Appendix A

The fill factor of the base tracks also depends on the position of the scanned film. The typical causes of the inefficiency are heterogeneous thickness of the emulsion layers, some dusts or scratches on the emulsion surface, and the poorly tuned parameters for the scanning.

Fig. 15 shows the position distribution of the fill factor of all films of an ECC. For example, at upper left the films tend to have the low efficiency (e.g., a-f, h, k, l, q). This part has the larger thickness of emulsion layer because drips were left in the upper left corner when drying after soaking with glycerin solution. Fig. 15(s) and (t) have larger low efficiency area in the right and left. The reason might be the poorly tuned parameters for the scanning.

Compared to the size of the cone, the ECC is a very small "element", thus the local position dependence of the fill factor can be approximately treated as an average fill factor $\varepsilon_j(\theta_x, \theta_y)$. The inefficiency of the basetrack is reflected in the $\varepsilon_j(\theta_x, \theta_y)$ in Eq. (4). Finally, $\varepsilon_j(\theta_x, \theta_y)$, which encompasses the effects of the local inefficiency of the basetrack, is effectively used to derive the angle-dependent muon detection efficiency.

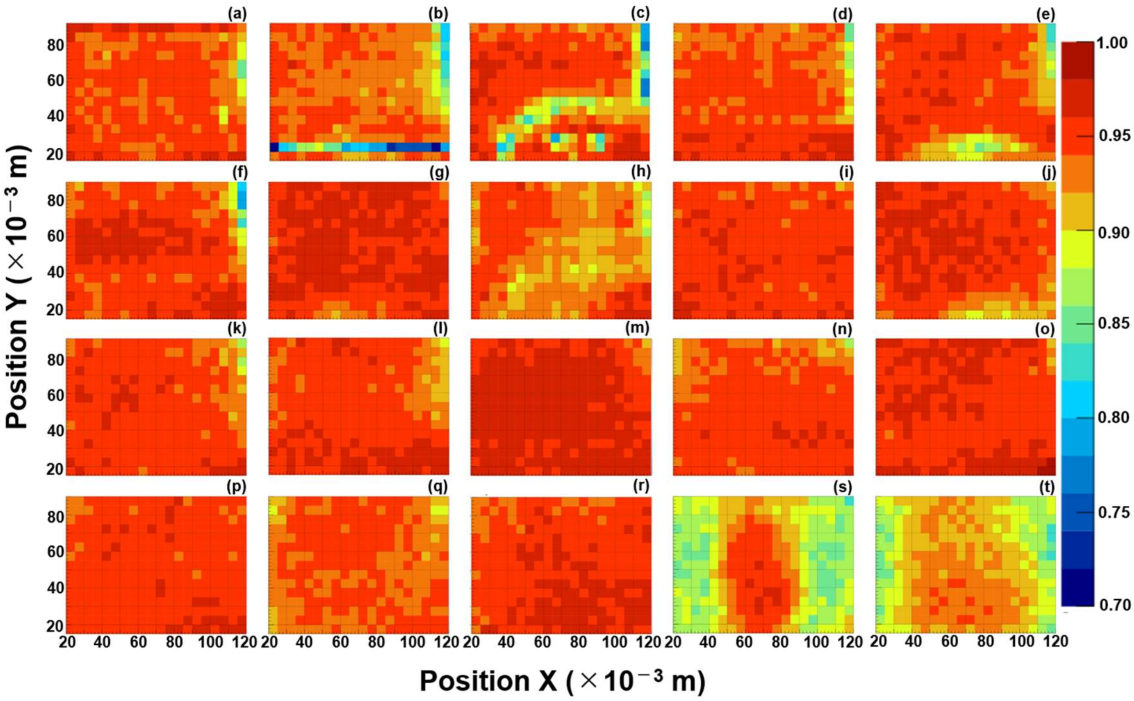

Figure 15. The position distribution of the fill factor in each film of ECC02. (a)–(t) represent PL01–PL20, respectively.