Contribution ID: **8** Type: **Poster**

Future Upgrade of the 2D ACAR Spectrometer at NEPOMUC

Wednesday, 11 December 2019 15:40 (20 minutes)

Two dimensional angular correlation of annihilation radiation (2D ACAR) is a powerful probe for the investigation of the electronic structure of materials. In ACAR a 2D projection of the two-photon momentum density is recorded, which is closely related to the electron momentum density. From a series of such measurement at different projection angles the 3D Fermi surface(s) can be reconstructed. The current ACAR spectrometer at the Technical University Munich uses positrons from a ^{22}Na source, which enables spin-resolved measurements of the bulk electronic structure. Various questions that have been successfully tackled at our spectrometer are the reconstruction of the spin-resolved Fermi sheets of Cu_2MnAl [1], the electron-electron correlation strength in nickel [2] or the electronic correlations in vanadium [3].

In a future upgrade the spectrometer will be moved to the positron beamline at the NEPOMUC positron source of FRM II. The utilization of the mono-energetic positron beam allow the depth resolved investigation of the electronic structure. This opens the possibility to clarify questions on the evolution of the electronic structure from surface to bulk and to measure layered systems.

[1] J.A. Weber, et al., PRL 115 (2015) 206404
[2] H. Ceeh, et al., Sci. Rep. 6 (2016) 20898
[3] J.A. Weber, et al., PRB 95 (2017) 075119

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Session Classification: Poster session

Track Classification: Positrons