Full wwPDB X-ray Structure Validation Report (i)

Oct 13, 2024 – 07:12 AM EDT

PDB ID	:	1YRP
Title	:	Catalytic domain of human ZIP kinase phosphorylated at Thr265
Authors	:	Kursula, P.; Vahokoski, J.; Wilmanns, M.
Deposited on	:	2005-02-04
Resolution	:	3.10 Å(reported)

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

|		
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

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 3.10 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.
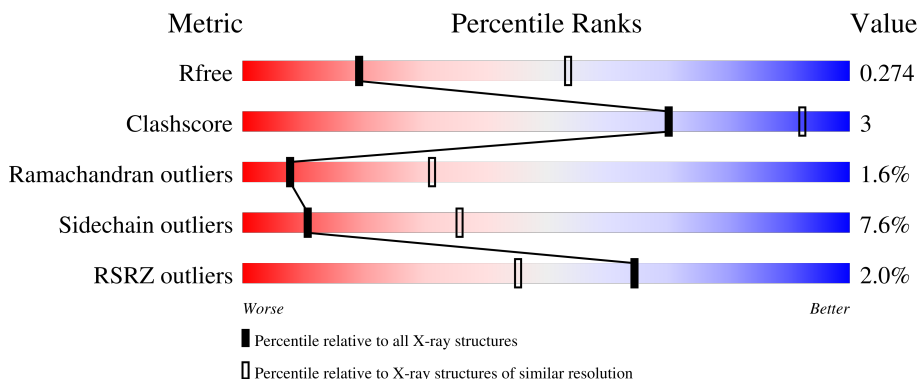
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	164625	1351 (3.10-3.10)
Clashscore	180529	1454 (3.10-3.10)
Ramachandran outliers	177936	1391 (3.10-3.10)
Sidechain outliers	177891	1391 (3.10-3.10)
RSRZ outliers	164620	1351 (3.10-3.10)

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	278	2% 83% 11% • • •
1	B	278	2% 83% 12% • ••

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
2	DTT	B	278	X	-	-	-

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 4498 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 Death-associated protein kinase 3.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	276	Total	C	N	O	P	S	0	0	0
			2245	1427	384	428	1	5			
1	B	276	Total	C	N	O	P	S	0	0	0
			2245	1427	384	428	1	5			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	GLY	-	expression tag	UNP O43293
B	0	GLY	-	expression tag	UNP O43293

- Molecule 2 is 2,3-DIHYDROXY-1,4-DITHIOBUTANE (three-letter code: DTT) (formula: $C_4H_{10}O_2S_2$).
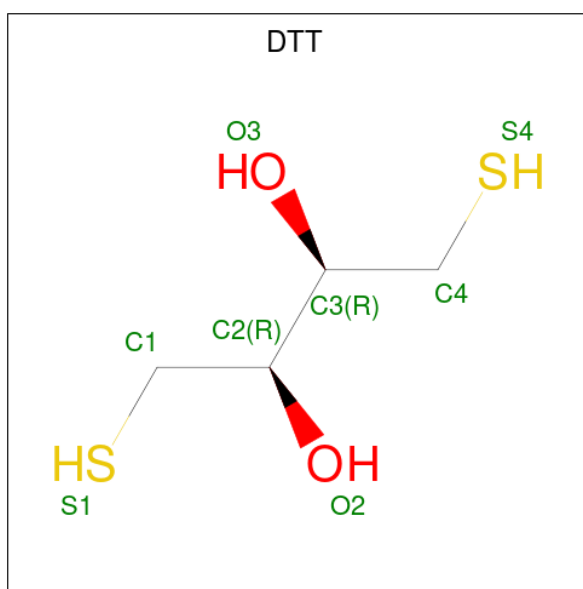

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	B	1	Total	C	O	S	0	0
			8	4	2	2		

3 Residue-property plots ⓘ

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: Death-associated protein kinase 3

Chain A:

• Molecule 1: Death-associated protein kinase 3

Chain B:
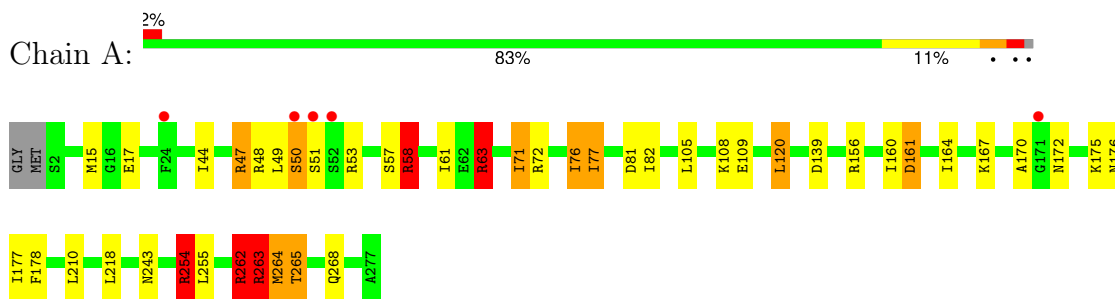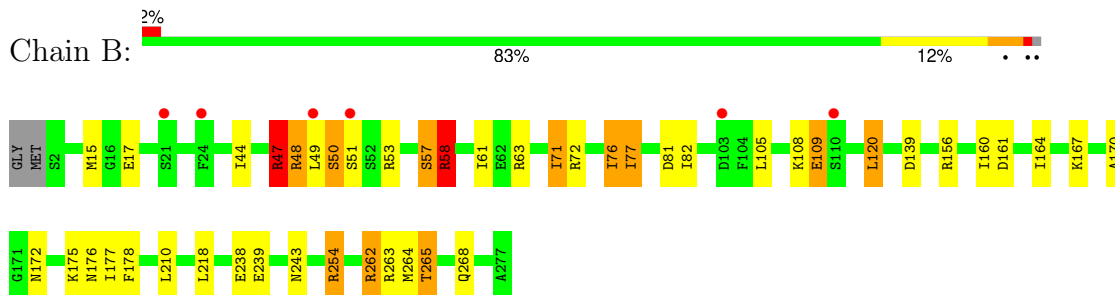
4　Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	53.56Å　　60.93Å　　87.95Å 90.00°　　92.17°　　90.00°	Depositor
Resolution (Å)	20.00　–　3.10 20.00　–　3.10	Depositor EDS
% Data completeness (in resolution range)	97.6 (20.00-3.10) 97.2 (20.00-3.10)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.10	Depositor
$< I/\sigma(I) >$ [1]	3.46 (at 3.13Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.244　,　0.268 0.247　,　0.274	Depositor DCC
R_{free} test set	509 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	44.1	Xtriage
Anisotropy	0.772	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 25.8	EDS
L-test for twinning [2]	$< |L| > = 0.46$, $< L^2 > = 0.28$	Xtriage
Estimated twinning fraction	0.054 for h,-k,-l	Xtriage
F_o,F_c correlation	0.87	EDS
Total number of atoms	4498	wwPDB-VP
Average B, all atoms (Å^2)	49.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.71% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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 ⓘ

5.1 Standard geometry ⓘ

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

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	0.34	0/2276	1.31	18/3062 (0.6%)
1	B	0.33	0/2276	1.24	18/3062 (0.6%)
All	All	0.34	0/4552	1.27	36/6124 (0.6%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	7
1	B	0	6
All	All	0	13

There are no bond length outliers.

All (36) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	263	ARG	NE-CZ-NH2	-21.57	109.51	120.30
1	A	63	ARG	NE-CZ-NH2	-21.24	109.68	120.30
1	A	254	ARG	NE-CZ-NH2	-20.88	109.86	120.30
1	A	262	ARG	NE-CZ-NH2	-20.33	110.13	120.30
1	A	58	ARG	NE-CZ-NH2	-20.01	110.30	120.30
1	B	47	ARG	NE-CZ-NH2	-19.55	110.52	120.30
1	B	58	ARG	NE-CZ-NH1	-19.46	110.57	120.30
1	B	254	ARG	NE-CZ-NH1	-18.54	111.03	120.30
1	A	47	ARG	NE-CZ-NH1	-18.54	111.03	120.30
1	B	63	ARG	NE-CZ-NH1	-17.31	111.65	120.30
1	B	262	ARG	NE-CZ-NH1	-17.18	111.71	120.30
1	A	47	ARG	NE-CZ-NH2	16.91	128.76	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	263	ARG	NE-CZ-NH1	-16.27	112.16	120.30
1	B	63	ARG	NE-CZ-NH2	16.20	128.40	120.30
1	B	58	ARG	NE-CZ-NH2	16.04	128.32	120.30
1	A	58	ARG	NE-CZ-NH1	15.96	128.28	120.30
1	B	262	ARG	NE-CZ-NH2	15.71	128.15	120.30
1	B	254	ARG	NE-CZ-NH2	15.22	127.91	120.30
1	B	47	ARG	NE-CZ-NH1	15.05	127.82	120.30
1	B	263	ARG	NE-CZ-NH2	15.01	127.80	120.30
1	A	63	ARG	NE-CZ-NH1	14.73	127.66	120.30
1	A	262	ARG	NE-CZ-NH1	13.63	127.11	120.30
1	A	263	ARG	NE-CZ-NH1	13.48	127.04	120.30
1	A	254	ARG	NE-CZ-NH1	13.24	126.92	120.30
1	A	63	ARG	CD-NE-CZ	11.16	139.23	123.60
1	A	263	ARG	CD-NE-CZ	10.59	138.43	123.60
1	A	254	ARG	CD-NE-CZ	10.38	138.13	123.60
1	A	262	ARG	CD-NE-CZ	10.35	138.09	123.60
1	B	47	ARG	CD-NE-CZ	9.75	137.25	123.60
1	A	58	ARG	CD-NE-CZ	9.14	136.40	123.60
1	B	58	ARG	CD-NE-CZ	9.04	136.25	123.60
1	A	47	ARG	CD-NE-CZ	8.82	135.95	123.60
1	B	254	ARG	CD-NE-CZ	8.37	135.31	123.60
1	B	63	ARG	CD-NE-CZ	8.05	134.87	123.60
1	B	262	ARG	CD-NE-CZ	7.92	134.68	123.60
1	B	263	ARG	CD-NE-CZ	7.49	134.08	123.60

There are no chirality outliers.

All (13) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	108	LYS	Peptide
1	A	170	ALA	Peptide
1	A	254	ARG	Sidechain
1	A	262	ARG	Sidechain
1	A	263	ARG	Sidechain
1	A	58	ARG	Sidechain
1	A	63	ARG	Sidechain
1	B	108	LYS	Peptide
1	B	170	ALA	Peptide
1	B	254	ARG	Sidechain
1	B	262	ARG	Sidechain
1	B	47	ARG	Sidechain
1	B	58	ARG	Sidechain

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	2245	0	2236	17	0
1	B	2245	0	2236	16	0
2	B	8	0	10	0	0
All	All	4498	0	4482	30	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 (30) 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:139:ASP:HB2	1:A:164:ILE:HG21	1.84	0.59
1:B:139:ASP:HB2	1:B:164:ILE:HG21	1.86	0.58
1:A:105:LEU:O	1:A:109:GLU:HA	2.08	0.53
1:B:265:TPO:OG1	1:B:268:GLN:HG3	2.09	0.53
1:A:51:SER:HA	1:B:218:LEU:HD22	1.90	0.52
1:A:177:ILE:HG21	1:B:177:ILE:HG21	1.92	0.51
1:A:218:LEU:HD22	1:B:51:SER:HA	1.94	0.50
1:B:47:ARG:HE	1:B:57:SER:HB2	1.75	0.49
1:A:265:TPO:OG1	1:A:268:GLN:HG3	2.12	0.49
1:B:44:ILE:HG21	1:B:61:ILE:HG12	1.96	0.48
1:B:77:ILE:HD13	1:B:160:ILE:HG22	1.96	0.47
1:A:77:ILE:HD13	1:A:160:ILE:HG22	1.97	0.47
1:B:105:LEU:O	1:B:109:GLU:HA	2.14	0.47
1:A:44:ILE:HG21	1:A:61:ILE:HG12	1.96	0.46
1:A:49:LEU:O	1:A:50:SER:C	2.54	0.46
1:B:71:ILE:HG23	1:B:76:ILE:CG2	2.47	0.45
1:B:49:LEU:O	1:B:50:SER:C	2.55	0.45
1:A:71:ILE:HG23	1:A:76:ILE:CG2	2.47	0.44
1:B:175:LYS:O	1:B:176:ASN:HB3	2.19	0.43
1:A:255:LEU:O	1:A:263:ARG:HD3	2.20	0.42
1:A:175:LYS:O	1:A:176:ASN:HB3	2.19	0.42
1:B:48:ARG:HB3	1:B:49:LEU:H	1.72	0.42
1:B:120:LEU:HD22	1:B:210:LEU:HD12	2.02	0.42
1:B:71:ILE:HG23	1:B:76:ILE:HG21	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:120:LEU:HD22	1:A:210:LEU:HD12	2.01	0.41
1:A:254:ARG:HD2	1:A:264:MET:HG3	2.03	0.41
1:A:160:ILE:HD12	1:A:161:ASP:HB2	2.03	0.41
1:B:238:GLU:O	1:B:239:GLU:C	2.59	0.40
1:A:71:ILE:HG23	1:A:76:ILE:HG21	2.02	0.40
1:A:139:ASP:HB2	1:A:164:ILE:CG2	2.51	0.40

There are no symmetry-related clashes.

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	273/278 (98%)	251 (92%)	18 (7%)	4 (2%)	8	33
1	B	273/278 (98%)	251 (92%)	17 (6%)	5 (2%)	7	29
All	All	546/556 (98%)	502 (92%)	35 (6%)	9 (2%)	8	31

All (9) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	109	GLU
1	A	50	SER
1	B	50	SER
1	A	17	GLU
1	A	48	ARG
1	B	17	GLU
1	B	48	ARG
1	A	161	ASP
1	B	161	ASP

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	244/245 (100%)	224 (92%)	20 (8%)	9	33
1	B	244/245 (100%)	227 (93%)	17 (7%)	12	39
All	All	488/490 (100%)	451 (92%)	37 (8%)	11	36

All (37) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	15	MET
1	A	47	ARG
1	A	53	ARG
1	A	57	SER
1	A	58	ARG
1	A	63	ARG
1	A	71	ILE
1	A	72	ARG
1	A	76	ILE
1	A	77	ILE
1	A	81	ASP
1	A	82	ILE
1	A	120	LEU
1	A	156	ARG
1	A	167	LYS
1	A	172	ASN
1	A	178	PHE
1	A	243	ASN
1	A	262	ARG
1	A	264	MET
1	B	15	MET
1	B	53	ARG
1	B	57	SER
1	B	58	ARG
1	B	71	ILE
1	B	72	ARG
1	B	76	ILE

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Mol	Chain	Res	Type
1	B	77	ILE
1	B	81	ASP
1	B	82	ILE
1	B	120	LEU
1	B	156	ARG
1	B	167	LYS
1	B	172	ASN
1	B	178	PHE
1	B	243	ASN
1	B	264	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	32	GLN
1	A	172	ASN
1	A	243	ASN
1	B	32	GLN
1	B	172	ASN
1	B	243	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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	TPO	B	265	1	8,10,11	1.31	1 (12%)	10,14,16	0.86	0
1	TPO	A	265	1	8,10,11	1.30	1 (12%)	10,14,16	0.88	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
1	TPO	B	265	1	-	1/9/11/13	-
1	TPO	A	265	1	-	1/9/11/13	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	265	TPO	P-O1P	2.89	1.59	1.50
1	A	265	TPO	P-O1P	2.78	1.59	1.50

There are no bond angle outliers.

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	265	TPO	O-C-CA-CB
1	B	265	TPO	O-C-CA-CB

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	B	265	TPO	1	0
1	A	265	TPO	1	0

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

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	DTT	B	278	-	7,7,7	0.65	0	4,8,8	0.96	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	DTT	B	278	-	1/1/2/2	2/8/8/8	-

There are no bond length outliers.

There are no bond angle outliers.

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	B	278	DTT	C3

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	278	DTT	O2-C2-C3-C4
2	B	278	DTT	O2-C2-C3-O3

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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	275/278 (98%)	0.21	5 (1%) 67	49	49, 49, 50, 50	0
1	B	275/278 (98%)	0.28	6 (2%) 62	42	49, 49, 50, 50	0
All	All	550/556 (98%)	0.25	11 (2%) 64	45	49, 49, 50, 50	0

All (11) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	51	SER	4.7
1	A	50	SER	4.3
1	A	171	GLY	3.8
1	B	51	SER	3.8
1	B	24	PHE	3.5
1	B	103	ASP	3.3
1	B	21	SER	2.4
1	A	24	PHE	2.3
1	A	52	SER	2.3
1	B	110	SER	2.3
1	B	49	LEU	2.2

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

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	TPO	B	265	11/12	0.83	0.12	48,49,49,49	0
1	TPO	A	265	11/12	0.88	0.12	48,49,49,49	0

6.3 Carbohydrates ⓘ

There are no monosaccharides in this entry.

6.4 Ligands ⓘ

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	DTT	B	278	8/8	0.82	0.14	43,44,45,45	0

6.5 Other polymers ⓘ

There are no such residues in this entry.