# Testing out DMFormFactor functions

In[5]:=
```
<< "v6/dmformfactor  -V6.m ";
```

```
Welcome to
   DMFormFactor version 1.1.
```

```
Functions are SetCoeffsNonrel, SetCoeffsRel, SetCoeffsNucl, ZeroCoeffs,
    SetJChi, SetMchi, SetIsotope, SetHALO, SetHelm , TransitionProbability,
    ResponseNucl, DiffCrossSection, ApproxTotalCrossSection, and EventRate.
```

---

## Event rate

Model setup

In[802]:=
```
(* Model Setup *)
SetJChi[1/2](* WIMP spin *)
SetMChi[MWIMP GeV](* WIMP mass  in GeV *)
Xe131filename = "default";
(* nuclear density matrix  (using default density matrices ) *)
bFM = "default";
(* oscillation parameter  (default: approximate  formulae  used) *)
SetIsotope[54, 131, bFM, Xe131filename ](*[Z,A,bFM,filename ]*)
ZeroCoeffs[];(*Reset all coefficients*)
SetCoeffsNonrel[1, c1p, "p"]
SetCoeffsNonrel[1, c1n, "n"]
SetCoeffsNonrel[2, c2p, "p"]
SetCoeffsNonrel[2, c2n, "n"]
SetCoeffsNonrel[3, c3p, "p"]
SetCoeffsNonrel[3, c3n, "n"]
SetCoeffsNonrel[4, c4p, "p"]
SetCoeffsNonrel[4, c4n, "n"]
SetCoeffsNonrel[5, c5p, "p"]
SetCoeffsNonrel[5, c5n, "n"]
SetCoeffsNonrel[6, c6p, "p"]
SetCoeffsNonrel[6, c6n, "n"]
SetCoeffsNonrel[7, c7p, "p"]
SetCoeffsNonrel[7, c7n, "n"]
SetCoeffsNonrel[8, c8p, "p"]
SetCoeffsNonrel[8, c8n, "n"]
SetCoeffsNonrel[9, c9p, "p"]
SetCoeffsNonrel[9, c9n, "n"]
SetCoeffsNonrel[10, c10p, "p"]
SetCoeffsNonrel[10, c10n, "n"]
SetCoeffsNonrel[11, c11p, "p"]
SetCoeffsNonrel[11, c11n, "n"]
SetCoeffsNonrel[12, c12p, "p"]
SetCoeffsNonrel[12, c12n, "n"]
SetCoeffsNonrel[13, c13p, "p"]
SetCoeffsNonrel[13, c13n, "n"]
SetCoeffsNonrel[14, c14p, "p"]
SetCoeffsNonrel[14, c14n, "n"]
SetCoeffsNonrel[15, c15p, "p"]
SetCoeffsNonrel[15, c15n, "n"]
(* Set non-zero NR EFT coefficient values *)
```

```
Getting default matrix ...

Setting isotope to xenon-131.
```

Attempting to compute a recoil spectrum...

In[836]:=
```
(* Parameters  *)
mNucleon  = 0.938 GeV;
NT = 1/(131 mNucleon );
(*Number  of target nuclei per detector mass *)
Centimeter  = (10^13 Femtometer  );
rhoDM = 0.3 GeV/Centimeter ^3; (*Local dark matter  density*)
ve = 232 KilometerPerSecond ;
(*Earth's velocity in galactic rest frame *)
v0 = 220 KilometerPerSecond ;(*Mean WIMP speed in galactic rest frame *)
SetHALO["MB"];
(*using default MB Halo*)
```

In[840]:=
```
dRdE = EventRate[NT, rhoDM, qGeV, ve, v0]
```

Your Lagrangian is

$$L_{prot}=\frac{0.0000187399\,(i\ q\cdot S_\chi)\,(v^\perp.(iq\times S_N))\,c15p}{GeV^4}+\frac{0.0000187399\,(S_\chi\cdot q)\,(S_N\cdot q)\,c6p}{GeV^4}+\frac{0.0000175831\,i\ S_N\cdot q\,c10p}{GeV^3}+\frac{0.0000175831\,i\ S_\chi\cdot q\,c11p}{GeV^3}+\frac{0.0000175831\,(iq\times S_\chi)\cdot(S_N\cdot v^\perp)\,c13p}{GeV^3}+\frac{0.0000175831\,(i\ q\cdot S_\chi)\,(v^\perp\cdot S_N)\,c14p}{GeV^3}+\frac{0.0000175831\,i\ S_N\cdot(q\times v^\perp)\,c3p}{GeV^3}+\frac{0.0000175831\,i\ S_\chi\cdot(q\times v^\perp)\,c5p}{GeV^3}+\frac{0.0000175831\,i\ S_\chi.(S_N\times q)\,c9p}{GeV^3}+\frac{0.0000164977\,S_\chi\cdot(S_N\times v^\perp)\,c12p}{GeV^2}+\frac{0.00001649771\,c1p}{GeV^2}+\frac{0.0000164977\,(v^\perp)^2\,c2p}{GeV^2}+\frac{0.0000164977\,S_\chi\cdot S_N\,c4p}{GeV^2}+\frac{0.0000164977\,S_N\cdot v^\perp\,c7p}{GeV^2}+\frac{0.0000164977\,S_\chi\cdot v^\perp\,c8p}{GeV^2}$$

$$L_{neut}=\frac{0.0000187399\,(i\ q\cdot S_\chi)\,(v^\perp.(iq\times S_N))\,c15n}{GeV^4}+\frac{0.0000187399\,(S_\chi\cdot q)\,(S_N\cdot q)\,c6n}{GeV^4}+\frac{0.0000175831\,i\ S_N\cdot q\,c10n}{GeV^3}+\frac{0.0000175831\,i\ S_\chi\cdot q\,c11n}{GeV^3}+\frac{0.0000175831\,(iq\times S_\chi)\cdot(S_N\cdot v^\perp)\,c13n}{GeV^3}+\frac{0.0000175831\,(i\ q\cdot S_\chi)\,(v^\perp\cdot S_N)\,c14n}{GeV^3}+\frac{0.0000175831\,i\ S_N\cdot(q\times v^\perp)\,c3n}{GeV^3}+\frac{0.0000175831\,i\ S_\chi\cdot(q\times v^\perp)\,c5n}{GeV^3}+\frac{0.0000175831\,i\ S_\chi.(S_N\times q)\,c9n}{GeV^3}+\frac{0.0000164977\,S_\chi\cdot(S_N\times v^\perp)\,c12n}{GeV^2}+\frac{0.00001649771\,c1n}{GeV^2}+\frac{0.0000164977\,(v^\perp)^2\,c2n}{GeV^2}+\frac{0.0000164977\,S_\chi\cdot S_N\,c4n}{GeV^2}+\frac{0.0000164977\,S_N\cdot v^\perp\,c7n}{GeV^2}+\frac{0.0000164977\,S_\chi\cdot v^\perp\,c8n}{GeV^2}$$

# Warning: Implementation of $O_2$ discards $v_N^2$ piece.

Your event rate is

Out[840]=
$$\frac{1}{GeV\,MWIMP^3}2.6053\times10^{-44}\left(646.112\,e^{-67.4762\,qGeV^2}\left(0.223035\,qGeV^2\left(3.83376\times10^{-9}\,c12p^2\,MWIMP^2+4.3548\times10^{-9}\,c13p^2\,MWIMP^2\,qGeV^2\right)\right.\right.$$

$$\left(0.0798479 + 0.605014\,\text{qGeV}^2 - 53.138\,\text{qGeV}^4 + 262.736\,\text{qGeV}^6 - 0.0000142182\,\text{qGeV}^8\right)^2 + 0.223035\,\text{qGeV}^2\left(3.83376\times10^{-9}\,\text{c12n}^2\,\text{MWIMP}^2 + 4.3548\times10^{-9}\,\text{c13n}^2\,\text{MWIMP}^2\,\text{qGeV}^2\right)\left(0.516607 - 22.1809\,\text{qGeV}^2 + 263.486\,\text{qGeV}^4 - 1294.83\,\text{qGeV}^6 + 1311.43\,\text{qGeV}^8\right)^2 + 0.141988\,\text{qGeV}^2\left(3.83376\times10^{-9}\,\text{c12n c12p MWIMP}^2 + 4.3548\times10^{-9}\,\text{c13n c13p MWIMP}^2\,\text{qGeV}^2\right)\left(-0.129591 + 4.58215\,\text{qGeV}^2 + 62.3055\,\text{qGeV}^4 - 4305.25\,\text{qGeV}^6 + 64426.2\,\text{qGeV}^8 - 436132.\,\text{qGeV}^{10} + 1.28769\times10^6\,\text{qGeV}^{12} - 1.08247\times10^6\,\text{qGeV}^{14} + 0.0585786\,\text{qGeV}^{16}\right) + \left(0.266447\,\text{GeV}\left(\frac{4.08598\times10^{-9}\,\text{c4p c5p MWIMP}^2}{\text{GeV}} - \frac{4.08598\times10^{-9}\,\text{c8p c9p MWIMP}^2}{\text{GeV}}\right)\text{qGeV}^2 + \frac{1}{\text{GeV}^2}7.20622\times10^{-14}\,\text{c2p c3p}\,(122.914\,\text{GeV} + \text{GeV MWIMP})^2\,\text{qGeV}^4\right)\left(0.00160907 - 0.274616\,\text{qGeV}^2 + 5.35326\,\text{qGeV}^4 + 188.744\,\text{qGeV}^6 - 7857.19\,\text{qGeV}^8 + 102543.\,\text{qGeV}^{10} - 567802.\,\text{qGeV}^{12} + 1.13687\times10^6\,\text{qGeV}^{14} - 14.3099\,\text{qGeV}^{16} + 0.0000454276\,\text{qGeV}^{18}\right) + \left(0.266447\,\text{GeV}\left(\frac{4.08598\times10^{-9}\,\text{c4n c5p MWIMP}^2}{\text{GeV}} - \frac{4.08598\times10^{-9}\,\text{c8p c9n MWIMP}^2}{\text{GeV}}\right)\text{qGeV}^2 + \frac{1}{\text{GeV}^2}7.20622\times10^{-14}\,\text{c2p c3n}\,(122.914\,\text{GeV} + \text{GeV MWIMP})^2\,\text{qGeV}^4\right)\left(0.0626746 - 12.4529\,\text{qGeV}^2 + 816.667\,\text{qGeV}^4 - 26193.6\,\text{qGeV}^6 + 453298.\,\text{qGeV}^8 - 4.27212\times10^6\,\text{qGeV}^{10} + 2.04296\times10^7\,\text{qGeV}^{12} - 3.82971\times10^7\,\text{qGeV}^{14} - 3.63158\times10^6\,\text{qGeV}^{16} + 24.4556\,\text{qGeV}^{18}\right) + \left(0.266447\,\text{GeV}\left(\frac{4.08598\times10^{-9}\,\text{c4p c5n MWIMP}^2}{\text{GeV}} - \frac{4.08598\times10^{-9}\,\text{c8n c9p MWIMP}^2}{\text{GeV}}\right)\text{qGeV}^2 + \frac{1}{\text{GeV}^2}7.20622\times10^{-14}\,\text{c2n c3p}\,(122.914\,\text{GeV} + \text{GeV MWIMP})^2\,\text{qGeV}^4\right)\left(0.00804988 - 1.39694\,\text{qGeV}^2 + 30.5161\,\text{qGeV}^4 + 767.591\,\text{qGeV}^6 - 49133.4\,\text{qGeV}^8 + 860740.\,\text{qGeV}^{10} - 6.1233\times10^6\,\text{qGeV}^{12} + 1.57859\times10^7\,\text{qGeV}^{14} - 4.2049\times10^6\,\text{qGeV}^{16} + 24.4556\,\text{qGeV}^{18}\right) + \left(0.266447\,\text{GeV}\left(\frac{4.08598\times10^{-9}\,\text{c4n c5n MWIMP}^2}{\text{GeV}} - \frac{4.08598\times10^{-9}\,\text{c8n c9n MWIMP}^2}{\text{GeV}}\right)\text{qGeV}^2 + \frac{1}{\text{GeV}^2}7.20622\times10^{-14}\,\text{c2n c3n}\,(122.914\,\text{GeV} + \text{GeV MWIMP})^2\,\text{qGeV}^4\right)\left(0.31355 - 63.199\,\text{qGeV}^2 + 4351.6\,\text{qGeV}^4 - 157684.\,\text{qGeV}^6 + 3.26796\times10^6\,\text{qGeV}^8 - 3.79559\times10^7\,\text{qGeV}^{10} + 2.25918\times10^8\,\text{qGeV}^{12} - 5.50605\times10^8\,\text{qGeV}^{14} + 9.9853\times10^7\,\text{qGeV}^{16} + 1.33494\times10^7\,\text{qGeV}^{18}\right) + \left(201.935 - 21488.2\,\text{qGeV}^2 + 888868.\,\text{qGeV}^4 - 1.84641\times10^7\,\text{qGeV}^6 + 2.11327\times10^8\,\text{qGeV}^8 - 1.3687\times10^9\,\text{qGeV}^{10} + 4.91456\times10^9\,\text{qGeV}^{12} - 8.96637\times10^9\,\text{qGeV}^{14} + 6.45128\times10^9\,\text{qGeV}^{16}\right)\left(1.23666\times10^{-9}\,\text{c3n}^2\,\text{MWIMP}^2\,\text{qGeV}^4 + 0.0709941\,\text{qGeV}^2\left(0.0000619174\,\text{c12n MWIMP} - 0.0000703324\,\text{c15n MWIMP qGeV}^2\right)^2\right) + 2\left(145.179 - 13580.4\,\text{qGeV}^2 + 488429.\,\text{qGeV}^4 - 8.70932\times10^6\,\text{qGeV}^6 + 8.34711\times10^7\,\text{qGeV}^8 - 4.30669\times10^8\,\text{qGeV}^{10} + 1.10482\times10^9\,\text{qGeV}^{12} - 1.07444\times10^9\,\text{qGeV}^{14} + 933.526\,\text{qGeV}^{16}\right)\left(1.23666\times10^{-9}\,\text{c3n c3p MWIMP}^2\,\text{qGeV}^4 + 0.0709941\,\text{qGeV}^2\left(0.0000619174\,\text{c12n MWIMP} - 0.0000703324\,\text{c15n MWIMP qGeV}^2\right)\right)$$

$$\left(0.0000619174\,c12p\,MWIMP - 0.0000703324\,c15p\,MWIMP\,qGeV^2\right)\Big) +$$
$$\left(104.803 - 8490.45\,qGeV^2 + 263668.\,qGeV^4 - 3.98191\times10^6\,qGeV^6 + 3.1089\times10^7\,qGeV^8 - 1.20073\times10^8\,qGeV^{10} + 1.81321\times10^8\,qGeV^{12} - 314.895\,qGeV^{14} + 0.000136721\,qGeV^{16}\right)$$
$$\Big(1.23666\times10^{-9}\,c3p^2\,MWIMP^2\,qGeV^4 + 0.0709941\,qGeV^2 \left(0.0000619174\,c12p\,MWIMP - 0.0000703324\,c15p\,MWIMP\,qGeV^2\right)^2\Big) +$$
$$\left(0.559596 - 48.5209\,qGeV^2 + 2053.49\,qGeV^4 - 48572.5\,qGeV^6 + 665153.\,qGeV^8 - 4.71895\times10^6\,qGeV^{10} + 1.42707\times10^7\,qGeV^{12} - 7.3766\times10^6\,qGeV^{14} + 1.05877\times10^6\,qGeV^{16}\right)$$
$$\Big(-\frac{1}{GeV^2}1.44124\times10^{-13}\,c2n^2\,(122.914\,GeV + GeV\,MWIMP)^2\,qGeV^4 + 0.283977\,qGeV^2\left(3.83376\times10^{-9}\,c8n^2\,MWIMP^2 + 4.3548\times10^{-9}\,c5n^2\,MWIMP^2\,qGeV^2\right)\Big) +$$
$$2\left(0.111856 - 9.37791\,qGeV^2 + 352.965\,qGeV^4 - 7196.74\,qGeV^6 + 80309.1\,qGeV^8 - 456971.\,qGeV^{10} + 1.07816\times10^6\,qGeV^{12} - 288545.\,qGeV^{14} + 1.9461\,qGeV^{16}\right)$$
$$\Big(-\frac{1}{GeV^2}1.44124\times10^{-13}\,c2n\,c2p\,(122.914\,GeV + GeV\,MWIMP)^2\,qGeV^4 + 0.283977\,qGeV^2\left(3.83376\times10^{-9}\,c8n\,c8p\,MWIMP^2 + 4.3548\times10^{-9}\,c5n\,c5p\,MWIMP^2\,qGeV^2\right)\Big) +$$
$$\left(0.0223585 - 1.8104\,qGeV^2 + 59.7764\,qGeV^4 - 1012.75\,qGeV^6 + 9223.45\,qGeV^8 - 42699.9\,qGeV^{10} + 78901.5\,qGeV^{12} - 1.06781\,qGeV^{14} + 3.62403\times10^{-6}\,qGeV^{16}\right)$$
$$\Big(-\frac{1}{GeV^2}1.44124\times10^{-13}\,c2p^2\,(122.914\,GeV + GeV\,MWIMP)^2\,qGeV^4 + 0.283977\,qGeV^2\left(3.83376\times10^{-9}\,c8p^2\,MWIMP^2 + 4.3548\times10^{-9}\,c5p^2\,MWIMP^2\,qGeV^2\right)\Big) +$$
$$\left(-1092.61 + 136660.\,qGeV^2 - 6.69697\times10^6\,qGeV^4 + 1.67374\times10^8\,qGeV^6 - 2.3488\times10^9\,qGeV^8 + 1.91238\times10^{10}\,qGeV^{10} - 8.93828\times10^{10}\,qGeV^{12} + 2.25368\times10^{11}\,qGeV^{14} - 2.6101\times10^{11}\,qGeV^{16} + 8.70616\times10^{10}\,qGeV^{18}\right)$$
$$\Big(0.0000175831\,c11n\,MWIMP\,qGeV^2 \left(0.0000619174\,c12n\,MWIMP - 0.0000703324\,c15n\,MWIMP\,qGeV^2\right) + 0.0000703324\,c3n\,MWIMP\,qGeV^2\left(0.0000619174\,c1n\,MWIMP - \left(1.0246\times10^{-9}\,c2n\,(122.914\,GeV + GeV\,MWIMP)^2\,qGeV^2\right)/\left(GeV^2\,MWIMP\right)\right)\Big) +$$
$$\left(-788.171 + 88535.2\,qGeV^2 - 3.83095\times10^6\,qGeV^4 + 8.34616\times10^7\,qGeV^6 - 1.00003\times10^9\,qGeV^8 + 6.69854\times10^9\,qGeV^{10} - 2.38915\times10^{10}\,qGeV^{12} + 3.83802\times10^{10}\,qGeV^{14} - 1.44998\times10^{10}\,qGeV^{16} + 12598.1\,qGeV^{18}\right)$$
$$\Big(0.0000175831\,c11n\,MWIMP\,qGeV^2 \left(0.0000619174\,c12p\,MWIMP - 0.0000703324\,c15p\,MWIMP\,qGeV^2\right) + 0.0000703324\,c3p\,MWIMP\,qGeV^2\left(0.0000619174\,c1n\,MWIMP - \left(1.0246\times10^{-9}\,c2n\,(122.914\,GeV + GeV\,MWIMP)^2\,qGeV^2\right)/\left(GeV^2\,MWIMP\right)\right)\Big) +$$
$$\left(-766.296 + 87381.7\,qGeV^2 - 3.85542\times10^6\,qGeV^4 + 8.50187\times10^7\,qGeV^6 - 1.02681\times10^9\,qGeV^8 + 6.95791\times10^9\,qGeV^{10} - 2.58068\times10^{10}\,qGeV^{12} + 4.78309\times10^{10}\,qGeV^{14} - 3.44354\times10^{10}\,qGeV^{16} + 12598.1\,qGeV^{18}\right)$$
$$\Big(0.0000175831\,c11p\,MWIMP\,qGeV^2 \left(0.0000619174\,c12n\,MWIMP - 0.0000703324\,c15n\,MWIMP\,qGeV^2\right) + 0.0000703324\,c3n\,MWIMP\,qGeV^2\left(0.0000619174\,c1p\,MWIMP - \left(1.0246\times10^{-9}\,c2p\,(122.914\,GeV + GeV\,MWIMP)^2\,qGeV^2\right)/\left(GeV^2\,MWIMP\right)\right)\Big) +$$
$$\left(-552.779 + 55988.5\,qGeV^2 - 2.15745\times10^6\,qGeV^4 + 4.09181\times10^7\,qGeV^6 - 4.1376\times10^8\,qGeV^8 + 2.23042\times10^9\,qGeV^{10} - 5.88876\times10^9\,qGeV^{12} + 5.71999\times10^9\,qGeV^{14} - 7095.2\,qGeV^{16} + 0.00184509\,qGeV^{18}\right)$$

$$\Big(0.0000175831\,\text{c11p}\,\text{MWIMP}\,\text{qGeV}^2\Big(0.0000619174\,\text{c12p}\,\text{MWIMP}-0.0000703324\,\text{c15p}\,\text{MWIMP}\,\text{qGeV}^2\Big)+0.0000703324\,\text{c3p}\,\text{MWIMP}\,\text{qGeV}^2\Big(0.0000619174\,\text{c1p}\,\text{MWIMP}-\Big(1.0246\times10^{-9}\,\text{c2p}\,(122.914\,\text{GeV}+\text{GeV}\,\text{MWIMP})^2\,\text{qGeV}^2\Big)\Big/\Big(\text{GeV}^2\,\text{MWIMP}\Big)\Big)\Big)+\Big(0.0878436+9.96911\,\text{qGeV}^2-264.17\,\text{qGeV}^4-17861.1\,\text{qGeV}^6+1.61079\times10^6\,\text{qGeV}^8-4.68721\times10^7\,\text{qGeV}^{10}+6.461\times10^8\,\text{qGeV}^{12}-4.27656\times10^9\,\text{qGeV}^{14}+1.11665\times10^{10}\,\text{qGeV}^{16}-4.34684\times10^8\,\text{qGeV}^{18}+4.29089\times10^6\,\text{qGeV}^{20}\Big)\Big(1.0887\times10^{-9}\,\text{c10n}^2\,\text{MWIMP}^2\,\text{qGeV}^2+\frac{1}{16}\Big(3.83376\times10^{-9}\,\text{c4n}^2\,\text{MWIMP}^2+8.70959\times10^{-9}\,\text{c4n}\,\text{c6n}\,\text{MWIMP}^2\,\text{qGeV}^2+4.94664\times10^{-9}\,\text{c6n}^2\,\text{MWIMP}^2\,\text{qGeV}^4-\frac{1}{\text{GeV}^2\,\text{MWIMP}^2}0.0000165478\,(122.914\,\text{GeV}+\text{GeV}\,\text{MWIMP})^2\,\text{qGeV}^2\Big(3.83376\times10^{-9}\,\text{c12n}^2\,\text{MWIMP}^2+4.3548\times10^{-9}\,\text{c13n}^2\,\text{MWIMP}^2\,\text{qGeV}^2\Big)\Big)\Big)+\Big(0.00225524+0.106455\,\text{qGeV}^2-12.073\,\text{qGeV}^4-29.6556\,\text{qGeV}^6+24984.9\,\text{qGeV}^8-773389.\,\text{qGeV}^{10}+9.78397\times10^6\,\text{qGeV}^{12}-5.59042\times10^7\,\text{qGeV}^{14}+1.14708\times10^8\,\text{qGeV}^{16}-2.13056\times10^6\,\text{qGeV}^{18}+6.86271\,\text{qGeV}^{20}\Big)\Big(1.0887\times10^{-9}\,\text{c10n}\,\text{c10p}\,\text{MWIMP}^2\,\text{qGeV}^2+\frac{1}{16}\Big(3.83376\times10^{-9}\,\text{c4n}\,\text{c4p}\,\text{MWIMP}^2+8.70959\times10^{-9}\,\text{c4p}\,\text{c6n}\,\text{MWIMP}^2\,\text{qGeV}^2+4.94664\times10^{-9}\,\text{c6n}\,\text{c6p}\,\text{MWIMP}^2\,\text{qGeV}^4-\frac{1}{\text{GeV}^2\,\text{MWIMP}^2}0.0000165478\,(122.914\,\text{GeV}+\text{GeV}\,\text{MWIMP})^2\,\text{qGeV}^2\Big(3.83376\times10^{-9}\,\text{c12n}\,\text{c12p}\,\text{MWIMP}^2+4.3548\times10^{-9}\,\text{c13n}\,\text{c13p}\,\text{MWIMP}^2\,\text{qGeV}^2\Big)\Big)\Big)+\Big(0.00225524+0.106455\,\text{qGeV}^2-12.073\,\text{qGeV}^4-29.6556\,\text{qGeV}^6+24984.9\,\text{qGeV}^8-773389.\,\text{qGeV}^{10}+9.78397\times10^6\,\text{qGeV}^{12}-5.59042\times10^7\,\text{qGeV}^{14}+1.14708\times10^8\,\text{qGeV}^{16}-2.13056\times10^6\,\text{qGeV}^{18}+6.86271\,\text{qGeV}^{20}\Big)\Big(1.0887\times10^{-9}\,\text{c10n}\,\text{c10p}\,\text{MWIMP}^2\,\text{qGeV}^2+\frac{1}{16}\Big(3.83376\times10^{-9}\,\text{c4n}\,\text{c4p}\,\text{MWIMP}^2+8.70959\times10^{-9}\,\text{c4n}\,\text{c6p}\,\text{MWIMP}^2\,\text{qGeV}^2+4.94664\times10^{-9}\,\text{c6n}\,\text{c6p}\,\text{MWIMP}^2\,\text{qGeV}^4-\frac{1}{\text{GeV}^2\,\text{MWIMP}^2}0.0000165478\,(122.914\,\text{GeV}+\text{GeV}\,\text{MWIMP})^2\,\text{qGeV}^2\Big(3.83376\times10^{-9}\,\text{c12n}\,\text{c12p}\,\text{MWIMP}^2+4.3548\times10^{-9}\,\text{c13n}\,\text{c13p}\,\text{MWIMP}^2\,\text{qGeV}^2\Big)\Big)\Big)+\Big(0.0000578995-0.00110472\,\text{qGeV}^2+0.145001\,\text{qGeV}^4-23.9866\,\text{qGeV}^6+1134.14\,\text{qGeV}^8-23107.7\,\text{qGeV}^{10}+224088.\,\text{qGeV}^{12}-984096.\,\text{qGeV}^{14}+1.57479\times10^6\,\text{qGeV}^{16}-5.92859\,\text{qGeV}^{18}+0.0000113549\,\text{qGeV}^{20}\Big)\Big(1.0887\times10^{-9}\,\text{c10p}^2\,\text{MWIMP}^2\,\text{qGeV}^2+\frac{1}{16}\Big(3.83376\times10^{-9}\,\text{c4p}^2\,\text{MWIMP}^2+8.70959\times10^{-9}\,\text{c4p}\,\text{c6p}\,\text{MWIMP}^2\,\text{qGeV}^2+4.94664\times10^{-9}\,\text{c6p}^2\,\text{MWIMP}^2\,\text{qGeV}^4-\frac{1}{\text{GeV}^2\,\text{MWIMP}^2}0.0000165478\,(122.914\,\text{GeV}+\text{GeV}\,\text{MWIMP})^2\,\text{qGeV}^2\Big(3.83376\times10^{-9}$$

$$c12p^2\,MWIMP^2 + 4.3548\times10^{-9}\,c13p^2\,MWIMP^2\,qGeV^2\Big)\Big)\Big) +$$

$$\Big(5928.2 - 851956.\,qGeV^2 + 4.86226\times10^{7}\,qGeV^4 - 1.43569\times10^{9}\,qGeV^6 +$$
$$2.42258\times10^{10}\,qGeV^8 - 2.42602\times10^{11}\,qGeV^{10} + 1.43964\times10^{12}\,qGeV^{12} -$$
$$4.84312\times10^{12}\,qGeV^{14} + 8.236\times10^{12}\,qGeV^{16} - 5.41182\times10^{12}\,qGeV^{18} +$$
$$1.17492\times10^{12}\,qGeV^{20}\Big)\Big(3.83376\times10^{-9}\,c1n^2\,MWIMP^2 - \frac{1}{GeV^2}$$
$$1.26881\times10^{-13}\,c1n\,c2n\,(122.914\,GeV + GeV\,MWIMP)^2\,qGeV^2 +$$
$$\Big(1.0498\times10^{-18}\,c2n^2\,(122.914\,GeV + GeV\,MWIMP)^4\,qGeV^4\Big)\Big/\Big(GeV^4\,MWIMP^2\Big) +$$
$$\frac{1}{4}\Big(4.3548\times10^{-9}\,c11n^2\,MWIMP^2\,qGeV^2 - \frac{1}{GeV^2\,MWIMP^2}$$
$$0.0000165478\,(122.914\,GeV + GeV\,MWIMP)^2\,qGeV^2$$
$$\Big(3.83376\times10^{-9}\,c8n^2\,MWIMP^2 + 4.3548\times10^{-9}\,c5n^2\,MWIMP^2\,qGeV^2\Big)\Big)\Big) +$$

$$2\Big(4157.7 - 551594.\,qGeV^2 + 2.86787\times10^{7}\,qGeV^4 - 7.57984\times10^{8}\,qGeV^6 +$$
$$1.12026\times10^{10}\,qGeV^8 - 9.54998\times10^{10}\,qGeV^{10} +$$
$$4.63347\times10^{11}\,qGeV^{12} - 1.19651\times10^{12}\,qGeV^{14} +$$
$$1.39184\times10^{12}\,qGeV^{16} - 4.64714\times10^{11}\,qGeV^{18} + 170015.\,qGeV^{20}\Big)$$
$$\Big(\Big(0.0000619174\,c1n\,MWIMP - \Big(1.0246\times10^{-9}\,c2n\,(122.914\,GeV + GeV\,MWIMP)^2$$
$$qGeV^2\Big)\Big/\Big(GeV^2\,MWIMP\Big)\Big)$$
$$\Big(0.0000619174\,c1p\,MWIMP - \Big(1.0246\times10^{-9}\,c2p$$
$$(122.914\,GeV + GeV\,MWIMP)^2\,qGeV^2\Big)\Big/\Big(GeV^2\,MWIMP\Big)\Big) +$$
$$\frac{1}{4}\Big(4.3548\times10^{-9}\,c11n\,c11p\,MWIMP^2\,qGeV^2 - \frac{1}{GeV^2\,MWIMP^2}$$
$$0.0000165478\,(122.914\,GeV + GeV\,MWIMP)^2\,qGeV^2\,\Big(3.83376\times10^{-9}$$
$$c8n\,c8p\,MWIMP^2 + 4.3548\times10^{-9}\,c5n\,c5p\,MWIMP^2\,qGeV^2\Big)\Big)\Big) +$$

$$\Big(2915.98 - 354651.\,qGeV^2 + 1.66663\times10^{7}\,qGeV^4 - 3.89909\times10^{8}\,qGeV^6 +$$
$$4.97028\times10^{9}\,qGeV^8 - 3.52778\times10^{10}\,qGeV^{10} + 1.35444\times10^{11}\,qGeV^{12} -$$
$$2.55168\times10^{11}\,qGeV^{14} + 1.83904\times10^{11}\,qGeV^{16} - 134154.\,qGeV^{18} +$$
$$0.0248999\,qGeV^{20}\Big)\Big(3.83376\times10^{-9}\,c1p^2\,MWIMP^2 - \frac{1}{GeV^2}$$
$$1.26881\times10^{-13}\,c1p\,c2p\,(122.914\,GeV + GeV\,MWIMP)^2\,qGeV^2 +$$
$$\Big(1.0498\times10^{-18}\,c2p^2\,(122.914\,GeV + GeV\,MWIMP)^4\,qGeV^4\Big)\Big/\Big(GeV^4\,MWIMP^2\Big) +$$
$$\frac{1}{4}\Big(4.3548\times10^{-9}\,c11p^2\,MWIMP^2\,qGeV^2 - \frac{1}{GeV^2\,MWIMP^2}$$
$$0.0000165478\,(122.914\,GeV + GeV\,MWIMP)^2\,qGeV^2$$
$$\Big(3.83376\times10^{-9}\,c8p^2\,MWIMP^2 + 4.3548\times10^{-9}\,c5p^2\,MWIMP^2\,qGeV^2\Big)\Big)\Big) +$$

$$\Big(0.175687 - 55.5895\,qGeV^2 + 6549.51\,qGeV^4 - 372689.\,qGeV^6 + 1.1805\times10^{7}\,qGeV^8 -$$
$$2.12171\times10^{8}\,qGeV^{10} + 2.11089\times10^{9}\,qGeV^{12} - 1.06654\times10^{10}\,qGeV^{14} +$$
$$2.0847\times10^{10}\,qGeV^{16} + 3.72292\times10^{9}\,qGeV^{18} + 1.68457\times10^{8}\,qGeV^{20}\Big)$$
$$\Big(-\frac{1}{GeV^2\,MWIMP^2}2.06847\times10^{-6}\,(122.914\,GeV + GeV\,MWIMP)^2\,qGeV^2$$
$$\Big(3.83376\times10^{-9}\,c7n^2\,MWIMP^2 + 4.3548\times10^{-9}\,c3n^2\,MWIMP^2\,qGeV^2\Big) +$$
$$\frac{1}{32}\Big(7.66753\times10^{-9}\,c4n^2\,MWIMP^2 + 8.70959\times10^{-9}\,c9n^2\,MWIMP^2\,qGeV^2 -$$
$$\frac{1}{GeV^2\,MWIMP^2}0.0000165478\,(122.914\,GeV + GeV\,MWIMP)^2$$

$$\text{qGeV}^2\left(3.83376\times10^{-9}\,\text{c12n}^2\,\text{MWIMP}^2+4.3548\times10^{-9}\,\text{c14n}^2\,\text{MWIMP}^2\,\text{qGeV}^2-8.70959\times10^{-9}\,\text{c12n}\,\text{c15n}\,\text{MWIMP}^2\,\text{qGeV}^2+4.94664\times10^{-9}\,\text{c15n}^2\,\text{MWIMP}^2\,\text{qGeV}^4\right)\Big)\Big)+$$

$$\left(0.00451048-1.30077\,\text{qGeV}^2+107.856\,\text{qGeV}^4-1443.82\,\text{qGeV}^6-100302.\,\text{qGeV}^8+3.81807\times10^6\,\text{qGeV}^{10}-5.10723\times10^7\,\text{qGeV}^{12}+2.91685\times10^8\,\text{qGeV}^{14}-5.90895\times10^8\,\text{qGeV}^{16}-5.32206\times10^7\,\text{qGeV}^{18}+307.518\,\text{qGeV}^{20}\right)$$

$$\left(-\frac{1}{\text{GeV}^2\,\text{MWIMP}^2}2.06847\times10^{-6}\,(122.914\,\text{GeV}+\text{GeV}\,\text{MWIMP})^2\,\text{qGeV}^2\left(3.83376\times10^{-9}\,\text{c7n}\,\text{c7p}\,\text{MWIMP}^2+4.3548\times10^{-9}\,\text{c3n}\,\text{c3p}\,\text{MWIMP}^2\,\text{qGeV}^2\right)+\frac{1}{32}\left(7.66753\times10^{-9}\,\text{c4n}\,\text{c4p}\,\text{MWIMP}^2+8.70959\times10^{-9}\,\text{c9n}\,\text{c9p}\,\text{MWIMP}^2\,\text{qGeV}^2-\frac{1}{\text{GeV}^2\,\text{MWIMP}^2}0.0000165478\,(122.914\,\text{GeV}+\text{GeV}\,\text{MWIMP})^2\,\text{qGeV}^2\left(3.83376\times10^{-9}\,\text{c12n}\,\text{c12p}\,\text{MWIMP}^2+4.3548\times10^{-9}\,\text{c14n}\,\text{c14p}\,\text{MWIMP}^2\,\text{qGeV}^2-8.70959\times10^{-9}\,\text{c12p}\,\text{c15n}\,\text{MWIMP}^2\,\text{qGeV}^2+4.94664\times10^{-9}\,\text{c15n}\,\text{c15p}\,\text{MWIMP}^2\,\text{qGeV}^4\right)\right)\right)+$$

$$\left(0.00451048-1.30077\,\text{qGeV}^2+107.856\,\text{qGeV}^4-1443.82\,\text{qGeV}^6-100302.\,\text{qGeV}^8+3.81807\times10^6\,\text{qGeV}^{10}-5.10723\times10^7\,\text{qGeV}^{12}+2.91685\times10^8\,\text{qGeV}^{14}-5.90895\times10^8\,\text{qGeV}^{16}-5.32206\times10^7\,\text{qGeV}^{18}+307.518\,\text{qGeV}^{20}\right)$$

$$\left(-\frac{1}{\text{GeV}^2\,\text{MWIMP}^2}2.06847\times10^{-6}\,(122.914\,\text{GeV}+\text{GeV}\,\text{MWIMP})^2\,\text{qGeV}^2\left(3.83376\times10^{-9}\,\text{c7n}\,\text{c7p}\,\text{MWIMP}^2+4.3548\times10^{-9}\,\text{c3n}\,\text{c3p}\,\text{MWIMP}^2\,\text{qGeV}^2\right)+\frac{1}{32}\left(7.66753\times10^{-9}\,\text{c4n}\,\text{c4p}\,\text{MWIMP}^2+8.70959\times10^{-9}\,\text{c9n}\,\text{c9p}\,\text{MWIMP}^2\,\text{qGeV}^2-\frac{1}{\text{GeV}^2\,\text{MWIMP}^2}0.0000165478\,(122.914\,\text{GeV}+\text{GeV}\,\text{MWIMP})^2\,\text{qGeV}^2\left(3.83376\times10^{-9}\,\text{c12n}\,\text{c12p}\,\text{MWIMP}^2+4.3548\times10^{-9}\,\text{c14n}\,\text{c14p}\,\text{MWIMP}^2\,\text{qGeV}^2-8.70959\times10^{-9}\,\text{c12n}\,\text{c15p}\,\text{MWIMP}^2\,\text{qGeV}^2+4.94664\times10^{-9}\,\text{c15n}\,\text{c15p}\,\text{MWIMP}^2\,\text{qGeV}^4\right)\right)\right)+$$

$$\left(0.000115799-0.0301499\,\text{qGeV}^2+1.76061\,\text{qGeV}^4+57.4599\,\text{qGeV}^6-897.29\,\text{qGeV}^8-51856.5\,\text{qGeV}^{10}+1.18093\times10^6\,\text{qGeV}^{12}-7.92115\times10^6\,\text{qGeV}^{14}+1.70034\times10^7\,\text{qGeV}^{16}-191.821\,\text{qGeV}^{18}+0.000569711\,\text{qGeV}^{20}\right)$$

$$\left(-\frac{1}{\text{GeV}^2\,\text{MWIMP}^2}2.06847\times10^{-6}\,(122.914\,\text{GeV}+\text{GeV}\,\text{MWIMP})^2\,\text{qGeV}^2\left(3.83376\times10^{-9}\,\text{c7p}^2\,\text{MWIMP}^2+4.3548\times10^{-9}\,\text{c3p}^2\,\text{MWIMP}^2\,\text{qGeV}^2\right)+\frac{1}{32}\left(7.66753\times10^{-9}\,\text{c4p}^2\,\text{MWIMP}^2+8.70959\times10^{-9}\,\text{c9p}^2\,\text{MWIMP}^2\,\text{qGeV}^2-\frac{1}{\text{GeV}^2\,\text{MWIMP}^2}0.0000165478\,(122.914\,\text{GeV}+\text{GeV}\,\text{MWIMP})^2\,\text{qGeV}^2\left(3.83376\times10^{-9}\,\text{c12p}^2\,\text{MWIMP}^2+4.3548\times10^{-9}\,\text{c14p}^2\,\text{MWIMP}^2\,\text{qGeV}^2-8.70959\times10^{-9}\,\text{c12p}\,\text{c15p}\,\text{MWIMP}^2\,\text{qGeV}^2+4.94664\times10^{-9}\,\text{c15p}^2\,\text{MWIMP}^2\,\text{qGeV}^4\right)\right)\right)\Big)\Big)$$

$$\left(\text{Erf}\left[1.05455-\frac{5.54336\,(122.914\,\text{GeV}+\text{GeV}\,\text{MWIMP})\,\text{qGeV}}{\text{GeV}\,\text{MWIMP}}\right]+\text{Erf}\left[1.05455+\frac{5.54336\,(122.914\,\text{GeV}+\text{GeV}\,\text{MWIMP})\,\text{qGeV}}{\text{GeV}\,\text{MWIMP}}\right]\right)+$$

$$
\begin{aligned}
&0.000733832\, e^{-67.4762\,\mathrm{qGeV}^2} \\
&\Big(8.70959\times10^{-9}\,\mathrm{c2p}^2\,\mathrm{MWIMP}^2\,\mathrm{qGeV}^2 \\
&\quad\big(0.0223585-1.8104\,\mathrm{qGeV}^2+59.7764\,\mathrm{qGeV}^4-1012.75\,\mathrm{qGeV}^6+9223.45\,\mathrm{qGeV}^8- \\
&\qquad 42699.9\,\mathrm{qGeV}^{10}+78901.5\,\mathrm{qGeV}^{12}-1.06781\,\mathrm{qGeV}^{14}+3.62403\times10^{-6}\,\mathrm{qGeV}^{16}\big)+ \\
&\quad 1.74192\times10^{-8}\,\mathrm{c2n\,c2p\,MWIMP}^2\,\mathrm{qGeV}^2\,\big(0.111856-9.37791\,\mathrm{qGeV}^2+ \\
&\qquad 352.965\,\mathrm{qGeV}^4-7196.74\,\mathrm{qGeV}^6+80309.1\,\mathrm{qGeV}^8-456971.\,\mathrm{qGeV}^{10}+ \\
&\qquad 1.07816\times10^6\,\mathrm{qGeV}^{12}-288545.\,\mathrm{qGeV}^{14}+1.9461\,\mathrm{qGeV}^{16}\big)+ \\
&\quad 8.70959\times10^{-9}\,\mathrm{c2n}^2\,\mathrm{MWIMP}^2\,\mathrm{qGeV}^2\,\big(0.559596-48.5209\,\mathrm{qGeV}^2+2053.49\,\mathrm{qGeV}^4- \\
&\qquad 48572.5\,\mathrm{qGeV}^6+665153.\,\mathrm{qGeV}^8-4.71895\times10^6\,\mathrm{qGeV}^{10}+ \\
&\qquad 1.42707\times10^7\,\mathrm{qGeV}^{12}-7.3766\times10^6\,\mathrm{qGeV}^{14}+1.05877\times10^6\,\mathrm{qGeV}^{16}\big)- \\
&\quad 4.3548\times10^{-9}\,\mathrm{c2p\,c3p}\,\mathrm{MWIMP}^2\,\mathrm{qGeV}^2\,\big(0.00160907-0.274616\,\mathrm{qGeV}^2+5.35326\,\mathrm{qGeV}^4+ \\
&\qquad 188.744\,\mathrm{qGeV}^6-7857.19\,\mathrm{qGeV}^8+102543.\,\mathrm{qGeV}^{10}-567802.\,\mathrm{qGeV}^{12}+ \\
&\qquad 1.13687\times10^6\,\mathrm{qGeV}^{14}-14.3099\,\mathrm{qGeV}^{16}+0.0000454276\,\mathrm{qGeV}^{18}\big)+ \\
&\quad 4.3548\times10^{-9}\,\mathrm{c2p\,c3p}\,\mathrm{MWIMP}^2\,\mathrm{qGeV}^2\,\big(-552.779+55988.5\,\mathrm{qGeV}^2- \\
&\qquad 2.15745\times10^6\,\mathrm{qGeV}^4+4.09181\times10^7\,\mathrm{qGeV}^6-4.1376\times10^8\,\mathrm{qGeV}^8+ \\
&\qquad 2.23042\times10^9\,\mathrm{qGeV}^{10}-5.88876\times10^9\,\mathrm{qGeV}^{12}+ \\
&\qquad 5.71999\times10^9\,\mathrm{qGeV}^{14}-7095.2\,\mathrm{qGeV}^{16}+0.00184509\,\mathrm{qGeV}^{18}\big)- \\
&\quad 4.3548\times10^{-9}\,\mathrm{c2p\,c3n}\,\mathrm{MWIMP}^2\,\mathrm{qGeV}^2\,\big(0.0626746-12.4529\,\mathrm{qGeV}^2+816.667\,\mathrm{qGeV}^4- \\
&\qquad 26193.6\,\mathrm{qGeV}^6+453298.\,\mathrm{qGeV}^8-4.27212\times10^6\,\mathrm{qGeV}^{10}+2.04296\times10^7\,\mathrm{qGeV}^{12}- \\
&\qquad 3.82971\times10^7\,\mathrm{qGeV}^{14}-3.63158\times10^6\,\mathrm{qGeV}^{16}+24.4556\,\mathrm{qGeV}^{18}\big)- \\
&\quad 4.3548\times10^{-9}\,\mathrm{c2n\,c3p}\,\mathrm{MWIMP}^2\,\mathrm{qGeV}^2\,\big(0.00804988-1.39694\,\mathrm{qGeV}^2+30.5161\,\mathrm{qGeV}^4+ \\
&\qquad 767.591\,\mathrm{qGeV}^6-49133.4\,\mathrm{qGeV}^8+860740.\,\mathrm{qGeV}^{10}-6.1233\times10^6\,\mathrm{qGeV}^{12}+ \\
&\qquad 1.57859\times10^7\,\mathrm{qGeV}^{14}-4.2049\times10^6\,\mathrm{qGeV}^{16}+24.4556\,\mathrm{qGeV}^{18}\big)+ \\
&\quad 4.3548\times10^{-9}\,\mathrm{c2p\,c3n}\,\mathrm{MWIMP}^2\,\mathrm{qGeV}^2\,\big(-766.296+87381.7\,\mathrm{qGeV}^2- \\
&\qquad 3.85542\times10^6\,\mathrm{qGeV}^4+8.50187\times10^7\,\mathrm{qGeV}^6-1.02681\times10^9\,\mathrm{qGeV}^8+ \\
&\qquad 6.95791\times10^9\,\mathrm{qGeV}^{10}-2.58068\times10^{10}\,\mathrm{qGeV}^{12}+ \\
&\qquad 4.78309\times10^{10}\,\mathrm{qGeV}^{14}-3.44354\times10^{10}\,\mathrm{qGeV}^{16}+12598.1\,\mathrm{qGeV}^{18}\big)+ \\
&\quad 4.3548\times10^{-9}\,\mathrm{c2n\,c3p}\,\mathrm{MWIMP}^2\,\mathrm{qGeV}^2\,\big(-788.171+88535.2\,\mathrm{qGeV}^2- \\
&\qquad 3.83095\times10^6\,\mathrm{qGeV}^4+8.34616\times10^7\,\mathrm{qGeV}^6-1.00003\times10^9\,\mathrm{qGeV}^8+ \\
&\qquad 6.69854\times10^9\,\mathrm{qGeV}^{10}-2.38915\times10^{10}\,\mathrm{qGeV}^{12}+ \\
&\qquad 3.83802\times10^{10}\,\mathrm{qGeV}^{14}-1.44998\times10^{10}\,\mathrm{qGeV}^{16}+12598.1\,\mathrm{qGeV}^{18}\big)- \\
&\quad 4.3548\times10^{-9}\,\mathrm{c2n\,c3n}\,\mathrm{MWIMP}^2\,\mathrm{qGeV}^2\,\big(0.31355-63.199\,\mathrm{qGeV}^2+ \\
&\qquad 4351.6\,\mathrm{qGeV}^4-157684.\,\mathrm{qGeV}^6+3.26796\times10^6\,\mathrm{qGeV}^8- \\
&\qquad 3.79559\times10^7\,\mathrm{qGeV}^{10}+2.25918\times10^8\,\mathrm{qGeV}^{12}- \\
&\qquad 5.50605\times10^8\,\mathrm{qGeV}^{14}+9.9853\times10^7\,\mathrm{qGeV}^{16}+1.33494\times10^7\,\mathrm{qGeV}^{18}\big)+ \\
&\quad 4.3548\times10^{-9}\,\mathrm{c2n\,c3n}\,\mathrm{MWIMP}^2\,\mathrm{qGeV}^2\,\big(-1092.61+136660.\,\mathrm{qGeV}^2- \\
&\qquad 6.69697\times10^6\,\mathrm{qGeV}^4+1.67374\times10^8\,\mathrm{qGeV}^6-2.3488\times10^9\,\mathrm{qGeV}^8+ \\
&\qquad 1.91238\times10^{10}\,\mathrm{qGeV}^{10}-8.93828\times10^{10}\,\mathrm{qGeV}^{12}+ \\
&\qquad 2.25368\times10^{11}\,\mathrm{qGeV}^{14}-2.6101\times10^{11}\,\mathrm{qGeV}^{16}+8.70616\times10^{10}\,\mathrm{qGeV}^{18}\big)+ \\
&\quad \frac{1}{16}\big(3.83376\times10^{-9}\,\mathrm{c12p}^2\,\mathrm{MWIMP}^2+4.3548\times10^{-9}\,\mathrm{c13p}^2\,\mathrm{MWIMP}^2\,\mathrm{qGeV}^2\big) \\
&\qquad\big(0.0000578995-0.00110472\,\mathrm{qGeV}^2+0.145001\,\mathrm{qGeV}^4-23.9866\,\mathrm{qGeV}^6+ \\
&\qquad 1134.14\,\mathrm{qGeV}^8-23107.7\,\mathrm{qGeV}^{10}+224088.\,\mathrm{qGeV}^{12}-984096.\,\mathrm{qGeV}^{14}+ \\
&\qquad 1.57479\times10^6\,\mathrm{qGeV}^{16}-5.92859\,\mathrm{qGeV}^{18}+0.0000113549\,\mathrm{qGeV}^{20}\big)+ \\
&\quad \frac{1}{8}\big(3.83376\times10^{-9}\,\mathrm{c12n\,c12p}\,\mathrm{MWIMP}^2+4.3548\times10^{-9}\,\mathrm{c13n\,c13p}\,\mathrm{MWIMP}^2\,\mathrm{qGeV}^2\big) \\
&\qquad\big(0.00225524+0.106455\,\mathrm{qGeV}^2-12.073\,\mathrm{qGeV}^4-29.6556\,\mathrm{qGeV}^6+24984.9\,\mathrm{qGeV}^8- \\
&\qquad 773389.\,\mathrm{qGeV}^{10}+9.78397\times10^6\,\mathrm{qGeV}^{12}-5.59042\times10^7\,\mathrm{qGeV}^{14}+ \\
&\qquad 1.14708\times10^8\,\mathrm{qGeV}^{16}-2.13056\times10^6\,\mathrm{qGeV}^{18}+6.86271\,\mathrm{qGeV}^{20}\big)+
\end{aligned}
$$

$$\frac{1}{16}\left(3.83376\times10^{-9}\,c12n^2\,MWIMP^2+4.3548\times10^{-9}\,c13n^2\,MWIMP^2\,qGeV^2\right)$$
$$\left(0.0878436+9.96911\,qGeV^2-264.17\,qGeV^4-17861.1\,qGeV^6+\right.$$
$$1.61079\times10^6\,qGeV^8-4.68721\times10^7\,qGeV^{10}+6.461\times10^8\,qGeV^{12}-$$
$$\left.4.27656\times10^9\,qGeV^{14}+1.11665\times10^{10}\,qGeV^{16}-\right.$$
$$\left.4.34684\times10^8\,qGeV^{18}+4.29089\times10^6\,qGeV^{20}\right)+$$
$$\left(5928.2-851956.\,qGeV^2+4.86226\times10^7\,qGeV^4-1.43569\times10^9\,qGeV^6+\right.$$
$$2.42258\times10^{10}\,qGeV^8-2.42602\times10^{11}\,qGeV^{10}+$$
$$1.43964\times10^{12}\,qGeV^{12}-4.84312\times10^{12}\,qGeV^{14}+8.236\times10^{12}\,qGeV^{16}-$$
$$\left.5.41182\times10^{12}\,qGeV^{18}+1.17492\times10^{12}\,qGeV^{20}\right)$$
$$\left(7.66753\times10^{-9}\,c1n\,c2n\,MWIMP^2-\frac{1}{GeV^2}\right.$$
$$1.26881\times10^{-13}\,c2n^2\,(122.914\,GeV+GeV\,MWIMP)^2\,qGeV^2+$$
$$\left.\frac{1}{4}\left(3.83376\times10^{-9}\,c8n^2\,MWIMP^2+4.3548\times10^{-9}\,c5n^2\,MWIMP^2\,qGeV^2\right)\right)+$$
$$\left(2915.98-354651.\,qGeV^2+1.66663\times10^7\,qGeV^4-3.89909\times10^8\,qGeV^6+\right.$$
$$4.97028\times10^9\,qGeV^8-3.52778\times10^{10}\,qGeV^{10}+$$
$$1.35444\times10^{11}\,qGeV^{12}-2.55168\times10^{11}\,qGeV^{14}+$$
$$\left.1.83904\times10^{11}\,qGeV^{16}-134154.\,qGeV^{18}+0.0248999\,qGeV^{20}\right)$$
$$\left(7.66753\times10^{-9}\,c1p\,c2p\,MWIMP^2-\frac{1}{GeV^2}\right.$$
$$1.26881\times10^{-13}\,c2p^2\,(122.914\,GeV+GeV\,MWIMP)^2\,qGeV^2+$$
$$\left.\frac{1}{4}\left(3.83376\times10^{-9}\,c8p^2\,MWIMP^2+4.3548\times10^{-9}\,c5p^2\,MWIMP^2\,qGeV^2\right)\right)+$$
$$2\left(4157.7-551594.\,qGeV^2+2.86787\times10^7\,qGeV^4-7.57984\times10^8\,qGeV^6+\right.$$
$$1.12026\times10^{10}\,qGeV^8-9.54998\times10^{10}\,qGeV^{10}+$$
$$4.63347\times10^{11}\,qGeV^{12}-1.19651\times10^{12}\,qGeV^{14}+$$
$$\left.1.39184\times10^{12}\,qGeV^{16}-4.64714\times10^{11}\,qGeV^{18}+170015.\,qGeV^{20}\right)$$
$$\left(0.+\frac{1}{4}\left(3.83376\times10^{-9}\,c8n\,c8p\,MWIMP^2+4.3548\times10^{-9}\,c5n\,c5p\,MWIMP^2\,qGeV^2\right)+\right.$$
$$0.0000619174\,c2p\,MWIMP\left(0.0000619174\,c1n\,MWIMP-\left(1.0246\times10^{-9}\,c2n\right.\right.$$
$$\left.\left.(122.914\,GeV+GeV\,MWIMP)^2\,qGeV^2\right)/\left(GeV^2\,MWIMP\right)\right)+$$
$$0.0000619174\,c2n\,MWIMP\left(0.0000619174\,c1p\,MWIMP-\left(1.0246\times10^{-9}\right.\right.$$
$$\left.\left.\left.c2p\,(122.914\,GeV+GeV\,MWIMP)^2\,qGeV^2\right)/\left(GeV^2\,MWIMP\right)\right)\right)+$$
$$\left(0.175687-55.5895\,qGeV^2+6549.51\,qGeV^4-372689.\,qGeV^6+1.1805\times10^7\,qGeV^8-\right.$$
$$2.12171\times10^8\,qGeV^{10}+2.11089\times10^9\,qGeV^{12}-1.06654\times10^{10}\,qGeV^{14}+$$
$$\left.2.0847\times10^{10}\,qGeV^{16}+3.72292\times10^9\,qGeV^{18}+1.68457\times10^8\,qGeV^{20}\right)$$
$$\left(\frac{1}{8}\left(3.83376\times10^{-9}\,c7n^2\,MWIMP^2+4.3548\times10^{-9}\,c3n^2\,MWIMP^2\,qGeV^2\right)+\right.$$
$$\frac{1}{32}\left(3.83376\times10^{-9}\,c12n^2\,MWIMP^2+4.3548\times10^{-9}\,c14n^2\,MWIMP^2\,qGeV^2-\right.$$
$$8.70959\times10^{-9}\,c12n\,c15n\,MWIMP^2\,qGeV^2+$$
$$\left.\left.4.94664\times10^{-9}\,c15n^2\,MWIMP^2\,qGeV^4\right)\right)+$$
$$\left(0.00451048-1.30077\,qGeV^2+107.856\,qGeV^4-1443.82\,qGeV^6-100302.\,qGeV^8+\right.$$
$$3.81807\times10^6\,qGeV^{10}-5.10723\times10^7\,qGeV^{12}+2.91685\times10^8\,qGeV^{14}-$$
$$\left.5.90895\times10^8\,qGeV^{16}-5.32206\times10^7\,qGeV^{18}+307.518\,qGeV^{20}\right)$$
$$\left(\frac{1}{8}\left(3.83376\times10^{-9}\,c7n\,c7p\,MWIMP^2+4.3548\times10^{-9}\,c3n\,c3p\,MWIMP^2\,qGeV^2\right)+\right.$$

$$\frac{1}{32}\left(3.83376\times10^{-9}\,c12n\,c12p\,MWIMP^2+4.3548\times10^{-9}\,c14n\,c14p\,MWIMP^2\,qGeV^2-8.70959\times10^{-9}\,c12p\,c15n\,MWIMP^2\,qGeV^2+4.94664\times10^{-9}\,c15n\,c15p\,MWIMP^2\,qGeV^4\right)\Bigg)+\left(0.00451048-1.30077\,qGeV^2+107.856\,qGeV^4-1443.82\,qGeV^6-100302.\,qGeV^8+3.81807\times10^6\,qGeV^{10}-5.10723\times10^7\,qGeV^{12}+2.91685\times10^8\,qGeV^{14}-5.90895\times10^8\,qGeV^{16}-5.32206\times10^7\,qGeV^{18}+307.518\,qGeV^{20}\right)\left(\frac{1}{8}\left(3.83376\times10^{-9}\,c7n\,c7p\,MWIMP^2+4.3548\times10^{-9}\,c3n\,c3p\,MWIMP^2\,qGeV^2\right)+\frac{1}{32}\left(3.83376\times10^{-9}\,c12n\,c12p\,MWIMP^2+4.3548\times10^{-9}\,c14n\,c14p\,MWIMP^2\,qGeV^2-8.70959\times10^{-9}\,c12n\,c15p\,MWIMP^2\,qGeV^2+4.94664\times10^{-9}\,c15n\,c15p\,MWIMP^2\,qGeV^4\right)\Bigg)+\left(0.000115799-0.0301499\,qGeV^2+1.76061\,qGeV^4+57.4599\,qGeV^6-897.29\,qGeV^8-51856.5\,qGeV^{10}+1.18093\times10^6\,qGeV^{12}-7.92115\times10^6\,qGeV^{14}+1.70034\times10^7\,qGeV^{16}-191.821\,qGeV^{18}+0.000569711\,qGeV^{20}\right)\left(\frac{1}{8}\left(3.83376\times10^{-9}\,c7p^2\,MWIMP^2+4.3548\times10^{-9}\,c3p^2\,MWIMP^2\,qGeV^2\right)+\frac{1}{32}\left(3.83376\times10^{-9}\,c12p^2\,MWIMP^2+4.3548\times10^{-9}\,c14p^2\,MWIMP^2\,qGeV^2-8.70959\times10^{-9}\,c12p\,c15p\,MWIMP^2\,qGeV^2+4.94664\times10^{-9}\,c15p^2\,MWIMP^2\,qGeV^4\right)\Bigg)\Bigg)\Bigg(0.267504\left(-e^{-\left(1.05455+\frac{5.54336\,(122.914\,GeV+GeV\,MWIMP)\,qGeV}{GeV\,MWIMP}\right)^2}\left(-1.05455+\frac{5.54336\,(122.914\,GeV+GeV\,MWIMP)\,qGeV}{GeV\,MWIMP}\right)+e^{-\left(1.05455-\frac{5.54336\,(122.914\,GeV+GeV\,MWIMP)\,qGeV}{GeV\,MWIMP}\right)^2}\left(1.05455+\frac{5.54336\,(122.914\,GeV+GeV\,MWIMP)\,qGeV}{GeV\,MWIMP}\right)\right)+0.764342\left(\mathrm{Erf}\left[1.05455-\frac{5.54336\,(122.914\,GeV+GeV\,MWIMP)\,qGeV}{GeV\,MWIMP}\right]+\mathrm{Erf}\left[1.05455+\frac{5.54336\,(122.914\,GeV+GeV\,MWIMP)\,qGeV}{GeV\,MWIMP}\right]\right)\Bigg)\Bigg)$$

In[841]:=
```
dRdEsimp = Simplify[dRdE, {Element[GeV, Reals], GeV > 0,
    Element[MWIMP, Reals], MWIMP > 0, Element[qGeV, Reals], qGeV > 0}];
```

In[842]:=
```
fdRdE[q_] := dRdE /. qGeV → q;
```

In[843]:=
```
fdRdE[0.1] GeV * 2500 KilogramDay /. MWIMP → (150 (*GeV*))
```

Out[843]=
$$1.42103\times10^9\Bigg(0.000505338\left(0.0097051\left(0.0000862597\,c12n^2+9.79829\times10^{-7}\,c13n^2\right)+0.000283073\left(0.0000862597\,c12n\,c12p+9.79829\times10^{-7}\,c13n\,c13p\right)+2.91318\times10^{-6}\left(0.0000862597\,c12p^2+9.79829\times10^{-7}\,c13p^2\right)+4.6514\times10^{-7}\,c2n^2+1.83953\times10^{-7}\,c2n\,c2p+1.82394\times10^{-8}\,c2p^2-0.000244946\,c2n\,c3n-0.000198511\,c2p\,c3n-0.000207532\,c2n\,c3p-0.000168179\,c2p\,c3p+$$

$$
\begin{aligned}
&0.000893815\left(\frac{1}{32}\left(0.0000862597\,c12n^2+9.79829\times10^{-7}\,c14n^2-\right.\right.\\
&\qquad\left.\left.1.95966\times10^{-6}\,c12n\,c15n+1.11299\times10^{-8}\,c15n^2\right)+\right.\\
&\qquad\left.\frac{1}{8}\left(9.79829\times10^{-7}\,c3n^2+0.0000862597\,c7n^2\right)\right)+\\
&0.000175163\left(\frac{1}{32}\left(0.0000862597\,c12n\,c12p+9.79829\times10^{-7}\,c14n\,c14p-\right.\right.\\
&\qquad\left.\left.1.95966\times10^{-6}\,c12p\,c15n+1.11299\times10^{-8}\,c15n\,c15p\right)+\right.\\
&\qquad\left.\frac{1}{8}\left(9.79829\times10^{-7}\,c3n\,c3p+0.0000862597\,c7n\,c7p\right)\right)+\\
&0.000175163\left(\frac{1}{32}\left(0.0000862597\,c12n\,c12p+9.79829\times10^{-7}\,c14n\,c14p-\right.\right.\\
&\qquad\left.\left.1.95966\times10^{-6}\,c12n\,c15p+1.11299\times10^{-8}\,c15n\,c15p\right)+\right.\\
&\qquad\left.\frac{1}{8}\left(9.79829\times10^{-7}\,c3n\,c3p+0.0000862597\,c7n\,c7p\right)\right)+\\
&0.000034766\left(\frac{1}{32}\left(0.0000862597\,c12p^2+9.79829\times10^{-7}\,c14p^2-\right.\right.\\
&\qquad\left.\left.1.95966\times10^{-6}\,c12p\,c15p+1.11299\times10^{-8}\,c15p^2\right)+\right.\\
&\qquad\left.\frac{1}{8}\left(9.79829\times10^{-7}\,c3p^2+0.0000862597\,c7p^2\right)\right)+\\
&1054.6\left(0.000172519\,c1n\,c2n-9.4503\times10^{-11}\,c2n^2+\right.\\
&\qquad\left.\frac{1}{4}\left(9.79829\times10^{-7}\,c5n^2+0.0000862597\,c8n^2\right)\right)+\\
&1709.15\left(0.+0.00928761\,c2n\left(0.00928761\,c1p-5.08759\times10^{-9}\,c2p\right)+\right.\\
&\qquad0.00928761\left(0.00928761\,c1n-5.08759\times10^{-9}\,c2n\right)c2p+\\
&\qquad\left.\frac{1}{4}\left(9.79829\times10^{-7}\,c5n\,c5p+0.0000862597\,c8n\,c8p\right)\right)+\\
&692.49\left(0.000172519\,c1p\,c2p-9.4503\times10^{-11}\,c2p^2+\right.\\
&\qquad\left.\left.\frac{1}{4}\left(9.79829\times10^{-7}\,c5p^2+0.0000862597\,c8p^2\right)\right)\right)+\\
&344.948\left(0.000228195\left(0.0000862597\,c12n^2+9.79829\times10^{-7}\,c13n^2\right)-\right.\\
&\qquad0.000115354\left(0.0000862597\,c12n\,c12p+9.79829\times10^{-7}\,c13n\,c13p\right)+\\
&\qquad0.0000145781\left(0.0000862597\,c12p^2+9.79829\times10^{-7}\,c13p^2\right)-\\
&\qquad250.001\left(0.0000263746\,c11n\left(0.00928761\,c12n-0.000105499\,c15n\right)+\right.\\
&\qquad\qquad\left.0.000105499\left(0.00928761\,c1n-5.08759\times10^{-9}\,c2n\right)c3n\right)-\\
&\qquad202.599\left(0.0000263746\,c11p\left(0.00928761\,c12n-0.000105499\,c15n\right)+\right.\\
&\qquad\qquad\left.0.000105499\left(0.00928761\,c1p-5.08759\times10^{-9}\,c2p\right)c3n\right)+59.457\\
&\qquad\left(0.000709941\left(0.00928761\,c12n-0.000105499\,c15n\right)^2+2.78248\times10^{-9}\,c3n^2\right)-\\
&\qquad211.807\left(0.0000263746\,c11n\left(0.00928761\,c12p-0.000105499\,c15p\right)+\right.\\
&\qquad\qquad\left.0.000105499\left(0.00928761\,c1n-5.08759\times10^{-9}\,c2n\right)c3p\right)-\\
&\qquad171.641\left(0.0000263746\,c11p\left(0.00928761\,c12p-0.000105499\,c15p\right)+\right.\\
&\qquad\qquad\left.0.000105499\left(0.00928761\,c1p-5.08759\times10^{-9}\,c2p\right)c3p\right)+\\
&\qquad100.603\left(0.000709941\left(0.00928761\,c12n-0.000105499\,c15n\right)\right.\\
&\qquad\qquad\left.\left(0.00928761\,c12p-0.000105499\,c15p\right)+2.78248\times10^{-9}\,c3n\,c3p\right)+\\
&\qquad42.5825\left(0.000709941\left(0.00928761\,c12p-0.000105499\,c15p\right)^2+
\end{aligned}
$$

$$2.78248\times10^{-9}\,c3p^2\Big)+0.155282\,\Big(2.44957\times10^{-7}\,c10n^2+\frac{1}{16}\Big(-5.47782\times10^{-7}\,\Big(0.0000862597\,c12n^2+9.79829\times10^{-7}\,c13n^2\Big)+0.0000862597\,c4n^2+1.95966\times10^{-6}\,c4n\,c6n+1.11299\times10^{-8}\,c6n^2\Big)\Big)+0.00226459\,\Big(2.44957\times10^{-7}\,c10n\,c10p+\frac{1}{16}\Big(-5.47782\times10^{-7}\,\Big(0.0000862597\,c12n\,c12p+9.79829\times10^{-7}\,c13n\,c13p\Big)+0.0000862597\,c4n\,c4p+1.95966\times10^{-6}\,c4p\,c6n+1.11299\times10^{-8}\,c6n\,c6p\Big)\Big)+0.00226459\,\Big(2.44957\times10^{-7}\,c10n\,c10p+\frac{1}{16}\Big(-5.47782\times10^{-7}\,\Big(0.0000862597\,c12n\,c12p+9.79829\times10^{-7}\,c13n\,c13p\Big)+0.0000862597\,c4n\,c4p+1.95966\times10^{-6}\,c4n\,c6p+1.11299\times10^{-8}\,c6n\,c6p\Big)\Big)+0.0000466109\,\Big(2.44957\times10^{-7}\,c10p^2+\frac{1}{16}\Big(-5.47782\times10^{-7}\,\Big(0.0000862597\,c12p^2+9.79829\times10^{-7}\,c13p^2\Big)+0.0000862597\,c4p^2+1.95966\times10^{-6}\,c4p\,c6p+1.11299\times10^{-8}\,c6p^2\Big)\Big)+0.237357\,\Big(-1.07347\times10^{-12}\,c2n^2+0.00283977\,\Big(9.79829\times10^{-7}\,c5n^2+0.0000862597\,c8n^2\Big)\Big)+1054.6\,\Big(0.0000862597\,c1n^2-9.4503\times10^{-11}\,c1n\,c2n+2.58835\times10^{-17}\,c2n^2+\frac{1}{4}\Big(9.79829\times10^{-7}\,c11n^2-5.47782\times10^{-7}\,\Big(9.79829\times10^{-7}\,c5n^2+0.0000862597\,c8n^2\Big)\Big)\Big)+0.09387\,\Big(-1.07347\times10^{-12}\,c2n\,c2p+0.00283977\,\Big(9.79829\times10^{-7}\,c5n\,c5p+0.0000862597\,c8n\,c8p\Big)\Big)+0.00930743\,\Big(-1.07347\times10^{-12}\,c2p^2+0.00283977\,\Big(9.79829\times10^{-7}\,c5p^2+0.0000862597\,c8p^2\Big)\Big)+1709.15\,\Big(\Big(0.00928761\,c1n-5.08759\times10^{-9}\,c2n\Big)\Big(0.00928761\,c1p-5.08759\times10^{-9}\,c2p\Big)+\frac{1}{4}\Big(9.79829\times10^{-7}\,c11n\,c11p-5.47782\times10^{-7}\,\Big(9.79829\times10^{-7}\,c5n\,c5p+0.0000862597\,c8n\,c8p\Big)\Big)\Big)+692.49\,\Big(0.0000862597\,c1p^2-9.4503\times10^{-11}\,c1p\,c2p+2.58835\times10^{-17}\,c2p^2+\frac{1}{4}\Big(9.79829\times10^{-7}\,c11p^2-5.47782\times10^{-7}\,\Big(9.79829\times10^{-7}\,c5p^2+0.0000862597\,c8p^2\Big)\Big)\Big)+0.000893815\,\Big(-6.84728\times10^{-8}\,\Big(9.79829\times10^{-7}\,c3n^2+0.0000862597\,c7n^2\Big)+\frac{1}{32}\Big(-5.47782\times10^{-7}\,\Big(0.0000862597\,c12n^2+9.79829\times10^{-7}\,c14n^2-1.95966\times10^{-6}\,c12n\,c15n+1.11299\times10^{-8}\,c15n^2\Big)+0.000172519\,c4n^2+1.95966\times10^{-6}\,c9n^2\Big)\Big)+$$

$$0.000175163\left(-6.84728\times10^{-8}\left(9.79829\times10^{-7}\,c3n\,c3p+0.0000862597\,c7n\,c7p\right)+\frac{1}{32}\left(-5.47782\times10^{-7}\left(0.0000862597\,c12n\,c12p+9.79829\times10^{-7}\,c14n\,c14p-1.95966\times10^{-6}\,c12p\,c15n+1.11299\times10^{-8}\,c15n\,c15p\right)+0.000172519\,c4n\,c4p+1.95966\times10^{-6}\,c9n\,c9p\right)\right)+$$
$$0.000175163\left(-6.84728\times10^{-8}\left(9.79829\times10^{-7}\,c3n\,c3p+0.0000862597\,c7n\,c7p\right)+\frac{1}{32}\left(-5.47782\times10^{-7}\left(0.0000862597\,c12n\,c12p+9.79829\times10^{-7}\,c14n\,c14p-1.95966\times10^{-6}\,c12n\,c15p+1.11299\times10^{-8}\,c15n\,c15p\right)+0.000172519\,c4n\,c4p+1.95966\times10^{-6}\,c9n\,c9p\right)\right)+$$
$$0.000034766\left(-6.84728\times10^{-8}\left(9.79829\times10^{-7}\,c3p^2+0.0000862597\,c7p^2\right)+\frac{1}{32}\left(-5.47782\times10^{-7}\left(0.0000862597\,c12p^2+9.79829\times10^{-7}\,c14p^2-1.95966\times10^{-6}\,c12p\,c15p+1.11299\times10^{-8}\,c15p^2\right)+0.000172519\,c4p^2+1.95966\times10^{-6}\,c9p^2\right)\right)-$$
$$0.0118596\left(5.36733\times10^{-13}\,c2n\,c3n+0.00266447\left(\frac{0.0000919346\,c4n\,c5n}{\text{GeV}}-\frac{0.0000919346\,c8n\,c9n}{\text{GeV}}\right)\text{GeV}\right)-$$
$$0.00225574\left(5.36733\times10^{-13}\,c2p\,c3n+0.00266447\left(\frac{0.0000919346\,c4n\,c5p}{\text{GeV}}-\frac{0.0000919346\,c8p\,c9n}{\text{GeV}}\right)\text{GeV}\right)-$$
$$0.00251155\left(5.36733\times10^{-13}\,c2n\,c3p+0.00266447\left(\frac{0.0000919346\,c4p\,c5n}{\text{GeV}}-\frac{0.0000919346\,c8n\,c9p}{\text{GeV}}\right)\text{GeV}\right)-$$
$$0.000481896\left(5.36733\times10^{-13}\,c2p\,c3p+0.00266447\left(\frac{0.0000919346\,c4p\,c5p}{\text{GeV}}-\frac{0.0000919346\,c8p\,c9p}{\text{GeV}}\right)\text{GeV}\right)\Big)\Big)$$

In[845]:=
```
fdRdE[0.1] GeV * 2500 KilogramDay /. MWIMP → (150 (*GeV*)) /.
  {c1p → 1, c1n → 1, c2p → 1, c2n → 1, c3p → 1, c3n → 1, c4p → 1, c4n → 1, c5p → 1, c5n → 1, c6p → 1,
    c6n → 1, c7p → 1, c7n → 1, c8p → 1, c8n → 1, c9p → 1, c9n → 1, c10p → 1, c10n → 1, c11p → 1,
    c11n → 1, c12p → 1, c12n → 1, c13p → 1, c13n → 1, c14p → 1, c14n → 1, c15p → 1, c15n → 1}
```

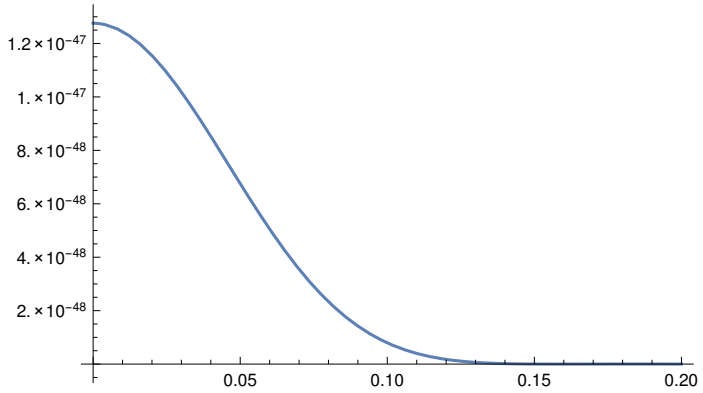
Out[845]= $1.4606\times10^{11}$

In[846]:=
```
fplot = Simplify [
    fdRdE[q] GeV /. MWIMP → (150 (*GeV*)) /. {c1p → 1, c1n → 1, c2p → 1, c2n → 1, c3p → 1,
        c3n → 1, c4p → 1, c4n → 1, c5p → 1, c5n → 1, c6p → 1, c6n → 1, c7p → 1, c7n → 1, c8p → 1,
        c8n → 1, c9p → 1, c9n → 1, c10p → 1, c10n → 1, c11p → 1, c11n → 1, c12p → 1,
        c12n → 1, c13p → 1, c13n → 1, c14p → 1, c14n → 1, c15p → 1, c15n → 1}, GeV > 0]
```

Out[846]=
$$
\begin{aligned}
&e^{-270.92 q^2} \Big(5.75631\times10^{-55} e^{(1.05455-10.0857 q)^2} + 5.75631\times10^{-55} e^{(1.05455+10.0857 q)^2} - \\
&\quad 5.50537\times10^{-54} e^{(1.05455-10.0857 q)^2} q + 5.50537\times10^{-54} e^{(1.05455+10.0857 q)^2} q - \\
&\quad 7.74654\times10^{-53} e^{(1.05455-10.0857 q)^2} q^2 - 7.74654\times10^{-53} e^{(1.05455+10.0857 q)^2} q^2 + \\
&\quad 7.40883\times10^{-52} e^{(1.05455-10.0857 q)^2} q^3 - 7.40883\times10^{-52} e^{(1.05455+10.0857 q)^2} q^3 + \\
&\quad 4.11074\times10^{-51} e^{(1.05455-10.0857 q)^2} q^4 + 4.11074\times10^{-51} e^{(1.05455+10.0857 q)^2} q^4 - \\
&\quad 3.93153\times10^{-50} e^{(1.05455-10.0857 q)^2} q^5 + 3.93153\times10^{-50} e^{(1.05455+10.0857 q)^2} q^5 - \\
&\quad 1.11857\times10^{-49} e^{(1.05455-10.0857 q)^2} q^6 - 1.11857\times10^{-49} e^{(1.05455+10.0857 q)^2} q^6 + \\
&\quad 1.06981\times10^{-48} e^{(1.05455-10.0857 q)^2} q^7 - 1.06981\times10^{-48} e^{(1.05455+10.0857 q)^2} q^7 + \\
&\quad 1.72327\times10^{-48} e^{(1.05455-10.0857 q)^2} q^8 + 1.72327\times10^{-48} e^{(1.05455+10.0857 q)^2} q^8 - \\
&\quad 1.64814\times10^{-47} e^{(1.05455-10.0857 q)^2} q^9 + 1.64814\times10^{-47} e^{(1.05455+10.0857 q)^2} q^9 - \\
&\quad 1.55922\times10^{-47} e^{(1.05455-10.0857 q)^2} q^{10} - 1.55922\times10^{-47} e^{(1.05455+10.0857 q)^2} q^{10} + \\
&\quad 1.49124\times10^{-46} e^{(1.05455-10.0857 q)^2} q^{11} - 1.49124\times10^{-46} e^{(1.05455+10.0857 q)^2} q^{11} + \\
&\quad 8.25379\times10^{-47} e^{(1.05455-10.0857 q)^2} q^{12} + 8.25379\times10^{-47} e^{(1.05455+10.0857 q)^2} q^{12} - \\
&\quad 7.89396\times10^{-46} e^{(1.05455-10.0857 q)^2} q^{13} + 7.89396\times10^{-46} e^{(1.05455+10.0857 q)^2} q^{13} - \\
&\quad 2.43196\times10^{-46} e^{(1.05455-10.0857 q)^2} q^{14} - 2.43196\times10^{-46} e^{(1.05455+10.0857 q)^2} q^{14} + \\
&\quad 2.32594\times10^{-45} e^{(1.05455-10.0857 q)^2} q^{15} - 2.32594\times10^{-45} e^{(1.05455+10.0857 q)^2} q^{15} + \\
&\quad 3.49548\times10^{-46} e^{(1.05455-10.0857 q)^2} q^{16} + 3.49548\times10^{-46} e^{(1.05455+10.0857 q)^2} q^{16} - \\
&\quad 3.34309\times10^{-45} e^{(1.05455-10.0857 q)^2} q^{17} + 3.34309\times10^{-45} e^{(1.05455+10.0857 q)^2} q^{17} - \\
&\quad 1.70511\times10^{-46} e^{(1.05455-10.0857 q)^2} q^{18} - 1.70511\times10^{-46} e^{(1.05455+10.0857 q)^2} q^{18} + \\
&\quad 1.63077\times10^{-45} e^{(1.05455-10.0857 q)^2} q^{19} - 1.63077\times10^{-45} e^{(1.05455+10.0857 q)^2} q^{19} + \\
&\quad 1.40675\times10^{-47} e^{(1.05455-10.0857 q)^2} q^{20} + 1.40675\times10^{-47} e^{(1.05455+10.0857 q)^2} q^{20} - \\
&\quad 1.34543\times10^{-46} e^{(1.05455-10.0857 q)^2} q^{21} + 1.34543\times10^{-46} e^{(1.05455+10.0857 q)^2} q^{21} + \\
&\quad 4.97497\times10^{-48} e^{(1.05455-10.0857 q)^2} q^{22} + 4.97497\times10^{-48} e^{(1.05455+10.0857 q)^2} q^{22} - \\
&\quad 4.75809\times10^{-47} e^{(1.05455-10.0857 q)^2} q^{23} + 4.75809\times10^{-47} e^{(1.05455+10.0857 q)^2} q^{23} + \\
&\quad 1.0127\times10^{-52} e^{(1.05455-10.0857 q)^2} q^{24} + 1.0127\times10^{-52} e^{(1.05455+10.0857 q)^2} q^{24} - \\
&\quad 9.68551\times10^{-52} e^{(1.05455-10.0857 q)^2} q^{25} + 9.68551\times10^{-52} e^{(1.05455+10.0857 q)^2} q^{25} + \\
&\quad e^{203.444 q^2} \Big(7.38256\times10^{-48} - 9.93584\times10^{-46} q^2 + 5.2708\times10^{-44} q^4 - 1.43277\times10^{-42} q^6 + \\
&\qquad 2.2024\times10^{-41} q^8 - 1.98398\times10^{-40} q^{10} + 1.04114\times10^{-39} q^{12} - 3.01101\times10^{-39} q^{14} + \\
&\qquad 4.11902\times10^{-39} q^{16} - 1.59098\times10^{-39} q^{18} - 1.7235\times10^{-40} q^{20} + 1.31686\times10^{-40} q^{22} - \\
&\qquad 7.71663\times10^{-45} q^{24} - 1.60078\times10^{-49} q^{26}\Big) \operatorname{Erf}[1.05455 - 10.0857 q] + \\
&\quad e^{203.444 q^2} \Big(7.38256\times10^{-48} - 9.93584\times10^{-46} q^2 + 5.2708\times10^{-44} q^4 - 1.43277\times10^{-42} q^6 + \\
&\qquad 2.2024\times10^{-41} q^8 - 1.98398\times10^{-40} q^{10} + 1.04114\times10^{-39} q^{12} - 3.01101\times10^{-39} q^{14} + \\
&\qquad 4.11902\times10^{-39} q^{16} - 1.59098\times10^{-39} q^{18} - 1.7235\times10^{-40} q^{20} + 1.31686\times10^{-40} q^{22} - \\
&\qquad 7.71663\times10^{-45} q^{24} - 1.60078\times10^{-49} q^{26}\Big) \operatorname{Erf}[1.05455 + 10.0857 q]\Big)
\end{aligned}
$$

In[847]:=
```
Plot[fplot, {q, 0, 0.2}]
```

Out[847]=




Total predicted number of events for 150 GeV WIMP

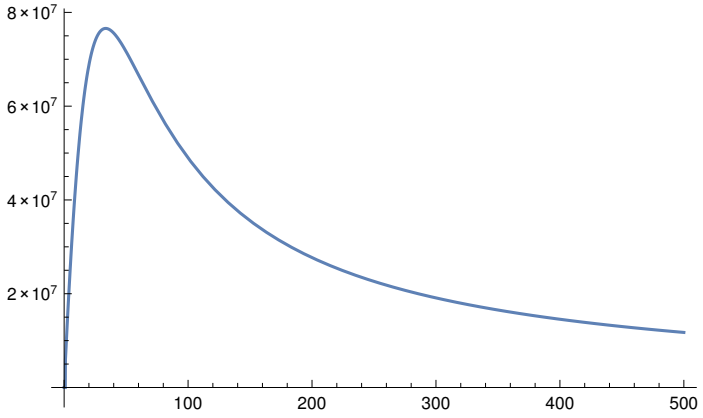
In[848]:=
```
2500 KilogramDay *
  NIntegrate[fdRdE[qGeV] GeV * (qGeV GeV / (131 mNucleon )) /. MWIMP → (150 (*GeV*)) /.
      {c1p → 1, c1n → 1, c2p → 1, c2n → 1, c3p → 1, c3n → 1, c4p → 1, c4n → 1,
        c5p → 1, c5n → 1, c6p → 1, c6n → 1, c7p → 1, c7n → 1, c8p → 1, c8n → 1,
        c9p → 1, c9n → 1, c10p → 1, c10n → 1, c11p → 1, c11n → 1, c12p → 1, c12n → 1,
        c13p → 1, c13n → 1, c14p → 1, c14n → 1, c15p → 1, c15n → 1}, {qGeV, 0, 10}]
```

Out[848]=
$$3.55634 \times 10^{7}$$

Total predicted number of events as function of WIMP mass

In[849]:=
```
Plot[2500 KilogramDay *
    NIntegrate[fdRdE[qGeV] GeV * (qGeV GeV / (131 mNucleon )) /. MWIMP → (M (*GeV*)) /.
        {c1p → 1, c1n → 1, c2p → 1, c2n → 1, c3p → 1, c3n → 1, c4p → 1, c4n → 1, c5p → 1,
          c5n → 1, c6p → 1, c6n → 1, c7p → 1, c7n → 1, c8p → 1, c8n → 1, c9p → 1, c9n → 1,
          c10p → 1, c10n → 1, c11p → 1, c11n → 1, c12p → 1, c12n → 1, c13p → 1, c13n → 1,
          c14p → 1, c14n → 1, c15p → 1, c15n → 1}, {qGeV, 0, 10}], {M, 0, 500}]
```

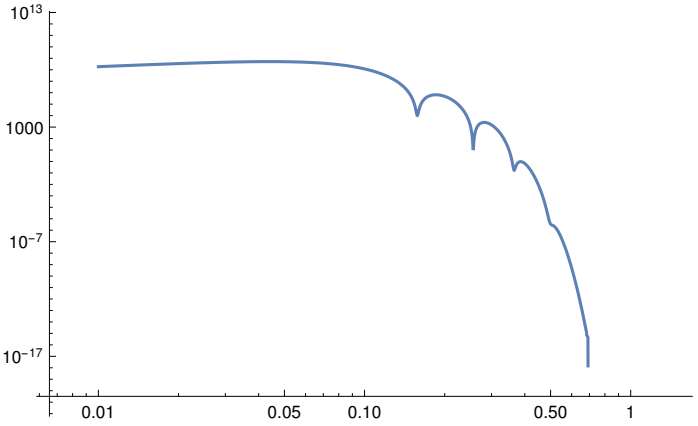
Out[849]=




Recoil spectra for 150 GeV WIMP, for one coupling at a time (coupling values still set to 1)
Note units of $\frac{dR_D}{dE_R}$ are “event rate per unit time, per unit detector mass, per unit recoil energy”

In[850]:=
```
(*as function of q *)
LogLogPlot[2500 KilogramDay *fdRdE[qGeV] GeV*(qGeV GeV/(131 mNucleon )) /.
      MWIMP→(150(*GeV*)) /. {c1p→1, c1n→1, c2p→1, c2n→1, c3p→1, c3n→1,
      c4p→1, c4n→1, c5p→1, c5n→1, c6p→1, c6n→1, c7p→1, c7n→1, c8p→1,
      c8n→1, c9p→1, c9n→1, c10p→1, c10n→1, c11p→1, c11n→1, c12p→1, c12n→1,
      c13p→1, c13n→1, c14p→1, c14n→1, c15p→1, c15n→1}, {qGeV, 0.01, 1}]
```

Out[850]=




Note: E_R = q^2 / 2mT
i.e. q = sqrt( 2*mT*E_R )

In[851]:=
```
(*as function of E_R *)
mT  = 131 mNucleon ;
2500 KilogramDay *fdRdE[Sqrt[2 mT  ER/GeV]] GeV /. MWIMP→(150(*GeV*)) /.
  {c1p→1, c1n→1, c2p→1, c2n→1, c3p→1, c3n→1, c4p→1, c4n→1, c5p→1, c5n→1, c6p→1,
    c6n→1, c7p→1, c7n→1, c8p→1, c8n→1, c9p→1, c9n→1, c10p→1, c10n→1, c11p→1,
    c11n→1, c12p→1, c12n→1, c13p→1, c13n→1, c14p→1, c14n→1, c15p→1, c15n→1}
```

Out[852]=
$$
\begin{aligned}
&1.42103\times10^{9}\left(646.112\,e^{-16582.7\,ER}\left(54.8121\,(0.0000862597+0.0240799\,ER)\,ER\right.\right.\\
&\quad\left(0.0798479+148.686\,ER-3.20932\times10^{6}\,ER^{2}+3.89971\times10^{9}\,ER^{3}-51863.4\,ER^{4}\right)^{2}+\\
&54.8121\,(0.0000862597+0.0240799\,ER)\,ER\left(0.516607-5451.09\,ER+\right.\\
&\quad\left.1.59135\times10^{7}\,ER^{2}-1.92187\times10^{10}\,ER^{3}+4.78368\times10^{12}\,ER^{4}\right)^{2}+\\
&\left(69.7889\,(0.0000862597+0.0240799\,ER)\,ER-0.00064833\,ER^{2}\right)\\
&\quad\left(0.0223585-444.918\,ER+3.61025\times10^{6}\,ER^{2}-\right.\\
&\quad\quad1.50319\times10^{10}\,ER^{3}+3.36442\times10^{13}\,ER^{4}-3.82779\times10^{16}\,ER^{5}+\\
&\quad\quad\left.1.73824\times10^{19}\,ER^{6}-5.78125\times10^{16}\,ER^{7}+4.82197\times10^{13}\,ER^{8}\right)+\\
&\left(17.4472\,(0.00928761-2.59269\,ER)^{2}\,ER+1.68051\,ER^{2}\right)\\
&\quad\left(104.803-2.08658\times10^{6}\,ER+1.59245\times10^{10}\,ER^{2}-\right.\\
&\quad\quad5.91022\times10^{13}\,ER^{3}+1.13403\times10^{17}\,ER^{4}-1.07638\times10^{20}\,ER^{5}+\\
&\quad\quad\left.3.99459\times10^{22}\,ER^{6}-1.70488\times10^{19}\,ER^{7}+1.81915\times10^{15}\,ER^{8}\right)+\\
&34.8945\,(0.0000862597+0.0240799\,ER)\,ER\left(-0.129591+1126.09\,ER+\right.\\
&\quad\left.3.763\times10^{6}\,ER^{2}-6.39014\times10^{10}\,ER^{3}+2.35006\times10^{14}\,ER^{4}-3.90966\times10^{17}\,ER^{5}+\right.\\
&\quad\left.2.83685\times10^{20}\,ER^{6}-5.86062\times10^{22}\,ER^{7}+7.79421\times10^{17}\,ER^{8}\right)+\\
&2\left(69.7889\,(0.0000862597+0.0240799\,ER)\,ER-0.00064833\,ER^{2}\right)\\
&\quad\left(0.111856-2304.68\,ER+2.13177\times10^{7}\,ER^{2}-\right.\\
&\quad\quad1.06819\times10^{11}\,ER^{3}+2.92942\times10^{14}\,ER^{4}-4.09646\times10^{17}\,ER^{5}+\\
&\quad\quad\left.2.37523\times10^{20}\,ER^{6}-1.56222\times10^{22}\,ER^{7}+2.5894\times10^{19}\,ER^{8}\right)+\\
&2\left(17.4472\,(0.00928761-2.59269\,ER)^{2}\,ER+1.68051\,ER^{2}\right)\\
&\quad\left(145.179-3.33747\times10^{6}\,ER+2.94991\times10^{10}\,ER^{2}-\right.
\end{aligned}
$$

$$
\begin{aligned}
&\quad 1.2927\times10^{14}\,ER^3+3.04476\times10^{17}\,ER^4-3.86068\times10^{20}\,ER^5+\\
&\quad 2.43398\times10^{23}\,ER^6-5.81714\times10^{25}\,ER^7+1.24211\times10^{22}\,ER^8\big)+\\
&\big(69.7889\,(0.0000862597+0.0240799\,ER)\,ER-0.00064833\,ER^2\big)\\
&\quad \big(0.559596-11924.3\,ER+1.24023\times10^{8}\,ER^2-\\
&\quad 7.20947\times10^{11}\,ER^3+2.42626\times10^{15}\,ER^4-4.23025\times10^{18}\,ER^5+\\
&\quad 3.1439\times10^{21}\,ER^6-3.99379\times10^{23}\,ER^7+1.40875\times10^{25}\,ER^8\big)+\\
&\big(17.4472\,(0.00928761-2.59269\,ER)^2\,ER+1.68051\,ER^2\big)\\
&\quad \big(201.935-5.28086\times10^{6}\,ER+5.36841\times10^{10}\,ER^2-\\
&\quad 2.74057\times10^{14}\,ER^3+7.70852\times10^{17}\,ER^4-1.22696\times10^{21}\,ER^5+\\
&\quad 1.0827\times10^{24}\,ER^6-4.85451\times10^{26}\,ER^7+8.58379\times10^{28}\,ER^8\big)+\\
&\big(0.+0.000324165\,ER^2\big)\,\big(0.00160907-67.4885\,ER+323316.\,ER^2+\\
&\quad 2.80147\times10^{9}\,ER^3-2.86605\times10^{13}\,ER^4+9.19234\times10^{16}\,ER^5-1.2509\times10^{20}\,ER^6+\\
&\quad 6.15518\times10^{22}\,ER^7-1.90402\times10^{20}\,ER^8+1.48545\times10^{17}\,ER^9\big)+\\
&\big(0.648172\,(0.00928761-2.59269\,ER)\,ER+\\
&\quad 2.59269\,(0.00928761-0.00012503\,ER)\,ER\big)\\
&\quad \big(-552.779+1.37595\times10^{7}\,ER-1.30301\times10^{11}\,ER^2+6.07335\times10^{14}\,ER^3-\\
&\quad 1.50926\times10^{18}\,ER^4+1.99944\times10^{21}\,ER^5-1.29733\times10^{24}\,ER^6+\\
&\quad 3.09688\times10^{26}\,ER^7-9.44056\times10^{22}\,ER^8+6.03328\times10^{18}\,ER^9\big)+\\
&\big(0.+0.000324165\,ER^2\big)\,\big(0.0626746-3060.38\,ER+4.93235\times10^{7}\,ER^2-\\
&\quad 3.88784\times10^{11}\,ER^3+1.65349\times10^{15}\,ER^4-3.82969\times10^{18}\,ER^5+4.50076\times10^{21}\\
&\quad ER^6-2.07346\times10^{24}\,ER^7-4.83202\times10^{25}\,ER^8+7.99679\times10^{22}\,ER^9\big)+\\
&\big(0.+0.000324165\,ER^2\big)\,\big(0.00804988-343.307\,ER+1.84305\times10^{6}\,ER^2+\\
&\quad 1.13931\times10^{10}\,ER^3-1.79223\times10^{14}\,ER^4+7.716\times10^{17}\,ER^5-1.34899\times10^{21}\,ER^6+\\
&\quad 8.54669\times10^{23}\,ER^7-5.59485\times10^{25}\,ER^8+7.99679\times10^{22}\,ER^9\big)+\\
&\big(0.648172\,(0.00928761-2.59269\,ER)\,ER+\\
&\quad 2.59269\,(0.00928761-0.00012503\,ER)\,ER\big)\\
&\quad \big(-766.296+2.14746\times10^{7}\,ER-2.32852\times10^{11}\,ER^2+1.26191\times10^{15}\,ER^3-\\
&\quad 3.74546\times10^{18}\,ER^4+6.23734\times10^{21}\,ER^5-5.68536\times10^{24}\,ER^6+\\
&\quad 2.58963\times10^{27}\,ER^7-4.58182\times10^{29}\,ER^8+4.11949\times10^{25}\,ER^9\big)+\\
&\big(0.648172\,(0.00928761-2.59269\,ER)\,ER+\\
&\quad 2.59269\,(0.00928761-0.00012503\,ER)\,ER\big)\\
&\quad \big(-788.171+2.1758\times10^{7}\,ER-2.31374\times10^{11}\,ER^2+1.23879\times10^{15}\,ER^3-\\
&\quad 3.64779\times10^{18}\,ER^4+6.00483\times10^{21}\,ER^5-5.26342\times10^{24}\,ER^6+\\
&\quad 2.07795\times10^{27}\,ER^7-1.92928\times10^{29}\,ER^8+4.11949\times10^{25}\,ER^9\big)+\\
&\big(0.+0.000324165\,ER^2\big)\,\big(0.31355-15531.5\,ER+2.62819\times10^{8}\,ER^2-\\
&\quad 2.34046\times10^{12}\,ER^3+1.19205\times10^{16}\,ER^4-3.40252\times10^{19}\,ER^5+4.97709\times10^{22}\\
&\quad ER^6-2.98105\times10^{25}\,ER^7+1.3286\times10^{27}\,ER^8+4.36516\times10^{28}\,ER^9\big)+\\
&\big(0.648172\,(0.00928761-2.59269\,ER)\,ER+2.59269\,(0.00928761-0.00012503\,ER)\\
&\quad ER\big)\,\big(-1092.61+3.35849\times10^{7}\,ER-4.0447\times10^{11}\,ER^2+2.48429\times10^{15}\,ER^3-\\
&\quad 8.56765\times10^{18}\,ER^4+1.71434\times10^{22}\,ER^5-1.96915\times10^{25}\,ER^6+\\
&\quad 1.22017\times10^{28}\,ER^7-3.47288\times10^{30}\,ER^8+2.84684\times10^{32}\,ER^9\big)+\\
&2\,\big(4157.7-1.35558\times10^{8}\,ER+1.73208\times10^{12}\,ER^2-1.12505\times10^{16}\,ER^3+\\
&\quad 4.08636\times10^{19}\,ER^4-8.56097\times10^{22}\,ER^5+1.02078\times10^{26}\,ER^6-\\
&\quad 6.47808\times10^{28}\,ER^7+1.85192\times10^{31}\,ER^8-1.51958\times10^{33}\,ER^9+\\
&\quad 1.36624\times10^{29}\,ER^{10}\big)\,\Big((0.00928761-0.00012503\,ER)^2+\\
&\quad \frac{1}{4}\,(0.0240799\,ER-0.0134621\,(0.0000862597+0.0240799\,ER)\,ER)\Big)+\\
&\big(2915.98-8.71577\times10^{7}\,ER+1.00658\times10^{12}\,ER^2-5.7873\times10^{15}\,ER^3+\\
&\quad 1.813\times10^{19}\,ER^4-3.16244\times10^{22}\,ER^5+2.98391\times10^{25}\,ER^6-1.38151\times10^{28}\,ER^7+\\
&\quad 2.44694\times10^{30}\,ER^8-4.38672\times10^{26}\,ER^9+2.00096\times10^{22}\,ER^{10}\big)
\end{aligned}
$$

$$\left(0.0000862597 - 2.32247\times10^{-6}\,\mathrm{ER} + 1.56326\times10^{-8}\,\mathrm{ER}^2 + \frac{1}{4}\left(0.0240799\,\mathrm{ER} - 0.0134621\left(0.0000862597 + 0.0240799\,\mathrm{ER}\right)\mathrm{ER}\right)\right) + \left(5928.2 - 2.09373\times10^{8}\,\mathrm{ER} + 2.93661\times10^{12}\,\mathrm{ER}^2 - 2.13095\times10^{16}\,\mathrm{ER}^3 + 8.83678\times10^{19}\,\mathrm{ER}^4 - 2.17478\times10^{23}\,\mathrm{ER}^5 + 3.1716\times10^{26}\,\mathrm{ER}^6 - 2.62213\times10^{29}\,\mathrm{ER}^7 + 1.09585\times10^{32}\,\mathrm{ER}^8 - 1.76962\times10^{34}\,\mathrm{ER}^9 + 9.44166\times10^{35}\,\mathrm{ER}^{10}\right)$$

$$\left(0.0000862597 - 2.32247\times10^{-6}\,\mathrm{ER} + 1.56326\times10^{-8}\,\mathrm{ER}^2 + \frac{1}{4}\left(0.0240799\,\mathrm{ER} - 0.0134621\left(0.0000862597 + 0.0240799\,\mathrm{ER}\right)\mathrm{ER}\right)\right) + \left(0.0000578995 - 0.271491\,\mathrm{ER} + 8757.46\,\mathrm{ER}^2 - 3.56025\times10^{8}\,\mathrm{ER}^3 + 4.13698\times10^{12}\,\mathrm{ER}^4 - 2.07147\times10^{16}\,\mathrm{ER}^5 + 4.93678\times10^{19}\,\mathrm{ER}^6 - 5.32802\times10^{22}\,\mathrm{ER}^7 + 2.09535\times10^{25}\,\mathrm{ER}^8 - 1.9386\times10^{22}\,\mathrm{ER}^9 + 9.12483\times10^{18}\,\mathrm{ER}^{10}\right)$$

$$\left(0.00601997\,\mathrm{ER} + \frac{1}{16}\left(0.0000862597 + 0.0481598\,\mathrm{ER} - 0.0134621\left(0.0000862597 + 0.0240799\,\mathrm{ER}\right)\mathrm{ER} + 6.72204\,\mathrm{ER}^2\right)\right) + 2\left(0.00225524 + 26.162\,\mathrm{ER} - 729158.\,\mathrm{ER}^2 - 4.40169\times10^{8}\,\mathrm{ER}^3 + 9.1137\times10^{13}\,\mathrm{ER}^4 - 6.93296\times10^{17}\,\mathrm{ER}^5 + 2.15546\times10^{21}\,\mathrm{ER}^6 - 3.02673\times10^{24}\,\mathrm{ER}^7 + 1.52625\times10^{27}\,\mathrm{ER}^8 - 6.96676\times10^{27}\,\mathrm{ER}^9 + 5.51489\times10^{24}\,\mathrm{ER}^{10}\right)$$

$$\left(0.00601997\,\mathrm{ER} + \frac{1}{16}\left(0.0000862597 + 0.0481598\,\mathrm{ER} - 0.0134621\left(0.0000862597 + 0.0240799\,\mathrm{ER}\right)\mathrm{ER} + 6.72204\,\mathrm{ER}^2\right)\right) + \left(0.0878436 + 2449.97\,\mathrm{ER} - 1.59548\times10^{7}\,\mathrm{ER}^2 - 2.65107\times10^{11}\,\mathrm{ER}^3 + 5.87564\times10^{15}\,\mathrm{ER}^4 - 4.2018\times10^{19}\,\mathrm{ER}^5 + 1.42339\times10^{23}\,\mathrm{ER}^6 - 2.31539\times10^{26}\,\mathrm{ER}^7 + 1.48576\times10^{29}\,\mathrm{ER}^8 - 1.42138\times10^{30}\,\mathrm{ER}^9 + 3.44817\times10^{30}\,\mathrm{ER}^{10}\right)$$

$$\left(0.00601997\,\mathrm{ER} + \frac{1}{16}\left(0.0000862597 + 0.0481598\,\mathrm{ER} - 0.0134621\left(0.0000862597 + 0.0240799\,\mathrm{ER}\right)\mathrm{ER} + 6.72204\,\mathrm{ER}^2\right)\right) + \left(0.000115799 - 7.40952\,\mathrm{ER} + 106334.\,\mathrm{ER}^2 + 8.52859\times10^{8}\,\mathrm{ER}^3 - 3.27302\times10^{12}\,\mathrm{ER}^4 - 4.64862\times10^{16}\,\mathrm{ER}^5 + 2.60166\times10^{20}\,\mathrm{ER}^6 - 4.28861\times10^{23}\,\mathrm{ER}^7 + 2.2624\times10^{26}\,\mathrm{ER}^8 - 6.27238\times10^{23}\,\mathrm{ER}^9 + 4.57821\times10^{20}\,\mathrm{ER}^{10}\right)$$

$$\left(-0.00168276\left(0.0000862597 + 0.0240799\,\mathrm{ER}\right)\mathrm{ER} + \frac{1}{32}\left(0.000172519 + 0.0481598\,\mathrm{ER} - 0.0134621\,\mathrm{ER}\left(0.0000862597 - 0.0240799\,\mathrm{ER} + 6.72204\,\mathrm{ER}^2\right)\right)\right) + 2\left(0.00451048 - 319.671\,\mathrm{ER} + 6.51407\times10^{6}\,\mathrm{ER}^2 - 2.14302\times10^{10}\,\mathrm{ER}^3 - 3.65868\times10^{14}\,\mathrm{ER}^4 + 3.42267\times10^{18}\,\mathrm{ER}^5 - 1.12515\times10^{22}\,\mathrm{ER}^6 + 1.57922\times10^{25}\,\mathrm{ER}^7 - 7.86219\times10^{27}\,\mathrm{ER}^8 - 1.74027\times10^{29}\,\mathrm{ER}^9 + 2.47122\times10^{26}\,\mathrm{ER}^{10}\right)$$

$$\left(-0.00168276\left(0.0000862597 + 0.0240799\,\mathrm{ER}\right)\mathrm{ER} + \frac{1}{32}\left(0.000172519 + 0.0481598\,\mathrm{ER} - 0.0134621\,\mathrm{ER}\left(0.0000862597 - 0.0240799\,\mathrm{ER} + 6.72204\,\mathrm{ER}^2\right)\right)\right) + \left(0.175687 - 13661.5\,\mathrm{ER} + 3.95565\times10^{8}\,\mathrm{ER}^2 - 5.53171\times10^{12}\,\mathrm{ER}^3 +$$

$$
\begin{aligned}
&4.3061\times10^{16}\,ER^4-1.90198\times10^{20}\,ER^5+4.6504\times10^{23}\,ER^6-5.77441\times10^{26}\,ER^7+\\
&2.77381\times10^{29}\,ER^8+1.21737\times10^{31}\,ER^9+1.35373\times10^{32}\,ER^{10}\Big)\\
&\Big(-0.00168276\,(0.0000862597+0.0240799\,ER)\,ER+\\
&\frac{1}{32}\Big(0.000172519+0.0481598\,ER-\\
&0.0134621\,ER\left(0.0000862597-0.0240799\,ER+6.72204\,ER^2\right)\Big)\Big)\\
&\left(\mathrm{Erf}\left[1.05455-158.11\sqrt{ER}\,\right]+\mathrm{Erf}\left[1.05455+158.11\sqrt{ER}\,\right]\right)+\\
&0.000733832\,e^{-16582.7\,ER}\\
&\Big(0.0481598\,ER\left(0.0223585-444.918\,ER+3.61025\times10^6\,ER^2-\right.\\
&1.50319\times10^{10}\,ER^3+3.36442\times10^{13}\,ER^4-3.82779\times10^{16}\,ER^5+\\
&1.73824\times10^{19}\,ER^6-5.78125\times10^{16}\,ER^7+4.82197\times10^{13}\,ER^8\Big)+\\
&0.0963195\,ER\left(0.111856-2304.68\,ER+2.13177\times10^7\,ER^2-\right.\\
&1.06819\times10^{11}\,ER^3+2.92942\times10^{14}\,ER^4-4.09646\times10^{17}\,ER^5+\\
&2.37523\times10^{20}\,ER^6-1.56222\times10^{22}\,ER^7+2.5894\times10^{19}\,ER^8\Big)+\\
&0.0481598\,ER\left(0.559596-11924.3\,ER+1.24023\times10^8\,ER^2-\right.\\
&7.20947\times10^{11}\,ER^3+2.42626\times10^{15}\,ER^4-4.23025\times10^{18}\,ER^5+\\
&3.1439\times10^{21}\,ER^6-3.99379\times10^{23}\,ER^7+1.40875\times10^{25}\,ER^8\Big)-\\
&0.0240799\,ER\left(0.00160907-67.4885\,ER+323316.\,ER^2+2.80147\times10^9\,ER^3-\right.\\
&2.86605\times10^{13}\,ER^4+9.19234\times10^{16}\,ER^5-1.2509\times10^{20}\,ER^6+\\
&6.15518\times10^{22}\,ER^7-1.90402\times10^{20}\,ER^8+1.48545\times10^{17}\,ER^9\Big)+\\
&0.0240799\,ER\left(-552.779+1.37595\times10^7\,ER-1.30301\times10^{11}\,ER^2+6.07335\times10^{14}\,ER^3-\right.\\
&1.50926\times10^{18}\,ER^4+1.99944\times10^{21}\,ER^5-1.29733\times10^{24}\,ER^6+\\
&3.09688\times10^{26}\,ER^7-9.44056\times10^{22}\,ER^8+6.03328\times10^{18}\,ER^9\Big)-\\
&0.0240799\,ER\left(0.0626746-3060.38\,ER+4.93235\times10^7\,ER^2-3.88784\times10^{11}\,ER^3+\right.\\
&1.65349\times10^{15}\,ER^4-3.82969\times10^{18}\,ER^5+4.50076\times10^{21}\,ER^6-\\
&2.07346\times10^{24}\,ER^7-4.83202\times10^{25}\,ER^8+7.99679\times10^{22}\,ER^9\Big)-\\
&0.0240799\,ER\left(0.00804988-343.307\,ER+1.84305\times10^6\,ER^2+1.13931\times10^{10}\,ER^3-\right.\\
&1.79223\times10^{14}\,ER^4+7.716\times10^{17}\,ER^5-1.34899\times10^{21}\,ER^6+\\
&8.54669\times10^{23}\,ER^7-5.59485\times10^{25}\,ER^8+7.99679\times10^{22}\,ER^9\Big)+\\
&0.0240799\,ER\left(-766.296+2.14746\times10^7\,ER-2.32852\times10^{11}\,ER^2+1.26191\times10^{15}\,ER^3-\right.\\
&3.74546\times10^{18}\,ER^4+6.23734\times10^{21}\,ER^5-5.68536\times10^{24}\,ER^6+\\
&2.58963\times10^{27}\,ER^7-4.58182\times10^{29}\,ER^8+4.11949\times10^{25}\,ER^9\Big)+\\
&0.0240799\,ER\left(-788.171+2.1758\times10^7\,ER-2.31374\times10^{11}\,ER^2+1.23879\times10^{15}\,ER^3-\right.\\
&3.64779\times10^{18}\,ER^4+6.00483\times10^{21}\,ER^5-5.26342\times10^{24}\,ER^6+\\
&2.07795\times10^{27}\,ER^7-1.92928\times10^{29}\,ER^8+4.11949\times10^{25}\,ER^9\Big)-\\
&0.0240799\,ER\left(0.31355-15531.5\,ER+2.62819\times10^8\,ER^2-2.34046\times10^{12}\,ER^3+\right.\\
&1.19205\times10^{16}\,ER^4-3.40252\times10^{19}\,ER^5+4.97709\times10^{22}\,ER^6-\\
&2.98105\times10^{25}\,ER^7+1.3286\times10^{27}\,ER^8+4.36516\times10^{28}\,ER^9\Big)+\\
&0.0240799\,ER\left(-1092.61+3.35849\times10^7\,ER-4.0447\times10^{11}\,ER^2+2.48429\times10^{15}\,ER^3-\right.\\
&8.56765\times10^{18}\,ER^4+1.71434\times10^{22}\,ER^5-1.96915\times10^{25}\,ER^6+\\
&1.22017\times10^{28}\,ER^7-3.47288\times10^{30}\,ER^8+2.84684\times10^{32}\,ER^9\Big)+\\
&\frac{1}{16}\,(0.0000862597+0.0240799\,ER)\left(0.0000578995-0.271491\,ER+\right.\\
&8757.46\,ER^2-3.56025\times10^8\,ER^3+4.13698\times10^{12}\,ER^4-\\
&2.07147\times10^{16}\,ER^5+4.93678\times10^{19}\,ER^6-5.32802\times10^{22}\,ER^7+\\
&2.09535\times10^{25}\,ER^8-1.9386\times10^{22}\,ER^9+9.12483\times10^{18}\,ER^{10}\Big)+
\end{aligned}
$$

$$\left(0.000172519+\frac{1}{4}(0.0000862597+0.0240799\,\mathrm{ER})-2.32247\times10^{-6}\,\mathrm{ER}\right)$$
$$\left(2915.98-8.71577\times10^{7}\,\mathrm{ER}+1.00658\times10^{12}\,\mathrm{ER}^2-5.7873\times10^{15}\,\mathrm{ER}^3+\right.$$
$$1.813\times10^{19}\,\mathrm{ER}^4-3.16244\times10^{22}\,\mathrm{ER}^5+2.98391\times10^{25}\,\mathrm{ER}^6-1.38151\times10^{28}\,\mathrm{ER}^7+$$
$$\left.2.44694\times10^{30}\,\mathrm{ER}^8-4.38672\times10^{26}\,\mathrm{ER}^9+2.00096\times10^{22}\,\mathrm{ER}^{10}\right)+$$
$$\frac{1}{8}(0.0000862597+0.0240799\,\mathrm{ER})\left(0.00225524+26.162\,\mathrm{ER}-\right.$$
$$729158.\,\mathrm{ER}^2-4.40169\times10^{8}\,\mathrm{ER}^3+9.1137\times10^{13}\,\mathrm{ER}^4-$$
$$6.93296\times10^{17}\,\mathrm{ER}^5+2.15546\times10^{21}\,\mathrm{ER}^6-3.02673\times10^{24}\,\mathrm{ER}^7+$$
$$\left.1.52625\times10^{27}\,\mathrm{ER}^8-6.96676\times10^{27}\,\mathrm{ER}^9+5.51489\times10^{24}\,\mathrm{ER}^{10}\right)+$$
$$2\left(0.+0.0185752\,(0.00928761-0.00012503\,\mathrm{ER})+\right.$$
$$\left.\frac{1}{4}(0.0000862597+0.0240799\,\mathrm{ER})\right)$$
$$\left(4157.7-1.35558\times10^{8}\,\mathrm{ER}+1.73208\times10^{12}\,\mathrm{ER}^2-1.12505\times10^{16}\,\mathrm{ER}^3+\right.$$
$$4.08636\times10^{19}\,\mathrm{ER}^4-8.56097\times10^{22}\,\mathrm{ER}^5+1.02078\times10^{26}\,\mathrm{ER}^6-6.47808\times10^{28}$$
$$\left.\mathrm{ER}^7+1.85192\times10^{31}\,\mathrm{ER}^8-1.51958\times10^{33}\,\mathrm{ER}^9+1.36624\times10^{29}\,\mathrm{ER}^{10}\right)+$$
$$\frac{1}{16}(0.0000862597+0.0240799\,\mathrm{ER})\left(0.0878436+2449.97\,\mathrm{ER}-\right.$$
$$1.59548\times10^{7}\,\mathrm{ER}^2-2.65107\times10^{11}\,\mathrm{ER}^3+5.87564\times10^{15}\,\mathrm{ER}^4-$$
$$4.2018\times10^{19}\,\mathrm{ER}^5+1.42339\times10^{23}\,\mathrm{ER}^6-2.31539\times10^{26}\,\mathrm{ER}^7+$$
$$\left.1.48576\times10^{29}\,\mathrm{ER}^8-1.42138\times10^{30}\,\mathrm{ER}^9+3.44817\times10^{30}\,\mathrm{ER}^{10}\right)+$$
$$\left(0.000172519+\frac{1}{4}(0.0000862597+0.0240799\,\mathrm{ER})-2.32247\times10^{-6}\,\mathrm{ER}\right)$$
$$\left(5928.2-2.09373\times10^{8}\,\mathrm{ER}+2.93661\times10^{12}\,\mathrm{ER}^2-2.13095\times10^{16}\,\mathrm{ER}^3+\right.$$
$$8.83678\times10^{19}\,\mathrm{ER}^4-2.17478\times10^{23}\,\mathrm{ER}^5+3.1716\times10^{26}\,\mathrm{ER}^6-2.62213\times10^{29}$$
$$\left.\mathrm{ER}^7+1.09585\times10^{32}\,\mathrm{ER}^8-1.76962\times10^{34}\,\mathrm{ER}^9+9.44166\times10^{35}\,\mathrm{ER}^{10}\right)+$$
$$\left(0.000115799-7.40952\,\mathrm{ER}+106334.\,\mathrm{ER}^2+8.52859\times10^{8}\,\mathrm{ER}^3-3.27302\times10^{12}\,\mathrm{ER}^4-\right.$$
$$4.64862\times10^{16}\,\mathrm{ER}^5+2.60166\times10^{20}\,\mathrm{ER}^6-4.28861\times10^{23}\,\mathrm{ER}^7+$$
$$\left.2.2624\times10^{26}\,\mathrm{ER}^8-6.27238\times10^{23}\,\mathrm{ER}^9+4.57821\times10^{20}\,\mathrm{ER}^{10}\right)$$
$$\left(\frac{1}{8}(0.0000862597+0.0240799\,\mathrm{ER})+\right.$$
$$\left.\frac{1}{32}\left(0.0000862597-0.0240799\,\mathrm{ER}+6.72204\,\mathrm{ER}^2\right)\right)+$$
$$2\left(0.00451048-319.671\,\mathrm{ER}+6.51407\times10^{6}\,\mathrm{ER}^2-2.14302\times10^{10}\,\mathrm{ER}^3-\right.$$
$$3.65868\times10^{14}\,\mathrm{ER}^4+3.42267\times10^{18}\,\mathrm{ER}^5-1.12515\times10^{22}\,\mathrm{ER}^6+$$
$$1.57922\times10^{25}\,\mathrm{ER}^7-7.86219\times10^{27}\,\mathrm{ER}^8-1.74027\times10^{29}\,\mathrm{ER}^9+$$
$$\left.2.47122\times10^{26}\,\mathrm{ER}^{10}\right)\left(\frac{1}{8}(0.0000862597+0.0240799\,\mathrm{ER})+\right.$$
$$\left.\frac{1}{32}\left(0.0000862597-0.0240799\,\mathrm{ER}+6.72204\,\mathrm{ER}^2\right)\right)+$$
$$\left(0.175687-13661.5\,\mathrm{ER}+3.95565\times10^{8}\,\mathrm{ER}^2-5.53171\times10^{12}\,\mathrm{ER}^3+\right.$$
$$4.3061\times10^{16}\,\mathrm{ER}^4-1.90198\times10^{20}\,\mathrm{ER}^5+4.6504\times10^{23}\,\mathrm{ER}^6-5.77441\times10^{26}\,\mathrm{ER}^7+$$
$$\left.2.77381\times10^{29}\,\mathrm{ER}^8+1.21737\times10^{31}\,\mathrm{ER}^9+1.35373\times10^{32}\,\mathrm{ER}^{10}\right)$$
$$\left(\frac{1}{8}(0.0000862597+0.0240799\,\mathrm{ER})+\right.$$
$$\left.\left.\frac{1}{32}\left(0.0000862597-0.0240799\,\mathrm{ER}+6.72204\,\mathrm{ER}^2\right)\right)\right)$$
$$\left(0.267504\left(-e^{-\left(1.05455+158.11\sqrt{\mathrm{ER}}\right)^2}\left(-1.05455+158.11\sqrt{\mathrm{ER}}\right)+\right.\right.$$

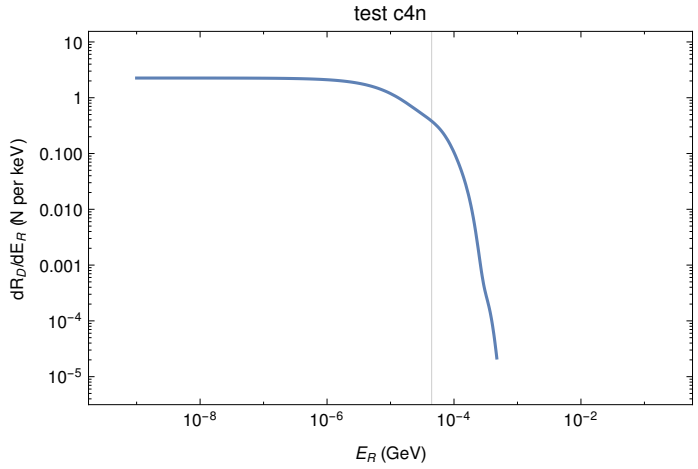
$$e^{-\left(1.05455-158.11\sqrt{ER}\right)^2}\left(1.05455+158.11\sqrt{ER}\right)\Big)+$$
$$0.764342\left(\text{Erf}\left[1.05455-158.11\sqrt{ER}\right]+\text{Erf}\left[1.05455+158.11\sqrt{ER}\right]\right)\Big)\Big)$$

Note units of $\frac{dR_D}{dE_R}$ are "event rate per unit time, per unit detector mass, per unit recoil energy". Multiplying in the exposure in kilogram days gets "event rate per unit recoil energy"
Note also kinematic threshold $E_{R,\max} = 2\frac{\mu_T^2 v^2}{m_T}$, with $\mu_T = \frac{m_\chi m_T}{m_\chi + m_T}$(I assume).

In[853]:=
```
(*as function of E_R *)
mχ = 150; (*GeV*)
mT = 131 mNucleon ;
μT = mχ GeV mT / (mχ GeV + mT);
ERmax = 2 μT^2 v^2 / mT / GeV /. v → ve(*just using earth speed to get rough number ,
and get rid of GeV units for plotting*)

resttozero = {c1p → 0, c1n → 0, c2p → 0, c2n → 0, c3p → 0, c3n → 0, c4p → 0,
      c4n → 0, c5p → 0, c5n → 0, c6p → 0, c6n → 0, c7p → 0, c7n → 0, c8p → 0,
      c8n → 0, c9p → 0, c9n → 0, c10p → 0, c10n → 0, c11p → 0, c11n → 0, c12p → 0,
      c12n → 0, c13p → 0, c13n → 0, c14p → 0, c14n → 0, c15p → 0, c15n → 0};
arg = 2500 KilogramDay * fdRdE[Sqrt[2 mT ER / GeV]] GeV /. MWIMP → mχ /. {c4n → 1} /.
      resttozero;
LogLogPlot[10^3 * arg * 10^-9, {ER, 10^-9, 0.1}, Frame → True,
  FrameLabel → {"E_R (GeV)", "dR_D/dE_R (N per keV)"},
  GridLines→ {{ERmax }, {}}, PlotLabel → "test c4n"]
```

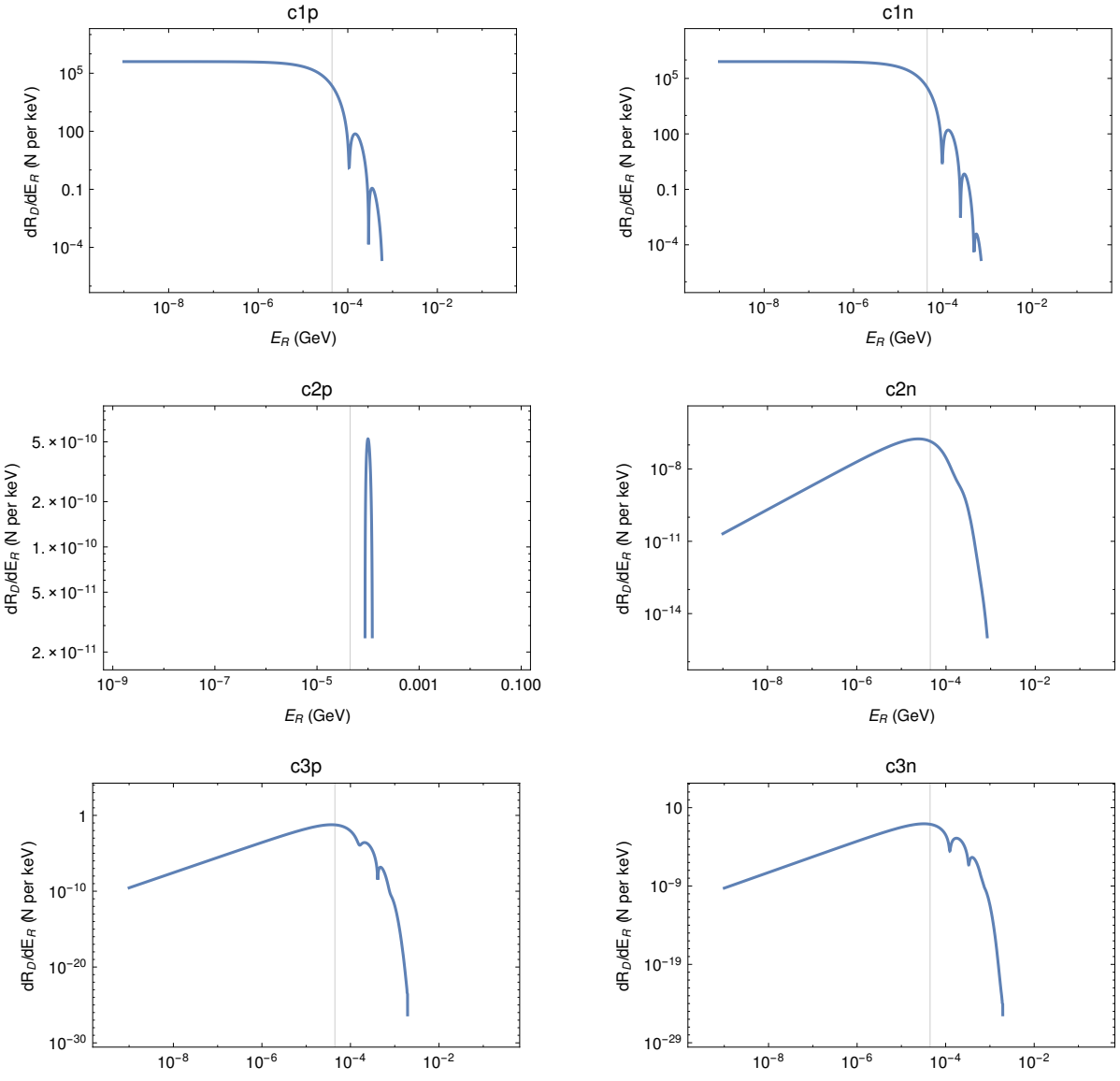
Out[856]= 0.0000444707

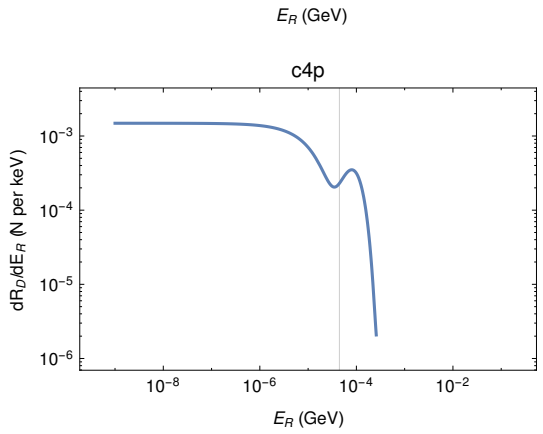
Out[859]=

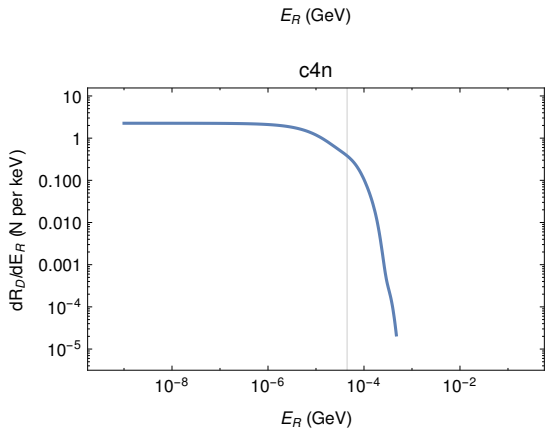


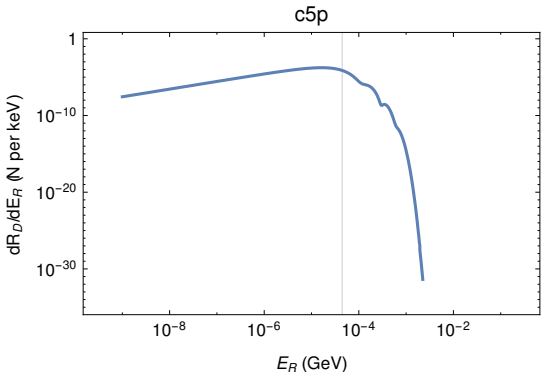
In[860]:=
```
(* Grid *)
arg = 2500 KilogramDay * fdRdE[Sqrt[2 mT ER / GeV]] GeV /. MWIMP → mχ ;

coefflist = {c1p, c1n, c2p, c2n, c3p, c3n, c4p, c4n, c5p, c5n, c6p, c6n, c7p, c7n, c8p, c8n,
    c9p, c9n, c10p, c10n, c11p, c11n, c12p, c12n, c13p, c13n, c14p, c14n, c15p, c15n};
resttozero = {c1p → 0, c1n → 0, c2p → 0, c2n → 0, c3p → 0, c3n → 0, c4p → 0,
    c4n → 0, c5p → 0, c5n → 0, c6p → 0, c6n → 0, c7p → 0, c7n → 0, c8p → 0,
    c8n → 0, c9p → 0, c9n → 0, c10p → 0, c10n → 0, c11p → 0, c11n → 0, c12p → 0,
    c12n → 0, c13p → 0, c13n → 0, c14p → 0, c14n → 0, c15p → 0, c15n → 0};
rules = Table[{coefflist[[i]] → 1}, {i, 1, 30}];
titles = Table[coefflist[[i]], {i, 1, 30}];
plots = Table[
    LogLogPlot[10^3 * arg * 10^-9 /. rules[[i]] /. resttozero, {ER, 10^-9, 0.1},
      Frame → True, FrameLabel → {"E_R (GeV)", "dR_D/dE_R (N per keV)"},
      GridLines→ {{ERmax }, {}}, PlotLabel → titles[[i]]], {i, 1, 30}];
```

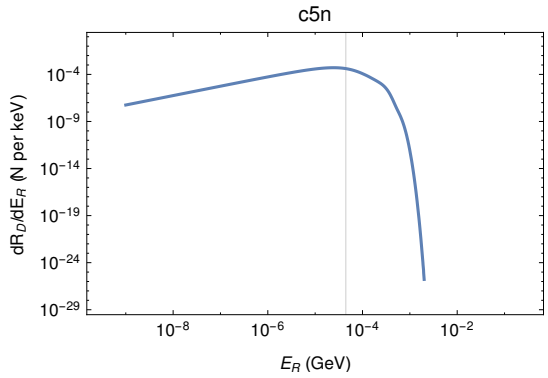
In[866]:=
```
GraphicsGrid[ArrayReshape[plots, {15, 2}], ImageSize → Full]
```

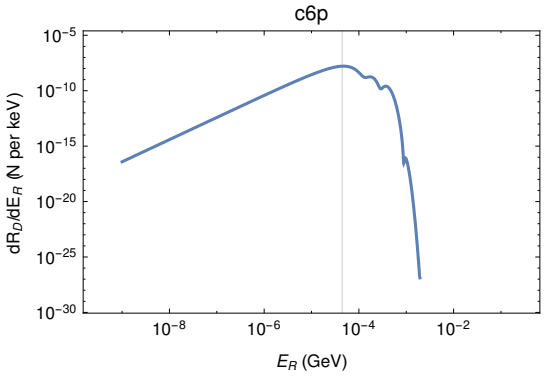


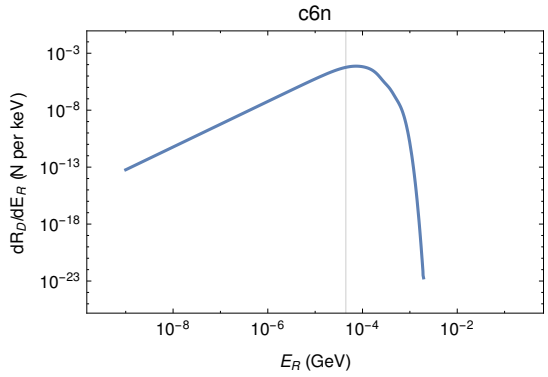

$E_R$ (GeV)
c4p
$dR_D/dE_R$ (N per keV)
$10^{-3}$
$10^{-4}$
$10^{-5}$
$10^{-6}$
$10^{-8}$
$10^{-6}$
$10^{-4}$
$10^{-2}$
$E_R$ (GeV)

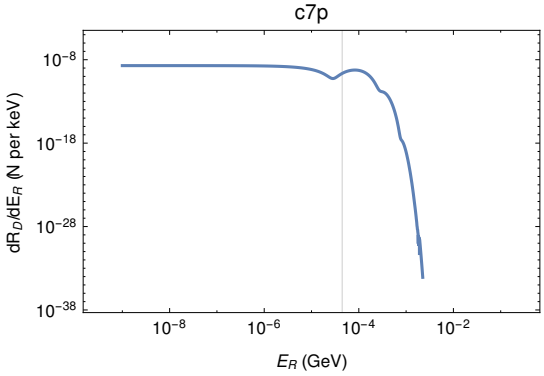

$E_R$ (GeV)
c4n
$dR_D/dE_R$ (N per keV)
10
1
0.100
0.010
0.001
$10^{-4}$
$10^{-5}$
$10^{-8}$
$10^{-6}$
$10^{-4}$
$10^{-2}$
$E_R$ (GeV)

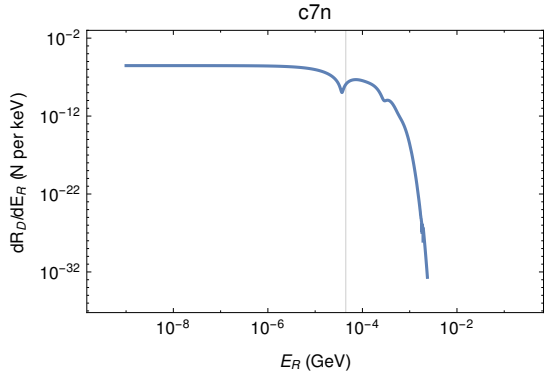

c5p
$dR_D/dE_R$ (N per keV)
1
$10^{-10}$
$10^{-20}$
$10^{-30}$
$10^{-8}$
$10^{-6}$
$10^{-4}$
$10^{-2}$
$E_R$ (GeV)

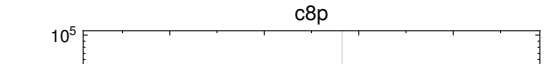

c5n
$dR_D/dE_R$ (N per keV)
$10^{-4}$
$10^{-9}$
$10^{-14}$
$10^{-19}$
$10^{-24}$
$10^{-29}$
$10^{-8}$
$10^{-6}$
$10^{-4}$
$10^{-2}$
$E_R$ (GeV)

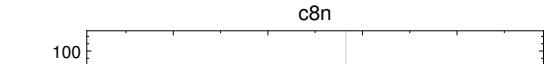

c6p
$dR_D/dE_R$ (N per keV)
$10^{-5}$
$10^{-10}$
$10^{-15}$
$10^{-20}$
$10^{-25}$
$10^{-30}$
$10^{-8}$
$10^{-6}$
$10^{-4}$
$10^{-2}$
$E_R$ (GeV)


c6n
$dR_D/dE_R$ (N per keV)
$10^{-3}$
$10^{-8}$
$10^{-13}$
$10^{-18}$
$10^{-23}$
$10^{-8}$
$10^{-6}$
$10^{-4}$
$10^{-2}$
$E_R$ (GeV)

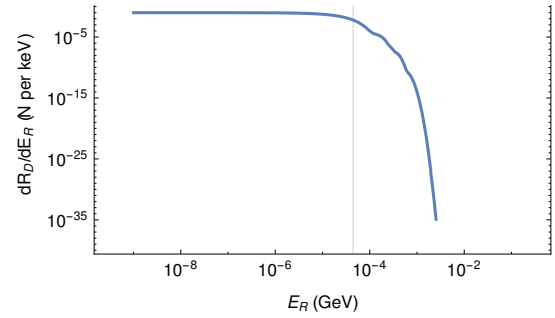

c7p
$dR_D/dE_R$ (N per keV)
$10^{-8}$
$10^{-18}$
$10^{-28}$
$10^{-38}$
$10^{-8}$
$10^{-6}$
$10^{-4}$
$10^{-2}$
$E_R$ (GeV)

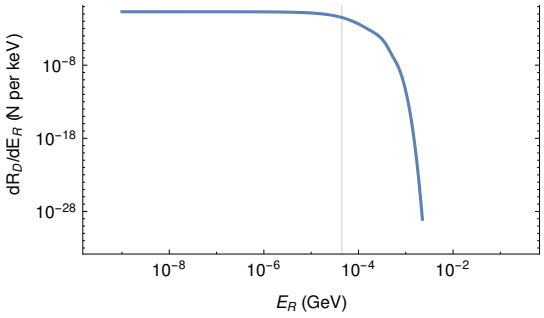

c7n
$dR_D/dE_R$ (N per keV)
$10^{-2}$
$10^{-12}$
$10^{-22}$
$10^{-32}$
$10^{-8}$
$10^{-6}$
$10^{-4}$
$10^{-2}$
$E_R$ (GeV)

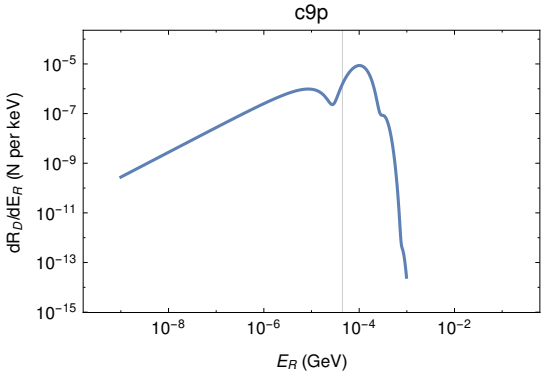

c8p
$10^5$

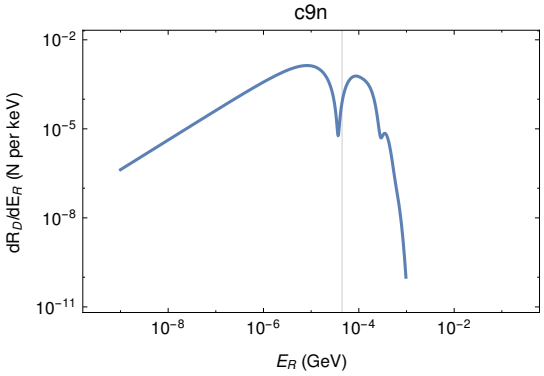

c8n
100

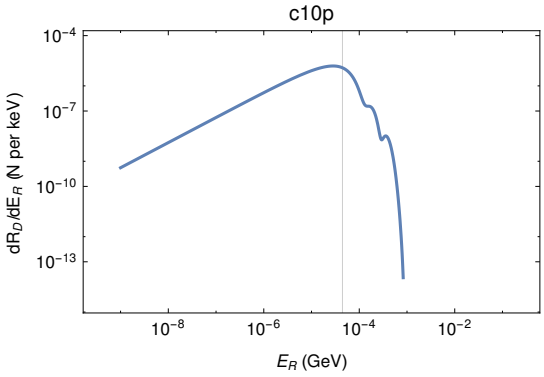
Out[866]=

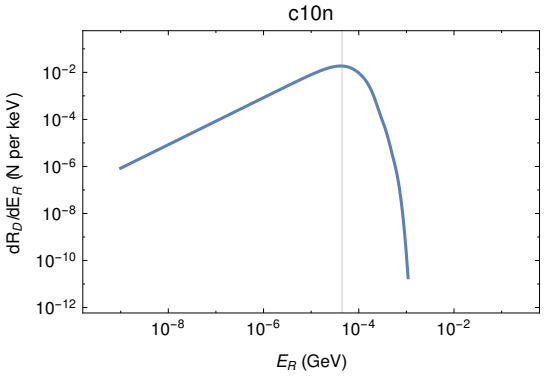

dR_D/dE_R (N per keV)
E_R (GeV)

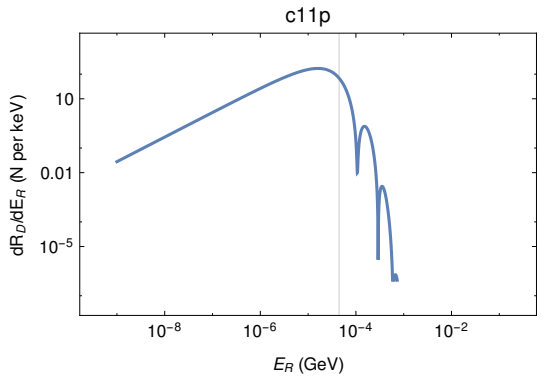

dR_D/dE_R (N per keV)
E_R (GeV)

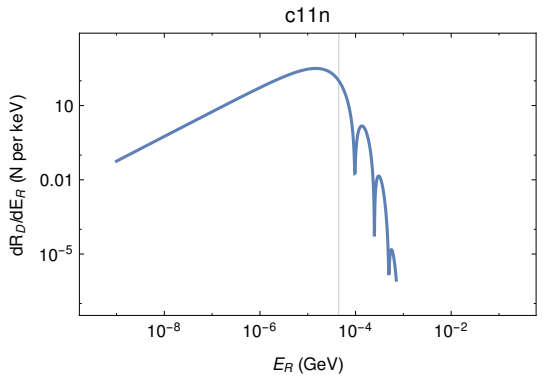

c9p
dR_D/dE_R (N per keV)
E_R (GeV)

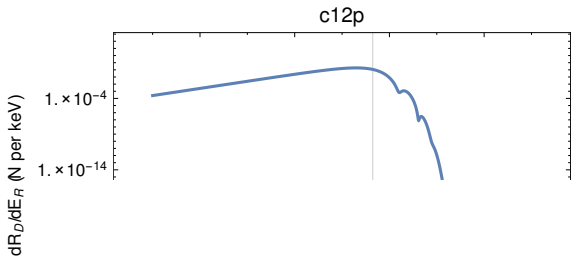

c9n
dR_D/dE_R (N per keV)
E_R (GeV)

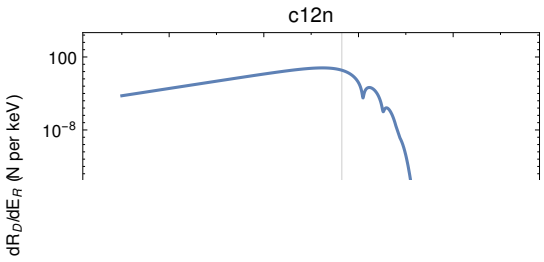

c10p
dR_D/dE_R (N per keV)
E_R (GeV)

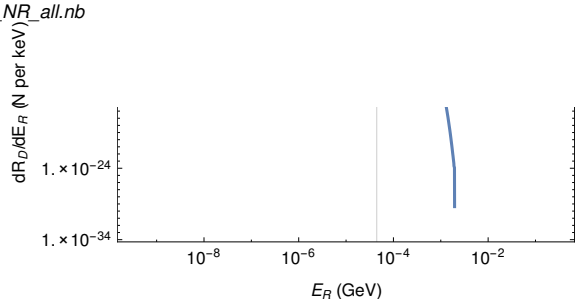

c10n
dR_D/dE_R (N per keV)
E_R (GeV)

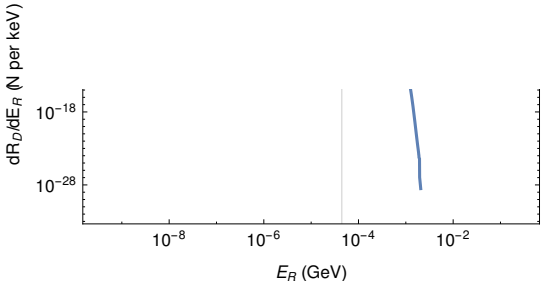

c11p
dR_D/dE_R (N per keV)
E_R (GeV)

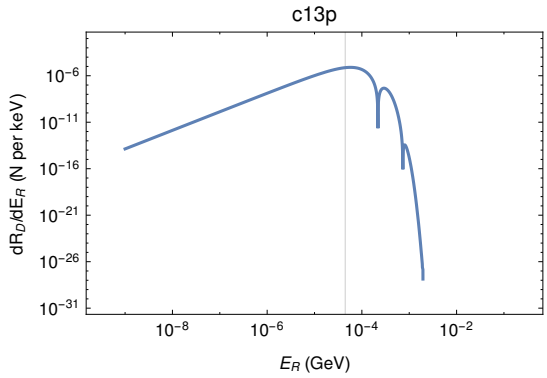

c11n
dR_D/dE_R (N per keV)
E_R (GeV)

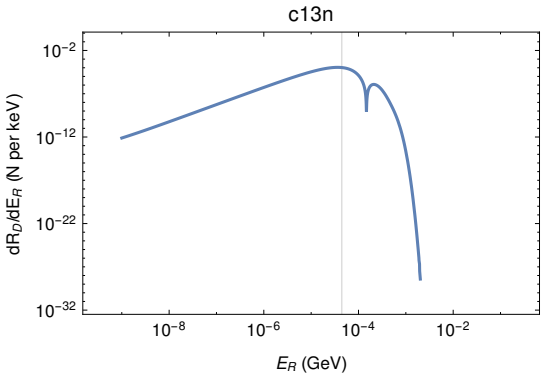

c12p
dR_D/dE_R (N per keV)

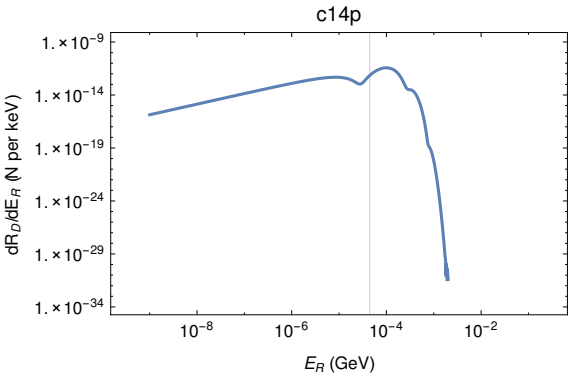

c12n
dR_D/dE_R (N per keV)

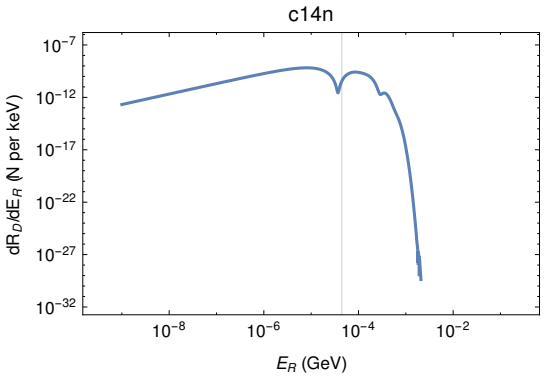

dR_D/dE_R (N per keV)
1.×10^-24
1.×10^-34
10^-8
10^-6
10^-4
10^-2
E_R (GeV)

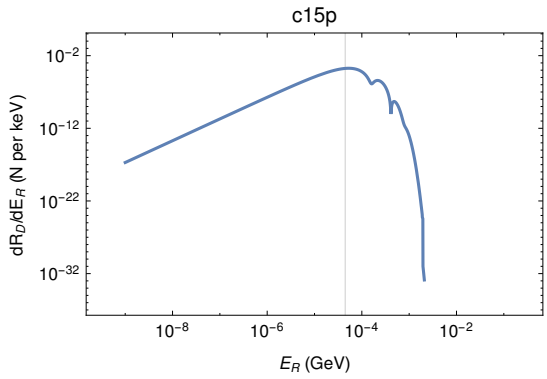

dR_D/dE_R (N per keV)
10^-18
10^-28
10^-8
10^-6
10^-4
10^-2
E_R (GeV)

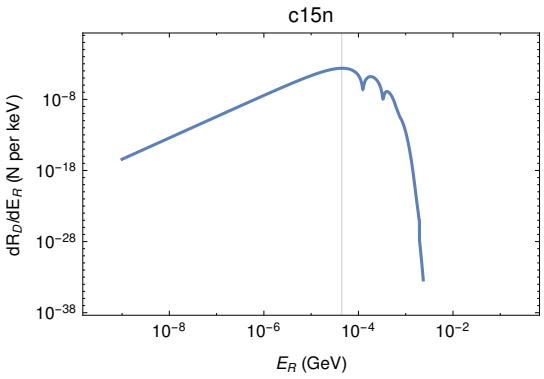

c13p
dR_D/dE_R (N per keV)
10^-6
10^-11
10^-16
10^-21
10^-26
10^-31
10^-8
10^-6
10^-4
10^-2
E_R (GeV)


c13n
dR_D/dE_R (N per keV)
10^-2
10^-12
10^-22
10^-32
10^-8
10^-6
10^-4
10^-2
E_R (GeV)


c14p
dR_D/dE_R (N per keV)
1.×10^-9
1.×10^-14
1.×10^-19
1.×10^-24
1.×10^-29
1.×10^-34
10^-8
10^-6
10^-4
10^-2
E_R (GeV)


c14n
dR_D/dE_R (N per keV)
10^-7
10^-12
10^-17
10^-22
10^-27
10^-32
10^-8
10^-6
10^-4
10^-2
E_R (GeV)


c15p
dR_D/dE_R (N per keV)
10^-2
10^-12
10^-22
10^-32
10^-8
10^-6
10^-4
10^-2
E_R (GeV)


c15n
dR_D/dE_R (N per keV)
10^-8
10^-18
10^-28
10^-38
10^-8
10^-6
10^-4
10^-2
E_R (GeV)