Phasemeter
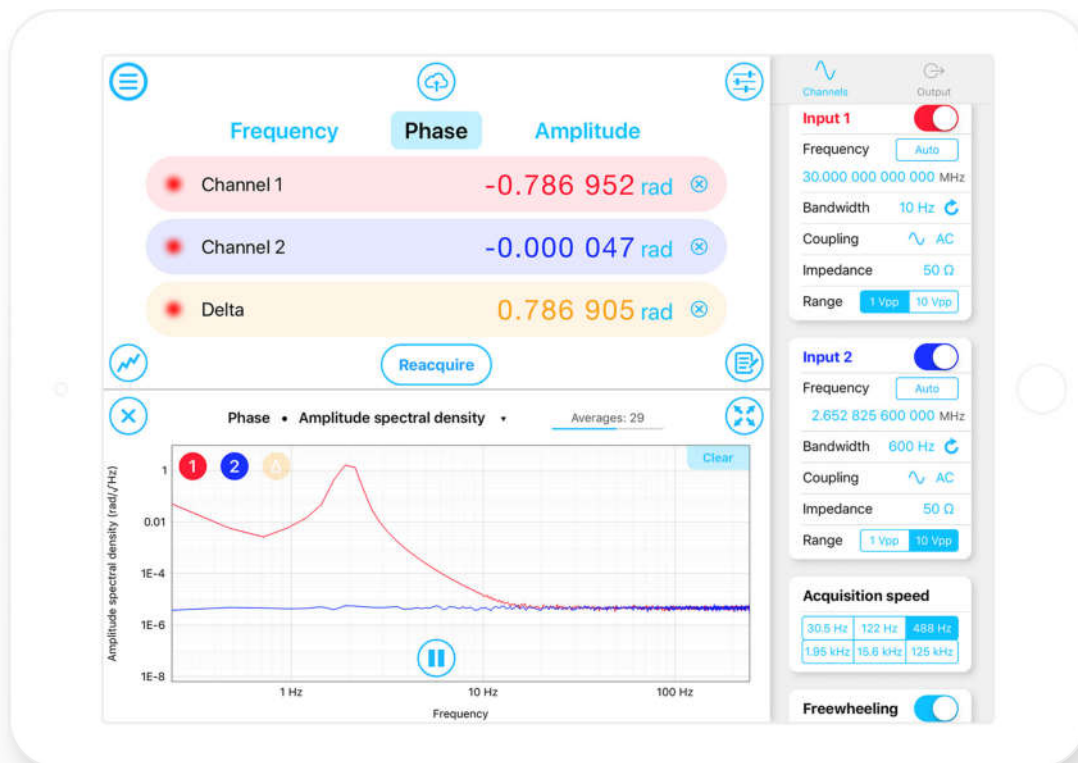
Description

The Moku:Phasemeter can be used to measure the phase with better than 6 μradian precision for input signals oscillating between 1 kHz and 200 MHz. The Moku:Phasemeter uses a digitally implemented phase-locked loop architecture, providing exceptional dynamic range and precision far exceeding the capabilities of conventional lock-in amplifiers and frequency counters. The phasemeter is ideal for any application requiring the precise measurement of phase or frequency including displacement measurements using heterodyne interferometry, channel characterisation in communication networks, clock recovery, and signal reconditioning.

Features

- Measure phase over a range of more than 65 million cycles with better than 1 μcycle precision
- Simultaneously measure the phase, frequency and amplitude of an incoming signal
- Acquire data at up to 125 kS/s
- Observe measurement data in

Specifications

Inputs

Input characteristics

Input frequency range	1 kHz to 200 MHz
Input voltage range	± 0.5 V into 50 Ω
Input impedance	50 Ω / 1 MΩ
Input coupling	AC / DC

Measurement

Measurement characteristics

Frequency set-point precision	3.55 µHz	
Modes of operation	Auto-acquire	Automatically determines input frequency for signals above 1 MHz
	Manual	Initializes the phasemeter to a specific frequency
Tracking bandwidth	10 Hz / 40 Hz / 150 Hz / 600 Hz / 2.5 kHz / 10 kHz (user selectable)	
Frequency precision	**Input Frequency**	**Precision (f = Fourier frequency)**
	< 10 MHz	f x 10 µHz/√Hz from 1 mHz to 1 kHz
	< 100 MHz	f x 20 µHz/√Hz from 1 mHz to 1 kHz
	> 100 MHz	20 µHz/√Hz below 1 Hz f x 20 µHz/√Hz from 1 Hz to 1 kHz
Phase precision[7]	< 10 MHz	100 nCycles/√Hz above 1 Hz
	< 100 MHz	2 µCycles/√Hz above 1 Hz
	> 100 MHz	20 µCycles/√Hz above 1 Hz

Data visualisation

Visualisations	Timeseries, Power Spectral Density, Amplitude Spectral Density, Coherence, Rayleigh Spectrum, Allan Deviation

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[7] Frequency and phase measurement precision is limited by sampling jitter at low Fourier frequencies.

Saving Data

Saving data

Logging rates	30 S/s, 120 S/s, 490 S/s, 1.95 kS/s, 15.6 kS/s, 125 kS/s
File formats	Plain text: records data using a standard CSV format
	Binary: records data using a proprietary LI format for high-speed data logging.
	Note: data saved using the LI format must be converted to plain text using the LI file converter available here: https://github.com/liquidinstruments/lireader
Export modes	SD Card, Dropbox, E-mail and iCloud, My Files (iOS 11)
Delayed log start time	Up to 240 hours
Log duration	1 second up to 240 hours

Synthesizer

Synthesizer[8]

Channels	2
Output impedance	50 Ω
Waveform shape	Sine
Output modes	Manual, phase-locked to input signal
Sampling rate	1 GS/s per channel
Voltage range	± 1 V into 50 Ω

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[8] Where not stated, the phasemeter's synthesizer specifications match those of the Moku:WaveformGenerator instrument.