A dataset for hadron elastic scattering

J.R. Cudell[a], A. Lengyel[b] and E. Martynov[c]

[a] Physique théorique fondamentale, Dép. de Physique, Université de Liège,
Allée du 6 Août 17, bât. B5a, B-4000 Liège 1, Belgium
E-mail: JR.Cudell@ulg.ac.be

[b] Inst. of Electron Physics, Universitetska 21, UA-88000 Uzhgorod, Ukraine.
E-mail: sasha@len.uzhgorod.ua

[c] Bogolyubov Inst. for Theoretical Physics, UA-03143 Kiev, Ukraine.
E-mail: martynov@bitp.kiev.ua

November 7, 2005

observable	N_{pp}	$N_{\bar{p}p}$	N_{π^+p}	N_{π^-p}	N_{K^+p}	N_{K^-p}	N_{tot}
$d\sigma_{el}/dt$ (full set)	4639	1252	802	2169	595	731	10188
analysis of [1]	818	281	290	483	166	169	2207
after exclusion	795	226	281	478	166	169	2115

Table 1: The statistics of the full dataset and of the analysis of [1].

Note that in the low-t analysis of [1], we found it necessary to exclude sets with a confidence level less than 10^{-8}, which are incompatible with other datasets : Bruneton [29] (sets 1050, 1204 and 1313, 25 points), Armitage [12] (set 1038, 12 points), Akerlof [4] $\bar{p}p$ for $\sqrt{s} = 9.78$ GeV (set 1101, 20 points) and Bogolyubsky [24] (set 1114, 35 points).

Experimental data

$pp \to pp$

set	ref.	$\sqrt{s}$ (GeV)	$\|t\|_{min}$ (GeV^2)	$\|t\|_{max}$ (GeV^2)	syst.	number of points

1001	[4]	9.8 13.8 19.4	0.075	1.03 2.8 3.3	7%	50 61 55
1002	[5]	23.4 26.9 30.6	0.15 0.15 0.25	1.1 0.55 0.95	15%	19 8 15
		32.4 35.2 38.3	0.20 0.20 0.20	0.35 0.75 0.7		4 9 9
1014	[6]	4.5 4.9 5.3	0.14 0.10 0.27	2.1 2.7 3.5	15%	24 25 22
1015		6.2 6.4	0.058 0.070	6.0 1.9	8%	37 17
1037		4.6 4.8 5.0	2.0 2.2 2.5	8.6 9.6 10.5	7%	18 15 15
		5.3 5.8 6.2	7.6 9.1 9.7	13 15 17		4 9 4
		6.5	11	18		4
1039		6.8	0.083	6.7	10%	35
1020	[7]	23.5 30.7	0.042 0.016	0.24 0.11	1.2%	50 48
1021		30.7 44.7	0.11 0.05	0.46 0.29	2%	58 95
1030		23.5	0.25	0.79	3%	28
1022		23.5 30.7	0.83 0.90	3.0 5.8	5%	34 55
		44.7 62.5	0.62 0.27	7.3 6.3		65 74
1023		23.5	3.1	5.8	10%	21
1024		30.7	0.0011	0.008	0.40%	9
1025		62.5	0.0017	0.009	0.25%	16
1026		30.7	0.46	0.86	3.5%	11
1027		44.7	0.001	0.009	0.2%	24
1028		44.7 62.5	0.0092 0.0095	0.052 0.099	1%	46 49
1003	[8]	52.8	0.011	0.048	*0.4%*[1]	36
1009	[9]	23.5 30.6	0.0004 0.0005	0.010 0.018	1%	31 32
		52.8 62.3	0.0011 0.0054	0.055 0.051		34 22
1004	[11]	9.0 10.0	0.0019	0.043 0.05	1.1%	20 18
1038	[12]	53.0	0.13	0.46	5%	12
1052	[13]	9.8	0.825	3.8	15%	17
1005	[15]	9.8 11.5 13.8	0.038	0.75 0.70 0.75	3%	16 17 18
		16.3 18.2	0.0375 0.075	0.80 0.75		19 15
1006	[22]	4.4 5.1 5.6	0.0008 0.0092 0.0089	0.013 0.10 0.11	*2%*[2]	34 22 27
		6.1 6.2 6.5	0.0009 0.0011 0.015	0.11 0.014 0.11		67 35 30
		6.9 7.3 9.8	0.011 0.0093 0.0010	0.11 0.11 0.12		26 33 66
		7.7 8.0 8.3	0.011 0.0171 0.0093	0.11 0.11 0.11		29 24 28
		8.6 8.7 8.8	0.0009 0.0011 0.0009	0.11 0.015 0.11		65 47 65
		9.3 10.0 10.2	0.0114 0.0109 0.0108	0.12		29 34 29
		10.3 10.4 10.6	0.0008 0.013 .0008	0.015 0.12 0.015		37 35 44
		10.7 11.0 11.2	0.0108 0.013 0.011	0.12 0.12 0.12		33 33 30
		11.5	0.011 0.0010	0.12 0.11		26 156
1013	[26]	4.6	0.023	1.5	2%	97
1031	[27]	31.0 53.0 62.0	0.050 0.11 0.13	0.85	10%	24 24 23
1064		53.0	0.62	3.4	20%	31
1055	[28]	16.7	0.01	0.62	*2%*[3]	26

[1] From the luminosity measurement by the experiment.
[2] From the uncertainty on the optical point used to normalise the data.
[3] This uncertainty in the luminosity, originally included in the statistical error, has been removed from

1007	[30]	13.8 16.8	0.0022	0.039	1%	73 68
		21.7 23.8				64 60
1054	[33]	13.8 19.4	0.035	0.095	0.8%	7 7
1058	[34]	19.5 27.4	5.0 2.3	12 16	20%	31 87
1017	[36]	4.7	0.0028	0.14	*1.6%*[2]	13
1053	[38]	9.8	0.012	0.12	*3%*[2]	10
1042	[39]	5.0	0.011	0.34	15%	5
1044		5.6	0.019	0.56	13%	5
1045		6.1 7.1	0.036 0.064	0.79 1.0	20%	5 4
1046		6.5	0.032	1.1	17%	5
1019	[43]	4.5 5.5	0.016 0.027	5.1 4.9	15%	31 32
		6.3 7.6	0.032 0.079	3.8 2.8		30 29
1029	[44]	53.0	0.64	2.05	10%	15
1057	[45]	19.5 27.4	5.0 5.5	12 14	15%	34 30
1056	[46]	19.4	0.61	3.9	*15%*[4]	33
1016	[47]	4.7 5.1 5.4	0.058 0.049 0.066	0.82 0.86 0.78	5%	13 13 12
		5.8 6.2	0.042 0.12	0.70 0.81		12 11
1018		4.7 5.5 6.2	0.2 0.22 0.23	0.89 0.74 0.79	5%	9 7 7
		6.5 6.9	0.24 0.25	0.81 0.75		7 6
1048	[48]	7.6 9.8 11.5	0.0027 0.0026 0.0028	0.119 0.12 0.12	*2%*[2]	21 23 21
1049	[49]	8.2 10.2 11.1	0.29 0.34 0.34	1.93 1.98 1.98	15%	21 20 20
		12.3 13.8 15.7	0.35	0.70 2.0 0.99		8 19 11
		16.8 17.9 18.9	0.35 0.35 0.29	2.1		32 29 30
		19.9 20.8 21.7	0.29	2.1 2.0 2.0		29 19 17
1043	[50]	5.0 6.0	0.13 0.19	2.0 3.6	7%	22 20
1040	[52]	4.5	0.0018	0.097	1%	55
1050	[29]	9.2	0.16	2.0	*2%*[2]	27
1036	[53]	10.0	0.0006	0.031	0.9%	72
1035		12.3	0.0007	0.029	0.69%	58
1034		19.4	0.0007	0.032	0.56%	69
1033		22.2	0.0005	0.030	0.57%	63
1032		23.9	0.0007	0.032	0.5%	66
1008		27.4	0.0005	0.026	0.52%	60
1010	[56]	52.8	0.83	9.8	5%	63
1041	[57]	4.9	1.2	2.5	10%	5
1011	[59]	13.8 19.4	0.55 0.95	2.5 10.3	15%	20 35
1012	[61]	19.4	0.021	0.66	*4%*[5]	134

$$\bar{p}p \rightarrow \bar{p}p$$

set	ref.	$\sqrt{s}$	$\|t\|_{min}$	$\|t\|_{max}$	syst.	number

it.

[4]This uncertainty is the same as in [49].

[5]The t-dependent systematics have been included in the statistical error.

		(GeV)	(GeV^2)	(GeV^2)		of points
1130	[2]	546.0	0.026	0.078	*0.52%*[6]	14
1132		1800.0	0.035	0.285	*0.48%*[6]	26
1101	[4]	9.8 13.8 19.4	0.075	1.0 0.95 0.75	7%	31 30 13
1102	[8]	52.8	0.011	0.048	*1.54 %*[1]	48
1103	[9]	30.4 52.6	0.0007 0.001	0.016 0.039	2.5%	29 28
		62.3	0.0063	0.038		17
1104		1800.0	0.034	0.63	9%	17 51
1105	[10]	6.9 7.0 8.8	0.19 0.83 0.075	0.58 3.8 0.58	5%	22 17 33
1106	[14]	540.0	0.045	0.43	8%	36
1107	[13]	7.6 9.8	0.53 0.83	5.4 3.8	15%	30 17
1108	[15]	9.8 11.5 13.8	0.038	0.75 0.5 0.75	3%	17 13 15
		16.3 18.2	0.075 0.038	0.6		11 13
1109	[19]	6.6	0.055	0.88	*2.1 %*[2]	43
1110	[20]	4.6	0.19	3.0	5%	35
1111	[21]	546.0	0.0022	0.035	2.5%	66
1112		630.0	0.73	2.1	15%	19
1126	[23]	5.6	0.11	1.3	*10%*[7]	23
1114	[24]	7.9	0.055	1.0	*0.8%*[2]	52
1113	[25]	546.0	0.032	0.50	5%	87
1117		546.0	0.46	1.5	10%	34
1118	[26]	4.6	0.023	1.5	2%	97
1115	[27]	53.0	0.52	3.5	30%	27
1116		31.0 53.0 62.0	0.05 0.11 0.13	0.85	15%	22 24 23
1128	[33]	13.8 19.4	0.035	0.095	0.8%	7 7
1129	[44]	53.0	0.64	1.9	10%	8
1124	[47]	4.5 4.9	0.03 0.043	0.18 0.52	5%	6 10
1125		4.9 5.6	0.20 0.22	0.49 0.45	5%	5 4
1123	[52]	4.5	0.0018	0.097	1%	55
1127	[29]	8.7	0.17	1.24	*2%*[2]	11
1119	[54]	7.9	0.07	0.62	*2%*[2]	23
1131	[58]	4.5	0.76	5.5	5%	10
1121	[60]	5.6	0.085	1.2	5%	34
1120	[59]	13.8	0.55	2.5	15%	15
1122		19.4	0.95	3.8	35%	7

$$\pi^+ p \to \pi^+ p$$

set	ref.	$\sqrt{s}$ (GeV)	$\lvert t\rvert_{min}$ (GeV^2)	$\lvert t\rvert_{max}$ (GeV^2)	syst.	number of points
1212	[3]	21.7	0.08	0.94	*2%*[2]	18
1205	[4]	9.7 13.7 19.4	0.075	1.7 1.7 1.8	7%	70 63 53

[6] From Table VI of [2].

[7] From [23].

1203	[11]	9.0 9.9	0.002 0.0019	0.043 0.05	1.1%	20 18
1214	[16]	7.8	0.075	0.68	*1.4%*[2]	13
1206	[13]	9.7	0.75	3.9	15%	22
1207	[15]	9.7 11.5	0.038	0.8 0.7	3%	19 17
		13.7 16.2 18.1	0.11 0.038 0.075	0.8		17 19 18
1215	[17]	4.4	0.46	17.3	15%	84
1201	[26]	4.5	0.023	1.5	2%	97
1210	[28]	16.6	0.01	0.58	*2%*[3]	25
1209	[33]	13.7 19.4	0.035	0.095	0.8%	7 7
1204	[29]	9.2	0.16	1.92	*2%*[2]	18
1202	[59]	5.2	0.65	3.8	10%	24
1208		13.7 19.4	0.55 0.95	2.5 3.4	15%	20 20
1211	[61]	19.4	0.022	0.66	*4%*[5]	133

$$\pi^- p \to \pi^- p$$

set	ref.	$\sqrt{s}$ (GeV)	$\vert t\vert_{min}$ (GeV^2)	$\vert t\vert_{max}$ (GeV^2)	syst.	number of points
1302	[4]	9.7 13.7 19.4	0.075	1.60 1.83 2.38	7%	64 60 61
1310		6.9 8.7	0.075	0.78 0.70	5%	38 38
1324		8.7	0.19	1.3	10%	28
1301	[11]	8.7	0.002	0.008	1.5%	21
1312		8.0 8.4 8.7	0.0012 0.0015 0.0016	0.025 0.03 0.034	1.5%	19 19 36
		9.3 9.8	0.0022 0.0028	0.05 0.056		17 18
		10.4 10.6	0.0035 0.0014	0.077 0.085		18 19
1314		8.7 9.7	0.0016 0.0022	0.021 0.035	*1%*[2]	20 34
1309	[13]	6.2 9.7	0.65 0.73	6.0 7.8	15%	22 46
1315	[15]	9.7 11.5	0.038	0.75 0.50	3%	18 13
		13.7 16.2 18.1	0.038	0.80 0.75 0.80		19 18 19
1304	[17]	6.2 7.6	7.4 10.	17 25	15%	6 4
1305	[26]	4.5	0.023	1.5	2%	97
1318	[30]	13.7 16.8 19.4	0.0022 0.0022 0.0023	0.039	1%	73 68 64
		21.7 23.7 24.7	0.0022			116 59 56
		25.5		0.038		57
1317	[32]	13.7	0.028	0.092	*10%*[8]	5
1303	[33]	13.7 19.4	0.035	0.095	0.8%	7 7
1308	[35]	5.2	0.75	4.5	9%	25
1325		6.6	0.3	5.2	12%	44
1311	[40]	7.9 8.2 8.9	0.057 0.16 0.066	0.20 0.49 0.37	5%	14 18 25
		9.3 9.6 9.8	0.068 0.04 0.082	0.42 0.37 0.55		18 25 27
		10.2 10.2	0.054 0.055	0.53 0.46		19 17
1306		9.7	0.035	0.40	2.5%	37

[8]From [32].

1326	[42]	5.2	0.015	0.77	6%	41
1307	[50]	4.1 4.9 6.0	0.05 0.09 0.19	1.1 2.0 3.6	7%	23 24 20
1320	[51]	4.02 4.06 4.11 4.14 4.18 4.21 4.26 4.30 4.33	4.5 4.9 5.3	9.3 9.9 9.9 9.9 10.1 10.9 10.7 10.5 10.7	3%	25 28 28 26 27 30 26 22 21
1313	[29]	8.6	0.17	2.1	*2%*[2]	20
1321	[57]	4.8	1.2	2.4	10%	4
1322	[60]	5.6	0.15	1.8	5%	38
1316	[59]	13.7 19.4	0.55 0.95	2.5 10	15%	20 31
1319	[61]	19.4	0.021	0.66	4%	134

$K^-p \to K^-p$

set	ref.	$\sqrt{s}$ (GeV)	$\lvert t\rvert_{min}$ (GeV^2)	$\lvert t\rvert_{max}$ (GeV^2)	syst.	number of points
1414	[3]	21.7	0.12	0.94	*2%*[2]	17
1406	[4]	9.7 13.7 19.4	0.075 0.075 0.07	1.5 1.9 1.9	7%	21 35 35
1404	[11]	9.0 10.0	0.0019	0.043 0.050	1.1%	20 18
1408	[13]	9.7	0.75	7.0	15%	23
1407	[15]	9.7 11.5 13.7 16.2 18.2	0.038 0.075 0.075 0.038	0.70 0.65 0.75 0.70 0.75	3%	16 16 13 16 17
1415	[18]	11.5	0.090	0.98	*2.6%*[9]	36
1411	[28]	16.6	0.02	0.56	*2%*[3]	10
1402	[26]	4.5 5.2	0.023	1.5	2%	97 97
1409	[33]	13.7	0.045	0.095	*0.8%*[2]	6
1405	[29]	9.2	0.16	1.25	2%[2]	13
1401	[54]	7.8	0.09	1.4	*2%*[2]	48
1410 1403	[59]	13.7 19.4 5.2	0.55 0.95 0.75	2.1 2.4 2.2	15% 10%	16 12 12

$K^-p \to K^-p$

set	ref.	$\sqrt{s}$ (GeV)	$\lvert t\rvert_{min}$ (GeV^2)	$\lvert t\rvert_{max}$ (GeV^2)	syst.	number of points
1508 1513	[10]	7.0 8.7 8.7	0.075 0.19	0.78 1.3	5% 10%	38 38 28
1507	[13]	6.2	0.65	4.25	15%	16
1511	[15]	9.7 11.5 13.7 16.2 18.2	0.075 0.0375 0.0375 0.075	0.75 0.45 0.75 0.6 0.75	3%	14 12 16 13 15
1510	[4]	9.7 13.7 19.4	0.070	1.4 1.7 1.0	7%	26 42 17
1501	[20]	4.5	0.19	2.3	5%	49
1503	[26]	4.5 5.2	0.023	1.5	2%	97 97
1502	[31]	4.5	0.0070	2.1	*1.8%*[2]	42
1505	[37]	5.3	0.010	2.4	*2%*[2]	27
1506	[41]	5.3	0.045	1.9	*2%*[2]	62
1509	[29]	8.6	0.17	2.0	*2%*[2]	13
1504	[55]	5.3	0.035	1.3	3%	41
1512	[59]	13.7 19.4	0.55 0.95	2.5 2.2	15%	20 8

References

[1] J. R. Cudell, A. Lengyel and E. Martynov, arXiv:hep-ph/0511073.

[9] From the error on the topological cross section used to normalise the data.

[2] F. Abe *et al.*, Phys. Rev. D **50**, 5518 (1994).

[3] M. Adamus *et al.*, Phys. Lett. B **186**, 223 (1987), Yad. Fiz. **47**, 722 (1988) [Sov. J. Nucl. Phys. **47**, 722 (1988)].

[4] C. W. Akerlof *et al.*, Phys. Rev. D **14**, 2864 (1976).

[5] M. G. Albrow *et al.*, Nucl. Phys. B **108**, 1 (1976), *ibid.* **23**, 445 (1970).

[6] J. V. Allaby *et al.*, Nucl. Phys. B **52**, 316 (1973), Phys. Lett. B **28**, 67 (1968), *ibid.* **27**, 9 (1968).

[7] U. Amaldi and K. R. Schubert, Nucl. Phys. B **166**, 301 (1980).

[8] M. Ambrosio *et al.*, Phys. Lett. B **115**, 495 (1982).

[9] N. Amos *et al.*, Nucl. Phys. B **262**, 689 (1985), Phys. Lett. B **247**, 127 (1990).

[10] Y. M. Antipov *et al.*, Yad. Fiz. **48**, 138 (1988) [Sov. J. Nucl. Phys. **48**, 85 (1988)]. Nucl. Phys. B **57**, 333 (1973).

[11] V. D. Apokin *et al.*, Yad. Fiz. **25**, 94 (1977), Nucl. Phys. B **106**, 413 (1976), Yad. Fiz. **28**, 1529 (1978) [Sov. J. Nucl. Phys. **28**, 786 (1978)]. Yad. Fiz. **21**, 1240 (1975) [Sov. J. Nucl. Phys. **21**, 640 (1975)].

[12] J. C. M. Armitage *et al.*, Nucl. Phys. B **132**, 365 (1978).

[13] Z. Asad *et al.*, Nucl. Phys. B **255**, 273 (1985),

[14] G. Arnison *et al.*, Phys. Lett. B **128**, 336 (1983).

[15] D. S. Ayres *et al.*, Phys. Rev. D **15**, 3105 (1977).

[16] I. V. Azhinenko *et al.*, Yad. Fiz. **31**, 648 (1980) [Sov. J. Nucl. Phys. **31**, 337 (1980)].

[17] C. Baglin *et al.*, Nucl. Phys. B **216**, 1 (1983), *ibid.* **98**, 365 (1975).

[18] M. Barth *et al.*, Z. Phys. C **16**, 111 (1982).

[19] B. V. Batyunya *et al.*, Yad. Fiz. **44**, 1489 (1986) [Sov. J. Nucl. Phys. **44**, 969 (1986)].

[20] A. Berglund *et al.*, Nucl. Phys. B **176**, 346 (1980).

[21] D. Bernard *et al.*, Phys. Lett. B **198**, 583 (1987), *ibid.* **171**, 142 (1986).

[22] G. G. Beznogikh *et al.*, Nucl. Phys. B **54**, 78 (1973).

[23] D. Birnbaum *et al.*, Phys. Rev. Lett. **23**, 663 (1969).

[24] M. Y. Bogolyubsky *et al.*, Yad. Fiz. **41**, 1210 (1985) [Sov. J. Nucl. Phys. **41**, 773 (1985)].

[25] M. Bozzo *et al.*, Phys. Lett. B **155**, 197 (1985), *ibid.* **147**, 385 (1984).

[26] G. W. Brandenburg *et al.*, Phys. Lett. B **58**, 367 (1975).

[27] A. Breakstone *et al.*, Nucl. Phys. B **248**, 253 (1984), Phys. Rev. Lett. **54**, 2180 (1985).

[28] D. Brick *et al.*, Phys. Rev. D **25**, 2794 (1982).

[29] C. Bruneton *et al.*, Nucl. Phys. B **124**, 391 (1977);

[30] J. P. Burq *et al.*, Nucl. Phys. B **217**, 285 (1983);

[31] J. R. Campbell *et al.*, Nucl. Phys. B **64**, 1 (1973);

[32] T. J. Chapin *et al.*, Phys. Rev. D **31**, 17 (1985).

[33] R. L. Cool *et al.*, Phys. Rev. D **24**, 2821 (1981).

[34] S. Conetti *et al.*, Phys. Rev. Lett. **41**, 924 (1978).

[35] P. Cornillon *et al.*, Phys. Rev. Lett. **30**, 403 (1973).

[36] N. Dalkhazav *et al.*, Yad. Fiz. **8**, 342 (1968) [Sov. J. Nucl. Phys. **8**, 196 (1969)]; L. F. Kirillova *et al.*, Yad. Fiz. **1**, 533 (1965) [Sov. J. Nucl. Phys. **1**, 379 (1965)].

[37] R. J. De Boer *et al.*, Nucl. Phys. B **106**, 125 (1976).

[38] P. A. Devenski *et al.*, Yad. Fiz. **14**, 367 (1971) [Sov. J. Nucl. Phys. **14**, 206 (1971)].

[39] A. N. Diddens *et al.*, Phys. Rev. Lett. **9** , 108 (1962).

[40] A. A. Derevshchikov *et al.*, Nucl. Phys. B **80**, 442 (1974), Phys. Lett. B **48**, 367 (1974).

[41] B. Drevillon *et al.*, Nucl. Phys. B **97**, 392 (1975);

[42] A. R. Dzierba *et al.*, Phys. Rev. D **7**, 725 (1973);

[43] R. M. Edelstein *et al.*, Phys. Rev. D **5**, 1073 (1972);

[44] S. Erhan *et al.*, Phys. Lett. B **152**, 131 (1985).

[45] W. Faissler *et al.*, Phys. Rev. D **23**, 33 (1981);

[46] G. Fidecaro *et al.*, Nucl. Phys. B **173**, 513 (1980).

[47] K. J. Foley *et al.*, Phys. Rev. Lett. **15**, 45 (1965), *ibid.* **11**, 425, 503 (1963).

[48] I. M. Geshkov, N. L. Ikov, P. K. Markov and R. K. Trayanov, Phys. Rev. D **13**, 1846 (1976).

[49] R. Rusack *et al.*, Phys. Rev. Lett. **41**, 1632 (1978);

[50] D. Harting, Nuov. Cim. **38**, 60 (1965);

[51] K. A. Jenkins *et al.*, Phys. Rev. Lett. **40**, 425, 429 (1978).

[52] P. Jenni, P. Baillon, Y. Declais, M. Ferro-Luzzi, J. M. Perreau, J. Seguinot and T. Ypsilantis, Nucl. Phys. B **129**, 232 (1977).

[53] A. A. Kuznetsov *et al.*, Yad. Fiz. **33**, 142 (1981) [Sov. J. Nucl. Phys. **33**, 74 (1981)];

[54] C. Lewin *et al.*, Z. Phys. C **3**, 275 (1979);

[55] R. J. Miller *et al.*, Phys. Lett. B **34**, 230 (1971);

[56] E. Nagy *et al.*, Nucl. Phys. B **150**, 221 (1979).

[57] J. Orear *et al.*, Phys. Rev. **152**, 1162 (1966).

[58] D. P. Owen *et al.*, Phys. Rev. **181**, 1794 (1969).

[59] R. Rubinstein *et al.*, Phys. Rev. D **30**, 1413 (1984), Phys. Rev. Lett. **30**, 1010 (1973).

[60] J. S. Russ *et al.*, Phys. Rev. D **15**, 3139 (1977);

[61] A. Schiz *et al.*, Phys. Rev. D **24**, 26 (1981);