Lecture #7

9/21/2016

Last Class

- AMPS - FDMA
- AMPS RCC / FCC Access
- Hamming Block Codes

Today

- Multiple Access Techniques

Next Class

- CDMA

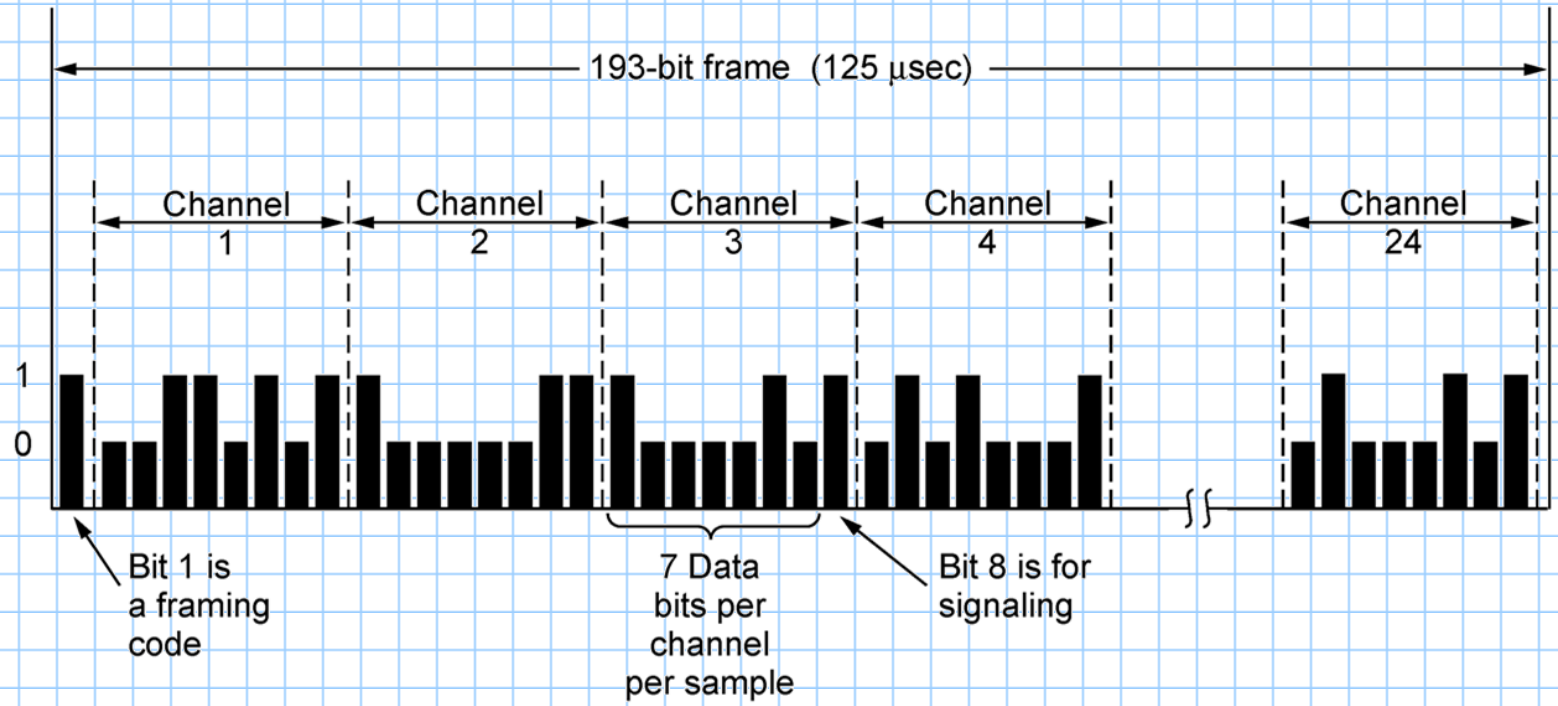
Announcements

- Homework #2 Due (No Later than Friday)
- Homework #3 Posted, Due Next Week

Multiple Access Techniques

Time Division Multiple Access

Sharing Access By Time



TDMA Example: T1 Landlines

Spread Spectrum Modulation

Transmitted signal takes up more Frequency Domain Bandwidth than the information signal

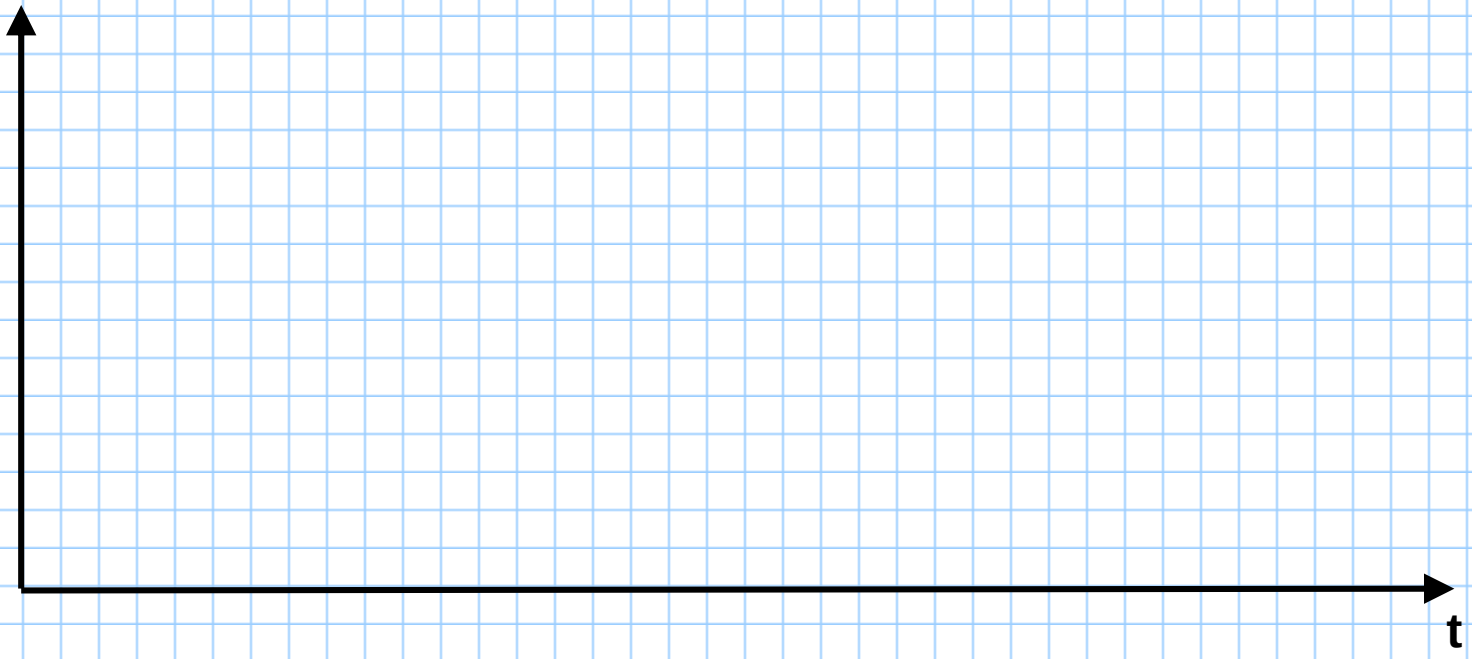
Wide bandwidth deliberately used so that more can share

Two main Spread Spectrum Modulation Schemes

Both schemes use concept of ‘Bit Chipping’

Spread Spectrum Modulation
Bit-Chipping

Ex: 1 Byte of Data Chipped by a factor of 4



*Serial transmission of 1 byte of data viewed with a **Chip Rate of 4***

"Bit Chipping" Seems inefficient at first glance…….

Chipping enables multiple codes to be transmitted at expense of higher frequency requirements

Multiple messages can be transmitted simultaneously, during duration of 1 bit time

Spread Spectrum Modulation
History

Bit Chipping is used in Direct Sequence Spread Spectrum modulation

DSSS techniques originally created for military applications

- Avoid determination of location of transmitters by triangulation
- Align a rotating antenna in direction of strongest signal to locate angle
- If two receivers known, then location can be triangulated

Triangulation prevented by hopping from one frequency to another in order to provide sufficient time for enemy receiver to lock on (i.e. find angle where power is maximum)

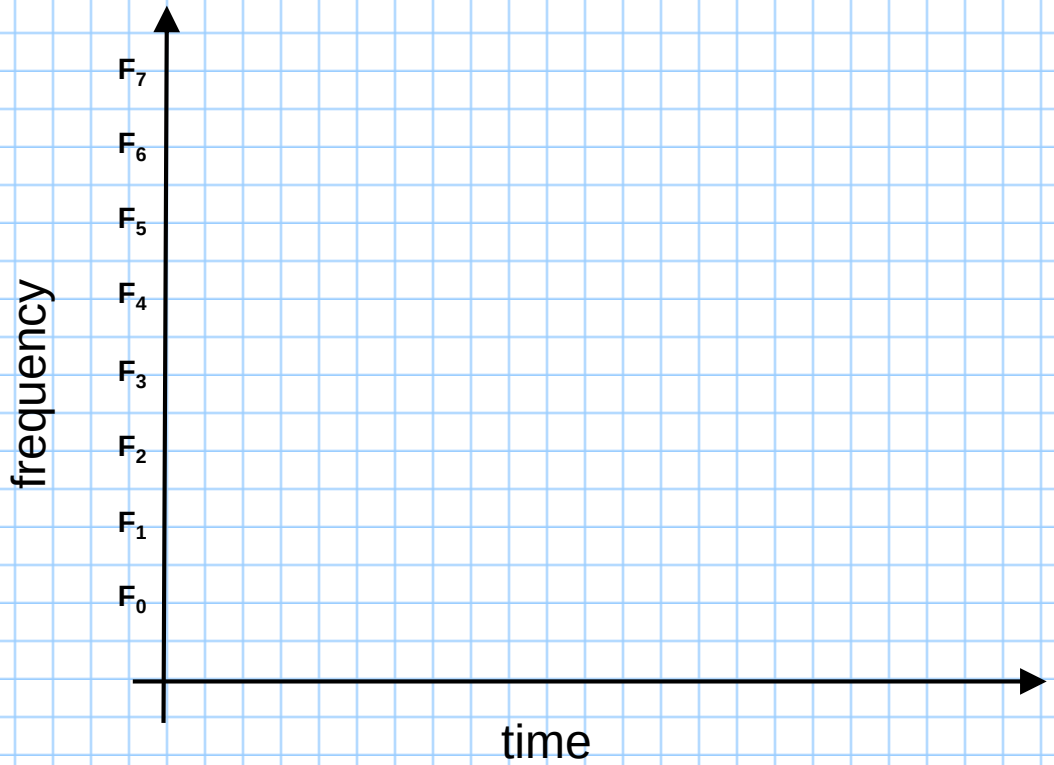
Spread Spectrum Modulation

Frequency Hopping Spread Spectrum (FHSS)

A pseudo-random set of frequencies in time and switching order known to friendly transmitter and Receiver

Messages can be decoded only if frequency hopping scheme is known

<u>Entire</u> Bandwidth is used



How is this useful for wireless communications?

Spread Spectrum Modulation
Direct Sequence Spread Spectrum (DSSS)

DSSS modulated signal can be transmitted via FHSS, provides:

Data Security

Position Security