

Using drones to test RF signals in EMF scenarios

The technology of Unmanned Aircraft Systems (UAS)—more popularly known as drones—has developed rapidly over the last few years. At IMST GmbH too, the subject of making measurements using helicopter drone systems has become increasingly important.

UAS have already been used successfully in various projects (e.g. CopKA, support for BOS by the use of UAS through satellite communications). The latest application involves the use of drones to measure immissions in scenarios that involve cellular base stations, radio link paths, and radar equipment (up to 6 GHz).

The experts at IMST used a modified DJI S1000 Octo-Copter for this task. This had already been successfully immunity tested at more than 100 V/m and is ideal for measurements in the immediate vicinity of RF sources such as cellular base stations. The copter itself is considered as a system unit that is capable of carrying different measuring devices (RF, LF, magnetic field, infrared cameras, radar or HD camera), to allow measurements in inaccessible areas.

The modification involves fitting a measuring device to the copter unit. In this case, the device is a Narda SRM 3006 Selective Radiation Meter, supplied by Telemeter Electronic, which is controlled from a mini PC via an optical interface. The mini PC itself uses a radio interface connected to a ground control station. The 868 MHz modem used provides a secure link between the ground station and the drone even over longer distances thanks to its excellent error correction and encryption, even if the bandwidth at this frequency seems less than ideal for transmitting a complete screenshot back to the ground station, which is what users of the SRM are familiar with from normal PC control. For this reason, complete screenshot data is only transmitted for system check purposes and the internal memory of the Narda measuring device is used to save the data, with commands only being initiated from the ground station. This enables the use of all of the commands that the device offers. A confirmation is also returned to the ground station each time that a command is set, so that the entire communication sequence is secure.

Figure 1 at the top of the page shows the command window (left) and the image transmitted back from the drone unit (right, in background). The necessary software is based on Narda drivers and a Python script as well as explicit error correction. The usual sweep method used to sample the electromagnetic field within a small area cannot be handled by the

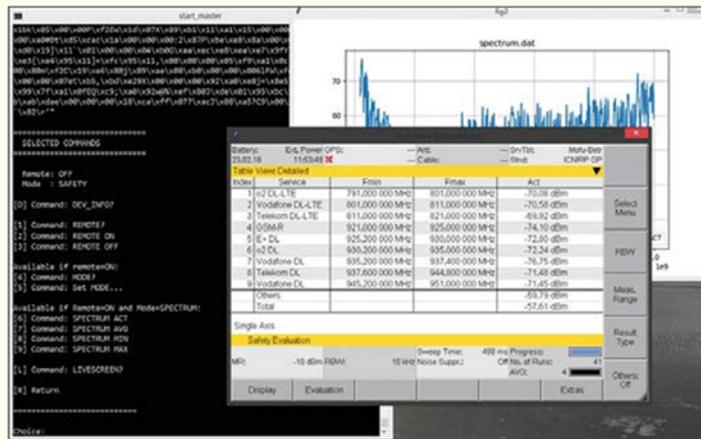


Figure 1: Remote control of the SRM 3006 from the ground station

copter unit because it cannot be controlled precisely enough for the meandering path required, in contrast with a check done on the ground. An isotropic antenna must therefore always be used.

However, the antenna must be positioned vertically for attitude control of the copter. This results in further problems, for example in the takeoff and landing maneuvers. Figure 2 shows the solution, which is a takeoff and landing pod that has an area cut out to accommodate the vertical antenna.

Other applications for this copter system are measurements on high tension cables or LF transmitters. The drone can be fitted e.g. with a Narda EHP-50 or Narda EHP-200A for this purpose. Both of these devices have optical interfaces that can be used to control the instrument. As they are also more compact, less work is needed to cope with the antenna because the E field and H field antennas are both integrated into the instrument.



Figure 2: Drone on the start pod with antenna fitted



Figure 3: Drone in flight above the test turntable with active measuring device control during immunity testing (without isotropic antenna)

IMST GmbH has been active in the field of EMC, EMI, and radio frequency measurements for more than 20 years. The laboratory used to perform the measurements is DAkkS accredited (German Accreditation Agency) for all the above measurements. IMST GmbH is a member of UAV DACH (UAV governing body) and performs UAV DACH tests complying with §21d LuftVO for the accredited location.

Autor: Markus Ridder

Fotos: IMST GmbH

