

Example Error Calculations

$$q = m^2/L$$

$$m^2 = 32 \pm 1.6$$

$$L = 10 \pm .1$$

$$\frac{\delta q}{q} = \frac{\delta m^2}{m^2} \oplus \frac{\delta L}{L}$$

$$= .05 \oplus .01 = .051$$

$$\delta q = .051 \times 9 = .051 (3.2) = .163$$

$$h = t/2 \sin \theta$$

$$t = 5 \pm .1$$

$$\theta = 41 \pm 1^\circ$$

$$\frac{\delta h}{h} = \frac{\delta t}{t} \oplus \frac{\delta \sin \theta}{\sin \theta}$$

$$= .020 \oplus .0199$$

$$= .028$$

$$\delta h = (\delta h/h) h = .028 (1.64)$$

$$= .046$$

$$\frac{\delta \sin \theta}{\sin \theta} = \frac{|\sin(\theta + \delta\theta) - \sin \theta|}{\sin \theta}$$

$$= \frac{|\sin 42^\circ - \sin 41^\circ|}{\sin 41^\circ}$$

$$= .0199$$

$$B = I^2 R / (x^2 + c^2) = u/v$$

$$\frac{\delta u}{u} = \left(\frac{2 \delta I}{I} \right) \oplus \frac{\delta R}{R}$$

$$I = 100 \pm 2 \quad R = 10 \pm .1$$

$$x = 12.3 \pm 1 \quad c = 5 \pm .00001$$

$$\frac{\delta u}{u} = (2 \times .02) \oplus .01 = .041$$

$$\delta v = \delta(x^2) \oplus \delta(c^2) = 2x \delta x \oplus 2c \delta c$$

$$= 24.6 \oplus .001 = 24.6$$

$$\frac{\delta v}{v} = \frac{24.6}{12.3^2 + 5^2} = .033$$

$$\frac{\delta B}{B} = \frac{\delta u}{u} \oplus \frac{\delta v}{v} = .041 \oplus .033 = .053$$

$$\delta B = B \cdot (\delta B/B) = 132.2 \times (.053) = 6.94$$