Catom Prototype 7
Goals

• Full catom orbiting
• Closed-loop control
• Basic ensemble motion

Major Features

• Electromagnets for locomotion
• Electronics to drive electromagnets
• Conductive rings for power sharing
• IrDA hardware for p-p communications
Coil Change

Old:  4.4mm ID
      7mm OD
New:  4.4mm ID
      8mm OD

33% less power for same excitation
18 g heavier

* (Shorter instead?)
cp7-md

• 12 drivers per board
  – one board per magnet layer
  – no interface board
• H-bridge has dual external supplies
  – High Voltage, Low DC to get catoms moving
  – Low Voltage, High DC to hold them together
• Basic protection logic (also lowers # pins)
• Constraint: LVP < HVP
cp7-ir

- 24 IrDA modules aligned with magnets
  - TxLED current resistor TBD
- IrDA lines into 2x 32:1 analog mux/demux
  - Can switch RX/TX ports independently
  - IrDA transceiver interfaces to UART
- Tri-state line buffers allow TX broadcast
cp7-pib

• Power rings TBD
  – based on Burak’s previous work
  – two per catom, one catom must be tethered

• Power regulation – VCC, HVP, LVP
  – At 3x, custom circuit will be worthwhile
  – Phase issues
  – Constraints on # of electromagnets active

• Power monitoring, V/I sense
Other design decisions

• Using Atmel AVRs
  – Bootloaders straightforward
  – Different chips based on need

• Single communications bus
  – Programming over bus via bootloaders
  – Bandwidth constraints a problem?

• Connectors likely barebones
  – Minimum count for power, communications
  – Lone pins
Other Design Decisions, 2

• Additional connectors on boards for initial programming
• Laser-cut shunt alignment plates
  – Instead of a single plastic piece
  – Reduce weight
  – Make assembly more accurate
Next Steps

• Power circuitry
• Build/test one-off circuit prototypes
• Power Rings
• Finalize/manufacture mechanical parts
• Board layout / assembly