University Of Bologna, Italy

CASE STUDY
2023

Spectrum Compact

for educational research and development

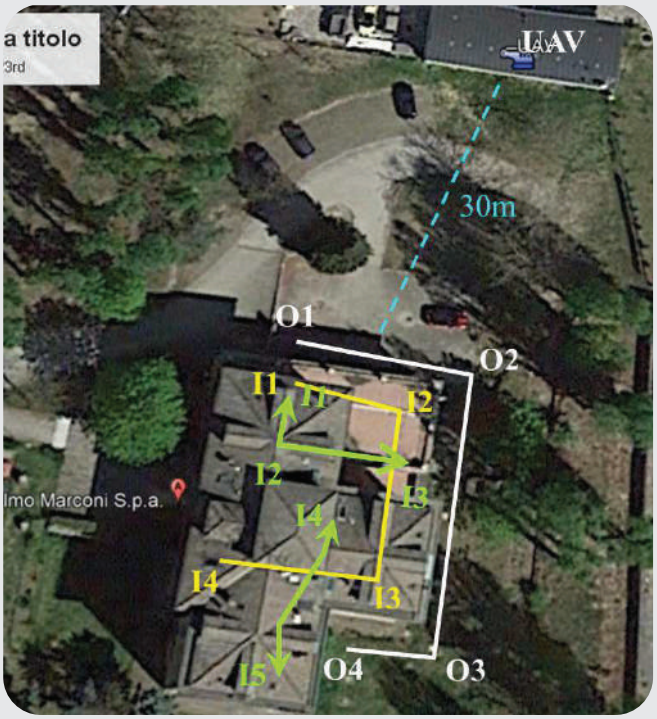
INTRODUCTION

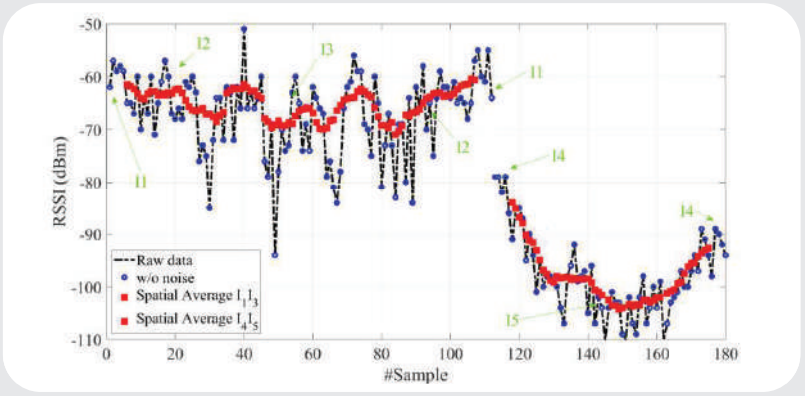
The age of UAV's or better known as drones is upon us. The applications range from the fun – getting your Amazon package or take-out food delivered by UAV. To the life altering serious - like having critical medical supplies delivered over remote and difficult terrain.

Telecommunications, utilities, and energy are using UAVs for infrastructure inspection. Man-hours in the field are dramatically decreased. Inspections taking weeks can be completed in hours. Site inspection in these industries is one of the most high-risk activities for workers. UAVs lower the risk and improve inspection efficiency.

CHALLENGE - 5G SIGNAL PROPAGATION

Taking physical site inspection to the next level – equipping UAVs for 5G signal propagation studies in urban environments at millimeter wave. Scientific researchers at UNIBO (University of Bologna) have been busy thinking about solutions. UNIBO has a long history of excellence in studies supporting the progress of telecommunications and electrical engineering.





The team at UNIBO developed a measurement setup for air-to-ground (A2G) full 3-D wireless propagation analysis. The flexible system includes millimeter-wave and ultrawideband transceivers mounted on a customized unmanned aerial vehicle and a ground station. Their work is published in **IEEE TRANSACTIONS ON INSTRUMENTATION AND MEASUREMENT** (Volume 70).

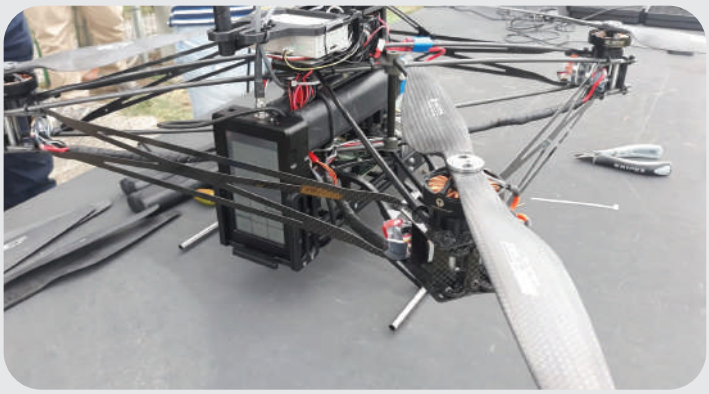
AIR SEGMENT OBSTACLES

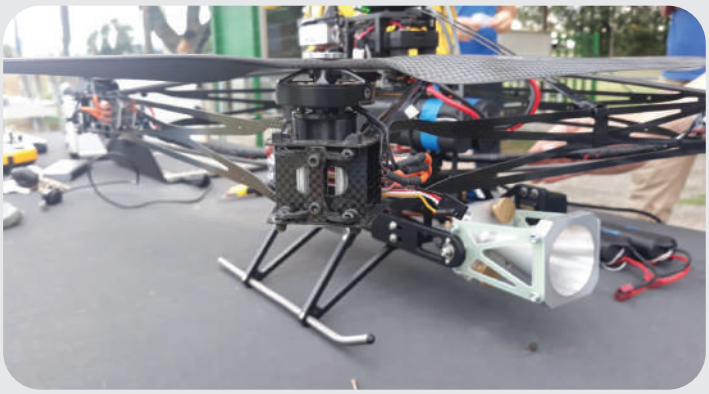
- **Commercial Availability: lack of suitable off-the-shelf UAV**
- **Payload: max 4kg – measurement equipment included**
- **Power: 20 min flight time on UAV battery**
- **Affordability: low-cost millimeter-wave spectrum analyzer**

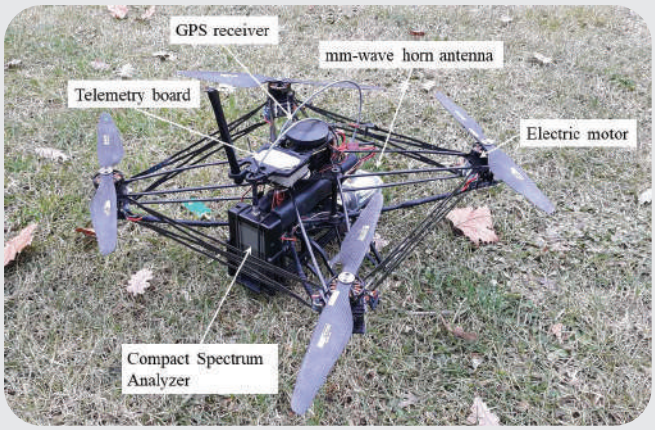
''Our goal was to find a suitable product for our research purposes that fit our allocated budget and would be easy to set up and use'' *– Marina Barbiroli, PhD, Associate Professor at the Dept. of Electrical, Electronic and Information Engineering ''G. Marconi'' at UNIBO*

SOLUTION

UNIBO designed and built a customized quad-copter UAV with a carbon fiber frame and metal landing skid weighing under 4kg (including the 1.5kg electronics payload). The fiber frame elements provide structural vibration and stability, the metal skid provides damage control during hard landings. The custom gimbal and payload were configured for weight distribution between the spectrum analyzer and horn antenna. The one-axis gimbal allows for pitch orientation and drone tilt.







The 4kg weight specification was crucial to the mission – as it is the max weight for ''class A2'' drones. Which allowed for simpler regulatory compliance compared to heavier and higher class fixed-wing UAVs.

SPECTRUM ANALYSIS EQUIPMENT

SAF Tehnika's Spectrum Compact series was just the right fit for the UNIBO 5G signal propagation study.

SAF's solution provided the flexibility and affordability for the milli-meter spectrum analyzer and signal generator (J0SSAP14 24-40 GHz spectrum analyzer and JOSSAG14 24-40 GHz signal generator).

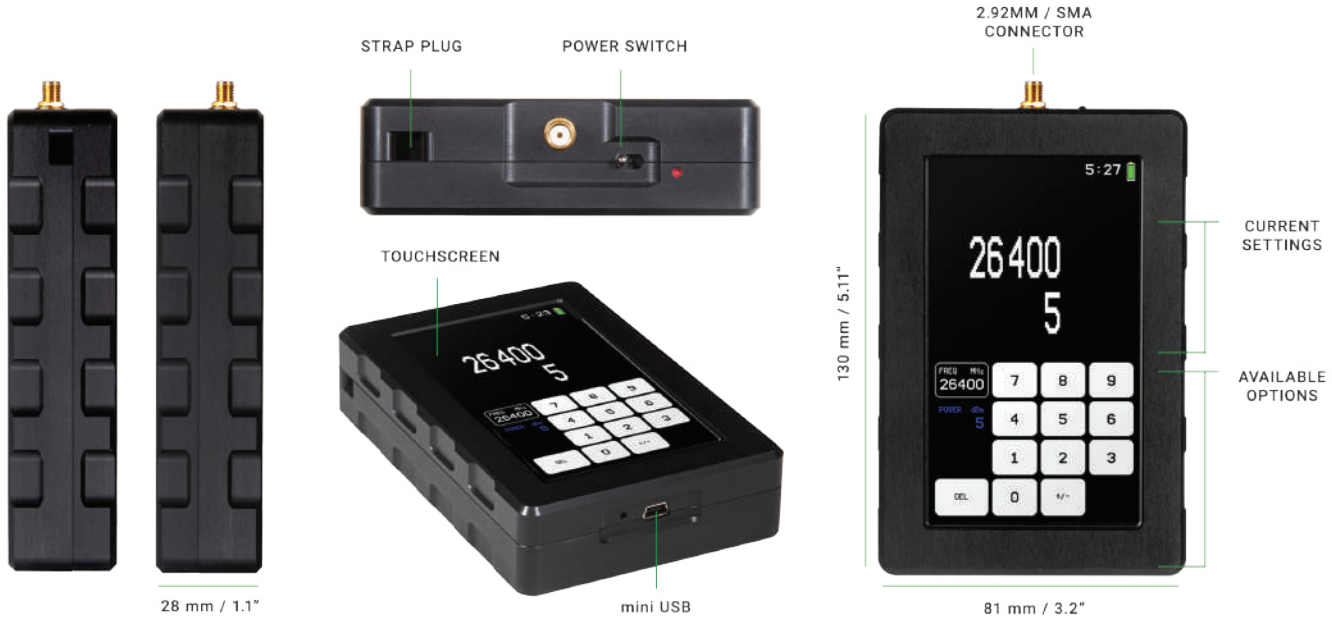
SAF's product development team understands that in the field you need tools that are ultra-light with a compact form factor, easy to use, and affordable. We accomplish the affordability by giving researchers, RF Engineers, and test technicians a product line of 7 devices, each dedicated to its own frequency range – spanning 10 MHz – 87 GHz.

''We were pleasantly surprised by the cost of Spectrum Compact and its potential suitability to our measurement campaign in real propagation conditions – that is not limited to a restricted and static environment like a research lab.''

– Franco Fuschini, PhD, Associate Professor at the Dept. of Electrical, Electronic and Information Engineering ''G. Marconi'' at UNIBO

SIGNAL GENERATOR

SAF's decades of expertise in wireless data transmission design and manufacturing led to the industry-first handheld signal generator weighing only **400 grams.** The 24 – 40 GHz unit's form factor, long battery life, and integration-ready platform with application programming interface (API) was perfectly suited for UNIBO's UAV signal propagation study.



ABOUT SPECTRUM COMPACT

The Spectrum Compact series of handheld spectrum analyzers and signal generators are used throughout the world. Applications range from out-of-the-box simplicity to custom API integration for drone-based full 3-D signal propagation characterization in urban environments.

Spectrum Compact's rugged handheld devices are designed for quick and efficient use in the field as well as the research lab. RF engineers, regulators, and industry professionals use them for various applications in 5G, LTE, VSAT, EW (electromagnetic warfare), DAS, and drone-based site inspections.

SAF Tehnika is one of the most specialized microwave data transmission technology manufacturers in Europe with long-term competence in the development and production of microwave radios, compact handheld touchscreen spectrum analyzers **Spectrum Compact** and radio signal generators, and IoT wireless monitoring ecosystem **Aranet**.

For more detailed information visit **saftehnika.com**
or contact your SAF Tehnika representative **info@saftehnika.com**
Product features may vary between different models and configurations.
They are subject to change without prior notice. **SAF Tehnika © 2023**