RF-ID

RF-ID Overview

- **What is RFID?**
- **Components.**
- **Block diagram & Working.**
- **Frequency Ranges.**
- **Advantages & Disadvantages.**
- **Applications.**

What is RF-ID?

- **R**adio **F**requency **Id**entification.
- RF-ID is an technology that use Radio-Frequency waves to transfer data between a reader and movable item for detection, tracking or identification purpose.
- RFID is also called ***dedicated short range*** **communication *(DSRC)*.**

- RFID is a technology that uses radio-frequency waves to transfer data between a reader and a movable item to identify, categorize, track...

- RFID is fast, reliable, and does not require physical sight or contact between reader/scanner and the tagged item.

RF-ID Components

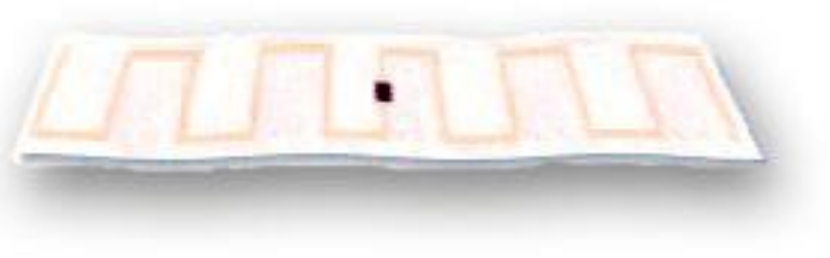
- An antenna or coil.
- A transponder (RF tag) electronically programmed with unique information.
- A antenna and transceiver together also know as interrogator or reader.
- Host Computer & Appropriate software.

RF-ID Tags

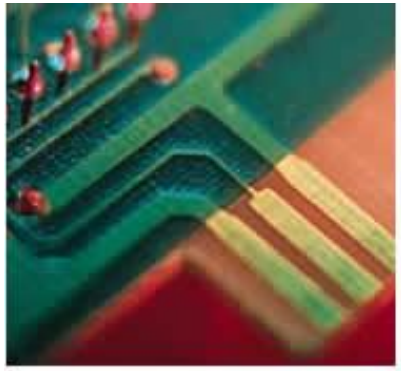
- In an RF-ID system the transponder that contains the data to be transmitted is called an RF tag is the core of the RF-ID System.
- Different types of RF tag:-

a) **Active**

b) **Passive**



Active Tags



- Active tags have internal battery supplies to power their internal circuits.
- Active tag uses its battery to broadcast radio waves to a reader.
- Semi-passive tag relies on reader to supply its power for broadcasting.
- High broadcasting frequency i.e. 850-950Mhz.
- Greater range 100-300meter.
- More information in Kbytes.
- More expensive & Shorter life span.

Passive Tags

- Passive RFID tags rely entirely on reader as their power source.
- This tag is powered by electromagnetic field generated in doorways, reflecting back a weak signal containing data.
- These can be read upto 20 feet away.

Comparison between active & passive tags

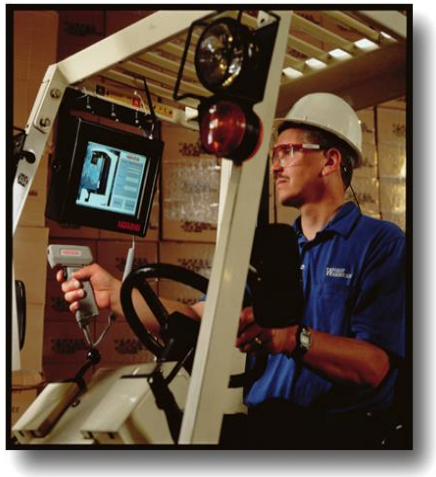
	Active RFID	**Passive RFID**
Tag Power Source	Internal to tag	Energy transferred using RF from reader
Tag Battery	Yes	No
Availability of power	Continuous	Only in field of reader
Required signal strength to Tag	Very Low	Very High
Range	Up to 100m	Up to 3-5m, usually less
Multi-tag reading	1000's of tags recognized – up to 100mph	Few hundred within 3m of reader
Data Storage	Up to 1Mb or read/write	32-128 bits of read only

Reader (Interrogator)

Performa Long Range Reader

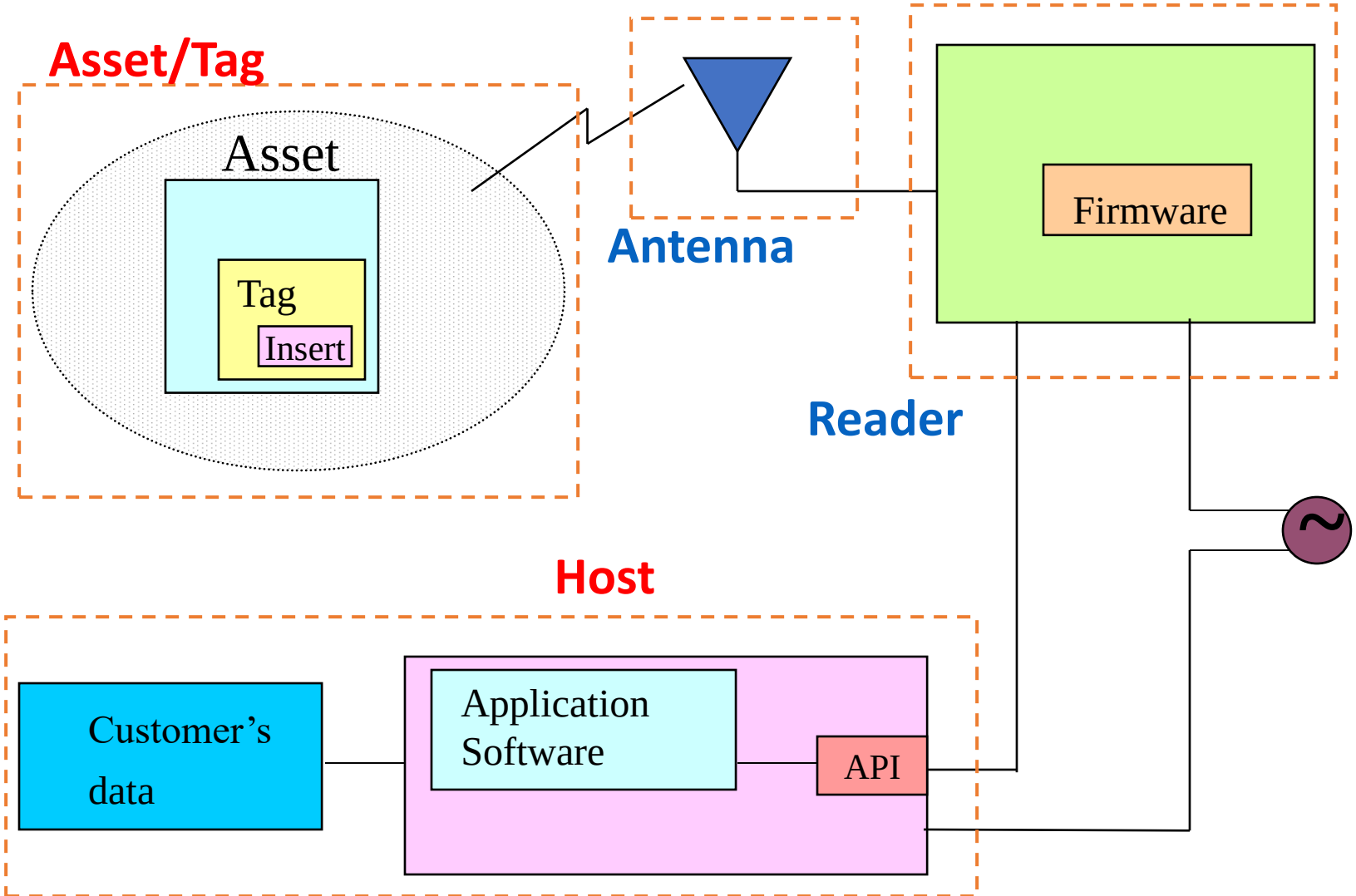
- A RF-ID reader sends out a radio frequency wave to the 'Tag' and the 'Tag' broadcasts back its stored data to the reader.
- The data collected from the ‘Tag’ is uploaded with the help of reader on the computer for further processing.

Reader (Interrogator)



- Readers can be at fixed points such as:-
  - -Entrance/exit
  - -Warehouse
- Readers can also be mobile –hand-held, or wireless.

RF-ID System (block diagram)

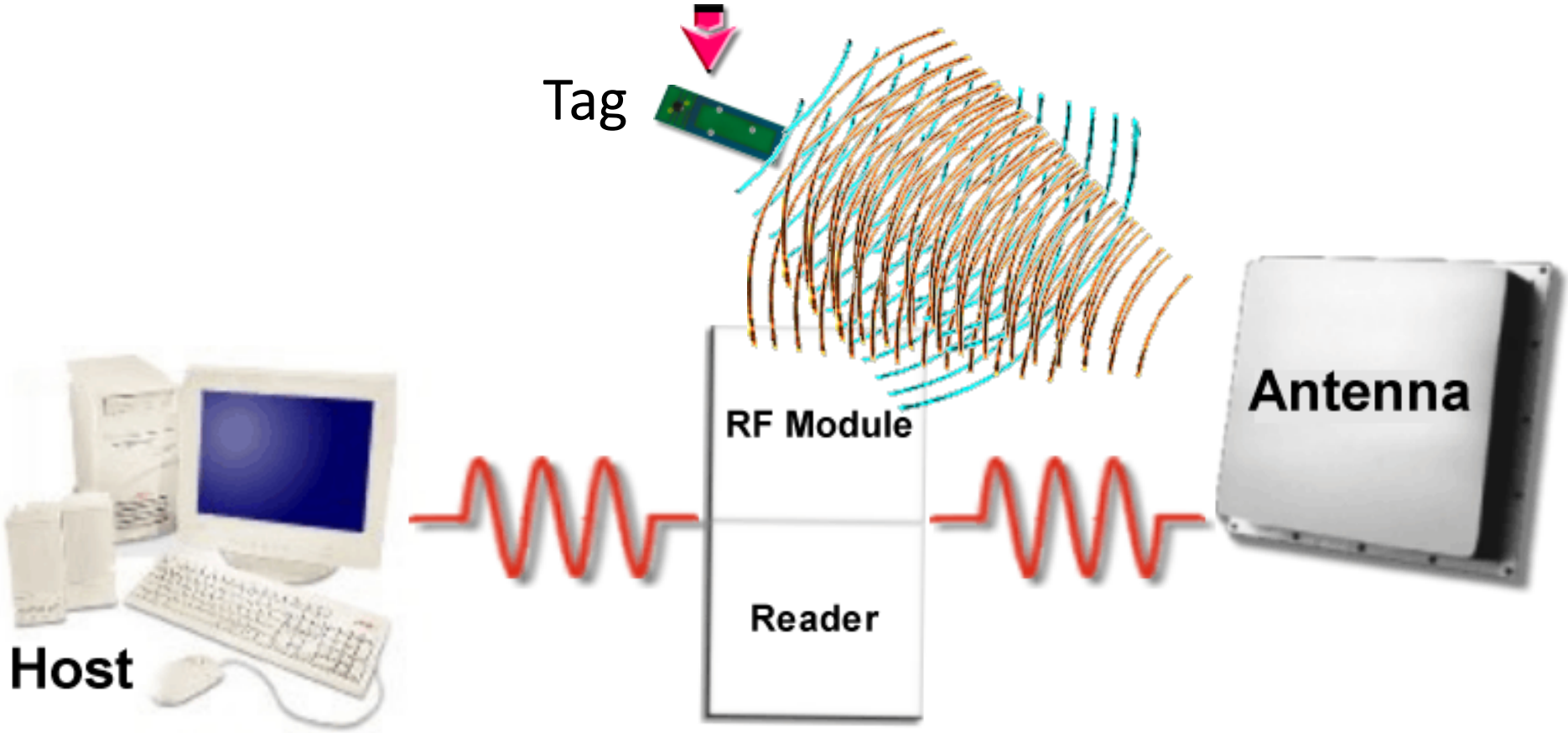


RF-ID Operation

Sequence of Communication

- Host Manages Reader(s) and Issues Commands.
- Reader and tag communicate via RF signal.
- Carrier signal generated by the reader (upon request from the host application).
- Carrier signal sent out through the antennas.
- Carrier signal hits tag(s).
- Tag receives and modifies carrier signal.
  - “sends back” modulated signal.
  - Antennas receive the modulated signal and send them to the Reader.
- Reader decodes the data.
  - Results provided to the host application for further processing.

RF-ID Operation



Standard RFID Operating Frequencies

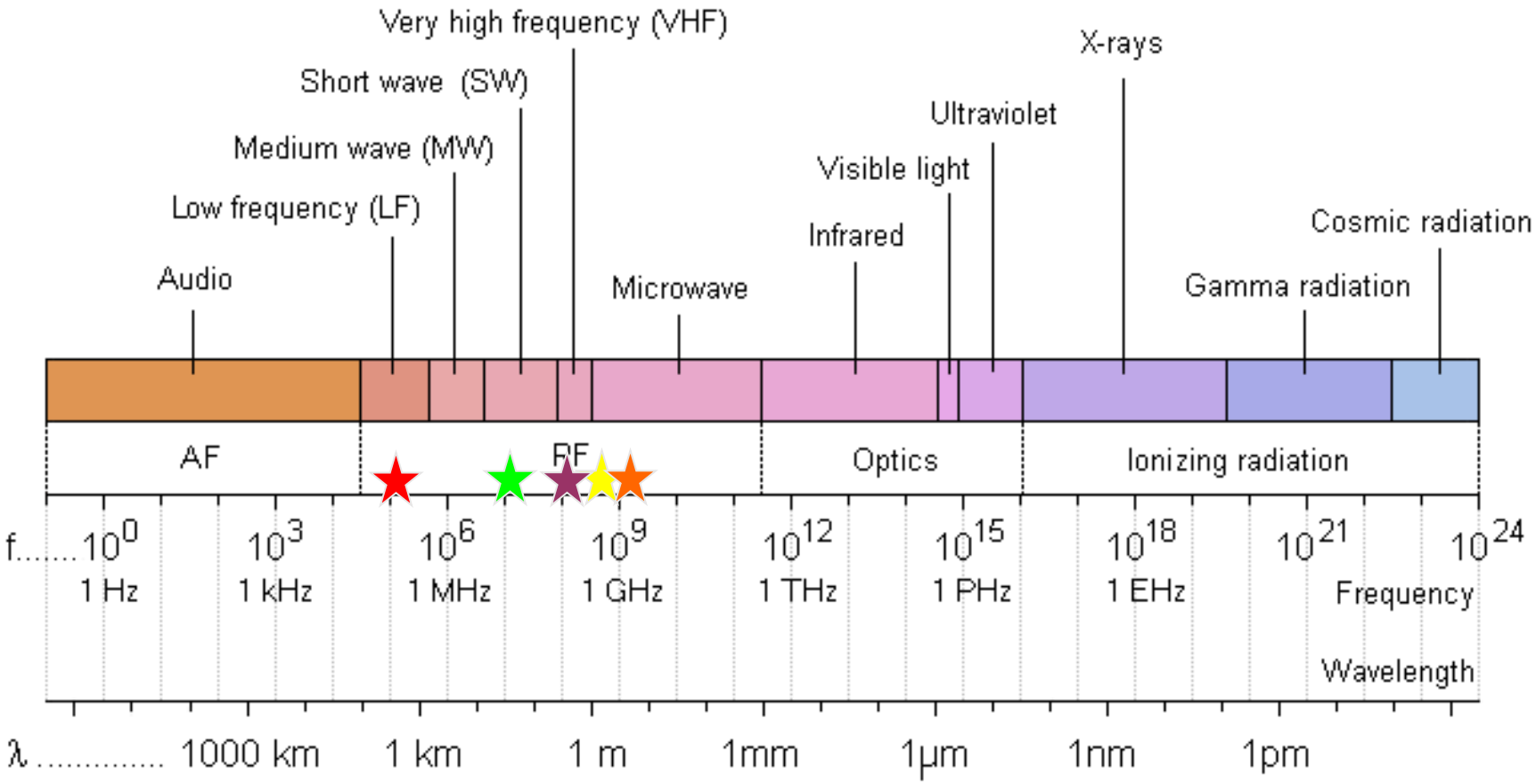
ISO 18000-2 ~ 135 kHz

ISO 18000-3 ~ 13.56 MHz

ISO 18000-7 ~ 433 MHz

ISO 18000-6 ~ 800-960 MHz

ISO 18000-4 ~ 2.45 GHz



RF-ID Frequency ranges

- RF-ID systems are distinguished by their frequency ranges :-

  a) Low frequency (30-500 KHz).

  b) High frequency (850-950 MHz) & (2.4 - 2.5 GHz).

ISO 18000-2

- Operates at >135 KHz
- Inductive
- Unaffected by presence of water
- Short range (a few centimeters)
- Fairly costly because of coil in tAG

ISO 18000-3

- Operates at 13.56 MHz
- Inductive
- Lower cost ~ 35 cents
- Thin flexible form factor (smart label)
- Read / write capable
- Unaffected by water (but has to be tuned to item)
- Mid range, 70 – 125 cms

ISO 18000-4

- Operates at 2.45 GHz
- Affected by water (signal absorbed…microwave)
- Read / write capable
- Moderate cost
- Small antenna

ISO 18000-6 A/B

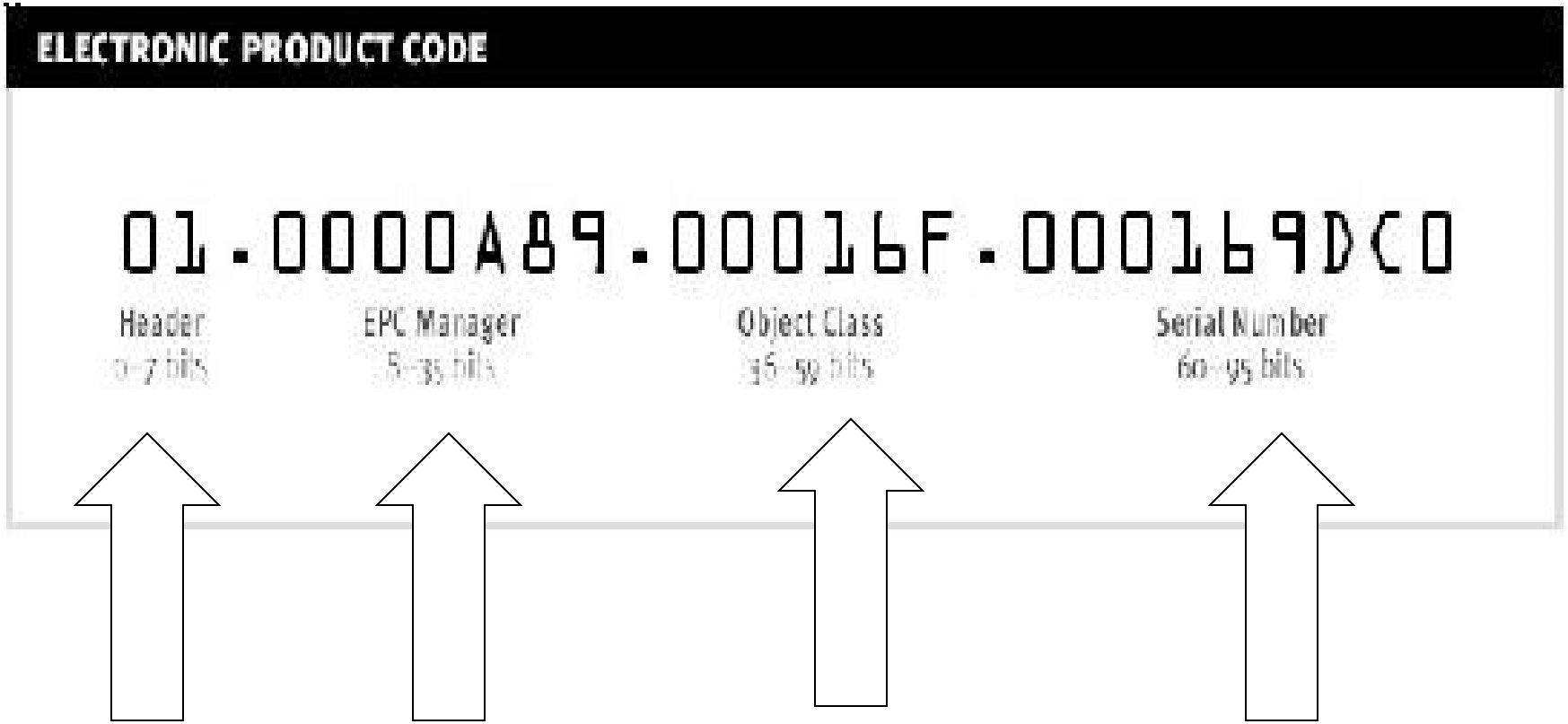
- Operates between 860 – 960 MHz
- Propagating
- Long range 2-5 meters
- Low cost
- High data rates
- Read / write capable
- Relatively large antenna
- The future for mass application RFID

ISO 18000-7

- Operates at 433 MHz
- Active
- Long range - many meters
- High cost
- High data rates
- Read / write capable

The EPC Code

- The objective of the Electronic Product Code (EPC) is to provide unique identification of physical objects.
- The EPC will be used to address and access individual objects from the computer network.
- It is of total 95 bits.



Header
0-7bits

ECP
Manager
8-35 bits

Object
Class
36-
59bits

Serial
Number
60-95bits

Advantages

- Penetrates materials well (water, tissue, wood, aluminum).
- Good non-line-of-sight communication (except for conductive, "lossy" materials).
- Less than 100 milliseconds.
- No contact.
- Simultaneous read of multiple items.

Disadvantages

- Does not penetrate or transmit around metals
  (iron, steel).
- Accidental eating of tags in food.
- Shielding of tags accidentally or deliberately so the product is not paid at the checkout.
- Radiation laws and Perception.

Applications

- Airline Baggage Tracking.
- Vehicle Security System.
- Hotel Room Access.
- Live stock Tracking.
- Parcel Shipping System.
- Valuable Asset Tracking.
- Toll System.