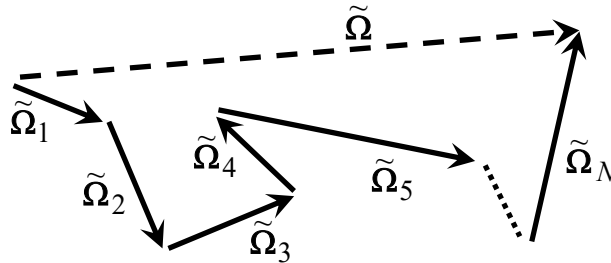


## PMDE1000 Polarization Mode Dispersion Emulator

- $N+1$  polarization scrambler modules (boards) EPS1000 with speeds up to 20 Mrad/s (or 50 Mrad/s) and  $N$  differential group delay (DGD) sections are integrated into one case. (Standard: 19 inch rack-mount)
- Section DGDs can be switched.
- Typical configuration: 3 EPS1000, 2 DGD sections (switchable, e.g., 15 ps, 50 ps, ..., or external)
- Applications: Polarization mode dispersion (PMD) emulator for coherent fiber links (400 Gb/s 80 km ZR, transoceanic links, Tb/s links, ...). PMD equalization (with user-supplied control signals).



Exemplary differential group delay profile, with overall first-order PMD being equal to sum of individual DGD or PMD vectors



PMD emulator with  $N$  DGD sections (indices 1... $N$ ) placed between  $N+1$  retarders/scramblers SCR (indices 0... $N$ )



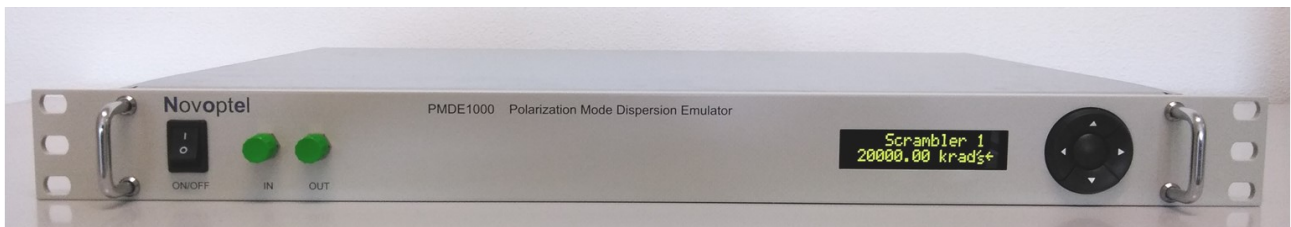
Example: PMDE1000 with 3 EPS1000 and 2 switchable DGD sections

### Reasoning:

See our contribution to PMD emulator standardization

[http://www.ieee802.org/3/ct/public/adhoc/19\\_0328/noe\\_3ct\\_01a\\_190328.pdf](http://www.ieee802.org/3/ct/public/adhoc/19_0328/noe_3ct_01a_190328.pdf) and underlying arguments in <https://arxiv.org/abs/1903.05248> [eess.SP].

We have shown in [https://www.novoptel.de/Control/Literature/getPDF4\\_annot.pdf](https://www.novoptel.de/Control/Literature/getPDF4_annot.pdf) (Section V.) that the physical DGD section model (distributed or discrete) of PMD displayed above is the only one which makes sense because it approximates natural PMD best. (Higher-order PMD modeling based on a finite Taylor expansion of the PMD vector is unphysical because it inevitably predicts infinite PMD far off the optical reference frequency.) In [https://www.novoptel.de/Control/Literature/70EF9388d01\\_annot.pdf](https://www.novoptel.de/Control/Literature/70EF9388d01_annot.pdf) (Section II.A) is described why this is much more reasonable than the usage of variable DGD sections. PMD is emulated highly realistically by the usage of several EPS1000 and DGD sections in the PMDE1000



PMDE1000 with up to 4 EPS1000 and 3 switchable DGD sections in 19" rackmount