



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 18, 2025 – 03:46 PM EDT

PDB ID : 2R0W  
Title : PFA2 FAB complexed with Abeta1-8  
Authors : Gardberg, A.S.; Dealwis, C.  
Deposited on : 2007-08-21  
Resolution : 2.50 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](mailto: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>.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 2022.3.0, CSD as543be (2022)  
Xtriage (Phenix) : 1.21  
EDS : 3.0  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
CCP4 : 9.0.004 (Gargrove)  
Density-Fitness : 1.0.11  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.41.4

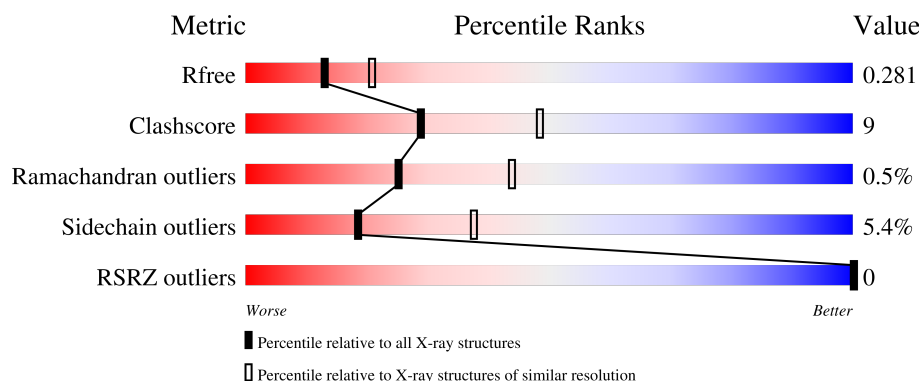
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*




The reported resolution of this entry is 2.50 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))
$R_{free}$	164625	5504 (2.50-2.50)
Clashscore	180529	6282 (2.50-2.50)
Ramachandran outliers	177936	6191 (2.50-2.50)
Sidechain outliers	177891	6193 (2.50-2.50)
RSRZ outliers	164620	5504 (2.50-2.50)

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  $\geq 3$ , 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	L	219	 72% 26% .
2	H	223	 77% 17% . .
3	Q	8	 62% 25% 12%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
1	YCM	L	213	-	-	X	-

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 3481 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 IgG2a Fab fragment light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	L	219	Total	C	N	O	S	0	0	0
			1701	1062	288	344	7			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
L	27E	SER	THR	conflict	UNP A2NHM3
L	96	LEU	ARG	conflict	UNP A2NHM3
L	100	ALA	GLY	conflict	UNP A2NHM3
L	213	YCM	CYS	modified residue	UNP A2NHM3

- Molecule 2 is a protein called IgG2a Fab fragment heavy chain, Fd portion.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	H	217	Total	C	N	O	S	0	0	0
			1655	1053	277	320	5			

- Molecule 3 is a protein called Amyloid beta peptide fragment.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	Q	7	Total	C	N	O	0	0	0
			61	36	12	13			

- Molecule 4 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	L	1	Total	Na	0	0
			1	1		

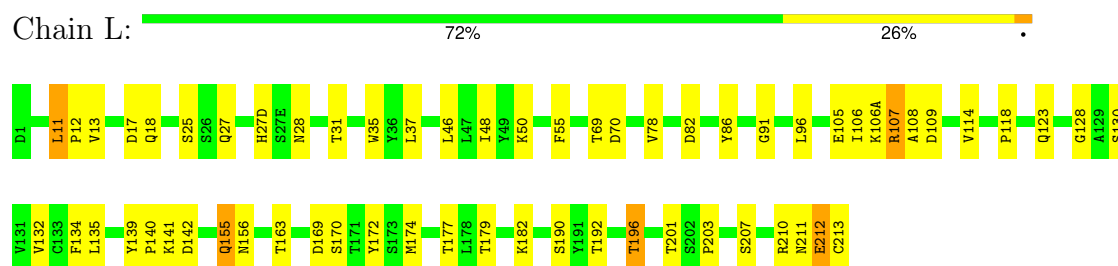
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	L	31	Total 31	O 31	0	0
5	H	31	Total 31	O 31	0	0
5	Q	1	Total 1	O 1	0	0

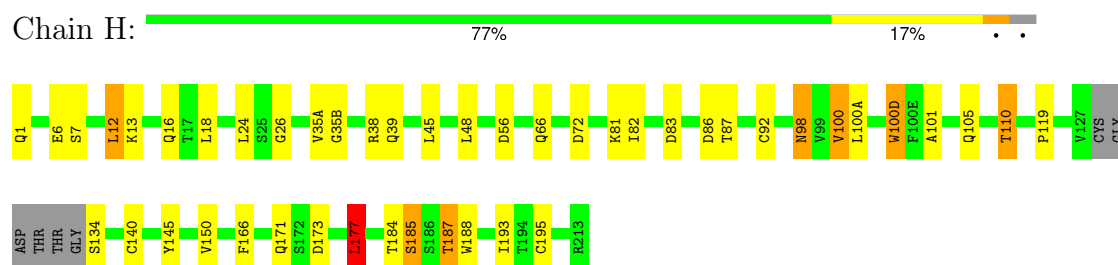
### 3 Residue-property plots

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 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.

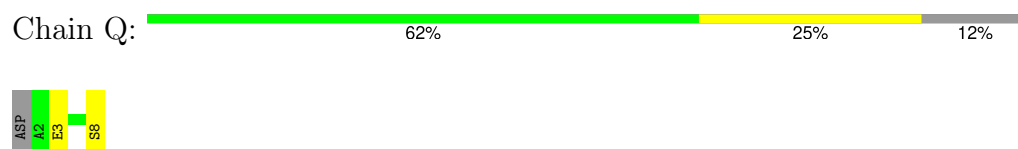
- Molecule 1: IgG2a Fab fragment light chain



- Molecule 2: IgG2a Fab fragment heavy chain, Fd portion



- Molecule 3: Amyloid beta peptide fragment



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	42.79Å 43.33Å 58.46Å 92.51° 94.96° 90.55°	Depositor
Resolution (Å)	42.64 – 2.50 42.64 – 2.50	Depositor EDS
% Data completeness (in resolution range)	95.8 (42.64-2.50) 95.7 (42.64-2.50)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.91 (at 2.51Å)	Xtriage
Refinement program	REFMAC 5.2.0007	Depositor
R, $R_{free}$	0.208 , 0.277 0.212 , 0.281	Depositor DCC
$R_{free}$ test set	695 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	47.6	Xtriage
Anisotropy	0.055	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 36.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.012 for -k,-h,-l	Xtriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	3481	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	42.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.60% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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](#)

Bond lengths and bond angles in the following residue types are not validated in this section: NA, YCM

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	L	0.76	0/1728	0.90	5/2345 (0.2%)
2	H	0.73	1/1698 (0.1%)	0.89	6/2322 (0.3%)
3	Q	0.76	0/62	0.77	0/80
All	All	0.75	1/3488 (0.0%)	0.90	11/4747 (0.2%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	H	195	CYS	CB-SG	-5.22	1.73	1.81

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	72	ASP	CB-CG-OD2	6.67	124.31	118.30
1	L	109	ASP	CB-CG-OD2	6.33	124.00	118.30
1	L	70	ASP	CB-CG-OD2	5.70	123.43	118.30
2	H	86	ASP	CB-CG-OD2	5.51	123.26	118.30
1	L	82	ASP	CB-CG-OD2	5.43	123.18	118.30
1	L	210	ARG	NE-CZ-NH1	5.38	122.99	120.30
1	L	169	ASP	CB-CG-OD2	5.34	123.10	118.30
2	H	56	ASP	CB-CG-OD2	5.18	122.96	118.30
2	H	177	LEU	CB-CG-CD1	5.04	119.58	111.00
2	H	83	ASP	CB-CG-OD2	5.03	122.83	118.30
2	H	173	ASP	CB-CG-OD2	5.03	122.83	118.30

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	L	1701	0	1644	37	0
2	H	1655	0	1643	22	0
3	Q	61	0	48	3	0
4	L	1	0	0	0	0
5	H	31	0	0	0	0
5	L	31	0	0	0	0
5	Q	1	0	0	1	0
All	All	3481	0	3335	58	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 (58) 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:L:212:GLU:C	1:L:213:YCM:H2	1.05	1.57
1:L:212:GLU:C	1:L:213:YCM:N	1.87	1.25
1:L:212:GLU:CA	1:L:213:YCM:H2	1.93	0.81
1:L:17:ASP:O	1:L:78:VAL:HG23	1.99	0.61
1:L:130:SER:OG	1:L:179:THR:HG23	2.02	0.59
1:L:212:GLU:N	1:L:213:YCM:N	2.52	0.58
2:H:66:GLN:O	2:H:82:ILE:HA	2.05	0.57
1:L:106:ILE:HD11	1:L:170:SER:OG	2.07	0.55
1:L:155:GLN:HE22	1:L:156:ASN:HD22	1.55	0.54
2:H:119:PRO:HB3	2:H:145:TYR:HB3	1.89	0.54
1:L:91:GLY:HA2	1:L:96:LEU:HD22	1.89	0.53
2:H:87:THR:HG23	2:H:110:THR:HA	1.90	0.53
2:H:12:LEU:N	2:H:12:LEU:HD12	2.24	0.52
1:L:141:LYS:HB3	1:L:172:TYR:CE2	2.44	0.52
1:L:25:SER:HB3	1:L:27:GLN:O	2.11	0.51
1:L:31:THR:O	1:L:50:LYS:HA	2.13	0.49
1:L:132:VAL:HG22	1:L:177:THR:HG23	1.95	0.49
2:H:145:TYR:CE2	2:H:150:VAL:HG13	2.48	0.49
1:L:12:PRO:HA	1:L:105:GLU:O	2.13	0.49
1:L:192:THR:HA	1:L:207:SER:HB3	1.95	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:188:TRP:CD1	2:H:193:ILE:HD12	2.49	0.48
1:L:212:GLU:C	1:L:213:YCM:CA	2.77	0.47
1:L:12:PRO:HB2	1:L:106(A):LYS:HB3	1.96	0.47
2:H:39:GLN:HB2	2:H:45:LEU:HD23	1.97	0.47
1:L:192:THR:HG23	1:L:207:SER:HB3	1.97	0.46
1:L:139:TYR:CG	1:L:140:PRO:HA	2.51	0.46
1:L:212:GLU:O	1:L:213:YCM:N	2.46	0.46
1:L:107:ARG:HD3	1:L:108:ALA:O	2.16	0.45
1:L:123:GLN:HG2	1:L:128:GLY:O	2.17	0.45
1:L:28:ASN:HB2	3:Q:8:SER:HA	1.98	0.45
1:L:141:LYS:HB3	1:L:172:TYR:CD2	2.52	0.45
1:L:27(D):HIS:CD2	3:Q:3:GLU:HG2	2.51	0.45
1:L:114:VAL:HA	1:L:134:PHE:O	2.17	0.44
2:H:18:LEU:O	2:H:81:LYS:HA	2.17	0.44
1:L:212:GLU:CA	1:L:213:YCM:N	2.63	0.44
2:H:98:ASN:OD1	2:H:100:VAL:CG1	2.66	0.44
2:H:100(D):TRP:CD1	2:H:101:ALA:HB2	2.53	0.43
2:H:134:SER:O	2:H:185:SER:OG	2.31	0.43
1:L:196:THR:HG23	1:L:203:PRO:HB3	2.00	0.43
2:H:98:ASN:HD21	2:H:100(A):LEU:HB2	1.83	0.43
1:L:11:LEU:HD22	1:L:13:VAL:HG13	2.01	0.42
2:H:35(B):GLY:O	2:H:92:CYS:HA	2.19	0.42
1:L:37:LEU:HD13	1:L:86:TYR:CZ	2.54	0.42
1:L:118:PRO:HG3	1:L:213:YCM:HD3	2.01	0.42
2:H:1:GLN:O	2:H:26:GLY:HA3	2.20	0.42
1:L:27(D):HIS:NE2	3:Q:3:GLU:HG2	2.35	0.42
2:H:184:THR:O	2:H:187:THR:HB	2.19	0.42
2:H:98:ASN:HB3	5:Q:61:HOH:O	2.19	0.42
2:H:6:GLU:N	2:H:6:GLU:OE1	2.53	0.41
1:L:135:LEU:HB2	1:L:174:MET:HB3	2.03	0.41
1:L:46:LEU:HD23	1:L:55:PHE:CD1	2.56	0.41
1:L:211:ASN:C	1:L:213:YCM:N	2.74	0.41
1:L:35:TRP:HB2	1:L:48:ILE:HB	2.03	0.41
2:H:24:LEU:HD21	2:H:35(A):VAL:HG21	2.02	0.41
2:H:38:ARG:HG2	2:H:48:LEU:HD21	2.03	0.41
2:H:177:LEU:C	2:H:177:LEU:HD12	2.42	0.40
2:H:13:LYS:H	2:H:16:GLN:NE2	2.20	0.40
1:L:163:THR:HG23	2:H:166:PHE:CE2	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	L	217/219 (99%)	210 (97%)	7 (3%)	0	100	100
2	H	213/223 (96%)	192 (90%)	19 (9%)	2 (1%)	14	28
3	Q	5/8 (62%)	5 (100%)	0	0	100	100
All	All	435/450 (97%)	407 (94%)	26 (6%)	2 (0%)	25	44

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	H	100	VAL
2	H	187	THR

### 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	L	195/195 (100%)	184 (94%)	11 (6%)	17	36
2	H	190/194 (98%)	180 (95%)	10 (5%)	19	38
3	Q	6/7 (86%)	6 (100%)	0	100	100
All	All	391/396 (99%)	370 (95%)	21 (5%)	18	37

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	L	11	LEU

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Mol	Chain	Res	Type
1	L	18	GLN
1	L	69	THR
1	L	107	ARG
1	L	142	ASP
1	L	155	GLN
1	L	182	LYS
1	L	190	SER
1	L	196	THR
1	L	201	THR
1	L	212	GLU
2	H	7	SER
2	H	12	LEU
2	H	98	ASN
2	H	100(D)	TRP
2	H	105	GLN
2	H	110	THR
2	H	140	CYS
2	H	171	GLN
2	H	177	LEU
2	H	185	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	L	155	GLN
1	L	211	ASN
2	H	16	GLN
2	H	98	ASN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

1 non-standard protein/DNA/RNA residue is modelled in this entry.

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	$\# Z  > 2$
1	YCM	L	213	-	8,10,10	1.03	0	6,12,12	1.10	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
1	YCM	L	213	-	-	1/10/10/10	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	L	213	YCM	SG-CD-CE-NZ2

There are no ring outliers.

1 monomer is involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	L	213	YCM	9	0

## 5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 1 ligands modelled in this entry, 1 is monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

## 5.7 Other polymers ⓘ

There are no such residues in this entry.

## 5.8 Polymer linkage issues ⓘ

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	L	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	L	212:GLU	C	213:YCM	N	1.87

## 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	L	218/219 (99%)	0.07	0 100 100	32, 41, 48, 56	1 (0%)
2	H	217/223 (97%)	0.07	0 100 100	34, 42, 48, 52	0
3	Q	7/8 (87%)	0.21	0 100 100	53, 56, 58, 58	0
All	All	442/450 (98%)	0.07	0 100 100	32, 42, 49, 58	1 (0%)

There are no RSRZ outliers to report.

### 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q< 0.9’ lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
1	YCM	L	213	11/11	0.87	0.10	39,45,45,45	0

### 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q< 0.9’ lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
4	NA	L	214	1/1	0.94	0.12	50,50,50,50	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.