

Reflectivity measurement of 95% beam splitter in two polarizations

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1. Introduction

This document covers reflectivity (or equivalently transmissivity) measurement performed in the lab with a 95% beam splitter (E1000871-02) and a 1064 nm free space laser at two different polarizations.

2. Background

In the original drawing of HAM1 optical layout (D1000313-v10) this beam splitter was labeled as ‘M14’ and placed so as to reflect a S-polarizing beam instead of P-polarizing beam. However, on the other hand, because this particular beam splitter was designed for P-polarizing beam we needed to measure the actual reflectivity of it with a S-polarizing beam at wavelength of 1064 nm.

3. Set up

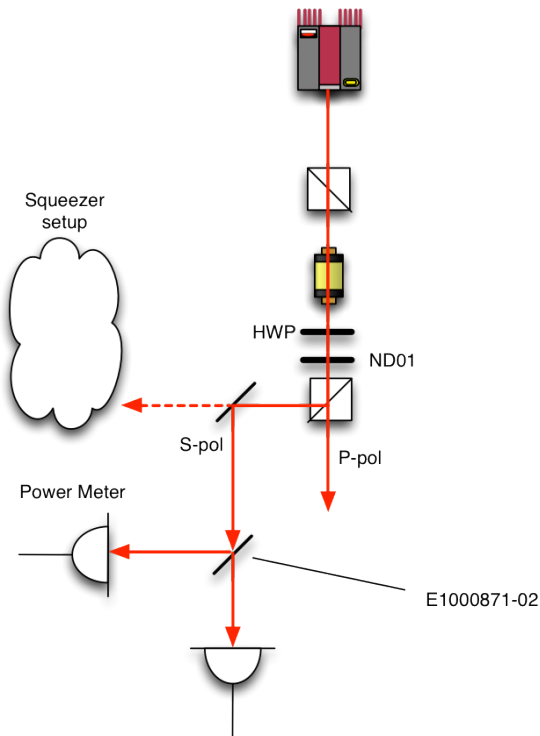


Figure.1 Measurement setup



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As for the laser source I used the existing Lightwave NPRO which had been setup for a reference cavity and SURF squeezer experiment at the Hanford OSB optics lab. A polarizing beam splitter (PBS), which was already setup, was used to generate both S- and P-polarizing beams as shown in figure 1.

Items used :

- 1064 nm laser source (which had been already setup)
- Polarizing cube beam splitter, 1064nm (which had been already setup)
- Half wave plate, 1064 nm (which had been already setup)
- ND01 neutral density filter
- Steering mirror, 1064 nm
- Ophir laser power meter, Vega , with filter removed

4. Measurements

Below are the results of the measurements (S-pol was measured with the reflected light off of the PBS and P-pol with the transmitted light). Losses are assumed to be very small so that $R+T=1$.

$R = 99.4 \pm 0.1 \%$ for S-pol at 1064 nm, 45 deg

$R = 94.8 \pm 0.9 \%$ for P-pol at 1064 nm, 45 deg

5. Links

- Beam splitter specification : E1000871-02-v1
<https://dcc.ligo.org/DocDB/0029/E1000871/001/E1000871-v1.pdf>
- HAM1 optical layout : D1000313-v10
https://dcc.ligo.org/DocDB/0009/D1000313/010/D1000313-v10_HAM1.pdf
- LHO alog 7817
<https://alog.ligo-wa.caltech.edu/aLOG/index.php?callRep=7817>