Rules and procedures for use of the instrument GRATING COUPLED INTERFEROMETRY TECHNOLOGY purchased under the MUR Department of Excellence Project 2023–2027

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TECHNICAL CONTACT
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Instrument description

The Creoptix® WAVEsystem is a state-of-the-art optical biosensor platform designed for real-time, label-free studies of binding kinetics and molecular affinity. It offers a highly sensitive advance over conventional Surface Plasmon Resonance (SPR).

Compared with conventional SPR systems, the patented Grating-Coupled Interferometry (GCI) technology offers the following advantages:

Higher intrinsic sensitivity: The light beam travels along the entire chip waveguide rather than being reflected at a single point. This enables detection of extremely weak signals (below 1 pg/mm²), ideal for small molecular fragments (fragment screening) or low immobilisation levels.

Temporal resolution and stability: Refractive index changes are measured as phase shifts in the time domain, making the signal immune to vibrations or thermal drift.

Reduced bulk interference: The evanescent field penetrates less deeply into the biological solution, drastically reducing background interference.

The system features advanced no-clog microfluidics.

The WAVEsystem incorporates WAVEchips, specialised disposable microfluidic cartridges with parallel continuous-flow channels.

It can analyse unpurified biological matrices such as blood plasma, 100% serum, cell extracts, and viruses or particles up to 1,000 nm.

It supports high concentrations of aggressive or non-conventional solvents, including DMSO and acetonitrile.

Flow transitions take just 150 ms, optimising the analysis of weak or ultra-fast interactions.

Main applications

Drug discovery: High-throughput screening (HTS) of small molecules and chemical fragments.

Membrane proteins and GPCRs: Studies of complex, hydrophobic targets directly within nanodiscs or unpurified membrane preparations.

Biologics and antibodies: Affinity characterisation (ka, kd and KD parameters) directly from clinical fluids without purification steps.

Main instrument modules and accessories:
The Creoptix WAVEsystem from Malvern Panalytical is an integrated platform combining precision hardware, smart microfluidic consumables and advanced software.
The system comprises four main modules and accessories designed to work together without requiring complex external components:
1. The central unit (WAVE Core)
This is the main biosensor hardware unit. It contains:

- GCI optical system: Houses the lasers and interferometric detectors that measure light phase shifts along the chip.
- Buffer compartments: Dedicated spaces for the running buffers required for continuous flow.

- Quick-loading port: A front compartment into which the disposable cartridge (WAVEchip) clicks into place, eliminating manual optical alignment.

2. The robotic autosampler (WAVE Sampler)

The sample handling module is fully automated and integrated into the chassis for maximum efficiency:

- Temperature control: Keeps samples refrigerated or at a controlled temperature to preserve protein and reagent stability during extended screening sessions.
- Flexible formats: Accommodates two 96-well plates simultaneously, one 384-well plate (ideal for high throughput), or dedicated racks for larger-volume vials.

3. Disposable microfluidic cartridges (WAVEchips)

The WAVEchip is a self-contained microfluidic module incorporating both parallel flow channels (2 channels for the WAVE model, 4 for the WAVEdelta model) and the sensing surface. It is replaced whenever the application changes, eliminating cross-contamination and instrument blockages.

Chip surface chemistries vary according to the application:

- PCP / PCH: Polycarboxylate hydrogel matrices (quasi-planar or three-dimensional) for standard covalent protein immobilisation via amide coupling chemistry.
- PCP-STA: Streptavidin-functionalised surfaces for high-affinity capture of biotinylated molecules.
- PCP-RST: Regenerable streptavidin chips, ideal for repeated screening of ligand libraries.
- PCP-PAG: Surfaces with pre-immobilised Protein A/G, specifically designed for oriented capture of antibodies (IgG) and Fc fusion proteins.

4. Control and analysis software (WAVEcontrol)

The integrated software package manages the entire experimental workflow, from plate setup to final reporting:

- Guided programming: An intuitive interface for configuring analyte injections and automating wash or regeneration cycles.
- Kinetic fitting algorithms: Instantly processes data from both conventional titration and single pulses from the waveRAPID module, calculating kinetic constants in real time.

Authorised permanent staff and trainers

Surname	First name	Dept./Centre	Contact
Bruno	Stefano	Food and Drug	stefano.bruno@unipr.it
Tognolini	Massimiliano	Food and Drug	massimiliano.tognolini@unipr.it
Tagliazucchi	Lorenzo	Food and Drug	lorenzo.tagliazucchi@unipr.it
De Paolis	Marco	Food and Drug	marco.depaolis@unipr.it

The list of authorised staff is kept up to date and is available in **Annex 2** to these Rules.

Instrument access and use

1) ALIFAR Department research groups with authorised users may access the instrument through their own staff, subject to prior booking on the dedicated Teams platform managed by the Technical Contact. Groups without a designated contact may contact the relevant staff. Access remains subject to booking on the Teams platform. Use of the instrument without a booking will result in a charge for a full working day of eight hours. Use is restricted to staff who have completed the initial training (authorised staff and trainers) or have subsequently been trained by the trainers.
2) Users from other University departments and external users may contact the Scientific Supervisor by completing the analysis request form (**Annex 1**).

Fees

Three user categories apply to instrument usage fees:

1) ALIFAR users: academic and research staff of the University of Parma affiliated with the ALIFAR Department;
2) Internal users: academic and research staff of the University of Parma;
3) External users: researchers and operators from universities, research bodies and public or private institutions.

Type of analysis requested	**Recommended chips (decision tree)**	**ALIFAR USER (hourly rate)**	**INTERNAL NON-ALIFAR USER (hourly rate)**	**EXTERNAL USER (per sample in triplicate)**
1. Macromolecular kinetics (Protein–protein interactions, antibodies or standard amine-based screening – Estimated time: 4 h)	PCP / PCH / PCZ / PCL (covalent surfaces)	4.00 €/h + chip cost	21.00 €/h + chip cost	**€260.00** + chip cost
2. Screening & Small Molecules (Small molecules / low-MW fragments with mandatory DMSO calibration – Estimated time: 6 h)	PCH / GCH (high-density hydrogel)	4.00 €/h + chip cost	21.00 €/h + chip cost	**€390.00** + chip cost
3. Specific capture kinetics (Targets with His-tag, biotin, aptamers or Fc-tag orientation – Estimated time: 4 h)	STA / NTA / PAG / RST (regenerable surfaces)	4.00 €/h + chip cost	21.00 €/h + chip cost	**€260.00** + chip cost
4. Membrane / lipid interactions (Studies of liposomes, lipid vesicles or stable hydrophobic targets – Estimated time: 5 h)	PCP-LIP (pre-immobilised lipophilic groups)	4.00 €/h + chip cost	21.00 €/h + chip cost	**€325.00** + chip cost

Application notes and consumables charging criteria

- **Internal users (ALIFAR and non-ALIFAR):** Charges are based solely on the actual hours the system is occupied (injections, washing and conditioning). The sensor chip selected using the supplier's decision tree is not included in the hourly rate and must be purchased by the user from their research funds.
- **External users:** External users are charged a package rate per sample analysed in triplicate. The final price shown in the table includes the doubled instrument hourly rate (42 €/h) and the technician's rate (21 €/h), multiplied by the estimated average hours required for the specific protocol.
  The cost of the disposable sensor chip is excluded from the fee and will be charged separately at the current Creoptix list cost, or the chip may be supplied directly by the client.
- **Costs according to complexity (DMSO / small molecules):** Small-molecule analyses (Type 2) require DMSO solvent calibration before and after runs to eliminate optical breakthrough effects, as well as intensive fluidics degreasing protocols. This results in an average instrument time of 6 hours (compared with the standard 4 hours), accounting for the difference in the external flat rate.
- **Note on analytical session duration:** The run times shown in the table (4 h, 5 h, 6 h) refer to standard analytical protocols. If the nature of the samples requires an extended experimental design — such as repeated blank (buffer) injections between increasing concentrations to monitor *carry-over*, or particularly long dissociation times — the total session duration will be recalculated based on the actual hours the instrument is occupied. For external users, these changes will be agreed at the quotation stage.

ALIFAR users who use their research funds to contribute to annual preventive maintenance and/or insurance contracts (*all risks*) or to pay for repairs will not be charged until their contribution has been offset in full.

Annex 1. GRATING COUPLED INTERFEROMETRY TECHNOLOGY – ANALYSIS REQUEST FORM

to be emailed to authorised staff

Applicant details

INTERNAL USER AT THE UNIVERSITY OF PARMA
Dept./Centre:
Applicant:
Instrument user:
E-mail:
Telephone:

EXTERNAL USER
Organisation name:
VAT no./Tax code
Address:
Applicant:
Instrument user:
E-mail:
Telephone:

Information on samples and type of analysis

Field	Information required
Analysis objective	☐ KD, ☐ kon ☐ koff, ☐ screening, ☐ competition
Measurement type	☐ Affinity ☐ Full kinetics ☐ Screening ☐ Competition ☐ Other
Number of samples to analyse	
Number of replicates required	☐ Single ☐ Duplicate ☐ Triplicate
Ligand name	
Ligand type	☐ Protein ☐ Antibody ☐ Peptide ☐ Nucleic acid ☐ Other
Ligand molecular weight	
Ligand concentration	
Ligand storage buffer	
Available ligand volume	
Presence of tags	☐ His-tag ☐ Fc ☐ GST ☐ Biotin ☐ Other
Analyte name	
Analyte type	☐ Protein ☐ Antibody ☐ Peptide ☐ Small molecule ☐ Other
Analyte molecular weight	
Analyte stock concentration	
Concentration range to test	
Available analyte volume	
Sample matrix	☐ PBS, ☐ HBS-EP+, ☐ serum, plasma ☐ Other
pH	
Additives present	☐ DMSO, Tween-20, ☐ glycerol, ☐ BSA ☐ Other
DMSO percentage	
Particulates present	☐ YES ☐ NO
Clean-up performed	☐ YES ☐ NO
Clean-up method	☐ Filtration, ☐ centrifugation, ☐ SEC, ☐ dialysis ☐ Other
Storage conditions	☐ 4°C ☐ -20°C ☐ -80°C
Number of freeze–thaw cycles	
Type of chip requested	☐ 2PCH ☐ 4PCH ☐ 4PCP ☐ Streptavidin ☐ Other
Immobilisation method	☐ Amine coupling ☐ His capture ☐ Fc capture ☐ Biotin–Streptavidin
Sample for optimisation	☐ YES ☐ NO
Known regeneration conditions	☐ YES ☐ NO
Negative sample available	☐ YES ☐ NO
Positive sample available	☐ YES ☐ NO
Biological material	☐ YES ☐ NO

Field	Information required
Human origin	☐ YES ☐ NO
Animal origin	☐ YES ☐ NO
GMO	☐ YES ☐ NO
Potentially infectious	☐ YES ☐ NO
Flammable	☐ YES ☐ NO
Irritant	☐ YES ☐ NO
Toxic	☐ YES ☐ NO
Corrosive	☐ YES ☐ NO
Hazardous to the environment	☐ YES ☐ NO
Additional notes	

Bookings may be cancelled up to the third working day before the requested date.

If the booking is not cancelled in time, the service will be charged even if it is not used.

Date …….

Applicant's signature (fund holder)

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Annex 2. Staff authorised to use the instrument

Permanent staff and trainers			
Surname	**First name**	**Dept./Centre**	**Contact**
Bruno	Stefano	Food and Drug	stefano.bruno@unipr.it
Tognolini	Massimiliano	Food and Drug	massimiliano.tognolini@unipr.it
Tagliazucchi	Lorenzo	Food and Drug	lorenzo.tagliazucchi@unipr.it
De Paolis	Marco	Food and Drug	marco.depaolis@unipr.it
Authorised permanent staff			
Surname	**First name**	**Dept./Centre**	**Contact**
Bianchera	Annalisa	Food and Drug	annalisa.bianchera@unipr.it
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Vacondio	Federica	Food and Drug	federica.vacondio@unipr.it
Lodola	Alessio	Food and Drug	alessio.lodola@unipr.it
Instrument users			
Bonicco	Paola	Food and Drug	paola.bonicco@studenti.unipr.it
Faggiano	Serena	Food and Drug	serena.faggiano@unipr.it
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Scarano	Antonio	Food and Drug	antonio.scarano@unipr.it