OCM

OPTICAL CLOCK MULTIPLIER

Applications

PriTel's OCM Series of Optical Clock Multipliers are designed for applications in high data rate fiber-optic communications at 1550 nm:

- pure multiplier factors of 2, 4, 8, and 16 for input bit rates from 10 to 20 GHz

- pseudo bit-error-rate testing at 40 Gb/s or 160 Gb/s using 10 Gb/s bit-error-rate testers

- engineered for optimal stability of pulse amplitudes and rates
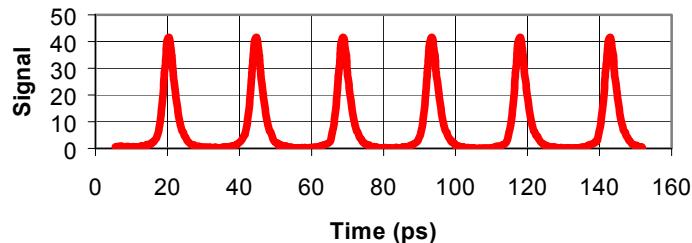
PriTel

Model OCM - 4

Specifications for PriTel's Optical Clock Multiplier OCM

	OCM-2	OCM-4	OCM-8	OCM-16
Multiplier factor	2 X	4 X	8 X	16 X
Insertion loss	<5 dB	<10 dB	<15 dB	<20 dB
Tunable delay	70 ps			
Polarization extinction ratio	>20 dB			
Output (20 GHz or 40 GHz)-to-input (10 GHz) extinction ratio	>35 dB			
Temperature stability	10 ppm/°C			
Dimensions	10 cm x 26 cm x 28 cm			
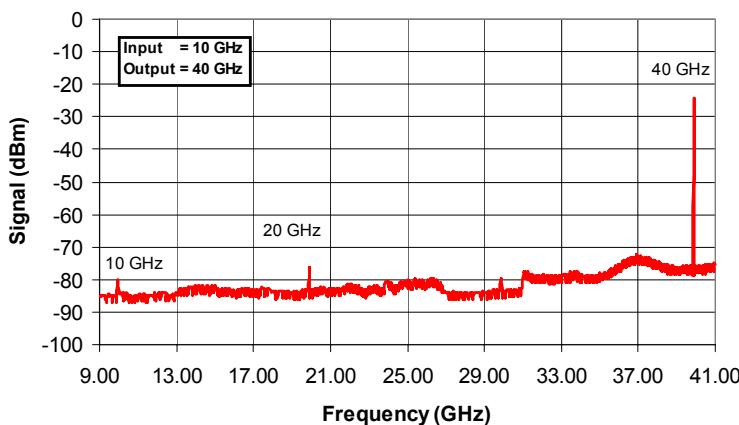
OCM: Streak Camera Trace
Output = 40 GHz

The Sync micrometer precisely adjusts the pulse time delay in one leg to the desired value. The maximum tunable pulse delay is 70 ps.

RF Spectrum Analyzer
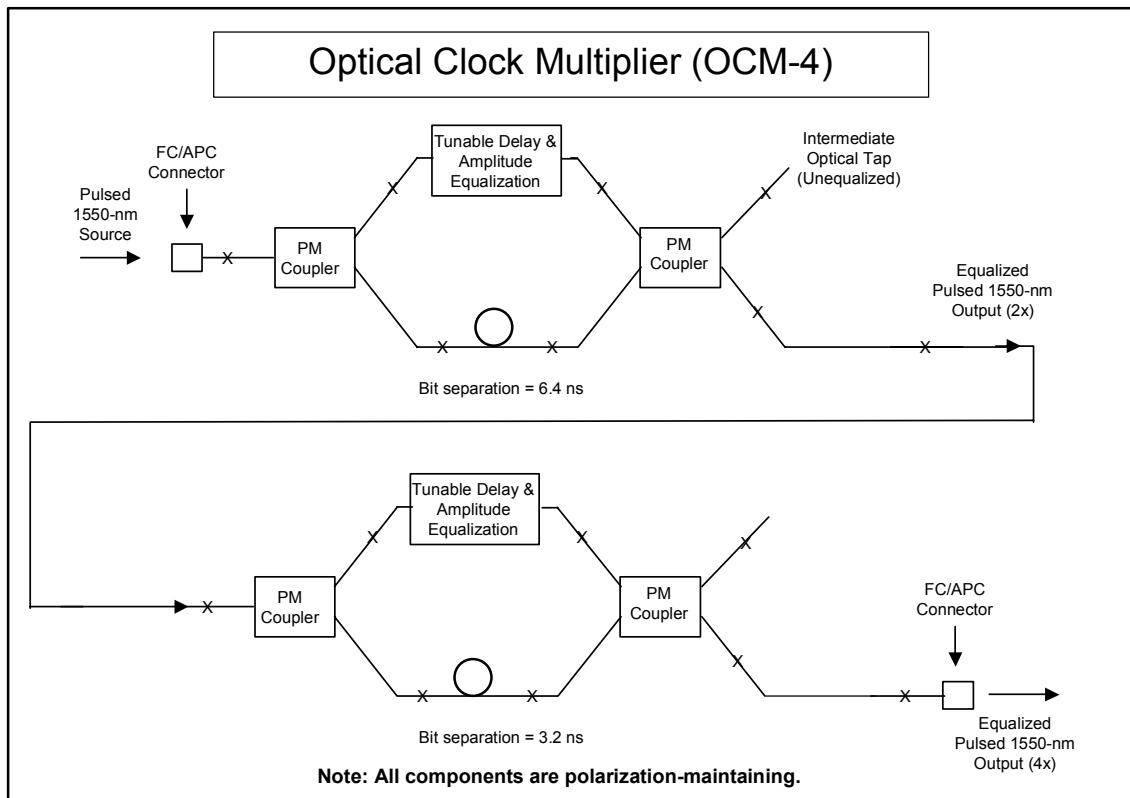
The Equalizer micrometer adjusts the amplitude of one pulse leg so that the two recombined pulses have equal amplitude. The suppression of the input frequency is at least 35 dB.

Principle of Operation

PriTel's OCM uses Optical Time Domain Multiplexing to increase the input pulse rate. As shown in the schematic below, this is accomplished by dividing the input pulse into two separate legs of a Mach-Zehnder fiber interferometer. One leg provides a variable pulse delay and amplitude equalization, and the other leg, a fixed bit-pattern delay. The two pulses are then recombined, interleaving them to produce a repetition rate of two times the input rate. The OCM-4 unit has two cascaded stages of 2X. The OCM-8 and OCM-16 add additional stages of 2X and 4X to the OCM-4.

As shown in the schematic, there is an intermediate optical tap, and the OCM-4 can be configured to provide 2X output pulses. This feature allows the researcher to align the experimental setup at lower rates. When the OCM is operating at 4X output, this 2X intermediate port has unequalized pulses with a reduced input extinction ratio.

For Bit Error Rate Testing with PRBS, the input data pattern is delayed by ½ the pattern length and then recombined to produce the same PRBS at twice the repetition rate. In the example diagram, the delay in the first stage is 6.4 nsec and corresponds to 2^7-1 bits at 10 GHz. For researchers who use several different bit pattern/pulse rate combinations, kits are available for the user to reconfigure the OCM.

Optical Clock Multiplier (OCM-4)

FC/APC Connector

Tunable Delay & Amplitude Equalization

Intermediate Optical Tap (Unequalized)

Pulsed 1550-nm Source

PM Coupler

PM Coupler

Equalized Pulsed 1550-nm Output (2x)

Bit separation = 6.4 ns

Tunable Delay & Amplitude Equalization

PM Coupler

PM Coupler

FC/APC Connector

Bit separation = 3.2 ns

Equalized Pulsed 1550-nm Output (4x)

Note: All components are polarization-maintaining.

ocm.rev11.doc