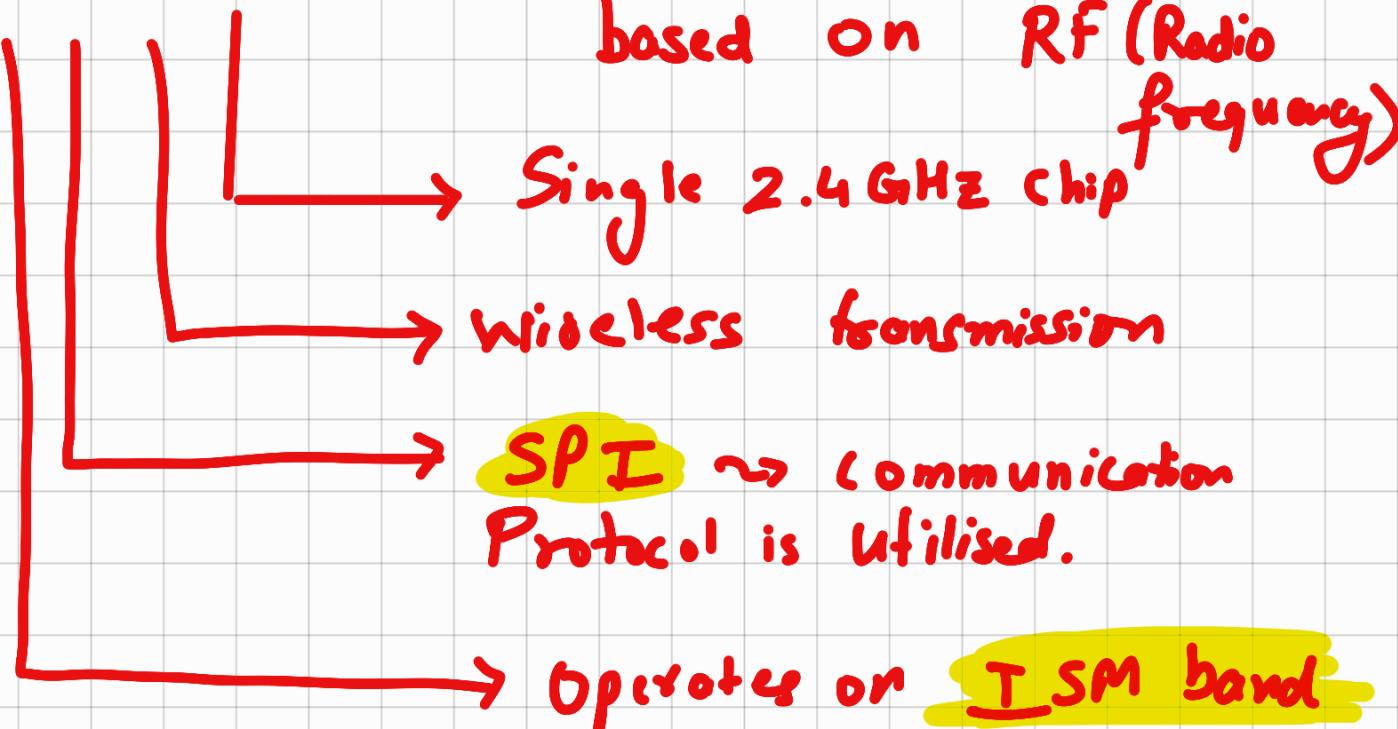


NRF24L01 → transceiver module based on RF (Radio frequency)

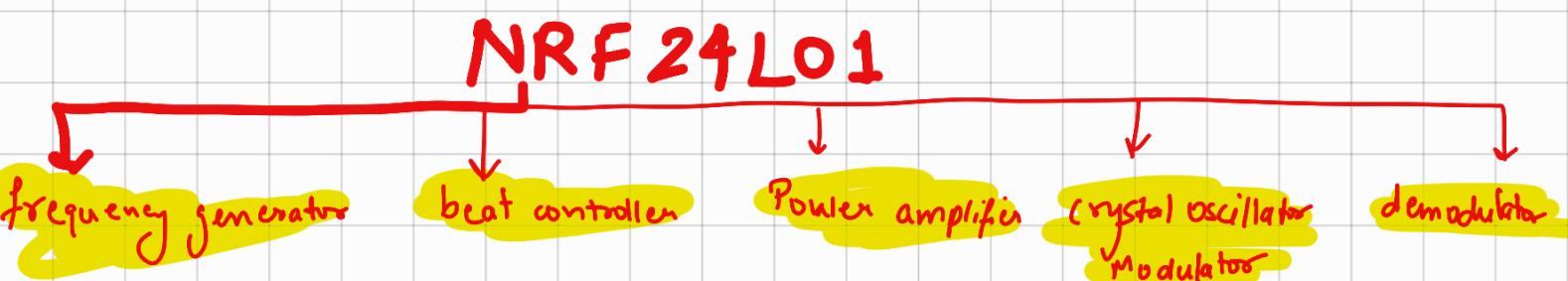


"Industrial ; Scientific & Medical purpose Radio band frequency"

→ 100 m range in open space → efficient operating range

→ Powering voltage ~ 3.3 Volts

↳ Other pins can work at 5V or 3.3V hence it can be used with Arduino.



→ 125 address range & can communicate with 6 channels at a time.

3 working modes;

→ Transmitter Mode (11.3 mA)

→ Receiving Mode (13.5 mA)

Transceiver Mode

↳ long distance & quick transmission of data.

→ Range of band rate → [250 Kbps ↔ 2 Mbps]

→ Channel range ~ 125 & 6 maximum nodes.

→ It is a single chip GFSK transceiver module with OSI link layer hardware.

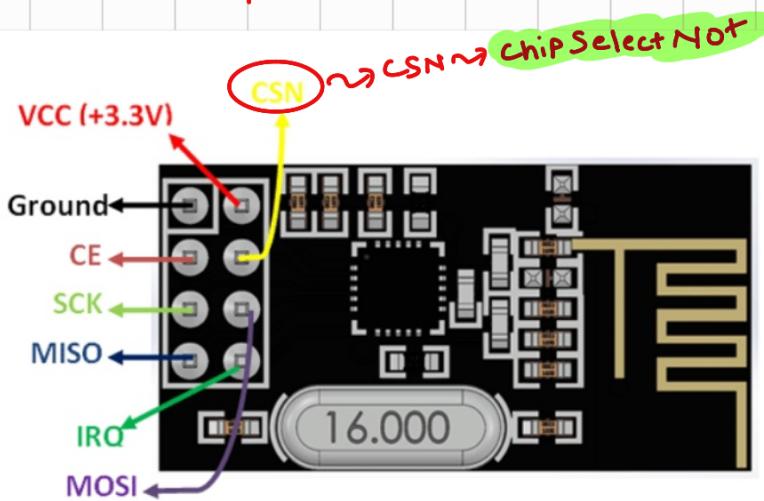
"SPI Communication Protocol"

[Serial Peripheral Interface]

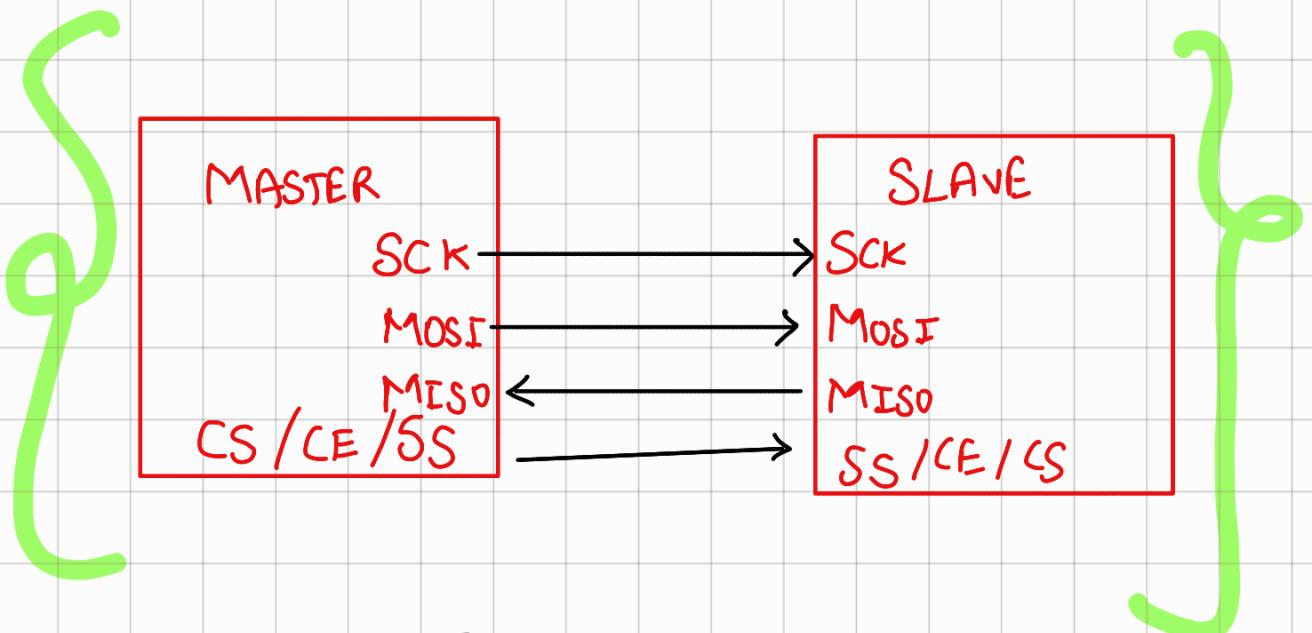
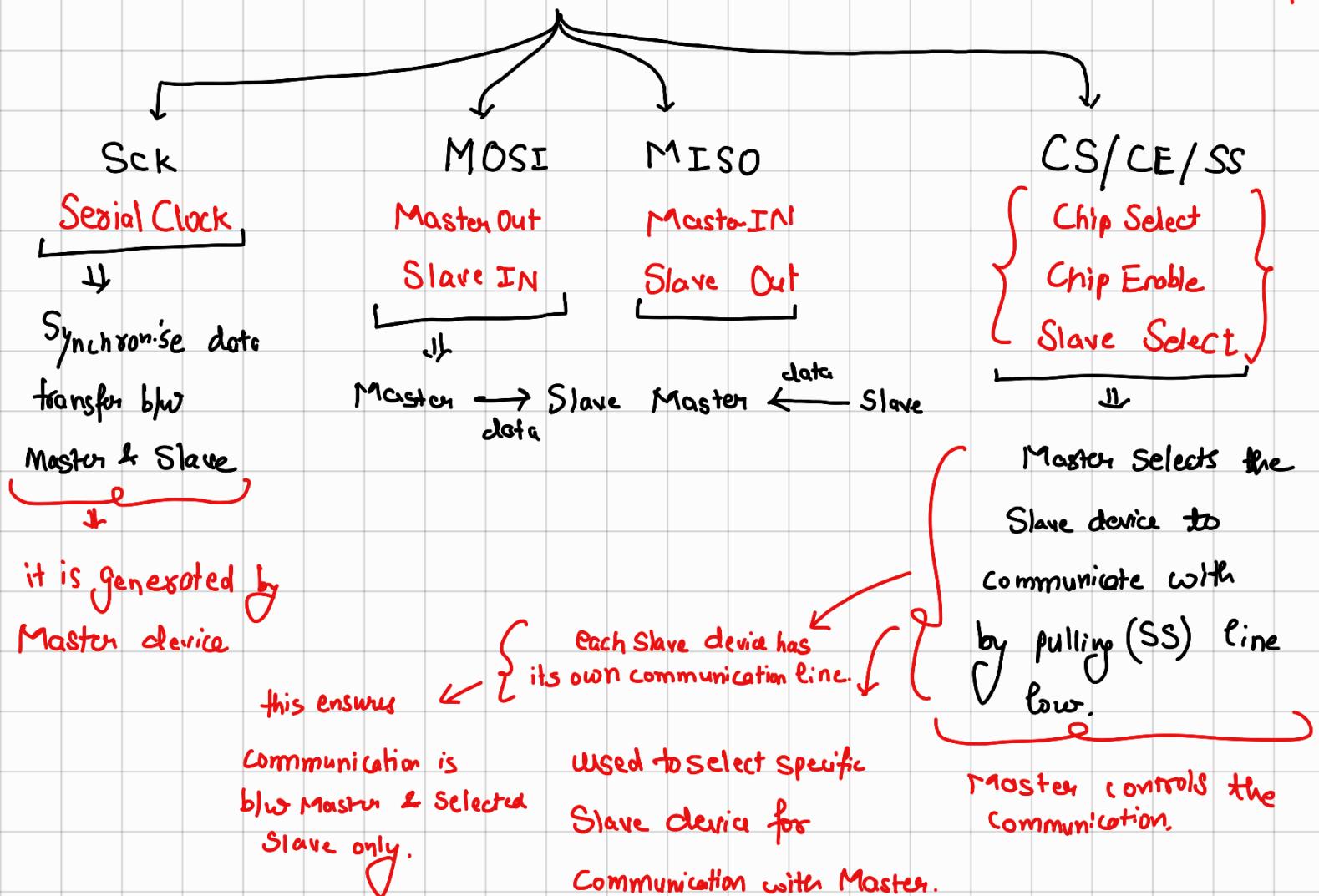
→ developed by "Motorola"

SPI

- Full duplex
- Master/Slave architect
- Synchronous communication
- Supports Multi Master/Slave.
- Limited distance
- Variable Data Length
- Configurable Clock frequency



SPI bus has 4 lines to send & receive data between devices.



- [ISM frequency band] → in every country RF communication is regulated by a certain organisation. These authorities allocate the radio frequency bandwidth to each individual which includes television, military, govt etc. One needs to get permission to get certain frequency for their use. However, these authorities have kept aside certain frequencies which can be flexibly used by the user. These bands are called ISM frequency bands.

ISM \rightsquigarrow Industrial ; Scientific & Medical Radio bands

↓
Unlicensed which means anyone can use them without having to acquire permission or pay for it.

→ Globally 2.4 GHz is an ISM band → more precisely 2.4 GHz - 2.525 GHz

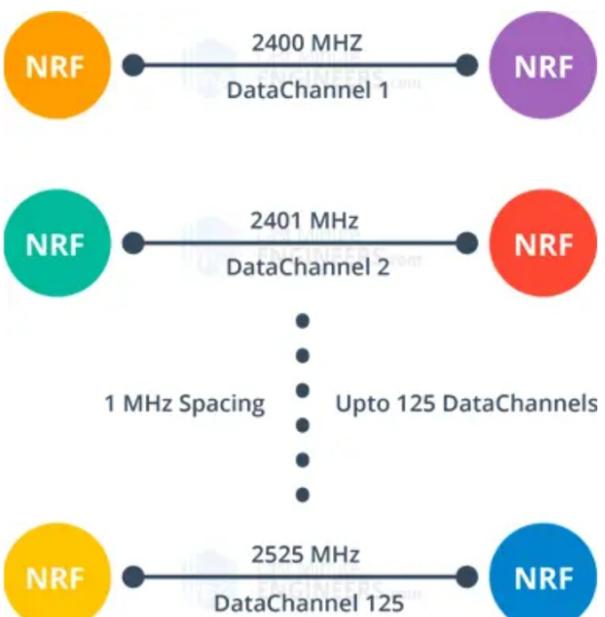
$$(2525 - 2400) \text{ MHz} = \underline{125 \text{ channels}}$$

125 channels with bandwidth 1 MHz

→ There are certain rules & regulation to use ISM bands for communication as these emit powerful signals that can create electromagnetic interference & degrade the communication services of other users.

↙ "it is not prohibited"

{These are taken care of by the manufacturer}



125 channels &

1 MHz Spacing
or bandwidth
to avoid cross - talk b/w channels



- At 250kbps and 1Mbps air data rates, each channel takes up less than 1 MHz of bandwidth, so there is a 1 MHz gap between the two channels. However, for a 2 Mbps air data rate, 2MHz of bandwidth is required (greater than the resolution of the RF channel frequency setting). So, in 2 Mbps mode, keep a 2MHz gap between the two channels to ensure non-overlapping channels and reduce cross-talk.

→ NRF24L01
As data transfer
Speed of NRF24L01 can
be 250 Kbps or 1 Mbps or
2Mbps

→ NRF24L01 supports communication with 6 nodes over each channel using single CS pin because of its Multiciever feature.

↓
Multiple transmitter & Single receiver.