Simulation model for discharges study in MPGD

Meeting SPLAM 03/02/2012

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Simulation model for discharges study in MPGD (µmegas)

GOAL :

•Define the optimum material for the resistive layer and the optimum size and thickness (spark protection/signal collection)

BUT : model must be correct in order to have a good background

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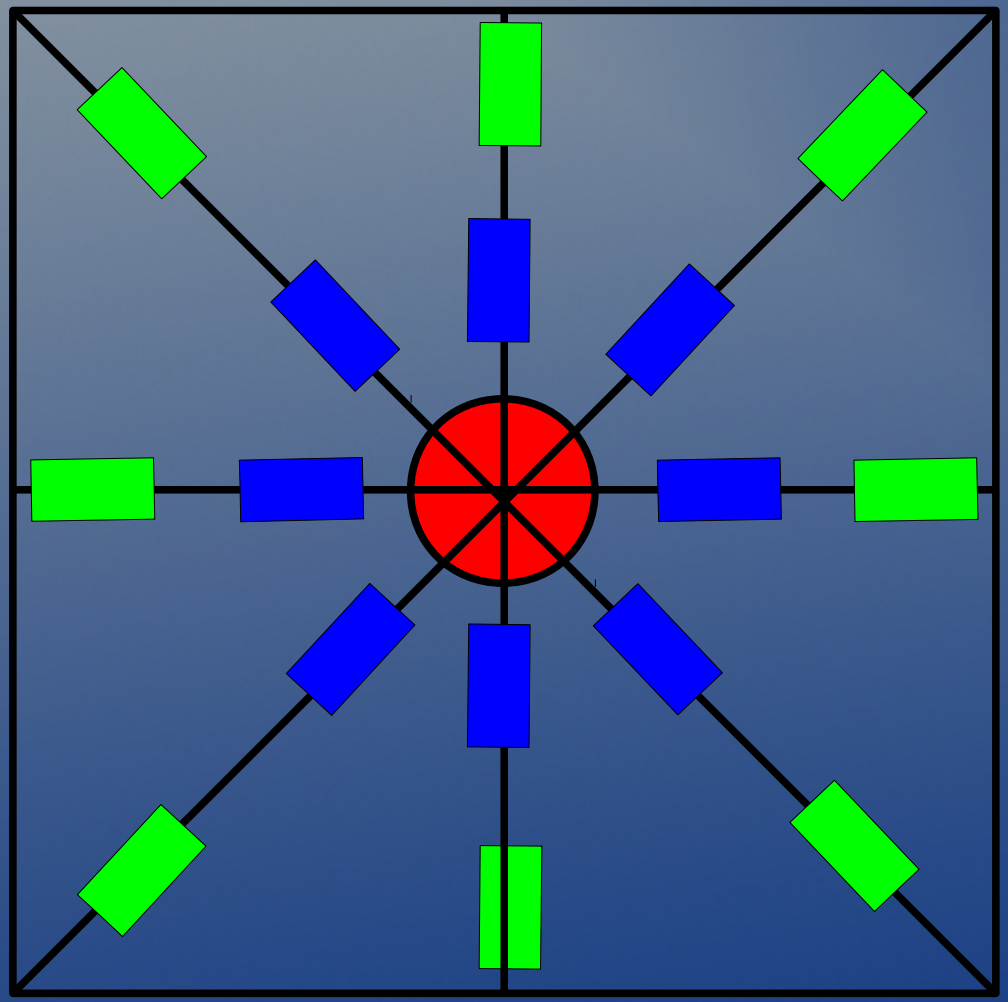

Modelisation of the mesh and the ground plane : connection with the neighbour via resistor (R = 10 mΩ for horizontal and vertical and 14 mΩ for diagonal) and inductance (L = 100 fH)

The pad and mesh described by a point

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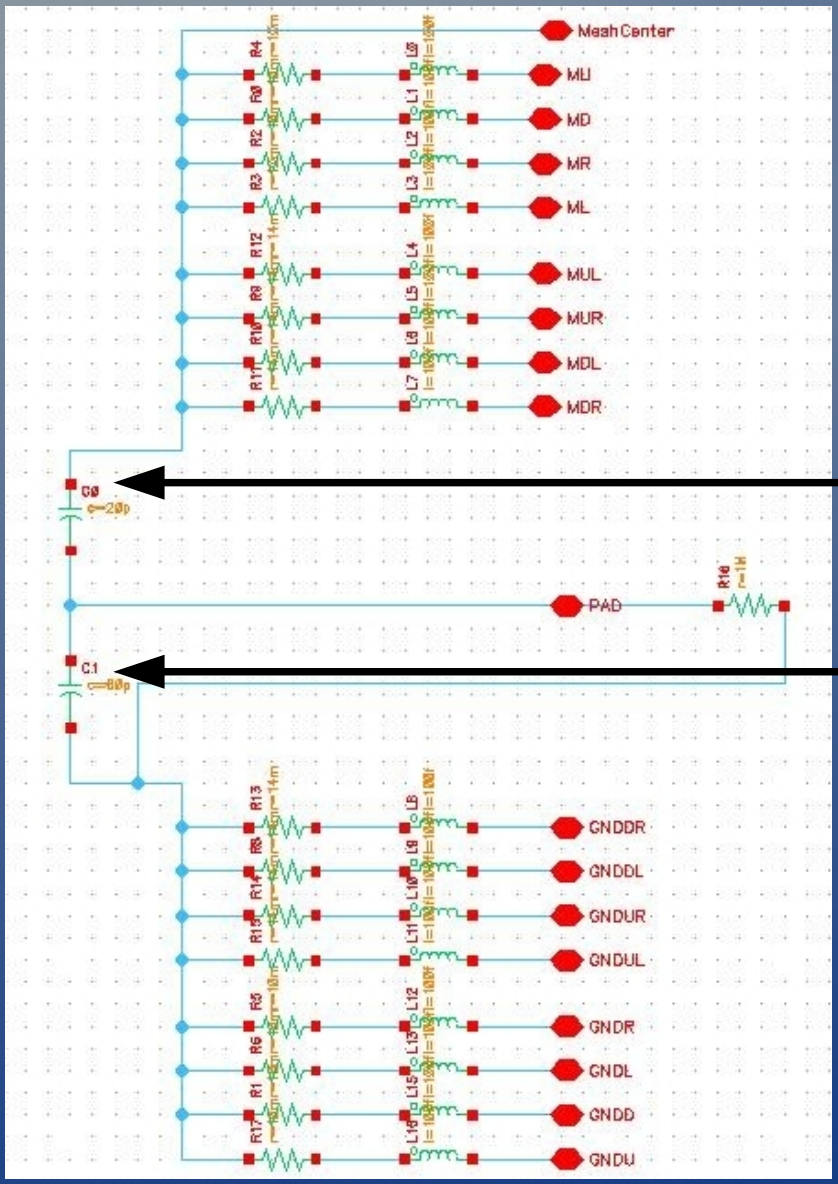

Elementary cell

mesh

$C_{mesh/pad}$ = 20 pF

pad

$C_{pad/gnd}$ = 60 pF

ground

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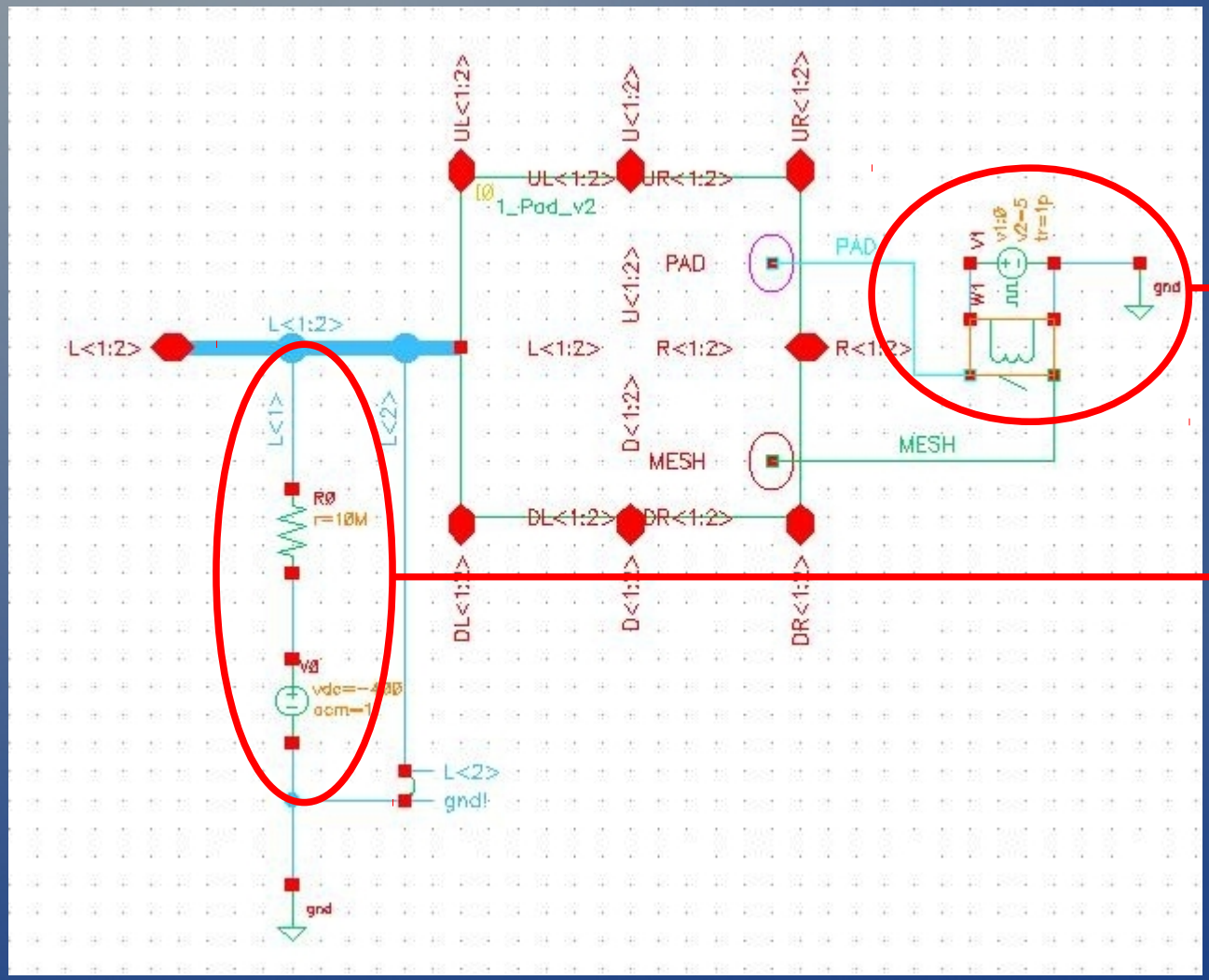

Switch to modelise discharge (short cut between mesh and pad)

Power supply of the mesh

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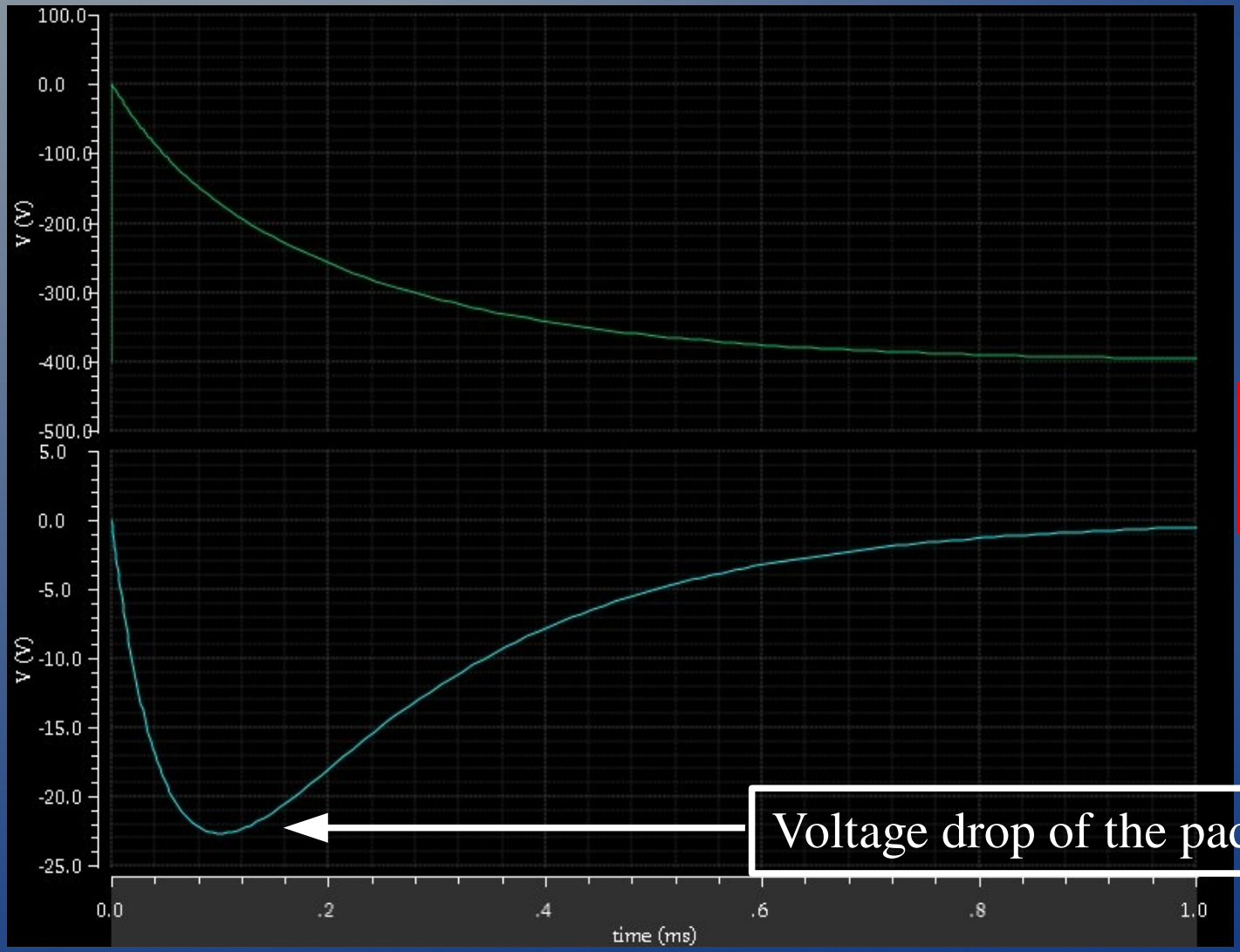

Discharge model:
switch closed @ 1µs
rise time = fall time = 1 ps
pulse duration = 1 ns

Fast component for the mesh and slow for the pad

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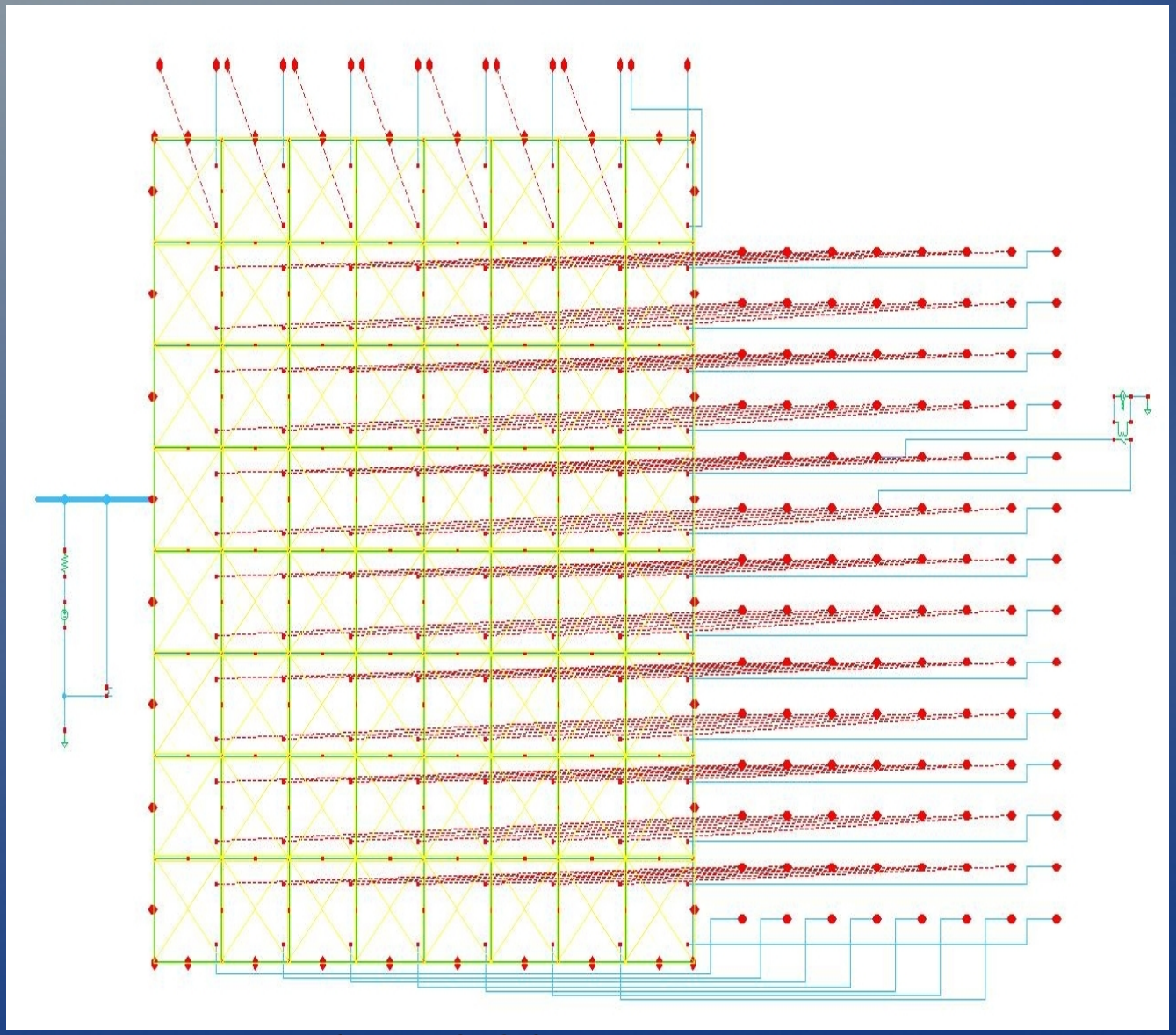

64 pads model
=> extend the model to N×N pads

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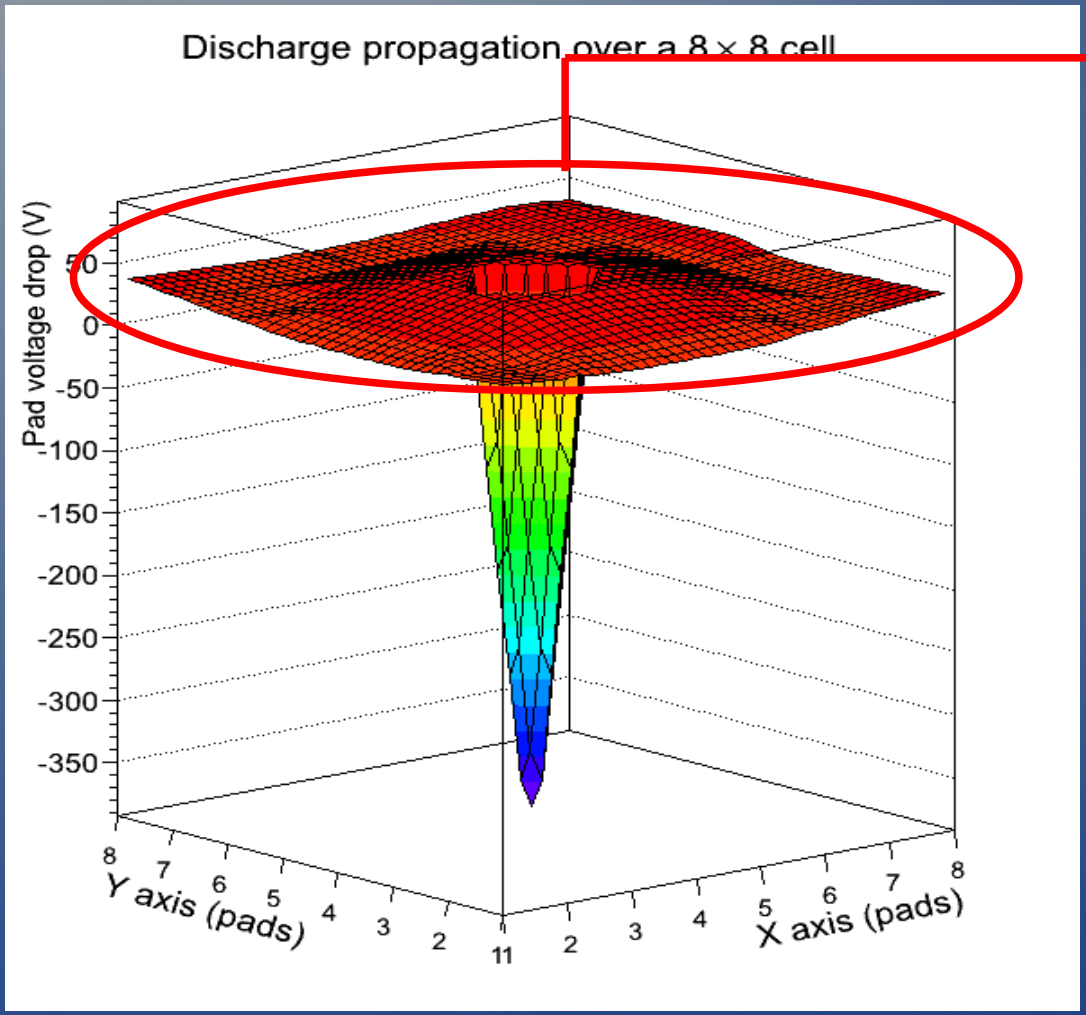

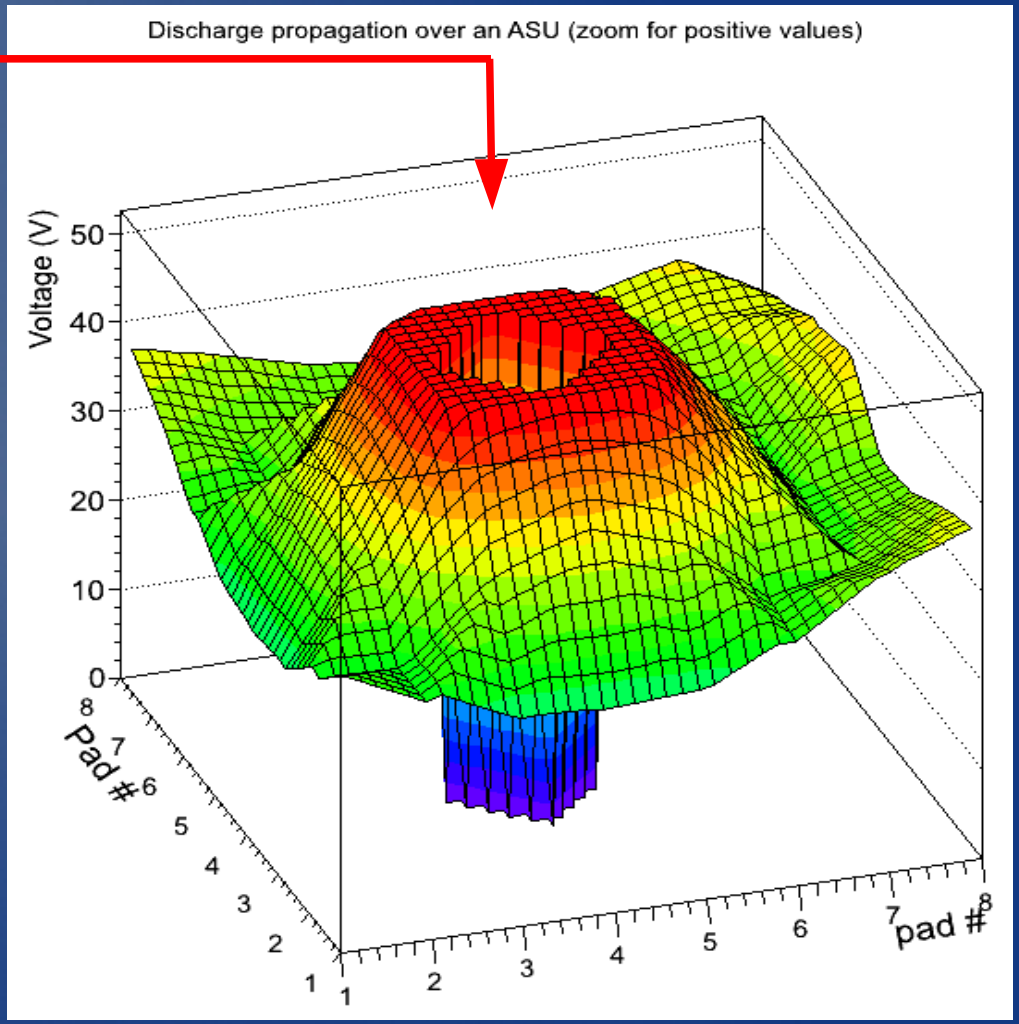

Discharge pad votage → mesh voltage (-400V)

Neighbors pads compensate with positive voltage

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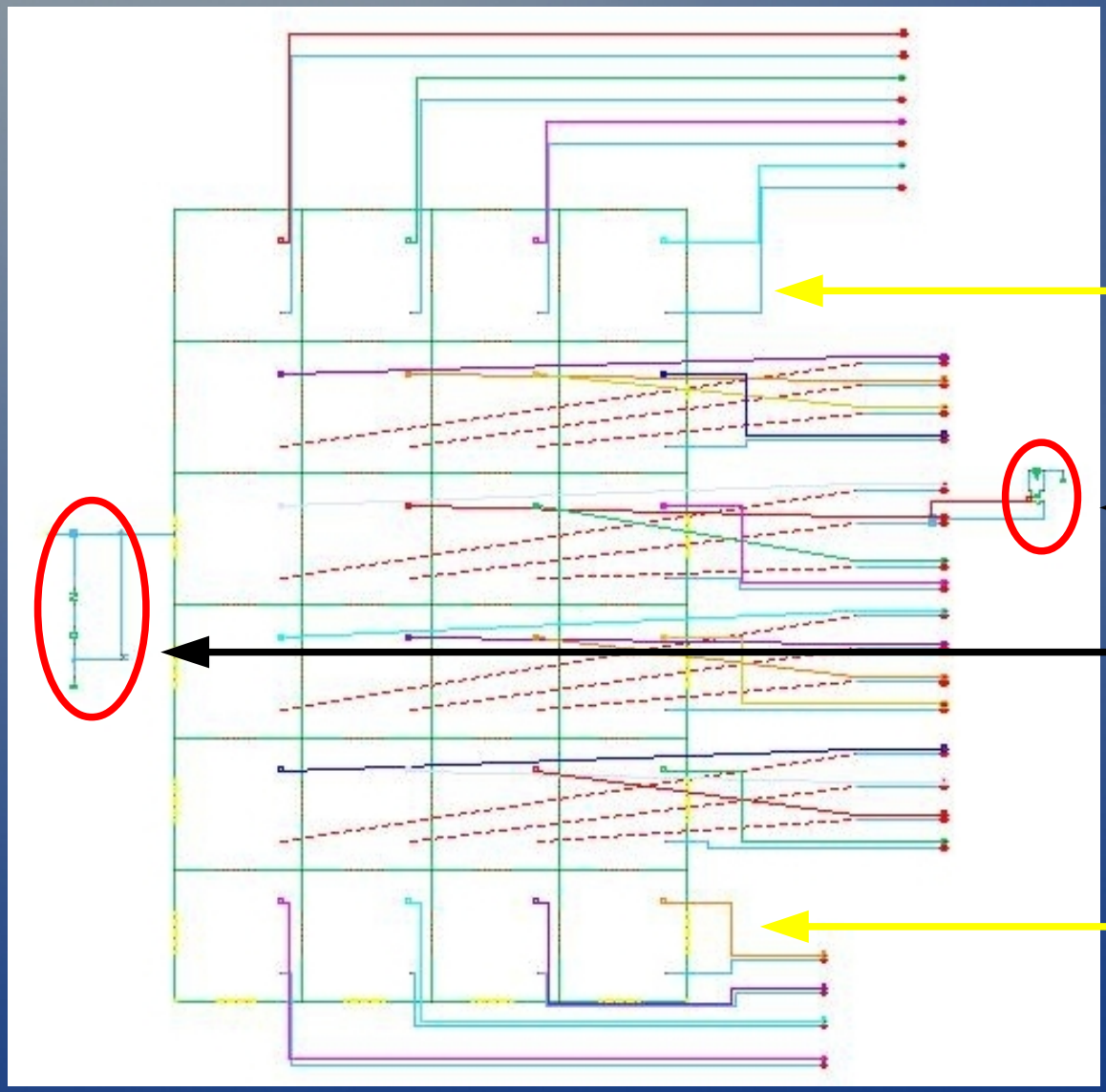

32×48 pads model using 8×8 cells

Bus of 64 meshes

Switch

Power supply of the mesh

Bus of 64 pads

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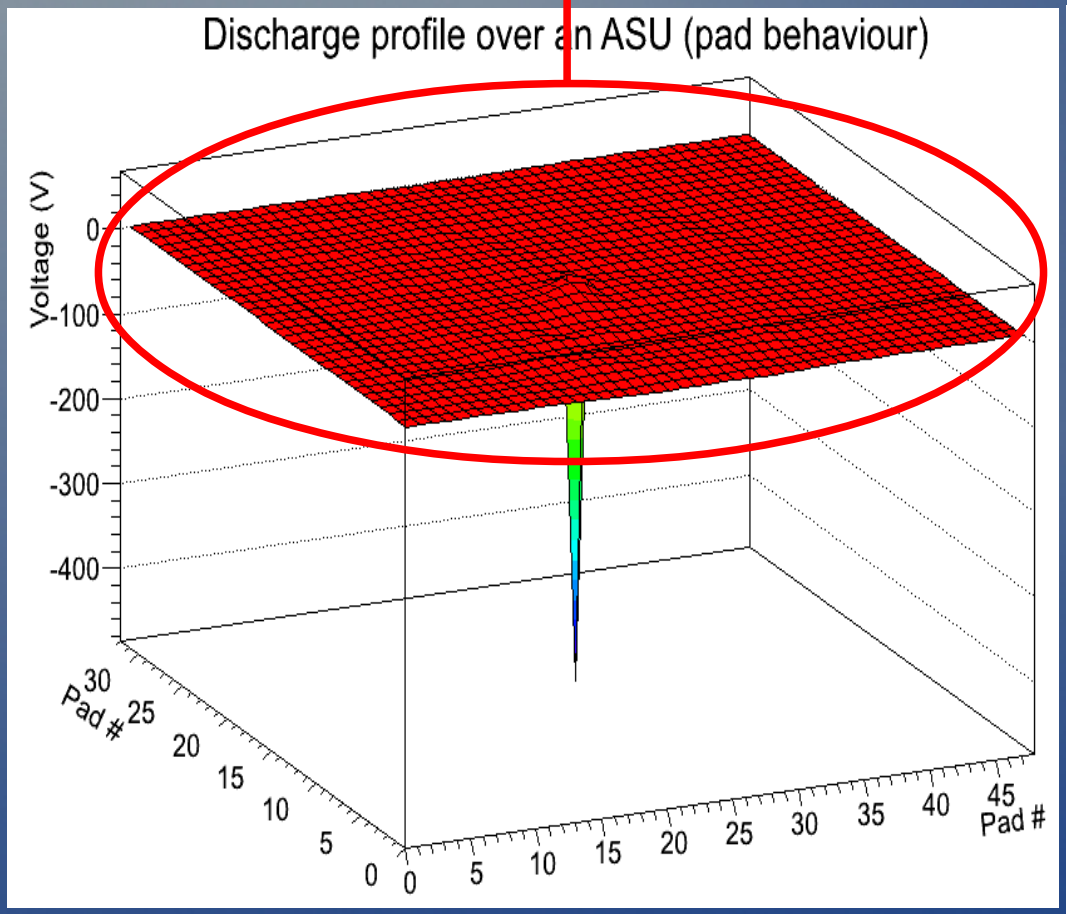

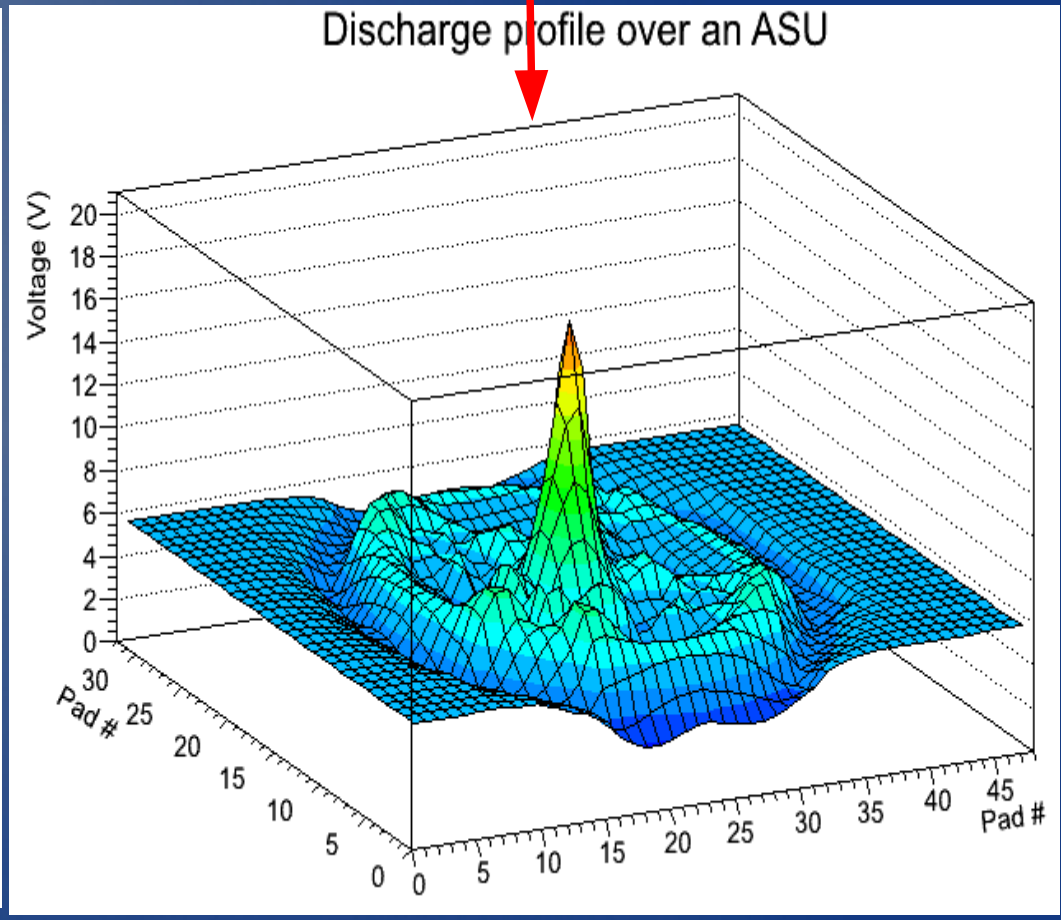

Same behavior as with 64 pads but lower voltage drop due to greater # of pads

Summary and future work

1. Implement resistive material in the simulations and observe the effect
2. Perform measurments with a dedicated electronic pcb and compare results with simulations
3. Improve the model → more accurate simulations to determine the optimum value for the resistive layer