

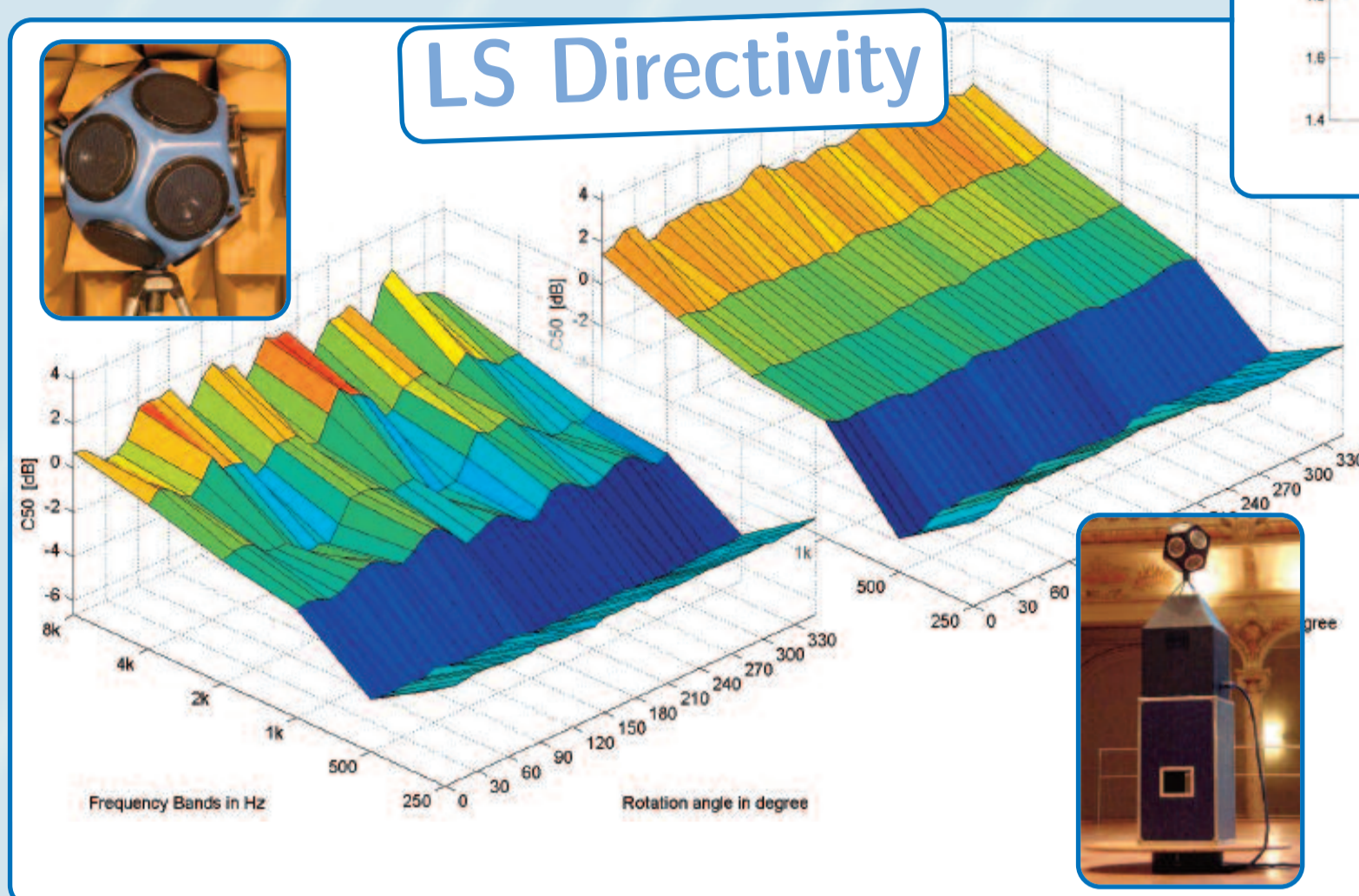
Influence of Loudspeaker Distortion on Room Acoustic Parameters

Motivation

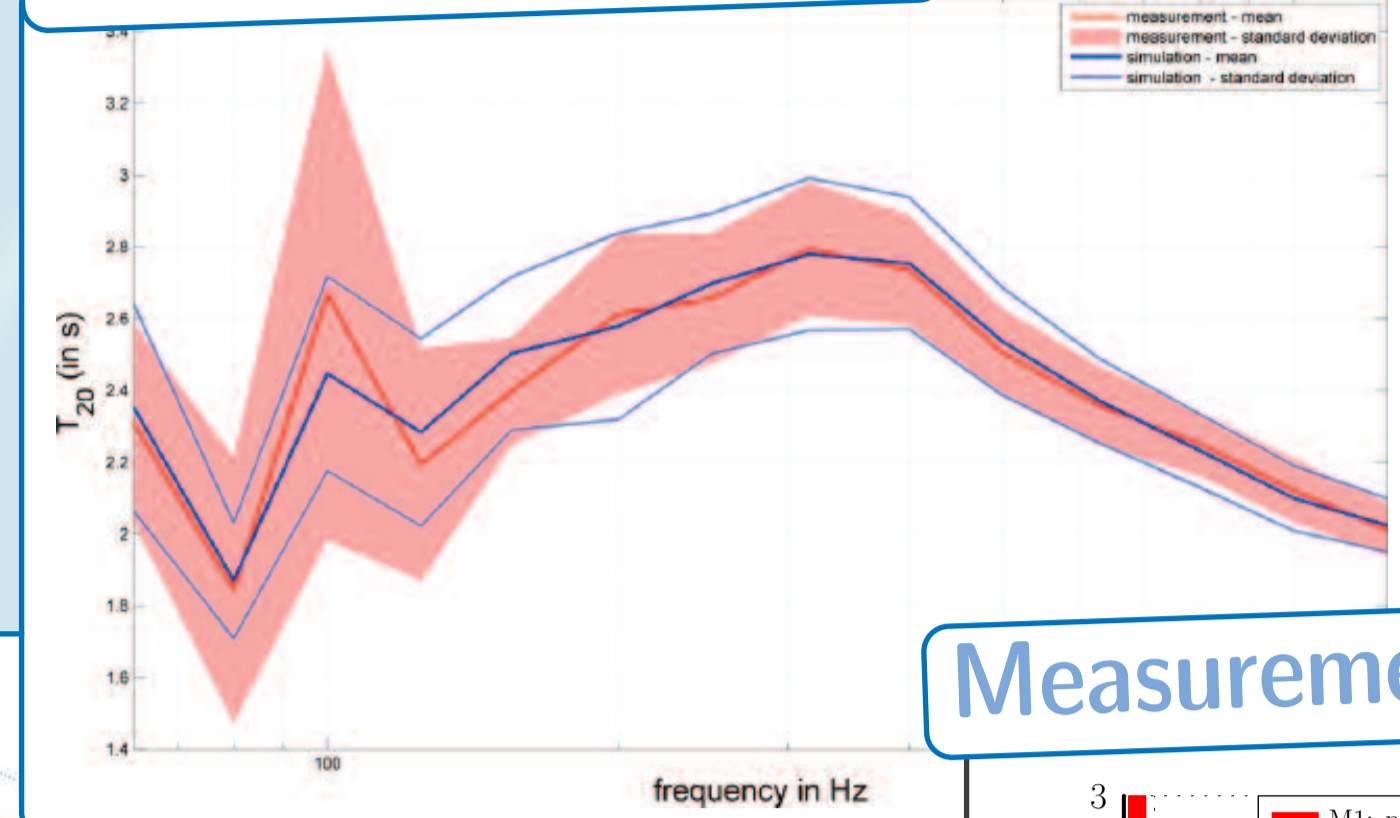
What has been investigated?

ISO 3382 parameters show influence on:

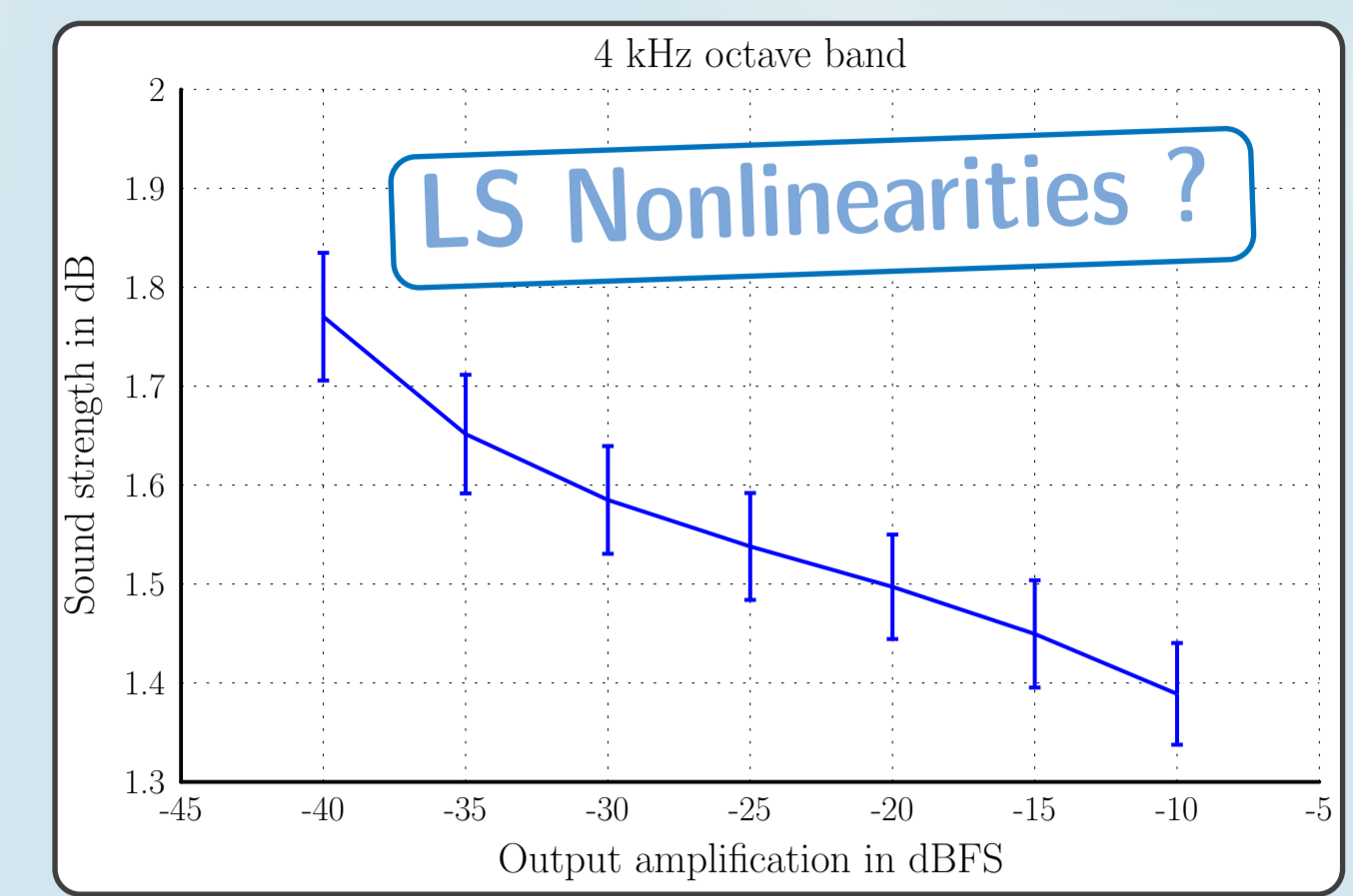
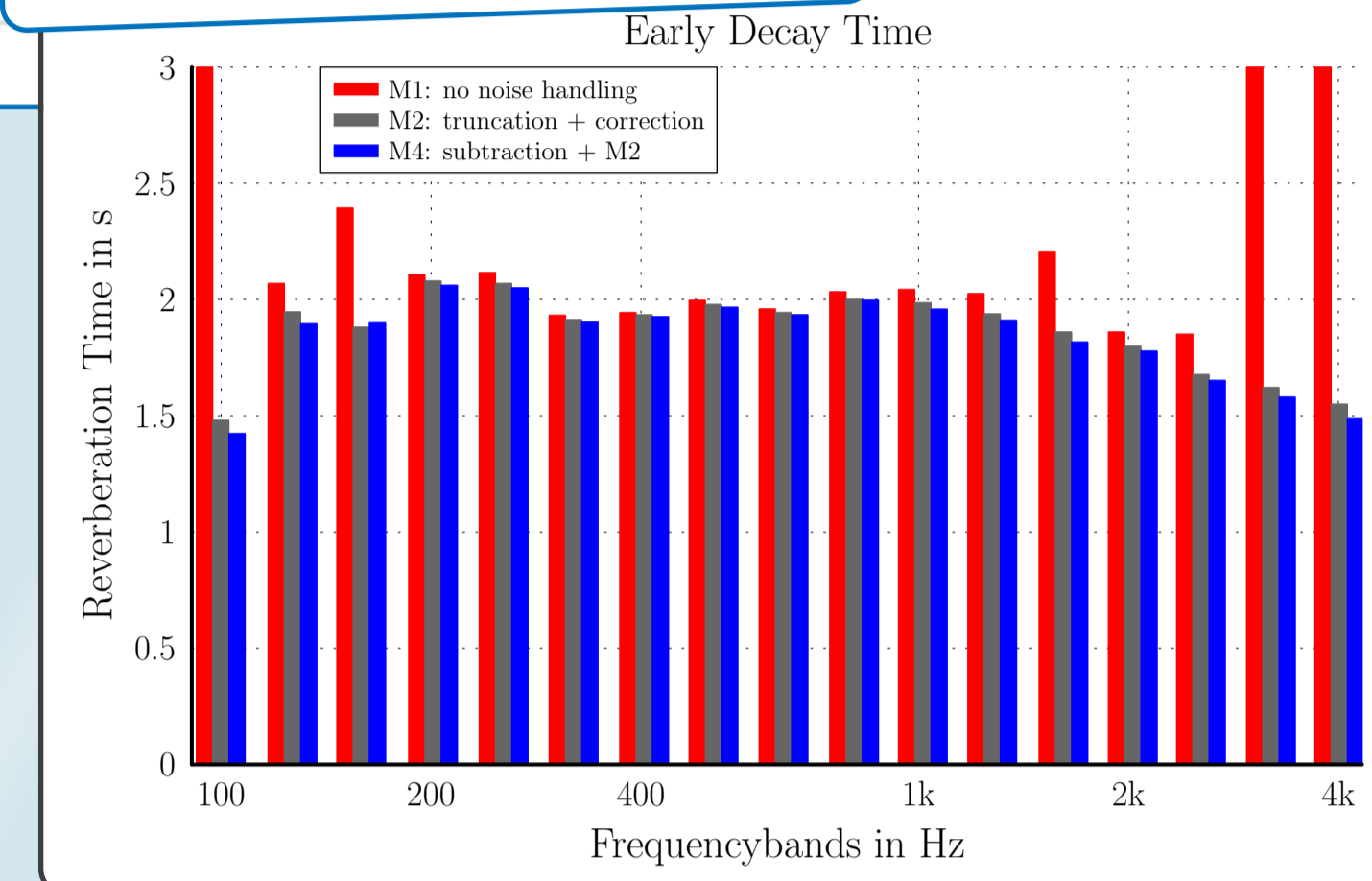
- Background noise
- Microphone and loudspeaker position
- Directivity pattern of microphone and loudspeaker (LS)



Variation of Position



Measurement Noise



References

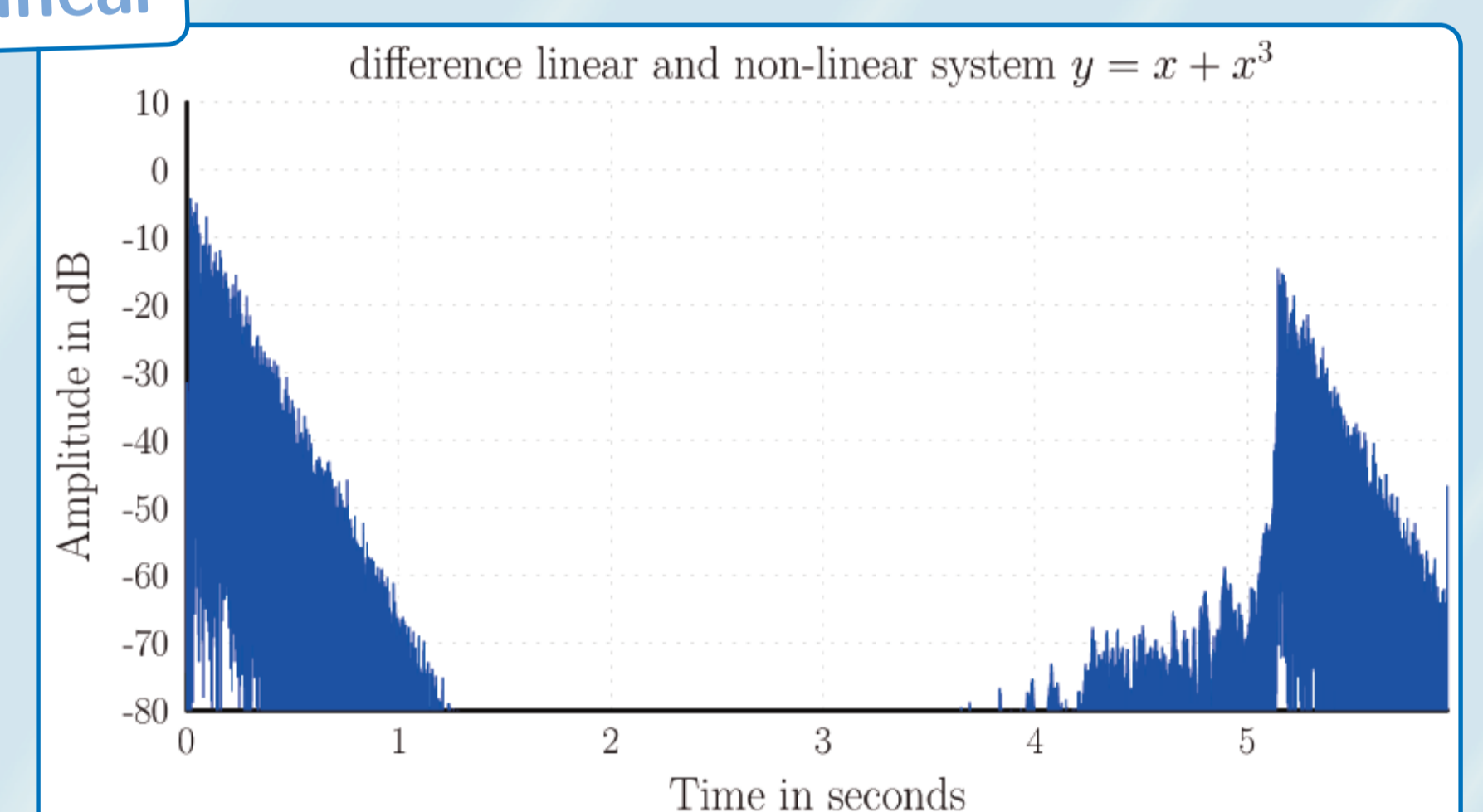
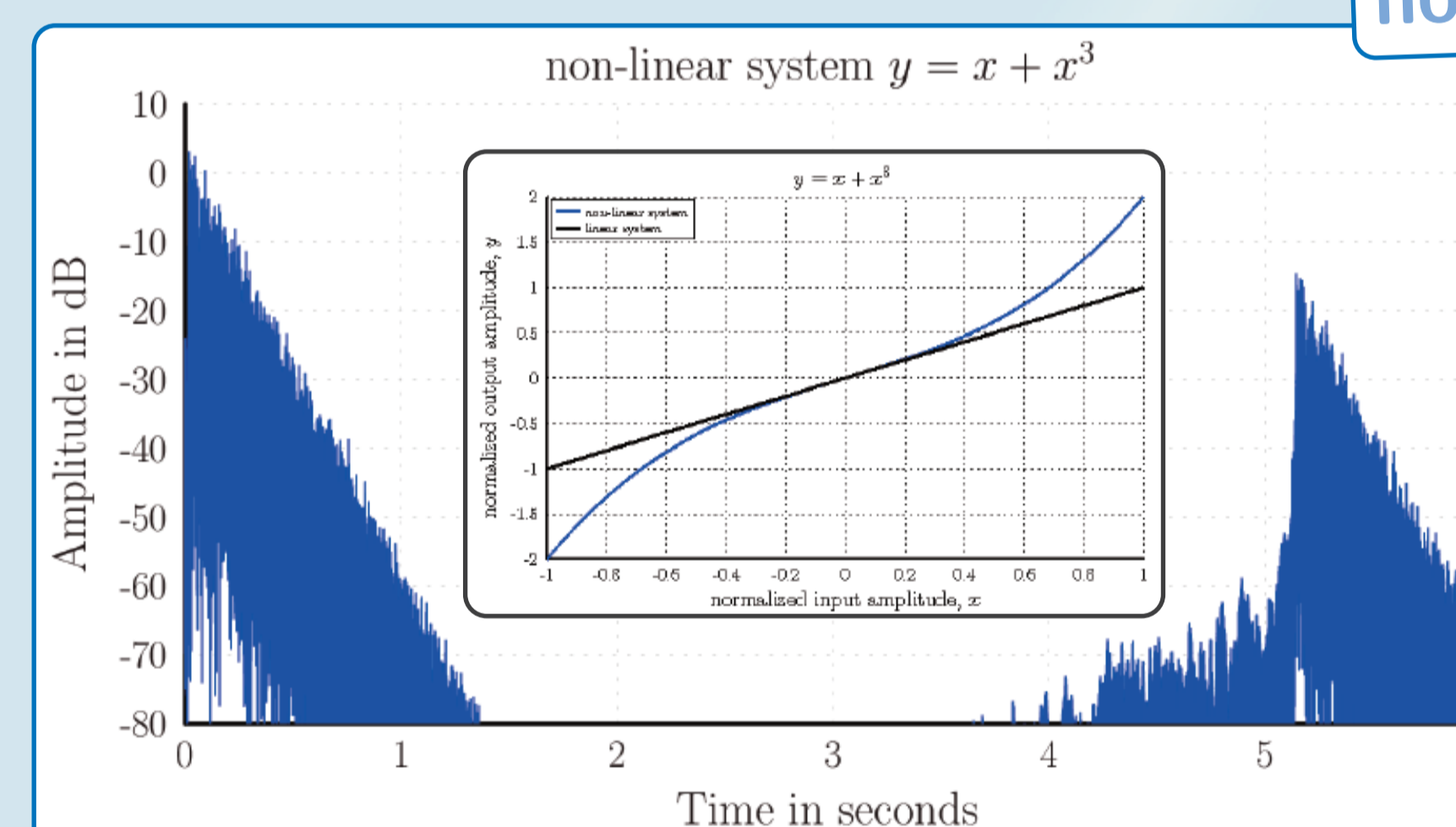
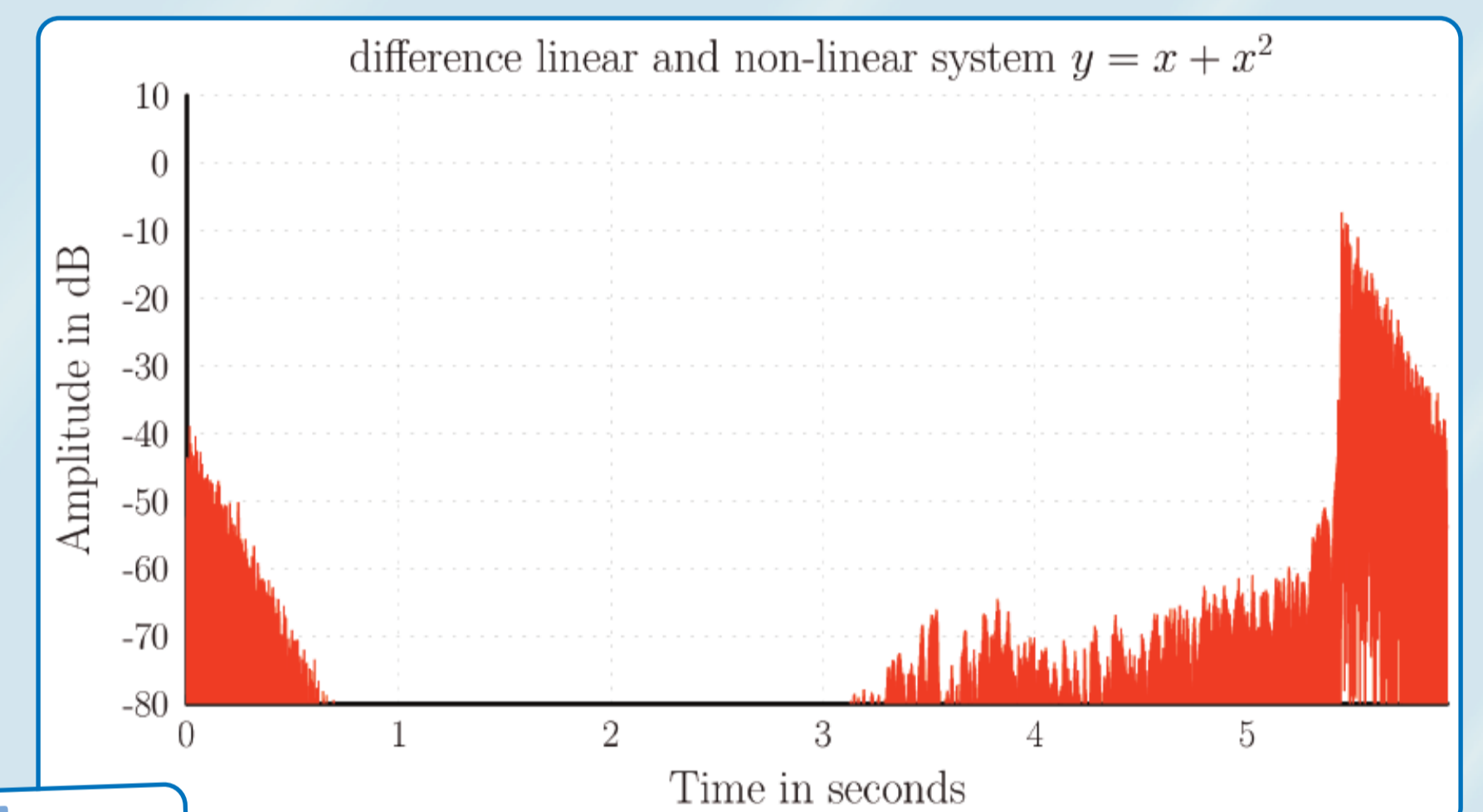
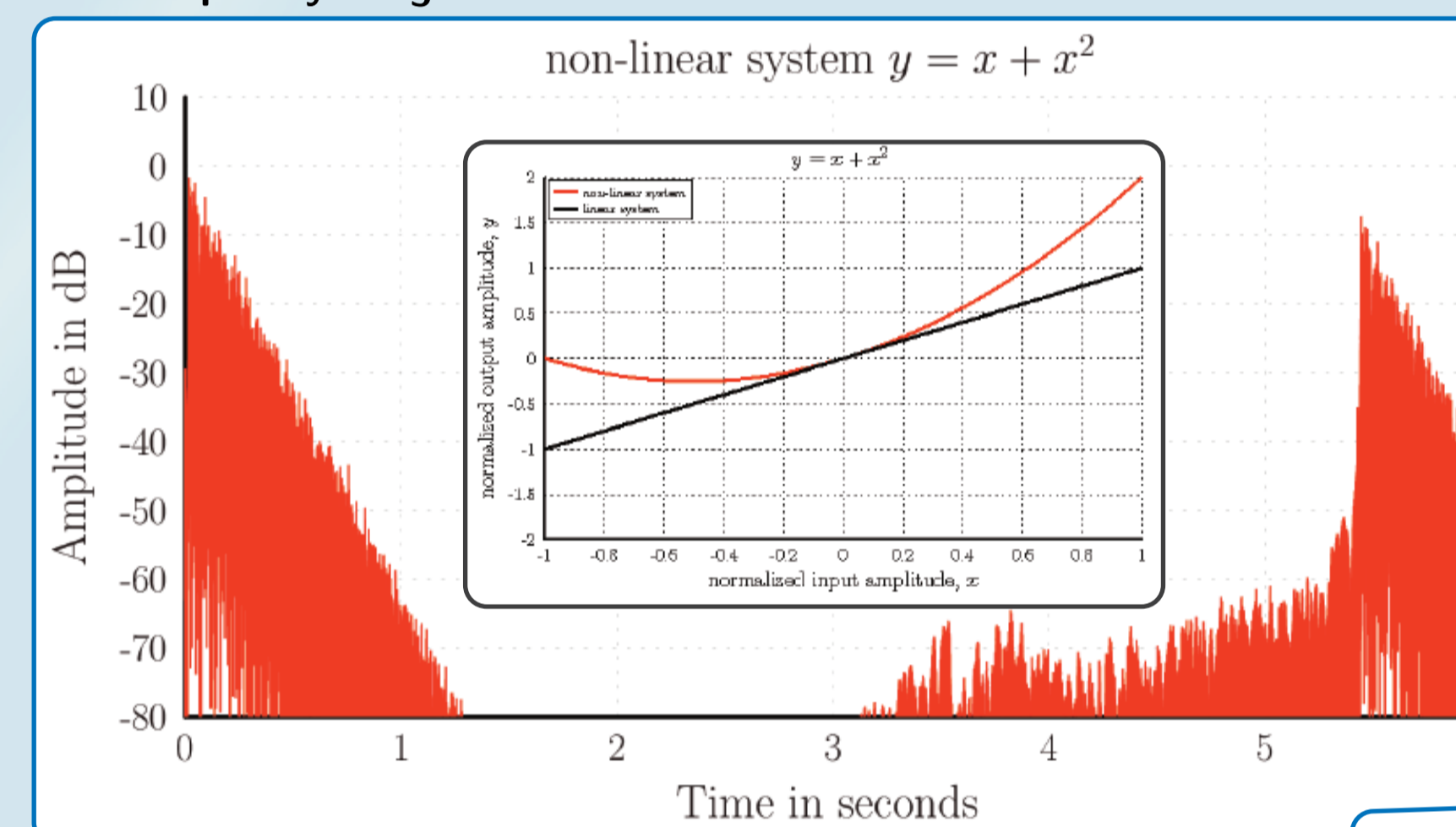
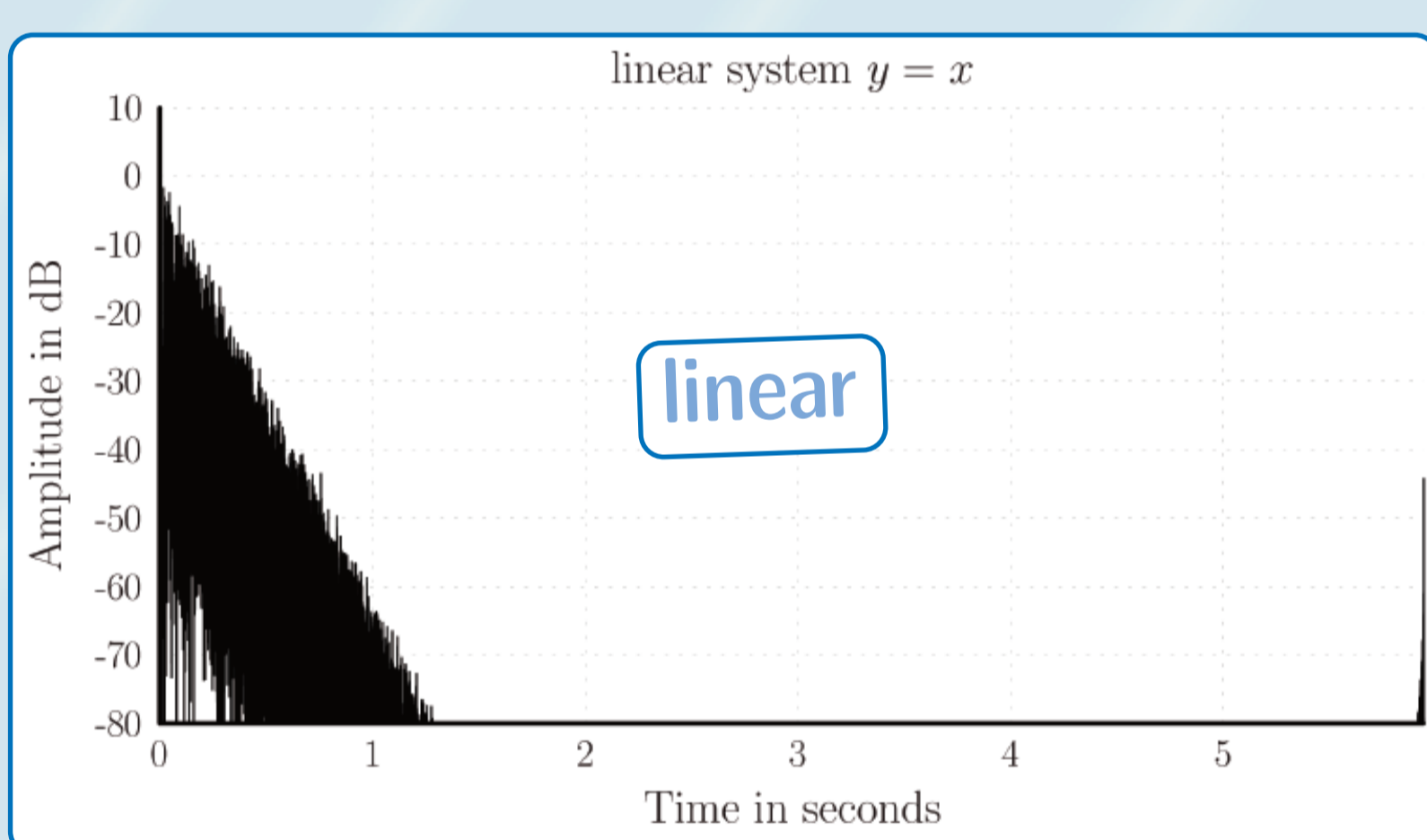
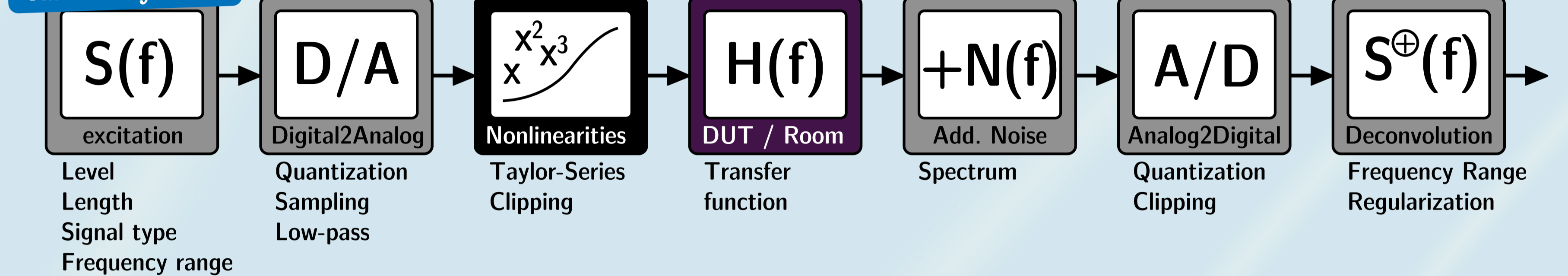
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Simulation Model

Emulation of Measurement Chain

- Predict influence of measurement method, e.g. excitation signal, deconvolution, frequency range
- Emulate quantization, hard clipping, non-linearities (simple Wiener-Hammerstein model) or noise (various shapes)
- Investigate influence on measurement of impulse response independently for each effect
- Implemented routines available as application inside open-source ITA-Toolbox for MATLAB

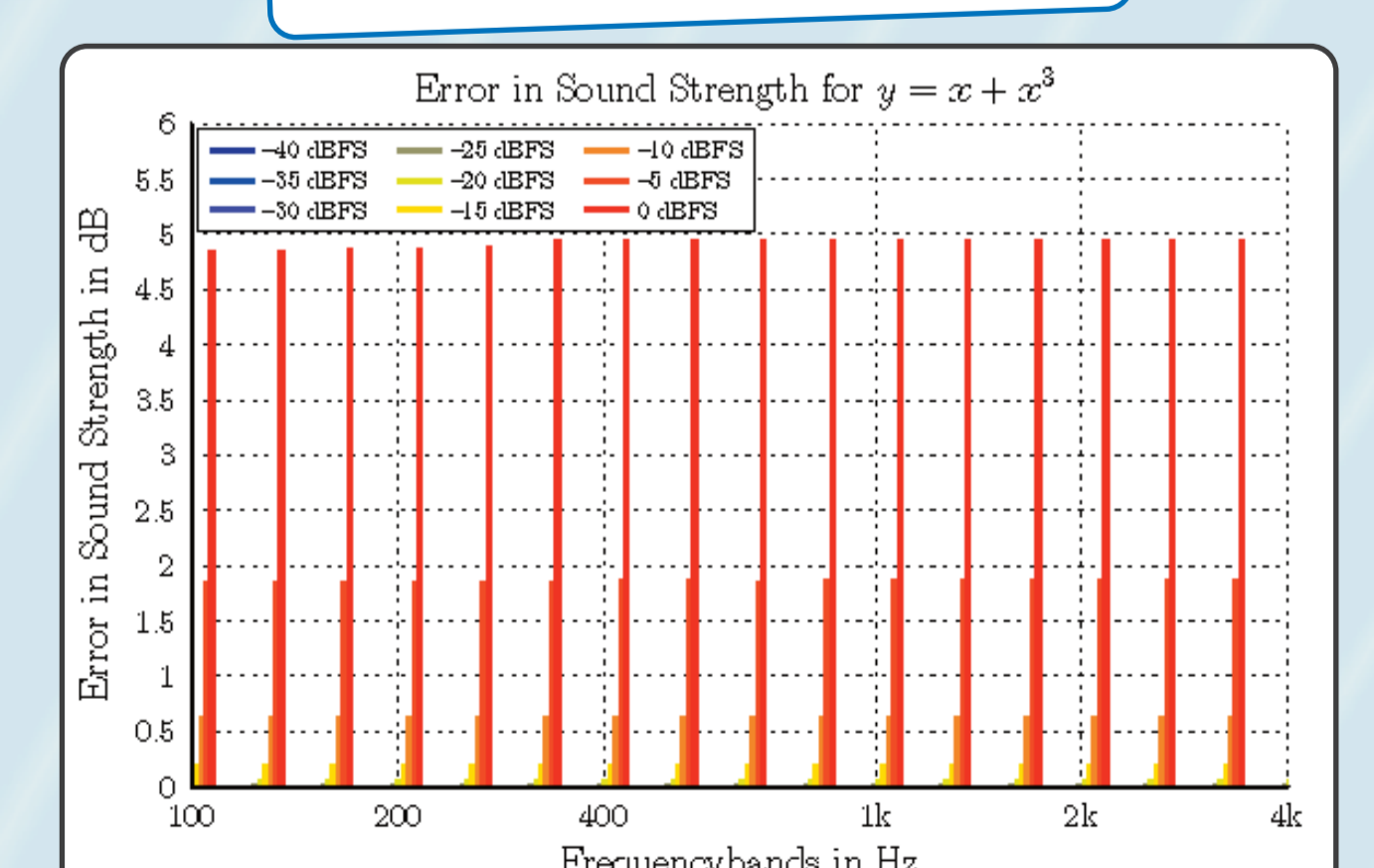
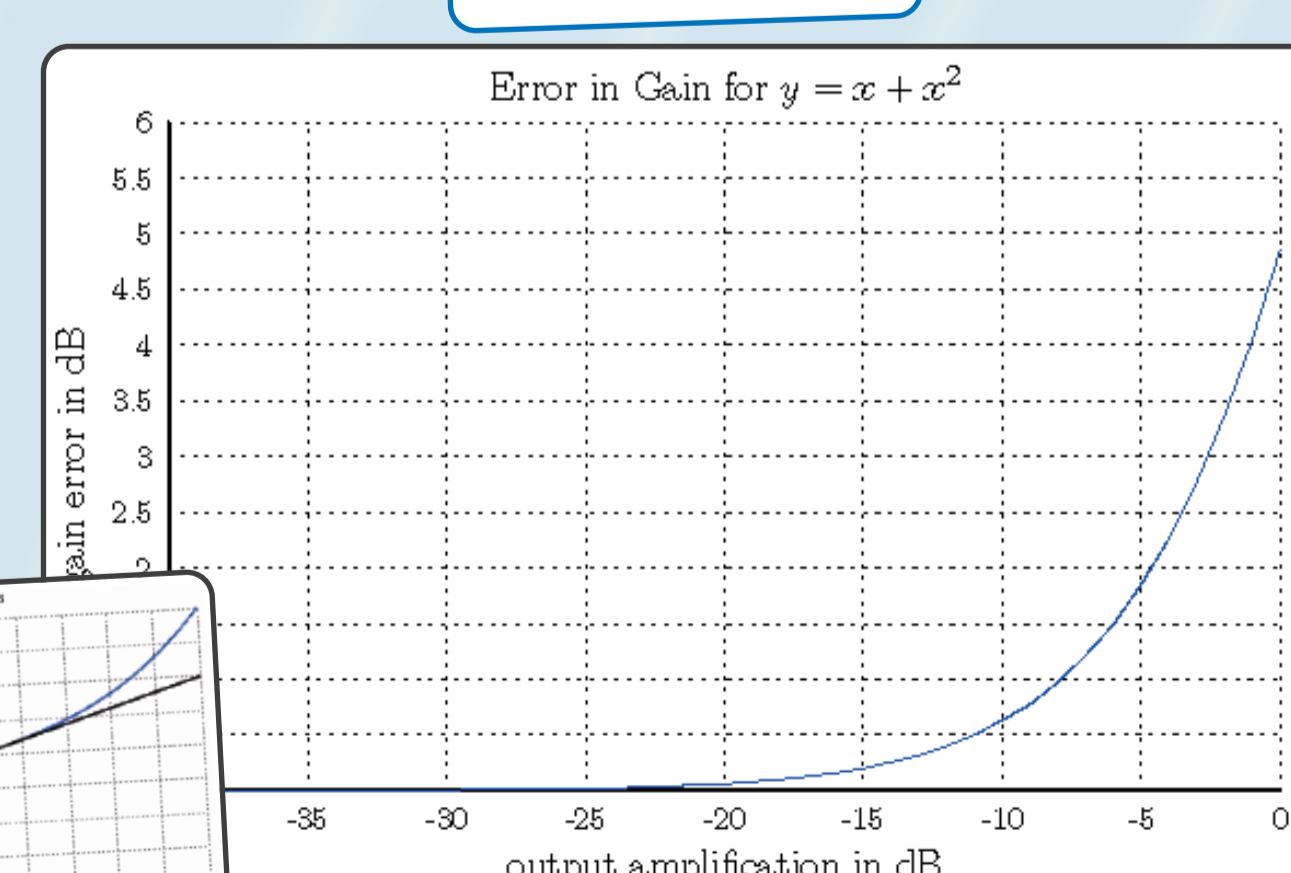
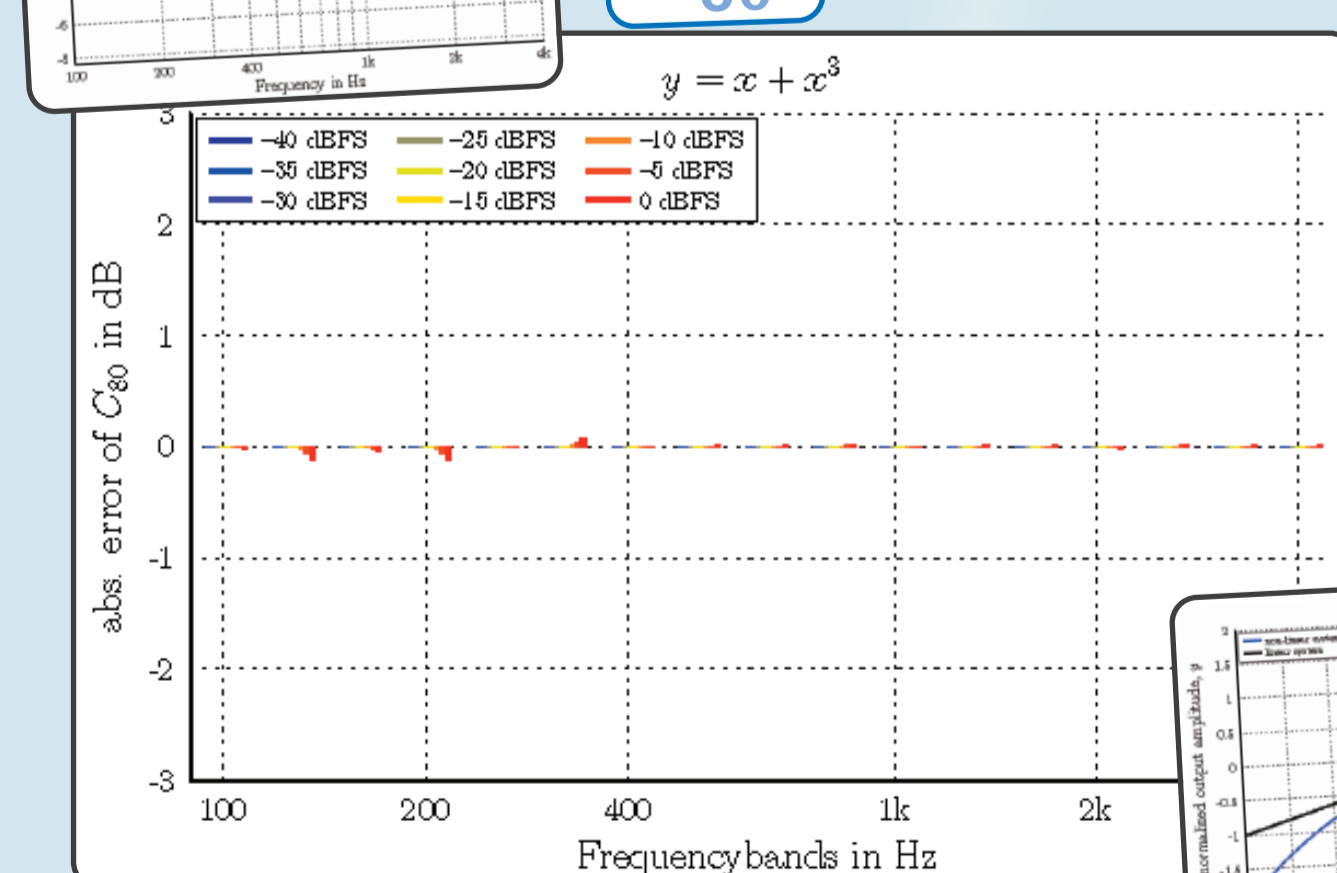
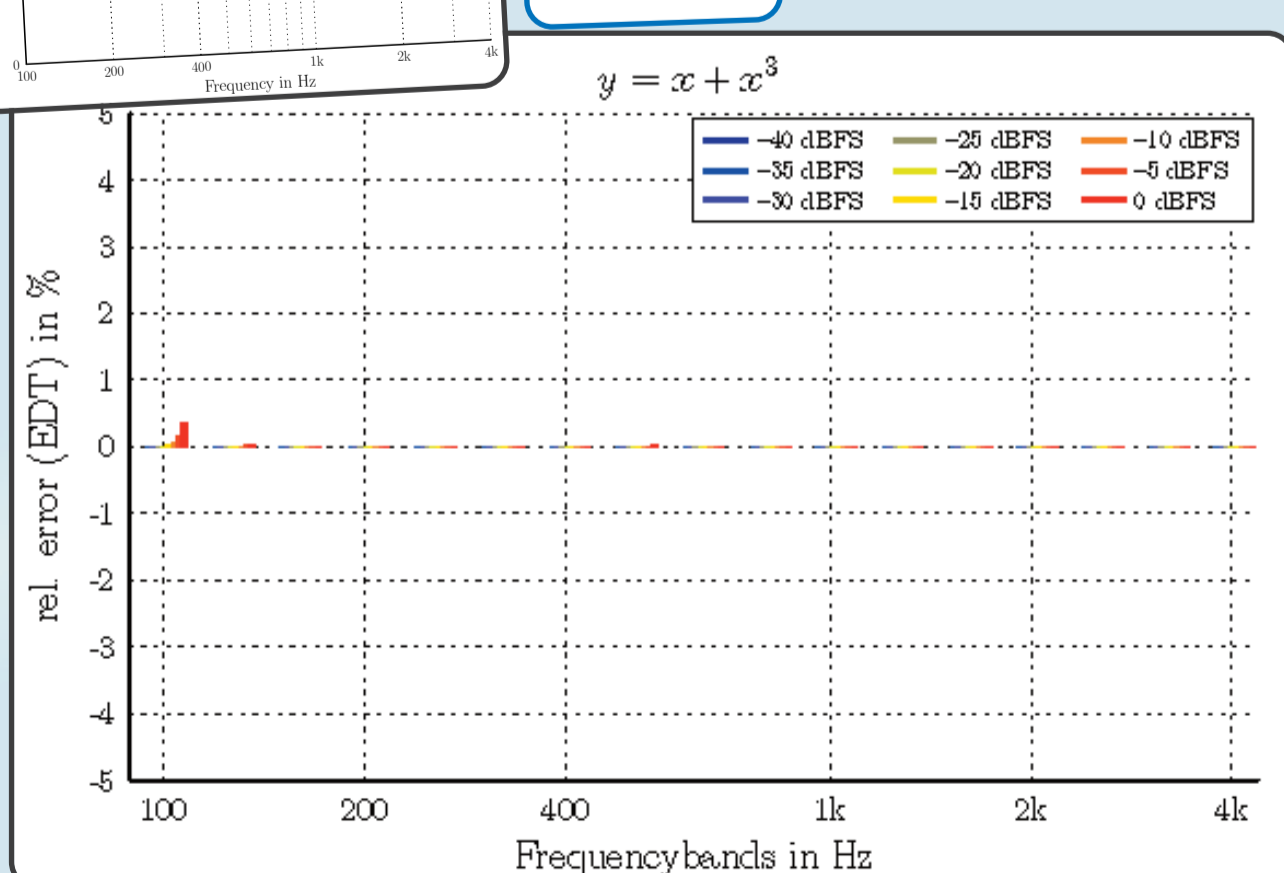
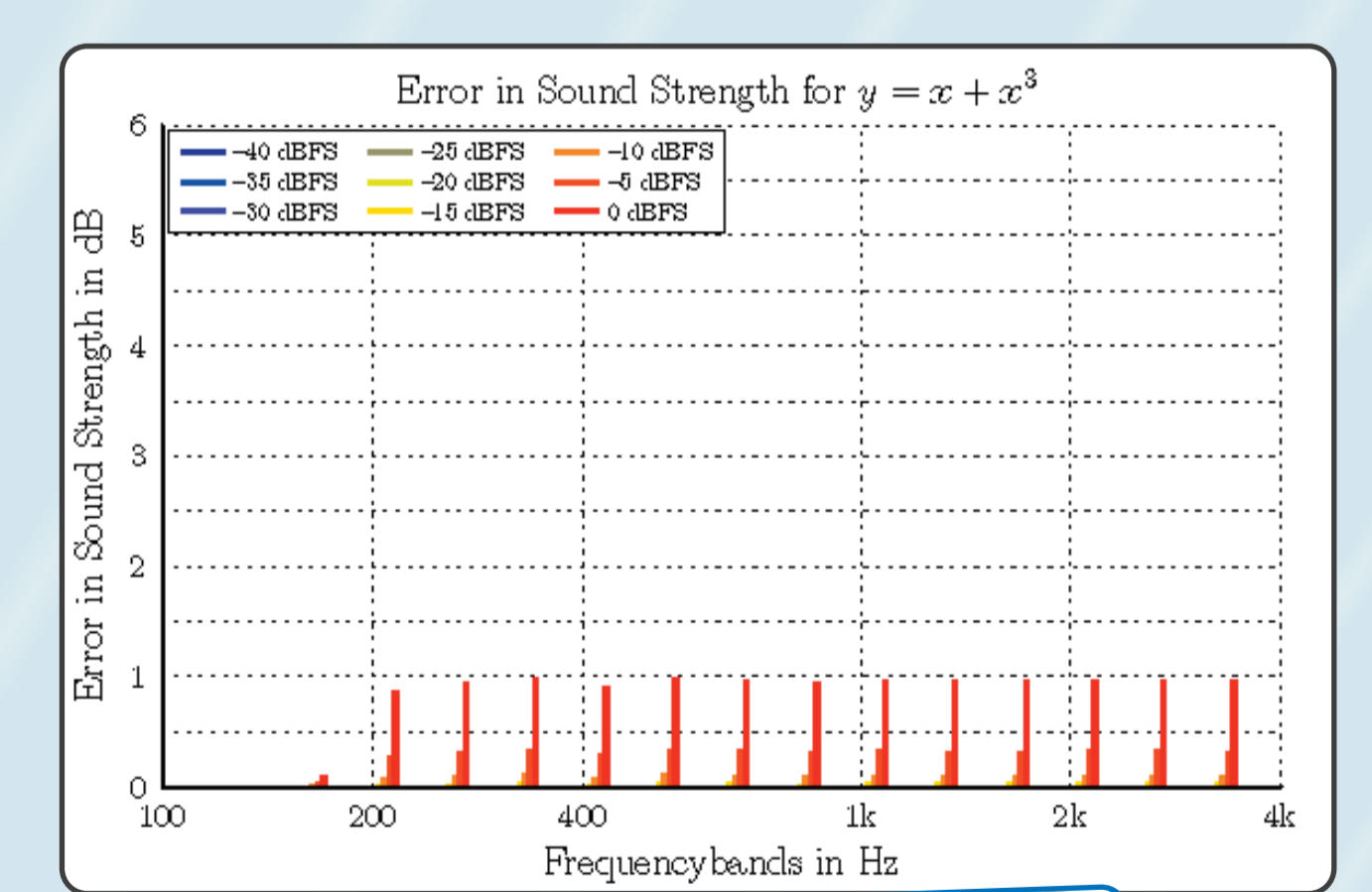
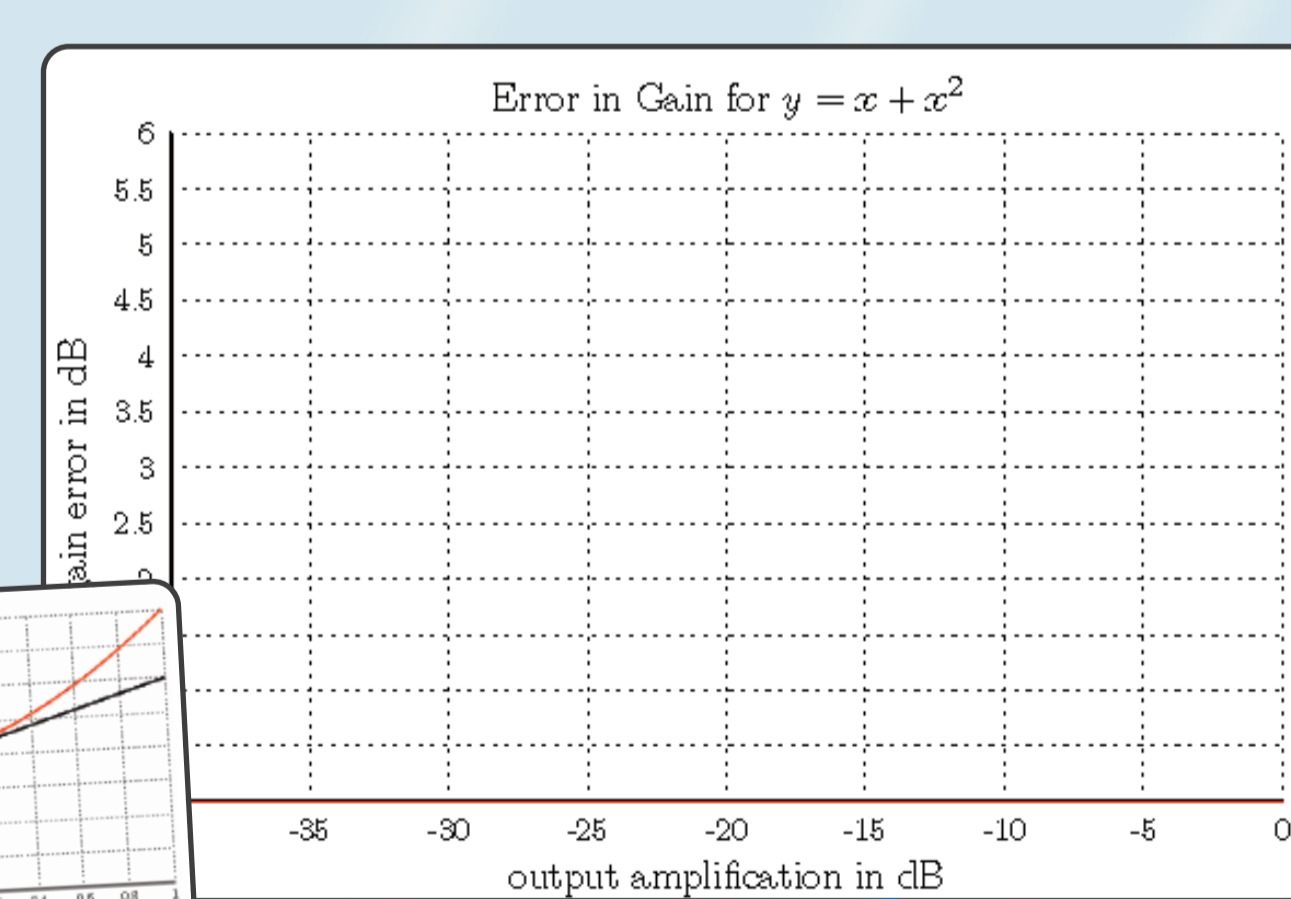
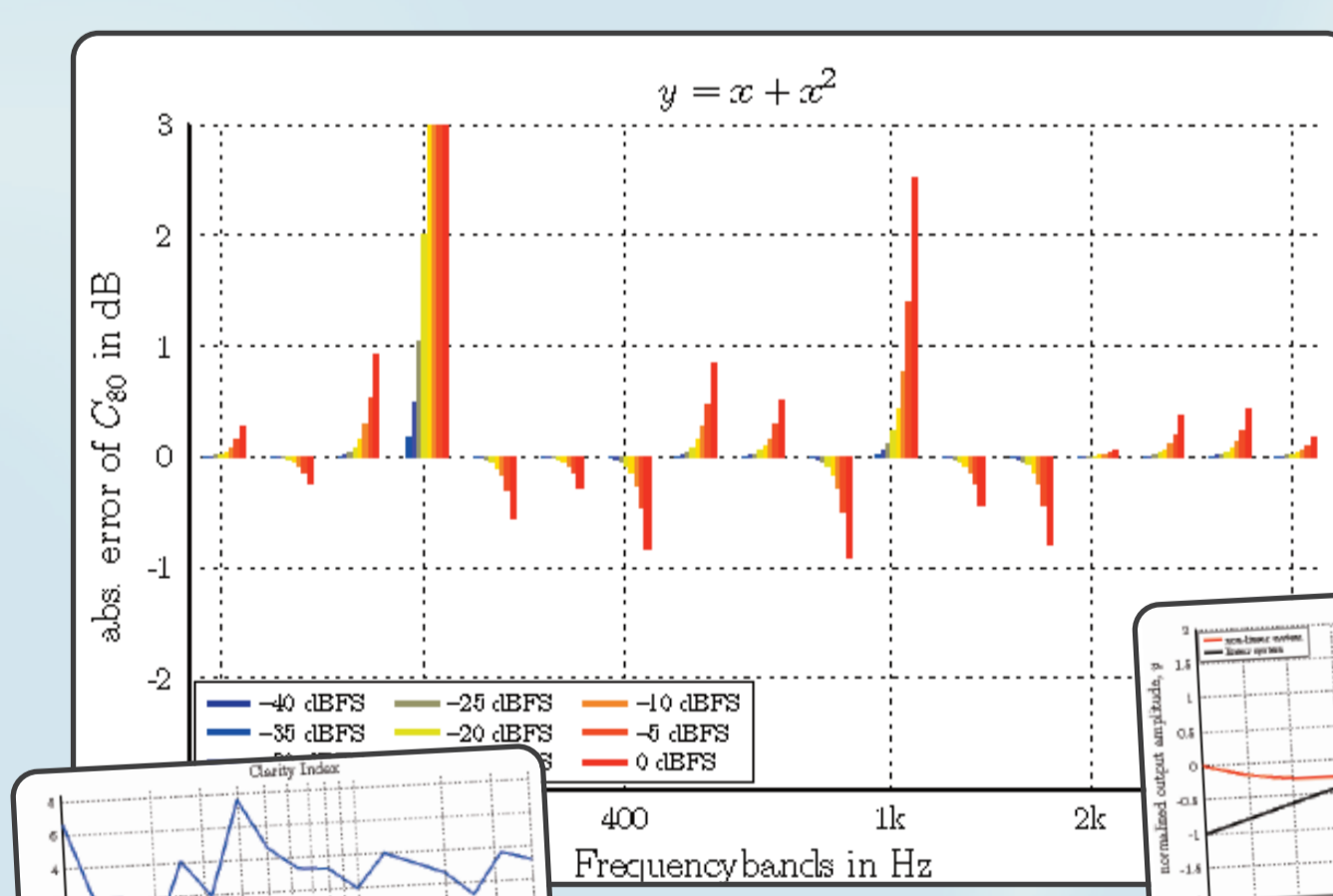
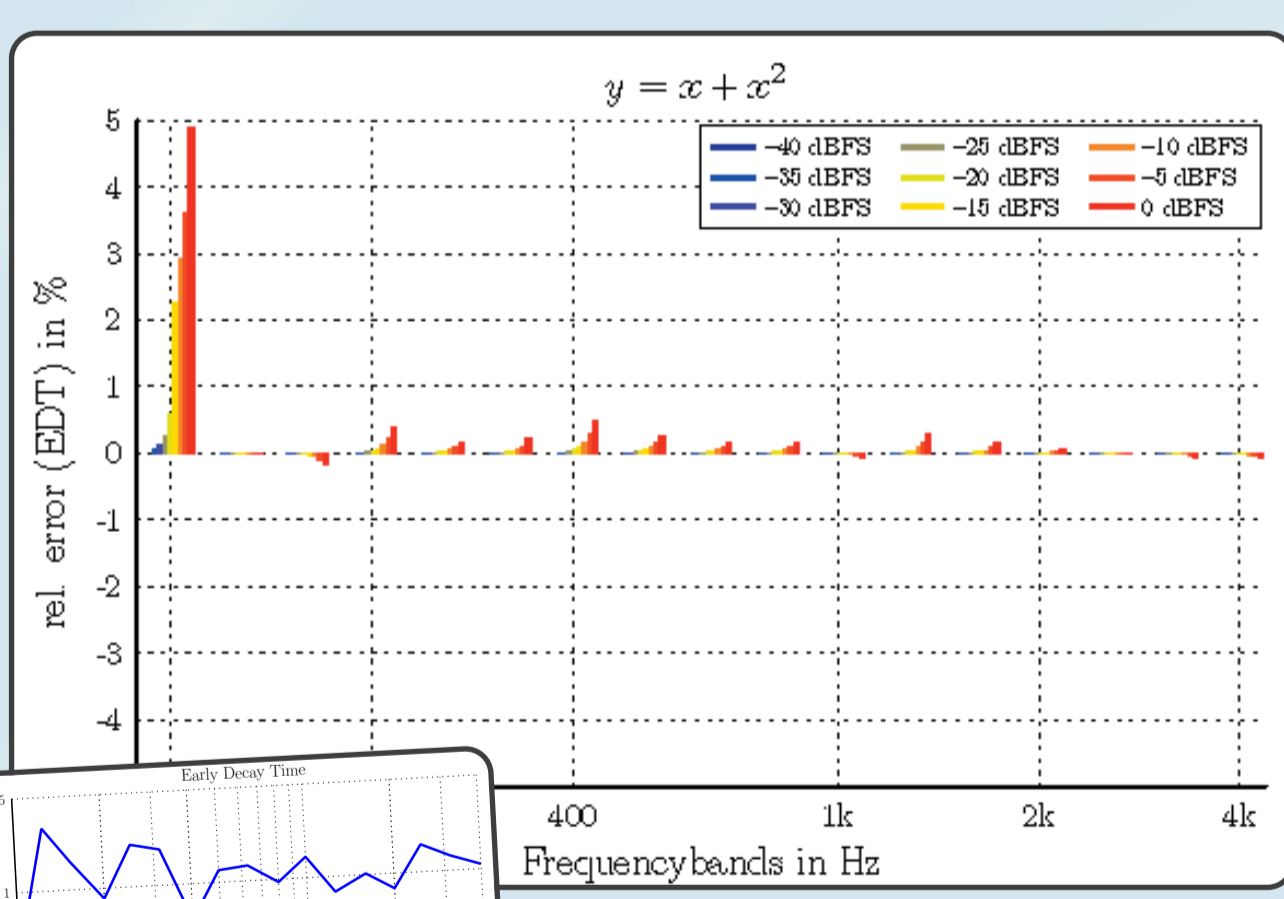
MSdummy .run



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Results



Conclusion

- Even and odd orders of non-linear model show different effects. Odd orders modify the fundamental IR. Harmonic impulse responses might overlap with fundamental IR.
- Reverberation time and energy parameters are not really affected by frequency independent non-linearities of odd polynomial but of even order.
- Sound strength is subject to a calibration measurement and fundamental impulse response of loudspeaker might deviate due to level changes as observed in measurement.
- Sound strength is also affected by overlapping harmonic impulse responses in sweep measurements (even order) – sweep parameters should be chosen carefully.