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

The parameters μ and γ defined in the paper, for this given model, are given by:

Out[55]=
$$\mu == -\Bigg(\Bigg(2\Big(-2\,\dot{\tilde{\alpha}}_C^{\,2}\,H\,M_V^{\,2} - 2\,\tilde{\alpha}_C^{\,2}\,\left(1+\tilde{\alpha}_M\right)^2 H^3\,M_V^{\,2} + \left(-\tilde{\alpha}_M+\tilde{\alpha}_T\right)\tilde{\alpha}_V\,H^3\,M_V^{\,2} + \dot{\tilde{\alpha}}_C\left(\dot{\varphi}^2 + 2\left(\dot{H} - \left(\tilde{\alpha}_M + 2\,\tilde{\alpha}_C\left(1+\tilde{\alpha}_M\right) - \tilde{\alpha}_T\right)H^2\right)M_V^{\,2}\right) + \tilde{\alpha}_C\left(1+\tilde{\alpha}_M\right)H\left(\dot{\varphi}^2 + 2\left(\dot{H} + \left(-\tilde{\alpha}_M+\tilde{\alpha}_T\right)H^2\right)M_V^{\,2}\right)\Big)M_P^2\,V'[\varphi]\Bigg)\Big/ \Bigg(\left(\ddot{\varphi} + 3\,\dot{\varphi}\,H\right)M_V^{\,2}\Big(H\Big(\tilde{\alpha}_A^{\,2}\left(-\tilde{\alpha}_M+\tilde{\alpha}_T\right)H^2\,M_V^{\,2} + \tilde{\alpha}_A\Big(\left(1+\tilde{\alpha}_C\right)\dot{\varphi}^2 + 2\left(1+\tilde{\alpha}_C\right)\dot{H}\,M_V^{\,2} - 2\left(1+2\,\tilde{\alpha}_C\right)H\left(\dot{\tilde{\alpha}}_C + \left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)H\right)M_V^{\,2}\Big) + 2\,\tilde{\alpha}_C\left(1+\tilde{\alpha}_C\right)\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)\Big) + \tilde{\alpha}_K\Big(2\,\dot{\tilde{\alpha}}_C^{\,2}\,H\,M_V^{\,2} + 2\,\tilde{\alpha}_C^{\,2}\left(1+\tilde{\alpha}_M\right)^2 H^3\,M_V^{\,2} + \left(\tilde{\alpha}_M-\tilde{\alpha}_T\right)\tilde{\alpha}_V\,H^3\,M_V^{\,2} - \dot{\tilde{\alpha}}_C\left(\dot{\varphi}^2 + 2\left(\dot{H} - \left(\tilde{\alpha}_M + 2\,\tilde{\alpha}_C\left(1+\tilde{\alpha}_M\right) - \tilde{\alpha}_T\right)H^2\right)M_V^{\,2}\right) - \tilde{\alpha}_C\left(1+\tilde{\alpha}_M\right)H\left(\dot{\varphi}^2 + 2\left(\dot{H} + \left(-\tilde{\alpha}_M+\tilde{\alpha}_T\right)H^2\right)M_V^{\,2}\right)\Big) + \gamma\Big(-4\,\dot{\tilde{\alpha}}_C^{\,2}\,H\,M_V^{\,2} + 2\,\dot{\tilde{\alpha}}_C\Big(\left(1+\tilde{\alpha}_C\right)\dot{\varphi}^2 + 2\left(1+\tilde{\alpha}_C\right)\dot{H}\,M_V^{\,2} + \left(\tilde{\alpha}_A\left(1+\tilde{\alpha}_M\right) - 2\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)\right)H^2\,M_V^{\,2}\Big) + H\Big(-\tilde{\alpha}_A\Big(\left(1+\tilde{\alpha}_T\right)\dot{\varphi}^2 + 2\left(1+\tilde{\alpha}_T\right)\dot{H}\,M_V^{\,2} - 2\left(1+\tilde{\alpha}_M\right)\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)H^2\,M_V^{\,2}\Big) + 2\left(\tilde{\alpha}_C+\tilde{\alpha}_M+\tilde{\alpha}_C\,\tilde{\alpha}_M-\tilde{\alpha}_T\right)\Big(-\tilde{\alpha}_V\,H^2\,M_V^{\,2} + \tilde{\alpha}_C\left(\dot{\varphi}^2 + 2\,\dot{H}\,M_V^{\,2}\right)\Big)\Big)\Big)\Big)\Big)\Big)$$

where we have expressed μ in terms of the free parameters of the model, and γ which is explicitly given by:

Out[33]=
$$\gamma == \Big(-4\,\dot{\tilde{\alpha}}_C^{\,3}\,H^2\Big(\dot{\tilde{\alpha}}_K + \left(-\tilde{\alpha}_A - 2\,\tilde{\alpha}_C + \tilde{\alpha}_K + \tilde{\alpha}_K\,\tilde{\alpha}_M\right)H\Big)M_V^{\,2^2} + \tilde{\alpha}_A\Big(4\left(1+\tilde{\alpha}_C\right)\dot{H}^3\,M_V^{\,2^2} - 2\,\dot{H}^2\,M_V^{\,2}\Big(-2\left(1+\tilde{\alpha}_C\right)\dot{\varphi}^2 + \left(-2+2\,\tilde{\alpha}_M+6\,\tilde{\alpha}_C^{\,2}\left(1+\tilde{\alpha}_M\right) - 4\,\tilde{\alpha}_T + \tilde{\alpha}_V + \tilde{\alpha}_C\left(6\,\tilde{\alpha}_M - 6\,\tilde{\alpha}_T + \tilde{\alpha}_V\right)\right)H^2\,M_V^{\,2}\Big) + \dot{H}\Big(\left(1+\tilde{\alpha}_C\right)\dot{\varphi}^4 - \left(-4+6\,\tilde{\alpha}_C^{\,2}\left(1+\tilde{\alpha}_M\right) - 4\,\tilde{\alpha}_T + \tilde{\alpha}_V + \tilde{\alpha}_C\left(-4+2\,\tilde{\alpha}_M - 6\,\tilde{\alpha}_T + \tilde{\alpha}_V\right)\right)\dot{\varphi}^2\,H^2\,M_V^{\,2} + 2\,H^3\Big(-\tilde{\alpha}_M\,\dot{\tilde{\alpha}}_A + \tilde{\alpha}_T\,\dot{\tilde{\alpha}}_A - \dot{\tilde{\alpha}}_V - 4\,\tilde{\alpha}_M\,H - 2\,\tilde{\alpha}_M^{\,2}\,H + 4\,\tilde{\alpha}_C^{\,3}\left(1+\tilde{\alpha}_M\right)^2 H + 4\,\tilde{\alpha}_T\,H + 2\,\tilde{\alpha}_T^{\,2}\,H + 2\,\tilde{\alpha}_C^{\,2}\left(1+\tilde{\alpha}_M\right)\left(-3+\tilde{\alpha}_M - 4\,\tilde{\alpha}_T - \tilde{\alpha}_V\right)H + \tilde{\alpha}_V\,H + \tilde{\alpha}_T\,\tilde{\alpha}_V\,H + \tilde{\alpha}_C\Big(\left(1+\tilde{\alpha}_M\right)\dot{\tilde{\alpha}}_A - \dot{\tilde{\alpha}}_V +$$

$$\left(-4-4\,\tilde{\alpha}_M{}^2+4\,\tilde{\alpha}_T{}^2+\tilde{\alpha}_V+2\,\tilde{\alpha}_T\,\left(2+\tilde{\alpha}_V\right)-\tilde{\alpha}_M\,\left(12+4\,\tilde{\alpha}_T+\tilde{\alpha}_V\right)\right)\,H\Bigg)\Bigg)\,M_V{}^{2\,2}\Bigg)+$$

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

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

$$\tilde{\alpha}_C\,\Bigg(\left(1+\tilde{\alpha}_M\right)\,\dot{\tilde{\alpha}}_A-\dot{\tilde{\alpha}}_V+\left(-12\,\tilde{\alpha}_M{}^2+2\,\left(-2+4\,\tilde{\alpha}_T+\tilde{\alpha}_V\right)+\tilde{\alpha}_M\,\left(-16+8\,\tilde{\alpha}_T+\tilde{\alpha}_V\right)\right)\,H\Bigg)\Bigg)\,M_V{}^2+$$

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

$$2\,\tilde{\alpha}_T\,H-2\,\tilde{\alpha}_M\,\tilde{\alpha}_T\,H+\tilde{\alpha}_C\,\Bigg(-\left(1+\tilde{\alpha}_M\right)\,\dot{\tilde{\alpha}}_A+\dot{\tilde{\alpha}}_V+2\,\left(1+\tilde{\alpha}_M\right)\,\left(1+3\,\tilde{\alpha}_M-2\,\tilde{\alpha}_T\right)\,H\Bigg)\Bigg)+$$

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

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

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

$$2\,\dot{\tilde{\alpha}}_C{}^2\,H\,M_V{}^2\,\Bigg(\dot{\tilde{\alpha}}_K\,\left(2\,\dot{\varphi}^2+4\,\dot{H}\,M_V{}^2+\left(-4\,\tilde{\alpha}_M-6\,\tilde{\alpha}_C\,\left(1+\tilde{\alpha}_M\right)+4\,\tilde{\alpha}_T+\tilde{\alpha}_V\right)\,H^2\,M_V{}^2\right)+$$

$$H\,\Bigg(2\,\tilde{\alpha}_K\,\dot{\varphi}^2+2\,\tilde{\alpha}_K\,\tilde{\alpha}_M\,\dot{\varphi}^2+4\,\tilde{\alpha}_K\,\dot{H}\,M_V{}^2+4\,\tilde{\alpha}_K\,\tilde{\alpha}_M\,\dot{H}\,M_V{}^2+2\,\dot{\tilde{\alpha}}_A\,H\,M_V{}^2-4\,\tilde{\alpha}_K\,\tilde{\alpha}_M\,H^2\,M_V{}^2-$$

$$4\,\tilde{\alpha}_K\,\tilde{\alpha}_M{}^2\,H^2\,M_V{}^2+\tilde{\alpha}_A{}^2\,\left(1+\tilde{\alpha}_M\right)\,H^2\,M_V{}^2+4\,\tilde{\alpha}_K\,\tilde{\alpha}_T\,H^2\,M_V{}^2+4\,\tilde{\alpha}_K\,\tilde{\alpha}_M\,\tilde{\alpha}_T\,H^2\,M_V{}^2-$$

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

$$\tilde{\alpha}_A\,\left(2\,\dot{\varphi}^2+\left(2-4\,\tilde{\alpha}_C\right)\,\dot{H}\,M_V{}^2+H\,\left(\dot{\tilde{\alpha}}_A+\left(-2-6\,\tilde{\alpha}_M-8\,\tilde{\alpha}_C\,\left(1+\tilde{\alpha}_M\right)+4\,\tilde{\alpha}_T+\tilde{\alpha}_V\right)\,H\right)\,M_V{}^2\right)-$$

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

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

$$\Bigg(-2\,\dot{H}^2\,M_V{}^2-\dot{H}\,\left(\dot{\varphi}^2+2\,\left(1+\tilde{\alpha}_T\right)\,H^2\,M_V{}^2\right)+$$

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

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

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

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

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

$$2\left(3\tilde{\alpha}_C^2\left(1+\tilde{\alpha}_M\right)^2+\left(\tilde{\alpha}_M-\tilde{\alpha}_T\right)^2+\tilde{\alpha}_C\left(1+\tilde{\alpha}_M\right)\left(4\tilde{\alpha}_M-4\tilde{\alpha}_T-\tilde{\alpha}_V\right)\right)H^4\right)M_V{}^{22}\Big)+$$

$$H\Big(\tilde{\alpha}_K\dot{\varphi}^4+\tilde{\alpha}_K\tilde{\alpha}_M\dot{\varphi}^4+4\tilde{\alpha}_K\dot{H}\dot{\varphi}^2M_V{}^2+4\tilde{\alpha}_K\tilde{\alpha}_M\dot{H}\dot{\varphi}^2M_V{}^2+4\dot{\tilde{\alpha}}_A\dot{\varphi}^2HM_V{}^2-4\tilde{\alpha}_K\tilde{\alpha}_M\dot{\varphi}^2H^2M_V{}^2-$$

$$4\tilde{\alpha}_K\tilde{\alpha}_M{}^2\dot{\varphi}^2H^2M_V{}^2+4\tilde{\alpha}_K\tilde{\alpha}_T\dot{\varphi}^2H^2M_V{}^2+4\tilde{\alpha}_K\tilde{\alpha}_M\tilde{\alpha}_T\dot{\varphi}^2H^2M_V{}^2-4\tilde{\alpha}_V\dot{\varphi}^2H^2M_V{}^2+$$

$$\tilde{\alpha}_K\tilde{\alpha}_V\dot{\varphi}^2H^2M_V{}^2+\tilde{\alpha}_K\tilde{\alpha}_M\tilde{\alpha}_V\dot{\varphi}^2H^2M_V{}^2+4\tilde{\alpha}_K\dot{H}^2M_V{}^{22}+4\tilde{\alpha}_K\tilde{\alpha}_M\dot{H}^2M_V{}^{22}+8\dot{\tilde{\alpha}}_A\dot{H}HM_V{}^{22}-$$

$$8\tilde{\alpha}_K\tilde{\alpha}_M\dot{H}H^2M_V{}^{22}-8\tilde{\alpha}_K\tilde{\alpha}_M{}^2\dot{H}H^2M_V{}^{22}+8\tilde{\alpha}_K\tilde{\alpha}_T\dot{H}H^2M_V{}^{22}+8\tilde{\alpha}_K\tilde{\alpha}_M\tilde{\alpha}_T\dot{H}H^2M_V{}^{22}-$$

$$8\tilde{\alpha}_V\dot{H}H^2M_V{}^{22}+2\tilde{\alpha}_K\tilde{\alpha}_V\dot{H}H^2M_V{}^{22}+2\tilde{\alpha}_K\tilde{\alpha}_M\tilde{\alpha}_V\dot{H}H^2M_V{}^{22}-8\tilde{\alpha}_M\dot{\tilde{\alpha}}_AH^3M_V{}^{22}+$$

$$8\tilde{\alpha}_T\dot{\tilde{\alpha}}_AH^3M_V{}^{22}+2\tilde{\alpha}_V\dot{\tilde{\alpha}}_AH^3M_V{}^{22}+4\tilde{\alpha}_K\tilde{\alpha}_M{}^2H^4M_V{}^{22}+4\tilde{\alpha}_K\tilde{\alpha}_M{}^3H^4M_V{}^{22}-8\tilde{\alpha}_K\tilde{\alpha}_M\tilde{\alpha}_TH^4M_V{}^{22}-$$

$$8\tilde{\alpha}_K\tilde{\alpha}_M{}^2\tilde{\alpha}_TH^4M_V{}^{22}+4\tilde{\alpha}_K\tilde{\alpha}_T{}^2H^4M_V{}^{22}+4\tilde{\alpha}_K\tilde{\alpha}_M\tilde{\alpha}_T{}^2H^4M_V{}^{22}+8\tilde{\alpha}_M\tilde{\alpha}_VH^4M_V{}^{22}-$$

$$8\tilde{\alpha}_T\tilde{\alpha}_VH^4M_V{}^{22}-2\tilde{\alpha}_V{}^2H^4M_V{}^{22}-8\tilde{\alpha}_C{}^3\left(1+\tilde{\alpha}_M\right)H^2\left(2\dot{H}+3\left(1+\tilde{\alpha}_M\right)H^2\right)M_V{}^{22}-$$

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

$$\left(-4\dot{H}^2+2\dot{H}H\left(-2\dot{\tilde{\alpha}}_A+\left(4\tilde{\alpha}_K\left(1+\tilde{\alpha}_M\right)^2+\tilde{\alpha}_V\right)H\right)+\right.$$

$$H^3\left(\left(4+8\tilde{\alpha}_M-4\tilde{\alpha}_T-\tilde{\alpha}_V\right)\dot{\tilde{\alpha}}_A+\left(4\tilde{\alpha}_M{}^2+4\tilde{\alpha}_T{}^2-2\tilde{\alpha}_K\left(1+\tilde{\alpha}_M\right)^2\left(4\tilde{\alpha}_M-4\tilde{\alpha}_T-\tilde{\alpha}_V\right)-\right.\right.$$

$$\left.\left.\left.4\tilde{\alpha}_V+4\tilde{\alpha}_T\tilde{\alpha}_V+\tilde{\alpha}_V{}^2-8\tilde{\alpha}_M\left(\tilde{\alpha}_T+\tilde{\alpha}_V\right)\right)H\right)\right)M_V{}^{22}\Big)-$$

$$\tilde{\alpha}_A\Big(\dot{\varphi}^4+\dot{\varphi}^2\left(H\left(\dot{\tilde{\alpha}}_A+\left(-4-8\tilde{\alpha}_M+4\tilde{\alpha}_T+\tilde{\alpha}_V\right)H\right)-6\tilde{\alpha}_C\left(\dot{H}+2\left(1+\tilde{\alpha}_M\right)H^2\right)\right)M_V{}^2-$$

$$2\left(\left(2+6\tilde{\alpha}_C\right)\dot{H}^2+\dot{H}H\left(-\dot{\tilde{\alpha}}_A+\left(4+4\tilde{\alpha}_M-8\tilde{\alpha}_C{}^2\left(1+\tilde{\alpha}_M\right)-\tilde{\alpha}_V+\tilde{\alpha}_C\left(8+8\tilde{\alpha}_T+\tilde{\alpha}_V\right)\right)H\right)-\right.$$

$$H^3\left(\dot{\tilde{\alpha}}_V+4\tilde{\alpha}_MH+6\tilde{\alpha}_M{}^2H+10\tilde{\alpha}_C{}^2\left(1+\tilde{\alpha}_M\right)^2H-4\tilde{\alpha}_TH-\right.$$

$$8\tilde{\alpha}_M\tilde{\alpha}_TH+2\tilde{\alpha}_T{}^2H-2\tilde{\alpha}_VH-3\tilde{\alpha}_M\tilde{\alpha}_VH+\tilde{\alpha}_T\tilde{\alpha}_VH+$$

$$\left.\left.\tilde{\alpha}_C\left(-2\left(1+\tilde{\alpha}_M\right)\dot{\tilde{\alpha}}_A+\dot{\tilde{\alpha}}_V+4\left(1+\tilde{\alpha}_M\right)\left(1+4\tilde{\alpha}_M-3\tilde{\alpha}_T-\tilde{\alpha}_V\right)H\right)\right)\right)M_V{}^{22}\Big)+$$

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

$$\left.\left(4\dot{\varphi}^2+H\left(-2\dot{\tilde{\alpha}}_A+\left(-8\tilde{\alpha}_M+3\tilde{\alpha}_K\left(1+\tilde{\alpha}_M\right)^2+8\tilde{\alpha}_T+4\tilde{\alpha}_V\right)H\right)M_V{}^2\right)\right)-$$

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

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

$$\left.\left.\left.2H\left(\ddot{\tilde{\alpha}}_C+H\left(\dot{\tilde{\alpha}}_M+\tilde{\alpha}_C\dot{\tilde{\alpha}}_M-\dot{\tilde{\alpha}}_T+\tilde{\alpha}_CH-\tilde{\alpha}_TH\right)\right)M_V{}^2\right)\right)\right)+$$

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

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

$$\left(3+7\,\tilde{\alpha}_M-4\,\tilde{\alpha}_T\right)-6\,\tilde{\alpha}_T+2\,\tilde{\alpha}_T{}^2-\tilde{\alpha}_T\,\tilde{\alpha}_V+\tilde{\alpha}_M\,\left(-2-10\,\tilde{\alpha}_T+\tilde{\alpha}_V\right)\Big)\,H\Big)+$$

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

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

$$2\,\dot{\tilde{\alpha}}_T+\left(-4+4\,\tilde{\alpha}_M{}^2+2\,\tilde{\alpha}_T{}^2-2\,\tilde{\alpha}_M\,\left(1+5\,\tilde{\alpha}_T\right)-\tilde{\alpha}_V-\tilde{\alpha}_T\,\left(6+\tilde{\alpha}_V\right)\right)\,H\Big)\Big)\Big)\,M_V{}^{2\,2}\Big)+$$

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

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

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

$$4\,\tilde{\alpha}_C\,\tilde{\alpha}_M+3\,\tilde{\alpha}_C\,\tilde{\alpha}_M{}^2-\tilde{\alpha}_T-2\,\tilde{\alpha}_M\,\tilde{\alpha}_T\right)\,H\Big)+H\,\Big(-\left(1+\tilde{\alpha}_T\right)\,\dot{\tilde{\alpha}}_V+\left(-6\,\tilde{\alpha}_M{}^2-2\,\tilde{\alpha}_M{}^3+$$

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

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

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

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

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

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

$$\dot{\tilde{\alpha}}_T+\tilde{\alpha}_C\,H+\tilde{\alpha}_M\,H+2\,\tilde{\alpha}_C\,\tilde{\alpha}_M\,H+\tilde{\alpha}_M{}^2\,H+\tilde{\alpha}_C\,\tilde{\alpha}_M{}^2\,H-\tilde{\alpha}_T\,H-\tilde{\alpha}_M\,\tilde{\alpha}_T\,H\Big)\Big)\Big)\,M_V{}^{2\,2}\Big)\Big)\Big)$$