



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 05:29 PM UTC

PDB ID : 4D3C / pdb_00004d3c
Title : Crystal structure of the NK1 domain of HGF in complex with anti-HGF monoclonal antibody SFN68.
Authors : Kang, Y.J.; Kim, K.L.; Cho, H.S.; Chung, J.H.
Deposited on : 2014-10-21
Resolution : 2.62 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

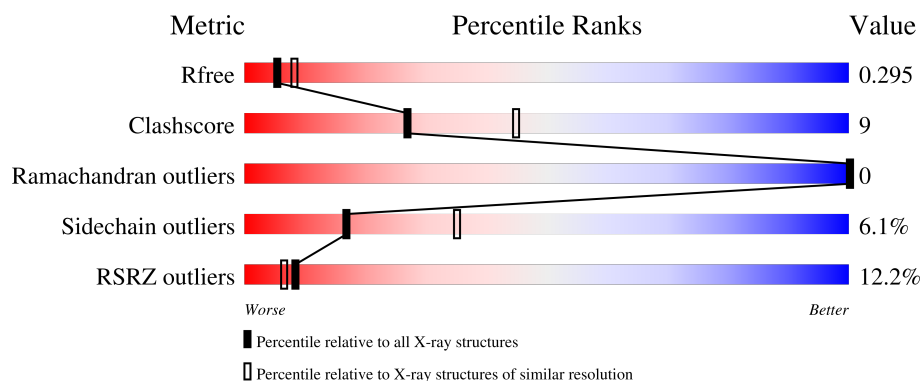
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.62 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	4951 (2.64-2.60)
Clashscore	190562	5303 (2.64-2.60)
Ramachandran outliers	187476	5217 (2.64-2.60)
Sidechain outliers	187428	5217 (2.64-2.60)
RSRZ outliers	180081	4950 (2.64-2.60)

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	A	193	18% 51% 18% • 29%
2	H	218	6% 78% 15% • •
3	L	215	10% 70% 23% 5% •

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 4247 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 HEPATOCYTE GROWTH FACTOR.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	137	Total	C	N	O	S	0	0	0
			1095	688	191	204	12			

There are 15 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	18	MET	-	expression tag	UNP P14210
A	19	GLY	-	expression tag	UNP P14210
A	20	SER	-	expression tag	UNP P14210
A	21	SER	-	expression tag	UNP P14210
A	22	HIS	-	expression tag	UNP P14210
A	23	HIS	-	expression tag	UNP P14210
A	24	HIS	-	expression tag	UNP P14210
A	25	HIS	-	expression tag	UNP P14210
A	26	HIS	-	expression tag	UNP P14210
A	27	HIS	-	expression tag	UNP P14210
A	28	SER	-	expression tag	UNP P14210
A	29	GLN	-	expression tag	UNP P14210
A	30	ASP	-	expression tag	UNP P14210
A	31	PRO	-	expression tag	UNP P14210
A	134	GLY	ARG	engineered mutation	UNP P14210

- Molecule 2 is a protein called SFN68 FAB.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	H	210	Total	C	N	O	S	0	0	0
			1566	988	260	311	7			

- Molecule 3 is a protein called SFN68 FAB.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	L	209	Total 1564	C 975	N 260	O 324	S 5	0	0	0

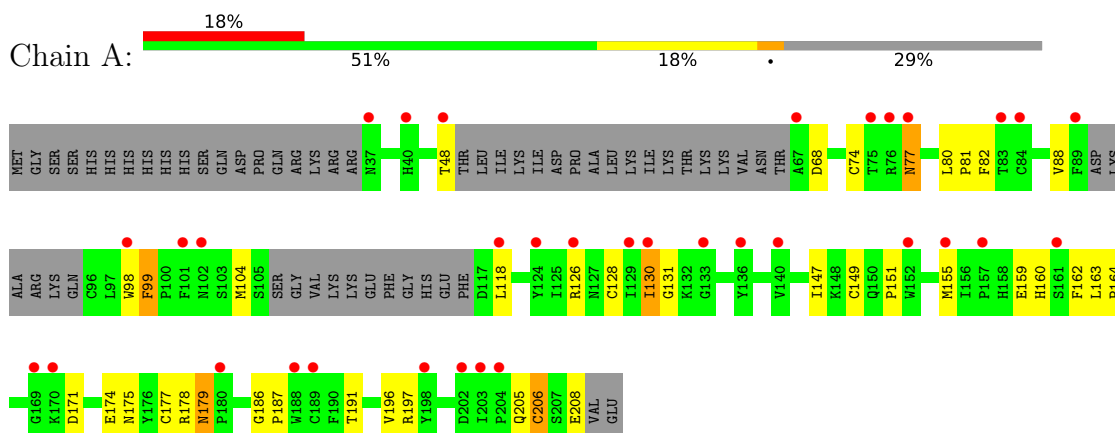
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	4	Total 4	O 4	0	0
4	H	7	Total 7	O 7	0	0
4	L	11	Total 11	O 11	0	0

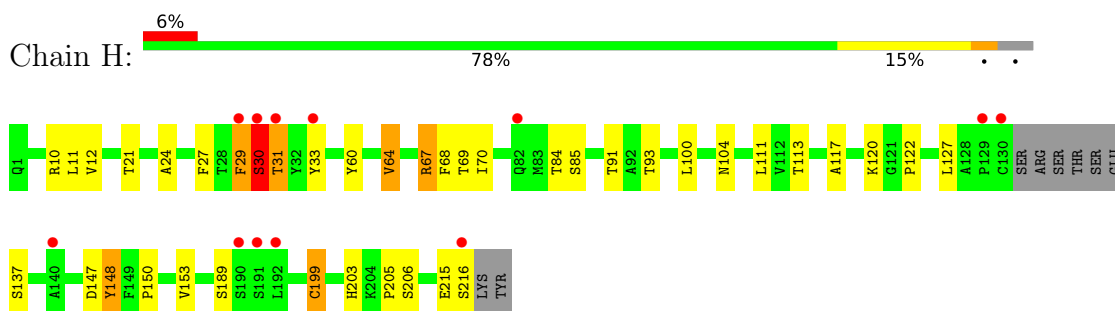
3 Residue-property plots [i](#)

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.

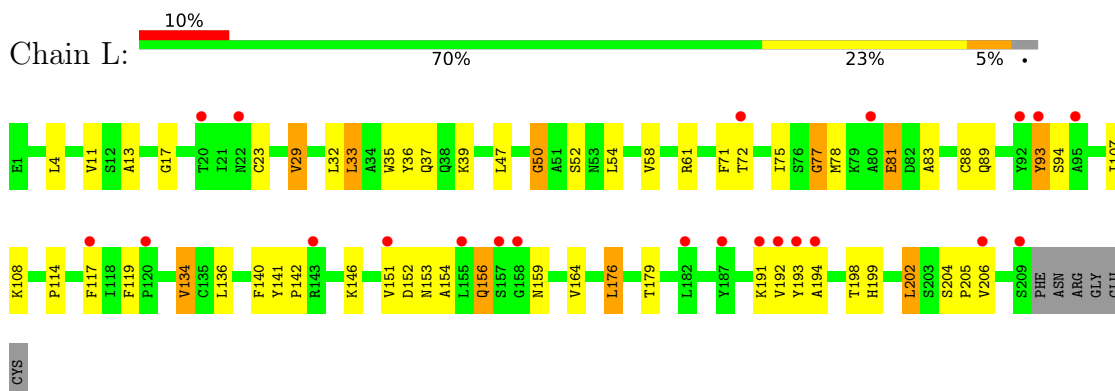
• Molecule 1: HEPATOCYTE GROWTH FACTOR



• Molecule 2: SFN68 FAB



• Molecule 3: SFN68 FAB



4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	86.70Å 297.69Å 70.71Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.79 – 2.62 29.79 – 2.62	Depositor EDS
% Data completeness (in resolution range)	95.5 (29.79-2.62) 95.7 (29.79-2.62)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.03 (at 2.61Å)	Xtriage
Refinement program	REFMAC 5.7.0029	Depositor
R, R_{free}	0.268 , 0.298 0.263 , 0.295	Depositor DCC
R_{free} test set	1347 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å ²)	57.1	Xtriage
Anisotropy	0.349	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.28 , 61.7	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	0.91	EDS
Total number of atoms	4247	wwPDB-VP
Average B, all atoms (Å ²)	87.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.67% 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	A	0.54	0/1123	0.86	6/1510 (0.4%)
2	H	1.00	4/1602 (0.2%)	0.94	3/2185 (0.1%)
3	L	0.76	1/1595 (0.1%)	0.95	6/2169 (0.3%)
All	All	0.81	5/4320 (0.1%)	0.92	15/5864 (0.3%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	L	77	GLY	CA-C	-6.59	1.47	1.52
2	H	147	ASP	CA-C	-5.86	1.46	1.53
2	H	148	TYR	CG-CD1	-5.72	1.27	1.39
2	H	120	LYS	CA-C	5.31	1.59	1.52
2	H	199	CYS	CA-CB	-5.23	1.45	1.53

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	L	77	GLY	N-CA-C	-10.07	95.30	110.71
2	H	30	SER	CA-C-N	6.24	132.92	121.70
2	H	30	SER	C-N-CA	6.24	132.92	121.70
3	L	154	ALA	N-CA-C	5.97	118.22	108.55
2	H	29	PHE	N-CA-C	5.68	117.16	110.97
1	A	186	GLY	CA-C-N	-5.56	114.20	119.76
1	A	186	GLY	C-N-CA	-5.56	114.20	119.76
1	A	99	PHE	CA-C-N	5.30	126.46	119.84
1	A	99	PHE	C-N-CA	5.30	126.46	119.84
3	L	194	ALA	N-CA-C	5.28	117.28	108.99
1	A	179	ASN	CA-C-N	5.28	124.94	119.56
1	A	179	ASN	C-N-CA	5.28	124.94	119.56
3	L	50	GLY	N-CA-C	-5.27	101.22	111.02
3	L	204	SER	CA-C-N	-5.01	114.62	119.78
3	L	204	SER	C-N-CA	-5.01	114.62	119.78

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	1095	0	1031	22	0
2	H	1566	0	1535	21	0
3	L	1564	0	1518	36	0
4	A	4	0	0	0	0
4	H	7	0	0	0	0
4	L	11	0	0	0	0
All	All	4247	0	4084	76	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 9.

All (76) 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)
3:L:151:VAL:HG21	3:L:193:TYR:HA	1.43	1.00
3:L:33:LEU:O	3:L:50:GLY:O	1.83	0.96
1:A:128:CYS:SG	1:A:206:CYS:N	2.50	0.84
3:L:61:ARG:HD2	3:L:77:GLY:O	1.86	0.75
3:L:119:PHE:HB2	3:L:134:VAL:HG22	1.73	0.71
3:L:152:ASP:N	3:L:153:ASN:HA	2.07	0.70
3:L:39:LYS:NZ	3:L:81:GLU:O	2.23	0.68
2:H:64:VAL:HG13	2:H:68:PHE:HB2	1.78	0.66
1:A:159:GLU:O	1:A:197:ARG:NH2	2.24	0.63
2:H:137:SER:N	2:H:189:SER:HG	1.96	0.63
3:L:151:VAL:CG2	3:L:193:TYR:HA	2.23	0.62
2:H:33:TYR:OH	3:L:93:TYR:HB2	2.02	0.60
3:L:61:ARG:CD	3:L:77:GLY:O	2.50	0.58
3:L:202:LEU:HD13	3:L:205:PRO:HA	1.85	0.58
1:A:171:ASP:OD2	1:A:178:ARG:NH2	2.27	0.58
2:H:10:ARG:NH1	2:H:11:LEU:O	2.36	0.58
1:A:126:ARG:NH2	1:A:206:CYS:SG	2.79	0.56

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:L:134:VAL:HG12	3:L:179:THR:HG23	1.87	0.56
3:L:17:GLY:O	3:L:78:MET:HG3	2.06	0.55
1:A:74:CYS:HB2	1:A:98:TRP:CD1	2.42	0.55
2:H:29:PHE:HB3	2:H:30:SER:HA	1.88	0.54
1:A:77:ASN:ND2	1:A:82:PHE:O	2.40	0.54
3:L:4:LEU:HD22	3:L:23:CYS:SG	2.49	0.53
1:A:191:THR:OG1	1:A:196:VAL:O	2.26	0.53
3:L:29:VAL:HG13	3:L:32:LEU:HB2	1.91	0.53
3:L:35:TRP:CZ3	3:L:88:CYS:HB3	2.44	0.52
3:L:151:VAL:C	3:L:153:ASN:HA	2.33	0.52
1:A:149:CYS:HB2	1:A:175:ASN:HB2	1.92	0.52
1:A:88:VAL:HG22	1:A:118:LEU:HD22	1.93	0.51
3:L:13:ALA:O	3:L:108:LYS:N	2.39	0.51
1:A:197:ARG:HE	2:H:31:THR:HG22	1.76	0.51
2:H:203:HIS:CD2	2:H:205:PRO:HD2	2.46	0.51
3:L:114:PRO:HB3	3:L:140:PHE:CD2	2.46	0.50
2:H:215:GLU:OE1	2:H:216:SER:N	2.44	0.50
3:L:199:HIS:H	3:L:202:LEU:HD11	1.76	0.50
1:A:177:CYS:O	1:A:178:ARG:NH1	2.45	0.49
3:L:114:PRO:HD3	3:L:199:HIS:ND1	2.28	0.49
2:H:122:PRO:HB3	2:H:148:TYR:HB3	1.94	0.48
1:A:151:PRO:HA	1:A:174:GLU:O	2.12	0.48
3:L:164:VAL:HG22	3:L:176:LEU:HB2	1.95	0.48
3:L:93:TYR:O	3:L:94:SER:OG	2.23	0.48
1:A:160:HIS:ND1	1:A:162:PHE:HB2	2.29	0.48
1:A:130:ILE:HG22	1:A:131:GLY:H	1.79	0.47
3:L:159:ASN:OD1	3:L:159:ASN:N	2.47	0.47
2:H:93:THR:HG22	2:H:111:LEU:HD13	1.97	0.47
3:L:78:MET:HE2	3:L:78:MET:HB3	1.73	0.46
3:L:33:LEU:HD22	3:L:71:PHE:CG	2.51	0.45
2:H:67:ARG:O	2:H:84:THR:OG1	2.32	0.45
1:A:88:VAL:HG23	1:A:99:PHE:CE2	2.51	0.45
2:H:11:LEU:HB2	2:H:150:PRO:HG3	1.98	0.45
3:L:151:VAL:N	3:L:156:GLN:OE1	2.34	0.45
1:A:126:ARG:HE	1:A:128:CYS:HB3	1.82	0.45
3:L:54:LEU:HD21	3:L:58:VAL:O	2.17	0.45
2:H:24:ALA:HB1	2:H:27:PHE:CE1	2.52	0.44
2:H:60:TYR:HE1	2:H:70:ILE:HG13	1.84	0.43
3:L:146:LYS:HB2	3:L:198:THR:HB	2.00	0.43
3:L:151:VAL:HG21	3:L:192:VAL:O	2.19	0.43
1:A:80:LEU:HA	1:A:81:PRO:HD3	1.77	0.43

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:127:LEU:HB3	3:L:119:PHE:CD1	2.54	0.43
2:H:67:ARG:HD2	2:H:85:SER:HB2	2.01	0.43
2:H:30:SER:HB2	2:H:31:THR:OG1	2.19	0.43
2:H:91:THR:HG23	2:H:113:THR:HA	2.01	0.42
1:A:155:MET:HE1	1:A:160:HIS:O	2.19	0.42
3:L:202:LEU:HD22	3:L:206:VAL:HG23	2.02	0.42
3:L:37:GLN:HB2	3:L:47:LEU:HD11	2.01	0.42
3:L:117:PHE:HB2	3:L:136:LEU:HB3	2.02	0.42
2:H:203:HIS:ND1	2:H:206:SER:HB3	2.34	0.41
1:A:179:ASN:HB2	1:A:187:PRO:HA	2.01	0.41
1:A:163:LEU:HG	1:A:164:PRO:HD2	2.02	0.41
2:H:148:TYR:CE2	2:H:153:VAL:HG23	2.55	0.41
3:L:83:ALA:HB2	3:L:107:ILE:HG12	2.03	0.41
1:A:147:ILE:HG21	1:A:191:THR:HB	2.03	0.41
1:A:205:GLN:HB2	1:A:208:GLU:HG3	2.02	0.40
2:H:11:LEU:HD21	2:H:117:ALA:O	2.22	0.40
3:L:36:TYR:HE2	3:L:89:GLN:HB3	1.86	0.40
3:L:141:TYR:CG	3:L:142:PRO:HA	2.56	0.40

There are no symmetry-related clashes.

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	129/193 (67%)	115 (89%)	14 (11%)	0	100	100
2	H	206/218 (94%)	196 (95%)	10 (5%)	0	100	100
3	L	207/215 (96%)	193 (93%)	14 (7%)	0	100	100
All	All	542/626 (87%)	504 (93%)	38 (7%)	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	123/174 (71%)	117 (95%)	6 (5%)	22	44
2	H	178/186 (96%)	168 (94%)	10 (6%)	19	39
3	L	175/180 (97%)	162 (93%)	13 (7%)	13	27
All	All	476/540 (88%)	447 (94%)	29 (6%)	17	35

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	48	THR
1	A	68	ASP
1	A	77	ASN
1	A	104	MET
1	A	130	ILE
1	A	206	CYS
2	H	12	VAL
2	H	21	THR
2	H	30	SER
2	H	31	THR
2	H	64	VAL
2	H	67	ARG
2	H	69	THR
2	H	100	LEU
2	H	104	ASN
2	H	199	CYS
3	L	11	VAL
3	L	29	VAL
3	L	33	LEU
3	L	52	SER
3	L	72	THR
3	L	75	ILE
3	L	81	GLU
3	L	93	TYR
3	L	134	VAL
3	L	156	GLN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
3	L	176	LEU
3	L	191	LYS
3	L	202	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
2	H	74	ASN
3	L	153	ASN
3	L	161	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	A	137/193 (70%)	1.56	34 (24%) 2 1	77, 122, 156, 162	0
2	H	210/218 (96%)	0.41	12 (5%) 29 24	19, 63, 103, 149	0
3	L	209/215 (97%)	0.91	22 (10%) 11 9	51, 81, 117, 154	0
All	All	556/626 (88%)	0.88	68 (12%) 8 6	19, 81, 144, 162	0

All (68) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	L	193	TYR	6.5
1	A	203	ILE	4.8
3	L	194	ALA	4.8
1	A	124	TYR	4.8
1	A	204	PRO	4.7
1	A	188	TRP	4.7
2	H	130	CYS	4.2
1	A	98	TRP	3.9
1	A	75	THR	3.9
2	H	31	THR	3.9
2	H	216	SER	3.9
3	L	192	VAL	3.8
3	L	22	ASN	3.7
3	L	72	THR	3.6
1	A	161	SER	3.6
2	H	29	PHE	3.4
3	L	151	VAL	3.4
1	A	101	PHE	3.4
1	A	84	CYS	3.3
1	A	67	ALA	3.3
1	A	77	ASN	3.2
1	A	130	ILE	3.2
1	A	189	CYS	3.2

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
3	L	191	LYS	3.1
3	L	182	LEU	3.1
1	A	136	TYR	3.1
3	L	20	THR	3.1
3	L	92	TYR	3.1
3	L	155	LEU	3.1
1	A	48	THR	3.0
1	A	83	THR	3.0
1	A	152	TRP	2.9
3	L	157	SER	2.9
2	H	140	ALA	2.9
1	A	198	TYR	2.8
3	L	120	PRO	2.8
1	A	202	ASP	2.8
1	A	89	PHE	2.8
1	A	155	MET	2.7
2	H	190	SER	2.7
1	A	170	LYS	2.7
3	L	93	TYR	2.6
1	A	118	LEU	2.5
3	L	187	TYR	2.5
1	A	157	PRO	2.5
1	A	76	ARG	2.5
2	H	192	LEU	2.5
2	H	30	SER	2.5
1	A	102	ASN	2.5
1	A	169	GLY	2.5
1	A	180	PRO	2.5
3	L	209	SER	2.4
1	A	129	ILE	2.4
2	H	82	GLN	2.3
2	H	33	TYR	2.3
3	L	80	ALA	2.2
3	L	95	ALA	2.2
1	A	140	VAL	2.2
3	L	143	ARG	2.2
2	H	191	SER	2.2
1	A	133	GLY	2.1
3	L	158	GLY	2.1
3	L	206	VAL	2.1
3	L	117	PHE	2.1
1	A	40	HIS	2.1

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
2	H	129	PRO	2.0
1	A	37	ASN	2.0
1	A	126	ARG	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.