NANOPAT:

Process Analytical Technologies for Industrial Nanoparticle Production

Ioannis Kakogiannos, IRIS

This project is funded by the Horizon 2020 Framework Programme of the European Union under Grant Agreement Number **862583**

Agenda

- Intoduction of NANOPAT (15 min) – Ioannis Kakogiannos, Coordinator
- Feedback round (5 min)
- Training session on PDW (45 min) – Marvin Munzberg (UP)
- Break (5 min)
- Training session on OF2i (45 min) – Christina Hill (BRAVE)
- Break (5 min)
- Training session on TUS (20 min) – Nicola Palombo (IRIS)
- Feedback from the audience and discusión (30 min)

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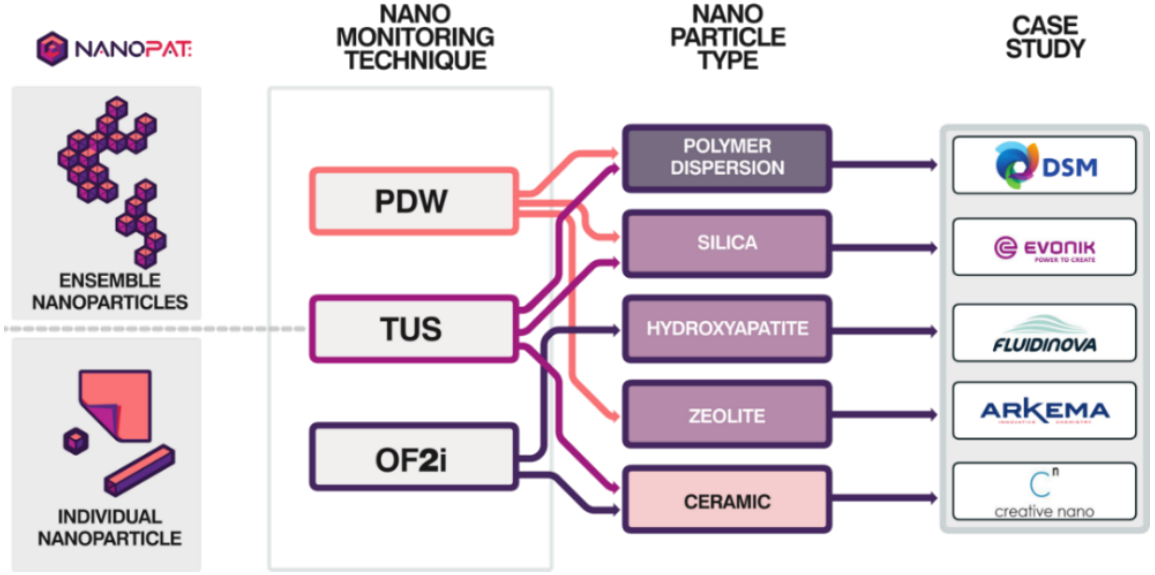
Scope of the project

The overriding goal of NanoPAT is to deliver three novel, real-time nano-characterisation Process Analytical Technologies (PAT) validated in five different industrial manufacturing environments, including real-time data handling for digital production process monitoring and quality control.

- Photon Density Wave spectroscopy (PDW)
- OptoFluidic force induction (OF2i)
- Turbidity spectrometry (TUS)



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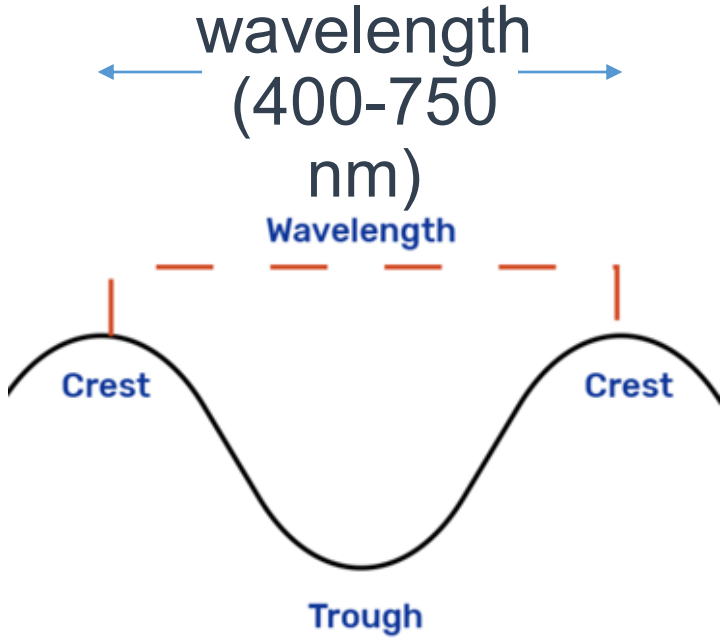
The problem of NPs size measurement

NPs use in commercial products

NPs are smaller than light diffraction limit!



50 nm NP

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Main Objectives

- To develop inline monitoring tools based on PDW, Of2i and TUS Spectroscopy for the real time characterization of polymer dispersions, nano-silica and zeolite NPs
- To design innovative data elaboration techniques for PAT applications
- To set up the most suitable nano-characterization integrated solution for the production of polymer dispersions in each case study
- To maximize the impacts of NanoPAT, including growth and job creation, via post project industrial commercialization of the project outcomes

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Consortium

- 8 countries
- 16 partners
  - *5 RTO's*
  - *8 SME's*
  - *3 Large's*
- Coordinator: IRIS
- Technical Management: UP
- Budget: €4.968.508,79
- Duration: 4 years

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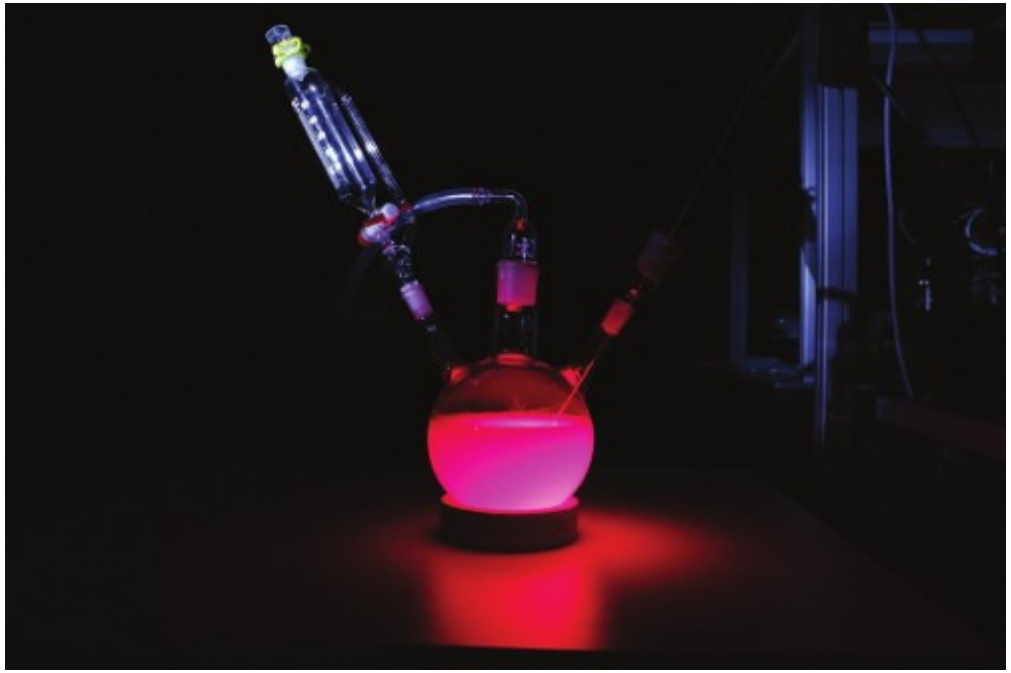
Photon Density Wave spectroscopy (PDW)

Lead Partner: PDWA

Inline PAT capable of calibration-free quantification of light absorption and light scattering in highly turbid, highly concentrated liquid dispersions, even under strong stirring conditions.



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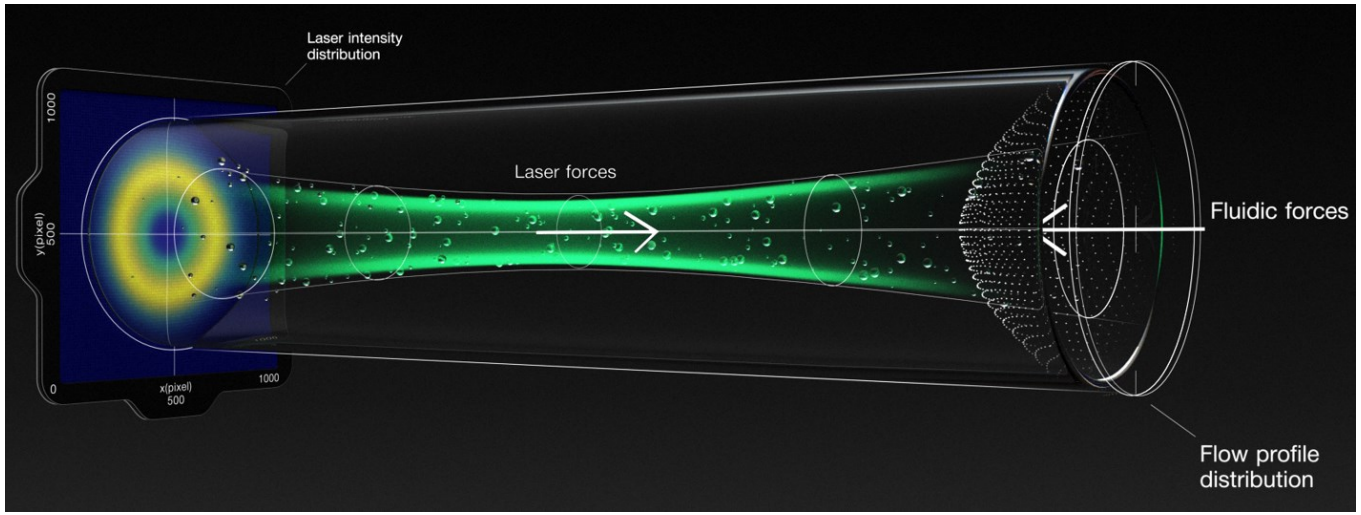
OptoFluidic force induction (OF2i)

Lead Partner: BRAVE



Of2i is arranged as a high throughput counting method for real-time process monitoring. The principle is based on the combination of very defined fluidic- as well as optically induced forces acting on particle streams.

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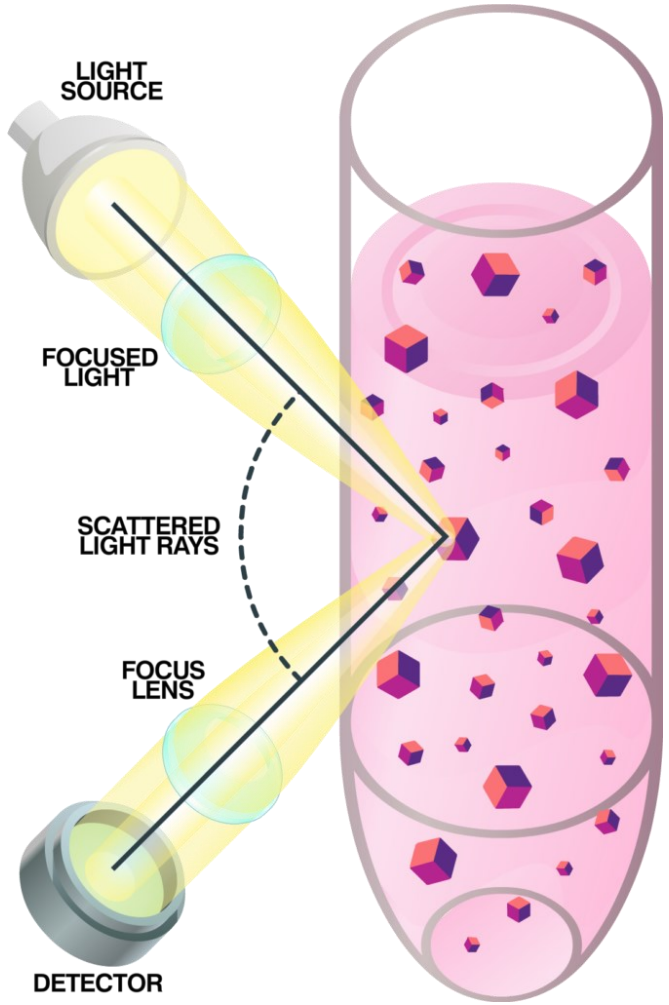
Turbidity spectrometry (TUS)

Lead Partner: IRIS

A flexible optical technique for monitoring the evolution of suspending particles which size ranges from approx. 100 nm up to few microns.



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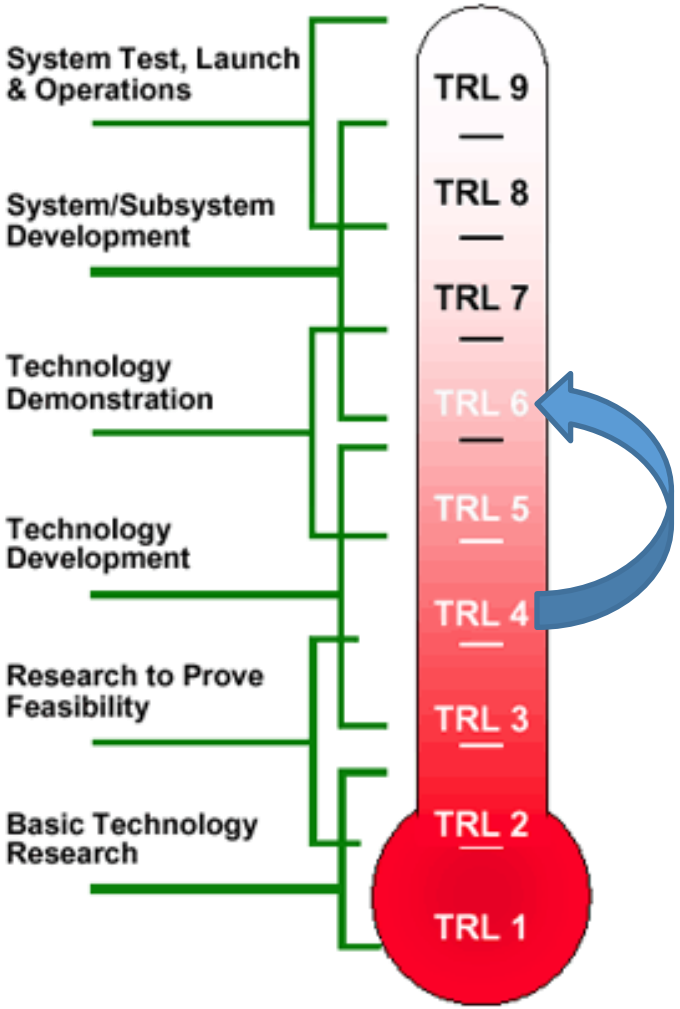
Technology readiness



The three technologies will be advanced from the “lab-status” (TRL 4) to a technology demonstration level for inline/online process monitoring at pilot scale in the industrial environment (TRL 6) of the **NanoPAT** industrial partners.

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Case Studies

Silica (Partner Lead: EVONIK)

Real-time in-situ monitoring of the genesis of nanostructured silica under different precipitation conditions.

Hydroxyapatite (Partner Lead: FLUIDINOVA)

Nanohydroxyapatite particle size characterization using online OptoFluidic force induction (OF2i) technology.

Ceramic (Partner Lead: Cnano)

Monitoring of ceramic nanoparticle suspensions in pilot scale production of nanocomposite coatings.

Polymers (Partner Lead: DSM)

Monitoring Particle Formation of Polyurethane dispersions and Polyacrylate emulsions.

Zeolite (Partner Lead: ARKEMA)

Continuous inline characterization for the manufacturing of zeolites in batch and continuous systems.

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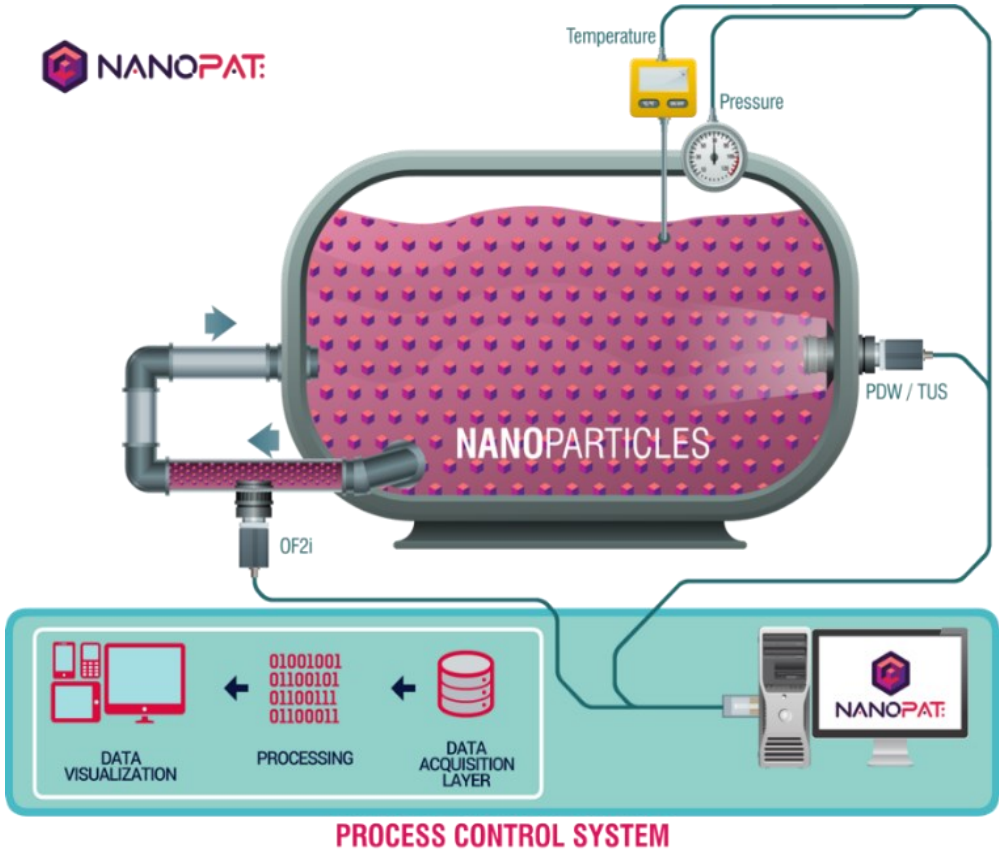
Advanced monitoring system



All processes will feed data separately to a monitoring system, to be developed within the project.

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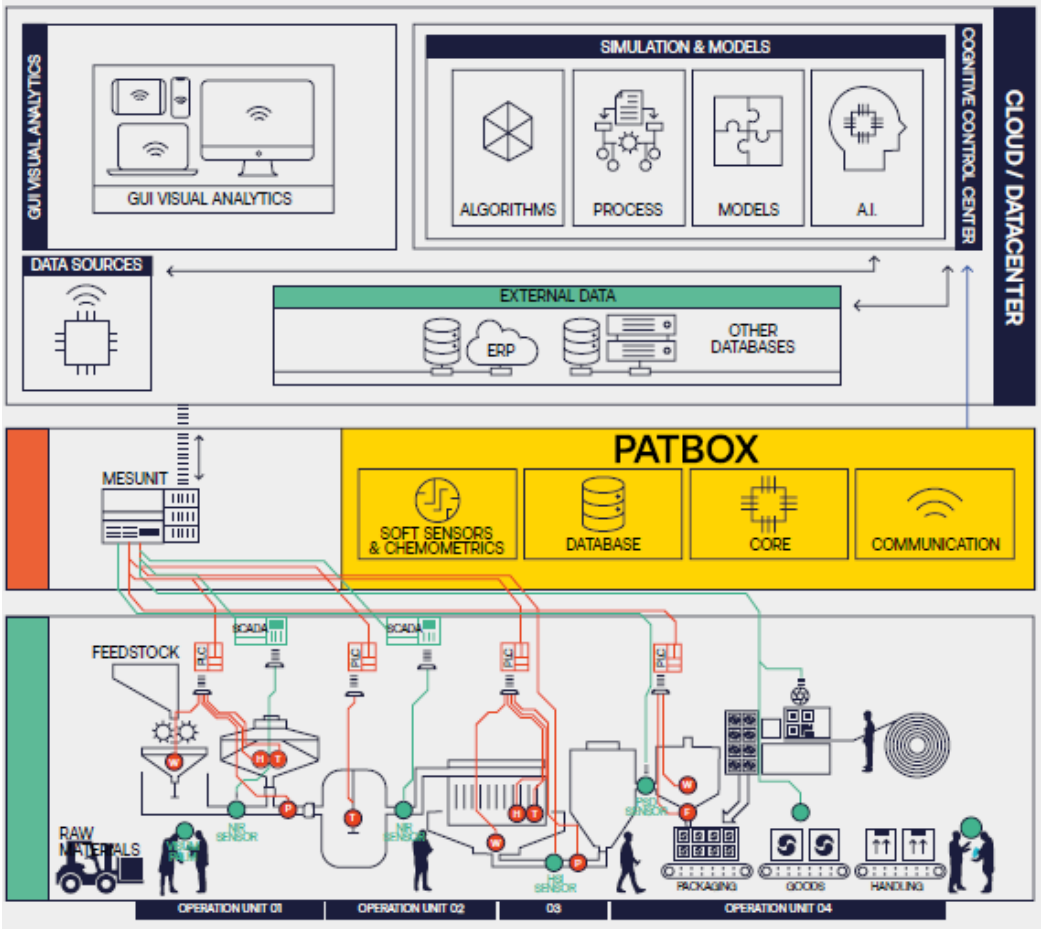
Advanced monitoring system

A vertical architecture is proposed and interconnection with SCADA and ERP systems will be achieved.



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Advancements, Current stage and next step

- Prototypes have been developed
- Validated in Lab scale
- Pilot scale validation undergoing

- Next step is the production scale validation

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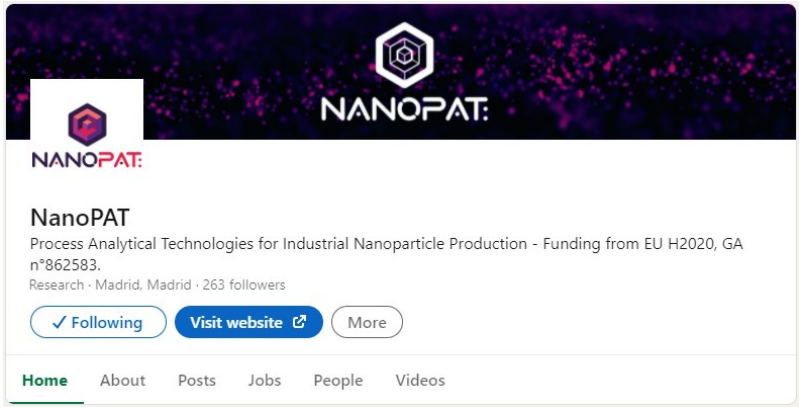
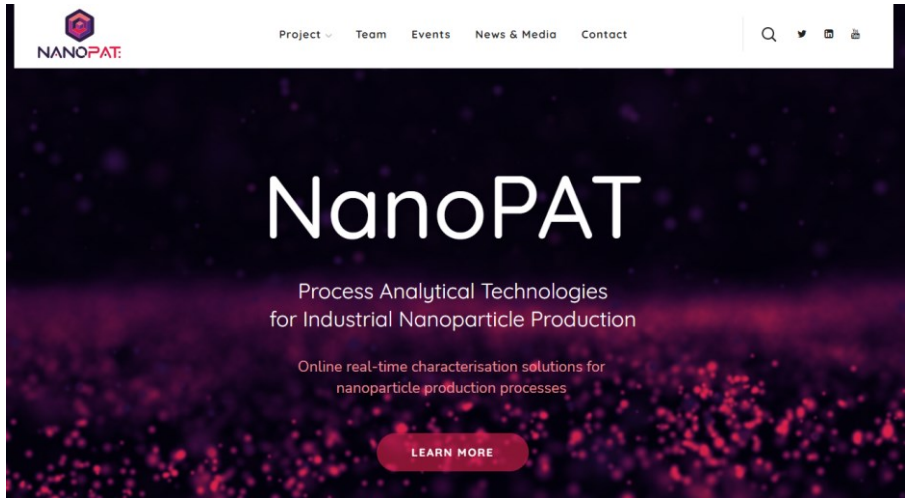
Get in touch

https://www.nanopat.eu/





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THANK YOU FOR YOUR ATTENTION

Happy to discuss with you during the Q&A Session!

Ioannis Kakogiannos, Project Coordinator

Email: ikakogiannos@iris-eng.com

IRIS

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