I/UCRC Executive Summary - Project Synopsis	**Date**: October 2020
Center/Site: CANFSA/Iowa State University	
Tracking No.: Spatially Resolved Acoustic Spectroscopy (SRAS)	**E-mail :** tkales [at] iastate [dot] edu **Phone :** (515) 294 - 1214
Center/Site Director: CANFSA/P. Collins	**Type: (Continuing)**
Project Leader: Thomas K Ales	**Proposed Budget**: N / A

Project Description: Spatially Resolved Acoustic Spectroscopy (SRAS) is a laser ultrasound technique that can provide limited crystallographic orientation data on the meter scale through the generation of Surface Acoustic Waves (SAWs). Work is ongoing to integrate this technique into a RoboMet.3D serial sectioning instrument in order to obtain 3-dimensional crystallographic information from samples.

Experimental plan: Work is ongoing to complete several modifications to stock optical hardware in order to allow for remote operation of the custom designed SRAS imaging instrument. Modifications to the RoboMet.3D's firmware have been completed along with the design and installation of a 1-dimensional transfer shuttle and magnetic gripper to facilitate sample exchange between the RoboMet.3D's optical microscope and the custom SRAS instrument.

Related work elsewhere: SRAS has mostly been limited to the University of Nottingham, where it was developed by Drs. Steve Sharples and Matt Clark. Implementations in the available literature have used fixed generation gratings to excite SAW packets. Nottingham has mostly focused on developing a reliable 2D scanning system.

How this project is different: The project leader and site director are presently unaware of any SRAS system capable of acquiring 3-dimensional data. This project has also developed a detector based on presently available hardware; previous detector designs have relied on components that have been EOL since 2013.

Milestones for the current proposed year: Finish implementation of detector mechantronics. Install SRAS system into RoboMet.3D and validate proper transfer system integration and operation.

Deliverables for the current proposed year: Fusion of first 3-dimensional datasets. Assessment of measurement uncertainty and orientation solution accuracy.

How the project may be transformative and/or benefit society: There is a significant lack of crystallographic data at the mesoscale. The SRAS characterization technique can help fill this gap, along with other areas in the realms of process monitoring, quality assurance, and material state awareness.

Research areas of expertise needed for project success:
Access to a PLC-modified RoboMet.3D. Development of multichannel real-time control software for repeatable, automatic optical alignment. Custom visualisation software for solving the wavespeed to orientation problem.

Potential Member Company Benefits:
Access to crystallographic information at the lab-sample scale (1.25" mount), and possibly larger scales (50-200mm^2) as other SRAS systems are brought online in the future.

Progress to Date: Development and design of compact custom optical system. Development of various real-time control and communication software. Development of process-agnostic sample transfer system for RoboMet.3D. Development of custom detection systems.

Estimated Start Date: Spring 2017	**Estimated Knowledge Transfer Date**: Spring 2021

The Executive Summary is used by corporate stakeholders in evaluating the value of their leveraged investment in the center and its projects. It also enables stakeholders to discuss and decide on the projects that provide value to their respective organizations. **Ideally, the tool is completed and shared in advance of IAB meetings to help enable rational decision making.**