

FLUCTUATIONS IN ECHO LEVEL ASSOCIATED WITH CHANGES IN TARGET ASPECT AND TARGET FREQUENCY RESPONSE

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***Abstract:** Ping-to-ping variations in echo level can be caused by time variations in sonar parameters (source level, orientation), target aspect, relative and absolute motion of sonar and target, and time varying environment (e.g. surface waves). Quantifying and understanding such fluctuations are important, since they enable an appropriate choice of receiver operating characteristics (ROC) curve, and suggest strategies for optimizing parameters such as the sonar frequency. One important aspect of this problem is given by the target echo fluctuations due to changes in target aspect and in sonar bandwidth. In some regions of aspect angle-frequency space the fluctuations are stronger and apparently less organized than in other regions. These effects can be explained in terms of scattering physics, and analyzed with high-fidelity target scatter modeling tools, such as those based on finite element methods. This paper presents a numerical study in which one target is analyzed over a broad range of aspect angles and frequencies. The fluctuations in target echo amplitude are studied and characterized in the angle-frequency space, with the objective of obtaining a better understanding of the underlying target-specific echo strength distribution. The result is discussed in view of the construction of target scattering physics-based ROC curves.*

