WDM Routing

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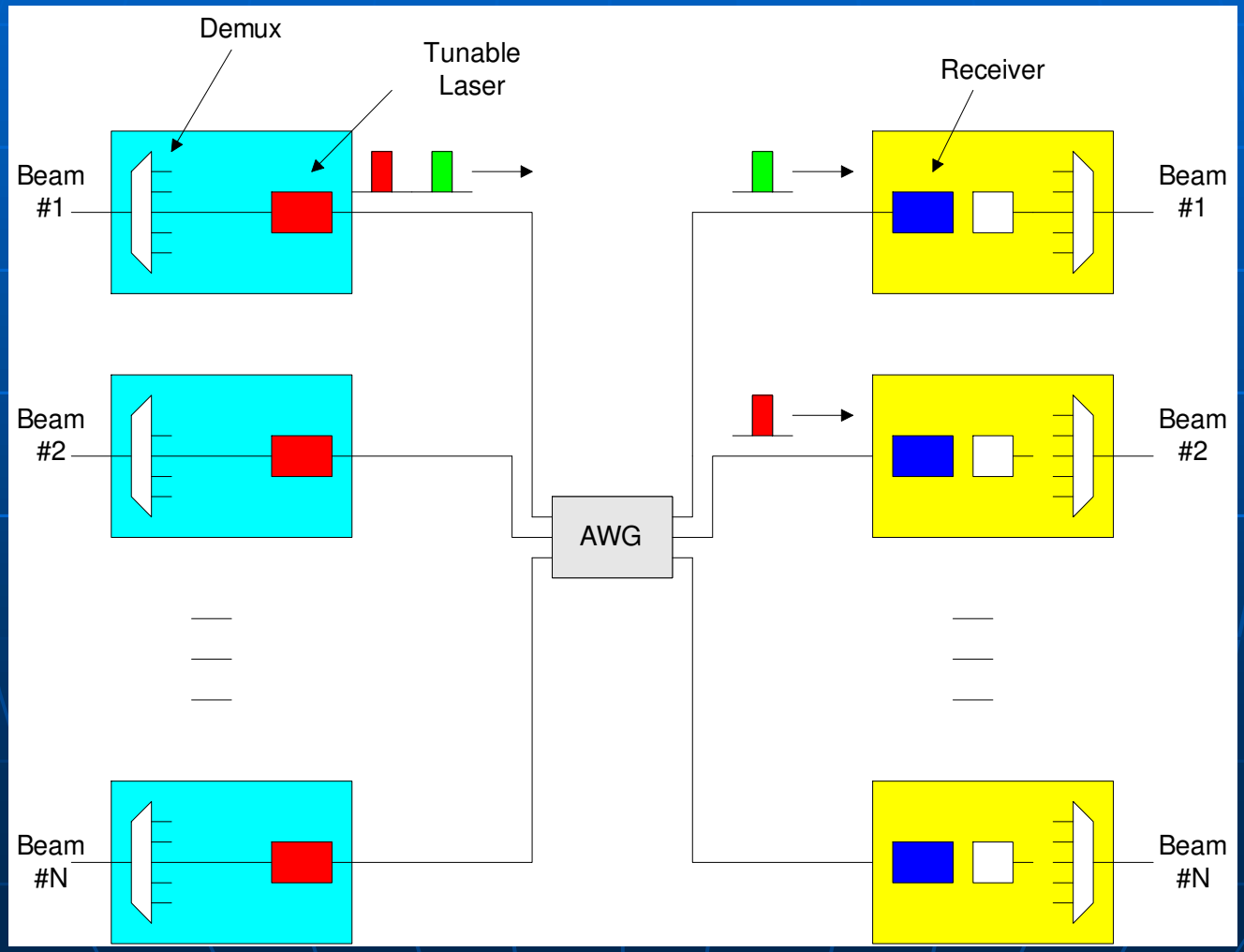
Interconnects on Telecommunications Satellites

- Two main types of interconnect considered here
  - Transparent internal routing in processor
    - Can be achieved with WDM routing
  - Antenna to processor
    - Optics enables simplified transmission to and from antenna

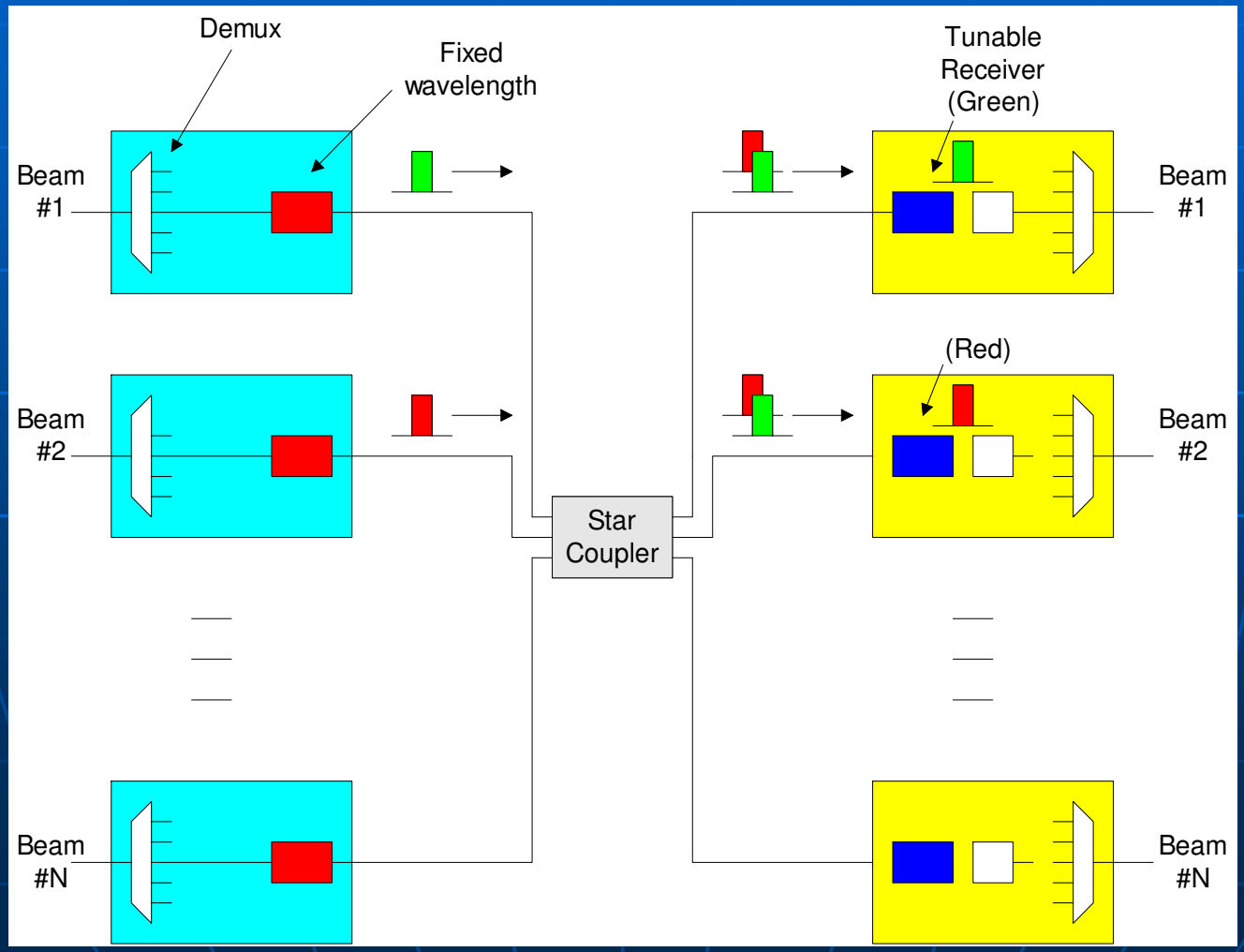
Internal Routing Interconnects

- WDM Routing achieved with high speed optical switching
- Replaces routing ASICs with all-optical routing
- Interconnects are all fibre with one per beam and no cross-overs
- Two main approaches
  - Tunable Lasers
  - Tunable Filter (tunable receivers)

Satellite WDM Routing (Tunable Laser)



Satellite WDM Routing (Tunable Receiver)

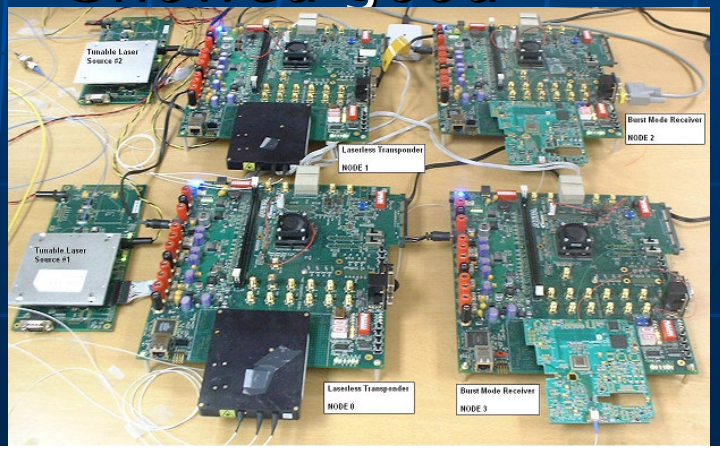


WDM Routing Figures

- Optical Core can support combined data rates of >2Tb/s (200 beams with 10Gb/s per beam)
- Granularity of MHz feasible
- Buffering requirement dependent on speed of optical switch

Multigigabit Optical Backplanes

- Completed ESA project – Demonstration of WDM routing
- High speed switching tunable lasers used
  - 200ns switching speed
  - 4 node system and 10Gb/s per node
- Radiation Hardness of optical components tested – (Initial Study)
  - Tunable Lasers (Intune) – Showed good radiation hardness
  - AWG(IMEC)



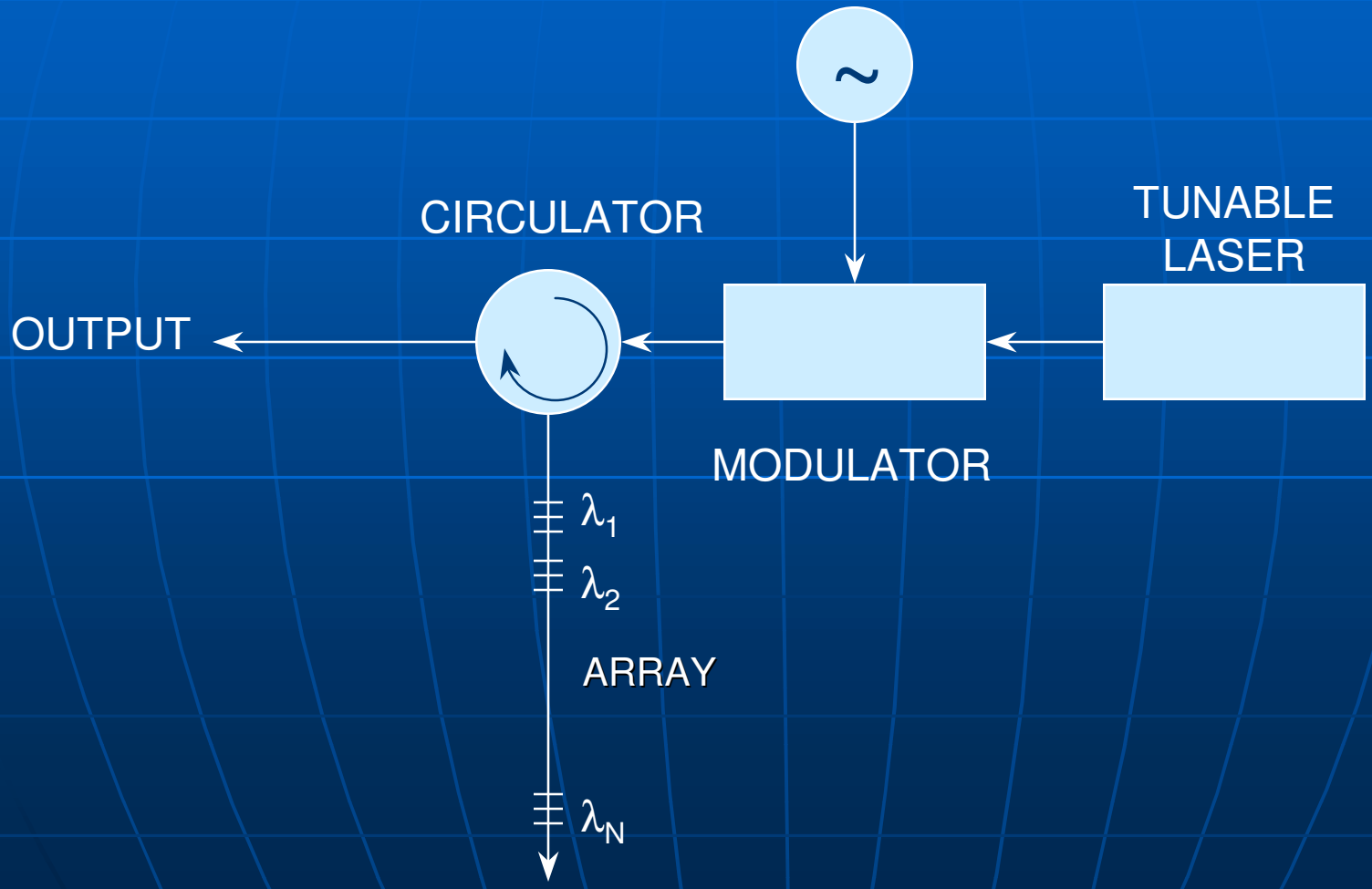
Satellite Antenna interconnect requirements

- High frequency, high capacity capability
- Low distortion (linearity) for multi-channel Tx and Rx
- Low SWaP (Size, Weight and Power)
- Low loss fibre - light *anywhere*

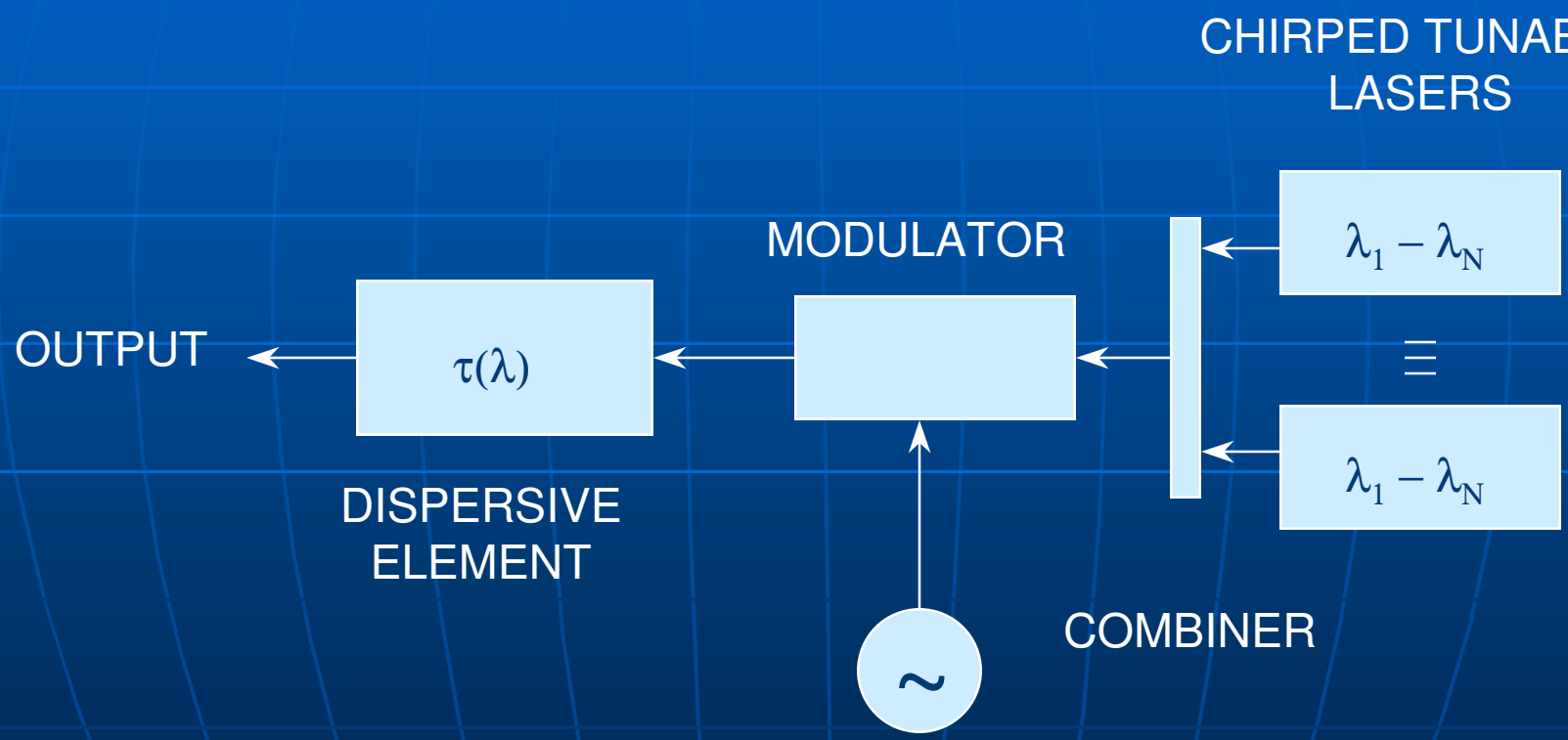
Technological needs

- Low drive componets - efficient
- High frequency modulators and detectors
- Efficient means of phased array feeding
- Large fan out

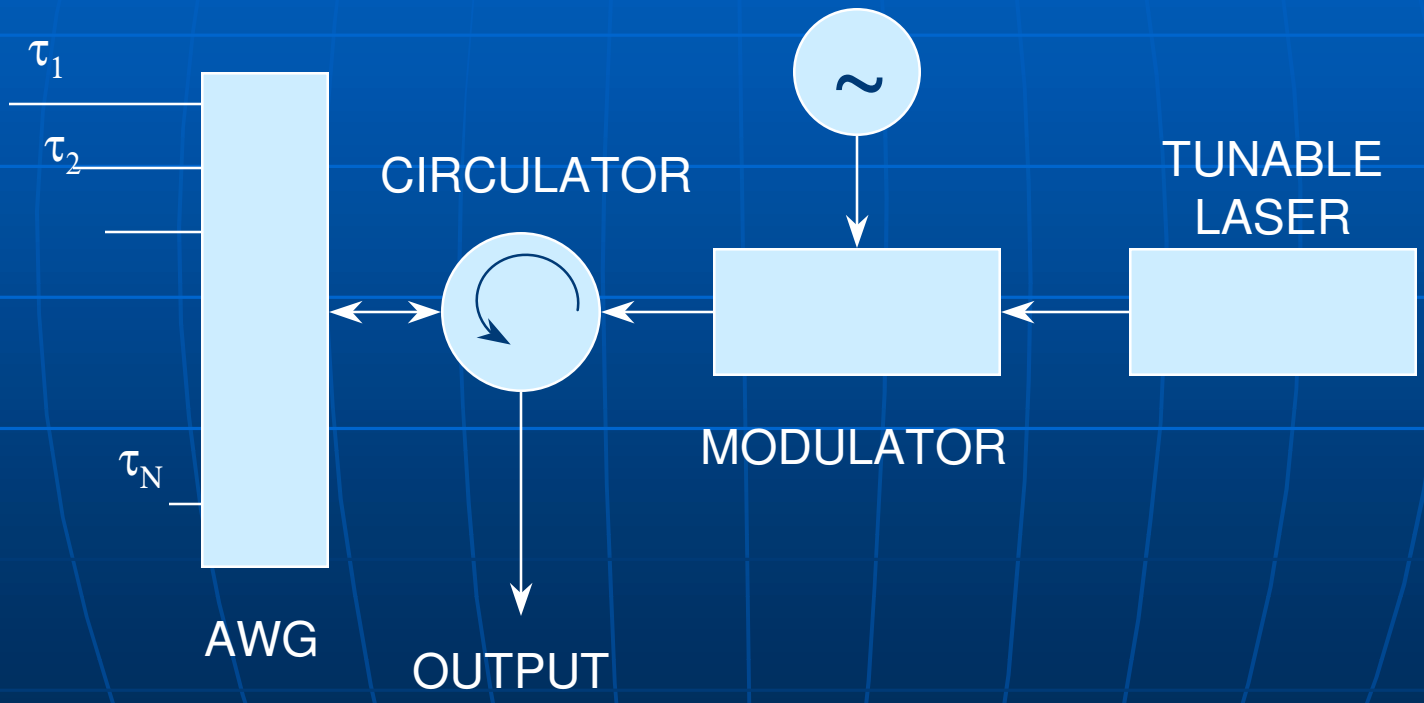
Phased array example (1)



Phased array example (2)



Phased array example (3)



Supporting optical technologies

- Power splitters
- Power boosters
- Tunable filters/fixed frequency filters
- Array Waveguides - wavelength processing
- Electro-absorption modulators/ Mach Zenhder Modulators
- AWG/SOA/tunable lasers, e.g photonic packet processors