



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 12, 2026 – 10:36 PM UTC

PDB ID : 6JEP / pdb_00006jep
Title : Structure of a neutralizing antibody bound to the Zika envelope protein domain III
Authors : Wang, L.; Wang, R.K.; Wang, L.; Ben, H.J.; Yu, L.; Gao, F.; Shi, X.L.; Yin, C.B.; Zhang, F.C.; Xiang, Y.; Zhang, L.Q.
Deposited on : 2019-02-07
Resolution : 2.32 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

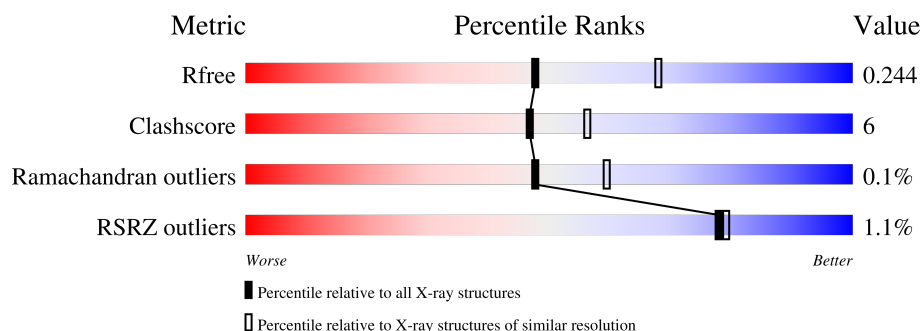
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.32 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	7754 (2.34-2.30)
Clashscore	190562	8383 (2.34-2.30)
Ramachandran outliers	187476	8303 (2.34-2.30)
RSRZ outliers	180081	7760 (2.34-2.30)

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	235	3% 90% 10%
1	K	235	% 89% 11%
2	I	214	87% 13%
2	L	214	89% 11%
3	E	101	87% 13%
3	F	101	% 88% 12%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 8899 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 heavy chain of Fab ZK2B10.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	H	235	Total	C	N	O	S	0	0	0
			1784	1122	302	351	9			
1	K	235	Total	C	N	O	S	0	0	0
			1784	1122	302	351	9			

- Molecule 2 is a protein called light chain of Fab ZK2B10.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	L	214	Total	C	N	O	S	0	0	0
			1604	1000	274	326	4			
2	I	214	Total	C	N	O	S	0	0	0
			1604	1000	274	326	4			

- Molecule 3 is a protein called Genome polyprotein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	E	101	Total	C	N	O	S	0	0	0
			768	488	126	148	6			
3	F	101	Total	C	N	O	S	0	1	0
			775	493	128	148	6			

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	H	149	Total	O	0	0
			149	149		
4	L	105	Total	O	0	0
			105	105		
4	E	51	Total	O	0	0
			51	51		
4	K	117	Total	O	0	0
			117	117		

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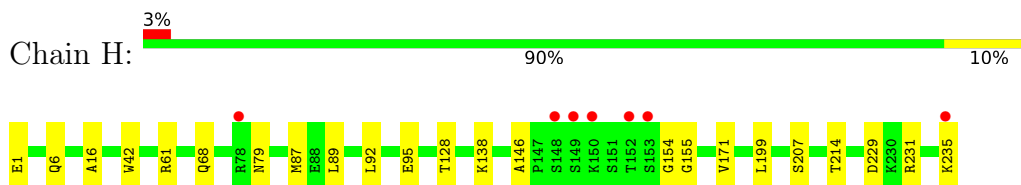
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	I	117	Total 117	O 117	0	0
4	F	41	Total 41	O 41	0	0

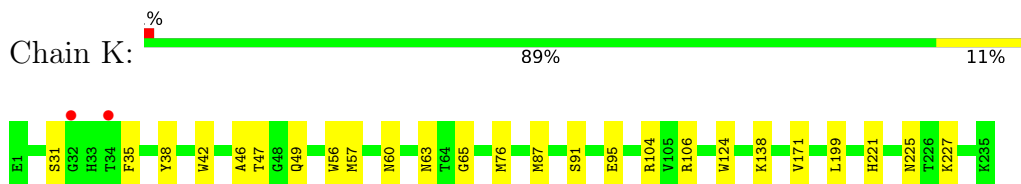
3 Residue-property plots [i](#)

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.

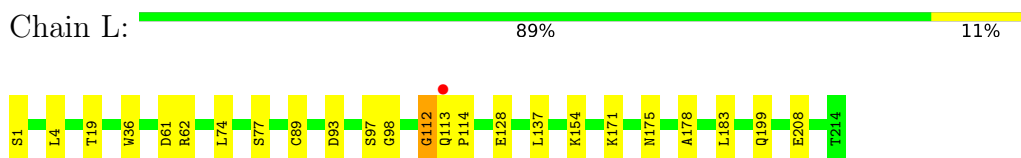
- Molecule 1: heavy chain of Fab ZK2B10



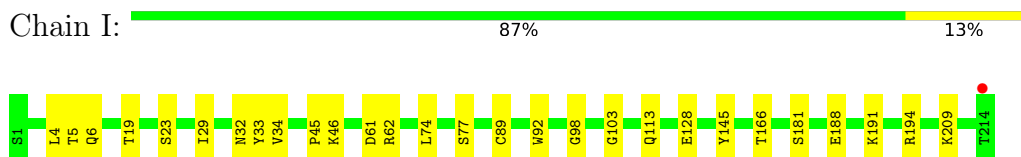
- Molecule 1: heavy chain of Fab ZK2B10



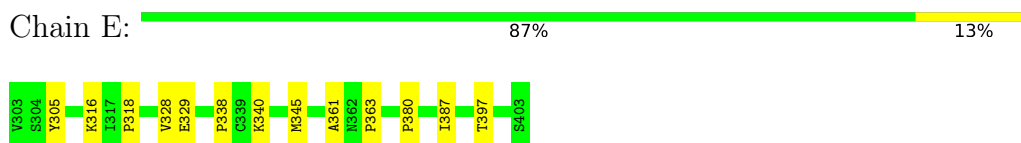
- Molecule 2: light chain of Fab ZK2B10



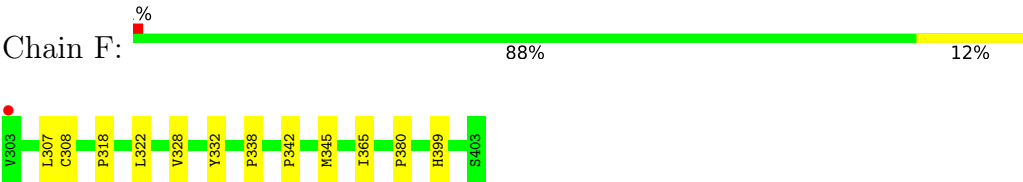
- Molecule 2: light chain of Fab ZK2B10



- Molecule 3: Genome polyprotein



- Molecule 3: Genome polyprotein



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	66.46Å 126.98Å 70.35Å 90.00° 96.00° 90.00°	Depositor
Resolution (Å)	35.65 – 2.32 35.65 – 2.32	Depositor EDS
% Data completeness (in resolution range)	99.7 (35.65-2.32) 99.7 (35.65-2.32)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.58 (at 2.31Å)	Xtriage
Refinement program	PHENIX 1.14_3247	Depositor
R, R_{free}	0.166 , 0.219 (Not available) , 0.244	Depositor DCC
R_{free} test set	2435 reflections (4.82%)	wwPDB-VP
Wilson B-factor (Å ²)	31.9	Xtriage
Anisotropy	0.620	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 41.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	8899	wwPDB-VP
Average B, all atoms (Å ²)	36.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.38% 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	H	0.35	0/1830	0.54	1/2493 (0.0%)
1	K	0.39	0/1830	0.55	0/2493
2	I	0.32	0/1647	0.55	0/2249
2	L	0.36	0/1647	0.61	2/2249 (0.1%)
3	E	0.32	0/786	0.52	0/1073
3	F	0.30	0/797	0.52	0/1088
All	All	0.35	0/8537	0.56	3/11645 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	L	112	GLY	CA-C-N	-5.72	112.86	123.11
2	L	112	GLY	C-N-CA	-5.72	112.86	123.11
1	H	68	GLN	CA-CB-CG	5.04	124.18	114.10

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	H	1784	0	1724	20	0
1	K	1784	0	1724	24	0
2	I	1604	0	1537	20	0
2	L	1604	0	1537	19	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	E	768	0	762	8	0
3	F	775	0	769	8	0
4	E	51	0	0	1	0
4	F	41	0	0	2	0
4	H	149	0	0	8	1
4	I	117	0	0	4	0
4	K	117	0	0	2	0
4	L	105	0	0	5	0
All	All	8899	0	8053	94	1

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 6.

All (94) 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)
2:I:166:THR:HG22	2:I:181:SER:OG	1.78	0.82
2:I:194:ARG:NH2	4:I:302:HOH:O	2.12	0.81
2:L:112:GLY:C	2:L:113:GLN:HG2	2.09	0.76
1:H:138:LYS:HA	2:I:128:GLU:HG3	1.69	0.75
1:H:235:LYS:NZ	4:H:304:HOH:O	2.15	0.74
2:L:61:ASP:OD1	4:L:301:HOH:O	2.06	0.73
1:K:57:MET:HB2	1:K:76:MET:HE2	1.70	0.72
2:L:128:GLU:HG2	1:K:138:LYS:HA	1.71	0.72
1:H:1:GLU:OE1	4:H:302:HOH:O	2.07	0.71
2:L:97:SER:O	4:L:302:HOH:O	2.07	0.71
2:I:61:ASP:O	4:I:301:HOH:O	2.12	0.67
1:H:146:ALA:O	4:H:303:HOH:O	2.11	0.66
2:I:29:ILE:HG12	2:I:34:VAL:HG22	1.77	0.66
1:K:91:SER:OG	4:K:301:HOH:O	2.13	0.66
1:K:38:TYR:CE1	1:K:106:ARG:HG3	2.31	0.65
3:F:318:PRO:HB3	3:F:328:VAL:HG12	1.80	0.64
3:E:340:LYS:HZ1	3:E:363:PRO:HD2	1.63	0.62
1:K:47:THR:O	4:K:302:HOH:O	2.16	0.61
3:E:318:PRO:HB3	3:E:328:VAL:HG12	1.82	0.61
1:K:171:VAL:HG22	1:K:199:LEU:HD21	1.83	0.60
1:H:6:GLN:HE21	1:H:128:THR:HG23	1.67	0.59
1:H:1:GLU:O	4:H:305:HOH:O	2.16	0.59
3:F:345:MET:HE2	3:F:380:PRO:HB3	1.85	0.58
1:K:31:SER:N	1:K:60:ASN:HD21	2.01	0.58
1:H:79:ASN:ND2	4:H:312:HOH:O	2.37	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:L:112:GLY:O	2:L:113:GLN:HG2	2.04	0.57
1:K:42:TRP:CD1	1:K:76:MET:HE3	2.39	0.57
1:H:6:GLN:NE2	1:H:128:THR:HG23	2.20	0.57
3:F:322:LEU:HG	4:F:529:HOH:O	2.05	0.55
1:K:171:VAL:HG12	1:K:221:HIS:CD2	2.42	0.55
1:H:214:THR:HG23	1:H:231:ARG:HD2	1.89	0.54
3:E:345:MET:HE2	3:E:380:PRO:HB3	1.91	0.52
3:E:316:LYS:HG2	3:E:329:GLU:HB3	1.92	0.52
2:L:171:LYS:HE3	2:L:175:ASN:HA	1.92	0.52
1:H:89:LEU:O	1:H:92:LEU:HD11	2.10	0.51
1:H:155:GLY:O	1:H:207:SER:N	2.25	0.51
2:I:6:GLN:OE1	2:I:103:GLY:HA3	2.10	0.51
2:I:194:ARG:CZ	2:I:194:ARG:HB2	2.40	0.51
2:L:113:GLN:HB3	2:L:114:PRO:HD2	1.93	0.51
2:L:62:ARG:HB2	2:L:77:SER:O	2.11	0.50
3:F:399[B]:HIS:ND1	4:F:501:HOH:O	2.17	0.50
1:H:231:ARG:HB3	1:K:225:ASN:HB3	1.95	0.49
1:K:42:TRP:HD1	1:K:76:MET:HE3	1.76	0.49
1:K:124:TRP:CZ3	2:I:45:PRO:HG2	2.49	0.48
1:K:199:LEU:C	1:K:199:LEU:HD12	2.38	0.48
1:H:95:GLU:CD	1:H:95:GLU:H	2.21	0.48
3:E:340:LYS:NZ	3:E:363:PRO:HD2	2.29	0.47
2:L:4:LEU:HD23	2:L:89:CYS:SG	2.55	0.47
2:I:92:TRP:CZ2	2:I:98:GLY:HA3	2.49	0.47
2:L:1:SER:O	4:L:303:HOH:O	2.20	0.47
1:H:231:ARG:NE	4:H:317:HOH:O	2.47	0.46
2:L:154:LYS:NZ	4:L:305:HOH:O	2.36	0.46
1:K:31:SER:O	1:K:35:PHE:HD1	1.98	0.46
2:I:46:LYS:NZ	4:I:317:HOH:O	2.49	0.46
2:I:4:LEU:HD23	2:I:89:CYS:SG	2.55	0.46
1:H:79:ASN:ND2	4:H:301:HOH:O	1.94	0.46
3:E:361:ALA:N	4:E:501:HOH:O	2.11	0.46
2:L:178:ALA:HB2	4:L:391:HOH:O	2.15	0.45
1:K:38:TYR:HB3	1:K:104:ARG:HG3	1.98	0.45
2:I:188:GLU:CD	2:I:188:GLU:H	2.24	0.45
1:K:31:SER:H	1:K:60:ASN:HD21	1.64	0.45
1:K:42:TRP:CE2	1:K:87:MET:HB2	2.52	0.45
2:I:32:ASN:CG	2:I:33:TYR:H	2.26	0.44
3:F:308:CYS:HB3	3:F:332:TYR:CZ	2.52	0.44
3:E:305:TYR:CE1	3:E:338:PRO:HB2	2.53	0.44
2:L:93:ASP:O	2:L:98:GLY:HA2	2.17	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:H:42:TRP:CE2	1:H:87:MET:HB2	2.53	0.43
2:I:62:ARG:HB3	2:I:77:SER:O	2.19	0.43
3:F:307:LEU:HD12	3:F:307:LEU:HA	1.91	0.43
1:H:61:ARG:HB2	4:H:327:HOH:O	2.18	0.42
2:L:137:LEU:HB2	2:L:183:LEU:HB3	2.00	0.42
1:K:95:GLU:H	1:K:95:GLU:CD	2.27	0.42
1:K:171:VAL:HG12	1:K:221:HIS:HD2	1.82	0.42
2:L:36:TRP:CE2	2:L:74:LEU:HB2	2.54	0.42
3:F:307:LEU:HG	3:F:342:PRO:HG3	2.00	0.42
2:I:113:GLN:HB2	2:I:145:TYR:CE1	2.54	0.42
1:H:16:ALA:O	1:H:92:LEU:HD13	2.20	0.42
2:I:166:THR:HG22	2:I:181:SER:HG	1.81	0.42
3:F:338:PRO:HA	3:F:365:ILE:O	2.20	0.42
2:I:5:THR:OG1	2:I:23:SER:HB2	2.20	0.42
1:H:229:ASP:HB2	1:K:227:LYS:HB3	2.02	0.41
1:K:63:ASN:OD1	1:K:63:ASN:N	2.53	0.41
1:H:171:VAL:CG2	1:H:199:LEU:HD21	2.50	0.41
2:L:19:THR:HA	2:L:74:LEU:O	2.21	0.41
1:K:56:TRP:NE1	1:K:65:GLY:HA3	2.35	0.41
2:L:171:LYS:HE3	2:L:175:ASN:CA	2.50	0.41
2:I:191:LYS:NZ	4:I:313:HOH:O	2.44	0.41
2:L:199:GLN:HG2	2:L:208:GLU:HG3	2.03	0.41
1:K:46:ALA:HB3	1:K:49:GLN:HB2	2.02	0.41
3:E:387:ILE:O	3:E:397:THR:HA	2.20	0.41
2:L:171:LYS:CE	2:L:175:ASN:HA	2.50	0.40
2:I:19:THR:HA	2:I:74:LEU:O	2.21	0.40
1:K:87:MET:HE3	1:K:87:MET:HB3	1.89	0.40
2:I:209:LYS:HA	2:I:209:LYS:HD3	1.82	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:H:445:HOH:O	4:H:447:HOH:O[1_655]	2.03	0.17

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	233/235 (99%)	223 (96%)	9 (4%)	1 (0%)	30	37
2	I	134/214 (63%)	128 (96%)	6 (4%)	0	100	100
2	L	204/214 (95%)	198 (97%)	6 (3%)	0	100	100
3	E	10/101 (10%)	10 (100%)	0	0	100	100
3	F	100/101 (99%)	98 (98%)	2 (2%)	0	100	100
All	All	681/865 (79%)	657 (96%)	23 (3%)	1 (0%)	48	59

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	H	154	GLY

5.3.2 Protein sidechains [i](#)

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

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

There are no ligands in this entry.

5.7 Other polymers

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	H	235/235 (100%)	-0.20	7 (2%) 52 55	21, 33, 64, 85	0
1	K	235/235 (100%)	-0.20	2 (0%) 81 82	17, 34, 69, 112	0
2	I	214/214 (100%)	-0.36	1 (0%) 87 88	21, 31, 50, 72	0
2	L	214/214 (100%)	-0.26	1 (0%) 87 88	21, 32, 54, 81	0
3	E	101/101 (100%)	-0.22	0 100 100	22, 35, 56, 71	0
3	F	101/101 (100%)	-0.14	1 (0%) 79 81	15, 39, 60, 78	1 (0%)
All	All	1100/1100 (100%)	-0.24	12 (1%) 78 79	15, 33, 61, 112	1 (0%)

All (12) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	H	153	SER	3.3
1	H	152	THR	2.6
2	L	113	GLN	2.6
1	H	150	LYS	2.6
2	I	214	THR	2.5
1	H	235	LYS	2.5
1	H	148	SER	2.4
1	K	34	THR	2.4
1	K	32	GLY	2.3
3	F	303	VAL	2.2
1	H	149	SER	2.1
1	H	78	ARG	2.1

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.