This paper describes a new structurally and thermally stable design for the mode-match z-axis gyroscope and uses the stiffness softening effect to modify the mode-frequency shifts. There is not much innovation in this article. In theory, dual-mass resonant MEMS gyroscopes and the use of electrostatic tuning for frequency mismatch compensation are both mature technologies. It would be better if this article can realize the fabrication of the sensor, measure its characteristics, and discuss the difference between simulation and measurement results.

For this article, I have the following questions to ask the authors.

1.

Can the variables in Table 1 also be marked in Figure 1? Is the drive tuning comb pairs (Nt) used to tune for frequency mismatch? How is it arranged in the sensing plate pairs (Ns)?

If the structure sense gap is 3um, there is no need to indicate the smaller and larger sense gap (d1, d2).

2.

Formulas 3 and 4 apply to a single fixed-guided beam. Since FEM analysis has been used for mode shapes, please also compare and discuss the theoretical formulas of elastic coefficients (kx and ky) obtained by finite element simulation.

3.

This article does not discuss the frequency offset caused by the process uncertainty. If the frequency of the sense axis is lower than the drive axis due to the process offset, the stiffness softening effect of the sense axis cannot be used for frequency compensation. So how to achieve mode match, is there any other compensation mechanism?

4.

The quality factors of Figure 7 and Figure 8 are quite high. If the capacitive gyroscope is operated in an air environment, it is usually impossible to obtain such a high quality factor. What is the vacuum level corresponding to the FEM simulation? Is there a mechanism to reduce the structural anchor loss?