Exploring the fastest timescales in Astronomy with OPTICAM

A. Castro,1,2,† D. Altamirano,1 R. Michel,2 P. Gandhi,1 J. Echevarría,4 J.V. Hernández-Santiesteban,4,1 C. Knigge,1 C. Tejada,2 G. Sierra,2 E. Colorado,2 J. Hernández-Landa,2 D. Whiter,1 M. Middleton,1 G. Guisa,2 B. García,2 N. Castro-Segura,1 U. Ceseña,2 M. O. Arabaci1

OPTICAM is a high-speed optical system designed to perform triple-channel fast-photometry. OPTICAM will have a set of u′g′r′z′ SDSS filters which will allow coverage in the 320-<λ[Å]<1,100 wavelength range. OPTICAM will be mounted in the Cassegrain focus of the OAN-SPM 2.1 m telescope, in Ensenada, Mexico. Incident light will be splitted into three different beams using a pair of dichroic beam splitters. One beam is dedicated to either the u′ or g′ filter, whereas the second beam will be dedicated to r′ and the third beam to either the i′ or the z′ filter. These filter combinations will be selected through the use of a manual filter exchanger available on each arm of the optical system. The filters will be placed according to the astronomer science needs. The image acquisition will be done by means of three modern cameras (sCMOS1, sCMOS2 and sCMOS3). Design of the OPTICAM optical layout showing the major optical components: the dichroics (D1 and D2), optical cameras (C1, C2 and C3), filter exchangers (FE1 and FE2) and sCMOS detectors, one for each arm of the system.

Due to its unique optical and timing capabilities, OPTICAM will allow us to perform strictly simultaneous triple-band observations of a wide variety of astronomical objects with dynamical times-scales ranging from seconds in white dwarfs (WDs) to milliseconds in neutron stars and galactic black holes, among other astrophysical phenomena. Image credits: NASA.

1 Physics and Astronomy, University of Southampton, SO17 1BJ, Southampton, UK
2 Instituto de Astronomía, Universidad Nacional Autónoma de México, Ciudad de México, México
3 Anton Pannekoek Institute for Astronomy, University of Amsterdam, 1090 GE, Amsterdam, Netherlands
4 Instituto de Astronomía, Universidad Nacional Autónoma de México, México Nacional Autónoma de México (IA-UNAM).

† On behalf of the OPTICAM team.

Throughput estimation of OPTICAM on the OAN-SPM 2.1 m telescope. OPTICAM will have a set of SDSS filters (u′g′r′z′), which is the most common filter set in modern Astronomy. This calculation considers the contribution of filters, dichroic beam splitters, camera lenses and the sCMOS detector.

Preliminary limiting magnitude plot for a detection of σ-initiative 5-σ in the OAN-SPM 2.1 m telescope. OPTICAM uses 3 Andor Zyla 4.2-P sCMOS detectors, one for each arm of the system.

Layout of the optomechanical system of the OAN-SPM 2.1 m telescope and OPTICAM. Incident light is separated into three channels by two dichroic beam splitters. The diagram is not to scale but is for illustrative purposes.

Bright stars Betelgeuse (left) and Sirius (right) were imaged - without filter - during a preliminary test of our self-developed software using a 12-in Meade LX200 telescope with exposure times of 0.2 and 1 ms, respectively.

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