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Future Circular Collider and Next Generation Light Sources

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The e+/e- Future Circular Collider (FCC-ee) is currently favoured as the most likely next flagship collider project to follow on from the Large Hadron Collider (LHC) at CERN. At 90-km in circumference, FCC-ee aims to reach unprecedented luminosity. At the same time, the Accelerator Physics group at the Australian Synchrotron is currently developing a new, next generation synchrotron light source design called AS2, which will achieve orders of magnitude greater brilliance X-rays for the user community.

Despite different aims, AS2 and FCC-ee have many traits in common. Both high-performance machines have ultra-low emittance electron storage rings, needing impressive beam control and novel optics correction schemes. A challenge facing both machines, AS2 and FCC-ee, arises from the far greater sensitivity to small misalignment and field errors. We need to determine how to steer and control the beam properties, particularly during the early stages of commissioning before initial corrections and calibrations have been applied.

Figure 1: FCC and LHC positioning, near and around Geneva, Switzerland. Image: CERN.

Student Opportunities:
This research project will involve theoretical and computational beam dynamics studies, with the opportunity to gain hands-on experience contributing to machine studies at the Australian Synchrotron. This project also involves close collaboration with colleagues at CERN, working with members of the FCC collaboration.

Previous experience in Accelerator Physics is not necessary, as this area of physics is rarely covered in undergraduate degrees. Interest in electromagnetism, applied physics, and/or computational physics, would be beneficial. PhD students receive training and supervision in Accelerator Physics, with the opportunity to attend international accelerator schools and conferences.