

## ABSTRACT

Small displacement as a parameter that indicates problems in several areas such as monitoring the health of building structures, landslides, monitoring of vibrations in large mechanical structures and also in health fields such as respiration and heart rate. The phenomenon of small displacement does not allow it to be measured directly, measurements need to cover a large area. Non-contact sensors are then the right choice for a number of these cases. The radar system has begun to be researched in the development of non-contact sensor technology for small displacement cases. The FMCW radar system was chosen because it has the advantage of detecting target distances even though it is not yet able to detect small displacement for narrow bandwidth.

The problem of the shortcomings of FMCW radar systems in detecting small displacement needs to be overcome so that the system can be realized with narrow bandwidth. Modification of the FMCW radar system by conducting phase processing into a potential alternative solution, however, it is necessary to further study its performance in more detail related to system parameters and the presence of noise amplitude that may occur. Noise is a common problem that affects the detection results and needs to be investigated in system development.

Radar modeling in laboratory experiments and computer simulation have been carried out in this thesis. The results of FMCW radar modeling with a simulation using computer simulation and using a VNA device show that the modeling can present the FMCW system. The results obtained show that the target distance can be detected, where targets with different distances can be distinguished based on the beat frequency value. The bandwidth used is 200 MHz, the resolution of the FMCW radar system is 75 cm, and the maximum range of the radar is 600 meters.

**Keywords:** Small Displacement, Radar, FMCW, VNA.