

Metasurfaces for sunlight steering: a tool for satellite attitude control and communications

We developed a method to design metasurfaces (nano-scale textured coatings) that can deflect and diffract light as desired, with an efficiency above 70% for wavelengths between 600nm to 1micron. Those structures can be insensitive to light polarization, making it suitable for sunlight operation, or very narrow band for laser control. Additionally, they can be insensitive to small incidence variations in some directions, or very dependent to it in some other. All those features offer tools to manipulate all sources of light with a lightweight flat device for various applications. For example, complex light reflection allows a complete attitude control by radiation pressure (photonic propulsion), with a direct integrability onto solar sails. It also shows potential for beam steering and shaping, interesting for precise interplanetary optical communication.