Description for the general public

Imagine that on an ordinary, lens that we know from everyday life, falls a white light. Speaking of white I mean sunlight or light from a light bulb. As a result of the so-called chromatic aberrations blue part of light would be focusing closest then green then red part of light. Thus, chromatic aberration are drawback of optical elements (like foe e.g. lens) consisting on focusing various wavelengths (colors) at a different distance. Such a defect of optical elements is not desirable in laboratories, in industry and in daily life (e.g. when we are taking photos). In addition, the previously mentioned lens is a refractive lens, such that we can meet in glasses, that means that it is made of glass, is relatively thick and heavy. Alternatively to the refractive optics is diffractive optics consisting of "cutting" in slices optical element and leaving only the part that changes phase. The result, with appropriate assumptions, is an optical element having the same effect only thinner, lighter and cheaper to produce. One of drawbacks of this method is strong increasing previously mentioned chromatic aberration in comparison of refractive optics.

The project is the study of diffractive structures for broadband use. This means that we want to reduce chromatic aberrations at a define wavelength range. It will be done in a very booming in recent years, range - THZ range. Frequencies in THz range are in the range of 0.1 THz to 10 THz. Whereas the wavelengths are in the range of 3 mm to 3 mm. THz waves have many interesting properties. They can penetrate through the air, paper, wood, polymers, clothing and many other things that do not contain water. Terahertz waves do not pass through water, and metals (see Fig. 1). This radiation is not ionizing, which mean is not harmful to humans, unlike X-rays. In connection with the above properties of these waves, they are not only interesting from a scientific approach, but there is also a lot of potential applications that could be used. Examples of applications are: THz scanners at airports to scan passengers, postal THz scanners to check the contents of shipments, in telecommunications (the higher the frequency of the media, the higher the frequency of the data).

However, to create more applications that will benefit from these properties to three things must be worked out. Firstly source, secondly detector and thirdly create the best possible beam shaping optics for THz range - which is the subject of this work.

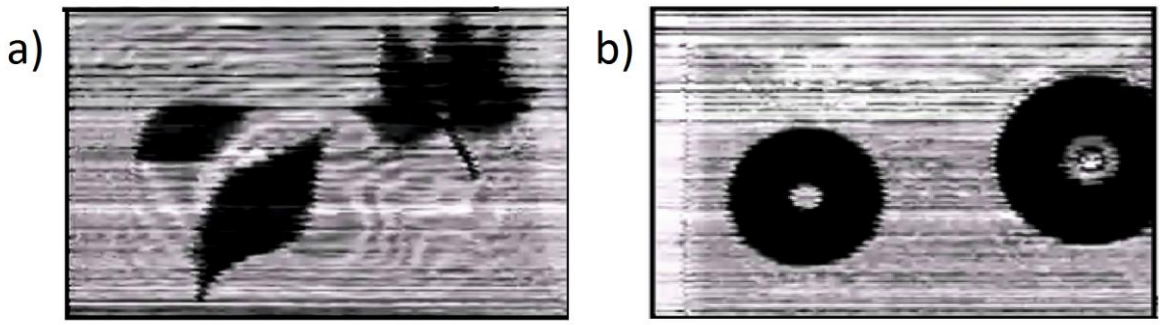

Fig. 1 In the picture are scanned envelopes. a) the contrast of the image comes from the fact that the water in the fresh leaves absorbs THz range, b) CDs. The radiation penetrates through the paper, but does not penetrate the metal.