

## Dilute excited states in light nuclei

Thursday, 5 December 2013 16:15 (20 minutes)

The results of measuring the radii of some excited states of light nuclei are presented. A method based on the analysis the diffraction patterns of the cross-section (Modified diffraction model MDM) was proposed. We studied the inelastic  $\alpha$ -scattering on  $^9\text{Be}$ ,  $^{11}\text{B}$ ,  $^{12}\text{C}$  and  $^{13}\text{C}$  with the excitation of some excited states whose structure recently attracted a lot of attention from different theoretical investigations. The evidence that the famous Hoyle state ( $0^+$ , 7.65 MeV) in  $^{12}\text{C}$  has the enhanced dimensions and is the head of a rotational band (besides the band based on the ground state) was obtained. The radius of the second  $2^+$  member state ( $E = 9.8$  or  $9.6$  MeV) occurred to be similar to that of the Hoyle state ( $\sim 3.0$  fm). A  $4^+$  state was identified at  $E = 13.75$  MeV. The radii of the 8.86 MeV,  $1/2^-$  state in  $^{13}\text{C}$  and 8.56 MeV,  $3/2^-$  state in  $^{11}\text{B}$  occurred to be close to that of the Hoyle state and these states can be considered as analogues of the latter. Comparison of the data with the predictions of such theoretical models as alpha condensation (AC) and antisymmetrized molecular dynamics (AMD) has been done. Though some of the predictions of AC (e.g., the probability of the  $L = 0$  component of alpha clusters in the Hoyle state) are close to the experiment most of the data disagree with them and one may speak only about rudimentary manifestation of the condensate effects.

A neutron halo was observed in the excited 3.09 MeV,  $1/2^+$  state of  $^{13}\text{C}$  and in the 1.68 MeV,  $1/2^+$  state of  $^9\text{Be}$ . The data obtained from the inelastic scattering were confirmed by the analysis of the asymptotic normalization coefficients extracted from the  $^{12}\text{C}(d,p)^{13}\text{C}$  reaction.

**Primary author:** Dr DEMYANOVA, Alla (NRC Kurchatov Institute Moscow Russia)

**Presenter:** Dr DEMYANOVA, Alla (NRC Kurchatov Institute Moscow Russia)

**Session Classification:** Nuclear Physics: Parallel Session I