



# Full wwPDB X-ray Structure Validation Report ⓘ

May 13, 2020 – 07:28 am BST

PDB ID : 6N4A  
Title : PII-like SbtB from Cyanobium sp PCC 7001 (apo)  
Authors : Kaczmarek, J.A.; Jackson, C.J.  
Deposited on : 2018-11-18  
Resolution : 2.30 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](mailto: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.

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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 : 2.11  
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) : 2.11

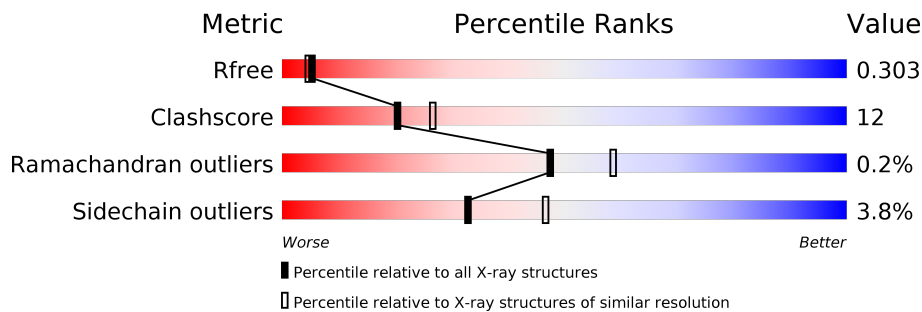
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.30 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	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)

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  $\geq 3$ , 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  $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	A	103	73% (green), 8% (yellow), 17% (grey)
1	B	103	61% (green), 18% (yellow), 18% (grey)
1	C	103	66% (green), 15% (yellow), 17% (grey)
1	D	103	72% (green), 10% (yellow), 18% (grey)
1	E	103	71% (green), 10% (yellow), 17% (grey)
1	F	103	50% (green), 30% (yellow), 17% (grey)

## 2 Entry composition [i](#)

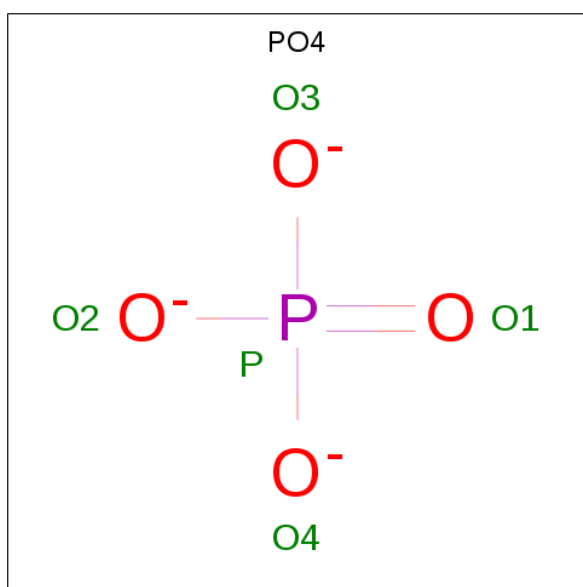
There are 3 unique types of molecules in this entry. The entry contains 4010 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 PII-like SbtB.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	85	Total 661	C 427	N 105	O 128	S 1	0	0	0
1	B	84	Total 659	C 426	N 106	O 126	S 1	0	0	0
1	C	85	Total 673	C 434	N 108	O 129	S 2	0	1	0
1	D	84	Total 651	C 421	N 101	O 128	S 1	0	0	0
1	E	85	Total 667	C 431	N 107	O 128	S 1	0	0	0
1	F	85	Total 667	C 431	N 107	O 128	S 1	0	0	0

- Molecule 2 is PHOSPHATE ION (three-letter code: PO4) (formula: O<sub>4</sub>P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	P	0	0
			5	4	1		
2	E	1	Total	O	P	0	0
			5	4	1		

- Molecule 3 is water.

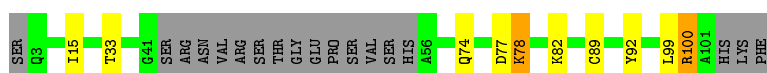
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	5	Total	O	0	0
			5	5		
3	B	3	Total	O	0	0
			3	3		
3	C	4	Total	O	0	0
			4	4		
3	D	6	Total	O	0	0
			6	6		
3	E	4	Total	O	0	0
			4	4		

### 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 the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. 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. 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.

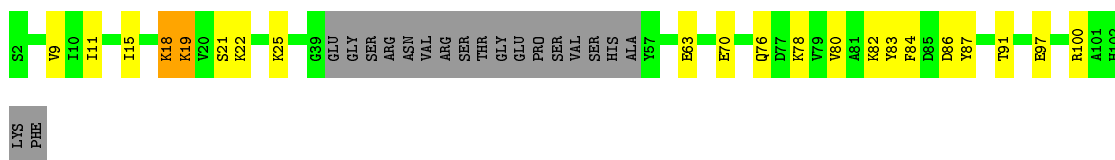
- Molecule 1: PII-like SbtB

Chain A: 



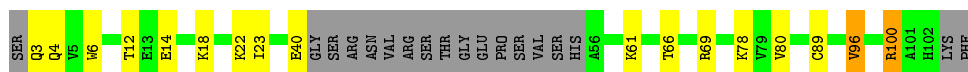
- Molecule 1: PII-like SbtB

Chain B: 



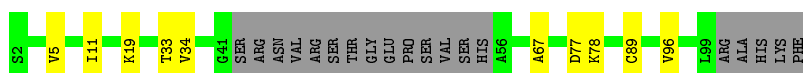
- Molecule 1: PII-like SbtB

Chain C: 



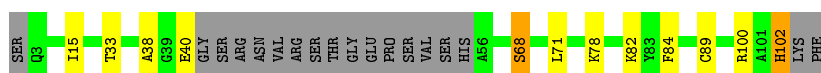
- Molecule 1: PII-like SbtB

Chain D: 



- Molecule 1: PII-like SbtB

Chain E: 



- Molecule 1: PII-like SbtB

Chain F: 

SER Q3 V9 I10 I11 I15 I16 I17 I18 I19 I20 S21 K22 I23 I24 I25 F26 A27 Y32 T33 V34 L35 A38 G39 E40 GLY SER ARG ARG ASN VAL ARG ARG SER SER THR GLY GLU PRO SER SER VAL SER HIS A56 Y57 I60 K61 F62 R69 E70 L71 A72 D73 Q74 I75 Q76

V79 V80 A81 K82 Y83 F84 D85 D86 Y87 T91 S94 R100 A101 H102 LYS PHE

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	46.62Å 51.03Å 66.60Å 94.39° 106.13° 103.55°	Depositor
Resolution (Å)	49.03 – 2.30 49.04 – 2.30	Depositor EDS
% Data completeness (in resolution range)	98.0 (49.03-2.30) 97.8 (49.04-2.30)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.30 (at 2.29Å)	Xtrriage
Refinement program	PHENIX	Depositor
R, $R_{free}$	(Not available) , (Not available) 0.246 , 0.303	Depositor DCC
$R_{free}$ test set	1185 reflections (4.81%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	59.5	Xtrriage
Anisotropy	0.361	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 54.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	4010	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	75.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.55% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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 [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: PO4

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	0.46	0/668	0.65	0/901
1	B	0.38	0/667	0.54	0/900
1	C	0.48	0/681	0.60	0/919
1	D	0.43	0/658	0.53	0/888
1	E	0.38	0/675	0.57	0/911
1	F	0.38	0/675	0.63	0/911
All	All	0.42	0/4024	0.59	0/5430

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 [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	661	0	682	12	0
1	B	659	0	680	26	0
1	C	673	0	690	20	0
1	D	651	0	669	9	0
1	E	667	0	686	17	0
1	F	667	0	686	39	0
2	A	5	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	E	5	0	0	0	0
3	A	5	0	0	1	0
3	B	3	0	0	0	0
3	C	4	0	0	2	0
3	D	6	0	0	0	0
3	E	4	0	0	0	0
All	All	4010	0	4093	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 12.

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:B:18:LYS:HE2	1:B:18:LYS:H	1.05	1.17
1:A:92:TYR:CD1	1:C:96:VAL:HG21	1.87	1.09
1:F:38:ALA:HB2	1:F:57:TYR:HA	1.44	0.97
1:B:18:LYS:HE2	1:B:18:LYS:N	1.88	0.87
1:B:19:LYS:HE3	1:B:22:LYS:HZ1	1.40	0.86
1:B:19:LYS:HE3	1:B:22:LYS:NZ	1.95	0.80
1:B:18:LYS:CE	1:B:18:LYS:H	1.94	0.75
1:A:77:ASP:O	1:A:78:LYS:HB2	1.88	0.73
1:D:5:VAL:HG23	1:D:67:ALA:HA	1.68	0.72
1:A:92:TYR:HD1	1:C:96:VAL:HG21	1.56	0.69
1:E:40:GLU:OE2	1:E:40:GLU:N	2.26	0.69
1:F:27:ALA:CB	1:F:75:ILE:HD11	2.24	0.68
1:D:34:VAL:HG22	1:F:38:ALA:O	1.94	0.68
1:A:92:TYR:CD1	1:C:96:VAL:CG2	2.74	0.67
1:F:76:GLN:O	1:F:80:VAL:HG12	1.95	0.67
1:B:76:GLN:O	1:B:80:VAL:HG12	1.96	0.65
1:B:15:ILE:H	1:B:15:ILE:HD12	1.62	0.64
1:F:83:TYR:HB3	1:F:87:TYR:HD2	1.64	0.63
1:C:14:GLU:HG2	3:C:204:HOH:O	1.98	0.63
1:F:22:LYS:HA	1:F:25:LYS:HG3	1.80	0.62
1:B:100:ARG:HH11	1:C:80:VAL:HG11	1.64	0.62
1:C:4:GLN:HB2	1:E:15:ILE:HG12	1.83	0.61
1:F:69:ARG:NH1	1:F:73:ASP:OD2	2.36	0.59
1:B:97:GLU:OE2	1:C:69:ARG:NH1	2.32	0.58
1:E:38:ALA:HB3	1:F:34:VAL:HG13	1.85	0.58
1:F:15:ILE:HG13	1:F:16:LEU:HD22	1.86	0.58
1:B:19:LYS:CE	1:B:22:LYS:NZ	2.66	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:82:LYS:HD2	1:F:83:TYR:CZ	2.39	0.57
1:F:27:ALA:HB2	1:F:75:ILE:HD11	1.87	0.56
1:A:74:GLN:O	1:A:77:ASP:O	2.25	0.55
1:B:19:LYS:CE	1:B:19:LYS:CA	2.85	0.54
1:F:18:LYS:O	1:F:22:LYS:HE2	2.07	0.54
1:E:40:GLU:HG3	1:F:32:TYR:HE1	1.73	0.54
1:F:80:VAL:HG23	1:F:84:PHE:HB2	1.89	0.54
1:B:100:ARG:HD2	1:C:80:VAL:HG21	1.89	0.53
1:F:100:ARG:HG2	1:F:100:ARG:HH21	1.72	0.53
1:A:92:TYR:HD1	1:C:96:VAL:CG2	2.19	0.53
1:C:12:THR:HG22	1:C:89[A]:CYS:SG	2.49	0.53
1:D:11:ILE:HD13	1:E:33:THR:HG21	1.90	0.52
1:B:63:GLU:OE2	1:C:61:LYS:NZ	2.38	0.52
1:C:3:GLN:C	1:E:15:ILE:HD11	2.30	0.52
1:A:78:LYS:O	1:A:82:LYS:HB2	2.09	0.52
1:B:18:LYS:HA	1:B:21:SER:OG	2.11	0.51
1:E:78:LYS:HE3	1:E:82:LYS:HG3	1.91	0.51
1:E:40:GLU:HG3	1:F:32:TYR:CE1	2.46	0.51
1:C:40:GLU:OE1	1:C:40:GLU:N	2.44	0.50
1:D:89:CYS:O	1:E:102:HIS:N	2.40	0.50
1:C:100:ARG:NE	1:C:100:ARG:HA	2.26	0.50
1:C:23:ILE:HD13	1:C:78:LYS:HG2	1.94	0.50
1:B:25:LYS:NZ	1:C:40:GLU:HG3	2.26	0.50
1:B:86:ASP:OD1	1:B:86:ASP:N	2.44	0.50
1:F:27:ALA:HB1	1:F:75:ILE:HD11	1.93	0.50
1:B:80:VAL:HG23	1:B:84:PHE:CG	2.47	0.49
1:F:71:LEU:O	1:F:75:ILE:HD13	2.13	0.49
1:B:19:LYS:HA	1:B:19:LYS:CE	2.43	0.49
1:E:84:PHE:CE1	1:F:102:HIS:HB2	2.48	0.48
1:C:66:THR:HA	3:C:201:HOH:O	2.13	0.48
1:A:77:ASP:O	1:A:78:LYS:CB	2.60	0.48
1:A:99:LEU:O	1:A:100:ARG:HD3	2.14	0.48
1:D:77:ASP:OD1	1:E:100:ARG:NH1	2.47	0.48
1:A:33:THR:HG21	1:B:11:ILE:HD13	1.96	0.47
1:C:23:ILE:HG23	1:C:78:LYS:HD3	1.96	0.47
1:B:78:LYS:O	1:B:82:LYS:HG3	2.14	0.47
1:F:60:ILE:HD12	1:F:62:PHE:CE1	2.50	0.47
1:F:82:LYS:O	1:F:82:LYS:HG2	2.14	0.47
1:F:82:LYS:HB2	1:F:82:LYS:HE3	1.59	0.45
1:F:75:ILE:N	1:F:75:ILE:HD12	2.31	0.45
1:F:82:LYS:HG2	1:F:83:TYR:CE1	2.51	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:21:SER:O	1:B:25:LYS:HG2	2.17	0.45
1:B:70:GLU:CD	1:B:70:GLU:H	2.18	0.45
1:E:78:LYS:CE	1:E:82:LYS:HG3	2.47	0.45
1:F:80:VAL:HG23	1:F:84:PHE:HD2	1.81	0.45
1:B:83:TYR:O	1:B:84:PHE:HB3	2.16	0.45
1:E:84:PHE:CZ	1:F:102:HIS:HB2	2.52	0.45
1:A:15:ILE:H	1:A:15:ILE:HD12	1.82	0.44
1:D:5:VAL:HG12	1:D:96:VAL:HG23	2.00	0.44
1:F:82:LYS:HD2	1:F:83:TYR:OH	2.17	0.44
1:F:22:LYS:HD3	1:F:25:LYS:HE2	1.99	0.43
1:F:75:ILE:O	1:F:79:VAL:HG23	2.17	0.43
1:F:84:PHE:HD1	1:F:84:PHE:O	2.01	0.43
1:F:20:VAL:HA	1:F:23:ILE:HD12	1.99	0.43
1:E:78:LYS:HD2	1:E:78:LYS:HA	1.79	0.43
1:F:82:LYS:O	1:F:83:TYR:CD1	2.72	0.42
1:B:83:TYR:HB3	1:B:87:TYR:HB2	2.01	0.42
1:C:3:GLN:N	1:E:15:ILE:HD11	2.34	0.42
1:B:19:LYS:HE2	1:B:19:LYS:HB3	1.76	0.42
1:B:9:VAL:O	1:B:91:THR:HA	2.20	0.42
1:E:68:SER:HG	1:E:71:LEU:H	1.66	0.42
1:D:33:THR:HG21	1:F:11:ILE:HD13	2.01	0.42
1:A:99:LEU:C	1:A:100:ARG:HD3	2.40	0.41
1:D:19:LYS:HA	1:D:19:LYS:HE2	2.03	0.41
1:F:19:LYS:O	1:F:23:ILE:HG13	2.21	0.41
1:F:9:VAL:O	1:F:91:THR:HA	2.21	0.41
1:D:96:VAL:HG12	1:F:94:SER:HB3	2.03	0.41
1:F:35:LEU:HD22	1:F:35:LEU:N	2.36	0.41
1:E:78:LYS:HZ1	1:E:82:LYS:HG3	1.85	0.40
1:F:80:VAL:HG23	1:F:84:PHE:CD2	2.57	0.40
2:A:201:PO4:O1	3:A:301:HOH:O	2.21	0.40
1:C:6:TRP:CE2	1:C:69:ARG:HB2	2.56	0.40
1:F:16:LEU:HD21	1:F:87:TYR:CE2	2.56	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	81/103 (79%)	78 (96%)	2 (2%)	1 (1%)	13	14
1	B	80/103 (78%)	74 (92%)	6 (8%)	0	100	100
1	C	82/103 (80%)	79 (96%)	3 (4%)	0	100	100
1	D	80/103 (78%)	78 (98%)	2 (2%)	0	100	100
1	E	81/103 (79%)	80 (99%)	1 (1%)	0	100	100
1	F	81/103 (79%)	77 (95%)	4 (5%)	0	100	100
All	All	485/618 (78%)	466 (96%)	18 (4%)	1 (0%)	47	58

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	78	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	70/87 (80%)	68 (97%)	2 (3%)	42	58
1	B	71/87 (82%)	69 (97%)	2 (3%)	43	60
1	C	72/87 (83%)	68 (94%)	4 (6%)	21	29
1	D	70/87 (80%)	69 (99%)	1 (1%)	67	81
1	E	71/87 (82%)	68 (96%)	3 (4%)	30	42
1	F	71/87 (82%)	67 (94%)	4 (6%)	21	29
All	All	425/522 (81%)	409 (96%)	16 (4%)	33	47

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	89	CYS
1	A	100	ARG
1	B	18	LYS
1	B	19	LYS
1	C	18	LYS
1	C	22	LYS
1	C	96	VAL
1	C	100	ARG
1	D	78	LYS
1	E	68	SER
1	E	89	CYS
1	E	102	HIS
1	F	34	VAL
1	F	35	LEU
1	F	84	PHE
1	F	86	ASP

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

Mol	Chain	Res	Type
1	A	76	GLN
1	F	74	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 carbohydrates in this entry.

### 5.6 Ligand geometry [i](#)

2 ligands are 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
2	PO4	A	201	-	4,4,4	0.80	0	6,6,6	0.56	0
2	PO4	E	201	-	4,4,4	0.77	0	6,6,6	0.52	0

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.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	201	PO4	1	0

## 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

Unable to reproduce the depositors R factor - this section is therefore empty.

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

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.3 Carbohydrates

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.4 Ligands

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.5 Other polymers

Unable to reproduce the depositors R factor - this section is therefore empty.