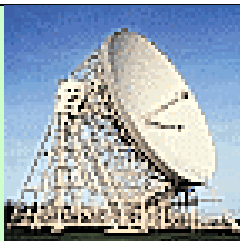


Fibre developments at Jodrell Bank Observatory

Roshene McCool

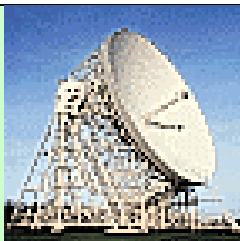
Fibre Optic Engineer

Jodrell Bank Observatory



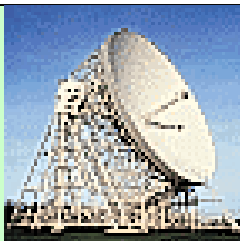
Objectives

- Brief summary of the ALMA and e-MERLIN projects, without covering old ground.
- Review of the practical aspects of implementing these optical systems
 - Testing
 - Component choices



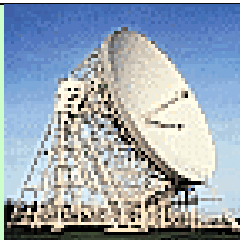
Contents

- ALMA
- e-MERLIN
- Test and implementation
- Optical Components



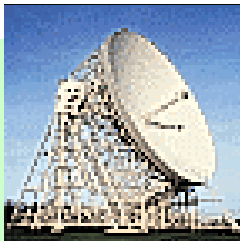
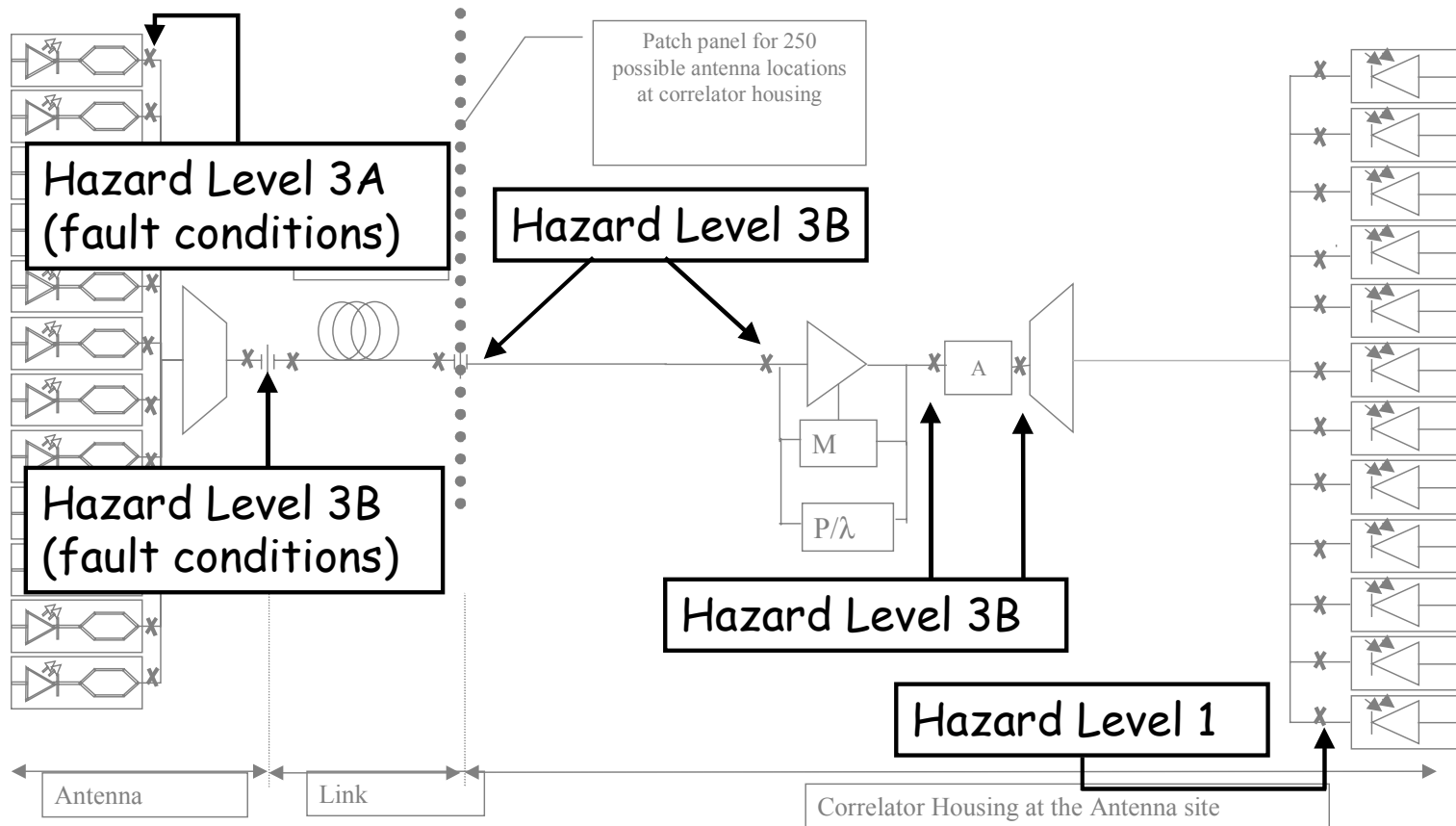
ALMA work at JBO

- Responsible for the Optical Data Transfer System
 - Design & safety design
 - Fibre management design
 - Test and implementation of optical system design
 - Pre-production prototypes & production

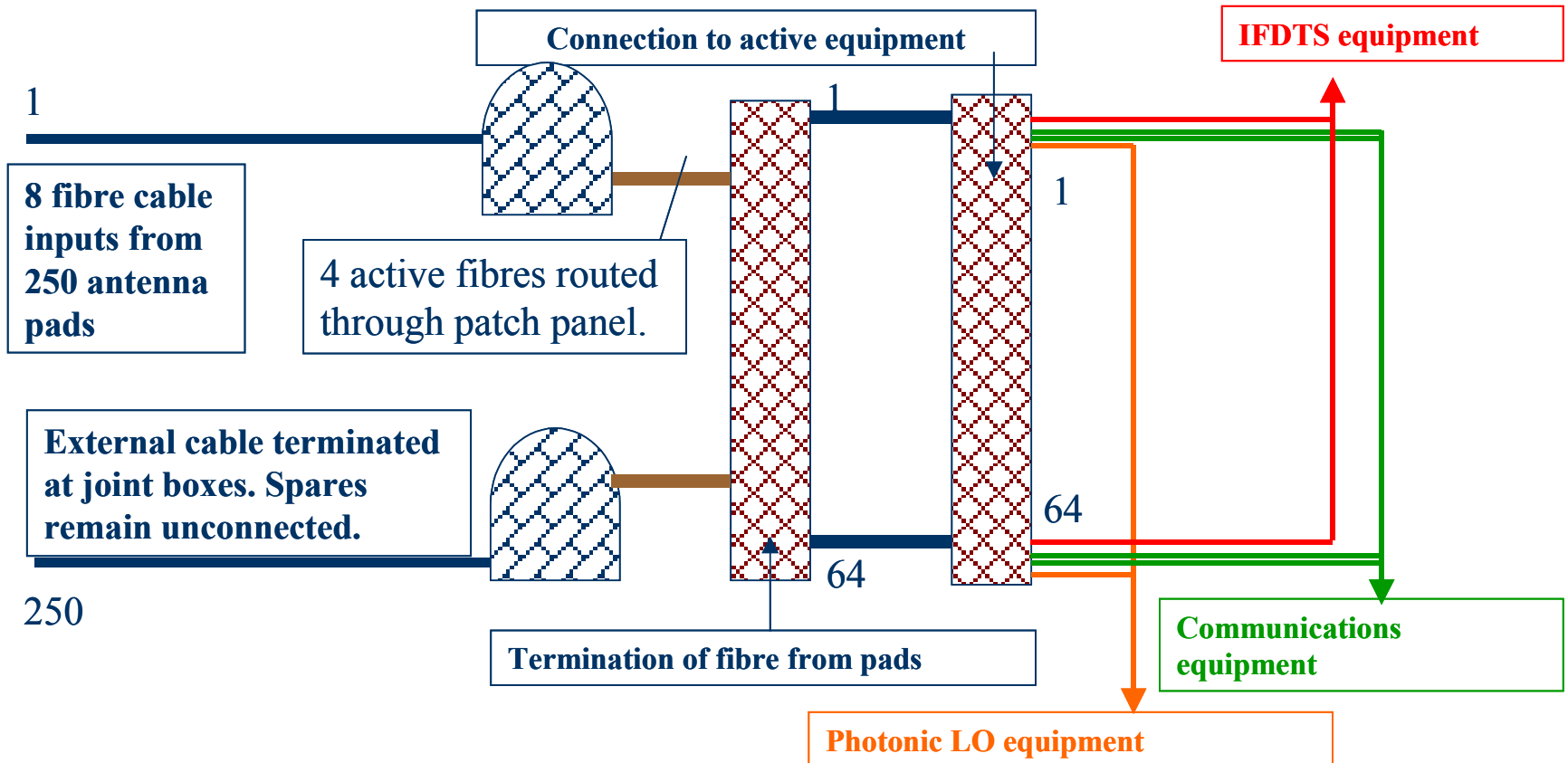


ALMA Optical DTS Design

Proposed Design for the Baseline Link

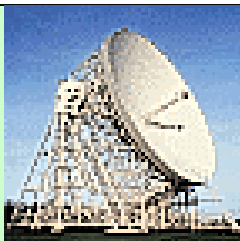


Fibre Management

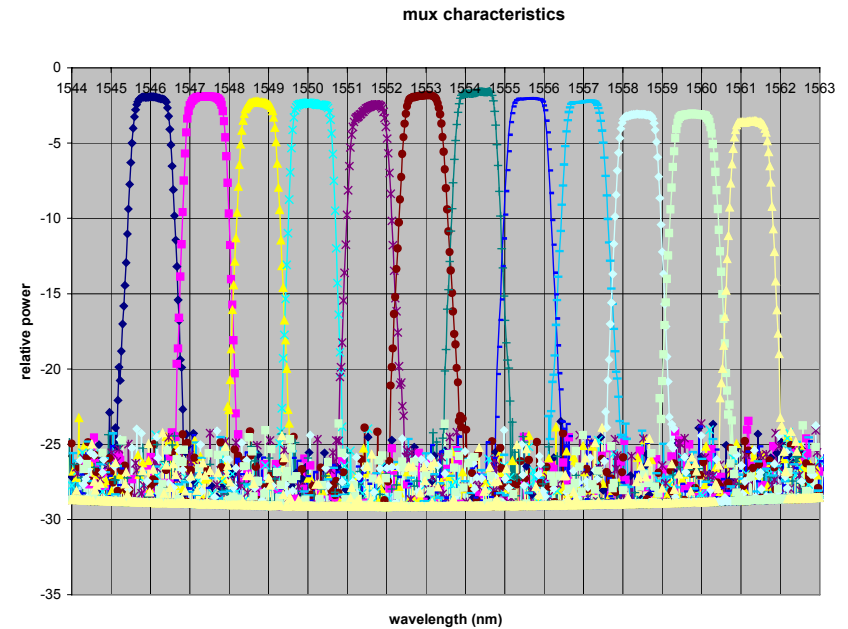
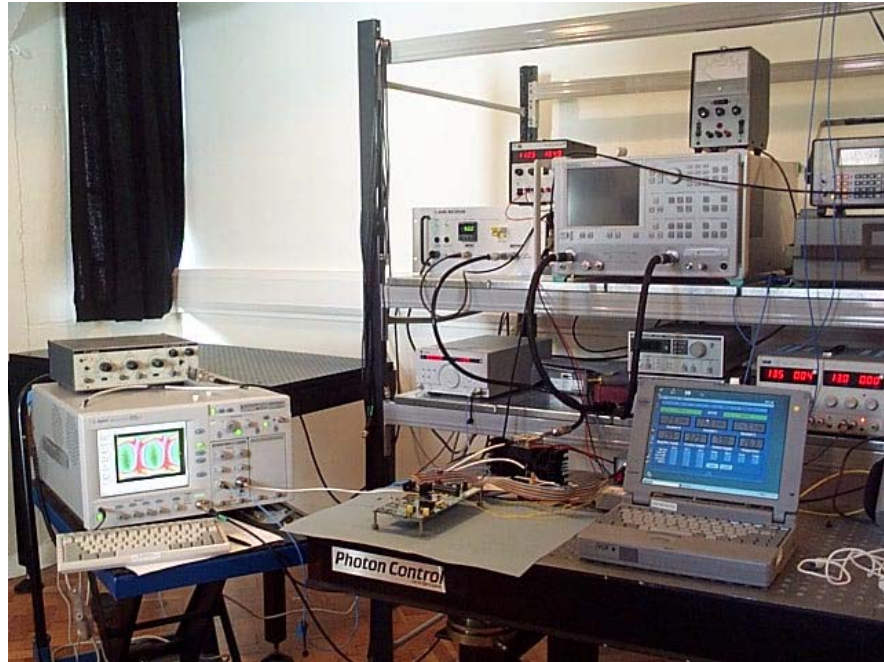


e-MERLIN

- Hardware design drawn from ALMA work at JBO
- Longer distance, requires additional amplification & dispersion compensation.
- Commercial networked fibre used, with some new fibre dig.
- 30 Gbps per antenna, total bandwidth 240 Gbps

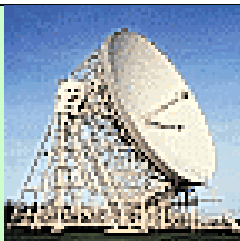


Test & Implementation



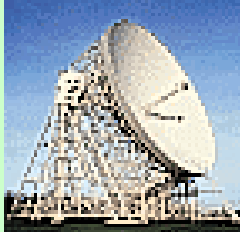
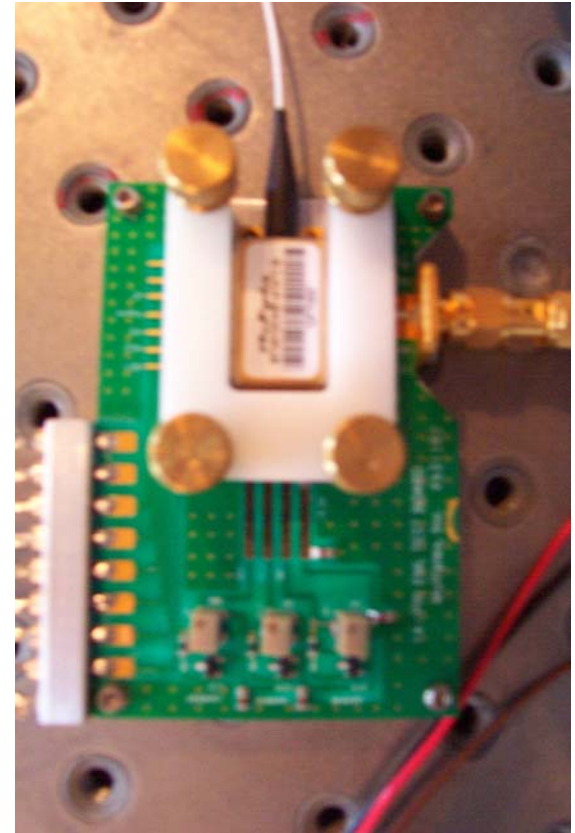
Testing

- Optical & Electrical signal testing
 - *Agilent Infinium sampling Oscilloscope*
- Wavelength testing (including multiple wavelengths simultaneously)
 - *Agilent Optical Spectrum Analyser & 8 channel ILX laser diode controller*
- Optical power testing (including polarisation effects)
 - *ILX optical power meter & FiberControl Polarisation controller*



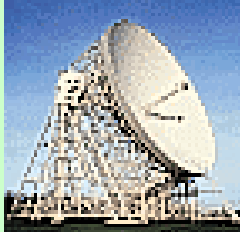
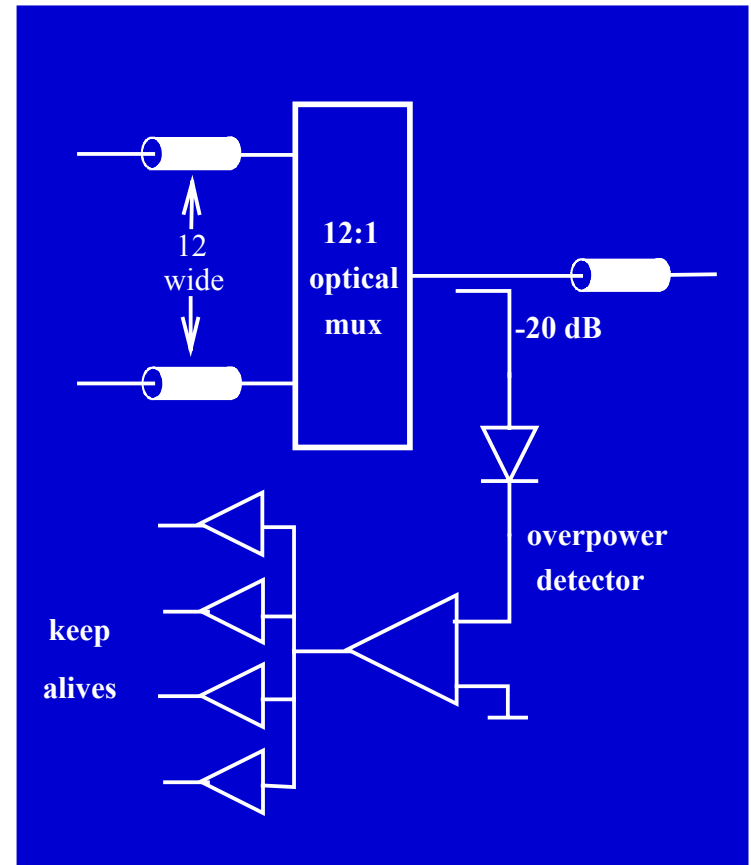
Transmitter Module

- Multiplex Inc MTX510ie
 - EA modulated laser with integrated modulator driver.
 - Coax connection from an NRAO designed digital board, delivers digital signals @ 10 Gbps.
 - 40km span (available up to 80km span)



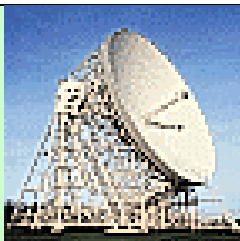
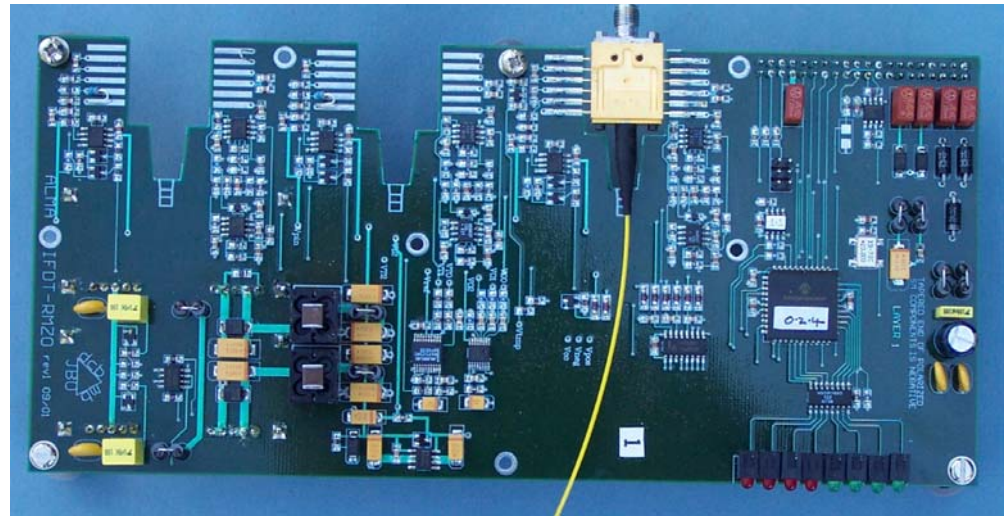
Mux and over power monitor

- 200GHz channel spacing allows relaxed wavelength stability criteria .
- Safety incorporated into the design. An over power prevents a hazard condition occurring at the output of the MUX.



Optical Receiver Board

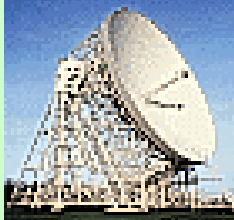
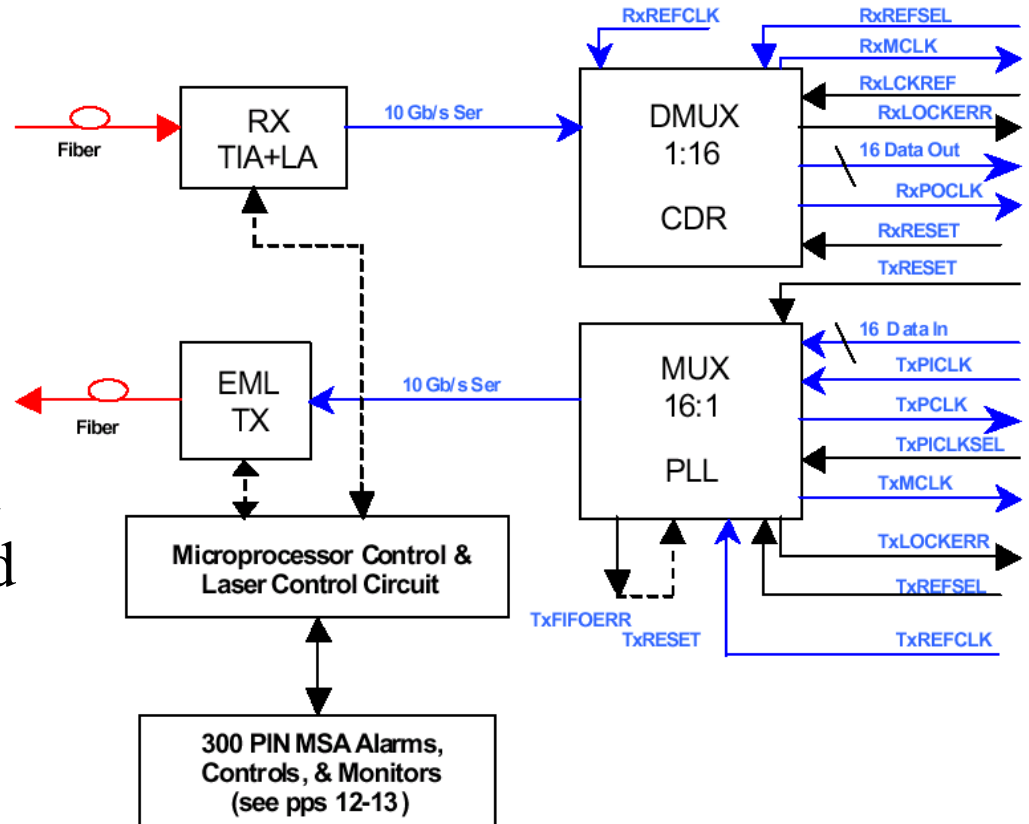
- Multiplex MTRX192L with integrated trans-impedance and limiting amplifier.
- Sensitivities of $\sim -20\text{dBm}$ @BER 10^{-10}
- Connects to the digital NRAO receiver board via coax.



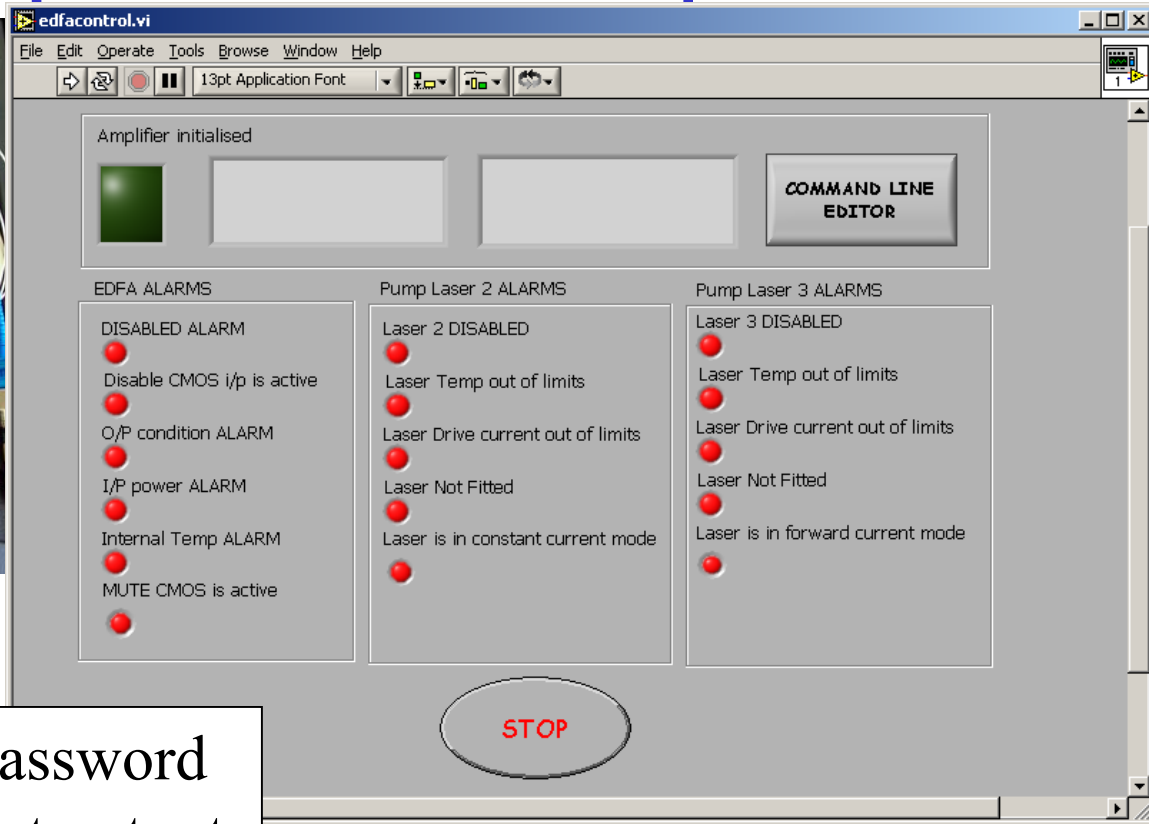
10 Gbps Transponder Components



10 Gbps transponder with Mux and deMux functions integrated into the package.



Erbium Doped Fibre Amplifier



RS232 control, password protected, constant output power or constant gain control, alarm signals.



Conclusions

- ALMA and e-MERLIN will both have custom built optical transmission equipment developed at JBO
- Testing facilities essential for the development of this equipment
- Integrated components available that make this task easier

