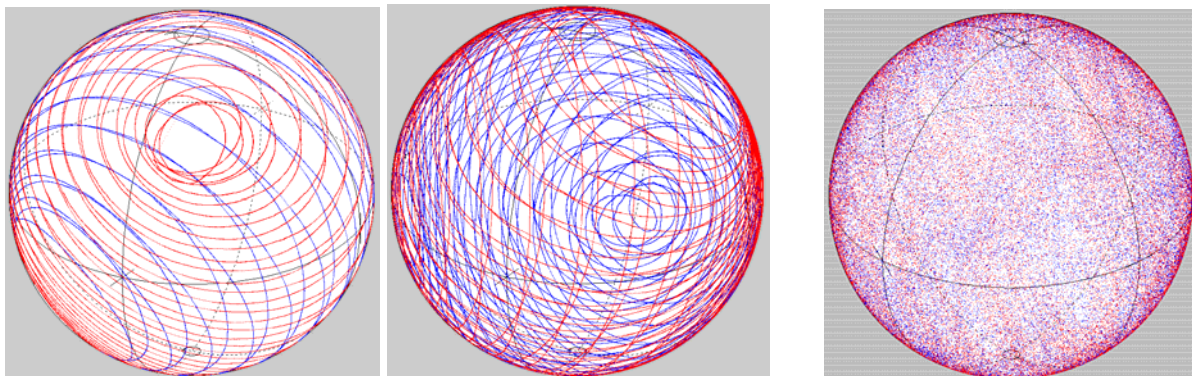


## EPS1000 Polarization Scrambler/Transformer

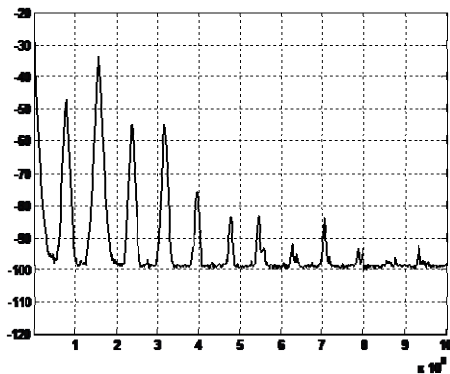
- Ultrafast endless optical polarization scrambling with **40 ns updating intervals**
- Continuous, quasi-steady endless polarization trajectories 0.01 rad/s ... **10000 krad/s** (20000 krad/s with reduced accuracy). **Small steps, e.g., 0.02 rad at 500 krad/s**
- 6 electrooptic quarterwave plates (QWP) and 1 halfwave plate (HWP) with adjustable rotation speeds (QWP: -999999.99 ... +999999.99 rad/s; HWP: -10000.00 ... +10000.00 krad/s)
- Optical frequency can be preset for most accurate waveplate operation, at least from C band to L band (186.2 ... 196.0 THz, 1529 ... 1610 nm). Optional: S band, 1310 nm
- Insertion loss ~1.5 ... 3 dB. Power consumption ~12 W (+5 V power supply 100 ... 240 V included)
- Differential group delay (DGD) sections consisting of polarization-maintaining fibers (PMF) available for highly realistic PMD emulation, using several EPS1000 and DGD sections.
- Available as a desktop unit, module or intellectual property core
- Operation of desktop unit via control buttons or USB (software is included). Several units can be controlled simultaneously by the graphical user interface (see p. 2) or by Matlab™. Speeds of rotating and positions of stopped waveplates and electrode voltages can be set, saved and loaded.
- Serial Peripheral Interface (SPI) for realtime operation; e.g., direct setting of waveplate voltages.
- In synchronous scrambling mode, user-generated tables with sets of waveplate positions can be loaded. Following an external trigger event (3.3 V LVCMOS signal applied at BNC connector, or SPI command) the sets are executed sequentially at specified instants (granularity: 40 ns; minimum delay until next execution instant: 200 ns). Useful for **recirculating loop experiments**.
- In triggered scrambling mode, the sets are executed cyclically one by one upon external trigger events or USB commands (minimum delay until next execution instant: 200 ns). Application examples: polarization-dependent loss (PDL) and Mueller/Jones matrix measurements.
- **Optional photodetectors enable accurate PDL and loss measurements**
- EPX1000 = cost-saving desktop unit with combined functionalities of EPS1000 and 40...100 krad/s polarization controller/demultiplexer EPC1000
- PMS1000 = combination of EPS1000 with ultrafast (100 MHz) polarimeter PM1000



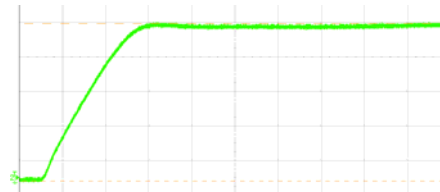
Slow HWP operation

Fast HWP operation

Exemplary output trajectories on Poincaré sphere

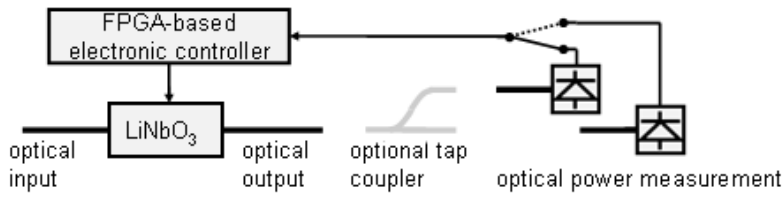


Electrical scrambling spectrum behind polarizer at 10 Mrad/s (horizontal: Hz; vertical: 10 dB/div)

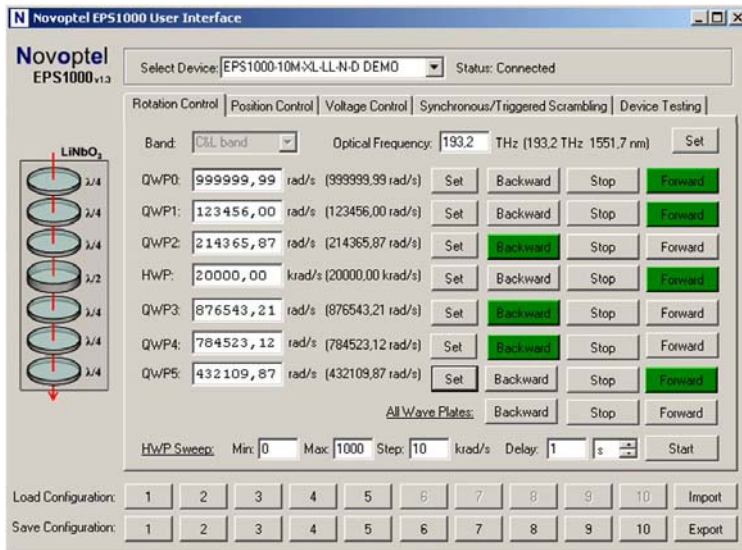


60-V step at HWP settles completely within 50 ns (20 ns/div). Small-signal response is a lot faster.





EPS1000 configuration with optional, electronically switched photodetectors for accurate **PDL and loss measurement**. Optomechanical switch available for device-under-test switching.



Shown are frequently used operation modes of USB-operated graphical user interface.

Other operation modes are:

- Voltage Control: Direct setting of 16 electrode voltages
- Device Testing: Intensity recording for PDL and loss measurement (optional)

