

# A Study on the performance principle of multi-layer radome cover through millimeter-wave characteristics of extremely high frequency radar

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Automotive radar systems have been available in passenger cars for some time now and were first developed in the early 1970's. They have not only been used to increase the comfortability of driving, i.e. Advanced Driver Assistance Systems (ADAS), but also in applications to increase safety i.e. Active Safety (AS). With the progress in Autonomous Drive, new challenges are presented in terms of ADAS and AS. The radar-systems should not only be able to perform the fairly easy task of detecting an obstacle in front of the car on the highways, but must be able to navigate in more challenging environments such as city traffic. Therefore, a new frequency band (77 to 81 GHz with a wavelength of 3.70-3.89mm in vacuum) has been assigned to new ADAS and AS systems in the European Union to replace the 24 GHz ultra-wide band radar sensors. Even though the new frequency band radar sensors are considered to be an essential part of future vehicle safety systems, the incorporation of radar sensors into cars is facing some difficulties. Since these radar units are placed behind the painted plastic fascia of the cars, both electromagnetic and design constraints must be considered. Thus, to increase the radar transparency it is important to understand the attenuating and reflective effects of the surface treatment fascia.

The aim with this paper work is to investigate how the multi-layer plastic material affect 77 GHz radar signals. How the composition of the plastic material and surface design parameter affects the reflection of the electromagnetic wave. Different factors such as i) type and ratio of layers in the plastic, ii) level of crystallization of the plastic, iii) size, amount and orientation of metallic surface and the other things in the cover, iv) incident angle of radar system, vi) variable thickness of the different layers and vii) number of layers, will be analyzed.

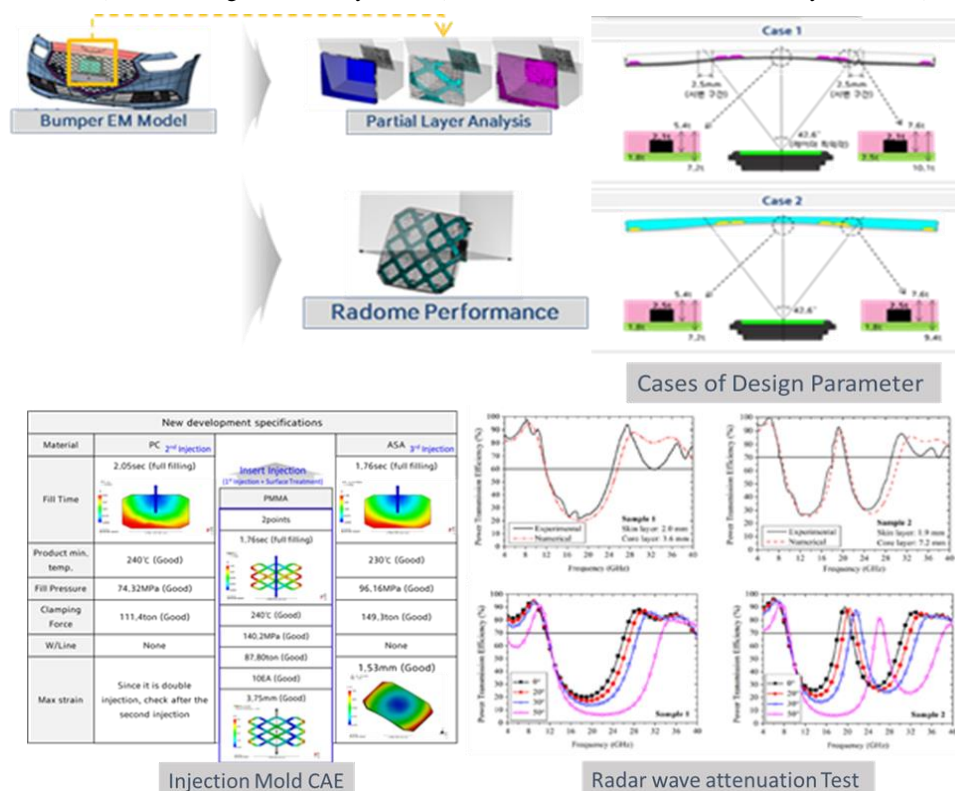


Figure1. Study process of multi-layer radome cover performance development based on design parameter