```
(*1st spherical harmonic Lorentz-collisions normalised to -n nu / 2,
equation B.12 *)

alpha = 1 + r / (1 - r) + t / (1 - t);
V = (1 - r)^-5/2 (1 - t)^-5/2 alpha^-1;
S = FullSimplify[V] (* the generating function *)
l = 6; (* number of polynomials - 1 *)
Series[S, {r, 0, l}, {t, 0, l}];
Kei[i_, j_] := SeriesCoefficient[S, {r, 0, i}, {t, 0, j}]
(* coefficients function *)
Print[Table[Kei[i, j], {i, 0, l}, {j, 0, l}]] (* table of coefficients *)
MatrixForm[Table[Kei[i, j], {i, 0, l}, {j, 0, l}]]
(* matrix form of L_pq given in C.15 *)
```

Out[ ]=
$$\frac{1}{(1-r)^{3/2}\,(1-t)^{3/2}\,(1-r\,t)}$$

$$\left\{\left\{1, \frac{3}{2}, \frac{15}{8}, \frac{35}{16}, \frac{315}{128}, \frac{693}{256}, \frac{3003}{1024}\right\}, \left\{\frac{3}{2}, \frac{13}{4}, \frac{69}{16}, \frac{165}{32}, \frac{1505}{256}, \frac{3339}{512}, \frac{14553}{2048}\right\},\right.$$
$$\left\{\frac{15}{8}, \frac{69}{16}, \frac{433}{64}, \frac{1077}{128}, \frac{10005}{1024}, \frac{22435}{2048}, \frac{98469}{8192}\right\}, \left\{\frac{35}{16}, \frac{165}{32}, \frac{1077}{128}, \frac{2957}{256}, \frac{28257}{2048}, \frac{64275}{4096}, \frac{284585}{16384}\right\},$$
$$\left\{\frac{315}{128}, \frac{1505}{256}, \frac{10005}{1024}, \frac{28257}{2048}, \frac{288473}{16384}, \frac{670407}{32768}, \frac{3002745}{131072}\right\},$$
$$\left\{\frac{693}{256}, \frac{3339}{512}, \frac{22435}{2048}, \frac{64275}{4096}, \frac{670407}{32768}, \frac{1634141}{65536}, \frac{7444335}{262144}\right\},$$
$$\left.\left\{\frac{3003}{1024}, \frac{14553}{2048}, \frac{98469}{8192}, \frac{284585}{16384}, \frac{3002745}{131072}, \frac{7444335}{262144}, \frac{35164265}{1048576}\right\}\right\}$$

Out[ ]//MatrixForm=

1	$\frac{3}{2}$	$\frac{15}{8}$	$\frac{35}{16}$	$\frac{315}{128}$	$\frac{693}{256}$	$\frac{3003}{1024}$
$\frac{3}{2}$	$\frac{13}{4}$	$\frac{69}{16}$	$\frac{165}{32}$	$\frac{1505}{256}$	$\frac{3339}{512}$	$\frac{14553}{2048}$
$\frac{15}{8}$	$\frac{69}{16}$	$\frac{433}{64}$	$\frac{1077}{128}$	$\frac{10005}{1024}$	$\frac{22435}{2048}$	$\frac{98469}{8192}$
$\frac{35}{16}$	$\frac{165}{32}$	$\frac{1077}{128}$	$\frac{2957}{256}$	$\frac{28257}{2048}$	$\frac{64275}{4096}$	$\frac{284585}{16384}$
$\frac{315}{128}$	$\frac{1505}{256}$	$\frac{10005}{1024}$	$\frac{28257}{2048}$	$\frac{288473}{16384}$	$\frac{670407}{32768}$	$\frac{3002745}{131072}$
$\frac{693}{256}$	$\frac{3339}{512}$	$\frac{22435}{2048}$	$\frac{64275}{4096}$	$\frac{670407}{32768}$	$\frac{1634141}{65536}$	$\frac{7444335}{262144}$
$\frac{3003}{1024}$	$\frac{14553}{2048}$	$\frac{98469}{8192}$	$\frac{284585}{16384}$	$\frac{3002745}{131072}$	$\frac{7444335}{262144}$	$\frac{35164265}{1048576}$

```
(*1st spherical harmonic self-collisions normalised to -n nu /2, , equation B.11 *)
M = (1 - r)^-1 + (1 - t)^-1;
V = Sqrt[1 / 2] (1 - r)^-1 (1 - t)^-1 (2 - r - t)^-1/2 r t
    ((1 - r t)^-1 (1 - M^-1 (r (1 - r)^-1 + t (1 - t)^-1) + 5 r t / (M^2 (1 - r) (1 - t))) +
      2 / (M^2 (1 - r) (1 - t)) + 2 / (M^2 (1 - r t)^2));
S = FullSimplify[V] (* the generating function / sqrt 2 *)
l = 6; (* the number of polynomials - 1 *)
Series[S, {r, 0, l}, {t, 0, l}];
Kee[i_, j_] := Simplify[SeriesCoefficient[S, {r, 0, i}, {t, 0, j}]]
(* coefficients function, noting lack of sqrt 2 factor *)
Print[Table[Kee[i, j], {i, 0, l}, {j, 0, l}]]
(* table of coefficients, noting lack of sqrt 2 factor  *)
Sqrt[2] MatrixForm[Table[Kee[i, j], {i, 0, l}, {j, 0, l}]]
(* matrix form of C_pq given in C.14 *)
```

Out[ ]=
$$-\frac{r t \left(4 (-2+t)+r \left(4+t-2 r t+(-2+3 r) t^2\right)\right)}{\sqrt{2}\ (2-r-t)^{5/2}\ (-1+r t)^2}$$

$$\left\{\{0,0,0,0,0,0,0\},\left\{0,1,\frac{3}{4},\frac{15}{32},\frac{35}{128},\frac{315}{2048},\frac{693}{8192}\right\},\right.$$
$$\left\{0,\frac{3}{4},\frac{45}{16},\frac{309}{128},\frac{885}{512},\frac{9345}{8192},\frac{23\,499}{32\,768}\right\},\left\{0,\frac{15}{32},\frac{309}{128},\frac{5657}{1024},\frac{20\,349}{4096},\frac{249\,285}{65\,536},\frac{705\,635}{262\,144}\right\},$$
$$\left\{0,\frac{35}{128},\frac{885}{512},\frac{20\,349}{4096},\frac{149\,749}{16\,384},\frac{2\,204\,625}{262\,144},\frac{7\,034\,355}{1\,048\,576}\right\},$$
$$\left\{0,\frac{315}{2048},\frac{9345}{8192},\frac{249\,285}{65\,536},\frac{2\,204\,625}{262\,144},\frac{57\,292\,281}{4\,194\,304},\frac{213\,752\,391}{16\,777\,216}\right\},$$
$$\left.\left\{0,\frac{693}{8192},\frac{23\,499}{32\,768},\frac{705\,635}{262\,144},\frac{7\,034\,355}{1\,048\,576},\frac{213\,752\,391}{16\,777\,216},\frac{1\,280\,638\,685}{67\,108\,864}\right\}\right\}$$

Out[ ]=
$$\sqrt{2}\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & \frac{3}{4} & \frac{15}{32} & \frac{35}{128} & \frac{315}{2048} & \frac{693}{8192} \\ 0 & \frac{3}{4} & \frac{45}{16} & \frac{309}{128} & \frac{885}{512} & \frac{9345}{8192} & \frac{23\,499}{32\,768} \\ 0 & \frac{15}{32} & \frac{309}{128} & \frac{5657}{1024} & \frac{20\,349}{4096} & \frac{249\,285}{65\,536} & \frac{705\,635}{262\,144} \\ 0 & \frac{35}{128} & \frac{885}{512} & \frac{20\,349}{4096} & \frac{149\,749}{16\,384} & \frac{2\,204\,625}{262\,144} & \frac{7\,034\,355}{1\,048\,576} \\ 0 & \frac{315}{2048} & \frac{9345}{8192} & \frac{249\,285}{65\,536} & \frac{2\,204\,625}{262\,144} & \frac{57\,292\,281}{4\,194\,304} & \frac{213\,752\,391}{16\,777\,216} \\ 0 & \frac{693}{8192} & \frac{23\,499}{32\,768} & \frac{705\,635}{262\,144} & \frac{7\,034\,355}{1\,048\,576} & \frac{213\,752\,391}{16\,777\,216} & \frac{1\,280\,638\,685}{67\,108\,864} \end{pmatrix}$$