Effect of Targets Illumination Region on RCS in Random Media with Horizontal Polarization

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The shape of the target constitutes an important factor in the radar detection problems. In this regard, the scattering characteristics are analyzed through studying the behaviour of radar cross-section (RCS) of targets in random media. We evaluate the effects of the target configuration including size and curvature implemented in the illumination region and complexity index δ on the RCS. To achieve this aim, we draw on the method that solves the scattering problem as a boundary value problem and calculates the scattering waves using the current generated on the surface of the target. Here, we assume horizontal polarization of incident waves. From the numerical results, it is noticed that there are two effects on the RCS. With concave illumination region, the first is the effect of target curvature and can be seen clearly with δ. With enlarging δ, RCS obviously gets bigger with normalized target size ka, where k is the wave number in free space and a is the mean size of the target. This behaviour is owing to the expansion of effective illumination region (EIR) to a certain inflection point limit and then lessens in ascending manner due to the effect of stationary points. On the contrary, RCS reduces with δ in case of convex illumination region. The second is the effect of spatial coherence length of waves around the target (SCL). As the SCL increases, the behaviour of RCS in random media becomes closer to its behaviour in free space except for the magnitude. Also, it is noticed that as magnifying SCL, as the RCS increases due to the EIR extension, and vice versa. Moreover, it is observed that RCS suffers from oscillated behaviour especially with small SCL and we attribute this manner to the random medium effect.