

BIABooster CE-LIF SYSTEM



BIABooster Platform:

- Agilent Technologies 7100 Capillary Electrophoresis
- Picometrics Zetalif™ Laser Induced Fluorescence Detector
- Capillary Device

This note describes how the μ LAS technology is used with the Agilent Technologies 7100 Capillary Electrophoresis coupled to Picometrics Laser Induced Fluorescence Detector (CE-LIF).

The BIABooster system provides high sensitivity and extended range of DNA size analysis. It is also possible to perform all modes of capillary electrophoresis that are available with the Agilent Technologies CE.

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 info@adelis-tech.com

www.adelis-tech.com

Instrumental Set-Up

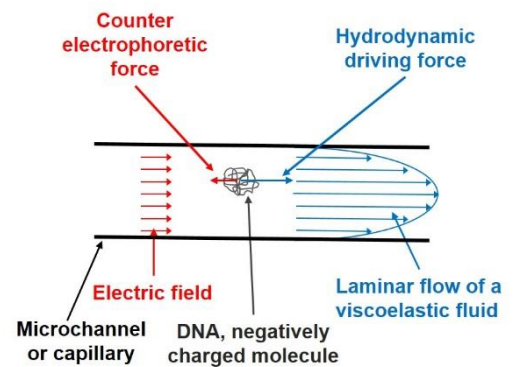
The BIABooster solution consists of the following items:

- Agilent Technologies 7100 Capillary Electrophoresis System including all functional hardware for performing CE separation
- Picometrics Zetalif™ Laser Detector including a Detector, Optical Cell, LIF Cassette, Laser light source with the corresponding emission filter block, LIF Driver for Agilent Technologies Software.
- Proprietary capillary device for μ LAS technology
- BIABooster Analytics software to quantify, qualify and size DNA.

About μ LAS Technology

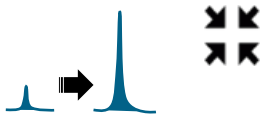
μ LAS technology simultaneously uses electric field and pressure in a viscoelastic fluid to analyse DNA. The capillary device is specially designed to take full benefit of the technology.

Basic principle : DNA is subjected to a pressure-driven viscoelastic flow in combination with a counter-electrophoresis. In these conditions, DNA undergoes a viscoelastic force oriented toward the channel walls, the amplitude of which depends on its size. Because of the parabolic velocity profile of the flow, DNA molecules are transported by the fluid at a rate which depends on their size, like in gel electrophoresis.



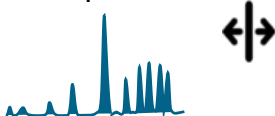
μ LAS basically covers three functions:

C O N C E N T R A T E
On-line concentration



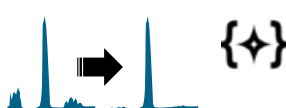
To concentrate DNA "in line": μ LAS enables the design of "DNA traps" within a flow, by joining two capillaries of different diameters. In these traps, molecules are confined precisely at capillary junction, allowing to stack them and/or remove them from the flow. DNA can therefore be concentrated before being separated, for unmatched analytical sensitivity.

S E P A R A T E
Size separation



To separate and quantify DNA fragments of different sizes, which have equal electrophoretic mobilities. As such, it is a new separation technique, complementary to gel electrophoresis since molecules are separated in solution.

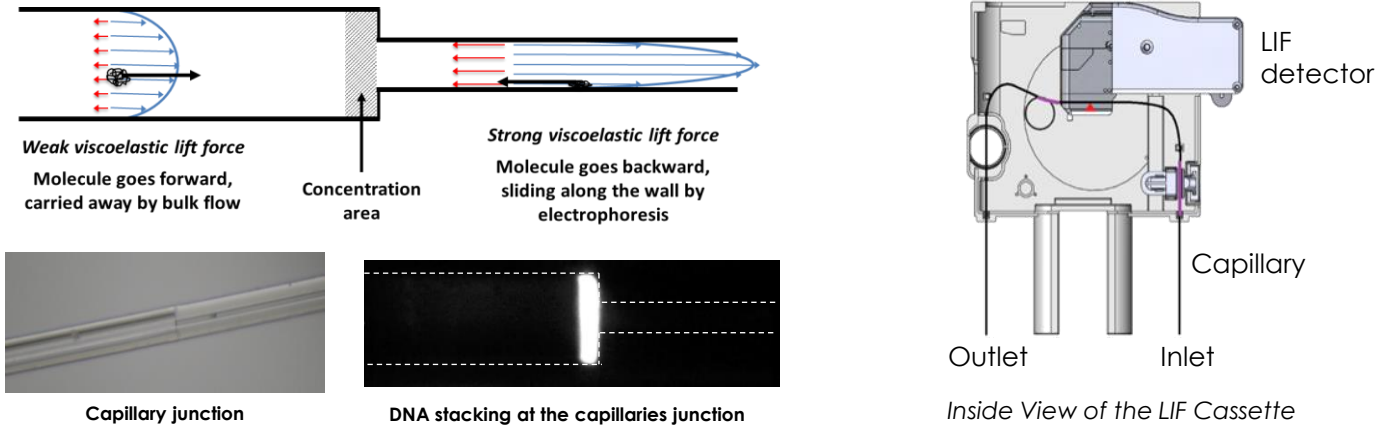
P U R I F Y
On-line purification



To isolate and purify DNA fragments of interest: this functionality is obtained by combining the two functions of concentration and separation, and by adding a collecting function available with the 7100 CE. DNAs of the desired size can be selected, excluding other DNAs present in the sample.

Proprietary Capillary Device

A modified cassette accommodates the integration of a LIF detection system and any type of μ LAS capillary device.



On-line DNA concentration at a μ LAS capillary junction before separation

Specifications for cfDNA Analysis

cfDNA is a promising biomarker for non-invasive monitoring of cancer disease. Getting a DNA profile of plasmatic free DNA is difficult using existing electrophoresis systems. But it is an easy thing with the BIABooster system using the **DNA 1K** and **DNA 10K Kits** which is used for Quality Control of circulating DNA previously purified from plasma.

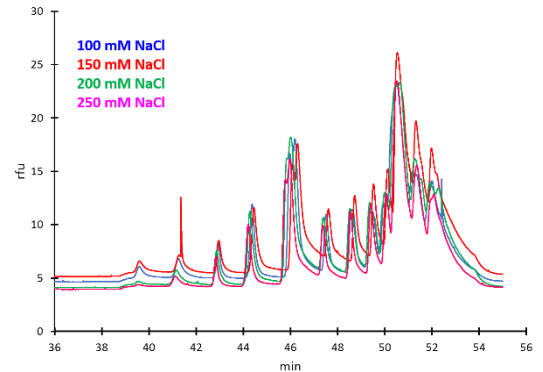
| Analytical specifications | Kit DNA 1K | Kit DNA 10K |
|------------------------------|--|---|
| Sizing range | 0.1-1.5 kb | 1-10 kb |
| Limit of detection (S/N = 3) | 10 pg/ml at 1 kb 100 pg/ml at 100bp | 10 pg/ml at 10 kb 30 pg/ml at 1 kb |
| Sizing accuracy* | +/- 3% | +/- 3% (from 1kb to 6kb) +/- 5% (from 6kb to 10kb) |
| Sizing reproducibility | 3% CV | 3% CV |
| Quantitative range* | 5-1000 ng/ml for cfDNA | 0.5-400 ng/ml for DNA smear |
| Quantitative precision | 20% CV | 20% CV |
| Quantitative accuracy | 20% | 20% |
| Minimum sample volume | 10 μ l (1 μ l injected) | 10 μ l (1 μ l injected) |
| Maximum salt concentration | 15 mM | 15 mM |

* Determined using a commercial ladder as a sample, different from the standard used for reference.
Excitation wavelength : 488nm Laser or LED option available

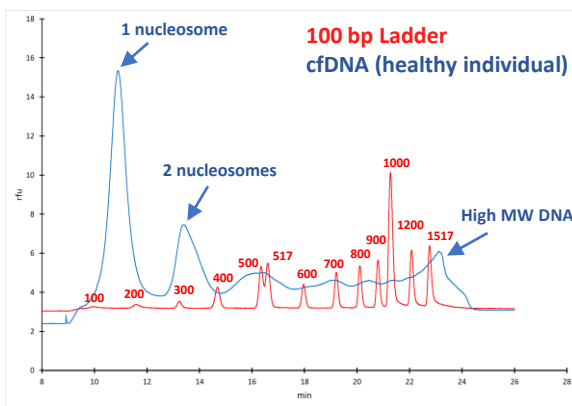
Some BIABooster Applications

cfDNA Analysis in Plasma

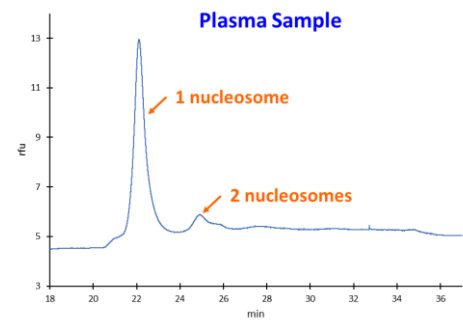
- Unrivalled Sensitivity
- Unrivalled Robustness
- Purification + Concentration + Separation in 30 minutes



Concentration and separation of 100 bp ladder with 100 mM NaCl (blue), 150 mM NaCl (red), 200mM NaCl (green), 250 mM NaCl (pink)



Analysis of purified cfDNA (blue) and 100 bp ladder (red)



Analysis of endogenous DNA of plasma (with Proteinase K + SDS treatment)

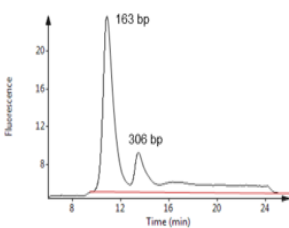
The BIABooster system is able to provide a profile of circulating DNA directly from **plasma**.

cfDNA Sample Quality Control

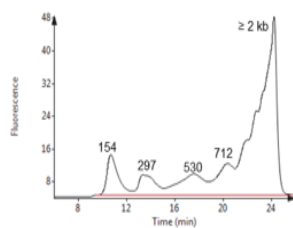


Qualify your samples before PCR and sequencing analysis:

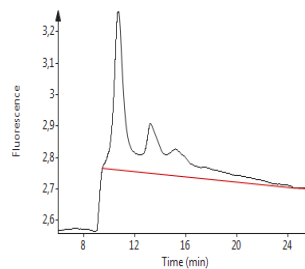
- Concentration
- Integrity
- Genomic DNA contamination



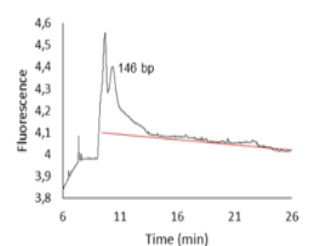
cfDNA at 210 ng/ml
Typical profile



cfDNA at 270 ng/ml
HMW contamination



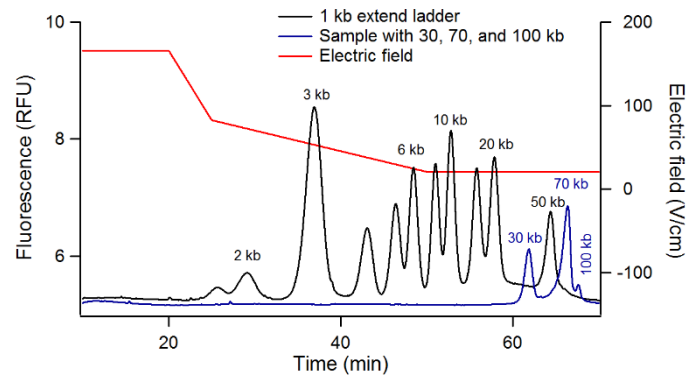
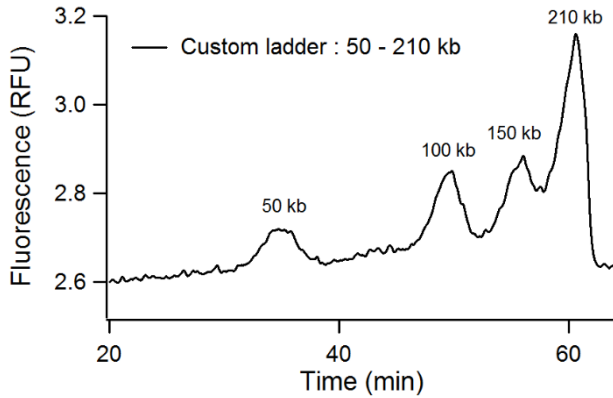
cfDNA at 4 ng/ml
Low concentration of cfDNA
with good integrity



cfDNA at 7 ng/ml
Low concentration of
degraded cfDNA

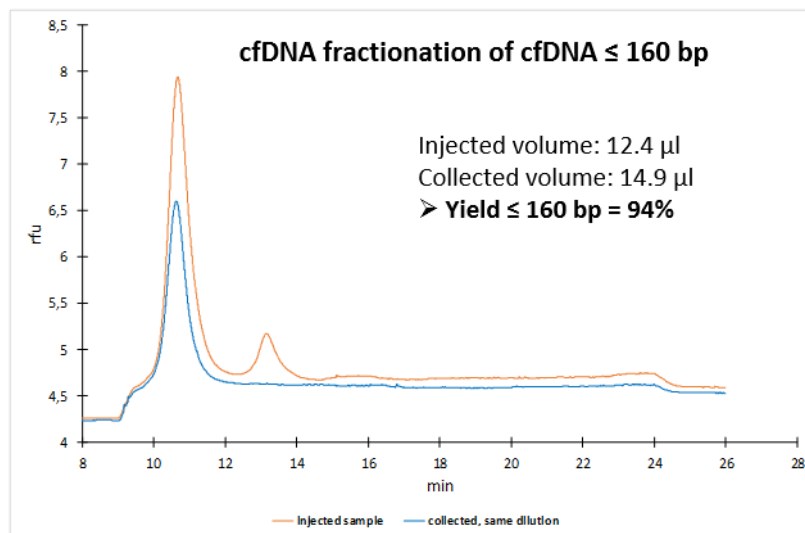
High Molecular Weight DNA Separation

Next generation long read sequencing has increased interest in large DNA fragment analysis. BIABooster platform enables to quantify and qualify DNA fragments up to 150 kb.



cfDNA Fractionation

μ LAS technology can be used to select a DNA size range of interest. This has been used for cell free circulating DNA in which tumoral cfDNA has been reported to have a smaller size compared to constitutional cfDNA. The isolation of tumoral cfDNA is expected to provide a better sensitivity for mutation detection.



References:

CfDNA Biomarker research applications, see [article in Anal. Chem., 2018, 90 \(6\), pp 3766–3774](#)



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 info@adelis-tech.com

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Specifications subject to change without notice as part of our ongoing quality improvement program.
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