Linear Coupling Resonance Correction of the J-PARC Main Ring

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To reach higher beam power, a linear coupling resonance [1, 2] in the J-PARC Main Ring (MR) should be corrected. The resonance is caused by alignment error of quadrupole magnets and vertical closed orbit distortion in sextupole magnets. To reduce the resonance effect, four skew quadrupole magnets have been installed at front and end of straight sections for injection and fast extraction as shown in Fig. 1.

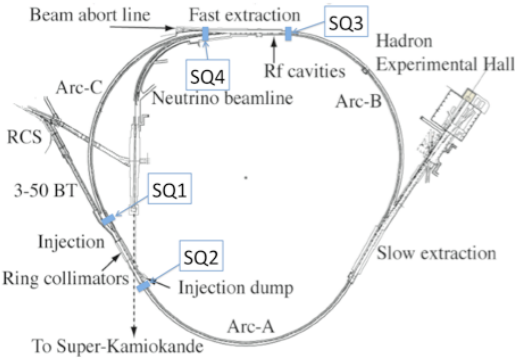

Fig. 1: Locations of skew quadrupole magnets in the MR

Before manufacturing the skew quadrupole magnets, strength of the resonance was measured by scanning vertical local bump at sextupole magnets. With the measurement, required properties of the skew quadrupole magnets had been fixed.

As the first step for correcting the resonance, the MR operating tune was set on the resonance to observe the beam loss, and then we searched good operating currents of the skew quadrupole magnets without accelerating (3GeV DC mode at injection energy). For the next step, the MR was switched to acceleration mode up to 30GeV, and the good operating patterns of the magnets were found successfully.

In this paper, design and field measurement of the skew quadrupole magnets, simulated results of the linear coupling resonance, and results of beam study will be shown.

References

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