

Progress towards ultra-high-resolution displays via a graphene-based approach*



To address the increasing demand for ultra high-resolution displays for applications like glasses-free 3D displays, we embarked upon a challenging journey as **MEGAMORPH** partners, and we have been making good progress. Our aim is to make evaluation kits of Graphene Modulator (**GMOD**) displays available to interested potential customers and partners, and showcase them towards commercialization.

MEGAMORPH, under ATTRACT phase 2, is a high-risk, high-reward consortium project with an innovative approach to creating the future value chain for GMOD displays. Their fabrication requires the integration of novel materials and the combination of processes and technologies from different sectors, which are incredibly complex.

Fortunately, MEGAMORPH's Frontplane Taskforce combines the unique skills of Graphenea Semiconductor, Morphotonics and SCALE Nanotech to make GMOD modules come true. Recently, we were able to develop an early demonstrator featuring 4-micron pixels (5000 PPI) to showcase what is possible with GMOD.

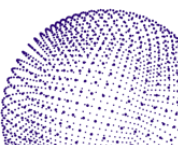
To address fabrication and assembly challenges, the consortium was organized into "taskforces" to allow for quick intra-taskforce iterations. In this scheme, SCALE Nanotech acts not only as the project coordinator but also as consolidator of the different parts of the future value chain:

- Frontplane Taskforce (upstream companies): Graphenea Semiconductor and Morphotonics.
- Backplane Taskforce: Foundry subcontracted by SCALE Nanotech.
- Display Taskforce (downstream companies): CIN-ergy and VividQ.

In the Frontplane Taskforce, **Graphenea Semiconductor**, an SME based in Donostia (Spain), creates custom-made CVD graphene of extraordinary quality. Their track record and expertise in material growth, transfer and characterization are critical.

Morphotonics, an SME based in Eindhoven (The Netherlands), uses their unique nanoimprint lithography equipment Portis 600/1100 to replicate the millions of microstructures in arrays that form the GMOD spacer, spanning incredibly large areas without missing a feature from the intended design.

SCALE Nanotech, a startup based in Tallinn (Estonia) with operations in Valencia (Spain), combines those materials and further elements to obtain GMOD modules, which are a subcomponent of GMOD displays that contain the graphene pixels and hence can change the color. They need to be characterized by SCALE Nanotech and optimized in the



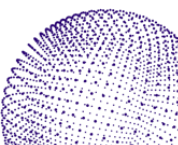


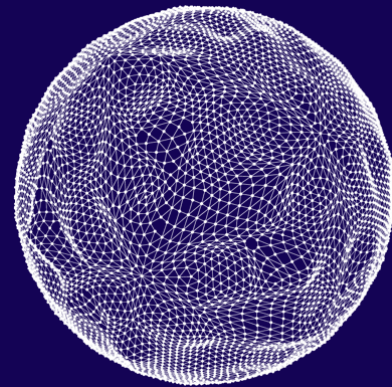
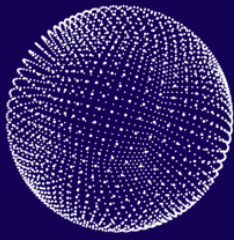
cleanroom environment of the **Nanophotonics Technology Center** prior to integration with other subcomponents.

In the next months, we will further increase the TRL of the underlying technologies and assemble the different subcomponents of a display to make such evaluation kits. To show the performance of these evaluation kits in a user environment, we will count as well in the project with the contributions of two partners conforming the Display Taskforce.

CIN-ergy, an SME with its HQ & RD in Leeuwarden (NL) and strategically located on the Health Campus in Maastricht (NL), bringing more than 25 years of unprecedented expertise in designing & developing top-tier driver boards and specialized in a diverse spectrum of (micro) display technologies in the highest resolution and **VividQ**, a start-up based in Cambridge (UK) developing algorithms and hardware for holographic displays which since its founding in 2017 have become a world-leader in holographic display, solving many technical challenges and in turn developing an extensive patent portfolio.

* This article was originally published at the MEGAMORPH EU website:
<https://megamorph.eu/progress-towards-ultra-high-resolution-displays-via-a-graphene-based-approach/>





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