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## Metamaterial quasi-optical components for astronomical instrumentation at millimetre and sub-millimetre wavelengths

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We report on the development of novel optical components based on metamaterials, carried out in the last years, for mm and sub-mm astronomical instrumentation. Using the mesh-filter technology, we have realised transmissive and reflective half-wave plates, flat lenses, anti-reflection coatings, absorbers, etc. The metal-mesh technology, based on copper grids embedded within polypropylene layers, gives the possibility to accurately and arbitrarily manipulate the radiation across surfaces and allows in principle to replace any classical optical component with a mesh-equivalent one. The devices mentioned above can find applications in other fields such as telecommunications and security. The technology itself can be pushed further to realise novel/exotic metamaterials with properties of interest for theoretical studies. In addition, the realisation of these metamaterials can be extended into the Silicon technology, with all the advantages associated with it.

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