

**Analysis The Difference Microcantilever L300 and
L400: Simulated with Modal Analysis**

BACHELOR THESIS



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In the name of Allah SWT, the beneficent and merciful. All praise is merely to The Mightiest Allah SWT, the lord of the worlds, for the gracious mercy and tremendous blessing that enable me to accomplish this proposal. This proposal entitled "Analysis The Difference Microcantilever L300 and L400: Simulated with Modal Analysis", is submitted to fulfill one of the requirements in accomplishing the bachelor degree Program at the Physics Department of Mathematics and Natural Science Faculty, University of Negeri Jakarta:

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The writer realized that this paper still imperfect in arrangement and the content. the writer hope the criticism from the readers can help the writer in perfecting the next paper. last but not the least Hopefully, this paper can helps the readers to gain more knowledge.

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ABSTRACT

Micro Electro Mechanical System (MEMS) is a compilation of micromachines, and one of those micromachines is a sensor for frequency, called a microcantilever. This micromachine used the cantilever concept and applied it at the microscopic level to detect the frequency by vibrating it at a constant rate. A microcantilever is a very flexible sensor that can be utilized in many fields that correlate with frequency. However, microcantilever is very small that it cannot be seen directly; therefore, we cannot tell how microcantilever detects the frequency or what other aspects influence microcantilever. This can be a problem because microcantilevers have a Q-factor that indicates the quality of the machine in detecting the frequency.

Furthermore this research paper will find out other aspects that influence the microcantilever, how the microcantilever detects the frequency and Q-factor by simulating it in ANSYS. There are two types of microcantilevers that will be compared to add more samples and data for the simulation and to see which one is better. Last but not least, the method that will be used is multiple, but modal analysis is the most the most important method out of all. Modal analysis is a method that is available in ANSYS with the purpose of calculating the natural frequency of a simulation. With this simulation, multiple tables, pictures of the model, and graphs are produced. This data shows that modal analysis is important because it's the only method in ANSYS that can calculate natural frequency, the Q-factor can decrease when the conductor line and the cantilever beam create an inherent damping, and the L300 meander is much more consistent in frequency reading.

Keyword. Microcantilever; simulation; ANSYS;

ABSTRAK

Micro Electro Mechanical System (MEMS) adalah kompilasi dari micromachines, dan salah satu *micromachines* tersebut adalah sensor frekuensi, yang disebut *microcantilever*. *Micromachine* ini menggunakan konsep cantilever dan menerapkannya pada tingkat mikroskopis untuk mendeteksi frekuensi dengan bergetar dengan kecepatan konstan. *Microcantilever* adalah sensor yang sangat fleksibel yang dapat digunakan dalam banyak bidang yang berkorelasi dengan frekuensi. Namun, *microcantilever* sangat kecil sehingga tidak dapat dilihat secara langsung; oleh karena itu, kita tidak dapat mengatakan bagaimana *microcantilever* mendeteksi frekuensi atau apa aspek lain yang mempengaruhi *microcantilever*. Ini bisa menjadi masalah karena *microcantilevers* memiliki *Q-factor* yang menunjukkan kualitas mesin dalam mendeteksi frekuensi.

Selanjutnya, makalah penelitian ini akan mencari tahu aspek lain yang mempengaruhi *microcantilever*, bagaimana *microcantilever* mendeteksi frekuensi dan *Q-factor* dengan mensimulasikannya di *ANSYS*. Ada dua jenis *microcantilevers* yang akan dibandingkan untuk menambahkan lebih banyak sampel dan data untuk simulasi dan untuk melihat mana yang lebih baik.. LTerakhir tetapi tidak kurang, metode yang akan digunakan adalah banyak, tetapi *modal analysis* adalah yang paling penting metode dari semua. *Modal analysis* adalah metode yang tersedia di *ANSYS* dengan tujuan menghitung frekuensi alami dari simulasi. Dengan simulasi ini, beberapa tabel, gambar model, dan grafik diproduksi. Data ini menunjukkan bahwa analisis modal penting karena itu adalah satu-satunya metode di *ANSYS* yang dapat menghitung frekuensi alami, *Q-factor* dapat menurun ketika garis konduktor dan sinar cantilever menciptakan penghematan inherent, dan *meander L300* jauh lebih konsisten dalam pembacaan frekuensinya..

Keyword. *Microcantilever; simulation; ANSYS;*

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MEMS	: Micro Electro Mechanical System	
FEM	: Finite Element Method	
ZnO	: Zinc Oxide	
AFM	: Atomic Force Microscopy	
SCL	: Self-sensing Cantilever	
BRIN	: <i>Badan Riset Inovasi Nasional</i>	
FPM	: fixed permanent magnets	
MPM	: mobile permanent magnet	
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