



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2026 – 01:35 AM UTC

PDB ID : 6FY3 / pdb_00006fy3
Title : Crystal structure of a V2-directed, RV144 vaccine-like antibody from HIV-1 infection, CAP228-3D, bound to a heterologous V2 peptide
Authors : Wibmer, C.K.; Moore, P.L.; Morris, L.
Deposited on : 2018-03-10
Resolution : 2.60 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

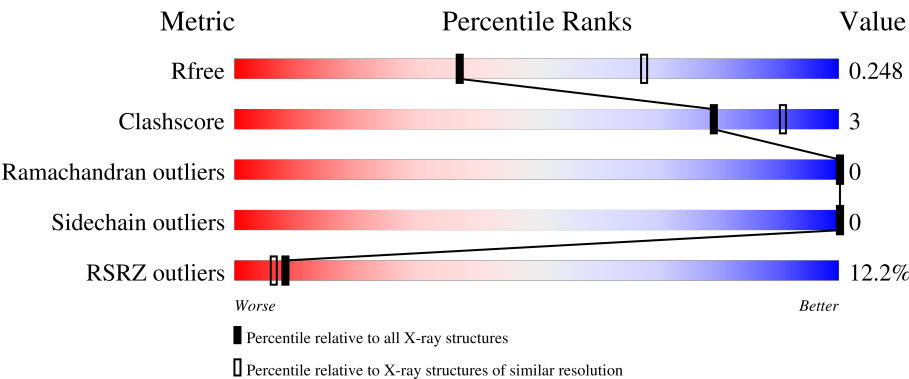
MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R _{free}	180053	4008 (2.60-2.60)
Clashscore	190562	4347 (2.60-2.60)
Ramachandran outliers	187476	4277 (2.60-2.60)
Sidechain outliers	187428	4277 (2.60-2.60)
RSRZ outliers	180081	4008 (2.60-2.60)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	H	238	7% 86% 9% 5%
1	X	238	13% 69% 6% 25%
2	L	218	10% 95% •
2	Y	218	15% 89% • 7%
3	P	19	11% 63% 16% 21%

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Mol	Chain	Length	Quality of chain
3	Z	19	11% 74% 11% 16%

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 13013 atoms, of which 6319 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called CAP228-3D Heavy Chain.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	X	178	Total	C	H	N	O	S	0	0	0
			2730	887	1349	221	265	8			
1	H	226	Total	C	H	N	O	S	0	0	0
			3394	1096	1681	275	334	8			

- Molecule 2 is a protein called CAP228-3D Light Chain.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
2	Y	202	Total	C	H	N	O	S	0	0	0
			2996	955	1462	256	317	6			
2	L	214	Total	C	H	N	O	S	0	0	0
			3168	1008	1546	271	337	6			

- Molecule 3 is a protein called CAP45 V2 peptide.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	Z	16	Total	C	H	N	O	0	0	0
			288	93	146	26	23			
3	P	15	Total	C	H	N	O	0	0	0
			269	87	135	25	22			

- Molecule 4 is water.

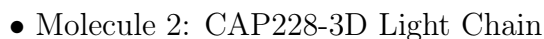
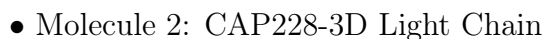
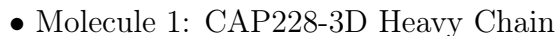
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	X	14	Total	O	0	0
			14	14		
4	Y	32	Total	O	0	0
			32	32		
4	Z	6	Total	O	0	0
			6	6		
4	H	77	Total	O	0	0
			77	77		

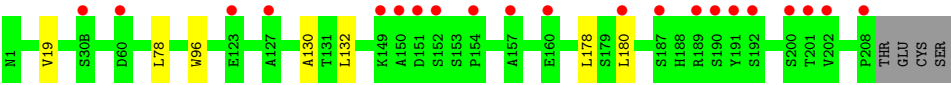
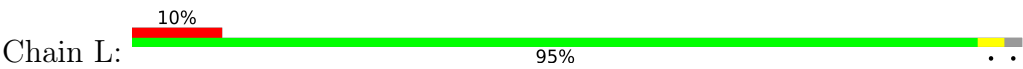
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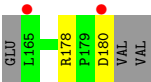
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	L	35	Total 35	O 35	0	0
4	P	4	Total 4	O 4	0	0

- Molecule 1: CAP228-3D Heavy Chain





• Molecule 3: CAP45 V2 peptide



• Molecule 3: CAP45 V2 peptide



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	208.36Å 43.81Å 119.91Å 90.00° 93.77° 90.00°	Depositor
Resolution (Å)	42.87 – 2.60 42.87 – 2.60	Depositor EDS
% Data completeness (in resolution range)	99.4 (42.87-2.60) 99.5 (42.87-2.60)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.21 (at 2.61Å)	Xtriage
Refinement program	PHENIX 1.13.2998	Depositor
R, R_{free}	0.220 , 0.250 0.219 , 0.248	Depositor DCC
R_{free} test set	1698 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å ²)	39.8	Xtriage
Anisotropy	0.625	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 58.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	13013	wwPDB-VP
Average B, all atoms (Å ²)	71.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.99% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# $ Z > 5$	RMSZ	# $ Z > 5$
1	H	0.13	0/1760	0.34	0/2398
1	X	0.11	0/1417	0.31	0/1919
2	L	0.11	0/1663	0.32	0/2271
2	Y	0.12	0/1572	0.33	0/2145
3	P	0.12	0/137	0.38	0/181
3	Z	0.11	0/145	0.34	0/192
All	All	0.12	0/6694	0.33	0/9106

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	H	1713	1681	1681	17	0
1	X	1381	1349	1345	8	0
2	L	1622	1546	1546	5	0
2	Y	1534	1462	1461	6	0
3	P	134	135	135	4	0
3	Z	142	146	146	2	0
4	H	77	0	0	0	0
4	L	35	0	0	0	0
4	P	4	0	0	0	0
4	X	14	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	Y	32	0	0	0	0
4	Z	6	0	0	0	0
All	All	6694	6319	6314	35	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 3.

All (35) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:H:50:MET:HE1	3:P:176:PHE:CE1	2.23	0.74
2:Y:61:ARG:NH1	2:Y:82:ASP:OD2	2.23	0.71
1:H:50:MET:HE1	3:P:176:PHE:HE1	1.60	0.65
1:X:56:ASP:OD2	3:Z:178:ARG:NH1	2.37	0.57
2:Y:3:MET:HE1	1:H:100(B):SER:O	2.05	0.55
1:H:63:LEU:HD13	1:H:67:VAL:HG22	1.88	0.54
1:X:50:MET:HE1	1:X:95:LEU:HD22	1.89	0.54
1:X:48:MET:HE1	1:X:80:LEU:HD21	1.91	0.52
1:H:160:THR:HG22	1:H:160:THR:O	2.09	0.52
1:H:178:LEU:C	1:H:178:LEU:HD12	2.35	0.52
1:H:18:LEU:HB2	1:H:82(C):LEU:HD11	1.92	0.50
2:Y:3:MET:HE3	1:H:100(D):PHE:CE2	2.46	0.50
2:Y:54:ARG:NE	2:Y:62:PHE:O	2.34	0.49
1:X:67:VAL:HG12	1:X:82:TRP:CD1	2.47	0.49
1:H:50:MET:HE3	2:L:96:TRP:CZ2	2.47	0.49
2:L:132:LEU:HD12	2:L:178:LEU:HD23	1.94	0.49
3:P:180:ASP:N	3:P:180:ASP:OD1	2.46	0.48
1:X:178:LEU:C	1:X:178:LEU:HD12	2.38	0.48
1:H:6:GLN:HG2	1:H:22:CYS:SG	2.54	0.47
1:H:152:VAL:HG11	1:H:180:SER:CB	2.45	0.46
3:Z:180:ASP:N	3:Z:180:ASP:OD1	2.48	0.46
1:H:154:TRP:CZ3	1:H:196:CYS:HB3	2.51	0.46
2:L:130:ALA:HB3	2:L:180:LEU:O	2.17	0.45
2:L:19:VAL:HG13	2:L:78:LEU:HD11	1.99	0.45
1:H:30:SER:HB2	1:H:53:GLY:HA2	2.00	0.44
1:H:63:LEU:HD13	1:H:67:VAL:CG2	2.47	0.44
1:H:56:ASP:OD2	3:P:178:ARG:NH2	2.51	0.43
1:H:150:VAL:CG2	1:H:178:LEU:HD21	2.49	0.43
1:H:40:MET:HE3	1:H:43:LYS:HD2	2.01	0.42
1:X:97:ASN:HB3	1:X:100(G):TRP:CD1	2.54	0.42
2:Y:35:TRP:HB2	2:Y:48:ILE:HB	2.02	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:X:52:TYR:O	1:X:55:SER:N	2.53	0.41
2:Y:159:VAL:HG22	2:Y:178:LEU:HD13	2.02	0.41
1:X:201:LYS:N	1:X:202:PRO:CD	2.83	0.41
2:L:19:VAL:CG1	2:L:78:LEU:HD11	2.52	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	H	224/238 (94%)	220 (98%)	4 (2%)	0	100	100
1	X	170/238 (71%)	167 (98%)	3 (2%)	0	100	100
2	L	212/218 (97%)	206 (97%)	6 (3%)	0	100	100
2	Y	198/218 (91%)	193 (98%)	5 (2%)	0	100	100
3	P	13/19 (68%)	13 (100%)	0	0	100	100
3	Z	14/19 (74%)	14 (100%)	0	0	100	100
All	All	831/950 (88%)	813 (98%)	18 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	H	193/204 (95%)	193 (100%)	0	100	100
1	X	154/204 (76%)	154 (100%)	0	100	100
2	L	187/191 (98%)	187 (100%)	0	100	100
2	Y	177/191 (93%)	177 (100%)	0	100	100
3	P	13/17 (76%)	13 (100%)	0	100	100
3	Z	14/17 (82%)	14 (100%)	0	100	100
All	All	738/824 (90%)	738 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	X	66	GLN
1	X	197	ASN
2	Y	37	GLN
2	Y	53	GLN
2	Y	197	HIS
1	H	164	HIS
2	L	37	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	H	226/238 (94%)	0.46	17 (7%) 20 16	13, 50, 141, 179	0
1	X	178/238 (74%)	0.79	30 (16%) 4 3	28, 61, 182, 234	0
2	L	214/218 (98%)	0.59	21 (9%) 13 10	24, 61, 120, 169	0
2	Y	202/218 (92%)	0.92	32 (15%) 5 4	14, 74, 181, 217	0
3	P	15/19 (78%)	0.22	2 (13%) 7 5	19, 30, 78, 97	0
3	Z	16/19 (84%)	0.70	2 (12%) 8 6	33, 57, 124, 151	0
All	All	851/950 (89%)	0.67	104 (12%) 8 6	13, 60, 157, 234	0

All (104) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	H	22	CYS	7.5
2	Y	118	PHE	5.2
2	Y	119	PRO	5.1
1	X	211	VAL	4.9
1	X	181	VAL	4.7
1	X	139	GLY	4.6
2	Y	202	VAL	4.5
2	Y	191	TYR	4.1
1	X	141	LEU	3.9
2	L	208	PRO	3.8
2	Y	1	ASN	3.8
2	Y	182	PRO	3.7
2	Y	117	LEU	3.6
3	P	180	ASP	3.6
1	X	149	PRO	3.6
1	H	213	PRO	3.6
1	X	120	SER	3.6
2	Y	185	TRP	3.5
1	H	140	CYS	3.5

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Mol	Chain	Res	Type	RSRZ
2	L	189	ARG	3.4
2	Y	152	SER	3.3
2	L	160	GLU	3.3
3	P	166	ARG	3.3
1	H	197	ASN	3.3
1	X	180	SER	3.2
1	X	196	CYS	3.2
1	X	166	PHE	3.1
2	Y	146	VAL	3.1
2	Y	168	SER	3.1
2	Y	193	CYS	3.1
1	H	187	SER	3.1
1	H	159	LEU	3.0
3	Z	165	LEU	3.0
3	Z	180	ASP	3.0
2	Y	133	VAL	3.0
2	Y	154	PRO	3.0
2	Y	180	LEU	3.0
2	Y	201	THR	3.0
1	H	196	CYS	2.9
2	L	151	ASP	2.9
2	Y	169	ASN	2.9
1	X	142	VAL	2.9
1	H	138	LEU	2.8
1	X	202	PRO	2.8
2	L	152	SER	2.8
1	H	64	GLN	2.7
2	L	202	VAL	2.7
2	Y	178	LEU	2.7
2	L	180	LEU	2.7
1	X	210	LYS	2.7
1	X	119	PRO	2.6
2	L	154	PRO	2.6
2	Y	206	VAL	2.6
1	X	213	PRO	2.6
1	X	199	ASN	2.6
2	L	192	SER	2.6
1	X	198	VAL	2.6
1	X	173	SER	2.5
2	L	190	SER	2.5
2	L	200	SER	2.5
1	H	129	LYS	2.5

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Mol	Chain	Res	Type	RSRZ
1	X	146	PHE	2.5
1	H	190	GLY	2.5
2	L	157	ALA	2.5
2	L	191	TYR	2.5
1	X	105	ARG	2.5
2	L	187	SER	2.5
2	L	60	ASP	2.5
2	Y	83	GLU	2.5
2	Y	155	VAL	2.5
1	X	147	PRO	2.4
2	Y	113	PRO	2.4
2	Y	158	GLY	2.4
1	H	211	VAL	2.4
2	L	150	ALA	2.4
1	X	140	CYS	2.4
1	H	74	SER	2.4
2	Y	136	ILE	2.3
2	L	30(B)	SER	2.3
1	X	207	VAL	2.3
1	H	121	VAL	2.3
2	Y	188	HIS	2.3
2	L	123	GLU	2.3
2	Y	165	SER	2.3
2	Y	179	SER	2.3
1	H	100	ASP	2.2
2	Y	184	GLN	2.2
2	L	201	THR	2.2
1	X	179	SER	2.2
1	H	100(A)	SER	2.2
2	L	127	ALA	2.1
1	X	98	ASN	2.1
1	X	208	ASP	2.1
2	Y	130	ALA	2.1
2	Y	116	THR	2.1
1	X	174	GLY	2.1
1	X	5	VAL	2.1
2	Y	199	GLY	2.1
1	X	148	GLU	2.0
1	X	117	LYS	2.0
1	X	209	LYS	2.0
1	H	206	LYS	2.0
2	Y	17	LYS	2.0

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Mol	Chain	Res	Type	RSRZ
2	L	149	LYS	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.