



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 26, 2024 – 04:19 AM EDT

PDB ID : 7JUM  
Title : Pfs230 D1 domain in complex with neutralizing antibody LMIV230-01  
Authors : Tolia, N.; Tang, W.K.  
Deposited on : 2020-08-20  
Resolution : 2.00 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  
Xtriage (Phenix) : 1.13  
EDS : 2.37.1  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.37.1

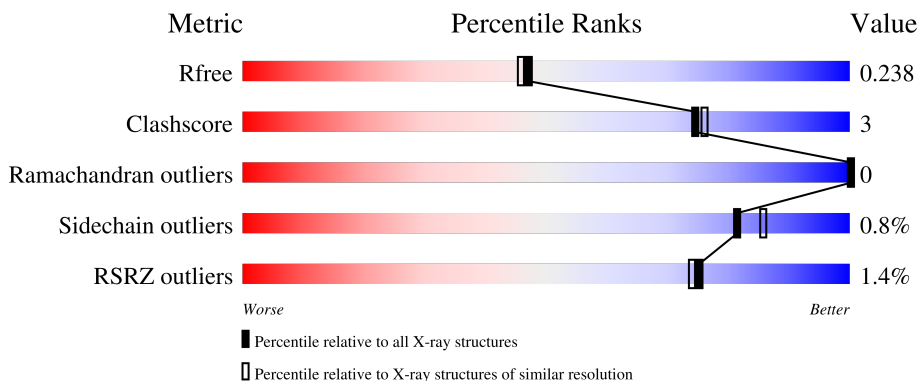
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.00 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))
$R_{free}$	130704	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

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	A	195	<div style="display: flex; align-items: center;"> <div style="width: 2%; height: 10px; background-color: red; margin-right: 2px;"></div> <div style="width: 85%; height: 10px; background-color: green; margin-right: 2px;"></div> <div style="width: 5%; height: 10px; background-color: yellow; margin-right: 2px;"></div> <div style="width: 10%; height: 10px; background-color: grey;"></div> </div> <p style="text-align: center;">2%      85%      5%      10%</p>
1	B	195	<div style="display: flex; align-items: center;"> <div style="width: 0%; height: 10px; background-color: red; margin-right: 2px;"></div> <div style="width: 84%; height: 10px; background-color: green; margin-right: 2px;"></div> <div style="width: 6%; height: 10px; background-color: yellow; margin-right: 2px;"></div> <div style="width: 11%; height: 10px; background-color: grey;"></div> </div> <p style="text-align: center;">%      84%      6%      11%</p>
1	C	195	<div style="display: flex; align-items: center;"> <div style="width: 2%; height: 10px; background-color: red; margin-right: 2px;"></div> <div style="width: 82%; height: 10px; background-color: green; margin-right: 2px;"></div> <div style="width: 6%; height: 10px; background-color: yellow; margin-right: 2px;"></div> <div style="width: 12%; height: 10px; background-color: grey;"></div> </div> <p style="text-align: center;">2%      82%      6%      12%</p>
2	H	257	<div style="display: flex; align-items: center;"> <div style="width: 0%; height: 10px; background-color: red; margin-right: 2px;"></div> <div style="width: 82%; height: 10px; background-color: green; margin-right: 2px;"></div> <div style="width: 7%; height: 10px; background-color: yellow; margin-right: 2px;"></div> <div style="width: 11%; height: 10px; background-color: grey;"></div> </div> <p style="text-align: center;">%      82%      7%      11%</p>
2	I	257	<div style="display: flex; align-items: center;"> <div style="width: 0%; height: 10px; background-color: red; margin-right: 2px;"></div> <div style="width: 81%; height: 10px; background-color: green; margin-right: 2px;"></div> <div style="width: 9%; height: 10px; background-color: yellow; margin-right: 2px;"></div> <div style="width: 11%; height: 10px; background-color: grey;"></div> </div> <p style="text-align: center;">%      81%      9%      11%</p>

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Mol	Chain	Length	Quality of chain
2	J	257	 <p>A horizontal bar chart representing the quality of chain. The bar is divided into four segments: a small red segment at the beginning labeled '2%', a large green segment labeled '81%', a small yellow segment labeled '7%', and a grey segment at the end labeled '12%'.</p>

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 10521 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 Gametocyte surface protein P230.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	176	1413	905	219	285	4	0	1	0
1	B	174	1391	891	216	280	4	0	0	0
1	C	172	1374	881	213	276	4	0	0	0

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	585	GLN	ASN	conflict	UNP P68874
B	585	GLN	ASN	conflict	UNP P68874
C	585	GLN	ASN	conflict	UNP P68874

- Molecule 2 is a protein called Neutralizing antibody, LMIV230-01 Single-chain Fv.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	H	228	1751	1108	298	338	7	0	0	0
2	I	230	1759	1112	300	340	7	0	0	0
2	J	227	1747	1106	297	337	7	0	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	191	Total 191 O 191	0	0
3	B	177	Total 177 O 177	0	0

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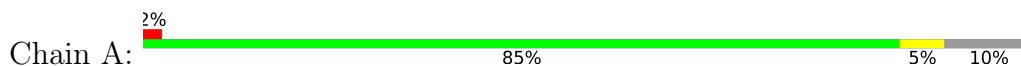
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<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
3	C	114	Total 114	O 114	0	0
3	H	240	Total 240	O 240	0	0
3	I	227	Total 227	O 227	0	0
3	J	137	Total 137	O 137	0	0

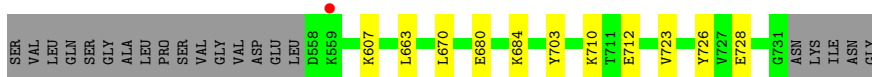
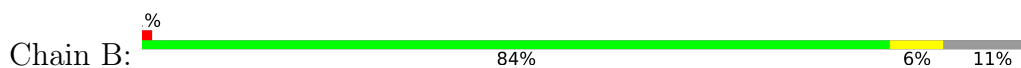
### 3 Residue-property plots [i](#)

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.

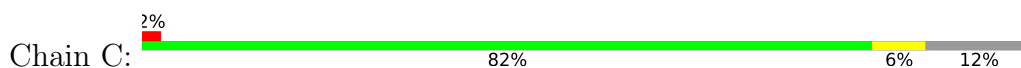
- Molecule 1: Gametocyte surface protein P230



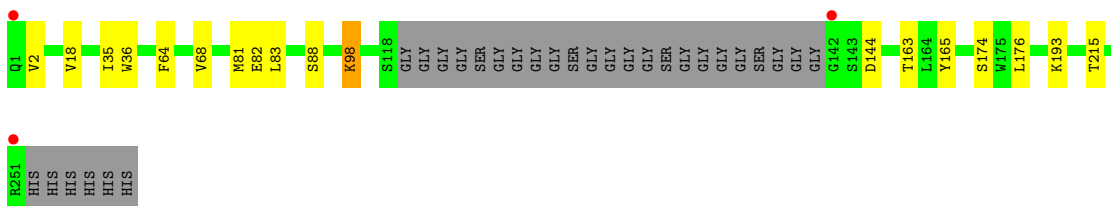
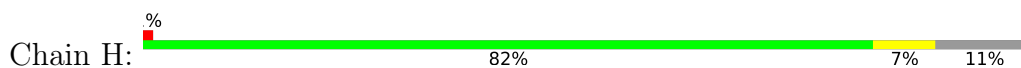
- Molecule 1: Gametocyte surface protein P230



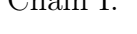
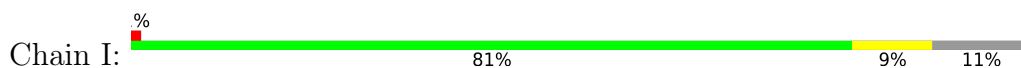
- Molecule 1: Gametocyte surface protein P230

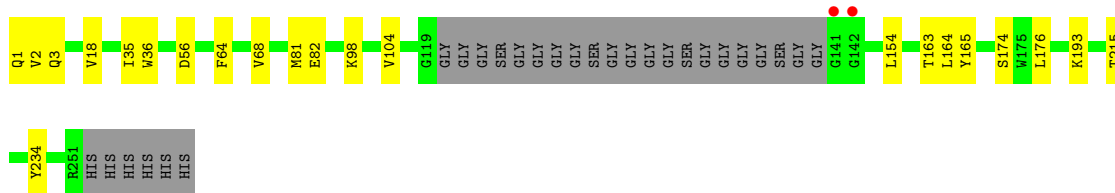


- Molecule 2: Neutralizing antibody, LMIV230-01 Single-chain Fv

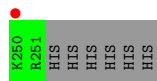
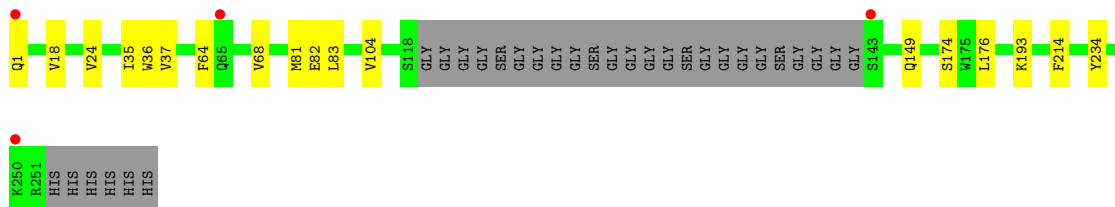
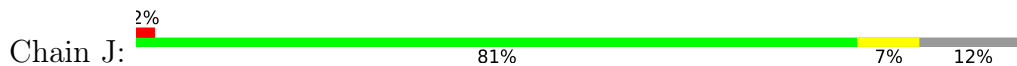


- Molecule 2: Neutralizing antibody, LMIV230-01 Single-chain Fv





● Molecule 2: Neutralizing antibody, LMIV230-01 Single-chain Fv



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 31	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	144.02Å 144.02Å 54.53Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	19.74 – 2.00 19.74 – 2.00	Depositor EDS
% Data completeness (in resolution range)	99.2 (19.74-2.00) 99.3 (19.74-2.00)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.45 (at 2.01Å)	Xtriage
Refinement program	REFMAC 5.8.0258	Depositor
R, $R_{free}$	0.191 , 0.233 0.198 , 0.238	Depositor DCC
$R_{free}$ test set	4252 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	30.3	Xtriage
Anisotropy	0.055	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 28.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.268 for -h,-k,l 0.026 for h,-h-k,-l 0.023 for -k,-h,-l	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	10521	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	34.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.51% 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](#)

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	0.73	0/1442	0.81	0/1950
1	B	0.72	0/1417	0.81	0/1916
1	C	0.70	0/1400	0.80	0/1894
2	H	0.68	0/1790	0.84	0/2423
2	I	0.68	0/1798	0.83	0/2433
2	J	0.69	0/1786	0.81	0/2418
All	All	0.70	0/9633	0.82	0/13034

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts [i](#)

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	1413	0	1424	7	0
1	B	1391	0	1401	8	0
1	C	1374	0	1384	8	0
2	H	1751	0	1727	13	0
2	I	1759	0	1733	16	0
2	J	1747	0	1724	11	0
3	A	191	0	0	6	0
3	B	177	0	0	7	0
3	C	114	0	0	3	0
3	H	240	0	0	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	I	227	0	0	3	0
3	J	137	0	0	3	0
All	All	10521	0	9393	60	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 3.

All (60) 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:A:805:HOH:O	2:H:98:LYS:CE	2.23	0.86
3:A:805:HOH:O	2:H:98:LYS:HE3	1.84	0.74
1:A:717:LYS:HE3	3:A:959:HOH:O	1.91	0.70
2:J:176:LEU:HD22	2:J:214:PHE:CG	2.32	0.65
1:C:588:ASN:HB2	3:C:826:HOH:O	1.98	0.62
2:J:104:VAL:HG13	2:J:234:TYR:CZ	2.35	0.62
2:I:56:ASP:HA	3:I:367:HOH:O	2.01	0.60
2:J:24:VAL:HG12	3:J:302:HOH:O	2.03	0.58
3:B:851:HOH:O	2:I:1:GLN:CB	2.52	0.58
1:B:712:GLU:OE2	2:H:163:THR:HB	2.03	0.57
1:C:581:LYS:NZ	3:C:804:HOH:O	2.38	0.56
2:J:64:PHE:HB3	2:J:68:VAL:HG23	1.87	0.56
2:H:64:PHE:HB3	2:H:68:VAL:HG23	1.87	0.56
2:I:64:PHE:HB3	2:I:68:VAL:HG23	1.88	0.55
1:A:712[A]:GLU:OE2	2:I:163:THR:HB	2.08	0.54
3:A:814:HOH:O	2:H:2:VAL:HG21	2.08	0.54
2:I:3:GLN:HG2	3:I:476:HOH:O	2.07	0.52
1:B:663:LEU:HG	1:B:670:LEU:HD22	1.92	0.52
1:B:607:LYS:NZ	3:B:807:HOH:O	2.42	0.52
1:A:663:LEU:HG	1:A:670:LEU:HD22	1.92	0.51
2:J:149:GLN:HG2	3:J:336:HOH:O	2.12	0.49
1:B:703:TYR:HA	1:B:723:VAL:O	2.12	0.49
1:A:623:LYS:HE3	1:A:689:GLU:OE2	2.11	0.49
1:A:703:TYR:HA	1:A:723:VAL:O	2.13	0.48
1:C:663:LEU:HG	1:C:670:LEU:HD22	1.95	0.48
2:H:35:ILE:HG12	3:H:410:HOH:O	2.12	0.48
2:I:35:ILE:HG12	3:I:438:HOH:O	2.12	0.48
2:I:174:SER:O	2:I:193:LYS:HA	2.15	0.47
2:J:68:VAL:HG22	2:J:83:LEU:HD13	1.97	0.47
1:C:703:TYR:HA	1:C:723:VAL:O	2.15	0.46
2:J:174:SER:O	2:J:193:LYS:HA	2.16	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:958:HOH:O	2:I:215:THR:HG21	2.16	0.46
1:C:641:TYR:O	1:C:644:LYS:HE2	2.16	0.45
1:C:623:LYS:HE2	1:C:625:ILE:HD11	1.98	0.45
2:H:174:SER:O	2:H:193:LYS:HA	2.16	0.45
1:A:654:GLU:HG3	3:A:922:HOH:O	2.15	0.45
3:B:851:HOH:O	2:I:1:GLN:HB2	2.15	0.45
1:B:710:LYS:NZ	3:B:816:HOH:O	2.50	0.45
1:A:712[B]:GLU:CD	2:I:154:LEU:HD21	2.37	0.45
2:H:165:TYR:CD1	2:H:215:THR:HG22	2.52	0.45
2:J:1:GLN:N	3:J:303:HOH:O	2.44	0.44
2:J:36:TRP:CE2	2:J:81:MET:HB2	2.53	0.44
2:H:18:VAL:O	2:H:82:GLU:HA	2.18	0.43
1:B:728:GLU:HG2	3:B:843:HOH:O	2.18	0.43
2:I:36:TRP:CE2	2:I:81:MET:HB2	2.54	0.43
1:C:623:LYS:CE	1:C:625:ILE:HD11	2.49	0.42
3:B:824:HOH:O	2:I:2:VAL:HG21	2.18	0.42
2:I:18:VAL:O	2:I:82:GLU:HA	2.20	0.42
1:B:728:GLU:CG	3:B:843:HOH:O	2.67	0.42
2:H:36:TRP:CE2	2:H:81:MET:HB2	2.55	0.42
2:H:144:ASP:OD1	3:H:301:HOH:O	2.21	0.41
2:I:163:THR:C	2:I:164:LEU:HD12	2.41	0.41
2:I:104:VAL:HG13	2:I:234:TYR:CZ	2.55	0.41
2:I:165:TYR:CD1	2:I:215:THR:HG22	2.56	0.41
1:B:680:GLU:OE1	1:B:684:LYS:HE2	2.20	0.41
1:C:629:LYS:NZ	3:C:816:HOH:O	2.53	0.41
2:J:35:ILE:HD12	2:J:37:VAL:HG23	2.02	0.41
2:H:36:TRP:CD2	2:H:81:MET:HB2	2.56	0.40
2:H:68:VAL:HG22	2:H:83:LEU:HD13	2.03	0.40
2:J:18:VAL:O	2:J:82:GLU:HA	2.21	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	175/195 (90%)	169 (97%)	6 (3%)	0	100	100
1	B	172/195 (88%)	167 (97%)	5 (3%)	0	100	100
1	C	170/195 (87%)	165 (97%)	5 (3%)	0	100	100
2	H	224/257 (87%)	216 (96%)	8 (4%)	0	100	100
2	I	226/257 (88%)	218 (96%)	8 (4%)	0	100	100
2	J	223/257 (87%)	218 (98%)	5 (2%)	0	100	100
All	All	1190/1356 (88%)	1153 (97%)	37 (3%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains [i](#)

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	166/180 (92%)	165 (99%)	1 (1%)	86	90
1	B	163/180 (91%)	162 (99%)	1 (1%)	86	90
1	C	161/180 (89%)	160 (99%)	1 (1%)	86	90
2	H	188/198 (95%)	185 (98%)	3 (2%)	62	67
2	I	188/198 (95%)	186 (99%)	2 (1%)	73	78
2	J	188/198 (95%)	188 (100%)	0	100	100
All	All	1054/1134 (93%)	1046 (99%)	8 (1%)	81	86

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	726	TYR
1	B	726	TYR
1	C	726	TYR
2	H	88	SER
2	H	98	LYS
2	H	176	LEU
2	I	98	LYS

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Mol	Chain	Res	Type
2	I	176	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 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 monosaccharides 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, 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	A	176/195 (90%)	-0.44	3 (1%) 70 68	18, 27, 46, 80	0
1	B	174/195 (89%)	-0.47	1 (0%) 89 88	20, 28, 50, 76	0
1	C	172/195 (88%)	-0.25	4 (2%) 60 59	29, 38, 62, 87	0
2	H	228/257 (88%)	-0.44	3 (1%) 77 76	19, 27, 45, 84	0
2	I	230/257 (89%)	-0.40	2 (0%) 84 83	20, 28, 48, 72	0
2	J	227/257 (88%)	-0.20	4 (1%) 68 66	27, 40, 60, 79	0
All	All	1207/1356 (89%)	-0.37	17 (1%) 75 74	18, 32, 56, 87	0

All (17) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	H	251	ARG	4.9
2	J	1	GLN	3.5
1	C	715	ASN	3.4
2	I	141	GLY	3.2
1	A	559	LYS	2.8
1	C	714	ASP	2.8
2	H	1	GLN	2.7
2	J	65	GLN	2.5
1	A	558	ASP	2.5
1	C	560	ILE	2.4
2	H	142	GLY	2.4
1	C	588	ASN	2.3
1	A	732	ASN	2.3
2	I	142	GLY	2.3
2	J	250	LYS	2.3
1	B	559	LYS	2.1
2	J	143	SER	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 monosaccharides 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.