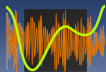


Parametric Equalizer on an FPGA

Joseph Colosimo

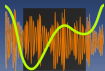
November 18, 2010

6.111



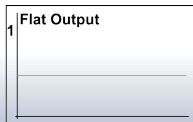
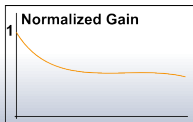
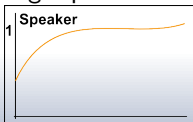
Parametric Equalizers

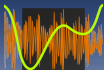
- Highly configurable waveform manipulation
- Arbitrary filter creation
- Usually implemented in software
- Many uses



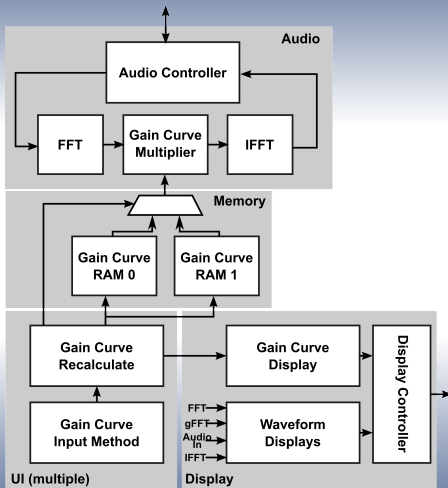
Parametric Equalizers

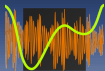
- Highly configurable waveform manipulation
- Arbitrary filter creation
- Usually implemented in software
- Many uses
- E.g. speaker correction



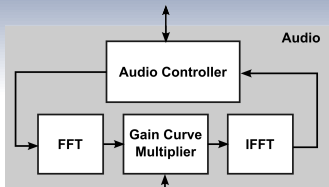


Block Diagram

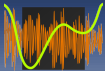




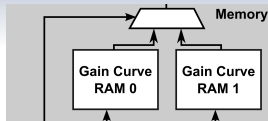
Audio System



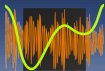
- Streaming mode FFT, IFFT
- Hardware Multiplier
- AC97 Controller (like Lab 4)
- Resolution vs. chip space



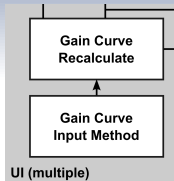
RAM



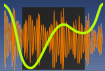
- 2 BRAMs (uninterrupted output)
- $n \times r$
- BRAM memory limitations



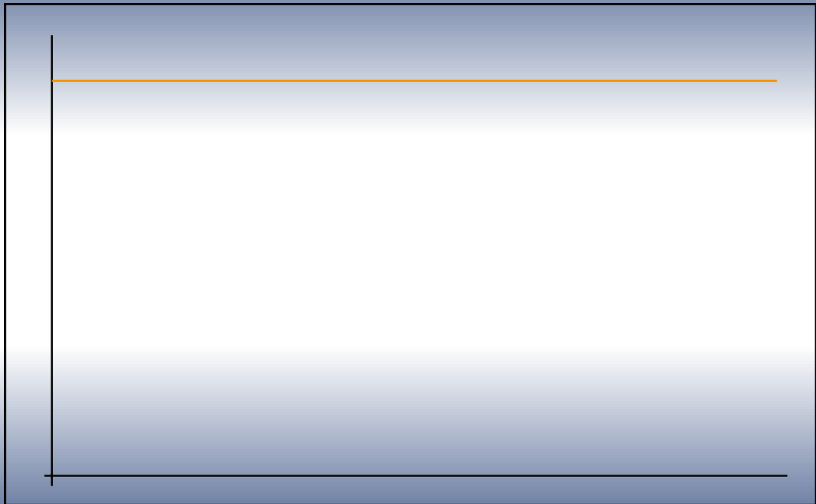
UI

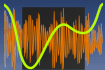


- Need to specify “gain curve”
- Modular design — easy to integrate new input methods
 - Mouse input
 - Incremental curve calculation

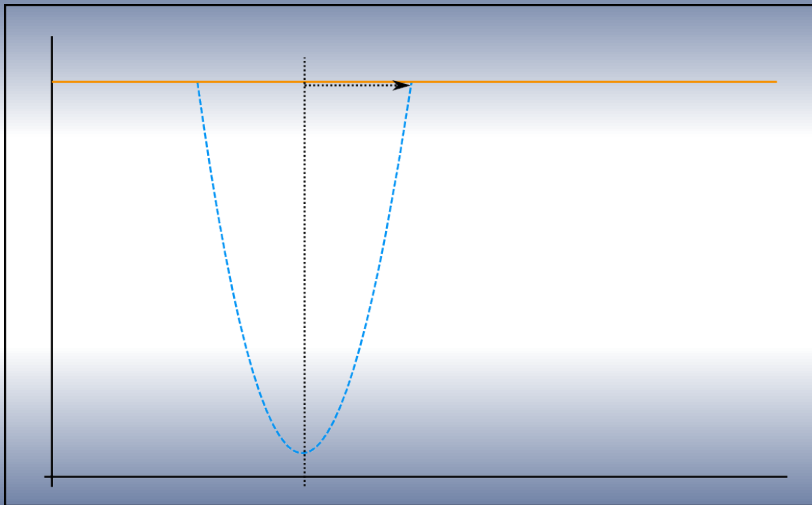


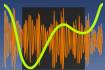
Building Gain Curves



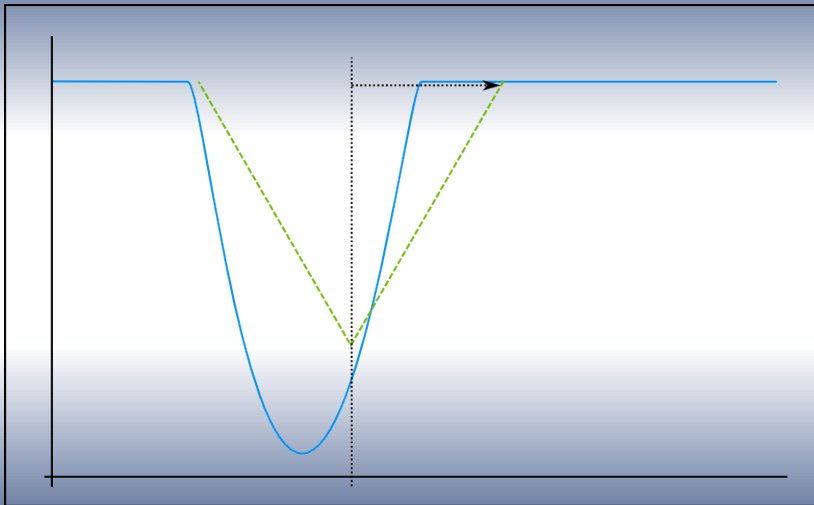


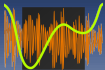
Building Gain Curves



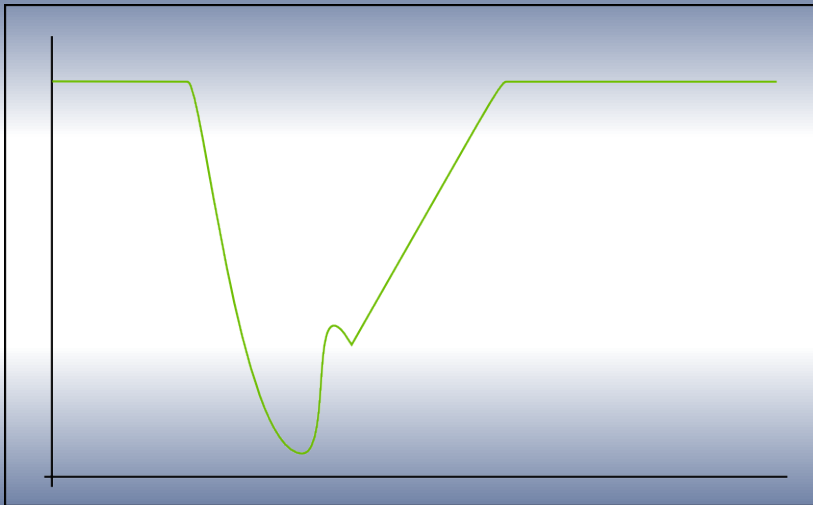


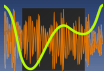
Building Gain Curves



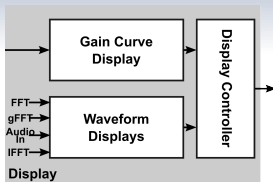


Building Gain Curves

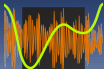




Display



- Gain curve display
- Live FFT and waveform visualization



Timeline

