



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2026 – 01:14 PM UTC

PDB ID : 9ICA / pdb\_00009ica  
Title : DNA POLYMERASE BETA (E.C.2.7.7.7)/DNA COMPLEX + 2'-DEOXYADENOSINE-5'-O-(1-THIOTRIPHOSPHATE), SOAKED IN THE PRESENCE OF DATP(ALPHA)S AND MNCL2  
Authors : Pelletier, H.; Sawaya, M.R.  
Deposited on : 1995-12-15  
Resolution : 3.00 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	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

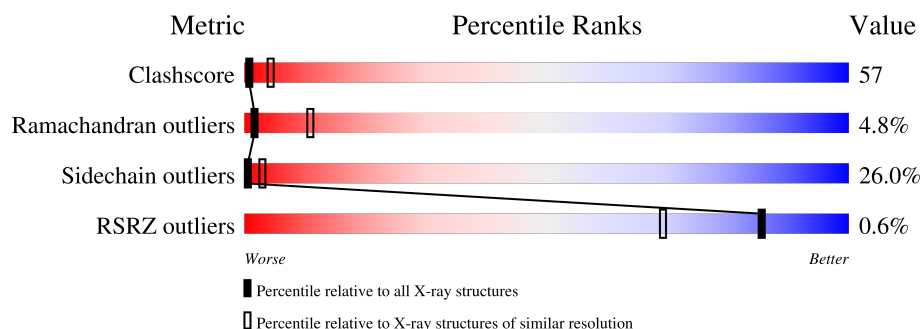
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*


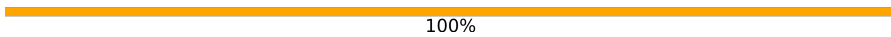

The reported resolution of this entry is 3.00 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	190562	2977 (3.00-3.00)
Ramachandran outliers	187476	2877 (3.00-3.00)
Sidechain outliers	187428	2880 (3.00-3.00)
RSRZ outliers	180081	2671 (3.00-3.00)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments 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	T	8	
2	P	7	
3	A	335	

## 2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 3062 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 DNA chain called DNA (5'-D(\*CP\*AP\*TP\*TP\*AP\*GP\*AP\*A)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	T	8	Total	C	N	O	P	0	0	0
			145	69	27	42	7			

- Molecule 2 is a DNA chain called DNA (5'-D(\*TP\*CP\*TP\*AP\*AP\*TP\*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	P	7	Total	C	N	O	P	0	0	0
			144	69	24	44	7			

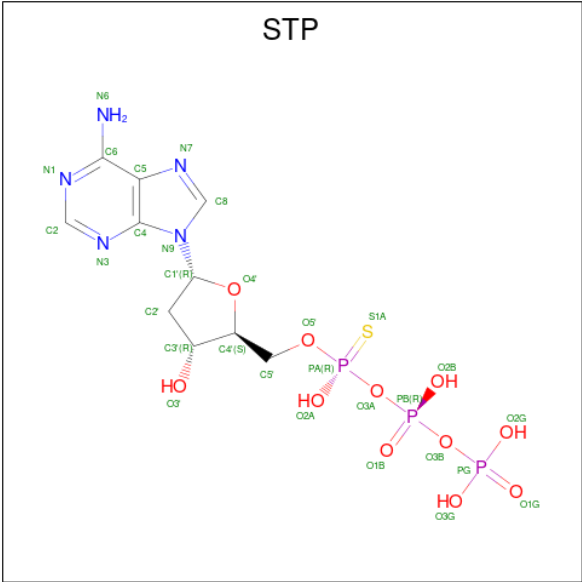
- Molecule 3 is a protein called PROTEIN (DNA POLYMERASE BETA (E.C.2.7.7.7)).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	A	327	Total	C	N	O	S	18	0	0
			2623	1657	458	499	9			

- Molecule 4 is MANGANESE (II) ION (CCD ID: MN) (formula: Mn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	2	Total	Mn	0	0
			2	2		

- Molecule 5 is 2'-DEOXYADENOSINE 5'-O-(1-THIOTRIPHOSPHATE) (CCD ID: STP) (formula: C<sub>10</sub>H<sub>16</sub>N<sub>5</sub>O<sub>11</sub>P<sub>3</sub>S).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	A	1	Total	O	P	S	0	0
			13	9	3	1		

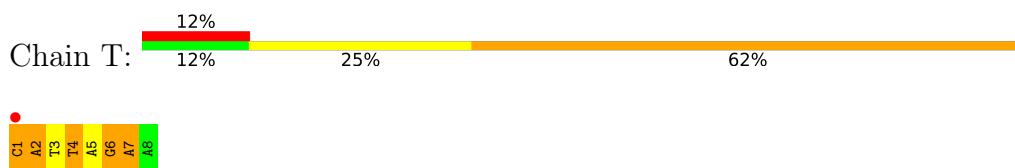
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	T	17	Total	O	0	0
			17	17		
6	P	15	Total	O	0	0
			15	15		
6	A	103	Total	O	0	0
			103	103		

### 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.

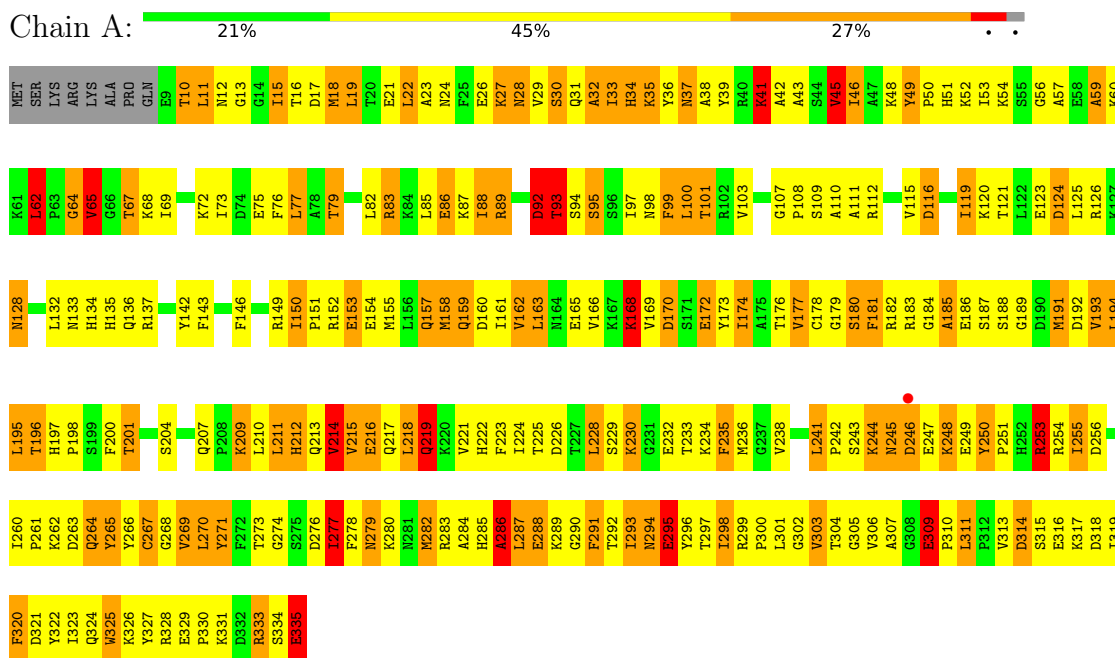
- Molecule 1: DNA (5'-D(\*CP\*AP\*TP\*TP\*AP\*GP\*AP\*A)-3')



- Molecule 2: DNA (5'-D(\*TP\*CP\*TP\*AP\*AP\*TP\*G)-3')



- Molecule 3: PROTEIN (DNA POLYMERASE BETA (E.C.2.7.7.7))



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	178.48Å 57.75Å 48.51Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 3.00 20.00 – 3.00	Depositor EDS
% Data completeness (in resolution range)	87.0 (20.00-3.00) 86.8 (20.00-3.00)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	5.70	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.26 (at 2.70Å)	Xtriage
Refinement program	TNT 5-D	Depositor
R, $R_{free}$	0.167 , (Not available) (Not available) , (Not available)	Depositor DCC
$R_{free}$ test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	36.5	Xtriage
Anisotropy	0.166	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.20 , 189.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.45$ , $\langle L^2 \rangle = 0.28$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	3062	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	41.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.05% 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

### 5.1 Standard geometry

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

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	T	1.01	0/162	3.12	11/249 (4.4%)
2	P	1.34	2/160 (1.2%)	3.76	18/243 (7.4%)
3	A	1.46	10/2672 (0.4%)	2.15	105/3590 (2.9%)
All	All	1.43	12/2994 (0.4%)	2.35	134/4082 (3.3%)

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
3	A	1	0

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	35	LYS	CA-C	-7.37	1.43	1.52
2	P	1	DT	OP3-P	6.58	1.61	1.48
3	A	224	ILE	CA-C	-6.41	1.44	1.52
3	A	193	VAL	CA-CB	-6.24	1.46	1.54
3	A	69	ILE	CA-CB	-6.14	1.46	1.54
3	A	224	ILE	CA-CB	-5.78	1.47	1.54
3	A	213	GLN	CA-C	-5.72	1.45	1.52
3	A	163	LEU	N-CA	-5.55	1.39	1.46
2	P	2	DC	C1'-N1	5.52	1.66	1.49
3	A	242	PRO	N-CA	-5.44	1.40	1.47
3	A	225	THR	CA-C	-5.31	1.46	1.52
3	A	196	THR	CA-C	-5.17	1.46	1.52

All (134) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	P	6	DT	C2-N1-C1'	19.94	149.25	119.35
2	P	6	DT	C6-N1-C1'	-19.13	90.66	119.35
1	T	7	DA	C4-N9-C1'	-18.75	98.92	127.05
1	T	4	DT	C2-N1-C1'	18.40	146.96	119.35
2	P	1	DT	C6-N1-C1'	-17.99	92.36	119.35
1	T	4	DT	C6-N1-C1'	-17.98	92.37	119.35
2	P	1	DT	C2-N1-C1'	17.64	145.81	119.35
1	T	7	DA	C8-N9-C1'	16.99	152.53	127.05
2	P	3	DT	C2-N1-C1'	15.78	143.02	119.35
2	P	3	DT	C6-N1-C1'	-14.78	97.18	119.35
1	T	6	DG	C8-N9-C1'	14.74	149.11	127.00
1	T	6	DG	C4-N9-C1'	-13.90	106.16	127.00
2	P	7	DG	C4-N9-C1'	-12.63	108.05	127.00
2	P	7	DG	C8-N9-C1'	12.50	145.75	127.00
2	P	2	DC	C2-N1-C1'	12.37	138.25	119.70
3	A	49	TYR	CA-C-N	11.89	134.70	119.84
3	A	49	TYR	C-N-CA	11.89	134.70	119.84
2	P	5	DA	C4-N9-C1'	9.94	141.95	127.05
2	P	5	DA	C8-N9-C1'	-9.51	112.78	127.05
2	P	2	DC	C6-N1-C1'	-9.46	105.52	119.70
3	A	51	HIS	CA-CB-CG	9.12	122.92	113.80
3	A	333	ARG	N-CA-C	-8.53	102.43	112.92
3	A	32	ALA	N-CA-C	8.49	121.35	110.65
3	A	192	ASP	CB-CA-C	-8.40	98.24	111.17
3	A	28	ASN	CA-CB-CG	-8.35	104.25	112.60
3	A	157	GLN	N-CA-CB	8.31	122.46	110.16
3	A	212	HIS	CA-CB-CG	-8.25	105.55	113.80
3	A	116	ASP	N-CA-CB	8.08	122.00	110.12
3	A	88	ILE	CB-CA-C	-7.98	101.76	111.97
3	A	64	GLY	CA-C-N	-7.77	112.64	122.43
3	A	64	GLY	C-N-CA	-7.77	112.64	122.43
3	A	116	ASP	CB-CA-C	7.76	123.67	110.79
3	A	222	HIS	CA-CB-CG	-7.59	106.21	113.80
3	A	65	VAL	N-CA-C	7.35	119.19	107.73
3	A	49	TYR	O-C-N	7.34	128.01	121.18
1	T	2	DA	C4-N9-C1'	-7.33	116.05	127.05
3	A	168	LYS	N-CA-CB	7.25	120.78	110.12
3	A	92	ASP	N-CA-CB	7.21	120.72	110.12
3	A	303	VAL	N-CA-C	7.16	121.05	111.17
1	T	1	DC	P-O3'-C3'	7.14	130.91	120.20
3	A	291	PHE	CA-CB-CG	-7.13	106.67	113.80
3	A	193	VAL	N-CA-CB	-7.10	102.91	111.21
3	A	219	GLN	CB-CA-C	-6.93	100.00	110.88

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	253	ARG	N-CA-C	6.90	120.15	108.90
3	A	181	PHE	CA-CB-CG	-6.83	106.97	113.80
3	A	15	ILE	N-CA-CB	6.76	117.99	110.62
3	A	146	PHE	CA-CB-CG	-6.64	107.16	113.80
3	A	176	THR	CA-C-N	-6.64	114.07	122.43
3	A	176	THR	C-N-CA	-6.64	114.07	122.43
3	A	211	LEU	CA-C-N	6.63	129.46	120.38
3	A	211	LEU	C-N-CA	6.63	129.46	120.38
3	A	87	LYS	CA-C-N	6.58	128.85	120.56
3	A	87	LYS	C-N-CA	6.58	128.85	120.56
3	A	320	PHE	CA-CB-CG	-6.58	107.22	113.80
3	A	271	TYR	CA-CB-CG	-6.58	102.06	113.90
3	A	45	VAL	N-CA-C	6.57	118.16	111.00
3	A	86	GLU	N-CA-CB	6.56	119.87	110.16
3	A	33	ILE	N-CA-CB	-6.54	102.29	110.47
3	A	286	ALA	CA-C-N	6.52	129.54	120.29
3	A	286	ALA	C-N-CA	6.52	129.54	120.29
1	T	2	DA	C8-N9-C1'	6.49	136.78	127.05
3	A	24	ASN	CA-CB-CG	-6.47	106.13	112.60
3	A	98	ASN	CA-CB-CG	-6.46	106.14	112.60
3	A	99	PHE	CA-CB-CG	-6.42	107.38	113.80
2	P	3	DT	C4'-C3'-O3'	-6.33	100.50	110.00
3	A	267	CYS	N-CA-C	-6.29	104.34	111.07
3	A	313	VAL	N-CA-C	6.25	116.91	108.17
3	A	59	ALA	O-C-N	6.16	129.17	122.15
3	A	17	ASP	N-CA-C	6.14	117.97	111.28
3	A	224	ILE	CA-CB-CG1	-6.13	99.98	110.40
3	A	64	GLY	N-CA-C	-6.12	106.30	114.25
1	T	4	DT	N1-C1'-C2'	6.10	122.65	113.50
3	A	214	VAL	O-C-N	6.10	128.03	121.87
3	A	271	TYR	N-CA-CB	-6.10	100.19	110.49
3	A	170	ASP	N-CA-CB	6.09	121.33	110.80
3	A	134	HIS	CA-CB-CG	6.08	119.88	113.80
3	A	335	GLU	N-CA-CB	6.07	120.83	110.50
3	A	186	GLU	N-CA-C	6.05	118.65	111.33
3	A	270	LEU	O-C-N	6.02	128.35	122.09
3	A	320	PHE	N-CA-C	-5.98	104.46	110.97
3	A	49	TYR	CA-C-O	5.95	125.39	119.49
3	A	177	VAL	N-CA-CB	5.91	118.58	111.31
3	A	62	LEU	CA-C-O	5.88	126.69	120.64
3	A	223	PHE	N-CA-C	-5.81	104.38	112.45
3	A	223	PHE	CA-CB-CG	-5.77	108.03	113.80

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	65	VAL	N-CA-CB	5.77	118.41	111.31
3	A	288	GLU	N-CA-C	-5.75	104.39	111.40
3	A	34	HIS	CA-C-N	5.73	127.96	120.28
3	A	34	HIS	C-N-CA	5.73	127.96	120.28
3	A	35	LYS	N-CA-C	-5.72	105.04	111.28
3	A	124	ASP	CA-CB-CG	5.71	118.31	112.60
3	A	62	LEU	N-CA-C	5.69	118.55	110.24
3	A	251	PRO	CB-CA-C	-5.63	104.02	111.23
3	A	93	THR	N-CA-C	5.63	117.10	111.07
2	P	1	DT	P-O3'-C3'	5.61	128.61	120.20
2	P	7	DG	O5'-C5'-C4'	5.58	119.18	110.80
3	A	215	VAL	N-CA-CB	5.57	118.12	110.54
3	A	334	SER	N-CA-C	5.57	119.58	112.34
3	A	213	GLN	CB-CA-C	-5.56	102.39	110.96
2	P	3	DT	N1-C1'-C2'	5.55	121.82	113.50
3	A	150	ILE	N-CA-C	5.54	113.98	107.77
3	A	250	TYR	N-CA-C	5.51	117.91	110.31
3	A	246	ASP	N-CA-C	5.49	122.49	110.80
3	A	195	LEU	N-CA-C	5.48	118.40	109.24
3	A	309	GLU	CA-C-N	5.45	126.66	119.84
3	A	309	GLU	C-N-CA	5.45	126.66	119.84
3	A	295	GLU	CB-CG-CD	5.45	121.87	112.60
3	A	17	ASP	CB-CA-C	5.41	119.76	110.79
3	A	314	ASP	N-CA-CB	5.38	118.30	110.88
3	A	277	ILE	N-CA-CB	5.33	117.40	110.57
3	A	214	VAL	N-CA-CB	5.33	119.76	110.65
3	A	83	ARG	N-CA-CB	5.33	117.70	109.98
3	A	192	ASP	CA-CB-CG	5.33	117.93	112.60
2	P	7	DG	P-O5'-C5'	5.32	127.98	120.00
3	A	224	ILE	N-CA-CB	5.32	116.52	110.72
3	A	241	LEU	O-C-N	5.31	127.05	121.42
3	A	124	ASP	N-CA-C	-5.28	104.99	111.75
3	A	223	PHE	CA-C-N	-5.28	115.56	122.37
3	A	223	PHE	C-N-CA	-5.28	115.56	122.37
3	A	185	ALA	CA-C-N	5.28	127.61	120.38
3	A	185	ALA	C-N-CA	5.28	127.61	120.38
3	A	291	PHE	N-CA-C	5.22	116.22	108.86
2	P	4	DA	C8-N9-C1'	-5.20	119.24	127.05
3	A	158	MET	O-C-N	5.19	127.43	122.03
3	A	16	THR	N-CA-CB	5.16	117.70	110.12
3	A	266	TYR	CA-CB-CG	-5.13	104.67	113.90
3	A	174	ILE	CA-C-N	-5.13	114.42	122.73

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	174	ILE	C-N-CA	-5.13	114.42	122.73
3	A	162	VAL	N-CA-C	5.09	115.30	110.42
3	A	253	ARG	CA-C-O	5.08	125.84	120.36
3	A	41	LYS	N-CA-C	-5.06	105.76	111.28
3	A	124	ASP	CB-CA-C	-5.04	100.67	110.46
3	A	67	THR	CA-CB-OG1	5.03	117.15	109.60
1	T	6	DG	P-O3'-C3'	5.02	127.73	120.20

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
3	A	116	ASP	CA

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	T	145	0	80	8	0
2	P	144	0	81	15	0
3	A	2623	0	2641	304	0
4	A	2	0	0	0	0
5	A	13	0	0	1	0
6	A	103	0	0	17	0
6	P	15	0	0	2	0
6	T	17	0	0	2	0
All	All	3062	0	2802	320	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 57.

All (320) 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)
3:A:293:ILE:HD13	3:A:298:ILE:HG13	1.27	1.10

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:29:VAL:HG21	3:A:94:SER:HB2	1.33	1.09
3:A:151:PRO:HG2	3:A:154:GLU:HG3	1.30	1.06
3:A:31:GLN:NE2	3:A:112:ARG:HH12	1.57	1.02
3:A:73:ILE:HG22	3:A:77:LEU:HD22	1.44	0.97
3:A:155:MET:HE2	3:A:188:SER:HB2	1.46	0.97
3:A:11:LEU:HD23	3:A:11:LEU:H	1.30	0.96
3:A:31:GLN:HE21	3:A:112:ARG:NH1	1.64	0.95
3:A:245:ASN:N	3:A:245:ASN:HD22	1.58	0.94
3:A:178:CYS:SG	3:A:194:LEU:HD23	2.11	0.90
3:A:245:ASN:HD22	3:A:245:ASN:H	0.91	0.89
3:A:151:PRO:HB2	3:A:153:GLU:HG2	1.59	0.85
2:P:5:DA:H2''	2:P:6:DT:C5'	2.06	0.83
3:A:18:MET:HE2	3:A:82:LEU:HD13	1.59	0.83
3:A:260:ILE:HG23	3:A:261:PRO:HD2	1.61	0.82
3:A:41:LYS:HE2	3:A:64:GLY:HA2	1.59	0.82
3:A:150:ILE:HG21	3:A:158:MET:HE1	1.61	0.82
2:P:5:DA:H2''	2:P:6:DT:H5''	1.61	0.81
3:A:245:ASN:H	3:A:245:ASN:ND2	1.73	0.81
3:A:60:LYS:HA	3:A:65:VAL:HG23	1.62	0.81
3:A:293:ILE:CD1	3:A:298:ILE:HG13	2.09	0.80
3:A:41:LYS:HD3	3:A:42:ALA:N	1.97	0.80
3:A:212:HIS:HB3	6:A:541:HOH:O	1.82	0.80
3:A:278:PHE:CE2	3:A:333:ARG:HD2	2.16	0.80
3:A:108:PRO:O	3:A:112:ARG:HG3	1.83	0.79
3:A:151:PRO:HG2	3:A:154:GLU:CG	2.11	0.79
3:A:155:MET:HE2	3:A:188:SER:CB	2.13	0.79
3:A:165:GLU:HA	3:A:168:LYS:HG2	1.65	0.78
3:A:330:PRO:HA	3:A:333:ARG:CG	2.13	0.78
3:A:18:MET:HE3	3:A:76:PHE:HB2	1.66	0.77
3:A:111:ALA:O	3:A:115:VAL:HG23	1.85	0.77
3:A:277:ILE:HG12	3:A:335:GLU:HA	1.67	0.76
3:A:12:ASN:HA	6:A:553:HOH:O	1.87	0.75
3:A:60:LYS:HA	3:A:65:VAL:CG2	2.17	0.75
6:T:617:HOH:O	3:A:234:LYS:HD3	1.86	0.74
3:A:207:GLN:O	3:A:210:LEU:HB2	1.88	0.74
3:A:177:VAL:HG11	3:A:191:MET:HE2	1.68	0.74
3:A:201:THR:HA	3:A:261:PRO:HB2	1.70	0.73
3:A:15:ILE:HD11	3:A:77:LEU:HD11	1.70	0.73
3:A:201:THR:HA	3:A:261:PRO:CB	2.19	0.72
3:A:18:MET:CE	3:A:82:LEU:HD13	2.19	0.72
3:A:23:ALA:HB2	3:A:39:TYR:HB3	1.71	0.72

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:P:1:DT:H2''	2:P:2:DC:H5'	1.70	0.71
3:A:302:GLY:H	3:A:307:ALA:HB3	1.55	0.71
3:A:254:ARG:NH1	3:A:255:ILE:N	2.38	0.71
3:A:191:MET:HG2	3:A:255:ILE:HG13	1.73	0.70
3:A:327:TYR:HE1	3:A:333:ARG:HH21	1.39	0.70
3:A:253:ARG:HG3	3:A:253:ARG:HH11	1.56	0.70
3:A:31:GLN:HE21	3:A:112:ARG:HH12	0.79	0.69
3:A:73:ILE:HG22	3:A:77:LEU:CD2	2.20	0.69
3:A:18:MET:HE2	3:A:82:LEU:CD1	2.23	0.69
3:A:29:VAL:CG2	3:A:94:SER:HB2	2.19	0.69
3:A:323:ILE:O	3:A:324:GLN:HG2	1.93	0.68
2:P:5:DA:H2''	2:P:6:DT:H5'	1.74	0.68
3:A:181:PHE:HA	6:A:530:HOH:O	1.94	0.68
3:A:279:ASN:O	3:A:283:ARG:HG3	1.94	0.68
3:A:294:ASN:O	3:A:296:TYR:N	2.26	0.68
3:A:302:GLY:N	3:A:307:ALA:HB3	2.08	0.68
3:A:41:LYS:HE2	3:A:64:GLY:CA	2.23	0.67
3:A:268:GLY:O	3:A:271:TYR:HB3	1.94	0.67
3:A:59:ALA:O	3:A:62:LEU:HB2	1.95	0.67
2:P:3:DT:H4'	6:P:569:HOH:O	1.95	0.67
3:A:165:GLU:HB3	3:A:217:GLN:HG3	1.78	0.66
3:A:323:ILE:C	3:A:324:GLN:HG2	2.20	0.66
3:A:306:VAL:HG22	6:A:650:HOH:O	1.95	0.66
3:A:286:ALA:CB	3:A:293:ILE:HD11	2.26	0.66
3:A:330:PRO:HA	3:A:333:ARG:HG3	1.76	0.66
3:A:35:LYS:O	3:A:38:ALA:HB3	1.96	0.65
6:P:568:HOH:O	3:A:110:ALA:HB2	1.95	0.65
3:A:155:MET:HA	3:A:158:MET:HE3	1.79	0.65
3:A:152:ARG:NE	3:A:184:GLY:O	2.29	0.64
3:A:11:LEU:H	3:A:11:LEU:CD2	2.08	0.64
3:A:180:SER:HB3	3:A:183:ARG:HH21	1.61	0.64
3:A:23:ALA:HB2	3:A:39:TYR:CB	2.27	0.64
3:A:265:TYR:O	3:A:269:VAL:N	2.27	0.64
3:A:278:PHE:HB2	3:A:333:ARG:O	1.98	0.64
3:A:165:GLU:HA	3:A:168:LYS:CG	2.29	0.63
3:A:182:ARG:NH1	3:A:273:THR:OG1	2.31	0.63
3:A:302:GLY:HA3	3:A:307:ALA:HB2	1.81	0.63
3:A:82:LEU:HB3	3:A:85:LEU:HB2	1.80	0.63
3:A:177:VAL:HG22	3:A:193:VAL:HG22	1.80	0.63
3:A:292:THR:O	3:A:298:ILE:HA	1.98	0.63
3:A:293:ILE:HD13	3:A:298:ILE:CG1	2.18	0.62

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:330:PRO:HA	3:A:333:ARG:HG2	1.81	0.62
3:A:277:ILE:HD13	3:A:277:ILE:H	1.64	0.62
3:A:270:LEU:HA	3:A:316:GLU:OE2	2.00	0.62
3:A:33:ILE:HG23	3:A:34:HIS:H	1.65	0.62
3:A:33:ILE:HG23	3:A:34:HIS:N	2.15	0.62
3:A:291:PHE:CD1	3:A:300:PRO:HA	2.34	0.61
3:A:119:ILE:HG23	3:A:124:ASP:HB3	1.81	0.61
3:A:260:ILE:CG2	3:A:261:PRO:HD2	2.29	0.61
3:A:48:LYS:O	3:A:50:PRO:HD3	2.00	0.61
3:A:75:GLU:O	3:A:79:THR:HG23	2.01	0.60
3:A:261:PRO:HG2	3:A:264:GLN:HG3	1.82	0.60
3:A:276:ASP:O	3:A:280:LYS:HG3	2.02	0.60
3:A:282:MET:O	3:A:282:MET:HG3	1.97	0.60
3:A:248:LYS:O	3:A:248:LYS:HG2	2.01	0.59
3:A:165:GLU:O	3:A:168:LYS:HG2	2.01	0.59
3:A:295:GLU:HA	6:A:592:HOH:O	2.02	0.59
3:A:327:TYR:HD1	3:A:328:ARG:N	2.01	0.59
1:T:6:DG:H2"	1:T:7:DA:C8	2.38	0.59
3:A:82:LEU:HD23	3:A:85:LEU:HB2	1.83	0.59
3:A:180:SER:HA	3:A:183:ARG:HE	1.67	0.59
3:A:188:SER:HB3	6:A:522:HOH:O	2.02	0.59
3:A:286:ALA:O	3:A:291:PHE:N	2.36	0.59
3:A:291:PHE:HD2	3:A:323:ILE:HG22	1.67	0.59
3:A:245:ASN:N	3:A:245:ASN:ND2	2.35	0.58
3:A:200:PHE:CD2	3:A:261:PRO:HA	2.37	0.58
3:A:300:PRO:HD3	3:A:311:LEU:HD13	1.84	0.58
3:A:124:ASP:O	3:A:128:ASN:ND2	2.37	0.58
3:A:18:MET:O	3:A:21:GLU:HB2	2.04	0.58
3:A:82:LEU:HD23	3:A:85:LEU:HD22	1.86	0.58
3:A:29:VAL:HG21	3:A:94:SER:CB	2.21	0.58
3:A:197:HIS:CD2	3:A:198:PRO:HD2	2.38	0.58
3:A:241:LEU:HB2	3:A:250:TYR:CD2	2.39	0.58
3:A:152:ARG:HA	3:A:155:MET:HB2	1.84	0.58
3:A:254:ARG:HH11	3:A:254:ARG:HA	1.69	0.58
3:A:172:GLU:CG	3:A:198:PRO:HG2	2.35	0.57
3:A:18:MET:HG3	3:A:82:LEU:HD22	1.86	0.57
3:A:41:LYS:NZ	3:A:64:GLY:O	2.30	0.57
3:A:288:GLU:C	3:A:290:GLY:H	2.13	0.57
3:A:33:ILE:O	3:A:37:ASN:HB2	2.05	0.57
3:A:174:ILE:O	3:A:195:LEU:HD12	2.04	0.57
3:A:119:ILE:N	3:A:119:ILE:HD13	2.20	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:P:5:DA:OP2	3:A:109:SER:HB3	2.05	0.56
3:A:133:ASN:O	3:A:137:ARG:HG3	2.05	0.56
3:A:282:MET:HG2	6:A:555:HOH:O	2.04	0.56
3:A:152:ARG:NH2	3:A:181:PHE:O	2.33	0.56
3:A:12:ASN:HD21	3:A:53:ILE:H	1.53	0.56
3:A:254:ARG:NH2	3:A:256:ASP:OD1	2.29	0.56
3:A:299:ARG:HG2	3:A:310:PRO:N	2.19	0.56
2:P:5:DA:P	3:A:109:SER:HB3	2.46	0.56
2:P:1:DT:H2''	2:P:2:DC:C5'	2.36	0.56
3:A:11:LEU:HD23	3:A:11:LEU:N	2.09	0.55
3:A:103:VAL:HG22	3:A:143:PHE:CD2	2.42	0.55
3:A:254:ARG:NH1	3:A:255:ILE:H	2.03	0.55
3:A:180:SER:CB	3:A:183:ARG:HH21	2.19	0.55
3:A:292:THR:HG22	3:A:299:ARG:O	2.06	0.55
3:A:30:SER:HA	6:A:558:HOH:O	2.07	0.54
3:A:255:ILE:HG12	3:A:256:ASP:N	2.22	0.54
3:A:254:ARG:HH11	3:A:255:ILE:N	2.05	0.54
3:A:277:ILE:HG13	3:A:335:GLU:HB2	1.87	0.54
3:A:120:LYS:N	3:A:124:ASP:OD2	2.31	0.54
3:A:254:ARG:HH11	3:A:254:ARG:CA	2.19	0.54
3:A:41:LYS:O	3:A:45:VAL:HG13	2.08	0.54
3:A:286:ALA:HB1	3:A:293:ILE:HD11	1.88	0.54
3:A:189:GLY:H	5:A:338:STP:PG	2.31	0.53
3:A:200:PHE:C	3:A:201:THR:HG22	2.34	0.53
3:A:286:ALA:HB2	3:A:293:ILE:HD11	1.89	0.53
3:A:326:LYS:O	3:A:328:ARG:HG2	2.08	0.53
3:A:89:ARG:HD3	3:A:89:ARG:C	2.32	0.53
3:A:119:ILE:HG23	3:A:124:ASP:CB	2.38	0.53
3:A:250:TYR:HB3	6:A:577:HOH:O	2.08	0.53
3:A:264:GLN:NE2	3:A:296:TYR:HB3	2.23	0.53
3:A:271:TYR:HB2	6:A:592:HOH:O	2.09	0.53
3:A:172:GLU:HG3	3:A:198:PRO:HG2	1.91	0.53
3:A:182:ARG:NH1	3:A:273:THR:HG21	2.24	0.53
3:A:165:GLU:O	3:A:168:LYS:N	2.42	0.52
3:A:200:PHE:O	3:A:262:LYS:N	2.40	0.52
3:A:286:ALA:HA	3:A:323:ILE:HG21	1.92	0.52
3:A:180:SER:HB3	3:A:183:ARG:NH2	2.23	0.52
3:A:277:ILE:CG1	3:A:335:GLU:HB2	2.40	0.52
3:A:182:ARG:HH11	3:A:273:THR:CG2	2.23	0.52
3:A:298:ILE:HA	6:A:593:HOH:O	2.09	0.52
3:A:92:ASP:HB3	6:A:647:HOH:O	2.10	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:291:PHE:HD1	3:A:300:PRO:HA	1.73	0.52
3:A:212:HIS:N	3:A:212:HIS:CD2	2.77	0.52
3:A:18:MET:HE3	3:A:76:PHE:CB	2.38	0.51
3:A:270:LEU:HD21	3:A:282:MET:HE3	1.91	0.51
3:A:293:ILE:HA	6:A:593:HOH:O	2.09	0.51
2:P:5:DA:C2'	2:P:6:DT:H5''	2.37	0.51
1:T:4:DT:O2	2:P:4:DA:H2	1.94	0.51
3:A:278:PHE:HE1	3:A:325:TRP:HZ3	1.58	0.51
3:A:150:ILE:CD1	3:A:253:ARG:HG2	2.41	0.51
3:A:76:PHE:O	3:A:79:THR:O	2.29	0.50
3:A:83:ARG:O	3:A:86:GLU:N	2.44	0.50
3:A:316:GLU:O	3:A:320:PHE:HD2	1.93	0.50
3:A:197:HIS:CG	3:A:198:PRO:HD2	2.47	0.50
3:A:209:LYS:HA	3:A:212:HIS:HB2	1.93	0.50
2:P:6:DT:H2''	2:P:7:DG:H5''	1.93	0.50
3:A:27:LYS:HB2	3:A:36:TYR:CD1	2.47	0.50
3:A:195:LEU:O	3:A:260:ILE:N	2.43	0.50
3:A:291:PHE:CD2	3:A:323:ILE:HG22	2.47	0.50
3:A:155:MET:HE3	3:A:181:PHE:HB2	1.94	0.50
3:A:159:GLN:HG2	3:A:160:ASP:N	2.19	0.50
3:A:267:CYS:O	3:A:271:TYR:HB2	2.11	0.50
3:A:330:PRO:O	3:A:333:ARG:HG2	2.11	0.50
3:A:32:ALA:O	3:A:36:TYR:HB3	2.12	0.49
3:A:162:VAL:O	3:A:166:VAL:HG23	2.12	0.49
3:A:211:LEU:HB3	3:A:212:HIS:HD2	1.77	0.49
3:A:212:HIS:CD2	3:A:212:HIS:H	2.29	0.49
3:A:297:THR:HG22	6:A:626:HOH:O	2.10	0.49
3:A:319:ILE:O	3:A:322:TYR:HB2	2.12	0.49
3:A:26:GLU:HB3	3:A:32:ALA:HB3	1.94	0.49
3:A:157:GLN:O	3:A:160:ASP:HB3	2.11	0.49
3:A:170:ASP:HB3	3:A:173:TYR:CD2	2.47	0.49
3:A:18:MET:CG	3:A:82:LEU:HD22	2.42	0.49
3:A:83:ARG:HA	3:A:86:GLU:HG2	1.95	0.49
3:A:150:ILE:HG12	3:A:253:ARG:HG2	1.92	0.49
3:A:19:LEU:HB3	3:A:43:ALA:HB2	1.94	0.49
3:A:243:SER:O	3:A:244:LYS:O	2.30	0.49
3:A:286:ALA:O	3:A:291:PHE:HB2	2.13	0.49
3:A:310:PRO:HB3	6:A:626:HOH:O	2.11	0.49
3:A:93:THR:HG22	3:A:94:SER:N	2.24	0.49
3:A:311:LEU:HB3	3:A:322:TYR:CE2	2.48	0.49
3:A:194:LEU:HB3	3:A:265:TYR:CE1	2.47	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:92:ASP:HA	3:A:95:SER:HB2	1.95	0.48
3:A:23:ALA:O	3:A:36:TYR:HD1	1.97	0.48
3:A:97:ILE:O	3:A:101:THR:HB	2.14	0.48
3:A:321:ASP:O	3:A:324:GLN:N	2.46	0.48
2:P:6:DT:H6	2:P:6:DT:H2'	1.13	0.48
3:A:123:GLU:O	3:A:126:ARG:N	2.47	0.48
3:A:31:GLN:NE2	3:A:112:ARG:NH1	2.40	0.48
3:A:159:GLN:HG3	3:A:163:LEU:HD12	1.96	0.48
3:A:299:ARG:HG2	3:A:310:PRO:CA	2.44	0.48
3:A:182:ARG:NH1	3:A:182:ARG:HG2	2.29	0.48
3:A:196:THR:OG1	3:A:262:LYS:HA	2.14	0.47
3:A:216:GLU:HA	3:A:219:GLN:OE1	2.13	0.47
3:A:286:ALA:HA	3:A:323:ILE:CG2	2.45	0.47
3:A:287:LEU:HD13	3:A:287:LEU:HA	1.63	0.47
3:A:328:ARG:O	3:A:333:ARG:NE	2.27	0.47
3:A:295:GLU:N	3:A:295:GLU:OE1	2.47	0.47
3:A:303:VAL:C	3:A:305:GLY:H	2.20	0.47
3:A:320:PHE:HD1	3:A:325:TRP:HB3	1.78	0.47
3:A:27:LYS:CB	3:A:36:TYR:CD1	2.97	0.47
3:A:255:ILE:HG23	3:A:255:ILE:O	2.14	0.47
3:A:18:MET:CE	3:A:76:PHE:HB2	2.42	0.47
3:A:299:ARG:HG2	3:A:310:PRO:HA	1.96	0.47
3:A:330:PRO:CA	3:A:333:ARG:HG2	2.45	0.47
3:A:142:TYR:CE2	3:A:238:VAL:HG11	2.50	0.47
3:A:207:GLN:OE1	3:A:210:LEU:HG	2.14	0.47
1:T:6:DG:C2'	1:T:7:DA:C8	2.98	0.46
3:A:85:LEU:HD12	3:A:85:LEU:HA	1.54	0.46
3:A:133:ASN:HD21	3:A:135:HIS:HB3	1.78	0.46
3:A:18:MET:HE2	3:A:82:LEU:HD22	1.97	0.46
3:A:57:ALA:HA	3:A:60:LYS:HB3	1.98	0.46
3:A:28:ASN:HD22	3:A:28:ASN:HA	1.36	0.46
3:A:72:LYS:HG2	3:A:82:LEU:HD11	1.97	0.46
3:A:41:LYS:HD3	3:A:42:ALA:H	1.80	0.46
3:A:180:SER:O	3:A:185:ALA:HB3	2.16	0.46
3:A:235:PHE:CD1	3:A:235:PHE:C	2.94	0.46
3:A:274:GLY:O	3:A:278:PHE:HD2	1.97	0.46
3:A:278:PHE:HE1	3:A:325:TRP:CZ3	2.34	0.46
3:A:309:GLU:HA	3:A:310:PRO:HD2	1.81	0.46
3:A:165:GLU:OE1	3:A:217:GLN:OE1	2.34	0.46
3:A:299:ARG:HA	3:A:300:PRO:HD3	1.91	0.46
3:A:278:PHE:O	3:A:282:MET:N	2.41	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:49:TYR:CE2	3:A:53:ILE:HG12	2.51	0.46
3:A:278:PHE:CE1	3:A:325:TRP:HZ3	2.34	0.46
3:A:31:GLN:N	6:A:641:HOH:O	2.37	0.45
3:A:172:GLU:HG2	3:A:198:PRO:HG2	1.99	0.45
3:A:150:ILE:HG21	3:A:158:MET:CE	2.40	0.45
3:A:82:LEU:CD2	3:A:85:LEU:HD22	2.46	0.45
3:A:320:PHE:CE1	3:A:328:ARG:HG3	2.52	0.45
2:P:5:DA:P	3:A:107:GLY:HA3	2.57	0.45
3:A:22:LEU:HD21	3:A:82:LEU:HD21	1.98	0.45
3:A:149:ARG:NH2	3:A:188:SER:HA	2.32	0.45
3:A:119:ILE:HG22	3:A:124:ASP:HB2	1.99	0.45
3:A:302:GLY:H	3:A:307:ALA:CB	2.27	0.45
3:A:182:ARG:HB3	3:A:273:THR:HG23	1.97	0.45
6:T:547:HOH:O	3:A:133:ASN:HB2	2.17	0.44
3:A:103:VAL:HG22	3:A:143:PHE:CE2	2.53	0.44
3:A:165:GLU:CA	3:A:168:LYS:HG2	2.39	0.44
3:A:230:LYS:HB2	3:A:230:LYS:HE2	1.57	0.44
3:A:253:ARG:NH2	6:A:620:HOH:O	2.28	0.44
3:A:210:LEU:HD23	3:A:210:LEU:HA	1.82	0.44
3:A:182:ARG:HH11	3:A:182:ARG:HG2	1.82	0.44
3:A:244:LYS:HB3	3:A:245:ASN:HD22	1.82	0.44
3:A:294:ASN:HB2	3:A:295:GLU:OE1	2.18	0.43
1:T:2:DA:H2''	1:T:3:DT:OP2	2.18	0.43
3:A:260:ILE:HG22	3:A:261:PRO:O	2.18	0.43
1:T:4:DT:N3	2:P:4:DA:C2	2.80	0.43
3:A:182:ARG:NH1	3:A:273:THR:CG2	2.80	0.43
3:A:218:LEU:N	3:A:218:LEU:CD1	2.80	0.43
3:A:15:ILE:HB	3:A:46:ILE:HD11	2.01	0.43
3:A:128:ASN:ND2	3:A:128:ASN:N	2.66	0.43
3:A:166:VAL:CG1	3:A:173:TYR:HB3	2.48	0.43
3:A:119:ILE:CG2	3:A:124:ASP:HB2	2.48	0.43
3:A:322:TYR:C	3:A:324:GLN:H	2.26	0.43
3:A:179:GLY:O	3:A:182:ARG:HB3	2.18	0.43
3:A:150:ILE:O	3:A:187:SER:HA	2.19	0.43
1:T:5:DA:H5'	3:A:229:SER:HB2	2.01	0.42
3:A:279:ASN:HD22	3:A:279:ASN:HA	1.64	0.42
3:A:280:LYS:O	3:A:284:ALA:N	2.42	0.42
3:A:15:ILE:HB	3:A:46:ILE:CD1	2.49	0.42
3:A:18:MET:HE2	3:A:82:LEU:CD2	2.50	0.42
3:A:243:SER:OG	3:A:249:GLU:HG3	2.19	0.42
3:A:56:GLY:O	3:A:59:ALA:N	2.53	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:285:HIS:HD2	3:A:323:ILE:HD12	1.85	0.42
3:A:330:PRO:C	3:A:333:ARG:HG2	2.44	0.42
3:A:88:ILE:HD13	3:A:88:ILE:HG21	1.82	0.42
3:A:228:LEU:HD12	3:A:228:LEU:HA	1.50	0.42
3:A:278:PHE:CD2	3:A:333:ARG:HB3	2.55	0.42
3:A:254:ARG:HH11	3:A:255:ILE:H	1.64	0.42
3:A:125:LEU:HA	3:A:125:LEU:HD23	1.52	0.41
3:A:204:SER:O	3:A:204:SER:OG	2.30	0.41
3:A:264:GLN:HB3	3:A:296:TYR:O	2.20	0.41
3:A:327:TYR:C	3:A:327:TYR:CD1	2.96	0.41
3:A:49:TYR:CD2	3:A:53:ILE:CG1	3.04	0.41
3:A:194:LEU:HD13	3:A:194:LEU:HA	1.68	0.41
3:A:191:MET:HE3	3:A:191:MET:HB2	1.82	0.41
3:A:163:LEU:HA	3:A:163:LEU:HD23	1.67	0.41
3:A:182:ARG:HG2	3:A:273:THR:CG2	2.50	0.41
3:A:32:ALA:HB1	3:A:35:LYS:HB2	2.02	0.41
3:A:214:VAL:O	3:A:218:LEU:HD13	2.21	0.41
3:A:243:SER:HB3	3:A:249:GLU:HA	2.01	0.41
3:A:270:LEU:HD21	3:A:282:MET:CE	2.50	0.41
1:T:6:DG:C6	2:P:2:DC:N3	2.89	0.41
3:A:15:ILE:CG2	3:A:46:ILE:CD1	2.99	0.41
3:A:36:TYR:CD2	3:A:37:ASN:N	2.89	0.41
3:A:172:GLU:HG3	3:A:198:PRO:CG	2.51	0.41
3:A:215:VAL:O	3:A:219:GLN:OE1	2.38	0.41
3:A:286:ALA:CB	3:A:293:ILE:CG1	2.99	0.41
1:T:1:DC:H6	1:T:1:DC:H2'	1.58	0.40
3:A:15:ILE:CG2	3:A:46:ILE:HD13	2.51	0.40
3:A:119:ILE:CG2	3:A:124:ASP:CB	2.99	0.40
3:A:315:SER:C	3:A:317:LYS:N	2.79	0.40
3:A:195:LEU:HD12	3:A:195:LEU:HA	1.67	0.40
3:A:99:PHE:CD1	3:A:99:PHE:C	2.99	0.40
3:A:100:LEU:HA	3:A:100:LEU:HD12	1.67	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	
3	A	290/335 (87%)	235 (81%)	41 (14%)	14 (5%)	2	11

All (14) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	A	244	LYS
3	A	246	ASP
3	A	247	GLU
3	A	295	GLU
3	A	10	THR
3	A	289	LYS
3	A	232	GLU
3	A	286	ALA
3	A	309	GLU
3	A	233	THR
3	A	13	GLY
3	A	318	ASP
3	A	263	ASP
3	A	265	TYR

### 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	
3	A	288/295 (98%)	213 (74%)	75 (26%)	0	3

All (75) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	A	10	THR
3	A	11	LEU
3	A	18	MET

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Mol	Chain	Res	Type
3	A	19	LEU
3	A	22	LEU
3	A	27	LYS
3	A	30	SER
3	A	37	ASN
3	A	41	LYS
3	A	45	VAL
3	A	46	ILE
3	A	52	LYS
3	A	54	LYS
3	A	62	LEU
3	A	65	VAL
3	A	67	THR
3	A	68	LYS
3	A	77	LEU
3	A	79	THR
3	A	89	ARG
3	A	92	ASP
3	A	93	THR
3	A	95	SER
3	A	100	LEU
3	A	101	THR
3	A	116	ASP
3	A	119	ILE
3	A	121	THR
3	A	128	ASN
3	A	132	LEU
3	A	136	GLN
3	A	153	GLU
3	A	159	GLN
3	A	161	ILE
3	A	168	LYS
3	A	169	VAL
3	A	172	GLU
3	A	180	SER
3	A	191	MET
3	A	194	LEU
3	A	201	THR
3	A	209	LYS
3	A	214	VAL
3	A	216	GLU
3	A	218	LEU

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Mol	Chain	Res	Type
3	A	219	GLN
3	A	221	VAL
3	A	226	ASP
3	A	228	LEU
3	A	230	LYS
3	A	235	PHE
3	A	236	MET
3	A	245	ASN
3	A	248	LYS
3	A	253	ARG
3	A	255	ILE
3	A	264	GLN
3	A	269	VAL
3	A	277	ILE
3	A	279	ASN
3	A	282	MET
3	A	287	LEU
3	A	293	ILE
3	A	294	ASN
3	A	295	GLU
3	A	298	ILE
3	A	301	LEU
3	A	304	THR
3	A	309	GLU
3	A	311	LEU
3	A	314	ASP
3	A	325	TRP
3	A	329	GLU
3	A	331	LYS
3	A	335	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
3	A	12	ASN
3	A	28	ASN
3	A	31	GLN
3	A	37	ASN
3	A	90	GLN
3	A	128	ASN
3	A	133	ASN
3	A	136	GLN

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Mol	Chain	Res	Type
3	A	157	GLN
3	A	212	HIS
3	A	213	GLN
3	A	217	GLN
3	A	245	ASN
3	A	264	GLN
3	A	279	ASN
3	A	294	ASN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

### 5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

Of 3 ligands modelled in this entry, 2 are monoatomic - leaving 1 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	STP	A	338	4	10,12,32	6.60	3 (30%)	14,20,50	1.36	1 (7%)

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
5	STP	A	338	4	-	5/11/12/34	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	338	STP	PA-S1A	-19.21	1.49	1.90
5	A	338	STP	PB-O3A	7.06	1.67	1.59
5	A	338	STP	PB-O3B	-2.28	1.57	1.59

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	338	STP	O2B-PB-O3A	2.10	112.94	107.27

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	338	STP	PB-O3B-PG-O2G
5	A	338	STP	PB-O3B-PG-O1G
5	A	338	STP	PG-O3B-PB-O2B
5	A	338	STP	PA-O3A-PB-O1B
5	A	338	STP	PG-O3B-PB-O1B

There are no ring outliers.

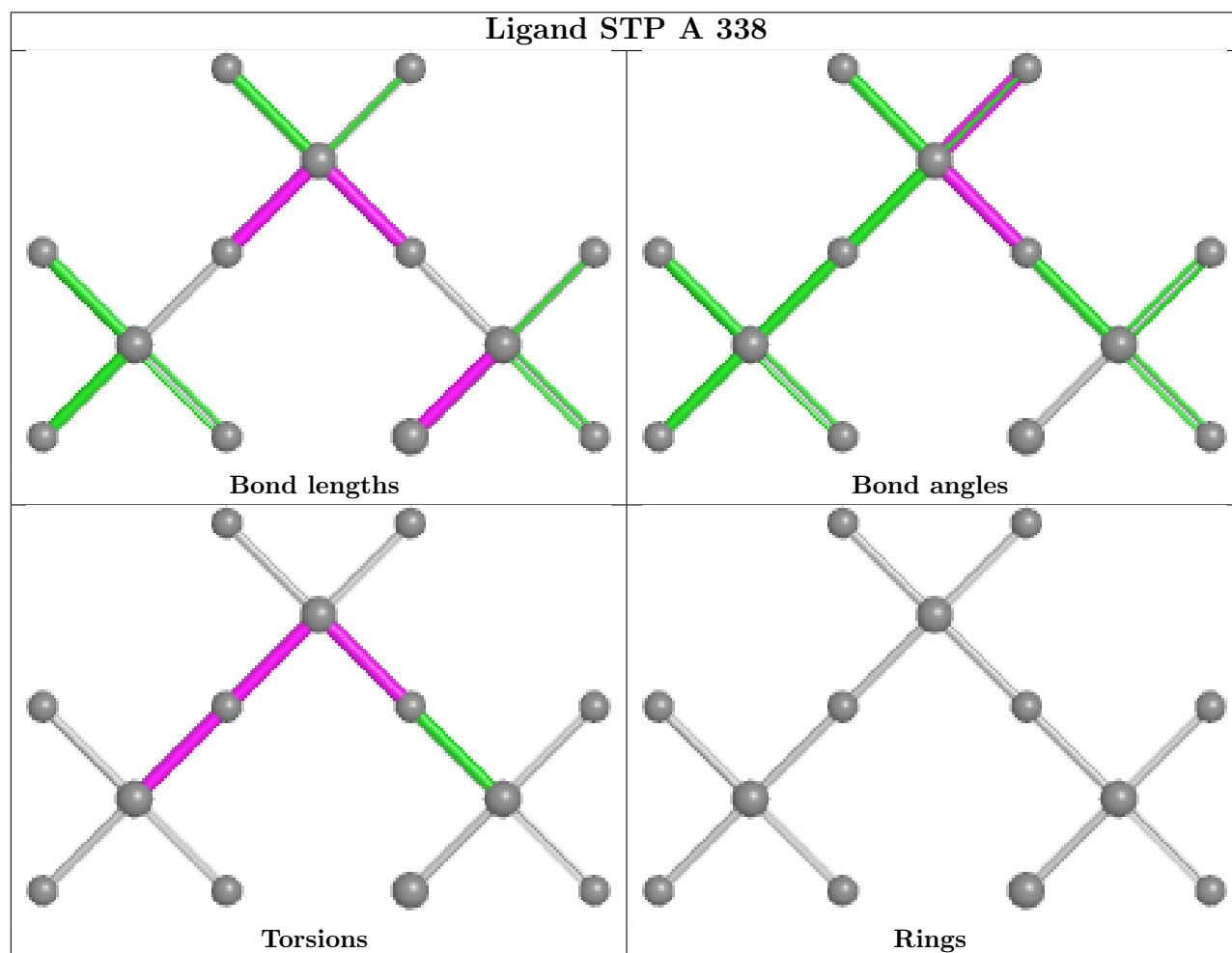
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	338	STP	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 [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	T	8/8 (100%)	-0.26	1 (12%) 8 5	22, 40, 98, 100	0
2	P	7/7 (100%)	-0.66	0 100 100	21, 23, 38, 100	0
3	A	325/335 (97%)	-0.89	1 (0%) 90 79	5, 32, 83, 100	0
All	All	340/350 (97%)	-0.87	2 (0%) 85 69	5, 32, 86, 100	0

All (2) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	A	246	ASP	2.7
1	T	1	DC	2.6

### 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 oligosaccharides 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.

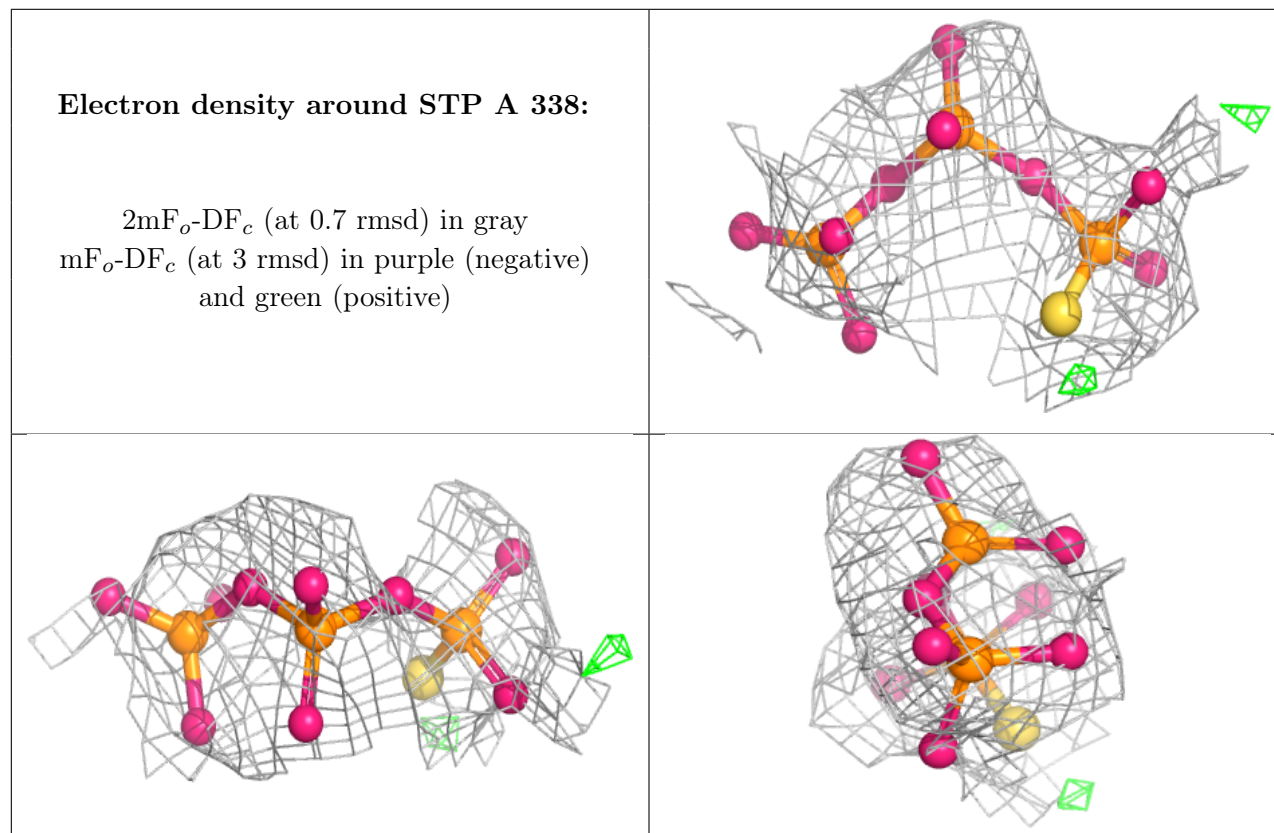
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
4	MN	A	340	1/1	0.89	0.06	30,30,30,30	1

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
5	STP	A	338	13/30	0.90	0.12	59,74,81,82	13
4	MN	A	339	1/1	0.93	0.05	30,30,30,30	1

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.



## 6.5 Other polymers [i](#)

There are no such residues in this entry.