



**DRAGONFLY
COMPUTING**

URI CSC-592 SPRING 2005

CTEM Analysis SRS

Serial 20050519T1-0

Date 19 May 2005

**Software Requirements Specification
for the
Cryogenic Transmission Electron Microscope
Analysis Toolkit**

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CSC592
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Table Preamble-1. Document Revision History

Date	Revision	Notes
19 May 2005	20050519T1-0	Final draft release for CSC592.

Table Preamble-2. Document Formatting Conventions

ARIAL	Font is used for normal text.
COURIER NEW	Font is used for file names and directory listings.
!!!! CAUTION !!!!	Is used to denote warnings that must be followed to prevent bodily injury or equipment damage.
!!!! IMPORTANT !!!!	Is used to denote important information that must be followed to prevent incorrect measurements.
indicator	Is used to denote a READ-ONLY GUI item
control	Is used to denote a READ-WRITE GUI item



1 SCOPE

This document provides the software requirements for the CTEM Analysis software.

1.1 IDENTIFICATION

The 'system' addressed in this document is the CTEM Analysis software. This software is more fully identified by a version number of the software.

1.2 SOFTWARE OVERVIEW

The CTEM Analysis software is used to process the images acquired from the CTEM equipment. This processing is geared towards the determination of geometric shapes and sizes of LDL particles as described in reference 4.

1.3 DOCUMENT OVERVIEW

The operation instructions are documented following the guidelines of ISO-12207 [1] and MIL-STD-498 [2] (from which ISO-12207 originated). This section provides an overview of the system and this document. The remaining sections of this document provide information as listed in Table 1-1.

Table 1-1. Document Overview	
§ 1	Scope
§ 2	Referenced Documents
§ 3	Software Requirements
§ 4	Qualification Provisions
§ 5	Requirements Traceability
§ 6	Notes



2 REFERENCED DOCUMENTS

This section provides a list of reference documents for the system.

2.1 GENERAL DOCUMENTS

1. "Industry Implementation of International Standard ISO/IEC 12207:1995 (Standard for Information Technology Software life cycle processes)" IEEE/EIA 12207.0-1996, March 1998
2. Software Development and Documentation, MIL-STD-498, 5 December 1994

2.2 APPLICATION-SPECIFIC DOCUMENTS

3. "System Performance Specification for Cryogenic Transmission Electron Microscope Image Acquisition and Analysis Toolkit", DCI Document Number 20050226T1-1, 16 May 2005.
4. "Acquisition and Analysis of Cryogenic Transmission Electron Microscope Biological Images", DCI Document Number 20050516T1-, 16 May 2005.



3 SOFTWARE REQUIREMENTS

This section provides the detailed requirements to be met by the CTEM Analysis software. These requirements are organized as defined in reference 2, except that the order of the external interfaces and capabilities are reversed to match the tailoring followed in reference 3.

3.1 STATES AND MODES

The CTEM Analysis software implements the processing mode of the analysis state of the overall system as defined in reference 3.

3.1.1 STATES

The CTEM Analysis software states are defined by the image to be processed.

Requirement 3.1.1-1: Analysis Image State	
Requirement:	The CTEM Analysis system shall provide a state in which the analysis image is processed.
Specifics:	The CTEM Analysis system shall provide a state in which the analysis image is processed. The analysis image is an image of discs that is generated by the CTEM Analysis software.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

Requirement 3.1.1-2: Transposed Analysis Image State	
Requirement:	The CTEM Analysis system shall provide a state in which the transposed version of the analysis image is processed.
Specifics:	The CTEM Analysis system shall provide a state in which the transposed version of the analysis image is processed. The analysis image is an image of discs that is generated by the CTEM Analysis software.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A



Requirement 3.1.1-3: Maya Image State	
Requirement:	The CTEM Analysis system shall provide a state in which the Maya image is processed.
Specifics:	The CTEM Analysis system shall provide a state in which the Maya image is processed. The Maya image is an image of discs that is generated by the Maya® software.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

Requirement 3.1.1-4: Blood Image State	
Requirement:	The CTEM Analysis system shall provide a state in which the blood image is processed.
Specifics:	The CTEM Analysis system shall provide a state in which the blood image is processed. The blood image is an image that has been obtained from the TEM.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	This should probably be called something else but this is what is called for now since the original images are of "simple" blood.

3.1.2 MODES

The CTEM Analysis software modes are defined by the image to be displayed.

Requirement 3.1.2-1: Base Image Mode	
Requirement:	The CTEM Analysis system shall provide a mode in which the base image of the current state is displayed.
Specifics:	The CTEM Analysis system shall provide a mode in which the base image of the current state is displayed.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A



Requirement 3.1.2-2: FFT of Base Image Mode	
Requirement:	The CTEM Analysis system shall provide a mode in which the 2-D FFT of the base image of the current state is displayed.
Specifics:	The CTEM Analysis system shall provide a mode in which the 2-D FFT of the base image of the current state is displayed.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

Requirement 3.1.2-3: Template Image Mode	
Requirement:	The CTEM Analysis system shall provide a mode in which the template image of the current state is displayed.
Specifics:	The CTEM Analysis system shall provide a mode in which the template image of the current state is displayed.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

Requirement 3.1.2-4: FFT of Template Image Mode	
Requirement:	The CTEM Analysis system shall provide a mode in which the 2-D FFT of the template image of the current state is displayed.
Specifics:	The CTEM Analysis system shall provide a mode in which the 2-D FFT of the template image of the current state is displayed.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A



Requirement 3.1.2-5: Results Image Mode	
Requirement:	The CTEM Analysis system shall provide a mode in which the results image of the current state is displayed.
Specifics:	The CTEM Analysis system shall provide a mode in which the results image of the current state is displayed.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

Requirement 3.1.2-6: FFT of Results Image Mode	
Requirement:	The CTEM Analysis system shall provide a mode in which the 2-D FFT of the results image of the current state is displayed.
Specifics:	The CTEM Analysis system shall provide a mode in which the 2-D FFT of the results image of the current state is displayed.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

3.2 INTERFACES

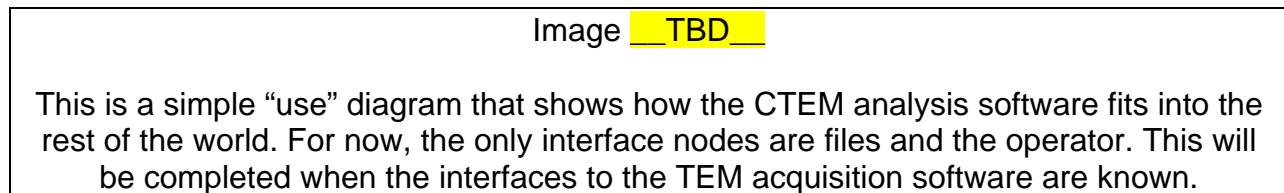


Figure 3-1. CTEM Analysis Context Diagram

3.2.1 FILE INTERFACES

The CTEM Analysis software provides the specified interfaces to the following files.

**3.2.1.1 Input Files**

Requirement 3.2.1.1-1: Maya File Interface	
Requirement:	The CTEM Analysis system shall provide an interface to read in files generated by the Maya® software package.
Specifics:	The CTEM Analysis system shall provide an interface to read in files generated by the Maya® software package. These files will be in the PPM format. The bitmap contents of these files will be created from a series of discs in each of the R, G, and B color spaces. The discs can then be added together to create a noisy version in the internal data representation.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

Requirement 3.2.1.1-2: Blood File Interface	
Requirement:	The CTEM Analysis system shall provide an interface to read in files generated by the TEM.
Specifics:	The CTEM Analysis system shall provide an interface to read in files generated by the TEM. The base format of the TEM is TIFF. These files may need conversion to TGA or PPM format so that they can reading with the CSC583 library software.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	Dr. Herve' can convert these files.



3.2.1.2 Output Files

Requirement 3.2.1.2-1: Statistics File Interface	
Requirement:	The CTEM Analysis system shall provide an interface to write files to store the peak values of the processing.
Specifics:	The CTEM Analysis system shall provide an interface to write files to store the peak values of the processing. These files shall store the maximum value found within +/- 20 pixels of expected locations.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	These files provide data regarding the correlation of the images against varying templates. They are CSV format files so that they can be read into Excel.

3.2.2 GRAPHICAL USER INTERFACES

The CTEM Analysis software GUI requirements are defined by the display of data and the input of data from the operator.

3.2.2.1 Data Display Interfaces

Requirement 3.2.2.1-1: Decimated Image Display Window Interface	
Requirement:	The CTEM Analysis system shall provide an interface to display a decimated version of the current image.
Specifics:	The CTEM Analysis system shall provide an interface to display a decimated version of the current image. The decimated image will be combined to 512x512 pixels so that it will fit on standard computer displays.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A



Requirement 3.2.2.1-2: Decimated Image Display Window ROI Interface	
Requirement:	The CTEM Analysis system shall provide an interface to display a ROI boundary on the decimated version of the current image.
Specifics:	The CTEM Analysis system shall provide an interface to display a ROI boundary on the decimated version of the current image.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	Since the decimated display window represents an area larger than 512x512, a bounding box will be drawn that represents the region that is being displayed in the non-decimated display window. The preferred color for this ROI is red.

Requirement 3.2.2.1-3: Decimated Image Readout Interface	
Requirement:	The CTEM Analysis system shall provide an interface to display pertinent information from the decimated version of the current image.
Specifics:	The CTEM Analysis system shall provide an interface to display pertinent information from the decimated version of the current image. This information will include the image state and mode, the mean, minimum, and maximum of the decimated version of the current image as well as the value associated with the current cursor position.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

Requirement 3.2.2.1-4: Non-Decimated Image Display Window Interface	
Requirement:	The CTEM Analysis system shall provide an interface to display a non-decimated version of a portion of the current image.
Specifics:	The CTEM Analysis system shall provide an interface to display a non-decimated version of a portion of the current image. The non-decimated image will be limited to a maximum of 512x512 pixels so that it will fit on standard computer displays.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A



Requirement 3.2.2.1-5: Non-Decimated Image Readout Interface	
Requirement:	The CTEM Analysis system shall provide an interface to display pertinent information from the non-decimated version of the current image.
Specifics:	The CTEM Analysis system shall provide an interface to display pertinent information from the non-decimated version of the current image. This information will include the image state and mode, the mean, minimum, and maximum of the non-decimated version of the current image as well as the value associated with the current cursor position.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

Requirement 3.2.2.1-6: Main Display Interface	
Requirement:	The CTEM Analysis system shall provide an interface to simultaneously display both the decimated and non-decimated windows as well as the associated data readouts.
Specifics:	The CTEM Analysis system shall provide an interface to simultaneously display both the decimated and non-decimated windows as well as the associated data readouts. The main window will be limited to a maximum of 1280x768 pixels so that it will fit on standard computer displays.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A



3.2.2.2 Operator Inputs

Requirement 3.2.2.2-1: Main Display Window Menu Interface	
Requirement:	The CTEM Analysis system shall provide an interface in the main window allow for the state selection of the image family to be displayed.
Specifics:	The CTEM Analysis system shall provide an interface in the main window allow for the state selection of the image family to be displayed. This interface shall also allow for the resetting of the images, for the termination of the software, and for the selection of the background color of the main window.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	<p>The currently available main display window menu options are:</p> <ul style="list-style-type: none">• Quit• Reset Images• Process Analysis Image• Process Transposed Analysis Image• Process Maya Image• Process Blood Image• Color→Black,Red,Green,Yellow,Cyan



Requirement 3.2.2.2-2: Main Display Window Cursor Interface	
Requirement:	The CTEM Analysis system shall provide an interface in the main display window to allow for the alteration of current cursor location in both the decimated and non-decimated display windows.
Specifics:	The CTEM Analysis system shall provide an interface in the main display window to allow for the alteration of current cursor location in both the decimated and non-decimated display windows. The CTEM Analysis system will not provide an interface to set the cursor readout position in either the decimated or non-decimated display windows via the mouse when the main display window is in focus.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	<p>The focus of the keyboard is determined by selection of a window with a mouse button. Activation of the main display window will allow for this interface to become operational.</p> <p>Access in the decimated window will be done with lower case versions of "L,R,U,D". Access in the non-decimated window will be done with upper case versions of "L,R,U,D".</p> <p>Entry of one of these keys will advance the current cursor location by a single point in the selected window in the direction of Left, Right, Up, and Down based on the first letter of the direction word.</p>



Requirement 3.2.2.2-3: Decimated Display Window Menu Interface	
Requirement:	The CTEM Analysis system shall provide an interface in the decimated window to allow for the mode selection of the image to be displayed.
Specifics:	The CTEM Analysis system shall provide an interface in the decimated window allow for the mode selection of the image to be displayed. This interface shall also allow for the resetting of the images, for the termination of the software, and for the toggling (on/off) of the capability to highlight the maximum data value in the decimated image window.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	<p>The currently available decimated display window menu options are:</p> <ul style="list-style-type: none">• Quit• Reset Images• Toggle show Max Point• Show Base Image• Show FFT of Base Image• Show Template Image• Show FFT of Template Image• Show Results Image• Show FFT of Results Image



Requirement 3.2.2.2-4: Decimated Display Window Cursor Interface	
Requirement:	The CTEM Analysis system shall provide an interface in the decimated display window to allow for the selection or alteration of the current cursor location in the decimated display window.
Specifics:	The CTEM Analysis system shall provide an interface in the decimated display window to allow for the selection or alteration of the current cursor location in the decimated display window. The event of pressing the left mouse button down shall be used to set the current cursor position.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	<p>The focus of the keyboard is determined by selection of a window with a mouse button. Activation of the decimated display window will allow for the keyboard interface to become operational.</p> <p>Once the decimated window is in focus, the keyboard entry of either lower case or upper case versions of "L,R,U,D" will result in the current cursor position being altered.</p> <p>Entry of one of these keys will advance the current cursor location by a single point in the selected window in the direction of Left, Right, Up, and Down based on the first letter of the direction word.</p>



Requirement 3.2.2.2-5: Non-Decimated Display Window Menu Interface	
Requirement:	The CTEM Analysis system shall provide an interface in the non-decimated window to allow for the selection of the processing to be performed on the current image family.
Specifics:	The CTEM Analysis system shall provide an interface in the non-decimated window to allow for the selection of the processing to be performed on the current image family. This interface shall also allow for the resetting of the images, for the termination of the software, and for the toggling (on/off) of the capability to highlight the maximum data value in the non-decimated image window.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	<p>The currently available decimated display window menu options are:</p> <ul style="list-style-type: none">• Quit• Reset Images• Toggle show Max Point• Process ROI w/ Correlation• Process ROI w/ FFT Correlation• Process Combined Image w/ Correlation• Process Entire Image w/ Correlation• Process Entire Image w/ FFT Correlation• Process Combined Image w/ Template Series and Correlation• Process Entire Image w/ Template Series and FFT Correlation• Process ROI-Centered 1Kx1K of Image w/ FFT Correlation



Requirement 3.2.2.2-6: Non-Decimated Display Window Cursor Interface	
Requirement:	The CTEM Analysis system shall provide an interface in the non-decimated display window to allow for the selection or alteration of the current cursor location in the non-decimated display window.
Specifics:	The CTEM Analysis system shall provide an interface in the non-decimated display window to allow for the selection or alteration of the current cursor location in the non-decimated display window. The event of pressing the left mouse button down shall be used to set the current cursor position.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	<p>The focus of the keyboard is determined by selection of a window with a mouse button. Activation of the non-decimated display window will allow for the keyboard interface to become operational.</p> <p>Once the non-decimated window is in focus, the keyboard entry of either lower case or upper case versions of "L,R,U,D" will result in the current cursor position being altered.</p> <p>Entry of one of these keys will advance the current cursor location by a single point in the selected window in the direction of Left, Right, Up, and Down based on the first letter of the direction word.</p>

3.3 PROCESSING

The CTEM Analysis software provides the following processing capabilities.

3.3.1 DIRECT CORRELATION

The CTEM Analysis software provides the following direct correlation processing capabilities.

**3.3.1.1 Decimated Image**

Requirement 3.3.1.1-1: Direct Correlation of Entire Decimated Image	
Requirement:	The CTEM Analysis system shall provide the capability to perform the direct correlation of the template image with the decimated version of the current state base image.
Specifics:	The CTEM Analysis system shall provide the capability to perform the direct correlation of the template image with the decimated version of the current state base image.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	This will perform a correlation of 512x512 * ~25x25.

Requirement 3.3.1.1-2: Direct Correlation of Entire Decimated Image with Series of Templates	
Requirement:	The CTEM Analysis system shall provide the capability to perform the direct correlation of a series of template images with the decimated version of the current state base image.
Specifics:	The CTEM Analysis system shall provide the capability to perform the direct correlation of a series of template images with the decimated version of the current state base image.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	This will perform a correlation of 512x512 * ~25x25 per template.



3.3.1.2 Non-Decimated Image

Requirement 3.3.1.2-1: Direct Correlation of ROI of Non-Decimated Image	
Requirement:	The CTEM Analysis system shall provide the capability to perform the direct correlation of the template image with the specified ROI of the decimated version of the current state base image.
Specifics:	The CTEM Analysis system shall provide the capability to perform the direct correlation of the template image with the specified ROI of the decimated version of the current state base image. The system shall create a decimated version of the template in order to perform this direct correlation.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	This will perform a correlation of $512 \times 512 * \sim 25 \times 25$.

Requirement 3.3.1.2-2: Direct Correlation of Entire Non-Decimated Image	
Requirement:	The CTEM Analysis system shall provide the capability to perform the direct correlation of the template image with the entire non-decimated version of the current state base image.
Specifics:	The CTEM Analysis system shall provide the capability to perform the direct correlation of the template image with the entire non-decimated version of the current state base image.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	This will perform a correlation of $2048 \times 2048 * \sim 99 \times 99$, which is about 42 BILLION multiplies and adds.

3.3.2 FFT CORRELATION

The CTEM Analysis software provides the following correlation via FFT processing capabilities.



3.3.2.1 Non-Decimated Image

Requirement 3.3.2.1-1: FFT Correlation of ROI of Non-Decimated Image	
Requirement:	The CTEM Analysis system shall provide the capability to perform the FFT correlation of the template image with the specified ROI of the non-decimated version of the current state base image.
Specifics:	The CTEM Analysis system shall provide the capability to perform the FFT correlation of the template image with the specified ROI of the non-decimated version of the current state base image.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	<p>This will take 2-D FFTs of the template and current image, do a complex point by point multiply, and then take an inverse FFT.</p> <p>Scaling is TBD. Direct correlation is self-normalizing. The range of values needs to be investigated for this FFT correlation processing.</p>

Requirement 3.3.2.1-2: FFT Correlation of Entire Non-Decimated Image	
Requirement:	The CTEM Analysis system shall provide the capability to perform the FFT correlation of the template image with the entire non-decimated version of the current state base image.
Specifics:	The CTEM Analysis system shall provide the capability to perform the FFT correlation of the template image with the entire non-decimated version of the current state base image.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	<p>This will take 2-D FFTs of the template and current image, do a complex point by point multiply, and then take an inverse FFT.</p> <p>Scaling is TBD. Direct correlation is self-normalizing. The range of values needs to be investigated for this FFT correlation processing.</p>



Requirement 3.3.2.1-3: FFT Correlation of Entire Non-Decimated Image with Series of Templates	
Requirement:	The CTEM Analysis system shall provide the capability to perform the FFT correlation of a series of template images with the non-decimated version of the current state base image.
Specifics:	The CTEM Analysis system shall provide the capability to perform the FFT correlation of a series of template images with the non-decimated version of the current state base image.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	<p>This will take 2-D FFTs of the template and current image, do a complex point by point multiply, and then take an inverse FFT.</p> <p>Scaling is TBD. Direct correlation is self-normalizing. The range of values needs to be investigated for this FFT correlation processing.</p>

3.3.2.2 Zero-Padded Image

Requirement 3.3.2.2-1: FFT Correlation of 1Kx1K ROI of Non-Decimated Image	
Requirement:	The CTEM Analysis system shall provide the capability to perform the FFT correlation of the template image with a 1Kx1K region as centered by the center location of the specified ROI of the non-decimated version of the current state base image.
Specifics:	The CTEM Analysis system shall provide the capability to perform the FFT correlation of the template image with a 1Kx1K region as centered by the center location of the specified ROI of the non-decimated version of the current state base image.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	<p>This will take a 1Kx1K region, pad the remainder of the 2Kx2K with zeroes in both the template and base image then do the processing.</p> <p>This capability is provided to allow for investigation of FFT effects caused by the template shapes.</p> <p>This will take 2-D FFTs of the template and current image, do a complex point by point multiply, and then take an inverse FFT.</p> <p>Scaling is TBD. Direct correlation is self-normalizing. The range of values needs to be investigated for this FFT correlation processing.</p>



3.4 INTERNAL INTERFACE REQUIREMENTS

Requirement 3.4-1: SPS Internal Interface Requirements	
Requirement:	The CTEM Analysis system shall meet the internal interface requirements as listed in reference 3.
Specifics:	The CTEM Analysis system shall meet the internal interface requirements as listed in reference 3.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

3.5 INTERNAL DATA REQUIREMENTS

Requirement 3.5-1: SPS Internal Data Requirements	
Requirement:	The CTEM Analysis system shall meet the internal data requirements as listed in reference 3.
Specifics:	The CTEM Analysis system shall meet the internal data requirements as listed in reference 3.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

Requirement 3.5-2: CSC583Lib Data Structures	
Requirement:	The CTEM Analysis system shall utilize the data structures as defined in the CSC583 library software.
Specifics:	The CTEM Analysis system shall utilize the data structures as defined in the CSC583 library software.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A



3.6 ADAPTATION REQUIREMENTS

Requirement 3.6-1: SPS Adaptation Requirements	
Requirement:	The CTEM Analysis system shall meet the adaptation requirements as listed in reference 3.
Specifics:	The CTEM Analysis system shall meet the adaptation requirements as listed in reference 3.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

3.7 SAFETY REQUIREMENTS

Requirement 3.7-1: SPS Safety Requirements	
Requirement:	The CTEM Analysis system shall meet the safety requirements as listed in reference 3.
Specifics:	The CTEM Analysis system shall meet the safety requirements as listed in reference 3.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

3.8 SECURITY AND PRIVACY REQUIREMENTS

Requirement 3.8-1: SPS Security and Privacy Requirements	
Requirement:	The CTEM Analysis system shall meet the security and privacy requirements as listed in reference 3.
Specifics:	The CTEM Analysis system shall meet the security and privacy requirements as listed in reference 3.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A



3.9 ENVIRONMENT REQUIREMENTS

Requirement 3.9-1: SPS Environment Requirements	
Requirement:	The CTEM Analysis system shall meet the environment requirements as listed in reference 3.
Specifics:	The CTEM Analysis system shall meet the environment requirements as listed in reference 3.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

3.10 REQUIREMENTS

Requirement 3.10-1: SPS Computer Resource Requirements	
Requirement:	The CTEM Analysis system shall meet the computer resource requirements as listed in reference 3.
Specifics:	The CTEM Analysis system shall meet the computer resource requirements as listed in reference 3.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

3.11 SOFTWARE QUALITY REQUIREMENTS

Requirement 3.11-1: SPS Software Quality Requirements	
Requirement:	The CTEM Analysis system shall meet the software quality requirements as listed in reference 3.
Specifics:	The CTEM Analysis system shall meet the software quality requirements as listed in reference 3.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

**3.12 DESIGN AND IMPLEMENTATION REQUIREMENTS**

Requirement 3.12-1: SPS Design and Implementation Requirements	
Requirement:	The CTEM Analysis system shall meet the design and implementation requirements as listed in reference 3.
Specifics:	The CTEM Analysis system shall meet the design and implementation requirements as listed in reference 3.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

3.13 PERSONNEL-RELATED REQUIREMENTS

Requirement 3.13-1: SPS Design and Implementation Requirements	
Requirement:	The CTEM Analysis system has no personnel requirements.
Specifics:	The CTEM Analysis system has no personnel requirements.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

3.14 TRAINING REQUIREMENTS

Requirement 3.14-1: SPS Training Requirements	
Requirement:	The CTEM Analysis system shall meet the training requirements as listed in reference 3.
Specifics:	The CTEM Analysis system shall meet the training requirements as listed in reference 3.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

**3.15 LOGISTICS REQUIREMENTS**

Requirement 3.15-1: SPS Logistics Requirements	
Requirement:	The CTEM Analysis system shall meet the logistics requirements as listed in reference 3.
Specifics:	The CTEM Analysis system shall meet the logistics requirements as listed in reference 3.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A

3.16 OTHER REQUIREMENTS

Requirement 3.16-1: SPS Other Requirements	
Requirement:	The CTEM Analysis system has no additional requirements.
Specifics:	The CTEM Analysis system has no additional requirements.
Acceptance:	The CTEM Analysis system to meet this requirement by inspection.
Status:	Active
Notes:	N/A

3.17 PACKAGING REQUIREMENTS

Requirement 3.17-1: SPS Packaging Requirements	
Requirement:	The CTEM Analysis system shall meet the packaging requirements as listed in reference 3.
Specifics:	The CTEM Analysis system shall meet the packaging requirements as listed in reference 3.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A



3.18 PRECEDENCE AND CRITICALITY OF REQUIREMENTS

Requirement 3.18-1: SPS Precedence and Criticality of requirements	
Requirement:	All requirements levied on the CTEM Analysis system shall have the same precedence and criticality with the single exception of safety.
Specifics:	All requirements levied on the CTEM Analysis system shall have the same precedence and criticality with the single exception of safety. All requirements that relate to the safety of the personnel who come in contact with this system shall take precedence over all other requirements.
Acceptance:	The CTEM Analysis system shall be deemed to meet this requirement by inspection.
Status:	Active
Notes:	N/A



4 QUALIFICATION PROVISIONS

This section is TBD.



5 REQUIREMENTS TRACEABILITY

This section is **TBD**. Once the requirements have stabilized, they will be mapped between the SPS and this SRS so that traceability exists. This tracking is used to make sure that changes in the SPS get revisited in this document.



6 NOTES

This section provides an acronym list and general notes for this document.

6.1 ACRONYM LIST

Table 6-1. Acronym List	
Acronym	Description
ATP	Acceptance Test Procedure
CTEM	Cryogenic Transmission Electron Microscope
DOF	Depth Of Focus
DUT	Device Under Test
DUTIF	Device Under Test Inter-Face
EO	Electro-Optical
FOV	Field Of View
NA	Not Applicable
NI	National Instruments
SPS	System Performance Specification
TEM	Transmission Electron Microscope
ROI	Region Of Interest
<u>TBD</u>	To Be Determined
V-SYNC	Vertical Synchronization

6.2 GENERAL NOTES

TBD