



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 07:00 PM UTC

PDB ID : 3GGW / pdb_00003ggw
Title : Crystal Structure of FAB F22-4 in complex with a Carbohydrate-mimetic peptide
Authors : Saul, F.A.; Vulliez-Le Normand, B.; Bentley, G.A.
Deposited on : 2009-03-02
Resolution : 1.70 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

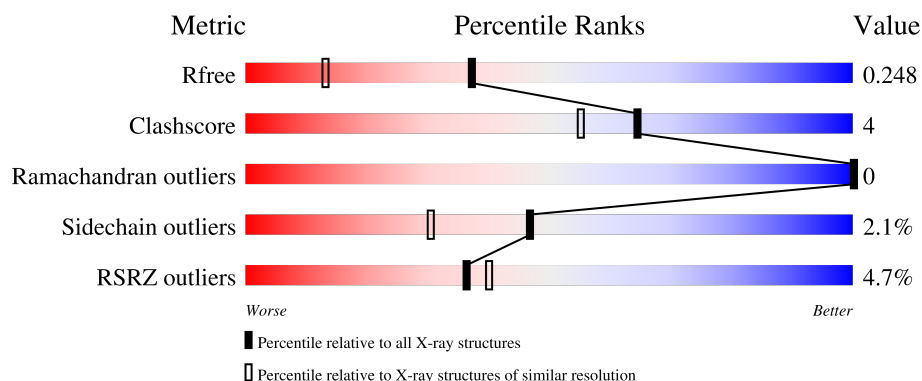
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.70 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	5551 (1.70-1.70)
Clashscore	190562	5924 (1.70-1.70)
Ramachandran outliers	187476	5846 (1.70-1.70)
Sidechain outliers	187428	5846 (1.70-1.70)
RSRZ outliers	180081	5554 (1.70-1.70)

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	219	5% 92% 8%
1	C	219	2% 93% 7%
2	B	217	8% 84% 11% 5%
2	D	217	2% 82% 12% • •
3	E	12	17% 92% 8%

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Mol	Chain	Length	Quality of chain
3	F	12	17% 83% 8% 8%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 7619 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 FAB F22-4 LIGHT CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	218	Total	C	N	O	S	0	3	0
			1701	1063	289	341	8			
1	C	219	Total	C	N	O	S	0	2	0
			1702	1063	289	341	9			

- Molecule 2 is a protein called FAB F22-4 HEAVY CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	207	Total	C	N	O	S	0	3	0
			1601	1022	256	312	11			
2	D	209	Total	C	N	O	S	0	2	0
			1606	1023	260	312	11			

- Molecule 3 is a protein called PEPTIDE B1.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	E	11	Total	C	N	O	0	0	0
			105	69	16	20			
3	F	12	Total	C	N	O	0	0	0
			115	75	18	22			

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	196	Total	O	0	0
			196	196		
4	B	206	Total	O	0	0
			206	206		
4	C	215	Total	O	0	0
			215	215		
4	D	149	Total	O	0	0
			149	149		

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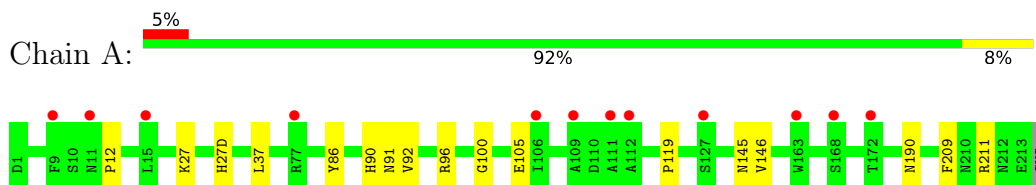
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	E	11	Total 11	O 11	0	0
4	F	12	Total 12	O 12	0	0

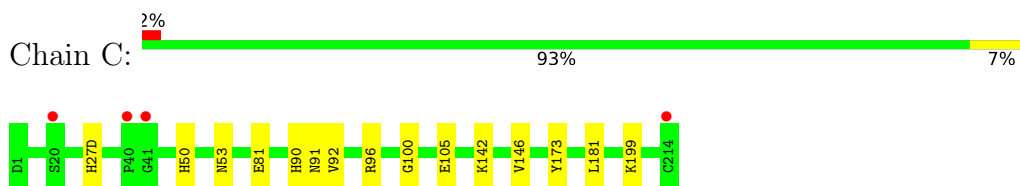
3 Residue-property plots [i](#)

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.

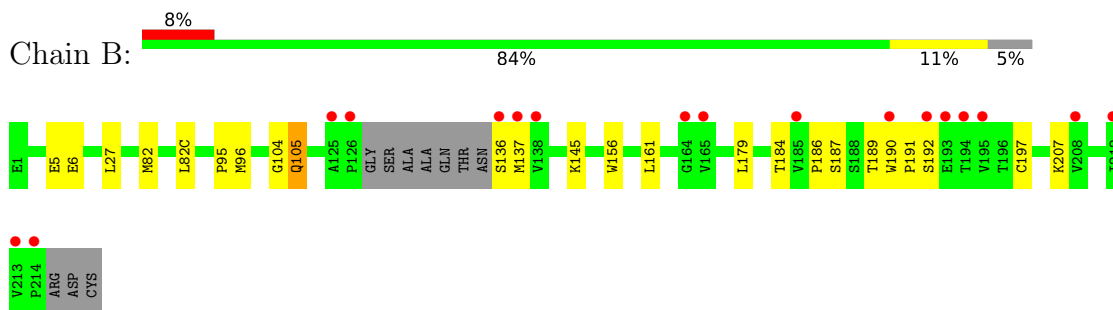
- Molecule 1: FAB F22-4 LIGHT CHAIN



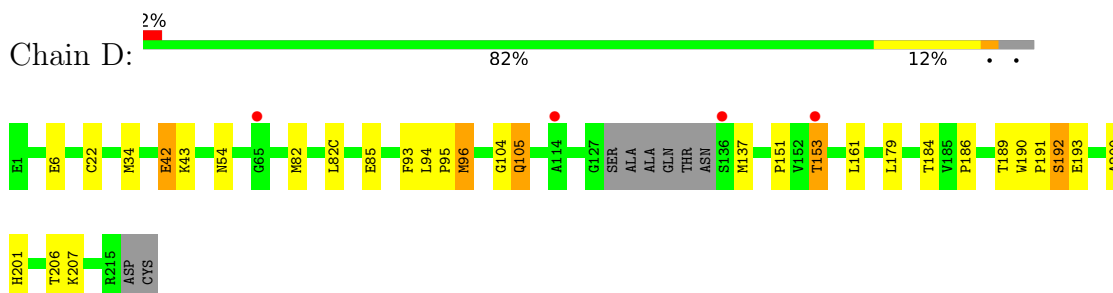
- Molecule 1: FAB F22-4 LIGHT CHAIN



- Molecule 2: FAB F22-4 HEAVY CHAIN

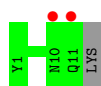


- Molecule 2: FAB F22-4 HEAVY CHAIN

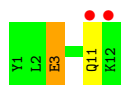
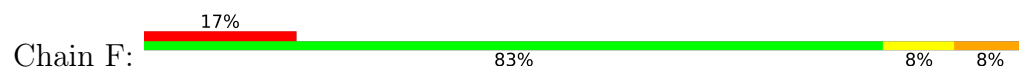


- Molecule 3: PEPTIDE B1





● Molecule 3: PEPTIDE B1



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	66.88Å 69.53Å 110.19Å 90.00° 97.71° 90.00°	Depositor
Resolution (Å)	47.97 – 1.70 47.97 – 1.70	Depositor EDS
% Data completeness (in resolution range)	97.6 (47.97-1.70) 97.6 (47.97-1.70)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	0.07	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.77 (at 1.69Å)	Xtriage
Refinement program	REFMAC 5.2.0003	Depositor
R, R_{free}	0.197 , 0.245 0.202 , 0.248	Depositor DCC
R_{free} test set	2185 reflections (2.00%)	wwPDB-VP
Wilson B-factor (Å ²)	21.3	Xtriage
Anisotropy	0.294	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 42.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	7619	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 7.45% 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	0.78	0/1749	0.88	2/2376 (0.1%)
1	C	0.85	0/1747	0.93	2/2373 (0.1%)
2	B	0.94	0/1652	0.93	0/2253
2	D	0.86	1/1654 (0.1%)	0.91	3/2256 (0.1%)
3	E	0.56	0/108	0.84	0/146
3	F	0.59	0/118	0.92	0/157
All	All	0.85	1/7028 (0.0%)	0.91	7/9561 (0.1%)

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
2	B	0	1
2	D	0	1
All	All	0	2

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	96	MET	C-N	6.63	1.43	1.33

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	100	GLY	N-CA-C	-7.68	105.25	115.32
1	C	146	VAL	N-CA-C	7.64	119.61	108.53
1	A	100	GLY	N-CA-C	-7.44	105.57	115.32
2	D	193	GLU	N-CA-C	6.48	120.07	110.48
2	D	192	SER	N-CA-C	6.04	117.54	111.07
1	A	146	VAL	N-CA-C	5.88	117.83	108.89
2	D	153	THR	N-CA-C	5.32	118.49	109.76

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	B	192	SER	Peptide
2	D	192	SER	Peptide

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	1701	0	1642	12	0
1	C	1702	0	1641	7	0
2	B	1601	0	1579	13	0
2	D	1606	0	1578	18	0
3	E	105	0	95	0	0
3	F	115	0	108	2	0
4	A	196	0	0	3	1
4	B	206	0	0	1	1
4	C	215	0	0	2	1
4	D	149	0	0	1	0
4	E	11	0	0	0	0
4	F	12	0	0	1	0
All	All	7619	0	6643	52	2

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 4.

All (52) 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:D:34:MET:SD	2:D:94:LEU:HG	2.20	0.81
2:B:145:LYS:NZ	4:B:422:HOH:O	2.16	0.74
1:A:27:LYS:NZ	4:A:401:HOH:O	2.23	0.71
1:A:190:ASN:HD21	1:A:211:ARG:HH21	1.39	0.70
1:C:105:GLU:OE1	4:C:428:HOH:O	2.11	0.69
2:B:136:SER:N	2:B:187:SER:HG	1.96	0.62
1:A:27(D):HIS:HD2	4:A:379:HOH:O	1.84	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:137:MET:HE3	2:B:184:THR:HG22	1.83	0.60
2:D:34:MET:HE1	2:D:94:LEU:HD11	1.84	0.59
1:A:190:ASN:ND2	1:A:211:ARG:HE	2.01	0.59
3:F:3:GLU:HG2	4:F:14:HOH:O	2.03	0.58
1:A:91:ASN:ND2	1:A:96:ARG:HH12	2.03	0.57
1:A:190:ASN:HD22	1:A:211:ARG:HE	1.53	0.57
2:B:179:LEU:HD12	2:B:179:LEU:C	2.30	0.56
2:D:137:MET:HE3	2:D:184:THR:HG22	1.86	0.56
2:B:5:GLU:HA	2:B:105:GLN:HE22	1.70	0.56
1:C:90:HIS:HD2	1:C:92:VAL:H	1.54	0.56
1:A:90:HIS:HD2	1:A:92:VAL:H	1.55	0.54
2:D:201:HIS:HB3	2:D:206:THR:HB	1.92	0.52
1:A:37:LEU:HD13	1:A:86:TYR:CZ	2.45	0.51
2:B:186:PRO:O	2:B:189:THR:OG1	2.25	0.51
2:B:156:TRP:CZ3	2:B:197[B]:CYS:HB3	2.47	0.49
2:D:34:MET:SD	2:D:94:LEU:CG	2.96	0.49
2:D:94:LEU:HD12	2:D:94:LEU:N	2.27	0.49
2:B:82:MET:HB3	2:B:82(C):LEU:HD21	1.95	0.49
1:C:91:ASN:ND2	1:C:96:ARG:HH12	2.11	0.48
2:B:6:GLU:OE2	2:B:104:GLY:HA3	2.14	0.48
2:B:156:TRP:CZ3	2:B:197[A]:CYS:HB3	2.50	0.47
1:C:27(D):HIS:HD2	4:C:374:HOH:O	1.98	0.47
2:D:153:THR:OG1	2:D:200:ALA:HB3	2.15	0.46
2:D:6:GLU:OE1	2:D:105:GLN:HG3	2.15	0.46
2:D:82:MET:HB3	2:D:82(C):LEU:HD21	1.98	0.45
2:D:95:PRO:HA	2:D:96:MET:HA	1.67	0.45
1:A:119:PRO:HB3	1:A:209:PHE:CE1	2.52	0.45
2:D:34:MET:HE1	2:D:94:LEU:CD1	2.47	0.43
1:A:12:PRO:HA	1:A:105:GLU:O	2.19	0.43
1:A:37:LEU:HD13	1:A:86:TYR:CE2	2.54	0.43
2:D:42:GLU:HG2	4:D:365:HOH:O	2.19	0.43
2:D:42:GLU:H	2:D:42:GLU:CD	2.27	0.43
2:D:6:GLU:OE2	2:D:104:GLY:HA3	2.19	0.42
3:F:3:GLU:H	3:F:3:GLU:CD	2.27	0.42
1:C:81:GLU:HG3	1:C:81:GLU:O	2.20	0.42
2:B:190:TRP:CD1	2:B:191:PRO:HA	2.55	0.42
2:D:6:GLU:HG3	2:D:22:CYS:HB3	2.02	0.41
1:C:50:HIS:HB2	1:C:53:ASN:HD22	1.86	0.41
2:D:186:PRO:HB2	2:D:189:THR:HG23	2.02	0.41
1:C:142:LYS:HB3	1:C:173:TYR:CE1	2.55	0.41
1:A:145:ASN:HB3	4:A:385:HOH:O	2.21	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:93:PHE:O	2:D:95:PRO:HD3	2.19	0.41
2:D:190:TRP:CD1	2:D:191:PRO:HA	2.56	0.41
2:B:27:LEU:HD12	2:B:27:LEU:C	2.46	0.41
2:B:95:PRO:HA	2:B:96:MET:HA	1.69	0.40

All (2) 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:C:311:HOH:O	4:C:421:HOH:O[2_645]	1.84	0.36
4:A:255:HOH:O	4:B:391:HOH:O[2_656]	2.15	0.05

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	219/219 (100%)	215 (98%)	4 (2%)	0	100	100
1	C	219/219 (100%)	216 (99%)	3 (1%)	0	100	100
2	B	206/217 (95%)	204 (99%)	2 (1%)	0	100	100
2	D	207/217 (95%)	205 (99%)	2 (1%)	0	100	100
3	E	9/12 (75%)	9 (100%)	0	0	100	100
3	F	10/12 (83%)	10 (100%)	0	0	100	100
All	All	870/896 (97%)	859 (99%)	11 (1%)	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	196/194 (101%)	196 (100%)	0	100	100
1	C	196/194 (101%)	194 (99%)	2 (1%)	68	58
2	B	187/191 (98%)	184 (98%)	3 (2%)	55	41
2	D	186/191 (97%)	177 (95%)	9 (5%)	23	8
3	E	11/12 (92%)	11 (100%)	0	100	100
3	F	12/12 (100%)	10 (83%)	2 (17%)	2	0
All	All	788/794 (99%)	772 (98%)	16 (2%)	47	32

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	105	GLN
2	B	161	LEU
2	B	207	LYS
1	C	181	LEU
1	C	199	LYS
2	D	42	GLU
2	D	43	LYS
2	D	54	ASN
2	D	85	GLU
2	D	105	GLN
2	D	151	PRO
2	D	161	LEU
2	D	179	LEU
2	D	207	LYS
3	F	3	GLU
3	F	11	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (24) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	11	ASN

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Mol	Chain	Res	Type
1	A	27(D)	HIS
1	A	38	GLN
1	A	42	GLN
1	A	90	HIS
1	A	91	ASN
1	A	189	HIS
1	A	190	ASN
2	B	31	ASN
2	B	39	GLN
2	B	81	GLN
2	B	82(A)	ASN
2	B	82(B)	ASN
2	B	105	GLN
2	B	173	GLN
1	C	27(D)	HIS
1	C	53	ASN
1	C	90	HIS
1	C	91	ASN
2	D	31	ASN
2	D	81	GLN
2	D	82(B)	ASN
3	F	9	ASN
3	F	11	GLN

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 ⓘ

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	A	218/219 (99%)	0.56	12 (5%)	30 34	15, 27, 38, 42	3 (1%)
1	C	219/219 (100%)	0.24	4 (1%)	67 72	11, 23, 33, 52	2 (0%)
2	B	207/217 (95%)	0.37	17 (8%)	17 19	14, 21, 43, 51	3 (1%)
2	D	209/217 (96%)	0.46	4 (1%)	66 71	12, 26, 37, 42	2 (0%)
3	E	11/12 (91%)	0.66	2 (18%)	3 3	21, 25, 45, 48	0
3	F	12/12 (100%)	1.15	2 (16%)	4 4	29, 36, 45, 47	0
All	All	876/896 (97%)	0.42	41 (4%)	36 40	11, 24, 39, 52	10 (1%)

All (41) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	214	CYS	3.8
2	B	212	ILE	3.2
2	D	136	SER	3.1
2	B	213	VAL	2.9
2	B	190	TRP	2.9
2	B	138	VAL	2.8
2	B	165	VAL	2.8
1	A	106	ILE	2.7
2	B	194	THR	2.7
3	E	11	GLN	2.6
3	F	11	GLN	2.6
1	C	20	SER	2.6
2	B	193	GLU	2.6
2	B	126	PRO	2.5
2	B	208	VAL	2.5
1	A	11	ASN	2.5
1	A	111	ALA	2.5
2	B	214	PRO	2.5
1	A	172	THR	2.5

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Mol	Chain	Res	Type	RSRZ
3	E	10	ASN	2.4
2	B	136	SER	2.4
2	D	153	THR	2.3
2	B	185	VAL	2.3
2	D	114	ALA	2.3
1	A	127	SER	2.3
1	C	41	GLY	2.3
1	A	163	TRP	2.2
2	D	65	GLY	2.2
2	B	192	SER	2.2
2	B	125	ALA	2.1
1	C	40	PRO	2.1
1	A	168	SER	2.1
1	A	9	PHE	2.1
1	A	109	ALA	2.1
2	B	195	VAL	2.1
1	A	15	LEU	2.1
2	B	164	GLY	2.0
1	A	77	ARG	2.0
2	B	137	MET	2.0
1	A	112	ALA	2.0
3	F	12	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.