



Contribution ID: 99

Type: Oral

Unusual properties of piezo-resonators at millikelvin temperature range and high magnetic fields

Thursday 10 September 2020 11:05 (20 minutes)

We present unusual properties of the commercial quartz tuning forks (QTFs) operating at resonance frequencies of 32 kHz, 77 kHz and 100 kHz at temperature range below 1K and in high magnetic fields up to 7.5 T. We show that in millikelvin temperature range, the quartz tuning forks exhibit the property of the coherent oscillations. These are manifested as a temperature-dependent, extremely accurate tune-up of QTFs resonance frequencies in 9th order with very high frequency stability characterized by the low values of the Allan deviations comparable with those in lasers. Even more, we demonstrate that a normalized resonance frequency of the tuning forks manifests a universal temperature dependence, which is independent on the magnetic field strength. This feature make the QTFs a very promising low temperature thermometer in high magnetic fields in temperature range below 1 K while having the B/T ratio up to 1000. We also discuss the physical origin of the observed dependencies.

Author: MARCEL ČLOVEČKO, PETER SKYBA

Presenter: ČLOVEČKO M. (Centre of low temperature physics, Institute of Experimental Physics SAS, Košice)

Session Classification: Parallel sessions