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MANDALAY BAY | LAS VEGAS, NV

# Integrating RFID into Manufacturing Processes and Systems

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Business Development/Technical Marketing NFC/RFID





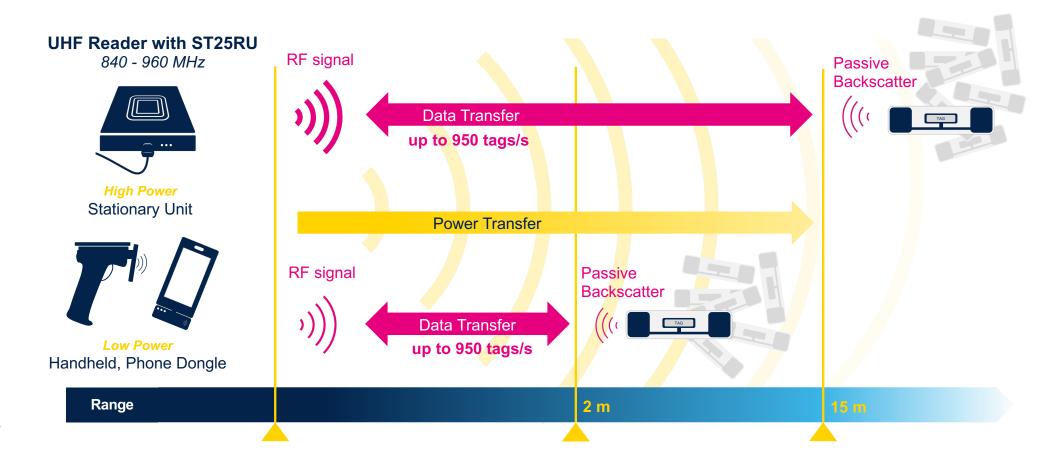
RFID	LF	HF	UHF		
Coupling mode Inductive		Inductive	Electro-magnetic backscatter		
<b>Operating frequency</b>	125kHz – 134kHz	13.56MHz	860MHz – 960MHz		
Antenna	Coil	Coil	Dipole		
Max operating distance	up to 1m	Vicinity: up to 1m Proximity: up to 10cm	~10m		
Regulation	Worldwide harmonized	Worldwide harmonized	Different regulations per country		
Standards	ISO14223 ISO18000-2	ISO14443 A/B ISO15693 ISO18092 ISO18000-3 NFC Forum	ISO18000-6 B/C EPC Class 1 Gen 2 RAIN RFID		
Environmental influences	Small influence on operating distance Works in metal and industrial environment	Small influence on operating distance Works in metal and industrial environment	Influence on operating distance by reflection and absorption (metal and liquids)		
<b>Applications</b> Animal tagging		Product identification Public transport / Libraries Access control / Payment	Pallets and container ID  Retail / Logistics  Authentication		
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#### **RFID Comparison With Other Wireless Technologies**

Feature	NFC	UHF/RAIN	BTLE	Wifi	ZigBee
Base station cost (incl. reader)	\$\$	\$\$\$\$	\$\$\$	\$\$\$	\$\$\$
Receiver cost (tag)	\$\$	\$	\$\$\$	\$\$\$	\$\$\$
Passive receiver	Yes	Yes	No	No	No
Current consumption receiver	<0.1mA passive	<0.1mA passive	15mA	>100mA	15mA
Multipoint connection	No	Yes	No	Yes	Yes
User setup required	No	No	Yes	Yes	Yes
Typical number of receivers	1~5	>1000	~7	1~1000	32
Typical range	0.1m	1-15m	1-10m	1-100m	1-300m



### A UHF system typically comprises a few readers and many tags





#### Ideal for battery operated handheld or stationary devices



#### **UHF** solution

Suitable for Hand-held readers, stationary readers, Embedded readers and mobile UHF RFID readers

Dense Reader Mode for Battery Handheld

**Fast Moving Consumer Goods** 

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UHF Reader



Order for product placed





#### **Production**

Inventory Management Process Optimization Condition Monitoring Smart Sensing



#### Storage

Automated Management Item Localization Condition Monitoring





#### **UHF** Reader



#### **Shipment**

Item-Level Tracking Condition Logging Security



#### Home

Localization
Inventory Management
Smart Sensing
Security







#### **Store**

Inventory Management
Authentication
Consumer Engagement
Automated Check-out
Theft Protection





#### **Tools & Inventory Management**

Ensure availability of tools and planning certainty by automated tracking of tools and machinery as well as of the stock of inventory and goods.



#### **Process Optimization**

Monitor manufacturing processes and supply routes to optimize machine usage or downtimes and to prevent traffic jams and bottlenecks within the factory.



#### **Condition Monitoring**

Track and record environmental conditions of your products at production and in storage to ensure a correct handling.



#### **Smart Sensing**

Use battery- and wireless sensor tags to monitor various parameter and conditions of tools, goods or machinery with a simple and quick setup.



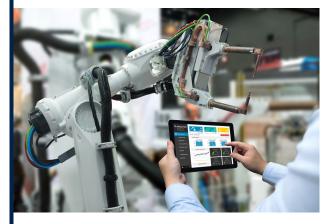


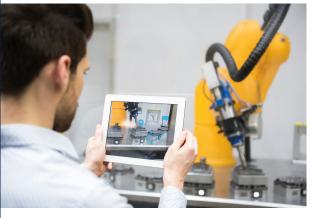
















#### **Inventory Management**

Manage the check-out and replenishment of medication. Automate processes and ensure stock of critical inventory.



#### **Safer Patient Care & Tracking**

Avoid incompatible cross medication with UHF enabled safeguards. Track the movement and location of patients with special needs to ensure their safety.





#### **Access Control**

Secure critical premises like storage or emergency rooms while ensuring automatic and remote opening of doors for patient beds or medical equipment.



#### **Asset Management**

Manage storage, maintenance, utilization tracking and access to assets.























### UHF RFID Medical Tracking Example

Courtesy Thinkify <a href="https://thinkifyit.com/">https://thinkifyit.com/</a>











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ST solutions			40		



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### NFC technology at a glance



- Near Field Communication, a short range wireless technology
  - Operating at 13.56MHz
  - Based on the RFID HF standard (ISO14443 & ISO15693)
- Interactive and zero power, enabling convenient connection to the Internet of Things
- → NFC-enabled mobile phone can engage with items by a simple tap
- NFC is developed by the NFC Forum
  - Interoperability between devices
  - Standardized use cases (web link, Bluetooth handover,...)
- Fast growing deployment in Mobile phone
  - In 2022, more than 75% phones to come with NFC
  - NFC is used for Mobile payment (EMVco) like ApplePay
  - Apple added in 2017 support of NFC reader mode from iOS11 onward and support of NFC writer mode from iOS13 in September 2019



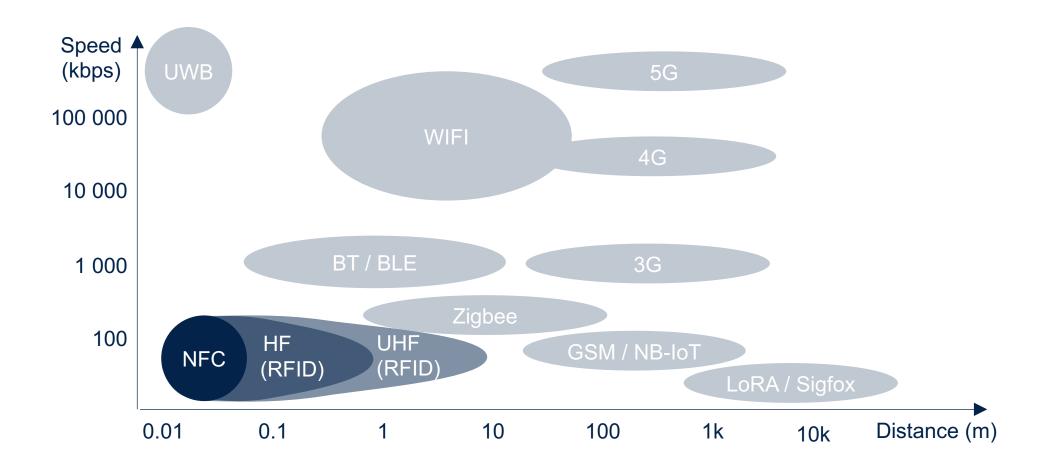








NFC is unique in the wireless spectrum: Short distance, Low data-rate & Zero power consumption for the application





NFC specification

→ Upper layer SW



⇒ HW / SW protocol



NDEF (NFC Data Exchange Format)

NFC Forum
Type 2 and Type 4

NFC Forum Type 5



ISO14443

Type A and Type B

« Short Range » 106kbps



« Long Range » 26kbps



### NFC Phones ISO14443 (106kb/s) Up to 5cm (2in.) ISO15693 (26kb/s) Up to 7cm (3in.) **RFID Readers** ISO14443 (106kb/s) Up to 10cm (4in.) ISO15693 (26kb/s) **Up to 1m (3ft)**

- ISO14443 (NFC Forum Type 2 & Type 4) is called « short range » standard while with higher RF speed
- ISO15693 (NFC Forum Type 5) is called « long range » standard



Consumer engagement, Asset tracking, Ticketing, Brand protection, Access control, Gaming...

www.st.com/st25t

**T**ags









NFC phone / RFID Reader

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Dynamic tags







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Readers















#### Consumer engagement & brand recognition with Cloud management



**Branding and Consumer Engagement** 

Product identification with enriched information

**Identity check using TruST25 digital signature** 

Tamper detect for open-close detection

ST solutions



Tag



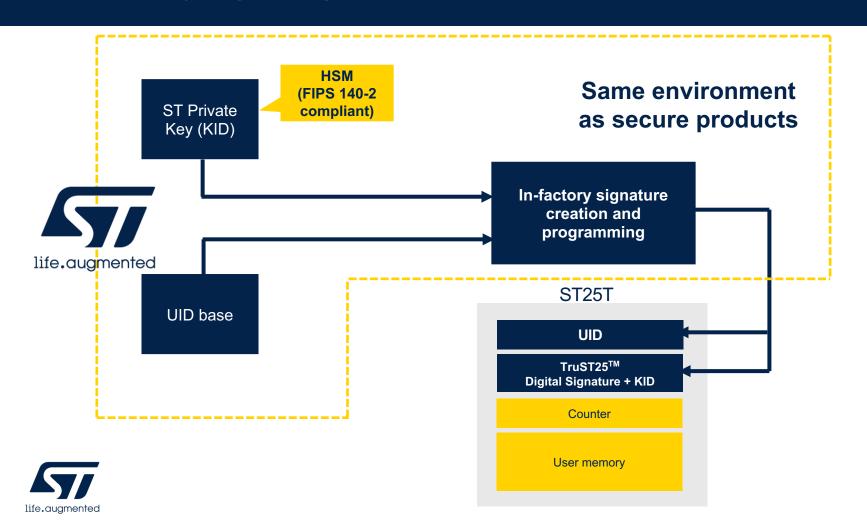
#### How does authentication work in a simple NFC tag?

- TruST25<sup>™</sup> encompasses industrialization processes and tools deployed by STMicroelectronics to create and write Digital Signature in house and that benefits from Secure product environment (HSM FIPS140-2)
- TruST25 is a STMicroelectronics trademark
- Digital Signature allows applications to verify the authenticity of a product
- A dedicated application note AN5104 describes the digital Signature and how to read and verify the TruST25TM Digital Signature. Application note distributed under NDA
- Public Key will sent to customers





#### ST in-Factory Digital Signature creation in secure environment



#### For higher protection

Digital Signature protect ST customers (inlay makers) against copy.

This is a protection in the supply chain. To protect consumer the SI has to embed the signature of applicative data

#### **Verify TruST25™ Digital Signature**

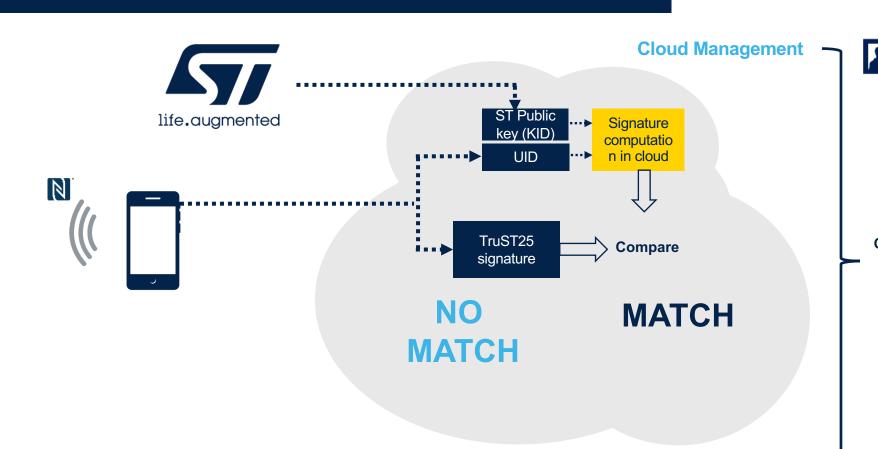
ST25T

UID

TruST25<sup>™</sup> Digital Signature + KID

Counter

User memory







#### **Enhanced logistic operations**



#### Save time on your production lines

From DIP switch / resistor to contactless setting
Get rid of manual operation

In the Box "programming" Simple & flexible

Upload new setting to powered off devices
Personalize your boxed devices on the production belt

ST solutions



Dynamic Tag



#### Real-time communication and in application programming



#### Brand recognition and parameters setting



NFC for accessory identification

Convenient and reliable brand identification

Automatic System configuration
Upon accessory type recognition

**Brand Recognition**Ensure only branded accessory are used

ST solutions



- Tag
- Dynamic Tag
- HF Reader

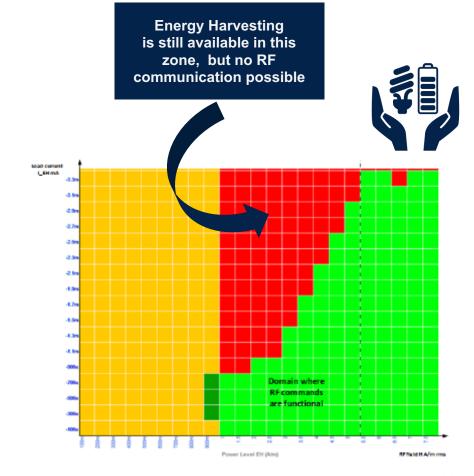
### How much power can I get?

Reader's AM= 100% (NFC Forum & ISO15693)

H_EH	A/m rms	1	1,5	2	2,5	3	3,5	4	4,5	5
V_EH	V	3,25	3,25	3,2	3,15	3,1	2,99	3,05	3,13	3,31
I_EH	mA	0,7	0,7	0,9	1,1	1,3	1,9	2,1	2,7	3,1
P_EH	mW	2,275	2,275	2,88	3,465	4,03	5,681	6,405	8,451	10,26

• Reader's **AM= 10%** (ISO15693)

H_EH	A/m rms	1	1,5	2	2,5	3	3,5	4	4,5	5
V_EH	V	3,25	3,25	3,2	3,15	3,1	2,99	3,05	3,13	3,31
I_EH	mA	0,7	0,7	0,9	1,1	1,3	1,9	2,5	3,3	4,3
P_EH	mW	2,275	2,275	2,88	3,465	4,03	5,681	7,625	10,33	14,23







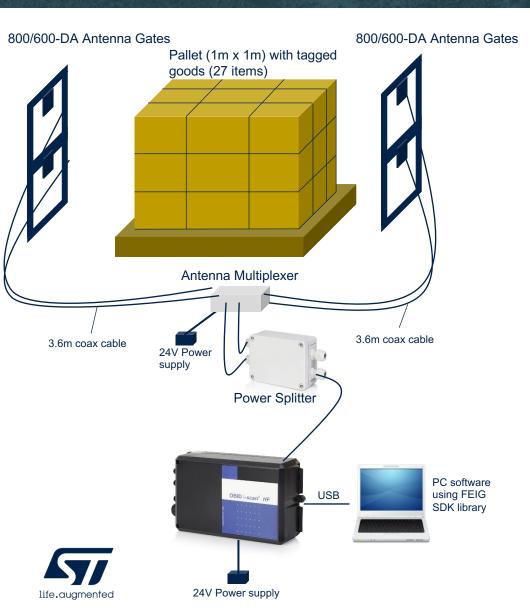


STEVAL-SMARTAG1

#### **NFC Sensor Tag**

- ST25DV64K dynamic NFC tag
- STM32L0 ultra-low-power MCU
- LIS2DW12 three-axis linear accelerometer
- LPS22HB piezo-resistive pressure sensor
- HTS221 humidity and temperature sensor
- 40x40mm 8 turns antenna
- Optional CR2032 battery





#### Use cases

- Inventory + parameters setting using RFID/NFC on a large volume (1m x 1m x 1m (3 feet 3 inches x 3 feet 3 inches x 3 feet 3 inches)
- Firmware upgrade (for devices stocked for a long time)

#### Benefits

 Taking advantage of the presence of HF in the final products (for parameters settings, consumer engagement in the field etc.) for quick configuration at warehouse or before shipment to final customer's location.

- Pallet + 27 boxes (30x20x20cm)
- 27 x ST25DV-I2C Disco kits Ant\_C1
- Reader LR2500
- 2 x 2 antennas (80x60 cm)
- Feig SDK
- Distance between antennas 110cm



In factory programming via NFC



