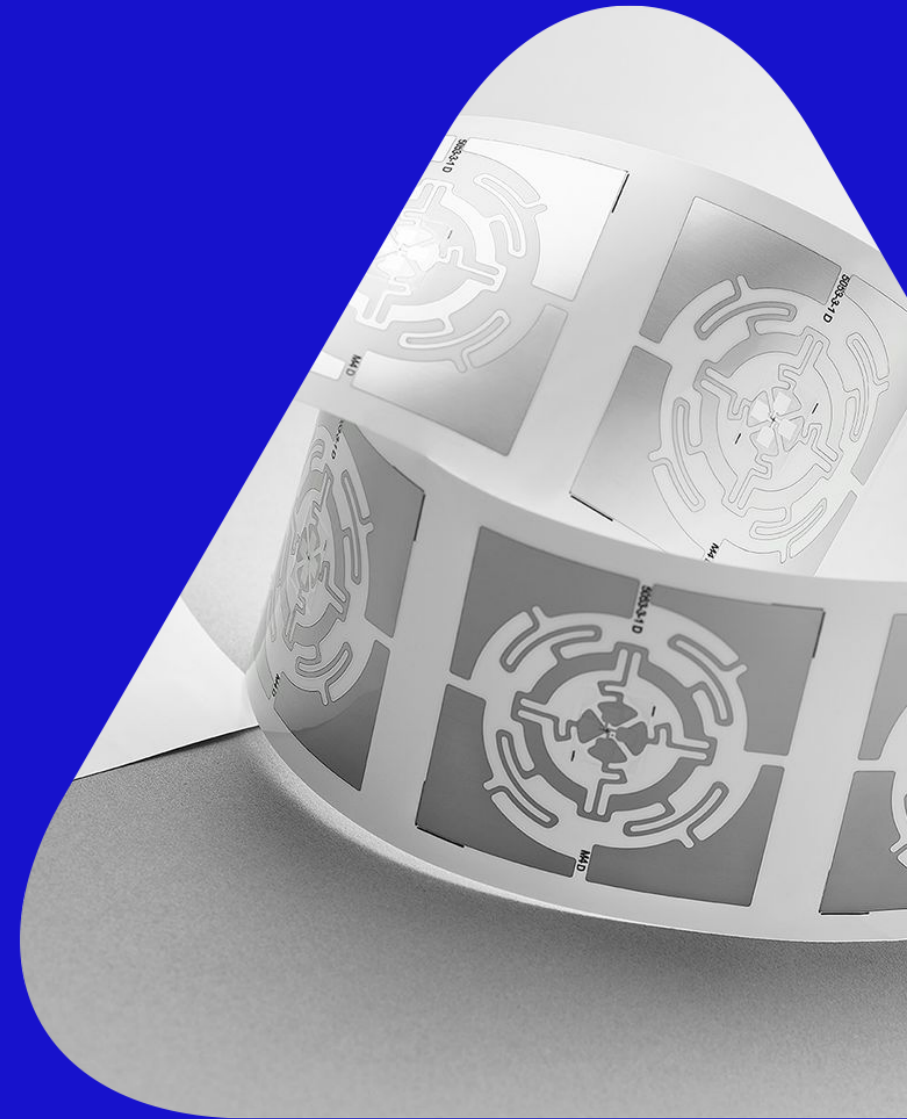


RFID from A to Z: Everything You Need to Know

October 11-14, 2021



Agenda for the week ahead

Monday, 11 October - 14.00 to 15.30

RFID for beginners – what you need to know

See what RFID can do for you, your customers and the world and you get up to speed on the basics

Tuesday, 12 October - 14.00 to 16.00

RFID - looking at the big picture

Discover the connectivity ecosystem, future trends, potential changes and valuable partnerships that can impact your RFID business

Wednesday, 13 October - 11.00 to 12.00

RFID - from key players to choosing inlays

Get ready to enter the RFID market and learn about some of the most important things you need to know

Wednesday, 13 October - 14.00 to 15.00

Advanced RFID training

Hear about the investments you need to make, the different types of inlay formats and the basics of different RFID processes

Thursday, 14 October - 14.00 to 15.50

RFID growth markets - deep dive

Learn how to provide best-in-class service to expanding and upcoming markets, including wine and spirits and logistics, as well as industrial applications for RFID

Agenda for today

14.05 -14.25

Becoming a digital converter

Q&A

14.25 - 15.30

What RFID can do for you,
your customers and the world

Q&A



Digital Converter: Unlocking New Market Opportunities for Label Converters



Agenda

- Latest Market Trends
- RFID Application Cases



Patrick Eichstädt

Director Sales, EMEA,
Avery Dennison Smartrac

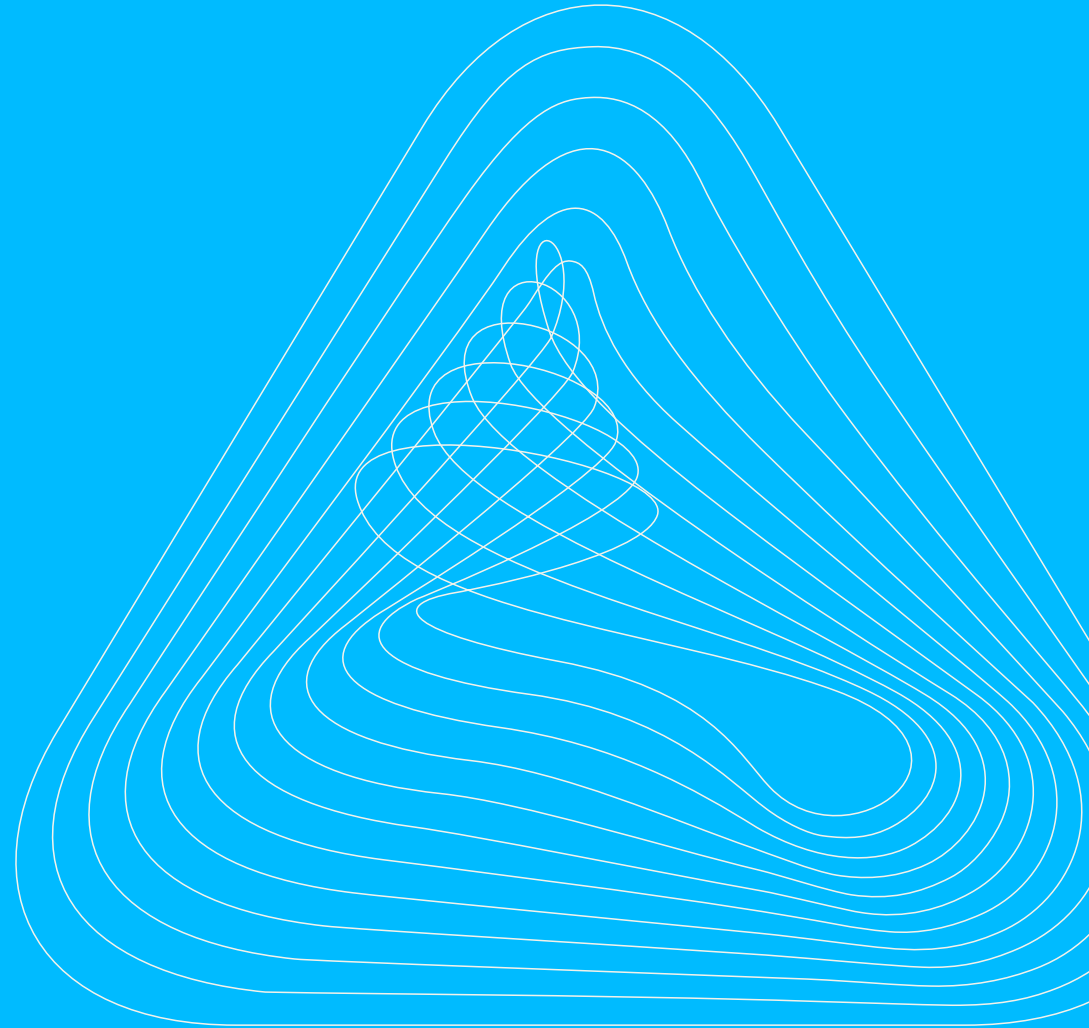
At Avery Dennison

We recognize there are problems in the world where technology has the potential to solve them.

To this end, we consider ourselves a **solutions enabler**. Where we don't believe in technology for the sake of it... but in technology for everyone's sake.

Technology and invention – for us – is about creating new possibilities with a clear sense of purpose. To fix and improve things. To create a world that can be better connected, better harmonized and more in-sync.

Latest Market Trends



Avery Dennison Smartrac Creating a More Connected World

We believe in a future, where every physical item will have a unique digital identity and digital life.



**Digital ID technologies that
authenticate product history, provide
tracking and inventory solutions and
enable richer consumer encounters.**

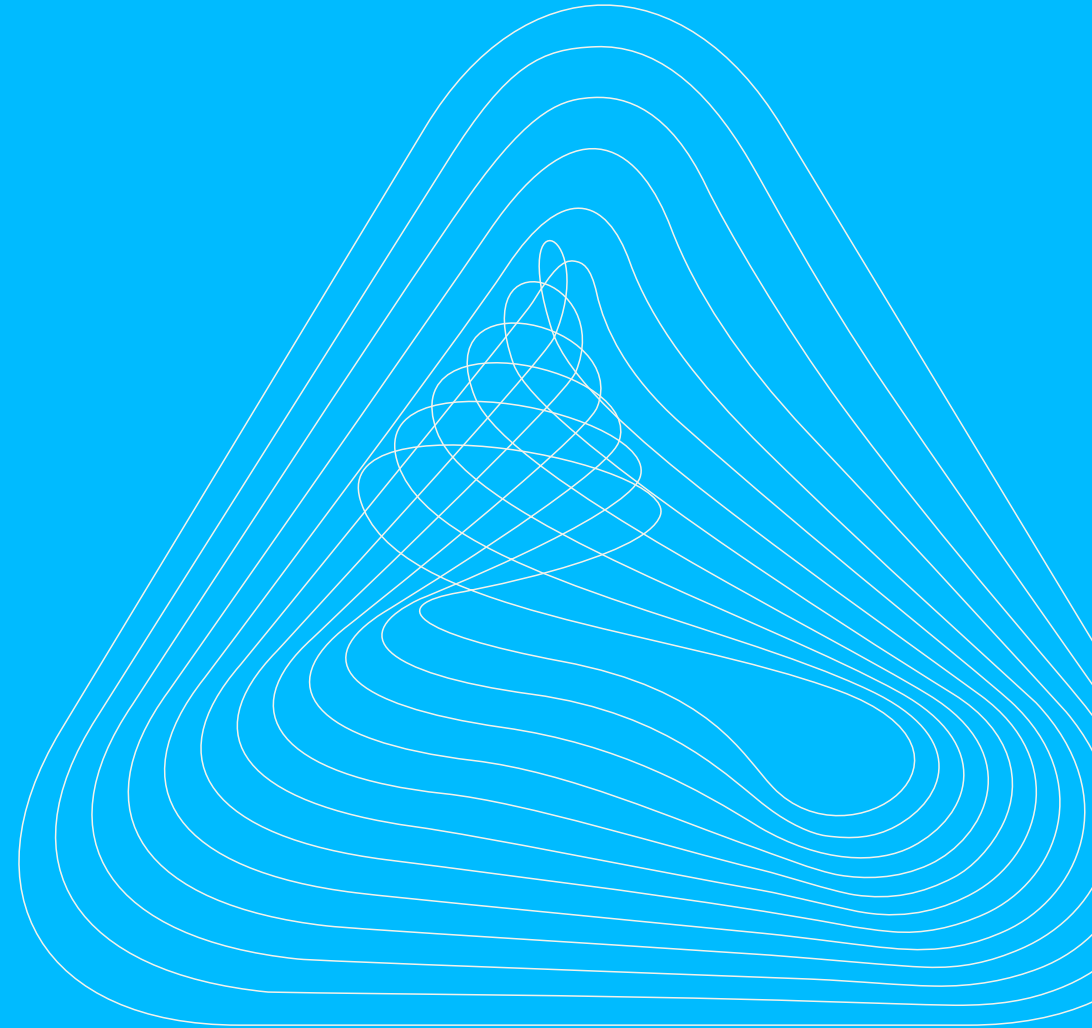
In a world of mass data and mass information, Avery Dennison Smartrac helps create certainty.
Where a connected world can be a better world, full of greater possibilities.

Converter Segment Opportunities

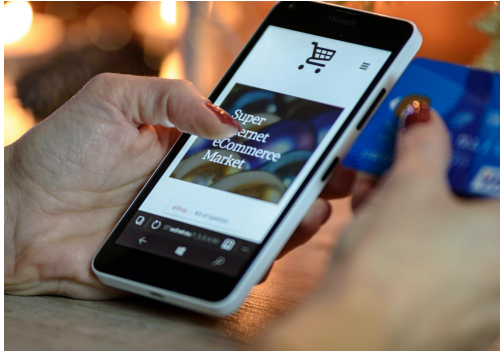


RFID is profoundly transforming the industries that we serve and is opening up a whole realm of emerging segment opportunities. In Avery Dennison we have a vertical segment approach, offering specialized solutions, designed for maximum performance in key market applications.

RFID Applications



Industry Disruption Accelerating Digitization



Omnichannel



New delivery models



Safety



Consumer experience



Automation



Supply chain transparency



Touchless technology

Key Markets & Trends

Pharmaceutical & Healthcare



Inventory management



Patient safety & connected consumer



Brand protection & authentication



Labor & operational efficiency

Automotive



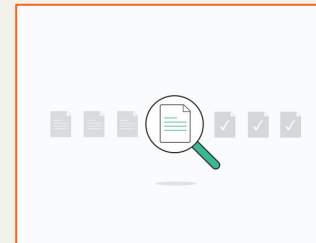
Part tracking, traceability & process automation



Customer safety



Authentication & anti-counterfeiting



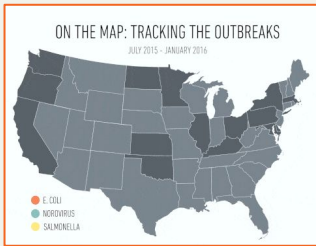
Brand protection



Labor & operations efficiency

Key Markets & Trends

Food



Food safety



Consumer experience



Traceability



Labor efficiency



Sustainability / food waste



Legislation

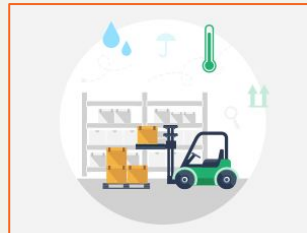
Logistics & Transportation



Shipment verification / cross dock operation



Omnichannel / inventory accuracy



Pallet level to item management

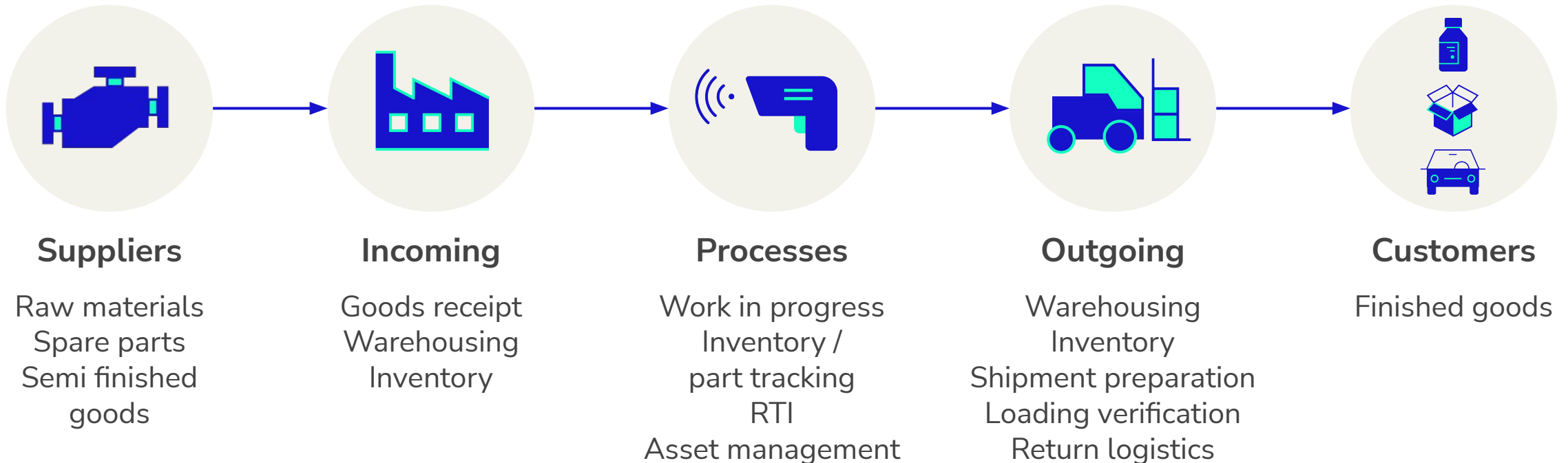


Distribution efficiency (inbound, pick / pack, outbound, returns)



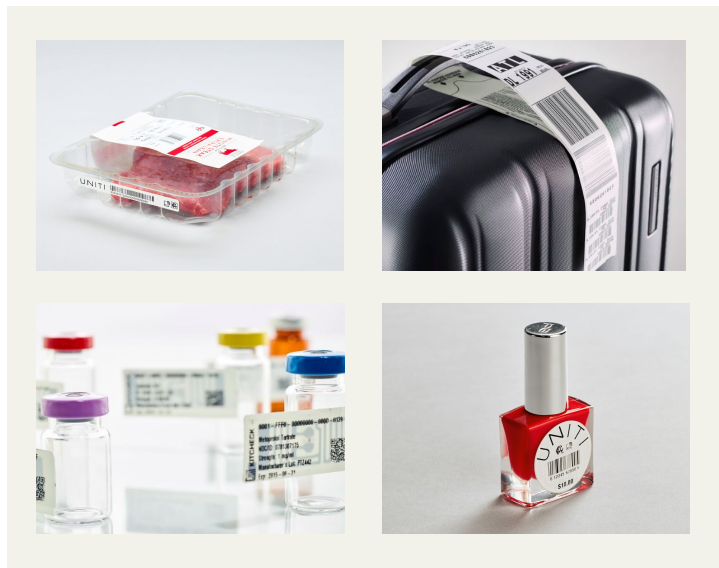
Supply chain automation, labour efficiency & closing the IoT GAP

Supply Chain Transparency: End-To-End Traceability

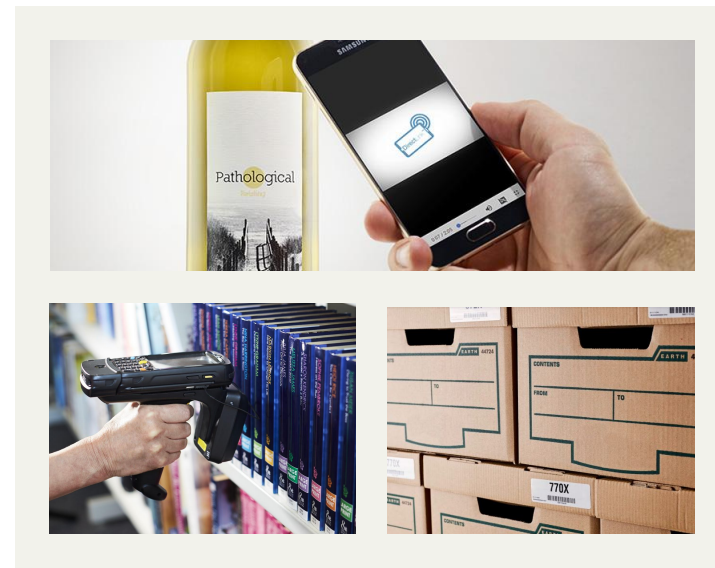


RFID Inlay Solutions

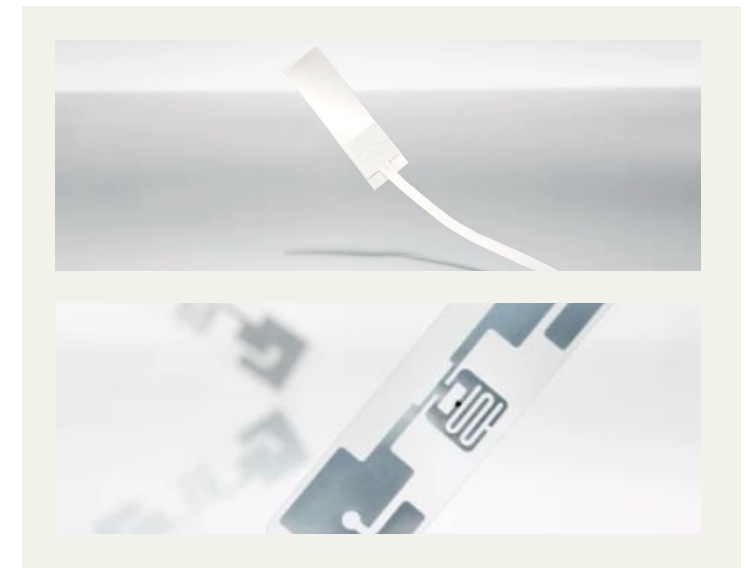
UHF RFID Inlays



HF and NFC RFID Inlays



Sensor Tags



Explore our progressive portfolio of digital ID technologies to choose the product or solution that fits your business needs. Visit rfid.averydennison.com/product-finder for more information.

Automotive

- Parts management
- Process automation in production
- Leakage detection



100% inline quality control



Considerable cost reduction



Greater customer satisfaction



Turnkey system solution



Healthcare

SUKU: Authentication of COVID-19 Test Kits

- Special NFC tags enabled by blockchain
- Can be attached to any test kit
- Allowing organizations to source secure, immutable, confidential, and real time data from test results
- Solution developed on SUKU blockchain based supply chain platform

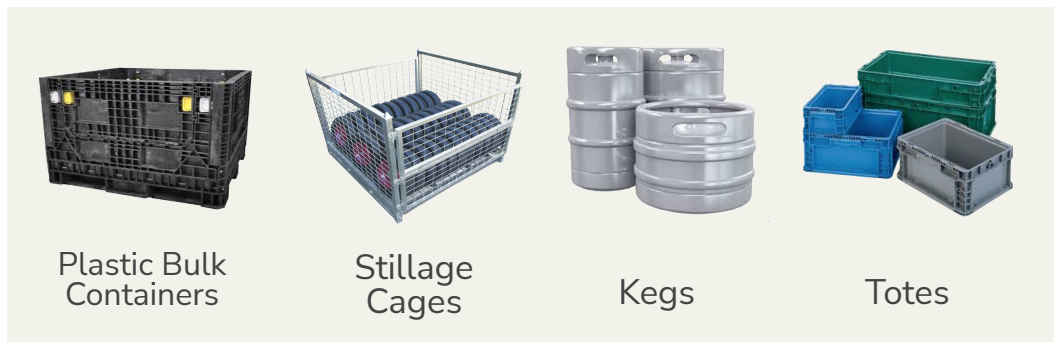


Logistics & Transportation

Returnable Transport Items (RTIs)

Utilized in all industries that rely on a supply chain — it provides a method for moving materials, parts, tools, and finished goods from one location to another.

- Reduce over-buying of RTIs by having accurate inventory visibility across your supply chain
- Execute timely maintenance and cleaning schedules with accurate RTI inventory location
- Prevent operational line-downs with adequate RTI supply levels



Reynolds Increases Sustainability by Enabling UHF RFID

The Challenge

- 60,000 disposable cardboard cartons weekly to 4,000 different customer sites

The Results

- £46k annual labour cost saving on assembling and managing cardboard boxes vs reusable trays
- 40% reduction of storage space when storing nested plastic crates versus stacked cardboard
- 92% return rates in the first year of RFID deployment



Retail & Consumer Engagement

Southern Fried Cotton (SFC), an apparel company located in South Carolina, was looking for a solution to uniquely identify its products for the benefit of its retailers and company operations.

Achievements after implementation:

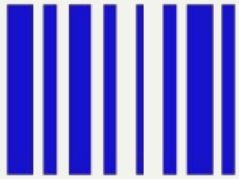
- Item-level RFID tagging solution that reduced discrepancy charge-backs by 98%
- increased carton unit accuracy by 99.5%
- improved operational efficiencies and fulfilled customer orders quicker.



Our Progressive Family

We describe our technology solutions as a progressive family;
flexible, adaptive, ever expanding...

Digital ID technologies



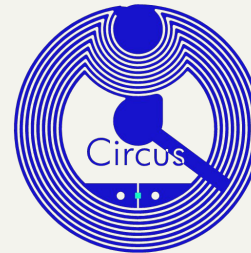
Bar Code



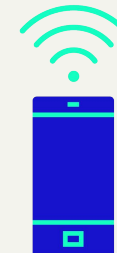
QR Code



RAIN RFID / UHF



NFC / HF



Printed Electronics



Passive Bluetooth

A progressive family, continuously advancing.

Q

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What RFID can do for you, your customers and the world

October 11-14, 2021



Agenda

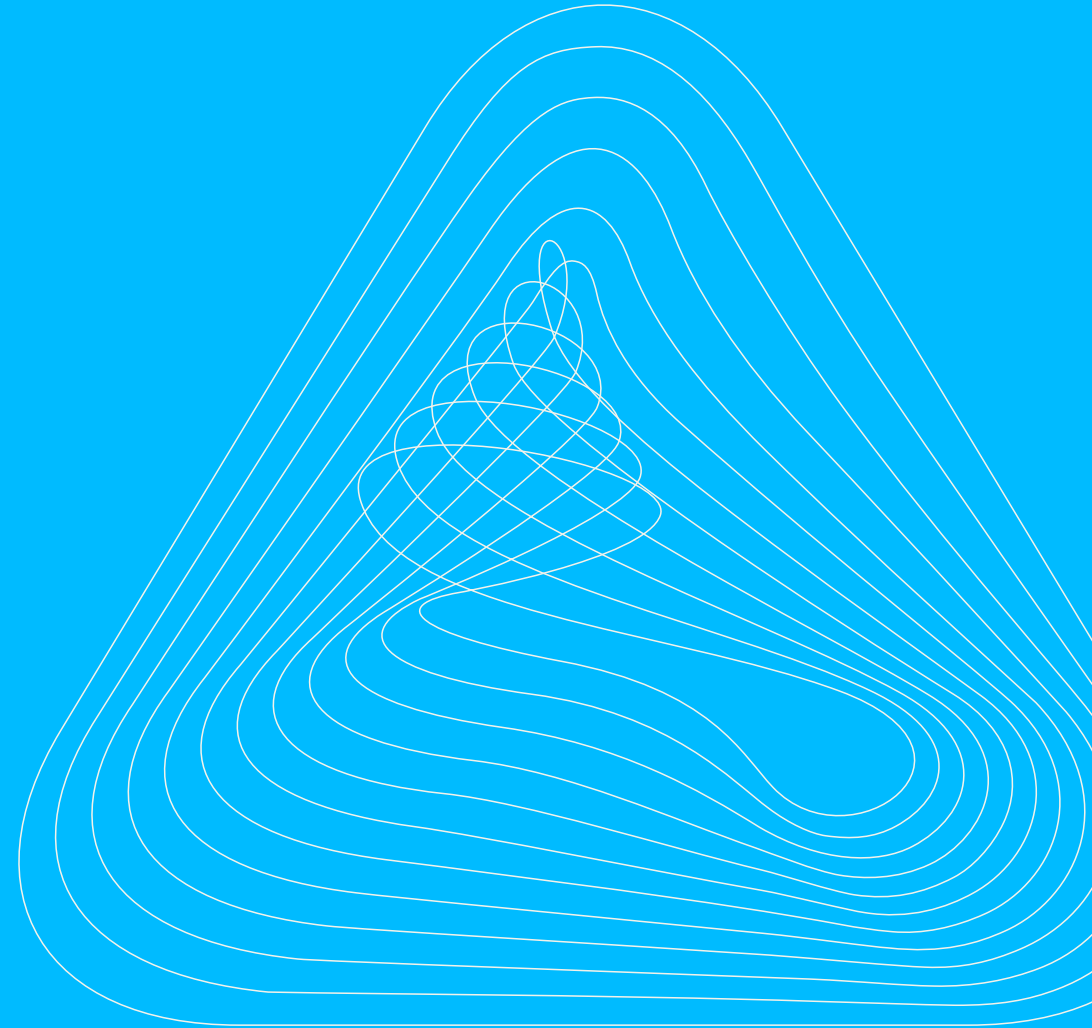
- What is RFID?
- Benefits
- RFID Inlay Construction
- RFID Types
- How it works
- RFID Around Us
- Future of RFID



Matti Taviampi

Global Sr. Manager Product
Line Management,
Avery Dennison Smartrac

What is RFID?



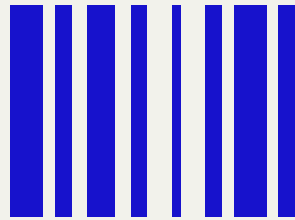
What is RFID?



Radio Frequency Identification

The wireless, automatic capture and transfer of information to or from electronic tags, to track an item in inventory or supply chain settings.

RFID vs. Barcode



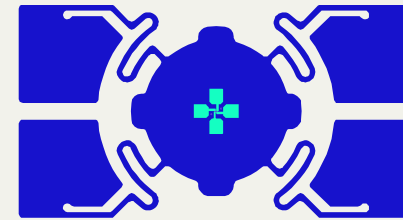
Barcode scanning

Needs a line of sight

One to one communication

Limited amount of information

Reads at close proximity



UHF RFID scanning

No line of sight needed

One to many communication

Extended amount of information, unique per product

Readability of several meters

RFID

RFID bridges the physical to the digital



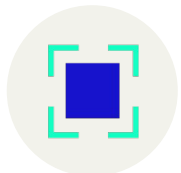
Connection to digital



Automated read



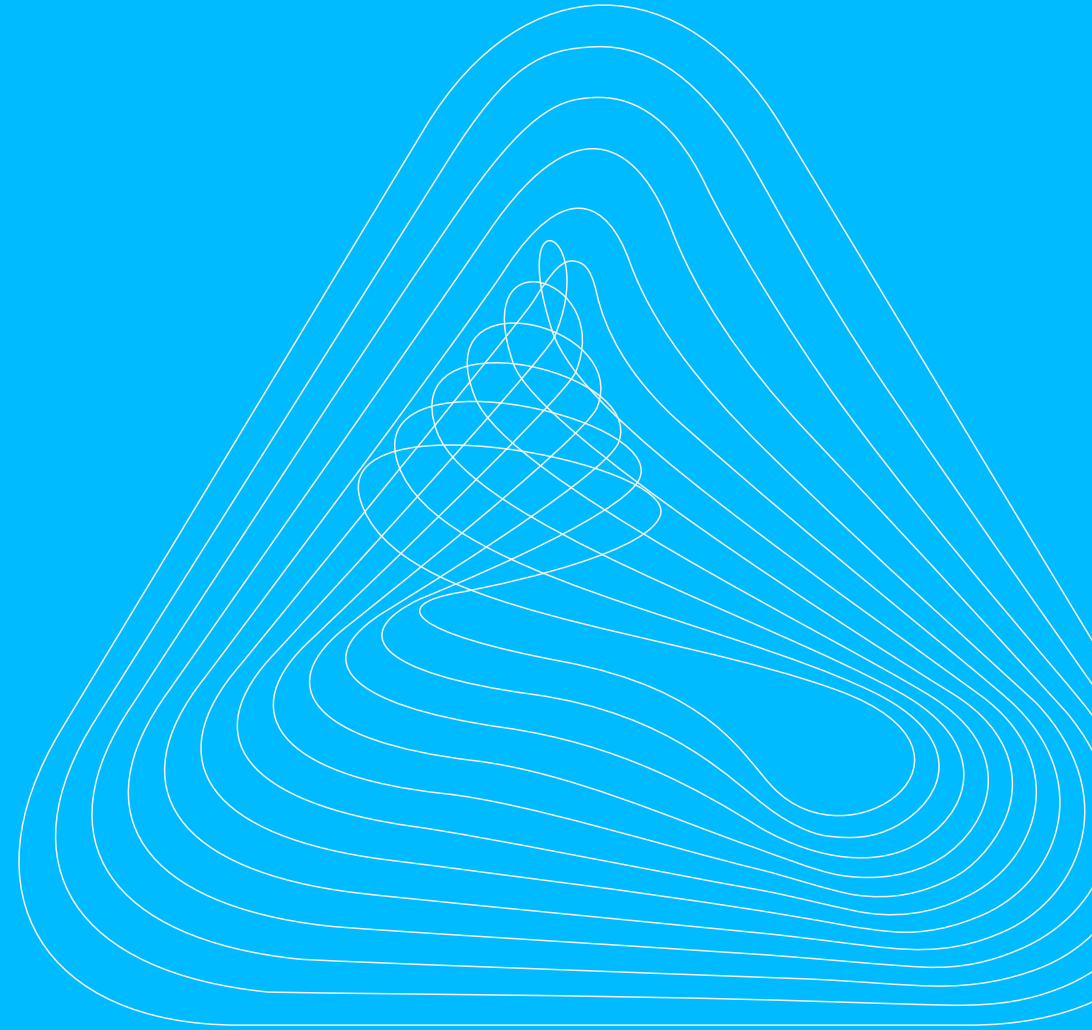
Fast read: Non-Line of sight and simultaneous



Uniquely identifies physical Items



Benefits



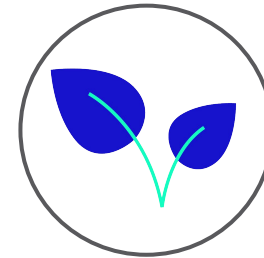
RFID Benefits



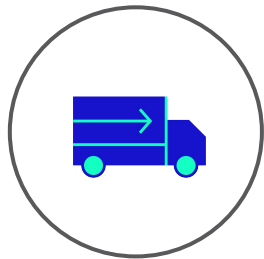
Security



Engagement



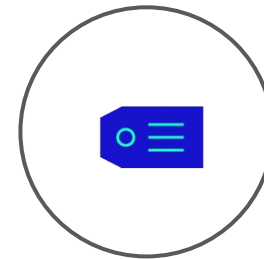
Sustainability



Track & Trace



Compliance



Aesthetics

A Connected World Through RFID

A connected world driven by digital platforms



Digital twin

A digital version of the physical product is created



Source

Materials, ingredients, provenance and sustainability



Manufacture

Product provenance, manufacturing performance and shipping accuracy



Distribute

Receiving and shipping, performance and accuracy



Retail

Product availability, inventory accuracy and consumer engagement



Consume and operate

Post-purchase interactions and consumer patterns



Recycle

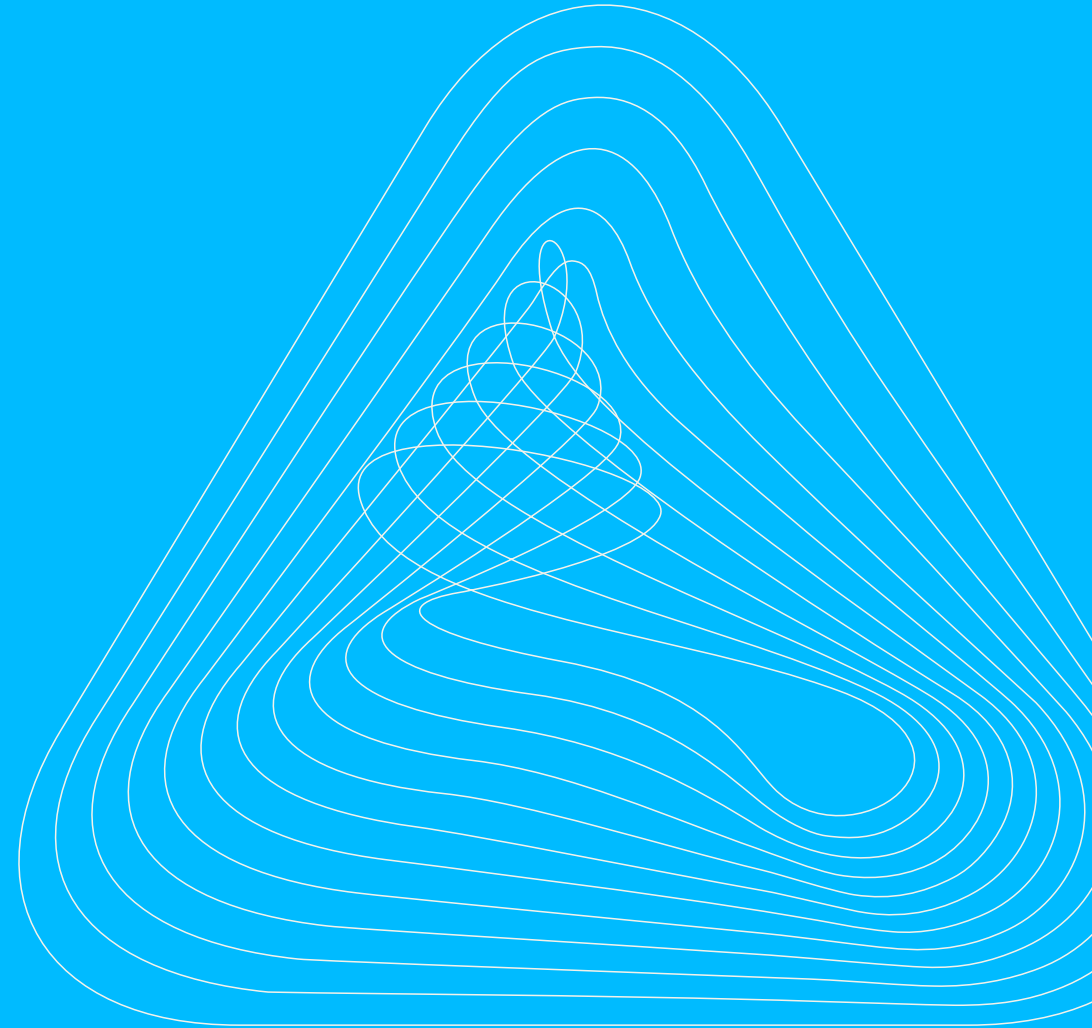
Sustainable recycling, circular economy and secondary marketplaces



Responsibly handled

Appropriate handling at the end of a product's life

RFID Inlay Construction



Parts of an RFID Inlay

Chip or IC (Integrated circuit)

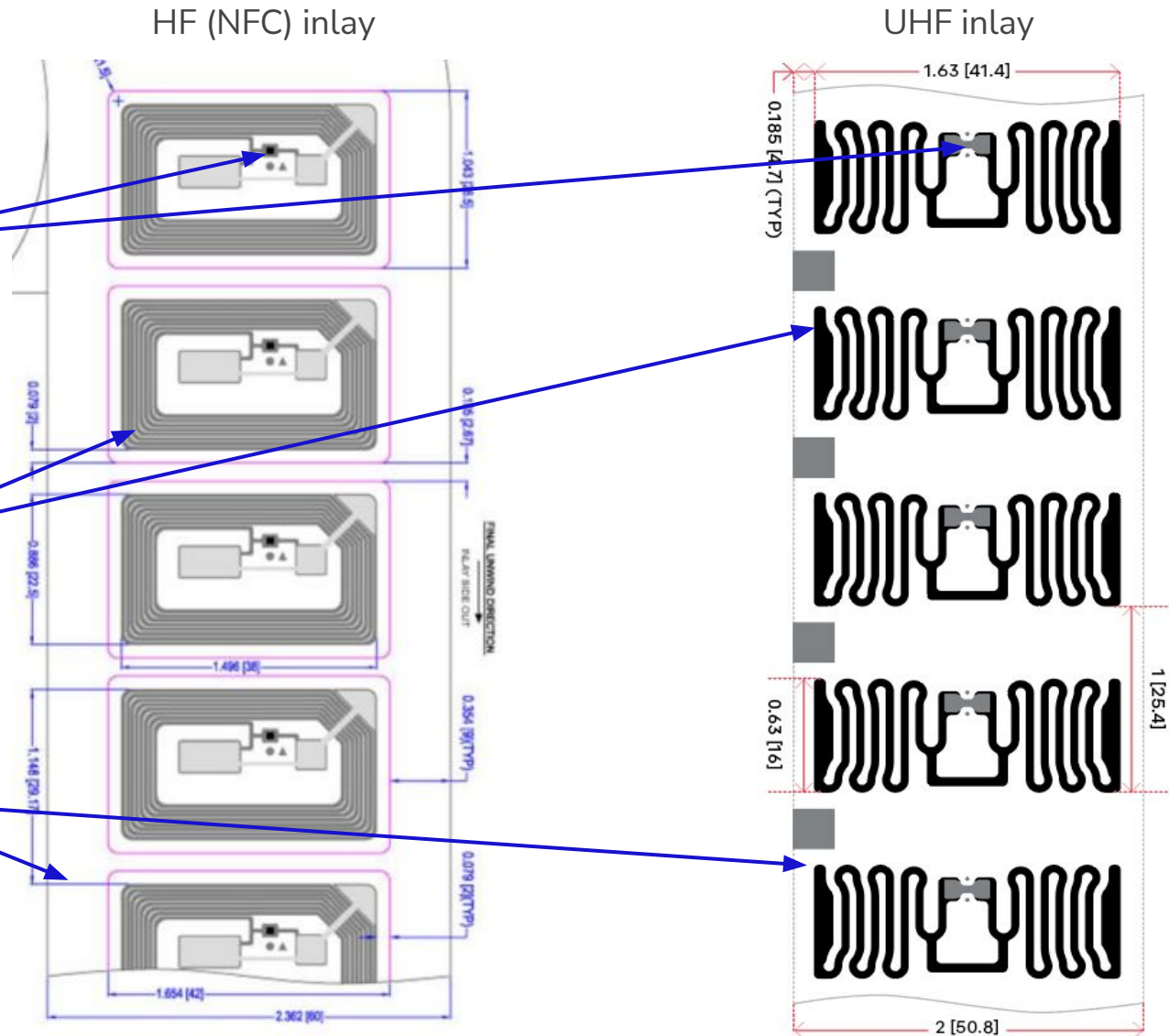
Intelligence of Inlay
Memory
Special features

Antenna (Conductive geometric shape)

Mature technology (aluminum)
Good performance
Shape of antenna tuned for use

Antenna carrier

Different materials:
PET substrate
Paper substrate
Fabric substrate

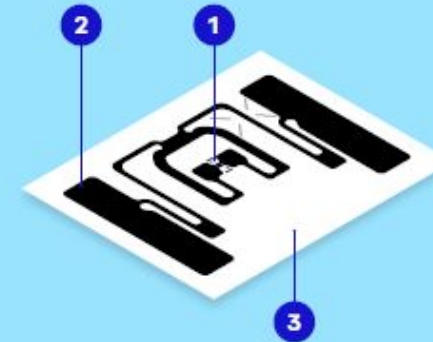


RFID Tag

Standard label



RFID inlay



1. Chip

The intelligence of the inlay, which communicates with the reader and allocates memory storage space for specific information

2. Antenna

A conductive geometric device that captures the signal from the reader and sends it to the chip

3. Carrier

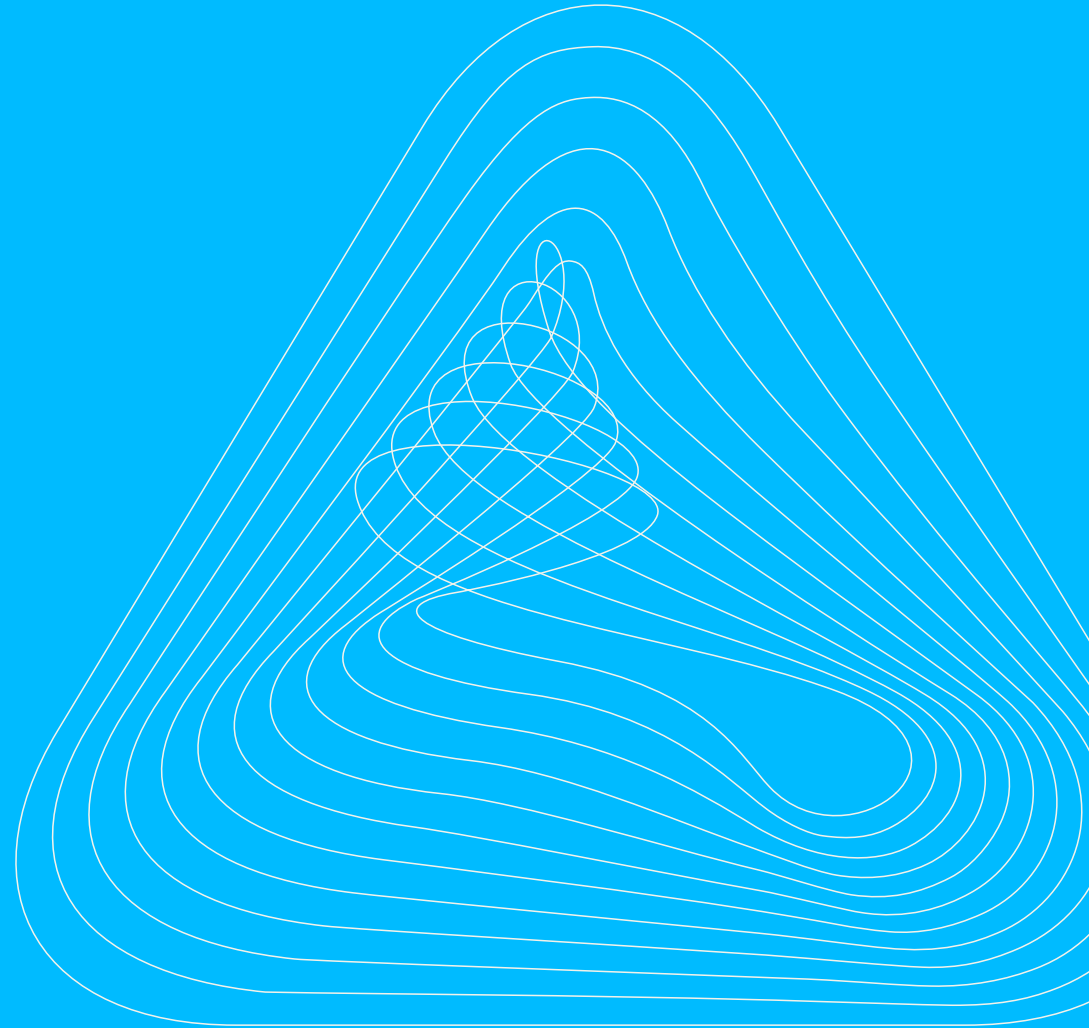
A substrate that holds the chip and antenna, which can be made of PET, paper or fabric

RFID tag

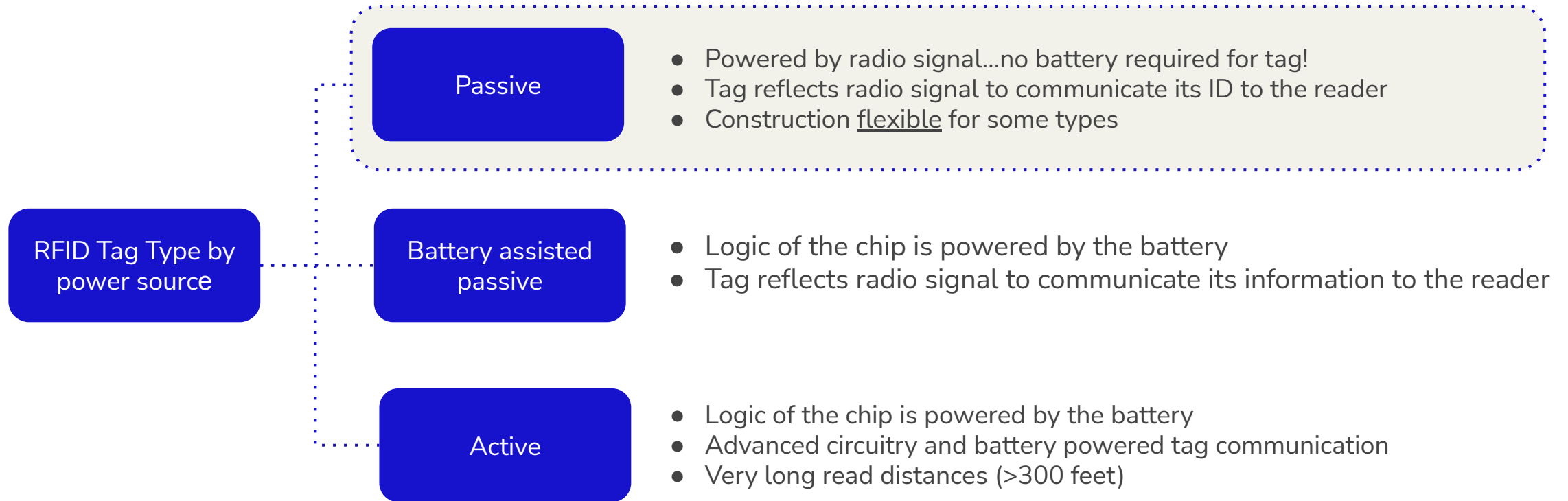


Finished ticket or label encasing the RFID inlay

Types of RFID



RFID Tag Type: Power Source



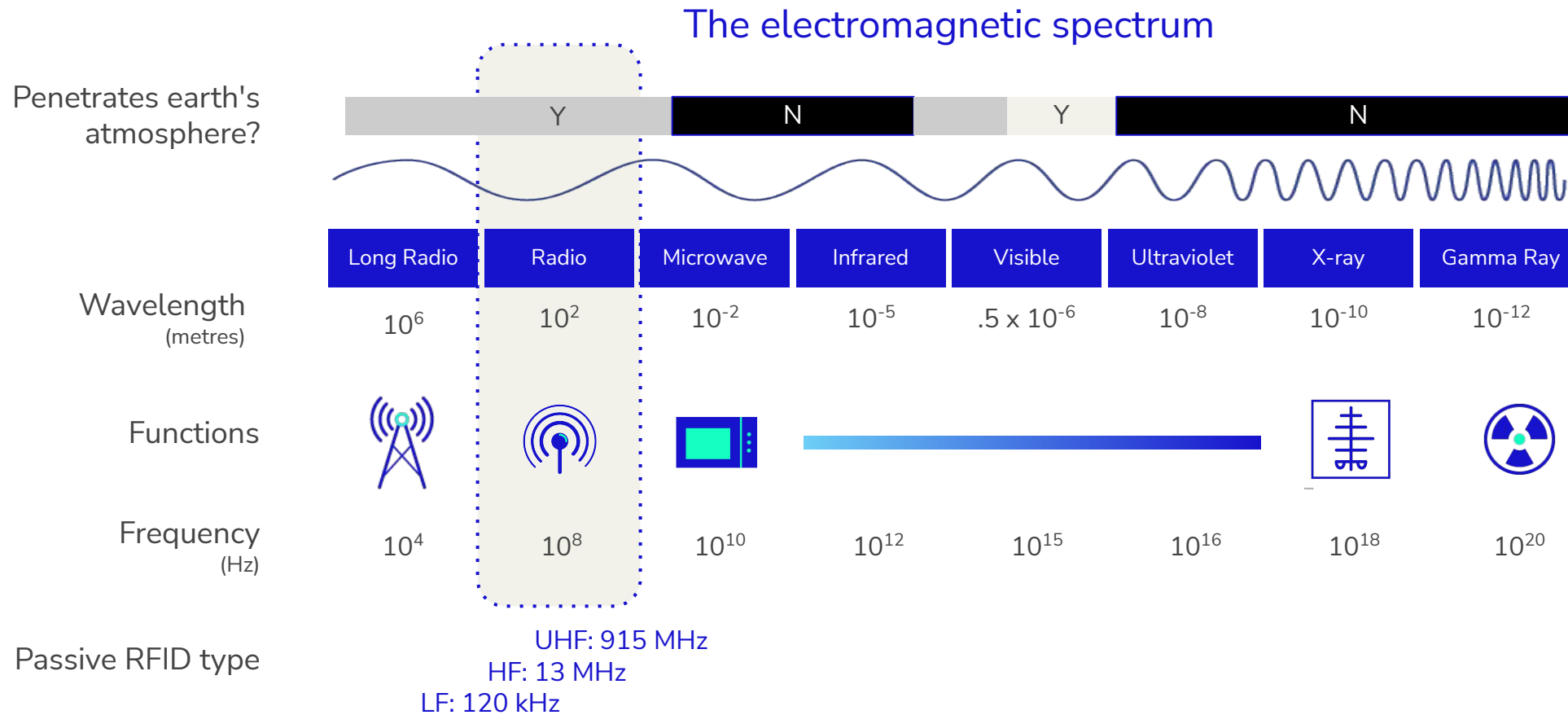
Passive vs Active: UHF



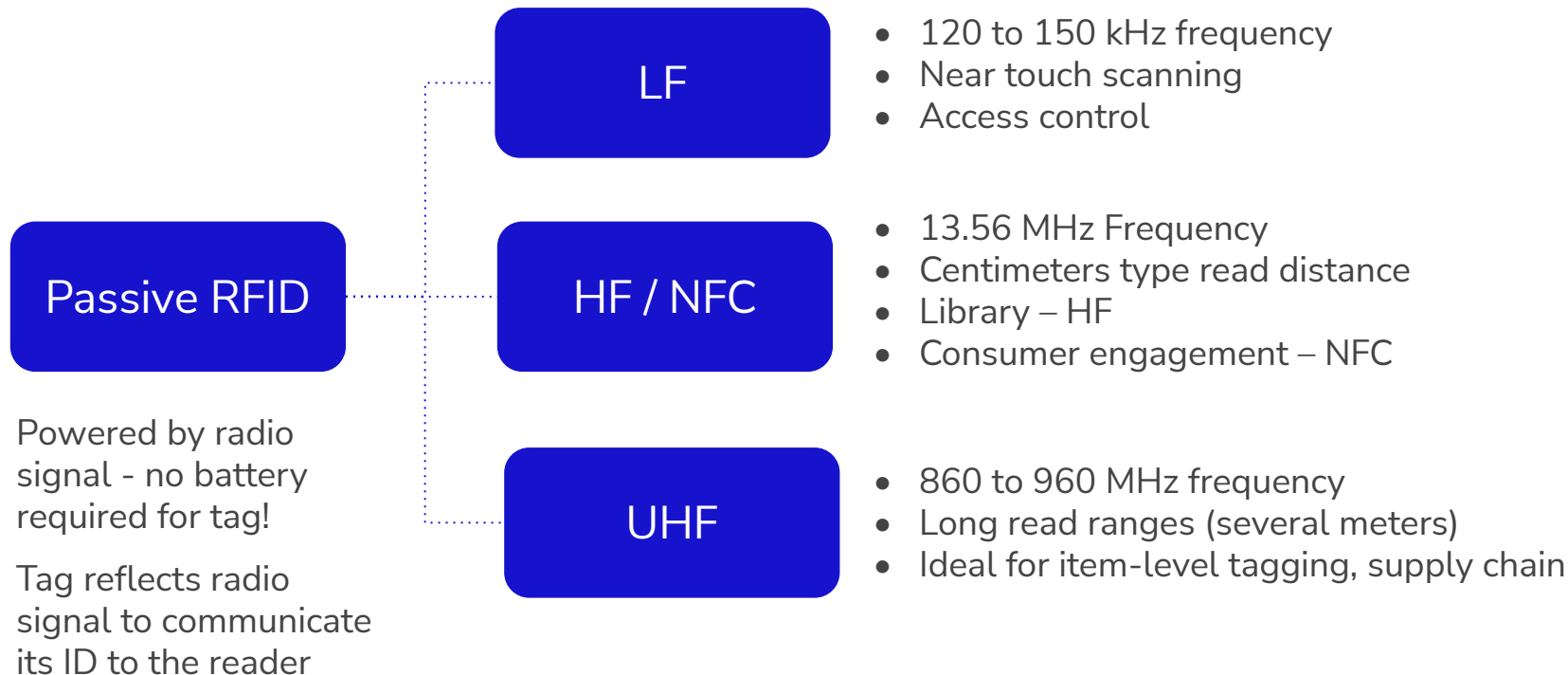
	Passive	Active
Battery	No	Yes
Reading Range	Up to 12 metres	Up to 100 metres
Memory, Functions	Memory limited to RFID Chip Reader logs reads	May have larger Memory May self log data to Memory
Cost	Low	High



The Wireless World We Live in...



Passive RFID: Comparison by Frequency Band



Passive RFID: Comparison by Frequency Band



LF
125KHz



HF
13.56MHz



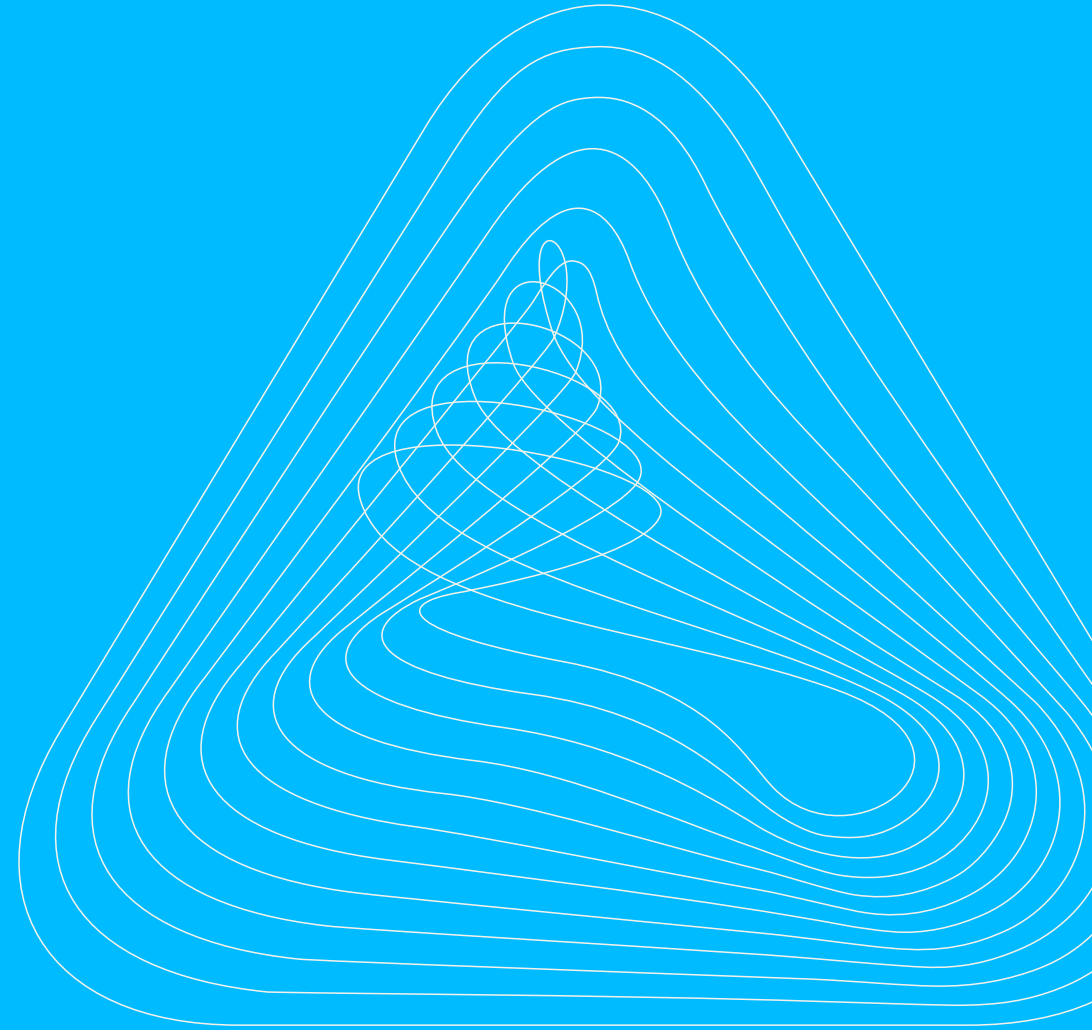
UHF
868-915MHz



Microwave
2.45 GHz

	LF 125KHz	HF 13.56MHz	UHF 868-915MHz	Microwave 2.45 GHz
Data rate	Slower	[Progressive bar from dark blue to light blue]		Faster
Read distance	Near	[Progressive bar from dark blue to light blue]		Far
Use near metal / liquid	Better	[Progressive bar from light blue to dark blue]		Worse
Cost	Highest	Low	Lowest	Highest

How it Works



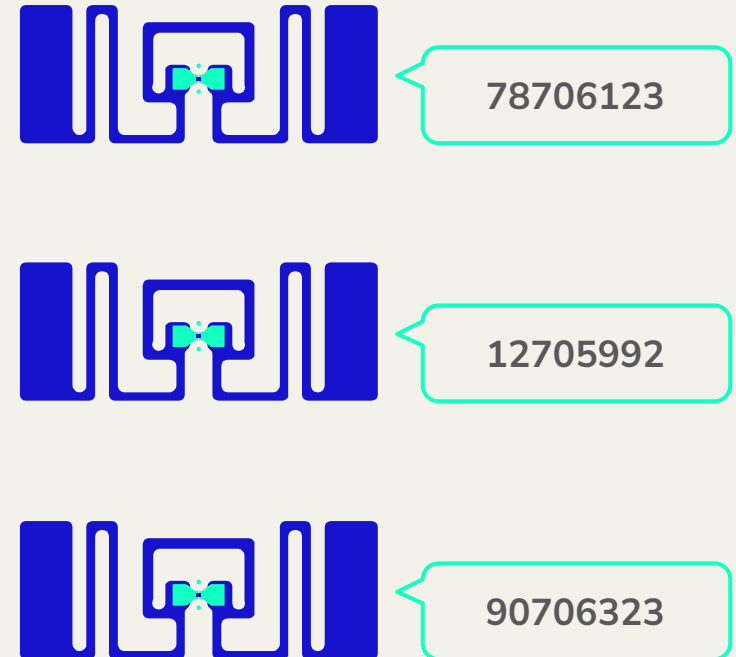
How Passive RFID Works

RFID tags contain an integrated circuit and antenna that allow them to store and transmit data to an RFID reader.

The RFID tag antenna collects RF energy from the reader and sends the energy to the chip. This powers up the integrated circuit (chip) so it can reply to the reader.

Process:

- Reader sends radio signal (prompt) to the tags
- Tags wake up from their sleep!
- Tags acknowledge the scanner's prompt for ID
- Each tag responds with a unique number



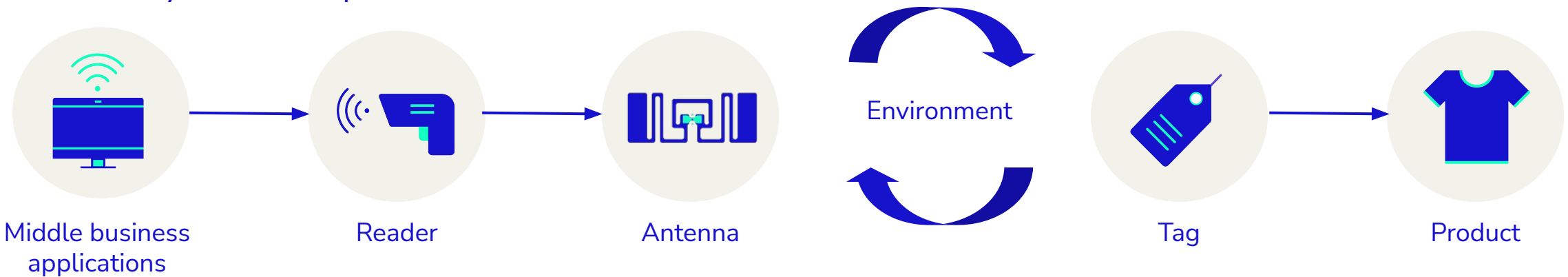
What is RFID Technology?

Radio Frequency Identification is the wireless transfer of data to or from electronic tags that are attached to items

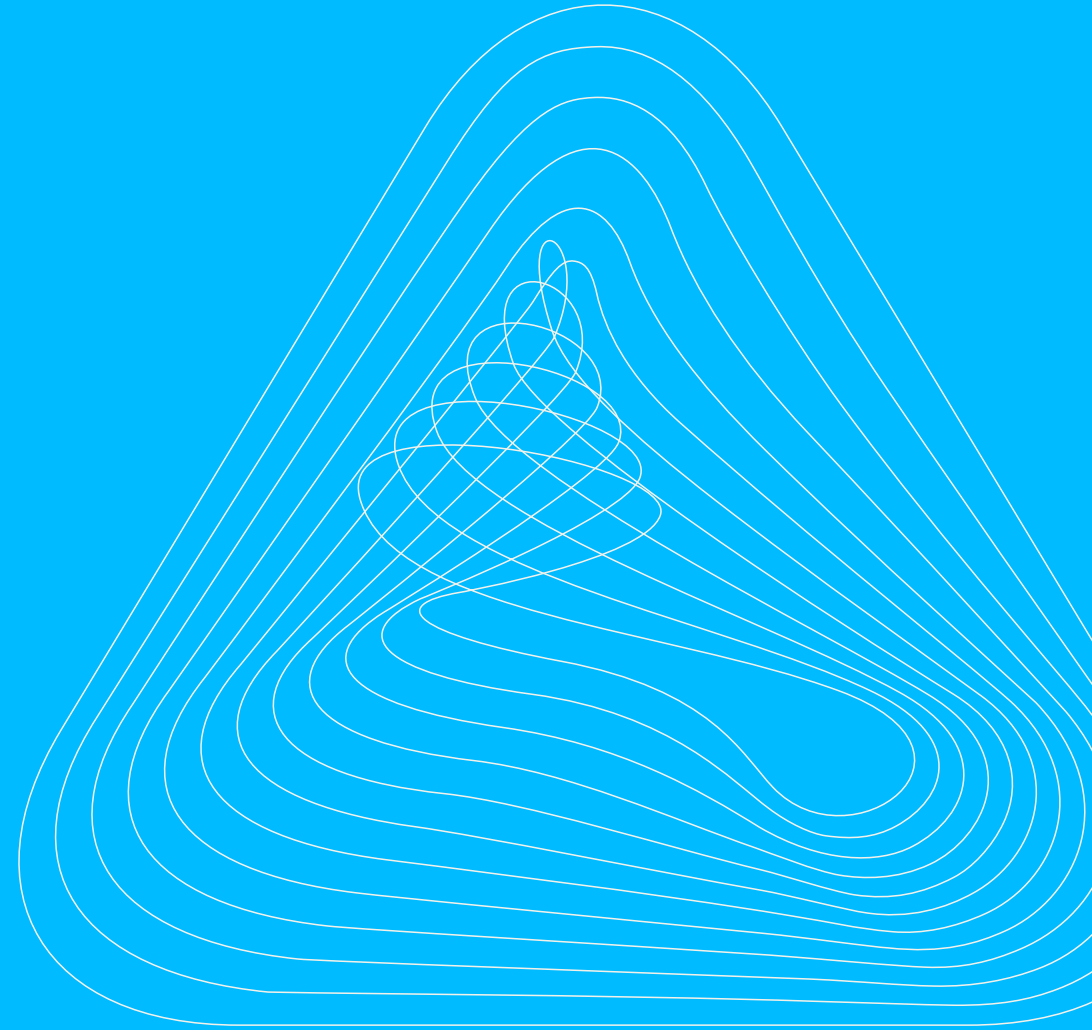
Uniquely identifies each item

Requires a matching RFID reader to interrogate tag

RFID full system example: Passive UHF RFID



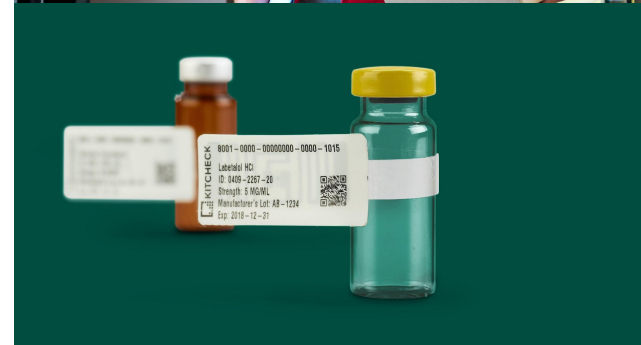
RFID Around Us



RFID: Hiding in Plain Sight

RFID is being used in every major market in the world to **improve efficiencies** and **increase visibility** throughout the supply chain.

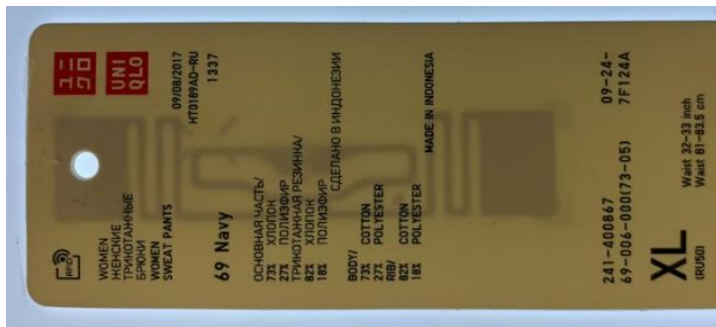
Customer **demand for supply chain optimization**, increased visibility and improved inventory accuracy are key drivers.



RFID: Hiding in Plain Sight

RFID is being used in every major market in the world to **improve efficiencies** and **increase visibility** throughout the supply chain. Customer **demand for supply chain optimization**, increased visibility and improved inventory accuracy are key drivers.

Uniqlo hang tags



Decathlon self-checkout kiosks



Baggage tags



Door access



Public transportation



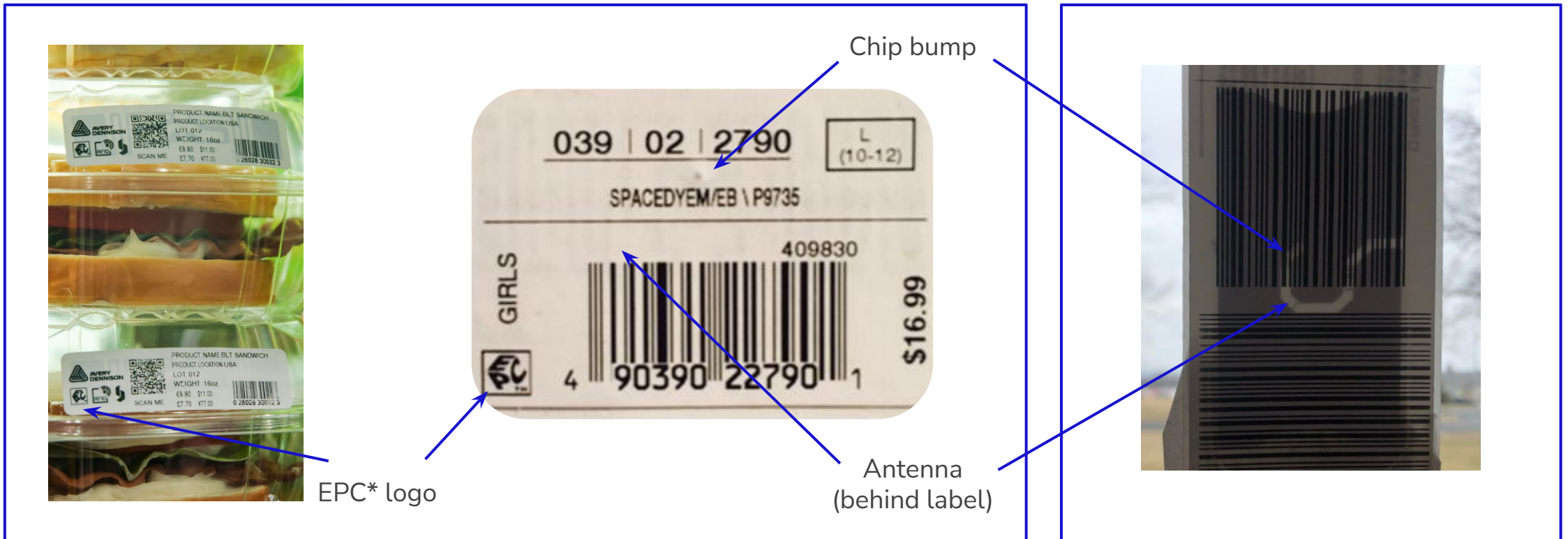
Electronic toll collection (MY/ID/IN/PH/TH/VN)



Identifying RFID in the Wild

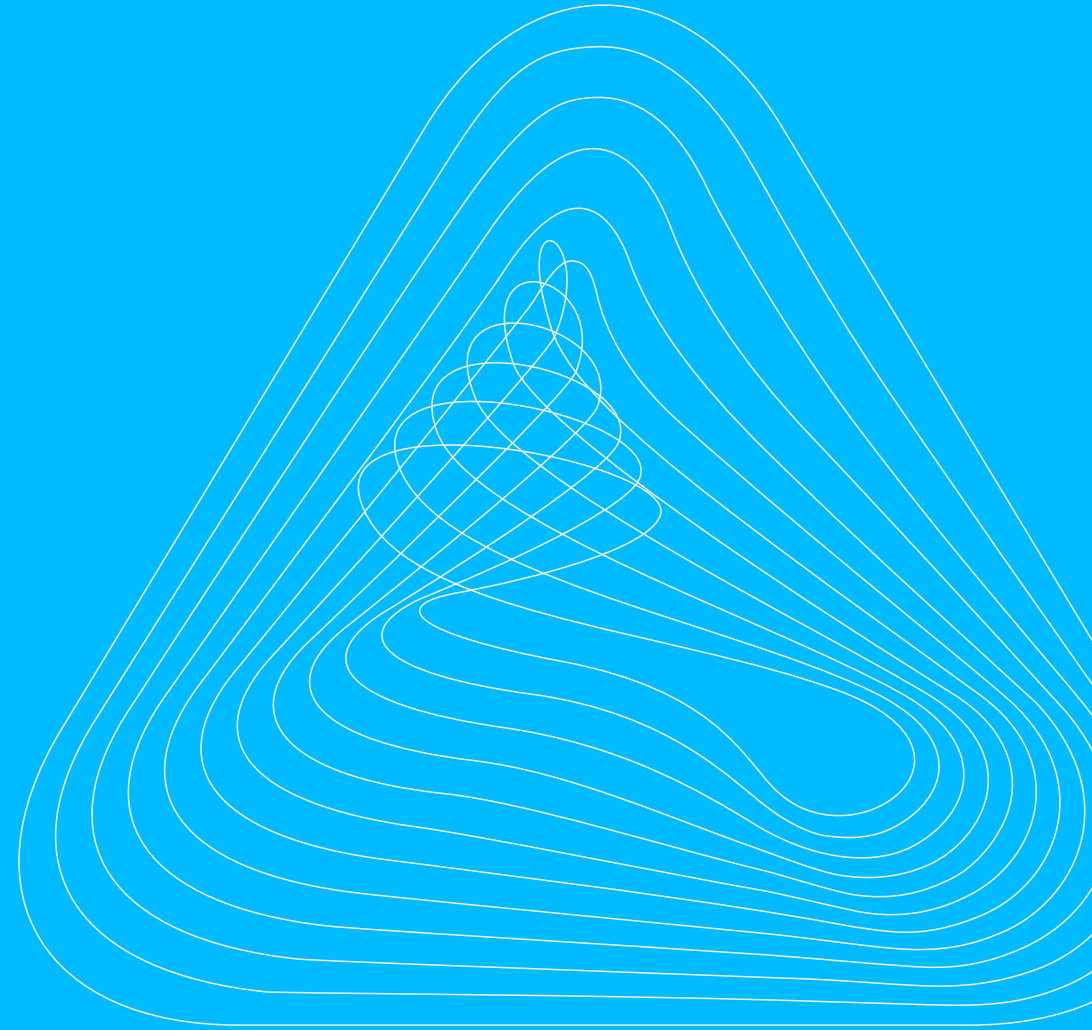
Retail

Baggage tag

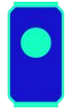


*EPC stands for Electronic Product Code

Future of RFID



Future of RFID



Food, wine and spirits



Retail



Healthcare

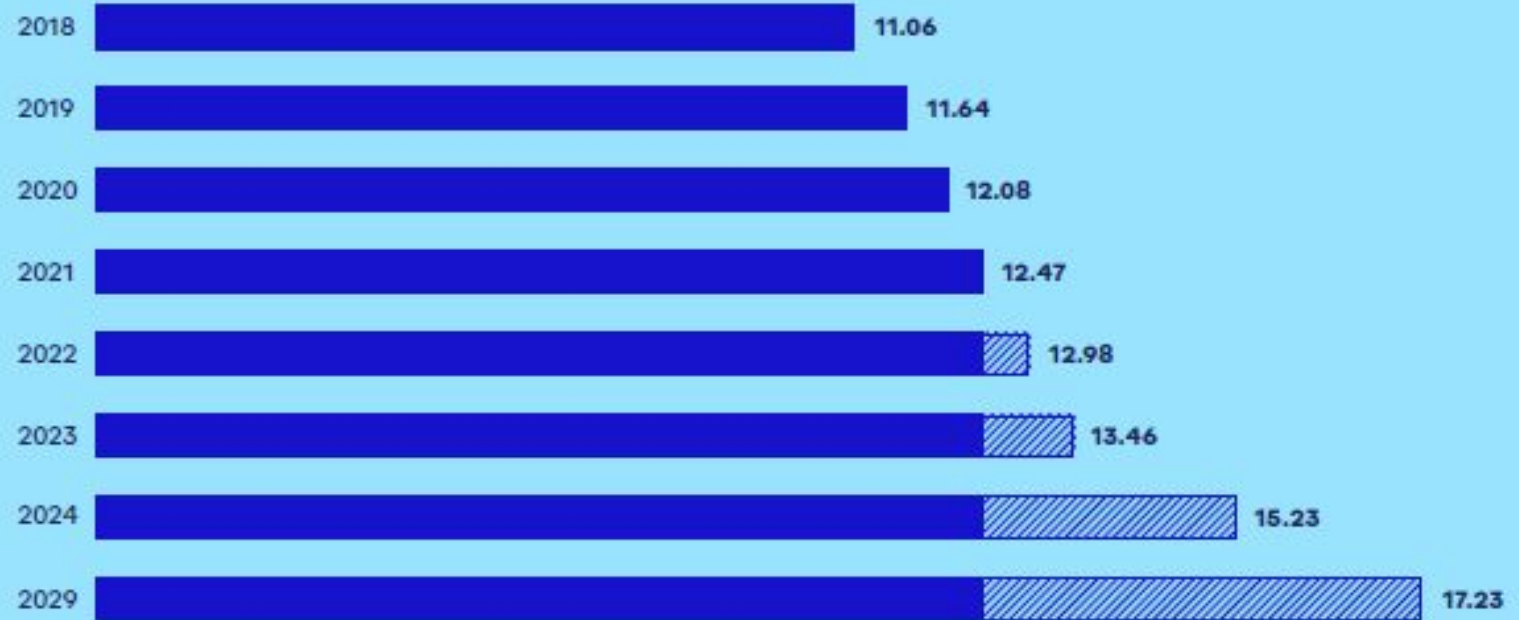


Automotive



Commercial aviation

Market size 2018–2029, \$ billions



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