FEMTOCHROME®
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FR-103 WS AUTO/CROSSCORRELATOR

Specifications:

* Pulsewidth Resolution: < 2fs
* Minimum Pulsewidth: < 10fs
* Maximum Pulsewidth: ~ 400ps'
* Scan Range: > 500ps '
* Sensitivity: $[P_{av}P_{pk}]_{min}=10^{-7}W^2$ "
* Wavelength Range: 410-5000nm
* Background-free (non-collinear SHG)
* Crosscorrelation
* Fiber Coupled/ Free Space
* Computer Data Acquisition Option

' 1ns scan range w/WSR option
" w/ PMT [500-1700nm]

The **FR-103WS** is a dispersion-free, NL crystal auto/crosscorrelator for continuous **'real-time'** monitoring of temporal width of ultrashort laser pulses. Offering unsurpassed sensitivity, wide scan range and dynamic range, it is easy to operate. The **FR-103WS** is ideally suited for long pulsewidths (> 100ps), but it is also capable to measure pulses as short as ~ 15fs, from any mode-locked laser over a wide spectral range, for input pulse rep rates > 500Hz*.

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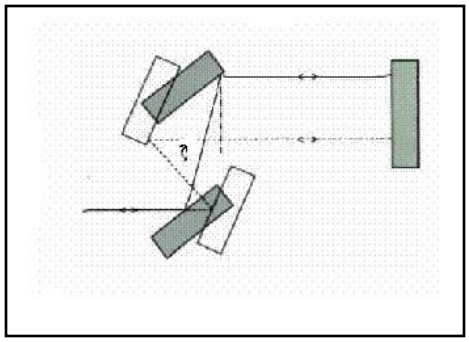
*input pulse rep rates > 4Hz w/ CDA option

DISPERSION-FREE, HIGH RESOLUTION

Dispersion is negligible in the **FR-103WS** for pulsewidths down to ~10fs. Using high reflective metallic-coated optics [the only transmissive element is an ultrathin (<1um) pellicle beamsplitter], an exceptional resolution < 2fs [limited only by the NL crystal thickness] is attained.

PARALLEL (//) MIRROR ASSEMBLY

Rapid scan, periodic optical delay is introduced by means of a parallel (//) mirror assembly.*
Large delays are easily generated, with dispersion-free interferometric resolution.



WIDE SCAN RANGE/LINEARITY

With its wide scan range (~ 500ps) , the **FR-103WS** is ideally suited for measuring longer pulsewidths > 100ps. Its unique mechanism is designed to correct for any delay nonlinearity over such a wide scan range, resulting in an exceptional linear delay.

SLOW SCAN OPERATION

In this mode of operation of the **FR-103WS**, the // mirrors slow down greatly (3 selectable speeds) over a period when the pulses on the two arms of the Michelson Interferometer set-up are overlapping. The // mirrors speed up beyond this range, to return quickly for a repetition of the cycle. This mode renders the unit suitable for **'real-time'** autocorrelation of lasers with any rep rate > 500Hz.
[Input rep rates can be as low as 4Hz w/ CDA option].

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

HIGH SENSITIVITY & WIDE DYNAMIC RANGE

The remarkable sensitivity of the **FR-103WS** is demonstrated by its noise equivalent signal level of $[P_{av}P_{pk}]_{min} = 10^{-7}W^{2}$ *. This is further augmented by an unprecedented dynamic range of ~10^{4}.
These remarkable figures render the **FR-103WS** powerful for the measurement of weak satellite pulses which commonly occur with modelocked lasers:

WAVELENGTH RANGES (/BBO/KDP/IR/xxxx)

Three optimal **NL crystals** provide operation to ~ 5000nm. The standard unit comes with one customer specified NL crystal:

/BBO → 410-600nm
/KDP → 510-1100nm
/IR → 850-5000nm.

These NL crystals accept **vertically** polarized input beams, they are BBAR coated and fundamental blocking filters are provided for their operational range. For long term reliability, a desiccators is provided to protect the crystal when not in use. The standard NL crystal thickness is customer specified (0.1mm/0.3mm/1mm), with attention to the trade-off between resolution (thinner NL crystal) and sensitivity (thicker NL crystal).
Generally, a 0.3mm crystal thickness can be considered sufficient for pulsewidths down to ~30fs. With shorter pulses, a thinner crystal is necessary. For sub 10fs pulsewidths, a custom (<25µm) NL crystal thickness will need to be specified.

/xxxx PD modules for extended IR wavelengths

The photomultiplier (PMT) in the standard **FR-103WS** covers the 410-1800nm operation. This range can be extended in the IR, by plug-in photodiode (PD) modules (/xxxx) which mount in front of the PMT enclosure. The PD module selections are:

/1300 → 1300-2200nm
/2200 → 2200-3400nm
/3000 → 3000-5000nm

Sensitivity is greatly reduced when operating with these PD modules since they lack the gain as provided by a PMT. Typically, a minimum of ~ 5mW avg. power is needed for a subpicosecond modelocked pulse, over the wavelengths covered by these modules.

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* Over wavelengths 550-1700nm , PMT operation w/ 1ps integration time, and a NL crystal thickness of 1mm.

OPTIONS:

CROSSCORRELATION (/CC)

The **FR-103WS** has a built-in auxiliary port for crosscorrelation of two spatially separate synchronized beams. No additional optics is necessary for this mode of operation.

FIBER ADAPTER OPTION (/FA)

An optional gimbal mount with a collimator is installed over the variable input aperture of the **FR-103WS**, for easy connection of fiber-coupled beams. Factory aligned, repeated connections without a need for realignment is facilitated. The /FA is easily removable for a free-space input beam. Its standard adapter is FC [FC/PC or FC/APC]. For operation at 1550nm, a PM-DSF patchcord can be attached to the /FA. The collimator of the /FA is focus adjustable to obtain good collimation if it needs to be used over greatly different wavelengths. A $\lambda/2$ plate holder is also provided within the /FA assembly, for users to install one for their wavelength of operation, if needed for polarization control. The /FA option can also be applied to the CC port [/FA(CC)].

COMPUTER DATA ACQUISITION OPTION (CDA)

A data acquisition board is installed in the **FR-103WS**/CDA, providing an interface (USB) with any PC w/ Windows OS. Its associated software allows traces to be displayed, analyzed [averaged and/or fit with typical pulseshapes (Gaussian and $Sech^2$)] or saved.

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SPECIFICATIONS:

* Pulsewidth Resolution: < 2fs
* Minimum Pulsewidth: < 10fs
* Maximum Pulsewidth: ~ 400ps
* Scan Range: > 500ps (1ns w/WSR)
* Sensitivity: $[P_{av}P_{pk}]_{min}=10^{-7}W^2$ [w/PMT over 550-1700nm]
* Wavelength Range: 410-5000nm
* Background-free (Non-collinear SHG)
* Fiber Coupled/ Free Space
* Crosscorrelation Option
* 'real-time' autocorrelation for any input rep rate > 500Hz
* Computer Data Acquisition Option

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