Full wwPDB X-ray Structure Validation Report (i)

Aug 30, 2022 – 12:08 PM JST

PDB ID	:	7EWF
Title	:	Selenomethionine-substituted structure of S. cerevisiae Csn12 in complex with Thp3 and Sem1
Authors	:	Kuang, Z.; Niu, L.
Deposited on	:	2021-05-25
Resolution	:	2.85 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 (i) 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 (1)) were used in the production of this report:

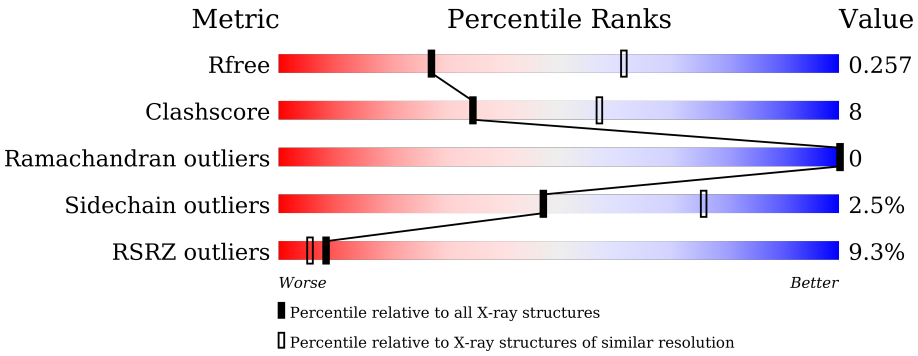
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.30
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.30

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 2.85 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	3168 (2.90-2.82)
Clashscore	141614	3438 (2.90-2.82)
Ramachandran outliers	138981	3348 (2.90-2.82)
Sidechain outliers	138945	3351 (2.90-2.82)
RSRZ outliers	127900	3103 (2.90-2.82)

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 <=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	289	2% 83% 10% 6%
2	B	423	14% 70% 25%
3	C	89	48% 17% 35%

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 6123 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 Protein THP3.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	272	Total	C	N	O	S	Se	0	0	0
			2243	1436	368	422	8	9			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	182	GLY	-	expression tag	UNP Q12049
A	183	SER	-	expression tag	UNP Q12049
A	184	HIS	-	expression tag	UNP Q12049
A	185	MSE	-	expression tag	UNP Q12049

- Molecule 2 is a protein called Cop9 signalosome complex subunit 12.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
2	B	410	Total	C	N	O	S	Se	0	0	0
			3381	2162	601	601	9	8			

- Molecule 3 is a protein called 26S proteasome complex subunit SEM1.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	C	58	Total	C	N	O	0	0	0
			491	302	78	111			

- Molecule 4 is water.

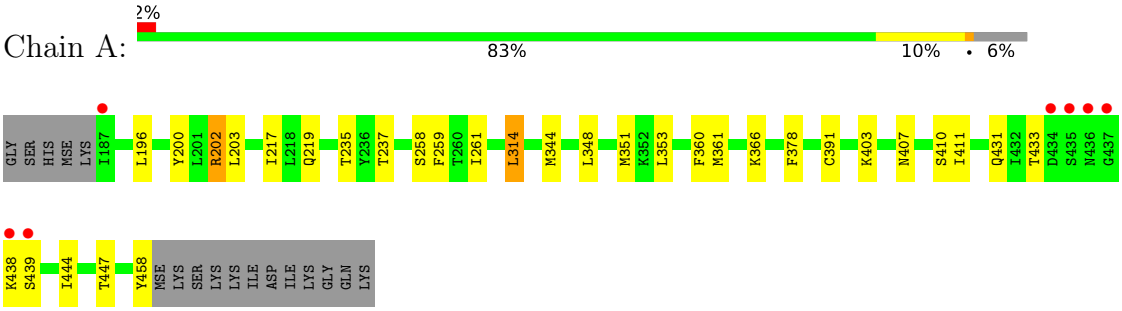
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	7	Total	O	0	0
			7	7		
4	B	1	Total	O	0	0
			1	1		

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.

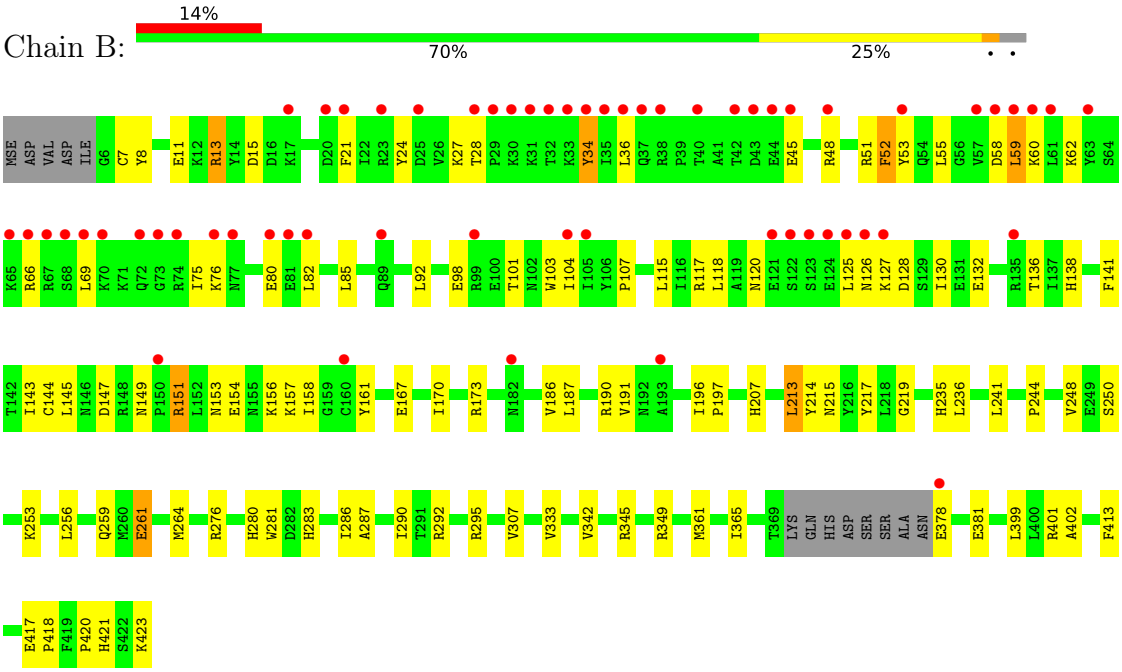
• Molecule 1: Protein THP3

Chain A:



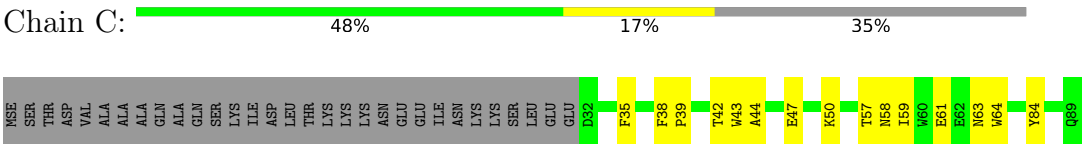
• Molecule 2: Cop9 signalosome complex subunit 12

Chain B:



• Molecule 3: 26S proteasome complex subunit SEM1

Chain C:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α, β, γ	116.32Å 116.32Å 127.35Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	33.58 – 2.85 33.58 – 2.85	Depositor EDS
% Data completeness (in resolution range)	99.7 (33.58-2.85) 99.7 (33.58-2.85)	Depositor EDS
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.51 (at 2.85Å)	Xtriage
Refinement program	PHENIX 1.15.2_3472	Depositor
R, R_{free}	0.212 , 0.257 0.212 , 0.257	Depositor DCC
R_{free} test set	1181 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	64.9	Xtriage
Anisotropy	0.280	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.28 , 45.9	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.30$	Xtriage
Estimated twinning fraction	0.037 for -h,-k,l	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	6123	wwPDB-VP
Average B, all atoms (Å^2)	87.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.86% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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

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	0.31	0/2276	0.49	0/3051
2	B	0.33	1/3440 (0.0%)	0.54	0/4623
3	C	0.32	0/501	0.54	0/682
All	All	0.32	1/6217 (0.0%)	0.52	0/8356

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	27	LYS	C-N	5.09	1.45	1.34

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	2243	0	2253	21	0
2	B	3381	0	3464	79	0
3	C	491	0	423	11	0
4	A	7	0	0	0	0
4	B	1	0	0	0	0
All	All	6123	0	6140	102	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 8.

All (102) 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:B:101:THR:HG1	2:B:103:TRP:HD1	0.98	0.94
2:B:69:LEU:HD22	2:B:75:ILE:HG21	1.56	0.87
1:A:433:THR:HG22	1:A:439:SER:HB3	1.65	0.77
2:B:117:ARG:HA	2:B:120:ASN:HB3	1.68	0.76
2:B:34:TYR:H	2:B:34:TYR:HD1	1.33	0.75
2:B:62:LYS:HE3	2:B:85:LEU:HD21	1.69	0.74
2:B:101:THR:HA	2:B:154:GLU:HB2	1.70	0.73
2:B:141:PHE:HZ	2:B:187:LEU:HD11	1.55	0.72
2:B:157:LYS:HB3	2:B:196:ILE:HG22	1.70	0.72
2:B:115:LEU:HD12	2:B:118:LEU:HD23	1.72	0.71
1:A:344:MSE:HE2	1:A:366:LYS:HB2	1.72	0.71
2:B:261:GLU:OE2	2:B:295:ARG:NH2	2.29	0.66
2:B:101:THR:OG1	2:B:103:TRP:HD1	1.75	0.66
2:B:52:PHE:HB2	2:B:92:LEU:HD22	1.77	0.65
2:B:361:MSE:HE3	2:B:413:PHE:HE2	1.62	0.65
1:A:353:LEU:HD21	2:B:333:VAL:HG13	1.79	0.63
2:B:307:VAL:HA	2:B:342:VAL:HG22	1.82	0.61
2:B:207:HIS:HA	3:C:42:THR:HB	1.83	0.60
2:B:276:ARG:HH22	2:B:399:LEU:HD22	1.67	0.60
2:B:248:VAL:HG12	2:B:250:SER:H	1.67	0.59
2:B:365:ILE:HG12	3:C:84:TYR:CE2	2.39	0.58
2:B:378:GLU:HB2	2:B:381:GLU:HB2	1.85	0.58
2:B:158:ILE:HG22	2:B:197:PRO:HG3	1.85	0.58
2:B:345:ARG:HD3	3:C:64:TRP:CZ2	2.41	0.56
1:A:219:GLN:HG2	1:A:259:PHE:CE1	2.41	0.55
1:A:235:THR:HG22	1:A:237:THR:H	1.70	0.55
2:B:132:GLU:O	2:B:136:THR:OG1	2.25	0.55
2:B:141:PHE:CE1	2:B:145:LEU:HD22	2.42	0.54
2:B:141:PHE:HE1	2:B:145:LEU:HD22	1.73	0.54
2:B:126:ASN:OD1	2:B:127:LYS:N	2.40	0.54
2:B:7:CYS:SG	2:B:13:ARG:NH2	2.80	0.54
3:C:61:GLU:HG2	3:C:63:ASN:OD1	2.07	0.53
2:B:244:PRO:HD3	3:C:43:TRP:CZ2	2.43	0.53
2:B:76:LYS:O	2:B:80:GLU:HG2	2.09	0.52
2:B:401:ARG:HG3	2:B:420:PRO:HG3	1.92	0.52
1:A:348:LEU:HA	1:A:351:MSE:HE2	1.92	0.52
1:A:391:CYS:HA	1:A:447:THR:HB	1.92	0.52
2:B:149:ASN:HB3	2:B:151:ARG:HD2	1.92	0.51
2:B:45:GLU:HA	2:B:48:ARG:HG3	1.93	0.51
2:B:103:TRP:CZ3	2:B:104:ILE:HD13	2.44	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:141:PHE:CZ	2:B:187:LEU:HD11	2.39	0.51
2:B:191:VAL:HG23	2:B:196:ILE:O	2.11	0.51
2:B:361:MSE:HE3	2:B:413:PHE:CE2	2.42	0.50
1:A:196:LEU:HD23	1:A:217:ILE:HG23	1.93	0.50
2:B:138:HIS:HA	2:B:167:GLU:OE1	2.11	0.50
2:B:241:LEU:HB3	3:C:50:LYS:HG3	1.94	0.50
2:B:8:TYR:HE1	2:B:15:ASP:HB2	1.77	0.50
2:B:151:ARG:H	2:B:151:ARG:NE	2.09	0.50
2:B:58:ASP:O	2:B:62:LYS:HG2	2.11	0.49
2:B:215:ASN:HB3	2:B:235:HIS:O	2.13	0.48
2:B:144:CYS:HB3	2:B:156:LYS:O	2.12	0.48
2:B:52:PHE:HB2	2:B:92:LEU:CD2	2.44	0.48
2:B:253:LYS:HE2	2:B:292:ARG:HD3	1.96	0.48
2:B:213:LEU:HD22	2:B:217:TYR:CE2	2.48	0.47
2:B:144:CYS:O	2:B:157:LYS:HG2	2.14	0.47
2:B:256:LEU:CD2	3:C:39:PRO:HD2	2.44	0.47
1:A:314:LEU:HB2	1:A:378:PHE:CD1	2.49	0.47
1:A:361:MSE:O	1:A:407:ASN:ND2	2.47	0.47
2:B:281:TRP:O	2:B:287:ALA:HB2	2.14	0.47
2:B:125:LEU:HA	2:B:128:ASP:HB3	1.96	0.47
2:B:417:GLU:N	2:B:418:PRO:HD3	2.30	0.47
1:A:235:THR:HG22	1:A:237:THR:N	2.30	0.46
1:A:200:TYR:HE2	1:A:202:ARG:HD3	1.81	0.46
2:B:130:ILE:HD11	2:B:170:ILE:HG23	1.96	0.45
2:B:401:ARG:HG3	2:B:420:PRO:HD3	1.99	0.45
1:A:314:LEU:HD12	1:A:378:PHE:HB3	1.99	0.45
2:B:104:ILE:HD12	2:B:107:PRO:HG2	1.98	0.45
2:B:36:LEU:HD23	2:B:53:TYR:CD2	2.52	0.45
2:B:115:LEU:CD1	2:B:118:LEU:HD23	2.44	0.44
2:B:421:HIS:CE1	2:B:423:LYS:HE3	2.52	0.44
1:A:431:GLN:H	1:A:431:GLN:CD	2.20	0.44
1:A:200:TYR:CE2	1:A:202:ARG:HD3	2.52	0.44
2:B:161:TYR:HD1	2:B:214:TYR:CZ	2.36	0.44
2:B:345:ARG:O	2:B:349:ARG:HG2	2.18	0.44
2:B:98:GLU:HA	2:B:143:ILE:HG23	2.00	0.43
2:B:147:ASP:H	2:B:157:LYS:HE2	1.83	0.43
2:B:82:LEU:HA	2:B:85:LEU:HD22	1.98	0.43
1:A:258:SER:O	1:A:261:ILE:HG22	2.18	0.43
1:A:411:ILE:H	1:A:411:ILE:HD12	1.83	0.43
2:B:51:ARG:O	2:B:55:LEU:HG	2.18	0.43
2:B:36:LEU:HD23	2:B:53:TYR:CG	2.54	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:283:HIS:CE1	3:C:59:ILE:HG22	2.54	0.43
2:B:11:GLU:HB2	2:B:13:ARG:HH21	1.84	0.42
2:B:82:LEU:HA	2:B:82:LEU:HD23	1.84	0.42
2:B:264:MSE:HE1	2:B:286:ILE:HD12	2.01	0.42
2:B:21:PHE:HA	2:B:60:LYS:NZ	2.34	0.42
1:A:348:LEU:HD12	1:A:351:MSE:CE	2.49	0.42
2:B:24:TYR:CD2	2:B:59:LEU:HD13	2.55	0.41
2:B:62:LYS:O	2:B:66:ARG:N	2.52	0.41
2:B:127:LYS:O	2:B:127:LYS:HG2	2.19	0.41
1:A:203:LEU:HA	1:A:203:LEU:HD23	1.64	0.41
2:B:219:GLY:HA3	2:B:236:LEU:HG	2.03	0.41
2:B:402:ALA:HB2	2:B:413:PHE:HA	2.02	0.41
2:B:186:VAL:O	2:B:190:ARG:HG2	2.20	0.41
2:B:259:GLN:HG2	3:C:38:PHE:CZ	2.56	0.41
2:B:264:MSE:HE3	2:B:290:ILE:HD11	2.03	0.41
1:A:351:MSE:HE3	1:A:360:PHE:HA	2.03	0.41
1:A:444:ILE:HD13	1:A:444:ILE:HA	1.93	0.41
2:B:128:ASP:HB2	2:B:130:ILE:HG22	2.03	0.40
3:C:44:ALA:HB3	3:C:47:GLU:HG3	2.04	0.40
2:B:153:ASN:OD1	2:B:154:GLU:N	2.55	0.40
3:C:57:THR:OG1	3:C:58:ASN: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	270/289 (93%)	268 (99%)	2 (1%)	0	100	100
2	B	406/423 (96%)	399 (98%)	7 (2%)	0	100	100
3	C	56/89 (63%)	56 (100%)	0	0	100	100
All	All	732/801 (91%)	723 (99%)	9 (1%)	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	261/265 (98%)	255 (98%)	6 (2%)	50 78
2	B	375/378 (99%)	365 (97%)	10 (3%)	44 74
3	C	54/80 (68%)	53 (98%)	1 (2%)	57 81
All	All	690/723 (95%)	673 (98%)	17 (2%)	47 76

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	202	ARG
1	A	314	LEU
1	A	403	LYS
1	A	410	SER
1	A	438	LYS
1	A	458	TYR
2	B	13	ARG
2	B	28	THR
2	B	34	TYR
2	B	52	PHE
2	B	59	LEU
2	B	151	ARG
2	B	173	ARG
2	B	213	LEU
2	B	261	GLU
2	B	280	HIS
3	C	35	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	219	GLN

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Mol	Chain	Res	Type
2	B	87	ASN

5.3.3 RNA

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates

There are no monosaccharides 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, 95^{th} 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	263/289 (91%)	-0.21	7 (2%) 54 50	31, 53, 120, 195	0
2	B	402/423 (95%)	0.68	60 (14%) 2 1	34, 90, 177, 197	0
3	C	58/89 (65%)	-0.14	0 100 100	62, 90, 130, 151	0
All	All	723/801 (90%)	0.29	67 (9%) 8 5	31, 75, 174, 197	0

All (67) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	34	TYR	8.8
2	B	40	THR	7.1
2	B	59	LEU	7.0
2	B	37	GLN	6.9
2	B	126	ASN	6.5
1	A	439	SER	6.1
2	B	125	LEU	5.9
2	B	160	CYS	5.8
2	B	127	LYS	5.7
2	B	33	LYS	5.7
1	A	435	SER	5.5
1	A	437	GLY	5.4
2	B	32	THR	5.3
1	A	436	ASN	4.7
2	B	80	GLU	4.6
2	B	28	THR	4.4
2	B	61	LEU	4.3
2	B	69	LEU	4.3
2	B	35	ILE	4.3
2	B	66	ARG	4.3
2	B	76	LYS	4.1
2	B	30	LYS	4.1
2	B	73	GLY	4.1

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Mol	Chain	Res	Type	RSRZ
2	B	31	LYS	4.0
2	B	38	ARG	4.0
2	B	42	THR	4.0
2	B	17	LYS	3.9
2	B	124	GLU	3.9
2	B	74	ARG	3.8
2	B	29	PRO	3.6
2	B	43	ASP	3.5
2	B	121	GLU	3.5
2	B	53	TYR	3.4
2	B	68	SER	3.4
2	B	60	LYS	3.3
2	B	36	LEU	3.3
2	B	57	VAL	3.3
2	B	72	GLN	3.3
2	B	21	PHE	3.2
2	B	378	GLU	3.2
2	B	150	PRO	3.1
2	B	99	ARG	3.1
2	B	67	ARG	3.0
2	B	63	TYR	3.0
2	B	23	ARG	3.0
2	B	81	GLU	3.0
2	B	193	ALA	2.9
1	A	187	ILE	2.8
2	B	135	ARG	2.8
2	B	45	GLU	2.7
2	B	70	LYS	2.7
2	B	58	ASP	2.5
2	B	82	LEU	2.4
2	B	48	ARG	2.4
2	B	122	SER	2.4
2	B	25	ASP	2.4
2	B	65	LYS	2.3
2	B	105	ILE	2.2
2	B	20	ASP	2.2
2	B	77	ASN	2.2
1	A	438	LYS	2.1
2	B	123	SER	2.1
2	B	44	GLU	2.1
2	B	104	ILE	2.1
2	B	182	ASN	2.0

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Mol	Chain	Res	Type	RSRZ
1	A	434	ASP	2.0
2	B	89	GLN	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)

There are no ligands in this entry.

6.5 Other polymers (i)

There are no such residues in this entry.