**System Test Plan**

**For**

RF Direction of Arrival System

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# Introduction

## Purpose

This document is a test plan for the Radio Frequency (RF) Direction of Arrival (DoA) System Testing, produced by the RF DoA team 2. It describes the testing strategy and approach that the DoA testing team will use to verify that the application meets the established requirements needed in the classroom prior to release. Some of the testing for this system includes subsystem testing such as antenna response, antenna switching capabilities, analog to digital signal processing and computer software computation of angle given a sampled signal.

## Objectives

* Meets the requirements, specifications and the Competition Rules.
* Supports the intended business functions and achieves the required standards.
* Satisfies the Entrance Criteria for User Acceptance Testing.

# Functional Scope

The Modules in the scope of testing for the RF DoA System Testing are mentioned as follows.

* Antenna Array Testing
* Antenna Switching Array Testing
* Analog to Digital Signal Testing
* Directional Computational Software Testing
* Visual Display Output Testing
* Product Usability Testing

# Overall Strategy and Approach

## Testing Strategy

The RF DoA System Testing will include testing of all functionalities that are in the scope (refer to the Functional Scope Section) identified. System testing activities will include the testing of 5G signal detection, antenna switching, analog to digital, software signal computations, and screen level validations.

## System Testing Entrance Criteria

In order to start system testing, certain requirement must be met for testing readiness. The readiness can be classified into:

* Requirements have been clearly defined and met.
* Testable code and hardware are available.
* Test cases have been developed and are available to be executed.
* Test environment has been prepared and is available.

## Testing Types

### Usability Testing

User interface attributes, cosmetic presentation and content will be tested for accuracy and general usability. The goal of Usability Testing is to ensure that the User Interface is comfortable to use and provides the user with consistent and appropriate access and navigation through the functions of the application (e.g., access keys, consistent tab order, readable fonts etc.)

### Functional Testing

The objective of this test is to ensure that each element of the component meets the functional requirements of the business as outlined in the:

* Competition / Functional Requirements
* Competition rules or conditions
* Other functional documents produced during the course of the project i.e. resolution to issues/change requests/feedback

## Suspension Criteria and Resumption Requirements

This section will specify the criteria that will be used to suspend all or a portion of the testing activities on the items associated with this test plan.

### Suspension Criteria

Testing will be suspended if the incidents found will not allow further testing of the system/application under-test. If testing is halted, and changes are made to the hardware, software or database, it is up to the Testing Manager to determine whether the test plan will be re-executed or part of the plan will be re-executed.

### Resumption Requirements

Resumption of testing will be possible when the functionality that caused the suspension of testing has been retested successfully.

# Execution Plan

## Execution Plan

The execution plan will detail the test cases to be executed. The Execution plan will be put together to ensure that all the requirements are covered. The execution plan will be designed to accommodate some changes if necessary, if testing is incomplete on any day. All the test cases of the projects under test in this release are arranged in a logical order depending upon their inter dependency.

# Traceability Matrix & Defect Tracking

## Traceability Matrix

Requirement numbers correspond the SRS documentation and were left unchanged to avoid confusion.

3.1 Functional Requirements

3.1.1) The system shall be able to detect a 5.8GHz signal in the ISM band.

3.1.2) The system shall prevent a signal from being detected by more than one antenna by using copper deflectors.

3.1.3) The system shall be able to receive a signal in the 5.7-5.9GHz range for interpretation using the antenna array.

3.1.4) The system shall switch between which antenna is currently inputting data into the system.

3.1.5) The system shall filter out noise using the bandpass filter.

3.1.6) The system shall amplify the signal through the LNA.

3.1.7) The system shall process the signal from analog to digital through the SDR.

3.1.8) The system shall analyze the signal through the algorithm ran on the computer.

3.1.9) The system shall determine the DoA of the 5.8GHz signal.

3.1.10) The system shall display the DoA of the 5.8GHz signal.

3.1.11) The system shall repeat the process starting from functional requirement 1 once functional requirements 9 and 10 are met.

|  |  |  |  |
| --- | --- | --- | --- |
| Tests ID | 1 | 2 | 3 |
| Requirement |  |  |  |
| 3.1.1 |  |  |  |
| 3.1.2 |  |  |  |
| 3.1.3 |  |  |  |
| 3.1.4 |  |  |  |
| 3.1.5 |  |  |  |
| 3.1.6 |  |  |  |
| 3.1.7 |  |  |  |
| 3.1.8 |  |  |  |
| 3.1.9 |  |  |  |
| 3.1.10 |  |  |  |
| 3.1.11 |  |  |  |

3.2 Interface requirements

3.2.1) The system shall turn on when a switch is flipped to the ON position

3.2.2) The system shall turn off when a switch is flipped to the OFF position

|  |  |  |  |
| --- | --- | --- | --- |
| Tests ID | 1 | 2 | 3 |
| Requirement |  |  |  |
| 3.2.1 |  |  |  |
| 3.2.2 |  |  |  |

3.3 Physical Environment Requirements

3.3.1) The system shall operate outdoors during clear weather conditions

3.3.2) The system shall operate indoors without interruption from other signals

|  |  |  |  |
| --- | --- | --- | --- |
| Tests ID | 1 | 2 | 3 |
| Requirement |  |  |  |
| 3.3.1 |  |  |  |
| 3.3.2 |  |  |  |

3.4 User and Human Factors Requirements

3.4.1) The system setup shall be understood for non-specialists

3.4.2) The system procedure shall be understandable for non-specialists

3.4.3) The system instructions shall provide detailed, step-by-step instructions for teaching

purposes

|  |  |  |  |
| --- | --- | --- | --- |
| Tests ID | 1 | 2 | 3 |
| Requirement |  |  |  |
| 3.4.1 |  |  |  |
| 3.4.2 |  |  |  |
| 3.4.3 |  |  |  |

3.5 Documentation Requirements

3.5.1) The documentation shall be understandable to those of at least a high school level of

education

|  |  |  |  |
| --- | --- | --- | --- |
| Tests ID | 1 | 2 | 3 |
| Requirement |  |  |  |
| 3.5.1 |  |  |  |

3.6 Data Requirements

3.6.1) The system shall collect the signal characteristics and save them for

reference.

|  |  |  |  |
| --- | --- | --- | --- |
| Tests ID | 1 | 2 | 3 |
| Requirement |  |  |  |
| 3.6.1 |  |  |  |

3.7 Resource Requirements

3.7.1) The system shall require components that can be purchased from vendors only

3.7.2) The price of components to build the system shall be less than or equal to $1,500

|  |  |  |  |
| --- | --- | --- | --- |
| Tests ID | 1 | 2 | 3 |
| Requirement |  |  |  |
| 3.7.1 |  |  |  |
| 3.7.2 |  |  |  |

3.8 Quality Assurance Requirements

3.8.1) The system shall not exceed x lbs

|  |  |  |  |
| --- | --- | --- | --- |
| Tests ID | 1 | 2 | 3 |
| Requirement |  |  |  |
| 3.8.1 |  |  |  |

## Defect Severity Definitions

|  |  |
| --- | --- |
| **Critical** | The defect causes a catastrophic or severe error that results in major problems and the functionality rendered is unavailable to the user. A manual procedure cannot be either implemented or a high effort is required to remedy the defect. Examples of a critical defect are as follows:   * System abends * Data cannot flow through a business function/lifecycle * Data is corrupted or cannot post to the database |
| **Medium** | The defect does not seriously impair system function can be categorized as a medium Defect. A manual procedure requiring medium effort can be implemented to remedy the defect. Examples of a medium defect are as follows:   * Form navigation is incorrect * Field labels are not consistent with global terminology |
| **Low** | The defect is cosmetic or has little to no impact on system functionality. A manual procedure requiring low effort can be implemented to remedy the defect. Examples of a low defect are as follows:   * Repositioning of fields on screens * Text font on reports is incorrect |

# Environment

## Antenna Environment

The System Testing Environment for the initial antenna testing will be the anechoic chamber in the MicaPlex.

The antenna will be mounted inside the chamber and each antenna will be tested.

## Overall System Environment

The System Testing Environment for the overall system will be the RF lab in the Lehman building.

# Assumptions

These test plan assumptions outline the expectations that will be had while performing system tests.

* All signals used for testing of the device will be user generated and controlled by testing team.
* System will operate by on/off switching capabilities and will not require user input for operation.
* If a sub-system in the sequence fails the testing criteria, the following systems in the test sequence will be delayed until sub-system can be verified.
  + System will be tested in order of sub-systems, starting with received signal at antennas and ending with user display output of direction.

# Risks and Contingencies

* Waiting for components to arrive could potentially delay the start of assembly.
* Exporting collected data from Airspy could potentially cause for the team to take a different approach on getting signal data.

# Appendices