Full wwPDB X-ray Structure Validation Report (i)

Dec 14, 2023 – 02:34 pm GMT

PDB ID	:	4P2A
Title	:	Structure of mouse VPS26A bound to rat SNX27 PDZ domain
Authors	:	Clairfeuille, T.; Gallon, M.; Mas, C.; Ghai, R.; Teasdale, R.; Cullen, P.; Collins, B.
Deposited on	:	2014-03-03
Resolution	:	2.70 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:

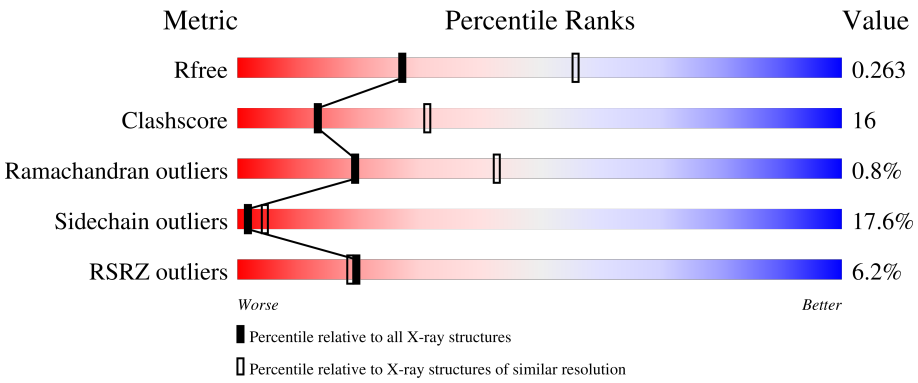
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.36
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation 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 2.70 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	2808 (2.70-2.70)
Clashscore	141614	3122 (2.70-2.70)
Ramachandran outliers	138981	3069 (2.70-2.70)
Sidechain outliers	138945	3069 (2.70-2.70)
RSRZ outliers	127900	2737 (2.70-2.70)

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	327	7%; 50%, 26%, 11%, 12%
2	B	101	2%; 67%, 27%, . .

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 3109 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 Vacuolar protein sorting-associated protein 26A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	287	2353	1515	390	439	9	0	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MET	-	initiating methionine	UNP P40336
A	2	HIS	-	expression tag	UNP P40336
A	3	HIS	-	expression tag	UNP P40336
A	4	HIS	-	expression tag	UNP P40336
A	5	HIS	-	expression tag	UNP P40336
A	6	HIS	-	expression tag	UNP P40336
A	7	HIS	-	expression tag	UNP P40336
A	8	MET	-	expression tag	UNP P40336

- Molecule 2 is a protein called Sorting nexin-27.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	B	97	719	446	137	136	0	0	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	35	GLY	-	expression tag	UNP Q8K4V4
B	36	SER	-	expression tag	UNP Q8K4V4
B	37	HIS	-	expression tag	UNP Q8K4V4
B	38	GLY	-	expression tag	UNP Q8K4V4
B	39	GLY	-	expression tag	UNP Q8K4V4
B	40	SER	-	expression tag	UNP Q8K4V4

- Molecule 3 is MERCURY (II) ION (three-letter code: HG) (formula: Hg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Hg		
3	A	2	2	2	0	0

- Molecule 4 is water.

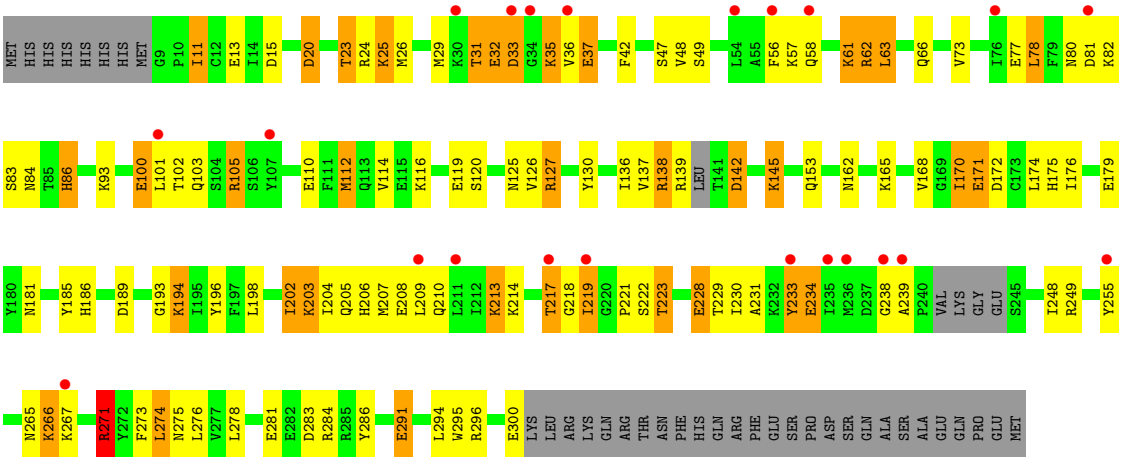
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
4	A	24	24	24	0	0
			Total	O		
4	B	11	11	11	0	0

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.

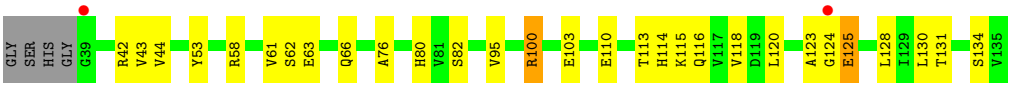
• Molecule 1: Vacuolar protein sorting-associated protein 26A

Chain A:



• Molecule 2: Sorting nexin-27

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 3 1 2	Depositor
Cell constants a, b, c, α, β, γ	113.81Å 113.81Å 94.77Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	56.91 – 2.70 56.91 – 2.70	Depositor EDS
% Data completeness (in resolution range)	100.0 (56.91-2.70) 100.0 (56.91-2.70)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.12 (at 2.69Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.8.4_1496)	Depositor
R, R_{free}	0.215 , 0.259 0.221 , 0.263	Depositor DCC
R_{free} test set	1949 reflections (10.03%)	wwPDB-VP
Wilson B-factor (Å^2)	65.5	Xtriage
Anisotropy	0.112	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 61.9	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.047 for -h,-k,l	Xtriage
F_o,F_c correlation	0.92	EDS
Total number of atoms	3109	wwPDB-VP
Average B, all atoms (Å^2)	82.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.15% 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 (i)

5.1 Standard geometry (i)

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

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	0.53	0/2399	0.69	1/3232 (0.0%)
2	B	0.51	0/726	0.73	0/979
All	All	0.52	0/3125	0.70	1/4211 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	271	ARG	NE-CZ-NH1	5.40	123.00	120.30

There are no chirality outliers.

There are no planarity outliers.

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	A	2353	0	2364	82	0
2	B	719	0	742	19	0
3	A	2	0	0	0	0
4	A	24	0	0	1	0
4	B	11	0	0	4	0
All	All	3109	0	3106	100	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 16.

All (100) 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:271:ARG:HH11	1:A:271:ARG:HG2	1.27	0.96
2:B:58:ARG:HG2	2:B:82:SER:HB3	1.51	0.92
2:B:100:ARG:HG3	2:B:100:ARG:HH11	1.43	0.83
1:A:56:PHE:HZ	1:A:101:LEU:HB3	1.44	0.82
1:A:210:GLN:HG3	1:A:275:ASN:HB2	1.64	0.78
2:B:134:SER:OG	4:B:205:HOH:O	1.98	0.76
1:A:271:ARG:NH1	1:A:291:GLU:OE1	2.20	0.75
1:A:31:THR:HG22	1:A:37:GLU:HG2	1.70	0.73
1:A:62:ARG:NH2	1:A:100:GLU:OE2	2.21	0.73
1:A:291:GLU:OE2	4:A:509:HOH:O	2.07	0.73
1:A:56:PHE:CZ	1:A:101:LEU:HB3	2.25	0.71
1:A:138:ARG:HB3	1:A:139:ARG:HD2	1.75	0.67
1:A:101:LEU:HD21	1:A:105:ARG:HE	1.60	0.67
2:B:53:TYR:OH	2:B:125:GLU:O	2.12	0.66
1:A:126:VAL:HB	1:A:217:THR:CG2	2.25	0.66
1:A:47:SER:OG	1:A:112:MET:O	2.10	0.66
1:A:126:VAL:HB	1:A:217:THR:HG21	1.78	0.65
2:B:113:THR:H	2:B:116:GLN:NE2	1.95	0.64
1:A:175:HIS:HD2	1:A:198:LEU:HB2	1.66	0.61
1:A:119:GLU:OE1	1:A:296:ARG:NH1	2.34	0.61
1:A:202:ILE:HD12	1:A:203:LYS:N	2.16	0.61
1:A:80:ASN:H	1:A:80:ASN:HD22	1.50	0.60
1:A:213:LYS:HB3	1:A:230:ILE:HD11	1.84	0.60
1:A:86:HIS:CE1	1:A:265:ASN:HD22	2.20	0.59
1:A:20:ASP:OD1	1:A:20:ASP:N	2.35	0.59
2:B:113:THR:H	2:B:116:GLN:HE21	1.50	0.59
1:A:77:GLU:OE1	1:A:127:ARG:NH2	2.27	0.58
1:A:49:SER:HB3	1:A:110:GLU:HG3	1.85	0.57
2:B:124:GLY:N	4:B:209:HOH:O	2.36	0.57
2:B:76:ALA:HB3	2:B:110:GLU:HB3	1.87	0.57
1:A:219:ILE:HD12	1:A:222:SER:HB2	1.88	0.56
1:A:25:LYS:HE3	1:A:26:MET:H	1.73	0.54
2:B:58:ARG:HG3	2:B:80:HIS:CE1	2.43	0.54
1:A:202:ILE:HD11	1:A:281:GLU:HB3	1.91	0.53
1:A:206:HIS:HE1	1:A:234:GLU:HG2	1.72	0.53
1:A:284:ARG:HD3	1:A:286:TYR:CZ	2.42	0.53
2:B:128:LEU:HD21	2:B:130:LEU:HD21	1.90	0.53
1:A:174:LEU:HB2	1:A:202:ILE:HG23	1.92	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:63:GLU:HG2	2:B:113:THR:HG23	1.91	0.52
1:A:20:ASP:HB3	1:A:24:ARG:HB2	1.93	0.51
2:B:42:ARG:NH2	4:B:205:HOH:O	2.40	0.51
1:A:231:ALA:HB2	1:A:255:TYR:CZ	2.46	0.50
1:A:82:LYS:HB3	1:A:83:SER:HB3	1.93	0.50
1:A:170:ILE:CG2	1:A:174:LEU:HB3	2.42	0.50
1:A:214:LYS:HD3	1:A:273:PHE:CE1	2.45	0.50
1:A:66:GLN:N	1:A:137:VAL:O	2.39	0.50
1:A:194:LYS:HD3	1:A:196:TYR:CE1	2.46	0.50
1:A:103:GLN:HE21	1:A:105:ARG:NH1	2.09	0.50
2:B:114:HIS:CE1	2:B:118:VAL:HG21	2.47	0.49
2:B:44:VAL:HG11	2:B:95:VAL:CG2	2.42	0.49
1:A:20:ASP:CB	1:A:24:ARG:HB2	2.42	0.49
2:B:58:ARG:CG	2:B:82:SER:HB3	2.32	0.49
2:B:123:ALA:HB3	4:B:209:HOH:O	2.12	0.49
1:A:31:THR:OG1	1:A:33:ASP:OD2	2.25	0.49
1:A:139:ARG:HD2	1:A:139:ARG:N	2.29	0.48
1:A:175:HIS:CD2	1:A:198:LEU:HD12	2.50	0.47
1:A:274:LEU:HD12	1:A:274:LEU:HA	1.80	0.46
1:A:78:LEU:HD23	1:A:126:VAL:HG23	1.97	0.46
1:A:271:ARG:HG2	1:A:271:ARG:NH1	2.05	0.46
2:B:103:GLU:HG3	2:B:131:THR:HB	1.98	0.46
1:A:78:LEU:HD23	1:A:78:LEU:HA	1.72	0.46
1:A:204:ILE:HG12	1:A:278:LEU:HD11	1.97	0.46
1:A:218:GLY:HA3	1:A:223:THR:HA	1.97	0.46
1:A:11:ILE:HD11	1:A:63:LEU:CD2	2.45	0.45
1:A:205:GLN:NE2	1:A:283:ASP:OD1	2.48	0.45
1:A:181:ASN:OD1	1:A:181:ASN:N	2.50	0.45
1:A:33:ASP:CG	1:A:35:LYS:H	2.19	0.44
1:A:42:PHE:CE2	1:A:48:VAL:HG22	2.52	0.44
2:B:100:ARG:HG3	2:B:100:ARG:NH1	2.20	0.44
1:A:186:HIS:O	1:A:189:ASP:HB2	2.17	0.44
1:A:58:GLN:HB2	1:A:61:LYS:HG2	2.00	0.44
1:A:78:LEU:HD21	1:A:267:LYS:HB3	1.99	0.44
1:A:185:TYR:O	1:A:294:LEU:HA	2.17	0.44
1:A:186:HIS:HB3	1:A:295:TRP:CZ2	2.53	0.43
1:A:273:PHE:CE2	1:A:291:GLU:HB2	2.52	0.43
1:A:11:ILE:H	1:A:11:ILE:HG12	1.67	0.43
1:A:233:TYR:CE2	1:A:248:ILE:HD12	2.53	0.43
1:A:25:LYS:HD2	1:A:25:LYS:HA	1.40	0.43
1:A:101:LEU:HD23	1:A:105:ARG:HH21	1.84	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:20:ASP:O	1:A:23:THR:HG23	2.19	0.43
1:A:103:GLN:HE21	1:A:105:ARG:CZ	2.31	0.43
1:A:29:MET:O	1:A:37:GLU:HG3	2.20	0.42
1:A:179:GLU:O	1:A:193:GLY:HA2	2.19	0.42
1:A:153:GLN:NE2	2:B:66:GLN:HB3	2.35	0.42
1:A:73:VAL:O	1:A:130:TYR:HA	2.18	0.42
1:A:168:VAL:HG23	1:A:276:LEU:HD23	2.01	0.42
1:A:176:ILE:HD11	1:A:204:ILE:HD11	2.01	0.42
1:A:101:LEU:HD23	1:A:101:LEU:HA	1.67	0.41
1:A:142:ASP:N	1:A:142:ASP:OD1	2.53	0.41
1:A:32:GLU:OE2	1:A:33:ASP:N	2.54	0.41
1:A:114:VAL:HB	1:A:116:LYS:NZ	2.35	0.41
1:A:145:LYS:HD3	1:A:145:LYS:HA	1.86	0.41
1:A:171:GLU:HG3	1:A:172:ASP:N	2.36	0.41
1:A:86:HIS:NE2	1:A:265:ASN:ND2	2.69	0.41
1:A:238:GLY:HA2	1:A:239:ALA:HA	1.70	0.41
1:A:198:LEU:HD23	1:A:198:LEU:HA	1.88	0.41
1:A:209:LEU:HD12	1:A:275:ASN:O	2.21	0.41
1:A:221:PRO:O	1:A:223:THR:OG1	2.38	0.41
1:A:228:GLU:HG3	1:A:229:THR:N	2.35	0.40
1:A:33:ASP:OD1	1:A:35:LYS:HE2	2.22	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	281/327 (86%)	272 (97%)	6 (2%)	3 (1%)	14 34
2	B	95/101 (94%)	92 (97%)	3 (3%)	0	100 100
All	All	376/428 (88%)	364 (97%)	9 (2%)	3 (1%)	19 43

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	171	GLU
1	A	78	LEU
1	A	266	LYS

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	260/298 (87%)	208 (80%)	52 (20%)	1 3
2	B	76/78 (97%)	69 (91%)	7 (9%)	9 21
All	All	336/376 (89%)	277 (82%)	59 (18%)	2 4

All (59) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	11	ILE
1	A	13	GLU
1	A	15	ASP
1	A	20	ASP
1	A	23	THR
1	A	25	LYS
1	A	31	THR
1	A	32	GLU
1	A	33	ASP
1	A	35	LYS
1	A	36	VAL
1	A	37	GLU
1	A	57	LYS
1	A	61	LYS
1	A	62	ARG
1	A	63	LEU
1	A	81	ASP
1	A	84	ASN
1	A	86	HIS
1	A	93	LYS

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Mol	Chain	Res	Type
1	A	100	GLU
1	A	102	THR
1	A	105	ARG
1	A	112	MET
1	A	120	SER
1	A	125	ASN
1	A	127	ARG
1	A	136	ILE
1	A	138	ARG
1	A	142	ASP
1	A	145	LYS
1	A	162	ASN
1	A	165	LYS
1	A	170	ILE
1	A	194	LYS
1	A	202	ILE
1	A	203	LYS
1	A	207	MET
1	A	208	GLU
1	A	213	LYS
1	A	217	THR
1	A	219	ILE
1	A	223	THR
1	A	228	GLU
1	A	233	TYR
1	A	234	GLU
1	A	249	ARG
1	A	266	LYS
1	A	271	ARG
1	A	274	LEU
1	A	291	GLU
1	A	300	GLU
2	B	43	VAL
2	B	61	VAL
2	B	62	SER
2	B	100	ARG
2	B	115	LYS
2	B	120	LEU
2	B	125	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	80	ASN
1	A	103	GLN
1	A	175	HIS
1	A	265	ASN
2	B	116	GLN

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)

Of 2 ligands modelled in this entry, 2 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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	A	287/327 (87%)	0.63	22 (7%)	13	11	44, 85, 131, 152	0
2	B	97/101 (96%)	0.44	2 (2%)	63	65	42, 68, 100, 126	0
All	All	384/428 (89%)	0.58	24 (6%)	20	19	42, 79, 126, 152	0

All (24) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	219	ILE	4.7
1	A	30	LYS	4.6
1	A	235	ILE	3.9
2	B	39	GLY	3.5
1	A	54	LEU	3.2
1	A	101	LEU	3.2
1	A	76	ILE	2.9
1	A	34	GLY	2.9
1	A	239	ALA	2.9
1	A	33	ASP	2.8
1	A	56	PHE	2.7
1	A	81	ASP	2.7
1	A	36	VAL	2.7
1	A	107	TYR	2.6
1	A	238	GLY	2.5
1	A	209	LEU	2.5
1	A	236	MET	2.5
1	A	233	TYR	2.4
1	A	217	THR	2.3
1	A	267	LYS	2.2
1	A	255	TYR	2.2
2	B	124	GLY	2.2
1	A	58	GLN	2.2
1	A	211	LEU	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
3	HG	A	402	1/1	0.83	0.20	203,203,203,203	1
3	HG	A	401	1/1	0.91	0.17	189,189,189,189	1

6.5 Other polymers (i)

There are no such residues in this entry.