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## SuperKEKB IR upgrade idea with Nb<sub>3</sub>Sn quadrupole magnets

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The SuperKEKB IR is designed to achieve extremely small vertical and horizontal beta functions at the IP. Superconducting magnets provide the focusing magnetic field required to squeeze down the beta functions. The Belle II detector solenoid field is fully compensated with the superconducting anti-solenoids on each side of the IP. For further luminosity improvement, an upgrade of the superconducting final focus quadrupole magnets is required; a new canceling scheme for the Belle-II solenoid field, based on new anti-solenoids, is to be implemented.

The design concept of the new IR is to make the beam trajectory as parallel to the QC1 magnet axis as possible to cancel the X-Y coupling and chromaticity between the IP and QC1s and minimize vertical emittance by redesigning the anti-solenoid profile. Moving QC1P closer to the IP results in an increase in the required field strength and current density. Nb<sub>3</sub>Sn is selected as the cable material instead of the present NbTi. While superconducting properties are better, Nb<sub>3</sub>Sn magnet fabrication is quite difficult because of the brittleness of the material. New IR design idea and the technical challenges of the new IR magnets are described.

### Footnotes

### Funding Agency

### Paper preparation format

Word

### Region represented

Asia

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