**Tag Calibration Test Documentation for R420 Reader**

**Objective:**

To calibrate the R420 reader’s RFID capabilities by measuring the signal strength (RSSI), phase angle, and other relevant data at 20 different locations within a 6ft x 6ft square. This test will help assess the accuracy of the R420’s performance in estimating the position of RFID tags within a specified area.

**Test Setup:**

• **Area Dimensions**: 6ft x 6ft square

• **Number of Test Locations**: 20 locations (evenly spaced within the 6ft x 6ft area)

• **Duration per Test**: 10-second interval at each location, cycling through antennas every second.

• **Reader**: R420 Impinj Reader

• **Antennas**: [List antenna IDs or configurations used]

• **Reader IP Address**: 169.254.1.1 (or specific address)

• **Port**: 14150

• **Power Setting**: Max power for all antenna transmissions during the test

**CSV File Format:**

Each CSV file generated for each test location will contain the following columns:

| **Column Name** | **Description** |
| --- | --- |
| **Timestamp** | Time of the reading (in UTC format) |
| **EPC** | Electronic Product Code of the RFID tag |
| **AntennaID** | Antenna ID number where the tag was detected |
| **RSSI** | Received Signal Strength Indicator (RSSI) |
| **PhaseAngle** | Phase angle of the detected signal |
| **Frequency** | Channel frequency of the tag reading |
| **TagSeenCount** | Number of times the tag was detected |
| **DopplerFrequency** | Doppler frequency (if applicable) |
| **LastSeenTimestampUTC** | Timestamp of the last tag detection |

**Locations:**

• **Coordinates**: Each test location will have known (x, y) coordinates within the 6ft x 6ft area.

• **Location Format**: (x, y) values in feet or meters based on your measurement system.

• **Spacing**: Locations are evenly spaced to cover the entire square area, ensuring consistent readings.

**Test Process:**

1. **Prepare the Reader and Antennas**:

• Ensure the R420 reader is connected to the testing machine via the appropriate network.

• Set up antennas at predefined locations within the 6ft x 6ft test area.

• Configure the reader to use max power for all antenna transmissions during the test.

2. **Tag Placement**:

• Place an RFID tag at each of the 20 locations on the square. The tag should remain static during the test interval.

3. **Data Collection**:

• For each location, start a 10-second data collection interval, during which antennas will cycle every second.

• The reader will record the tag’s EPC, RSSI, and other signal data for each antenna that detects the tag.

4. **Data Storage**:

• Each location’s data will be saved in a CSV file. Each file should be named using a consistent naming convention (e.g., location\_x\_y.csv).

• Example file name: test\_location\_1\_1.csv for the first test at location (1, 1).

5. **Repeat for All 20 Locations**:

• Complete the test for all 20 predefined locations, ensuring that data for each test is stored in separate CSV files.

**Data Analysis:**

1. **Tag Location**:

• Use the (x, y) coordinates of each location to match the corresponding data in the CSV files.

2. **RSSI Data**:

• Analyze the RSSI values from each antenna to assess signal strength at each location.

• Look for patterns or anomalies in the RSSI data across different locations.

3. **Error Estimation**:

• Compare the known (x, y) tag locations with the estimated tag positions (based on the RSSI and phase angle data).

• Calculate the errors in position estimation.

4. **Antenna Performance**:

• Evaluate the performance of each antenna based on the tag’s ability to be detected and the accuracy of RSSI readings at various locations.

**Expected Output:**

• A series of 20 CSV files with the recorded data for each of the 20 test locations.

• Analysis reports comparing the actual tag locations with estimated positions based on RSSI and phase angle data.

• Performance metrics for the reader and antennas used during the test.

**Notes:**

• Ensure the reader is correctly calibrated before starting the test.

• Use a consistent method to mark the (x, y) locations within the square to ensure accuracy.

• If any anomalies or issues arise during the test, document them for further analysis.