

# DIESE WOCH

## PHYSIKALISCHES KOLLOQUIUM

des Fachbereichs Physik  
der Johann Wolfgang Goethe-Universität Frankfurt

Mittwoch, den 11.12.2013, 16 Uhr c.t.  
Großer Hörsaal, Raum \_0.111,  
Max-von-Laue-Str. 1

**Prof. Dr. Andrey V. Solov'yov**  
Frankfurt Institute for Advanced Studies (FIAS),  
Frankfurt am Main

### *„Multiscale physics of ion beam cancer therapy: nanoscale insights“*

The multiscale approach to the molecular level assessment of radiation damage in biological targets consequent to irradiation by ions was designed in order to qualitatively and quantitatively describe the effects that take place when energetic ions interact with living tissues, e.g. the Relative Biological Effectiveness (RBE) of radiation [1, 2]. A road towards the understanding physical aspects of ion-beam cancer therapy on the molecular level revealed that this problem has many temporal, spatial, and energy scales, while the main events leading to the cell death happen on a nanometer scale. The multiscale approach is interdisciplinary, phenomenon-based and, having started some years ago, passed several milestones making discoveries on different scales, for review see [1, 2]. Thus, in addition to the traditional pathways of biodamage often related to secondary electrons and free radicals production in cells after irradiation [3], the multiscale approach also considers a new efficient pathway of DNA damage caused by the nanoscopic shock waves created by the strong local heating in the vicinity of the ion tracks due to the energy deposited by ions [4].

#### References

[1] E. Surdutovich, A.V. Solov'yov, J. Phys.: Conf. Ser. 373, 012001 (2012) [2] E. Surdutovich, A.V. Solov'yov, Eur. Phys. J. D, Colloquium paper (2013); <http://xxx.lanl.gov/> arXiv:1312.0897v1 [physics.bio-ph] 3 Dec 2013 [3] P. de Vera, R. Garcia-Molina, I. Abril, A.V. Solov'yov, Physical Review Letters 110,148104 (2013) [4] E. Surdutovich, A. Yakubovich, and A.V. Solov'yov, [www.nature.com/scientificreports](http://www.nature.com/scientificreports), 3, 1289 (2013).

Die Dozenten der Physik

# Kolloquium