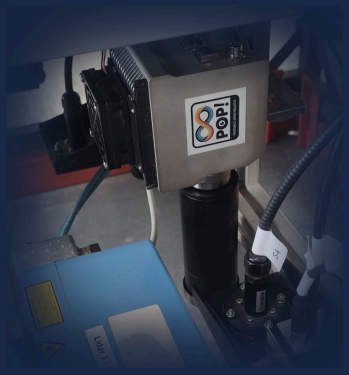
PRECISION AGRICULTURE · PHENOTYPING

PRO-PIX

PHOTONICS OPEN PROJECTS



FROM MEASUREMENT TO DECISION

CAPABILITY
Scene segmentation according to the target you define

MEASUREMENT
One spectrum per selected target: plant organ, whole plant, weed or soil

USE
Phenotyping, canopy monitoring, soil and produce characterisation

DECISION
Compare treatments on a consistent measurement basis

BEFORE / AFTER

Mixed pixel: soil, residue and plant	→ **One spectrum per target, no mixing**
A handful of broad bands	→ **Fine spectrum, 0.06 to 20 nm depending on configuration**
Full hypercube to post-process	→ **Data addressed to the selected zones**
Measurement with no visual record	→ **Spectrum tied to its RGB image**

DESCRIBE YOUR MEASUREMENT PROTOCOL.

Which target, which crop, which growth stage? We help you identify the spectral configuration that best fits your application. Develop and validate your method on the ONE-PIX kit, then transfer it to PRO-PIX.

Tel. +33 7 83 41 41 36
sales@photonics-open-projects.com
www.photonics-open-projects.com

Readings that compare from one plot and one date to the next, because the target measured is always the same.

"The sensor segments the scene before measuring: each spectrum describes a homogeneous target, crop, weed, organ or soil."

1 CURRENT LIMITATIONS

- **Field measurement rests on a pixel that mixes soil, residue and vegetation.** Whatever the target, the signal is diluted by everything around it.
  The index then depends as much on ground cover as on the true state of the target.
- **RGB and multispectral sensors offer only a handful of broad bands.** Enough to map vigour, rarely enough to characterise.
  Heterogeneity is detected without its cause being explained.
- **Conventional hyperspectral imaging generates huge volumes of data.** Most of it is discarded in post-processing.
  The cost shifts to processing and the delay to the end of the campaign.

2 ADDRESSED MEASUREMENT

1 OBSERVATION
The scene, through a built-in 1080 px RGB camera that also supplies the colour reference.

2 SEGMENTATION AND MEASUREMENT
A segmentation model isolates the target you defined, crop, weed, organ or soil; the spectrometer measures those zones only.

3 RESULT
One spectrum per selected target, analysed on board in near real time: what leaves the sensor is already analysable data. The hypercube analysis step is avoided.

3 PRIORITY APPLICATIONS

FIELD PHENOTYPING

SITUATION Trial plot, sensor on a mast, carried on foot or vehicle-mounted, from 1.5 m.

MEASURED Scene segmentation, then spectral measurement of the selected targets.

RESULT One spectrum per micro-plot, plant or identified organ.

Compare treatments on homogeneous targets, free of ground-cover bias.

CANOPY MONITORING OVER TIME

SITUATION Same plots, repeated passes over weeks.

MEASURED Same protocol at every pass, RGB reference retained.

RESULT A spectral time course, and any index computed on the selected target.

Place a growth stage or a trend against a stable baseline.

MOUNTING ON A ROBOT OR CARRIER

SITUATION Outdoor pass, battery or PoE powered.

MEASURED Driven by ROS or the Python SDK, hardware and software triggers.

RESULT Geolocatable measurements as the pass proceeds, no laboratory rework.

Fit spectral measurement into an already robotised route.

PRODUCE AND MATERIAL CHARACTERISATION

SITUATION Fixed station: samples, batches or products shown to the sensor.

MEASURED Contactless measurement, no preparation, zone by zone.

RESULT One signature per sample, comparable batch to batch.

Objective grounds for a sorting or grading decision, upstream or downstream.

WHAT CHANGES

01 ON-BOARD ANALYSIS
One index per target, returned at the point of observation.

02 CHOSEN TARGET
The spectrum covers the target you defined.

03 VISUAL RECORD
Every spectrum keeps the image of the zone that produced it.

04 FIELD-MOUNTABLE
IP65, under 700 g, ROS and Python SDK: measurement happens in the field.

TECHNOLOGY LICENSED FROM ARVALIS / PHOTONICS BRETAGNE

SPEC. PRO-PIX

PRECISION AGRICULTURE · PHENOTYPING

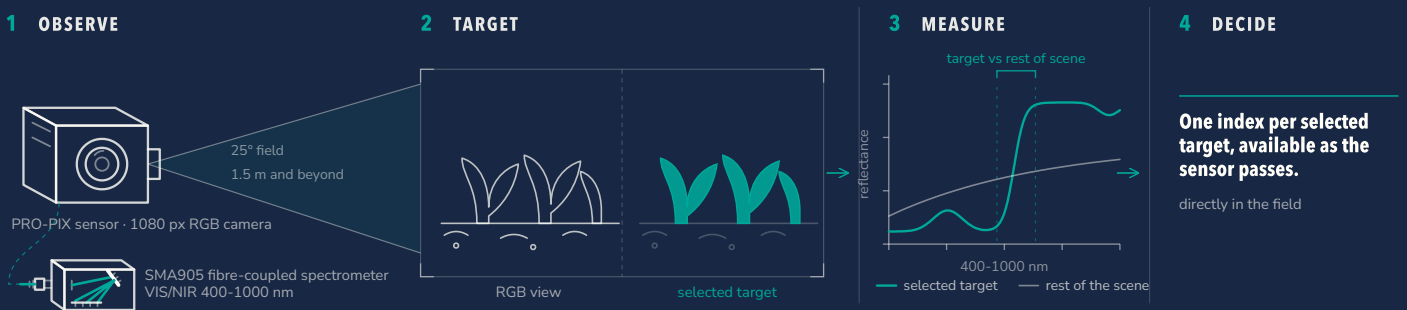
- **Your on-board algorithms remain your property**
- **Method proven on ONE-PIX, transferred to PRO-PIX**
- **OEM white-label integration**
- **Designed and made in France, in Lannion**

SPECIFICATIONS

SPECIFICATION	PRO-PIX VIS/NIR	PRO-PIX SWIR
Typical spectral range*	400-1000 nm *The range is chosen to suit the spectral question.*	900-2500 nm
Spectral resolution*	0.5 nm typical (0.06 to 20 nm depending on configuration) *The finer the resolution, the better the discrimination and the longer the integration time.*	
Built-in RGB camera	1080 px, segmentation and colour reference	
Measurement and analysis rate**	4 to 10 Hz at best *Segmentation, measurement and analysis included: this is the rate at which usable data leaves the sensor.*	
Typical working distance / FOV	1.5 m to infinity / 25°	
Power / Connectivity	xVolt battery or PoE / GigE	
Control software	Graphical interface / Python SDK / ROS	
Dimensions / Weight***	125 × 90 × 90 mm / < 700 g	
Ingress protection / Temperature	IP65, complete system / 0-40 °C	

* depending on the spectrometer selected. ** depending on the number of clusters and the segmentation and integration times. *** excluding the remote optical head

OPERATING PRINCIPLE: ADDRESSED MEASUREMENT



1 RGB observation · 2 zone segmentation · 3 addressed spectral measurement · 4 on-board analysis inside the sensor, 4 to 10 Hz

DOCUMENTED RESULTS

Results obtained with PRO-PIX:

- Canopy monitoring documented over four passes spread from D to D+35: RGB images, spectral indices derived from the measurements and addressed-measurement masks at each date.
- Full chain published: RGB camera, segmentation model, vegetation/soil mask, addressed spectral measurement, output.
- Partners and users: ARVALIS-Institut du Végétal · Photonics Bretagne · Groupe Roullier · Photon Lines

WHO FOR?

- **Phenotyping platforms**: compare treatments on homogeneous targets.
- **Integrators and agricultural robotics teams**: add spectral measurement to an already robotised run.
- **Seed and agri-input R&D**: qualify an effect on a stable measurement basis.

CONDITIONS AND LIMITS OF USE

- Working distance from 1.5 m: the sensor observes a scene.
- 4 to 10 Hz at best, depending on the number of clusters.
- Addressed measurement requires a segmentation model suited to your target, crop and growth stage.
- **A spectral measurement is not an agronomic diagnosis:** interpretation remains a matter for your protocols.
- IP65 across the complete system, 0-40 °C temperature range.

LET'S SETTLE THE TARGET BEFORE THE CONFIGURATION.

We start from your agronomic question to define the configuration. Indicative lead time: three months. Rental is available for an evaluation in real conditions.

WHAT TO SEND US

- → The target to measure: organ, plant or soil
- → The crop and growth stage concerned
- → The working distance and carrier available

Tel. +33 7 83 41 41 36 · sales@photonics-open-projects.com · **www.photonics-open-projects.com** · 4 rue Louis de Broglie, 22300 Lannion, France
Technology licensed from ARVALIS / Photonics Bretagne