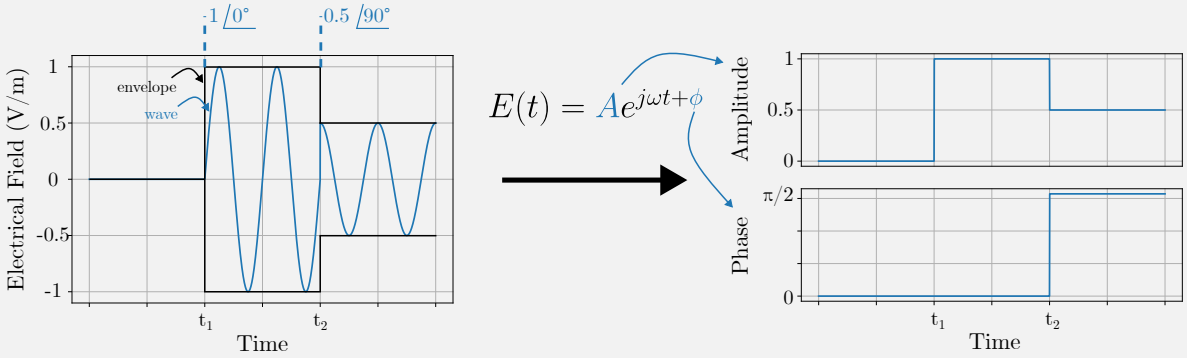
SPECS CHEATSHEET

Signal Representation

SPECS abstracts photonic signals by their amplitude and phase. This is a fair assumption as control signals usually are much slower than the oscilating frequencies (on the THz range).



Simulation directives

- `.op`
  finds the operation point of the circuit, ignoring all VLSRC
- `.tran T`
  performs a transient time-domain simulation for T seconds, using the timescale determined in the options
- `.dc WL(cwsrc1) wl0 wl1 dwl`
  performs a sequence of .op, sweeping between wl0 and wl1, using dwl as the step. Other parameters can be chosen

Options

```
.options timescale=val reltol=val
+ abstol=val traceall=val
```

- timescale (negative int) sets the smallest time resolution in the simulator as 10^val
- reltol (float) sets the relative tolerance of the simulator
- abstol (float) sets the absolute tolerance of the simulator
- traceall (0/1) is a flag that determines if all nets will be probed

Components

Continuous-wave source (CWSRC)


```
cwsrc1 1 power=val phi=val wl=val
```

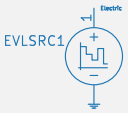
- 1 is the output terminal
- power is the output power in watts
- phi is the output phase in degrees
- wl is the supporting wavelength

Value source (VLSRC)


```
vlsrc1 1 values=[[t0,p0,wl0],[t1,p1,wl1],...]
```

- 1 is the output terminal
- t0, t1, ... is the time in seconds of each sample in the list
- p0, p1, ... is the power in watts of each sample in the list
- wl0, wl1, ... is the supporting wavelength for each sample in the list

Electrical value source (EVLSRC)




```
evlsrc1 1 values=[[t0,v0],[t1,v1],...]
```

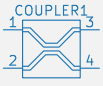
- 1 is the output terminal
- t0,t1, ... is the time in seconds of each sample
- v0, v1, ... is the voltage in volts of each sample

Optical probe (PROBE)


```
probe1 1
```

- 1 is the output terminal
- The net connected to the probe will be saved in the output files under the appropriate net name.

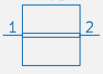
Directional coupler (COUPLER)




```
coupler1 1 2 3 4 k=val loss=val
```

- 1,2 are input terminals, 3,4 are output terminals
- k is the cross coupling coefficient for field
- loss is the insertion loss of the device in dB

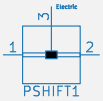
Waveguide (WG)




```
wg1 1 2 length=val att=val neff=val
        + ng=val d=val
```

- 1 is the input terminal, 2 is the output terminal
- length is the length of the waveguide in meters
- att is the attenuation of the waveguide in dB/cm
- neff is the effective refractive index at 1550nm
- ng is the group index at 1550nm
- d is the dispersion in s/m/m at 1550nm

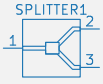
Phase shifter (PSHIFT)




```
pshift1 1 2 3 att=val, gain=val
```

- 1,2 are the optical input and output, 3 is the electrical input
- att is the device attenuation in dB
- gain is the phase shifting scale in rad/volts

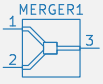
Splitter (SPLITTER)




```
splitter1 1 2 3 il=val ratio=val
```

- 1 is an input terminal, 2,3 are output terminals
- il is the insertion loss of the device in dB
- ratio is the splitting ratio between 0 and 1

Combiner (MERGER)




```
merger1 1 2 3 il=val
```

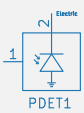
- 1,2 are input terminals, 3 is an output terminal
- il is the insertion loss of the device in dB
- loss is the insertion loss of the device in dB

Multi-wavelength probe (MLPROBE)


```
mlprobe1 1 wl=[wl0,wl1,...]
```

- 1 is the input terminal
- wl0, wl1, ... are the wavelengths that will be tracked by the probe

Photodiode (PD)




```
pd 1 2 r=val ts=val
```

- 1 is an optical input, 2 is the electrical output
- r is the responsivity of the devicei in A/W
- ts is the sampling time of the output current