



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 06:09 PM UTC

PDB ID : 3G6V / pdb_00003g6v
Title : DNA synthesis across an abasic lesion by human DNA polymerase-iota
Authors : Nair, D.T.; Aggarwal, A.K.
Deposited on : 2009-02-09
Resolution : 2.20 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 : 4-5-2 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

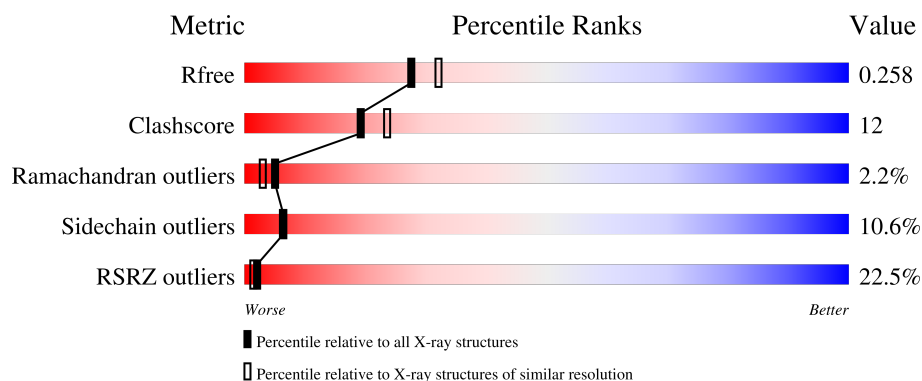
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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}	180053	6164 (2.20-2.20)
Clashscore	190562	6851 (2.20-2.20)
Ramachandran outliers	187476	6768 (2.20-2.20)
Sidechain outliers	187428	6769 (2.20-2.20)
RSRZ outliers	180081	6166 (2.20-2.20)

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	420	20% 61% 22% 5% 11%
2	P	7	29% 43% 29%
3	T	12	8% 25% 50% 25%

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 3390 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 DNA polymerase iota.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	373	Total	C	N	O	S	0	0	0
			2876	1809	504	542	21			

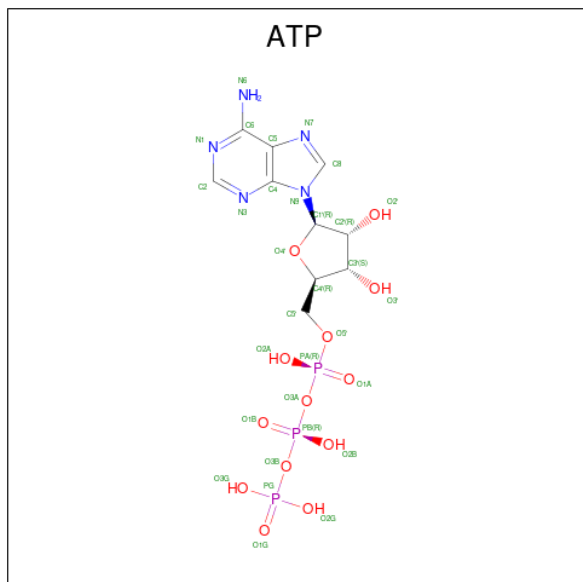
- Molecule 2 is a DNA chain called Primer DNA strand.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	P	7	Total	C	N	O	P	0	0	0
			139	67	29	37	6			

- Molecule 3 is a DNA chain called Template DNA strand.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	T	9	Total	C	N	O	P	0	0	0
			172	83	27	54	8			

- Molecule 4 is ADENOSINE-5'-TRIPHOSPHATE (CCD ID: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0	0
			30	10	5	12	3		

- Molecule 5 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	2	Total	Mg	0	0
			2	2		

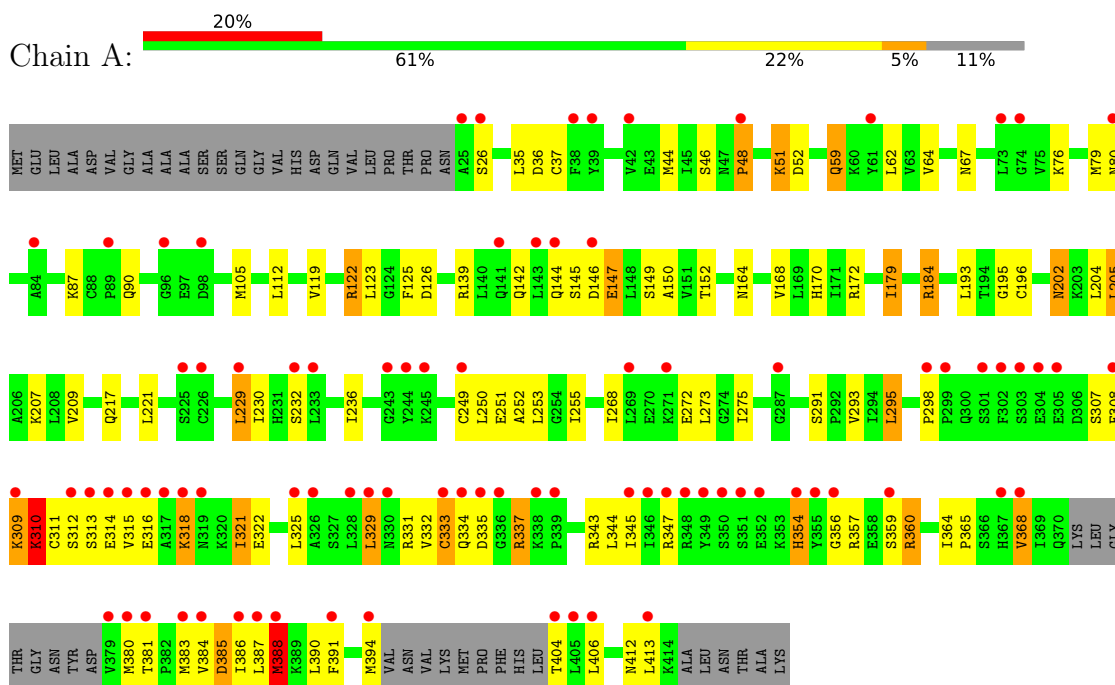
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	156	Total	O	0	0
			156	156		
6	P	3	Total	O	0	0
			3	3		
6	T	12	Total	O	0	0
			12	12		

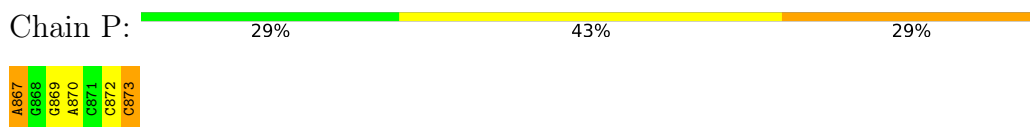
3 Residue-property plots [i](#)

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.

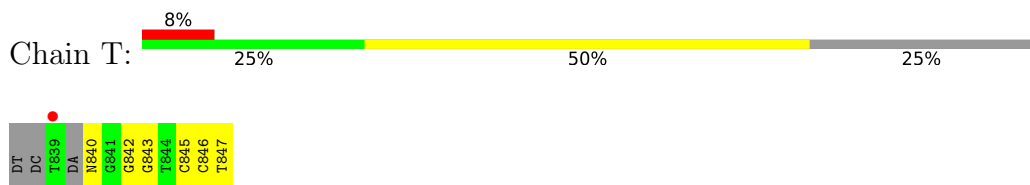
- Molecule 1: DNA polymerase iota



- Molecule 2: Primer DNA strand



- Molecule 3: Template DNA strand



4 Data and refinement statistics

Property	Value	Source
Space group	P 65 2 2	Depositor
Cell constants a, b, c, α , β , γ	98.15Å 98.15Å 203.31Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	39.22 – 2.20 39.22 – 2.20	Depositor EDS
% Data completeness (in resolution range)	97.0 (39.22-2.20) 96.9 (39.22-2.20)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	5.46 (at 2.20Å)	Xtriage
Refinement program	REFMAC 5.2.0019, CNS 1.1	Depositor
R, R_{free}	0.211 , 0.251 0.217 , 0.258	Depositor DCC
R_{free} test set	2417 reflections (8.00%)	wwPDB-VP
Wilson B-factor (Å ²)	34.3	Xtriage
Anisotropy	0.206	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 52.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	3390	wwPDB-VP
Average B, all atoms (Å ²)	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.74% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: DOC, ATP, 3DR, MG

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	1.32	10/2914 (0.3%)	1.31	23/3934 (0.6%)
2	P	0.88	0/136	1.92	5/208 (2.4%)
3	T	0.94	0/178	1.80	4/271 (1.5%)
All	All	1.29	10/3228 (0.3%)	1.38	32/4413 (0.7%)

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	122	ARG	CD-NE	-7.79	1.35	1.46
1	A	119	VAL	CA-CB	6.26	1.60	1.53
1	A	184	ARG	CD-NE	-5.86	1.38	1.46
1	A	295	LEU	C-O	-5.63	1.16	1.24
1	A	26	SER	CA-C	5.50	1.60	1.52
1	A	207	LYS	CE-NZ	-5.47	1.32	1.49
1	A	230	ILE	CA-CB	5.43	1.61	1.54
1	A	386	ILE	CA-CB	5.28	1.60	1.54
1	A	179	ILE	CG1-CD1	-5.27	1.31	1.51
1	A	46	SER	C-O	-5.08	1.18	1.24

All (32) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	122	ARG	NE-CZ-NH2	-13.93	106.66	119.20
3	T	845	DC	P-O5'-C5'	10.07	135.10	120.00
1	A	122	ARG	CD-NE-CZ	9.22	137.31	124.40
1	A	184	ARG	NE-CZ-NH2	-7.46	112.48	119.20
2	P	870	DA	O4'-C1'-N9	7.02	118.94	108.40
1	A	122	ARG	CG-CD-NE	-6.83	96.98	112.00
3	T	845	DC	P-O3'-C3'	6.46	129.89	120.20
1	A	122	ARG	NE-CZ-NH1	6.45	127.95	121.50

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	P	867	DA	O4'-C1'-N9	6.17	117.65	108.40
1	A	268	ILE	N-CA-C	-6.00	104.66	110.72
1	A	125	PHE	CA-C-N	-5.99	112.14	122.14
1	A	125	PHE	C-N-CA	-5.99	112.14	122.14
1	A	310	LYS	N-CA-C	-5.96	98.12	110.80
1	A	385	ASP	N-CA-C	5.92	117.82	111.36
1	A	321	ILE	CB-CA-C	5.88	120.12	112.24
1	A	318	LYS	N-CA-C	-5.75	106.42	113.50
1	A	388	MET	N-CA-C	5.72	117.52	111.28
1	A	184	ARG	NE-CZ-NH1	5.67	127.17	121.50
1	A	354	HIS	N-CA-C	5.54	122.61	110.80
1	A	293	VAL	N-CA-C	-5.50	102.42	109.30
2	P	867	DA	O5'-C5'-C4'	5.50	119.05	110.80
1	A	291	SER	CA-C-N	5.48	125.39	119.85
1	A	291	SER	C-N-CA	5.48	125.39	119.85
3	T	843	DG	P-O5'-C5'	5.45	128.17	120.00
2	P	869	DG	O5'-C5'-C4'	5.33	118.80	110.80
1	A	412	ASN	N-CA-C	-5.32	104.10	111.28
1	A	179	ILE	CB-CA-C	-5.29	105.00	112.14
3	T	842	DG	P-O5'-C5'	5.28	127.92	120.00
2	P	869	DG	P-O3'-C3'	-5.25	112.32	120.20
1	A	298	PRO	CA-C-N	5.22	125.12	119.85
1	A	298	PRO	C-N-CA	5.22	125.12	119.85
1	A	59	GLN	N-CA-C	-5.01	99.94	108.26

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	2876	0	2899	72	0
2	P	139	0	79	1	1
3	T	172	0	102	1	1
4	A	30	0	10	0	0
5	A	2	0	0	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	A	156	0	0	3	0
6	P	3	0	0	0	0
6	T	12	0	0	0	0
All	All	3390	0	3090	74	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 12.

All (74) 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:344:LEU:CD1	1:A:387:LEU:HD13	1.81	1.10
1:A:309:LYS:H	1:A:309:LYS:CD	1.64	1.08
1:A:344:LEU:HD11	1:A:387:LEU:CD1	1.86	1.05
1:A:309:LYS:H	1:A:309:LYS:HD2	1.16	1.05
1:A:344:LEU:HD11	1:A:387:LEU:HD13	0.97	0.93
1:A:44:MET:CE	1:A:67:ASN:HD22	1.80	0.93
1:A:331:ARG:HD2	6:A:1014:HOH:O	1.70	0.92
1:A:164:ASN:H	1:A:170:HIS:HD2	1.20	0.88
1:A:44:MET:HE3	1:A:67:ASN:HD22	1.39	0.86
1:A:344:LEU:HD13	1:A:390:LEU:HD12	1.60	0.84
1:A:309:LYS:CD	1:A:309:LYS:N	2.45	0.79
1:A:249:CYS:SG	1:A:273:LEU:HD21	2.27	0.73
1:A:335:ASP:OD2	1:A:337:ARG:HD3	1.88	0.72
1:A:44:MET:HE3	1:A:67:ASN:ND2	2.05	0.71
1:A:347:ARG:HD2	1:A:404:THR:OG1	1.89	0.71
1:A:80:ASN:HB3	6:A:1018:HOH:O	1.94	0.68
1:A:164:ASN:H	1:A:170:HIS:CD2	2.09	0.66
1:A:44:MET:CE	1:A:67:ASN:ND2	2.58	0.66
1:A:335:ASP:CG	1:A:337:ARG:HD3	2.21	0.65
1:A:48:PRO:O	1:A:51:LYS:HB2	1.98	0.64
1:A:343:ARG:HD2	1:A:345:ILE:HD11	1.80	0.64
1:A:202:ASN:ND2	1:A:205:LEU:H	1.99	0.60
1:A:321:ILE:HD11	1:A:406:LEU:HD22	1.84	0.59
1:A:309:LYS:HD2	1:A:309:LYS:N	2.01	0.59
1:A:380:MET:HE3	1:A:384:VAL:HG21	1.83	0.58
1:A:76:LYS:HB2	1:A:79:MET:HE3	1.85	0.58
1:A:360:ARG:HG2	1:A:394:MET:HG3	1.86	0.57
1:A:335:ASP:OD1	1:A:337:ARG:HD3	2.05	0.56
1:A:333:CYS:O	1:A:335:ASP:N	2.40	0.55
1:A:365:PRO:HB2	1:A:368:VAL:HG13	1.89	0.53

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:112:LEU:C	1:A:112:LEU:HD23	2.35	0.52
1:A:309:LYS:HD3	1:A:311:CYS:SG	2.50	0.52
1:A:44:MET:HE2	1:A:51:LYS:O	2.09	0.51
1:A:318:LYS:HB2	1:A:388:MET:SD	2.50	0.51
1:A:309:LYS:H	1:A:309:LYS:HD3	1.67	0.51
1:A:36:ASP:O	1:A:37:CYS:C	2.55	0.50
1:A:202:ASN:HD22	1:A:202:ASN:C	2.18	0.50
1:A:184:ARG:HD2	1:A:195:GLY:O	2.12	0.49
1:A:44:MET:HE2	1:A:51:LYS:HA	1.95	0.47
1:A:251:GLU:O	1:A:252:ALA:C	2.57	0.47
1:A:122:ARG:HD3	6:A:957:HOH:O	2.14	0.47
1:A:383:MET:HE2	1:A:383:MET:HA	1.96	0.47
3:T:846:DC:H1'	3:T:847:DT:H5'	1.96	0.47
1:A:308:PHE:HD1	1:A:311:CYS:H	1.62	0.47
1:A:329:LEU:HD13	1:A:380:MET:HG3	1.97	0.46
1:A:44:MET:HE1	1:A:67:ASN:HD22	1.74	0.46
1:A:253:LEU:HD11	1:A:272:GLU:HG2	1.98	0.46
1:A:168:VAL:HG22	1:A:172:ARG:HD2	1.97	0.45
1:A:380:MET:HE3	1:A:384:VAL:CG2	2.47	0.45
1:A:139:ARG:CZ	1:A:179:ILE:CD1	2.94	0.45
1:A:388:MET:O	1:A:391:PHE:HB3	2.18	0.44
1:A:196:CYS:HA	1:A:217:GLN:O	2.17	0.44
1:A:221:LEU:HD22	1:A:229:LEU:HD12	1.99	0.44
1:A:144:GLN:C	1:A:146:ASP:H	2.26	0.44
1:A:368:VAL:HG21	1:A:383:MET:HE3	1.99	0.43
1:A:105:MET:CG	1:A:193:LEU:HD11	2.48	0.43
1:A:59:GLN:OE1	1:A:64:VAL:HG11	2.19	0.43
1:A:312:SER:C	1:A:314:GLU:H	2.27	0.42
1:A:325:LEU:O	1:A:329:LEU:HD12	2.19	0.42
1:A:164:ASN:N	1:A:170:HIS:HD2	2.02	0.42
1:A:345:ILE:HG13	1:A:359:SER:HB3	2.02	0.42
1:A:309:LYS:N	1:A:309:LYS:HD3	2.31	0.42
1:A:364:ILE:HG23	1:A:368:VAL:HG22	2.01	0.42
1:A:344:LEU:O	1:A:359:SER:HA	2.20	0.42
1:A:347:ARG:HD2	1:A:404:THR:HG1	1.83	0.41
1:A:147:GLU:H	1:A:147:GLU:HG2	1.56	0.41
1:A:250:LEU:HB3	1:A:255:ILE:HB	2.01	0.41
2:P:872:DC:H2'	2:P:873:DOC:H6	2.03	0.41
1:A:359:SER:O	1:A:360:ARG:HD3	2.21	0.40
1:A:76:LYS:HD3	1:A:76:LYS:HA	1.84	0.40
1:A:150:ALA:O	1:A:152:THR:HG23	2.20	0.40

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:202:ASN:HD21	1:A:205:LEU:H	1.68	0.40
1:A:229:LEU:O	1:A:232:SER:OG	2.38	0.40
1:A:322:GLU:H	1:A:322:GLU:HG3	1.73	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)
2:P:867:DA:O5'	3:T:847:DT:O3'[10_665]	1.84	0.36

5.3 Torsion angles

5.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	A	367/420 (87%)	341 (93%)	18 (5%)	8 (2%)	5 3

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	310	LYS
1	A	315	VAL
1	A	333	CYS
1	A	334	GLN
1	A	354	HIS
1	A	313	SER
1	A	316	GLU
1	A	356	GLY

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	A	321/376 (85%)	287 (89%)	34 (11%)	6 6

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

Mol	Chain	Res	Type
1	A	35	LEU
1	A	48	PRO
1	A	51	LYS
1	A	52	ASP
1	A	62	LEU
1	A	87	LYS
1	A	90	GLN
1	A	123	LEU
1	A	126	ASP
1	A	142	GLN
1	A	145	SER
1	A	147	GLU
1	A	149	SER
1	A	202	ASN
1	A	204	LEU
1	A	205	LEU
1	A	209	VAL
1	A	229	LEU
1	A	236	ILE
1	A	275	ILE
1	A	295	LEU
1	A	307	SER
1	A	309	LYS
1	A	310	LYS
1	A	329	LEU
1	A	332	VAL
1	A	337	ARG
1	A	357	ARG
1	A	360	ARG
1	A	368	VAL

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	381	THR
1	A	385	ASP
1	A	388	MET
1	A	413	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	58	GLN
1	A	67	ASN
1	A	80	ASN
1	A	170	HIS
1	A	202	ASN
1	A	216	ASN
1	A	256	ASN
1	A	262	GLN
1	A	361	GLN
1	A	412	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

2 non-standard protein/DNA/RNA residues are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	DOC	P	873	3,2	16,19,20	1.32	1 (6%)	20,26,29	2.15	4 (20%)
3	3DR	T	840	3	8,11,12	1.39	1 (12%)	7,14,17	1.82	3 (42%)

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	DOC	P	873	3,2	-	0/7/18/19	0/2/2/2
3	3DR	T	840	3	-	0/3/15/16	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	T	840	3DR	O4'-C4'	-3.29	1.38	1.44
2	P	873	DOC	C6-C5	3.12	1.42	1.35

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	P	873	DOC	C2'-C1'-N1	-6.06	100.91	112.40
2	P	873	DOC	C3'-C2'-C1'	4.80	108.40	102.87
2	P	873	DOC	O4'-C4'-C3'	2.99	109.73	104.81
2	P	873	DOC	O4'-C1'-N1	2.93	113.06	107.86
3	T	840	3DR	C1'-C2'-C3'	-2.77	100.29	103.26
3	T	840	3DR	O3'-C3'-C2'	-2.67	105.17	111.43
3	T	840	3DR	O4'-C1'-C2'	-2.38	101.66	106.34

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	P	873	DOC	1	0

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
4	ATP	A	875	5	31,32,33	2.38	7 (22%)	46,50,52	1.95	14 (30%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	ATP	A	875	5	-	4/22/34/38	0/3/3/3

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	875	ATP	PB-O3B	6.77	1.66	1.59
4	A	875	ATP	C5-C4	6.16	1.50	1.39
4	A	875	ATP	C8-N7	3.93	1.39	1.31
4	A	875	ATP	O3'-C3'	3.71	1.51	1.43
4	A	875	ATP	C4-N3	3.15	1.40	1.34
4	A	875	ATP	C5'-C4'	2.36	1.58	1.51
4	A	875	ATP	C2'-C1'	2.30	1.58	1.52

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	875	ATP	N3-C4-N9	4.41	134.66	127.17
4	A	875	ATP	O2B-PB-O3A	4.40	119.17	107.27
4	A	875	ATP	C4-N9-C8	3.73	109.66	105.74
4	A	875	ATP	N6-C6-N1	3.59	126.37	118.38
4	A	875	ATP	N3-C2-N1	-3.38	123.46	128.58
4	A	875	ATP	C5-C4-N3	-3.36	122.09	126.72
4	A	875	ATP	C5-C6-N6	-3.08	115.67	123.29
4	A	875	ATP	C2-N1-C6	3.01	123.67	118.73
4	A	875	ATP	O3A-PB-O1B	-2.84	102.17	110.70
4	A	875	ATP	O2B-PB-O3B	2.49	114.00	107.27
4	A	875	ATP	C5-C4-N9	-2.36	103.24	105.81

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	875	ATP	O3'-C3'-C2'	2.21	118.57	110.88
4	A	875	ATP	C2-N3-C4	2.21	117.22	111.83
4	A	875	ATP	O2A-PA-O3A	-2.16	101.45	107.27

There are no chirality outliers.

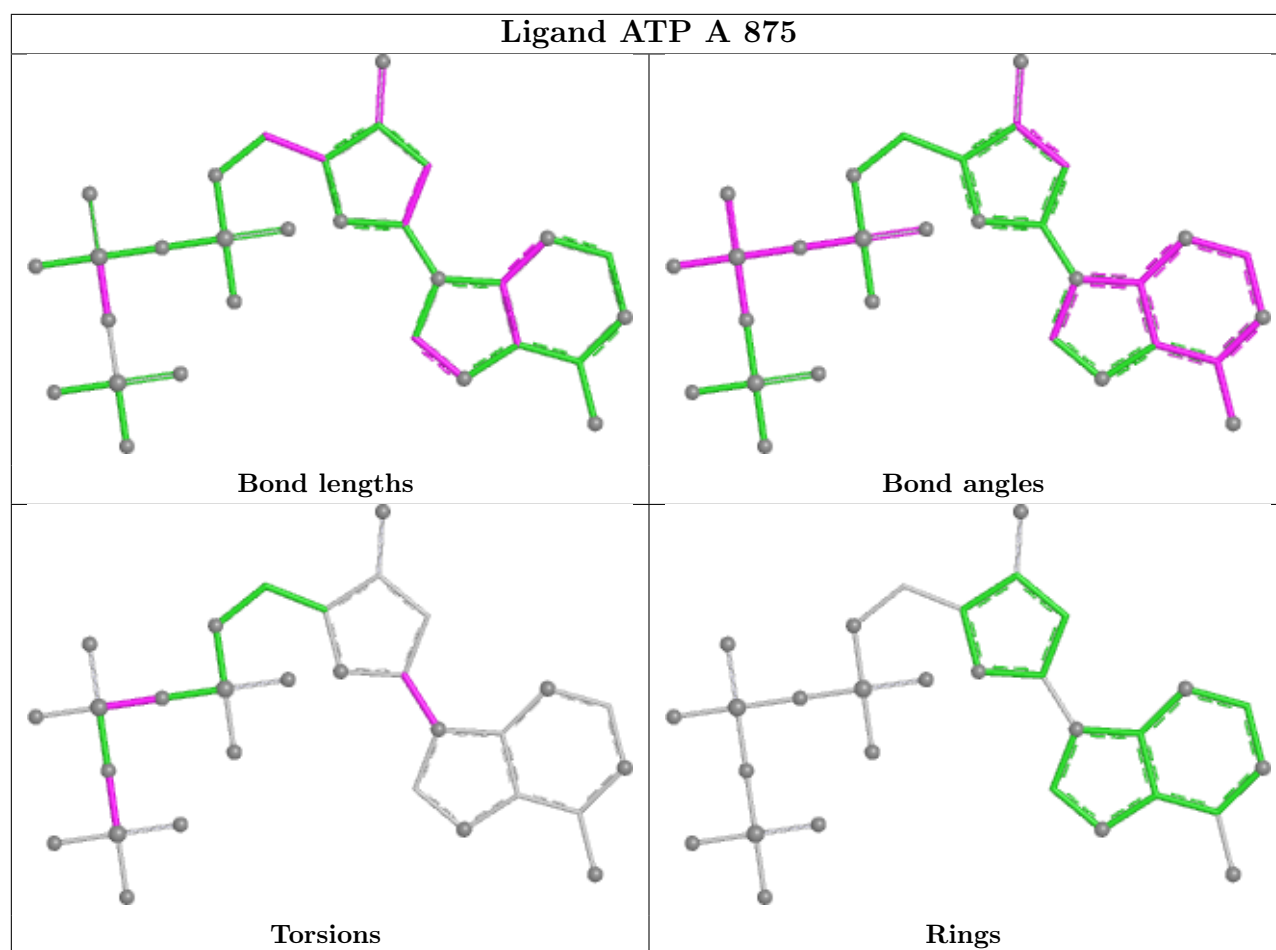
All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	875	ATP	C2'-C1'-N9-C4
4	A	875	ATP	O4'-C1'-N9-C4
4	A	875	ATP	PB-O3B-PG-O2G
4	A	875	ATP	PA-O3A-PB-O2B

There are no ring outliers.

No monomer is involved in short contacts.

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

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	373/420 (88%)	0.93	86 (23%) 2 1	11, 25, 46, 62	0
2	P	6/7 (85%)	0.22	0 100 100	22, 29, 32, 35	0
3	T	8/12 (66%)	0.49	1 (12%) 8 6	15, 18, 25, 162	0
All	All	387/439 (88%)	0.91	87 (22%) 2 1	11, 25, 46, 162	0

All (87) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	25	ALA	9.1
1	A	354	HIS	6.5
1	A	349	TYR	6.0
3	T	839	DT	5.2
1	A	379	VAL	4.6
1	A	317	ALA	4.4
1	A	351	SER	4.1
1	A	355	TYR	4.0
1	A	298	PRO	4.0
1	A	39	TYR	4.0
1	A	316	GLU	3.9
1	A	243	GLY	3.8
1	A	225	SER	3.7
1	A	394	MET	3.6
1	A	42	VAL	3.5
1	A	329	LEU	3.5
1	A	299	PRO	3.4
1	A	315	VAL	3.4
1	A	249	CYS	3.4
1	A	326	ALA	3.3
1	A	80	ASN	3.3
1	A	146	ASP	3.2
1	A	325	LEU	3.2

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	319	ASN	3.2
1	A	345	ILE	3.2
1	A	244	TYR	3.2
1	A	312	SER	3.2
1	A	305	GLU	3.2
1	A	304	GLU	3.1
1	A	356	GLY	3.1
1	A	339	PRO	3.1
1	A	404	THR	3.0
1	A	367	HIS	3.0
1	A	386	ILE	3.0
1	A	303	SER	3.0
1	A	352	GLU	3.0
1	A	308	PHE	2.9
1	A	26	SER	2.9
1	A	391	PHE	2.9
1	A	287	GLY	2.9
1	A	226	CYS	2.9
1	A	313	SER	2.8
1	A	359	SER	2.8
1	A	330	ASN	2.8
1	A	144	GLN	2.8
1	A	350	SER	2.8
1	A	98	ASP	2.7
1	A	333	CYS	2.7
1	A	73	LEU	2.7
1	A	74	GLY	2.7
1	A	301	SER	2.6
1	A	334	GLN	2.6
1	A	368	VAL	2.6
1	A	38	PHE	2.6
1	A	89	PRO	2.6
1	A	380	MET	2.5
1	A	96	GLY	2.5
1	A	245	LYS	2.5
1	A	143	LEU	2.5
1	A	336	GLY	2.5
1	A	269	LEU	2.4
1	A	388	MET	2.4
1	A	141	GLN	2.4
1	A	346	ILE	2.4
1	A	309	LYS	2.4

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	233	LEU	2.4
1	A	405	LEU	2.4
1	A	302	PHE	2.4
1	A	338	LYS	2.4
1	A	384	VAL	2.3
1	A	348	ARG	2.3
1	A	381	THR	2.2
1	A	387	LEU	2.2
1	A	232	SER	2.2
1	A	347	ARG	2.2
1	A	413	LEU	2.2
1	A	61	TYR	2.1
1	A	318	LYS	2.1
1	A	314	GLU	2.1
1	A	335	ASP	2.1
1	A	328	LEU	2.1
1	A	84	ALA	2.1
1	A	229	LEU	2.1
1	A	271	LYS	2.0
1	A	406	LEU	2.0
1	A	383	MET	2.0
1	A	48	PRO	2.0

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

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	3DR	T	840	11/12	0.92	0.10	22,37,53,53	0
2	DOC	P	873	18/19	0.94	0.10	12,16,24,25	0

6.3 Carbohydrates [i](#)

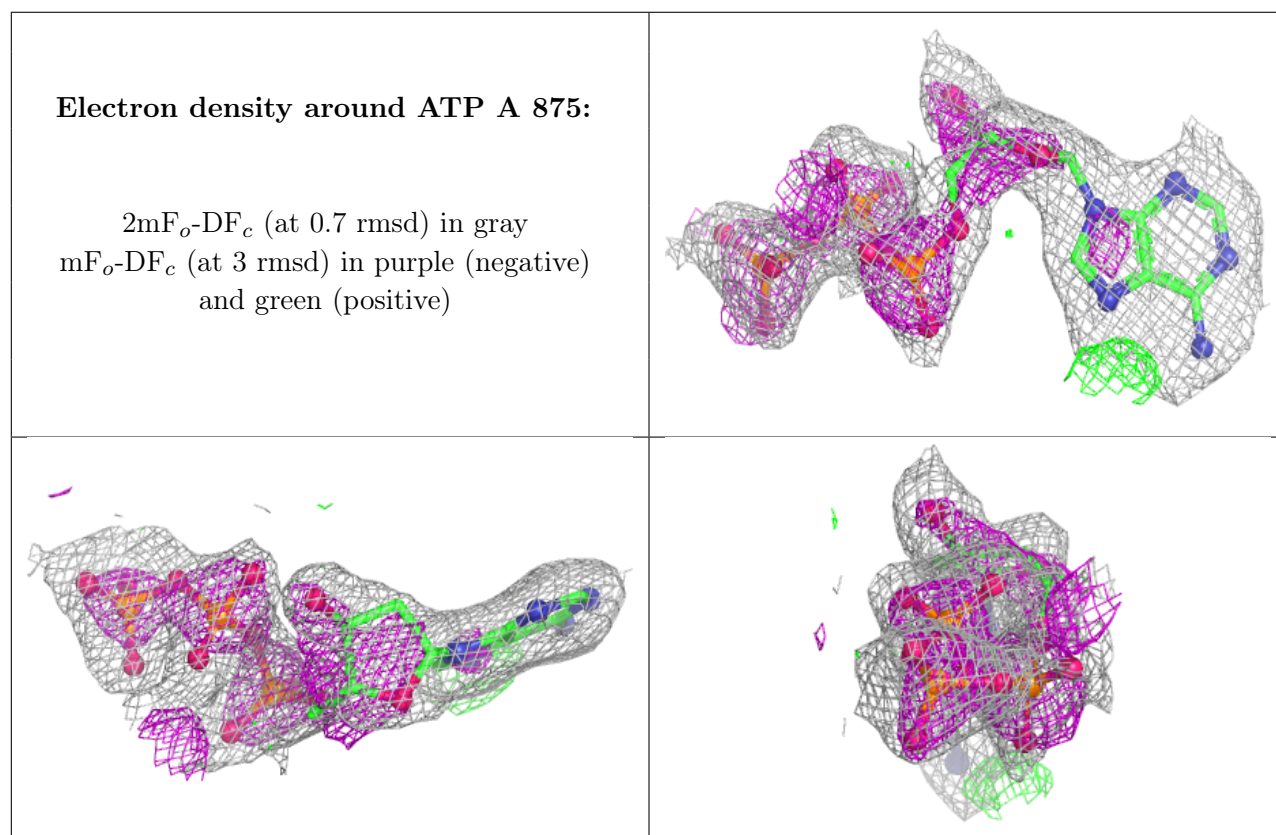
There are no oligosaccharides in this entry.

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, 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
4	ATP	A	875	30/31	0.91	0.11	14,27,29,33	0
5	MG	A	872	1/1	0.91	0.28	58,58,58,58	0
5	MG	A	871	1/1	0.94	0.21	16,16,16,16	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.



6.5 Other polymers [i](#)

There are no such residues in this entry.