RESULTS AND CONCLUSIONS

According to Figure 3, our calculated value for *c* agrees with the accepted value for the speed of light. The point plotted in Figure 3 represents our experimental value for *c*. This point's value, with uncertainties, is $3.024 \times 10^8 \pm 2.6999 \times 10^6$ m/s. Applying the usual method of rounding the final result, our experimental value for *c* is $3.0 \times 10^8 \pm 2.7 \times 10^6$ m/s. This agrees with the accepted value for *c* of 299,792,458 m/s to within uncertainties.

The uncertainty in the final result is on the order of 1% of the experimental value. This seems to imply that there is some small room for improvement. Using Eq. (10)

$$c = \frac{8\pi A D^2 (\frac{Rev}{s}_{CW} + \frac{Rev}{s}_{CCW})}{(D+B)(s'_{CW} - s'_{CCW})} \qquad (10)$$

one can take the total differential to obtain

$$dc = \frac{8\pi A\left(\frac{Rev}{s}_{CW} + \frac{Rev}{s}_{CCW}\right)}{\left(s'_{CW} - s'_{CCW}\right)} * \frac{D(D+2B)}{(D+B)^2}\, dD + \frac{8\pi D^2\left(\frac{Rev}{s}_{CW} + \frac{Rev}{s}_{CCW}\right)}{(D+B)(s'_{CW} - s'_{CCW})}\, dA$$

$$+ \frac{8\pi A D^2(\frac{Rev}{s}_{CW} + \frac{Rev}{s}_{CCW})}{(s'_{CW} - s'_{CCW})} * \frac{-1}{(D+B)^2}\, \mathrm{dB} + \frac{8\pi A D^2}{\left(s'_{CW} - s'_{CCW}\right)(D+B)}\, d\frac{Rev}{s}_{CW}$$

$$+ \frac{8\pi A D^2}{\left(s'_{CW} - s'_{CCW}\right)(D+B)}\, d\frac{Rev}{s}_{CCW} + \frac{8\pi A D^2}{(D+B)} * \frac{-1}{\left(s'_{CW} - s'_{CCW}\right)^2}\, d\,s'_{CW}$$

$$+ \frac{8\pi A D^2}{(D+B)} * \frac{1}{\left(s'_{CW} - s'_{CCW}\right)^2}\, d\,s'_{CCW} \qquad (11)$$

Treating infinitesimally small changes in *c*, *D*, *A*, *B*, *Rev/s,* and *s'* (traditional calculus notation) as experimental uncertainties, Eq. (11) can be rewritten as an error equation as follows.

$$\delta c = \frac{8\pi A\left(\frac{Rev}{s}_{CW} + \frac{Rev}{s}_{CCW}\right)}{\left(s'_{CW} - s'_{CCW}\right)} * \frac{D(D+2B)}{(D+B)^2}\, \delta D + \frac{8\pi D^2\left(\frac{Rev}{s}_{CW} + \frac{Rev}{s}_{CCW}\right)}{(D+B)(s'_{CW} - s'_{CCW})}\, \delta A$$

$$+ \frac{8\pi A D^2(\frac{Rev}{s}_{CW} + \frac{Rev}{s}_{CCW})}{(s'_{CW} - s'_{CCW})} * \frac{-1}{(D+B)^2}\, \delta \mathrm{B} + \frac{8\pi A D^2}{\left(s'_{CW} - s'_{CCW}\right)(D+B)}\, \delta\frac{Rev}{s}_{CW}$$

$$+ \frac{8\pi A D^2}{\left(s'_{CW} - s'_{CCW}\right)(D+B)}\, \delta\frac{Rev}{s}_{CCW} + \frac{8\pi A D^2}{(D+B)} * \frac{-1}{\left(s'_{CW} - s'_{CCW}\right)^2}\, \delta s'_{CW}$$

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$$+ \frac{8\pi A D^2}{(D+B)} * \frac{1}{\left(s'_{CW} - s'_{CCW}\right)^2} \, \delta \, s'_{CCW} \qquad (12)$$

Each term is an expression that illustrates how small uncertainties in each variable translate into small uncertainties in *c*.

An error-analysis table can be constructed where the terms in Eq. (11) serve as column headings. With this table one can identify the dominant source of error.

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