



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 27, 2024 – 08:27 pm BST

PDB ID : 4A22
Title : Structure of Mycobacterium tuberculosis fructose 1,6-bisphosphate aldolase bound to N-(4-hydroxybutyl)- glycolohydroxamic acid bis- phosphate
Authors : Coincon, M.; De la Paz Santangelo, M.; Gest, P.M.; Guerin, M.E.; Pham, H.; Ryan, G.; Puckett, S.E.; Spencer, J.S.; Gonzalez-Juarrero, M.; Daher, R.; Lenaerts, A.J.; Schnappinger, D.; Therisod, M.; Ehrt, S.; Jackson, M.; Sygusch, J.
Deposited on : 2011-09-21
Resolution : 1.90 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 : 2.36.2
buster-report : 1.1.7 (2018)
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)

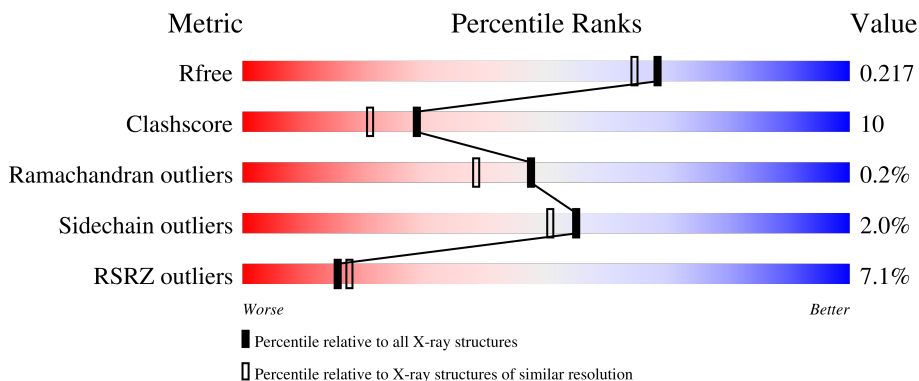
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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	6207 (1.90-1.90)
Clashscore	141614	6847 (1.90-1.90)
Ramachandran outliers	138981	6760 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)
RSRZ outliers	127900	6082 (1.90-1.90)

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	344	 3% 85% 11%
1	B	344	 6% 77% 17%
1	C	344	 11% 79% 16%

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Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
 Validation Pipeline (wwPDB-VP) : 2.36.2

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Mol	Chain	Length	Quality of chain
1	D	344	

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
5	SO4	C	1345	-	-	X	-
5	SO4	D	1344	-	-	X	-

2 Entry composition [i](#)

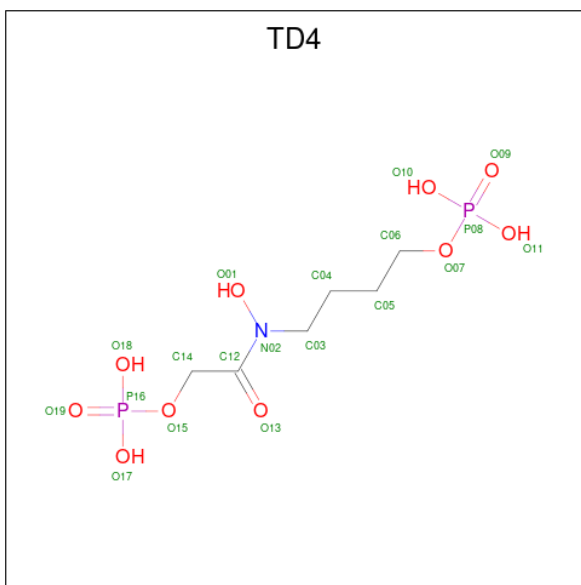
There are 6 unique types of molecules in this entry. The entry contains 20736 atoms, of which 9796 are hydrogens and 0 are deuteriums.

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 FRUCTOSE-BISPHOSPHATE ALDOLASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	H	N	O				S
1	A	329	4894	1557	2442	415	470	10	0	0	0
1	B	329	4894	1557	2442	415	470	10	0	0	0
1	C	329	4897	1557	2445	415	470	10	0	0	0
1	D	329	4897	1557	2445	415	470	10	0	0	0

- Molecule 2 is 4-{hydroxy[(phosphonoxy)acetyl]amino}butyl dihydrogen phosphate (three-letter code: TD4) (formula: C₆H₁₅NO₁₀P₂).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	H	N	O			P
2	A	1	30	6	11	1	10	2	0	1
2	B	1	30	6	11	1	10	2	0	1

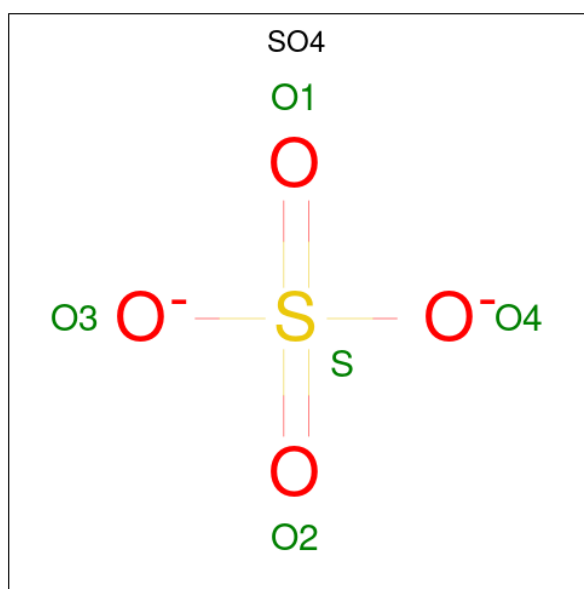
- Molecule 3 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	3	Total Na 3 3	0	0
3	B	1	Total Na 1 1	0	0
3	C	1	Total Na 1 1	0	0
3	D	1	Total Na 1 1	0	0

- Molecule 4 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total Zn 1 1	0	0
4	B	1	Total Zn 1 1	0	0

- Molecule 5 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



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

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


- Molecule 6 is water.

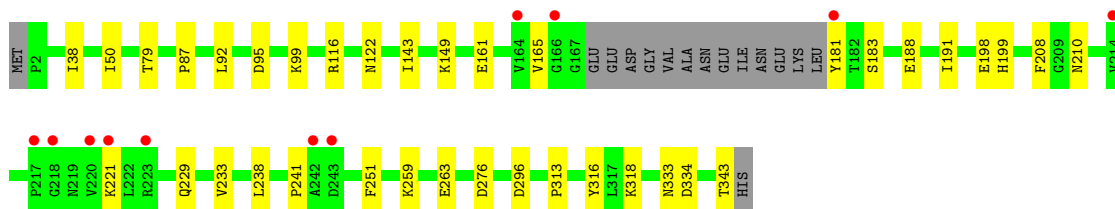
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	279	Total	O	0	0
			279	279		
6	B	253	Total	O	0	0
			253	253		
6	C	218	Total	O	0	0
			218	218		
6	D	296	Total	O	0	0
			296	296		

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.

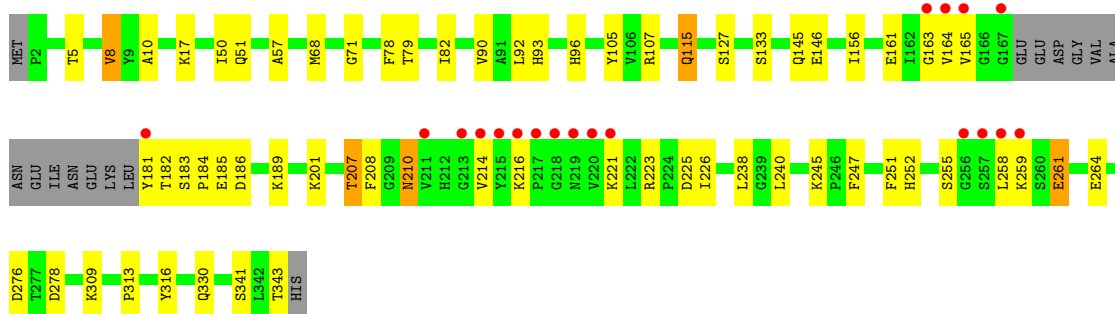
• Molecule 1: FRUCTOSE-BISPHOSPHATE ALDOLASE

Chain A: 




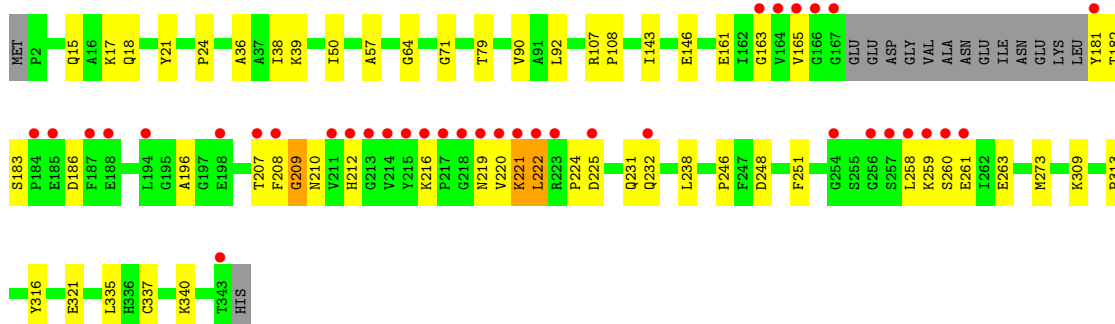
• Molecule 1: FRUCTOSE-BISPHOSPHATE ALDOLASE

Chain B: 




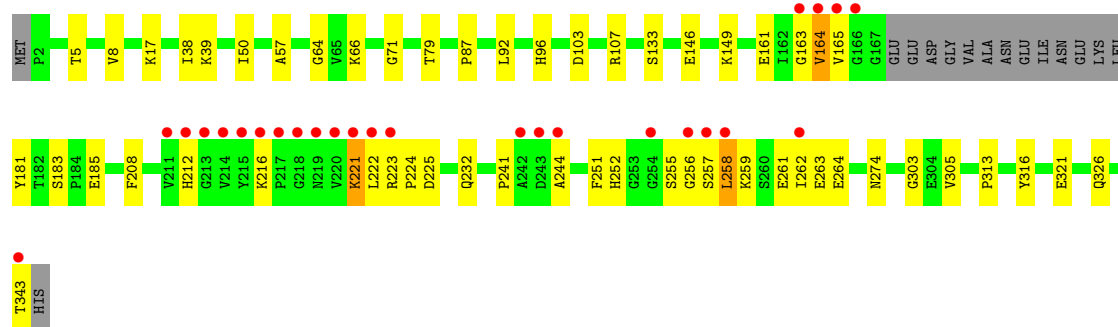
• Molecule 1: FRUCTOSE-BISPHOSPHATE ALDOLASE

Chain C: 



- Molecule 1: FRUCTOSE-BISPHOSPHATE ALDOLASE

Chain D:  8% 79% 15%



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	335.39Å 42.98Å 102.60Å 90.00° 99.39° 90.00°	Depositor
Resolution (Å)	45.41 – 1.90 46.70 – 1.90	Depositor EDS
% Data completeness (in resolution range)	99.3 (45.41-1.90) 99.3 (46.70-1.90)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.92 (at 1.90Å)	Xtrriage
Refinement program	PHENIX (PHENIX.REFINE)	Depositor
R, R_{free}	0.179 , 0.221 0.180 , 0.217	Depositor DCC
R_{free} test set	8854 reflections (7.75%)	wwPDB-VP
Wilson B-factor (Å ²)	20.9	Xtrriage
Anisotropy	0.430	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.41 , 52.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	20736	wwPDB-VP
Average B, all atoms (Å ²)	34.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.05% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: NA, SO4, ZN, TD4

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	0.44	0/2501	0.58	0/3387
1	B	0.43	0/2501	0.56	0/3387
1	C	0.37	0/2501	0.56	0/3387
1	D	0.44	0/2501	0.59	0/3387
All	All	0.42	0/10004	0.57	0/13548

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	2452	2442	2436	29	1
1	B	2452	2442	2436	58	1
1	C	2452	2445	2436	48	0
1	D	2452	2445	2436	53	0
2	A	19	11	10	3	0
2	B	19	11	10	1	0
3	A	3	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	D	1	0	0	0	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
5	A	10	0	0	2	0
5	B	10	0	0	1	0
5	C	10	0	0	2	0
5	D	10	0	0	4	0
6	A	279	0	0	9	1
6	B	253	0	0	13	0
6	C	218	0	0	7	0
6	D	296	0	0	23	1
All	All	10940	9796	9764	190	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 10.

All (190) 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:259:LYS:NZ	1:A:334:ASP:OD1	1.69	1.26
1:D:261:GLU:OE2	6:D:2220:HOH:O	1.72	1.05
1:C:216:LYS:NZ	1:D:303:GLY:O	1.96	0.97
1:C:232:GLN:NE2	6:C:2141:HOH:O	1.98	0.96
1:B:146:GLU:OE2	6:B:2138:HOH:O	1.86	0.94
1:D:146:GLU:OE1	6:D:2156:HOH:O	1.87	0.92
1:C:216:LYS:HD3	1:D:305:VAL:HG13	1.51	0.90
1:D:262:ILE:HD12	1:D:263:GLU:N	1.90	0.86
1:D:225:ASP:OD2	6:D:2207:HOH:O	1.93	0.86
1:A:318:LYS:NZ	6:A:2253:HOH:O	2.08	0.85
1:C:309:LYS:NZ	6:C:2187:HOH:O	2.09	0.84
1:D:255:SER:OG	5:D:1344:SO4:O3	1.97	0.80
1:A:181:TYR:N	6:A:2167:HOH:O	2.15	0.79
1:B:163:GLY:HA3	1:B:207:THR:CG2	2.13	0.79
1:B:223:ARG:NH1	6:B:2181:HOH:O	2.18	0.77
1:A:87:PRO:O	1:A:343:THR:HG21	1.85	0.77
5:C:1345:SO4:O3	6:C:2060:HOH:O	2.03	0.77
1:C:207:THR:O	1:C:207:THR:HG23	1.86	0.75
1:D:208:PHE:CE2	1:D:222:LEU:HD11	2.21	0.74
6:C:2180:HOH:O	1:D:216:LYS:NZ	2.20	0.74
1:D:326:GLN:NE2	6:D:2267:HOH:O	2.14	0.74
1:D:258:LEU:HB2	1:D:261:GLU:CD	2.06	0.74

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:107:ARG:NE	6:B:2093:HOH:O	2.06	0.74
5:D:1345:SO4:O2	6:D:2291:HOH:O	2.06	0.73
1:A:181:TYR:OH	1:A:221:LYS:HG3	1.90	0.71
1:A:122:ASN:ND2	6:A:2142:HOH:O	2.16	0.70
1:D:259:LYS:O	1:D:262:ILE:HG13	1.90	0.70
1:B:341:SER:OG	1:B:343:THR:HG22	1.91	0.70
1:B:163:GLY:HA3	1:B:207:THR:HG22	1.75	0.69
1:A:296:ASP:OD1	6:A:2213:HOH:O	2.10	0.69
1:D:257:SER:HA	6:D:2220:HOH:O	1.93	0.68
1:C:182:THR:N	1:C:207:THR:CG2	2.57	0.68
1:D:5:THR:OG1	1:D:8:VAL:HG13	1.93	0.68
1:B:238:LEU:CB	1:B:240:LEU:HD13	2.24	0.68
1:B:238:LEU:HB2	1:B:240:LEU:HD13	1.77	0.67
5:D:1344:SO4:O2	6:D:2198:HOH:O	2.11	0.67
1:C:259:LYS:O	1:C:263:GLU:HG2	1.94	0.67
1:B:115:GLN:OE1	6:B:2112:HOH:O	2.12	0.67
1:B:309:LYS:HD2	6:B:2224:HOH:O	1.95	0.67
1:B:330:GLN:OE1	6:B:2245:HOH:O	2.12	0.66
1:C:207:THR:O	1:C:207:THR:CG2	2.43	0.66
1:D:208:PHE:CD2	1:D:222:LEU:HD11	2.31	0.66
1:D:224:PRO:HB2	1:D:264:GLU:HG2	1.78	0.65
1:C:17:LYS:HD3	1:C:248:ASP:OD1	1.97	0.65
1:B:163:GLY:HA3	1:B:207:THR:HG21	1.80	0.63
2:A:1344[A]:TD4:O09	6:A:2069:HOH:O	2.15	0.63
1:C:79:THR:HG21	1:C:92:LEU:HD21	1.81	0.62
1:D:183:SER:OG	1:D:185:GLU:HG2	1.99	0.62
1:B:17:LYS:HE3	1:B:247:PHE:O	2.01	0.61
1:C:182:THR:N	1:C:207:THR:HG22	2.17	0.60
1:C:196:ALA:HB2	1:C:238:LEU:HD11	1.83	0.60
1:A:116:ARG:HD2	6:A:2129:HOH:O	2.00	0.59
1:D:241:PRO:O	1:D:244:ALA:CB	2.50	0.59
5:C:1345:SO4:O3	6:C:2218:HOH:O	2.16	0.59
1:C:163:GLY:HA3	1:C:207:THR:HB	1.85	0.58
1:C:181:TYR:HA	1:C:207:THR:HG23	1.85	0.58
1:D:262:ILE:HD12	1:D:263:GLU:CA	2.34	0.58
1:D:255:SER:CB	5:D:1344:SO4:O3	2.52	0.57
1:D:258:LEU:N	6:D:2220:HOH:O	2.29	0.57
1:B:181:TYR:CB	1:B:223:ARG:NH2	2.68	0.56
1:C:222:LEU:HD11	1:C:261:GLU:HB3	1.86	0.56
1:B:133:SER:HB2	1:B:163:GLY:O	2.06	0.56
1:B:276:ASP:HB2	2:B:1344[B]:TD4:H03A	1.88	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:181:TYR:CB	1:B:223:ARG:HH21	2.18	0.56
1:C:15:GLN:NE2	6:C:2014:HOH:O	2.38	0.55
1:A:79:THR:HG21	1:A:92:LEU:HD21	1.88	0.55
1:D:241:PRO:O	1:D:244:ALA:HB3	2.07	0.55
1:D:87:PRO:O	1:D:343:THR:HG23	2.07	0.55
1:B:185:GLU:OE1	1:B:189:LYS:HE3	2.06	0.54
1:D:244:ALA:HA	6:D:2217:HOH:O	2.07	0.54
1:A:333:ASN:ND2	6:A:2268:HOH:O	2.40	0.54
1:A:188:GLU:HG2	1:A:233:VAL:CG1	2.38	0.54
1:D:96:HIS:HE1	6:D:2098:HOH:O	1.91	0.54
1:B:164:VAL:H	1:B:207:THR:HG21	1.73	0.54
1:B:276:ASP:HB3	5:B:1346[A]:SO4:O4	2.08	0.54
1:C:181:TYR:HA	1:C:207:THR:CG2	2.39	0.53
1:B:223:ARG:NH1	1:B:226:ILE:HD11	2.23	0.53
1:A:181:TYR:OH	1:A:221:LYS:HE3	2.09	0.53
1:B:79:THR:HG21	1:B:92:LEU:HD21	1.89	0.52
1:B:68:MET:HB3	1:B:105:TYR:CD1	2.45	0.52
1:A:191:ILE:HD11	1:A:238:LEU:HD11	1.92	0.52
1:B:5:THR:OG1	1:B:8:VAL:HG13	2.10	0.51
1:D:263:GLU:HG3	6:D:2223:HOH:O	2.10	0.51
1:C:216:LYS:HD3	1:D:305:VAL:CG1	2.34	0.51
1:A:313:PRO:HA	1:A:316:TYR:CE1	2.46	0.51
1:C:165:VAL:HG11	1:C:212:HIS:CE1	2.46	0.51
1:A:259:LYS:HZ1	1:A:334:ASP:CG	2.12	0.51
1:D:252:HIS:CE1	1:D:274:ASN:ND2	2.78	0.51
1:B:78:PHE:CE2	1:B:82:ILE:HG13	2.45	0.51
1:D:232:GLN:HG2	6:D:2210:HOH:O	2.11	0.51
1:B:238:LEU:HB3	1:B:240:LEU:HD13	1.94	0.50
1:B:258:LEU:HB2	1:B:261:GLU:HG3	1.93	0.50
1:D:244:ALA:HA	6:D:2212:HOH:O	2.12	0.50
1:C:107:ARG:HB2	1:C:108:PRO:HD3	1.94	0.50
1:C:209:GLY:HA3	1:C:222:LEU:HA	1.93	0.49
1:C:183:SER:OG	1:C:186:ASP:N	2.41	0.49
1:D:79:THR:HG21	1:D:92:LEU:HD21	1.94	0.48
1:A:38:ILE:HG13	1:A:50:ILE:HD11	1.94	0.48
1:C:18:GLN:NE2	6:C:2021:HOH:O	2.36	0.48
1:B:107:ARG:NH2	6:B:2093:HOH:O	2.47	0.48
1:B:161:GLU:OE2	1:B:165:VAL:HG23	2.13	0.48
1:D:133:SER:HB2	1:D:163:GLY:C	2.34	0.47
1:A:221:LYS:HG3	1:A:221:LYS:O	2.13	0.47
1:B:17:LYS:HE2	1:B:245:LYS:CB	2.44	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:259:LYS:NZ	1:A:334:ASP:CG	2.58	0.47
1:A:259:LYS:O	1:A:263:GLU:HG3	2.13	0.47
1:D:66:LYS:HE3	6:D:2066:HOH:O	2.15	0.47
1:D:321:GLU:OE1	6:D:2262:HOH:O	2.21	0.47
1:B:181:TYR:HB2	1:B:223:ARG:NH2	2.29	0.47
1:C:222:LEU:HD12	1:C:224:PRO:HD3	1.97	0.46
1:B:10:ALA:CB	1:B:201:LYS:HE3	2.45	0.46
1:A:229:GLN:HB2	6:A:2186:HOH:O	2.16	0.46
1:C:21:TYR:CE2	1:C:340:LYS:HD3	2.50	0.46
5:A:1350[B]:SO4:O3	6:A:2069:HOH:O	2.19	0.46
1:A:188:GLU:O	1:A:191:ILE:HG22	2.16	0.46
1:A:198:GLU:HG2	1:A:199:HIS:ND1	2.31	0.46
1:B:182:THR:HG23	6:B:2147:HOH:O	2.16	0.46
1:B:309:LYS:HG3	6:B:2223:HOH:O	2.15	0.46
1:B:238:LEU:HB3	1:B:240:LEU:CD1	2.46	0.46
1:B:240:LEU:HD12	1:B:240:LEU:N	2.31	0.46
1:A:198:GLU:HG2	1:A:199:HIS:N	2.31	0.46
1:B:214:VAL:HG21	1:B:278:ASP:OD1	2.16	0.46
1:C:38:ILE:HG13	1:C:50:ILE:HD11	1.98	0.46
1:A:99:LYS:HE3	1:A:143:ILE:HD11	1.98	0.45
1:C:313:PRO:HA	1:C:316:TYR:CE2	2.51	0.45
1:D:149:LYS:CG	6:D:2061:HOH:O	2.64	0.45
1:B:210:ASN:HB3	1:B:252:HIS:O	2.16	0.45
1:C:221:LYS:O	1:C:221:LYS:HG3	2.17	0.45
1:C:182:THR:H	1:C:207:THR:CG2	2.27	0.45
1:B:259:LYS:HG2	6:B:2089:HOH:O	2.16	0.44
1:D:163:GLY:CA	6:D:2166:HOH:O	2.65	0.44
1:B:258:LEU:HB2	1:B:261:GLU:CG	2.47	0.44
1:C:165:VAL:HG11	1:C:212:HIS:CD2	2.51	0.44
1:C:231:GLN:OE1	1:C:246:PRO:HD2	2.18	0.44
1:D:258:LEU:HB2	1:D:261:GLU:CG	2.47	0.44
1:B:17:LYS:HE2	1:B:245:LYS:HB2	2.00	0.44
1:A:161:GLU:OE2	1:A:165:VAL:HG23	2.18	0.44
1:B:182:THR:HG22	1:B:183:SER:N	2.32	0.44
1:B:313:PRO:HA	1:B:316:TYR:CZ	2.53	0.44
1:D:38:ILE:HG13	1:D:50:ILE:HD11	2.00	0.44
1:C:64:GLY:CA	1:D:39:LYS:HD3	2.49	0.43
1:C:208:PHE:O	1:C:208:PHE:CG	2.72	0.43
1:D:164:VAL:N	6:D:2140:HOH:O	2.50	0.43
1:C:210:ASN:OD1	1:C:210:ASN:N	2.51	0.43
1:D:313:PRO:HA	1:D:316:TYR:CE1	2.53	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:50:ILE:HD12	1:B:90:VAL:HG11	1.99	0.43
1:B:183:SER:OG	1:B:186:ASP:CG	2.56	0.43
1:D:165:VAL:HG21	1:D:212:HIS:CE1	2.53	0.43
1:D:221:LYS:HG2	6:D:2171:HOH:O	2.18	0.43
1:B:107:ARG:CZ	6:B:2093:HOH:O	2.58	0.43
1:B:57:ALA:O	1:B:71:GLY:HA3	2.19	0.43
1:C:258:LEU:HG	1:C:260:SER:H	1.83	0.43
1:C:220:VAL:O	1:C:220:VAL:HG12	2.19	0.42
1:D:103:ASP:OD1	1:D:107:ARG:NH1	2.46	0.42
1:D:161:GLU:CD	6:D:2098:HOH:O	2.58	0.42
1:A:95:ASP:OD2	2:A:1344[A]:TD4:H03	2.19	0.42
1:C:50:ILE:HD12	1:C:90:VAL:HG11	2.01	0.42
1:C:182:THR:H	1:C:207:THR:HG22	1.83	0.42
1:C:208:PHE:CD1	1:C:208:PHE:N	2.87	0.42
1:B:51:GLN:HA	1:B:93:HIS:O	2.19	0.42
1:B:127:SER:HA	1:B:156:ILE:HG23	2.02	0.42
1:C:143:ILE:O	1:C:146:GLU:HG2	2.19	0.42
1:C:24:PRO:HD3	1:C:337:CYS:SG	2.59	0.42
1:C:36:ALA:HB2	1:C:321:GLU:HG3	2.02	0.42
1:D:262:ILE:CD1	1:D:263:GLU:N	2.73	0.42
1:D:164:VAL:HB	6:D:2140:HOH:O	2.20	0.42
1:D:57:ALA:O	1:D:71:GLY:HA3	2.20	0.41
1:C:182:THR:HG23	1:C:186:ASP:HB2	2.02	0.41
1:D:256:GLY:HA2	6:D:2219:HOH:O	2.19	0.41
1:B:183:SER:HA	1:B:184:PRO:HD3	1.90	0.41
1:A:313:PRO:HA	1:A:316:TYR:CZ	2.56	0.41
1:B:216:LYS:NZ	6:B:2178:HOH:O	2.25	0.41
1:C:161:GLU:HG2	1:C:163:GLY:O	2.21	0.41
1:C:216:LYS:O	1:C:219:ASN:OD1	2.38	0.41
1:B:10:ALA:HB2	1:B:201:LYS:HE3	2.03	0.41
1:B:181:TYR:O	6:B:2151:HOH:O	2.21	0.41
1:B:208:PHE:CD1	1:B:208:PHE:N	2.89	0.41
1:C:39:LYS:HD3	1:D:64:GLY:HA3	2.03	0.41
1:C:273:MET:CE	1:C:335:LEU:HD21	2.51	0.41
1:D:149:LYS:HG2	6:D:2061:HOH:O	2.20	0.41
1:A:208:PHE:CD1	1:A:208:PHE:N	2.89	0.41
1:A:276:ASP:HB3	5:A:1349[B]:SO4:O2	2.20	0.41
1:B:225:ASP:OD1	1:B:264:GLU:OE2	2.39	0.41
1:B:255:SER:HB3	1:B:278:ASP:CG	2.41	0.41
1:D:133:SER:HB2	1:D:163:GLY:O	2.20	0.41
1:C:57:ALA:O	1:C:71:GLY:HA3	2.21	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:182:THR:CG2	1:B:183:SER:N	2.84	0.40
1:D:181:TYR:CZ	1:D:223:ARG:HG3	2.55	0.40
1:B:133:SER:CB	1:B:163:GLY:O	2.68	0.40
2:A:1344[A]:TD4:H14	2:A:1344[A]:TD4:H03A	1.83	0.40

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:145:GLN:OE1	6:D:2285:HOH:O[1_554]	1.77	0.43
1:A:149:LYS:HZ2	6:A:2272:HOH:O[1_545]	1.35	0.25

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	325/344 (94%)	323 (99%)	2 (1%)	0	100	100
1	B	325/344 (94%)	321 (99%)	3 (1%)	1 (0%)	41	31
1	C	325/344 (94%)	321 (99%)	3 (1%)	1 (0%)	41	31
1	D	325/344 (94%)	320 (98%)	5 (2%)	0	100	100
All	All	1300/1376 (94%)	1285 (99%)	13 (1%)	2 (0%)	47	38

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	96	HIS
1	C	209	GLY

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	253/266 (95%)	249 (98%)	4 (2%)	62	60
1	B	253/266 (95%)	246 (97%)	7 (3%)	43	36
1	C	253/266 (95%)	249 (98%)	4 (2%)	62	60
1	D	253/266 (95%)	248 (98%)	5 (2%)	55	51
All	All	1012/1064 (95%)	992 (98%)	20 (2%)	55	51

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	183	SER
1	A	210	ASN
1	A	241	PRO
1	A	251	PHE
1	B	8	VAL
1	B	115	GLN
1	B	207	THR
1	B	210	ASN
1	B	221	LYS
1	B	251	PHE
1	B	261	GLU
1	C	221	LYS
1	C	222	LEU
1	C	225	ASP
1	C	251	PHE
1	D	17	LYS
1	D	164	VAL
1	D	221	LYS
1	D	251	PHE
1	D	258	LEU

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	89	ASN
1	A	333	ASN
1	A	336	HIS
1	C	212	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](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 18 ligands modelled in this entry, 8 are monoatomic - leaving 10 for Mogul analysis.

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
5	SO4	B	1347[A]	-	4,4,4	0.15	0	6,6,6	0.08	0
5	SO4	A	1349[B]	3	4,4,4	0.15	0	6,6,6	0.07	0
5	SO4	B	1346[A]	3	4,4,4	0.15	0	6,6,6	0.08	0
5	SO4	D	1345	-	4,4,4	0.15	0	6,6,6	0.19	0
5	SO4	C	1344	3	4,4,4	0.19	0	6,6,6	0.15	0
5	SO4	D	1344	3	4,4,4	0.13	0	6,6,6	0.21	0
2	TD4	A	1344[A]	4,3	18,18,18	2.82	7 (38%)	20,25,25	1.25	2 (10%)
5	SO4	A	1350[B]	-	4,4,4	0.13	0	6,6,6	0.05	0
5	SO4	C	1345	-	4,4,4	0.18	0	6,6,6	0.18	0
2	TD4	B	1344[B]	4,3	18,18,18	2.92	7 (38%)	20,25,25	1.28	2 (10%)

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	TD4	A	1344[A]	4,3	-	7/19/19/19	-
2	TD4	B	1344[B]	4,3	-	8/19/19/19	-

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	1344[B]	TD4	C12-N02	8.25	1.46	1.34
2	A	1344[A]	TD4	C12-N02	8.03	1.45	1.34
2	B	1344[B]	TD4	P08-O09	4.93	1.66	1.50
2	B	1344[B]	TD4	O15-C14	-4.91	1.39	1.43
2	A	1344[A]	TD4	P08-O09	4.75	1.65	1.50
2	A	1344[A]	TD4	O15-C14	-4.63	1.39	1.43
2	A	1344[A]	TD4	P08-O10	2.78	1.65	1.54
2	B	1344[B]	TD4	P08-O10	2.61	1.64	1.54
2	A	1344[A]	TD4	P16-O18	2.58	1.64	1.54
2	B	1344[B]	TD4	P16-O18	2.53	1.64	1.54
2	B	1344[B]	TD4	P16-O17	2.29	1.63	1.54
2	B	1344[B]	TD4	P08-O11	-2.20	1.46	1.54
2	A	1344[A]	TD4	P08-O11	-2.13	1.46	1.54
2	A	1344[A]	TD4	P16-O17	2.11	1.63	1.54

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	1344[B]	TD4	C04-C03-N02	3.12	117.54	111.06
2	A	1344[A]	TD4	C04-C03-N02	2.92	117.12	111.06
2	B	1344[B]	TD4	O07-C06-C05	2.85	118.48	108.99
2	A	1344[A]	TD4	O07-C06-C05	2.35	116.82	108.99

There are no chirality outliers.

All (15) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	1344[A]	TD4	N02-C03-C04-C05
2	A	1344[A]	TD4	C06-O07-P08-O10
2	A	1344[A]	TD4	C06-O07-P08-O11
2	B	1344[B]	TD4	N02-C03-C04-C05

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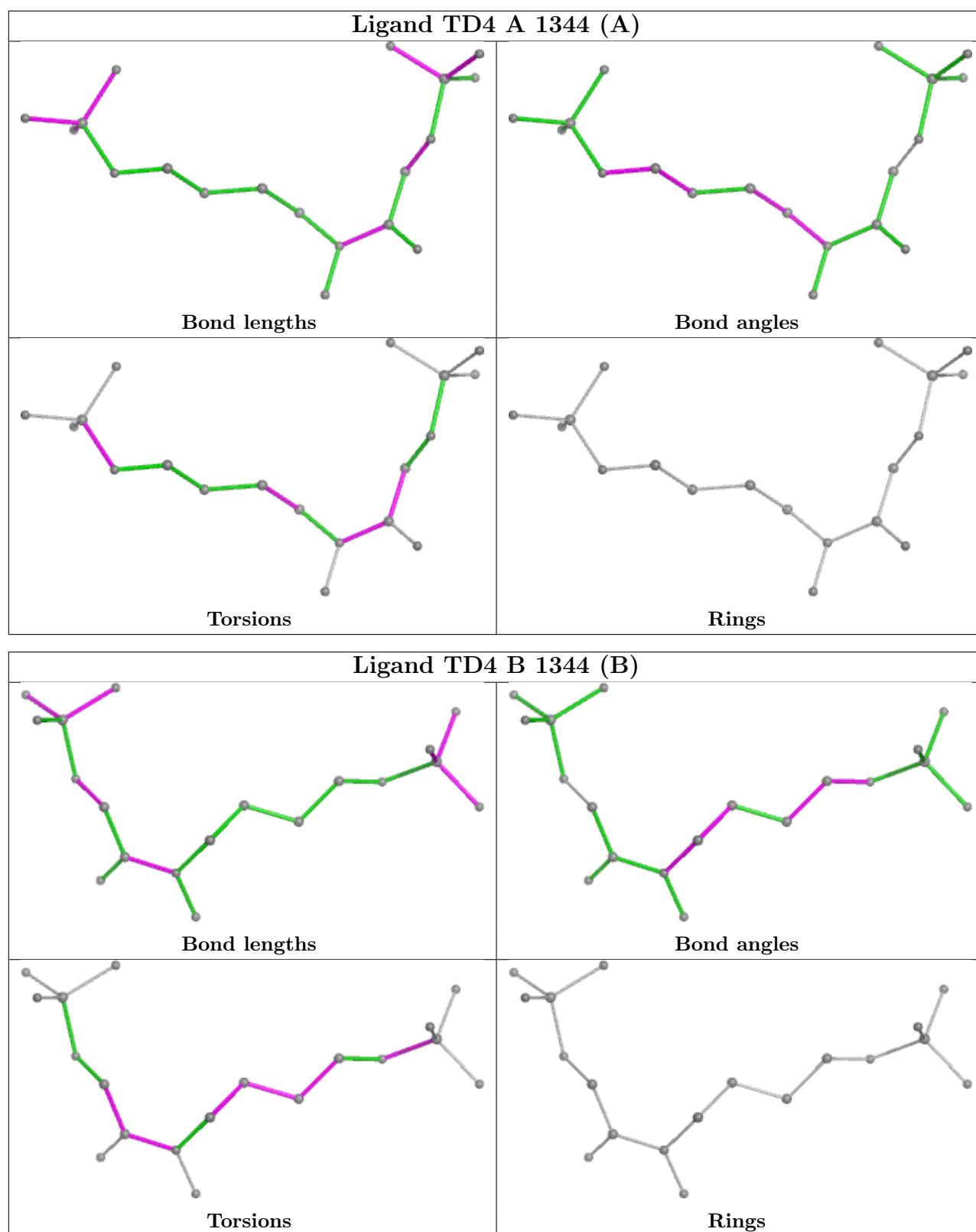
Mol	Chain	Res	Type	Atoms
2	B	1344[B]	TD4	C06-O07-P08-O09
2	B	1344[B]	TD4	C06-O07-P08-O10
2	B	1344[B]	TD4	C06-O07-P08-O11
2	B	1344[B]	TD4	C03-C04-C05-C06
2	A	1344[A]	TD4	C06-O07-P08-O09
2	B	1344[B]	TD4	C04-C05-C06-O07
2	A	1344[A]	TD4	O13-C12-C14-O15
2	A	1344[A]	TD4	N02-C12-C14-O15
2	B	1344[B]	TD4	N02-C12-C14-O15
2	A	1344[A]	TD4	O13-C12-N02-O01
2	B	1344[B]	TD4	O13-C12-N02-O01

There are no ring outliers.

8 monomers are involved in 13 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	1349[B]	SO4	1	0
5	B	1346[A]	SO4	1	0
5	D	1345	SO4	1	0
5	D	1344	SO4	3	0
2	A	1344[A]	TD4	3	0
5	A	1350[B]	SO4	1	0
5	C	1345	SO4	2	0
2	B	1344[B]	TD4	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



5.7 Other polymers [\(i\)](#)

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	329/344 (95%)	0.05	11 (3%) 46 49	10, 21, 53, 111	0
1	B	329/344 (95%)	0.13	19 (5%) 23 25	12, 24, 57, 121	0
1	C	329/344 (95%)	0.45	37 (11%) 5 6	12, 33, 84, 137	0
1	D	329/344 (95%)	0.35	26 (7%) 12 14	11, 22, 77, 146	0
All	All	1316/1376 (95%)	0.25	93 (7%) 16 17	10, 25, 70, 146	0

All (93) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	164	VAL	20.2
1	D	218	GLY	12.1
1	D	212	HIS	9.7
1	C	220	VAL	8.6
1	C	215	TYR	8.5
1	D	220	VAL	8.4
1	C	216	LYS	8.4
1	D	165	VAL	8.3
1	B	220	VAL	7.3
1	C	217	PRO	7.2
1	C	214	VAL	7.0
1	B	217	PRO	6.7
1	C	164	VAL	6.6
1	D	163	GLY	6.4
1	D	219	ASN	6.4
1	D	217	PRO	6.3
1	A	218	GLY	6.1
1	D	214	VAL	6.1
1	B	216	LYS	5.8
1	B	221	LYS	5.8
1	C	163	GLY	5.8

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Mol	Chain	Res	Type	RSRZ
1	C	219	ASN	5.7
1	D	215	TYR	5.7
1	C	218	GLY	5.6
1	B	218	GLY	5.4
1	D	221	LYS	5.2
1	B	215	TYR	4.7
1	C	221	LYS	4.6
1	B	219	ASN	4.6
1	D	216	LYS	4.5
1	B	214	VAL	4.3
1	A	181	TYR	4.3
1	C	165	VAL	4.3
1	C	167	GLY	4.2
1	D	242	ALA	4.2
1	C	184	PRO	4.2
1	B	163	GLY	3.9
1	C	232	GLN	3.9
1	C	213	GLY	3.7
1	A	220	VAL	3.6
1	C	181	TYR	3.6
1	B	181	TYR	3.5
1	B	164	VAL	3.5
1	C	211	VAL	3.5
1	C	343	THR	3.4
1	C	212	HIS	3.3
1	D	213	GLY	3.2
1	D	244	ALA	3.2
1	D	256	GLY	3.2
1	A	242	ALA	3.2
1	D	257	SER	3.1
1	C	207	THR	3.1
1	D	211	VAL	3.1
1	B	256	GLY	3.1
1	C	261	GLU	3.0
1	D	243	ASP	3.0
1	C	166	GLY	2.9
1	D	254	GLY	2.9
1	D	166	GLY	2.8
1	C	208	PHE	2.8
1	A	221	LYS	2.7
1	C	258	LEU	2.7
1	A	164	VAL	2.7

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Mol	Chain	Res	Type	RSRZ
1	C	223	ARG	2.7
1	C	256	GLY	2.6
1	B	165	VAL	2.6
1	B	259	LYS	2.6
1	B	257	SER	2.6
1	B	258	LEU	2.5
1	D	343	THR	2.5
1	B	211	VAL	2.5
1	D	223	ARG	2.5
1	C	257	SER	2.4
1	A	217	PRO	2.4
1	A	243	ASP	2.4
1	A	214	VAL	2.4
1	C	194	LEU	2.3
1	C	225	ASP	2.3
1	C	188	GLU	2.3
1	A	166	GLY	2.2
1	C	260	SER	2.2
1	A	223	ARG	2.2
1	D	258	LEU	2.2
1	C	185	GLU	2.2
1	D	262	ILE	2.2
1	C	259	LYS	2.2
1	B	167	GLY	2.2
1	C	187	PHE	2.2
1	C	254	GLY	2.2
1	C	198	GLU	2.2
1	C	222	LEU	2.1
1	D	222	LEU	2.1
1	B	213	GLY	2.1

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 monosaccharides in this entry.

6.4 Ligands

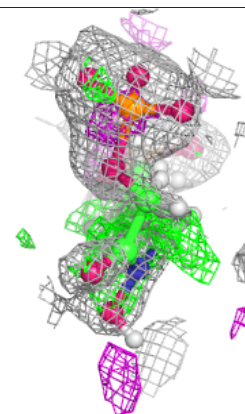
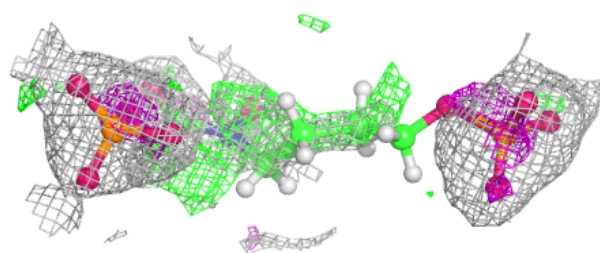
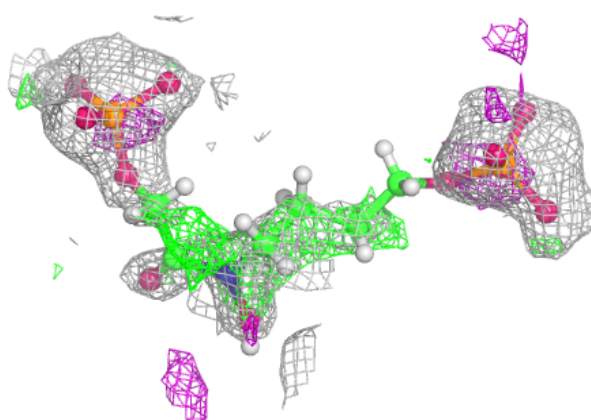
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	NA	C	1346	1/1	0.40	0.14	71,71,71,71	0
3	NA	D	1346	1/1	0.81	0.12	73,73,73,73	0
4	ZN	B	1345	1/1	0.83	0.25	45,45,45,45	1
3	NA	B	1348	1/1	0.92	0.11	46,46,46,46	0
4	ZN	A	1348	1/1	0.92	0.10	36,36,36,36	1
2	TD4	B	1344[B]	19/19	0.92	0.20	23,34,45,47	30
5	SO4	A	1350[B]	5/5	0.93	0.10	33,35,38,41	5
5	SO4	B	1347[A]	5/5	0.93	0.15	38,44,47,48	5
5	SO4	C	1345	5/5	0.93	0.13	33,35,60,62	0
5	SO4	D	1344	5/5	0.93	0.19	34,40,52,55	0
5	SO4	D	1345	5/5	0.93	0.13	34,40,56,56	0
2	TD4	A	1344[A]	19/19	0.94	0.11	21,31,40,41	30
3	NA	A	1345	1/1	0.94	0.07	33,33,33,33	0
5	SO4	C	1344	5/5	0.95	0.12	38,43,51,55	0
3	NA	A	1346	1/1	0.96	0.19	31,31,31,31	0
5	SO4	B	1346[A]	5/5	0.98	0.15	31,32,38,39	5
5	SO4	A	1349[B]	5/5	0.98	0.10	22,23,28,28	5
3	NA	A	1347	1/1	0.98	0.06	25,25,25,25	0

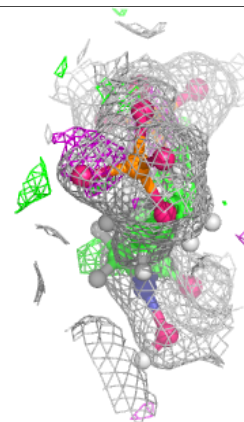
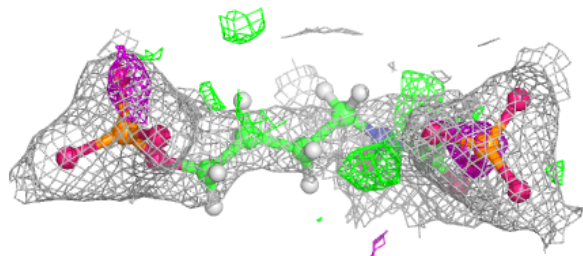
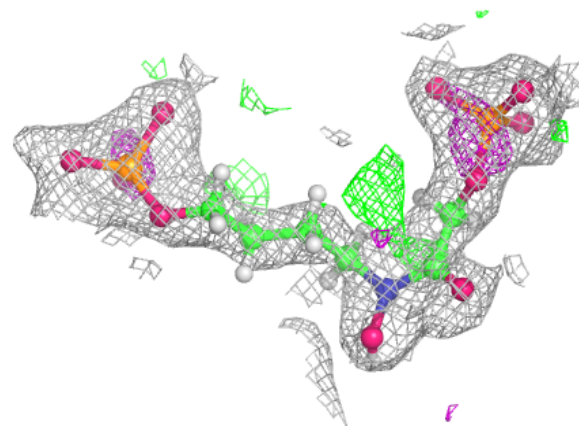
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around TD4 B 1344 (B):

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

**Electron density around TD4 A 1344 (A):**

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



6.5 Other polymers [i](#)

There are no such residues in this entry.