Erratum: A Study of the Coupled Gravitational and Electromagnetic Perturbations to the Reissner--Nordstrom Black Hole: The Scattering Matrix, Energy Conversion, and Quasi-Normal Modes

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ERRATUM

Phil. Trans. R. Soc. Lond. A **296**, 497–526 (1980)

A study of the coupled gravitational and electromagnetic perturbations to the Reissner–Nordström black hole: the scattering matrix, energy conversion, and quasi-normal modes

By D. L. Gunter

In Tables $1(a)$–$3(c)$ (pp. 509–520) the phase shifts of the reflected waves of the positive-parity perturbations, $\delta_2^{r,+}$ and $\Delta_{12}^{r}{}^{+}$, are incorrect; they are corrected in the accompanying tables. None of the other entries in the published tables need to be changed; nor are the other results or conclusions of the paper altered in any way. The error occurred after the calculations were completed and when the tables were being compiled. Thus, even though the phase shifts $\Delta_{12}^{r}{}^{+}$ are crucial in the calculation of the conversion coefficients $\mathbb{C}^{+}$, figures 1–10, which show the conversion coefficients, are correct.

Table ...	$1\,(a)$		$2\,(a)$		$3\,(a)$	
Q_* ...	$0.3M$		$0.5M$		$0.7M$	
l ...	2		2		2	
$M\sigma$	$\delta_2^{r,+}$	$\Delta_{12}^{r,+}$	$\delta_2^{r,+}$	$\Delta_{12}^{r,+}$	$\delta_2^{r,+}$	$\Delta_{12}^{r,+}$
0.02	3.290	0.044	3.291	0.049	3.294	0.055
0.04	3.319	0.089	3.322	0.099	3.330	0.113
0.06	3.303	0.135	3.306	0.151	3.317	0.171
0.08	3.252	0.183	3.258	0.204	3.272	0.232
0.10	3.175	0.233	3.182	0.260	3.202	0.296
0.12	3.075	0.285	3.084	0.317	3.108	0.361
0.14	2.953	0.340	2.964	0.378	2.994	0.429
0.16	2.811	0.396	2.825	0.442	2.859	0.501
0.18	2.650	0.456	2.666	0.509	2.707	0.576
0.20	2.469	0.522	2.489	0.579	2.535	0.656
0.22	2.268	0.591	2.290	0.656	2.345	0.741
0.24	2.044	0.668	2.071	0.740	2.135	0.834
0.26	1.797	0.752	1.829	0.833	1.903	0.934
0.28	1.523	0.849	1.561	0.936	1.645	1.046
0.30	1.218	0.959	1.264	1.054	1.362	1.172
0.32	0.877	1.087	0.931	1.189	1.048	1.315
0.34	0.499	1.231	0.563	1.344	0.698	1.479
0.36	0.087	1.386	0.160	1.515	0.311	1.664
0.38	5.941	1.535	6.016	1.688	6.177	1.863
0.40	5.512	1.652	5.585	1.840	5.744	2.061
0.42	5.106	1.716	5.171	1.947	5.317	2.230
0.44	4.731	1.715	4.786	1.994	4.914	2.352
0.46	4.389	1.658	4.434	1.975	4.544	2.414
0.48	4.074	1.561	4.111	1.903	4.205	2.416
0.50	3.784	1.448	3.814	1.792	3.893	2.360
0.52	3.512	1.337	3.536	1.664	3.604	2.256
0.54	3.255	1.240	3.274	1.539	3.332	2.118
0.56	3.011	1.158	3.026	1.428	3.076	1.967
0.58	2.777	1.088	2.788	1.332	2.832	1.820
0.60	2.552	1.031	2.560	1.252	2.597	1.687
0.62	2.334	0.984	2.339	1.184	2.372	1.572
0.64	2.123	0.943	2.126	1.128	2.154	1.475
0.66	1.919	0.910	1.918	1.080	1.943	1.392
0.68	1.718	0.880	1.716	1.039	1.737	1.321
0.70	1.523	0.854	1.518	1.002	1.536	1.259
0.72	1.330	0.831	1.324	0.970	1.340	1.206
0.74	1.143	0.811	1.135	0.942	1.148	1.159
0.76	0.958	0.793	0.949	0.917	0.959	1.117
0.78	0.776	0.777	0.766	0.895	0.775	1.078
0.80	0.598	0.762	0.585	0.875	0.593	1.044
0.82	0.422	0.749	0.407	0.857	0.414	1.013
0.84	0.247	0.738	0.232	0.840	0.237	0.984
0.86	0.076	0.727	0.059	0.824	0.063	0.957
0.88	6.189	0.717	6.171	0.811	6.175	0.934
0.90	6.021	0.709	6.002	0.798	6.005	0.911
0.92			5.835	0.786	5.838	0.890
0.94			5.669	0.775	5.672	0.870
0.96			5.505	0.765	5.508	0.852
0.98			5.343	0.756	5.345	0.834
1.00			5.182	0.747	5.184	0.818

Table ...	1(b)		2(b)		3(b)	
Q_* ...	0.3M		0.5M		0.7M	
l ...	3		3		3	
$M\sigma$	$\delta_2^{r_*}+$	$\Delta_{12}^{r_*}+$	$\delta_2^{r_*}+$	$\Delta_{12}^{r_*}+$	$\delta_2^{r_*}+$	$\Delta_{12}^{r_*}+$
0.04	0.347	0.034	0.351	0.042	0.361	0.051
0.06	0.362	0.051	0.367	0.063	0.381	0.077
0.08	0.365	0.070	0.372	0.085	0.391	0.105
0.10	0.350	0.089	0.359	0.108	0.383	0.133
0.12	0.318	0.107	0.330	0.132	0.359	0.162
0.14	0.270	0.127	0.285	0.156	0.318	0.191
0.16	0.207	0.147	0.224	0.180	0.263	0.222
0.18	0.131	0.169	0.149	0.206	0.194	0.253
0.20	0.040	0.190	0.061	0.233	0.112	0.285
0.22	6.220	0.213	6.244	0.261	0.018	0.319
0.24	6.105	0.236	6.131	0.290	6.194	0.355
0.26	5.977	0.261	6.007	0.320	6.077	0.391
0.28	5.839	0.286	5.871	0.350	5.948	0.429
0.30	5.688	0.313	5.724	0.383	5.808	0.468
0.32	5.525	0.342	5.565	0.418	5.656	0.510
0.34	5.351	0.371	5.394	0.454	5.493	0.553
0.36	5.163	0.404	5.211	0.493	5.319	0.599
0.38	4.963	0.438	5.016	0.533	5.132	0.647
0.40	4.750	0.475	4.807	0.578	4.934	0.699
0.42	4.521	0.515	4.584	0.625	4.722	0.756
0.44	4.278	0.559	4.347	0.678	4.497	0.816
0.46	4.017	0.609	4.092	0.735	4.256	0.881
0.48	3.735	0.664	3.819	0.799	4.000	0.952
0.50	3.431	0.729	3.526	0.872	3.724	1.032
0.52	3.101	0.805	3.207	0.957	3.427	1.123
0.54	2.739	0.893	2.860	1.056	3.106	1.227
0.56	2.344	0.994	2.480	1.171	2.755	1.347
0.58	1.918	1.103	2.067	1.299	2.373	1.486
0.60	1.469	1.208	1.627	1.434	1.957	1.644
0.62	1.016	1.286	1.174	1.558	1.516	1.812
0.64	0.578	1.318	0.726	1.647	1.061	1.973
0.66	0.167	1.298	0.301	1.683	0.614	2.105
0.68	6.070	1.233	6.190	1.661	0.188	2.190
0.70	5.719	1.143	5.826	1.588	6.077	2.216
0.72	5.393	1.049	5.488	1.482	5.712	2.183
0.74	5.088	0.962	5.172	1.366	5.374	2.097
0.76	4.799	0.885	4.875	1.252	5.057	1.971
0.78	4.525	0.821	4.593	1.152	4.760	1.825
0.80	4.263	0.767	4.325	1.067	4.477	1.678
0.82	4.010	0.721	4.068	0.995	4.208	1.543
0.84	3.766	0.681	3.819	0.932	3.949	1.424
0.86	3.531	0.647	3.578	0.879	3.700	1.322
0.88	3.301	0.617	3.345	0.833	3.459	1.235
0.90	3.078	0.589	3.118	0.792	3.225	1.159
0.92	2.860	0.565	2.897	0.755	2.997	1.092
0.94	2.646	0.543	2.680	0.722	2.775	1.034
0.96	2.438	0.522	2.470	0.692	2.558	0.981
0.98	2.234	0.504	2.263	0.665	2.347	0.933
1.00	2.034	0.487	2.059	0.639	2.139	0.890
1.02	1.836	0.470	1.859	0.615	1.935	0.850
1.04	1.642	0.455	1.663	0.594	1.735	0.813
1.06	1.452	0.442	1.470	0.574	1.538	0.779
1.08	1.263	0.428	1.280	0.554	1.345	0.747
1.10	1.077	0.416	1.092	0.536	1.154	0.716
1.12					0.966	0.688
1.14					0.780	0.661
1.16					0.598	0.636
1.18					0.417	0.612
1.20					0.238	0.589

Table ...		1 (c)		2 (c)		3 (c)	
Q_* ...		0.3M		0.5M		0.7M	
l ...		6		6		6	
$M\sigma$		$\delta_2^{r}{}^+$	$\Delta_{12}^{r}{}^+$	$\delta_2^{r}{}^+$	$\Delta_{12}^{r}{}^+$	$\delta_2^{r}{}^+$	$\Delta_{12}^{r}{}^+$
0.06		1.748	0.017	1.754	0.027	3.698	0.030
0.08		2.684	0.022	2.694	0.032	3.792	0.041
0.10		4.029	0.026	4.042	0.037	3.864	0.050
0.12		4.036	0.032	4.052	0.046	3.916	0.061
0.14		4.026	0.037	4.046	0.054	3.954	0.072
0.16		4.010	0.043	4.031	0.062	3.978	0.083
0.18		3.988	0.049	4.013	0.071	3.991	0.094
0.20		3.961	0.055	3.988	0.079	3.993	0.106
0.22		3.890	0.061	3.921	0.087	3.986	0.117
0.24		3.865	0.067	3.897	0.096	3.969	0.129
0.26		3.830	0.073	3.867	0.106	3.944	0.141
0.28		3.788	0.079	3.827	0.114	3.911	0.152
0.30		3.737	0.086	3.780	0.124	3.871	0.165
0.32		3.680	0.092	3.725	0.133	3.824	0.177
0.34		3.616	0.099	3.665	0.142	3.769	0.190
0.36		3.544	0.105	3.596	0.152	3.707	0.203
0.38		3.466	0.113	3.522	0.163	3.640	0.217
0.40		3.382	0.119	3.440	0.172	3.566	0.230
0.42		3.291	0.127	3.354	0.183	3.487	0.244
0.44		3.194	0.134	3.261	0.194	3.401	0.258
0.46		3.091	0.142	3.161	0.204	3.309	0.272
0.48		2.983	0.149	3.057	0.216	3.212	0.287
0.50		2.868	0.158	2.946	0.227	3.108	0.302
0.52		2.747	0.165	2.830	0.238	3.000	0.317
0.54		2.621	0.173	2.707	0.250	2.886	0.333
0.56		2.490	0.182	2.580	0.263	2.767	0.349
0.58		2.351	0.190	2.446	0.275	2.642	0.366
0.60		2.209	0.200	2.307	0.288	2.511	0.383
0.62		2.059	0.209	2.162	0.302	2.376	0.400
0.64		1.904	0.219	2.012	0.315	2.235	0.417
0.66		1.744	0.228	1.856	0.329	2.089	0.436
0.68		1.577	0.239	1.695	0.344	1.937	0.455
0.70		1.405	0.249	1.527	0.358	1.779	0.474
0.72		1.227	0.260	1.355	0.374	1.617	0.494
0.74		1.042	0.271	1.176	0.390	1.448	0.515
0.76		0.852	0.283	0.991	0.406	1.275	0.536
0.78		0.655	0.295	0.800	0.423	1.095	0.559
0.80		0.452	0.307	0.603	0.441	0.909	0.581
0.82		0.243	0.321	0.400	0.459	0.719	0.605
0.84		0.025	0.334	0.190	0.479	0.521	0.629
0.86		6.085	0.349	6.257	0.499	0.318	0.654
0.88		5.855	0.364	6.033	0.520	0.108	0.681
0.90		5.615	0.381	5.803	0.542	6.176	0.709
0.92		5.369	0.398	5.564	0.566	5.952	0.738
0.94		5.113	0.416	5.319	0.590	5.722	0.768
0.96		4.850	0.435	5.064	0.617	5.485	0.800
0.98		4.576	0.457	4.801	0.645	5.240	0.834
1.00		4.292	0.479	4.528	0.675	4.988	0.870
1.02		3.997	0.503	4.246	0.707	4.726	0.907
1.04		3.690	0.531	3.952	0.743	4.455	0.947
1.06		3.368	0.562	3.647	0.781	4.176	0.991
1.08		3.031	0.597	3.327	0.824	3.885	1.037
1.10		2.675	0.637	2.993	0.873	3.583	1.088
1.12		2.299	0.685	2.641	0.927	3.268	1.144
1.14		1.897	0.740	2.269	0.991	2.939	1.206
1.16		1.466	0.805	1.871	1.066	2.594	1.276
1.18		1.004	0.877	1.447	1.152	2.229	1.355
1.20		0.515	0.953	0.992	1.252	1.842	1.445

Table ...	1 (c)		2 (c)		3 (c)	
Q_* ...	0.3M		0.5M		0.7M	
l ...	6		6		6	
$M\sigma$	$\delta_2^{r_*}+$	$\Delta_{12}^{r_*}+$	$\delta_2^{r_*}+$	$\Delta_{12}^{r_*}+$	$\delta_2^{r_*}+$	$\Delta_{12}^{r_*}+$
1.22	0.005	1.016	0.508	1.361	1.428	1.551
1.24	5.779	1.052	0.002	1.466	0.986	1.674
1.26	5.284	1.047	5.775	1.550	0.513	1.813
1.28	4.817	1.005	5.277	1.591	0.014	1.961
1.30	4.381	0.942	4.803	1.580	5.787	2.103
1.32	3.972	0.870	4.360	1.521	5.280	2.218
1.34	3.588	0.803	3.945	1.429	4.794	2.286
1.36	3.225	0.744	3.556	1.325	4.336	2.298
1.38	2.878	0.694	3.188	1.226	3.907	2.251
1.40	2.548	0.651	2.838	1.137	3.506	2.156
1.42	2.229	0.616	2.503	1.059	3.127	2.027
1.44	1.920	0.584	2.181	0.994	2.769	1.886
1.46	1.622	0.557	1.870	0.939	2.425	1.748
1.48	1.332	0.532	1.569	0.889	2.096	1.624
1.50	1.050	0.511	1.276	0.847	1.779	1.516
1.52	0.775	0.490	0.991	0.810	1.472	1.423
1.54	0.505	0.471	0.713	0.775	1.174	1.343
1.56	0.242	0.455	0.442	0.744	0.884	1.272
1.58	6.267	0.439	0.176	0.716	0.602	1.211
1.60	6.013	0.425	6.200	0.689	0.326	1.155
1.62	5.765	0.411	5.944	0.665	0.056	1.105
1.64	5.520	0.398	5.694	0.643	6.076	1.060
1.66	5.281	0.386	5.448	0.621	5.817	1.018
1.68	5.045	0.375	5.206	0.601	5.563	0.979
1.70	4.811	0.363	4.969	0.582	5.314	0.943
1.72					5.068	0.909
1.74					4.827	0.876
1.76					4.590	0.846
1.78					4.356	0.817
1.80					4.125	0.790