Excellence in Surface Plasmon Resonance

BioNavis

See more with MP-SPR!

Multi-Parametric
Surface Plasmon Resonance
For Life Sciences

MP-SPR Applications

Pharmaceuticals

The unique PureKinetics™ feature together with a large working range make MP-SPR an essential tool for new challenges posed by the shift from synthetic to biopharmaceutial drugs. From small molecule measurements through antibody characterization up to controlled drug release strategies, MP-SPR helps you to get ahead of the competition.

Living cells

MP-SPR technology enables you to measure cell adhesion and cell-based interactions in physiologically relevant conditions. This gives an opportunity to characterize drug absorption routes and nanoparticle uptake by living cells.

"MP-SPR allows us to work with living cell monolayers grown directly on the sensor surface or with the aid of e.g. fibronectin and other growth promoting proteins. With MP-SPR, we are able to observe and quantify the differences in cell uptake kinetics of nanoparticles in dependence with the surface characteristics of the nanoparticle and their targeting."

–As. Prof. Tapani Viitala, University of Helsinki, Finland

Antibody characterization

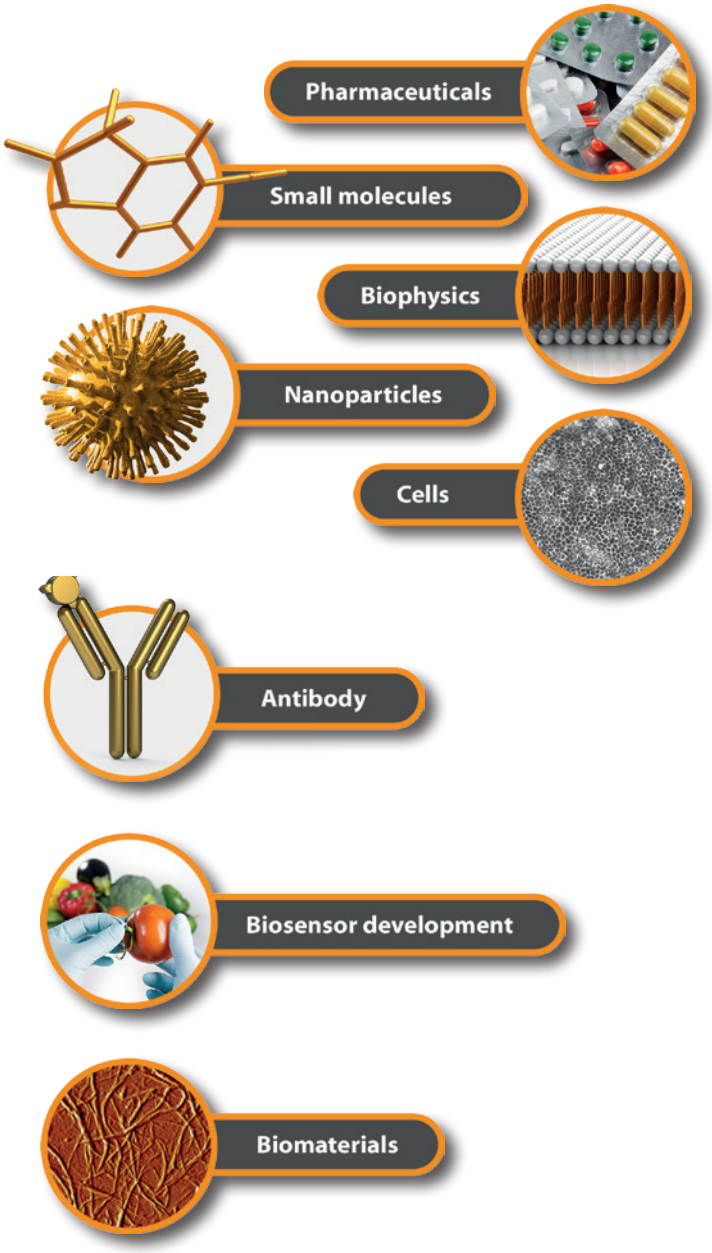
Antibody-antigen interaction affinity and kinetic measurements can be performed in diverse liquids including complex liquids such as 100% serum, blood plasma, cell growth media, urine or saliva.

Biosensor development

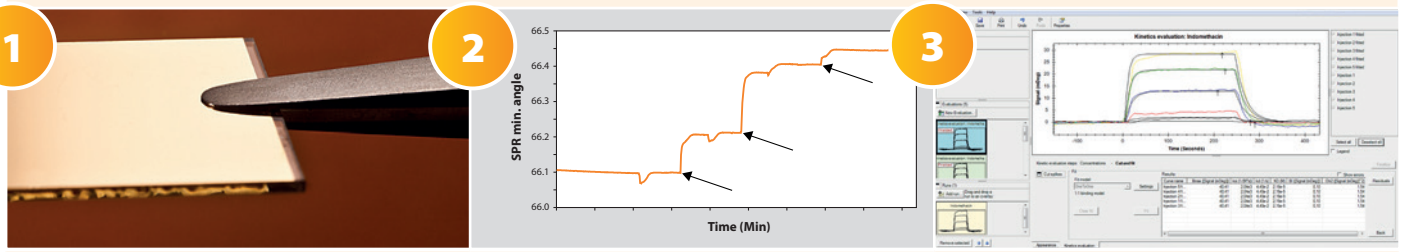
From nanoparticle-based competitive assays through electrochemical sensors to direct assays, MP-SPR shows all the steps of your assay may you develop it on top of glass, polymer, silica, metal surfaces or nanoparticles! Quantify bacteria, cancer cells, DNA, small molecules in real samples, using our concentration analysis module.

Biomaterials

MP-SPR measures interactions on polymers up to 20 µm thick. MP-SPR is the most sensitive label-free technique for biomaterial interaction studies and layer characterization. It allows optimization of formulations for controlled drug release, novel coatings for cell and tissue engineering as well as industrial barrier coatings.



Measurement step-by-step



Choose a ready substrate, e.g. CMD, HisTag, Au, Pt, SiO2, PS, PDMS, nanocellulose or make your own using CVD, LB, sol-gel, spin-coating, self-assembly, etc.

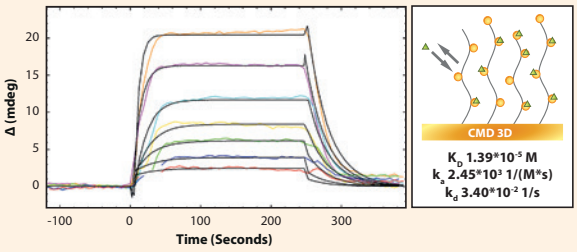
Measure interactions in real-time: on-/off-rates, affinity, adsorbed mass, binding capacity, concentration, etc.

Using TraceDrawer for MP-SPR Navi™, fit measured data with binding models to evaluate affinity(K_D) or half-maximal response (EC50) of the interaction. Multiple fitting models are available including affinity, EC50 and affinity 1:2.

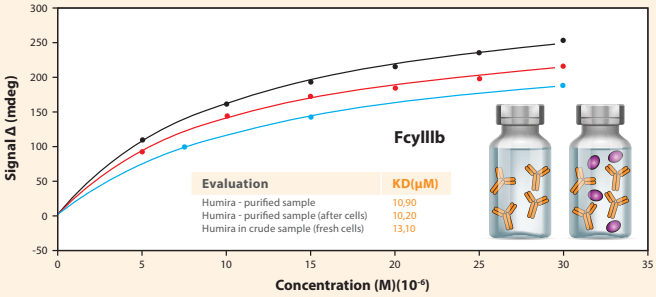
Note: See also our brochure on material science applications!

Why choose MP-SPR?

From small to large molecules: Thanks to PureKinetics™, MP-SPR is a sensitive platform to determine drug-target interactions as well as nanoparticle-target interactions. Label-free interactions are measured in real-time revealing affinity and kinetics of the binding, whether the molecule is small or large.

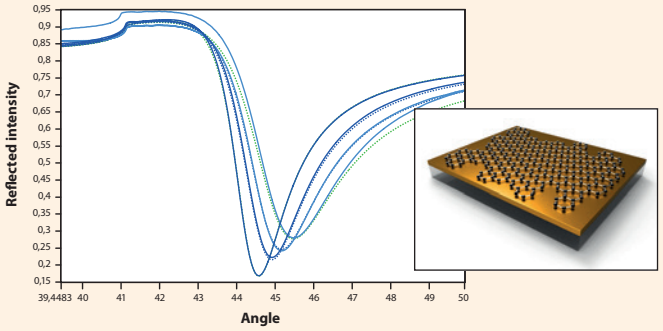


Indomethacin (358 Da) interaction with human serum albumin (HSA). Different concentrations of analyte (colour) are fitted (black curves) using TraceDrawer™ to obtain on- and off-rates as well as affinity.

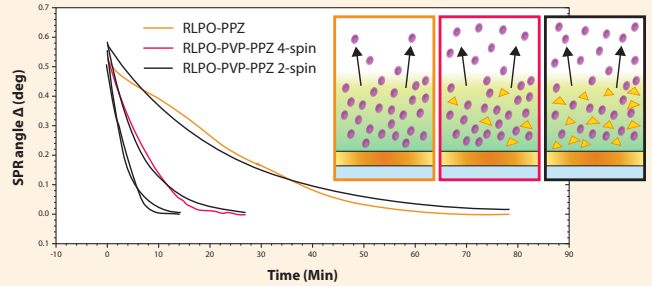


MP-SPR With PureKinetics™ is unique, as it is able to measure biopharmaceutical (Humira) samples even from cell medium including 1 million cells.

From Å to μm: Unique wide scanning angular range measurement ensures compatibility not only with thin layers (from Ångströms) but also thicker layers (up to 20 micrometers).

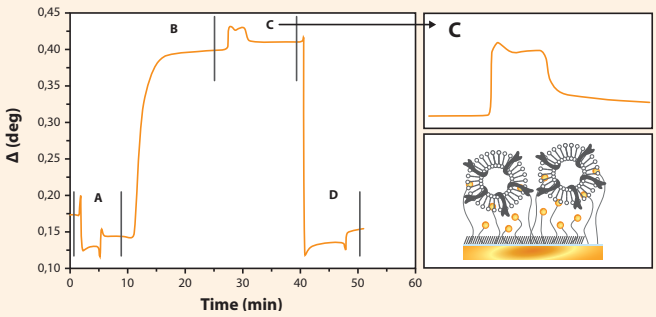


Single monolayer of graphene was measured as 3.7 Å thick at 670 nm wavelength. Thin layers form a single peak in a MP-SPR scan.

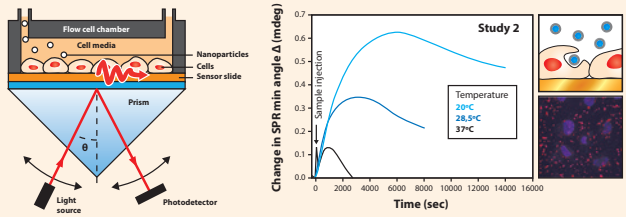


Perphenazine drug release from a micrometers-thick EUDRAGIT® polymer matrix. Faster release rates obtained by adding PVP polymer and varying thickness of the film.

From lipids to living cells: MP-SPR enables to move from drug-target measurements, through drug-membrane interactions all the way to drug-cell interactions.



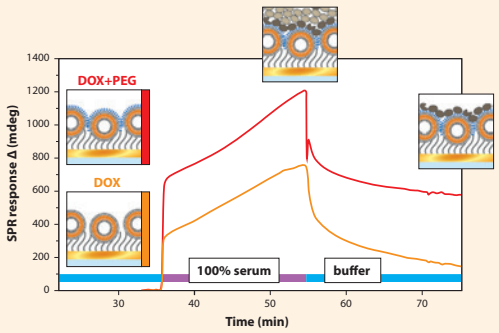
Lipid vesicles are bound to a hydrogel sensor surface and the interaction with a protein is studied. (A) Sensor cleaning injection, (B) Vesicle binding to surface, (C) Protein interaction, (D) Sensor regeneration.

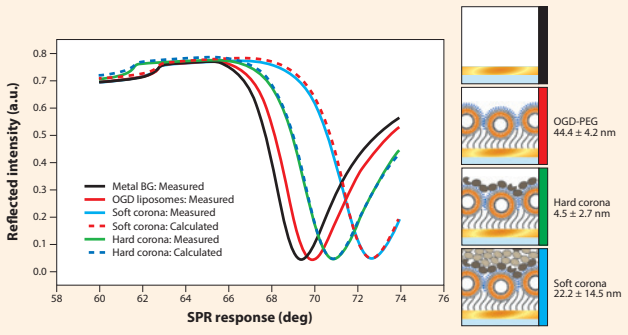


HeLa cells were grown on a sensor slide. The microscopy picture was aqcuired *ex-situ* after the SPR experiment. Uptake of bPEI–DNA polyplexes decreased when temperature was increased.

Not only function, but also structure: Thanks to multiple wavelengths and LayerSolver™, MP-SPR helps you to measure biomembrane interaction kinetics as well as underlying structural changes.

MP-SPR enables assessment of the lipid structure on the surface. Thickness and optical density of the layer shed light on the conformation.





100% serum sample formed soft and hard corona (complex layer of biomolecules) on surface immobilized liposomes. Thickness and refractive index for liposomes and corona layers were determined.

MP-SPR Technology

From traditional SPR to MP-SPR: From measurements to understanding

Surface Plasmon Resonance (SPR) is an established method for biomolecular interaction analysis. It is popular due to its sensitivity as well as its capability to measure label-free and in real-time. Multi-Parametric Surface Plasmon Resonance (MP-SPR) is based on SPR principle, however its unique optical setup measures a full SPR curve which enables new insight into interactions. For instance, PureKinetics™ feature provides measurements of small molecules, lipids and biomaterials without bulk effect. MP-SPR widens the application range of traditional SPR from small molecules up to nanoparticles and even living cells. Measurements can be performed also in complex media, such as 100% serum or samples containing cells.

Additionaly, MP-SPR provides information about layer properties. Thickness and refractive index (RI) data can be utilized in material characterization from Ångström thick layers up to micrometers or to ensure conformation of the molecules on the surface.

What can you measure with MP-SPR?

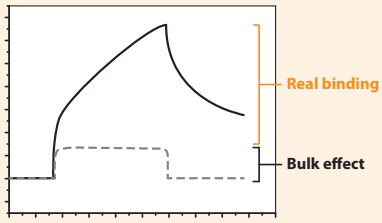
Molecular interactions	Layer properties
Kinetics (k_a, k_d)	Refractive index (n)
Affinity (K_D)	Thickness (d)
Concentration (c)	Thickness & refractive index (n,d)
PureKinetics (k_a, k_d, K_D, c)	Extinction coefficient (k)
Adsorption/Absorption	Density (ρ)
Desorption	Surface coverage (Γ)
Adhesion	Swelling (Δd)
Electrochemistry (E, I, Z (ω))	Optical dispersion (n(λ))

The table above shows properties that can be measured with MP-SPR and traditional SPR, and those that can be measured only with MP-SPR.

Premium quality kinetic data with PureKinetics™ (pat.pend.)

Bulk effect (sometimes called DMSO effect, salt or solvent artifact) is the difference in liquid composition between samples and running buffer. The composition difference is seen as a change in refractive index, which in turn appears as a shift in measured SPR curve. In traditional SPR, imaging SPR or localized SPR, only part of the SPR curve can be seen and therefore, several steps have to be taken in order to separate true molecular binding from the undesired bulk effect.

The unique optical setup of MP-SPR instruments enables cross-correlation of parameters provided by the MP-SPR method and allows simple in-line elimination of interfering bulk signal using PureKinetics™ feature. This feature is available in all MP-SPR Navi™ instruments.



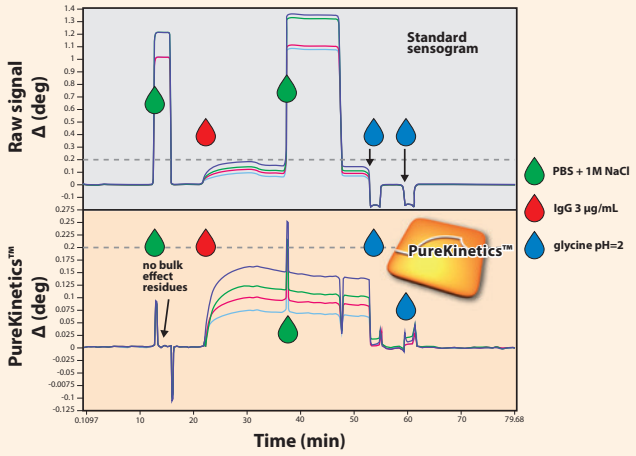
Why is PureKinetics™ the best choice?

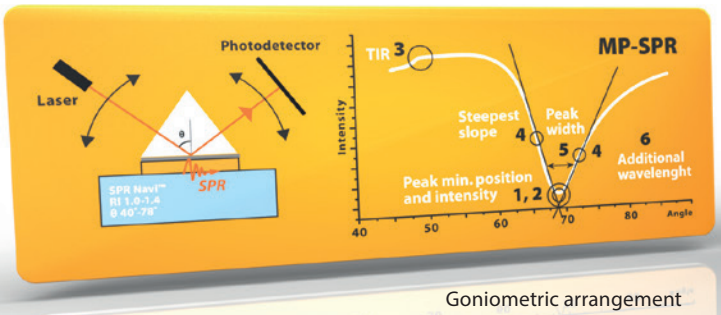
- No reference channel needed
- Tolerates even 5% changes in DMSO concentration
- Does not require multiple DMSO injections for calibration
- Enables measurements in complex media

When is PureKinetics™ essential?

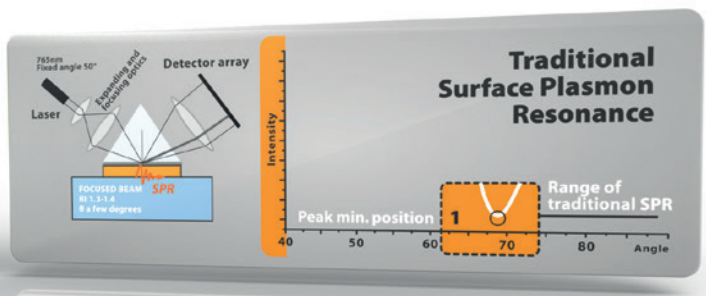
Kinetic measurements

- of small molecules
- on lipid bilayers
- on biomaterials
- in solvents
- in high ion concentration or
- in 100% serum





Goniometric arrangement
Typical range
1.0-1.4 of bulk RI
Wide angular range (up to 38 degrees)
Layers up to microns thick, in gas and in liquid



Focused beam arrangement
Typical range
1.33-1.38 of bulk RI
10 deg of angular range
Layers < 100 nm thick, in liquid

MP-SPR Navi™ Comparison

	MP-SPR Navi™ 420A ILVES	MP-SPR Navi™ 220A NAALI	MP-SPR Navi™ 410A KAURIS	MP-SPR Navi™ 210A VASA	MP-SPR Navi™ 400 KONTIO	MP-SPR Navi™ 200 OTSO
Number of fluidic channels	4	2	4	2	4	2
Autosampler for liquids	96 and 384 well plate, 6-vials	96 and 384 well plate, 6-vials	7-vials	6-vials	–	–
Unattended run	★★★	★★	★	★	–	–
Partial loop injections (minimum sample consumption)	★★★	★★★	★★	★★	–	–
Sample requirement standard / partial injection	300µL / 80 µL	300µL / 80 µL	350µL / 100 µL	350µL / 100 µL	500µL / –	500µL / –
Minimum injected volume	50 µL	50 µL	50 µL	50 µL	50 µL	50 µL
Buffer degasser	★★★	★★★	★★★	★★★	(★★)	(★★)
Compatibility with organic solvents	★	(★★)	★	★★★	★	(★★)
Functionality						
Sensitivity	★★★	★★★	★★★	★★★	★★★	★★★
Kinetics and affinity characterization	★★★	★★★	★★★	★★	★	★
PureKinetics™	★★★	★★★	★★★	★★★	★★★	★★★
Concentration analysis	★★	★★	★★	★★	★★	★★
Thermodynamic analysis	★★	★★	★★	★★	★★	★★
KineticTitration	★★★	–	★★★	–	–	–
Living cell measurements	★	★★	★★★	★★★	★★★	★★
Electrochemistry measurements	(★)	(★★)	(★★★)	(★★★)	(★★★)	(★★★)
Fluorescense measurements	–	(★)	–	(★★)	–	(★★)
Additional lasers (-L): 2-4 wavelengths/flow channel	4X2L	2x2L / 3L / 4L	4X2L	2x2L / 3L / 4L	4x2L	2x2L / 3L / 4L
Sensor slide range	★★★ carboxymethyl dextran (CMD), protein A/G, HisTag, biotin, regenerable avidin, Au, SiO2, PDMS etc.					
MP-SPR Software						
TraceDrawer™: Affinity, concentration & kinetics	★★★	★★★	★★★	(★★★)	(★★★)	(★★★)
LayerSolver™: Thickness and complex RI[a]	(★★)	(★★★)	(★★★)	★★★	(★★★)	(★★★)
Control and Data Viewer	★★★	★★★	★★★	★★★	★★★	★★★

★★★ Optimal ★★ Excellent ★ Good

★ in standard configuration (★) optional feature

a) To get the full benefit, combine MP-SPR Navi™ LayerSolver™ with additional wavelength (-L) feature.

All of our instruments are designed and manufactured in Finland.
To honor the Finnish roots of our products, we named our instruments after Finnish wild animals: OTSO and KONTIO (bears), VASA (a reindeer), KAURIS (a capricorn), NAALI (an arctic fox) and ILVES (a lynx).

More detailed specifications are available in product sheets.
Specifications are subject to change without prior notice.
Information in this catalogue is believed to be reliable. However, no responsibility is assumed for possible inaccuracies or omissions.

Our mission

**We develop Surface Plasmon Resonance (SPR) technology beyond today's capabilities.
We stay ahead of the latest developments to bring the best to the market.
We manufacture MP-SPR instruments with superior features and performance.**

Team of BioNavis

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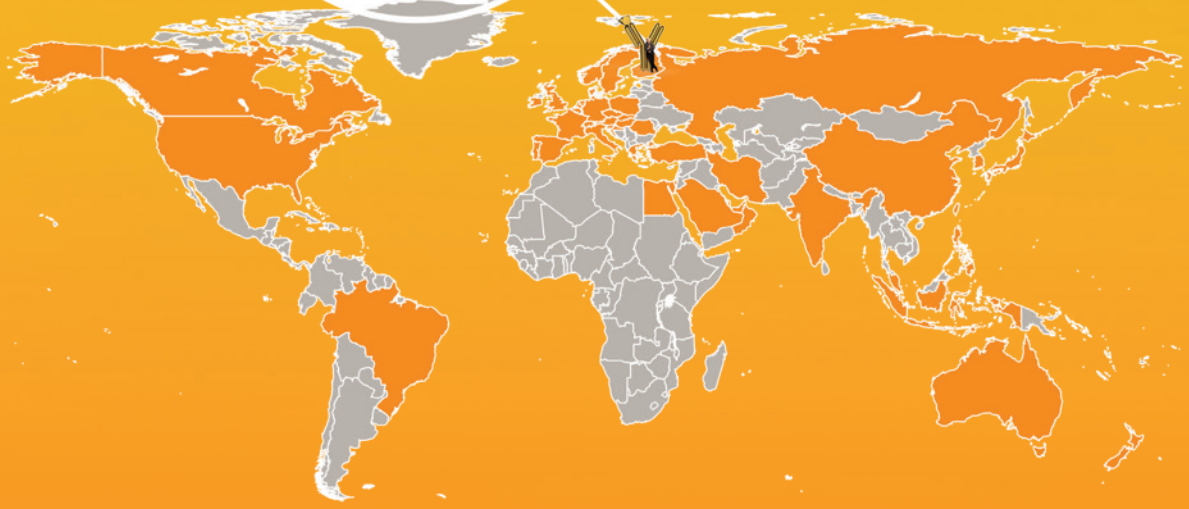
Services

Besides instrumentation, BioNavis provides also measurement and testing services on contract basis. Our team of experts encompasses know-how on biomolecular interactions and on drug screening all the way to coating characterization. We measure different biochemical interactions (e.g. protein-protein, protein-antibody, drug-target, nanoparticle-target) as well as molecule or nanoparticle interactions with hydrogels or polymers, metals or release of such analysts from solid layers.

About MP-SPR Navi™

MP-SPR instruments have been developed in collaboration with Dr. Janusz Sadowski who has been the main driver in the research of SPR technique at VTT Technical Research Center of Finland for over 20 years, and Dr. Ulf Jönsson, the founder and former CEO of Biacore, the company that pioneered the use of SPR spectroscopy for protein interaction analysis.



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