

# DIY CWDM

---

SANOG14

Chennai, India. July 2009

Jonny Martin, [jonny@jonnynet.net](mailto:jonny@jonnynet.net)

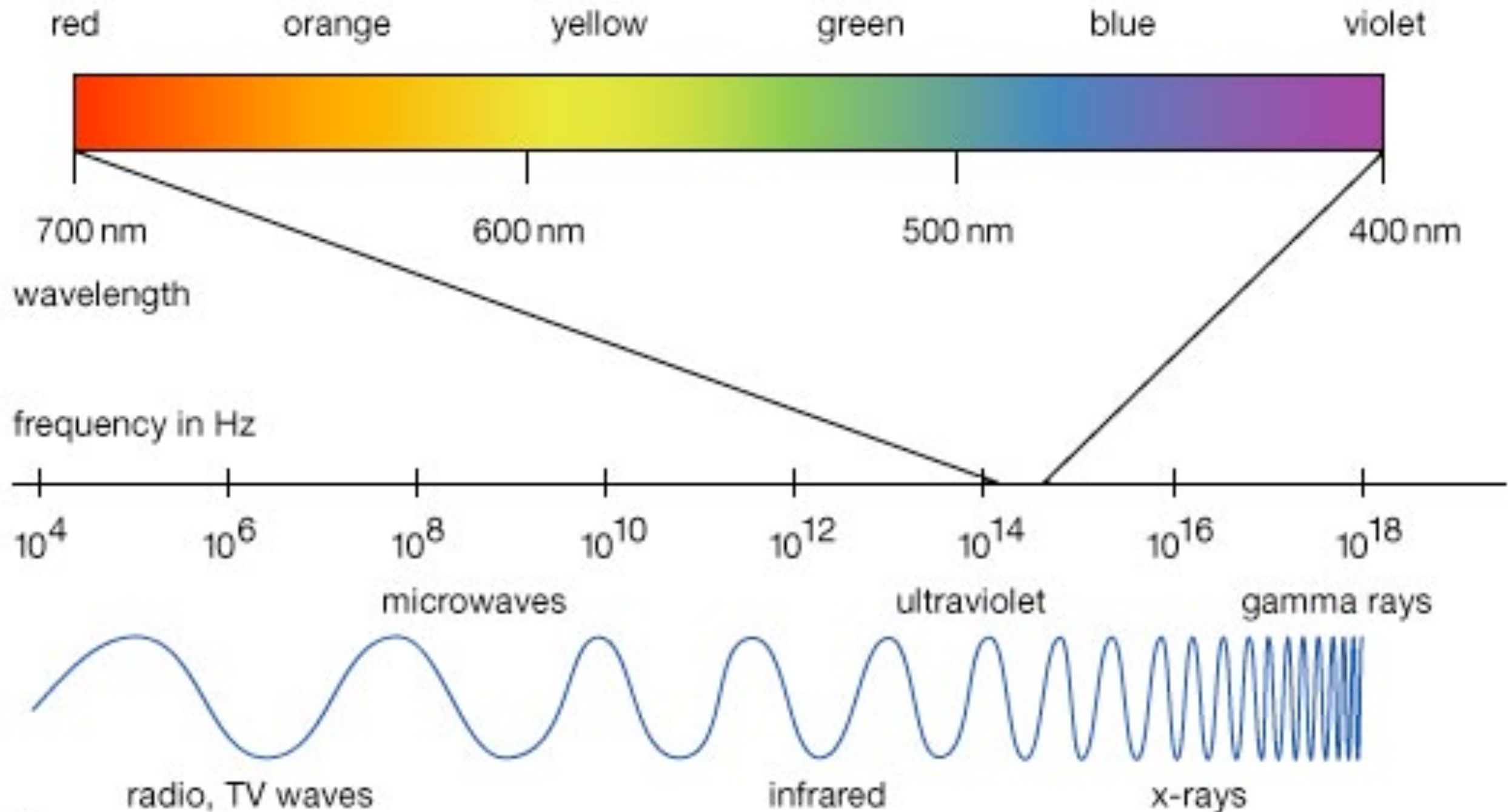
# What is light?

---

- Electromagnetic radiation
  - Requires no medium through which to transport its energy
  - Covers a large spectrum all the way from subsonic - audible - RF - visible - x-ray and gamma rays
- Sometimes behaves like a wave, sometimes like a particle
- Waves have a wavelength and corresponding frequency

$$\text{frequency} = \frac{c}{\lambda}$$
$$\lambda = \frac{c}{\text{frequency}}$$

# Electromagnetic Spectrum



# Optical Multiplexers

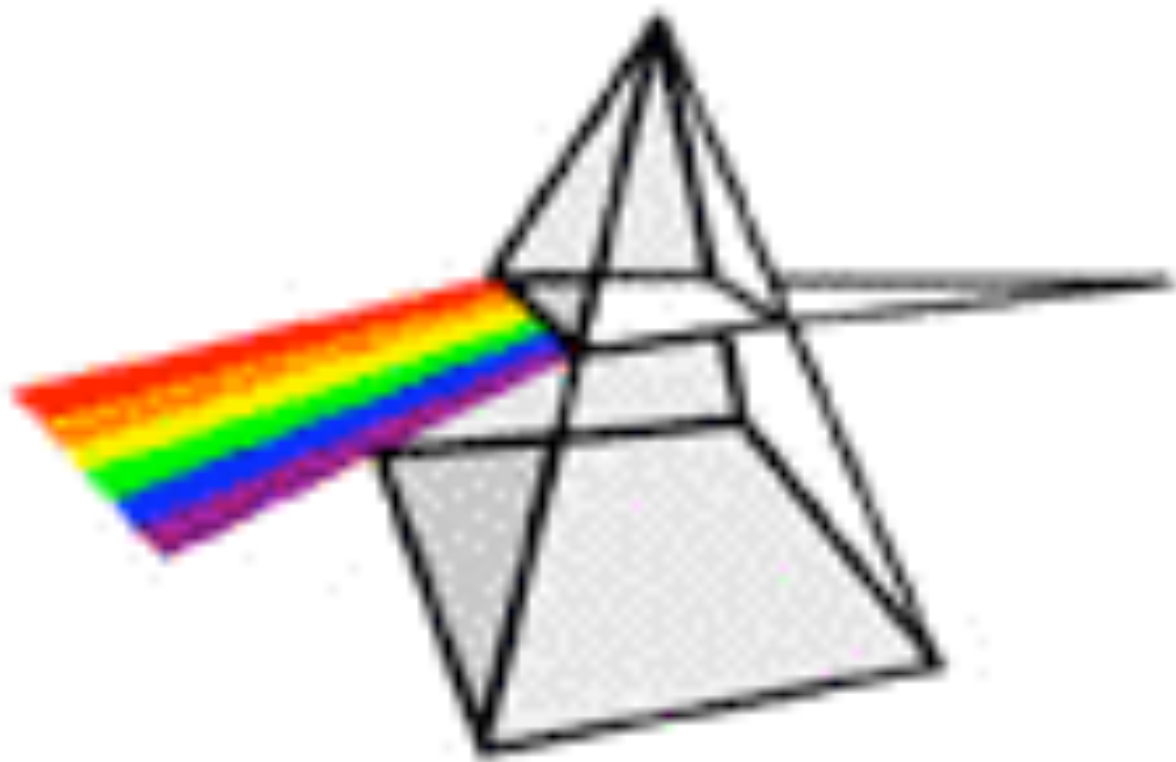
---

- Fibre optic cables can carry a very large bandwidth
- Mux techniques
  - Directional - i.e. Rx and Tx on the same fibre
  - Wavelength Division Multiplexing (WDM) - multiple different frequencies on the same fibre
    - Coarse WDM (CWDM) provides up to 8 channels with simple optics
    - Dense WDM (DWDM) provides up to 128 channels with advanced optics

# WDM mux

---

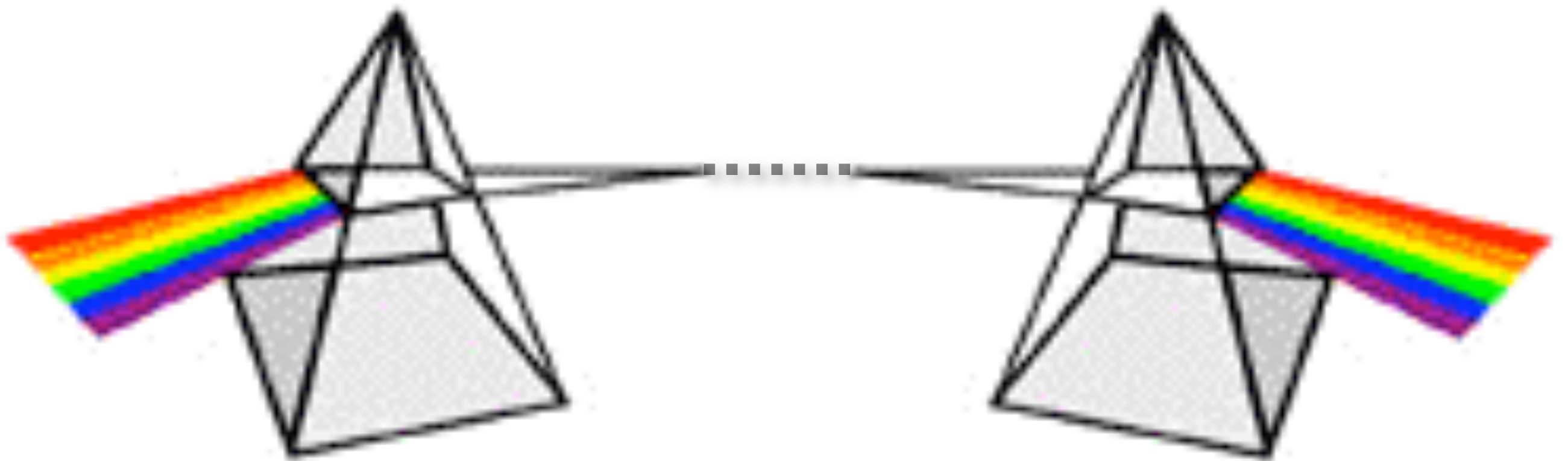
- Uses prisms to mux and demux multiple wavelengths onto one fibre
- Heart of CWDM and DWDM systems



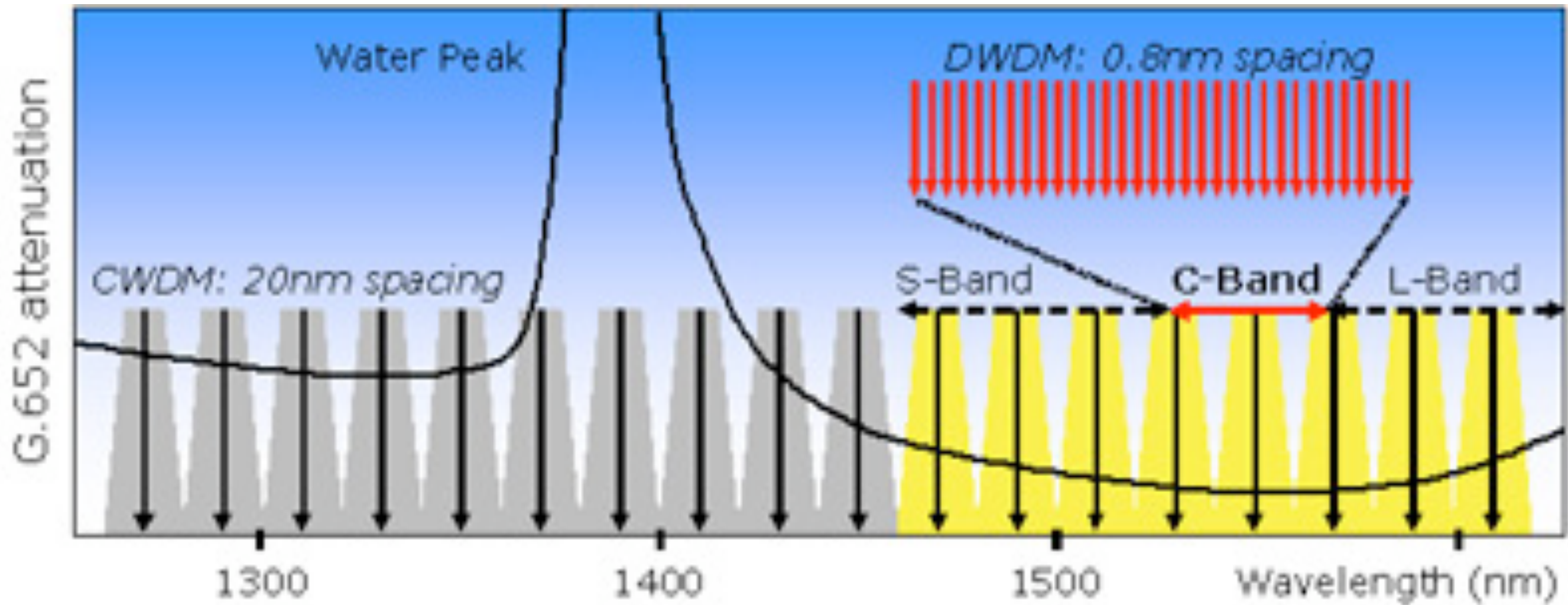
# WDM mux + demux

---

- Uses prisms to mux and demux multiple wavelengths onto one fibre
- Heart of CWDM and DWDM systems



# Channel spacing



# CWDM

---

- Basic WDM mux, completely passive
- May have monitor ports for checking power levels
- Uses 'coloured' optics which must be plugged into the corresponding 'colour' on the WDM mux or demux
- Manual physical configuration
- May require attenuators to reduce signal levels
- Wide (20nm) spacing between adjacent channels



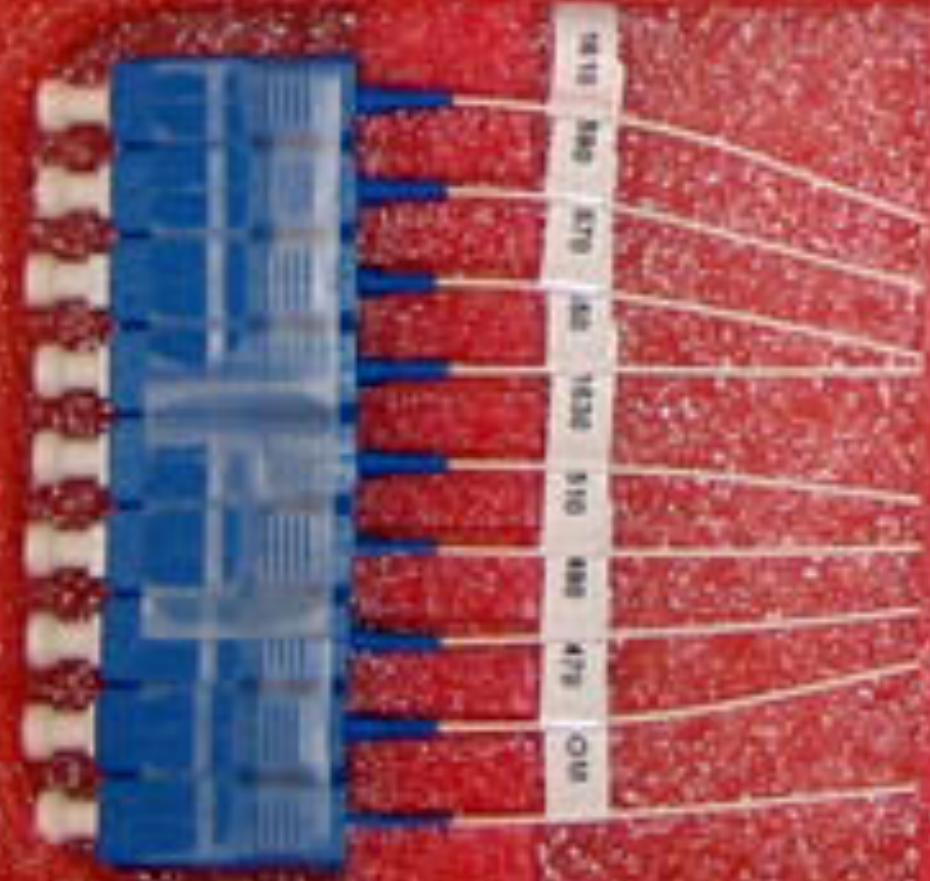






oeMarket.com

oeMarket.com





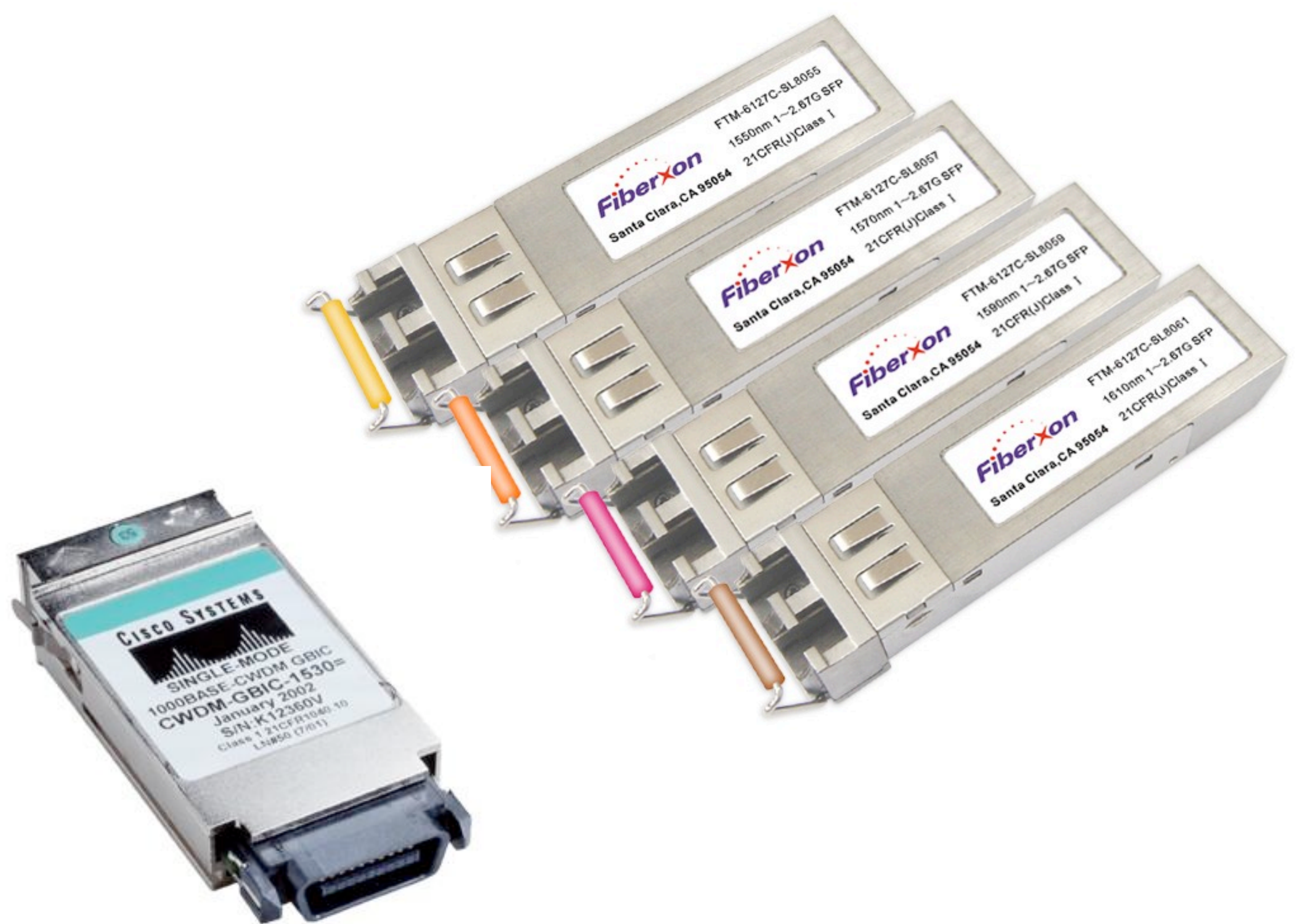
# DIY CWDM

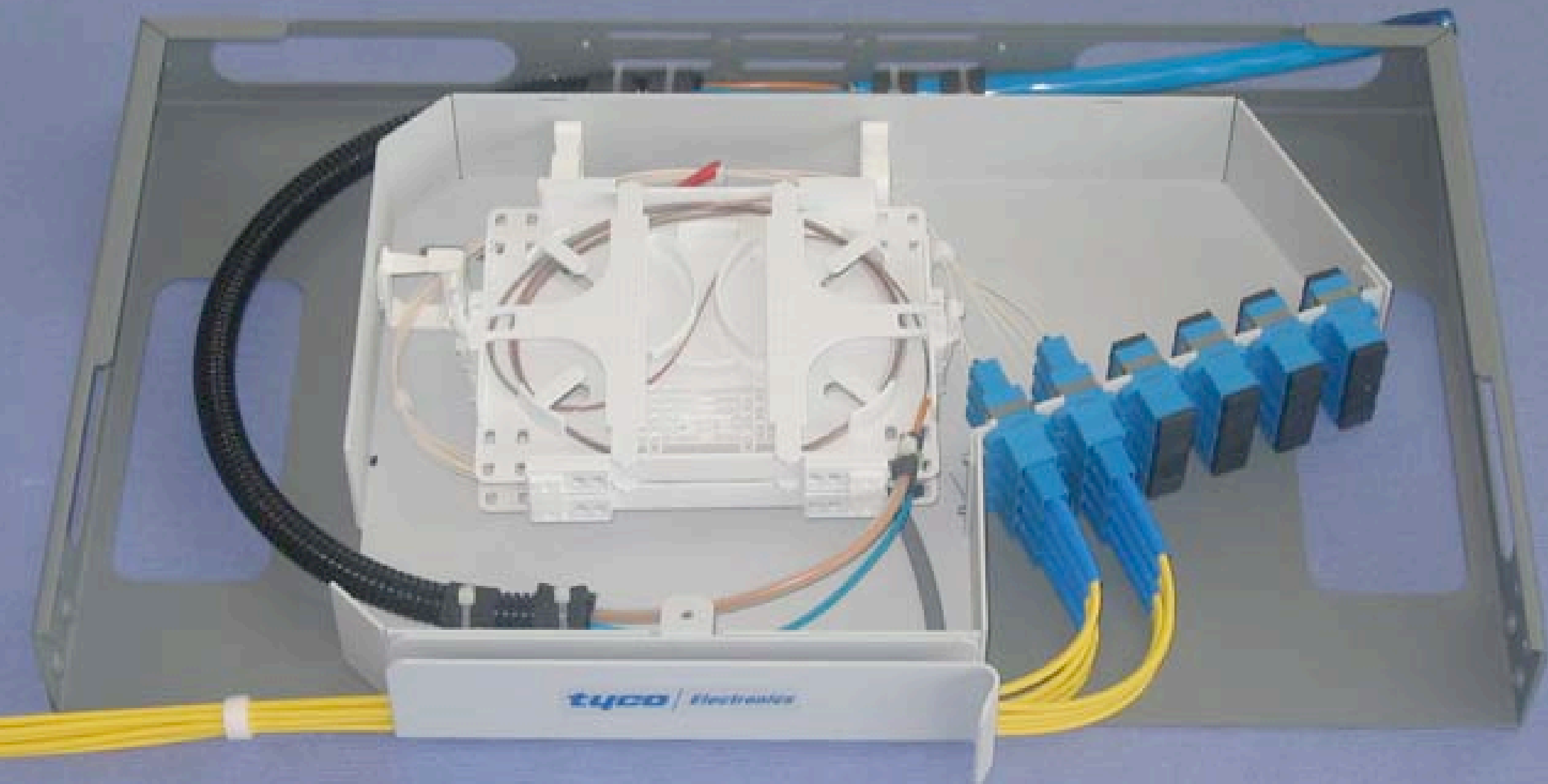
---

- All you need:
- A CWDM mux and demux
- Coloured Optics
  - 1gig optics readily available
  - 10gig optics available but still expensive

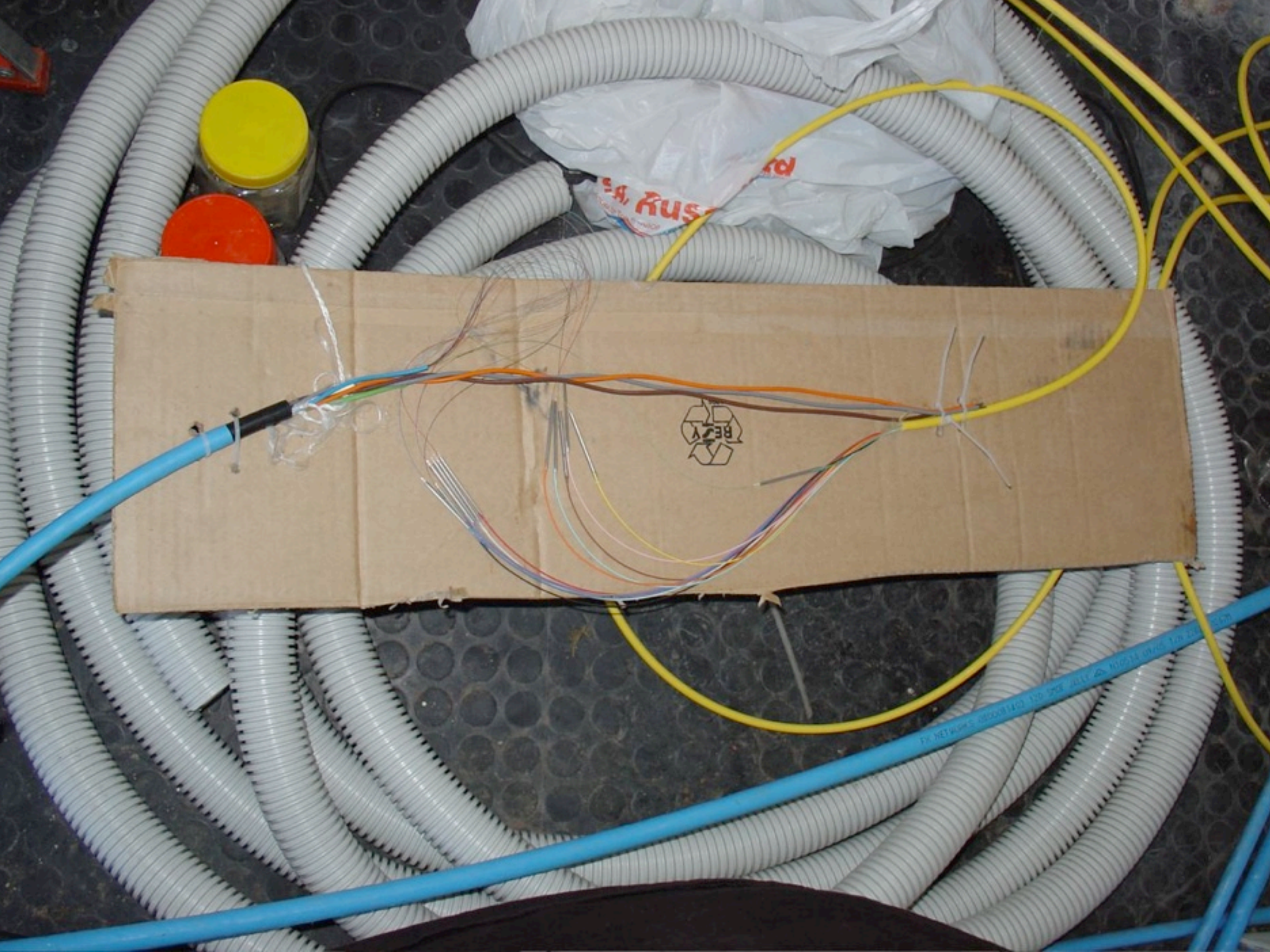














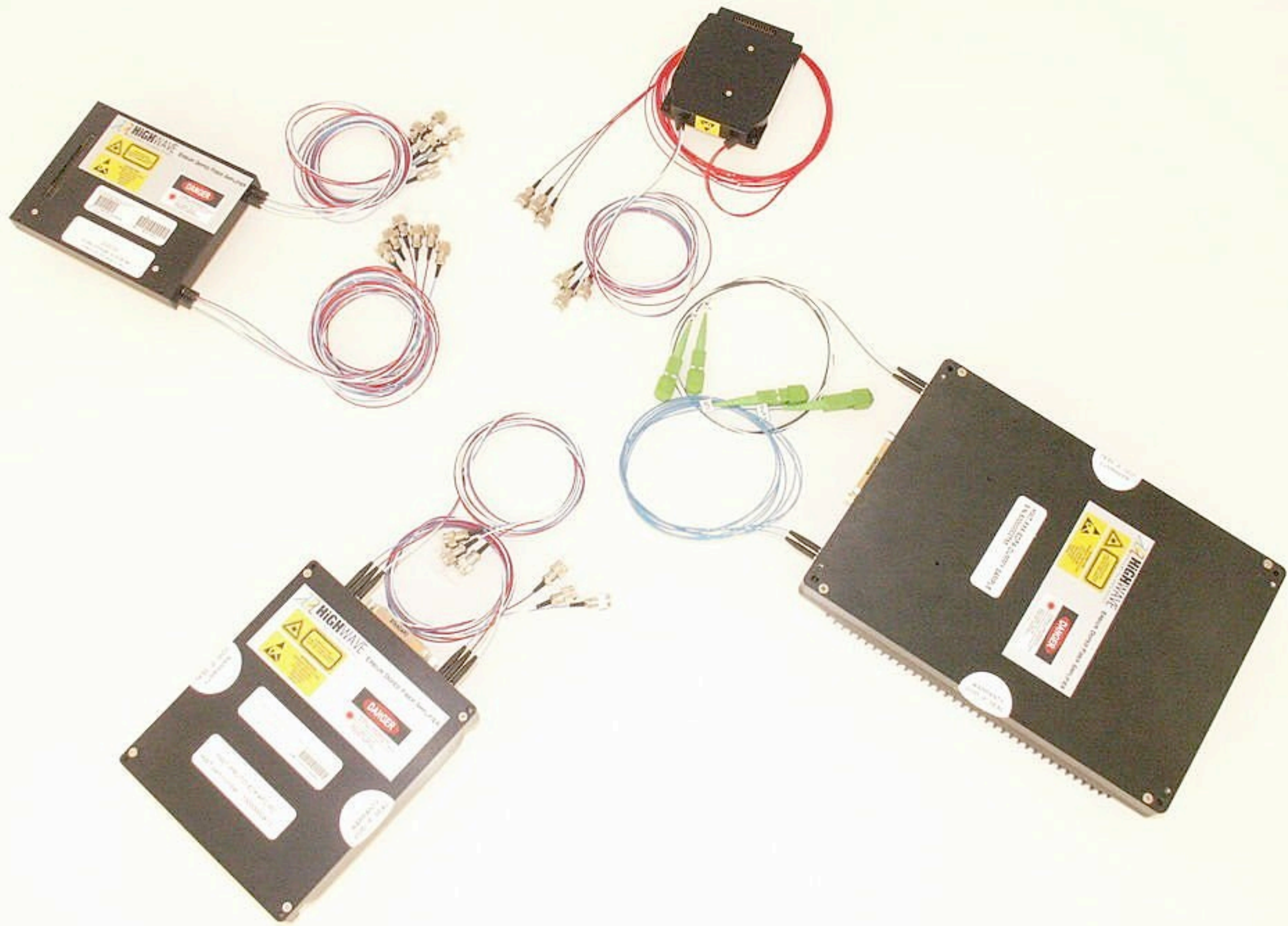




# Taking it further...

---

- CWDM optics typically rated at '80km'
  - Based on optical budget
  - Need to subtract CWDM mux losses
- Can use optical amplifiers
  - EDFA - Erbium Doped Fibre Amplifier
  - Need to pay attention to channel levels to keep them all similar
  - Just another piece of optical kit...



# DIY DWDM

---

- Same principle as CWDM
- Typically 32 -> 128 x 1 / 2.5 / 10Gbit/s channels
- Same idea as CWDM
- Much finer tolerances
- Need to pay much more attention to channel levels