HELZEL Messtechnik

WERA Remote Ocean Sensing

Calibration of WERA Systems
Quality of Beam Forming

WERA is using **Software Beam Forming**, transferring all phase and amplitude information of the received high frequency signals into digital data without losing information. With this technique all data can be collected **in parallel** and the beam forming algorithm can be applied in **finest resolution** by means of software processing in **near real-time**. For this Software Beam Forming technique it is essential to keep all system and antenna parameter under control. For this reason several calibration steps and automatic procedures are applied:

1. **WERA "Full calibration"** to equalize all receiver channels and LF filters, carried out at the factory prior to shipment. **Valid** for the **lifetime** of the system.

2. **WERA "Internal Calibration"** to equalize the HF characteristic all channels and HF filters, carried out at site during installation phase. **Valid** for the **lifetime** of the system.

3. **WERA "Calibration"** to correct for tolerances of the coax cables, carried out at the factory or in the field after installation. **Valid** for the **lifetime** of the cables.

4. **There are no additional Antenna Calibrations** for receive or transmit required. With an adequate antenna installation and tuning the beam characteristic is sufficient. The status of this characteristic after the installation will be saved and used as reference to monitor the beam characteristic, once per hour. **Valid** for the **lifetime** of the antennas.

5. **Beam Forming Self Calibration**:
Once an hour a **self calibration** procedure is carried out for optimization of the receive antenna beam characteristic which can be effected by environmental effects, e.g. tides or weather conditions. This self calibration is the guarantor of the **excellent accuracy** of the beam steering (typically ±1°). **Valid**: **always**, updated once per hour.

6. **Optional** "**Antenna Phase Calibration"**. Required only if the beam forming quality might be degraded due to environmental conditions (metal structures next to the array) and needs to be improved to get best quality wave analysis. This calibration can be carried out in the field after installation with different methods, the easiest is using reflections from ships. **Valid** for the **lifetime** of the antennas.

TÜV SÜD ISO 9001

Always a wavelength ahead !

WERA years of excellence in remote ocean sensing