

Module 4 – Standards and Regulations

Main Objectives:

1. Know which are the global RFID standards setting and regulatory bodies
2. Know what are the common global Standards Development Organizations (SDO's) for each type of RFID
3. Know which regulations could dictate for RFID operation
4. Understand who is responsible for ensuring that RFID equipment is manufactured according to regulations.
5. Understand who is responsible for ensuring that RFID equipment is used in accordance with the regulations of the country where it is being used.

1. Which are the global RFID standards setting and regulatory bodies?

Global standards provide a way to ensure interoperability of RFID equipment from different manufacturers and for global use. They also provide a means to define, use and interpret data in the same way regardless of who is using the data or where that data is being used. The main Standards Developing Organizations (SDO's) for RFID are:

- ISO/IEC
- IEEE
- GS1/EPCglobal

Regulations for the use of radio devices, which includes RFID, exist in all countries and each country is responsible for defining its own regulations. Some countries are part of a regional group and others decide to model their own regulations on those of another country or group. The regulations most commonly used as a model for other countries are those of:

- The United States of America Federal Communication Commission (FCC)
- The European Conference of Postal and Telecommunications Administrations (CEPT) through its European Telecommunications Standards Institute (ETSI)

2. What are the common global Standards Development Organizations (SDO's) for each type of RFID?

- a. Passive LF, HF, UHF, Microwave – ISO/IEC
- b. UHF – EPC Global/GS1 (ratified into ISO 18000-6C)
- c. Active RFID at 433 MHz – ISO/IEC
- d. Active systems aka Wi-Fi and Zigbee – IEEE

Most used Air Interface Standards:

Passive RFID:

- LF – ISO/IEC 18000-2 for 125 kHz
- HF – ISO/IEC 18000-3 for 13.56 MHz, ISO/IEC 15693, ISO/IEC 14443
- UHF – ISO/IEC 18000-6 (A, B, C) for 860 – 960 MHz, EPC Global/GS1 Class 1 Gen 2 (ratified into ISO 18000-6C)
- Microwave – ISO/IEC 18000-4 for 2.45 GHz

Active RFID:

- UHF – ISO/IEC 18000-7 for 433 MHz
- Microwave – ISO/IEC 18000-4 for 2.45 GHz
- DASH7 (2nd gen of ISO 18000-7) for 433 MHz
- Wi-Fi IEEE 802.11n – 2.45 GHz
- Zigbee IEEE 802.15.4 for 868/915 MHz or 2.45 GHz

Most Used Data Standards

- **ISO/IEC 15961** - Data Protocol: Application Interface (defines AFI = Application Family Identifier, equivalent to EPC Header)
- **ISO/IEC 15962** - Data Protocol: Data Encoding Rules and Logical Memory Functions
- **ISO/IEC 15963** - Unique Identification for RF Tags (related to TID Memory)
- **GS1/EPC Global** - EPC Tag Data Standards, Version 1.9

This standard defines EPC tag data formats for Generation 2 tags. It defines how the EPC is encoded on the tag and how it is encoded for use in the information systems layers of the EPC Systems Network. The standard includes specific encoding schemes for EPC General Identifier (GID). It also defines encoding of six other numbering systems for 96 bits used in global trade:

- SGTIN (Serialized GTIN) - Serialized EAN.UCC Global Trade Item Number
- SSCC - EAN.UCC Serial Shipping Container Code
- GLN - EAN.UCC Global Location Number
- GRAI - EAN.UCC Global Returnable Asset Identifier
- GIAI - EAN.UCC Global Individual Asset Identifier
- DoD - US Department of Defense number

GID FORMAT

	HEADER	GENERAL MANAGER NUMBER	OBJECT CLASS NUMBER	SERIAL NUMBER
Decimal capacity	0011 0101(actual value)	268,435,455	16,777,215	36 bits
GID-96	8 bits	28 bits	24 bits	24 bits

The standard also defines encoding of other numbering systems for 96 bits used in global trade.

3. Which regulations could dictate for RFID operation

They can dictate:

- Transmission power levels
- Transmission channels
- Frequency use
- Type approval

- FCC Part 15.247 – governs allowed transmitted power from the reader/interrogator (maximum 4 W EIRP), frequency hopping channels (50) and the channel width (500 kHz).
 - For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands, the maximum peak conducted output power of intentional radiators is 1 watt.

- ETSI 302 208 (newer)
 - 865.0 – 868.0 MHz
 - 15 channels – 200 kHz each
 - Three sub-bands
 - Up to 2 W ERP in subband 865.6 – 877.6 MHz (10 channels)
 - Required Listen Before Talk (LBT)
- ETSI 300-220 (older, restrictive)

Each country has their own organization and regulations, often they take guidelines from the FCC or ETSI.

4. **Who is responsible for ensuring that RFID equipment is manufactured according to regulations** – always a manufacturer.
5. **Who is responsible for ensuring that RFID equipment is used in accordance with the regulations of the country where it is being used** – always a user.

Study List

For comprehensive explanation, please read:

[Standards and Mandates](#)

[RFID Regulations](#)

[EPC Gen 2](#)

[EPC Gen 2 Reader Commands](#)