



Single Fiber, Single wavelength, GbE / FE transceiver Foreign Ingress Issues

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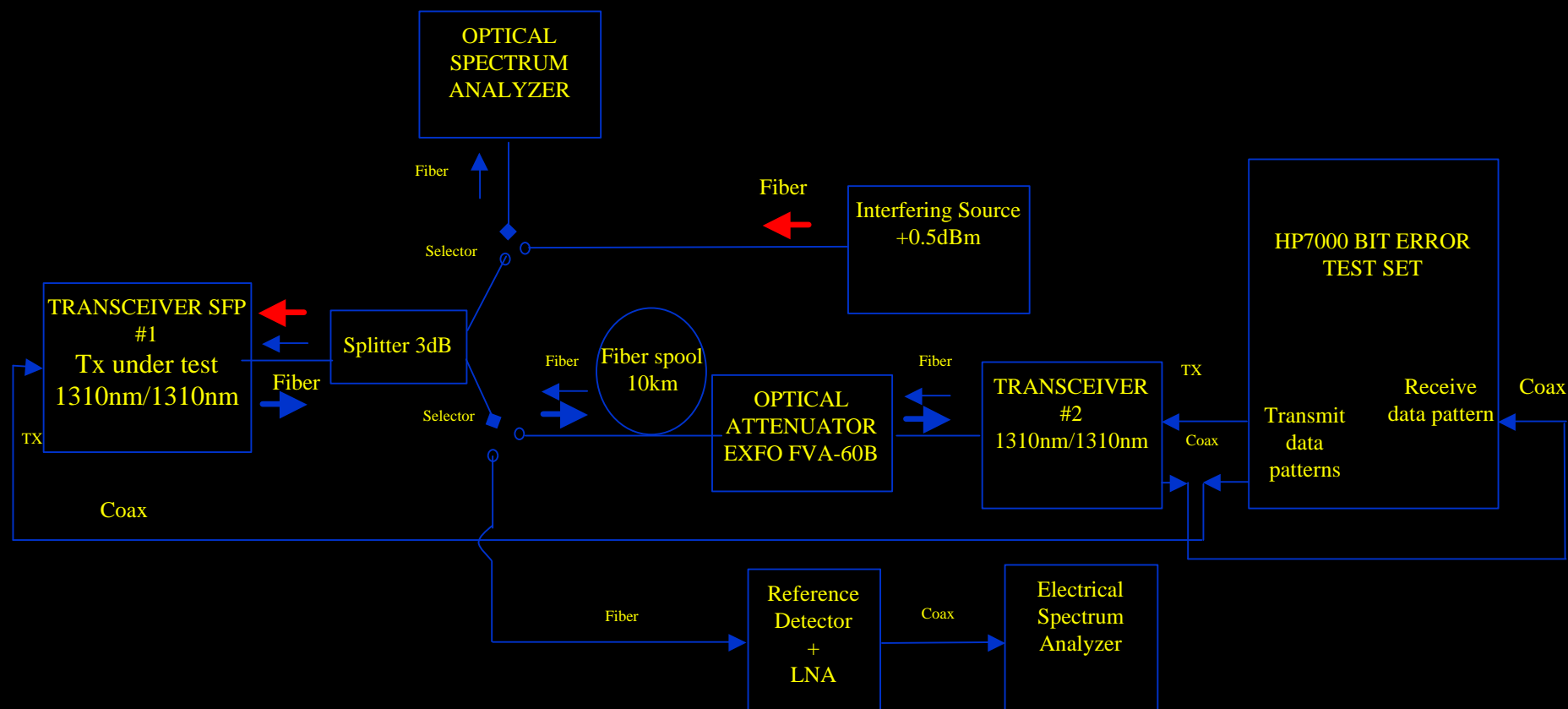
IEEE 802.3 ah interim
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“Foreign ingress” light coming back into the laser – single wavelength

■ Actual measurements set-up Preliminary tests



■ Report

Measurements

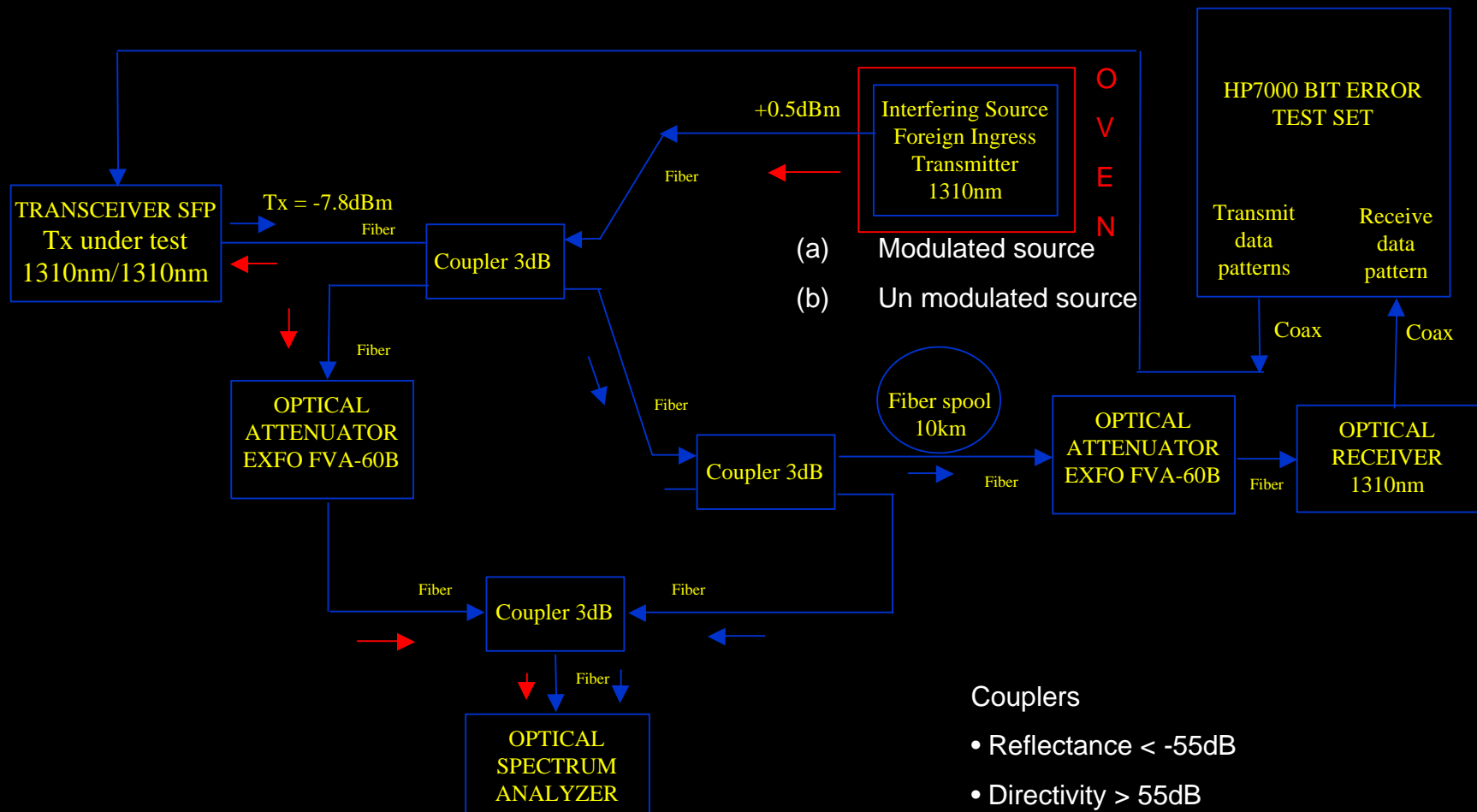
- Initial Test

- ◆ Link – $P_{\text{out}} = -5.7\text{dBm}$ $P_{\text{ingress}} = -2.3\text{dBm}$ BOTH MEASURED at the Transceiver fiber interface
- ◆ Measured sensitivity in the presence of direct light into the laser
- ◆ Unit 1 was cooled to get a wavelength sweep to cover the overlap)
- ◆ Both sensitivity and noise floor were measured.

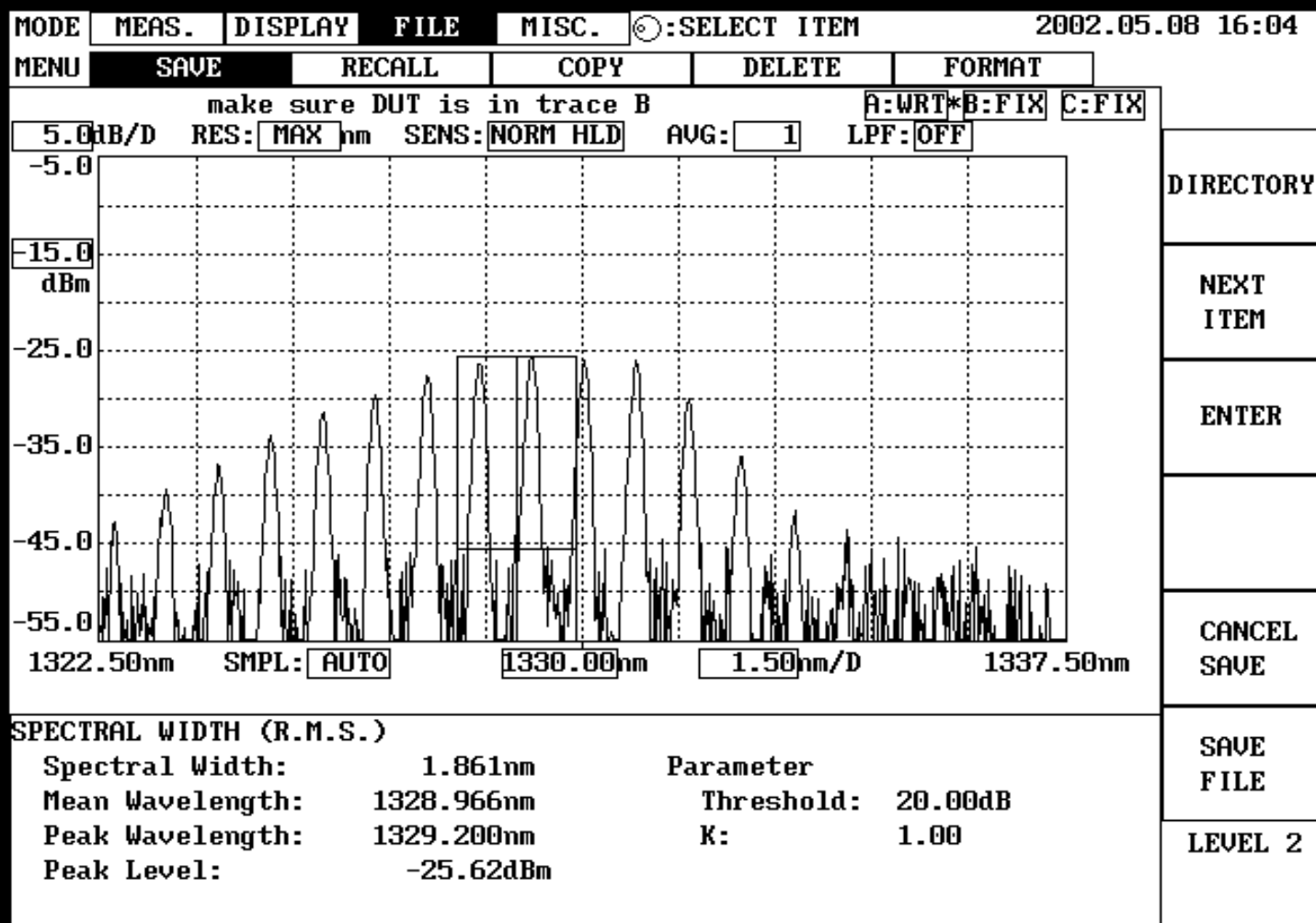
Results Measured sensitivity in the presence of direct light into the laser

- The Transceiver under test was placed in an environmental chamber and temperature was swept from -20°C to 50°C to ensure wavelength overlap.
- Link – $P_{\text{out}} = -5.7\text{dBm}$ $P_{\text{ingress}} = -2.3\text{dBm}$ BOTH MEASURED at the Transceiver fiber interface
 - ◆ Unit 1 was cooled to get a wavelength sweep to cover the overlap)
- Sensitivity of reference receiver AND RIN of the “contaminated” Tx were measured
 - ◆ Worst case sensitivity penalty (when wavelength overlap) 0.3 dB
 - ◆ Worst case RIN degradation (when wavelength overlap) 1dB
- Since “foreign ingress” is high power low loss situation – the above penalties DO NOT MATTER

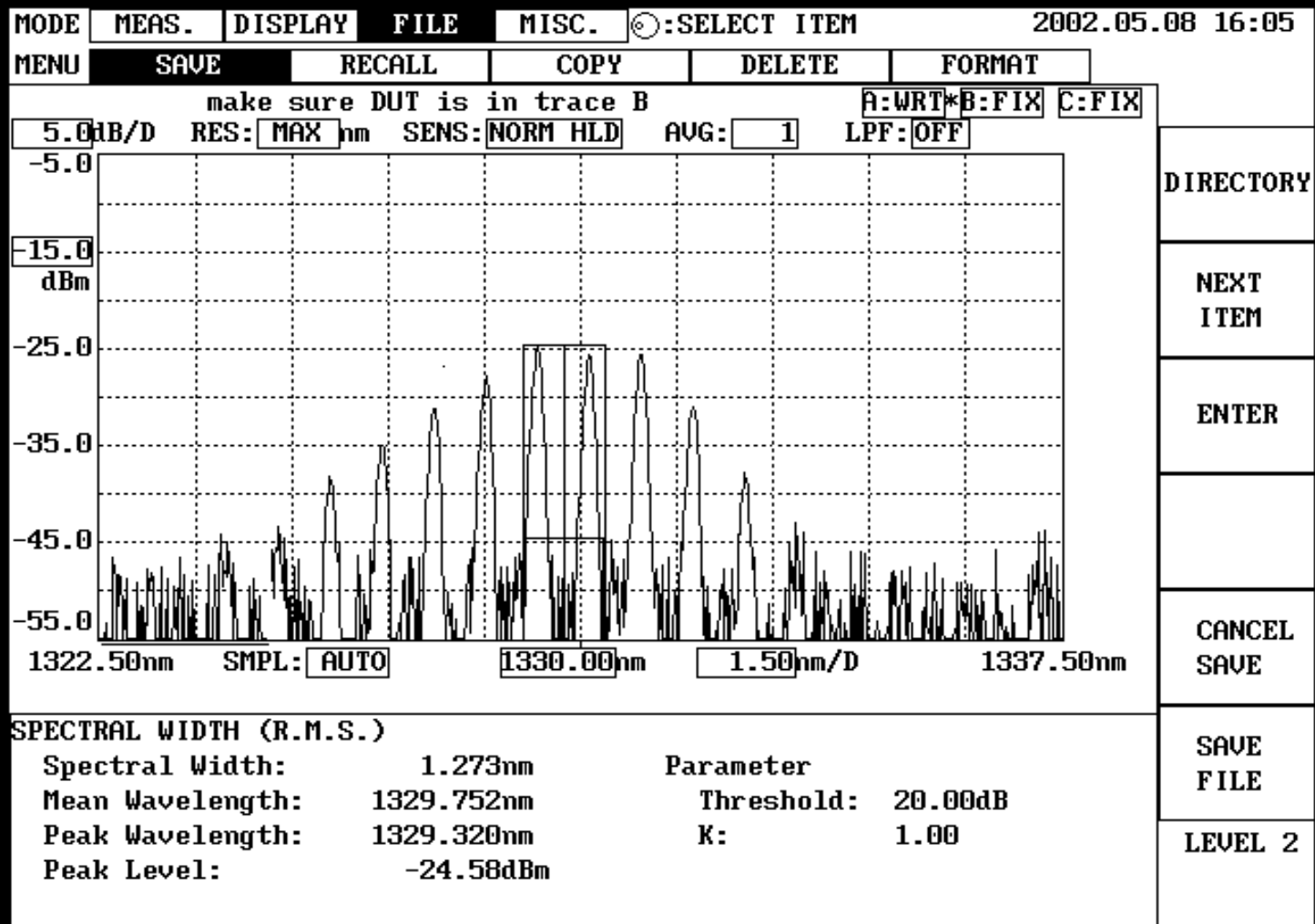
“Foreign ingress” light coming back into the laser – single wavelength



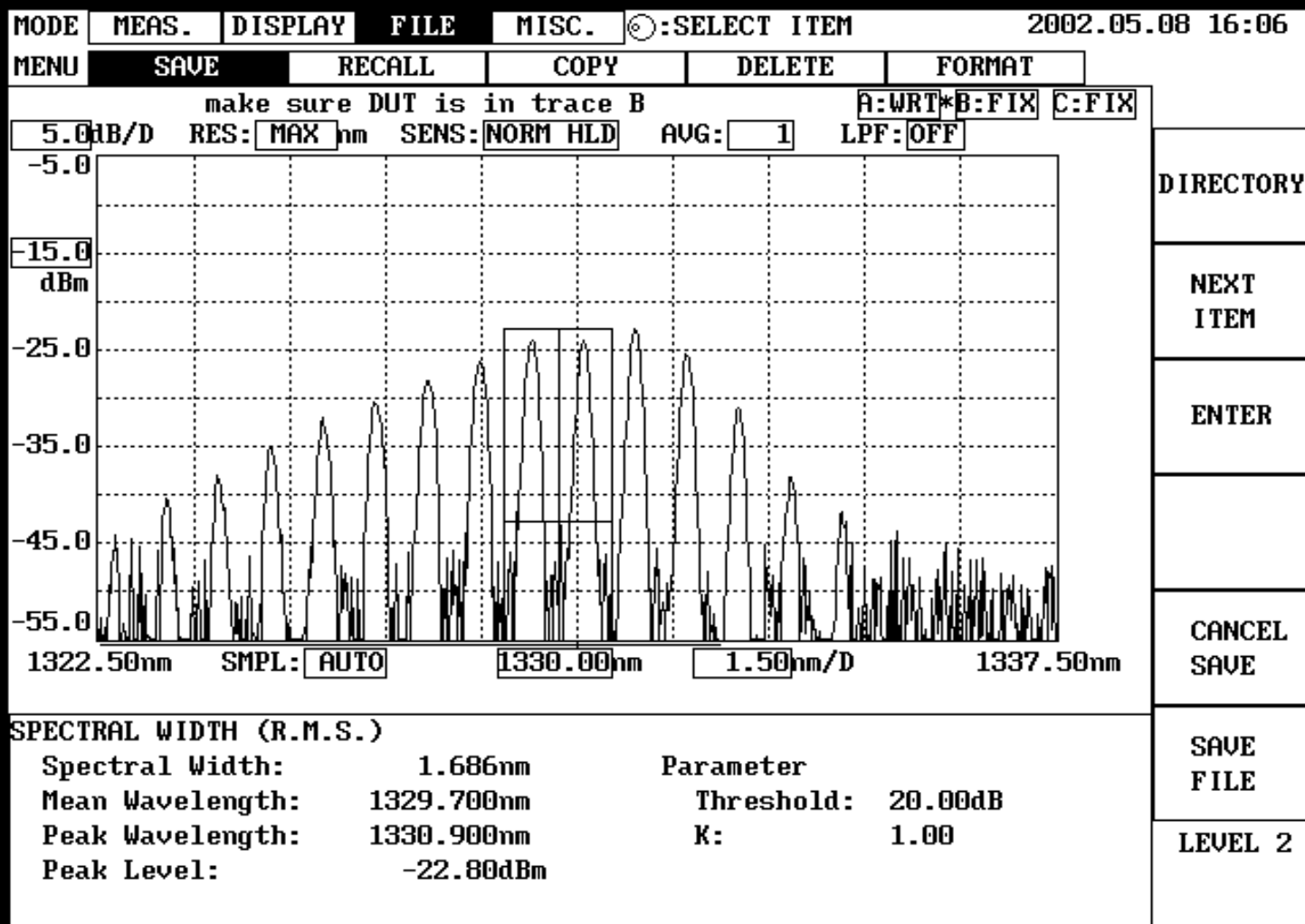
FOREIGN INGRESS SOURCE - MODULATED (a)



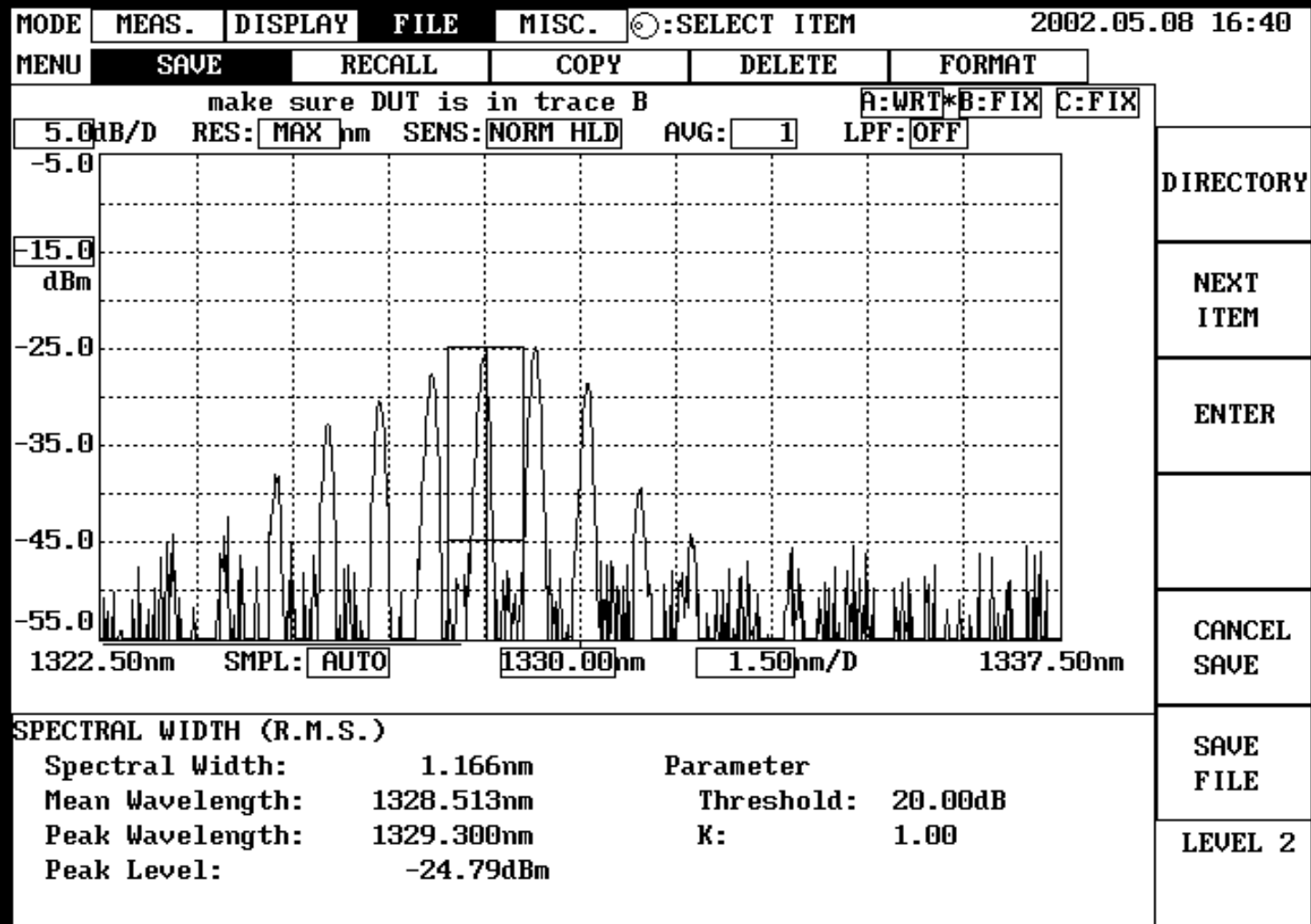
Single Fiber Single 1 SFP (a,b)



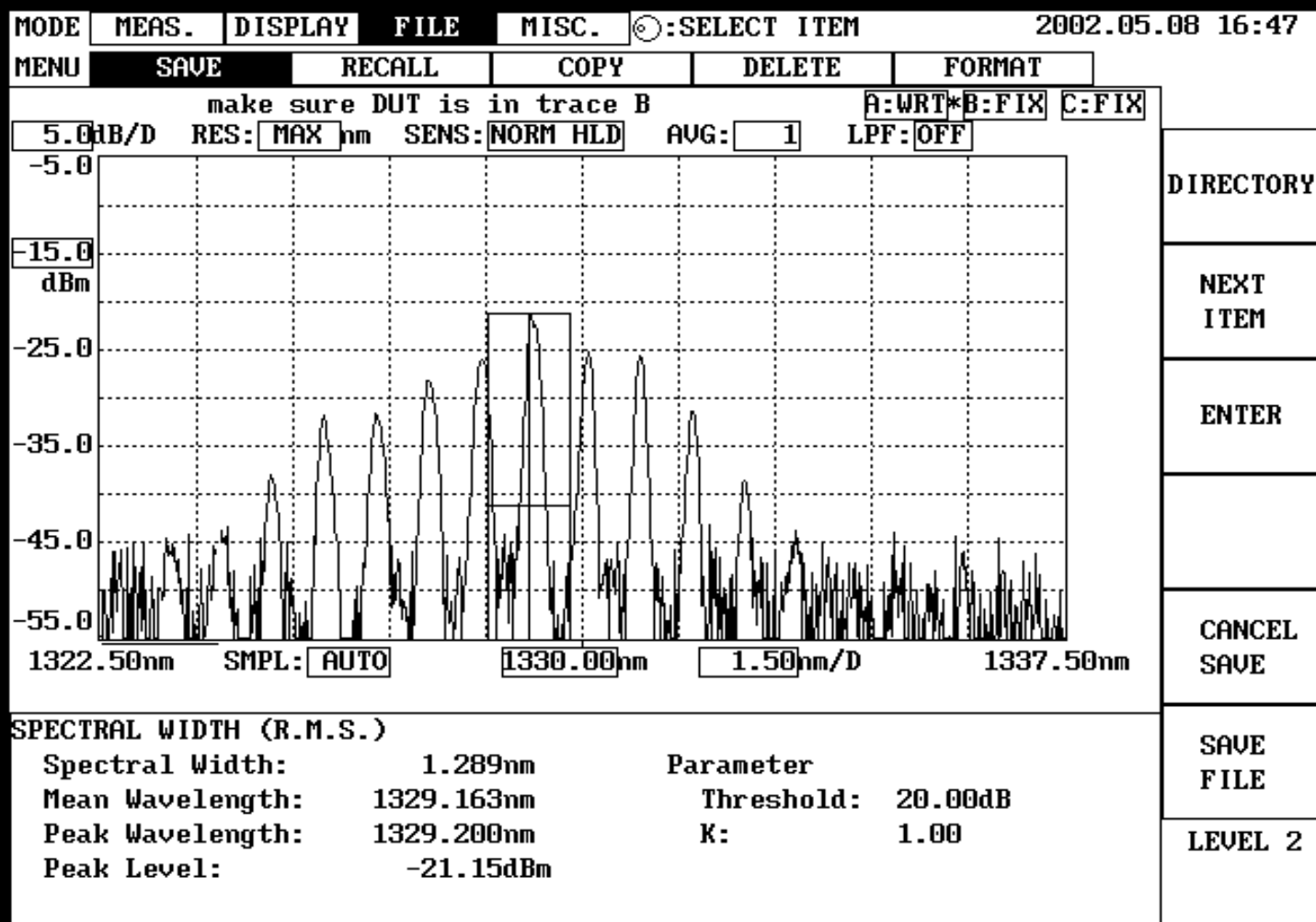
Foreign Ingress Modulated + Single Fiber Single 1 SFP (a)



FOREIGN INGRESS SOURCE UN MODULATED (b)

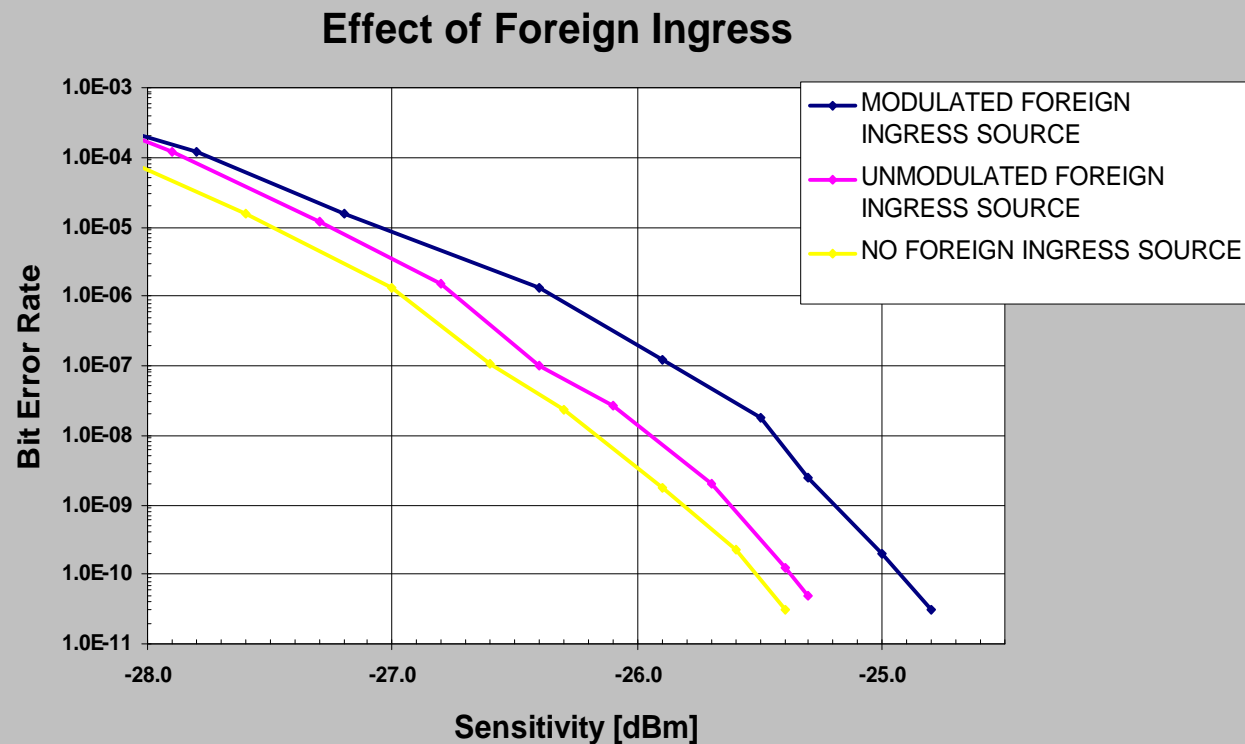


Foreign Ingress UnModulated + Single Fiber Single 1 SFP (b)



Foreign Ingress Interference on Tx (reference Rx sensitivity)

Exact wavelength/modes overlap



The sensitivity measured at a receiver that accepts the output from “contaminated” source

$$P_{\text{out}} = -8\text{dBm} \quad P_{\text{ingress}} = -3\text{dBm}$$

Major installer of 1310/1310 links **could not** induce foreign ingress effects

- "Marconi is a pioneer in the deployment of fiber optics in the last mile portion of the network. Over the past 5 years, Marconi has deployed more than 100,000 single fiber, full-duplex, single mode 1310nm optical links in the access network."

*Mark Cannata, Vice President, Marconi, North American Product Line
Management and Marketing, Access*

- We have extensively tested such interference (foreign ingress, MB) with FP using the 100BaseT single fiber transport we use from XXXX but could not induce such phenomena.

George BuAbbud, Chief Scientist Access Systems, Marconi

Conclusion

- Foreign Ingress – IS NOT AN ISSUE
 - ◆ Applicable for very short reach (strong incoming signal)
 - ◆ Effect is either non-detectable or very small
 - ◆ Actual margins under such conditions – more than 10dB

PMD Specification

Description	ONU/OLT Module	Unit
Transmitter Type	Bi-directional, 1 fibre	
Signaling speed	1.25 / 0.125	GBd
Link length (range)	0.5 to 10,000	m
Power Budget	10	dB
Wavelength (range)	1270 to 1360	nm
$T_{\text{rise}}/T_{\text{fall}}$ (Max, 20%-80% response time)	0.26	ns
RMS spectral width (max)	2.4	nm
Average launch power (min)	-9	dBm
Average launch power (max)	-4	dBm
Extinction ratio (min)	9	dB
RIN (max)	-120	dB/Hz
Receiver sensitivity (min)	-19	dBm
Return loss of ODN (min)	20	dB
Return Loss of module (min)	18	dB