$$\frac{\tau \in [\![\mathcal{P}]\!], t_{max} \geq \max(\tau), \quad N_P \in \mathsf{Nonce}_P}{\tau \cdot (t_{max}, \mathrm{send}_P(N_P)) \in [\![\mathcal{P}]\!]}\ \mathtt{P1}$$

$$\frac{\tau \in [\![\mathcal{P}]\!], t_{max} \geq \max(\tau), \quad (t_1, \mathrm{recv}_V(N_P)) \in \tau, N_V \in \mathsf{Nonce}_V}{\tau \cdot (t_{max}, \mathrm{send}_V(MAC_{k(V,P)}(N_P, N_V), N_V)) \in [\![\mathcal{P}]\!]}\ \mathtt{V1}$$

$$\frac{\tau \in [\![\mathcal{P}]\!], t_{max} \geq \max(\tau), (t_1, \mathrm{send}_P(N_P)) \in \tau, \quad (t_2, \mathrm{recv}_P(MAC_{k(V,P)}(N_P, N_V), N_V))}{\tau \cdot (t_{max}, \mathrm{claim}_P(auth, V)) \in [\![\mathcal{P}]\!]}\ \mathtt{P2}$$

$$\frac{\tau \in [\![\mathcal{P}]\!], t_{max} \geq \max(\tau), (t_1, \mathrm{recv}_V(N_P)) \in \tau, \quad (t_2, \mathrm{send}_V(MAC_{k(V,P)}(N_P, N_V), N_V)) \in \tau, \quad C \in \mathsf{Nonce}_V}{\tau \cdot (t_{max}, \mathrm{send}_V(C)) \in [\![\mathcal{P}]\!]}\ \mathtt{V2}$$

$$\frac{\tau \in [\![\mathcal{P}]\!], t_{max} \geq \max(\tau), (t_1, \mathrm{send}_P(N_P)) \in \tau, \quad (t_2, \mathrm{recv}_P(MAC_{k(V,P)}(N_P, N_V))) \in \tau, \quad (t_3, \mathrm{recv}_P(C)) \in \tau}{\tau \cdot (t_{max}, \mathrm{send}_P(h(k(P,V), N_P, N_V, C)) \in [\![\mathcal{P}]\!]}\ \mathtt{P3}$$

$$\frac{\tau \in [\![\mathcal{P}]\!], t_{max} \geq \max(\tau), (t_1, \mathrm{recv}_V(N_P)) \in \tau, \quad (t_2, \mathrm{send}_V(MAC_{k(V,P)}(N_P, N_V))) \in \tau, \quad (t_3, \mathrm{send}_V(C)) \in \tau, (t_4, \mathrm{recv}_V(h(k(P,V), N_P, N_V, C)) \in \tau}{\tau \cdot (t_{max}, \mathrm{claim}_V(\mathit{erasure}, P, h(k(P,V), N_P, N_V, C))) \in [\![\mathcal{P}]\!]}\ \mathtt{V3}$$