Case Studies in Modern Music Production: where science meets art

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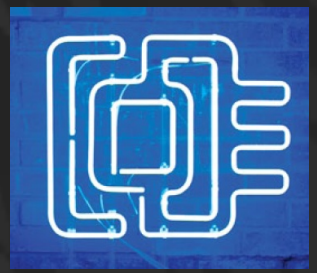


Institute of Acoustics
26 March 2014

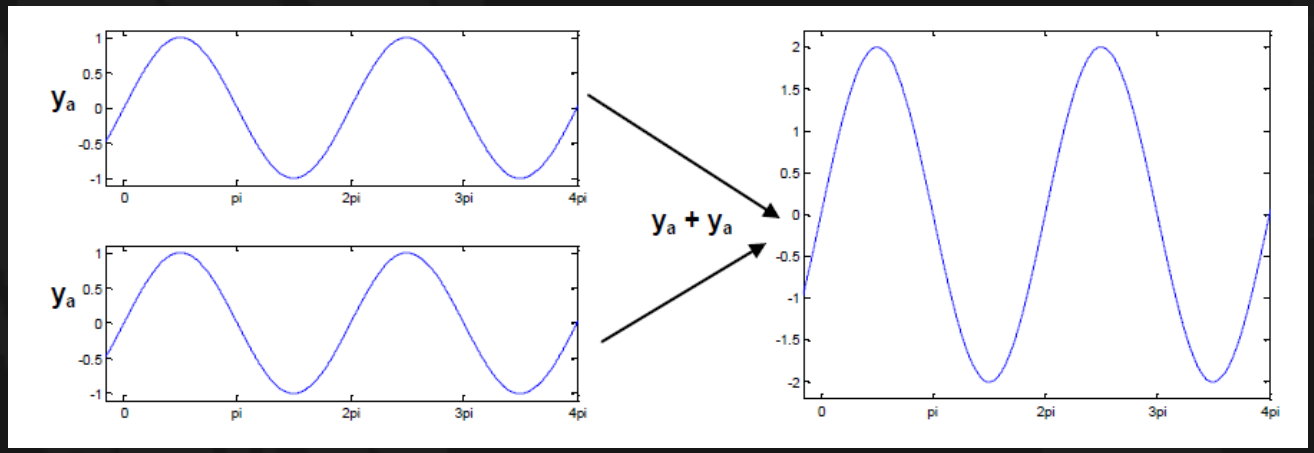
Anglia Ruskin University

Summary

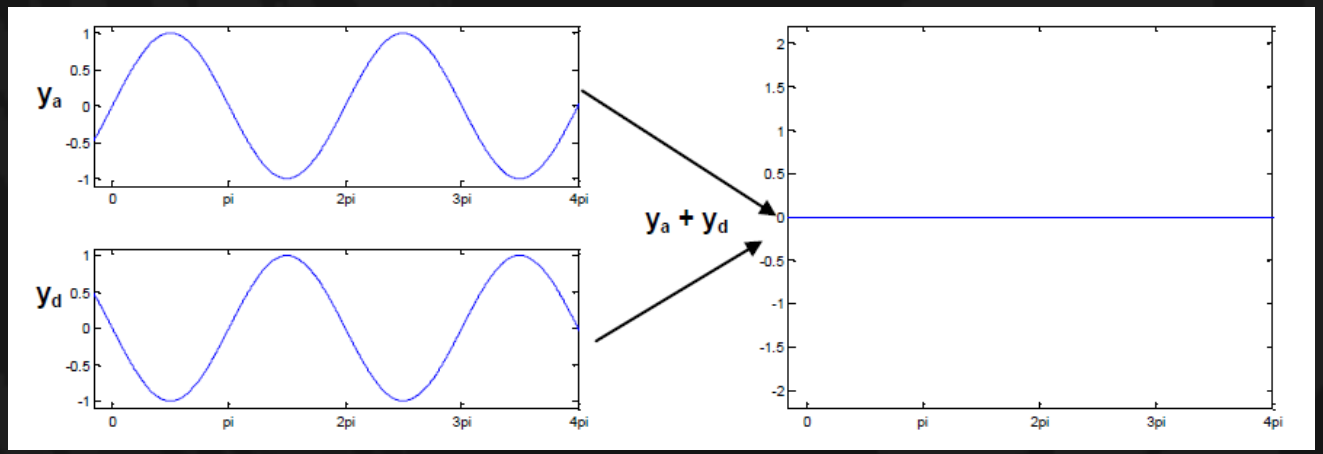
- Introduction
- The science of sound and signals (examples)
  - Comb filtering
  - Intermodulation distortion
- Case studies in modern music production
  - Ethan Ash live in the studio
  - Mediaeval Baebes studio production and mastering
  - Orchestra recording experiment
  - I Strip For Couples contemporary string recording
- Conclude and questions

Simple theory – comb filtering

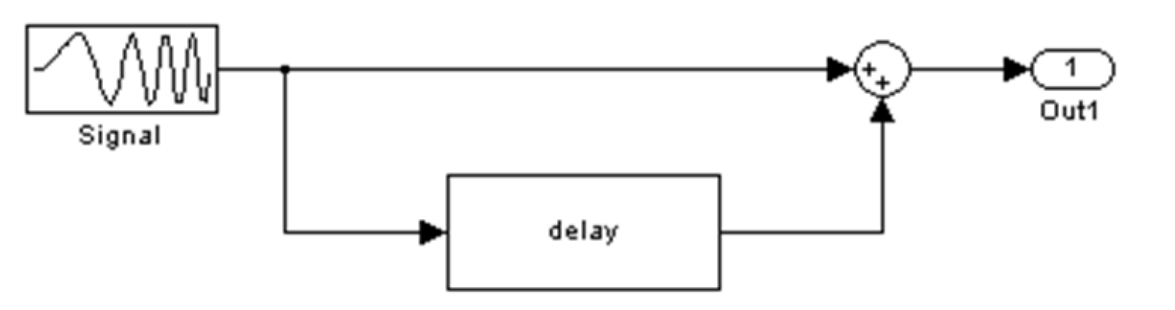
Phase gain

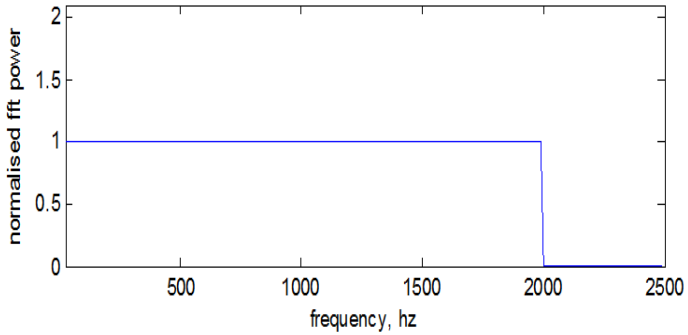


Phase cancelation

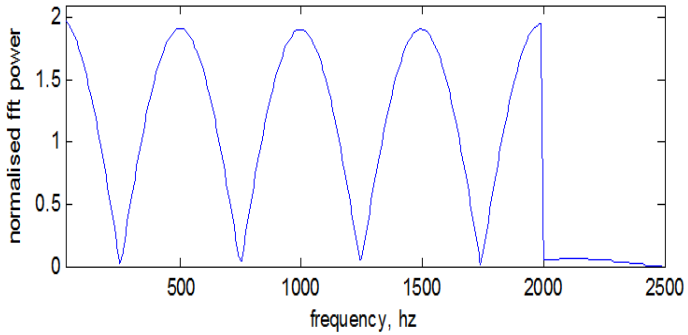


Simple theory – comb filtering

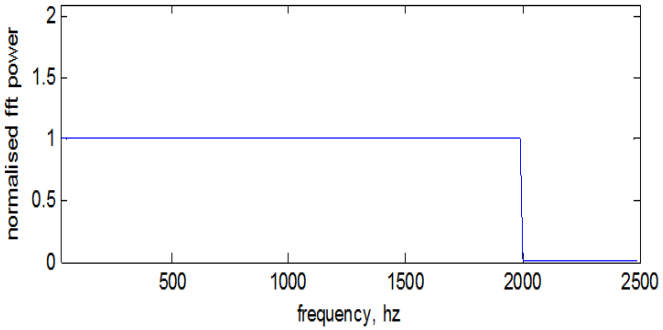




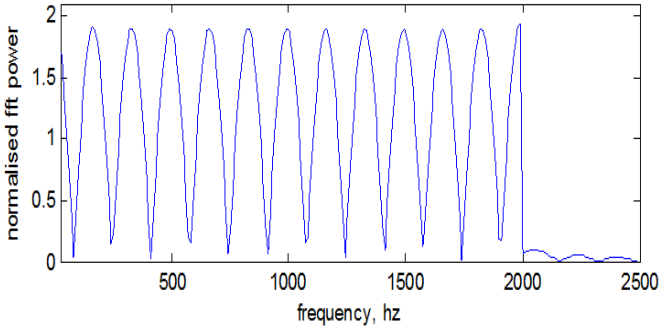
Spectrum of original signal



Spectrum of 2 ms delayed signal mixed with original signal

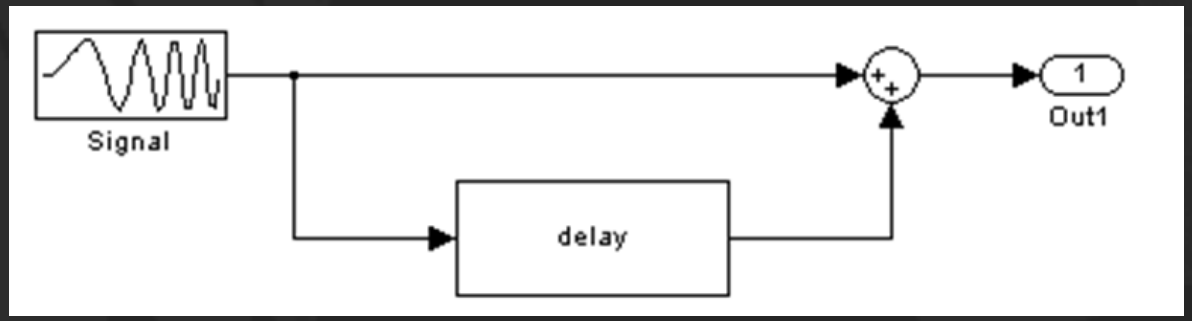


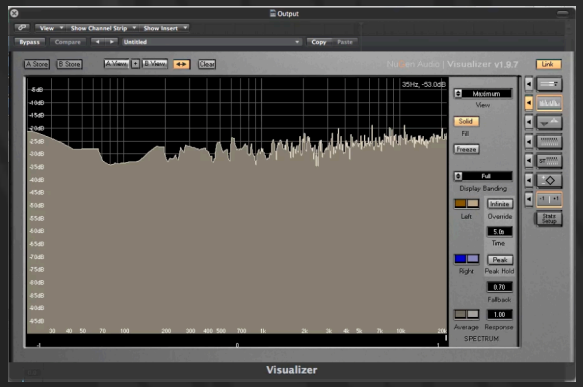
Spectrum of original signal

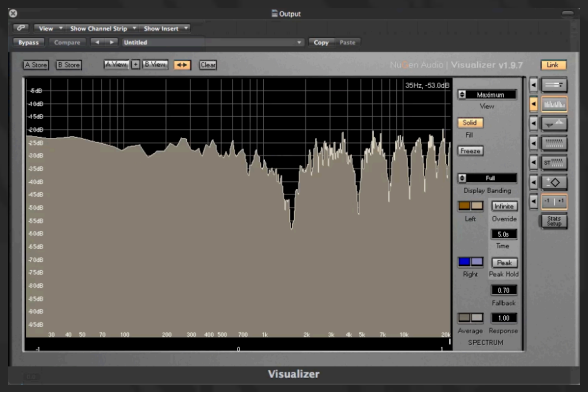


Spectrum of 6 ms delayed signal mixed with original signal

Simple theory – comb filtering







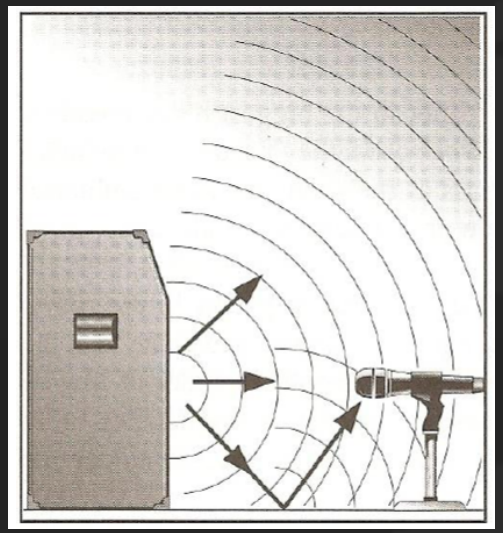
YouTube Demo Video

Comb filtering – in practice

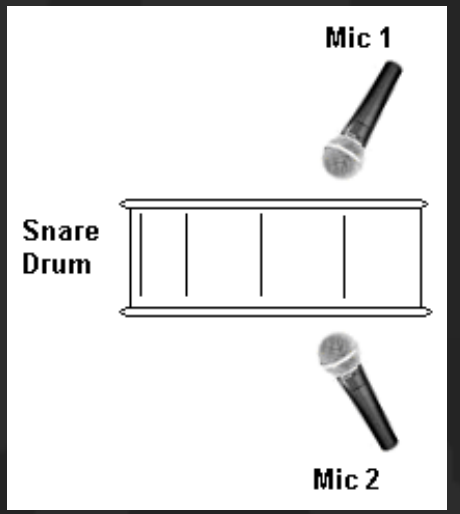
Multiple microphones at different distances

Inverted signals

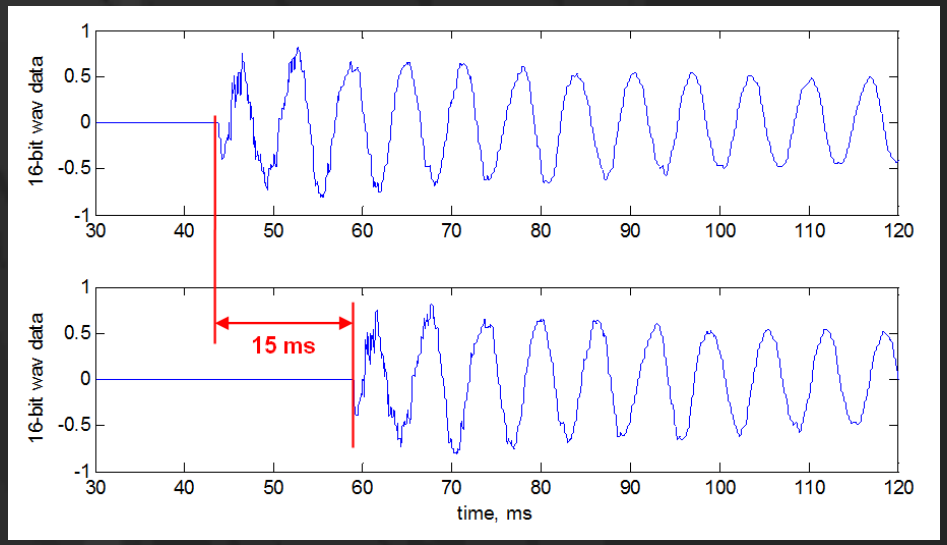
Reflected signals

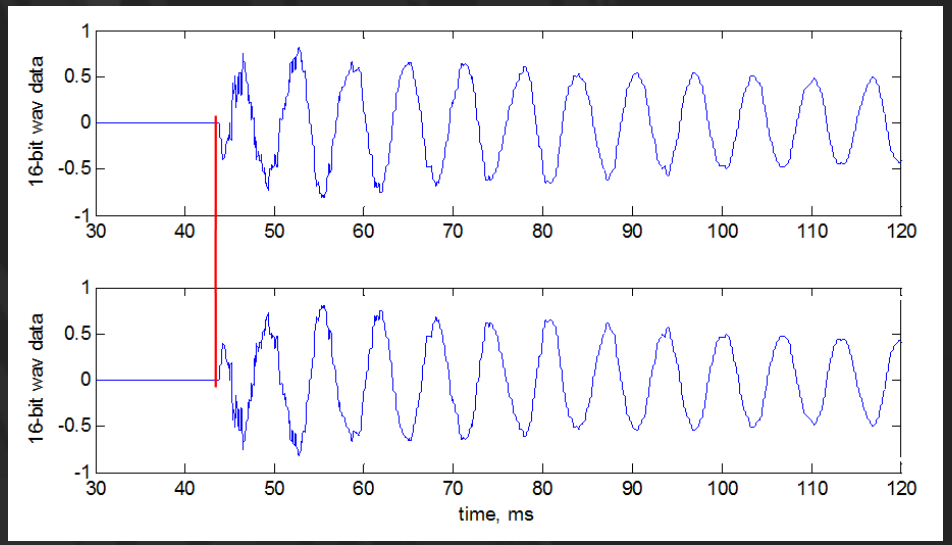


Off-axis signals?



Comb filtering – in practice





Use of the word ‘phase’ is misleading in this context, as it’s really just ‘delay’ or ‘inversion’

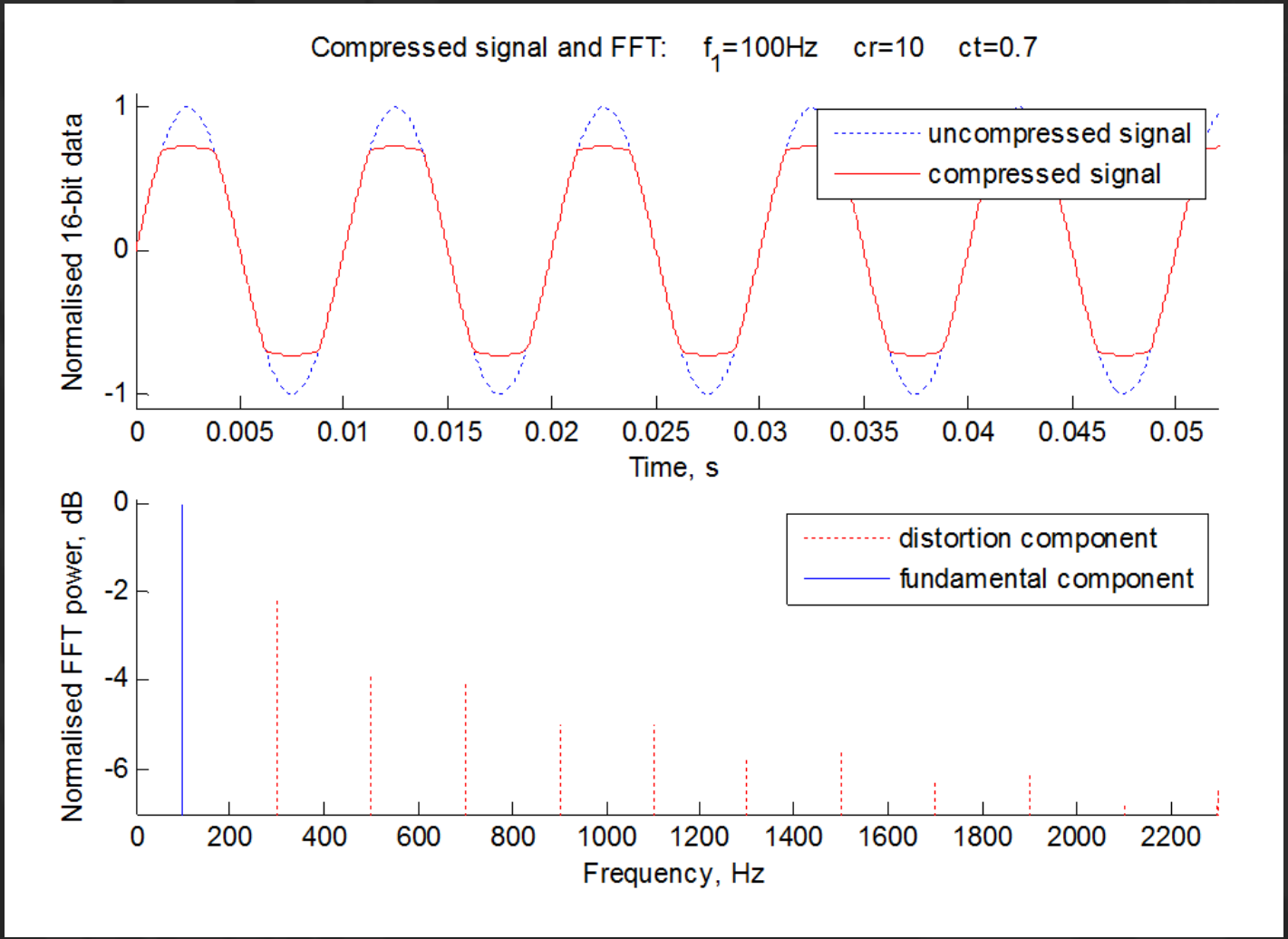
In reality comb filtering appears as a type of fixed EQ filter

But that can be good or bad – it’s just another colouration of the sound

Comb filtering is all over the place, so in music production you really just have to listen and trust your ears

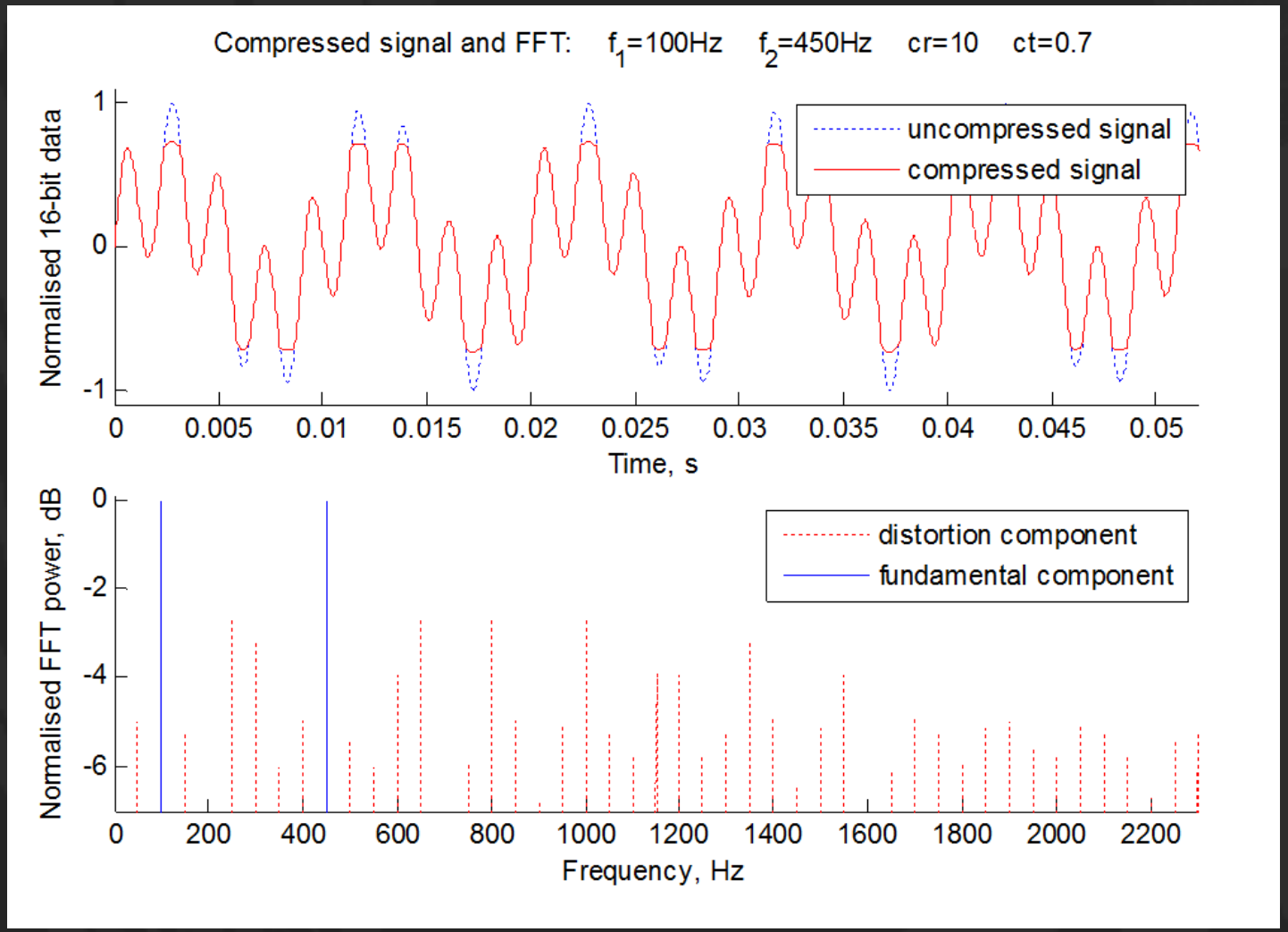
If an accurate recording is desired, then avoid comb filtering by using fewer microphones

Non-linear distortion from compression



Odd harmonic distortion components are generated for pure sine wave

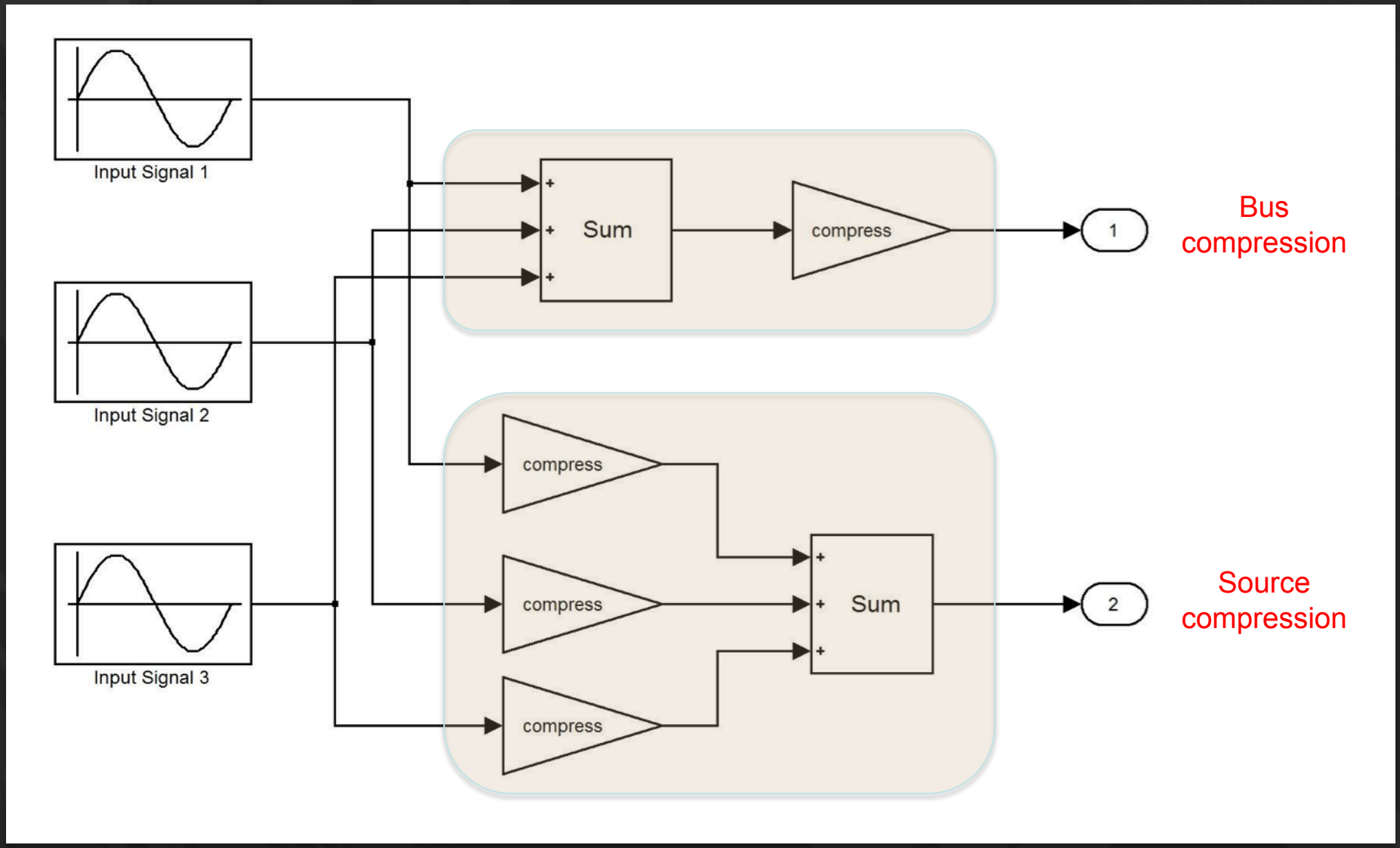
Non-linear distortion from compression



Distortion components are not harmonic for mixed signals

Applying compression

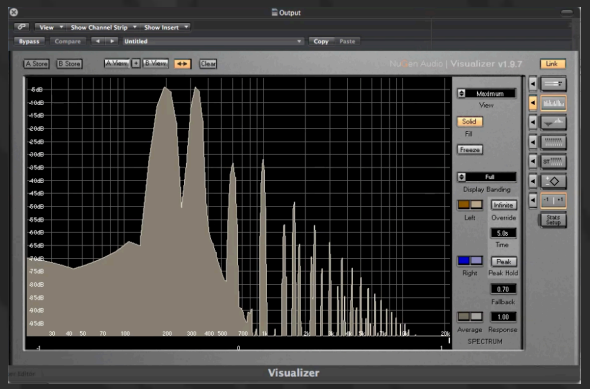
Is it better to compress before mixing or after mixing?



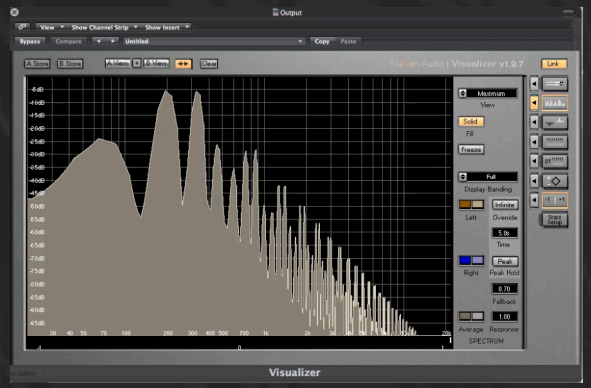
Applying compression

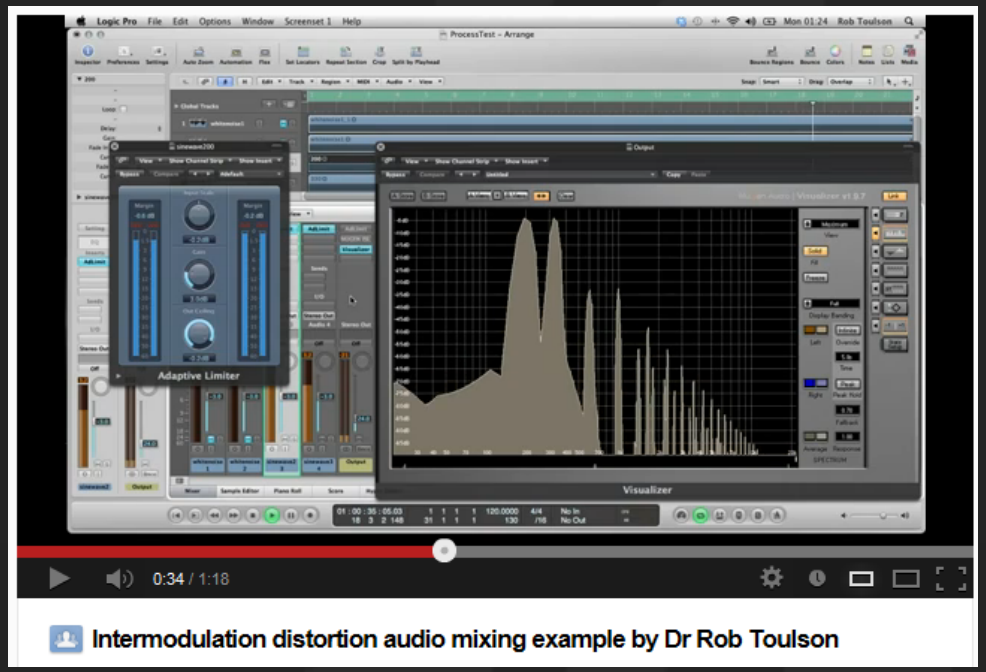
Is it better to compress before or after summation?
Take two sine waves at 200 Hz and 300 Hz

Compress before mixing



Compress after mixing



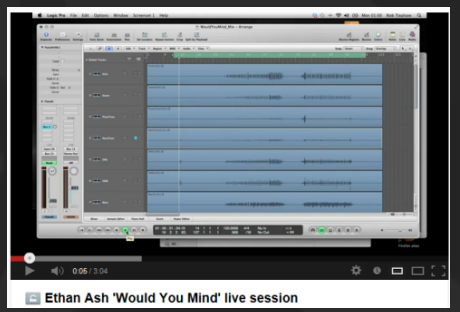


YouTube Demo Video

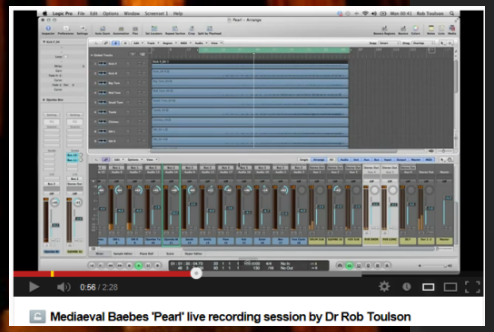
Music production examples

Ethan Ash
www.ethanashmusic.com

Full band recorded live at Anglia Ruskin



Music production examples



Mediaeval Baebes - Live studio take (High Barn Studios)

www.mediaevalbaebes.com

'The Huntress' released 16th November 2012

Music production examples

Mediaeval Baebes

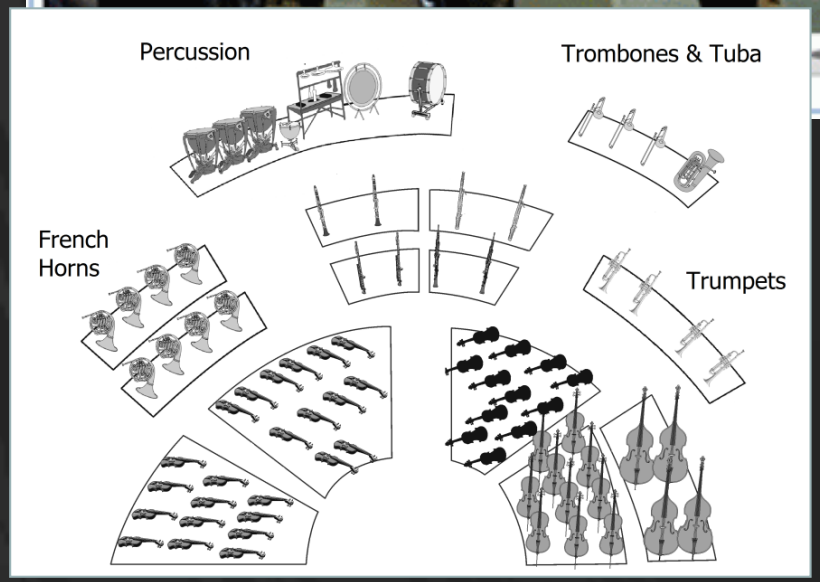
www.mediaevalbaebes.com

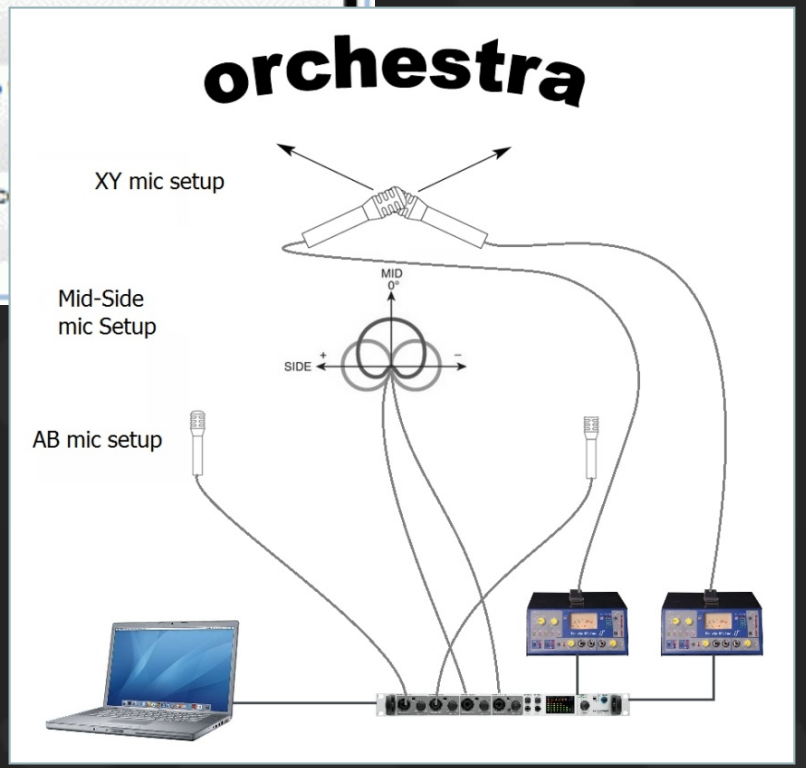
‘Of Kings And Angels’ released 17th November 2013

Music production examples

[YouTube]

[Bandcamp]





Music production examples

I Strip For Couples
String recording feature
in Sound On Sound (April 2014)

Music production examples

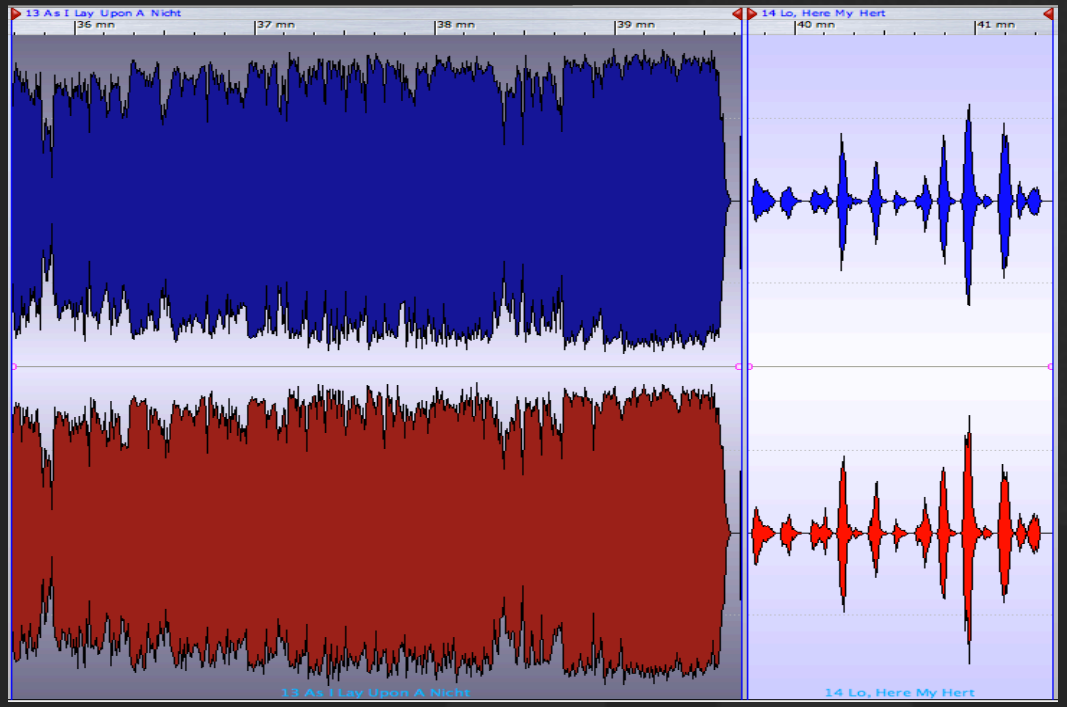
Mediaeval Baebes – Devotion Compilation

www.mediaevalbaebes.com

Released 23rd November 2012

Peak and Loudness Analysis

Crest Factor = RMS – Peak
EBU 1770 Loudness (R128)
Tischmeyer DR readings



SONG	Pre Crest Factor dBFS	Post RMS dbFS	Post EBU Integrated dBLUFS	Post EBU Loudness Range dBLU	Post DR dB
01 Gaudete	-16.8	-17.6	-17.3	8.7	13
02 I Sing of a Maiden	-7.7	-12.6	-13.0	4.0	6
03 There is no Rose of Swych Vertu	-20.2	-21.1	-19.7	14.1	15
04 Adam Lay Ibounden	-18.7	-22.0	-21.1	10.6	15
05 Orientus	-15.7	-19.1	-18.8	9.0	12
06 Laude Novella	-15.2	-17.2	-17.0	9.5	12
07 The Coventry Carol	-19.7	-19.9	-19.1	12.1	13
08 Come My Swete	-18.0	-18.7	-18.8	10.5	14
09 Star of the Sea	-18.1	-18.2	-17.8	6.8	14
10 Salva Nos	-16.8	-17.4	-16.5	9.5	13
11 Maiden in the Mor Lay	-21.5	-22.7	-19.1	20.7	16
12 Love Me Broughte	-11.4	-15.2	-15.3	6.8	10
13 As I Lay Upon a Nicht	-8.7	-19.5	-19.9	3.2	8
14 Lo Here My Hert	-21.0	-19.3	-15.1	24.4	12
15 Temptasyon	-14.0	-16.1	-15.3	16.7	9
16 Dies Irae	-19.9	-17.7	-17.0	13.4	13

Conclusions

- Hearing is believing!
- The simple theory is rarely sufficient to give a true understanding of the complex nature of sound, acoustics and audio systems.
- For music production purposes it's important to understand the underlying theory, but to complement this with diverse experience and critical listening skills.
- Experimentation and analysis is key to gaining a rich understanding and valuable sonic experiences
- But our ears don't capture everything, sometimes sophisticated analysis tools can help us to understand what we hear and to evaluate things we cannot always hear.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