



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 19, 2023 – 04:18 PM EDT

PDB ID : 8EIA
Title : Crystal structure of beta-catenin and the MDM2 p53-binding domain in complex with H333, a Helicon Polypeptide
Authors : Li, K.; Travaline, T.L.; Swiecicki, J.-M.; Tokareva, O.S.; Thomson, T.M.; Verdine, G.L.; McGee, J.H.
Deposited on : 2022-09-14
Resolution : 3.60 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
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36
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

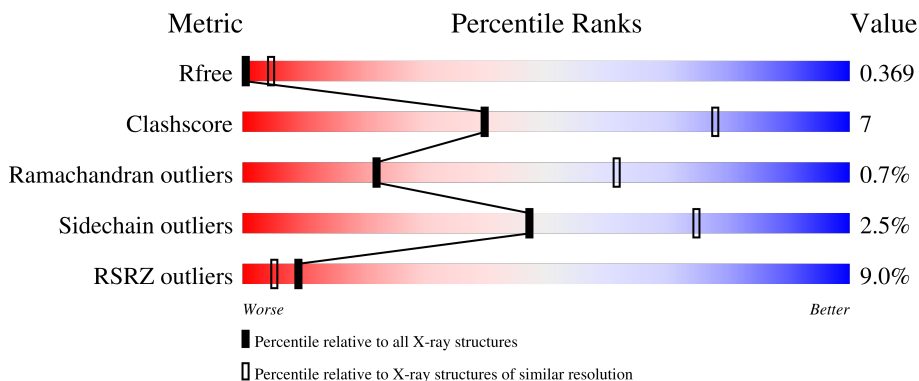
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.60 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	1257 (3.70-3.50)
Clashscore	141614	1353 (3.70-3.50)
Ramachandran outliers	138981	1307 (3.70-3.50)
Sidechain outliers	138945	1307 (3.70-3.50)
RSRZ outliers	127900	1161 (3.70-3.50)

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 ≥ 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	533	
2	B	95	
3	C	23	

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 4727 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 Catenin beta-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	510	3890	2442	708	714	26	0	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	133	GLY	-	expression tag	UNP P35222

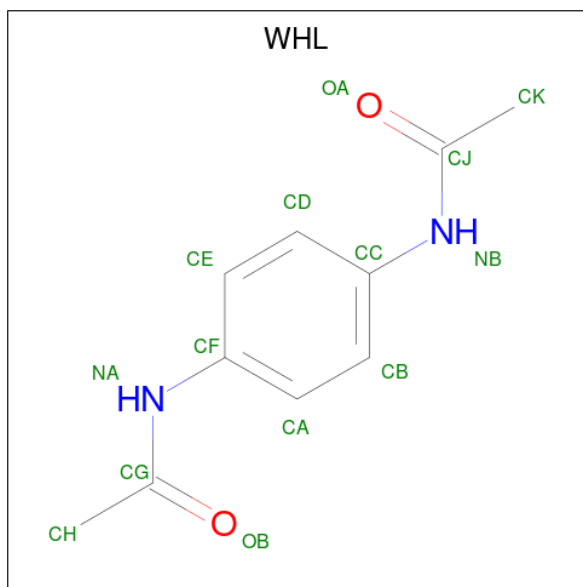
- Molecule 2 is a protein called E3 ubiquitin-protein ligase Mdm2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	85	703	462	116	121	4	0	0	0

- Molecule 3 is a protein called H333.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	C	13	120	86	15	17	2	0	0	0

- Molecule 4 is N,N'-(1,4-phenylene)diacetamide (three-letter code: WHL) (formula: C₁₀H₁₂N₂O₂).

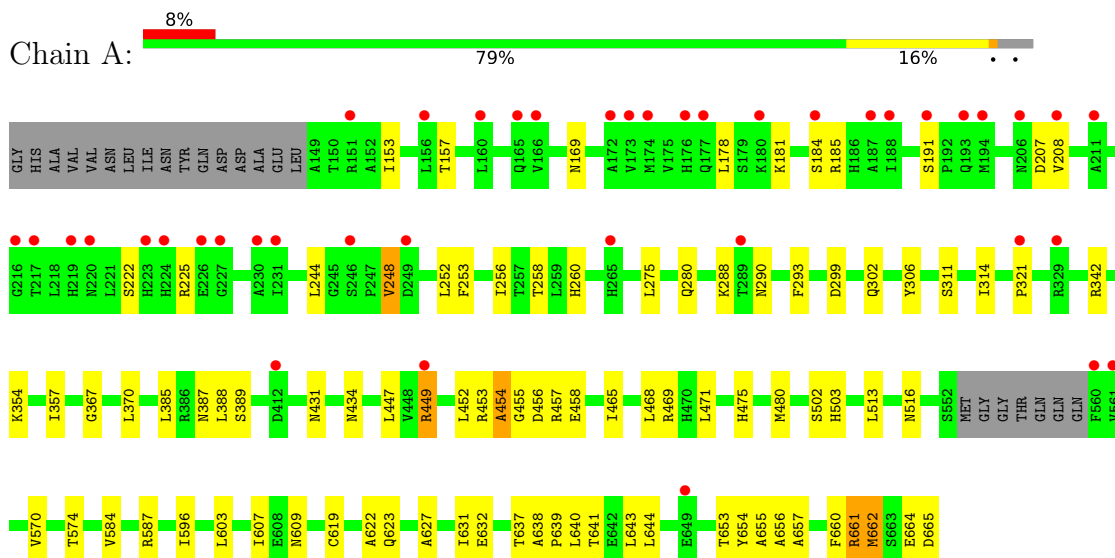


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
4	C	1	14	10	2	2	0	0

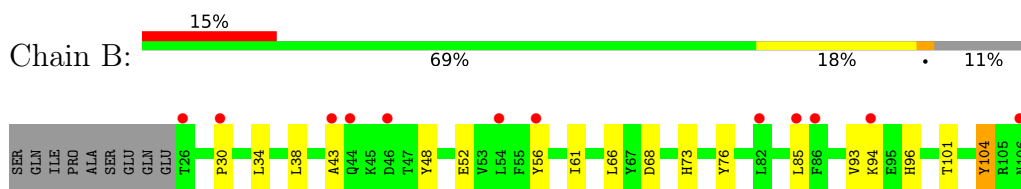
3 Residue-property plots [i](#)

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.

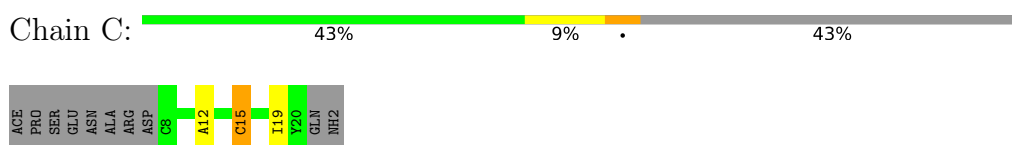
- Molecule 1: Catenin beta-1



- Molecule 2: E3 ubiquitin-protein ligase Mdm2



- Molecule 3: H333



4 Data and refinement statistics i

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	49.81Å 96.07Å 76.79Å 90.00° 106.62° 90.00°	Depositor
Resolution (Å)	47.73 – 3.60 48.03 – 3.60	Depositor EDS
% Data completeness (in resolution range)	92.7 (47.73-3.60) 92.4 (48.03-3.60)	Depositor EDS
R_{merge}	0.24	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.49 (at 3.57Å)	Xtrriage
Refinement program	PHENIX 1.20.1_4487, PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.354 , 0.373 0.353 , 0.369	Depositor DCC
R_{free} test set	750 reflections (9.99%)	wwPDB-VP
Wilson B-factor (Å ²)	87.0	Xtrriage
Anisotropy	0.614	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 30.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.44$, $\langle L^2 \rangle = 0.27$	Xtrriage
Estimated twinning fraction	0.067 for h,-k,-h-l	Xtrriage
F_o, F_c correlation	0.79	EDS
Total number of atoms	4727	wwPDB-VP
Average B, all atoms (Å ²)	100.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.65% 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

5.1 Standard geometry

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

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	0.25	0/3944	0.47	0/5351
2	B	0.25	0/717	0.48	0/966
3	C	0.26	0/127	0.35	0/174
All	All	0.25	0/4788	0.47	0/6491

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	3890	0	4035	55	0
2	B	703	0	743	16	0
3	C	120	0	99	4	0
4	C	14	0	0	1	0
All	All	4727	0	4877	70	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 7.

All (70) 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:632:GLU:OE2	1:A:637:THR:HG22	1.54	1.05
1:A:632:GLU:CD	1:A:637:THR:HG22	1.88	0.93
1:A:632:GLU:OE2	1:A:637:THR:CG2	2.30	0.79
2:B:61:ILE:HG23	2:B:66:LEU:HB2	1.72	0.72
2:B:43:ALA:HB1	2:B:48:TYR:OH	1.91	0.71
1:A:653:THR:O	1:A:655:ALA:N	2.25	0.70
1:A:321:PRO:HB3	1:A:357:ILE:HG12	1.76	0.68
1:A:354:LYS:NZ	1:A:387:ASN:O	2.27	0.67
1:A:471:LEU:O	1:A:475:HIS:NE2	2.24	0.66
1:A:632:GLU:OE1	1:A:662:MET:CE	2.46	0.62
1:A:632:GLU:CD	1:A:637:THR:CG2	2.68	0.61
1:A:311:SER:HA	1:A:314:ILE:HD12	1.83	0.60
1:A:253:PHE:HE1	1:A:293:PHE:HB2	1.68	0.58
1:A:465:ILE:HG23	1:A:513:LEU:HD22	1.86	0.57
1:A:660:PHE:HB2	4:C:101:WHL:OA	2.02	0.57
1:A:449:ARG:HA	1:A:452:LEU:HD12	1.87	0.56
2:B:48:TYR:HD1	2:B:52:GLU:OE1	1.87	0.56
1:A:153:ILE:HG21	1:A:191:SER:OG	2.07	0.55
1:A:623:GLN:HE21	2:B:96:HIS:HB2	1.73	0.54
1:A:207:ASP:OD1	1:A:208:VAL:N	2.41	0.54
1:A:603:LEU:HD21	1:A:640:LEU:HG	1.94	0.50
1:A:570:VAL:O	1:A:574:THR:OG1	2.27	0.50
1:A:632:GLU:OE1	1:A:662:MET:SD	2.69	0.50
2:B:34:LEU:HA	2:B:85:LEU:HD21	1.94	0.50
1:A:288:LYS:HG2	1:A:290:ASN:H	1.78	0.49
2:B:94:LYS:HZ1	3:C:15:CYS:HB2	1.78	0.49
2:B:68:ASP:HB2	2:B:76:TYR:HE2	1.78	0.48
1:A:623:GLN:OE1	1:A:623:GLN:N	2.39	0.48
2:B:101:THR:HA	2:B:104:TYR:HB2	1.94	0.48
1:A:607:ILE:HG22	1:A:609:ASN:H	1.78	0.48
1:A:622:ALA:O	1:A:661:ARG:HD2	2.14	0.48
1:A:181:LYS:O	1:A:185:ARG:HB2	2.13	0.48
1:A:222:SER:OG	1:A:258:THR:HG23	2.14	0.48
1:A:260:HIS:NE2	1:A:299:ASP:OD2	2.47	0.48
1:A:657:ALA:HA	2:B:94:LYS:NZ	2.29	0.48
1:A:299:ASP:OD1	1:A:342:ARG:NH2	2.47	0.47
1:A:178:LEU:O	1:A:184:SER:OG	2.23	0.47
1:A:458:GLU:OE2	1:A:502:SER:HA	2.14	0.47
1:A:447:LEU:HD22	1:A:468:LEU:HG	1.96	0.46
3:C:19:ILE:H	3:C:19:ILE:HD12	1.81	0.45
2:B:68:ASP:HB2	2:B:76:TYR:CE2	2.52	0.45
1:A:469:ARG:HG3	1:A:516:ASN:OD1	2.16	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:665:ASP:N	1:A:665:ASP:OD1	2.48	0.45
2:B:48:TYR:CE1	2:B:56:TYR:HE2	2.35	0.45
1:A:644:LEU:HD22	1:A:656:ALA:HB2	1.99	0.45
1:A:627:ALA:O	1:A:631:ILE:HG13	2.17	0.44
1:A:367:GLY:HA2	1:A:370:LEU:HG	1.99	0.44
1:A:660:PHE:O	1:A:664:GLU:HG3	2.18	0.43
2:B:94:LYS:NZ	3:C:15:CYS:HB2	2.33	0.43
1:A:584:VAL:HA	1:A:587:ARG:HE	1.81	0.43
1:A:302:GLN:O	1:A:306:TYR:HB2	2.19	0.43
1:A:596:ILE:HG21	1:A:631:ILE:HG12	2.01	0.43
1:A:253:PHE:CE1	1:A:293:PHE:HB2	2.51	0.43
1:A:244:LEU:HD11	1:A:256:ILE:HD13	2.00	0.43
1:A:454:ALA:O	1:A:457:ARG:NE	2.52	0.43
1:A:640:LEU:HD23	1:A:643:LEU:HD12	2.01	0.42
2:B:38:LEU:HD22	2:B:56:TYR:HB2	2.01	0.42
2:B:30:PRO:HA	2:B:107:LEU:HA	2.01	0.42
1:A:431:ASN:HB3	1:A:434:ASN:HB2	2.02	0.41
1:A:153:ILE:HG21	1:A:191:SER:CB	2.50	0.41
1:A:248:VAL:O	1:A:252:LEU:HG	2.20	0.41
1:A:153:ILE:O	1:A:157:THR:N	2.54	0.41
1:A:385:LEU:O	1:A:389:SER:N	2.53	0.41
1:A:637:THR:O	1:A:641:THR:OG1	2.38	0.41
2:B:93:VAL:HG11	3:C:12:ALA:HB1	2.02	0.41
1:A:225:ARG:HD2	1:A:225:ARG:HA	1.87	0.41
1:A:455:GLY:C	1:A:457:ARG:H	2.24	0.41
1:A:458:GLU:OE2	1:A:503:HIS:N	2.42	0.41
2:B:73:HIS:O	2:B:73:HIS:ND1	2.54	0.41
1:A:638:ALA:H	1:A:639:PRO:HD2	1.86	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	506/533 (95%)	462 (91%)	40 (8%)	4 (1%)	19	59
2	B	83/95 (87%)	75 (90%)	8 (10%)	0	100	100
3	C	11/23 (48%)	9 (82%)	2 (18%)	0	100	100
All	All	600/651 (92%)	546 (91%)	50 (8%)	4 (1%)	22	61

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	654	TYR
1	A	662	MET
1	A	454	ALA
1	A	456	ASP

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	423/441 (96%)	413 (98%)	10 (2%)	49	75
2	B	80/89 (90%)	78 (98%)	2 (2%)	47	75
3	C	11/18 (61%)	10 (91%)	1 (9%)	9	39
All	All	514/548 (94%)	501 (98%)	13 (2%)	47	75

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	169	ASN
1	A	248	VAL
1	A	275	LEU
1	A	280	GLN
1	A	388	LEU
1	A	449	ARG
1	A	453	ARG
1	A	480	MET
1	A	619	CYS

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Mol	Chain	Res	Type
1	A	661	ARG
2	B	104	TYR
2	B	107	LEU
3	C	15	CYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	96	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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

1 ligand 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
4	WHL	C	101	3	14,14,14	2.90	6 (42%)	18,18,18	3.53	7 (38%)

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
4	WHL	C	101	3	-	0/8/8/8	0/1/1/1

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	101	WHL	CG-NA	7.09	1.49	1.36
4	C	101	WHL	CJ-NB	4.90	1.45	1.36
4	C	101	WHL	CF-NA	3.98	1.49	1.41
4	C	101	WHL	CC-NB	3.25	1.48	1.41
4	C	101	WHL	OA-CJ	-2.99	1.16	1.23
4	C	101	WHL	CH-CG	2.24	1.55	1.50

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	101	WHL	CE-CF-NA	-8.88	90.53	120.40
4	C	101	WHL	CA-CF-NA	8.22	148.04	120.40
4	C	101	WHL	CF-NA-CG	-5.25	118.46	127.99
4	C	101	WHL	CH-CG-NA	3.54	120.18	114.98
4	C	101	WHL	CK-CJ-NB	3.47	120.07	114.98
4	C	101	WHL	CC-NB-CJ	-2.64	123.20	127.99
4	C	101	WHL	OB-CG-NA	-2.40	119.89	123.04

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	C	101	WHL	1	0

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

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	510/533 (95%)	0.50	41 (8%) 12 7	59, 87, 169, 213	0
2	B	85/95 (89%)	1.06	14 (16%) 1 1	95, 116, 126, 145	0
3	C	13/23 (56%)	0.45	0 100 100	85, 97, 107, 110	0
All	All	608/651 (93%)	0.58	55 (9%) 9 5	59, 93, 167, 213	0

All (55) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	230	ALA	7.2
1	A	227	GLY	5.6
1	A	265	HIS	5.0
1	A	226	GLU	4.8
2	B	30	PRO	4.6
1	A	165	GLN	4.4
1	A	187	ALA	4.3
1	A	649	GLU	4.1
1	A	561	VAL	3.9
2	B	44	GLN	3.9
1	A	172	ALA	3.8
1	A	208	VAL	3.6
1	A	216	GLY	3.6
1	A	329	ARG	3.5
2	B	85	LEU	3.4
1	A	166	VAL	3.4
2	B	56	TYR	3.4
1	A	194	MET	3.3
2	B	86	PHE	3.2
1	A	220	ASN	3.2
1	A	231	ILE	3.2
1	A	246	SER	3.1
1	A	206	ASN	3.1

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Mol	Chain	Res	Type	RSRZ
2	B	110	VAL	3.1
1	A	173	VAL	3.1
1	A	180	LYS	3.1
1	A	191	SER	3.0
1	A	560	PHE	2.8
1	A	321	PRO	2.7
1	A	193	GLN	2.7
1	A	249	ASP	2.7
1	A	217	THR	2.7
1	A	151	ARG	2.6
1	A	176	HIS	2.6
1	A	211	ALA	2.5
1	A	177	GLN	2.5
2	B	26	THR	2.4
2	B	106	ASN	2.3
2	B	54	LEU	2.3
2	B	94	LYS	2.3
1	A	289	THR	2.3
1	A	156	LEU	2.2
1	A	224	HIS	2.2
1	A	160	LEU	2.2
2	B	82	LEU	2.2
1	A	412	ASP	2.1
2	B	46	ASP	2.1
1	A	188	ILE	2.1
1	A	219	HIS	2.1
1	A	174	MET	2.1
1	A	223	HIS	2.1
2	B	107	LEU	2.1
2	B	43	ALA	2.0
1	A	184	SER	2.0
1	A	449	ARG	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 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, 95th 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 ²)	Q<0.9
4	WHL	C	101	14/14	0.76	0.29	93,98,106,106	0

6.5 Other polymers [i](#)

There are no such residues in this entry.