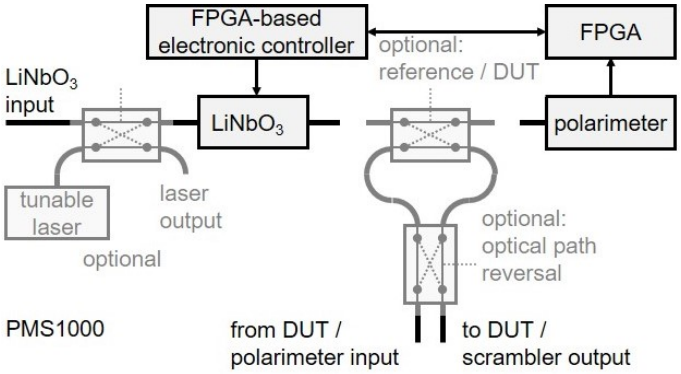


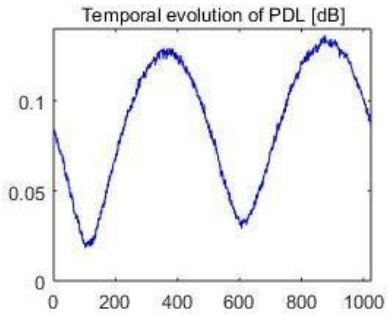
PMS1000 Polarimeter and Polarization Scrambler/Transformer

- Combination of the PM1000 polarimeter with the EPS1000 polarization scrambler/transformer
- All functionalities and data of PM1000 and EPS1000
- Ideal for **synthesis of desired polarization states** and **device under test (DUT) polarimetry**
- Opto-mechanical or **MEMS** 2x2 switch (optional) can connect output of $LiNbO_3$ polarization transformer directly to input of polarimeter. Insertion loss of each path is thereby increased by ~0.5 dB (<1 dB).
- Another 2x2 switch (optional) can exchange output of $LiNbO_3$ polarization transformer and input of polarimeter, to determine DUT reciprocity by backward measurement.
- **Wide support of lasers** (LU1000 + other manufacturers) and software (Matlab, Octave, Python)
- Desktop units (combined PMS1000 or separate EPS1000 & PM1000) or module cards
- Switching between PM1000 and EPS1000 via control buttons, or parallel operation via USB

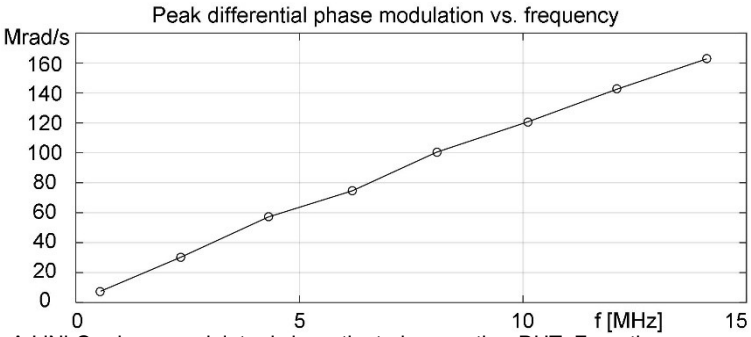


PMS1000 for measurement of Mueller and Jones matrices and PMD of a device under test (DUT). Optional components are shaded. C&L band tunable laser modules are available (usually in LU1000 laser unit). EPS1000 polarization scrambler/transformer and PM1000 polarimeter are individually accessible, even when they are combined into one unit.

- 4 (or more) of polarization states is generated for the DUT. Subsequent calculations yield:
  - **Mueller matrix**, **Mueller-Jones matrix** (= Mueller matrix made non-depolarizing) and **Jones matrix**
  - **Measurement time** can be **5.12 us** or even less
  - **Eigenmodes**, **retardation**, **mean loss**, **PDL** (up to **~60 dB**) (= polarization-dependent loss) ⟶
  - Decomposition of Mueller and Jones matrices into sequences SBA + PPPS + SBA. Definitions: PPPS = horizontal **p**artial **p**olarizer and **p**hase **s**hifter. SBA = **S**oleil-**B**abinet **a**nalog = retarder with retardation 0...π and eigenmodes anywhere on the S_2-S_3 great circle of the Poincaré sphere. An SBA does to horizontal polarization the same as a Soleil-Babinet compensator to circular polarization: mode conversion with adjustable phase shift.
  - **10 ns temporal resolution** of all time-variable component properties (Mueller matrix etc.) ⟶
  - **PMD measurement <10 fs ... 10 ps with standard deviation ≤3 fs**

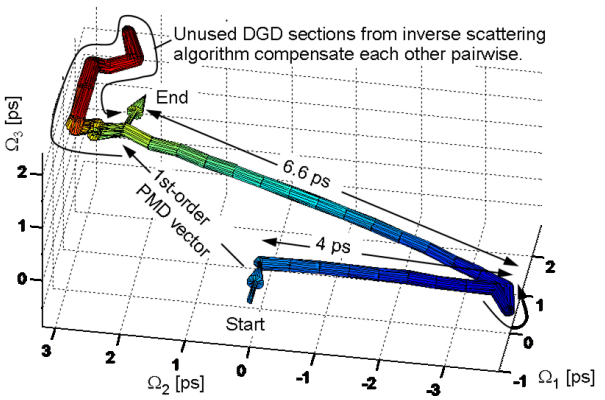


Time-resolved PDL of a rotating electrooptic halfwave plate (EPS1000) as a DUT, extracted from 1024 Mueller matrices recorded with **320 ns** temporal spacing.



A $LiNbO_3$ phase modulator is investigated as another DUT. From the measured time-resolved Mueller matrices the differential phase modulation is extracted (peak value: 163 Mrad/s).

- With LU1000 or available tunable laser(s), Mueller and Jones matrices can be measured as a function of optical frequency, and **PMD** is determined. Inverse scattering allows a **DGD profile** (= differential group delay profile) to be generated (JLT **21**(2003)5, p. 1198, JLT **33**(2015)10, pp. 2127-2138, 2015).



Measured DGD profile in the PMD vector space of two concatenated, arbitrarily oriented PMFs, with DGDs of 4 and 6.6 ps. Not only the total 1st-order PMD vector but also the structure of the DUT becomes apparent.