



## RPG-TAU-G5 series

The RPG-TAU-G5 series is designed for the estimation of atmospheric opacity (optical thickness, tau, attenuation) in the observation bands of radio astronomy applications. Sub-mm frequency channels at 183 GHz, 225 GHz, and 340 GHz can easily be combined in a single instrument.

## Applications

- Tau / opacity estimation
- Attenuation monitoring
- Beacon experiments
- Satellite tracking



## Models

- **RPG-TAU-225**
  - Channel-1: 225 GHz heterodyne receiver, 4000 MHz bandwidth
- **RPG-TAU-225-340**
  - Channel-1: 225 GHz heterodyne receiver, 4000 MHz bandwidth
  - Channel-2: 340 GHz heterodyne receiver, 4000 MHz bandwidth
- **RPG-LHUMPRO-225-340**
  - Channel-1: 225 GHz heterodyne receiver, 4000 MHz bandwidth
  - Channel-2: 340 GHz heterodyne receiver, 4000 MHz bandwidth
  - Water vapour sounding at 183 GHz (heterodyne receiver, 6 DSB channels)



## Features

### State of the art Retrievals

- Neural Network (NN)
- Customized

### Atmospheric Attenuation Spectra

140 - 400 GHz\*\*\*

### Wide Operating Temperature Range

-40C to +45°C

### Integrated GPS Receiver

for accurate timing and North alignment\*\*

### Ethernet Interface

for network capability

### IR Radiometer

for ice cloud detection\*



### Azimuth Positioner

for full sky scanning\*

### IR Scanner

for synchronous IR and microwave observations\*

### Satellite Tracking

Atmospheric attenuation\*\* along line of sight

### Standalone Operation

- Data backup on embedded PC
- Automatic recovery after power failures

### Integrated Automatic Weather Station

Vaisala® WTX536 to measure surface wind, rain rate, pressure, temperature, and relative humidity

\*optional, \*\*only with azimuth positioner, \*\*\*only with 183 GHz receiver



## Detailed Instrument Specifications

Parameter	Specification
Atmospheric attenuation	Retrieved at observed frequencies. Attenuation spectra (140-400 GHz) only with optional 183 GHz receiver
Satellite tracking mode (only with azimuth positioner option)	<ul style="list-style-type: none"> <li>• Determines tropospheric wet delay (only with optional 183 GHz receiver) and attenuation along line of sight for all visible GPS / Galileo satellites in a single scan (2 minutes).</li> <li>• Tracking via RINEX navigation files or direct GPS vector readings from integrated GPS receiver.</li> </ul>
Channel centre frequencies	183 GHz (6 channel DSB), 225 GHz, 340 GHz
Channel bandwidth	200 MHz @ 225 GHz, 4 GHz @ 225 and 340 GHz
System noise temperatures	<p>&lt; 1200 K typical for 183 GHz</p> <p>&lt; 1400 K typical for 225 GHz</p> <p>&lt; 2200 K typical for 340 GHz</p>
Radiometric resolution	<p>&lt; 0.2 K RMS typical @ 183 and 225 GHz,</p> <p>&lt; 0.4 K RMS typical @ 340 GHz (@1 s integration time)</p>
Absolute brightness temperature accuracy	±0.5 K
Radiometric range	0-800 K
Absolute calibration	With internal ambient & external cold load
Internal calibration	<ul style="list-style-type: none"> <li>• gain: with internal noise standard</li> <li>• gain + system noise: ambient temperature target + noise standard</li> <li>• abs. cal. of humidity profiler: sky tipping calibration</li> </ul>
Receiver and antenna thermal stabilization	stability better than 0.03 K over full operating temperature range
Gain nonlinearity error correction	Automatic, 4-point method
Brightness calculation	Based on exact Planck radiation law
Integration time	≥ 0.4 seconds for each channel, user selectable
Sampling rate for profiles	≥ 1 second (user-selectable)



Parameter	Specification
Rain / fog mitigation system	Highly efficient blower system (130 Watts), hydrophobic coated microwave transparent window, 1.8 kW heater module to avoid formation of dew in case of fog.
IR radiometer option	9.6-11.5 $\mu\text{m}$ band, accuracy 1 K, noise: 0.2 K RMS
Data interface / rate	Ethernet (TCP/IP)
Instrument control (external PC)	Windows™ System with Ethernet interface
Instrument control (internal PC)	Embedded PC controls internal calibrations, data acquisition, azimuth positioner, and communication with Host-PC. Can run measurements independently from Host-PC - with possible data file backup on 10 GB flash memory.
Housekeeping data	Detailed instrument status information, including health checks / quality flags, calibration history and log files
Retrieval algorithms	Neural Network algorithms
Optical resolution	1.3° HPBW
Side-lobe level	< -40 dBc @183 GHz, < -50 dBc @225 and 350 GHz
Pointing range / resolution	Elevation: 0° to 180° (0.1° steps), full s/w control Azimuth (optional): 0° to 360° (0.1° steps), full s/w control
Pointing speed	45°/sec (elevation), 40°/sec (azimuth, optional)
Operating temperature range	-40°C to +45°C
Power consumption	< 120 Watts average, 350 Watts peak for warming-up (without dew blower heater), blower: 130 Watts maximum
Lightning protection	Power line: circuit breakers Data line: optical fibre cable (max. length: 1400 m)
Input voltage	90-230 V AC, 50 to 60 Hz
Weight	60 kg (without dew blower)
Dimensions	63 × 36 × 90 cm <sup>3</sup>
Integrated weather station	Vaisala® WXT536 on 1-m mast mounted to radiometer: <ul style="list-style-type: none"> <li>• temperature, pressure, relative humidity</li> <li>• wind speed, wind direction, and rain rate</li> </ul>