

This note reports the bulk absorption measurement of the aLIGO CP01 substrate at the RTS bench. One mapping scan was carried out over center 160 mm at depth of about 25 mm with step of 1 mm. As expected, the bulk absorption of the Heraeus 3001 fuse silica is too small (<0.02 ppm/cm, E080494) to be measured, in other word, the amplitude of the lock-in amplifier was in noise range and the phase angle random during the scan.

Using the LIGO-I TM04 witness sample (3.3 ppm/cm), the measured 'noise' and signature (with 30 YAG laser off) were calibrated as shown in the following figure. The bulk absorption would be 0.1 ± 0.7 ppm/cm. Several 'green' points were manually checked and found that none of them was real absorption point. This measurement should be considered to be checks of high absorption points and upper limit. Following investigation showed that the chiller pump of the 30W Nd:YAG laser was the main noise source which caused the wider distribution (red histogram in the figure) when the YAG was on. So the conclusion is that no measurable absorption was observed. We will try to decrease the coupling of the chiller pump's vibration into the signal channel and thus push down the measurement uncertainty. We'll also order a piece of this type of material to try to measure its bulk absorption.

