



Full wwPDB X-ray Structure Validation Report ⓘ

Jan 31, 2016 – 09:35 PM GMT

PDB ID : 1PQZ
Title : MURINE CYTOMEGALOVIRUS IMMUNOMODULATORY PROTEIN M144
Authors : Miley, M.J.; Fremont, D.H.; Midwest Center for Structural Genomics (MCSG)
Deposited on : 2003-06-19
Resolution : 2.10 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
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

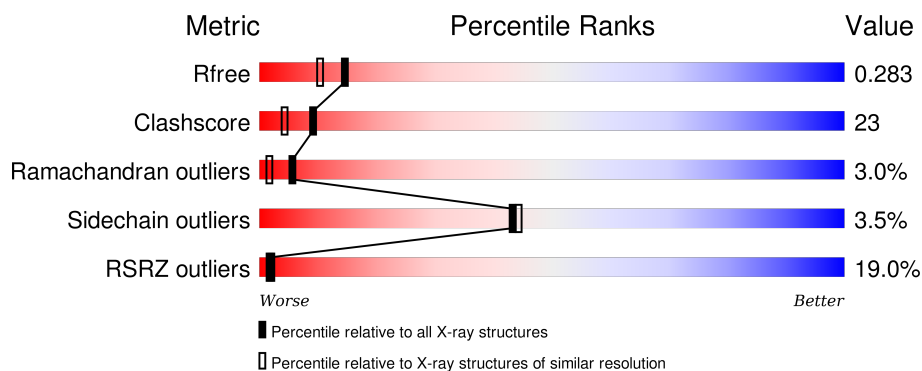
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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}	91344	3939 (2.10-2.10)
Clashscore	102246	4460 (2.10-2.10)
Ramachandran outliers	100387	4413 (2.10-2.10)
Sidechain outliers	100360	4414 (2.10-2.10)
RSRZ outliers	91569	3948 (2.10-2.10)

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 ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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	238	<div> <div>22%</div> <div>59%</div> <div>37%</div> <div>.</div> </div>
2	B	99	<div> <div>11%</div> <div>68%</div> <div>29%</div> <div>.</div> </div>

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 2853 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 MCMV M144.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	238	Total	C	N	O	S	0	0	0
			1860	1147	340	365	8			

- Molecule 2 is a protein called Beta-2-microglobulin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	99	Total	C	N	O	S	0	0	0
			821	524	138	152	7			

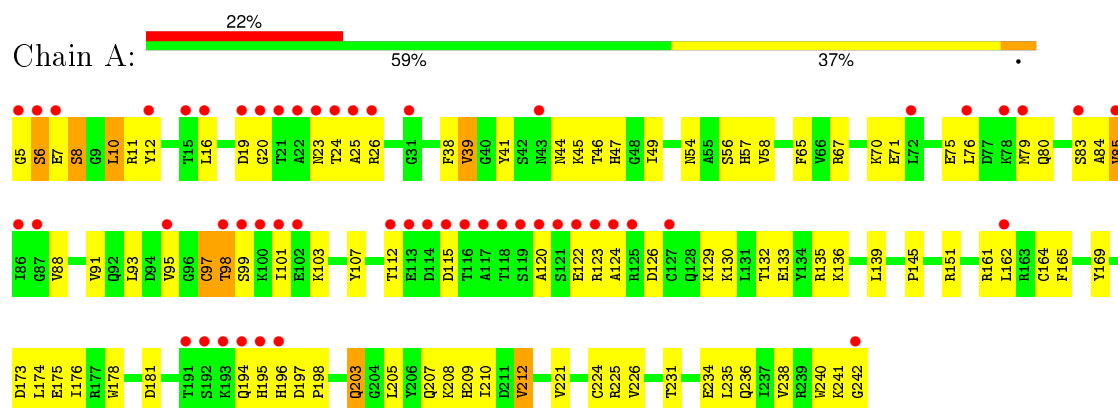
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	104	Total	O	0	0
			104	104		
3	B	68	Total	O	0	0
			68	68		

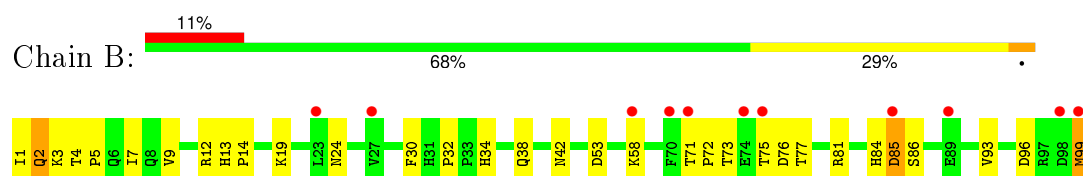
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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: MCMV M144



• Molecule 2: Beta-2-microglobulin



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	128.80 Å 50.60 Å 71.20 Å 90.00° 104.10° 90.00°	Depositor
Resolution (Å)	19.72 – 2.10 19.72 – 2.04	Depositor EDS
% Data completeness (in resolution range)	89.8 (19.72-2.10) 88.2 (19.72-2.04)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	0.05	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.59 (at 2.04 Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.245 , 0.287 0.243 , 0.283	Depositor DCC
R_{free} test set	1161 reflections (4.93%)	DCC
Wilson B-factor (Å ²)	38.1	Xtriage
Anisotropy	0.390	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 47.6	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 27229 reflections	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	2853	wwPDB-VP
Average B, all atoms (Å ²)	55.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.77% 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, 0.375 respectively for untwinned datasets, and 0.333, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

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	0/1895	0.65	0/2554
2	B	0.42	0/847	0.67	0/1148
All	All	0.39	0/2742	0.66	0/3702

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

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	1860	0	1784	94	0
2	B	821	0	796	31	0
3	A	104	0	0	5	0
3	B	68	0	0	1	0
All	All	2853	0	2580	121	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 23.

All (121) 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:24:THR:HG23	1:A:26:ARG:HH11	1.19	1.01

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:73:THR:HG22	2:B:75:THR:H	1.45	0.81
2:B:96:ASP:HB3	2:B:99:MET:HG2	1.61	0.81
1:A:85:VAL:HG13	1:A:88:VAL:HG21	1.62	0.80
1:A:24:THR:HG23	1:A:26:ARG:NH1	1.96	0.78
1:A:5:GLY:HA3	1:A:173:ASP:OD1	1.85	0.76
1:A:197:ASP:HB3	1:A:198:PRO:HD2	1.66	0.75
1:A:123:ARG:HA	1:A:126:ASP:OD2	1.89	0.72
2:B:19:LYS:O	2:B:72:PRO:HD2	1.89	0.72
1:A:126:ASP:O	1:A:129:LYS:HG2	1.92	0.69
1:A:98:THR:HG23	1:A:99:SER:H	1.57	0.69
1:A:80:GLN:HG2	1:A:85:VAL:O	1.93	0.69
1:A:203:GLN:HE22	1:A:205:LEU:HB2	1.59	0.67
1:A:11:ARG:HG2	3:A:258:HOH:O	1.94	0.66
1:A:231:THR:O	1:A:234:GLU:HG2	1.94	0.66
2:B:7:ILE:HB	2:B:93:VAL:HG21	1.76	0.66
1:A:46:THR:HG22	1:A:58:VAL:HG13	1.76	0.66
1:A:95:VAL:HG12	1:A:103:LYS:HD2	1.78	0.66
2:B:42:ASN:HD21	2:B:76:ASP:HA	1.60	0.66
1:A:71:GLU:O	1:A:75:GLU:HG2	1.95	0.65
1:A:85:VAL:HG13	1:A:88:VAL:CG2	2.27	0.65
1:A:67:ARG:O	1:A:70:LYS:HG2	1.96	0.65
2:B:42:ASN:ND2	2:B:77:THR:H	1.94	0.65
1:A:161:ARG:HD3	3:A:302:HOH:O	1.95	0.64
1:A:98:THR:HG23	1:A:99:SER:N	2.14	0.62
1:A:83:SER:C	1:A:85:VAL:H	2.02	0.61
1:A:174:LEU:O	1:A:208:LYS:HE2	2.01	0.60
1:A:203:GLN:HG2	2:B:12:ARG:NH1	2.15	0.60
1:A:6:SER:O	1:A:7:GLU:HB2	2.00	0.60
1:A:101:ILE:HG12	1:A:124:ALA:CB	2.32	0.60
1:A:224:CYS:HB3	1:A:238:VAL:HG23	1.83	0.60
1:A:126:ASP:HA	1:A:129:LYS:HE2	1.83	0.59
2:B:32:PRO:O	2:B:84:HIS:HE1	1.86	0.59
2:B:84:HIS:CD2	2:B:86:SER:H	2.21	0.58
1:A:231:THR:HG22	1:A:236:GLN:NE2	2.18	0.58
1:A:162:LEU:HB2	1:A:212:VAL:HG23	1.85	0.57
1:A:84:ALA:O	1:A:85:VAL:HG23	2.05	0.57
1:A:203:GLN:H	1:A:203:GLN:HE21	1.52	0.57
1:A:38:PHE:HA	1:A:49:ILE:O	2.04	0.57
1:A:19:ASP:HB3	1:A:24:THR:CB	2.34	0.56
1:A:19:ASP:HB3	1:A:24:THR:HB	1.87	0.56
1:A:176:ILE:HG22	1:A:208:LYS:HE3	1.88	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:123:ARG:O	1:A:126:ASP:HB2	2.07	0.55
1:A:70:LYS:HG3	1:A:71:GLU:N	2.21	0.55
1:A:122:GLU:C	1:A:124:ALA:H	2.09	0.55
1:A:54:ASN:H	1:A:57:HIS:HD2	1.53	0.55
2:B:38:GLN:HE22	2:B:81:ARG:HD2	1.72	0.55
1:A:107:TYR:HD2	1:A:112:THR:HG21	1.72	0.54
2:B:71:THR:HG23	2:B:71:THR:O	2.07	0.54
1:A:194:GLN:NE2	3:A:251:HOH:O	2.40	0.54
1:A:130:LYS:HA	1:A:133:GLU:HG2	1.90	0.54
1:A:12:TYR:HB2	1:A:95:VAL:CG2	2.39	0.53
1:A:98:THR:CG2	1:A:99:SER:H	2.18	0.53
1:A:203:GLN:NE2	1:A:205:LEU:H	2.07	0.53
2:B:73:THR:HB	2:B:76:ASP:OD2	2.08	0.53
1:A:176:ILE:CG2	1:A:208:LYS:HE3	2.39	0.53
1:A:95:VAL:O	1:A:95:VAL:HG23	2.10	0.52
1:A:47:HIS:HE1	2:B:53:ASP:OD2	1.92	0.52
2:B:1:ILE:O	2:B:1:ILE:HG22	2.09	0.52
1:A:122:GLU:C	1:A:124:ALA:N	2.62	0.51
1:A:6:SER:C	1:A:8:SER:H	2.09	0.51
2:B:34:HIS:HB2	3:B:122:HOH:O	2.09	0.51
1:A:176:ILE:HG12	1:A:210:ILE:CD1	2.41	0.50
1:A:120:ALA:HB1	1:A:123:ARG:HB2	1.93	0.50
1:A:75:GLU:O	1:A:79:MET:HG2	2.12	0.50
1:A:101:ILE:HG12	1:A:124:ALA:HB2	1.93	0.50
1:A:44:ASN:N	3:A:304:HOH:O	2.36	0.50
1:A:181:ASP:HB2	1:A:221:VAL:HG13	1.93	0.50
2:B:38:GLN:NE2	2:B:81:ARG:HD2	2.28	0.49
1:A:151:ARG:CZ	1:A:240:TRP:CH2	2.97	0.48
1:A:6:SER:C	1:A:8:SER:N	2.66	0.48
2:B:4:THR:HA	2:B:86:SER:OG	2.15	0.47
1:A:145:PRO:HB3	1:A:169:TYR:HB3	1.97	0.47
1:A:207:GLN:HE22	2:B:12:ARG:HA	1.81	0.46
2:B:96:ASP:HB3	2:B:99:MET:CG	2.38	0.46
2:B:84:HIS:HD2	2:B:86:SER:H	1.63	0.46
2:B:1:ILE:O	2:B:2:GLN:HB2	2.15	0.46
2:B:85:ASP:OD1	2:B:86:SER:N	2.49	0.46
1:A:175:GLU:O	1:A:226:VAL:HA	2.16	0.46
1:A:85:VAL:HG12	1:A:85:VAL:O	2.15	0.45
1:A:225:ARG:HB3	1:A:235:LEU:HD11	1.97	0.45
1:A:132:THR:HG22	1:A:136:LYS:HE2	1.98	0.45
2:B:73:THR:CG2	2:B:75:THR:HG22	2.46	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:12:TYR:HB2	1:A:95:VAL:HG23	1.98	0.45
1:A:240:TRP:CE2	1:A:242:GLY:HA3	2.52	0.45
1:A:67:ARG:HA	1:A:70:LYS:HE2	1.98	0.45
1:A:240:TRP:CZ2	1:A:242:GLY:HA3	2.52	0.45
1:A:39:VAL:HG13	1:A:65:PHE:HE2	1.82	0.44
2:B:5:PRO:HB3	2:B:30:PHE:HB3	1.99	0.44
1:A:16:LEU:HB3	1:A:91:VAL:HB	2.00	0.44
1:A:123:ARG:HG3	1:A:126:ASP:OD2	2.18	0.44
1:A:241:LYS:O	1:A:242:GLY:OXT	2.36	0.44
1:A:98:THR:OG1	1:A:99:SER:N	2.50	0.44
1:A:93:LEU:HG	1:A:95:VAL:HG13	2.00	0.43
1:A:67:ARG:O	1:A:70:LYS:CG	2.66	0.43
1:A:54:ASN:OD1	1:A:56:SER:HB2	2.18	0.43
1:A:83:SER:C	1:A:85:VAL:N	2.69	0.43
1:A:101:ILE:HG12	1:A:124:ALA:HB1	1.98	0.43
1:A:76:LEU:HD23	1:A:76:LEU:O	2.19	0.43
2:B:84:HIS:HD2	2:B:86:SER:OG	2.00	0.43
1:A:7:GLU:HA	2:B:58:LYS:HE3	2.00	0.43
1:A:54:ASN:H	1:A:57:HIS:CD2	2.36	0.43
2:B:42:ASN:HD21	2:B:77:THR:H	1.63	0.42
1:A:203:GLN:OE1	1:A:205:LEU:HD12	2.19	0.42
1:A:10:LEU:HD22	1:A:12:TYR:CE2	2.55	0.42
1:A:178:TRP:CD1	1:A:212:VAL:HG22	2.55	0.42
1:A:164:CYS:O	1:A:209:HIS:HA	2.19	0.42
2:B:9:VAL:HA	2:B:24:ASN:O	2.19	0.42
1:A:135:ARG:O	1:A:139:LEU:HG	2.20	0.42
2:B:3:LYS:HB3	2:B:3:LYS:NZ	2.35	0.42
1:A:19:ASP:HB3	1:A:24:THR:OG1	2.19	0.42
1:A:39:VAL:HG13	1:A:65:PHE:CE2	2.55	0.42
1:A:24:THR:O	1:A:25:ALA:C	2.58	0.42
1:A:203:GLN:HE22	1:A:205:LEU:CB	2.30	0.41
1:A:176:ILE:CD1	1:A:210:ILE:HG12	2.50	0.41
1:A:161:ARG:NH1	3:A:302:HOH:O	2.53	0.41
2:B:2:GLN:HE21	2:B:2:GLN:HB2	1.60	0.41
1:A:41:TYR:OH	1:A:44:ASN:HA	2.21	0.41
2:B:13:HIS:O	2:B:14:PRO:C	2.59	0.41
1:A:7:GLU:OE1	1:A:11:ARG:HD3	2.22	0.40
1:A:176:ILE:HG23	1:A:176:ILE:O	2.22	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	236/238 (99%)	205 (87%)	22 (9%)	9 (4%)	4	1
2	B	97/99 (98%)	90 (93%)	6 (6%)	1 (1%)	19	13
All	All	333/337 (99%)	295 (89%)	28 (8%)	10 (3%)	5	2

All (10) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	23	ASN
1	A	98	THR
1	A	195	HIS
1	A	6	SER
1	A	20	GLY
1	A	97	CYS
1	A	85	VAL
1	A	8	SER
1	A	196	HIS
2	B	2	GLN

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	195/195 (100%)	187 (96%)	8 (4%)	37	36
2	B	94/94 (100%)	92 (98%)	2 (2%)	61	66
All	All	289/289 (100%)	279 (96%)	10 (4%)	43	44

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	10	LEU
1	A	39	VAL
1	A	45	LYS
1	A	97	CYS
1	A	115	ASP
1	A	165	PHE
1	A	203	GLN
1	A	212	VAL
2	B	85	ASP
2	B	99	MET

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	47	HIS
1	A	57	HIS
1	A	110	ASN
1	A	196	HIS
1	A	203	GLN
1	A	207	GLN
1	A	236	GLN
2	B	2	GLN
2	B	38	GLN
2	B	42	ASN
2	B	84	HIS

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

There are no ligands in this entry.

5.7 Other polymers

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 ⓘ

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	238/238 (100%)	1.36	53 (22%) 1 1	27, 48, 120, 143	0
2	B	99/99 (100%)	0.61	11 (11%) 7 10	24, 44, 65, 83	0
All	All	337/337 (100%)	1.14	64 (18%) 2 2	24, 46, 116, 143	0

All (64) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	116	THR	10.3
1	A	119	SER	9.8
1	A	121	SER	9.5
1	A	21	THR	9.4
1	A	118	THR	8.7
1	A	117	ALA	8.0
1	A	24	THR	7.4
1	A	114	ASP	7.1
1	A	20	GLY	7.1
1	A	99	SER	6.7
1	A	120	ALA	6.6
1	A	22	ALA	6.3
1	A	6	SER	6.1
1	A	100	LYS	6.1
1	A	124	ALA	5.7
1	A	7	GLU	5.3
1	A	195	HIS	5.2
1	A	79	MET	4.9
1	A	113	GLU	4.8
1	A	19	ASP	4.8
1	A	78	LYS	4.8
1	A	196	HIS	4.6
1	A	122	GLU	4.4
1	A	23	ASN	4.3

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Mol	Chain	Res	Type	RSRZ
1	A	76	LEU	4.3
2	B	99	MET	4.1
1	A	194	GLN	4.0
1	A	125	ARG	4.0
1	A	193	LYS	4.0
1	A	123	ARG	4.0
1	A	26	ARG	3.7
1	A	5	GLY	3.6
1	A	85	VAL	3.6
1	A	242	GLY	3.5
2	B	23	LEU	3.4
1	A	192	SER	3.4
1	A	191	THR	3.3
1	A	72	LEU	3.2
1	A	127	CYS	3.1
1	A	101	ILE	3.1
2	B	85	ASP	3.0
1	A	87	GLY	2.9
1	A	43	ASN	2.8
1	A	115	ASP	2.7
2	B	98	ASP	2.7
1	A	83	SER	2.7
2	B	27	VAL	2.7
2	B	74	GLU	2.7
1	A	162	LEU	2.6
1	A	86	ILE	2.6
1	A	98	THR	2.6
1	A	16	LEU	2.6
1	A	112	THR	2.5
1	A	95	VAL	2.5
2	B	70	PHE	2.4
2	B	89	GLU	2.4
1	A	12	TYR	2.3
1	A	25	ALA	2.3
1	A	15	THR	2.2
1	A	31	GLY	2.2
1	A	102	GLU	2.1
2	B	71	THR	2.0
2	B	75	THR	2.0
2	B	58	LYS	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 carbohydrates 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.