

# Cavity Simulator in FPGA

Larry Doolittle, LBNL, June 2014

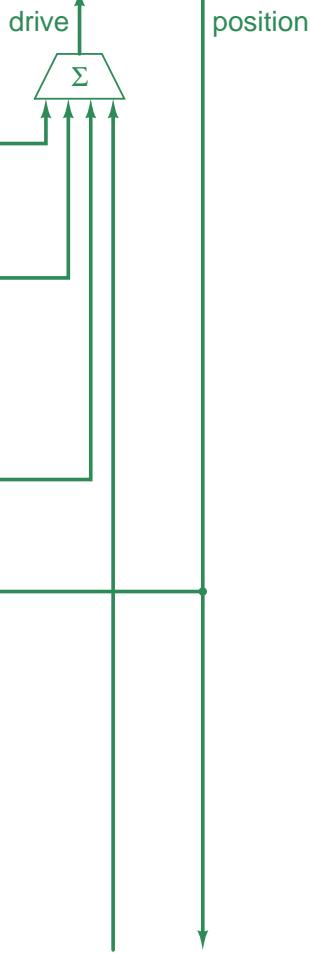
(abridged)

Clocks at ~200 MHz in Xilinx 7Axxx  
8 cavity-controller pairs could fit on AC701?

m mechanical modes updated every 2m cycles

Mechanical eigenmode propagator  
 $zy = My + d$

resonator.v



Gaussian noise  
Environmental sources?

m time-multiplexed complex values in eigen-coordinates

outer  
outer\_prod.v

Piezo control

Virtual Piezo

outer  
outer\_prod.v

Beam timing

Cavity electromagnetics simulator

Electromagnetic eigenmode propagator ( $\pi$  mode)  
cav\_mode.v

outer  
outer\_prod.v

dot  
dot\_prod.v

Electromagnetic eigenmode propagator ( $8\pi/9$  mode)  
cav\_mode.v

outer  
outer\_prod.v

dot  
dot\_prod.v

Drive

Forward

Reflected

Probe

Outputs at IF updated every 10 ns

