



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 06:58 AM UTC

PDB ID : 5W6A / pdb_00005w6a
Title : HLA-C*06:02 presenting ARTELYRSL
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Deposited on : 2017-06-16
Resolution : 1.74 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

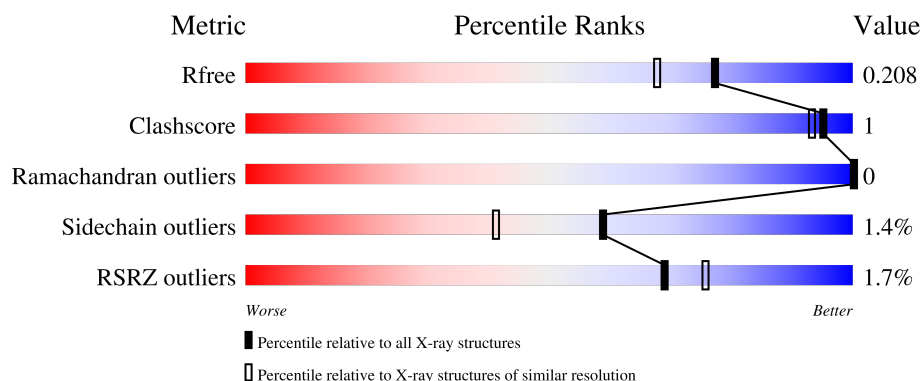
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.74 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	1187 (1.74-1.74)
Clashscore	190562	1207 (1.74-1.74)
Ramachandran outliers	187476	1200 (1.74-1.74)
Sidechain outliers	187428	1200 (1.74-1.74)
RSRZ outliers	180081	1188 (1.74-1.74)

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	A	276	0% 86% 12% ..
1	C	276	0% 88% 11% .
2	B	100	2% 90% 10%
2	D	100	3% 90% 8% .
3	E	9	67% 22% 11%

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Mol	Chain	Length	Quality of chain
3	F	9	89% 11%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 7031 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 HLA class I histocompatibility antigen, Cw-6 alpha chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	273	Total	C	N	O	S	0	0	0
			2221	1384	408	423	6			
1	C	273	Total	C	N	O	S	0	0	0
			2235	1392	410	427	6			

- Molecule 2 is a protein called Beta-2-microglobulin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	100	Total	C	N	O	S	0	0	0
			817	520	138	155	4			
2	D	100	Total	C	N	O	S	0	0	0
			817	520	138	155	4			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	0	MET	-	initiating methionine	UNP P61769
D	0	MET	-	initiating methionine	UNP P61769

- Molecule 3 is a protein called ALA-ARG-THR-GLU-LEU-TYR-ARG-SER-LEU.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	E	9	Total	C	N	O	0	0	0
			78	48	15	15			
3	F	9	Total	C	N	O	0	0	0
			78	48	15	15			

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	292	Total	O	0	0
			292	292		

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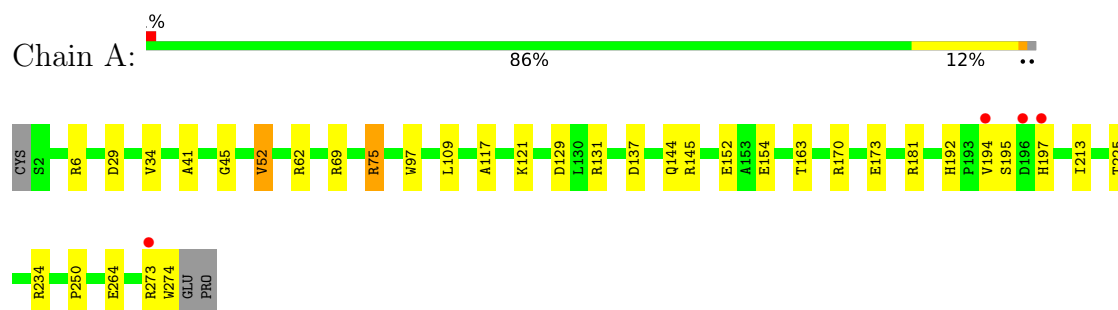
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	B	107	Total 107	O 107	0	0
4	C	268	Total 268	O 268	0	0
4	D	100	Total 100	O 100	0	0
4	E	9	Total 9	O 9	0	0
4	F	9	Total 9	O 9	0	0

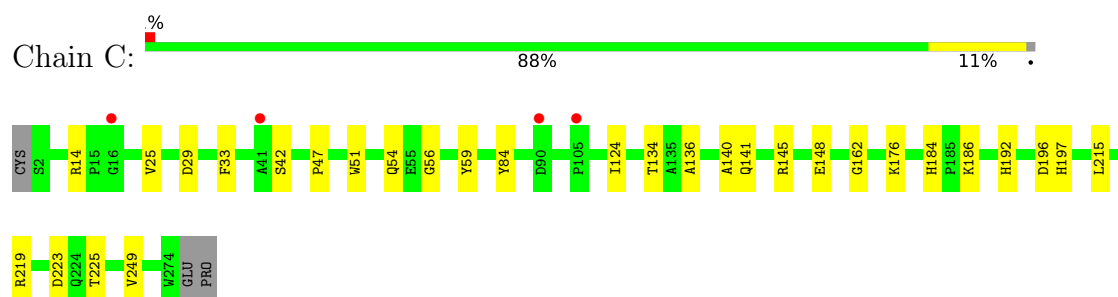
3 Residue-property plots [i](#)

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 and electron density. 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. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). 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.

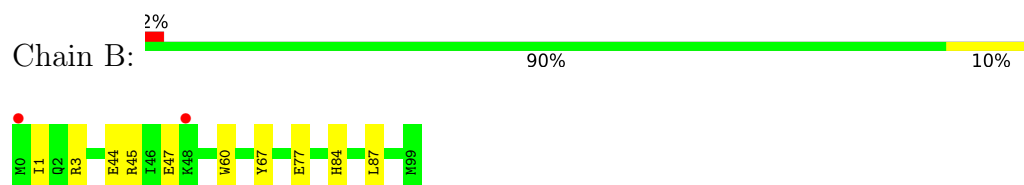
- Molecule 1: HLA class I histocompatibility antigen, Cw-6 alpha chain



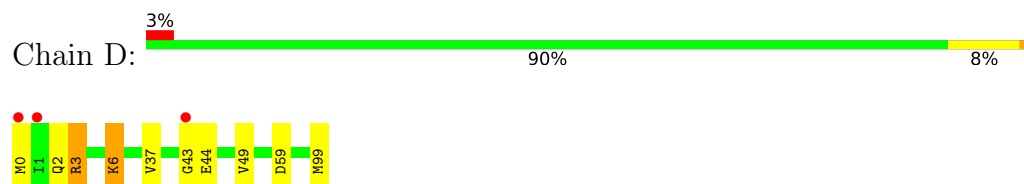
- Molecule 1: HLA class I histocompatibility antigen, Cw-6 alpha chain



- Molecule 2: Beta-2-microglobulin



- Molecule 2: Beta-2-microglobulin



- Molecule 3: ALA-ARG-THR-GLU-LEU-TYR-ARG-SER-LEU

Chain E:  67% 22% 11%



● Molecule 3: ALA-ARG-THR-GLU-LEU-TYR-ARG-SER-LEU

Chain F:  89% 11%



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	46.19Å 136.95Å 70.96Å 90.00° 107.06° 90.00°	Depositor
Resolution (Å)	68.47 – 1.74 68.47 – 1.74	Depositor EDS
% Data completeness (in resolution range)	99.5 (68.47-1.74) 99.9 (68.47-1.74)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.15 (at 1.74Å)	Xtriage
Refinement program	REFMAC 5.8.0158	Depositor
R, R_{free}	0.161 , 0.201 0.171 , 0.208	Depositor DCC
R_{free} test set	4391 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å ²)	20.1	Xtriage
Anisotropy	0.249	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 38.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.025 for h,-k,-h-l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	7031	wwPDB-VP
Average B, all atoms (Å ²)	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.16% 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

5.1 Standard geometry

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	1.65	15/2285 (0.7%)	1.40	17/3108 (0.5%)
1	C	1.67	18/2299 (0.8%)	1.31	3/3126 (0.1%)
2	B	1.56	5/840 (0.6%)	1.24	2/1140 (0.2%)
2	D	1.50	3/840 (0.4%)	1.30	3/1140 (0.3%)
3	E	2.43	3/78 (3.8%)	1.78	2/102 (2.0%)
3	F	1.99	1/78 (1.3%)	1.51	0/102
All	All	1.64	45/6420 (0.7%)	1.34	27/8718 (0.3%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	2

All (45) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	E	5	LEU	C-O	11.90	1.39	1.23
1	A	6	ARG	NE-CZ	-8.27	1.24	1.33
1	C	196	ASP	C-O	7.09	1.33	1.24
1	A	264	GLU	C-O	-7.09	1.15	1.24
1	C	225	THR	C-O	6.93	1.32	1.24
1	C	29	ASP	CA-C	6.70	1.59	1.53
1	A	163	THR	N-CA	-6.67	1.38	1.46
2	D	44	GLU	N-CA	6.59	1.54	1.46
2	B	45	ARG	C-O	-6.51	1.16	1.23
1	A	29	ASP	CA-C	6.17	1.59	1.53
1	C	148	GLU	N-CA	6.17	1.53	1.46
2	B	87	LEU	C-O	-5.99	1.16	1.24
1	A	34	VAL	CA-CB	5.97	1.64	1.55
1	C	223	ASP	C-O	-5.92	1.16	1.23

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	192	HIS	CA-CB	5.91	1.59	1.53
1	A	137	ASP	CG-OD2	5.91	1.36	1.25
2	B	1	ILE	C-O	5.89	1.30	1.24
1	C	197	HIS	CA-CB	-5.86	1.45	1.53
1	C	215	LEU	CB-CG	-5.83	1.41	1.53
1	A	131	ARG	C-O	-5.67	1.16	1.24
1	C	47	PRO	C-O	5.61	1.29	1.23
3	F	9	LEU	C-OXT	5.55	1.34	1.23
1	A	194	VAL	N-CA	5.54	1.51	1.46
1	C	219	ARG	C-O	-5.52	1.17	1.24
1	A	173	GLU	C-O	5.49	1.30	1.24
1	C	59	TYR	C-O	-5.48	1.17	1.24
3	E	5	LEU	CA-C	5.46	1.59	1.52
1	C	134	THR	C-O	-5.44	1.17	1.24
1	A	29	ASP	C-O	-5.43	1.19	1.24
1	C	124	ILE	N-CA	5.39	1.52	1.46
3	E	7	ARG	NE-CZ	5.31	1.38	1.33
1	A	250	PRO	N-CA	-5.31	1.40	1.47
2	B	44	GLU	N-CA	5.30	1.52	1.46
1	A	145	ARG	CZ-NH2	5.29	1.40	1.33
2	D	49	VAL	C-O	-5.25	1.18	1.24
1	A	192	HIS	C-O	-5.23	1.20	1.24
1	C	162	GLY	N-CA	-5.22	1.41	1.45
1	C	14	ARG	N-CA	5.21	1.52	1.46
1	C	25	VAL	CA-CB	-5.21	1.46	1.55
1	C	84	TYR	CA-C	5.16	1.59	1.52
2	D	43	GLY	CA-C	5.15	1.58	1.51
1	C	56	GLY	N-CA	5.13	1.51	1.44
2	B	67	TYR	C-O	5.08	1.30	1.23
1	A	234	ARG	N-CA	5.03	1.51	1.45
1	A	45	GLY	N-CA	-5.02	1.39	1.45

All (27) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	194	VAL	CB-CA-C	-15.20	95.65	110.70
1	A	145	ARG	NE-CZ-NH1	-8.01	113.49	121.50
3	E	5	LEU	N-CA-C	6.90	120.10	108.23
1	A	75	ARG	CG-CD-NE	-6.55	97.59	112.00
3	E	5	LEU	CB-CA-C	-6.54	100.01	111.05
2	D	6	LYS	CD-CE-NZ	6.33	132.15	111.90
1	C	162	GLY	N-CA-C	6.26	115.90	110.21

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	181	ARG	CB-CA-C	-6.09	102.58	111.23
1	A	152	GLU	CG-CD-OE1	-5.72	105.24	118.40
1	C	136	ALA	N-CA-C	5.63	119.41	112.54
1	A	62	ARG	CB-CG-CD	5.62	124.23	111.30
1	A	69	ARG	N-CA-C	-5.62	105.23	111.36
1	A	195	SER	N-CA-C	-5.57	98.95	110.80
1	A	52	VAL	CB-CA-C	-5.42	104.07	110.84
2	B	47	GLU	CB-CG-CD	5.21	121.46	112.60
1	A	170	ARG	NE-CZ-NH1	-5.20	116.30	121.50
2	B	84	HIS	N-CA-CB	-5.17	103.54	111.56
1	A	129	ASP	CB-CG-OD1	5.16	130.27	118.40
2	D	99	MET	CG-SD-CE	5.13	112.19	100.90
1	A	213	ILE	CA-C-O	-5.12	116.89	121.09
1	A	197	HIS	N-CA-C	5.12	120.64	113.02
2	D	3	ARG	NE-CZ-NH2	5.10	123.79	119.20
1	C	140	ALA	N-CA-C	5.09	117.56	111.71
1	A	41	ALA	CA-C-N	-5.05	117.38	122.74
1	A	41	ALA	C-N-CA	-5.05	117.38	122.74
1	A	109	LEU	CD1-CG-CD2	-5.05	99.69	110.80
1	A	152	GLU	OE1-CD-OE2	5.04	134.99	122.90

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	144	GLN	Sidechain
1	A	75	ARG	Sidechain

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	2221	0	2049	3	0
1	C	2235	0	2072	5	0
2	B	817	0	762	3	0
2	D	817	0	762	4	0
3	E	78	0	82	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	F	78	0	82	0	0
4	A	292	0	0	0	0
4	B	107	0	0	2	0
4	C	268	0	0	2	0
4	D	100	0	0	1	0
4	E	9	0	0	0	0
4	F	9	0	0	0	0
All	All	7031	0	5809	14	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 1.

All (14) 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:A:273:ARG:HG2	1:A:274:TRP:N	2.13	0.62
2:B:77:GLU:HG2	4:B:160:HOH:O	2.06	0.54
1:C:54:GLN:H	1:C:54:GLN:CD	2.17	0.52
2:B:3:ARG:NE	4:B:103:HOH:O	2.43	0.52
2:D:37:VAL:O	4:D:101:HOH:O	2.19	0.50
2:D:0:MET:HE3	2:D:2:GLN:HE21	1.76	0.49
1:C:141:GLN:O	1:C:145:ARG:HG2	2.14	0.48
1:C:184:HIS:ND1	4:C:302:HOH:O	2.24	0.45
1:A:117:ALA:HB2	2:B:60:TRP:CE2	2.53	0.44
2:D:3:ARG:NH1	2:D:59:ASP:OD2	2.52	0.43
1:A:97:TRP:CZ2	3:E:7:ARG:HG2	2.55	0.42
1:C:176:LYS:HE2	4:C:308:HOH:O	2.21	0.41
2:D:0:MET:CE	2:D:2:GLN:HE21	2.34	0.40
1:C:33:PHE:HB3	1:C:51:TRP:CH2	2.56	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	271/276 (98%)	267 (98%)	4 (2%)	0	100	100
1	C	271/276 (98%)	266 (98%)	5 (2%)	0	100	100
2	B	98/100 (98%)	97 (99%)	1 (1%)	0	100	100
2	D	98/100 (98%)	97 (99%)	1 (1%)	0	100	100
3	E	7/9 (78%)	7 (100%)	0	0	100	100
3	F	7/9 (78%)	7 (100%)	0	0	100	100
All	All	752/770 (98%)	741 (98%)	11 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

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	224/233 (96%)	220 (98%)	4 (2%)	51	30
1	C	228/233 (98%)	225 (99%)	3 (1%)	61	43
2	B	90/95 (95%)	90 (100%)	0	100	100
2	D	90/95 (95%)	89 (99%)	1 (1%)	65	50
3	E	8/8 (100%)	7 (88%)	1 (12%)	4	0
3	F	8/8 (100%)	8 (100%)	0	100	100
All	All	648/672 (96%)	639 (99%)	9 (1%)	59	41

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	52	VAL
1	A	121	LYS
1	A	154	GLU
1	A	225	THR

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Mol	Chain	Res	Type
1	C	42	SER
1	C	186	LYS
1	C	249	VAL
2	D	6	LYS
3	E	4	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	115	GLN
1	A	180	GLN
1	A	224	GLN
2	B	13	HIS
1	C	115	GLN
1	C	144	GLN
1	C	224	GLN
2	D	2	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

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	A	273/276 (98%)	-0.13	4 (1%) 72 79	11, 22, 41, 60	4 (1%)
1	C	273/276 (98%)	-0.04	4 (1%) 72 79	12, 24, 41, 51	0
2	B	100/100 (100%)	0.10	2 (2%) 65 72	12, 29, 49, 57	0
2	D	100/100 (100%)	0.13	3 (3%) 52 61	13, 29, 49, 54	0
3	E	9/9 (100%)	-0.15	0 100 100	14, 18, 22, 32	0
3	F	9/9 (100%)	-0.17	0 100 100	15, 19, 25, 32	0
All	All	764/770 (99%)	-0.03	13 (1%) 69 76	11, 24, 46, 60	4 (0%)

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	194	VAL	3.2
1	A	196	ASP	3.0
2	D	0	MET	2.9
1	C	105	PRO	2.8
2	B	0	MET	2.6
2	D	1	ILE	2.4
1	C	41	ALA	2.4
1	A	197	HIS	2.3
1	A	273	ARG	2.3
1	C	90	ASP	2.2
1	C	16	GLY	2.1
2	D	43	GLY	2.1
2	B	48	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.