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# Development of off-axis beamline for KSTAR

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Present 6 MW NBI system is one of the important heating device in KSTAR. In 2016 campaign, the system contributed to high betaN, and almost steady-state operation of 78.3 seconds. In addition to the present system, the KSTAR has plans to enhance heating and current drive. For this plan, one more 6 MW NBI system will be installed in 2017, and will be operated from 2018. Two of three ion sources are for an off-axis current drive, and the other one is for an on-axis current drive. The target operating pulse duration is 300 seconds. The neutral power of each ion source is 2MW. The vertical slant angle of the off-axis ion source is 5.5 degree, and the beam tangency radius is 1.56 m from the axis of the tokamak. The beam size at the ion source exit grid is 450mm×130mm. The beam comprises 280 beamlets, and the partial beamlets are focused at 10 and 12 m vertically and horizontally, respectively, from the ion source in order to increase the beam transmission efficiency. A beam transport characteristic has been predicted with beam transport code. The code can simulate neutral beam transport, loss, ionization, and heat load of beamline components. The heat load was calculated assuming that the fractional energy current fraction of the neutral beam is 8: 1: 1(full energy: half energy: third energy). The transmitted beam powers were 2.14 MW of full energy, 0.134MW of half energy and 0.095MW of third energy. Total injected neutral beam power would be 2.284MW, and total transmission efficiency was estimated to be 84.1%. The peak loaded beam density on the whole beam line components except a residual ion dump and a calorimeter was below 4MW/m2. The highest residual ion beam load onto a full energy dump was expected to be 6.7 MW/m 2. The designed calorimeter is a hinged door structure. When the calorimeter was closed, the peak loaded beam power density was 6.49MW/m2. These results satisfy critical heat flux of hypervapotron, > 10MW/m2. Based on these results, the beamline components of new NBI system is being manufactured.

## Eligible for student paper award?

No

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