

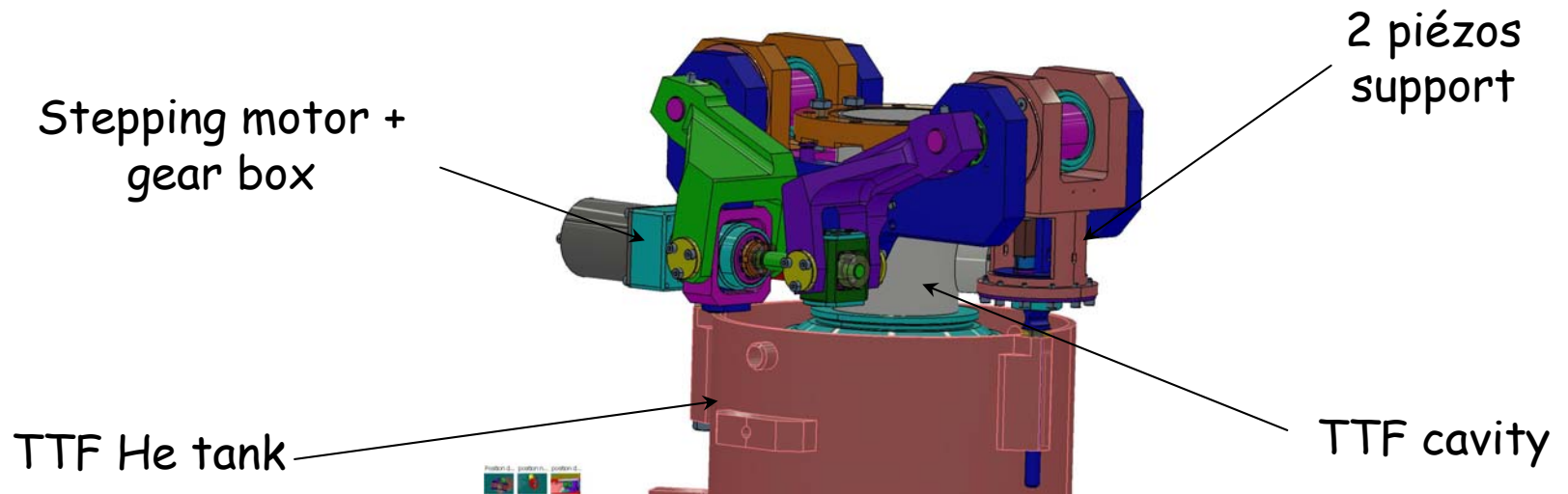
Piézo Tuning System - PTS

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Principle of the Super-3HC tuner with 3 fixations on the TTF helium tank

Full tuning range: ± 460 kHz

Resolution \sim present TTF tuner (~ 4 nm)



Two tuners have been ordered:

- delivery: end of May
- price: 7.5 k€ for each tuner mechanic
- PHYTRON motor: 1.9 k€
- gear box with surface treatment: 1.6 k€
- piezo: 522 € (1044 € for two)

} total:
~ 12 k€/tuner
without control system

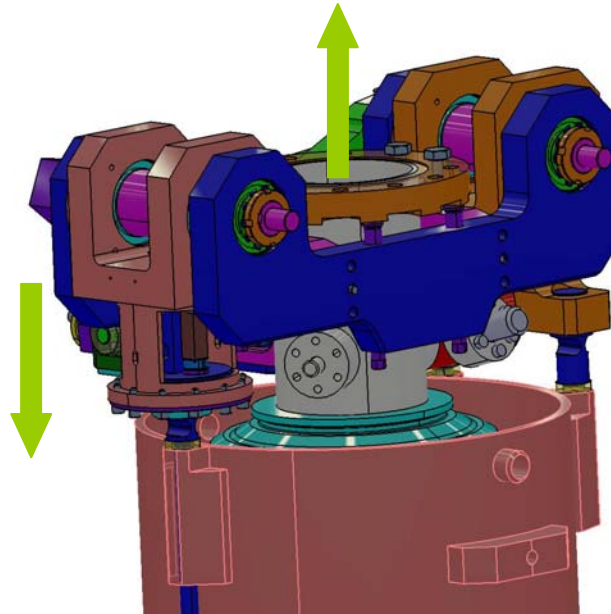
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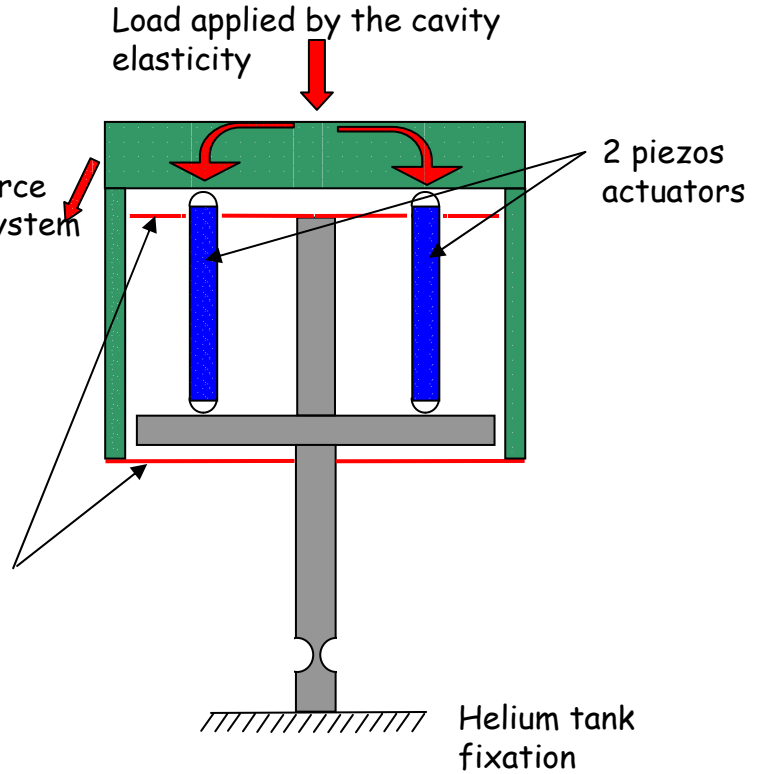
saclay

The cavity is stretched

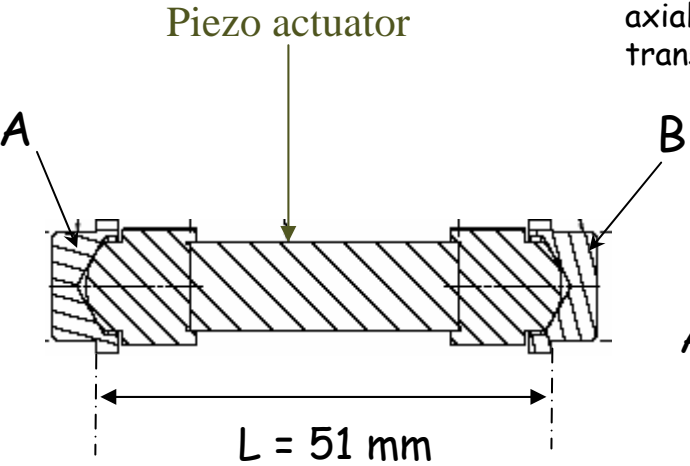
Piezo support is
compressed by the
cavity elasticity



piezo support principle



2 flexible steel foils for transverse force transmission and axial piezo stroke transmission



A and B pieces have to be machined in order to adjust the length L for the 2 piezos

Goal with the "usual" tuner without piezo: deform the cavity to tune it (don't care about the forces amplitude - just keep them in one direction !)

The goal with a piezo tuner is to get after cooling to 2 K simultaneously:

1. the good frequency
2. the good preload of the piezo actuators

⇒ This needs a good pre-tuning of the cavity at 300K (at field flatness tuning)

Scattering effects on the piezo preload at 2 K:

Taking into account all scattering effects of the cavity preparation on its frequency (pre-tuning at 300K, chemical treatment, pumping, cooling down), and the cavity elasticity over the whole available tuning range (± 460 kHz), one can calculate that the final preload forces can only be determined within a wide range of forces:

Example:

frequency tuning at field flatness (300K, filled with air):

$$F_1 = 1297.038 \text{ MHz}$$

The final preload on each piezo at 2 K is estimated within the range:

$$70\text{N} < F_{\text{preload}} < 1610 \text{ N}$$

⇒ We need piezos actuators with the maximum blocking force available !

- NOLIAC piezo: blocking force ~ 6000 N
- P.I. Piezo: blocking force ~ 3000 N

Future plan:

- preparation of the tuners delivery:

In progress

- preparation of the control electronics for motor and piezos

In progress

- preparation of the tests at room temperature on a test stand and on the TTF cavity

tests before July

- preparation of the tests in CRYHOLAB

- cavity support, cabling, etc.

- preparation of the general tests

tests in September