The development of modern wireless communication networks and radar systems is related to the use of high-frequency electromagnetic waves. In the case of communication networks, this is due to the increasing number of users and the constant demand for high-speed Internet access, and in the case of radar systems, it is related to increasing the accuracy of the measurements made. Both wireless communication systems and radars need antenna systems. However, using high frequency makes existing methods of implementing antenna systems costly or results in energy loss. Therefore, high-frequency antenna systems use lenses that focus the electromagnetic wave in a manner similar to lenses in glasses to achieve the desired performance in a low-cost way.

One of the microwave lenses used in antenna systems is the variable refractive index lens, as the best performance can be achieved using this lens. In ideal variable refractive index lenses, the refractive index changes continuously. Unfortunately, previous attempts to make these lenses have led to lenses with stepped refractive index change, which only approximates the performance of ideal lenses. Another aspect is that such lenses are made of plastic or similar materials. Although such materials can be recycled, one hears more and more about the harmful effects of micro-plastics, which can be created, among other things, in the production of these devices. Unfortunately, to date, the use of biodegradable materials to make these lenses has not been considered.

The purpose of the proposed research topic is to develop quasi-ideal variable refractive index lenses i.e., lenses that will have the same performance as the ideal variable refractive index lenses. The research will develop novel solutions to design and manufacture such lenses. Additionally, out of concern for the environment, research in the project will also be related to the use of biodegradable materials to make microwave lenses.