



100Gbps Transmission Trial

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Credit...

Much of the work here was performed by
Verizon and Nortel

We were mainly observers

Especially

Tom Sims at Verizon

Alan Beard at Nortel



100G Transmission

At the optical layer, line side and client side are very different.

Client side tends to be standardised

Ethernet, SDH

Connect to the users of the network

Line side is often proprietary

Forward Error Correction algorithms

Client side encoding

Nortel to Nortel, Ciena to Ciena



100G Transmission

Optical equipment vendors working on 100Gbps independently of IEEE 100Gbps ethernet standardisation

Still useful in the meantime to carry multiple 1/2.5/10/40Gbps signals on a single wavelength

Not totally in isolation, of course

Needs to be fast enough to carry 100GE

Needs to be fast enough to carry ODU-4



100G Transmission

Existing DWDM systems use ITU grid

Wavelengths 50GHz apart

100G should fit in same grid

Too much deployed kit for anything else

POLMUX-QPSK

Do I have to explain it again?



100G Trial

~100km dark fibre

London to Reading

Three neighbouring 50GHz channels

100, 40 & 10Gbps

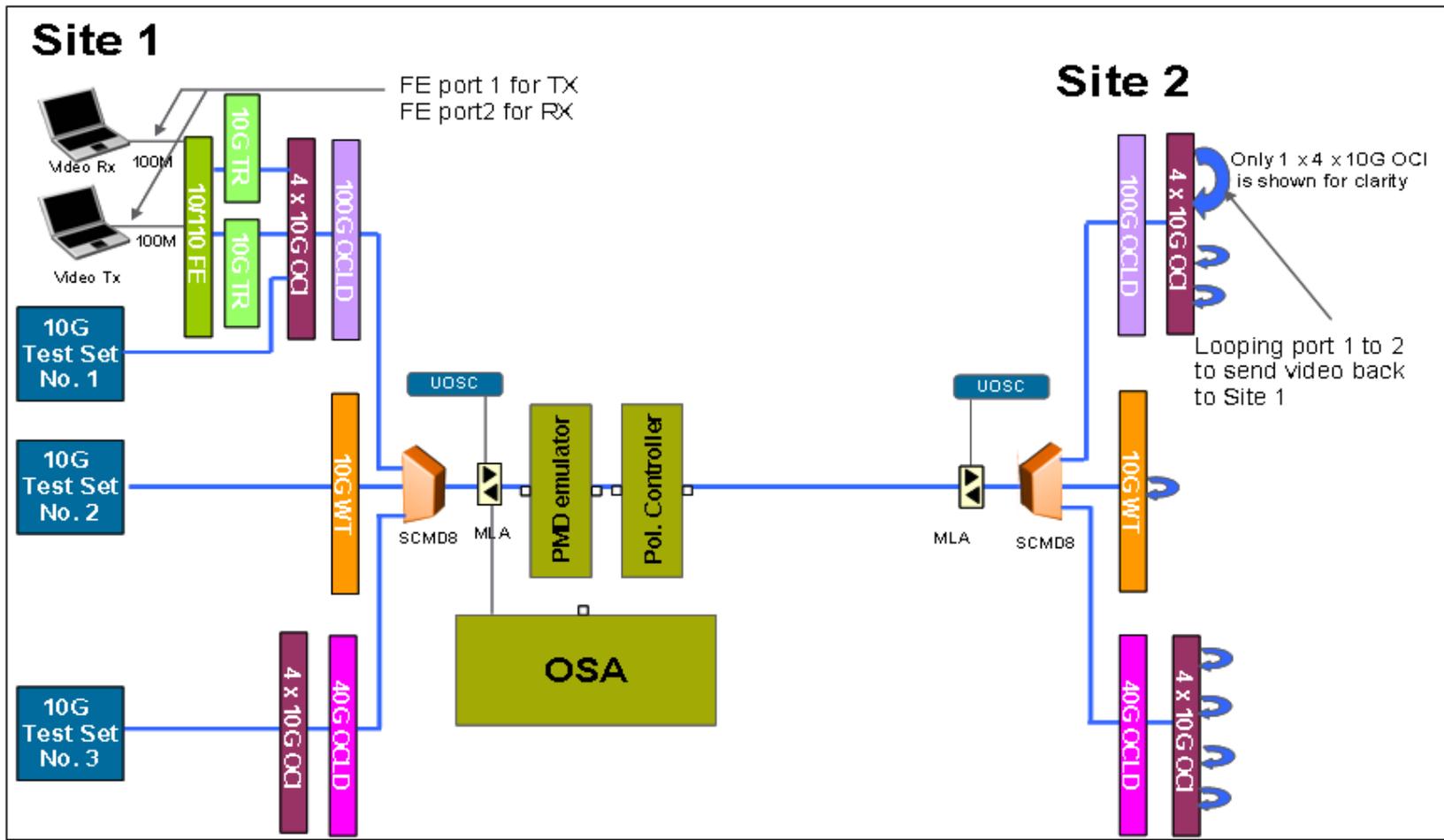
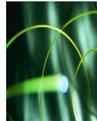
PMD Emulator

Ethernet & SDH test sets

Optical Spectrum Analyser

...and the only two 100G Nortel linecards
in Europe.

100G Trial





100G Trial

100Gbps signal in centre grid position

POLMUX-QPSK

Some of the D/A & A/D circuitry isn't working at 100Gbps yet

Two POLMUX-QPSK carriers of ~50Gbps within same 50GHz grid spacing

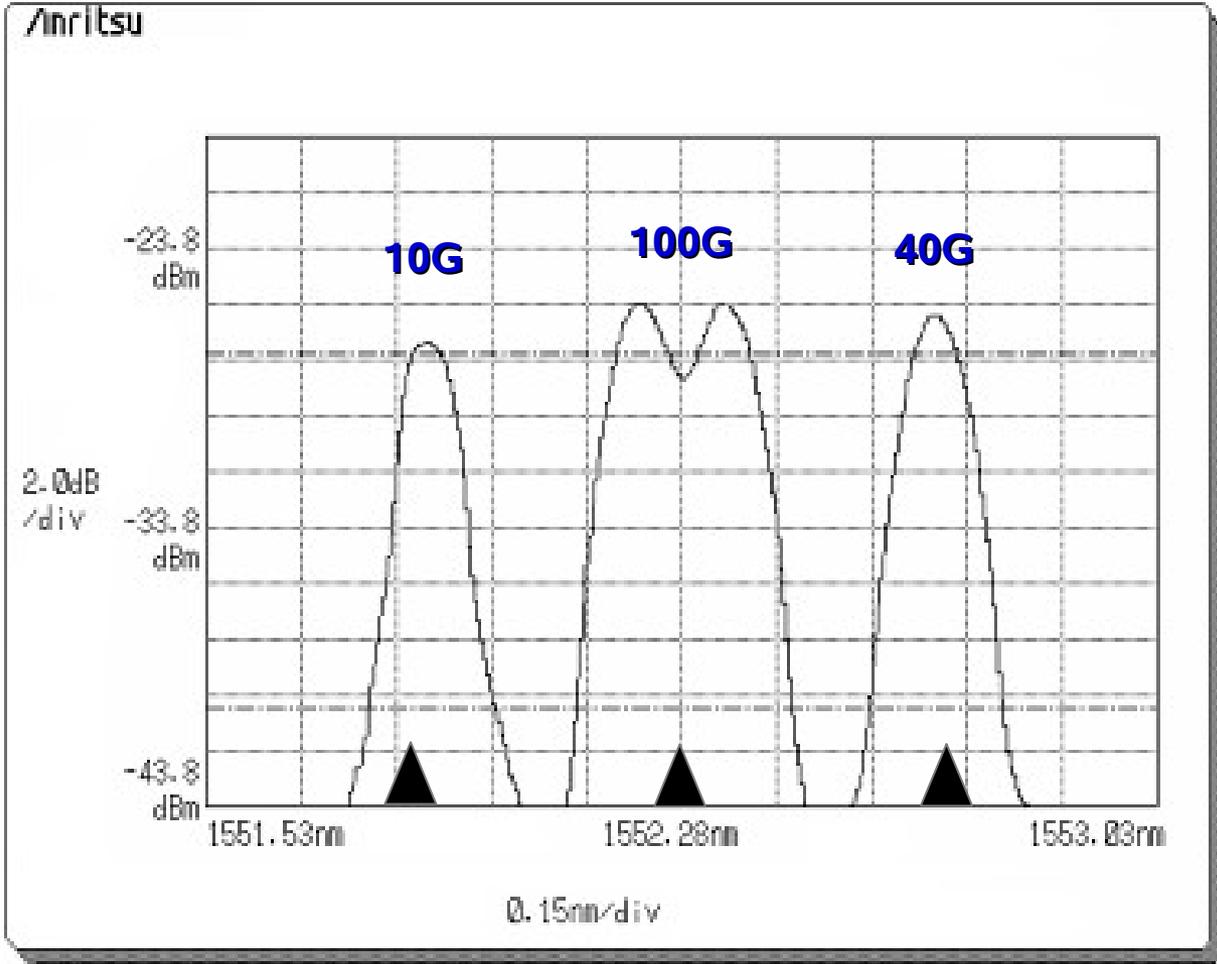
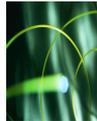
10Gbps signal one side

Duobinary

40Gbps signal other side

POLMUX-QPSK

100G Trial





100G Trial

PMD simulator increased 'instantaneous'
PMD from 0 to 150ps

Equivalent to ~50ps DGD

10G SDH test set started recording errors
at ~21ps mean DGD

40 & 100Gbps FEC started having to work
at ~40ps mean DGD

Started to get client side errors at ~50ps
mean DGD



In context

Worst mean DGD we've seen on our fibre is ~15ps.

On trial link, 100G transmission was working fine with much worse simulated PMD.

Encouraging for rolling out 100G on installed fibre.



Questions?