

RFID
JOURNAL
LIVE! 20 
2003 - 2022

MAY 17 - 19, 2022

MANDALAY BAY | LAS VEGAS, NV

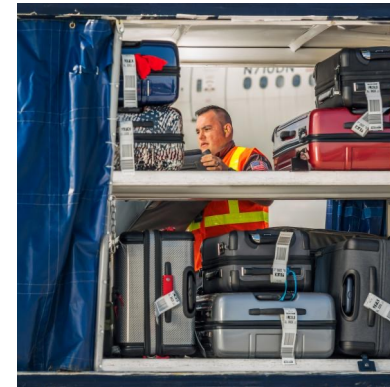
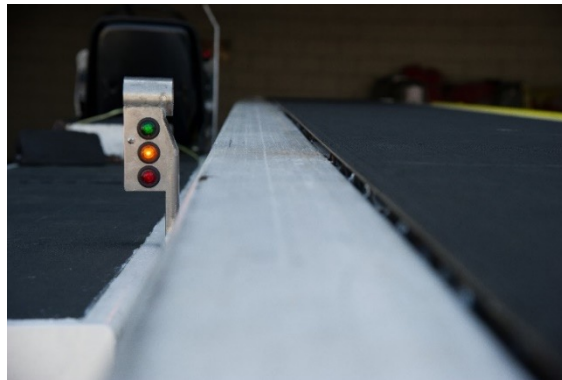
Choosing the Right Tag for Your Product

Justin Patton

Auburn University RFID Lab Director

RFID Tag Performance

Tag performance is ensuring that we can read the tagged item reliably in a given scenario



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Types of RFID

ACTIVE



PASSIVE

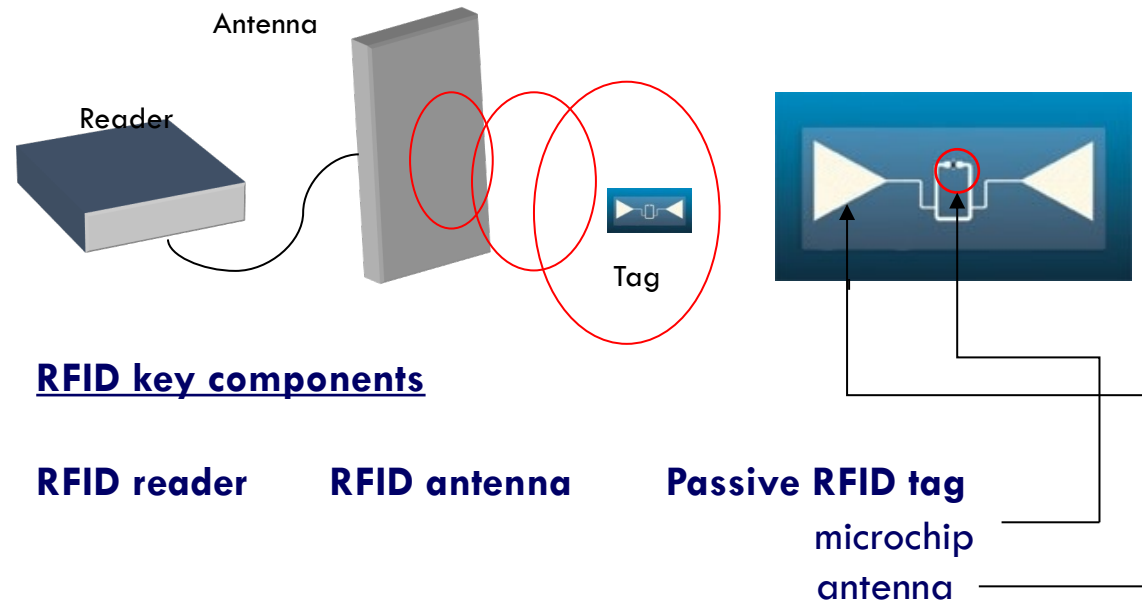


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Passive UHF RFID Technology



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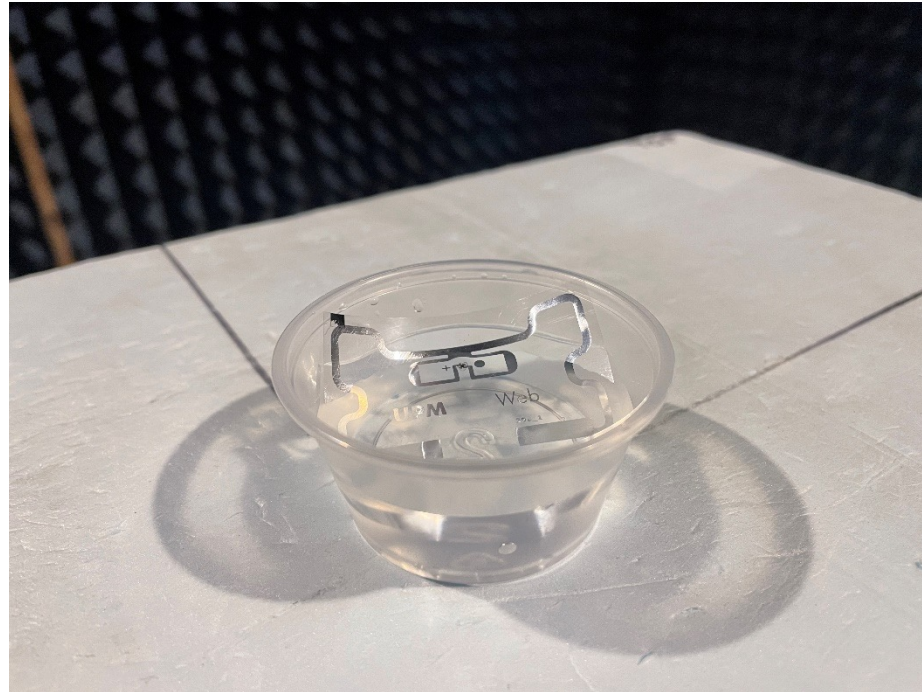
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RFID Physics

METAL



WATER



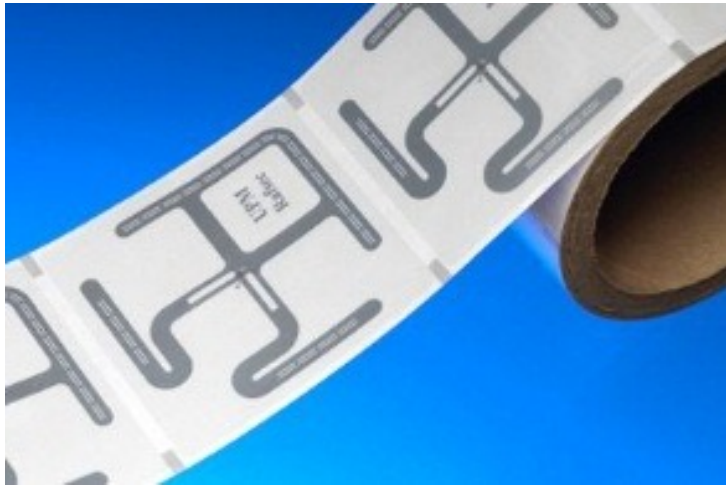
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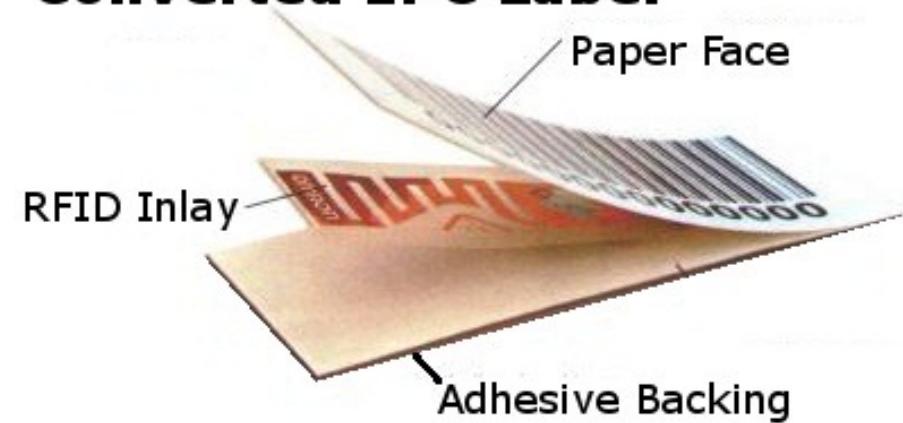
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Inlays, Tags, and Labels

Wet Inlays Roll



Converted EPC Label

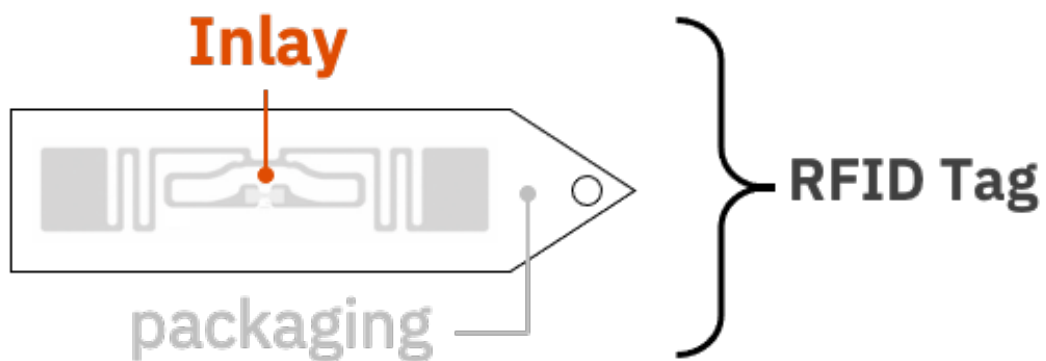
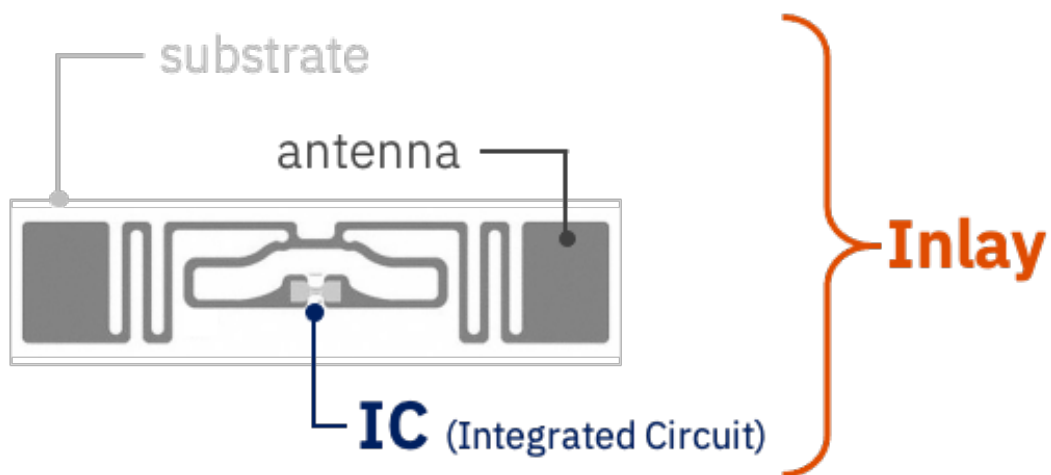


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Anatomy of an RFID Tag



RFID Tags come in many shapes and sizes, but a passive UHF RFID tag is a combination of an **Inlay** and some sort of paper-based or adhesive packaging. An **Inlay** is made up of three components: an antenna, an **Integrated Circuit (IC for short)**, and a substrate.

The antenna is the squiggly part of the inlay. It registers radio waves emitted by RFID Readers and relays that energy to the **IC**.

The **IC** is where data is stored on a tag; they are also referred to as **chips**. The **IC** is activated when the antenna relays radio energy, and it shares its data through the antenna back to the RFID reader. A plastic or paper substrate holds the antenna and the **IC** in place.

The **Inlay** is embedded in paper-based or adhesive packaging, creating a complete label that can be applied to products. Once they are embedded in packaging, Inlays are not typically visible. The combination of an Inlay and packaging is referred to as an **RFID Tag** or an RFID Label.

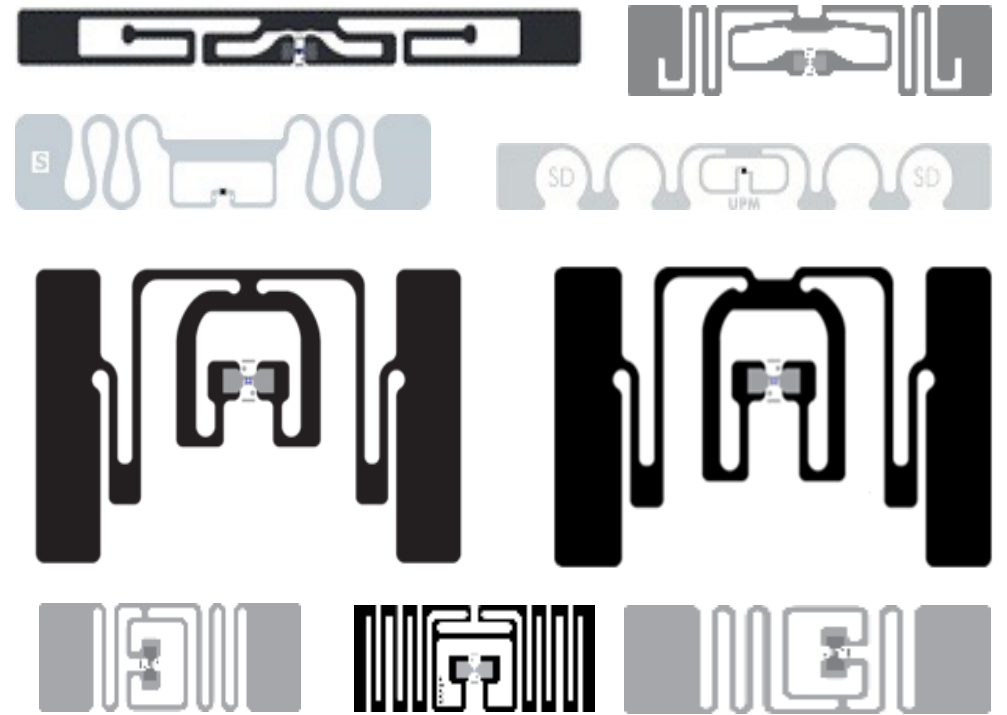


A Good RFID tag...

The performance of the tag depends on

- *Items that will be tagged*
- *Type of RFID reader*
- *Distance between reader and tag*
- *Countries of operation*
- *Environment*
- *Size of the tag*
- *Many other variables...*

So the RFID tag needs to be 'designed' to perform well in **YOUR** deployment



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Where we started....

2005 - 2009

- *Limited guidance from retailers to their brands on what types of RFID tags to use and tagging location*
- *Each brand individually responsible for RF testing their products against unknown requirements*
- *Expensive for the brands, duplication of testing effort, performance problems were frequent, and deployments took much longer*



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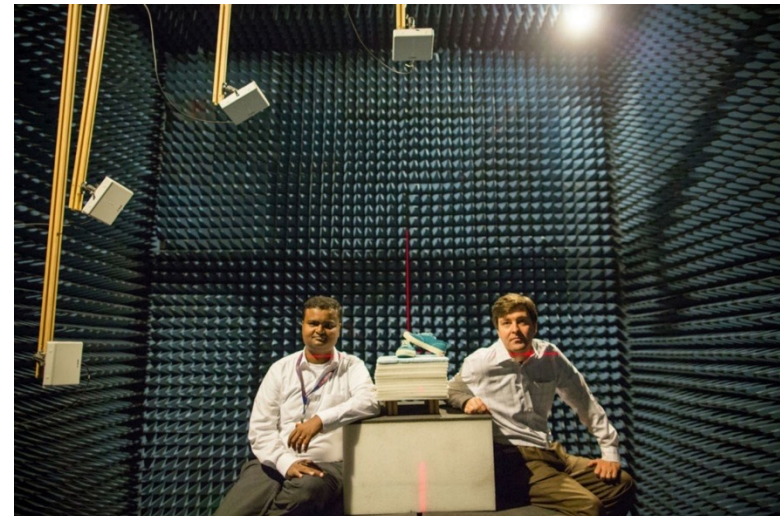


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The ARC Program

2009-Now

- *Funded by Walmart, JC Penney, Dillard's, and solution providers*
- *Non-profit, vendor neutral, academic*
- *Proactively test products for optimal tag location, and provide a broad selection of vetted vendor options to brands*



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What is the ARC program?

GOAL

Help end users choose tags that meet the
Performance + Quality
requirements of their deployment



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RFID Tag Performance

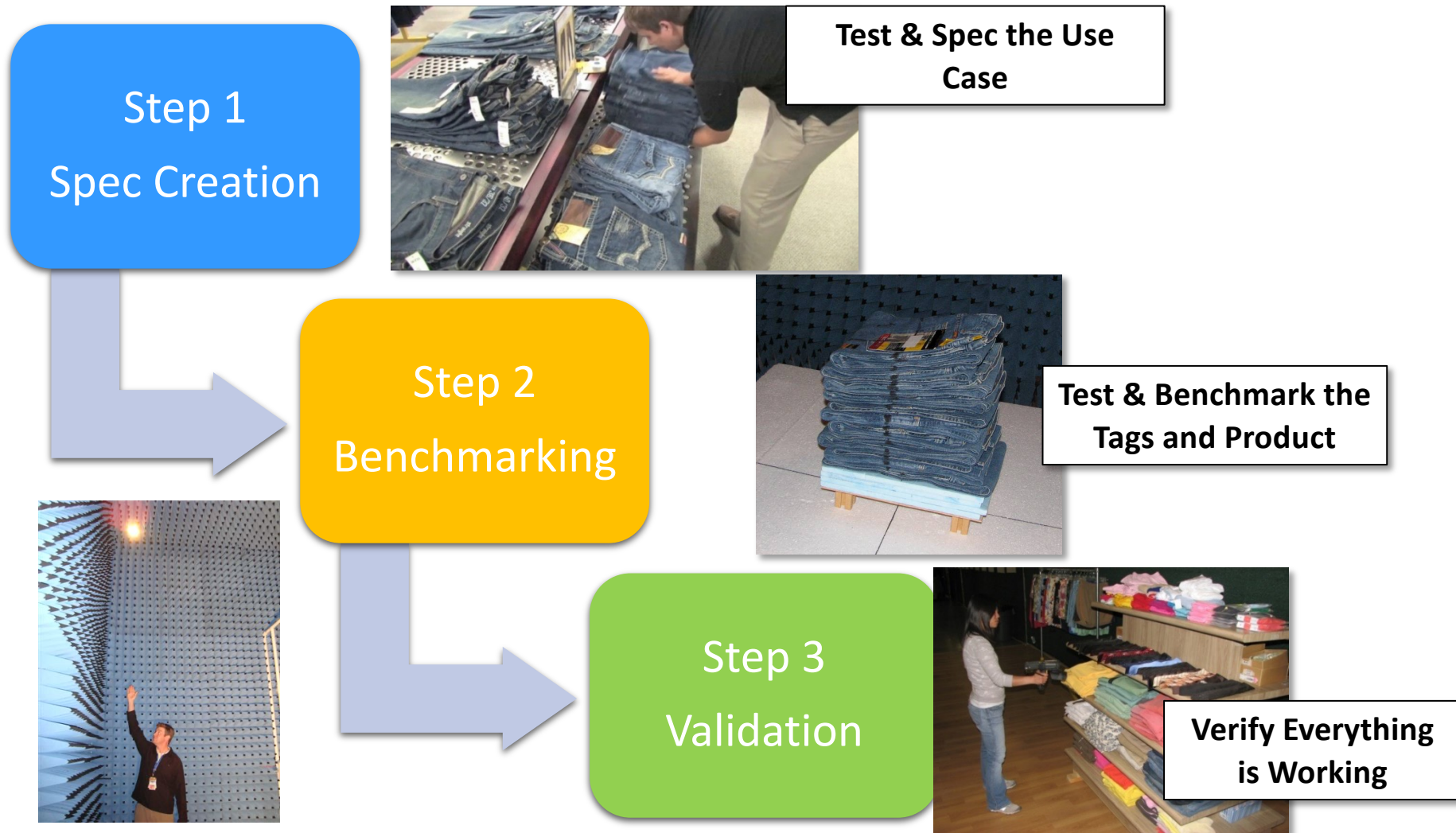


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ARC Process

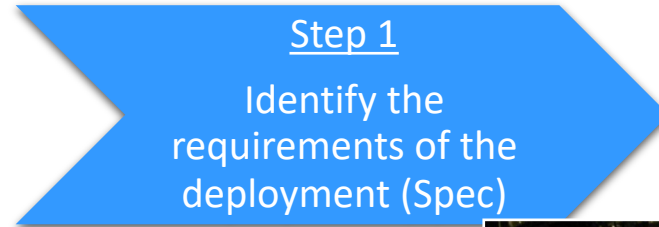


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Tag Performance



- Spec A
- Spec B
- Spec C
- Spec D
- Spec F
- Spec G
- Spec I
- Spec K
- Spec M
- Spec N
- Spec Q
- Spec U

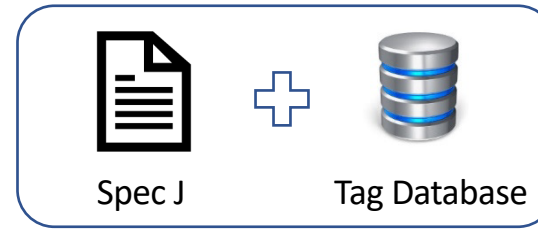


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Tag Performance



Step 2
Spec + Tag Database
= Approved Tag list

Approved Inlay List - Spec J

Sort By:

Company
Silicon
Dimension 2

Model
Dimension 1

Company: Avery Dennison
Model: AD-236u7
Silicon: NXP UCODE 7
70 mm x 14.5 mm



Company: Checkpoint
Model: Triumph 2
Silicon: NXP UCODE 7
70 mm x 14 mm



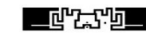
Company: Smartrac
Model: Belt
Silicon: NXP UCODE 8
70 mm x 14 mm



Company: Avery Dennison
Model: AD-385u8
Silicon: NXP UCODE 8
50 mm x 30 mm



Company: SML
Model: MAZE_R6
Silicon: Monza R6
68 mm x 14 mm



Company: Smartrac
Model: Belt
Silicon: NXP UCODE 7
70 mm x 10 mm



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Tag Performance



No RFID Inlay	1%
Encoding Issue	1%
Double inlays	0.3%
Stray Inlay	0%
Duplicate inlays	0%
Dead Inlay	0%
Performance Issue	1%
System Issue (Overstated)	2%
Total issues	5%



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RFID Tag Quality



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RFID Tag Quality

Certification that the RFID tag manufacturer has a Quality Management System that covers the critical aspects of designing and manufacturing of RFID tags

Focus areas,

- *Design & development*
- *Supplier & raw material*
- *Non-conforming product - identification, isolation, and analysis*
- *Experience, expertise, and resources*



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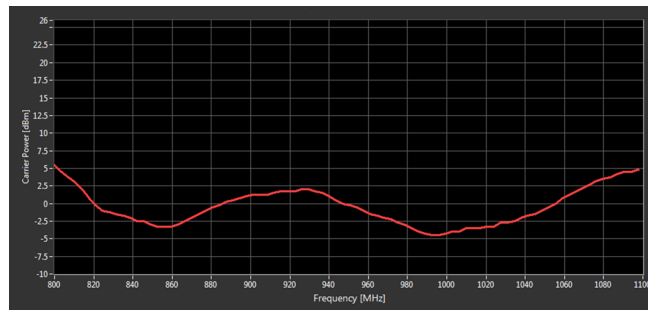


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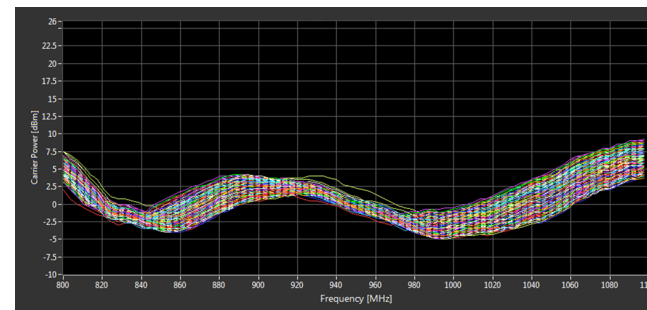
Tag Quality

Tag Manufacturing Quality was the most significant cause of RFID scanning failure prior to the implementation of Quality certification requirements for all new ARC inlay submissions

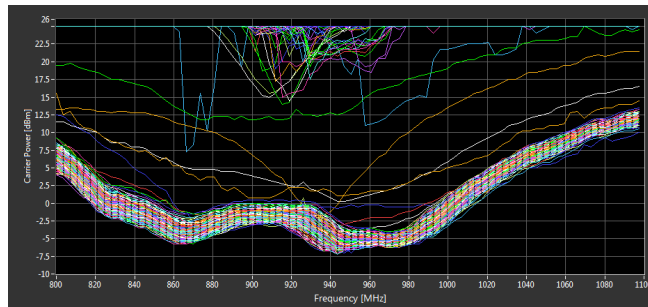
1 Tag



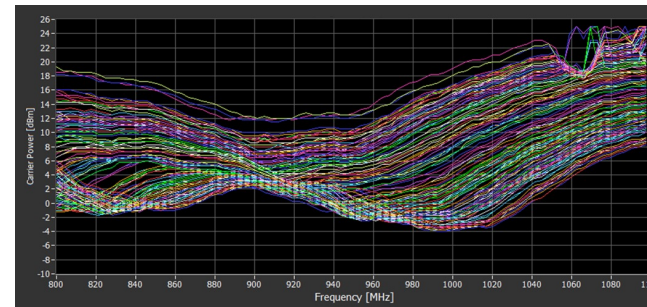
10,000 Tags – Good Quality



10,000 Tags – Bad Quality



10,000 Tags – Bad Quality



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My label provider has a cheaper/different inlay that is not on the ARC lists. Why can't I use it?

Retailers have experienced failure rates of over 30% of the inlays due to quality manufacturing issues from non quality certified inlay manufacturers.

RFID inlay costs are linked to component prices. Short run inlay manufacturers reduce costs by eliminating quality selection processes from their output, or by changing fabrication sites, which may have immediate catastrophic impact on output quality.

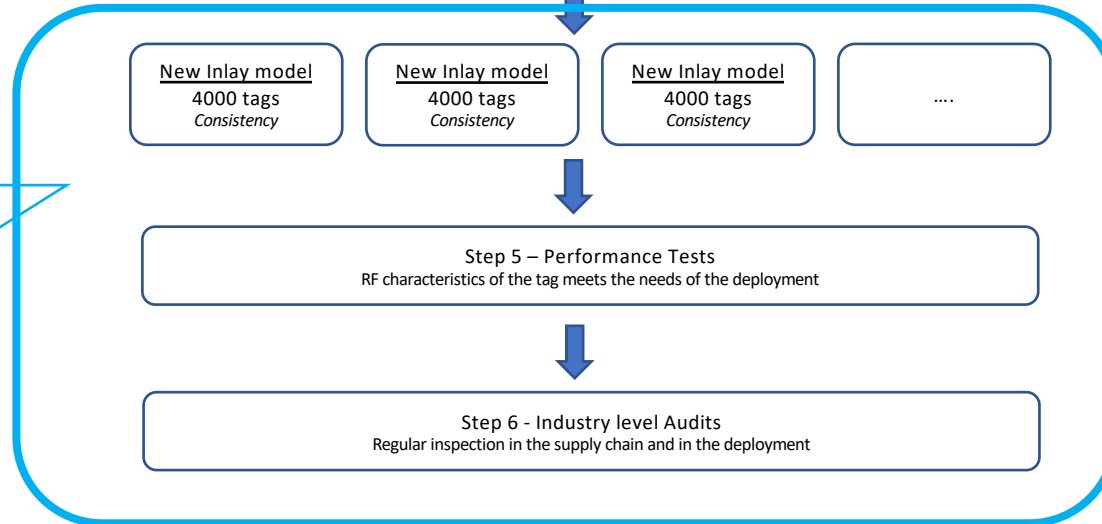
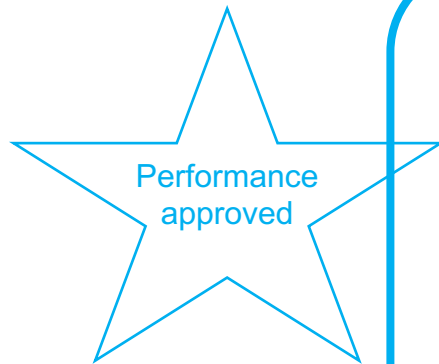
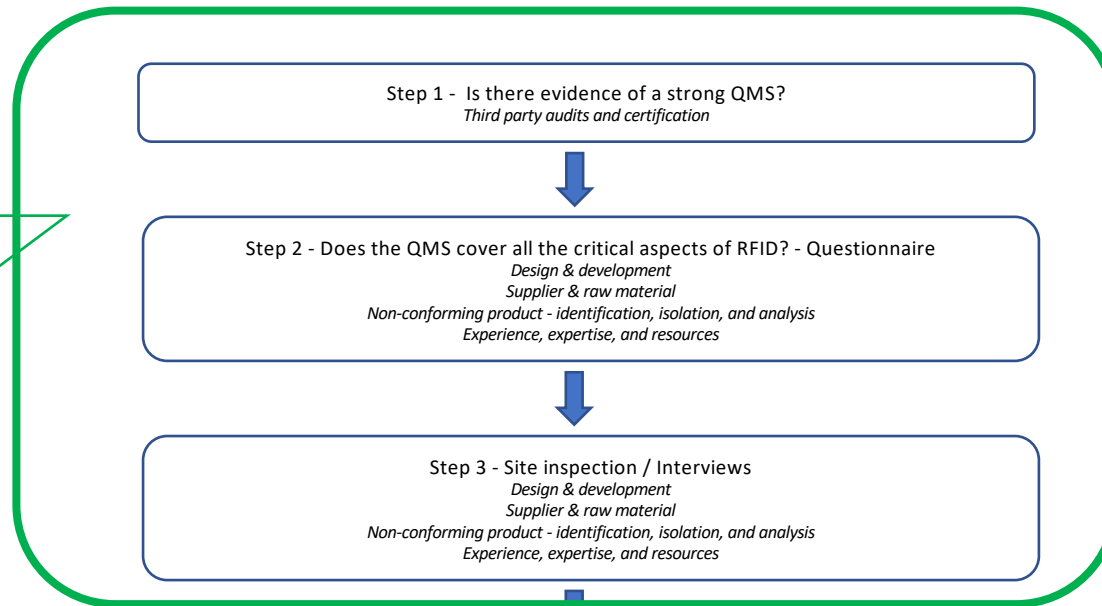
Any reputable inlay manufacturer will be happy to prove the quality of their product.



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What Does ARC Mean for You?

When you receive your playbook from your retailer, it should include 2 things:

- 1. The required ARC spec, and link to the list of approved inlays for that location*
- 2. The tagging guideline, that shows the approved tag location for your packaging*

Just put one of the ARC approved tags in the location approved in your playbook, and that's all you need to know about RFID Performance and Quality!!!!



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THANK YOU

