Novel Signal-Processing Prototypes

MIPS Technical Review of Phase I Status
Phase II Plans
Business Developments
## Project Overview @ 6 months

### Work Proposed

- **Passive parametric EQ**
  - Develop & characterize
  - Extend Q; go active?

- **Hi-fidelity active audio cables**
  - Investigate causes of loss
  - Develop mitigation strategy

- **Tunable filters for RF systems**
  - Understand requirements
  - Scale to GHz range

### Status & Accomplishments

- **Developed, optimized, shipped**
  - Effective filter, some hi-freq loss
  - Active circuit in development

- **In development, done by Jan 2010**
  - Cable char’zation => Z mis-match
  - Preamp developed, currently optimizing the design for sound
  - Battery, form factor, productize

- **Initial planning stages**
Parametric EQ — show & tell
2-Band Active Parametric EQ

Figure: example circuit of 2 band parametric eq. Vin sweeps from 10Hz to 10kHz.

Amplitude: The 2 resistors connected at the node labeled "Amplitude1" (R2 & R3) actually represent a 10kOhm potentiometer. Likewise for "Amplitude 2". At equal ratios (as shown) amplitude of the notch/boost is unity. Rolling the pot, thus changing this ratio creates either a notch or a boost at the center frequency for the respective band.

Q: Resistors R5 and R12 represent the Q potentiometers (wiper shorted to 1 side). With the pot all the way open (as shown) the Q factor is very wide. The lower this value the steeper the Q.

Freq: Resistors R8 and R11 represent the frequency select pots (again wiper shorted to bottom side). Decreasing this resistance increases the center frequency. The bottoms of these branches (e.g. from R6 down on the right one) are actually simulated inductors (inductance gyrators). By changing the effective inductance in each branch (by changing R8 or R11) we change the resonant frequency of that branch.

These branches are very separable (evidenced by the included simulations) and more branches can be easily added to the circuit. All that is needed is another amplitude potentiometer (same value, 10kOhms) in parallel with the others, and another duplicate "branch" (from C1 down). To set the frequency range the values of the 2 caps in the tree are changed.
Etc. — High-Freq Issues

Lower frequencies naturally "warmer" and "fuller" = more energy. Higher frequencies can be overpowered, especially evident when playing chords.

Figure: frequencies below about 300Hz have more power.

2 proposed ideas/solutions — or combine the two.

Add a gain in the highs:
- determine this frequency cutoff point, where there is a significant drop in signal power (do characterizations of several players, chord types, and guitars).
- actively add gain (+3dB or so) above this point using a HP or BP filter.

Adding Phase:
- perhaps just making these frequencies louder wont accomplish this desired "fullness" quality.
- instead of just making the frequencies louder, duplicate them, adjust their phase so that they are not in line with the original, and then add the original and phase adjusted signals.
- gives the feeling of more information in the higher registers.
- still increases signal power but possibly in a more "natural" way.
Active Cables — show & tell
Active Cables — Characterizations

Gain of Guitars with Various Pickups

-45 -40 -35 -30 -25 -20 -15 -10 -5 0

Frequency (Hz)

Gain (dB)

Bartolini
Monster S100 Alone
Stock
Active Cables — Characterizations

Bartolini w/ Monster S100

Gain

Bartolini through Mogami Gold into GNX1
Active Cables — Preamp v1
Active Cables — Preamp v2
Active Cables — Preamp v2.5
Active Cables — Preamp v2.6
Active Cables — Preamp v2.7
Active Cables — Preamp v2.7

Next we got the micro 2.7 working correctly and wanted to compare it to the full size version.

150/270 and 150/250 are the gain ratios. 270 is not exactly 250 but close enough for an “apples to apples” comparison.

The gain of the large version should be 1.8 so it’s dead on. The gain of micro should be 1.67 so it’s a bit lower than expected.

Lastly we have the triangular issue. In this case 15k Hz is high enough that it probably doesn't matter.

The 2.7 is good because it operates passively. However it has a lower input impedance, but so far subjective testing shows that to be a non-issue.
Test to compare series-wired volume potentiometers versus ground-wired volume pots. The measurements show that it doesn’t really make much of a difference. Subjective testing will be done soon.

The traditional wiring seemed to perform better. Overall there are few data points because we saw little change until we got to very high frequencies.

Reasoning: if a series-wired volume pot sounds better, we could use a switch pot instead of a ground-wire pot.
Phase I Forecast

**Active Cables**

- Finish optimizing preamp, miniaturization
- Choose battery technology & form factor
- Develop prototype in time for The NAMM Show (January 2010)

**Active Parametric EQ**

- Finish development
Planned for Phase II

Active Cables

• Develop beyond prototype — refine design

• Achieve near-zero-overhead form factor

Tunable Filters for RF

• Visit with Thales to determine today’s requirements

• Develop filters and miniaturize
## Business Developments — Active Cables

### GWires Active Cable

**Instrument analog active cables**
- UC22
- RC22 - ROCK
- JC22 - JAZZ
- BG22 - CLEAN
- BC22 - BASS
- MI22 - BASS
- DB22 (for driver box)
- DB23 (for driver box)

**Professional analog active cables**
- AC2
- AC3

### UC22 UNI

**Gwires instrument active cable for the clearest and most accurate sound reproduction.**

- Rejects noise and hum
- Rejects RFI and EMI
- Extra-flexible outer jacket

### Features

**UC22 - universal**

High-performance multi-instrument cable engineered to provide the full frequency response and distinctive characteristics of any instrument.

- Delivers punch, clarity and warmth by using construction "TRUE TONE".
- Rejects RFI and EMI for a lower noise floor and increased resolution.
- Extra-flexible outer jacket for superior reliability.
- Gold contact connectors are durable and corrosion resistant.

Exclusive GWires construction rejects noise and hum, and preserves warmth, presence, and full-bodied overtones.

GWires preserves the fast transients, clean highs and vivid harmonics for accurate sound.

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**Reviews**

Analog active cable™ GWires BC22 BASS

"Active cable is ideal for any guitar. Supercolossal."  
- Martin Ivan - bassguitar
- Trio Michala Pavlička

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Business Developments — Programmable Switch

**ToneShaper For Stratocaster®**

SKU: TS-S1/SSS-RET
MSRP: $199.95
PRICE: $129.95
Business Developments — Made in Maryland

... and they want to buy our electronics