(large iron meteorite), then $x_1 = 4.2 \times 10^{-3}$, $T_1 = 4550°$, $n_1 = 1.4 \times 10^{17}$ cm^{-3}, and $x_\infty = 2.1 \times 10^{-4}$. If $r_0 = 1$ cm, which is closer to the laboratory scale, then $x_1 = 0.58$, $T_1 = 9300°$, $n_1 = 6.6 \times 10^{17}$ cm^{-3}, $r_1 = 50$ cm, and $x_\infty = 0.13$.

The smaller the mass of the evaporated substance and the greater the initial heating, the greater the residual ionization.

I express deep gratitude to Ya. B. Zel'dovich for interest in the work and for valuable comments.

*For example, when high-energy meteorites strike the surface of a planet that has no atmosphere, during explosions of wire by electric currents in evacuated apparatus, during evaporation of anode points in pulsed X-ray tubes,[1] etc.

†Triple collisions in which heavy particles participate are important only if $x \lesssim 10^{-4}$ and do not play any role under our conditions.

‡In view of the absence of experimental data we assume the following likely values for the cross sections:

$$\sigma_e = 3 \cdot 10^{-17} \text{ cm}^2, \quad \sigma_{ph} = 2 \cdot 10^{-21} T^{-1} \text{ cm}^2 \text{ (T is in ev).}$$

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114

MEASUREMENTS OF NUCLEAR MAGNETIC MOMENTS IN THE ALKALI EARTHS BY MOLECULAR BEAM MAGNETIC RESONANCE

A. G. KUCHERYAEV, Yu. K. SZHENOV, and Sh. M. GOGICHAĬSHVILI

Physico-Technical Institute, Academy of Sciences, Georgian S.S.R.

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THE molecular beam magnetic resonance method (MBMR) has a number of advantages as compared with other methods of measuring nuclear magnetic moments in those cases in which the molecular beam consists of atoms in the S_0 state. The interaction of such atoms with an external magnetic field depends solely on the orientation of the nuclear magnetic moment. The magnetic resonance spectrum consists of one line and the shape of the line is not distorted by other interactions. Moreover, the position of the resonance is not subject to chemical shifts. Thus, the diamagnetic correction, which has been calculated accurately only for atomic and molecular hydrogen,[1] can be examined carefully.

The MBMR method (using atoms in the S_0 state) has been used to measure the magnetic moments of Ba^{135} and Ba^{137},[2] Ne^{21},[3] and Sr^{87}.[4] The application of this technique to other nuclei has been limited by the possibility of producing and detecting the appropriate atomic beams. It has been found possible to carry out these measurements in atomic beams of all the alkali earth metals using apparatus developed for this purpose.[5] This apparatus has been described by us earlier.[4]

Atomic beams of strontium, barium, and magnesium have been obtained by heating these metals (natural isotopic composition) in an oven source. A calcium atomic beam with sufficient intensity for detection of the Ca^{43} isotope was obtained by heating a mixture of CaO with 6% of the Ca^{43} isotope and mischmetal. The atomic beam was detected by a mass-spectrometer detector, using surface ionization of the atoms on tungsten, cleansed by oxygen under the optium conditions for each element.[5] The detectable intensities of narrow beams (I), the corresponding source temperatures (t), and the surface ionization coefficients (β) for the optimum detection conditions are given in Table I.

TABLE I

Isotope	t, °C	I, counts/sec	β
Mg^{25}	600	200	$2 \cdot 10^{-4}$
Ca^{43}	1070	300	0.02
Sr^{87}	750	10^4	0.2
Ba^{135}	800	500	0.6
Ba^{137}		850	

The measurements, carried out by the techniques which have been described,[5] were made at fixed field. The field was measured by the magnetic resonance of protons in water and the magnetic resonance of the Sr^{87} in the atomic beam; in the latter case the source was loaded with the necessary amount of metallic strontium in addition to the material being investigated. The values of the magnetic moment μ (with the diamagnetic correction) thus obtained are given in nuclear magnetons in Table II. In these calculations the magnetic moment of the proton has been taken as 2.79275[6] while the magnetic moment of Sr^{87}

TABLE II

Nucleus	μ
Mg^{25}	-0.855 ± 0.002
Ca^{43}	1.317 ± 0.003
Sr^{87}	-0.0924 ± 0.0009
Ba^{135}	$+1.8370\pm0.0008$
Ba^{137}	$+0.9364\pm0.0009$

has been taken from the value obtained in the present work. The spins of the nuclei investigated in the present work have been taken from reference 7. The ratio of the resonance frequencies in Ba^{137} and Ba^{135} is found to be 1.1187 = 0.0003. The sign of the magnetic moments is determined from the Millman effect.[8] The sign of the magnetic moment of Ca^{43} was not determined. The chief source of error in these measurements is the instability in the detected intensity of the atomic beams and the spread of values of the magnetic field which arises in the remagnetization of the magnet which produces the homogeneous field.

The value of the Sr^{87} magnetic moment, which we have obtained earlier,[4] has been refined in the present work by virtue of the more exact calibration of the uniform magnetic field. In order to exclude systematic errors use was made of two electromagnets, each of which was calibrated independently. The results obtained with each magnet are the same.

All values of the magnetic moments obtained by the MBMR method in the present work agree with the values obtained by nuclear induction (within the limits of the quoted errors).[9-12]

In conclusion the authors with to thank T. S. Bokuchav, K. G. Mirzoev, and I. N. Leont'eva for help in carrying out the measurements and M. I. Guseva, V. M. Gusev, and D. V. Chkuaseli for preparing the enriched Ca^{43} samples.

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115

ON THE CROSS SECTION FOR COMPOUND-NUCLEUS FORMATION BY CHARGED PARTICLES

A. D. PILIYA

Leningrad Physico-Technical Institute, Academy of Sciences, U.S.S.R.

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IN considering nuclear reactions it is often necessary to evaluate the cross section for the formation of a compound nucleus. In the nonresonance region at comparatively large energies, this cross section is satisfactorily determined by the well known formula[1]

$$\sigma_c = \frac{\pi}{k^2}\sum_{l=0}^{\infty}(2l+1)\,\frac{4s_l KR}{\Delta_l^2+(KR+s_l)^2}\,, \qquad (1)$$

where k and K are the wave numbers of the particles inside and outside the nucleus; R is the radius of the nucleus;

$$s_l = kR/(G_l^2+F_l^2),$$

$$\Delta_l = kR\,(G_lG_l'+F_lF_l')/(G_l^2+F_l^2) \text{ with } r=R,$$

where $F_l(r)$ denotes the regular solution of the radial equation, while $G_l(r)$ is the irregular solution at zero.

The use of Eq. (1) is inconvenient for charged particles at large values of the Coulomb parameter $\eta = Z_1Z_2e^2/\hbar v \gg 1$. In the present communication we obtain for σ_c a closed expression, valid under the condition that the particle energy is lower than or very little higher than the Coulomb barrier.

In this case the following expressions[2] hold for the radial Coulomb functions

ERRATA TO VOLUME 9

On page 868, column 1, item (e) should read:

(e). Ferromagnetic weak solid solutions. By way of an example, we consider the system Fe-Me with A2 lattice, where Me = Ti, V, Cr, Mn, Co, and Ni. For these the variation of the moment m with concentration c is

$$dm/dc = (N_d)_{Me} \mp 0.642 \{8\ (2.478 - R_{Me}) + 6\,|\,2.861 - R_{Me}\,| \mp [\,8\,(2.478 - R_{\mathrm{Fe}}) + 6\,(2.861 - R_{\mathrm{Fe}})]\},$$

where the signs − and + pertain respectively to ferromagnetic and paramagnetic Me when in front of the curly brackets, and to metals of class 1 and 2 when in front of the square brackets. The first term and the square brackets are considered only for ferromagnetic Me. We then have dm/dc = −3 (−3.3) for Ti, −2.6 (−2.2) for V, −2.2 (−2.2) for Cr, −2 (−2) for Mn, 0.7 (0.6) for Ni, and 1.2 (1.2) for Co; the parentheses contain the experimental values.

ERRATA TO VOLUME 10

Page	Reads	Should Read
224, Ordinate of figure	10^{23}	10^{29}
228, Column 1, line 9 from top	3.6×10^{-2} mm/min	0.36 mm/min
228, Column 1, line 16 from top	0.5 mm/sec	0.05 mm/min
329, Third line of Eq. (23a)	+(1/4 cosh r +...	+1/4(cosh r +...
413, Table II, line 2 from bottom	−0.0924±	−1.0924±
413, Table II, line 3 from bottom	+1.8730±	+0.8370±
479, Fig. 7, right, 1st line	92 hr	9.2 hr
499, Second line of Eq. (1.8)	$+\widetilde{k}\sin^2\alpha/\omega_N^2 + \langle c^2\widetilde{k}^2 \ldots$	$+\left(\widetilde{k}/\omega_H\right)^2 \sin^2\alpha\ \langle c^2\widetilde{k}^2 \ldots$
648, Column 1, line 18 from top	18 × 80 mm	180 × 80 mm
804, First line of Eq. (17)	$-{}^1/_3\left(\alpha_x^2\alpha_y^2 + \ldots\right.$	$\ldots - 3\left(\alpha_x\alpha_y^2 + \ldots\right.$
967, Column 1, line 11 from top	$\sigma(N', \pi) \approx 46\,(N', N')$	$\sigma(N', \pi) > \sigma(N', N')$
976, First line of Eq. (10)	$= \frac{e^2}{3r^2c^4}$	$= \frac{e^2}{3\hbar^2c^2}$
978, First line of Eq. (23)	$\left[\frac{(2\gamma^2-1)^2}{(\gamma^2-1)\sin^4(\theta/2)}\right.$	$\left[\frac{(2\gamma^2-1)^2}{(\gamma^2-1)^2\sin^4(\theta/2)}\right.$