Disk SECTOR STABILITY

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Assumptions about intrinsic resolution

In ϕ

$\frac{50}{\sqrt{12}} = 14.4\mu$, with some charge sharing $\boxed{12\mu}$

Take 20% i.e $1.2 \times 12 = 14.4$ as the max. allowed resolution. Then

$$(14.4)^2 = 12^2 + \sigma_{stab}^{\phi\,2} \Rightarrow \boxed{\sigma_{stab}^{\phi} = 8\mu}$$

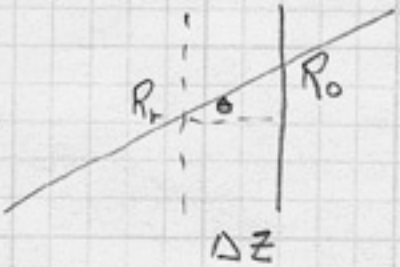
In R

$\frac{400}{\sqrt{12}} = 115.5\mu$, with some sharing $\boxed{100\mu}$

Again take 20% max degradation

$$120^2 = 100^2 + \sigma_{stab}^{R\,2} \Rightarrow \boxed{\sigma_{stab}^{R} = 66\mu}$$

In Z to affect R



$$\tan\theta = \frac{R_o - R_r}{\Delta Z} \Rightarrow \frac{\sigma_R}{\sigma_Z}$$

Now θ_{max} for 1st disk is about

$$\frac{182.2}{495-110} = 0.4732$$

beam spot

So worst case, $\sigma_R = 0.4732 \times \sigma_Z$

Thus if $\sigma^R_{stab} = 66\mu \Rightarrow \sigma^Z_{stab} \approx 140\mu$

We assume that stability budget is apportioned as

$$\left(\sigma^{total}_{stab}\right)^2 = \left(\sigma^{sector}_{stab}\right)^2 + \left(\sigma^{ring}_{stab}\right)^2 + \left(\sigma^{frame}_{stab}\right)^2$$

where frame includes ring mounts.

We further more assume

$$\sigma^{frame}_{stab} = 4\,\sigma^{sector}_{stab}$$

$$\sigma^{ring}_{stab} = 2\,\sigma^{sector}_{stab}$$

So if

$\sigma_{stab}^{total} = 8\mu$ then

$$8^2 = \left(\sigma_{stab}^{sector}\right)^2 (1+4+16) \Rightarrow \boxed{\sigma_{stab}^{sector} = 1.7\mu} \quad \phi$$

$\sigma_{stab}^{total} = 66\mu$ then

$$66^2 = \left(\sigma_{stab}^{sector}\right)^2 (1+4+16) \Rightarrow \boxed{\sigma_{stab}^{sector} = 14.4\mu} \quad R$$

$\sigma_{stab}^{total} = 140\mu$ then

$$\boxed{\sigma_{stab}^{sector} = 30.6\mu} \quad Z$$

Tolerances are $\sqrt{12} \times \sigma$ so

	ϕ	R	Z
Disk module stability (rms)	8	66	140μ
Disk sector stability (rms)	1.7	14.4	30.6
Disk sector stability tolerance	6	50	106