



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 1, 2026 – 06:34 AM UTC

PDB ID : 1QBZ / pdb_00001qbz
Title : THE CRYSTAL STRUCTURE OF THE SIV GP41 ECTODOMAIN AT 1.47 Å
Authors : Yang, Z.-N.; Mueser, T.C.; Kaufman, J.; Stahl, S.J.; Wingfield, P.T.; Hyde, C.C.
Deposited on : 1999-04-28
Resolution : 1.47 Å(reported)

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

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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
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

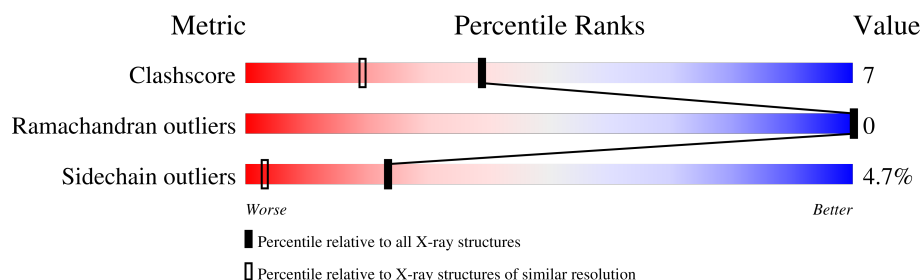
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.47 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))
Clashscore	190562	7025 (1.50-1.46)
Ramachandran outliers	187476	6917 (1.50-1.46)
Sidechain outliers	187428	6914 (1.50-1.46)

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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	123	
1	B	123	
1	C	123	

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 3229 atoms, of which 0 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 PROTEIN (SIV GP41 ECTODOMAIN).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	102	Total	C	N	O	S	0	14	0
			894	564	157	172	1			
1	B	114	Total	C	N	O	S	0	13	0
			1016	643	182	189	2			
1	C	120	Total	C	N	O	S	0	9	0
			1035	654	184	196	1			

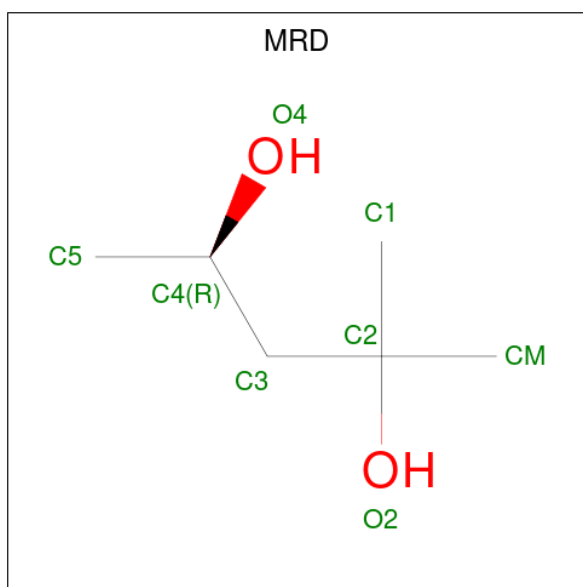
There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	86	ALA	CYS	engineered mutation	GB AAA47708
B	86	ALA	CYS	engineered mutation	GB AAA47708
C	86	ALA	CYS	engineered mutation	GB AAA47708
A	92	ALA	CYS	engineered mutation	GB AAA47708
B	92	ALA	CYS	engineered mutation	GB AAA47708
C	92	ALA	CYS	engineered mutation	GB AAA47708

- Molecule 2 is MERCURY (II) ION (CCD ID: HG) (formula: Hg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Hg	0	0
			1	1		
2	B	1	Total	Hg	0	0
			1	1		

- Molecule 3 is (4R)-2-METHYLPENTANE-2,4-DIOL (CCD ID: MRD) (formula: C₆H₁₄O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			8	6	2		
3	C	1	Total	C	O	0	0
			8	6	2		

- Molecule 4 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	B	1	Total	Cl	0	0
			1	1		
4	C	2	Total	Cl	0	0
			2	2		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	66	Total	O	0	1
			66	66		
5	B	105	Total	O	0	0
			105	105		
5	C	92	Total	O	0	0
			92	92		

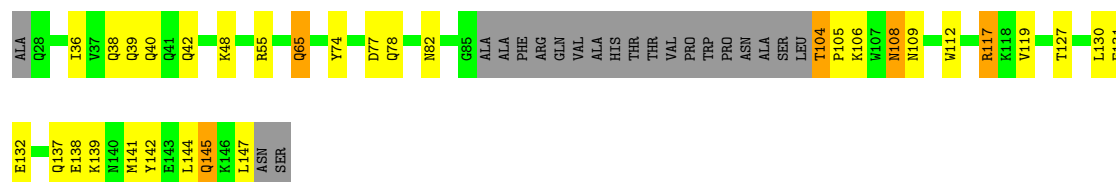
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

Note EDS was not executed.

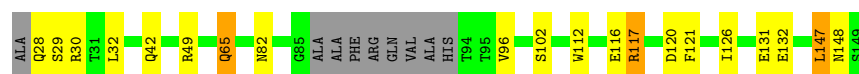
• Molecule 1: PROTEIN (SIV GP41 ECTODOMAIN)

Chain A: 



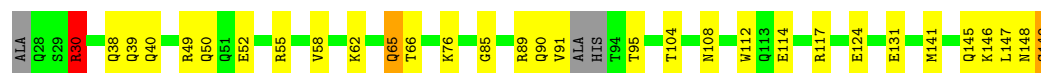
• Molecule 1: PROTEIN (SIV GP41 ECTODOMAIN)

Chain B: 



• Molecule 1: PROTEIN (SIV GP41 ECTODOMAIN)

Chain C: 



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	91.12Å 47.21Å 77.47Å 90.00° 100.83° 90.00°	Depositor
Resolution (Å)	15.00 – 1.47	Depositor
% Data completeness (in resolution range)	5.0 (15.00-1.47)	Depositor
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	SHELXL-97	Depositor
R, R_{free}	0.155 , 0.218	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3229	wwPDB-VP
Average B, all atoms (Å ²)	24.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CL, HG, MRD

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	A	0.70	0/968	1.63	15/1304 (1.2%)
1	B	0.70	0/1095	1.54	13/1478 (0.9%)
1	C	0.72	0/1095	1.56	10/1482 (0.7%)
All	All	0.71	0/3158	1.58	38/4264 (0.9%)

There are no bond length outliers.

All (38) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	148	ASN	OD1-CG-ND2	-9.80	112.80	122.60
1	B	121[A]	PHE	CA-CB-CG	-8.11	105.69	113.80
1	B	121[B]	PHE	CA-CB-CG	-8.11	105.69	113.80
1	C	108	ASN	OD1-CG-ND2	7.82	130.42	122.60
1	C	55	ARG	CD-NE-CZ	7.70	135.18	124.40
1	C	30	ARG	NE-CZ-NH2	7.04	125.54	119.20
1	B	49	ARG	NE-CZ-NH2	6.75	125.28	119.20
1	A	132	GLU	CA-CB-CG	6.73	127.57	114.10
1	B	82	ASN	CA-C-O	6.64	127.59	120.55
1	A	138	GLU	O-C-N	-6.64	115.08	122.12
1	A	39	GLN	OE1-CD-NE2	6.63	129.23	122.60
1	A	106	LYS	CA-C-N	6.63	129.49	120.54
1	A	106	LYS	C-N-CA	6.63	129.49	120.54
1	C	95	THR	CA-C-O	6.61	127.72	120.71
1	B	102	SER	CA-C-N	6.57	132.64	121.14
1	B	102	SER	C-N-CA	6.57	132.64	121.14
1	B	131	GLU	CB-CG-CD	6.47	123.60	112.60
1	C	30	ARG	NE-CZ-NH1	-6.41	115.09	121.50
1	A	117	ARG	CD-NE-CZ	6.20	133.08	124.40
1	C	40	GLN	CB-CG-CD	6.16	123.07	112.60
1	B	147	LEU	CA-C-N	-6.14	112.06	120.28

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	147	LEU	C-N-CA	-6.14	112.06	120.28
1	A	106	LYS	O-C-N	6.06	128.56	122.08
1	C	141	MET	CA-C-O	5.86	126.77	120.55
1	C	146	LYS	CA-CB-CG	5.73	125.56	114.10
1	B	65	GLN	OE1-CD-NE2	-5.60	117.00	122.60
1	A	130	LEU	CA-C-O	5.46	126.21	120.42
1	C	108	ASN	CA-CB-CG	-5.43	107.17	112.60
1	A	55[A]	ARG	CD-NE-CZ	5.39	131.95	124.40
1	A	55[B]	ARG	CD-NE-CZ	5.39	131.95	124.40
1	B	32	LEU	CA-C-O	-5.31	114.92	120.55
1	A	108	ASN	OD1-CG-ND2	5.22	127.82	122.60
1	B	126	ILE	O-C-N	5.18	127.17	121.83
1	C	38	GLN	CG-CD-NE2	5.18	124.17	116.40
1	A	117	ARG	NE-CZ-NH2	5.12	123.81	119.20
1	A	65[A]	GLN	OE1-CD-NE2	-5.10	117.50	122.60
1	A	65[B]	GLN	OE1-CD-NE2	-5.10	117.50	122.60
1	A	127	THR	CA-C-O	5.05	125.90	120.55

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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	A	894	0	894	16	0
1	B	1016	0	1017	8	0
1	C	1035	0	1026	19	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	8	0	14	0	0
3	C	8	0	14	0	0
4	B	1	0	0	0	0
4	C	2	0	0	0	0
5	A	66	0	0	6	0
5	B	105	0	0	3	0
5	C	92	0	0	3	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	3229	0	2965	41	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 7.

All (41) 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:C:30:ARG:HE	1:C:148:ASN:HD22	1.31	0.77
1:A:42[B]:GLN:HG2	5:B:8101:HOH:O	1.87	0.73
1:A:131[B]:GLU:HG3	5:A:8066:HOH:O	1.90	0.70
1:A:38:GLN:O	1:A:42[A]:GLN:HG3	1.94	0.67
5:A:8052:HOH:O	1:C:66:THR:HG22	2.00	0.61
1:A:142:TYR:O	1:A:145[A]:GLN:HB2	2.02	0.59
1:B:42[B]:GLN:HG2	5:B:8043:HOH:O	2.02	0.58
1:C:30:ARG:HE	1:C:148:ASN:ND2	2.02	0.58
1:C:65[B]:GLN:HG3	1:C:112:TRP:CD2	2.41	0.56
1:C:91:VAL:O	1:C:91:VAL:HG12	2.07	0.55
1:C:65[B]:GLN:HG3	1:C:112:TRP:CE3	2.44	0.53
1:A:144:LEU:O	1:A:147:LEU:HB2	2.09	0.52
1:B:30:ARG:HG3	1:B:147:LEU:CD2	2.39	0.52
1:B:65:GLN:HG3	1:B:112:TRP:CE3	2.44	0.52
1:B:65:GLN:HG3	1:B:112:TRP:CD2	2.47	0.49
1:A:139[A]:LYS:HD2	5:A:8025:HOH:O	2.12	0.48
1:A:36:ILE:O	1:A:40[A]:GLN:HG2	2.14	0.48
1:A:65[A]:GLN:HG3	1:A:112:TRP:CD2	2.49	0.47
1:A:82:ASN:ND2	5:A:8040:HOH:O	2.48	0.47
5:B:8027:HOH:O	1:C:50:GLN:NE2	2.47	0.46
1:C:30:ARG:HH11	1:C:148:ASN:ND2	2.14	0.46
1:C:85:GLY:O	1:C:89:ARG:N	2.48	0.46
1:C:104:THR:HA	5:C:8083:HOH:O	2.14	0.46
1:A:108:ASN:ND2	5:A:8022:HOH:O	2.49	0.46
1:C:114:GLU:OE1	1:C:117[A]:ARG:NH2	2.49	0.46
1:A:74:TYR:OH	1:A:78[A]:GLN:NE2	2.49	0.45
1:C:76:LYS:NZ	5:C:8092:HOH:O	2.50	0.45
1:C:131[A]:GLU:HG2	5:C:8084:HOH:O	2.16	0.45
1:B:116:GLU:OE2	1:B:120:ASP:OD1	2.35	0.44
1:A:77[A]:ASP:OD2	1:B:96:VAL:HG21	2.18	0.43
1:A:137:GLN:O	1:A:141:MET:HG3	2.18	0.43
1:C:124:GLU:HA	1:C:124:GLU:OE1	2.19	0.43
1:C:49[A]:ARG:HD3	1:C:52[A]:GLU:OE2	2.20	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:30:ARG:NE	1:C:148:ASN:HD22	2.08	0.42
1:A:42[B]:GLN:NE2	1:B:132[B]:GLU:HG3	2.35	0.41
1:C:58:VAL:O	1:C:62:LYS:HG3	2.20	0.41
1:A:104:THR:HG22	1:A:105:PRO:N	2.35	0.41
1:C:145:GLN:O	1:C:149:SER:HB2	2.20	0.41
1:C:58:VAL:CG1	1:C:62:LYS:HE3	2.51	0.40
1:A:48[B]:LYS:HG2	5:A:8021:HOH:O	2.20	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	A	112/123 (91%)	111 (99%)	1 (1%)	0	100	100
1	B	124/123 (101%)	123 (99%)	1 (1%)	0	100	100
1	C	125/123 (102%)	124 (99%)	1 (1%)	0	100	100
All	All	361/369 (98%)	358 (99%)	3 (1%)	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	A	102/109 (94%)	96 (94%)	6 (6%)	18	1
1	B	116/109 (106%)	111 (96%)	5 (4%)	26	4
1	C	115/109 (106%)	108 (94%)	7 (6%)	17	1
All	All	333/327 (102%)	315 (95%)	18 (5%)	23	2

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	104	THR
1	A	109	ASN
1	A	117	ARG
1	A	119	VAL
1	A	145[A]	GLN
1	A	145[B]	GLN
1	B	28	GLN
1	B	29	SER
1	B	117[A]	ARG
1	B	117[B]	ARG
1	B	117[C]	ARG
1	C	30	ARG
1	C	39	GLN
1	C	65[A]	GLN
1	C	65[B]	GLN
1	C	90	GLN
1	C	147	LEU
1	C	149	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	51	GLN
1	A	80	GLN
1	A	109	ASN
1	B	38	GLN
1	B	148	ASN
1	C	40	GLN
1	C	50	GLN
1	C	90	GLN
1	C	134	GLN
1	C	148	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 7 ligands modelled in this entry, 5 are monoatomic - leaving 2 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	MRD	A	7001	-	7,7,7	0.34	0	9,10,10	1.05	1 (11%)
3	MRD	C	7002	-	7,7,7	0.33	0	9,10,10	0.44	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	MRD	A	7001	-	-	2/5/5/5	-
3	MRD	C	7002	-	-	3/5/5/5	-

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
3	A	7001	MRD	O4-C4-C3	-2.20	102.59	111.35

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	7001	MRD	C2-C3-C4-O4
3	A	7001	MRD	C2-C3-C4-C5
3	C	7002	MRD	C1-C2-C3-C4
3	C	7002	MRD	C2-C3-C4-O4
3	C	7002	MRD	CM-C2-C3-C4

There are no ring outliers.

No monomer is involved in short contacts.

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

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.