Details for computation of stability conditions (vector-tensor theories with $\alpha_D = 0$)

The coefficients of the mass matrix (M_1, M_2 and M_M) mentioned in the paper are:

Out[885]=
$$-M_1\ \delta\varphi^{1\,2} == -\left(\left(k^2\,M_V{}^2\left(\tilde{\alpha}_K\,\dot{\varphi}^2\left(4\,\dot{H}+H\left(4\,\dot{\tilde{\alpha}}_C+\left(4\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)H\right)\right)+8\,\tilde{\alpha}_K\,\dot{H}^2\,M_V{}^2+\right.\right.\right.$$
$$\left.\left.2\,H^2\left(\left(-2+\tilde{\alpha}_A\right)^2\dot{\varphi}^2-2\left(4\left(-1+\tilde{\alpha}_A\right)\dot{H}+4\,\dot{\tilde{\alpha}}_C\,H+\left(4\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)H^2\right)M_V{}^2\right)\right)$$
$$\left.\delta\varphi^{1\,2}\ a^2\right)\Big/\left(4\,\tilde{\alpha}_K\left(\dot{\varphi}^2+2\,\dot{H}\,M_V{}^2\right)^2+8\,H^2\,M_V{}^2\right.$$
$$\left.\left(-2\left(-1+\tilde{\alpha}_A\right)\dot{\varphi}^2-\left(4\left(-1+\tilde{\alpha}_A\right)\dot{H}+4\,\dot{\tilde{\alpha}}_C\,H+\left(4\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)H^2\right)M_V{}^2\right)\right)\right)$$

Out[886]=
$$-M_2\ \delta A_1{}^{1\,2} ==$$
$$-\left(\left(H\,M_V{}^2\left(2\,\tilde{\alpha}_K\,H\left(\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\right)^2\dot{\varphi}^8+2\,\dot{\varphi}^5\left(\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\right)\left(6+\tilde{\alpha}_A+8\,\tilde{\alpha}_C\right)\dot{H}\,\dot{\varphi}+2\left(\left(-2+\tilde{\alpha}_A\right)\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\right)\right.\right.\right.\right.\right.$$
$$\left.\left.\left.\ddot{\varphi}-\left(-1+\tilde{\alpha}_A+\tilde{\alpha}_C\right)\dot{\tilde{\alpha}}_A\,\dot{\varphi}+\left(-2+3\,\tilde{\alpha}_A\right)\dot{\tilde{\alpha}}_C\,\dot{\varphi}\right)H+\left(-\tilde{\alpha}_A{}^2\left(1+2\,\tilde{\alpha}_M\right)+\right.\right.\right.$$
$$\left.\left.\left.\tilde{\alpha}_A\left(2+4\,\tilde{\alpha}_M+\tilde{\alpha}_C\left(6+4\,\tilde{\alpha}_M\right)-\tilde{\alpha}_V\right)+2\left(\tilde{\alpha}_C\left(-2+\tilde{\alpha}_V\right)+\tilde{\alpha}_V\right)\right)\dot{\varphi}\,H^2\right)M_V{}^2-$$
$$\dot{\varphi}^3\left(12\left(-6+\tilde{\alpha}_A-4\,\tilde{\alpha}_C\right)\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\right)\dot{H}^2\,\dot{\varphi}-4\left(4\left(-2+\tilde{\alpha}_A\right)\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\right)\ddot{\varphi}\,\dot{H}+\right.\right.$$
$$\left.\left.\left(-2+\tilde{\alpha}_A\right)\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\right)\ddot{H}\,\dot{\varphi}-2\left(3\left(-1+\tilde{\alpha}_A+\tilde{\alpha}_C\right)\dot{\tilde{\alpha}}_A+\left(6-5\,\tilde{\alpha}_A+8\,\tilde{\alpha}_C\right)\dot{\tilde{\alpha}}_C\right)\dot{H}\,\dot{\varphi}\right)\right.$$
$$H+4\left(-8\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\right)\ddot{\varphi}\,\dot{\tilde{\alpha}}_C+\left(4\,\tilde{\alpha}_C\,\dddot{\tilde{\alpha}}_C+2\left(\dot{\tilde{\alpha}}_A-2\,\dot{\tilde{\alpha}}_C\right)\ddot{\tilde{\alpha}}_C+\tilde{\alpha}_A{}^2\left(3+5\,\tilde{\alpha}_M\right)\dot{H}+\right.\right.$$
$$\left.\left.4\,\tilde{\alpha}_C\left(3+6\,\tilde{\alpha}_M+5\,\tilde{\alpha}_C\left(1+\tilde{\alpha}_M\right)-5\,\tilde{\alpha}_T\right)\dot{H}-\left(5+\tilde{\alpha}_C\right)\tilde{\alpha}_V\,\dot{H}+\right.\right.$$
$$\left.\left.2\,\tilde{\alpha}_A\left(\ddot{\tilde{\alpha}}_C+\left(-3-2\,\tilde{\alpha}_C\left(2+\tilde{\alpha}_M\right)-5\,\tilde{\alpha}_T+\tilde{\alpha}_V\right)\dot{H}\right)\right)\dot{\varphi}\right)H^2-$$
$$4\left(4\left(2\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\right)\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_C\,\tilde{\alpha}_V\right)\ddot{\varphi}-\left(-2\,\tilde{\alpha}_T\,\dot{\tilde{\alpha}}_A+\tilde{\alpha}_V\,\dot{\tilde{\alpha}}_A+4\,\tilde{\alpha}_T\,\dot{\tilde{\alpha}}_C+\right.\right.$$
$$\left.\left.\tilde{\alpha}_V\,\dot{\tilde{\alpha}}_C+2\,\tilde{\alpha}_M\left(\dot{\tilde{\alpha}}_A-2\,\dot{\tilde{\alpha}}_C+4\,\tilde{\alpha}_A\,\dot{\tilde{\alpha}}_C\right)+4\,\tilde{\alpha}_C{}^2\,\dot{\tilde{\alpha}}_M+\tilde{\alpha}_A\left(4\,\dot{\tilde{\alpha}}_C+2\,\dot{\tilde{\alpha}}_M-2\,\dot{\tilde{\alpha}}_T-\dot{\tilde{\alpha}}_V\right)+\right.\right.$$
$$\left.\left.\dot{\tilde{\alpha}}_V+\tilde{\alpha}_C\left(2\left(1+\tilde{\alpha}_M\right)\dot{\tilde{\alpha}}_A+4\left(-1+\tilde{\alpha}_M\right)\dot{\tilde{\alpha}}_C+2\left(2+\tilde{\alpha}_A\right)\dot{\tilde{\alpha}}_M-4\,\dot{\tilde{\alpha}}_T+\dot{\tilde{\alpha}}_V\right)\right)\dot{\varphi}\right)H^3+$$
$$\left(8\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\left(-1+\tilde{\alpha}_M\right)+3\,\tilde{\alpha}_A\,\tilde{\alpha}_M\right)\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\right.$$
$$\left.4\left(1+\tilde{\alpha}_C+3\,\tilde{\alpha}_M+3\,\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_A\left(1+\tilde{\alpha}_M\right)-2\,\tilde{\alpha}_T\right)\tilde{\alpha}_V+\tilde{\alpha}_V{}^2\right)\dot{\varphi}\,H^4\Big)\,M_V{}^{2\,2}-$$
$$2\,\dot{\varphi}\left(4\left(-18+5\,\tilde{\alpha}_A-8\,\tilde{\alpha}_C\right)\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\right)\dot{H}^3\,\dot{\varphi}-8\,\dot{H}\left(\left(-2+\tilde{\alpha}_A\right)\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\right)\ddot{\varphi}\,\dot{H}+\right.\right.$$
$$\left.\left.\left(\left(-2+\tilde{\alpha}_A\right)\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\right)\ddot{H}-3\left(-1+\tilde{\alpha}_A+\tilde{\alpha}_C\right)\dot{\tilde{\alpha}}_A\,\dot{H}+\left(-6+\tilde{\alpha}_A-16\,\tilde{\alpha}_C\right)\dot{\tilde{\alpha}}_C\,\dot{H}\right)\dot{\varphi}\right)H+\right.$$
$$4\left(-8\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\right)\ddot{\varphi}\,\dot{\tilde{\alpha}}_C\,\dot{H}+\left(-4\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\right)\ddot{H}\,\dot{\tilde{\alpha}}_C+4\left(\tilde{\alpha}_A\,\ddot{\tilde{\alpha}}_C+2\,\tilde{\alpha}_C\,\ddot{\tilde{\alpha}}_C+\left(\dot{\tilde{\alpha}}_A-2\,\dot{\tilde{\alpha}}_C\right)\right.\right.\right.$$
$$\left.\left.\left.\dot{\tilde{\alpha}}_C\right)\dot{H}+\left(\tilde{\alpha}_A{}^2\left(3+4\,\tilde{\alpha}_M\right)-4\,\tilde{\alpha}_V+\tilde{\alpha}_A\left(-6+12\,\tilde{\alpha}_M+\tilde{\alpha}_C\left(2+4\,\tilde{\alpha}_M\right)-\right.\right.\right.\right.$$
$$\left.\left.\left.\left.20\,\tilde{\alpha}_T+\tilde{\alpha}_V\right)+4\,\tilde{\alpha}_C\left(3+12\,\tilde{\alpha}_M+10\,\tilde{\alpha}_C\left(1+\tilde{\alpha}_M\right)-10\,\tilde{\alpha}_T+\tilde{\alpha}_V\right)\right)\dot{H}^2\right)\dot{\varphi}\right)$$
$$H^2-8\left(4\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\right)\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)\ddot{\varphi}\,\dot{H}+2\,\tilde{\alpha}_C\,\tilde{\alpha}_V\,\ddot{\varphi}\,\dot{H}+\right.$$
$$\left(2\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\right)\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_C\,\tilde{\alpha}_V\right)\ddot{H}\,\dot{\varphi}-\left(-2\,\tilde{\alpha}_T\,\dot{\tilde{\alpha}}_A+\tilde{\alpha}_V\,\dot{\tilde{\alpha}}_A+4\,\tilde{\alpha}_T\,\dot{\tilde{\alpha}}_C+\right.$$
$$\left.\tilde{\alpha}_V\,\dot{\tilde{\alpha}}_C+2\,\tilde{\alpha}_M\left(\dot{\tilde{\alpha}}_A-2\,\dot{\tilde{\alpha}}_C+3\,\tilde{\alpha}_A\,\dot{\tilde{\alpha}}_C\right)+4\,\tilde{\alpha}_C{}^2\,\dot{\tilde{\alpha}}_M+\tilde{\alpha}_A\left(4\,\dot{\tilde{\alpha}}_C+2\,\dot{\tilde{\alpha}}_M-2\,\dot{\tilde{\alpha}}_T-\dot{\tilde{\alpha}}_V\right)+\right.$$
$$\left.\dot{\tilde{\alpha}}_V+\tilde{\alpha}_C\left(2\left(1+\tilde{\alpha}_M\right)\dot{\tilde{\alpha}}_A-4\,\dot{\tilde{\alpha}}_C+2\left(2+\tilde{\alpha}_A\right)\dot{\tilde{\alpha}}_M-4\,\dot{\tilde{\alpha}}_T+\dot{\tilde{\alpha}}_V\right)\right)\dot{H}\,\dot{\varphi}\Big)\,H^3+$$

$$\left(-8\,\tilde{\alpha}_V\,\dddot{\varphi}\,\dot{\tilde{\alpha}}_C+\left(-4\,\dot{\tilde{\alpha}}_C\,\dot{\tilde{\alpha}}_V+16\,\left(\tilde{\alpha}_A-2\,\tilde{\alpha}_C+2\,\tilde{\alpha}_A\,\tilde{\alpha}_M\right)\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)\,\dot{H}+3\,\tilde{\alpha}_V{}^2\right.\right.$$
$$\left.\left.\dot{H}+4\,\tilde{\alpha}_V\,\left(\ddot{\tilde{\alpha}}_C+\left(2+3\,\tilde{\alpha}_C+7\,\tilde{\alpha}_M+5\,\tilde{\alpha}_C\,\tilde{\alpha}_M-2\,\tilde{\alpha}_A\,\left(1+\tilde{\alpha}_M\right)-5\,\tilde{\alpha}_T\right)\,\dot{H}\right)\right)\,\dot{\varphi}\right)\,H^4-$$
$$2\,\left(\tilde{\alpha}_V\,\left(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)\,\ddot{\varphi}-2\,\tilde{\alpha}_V\,\left(\tilde{\alpha}_M\,\dot{\tilde{\alpha}}_C+\dot{\tilde{\alpha}}_M+\tilde{\alpha}_C\,\dot{\tilde{\alpha}}_M-\dot{\tilde{\alpha}}_T\right)\,\dot{\varphi}+\right.$$
$$\left.2\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)\,\dot{\tilde{\alpha}}_V\,\dot{\varphi}\right)\,H^5-\tilde{\alpha}_V\,\left(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)\,\dot{\varphi}\,H^6\Big)\,M_V{}^{2\,3}-$$
$$4\,\left(8\,\left(-3+\tilde{\alpha}_A-\tilde{\alpha}_C\right)\,\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\right)\,\dot{H}^4+4\,\dot{H}^2\,\left(\left(2-\tilde{\alpha}_A\right)\,\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\right)\,\ddot{H}+\right.\right.$$
$$\left.\left.2\,\left(\left(-1+\tilde{\alpha}_A+\tilde{\alpha}_C\right)\,\dot{\tilde{\alpha}}_A+\left(2+\tilde{\alpha}_A+8\,\tilde{\alpha}_C\right)\,\dot{\tilde{\alpha}}_C\right)\,\dot{H}\right)\,H+$$
$$4\,\dot{H}\,\left(-4\,\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\right)\,\ddot{H}\,\dot{\tilde{\alpha}}_C+2\,\left(\tilde{\alpha}_A\,\ddot{\tilde{\alpha}}_C+2\,\tilde{\alpha}_C\,\ddot{\tilde{\alpha}}_C+\left(\dot{\tilde{\alpha}}_A-2\,\dot{\tilde{\alpha}}_C\right)\,\dot{\tilde{\alpha}}_C\right)\,\dot{H}+\right.$$
$$\left(\tilde{\alpha}_A{}^2\,\left(1+\tilde{\alpha}_M\right)+2\,\tilde{\alpha}_A\,\left(-1+4\,\tilde{\alpha}_M+2\,\tilde{\alpha}_C\,\left(1+\tilde{\alpha}_M\right)-5\,\tilde{\alpha}_T\right)+\right.$$
$$\left.\left.4\,\tilde{\alpha}_C\,\left(1+6\,\tilde{\alpha}_M+5\,\tilde{\alpha}_C\,\left(1+\tilde{\alpha}_M\right)-5\,\tilde{\alpha}_T\right)+\left(-1+3\,\tilde{\alpha}_C\right)\,\tilde{\alpha}_V\right)\,\dot{H}^2\right)\,H^2+4\,\dot{H}$$
$$\left(-2\,\left(2\,\left(\tilde{\alpha}_A+2\,\tilde{\alpha}_C\right)\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_C\,\tilde{\alpha}_V\right)\,\ddot{H}+\left(-2\,\tilde{\alpha}_T\,\dot{\tilde{\alpha}}_A+\tilde{\alpha}_V\,\dot{\tilde{\alpha}}_A+4\,\tilde{\alpha}_T\,\dot{\tilde{\alpha}}_C+\right.\right.$$
$$\tilde{\alpha}_V\,\dot{\tilde{\alpha}}_C+2\,\tilde{\alpha}_M\,\left(\dot{\tilde{\alpha}}_A+2\,\left(-1+\tilde{\alpha}_A\right)\,\dot{\tilde{\alpha}}_C\right)+4\,\tilde{\alpha}_C{}^2\,\dot{\tilde{\alpha}}_M+\tilde{\alpha}_A\,\left(4\,\dot{\tilde{\alpha}}_C+2\,\dot{\tilde{\alpha}}_M-2\,\dot{\tilde{\alpha}}_T-\dot{\tilde{\alpha}}_V\right)+$$
$$\left.\left.\dot{\tilde{\alpha}}_V+\tilde{\alpha}_C\,\left(2\,\left(1+\tilde{\alpha}_M\right)\,\dot{\tilde{\alpha}}_A-4\,\left(1+\tilde{\alpha}_M\right)\,\dot{\tilde{\alpha}}_C+2\,\left(2+\tilde{\alpha}_A\right)\,\dot{\tilde{\alpha}}_M-4\,\dot{\tilde{\alpha}}_T+\dot{\tilde{\alpha}}_V\right)\right)\,\dot{H}\right)\,H^3+$$
$$2\,\left(-2\,\tilde{\alpha}_V\,\ddot{H}\,\dot{\tilde{\alpha}}_C+2\,\left(\tilde{\alpha}_V\,\ddot{\tilde{\alpha}}_C-\dot{\tilde{\alpha}}_C\,\dot{\tilde{\alpha}}_V\right)\,\dot{H}+\left(4\,\left(\tilde{\alpha}_A-2\,\tilde{\alpha}_C\right)\,\left(1+\tilde{\alpha}_M\right)\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)-\right.\right.$$
$$\left.\left.2\,\left(-1-4\,\tilde{\alpha}_M+\tilde{\alpha}_A\,\left(1+\tilde{\alpha}_M\right)-2\,\tilde{\alpha}_C\,\left(1+\tilde{\alpha}_M\right)+3\,\tilde{\alpha}_T\right)\,\tilde{\alpha}_V+\tilde{\alpha}_V{}^2\right)\,\dot{H}^2\right)\,H^4-$$
$$\left(\tilde{\alpha}_V\,\left(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)\,\ddot{H}+4\,\left(\tilde{\alpha}_V\,\left(\left(-1-\tilde{\alpha}_C\right)\,\dot{\tilde{\alpha}}_M+\dot{\tilde{\alpha}}_T\right)+\right.\right.$$
$$\left.\left.\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)\,\dot{\tilde{\alpha}}_V\right)\,\dot{H}\right)\,H^5-$$
$$\left.\left(1+\tilde{\alpha}_M\right)\,\tilde{\alpha}_V\,\left(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)\,\dot{H}\,H^6\right)\,M_V{}^{2\,4}\Big)-$$
$$\tilde{\alpha}_K{}^2\,\left(\dot{\varphi}^2+2\,\dot{H}\,M_V{}^2\right)^2\,\left(4\,\dot{\tilde{\alpha}}_C\,\left(\dot{\varphi}^2+2\,\dot{H}\,M_V{}^2\right)^2+H\,\left(-\tilde{\alpha}_V\,\dot{\varphi}^4+2\,\dot{\varphi}\,\left(\tilde{\alpha}_V\,\dot{H}\,\dot{\varphi}+\dot{\tilde{\alpha}}_V\,\dot{\varphi}\,H+\right.\right.\right.$$
$$\left.\left.\left.\tilde{\alpha}_V\,H\,\left(-2\,\ddot{\varphi}+\left(1+2\,\tilde{\alpha}_M\right)\,\dot{\varphi}\,H\right)\right)\,M_V{}^2+\right.\right.$$
$$\left.\left.4\,\left(\dot{\tilde{\alpha}}_V\,\dot{H}\,H+\tilde{\alpha}_V\,\left(2\,\dot{H}^2-\ddot{H}\,H+\left(1+\tilde{\alpha}_M\right)\,\dot{H}\,H^2\right)\right)\,M_V{}^{2\,2}+4\,\tilde{\alpha}_C\,\left(1+\tilde{\alpha}_M\right)\,\left(\dot{\varphi}^2+2\,\dot{H}\,M_V{}^2\right)^2\right)\right)+$$
$$4\,H^2\,M_V{}^2\,\left(2\,\tilde{\alpha}_A{}^3\,H\,\left(\dot{\varphi}^2+2\,\dot{H}\,M_V{}^2\right)^2\,\left(-\dot{\varphi}^2+2\,\left(1+\tilde{\alpha}_M\right)\,H^2\,M_V{}^2\right)-\right.$$
$$\left(-2\,\dot{\varphi}^2-4\,\dot{H}\,M_V{}^2+H\,\left(4\,\dot{\tilde{\alpha}}_C+\left(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)\,H\right)\,M_V{}^2\right)$$
$$\left(2\,\tilde{\alpha}_C\,\dot{\varphi}^4\,\left(-\dot{\tilde{\alpha}}_K+2\,\tilde{\alpha}_C\,H\right)+\dot{\varphi}^2\,\left(-8\,\tilde{\alpha}_C\,\dot{\tilde{\alpha}}_K\,\dot{H}+8\,\tilde{\alpha}_C\,\left(1+2\,\tilde{\alpha}_C\right)\,\dot{H}\,H+\right.\right.$$
$$\left.\left.\left(4\,\left(1+\tilde{\alpha}_C\right)\,\dot{\tilde{\alpha}}_A-\tilde{\alpha}_V\,\dot{\tilde{\alpha}}_K\right)\,H^2+2\,\left(1+2\,\tilde{\alpha}_C\right)\,\tilde{\alpha}_V\,H^3\right)\,M_V{}^2-\right.$$
$$2\,\left(4\,\tilde{\alpha}_C\,\dot{\tilde{\alpha}}_K\,\dot{H}^2-8\,\tilde{\alpha}_C\,\left(1+\tilde{\alpha}_C\right)\,\dot{H}^2\,H+\left(-4\,\left(1+\tilde{\alpha}_C\right)\,\dot{\tilde{\alpha}}_A+8\,\tilde{\alpha}_C\,\dot{\tilde{\alpha}}_C+\tilde{\alpha}_V\,\dot{\tilde{\alpha}}_K\right)\,\dot{H}\,H^2+\right.$$
$$\left.\left.2\,\left(2\,\dot{\tilde{\alpha}}_A\,\dot{\tilde{\alpha}}_C+4\,\tilde{\alpha}_C\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)\,\dot{H}-\left(1+\tilde{\alpha}_C\right)\,\tilde{\alpha}_V\,\dot{H}\right)\,H^3+2\right.\right.$$
$$\left.\left.\left(2\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)\,\dot{\tilde{\alpha}}_A+\tilde{\alpha}_V\,\dot{\tilde{\alpha}}_C\right)\,H^4+2\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)\,\tilde{\alpha}_V\,H^5\right)\,M_V{}^{2\,2}\right)+$$
$$2\,\tilde{\alpha}_A\,\left(\dot{\tilde{\alpha}}_K\,\left(\dot{\varphi}^2+2\,\dot{H}\,M_V{}^2\right)^2\,\left(\left(-1+\tilde{\alpha}_C\right)\,\dot{\varphi}^2+2\,\left(-1+\tilde{\alpha}_C\right)\,\dot{H}\,M_V{}^2+\right.\right.$$
$$\left.\left.H\,\left(2\,\dot{\tilde{\alpha}}_C+\left(2\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)\,H\right)\,M_V{}^2\right)+\right.$$
$$2\,H\,\left(-2\,\left(-1+\tilde{\alpha}_C\right)\,\tilde{\alpha}_C\,\dot{\varphi}^6-\dot{\varphi}^4\,\left(2\,\left(-1-3\,\tilde{\alpha}_C+6\,\tilde{\alpha}_C{}^2\right)\,\dot{H}+H\,\left(2\,\dot{\tilde{\alpha}}_A+\left(-2+4\,\tilde{\alpha}_C\right)\,\dot{\tilde{\alpha}}_C+\right.\right.\right.$$

$$\left(-2-2\,\tilde{\alpha}_M+\tilde{\alpha}_V+\tilde{\alpha}_C\,\left(-2+2\,\tilde{\alpha}_M+4\,\tilde{\alpha}_C\,\left(1+\tilde{\alpha}_M\right)-4\,\tilde{\alpha}_T+3\,\tilde{\alpha}_V\right)\right)\,H\right)\,{M_V}^2+$$
$$\dot{\varphi}\,\left(8\,\left(1-3\,{\tilde{\alpha}_C}^2\right)\,\dot{H}^2\,\dot{\varphi}+\dot{H}\,\dot{\varphi}\,H\,\left(-8\,\dot{\tilde{\alpha}}_A+\left(8+4\,\tilde{\alpha}_C\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+8\,\tilde{\alpha}_T-\right.\right.\right.$$
$$\left.\left.\left.3\,\tilde{\alpha}_V-7\,\tilde{\alpha}_C\,\tilde{\alpha}_V\right)\,H\right)+H^2\,\left(4\,\left(\dot{\tilde{\alpha}}_A-\dot{\tilde{\alpha}}_C\right)\,\dot{\tilde{\alpha}}_C\,\dot{\varphi}+\tilde{\alpha}_C\,\left(-8\,\ddot{\varphi}\,\dot{\tilde{\alpha}}_C+4\,\ddot{\tilde{\alpha}}_C\,\dot{\varphi}\right)-\right.$$
$$2\,\left(\tilde{\alpha}_V+\tilde{\alpha}_C\,\left(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)\right)\,\ddot{\varphi}\,H+\left(-4\,\tilde{\alpha}_T\,\dot{\tilde{\alpha}}_A+\right.$$
$$\tilde{\alpha}_V\,\dot{\tilde{\alpha}}_A+4\,\tilde{\alpha}_M\,\left(\dot{\tilde{\alpha}}_A-3\,\dot{\tilde{\alpha}}_C\right)-8\,\dot{\tilde{\alpha}}_C+4\,\tilde{\alpha}_T\,\dot{\tilde{\alpha}}_C+\tilde{\alpha}_V\,\dot{\tilde{\alpha}}_C+4\,{\tilde{\alpha}_C}^2\,\dot{\tilde{\alpha}}_M+\dot{\tilde{\alpha}}_V+$$
$$\left.\tilde{\alpha}_C\,\left(4\,\left(1+\tilde{\alpha}_M\right)\,\dot{\tilde{\alpha}}_A-4\,\left(\dot{\tilde{\alpha}}_C-\dot{\tilde{\alpha}}_M+\dot{\tilde{\alpha}}_T\right)+\dot{\tilde{\alpha}}_V\right)\right)\,\dot{\varphi}\,H-4\,\left(2+\tilde{\alpha}_C+2\,\tilde{\alpha}_M\right)$$
$$\left.\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)\,\dot{\varphi}\,H^2+\left(-1+\tilde{\alpha}_C+2\,\tilde{\alpha}_M+2\,\tilde{\alpha}_C\,\tilde{\alpha}_M-2\,\tilde{\alpha}_T\right)\,\tilde{\alpha}_V\,\dot{\varphi}\,H^2\right)\right)$$
$${M_V}^{2\,2}+2\,\left(-4\,\left(-1+\tilde{\alpha}_C+2\,{\tilde{\alpha}_C}^2\right)\,\dot{H}^3-4\,\left(\dot{\tilde{\alpha}}_A+\dot{\tilde{\alpha}}_C-2\,\tilde{\alpha}_C\,\dot{\tilde{\alpha}}_C\right)\,\dot{H}^2\,H+\right.$$
$$\left(-4\,\tilde{\alpha}_C\,\ddot{H}\,\dot{\tilde{\alpha}}_C+4\,\left(\tilde{\alpha}_C\,\ddot{\tilde{\alpha}}_C+\dot{\tilde{\alpha}}_A\,\dot{\tilde{\alpha}}_C\right)\,\dot{H}+\left(4-4\,\tilde{\alpha}_M+\right.\right.$$
$$\left.\left.4\,\tilde{\alpha}_C\,\left(-1+2\,\tilde{\alpha}_M+3\,\tilde{\alpha}_C\,\left(1+\tilde{\alpha}_M\right)-3\,\tilde{\alpha}_T\right)+8\,\tilde{\alpha}_T-\left(1+\tilde{\alpha}_C\right)\,\tilde{\alpha}_V\right)\,\dot{H}^2\right)$$
$$H^2+\left(\left(-\tilde{\alpha}_V-\tilde{\alpha}_C\,\left(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)\right)\,\ddot{H}+\right.$$
$$\left(4\,\tilde{\alpha}_M\,\left(\dot{\tilde{\alpha}}_A-\dot{\tilde{\alpha}}_C\right)-8\,\dot{\tilde{\alpha}}_C-\left(4\,\tilde{\alpha}_T-\tilde{\alpha}_V\right)\,\left(\dot{\tilde{\alpha}}_A+\dot{\tilde{\alpha}}_C\right)+4\,{\tilde{\alpha}_C}^2\,\dot{\tilde{\alpha}}_M+\dot{\tilde{\alpha}}_V+$$
$$\left.\tilde{\alpha}_C\,\left(4\,\left(\dot{\tilde{\alpha}}_A+\tilde{\alpha}_M\,\dot{\tilde{\alpha}}_A+\dot{\tilde{\alpha}}_C+\tilde{\alpha}_M\,\dot{\tilde{\alpha}}_C+\dot{\tilde{\alpha}}_M-\dot{\tilde{\alpha}}_T\right)+\dot{\tilde{\alpha}}_V\right)\right)\,\dot{H}\right)\,H^3-$$
$$\left(\dot{\tilde{\alpha}}_C\,\left(-4\,\left(1+\tilde{\alpha}_M\right)\,\dot{\tilde{\alpha}}_C+\dot{\tilde{\alpha}}_V\right)+4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)\,\left(2+\tilde{\alpha}_M+\tilde{\alpha}_T\right)\,\dot{H}-\right.$$
$$\left.\tilde{\alpha}_V\,\left(\ddot{\tilde{\alpha}}_C+\left(-1+2\,\tilde{\alpha}_M+2\,\tilde{\alpha}_C\,\left(1+\tilde{\alpha}_M\right)-3\,\tilde{\alpha}_T\right)\,\dot{H}\right)\right)\,H^4+\left(8\,{\tilde{\alpha}_M}^2\,\dot{\tilde{\alpha}}_C-8\,\tilde{\alpha}_T\,\dot{\tilde{\alpha}}_C+\right.$$
$$2\,\tilde{\alpha}_V\,\dot{\tilde{\alpha}}_C+\tilde{\alpha}_V\,\dot{\tilde{\alpha}}_M-\tilde{\alpha}_V\,\dot{\tilde{\alpha}}_T+\tilde{\alpha}_T\,\dot{\tilde{\alpha}}_V-\tilde{\alpha}_M\,\left(8\,\tilde{\alpha}_T\,\dot{\tilde{\alpha}}_C-2\,\left(4+\tilde{\alpha}_V\right)\,\dot{\tilde{\alpha}}_C+\dot{\tilde{\alpha}}_V\right)+$$
$$\left.\tilde{\alpha}_C\,\left(8\,{\left(1+\tilde{\alpha}_M\right)}^2\,\dot{\tilde{\alpha}}_C+\tilde{\alpha}_V\,\dot{\tilde{\alpha}}_M-\left(1+\tilde{\alpha}_M\right)\,\dot{\tilde{\alpha}}_V\right)\right)\,H^5+\left(1+\tilde{\alpha}_M\right)$$
$$\left.\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)\,\left(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)\,H^6\right)\,{M_V}^{2\,3}\right)\right)+$$
$${\tilde{\alpha}_A}^2\,\left(\dot{\tilde{\alpha}}_K\,\left(\dot{\varphi}^2+2\,\dot{H}\,{M_V}^2\right)^3+H\,\left(2\,\left(1-4\,\tilde{\alpha}_C\right)\,\dot{\varphi}^6-\dot{\varphi}^4\,\left(40\,\tilde{\alpha}_C\,\dot{H}-4\,\left(\dot{\tilde{\alpha}}_A-3\,\dot{\tilde{\alpha}}_C\right)\,H+\right.\right.\right.$$
$$\left.\left.\left.\left(12+16\,\tilde{\alpha}_M+12\,\tilde{\alpha}_C\,\left(1+\tilde{\alpha}_M\right)-4\,\tilde{\alpha}_T+\tilde{\alpha}_V\right)\,H^2\right)\,{M_V}^2-2\,\dot{\varphi}\,\left(4\,\left(3+8\,\tilde{\alpha}_C\right)\,\dot{H}^2\,\dot{\varphi}+\right.\right.\right.$$
$$\dot{H}\,\dot{\varphi}\,H\,\left(-8\,\dot{\tilde{\alpha}}_A+8\,\dot{\tilde{\alpha}}_C+4\,\tilde{\alpha}_C\,\left(1+\tilde{\alpha}_M\right)\,H+3\,\left(4\,\left(2+\tilde{\alpha}_M+\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)\,H\right)+$$
$$H^2\,\left(8\,\ddot{\varphi}\,\dot{\tilde{\alpha}}_C-4\,\ddot{\tilde{\alpha}}_C\,\dot{\varphi}+8\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)\,\ddot{\varphi}\,H-2\,\tilde{\alpha}_V\,\ddot{\varphi}\,H+\right.$$
$$\dot{\varphi}\,H\,\left(-4\,\left(4+5\,\tilde{\alpha}_M\right)\,\dot{\tilde{\alpha}}_C-4\,\left(1+\tilde{\alpha}_C\right)\,\dot{\tilde{\alpha}}_M+4\,\dot{\tilde{\alpha}}_T+\dot{\tilde{\alpha}}_V-\right.$$
$$\left.\left.\left.\left.\left.\left(4\,\left(3+4\,\tilde{\alpha}_M\right)\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)\,H\right)\right)\,{M_V}^{2\,3}\right)\right)\right)\right)\,\delta{A_1}^{1\,2}\,a^2\right)\Big/$$
$$\left(4\,\left(\tilde{\alpha}_K\,\left(\dot{\varphi}^2+2\,\dot{H}\,{M_V}^2\right)^2-2\,H^2\,{M_V}^2\,\left(2\,\left(-1+\tilde{\alpha}_A\right)\,\dot{\varphi}^2+4\,\left(-1+\tilde{\alpha}_A\right)\,\dot{H}\,{M_V}^2+\right.\right.\right.$$

$$H\left(4\dot{\tilde{\alpha}}_C+\left(4\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)H\right)M_V{}^2\Big)\Big)^2\Big)\Big)$$

Out[887]=

$$-2\,M_M\;\delta\varphi^1\;\;\delta A_1{}^1 ==$$

$$-\Big(\Big(k\,M_V{}^2\;\Big(\tilde{\alpha}_K{}^2\;\left(\dot{\varphi}^2+2\,\dot{H}\,M_V{}^2\right)\;\Big(8\,\dot{H}^3\,\dot{\varphi}\,M_V{}^{2\,2}+2\,\dot{H}^2\,M_V{}^2\;\Big(4\,\dot{\varphi}^3+4\,\ddot{\varphi}\,H\,M_V{}^2-\dot{\varphi}\,H\,\Big(8\,\dot{\tilde{\alpha}}_C+\Big(4$$

$$\left(-1+3\,\tilde{\alpha}_M+3\,\tilde{\alpha}_C\,\left(1+\tilde{\alpha}_M\right)-3\,\tilde{\alpha}_T\right)+\tilde{\alpha}_V\Big)H\Big)M_V{}^2\Big)+$$

$$\dot{\varphi}\,H\,\Big(\dot{\varphi}^3\,\Big(-2\,\ddot{\varphi}+\left(2+2\,\tilde{\alpha}_M+\tilde{\alpha}_V\right)\dot{\varphi}\,H\Big)-\dot{\varphi}\,\Big(4\,\dot{H}\,\dot{\varphi}+H\,\Big(-12\,\ddot{\varphi}\,\dot{\tilde{\alpha}}_C+4\,\ddot{\tilde{\alpha}}_C\,\dot{\varphi}-$$

$$3\,\left(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)\ddot{\varphi}\,H+\dot{\varphi}\,H\,\Big(4\,\left(2+3\,\tilde{\alpha}_M\right)\dot{\tilde{\alpha}}_C+4\,\left(1+\tilde{\alpha}_C\right)\dot{\tilde{\alpha}}_M-$$

$$4\,\dot{\tilde{\alpha}}_T+\dot{\tilde{\alpha}}_V+\left(1+2\,\tilde{\alpha}_M\right)\,\left(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)H\Big)\Big)\Big)$$

$$M_V{}^2+4\,\ddot{H}\,H\,\Big(4\,\dot{\tilde{\alpha}}_C+\Big(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\Big)H\Big)M_V{}^{2\,2}\Big)+$$

$$\dot{H}\,\Big(2\,\dot{\varphi}^5+\dot{\varphi}^3\,H\,\Big(-8\,\dot{\tilde{\alpha}}_C+\left(8-8\,\tilde{\alpha}_M-12\,\tilde{\alpha}_C\,\left(1+\tilde{\alpha}_M\right)+12\,\tilde{\alpha}_T+\tilde{\alpha}_V\right)H\Big)M_V{}^2-2\,H\,\Big(4\,\ddot{H}\,\dot{\varphi}+$$

$$H\,\Big(4\,\ddot{\varphi}\,\dot{\tilde{\alpha}}_C+4\,\ddot{\tilde{\alpha}}_C\,\dot{\varphi}+\left(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)\ddot{\varphi}\,H+\dot{\varphi}\,H\,\Big(4\,\left(2+\tilde{\alpha}_M\right)\dot{\tilde{\alpha}}_C+$$

$$4\,\left(1+\tilde{\alpha}_C\right)\dot{\tilde{\alpha}}_M-4\,\dot{\tilde{\alpha}}_T+\dot{\tilde{\alpha}}_V+\left(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)H\Big)\Big)\Big)M_V{}^{2\,2}\Big)\Big)+$$

$$2\,\tilde{\alpha}_K\,H^2\,\Big(\tilde{\alpha}_A{}^2\,\left(\dot{\varphi}^2+2\,\dot{H}\,M_V{}^2\right)\,\Big(\dot{\varphi}^5+\dot{\varphi}^2\,\Big(\dot{H}\,\dot{\varphi}+3\,\ddot{\varphi}\,H-\left(1+2\,\tilde{\alpha}_M\right)\,\dot{\varphi}\,H^2\Big)M_V{}^2-$$

$$2\,\left(\dot{H}^2\,\dot{\varphi}-2\,\ddot{H}\,\dot{\varphi}\,H+\dot{H}\,H\,\left(\ddot{\varphi}+\dot{\varphi}\,H\right)\right)M_V{}^{2\,2}\Big)+$$

$$\Big(-2\,\dot{\varphi}^2-4\,\dot{H}\,M_V{}^2+H\,\Big(4\,\dot{\tilde{\alpha}}_C+\Big(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\Big)H\Big)M_V{}^2\Big)$$

$$\Big(2\,\tilde{\alpha}_C\,\dot{\varphi}^5+\dot{\varphi}^2\,\Big(2\,\dot{H}\,\left(\dot{\varphi}+4\,\tilde{\alpha}_C\,\dot{\varphi}\right)-H\,\Big(2\,\ddot{\varphi}+2\,\dot{\tilde{\alpha}}_A\,\dot{\varphi}+\left(2+\tilde{\alpha}_V\right)\,\dot{\varphi}\,H\Big)\Big)M_V{}^2+$$

$$\Big(4\,\dot{H}^2\,\left(\dot{\varphi}+2\,\tilde{\alpha}_C\,\dot{\varphi}\right)+H^2\,\Big(4\,\dot{\tilde{\alpha}}_C+\Big(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\Big)H\Big)\,\left(\ddot{\varphi}+\dot{\varphi}\,H\right)+$$

$$\dot{H}\,H\,\Big(-4\,\left(\ddot{\varphi}+\left(\dot{\tilde{\alpha}}_A+\dot{\tilde{\alpha}}_C\right)\,\dot{\varphi}\right)-\left(4\,\left(1+\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+3\,\tilde{\alpha}_V\right)\,\dot{\varphi}\,H\Big)\Big)M_V{}^{2\,2}\Big)+$$

$$2\,\tilde{\alpha}_A\,\Big(\left(-1+\tilde{\alpha}_C\right)\,\dot{\varphi}^7+\dot{\varphi}^4\,\Big(2\,\left(-2+3\,\tilde{\alpha}_C\right)\,\dot{H}\,\dot{\varphi}-2\,\ddot{\varphi}\,H+\dot{\varphi}\,H\,\Big(-\dot{\tilde{\alpha}}_A+2\,\dot{\tilde{\alpha}}_C+$$

$$2\,\left(-1+\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)H-\tilde{\alpha}_V\,H\Big)\Big)M_V{}^2+\dot{\varphi}^2\,\Big(4\,\left(-1+3\,\tilde{\alpha}_C\right)\,\dot{H}^2\,\dot{\varphi}+$$

$$\dot{H}\,H\,\Big(-8\,\ddot{\varphi}+\dot{\varphi}\,\Big(-4\,\dot{\tilde{\alpha}}_A+8\,\dot{\tilde{\alpha}}_C+4\,\left(-2+3\,\tilde{\alpha}_M+3\,\tilde{\alpha}_C\,\left(1+\tilde{\alpha}_M\right)-3\,\tilde{\alpha}_T\right)H-3\,\tilde{\alpha}_V\,H\Big)\Big)+$$

$$H^2\,\Big(-4\,\ddot{\varphi}\,\dot{\tilde{\alpha}}_C+4\,\ddot{\tilde{\alpha}}_C\,\dot{\varphi}-\left(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)\,\ddot{\varphi}\,H+\dot{\varphi}\,H\,\Big(8\,\left(1+\tilde{\alpha}_M\right)\,\dot{\tilde{\alpha}}_C+$$

$$4\,\left(1+\tilde{\alpha}_C\right)\,\dot{\tilde{\alpha}}_M-4\,\dot{\tilde{\alpha}}_T+\dot{\tilde{\alpha}}_V+\left(1+\tilde{\alpha}_M\right)\,\left(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)H\Big)\Big)\Big)$$

$$M_V{}^{2\,2}+2\,\Big(4\,\tilde{\alpha}_C\,\dot{H}^3\,\dot{\varphi}-2\,\dot{H}^2\,\Big(2\,\ddot{\varphi}+\left(\dot{\tilde{\alpha}}_A-2\,\dot{\tilde{\alpha}}_C\right)\,\dot{\varphi}\Big)H+\Big(4\,\ddot{\varphi}\,\dot{\tilde{\alpha}}_C\,\dot{H}-4\,\ddot{H}\,\dot{\tilde{\alpha}}_C\,\dot{\varphi}+$$

$$\dot{H}\,\Big(4\,\ddot{\tilde{\alpha}}_C+\left(-4+8\,\tilde{\alpha}_M+8\,\tilde{\alpha}_C\,\left(1+\tilde{\alpha}_M\right)-8\,\tilde{\alpha}_T-\tilde{\alpha}_V\right)\dot{H}\Big)\,\dot{\varphi}\Big)H^2+$$

$$\Big(\left(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)\,\ddot{\varphi}\,\dot{H}+\Big(\left(-4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)-\tilde{\alpha}_V\right)\,\ddot{H}+$$

$$\Big(4\,\left(2+\tilde{\alpha}_M\right)\,\dot{\tilde{\alpha}}_C+4\,\left(1+\tilde{\alpha}_C\right)\,\dot{\tilde{\alpha}}_M-4\,\dot{\tilde{\alpha}}_T+\dot{\tilde{\alpha}}_V\Big)\,\dot{H}\Big)\,\dot{\varphi}\Big)H^3+$$

$$\left(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\right)\,\dot{H}\,\dot{\varphi}\,H^4\Big)M_V{}^{2\,3}\Big)\Big)+2\,H^3\,M_V{}^2\,\Big(\dot{\tilde{\alpha}}_K\,\dot{\varphi}$$

$$\Big(\left(-2+\tilde{\alpha}_A\right)\,\dot{\varphi}^2+2\,\left(-2+\tilde{\alpha}_A\right)\,\dot{H}\,M_V{}^2+H\,\Big(4\,\dot{\tilde{\alpha}}_C+\Big(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\Big)H\Big)M_V{}^2\Big)^2-$$

$$2\,H\,\Big(2\,\tilde{\alpha}_C\,\dot{\varphi}\,\Big(2\,\dot{\varphi}^2+4\,\dot{H}\,M_V{}^2-H\,\Big(4\,\dot{\tilde{\alpha}}_C+\Big(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\Big)H\Big)M_V{}^2\Big)^2-2\,\tilde{\alpha}_A$$

$$\dot{\varphi}\,\Big(2\,\dot{\varphi}^2+4\,\dot{H}\,M_V{}^2+H\,\Big(-4\,\dot{\tilde{\alpha}}_C-\Big(4\,\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)+\tilde{\alpha}_V\Big)H\Big)M_V{}^2\Big)\,\left(\left(-1+3\,\tilde{\alpha}_C\right)\right.$$

$$\dot{\varphi}^2 + \left(-2 + 6\,\tilde{\alpha}_C\right)\,\dot{H}\,M_V{}^2 + H\left(-\dot{\tilde{\alpha}}_A + 2\left(\dot{\tilde{\alpha}}_C + \left(\tilde{\alpha}_C + \tilde{\alpha}_M + \tilde{\alpha}_C\,\tilde{\alpha}_M - \tilde{\alpha}_T\right)\,H\right)\right)\,M_V{}^2\Big) +$$
$$2\,\tilde{\alpha}_A{}^3\left(\dot{\varphi}^5 + \dot{\varphi}^2\left(3\,\dot{H}\,\dot{\varphi} + H\left(\ddot{\varphi} - \left(1 + \tilde{\alpha}_M\right)\,\dot{\varphi}\,H\right)\right)\,M_V{}^2 + 2\left(\dot{H}^2\,\dot{\varphi} + \ddot{H}\,\dot{\varphi}\,H - \dot{H}\,H\left(\ddot{\varphi} + \dot{\varphi}\,H\right)\right)\right.$$
$$\left.M_V{}^{2\,2}\right) + \tilde{\alpha}_A{}^2\left(\left(-6 + 4\,\tilde{\alpha}_C\right)\,\dot{\varphi}^5 - 2\,\ddot{\varphi}\,\dot{\varphi}^2\,H\,M_V{}^2 + \dot{\varphi}^3\left(2\,\left(-11 + 8\,\tilde{\alpha}_C\right)\,\dot{H} + \right.\right.$$
$$\left.H\left(-2\,\dot{\tilde{\alpha}}_A + 12\,\dot{\tilde{\alpha}}_C + \left(2\,\left(1 + 7\,\tilde{\alpha}_M + 6\,\tilde{\alpha}_C\,\left(1 + \tilde{\alpha}_M\right) - 6\,\tilde{\alpha}_T\right) + \tilde{\alpha}_V\right)\,H\right)\right)\,M_V{}^2 -$$
$$\ddot{\varphi}\,H\left(-4\,\dot{H} + H\left(4\,\dot{\tilde{\alpha}}_C + \left(4\,\left(\tilde{\alpha}_C + \tilde{\alpha}_M + \tilde{\alpha}_C\,\tilde{\alpha}_M - \tilde{\alpha}_T\right) + \tilde{\alpha}_V\right)\,H\right)\right)\,M_V{}^{2\,2} +$$
$$\dot{\varphi}\left(4\,\left(-5 + 4\,\tilde{\alpha}_C\right)\,\dot{H}^2 + \dot{H}\,H\left(-4\,\dot{\tilde{\alpha}}_A + 24\,\dot{\tilde{\alpha}}_C + 4\,\left(1 + 7\,\tilde{\alpha}_M + 7\,\tilde{\alpha}_C\,\left(1 + \tilde{\alpha}_M\right) - 7\,\tilde{\alpha}_T\right)\,H + \right.\right.$$
$$\left.3\,\tilde{\alpha}_V\,H\right) + H\left(-4\,\ddot{H} + H\left(4\,\ddot{\tilde{\alpha}}_C + H\left(4\,\tilde{\alpha}_M\,\dot{\tilde{\alpha}}_C + 4\,\dot{\tilde{\alpha}}_M + 4\,\tilde{\alpha}_C\,\dot{\tilde{\alpha}}_M - 4\,\dot{\tilde{\alpha}}_T + \right.\right.\right.$$
$$\left.\left.\left.\dot{\tilde{\alpha}}_V - \left(4\,\left(\tilde{\alpha}_C + \tilde{\alpha}_M + \tilde{\alpha}_C\,\tilde{\alpha}_M - \tilde{\alpha}_T\right) + \tilde{\alpha}_V\right)\,H\right)\right)\right)\,M_V{}^{2\,2}\Big)\Big)\Big)\Big)\,\delta\varphi^1$$
$$\delta A_1{}^1\;a^2\Big)\Big/\left(2\left(\tilde{\alpha}_K\left(\dot{\varphi}^2 + 2\,\dot{H}\,M_V{}^2\right)^2 - 2\,H^2\,M_V{}^2\left(2\,\left(-1 + \tilde{\alpha}_A\right)\,\dot{\varphi}^2 + 4\,\left(-1 + \tilde{\alpha}_A\right)\,\dot{H}\,M_V{}^2 + \right.\right.\right.$$
$$\left.\left.\left.H\left(4\,\dot{\tilde{\alpha}}_C + \left(4\,\left(\tilde{\alpha}_C + \tilde{\alpha}_M + \tilde{\alpha}_C\,\tilde{\alpha}_M - \tilde{\alpha}_T\right) + \tilde{\alpha}_V\right)\,H\right)\,M_V{}^2\right)^2\right)\right)$$

The initial anti-symmetric mixed kinetic-mass interaction terms ($\tilde D$, here denoted as D) mentioned in the paper is:

Out[888]=
$$D == -\left(\left(\dot{\varphi}\,H\,k\,M_V{}^2\left(-\tilde{\alpha}_A{}^2\,H^2\,M_V{}^2 + \tilde{\alpha}_K\left(\dot{\varphi}^2 + 2\,\dot{H}\,M_V{}^2 + H\left(-2\,\dot{\tilde{\alpha}}_C + \left(-2\,\tilde{\alpha}_M - 2\,\tilde{\alpha}_C\,\left(1 + \tilde{\alpha}_M\right) + 2\,\tilde{\alpha}_T + \tilde{\alpha}_V\right)\,H\right)\,M_V{}^2\right)\right)\right.\right.$$
$$\left.\left.a^2\right)\Big/\left(\tilde{\alpha}_K\left(\dot{\varphi}^2 + 2\,\dot{H}\,M_V{}^2\right)^2 + 4\,H^2\,M_V{}^2\right.\right.$$
$$\left.\left.\left(-\left(-1 + \tilde{\alpha}_A\right)\,\dot{\varphi}^2 - 2\,\left(-1 + \tilde{\alpha}_A\right)\,\dot{H}\,M_V{}^2 + H\left(-2\,\dot{\tilde{\alpha}}_C + \left(-2\,\tilde{\alpha}_M - 2\,\tilde{\alpha}_C\,\left(1 + \tilde{\alpha}_M\right) + 2\,\tilde{\alpha}_T + \tilde{\alpha}_V\right)\,H\right)\,M_V{}^2\right)\right)\right)$$