

**Table S23 Prescription for the calculation of two-locus X chromosome female diplotype probabilities at intermediate generations in the construction of 8-way RIL, from the corresponding probabilities for 4-way RIL. Only the states with non-zero probability are shown.**

Prototype	No. states	4-way state	Probability multiplier	Prototype	No. states	4-way state	Probability multiplier
<i>aa aa</i>	2	<i>AA AA</i>	$\frac{1-r}{2}$	<i>ac ef</i>	8	<i>AB CC</i>	$\frac{r}{4}$
<i>ab ab</i>	2	<i>AA AA</i>	$\frac{r}{2}$	<i>ae ae</i>	8	<i>AC AC</i>	$\frac{1}{4}$
<i>aa ac</i>	4	<i>AA AB</i>	$\frac{1-r}{2}$	<i>ae cc</i>	8	<i>AC BB</i>	$\frac{1}{4}$
<i>ab ac</i>	4	<i>AA AB</i>	$\frac{r}{2}$	<i>ae ce</i>	8	<i>AC BC</i>	$\frac{1}{4}$
<i>aa ae</i>	8	<i>AA AC</i>	$\frac{1-r}{4}$	<i>ae ea</i>	4	<i>AC CA</i>	$\frac{(1-r)^2}{4}$
<i>ab ae</i>	8	<i>AA AC</i>	$\frac{r}{4}$	<i>ae eb</i>	4	<i>AC CA</i>	$\frac{r(1-r)}{4}$
<i>aa cc</i>	2	<i>AA BB</i>	$\frac{1-r}{2}$	<i>ae fa</i>	4	<i>AC CA</i>	$\frac{r(1-r)}{4}$
<i>ab cc</i>	2	<i>AA BB</i>	$\frac{r}{2}$	<i>ae fb</i>	4	<i>AC CA</i>	$\frac{r^2}{4}$
<i>aa ce</i>	8	<i>AA BC</i>	$\frac{1-r}{4}$	<i>ae ec</i>	8	<i>AC CB</i>	$\frac{1-r}{4}$
<i>ab ce</i>	8	<i>AA BC</i>	$\frac{r}{4}$	<i>ae fc</i>	8	<i>AC CB</i>	$\frac{r}{4}$
<i>aa ee</i>	4	<i>AA CC</i>	$\frac{(1-r)^2}{4}$	<i>ae ee</i>	8	<i>AC CC</i>	$\frac{1-r}{4}$
<i>aa ef</i>	4	<i>AA CC</i>	$\frac{r(1-r)}{4}$	<i>ae fe</i>	8	<i>AC CC</i>	$\frac{r}{4}$
<i>ab ee</i>	4	<i>AA CC</i>	$\frac{r(1-r)}{4}$	<i>cc cc</i>	1	<i>BB BB</i>	1
<i>ab ef</i>	4	<i>AA CC</i>	$\frac{r^2}{4}$	<i>cc ce</i>	4	<i>BB BC</i>	$\frac{1}{2}$
<i>ac ac</i>	4	<i>AB AB</i>	$\frac{1}{2}$	<i>cc ee</i>	2	<i>BB CC</i>	$\frac{1-r}{2}$
<i>ac ae</i>	8	<i>AB AC</i>	$\frac{1}{4}$	<i>cc ef</i>	2	<i>BB CC</i>	$\frac{r}{2}$
<i>ac ca</i>	2	<i>AB BA</i>	$\frac{1-r}{2}$	<i>ce ce</i>	4	<i>BC BC</i>	$\frac{1}{2}$
<i>ac cb</i>	2	<i>AB BA</i>	$\frac{r}{2}$	<i>ce ec</i>	2	<i>BC CB</i>	$\frac{1-r}{2}$
<i>ac cc</i>	4	<i>AB BB</i>	$\frac{1}{2}$	<i>ce fc</i>	2	<i>BC CB</i>	$\frac{r}{2}$
<i>ac ce</i>	8	<i>AB BC</i>	$\frac{1}{4}$	<i>ce ee</i>	4	<i>BC CC</i>	$\frac{1-r}{2}$
<i>ac ea</i>	8	<i>AB CA</i>	$\frac{1-r}{4}$	<i>ce fe</i>	4	<i>BC CC</i>	$\frac{r}{2}$
<i>ac eb</i>	8	<i>AB CA</i>	$\frac{r}{4}$	<i>ee ee</i>	2	<i>CC CC</i>	$\frac{1-r}{2}$
<i>ac ec</i>	8	<i>AB CB</i>	$\frac{1}{4}$	<i>ef ef</i>	2	<i>CC CC</i>	$\frac{r}{2}$
<i>ac ee</i>	8	<i>AB CC</i>	$\frac{1-r}{4}$				