“Who’s Afraid Of….
….Low Impedance?”

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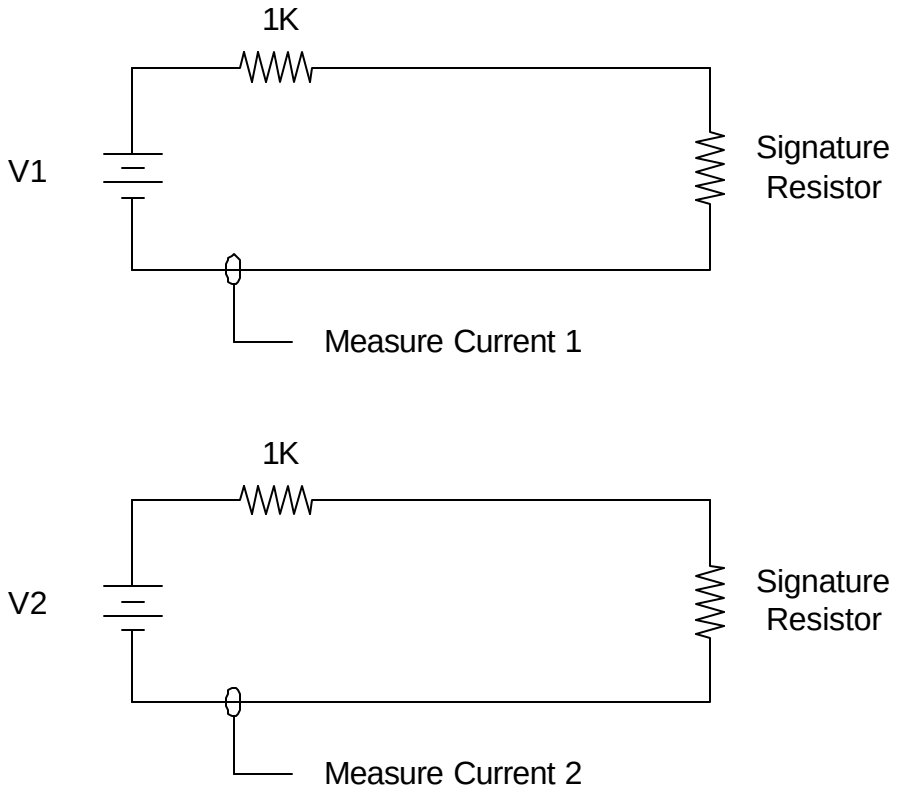
Resistive Discovery Using a Low Impedance PSE

- **An Idea for IC detection using a low impedance driver (an idea from Maxim)**
- **Two measurements are used to subtract out constant voltages and currents, only the measured load currents are subtracted instead of the probe voltages**



$$\text{If V1 > V2, then: Signature Slope} = \frac{(V1 - V2)}{(\text{Measure Current 1} - \text{Measure Current 2})}$$

Resistive Discovery Using a Low Impedance PSE

- **Advantages:**

- **can subtract out very large offset currents (e.g. leakages), up to 5 ma**
  - the maximum output current during discovery could then be 10ma
  - alternatively, a 1 ma maximum output current would allow for offset currents up to 500uA

- **Ability to drive 1 uF or higher capacitive loads across the PD signature at a rate that is 10 to 100 times faster compared to the high impedance drive approach**

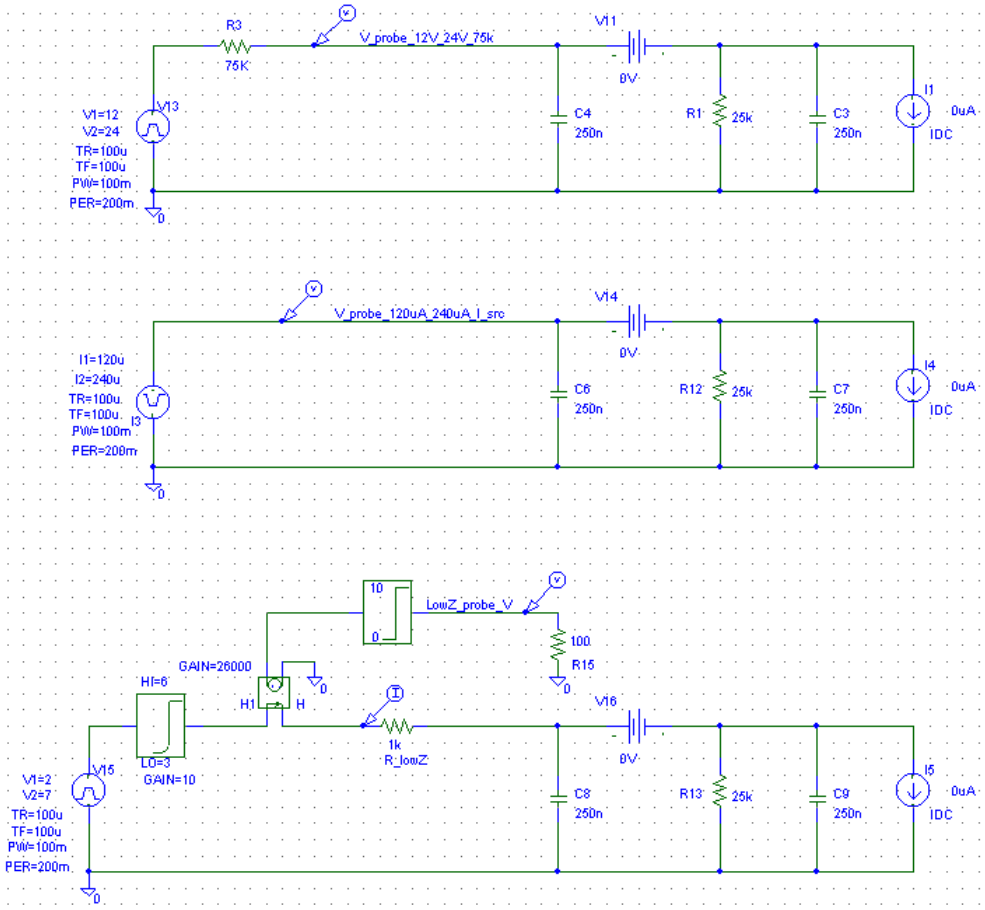
- **Faster Timing may allow for an effective cancellation of 50/60 Hz common mode noise**

- **EMI is controlled by limiting dV/dt and dI/dt**

- **Simulations follow, here the maximum output current was set at about 1 ma, rather than 10ma**

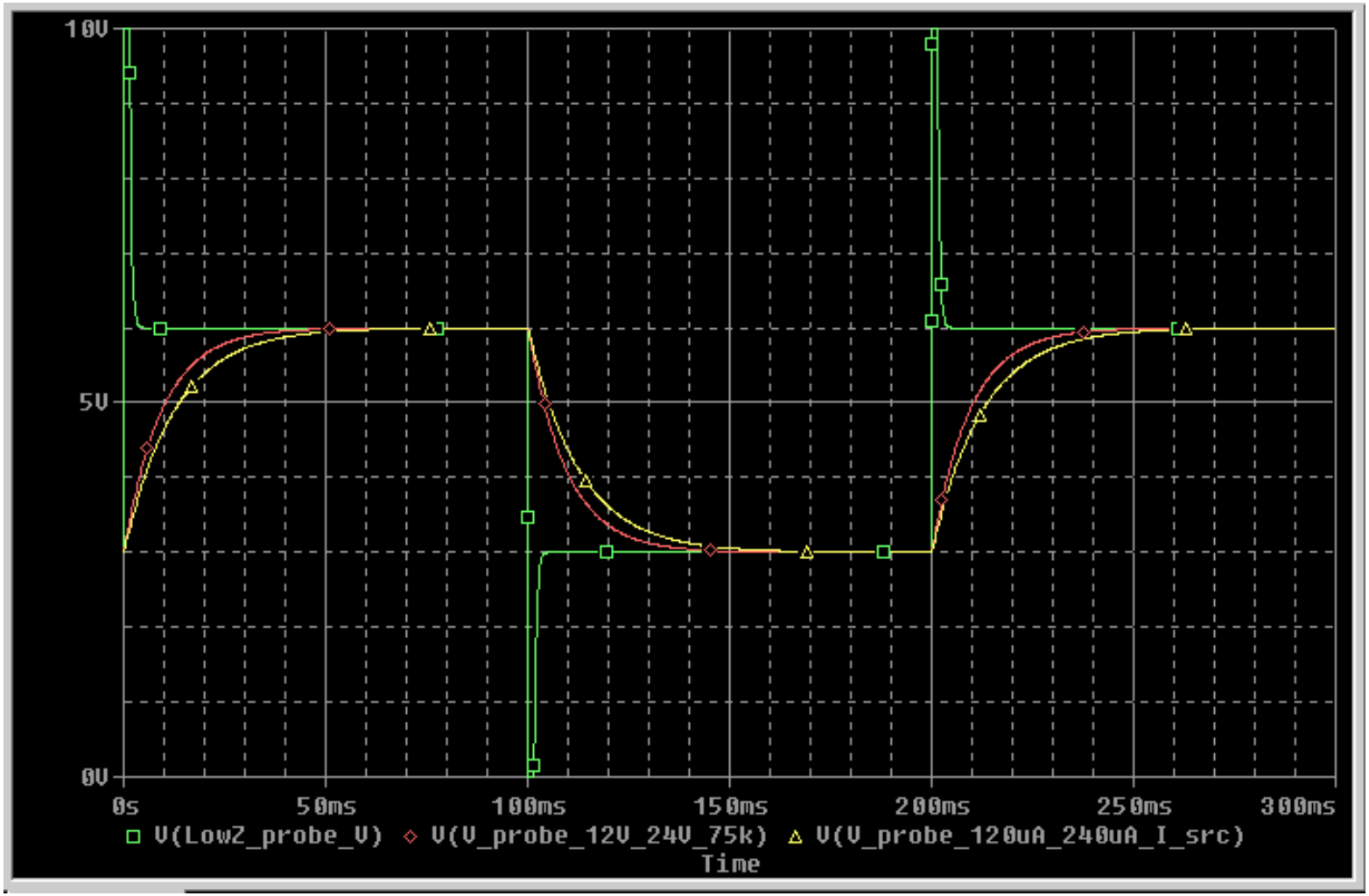
Resistive Discovery Using a Low Impedance PSE

- **Simulation Comparison**
  - top 12V, 24V, 75K, High Impedance PSE
  - middle 120 uA, 240 uA current source, High Impedance PSE
  - bottom 3V, 6V, low impedance PSE (1K output impedance)
    - the load current is scaled up by a factor of 26000 for comparison purposes



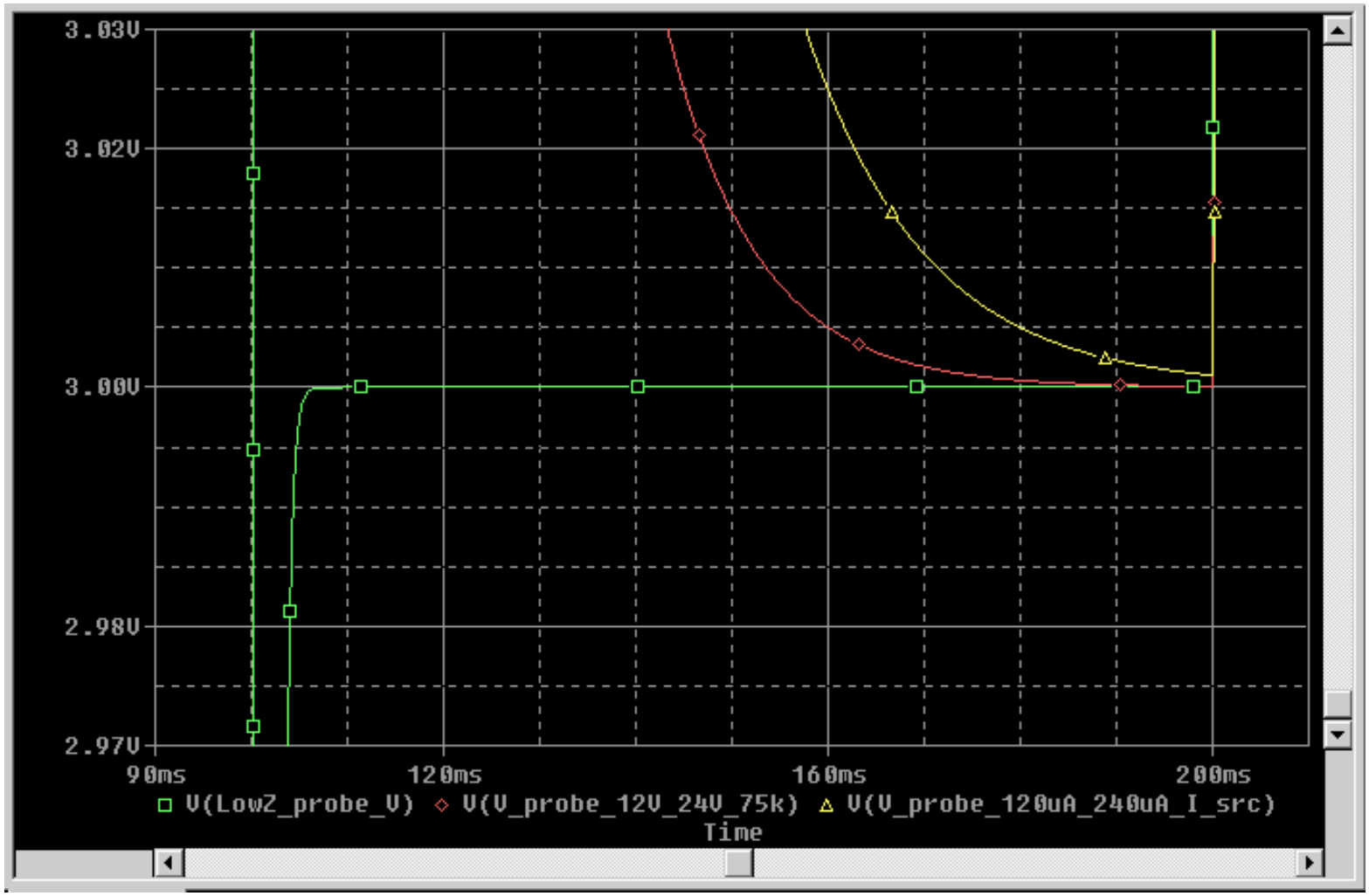
Resistive Discovery Using a Low Impedance PSE

- **Detection Time Simulation Results, 500 nF Load Capacitance**
  - yellow — 12V, 24V, 75K, High Impedance PSE: Result: 6V and 3V, with a 3V difference
  - red — 120 uA, 240 uA current source PSE: Result: 6V and 3V, with a 3V difference
  - green — 3V, 6V low impedance PSE: Result: 6V and 3V, with a 3V difference



Resistive Discovery Using a Low Impedance PSE

- **1% Settling Time Simulation Results, 500 nF Load Capacitance**
  - yellow 75K, 1% settling time is 43 ms
  - red Current Source 1% settling time is 57 ms
  - green Low Z (1K, 1ma max) 1% settling time is 4 ms



Resistive Discovery Using a Low Impedance PSE

- **Summary:**

- **Low Impedance can work, subtract currents rather than voltages**
- **I have shown that large constant leakage currents can be canceled (not shown herein)**
- **Detection time is greatly reduced with a capacitive load, more than a factor of 10**
- **One could run multiple cycles at a rate that tends to cancel out 50/60 Hz noise**
- **Low Z would have to be specified so as to not interfere with High Z methods**
- **We should consider allowing for this approach in the 802.3af spec if it can be shown to not interfere with high impedance methods which have already been demonstrated in Avaya Prototypes**