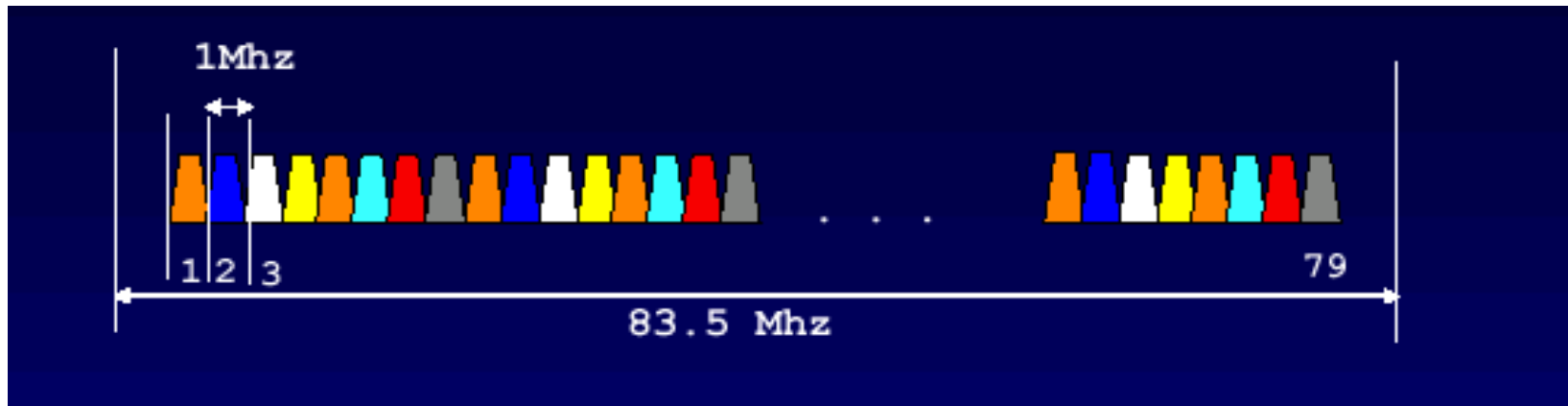
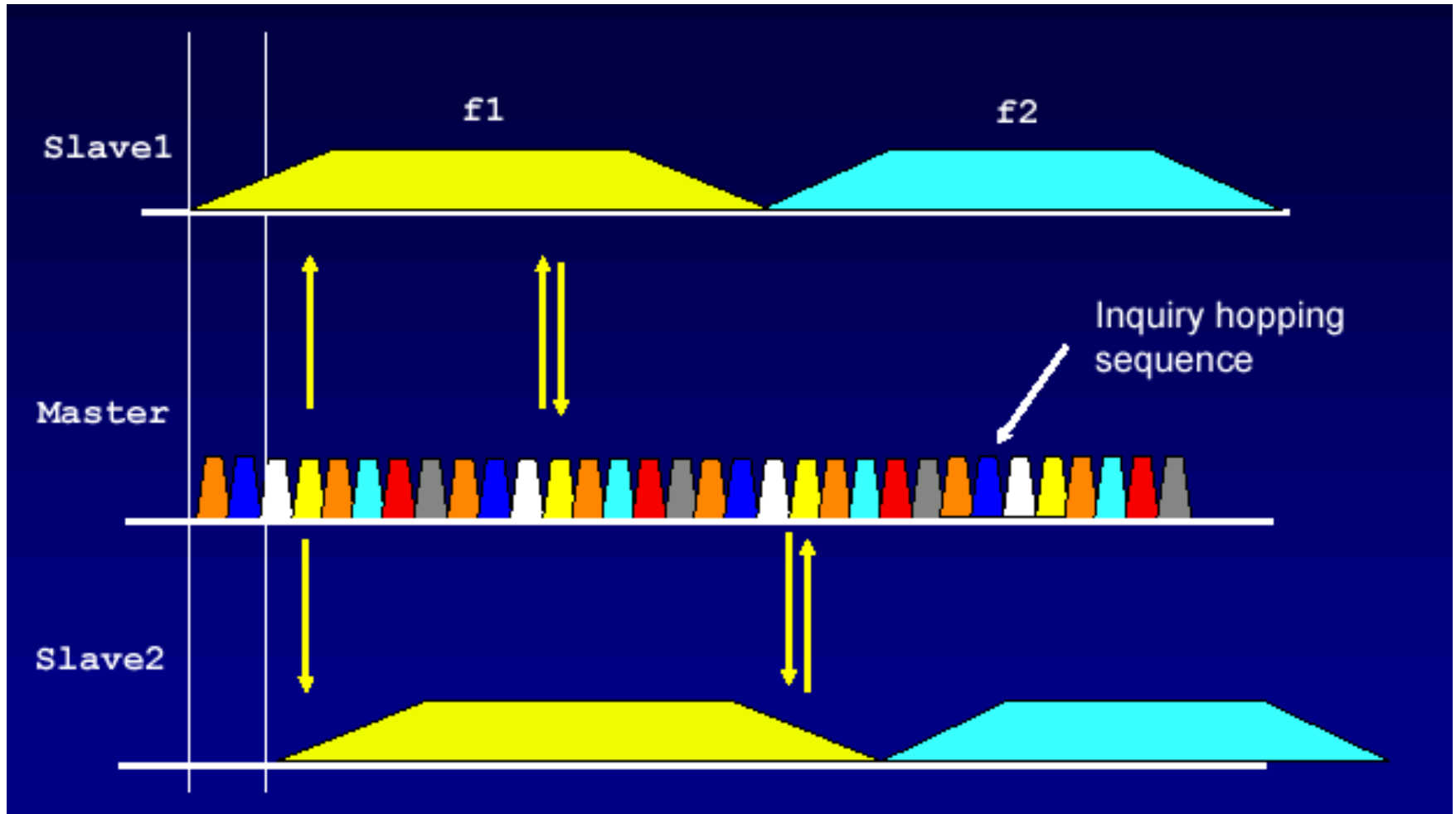


Bluetooth Frequency Spectrum



- frequency hopping spread spectrum
- $2.402 \text{ GHz} + k \text{ MHz}$, $k = 0, \dots, 78$
- 1,600 hops per second
- GFSK modulation
- 1 Mb/s symbol rate
- transmit power
- 0 dbm (up to 20dbm with power control)

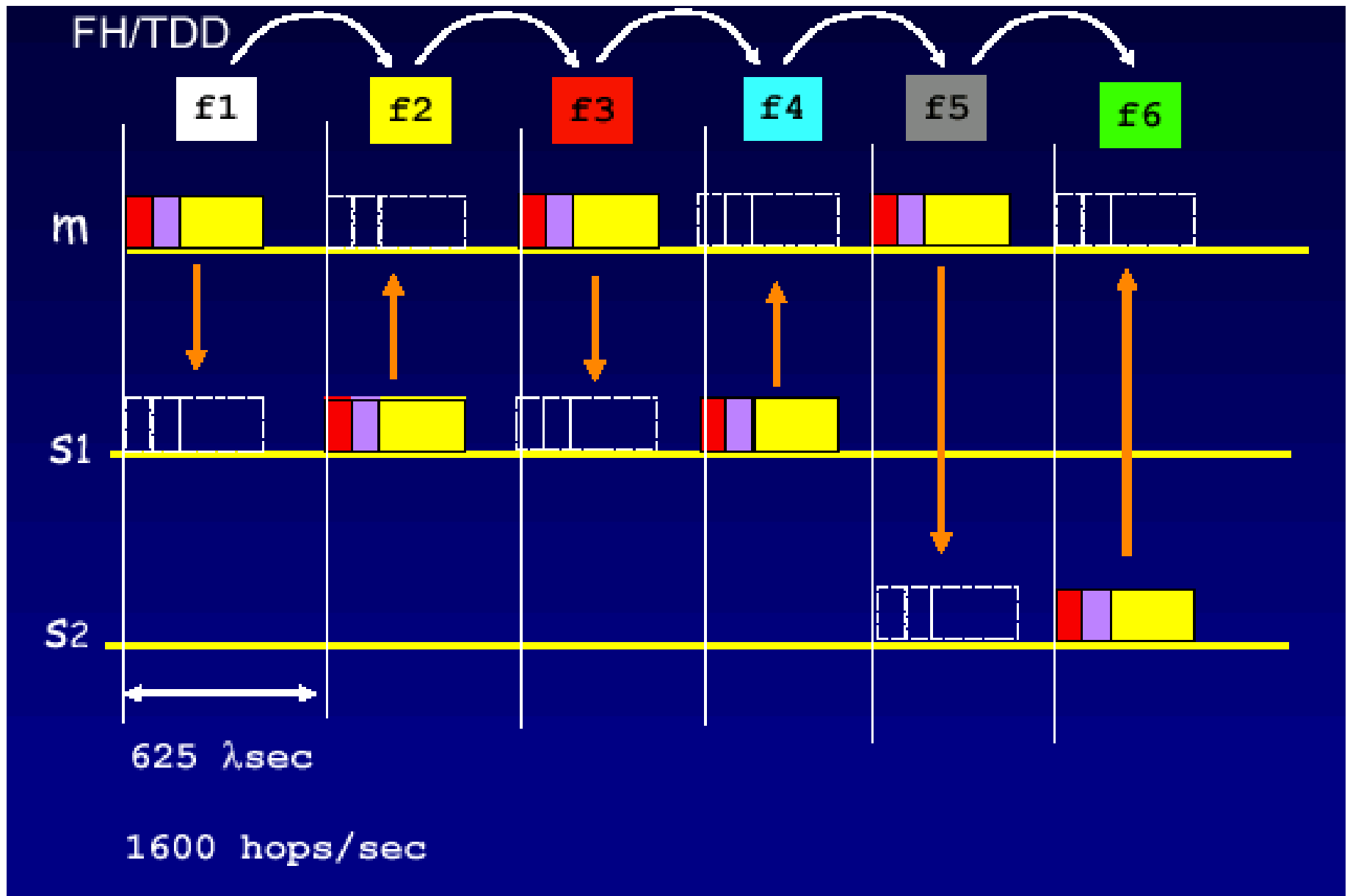
Inquiry Process



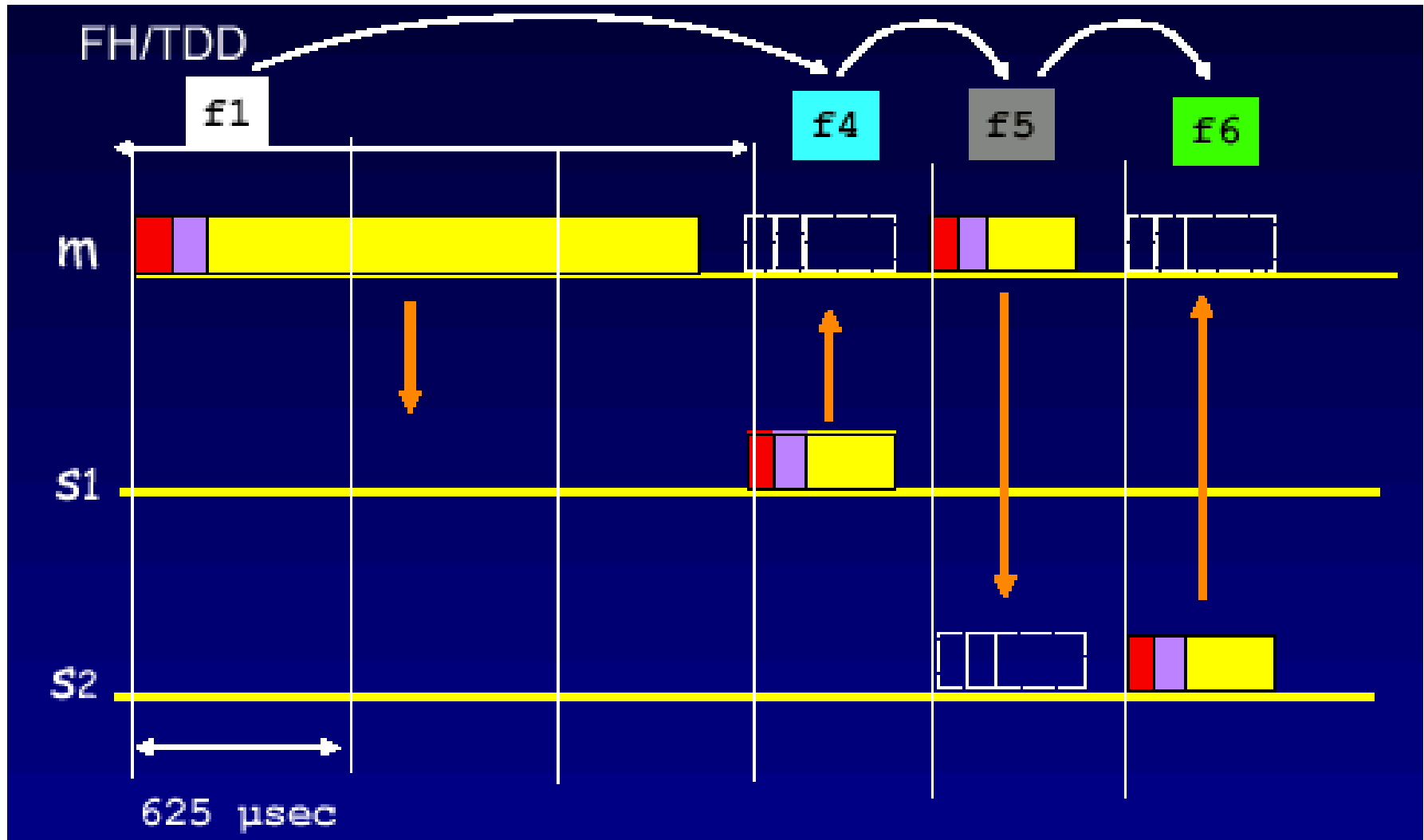
Bluetooth Addressing

- Bluetooth device address (BD_ADDR)
 - 48-bit IEEE MAC address
- Active Member address (AM_ADDR)
 - 3-bit active slave address
 - All zero broadcast address
- Parked Member address (PM_ADDR)
 - 8-bit parked slave address

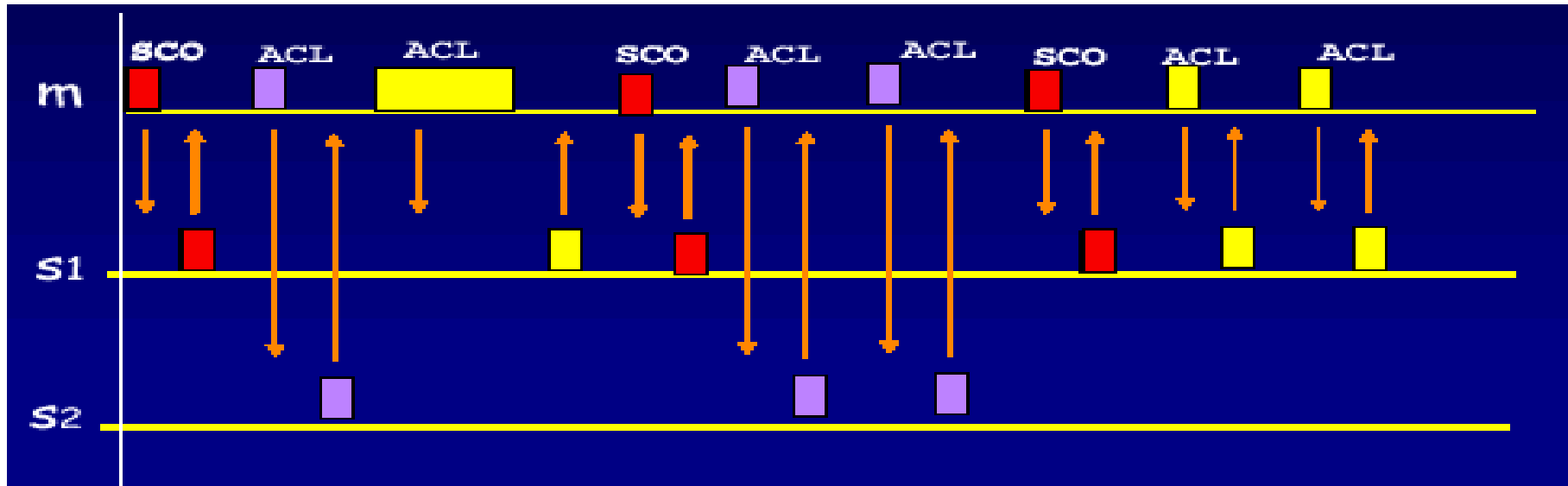
Piconet Channel



Multi-slot packets



Physical Link Types

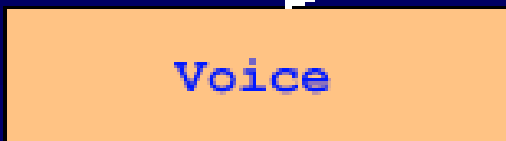


- Synchronous Connection Oriented (SCO) Link
 - Slot reservation at fixed intervals
- Asynchronous Connection-less (ACL) Link
 - Polling access method

Packet Types

- Control Packets
 - ID*
 - NULL
 - Poll
 - FHS
 - DM1
- Voice/Data Packets
 - HV1 -- DM1
 - HV2 -- DM3
 - HV3 -- DM5
 - DV -- DH1
 - DH3
 - DH5

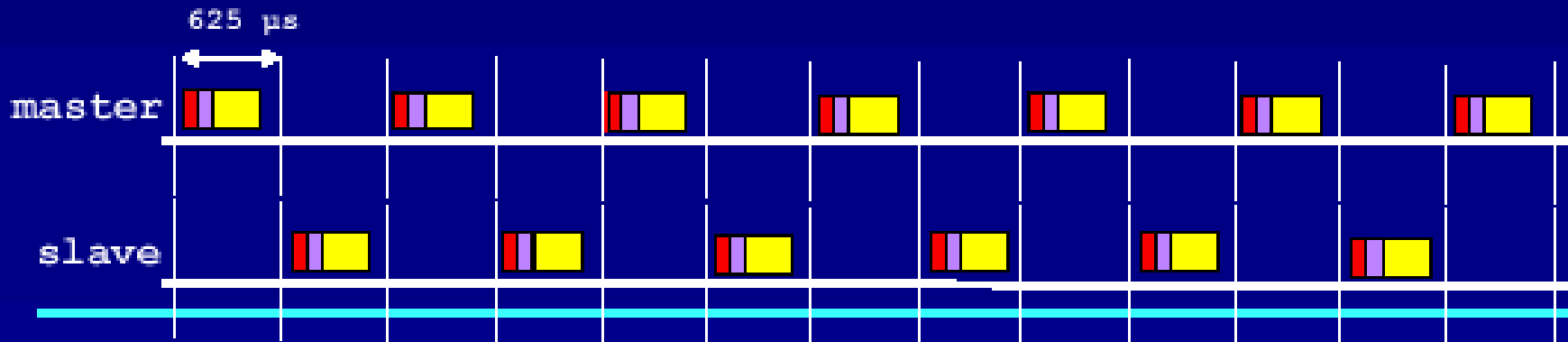
Packet Format



No CRC
No retries
FEC (optional)



ARQ
FEC (optional)



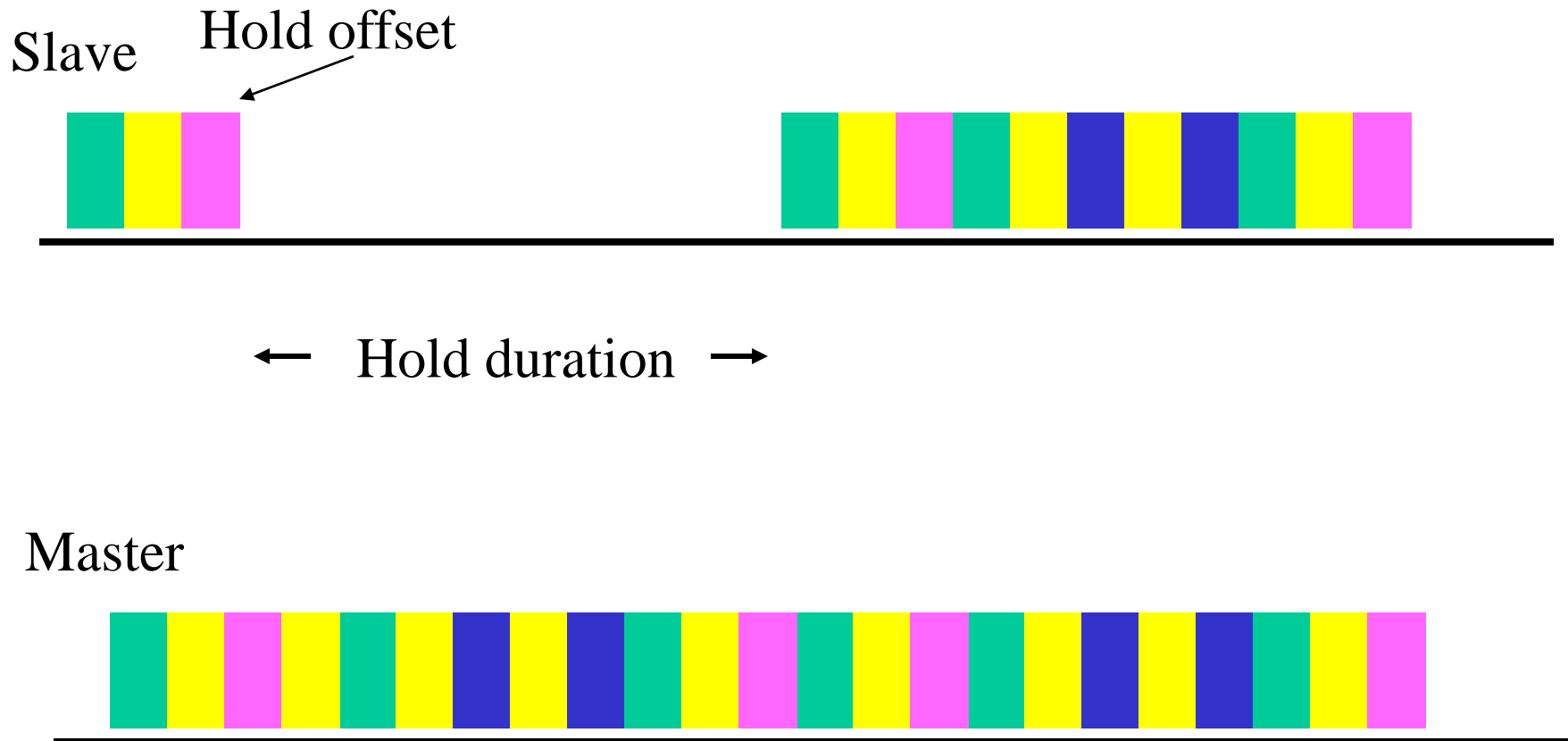
Access Code

- Purpose:
 - Synchronization
 - DC offset compensation
 - Identification
 - Signaling
- Types:
 - Channel Access Code (CAC)
 - Device Access Code (DAC)
 - Inquiry Access Code (IAC)

Packet Header

- Addressing (3) → Max 7 active slaves
- Packet types (4) → 16 packet types
(some unused)
- Flow control (1)
- 1-bit ARQ → broadcast packets
are not ACKed
- Sequencing → filtering retransmitted
packets
- HEC (8) → verify header integrity

Low Power Mode (Hold)



Low Power Mode (Sniff)

Sniff offset

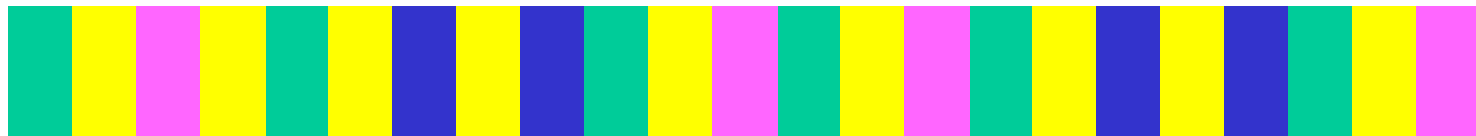


Slave



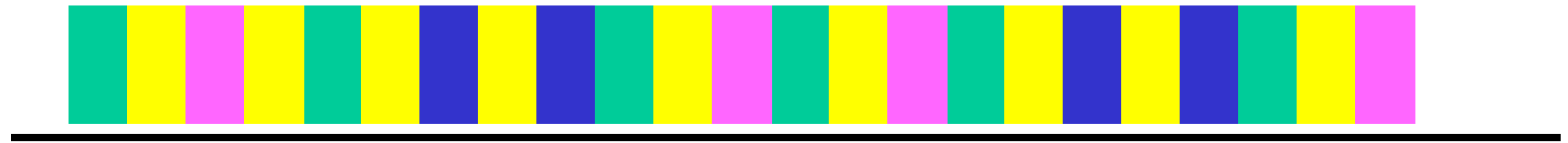
← Sniff duration →

← Sniff period →



Master

Low Power Mode (Park)



Master

Beacon Instance



Slave

← Beacon Period →

- Give up active member address, yet maintain synchronization
- Communication via broadcast LMP messages