



**AUBURN**

UNIVERSITY

**TAGGED CATEGORY PERFORMANCE SPECIFICATION**

**G**

**VERSION 1**

Copyright © 2009-2015 ARC

Contact information:

ARC - RFID Lab  
Auburn University  
Auburn, AL 36849  
[rfidlab@auburn.edu](mailto:rfidlab@auburn.edu)



## TABLE OF CONTENTS

<b>1 Test Overview</b> .....	<b>3</b>
<b>2 Description of Custom Test Configurations</b> .....	<b>4</b>
2.1 Single Inlay between Two Denim Articles.....	4
2.2 Single Inlay between Ten Denim Articles.....	5
<b>3 Read Sensitivity</b> .....	<b>6</b>
3.1 Standard Test - Single Inlay on Cardstock.....	7
3.2 Standard Test - Multi Inlay Proximity Test with 2.54 cm Spacing.....	8
3.3 Custom Test - Single Inlay between Two Denim Articles.....	9
3.4 Custom Test - Single Inlay between Ten Denim Articles.....	10
<b>4. Read Backscatter</b> .....	<b>11</b>
4.1 Standard Test - Single Inlay on Cardstock.....	12
4.2 Custom Test - Single Inlay between Two Denim Articles.....	13



## 1 TEST OVERVIEW

Equipment	ARC Benchmarking Equipment Document
Test process	ARC Benchmarking Methodology Document
Frequency	902 Mhz to 928 MHz in steps of 1 MHz
Distance between antennas and inlay	Antenna 1: 1.5 meter Antenna 2: 1.5 meter Antenna 3: 1.5 meter Antenna 4: 1.5 meter
Sensitivity at Receiver	-70 dB
Standard test configurations	Single Inlay on Cardstock Multi Inlay Proximity Test with 2.54cm Spacing (Please refer ARC Testing Methodology)
Custom test configurations	Single Inlay between Two Denim Articles Single Inlay between Ten Denim Articles

## 2 DESCRIPTION OF CUSTOM TEST CONFIGURATIONS

### 2.1 Single Inlay between Two Denim Articles

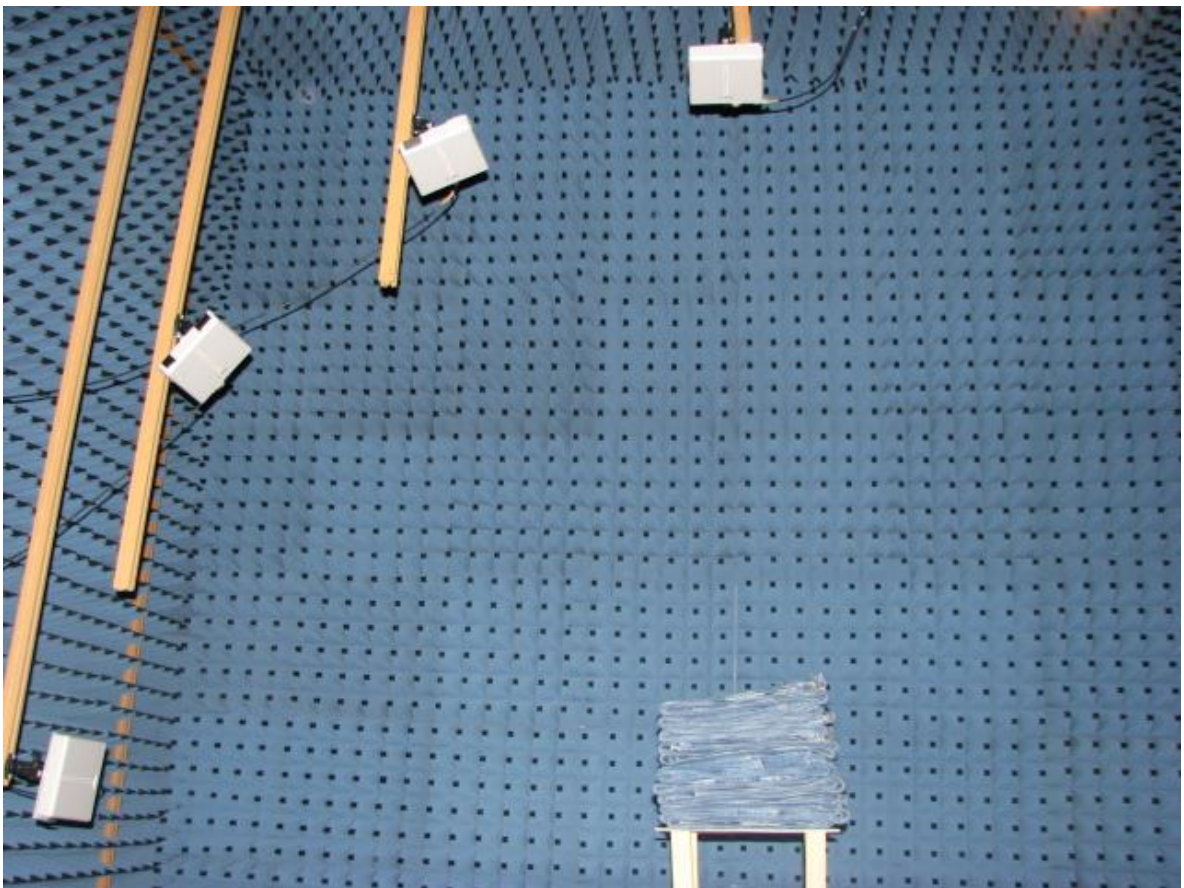
The inlay is measured when applied on the pocket flasher of a denim article with another untagged denim article placed on top of the tagged denim. Both the articles are placed on the testing platform as shown in Figure 1. The tagged denim article is placed on the platform such that the inlay is on the top. The face of the inlay will be parallel to the face of antenna 4.



**Figure 1: Single Inlay between Two Denim Articles**

## 2.2 Single Inlay between Ten Denim Articles

The inlay is measured when applied on the pocket flasher of a denim article (inlay on top) in the center of a stack of 10 untagged denim articles. The final stack is 11 articles tall. All of the denim articles are placed on the testing platform as shown in Figure 2. The face of the inlay will be parallel to the face of antenna 4.



**Figure 2: Single Inlay between Ten Denim Articles**



### **3 READ SENSITIVITY**

The inlay should meet the following read sensitivity (dBm) requirements in the following test configurations through the frequency range. All of the inlay samples tested should meet the minimum requirements. It is noted that the sensitivity is calculated at the tag by calibrating the measured power at the transmitter with the loss/gain during transmission.



### 3.1 Standard Test - Single Inlay on Cardstock

Position 0 Ant 1	Position 0: Ant 2	Position 0: Ant 3	Position 0: Ant 4
-10	-9.5	-9.5	-10
Position 30: Ant 1	Position 30: Ant 2	Position 30: Ant 3	Position 30: Ant 4
-7	-6	-6	-6
Position 60: Ant 1	Position 60: Ant 2	Position 60: Ant 3	Position 60: Ant 4
-2	-2	NA	NA
Position 120: Ant 1	Position 120: Ant 2	Position 120: Ant 3	Position 120: Ant 4
-2	-2	NA	NA
Position 150: Ant 1	Position 150: Ant 2	Position 150: Ant 3	Position 150: Ant 4
-7	-6	-6	-6
Position 180: Ant 1	Position 180: Ant 2	Position 180: Ant 3	Position 180: Ant 4
-10	-9.5	-9.5	-10
Position 210: Ant 1	Position 210: Ant 2	Position 210: Ant 3	Position 210: Ant 4
-7	-6	-6	-6
Position 240: Ant 1	Position 240: Ant 2	Position 240: Ant 3	Position 240: Ant 4
-2	-2	NA	NA
Position 300: Ant 1	Position 300: Ant 2	Position 300: Ant 3	Position 300: Ant 4
-2	-2	NA	NA
Position 330 Ant 1	Position 330: Ant 2	Position 330: Ant 3	Position 330: Ant 4
-7	-6	-6	-6



### 3.2 Standard Test - Multi Inlay Proximity Test with 2.54 cm Spacing

Position 0 Ant 1	Position 0: Ant 2	Position 0: Ant 3	Position 0: Ant 4
-2	-4	-6	-2
Position 30: Ant 1	Position 30: Ant 2	Position 30: Ant 3	Position 30: Ant 4
NA	-2	-4	NA
Position 60: Ant 1	Position 60: Ant 2	Position 60: Ant 3	Position 60: Ant 4
NA	NA	NA	NA
Position 120: Ant 1	Position 120: Ant 2	Position 120: Ant 3	Position 120: Ant 4
NA	-2	-4	NA
Position 150: Ant 1	Position 150: Ant 2	Position 150: Ant 3	Position 150: Ant 4
NA	-2	-4	NA
Position 180: Ant 1	Position 180: Ant 2	Position 180: Ant 3	Position 180: Ant 4
-2	-4	-6	-2
Position 210: Ant 1	Position 210: Ant 2	Position 210: Ant 3	Position 210: Ant 4
NA	-2	-4	NA
Position 240: Ant 1	Position 240: Ant 2	Position 240: Ant 3	Position 240: Ant 4
NA	-2	-4	NA
Position 300: Ant 1	Position 300: Ant 2	Position 300: Ant 3	Position 300: Ant 4
NA	-2	-4	NA
Position 330 Ant 1	Position 330: Ant 2	Position 330: Ant 3	Position 330: Ant 4
NA	-2	-4	NA





### 3.3 Custom Test - Single Inlay between Two Denim Articles

Position 0 Ant 1	Position 0: Ant 2	Position 0: Ant 3	Position 0: Ant 4
-10	-8	-9	-8.5
Position 30: Ant 1	Position 30: Ant 2	Position 30: Ant 3	Position 30: Ant 4
-7	-6	-6	-6.5
Position 60: Ant 1	Position 60: Ant 2	Position 60: Ant 3	Position 60: Ant 4
-2	NA	NA	NA
Position 120: Ant 1	Position 120: Ant 2	Position 120: Ant 3	Position 120: Ant 4
-2	NA	NA	NA
Position 150: Ant 1	Position 150: Ant 2	Position 150: Ant 3	Position 150: Ant 4
-7	-6	-6	-6.5
Position 180: Ant 1	Position 180: Ant 2	Position 180: Ant 3	Position 180: Ant 4
-10	-8	-9	-8.5
Position 210: Ant 1	Position 210: Ant 2	Position 210: Ant 3	Position 210: Ant 4
-7	-6	-6	-6.5
Position 240: Ant 1	Position 240: Ant 2	Position 240: Ant 3	Position 240: Ant 4
-2	NA	NA	NA
Position 300: Ant 1	Position 300: Ant 2	Position 300: Ant 3	Position 300: Ant 4
-2	NA	NA	NA
Position 330 Ant 1	Position 330: Ant 2	Position 330: Ant 3	Position 330: Ant 4
-7	-6	-6	-6.5



### 3.4 Custom Test - Single Inlay between Ten Denim Articles

Position 0 Ant 1	Position 0: Ant 2	Position 0: Ant 3	Position 0: Ant 4
-8.5	-7	-7	-7
Position 30: Ant 1	Position 30: Ant 2	Position 30: Ant 3	Position 30: Ant 4
-5	-4	-4	-4
Position 60: Ant 1	Position 60: Ant 2	Position 60: Ant 3	Position 60: Ant 4
NA	NA	NA	NA
Position 120: Ant 1	Position 120: Ant 2	Position 120: Ant 3	Position 120: Ant 4
NA	NA	NA	NA
Position 150: Ant 1	Position 150: Ant 2	Position 150: Ant 3	Position 150: Ant 4
-5	-4	-4	-4
Position 180: Ant 1	Position 180: Ant 2	Position 180: Ant 3	Position 180: Ant 4
-8.5	-7	-7	-7
Position 210: Ant 1	Position 210: Ant 2	Position 210: Ant 3	Position 210: Ant 4
-5	-4	-4	-4
Position 240: Ant 1	Position 240: Ant 2	Position 240: Ant 3	Position 240: Ant 4
NA	NA	NA	NA
Position 300: Ant 1	Position 300: Ant 2	Position 300: Ant 3	Position 300: Ant 4
NA	NA	NA	NA
Position 330 Ant 1	Position 330: Ant 2	Position 330: Ant 3	Position 330: Ant 4
-5	-4	-4	-4



#### **4. READ BACKSCATTER**

The inlay should meet the following read backscatter (dBm) requirements in the following test configurations through the entire frequency range. The backscatter value in the table below is the minimum backscatter that should be observed at the corresponding minimum read sensitivity value in section 3. All of the tagged item samples tested should meet the minimum requirements. It is noted that the backscatter is calculated at the tag by calibrating the measured power at the receiver with the loss/gain during transmission



#### 4.1 Standard Test - Single Inlay on Cardstock

Position 0 Ant 1	Position 0: Ant 2	Position 0: Ant 3	Position 0: Ant 4
-28	-29	-29	-28
Position 30: Ant 1	Position 30: Ant 2	Position 30: Ant 3	Position 30: Ant 4
NA	NA	NA	NA
Position 60: Ant 1	Position 60: Ant 2	Position 60: Ant 3	Position 60: Ant 4
NA	NA	NA	NA
Position 120: Ant 1	Position 120: Ant 2	Position 120: Ant 3	Position 120: Ant 4
NA	NA	NA	NA
Position 150: Ant 1	Position 150: Ant 2	Position 150: Ant 3	Position 150: Ant 4
NA	NA	NA	NA
Position 180: Ant 1	Position 180: Ant 2	Position 180: Ant 3	Position 180: Ant 4
-28	-29	-29	-28
Position 210: Ant 1	Position 210: Ant 2	Position 210: Ant 3	Position 210: Ant 4
NA	NA	NA	NA
Position 240: Ant 1	Position 240: Ant 2	Position 240: Ant 3	Position 240: Ant 4
NA	NA	NA	NA
Position 300: Ant 1	Position 300: Ant 2	Position 300: Ant 3	Position 300: Ant 4
NA	NA	NA	NA
Position 330 Ant 1	Position 330: Ant 2	Position 330: Ant 3	Position 330: Ant 4
NA	NA	NA	NA



#### 4.2 Custom Test - Single Inlay between Two Denim Articles

Position 0 Ant 1	Position 0: Ant 2	Position 0: Ant 3	Position 0: Ant 4
-26	-29	-29	-28
Position 30: Ant 1	Position 30: Ant 2	Position 30: Ant 3	Position 30: Ant 4
NA	NA	NA	NA
Position 60: Ant 1	Position 60: Ant 2	Position 60: Ant 3	Position 60: Ant 4
NA	NA	NA	NA
Position 120: Ant 1	Position 120: Ant 2	Position 120: Ant 3	Position 120: Ant 4
NA	NA	NA	NA
Position 150: Ant 1	Position 150: Ant 2	Position 150: Ant 3	Position 150: Ant 4
NA	NA	NA	NA
Position 180: Ant 1	Position 180: Ant 2	Position 180: Ant 3	Position 180: Ant 4
-26	-29	-29	-28
Position 210: Ant 1	Position 210: Ant 2	Position 210: Ant 3	Position 210: Ant 4
NA	NA	NA	NA
Position 240: Ant 1	Position 240: Ant 2	Position 240: Ant 3	Position 240: Ant 4
NA	NA	NA	NA
Position 300: Ant 1	Position 300: Ant 2	Position 300: Ant 3	Position 300: Ant 4
NA	NA	NA	NA
Position 330 Ant 1	Position 330: Ant 2	Position 330: Ant 3	Position 330: Ant 4
NA	NA	NA	NA