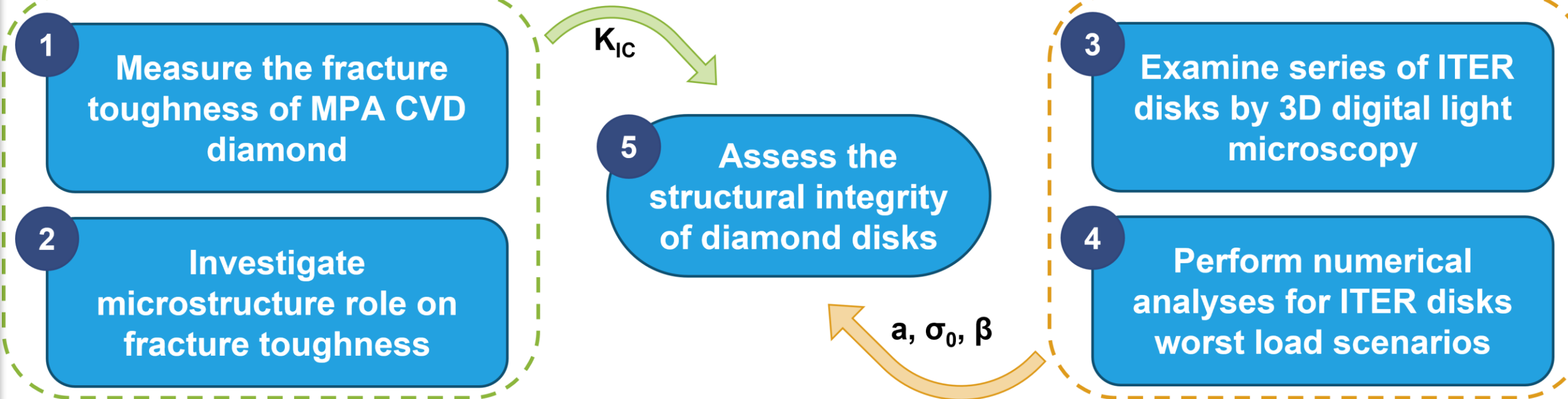
Motivation

Failure to fracture is the main failure mode for the diamond disks

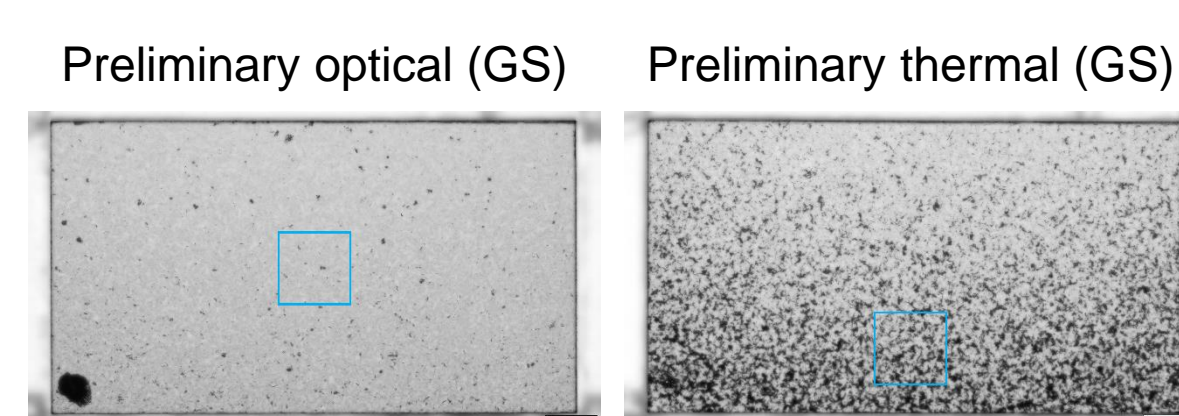
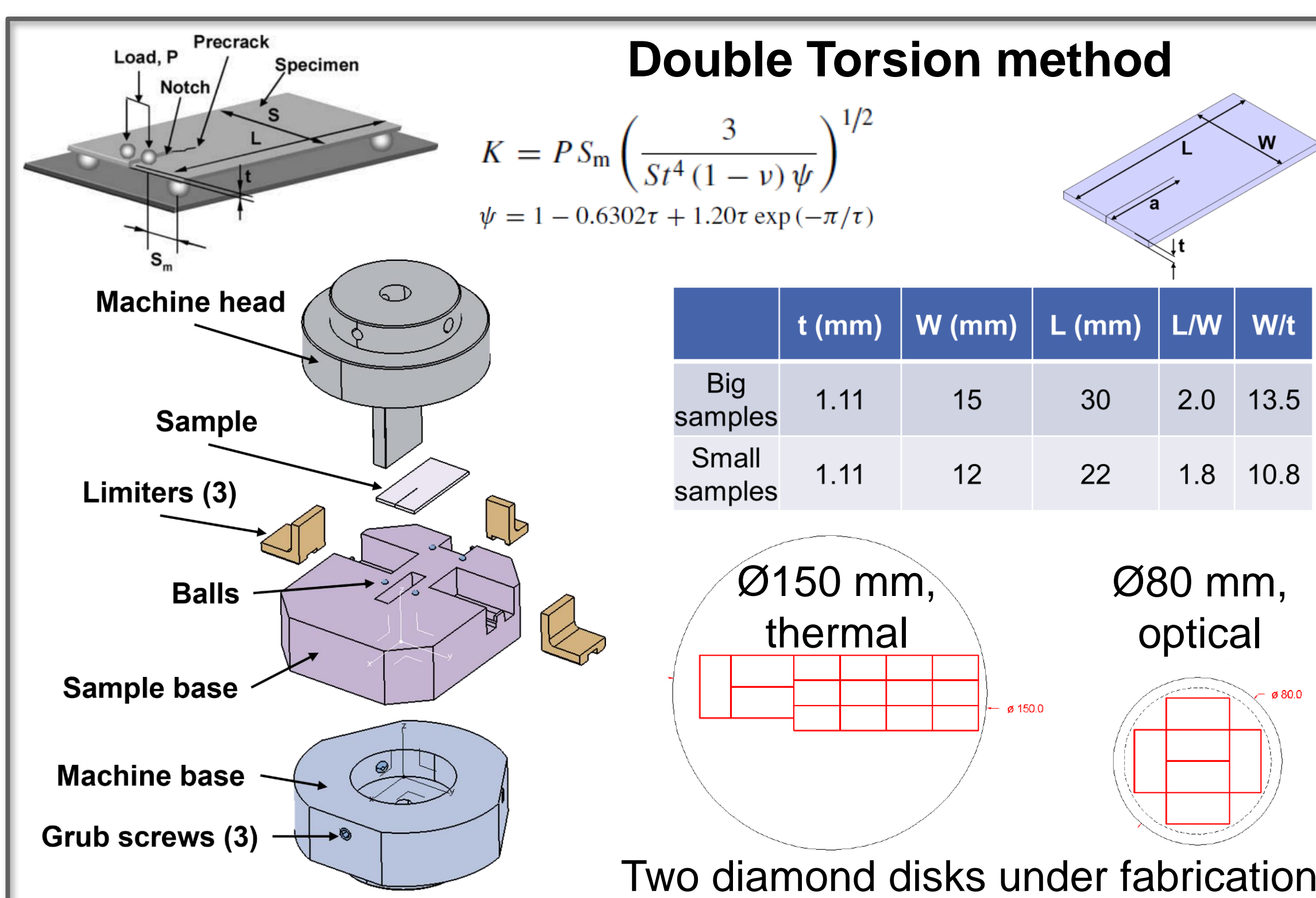


Objectives

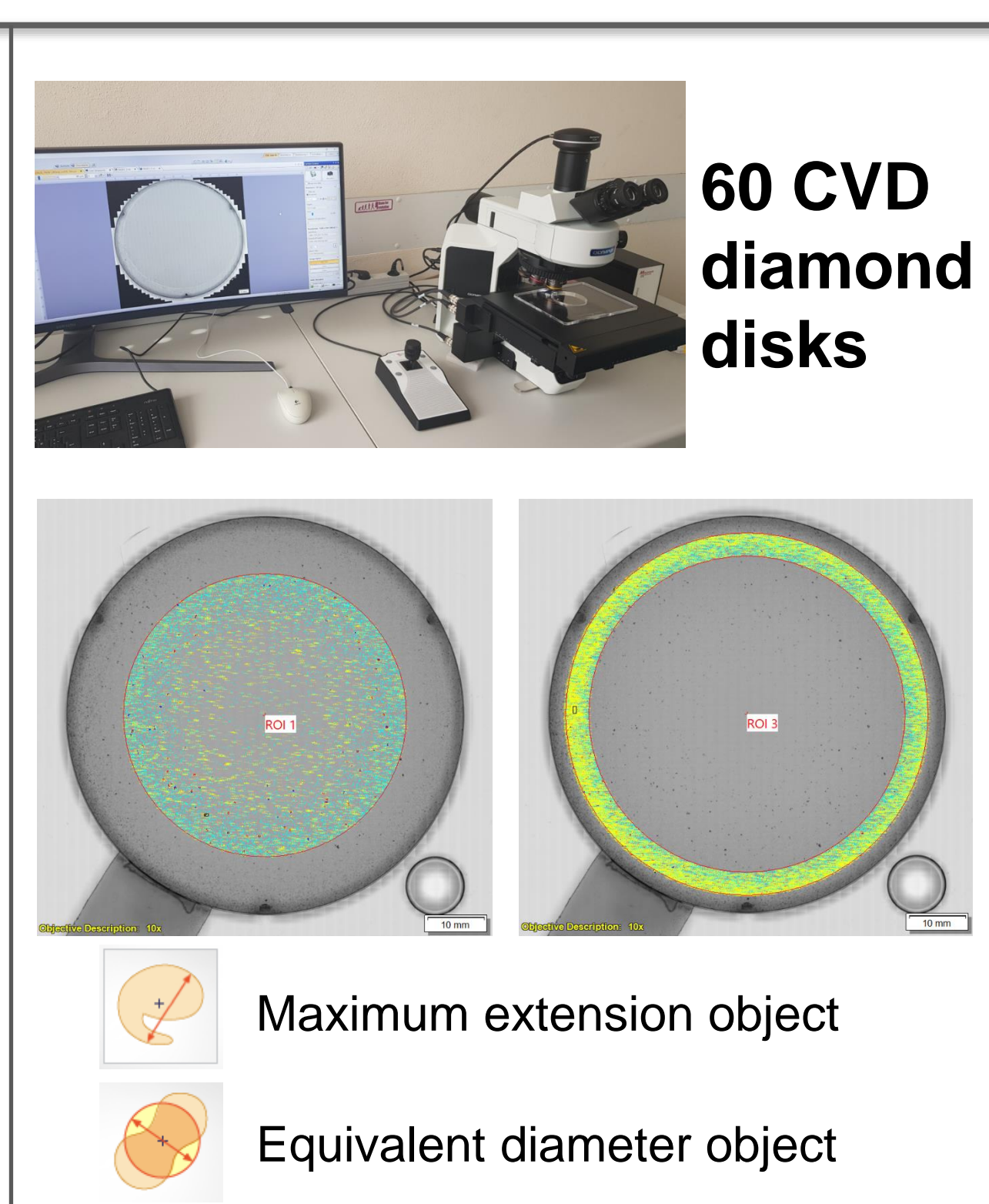
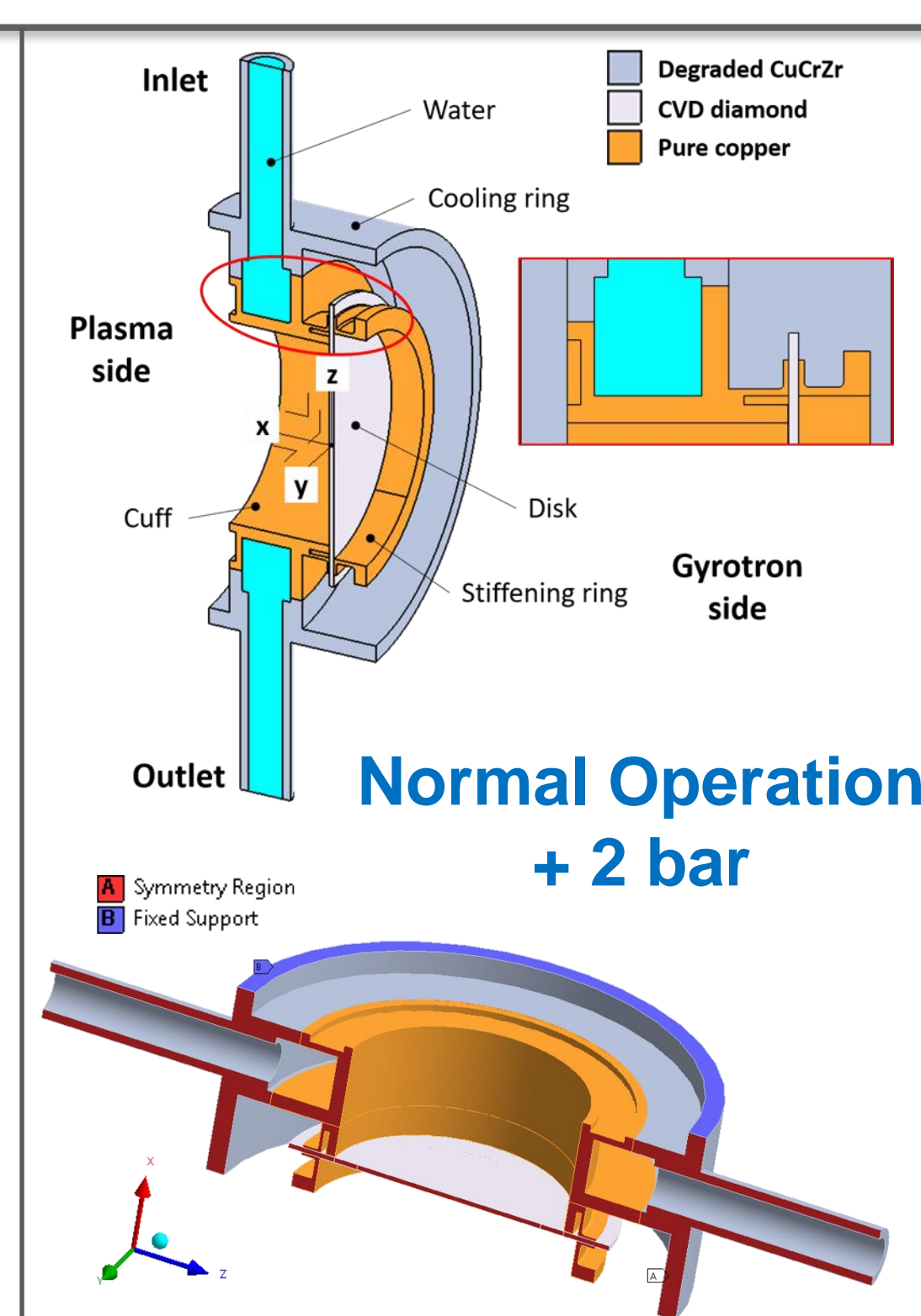
- $K_I = \beta \sigma_0 (\pi a)^{1/2}$, stress intensity factor
- $K_I < K_{IC}$, no crack propagation occurs



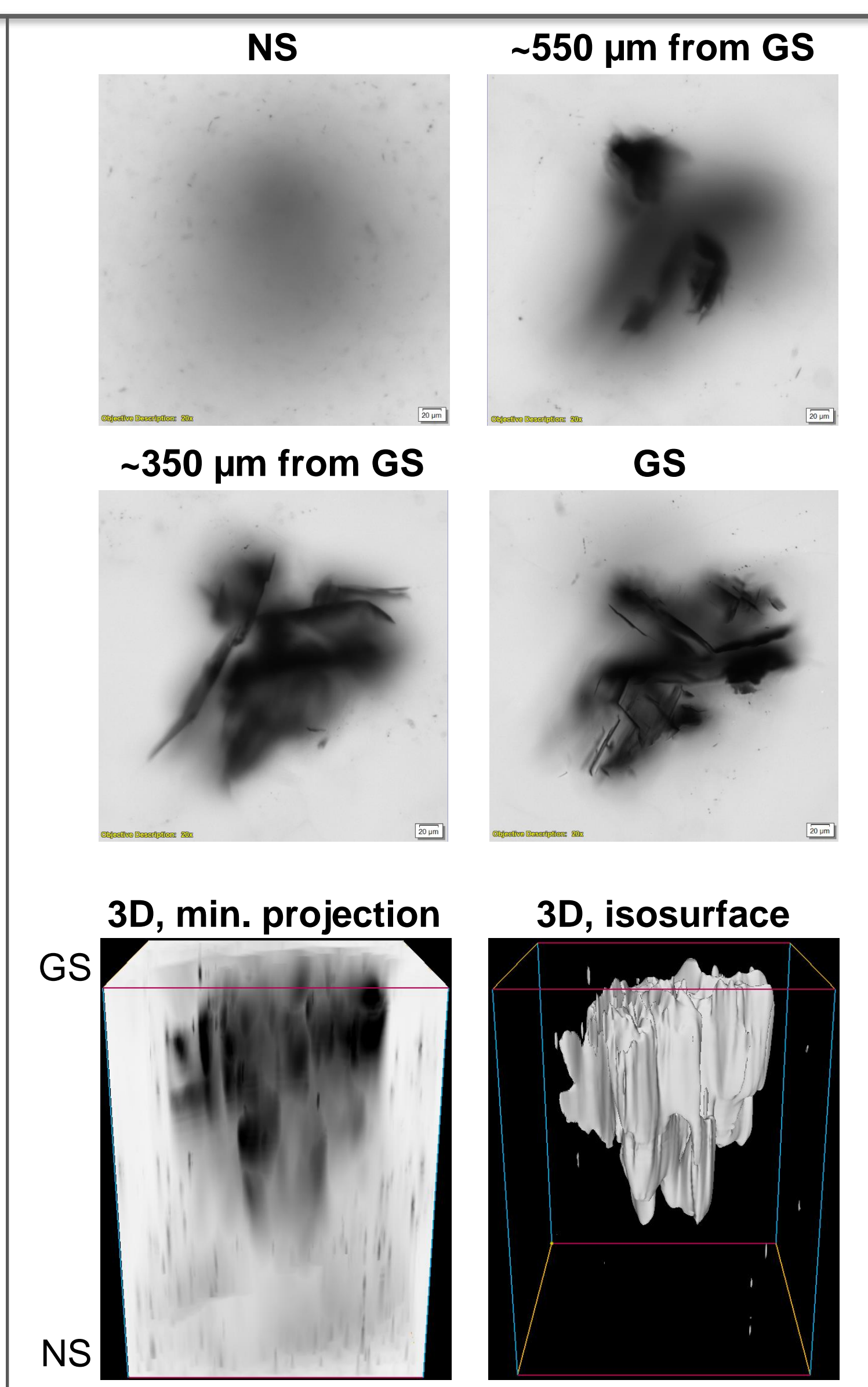
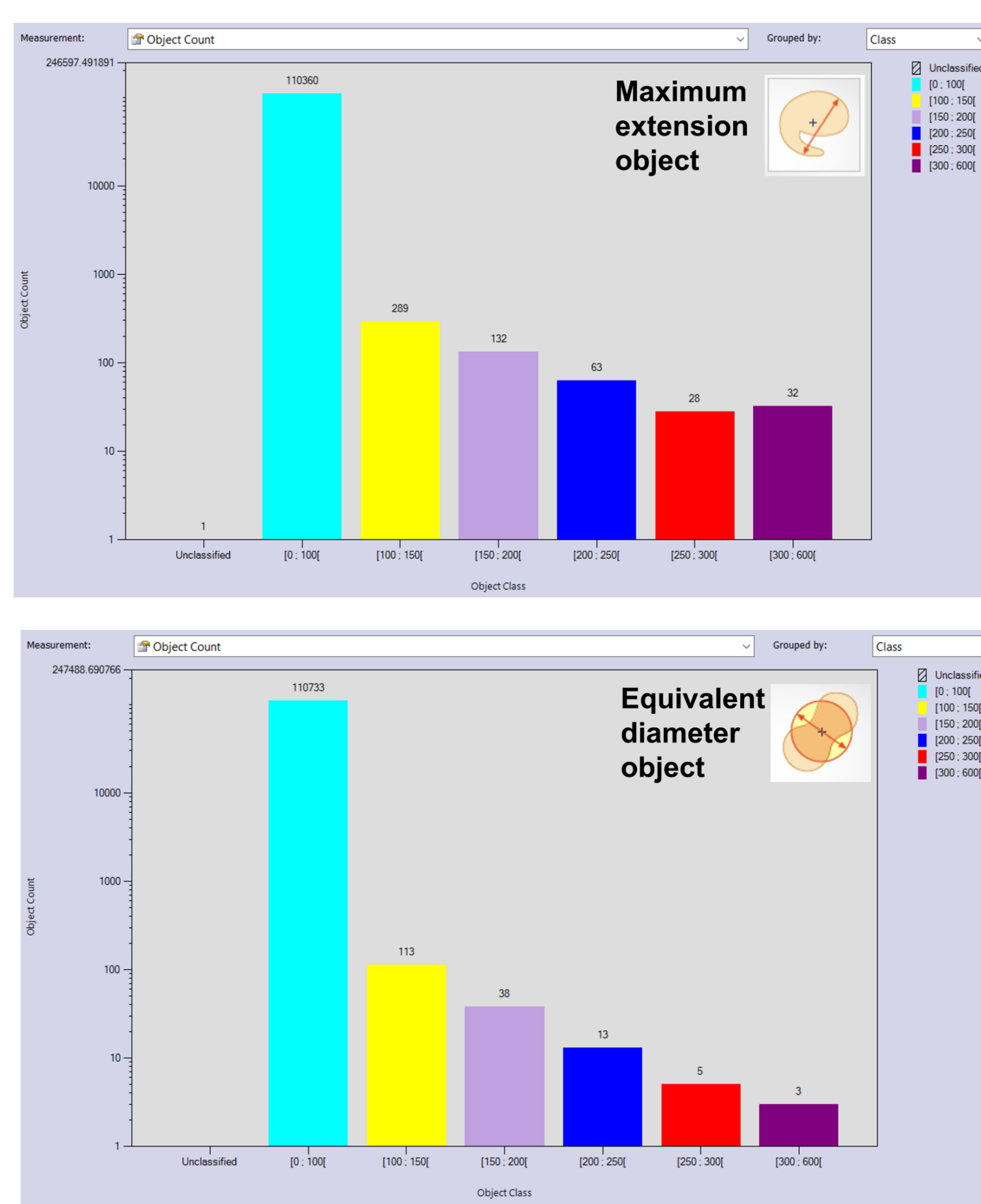
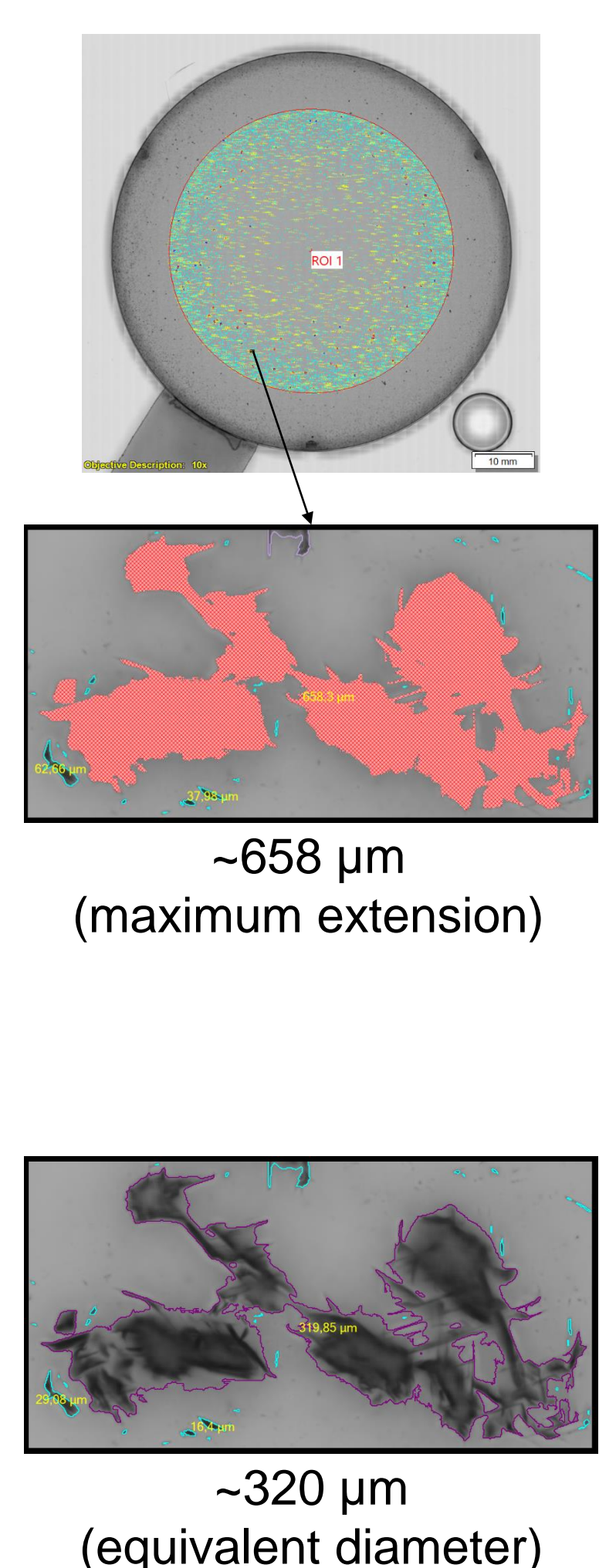
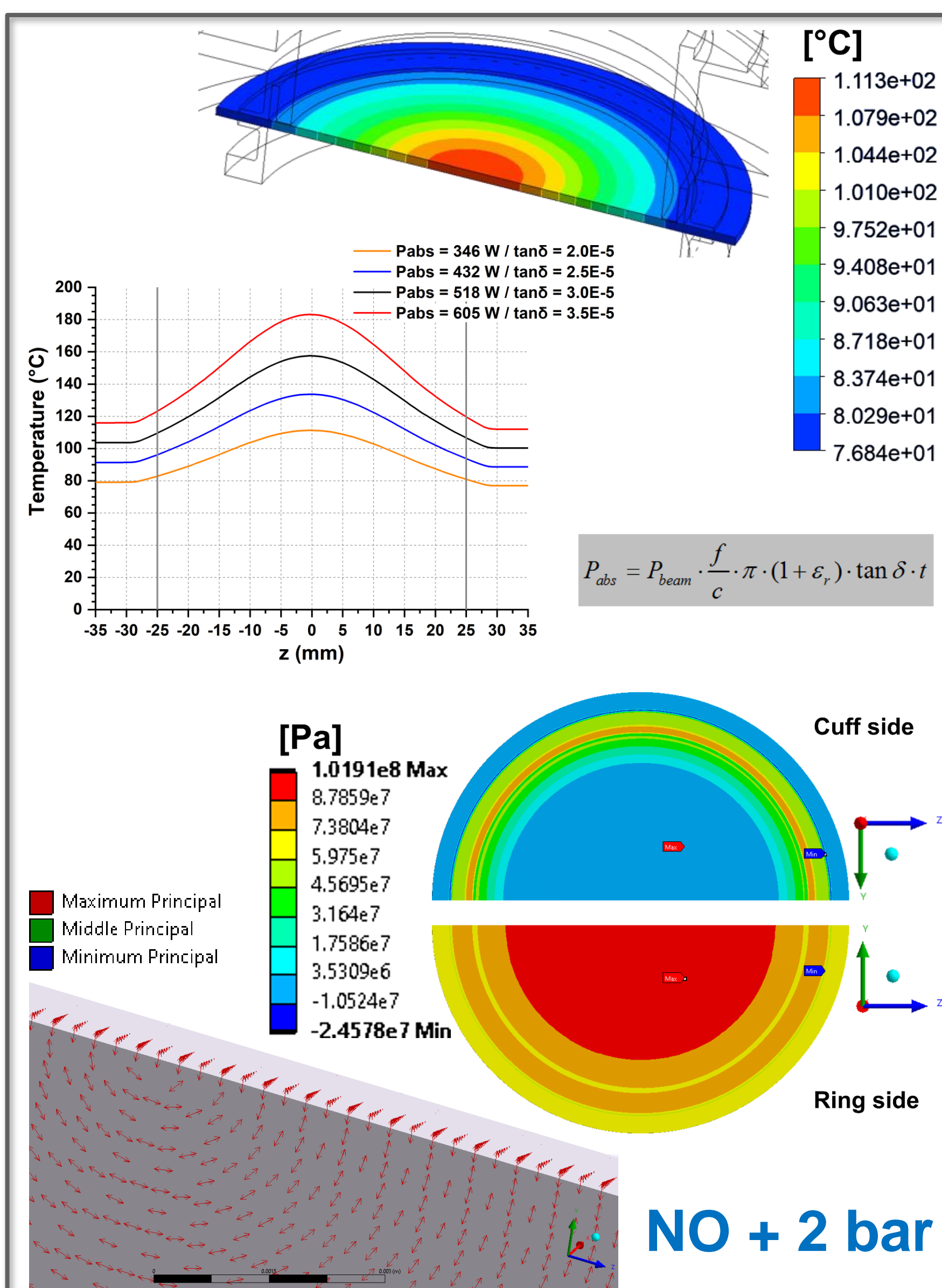
Approach



- EBSD
- XRD
- Raman
- Auger
- Pillar splitting



Results – Status of work



Outlook

- Loss tangent measurements on the two disks
- Characterization of the diamond samples to fracture
- Carry on microscopy activity on 60 ITER diamond disks
- Carry on experimental setup design for manufacturing