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System lightwave source characteristics

Table 2.1.
Lightwave source characteristics[8]

Description	HP 83400A/B	HP 83401A	HP 83402A/ B
Wavelength	1308 ±10 nm	1308 ±10 nm	1308 ±20 nm
Spectral width (typical)	≤ 2.5 nm	≤ 2.5 nm	≤ 2.5 nm
Average optical output power: Maximum Typical Minimum	 (A) 1500 µW (1.8 dBm) (A) 1100 µW (0.4 dBm) (A) 700 µW (–1.5 dBm)	 1500 µW (1.8 dBm) 1100 µW (0.4 dBm) 700 µW (–1.5 dBm)	 (A) 2400 µW (3.8 dBm) (A) 1300 µW (1.1 dBm) (A) 700 µW (–1.5 dBm)
Maximum Typical Minimum	(B) 1200 µW (0.8 dBm) (B) 550 µW (–2.6 dBm) (B) 275 µW (–5.6 dBm)		(B) 1900 µW (2.8 dBm) (B) 750 µW (–1.2 dBm) (B) 290 µW (–5.4 dBm)
Responsivity (at 50 MHz, nominal)	(A) 0.022 W/A (–33 dBe) (B) 0.011 W/A (–39 dBe)	0.022 W/A (–34 dBe)	(A) 0.022 W/A (–33dBe) (B) 0.011 W/A (–39 dBe)
Modulation bandwidth	300 kHz to 3 GHz	300 kHz to 3 GHz	300 kHz to 6 GHz
Modulation frequency resolution[9]	1 Hz	1 Hz	1 Hz
Modulated optical output power (nominal) Peak-to-peak Peak	 (A) 968 µW (–0.1 dBm) (A) 484 µW (–3.2 dBm)	 968 µW (–0.1 dBm) 484 µW (–3.2 dBm)	 (A) 968 µW (–0.1 dBm) (B) 484 µW (–3.2 dBm)
Peak-to-peak Peak	(A) 484 µW (–3.2 dBm) (B) 242 µW (–6.2 dBm)		(B) 484 µW (–3.2 dBm) (B) 242 µW (–6.2 dBm)
Modulation index (typical)[10]	(A) 44% (B) 44%	44%	(A) 37% (B) 32%
Laser isolation	(A) none (B) 50 dB	none	(A) none (B) 50 dB
Reflection sensitivity (nominal)[11]	(A) ±1.0 dB (B) ±0.25 dB	±1.0 dB	(A) ±2.0 dB (B) ±0.25 dB
Optical port return loss (nominal)[12]	(A) 10 dBo (B) 37 dBo	10 dBo	(A) 10 dBo (B) 37 dBo
Harmonic distortion (nominal)[13]	–25 dBc (300 kHz–1 GHz) –7 dBc (1 GHz–3 GHz)	–25 dBc (300 kHz–1 GHz) –7 dBc (1 GHz–3 GHz)	–25 dBc (300 kHz–1 GHz) –8 dBc (1 GHz–3 GHz)
Laser type	Fabry-Perot	Fabry-Perot	Fabry-Perot
Laser Class	FDA Class I and IEC Class IIIB	FDA Class I and IEC Class IIIB	FDA Class I and IEC Class IIIB
Compatible fiber	9/125 µm	50/125 µm	9/125 µm
Electrical port return loss	14 dB	14 dB	14 dB

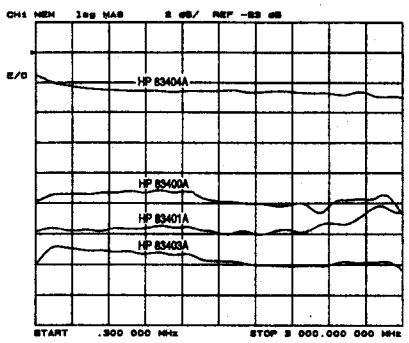
8 Lightwave source characteristics are described given a >30 dBo return loss optical termination and a 14 dBm RF drive power. The HP 83404 requires a 12 dBm RF drive power.
9 When used with the HP 8702B's synthesized RF source.
10 Modulation index is defined as peak modulated optical power divided by average optical power. For example, the HP 83400A has a modulation index of 44% (= 484 µW / 1100 µW).
11 Laser reflection sensitivity is tested using a 95% reflection, an optical coupler (15 dB coupling factor and 1.5 dB main arm loss) and the optical output power shown in Table 2.1 and 2.2.
12 All specifications are given using HMS-10/HP lightwave connectors.
13 Harmonic levels are given for average optical powers and modulation powers listed in Table 2.1 and 2.2. dBc rating is for dBe below the fundamental modulation components.
14



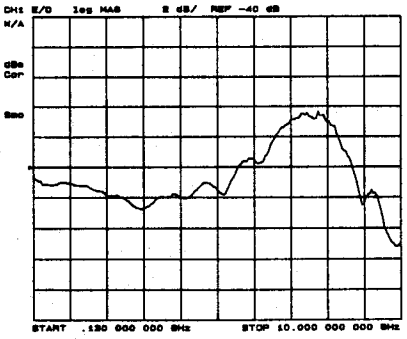
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Table 2.2.
Lightwave source characteristics[8]

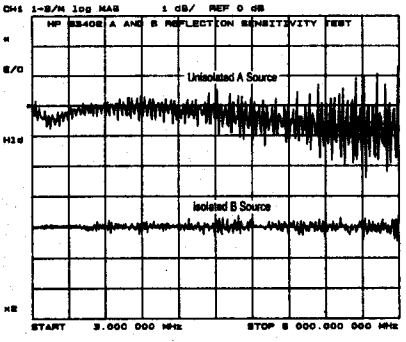
Description	HP 83403A/B	HP 83404A/B[14]
Wavelength	1550 ±20 nm	840 ±20 nm
Spectral width (typical)	≤ 3.5 nm	≤ 1 nm
Average optical output power:		
Maximum	(A) 1500 µW (1.8 dBm)	(A) 3000 µW (4.8 dBm)
Typical	(A) 675 µW (–1.7 dBm)	(A) 2000 µW (3.0dBm)
Minimum	(A) 350 µW (–4.6 dBm)	(A) 700 µW (–1.5 dBm)
Maximum	(B) 1200 µW (0.8 dBm)	(B) 1450 µW (1.6 dBm)
Typical	(B) 500 µW (–3.0 dBm)	(B) 600 µW (–2.2 dBm)
Minimum	(B) 135 µW (–8.7 dBm)	(B) 345 µW (–4.62 dBm)
Responsivity (at 50 MHz, nominal)	(A) 0.014 W/A (–37 dBe) (B) 0.007 W/A (–43 dBe)	(A) 0.063W/A (–24 dBe) (B) 0.011 W/A (–39 dBe)
Modulation bandwidth	300 kHz to 3 GHz	300 kHz to 3 GHz
Modulation frequency resolution[9]	1 Hz	1 Hz
Modulated optical output power (nominal)		
Peak-to-peak	(A) 616 µW (–2.1 dBm)	(A) 2770 µW (4.4 dBm)
Peak	(A) 308 µW (–5.1 dBm)	(A) 1390 µW (1.4 dBm)
Peak-to-peak	(B) 308 µW (–5.1 dBm)	(B) 484 µW (–3.2 dBm)
Peak	(B) 154 µW (–8.1 dBm)	(B) 242 µW (–6.2 dBm)
Modulation index (typical)[10]	(A) 46% (B) 30%	(A) 70% (B) 40%
Laser isolation	(A) 0 dB (B) 28 dB	(A) 0 dB (B) 28 dB
Reflection sensitivity (nominal)[11]	(A) ±1.0 dB (B) ±0.25 dB	(A) ±1.0 dB (B) ±0.25 dB
Optical port return loss (nominal)[12]	(A) 10 dBo (B) 37 dBo	(A) 10 dBo (B) 37 dBo
Harmonic distortion (nominal)[13]	–20 dBc (300 kHz to 1 GHz) –7 dBc (1 GHz to 3 GHz)	–20 dBc (300 kHz to 1 GHz) –10 dBc (1 GHz to 3 GHz)
Laser type	Fabry-Perot	Fabry-Perot
Laser Class	FDA Class I and IEC Class IIIB	FDA Class IIIB and IEC Class IIIB
Compatible fiber	9/125 µm	50/125 µm
Electrical port return loss	14 dB	14 dB



Typical frequency response for HP 83400A/B, HP 83401A, HP 83403A/B and HP 83404A/B sources



Typical frequency response for HP 83402A/B sources

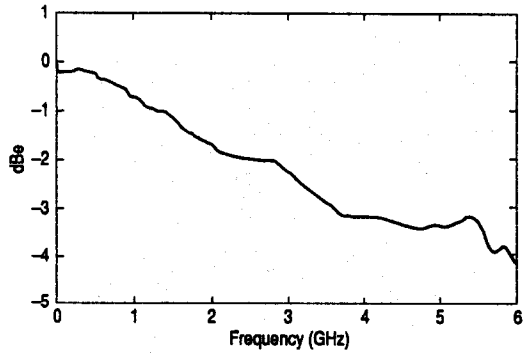


Built-in isolation in the HP 8340xB sources greatly reduces reflection sensitivity compared to the HP 8340xA models (plots show HP 83402 A and B responses to a 95% reflection termination).

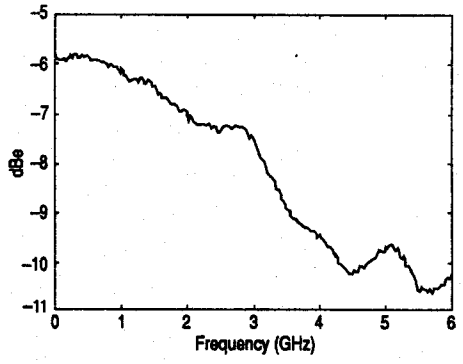
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Lightwave Source Performance Summary

Specifications and *Characteristics (in italics)*	HP 83402C	HP 83403C
Center wavelength[8,9]	1310 ±30 nm	1550 ±30 nm
Center wavelength stability[9]	*0.3% per year*	*0.3% per year*
Spectral Width[8,9]	*<50 MHz*	*<50 MHz*
Average optical output power[8,9]	2000–3000 µW	2000–3000 µW
Optical port return loss	*≥35.0 dBo*	*≥35.0 dBo*
Modulation range	300 kHz to 6 GHz	300 kHz to 6 GHz
RF input power (max)	*+11 dBm*	*+11 dBm*
DC into RF port (max)	20 V	20 V
Electrical port return loss[10]	≥11 dB	≥11 dB
Modulation frequency response (300 kHz to 6 GHz)[8]		
Corrected (disk) (specification)	±0.5 dBe	±0.5 dBe
Corrected (disk)	*±0.31 dBe*	*±0.31 dBe*
Corrected (polynomial)	*±1.5 dBe*	*±1.5 dBe*
Uncorrected	*±0.2/–4.8 dBe*	*+0.2/–4.8 dBe*
Responsivity at 140 MHz modulation frequency	*0.053 W/A (–25.5 dBe)*	*0.053 W/A (–25.5 dBe)*
Modulation (harmonic) distortion[11]		
300 kHz to 1 GHz	*25.0 dBc*	*25.0 dBc*
1 GHz to 3 GHz	*(footnote 12)*	*(footnote 12)*
1 GHz to 6 GHz	*8.0 dBc*	*8.0 dBc*
Third order intercept (min)[11]	*23 dBm*	*23 dBm*
1 dB modulation compression level at 50 MHz	—	—
Equivalent Input Noise		
0.01 to 5 GHz	*–124 dBm/Hz*	*–124 dBm/Hz*
5 to 6 GHz	*–119 dBm/Hz*	*–119 dBm/Hz*
Reflection Sensitivity (300 kHz to 6 GHz)[13]	*±0.04 dBe*	*±0.04 dBe*
Laser Type	DFB	DFB
Laser Class	FDA Class I and IEC Class IIIB	FDA Class I and IEC Class IIIB
Optical Fiber	9/125 µm	9/125 µm



HP 83402C modulation frequency response (characteristic)



HP 83403C modulation frequency response (characteristic)

8 Factory test system
9 No intensity modulation applied.
10 Measured on HP 8703 from 130 MHz to 6 GHz.
11 Measured with +10 dBm RF input power 0.01 to 6 GHz.
12 Changes linearly from 25 dBc at 1 GHz to 8 dBc at 3 GHz.
13 To a Fresnel reflection using a 9:1 optical coupler, averaging factor = 16

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