SPICE simulations of anodes strips planes for the 2-dimension readout of Micro-Channel Plates Photo-Detectors
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A SPICE linear electrical model has been developed having in view the evaluation of the pulse waveforms obtained at the end of 50 Ohms transmission microstrip lines laid out on a glass substrate.

Figure 1
Spice model of a set of 7 strips of 32 elements (1/4 ‘’ long each).

Each anode is terminated on 50 Ohms to a bottom strip tied to an ideal ground at its end. A current waveform of any shape can be injected at any boundary between elements 1 and 16 (left to center). This current returns to the ideal ground. The propagating pulse can be estimated at any boundary and at the ends, as well as the crosstalk.

Parameters deduced from the strips geometry have been taken as:

-1 Top to bottom strip capacitance c1
-2 Top and bottom strip inductance l1
-3 Inter-strip capacitance c2
-4 Inter-strip mutual inductance m1
-5 Top to bottom strip mutual inductance m2
-6 Strip resistance r1

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>c1</td>
<td>835 fF</td>
</tr>
<tr>
<td>l1</td>
<td>625 pH</td>
</tr>
<tr>
<td>c2</td>
<td>50 fF</td>
</tr>
<tr>
<td>m1</td>
<td>2.5e-3</td>
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Another model with the anodes grounded has been checked, and showed a very poor uniformity performance (pulses injected close to an end are strongly attenuated by the close ground). Figure 3 shows the pulses obtained at each end when a current pulse is injected close to one end. The triangular current pulse rise time is 300 ps, and the decay time is 600 ps. The parameters are taken as shown in Table 1.
From Figures 3 and 4, the response uniformity can be estimated to +/- 22%, and the crosstalk to 23%, 18%, and 12% for the first, second and third neighbours respectively. The crosstalk signals, have a zero average, as expected from the model.

Crosstalk on the three first neighbours on top.
sed at the center. The two waveforms are exactly superimposed. Crosstalk on the three first neighbours on top.