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# 4.35 Simulation of the beamline thermal measurements to derive particle beam parameters in the ITER neutral beam test facility

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Injection of high energy neutral beam particles will be used in the ITER experiment for plasma heating and current drive. In a ITER heating beam injector, 40 MW electrostatically accelerated negative beam will be neutralised and filtered along the beamline obtaining a nominal 16.5 MW neutral beam power to be injected in the tokamak plasma or intercepted during conditioning and commissioning. The beam will heat the active panels of the beamline components with up to 13 MW/m2 surface power density and 18 MW power. These extreme conditions require testing in a ITER full scale neutral beam test facility under construction in Padova where the temperature of the beamline components will be monitored by 600 embedded thermocouples for protection against critical conditions, for recognising beam conditioning, and for deriving beam parameters. Power density maps of the expected beam-component interactions are applied on a non-linear finite element model of the entire beamline to simulate maps of surface temperatures. Such thermal maps are analysed to derive the beam parameters during operation: divergence of 3-7 mrad, misalignment of 2 mrad, and non-uniformity of 10%. The sensitivity of the temperature measurements is discussed considering a 10% fraction of the nominal beam power.

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