



# METAMATERIALS & METASURFACES FOR OPTICS AND RF : Market, Technologies And Trends

## REPORT OUTLINE

- Title: METAMATERIALS & METASURFACES FOR OPTICS AND RF : Market, Technologies And Trends
- 80+ slides (PDF)
- € 3 490 - Multi users license

## KEY FEATURES OF THE REPORT

- Statistics on currently funded projects and recently submitted patents
- Key players description
- Market forecasts up to 2028
- Comprehensive overview of Metamaterial and Metasurface products
- Review of currently tested or potentially attractive applications
- Identification of challenges and bottlenecks
- Review of most promising upcoming systems/devices

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## METAMATERIALS AND METASURFACES HAVE EXTRAORDINARY FEATURES THAT CANNOT BE ACHIEVED WITH STANDARD MATERIALS

Metamaterials from the Greek word "meta-" (meaning to go beyond), are smart materials engineered to have photonic, acoustic, mechanical or RF properties that are not found in naturally occurring materials.

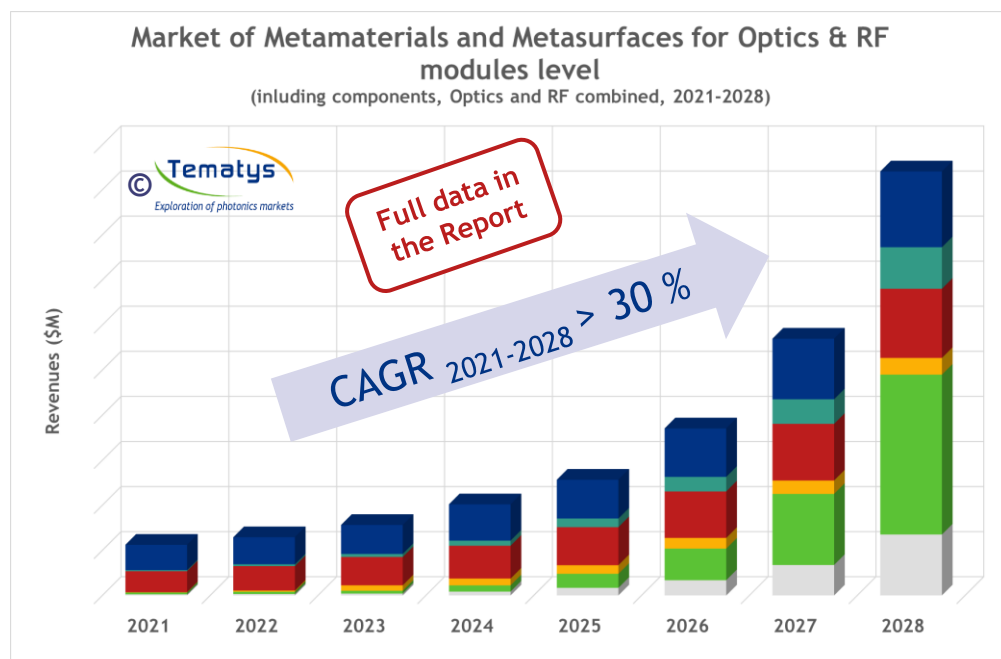
They are made by combining and patterning standard materials such as metals or polymers. The materials are usually arranged in repeating patterns, at scales that are smaller than the wavelength.

Metamaterials derive their features not from the properties of the base

materials, but from their newly designed structures. Their precise shape, geometry, size, orientation and arrangement gives them their smart properties capable to manipulate electromagnetic waves.

By blocking, absorbing, enhancing, bending waves, they achieve benefits that go beyond what is possible with conventional materials or are unachievable in other ways.

**They are in essence the materials of the future.**





**AUTHORS**



Dr. Thierry Robin has over 20 years' experience in both technical innovation and marketing in the photonics industry, running more than fifty projects in optics and photonics. Thierry graduated from École Polytechnique, Paris (France). He holds a master's degree from École Normale Supérieure, Paris (France) and a PhD from Ecole Polytechnique.



Benoît d'Humières is an expert in Optics, Electronics and Instrumentation for industrial and research applications. He has run many marketing and technological studies for major companies (THALES, ESSILOR, EDF, ...), SMEs and research institutes. He is Partner and Strategy Consultant at Tematys.

**IN JUNE 2022, STMICROELECTRONICS RELEASED THE FIRST CONSUMER MODULE USING A METASURFACE.**

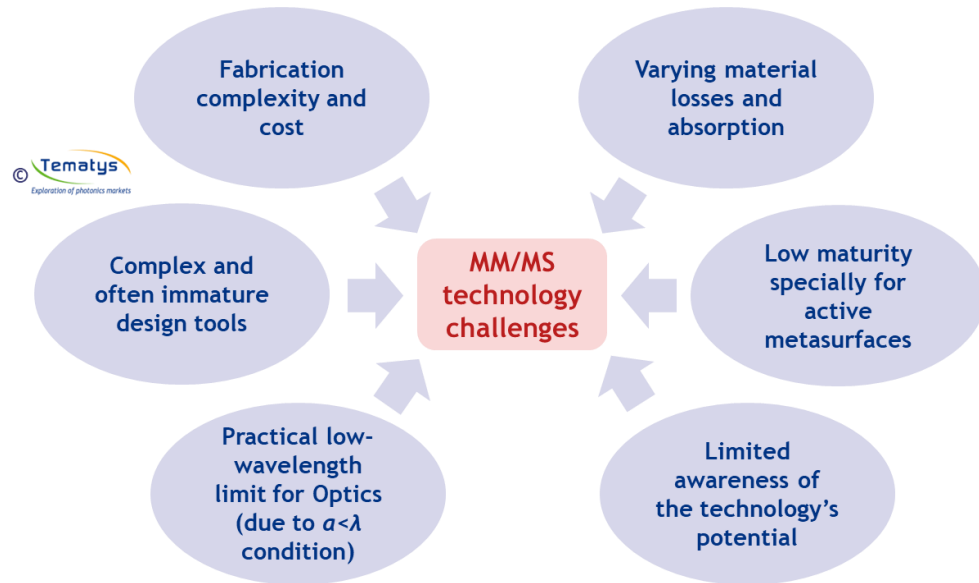
STMicro VL53L8 sensor is a new 3D direct Time-of-Flight (dToF) sensing module using metasurfaces developed through the partnership with Metalenz.

Metasurfaces are now on the market marking the introduction of this revolutionary optical technology in real-world consumer devices.

Developed in partnership with Metalenz, this first metasurface technology enables optical systems to collect more light, provide multiple functions in a single layer, and deliver new forms of sensing in smartphones and other devices, all in its compact package.

**The value chain for high-volume production is becoming a reality.**

**Metamaterials & Metasurfaces Technology - Challenges**



Despite some remaining challenges, the progress made to date shows great promise for the development of optics, photonics and RF systems.

For the RF market, metamaterials targeting microwave frequencies have been successfully harnessed for wireless (antenna) technology and they are now entering 5G and 6G infrastructure and other devices.

The main trends in Optics is the development of Metalenses and Metacomponents for smartphones, 3D sensing and AR/VR devices.

Thanks to unusual performances, Metamaterials and Metasurfaces will very soon lead to disruptions on the markets.

These performances, together with reduced size and weight, and new functionalities, make Metamaterials and Metasurfaces a potential game-changer, with the opportunity to revolutionize a lot of products in Optics and RF.



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## + COMPANIES CONDUCTING RESEARCH ON METAMATERIALS AND METASURFACES

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The Seller shall by no means be responsible for any delay in respect of article 2.2 above, and including in cases where a new event or access to new contradictory information would require for the analyst extra time to compute or compare the data in order to enable the Seller to deliver a high quality Products.

2.3 The mailing of the Product will occur only upon payment by the Buyer, in accordance with the conditions contained in article 3.

2.4 The mailing is operated through electronic means either by email via the sales department or automatically online via an email/password. If the Product's electronic delivery format is defective, the Seller undertakes to replace it at no charge to the Buyer provided that it is informed of the defective formatting within 90 days from the date of the original download or receipt of the

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2.5 The person receiving the Products on behalf of the Buyer shall immediately verify the quality of the Products and their conformity to the order. Any claim for apparent defects or for non-conformity shall be sent in writing to the Seller within 8 days of receipt of the Products. For this purpose, the Buyer agrees to produce sufficient evidence of such defects.

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IBAN : FR76 4255 9000 0341 0000 0185 992

To ensure the payments, the Seller reserves the right to request down payments from the Buyer. In this case, the need of down payments will be mentioned on the order.

3.4 Payment is due by the Buyer to the Seller within 30 days from invoice date, except in the case of a particular written agreement. If the Buyer fails to pay within this time and fails to contact the Seller, the latter shall be entitled to invoice interest in arrears based on the annual rate ref of the «BCE» + 7 points, in accordance with article L. 441-6 of the French Commercial Code. Our publications (report, database, tool...) are delivered only after reception of the payment.

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4.1 The Buyer or any other individual or legal person acting on its behalf, being a business user buying the Products for its business activities, shall be solely responsible for choosing the Products and for the use and interpretations he makes of the documents it purchases, of the results he obtains, and of the advice and acts it deduces thereof.

4.2 The Seller shall only be liable for (i) direct and (ii) foreseeable pecuniary loss, caused by the Products or arising from a material breach of this agreement

4.3 In no event shall the Seller be liable for:

a) damages of any kind, including without limitation, incidental or consequential damages (including, but not limited to, damages for loss of profits, business interruption and loss of programs or information) arising out of the use of or inability to use the Seller's website or the Products, or any information provided on the website, or in the Products;

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4.8 The Seller does not make any warranties, express or implied,

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### 5. Force majeure

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