- A selection is omitted in the previous closure test
- The ϵ_{evt} is calculated with a selection:

```
cut_reco_evt = "Trigger_Matched == 1 && fourMuFit_Mass[0]>0 &&
fourMuFit_ups1_VtxProb[0]>0.005 && fourMuFit_ups2_VtxProb[0]>0.005
&& !((trigger&8)==0)"
```

- The $\mu^+\mu^-$ vertex selection is regarded as a duplicate and gets omitted in the closure test
- But it is found a lot of events fail in this selection

New efficiency

$$\epsilon_1^i(J/\psi_1) = \frac{N[cut_1(J/\psi_1)\&\&Fid^i(J/\psi_1)]}{2N[Fid^i(J/\psi_1)]}$$

…

$$\epsilon_n^i(J/\psi_1) = \frac{N[cut_1(J/\psi_1)\ \dots\ cut_{n-1}(J/\psi_1)\&\&cut_n(J/\psi_1)\&\&Fid^i(J/\psi_1)]}{2N[cut_1(J/\psi_1)\ \dots\ cut_{n-1}(J/\psi_1)\&\&Fid^i(J/\psi_1)]}$$

⇓

$$\epsilon_1^i(J/\psi_1) = \frac{N[(cut_1(J/\psi_1) + cut_1(J/\psi_2))\&\&Fid^i(J/\psi_1)]}{2N[Fid^i(J/\psi_1)]}$$

…

$$\epsilon_n^i(J/\psi_1) = \frac{N[cut_1(J/\psi_1)\&\&cut_1(J/\psi_2)\ \dots\ cut_{n-1}(J/\psi_1)\&\&cut_{n-1}(J/\psi_2)\&\&(cut_n(J/\psi_1) + cut_n(J/\psi_2))\&\&Fid^i(J/\psi_1)]}{2N[cut_1(J/\psi_1)\&\&cut_1(J/\psi_2)\ \dots\ cut_{n-1}(J/\psi_1)\&\&cut_{n-1}(J/\psi_2)\&\&Fid^i(J/\psi_1)]}$$

New efficiency

Old

	N^{obs}	N^{Corr}_{SPS}	N^{Corr}_{DPS}	N^{Corr}_{37Mix}	N^{Corr}_{82Mix}
$Total$	13140	13909	10220	12485	13388
$RECO$	13140	13325	9869	11980	12856
$id(\mu)$	12410	12563	9382	11278	12097
$vtx(\mu^+\mu^-)$	11379	11407	8893	10376	11037
HLT	8337	8355	7970	8243	8302
evt	7306				

New

	N^{obs}	N^{Corr}_{SPS}	N^{Corr}_{DPS}	N^{Corr}_{37Mix}	N^{Corr}_{82Mix}
$Total$	13140	14959	10994	13582	14442
$RECO$	13140	14308	10433	12856	13765
$id(\mu)$	12410	13085	9684	11758	11592
$vtx(\mu^+\mu^-)$	11379	11407	8893	10376	11037
HLT	8337	8355	7970	8243	8302
evt	7306				

$$\epsilon_1^i(J/\psi_1) = \frac{N[(cut_1(J/\psi_1) + cut_1(J/\psi_2))\&\&Fid^i(J/\psi_1)]}{2N[Fid^i(J/\psi_1)]}$$

…

$$\epsilon_n^i(J/\psi_1) = \frac{N\big[[(cut_1(J/\psi_1) \dots cut_{n-1}(J/\psi_1)\&\&cut_n(J/\psi_1)\big) + (cut_1(J/\psi_2) \dots cut_{n-1}(J/\psi_2)\&\&cut_n(J/\psi_2))]\&\&Fid^i(J/\psi_1)]}{2N[[(cut_1(J/\psi_1) \dots cut_{n-1}(J/\psi_1)) + (cut_1(J/\psi_2) \dots cut_{n-1}(J/\psi_2))]\&\&Fid^i(J/\psi_1)]}$$

	N^{obs}	N^{Corr}_{SPS}	N^{Corr}_{DPS}	N^{Corr}_{37Mix}	N^{Corr}_{82Mix}
$Total$	13140	15380	11163	13833	14808
$RECO$	13140	14239	10348	12746	13691
$id(\mu)$	12410	13031	9614	11663	12531
$vtx(\mu^+\mu^-)$	11379	11406	8893	10376	11037
HLT	8337	9355	7970	8243	8302
evt	8160				