

It Goes To 11!

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If It's Too Loud, You're Too Old!

- Modern processing at extreme levels!
- L-O-U-D-N-E-S-S at the expense of quality
- More *loudness* than allowed by law!
- Recording industry on the bandwagon too!
- “Gotta be louder than the other guy” syndrome
- Reduction is quality/definition
- Increased audible annoyance!

We Want To Pump YOU Up!



The Challenge... ...And A Promise

- **Put Q-U-A-L-I-T-Y back into on-air audio**
- **...yet still maintain competitive L-O-U-D-N-E-S-S!**
- **Simple: Whip up new algo...(I wish!)**
- **Two year research project**
- **Exciting work and revealing results**
- **This preso highlights the journey of that effort!**

The Achilles Heel

- **Simple initial exercise: Listen to status quo**
- **Hot Rockin' - Flame Throwin' ~ Ouch!**
- **Benchmarking with presets and *crankage!***
- **Very humbling experience (ego has recovered)**

The Pain

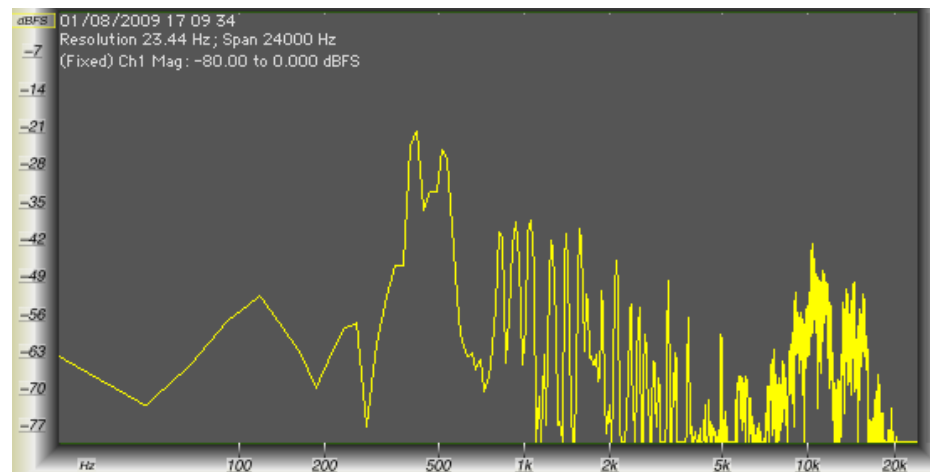
- **Modern Music Mastering...**
- **Rich sounding: Bass, presence, and treble**
- **Aggressive Processing yields...**
- **Synthetic tonality & quality**
- **Treble: Overly bright/harsh**
- **Bass: Tight defined, sometimes distorted**

Distinct Annoyance!

- **Sizzling, Frying Bacon & Eggs!!**
- **Annoying midrange, presence, and treble**
- **Noticeable on ALL processors!!**
- **Equal opportunity offender!**
- **(All have latest/greatest current S/W!)**
- **Reducing clipping eases the pain!**
- **Age-old issue of bass inducing clipper IM?**

Hello Kelly Clarkson!

- **Sonic challenge: “Because Of You”**
- **Intro tells the story: voice and piano**
- **Source audio sample ~ no processing applied**



Hello Kelly Clarkson!

- Aural obstacle course: “Because Of You”
- Processor subject #1
- Aggressive preset used...

Hello Kelly Clarkson!

- Aural obstacle course: “Because Of You”
- Processor subject #2
- Aggressive preset used...

Hello Kelly Clarkson!

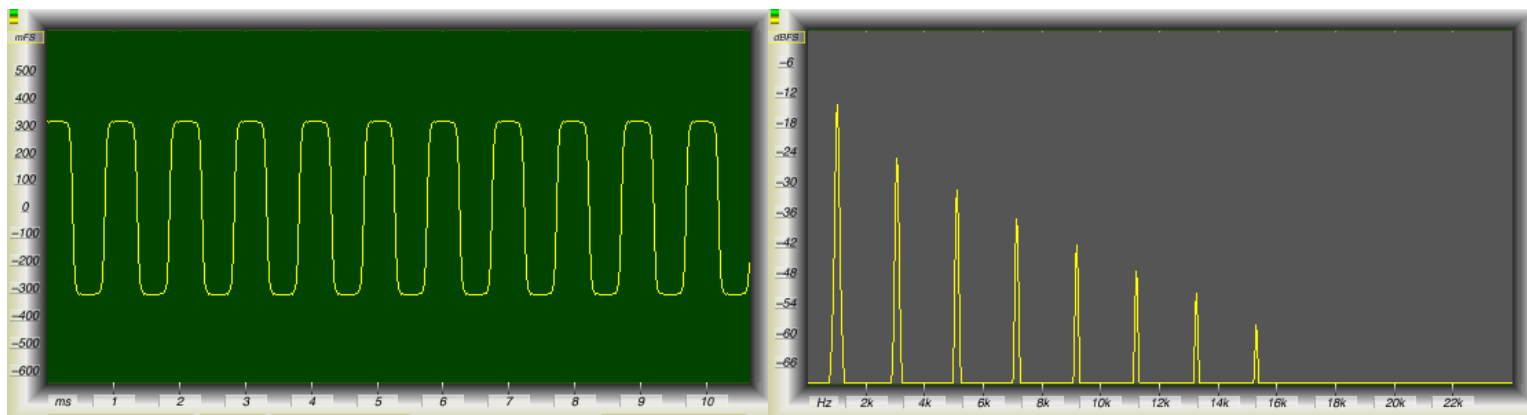
- Aural obstacle course: “Because Of You”
- No bass in segment, but sizzle remains
- Hmm...What’s going on?
- *Note: Same result occurs with ALL boxes!*

The Investigation

- **Probe into clipping methods**
- **Distortion control/canceling limitations?**
- **Push present means beyond capabilities?**

Under The Microscope

- Clipper/Harmonic 'basics'
- Harmonics: multiples of fundamental
- 1kHz example

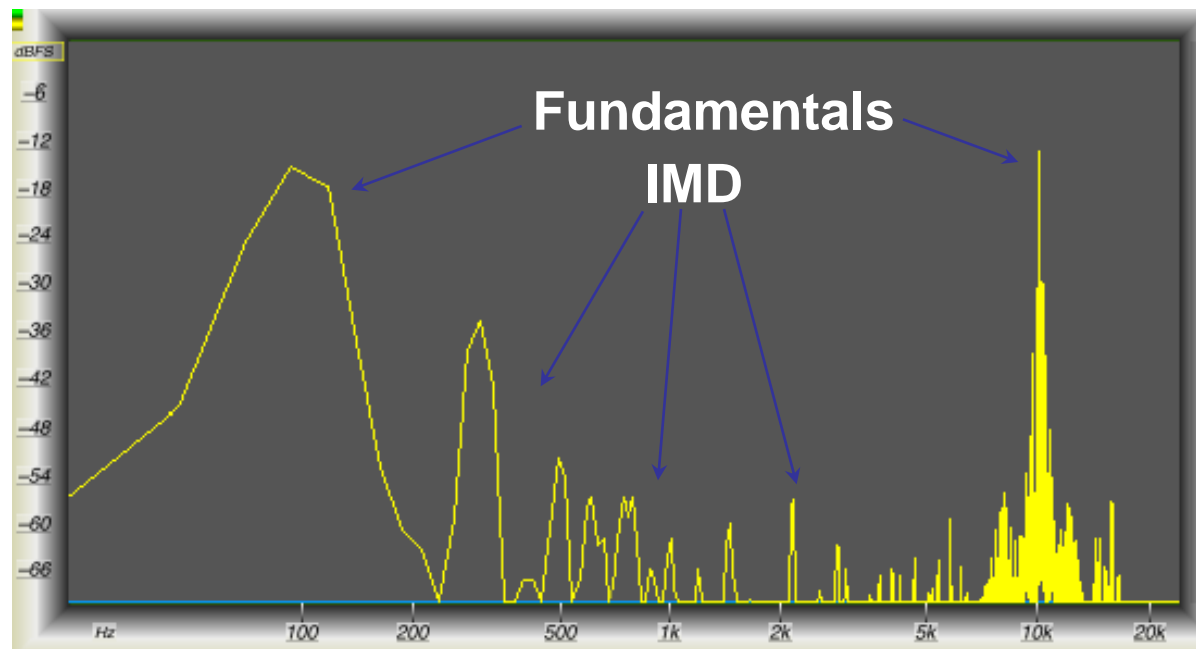


Under The Microscope

- What happens with added harmonic spectra?
- Clipper induced IMD test (easy to perform)
- 100Hz combined with 5kHz ~ 15kHz
- 100Hz set to produce 3dB of clipping
- 75 μ s preemphasis employed
- Spectrum falling between fundamentals is IMD

Under The Microscope

➤ Example: 100Hz & 10kHz



Under The Microscope

- **Example: Sweep 100Hz & 5kHz – 15kHz**

QuickTime™ and a
DV/DVCPRO - NTSC decompressor
are needed to see this picture.

Under The Microscope

- What happens with many signals present?
- It sizzles...(Not good!)

Clipper Methods, Distortion Canceling, And Too Many Bands!

- **Distortion Canceling: Static Method**
- **Masking filter(s) around critical band(s)**
- **IMD is random spectra**
- **Static approach not sufficient**
- **Filtering topology weaknesses...**

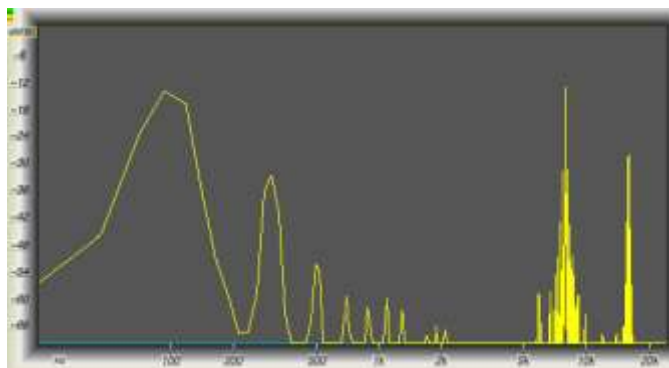
Clipper Methods, Distortion Canceling, And Too Many Bands!

- Likewise, more proc bands not the answer
- Waste of DSP cycles, MIPS, & marketing!
- Beware of marketing rhetoric!

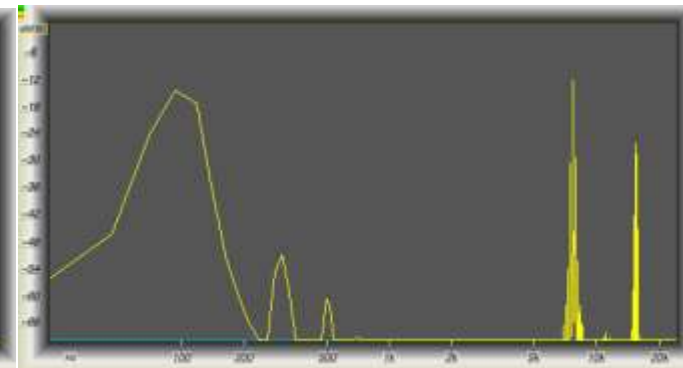
- Multiband clipping does not take into consideration any interactivity of outlying spectra. That's where the method eventually fails.

The Answer Is...

- Understanding clipper induced THD/IMD...
- Range of spectra generates both THD/IMD
- Adaptable means to suppress both simultaneously
- Spectral octaves and Gibbs Phenomenon
- Coca-Cola secret recipe!!
- Tony Soprano has the details!



100Hz/7kHz Before



100Hz/7kHz After

Proof

- **Sweep 100Hz & 5kHz – 15kHz**
- **Blue: Old Yellow: New**

QuickTime™ and a
DV/DVCPRO - NTSC decompressor
are needed to see this picture.

Proof: It Goes To 11!

- **Welcome back Kelly: “Because Of You”**
- **New *NoIMD* Method**
- **Same Aggressive preset used...**

It Goes To 11 And A Bit More!

- Kelly's still here: "Because Of You"
- New *NoIMD* Method
- Aggressive preset +2dB more clipping

What Gives!

- The answer lies not in the number of clipping bands and filters, but *how all distortion products are dealt with interactively on an instantaneous basis.*
- Multiband, 5/6, or more is not the answer!
- Multiband clipping does not take into consideration any interactivity of outlying spectra. That's where the method eventually fails. The proof is the sonic performance with critical content.

Where Next?

- The age old question!
- Imagination is limiting factor...
- Power offers added 'smarts'
- Interactivity within infrastructure

- *Who knows!!! :)*

A Cool Tool: MPX TOOL

QuickTime™ and a
DV/DVCPRO - NTSC decompressor
are needed to see this picture.

Acknowledgements

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Matt Connor

(In memoriam)

(In memoriam)

Thank You!

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Thank You!

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