

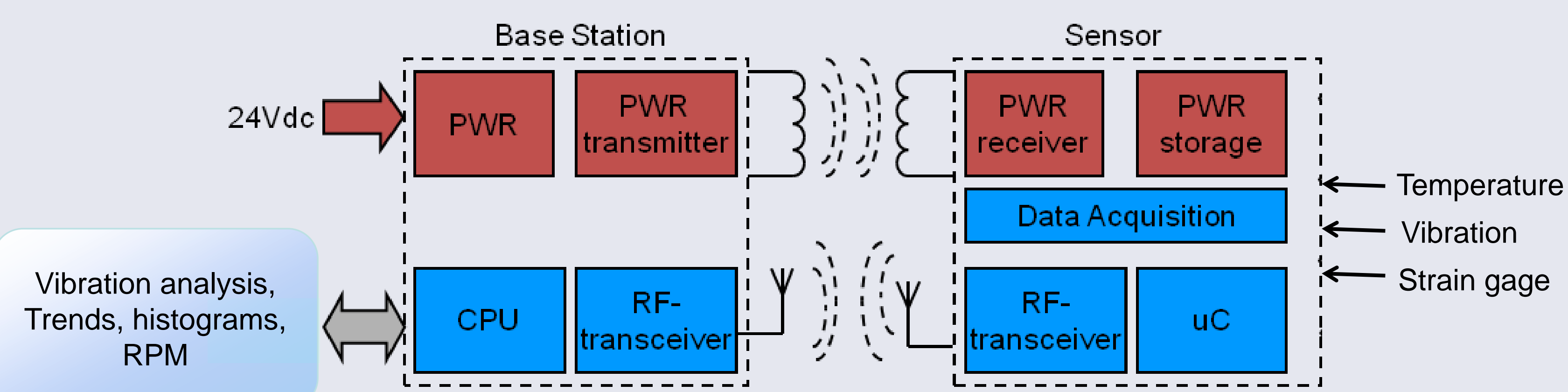
## Condition monitoring



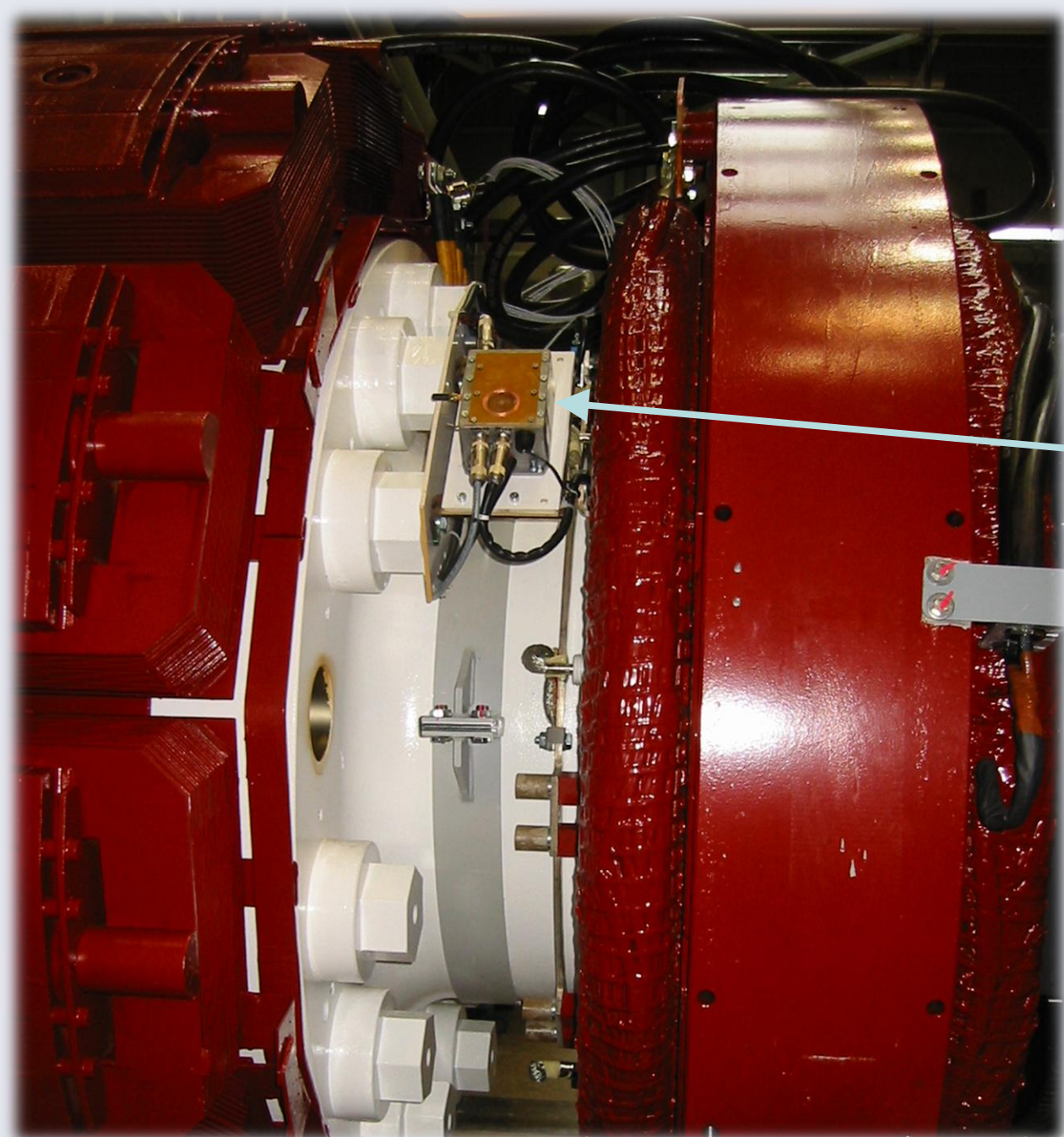
- **Why?**
  - Predictive maintenance.
  - "Disaster" prevention.
  - Warranty issues.
- **What?**
  - Oil quality – gearbox.
  - Temperatures, for example generator rotor temperature.
  - Forces from the turbine
  - Torques and forces transferred by the axis and drive chain.
  - Vibrations occurring in the drive chain.
- **Where?**
  - Main components: Turbine, gearbox, generator, axis in between...

- Interesting events occur in the rotating parts of the system.
- Measurements directly from rotating parts are currently not practical and therefore we satisfy with less accurate indirect measurements.

## Contactless measurement system



- Contactless and maintenance free measurement system by combining radio communication with inductive power transfer.
  - No batteries that need charging or replacement.
  - No mechanical parts that wear.
- Sensor unit can be mounted to a rotating object.
  - Measurements directly from the rotating part.
  - Several sensing elements can be connected to one sensor unit.
- Base station transfers wirelessly electrical power to sensor everytime sensor passes in front of it.
  - Easy installation and small size.
  - Tachometer information obtained as a side product from power transfer.

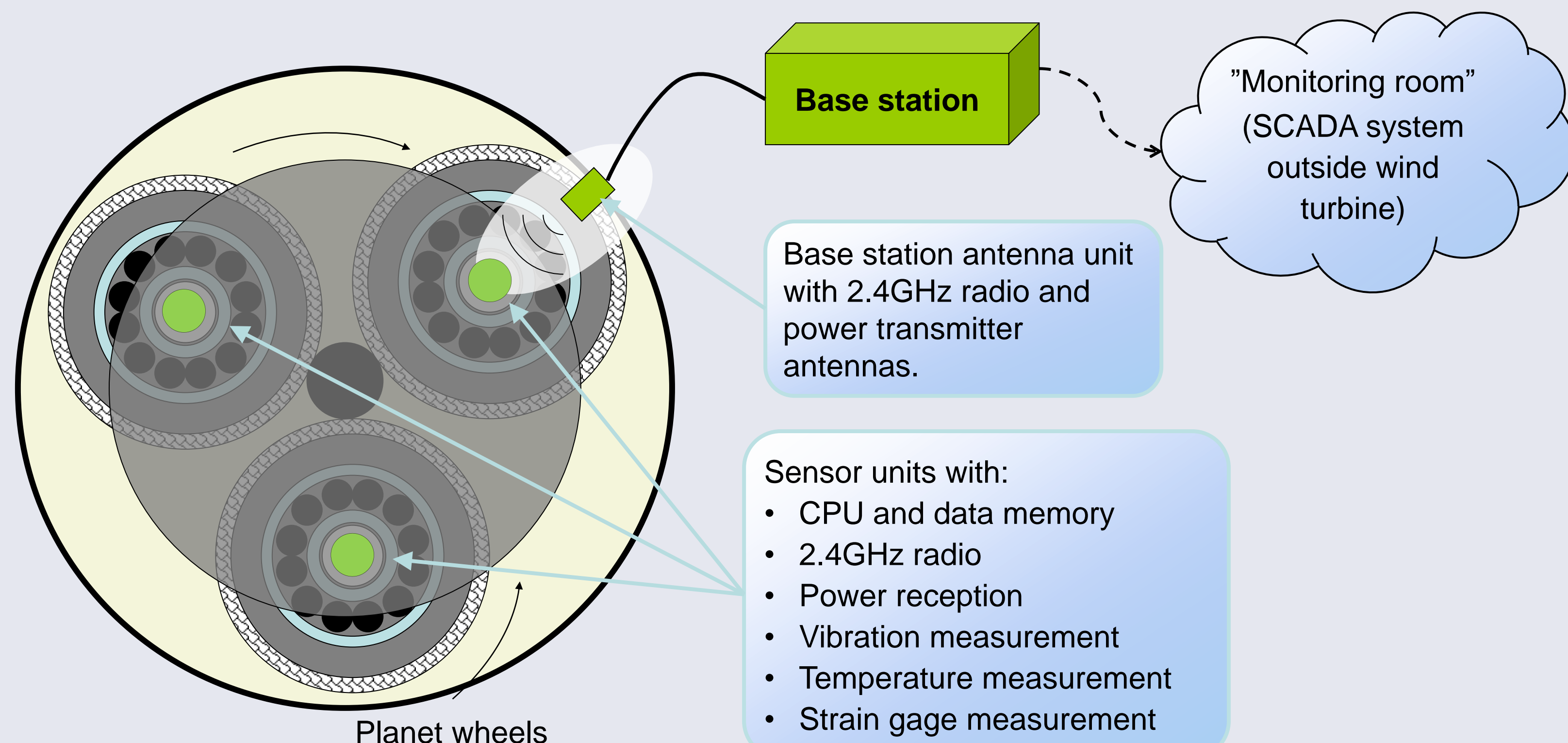


Sensor unit prototype installed in the field test environment.

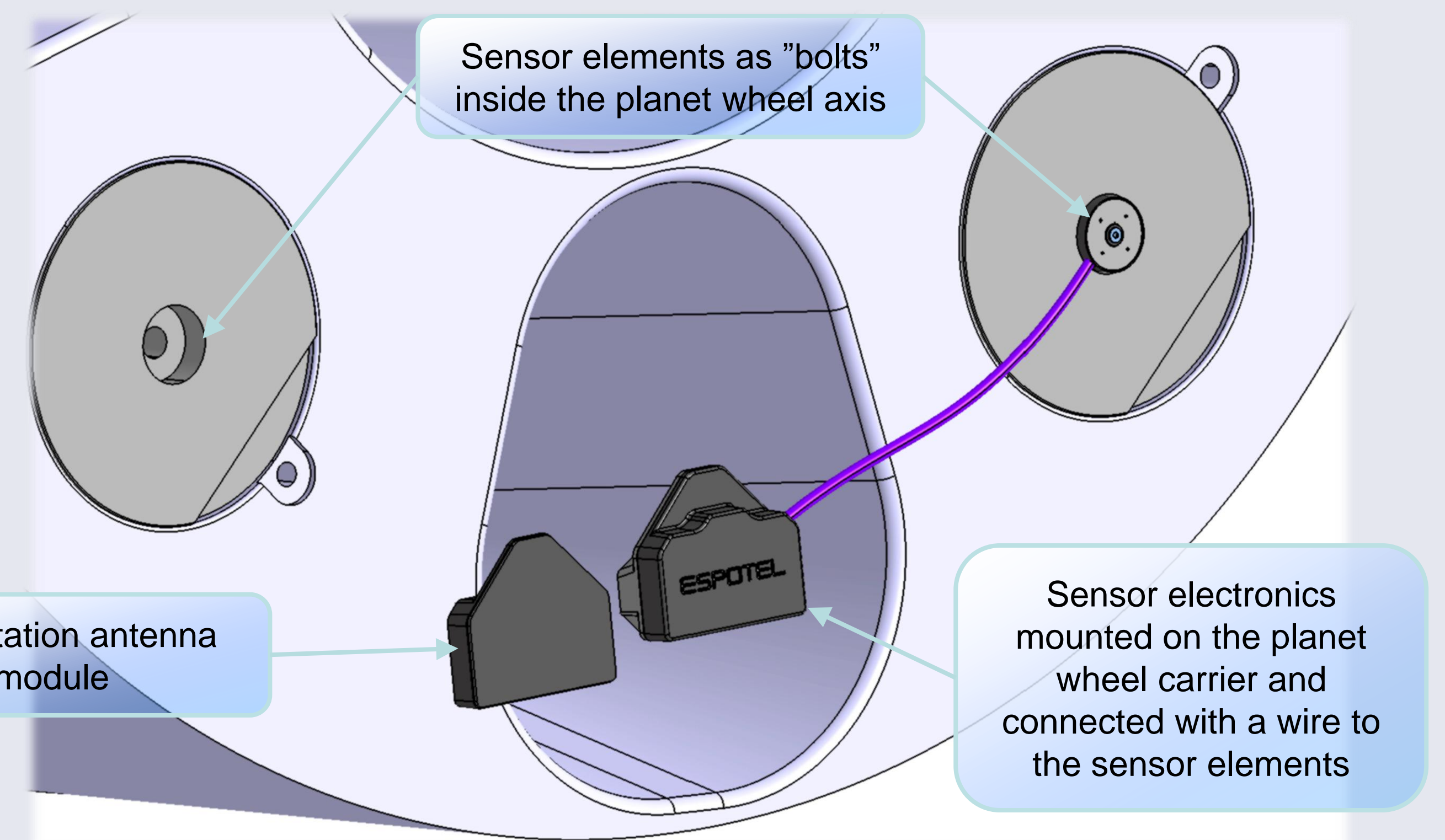
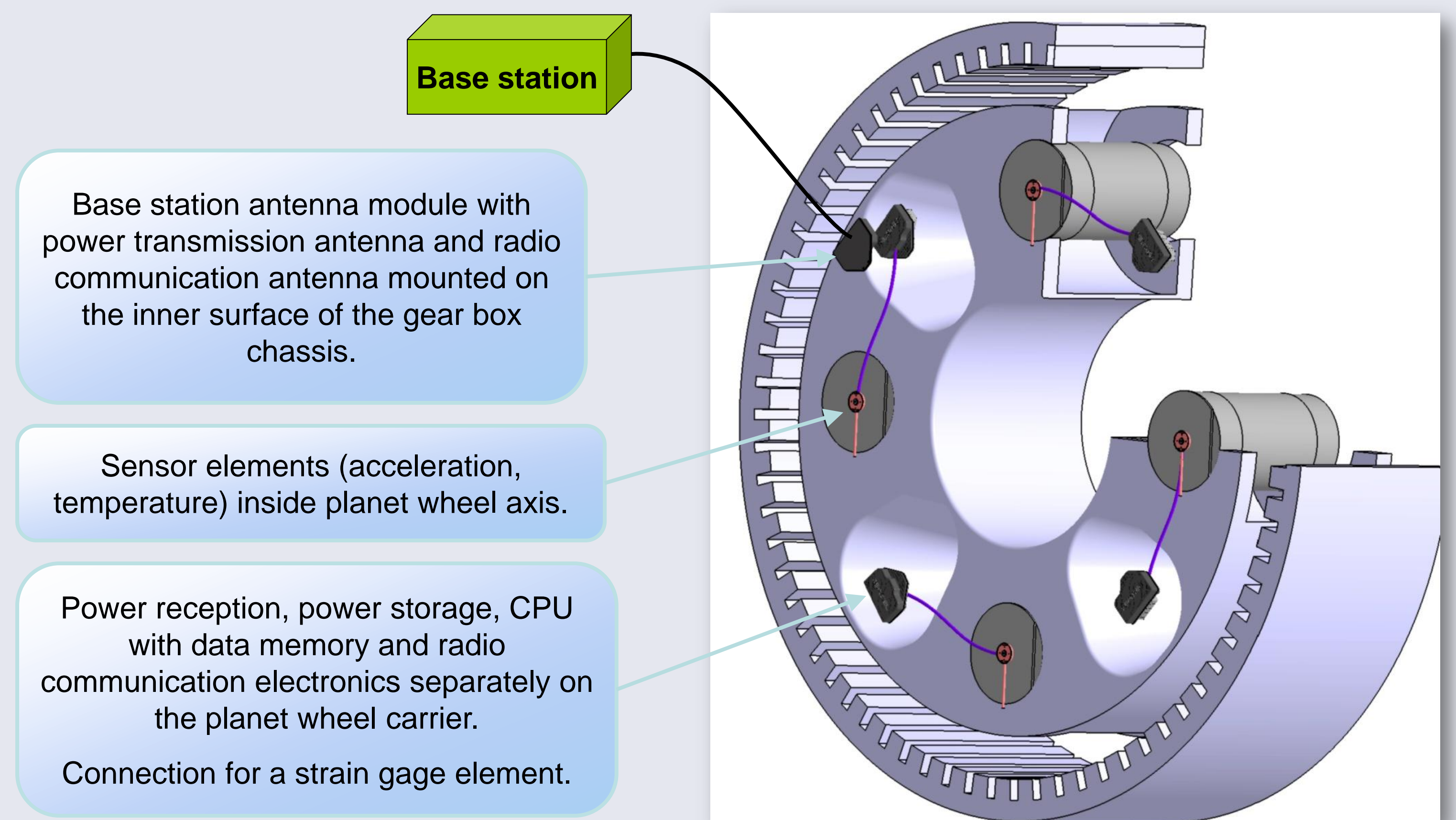
Power reception antenna prototype visible on the top cover. Base station and power transfer antenna not visible in the picture.

The behavior of radio communication, inductive power transfer and high accuracy measurements tested successfully in a challenging environment.

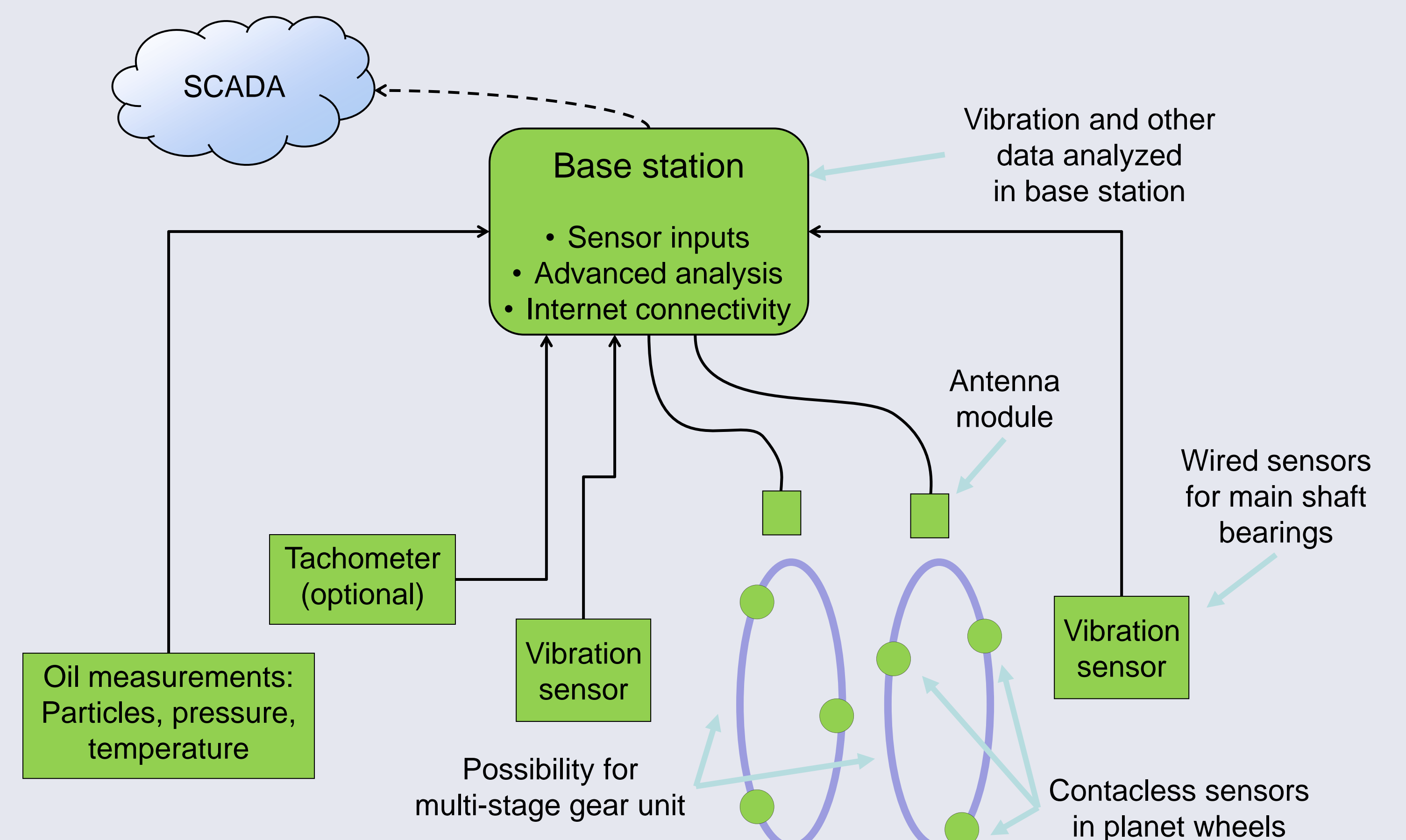
## Planet wheel condition monitoring principle



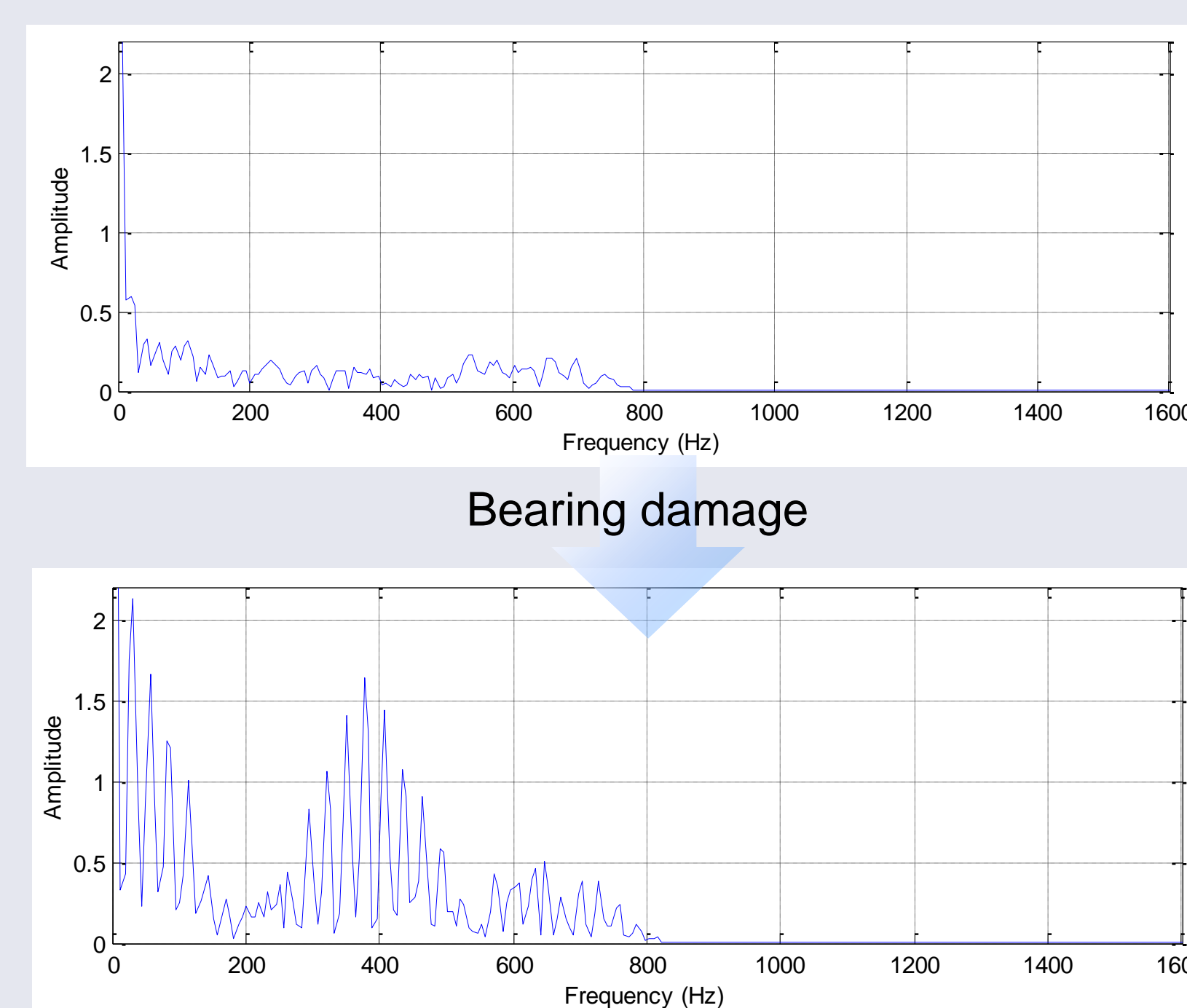
## Installation of the planet wheel monitoring in practice



## Full system with planet wheel monitoring



## Advanced vibration analysis



- Tachometer information is obtained as a side product from power transfer.
- Key figures from RPM-based vibration characteristics for "automation" of condition monitoring.
- Advanced vibration analyzing algorithms in base station:
  - RMS, Peak value, Crest factor and Envelope analysis for further information.
  - Algorithms can be easily tailored according to application-specific needs.