ElettroMagnetic Services SRL

COMPANY PRESENTATION

www.elettromagneticservices.com

www.antennacustomizer.com

HISTORY AND COMPANY PROFILE

History and company profile

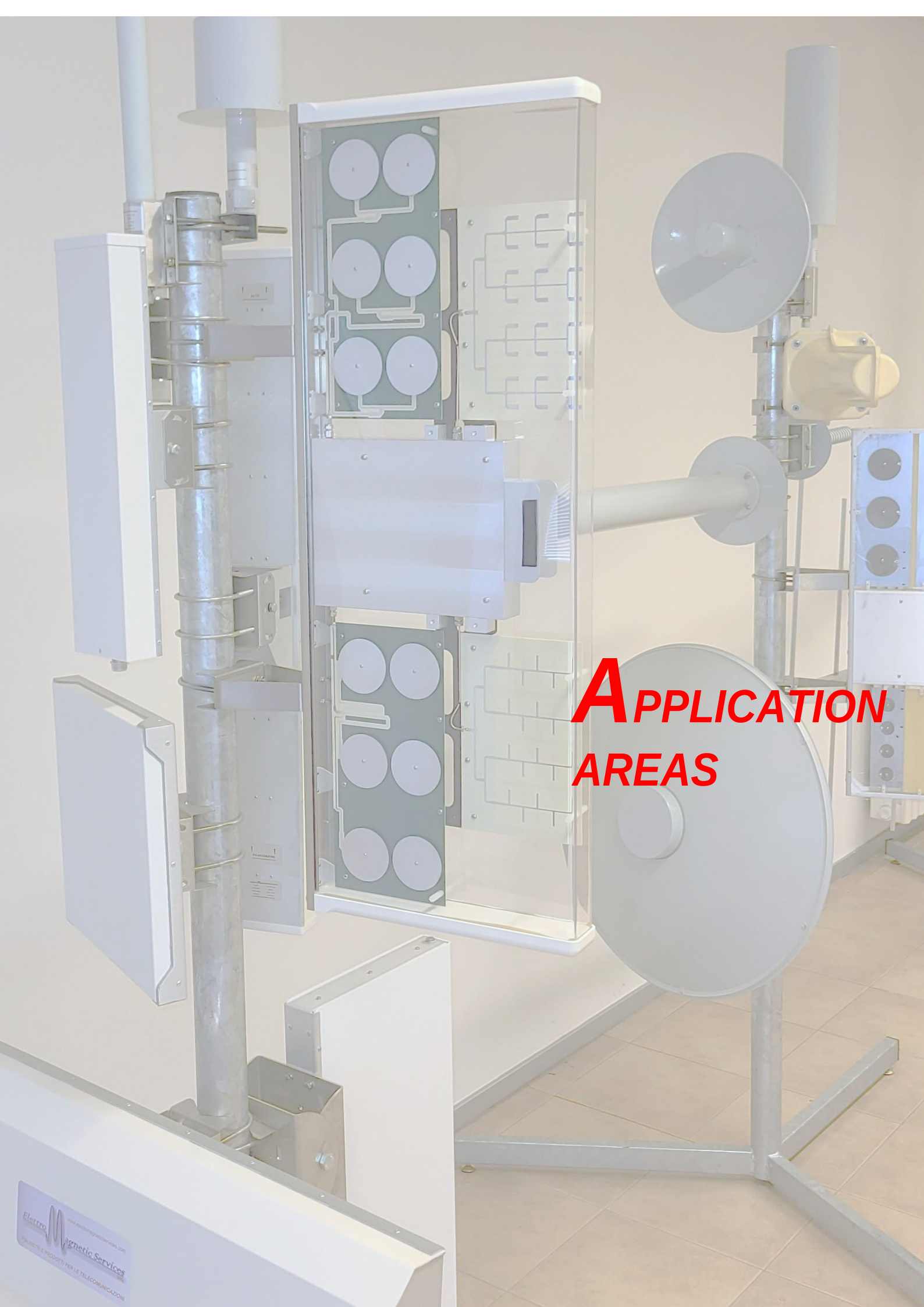
Founded in 2001 by two skilled partners who previously worked in R&D department of other telecommunications companies, **ElettroMagnetic Services s.r.l.** has a strong background in design and manufacturing solutions in the field of antennas and wireless systems, carrying out development, engineering and production activities by its own.

In 2005 the company moved into the bigger facility in Vailate, near the new A35 highway (the “Bre.Be.Mi”) linking Brescia to Milan, in the north-west part of Italy.

In this plant an RF laboratory with an anechoic chamber and a mechanical workshop have been accomplished to enhance the core business of the firm, i.e. the capability to carry out new antenna designs.

This activity, which distinguishes **ElettroMagnetic Services s.r.l.** from its competitors, consists in building customized antennas with particular specifications, according to Customer’s needs. In this area several projects have been completed, working with big manufacturing companies and also with universities and research institutes.

The keyword for **ElettroMagnetic Services s.r.l.** is **safety**, which translates into the ability to guarantee reliable results even when faced with stringent and ambitious requirements.



APPLICATION AREAS

Defense and Security

The “Defense and Security” sector is extremely demanding and requires communication solutions that ensure efficiency and reliability in critical operational conditions. In this context, ElettroMagnetic Services S.r.l. specializes in the design and production of custom antennas covering a wide range of land, naval and avionic military applications. These solutions are designed to ensure easy implementation, a reduced logistical footprint, increased mobility and a high level of reliability even in particularly challenging operational and environmental conditions.

Tactical Military Communications

We are capable of manufacturing custom antennas that cover a wide range of land, naval and avionic military applications, ensuring efficient and secure communications in the HF, VHF, UHF and UHF SATCOM frequency bands. This versatility is crucial to ensure connectivity in various operational scenarios and different propagation modes (LOS, BLOS, NVIS).

Conformal Antennas

We design and manufacture conformal antennas, perfectly integrated into vehicle structures without compromising operational efficiency and aesthetics. These antennas are ideal for applications where aerodynamic resistance is crucial, such as unmanned aerial vehicles (UAV) or underwater applications (ROV).

Jamming and Electronic Warfare Systems

We design wideband UWB antennas that integrate seamlessly, both mechanically and performance-wise, into jamming and electronic warfare systems to support and protect military operations. Customizing the antennas ensures optimal performance and greater reliability in every strategic aspect.

Antennas for IoBT (Internet of Battlefield Things)

Integrated antennas for the Internet of Battlefield Things (IoBT) support the growing need for interconnectivity between devices on the battlefield. These antennas are designed to enable reliable and secure communication between a wide range of devices and sensors, facilitating better data collection and a greater understanding of the operational context.

Ruggedness and Reliability

Our antennas feature rugged mechanical characteristics, designed to withstand extreme environmental conditions such as high temperatures, humidity, underwater pressure and intense vibrations. This ensures that performance and reliability are maintained even in the most difficult and critical operational situations.

Radar and Remote Sensing

We specialize in the design and manufacturing of custom antennas for radar systems operating in the L, S and C bands, offering great flexibility for various applications, such as space observation with BiRaLES technology, remote sensing with Synthetic Aperture Radar (SAR) and Ground Penetrating Radar (GPR) technology.

Arrays for Radar Systems

We design arrays for radar systems that meet the stringent technical requirements characteristic of these applications, developing customized solutions to fully meet our Customers' specific needs. Each array is meticulously developed to comply with extremely rigorous electrical, mechanical and environmental specifications, ensuring optimal performance even in the most challenging conditions. Through a personalized approach, we create tailored solutions that fully meet the required specifications.

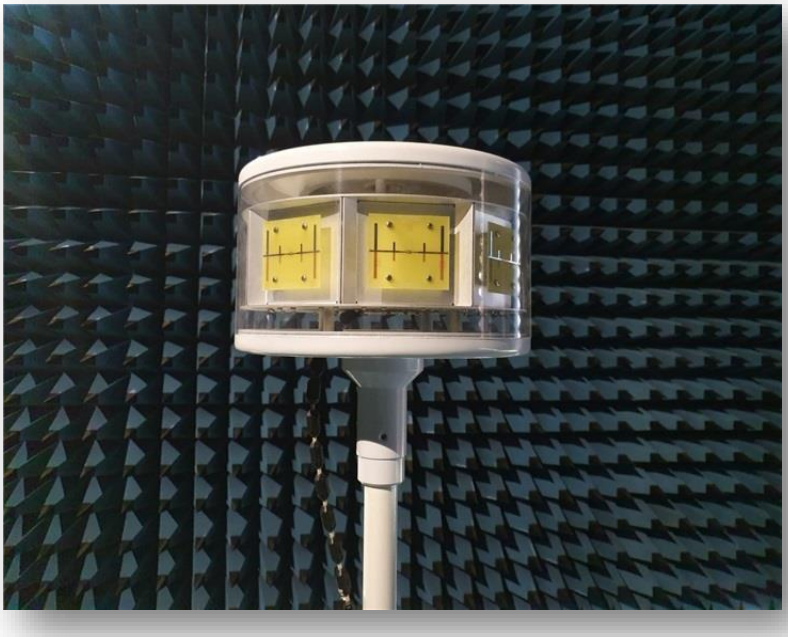
Custom Antennas for Remote Sensing

Our antennas are designed to ensure the most suitable technical specifications for the collection of high-resolution data and images remotely, a crucial feature in remote sensing applications. These antennas successfully support Synthetic Aperture Radar (SAR) technology, enabling detailed imaging of the Earth's surface and its features. We are also capable of developing tailor-made antennas to support Ground Penetrating Radar (GPR) methodology.

Ruggedness and Reliability

The antennas we develop are characterized by solid mechanical ruggedness, essential for ensuring system reliability even in challenging operational environments. This quality is particularly important in applications requiring installation in extreme environmental conditions, ensuring that operations can continue without malfunctions or interruptions.

Custom Antenna Systems



In the field of professional telecommunications, customization is the key to achieving superior performance. ElettroMagnetic Services Srl specializes in the design and production of custom antenna systems, both modular and non-modular, offering solutions that integrate various configurations: omnidirectional, sectorial, bidirectional, multiband, single or dual polarization, with downtilt and squint implementation. Examples of potential application sectors include airspace monitoring systems and DF applications, Smart Road applications, autonomous vehicles, radio coverage of strategic and public interest areas and antennas for MIMO technology.

Versatility and Customization

Our antenna systems are designed to perfectly adapt to the specific technical (electrical, mechanical, environmental and aesthetic) requirements of the Customers. This customization allows for optimized systems that guarantee far superior performance compared to standard antennas.

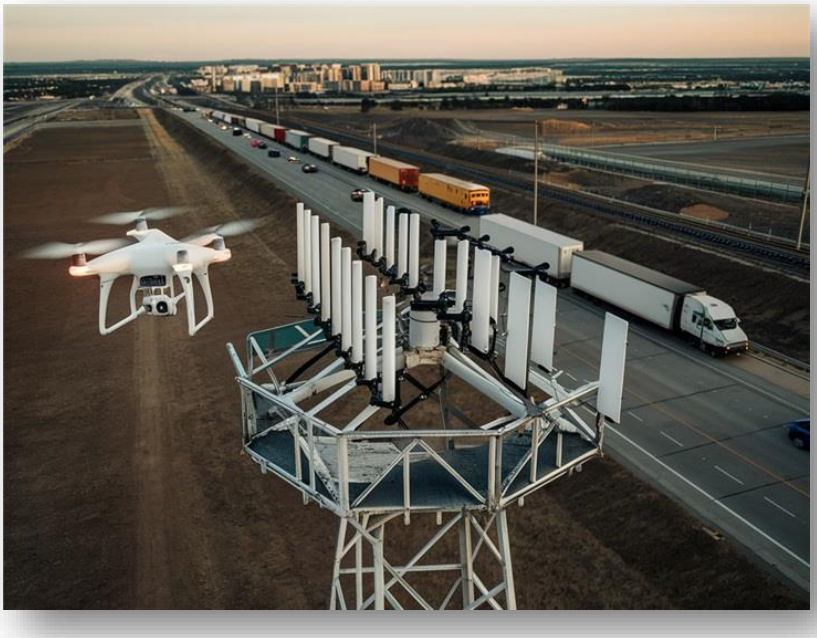
Installation and Operational Optimization

By integrating multiple radiating elements into a single modular system, we significantly facilitate installation and wiring. This approach not only reduces system complexity but also ensures uniformity in electrical characteristics and significantly reduces installation times. These innovations translate into valuable time savings and greater operational efficiency, allowing our Customers to focus on other critical aspects of their operations.

Long Product Lifespan and Reliability

We ensure that every component of the system maintains optimal performance over time, helping to reduce maintenance needs and ensure a long product lifespan, even in challenging environmental conditions. This aspect is particularly important in applications where minimizing malfunctions and downtime is essential.

Mobile Networks and Services



In the context of mobile networks and services, we specialize in the design of custom antennas that ensure performance and reliability. We offer innovative solutions that enhance connectivity across a wide range of application scenarios.

Customized Antennas for Every Type of Network

Our antennas are designed to optimize the use of existing mobile networks (GSM, UMTS, LTE, 3G/4G, and 5G). We develop omnidirectional, sectorial and directional antennas that significantly improve reception and signal quality. These solutions enable our Customers to maximize their network capabilities, ensuring fast and stable data transmission in all contexts, from densely populated urban areas to the most remote regions.

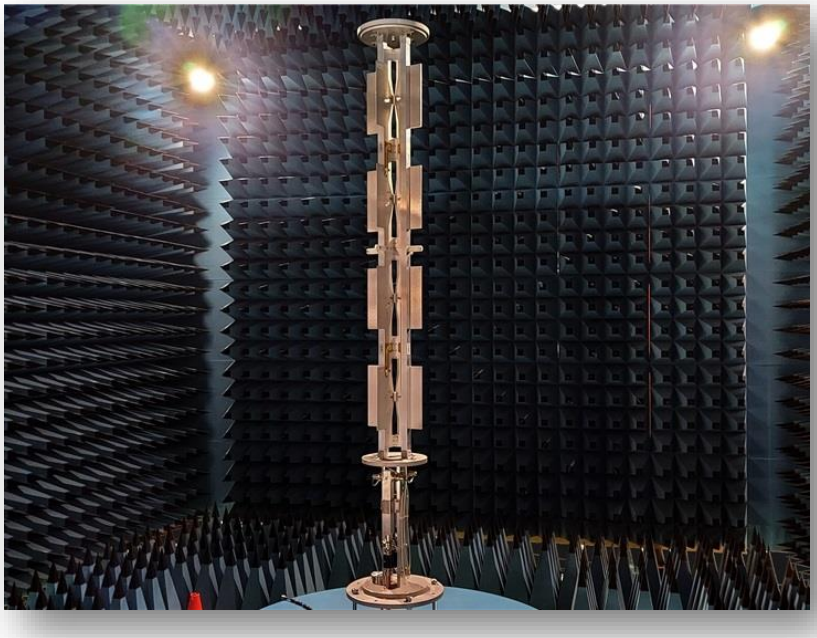
Improving Reception in Challenging Environments

Our solutions are particularly advantageous in the most challenging environments. In crowded urban areas where buildings can obstruct the signal, our antennas help maintain stable and reliable connections. In rural or remote settings, they optimize reception to ensure connectivity even where the signal is particularly weak.

Weather Resistance

We design antennas capable of withstanding weather elements, ensuring reliability and optimal performance even under adverse weather conditions.

Broadcasting



ElettroMagnetic Services Srl specializes in the design and production of custom antennas for the broadcasting sector in the FM, VHF, UHF, and 5G Broadcast bands. Our solutions are designed to meet specific transmission and reception needs, ensuring optimal performance even in the most challenging conditions.

Wide Range of Antenna Typologies

We are capable of designing and producing a wide range of antenna typologies (directional, sectorial, omnidirectional) to suit various coverage requirements. This flexibility allows our Customers to optimize their transmission network, improving signal quality and effectively reaching larger areas with reliability and efficiency.

Modular Structures and Mechanical Ruggedness

We can design modular structures that allow for easy installation and maintenance, ideal for broadcasting operators who need scalable and adaptable solutions. Additionally, our antennas are distinguished by their mechanical ruggedness, ensuring long-lasting performance even in environments with adverse weather conditions.

Reliability in Challenging Environmental Conditions

Our antennas are designed to maintain normal operation regardless of weather conditions or other environmental factors, ensuring that transmissions continue without interruptions even in extreme climatic situations.

UAV, UGV, and ROV Drones

Drones have now taken on a central role in numerous applications. A critical component for the operational success of these sophisticated devices is undoubtedly the antenna, which plays a fundamental role in the drone's communication system. Custom antenna design represents an optimal solution to overcome the limitations of standard antennas, ensuring performance, reliability and integration in line with the specific needs of each type of drone. Below, we outline the main advantages that custom antennas offer in the context of terrestrial, aerial and underwater drones.

Optimization of Communication Performance

In the drone sector, ensuring stable and reliable communication is essential. Custom antennas allow for maximizing signal quality and range in all operational environments.

Adaptability to Extreme Environmental Conditions

Drones often operate in harsh environments, exposed to extreme temperatures, humidity or high pressures. Our antennas are designed to withstand these conditions, maintaining optimal performance in any usage scenario.

Integration with Drone Design

Integrating the antenna into the drone's design can significantly enhance the device's aesthetic appearance. Additionally, accurate antenna design is crucial for optimizing the aerodynamic profile and reducing energy consumption.

Support for Multiple Communication Protocols

Modern drones need to support various communication protocols for functions such as GPS, RF control and data and video transmission. Custom antennas can be designed to create a multiband system capable of ensuring stable and efficient multifunctional communication.

Advanced Air Mobility (AAM)

Our custom antennas are particularly suited for new Advanced Air Mobility (AAM) applications. Designed to ensure reliable and secure communications, these advanced solutions enhance the efficiency and safety of urban air vehicles, facilitating the innovative transport of people and goods.

Increased Safety and Reliability

In critical missions such as search and rescue or environmental monitoring, drones must have stable, uninterrupted connectivity. Custom antennas ensure continuous and reliable connections, crucial for real-time control and secure data transmission.

Anti-Drone Jammer Systems

We design antenna systems for anti-drone jammers capable of fully meeting the required electrical, mechanical and environmental specifications. Customizing the antennas offers significant advantages over standard commercial solutions, such as integrated and compact design, optimized operational bands and radiation patterns, as well as reliability and durability even in challenging environmental conditions.

Remote Control and Monitoring

In the field of remote control and monitoring, the precision and reliability of communications are essential to ensure effective control and adequate operational security. ElettroMagnetic Services Srl is a leader in the design of custom antennas capable of guaranteeing optimal performance in a wide range of applications: from Smart Metering for monitoring faults and energy consumption to air and water quality control, from managing hydraulic systems and critical infrastructure to supporting mobility in public transportation.

Superior Real-Time Performance

The antennas we develop are particularly suited for real-time data and video transmission systems, indispensable for promptly responding to anomalies or emergencies, thus ensuring a safe and controlled operational environment.

Integration with Existing Systems

A significant advantage of our solutions is their ability to seamlessly integrate with various monitoring and remote-control systems, ensuring the necessary performance while adhering to the required mechanical and aesthetic constraints.

Custom Antennas for Remote Reading and Smart Metering

In the field of remote reading and monitoring, ElettroMagnetic Services Srl has developed specific expertise in supporting major communication technologies such as LoRaWAN, NB-IoT, and GSM/GPRS. We design integrated antennas in the most commonly used operational bands (ISM 169MHz, 433MHz, 868MHz, LTE, 5G) that significantly enhance the connectivity of smart meter communications. These antennas are optimized to operate in the specific environmental conditions of installation sites, ensuring consistent and uninterrupted data transmission. Integrating our antennas into remote reading devices not only improves data collection but also enables more efficient and precise resource management, contributing to reduced waste and improved overall operational efficiency.

Custom Antennas for Data Concentrators

At ElettroMagnetic Services Srl, we specialize in designing directional, sectorial, and omnidirectional antennas specifically for data concentrators used in Smart Metering networks. These antennas are characterized by their compact size and optimal performance, ensuring excellent coverage and reliable signal transmission. The combination of small dimensions and high efficiency makes them ideal for communication infrastructures, especially in applications requiring visual discretion without sacrificing connection quality.

Industrial Automation

In the context of Industry 4.0 and 5.0, Smart Factory and Industrial IoT (IIoT), our custom antennas are designed to support the latest IoT technologies and the most advanced industrial automation systems, including robotics. We develop solutions intended to ensure reliable communication between robots, machinery and control systems.

Antennas for IoT and Industrial Automation

Our antennas are specifically designed to facilitate the connection between various devices in the industrial sector, supporting a wide range of IoT applications. These antennas enhance the collection and transmission of data between machines, allowing operators to monitor and manage production processes more effectively.

Reliability in Challenging Environments

In industrial environments, where operating conditions can be challenging and difficult, our antennas demonstrate optimal performance even when exposed to high temperatures, intense vibrations and corrosive chemicals. In this way, connectivity is consistently maintained, eliminating interruptions that could compromise the safety and efficiency of processes.

Mechanical and Aesthetic Integration

Beyond functionality, we ensure the proper integration of antennas into work environments. Our solutions are designed to perfectly fit the required mechanical and environmental constraints, with the adoption of low-profile or conformal radiating elements in the case of moving parts, robotic arms, personnel or vehicles. This integration capability makes our antennas particularly suitable for modern industrial automation.

Biomedical

In the biomedical sector, due to the increasing development of IoMT (Internet of Medical Things) technology, precision and reliability in radio communications are of vital importance. ElettroMagnetic Services Srl specializes in designing custom antennas that fully meet the specific needs of this field, ensuring reliable connectivity in critical applications, such as remote patient monitoring systems, wearable health monitoring devices, integrated IoT applications for diagnostics and rehabilitative robotics.

Advantages of Custom Antennas in the Biomedical Sector

Our antennas are custom-designed to ensure superior performance compared to standard antennas available on the market. This personalized approach allows for the optimization of communication in specific medical devices, a crucial aspect when responsible for the health and safety of patients.

Custom Integration

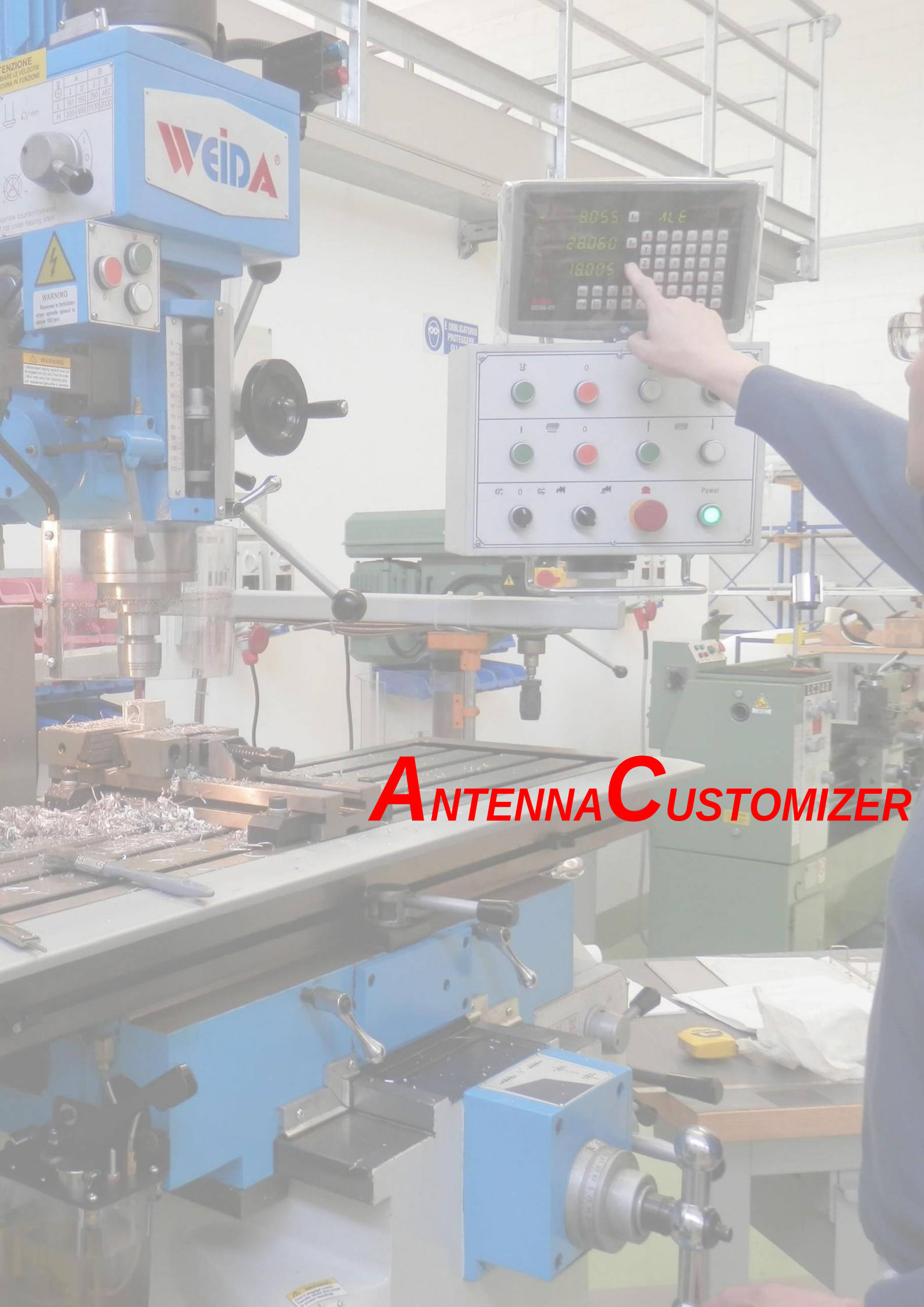
Our custom design ensures that each antenna fits perfectly, both functionally and visually, with the medical devices it is used with. This not only improves the overall appearance but also facilitates the use of the devices for medical personnel.

Wearable Antennas for Medical Applications

In the increasingly connected world of modern medicine, wearable antennas are revolutionizing the way we monitor patient health. ElettroMagnetic Services Srl develops integrated antennas for wearable IoT devices, making patient monitoring easier and more reliable. Our antennas are designed to integrate into small-sized devices, where space is limited and design is a critical factor, as well as to be embedded within wearable fabrics, ensuring maximum comfort for the patient.

Rehabilitative Robotics

Rehabilitative robotics is revolutionizing patient recovery, providing innovative and personalized solutions that accelerate the healing process. At ElettroMagnetic Services Srl, we develop custom antennas that enhance the connectivity and functionality of these robotic devices. Our advanced technologies ensure secure and reliable data transmission, essential for accurately monitoring patient progress and adapting therapies in real time. Our expertise ensures that each solution is designed to meet the specific needs of the rehabilitative sector, significantly improving the effectiveness of treatment.



ANTENNA CUSTOMIZER

AntennaCustomizer

This term synthesizes the core business of the company i.e., the research and development standardized method to manufacture antennas with particular electrical and mechanical specifications to suit any customer's request.

The acquired experience in this specific field has allowed us to define a fast and effective design procedure by which we can provide innovative products, in a quick and cost-effective way, even for all those applications where a tailored solution seems to be impracticable.

The **AntennaCustomizer** development activity is carried out through four steps, plus a possible production phase in the case that our customer will require this further service from us.

Step 1

Definition of the technical specifications and quote

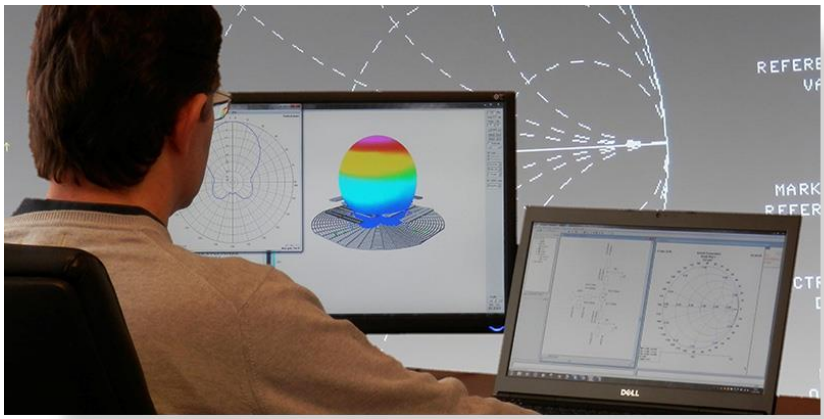
All projects start with a first phase of dialogue, absolutely not binding, that aims to put in evidence the specific needs of the Customer, in order to identify the proper solution. Depending on the particular application, we assess the electrical and mechanical specifications of the novel antenna, trying to give at each of them the correct weight in relation to project complexity.

Since this is a very delicate stage, we are available to arrange a free, open-ended meeting to answer all your questions and clarify any doubt.

At the end of this first phase, we will draw up a document showing the technical specifications we are able to guarantee, with delivery time and design cost.

Step 2

In-depth technical proposal



Before starting with the design activity, we propose a step called ***In-depth Technical Proposal***.

This document must be considered as a stand-alone activity, non-mandatory and non-binding and it has the following aims:

- To supply a technical advice about the required project
- To analize in-depth the technical details we consider more relevant
- To identify the rough edges that could be met during the design activity
- To supply a detailed description of the developing process phases

In this way, it will be possible to highlight any discrepancies and/or missing or incomplete data and verify that all the information have been transposed correctly.

Step 3

Antenna development

We proceed with the development of the novel antenna using both electromagnetic simulation tools (for the electrical design) and CAD software (for the mechanical design). In the case that some preliminary laboratory tests are needed for a direct validation of design choices, all the required measurements can be easily carried out thanks to the RF laboratory and the mechanical workshop, located inside our facility.

Then we proceed further on with the assembly of your first prototype. If some specific parts are needed, we can get them quickly from a network of specialist suppliers, under our total control. The experience allow us to reduce time and costs for pre series accomplishment.

When the assembly is completed, the prototype is carefully measured in order to verify its real correspondence with the formerly assessed specifications. The prototype will be validated only after this confirmation.

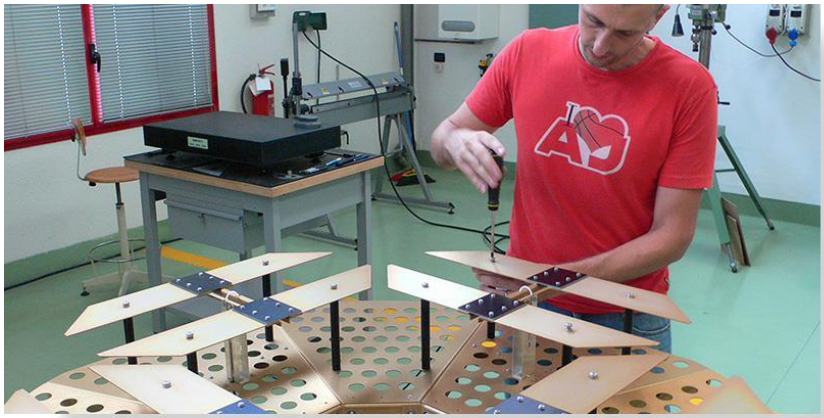
Inside our facility, our electromagnetic measurements laboratory in equipped with an anechoic chamber, a fully automated data acquisition system and all the instruments to carry out a complet and accurate characterization of the new antenna, both as a stand-alone product or integrated into a particular electronic device.

All the requested prototypes are manufactured and individually measured in order to verify the correct operation.

At the end, all the prototypes are delivered together with one or more technical reports containing the results of all the characterization measurements.

Step 4

Production and after-sales service

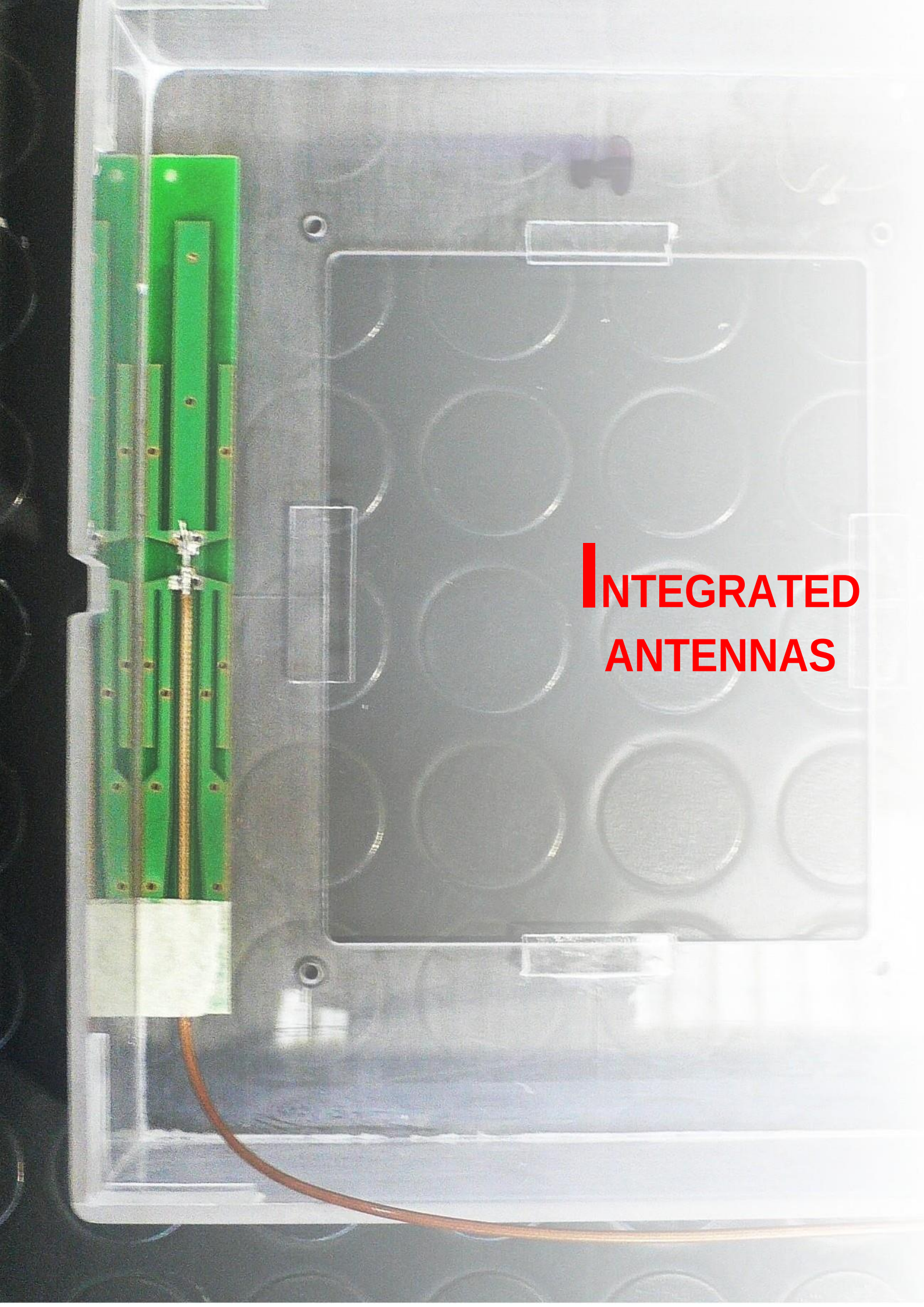


Al this stage, we are able to arrange a production and to supply the new antennas as mutually agreed with the following advantages:

- Defined delivery times
- Fixed and guaranteed price
- The certainty that the product will not be proposed or commercialized to other companies.

Furthermore, we will available for any tips and tricks on correct installation and maintenance, in order to obtain the best results.

If, over time, some changes should be required, we will be able to accomplish every required improvement.


INTEGRATED
ANTENNAS

Integrated antennas

What "*integrated antenna*" means

With the term "***integrated antenna"*** we mean a highly customized and optimized product that can be inserted into a proprietary electronic device (hosting device) or covert into a specific location to suit a particular application.

The main features of an integrated antenna, that also distinguish its development process from a more conventional design, are the following ones:

- The electrical parameters cannot be assessed without placing the antenna into its operating condition, i.e. an integrated antenna cannot be conceived as a stand-alone element since all the hosting device affects radiation;
- Unconventional, compact schemes of radiating elements are used in design, since severe limitations and mechanical constraints occur in the hosting device;
- Some lossy elements are often present in the electronics or materials of the hosting device, therefore the project must include measures to minimize these effects on antenna efficiency.

In these last years some PCB mounted antennas, both conventional and SMD, appeared in the market with the intent to provide a universal plug-in component for RF integrated systems and wireless devices.

The "plug & play" property of these products is often overestimated, since the declared electrical properties are measured by means of the manufacturer's evaluation board that in most cases differs substantially from the real PCB of the hosting device.

PCB size and shape, nearby electronic components and wirings, dielectric housing and metallic hardware are all factors that can detune the antenna and severely impair its capability to radiate and receive wireless signals.

Here at **ElettroMagnetic Services s.r.l.** we **do not** supply you an off-the-shelf integrated antenna that can reveal unpredictable performance when fitted in your particular application.

Here at **ElettroMagnetic Services s.r.l.** we follow your product development and we can design a specifically designed integrated antenna, to achieve the optimal performance for your hosting device.

Development of an *integrated antenna*

According to our proven **AntennaCustomizer** method, we can carry out an integrated antenna development process in the form of a comprehensive service to the Customer.

First...

we can submit to our customer a free preliminary technical proposal with detailed explanations about the possible solutions we can accomplish to develop the right antenna for his integration needs.

Second...

we can collaborate with our customer's technical office to take into account also the "electromagnetic factor" of his design i.e., components placement, materials choice, cables routing and other critical aspects to achieve maximum antenna performance.

Third...

we can develop the novel antenna directly in the Customer's hosting device, carrying out both electromagnetic simulations and electrical measurements of the real antenna parameters, thanks to our internal laboratory and mechanical workshop.

Fourth...

we can supply to our customer the complete characterization of the integrated antenna carrying out measurements in its definitive operating position, i.e. in the hosting device: a large number of measurements can be accomplished, according to Customer's product specifications and applications.

Fifth...

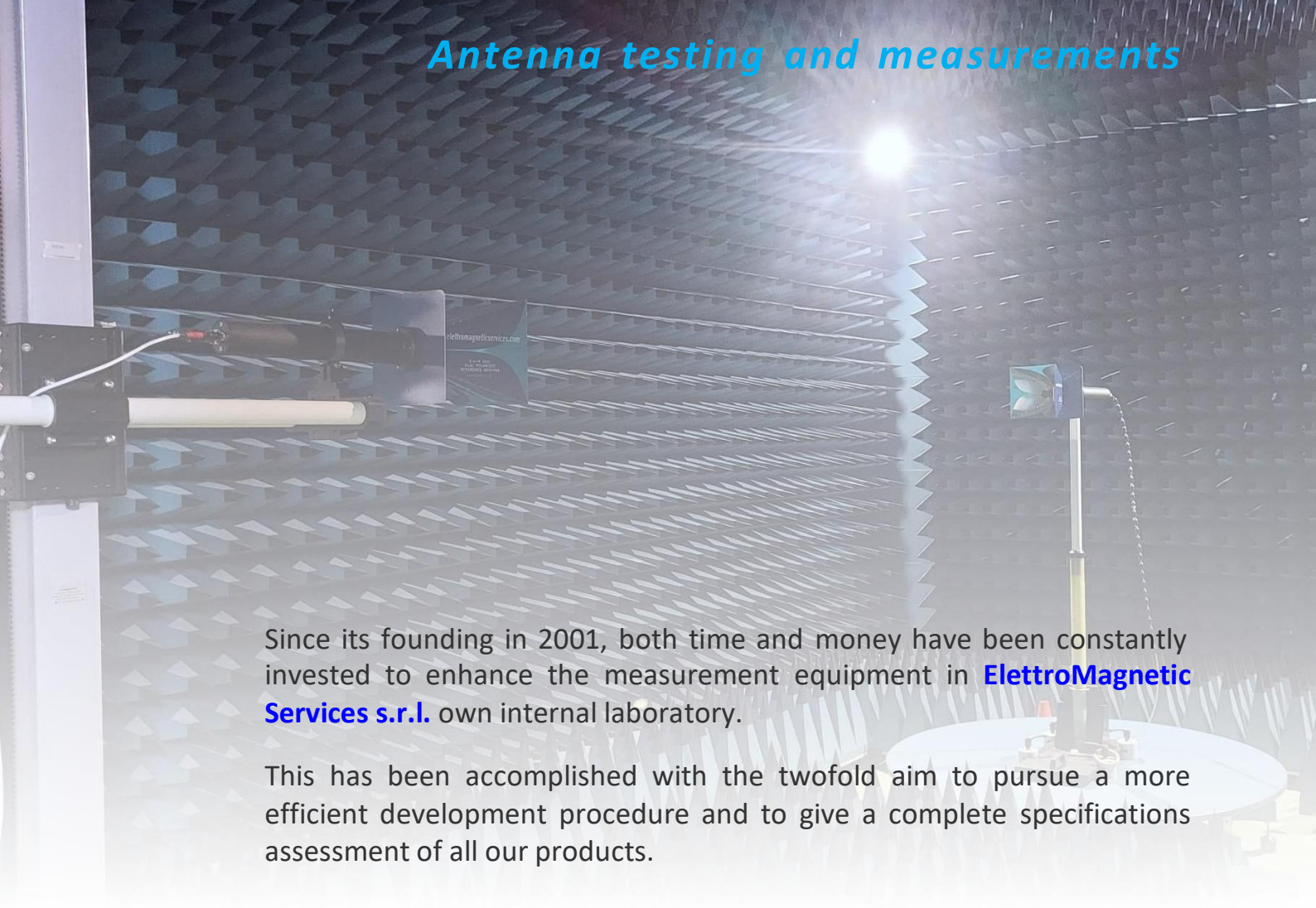
we can carry out both prototyping and engineering of the novel integrated antenna, that can be directly manufactured by our customer or supplied to him in quantities for production purposes.

Sixth...

we can support our customer further on production,
if some changes, upgrades or modifications
are needed during all product's life.

ANTENNA TESTING AND MEASUREMENTS

Antenna testing and measurements



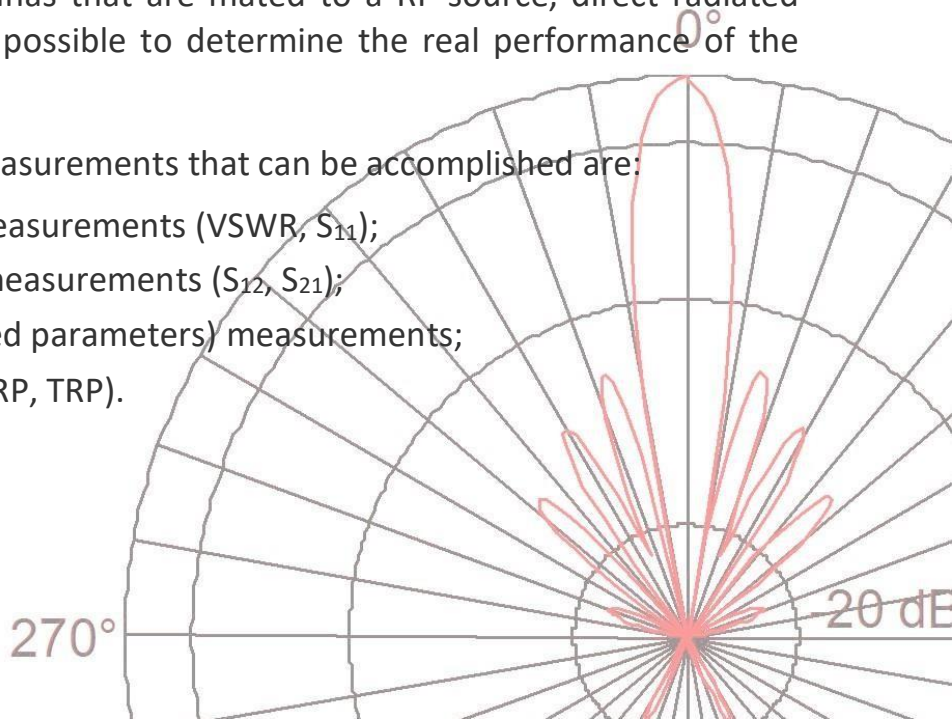
Since its founding in 2001, both time and money have been constantly invested to enhance the measurement equipment in **ElettroMagnetic Services s.r.l.** own internal laboratory.

This has been accomplished with the twofold aim to pursue a more efficient development procedure and to give a complete specifications assessment of all our products.

Now the company's laboratory includes an anechoic chamber with a fully automatic acquisition system that drives a rotary platform capable of a position accuracy down to 0.1 degrees. In this way it is easy to carry out precise radiation measurements also on antennas that are integrated into large housings or subsystems.

A complete set of measuring instruments (VNA, spectrum analyzer, RF signal generator, etc.) is part of the whole system, so it is possible to acquire a full characterization of antenna's electrical parameters.

In the case of integrated antennas that are mated to a RF source, direct radiated power measurements are also possible to determine the real performance of the whole system.



Some of the most important measurements that can be accomplished are:

- Impedance and reflection measurements (VSWR, S_{11});
- Insertion loss and isolation measurements (S_{12}, S_{21});
- Radiation pattern (and related parameters) measurements;
- Radiation measurements (EIRP, TRP).

Headquarters

ElettroMagnetic Services s.r.l.

via S. Pertini, 6
26019 VAILATE (CR)
ITALY

phone +39 0363 840 86
fax +39 0363 341 636
email *info@elettromagneticservices.com*

VAT nr. IT03121460962

Contacts

- COMMERCIAL OFFICE

  Flaminio Bollini
  mobile: +39 338 1666 122
  email *bollini@elettromagneticservices.com*

- TECHNICAL OFFICE

  Francesco Zaccarini, Ph.D
  mobile: +39 348 7433 605
  email *zaccarini@elettromagneticservices.com*

www.elettromagneticservices.com
www.antennacustomizer.com