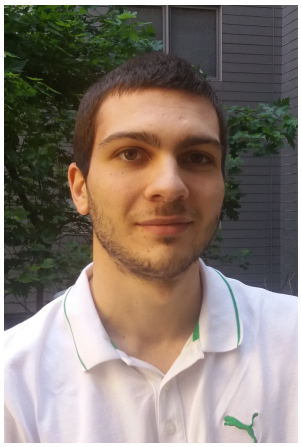
Kevin Barjot



Title

First light of the FIRST visible fibered interferometer upgrade at the Subaru telescope

Abstract

FIRSTv2 (Fibered Imager foR a Single Telescope version 2) is the upgrade of a post-AO spectro-interferometer (FIRST) that enables high contrast imaging and spectroscopy at spatial scales below the diffraction limit of a single telescope. FIRST is currently installed, and routinely used, on the Subaru telescope as a module of the Subaru Extreme AO (SCExAO) platform. It achieves sensitivity and accuracy by a unique combination of sparse aperture masking, spatial filtering by single-mode fibers and cross-dispersion in the visible (600-900nm). The ongoing upgrade aims at using a photonic chip beam combiner, allowing the measurement of the complex visibility for every baseline independently. Using the integrated optics technology will increase the stability and sensitivity, and thus improve the dynamic range. Integrated optics chips working in the visible wavelength range are challenging (in terms of throughput and polarization). Several photonic chips are under characterization in our laboratory and we have installed a first prototype chip in the FIRSTv2 instrument at the Subaru Telescope. I will thus report on the on-sky results obtained with this kind of device, for the first time in the visible. This is the first step towards the full upgrade of FIRSTv2, that will ultimately provide unique capabilities to detect and characterize close companions such as exoplanets, by combining high angular resolution and spectral resolution in the visible.

Kevin Barjot

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27 years old
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EDUCATION

- today **PhD - LESIA, Paris Observatory**
  University of Paris
  Substellar companion characterization with the FIRST fibered interferometer at the Subaru Telescope - Instrumentation, optical bench, control software (Python), data reduction, interferometry, integrated optics.
- 2019 **2nd year of Master (eq. MSc) degree - Astronomical and Space-based Systems Engineering**
  University of Paris, Paris Observatory
  Optics and atmosphere, automation, signal acquisition and processing, instrumental techniques, project management, systems.
- 2018 **1st year of Master degree (Fundamental Physics and Engineering Sciences)**
  University of Paris
- 2017 **Summer school (astrophysics and quantum mechanics) at Orsay - Paris-Saclay**
- 2017 **Bachelor of Physics (eq. BSc)**
  University of Paris
- 2015 **Undergraduate intensive program in Maths, Physics and Engineering**
  High school d'Arsonval - St Maur - 94
  Eligible at concours POLYTECH (e3a)
- 2013 **French HS diploma - Sciences major**
  High school Champlain - Chennevières-sur-Marne

WORK EXPERIENCE

- 2020 - 2022 **Observations at the Subaru Telescope (8m), Hawaii (∼20 nights)**
  Visible interferometry of binary stars with the FIRST instrument.
- 2019 **Lagrange laboratory (SPEED), Côte d'Azur Observatory - 6-month internship**
  Diffraction removal for segmented telescope for direct exoplanet detection.
  Referee: Patrice Martinez, patrice.martinez@oca.eu
- 2018 **APC laboratory (DUNE), University of Paris - 2-month internship**
  Characterization of readout electronics of Photomultipliers
  Referee: Jaime Dawson, jdawson@in2p3.fr
- oct. 2017 **Associated observer at Telescope Bernard Lyot, Pic du Midi de Bigorre (∼10 nights)**
  Use of the control software of the Spectro-polarimeter NARVAL for data acquisitions.
- 2017 **MPQ laboratory (STM), University of Paris - 1-month internship**
  Optimization of graphene production on SiC
- 2014, 2015 **Summer job, Hospital Saint Joseph (Paris): Hotel agent in maternity, courier**

COMPUTER SKILLS

- *Operating systems*: Windows, Linux, Mac
- *Software*: LaTeX, GitHub, conda, X2GO, Aspro, Zemax, ROOT, Siril, WordPress, Jekyll, Microsoft Office, Libre Office, Google tools (docs, slides...)
- *Programming language*: Python, C, C++, IDL, YAML, Markdown, HTML

LANGUAGES

French (native), English (fluent)

TEACHING

- 2020 - 2022 Optics - 1st and 2nd year of Physics bachelor degree, PSL University (27h/yr)
- 2020 - 2022 Education to astronomy and observations for teachers (1 week training at Observatoire de Haute Provence, OHP), Paris Observatory (25h/yr)
- 2020 - 2022 Python - 1st year of Sustainability Sciences bachelor degree, PSL University (18h/yr)
- 2020 - 2022 Observations and associated methods - 1st year of master degree, Paris Observatory (8h/yr)
- 2020 - 2022 Instrumentation project - 2nd year of master degree, Paris Observatory (8h/yr)

SEMINARS, WORKSHOPS AND SUMMER SCHOOLS

- Oct. 2021 NYRIA, poster, online
- June 2021 SF2A (French Society for Astronomy and Astrophysics), talk, online
- June 2021 VLTi summer school, online
- June 2021 CHARM seminar (IPAG), talk, online
- Dec. 2020 SPIE, poster, online
- Oct. 2020 NYRIA, talk, online
- Oct. 2020 WFS workshop, talk, online
- Feb. 2020 Elbereth (PhD student workshop in Paris), talk, IAP

PUBLICATIONS

• **Hα imaging of protoplanets with the spectro-interferometer FIRST at the Subaru Telescope.** Lallement, M.; Huby, E.; Lacour, S.; Barjot, K. et al., SF2A-2021: Proceedings of the Annual meeting of the French Society of Astronomy and Astrophysics. Eds.: A. Siebert, K. Baillié, E. Lagadec, N. Lagarde, J. Malzac, J.-B. Marquette, M. N'Diaye, J. Richard, O. Venot, pp.135-138, (2021), DOI/Bibcode: 2021sf2a.conf..135L

• **Very high resolution spectro-interferometry with wavefront sensing capabilities on Subaru / SCExAO using photonics.** Vievard, S.; Ahn, K.; Arriola, A.; Barjot, K. et al., Proceedings of the SPIE, Volume 11823, id. 118230C 11 pp. (2021), DOI/Bibcode: 10.1117/12.2594840

• **A metrological characterization of the SPEED test-bed PIAACMC components.** Barjot, K.; Martinez, P.; Beaulieu, M.; Gouvret, C. et al., Proceedings of the SPIE, Volume 11451, id. 114513B 8 pp. (2020), DOI/Bibcode: 10.1117/12.2557112

• **Status of the SCExAO instrument: recent technology upgrades and path to a system-level demonstrator for PSI.** Lozi, Julien; Guyon, Olivier; ...; Barjot, Kevin et al., Proceedings of the SPIE, Volume 11448, id. 114480N 12 pp. (2020), DOI/Bibcode: 10.1117/12.2562832

• **FIRST, a pupil-remapping fiber interferometer at the Subaru Telescope: on-sky results.** Vievard, S.; Huby, E.; Lacour, S.; Barjot, K. et al., Proceedings of the SPIE, Volume 11446, id. 1144629 11 pp. (2020), DOI/Bibcode: 10.1117/12.2563033

• **Recent results on electro-optic visible multi-telescope beam combiner for next generation FIRST/SUBARU instruments: hybrid and passive devices.** Martin, G.; Foin, M.; ...; Barjot, K. et al., Proceedings of the SPIE, Volume 11446, id. 1144626 6 pp. (2020), DOI/Bibcode: 10.1117/12.2562171

• **Laboratory characterization of FIRSTv2 photonic chip for the study of substellar companions.** Barjot, K.; Huby, E.; Vievard, S.; Cvetojevic, N. et al., Proceedings of the SPIE, Volume 11446, id. 1144623 7 pp. (2020), DOI/Bibcode: 10.1117/12.2561713

• **Design and manufacturing of a multi-zone phase-shifting coronagraph mask for extremely large telescopes.** Martinez, P.; Beaulieu, M.; Barjot, K. et al., Astronomy & Astrophysics, Volume 635, id.A126, 11 pp (2020), DOI/Bibcode: 10.1051/0004-6361/201936903

ADDITIONAL INFORMATION

- Member of the astronomy club 'Uranoscope de l'île-de-France' (since 2015): outreach talks, scientific vulgarization, astrophotography, webmaster, animations.
- Animation of astronomy observation nights in Paris for AFA (Association Française d'Astronomie) (3 summers)
- Organization of the Elbereth workshop (for PhD student in astrophysics in Paris) for 3 years
- Co-organizer of the GitHub High contrast testbed community website initiative

- President of the Paris Observatory student office (BDE de l'Observatoire) (2019 - 2020)
- Administrator of the 2nd year of master association AMOSAE (2018 - 2022)
- Personalised teacher in maths and physics for secondary students (for 2 years)
- Speed cubing (Rubik's Cube)
- Practice of badminton (for 10 years)
- Playing the piano (for 1 year)