PHILIPS

**The First International Workshop on IT-Solutions for Physical Security:**

# State of the Art Car Access Security Systems

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Customer Application Support Hamburg; BL Identification
Car Access and Immobilization

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# BLID CAI

Keyless Enty/Go


Immobilization

Remote Keyless Entry

Tire Pressure Monitoring

# Product Focus

- Immobilizer: Transponders and Basestations
  - high security anti-theft system
  - even with a perfect mechanical copy of the car key, the vehicle can not be started because several essential functions are blocked electronically
  - more than 250,000,000 parts sold

- Remote Keyless Entry: Combined Systems with Immobilizer
  - unlock and lock the car by remote control
  - combined with Immobilizer = security & comfort

# Product Focus

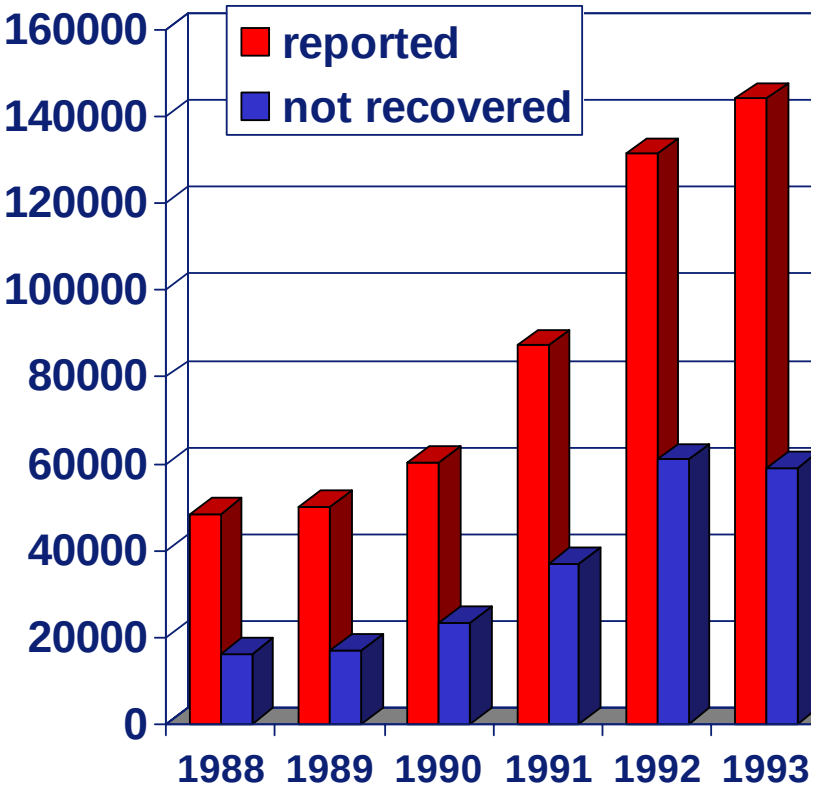
- Passive Entry / Passive Go: Fully integrated Systems
  - access your car by just pulling the door handle and start by pressing a button: the highest level of comfort
  - highly integrated 3-dimensional active LF-front-end with UHF-downlink

- Tire Pressure: Wireless tire pressure- and temperature- sensor signal conditioning and data transfer with 3D-LF-wakeup and UHF downlink
  - long live time (>6 years)
  - individual tire addressing

# 1st Generation

***Immobilizer***

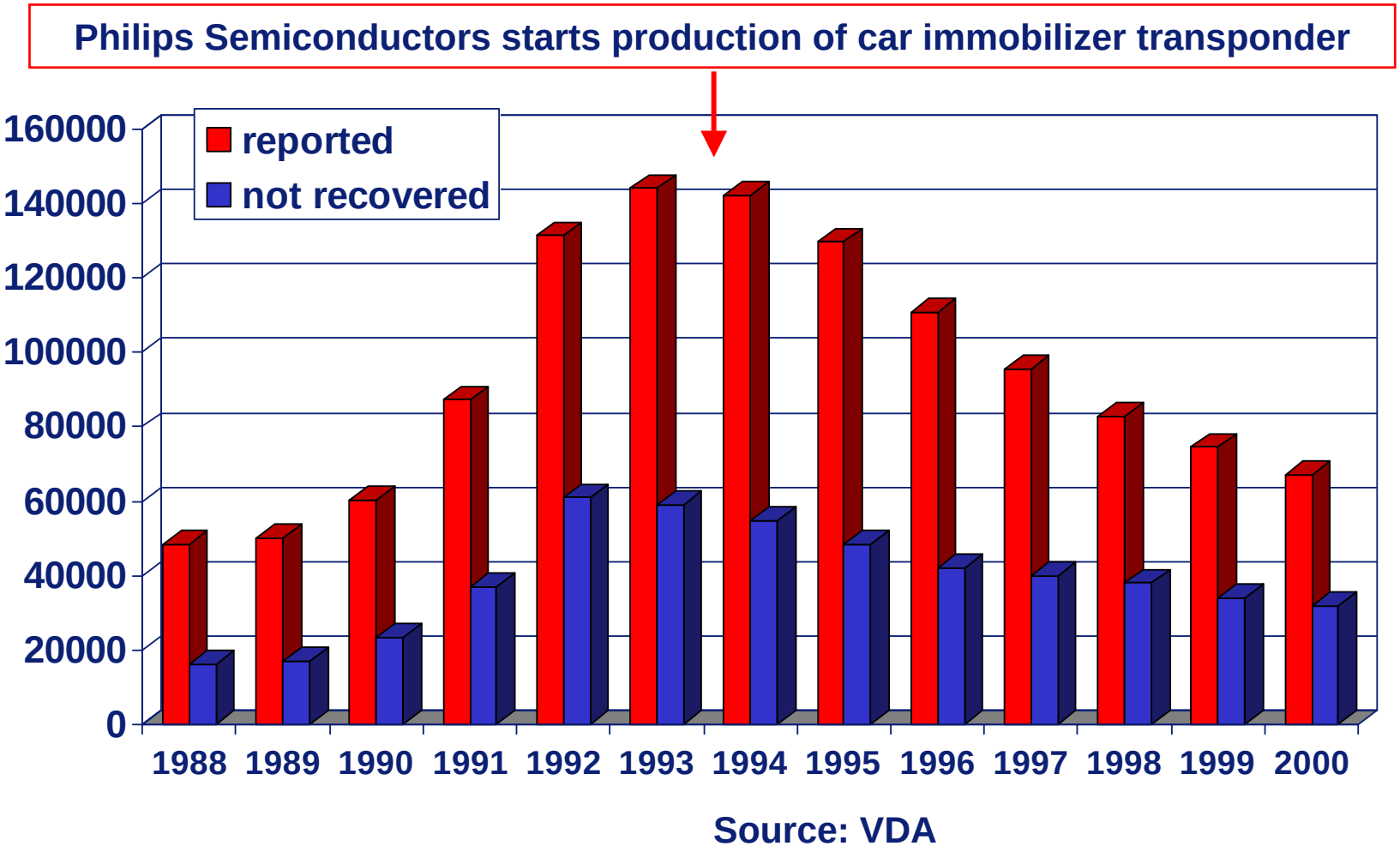
# Vehicle Theft Rate in Germany



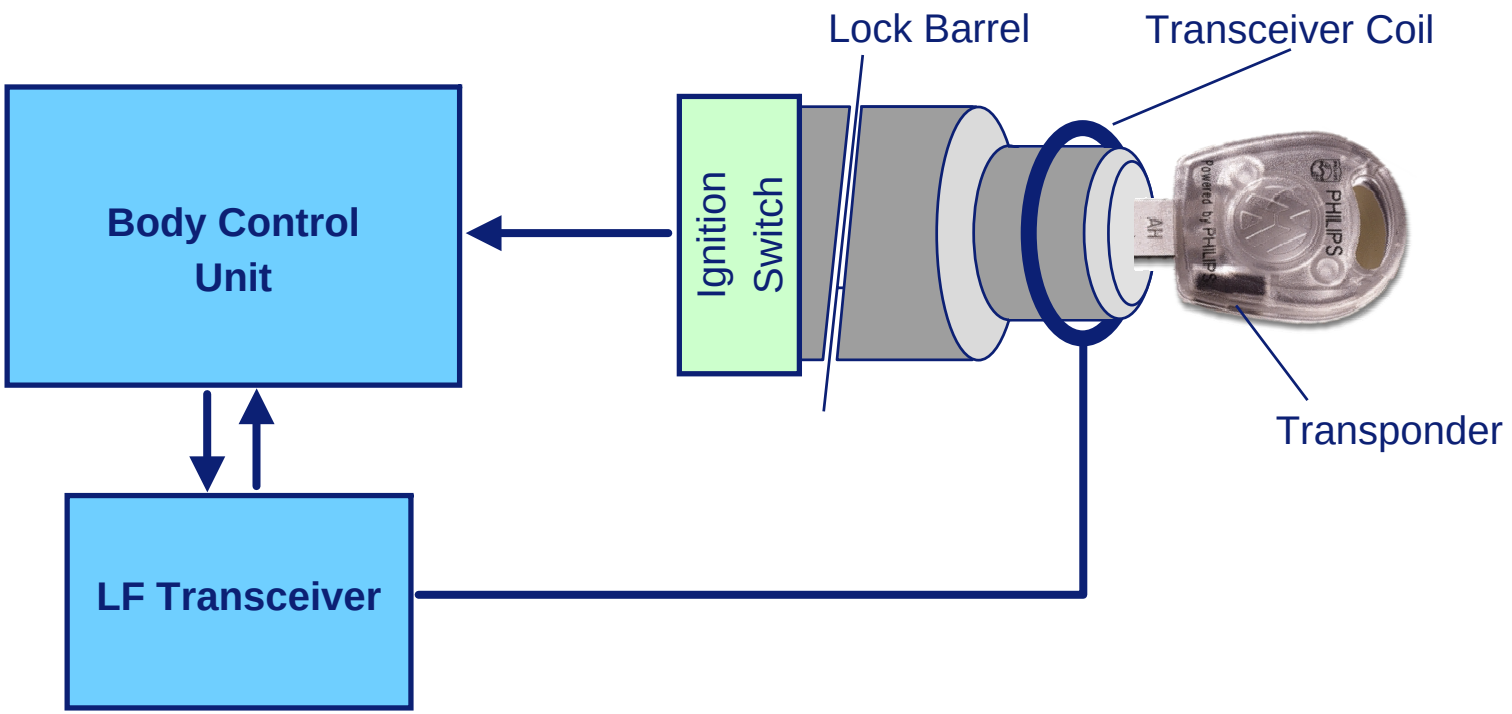

play video

**Source: VDA**

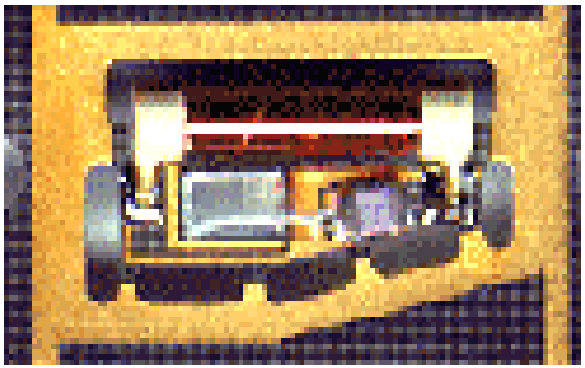
# Vehicle Theft Rate in Germany

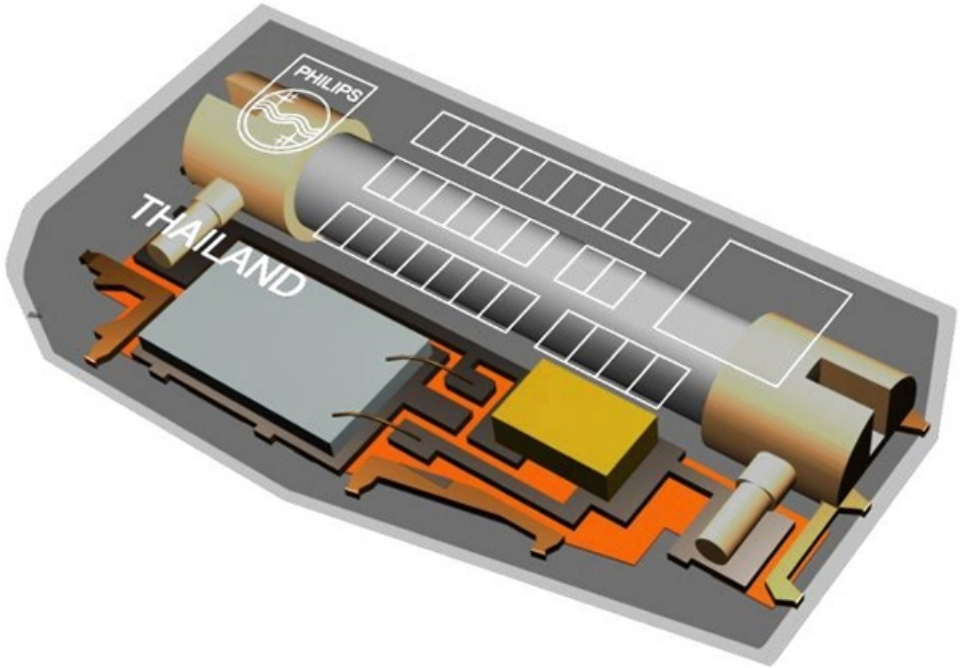


# Immobilizer System Configuration

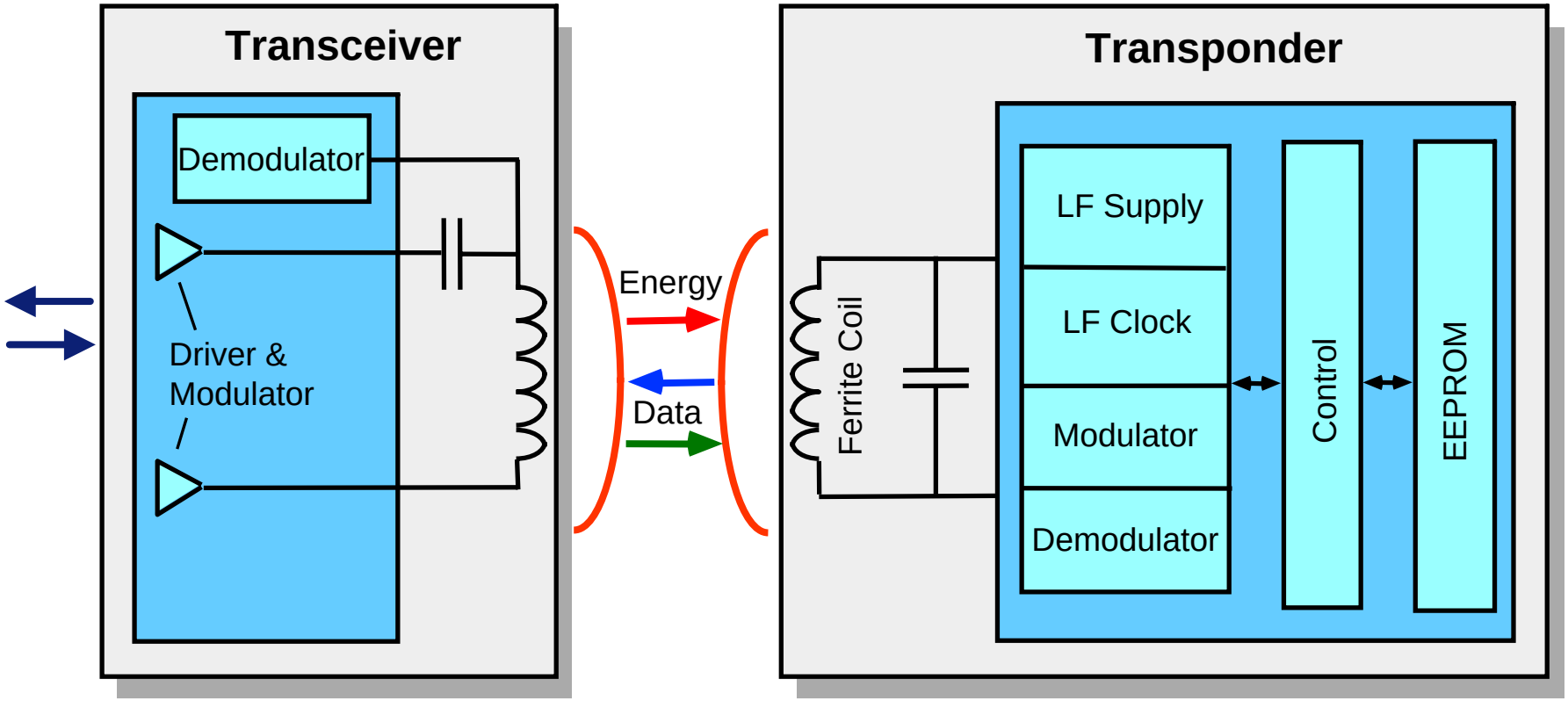


# Mechanical Setup

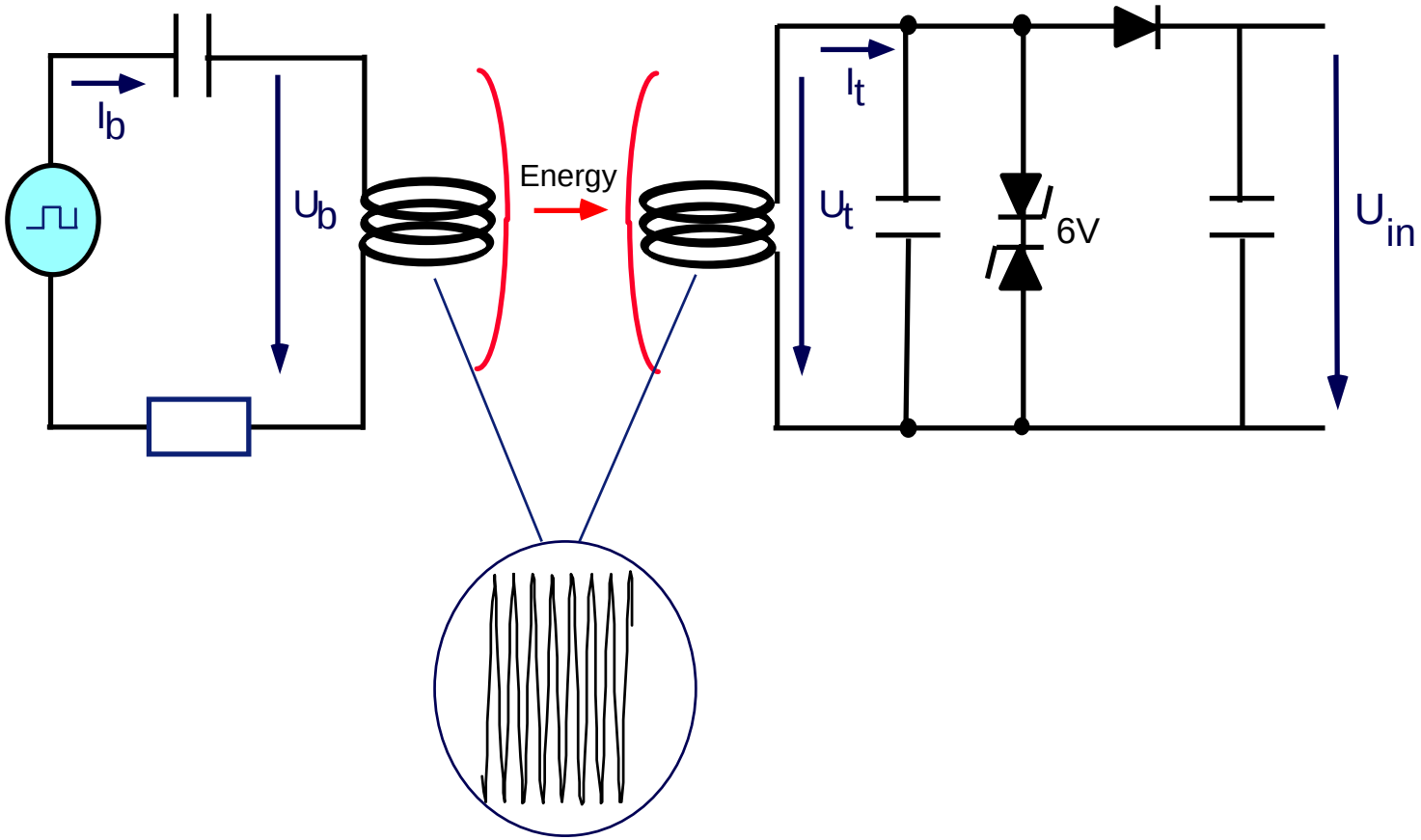





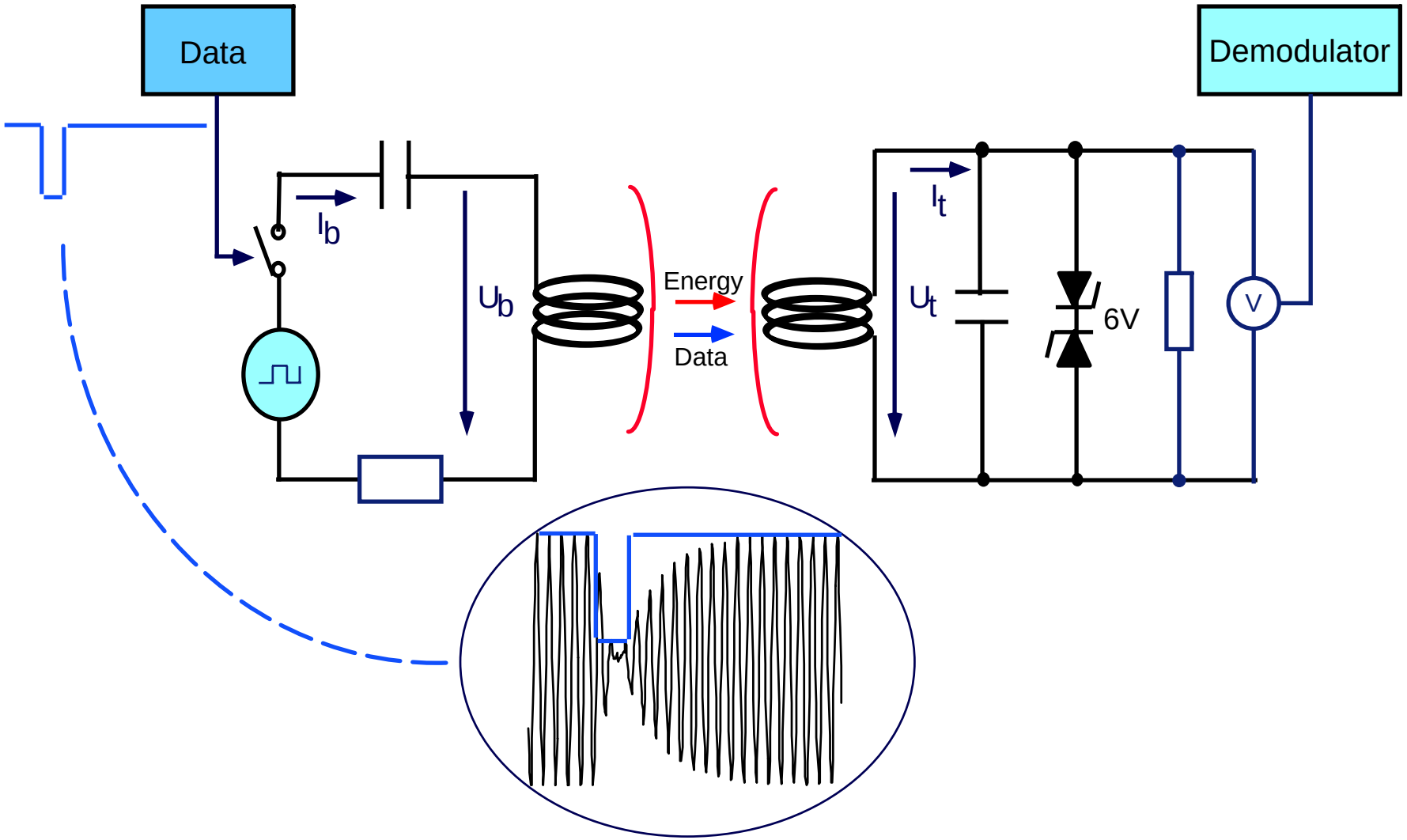
# Immobilizer System Detail



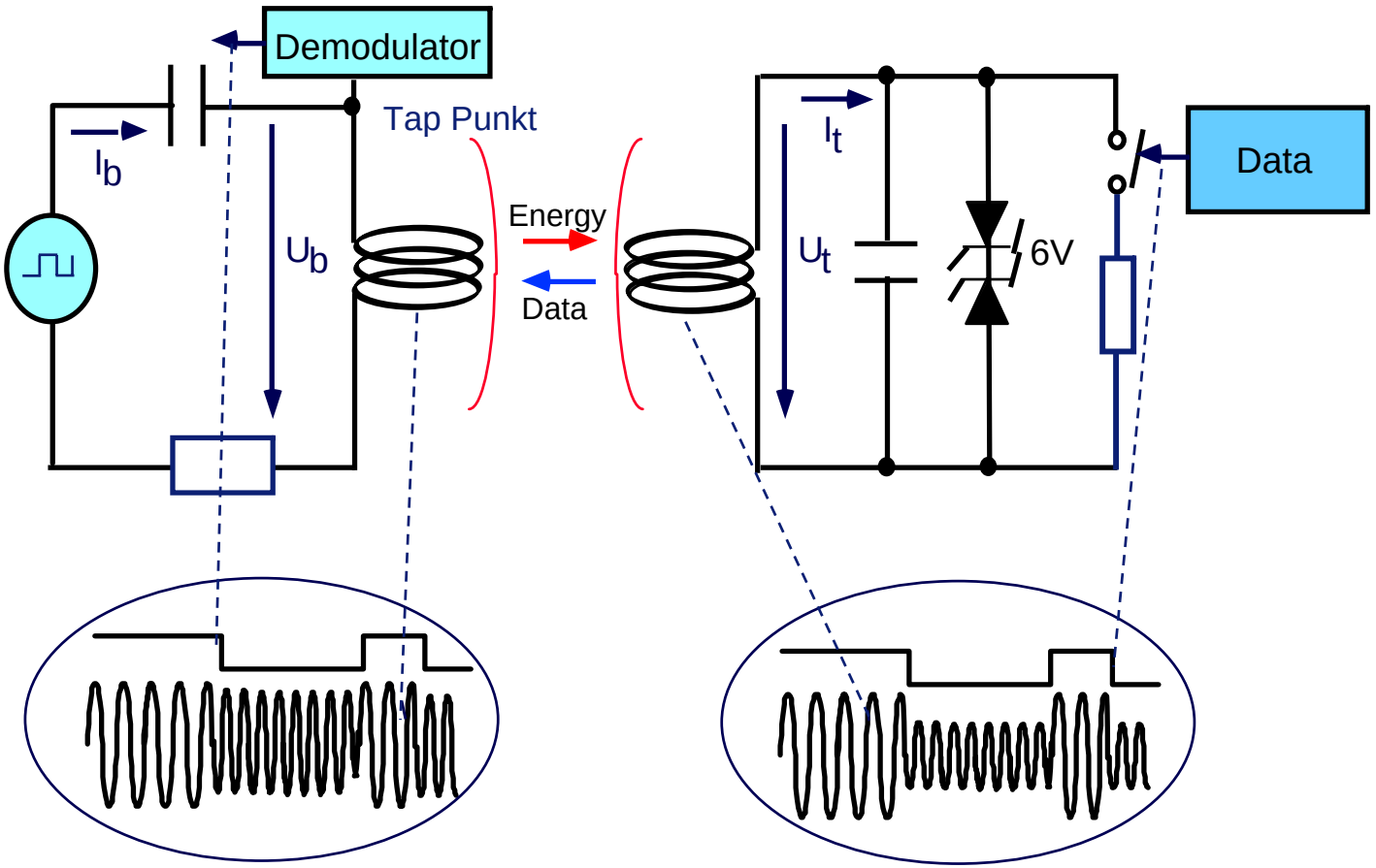
# Energy Transfer: Basestation → Transponder



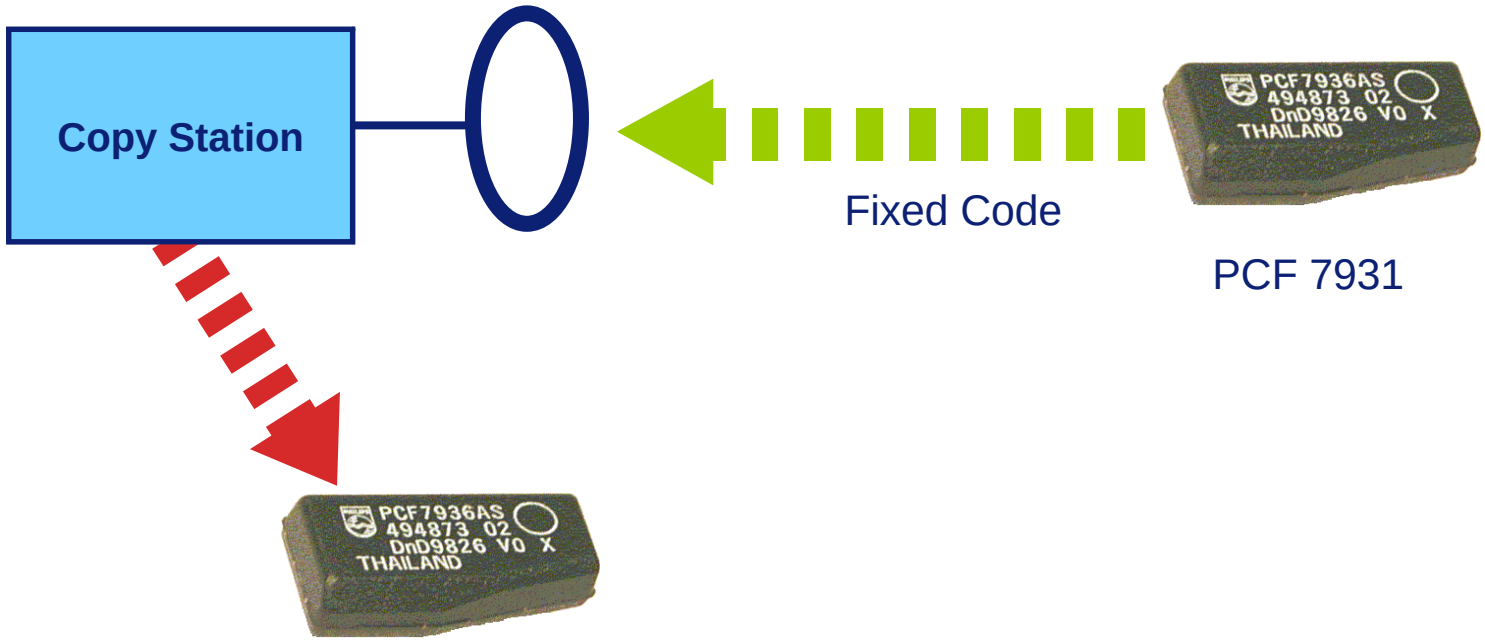
# Data Transfer: Basestation → Transponder



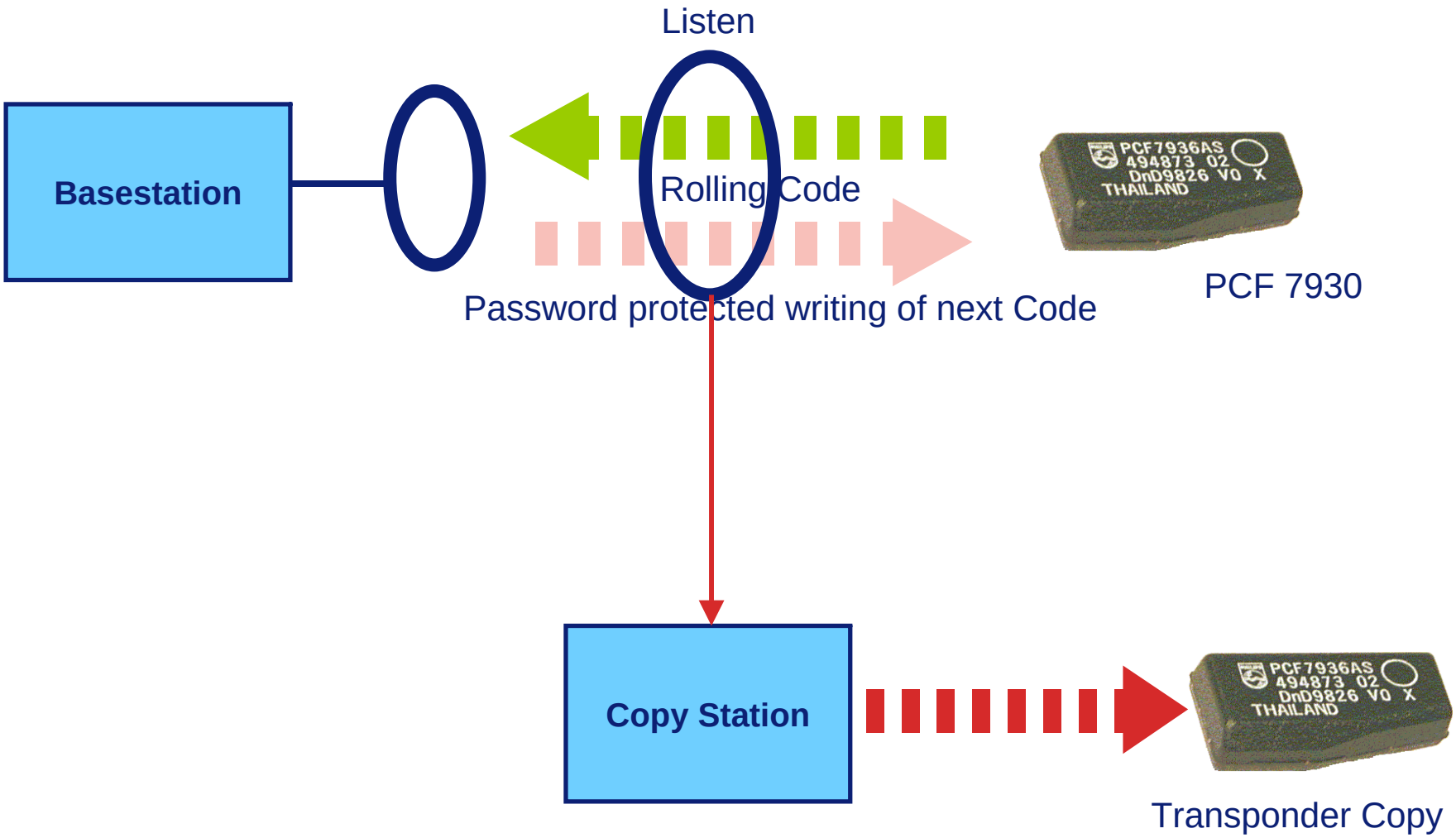
# Data Transfer: Transponder → Basisstation



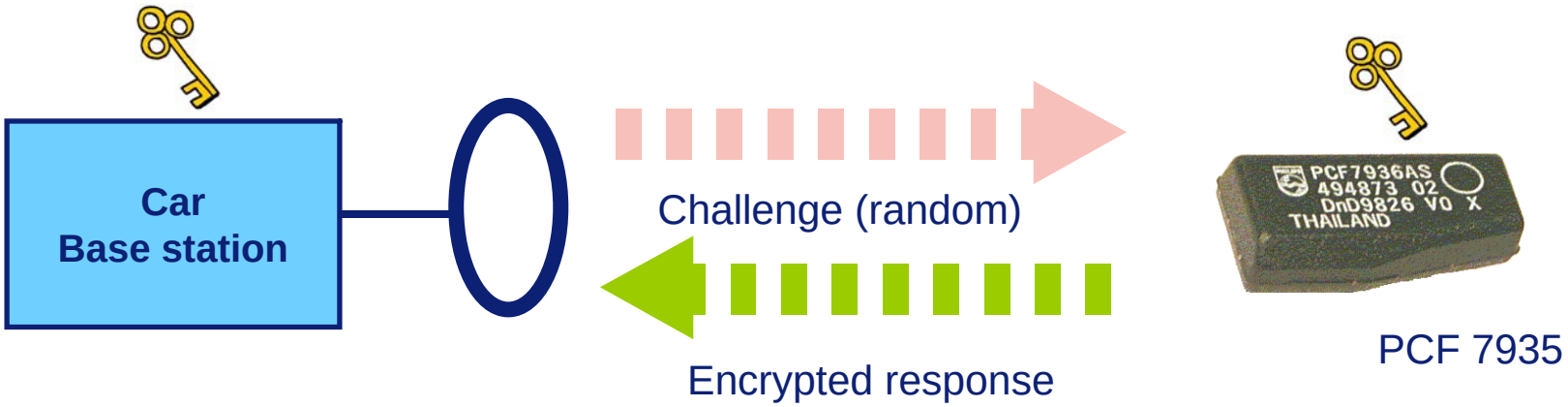
# First Transponder Generation: Read-Only



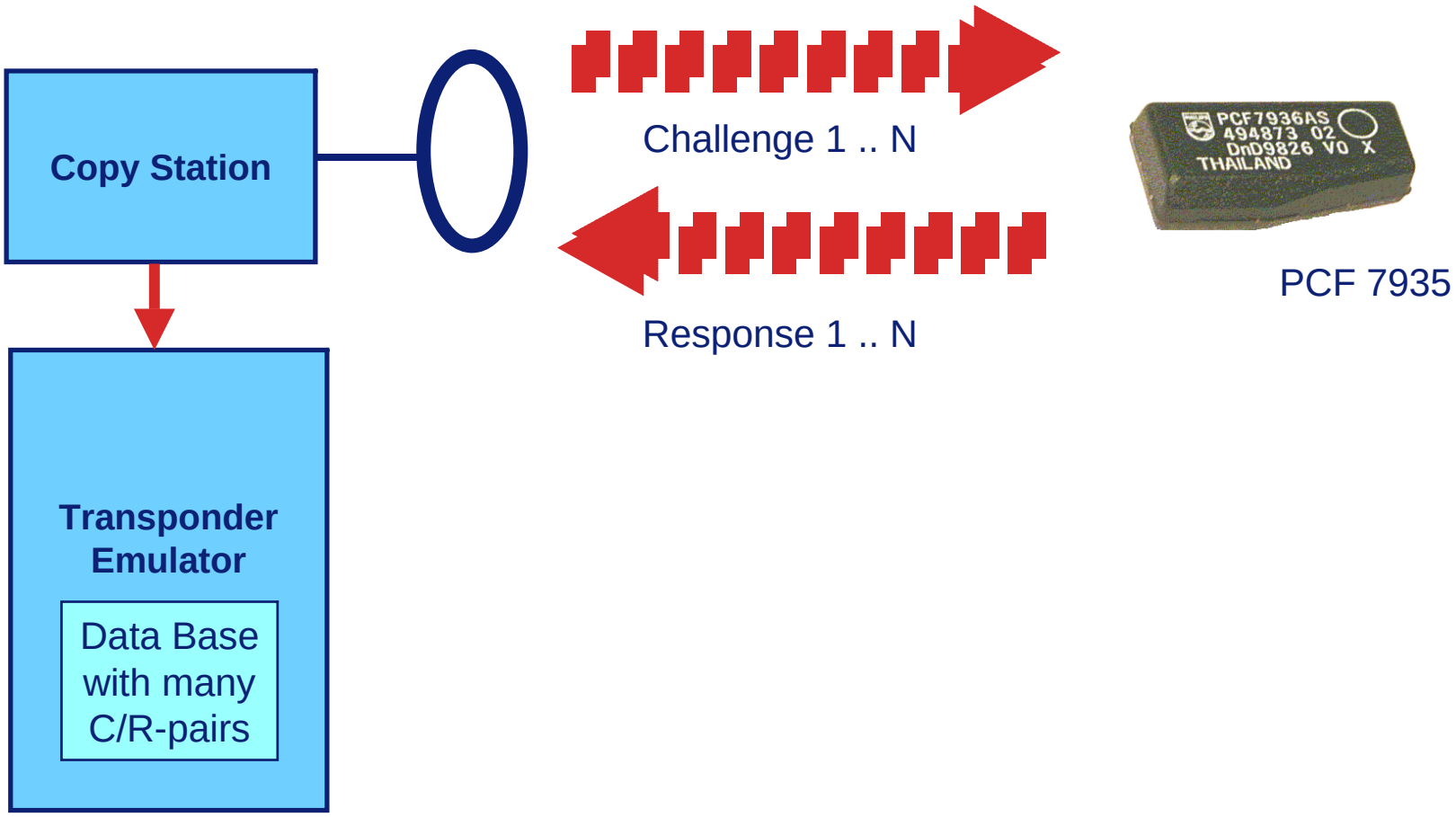
# 2nd Transponder Generation: Rolling Code



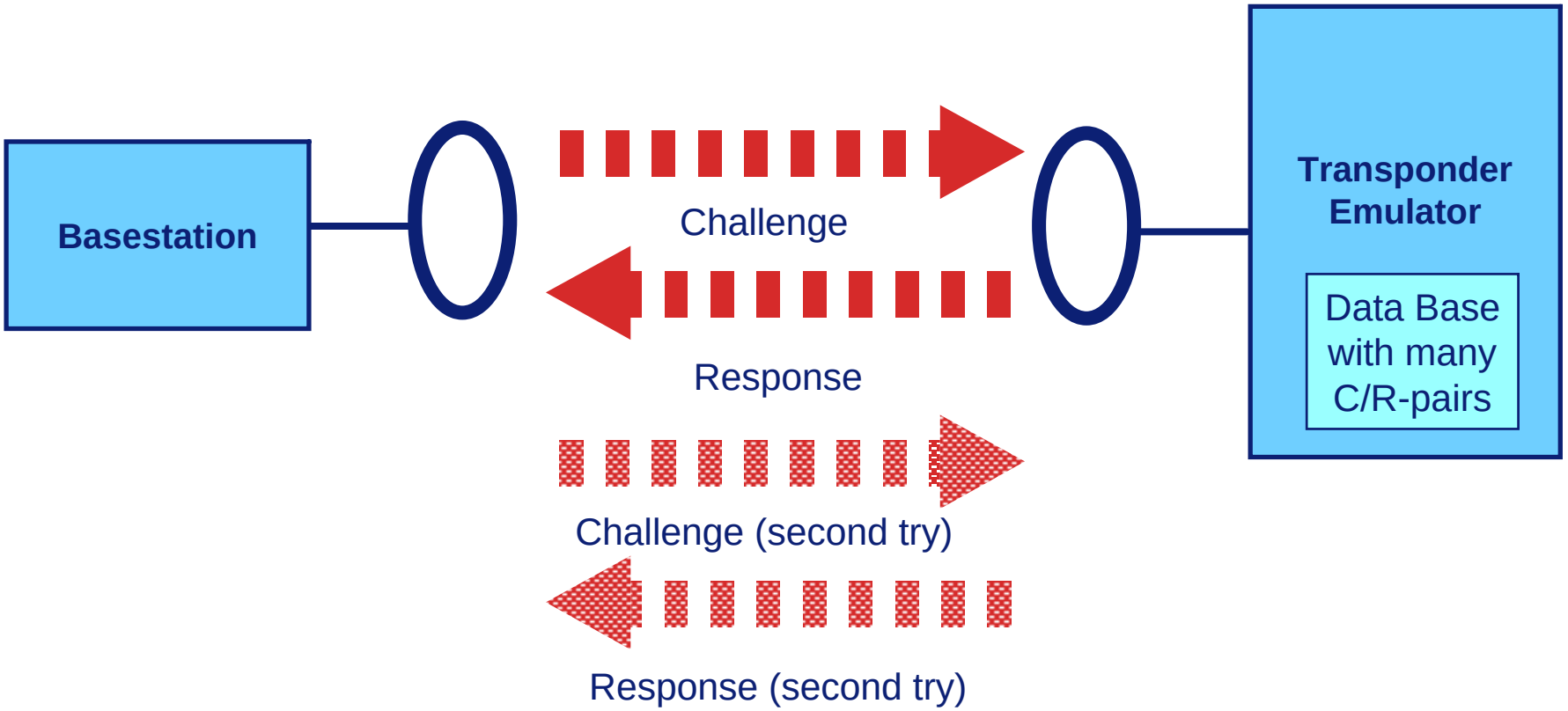
# 3rd Transponder Generation: Challenge Response



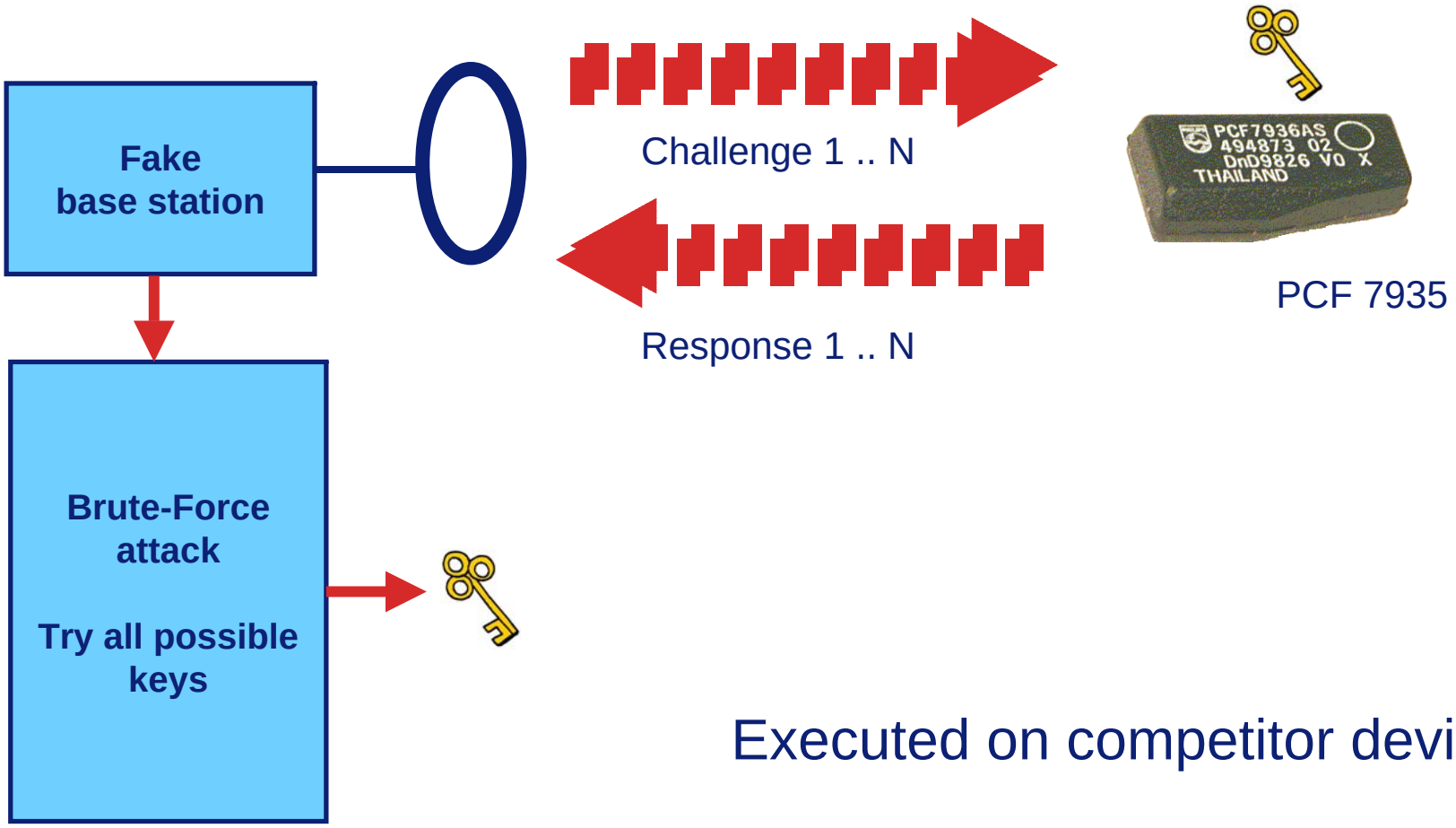
# 3rd Transponder Generation: Challenge Response



# 3rd Transponder Generation: Challenge Response

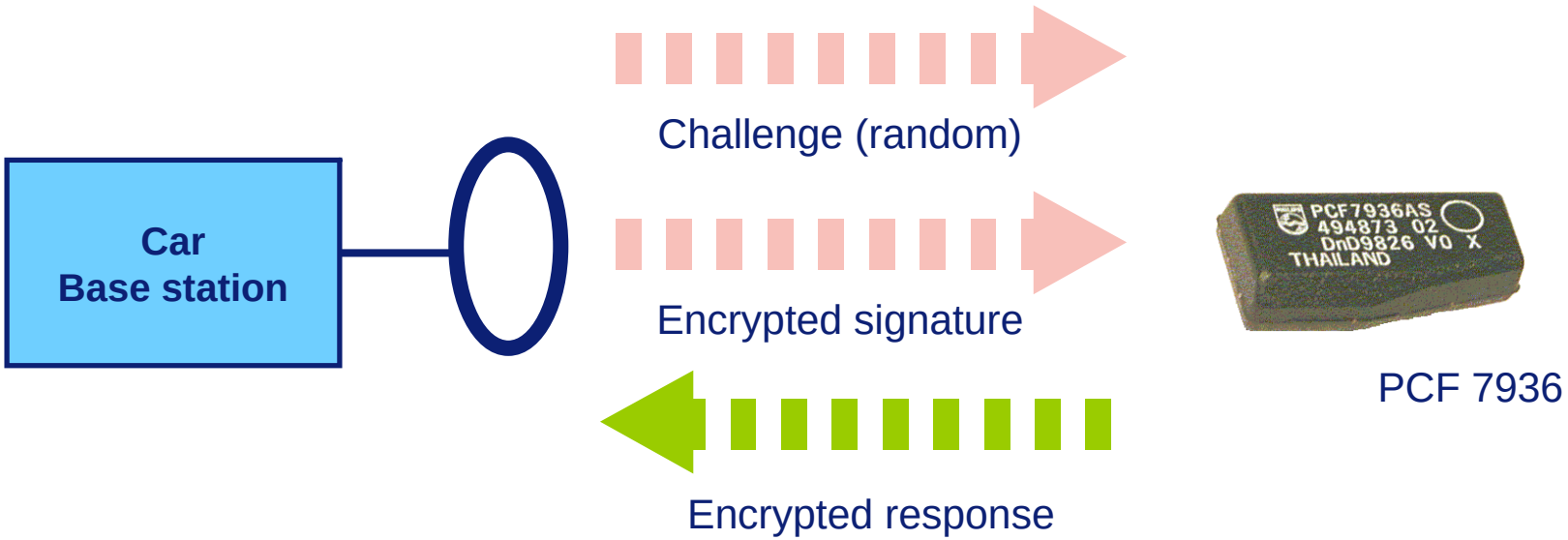


# 3rd Transponder Generation: Challenge Response

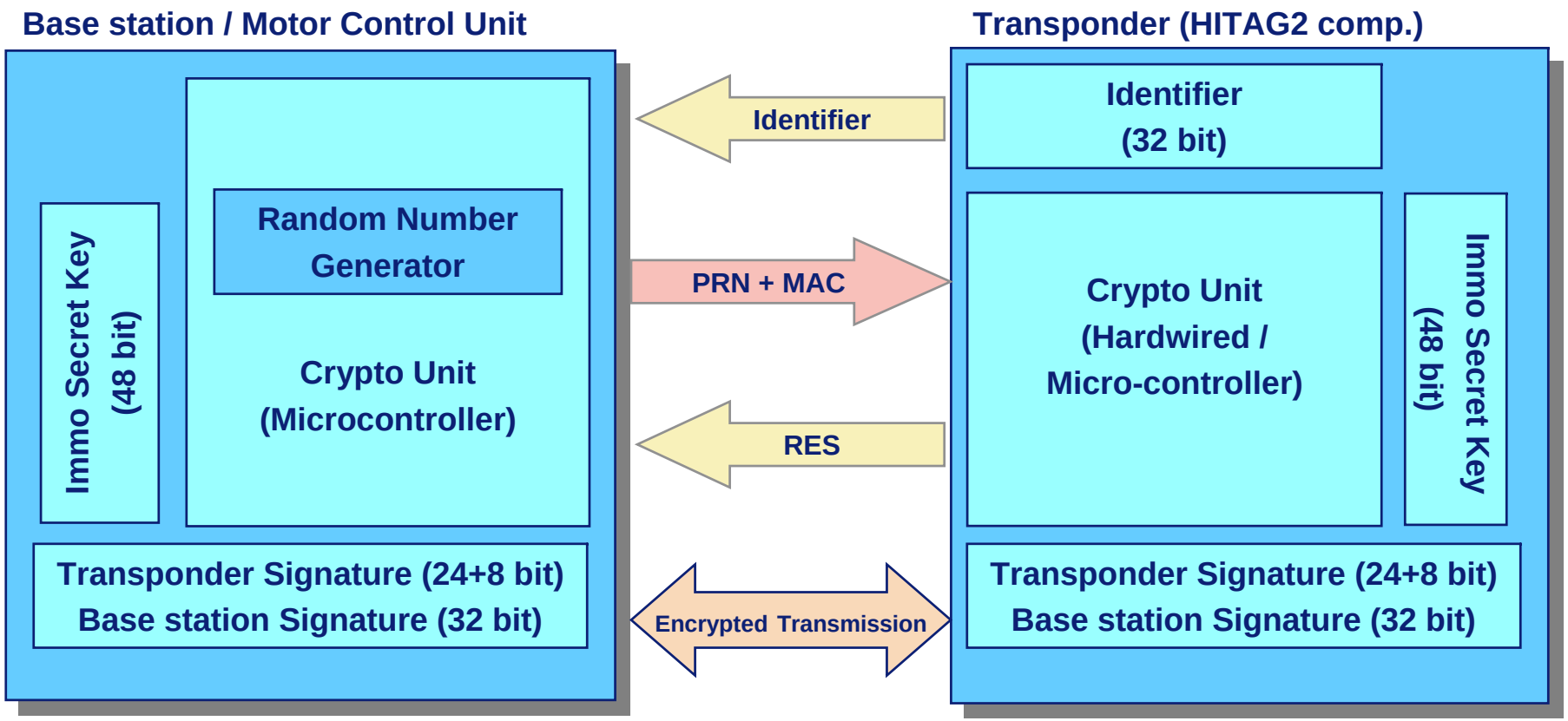



Executed on competitor device

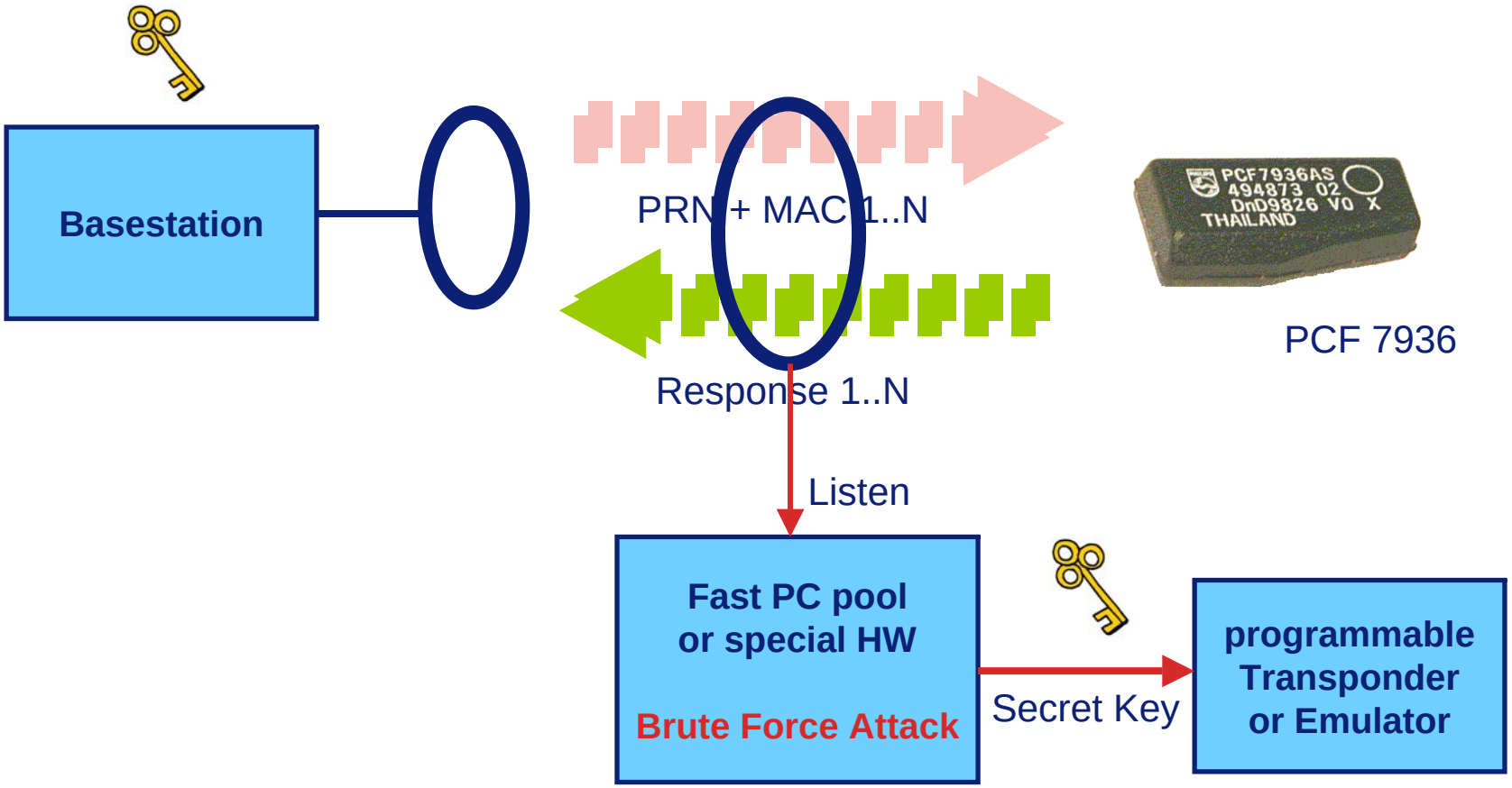
# 4th Transponder Generation: Mutual Authentication



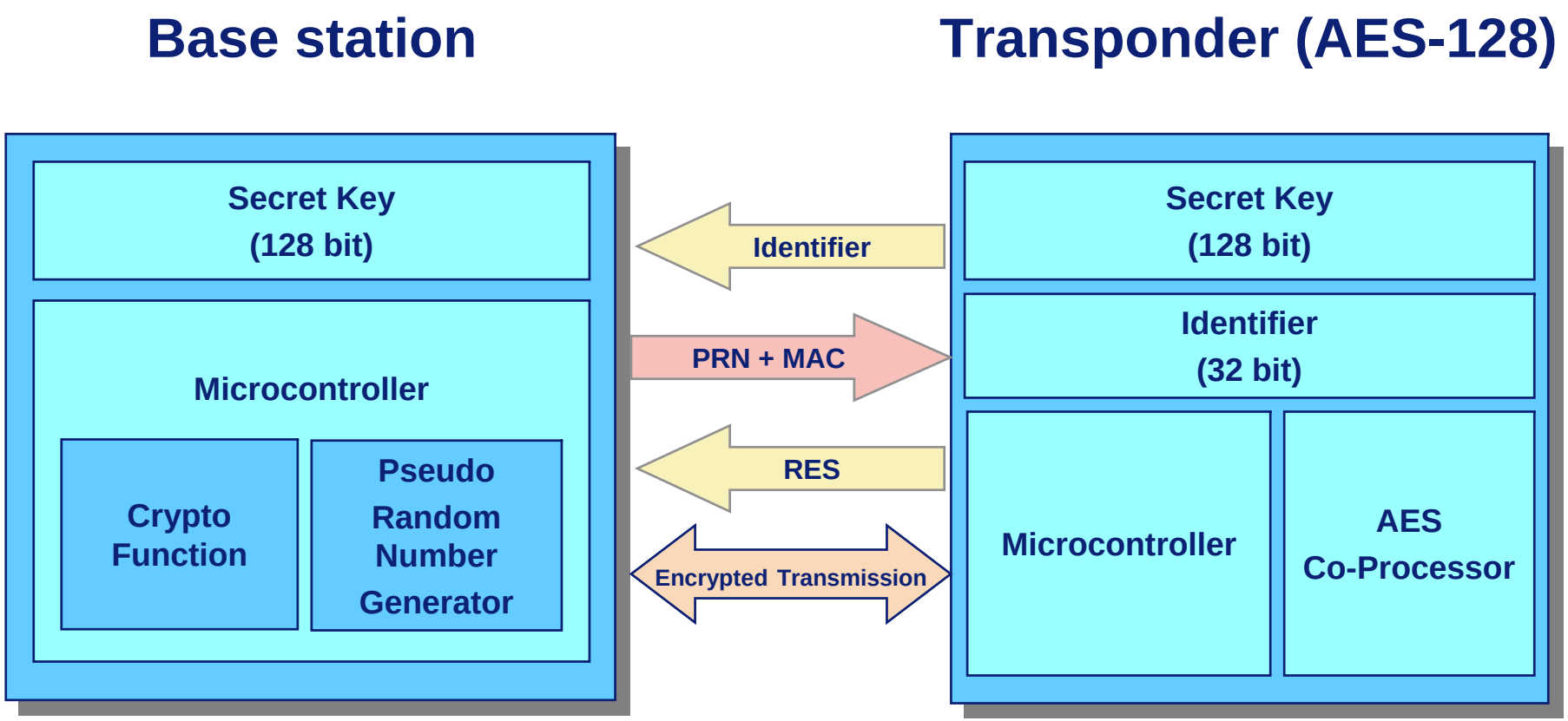
# Mutual Authentication Overview Hitag 2



# 4th Transponder Generation: Mutual Authentication



# 5th Generation Mutual Authentication Overview



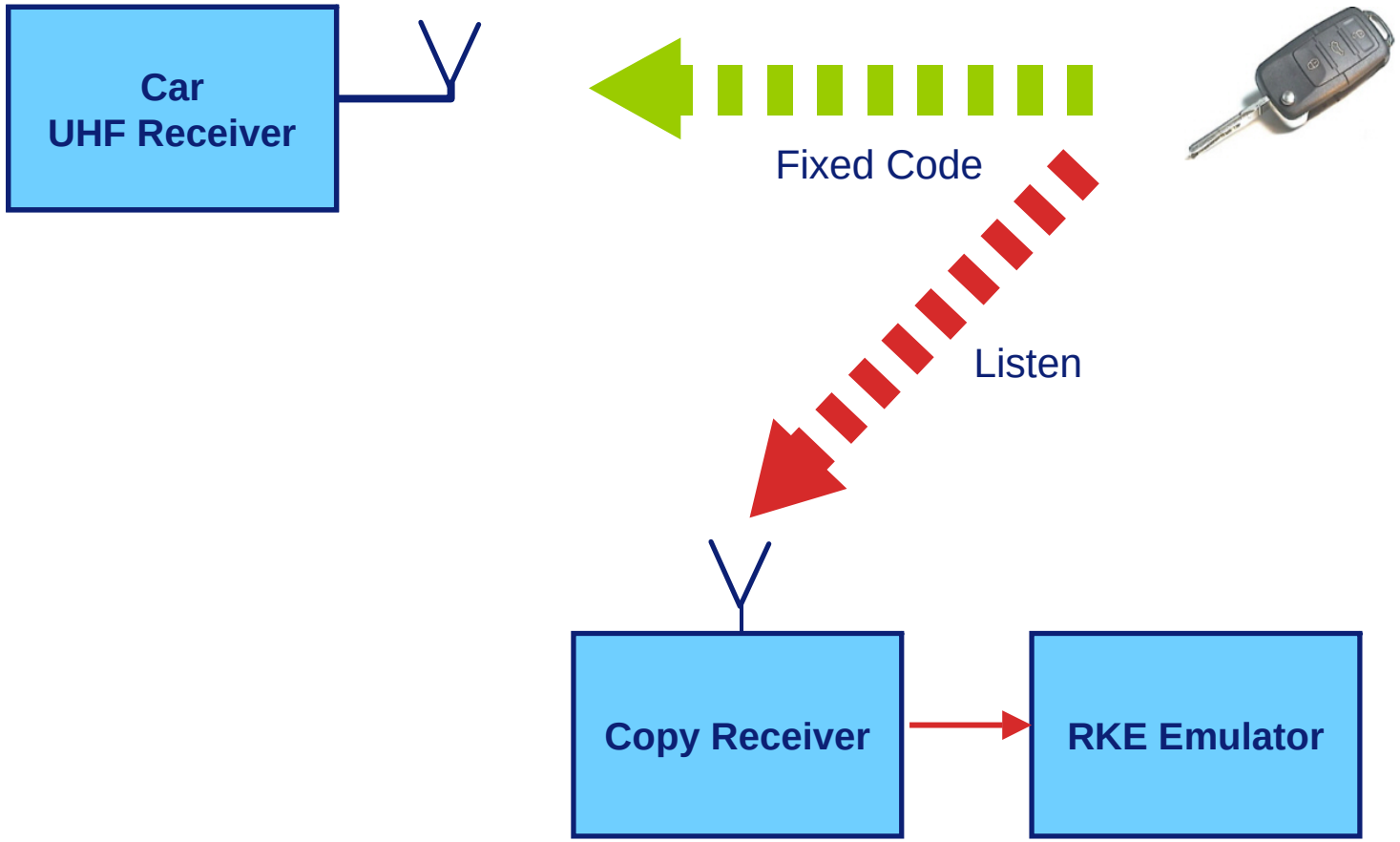
# 2nd Generation

## *Combi Key*
## *Immobilizer + RKE*

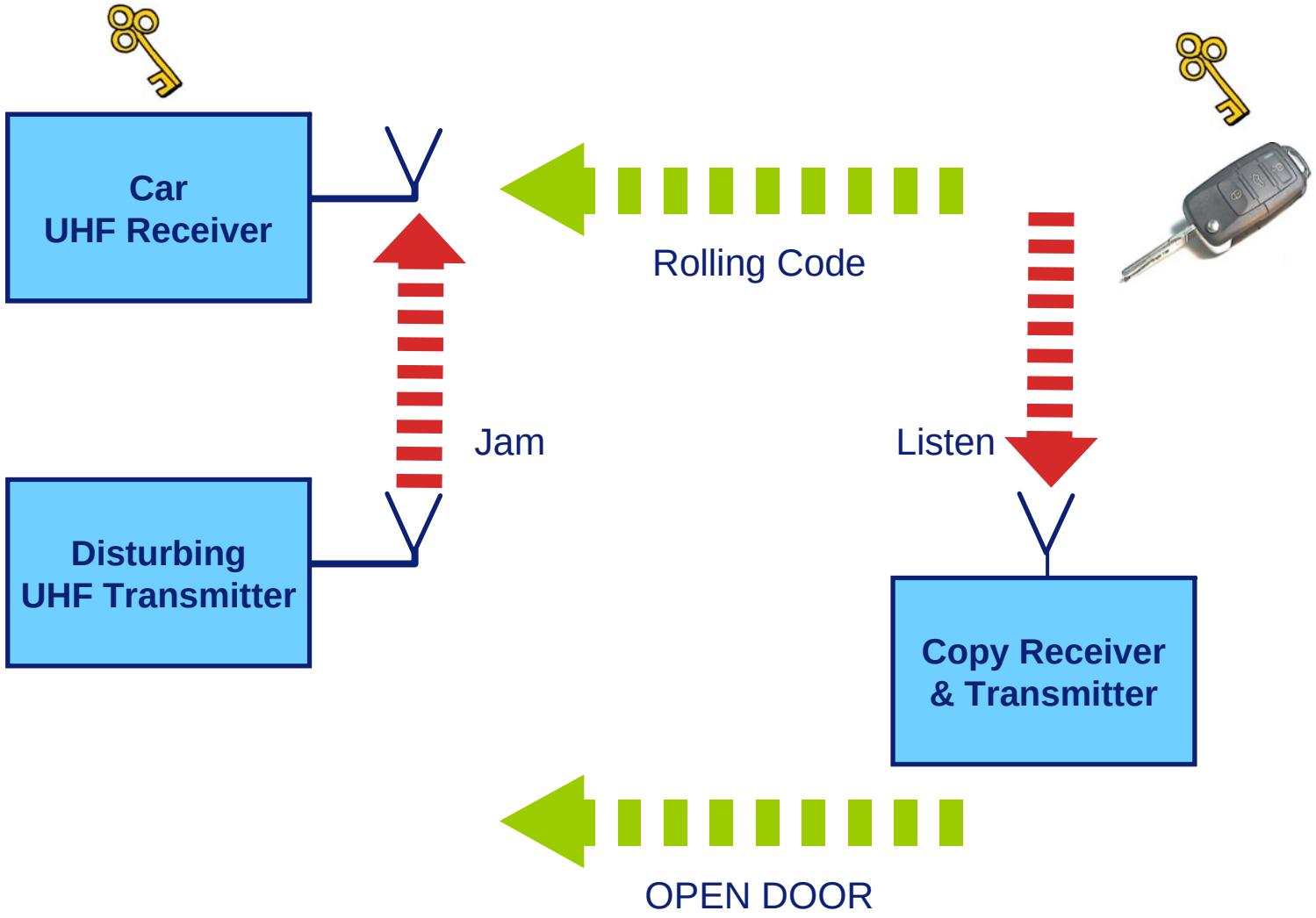
# Product Focus

- Remote Keyless Entry: Combined Systems with Immobilizer
  - unlock and lock the car by remote control
  - combined with Immobilizer = security & comfort

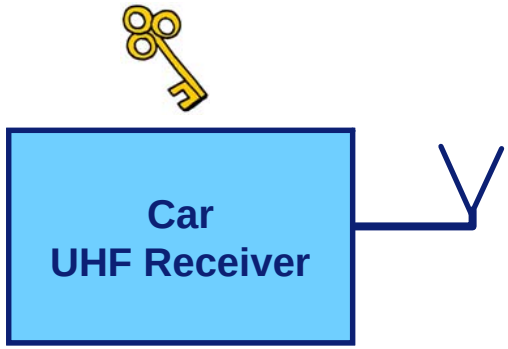
# 1st RKE Generation: Fixed Code



# 2nd RKE Generation: Rolling Code



# 2nd RKE Generation: Rolling Code + Key Code



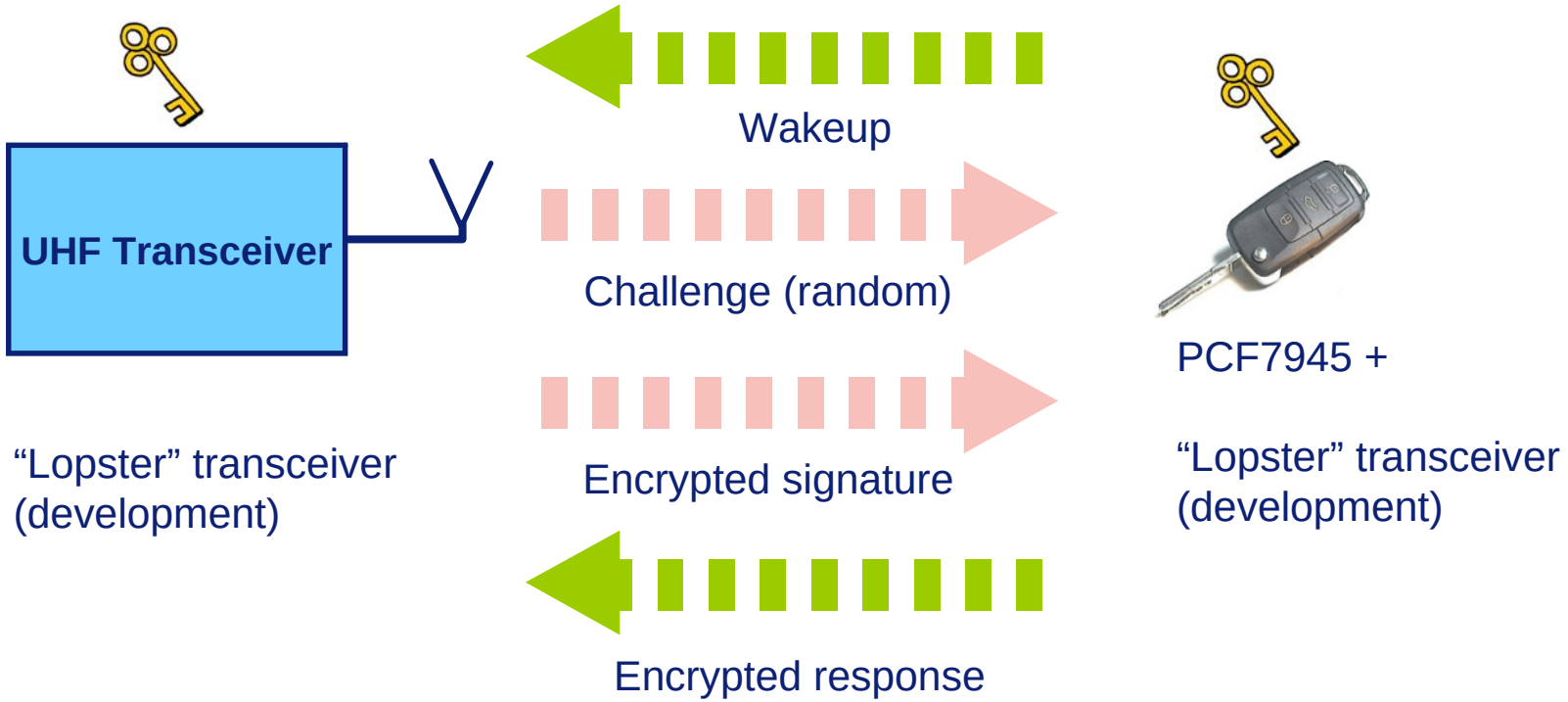

Rolling Code with
encrypted Key code

PCF7941

PCF7961

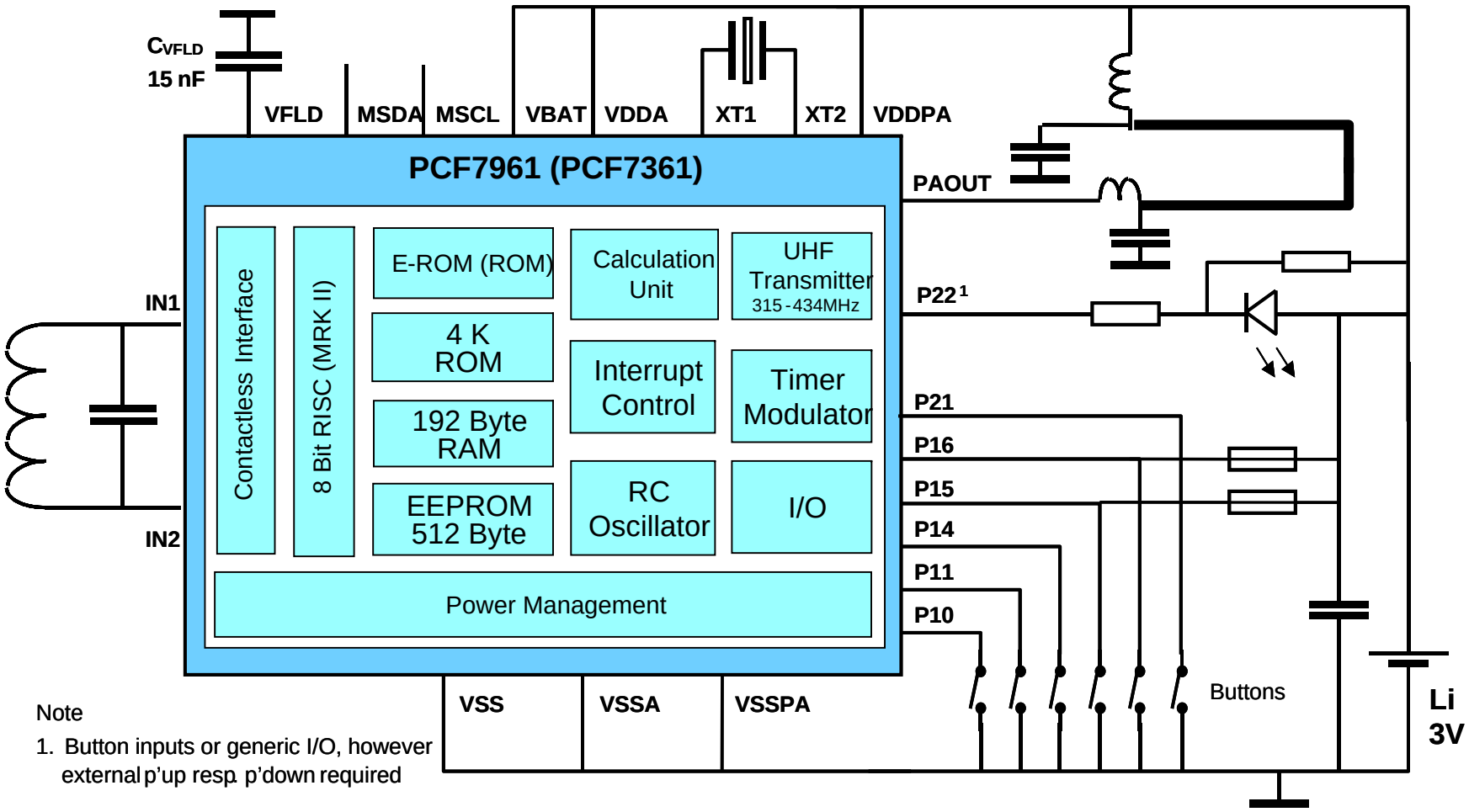
PCF7900 frac-N transmitter
(development)

# 3rd RKE Generation: Mutual Authentication



# Typical Application, SMART, PCF7x61

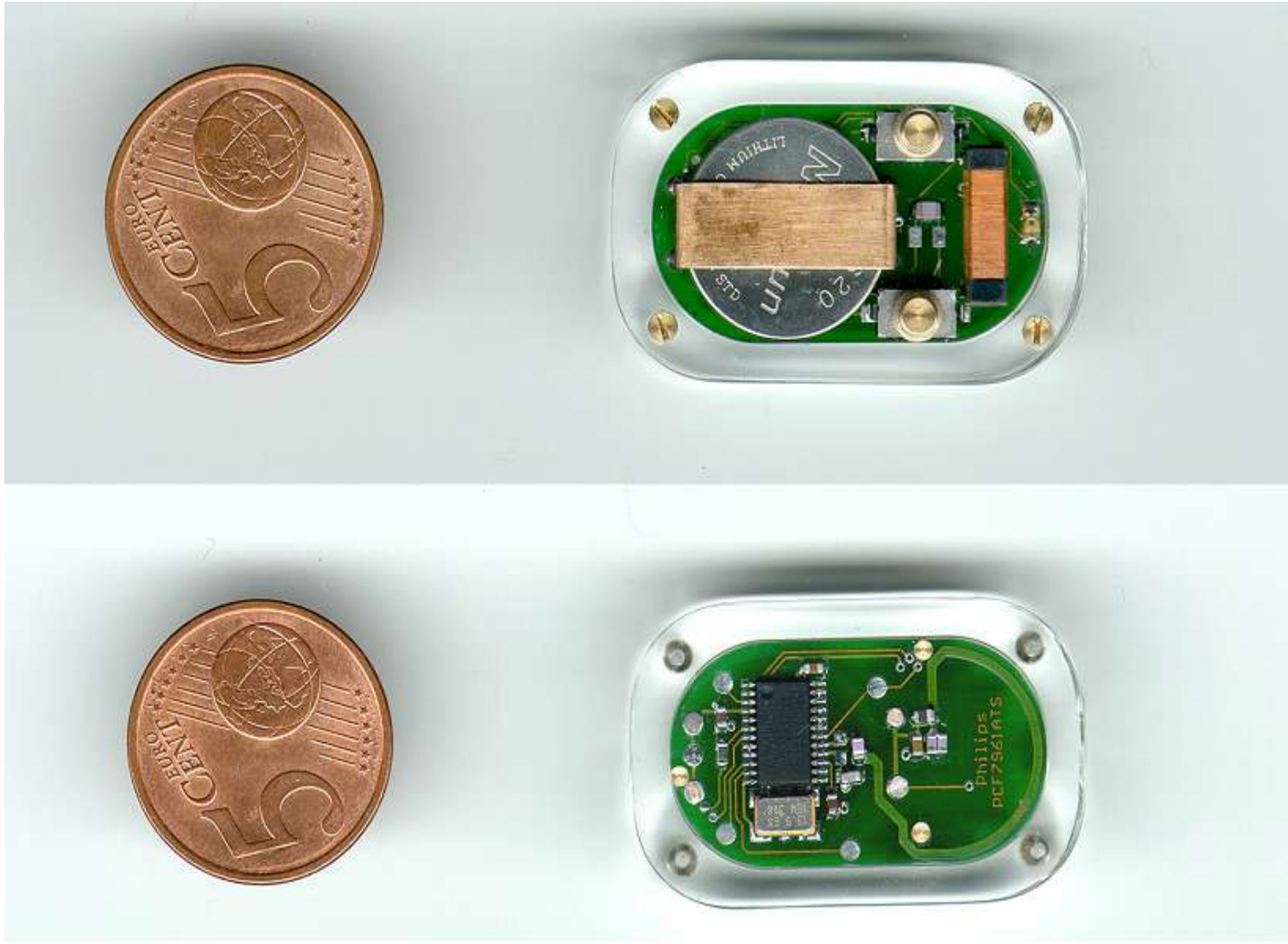
## Single Chip Transponder, Remote Keyless Entry and UHF Transmitter Solution




Note

1. Button inputs or generic I/O, however external p'up resp. p'down required

# 1-Chip Immobilizer/RKE-Combisystem



# RKE Demosystem with SMART

## 3rd Generation

# *Passive Keyless Entry / Go*

# Product Focus

- Passive Entry / Passive Go: Fully integrated Systems
  - access your car by just pulling the door handle and start by pressing a button: the highest level of comfort
  - highly integrated 3-dimensional active LF-front-end with UHF-downlink

# Passive Keyless Entry / Start

Security Tag



Driver Door Detection Range

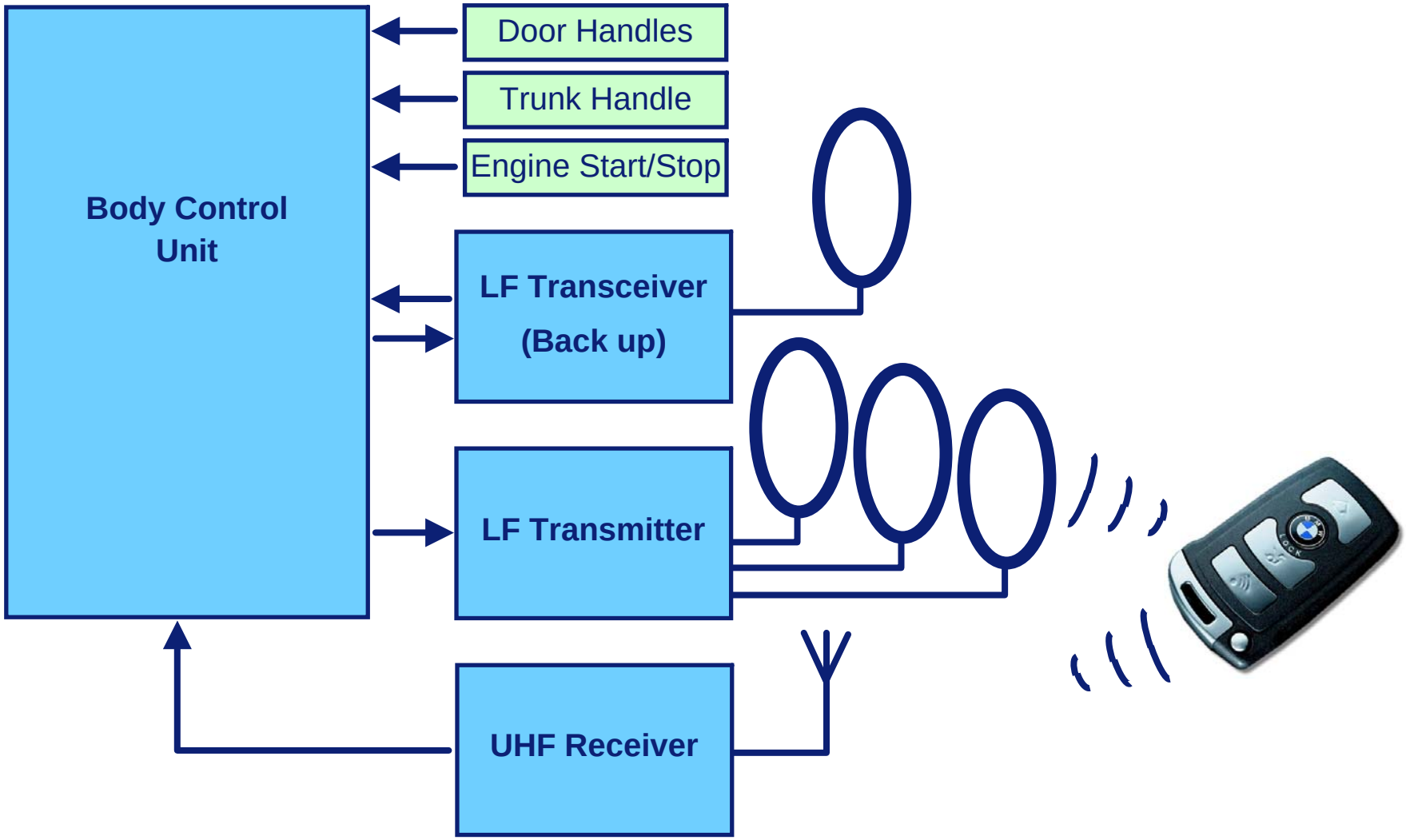
Trunk Area
Detection Range

Driver Interior
Detection Range

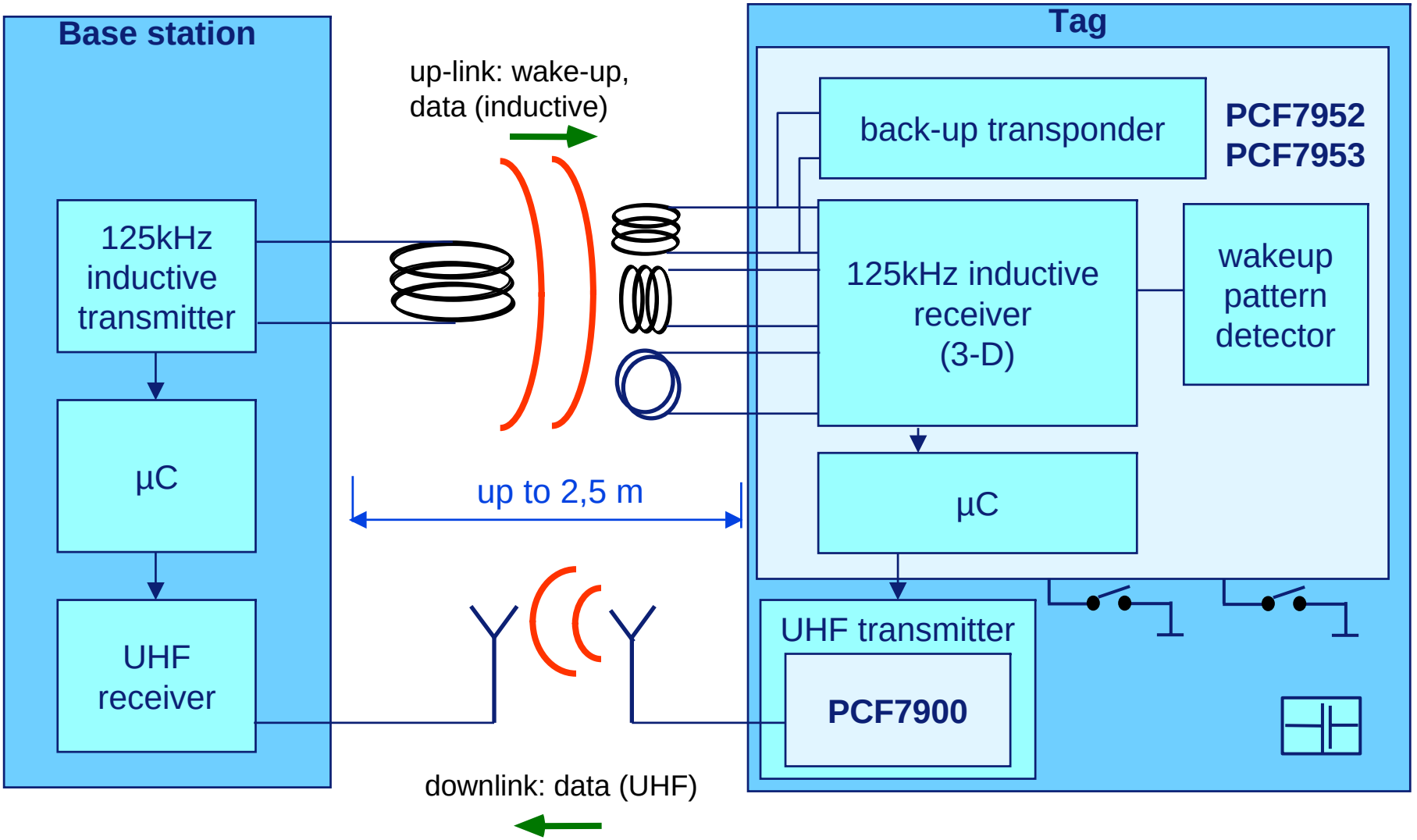
Passenger Door Detection Range


M WG 3936
LOCK

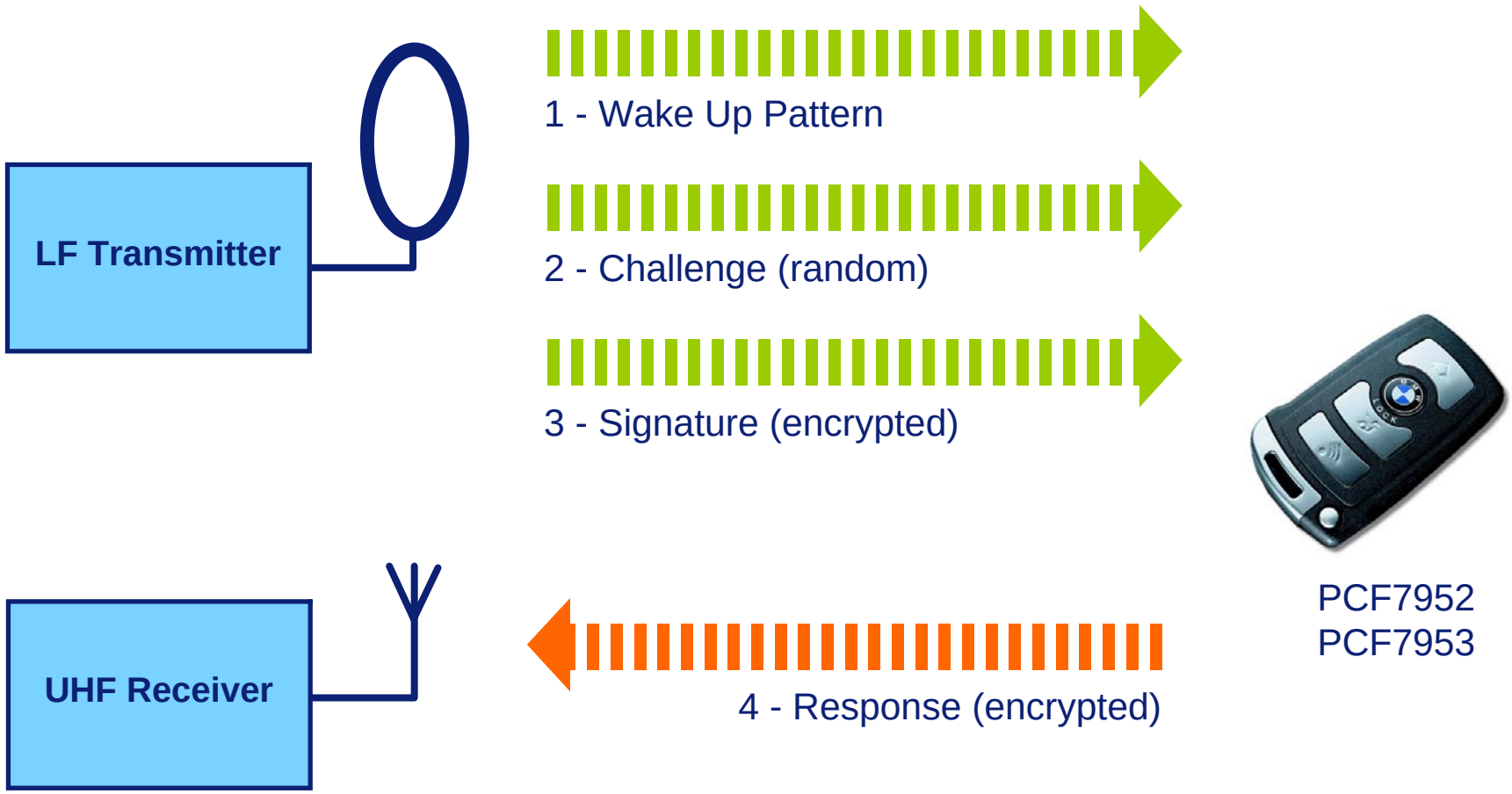
# System Configuration



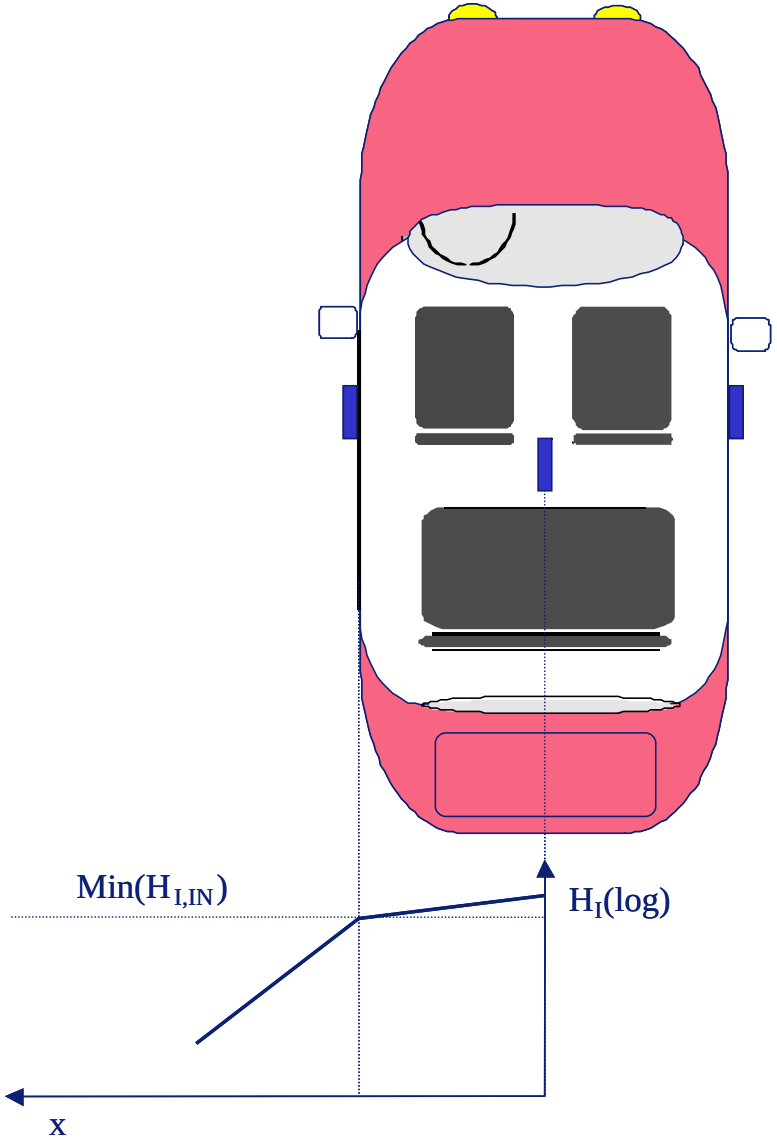
# Block diagram



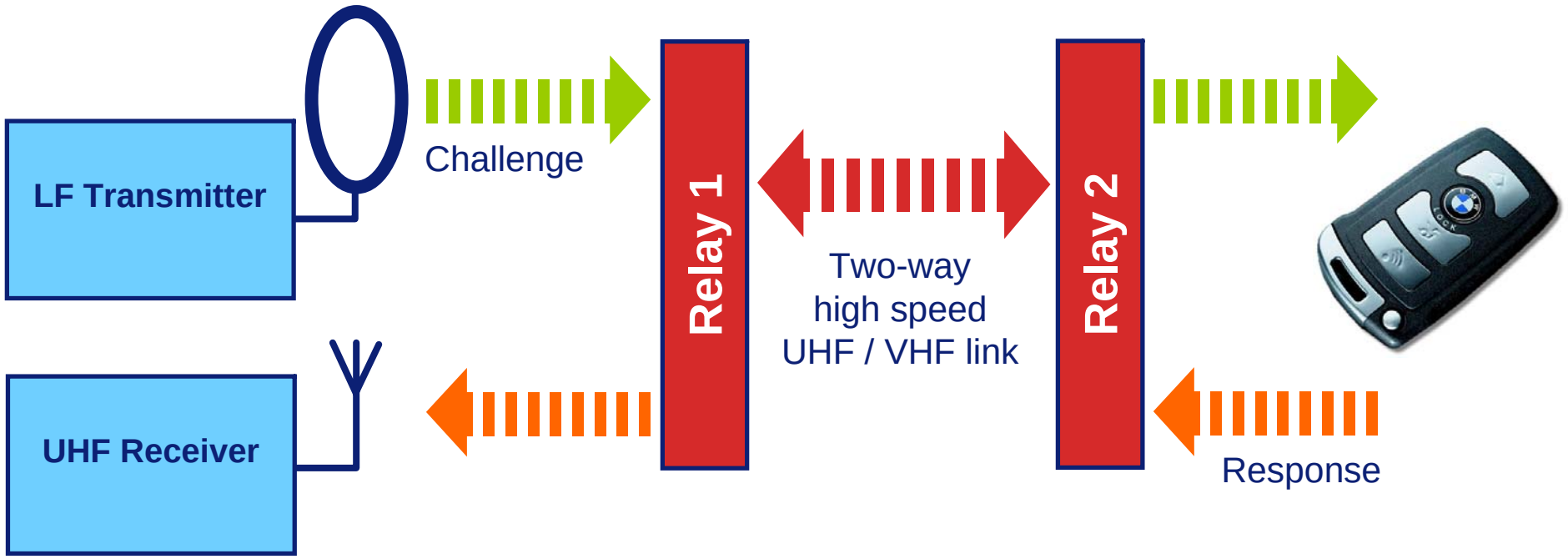
# Data Telegram Exchange



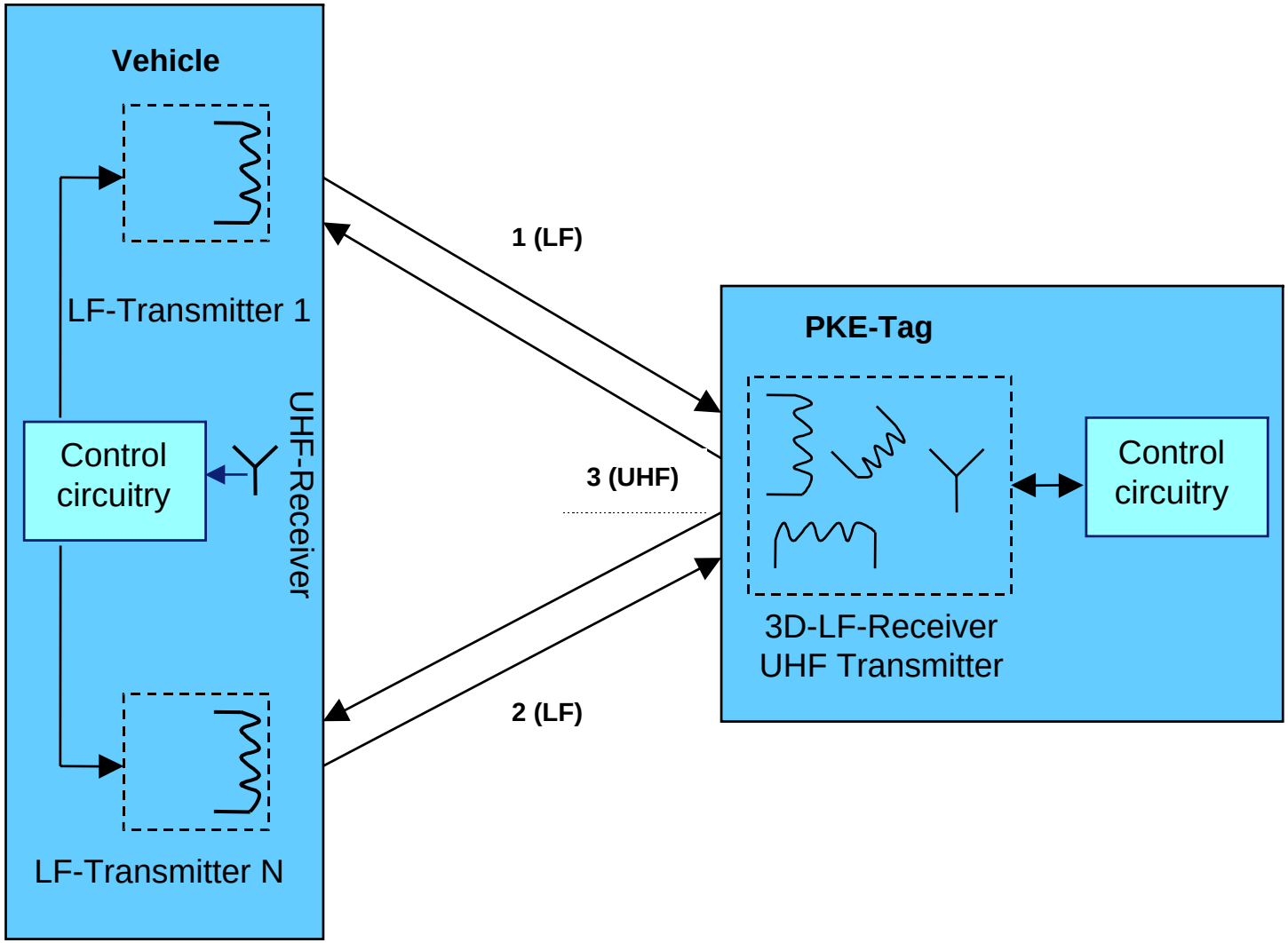
# Inside/Outside Detection



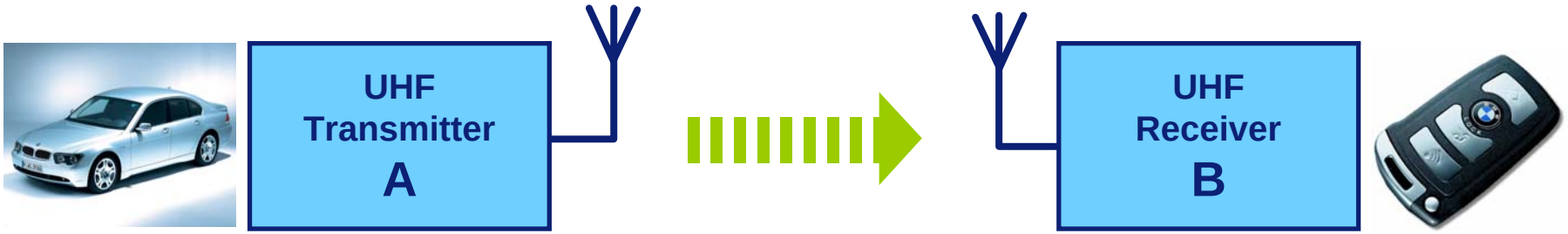
# Possible Threat: Relay Attack



# Position Detection of PKE Tag



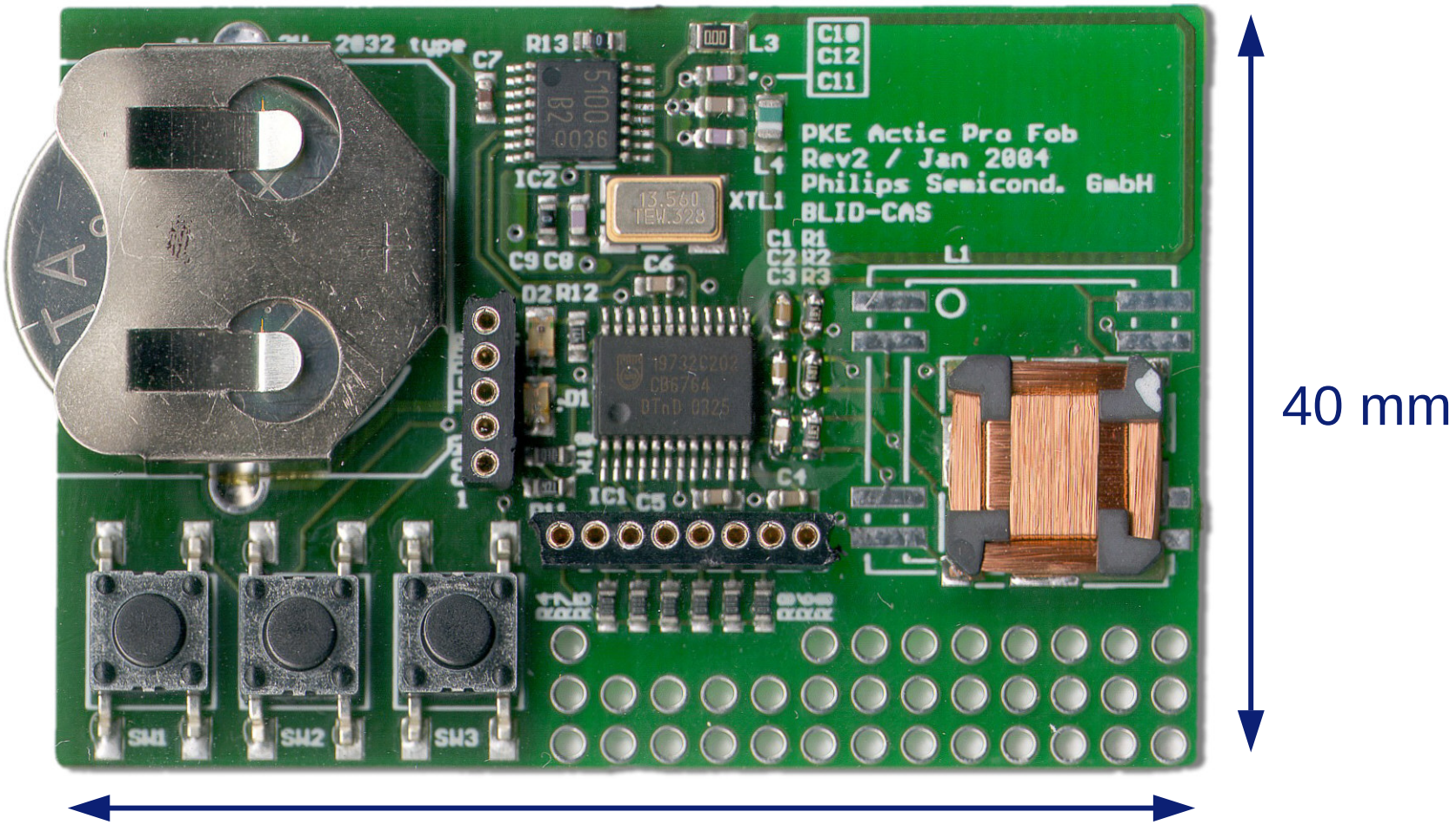
# Time Of Flight Measurement




**t = s / c**
**≅ 3.3 ns / m!**

- Sole 100% resistant countermeasure

# PKE Tag

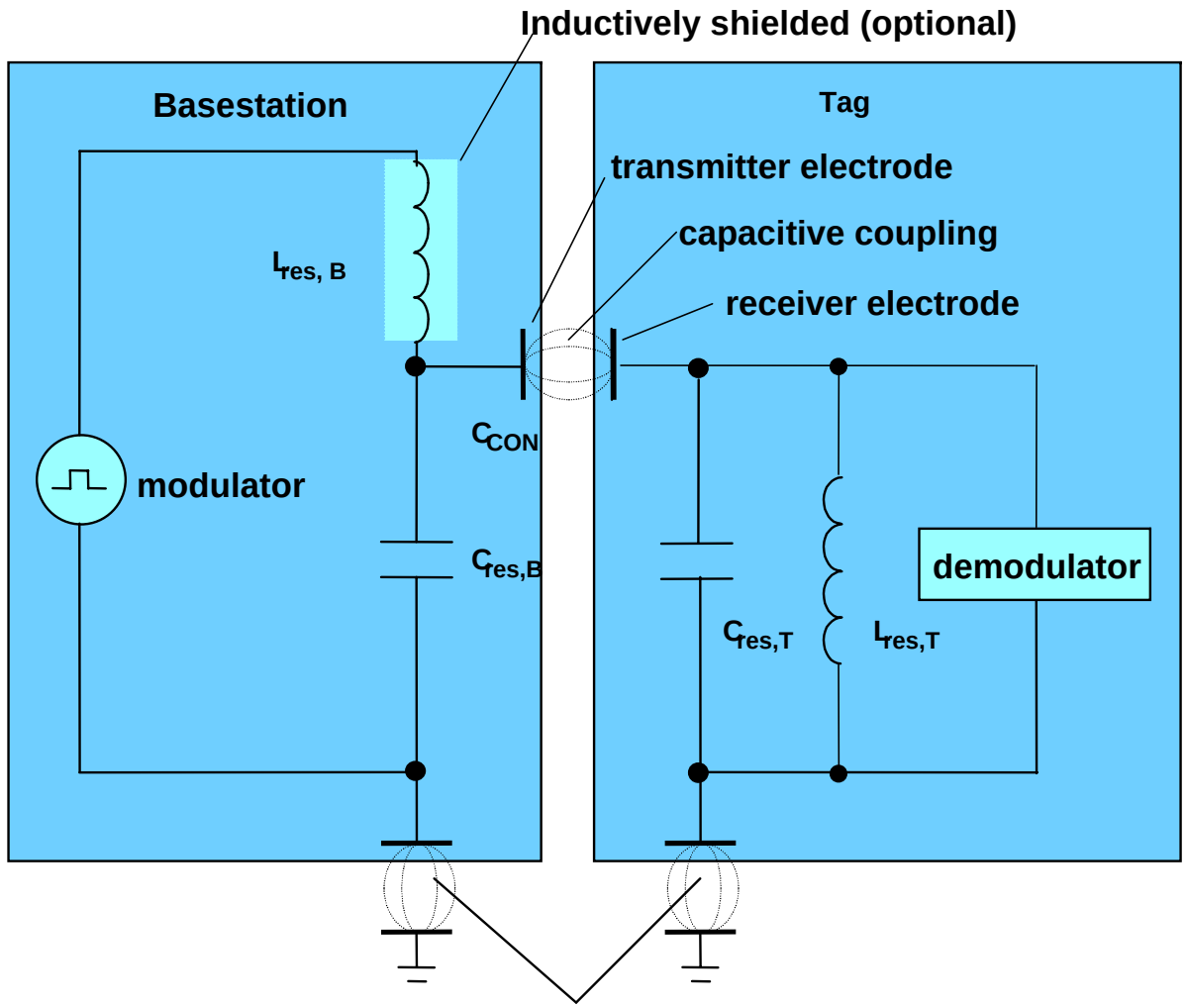

2032 type
R13
C7
L3
C10
C12
C11
PKE Actic Pro Fob
Rev2 / Jan 2004
Philips Semicond. GmbH
BLID-CAS
IC2
XTL1
L4
C1 R1
C2 R2
C3 R3
L1
C9 C8
C6
D2 R12
C4
IC1 C5
SW1
SW2
SW3
40 mm
55 mm

# Research:

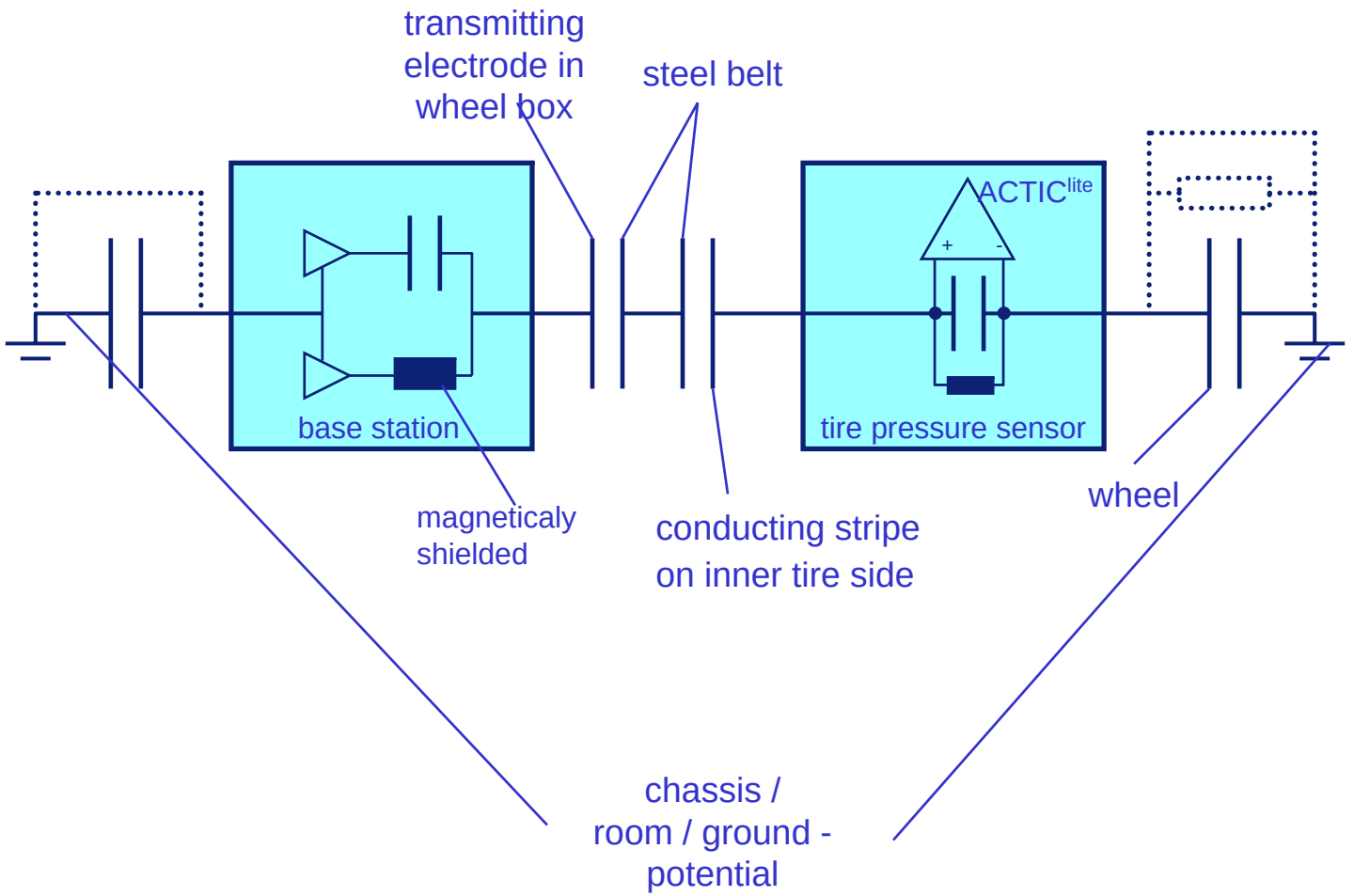
## Capacitve / Electrostatic Communication


- ***Body Area Networks***
- ***Capacitve Access Systems***
- ***Capacitive Tire Pressure Monitoring***

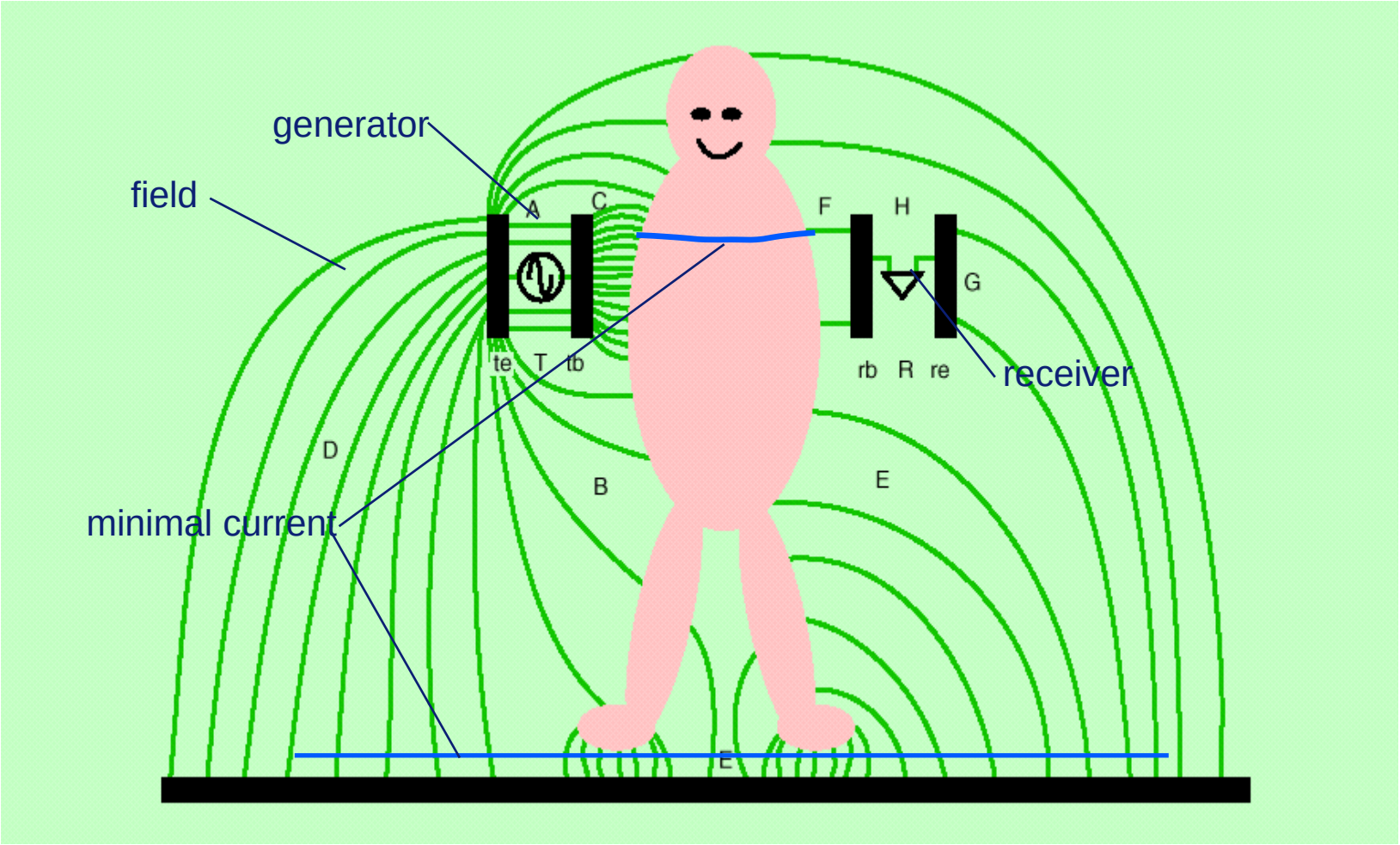
# Principle Circuitry (1)



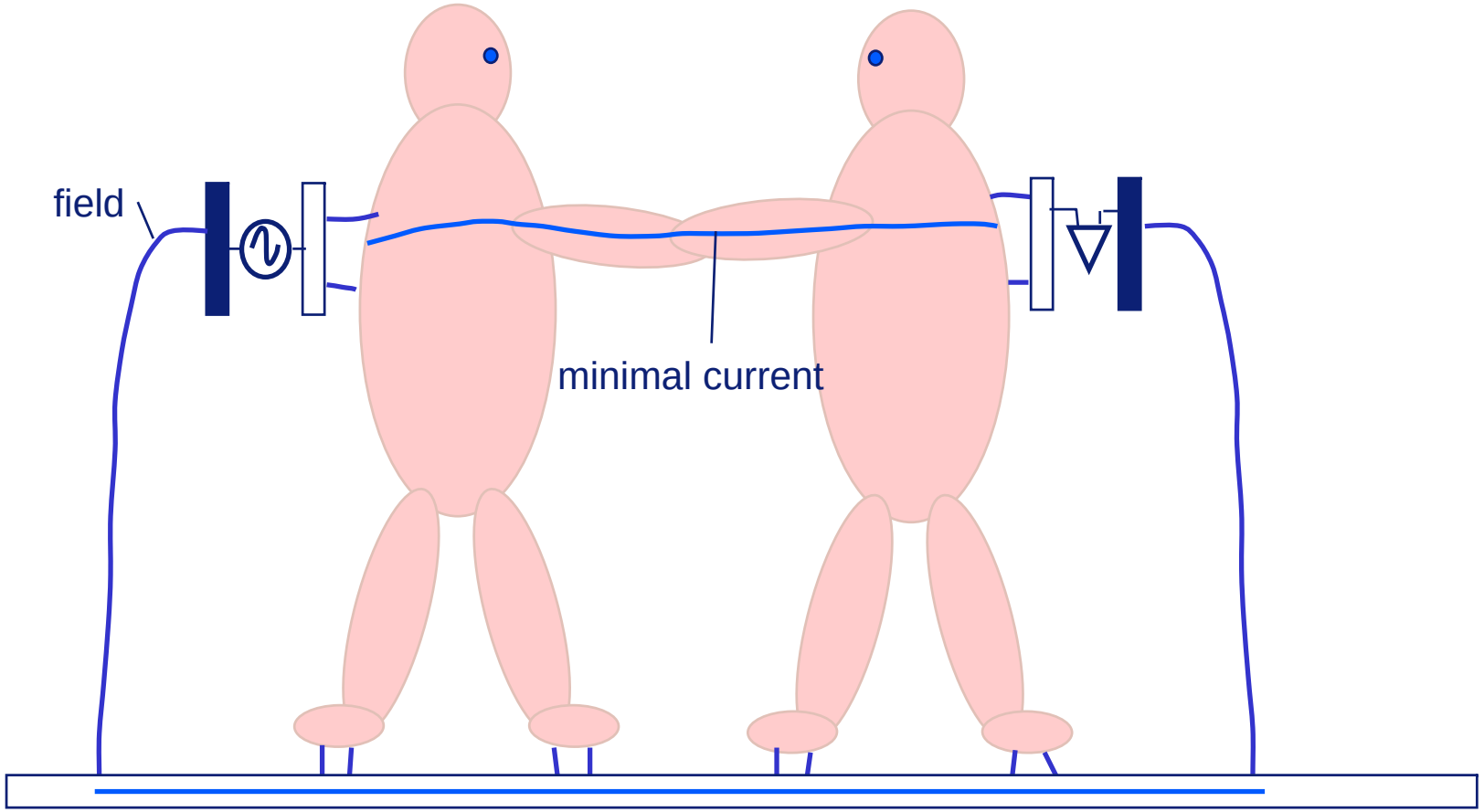
# Principle Circuitry (2)



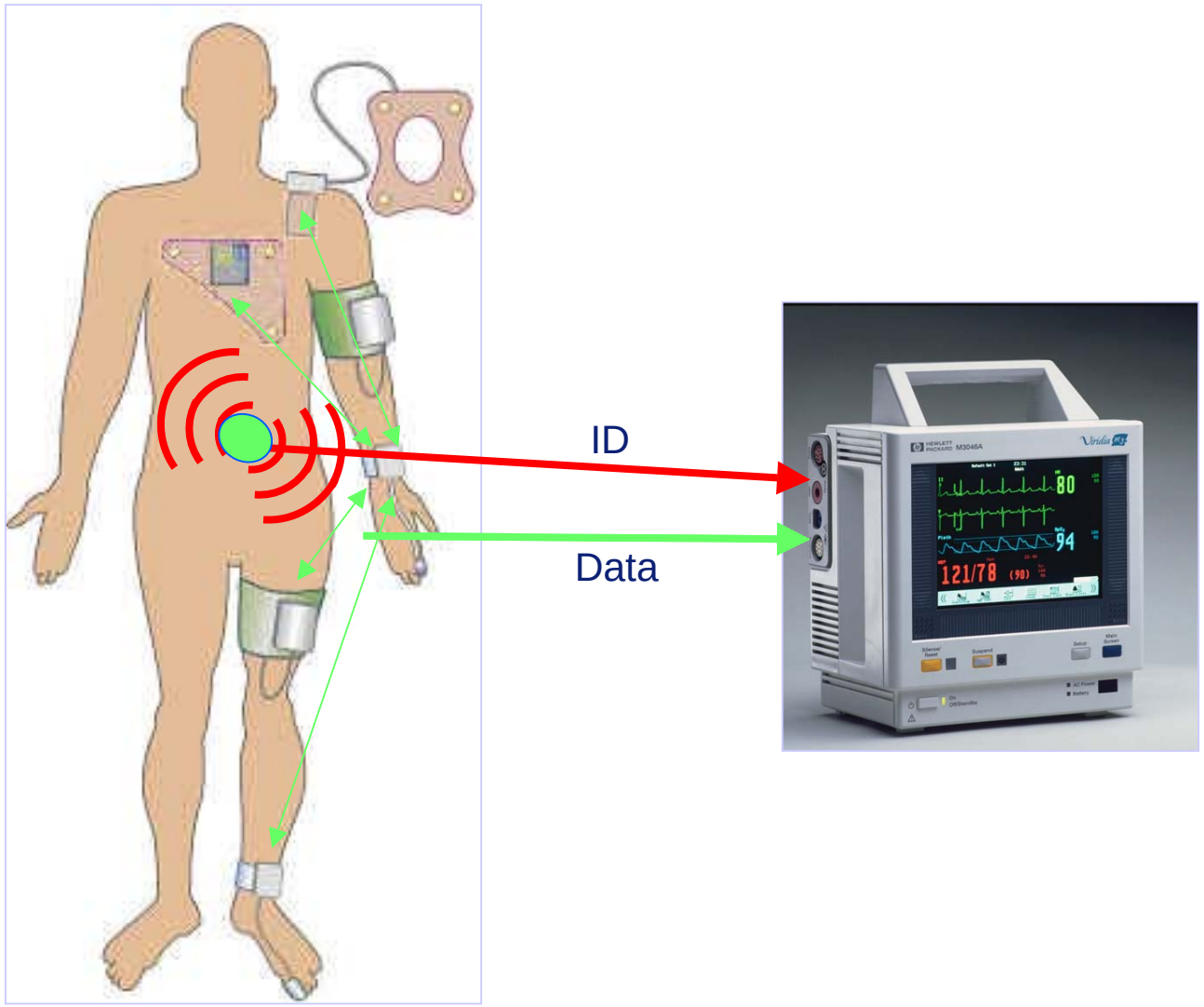
# Intra Body Communication (1)



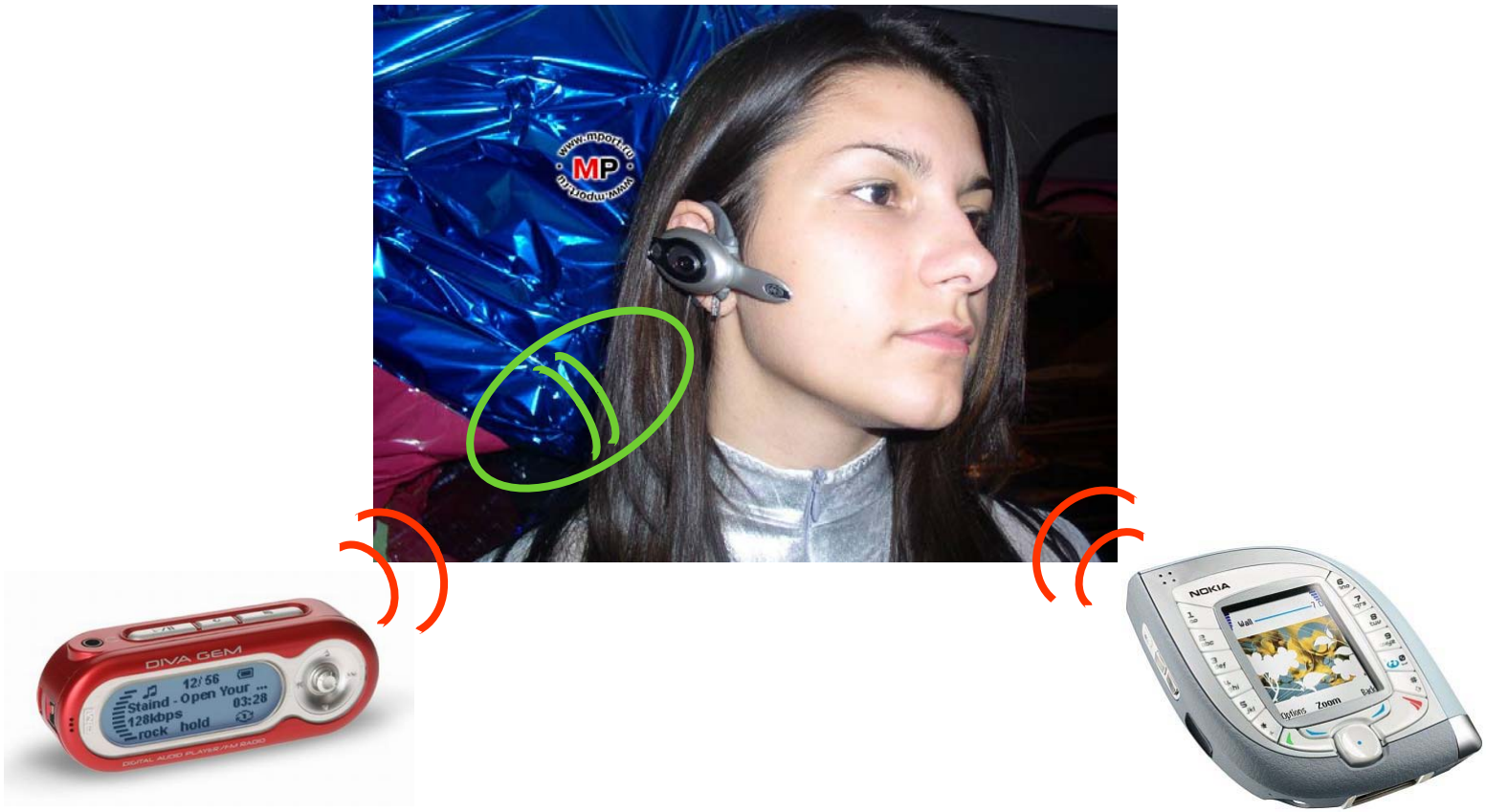
# Intra Body Communication (2)



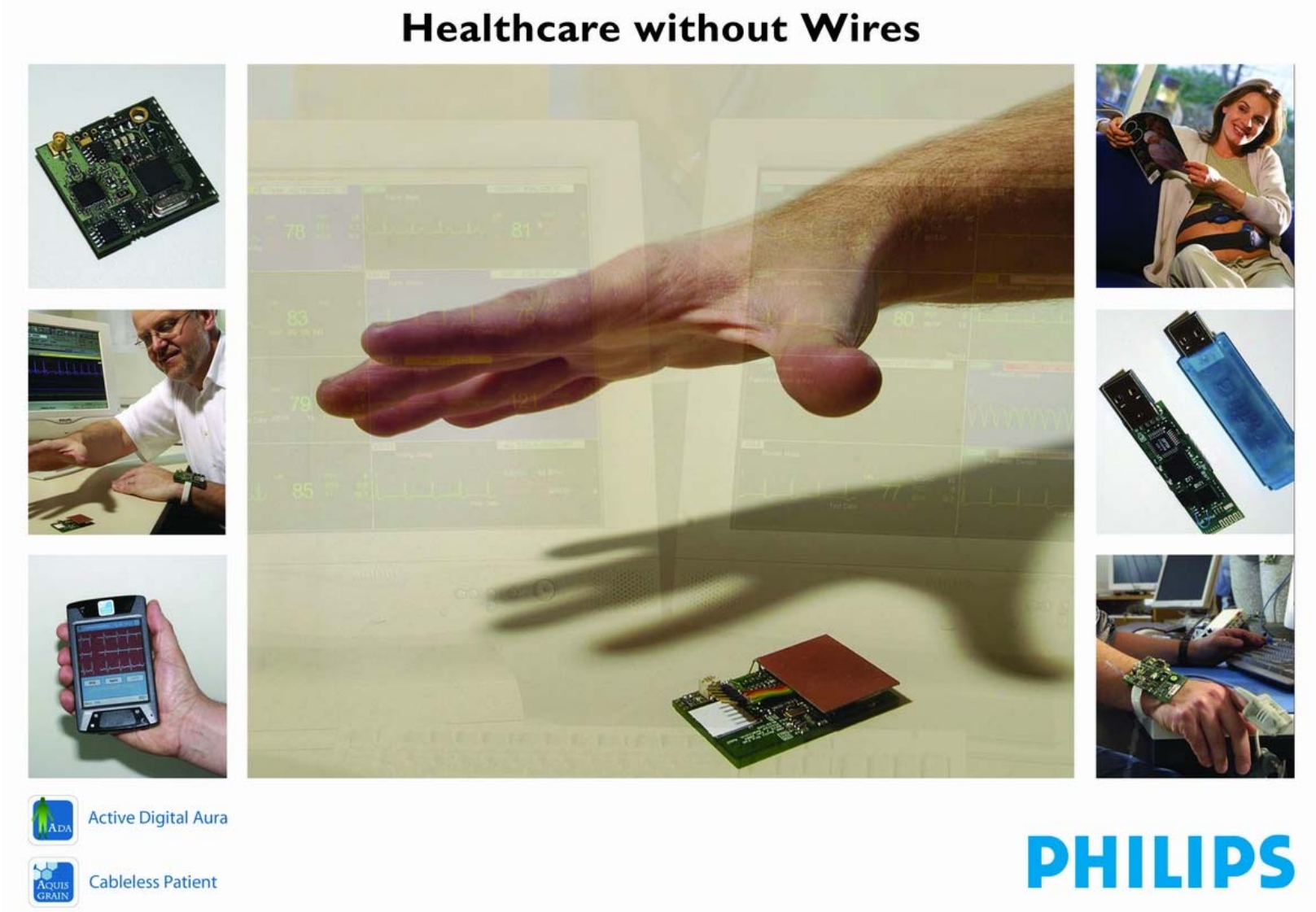
# ADA in Wireless Patient Monitoring



# Connectivity



# As shown at CRE 2005

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