Table S1. Crystallographic data collection and refinement statistics for Fab P-4G2PUUV Gc

|  |  |
| --- | --- |
|  | Fab P-4G2****PUUV Gc |
| **Data collection** |  |
| Space group | *P* 1 21 1 |
| Cell dimensions |  |
| *a*, *b*, *c* (Å) | 97.2, 50.5, 124.5 |
| *a*, *b*, *g*  () | 90.0, 107.7, 90.0 |
| Resolution (Å) | 92.6-3.50 (3.63-3.50)\* |
| *R*merge | 0.413 (-) |
| *R*pim | 0.140 (0.426) |
| I/σ I | 4.6 (1.9) |
| CC1/2 | 0.96 (0.65) |
| Completeness (%) | 99.7 (97.5) |
| Multiplicity | 9.6 (9.0) |
| **Refinement** |  |
| Resolution (Å) | 92.63-3.50 (3.77-3.50) |
| No. reflections | 14,903 |
| *R*work / *R*free | 0.217 / 0.264 |
| No. atoms |  |
| Protein | 6,464 |
| Ligand/ion | 32 |
| Water | 0 |
| *B*-factors |  |
| Protein | 70.6 |
| Ligand/ion | 58.2 |
| Ramachandran plot (%) |  |
| Favored region | 94.98 |
| Allowed region | 5.02 |
| Outliers | 0 |
| R.m.s deviations |  |
| Bond lengths (Å) | 0.001 |
| Bond angles () | 0.454 |

\* Highest resolution shell is shown in parentheses

**Table S2.** Cryo-EM tomography data collection, sub-tomogram reconstruction, and fitting statistics

|  |  |  |
| --- | --- | --- |
|  | **PUUV VLP** | **PUUV VLP +P-4G2 fab** |
| Tilt range (degrees) | -30–60 |  -30–60 |
| Tilt increment (degrees) | 3 |  3 |
| Frames per tilt | 6 |  6 |
| Electron exposure (e⁻/ Å²/tilt) | 4.5 |  4.5 |
| Total electron exposure (e⁻/ Å²) | 140 |  140 |
| Pixel size (Å) | 1.77 |  1.76 |
| Defocus range (μm) | 2.8–4.0 |  2.8–4.0 |
| Tilt series | 33 |  59 |
| Tomograms | 33 |  59 |
| VLP sub-volumes | 42 |  79 |
| Reconstruction | GP spike | GP spike | GP spike+P-4G2 |
| EMDB ID | EMD- xxxx | EMD- xxxx | EMD- xxxx |
| Spike sub-volumes | 4,323 | 1,976 | 1,721 |
| Symmetry  | C4 | C4 | C4 |
| Pixel size (Å) | 3.52 | 3.52 | 3.52 |
| Resolution (Å) | 13.9 | 14.3 | 13.4 |
| Model-to-Map CC  | 0.89^ | nd.  | 0.91\* |

CC: local map-to-map cross-correlation from Chimera fitmap

\* Fitted structure: Fab P-4G2–PUUV Gc complex crystal structure

^ Fitted structure: PUUV Gn (from PDB 5FXU)+PUUV GcGc–P-4G2

nd.: Not determined