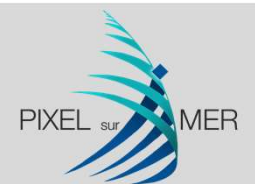




Structural health monitoring on racing sailing boats

by using fiber optic technologies

By Romain Guyard



*EPIC Online Technology Meeting on
Laser Range Finders and Sports Optics*



CONTENTS

Organization introduction

What we do : fiber optic sensors implementation

What we can offer / what we need



Romain Guyard



*EPIC Online Technology Meeting on
Laser Range Finders and Sports Optics*



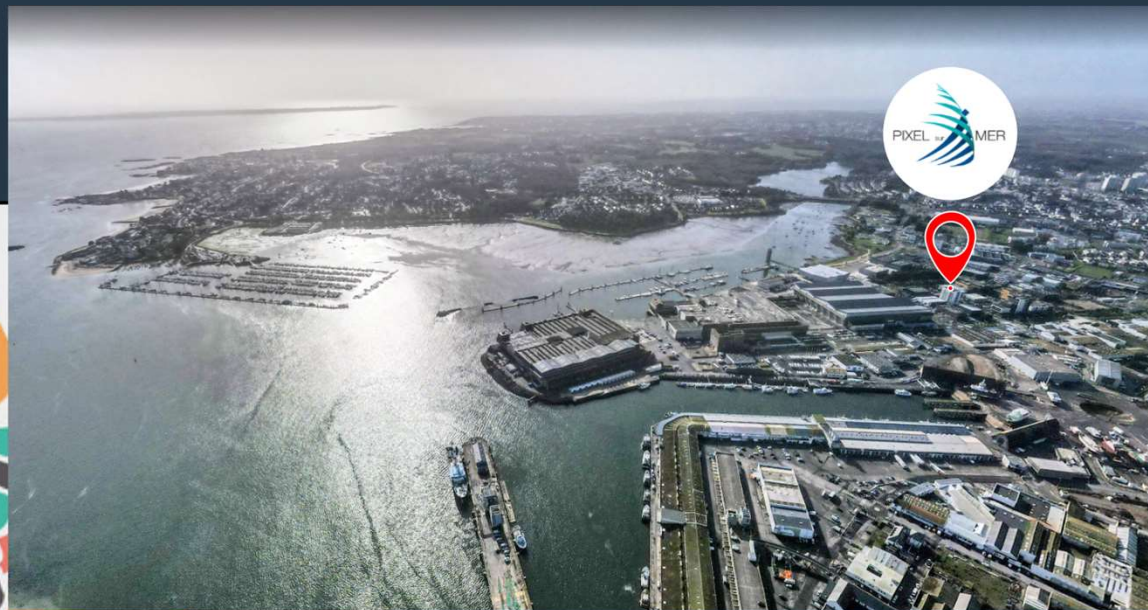
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EPIC Online Technology Meeting on Laser Range Finders and Sports Optics

ORGANIZATION

- 2008 CREATION
- 17 CO-WORKERS
- 2 M € TURNOVER
- 50% INTERNATIONAL PROJECTS
- 25 PROJECTS IN 2021





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DESIGN OFFICE

PRODUCT & SOFTWARE DESIGN

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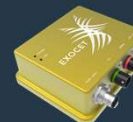
EXOCET Blue

Data acquisition



Exocet Silver

Pilot & on-board calculator



Exocet Gold

Flight controller

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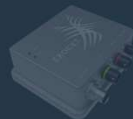
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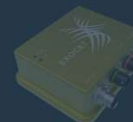
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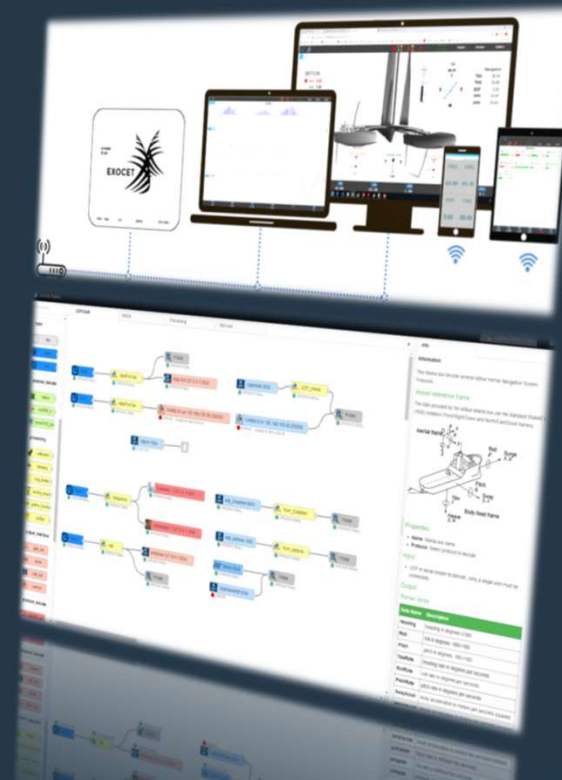
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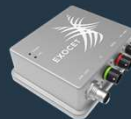
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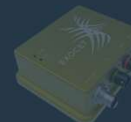
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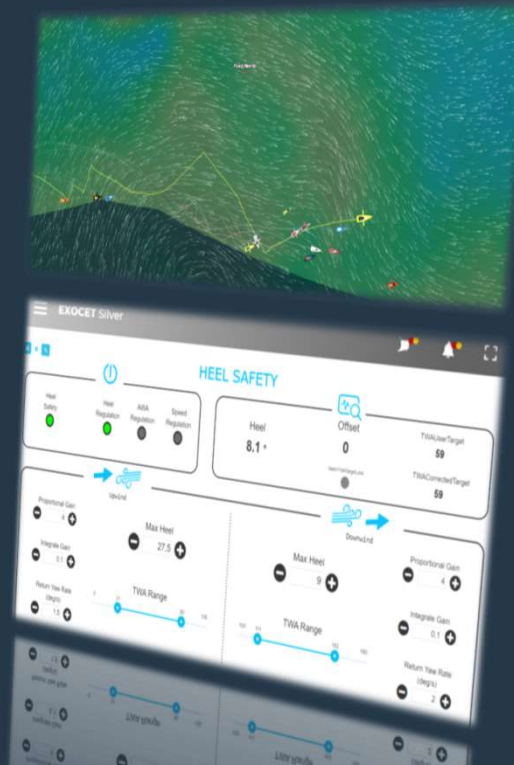
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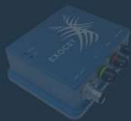
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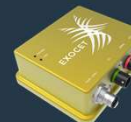
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ON-BOARD SYSTEMS INTEGRATION

CABLES & ELECTRONIC SYSTEMS

SUPPLIES and INSTALLATION

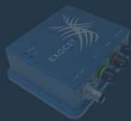
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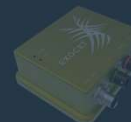
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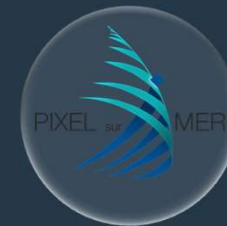


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ON-BOARD SYSTEMS INTEGRATION

CABLES & ELECTRONIC SYSTEMS

SUPPLIES and INSTALLATION

OPTICAL FIBER

STRUCTURE HEALTH

MONITORING

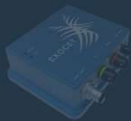
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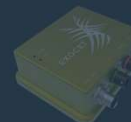
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Why?

Safety reason

Performance optimisation



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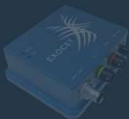
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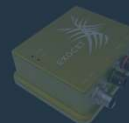
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WHY SHM ON RACING BOATS?



Vendée Globe

Offshore race

~70 days



Rough sea state



High speed sailing
~20-25 knts (50 km/h)



Structural damaging



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WHY SHM ON RACING BOATS?



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Offshore race
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Occupied Skipper



Necessity



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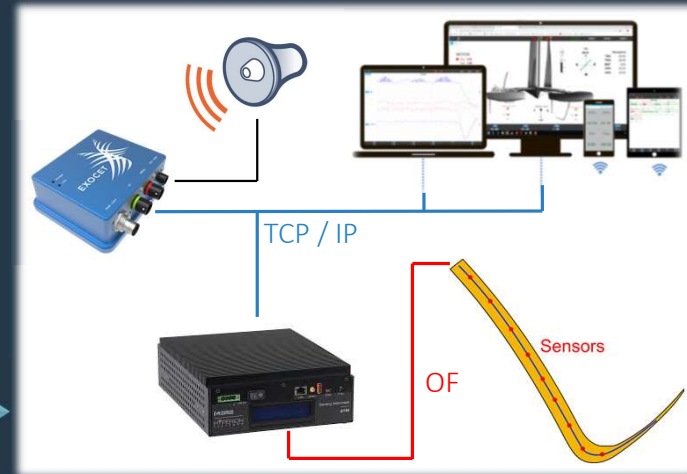


Vendée Globe
Offshore race



Occupied Skipper

Necessity



Structure health monitoring system highly recommended



Rough sea state

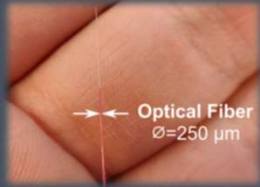


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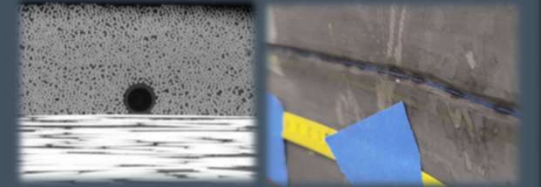
WHY OPTICAL FIBER?



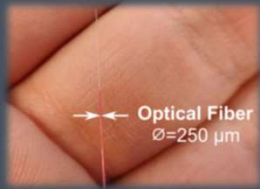
Highly compact



Easily integrable
Light weight



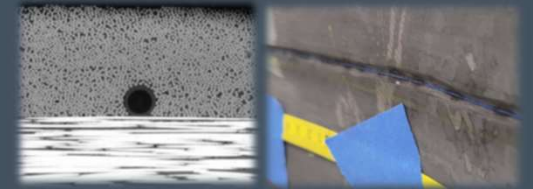
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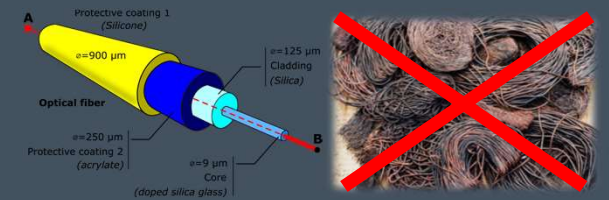
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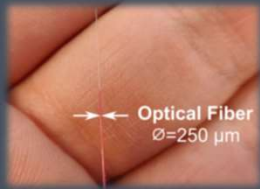
Suitable for marine environment



No corrosion



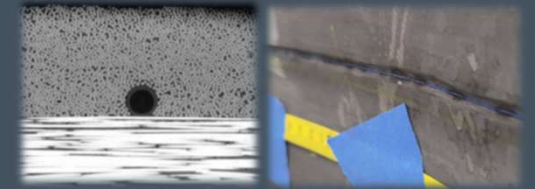
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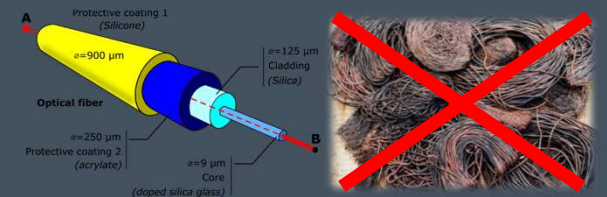
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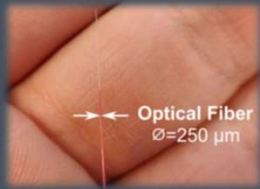
High precision measurement



10 micrometers lengthening of 1 m long bar



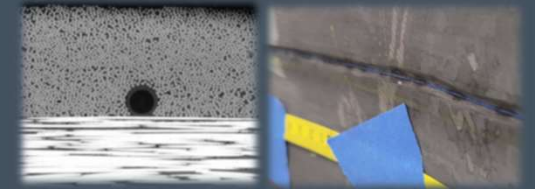
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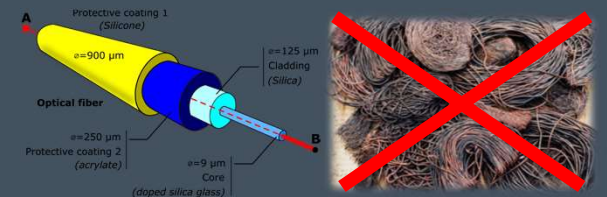
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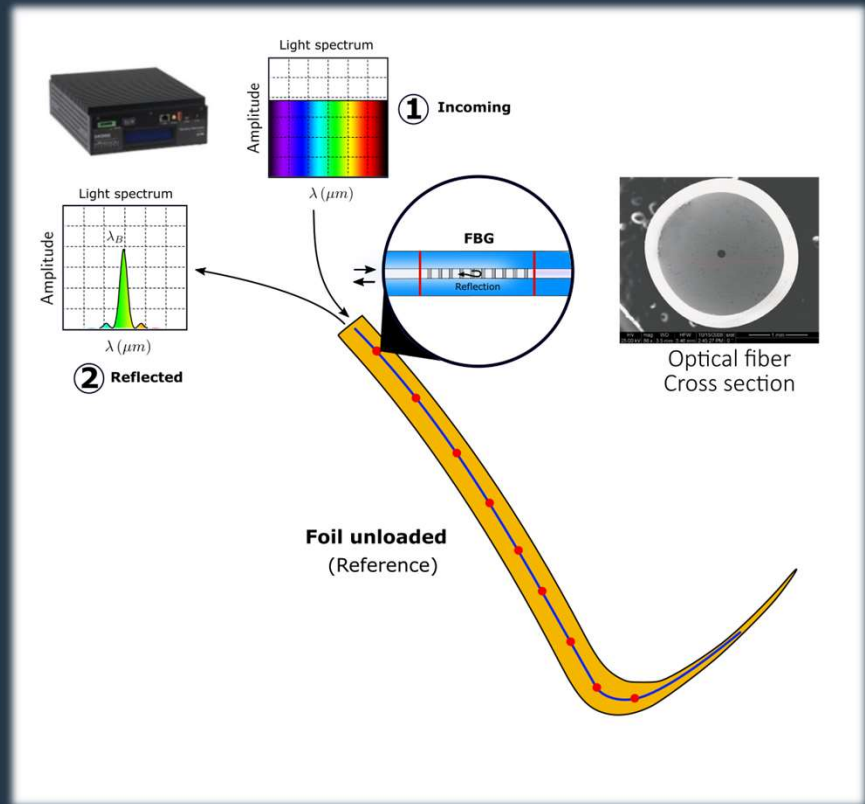
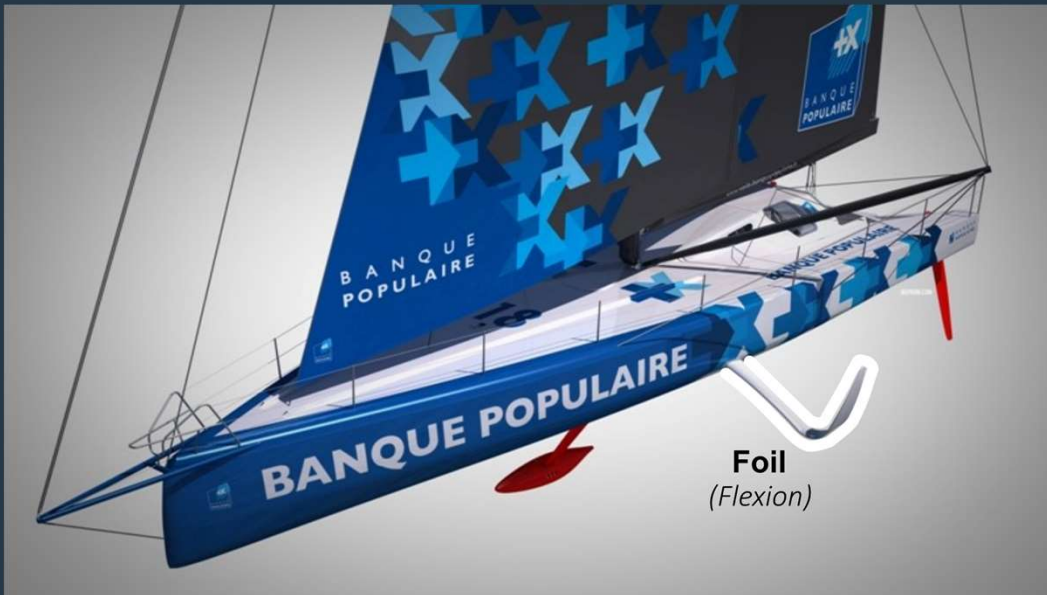
High frequency measurement



10 Hz or more

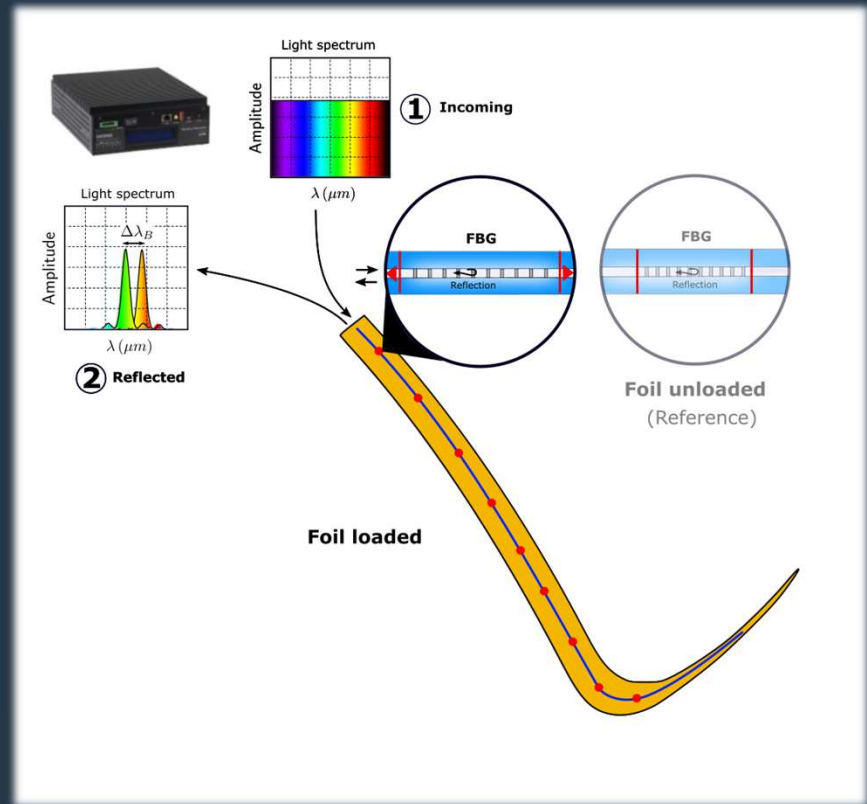
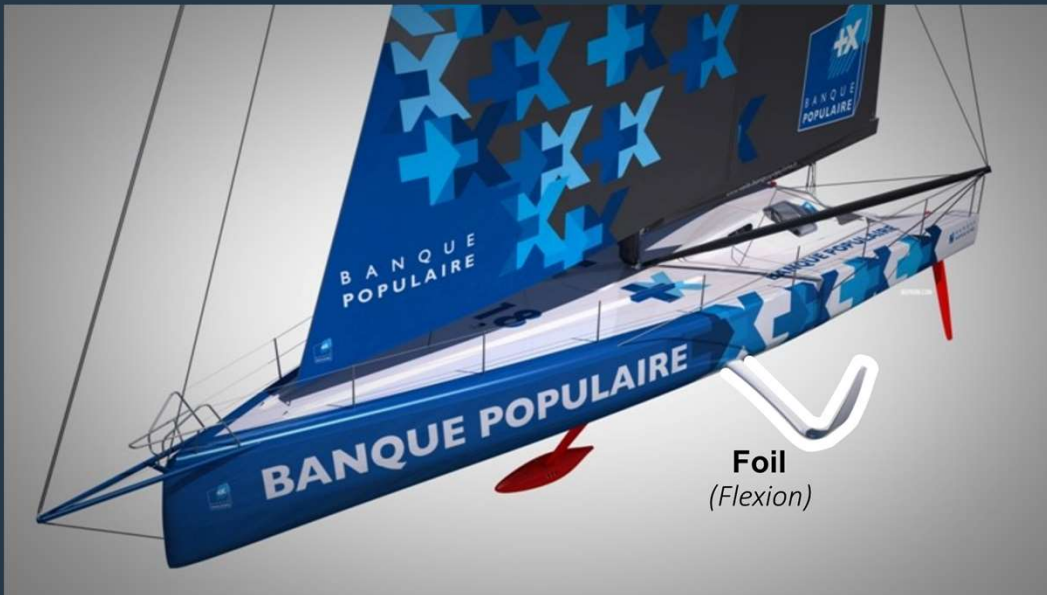


OPTICAL FIBER IMPLEMENTATION





OPTICAL FIBER IMPLEMENTATION



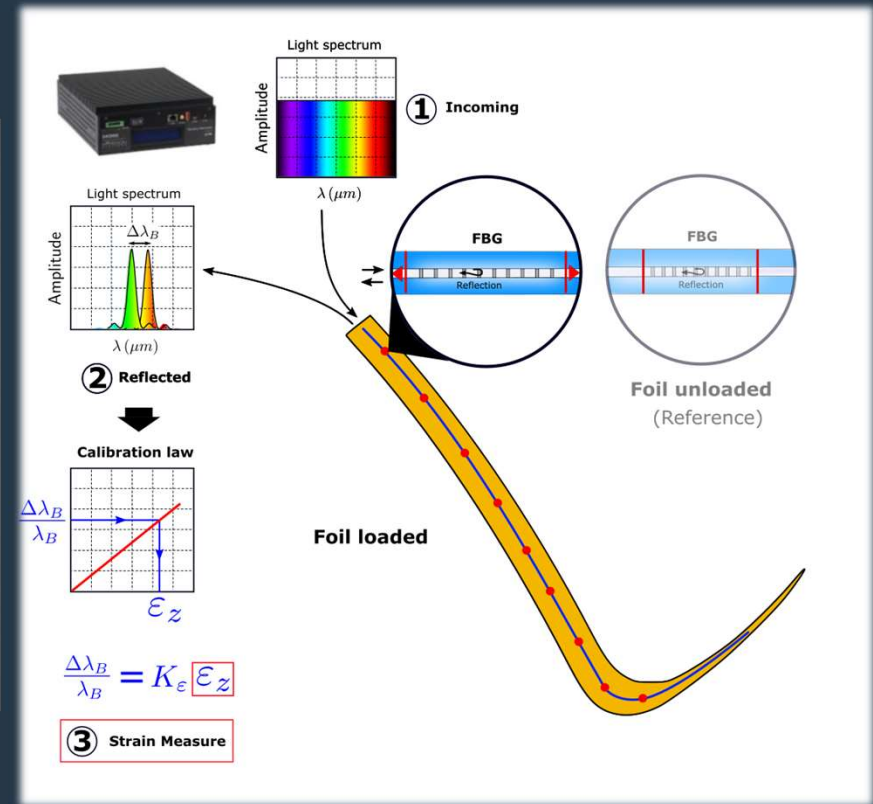
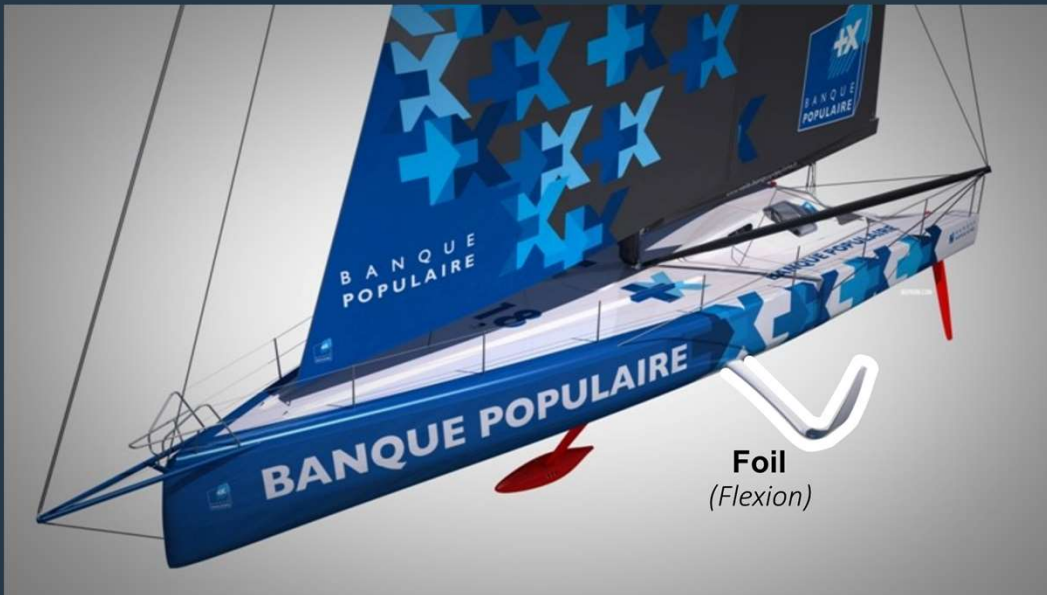


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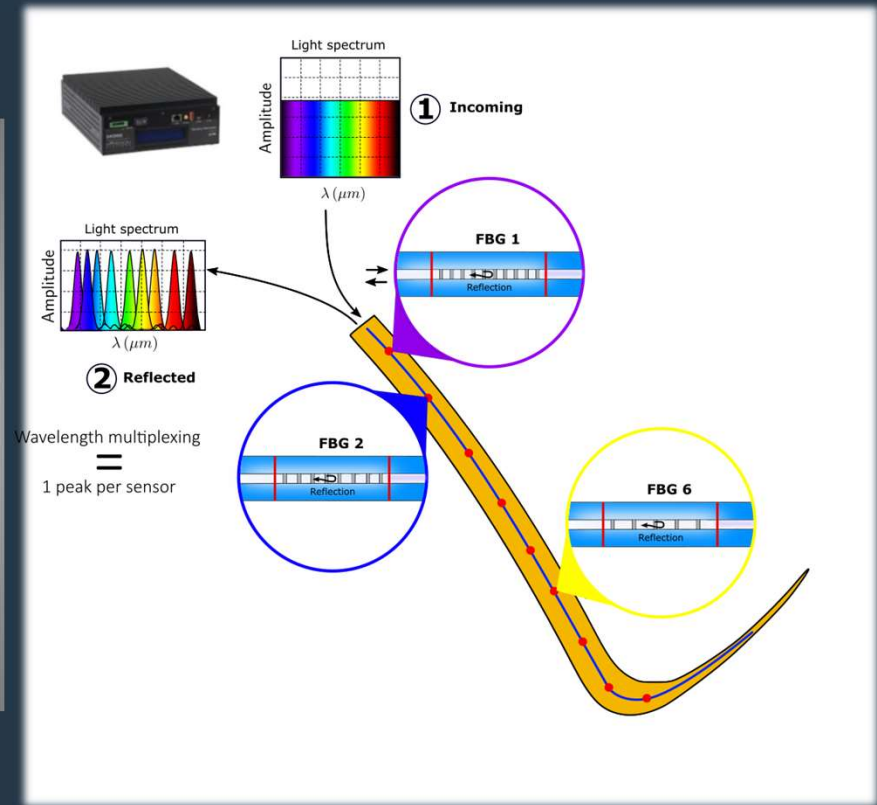
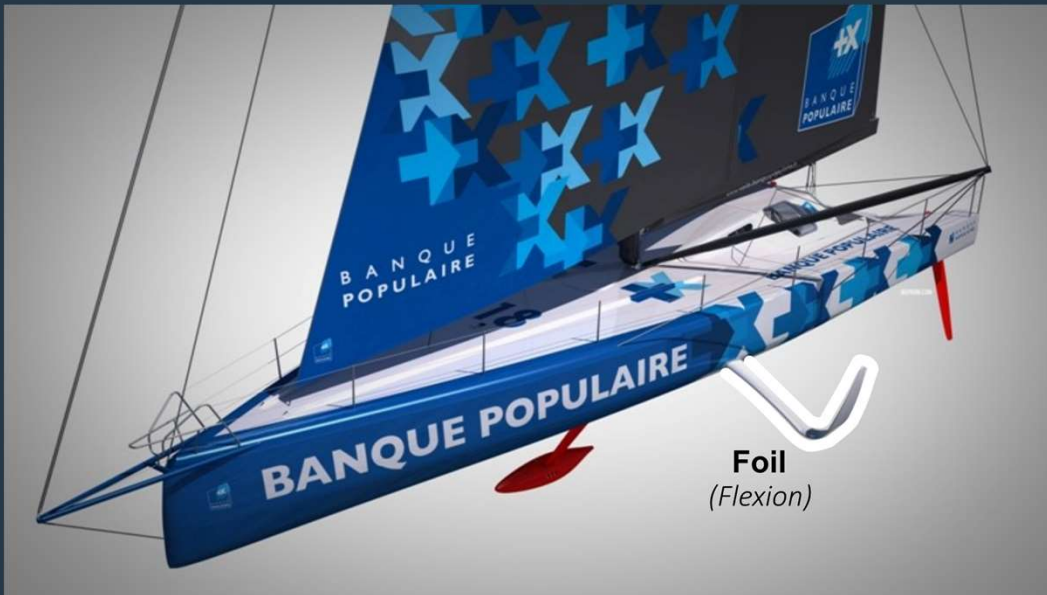


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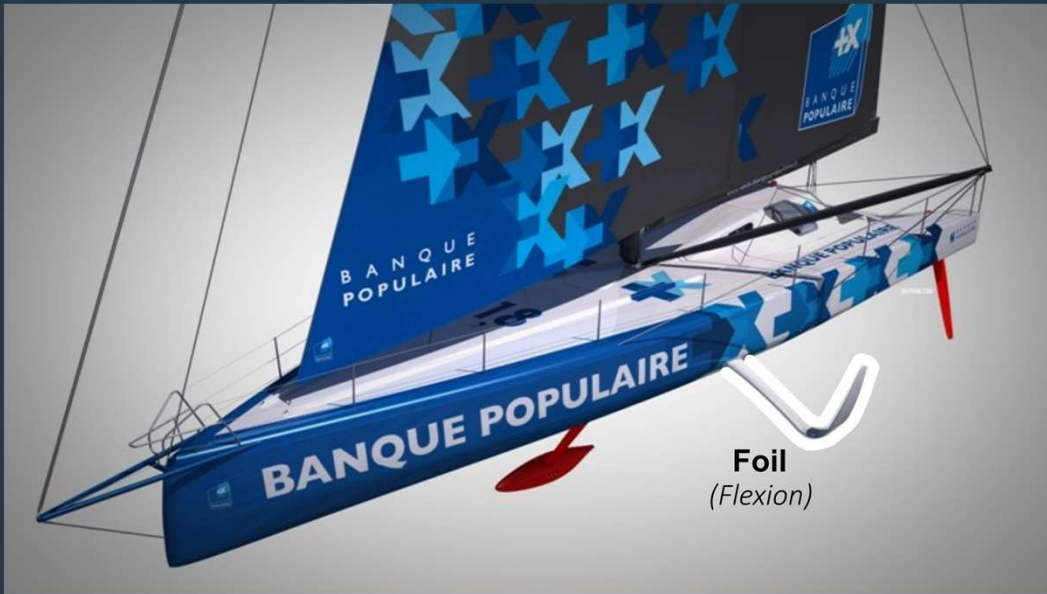


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OPTICAL FIBER IMPLEMENTATION



Failure by mechanical overload

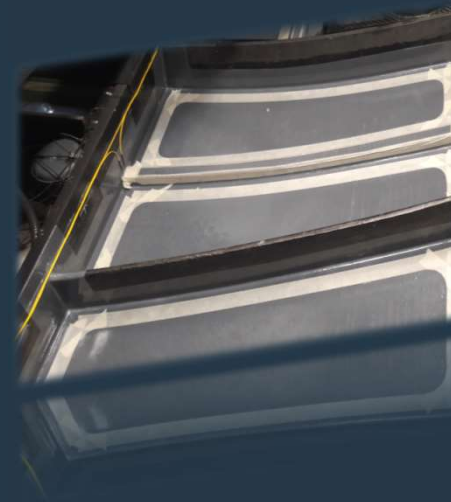
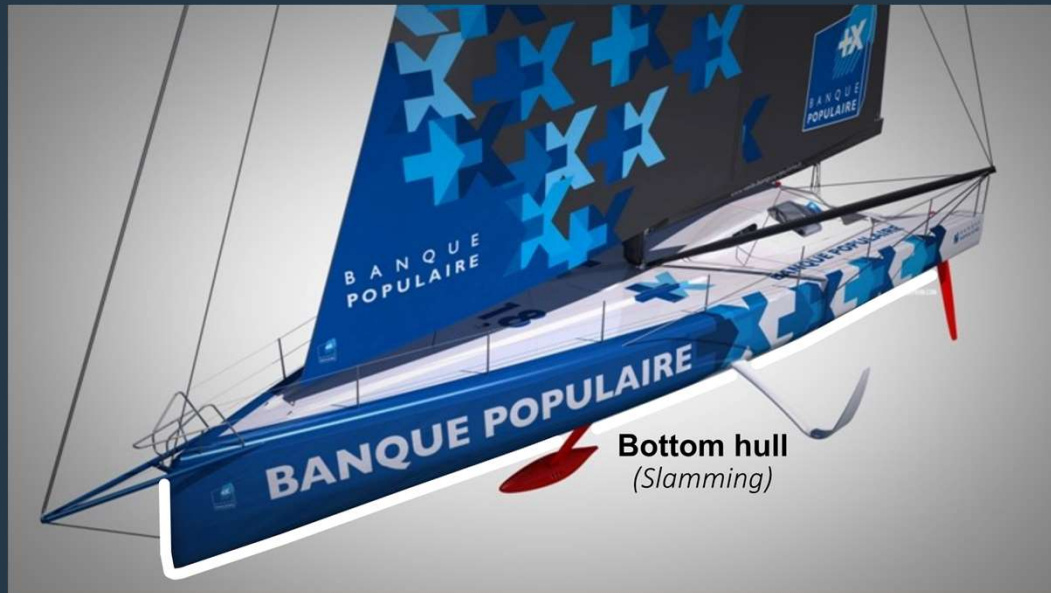


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OPTICAL FIBER IMPLEMENTATION



Crack initiation

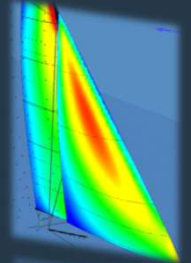
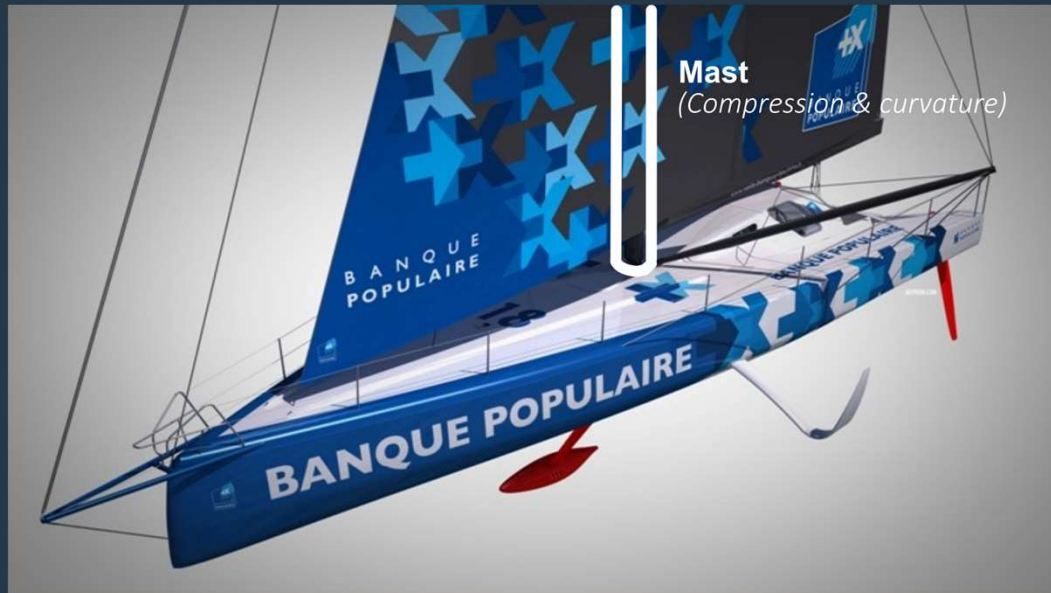


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OPTICAL FIBER IMPLEMENTATION



Demasting

Sail shape optimisation



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A few applications



AC75 Americas Cup



Ultimate



Skorpios Swan 125



IMOCA



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What we can offer



We are not an optical components manufacturer but an end-user

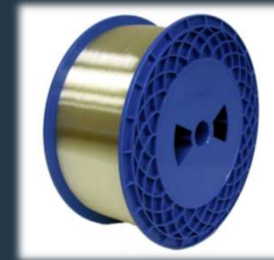
However we are distributor for :



Optical fiber patch cord



Optical Interrogator



FBG array

What we look for

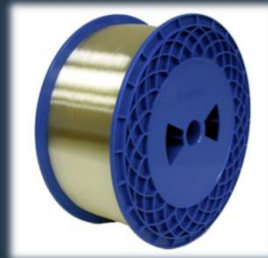


All optical equipments which could improve our installation



Optical interrogator

- Cost effective (<10 000 €)
- Light weight (<3kg)
- Low electrical consumption (<15W)
- Compact (20cm x 20 cm x 10 cm)



FBG array

- Draw tower gratings
- Gratings array within multicore fibers
- FBGs temperature probe
- FBGs strain rosette



Specific connectors and cables

- Cost effective IP68 connectors
- Heat-resistant connectors (120°C)
- Heat-resistant and flexible cables (120°C)



Other optical equipments

- Optical splitters (1x2, 1x4 ...)
- Optical switches
- Equipments for maintenance
- Equipments for splicing



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Thanks for your attention



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