

## POSITRON STATES IN DUSTY SPACE PLASMA

A.L. Suworov, *E.P. Prokopiev, V.I. Grafutin,  
A.F. Zakharov, T.L. Razinkova, S.P. Timoshenkov,  
Yu.V. Funtikov*

Federal State Unitary Enterprise “State Scientific Center  
of the Russian Federation – A.I. Alikhanov Institute  
for Theoretical and Experimental Physics”  
(25, *Bolshaya Cheremushkinskaya Str., Moscow 117218,  
Russia; e-mail: epprokopiev@mail.ru*)

### S u m m a r y

It has been demonstrated that monitoring the 0.511-MeV annihilation line of extraterrestrial origin allows information to be obtained concerning not only the availability of positron–electron pairs, but also their energy (and, hence, the velocity) at the annihilation moment, the direction of their motion with respect to the Earth, the distance to the pair source, and some properties of the medium where the annihilation of positrons took place. It has been shown that positroniums in dusty space plasma with a high concentration of charged dust particles can be formed by means of the processes of positron interaction with H atoms, free electrons, and the charged particles of dusty space plasma. A positronium yield of almost 100% is possible for such space plasma, which is evidenced by experimental data of the “Integral” space laboratory. Basing on the values for the diffusion coefficient, the dimensions of dust particles in space plasma proved to be larger than 100 nm. The dimensions of a dust particle is comparable with the diffusion length of positrons (0.01–1  $\mu\text{m}$ ). The initial energy of positrons can be equal to a few kiloelectronvolts. Thus, the obtained dimensions of dust particles agree well with the results of estimations derived from optical observation data.