

$$2.3 \quad a = \frac{v^2}{r}$$

$$\frac{\Delta v}{v} \times 100 = \pm 0,2\%$$

$$\frac{\Delta r}{r} \times 100 = \pm 0,8\%$$

$$\Delta a \approx \frac{\partial a}{\partial v} \Delta v + \frac{\partial a}{\partial r} \Delta r$$

$$\frac{\partial a}{\partial v} = \frac{\partial}{\partial v} \left( \frac{v^2}{r} \right)$$

$$= \frac{1}{r} \frac{\partial}{\partial v} (v^2)$$

$$= \frac{1}{r} 2v$$

$$\frac{\partial a}{\partial r} = \frac{\partial}{\partial r} \left( \frac{v^2}{r} \right)$$

$$= v^2 \cdot \frac{\partial}{\partial r} \left( \frac{1}{r} \right)$$

$$= v^2 \frac{\partial}{\partial r} (r^{-1})$$

$$= -v^2 r^{-2}$$

$$= -\frac{v^2}{r^2}$$

$$\Delta a \approx \frac{\partial a}{\partial v} \Delta v + \frac{\partial a}{\partial r} \Delta r$$

$$\Delta a = \frac{2v}{r} \Delta v - \frac{v^2}{r^2} \Delta r$$

$$\frac{\Delta a}{a} = \frac{2v}{2r} \frac{\Delta v}{v} - \frac{v^2}{2r^2} \frac{\Delta r}{r}$$

$$= \frac{r}{v^2} \frac{2v}{r^2} \Delta v - \frac{v^2 r}{r^2 v^2} \Delta r$$

$$= 2 \frac{\Delta v}{v} - \frac{\Delta r}{r}$$

$$-0,002 \leq \frac{\Delta v}{v} \leq +0,002$$

$$-0,008 \leq \frac{\Delta r}{r} \leq +0,008$$

2.3 cont... So for maximum error in  $a$ :

$$\frac{\Delta a}{a} = 2(+0,002) - (-0,008)$$

$$= 0,004 + 0,008 = 0,012$$

$$\frac{\Delta a}{a} \times 100 = \pm 1,2\% \text{ (MAX)}$$