Design, assembly and test of a near-infrared spectrograph for the TIGRE telescope

STAR Workshop
15/09/2017 – Mont Rigi
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Project overview – *Why studying massive stars?*

- **Massive? Initial mass above** $8 \, M_{\text{Sun}}$
  
  → *Production of heavy elements*

- **High temperature:** $20000 K \rightarrow 120000 K$

- **Mass loss:** $10^{-7} \rightarrow 10^{-3} \, M_{\text{Sun}} \, yr^{-1}$
  
  → *Stellar wind »*

- **Death:** *gigantic supernova*

They are key players for the evolution of the universe!
- Near-IR spectrograph
  - mounted on the TIGRE (ground)
- UV observing nano-satellite
  - feasibility study (space)
- UV-VIS Spectropolarimeter
  - pre-phase-A and phase-A (space)
- **Resolving power needed:** 10 000 (goal 20 000)
- **Spectral domain:** 1 to 1.1 μm
- **Detector trade-off:**
  - → CCD or specific IR detector?
- **Versatile interface:**
  - → fibre-fed
- **Should be adaptable to other telescopes (ARIES)**
From scientific requirements to instrumental specification

Optical design

Photometric budget

Alignment and tests in laboratory

Assemble and align optical components

First scratch, resolution power, tolerancing, calibration, straylight, alignment, SPS, …

@ TIGRE, @ Liège, SPS, observing strategy

First light

Debugging, first light? Debugging, first light? Debugging …

First light?

Bibliography on spectroscopy, fibers, detector technologies

PhD summary – Flowchart
**Instrument performances – Some (lab) results**

**Focal plane with HCL lamp minus dark**

HCL spectrum centered at 1006 nm (over fiber)
Observation – Close to first light
Different instruments, same goal... study massive stars!

From scientific requirements to first light

Performances are validated in lab

First light: coming soon!

Scientific requirements, choice of detector, first optical design

End optical design, purchase components

Integration, Testing activities

Test activities, first light in Liège

2013-2014

2014-2015

2015-2016

2016-2017

Conclusion

Different instruments, same goal... study massive stars!

From scientific requirements to first light

Performances are validated in lab

First light: coming soon!
Thank you for your attention

Any question?