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Dear colleagues, partners, and friends of HARMONY,

Welcome to the tenth edition of the HARMONY project newsletter! As we head into the holiday season and the close of 2025, the project is entering its final stretch. Over the past months, our doctoral candidates have continued to mature their research, consolidate results, and prepare key publications that will carry HARMONY's impact well beyond the lifetime of the project. Conference contributions and secondments across Europe have strengthened collaboration between academia and industry, and ensure a bright future for our talented researchers.

Visit our website to know more about the HARMONY PhDs!

Retrospective

On the systems engineering side, Alessandro Mastropietro continued to deepen his MBSE research with a focus on semantics and data-driven engineering to improve interoperability in complex system design. He presented his work in October at the **IEEE International Symposium on Systems Engineering 2025 (ISSE)** in Paris, France, and in November at the **MBSE Workshop 2025,** Vilnius, Lithuania. Both experiences were marked by rich exchanges with the systems community.

HARMONY had a particularly strong presence last October at the **IEEE International Symposium on Antennas and Propagation 2025 (ISAP)** in Fukuoka, Japan. Giulio Orlando presented his work on beamforming limitations for distributed antenna arrays under platform positioning deviations. Oscar Martinez presented "Rain Resilience of MIMO Ground Stations for LEO Constellations," while Alex Evrard shared his paper on an "Axi-Symmetric Parabolic Reflector for Directive Beam for ISL." Dany Mestas also contributed with a paper on the performance aperture distribution for signal localization.

Futhermore, in November he participated in and received the Best Paper Award at the **NATO STO Researcher's Meeting on Platform Implications for Hybrid Space Architectures** in Riga, Latvia.

Azra attended last September the EURASIP Seasonal SatNex School in Barcelona, where she followed lectures on non-terrestrial networks and modern satellite systems, and presented a poster on her work. She then presented a paper at the 30th Ka and Broadband Communications Conference in Turin, and continued to develop and test new techniques to make device authentication over satellite links more robust. Martin Togstad attended in October the **43rd ESA Antenna Workshop at ESTEC**, where he presented his work on improving the performance of satellite antennas when their reflector surfaces are not perfectly shaped. Since September, he has been studying how advanced signal processing and learning techniques can help correct these imperfections, with encouraging early results and more work planned in the coming months. Dorian Chenet presented his publication "Modeling Latency and Energy Trade-offs in Emerging Space Edge Computing Architectures" at the **European Data Handling and Processing Conference (EDHPC)** in Elche, Spain. He continues working on his theoretical models of the costs associated with the distribution of computing loads within a distributed satellite system.

Voices of HARMONY

Through HARMONY, I discovered the value of working within a truly international team, where different nationalities, backgrounds, and perspectives enriched our collaboration. I had the opportunity to work closely with both universities — bringing cutting-edge theoretical knowledge and the latest technological advances — and industrial partners, who contributed practical expertise, product experience, and concrete project challenges.

It strengthened my ability to write clear, structured reports intended for the European Commission. Finally, HARMONY taught me how to reach out to the public and communicate my research topics to a non-specialist audience, making my work accessible beyond the academic world. I am grateful for everything I have gained from this experience and will carry these lessons forward into the next chapter of my career at the European Space Agency.

Aymeric Cailleux - PhD Candidate

Commitment

At the end of November, ESA Member States agreed on a new budget at the ESA Council meeting at ministerial level – the largest financial commitment in the Agency's history. This renewed ambition confirms that space technologies are recognised as a key strategic investment for Europe, underpinning secure connectivity, climate services, and industrial competitiveness across the continent.

In this context, HARMONY sits at the heart of Europe's technological priorities. The project advances critical enablers for next-generation satellite systems – from distributed and fractionated architectures to smart payloads, inter-satellite links, and advanced antennas – that will feed future institutional and commercial missions.

By exploring these concepts at preliminary Technology Readiness Levels, HARMONY helps build a pipeline of advanced research and innovative solutions that can later be matured within ESA programmes and EU-funded initiatives. Although ESA is not an EU institution, the two are close partners, and HARMONY illustrates how EU-funded research can directly support Europe's ambitions in space telecommunications.

By training the next generation of space engineers and demonstrating advanced concepts for future satellite networks, HARMONY is actively contributing to Europe's strategic autonomy and long-term leadership in the global space economy.

"Shaping Europe's future in space communications through collaborative, creative and mission-driven research."

Looking Ahead

We hope this final newsletter of 2025 has given you a clear view of how far HARMONY has come – and how much potential still lies ahead. As we pause for the holidays, our researchers are already preparing for the last year of the project, with upcoming conferences, final demonstrations, and thesis submissions that will bring HARMONY's journey to a successful conclusion in 2026.

We wish you and your loved ones a restful and joyful holiday season. Thank you for your continued support and engagement with the HARMONY community, and we look forward to seeing you again in 2026 for the final chapter of this exciting adventure.

We wish you a productive and inspiring autumn!

Kind regards,

The HARMONY Team

Thank you!

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