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RFID in Healthcare

Safeguarding your assets

Today’s topics

- Murata introduction
- RFID/NFC technology
- Application reviews
- Murata’s RFID/NFC products
- Summary & take-aways

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RFID in Healthcare

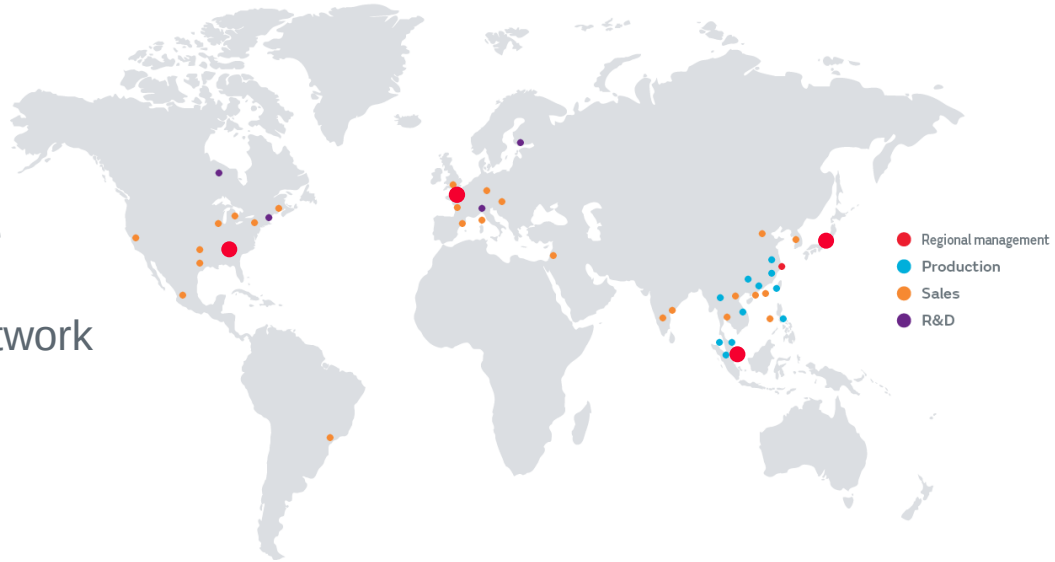
Murata – global corporate profile

Our business

We are worldwide leaders in the design, manufacturing and supply of electronic components and solutions.
We are **“Innovators in Electronics”**

Our strengths

- Advanced materials technology and expertise
- Broad product portfolio
- Extensive global manufacturing and sales network



Our figures

- Net sales 1,371,842 million JPY*
- Employees ~80,000
- Number of locations ~100
- Established in 1944

*as of March 2018

Who we are?

Murata is a global leader and supplier of advanced electronic materials and processes.

Materials technology	Materials design	Materials processing				
Front-end process technology	Laminating & stacking	Printing	Sintering	Nano & thin film fabrication	Surface finishing	Precision mechanical processing
Product design technology	High frequency design	Device design	Embedded	High reliability design	Circuit design	Simulation
Back-end process technology	Packaging	Measurement	Automation	Industrial engineering		
Analytical technology	Materials characterization	Failure analysis				

What we do?

Murata is a global leader in the design manufacture leading edge electronic components and multi-functional, high-density modules.

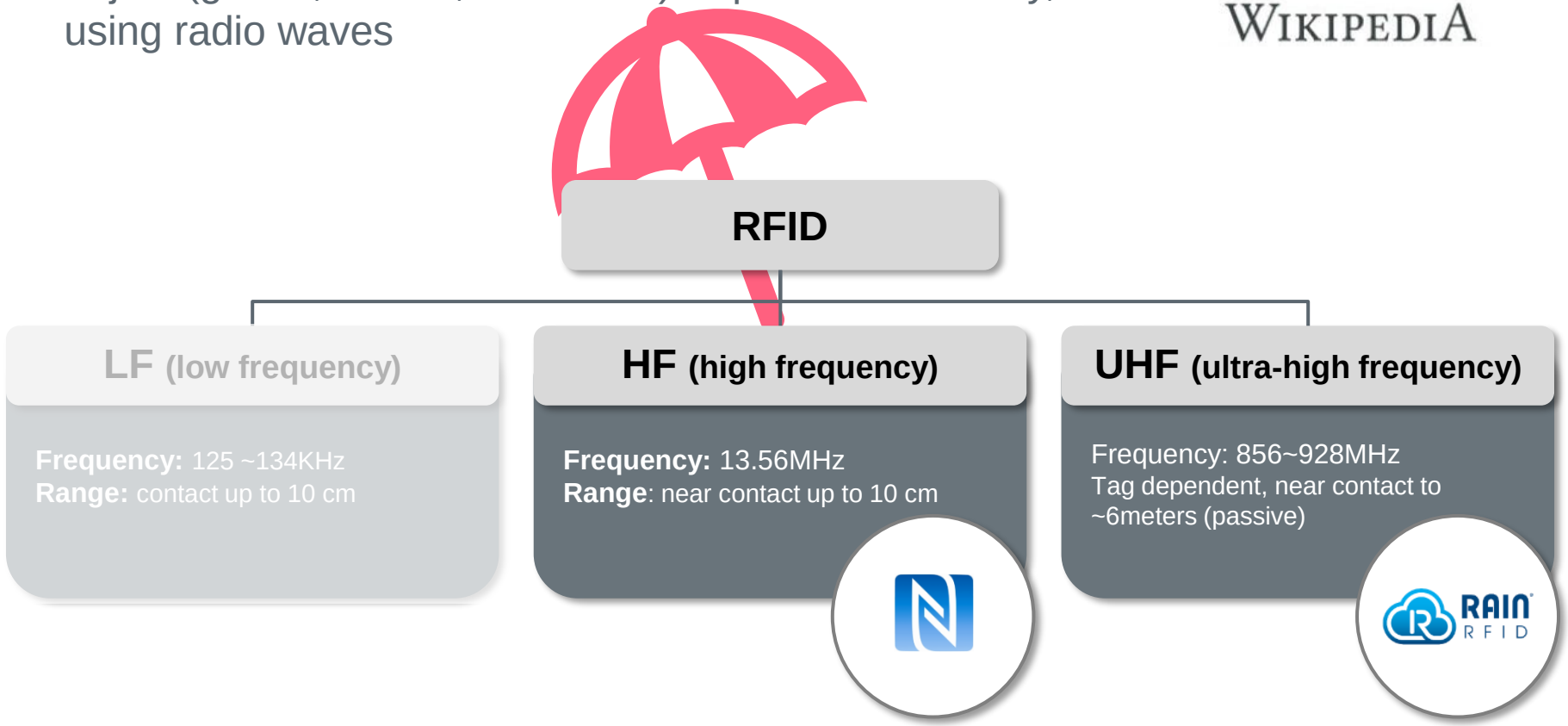
Wireless technologies = smart products

Wireless Technologies	Distance	Purpose
Close Proximity (~10cm) NFC	**Touch** 	**Item Level Tracking** • Asset tracking • Authentication • Production tracking • Logistics tracking • IoT • Industry 4.0 • Brand Protection
Mid Distance (.2~7 meters) RAIN RFID	**Room Size** 	
Long Distance (~75 meters) Wi Fi Bluetooth zigbee	Building Size 	**Connecting** • Networking & platform interface • Communication • Monitoring • Information exchange • Location / positioning
Very Long Distance (~7km) LoRa	Large Neighborhood 	
Ultra Long Distance (~20km) Lte	Across town 	

RFID technology - definition

Radio Frequency Identification (RFID) is a generic term that is used to describe a system that transmits the identity (in the form of a unique serial number) of an object (goods, assets, document) or person wirelessly, using radio waves

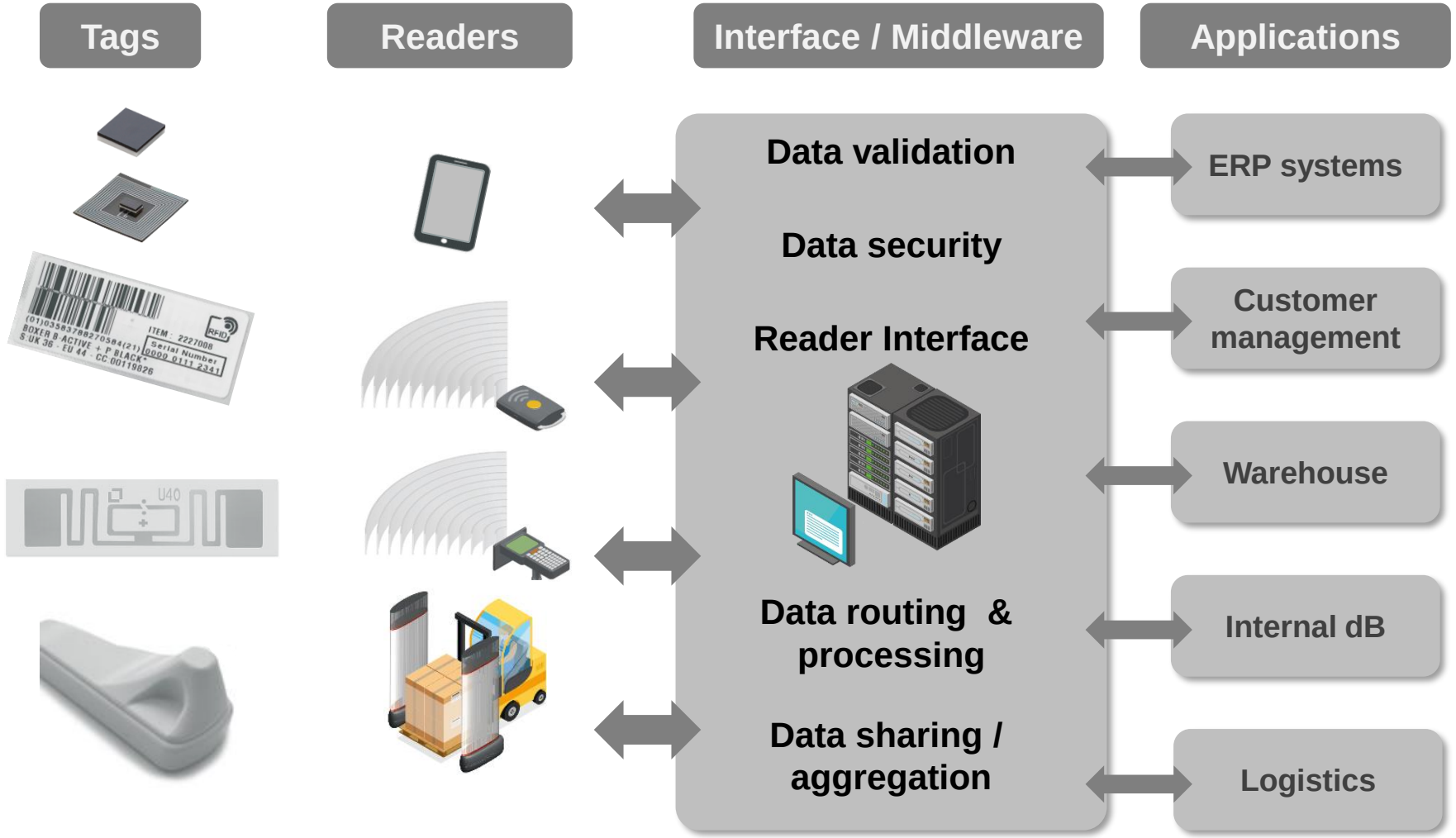
WIKIPEDIA



Feature comparison of RFID technologies

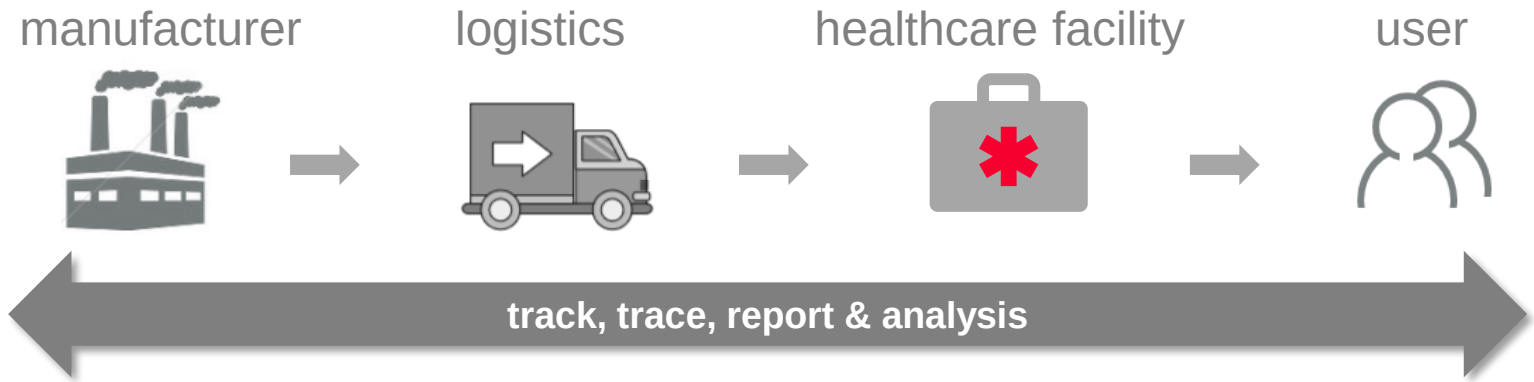
Frequency	HF (high freq) 13.56MHz Common frequency band WW	UHF (ultra high freq) 856 ~ 928MHz Different frequency band by region
Read range (typ)	Near contact up to 30cm	Near contact to ~5m
Cost	Tag: Less expensive RW: Least expensive	Tag: Least expensive RW: Expensive
Water affect	Some	Yes
Antenna design	Coil	Dipole, slot
Reading multiple tags	So-so	Very good
Standards	ISO14443 ISO15693	ISO18000-63 EPC Global Gen2
Applications	NFC, access cards, smart cards, retail, payment, library, product authentication	Baggage, logistics, tracking, retail, product authentication

RFID system architecture



Which technology to use?

Logistics Flow



Technology

RAIN

Main – B2B

secondary

secondary

Main – B2C

- long read range typically required
- high level carton tracking
- inventory management
- many tags can be read at one time

- short read range
- item level tracking
- secure
- individual tag reading

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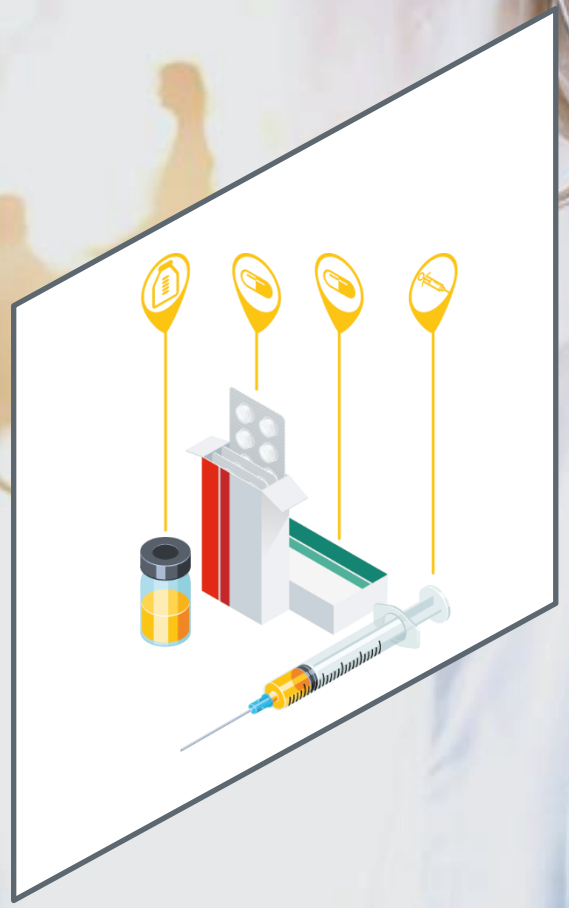
Why is RFID a good fit?



RFID value proposition in healthcare

Security / safety
Reduce risk / improve protection

Automation
Reduce repetitive manual processes

Improve efficiencies
Streamline processes

Improve accuracy
Reduce / eliminate errors

Improve work environment
Best in class, staff retention, etc.…

Authentication
Brand protection

Cost control
Improve bottom line

Enhance patient experience
Often overlooked

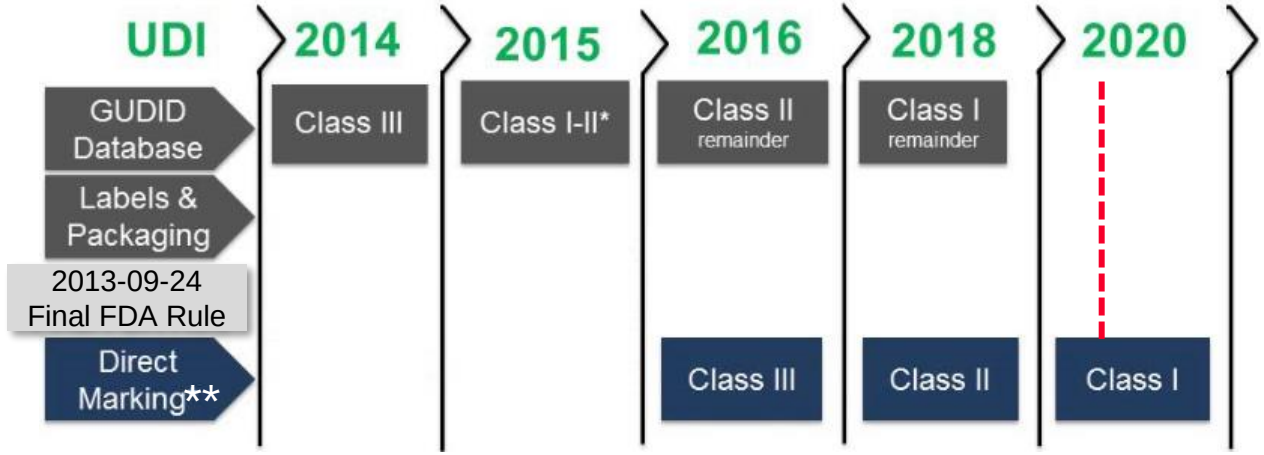
Device product differentiation
Increase product value

Brand protection
Secure name/brand

Government regulations - UDI

FDA-mandating permanent ID - Unique Device Identification (UDI)

FDA Compliance Timeline



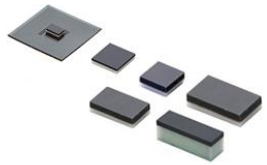
*** Implantable and life-sustain life support**
****Multi-use devices that are intended to be reprocessed before each use**

EU, Japan, China, and other regions are following trend.

Technology Options

Bar Code (vision)

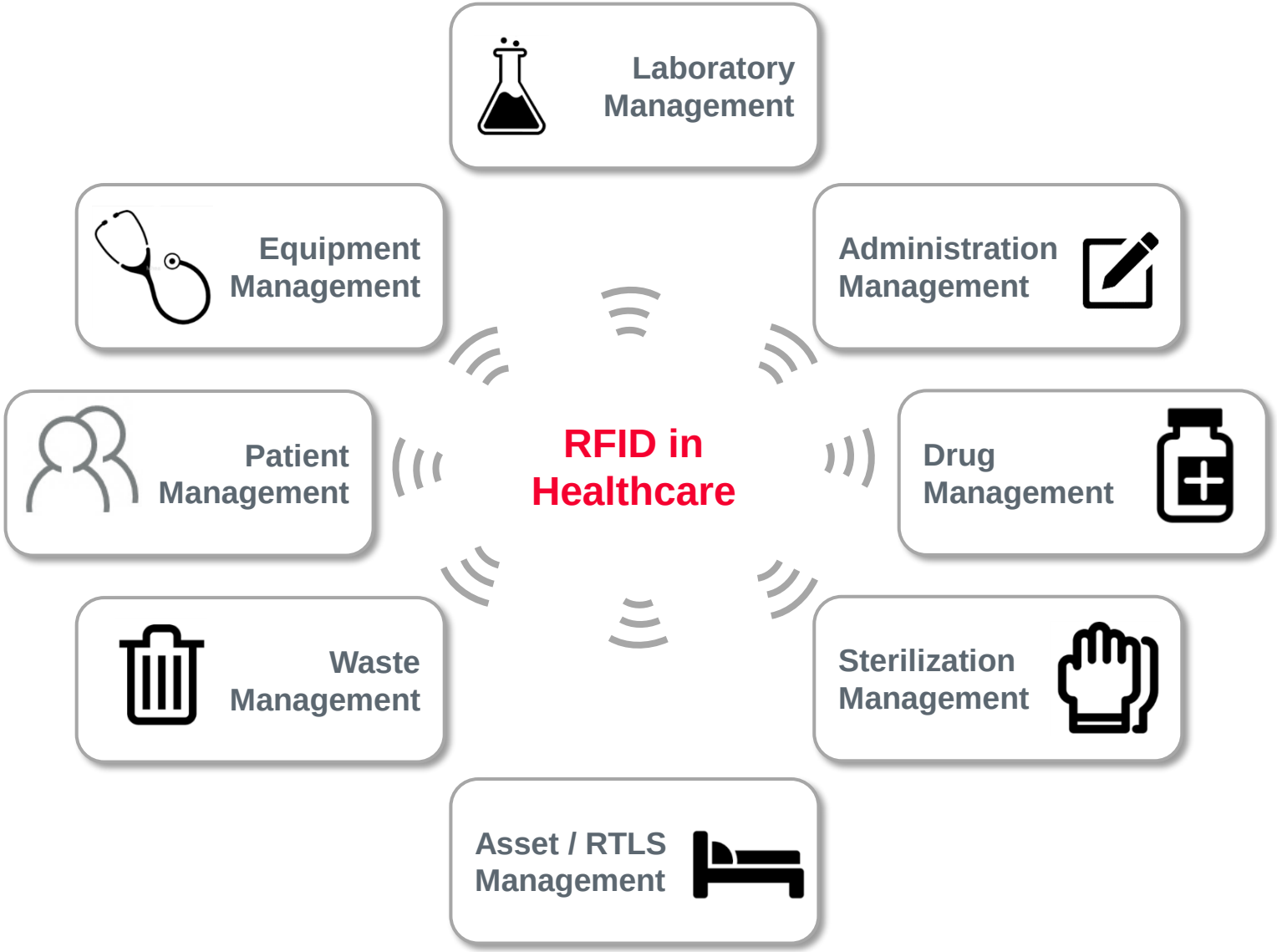
RFID / NFC (wireless)



Other (vision)

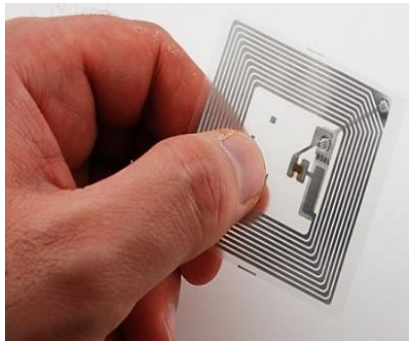
- label
- engraving/etched
- etc…

Where is RFID being used in healthcare?



Common NFC / RAIN RFID tags

NFC Tags
(13.56MHz)



UHF Tags
(856 ~ 928MHz)

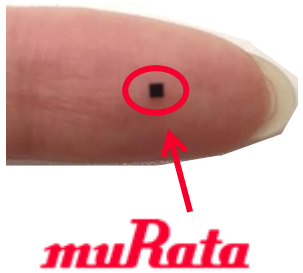
Large tags may not be an option on small size products for item level tracking!!

Item level tracking tag features

The ***standard inlay*** is popular choice for many healthcare applications - asset management, linen, garments, pharma, documents, etc….

<u>However many applications cannot adopt.</u>

- Too large
- Difficult to conceal
- Often removed from item after being read
- Read range is too long / read too many at one time



Ultra small tags - used for item level tracking.

<u>Value proposition :</u>

- Tag can be hidden - doesn’t interfere with product aesthetics
- Permanent item identification for brand protection
- Authenticate / validate product
- Protect their brand and their bottom line
- Lifetime tracking capabilities including RMA traceability
- Individual item identification
- Feature, increase product value

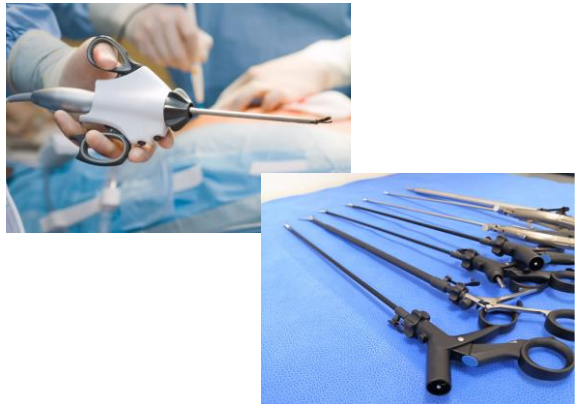
Healthcare items using small HF/UHF tags

Tools
(under evaluation)

Injectable devices
(under evaluation)

Lab analysis & storage
(under evaluation)

Medical device with accessary
(in use)



Disposables
(under evaluation)

Monitoring Products
(in use)

Medication
(under evaluation)

RFID in healthcare

Application review

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Application review

Test tube management using RFID

Application review – test tube tracking

Stakeholders:

- Laboratory
- Hospital

Current process:

- Individual item scanning
- Manual intensive process

The challenge

Manual process of tracking test tubes requires time and resources.

Customer requirements

- Reduce manual processes
- Automate product recognition
- Improve accuracy / eliminate errors
- Ability to track in real time
- Bulk reading capabilities
- Long term data retention
- Durable – must withstand wide temp range

Application review – test tube tracking

The challenge

Manual process of tracking test tubes requires time and resources.

Current method

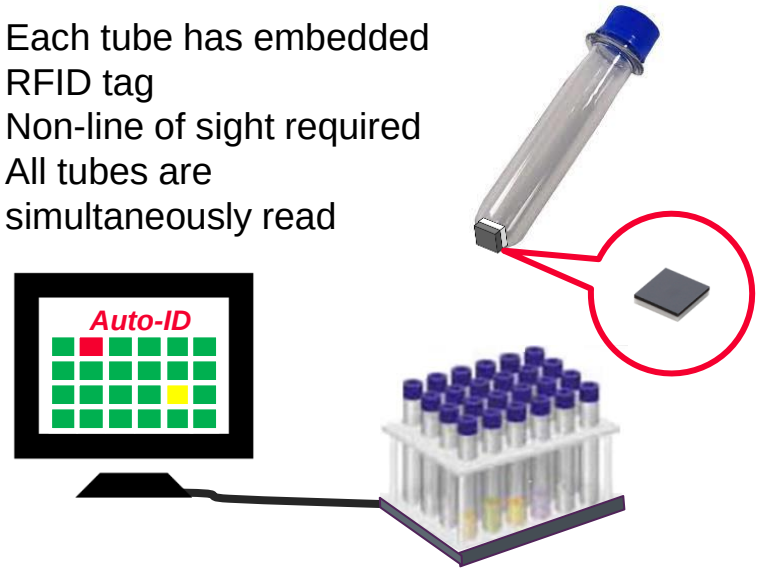
Lab

- Bar codes are used to identify tubes
- Each one requires to be read individual to capture information.
- Line of sight is required

RFID solution

Lab

- Each tube has embedded RFID tag
- Non-line of sight required
- All tubes are simultaneously read



RFID enabled reader/writer base unit with matrix loop antenna network

Application review – test tube tracking

Embedded HF/UHF tag features

- Small size
- Durable design
- Withstand over-molding / embeddable process
- RoHS compliant

Part number	LXMSJZNCMF-210	LXMS33HCNG-134
Type	Embeddable (Integrated Antenna)	
Appearance		
Standard	ISO18000-63 EPC global Gen2v2	ISO15693 NFC Forum type5
Frequency	UHF	HF
Memory size	EPC: 96bit User: N/A	NDEF: 896bit
Size (L x W x H) [mm]	1.2 x 1.2 x 0.55	3.2 x 3.2 x 0.7

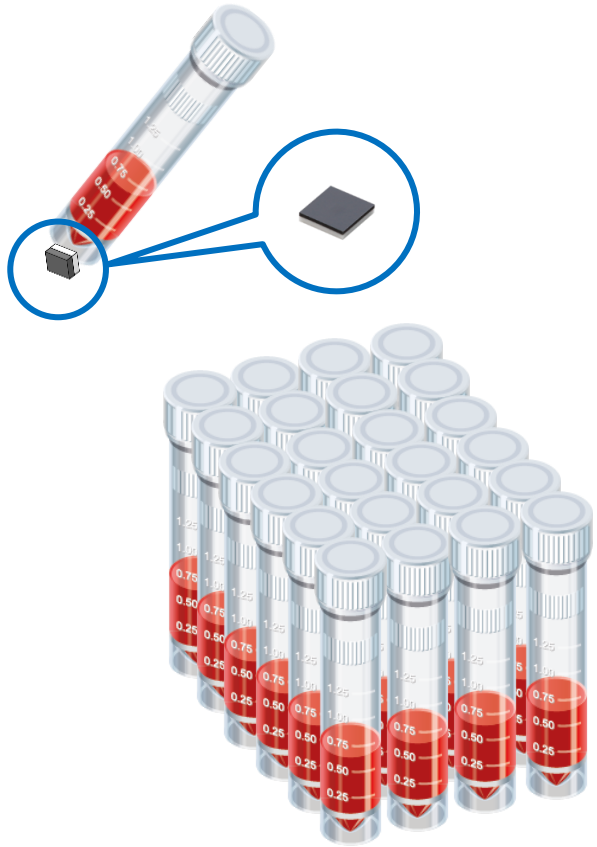
Note:

- Other HF & UHF embeddable tag options available

Application review - test tube tracking

Test tube tracking summary

- Automated processes
- Entire tray is simultaneously read
- Reduces repetitive manual tasks
- Improve accuracy / reduce errors
- Time saving
- Improve real time data
- Process improvements
- Unaffected by temperature fluctuation
- Able to withstand wide temperature environments
- Eliminates optical line of sight



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Application review

Pre-filled syringe drug tracking

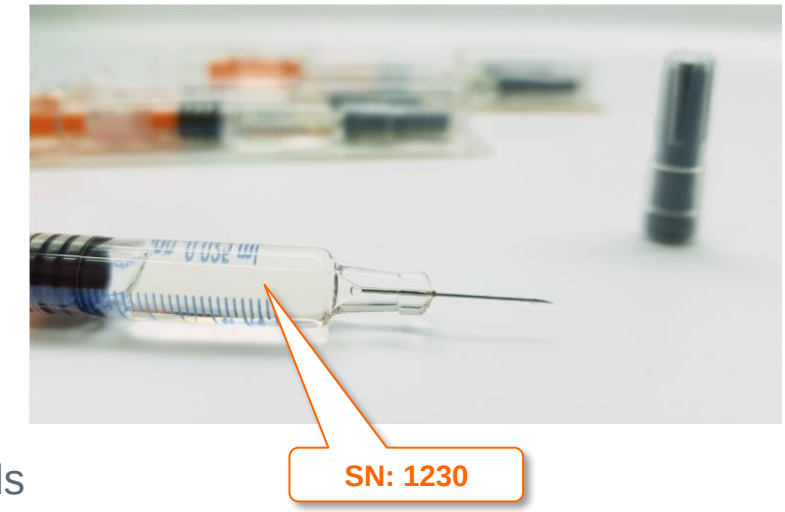
Application review – Pre-filled syringe drug tracking

Stakeholders:

- Pharmaceutical manufacturer
- Hospital
- Medical device manufacturer

Current method

Manual identification using barcode/QR/ serial no.



The challenge

Need more reliable product tracking method to ensure quality standards are met during the entire production process.

Customer requirements

- Cannot be removed or damaged by external shock
- Small enough to fit into product/container
- Withstand over-molding process
- Enhance brand protection
- Improve internal logistics

Application review – Pre-filled syringe tracking

The challenge

Need more reliable product tracking method to ensure quality standards are met during the entire production process.

Solution:

Embed ultra small RAIN RFID tag into syringe needle shield to replace manual process.

Current method

Factory

- S/N on external label is used to ID
- Small and difficult to read
- Requires manual entry process for tracking
- Label can be removed while going through several different suppliers
- Product small size limits conventional methods of identification and tracking

RFID solution

Factory

- RFID tag embedded in needle shield.

- SN number is wirelessly recorded
- Additional information is stored in memory

Application review – test tube tracking

Embedded HF/UHF tag features

- Small size
- Durable design
- Withstand over-molding / embeddable process
- RoHS compliant

Part number	LXMSJZNCMF-210	LXMS33HCNG-134
Type	**Embeddable** (Integrated Antenna)	
Appearance		
Standard	ISO18000-63 EPC global Gen2v2	ISO15693 NFC Forum type5
Frequency	UHF	HF
Memory size	EPC: 96bit User: N/A	NDEF: 896bit
Size (L x W x H) [mm]	1.2 x 1.2 x 0.55	3.2 x 3.2 x 0.7

Note:

- Other HF & UHF embeddable tag options available

Application review – Pre-filled syringe drug tracking

Pre-filled syringe drug tracking summary

- Simplifies identification process – manufacturing / quality control
- Ensures correct information remains with item.
- Embeddable & permanent to the item
- Additional quality information can be added to tag
- Enhanced quality control using RFID
- Reduces manual input errors

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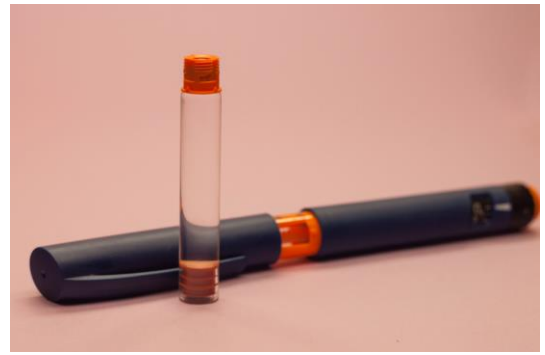
Application review

Medical cartridge device authentication

Application review

Stakeholders:

- Pharmaceutical manufacturer
- Medical staff
- Patient



The challenge

More and more patients are using self administration device at home.
Acquiring data on who, when, and how much is administrated becomes important.
Prevention of medication error is also an important challenge.

Customer requirements

- Read/Write drug information when injecting, to share use record among patients, doctors, and pharmaceutical companies
- Confirm correct drug is used
- Patients can understand correct dosage and timing.

Authentication for medical cartridge device example

Manual or self-administering drug dispensers & cartridges

Manufacturing

- Track usage data
- Authenticates product

Prescription

- Track usage data

Self-administration

- Automatically checks if correct drug within correct usage.
- Automatic device setting based on drug information.
- Alert function based on timing of dose.
- Access to more information on drug

Application review – Medical cartridge device authentication

Medical cartridge device authentication summary

- Tracks dosing record
- Prevent wrong usage of drug
- Simplifies dosage and timing of for patients.
- Automates device setting based on drug information
- Identification of drug after taken out from external package,

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Application review

Medical attachment device authentication

Application review

Stakeholders:

- Medical device manufacture
- Medical staff

The challenge

Automate authentication of attachment unit
Track and record usage of attachment during procedures

Customer requirements

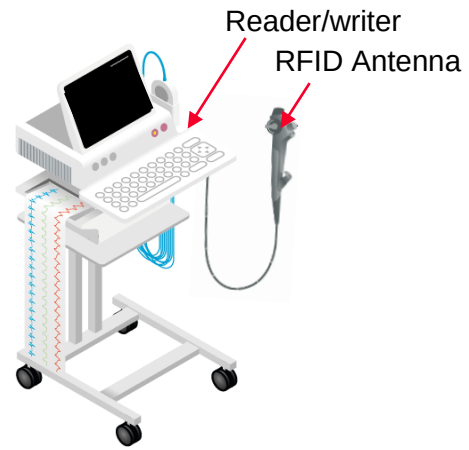
- Automatically confirm if the attachment is an authentic product.
- Record use data to prevent the use beyond specified times.
- Connect surgery information and attachment ID to track use record.

Application review – medical attachment device authentication

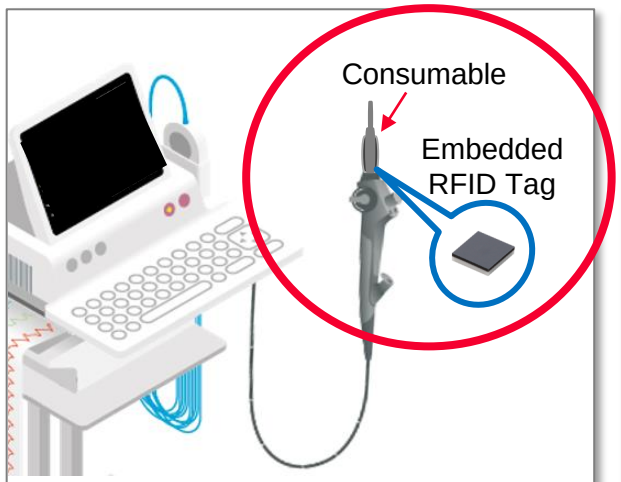
The challenge

Automate authentication of attachment unit
Track and record usage of attachment during procedures

RFID Solution



- Base unit is equipped with RFID reader/writer
- Antenna is permanently located in handheld unit



- RFID tag is embedded into base of consumable
- Consumable attached to handheld unit

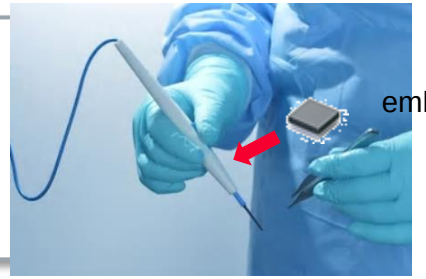
- Consumable is validated using tag unique ID number
- Unit operates

Application review

Authentication for medical device examples

Electric knife

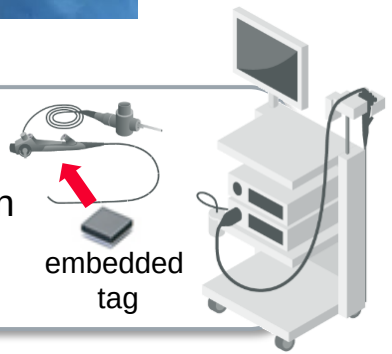
- Detect attachment device data and set unit operation
- Save usage data and prevent use beyond the limit



embedded tag

Endoscope

- Detect attachment device data and set unit operation
- Save usage/sterilization history



embedded tag

Disposable items

- Detect disposable item data and check if authentic product is used.

embedded tag

Application review – product authentication

Product authentication summary

- Automatically confirm if the attachment is an authentic product.
- Record use data to prevent the use beyond specified times.
- Record use data for maintenance in appropriate timing.
- Automatic device setting for each attachment.
- Connect surgery information and attachment ID used in the surgery.
- Understand actual number in operation to optimize necessary number of devices.

Product Authentication – Demo Video

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Application review

Tracking of surgical instruments

Surgical tool management

Stakeholders:

- Hospital Staff
- Sterilization service provider

The challenge

Reduce the amount of time used to count, track and identify individual surgical tools

Customer requirements

- Small size / non-invasive
- Non-disruptive
- Durable - withstand autoclave conditions
- Improve efficiencies & tool count
- Track tool usage

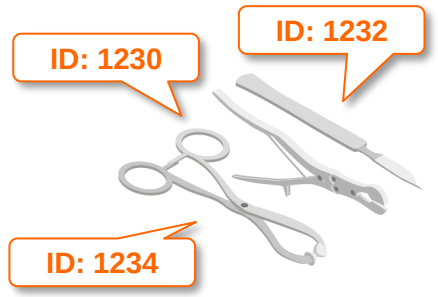
Surgical tool management

The challenge

Reduce the amount of time used to count, track and identify individual surgical tools

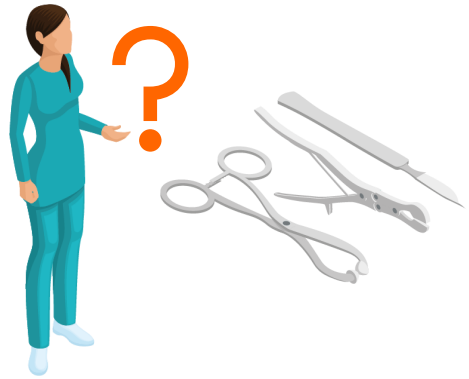
Current method

Tool Identification



- Global movement to ID each surgical tool

Tool Status



- Calibrated?
- Warranty?
- Sterilized?

Laser Marking

- Requires line of sight
- Individual tool scanning
- Time consuming

Surgical tool management

The challenge

Reduce the amount of time used to count, track and identify individual surgical tools

RFID Solution

RFID tagged tool

- RFID tag is used as a unique ID
- Detailed data analytics are easily captured and stored

Batch verification

- Wireless technology allows for efficient batch reading to verify each tool status

Usage & data capture

- Tool usage is measured to improve stocking levels
- Data is used to optimize preparation prior to procedure

On-metal chip tag – demo video

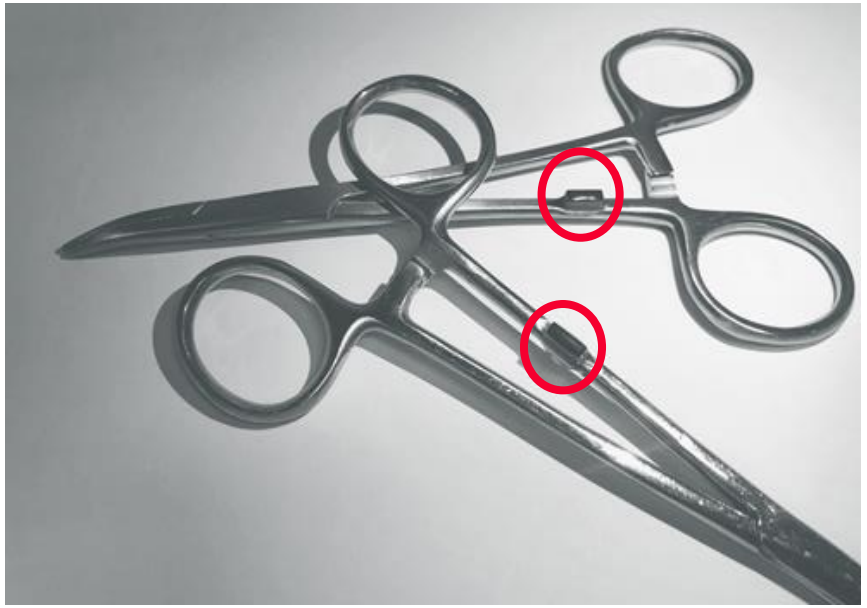
Total 11 items

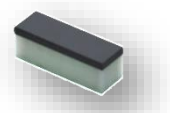
- 10 surgical instruments
- 1 metal mesh basket

On-metal chip tag – LXTBKZMCMG-010

Tag features

- Ultra small tag, durable design
- Wide frequency band characteristics
- Utilizes metal surface as booster antenna



Part number	LXTBKZMCMG-010
Type	Chip
Appearance	
Standard	ISO18000-63 and EPC Global Gen2v2
Frequency	865-928MHz
IC	Impinj Monza R6P
EPC Memory	96bit
User Memory	64bit
Size (L x W x H)	5.9×2.4×2.0mm
Read range (typ)	On metal: 1.0m *Read range depends on application
Heat resistance	Up to 85℃
Attachment	Adhesive glue / epoxy

Murata tag is not certified with medical grade.
Please evaluate with medical grade material cover before use.

Tool management summary & ROI review

Direct savings

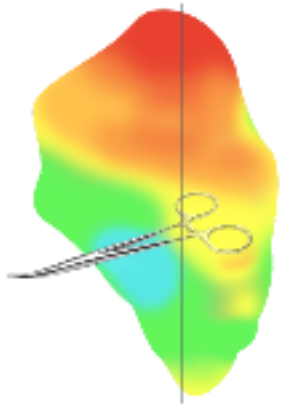
- Inventory optimization
- Reduction in lost instruments
- Accurate inventory count and optimization

Efficiency improvements

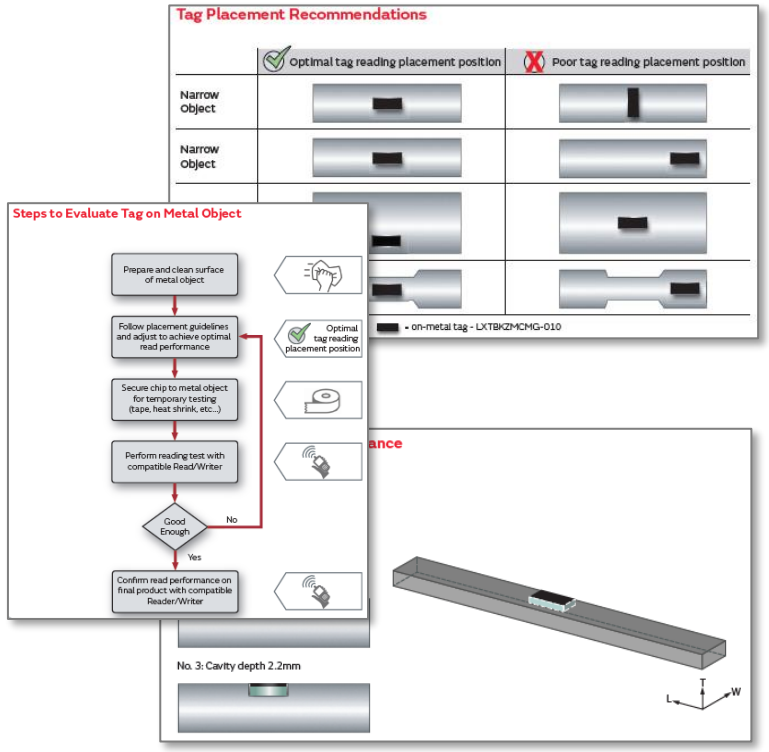
- OR time reduction
- Reduction of surgical delays
- Processing & sterilization (CPD)
- Locating instruments

Benefits

- Safety and quality improvements
- Personal and facility reputation
- Tool analytics
- Real time data capture
- Accurate inventory count



On-metal application guide



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Sterilization Review

Sterilization Review

Murata evaluated the impact of following sterilization methods

Auto-clave	ETO gas	Gamma-ray / E-Beam
Murata reference test data available.	No/very limited impact expected	Can result in damage to IC and lost data, not recommended
Recommend end user evaluate under their own condition. Not covered by warranty		
Please contact Murata for detailed information		

Wrapping things up

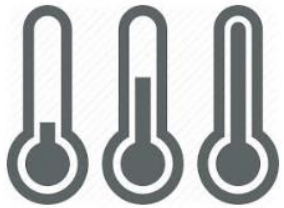
Take-a-ways

Murata's differentiation / value!

1. Ultra small size

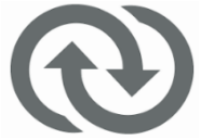
2. Durability

- Withstands extreme temperatures
- Embeddable / over-moldable
- Withstands high pressure



3. Unique product designs

- Integrated antenna – NFC & RAIN RFID
- On-metal chip tag for metal surfaces
- Integration of material and design
- Maximum performance for product size



4. Knowledge

- Vast experience in RF technology
- UHF / HF antenna design
- Materials, evaluation & testing

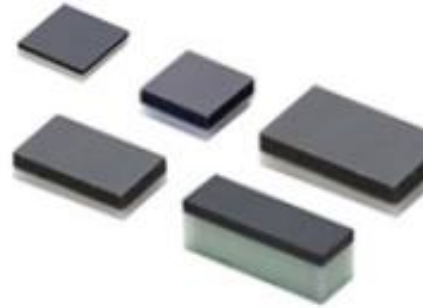
Murata's RFID tag lineup

Technology (freq.)	Feature	Part number	Appearance	EPC Memory	User Memory	Dimension (L x W x H)	Read range (typ.)
UHF (865~928MHz) RAIN RFID	Embeddable	LXMSJZNCMD-217		128bit	512bit	1.2 x 1.2 x 0.55	10mm
		LXMSJZNCMF-210		96bit	NA	1.2 x 1.2 x 0.55	10mm
	PCB mount	LXMS21ACMF-218		96bit	NA	2.0 x 1.2 x 0.5	9m
		LXMS21ACMD-220		128bit	512bit	2.0 x 1.2 x 0.5	7m
	On metal(chip)	LXTBKZMCMG-010		128/96bit	32/64bit	2.0 x 6.0 x 2.3	1.0m
HF/NFC (13.56MHz)	Embeddable	LXMS33HCNG-134		NA	896bit	3.2 x 3.2 x 0.7	20mm
		LXMS33HCNK-171		NA	384bit	3.2 x 3.2 x 0.75	15mm

UHF tag complies with ISO18000-63 and EPC Global Gen2.
HF tag complies with ISO15693 or ISO14443 TypeA.
Read range is based on Murata simulation at 4W EIRP.

Summary

- Small robust RFID / NFC Tags are available for item level tracking (many options)
- Companies are taking action against counterfeit products
- Technology adoption can lead to competitive advantage
- Enhancing user experience
- Product authentication is necessary to prevent wrong usage.
- Multiple solutions & options available
- RFID offers more security than traditional tracking solution

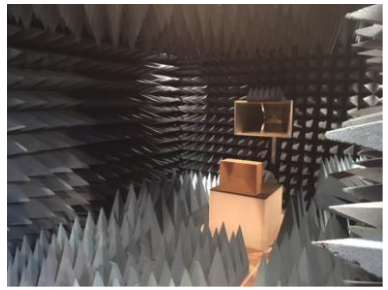


Murata's support material

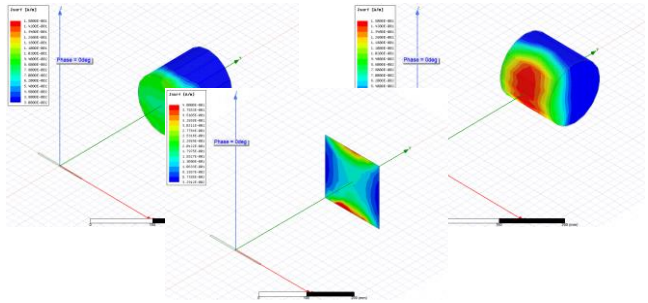
Case Studies

- Surgical tool tracking with RFID
- Authentification of medical cartridge with RFID
- Authentification of medical device with RFID
- PCB management with RFID
- Cable authentication with RFID
- Management of machinery equipment with RFID
- Traceability for small products with RFID

Anechoic Chamber



3D analysis of RFID wave with HFSS

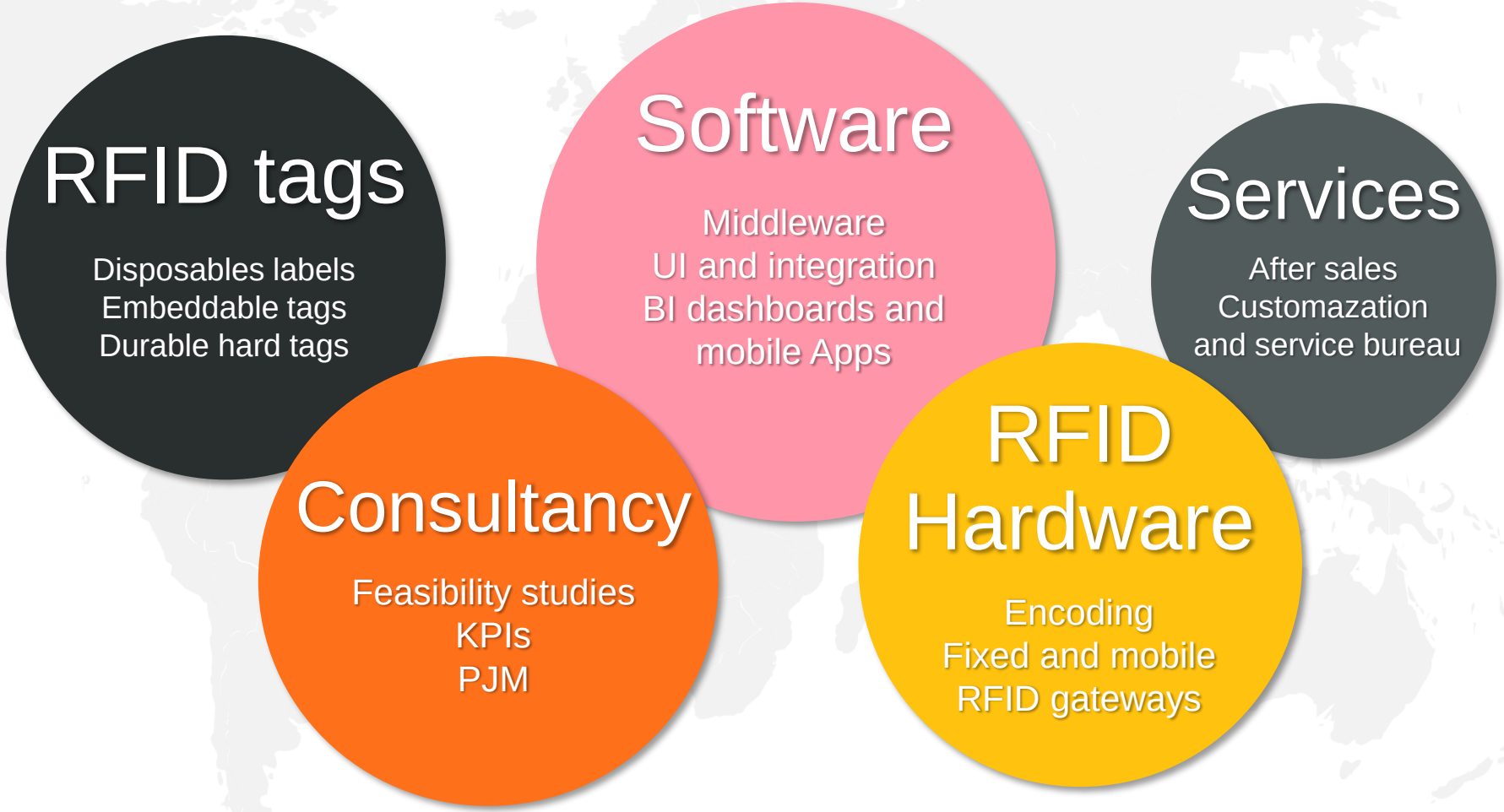


Application Guide

Videos

Murata ID-Solutions S.r.l

One global RFID partner, a single point of touch and responsibility.



The world will be smarter, and we want to play a role by putting a RFID tag into every single object!

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Questions???

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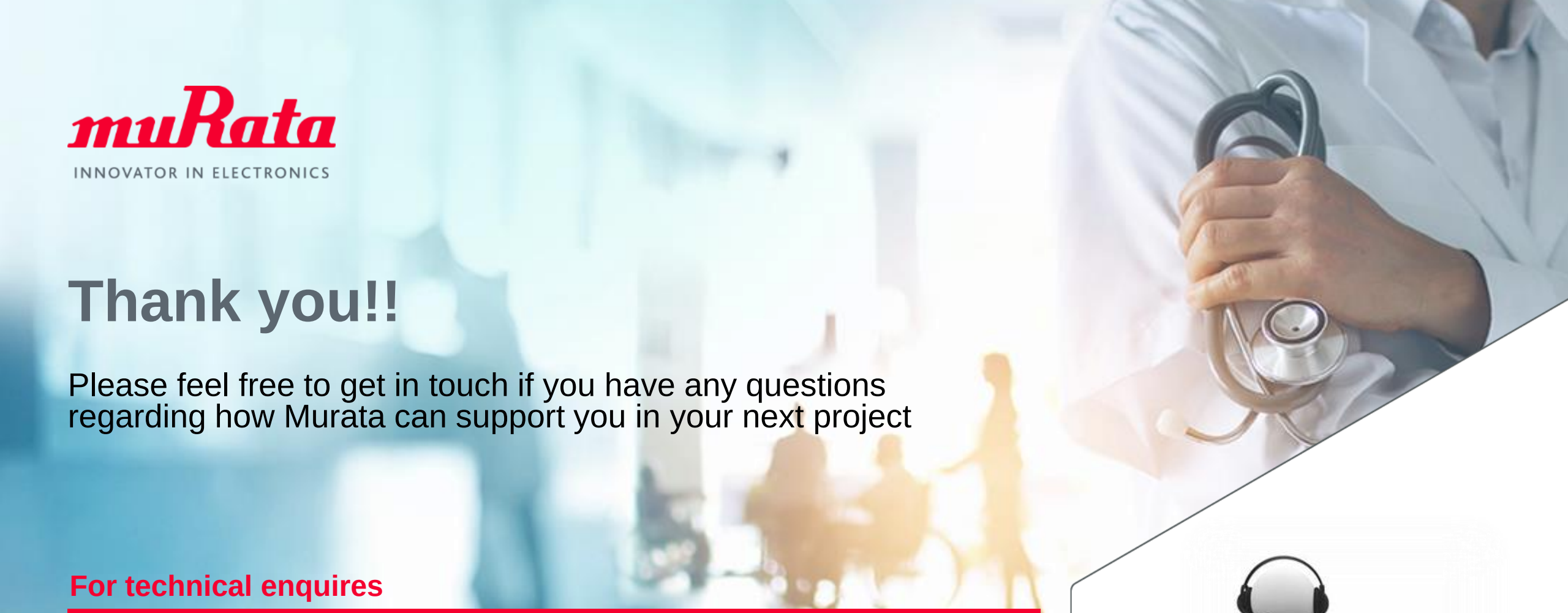
Thank you!!

Please feel free to get in touch if you have any questions regarding how Murata can support you in your next project



For technical enquires

Contact us: https://www.murata.com/en-eu/contactform