



# Full wwPDB X-ray Structure Validation Report ⓘ

Jan 2, 2024 – 11:28 am GMT

PDB ID : 4YEK  
Title : X-ray structure of the thymidine phosphorylase from *Salmonella typhimurium* in complex with thymidine  
Authors : Balaev, V.V.; Lashkov, A.A.; Gabdulkhakov, A.G.; Betzel, C.; Mikhailov, A.M.  
Deposited on : 2015-02-24  
Resolution : 2.55 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](mailto: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>.

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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)  
Validation Pipeline (wwPDB-VP) : 2.36

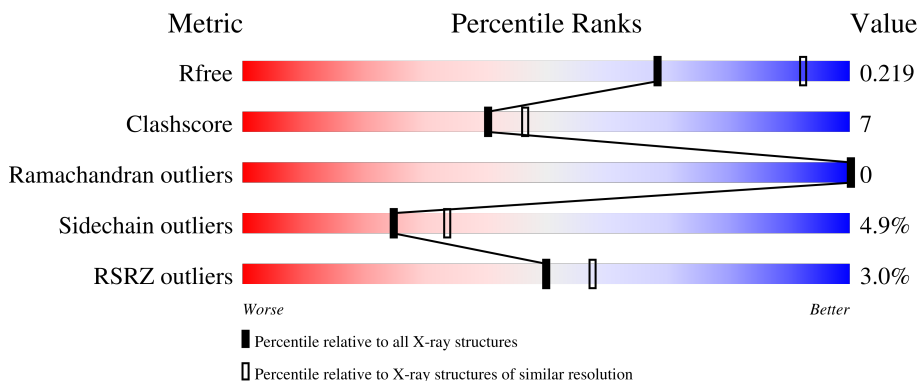
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.55 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	1284 (2.56-2.52)
Clashscore	141614	1332 (2.56-2.52)
Ramachandran outliers	138981	1315 (2.56-2.52)
Sidechain outliers	138945	1315 (2.56-2.52)
RSRZ outliers	127900	1272 (2.56-2.52)

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  $\geq 3$ , 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	440	 5% 84% 15%
1	B	440	 5% 79% 20%

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	THM	A	507	-	X	-	-
3	THM	B	505	-	X	-	-
3	THM	B	506	-	X	-	-

## 2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 6812 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 Thymidine phosphorylase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	440	Total 3290	C 2062	N 566	O 640	S 22	2	0	0
1	B	440	Total 3290	C 2062	N 566	O 640	S 22	2	0	0

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



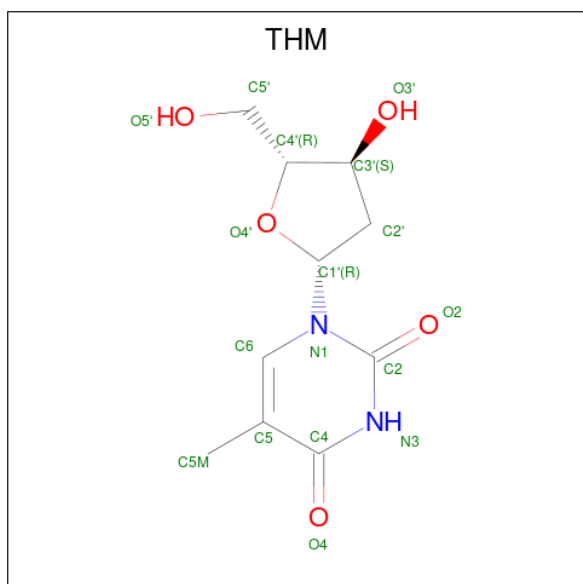
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	O	S		
2	A	1	Total 5	O 4	S 1	0	0
2	A	1	Total 5	O 4	S 1	0	0
2	A	1	Total 5	O 4	S 1	0	0
2	A	1	Total 5	O 4	S 1	0	0

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

- Molecule 3 is THYMIDINE (three-letter code: THM) (formula: C<sub>10</sub>H<sub>14</sub>N<sub>2</sub>O<sub>5</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	
3	A	1	Total	C	N	O	0	0
			17	10	2	5		
3	A	1	Total	C	N	O	0	0
			17	10	2	5		
3	B	1	Total	C	N	O	0	0
			17	10	2	5		
3	B	1	Total	C	N	O	0	0
			17	10	2	5		

- Molecule 4 is TRIETHYLENE GLYCOL (three-letter code: PGE) (formula: C<sub>6</sub>H<sub>14</sub>O<sub>4</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			10	6	4		

- Molecule 5 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).



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

- Molecule 6 is GLYCEROL (three-letter code: GOL) (formula:  $C_3H_8O_3$ ).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total C O 6 3 3	0	0

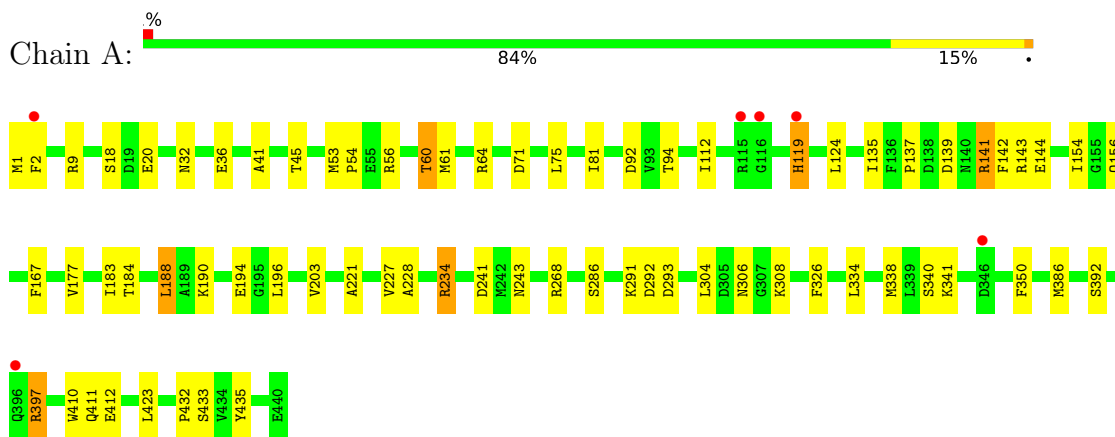
- Molecule 7 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	49	Total O 49 49	0	0
7	B	37	Total O 37 37	0	0

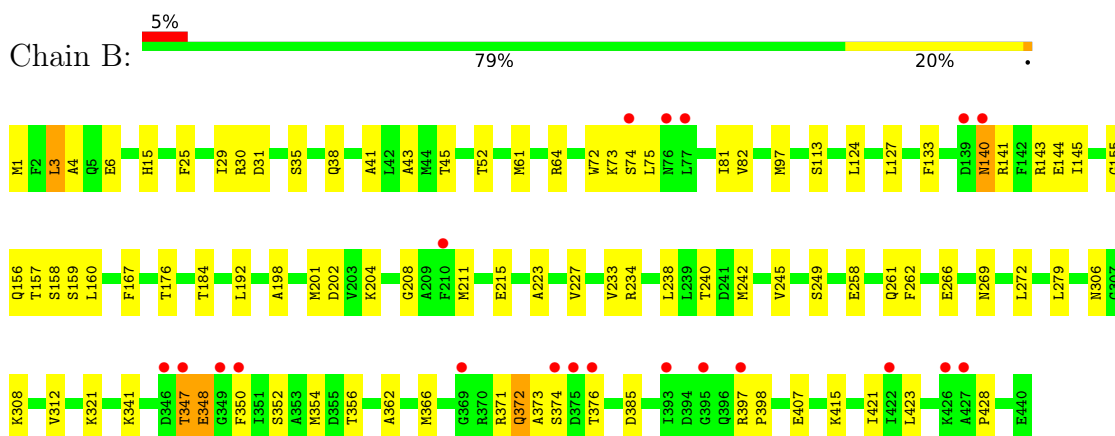
### 3 Residue-property plots [i](#)

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: Thymidine phosphorylase



- Molecule 1: Thymidine phosphorylase





## 4 Data and refinement statistics

Property	Value	Source
Space group	I 4	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	190.92Å 190.92Å 57.72Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	39.02 – 2.55 39.02 – 2.55	Depositor EDS
% Data completeness (in resolution range)	97.4 (39.02-2.55) 97.4 (39.02-2.55)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.65 (at 2.54Å)	Xtrriage
Refinement program	PHENIX	Depositor
R, $R_{free}$	0.176 , 0.215 0.182 , 0.219	Depositor DCC
$R_{free}$ test set	1695 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	63.6	Xtrriage
Anisotropy	0.080	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 49.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	0.025 for -k,-h,-l	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	6812	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	67.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.85% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: PGE, SO4, EDO, THM, GOL

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	0.54	0/3338	0.65	1/4514 (0.0%)
1	B	0.49	0/3338	0.63	0/4514
All	All	0.51	0/6676	0.64	1/9028 (0.0%)

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	1

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
1	A	188	LEU	CA-CB-CG	5.02	126.85	115.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	2	PHE	Peptide

### 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	3290	0	3306	39	1
1	B	3290	0	3306	57	1
2	A	30	0	0	2	0
2	B	20	0	0	0	0
3	A	34	0	25	2	0
3	B	34	0	27	5	0
4	A	10	0	14	0	0
5	A	8	0	12	0	0
5	B	4	0	6	0	0
6	A	6	0	8	0	0
7	A	49	0	0	1	0
7	B	37	0	0	5	0
All	All	6812	0	6704	96	1

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 7.

All (96) 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:238:LEU:HD12	1:B:279:LEU:HD23	1.53	0.89
1:B:43:ALA:HB1	1:B:176:THR:HG21	1.61	0.81
1:A:112:ILE:HD12	1:A:194:GLU:HG2	1.69	0.75
1:B:202:ASP:OD1	1:B:240:THR:OG1	2.07	0.73
1:B:82:VAL:HG12	1:B:198:ALA:HB3	1.72	0.71
1:B:385:ASP:H	3:B:505:THM:HO5'	1.40	0.69
1:B:15:HIS:ND1	7:B:601:HOH:O	2.25	0.69
1:A:61:MET:HG2	1:A:64:ARG:HH21	1.58	0.67
1:B:354:MET:HG3	1:B:421:ILE:HG13	1.78	0.66
1:A:119:HIS:H	1:A:119:HIS:CD2	2.11	0.64
1:A:137:PRO:O	1:A:156:GLN:NE2	2.30	0.63
1:B:97:MET:HG2	1:B:262:PHE:CD1	2.34	0.62
1:B:35:SER:HB3	1:B:38:GLN:HG3	1.82	0.62
1:A:56:ARG:O	1:A:60:THR:HG23	2.00	0.61
1:B:249:SER:HB3	3:B:505:THM:H5'1	1.82	0.59
1:A:139:ASP:O	1:A:143:ARG:HG3	2.04	0.58
1:B:61:MET:HG2	1:B:64:ARG:NH2	2.19	0.57
1:B:124:LEU:HA	7:B:633:HOH:O	2.02	0.57
1:A:338:MET:HB3	7:A:649:HOH:O	2.04	0.56
1:B:43:ALA:CB	1:B:176:THR:HG21	2.33	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:432:PRO:HD2	1:A:435:TYR:CE1	2.42	0.55
1:A:60:THR:HG21	1:A:227:VAL:HG11	1.88	0.55
1:B:41:ALA:O	1:B:45:THR:HG23	2.07	0.54
1:B:141:ARG:O	1:B:145:ILE:HG13	2.08	0.54
1:B:127:LEU:HD13	1:B:133:PHE:CZ	2.42	0.54
1:B:341:LYS:NZ	1:B:407:GLU:OE1	2.33	0.53
1:A:291:LYS:HG3	1:A:292:ASP:OD2	2.07	0.53
1:A:137:PRO:HB2	1:A:141:ARG:HB3	1.89	0.53
1:B:72:TRP:CD1	1:B:81:ILE:HG12	2.44	0.52
1:B:192:LEU:HD22	1:B:233:VAL:HG21	1.91	0.51
1:B:245:VAL:H	1:B:354:MET:HE1	1.74	0.51
1:A:124:LEU:HD13	1:A:135:ILE:HD12	1.93	0.51
1:B:140:ASN:OD1	1:B:140:ASN:N	2.38	0.50
1:A:9:ARG:NH2	2:A:502:SO4:O2	2.26	0.50
1:A:183:ILE:HG12	3:A:507:THM:HM52	1.94	0.50
1:A:81:ILE:HG22	1:A:196:LEU:HD23	1.93	0.49
1:B:124:LEU:HD11	1:B:155:GLY:HA2	1.94	0.49
1:B:306:ASN:OD1	1:B:308:LYS:HB2	2.12	0.49
1:B:3:LEU:O	1:B:6:GLU:HB3	2.12	0.49
1:B:249:SER:HB3	3:B:505:THM:C5'	2.42	0.49
1:B:127:LEU:HD12	7:B:633:HOH:O	2.11	0.49
1:B:372:GLN:OE1	1:B:373:ALA:O	2.30	0.48
1:A:341:LYS:HE3	1:A:410:TRP:CE2	2.49	0.48
1:A:75:LEU:HD21	1:A:143:ARG:HB3	1.95	0.48
1:B:258:GLU:HG3	7:B:621:HOH:O	2.14	0.48
1:A:71:ASP:O	1:A:143:ARG:NH2	2.46	0.47
1:A:241:ASP:OD2	1:A:243:ASN:ND2	2.46	0.47
1:A:184:THR:HG21	1:A:227:VAL:HG21	1.95	0.47
1:B:184:THR:HG21	1:B:227:VAL:HG21	1.96	0.47
1:B:373:ALA:O	1:B:374:SER:HB3	2.15	0.47
1:B:113:SER:O	1:B:156:GLN:HG3	2.14	0.47
1:B:30:ARG:HD2	1:B:31:ASP:OD1	2.15	0.46
1:B:223:ALA:O	1:B:227:VAL:HG23	2.15	0.46
1:A:326:PHE:HZ	1:A:334:LEU:HD21	1.81	0.46
1:A:177:VAL:HG13	3:A:507:THM:HM53	1.97	0.45
1:A:293:ASP:N	2:A:506:SO4:O2	2.38	0.45
1:A:41:ALA:O	1:A:45:THR:HG23	2.17	0.45
1:B:202:ASP:HB2	1:B:279:LEU:HD21	1.99	0.44
1:A:142:PHE:CE1	1:A:154:ILE:HD13	2.53	0.44
1:B:208:GLY:HA3	1:B:356:THR:HB	1.98	0.44
1:A:268:ARG:NH2	1:A:304:LEU:HB3	2.34	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:321:LYS:HB3	1:B:321:LYS:HE2	1.80	0.43
1:B:176:THR:O	1:B:176:THR:HG22	2.18	0.43
1:B:124:LEU:HD23	7:B:633:HOH:O	2.18	0.43
1:A:234:ARG:HG2	1:A:286:SER:HB3	2.01	0.43
1:A:350:PHE:O	1:A:423:LEU:HA	2.18	0.43
1:B:61:MET:HG2	1:B:64:ARG:HH21	1.84	0.43
1:B:127:LEU:HD23	1:B:127:LEU:HA	1.83	0.43
1:A:392:SER:O	1:A:397:ARG:NH1	2.52	0.42
1:B:362:ALA:O	1:B:366:MET:HG3	2.19	0.42
1:A:53:MET:HB3	1:A:54:PRO:HD3	2.00	0.42
1:B:25:PHE:O	1:B:29:ILE:HG13	2.20	0.42
1:B:269:ASN:HB3	1:B:272:LEU:HB3	2.01	0.42
1:B:350:PHE:O	1:B:423:LEU:HA	2.19	0.42
1:B:261:GLN:HB3	1:B:266:GLU:HB3	2.02	0.42
1:B:397:ARG:HA	1:B:398:PRO:HD3	1.77	0.42
1:B:75:LEU:HD21	1:B:143:ARG:NH1	2.35	0.42
1:A:386:MET:HE2	1:A:386:MET:HB3	1.92	0.41
1:A:432:PRO:HD2	1:A:435:TYR:HE1	1.82	0.41
1:A:20:GLU:CD	1:A:20:GLU:H	2.22	0.41
1:A:306:ASN:OD1	1:A:308:LYS:HB2	2.20	0.41
1:B:74:SER:HB3	1:B:143:ARG:HH22	1.86	0.41
1:A:18:SER:OG	1:A:20:GLU:HG2	2.21	0.41
1:A:203:VAL:HG21	1:A:221:ALA:HB2	2.03	0.41
1:B:352:SER:HA	1:B:428:PRO:HG3	2.03	0.41
1:A:341:LYS:HE3	1:A:410:TRP:CZ2	2.56	0.41
1:B:4:ALA:HB1	1:B:25:PHE:CE2	2.55	0.41
1:B:385:ASP:N	3:B:505:THM:O5'	2.22	0.41
1:A:188:LEU:HD21	1:A:228:ALA:HB2	2.04	0.40
1:B:308:LYS:O	1:B:312:VAL:HG12	2.21	0.40
1:B:385:ASP:N	3:B:505:THM:HO5'	2.13	0.40
1:B:201:MET:HE3	1:B:201:MET:HB2	1.95	0.40
1:B:350:PHE:CD1	1:B:350:PHE:N	2.89	0.40
1:A:92:ASP:OD1	1:A:94:THR:HG23	2.21	0.40
1:B:204:LYS:HD2	1:B:242:MET:HE3	2.04	0.40
1:B:347:THR:OG1	1:B:348:GLU:O	2.40	0.40

All (1) 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:A:36:GLU:OE2	1:B:35:SER:OG[1_556]	2.16	0.04

## 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	438/440 (100%)	422 (96%)	16 (4%)	0	100	100
1	B	438/440 (100%)	424 (97%)	14 (3%)	0	100	100
All	All	876/880 (100%)	846 (97%)	30 (3%)	0	100	100

There are no Ramachandran outliers to report.

### 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	344/344 (100%)	330 (96%)	14 (4%)	30	41
1	B	344/344 (100%)	324 (94%)	20 (6%)	20	26
All	All	688/688 (100%)	654 (95%)	34 (5%)	25	34

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

Mol	Chain	Res	Type
1	A	1	MET
1	A	32	ASN
1	A	60	THR
1	A	119	HIS
1	A	141	ARG
1	A	144	GLU
1	A	167	PHE
1	A	190	LYS

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Mol	Chain	Res	Type
1	A	234	ARG
1	A	340	SER
1	A	397	ARG
1	A	411	GLN
1	A	412	GLU
1	A	433	SER
1	B	1	MET
1	B	3	LEU
1	B	52	THR
1	B	73	LYS
1	B	140	ASN
1	B	144	GLU
1	B	157	THR
1	B	158	SER
1	B	159	SER
1	B	160	LEU
1	B	167	PHE
1	B	211	MET
1	B	215	GLU
1	B	234	ARG
1	B	347	THR
1	B	348	GLU
1	B	371	ARG
1	B	372	GLN
1	B	376	THR
1	B	415	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	119	HIS
1	A	261	GLN
1	A	411	GLN
1	B	372	GLN
1	B	411	GLN

### 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](#)

19 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	$\# Z  > 2$
5	EDO	B	507	-	3,3,3	0.66	0	2,2,2	0.21	0
2	SO4	A	501	-	4,4,4	0.17	0	6,6,6	0.32	0
2	SO4	B	504	-	4,4,4	0.18	0	6,6,6	0.11	0
2	SO4	B	503	-	4,4,4	0.25	0	6,6,6	0.19	0
2	SO4	A	505	-	4,4,4	0.16	0	6,6,6	0.14	0
3	THM	A	507	-	18,18,18	4.72	13 (72%)	26,26,26	3.18	12 (46%)
3	THM	B	506	-	18,18,18	4.70	11 (61%)	26,26,26	3.05	14 (53%)
2	SO4	A	502	-	4,4,4	0.14	0	6,6,6	0.72	0
4	PGE	A	509	-	9,9,9	0.34	0	8,8,8	0.66	0
5	EDO	A	510	-	3,3,3	0.58	0	2,2,2	0.05	0
6	GOL	A	512	-	5,5,5	0.35	0	5,5,5	0.25	0
3	THM	A	508	-	18,18,18	4.90	13 (72%)	26,26,26	2.40	11 (42%)
2	SO4	A	503	-	4,4,4	0.15	0	6,6,6	0.30	0
2	SO4	B	501	-	4,4,4	0.20	0	6,6,6	0.23	0
2	SO4	B	502	-	4,4,4	0.13	0	6,6,6	0.12	0
5	EDO	A	511	-	3,3,3	0.45	0	2,2,2	0.27	0
2	SO4	A	506	-	4,4,4	0.21	0	6,6,6	0.31	0
3	THM	B	505	-	18,18,18	4.68	12 (66%)	26,26,26	3.35	13 (50%)
2	SO4	A	504	-	4,4,4	0.20	0	6,6,6	0.14	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
3	THM	A	507	-	-	4/6/18/18	0/2/2/2
5	EDO	B	507	-	-	0/1/1/1	-
3	THM	B	506	-	-	3/6/18/18	0/2/2/2
5	EDO	A	511	-	-	1/1/1/1	-
4	PGE	A	509	-	-	2/7/7/7	-
5	EDO	A	510	-	-	0/1/1/1	-
3	THM	B	505	-	-	4/6/18/18	0/2/2/2
6	GOL	A	512	-	-	2/4/4/4	-
3	THM	A	508	-	-	0/6/18/18	0/2/2/2

All (49) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	507	THM	C2'-C3'	-11.25	1.23	1.52
3	B	506	THM	C2'-C3'	-11.05	1.23	1.52
3	A	508	THM	C2'-C3'	-10.79	1.24	1.52
3	B	505	THM	C2'-C3'	-10.71	1.24	1.52
3	B	506	THM	C2-N1	7.82	1.51	1.38
3	A	507	THM	C2-N1	7.80	1.51	1.38
3	A	508	THM	C6-C5	7.75	1.47	1.34
3	B	506	THM	O4'-C4'	-7.65	1.27	1.45
3	A	508	THM	C2-N1	7.54	1.50	1.38
3	A	507	THM	O4'-C4'	-7.51	1.28	1.45
3	B	505	THM	C2-N1	7.48	1.50	1.38
3	A	508	THM	O4'-C4'	-7.25	1.28	1.45
3	B	505	THM	O4'-C4'	-7.08	1.29	1.45
3	B	505	THM	C6-C5	6.85	1.45	1.34
3	A	507	THM	C6-C5	6.42	1.45	1.34
3	B	506	THM	C6-C5	6.10	1.44	1.34
3	B	505	THM	C1'-N1	-5.70	1.33	1.48
3	B	506	THM	C1'-N1	-5.61	1.33	1.48
3	A	508	THM	C2-N3	5.55	1.47	1.38
3	A	507	THM	C1'-N1	-5.23	1.34	1.48
3	A	508	THM	C1'-N1	-5.15	1.34	1.48
3	A	507	THM	C2-N3	4.98	1.46	1.38
3	B	505	THM	C2-N3	4.96	1.46	1.38
3	A	508	THM	C3'-C4'	4.87	1.66	1.53
3	B	506	THM	C3'-C4'	4.83	1.66	1.53
3	A	507	THM	C3'-C4'	4.83	1.66	1.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	506	THM	C2-N3	4.82	1.46	1.38
3	B	505	THM	C3'-C4'	4.63	1.65	1.53
3	A	508	THM	C4-C5	3.79	1.51	1.44
3	A	508	THM	O4'-C1'	3.61	1.50	1.42
3	A	508	THM	C6-N1	3.59	1.44	1.38
3	B	505	THM	O4'-C1'	3.28	1.49	1.42
3	A	507	THM	O4'-C1'	3.21	1.49	1.42
3	B	506	THM	C4-C5	3.12	1.50	1.44
3	B	505	THM	C4-C5	3.00	1.49	1.44
3	A	508	THM	O3'-C3'	2.96	1.49	1.43
3	B	505	THM	O3'-C3'	2.91	1.49	1.43
3	B	506	THM	O4'-C1'	2.88	1.48	1.42
3	A	507	THM	O3'-C3'	2.79	1.49	1.43
3	B	505	THM	C6-N1	2.77	1.42	1.38
3	A	507	THM	C6-N1	2.73	1.42	1.38
3	B	506	THM	O3'-C3'	2.55	1.48	1.43
3	B	506	THM	C6-N1	2.48	1.42	1.38
3	A	508	THM	C4-N3	2.46	1.43	1.38
3	A	507	THM	C4-C5	2.16	1.48	1.44
3	A	507	THM	C4-N3	2.15	1.42	1.38
3	A	507	THM	C2'-C1'	2.11	1.58	1.52
3	B	505	THM	C4-N3	2.11	1.42	1.38
3	A	508	THM	C2'-C1'	2.04	1.58	1.52

All (50) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	505	THM	C5-C4-N3	8.19	122.30	115.31
3	B	505	THM	C4-N3-C2	-7.04	118.23	127.35
3	A	507	THM	C4-N3-C2	-6.94	118.37	127.35
3	B	506	THM	C5-C4-N3	6.89	121.19	115.31
3	B	506	THM	C4-N3-C2	-6.80	118.55	127.35
3	A	507	THM	O4-C4-C5	-6.61	117.24	124.90
3	A	507	THM	C5-C4-N3	6.53	120.89	115.31
3	B	505	THM	O4'-C1'-N1	5.95	118.50	107.86
3	A	508	THM	C5-C4-N3	5.72	120.19	115.31
3	A	508	THM	C4-N3-C2	-5.42	120.33	127.35
3	B	505	THM	O4-C4-C5	-5.27	118.79	124.90
3	B	505	THM	C4'-O4'-C1'	-5.14	97.03	109.45
3	A	507	THM	O4'-C1'-N1	4.85	116.53	107.86
3	A	507	THM	N3-C2-N1	4.50	120.87	114.89
3	B	506	THM	C5M-C5-C6	-4.49	116.85	122.85

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	507	THM	C1'-N1-C2	4.30	126.11	117.64
3	B	506	THM	N3-C2-N1	4.10	120.34	114.89
3	B	506	THM	C5M-C5-C4	3.98	123.15	118.77
3	B	506	THM	O4'-C1'-N1	3.93	114.88	107.86
3	B	505	THM	N3-C2-N1	3.84	119.99	114.89
3	A	508	THM	O4'-C1'-N1	3.79	114.64	107.86
3	B	506	THM	C1'-N1-C2	3.71	124.96	117.64
3	A	508	THM	N3-C2-N1	3.64	119.72	114.89
3	A	507	THM	C1'-N1-C6	-3.54	114.67	120.77
3	B	505	THM	C1'-N1-C2	3.48	124.51	117.64
3	B	505	THM	C1'-N1-C6	-3.44	114.83	120.77
3	B	506	THM	O4-C4-C5	-3.41	120.94	124.90
3	A	507	THM	C5-C6-N1	-3.34	119.90	123.34
3	B	505	THM	C5-C6-N1	-3.31	119.94	123.34
3	A	507	THM	C6-C5-C4	3.27	120.77	118.03
3	B	506	THM	C1'-N1-C6	-3.27	115.13	120.77
3	A	508	THM	O4-C4-C5	-3.27	121.11	124.90
3	B	506	THM	C5-C6-N1	-3.23	120.01	123.34
3	A	508	THM	C4'-O4'-C1'	-3.06	102.05	109.45
3	B	506	THM	C4'-O4'-C1'	-2.98	102.24	109.45
3	A	507	THM	O2-C2-N3	-2.59	116.67	121.50
3	A	508	THM	C5-C6-N1	-2.59	120.67	123.34
3	B	505	THM	O4'-C1'-C2'	-2.52	101.49	106.25
3	A	508	THM	C5M-C5-C6	-2.40	119.64	122.85
3	B	506	THM	C6-C5-C4	2.36	120.00	118.03
3	B	505	THM	C5M-C5-C4	2.35	121.35	118.77
3	B	505	THM	C5M-C5-C6	-2.32	119.74	122.85
3	B	506	THM	O2-C2-N3	-2.32	117.18	121.50
3	B	505	THM	C5'-C4'-C3'	-2.31	108.97	114.81
3	B	506	THM	C2'-C3'-C4'	2.26	107.48	102.76
3	A	507	THM	C2'-C3'-C4'	2.24	107.43	102.76
3	A	508	THM	C2'-C3'-C4'	2.23	107.41	102.76
3	A	508	THM	O4'-C1'-C2'	-2.13	102.22	106.25
3	A	507	THM	C6-N1-C2	-2.07	119.20	121.30
3	A	508	THM	C5M-C5-C4	2.06	121.03	118.77

There are no chirality outliers.

All (16) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	507	THM	O4'-C1'-N1-C2
3	A	507	THM	O4'-C1'-N1-C6

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Mol	Chain	Res	Type	Atoms
3	B	505	THM	O4'-C1'-N1-C2
3	B	505	THM	O4'-C1'-N1-C6
3	B	506	THM	O4'-C1'-N1-C2
3	B	506	THM	O4'-C1'-N1-C6
6	A	512	GOL	O1-C1-C2-O2
3	A	507	THM	O4'-C4'-C5'-O5'
3	A	507	THM	C3'-C4'-C5'-O5'
6	A	512	GOL	O1-C1-C2-C3
3	B	505	THM	O4'-C4'-C5'-O5'
3	B	505	THM	C3'-C4'-C5'-O5'
5	A	511	EDO	O1-C1-C2-O2
4	A	509	PGE	O2-C3-C4-O3
4	A	509	PGE	O1-C1-C2-O2
3	B	506	THM	C3'-C4'-C5'-O5'

There are no ring outliers.

4 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	507	THM	2	0
2	A	502	SO4	1	0
2	A	506	SO4	1	0
3	B	505	THM	5	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 [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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	440/440 (100%)	-0.19	6 (1%) 75 81	41, 58, 93, 131	5 (1%)
1	B	440/440 (100%)	0.13	20 (4%) 33 40	48, 69, 103, 126	2 (0%)
All	All	880/880 (100%)	-0.03	26 (2%) 50 57	41, 63, 100, 131	7 (0%)

All (26) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	350	PHE	6.1
1	B	76	ASN	4.2
1	A	116	GLY	4.1
1	B	347	THR	4.1
1	A	346	ASP	4.0
1	B	393	ILE	3.7
1	B	77	LEU	3.6
1	B	426	LYS	3.3
1	B	346	ASP	3.1
1	B	422	ILE	3.1
1	B	369	GLY	3.0
1	B	140	ASN	2.7
1	A	115	ARG	2.7
1	B	427	ALA	2.7
1	B	210	PHE	2.7
1	B	375	ASP	2.6
1	B	349	GLY	2.6
1	B	374	SER	2.6
1	B	376	THR	2.5
1	B	139	ASP	2.5
1	B	74	SER	2.4
1	A	2	PHE	2.4
1	A	119	HIS	2.4
1	B	397	ARG	2.3

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Mol	Chain	Res	Type	RSRZ
1	B	395	GLY	2.1
1	A	396	GLN	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 [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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
5	EDO	A	510	4/4	0.86	0.18	70,76,76,79	0
4	PGE	A	509	10/10	0.87	0.17	87,90,91,93	0
5	EDO	B	507	4/4	0.87	0.16	56,60,62,64	0
3	THM	B	506	17/17	0.88	0.24	71,105,138,140	0
2	SO4	A	506	5/5	0.88	0.28	53,53,55,59	5
6	GOL	A	512	6/6	0.88	0.21	77,84,85,85	0
3	THM	A	507	17/17	0.89	0.13	81,100,111,112	0
5	EDO	A	511	4/4	0.89	0.44	72,75,79,82	0
3	THM	A	508	17/17	0.90	0.25	86,98,115,118	0
2	SO4	B	504	5/5	0.91	0.24	123,126,127,129	0
3	THM	B	505	17/17	0.92	0.17	78,81,87,96	0
2	SO4	A	505	5/5	0.93	0.30	106,107,122,127	0
2	SO4	A	503	5/5	0.96	0.11	68,83,87,90	0
2	SO4	A	504	5/5	0.96	0.10	81,84,87,88	0
2	SO4	B	502	5/5	0.98	0.07	80,87,90,93	0
2	SO4	B	503	5/5	0.98	0.09	69,72,76,77	0
2	SO4	A	502	5/5	0.98	0.14	53,54,59,59	0
2	SO4	A	501	5/5	0.99	0.11	70,71,75,78	0
2	SO4	B	501	5/5	0.99	0.18	75,76,83,84	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.