



Full wwPDB X-ray Structure Validation Report ⓘ

Jan 22, 2018 – 02:40 PM EST

PDB ID : 6BSN
Title : Structure of proline utilization A (PutA) with proline bound in remote sites
Authors : Tanner, J.J.; Korasick, D.A.
Deposited on : 2017-12-04
Resolution : 2.15 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

<http://wwpdb.org/validation/2016/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.7.2 (RC1), CSD as538be (2017)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20030736
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : rb-20030736

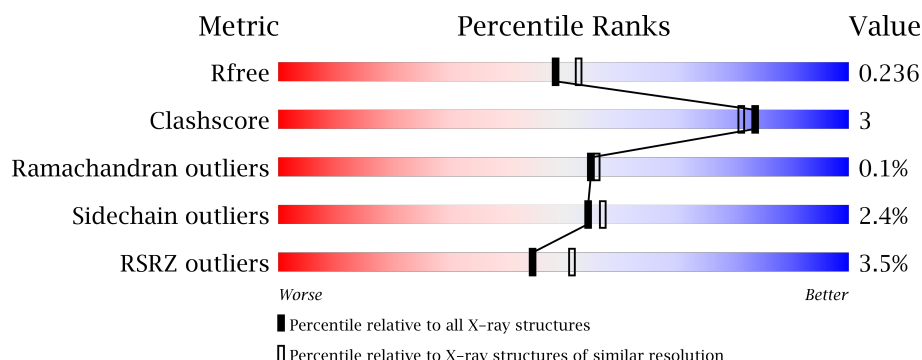
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.15 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}	100719	1170 (2.16-2.16)
Clashscore	112137	1278 (2.16-2.16)
Ramachandran outliers	110173	1256 (2.16-2.16)
Sidechain outliers	110143	1255 (2.16-2.16)
RSRZ outliers	101464	1175 (2.16-2.16)

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 ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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	1001	<div> <div>3%</div> <div>89%</div> <div>8%</div> <div>.</div> </div>
1	B	1001	<div> <div>4%</div> <div>90%</div> <div>7%</div> <div>.</div> </div>

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	PRO	A	2002	-	-	-	X
3	PRO	A	2003	-	-	-	X
3	PRO	A	2005	-	-	-	X
3	PRO	A	2006	-	-	-	X
3	PRO	B	1002	-	-	-	X
3	PRO	B	1003	-	-	-	X
3	PRO	B	1004	-	-	-	X
4	SO4	A	2007	-	-	-	X
4	SO4	A	2009	-	-	X	X
4	SO4	B	1010	-	-	-	X

2 Entry composition i

There are 5 unique types of molecules in this entry. The entry contains 15507 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.

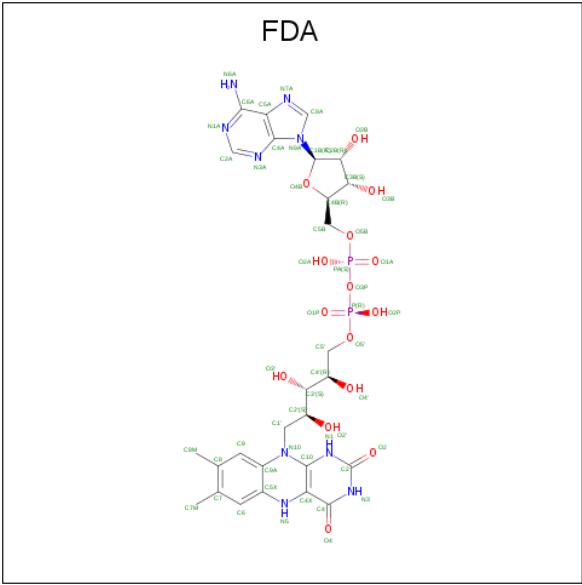
- Molecule 1 is a protein called Bifunctional protein PutA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	973	Total	C	N	O	S	0	2	0
			7269	4591	1316	1340	22			
1	B	973	Total	C	N	O	S	0	1	0
			7271	4593	1311	1345	22			

There are 6 discrepancies between the modelled and reference sequences:

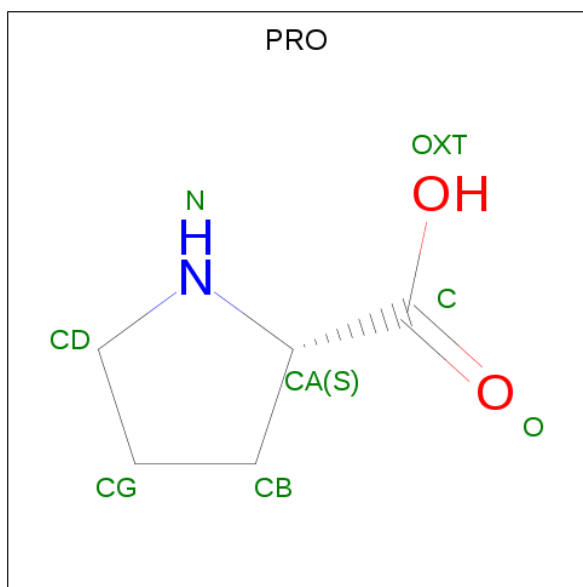
Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	expression tag	UNP Q89E26
A	0	HIS	-	expression tag	UNP Q89E26
A	792	ALA	CYS	engineered mutation	UNP Q89E26
B	-1	GLY	-	expression tag	UNP Q89E26
B	0	HIS	-	expression tag	UNP Q89E26
B	792	ALA	CYS	engineered mutation	UNP Q89E26

- Molecule 2 is DIHYDROFLAVINE-ADENINE DINUCLEOTIDE (three-letter code: FDA) (formula: C₂₇H₃₅N₉O₁₅P₂).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			53	27	9	15	2		
2	B	1	Total	C	N	O	P	0	0
			53	27	9	15	2		

- Molecule 3 is PROLINE (three-letter code: PRO) (formula: $C_5H_9NO_2$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			8	5	1	2		
3	A	1	Total	C	N	O	0	0
			8	5	1	2		
3	A	1	Total	C	N	O	0	0
			8	5	1	2		
3	A	1	Total	C	N	O	0	0
			8	5	1	2		
3	A	1	Total	C	N	O	0	0
			8	5	1	2		
3	B	1	Total	C	N	O	0	0
			8	5	1	2		
3	B	1	Total	C	N	O	0	0
			8	5	1	2		
3	B	1	Total	C	N	O	0	0
			8	5	1	2		

- Molecule 4 is SULFATE ION (three-letter code: SO4) (formula: O_4S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	O	S	0	0
			5	4	1		
4	A	1	Total	O	S	0	0
			5	4	1		
4	A	1	Total	O	S	0	0
			5	4	1		
4	A	1	Total	O	S	0	0
			5	4	1		
4	A	1	Total	O	S	0	0
			5	4	1		
4	A	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		

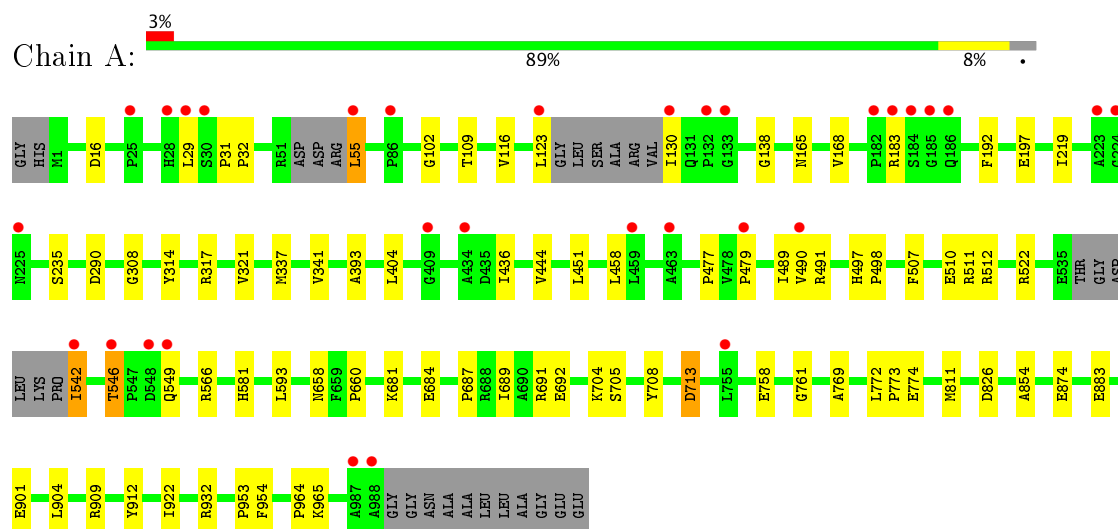
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	400	Total 400	O 400	0	0
5	B	319	Total 319	O 319	0	0

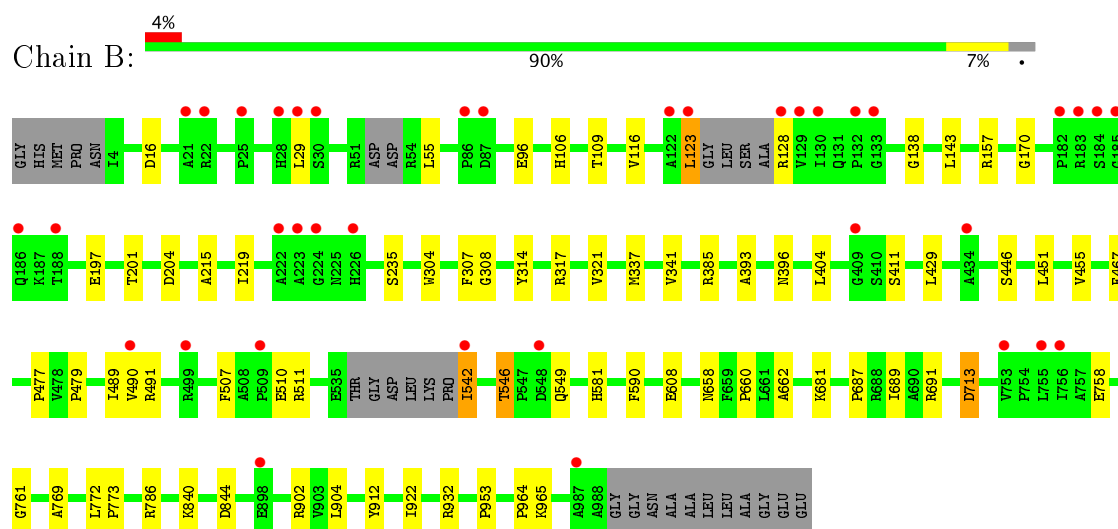
3 Residue-property plots [i](#)

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 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: Bifunctional protein PutA



• Molecule 1: Bifunctional protein PutA



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	166.76Å 194.21Å 108.74Å 90.00° 121.39° 90.00°	Depositor
Resolution (Å)	47.02 – 2.15 47.02 – 2.15	Depositor EDS
% Data completeness (in resolution range)	98.3 (47.02-2.15) 99.1 (47.02-2.15)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.14 (at 2.16Å)	Xtriage
Refinement program	PHENIX	Depositor
R, R_{free}	0.209 , 0.239 0.203 , 0.236	Depositor DCC
R_{free} test set	7938 reflections (5.02%)	DCC
Wilson B-factor (Å ²)	31.3	Xtriage
Anisotropy	0.318	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 40.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	15507	wwPDB-VP
Average B, all atoms (Å ²)	39.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 12.49% 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: FDA, SO4

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	0.41	0/7417	0.57	0/10086
1	B	0.38	0/7415	0.55	0/10082
All	All	0.40	0/14832	0.56	0/20168

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	7269	0	7244	42	0
1	B	7271	0	7237	38	0
2	A	53	0	33	1	0
2	B	53	0	33	0	0
3	A	40	0	35	2	0
3	B	32	0	28	2	0
4	A	35	0	0	2	0
4	B	35	0	0	1	0
5	A	400	0	0	3	0
5	B	319	0	0	1	0
All	All	15507	0	14610	81	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 3.

All (81) 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:512:ARG:NH1	4:A:2009:SO4:O1	2.22	0.73
1:A:964:PRO:HB3	3:B:1003:PRO:HB3	1.69	0.72
3:A:2003:PRO:HB3	1:B:964:PRO:HB3	1.73	0.70
1:B:581:HIS:ND1	4:B:1008:SO4:O1	2.28	0.65
1:B:660:PRO:HB2	1:B:689:ILE:HG21	1.79	0.65
1:A:546:THR:HG23	1:A:549:GLN:H	1.63	0.63
1:B:546:THR:HG23	1:B:549:GLN:H	1.62	0.63
1:A:581:HIS:ND1	4:A:2009:SO4:O4	2.30	0.62
1:A:477:PRO:HB2	1:A:479:PRO:HD2	1.82	0.61
1:A:55:LEU:HD21	1:A:165:ASN:HD22	1.67	0.60
1:B:451:LEU:HB3	1:B:772:LEU:HD13	1.84	0.59
1:A:901:GLU:OE1	1:A:932:ARG:NH2	2.32	0.57
1:A:308:GLY:HA3	1:A:337:MET:O	2.03	0.57
1:B:477:PRO:HB2	1:B:479:PRO:HD2	1.88	0.55
1:A:566:ARG:HH11	1:B:932:ARG:HA	1.72	0.55
1:B:507:PHE:O	1:B:510:GLU:HG2	2.06	0.55
1:A:116:VAL:HG11	1:A:773:PRO:HG2	1.90	0.54
1:A:542:ILE:HD12	1:A:687:PRO:HG2	1.89	0.54
1:B:109:THR:HG23	1:B:769:ALA:HB3	1.88	0.54
1:B:106:HIS:CD2	1:B:128:ARG:HD2	2.43	0.54
1:B:840:LYS:NZ	1:B:844:ASP:OD2	2.37	0.54
1:B:116:VAL:HG11	1:B:773:PRO:HG2	1.91	0.53
1:A:901:GLU:CD	1:A:932:ARG:HH22	2.12	0.53
1:B:308:GLY:HA3	1:B:337:MET:O	2.08	0.52
1:B:761:GLY:HA2	1:B:912:TYR:CD1	2.45	0.52
1:A:451:LEU:HB3	1:A:772:LEU:HD13	1.91	0.52
1:B:317:ARG:O	1:B:321:VAL:HG23	2.10	0.51
1:A:904:LEU:HD13	1:A:932:ARG:HG2	1.91	0.51
1:A:542:ILE:HD13	1:A:691:ARG:HD3	1.94	0.50
1:A:109:THR:HG23	1:A:769:ALA:HB3	1.92	0.50
1:A:341:VAL:HG12	1:A:393:ALA:HB3	1.94	0.49
1:B:590:PHE:HD2	1:B:689:ILE:HD11	1.79	0.48
1:B:904:LEU:HD13	1:B:932:ARG:HG2	1.96	0.48
1:B:542:ILE:HD12	1:B:687:PRO:HG2	1.95	0.48
1:A:290:ASP:OD2	1:A:522:ARG:NH2	2.38	0.47
1:A:192:PHE:CE2	1:A:219:ILE:HG23	2.50	0.47
1:B:396:ASN:HA	1:B:467:PHE:CD2	2.49	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:826:ASP:HB3	5:A:2424:HOH:O	2.14	0.47
1:B:404:LEU:HD22	1:B:429:LEU:HD11	1.97	0.47
1:A:593:LEU:HD11	1:A:692:GLU:HG3	1.97	0.46
1:A:684:GLU:OE1	1:A:713:ASP:HA	2.16	0.46
1:A:458:LEU:HD23	1:A:458:LEU:HA	1.72	0.46
1:B:608:GLU:HG3	1:B:662:ALA:HB2	1.98	0.45
3:B:1003:PRO:HA	5:B:1182:HOH:O	2.16	0.45
1:A:109:THR:HG22	5:A:2219:HOH:O	2.15	0.45
1:B:138:GLY:HA2	1:B:922:ILE:HG23	1.98	0.45
1:A:507:PHE:O	1:A:510:GLU:HG2	2.16	0.45
1:A:705:SER:HA	1:A:708:TYR:OH	2.18	0.44
1:A:761:GLY:HA2	1:A:912:TYR:CD1	2.53	0.44
1:A:953:PRO:HB2	1:A:965:LYS:HD3	2.00	0.43
1:B:489:ILE:O	1:B:491:ARG:N	2.45	0.43
1:B:215:ALA:O	1:B:219:ILE:HG12	2.18	0.43
1:B:304:TRP:CZ3	1:B:307:PHE:HB2	2.54	0.43
1:A:854:ALA:HB1	1:A:874:GLU:O	2.18	0.43
2:A:2001:FDA:H8A	5:A:2358:HOH:O	2.18	0.42
1:B:143:LEU:HA	1:B:143:LEU:HD12	1.88	0.42
1:B:713:ASP:OD2	1:B:713:ASP:N	2.47	0.42
1:A:774:GLU:HA	1:A:811:MET:SD	2.59	0.42
1:B:201:THR:O	1:B:204:ASP:HB2	2.19	0.42
1:B:451:LEU:O	1:B:455:VAL:HG23	2.20	0.42
1:A:436:ILE:HD13	1:A:436:ILE:HA	1.87	0.42
1:B:123:LEU:N	1:B:123:LEU:HD12	2.34	0.42
1:A:138:GLY:HA2	1:A:922:ILE:HG23	2.02	0.41
1:B:542:ILE:HD13	1:B:691:ARG:HD3	2.03	0.41
1:B:96:GLU:HG2	1:B:157:ARG:HH22	1.85	0.41
1:B:953:PRO:HB2	1:B:965:LYS:HD3	2.02	0.41
1:B:341:VAL:HG12	1:B:393:ALA:HB3	2.02	0.41
1:A:102:GLY:HA3	1:A:130:ILE:HG21	2.02	0.41
1:B:170:GLY:O	1:B:446:SER:HA	2.21	0.41
1:A:660:PRO:HB2	1:A:689:ILE:HG21	2.03	0.41
1:A:404:LEU:HD13	1:A:436:ILE:HD11	2.03	0.41
1:A:954:PHE:CE1	3:A:2002:PRO:HG2	2.55	0.41
1:A:31:PRO:HB2	1:A:32:PRO:HD3	2.03	0.41
1:A:497:HIS:ND1	1:A:498:PRO:HD2	2.35	0.41
1:A:168:VAL:HB	1:A:444:VAL:HG22	2.02	0.41
1:B:109:THR:CG2	1:B:769:ALA:HB3	2.51	0.40
1:B:385:ARG:NH1	1:B:411:SER:O	2.54	0.40
1:A:317:ARG:O	1:A:321:VAL:HG23	2.21	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:489:ILE:O	1:A:491:ARG:N	2.49	0.40
1:B:489:ILE:O	1:B:490:VAL:HG22	2.22	0.40
1:A:566:ARG:HG3	1:A:566:ARG:HH21	1.87	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	967/1001 (97%)	951 (98%)	15 (2%)	1 (0%)	55	56
1	B	966/1001 (96%)	951 (98%)	15 (2%)	0	100	100
All	All	1933/2002 (97%)	1902 (98%)	30 (2%)	1 (0%)	55	56

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	490	VAL

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	712/757 (94%)	694 (98%)	18 (2%)	53	55
1	B	712/757 (94%)	696 (98%)	16 (2%)	57	60

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	1424/1514 (94%)	1390 (98%)	34 (2%)	54 57

All (34) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	16	ASP
1	A	29	LEU
1	A	55	LEU
1	A	123	LEU
1	A	183	ARG
1	A	197	GLU
1	A	235	SER
1	A	314	TYR
1	A	511	ARG
1	A	542	ILE
1	A	546	THR
1	A	658	ASN
1	A	681	LYS
1	A	704	LYS
1	A	713	ASP
1	A	758	GLU
1	A	883	GLU
1	A	909	ARG
1	B	16	ASP
1	B	29	LEU
1	B	55	LEU
1	B	123	LEU
1	B	197	GLU
1	B	235	SER
1	B	314	TYR
1	B	511	ARG
1	B	542	ILE
1	B	546	THR
1	B	658	ASN
1	B	681	LYS
1	B	713	ASP
1	B	758	GLU
1	B	786	ARG
1	B	902	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	165	ASN
1	A	461	ASN
1	B	106	HIS
1	B	461	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 carbohydrates in this entry.

5.6 Ligand geometry ⓘ

25 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	FDA	A	2001	-	51,58,58	2.85	22 (43%)	54,89,89	2.13	9 (16%)
3	PRO	A	2002	-	5,8,8	1.68	1 (20%)	6,10,10	1.01	0
3	PRO	A	2003	-	5,8,8	1.70	1 (20%)	6,10,10	0.83	0
3	PRO	A	2004	-	5,8,8	1.72	1 (20%)	6,10,10	1.03	0
3	PRO	A	2005	-	5,8,8	1.69	1 (20%)	6,10,10	0.94	0
3	PRO	A	2006	-	5,8,8	1.53	1 (20%)	6,10,10	1.08	1 (16%)
4	SO4	A	2007	-	4,4,4	0.12	0	6,6,6	0.15	0
4	SO4	A	2008	-	4,4,4	0.22	0	6,6,6	0.18	0
4	SO4	A	2009	-	4,4,4	0.12	0	6,6,6	0.17	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	SO4	A	2010	-	4,4,4	0.16	0	6,6,6	0.11	0
4	SO4	A	2011	-	4,4,4	0.18	0	6,6,6	0.11	0
4	SO4	A	2012	-	4,4,4	0.13	0	6,6,6	0.13	0
4	SO4	A	2013	-	4,4,4	0.16	0	6,6,6	0.25	0
2	FDA	B	1001	-	51,58,58	2.90	21 (41%)	54,89,89	2.12	8 (14%)
3	PRO	B	1002	-	5,8,8	1.62	1 (20%)	6,10,10	1.06	1 (16%)
3	PRO	B	1003	-	5,8,8	1.81	1 (20%)	6,10,10	0.72	0
3	PRO	B	1004	-	5,8,8	1.52	1 (20%)	6,10,10	0.96	0
3	PRO	B	1005	-	5,8,8	1.62	1 (20%)	6,10,10	1.02	0
4	SO4	B	1006	-	4,4,4	0.17	0	6,6,6	0.10	0
4	SO4	B	1007	-	4,4,4	0.17	0	6,6,6	0.13	0
4	SO4	B	1008	-	4,4,4	0.16	0	6,6,6	0.13	0
4	SO4	B	1009	-	4,4,4	0.12	0	6,6,6	0.13	0
4	SO4	B	1010	-	4,4,4	0.21	0	6,6,6	0.08	0
4	SO4	B	1011	-	4,4,4	0.19	0	6,6,6	0.18	0
4	SO4	B	1012	-	4,4,4	0.15	0	6,6,6	0.13	0

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
2	FDA	A	2001	-	-	0/28/50/50	0/6/6/6
3	PRO	A	2002	-	-	0/0/11/11	0/1/1/1
3	PRO	A	2003	-	-	0/0/11/11	0/1/1/1
3	PRO	A	2004	-	-	0/0/11/11	0/1/1/1
3	PRO	A	2005	-	-	0/0/11/11	0/1/1/1
3	PRO	A	2006	-	-	0/0/11/11	0/1/1/1
4	SO4	A	2007	-	-	0/0/0/0	0/0/0/0
4	SO4	A	2008	-	-	0/0/0/0	0/0/0/0
4	SO4	A	2009	-	-	0/0/0/0	0/0/0/0
4	SO4	A	2010	-	-	0/0/0/0	0/0/0/0
4	SO4	A	2011	-	-	0/0/0/0	0/0/0/0
4	SO4	A	2012	-	-	0/0/0/0	0/0/0/0
4	SO4	A	2013	-	-	0/0/0/0	0/0/0/0
2	FDA	B	1001	-	-	0/28/50/50	0/6/6/6
3	PRO	B	1002	-	-	0/0/11/11	0/1/1/1
3	PRO	B	1003	-	-	0/0/11/11	0/1/1/1
3	PRO	B	1004	-	-	0/0/11/11	0/1/1/1
3	PRO	B	1005	-	-	0/0/11/11	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	SO4	B	1006	-	-	0/0/0/0	0/0/0/0
4	SO4	B	1007	-	-	0/0/0/0	0/0/0/0
4	SO4	B	1008	-	-	0/0/0/0	0/0/0/0
4	SO4	B	1009	-	-	0/0/0/0	0/0/0/0
4	SO4	B	1010	-	-	0/0/0/0	0/0/0/0
4	SO4	B	1011	-	-	0/0/0/0	0/0/0/0
4	SO4	B	1012	-	-	0/0/0/0	0/0/0/0

All (52) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	1003	PRO	CB-CA	-3.33	1.50	1.54
3	A	2004	PRO	CB-CA	-3.18	1.51	1.54
3	A	2005	PRO	CB-CA	-3.07	1.51	1.54
3	A	2003	PRO	CB-CA	-3.07	1.51	1.54
3	A	2002	PRO	CB-CA	-3.03	1.51	1.54
3	B	1002	PRO	CB-CA	-2.91	1.51	1.54
3	B	1005	PRO	CB-CA	-2.88	1.51	1.54
2	A	2001	FDA	C9A-C5X	-2.78	1.36	1.42
2	B	1001	FDA	C9A-C5X	-2.73	1.37	1.42
2	B	1001	FDA	C2B-C1B	-2.69	1.49	1.53
3	B	1004	PRO	CB-CA	-2.67	1.51	1.54
2	B	1001	FDA	O2'-C2'	-2.65	1.37	1.43
3	A	2006	PRO	CB-CA	-2.59	1.51	1.54
2	B	1001	FDA	O3B-C3B	-2.58	1.37	1.43
2	A	2001	FDA	O3B-C3B	-2.56	1.37	1.43
2	A	2001	FDA	O3'-C3'	-2.53	1.37	1.43
2	A	2001	FDA	PA-O5B	-2.47	1.48	1.59
2	A	2001	FDA	PA-O2A	-2.43	1.42	1.55
2	A	2001	FDA	C2B-C1B	-2.42	1.49	1.53
2	B	1001	FDA	C2B-C3B	-2.30	1.47	1.53
2	B	1001	FDA	PA-O5B	-2.24	1.49	1.59
2	B	1001	FDA	PA-O2A	-2.21	1.44	1.55
2	A	2001	FDA	C4X-C10	-2.10	1.37	1.41
2	B	1001	FDA	O2B-C2B	-2.10	1.38	1.43
2	B	1001	FDA	O4'-C4'	-2.08	1.38	1.43
2	A	2001	FDA	O2'-C2'	-2.07	1.38	1.43
2	A	2001	FDA	C2B-C3B	-2.07	1.48	1.53
2	B	1001	FDA	C2A-N3A	2.10	1.35	1.32
2	A	2001	FDA	C2-N3	2.16	1.42	1.38
2	B	1001	FDA	C6A-N6A	2.40	1.43	1.34
2	A	2001	FDA	C6A-N6A	2.45	1.44	1.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	2001	FDA	C2A-N3A	2.57	1.36	1.32
2	A	2001	FDA	C2-N1	2.60	1.43	1.38
2	B	1001	FDA	C2-N1	3.23	1.44	1.38
2	A	2001	FDA	C9-C9A	3.63	1.48	1.40
2	B	1001	FDA	C9-C9A	3.69	1.48	1.40
2	A	2001	FDA	C4-C4X	4.26	1.49	1.41
2	B	1001	FDA	C4-C4X	4.50	1.49	1.41
2	A	2001	FDA	C4-N3	4.62	1.41	1.33
2	B	1001	FDA	C4-N3	4.89	1.41	1.33
2	B	1001	FDA	O4-C4	4.94	1.37	1.24
2	A	2001	FDA	C9A-N10	5.08	1.45	1.38
2	A	2001	FDA	O4-C4	5.14	1.37	1.24
2	B	1001	FDA	C6-C5X	5.39	1.49	1.41
2	A	2001	FDA	C6-C5X	5.67	1.50	1.41
2	B	1001	FDA	C9A-N10	5.79	1.46	1.38
2	B	1001	FDA	C5X-N5	6.74	1.45	1.35
2	A	2001	FDA	C5X-N5	6.94	1.46	1.35
2	A	2001	FDA	C4X-N5	7.39	1.44	1.33
2	B	1001	FDA	C10-N1	8.00	1.44	1.33
2	B	1001	FDA	C4X-N5	8.11	1.45	1.33
2	A	2001	FDA	C10-N1	8.27	1.44	1.33

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	1001	FDA	N3A-C2A-N1A	-10.94	119.33	128.86
2	A	2001	FDA	N3A-C2A-N1A	-10.85	119.41	128.86
2	B	1001	FDA	O2A-PA-O5B	-3.15	93.25	108.14
2	A	2001	FDA	O2A-PA-O5B	-2.85	94.67	108.14
2	A	2001	FDA	C4X-C4-N3	-2.65	119.71	123.48
2	B	1001	FDA	C1B-N9A-C4A	-2.45	122.40	126.64
2	B	1001	FDA	C4X-C4-N3	-2.09	120.51	123.48
2	A	2001	FDA	C1B-N9A-C4A	-2.06	123.07	126.64
2	A	2001	FDA	C4A-C5A-N7A	-2.01	107.47	109.41
3	A	2006	PRO	CB-CA-N	2.06	110.51	104.78
3	B	1002	PRO	CB-CA-N	2.08	110.56	104.78
2	B	1001	FDA	C4X-C10-N10	2.19	122.04	120.52
2	A	2001	FDA	O5'-P-O1P	2.42	119.02	109.25
2	A	2001	FDA	C5X-C9A-N10	3.23	120.05	117.66
2	B	1001	FDA	C4-N3-C2	4.01	118.66	115.16
2	B	1001	FDA	C5X-C9A-N10	4.21	120.78	117.66
2	B	1001	FDA	C1'-N10-C9A	5.02	122.95	118.35

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	2001	FDA	C4-N3-C2	5.09	119.61	115.16
2	A	2001	FDA	C1'-N10-C9A	5.11	123.03	118.35

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

6 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	2001	FDA	1	0
3	A	2002	PRO	1	0
3	A	2003	PRO	1	0
4	A	2009	SO4	2	0
3	B	1003	PRO	2	0
4	B	1008	SO4	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

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	973/1001 (97%)	0.03	31 (3%) 48 56	22, 34, 61, 98	0
1	B	973/1001 (97%)	0.04	37 (3%) 41 48	25, 39, 66, 100	0
All	All	1946/2002 (97%)	0.03	68 (3%) 44 51	22, 36, 64, 100	0

All (68) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	409	GLY	8.8
1	B	129	VAL	6.3
1	B	185	GLY	5.6
1	A	409	GLY	5.1
1	A	185	GLY	5.0
1	A	542	ILE	4.8
1	A	183	ARG	4.7
1	A	184	SER	4.7
1	B	434	ALA	4.4
1	A	132	PRO	4.1
1	A	133	GLY	4.1
1	B	28	HIS	3.9
1	B	186	GLN	3.9
1	B	490	VAL	3.7
1	B	183	ARG	3.6
1	B	542	ILE	3.6
1	B	182	PRO	3.6
1	A	182	PRO	3.5
1	A	130	ILE	3.5
1	A	548	ASP	3.4
1	B	223	ALA	3.3
1	B	123	LEU	3.3
1	B	128	ARG	3.2
1	B	184	SER	3.2

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Mol	Chain	Res	Type	RSRZ
1	A	988	ALA	3.1
1	B	132	PRO	3.1
1	B	548	ASP	3.0
1	A	30	SER	3.0
1	B	130	ILE	3.0
1	B	987	ALA	3.0
1	B	87	ASP	3.0
1	B	226	HIS	2.9
1	B	755	LEU	2.9
1	A	224	GLY	2.9
1	A	987	ALA	2.9
1	A	55	LEU	2.8
1	B	122	ALA	2.8
1	A	755	LEU	2.8
1	A	546	THR	2.7
1	A	434	ALA	2.7
1	B	224	GLY	2.7
1	B	222	ALA	2.6
1	A	186	GLN	2.6
1	A	223	ALA	2.6
1	B	133	GLY	2.5
1	B	756	ILE	2.5
1	B	29	LEU	2.5
1	B	898	GLU	2.5
1	A	28	HIS	2.4
1	A	490	VAL	2.4
1	A	29	LEU	2.3
1	B	30	SER	2.3
1	B	188	THR	2.3
1	B	86	PRO	2.3
1	A	123	LEU	2.3
1	B	25	PRO	2.3
1	A	459	LEU	2.2
1	B	499	ARG	2.2
1	A	225	ASN	2.2
1	A	479	PRO	2.2
1	A	86	PRO	2.2
1	A	549	GLN	2.1
1	B	509	PRO	2.2
1	A	463	ALA	2.1
1	B	22	ARG	2.0
1	A	25	PRO	2.0

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Mol	Chain	Res	Type	RSRZ
1	B	753	VAL	2.0
1	B	21	ALA	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 carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors(Å ²)	Q<0.9
3	PRO	A	2005	8/8	0.88	0.26	7.82	53,54,55,57	8
3	PRO	B	1004	8/8	0.79	0.26	6.01	57,62,64,65	0
4	SO4	B	1010	5/5	0.89	0.34	5.24	92,93,95,95	5
3	PRO	A	2002	8/8	0.97	0.22	4.00	28,35,38,40	0
3	PRO	B	1003	8/8	0.92	0.29	3.44	40,46,60,62	0
3	PRO	B	1002	8/8	0.98	0.20	3.29	31,35,38,39	0
3	PRO	A	2006	8/8	0.89	0.15	3.23	38,43,47,47	8
3	PRO	A	2003	8/8	0.94	0.28	3.03	32,37,65,67	8
4	SO4	A	2009	5/5	0.93	0.22	2.15	56,58,63,66	5
4	SO4	A	2007	5/5	0.96	0.15	2.13	49,52,52,52	5
4	SO4	A	2012	5/5	0.91	0.23	1.82	96,97,98,99	0
4	SO4	B	1008	5/5	0.88	0.21	1.79	80,80,83,86	5
4	SO4	B	1007	5/5	0.83	0.16	1.34	76,82,83,84	5
3	PRO	B	1005	8/8	0.93	0.12	0.69	51,56,57,57	0
3	PRO	A	2004	8/8	0.92	0.11	-0.24	40,48,52,53	0
4	SO4	A	2008	5/5	0.93	0.10	-0.26	56,59,64,66	5
2	FDA	B	1001	53/53	0.95	0.11	-0.34	26,34,44,53	0
2	FDA	A	2001	53/53	0.97	0.11	-0.67	19,29,38,42	0
4	SO4	A	2010	5/5	0.90	0.26	-	82,82,83,86	5

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	LLDF	B-factors(\AA^2)	Q<0.9
4	SO4	A	2011	5/5	0.92	0.20	-	83,84,86,88	5
4	SO4	B	1006	5/5	0.97	0.11	-	50,53,56,57	5
4	SO4	A	2013	5/5	0.87	0.28	-	73,79,81,81	5
4	SO4	B	1011	5/5	0.94	0.13	-	75,76,81,84	5
4	SO4	B	1009	5/5	0.82	0.19	-	99,101,103,104	0
4	SO4	B	1012	5/5	0.88	0.42	-	91,95,95,96	5

6.5 Other polymers [i](#)

There are no such residues in this entry.