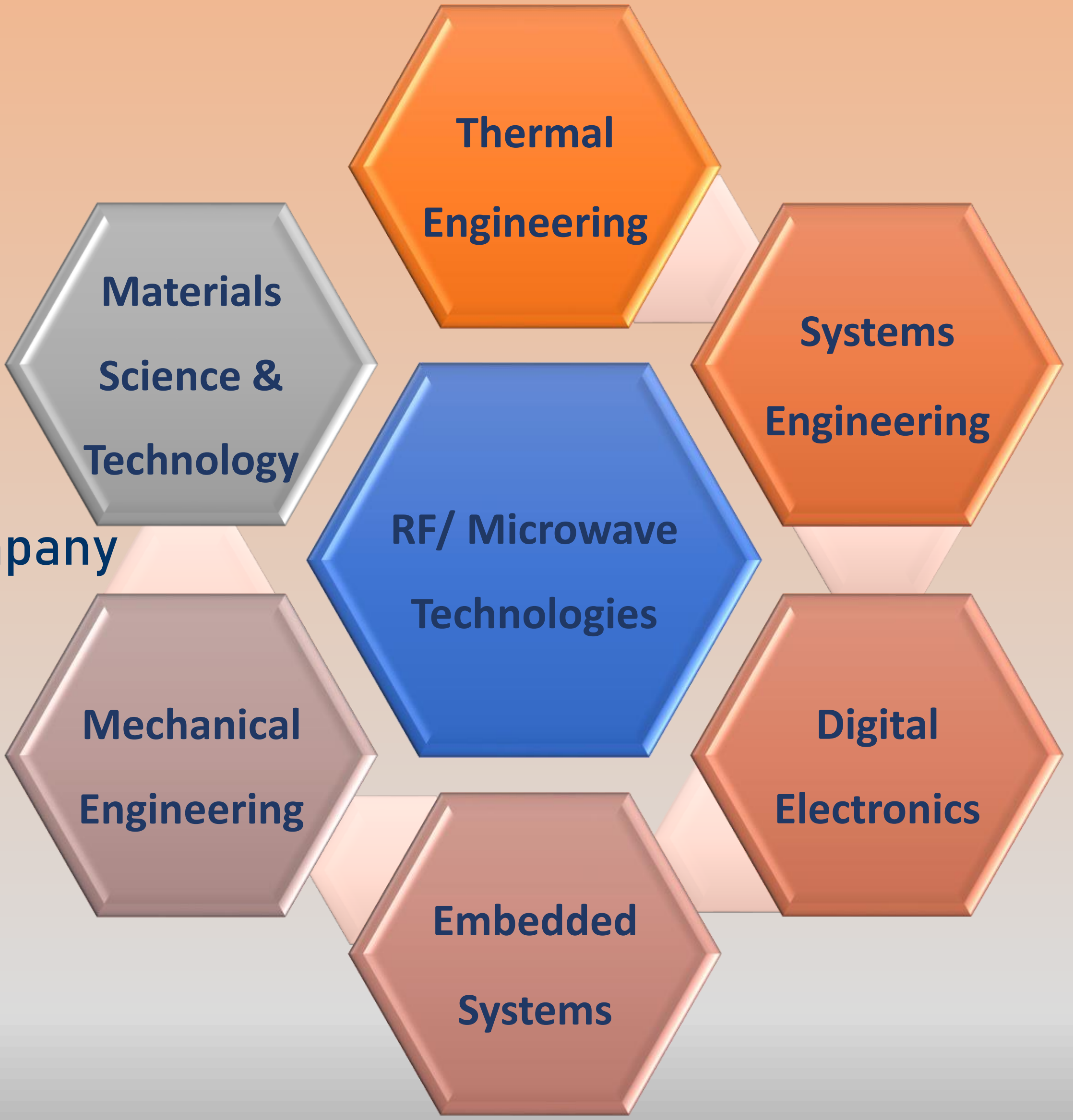

Ecliptic Defence and Space
Boundless technological capabilities in defence and space

Ecliptic Defence and Space

- Founded in 2020
- Premises in Latsia, Nicosia
- RF/ Microwave technology at its core
- All other technologies, revolve around it
- Hardware design, development & manufacturing company
- Two business lines



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Project SPATAR: 1st ESA PECS Call

Background and justification:

RF power amplifiers consume 80–90% of the spacecraft bus power. Therefore, amplifier DC to RF power conversion efficiency is of utmost importance. Increased efficiency decreases wasted power, which forms heat and directly affects thermal management, payload capability and ultimately the spacecraft sizing and mass.

The project aimed to:

1. Design a 360W S-Band Spatial Power Combining SSPA (SPC-SSPA) as an alternative to TWTA's.
2. To breadboard and test key components of the system.
3. To investigate the suitability of the Doherty SSPA architecture at S-Band to improve efficiency and power flexibility

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Project PLANESITE: 4th ESA PECS Call

Background and justification: Slotted Waveguide Array (SWA) antennas are often employed in radar applications where design specifications require narrow beamwidth, high gain, low sidelobes and ability to carry relatively high powers. SWA antennas present a good solution to satisfy these requirements. Most SWA antennas are fabricated either using CNC machining, spark erosion (EDM) or brazing. These manufacturing methods are always dependent on machining tolerances, manufacturing precision and tool radiuses. The most obvious problem however in creating a metallic structure, is the weight, whereas the issue of manufacturing tolerances degrades repeatability as well as the performance of the manufactured antenna, especially as the frequency of operation increases. For space applications, the problem of weight is a particularly difficult issue and it is clear that every gram of weight that can be saved for such interplanetary missions, is very significant.

This is where our new proprietary technology is becoming useful in addressing the problems of weight, repeatability and machining tolerancing.

The project aims to:

1. Design an Engineering Model, Ka-Band Slotted Waveguide Array antenna based the target technology, with RF performances equal to (or better than) those of the Altimeter Antennas used on the Exomars EDM.
2. To prove that the proposed antenna will weigh 30% less than that of the Exomars EDM RDA while keeping within the same mechanical envelope.
3. To de-risk the antenna qualification by subjecting the antenna through a specific environmental test campaign which will increase the confidence that such an antenna can successfully undergo a formal qualification campaign in future missions as an engineering qualification model.

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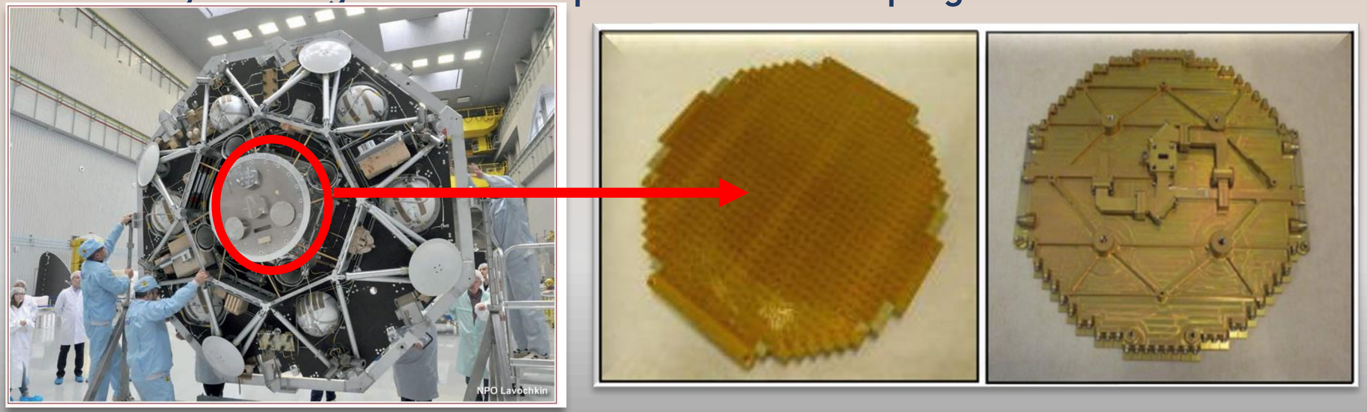

Project U-COMBS: 4th ESA PECS Call

Background and justification: RF Power combiners are employed in telecommunication satellites to increase the output RF power before the downlink transmission. Current power combiners are either bulky if they are based on waveguide technology, or exhibit significant losses, if they are based on planar or coaxial technologies. Most waveguide devices are fabricated either using CNC machining, spark erosion (EDM) or brazing. These manufacturing methods are always dependent on machining tolerances, manufacturing precision and tool radiuses. The most obvious problem however in creating a metallic structure, is the weight, whereas the issue of manufacturing tolerances degrades repeatability as well as the performance of the manufactured antenna, especially as the frequency of operation increases. For space applications, the problem of weight is a particularly difficult issue and it is clear that every gram of weight that can be saved for such interplanetary missions, is very significant. For planar and coaxial devices, loss always translates to waste of energy, which is finite on-board any satellite and must be managed properly. This is where our new proprietary technology is becoming useful in addressing the problems of insertion loss, weight, repeatability and machining tolerancing.

The project aims to:

1. The design of and manufacture of a Ku- and Ka-Band power combiner as technology demonstrators, based on our proprietary technology for a customer's transmit and receive Front Ends, capable of handling high RF Power.
2. The qualification of the developed technology through environmental testing, following ESCC specifications and guidelines, to increase the confidence that such combiners can be successfully used in future telecom missions.

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Project INKAIDUS: 5th ESA PECS Call

Background and justification: RF Isolators and RF Power combiners are employed together in telecommunication satellites to increase the output RF power before the downlink transmission, but also to provide isolation between the antenna and the power amplifiers. Currently, these devices are designed and manufactured separately. In spacecraft assembly and integration, each interconnection adds to cost, increases complexity and degrades reliability. Furthermore, the combined isolator and combiner devices must exhibit the lowest possible insertion loss to reduce power losses as much as possible. Current power combiners and isolators are either bulky if they are based on waveguide technology, or exhibit significant losses, if they are based on planar or coaxial technologies. For space applications, the problem of weight is a particularly difficult issue and it is clear that every gram of weight that can be saved for such interplanetary missions, is very significant. For planar and coaxial devices, loss always translates to waste of energy, which is finite on-board any satellite and must be managed properly.

This is where our new proprietary technology is becoming useful in addressing the problems of insertion loss, system-level integration improvement, weight, and reliability.

The project aims to:

1. The design and manufacture of a TRL5 Ka-Band (17.3 GHz to 20.2 GHz) prototype integrated Isolator and Combiner, using Class 3 PCB's, and designed fully in our proprietary technology.
2. The de-risking of the developed technology through environmental testing to increase the confidence that such an isolator can successfully undergo a formal qualification campaign in future missions as a Qualified Part for use on telecom spacecraft.

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Project LOCKATEC: 5th ESA PECS Call

<u>Background and justification:</u> For space missions requiring the downlink of large volumes of data, a dedicated Payload Data Transmitter is used. With ever-increasing data collected by satellites, the requirements for transmission bandwidth also increase. This is the reason why the Ka-Band lends itself well to the next generation of PDT's.

The problem with the use of Ka-Band is the unavailability and difficulty of sourcing of hermetic, rad-hard/ rad-tolerant Class 1 space-qualified EEE parts, and most certainly the cost of such components if they are at all available.

As cost is also a major driver in all missions, the use of Commercial Off-the-self components is the way forward, without reducing reliability to unacceptable levels.

<u>The project aims to:</u>

1. The development of a low-cost Ka-band payload data transmitter (Ka-Band PDT) using COTS components for future Category A missions.

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Lessons learned under the ESA PECS Programme

"STIF"

- Study the rules and the procedures for the PECS Programme
- Trust ESA's experts advice and guiding even though is demanding
- Implement technically and timely as promised in the proposals
- Follow with precision the guidelines of the ESA PECS CALLS

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Our Success

- Understanding the needs of our particular segment of the space industry,
- Understanding the technology roadmaps of ESA and those of our customers,
- Providing solutions with significant added value for customers,
- Having or building the expertise within the team to respond to the challenges of developing solutions for the customers,
- Having the crucial support of the ESA PECS Programme as well as of the Department of Electronic Communications.

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Our plan ahead..

- Collaborate with well-established, global large space integrators for ambitious joint space developments,
- Include expertise available from other areas of technology within the Cyprus space ecosystem,
- Keep our existing experts and repatriate additional experts working in the space industry in Europe and globally,
- Build the foundation for a strong space industry from the design phase to the manufacturing and qualification phase.

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