

Cryogenic distribution for FCC-hh

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The Future Circular Collider (FCC), with of about 86 km circumference, will be the largest particle accelerator ever constructed. Such a scale entails numerous problems, many of which have never been faced before. One of them is a considerable growth in the length of cryogenic distribution lines. In case of the FCC the maximum length for the distribution line is considered as 8.4 km, what is almost 3 times higher than for presently the longest, LHC distribution lines. During the gas flow through such a long process lines flow pressure drops is an issue. In order to reduce losses caused by pressure drops the process lines sizes or helium pressure must be increased. In case of thermal shield supply and return headers the pressure increase has no influence on the thermal shield cooling process, thus for FCC it is considered to increase the helium pressure from 20 bar, what is currently used in state-of-art transfer lines, to 50 bar. Due to pressure increase mechanical supports and vacuum barriers of the process headers need to be more massive, what will result in higher heat fluxes to the headers.

The talk presents three design options for the straight section of the FCC cryogenic distribution system. The designs will be compared in view of the heat fluxes to the process header for 20 bar and 50 bar helium pressure in the thermal shield cooling circuit as well as in view the system reliability. Recommendation of the final cryogenic distribution system design will be done.

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