GAMMA-RAY TRANSITIONS IN ^{207}Bi FOLLOWING THE DECAY OF ^{207}Po

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ABSTRACT

The decay of 5.7 h ^{207}Po to levels in ^{207}Bi has been studied using a Ge(Li)-detector. Combining the relative gamma-ray intensities with previously established conversion electron intensities, K-conversion coefficients are determined. The multipolarities of 29 transitions are deduced from a comparison with theoretical conversion coefficients, thus establishing the following spins and parities for the excited levels: 669.5 keV ($11/2^-$), 742.6 keV $7/2^-$, 892.3 keV ($9/2^-$), 992.3 keV $7/2^-$, 1148.3 keV $5/2^-$, (1360.4 keV $7/2^-$), 1372.4 keV $5/2^-$, 1680.0 keV $3/2^-$, (1690.6 keV $5/2^-$), 1762.7 keV $5/2^-$, 1902.0 keV $1/2^+$, 2060.0 keV $3/2^+$, and 2405.2 keV $5/2^+$. A comparison with a recent shell-model calculation shows good agreement for all negative parity levels.

RADIOACTIVITY ^{207}Po [from $^{209}\text{Bi}(p,3n)$];
measured E_γ, I_γ . ^{207}Bi deduced cc. J, π .
Ge(Li)-detector.

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1. INTRODUCTION

The structure of ^{207}Bi , having two neutron holes in the 126 shell and one proton in excess of the 82 shell, is of particular interest because it allows comparisons between experiment and detailed shell-model calculations. It was studied in the EC- β^+ -decay of 5.7 h ^{207}Po by Arbman, Burde and Gerholm¹⁾ (referred to as ABG in the following), who suggested a decay scheme with 11 well-established and 5 tentative excited levels. Of the 33 transitions considered as well-established in their work, only 18 were given definite multipolarity assignment, this being essentially due to the lack of reliable gamma intensities. The introduction of high-resolution lithium-drifted germanium detectors makes possible a much more accurate determination of gamma-ray intensities than was generally achieved before. Hence it was felt that a remeasurement of the gamma spectrum would shed some new light on the properties of ^{207}Bi .

This nucleus has also been studied recently by Bergström et al.²⁾, who established a consistent decay scheme of the 182 μsec isomer first discovered by Conlon³⁾.

2. EXPERIMENTAL PROCEDURE

2.1 Source preparation

Bismuth oxide (Bi_2O_3) was bombarded with 34 MeV protons in the Uppsala synchro-cyclotron. This energy is close to optimum for the (p,3n) reaction, whereas the cross-section for the (p,4n) reaction, which produces the interfering 9 d ^{206}Po activity, is still sufficiently small. The bismuth oxide was dissolved in 80°C 6N HCl and the polonium activity spontaneously deposited onto a 10 cm² silver foil which was stirred in the solution. More than 90% collection efficiency was achieved in 15 minutes.

2.2 Gamma-ray spectrometer

A $3 \text{ cm}^2 \times 0.8 \text{ cm}$ Ge(Li) detector connected to a preamplifier with a cooled field-effect transistor at the input stage was used (manufactured by AB Atomenergi, Studsvik, Sweden). The pulses were further amplified and shaped in a Tennelec TC 200 amplifier and fed to a Nuclear Data 161 multichannel analyser. The energy resolution of the system was 2.0 keV at 100 keV, and 3.0 keV at 1000 keV. Energy and intensity calibration was performed with a set of standard sources (^{241}Am , ^{57}Co , ^{203}Hg , ^{22}Na , ^{137}Cs , ^{54}Mn , ^{60}Co , and ^{88}Y) supplied by the IAEA, Vienna. The intensities of these are quoted to $\pm 2\%$ or better. The energies are known to 0.05 keV or better. [For an up-to-date review, see the report by Marion⁴).] The deviation from linearity in the energy to pulse-height relation showed a smooth behaviour and could be corrected for accurately. The energy calibrations were performed with the standard sources and the ^{207}Po source present simultaneously, thus establishing the energies of the strong transitions. These were then used to determine the energies of the other transitions. Hence errors due to drifts in the system were eliminated. The evaluation of the spectra was performed by least-squares fitting a Gaussian function (or in cases with close-lying lines, several Gaussian functions) and a straight line to a part of the spectrum. The statistical error in the position thus obtained is usually negligible compared to possible systematic errors, whereas the statistical error in the area can be considerable. Energy errors are typically 0.1 keV, while intensities are estimated to be accurate within 5%, if not limited by poor statistics.

Gamma spectra were recorded with two different amplifier settings: one "low-energy" run for energies up to 1150 keV and one "high-energy" run covering the energy interval 600-3000 keV. The distance from the source to the detector was varied during the measurements in order to ensure a count rate close to the maximal possible (about 3000/sec), without deteriorating the resolution due to "pile-up". For the "high-energy" spectrum, a graded shield consisting of 2 mm lead, 2 mm cadmium, and 1 mm copper was inserted in front of the detector in order to reduce the low-energy count rate.

3. RESULTS AND DECAY SCHEME

Figures 1 and 2 show the spectra obtained. The gamma energies and intensities deduced are listed in Table 1, which also contains the conversion electron data of ABG. Not all of the transitions established in ABG are seen in this investigation, due to the low efficiency of the detector. For these, only an upper limit of the gamma intensity is obtained. The transition energies of ABG and this work agree within 0.1 keV for energies below 950 keV. Above this energy there is a systematic deviation of at the most 0.7 keV. As this deviation varies smoothly, the energies of some transitions not seen in this work, but established in ABG, have been adjusted accordingly [cf. note (b) in Table 1].

K-conversion coefficients have been deduced by combining our gamma intensities with the electron intensities of ABG. For normalization, the 911.8 keV transition, established in ABG as E1, has been assumed to be pure E1, and its K-conversion coefficient is assumed to be equal to the theoretical value according to Sliv and Band⁵⁾. The experimental conversion coefficients deduced in this way are shown in Fig. 3, together with the theoretical values of Ref. 5. The deduced multipolarities are listed in Table 1. The error in the conversion coefficient is made up of the error in the electron intensity as given in ABG, the statistical error in the gamma intensity (one standard deviation), and a systematic error in the latter estimated to be 5%, all added quadratically. For the cases where it was only possible to put an upper limit on the gamma intensity, a corresponding lower limit is given for the conversion coefficient.

The decay scheme of ^{207}Po , according to ABG, is shown in Fig. 4. We will not repeat their arguments, but only note that all the fully drawn levels are well supported by our work. Sum relations of the type $E_1 + E_2 = E_3$, which agree within the experimental errors, are listed in Table 2. Of these about 8 per cent can be expected to be accidental. The level scheme we propose is in Fig. 5. Only some minor modifications concerning the positions of the transitions in the scheme are imposed by our work: the 369 keV transition is placed between the 2060 keV level and a new level at 1691 keV, depopulated by the 330 keV, 698 keV (weak in ABG), and

948 keV transitions. The sum relation $369.3 + 992.6 = 1360.7$ proposed in ABG is well (1.4 keV) outside our experimental errors. Furthermore, the 369 keV transition is E1, the 992 keV and 1361 keV transitions both M1 and hence cannot be interconnected. Thus the belief in the tentative level of ABG at 948 keV is somewhat reduced. The new level at 1691 keV is well supported energy-wise by the sum relation 21 of Table 2, and the connections with the well-established level at 992 keV and the tentative level at 1360 keV. A slight inconsistency in the intensity balance of the 1691 keV level can be seen from Table 3. The 1360 keV level is still very probable, supported by energy relation 29 and the connection with the 1691 keV level.

With the 698 keV and 330 keV transitions depopulating the 1691 keV level, we find no evidence for the levels at 1073/1031 keV and 1847 keV tentatively proposed by ABG. They require $288.0 + 330.1 = 369.5 + 249.6$ and $1846.8 + 214.4 = 2060.0$ keV respectively. Both these relations are incompatible with our energy data. Concerning the tentative 2583 keV level we have no comment, as the three transitions suggested for depopulating it are all too weak to be observed in our experiment.

The electron capture feedings are deduced on the assumption of no ground-state feeding and an intensity balance for the excited levels of ^{207}Bi . The weak positron branches are taken from ABG. Table 3 shows the intensity balance of each level. The slight positive feeding of the 1360 keV level should not be regarded as significant, nor do we find the negative balance of the 1691 keV level alarming. The discrepancies are easily balanced by weak unplaced or undetected transitions.

Spins and parities are determined according to the following arguments:

The ^{207}Po ground-state spin has been measured⁶⁾ in an atomic beam experiment to be $5/2$. The shell model predicts it to be due to a $2f_{5/2}$ neutron hole. The parity is hence assumed to be negative.

The ^{207}Bi ground state is assumed to be $9/2^-$ in analogy with $^{199}, ^{201}, ^{203}, ^{205}, ^{209}\text{Bi}$, where the spin has been measured⁶⁾ and interpreted as being due to a $1h_{9/2}$ proton outside the closed (82) proton shell.

In ABG the following further spins and parities were established: the 743 keV level $7/2^-$, 992 keV $7/2^-$, 1148 keV $5/2^-$, and 2060 keV $3/2^+$.

The 2405 keV level decays with an M1 transition to the $3/2^+$ 2060 keV level and with an E1 transition to the $7/2^-$ 743 keV state. Hence it must be $5/2^+$.

The 1902 keV level should be $1/2^+$ as it is fed with an M1 + E2 transition from the 2060 keV $3/2^+$ state and an E2 transition from the 2405 keV $5/2^+$ state. (See also the discussion on the 1680 keV level, where the argument is strengthened.)

The 1372 keV level decays with an E2 transition to the $9/2^-$ ground state and an M1 transition to the $5/2^-$ 1148 keV level. The 688 keV transition can energy-wise be placed either between the 2060 keV state and the 1372 keV state (sum relations 12, 19 and 33 in Table 2) or between the 1680 keV and 992 keV levels (sum relation 7). The first alternative is preferred because only this involves a parity change and the 688 keV transition is E1. Hence the 1372 keV state is fed by an E1 transition from the $3/2^+$ 2060 keV state and must thus be $5/2^-$.

The 1763 keV level must also be $5/2^-$ using an analogous argument.

The 1680 keV level is $3/2^-$ as it decays with M1 transitions to the $5/2^-$ states at 1372 keV and 1148 keV and is fed by an E1 transition from the 1902 keV $1/2^+$ state. No transitions to the $7/2^-$ states at 743 keV and 992 keV are observed. (The arguments for the assignment of the 1902 keV and 1680 keV states should be seen together: if one accepts the improbable situation that the spin difference between the 2405 keV and 1902 keV states is only one unit and the transition is still almost pure E2, the 1902 keV state could be $3/2^+$. The 1680 keV level could then be $5/2^-$. If so, it would be utterly strange that the 1902 keV level does not decay to any other $5/2^-$ state, neither does the 1680 keV level decay to any of the available $7/2^-$ states.)

The 1691 keV level (tentative) is $5/2^-$, as it is fed by an E1 transition from the 2060 keV $3/2^+$ state and decays with an M1 transition to the 743 keV $7/2^-$ level.

The 1360 keV level (tentative) is then $7/2^-$, as it decays to the $9/2^-$ ground state with an M1 transition and is fed by another M1 transition from the 1691 keV $5/2^-$ state.

The 892 keV level is fed by an M1 transition from the 992 keV $7/2^-$ level and decays with an M1 transition to the $9/2^-$ ground state. Hence it must be either $7/2^-$ or $9/2^-$. As it is not fed by any of the higher-lying $5/2^-$ levels, it is most likely $9/2^-$.

The 669 keV level, connected via M1 transitions to the $9/2^-$ ground state and the ($9/2^-$) 892 keV state is thus $7/2^-$, $9/2^-$, or $11/2^-$. It is not fed by any of the higher $5/2^-$ states nor from the $7/2^-$ states. The most probable assignment is thus $11/2^-$. The 222.7 keV-669 keV cascade could be reversed. However, data on the decay of ^{211}At can be interpreted⁷⁾ as an alpha-decay feeding of a level at 670 keV.

The decay scheme of Fig. 5 leaves several transitions unplaced. However, the strongest of these occurs in only 0.3% of the decays.

4. DISCUSSION

As pointed out in the Introduction, the main reason for studying the properties of ^{207}Bi is its nearness to the double-magic ^{208}Pb . It has one proton and two neutron holes outside closed shells.

The single-particle proton levels are best studied in ^{209}Bi , where all the shell-model states in the $82 < Z < 126$ shell have recently been located [see, for example, the paper by Ellegaard and Vedelsby⁸⁾]. They are $1h_{9/2}$ (g.s.), $2f_{7/2}$ (0.892 MeV), $1i_{13/2}$ (1.601 MeV), $2f_{5/2}$ (2.814 MeV), $3p_{3/2}$ (3.108 MeV) and $3p_{1/2}$ (3.624 MeV).

The two-neutron-hole coupling has been extensively studied both experimentally and theoretically in ^{206}Pb [see, for example, the paper by True⁹⁾, and references quoted therein]. The states resulting from the neutron hole - proton coupling in ^{208}Bi have been studied in considerable detail by Alford et al.¹⁰⁾ in stripping and pick-up reactions.

Using all the empirical information mentioned above, one can perform a shell-model calculation of ^{207}Bi essentially without any free parameters,

and hence get a check of the consistency of the assumptions involved. Due to the present detailed knowledge of ^{206}Pb and ^{208}Bi , ^{207}Bi is indeed a very favourable case for such a calculation. This has recently been done by Blomqvist¹¹⁾. His results for the energy levels are shown in Fig. 6, which also contains the high-spin levels of Bergström et al.²⁾ in the experimental column. The agreement between theory and experiment is very satisfactory for all the negative parity states that are observed experimentally. In particular, our probable spin assignments for the 669 keV and 892 keV levels (cf. Section 3) are confirmed. The tentative levels at 1360 keV and 1691 keV are also supported. It is comforting to note that all theoretically predicted states that can be expected to be populated with a reasonable strength in the cascades from the positive parity levels are observed.

It is remarkable that of all the possible beta transitions that would be allowed from spin and parity arguments alone, only those to the $7/2^-$ states at 743 keV and 992 keV are observed within the accuracy of this experiment. This is readily understood in the following way: due to the pairing interaction, the ^{207}Po ground-state proton configuration contains $(f_{7/2})^2$, and also higher components, in addition to the "naive" $(h_{9/2})^2$ configuration. If the $f_{7/2}$ single-particle proton is identified as being essentially in the 992 keV state but also mixed into the 743 keV state to a certain degree due to configuration interaction, the two beta transitions can be identified as $P(f_{7/2}) \rightarrow N(f_{5/2})$, the created neutron filling the hole in the ^{207}Po ground state. All other negative parity states involve unpaired neutron configurations that should have very small amplitude in the ^{207}Po ground state; thus the one-particle character of the beta operator prevents them from being populated in the beta process.

The positive parity states do not fit into the model with one proton and two neutron holes outside a ^{208}Pb core. We have presented elsewhere¹²⁾ several arguments for an interpretation of these states as proton core excitations, and refer the reader to the discussion therein. Thus, for example, the $3/2^+$ state at 2060 keV would have the configuration $P(h_{9/2}^2 d_{3/2}^{-1})N(p_{1/2}^{-2})$. In this way the relatively fast first forbidden beta transition to this state is explained as $P(d_{3/2}) \rightarrow N(f_{5/2})$.

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Table 1

Experimental information on transitions in ^{207}Bi

Transition energy (keV)	Gamma intensity $I(911.8)=1000$	K electron intensity (from ABG)	Total transition intensity	Internal K conversion coefficient	Assignment ^{c)}
99.8 ± 0.2	7.2 ± 1.6	9.8 ± 1.0(L _I)	76 ± 18	1.36 ± 0.31(L _I)	M1 + E2
149.6 ± 0.2	5.0 ± 0.7	12.0 ± 1.5	20 ± 3	2.4 ± 0.4	M1
156.1 ± 0.1 ^{a)}		7.2 ± 0.7	12 ± 1 ^{a)}		M1 ^{a)}
158.0 ± 0.1	31 ± 2	11.5 ± 1.0	62 ± 4	0.37 ± 0.04	M1 + E2
177.7 ^{a)}	< 1	2.0		> 2.0	
205.2 ± 0.2 ^{a)}	e)	1.2 ± 0.2	2.6 ± 0.3 ^{a)}		
214.4 ^{a)}	< 2	0.75		> 0.38	
222.1 ± 0.1	85 ⁺⁵ ₋₂₀ ^{f)}	3.5 ± 0.8	89 ⁺⁵ ₋₂₀	0.041 ^{+0.015} _{-0.010}	E1
222.7 ± 0.2 ^{a)}		14 ± 1	34 ± 3 ^{a)}		M1 ^{a)}
224.0 ± 0.2	11 ± 2	5.2 ± 0.8	18 ± 3	0.47 ± 0.11	M1 + E2
249.6 ± 0.1	90 ± 5	53 ± 3	153 ± 9	0.59 ± 0.05	M1
288.0 ± 0.3 ^{a)}	< 2.5	0.9 ± 0.2	3.3 ± 0.3 ^{a)}	> 0.28	
297.2 ± 0.1	56 ± 3	0.3(L _I)	61 ± 3	0.005(L _I)	E1
307.5 ± 0.1	36 ± 3	14 ± 1	51 ± 5	0.39 ± 0.04	M1
330.1 ± 0.2	13 ± 2	4.2 ± 0.5	18 ± 3	0.32 ± 0.06	M1
345.2 ± 0.2	111 ± 6	34 ± 3	160 ± 9	0.31 ± 0.03	M1
369.5 ± 0.1	107 ± 7	1.7 ± 0.3	109 ± 7	0.016 ± 0.003	E1
390.1 ^{a)}	< 6	0.65		> 0.11	(M1)
402.4 ± 0.4 ^{a)}		0.90 ± 0.10	6.5 ± 0.7 ^{a)}		
405.7 ± 0.1	563 ± 30	100	680 ± 36	0.18 ± 0.02	M1
503.3 ± 0.4	10 ± 4	0.26	10 ± 4	0.026 ± 0.013	E2
531.7 ± 0.4	33 ± 15	1.6 ± 0.3	35 ± 15	0.049 ± 0.024	M1 + E2
629.8 ± 0.1	82 ± 8	4.5 ± 0.5	87 ± 8	0.055 ± 0.008	M1
669.5 ± 0.2	28 ± 4	1.7 ± 0.2	30 ± 5	0.061 ± 0.011	M1
687.6 ± 0.1	113 ± 9	0.48 ± 0.08	113 ± 9	0.0042 ± 0.0008	E1
698.3 ^{a)}	< 6	0.20		> 0.033	(M1)
742.6 ± 0.1	1620 ± 80	59 ± 5	1690 ± 85	0.036 ± 0.003	M1

a) Information from ABG.

b) Energies from ABG have been adjusted (cf. text).

c) Multipolarities within parenthesis deduced from the level scheme.

d) The second alternative inconsistent with the level scheme.

e) Intensity limit uncertain due to Compton edges from the 345.2 and 369.5 keV transitions.

f) Includes the contribution from the 222.7 keV transition known from ABG.

Table 1 (cont.)

Transition energy (keV)	Gamma intensity I(911.8)= =1000	K electron intensity (from ABG)	Total transition intensity	Internal K conversion coefficient	Assignment ^{c)}
770.7± 0.7 ^{a)}	< 35	0.74± 0.10	26± 4 ^{a)}	> 0.018	(M1)
892.3± 0.2	24± 5	0.26± 0.05	24± 5	0.011± 0.003	M1 + E2
911.8± 0.1	1000± 50	2.6± 0.2	1000± 50	0.0026± 0.0002	E1
947.9± 0.1	60± 5	1.3± 0.1	62± 5	0.022± 0.002	M1
992.3± 0.1	3350± 180	54± 4	3420± 185	0.016± 0.001	M1
1020.0± 0 ^{a,b)}	< 10	0.05(L _I)		> 0.005(L _I)	
1148.3± 0.1	340± 30	1.50± 0.15	340± 30	0.0044± 0.0005	E2
1211.2± 1.0 ^{a,b)}	< 7	0.13± 0.02		> 0.016	
1317.5 ^{a,b)}	< 5	~ 0.013		> 0.0026	(M2)
1360.4± 0.2	35± 3	0.23± 0.03	35± 3	0.0066± 0.0010	M1, E3 ^{d)}
1372.4± 0.2	77± 6	0.25± 0.03	77± 6	0.0033± 0.0004	E2
1377.0± 0.5	9± 2		9± 2		
1586.1 ^{a)}	< 6	0.019± 0.004		> 0.0025	
1662.5± 0.4	22± 4	0.022± 0.004	22± 4	0.0010± 0.0003	E1
1762.7± 0.4	14± 3	0.027± 0.005	14± 3	0.0019± 0.0005	E2
1846.8± 0.2	19± 2	0.016± 0.004	19± 2	0.00084± 0.00022	E1
2060.0± 0.2	80± 6	0.21± 0.03	80± 6	0.0026± 0.0004	E3, M1 ^{d)}
2600 ^{a)}	< 4				

Table 2

Energy sum relations

(Only transitions that are well established in this work and/or by Arbman et al.¹) have been included.)

No.	E ₁	E ₂	E ₁ + E ₂	E ₃	Difference	Agrees with scheme
1	149.6	99.8	249.4	249.6	0.2	yes
2	158.0	149.6	307.6	307.5	0.1	no
3	249.6	156.1	405.7	405.7	0.0	yes
4	345.2	158.0	503.2	503.3	0.1	yes
5	307.5	224.0	531.5	531.7	0.2	yes
6	405.7	224.0	629.7	629.8	0.1	yes
7	531.7	156.1	687.8	687.6	0.2	no
8	402.4	369.5	771.9	770.7	1.2	no
9	669.5	222.7	892.2	892.3	0.1	yes
10	687.6	205.2	892.8	892.3	0.5	no
11	742.6	149.6	892.2	892.3	0.1	yes
12	687.6	224.0	911.6	911.8	0.2	yes
13	742.6	205.2	947.8	947.9	0.1	no
14	742.6	249.6	992.2	992.3	0.1	yes
15	770.7	222.1	992.8	992.3	0.5	no
16	892.3	99.8	992.1	992.3	0.2	yes
17	742.6	405.7	1148.3	1148.3	0.0	yes
18	992.3	156.1	1148.4	1148.3	0.1	yes
19	687.6	629.8	1317.4	1317.5	0.1	yes
20	911.8	405.7	1317.5	1317.5	0.0	yes
21	947.9	369.5	1317.4	1317.5	0.1	yes
22	1211.6	149.6	1361.2	1360.4	0.8	no
23	742.6	629.8	1372.4	1372.4	0.0	yes

Table 2 (cont.)

No.	E ₁	E ₂	E ₁ + E ₂	E ₃	Difference	Agrees with scheme
24	1148.3	224.0	1372.3	1372.4	0.1	yes
25	892.3	770.7	1663.0	1662.5	0.5	no
26	992.3	669.5	1661.8	1662.5	0.7	no
27	1317.5	345.2	1662.7	1662.5	0.2	yes
28	992.3	770.7	1763.0	1762.7	0.3	yes
29	1360.4	402.4	1762.8	1762.7	0.1	yes
30	1662.5	99.8	1762.3	1762.7	0.4	no
31	1148.3	911.8	2060.1	2060.0	0.1	yes
32	1317.5	742.6	2060.1	2060.0	0.1	yes
33	1372.4	687.6	2060.0	2060.0	0.0	yes
34	1762.7	297.2	2059.9	2060.0	0.1	yes

Table 3

Intensity balance and deduced EC - β^+ - feedings
for the excited states in ^{207}Bi

Level (keV)	Transitions depopulating the level		Transitions feeding the level		Deduced intensity of EC and β^+ branch	Log ft
	Energy (keV)	Intensity	Energy (keV)	Intensity		
669.5	669.5	30 ± 5	222.7	$34 \pm 3^a)$	-	
742.6	742.6	1690 ± 85	149.6 249.6 405.7 629.8 947.9 1020.0 1317.5 1662.5	20 ± 3 153 ± 9 680 ± 36 87 ± 8 62 ± 5 < 10 < 5 22 ± 4 1024 ± 80 $- 65$	$670 \pm 150; 12\%$	7.4
892.3	149.6 222.7 892.3	20 ± 3 $34 \pm 3^a)$ 24 ± 5 78 ± 11	99.8	76 ± 18	-	
992.3	99.8 249.6 992.3	76 ± 18 153 ± 9 3420 ± 185 3649 ± 212	156.1 698.3 770.7	$12 \pm 1^a)$ < 6 $26 \pm 4^a)$ 38 ± 11 $- 5$	$3600 \pm 200; 6\%$	6.5
1148.3	156.1 405.7 1148.3	$12 \pm 1^a)$ 680 ± 36 340 ± 30 1032 ± 67	224.0 531.7 911.8	18 ± 3 35 ± 15 1000 ± 50 1053 ± 68	-	
1360.4	1360.4	35 ± 3	330.1 402.4	18 ± 3 $7 \pm 1^a)$ 25 ± 4	$10 \pm 7; 0.3\%$	

a) Intensity from ABG.

b) The small negative intensity balance may be due to some weak unplaced transitions (cf. text).

Table 3 (cont.)

Level (keV)	Transitions depopulating the level		Transitions feeding the level		Deduced intensity of EC and β^+ branch	Log ft
	Energy (keV)	Intensity	Energy (keV)	Intensity		
1372.4	224.0 629.8 1372.4	18 ± 3 87 ± 8 77 ± 6 $\hline 182 \pm 17$	307.5 390.1 687.6	51 ± 5 < 6 113 ± 9 $\hline 164^{+20}_{-14}$	-	
1680.0	307.5 531.7	51 ± 5 35 ± 15 $\hline 86 \pm 20$	222.1	89^{+5}_{-20}	-	
1690.6	330.1 698.3 947.9	18 ± 3 < 6 62 ± 5 $\hline 80^{+14}_{-8}$	369.5	109 ± 7	$-29^{+21}_{-15}{}^b)$	
1762.7	390.1 402.4 770.7 1020.0 1762.7	< 6 $7 \pm 1^a)$ $26 \pm 4^a)$ < 10 14 ± 3 $\hline 47^{+24}_{-8}$	297.2	61 ± 3		
1902.0	222.1	89^{+5}_{-20}	158.0 503.3	62 ± 4 10 ± 4 $\hline 72 \pm 8$	-	
2060.0	158.0 297.2 369.5 687.6 911.8 1317.5 2060.0	62 ± 4 61 ± 3 109 ± 7 113 ± 9 1000 ± 50 < 5 80 ± 6 $\hline 1425^{+84}_{-79}$	345.2	160 ± 9	1270 ± 90 ; 22%	6.2
2405.2	345.2 503.3 1662.5	160 ± 9 10 ± 4 22 ± 4 $\hline 192 \pm 17$			190 ± 20 ; 3.3%	6.5

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Figure captions

- Fig. 1 : Gamma spectrum of the ^{207}Po decay (95-1150 keV) from the "low-energy" run. Insertions show regions around the peaks at 99.8, 149.6, 330.1, 503.3, 531.7 and 669.5 keV, where the contents of three channels have been added for each point to improve statistics.
- Fig. 2 : Gamma spectrum of the ^{207}Po decay (700-2100 keV) from the "high-energy" run.
- Fig. 3 : Internal K-conversion coefficients. Experimental points from Table 1. The lines represent theoretical values from Ref. 5.
- Fig. 4 : The decay scheme of ^{207}Po as suggested by Arbman et al.¹⁾.
- Fig. 5 : The ^{207}Po decay scheme including information from this experiment. Transitions indicated as fully drawn arrows have been well established in this work and/or by Arbman et al.¹⁾. Transitions that have been classified as less certain by Arbman et al. and not detected in our experiment are drawn as dashed arrows. The levels at 1690.6 keV and 1360.4 keV have been indicated with dashed lines, as the evidence for their existence is less conclusive.
- Fig. 6 : Excitation energies in ^{207}Bi calculated by Blomqvist¹¹⁾, compared with experimental data from Ref. 2 and this work.

Fig. 1

Fig. 2

Fig. 3

Fig. 5

^{207}Bi

Fig. 6