



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 13, 2024 – 10:08 AM EDT

PDB ID : 1NY7
Title : COWPEA MOSAIC VIRUS (CPMV)
Authors : Lin, T.; Chen, Z.; Usha, R.; Stauffacher, C.V.; Dai, J.-B.; Schmidt, T.; Johnson, J.E.
Deposited on : 2003-02-11
Resolution : 3.00 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

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 : 4.02b-467
Xtriage (Phenix) : 1.13
EDS : 2.36.2
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) : 2.36.2

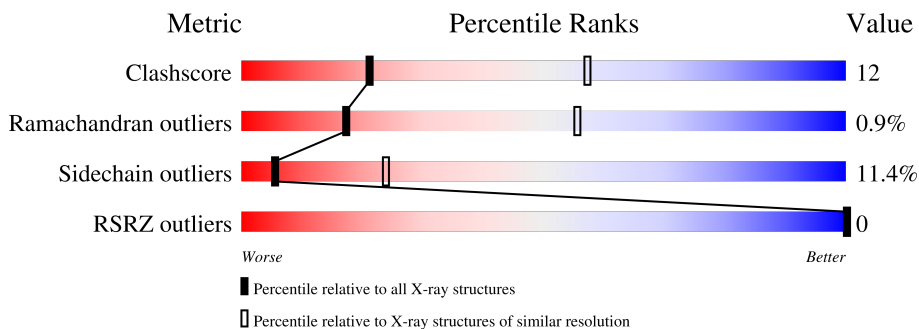
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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))
Clashscore	141614	2416 (3.00-3.00)
Ramachandran outliers	138981	2333 (3.00-3.00)
Sidechain outliers	138945	2336 (3.00-3.00)
RSRZ outliers	127900	1990 (3.00-3.00)

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 ≥ 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	1	189	 69% 24% 5% •
2	2	369	 70% 26% ••

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4407 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 COWPEA MOSAIC VIRUS, SMALL (S) SUBUNIT.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	1	189	1477	944	247	277	9	0	0	0

- Molecule 2 is a protein called COWPEA MOSAIC VIRUS, LARGE (L) SUBUNIT.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	2	369	2866	1822	480	542	22	0	0	0

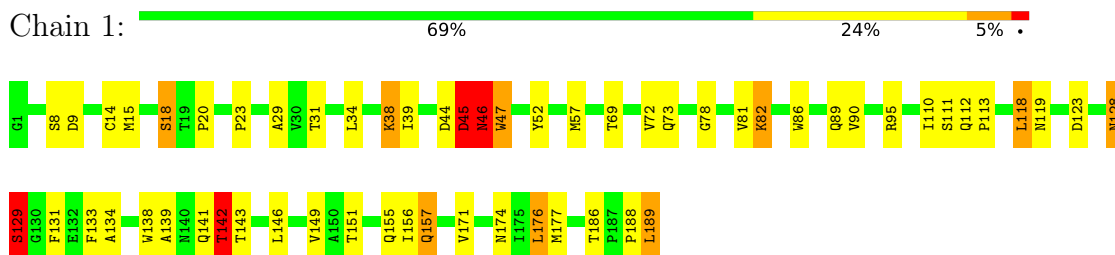
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	1	16	Total	O	0	0
			16	16		
3	2	48	Total	O	0	0
			48	48		

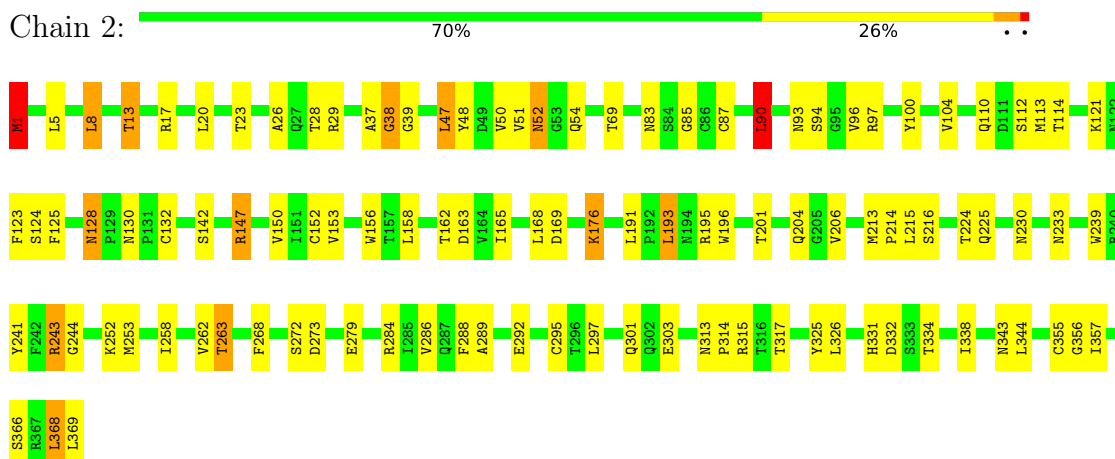
3 Residue-property plots [i](#)

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: COWPEA MOSAIC VIRUS, SMALL (S) SUBUNIT



- Molecule 2: COWPEA MOSAIC VIRUS, LARGE (L) SUBUNIT



4 Data and refinement statistics

Property	Value	Source
Space group	I 2 3	Depositor
Cell constants a, b, c, α , β , γ	317.00Å 317.00Å 317.00Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	10.00 – 3.00 18.61 – 3.00	Depositor EDS
% Data completeness (in resolution range)	86.2 (10.00-3.00) 85.8 (18.61-3.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	6.08 (at 2.98Å)	Xtrriage
Refinement program	X-PLOR 3.851	Depositor
R, R_{free}	0.202 , (Not available) 0.171 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	34.4	Xtrriage
Anisotropy	0.000	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 39.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	0.029 for -l,-k,-h	Xtrriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	4407	wwPDB-VP
Average B, all atoms (Å ²)	14.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 1.76% 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	1	0.74	0/1524	0.94	3/2089 (0.1%)
2	2	1.10	3/2933 (0.1%)	0.91	6/3983 (0.2%)
All	All	0.99	3/4457 (0.1%)	0.92	9/6072 (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
1	1	0	1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	2	1	MET	SD-CE	44.05	4.24	1.77
2	2	132	CYS	CB-SG	-6.71	1.70	1.82
2	2	295	CYS	CB-SG	-5.57	1.72	1.81

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	1	47	TRP	N-CA-C	-10.73	82.03	111.00
1	1	46	ASN	CA-C-N	-5.51	105.07	117.20
1	1	142	THR	N-CA-CB	-5.51	99.82	110.30
2	2	90	LEU	CA-CB-CG	5.21	127.28	115.30
2	2	1	MET	CG-SD-CE	-5.20	91.88	100.20
2	2	39	GLY	N-CA-C	-5.17	100.18	113.10
2	2	37	ALA	N-CA-C	5.15	124.91	111.00
2	2	38	GLY	N-CA-C	-5.13	100.26	113.10
2	2	52	ASN	N-CA-C	5.13	124.85	111.00

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	1	46	ASN	Mainchain

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	1	1477	0	1413	42	0
2	2	2866	0	2813	68	0
3	1	16	0	0	0	0
3	2	48	0	0	1	0
All	All	4407	0	4226	103	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 12.

All (103) 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)
2:2:96:VAL:CG1	2:2:147:ARG:HG3	2.07	0.85
2:2:83:ASN:HD22	2:2:158:LEU:HD23	1.43	0.84
2:2:96:VAL:HG13	2:2:147:ARG:HG3	1.62	0.81
2:2:48:TYR:O	2:2:51:VAL:HG12	1.81	0.80
2:2:1:MET:O	2:2:1:MET:HE2	0.97	0.79
2:2:1:MET:O	2:2:1:MET:HE1	0.97	0.78
2:2:83:ASN:ND2	2:2:158:LEU:HD23	1.98	0.78
1:1:177:MET:HE3	2:2:97:ARG:HB3	1.69	0.75
1:1:20:PRO:HA	1:1:46:ASN:O	1.87	0.74
1:1:73:GLN:HE21	1:1:119:ASN:HD21	1.38	0.72
2:2:20:LEU:HA	2:2:23:THR:HG22	1.73	0.70
2:2:162:THR:HG22	2:2:163:ASP:O	1.92	0.69
1:1:177:MET:CE	2:2:97:ARG:HB3	2.23	0.69
2:2:47:LEU:O	2:2:50:VAL:HB	1.94	0.68
1:1:174:ASN:H	2:2:110:GLN:NE2	1.94	0.65
1:1:139:ALA:H	1:1:141:GLN:HE21	1.44	0.65
2:2:96:VAL:HG11	2:2:147:ARG:HG3	1.78	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:2:5:LEU:HA	2:2:8:LEU:HD22	1.82	0.62
1:1:69:THR:HA	1:1:123:ASP:HB3	1.82	0.61
2:2:195:ARG:HH12	2:2:369:LEU:HD11	1.66	0.61
2:2:48:TYR:CD2	2:2:142:SER:HB2	2.36	0.61
1:1:52:TYR:OH	1:1:186:THR:HG22	2.01	0.61
1:1:176:LEU:HB2	2:2:96:VAL:HG12	1.82	0.60
2:2:279:GLU:OE2	2:2:331:HIS:HD2	1.85	0.60
1:1:29:ALA:HB2	1:1:149:VAL:HG22	1.84	0.59
2:2:128:ASN:ND2	2:2:130:ASN:H	2.02	0.58
2:2:201:THR:HG23	2:2:343:ASN:HD21	1.68	0.58
2:2:1:MET:N	3:2:370:HOH:O	2.38	0.57
2:2:313:ASN:HD22	2:2:315:ARG:H	1.54	0.56
2:2:289:ALA:HB3	2:2:292:GLU:HG3	1.88	0.55
2:2:258:ILE:HD11	2:2:338:ILE:HG22	1.88	0.55
2:2:313:ASN:ND2	2:2:315:ARG:H	2.05	0.55
2:2:201:THR:HA	2:2:343:ASN:HD22	1.71	0.55
1:1:73:GLN:NE2	1:1:119:ASN:HD21	2.04	0.54
1:1:174:ASN:HD22	2:2:93:ASN:HD22	1.56	0.54
2:2:243:ARG:NH1	2:2:301:GLN:OE1	2.40	0.54
1:1:20:PRO:CA	1:1:46:ASN:O	2.56	0.54
2:2:162:THR:HG22	2:2:163:ASP:N	2.22	0.54
2:2:87:CYS:SG	2:2:253:MET:HE3	2.49	0.53
2:2:51:VAL:HG22	2:2:51:VAL:O	2.09	0.52
1:1:110:ILE:HD11	1:1:118:LEU:HG	1.91	0.52
2:2:368:LEU:HD12	2:2:369:LEU:H	1.73	0.52
1:1:15:MET:HB2	1:1:39:ILE:HD11	1.92	0.51
2:2:153:VAL:HG11	2:2:253:MET:HE1	1.93	0.50
1:1:14:CYS:HB3	1:1:57:MET:SD	2.52	0.49
2:2:263:THR:HG21	2:2:279:GLU:OE2	2.12	0.49
2:2:243:ARG:HG2	2:2:244:GLY:N	2.28	0.49
1:1:81:VAL:HG12	1:1:82:LYS:O	2.12	0.49
1:1:45:ASP:O	1:1:46:ASN:HB2	2.12	0.49
2:2:1:MET:O	2:2:1:MET:HE3	0.97	0.49
1:1:90:VAL:HG12	1:1:156:ILE:HD13	1.95	0.48
1:1:134:ALA:HA	1:1:142:THR:O	2.13	0.48
2:2:153:VAL:CG1	2:2:253:MET:HE1	2.43	0.48
1:1:81:VAL:HG21	1:1:155:GLN:HG2	1.96	0.48
2:2:162:THR:CG2	2:2:163:ASP:N	2.77	0.48
2:2:90:LEU:HD22	2:2:150:VAL:HG22	1.96	0.48
2:2:176:LYS:HD3	2:2:176:LYS:H	1.79	0.47
2:2:38:GLY:HA2	2:2:152:CYS:O	2.15	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:1:129:SER:H	1:1:131:PHE:H	1.61	0.46
2:2:204:GLN:HA	2:2:334:THR:HB	1.97	0.46
1:1:157:GLN:HE21	1:1:157:GLN:HA	1.80	0.46
1:1:174:ASN:HD22	2:2:93:ASN:ND2	2.14	0.46
2:2:214:PRO:HG3	2:2:325:TYR:CE1	2.50	0.46
1:1:81:VAL:HG11	1:1:155:GLN:NE2	2.30	0.45
2:2:13:THR:HG23	2:2:13:THR:O	2.17	0.45
1:1:142:THR:HG23	1:1:143:THR:N	2.32	0.45
2:2:94:SER:H	2:2:110:GLN:HE22	1.64	0.45
2:2:28:THR:HB	2:2:168:LEU:HB2	1.99	0.45
1:1:38:LYS:HB2	1:1:38:LYS:HE2	1.67	0.44
2:2:191:LEU:HG	2:2:193:LEU:HD13	1.99	0.44
1:1:73:GLN:HE21	1:1:119:ASN:ND2	2.09	0.44
2:2:369:LEU:HD12	2:2:369:LEU:HA	1.58	0.44
1:1:157:GLN:HA	1:1:157:GLN:NE2	2.33	0.44
2:2:241:TYR:HB2	2:2:357:ILE:HB	1.99	0.44
1:1:44:ASP:O	1:1:45:ASP:O	2.35	0.43
1:1:78:GLY:HA2	1:1:157:GLN:H	1.84	0.43
1:1:89:GLN:HG2	1:1:111:SER:HB2	2.01	0.43
2:2:113:MET:HG3	2:2:123:PHE:HD2	1.84	0.43
2:2:239:TRP:CD1	2:2:356:GLY:HA3	2.53	0.43
1:1:18:SER:O	1:1:47:TRP:HA	2.19	0.42
2:2:29:ARG:CZ	2:2:165:ILE:HD13	2.49	0.42
1:1:110:ILE:HG22	1:1:111:SER:N	2.35	0.42
2:2:313:ASN:ND2	2:2:314:PRO:HD2	2.35	0.42
1:1:86:TRP:CD2	1:1:113:PRO:HA	2.55	0.41
2:2:26:ALA:CB	2:2:54:GLN:HG3	2.50	0.41
2:2:87:CYS:SG	2:2:253:MET:CE	3.08	0.41
2:2:206:VAL:O	2:2:206:VAL:CG1	2.69	0.41
2:2:196:TRP:O	2:2:369:LEU:HD21	2.20	0.41
2:2:85:GLY:O	2:2:156:TRP:HA	2.20	0.41
2:2:215:LEU:HD23	2:2:215:LEU:HA	1.89	0.41
2:2:262:VAL:HG23	2:2:286:VAL:HB	2.02	0.41
2:2:268:PHE:N	2:2:268:PHE:CD2	2.87	0.41
1:1:177:MET:CE	1:1:177:MET:HA	2.51	0.41
1:1:112:GLN:HA	1:1:113:PRO:HD3	1.70	0.41
1:1:72:VAL:HG12	1:1:73:GLN:N	2.34	0.41
1:1:128:ASN:O	1:1:128:ASN:ND2	2.54	0.41
2:2:96:VAL:HB	2:2:100:TYR:CD1	2.55	0.41
1:1:188:PRO:HG2	1:1:189:LEU:CD1	2.51	0.41
2:2:213:MET:HA	2:2:214:PRO:HD3	1.91	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:1:8:SER:O	1:1:9:ASP:HB2	2.21	0.40
1:1:174:ASN:H	2:2:110:GLN:HE22	1.65	0.40
2:2:176:LYS:H	2:2:176:LYS:CD	2.33	0.40
2:2:252:LYS:HE3	2:2:288:PHE:CB	2.52	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	1	187/189 (99%)	171 (91%)	13 (7%)	3 (2%)	9	40
2	2	367/369 (100%)	347 (95%)	18 (5%)	2 (0%)	29	68
All	All	554/558 (99%)	518 (94%)	31 (6%)	5 (1%)	17	55

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	1	45	ASP
1	1	129	SER
1	1	138	TRP
2	2	52	ASN
2	2	224	THR

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	1	163/163 (100%)	144 (88%)	19 (12%)	5	22
2	2	318/318 (100%)	282 (89%)	36 (11%)	6	24
All	All	481/481 (100%)	426 (89%)	55 (11%)	5	24

All (55) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	1	18	SER
1	1	23	PRO
1	1	31	THR
1	1	34	LEU
1	1	38	LYS
1	1	45	ASP
1	1	82	LYS
1	1	95	ARG
1	1	118	LEU
1	1	128	ASN
1	1	129	SER
1	1	133	PHE
1	1	142	THR
1	1	146	LEU
1	1	151	THR
1	1	157	GLN
1	1	171	VAL
1	1	176	LEU
1	1	189	LEU
2	2	1	MET
2	2	8	LEU
2	2	13	THR
2	2	17	ARG
2	2	47	LEU
2	2	69	THR
2	2	90	LEU
2	2	104	VAL
2	2	112	SER
2	2	114	THR
2	2	121	LYS
2	2	124	SER
2	2	125	PHE
2	2	128	ASN
2	2	147	ARG
2	2	169	ASP

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Mol	Chain	Res	Type
2	2	176	LYS
2	2	193	LEU
2	2	216	SER
2	2	225	GLN
2	2	230	ASN
2	2	233	ASN
2	2	243	ARG
2	2	263	THR
2	2	272	SER
2	2	273	ASP
2	2	284	ARG
2	2	297	LEU
2	2	303	GLU
2	2	317	THR
2	2	326	LEU
2	2	332	ASP
2	2	344	LEU
2	2	355	CYS
2	2	366	SER
2	2	368	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	1	73	GLN
1	1	96	GLN
1	1	128	ASN
2	2	52	ASN
2	2	83	ASN
2	2	93	ASN
2	2	110	GLN
2	2	128	ASN
2	2	130	ASN
2	2	230	ASN
2	2	247	HIS
2	2	302	GLN
2	2	313	ASN
2	2	331	HIS
2	2	343	ASN

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 [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, 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	1	189/189 (100%)	-0.99	0 100 100	4, 13, 43, 68	0
2	2	369/369 (100%)	-1.10	0 100 100	3, 11, 27, 56	0
All	All	558/558 (100%)	-1.06	0 100 100	3, 12, 31, 68	0

There are no RSRZ outliers to report.

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.