

## Front End Development for APS Renewal Over the Next Five Years

APS was originally built with standard front ends (version 1.2) for each of the original twenty sectors. Over the years, new designs were created for specific purposes: version 1.5 undulator only front end for higher stored beam current, canted undulator configuration (CU) and High Heat Load (HHL) for dual collinear undulators. As APS evolves, new designs will be developed for specialized insertion devices and experiments. The driving factors for new designs are the total power of the x-ray beam from the chosen insertion devices, the power density at the location of masks and absorbers, the horizontal separation and vertical divergence of the x-ray fan(s) and the desired front end exit opening aperture (windowed or windowless). A number of new front end designs for beamlines currently under design or consideration will be developed over the next 5 years. These include the front end for the IEX beamline at sector 29, a specialized front end for superconducting crab cavities for picosecond timing, and a front end for a short-period superconducting undulator. All new front end designs will be required to be able to absorb the x-ray thermal load from up to 200 mA of stored beam. One mrad separation for canted beams will remain the practical limit without substantial modification of the storage ring. Some ability to accommodate higher x-ray thermal loads than current designs may be possible. R &D to develop new materials and methods of dissipating these thermal loads is ongoing.

Science teams anticipating requirements that diverge from the standard capabilities of current generation front ends are encouraged to contact Patric Den Hartog, Mechanical Engineering and Design Group Leader, to discuss their needs.

### Thermal Capacity of Current Designs for APS Front Ends

FE Type	Total Power (kW)	Power Density (kW/mrad <sup>2</sup> )
Version 1.2	6.9	198
Version 1.5	8.9	245
CU	20	281
HHL	21	590