Improvements on LNLS TGM Beamline with VUV photons starting now at 3 eV

P. T. Fonseca(*), H. R. Moraes, L. Souza, W. R. Araújo, F. Rodrigues, D. D. A. Costa and D. Galante

Brazilian Synchrotron Light Laboratory, *P.O. Box 6192, 13081-970 Campinas – SP, Brazil*

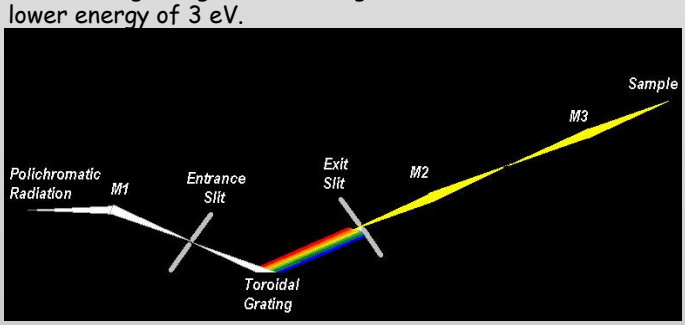
**Corresponding author: paulo.tarso@lnls.br*

Introduction:

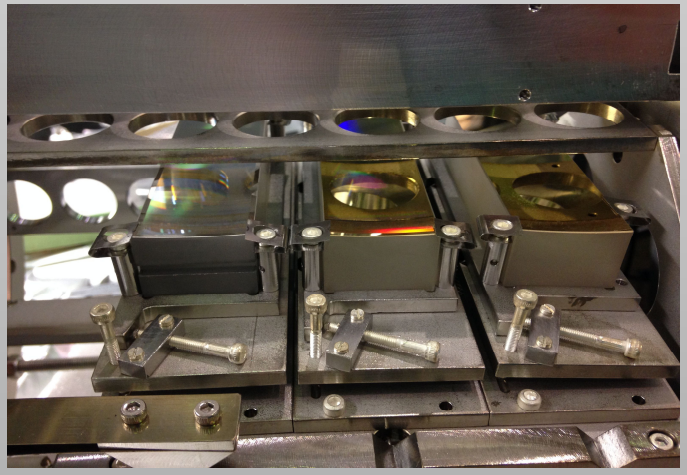
We report recent improvements and performance on the Toroidal Grating Monochromator (TGM) beamline at the Laboratório Nacional de Luz Síncrotron - LNLS. Compared to normal incidence monochromators, (NIMs), TGMs provide substantially wider energy range, with the cost of less resolving power and very poor higher harmonic rejection, which can be solved by the use of gas filters, like it is used on the LNLS beamline [1]. Here we report further improvements using a new grating extending the low-energy limit to 3 eV, while keeping the upper limit given by 330 eV . There are three interchangeable gratings in the monochromator. Further to this, we report on improvements in the beamline control. Now, we are using EPICS, software used in many synchrotrons around the world.

Optics:

The first grating was exchanged in order to reach even lower energy of 3 eV.



TGM optical layout.



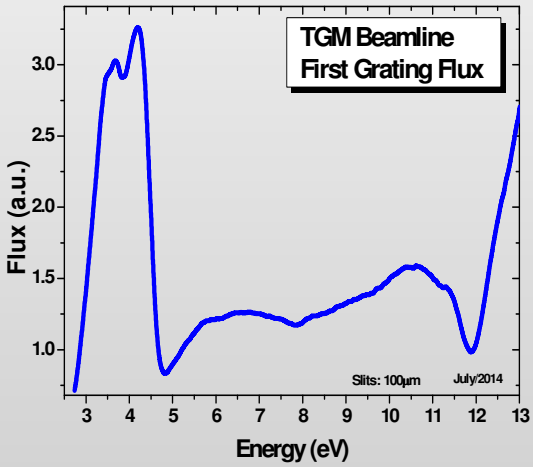
TGM monochromator under assembling with the new diffraction grating, energy range of 3 - 13 eV (left one).

Results and Perspectives:

TGM beamline is still under comissioning after the improvements. The new grating has the energy range 3-13 eV, the second one has the range 12-100 eV and the third grating covers 100-330 eV.

An automated system for exchanging gratings was implemented to facilitate data acquisition, since there is a range of energy of the first and second grating that overlap each other.

The old control system was replaced by EPICS - Experimental Physics and Industrial Control System. It is an environment of distributed control, for multiple clients. It offers the integration of hardware from several vendors, it is open-source and developed by a collaborative community [2].



Photon flux of the new grating was measured using PMT (Photomultiplier tubes) and a scintillator of sodium salicylate.

The beamline new range will cover the important first ionization threshold of most biomolecules, such as amino acids, and open the possibility for the study of electronic properties of important materials, such as photoluminescent ceramics and semi-conductors [3]. In addition, it will also enable the implementation of a SRCD branch at the beamline, offering this important technique at deep UV for the structural biology community [4].

References

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