Contribution ID: **882** Contribution code: **WEPS007** Type: **Poster Presentation**

Measurement of coherent synchrotron frequencies under conditions close to the Robinson limit at the Aichi Synchrotron Radiation Center

Wednesday 4 June 2025 16:00 (2 hours)

Past measurements* of coherent synchrotron frequencies at the Photon Factory storage ring revealed that the behavior of measured coherent frequencies could not be well explained with standard 4th-order characteristic equation under conditions close to the Robinson limit. To investigate whether similar phenomenon occurs in other storage rings, we measured the coherent synchrotron frequencies at a 1.2-GeV electron storage ring of Aichi Synchrotron Radiation Center as a function of the cavity voltage and the beam current. At beam currents higher than about 200 mA, we observed double peaks, one with a frequency higher than the incoherent synchrotron frequency and one with a lower frequency, that can correspond to two independent solutions of the 4th-order characteristic equation. Our preliminary analysis indicated that the frequencies of lower-frequency peak did not agree well with those predicted by the characteristic equation. We also observed that under a condition very close to the Robinson limit, the beam exhibited strong longitudinal coherent self-excited oscillation without beam dump. We present these measurement results and updated analysis.

Footnotes

- T. Yamaguchi et al., Phys. Rev. Acc. Beams 26, 044401 (2023).

Paper preparation format

Word

Region represented

Asia

Funding Agency

This work was supported by JSPS KAKENHI Grant Number JP24K15602.

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Session Classification: Wednesday Poster Session

Track Classification: MC5: Beam Dynamics and EM Fields: MC5.D06 Coherent and Incoherent Instabilities Measurements and Countermeasures