

SEARCH FOR POSSIBLE CHARGE  
NON-CONSERVING DECAY OF  $^{139}\text{La}$   
INTO  $^{139}\text{Ce}$  WITH  $\text{LaCl}_3(\text{Ce})$  SCINTILLATOR

*R. Bernabei, P. Belli, F. Montecchia,  
F. Nozzoli, A. D'Angelo<sup>1</sup>, F. Capella<sup>1</sup>,  
A. Incicchitti<sup>1</sup>, D. Prosperi<sup>1</sup>, S. Castellano<sup>2</sup>,  
R. Cerulli<sup>2</sup>, C.J. Dai<sup>3</sup>, V.I. Tretyak<sup>4</sup>*

Dipartimento di Fisica, Università di Roma  
"Tor Vergata" and INFN, Sezione di Roma Tor Vergata  
(I-00133 Rome, Italy; e-mail: [bernabei@roma2.infn.it](mailto:bernabei@roma2.infn.it)),

<sup>1</sup>Dipartimento di Fisica, Università di Roma  
"La Sapienza" and INFN, Sezione di Roma  
(I-00185 Rome, Italy),

<sup>2</sup>INFN, Laboratori Nazionali del Gran Sasso  
(67010 Assergi (AQ), Italy),

<sup>3</sup>IHEP, Chinese Academy, P.O. Box 918/3  
(100039 Beijing, PR China),

<sup>4</sup>Institute for Nuclear Research,  
Nat. Acad. Sci. of Ukraine  
(Kyiv 03680, Ukraine; e-mail: [tretyak@kinr.kiev.ua](mailto:tretyak@kinr.kiev.ua))

S u m m a r y

A search for the possible charge non-conserving (CNC) decay of  $^{139}\text{La}$  into  $^{139}\text{Ce}$  has been performed for the first time. For this purpose, a new  $\text{LaCl}_3(\text{Ce})$  crystal scintillator, recently developed, and the low background DAMA/R&D setup have been used to collect the data deep underground at the Gran Sasso National Laboratory of INFN. The limit  $\tau_{\text{CNC}}(^{139}\text{La} \rightarrow ^{139}\text{Ce}) > 1.0 \times 10^{18}$  yr (90% C.L.) has been obtained for the first time; this limit holds for whatever CNC  $^{139}\text{La}$  decay with emission of massless uncharged particles.