Verification and Validation Report: Measuring Microstructure Changes During Thermal Treatment

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1 Revision History

Table 1: **Revision History**

Date	Developer	Notes/Changes
Mar 7, 2023	Abdul Nour	Updated template
Mar 8, 2023	Abdul Nour	Added Functional Requirements Evaluation & Trace to Requirements
Mar 8, 2023	Abdul Nour	Added Functional Req's Unit Tests

2 Symbols, Abbreviations and Acronyms

symbol	description
T	Test

[symbols, abbreviations or acronyms – you can reference the SRS tables if needed —SS]

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3 Functional Requirements Evaluation

The following table suggests examples of system level tests that were executed in order to verify that the functional requirements of the system were met.

Table 2: Test Cases for Functional Requirements

ID	User Action	Expected Result	Result
ST1	Check "Current Source" radio button, type (1) in the "Current Supply" textbox, type (10) in the "Compliance" textbox and click "Set" button, click "Current ON" button, check "Nano-Voltmeter" radio button, click "Start Capture" button	Current Source is reset, current is set to 1mA and displayed, ompliance voltage is set to 10V, current is turned on, nanovoltmeter is reset and values from the voltmeter are continuously displayed on the application along with real-time calculations	PASS
ST2	System is capturing values, thermal treatment is taking place	Critical changes in resistivity are noted in the capture log	FAIL*
ST3	Choose an "Integration Rate" of (1 PLC) from the drop-down menu	Voltmeter display shows faster reading than default	PASS
ST4	System is capturing values, thermal treatment is taking place	Changes in resistivity-temperature slopes are noted in caputre log and displayed	FAIL*
ST5	Capture and current are on, click "Stop Experiment" button on remote interface	Capture and current supply are turned off	FAIL*
ST6	Start experiment and capture	Graph is displaying measurements and calculations	PASS
ST7	Enter experiment info & conduct an experiment	File output contains all experiment data	PASS

* This feature has not been implemented yet.

4 Nonfunctional Requirements Evaluation

4.1 Usability

4.2 Performance

4.3 etc.

5 Comparison to Existing Implementation

This section will not be appropriate for every project.

6 Unit Testing

6.1 Functional Requirements Testing

Table 3: Unit Tests for Functional Requirements

ID	User Action	Expected Result	Result
UT1	Check "Current Source" radio button	Current Source is reset	PASS
UT2	Type an integer (1) in the "Current Supply" textbox and click "Set" button	Current Supply is set to 1mA and displayed	PASS
UT3	Type an integer (10) in the "Compliance" textbox and click "Set" button	Compliance voltage is set to 10V	PASS
UT4	Click "Current ON" button	Current Source is supplying current	PASS
UT5	Click "Current OFF" button	Current Source stops supplying current	PASS
UT6	Check "Nano-Voltmeter" radio button	Nano-Voltmeter is reset	PASS
UT7	Click "Start Capture" button	Values from the voltmeter are continuously displayed on the application along with real-time calculations	PASS
UT8	Click "Stop Capture" button	Values and calcualtions stop generating, latest batch remains visible	PASS
UT9	Current supply is set up and capture is started	Accurate calculations of resistivity are displayed continuously	PASS

ID	User Action	Expected Result	Result
UT10	System is capturing values, thermal treatment is taking place	Critical changes in resistivity are noted in the capture log	FAIL*
UT11	System is capturing values, no thermal treatment	No critical changes in resistivity are noted	PASS
UT12	Choose an "Integration Rate" of (1 PLC) from the drop-down menu	Voltmeter display shows faster reading than default	PASS
UT13	Choose an "Integration Rate" of (5 PLC) from the drop-down menu	Voltmeter display shows no change than default rate	PASS
UT14	System is capturing values, thermal treatment is taking place	Changes in resistivity-temperature slopes are noted in caputre log and displayed	FAIL*
UT15	System is capturing values, no thermal treatment	No changes in resistivity-temperature slopes are noted in caputre log or displayed	PASS
UT16	Current supply is set up and capture is started, "Stop Experiment" button is clicked on remote interface	Capture and current supply are turned off	FAIL*
UT17	Current supply is set up and capture is started, remote interface is launched but not interacted with	Capture and current supply stay on (no change)	FAIL*

7   Changes Due to Testing

[This section should highlight how feedback from the users and from the supervisor (when one exists) shaped the final product. In particular the feedback from the Rev 0 demo to the supervisor (or to potential users) should

8   Automated Testing

9   Trace to Requirements

Table 4: Requirements Traceability

System Test	Unit Tests	Requirement	Plan
ST1	UT1 — UT9	FR1	FR-T1
ST2	UT10, UT11	FR2	FR-T2
ST3	UT12, UT13	FR3	FR-T3
ST4	UT14, UT15	FR4	FR-T4
ST5	UT16, UT17	FR5	FR-T5
ST6		FR6	FR-T6
ST7		FR7	FR-T7

10   Trace to Modules

11   Code Coverage Metrics

Appendix — Reflection

The information in this section will be used to evaluate the team members on the graduate attribute of Reflection. Please answer the following question:

1. In what ways was the Verification and Validation (VnV) Plan different from the activities that were actually conducted for VnV? If there were differences, what changes required the modification in the plan? Why did these changes occur? Would you be able to anticipate these changes in future projects? If there weren't any differences, how was your team able to clearly predict a feasible amount of effort and the right tasks needed to build the evidence that demonstrates the required quality? (It is expected that most teams will have had to deviate from their original VnV Plan.)