

POSSIBLE FUTURE EXPERIMENTAL SEARCHES AT CERN IN
ASTROPARTICLE PHYSICS

- 1) Continue with CAST and in particular with the 2nd phase, which will allow to search for solar axions with a rest mass up to $\sim 1 \text{ eV}/c^2$. The cosmologically allowed axion restmass region from the evaluated WMAP-data is up to $2\text{-}3 \text{ eV}/c^2$. In parallel, a search for solar or cosmic energetic axions can be performed . Other strong X-ray sources in the sky can also be pointed.
2. Understand the claimed result by PVLAS, which is at first sight inconsistent with CAST - results. This might motivate theoretical work, which could allow to suggest an independent experimental test.
3. CAST is sensitive also to Kaluza-Klein axions. Provided an axion signal will be observed, it is possible to distinguish between “conventional” axions and those expected from theories on extra dimensions.
4. Search for the spontaneous radiative decay of massive axion(-like) particles inside a large TPC, e.g., the ALICE/TPC with its large volume, high granularity and time resolution. The signature can be 2-prong events (2-gamma decays) and/or 1-prong events (induced particle conversion by the magnetic field). A sophisticated trigger is needed to optimize detector’s performance. Such direct searches for massive axions have never been performed before.

(K. Zioutas, CAST)