

Subcarrier Granularity for DS Bit Loading

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Goal

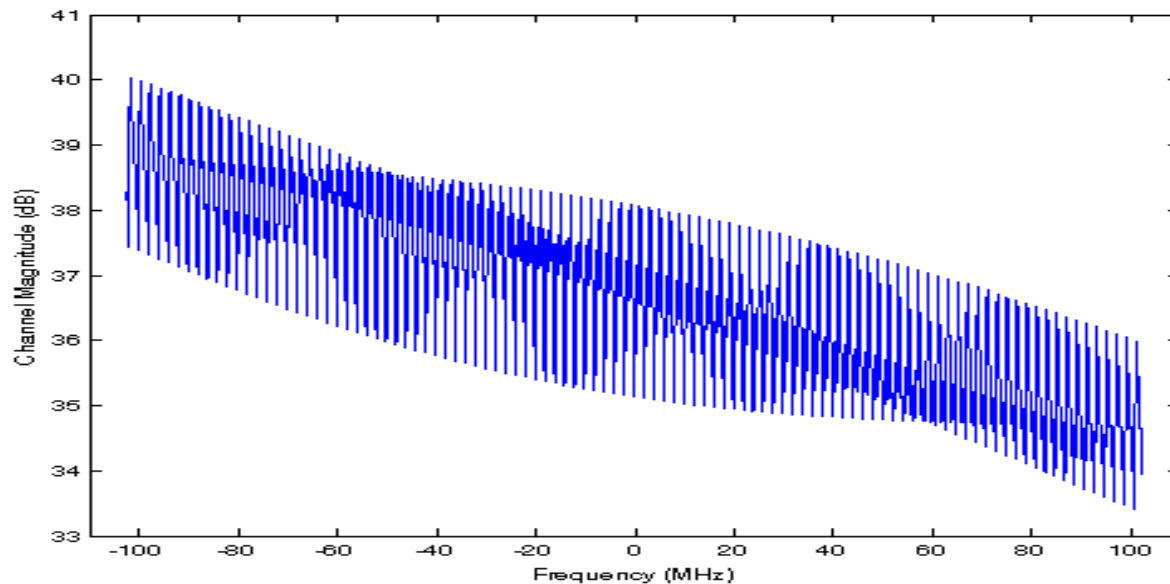
- EPoC FDD downstream uses single modulation profile.
- Single modulation profile needs to support bit loading for each sub-carriers or sub-carrier groups.
- Per-carrier bit loading has large overhead for control messages and memory.
- It is desirable to know if subcarriers can be grouped for bit loading.

Evaluation Method

- Use simple threshold-based bit loading algorithm.
 - SNR thresholds are obtained from AWGN simulations.
- Use baseline channel model.
 - Only consider echo channel, and amplitude tilt.
 - SNR is drawn randomly from statistics of field measurement performed by MSO.
 - Impact of other impairments on bit loading is for further study.
- Grouping of 2^n subcarriers, $n=0, 1, \dots, 10$
- Capacity is normalized w.r.t. per-carrier bit loading.
The percentage capacity loss can be read from plots.

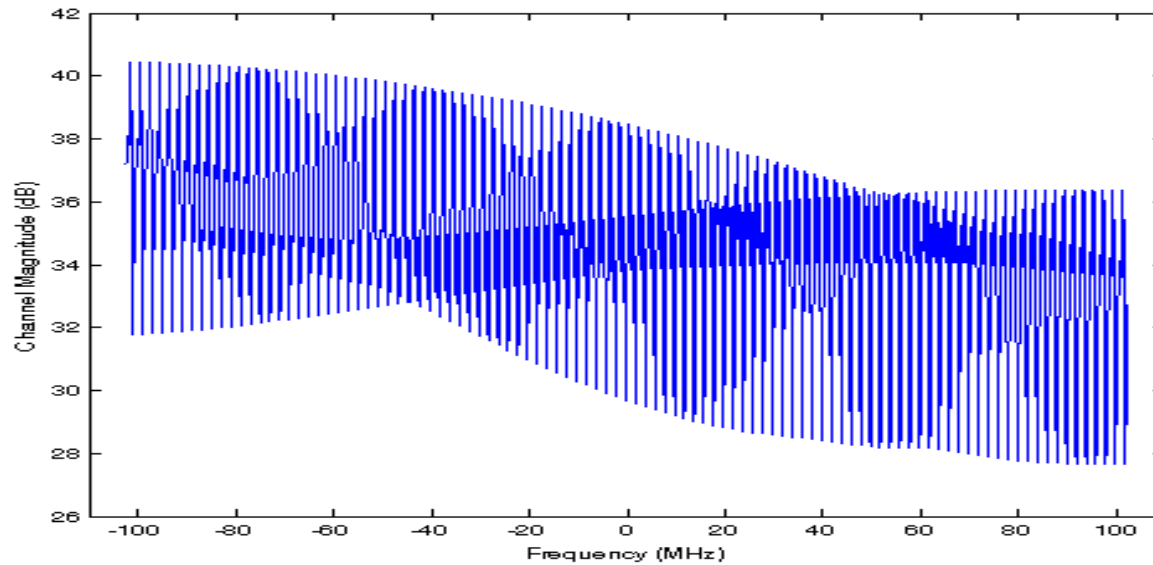
Channal-A

Delay (us)	0.5	1	1.5	2	3	4.5	5
Echo(dB)	-20	-25	-30	-35	-40	-45	-50
Amp. Tilt	0.02dB/MHz						

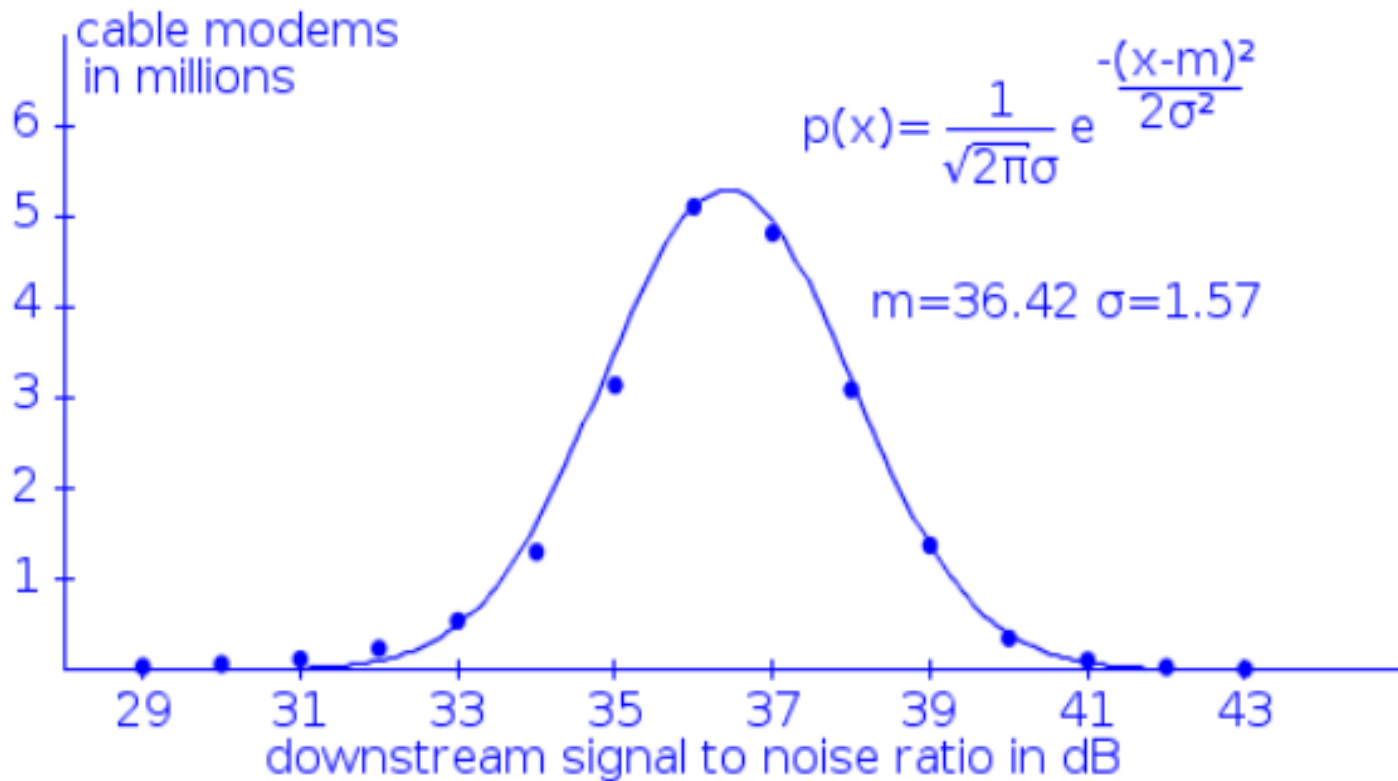


Channal-B

Delay (us)	0.5	1	1.5	4.5			
Echo(dB)	-10	-15	-20	-30			
Amp. Tilt	0.02dB/MHz						



SNR Statistics from MSO [1]

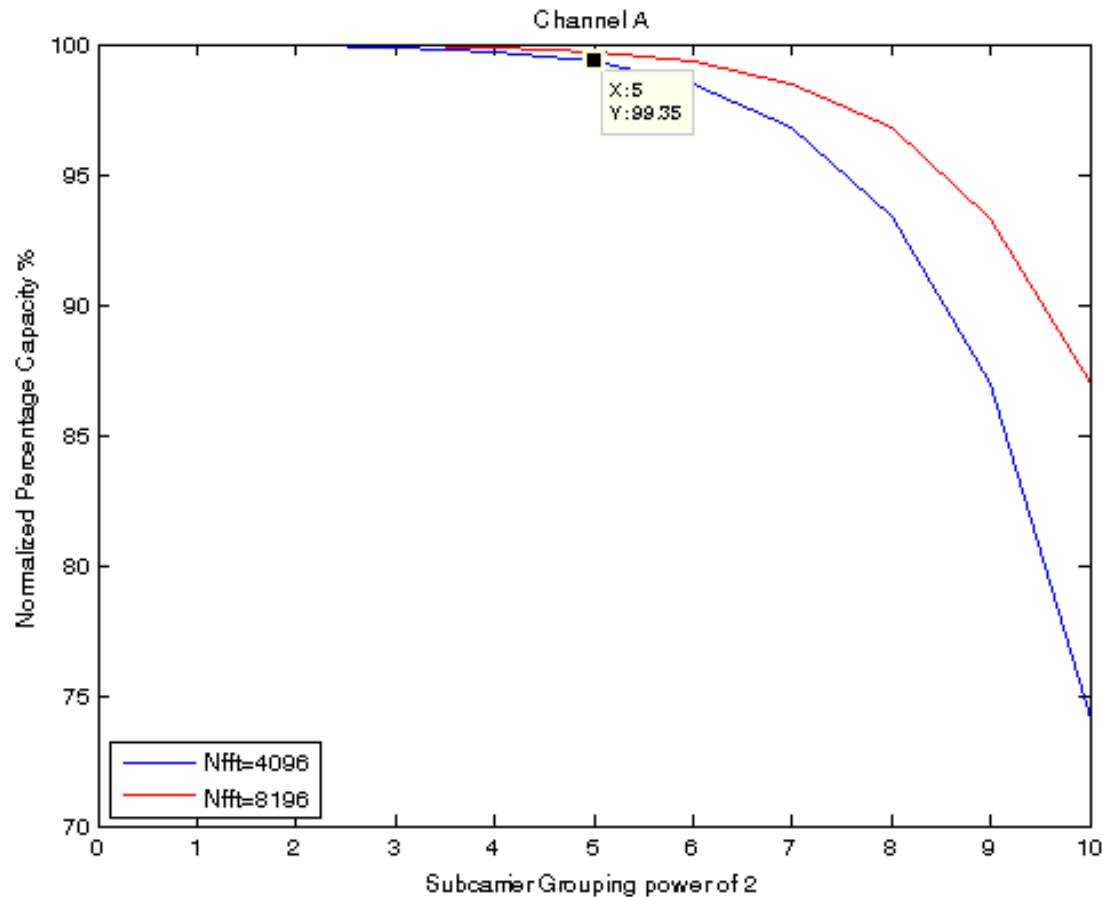


SNR Thresholds

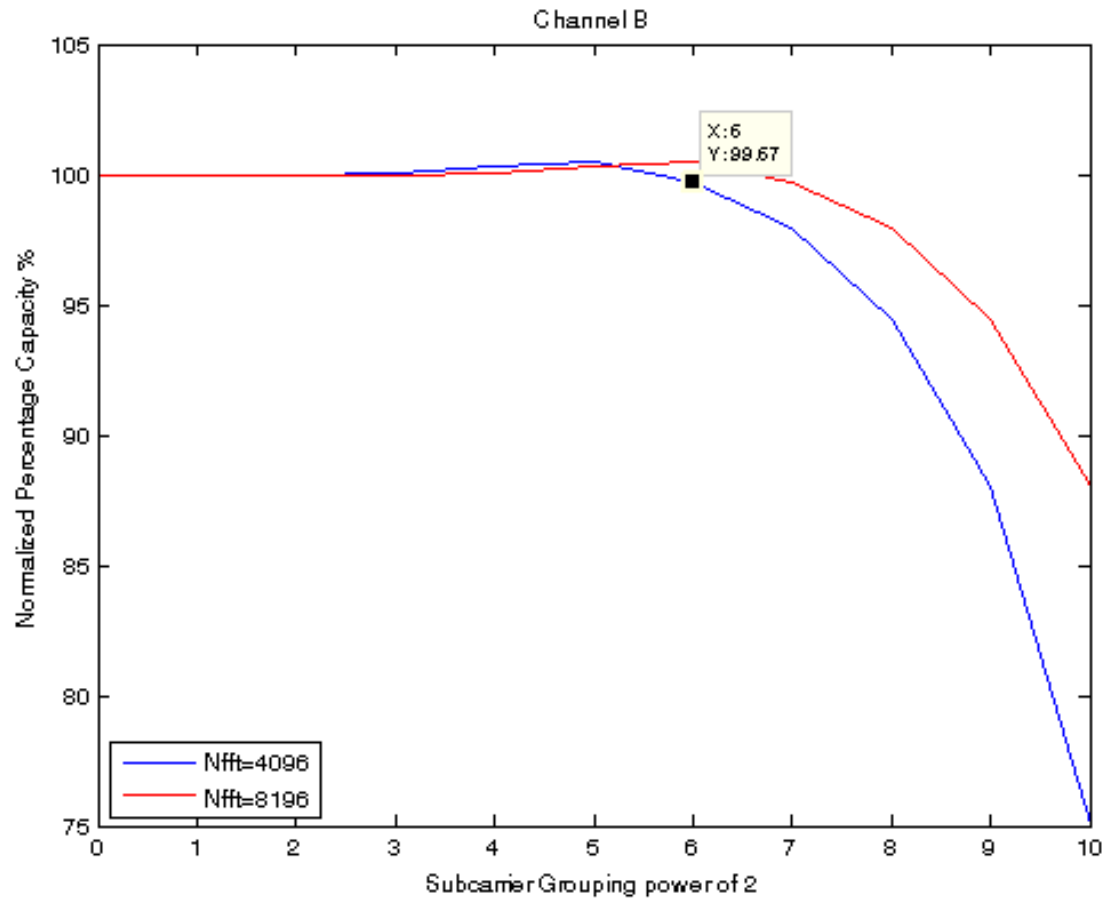
- Target WER=1e-6
- LDPC(16200,14400) w/ 30 iterations

Mod	16-QAM	64 QAM	128 QAM	256 QAM	512 QAM	1024 QAM	2048 QAM	4096 QAM
SNR (dB)	13.1	18.75	21.7	24.37	27.6	29.96	32.71	35.2

Evaluation Result – Channel A



Evaluation Result – Channel B



Conclusions and Further Study

- Preliminary results show it is promising to group subcarriers for bit loading.
 - Groups of 64 subcarriers still maintain 99% of capacity.
- Results need further fine-tune for the following factors:
 - Does Baseline Channel Model cover the worst case?
 - Does other impairments have more impact on bit loading?
 - Fine-tune the SNR thresholds for subcarrier grouping.