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## Use of two- and three-dimensional magnetic measurement data to refine the APS upgrade model

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The Advanced Photon Source (APS) has recently installed and begun commissioning of a hybrid seven-bend-achromat design to replace the original storage ring. The APS Upgrade lattice includes two types of longitudinal-gradient dipoles, five types of transverse-gradient dipoles, and five types of high-strength quadrupoles. All of these magnets were designed\*\* using three-dimensional magnetic models, the results of which were used in lattice development. After construction of the magnets, various types of two- and three-dimensional field maps were measured. We describe the uses and limitations of these measurements to refine the model prior to commissioning, and indicate what, if anything, commissioning experience tells us about the success of our efforts.

### Footnotes

- L. Farvacque et al., IPAC13, 79 (2013). \*\* M. Borland et al., IPAC 18, 2872 (2018). \*\*\* M. S. Jaski et al., IPAC 15, 3260 (2015).

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