



Development of the Next Generation Superconducting Undulators (SCU)

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Purpose of the Project

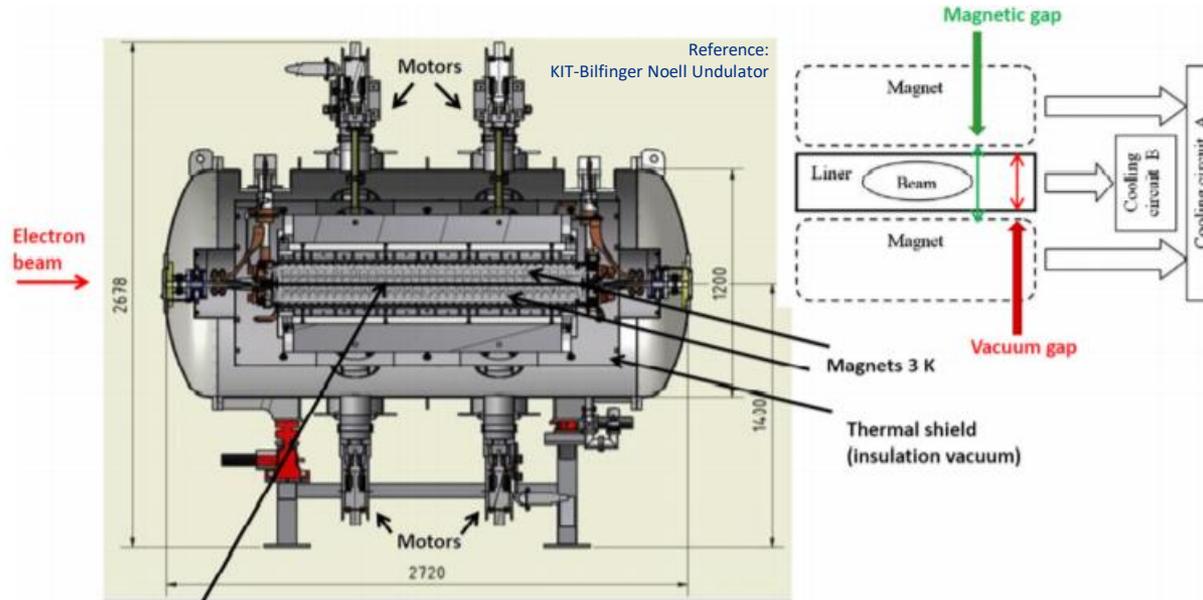
Goals of the SCU program at FNAL

- Increase the SCU performance in terms of intensity of the radiation (x-rays) produced.

My goal

- Design the part of the SCU that allows switching winding direction between adjacent coils. Thus change the direction of the electrical current in the high temperature superconducting tape or low temperature superconducting strands used to wind the coils.

What is an Undulator?



- An undulator is an insertion device that consists of a periodic magnetic structure. The static magnetic field generated along the axis of the device forces electrons to oscillate and thus radiate energy.
- Superconducting undulators typically operate at 4 K, this temperature is reached and maintained by means of cryocoolers.

Three Different Superconductor Topologies

- LTS round strand: NbTi, Nb₃Sn
- LTS rectangular strand: NbTi, Nb₃Sn
- 2G HTS reBCO Tape

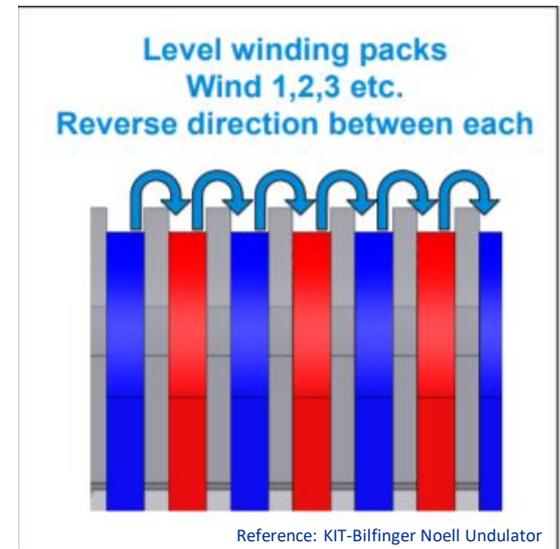
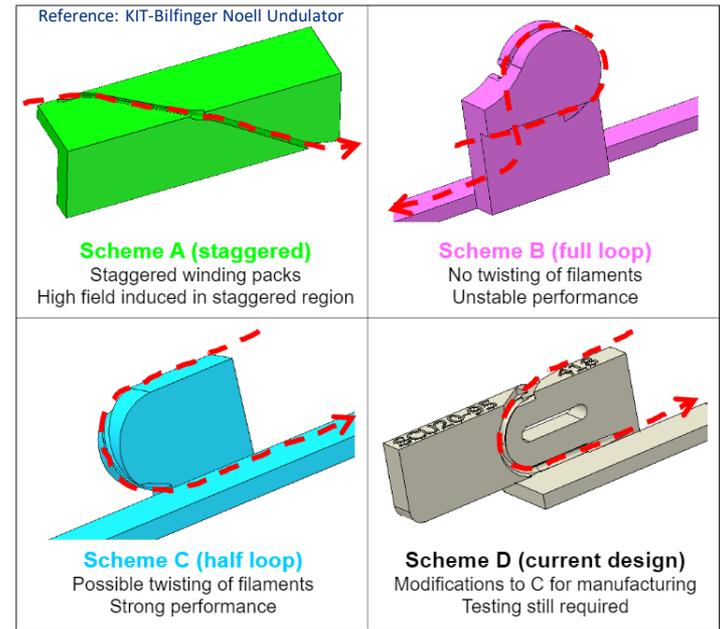


- Round strand: 0.6-0.7 mm diameter
- Rectangular strand: 0.8mm X 0.4mm
- Tape 0.1mm X 4 mm

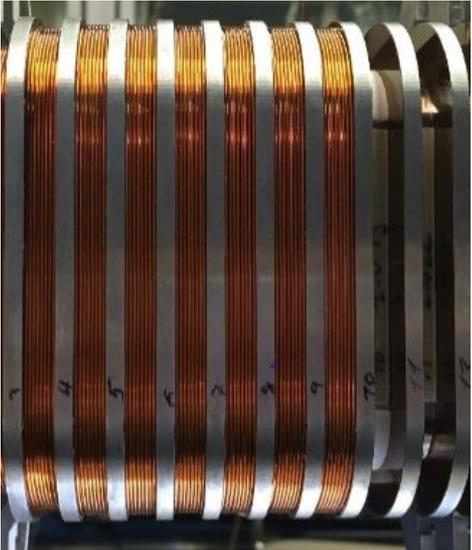
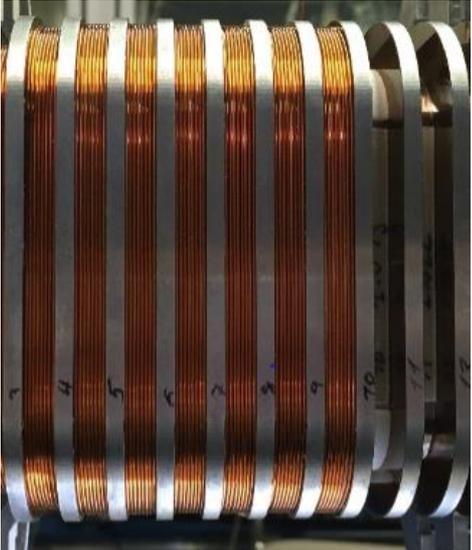
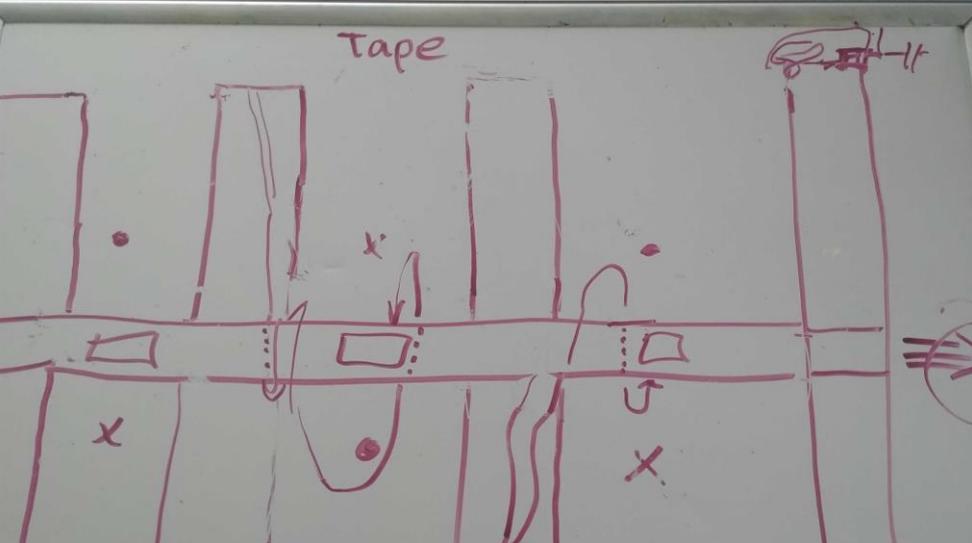
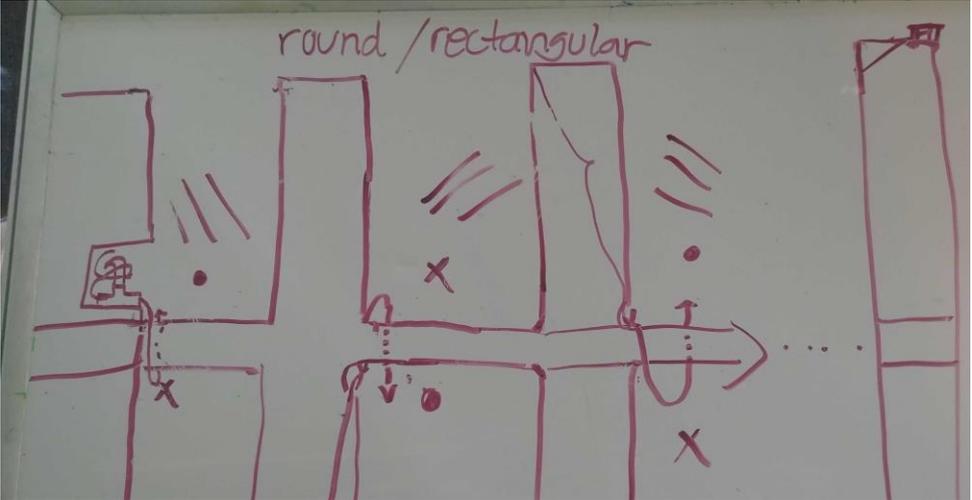


Concept Findings

- Designs for the round and rectangular wire would be similar.
- Tape will be distinct due to the asymmetry of the layers in the tape.
- Will be 3D printed with plastic that can withstand cryogenic conditions.



Current Concepts



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