

Cavity Simulator in FPGA

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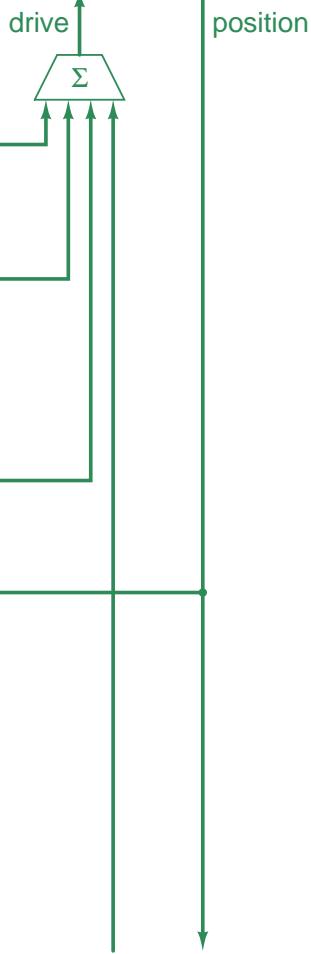
(abridged)

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

Piezo control

Virtual Piezo

outer
outer_prod.v

outer
outer_prod.v

Beam timing

Cavity electromagnetics simulator

Electromagnetic eigenmode propagator
(π 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

IQ

upconvert
pair_couple.v

IQ

IQ

IQ

cav_elec.v

m mechanical modes updated every 2m cycles

to additional cavities