

**YAG-444-4AH Four Quadrant Photodiode Measurements****LIGO T1100029-v2****R. Abbott, Caltech****14 January, 2011**

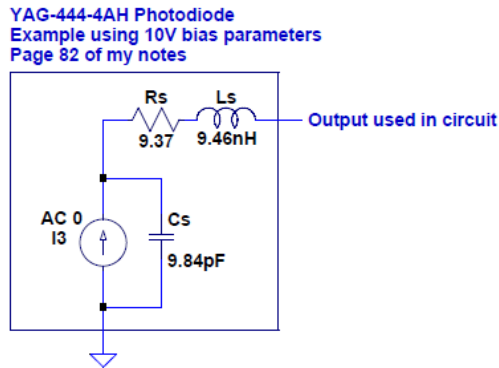
- 1. Overview:** Circuit models for the Perkin Elmer (formerly EG&G) YAG-444-4AH Enhanced Silicon Photodiode have been extracted at various reverse bias voltages from measurements taken on an HP4195A, RF Impedance Analyzer. A focused set of impedance measurements vs. bias are presented at 45 MHz. The calibration of the analyzer was checked using known components (resistors, capacitors, and inductors) to verify the accuracy of the analyzer calibration. Measurement error is less than 5%. The maximum bias voltage obtainable using the HP4195A is 40VDC; this was the limit of the measurement data.
- 2.** Data taken at 45MHz on a single quadrant of the four quadrant diode is shown in Table 1

**Table 1**

<b>Reverse Bias (Volts)</b>	<b>Series Capacitance (pF)</b>	<b>Series Resistance (ohms)</b>
0	11.9	95
5	10.7	58
10	10.5	49
15	10.3	43
20	10.2	38
25	10.1	33
30	10.0	30
35	10.0	27
40	9.9	23

- In order to use this model in a spice simulation, the following circuit topology should be used. The values shown in Figure 1 are taken from Table 2 as an example application. A reasonable number for the responsivity of this diode to 1064nm light is 0.45 amperes per watt.

Figure 1



- Table 2 shows the equivalent circuit model of the YAG-444-4AH at various bias levels. These models are derived from a fit obtained over a frequency span of 5 to 200 MHz.

Table 2

Reverse Bias (Volts)	Series Inductor (nH)	Series Capacitor (pF)	Series Resistor (ohms)
10	9.46	9.84	9.37
24	9.99	9.72	8.08
40	10.42	9.61	6.99