Linkage of RF Generation and Time-base Clocking

Jamshid Khun-Jush
Ericsson Eurolab - Nürnberg
Co-ordinator of HIPERLAN-2 Standard Area &
Chair of Physical Layer Technical Specification Group

Non-linked Sources

- Worst case drift between carrier frequency source and timing clock source
  - 40 ppm
- Tolerable phase shift for 16QAM
  - $(4*17^o + 8*22{,}5^o + 4*45^o)/16 = 26.75^o$
- Tolerable time shift
  - Let the numbering of subcarriers be from -32 to 31
  - A sampling time shift (50 ns) corresponds to $26/32*180^o$ phase shift
  - 26.75^o tolerable phase shift results in a tolerable time shift $(50ns*26.75^o*32)/(26*180^o) = 9.15$ ns
- Maximum burst length
  - 9.15ns/40ppm = 229 us corresponding to 57 OFDM symbol

⇨It is too short and necessitates the use a (very) fast closed loop for tracking of symbol timing.

Linked Source

- Assuming a frequency acquisition accuracy in the order 2% of sub-carrier spacing
  - With a max. frequency error 20ppm*5GHz, the 2%*(20MHz/64) frequency error after fine frequency acquisition corresponds to

➪1.25 ppm frequency error which allows a much longer max. burst length and makes the use of a very slow closed loop for tracking of symbol timing possible

➪ Conclusion: The linkage of clocks enables a reduced complexity receiver implementation