

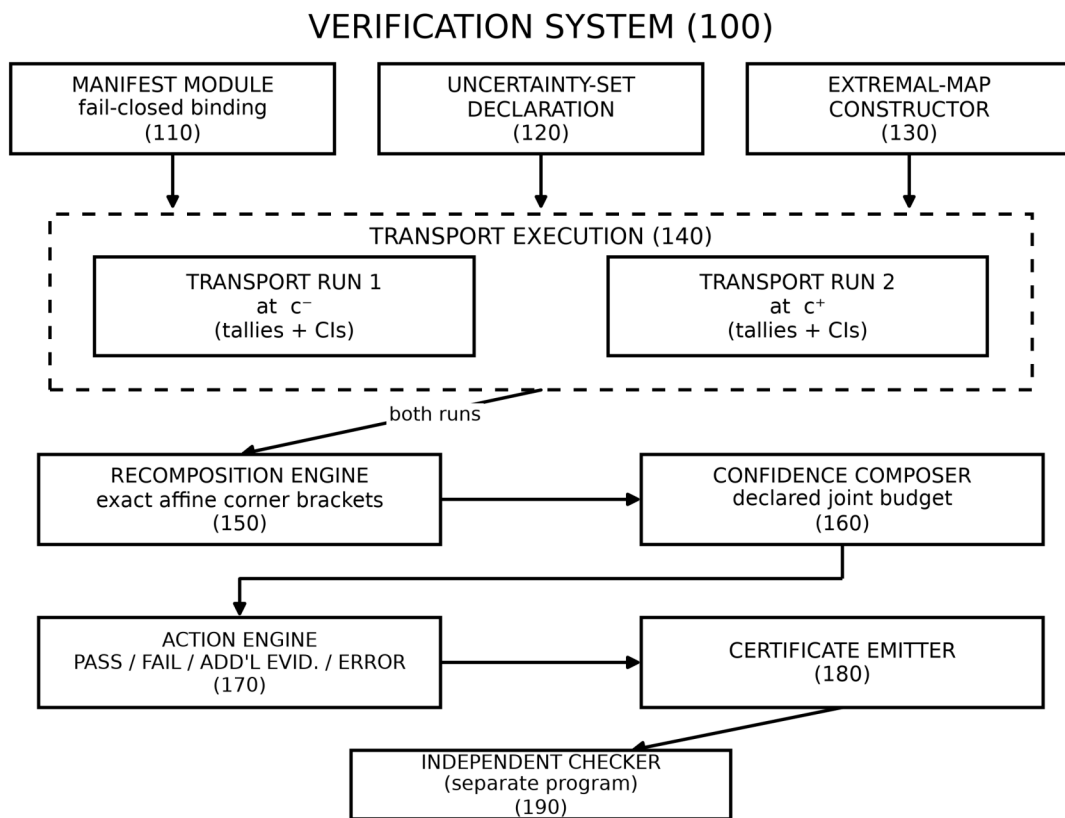


FIG. 1

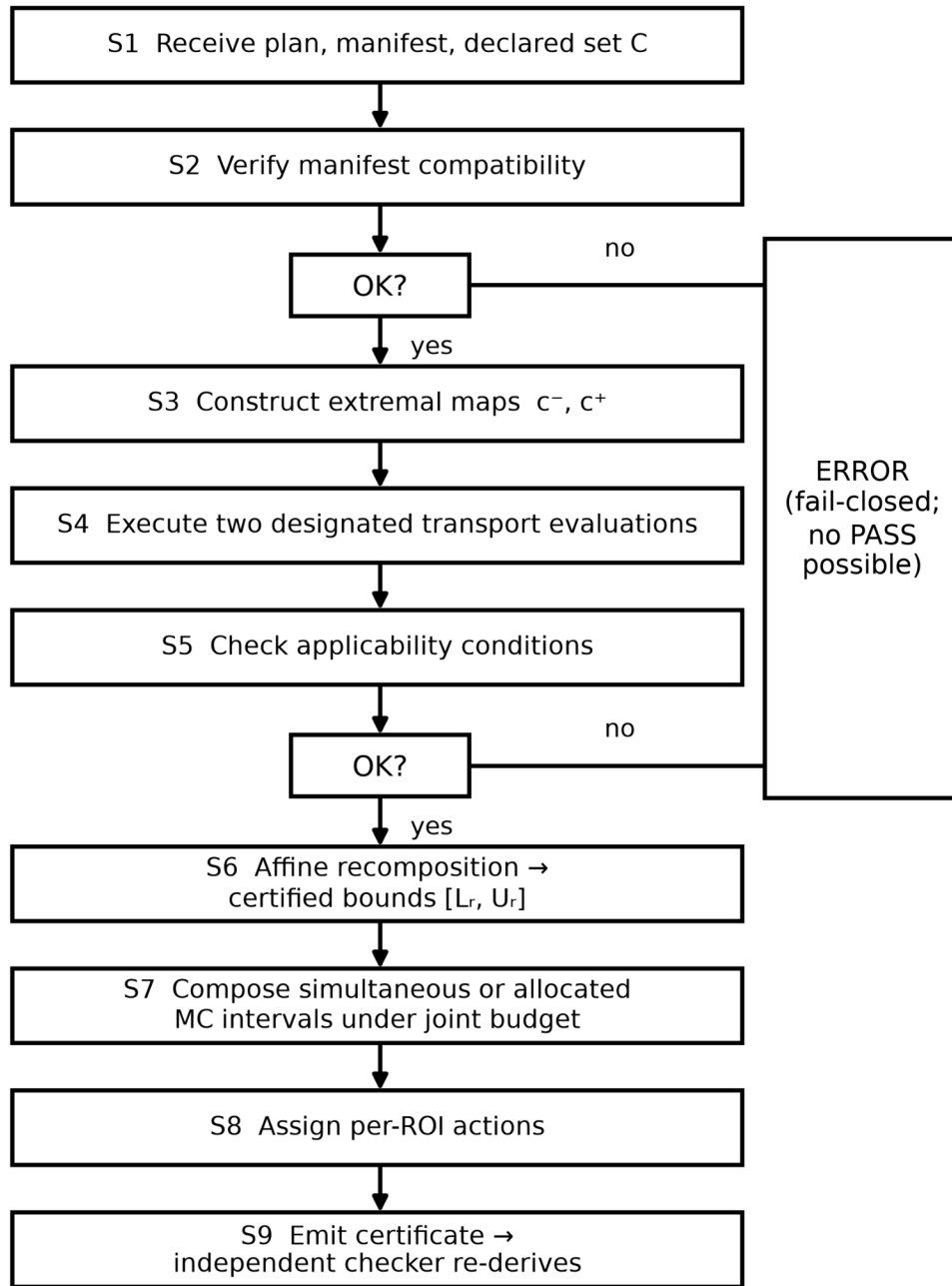


FIG. 2

$$\varphi(c^+) \leq \varphi(c) \leq \varphi(c^-) \quad \text{for every } c \in C$$

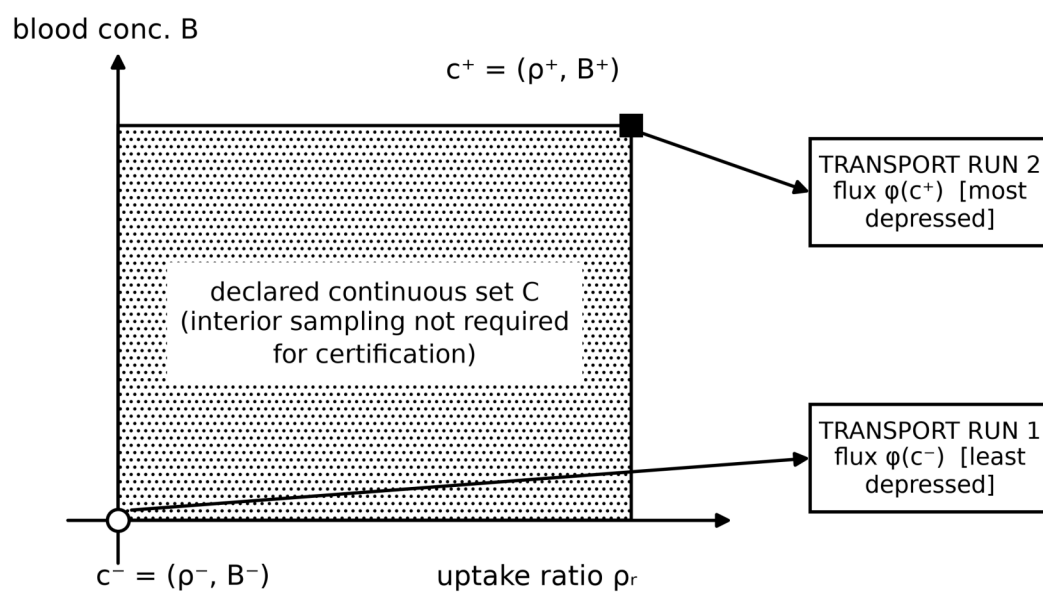
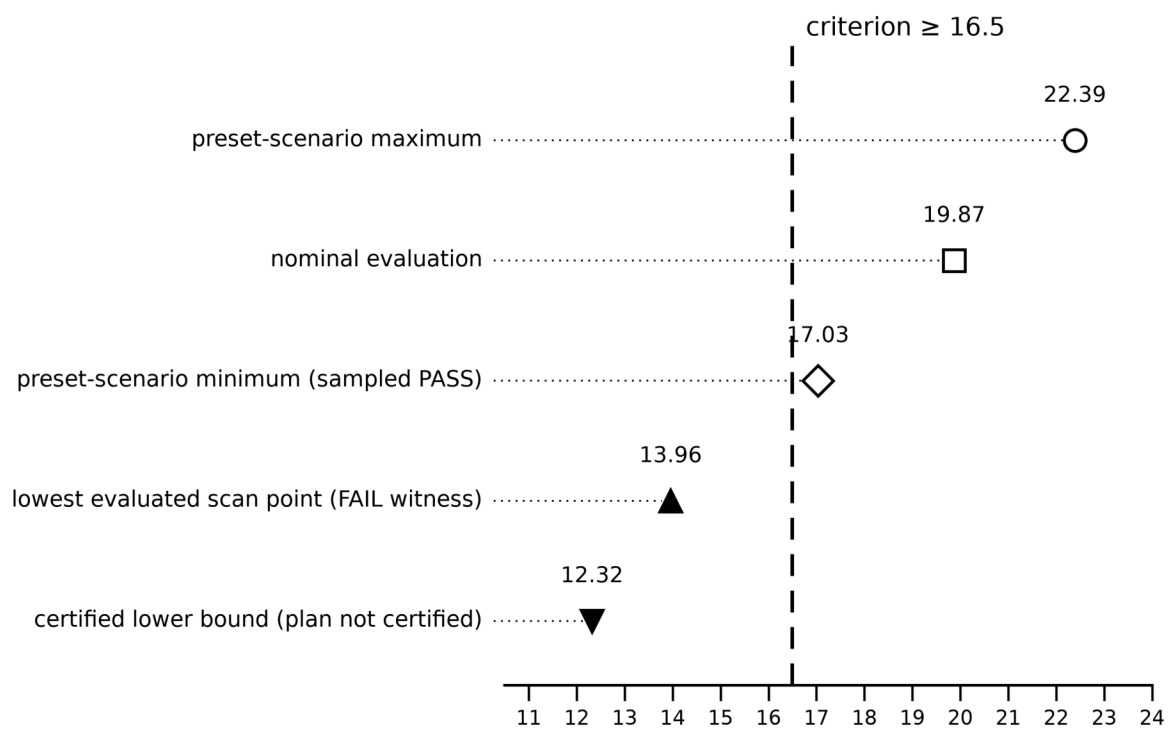


FIG. 3

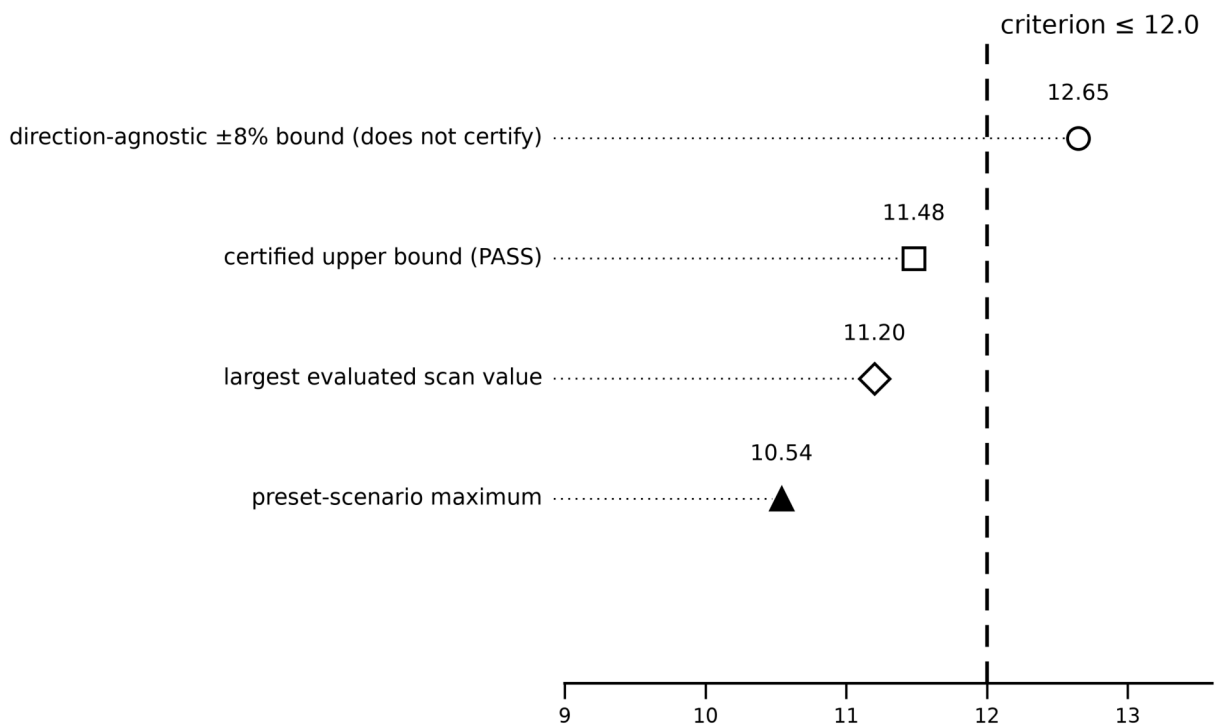
	LOWER BOUND uses	UPPER BOUND uses	
BORON $D_B \propto c \cdot \phi$	$\rho^- B^- \times K(c^+)$	$\rho^+ B^+ \times K(c^-)$	mixed corners (Eq. 4)
THERMAL/NITROGEN $D_N \propto \phi$	evaluate at c^+	evaluate at c^-	monotone (Eq. 3)
PHOTON D_g	H-capture at c^+ ; B-capture mixed; structural const.	H-capture at c^- ; B-capture mixed; structural const.	3-part decomposition
FAST D_f	run value $- \epsilon_f$	run value $+ \epsilon_f$	uniform certificate + endpoint consistency check

weighted sum with declared $w \geq 0 \rightarrow$ certified $L_r \leq D_{w,r}(c) \leq U_r \quad \forall c \in C$

FIG. 4



Plan X, tumor weighted dose (Gy-w) — Case A: preset schedule under-covers
FIG. 5



Plan Y, mucosa weighted dose (Gy-w) — Case B: certified bound is usably tight
FIG. 6