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## P2.131 Reviewed design of the high heat flux panels for the AUG and W7-X neutral beam calorimeter

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Each of the neutral beam injectors in the experimental devices ASDEX Upgrade (AUG) and Wendelstein-7X (W-7X) can be equipped with up to four positive ion sources with a neutral beam output power of 2.5 MW each. For the conditioning of the system, a movable calorimeter is placed in the path of the neutral beam to dump the heat load. The core of the calorimeter consists of a set of so called calorimeter panels (CP), six for each beam, arranged in defined positions and tilted with respect to the beam axis in order to spread the heat flux density from  $\sim 70 \text{ MW/m}^2$  to a limit below  $25 \text{ MW/m}^2$ . The CPs are made out of CuCrZr for its high thermal conductivity together with excellent mechanical strength at higher temperatures. They are intensively water cooled with a mass flow of 3 kg/s each, through a net of many small channels.

The design, originally from 1988, specified the lifetime of the CPs to 25000 heating cycles and discarded deformation due to thermal cyclic loading. This was predicted with the tools available at the time but the experience shows unexpected plastic deformation effects from the beginning. After some years of operation evidence of fatigue is observed. This has led a few times in the past to fatal water leaks and consequently to costly NBI system shutdown for repair. For that reason, careful inspection of the CPs is performed at every maintenance phase and damaged CPs are exchanged for new ones.

The causes leading to the failure and an optimized panel design are presented in this work. The new design aims at minimizing fatigue from thermal cycling by reducing thermal effects, improving material properties and increasing the flexibility of the panel.

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