# Bangiya Sabdakosh and The Graphical Law

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## Abstract

We study the Bangiya Sabdakosh: A Bengali-Bengali lexicon compiled by the Late Haricharan Bandyopadhyay. We draw the natural logarithm of the number of words, normalised, starting with a letter vs the natural logarithm of the rank of the letter, normalised. We conclude that the dictionary can be characterised by BW(c=0.01), the magnetisation curve of the Ising Model in the Bragg-Williams approximation in the presence of external magnetic field, H.  $c = \frac{H}{\gamma \epsilon} = 0.01$  with  $\epsilon$ being the strength of coupling between two neighbouring spins in the Ising Model,  $\gamma$  representing the number of nearest neighbours of a spin, which is very large.

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a	á	i	í	u	ú	ŗi	ŗí	li	lí	е	ei	0	ó	ou	ka	kha	ga	gha	gna	cha	chha	ja	jha
5962	2879	577	83	1631	146	98	3	4	5	578	50	190	0	66	4445	990	1823	429	2	1347	481	1151	364
nya	ţa	ţha	фa	dha	ņa	ta	tha	da	dha	na	pa	pha	ba	bha	ma	ya	ra	la	va	sha	sha	sa	ha
6	354	179	303	158	3	1693	160	1902	639	2112	4613	573	5267	1365	3750	882	1659	1073	0	2502	191	6620	1991

TABLE I. Bangiya Sabdakosh words: the odd rows represent letters of the "Kannada" alphabet,[4], in the serial order, omitting mostly non-zero words, the even rows represent the number of words of the Bangiya Sabdakosh, [1].

## I. INTRODUCTION

"....Moter upore, erup abhidan bangala bhaṣhay itipurbe bahir hoy nai."—-Suniti Kumar Chattopadhyay, an eminent linguist.

The abhidan (dictionary) is the Bangiya Sabdakosh: A Bengali-Bengali lexicon compiled by the Late Haricharan Bandyopadhyay, [1]. This is unique among the others of its folks, was published part be part over a span of fourteen years to get at the end a forward from Rabindranath Tagore. There is a clear cut separation between the set of words and the set of explanations appearing with the meaning of the words. The explanations were drawn through thorough researches from literature s, mythologies, folklore s, histories, geographies, cultures etc. This dictionary can stand as the standard for a dictionary of a language of a particular age. This mammoth dictionary spreads over two thousand four hundred pages. The other bengali-bengali dictionaries, we have studied are Samsad Bangla Abhidan compiled by Sailendra Biswas, the fifth edition, [2] and Chalantika, [3], before. Also we have studied embedding the bengali letters in the Kannada alphabet ala, [4]. We do that in this paper also, almost. We replace the Kannada letters lu and lú by li and lí respectively. We count each and every word of the Bangiya Sabdakosh, [1]. We have excluded

the Parishishta(addendum) from counting. The result is the table, I. To visualise we plot the number of words against the respective letters in the dictionary sequence,[1],[4], in the adjoining figure, fig.1. We put the Samsad Bangla Abhidan compiled by Sailendra Biswas, the fifth edition, [2] and Chalantika, [3] in the context in the following in the tables, II III and pictorially represent the number of words, entries against the respective letters in the dictionary sequence,[4], in the adjoining figure, fig.2.

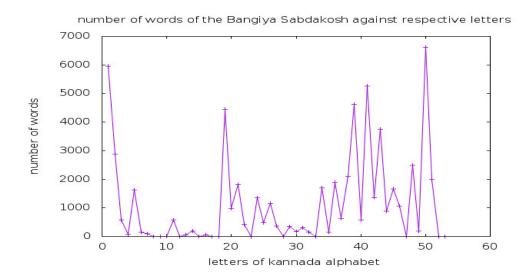


FIG. 1. The vertical axis is the number of words of the Bangiya Sabdakosh, [1]. The horizontal axis is the letters of the "Kannada" alphabet. Letters are represented by the sequence number in the alphabet as it appears in the dictionary, [4].

a	á	i	í	u	ú	ŗi	e	é	ei	0	ó	ou	ka	kha	ga	gha	gna	cha	chha	ja	jha	nya	ţa
4295	2029	271	59	1205	53	47	494	0	50	173	0	46	3864	835	1725	480	0	1531	495	1139	318	0	401
ţha	фa	dha	ņa	ta	tha	da	dha	na	pa	pha	ba	bha	ma	ya	ra	la	va	sha	sha	sa	ha	ļa	kşha
172	287	155	7	1653	153	2103	788	2263	4503	565	4745	1091	2902	577	1324	796	0	1586	88	4182	1119	0	0

TABLE II. Samsad Bangla Abhidan words: the odd rows represent letters of the "Kannada" alphabet,[4], in the serial order, omitting mostly non-zero entries, the even rows represent the number of entries of the Samsad Bangla Abhidan, [2].

a	á	i	í	u	ú	ŗi	e	é	ei	0	ó	ou	ka	kha	ga	gha	gna	cha	$^{\rm chha}$	ja	jha	nya	ţa
2595	1397	177	35	1034	30	25	237	0	28	113	0	30	2314	599	1157	316	0	988	350	895	235	0	236
ţha	фа	dha	ņa	ta	tha	da	dha	na	pa	pha	ba	bha	ma	ya	ra	la	va	sha	şha	$\mathbf{sa}$	ha	ļa	kșha
137	191	134	0	1078	102	1392	515	1463	3196	392	3170	791	1773	356	737	434	0	955	47	2530	629	0	0

TABLE III. Chalantika words: the odd rows represent letters of the "Kannada" alphabet,[4], in the serial order, omitting mostly non-zero entries, the even rows represent the number of the Chalantika words, [3].

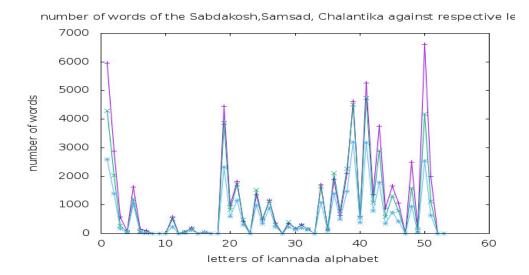


FIG. 2. The vertical axis is the number of words( entries), in red(green, blue), of the Sabdakosh(Samsad, Chalantika), Bengali-Bengali dictionary, [1]([2],[3]). The horizontal axis is the letters of the "Kannada" alphabet. Letters are represented by the sequence number in the alphabet as it appears in the dictionary, [4].

Next on to the Graphical Law, we proceed in the rest of the paper. We have started considering magnetic field pattern in [5], in the languages we converse with. We have studied there, a set of natural languages, [5] and have found existence of a magnetisation curve under each language. We have termed this phenomenon as the Graphical Law.

Then, we moved on to investigate into, [6], dictionaries of five disciplines of knowledge and found existence of a curve magnetisation under each discipline. This was followed by finding of the graphical law behind the bengali language, [7] and the basque language [8]. This was pursued by finding of the graphical law behind the Romanian language, [9], five more disciplines of knowledge, [10], Onsager core of Abor-Miri, Mising languages, [11], Onsager Core of Romanised Bengali language, [12], the graphical law behind the Little Oxford English Dictionary, [13], the Oxford Dictionary of Social Work and Social Care, [14], the Visayan-English Dictionary, [15], Garo to English School Dictionary, [16], Mursi-English-Amharic Dictionary, [17] and Names of Minor Planets, [18], A Dictionary of Tibetan and English, [19], Khasi English Dictionary, [20], Turkmen-English Dictionary, [21], Websters Universal Spanish-English Dictionary, [22], A Dictionary of Modern Italian, [23], Langenscheidt's German-English Dictionary, [24], Essential Dutch dictionary by G. Quist and D. Strik, [25], Swahili-English dictionary by C. W. Rechenbach, [26], Larousse Dictionnaire De Poche for the French, [27], the Onsager's solution behind the Arabic, [28], the graphical law behind Langenscheidt Taschenwörterbuch Deutsch-Englisch / Englisch-Deutsch, Völlige Neubearbeitung, [29], the graphical law behind the NTC's Hebrew and English Dictionary by Arie Comey and Naomi Tsur, [30], the graphical law behind the Oxford Dictionary Of Media and Communication, [31], the graphical law behind the Oxford Dictionary Of Mathematics, Penguin Dictionary Of Mathematics, [32], the Onsager's solution behind the Arabic Second part, [33], the graphical law behind the Penguin Dictionary Of Sociology, [34], behind the Concise Oxford Dictionary Of Politics, [35], a Dictionary Of Critical Theory by Ian Buchanan, [36], the Penguin Dictionary Of Economics, [37], the Concise Gojri-English Dictionary by Dr. Rafeeq Anjum, [38], A Dictionary of the Kachin Language by Rev.O.Hanson, [39], A Dictionary Of World History by Edmund Wright, [40], Ekagi-Dutch-English-Indonesian Dictionary by J. Steltenpool, [41], A Dictionary of Plant Sciences by Michael Allaby, [42], respectively. The graphical law was pursued more in Along the side of the Onsager's solution, the Ekagi language, [43], Along the side of the Onsager's solution, the Ekagi language-Part Three, [44], Oxford Dictionary of Biology by Robert S. Hine and the Graphical law, [45], A Dictionary of the Mikir Language by G. D. Walker and the Graphical law, [46], A Dictionary of Zoology by Michael Allaby and the Graphical Law, [47], Dictionary of all Scriptures and Myths by G. A. Gaskell and the Graphical Law, [48], Dictionary of Culinary Terms by Philippe Pilibossian and the Graphical law, [49], A Greek and English Lexicon by H.G.Liddle et al simplified by Didier Fontaine and the Graphical law, [50], Learner's Mongol-English Dictionary and the Graphical law, [51], Complete Bulgarian-English Dictionary and the Graphical law, [52], A Dictionary of Sindhi Literature by Dr. Motilal Jotwani and the Graphical Law, [53], Penguin Dictionary of Physics, the Fourth Edition, by John Cullerne, and the Graphical law, [54], Oxford Dictionary of Chemistry, the seventh edition and the Graphical Law, [55], A Burmese-English Dictionary, Part I-Part V, by J. A. Stewart and C. W. Dunn et al, head entries and the Graphical Law, [56], The Graphical Law behind the head words of Dictionary Kannada and English written by W. Reeve, revised, corrected and enlarged by Daniel Sanderson, [57], Sanchayita and the Graphical Law, [58], Samsad Bangla Abhidan and The Graphical Law, [59], respectively.

The planning of the paper is as follows. In the next section, we describe the Graphical Law analysis of the words of the Bangiya Sabdakosh: A Bengali-Bengali lexicon compiled by the Late Haricharan Bandyopadhyay, [1]. The section III, we give an introduction to the standard curves of magnetisation of Ising model. The section IV is Acknowledgment. The last section is Bibliography.

#### II. THE GRAPHICAL LAW ANALYSIS

For the purpose of exploring graphical law, we assort the letters according to the number of words, in the descending order, denoted by f and the respective rank, [66], denoted by k. k is a positive integer starting from one. Moreover, the minimum non-zero number of words is two. Hence, we attach a limiting word number one. The limiting rank is maximum rank plus one, here it is forty six. As a result both  $\frac{lnf}{lnf_{max}}$  and  $\frac{lnk}{lnk_{lim}}$  varies from zero to one. Then we tabulate in the adjoining table, IV, and plot  $\frac{lnf}{lnf_{max}}$  against  $\frac{lnk}{lnk_{lim}}$  in the figure fig.3. We then ignore the letter with the highest of words, tabulate in the adjoining table, IV, and starting from k = 2 in the figure fig.4. This programme we continue to get up to the figure fig.7

bit           1         0.480         0.480         0.480         0.480         0.480         0.480         0.480         0.480         0.480         0.480         0.480         0.480         0.480         0.480         0.480         0.480         0.480         0.480         0.490 </th <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>									
2         0.69         0.180         5962         8.693         0.988         1         Blank         Blank           1         1.00         0.287         5267         8.690         0.974         0.966         1         Blank           1         1.00         0.430         4.445         8.400         0.957         0.967         0.980         0.993         0.936         0.930         0.937         0.930         0.931         0.931         0.932         0.935         0.936         0.930         0.931         0.937           1         5.50         0.540         2502         7.825         0.880         0.900         0.913         0.927           1         2.40         0.647         1901         7.50         0.851         0.853         0.863         0.893         0.900           12         2.46         0.648         1632         7.434         0.853         0.864         0.841         0.851           12         2.46         0.668         1639         7.414         0.843         0.851         0.863         0.837           12         2.40         0.668         1639         7.414         0.843         0.863         0.841         0.842	k		$\ln k / ln k_{lim}$		lnf				
3         1.10         0.287         5267         8.560         0.974         0.986         1         Blank           4         1.30         0.363         4013         8.437         0.069         0.971         0.985         1           6         1.70         0.407         3750         8.230         0.935         0.947         0.960         0.975           7         1.95         0.509         2879         7.955         0.870         0.881         0.900         0.913         0.927           9         2.20         0.574         2112         7.655         0.870         0.881         0.893         0.907           11         2.40         0.627         1902         7.551         0.852         0.860         0.881         0.893         0.907           12         2.48         0.648         1823         7.508         0.853         0.861         0.877         0.801         0.893         0.862         0.893         0.863         0.877           12         2.48         0.648         1639         7.413         0.843         0.853         0.841         0.853         0.841           12         2.40         0.783         1639         <	1	0	0	6620	8.798	1	Blank	Blank	Blank
41.300.36346138.4370.9590.9710.985151.610.42044458.4000.9650.9660.9800.99671.950.50928797.9650.9050.9160.9300.94482.050.54325027.8250.8300.9060.9130.927102.200.57421127.6560.8700.8810.8930.907112.400.60119917.5960.8630.8740.8860.900122.480.64818237.5080.8530.8600.8810.895132.560.66816937.4340.8450.8550.8660.870142.640.64916377.3970.8410.8510.8630.877152.710.72816377.2060.8110.8630.8410.854162.770.72313657.2100.8310.8300.8410.854172.830.75513177.060.8110.8220.8110.854182.800.76813177.060.8130.7420.754192.910.76813976.7930.7340.7410.754192.920.900.7740.7540.7540.754192.800.7840.7340.7420.754193.800.7930.7340.742	2	0.69	0.180	5962	8.693	0.988	1	Blank	Blank
5         1.61         0.420         4445         8.400         0.955         0.966         0.980         0.996           6         1.79         0.467         3750         8.230         0.938         0.947         0.960         0.975           8         2.08         0.543         2507         7.856         0.889         0.900         0.913         0.927           9         2.20         0.574         2112         7.656         0.870         0.881         0.803         0.907           12         2.40         0.627         1902         7.556         0.883         0.861         0.893         0.890           12         2.44         0.648         1823         7.506         0.853         0.862         0.897         0.890           15         2.71         0.768         1653         7.11         0.813         0.851         0.863         0.865         0.871           16         2.77         0.723         1363         7.219         0.821         0.830         0.841         0.851           17         2.83         0.755         1151         7.048         0.801         0.811         0.822         0.835           18	3	1.10	0.287	5267	8.569	0.974	0.986	1	Blank
61.790.46737508.2300.9350.9470.9600.9130.97571.950.50328707.950.5050.9160.3030.94482.080.54325027.850.8870.8000.9130.927102.300.60119917.550.8700.8810.8030.907112.400.62719927.510.8830.8690.8810.895122.480.64818937.500.8530.8640.8760.890132.560.66816937.4140.8430.8530.8650.871152.710.70316167.4140.8410.8510.8630.877162.770.73316167.300.8110.8220.856172.830.75511517.040.8110.8220.831182.890.75311517.040.8010.7140.754182.300.8739066.890.7340.7420.754182.300.8739076.7830.7320.7310.7420.754192.440.8305776.3530.7230.7310.7420.754203.040.7948260.7230.7310.7410.753213.140.8305776.3630.6970.7410.753223.000.841 <td< td=""><td>4</td><td>1.39</td><td>0.363</td><td>4613</td><td>8.437</td><td>0.959</td><td>0.971</td><td>0.985</td><td>1</td></td<>	4	1.39	0.363	4613	8.437	0.959	0.971	0.985	1
7         1.95         0.509         2879         7.965         0.905         0.906         0.913         0.927           8         2.02         0.574         2112         7.655         0.879         0.881         0.893         0.907           10         2.30         0.601         1901         7.596         0.863         0.874         0.886         0.900           12         2.40         0.648         1823         7.508         0.853         0.864         0.876         0.890           13         2.56         0.668         1693         7.434         0.845         0.853         0.863         0.863         0.877           15         2.71         0.708         1631         7.30         0.831         0.811         0.863         0.863         0.877           16         2.77         0.723         1365         7.10         0.830         0.841         0.856           17         2.83         0.733         1347         7.06         0.810         0.811         0.812         0.832           18         2.90         0.753         1374         0.743         0.741         0.854           12         3.40         0.820         <	5	1.61	0.420	4445	8.400	0.955	0.966	0.980	0.996
8         2.08         0.543         2502         7.825         0.889         0.900         0.913         0.927           9         2.20         0.574         2112         7.655         0.870         0.881         0.803         0.907           11         2.40         0.601         1901         7.551         0.853         0.864         0.881         0.805           12         2.48         0.648         1803         7.508         0.853         0.864         0.870         0.800           12         2.48         0.648         1803         7.508         0.853         0.864         0.870         0.801           12         2.48         0.668         1603         7.44         0.843         0.853         0.863         0.863         0.877           15         2.71         0.708         1631         7.90         0.810         0.811         0.822         0.835         0.853           12         2.84         0.755         1151         7.048         0.801         0.813         0.814         0.854           12         2.40         0.754         1573         0.732         0.741         0.804           2         3.00         <	6	1.79	0.467	3750	8.230	0.935	0.947	0.960	0.975
92.200.57421127.6550.8700.8810.8930.907102.300.60119017.5060.8630.8740.8810.900122.480.64719027.5080.8530.8640.8760.890132.560.66816937.4340.8450.8530.8640.8760.890142.440.68916597.140.8410.8510.8630.877152.770.72313657.2190.8210.8300.8410.856162.770.72313657.0290.8310.8290.8410.854182.800.75511517.0480.7930.8030.7140.8030.8140.827192.940.76810736.790.7930.8030.7140.8040.837213.040.75410736.790.7930.7040.7540.754223.090.8076396.7400.7430.7510.754233.140.8305776.3580.7230.7310.7410.753243.180.8305776.3590.6070.6770.7070.718253.200.8115.390.6670.6750.6850.690263.300.8623.455.8970.6760.6750.6850.692273.300.8623.455.897 <td>7</td> <td>1.95</td> <td>0.509</td> <td>2879</td> <td>7.965</td> <td>0.905</td> <td>0.916</td> <td>0.930</td> <td>0.944</td>	7	1.95	0.509	2879	7.965	0.905	0.916	0.930	0.944
102.300.60119917.5960.8630.8740.8860.900112.400.62719027.5510.8580.8690.8760.895132.660.66816937.4340.8530.8640.8760.881142.640.68916937.4340.8430.8530.8630.879152.710.70816317.3970.8410.8530.8630.879152.770.72313657.2190.8210.8300.8420.856172.830.75511517.0460.8190.8290.8410.827182.900.76810736.9780.7930.8030.8140.827193.000.7539006.3980.7740.7800.7910.804213.000.7539006.3980.7230.7320.7420.754233.010.8076.390.7230.7310.7420.754243.180.8305.776.3500.6970.7070.712253.200.8414.876.7920.6770.6850.699273.300.8624296.0610.6780.6850.699283.300.8803.545.8970.6770.6670.677293.370.8803.545.6970.6040.6130.622293.370.880 <td< td=""><td>8</td><td>2.08</td><td>0.543</td><td>2502</td><td>7.825</td><td>0.889</td><td>0.900</td><td>0.913</td><td>0.927</td></td<>	8	2.08	0.543	2502	7.825	0.889	0.900	0.913	0.927
112.400.62719027.5510.8580.8690.8810.890122.480.64818237.5080.8530.8640.8760.890132.500.66816937.440.8430.8530.8650.867152.710.70816317.3970.8410.8510.8620.877162.730.73313657.2900.8110.8300.8410.854182.890.75511517.0480.8010.8110.8220.835192.400.76810736.7920.7730.7830.8030.8120.837213.040.75310736.7920.7110.7800.7910.804213.040.7839006.8980.7340.7340.7140.754213.040.7839006.8980.7340.7340.7140.754213.040.7848226.7220.7310.7140.7420.754233.140.8205786.3600.7220.7310.7420.753243.180.8614816.7620.7100.7120.732253.200.8614816.7670.6670.6670.667260.851485.890.6670.6770.6850.696330.8693645.890.6770.6840.6120.62226	9	2.20	0.574	2112	7.655	0.870	0.881	0.893	0.907
122.480.64818237.5080.8530.8640.8760.890132.660.66816937.4340.8450.8550.8680.871142.640.68916317.3970.8410.8510.8630.877152.710.70816317.3970.8210.8300.8420.856172.830.73913657.2190.8210.8300.8410.8510.822182.890.75511517.0480.8110.8220.8350.835192.940.76810736.9780.7930.8030.8140.827203.000.7839006.8980.7840.7940.8050.818213.040.7948826.7820.7740.7600.7910.804223.090.8076396.7800.7320.7310.7540.756233.140.8205776.3560.7230.7310.7410.753243.180.8603.6400.6720.7110.7410.753253.220.8415736.3510.6700.6770.6850.699263.350.8623.6415.8970.6700.6770.6850.692273.300.8623.545.8970.6700.6770.6850.692283.330.8603.545.8970.6770.67	10	2.30	0.601	1991	7.596	0.863	0.874	0.886	0.900
132.560.66816937.4340.8450.8550.8680.881142.640.68916507.4140.8430.8530.8650.879152.710.70816517.3970.8410.8300.8420.856162.770.73313657.2100.8210.8300.8410.856172.830.75511517.0480.8010.8110.8220.835182.990.76810736.7930.7910.8030.8140.827203.000.7839906.8920.7710.7040.8050.818213.040.7948826.7820.7710.7430.7540.766233.140.8205786.3600.7340.7310.7420.754243.180.8305776.3510.7220.7310.7410.732253.200.8415736.3510.7220.7310.7410.732263.200.8624296.0610.6970.6070.6770.635273.300.8623.6390.6670.6670.6670.6670.677283.330.8693645.8970.6040.6130.622293.340.8961915.2520.5970.6040.6130.622314.430.8961915.2520.5970.6040.612 <td>11</td> <td>2.40</td> <td>0.627</td> <td>1902</td> <td>7.551</td> <td>0.858</td> <td>0.869</td> <td>0.881</td> <td>0.895</td>	11	2.40	0.627	1902	7.551	0.858	0.869	0.881	0.895
142.640.68916597.1440.8430.8530.8650.879152.710.70313677.3070.8410.8510.8630.877162.730.73913477.2060.8190.8290.8410.854172.830.73913477.2060.8190.8290.8410.854182.890.75511517.040.8010.7810.8220.8140.827203.000.7839006.890.7840.7940.8050.814213.040.7948226.7820.7710.7800.7910.804223.090.8076396.3600.7340.7430.7540.754233.410.8205776.3630.7230.7310.7420.754243.80.8305776.3630.7230.7310.7410.753253.230.8624296.3610.6970.7070.718263.330.8693645.890.6670.6770.6850.696273.300.8623645.890.6740.6750.6670.667283.330.8693645.890.6770.6740.6920.697313.430.8961915.240.5970.6640.6120.62233340.9911520.5970.5840.5920.602 </td <td>12</td> <td>2.48</td> <td>0.648</td> <td>1823</td> <td>7.508</td> <td>0.853</td> <td>0.864</td> <td>0.876</td> <td>0.890</td>	12	2.48	0.648	1823	7.508	0.853	0.864	0.876	0.890
152.710.7081637.3070.8410.8510.8630.877162.770.72313657.2100.8210.8300.8420.856172.830.75313157.0460.8100.8110.8220.835182.890.75811517.0480.8010.8110.8220.835192.940.76810736.9780.7930.8030.8140.827213.000.7839006.8980.7840.7940.7540.764223.000.8076396.7820.7140.7540.754233.140.8205786.3600.7320.7310.7420.754243.180.8305776.3630.7230.7310.7420.754253.220.8415736.3610.7220.7100.7120.732263.260.8514816.1760.7210.7410.753273.300.8624296.670.6770.6860.699283.30.8693645.8690.6670.6750.6850.69233.40.8843035.710.6040.6130.62233.50.9141795.1870.5970.6040.6130.62233.60.9141795.1870.5970.6050.6150.61533.60.914	13	2.56	0.668	1693	7.434	0.845	0.855	0.868	0.881
162.770.72313657.2190.8210.8300.8420.856172.830.73913477.2060.8190.8290.8410.854182.890.75511517.0480.8010.8110.8220.835203.000.7839006.8980.7930.8030.8140.827213.040.7948826.7820.7110.7800.7910.804223.000.8076396.3600.7340.7420.7540.766233.140.8305776.360.7230.7310.7420.754243.180.8305776.3510.7220.7110.7420.754253.220.8415736.3510.7220.7110.7110.732263.690.8624296.0610.6970.7070.718273.300.8624296.0610.6970.6080.697283.330.8693645.8970.6700.6770.6850.696293.370.8863515.740.5960.6040.6130.622313.430.8961915.2470.5960.6040.6130.622323.470.9061905.2470.5910.6020.602333.500.9141795.1870.5810.5910.602343.53<	14	2.64	0.689	1659	7.414	0.843	0.853	0.865	0.879
172.830.73913477.2060.8190.8290.8410.854182.890.75511517.0480.8010.8110.8220.835192.440.76810736.9780.7930.8030.8140.827213.040.7948.826.7820.7740.8030.7910.804223.000.8076.396.4600.7340.7430.7540.766233.140.8205786.3600.7230.7310.7420.754243.180.8305776.3580.7230.7310.7410.753253.220.8415736.3510.7220.7100.7210.732263.360.8624816.1760.7020.7100.7210.732273.00.8624816.1760.6770.6670.6880.699283.330.8693645.8970.6700.6770.6850.699293.470.8863555.6770.6640.6130.622313.430.8961915.2470.5960.6040.6120.602323.470.9061905.2470.5970.5840.5910.602333.500.9141795.1870.5920.5910.602343.530.9221605.0770.5840.5920.59135 </td <td>15</td> <td>2.71</td> <td>0.708</td> <td>1631</td> <td>7.397</td> <td>0.841</td> <td>0.851</td> <td>0.863</td> <td>0.877</td>	15	2.71	0.708	1631	7.397	0.841	0.851	0.863	0.877
18         2.80         0.755         1151         7.048         0.801         0.811         0.822         0.835           19         2.94         0.768         1073         6.978         0.793         0.803         0.814         0.827           20         3.00         0.783         990         6.89         0.771         0.794         0.805         0.818           21         3.04         0.794         882         6.782         0.771         0.780         0.791         0.804           22         3.09         0.807         639         6.460         0.734         0.743         0.742         0.754           23         3.14         0.820         577         6.358         0.723         0.731         0.742         0.754           24         3.18         0.830         577         6.358         0.723         0.710         0.711         0.732           25         3.22         0.841         5.176         0.702         0.710         0.707         0.718           26         3.25         0.851         4589         0.667         0.667         0.667         0.677           3         3.43         0.869         191	16	2.77	0.723	1365	7.219	0.821	0.830	0.842	0.856
18         2.80         0.755         1151         7.048         0.801         0.811         0.822         0.835           19         2.94         0.768         1073         6.978         0.793         0.803         0.814         0.827           20         3.00         0.783         990         6.89         0.771         0.794         0.805         0.818           21         3.04         0.794         882         6.782         0.771         0.780         0.791         0.804           22         3.09         0.807         639         6.460         0.734         0.743         0.742         0.754           23         3.14         0.820         577         6.358         0.723         0.731         0.742         0.754           24         3.18         0.830         577         6.358         0.723         0.710         0.711         0.732           25         3.22         0.841         5.176         0.702         0.710         0.707         0.718           26         3.25         0.851         4589         0.667         0.667         0.667         0.677           3         3.43         0.869         191				1347			0.829	0.841	0.854
19 $2.94$ $0.768$ $1073$ $6.978$ $0.793$ $0.803$ $0.814$ $0.827$ 20 $3.00$ $0.783$ $990$ $6.898$ $0.784$ $0.794$ $0.805$ $0.818$ 21 $3.04$ $0.794$ $882$ $6.782$ $0.771$ $0.780$ $0.791$ $0.804$ 21 $3.04$ $0.807$ $639$ $6.460$ $0.734$ $0.7730$ $0.774$ $0.766$ 23 $3.14$ $0.820$ $578$ $6.360$ $0.723$ $0.732$ $0.742$ $0.754$ 24 $3.18$ $0.830$ $577$ $6.358$ $0.723$ $0.731$ $0.742$ $0.754$ 25 $3.22$ $0.841$ $573$ $6.351$ $0.722$ $0.731$ $0.742$ $0.754$ 25 $3.22$ $0.841$ $573$ $6.351$ $0.722$ $0.710$ $0.742$ $0.754$ 26 $3.26$ $0.851$ $481$ $6.176$ $0.702$ $0.710$ $0.718$ 27 $3.30$ $0.862$ $429$ $6.061$ $0.687$ $0.677$ $0.707$ $0.718$ 28 $3.33$ $0.869$ $364$ $5.897$ $0.667$ $0.667$ $0.667$ $0.667$ 29 $3.71$ $0.986$ $364$ $5.897$ $0.664$ $0.613$ $0.622$ 21 $3.47$ $0.906$ $190$ $5.247$ $0.596$ $0.604$ $0.612$ $0.622$ 33 $3.50$ $0.914$ $179$ $5.187$ $0.584$ $0.592$ $0.600$ 34 $3.58$ $0.935$ $14$				1151	7.048	0.801	0.811	0.822	0.835
20         3.00         0.783         990         6.898         0.784         0.794         0.805         0.818           21         3.04         0.794         882         6.782         0.771         0.780         0.791         0.804           22         3.09         0.807         639         6.460         0.734         0.743         0.754         0.766           23         3.14         0.820         578         6.360         0.723         0.731         0.742         0.754           24         3.18         0.830         577         6.358         0.723         0.731         0.741         0.753           26         3.22         0.841         573         6.351         0.722         0.710         0.711         0.732           27         3.0         0.862         429         6.061         0.689         0.697         0.677         0.707         0.718           28         3.3         0.869         191         5.252         0.597         0.664         0.685         0.696           30         3.40         0.888         303         5.714         0.604         0.612         0.622           31         3.43         0.9				1073	6.978	0.793	0.803	0.814	
13.040.7948826.7820.7710.7800.7910.804223.090.8076396.4600.7340.7430.7540.766233.140.8205786.3600.7230.7320.7420.754243.180.8305776.360.7230.7310.7420.754243.180.8305776.350.7220.7110.7420.753253.20.8415736.3510.7220.7100.7210.732263.260.8514816.1760.7020.7100.7070.718273.300.8624296.0610.6890.6970.6700.679283.330.8693645.8970.6700.6750.6850.696293.370.8803545.890.6670.6750.6670.677313.400.8883035.7140.6990.6670.6130.622333.500.9141795.2470.5900.6040.6120.622333.500.9141795.1870.5910.6050.5910.600343.530.9221605.0750.5820.5910.602353.560.9301580.5210.5270.5350.543363.640.95661.900.4450.4550.464373.69<								0.805	
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34         3.53         0.922         160         5.075         0.577         0.584         0.592         0.602           35         3.56         0.930         158         5.063         0.575         0.582         0.591         0.600           36         3.58         0.935         146         4.984         0.566         0.573         0.582         0.591         0.600           37         3.61         0.943         98         4.585         0.521         0.527         0.535         0.543           38         3.64         0.950         83         4.419         0.502         0.508         0.516         0.524           39         3.66         0.956         66         4.190         0.476         0.482         0.489         0.497           40         3.69         0.963         50         3.912         0.445         0.450         0.457         0.464           41         3.71         0.969         6         1.792         0.204         0.206         0.209         0.212           42         3.74         0.977         5         1.609         0.183         0.185         0.162         0.164           43         3.76 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>									
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37       3.61       0.943       98       4.585       0.521       0.527       0.535       0.543         38       3.64       0.950       83       4.419       0.502       0.508       0.516       0.524         39       3.66       0.956       66       4.190       0.476       0.482       0.489       0.497         40       3.69       0.963       50       3.912       0.445       0.450       0.457       0.464         41       3.71       0.969       6       1.792       0.204       0.206       0.209       0.212         42       3.74       0.977       5       1.609       0.183       0.185       0.188       0.191         43       3.76       0.982       4       1.386       0.158       0.159       0.162       0.164         44       3.78       0.987       3       1.099       0.125       0.126       0.128       0.130         45       3.81       0.995       2       0.693       0.079       0.080       0.081       0.082									
38         3.64         0.950         83         4.419         0.502         0.508         0.516         0.524           39         3.66         0.956         66         4.190         0.476         0.482         0.489         0.497           40         3.69         0.963         50         3.912         0.445         0.450         0.457         0.464           41         3.71         0.969         6         1.792         0.204         0.206         0.209         0.212           42         3.74         0.977         5         1.609         0.183         0.185         0.188         0.191           43         3.76         0.982         4         1.386         0.159         0.162         0.164           44         3.78         0.987         3         1.099         0.125         0.126         0.128         0.130           45         3.81         0.995         2         0.693         0.079         0.080         0.081         0.082									
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40       3.69       0.963       50       3.912       0.445       0.450       0.457       0.464         41       3.71       0.969       6       1.792       0.204       0.206       0.209       0.212         42       3.74       0.977       5       1.609       0.183       0.185       0.188       0.191         43       3.76       0.982       4       1.386       0.158       0.159       0.162       0.164         44       3.78       0.987       3       1.099       0.125       0.126       0.128       0.130         45       3.81       0.995       2       0.693       0.079       0.080       0.081       0.082									
41       3.71       0.969       6       1.792       0.204       0.206       0.209       0.212         42       3.74       0.977       5       1.609       0.183       0.185       0.188       0.191         43       3.76       0.982       4       1.386       0.158       0.159       0.162       0.164         44       3.78       0.987       3       1.099       0.125       0.126       0.128       0.130         45       3.81       0.995       2       0.693       0.079       0.080       0.081       0.082									
42       3.74       0.977       5       1.609       0.183       0.185       0.188       0.191         43       3.76       0.982       4       1.386       0.158       0.159       0.162       0.164         44       3.78       0.987       3       1.099       0.125       0.126       0.128       0.130         45       3.81       0.995       2       0.693       0.079       0.080       0.081       0.082									
43         3.76         0.982         4         1.386         0.158         0.159         0.162         0.164           44         3.78         0.987         3         1.099         0.125         0.126         0.128         0.130           45         3.81         0.995         2         0.693         0.079         0.080         0.081         0.082								0.209	0.212
44         3.78         0.987         3         1.099         0.125         0.126         0.128         0.130           45         3.81         0.995         2         0.693         0.079         0.080         0.081         0.082	42	3.74	0.977	5	1.609	0.183	0.185	0.188	0.191
45         3.81         0.995         2         0.693         0.079         0.080         0.081         0.082	<b>43</b>	3.76	0.982	4			0.159	0.162	0.164
	<b>44</b>	3.78	0.987	3	1.099	0.125	0.126	0.128	0.130
46 3.83 1 1 0 0 0 0 0	<b>45</b>	3.81	0.995	2	0.693	0.079	0.080	0.081	0.082
	<b>46</b>	3.83	1	1	0	0	0	0	0

TABLE IV. Bangiya Sabdakosh words: ranking, natural logarithm, normalisations

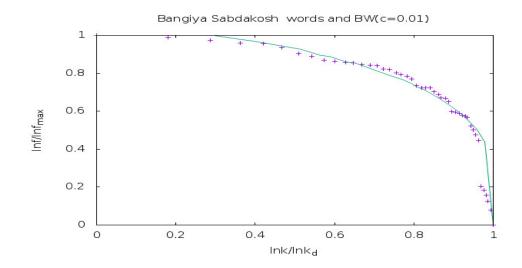


FIG. 3. The vertical axis is  $\frac{lnf}{lnf_{max}}$  and the horizontal axis is  $\frac{lnk}{lnk_{lim}}$ . The + points represent the Bangiya Sabdakosh words, with the fit curve being the Bragg-Williams curve in the presence of external magnetic field,  $c = \frac{H}{\gamma\epsilon} = 0.01$ .

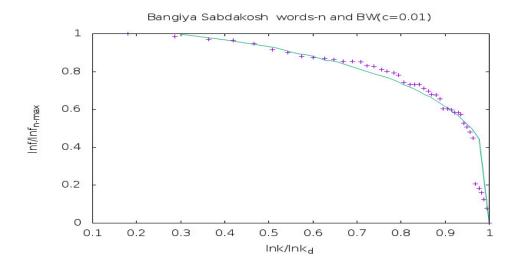


FIG. 4. The vertical axis is  $\frac{lnf}{lnf_{n-max}}$  and the horizontal axis is  $\frac{lnk}{lnk_{lim}}$ . The + points represent the Bangiya Sabdakosh words, with the fit curve being the Bragg-Williams curve in the presence of external magnetic field,  $c = \frac{H}{\gamma\epsilon} = 0.01$ .

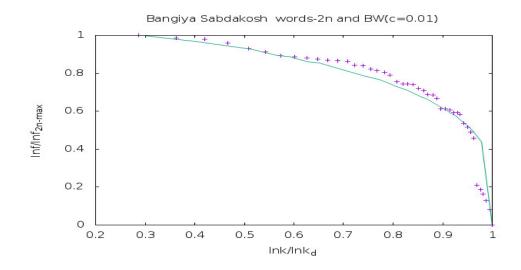


FIG. 5. The vertical axis is  $\frac{lnf}{lnf_{2n-max}}$  and the horizontal axis is  $\frac{lnk}{lnk_{lim}}$ . The + points represent the Bangiya Sabdakosh words, with the fit curve, being the Bragg-Williams curve in the presence of external magnetic field,  $c = \frac{H}{\gamma\epsilon} = 0.01$ .

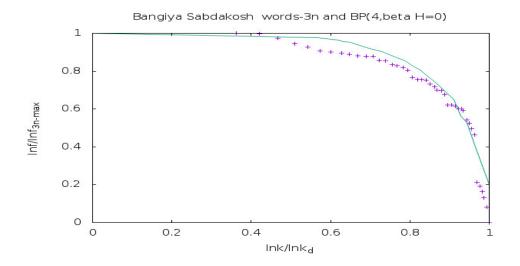


FIG. 6. The vertical axis is  $\frac{lnf}{lnf_{3n-max}}$  and the horizontal axis is  $\frac{lnk}{lnk_{lim}}$ . The + points represent the Bangiya Sabdakosh words, with the fit curve, BP(4, $\beta H = 0$ ), being the Bethe-Peierls curve in the presence of four nearest neighbours and no external magnetic field, m = 0 or,  $\beta H = 0$ .

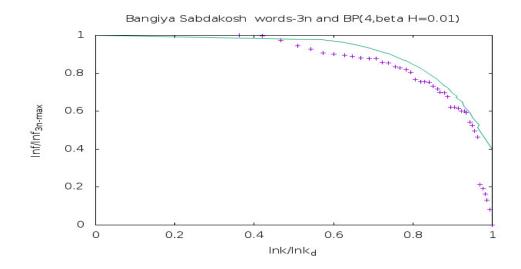


FIG. 7. The vertical axis is  $\frac{lnf}{lnf_{4n-max}}$  and the horizontal axis is  $\frac{lnk}{lnk_{lim}}$ . The + points represent the Bangiya Sabdakosh words, with the fit curve, BP(4, $\beta H = 0.01$ ), being the Bethe-Peierls curve in the presence of four nearest neighbours and external magnetic field, m = 0.005 or,  $\beta H = 0.01$ .

#### A. conclusion

From the figures (fig.3-fig.7), we observe that there is a curve of magnetisation, behind the Bangiya Sabdakosh words,[1]. This is the magnetisation curve in the Bragg-Williams approximation of the Ising model, in the presence of external magnetic field,  $c = \frac{H}{\gamma \epsilon} = 0.01$ . Moreover, the associated correspondence is,

$$\frac{lnf}{lnf_{max}} \longleftrightarrow \frac{M}{M_{max}},$$
$$lnk \longleftrightarrow T.$$

k corresponds to temperature in an exponential scale, [67].

#### **III. APENDIX: MAGNETISATION**

#### A. Bragg-Williams approximation

Let us consider a coin. Let us toss it many times. Probability of getting head or, tale is half i.e. we will get head and tale equal number of times. If we attach value one to head, minus one to tale, the average value we obtain, after many tossing is zero. Instead let us consider a one-sided loaded coin, say on the head side. The probability of getting head is more than one half, getting tale is less than one-half. Average value, in this case, after many tossing we obtain is non-zero, the precise number depends on the loading. The loaded coin is like ferromagnet, the unloaded coin is like para magnet, at zero external magnetic field. Average value we obtain is like magnetisation, loading is like coupling among the spins of the ferromagnetic units. Outcome of single coin toss is random, but average value we get after long sequence of tossing is fixed. This is long-range order. But if we take a small sequence of tossing, say, three consecutive tossing, the average value we obtain is not fixed, can be anything. There is no short-range order.

Let us consider a row of spins, one can imagine them as spears which can be vertically up or, down. Assume there is a long-range order with probability to get a spin up is two third. That would mean when we consider a long sequence of spins, two third of those are with spin up. Moreover, assign with each up spin a value one and a down spin a value minus one. Then total spin we obtain is one third. This value is referred to as the value of longrange order parameter. Now consider a short-range order existing which is identical with the long-range order. That would mean if we pick up any three consecutive spins, two will be up, one down. Bragg-Williams approximation means short-range order is identical with long-range order, applied to a lattice of spins, in general. Row of spins is a lattice of one dimension.

Now let us imagine an arbitrary lattice, with each up spin assigned a value one and a down spin a value minus one, with an unspecified long-range order parameter defined as above by  $L = \frac{1}{N} \sum_i \sigma_i$ , where  $\sigma_i$  is i-th spin, N being total number of spins. L can vary from minus one to one.  $N = N_+ + N_-$ , where  $N_+$  is the number of up spins,  $N_-$  is the number of down spins.  $L = \frac{1}{N} (N_+ - N_-)$ . As a result,  $N_+ = \frac{N}{2} (1 + L)$  and  $N_- = \frac{N}{2} (1 - L)$ . Magnetisation or, net magnetic moment , M is  $\mu \sum_i \sigma_i$  or,  $\mu (N_+ - N_-)$  or,  $\mu NL$ ,  $M_{max} = \mu N$ .  $\frac{M}{M_{max}} = L$ .  $\frac{M}{M_{max}}$  is

referred to as reduced magnetisation. Moreover, the Ising Hamiltonian,[60], for the lattice of spins, setting  $\mu$  to one, is  $-\epsilon \Sigma_{n.n} \sigma_i \sigma_j - H \Sigma_i \sigma_i$ , where n.n refers to nearest neighbour pairs. The difference  $\Delta E$  of energy if we flip an up spin to down spin is, [61],  $2\epsilon\gamma\bar{\sigma} + 2H$ , where  $\gamma$  is the number of nearest neighbours of a spin. According to Boltzmann principle,  $\frac{N_-}{N_+}$ equals  $exp(-\frac{\Delta E}{k_BT})$ , [62]. In the Bragg-Williams approximation,[63],  $\bar{\sigma} = L$ , considered in the thermal average sense. Consequently,

$$ln\frac{1+L}{1-L} = 2\frac{\gamma\epsilon L+H}{k_B T} = 2\frac{L+\frac{H}{\gamma\epsilon}}{\frac{T}{\gamma\epsilon/k_B}} = 2\frac{L+c}{\frac{T}{T_c}}$$
(1)

where,  $c = \frac{H}{\gamma \epsilon}$ ,  $T_c = \gamma \epsilon / k_B$ , [64].  $\frac{T}{T_c}$  is referred to as reduced temperature. Plot of L vs  $\frac{T}{T_c}$  or, reduced magentisation vs. reduced temperature is used as reference curve. In the presence of magnetic field,  $c \neq 0$ , the curve bulges outward. Bragg-Williams is a Mean Field approximation. This approximation holds when number of neighbours interacting with a site is very large, reducing the importance of local fluctuation or, local order, making the long-range order or, average degree of freedom as the only degree of freedom of the lattice. To have a feeling how this approximation leads to matching between experimental and Ising model prediction one can refer to FIG.12.12 of [61]. W. L. Bragg was a professor of Hans Bethe. Rudolf Peierls was a friend of Hans Bethe. At the suggestion of W. L. Bragg, Rudolf Peierls following Hans Bethe improved the approximation scheme, applying quasi-chemical method.

# B. Bethe-peierls approximation in presence of four nearest neighbours, in absence of external magnetic field

In the approximation scheme which is improvement over the Bragg-Williams, [60], [61], [62], [63], [64], due to Bethe-Peierls, [65], reduced magnetisation varies with reduced temperature, for  $\gamma$ neighbours, in absence of external magnetic field, as

$$\frac{ln\frac{\gamma}{\gamma-2}}{ln\frac{factor-1}{factor\frac{\gamma-1}{\gamma}-factor\frac{1}{\gamma}}} = \frac{T}{T_c}; factor = \frac{\frac{M}{M_{max}}+1}{1-\frac{M}{M_{max}}}.$$
(2)

 $ln\frac{\gamma}{\gamma-2}$  for four nearest neighbours i.e. for  $\gamma = 4$  is 0.693. For a snapshot of different kind of magnetisation curves for magnetic materials the reader is urged to give a google search "reduced magnetisation vs reduced temperature curve". In the following, we describe

BW	BW(c=0.01)	$BP(4,\beta H=0)$	reduced magnetisation
0	0	0	1
0.435	0.439	0.563	0.978
0.439	0.443	0.568	0.977
0.491	0.495	0.624	0.961
0.501	0.507	0.630	0.957
0.514	0.519	0.648	0.952
0.559	0.566	0.654	0.931
0.566	0.573	0.7	0.927
0.584	0.590	0.7	0.917
0.601	0.607	0.722	0.907
0.607	0.613	0.729	0.903
0.653	0.661	0.770	0.869
0.659	0.668	0.773	0.865
0.669	0.676	0.784	0.856
0.679	0.688	0.792	0.847
0.701	0.710	0.807	0.828
0.723	0.731	0.828	0.805
0.732	0.743	0.832	0.796
0.756	0.766	0.845	0.772
0.779	0.788	0.864	0.740
0.838	0.853	0.911	0.651
0.850	0.861	0.911	0.628
0.870	0.885	0.923	0.592
0.883	0.895	0.928	0.564
0.899	0.918		0.527
0.904	0.926	0.941	0.513
0.946	0.968	0.965	0.400
0.967	0.998	0.965	0.300
0.987		1	0.200
0.997		1	0.100
1	1	1	0

TABLE V. Reduced magnetisation vs reduced temperature data s for Bragg-Williams approximation, in absence of and in presence of magnetic field,  $c = \frac{H}{\gamma \epsilon} = 0.01$ , and Bethe-Peierls approximation in absence of magnetic field, for four nearest neighbours.

data s generated from the equation(1) and the equation(2) in the table, V, and curves of magnetisation plotted on the basis of those data s. BW stands for reduced temperature in Bragg-Williams approximation, calculated from the equation(1). BP(4) represents reduced temperature in the Bethe-Peierls approximation, for four nearest neighbours, computed from the equation(2). The data set is used to plot fig.1. Empty spaces in the table, V, mean corresponding point pairs were not used for plotting a line.

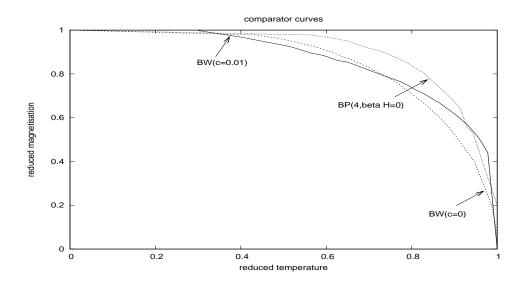


FIG. 8. Reduced magnetisation vs reduced temperature curves for Bragg-Williams approximation, in absence(dark) of and presence(inner in the top) of magnetic field,  $c = \frac{H}{\gamma \epsilon} = 0.01$ , and Bethe-Peierls approximation in absence of magnetic field, for four nearest neighbours (outer in the top).

# C. Bethe-peierls approximation in presence of four nearest neighbours, in the presence of external magnetic field

In the Bethe-Peierls approximation scheme, [65], reduced magnetisation varies with reduced temperature, for  $\gamma$  neighbours, in presence of external magnetic field, as

$$\frac{ln\frac{\gamma}{\gamma-2}}{ln\frac{factor-1}{e^{\frac{2\beta H}{\gamma}}factor\frac{\gamma-1}{\gamma}-e^{-\frac{2\beta H}{\gamma}}factor^{\frac{1}{\gamma}}}} = \frac{T}{T_c}; factor = \frac{\frac{M}{M_{max}}+1}{1-\frac{M}{M_{max}}}.$$
(3)

Derivation of this formula ala [65] is given in the appendix of [10].

 $ln\frac{\gamma}{\gamma-2}$  for four nearest neighbours i.e. for  $\gamma = 4$  is 0.693. For four neighbours,

$$\frac{0.693}{ln\frac{factor-1}{e^{\frac{2\beta H}{\gamma}}factor^{\frac{\gamma-1}{\gamma}}-e^{-\frac{2\beta H}{\gamma}}factor^{\frac{1}{\gamma}}}} = \frac{T}{T_c}; factor = \frac{\frac{M}{M_{max}}+1}{1-\frac{M}{M_{max}}}.$$
(4)

In the following, we describe datas in the table, VI, generated from the equation(4) and curves of magnetisation plotted on the basis of those datas. BP(m=0.03) stands for reduced temperature in Bethe-Peierls approximation, for four nearest neighbours, in presence of a variable external magnetic field, H, such that  $\beta H = 0.06$ . calculated from the equation(4). BP(m=0.025) stands for reduced temperature in Bethe-Peierls approximation, for four nearest neighbours, in presence of a variable external magnetic field, H, such that  $\beta H = 0.05$ . calculated from the equation(4). BP(m=0.02) stands for reduced temperature in Bethe-Peierls approximation, for four nearest neighbours, in presence of a variable external magnetic field, H, such that  $\beta H = 0.04$ . calculated from the equation(4). BP(m=0.01) stands for reduced temperature in Bethe-Peierls approximation, for four nearest neighbours, in presence of a variable external magnetic field, H, such that  $\beta H = 0.02$ . calculated from the equation(4). BP(m=0.005) stands for reduced temperature in Bethe-Peierls approximation, for four nearest neighbours, in presence of a variable external magnetic field, H, such that  $\beta H = 0.01$ . calculated from the equation(4). The data set is used to plot fig.2. Empty spaces in the table, VI, mean corresponding point pairs were not used for plotting a line.

BP(m=0.03)	BP(m=0.025)	BP(m=0.02)	BP(m=0.01)	BP(m=0.005)	reduced magnetisation
0	0	0	0	0	1
0.583	0.580	0.577	0.572	0.569	0.978
0.587	0.584	0.581	0.575	0.572	0.977
0.647	0.643	0.639	0.632	0.628	0.961
0.657	0.653	0.649	0.641	0.637	0.957
0.671	0.667		0.654	0.650	0.952
	0.716			0.696	0.931
0.723	0.718	0.713	0.702	0.697	0.927
0.743	0.737	0.731	0.720	0.714	0.917
0.762	0.756	0.749	0.737	0.731	0.907
0.770	0.764	0.757	0.745	0.738	0.903
0.816	0.808	0.800	0.785	0.778	0.869
0.821	0.813	0.805	0.789	0.782	0.865
0.832	0.823	0.815	0.799	0.791	0.856
0.841	0.833	0.824	0.807	0.799	0.847
0.863	0.853	0.844	0.826	0.817	0.828
0.887	0.876	0.866	0.846	0.836	0.805
0.895	0.884	0.873	0.852	0.842	0.796
0.916	0.904	0.892	0.869	0.858	0.772
0.940	0.926	0.914	0.888	0.876	0.740
	0.929			0.877	0.735
	0.936			0.883	0.730
	0.944			0.889	0.720
	0.945				0.710
	0.955			0.897	0.700
	0.963			0.903	0.690
	0.973			0.910	0.680
				0.909	0.670
	0.993			0.925	0.650
		0.976	0.942		0.651
	1.00				0.640
		0.983	0.946	0.928	0.628
		1.00	0.963	0.943	0.592
			0.972	0.951	0.564
			0.990	0.967	0.527
				0.964	0.513
			1.00		0.500
				1.00	0.400
					0.300
					0.200
					0.100
					0

TABLE VI. Bethe-Peierls approx. in presence of little external magnetic fields

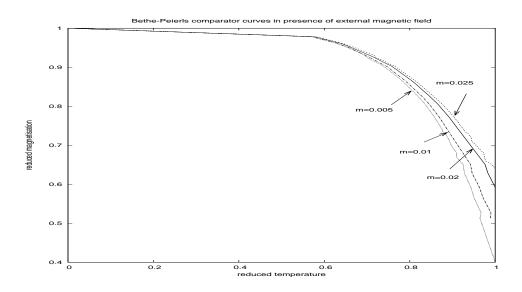


FIG. 9. Reduced magnetisation vs reduced temperature curves for Bethe-Peierls approximation in presence of little external magnetic fields, for four nearest neighbours, with  $\beta H = 2m$ .

## IV. ACKNOWLEDGMENT

We have used gnuplot for plotting the figures in this paper.

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