*Proof trees for transitions in Theorem 2*

By $\mathsf{Rule}^n$ below we assume $n$ applications of the transition rule Rule from Fig. 4. In case of $n$ consecutive applications of rules Par-l, Par-r we write $\mathsf{Par}^n$. Notice that $\alpha$-conversion is often used: in particular when the rule Extrusion is applied. We define $\chi_l(\vec{Y}, M)$ as the list of message terms obtained by the replacement of $l$th entry in $\vec{Y}$ with $M$. In *Case* 5, $\sigma'$, $\theta'$ are the frames accumulated at the point of input of $Y_l$. In the proof trees presented below we use the following abbreviations

$$S \triangleq \nu c.\nu ch.\overline{card}\langle ch\rangle.C_{\text{fix}}(s, ch, c)$$

$$I \triangleq \nu c.!\nu ch.\overline{card}\langle ch\rangle.C_{\text{fix}}(s, ch, c)$$

$$\dfrac{\dfrac{pk_s \,\#\, out, s, !S \quad out =_E out}{\overline{out}\langle \mathtt{pk}(s)\rangle.!S \xrightarrow{\overline{out}(pk_s)} \left(\left\{{}^{\mathtt{pk}(s)}/_{pk_s}\right\}\right) \mid !S} \text{Out} \qquad s \,\#\, out, pk_s}{\mathit{FIX}_{\text{spec}} \xrightarrow{\overline{out}(pk_s)} \nu s.\left(\left\{{}^{\mathtt{pk}(s)}/_{pk_s}\right\}\right) \mid !S} \text{Res}$$

*Case* 1. Transition $\mathit{FIX}_{\text{spec}} \xrightarrow{\overline{out}(pk_s)} \mathit{FIX}^{\varnothing}_{\text{spec}}(\varnothing)$.

$$\dfrac{\dfrac{pk_s \,\#\, out, s, !I \quad out =_E out}{\overline{out}\langle \mathtt{pk}(s)\rangle.!I \xrightarrow{\overline{out}(pk_s)} \left(\left\{{}^{\mathtt{pk}(s)}/_{pk_s}\right\}\right) \mid !I} \text{Out} \qquad s \,\#\, out, pk_s}{\mathit{FIX}_{\text{impl}} \xrightarrow{\overline{out}(pk_s)} \nu s.\left(\left\{{}^{\mathtt{pk}(s)}/_{pk_s}\right\}\right) \mid !I} \text{Res}$$

*Case* 1. Transition $\mathit{FIX}_{\text{impl}} \xrightarrow{\overline{out}(pk_s)} \mathit{FIX}^{\varnothing,\varnothing}_{\text{impl}}(\varnothing)$.

$$\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{u_{L+1} \,\#\, card, ch, C_{\text{fix}}(s, c_{L+1}, ch_{L+1}), \sigma \quad card\sigma =_E card}{\overline{card}\langle ch_{L+1}\rangle.C_{\text{fix}}(s, c_{L+1}, ch_{L+1}) \xrightarrow{\overline{card}(u_{L+1})} \sigma \circ \left\{{}^{ch_{L+1}}/_{u_{L+1}}\right\} \mid \mathcal{E}^{L+1}(ch_{L+1})} \text{Out} \qquad c_{L+1}, ch_{L+1} \,\#\, card, u_{L+1}, \sigma}{\sigma \mid S \xrightarrow{\overline{card}(u_{L+1})} \nu c_{L+1}, ch_{L+1}.(\sigma \circ \left\{{}^{ch_{L+1}}/_{u_{L+1}}\right\} \mid \mathcal{E}^{L+1}(ch_{L+1}))} \text{Extrusion}^2 \qquad c_{L+1}, ch_{L+1}, u_{L+1} \,\#\, S}{\sigma \mid !S \xrightarrow{\overline{card}(u_{L+1})} \nu c_{L+1}, ch_{L+1}.(\sigma \circ \left\{{}^{ch_{L+1}}/_{u_{L+1}}\right\} \mid \mathcal{E}^{L+1}(ch_{L+1}) \mid !S)} \text{Rep-act} \qquad c_{L+1}, ch_{L+1}, u_{L+1} \,\#\, C_i, i \le L}{\sigma \mid C_1 \mid \cdots \mid C_L \mid !S \xrightarrow{\overline{card}(u_{L+1})} \nu c_{L+1}, ch_{L+1}.(\sigma \circ \left\{{}^{ch_{L+1}}/_{u_{L+1}}\right\} \mid C_1 \mid \cdots \mid C_L \mid \mathcal{E}^{L+1}(ch_{L+1}) \mid !S)} \text{Par}^L \qquad \begin{array}{l} s, c_i, ch_i, a_k \\ i \le L, k \in \beta \cup \gamma \cup \delta \,\# \\ card, u_{L+1} \end{array}}{\mathit{FIX}^{\Psi}_{\text{spec}}(\vec{Y}) \xrightarrow{\overline{card}(u_{L+1})} \nu s, c_1, \cdots, c_L, c_{L+1}, ch_1, \cdots, ch_L, ch_{L+1}, a_{l_1}, \cdots, a_{l_K}.(\sigma \circ \left\{{}^{ch_{L+1}}/_{u_{L+1}}\right\} \mid C_1 \mid \cdots \mid C_L \mid \mathcal{E}^{L+1}(ch_{L+1}) \mid !S)} \text{Res}^{1+2L+K}$$

*Case* 2. Transition $\mathit{FIX}^{\Psi}_{\text{spec}}(\vec{Y}) \xrightarrow{\overline{card}(u_{L+1})} \mathit{FIX}^{\{\alpha \cup \{L+1\}, \beta, \gamma, \delta\}}_{\text{spec}}((Y_1, \cdots, Y_L, \varnothing))$.

$$\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{}{\begin{array}{l}u_{L+1}\ \#\ card, ch_{L+1}, C_{\text{fix}}(s,c_d,ch_{L+1}),\theta\\ card\theta =_E card\end{array}}\ \text{Out}}{\begin{array}{l}\theta \mid \overline{card}\langle ch_{L+1}\rangle.C_{\text{fix}}(s,c_d,ch_{L+1})\\ \xrightarrow{\overline{card}(u_{L+1})}\\ \theta\circ\{^{ch_{L+1}}/_{u_{L+1}}\} \mid \mathcal{E}^d(ch_{L+1})\end{array}}\ \text{Extrusion}}{\begin{array}{l}\theta \mid \nu ch.\overline{card}\langle ch\rangle.C_{\text{fix}}(s,c_d,ch)\\ \xrightarrow{\overline{card}(u_{L+1})}\\ \nu ch_{L+1}.(\theta\circ\{^{ch_{L+1}}/_{u_{L+1}}\} \mid \mathcal{E}^d(ch_{L+1}))\end{array}}\ \text{Rep-act}}{\begin{array}{l}\theta \mid !\nu ch.\overline{card}\langle ch\rangle.C_{\text{fix}}(s,c_d,ch)\\ \xrightarrow{\overline{card}(u_{L+1})}\\ \nu ch_{L+1}.(\theta\circ\{^{ch_{L+1}}/_{u_{L+1}}\} \mid \mathcal{E}^d(ch_{L+1}) \mid !\nu ch.\overline{card}\langle ch\rangle.C_{\text{fix}}(s,c_d,ch))\end{array}}\ \text{Par}^{D+L}}{\begin{array}{l}\theta \mid \cdots \mid !\nu ch.\overline{card}\langle ch\rangle.C_{\text{fix}}(s,c_d,ch) \mid \cdots \mid !I\\ \xrightarrow{\overline{card}(u_{L+1})}\\ \nu ch_{L+1}.(\theta\circ\{^{ch_{L+1}}/_{u_{L+1}}\} \mid \cdots \mid \mathcal{E}^d(ch_{L+1}) \mid !\nu ch.\overline{card}\langle ch\rangle.C_{\text{fix}}(s,c_d,ch) \mid \cdots \mid !I)\end{array}}\ \text{Res}^{1+D+L+K}$$

$$FIX^{\Psi,\Omega}_{\text{impl}}(\vec{Y}) \xrightarrow{\overline{card}(u_{L+1})} \nu s, c_1, \cdots, c_D, ch_1, \cdots, ch_L, ch_{L+1}, a_{l_1}, \cdots, a_{l_K}.(\theta\circ\{^{ch_{L+1}}/_{u_{L+1}}\} \mid \cdots \mid \mathcal{E}^d(ch_{L+1}) \mid !\nu ch.\overline{card}\langle ch\rangle.C_{\text{fix}}(s,c_d,ch) \mid \cdots \mid !I)$$

$ch_{L+1}\ \#$
$card, u_{L+1}, \theta$

$ch_{L+1}, u_{L+1}\ \#$
$\nu ch.\overline{card}\langle ch\rangle.$
$C_{\text{fix}}(s,c_d,ch)$

$ch_{L+1}, u_{L+1}\ \#$
$C^i_j, i \le D, j \le \max_{i\le D} L_i;$
$\nu ch.\overline{card}\langle ch\rangle.$
$C_{\text{fix}}(s,c_i,ch),$
$i \le D, i \ne d; !I$

$s, c_i, ch_j, a_k,$
$i \le D, j \le L, k \in \beta \cup \gamma \cup \delta\ \#$
$card, u_{L+1}$

*Case* 2. Transition $FIX^{\Psi,\Omega}_{\text{impl}}(\vec{Y}) \xrightarrow{\overline{card}(u_{L+1})} FIX^{\{\alpha\cup\{L+1\},\beta,\gamma,\delta\},\{\cdots,\zeta^d\cup\{L+1\},\cdots\}}_{\text{impl}}((Y_1,\cdots,Y_L,\varnothing))$: card $d$ starts new session.

$$\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{}{\begin{array}{l}u_{L+1}\ \#\ card, ch_{L+1}, C_{\text{fix}}(s,c_{D+1},ch_{L+1}),\theta\\ card\theta =_E card\end{array}}\ \text{Out}}{\begin{array}{l}\theta \mid \overline{card}\langle ch_{L+1}\rangle.C_{\text{fix}}(s,c_{D+1},ch_{L+1})\\ \xrightarrow{\overline{card}(u_{L+1})}\\ \theta\circ\{^{ch_{L+1}}/_{u_{L+1}}\} \mid \mathcal{E}^{D+1}(ch_{L+1})\end{array}}\ \text{Extrusion}}{\begin{array}{l}\theta \mid \nu ch.\overline{card}\langle ch\rangle.C_{\text{fix}}(s,c_{D+1},ch)\\ \xrightarrow{\overline{card}(u_{L+1})}\\ \nu ch_{L+1}.(\theta\circ\{^{ch_{L+1}}/_{u_{L+1}}\} \mid \mathcal{E}^{D+1}(ch_{L+1}))\end{array}}\ \text{Rep-act}}{\begin{array}{l}\theta \mid !\nu ch.\overline{card}\langle ch_{L+1}\rangle.C_{\text{fix}}(s,c_{D+1},ch)\\ \xrightarrow{\overline{card}(u_{L+1})}\\ \nu ch_{L+1}.(\theta\circ\{^{ch_{L+1}}/_{u_{L+1}}\} \mid \mathcal{E}^{D+1}(ch_{L+1}) \mid !\nu ch.\overline{card}\langle ch\rangle.C_{\text{fix}}(s,c_{D+1},ch))\end{array}}\ \text{Extrusion}}{\begin{array}{l}\theta \mid I\\ \xrightarrow{\overline{card}(u_{L+1})}\\ \nu c_{D+1}, ch_{L+1}.(\theta\circ\{^{ch_{L+1}}/_{u_{L+1}}\} \mid \mathcal{E}^{D+1}(ch_{L+1}) \mid !\nu ch.\overline{card}\langle ch\rangle.C_{\text{fix}}(s,c_{D+1},ch))\end{array}}\ \text{Rep-act}}{\begin{array}{l}\theta \mid !I\\ \xrightarrow{\overline{card}(u_{L+1})}\\ \nu c_{D+1}, ch_{L+1}.(\theta\circ\{^{ch_{L+1}}/_{u_{L+1}}\} \mid \mathcal{E}^{D+1}(ch_{L+1}) \mid !\nu ch.\overline{card}\langle ch\rangle.C_{\text{fix}}(s,c_{D+1},ch) \mid !I)\end{array}}\ \text{Par}^{D+L}}{\begin{array}{l}\theta \mid \cdots \mid !I\\ \xrightarrow{\overline{card}(u_{L+1})}\\ \nu c_{D+1}, ch_{L+1}.(\theta\circ\{^{ch_{L+1}}/_{u_{L+1}}\} \mid \cdots \mid \mathcal{E}^{D+1}(ch_{L+1}) \mid !\nu ch.\overline{card}\langle ch\rangle.C_{\text{fix}}(s,c_{D+1},ch) \mid !I)\end{array}}\ \text{Res}^{1+D+L+K}$$

$$FIX^{\Psi,\Omega}_{\text{impl}}(\vec{Y}) \xrightarrow{\overline{card}(u_{L+1})} \nu s, c_1, \cdots, c_D, c_{D+1}, ch_1, \cdots, ch_L, ch_{L+1}, a_{l_1}, \cdots, a_{l_K}.(\theta\circ\{^{ch_{L+1}}/_{u_{L+1}}\} \mid \cdots \mid \mathcal{E}^{D+1}(ch_{L+1}) \mid !\nu ch.\overline{card}\langle ch\rangle.C_{\text{fix}}(s,c_{D+1},ch) \mid !I)$$

$c_{D+1}\ \#$
$card,$
$u_{L+1}, \theta$

$ch_{L+1}, u_{L+1}\ \#$
$\nu ch.\overline{card}\langle ch\rangle.$
$C_{\text{fix}}(s,c_{D+1},ch)$

$c_{D+1},$
$ch_{L+1},$
$u_{L+1}\ \# I$

$c_{D+1}, ch_{L+1},$
$u_{L+1}\ \# C^i_j,$
$i \le D, j \le \max_{i\le D} L_i;$
$\nu ch.\overline{card}\langle ch\rangle.$
$C_{\text{fix}}(s,c_d,ch)$

$s, c_i, ch_j, a_k,$
$i \le D, j \le L,$
$k \in \beta \cup \gamma \cup \delta\ \#$
$card, u_{L+1}$

*Case* 2. Transition $FIX^{\Psi,\Omega}_{\text{impl}}(\vec{Y}) \xrightarrow{\overline{card}(u_{L+1})} FIX^{\{\alpha\cup\{L+1\},\beta,\gamma,\delta\},\Omega\cup\{\{L+1\}\}}_{\text{impl}}((Y_1,\cdots,Y_L,\varnothing))$: a new card is created.

$$\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{}{\begin{array}{l}v_l\ \#\ u_l, a_l, \mathcal{F}^l(ch_l,a_l),\sigma\\ u_l\sigma =_E ch_l\end{array}}\ \text{Out}}{\sigma \mid \overline{ch_l}\langle\phi(a_l,\phi(c_l,\mathsf{g}))\rangle.\mathcal{F}^l(ch_l,a_l) \xrightarrow{\overline{u_l}(v_l)} \sigma\circ\{^{\phi(a_l,\phi(c_l,\mathsf{g}))}/_{v_l}\} \mid \mathcal{F}^l(ch_l,a_l)}\ \text{Extrusion}}{\sigma \mid \nu a.\overline{ch_l}\langle\phi(a,\phi(c_l,\mathsf{g}))\rangle.\mathcal{F}^l(ch_l,a) \xrightarrow{\overline{u_l}(v_l)} \nu a_l.(\sigma\circ\{^{\phi(a_l,\phi(c_l,\mathsf{g}))}/_{v_l}\} \mid \mathcal{F}^l(ch_l,a_l))}\ \text{Par}^L}{\sigma \mid C_1 \mid \cdots \mid \mathcal{E}^l(ch_l) \mid \cdots \mid C_L \mid !S \xrightarrow{\overline{u_l}(v_l)} \nu a_l.(\sigma\circ\{^{\phi(a_l,\phi(c_l,\mathsf{g}))}/_{v_l}\} \mid \cdots \mid C_K \mid \cdots \mid \mathcal{F}^l(ch_l,a_l) \mid \cdots \mid !S)}\ \text{Res}^{1+2L+K}$$

$$FIX^{\Psi}_{\text{spec}}(\vec{Y}) \xrightarrow{\overline{u_l}(v_l)} \nu s, c_1, \cdots, c_L, ch_1, \cdots, ch_L, a_{l_1}, \cdots, a_{l_K}, a_l.(\sigma\circ\{^{\phi(a_l,\phi(c_l,\mathsf{g}))}/_{v_l}\} \mid \cdots \mid C_K \mid \cdots \mid \mathcal{F}^l(ch_l,a_l) \mid \cdots \mid !S)$$

$a_l\ \#\ u_l, v_l, \sigma$

$a_l, v_l\ \#\ C_i, i \le L, i \ne l; !S$

$s, c_i, ch_i, a_k$
$i \le L, k \in \beta \cup \gamma \cup \delta\ \#\ u_l, v_l$

*Case* 3. Transition $FIX^{\Psi}_{\text{spec}}(\vec{Y}) \xrightarrow{\overline{u_l}(v_l)} FIX^{\{\alpha\setminus\{l\},\beta\cup\{l\},\gamma,\delta\}}_{\text{spec}}(\vec{Y})$, $l \in \alpha$.

$$\dfrac{\dfrac{\dfrac{\dfrac{v_l \# u_l, a_l, \mathcal{F}^d(ch_l, a_l), \theta \quad u_l\theta =_E ch_l}{\theta \mid \overline{ch_l}\langle\phi(a_l,\phi(c_d,\mathrm{g}))\rangle.\mathcal{F}^d(ch_l,a_l) \xrightarrow{\overline{u_l}(v_l)} \theta\circ\left\{{}^{\phi(a_l,\phi(c_d,\mathrm{g}))}/_{v_l}\right\} \mid \mathcal{F}^d(ch_l,a_l)}\ \text{Out} \quad a_l \# u_l, v_l, \theta}{\theta \mid \nu a.\overline{ch_l}\langle\phi(a,\phi(c_d,\mathrm{g}))\rangle.\mathcal{F}^d(ch_l,a) \xrightarrow{\overline{u_l}(v_l)} \nu a_l.(\theta\circ\left\{{}^{\phi(a_l,\phi(c_d,\mathrm{g}))}/_{v_l}\right\} \mid \mathcal{F}^d(ch_l,a_l))}\ \text{Extrusion} \quad \begin{array}{l} a_l, v_l \# C^i_j, \\ i \le D, j \le \max\limits_{i\le D} L_i, \\ j \ne l; !I \end{array}}{\theta \mid \cdots \mid \mathcal{E}^d(ch_l) \mid \cdots \mid !I \xrightarrow{\overline{u_l}(v_l)} \nu a_l.(\theta\circ\left\{{}^{\phi(a_l,\phi(c_d,\mathrm{g}))}/_{v_l}\right\} \mid \cdots \mid \mathcal{F}^d(ch_l,a_l) \mid \cdots \mid !I)}\ \text{Par}^{D+L} \quad \begin{array}{l} s, c_i, ch_j, a_k \\ i \le D, j \le L, k \in \beta\cup\gamma\cup\delta\ \# \\ u_l, v_l \end{array}}{FIX^{\Psi,\Omega}_{\text{impl}}(\vec{Y}) \xrightarrow{\overline{u_l}(v_l)} \nu s, c_1, \cdots, c_D, ch_1, \cdots, ch_L, a_{l_1}, \cdots, a_{l_k}, a_l.(\theta\circ\left\{{}^{\phi(a_l,\phi(c_d,\mathrm{g}))}/_{v_l}\right\} \mid \cdots \mid \mathcal{F}^d(ch_l,a_l) \mid \cdots \mid !I)}\ \text{Res}^{1+D+L+K}$$

*Case* 3. Transition $FIX^{\Psi,\Omega}_{\text{impl}}(\vec{Y}) \xrightarrow{\overline{u_l}(v_l)} FIX^{\alpha\setminus\{l\},\beta\cup\{l\},\gamma,\delta\},\Omega}_{\text{impl}}(\vec{Y})$, $l \in \alpha$.

$$\dfrac{\dfrac{\dfrac{u_l\sigma =_E ch_l}{\sigma \mid ch_l(y).\mathcal{G}^l(ch_l,a_l,y) \xrightarrow{u_l\,Y_l} \sigma \mid \mathcal{G}^l(ch_l,a_l,Y_l\sigma)}\ \text{Inp}}{\sigma \mid C_1 \mid \cdots \mid \mathcal{F}^l(ch_l,a_l) \mid \cdots \mid C_L \mid !S \xrightarrow{u_l\,Y_l} \sigma \mid \cdots \mid \mathcal{G}^l(ch_l,a_l,Y_l\sigma) \mid \cdots \mid !S}\ \text{Par}^{L} \quad \begin{array}{l} s, c_i, ch_i, a_k \\ i \le L, k \in \beta\cup\gamma\cup\delta\ \#\ u_l, Y_l \end{array}}{FIX^{\Psi}_{\text{spec}}(\vec{Y}) \xrightarrow{u_l\,Y_l} \nu s, c_1, \cdots, c_L, ch_1, \cdots, ch_L, a_{l_1}, \cdots, a_{l_k}.\{\sigma \mid \cdots \mid \mathcal{G}^l(ch_l,a_l,Y_l\sigma) \mid \cdots \mid !S\}}\ \text{Res}^{1+2L+K}$$

*Case* 4. Transition $FIX^{\Psi}_{\text{spec}}(\vec{Y}) \xrightarrow{u_l\,Y_l} FIX^{\{\alpha,\beta\setminus\{l\},\gamma\cup\{l\},\delta\}}_{\text{spec}}(\chi_l(\vec{Y},Y_l))$, $l \in \beta$.

$$\dfrac{\dfrac{\dfrac{u_l\theta =_E ch_l}{\theta \mid ch_l(y).\mathcal{G}^d(ch_l,a_l,y) \xrightarrow{u_l\,Y_l} \theta \mid \mathcal{G}^d(ch_l,a_l,Y_l\sigma)}\ \text{Inp}}{\theta \mid \cdots \mid \mathcal{F}^d(ch_l,a_l) \mid \cdots \mid !I \xrightarrow{u_l\,Y_l} \theta \mid \cdots \mid \mathcal{G}^d(ch_l,a_l,Y_l\sigma) \mid \cdots \mid !I}\ \text{Par}^{D+L} \quad \begin{array}{l} s, c_i, ch_j, a_k \\ i \le D, j \le L, k \in \beta\cup\gamma\cup\delta\ \# \\ u_l, Y_l \end{array}}{FIX^{\Psi,\Omega}_{\text{impl}}(\vec{Y}) \xrightarrow{u_l\,Y_l} \nu s, c_1, \cdots, c_D, ch_1, \cdots, ch_L, a_{l_1}, \cdots, a_{l_K}.\{\theta \mid \cdots \mid \mathcal{G}^d(ch_l,a_l,Y_l\sigma) \mid \cdots \mid !I\}}\ \text{Res}^{1+D+L+K}$$

*Case* 4. Transition $FIX^{\Psi,\Omega}_{\text{impl}}(\vec{Y}) \xrightarrow{u_l\,Y_l} FIX^{\{\alpha,\beta\setminus\{l\},\gamma\cup\{l\},\delta\},\Omega}_{\text{impl}}(\chi_l(\vec{Y},Y_l))$ if there is a card at the stage $\mathcal{F}$.

$$\dfrac{\dfrac{\dfrac{w_l \# u_l, m^l(a_l, Y_l\sigma'), \sigma \quad u_l\theta =_E ch_l}{\sigma \mid \overline{ch_l}\left\langle m^l(a_l,Y_l\sigma')\right\rangle \xrightarrow{\overline{u_l}(w_l)} \sigma\circ\left\{{}^{m^l(a_l,Y_l\sigma')}/_{w_l}\right\} \mid \mathcal{H}^l}\ \text{Out}}{\sigma \mid C_1 \mid \cdots \mid \mathcal{G}^l(ch_l,a_l,Y_l\sigma') \mid \cdots \mid C_L \mid !S \xrightarrow{\overline{u_l}(w_l)} \sigma\circ\left\{{}^{m^l(a_l,Y_l\sigma')}/_{w_l}\right\} \mid \cdots \mid \mathcal{H}^l \mid \cdots \mid !S}\ \text{Par}^{L} \quad \begin{array}{l} s, c_i, ch_i, a_k \\ i \le L, k \in \beta\cup\gamma\cup\delta\ \#\ u_l, w_l \end{array}}{FIX^{\Psi}_{\text{spec}}(\vec{Y}) \xrightarrow{\overline{u_l}(w_l)} \nu s, c_1, \cdots, c_L, ch_1, \cdots, ch_L, a_{l_1}, \cdots, a_{l_K}.\{\sigma\circ\left\{{}^{m^l(a_l,Y_l\sigma')}/_{w_l}\right\} \mid \cdots \mid \mathcal{H}^l \mid \cdots \mid !S\}}\ \text{Res}^{1+2L+K}$$

*Case* 5. Transition $FIX^{\Psi}_{\text{spec}}(\vec{Y}) \xrightarrow{\overline{u_l}(w_l)} FIX^{\{\alpha,\beta,\gamma\setminus\{l\},\delta\cup\{l\}\}}_{\text{spec}}(\vec{Y})$, $l \in \gamma$.

$$\dfrac{\dfrac{\dfrac{w_l \# u_l, m^d(a_l, Y_l\theta'), \theta \quad u_l\theta =_E ch_l}{\theta \mid \overline{ch_l}\left\langle m^d(a_l,Y_l\theta')\right\rangle \xrightarrow{\overline{u_l}(w_l)} \theta\circ\left\{{}^{m^d(a_l,Y_l\theta')}/_{w_l}\right\} \mid \mathcal{H}^d}\ \text{Out}}{\theta \mid \cdots \mid \mathcal{G}^d(ch_l,a_l,Y_l\theta') \mid \cdots \mid !I \xrightarrow{\overline{u_l}(w_l)} \theta\circ\left\{{}^{m^d(a_l,Y_l\theta')}/_{w_l}\right\} \mid \cdots \mid \mathcal{H}^d \mid \cdots \mid !I}\ \text{Par}^{D+L} \quad \begin{array}{l} s, c_i, ch_j, a_k \\ i <\le D, j \le L, k \in \beta\cup\gamma\cup\delta\ \# \\ u_l, w_l \end{array}}{FIX^{\Psi,\Omega}_{\text{impl}}(\vec{Y}) \xrightarrow{\overline{u_l}(w_l)} \nu s, c_1, \cdots, c_D, ch_1, \cdots, ch_L, a_{l_1}, \cdots, a_{l_K}.\{\theta\circ\left\{{}^{m^d(a_l,Y_l\theta')}/_{w_l}\right\} \mid \cdots \mid \mathcal{H}^d \mid \cdots \mid !I\}}\ \text{Res}^{1+D+L+K}$$

*Case* 5. Transition $FIX^{\Psi,\Omega}_{\text{impl}}(\vec{Y}) \xrightarrow{\overline{u_l}(w_l)} FIX^{\{\alpha,\beta,\gamma\setminus\{l\},\delta\cup\{l\}\},\Omega}_{\text{impl}}(\vec{Y})$, $l \in \gamma$.