



Safety study of the NCal for O4

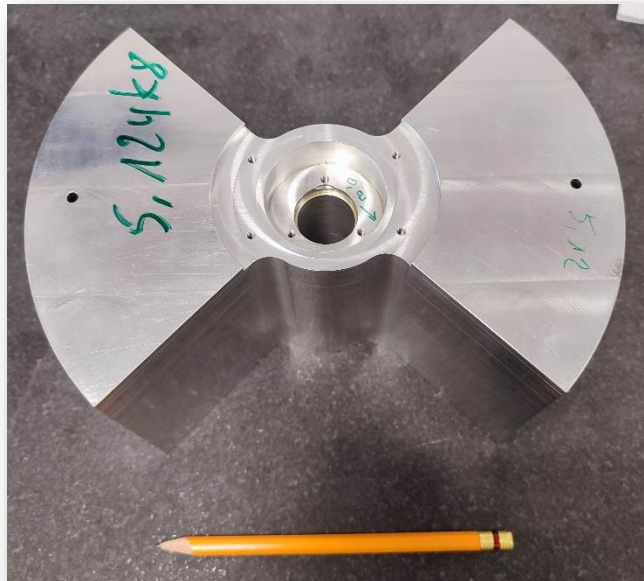
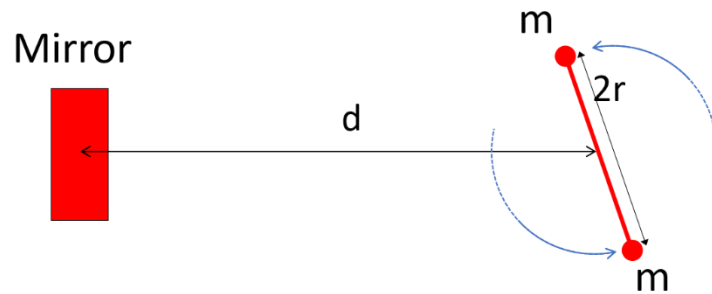
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VIR-0070A-22

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NCal safety possible issue ?

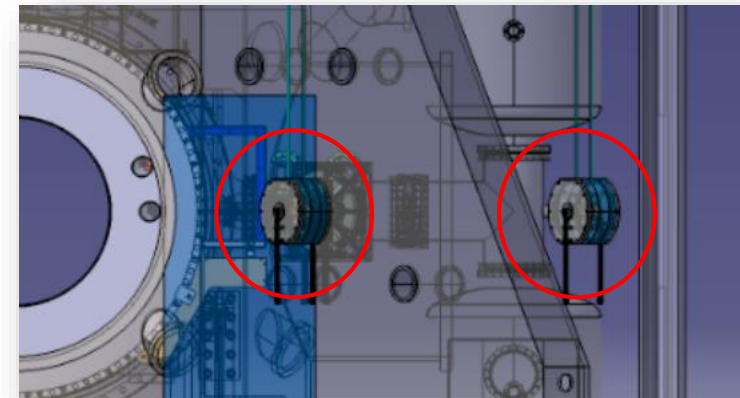
- NCal: Rotating mass close to the mirror to induce displacement.



- Risks of breaking ?

- ~5 kg rotating mass
- 100 Hz rotating speed (6000 rpm)
- Close to sensitive devices

→ **Safety study needed**



O3 safety study

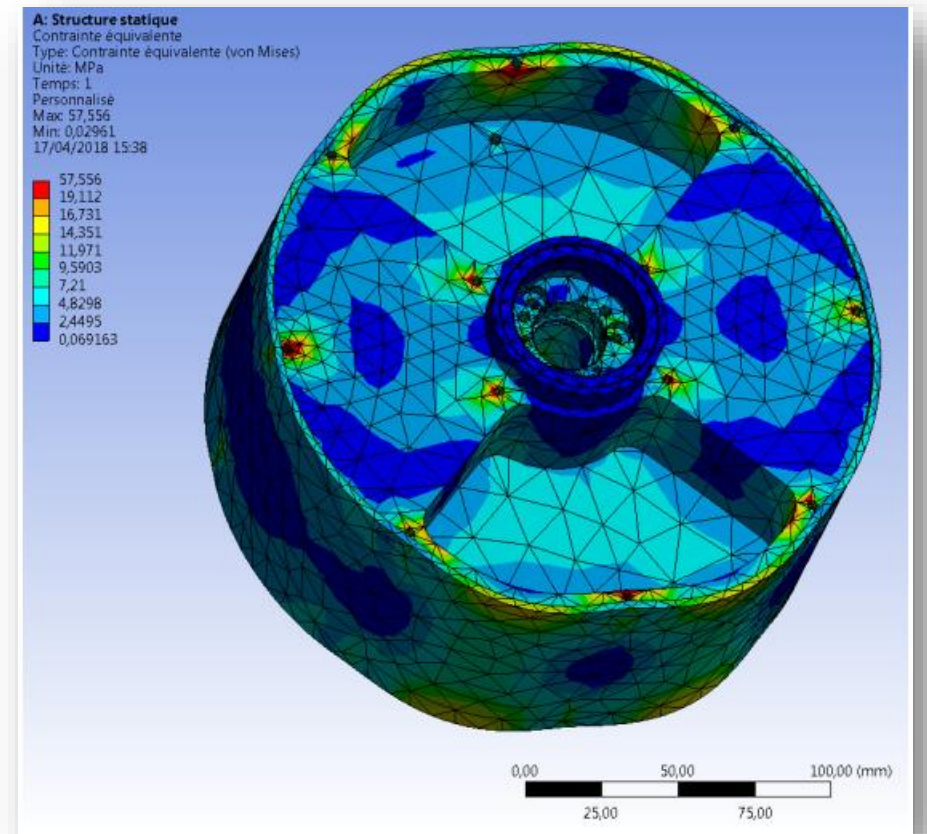
[VIR-0270A-18](#) B.Aimard, B. Lieunard, B.Mours
LAPP-Annecy

- Simulation at 100 Hz:

Result: Safety factor of 20-40

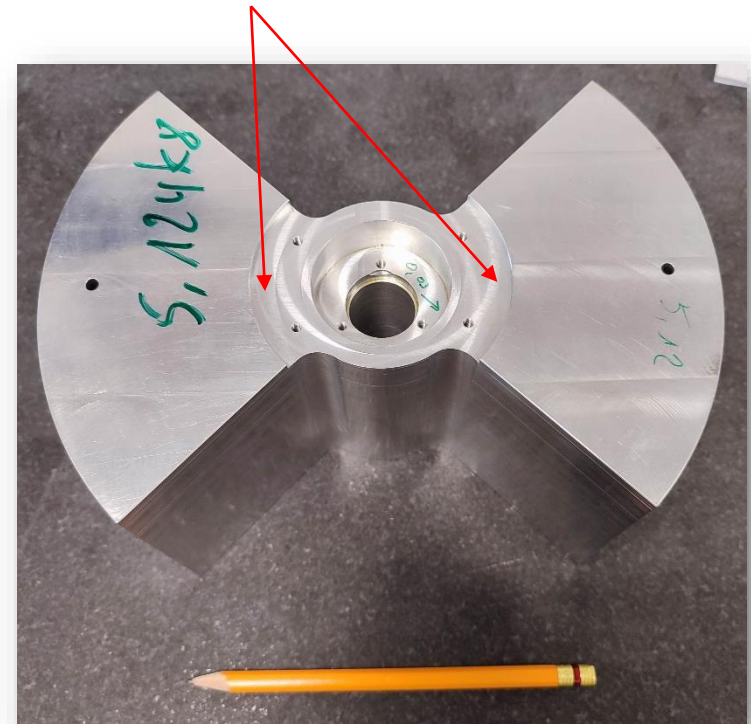
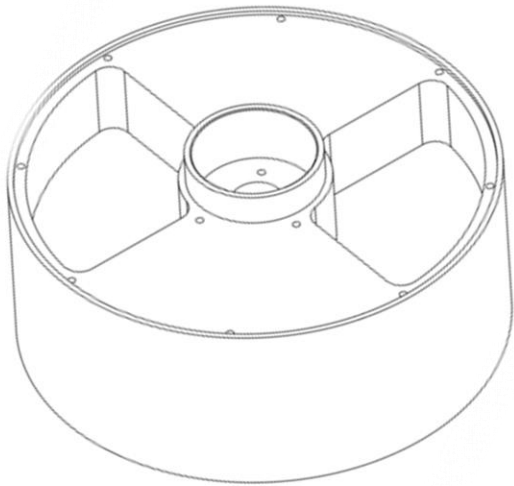
= Breaking of the rotor is extremely unlikely.

(The stress increases as the square of the frequency)



New O4 NCal: safety study [VIR-1327A-21](#)

- Simpler Geometry, outer disk removed: similar **weak part**.



- Redo the simple modelling: safety factor around 35

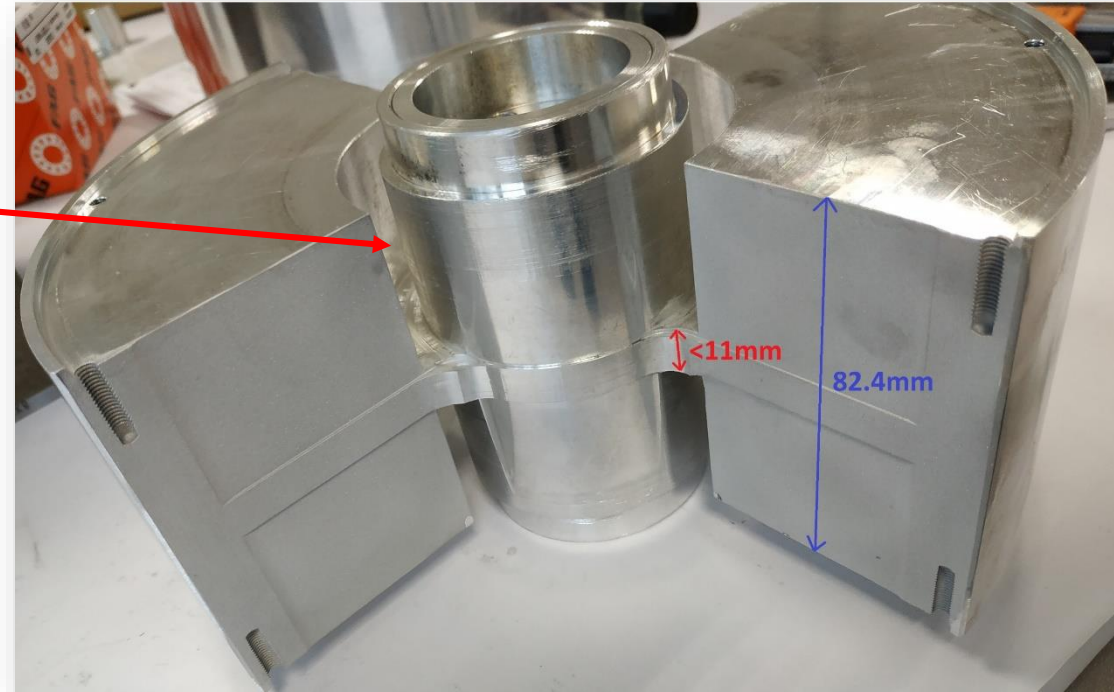
O4 safety test

[VIR-1327A-21](#)

Test at IPHC

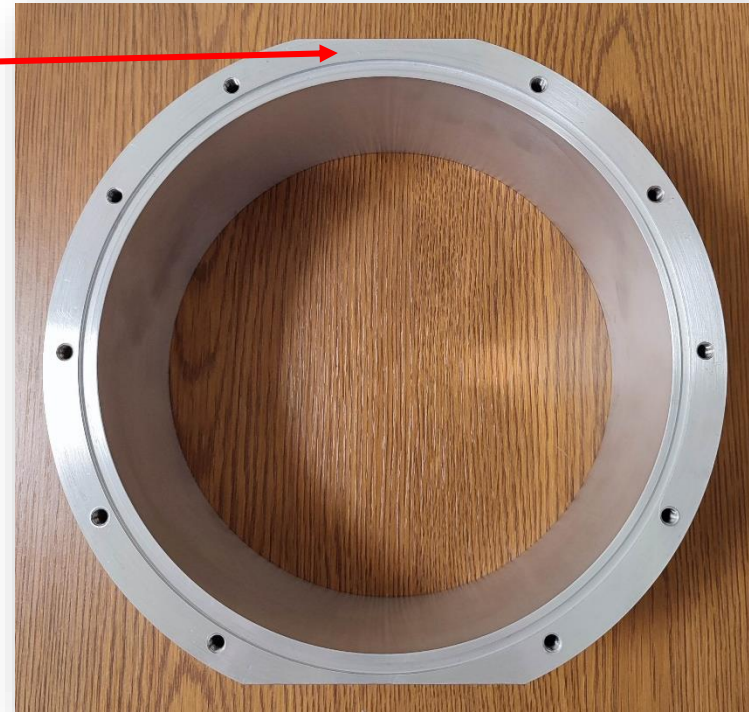
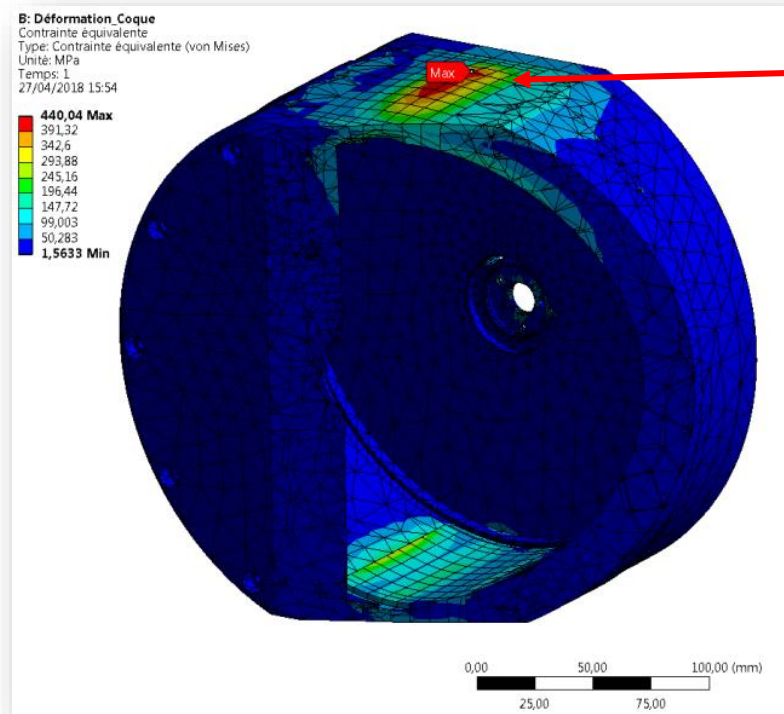
- O3 rotor machined: factor **8** of reduction on the cut part.
 - Remaining theoretical safety factor of 5 at 100 Hz.
- 96 Hz reached for 3 minutes without breaking.
 - Tested safety factor of 7.2 at 96 Hz.

= Validation of the O4 rotor



NCal Box safety

- O3 breaking simulation: The NCal box would contain the dislocation of the rotor at 100 Hz.
- O4 NCal box the thickness of the weak point is increased by 50% = safer



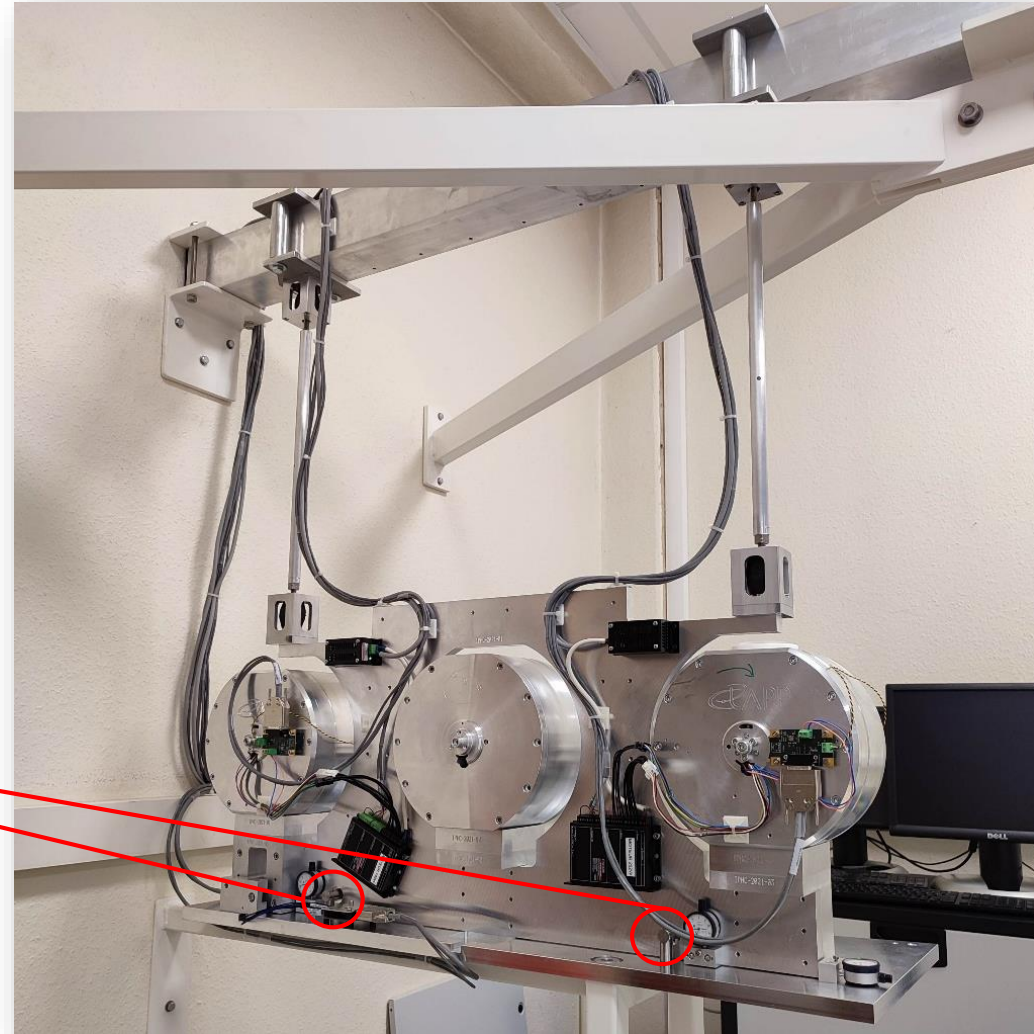
O4 setup: motion limitation

O4 setup being installed at IPHC:

- Rigid suspension = no risk of falling.
- Rods to limit the motion by few mm.



= NCal displacement constrained to few mm.



Conclusion

- ✓ Safety factor validated for the O4 rotor at 100 Hz.
- ✓ NCal box reinforced.
- ✓ Motion of the NCal system secured.

□ Looking forward to install 3 setup on NE tower.

Thank you for listening !

