OFDM based 802.16.3 PHY Proposal

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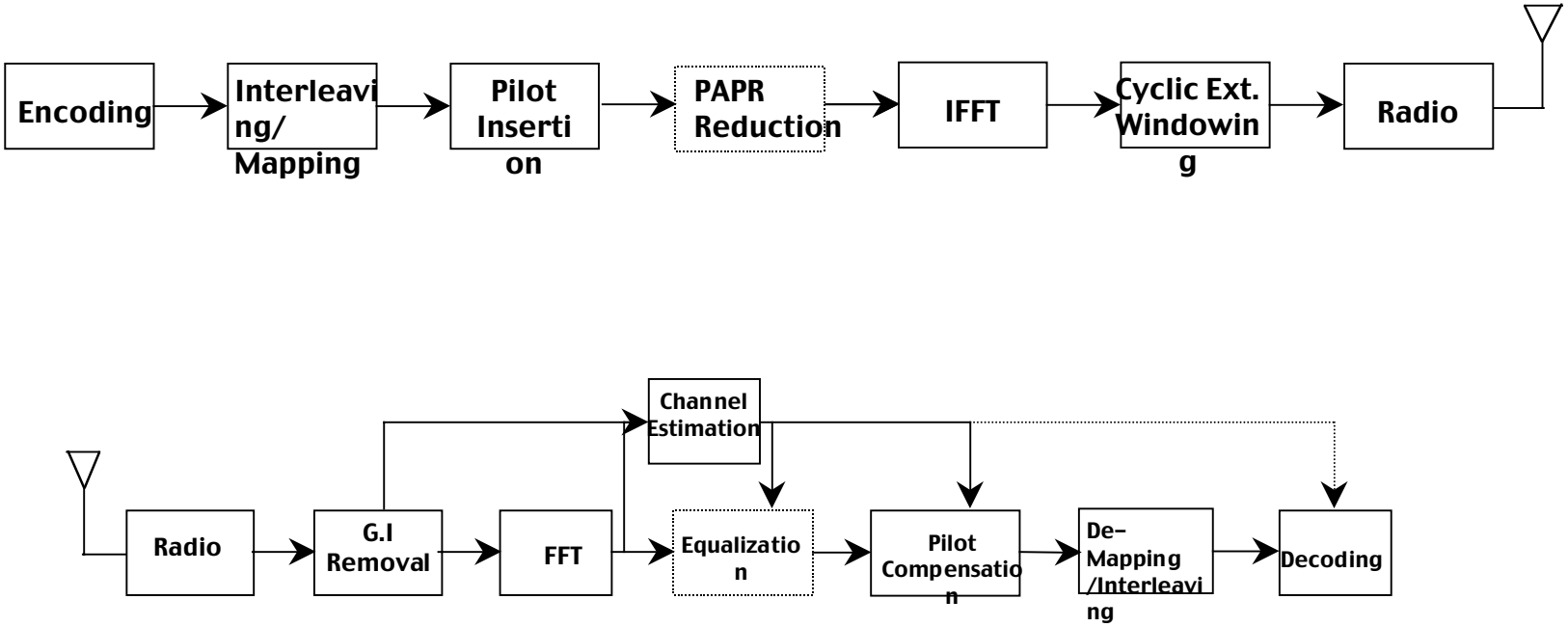
Purpose:

802.16.3 PHY proposal for presentation, discussion and decision

OFDM based PHY

- **Transmit & Receive chain**



DFT sizes

- Channel bandwidth support from 1.5 through 28 MHz
- Advantages of large DFT size:
  - Less overhead due to guard-interval
  - Steeper roll-off at band-edge, allowing higher occupied bandwidth
- Disadvantages of large DFT size:
  - Reduced carrier spacing means increased sensitivity to phase noise and carrier offset estimation errors, meaning tighter specifications and lower receiver sensitivity
  - Higher processing power means more expensive components
- 3 solutions for large bandwidth range support:
  - Constant DFT size with varying sub-carrier spacing
    - => Disadvantage: Wildly varying sub-carrier spacing, symbol and frame durations, varying performance in sensitivity
  - Constant DFT Constant sub-carrier spacing with sub-carrier nulling
    - => Disadvantage: Maximum sampling rate for low-bandwidth/performance devices
  - Varying DFT with with similar sub-carrier spacing

DFT sizes

- **Varying DFT with with ANSI/ETSI sub-carrier spacing**

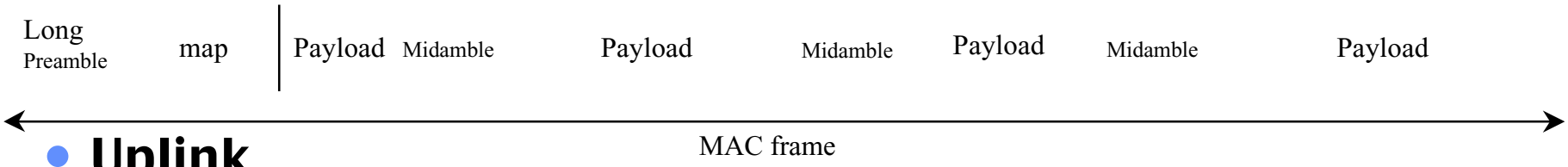
						raw data rate (Mbps)	
MHz	FFT #	pilots	data carriers	subcarrier spacing (kHz)	symbol duration (us)	BPSK-1/2, ~4 us guard	64QAM-3/4, ~1 us guard
1.5	64	4	48	23.44	42.67	0.51	4.95
1.75	64	4	48	27.34	36.57	0.59	5.75
3	128	6	106	23.44	42.67	1.14	10.92
3.5	128	6	106	27.34	36.57	1.31	12.70
6	256	8	216	23.44	42.67	2.31	22.26
7	256	8	216	27.34	36.57	2.66	25.87
12	512	16	432	23.44	42.67	4.63	44.52
14	512	16	432	27.34	36.57	5.32	51.74
24	1024	24	872	23.44	42.67	9.34	89.86
28	1024	24	872	27.34	36.57	10.75	104.44

  - **Advantage: Low-performance/bandwidth devices are not burdened by high-performance/high-bandwidth device requirements and have constant sensitivity performance.**

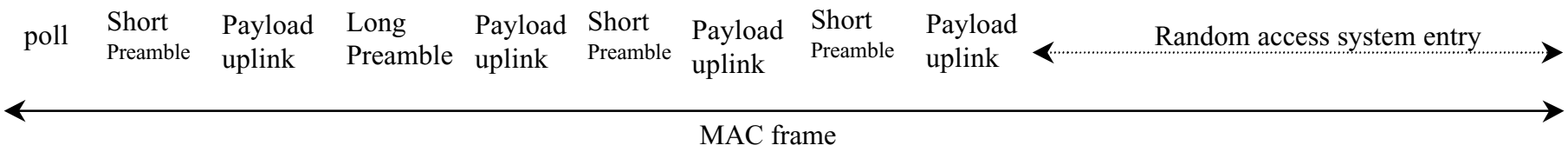
- **Various guard intervals should be supported as a system configurable parameter.**

FDD mode

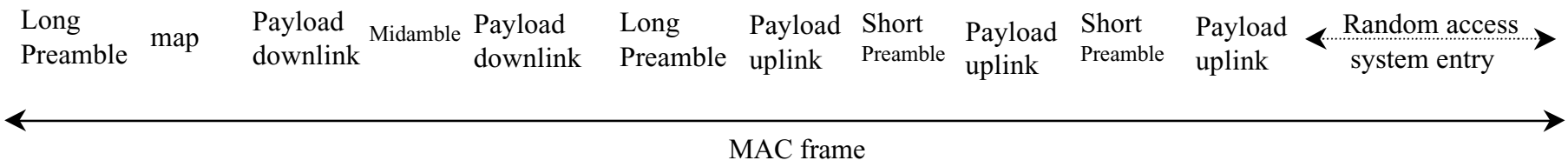
- **Frame size in the order of 10 ms (+/– 200 symbols).**
- **Downlink**
  - **Map followed by data in increasing modulation order**
  - **Midambles are used to mitigate changes in the channel etc..**



- **Uplink**
  - **Single sub-carrier polling to see if device has data with threshold detection**
  - **Data sent with short and long preambles as needed**
  - **A number of adjacent symbols need to be left for random access system entry**



TDD Mode



- **BS sends all data concatenated, as in FDD downstream**
- **CPEs use long and short preambles as required**

- **Concerns with broadcast standards in TDD mode**

OFDMA Mode

- Using OFDMA requires tighter specification of frequency offset, AGC variation and sampling clock offset errors.

  => Increased cost and complexity ?

  => Requires more investigation

- Possibility to assign all sub-carriers to each user allows OFDMA as optional mode.