

Cavity Simulator in FPGA

Larry Doolittle, LBNL, June 2014

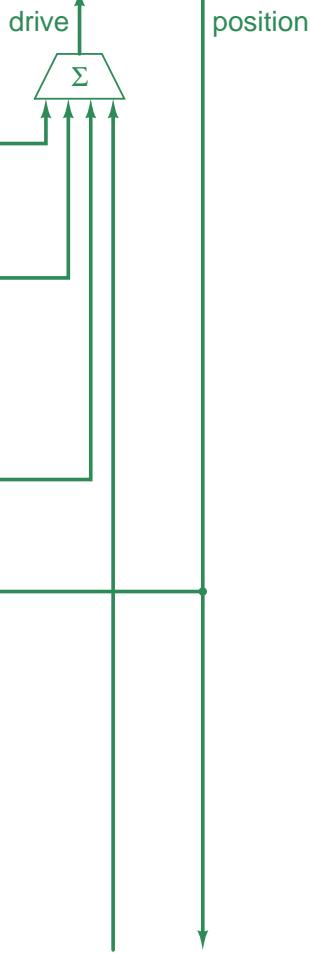
(abridged)

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?

outer
 $outer_prod.v$

Piezo control

Virtual Piezo

V
outer
 $outer_prod.v$

Beam timing

Cavity electromagnetics simulator

Electromagnetic eigenmode propagator (π mode)
 $cav_mode.v$

v^2
outer
 $outer_prod.v$

$\Delta\omega$
dot
 $dot_prod.v$

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

v^2
outer
 $outer_prod.v$

$\Delta\omega$
dot
 $dot_prod.v$

Drive

Forward

Reflected

Probe

Outputs at IF updated every 10 ns

$cav_elec.v$

IQ

upconvert
 $pair_couple.v$