Voyantic

RAIN RFID and NFC Label/Inlay Durability
Bendurance™ Standard Test Method

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1 Introduction

This document describes a standard Voyantic Bendurance test method for testing RAIN RFID and NFC inlay and label durability.

The test method provides comparable durability data of smart inlays and labels in a reasonable time.

This method is developed by testing several UHF RFID and NFC inlays.

2 Preparations

Count the number of tags in the liner and place the liner to the Bendurance.

- Bendurance liner length is about 2 meters (1900 mm – 2260 mm)
- Count the number of tags "PCS" in the liner
- Place the liner to Bendurance, IC away from the antenna

Tagsurance Test Recipe

- Set 30 (for UHF) or 10 (for HF) dummy points (indifferent result) to the beginning of the recipe
- Set Sweep test across the frequency range (note – Tagsurance HF can have max 120 points in the recipe)
- Set “must pass” TID read (UHF) or UID read (NFC) or Point Test 3x typical variance above the threshold curve to lower resonance frequency. If the variance is not known, set the value default 6dB above the threshold.

Note: the maximum tension to be used is 1 N/mm of liner width, for example, 20 mm liner should be used with max 20 N tension.

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3 Test Method

3.1 Overview

During the Test

- The tags are tested (TID /UID read and sweep) in stop and go mode in one round.
- Between the test rounds, 200 rounds are rolled with 30 m/min speed without testing.
- Nip force and tension are gradually increased between the test rounds.
- The test is stopped when the yield drops 20 % below the baseline yield (yield is displayed on the Tagsurance GUI, and visible in the result files).

Stop the Test when

- The yield of a full round drops 20 % from the baseline yield. The durability rate is the number of rounds, including the last round during which the yield dropped below the threshold.

Table 1: Bendurance settings for each test round

	Speed	**Nip**	**Tension**
Baseline	30% (~9 m/min), index	open	10 N
#1, 200 rounds	100% (30 m/min)	0.05 (36 N)	10 N
#1 test round	30% (~9 m/min), index	0.05 (36 N)	10 N
#2, 200 rounds	100% (30 m/min)	0.2 (144 N)	20 N
#2 test round	30% (~9 m/min), index	0.2 (144 N)	20 N
#3, 200 rounds	100% (30 m/min)	0.3 (216 N)	30 N
#3 test round	30% (~9 m/min), index	0.3 (216 N)	30 N
#4, 200 rounds	100% (30 m/min)	0.4 (288 N)	40 N
#4 test round	30% (~9 m/min), index	0.4 (288 N)	40 N
#5, 200 rounds	100% (30 m/min)	0.4 (288 N)	50 N
#5 test round	30% (~9 m/min), index	0.4 (288 N)	50 N
#6-, 200 rounds	100% (30 m/min)	0.4 (288 N)	60 N
#6- test round	30% (~9 m/min), index	0.4 (288 N)	60 N
		*max tension: 1 N for 1 mm line width	

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3.2 Baseline Test

Tagsurance Testing

- Set the counter stop value to PCS
- Turn index on
- Set nip to open
- Set tension to 10 N
- Set speed to 9 m/min [30 %]
- Note: if the tag dimensions prevent running with 30 m/min speed, use lower speed during the test rounds
- Use name "baseline" in the Tagsurance ID field
- Start the test
- After Bendurance stops (PCS count is reached), stop the case at Tagsurance

3.3 First Round

Fast Rounds

- Reset counter
- Set the counter stop value to 200*PCS
- Turn index off
- Set nip to close
- Set nip force to 36 N [0.05 Mpa]
- Set tension to 10 N
- Note: if the type of liner prevents the use of higher tension, maintain the highest possible liner tension - thin liners or perforated liners for example
- Set speed to 9 m/min [30 %]
- Run the 200*pcs without Tagsurance testing

Tagsurance Testing

- Reset counter and set stop value to PCS
- Turn index on
- Run the round using Test 1 as ID in Tagsurance
- Stop the case when Bendurance stops

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3.4 Second Round

Fast Rounds

- Reset counter
- Set the counter stop value to 200*PCS
- Turn index off
- Set nip force to 144 N [0.2 Mpa]
- Set tension to 20 N
- Set speed to 30 m/min [100 %]
- Run the 200*pcs without Tagsurance testing (high speed)

Tagsurance testing

- Reset counter and set stop value to PCS
- Turn index on
- Run the round using Test2 as an ID in Tagsurance
- Stop the case when Bendurance stops

3.5 Third Round

Repeat as the second round except:

- Set nip force to 216 N [0.3 Mpa]
- Set tension to 30 N
- Use ID Test3

3.6 Fourth Round

Repeat as the third round except:

- Set nip force to 288 N [0.4 Mpa]
- Set tension to 40 N
- Use ID Test4

3.7 Fifth Round

Repeat as the fourth round except

- Set nip force to 288 N [0.4 Mpa]
- Set tension to 50 N
- Use ID Test5

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3.8 6th - Nth Round

Repeat as the fifth round except

- Set nip force to 288 N [0.4 Mpa]
- Set tension to 60 N
- Use ID Test6 - TestN

4 Results

Inlay's durability rate is the round during which the yield of the inlays drops 20 %-points from the original yield. For example, if the original yield is 99 %, the yield from the round 5 is 82.1% and the yield from the round 6 is 77.2%, the durability rate is 6.

Results are displayed as in the picture and table below.

	Yields after test rounds		
	Inlay A	Inlay B	Inlay C
Baseline	100	99	99,5
Round 1	100	99	98
Round 2	100	99	96
Round 3	100	99	93
Round 4	100	98,6	88
Round 5	43,1	98,4	81
Round 6		98,1	72
Round 7		97,7	
Round 8		96,3	
Round 9		94	
Round 10		90,5	
Round 11		87,3	
Round 12		82,1	
Round 13		77,2	
Round 14			
Round 15			
Durability rate			
Durability rate	5	13	6

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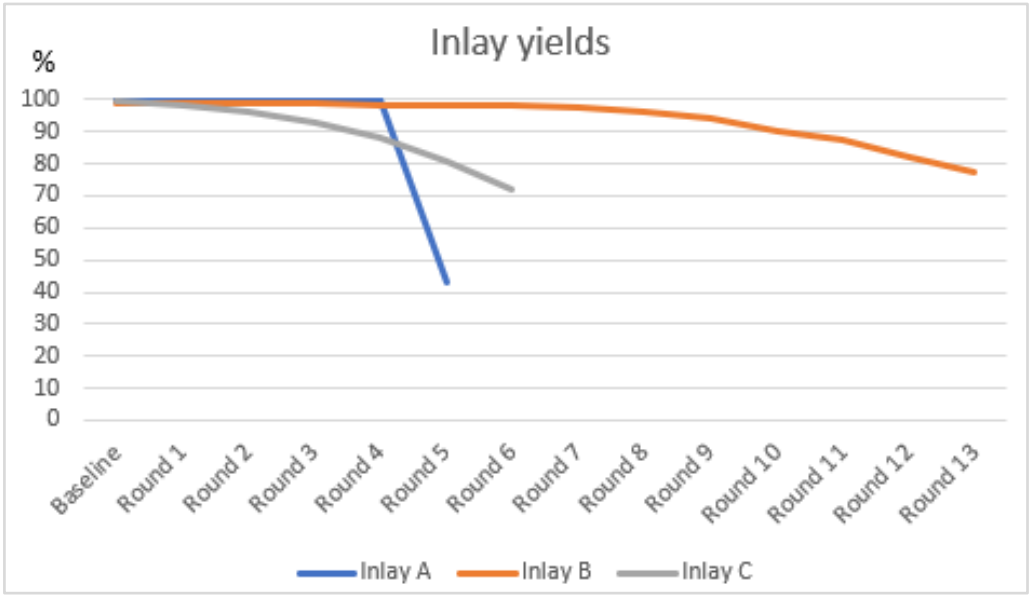

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