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# Conceptual Design of HTS Saddle Coil Winding Machine with 5-axis Robotic Arm

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This report details the design and fabrication of an HTS saddle coil winding machine, composed of a 2-axis linear stage and a 3-axis robotic arm. The study focuses on implementing a winding motion of a bobbin that consistently maintains the direction vector of the HTS wire during unwinding and winding processes, which is then parameterized for control. Inputting a 3D winding model achievable with sheet-type wire into the algorithm yields control variables for the motor and stage. For saddle coil winding of a specific scale, torque and stress analysis, accounting for gravity and acceleration, was conducted to optimize the specifications of the winding machine's motors and harmonic drives. The optimization process determined the arrangement and driving directions of components such as the robotic arm, linear stages, and tensioner. We showcase the currently manufactured winding machine and provide details on the implementation plan for a feedback system to correct motion errors and mechanical vibrations occurring during the winding process.

## Paper submission Plan

## Best Presentation

## Contribution track

ICABU WG1. Accelerator Systems

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