



Full wwPDB X-ray Structure Validation Report ⓘ

Dec 17, 2023 – 07:39 am GMT

PDB ID : 2YBX
Title : Crystal Structure of Human Phosphatidylinositol-5-phosphate 4-kinase type-2 alpha
Authors : Tresaugues, L.; Moche, M.; Arrowsmith, C.H.; Berglund, H.; Bountra, C.; Collins, R.; Edwards, A.M.; Ekblad, T.; Flodin, S.; Graslund, S.; Karlberg, T.; Kotenyova, T.; Kouznetsova, E.; Nyman, T.; Persson, C.; Schuler, H.; Siponen, M.I.; Thorsell, A.G.; Wahlberg, E.; Weigelt, J.; Nordlund, P.
Deposited on : 2011-03-30
Resolution : 2.56 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 : 4.02b-467
Mogul : 1.8.4, CSD as541be (2020)
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)

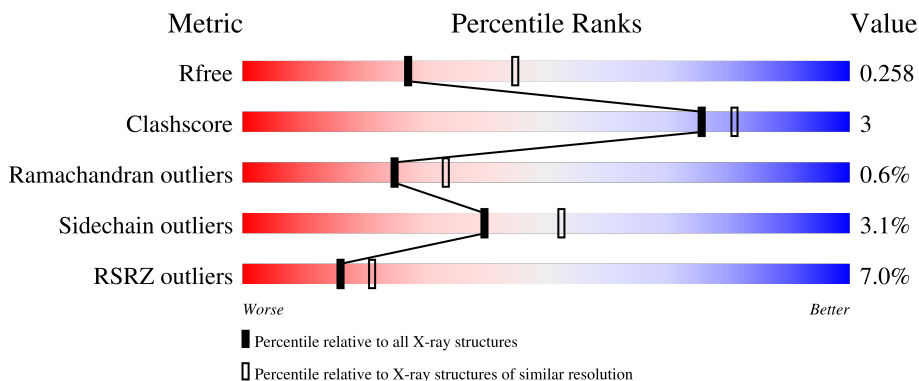
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.56 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	1279 (2.58-2.54)
Clashscore	141614	1327 (2.58-2.54)
Ramachandran outliers	138981	1312 (2.58-2.54)
Sidechain outliers	138945	1312 (2.58-2.54)
RSRZ outliers	127900	1269 (2.58-2.54)

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 $\leq 5\%$. 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	394	 7% 72% 9% 18%
1	B	394	 4% 69% 10% 21%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 5362 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 PHOSPHATIDYLINOSITOL-5-PHOSPHATE 4-KINASE TYPE-2 ALPHA.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	P	S			
1	A	322	2671	1708	446	502	1	14	0	2	0
1	B	312	2565	1648	432	471	1	13	0	1	0

There are 46 discrepancies between the modelled and reference sequences:

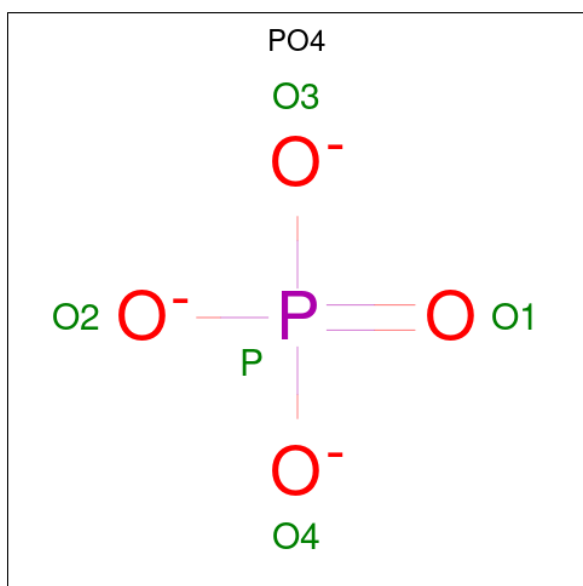
Chain	Residue	Modelled	Actual	Comment	Reference
A	12	MET	-	expression tag	UNP P48426
A	13	HIS	-	expression tag	UNP P48426
A	14	HIS	-	expression tag	UNP P48426
A	15	HIS	-	expression tag	UNP P48426
A	16	HIS	-	expression tag	UNP P48426
A	17	HIS	-	expression tag	UNP P48426
A	18	HIS	-	expression tag	UNP P48426
A	19	SER	-	expression tag	UNP P48426
A	20	SER	-	expression tag	UNP P48426
A	21	GLY	-	expression tag	UNP P48426
A	22	VAL	-	expression tag	UNP P48426
A	23	ASP	-	expression tag	UNP P48426
A	24	LEU	-	expression tag	UNP P48426
A	25	GLY	-	expression tag	UNP P48426
A	26	THR	-	expression tag	UNP P48426
A	27	GLU	-	expression tag	UNP P48426
A	28	ASN	-	expression tag	UNP P48426
A	29	LEU	-	expression tag	UNP P48426
A	30	TYR	-	expression tag	UNP P48426
A	31	PHE	-	expression tag	UNP P48426
A	32	GLN	-	expression tag	UNP P48426
A	33	SER	-	expression tag	UNP P48426
A	34	MET	-	expression tag	UNP P48426
B	12	MET	-	expression tag	UNP P48426

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Chain	Residue	Modelled	Actual	Comment	Reference
B	13	HIS	-	expression tag	UNP P48426
B	14	HIS	-	expression tag	UNP P48426
B	15	HIS	-	expression tag	UNP P48426
B	16	HIS	-	expression tag	UNP P48426
B	17	HIS	-	expression tag	UNP P48426
B	18	HIS	-	expression tag	UNP P48426
B	19	SER	-	expression tag	UNP P48426
B	20	SER	-	expression tag	UNP P48426
B	21	GLY	-	expression tag	UNP P48426
B	22	VAL	-	expression tag	UNP P48426
B	23	ASP	-	expression tag	UNP P48426
B	24	LEU	-	expression tag	UNP P48426
B	25	GLY	-	expression tag	UNP P48426
B	26	THR	-	expression tag	UNP P48426
B	27	GLU	-	expression tag	UNP P48426
B	28	ASN	-	expression tag	UNP P48426
B	29	LEU	-	expression tag	UNP P48426
B	30	TYR	-	expression tag	UNP P48426
B	31	PHE	-	expression tag	UNP P48426
B	32	GLN	-	expression tag	UNP P48426
B	33	SER	-	expression tag	UNP P48426
B	34	MET	-	expression tag	UNP P48426

- 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		

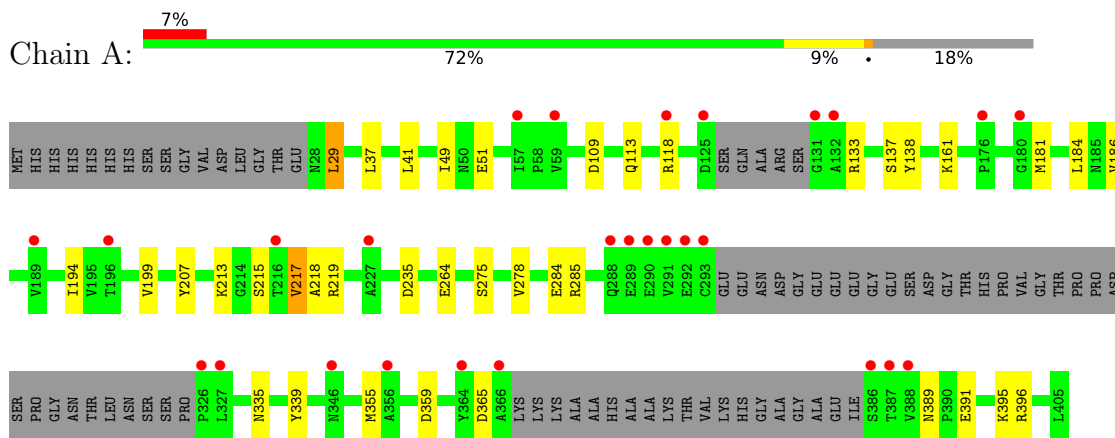
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	69	Total	O	0	0
			69	69		
3	B	52	Total	O	0	0
			52	52		

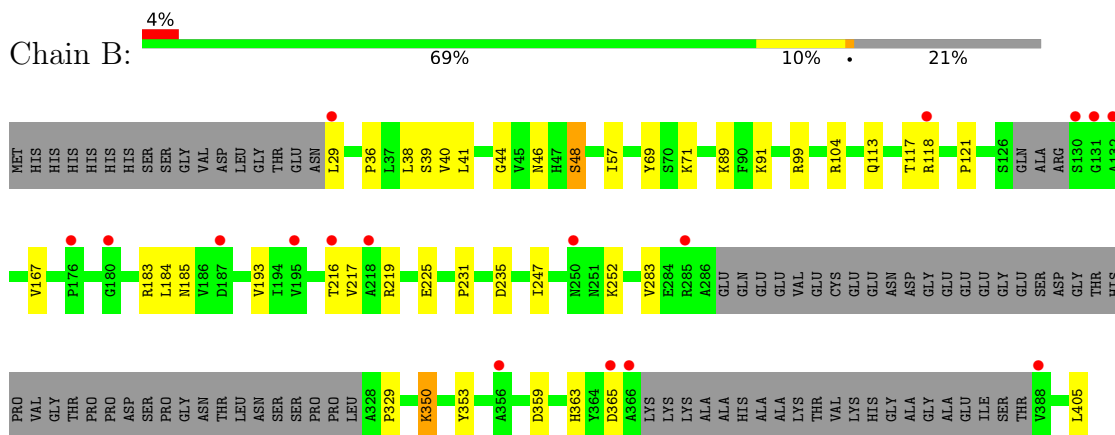
3 Residue-property plots [i](#)

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: PHOSPHATIDYLINOSITOL-5-PHOSPHATE 4-KINASE TYPE-2 ALPHA



- Molecule 1: PHOSPHATIDYLINOSITOL-5-PHOSPHATE 4-KINASE TYPE-2 ALPHA



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	44.04Å 98.51Å 104.88Å 90.00° 93.43° 90.00°	Depositor
Resolution (Å)	28.37 – 2.56 28.37 – 2.56	Depositor EDS
% Data completeness (in resolution range)	97.9 (28.37-2.56) 97.9 (28.37-2.56)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.19 (at 2.57Å)	Xtrriage
Refinement program	BUSTER 2.11.1	Depositor
R, R_{free}	0.188 , 0.238 0.202 , 0.258	Depositor DCC
R_{free} test set	1444 reflections (5.11%)	wwPDB-VP
Wilson B-factor (Å ²)	41.3	Xtrriage
Anisotropy	0.735	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 57.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	5362	wwPDB-VP
Average B, all atoms (Å ²)	49.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.95% 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: PHD, 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	0.50	0/2718	0.65	0/3664
1	B	0.51	0/2611	0.65	0/3520
All	All	0.51	0/5329	0.65	0/7184

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	2671	0	2606	13	0
1	B	2565	0	2515	19	0
2	A	5	0	0	0	0
3	A	69	0	0	0	0
3	B	52	0	0	0	0
All	All	5362	0	5121	32	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 (32) 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:283:VAL:HB	1:B:350:LYS:HB3	1.81	0.63
1:A:41:LEU:HB2	1:A:184:LEU:HD21	1.88	0.56
1:B:363:HIS:HD2	1:B:365:ASP:H	1.53	0.56
1:A:29:LEU:HD22	1:A:118:ARG:HA	1.88	0.55
1:B:29:LEU:HD13	1:B:117:THR:HG22	1.91	0.53
1:B:225:GLU:O	1:B:231:PRO:HB3	2.09	0.52
1:B:41:LEU:HB2	1:B:184:LEU:HD21	1.91	0.52
1:A:219:ARG:HD3	1:A:235:ASP:OD2	2.10	0.51
1:A:217:VAL:HG13	1:A:218:ALA:H	1.76	0.51
1:A:215:SER:HB3	1:A:396:ARG:HB3	1.95	0.48
1:B:247:ILE:HD11	1:B:353:TYR:CD2	2.49	0.47
1:A:37:LEU:HD23	1:A:186:VAL:HG12	1.97	0.47
1:B:219:ARG:NH1	1:B:235:ASP:OD1	2.48	0.46
1:A:49:ILE:HG21	1:A:113:GLN:HB2	1.98	0.45
1:B:57:ILE:HD13	1:B:99:ARG:CZ	2.46	0.45
1:B:41:LEU:HD13	1:B:193:VAL:HG21	1.97	0.45
1:B:44:GLY:O	1:B:48:SER:HB3	2.17	0.45
1:B:247:ILE:HD11	1:B:353:TYR:HD2	1.82	0.45
1:A:278:VAL:HG22	1:A:355:MET:HG2	1.99	0.44
1:B:38:LEU:HD22	1:B:121:PRO:HD2	1.98	0.44
1:A:199:VAL:HA	1:A:339:TYR:CD2	2.53	0.44
1:B:36:PRO:O	1:B:40:VAL:HG23	2.18	0.43
1:B:252:LYS:HD2	1:B:405:LEU:HD12	2.00	0.43
1:A:213:LYS:HG2	1:A:275:SER:HB3	1.99	0.43
1:A:215:SER:HB2	1:A:396:ARG:HD2	2.00	0.43
1:B:89:LYS:HB2	1:B:185:ASN:HB3	2.02	0.42
1:A:391:GLU:O	1:A:395:LYS:HG2	2.19	0.42
1:B:46:ASN:HA	1:B:113:GLN:HE21	1.84	0.42
1:B:91:LYS:HB3	1:B:183:ARG:HB3	2.02	0.42
1:A:181:MET:HB2	1:A:194:ILE:HD12	2.03	0.40
1:B:104:ARG:CZ	1:B:167:VAL:HG22	2.51	0.40
1:B:69:TYR:CE1	1:B:71:LYS:HD3	2.57	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	315/394 (80%)	305 (97%)	8 (2%)	2 (1%)	25	33
1	B	304/394 (77%)	290 (95%)	12 (4%)	2 (1%)	22	29
All	All	619/788 (79%)	595 (96%)	20 (3%)	4 (1%)	25	33

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	217	VAL
1	B	329	PRO
1	A	138	TYR
1	B	217	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	297/353 (84%)	283 (95%)	14 (5%)	26	35
1	B	282/353 (80%)	277 (98%)	5 (2%)	59	73
All	All	579/706 (82%)	560 (97%)	19 (3%)	40	50

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	29	LEU
1	A	51[A]	GLU
1	A	51[B]	GLU
1	A	109	ASP
1	A	133	ARG
1	A	137	SER
1	A	161	LYS
1	A	207	TYR
1	A	264	GLU

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Mol	Chain	Res	Type
1	A	284	GLU
1	A	285	ARG
1	A	335	ASN
1	A	365	ASP
1	A	389	ASN
1	B	39	SER
1	B	48	SER
1	B	118	ARG
1	B	216	THR
1	B	350	LYS

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

Mol	Chain	Res	Type
1	A	389	ASN
1	B	240	ASN
1	B	243	GLN
1	B	363	HIS

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

2 non-standard protein/DNA/RNA residues 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
1	PHD	A	359	1	9,11,12	1.29	1 (11%)	10,15,17	1.95	3 (30%)
1	PHD	B	359	1	9,11,12	1.03	1 (11%)	10,15,17	1.93	3 (30%)

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
1	PHD	A	359	1	-	2/8/11/13	-
1	PHD	B	359	1	-	0/8/11/13	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	359	PHD	P-OD1	3.65	1.64	1.59
1	B	359	PHD	P-OD1	2.78	1.63	1.59

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	359	PHD	OD1-CG-CB	3.65	121.16	111.11
1	B	359	PHD	CB-CA-C	3.39	117.83	111.47
1	B	359	PHD	OD1-CG-CB	2.95	119.23	111.11
1	A	359	PHD	OD2-CG-CB	-2.89	118.34	124.73
1	A	359	PHD	CA-CB-CG	2.84	118.82	112.86
1	B	359	PHD	CA-CB-CG	2.41	117.90	112.86

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	359	PHD	N-CA-CB-CG
1	A	359	PHD	C-CA-CB-CG

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

1 ligand is 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	1406	-	4,4,4	2.36	1 (25%)	6,6,6	0.47	0

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1406	PO4	P-O1	3.74	1.59	1.50

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

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	321/394 (81%)	0.28	27 (8%) 11 14	30, 45, 74, 111	0
1	B	311/394 (78%)	0.17	17 (5%) 25 32	28, 46, 75, 105	0
All	All	632/788 (80%)	0.23	44 (6%) 16 21	28, 46, 75, 111	0

All (44) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	131	GLY	8.6
1	A	293	CYS	7.2
1	A	386	SER	6.3
1	A	387	THR	5.7
1	B	130	SER	4.0
1	A	292	GLU	3.6
1	A	291	VAL	3.6
1	B	366	ALA	3.3
1	A	366	ALA	3.3
1	B	132	ALA	3.2
1	A	216	THR	3.2
1	A	356	ALA	3.1
1	A	189	VAL	3.1
1	A	132	ALA	2.9
1	A	227	ALA	2.6
1	A	125	ASP	2.6
1	B	195	VAL	2.6
1	B	285	ARG	2.6
1	A	326	PRO	2.6
1	A	176	PRO	2.5
1	A	364	TYR	2.5
1	B	131	GLY	2.5
1	A	346	ASN	2.5
1	B	388	VAL	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	57	ILE	2.4
1	A	288	GLN	2.4
1	B	29	LEU	2.4
1	B	176	PRO	2.4
1	B	365	ASP	2.4
1	A	118	ARG	2.3
1	A	180	GLY	2.3
1	B	356	ALA	2.3
1	A	388	VAL	2.2
1	B	118	ARG	2.2
1	A	290	GLU	2.2
1	B	187	ASP	2.1
1	A	196	THR	2.1
1	B	180	GLY	2.1
1	B	218	ALA	2.1
1	B	216	THR	2.0
1	A	59	VAL	2.0
1	B	250	ASN	2.0
1	A	327	LEU	2.0
1	A	289	GLU	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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
1	PHD	B	359	12/13	0.93	0.13	39,47,69,70	0
1	PHD	A	359	12/13	0.94	0.13	35,41,59,61	0

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(\AA^2)	Q<0.9
2	PO4	A	1406	5/5	0.94	0.14	78,82,85,85	0

6.5 Other polymers [i](#)

There are no such residues in this entry.