



life.augmented

ST25 new product & solution

Augment smart innovations

Charles Sun

ST MMY Technical Marketing

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ST NFC/RFID Product Overview





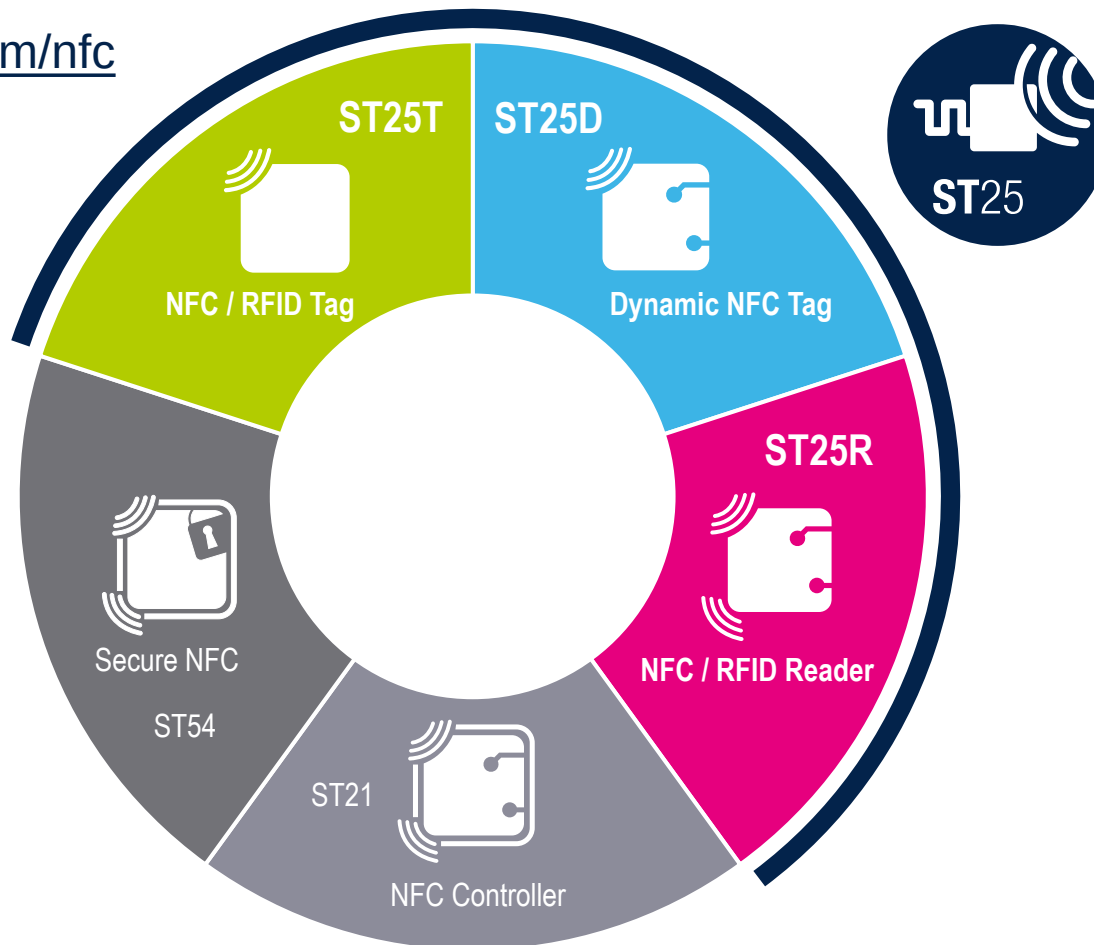
ST RFID Coverage

RFID	LF	HF	UHF
Coupling mode	Inductive	Inductive	Electro-magnetic backscatter
Operating frequency	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)
Applications	Animal tagging	Product identification Public transport / Libraries Access control / Payment	Pallets and container ID Retail / Logistics Authentication
ST solutions		√	√

ST NFC portfolio

Covering all NFC application needs and leveraging a rich ecosystem

www.st.com/nfc



STMicroelectronics is Member of

- NFC Forum
- RAIN Alliance
- ISO organizations
- Zhaga Consortium
- CCC (Car Connectivity Consortium)
- WPC (Wireless Power Consortium)
- CSA (connectivity standards alliance)
- LoRa alliance



ST25 products family

Consumer engagement, Asset tracking, Ticketing, Gaming, Brand protection, Access control, ... www.st.com/st25t



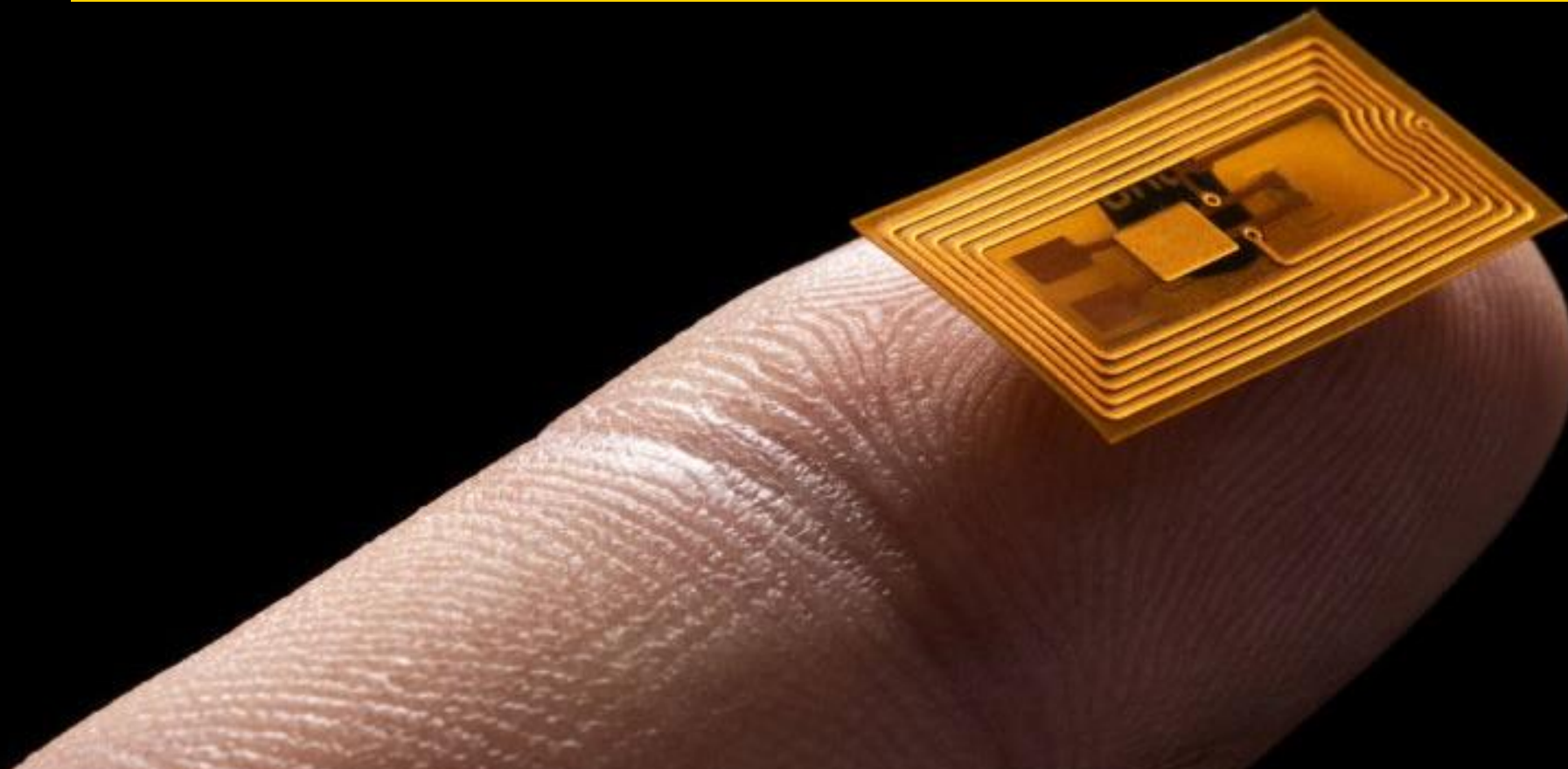
Industrial, Lighting, Consumer, Metering, Appliance, Healthcare, ... (Fast Transfer Mode and SW upgrade) www.st.com/st25d



POS & mPOS Terminals, Automotive, Access control, Gaming, ... www.st.com/st25r



ST25 series NFC/RFID products





ST25 NFC / RFID portfolio

one-stop-shop for tags and readers

Tags				Dynamic Tags			NFC / HF Readers					UHF Readers
ST25TA	ST25TB	ST25TN	ST25TVxxxC	M24SR	ST25DV-I2C EVO¹	ST25DV-PWM	ST25R95 ²	ST25R3911B ST25R3912 ST25R668 ³	ST25R3914 ST25R3915	ST25R3916/17 ST25R3916B/17B ST25R3918	ST25R3920 ST25R3920B	ST25RU3993
ISO14443-A 106kbps NFC Type 4	ISO14443-B 106Kbps	ISO14443-A 106kbps NFC Type 2	ISO15693 up to 53Kbps NFC Type 5	ISO14443-A 106kbps NFC Type 4	ISO15693 up to 53kbps NFC Type 5	ISO15693 up to 53kbps NFC Type 5	ISO14443-A/B ISO15693	ISO14443-A/B Felica ISO15693 ISO18092	ISO14443-A/B Felica ISO15693 ISO18092	ISO14443-A/B Felica ISO15693 ISO18092	ISO14443-A/B Felica ISO15693 ISO18092	ISO18000 6c & b Gen2 Protocol
EEPROM 512b-64Kb 200-year retention 1M cycles	EEPROM 512b-04Kb 40-year retention 1M cycles	EEPROM 512b-1.6Kb 40-year retention 100k cycles	EEPROM 512b-64Kb 60-year retention 100k cycles	EEPROM 2Kb-64Kb 200-year retention 1M cycles	256B Buffer EEPROM 4Kb-64Kb 40-year retention 1M cycles	EEPROM 2Kb 40-year retention 100k cycles	Reader/Writer Card Emulation	Reader/Writer P2P EMVco & PBOC	Reader/Writer P2P AEC-Q100	Reader/Writer P2P Card Emulation EMVco & PBOC	Reader/Writer P2P Card Emulation AEC-Q100	Reader / Writer -90dBm sensitivity Internal VCO
TruST25 digital signature 128b password 20b counter UID RF Field Detect	32b counter Lock OTP bits UID	Augmented NDEF TruST25 digital signature 24b UTC UID	Augmented NDEF TruST25 digital signature 64b password 24b UTC UID Tamper Detect	128b password RF disable RF Detect UID	Fast X-fer Mode 64b password E-Harvesting RF Detect UID	TruST25 digital signature 64b password UID		VHBR Auto Antenna Tuning Dynamic Power Out Multi-antenna	Auto Antenna Tuning Dynamic Power Out Multi-antenna	Active waveshaping Auto Antenna Tuning Dynamic Power Out Multi-antenna	Active waveshaping Auto Antenna Tuning Dynamic Power Out Multi-antenna	Dense Reader Mode Linear RSSI Automatic PSRR Auto ACK
				I2C 1MHz 2.4V-5.5V	I2C 1MHz Write 16B page 1.8V-5.5V	2x PWM 488-31.25 kHz 1.8V-5.5V	SPI 2Mbps UART 2.7V-5.5V 0.23W	SPI 6Mbps 2.4V-5.5V 1.4W – 1W	SPI 6Mbps 2.4V-5.5V 1W	SPI 10Mbps I2C 3.4Mbps 2.4V-5.5V 1.6W – 0.5W	SPI 5Mbps I2C 3.4Mbps 2.4V-5.5V 1.6W	SPI 10Mbps 1.65V-5.5V 0-20dBm
SBN12 / SBN075 / FPN5	SBN12	SBN12 / SBN075 / FPN5	SBN12 / SBN075 / FPN5	SO8 / TSSOP8 / FPN8 / SBN12	SO8 / TSSOP8 / FPN8 / FPN12 / WLCSP10	SO8 / TSSOP8	32-pin QFN	WF 32-pin QFN / 32-pin QFN / WLCSP-30 / Wafer	WF 32-pin QFN / 32-pin QFN	WF 32-pin QFN / WLCSP-36	WF 32-pin QFN	48-pin QFN



ST25 tag family

40 years
100k cycles

ST25 NFC tag family

Suitable application

ISO
14443-A

ST25TA512B ST25TA02KB

- NFC Forum type 4
- Password + Dig signature
- Capacitance: 50pF

Packaged Chip - GPO

ST25TA02KB-P ST25TA02KB-D

- NFC Forum Type 4
- Password + Digi signature
- GPO: Field detect/Wake up
- Capacitor: 50pF

ST25TA16K ST25TA64K

- NFC Forum Type 4
- Password 128-bit
- Capacitance: 25pF

ST25TN512 ST25TN01K

- NFC Forum **Type 2 (CR12)**
- Memory up to **16640 bits**
- **Augmented NDEF**
- Digital Signature
- Capacitance: 50pF
- Cost-effective

New

ISO
14443-B

ST25TB512-AC ST25TB02K-AC ST25TB04K-AC

- ISO14443B Proprietary
- Resettable OTP
- Capacitance: 68pF

ST25TB512-AT

- ISO14443B Proprietary
- Dedicated to transport
- Anti-tearing
- Capacitance: 68pF

ISO
15693

ST25TV512 ST25TV02K

- NFC Forum Type 5
- Digital Signature
- Untraceable & Kill modes
- Tamper Detect
- Capacitance: up to **99.7pF**

Packaged Chip - EH

ST25TV04K-PE

- NFC Forum Type 5
- **Digital Signature**
- **Energy Harvesting**
- **Configurable GPO**
- Capacitance: up to 99.7pF

High Density

ST25TV16K ST25TV64K

- NFC Forum Type 5
- Digital Signature
- Untraceable & Kill modes
- Tamper Detect
- Capacitance: 28.5pF

Large Capacitance

ST25TV512C ST25TV02KC

- NFC Forum Type 5 (**CR12**)
- Memory up to **2560 bits**
- **Augmented NDEF**
- Digital Signature
- Untraceable mode
- Unique Tap Code
- Capacitance: up to **99pF**

New



Product
information



Asset
tracking



Access
control



Anti-
counterfeit



Brand
protection



Gaming



Consumer
engagement



Transport

如何移植到ST25TN

	NTAG210μ	ST25TN512	NTAG213 FM11NT021	ST25TN01K
User RW memory	48 Bytes 384 bits	64 Bytes 512 bits	144 Bytes 1152 bits	160 Bytes ... 208 Bytes 1280 bits ... 1644 bits
Identification command	Proprietary	Standard	Proprietary	Standard
Write lock	Yes	Yes	Yes	Yes
ANDEF	No	14 Bytes Custom/UID UTC	UID Counter	14 Bytes Custom/UID UTC
Kill	No	Yes	No	Yes
Anticoll bypass	Yes	Yes	Yes	Yes
Digital signature	Yes Customizable	Yes Customizable	Yes Read-only	Yes Customizable
Conditional Read/Write	No	No	Password	No
Counter	No	No	On 1 st READ	No

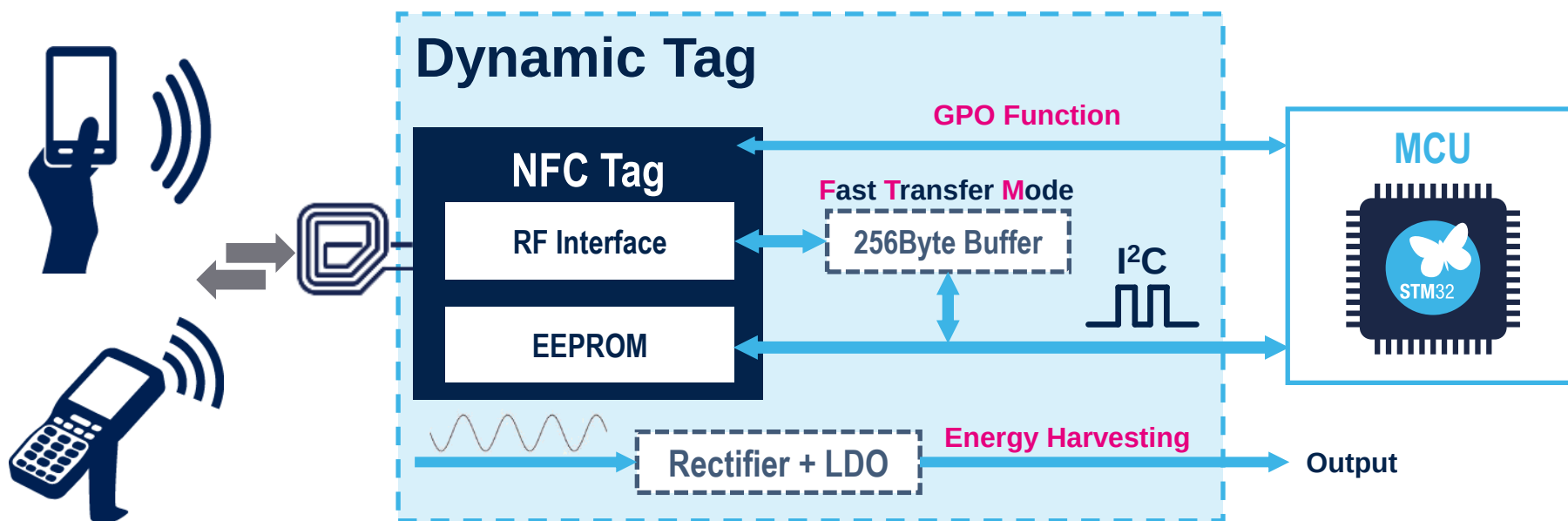
不同点:

- Memory size
- 寄存器定义/地址
- 非NFC-forum标准指令
- 数字签名
- Counter



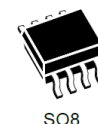
ST25DV Dynamic Tag

为MCU搭建了一条无线数据通道，使应用更灵活

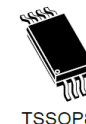


ST25DV-I2C/PWM

- NFC Type V
- 256Bytes buffer speed-up FTM
- Low Power mode < 1 μ A
- -40 to +125°C Industrial Grade
- Energy harvesting through RF



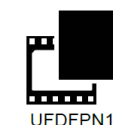
SO8



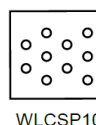
TSSOP8



UFD8FN8



UFD8FN12



WLCSP10



Wafer



I2C Interface

- Parameter configuration
- Fast pairing/networking



Fast Transfer Mode

- Firmware upgrade
- Data transmission



Energy Harvesting

- Sensor tag
- Batteryless ESL



GPO

- System wakeup





ST25 dynamic tag family

40 years
1M cycles

ST25DV NFC dynamic tag family

Suitable application

ISO
14443-A

M24SR02
M24SR04

- NFC Forum type 4
- 1MHz I2C supported
- Capacitance: 25pF

M24SR16
M24SR64

- NFC Forum type 4
- 1MHz I2C supported
- Capacitance: 25pF

ISO
15693

M24LR04
M24LR16
M24LR64

- NFC Forum Type 5
- 400kHz I2C
- Capacitance: 27.5pF

ST25DV04K
ST25DV16K
ST25DV64K

- NFC Forum Type 5
- **Fast Transfer Mode**
- **Energy Harvesting**
- **Configurable GPO**
- Capacitance: 28.5pF
- Industrial plus grade

ST25DV02K-W1
ST25DV02K-W2

- NFC Forum Type 5
- TruST25™ Digital signature
- Industrial plus grade
- Capacitance: 28.5pF

ST25DV04KC
ST25DV16KC
ST25DV64KC

- NFC Forum Type 5
- **Augmented NDEF**
- Fast Transfer Mode
- Energy Harvesting
- Configurable GPO
- Up to 1MHz I2C
- Single/multiple blocks read/write
- Low Power Down
- Industrial plus grade
- Capacitance: 28.5pF

New



Industrial
Automation



Lighting



Meter



Sharing
bike



IOT pairing



Gaming



Home
appliance



Screen
Sharing



Medical
Healthcare



ESL
Retail



Consumer
engagement



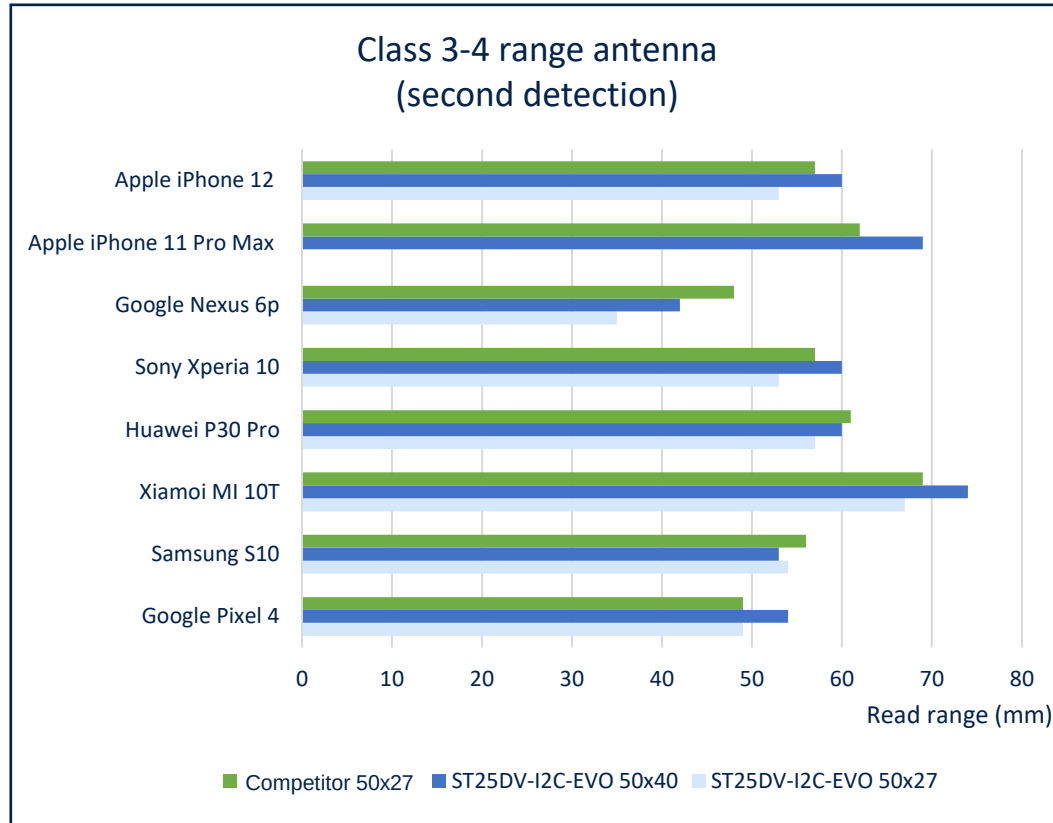
Brand
protection

ST25DV Roadmap



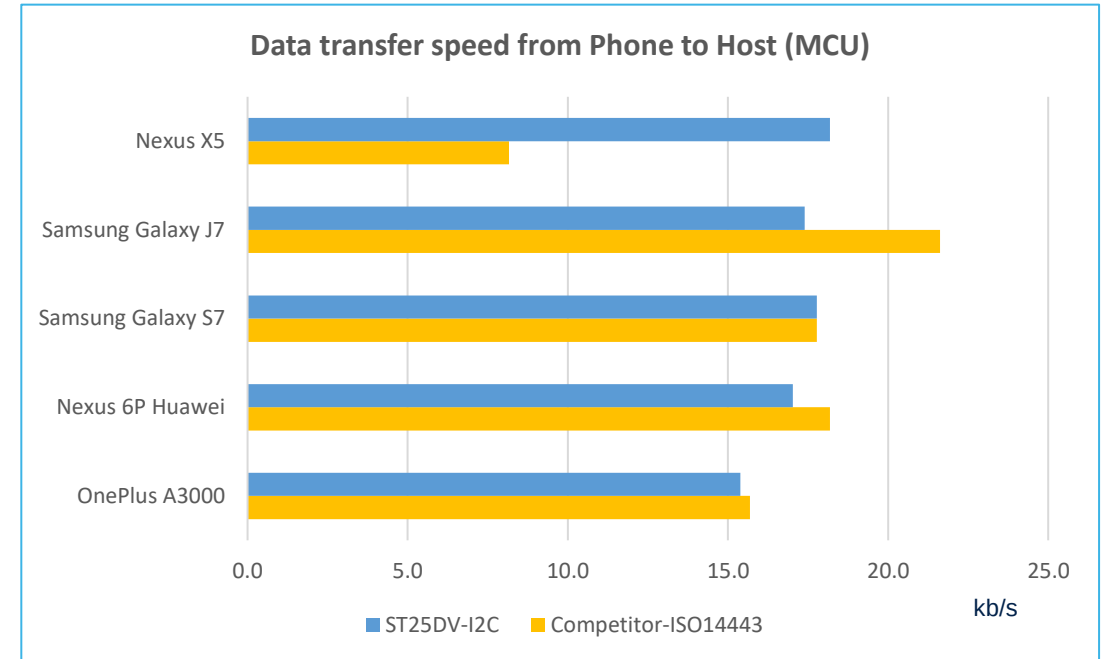
ST25DV performance benchmark

Reading distance



Higher is better.

Fast transfer speed



Test Condition: 100kBytes data transferred

- ST25DV-I2C has **equivalent data transfer speed** to NFC Type2 / ISO14443 I2C tag
- Even with lower RF speed (26kbit/s instead of 106kbit/s), thanks to its **larger buffer size of 256Bytes**



ST25R readers positioning

ST25R NFC reader family

Suitable application



Automotive

ST25R3914/15

- AEC-Q100 Grade 1
- CCC R2.0
- High performance
- 1.0W

ST25R3920

- AEC-Q100 Grade 2
- CCC R2.0 (NFC forum CR12)
- 1.6W, AWS, EMD, DPO
- Card Emulation/P2P

ST25R3920B

- AEC-Q100 Grade 2
- CCC R2.0 (NFC forum CR13)
- Excellent performance
- Card Emulation



High performance
EMVCo

ST25R3911B

- EMVCo 2.6
- 1.4W
- Rich function(AAT, LPD, DPO)

ST25R3916/17

- EMVCo 3.0
- 1.6W
- AWS, EMD, DPO, LPD
- Card Emulation/P2P

ST25R3916B/17B

- EMVCo 3.1
- Excellent performance (AWS, EMD, DPO, LPD)
- Card Emulation



General use
Cost-effective

ST25R3912

- Full standard support
- 1.0W
- WLCSP-small package

ST25R95

- Full standard support
- Card Emulation
- SPI & UART
- Low cost

ST25R668

- ISO14443A/B & ISO15693
- Low cost

ST25R3918

- ISO14443A/B & ISO15693
- Card Emulation
- 0.5W, SPI & I²C
- Cost-effective



Automotive



Digital Key



Charging
stations



POS



Industrial



Wireless
Charging



Transport



Consumer



Healthcare



Access
Control



Smart
Home



Gaming



ST25R3916B/17B/20B

Best choice for **NFC Forum CR13** and **EMVCo 3.1** certification



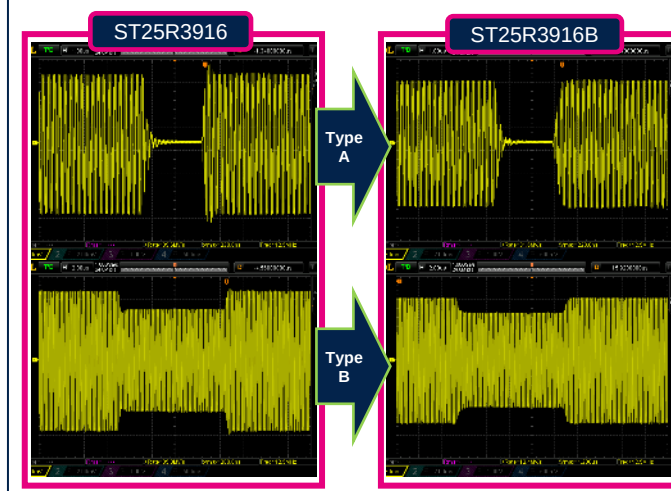
ST25R3916B/17B

Improved DPO

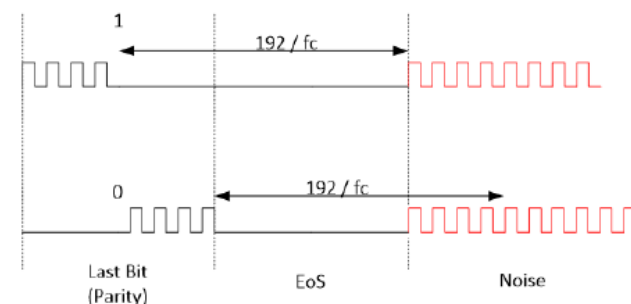
d_res<3:0>	Driver output resistance (normalized)
0	1.00
1	1.19
2	1.40
3	1.61
4	1.79
5	2.02
6	2.49
7	2.94
8	3.41
9	4.06
10	5.95
11	8.26
12	17.1
13	36.6
14	51.2
15	High Z

17 steps

Improved AWS



New EMD test pattern support





ST25R3918

Cost-effective NFC reader for general applications



Features	ST25R3916	ST25R3917	ST25R3918
Power	1.6W		0.5W
ISO/IEC 14443 Type-A	Yes		
ISO/IEC 14443 Type-B	Yes		
ISO/IEC 15693	Yes		
FeliCa™	Yes		No
NFC Tag read support	Yes		
ISO/IEC 18092 Passive Initiator mode	Yes		
ISO/IEC 18092 Passive Target mode	Yes	No	Yes
ISO/IEC 18092 Active Initiator and Target mode	Yes	No	
Card Emulation	Yes	No	Yes
Automatic antenna tuning (AAT)	Yes	No	
Capacitive sensor wakeup	Yes	No	
Low Power Tag Detection	Yes		

ST25R3918			
ISO14443 A/B ISO15693	Excellent RF performance		
Card Emulation	Advanced Features supported		
P2P compatible with 3916	AWS	DPO	LPD EMD

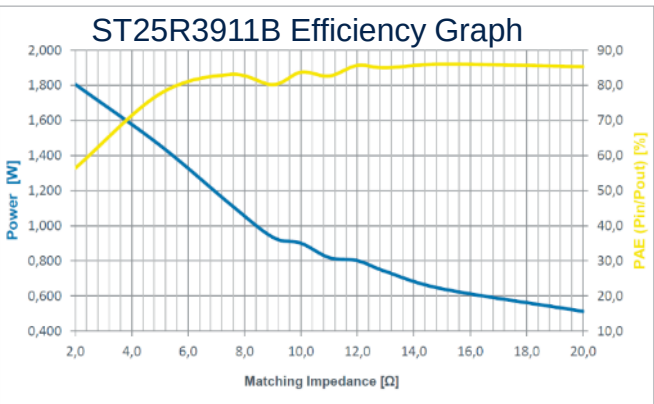




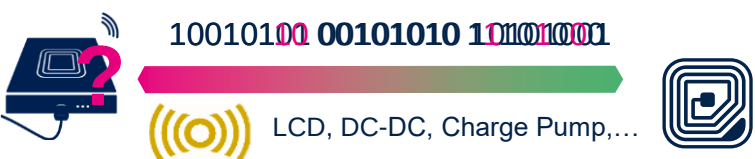
Excellent RF performance

Excellent RF performance, can handle hush design environment

High RF power



Noise Suppression Receiver



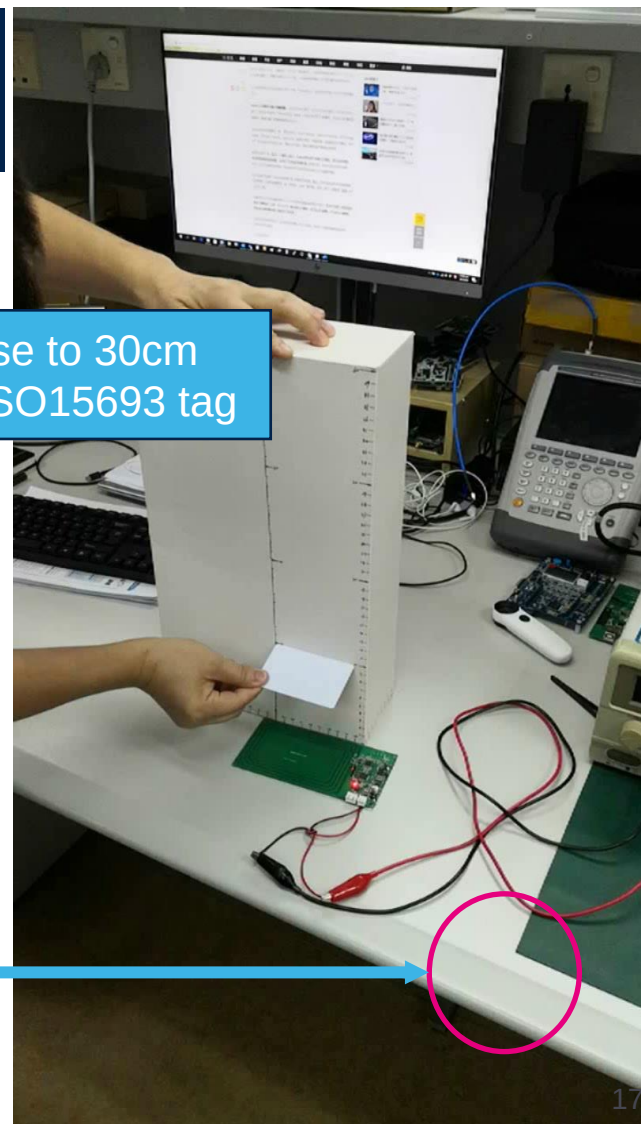
Excellent reading distance



- Excellent read range with big antenna size
- Smaller antenna size to achieve target distance

Close to 30cm with ISO15693 tag

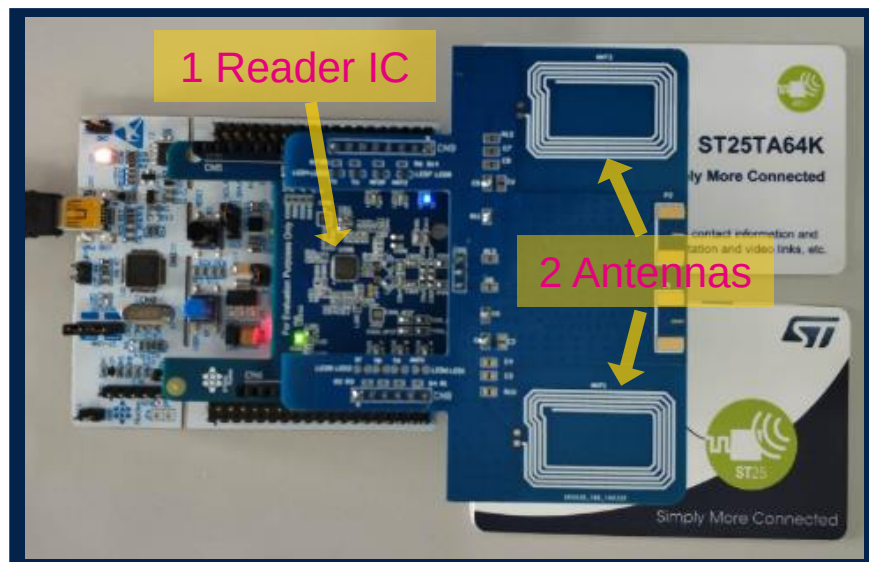
LED lights when tag captured





Dual antenna reader solution

To achieve cost effective and application flexible design thanks to ST25R's excellent RF performance



- The NFC reader can help to protect user's cards
- NFC gives enhanced user experience of Qi charger



Excellent Multi-tag reading ability

Multi-tag reading based on anti-collision algorithm





基于ST25R的大功率读写器

ST25DV具有灵活丰富的应用形式，提升生产效率



产品参数配置
产品**无需上电**即可完成参数配置，提升生产效率

生产流程记录
准确高效地读取产品信息，掌握产品生产状态

仓储/物流追踪
借助RFID自动实现生产全流程追踪

安装调试与维护
方便工程现场进行设备调试，提升应用灵活性

ST solutions



- Dynamic Tag
- HF Reader



LED 电源



水/电/气表



IOT设备

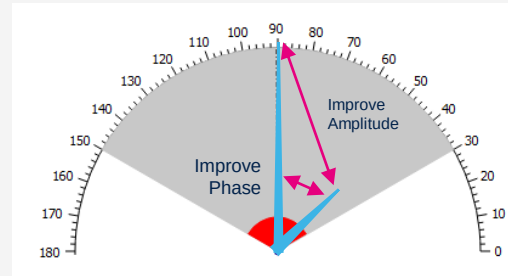


ST25R characteristics

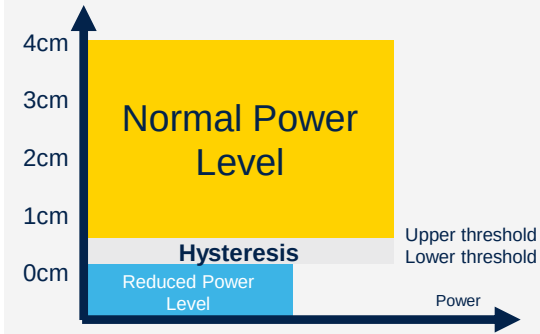
All standard supported

- ISO14443 A/B
- ISO15693
- Felica
- ISO18092

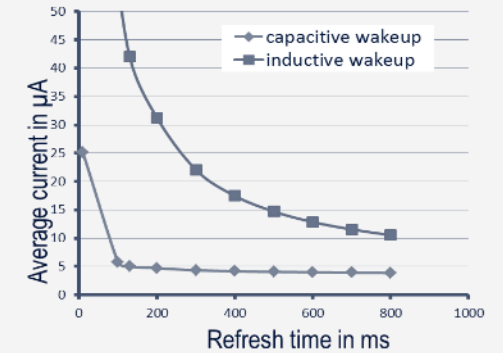
AAT
Automatic Antenna Tuning



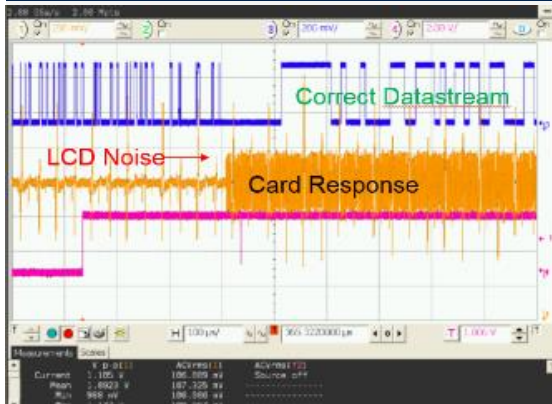
DPO
Dynamic Power Output



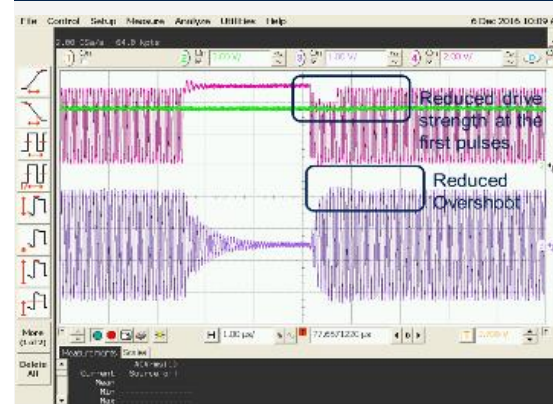
CIWU: Capacitive & Inductive Wakeup



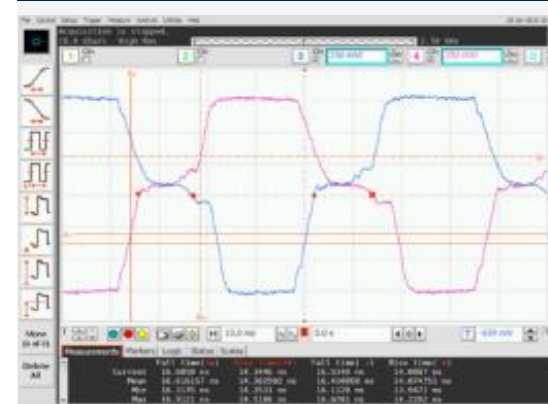
NSR: Noise Suppression
Receiver



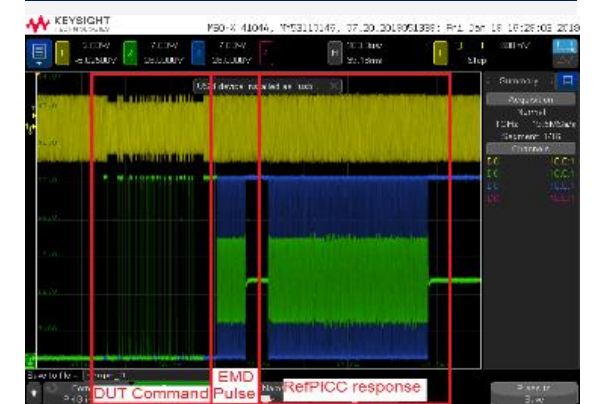
AWS
Active Wave shaping



DSA
Driver Slope Adjustment



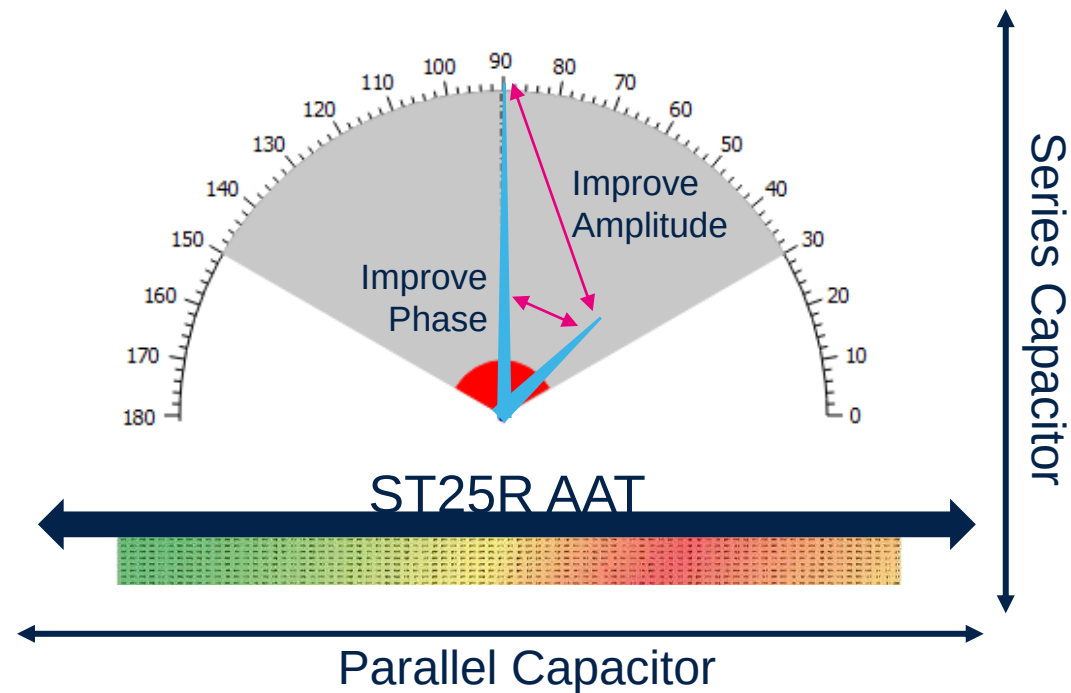
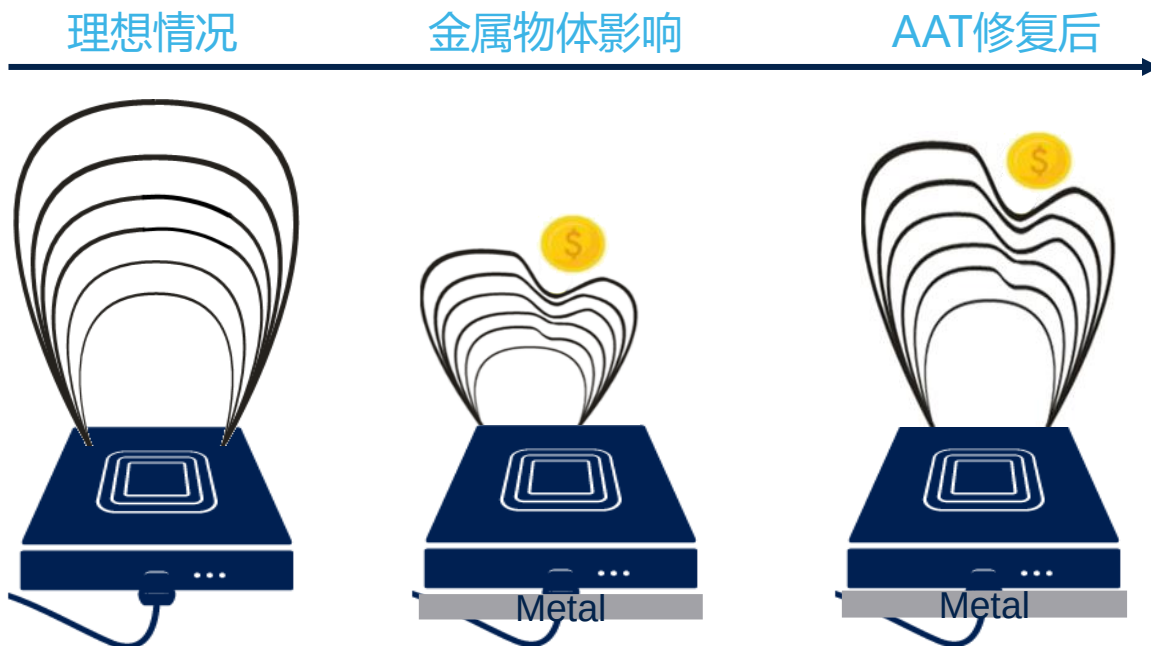
EMD: automatic EMD
suppression





AAT: Auto antenna tuning

AAT可显著改善金属结构对发射场强的影响，增强读写器对环境的适应能力

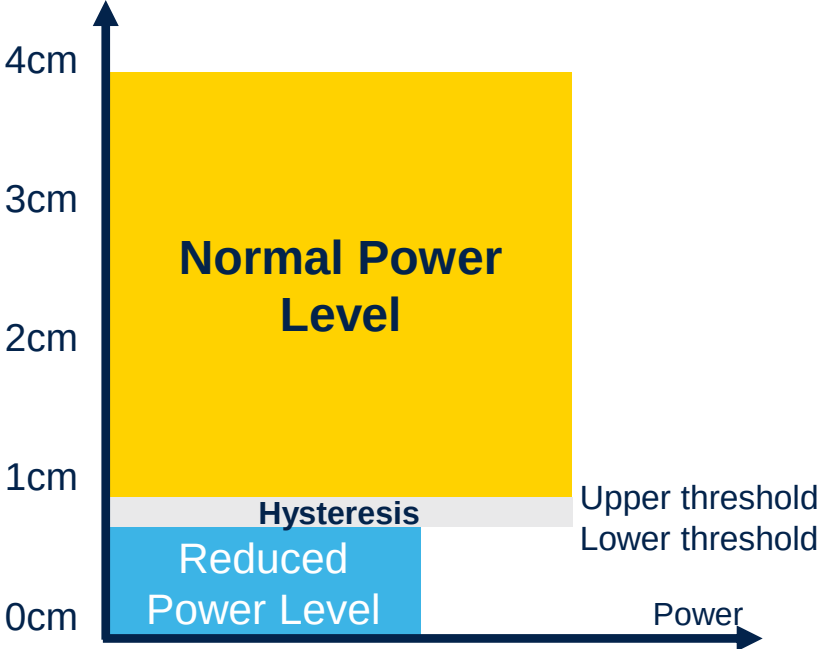
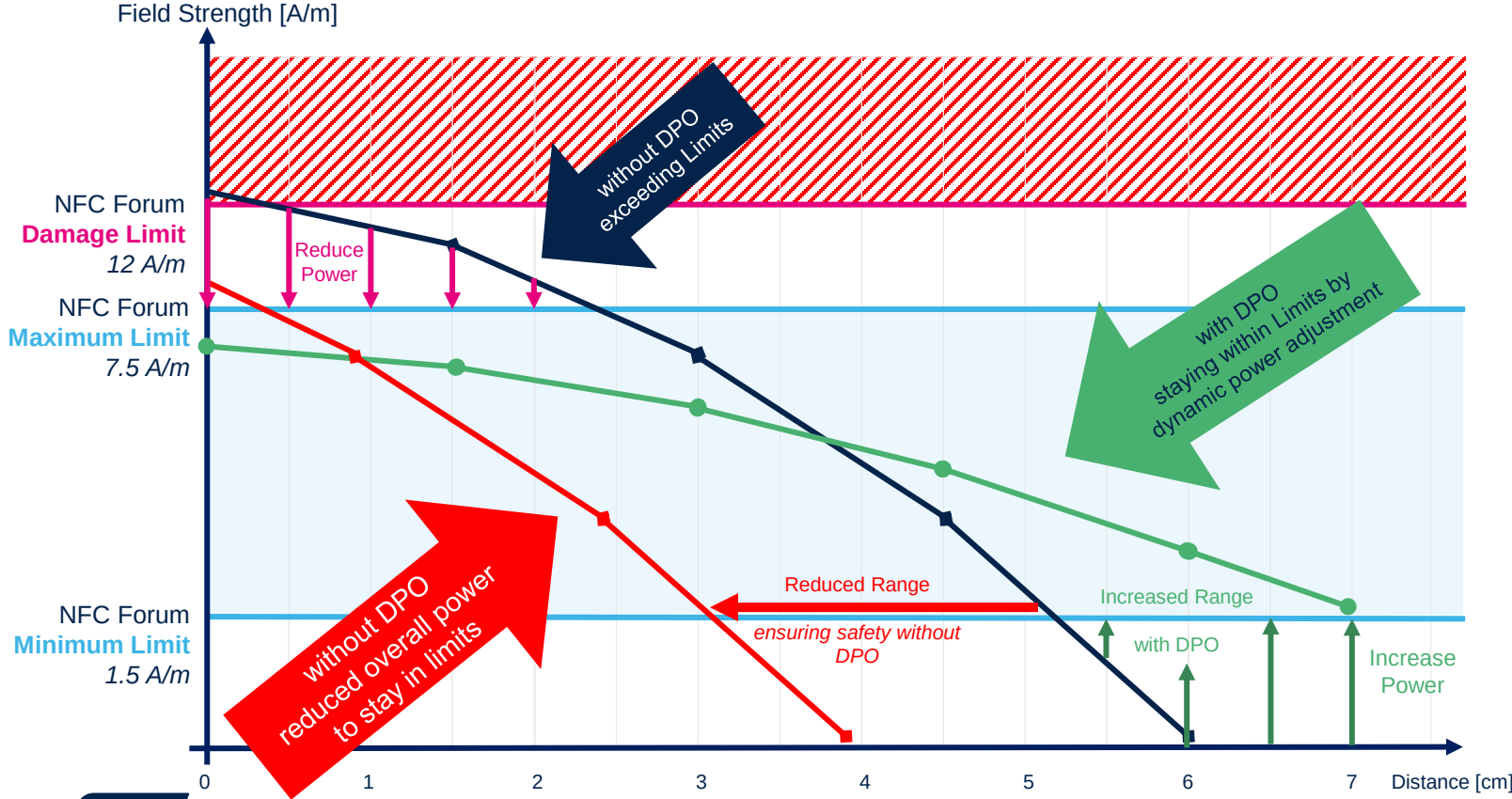


- 通过测量接收信号的幅值和相位，调节外接的并联/串联匹配电容
- 通过算法优化匹配参数，最大限度恢复发射场强



DPO: Dynamic power output

DPO enables precisely power control in different test plane



通过测量接收信号幅度，根据设定的门限调节发射功率，从时间和空间上实现发射场强的动态调节

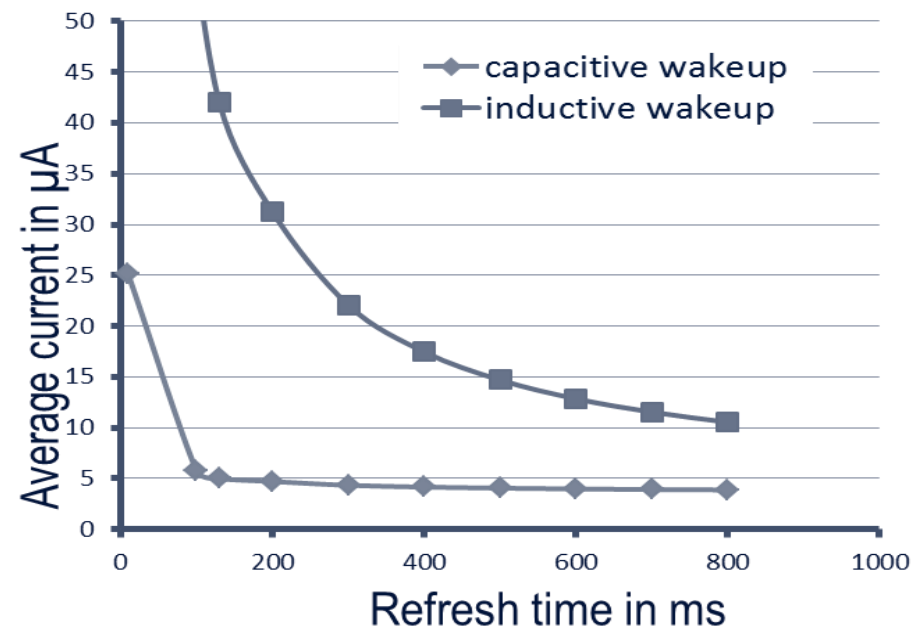
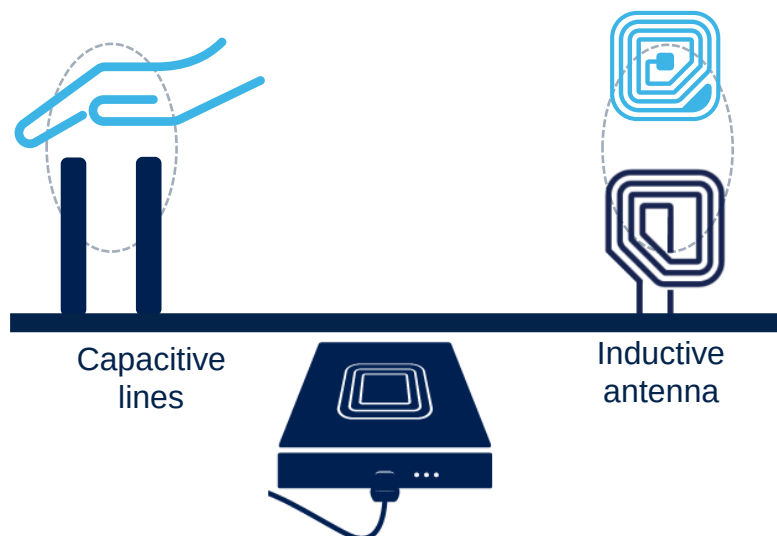


CIWU: Low power wakeup

Minimize system power consumption with excellent performance



Wake up



LPD Performance

- Capacitive: best power consumption (5µA), but low accuracy
- Inductive: relatively higher power consumption(10µA~40µA), but high accuracy



UHF RFID 读写器 - ST25RU3993

ST25RU3993 – 高性价比UHF RFID读写器



ST25RU3993-EVAL Read Performance Demonstration



ST solutions



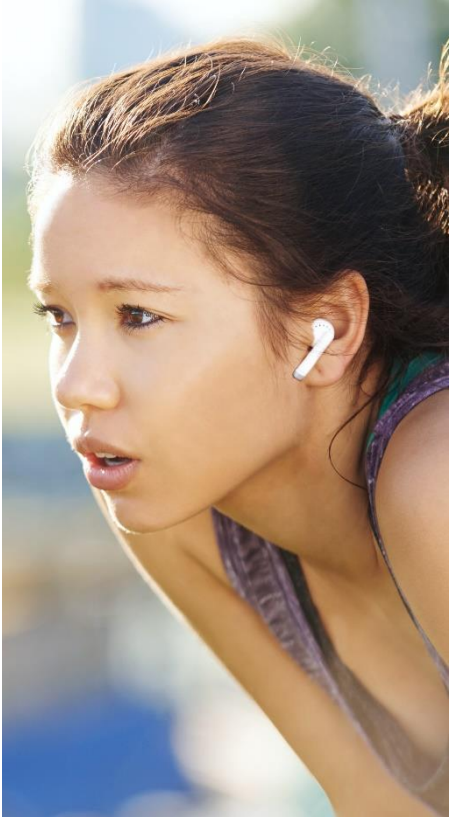
• ST25RU3993

NFC Wireless Charging





Target applications



**Earbuds &
Hearing aids**



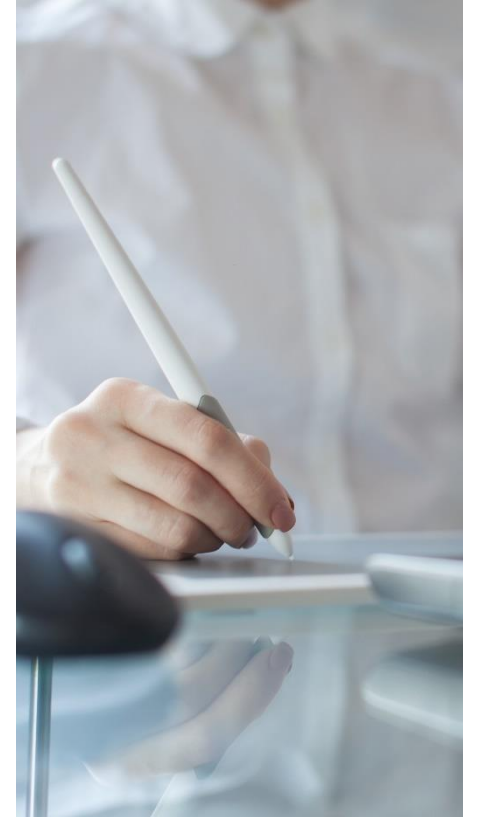
**Smart watches &
Fitness tracker**



**Smart glasses &
VR/AR products**



**Remotes &
Sensors**



Digital accessories

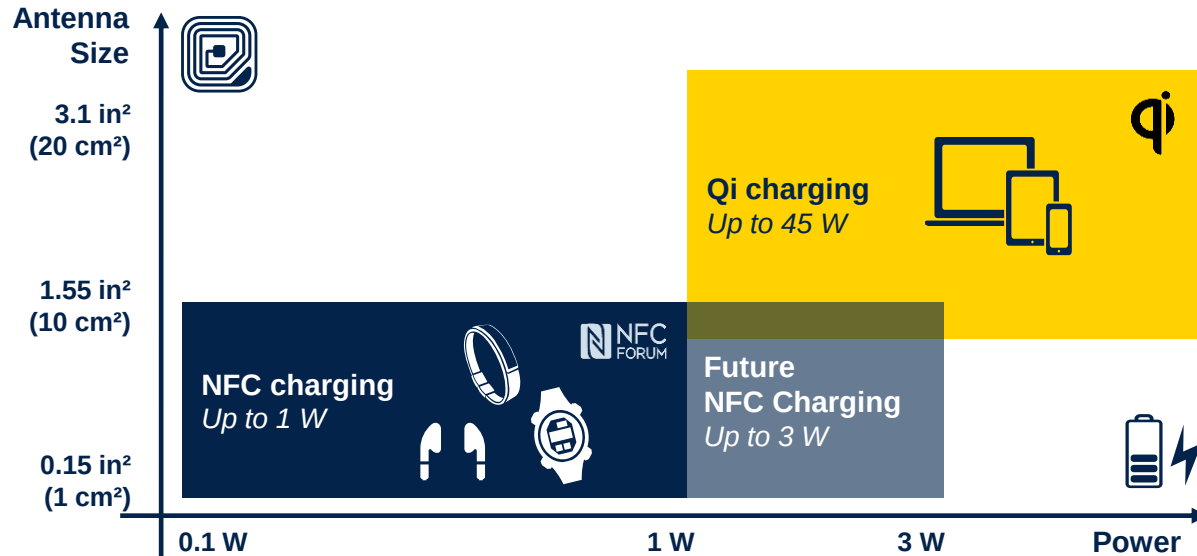


Charging setups of NFC WLC





NFC wireless charging brief



NFC Wireless Charging technology

- A new working mode defined by NFC Forum
- Target – Power < 3W
- More safer charging control mechanism
 - FOD (Foreign Object Detection)
 - Static / Negotiated mode controlled by protocol

Main
advantages
to Qi

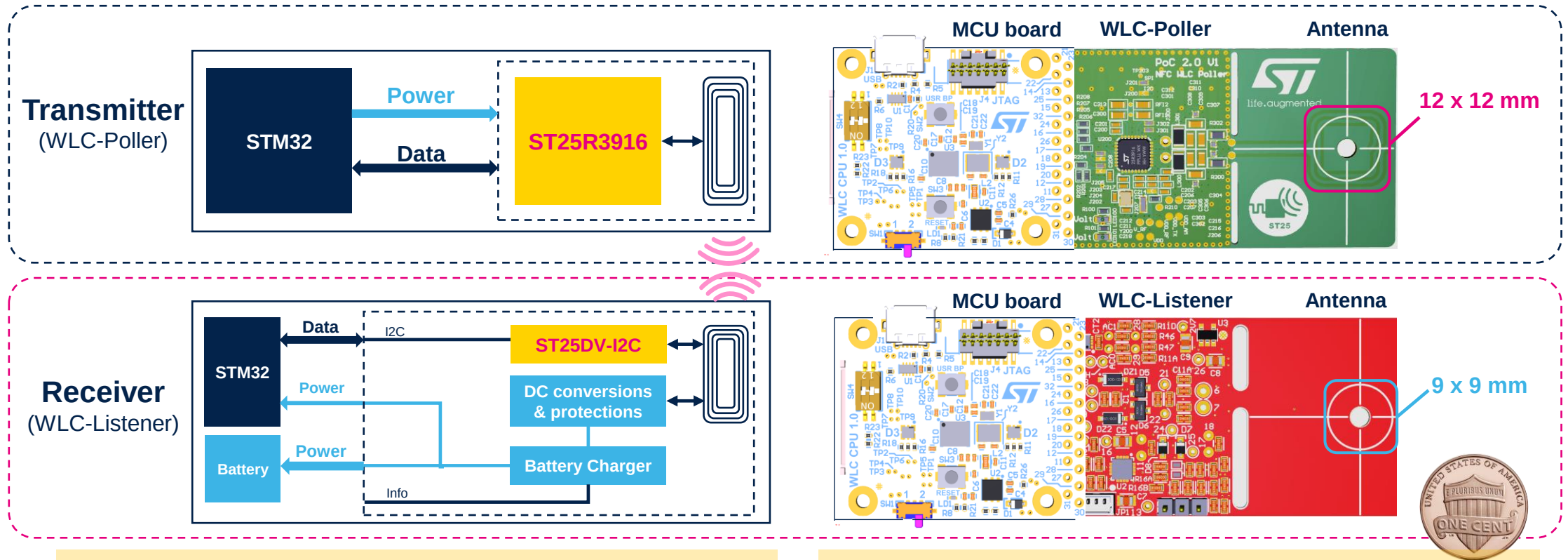
Smaller antenna size

Stronger data transfer capability

Safer charging based on FOD & control mechanism



ST25 NFC Charging Demo Solution



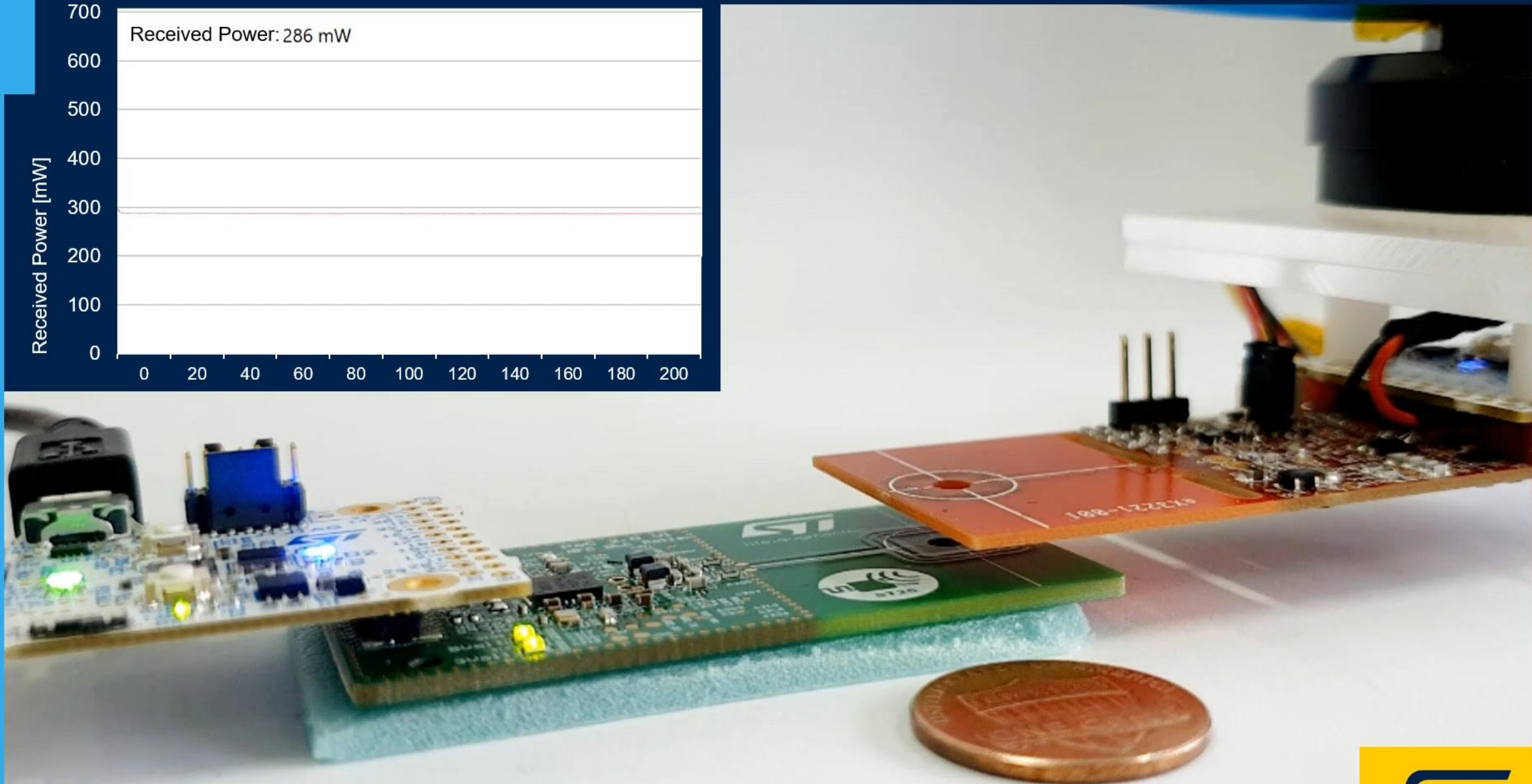
Highlights

- Up to **500mW** received power
- Implementation of **static** and **negotiated** mode
- Full NFC Forum compliancy

Design Challenge

- Power transmission **efficiency**
- Antenna design

Received Power [mW]



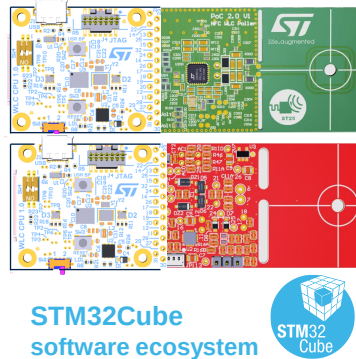


Why choose ST NFC?



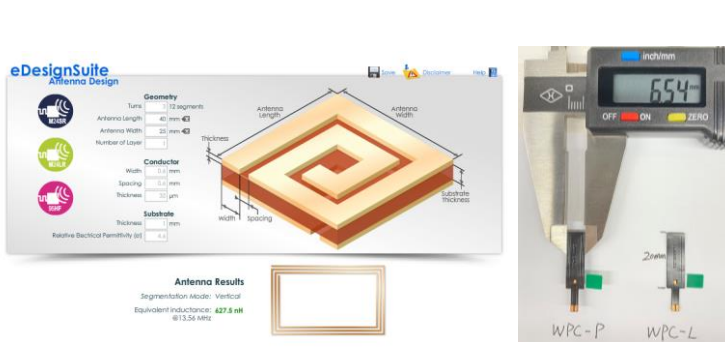
Product & Solution

- Comprehensive NFC products
- Advanced **ST25** NFC performance
- Full NFC Forum compliancy
- Fast productization thanks to mature reference design
- Open source for all



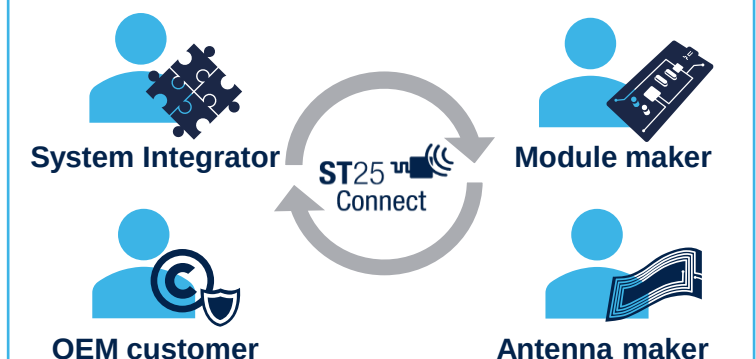
Support

- Antenna design and matching tools available, makes design easier
- Demo antennas to fit your design
- Expertise and patents to improve power efficiency



Ecosystem

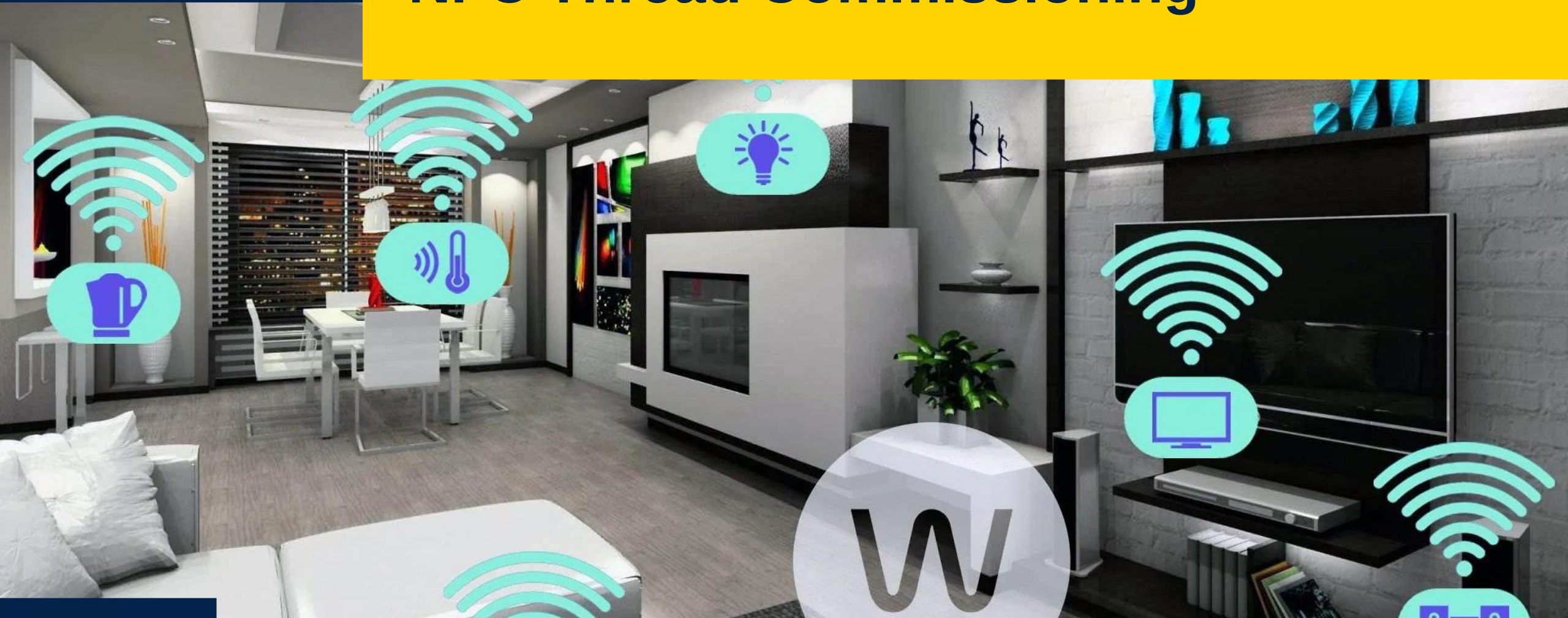
- Core member of NFC standard groups
- Extensive coverage of NFC market
- Strong partnership with extensive customer base
- ST25Connect program



End Products

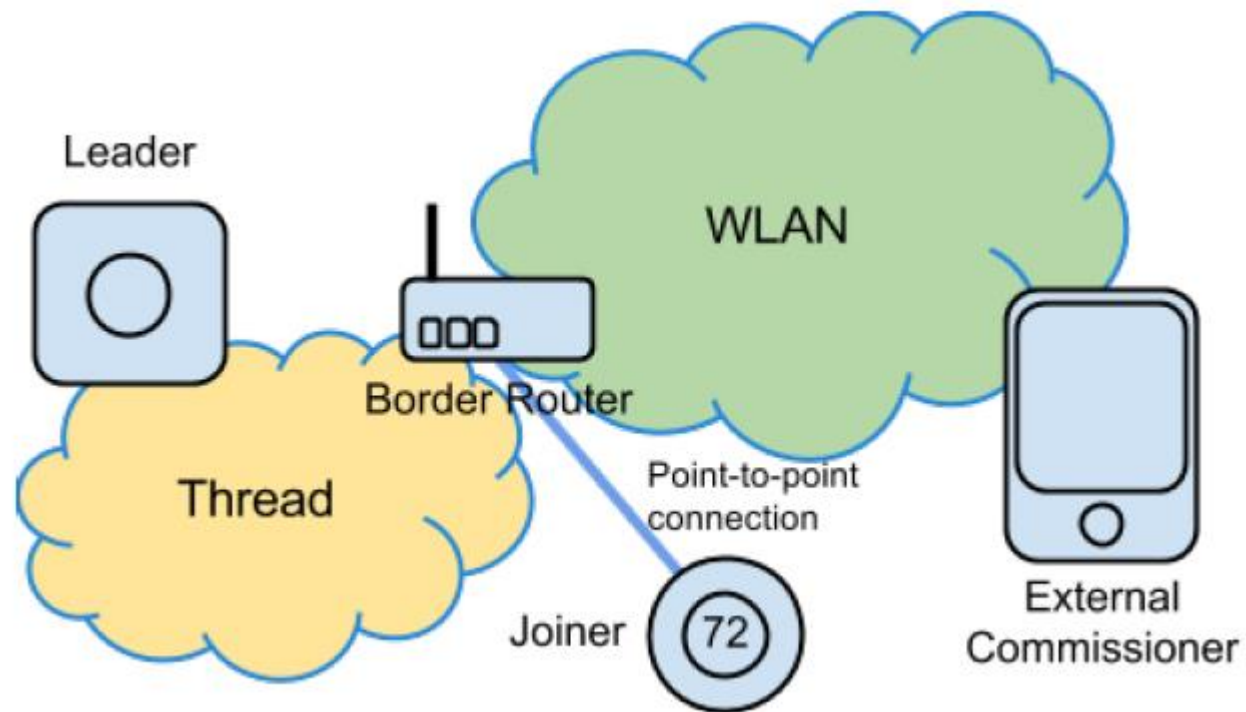
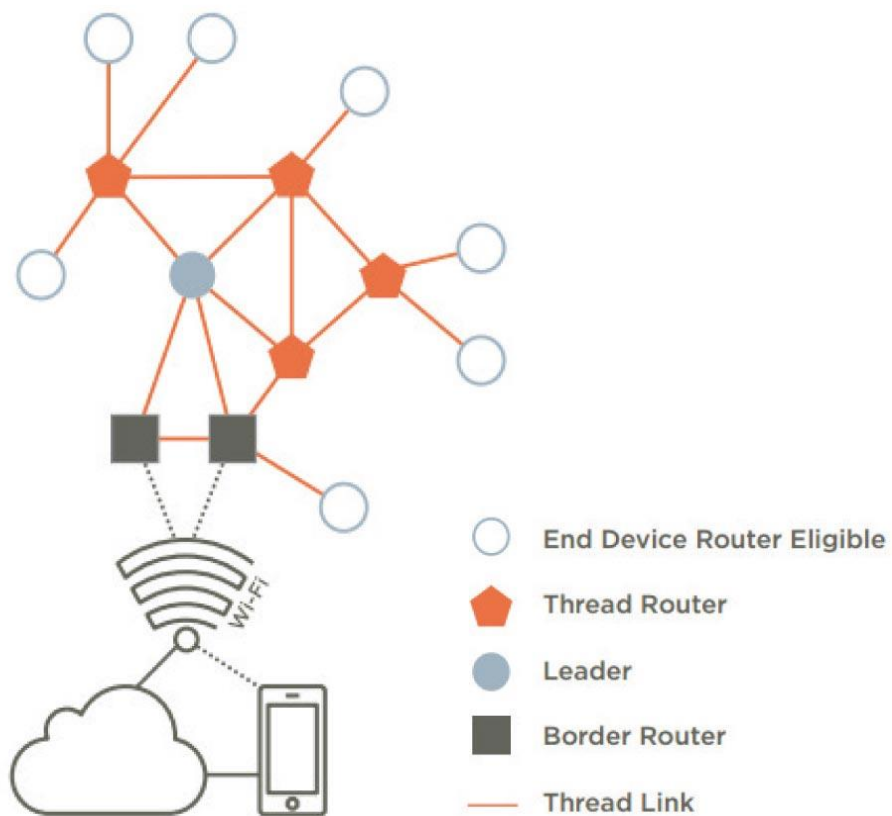


NFC Thread Commissioning



Thread networking

THREAD Network architecture



Thread

- designed specifically for Connected Home applications

open standard

IPV6

device-to-device

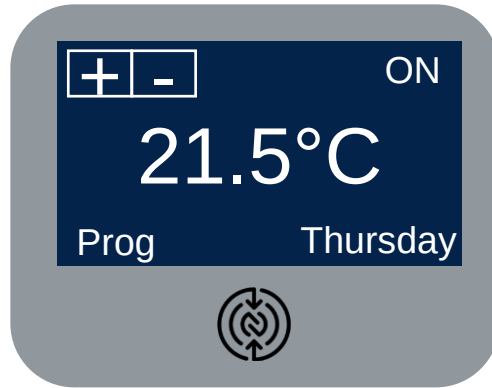
cost-effective

low-power

reliable

NFC如何改善IOT设备用户体验?

End device



Use cases

#1: Thread Commissioning

- Add a new device to network

#2: Parameter Setting

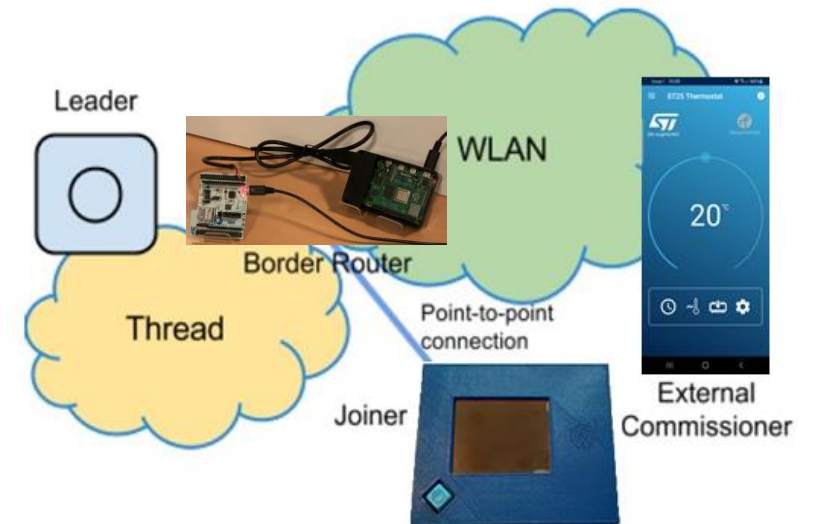
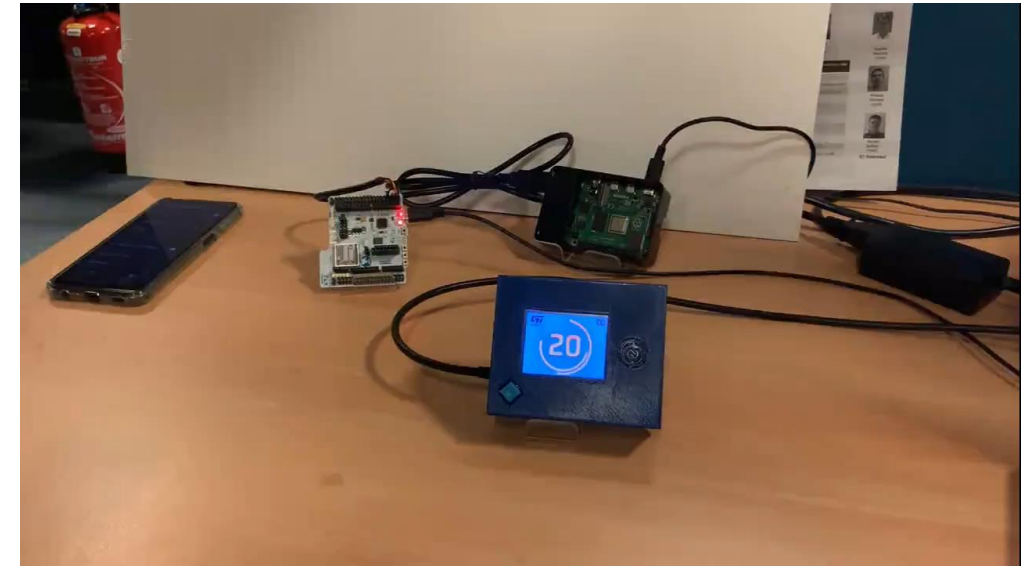
- Change temperature unit (°C, °F) or language (in prod)

#3: FW upgrade

- Update the firmware of the microcontroller, new User interface

#4: Audit device from NFC phone

- Get data log to smartphone



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