



## FEMTOCHROME<sup>®</sup> RESEARCH, INC.

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### FR-103MN RAPID SCANNING AUTO/CROSSCORRELATOR



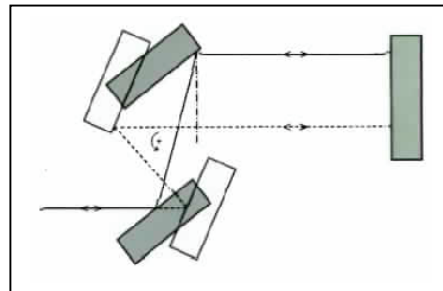
#### Specifications:

- Resolution: < 5fs
- Wavelength Range: 410-1800nm
- Scan Range: > 50ps
- Minimum Pulse Width: < 5fs
- Maximum Pulse Width: 20ps
- Sensitivity:  $(P_{av}P_{pk})_{min} = 0.3(10)^{-7}W^2$
- Fiber Coupled/Free Space
- Interferometric/Noncollinear
- Low Rep Rate Option
- Computer Data Acquisition Option
- VGA Display Option

Maintaining the resolution and stability of the FR-103XL Autocorrelator, the compact FR-103MN provides higher S/N for weak signals while providing a scan range > 50ps. A tighter focusing arrangement is implemented, resulting in more efficient 2nd harmonic generation (SHG). The FR-103MN is an ideal laser diode pulse width monitor, for pulsewidths < 20ps. It is also well suited for other modelocked lasers such as Ti:Sapphire with fs pulsewidths.

#### ROTATING PARALLEL MIRROR ASSEMBLY

Periodic linear delay is introduced by means of a rotating // mirror assembly\*. This unique mechanism results in dispersion-free operation with interferometric resolution. FWHM pulse width measurement error due to delay nonlinearity is < 1%/25ps.



\* Z.A.Yasa and N.M.Amer, Optics Commun., V36, 406 (1981)

### **DISPERSION-FREE, HIGH RESOLUTION**

Using high reflective metallic coated optics (the only transmissive element is an ultrathin ( $\sim 1\mu\text{m}$ ) pellicle beamsplitter), a resolution  $< 5\text{fs}$  is obtained, limited only by the SHG crystal thickness.

### **CROSSCORRELATION**

Two spatially separate synchronized signals can readily be crosscorrelated using the FR-103MN's built-in auxillary input for the second beam. No additional optics is needed for this mode of operation.

### **OPTIONS:**

#### **WAVELENGTH RANGES (/KDP, /BBO, /IR)**

Three NL crystals provide operation over a wavelength range of 410-1800nm. The standard unit with a KDP crystal (0.3mm) covers 530-1100nm (/KDP). Addition of a BBO (0.3mm)[410-900nm] (/BBO) extends the short wavelength range. A  $\text{LiIO}_3$  crystal (1mm), a red extended PMT and an IR beamsplitter extend the long wavelength range [700-1800nm] (/IR). Crystals are AR coated and include fundamental blocking filters covering their operation range. For long term reliability, a desiccator is provided to protect the crystals while not in use. NL crystals of any type, thickness (to  $< 25\mu\text{m}$ ) and cut can be provided for specific applications.

#### **INTERFEROMETRIC OPTION (/IO)**

The FR-103MN's standard configuration uses the non-collinear (background-free) SHG method. As an option, a plane mirror/mount is provided for collinear autocorrelation with background. Using the highest resolution setting of its integration-time switch, the interferometric response of the FR-103 MN is revealed, leading to fringe resolved autocorrelation.[This mode is of low gain/integration, requiring higher input intensity].

#### **HIGH SENSITIVITY OPTION (/HS)**

The FR-103MN is perfectly suited for the monitoring of pulses from low power lasers. The standard noise-equivalent signal level of  $P_{\text{av}}P_{\text{pk}} = (10)^{-7}\text{W}^2$  [using a 1mm  $\text{LiIO}_3$ , and 1ps integration] is further improved using the High Sensitivity Option (/HS) to the unprecedented level of  $(P_{\text{av}}P_{\text{pk}})_{\text{min}} = 0.3(10)^{-7}\text{W}^2$ .

#### **FIBER ADAPTER OPTION (/FA)**

An optional mount is attached on the input variable aperture of the FR-103MN, for easy connection of fiber-coupled beams. Factory aligned, repeated connections without realignment is facilitated. Connector options other than the standard FC/PC or FC/APC are available. This option can also be supplied for the crosscorrelation port.

#### **FIBER COUPLED OPTION (/FC)**

For telecommunication applications, a fixed fiber input is provided rather than the removable (/FA). In this option, all alignment controls are eliminated, rendering the units utmostly robust and plug-and play. The optics is optimized for 1300-1600nm. Input connectors can be customer specified [FC/PC, FC/APC or others].

### **LOW REPETITION RATE OPTION (/LRR)**

The rotation rate of the // mirrors is locked to the repetition rate (or submultiple) of the input beam, with linear phase modulation. Using this option in conjunction with the /CDA or /VGA options, autocorrelation traces are accumulated in typically < 30 secs for any rep rate (as low as 4Hz), and continuously monitored.

### **COMPUTER DATA ACQUISITION OPTION (/CDA)**

An A/D converter board with an RS232 interface is incorporated into the FR-103MN, and traces are displayed on a PC using its associated software. Delay is exactly computed, eliminating any trace nonlinearity. Continuous average, running average, fitting and pulse width readout with standard pulse shapes are featured. Data can be stored and printed. A laptop PC (/PC) can be added to this option for a factory tested complete system.

### **VGA DISPLAY OPTION (/VGA)**

As an upgrade of the /CDA, an embedded PC and a 640x480 VGA display is available for the FR-103MN, rendering the instrument fully complete with measurement display and data analysis, storage and printing capability in a single, compact enclosure. [/CDA is included in this option.]

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### **SPECIFICATIONS**

Pulse Width Resolution (0.05mm crystal)	< 5fs
Scan Range:	> 50ps
Minimum Pulse Width:	< 5fs
Maximum Pulse Width:	20ps
Pulse Width Error:	<1%
Wavelength Range:	410-1800nm
Noise Equivalent Signal (1mm LiIO <sub>3</sub> ):	$P_{av}P_{pk} = 0.3(10)^{-7}W^2$ (w/HS option)
Input Polarization:	Vertical
Dimensions:	4.5" X 4.5" X 9.0"

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