Full wwPDB X-ray Structure Validation Report ⓘ

Apr 28, 2025 – 12:30 PM EDT

PDB ID	:	3BIP / pdb_00003bip
Title	:	Crystal structure of yeast Spt16 N-terminal Domain
Authors	:	VanDemark, A.P.; Xin, H.; McCullough, L.; Rawlins, R.; Bentley, S.; Heroux, A.; David, S.J.; Hill, C.P.; Formosa, T.
Deposited on	:	2007-11-30
Resolution	:	1.94 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:

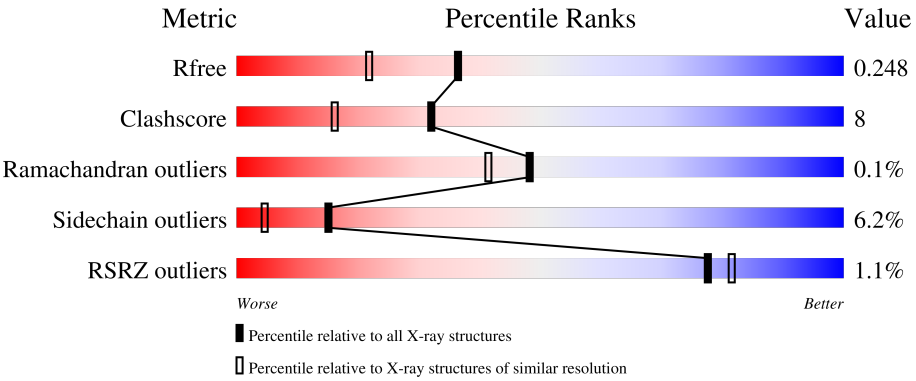
MolProbity	:	4-5-2 with Phenix2.0rc1
Xtriage (Phenix)	:	2.0rc1
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.006 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.43.1

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 1.94 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}	164625	1306 (1.94-1.94)
Clashscore	180529	1400 (1.94-1.94)
Ramachandran outliers	177936	1387 (1.94-1.94)
Sidechain outliers	177891	1387 (1.94-1.94)
RSRZ outliers	164620	1306 (1.94-1.94)

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	467	% 78% 15% • 5%
1	B	467	% 76% 16% • 5%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 8034 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 FACT complex subunit SPT16.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	444	Total	C	N	O	S	0	10	0
			3668	2353	601	705	9			
1	B	442	Total	C	N	O	S	0	10	0
			3645	2337	594	705	9			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	expression tag	UNP P32558
A	0	HIS	-	expression tag	UNP P32558
B	-1	GLY	-	expression tag	UNP P32558
B	0	HIS	-	expression tag	UNP P32558

- Molecule 2 is water.

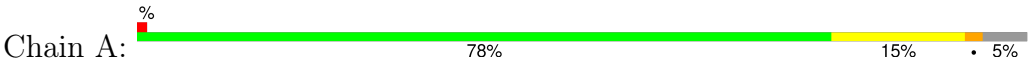
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	360	Total	O	0	0
			360	360		
2	B	361	Total	O	0	0
			361	361		

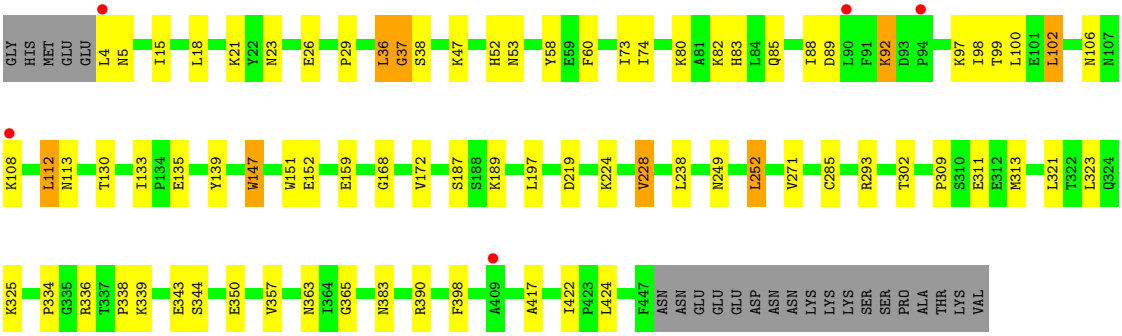
3 Residue-property plots (i)

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: FACT complex subunit SPT16

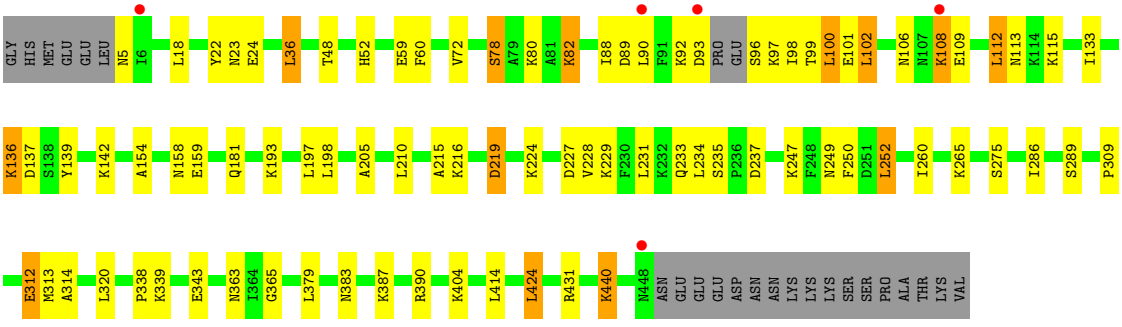
Chain A:





• Molecule 1: FACT complex subunit SPT16

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α, β, γ	51.14Å 60.14Å 85.93Å 72.59° 77.06° 89.88°	Depositor
Resolution (Å)	38.91 – 1.94 38.91 – 1.94	Depositor EDS
% Data completeness (in resolution range)	73.2 (38.91-1.94) 73.3 (38.91-1.94)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	3.16 (at 1.94Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.176 , 0.244 0.185 , 0.248	Depositor DCC
R_{free} test set	2656 reflections (5.15%)	wwPDB-VP
Wilson B-factor (Å^2)	21.6	Xtriage
Anisotropy	0.834	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 40.2	EDS
L-test for twinning[2]	$< \|L\| > = 0.46$, $< L^2 > = 0.29$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	8034	wwPDB-VP
Average B, all atoms (Å^2)	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.76% 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	0.72	1/3744 (0.0%)	0.90	2/5067 (0.0%)
1	B	0.72	0/3719	0.90	1/5031 (0.0%)
All	All	0.72	1/7463 (0.0%)	0.90	3/10098 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	357	VAL	CA-CB	6.90	1.57	1.54

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	22	TYR	N-CA-C	5.83	117.64	111.28
1	A	357	VAL	N-CA-CB	5.46	114.18	110.52
1	A	147	TRP	N-CA-C	5.11	116.65	111.14

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	3668	0	3660	59	0
1	B	3645	0	3625	61	0
2	A	360	0	0	17	0
2	B	361	0	0	7	0
All	All	8034	0	7285	116	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 (116) 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:4:LEU:HD12	1:A:83:HIS:CG	1.91	1.06
1:A:73:ILE:HG13	2:A:820:HOH:O	1.68	0.93
1:A:4:LEU:HD12	1:A:83:HIS:CD2	2.07	0.90
1:B:108:LYS:O	1:B:108:LYS:HD2	1.73	0.88
1:B:106:ASN:H	1:B:113:ASN:HD21	1.20	0.87
1:B:133:ILE:HG21	2:B:994:HOH:O	1.72	0.87
1:B:100:LEU:HD22	1:B:101:GLU:N	1.89	0.86
1:B:89:ASP:HA	1:B:92:LYS:HD2	1.57	0.83
1:A:52:HIS:HD2	1:A:60:PHE:H	1.25	0.82
1:A:249:ASN:HB3	1:A:252:LEU:HD22	1.61	0.81
1:B:363:ASN:HD22	1:B:365:GLY:H	1.28	0.80
1:A:106:ASN:H	1:A:113:ASN:HD21	1.27	0.80
1:A:4:LEU:HD22	1:A:58:TYR:CD2	2.19	0.77
1:B:72:VAL:O	1:B:100:LEU:HD23	1.89	0.72
1:B:52:HIS:HD2	1:B:60:PHE:H	1.39	0.71
1:A:4:LEU:CD2	1:A:58:TYR:CD2	2.73	0.71
1:A:293[B]:ARG:NH1	2:A:473:HOH:O	2.24	0.70
1:B:197:LEU:HD21	1:B:224:LYS:HG3	1.75	0.69
1:A:311:GLU:HG3	2:A:772:HOH:O	1.93	0.68
1:B:309:PRO:HB3	1:B:313:MET:HE2	1.76	0.67
1:B:154:ALA:O	1:B:158:ASN:HB2	1.93	0.67
1:A:36:LEU:C	1:A:36:LEU:HD12	2.20	0.66
1:A:133[A]:ILE:HG12	2:A:517:HOH:O	1.96	0.66
1:A:89:ASP:HA	1:A:92:LYS:HG3	1.77	0.65
1:A:26:GLU:OE1	1:B:390:ARG:NH2	2.30	0.64
1:B:78:SER:O	1:B:82:LYS:HD2	1.97	0.64
1:A:36:LEU:HD13	1:A:139:TYR:CE2	2.32	0.63
1:A:99:THR:HG23	2:A:787:HOH:O	1.98	0.63
1:A:88:ILE:HD11	1:A:102:LEU:HD22	1.84	0.60
1:B:80:LYS:HE2	2:B:783:HOH:O	2.01	0.60
1:B:404:LYS:HE2	2:B:1057:HOH:O	2.02	0.59
1:A:133[A]:ILE:CG1	2:A:517:HOH:O	2.50	0.59
1:A:23:ASN:HB2	2:A:606:HOH:O	2.02	0.58
1:B:219:ASP:CG	2:B:1019:HOH:O	2.47	0.57
1:B:88:ILE:HD11	1:B:102:LEU:HD22	1.85	0.57
1:B:181:GLN:HE22	1:B:424:LEU:HD22	1.69	0.56
1:A:4:LEU:CD1	1:A:83:HIS:CD2	2.87	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:100:LEU:HD22	1:B:100:LEU:C	2.31	0.56
1:A:73:ILE:CG1	2:A:820:HOH:O	2.41	0.56
1:A:152:GLU:HG3	2:A:782:HOH:O	2.06	0.56
1:A:189:LYS:HG3	1:A:238:LEU:HD12	1.87	0.55
1:B:231:LEU:HA	1:B:234:LEU:HD12	1.88	0.55
1:A:36:LEU:HD12	1:A:37:GLY:N	2.21	0.55
1:A:285:CYS:SG	1:A:313:MET:HE3	2.47	0.54
1:B:142:LYS:HD2	2:B:1107:HOH:O	2.06	0.54
1:B:320:LEU:HD22	1:B:414:LEU:HB3	1.90	0.53
1:A:159:GLU:HG2	2:A:506:HOH:O	2.08	0.53
1:B:205:ALA:HA	1:B:210:LEU:HG	1.89	0.53
1:A:74:ILE:HB	1:A:102:LEU:HD12	1.90	0.53
1:B:100:LEU:CD2	1:B:101:GLU:N	2.68	0.53
1:B:108:LYS:O	1:B:108:LYS:CD	2.54	0.52
1:A:106:ASN:HB3	1:A:112:LEU:HD23	1.91	0.52
1:B:260[B]:ILE:CG2	1:B:289:SER:HB2	2.40	0.52
1:A:302:THR:HB	1:A:417:ALA:HB3	1.92	0.51
1:B:78:SER:O	1:B:82:LYS:CD	2.59	0.51
1:B:60:PHE:CD2	1:B:80:LYS:HD3	2.46	0.51
1:A:336[A]:ARG:HD2	2:A:679:HOH:O	2.11	0.51
1:B:215:ALA:HA	1:B:275:SER:HB3	1.93	0.50
1:B:109:GLU:HG3	1:B:112:LEU:HB3	1.93	0.50
1:A:29:PRO:HA	1:A:130:THR:HG22	1.92	0.50
1:A:271:VAL:HB	2:A:684:HOH:O	2.12	0.49
1:B:339:LYS:HE3	1:B:343[B]:GLU:OE2	2.11	0.49
1:A:36:LEU:C	1:A:36:LEU:CD1	2.86	0.49
1:A:53:ASN:ND2	2:A:652:HOH:O	2.39	0.49
1:B:260[B]:ILE:HG22	1:B:289:SER:HB2	1.95	0.49
1:A:26:GLU:CD	1:B:390:ARG:HH22	2.20	0.49
1:A:4:LEU:HD12	1:A:83:HIS:CB	2.41	0.48
1:A:323:LEU:HD23	1:A:398:PHE:CE2	2.49	0.48
1:A:390:ARG:HH22	1:B:23:ASN:HD22	1.62	0.48
1:A:336[A]:ARG:NH1	1:A:344:SER:OG	2.47	0.47
1:A:106:ASN:N	1:A:113:ASN:HD21	2.06	0.47
1:B:338:PRO:HB2	1:B:383:ASN:HB3	1.97	0.47
1:B:136:LYS:HB2	2:B:773:HOH:O	2.13	0.47
1:A:52:HIS:CD2	1:A:60:PHE:H	2.17	0.47
1:B:52:HIS:HE1	2:B:772:HOH:O	1.96	0.47
1:B:36:LEU:HD13	1:B:139:TYR:CE2	2.50	0.46
1:B:96:SER:C	1:B:98:ILE:H	2.22	0.46
1:B:193:LYS:HE3	1:B:237:ASP:HB2	1.96	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:343[B]:GLU:OE1	2:A:815:HOH:O	2.20	0.46
1:B:247:LYS:NZ	1:B:247:LYS:HB3	2.31	0.46
1:A:168:GLY:O	1:A:172:VAL:HG23	2.16	0.46
1:B:100:LEU:HD22	1:B:101:GLU:H	1.73	0.46
1:A:363:ASN:HD22	1:A:365:GLY:H	1.64	0.46
1:B:181:GLN:NE2	1:B:424:LEU:HD22	2.31	0.45
1:B:82:LYS:HD2	1:B:82:LYS:N	2.32	0.45
1:B:89:ASP:HA	1:B:92:LYS:NZ	2.31	0.45
1:A:302:THR:HB	1:A:417:ALA:CB	2.48	0.44
1:A:4:LEU:CD2	1:A:58:TYR:CG	3.00	0.44
1:B:338:PRO:HB3	1:B:379:LEU:HA	2.00	0.44
1:B:106:ASN:N	1:B:113:ASN:HD21	2.01	0.43
1:B:227:ASP:OD1	1:B:229:LYS:HB3	2.17	0.43
1:A:197:LEU:HD21	1:A:224:LYS:HG3	2.01	0.43
1:A:60:PHE:CD2	1:A:80:LYS:HD3	2.54	0.43
1:B:249:ASN:HB3	1:B:252:LEU:HD22	2.01	0.43
2:A:669:HOH:O	1:B:387:LYS:HE2	2.19	0.42
1:A:21:LYS:HE2	2:A:790:HOH:O	2.19	0.42
1:B:89:ASP:HA	1:B:92:LYS:CD	2.39	0.42
1:A:29:PRO:HA	1:A:130:THR:CG2	2.50	0.42
1:A:334:PRO:HB2	1:B:24:GLU:HG2	2.02	0.42
1:B:309:PRO:CB	1:B:313:MET:HE2	2.46	0.42
1:A:47[A]:LYS:HD3	1:A:47[A]:LYS:HA	1.89	0.42
1:A:338:PRO:HB2	1:A:383:ASN:HB3	2.02	0.41
1:B:98:ILE:HG22	1:B:99:THR:N	2.35	0.41
1:B:250:PHE:C	1:B:252:LEU:H	2.28	0.41
1:B:314:ALA:HB1	1:B:440:LYS:HE3	2.02	0.41
1:B:36:LEU:HD21	1:B:59:GLU:HG3	2.02	0.41
1:B:198:LEU:C	1:B:198:LEU:HD23	2.45	0.41
1:B:312:GLU:HG2	1:B:313:MET:N	2.35	0.41
1:A:147:TRP:CE2	1:A:151:TRP:HB2	2.56	0.41
1:A:228:VAL:HG23	2:A:728:HOH:O	2.20	0.41
1:B:48:THR:OG1	1:B:137:ASP:OD1	2.35	0.41
1:B:100:LEU:C	1:B:100:LEU:CD2	2.93	0.41
1:A:339:LYS:O	1:A:343[A]:GLU:HG2	2.21	0.41
1:A:36:LEU:CD1	1:A:139:TYR:CE2	3.03	0.40
1:A:309:PRO:HB3	1:A:313:MET:HE2	2.04	0.40
1:A:321:LEU:HD23	1:A:321:LEU:HA	1.89	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	452/467 (97%)	436 (96%)	15 (3%)	1 (0%)	44 37
1	B	448/467 (96%)	438 (98%)	10 (2%)	0	100 100
All	All	900/934 (96%)	874 (97%)	25 (3%)	1 (0%)	48 41

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	37	GLY

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	416/427 (97%)	393 (94%)	23 (6%)	18 6
1	B	414/427 (97%)	387 (94%)	27 (6%)	14 4
All	All	830/854 (97%)	780 (94%)	50 (6%)	15 5

All (50) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	5	ASN
1	A	15	ILE
1	A	18	LEU
1	A	36	LEU
1	A	38	SER

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Mol	Chain	Res	Type
1	A	82	LYS
1	A	85	GLN
1	A	92	LYS
1	A	97	LYS
1	A	98	ILE
1	A	100	LEU
1	A	102	LEU
1	A	108	LYS
1	A	112	LEU
1	A	135	GLU
1	A	187	SER
1	A	219	ASP
1	A	228	VAL
1	A	252	LEU
1	A	325	LYS
1	A	350	GLU
1	A	422	ILE
1	A	424	LEU
1	B	5	ASN
1	B	18	LEU
1	B	36	LEU
1	B	78	SER
1	B	82	LYS
1	B	90	LEU
1	B	93	ASP
1	B	97	LYS
1	B	100	LEU
1	B	102	LEU
1	B	108	LYS
1	B	112	LEU
1	B	115	LYS
1	B	136	LYS
1	B	159	GLU
1	B	216	LYS
1	B	219	ASP
1	B	228	VAL
1	B	233	GLN
1	B	235	SER
1	B	252	LEU
1	B	265	LYS
1	B	286	ILE
1	B	312	GLU

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Mol	Chain	Res	Type
1	B	424	LEU
1	B	431	ARG
1	B	440	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (27) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	43	ASN
1	A	52	HIS
1	A	83	HIS
1	A	85	GLN
1	A	113	ASN
1	A	148	ASN
1	A	161	ASN
1	A	315	ASN
1	A	330	ASN
1	A	363	ASN
1	A	376	ASN
1	A	411	ASN
1	B	5	ASN
1	B	23	ASN
1	B	52	HIS
1	B	85	GLN
1	B	104	GLN
1	B	113	ASN
1	B	148	ASN
1	B	161	ASN
1	B	181	GLN
1	B	315	ASN
1	B	316	ASN
1	B	330	ASN
1	B	363	ASN
1	B	402	ASN
1	B	415	GLN

5.3.3 RNA

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 oligosaccharides 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

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	444/467 (95%)	-0.16	5 (1%)	77	81	7, 24, 45, 87	15 (3%)
1	B	442/467 (94%)	-0.22	5 (1%)	77	81	7, 23, 44, 79	17 (3%)
All	All	886/934 (94%)	-0.19	10 (1%)	77	81	7, 23, 45, 87	32 (3%)

All (10) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	4	LEU	5.0
1	A	94	PRO	3.5
1	B	93	ASP	3.1
1	A	108	LYS	2.8
1	B	448	ASN	2.7
1	B	108	LYS	2.3
1	A	409	ALA	2.3
1	B	90	LEU	2.3
1	A	90	LEU	2.2
1	B	6	ILE	2.1

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

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

6.3 Carbohydrates

There are no monosaccharides in this entry.

6.4 Ligands

There are no ligands in this entry.

6.5 Other polymers (i)

There are no such residues in this entry.