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Drone mapping procedures

Tools to bring on every mapping flight:

- ☐ SMA wrench
- ☐ Multi-tool
- ☐ Digital Multimeter
- ☐ Small screwdriver and allen key for drone bolts
- ☐ Drone rescue kit
- ☐ Spare props
- ☐ FieldFox (optional)
- ☐ Drone and usual equipment/payload

Items to bring if setting up an LWA and operating without an established ALBATROS station (ie soccer field ops):

- ☐ LWA
    - Topper
    - Hardware
    - Petals
    - Central fiberglass supports and flange
    - Central pole
    - Base (ie Xmas tree stand)
- ☐ FEE (with optional spare)
- ☐ Driver screwdrivers for LWA (2 sizes)
- ☐ Readout SNAP box with appropriate RF chain
- ☐ Hard drive if not internal to the SNAP box
- ☐ RF rescue kit (attenuators mainly)
- ☐ GPS antenna
- ☐ Batteries with cables (jumper and power cable to readout box)
- ☐ Coax cables
    - Riser cables for LWA central pole
    - Long cables from LWA to SNAP box

Setup instructions for flying without an established ALBATROS station (ie soccer field ops):

- ☐ Determine location of readout system and crew (ie picnic table)
- ☐ Determine location of LWA
    - Can uncoil coax cable and use its length to determine this
- ☐ Set up LWA with Xmas tree stand base
    - Includes connecting riser cables to FEE

- ☐ Jumper batteries and hook up power cable for the readout box (do not plug in readout box yet)
- ☐ Connect GPS antenna to readout box
- ☐ Connect hard drive to readout box if needed
- ☐ Connect coax cables to LWA riser cables and readout box
- ☐ Power on readout box
    - Ensure drone config file is in the new_daq directory and named “config.ini”
    - Ensure drive mounts and dump_baseband and dump_spectra run.
- ☐ Power off readout box.

Readout system should now be ready for drone operations.

From here on the instructions are applicable with or without a full ALBATROS station

- ☐ Perform normal drone preflight procedures.
- ☐ *Check all accessible SMA connectors on the drone’s payload before and after every flight.*

The following are general procedures to perform a complete series of mapping sorties. Flights can be tailored to specific needs of each mapping outing.

- ☐ Use the drone to measure the antenna’s lat/lon. Record this.
- ☐ Create a flightplan with the drone hovering directly over the antenna for 5 minutes at altitude (ideally 200 ft). Upload flightplan to the drone.
- ☐ Power on the transmitter but not the chopper.
- ☐ Have the drone takeoff and perform the flight (this is the “cal flight”).
- ☐ With the drone hovering over the antenna, power on the readout system and allow to autotune.
- ☐ Once autotuning is complete, take control of the drone in position mode and hand-fly to a landing.
- ☐ Check ADC bit numbers.
    - May need to tune the RF chains or the drone’s emitter
    - Repeat the cal flight as necessary.
- ☐ Power on the chopper.
- ☐ Perform the following flights (use saved MARS flightplans as references, flightplans can and should be created ahead of time and the pattern simply moved to the measured antenna position on-site). There will probably need to be 2-3 breaks to charge drone batteries (can take up to 1.5 hours):
    - Star pattern used for a quick check (~6 mins).
    - Center beam raster (~30 mins).
    - Orthogonal center beam raster (~30 mins).
        - Probable battery charge break here (~1.5 hrs).
    - Side-lobe raster (larger pattern but more spaced out, ~30 mins).
    - Orthogonal side-lobe raster (~30 mins).

        - Probable battery charge break here (~1.5 hrs).
    - “Disco ball” and roll/pitch flight: hover the drone at various positions and altitudes, yaw the drone 360 degrees and move the drone laterally to make it roll/pitch, this is to check polarization effects (~5 mins).
    - Re-do the cal flight with the emitter and chopper powered off. This is in preparation for the following drone RFI flight.
    - Drone RFI flight: flight with emitter/chopper powered off to try to gauge the drone’s own RF output. Fly either a simple cross or star pattern as time/battery permits.
- ☐ Power down / cleanup.