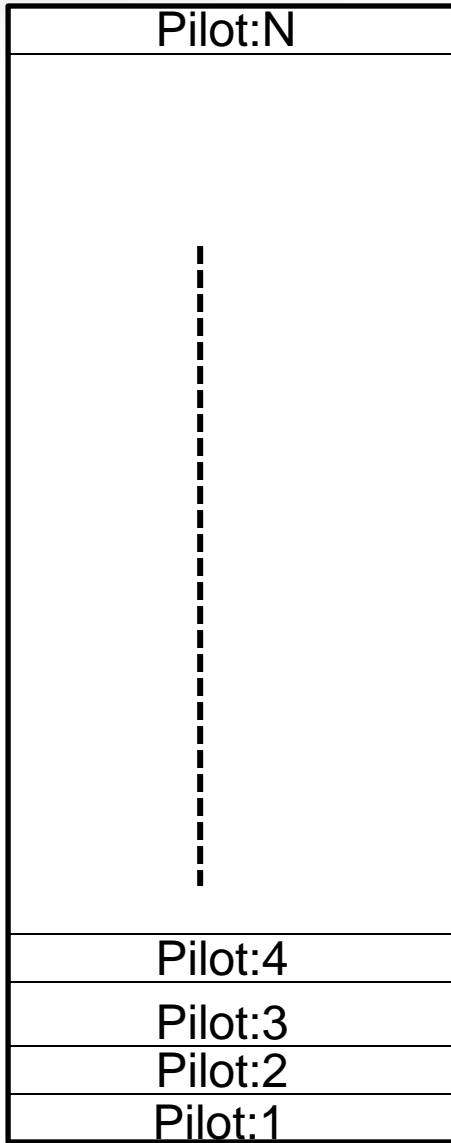
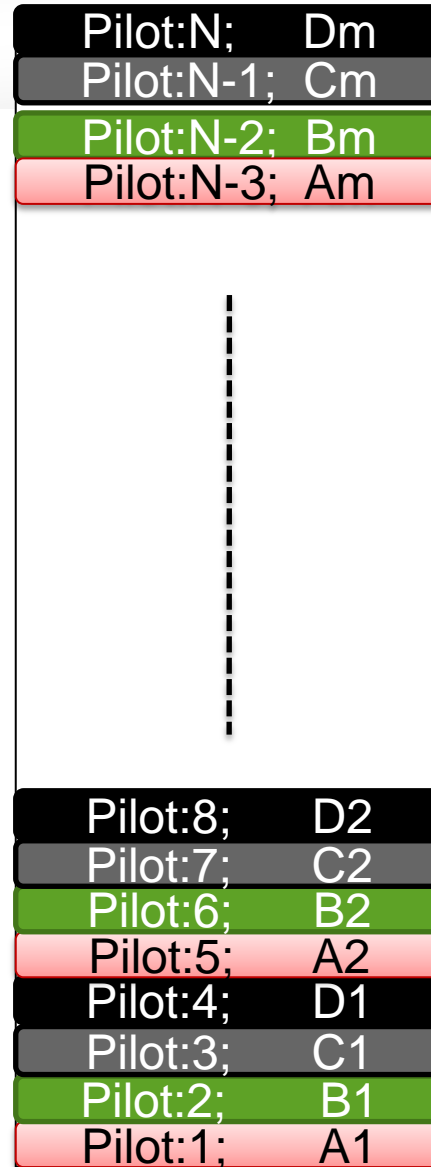


Simulation results for upstream probing in EPoC

Syed Rahman



Probing one CNU in a symbol



Probing 4 CNUs in a symbol

Example of Probing 4 CNUs in 1 Symbol:

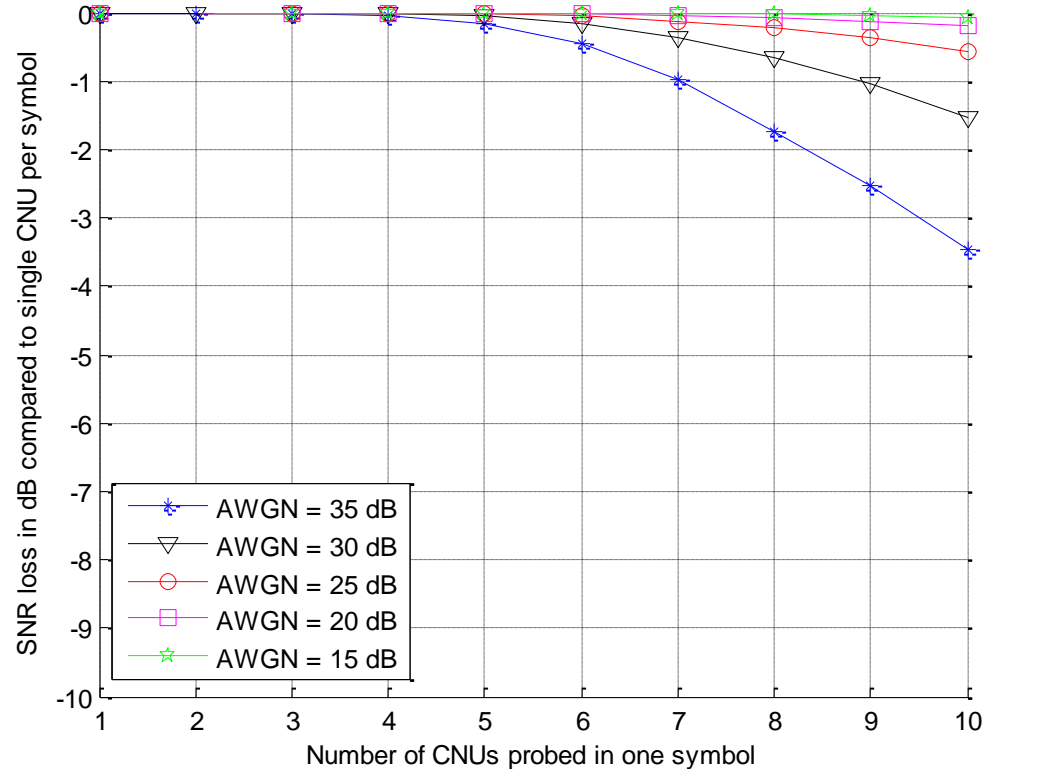
- A1,A2,...,Am are pilots for CNU A
- B1,B2,...,Bm are pilots for CNU B
- C1,C2,...,Cm are pilots for CNU C
- D1,D2,...,Dm are pilots for CNU D

Simulations:

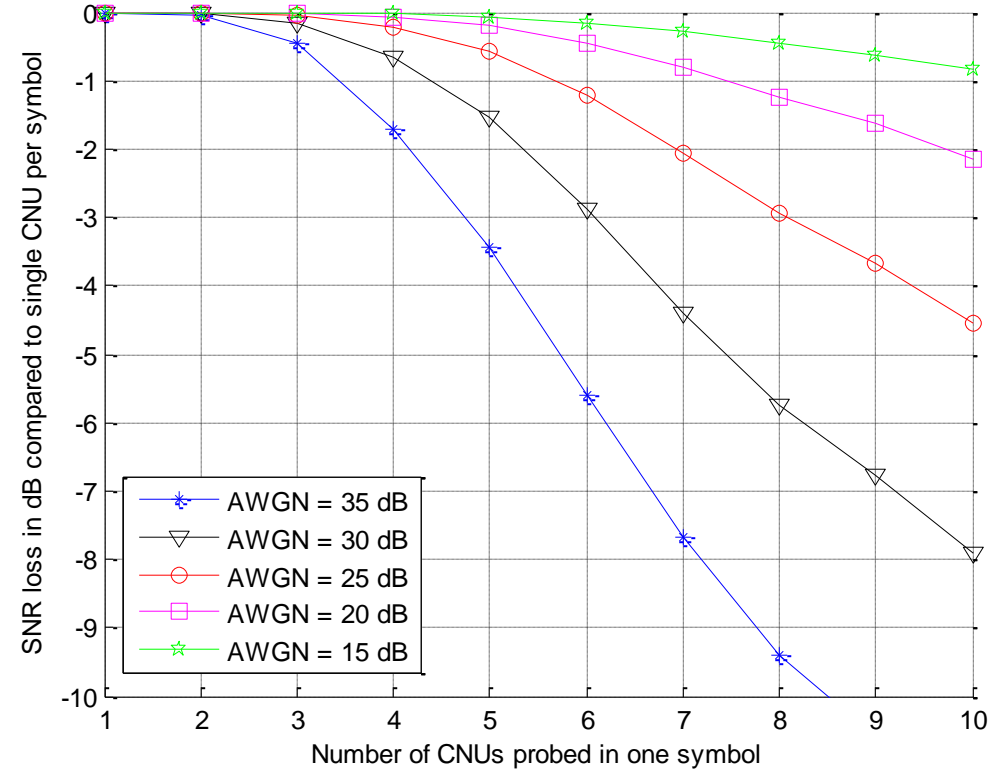
- Multipath
- Input AWGN of 15,20,25,30,35 dB.
- 1000 iterations of averaging.
- Probing sequence used is a BPSK PN sequence.
- The plots show the SNR difference between the equalized signals of the following two cases: 1) multiple CNU's probed in a single OFDM symbol and 2) single CNU probed in a single OFDM symbol

97% Multipath case: -16/-22/-29/-35/-42/-51 dB at 0.5/1/1.5/2/3/4.5 micro seconds.

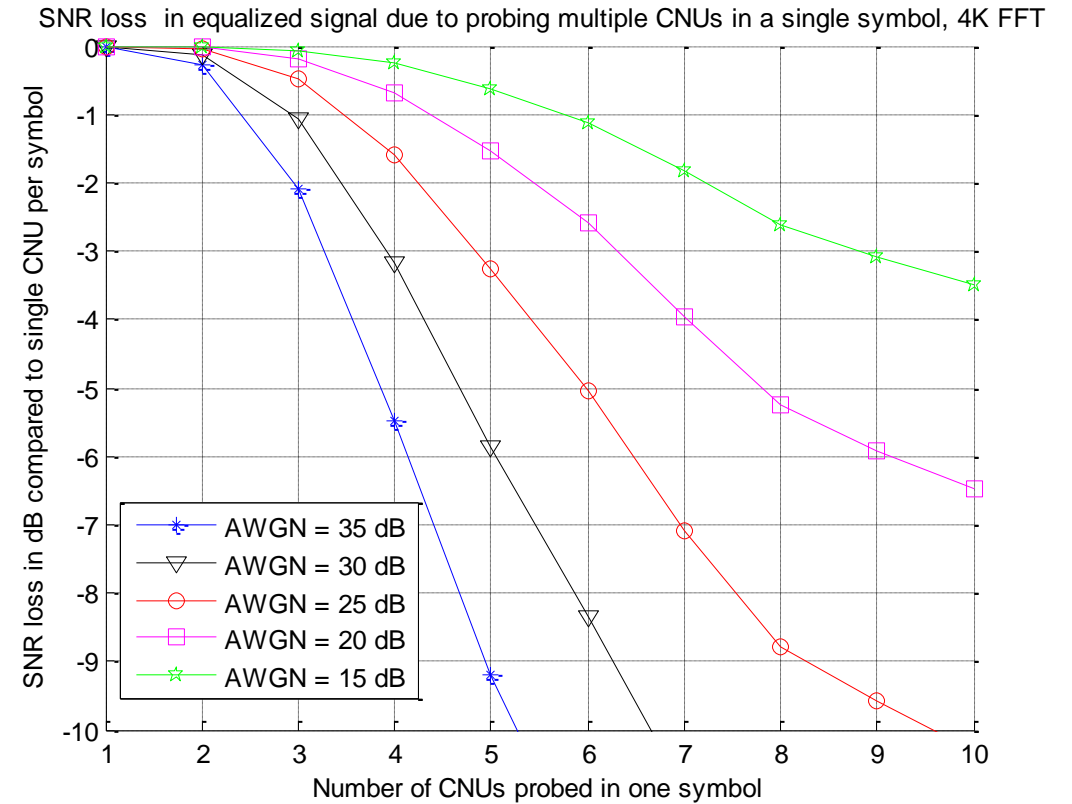
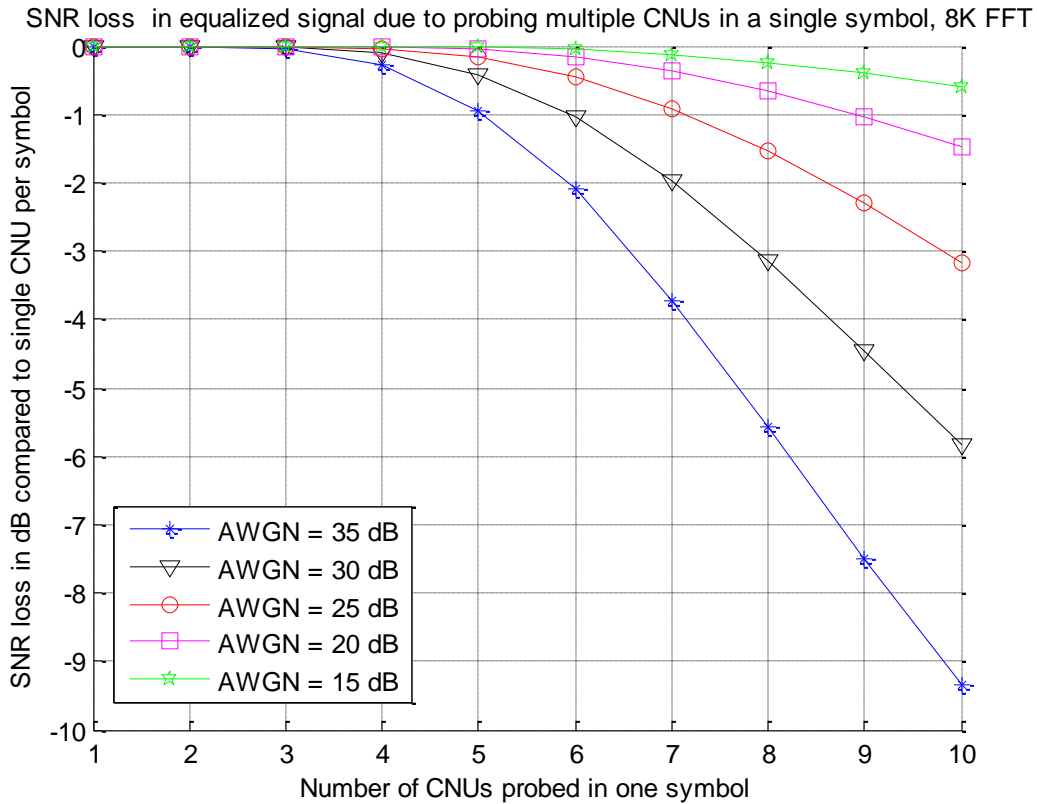
SNR loss in equalized signal due to probing multiple CNU in a single symbol, 8K FFT



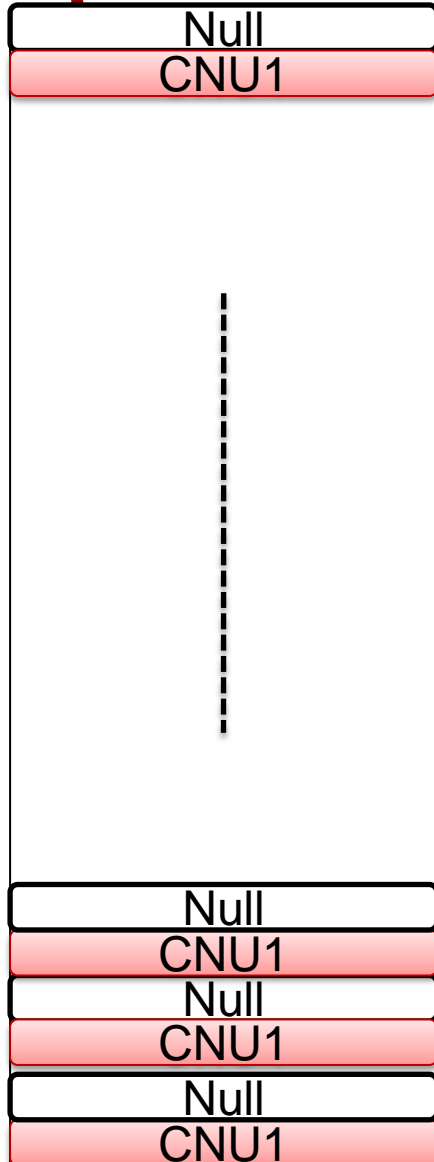
SNR loss in equalized signal due to probing multiple CNU in a single symbol, 4K FFT



Extreme Multipath Case: -10/-15/-20/-30 dB at 0.5/1/1.5/2 micro sec delay



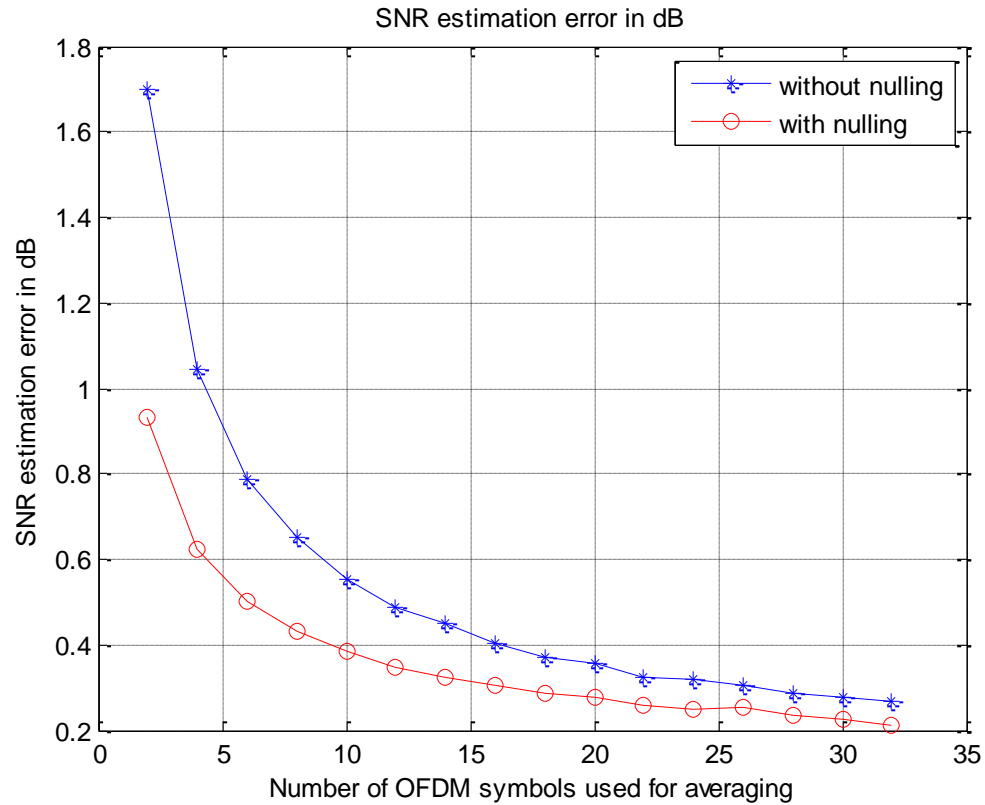
Improved Sub-carrier SNR measurement accuracy



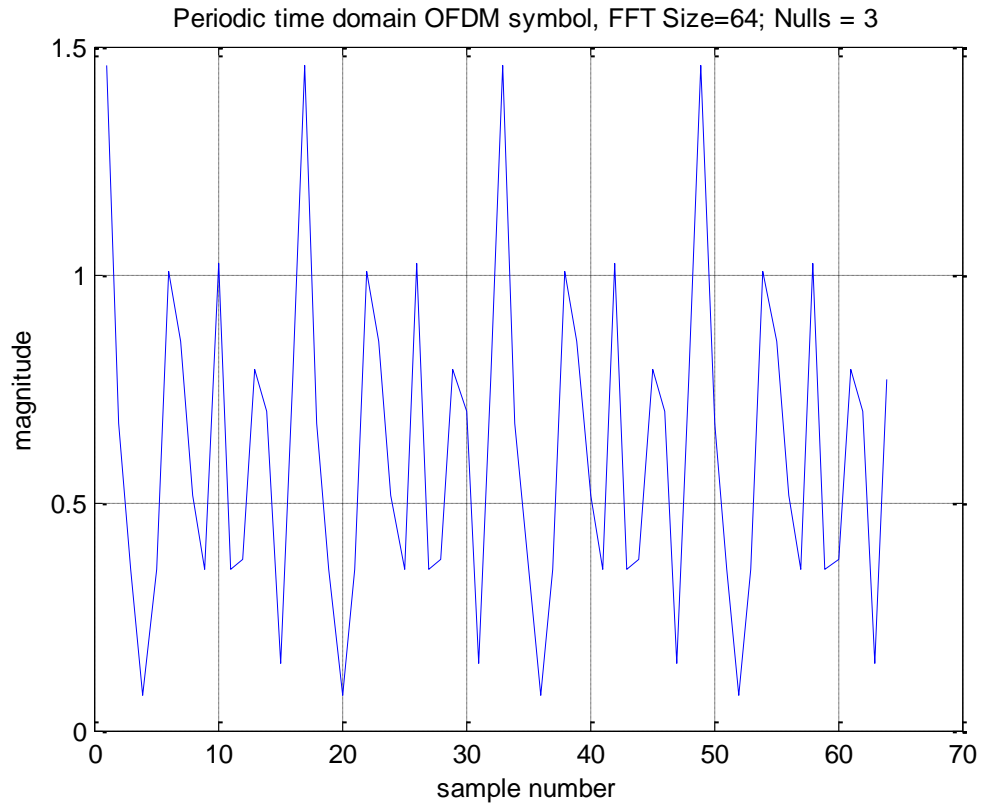
Null sub-carriers provides more accurate SNR measurement

The pilots could be separated by configurable number of Null sub-carriers, from zero to 15.

Sub-carrier SNR measurement accuracy



Using Nulls for Estimating Channel impulse response



Separating successive pilots by N null sub-carriers, results in a time domain OFDM symbols with $N+1$ Periodic repetitions.

Advantages of Proposed Scheme

- Can probe multiple CNU's per probing symbol.
- Can improve sub-carrier SNR measurement accuracy of a CNU by assigning null sub-carriers.
- Null sub-carriers can be used to create periodically varying OFDM symbol for estimating channel impulse response.
- Can still assign all pilots to a single CNU if desired.
- Provides flexibility and CLT vendor differentiation.
- **Associated cost to the CNU is only 8 bits (for pilot mapping).**



Thank you
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