Lecture 14 - Duplexing and Multiple-Access Techniques

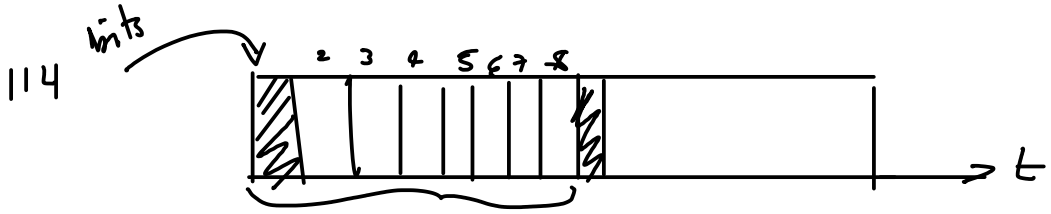
Exercise 1: Is a normal phone call half-duplex, full-duplex or simplex? How about a radio broadcast? A typical police dispatch radio using push-to-talk (PTT)?

phone – Full Duplex

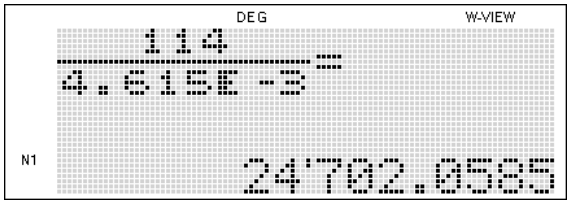
radio – simplex

PTT – H/D

Exercise 2: GSM cellular systems use FDD and TDMA. Each user gets to transmits 114 bits in one of eight "slots" per frame and each frame lasts is 4.615 ms long. What is the average data rate for each user? GSM channels are spaced every 200 kHz. An operator has one 5 MHz frequency allocation for each direction ("paired" spectrum). How many channels can this operator use?

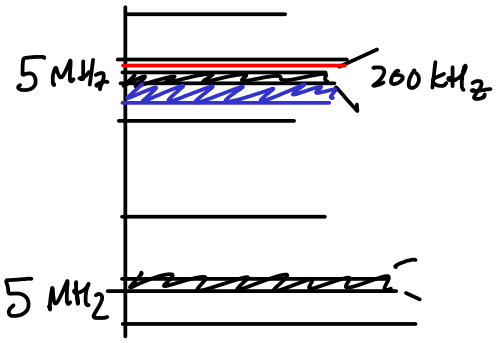


$$\frac{\text{bits}}{\text{second}} = \frac{114}{4.615\times10^{-3}} = \frac{4.615\text{ ms}}{24.702\text{ kb/s}}$$



overall data rate $= \frac{8\times114}{4.615} \approx 197$ kb/s

channels $= \frac{5\text{ MHz}}{200\text{ kHz}} = 25$



Exercise 3: The GSM TDMA frame duration is approximately 5ms. What frequency would you expect to hear if the GSM RF signal was rectified and output by a speaker?

about 1/5ms or 200 Hz.