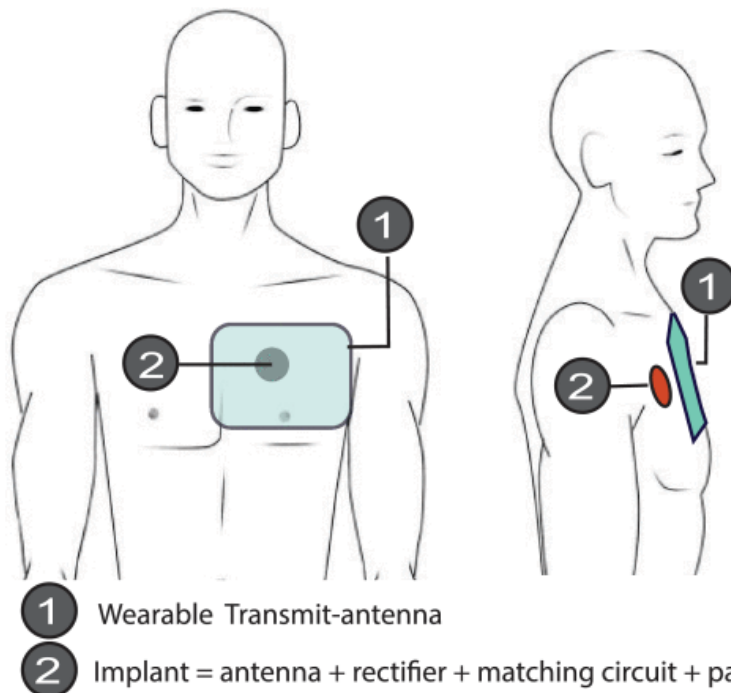# Wireless powered pacemaker

Users:

- People with critical heart problems:
    - Irregularity of heartbeat rate
    - A slow heartbeat rate

Device Components:

- Portable device
    - Wi-Fi module
    - Bluetooth module
    - LCD
    - RF Power Source
    - Microcontroller
    - software

- PCB
    - Accelerometer sensor
    - receiver (RX) on-chip antenna
    - RF DC Rectifier
    - PMU: Power management unit
    - 10 uF Capacitor
    - PMOS switch
    - Bluetooth module
    - pacemaker

1. Wearable Transmit-antenna
2. Implant = antenna + rectifier + matching circuit + pacemaker

Requirement:

- **Interface Requirement:**
- **Functional Requirement:**

  - **FN-1: The system shall detect abnormal heartbeat rate:**
    The system should detect an irregular or slow heartbeat rate.
  - **FN-2: The system shall enable the pacemaker to send electrical signals:**
    The pacemaker should be able to sends electrical signals to the heart when it is needed to correct the rate
  - **FN-3: The system shall enable the user to receive information**
    The system must send the data about the heartbeat behavior and battery level to the portable device via Bluetooth
  - **FN-4: The system shall detect abnormal mental or physical efforts:**
    The system needs to detect intensive body motion (translated by sport activity) or mental stress in order to regulate the rate if needed
  - **FN-5: The system shall enable the user to store information in the cloud:**
    The user can store his data in the clouds under request after giving a consent and connect the portable device to Wi-Fi.
  - **FN-5: The system shall enable the user to charge the inner battery:**
    By placing the portable device on the chest and direct on the skin, the antenna receives the electromagnetic power from the RF power source and the rectifier converts the AC power to a DC power and stores it in the capacitor.

- **Other Non-Functional Requirements**

    - **Performance Requirements**

    The system should respond to each action related to heartbeat rate within 1 milliseconds.

- **Design Requirements**
    - PCB need to be maximum 16 mm length and width
    - Portable device needs to be in a mobile size
- **Software System Attributes**
- **Reliability**

    The system should be full functioning.

- **Availability**

    The system should be always available under request, for the pacemaker once an abnormal behavior is detected and for the portable device once the user log into it

- **Security**

    The system should work after entering the patient health security number only

- **Maintainability**

    The system should have full documentation.

- **Portability**
- **Other Requirements**

    None