

التدريب الصيفي 2016

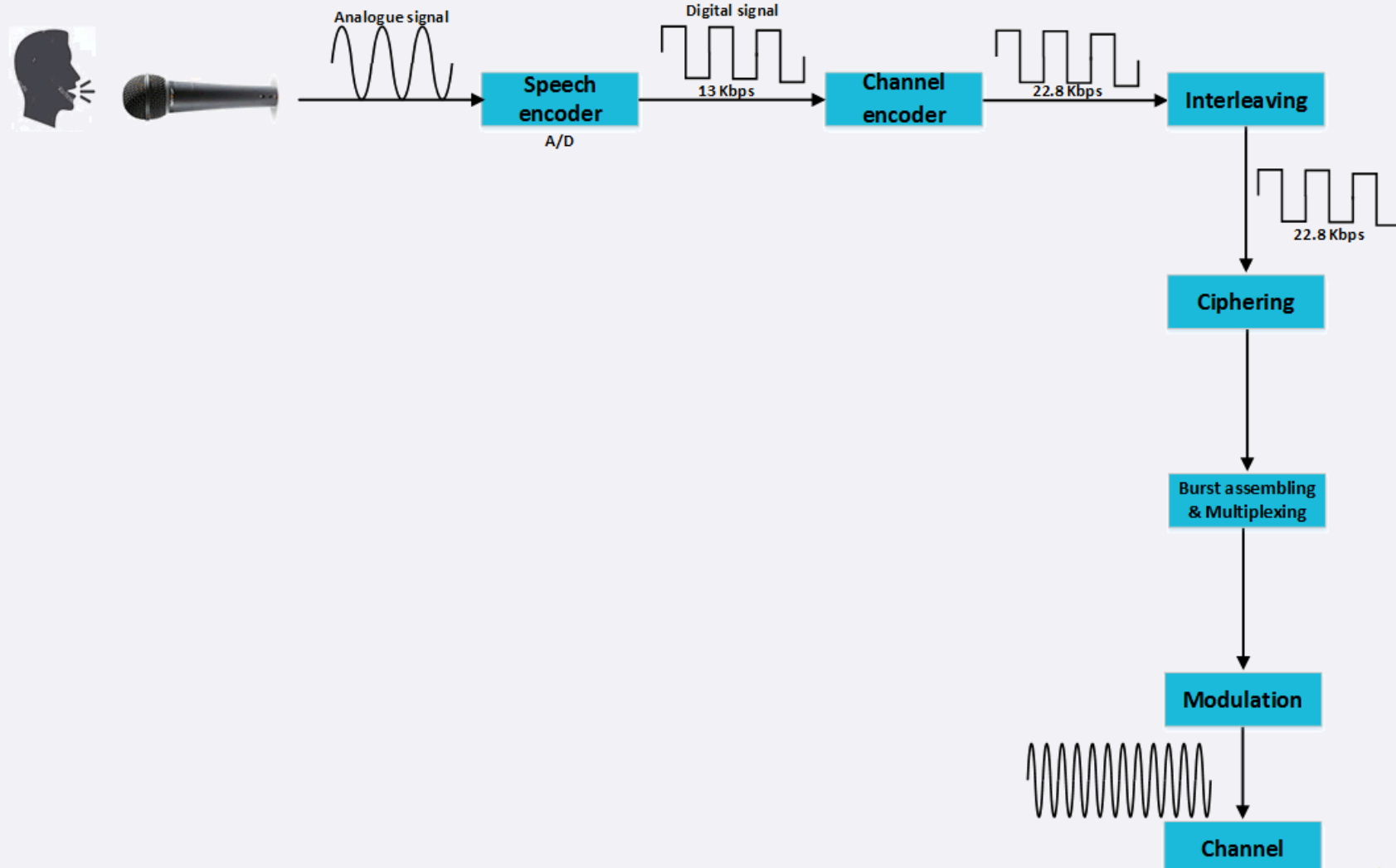


المصادر
الجديد



Mobile Stations
Transmission chain

GSM transmission chain



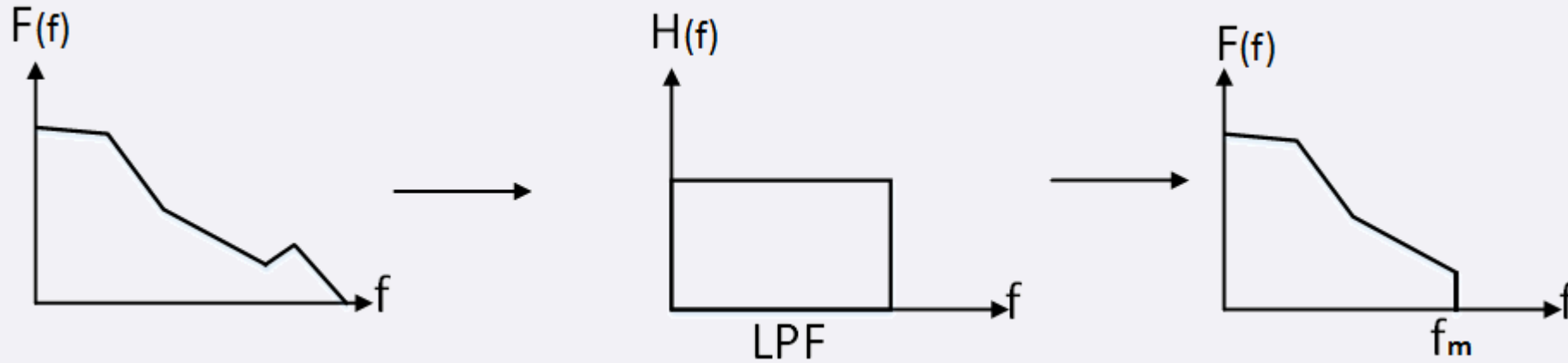
Speech Encoder

- Specification
 - Low bit rate
 - Good quality signal
 - Low cost
- Function
 - A/D
 - Segmentation
 - Predictive coding

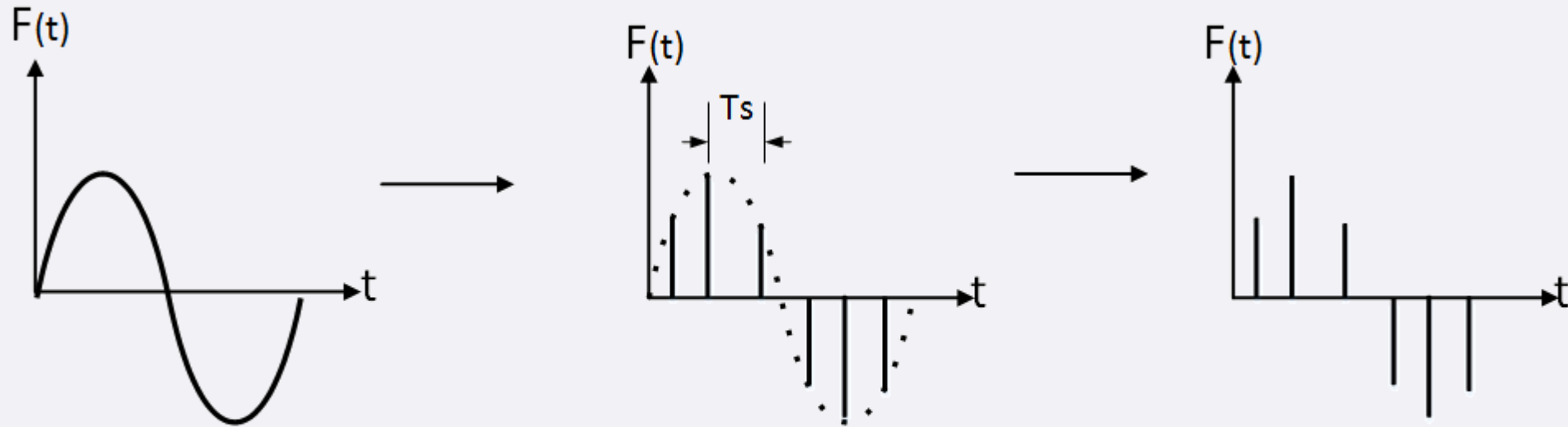
Speech encoder function (A/D)

- Pulse Coding Modulation
 1. Band limiting
 2. Sampling
 3. Quantizing
 4. Encoding

PCM (Band Limiting)

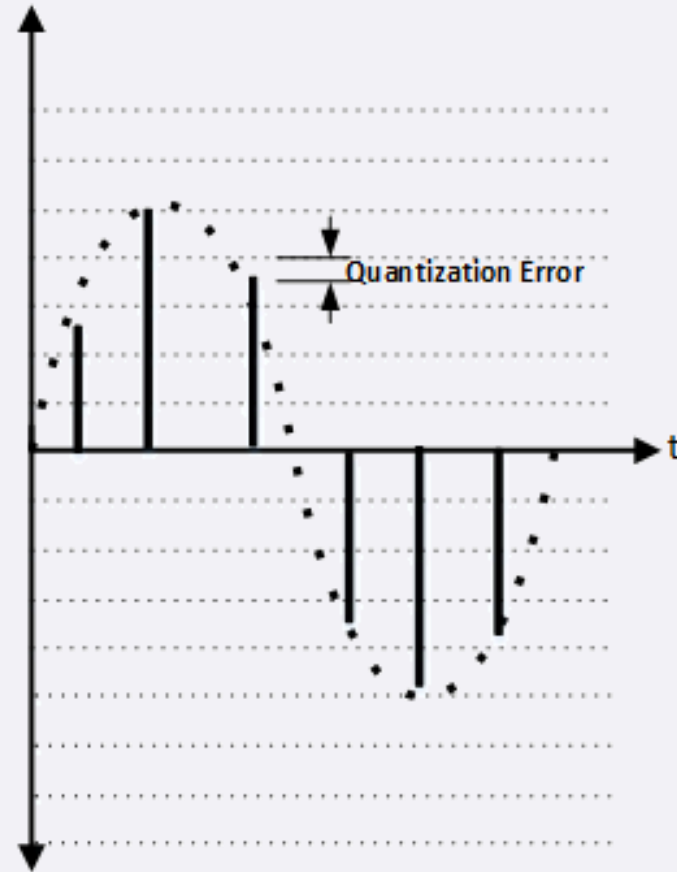


PCM (Sampling)



Nyquist
 $F_s = 2 F_m, F_s = 1 / T_s$

PCM (Quantization)



Number of Levels = 8192
Bit rate = 13 bit per sample

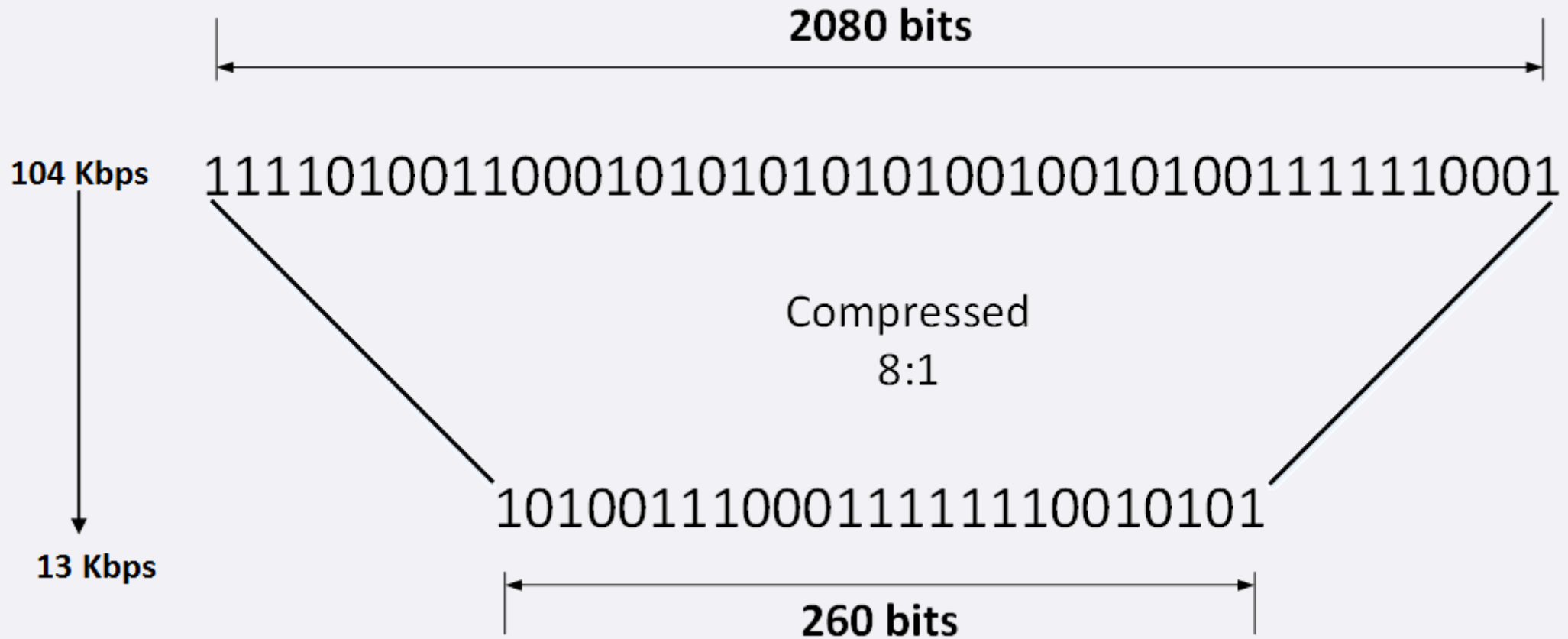
PCM (Encoding)

- 13 bit from quantizer
- $F_s = 8000$ KHz OR $T_s = 1/8000$ sec
- Bit rate = $13 \times 1 / (1/8000) = 104$ Kbps

Speech Encoder

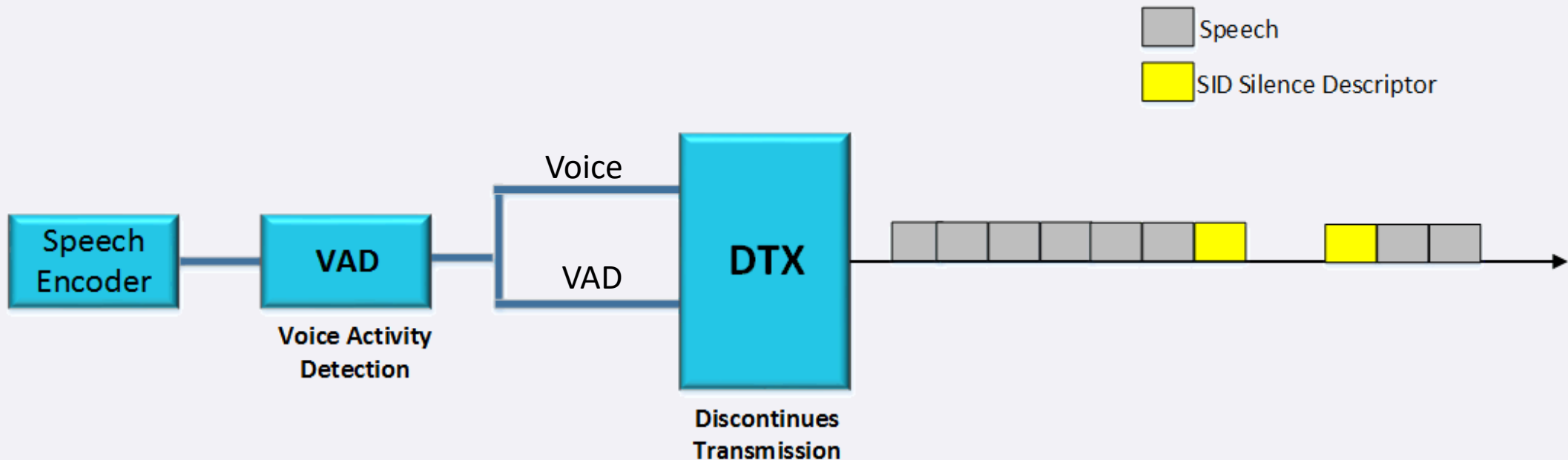
- Function
 - ~~A/D~~
 - Segmentation
 - Predictive coding

Speech encoder function (Segmentation)

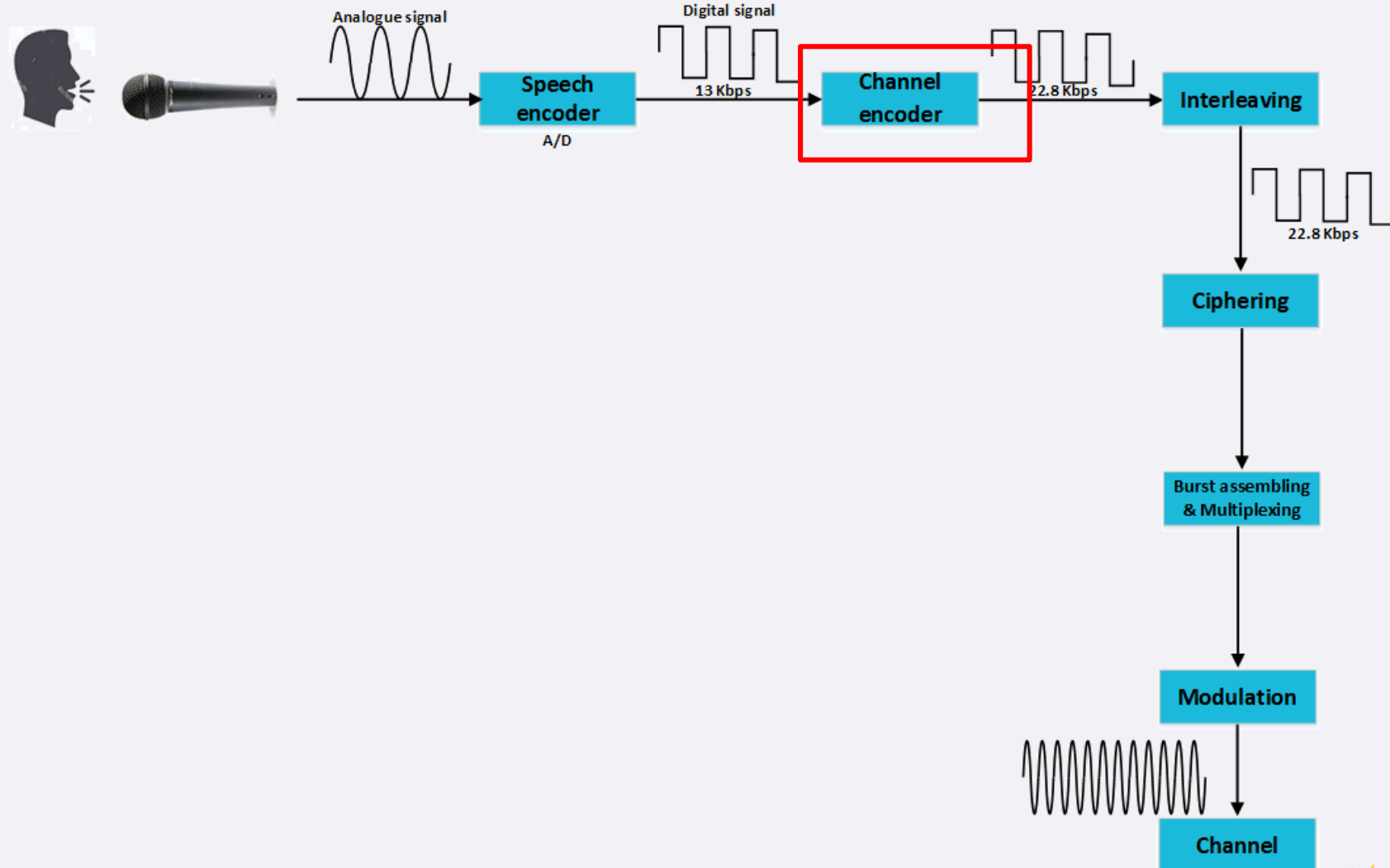


Speech encoder function (Predictive Coding)

- When the user is not talking during a call, noise(tones pitch,...etc.) is sent.
- Predictive Coding doesn't allow to send this noise.
- This leads to save power and minimize co-channel interference.

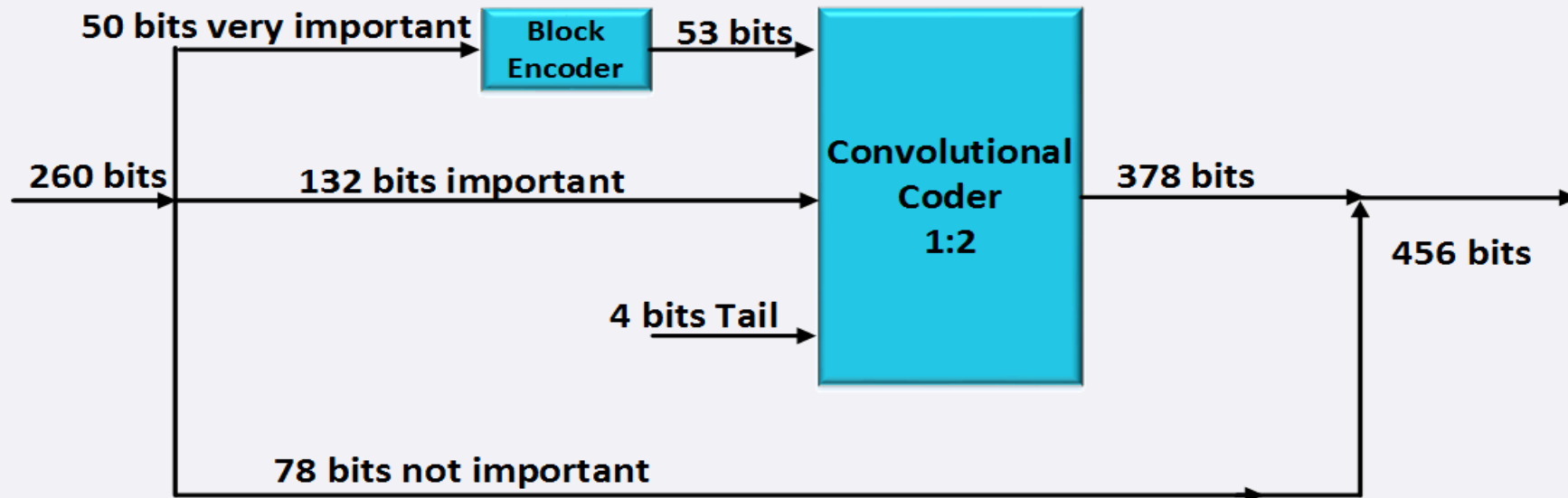


GSM transmission chain



Channel Encoder

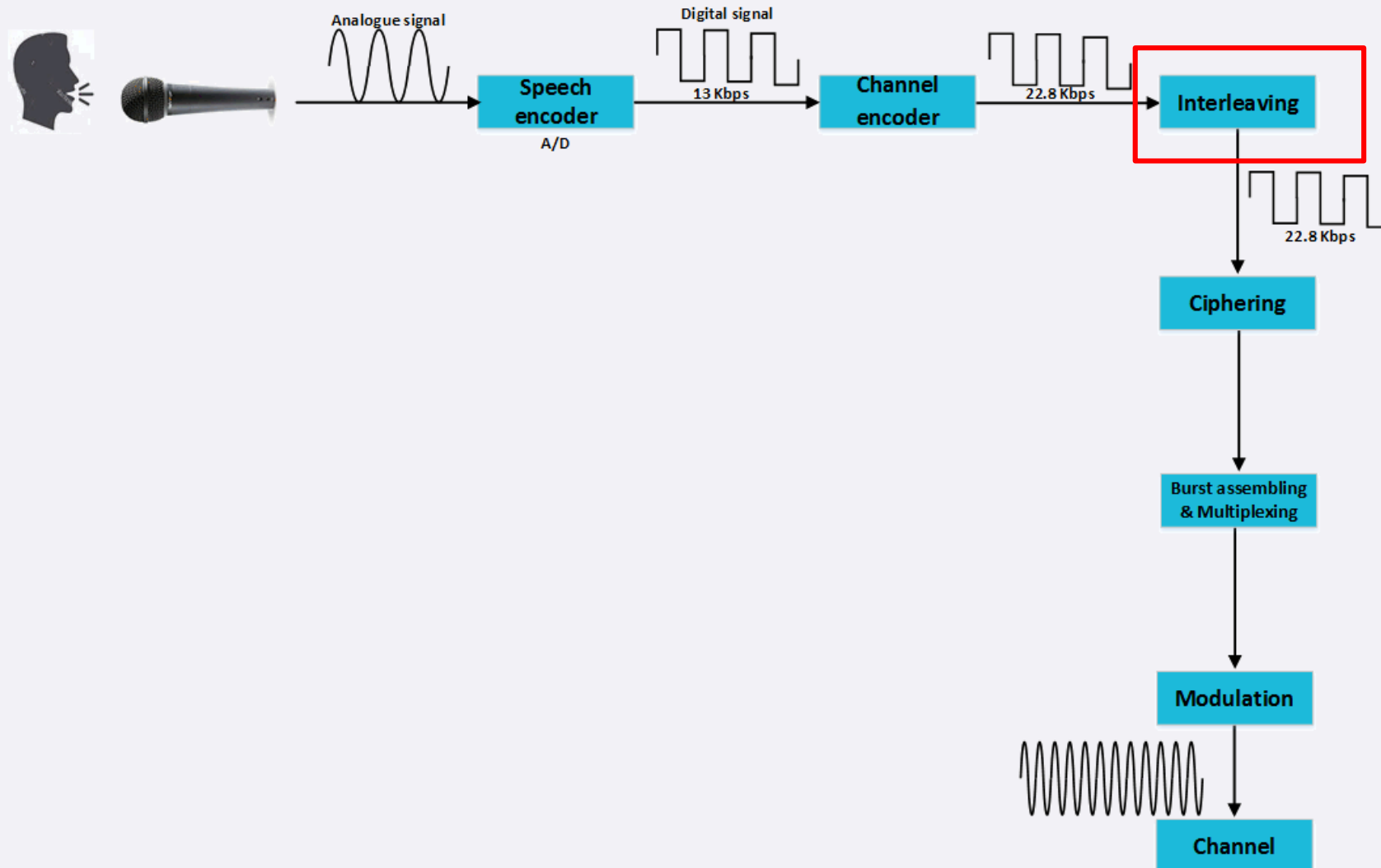
- REMINDER: to detect and correct errors
- In GSM: Convolutional Coder



456 bits every 20 msec \longrightarrow Bitrate = 22.8 Kbps (Full Rate)

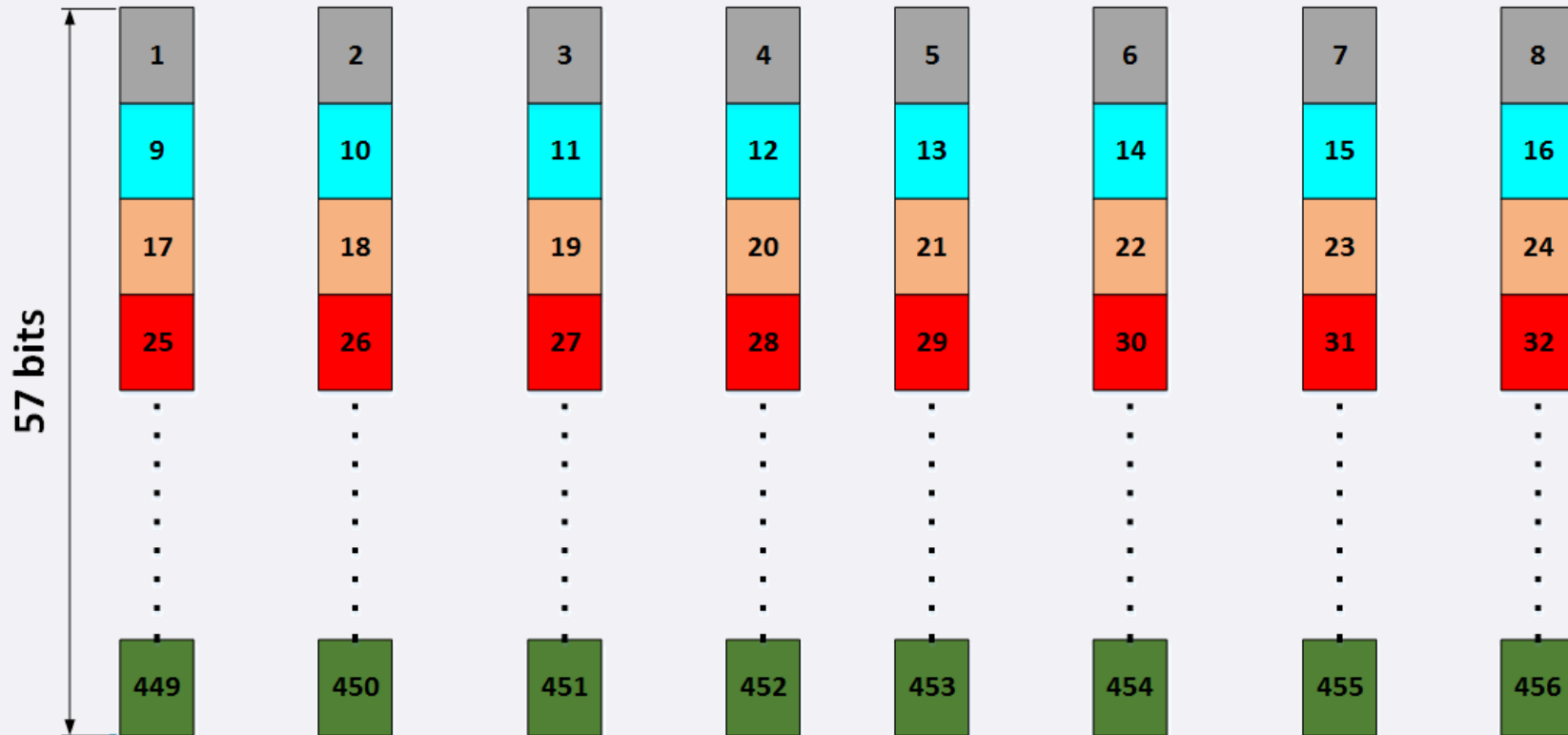
Redundancy $22.8 - 13 = 9.8$ Kbps

Interleaver



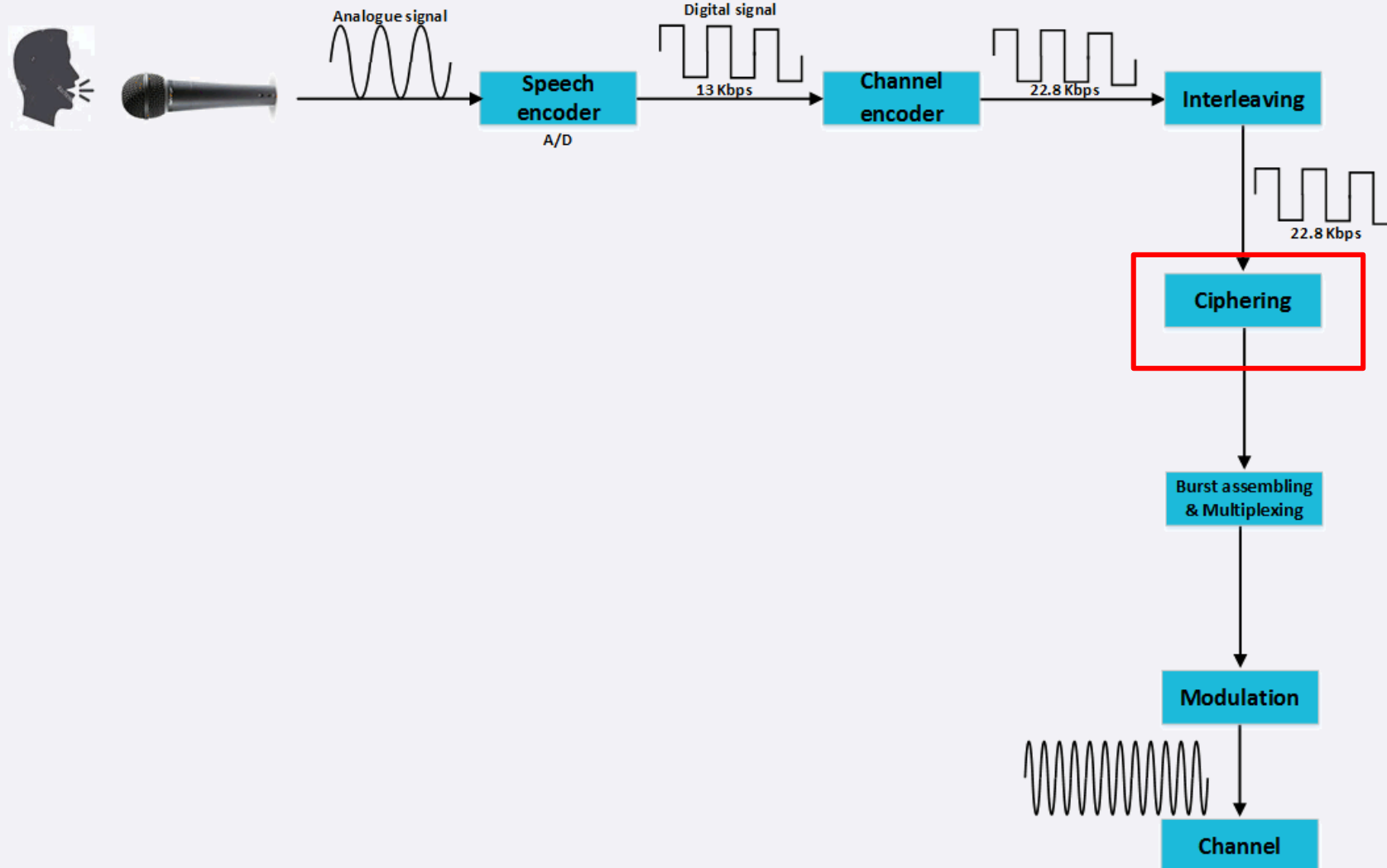
Interleaver

- To distribute the error on all bit blocks, not just one block.
- After convolutional coding the total bits is 456.
- Interleaver divides the 456 into 8 blocks:



- 57 bits from first 20msec and 57 bits from the second 20msec are sent together.
- The bit rate 22.8Kbps doesn't change.

Ciphering

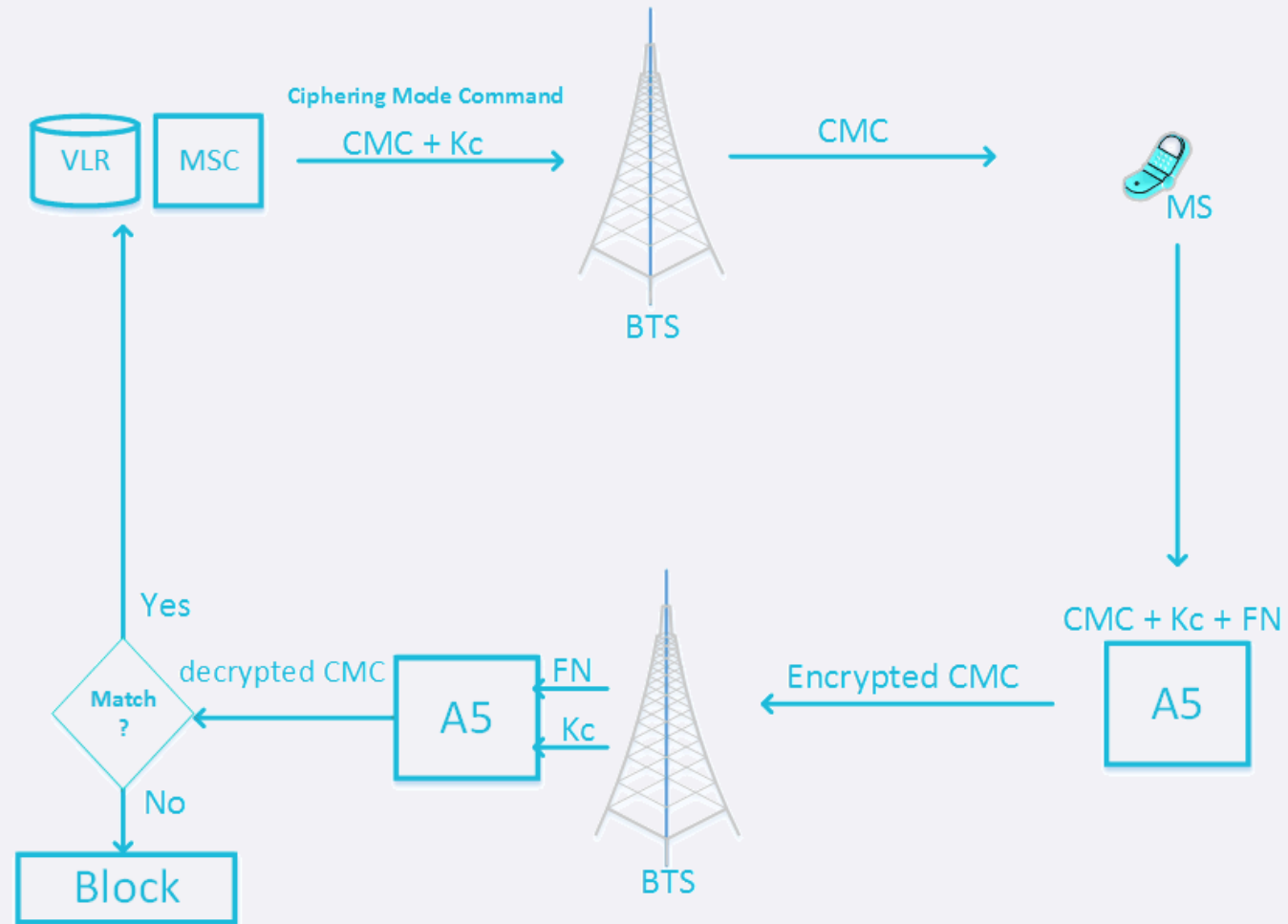


Ciphering

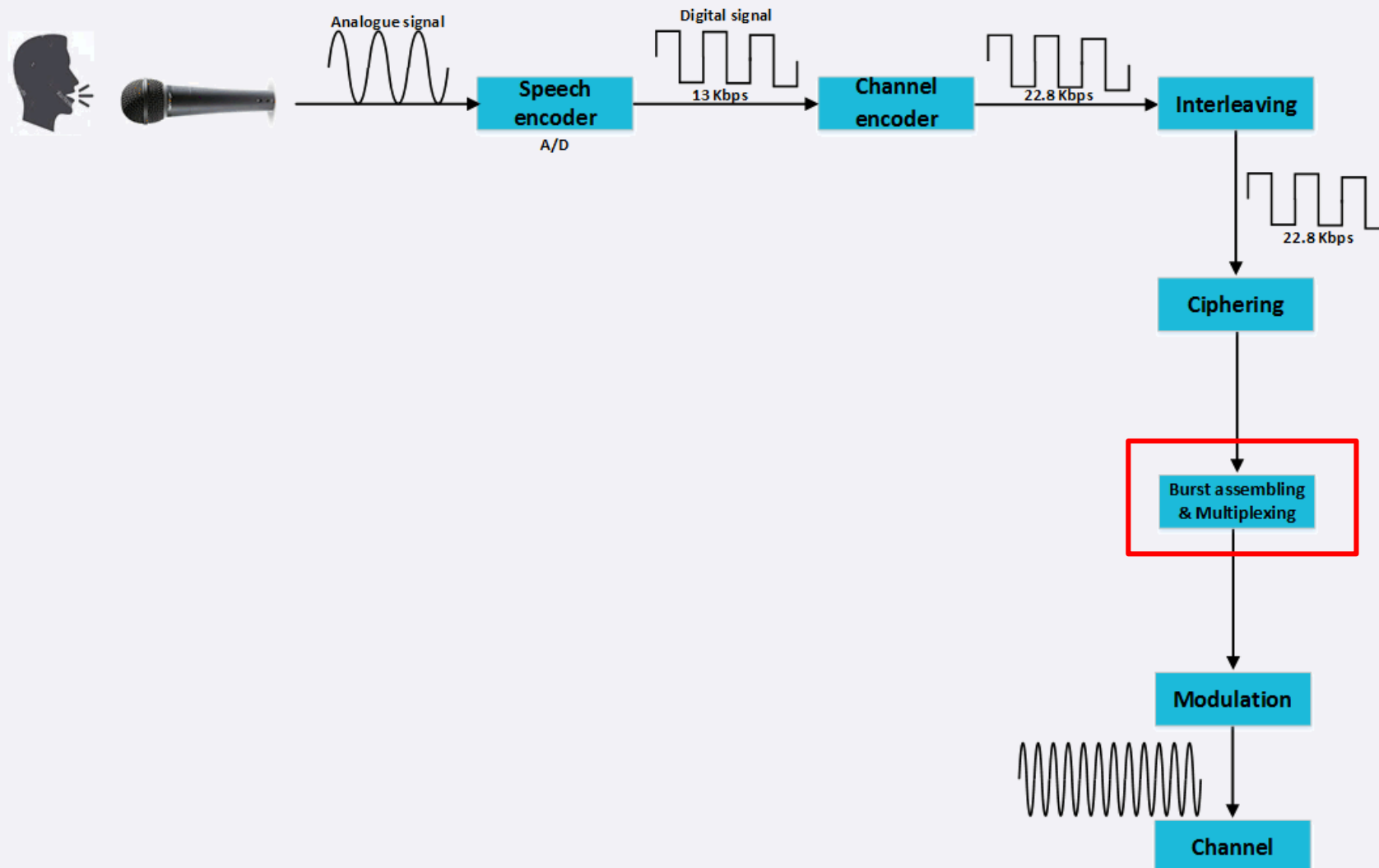
- REMINDER: Security in GSM:
 - TMSI
 - Authentication
 - IMEI check
 - ciphering

Ciphering

- Every time making call

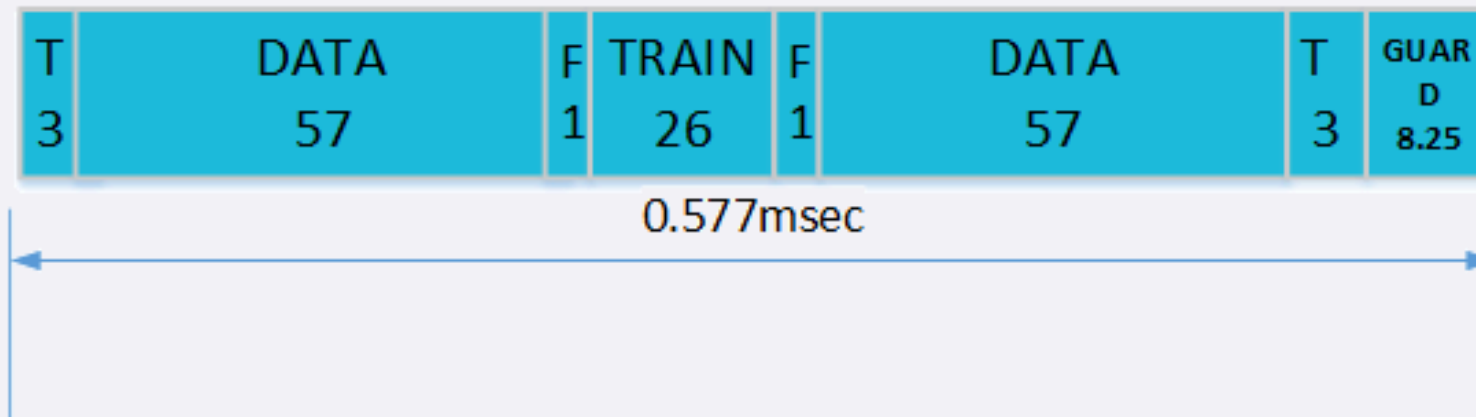


Burst assembling and multiplexing

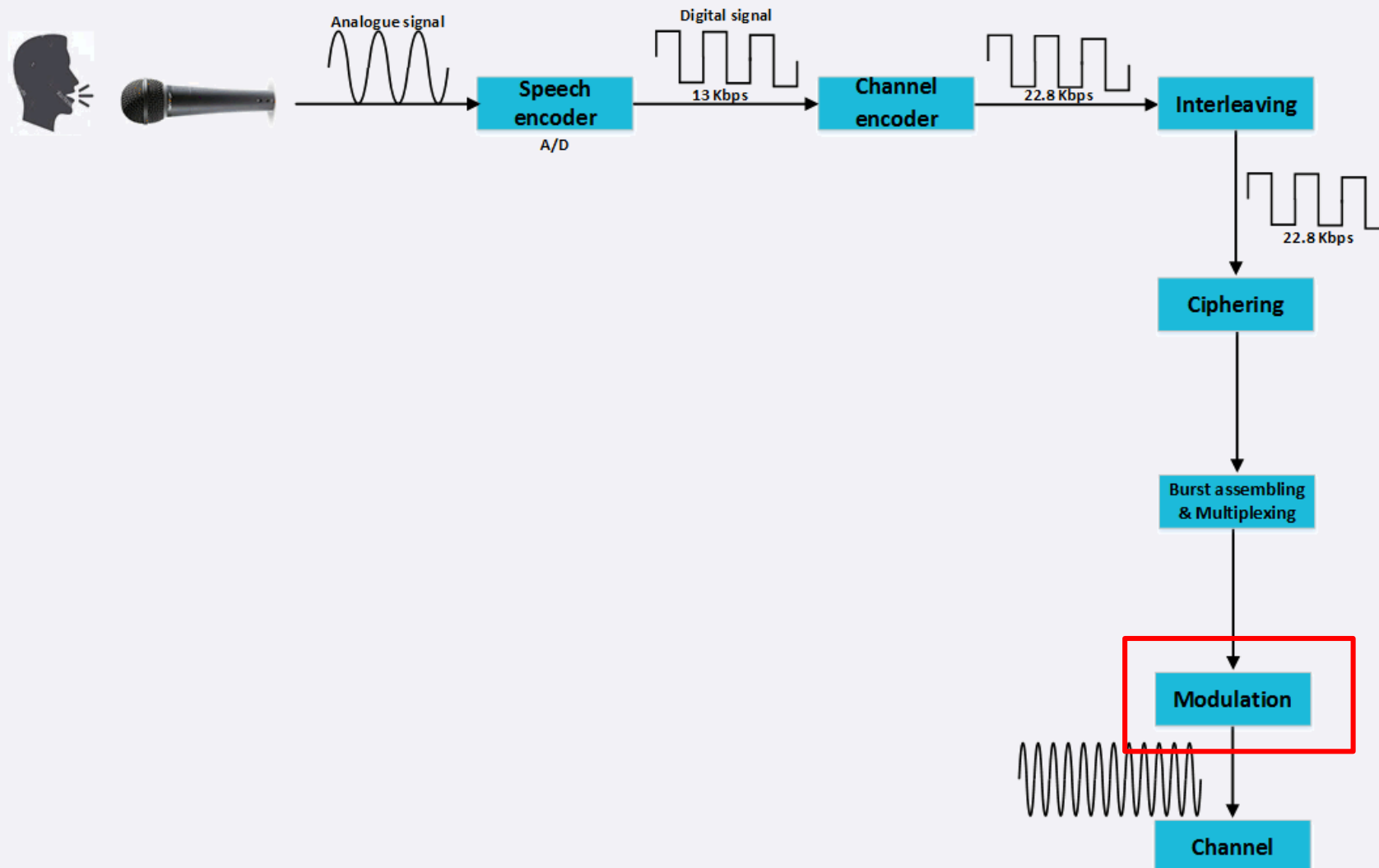


Burst assembling and multiplexing

- Adds the tail, training sequence and flags.



Modulation



Modulation

- Gaussian Minimum Shift Keying GMSK.
 - High BW efficiency : 1 Hz 1.35 bits
 - Low power
 - Good bit rate