

DIVISION B

WORKING GROUP ON ULTRAVIOLET ASTRONOMY

**DIVISION B /WORKING GROUP
ULTRAVIOLET ASTRONOMY**

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1. Background

The ultraviolet (UV) astronomy WG (WG-UVA) was created following the IAU General Assembly in Hawaii in 2015, with the main aim at building a road map for the UV Astronomy for the next 2-3 decades. WG-UVA built on the experience of the Network for UV Astronomy (NUVA) created by European astronomers back in 2004. The NUVA organized international meetings every three years with strong participation from non-European countries (the US, Brazil, Russia, India, China, etc.) and coordinated the activity in the area, world-wide. The WG-UVA has implemented these activities at global scale within the framework of the IAU.

During the first period (2015-2018), the WG outlined the roadmap for UV astronomy that was later incorporated within the IAU general roadmap. A main result from this activity was the realization of the impact that small, cubesat type missions are going to have in the progress of the field. The rapid evolution and standardization of space technologies together with the scarcity of large UV observatories is creating a new generation of UV astronomers developing small, project oriented satellites. As a result, it is expected that plenty of small, cubesat type missions will be flown in the next decade to run well defined experiments, including survey type probes.

In this context, the WG-UVA asked for a renewal for a new term, 2018-2021, to set the grounds for the definition of a UV photometric system suitable to be implemented in small missions and that grows on the scientific challenges addressed by using UV astronomical observations. This has been the main activity of the WG during this term.

**2. Activities within the past triennium: definition of the UV
photometric system**

In 2018, during IAU General Assembly in Vienna, an open call was issued to UV astronomers interested in participating in a dedicated working group to draft the proposal

for the UV photometric system. The team started working in October 2018 and was constituted by: Ana I Gómez de Castro, Noah Brosch and Mikhail Sachkov from the WG-UVA and Daniela Bettoni, David Valls-Gabaud, Leire Beitia-Antero and Paul Scowen from the UV community, at large.

Till May 2019, the group investigated the contents of the scientific archives of the UV missions and searched for the bands more commonly used by astronomers. Also a questionnaire was drafted to circulate among the astronomical community to identify the preferred/optimal bands. The questionnaire proposed a sample photometric system composed by:

- Three near UV (NUV) bands: NUV1 (from the blue edge of the GALEX NUV band to 210 nm), NUV2 (210-235 nm) and NUV3 (235 nm-275 nm).
- GALEX FUV band.
- Two to three bands (to be defined) to cover the 90-140 nm range.

The results from the poll, together with the deliberations of the WG-UVA, were used to define the list of filters (see Table 1).

Table 1. UV photometric bands proposed as standards

Band Id.	Spectral Range (nm)	Comments
UV1	90-110	FUSE window
UV2	120-140	Far UV avoiding geocoronal Lyman- α
UV3	140-180	GALEX FUV
UV4	180-210	Continuum shortward the UV bump
UV5	210-230	UV bump
UV6	230-280	Near continuum and Fe II bands - alike F250W in HST ACS/HRC
UV7	280-350	Ozone cut-off window - alike F330W in HST ACS/HRC

The system is based on the flux standards in the HST system that constitute the baseline for UV photometry and flux calibration. This set of spectrophotometric standards can be accessed through CALSPEC (Bohlin et al. 2014) and their spectral type and distribution in the sky is displayed in Figure 1.

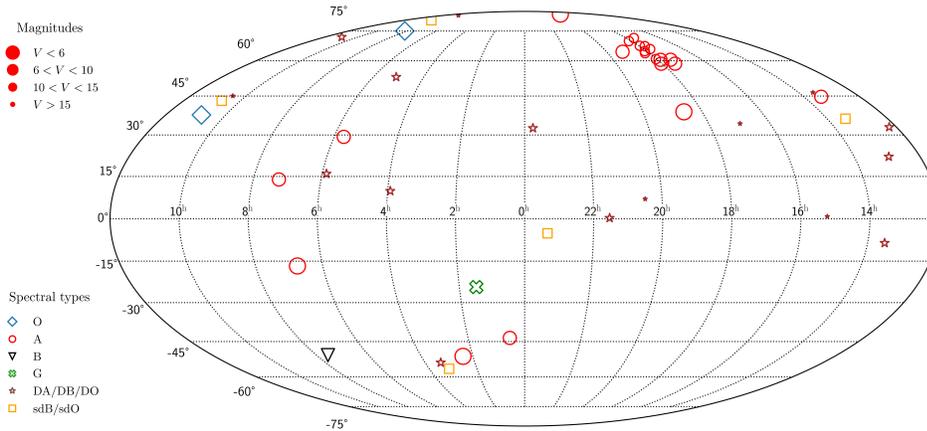


Figure 1. Distribution of UV spectro photometric standards in the sky.

In 2020, the document "On the creation of a standard photometric system for ultra-violet astronomy" was circulated for revisions and suggestion and later, endorsed by the

UV community and by the Steering Committee of Division B to be circulated as an IAU recommendation for future UV missions. The document is available in the IAU web site†

2.1. *Participation/organization of activities*

The WG-UV has organized a major workshop during the 2018-2021 trimester entitled "UV Astronomy in the XXI century". Covid-19 caused the in-person meeting to be delayed to 2022 but an e-meeting was held in October 27th-29th, 2020. The workshop had 249 registered participants and addressed, in the rather limited time frame of 3 hours per day, the new developments in UV science and the status of the missions. As part of the program, there was a special session where the UV photometric system was presented and reviewed by the community‡.

3. Closing remarks

The efforts made to define a UV photometric system need to be tested by, in practice, implementation. This is the next challenge. The WG-UVA will ask for a renewal to follow the implementation of the system and assists the groups intending to implement it.

The advent of COTS technologies and cheap launches for cubesat size space probes may revolutionize the field and guarantee that the knowledge achieved with great effort on UV spectral tracers is kept alive in the community.

Ana I. Gómez de Castro
Chair of the Working Group

References

Bohin, R.C., Gordon, K.D., Tremblay, P.E., 2014, PASP, 126, 711

† https://www.iau.org/static/science/scientific_bodies/working_groups/267/report-uva-wg-20200730.pdf

‡ <https://www.nuva.eu/home-virtual-meeting/>