

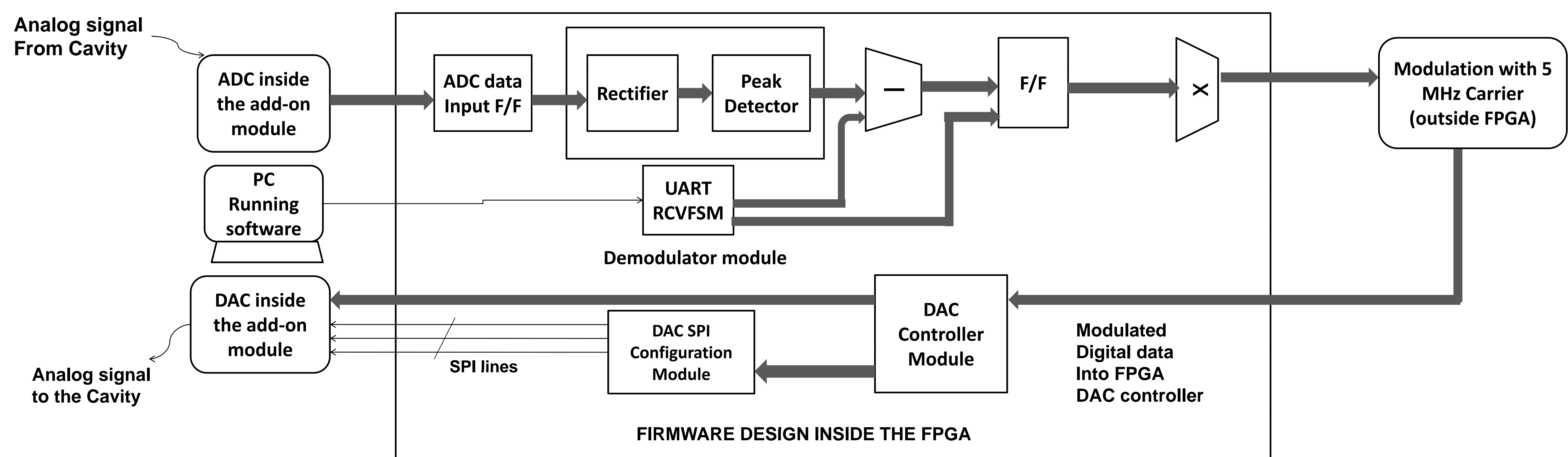
FPGA BASED AMPLITUDE CONTROL SYSTEM FOR ACCELERATING CAVITIES

MADHUSUDAN DEY, ABHISHEK SINGH, SURAJIT GHOSH, ADITYA MANDAL, SUDESHNA SETH, SUMIT SOM
Variable Energy Cyclotron Centre, Kolkata
email: singhabhishek@vecc.gov.in

Introduction:

An FPGA based digital controller has been designed and simulated for low level RF voltage control of a 650MHz cavity and 30Kw,CW mode. Any appropriate control strategy can be implemented in these platform. The voltage from pick up coil has been fed to the controller after down conversion; the signal is digitized using high speed ADCs.

Block Diagram of the system:



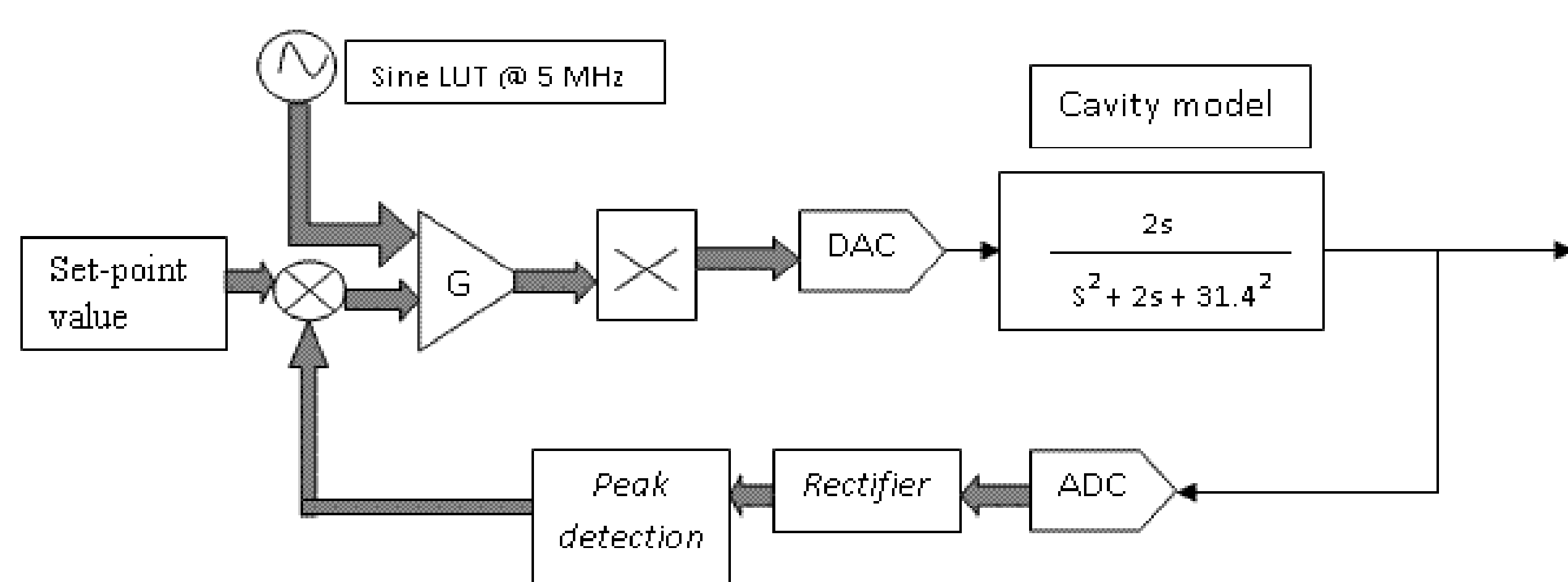
Hardware details of the design:

1. Virtex-4 FPGA (MB) board.
2. ADC DAC add on module.125 MSPS

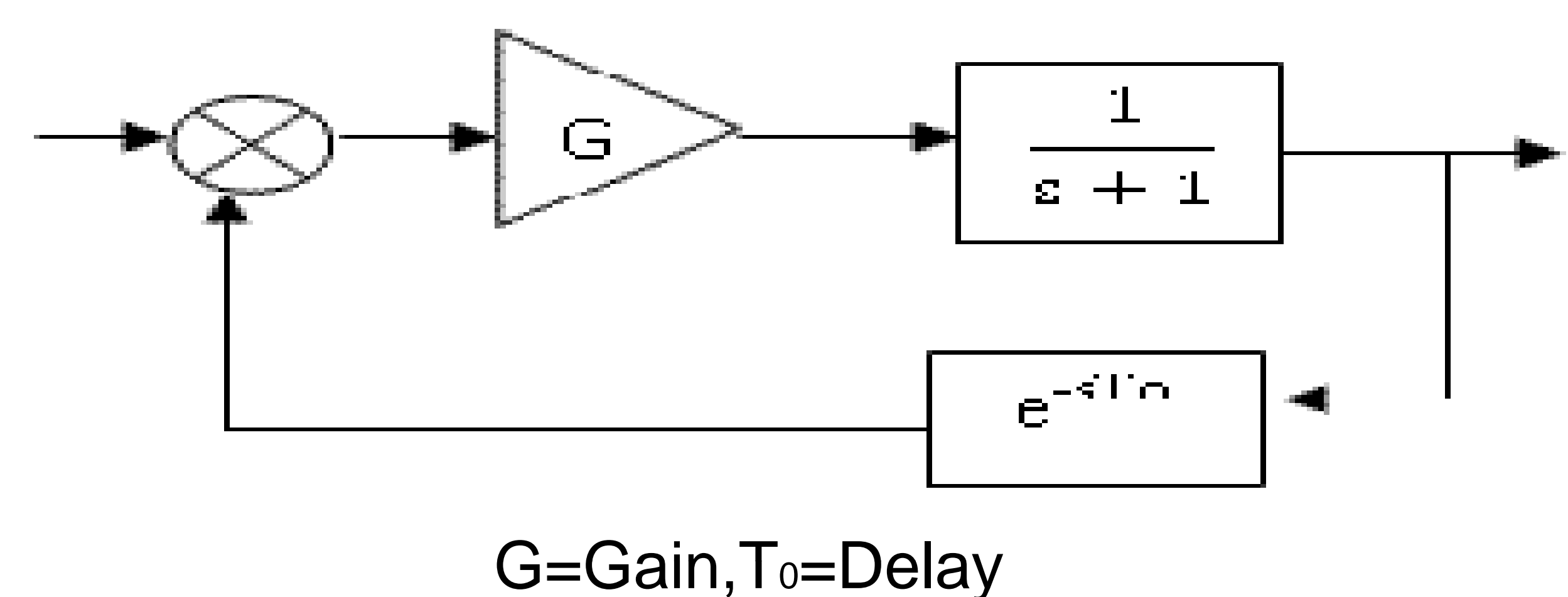
Design tool used:

1. Xilinx ISE 12.1 Design software.
2. MATLAB simulink simulation software.

FPGA Block Level Details of the control loop :

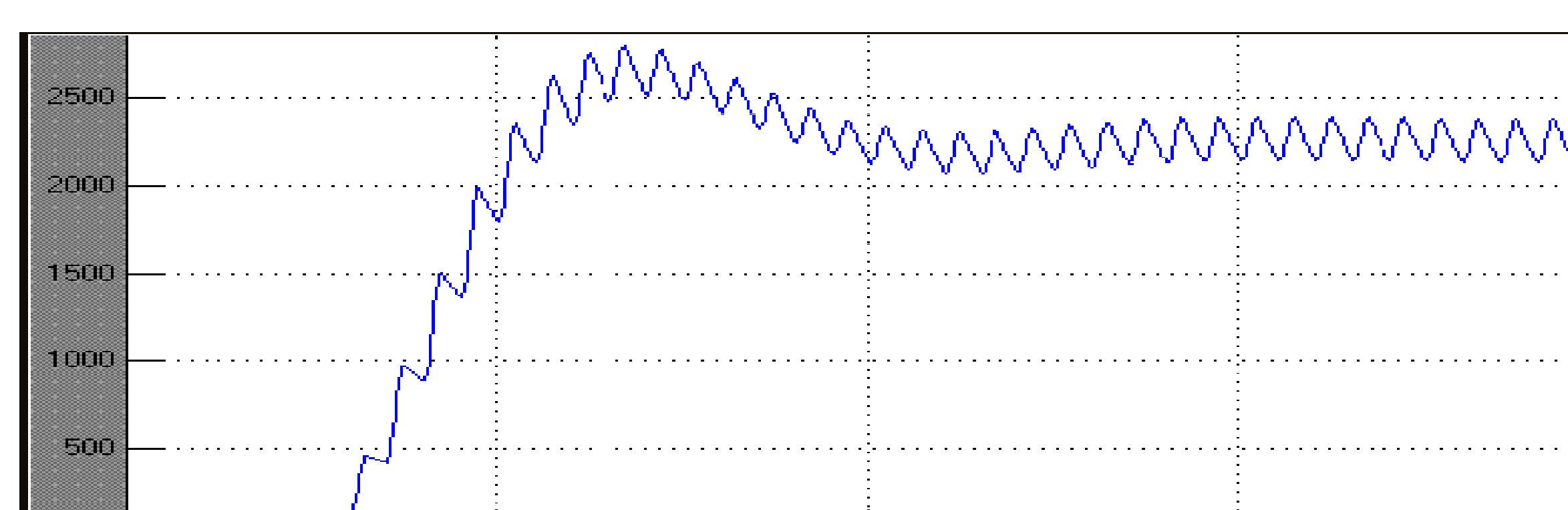


Baseband equivalent model of control loop:

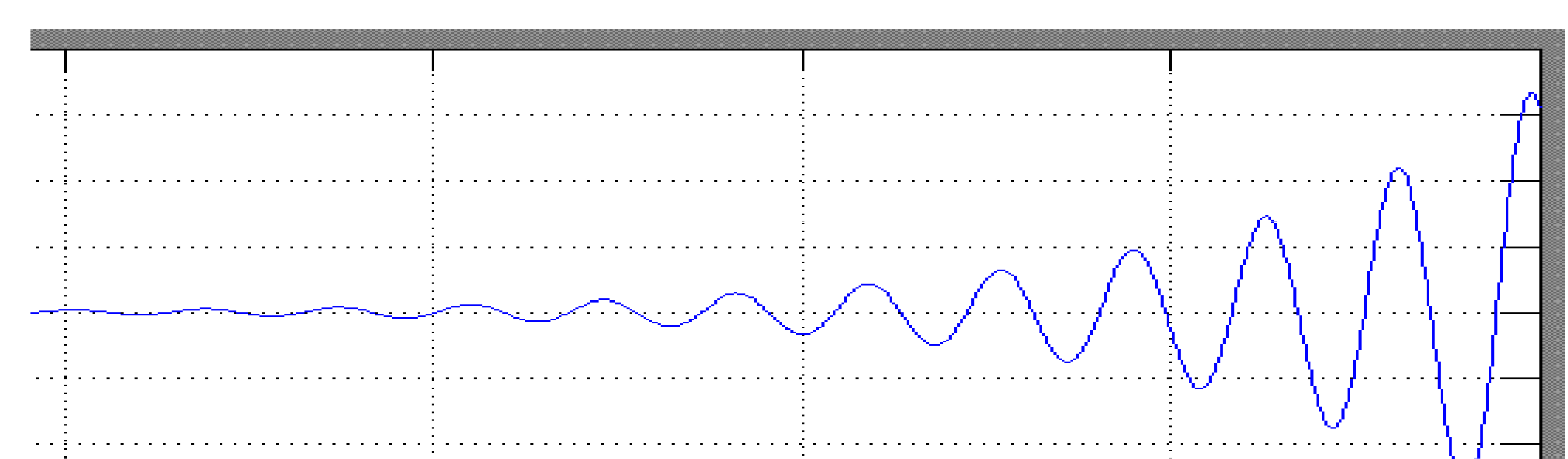


G=Gain, T_0 =Delay

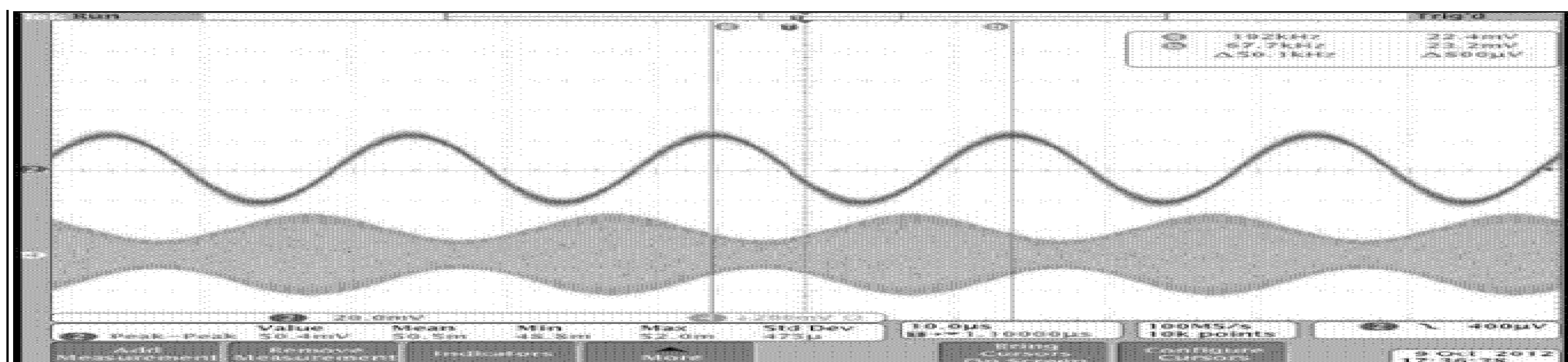
Simulation output:



Carrier model simulink output, G=10



Baseband model simulink output, G=10, $T_0=0.2$ sec



5 MHz carrier signal modulated by a 50 KHz baseband sine wave demodulated by demodulator module implemented in FPGA

Conclusion :

The simulation work was completed and the model is codified in VHDL. The design is not yet put on the actual cavity. The actual set-up and the performance study is undergoing.