



wwPDB X-ray Structure Validation Summary Report ⓘ

Jul 16, 2019 – 06:08 AM EDT

PDB ID : 3FTB
Title : The crystal structure of the histidinol-phosphate aminotransferase from *Clostridium acetobutylicum*
Authors : Zhang, R.; Bigelow, L.; Moy, S.; Joachimiak, A.; Midwest Center for Structural Genomics (MCSG)
Deposited on : 2009-01-12
Resolution : 2.00 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.0 (224370), CSD as540be (2019)
Xtriage (Phenix) : 1.13
EDS : 2.3.2
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)
Refmac : 5.8.0158
CCP4 : 7.0 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.3.2

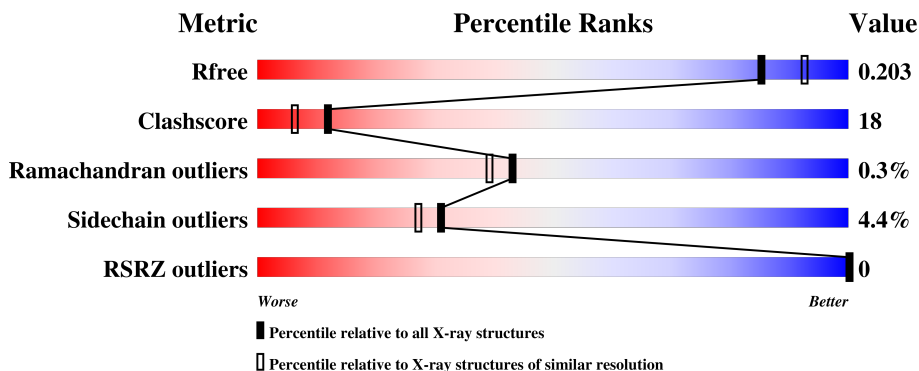
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION





The reported resolution of this entry is 2.00 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}	111664	7193 (2.00-2.00)
Clashscore	122126	8267 (2.00-2.00)
Ramachandran outliers	120053	8166 (2.00-2.00)
Sidechain outliers	120020	8165 (2.00-2.00)
RSRZ outliers	108989	7011 (2.00-2.00)

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	361	 66% 25% • 7%
1	B	361	 55% 35% • 7%
1	D	361	 62% 28% • 8%
1	E	361	 53% 38% • 7%

2 Entry composition [i](#)

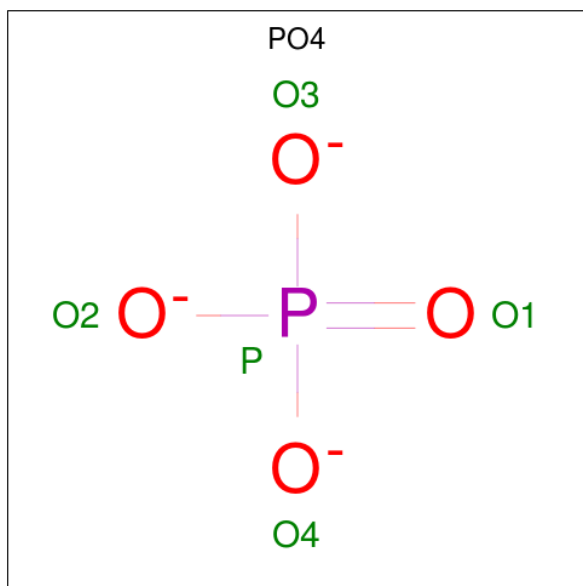
There are 3 unique types of molecules in this entry. The entry contains 11378 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Histidinol-phosphate aminotransferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	334	Total	C	N	O	S	1	0	0
			2684	1734	444	495	11			
1	B	334	Total	C	N	O	S	0	0	0
			2684	1734	444	495	11			
1	D	333	Total	C	N	O	S	1	0	0
			2675	1728	442	494	11			
1	E	334	Total	C	N	O	S	0	0	0
			2684	1734	444	495	11			

- Molecule 2 is PHOSPHATE ION (three-letter code: PO4) (formula: O₄P).



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

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

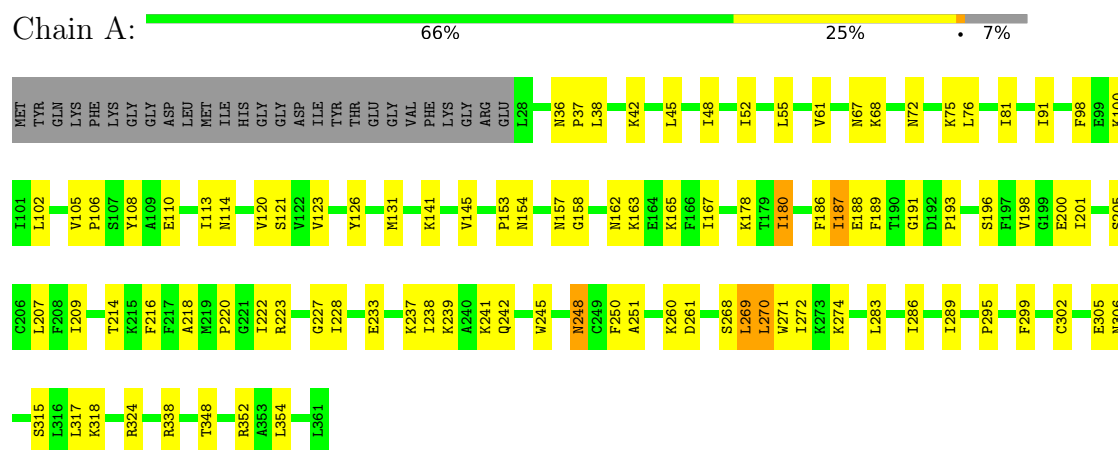
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	171	Total	O	0	0
			171	171		
3	B	162	Total	O	0	0
			162	162		
3	D	133	Total	O	0	0
			133	133		
3	E	135	Total	O	0	0
			135	135		

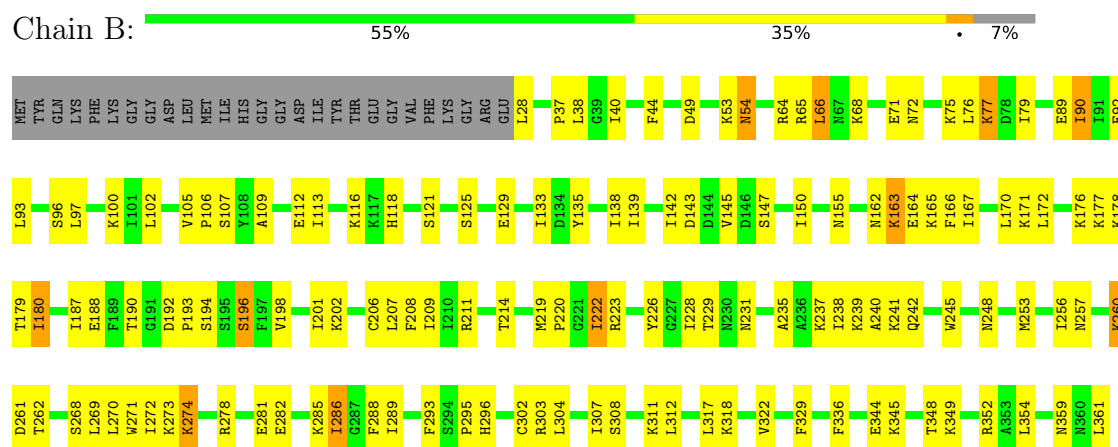
3 Residue-property plots

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.

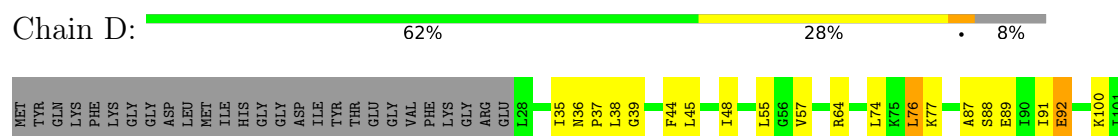
• Molecule 1: Histidinol-phosphate aminotransferase

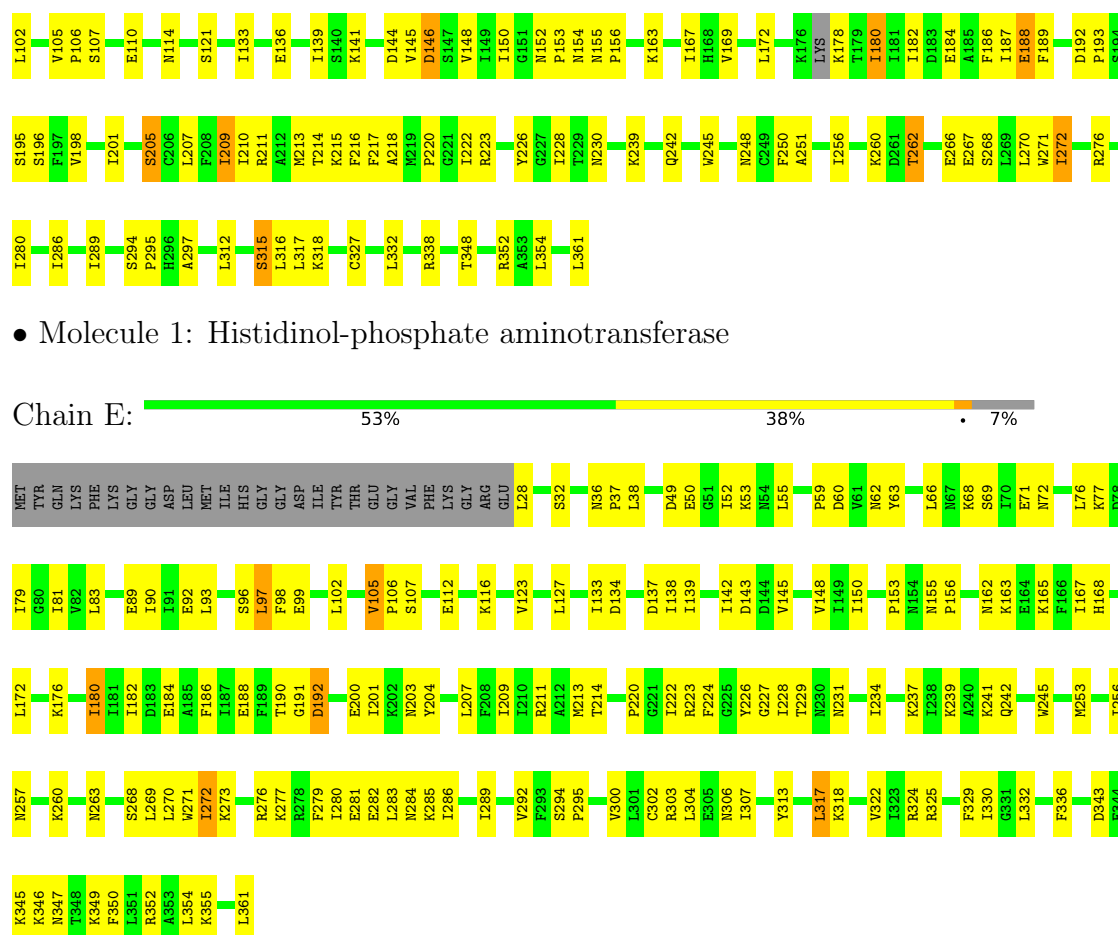


• Molecule 1: Histidinol-phosphate aminotransferase



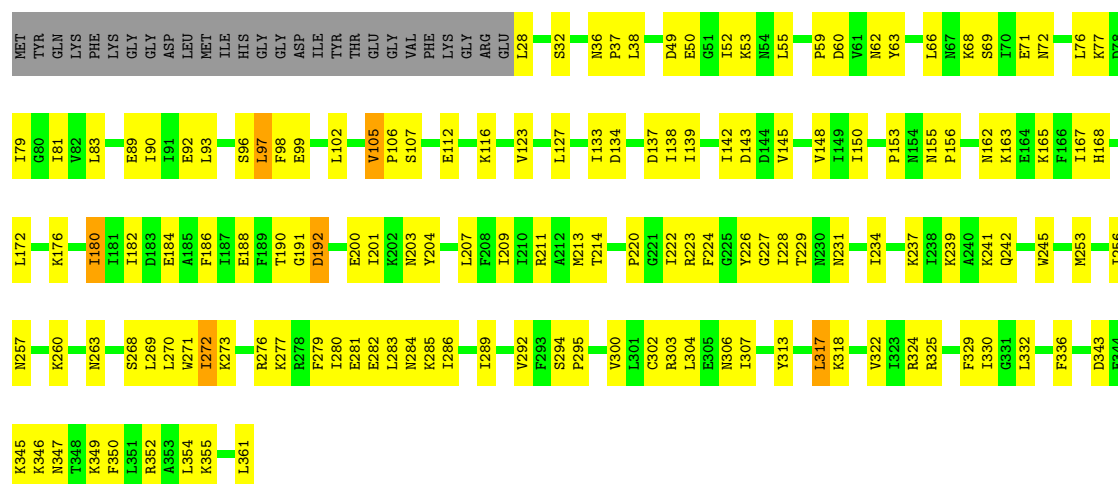
• Molecule 1: Histidinol-phosphate aminotransferase





• Molecule 1: Histidinol-phosphate aminotransferase

Chain E: 53% 38% 7%



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	66.56Å 121.66Å 94.19Å 90.00° 90.09° 90.00°	Depositor
Resolution (Å)	37.25 – 2.00 37.25 – 2.00	Depositor EDS
% Data completeness (in resolution range)	89.4 (37.25-2.00) 92.6 (37.25-2.00)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.69 (at 2.00Å)	Xtriage
Refinement program	PHENIX (phenix.refine), CNS	Depositor
R, R_{free}	0.174 , 0.212 0.177 , 0.203	Depositor DCC
R_{free} test set	4700 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å ²)	29.2	Xtriage
Anisotropy	0.706	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 38.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.467 for h,-k,-l	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	11378	wwPDB-VP
Average B, all atoms (Å ²)	39.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 47.02 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.0539e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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 [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	0.38	0/2732	0.54	0/3677
1	B	0.45	0/2732	0.56	0/3677
1	D	0.39	0/2722	0.55	0/3663
1	E	0.43	0/2732	0.57	0/3677
All	All	0.42	0/10918	0.56	0/14694

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	2684	0	2748	89	0
1	B	2684	0	2748	118	2
1	D	2675	0	2734	90	0
1	E	2684	0	2748	116	0
2	A	15	0	0	1	0
2	B	10	0	0	0	0
2	D	15	0	0	2	0
2	E	10	0	0	0	0
3	A	171	0	0	4	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	162	0	0	8	0
3	D	133	0	0	8	0
3	E	135	0	0	1	2
All	All	11378	0	10978	402	2

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 18.

The worst 5 of 402 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:286:ILE:HD11	1:B:289:ILE:HG13	1.39	1.03
1:B:162:ASN:HD22	1:B:165:LYS:H	1.11	0.96
1:D:102:LEU:HB3	1:D:148:VAL:HG22	1.50	0.90
1:D:100:LYS:HG3	1:D:121:SER:HB2	1.51	0.90
1:B:133:ILE:HD13	1:B:150:ILE:HD11	1.53	0.90

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:177:LYS:NZ	3:E:412:HOH:O[2_546]	0.49	1.71
1:B:177:LYS:CE	3:E:412:HOH:O[2_546]	1.66	0.54

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	332/361 (92%)	312 (94%)	18 (5%)	2 (1%)	27 21
1	B	332/361 (92%)	311 (94%)	21 (6%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	D	329/361 (91%)	309 (94%)	19 (6%)	1 (0%)	43	39
1	E	332/361 (92%)	309 (93%)	22 (7%)	1 (0%)	43	39
All	All	1325/1444 (92%)	1241 (94%)	80 (6%)	4 (0%)	43	39

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	261	ASP
1	E	97	LEU
1	D	327	CYS
1	A	187	ILE

5.3.2 Protein sidechains ⓘ

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	299/320 (93%)	291 (97%)	8 (3%)	48	49
1	B	299/320 (93%)	282 (94%)	17 (6%)	23	17
1	D	298/320 (93%)	282 (95%)	16 (5%)	24	19
1	E	299/320 (93%)	287 (96%)	12 (4%)	34	31
All	All	1195/1280 (93%)	1142 (96%)	53 (4%)	31	27

5 of 53 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	359	ASN
1	D	146	ASP
1	E	229	THR
1	B	361	LEU
1	D	88	SER

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 32 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	263	ASN
1	D	242	GLN
1	E	263	ASN
1	D	67	ASN
1	D	248	ASN

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](#)

10 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	362	-	4,4,4	1.06	0	6,6,6	0.53	0
2	PO4	A	363	-	4,4,4	0.88	0	6,6,6	0.47	0
2	PO4	A	364	-	4,4,4	0.79	0	6,6,6	0.43	0
2	PO4	B	362	-	4,4,4	0.89	0	6,6,6	0.50	0
2	PO4	B	363	-	4,4,4	0.87	0	6,6,6	0.56	0
2	PO4	D	362	-	4,4,4	0.79	0	6,6,6	0.64	0
2	PO4	D	363	-	4,4,4	0.88	0	6,6,6	0.58	0
2	PO4	D	364	-	4,4,4	0.85	0	6,6,6	0.51	0
2	PO4	E	362	-	4,4,4	0.92	0	6,6,6	0.48	0
2	PO4	E	363	-	4,4,4	0.92	0	6,6,6	0.33	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.

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	334/361 (92%)	-0.49	0 100 100	22, 39, 60, 76	1 (0%)
1	B	334/361 (92%)	-0.48	0 100 100	23, 39, 59, 94	0
1	D	333/361 (92%)	-0.58	0 100 100	21, 37, 54, 80	1 (0%)
1	E	334/361 (92%)	-0.55	0 100 100	20, 36, 56, 71	0
All	All	1335/1444 (92%)	-0.53	0 100 100	20, 37, 57, 94	2 (0%)

There are no RSRZ outliers to report.

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. 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
2	PO4	A	363	5/5	0.92	0.15	85,88,92,93	0
2	PO4	A	364	5/5	0.96	0.09	38,60,66,73	0
2	PO4	D	363	5/5	0.97	0.10	65,67,72,79	0
2	PO4	B	362	5/5	0.98	0.09	37,47,51,54	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	PO4	D	364	5/5	0.99	0.08	37,53,54,64	0
2	PO4	D	362	5/5	0.99	0.08	31,33,37,38	0
2	PO4	E	363	5/5	0.99	0.07	25,48,56,57	0
2	PO4	B	363	5/5	0.99	0.09	33,45,49,62	0
2	PO4	E	362	5/5	0.99	0.08	44,46,56,60	0
2	PO4	A	362	5/5	0.99	0.08	25,29,35,38	0

6.5 Other polymers [i](#)

There are no such residues in this entry.