Conceptual Design for a superconducting planar helical undulator

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Demands for Helical Undulator

- Circular polarization
- High brightness
- Low on-axis power density
- Higher photon energy
- Wider tuning range
- Larger gap (beam stay-clear)
Planar device

Period length: 26 mm, $j = 1$ kA/mm$^2$, Gap = 8 mm
Workshop on Superconducting Undulators and Wigglers @ ESRF
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Tilted planar device

Period length: 26mm, $j = 1\, \text{kA/mm}^2$, Gap = 8 mm

Need to boost horizontal field

Workshop on Superconducting Undulators and Wigglers @ ESRF
Crotalus Horridus
Poisonous Snake in North America
Snake-Coil CPU

Workshop on Superconducting Undulators and Wigglers @ ESRF
Period length: 26 mm, $j = 1$ kA/mm$^2$

- Gap=8 mm, Peak field = 0.504 T
- Gap=6 mm, Peak field = 0.695 T

Workshop on Superconducting Undulators and Wigglers @ ESRF
Conclusions

- Circularly polarized radiation from planar device
- Wide horizontal aperture
- Compatible with (or larger field than) a permanent magnet device
- No radiation damage
- Fixed helicity
- Difficulty of coil windings
- Need further improvements