



# Full wwPDB X-ray Structure Validation Report ⓘ

May 21, 2020 – 03:46 pm BST

PDB ID : 5MQC  
Title : Structure of black queen cell virus  
Authors : Spurny, R.; Kiem, H.H.T.; Plevka, P.  
Deposited on : 2016-12-20  
Resolution : 3.40 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.

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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 : 2.11  
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) : 2.11

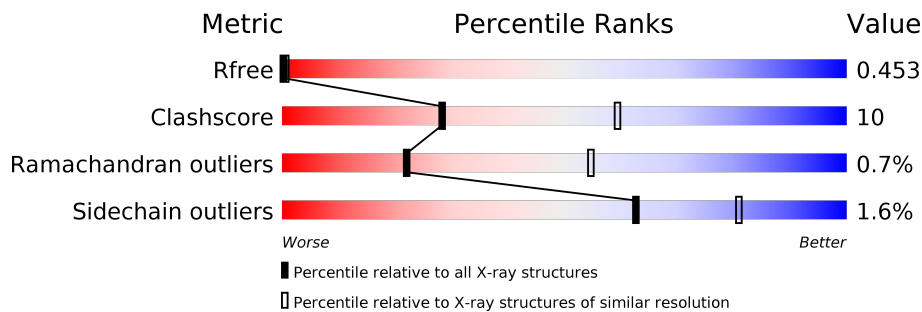
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.40 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	1026 (3.48-3.32)
Clashscore	141614	1055 (3.48-3.32)
Ramachandran outliers	138981	1038 (3.48-3.32)
Sidechain outliers	138945	1038 (3.48-3.32)

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 on 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  $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	A	280	
2	C	267	
3	B	231	

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 6115 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 VP1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	280	2199	1392	368	435	4	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	207	SER	THR	conflict	UNP Q9J7C2
A	208	ILE	VAL	conflict	UNP Q9J7C2

- Molecule 2 is a protein called VP3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	C	260	2066	1347	327	387	5	0	0	0

There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	8	ALA	THR	conflict	UNP Q9J7C2
C	93	GLY	ALA	conflict	UNP Q9J7C2
C	104	ILE	LYS	conflict	UNP Q9J7C2
C	146	VAL	ILE	conflict	UNP Q9J7C2
C	156	THR	ALA	conflict	UNP Q9J7C2
C	157	GLY	ASN	conflict	UNP Q9J7C2
C	158	THR	SER	conflict	UNP Q9J7C2

- Molecule 3 is a protein called VP2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	B	231	1850	1186	307	347	10	0	0	0

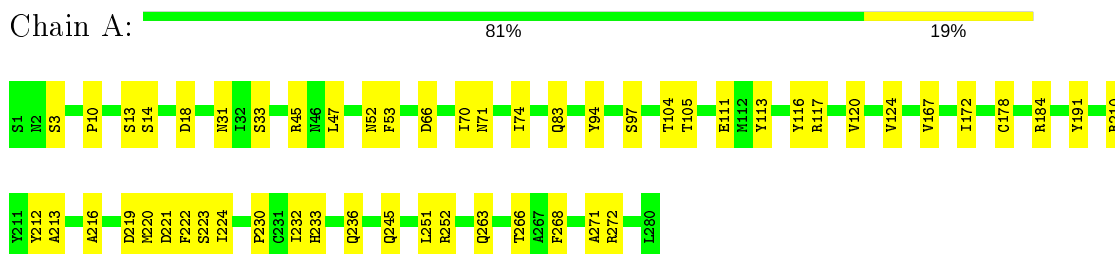
There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	40	SER	PRO	conflict	UNP Q9J7C2
B	43	PHE	TYR	conflict	UNP Q9J7C2
B	76	VAL	LEU	conflict	UNP Q9J7C2
B	210	PHE	TYR	conflict	UNP Q9J7C2

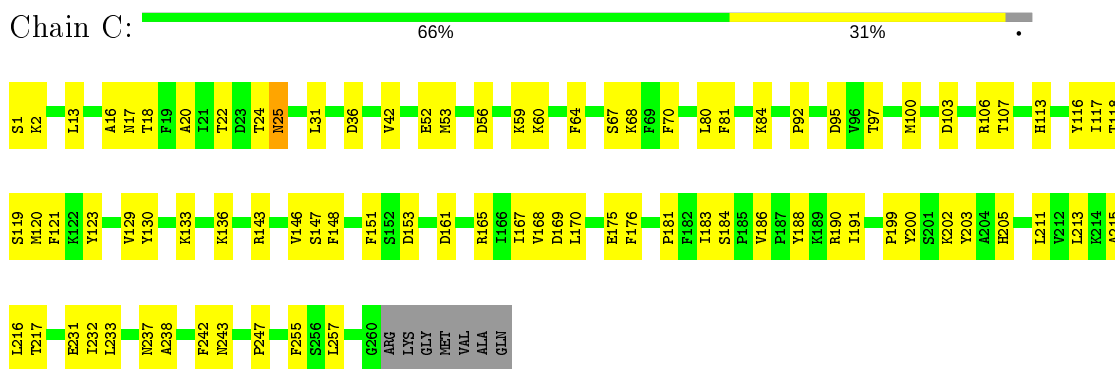
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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. 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. 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.

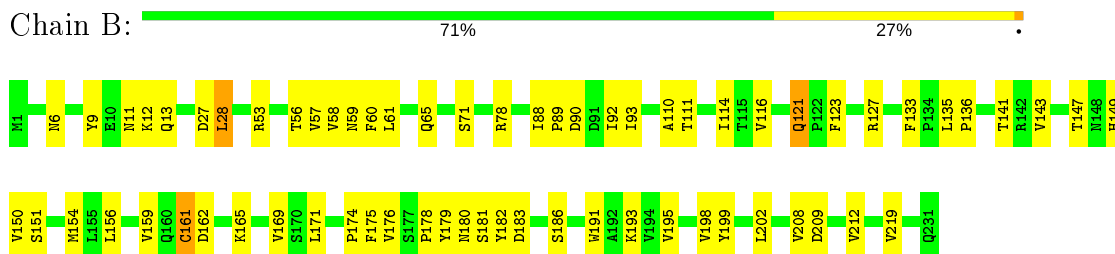
- Molecule 1: VP1



- Molecule 2: VP3



- Molecule 3: VP2



## 4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	332.91Å 350.96Å 362.54Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	39.81 – 3.40 39.81 – 3.40	Depositor EDS
% Data completeness (in resolution range)	68.1 (39.81-3.40) 60.9 (39.81-3.40)	Depositor EDS
$R_{merge}$	0.21	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.34 (at 3.40Å)	Xtrriage
Refinement program	PHENIX, CNS	Depositor
R, $R_{free}$	0.247 , (Not available) 0.460 , 0.453	Depositor DCC
$R_{free}$ test set	1995 reflections (0.91%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	67.8	Xtrriage
Anisotropy	0.440	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , -29.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	0.000 for -h,-l,-k	Xtrriage
$F_o, F_c$ correlation	0.34	EDS
Total number of atoms	6115	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	46.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.26% 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	0.37	0/2250	0.53	0/3063
2	C	0.40	0/2128	0.54	0/2907
3	B	0.39	0/1897	0.55	0/2582
All	All	0.38	0/6275	0.54	0/8552

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	2199	0	2134	37	0
2	C	2066	0	2035	61	0
3	B	1850	0	1818	43	0
All	All	6115	0	5987	119	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 10.

All (119) 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:A:222:PHE:H	2:C:53:MET:HE1	1.45	0.81

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:191:TYR:HE2	3:B:179:TYR:HE2	1.33	0.73
3:B:90:ASP:OD1	3:B:182:TYR:OH	2.06	0.72
1:A:52:ASN:ND2	1:A:105:THR:OG1	2.23	0.70
3:B:202:LEU:HD21	3:B:208:VAL:HG23	1.74	0.68
2:C:143:ARG:H	2:C:217:THR:CG2	2.08	0.67
2:C:100:MET:HE2	2:C:106:ARG:HB2	1.79	0.64
1:A:70:ILE:HD13	1:A:172:ILE:HG21	1.79	0.63
3:B:135:LEU:HD23	3:B:191:TRP:HA	1.82	0.62
3:B:59:ASN:O	3:B:60:PHE:HB2	1.98	0.62
2:C:1:SER:OG	2:C:2:LYS:N	2.34	0.61
1:A:71:ASN:OD1	1:A:116:TYR:OH	2.11	0.60
3:B:133:PHE:HA	3:B:156:LEU:HD21	1.83	0.60
2:C:129:VAL:HB	2:C:237:ASN:HB3	1.83	0.60
3:B:149:HIS:ND1	3:B:150:VAL:O	2.35	0.59
2:C:161:ASP:OD1	2:C:165:ARG:NH2	2.37	0.58
2:C:130:TYR:HD2	2:C:211:LEU:HD23	1.69	0.57
2:C:116:TYR:O	2:C:119:SER:OG	2.10	0.57
1:A:224:ILE:HG12	3:B:176:VAL:HG21	1.87	0.57
2:C:257:LEU:HB2	3:B:141:THR:HG23	1.86	0.56
1:A:233:HIS:HB2	1:A:236:GLN:HG3	1.87	0.56
1:A:52:ASN:HB2	1:A:104:THR:HG23	1.86	0.56
2:C:143:ARG:H	2:C:217:THR:HG21	1.71	0.56
3:B:151:SER:HA	3:B:154:MET:HG2	1.88	0.55
2:C:103:ASP:N	2:C:103:ASP:OD1	2.39	0.55
3:B:136:PRO:HG3	3:B:193:LYS:HB2	1.89	0.55
3:B:92:ILE:HD11	3:B:114:ILE:HD11	1.88	0.55
1:A:113:TYR:OH	2:C:53:MET:HA	2.08	0.54
3:B:11:ASN:O	3:B:13:GLN:N	2.41	0.53
1:A:18:ASP:OD1	2:C:60:LYS:NZ	2.41	0.53
2:C:17:ASN:ND2	2:C:25:ASN:O	2.40	0.53
1:A:191:TYR:HE2	3:B:179:TYR:CE2	2.21	0.53
2:C:168:VAL:HG22	2:C:170:LEU:HD22	1.90	0.53
2:C:81:PHE:HB3	2:C:213:LEU:HB3	1.90	0.53
3:B:161:CYS:HB2	3:B:169:VAL:HG21	1.91	0.53
1:A:232:ILE:HD13	1:A:251:LEU:HD13	1.92	0.52
2:C:64:PHE:HZ	2:C:67:SER:HB3	1.75	0.52
1:A:53:PHE:HA	1:A:213:ALA:HA	1.93	0.51
1:A:216:ALA:HB1	1:A:220:MET:HG3	1.92	0.51
1:A:14:SER:O	2:C:60:LYS:HE3	2.10	0.51
3:B:143:VAL:O	3:B:147:THR:HG22	2.11	0.51
2:C:146:VAL:HG21	2:C:176:PHE:CE2	2.46	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:83:GLN:HG3	1:A:94:TYR:HE1	1.76	0.50
2:C:136:LYS:HE2	2:C:170:LEU:HB3	1.93	0.50
3:B:121:GLN:O	3:B:123:PHE:N	2.45	0.50
2:C:143:ARG:NE	2:C:169:ASP:OD1	2.45	0.49
2:C:143:ARG:HD3	2:C:169:ASP:HA	1.94	0.49
2:C:133:LYS:HB2	2:C:233:LEU:HB2	1.93	0.49
1:A:172:ILE:HG13	2:C:31:LEU:HD12	1.93	0.49
1:A:10:PRO:HD2	1:A:13:SER:HB2	1.94	0.49
3:B:150:VAL:O	3:B:151:SER:OG	2.20	0.49
3:B:159:VAL:HG23	3:B:171:LEU:HD13	1.94	0.49
2:C:130:TYR:CD2	2:C:211:LEU:HD23	2.48	0.49
2:C:84:LYS:HD3	2:C:199:PRO:O	2.13	0.49
2:C:175:GLU:OE2	3:B:127:ARG:NH2	2.42	0.49
2:C:70:PHE:HB2	2:C:232:ILE:HD11	1.93	0.49
1:A:31:ASN:OD1	2:C:243:ASN:ND2	2.45	0.48
3:B:110:ALA:HB2	3:B:219:VAL:HA	1.94	0.48
2:C:202:LYS:O	2:C:203:TYR:HB2	2.13	0.48
2:C:143:ARG:H	2:C:217:THR:HG22	1.76	0.48
1:A:74:ILE:HD11	1:A:120:VAL:HG21	1.95	0.48
2:C:181:PRO:HB2	2:C:183:ILE:CD1	2.43	0.48
2:C:184:SER:OG	2:C:186:VAL:O	2.32	0.48
2:C:80:LEU:HD11	2:C:215:ALA:HB2	1.95	0.47
1:A:117:ARG:HH22	2:C:42:VAL:H	1.61	0.47
1:A:191:TYR:CE2	3:B:179:TYR:HE2	2.22	0.47
2:C:68:LYS:O	2:C:232:ILE:N	2.40	0.47
1:A:33:SER:HB2	2:C:243:ASN:ND2	2.29	0.47
3:B:110:ALA:O	3:B:175:PHE:HB2	2.15	0.47
2:C:59:LYS:HD2	2:C:242:PHE:HB3	1.96	0.47
2:C:56:ASP:HA	2:C:59:LYS:HE2	1.96	0.47
3:B:183:ASP:OD2	3:B:186:SER:OG	2.30	0.47
1:A:245:GLN:HG2	1:A:266:THR:HG21	1.98	0.46
3:B:58:VAL:O	3:B:61:LEU:HB2	2.16	0.46
2:C:18:THR:HG22	2:C:20:ALA:H	1.80	0.46
1:A:219:ASP:OD1	1:A:219:ASP:N	2.49	0.46
2:C:123:TYR:HB3	2:C:188:TYR:HB3	1.98	0.46
1:A:97:SER:HA	1:A:252:ARG:O	2.17	0.45
3:B:147:THR:OG1	3:B:195:VAL:HG21	2.17	0.45
3:B:56:THR:OG1	3:B:57:VAL:N	2.49	0.45
1:A:223:SER:O	2:C:52:GLU:HG3	2.17	0.44
2:C:97:THR:HG22	2:C:107:THR:OG1	2.16	0.44
2:C:95:ASP:HB3	2:C:107:THR:HG23	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:45:ARG:NH1	1:A:221:ASP:OD1	2.40	0.44
3:B:89:PRO:HB2	3:B:93:ILE:HG23	2.00	0.44
3:B:121:GLN:HE21	3:B:121:GLN:HB2	1.54	0.44
3:B:162:ASP:HB3	3:B:165:LYS:HB2	2.00	0.43
1:A:178:CYS:HB2	3:B:178:PRO:O	2.19	0.43
2:C:151:PHE:HE1	2:C:184:SER:HA	1.83	0.43
3:B:6:ASN:HD21	3:B:9:TYR:HB2	1.83	0.43
2:C:113:HIS:CE1	2:C:117:ILE:HD11	2.53	0.43
2:C:59:LYS:O	2:C:238:ALA:HB3	2.19	0.43
2:C:118:THR:HB	2:C:191:ILE:HD13	2.00	0.43
3:B:71:SER:HB3	3:B:209:ASP:OD1	2.19	0.42
1:A:230:PRO:HB2	2:C:255:PHE:CZ	2.54	0.42
2:C:190:ARG:HB2	2:C:205:HIS:CD2	2.55	0.42
2:C:233:LEU:HD13	3:B:199:TYR:CD2	2.54	0.42
1:A:124:VAL:HG22	1:A:212:TYR:CD1	2.54	0.42
3:B:159:VAL:HG11	3:B:169:VAL:HG13	2.01	0.42
2:C:121:PHE:HA	2:C:247:PRO:HA	2.02	0.42
2:C:80:LEU:CD1	2:C:215:ALA:HB2	2.50	0.42
3:B:78:ARG:HA	3:B:198:VAL:O	2.20	0.42
1:A:3:SER:HB3	2:C:176:PHE:HD1	1.84	0.42
1:A:111:GLU:HA	1:A:184:ARG:NH2	2.35	0.41
3:B:111:THR:HB	3:B:174:PRO:HA	2.02	0.41
2:C:153:ASP:OD1	2:C:200:TYR:HB3	2.20	0.41
1:A:167:VAL:HB	2:C:16:ALA:HB2	2.02	0.41
3:B:59:ASN:C	3:B:61:LEU:H	2.24	0.41
3:B:27:ASP:HB3	3:B:28:LEU:H	1.59	0.41
3:B:88:ILE:HA	3:B:89:PRO:HA	1.82	0.41
1:A:117:ARG:NH2	2:C:42:VAL:H	2.18	0.41
3:B:116:VAL:HG22	3:B:212:VAL:HG22	2.01	0.41
1:A:268:PHE:CE2	1:A:271:ALA:HB2	2.55	0.41
2:C:148:PHE:HE2	2:C:183:ILE:HD13	1.84	0.41
2:C:167:ILE:HG23	2:C:216:LEU:HD12	2.03	0.41
2:C:231:GLU:OE2	3:B:78:ARG:NH2	2.50	0.41
1:A:66:ASP:HB2	1:A:210:ARG:NH1	2.35	0.41
2:C:147:SER:HB3	2:C:165:ARG:HB3	2.03	0.41
3:B:180:ASN:OD1	3:B:181:SER:N	2.54	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	278/280 (99%)	263 (95%)	15 (5%)	0	100	100
2	C	258/267 (97%)	236 (92%)	19 (7%)	3 (1%)	13	41
3	B	229/231 (99%)	206 (90%)	21 (9%)	2 (1%)	17	49
All	All	765/778 (98%)	705 (92%)	55 (7%)	5 (1%)	22	55

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	C	24	THR
2	C	36	ASP
3	B	28	LEU
2	C	92	PRO
3	B	12	LYS

### 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	243/244 (100%)	240 (99%)	3 (1%)	71	85
2	C	234/242 (97%)	230 (98%)	4 (2%)	60	80
3	B	211/211 (100%)	207 (98%)	4 (2%)	57	78
All	All	688/697 (99%)	677 (98%)	11 (2%)	62	81

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	47	LEU
1	A	263	GLN
1	A	272	ARG
2	C	13	LEU
2	C	22	THR
2	C	25	ASN
2	C	120	MET
3	B	53	ARG
3	B	65	GLN
3	B	121	GLN
3	B	161	CYS

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

Mol	Chain	Res	Type
1	A	52	ASN
2	C	205	HIS
3	B	55	HIS
3	B	65	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 carbohydrates 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

There are no chain breaks in this entry.

## 6 Fit of model and data

### 6.1 Protein, DNA and RNA chains

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.2 Non-standard residues in protein, DNA, RNA chains

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.3 Carbohydrates

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.4 Ligands

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.5 Other polymers

Unable to reproduce the depositors R factor - this section is therefore empty.