Technical University of Denmark

High Capacity Radio-over-Fiber Links at 75-300 GHz

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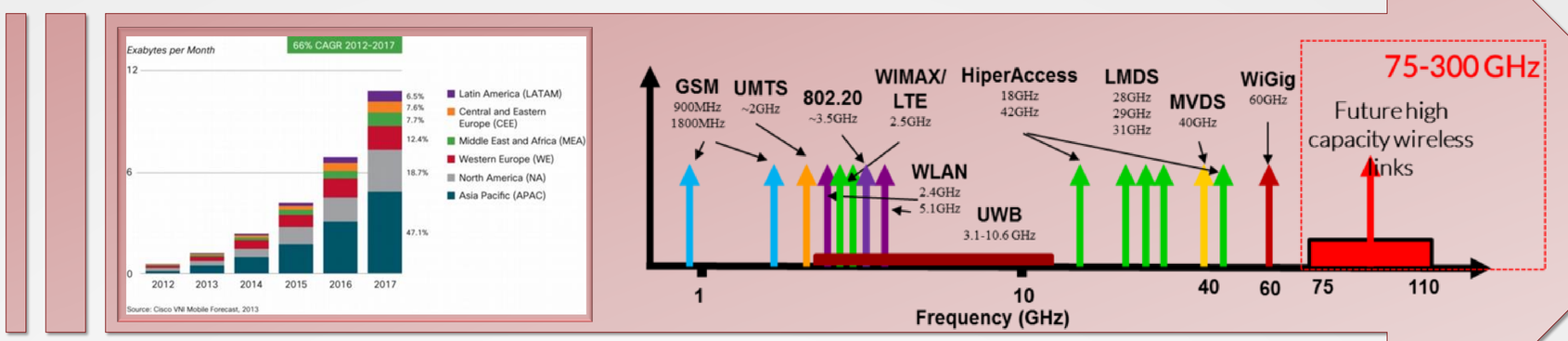
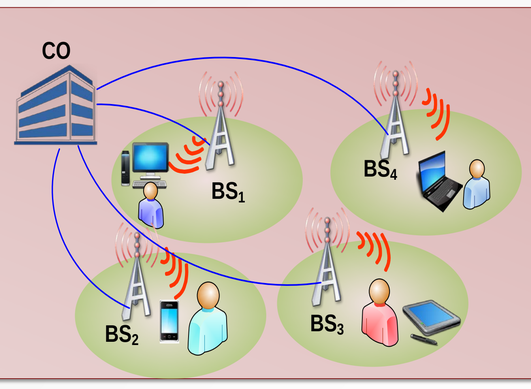
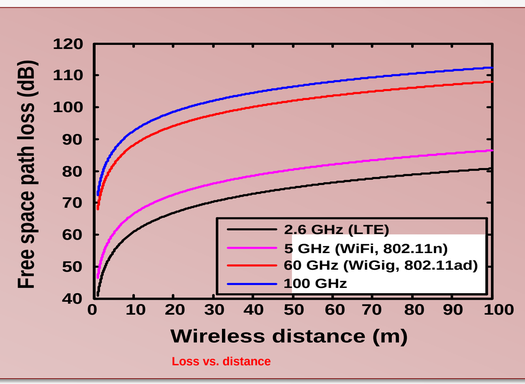
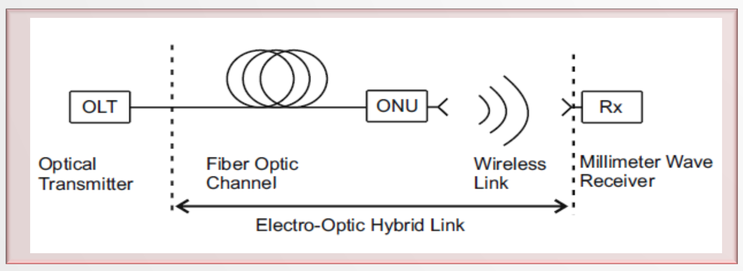






Loss vs. distance

- Radio over Fiber (RoF) represents a hybrid concept
  - Fiber
    - high bandwidth and low losses
    - continuously increasing bandwidth
  - Wireless
    - flexibility and mobility
    - lower capacity
    - operation in higher frequencies



- Advantages of using RoF at W-Band
  - Bandwidth (in terms of bits/s) is not a problem
    - Already developed technology, from optical communications
  - Transport over long distances (or short if one wishes)
    - Generators do not need to be next to the antenna
  - Very good scalability
    - Splitting and amplifying not really a problem in optics (*somehow*)

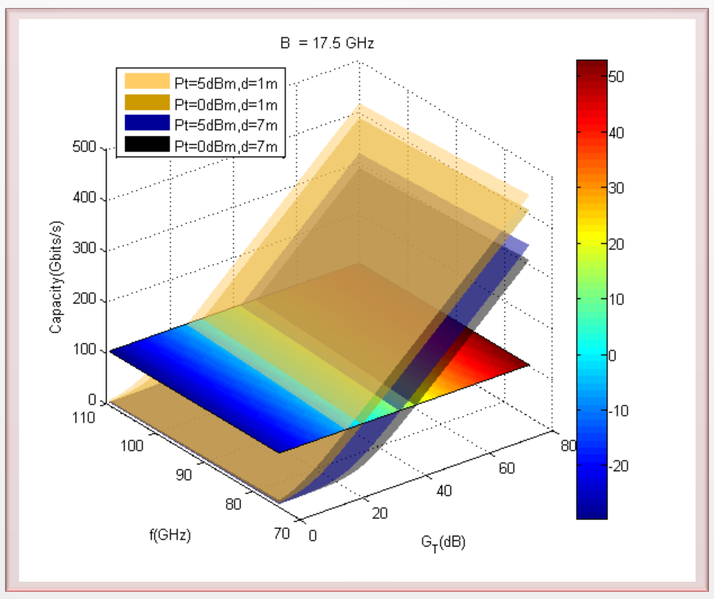
- Current work
  - Channel model for hybrid composite fiber-wireless
  - Use of advanced modulation formats

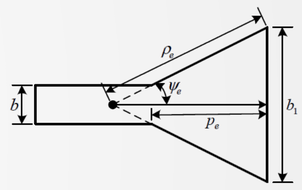
How far can we go?

$$C = BW.ld|1 + SNR|$$

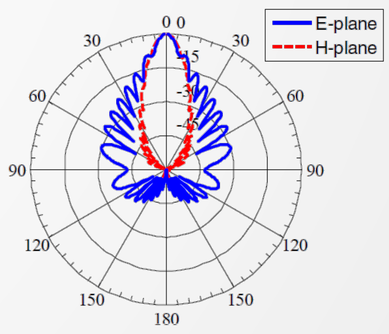
$$SNR = P_T + G_T + G_R - L_{FS} - IL - (N_0 + 10log_{10}B + NF)$$

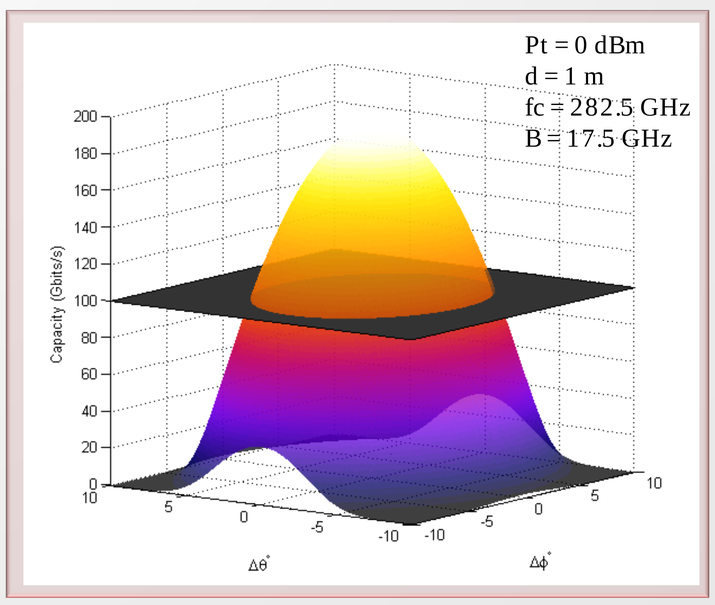
$$L_{FS} = 20\log_{10}\frac{4\pi f d_0}{c} + 10n\log_{10}\frac{d}{d_0}$$





$$G(\emptyset,\theta) = G_0.e^{-\left(\frac{\emptyset,\emptyset_0}{\sigma_{g,\emptyset}}\right)^2}.e^{-\left(\frac{\theta,\theta_0}{\sigma_{g,\theta}}\right)^2}$$





- Photonic technologies enable high capacity wireless links:
  - 100 Gbps wireless transmission
  - Transmission over different types of fibers
  - DSP techniques fairly mature
  - Bidirectional wireless-optical fibre bridge