



wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 15, 2017 – 02:27 am GMT

PDB ID : 2OCP
Title : Crystal Structure of Human Deoxyguanosine Kinase
Authors : Johansson, K.; Ramaswamy, S.; Ljungkrantz, C.; Knecht, W.; Piskur, J.;
Munch-Petersen, B.; Eriksson, S.; Eklund, H.
Deposited on : 2006-12-21
Resolution : 2.80 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<http://wwpdb.org/validation/2016/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467
Mogul : 1.7.2 (RC1), CSD as538be (2017)
Xtriage (Phenix) : 1.9-1692
EDS : trunk28620
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : recalc28949

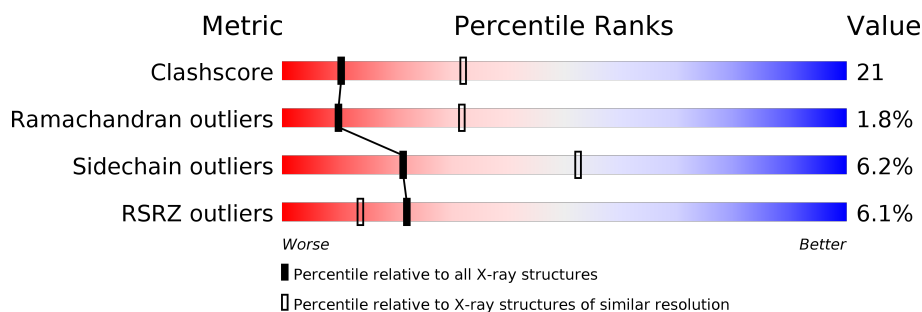
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 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	112137	3033 (2.80-2.80)
Ramachandran outliers	110173	2983 (2.80-2.80)
Sidechain outliers	110143	2985 (2.80-2.80)
RSRZ outliers	101464	2610 (2.80-2.80)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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	241	<div> <div>8%</div> <div>57%</div> <div>35%</div> <div>5%</div> </div>
1	B	241	<div> <div>3%</div> <div>55%</div> <div>36%</div> <div>5%</div> </div>
1	C	241	<div> <div>6%</div> <div>57%</div> <div>34%</div> <div>5%</div> </div>
1	D	241	<div> <div>3%</div> <div>58%</div> <div>34%</div> <div>5%</div> </div>
1	E	241	<div> <div>7%</div> <div>55%</div> <div>37%</div> <div>5%</div> </div>
1	F	241	<div> <div>7%</div> <div>56%</div> <div>36%</div> <div>5%</div> </div>
1	G	241	<div> <div>6%</div> <div>55%</div> <div>37%</div> <div>5%</div> </div>

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Mol	Chain	Length	Quality of chain
1	H	241	<div><div></div><div>7%</div><div>56%</div><div>36%</div><div>• 5%</div></div>

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 15832 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 Deoxyguanosine kinase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	229	Total	C	N	O	S	0	0	0
			1924	1249	326	344	5			
1	B	229	Total	C	N	O	S	0	0	0
			1924	1249	326	344	5			
1	C	229	Total	C	N	O	S	0	0	0
			1924	1249	326	344	5			
1	D	229	Total	C	N	O	S	0	0	0
			1924	1249	326	344	5			
1	E	229	Total	C	N	O	S	0	0	0
			1924	1249	326	344	5			
1	F	229	Total	C	N	O	S	0	0	0
			1924	1249	326	344	5			
1	G	229	Total	C	N	O	S	0	0	0
			1924	1249	326	344	5			
1	H	229	Total	C	N	O	S	0	0	0
			1924	1249	326	344	5			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	83	ASN	THR	variant	UNP Q16854
B	83	ASN	THR	variant	UNP Q16854
C	83	ASN	THR	variant	UNP Q16854
D	83	ASN	THR	variant	UNP Q16854
E	83	ASN	THR	variant	UNP Q16854
F	83	ASN	THR	variant	UNP Q16854
G	83	ASN	THR	variant	UNP Q16854
H	83	ASN	THR	variant	UNP Q16854

- Molecule 2 is 2'-DEOXYADENOSINE 5'-TRIPHOSPHATE (three-letter code: DTP) (formula: $C_{10}H_{16}N_5O_{12}P_3$).



- Molecule 3 is water.

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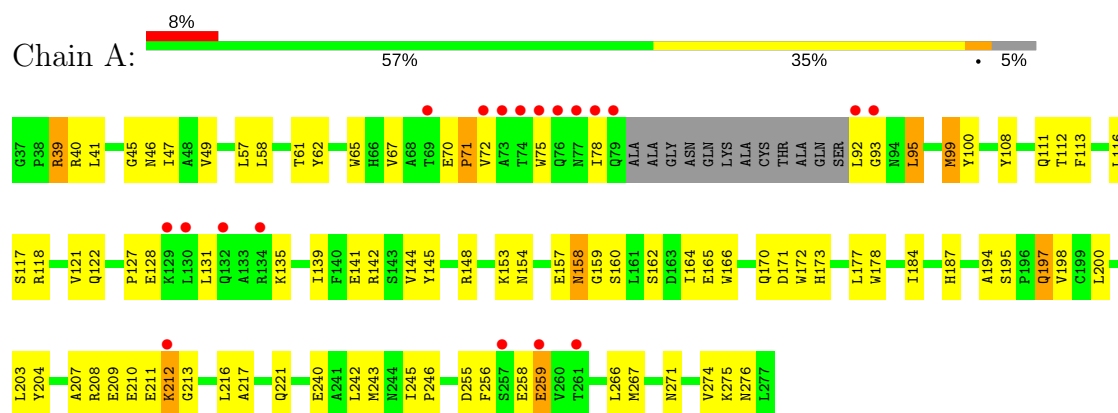
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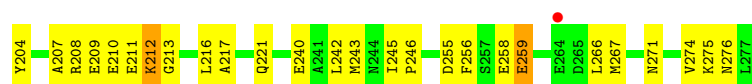
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	E	25	Total 25	O 25	0	0
3	F	25	Total 25	O 25	0	0
3	G	25	Total 25	O 25	0	0
3	H	25	Total 25	O 25	0	0

3 Residue-property plots

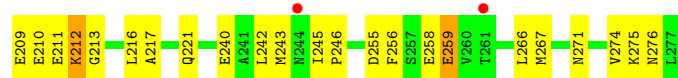
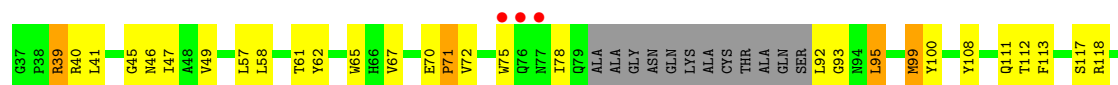
These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are 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 ($\text{RSRZ} > 2$). 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: Deoxyguanosine kinase

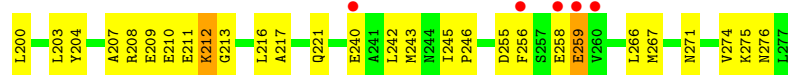
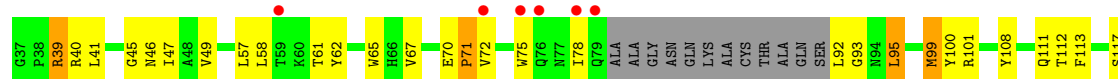




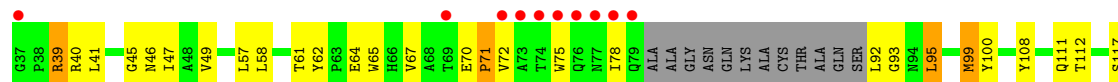
• Molecule 1: Deoxyguanosine kinase



• Molecule 1: Deoxyguanosine kinase

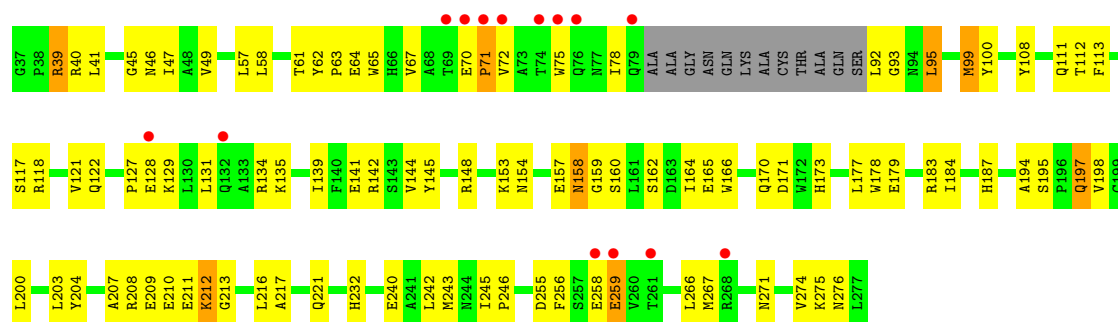


• Molecule 1: Deoxyguanosine kinase

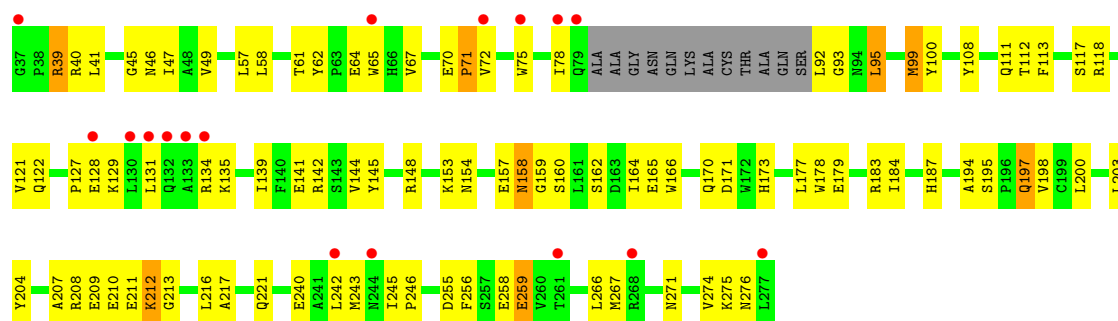


• Molecule 1: Deoxyguanosine kinase





• Molecule 1: Deoxyguanosine kinase



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	68.18Å 120.03Å 154.35Å 90.00° 90.68° 90.00°	Depositor
Resolution (Å)	30.00 – 2.80 38.77 – 2.80	Depositor EDS
% Data completeness (in resolution range)	97.5 (30.00-2.80) 97.5 (38.77-2.80)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.28 (at 2.81Å)	Xtriage
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.265 , 0.277 0.285 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	DCC
Wilson B-factor (Å ²)	35.1	Xtriage
Anisotropy	0.976	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 43.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.035 for h,-k,-l	Xtriage
F_o, F_c correlation	0.89	EDS
Total number of atoms	15832	wwPDB-VP
Average B, all atoms (Å ²)	43.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 11.84% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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

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	0.40	0/1976	0.61	0/2676
1	B	0.40	0/1976	0.61	0/2676
1	C	0.40	0/1976	0.61	0/2676
1	D	0.40	0/1976	0.61	0/2676
1	E	0.40	0/1976	0.61	0/2676
1	F	0.40	0/1976	0.61	0/2676
1	G	0.40	0/1976	0.61	0/2676
1	H	0.40	0/1976	0.61	0/2676
All	All	0.40	0/15808	0.61	0/21408

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1924	0	1899	81	1
1	B	1924	0	1899	90	3
1	C	1924	0	1899	76	10
1	D	1924	0	1899	77	2
1	E	1924	0	1899	87	11

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	F	1924	0	1899	83	3
1	G	1924	0	1899	83	7
1	H	1924	0	1899	82	3
2	A	30	0	12	1	0
2	B	30	0	12	3	0
2	C	30	0	12	2	0
2	D	30	0	12	2	0
2	E	30	0	12	1	0
2	F	30	0	12	2	0
2	G	30	0	12	3	0
2	H	30	0	12	3	0
3	A	25	0	0	5	0
3	B	25	0	0	5	0
3	C	25	0	0	5	0
3	D	25	0	0	5	0
3	E	25	0	0	5	0
3	F	25	0	0	5	0
3	G	25	0	0	5	0
3	H	25	0	0	5	0
All	All	15832	0	15288	639	20

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 21.

The worst 5 of 639 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:244:ASN:CB	1:E:134:ARG:HH22	1.36	1.34
1:B:244:ASN:HB3	1:E:134:ARG:NH2	1.58	1.16
1:B:244:ASN:CB	1:E:134:ARG:NH2	2.13	1.08
1:H:40:ARG:H	1:H:187:HIS:HD2	1.01	1.00
1:G:40:ARG:H	1:G:187:HIS:HD2	1.01	1.00

The worst 5 of 20 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:C:135:LYS:CD	1:E:240:GLU:OE1[2_756]	0.72	1.48
1:C:135:LYS:CE	1:E:240:GLU:OE1[2_756]	0.83	1.37
1:C:135:LYS:CE	1:E:240:GLU:CD[2_756]	1.09	1.11

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:129:LYS:CB	1:G:63:PRO:CB[1_655]	1.21	0.99
1:B:131:LEU:CD2	1:H:275:LYS:NZ[1_565]	1.48	0.72

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	225/241 (93%)	203 (90%)	18 (8%)	4 (2%)	10	32
1	B	225/241 (93%)	203 (90%)	18 (8%)	4 (2%)	10	32
1	C	225/241 (93%)	203 (90%)	18 (8%)	4 (2%)	10	32
1	D	225/241 (93%)	203 (90%)	18 (8%)	4 (2%)	10	32
1	E	225/241 (93%)	203 (90%)	18 (8%)	4 (2%)	10	32
1	F	225/241 (93%)	203 (90%)	18 (8%)	4 (2%)	10	32
1	G	225/241 (93%)	203 (90%)	18 (8%)	4 (2%)	10	32
1	H	225/241 (93%)	203 (90%)	18 (8%)	4 (2%)	10	32
All	All	1800/1928 (93%)	1624 (90%)	144 (8%)	32 (2%)	10	32

5 of 32 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	71	PRO
1	A	207	ALA
1	B	71	PRO
1	B	207	ALA
1	C	71	PRO

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	209/216 (97%)	196 (94%)	13 (6%)	21	52
1	B	209/216 (97%)	196 (94%)	13 (6%)	21	52
1	C	209/216 (97%)	196 (94%)	13 (6%)	21	52
1	D	209/216 (97%)	196 (94%)	13 (6%)	21	52
1	E	209/216 (97%)	196 (94%)	13 (6%)	21	52
1	F	209/216 (97%)	196 (94%)	13 (6%)	21	52
1	G	209/216 (97%)	196 (94%)	13 (6%)	21	52
1	H	209/216 (97%)	196 (94%)	13 (6%)	21	52
All	All	1672/1728 (97%)	1568 (94%)	104 (6%)	21	52

5 of 104 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	197	GLN
1	E	158	ASN
1	H	144	VAL
1	D	208	ARG
1	E	39	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 40 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	271	ASN
1	E	221	GLN
1	H	187	HIS
1	E	158	ASN
1	E	271	ASN

5.3.3 RNA ⓘ

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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

8 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	$\# Z > 2$
2	DTP	A	301	-	26,32,32	0.88	0	26,50,50	2.19	4 (15%)
2	DTP	B	301	-	26,32,32	0.88	1 (3%)	26,50,50	2.22	4 (15%)
2	DTP	C	301	-	26,32,32	0.88	1 (3%)	26,50,50	2.28	4 (15%)
2	DTP	D	301	-	26,32,32	0.95	1 (3%)	26,50,50	2.27	3 (11%)
2	DTP	E	301	-	26,32,32	0.97	1 (3%)	26,50,50	2.23	5 (19%)
2	DTP	F	301	-	26,32,32	0.91	1 (3%)	26,50,50	2.38	4 (15%)
2	DTP	G	301	-	26,32,32	0.94	1 (3%)	26,50,50	2.30	4 (15%)
2	DTP	H	301	-	26,32,32	0.92	1 (3%)	26,50,50	2.27	4 (15%)

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	DTP	A	301	-	-	0/18/34/34	0/3/3/3
2	DTP	B	301	-	-	0/18/34/34	0/3/3/3
2	DTP	C	301	-	-	0/18/34/34	0/3/3/3
2	DTP	D	301	-	-	0/18/34/34	0/3/3/3
2	DTP	E	301	-	-	0/18/34/34	0/3/3/3

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	DTP	F	301	-	-	0/18/34/34	0/3/3/3
2	DTP	G	301	-	-	0/18/34/34	0/3/3/3
2	DTP	H	301	-	-	0/18/34/34	0/3/3/3

The worst 5 of 7 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	F	301	DTP	C8-N7	-2.63	1.29	1.34
2	D	301	DTP	C8-N7	-2.49	1.30	1.34
2	C	301	DTP	C8-N7	-2.35	1.30	1.34
2	E	301	DTP	C8-N7	-2.27	1.30	1.34
2	H	301	DTP	C8-N7	-2.27	1.30	1.34

The worst 5 of 32 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	F	301	DTP	N3-C2-N1	-9.50	120.58	128.86
2	G	301	DTP	N3-C2-N1	-9.26	120.79	128.86
2	H	301	DTP	N3-C2-N1	-9.19	120.86	128.86
2	D	301	DTP	N3-C2-N1	-9.15	120.89	128.86
2	C	301	DTP	N3-C2-N1	-9.04	120.98	128.86

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

8 monomers are involved in 17 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	301	DTP	1	0
2	B	301	DTP	3	0
2	C	301	DTP	2	0
2	D	301	DTP	2	0
2	E	301	DTP	1	0
2	F	301	DTP	2	0
2	G	301	DTP	3	0
2	H	301	DTP	3	0

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data [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, 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	229/241 (95%)	0.15	19 (8%) 12 6	17, 39, 92, 113	0
1	B	229/241 (95%)	0.06	8 (3%) 44 33	16, 41, 85, 104	0
1	C	229/241 (95%)	0.08	14 (6%) 22 14	12, 31, 81, 95	0
1	D	229/241 (95%)	-0.03	7 (3%) 49 38	10, 29, 70, 103	0
1	E	229/241 (95%)	0.18	16 (6%) 17 10	19, 44, 91, 109	0
1	F	229/241 (95%)	0.20	16 (6%) 17 10	16, 36, 76, 120	0
1	G	229/241 (95%)	0.08	14 (6%) 22 14	19, 39, 75, 107	0
1	H	229/241 (95%)	0.26	17 (7%) 15 8	20, 46, 90, 107	0
All	All	1832/1928 (95%)	0.12	111 (6%) 22 14	10, 38, 87, 120	0

The worst 5 of 111 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	F	72	VAL	7.2
1	H	134	ARG	6.7
1	F	73	ALA	6.4
1	F	75	TRP	6.4
1	H	131	LEU	5.8

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 carbohydrates in this entry.

6.4 Ligands

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors(Å ²)	Q<0.9
2	DTP	D	301	30/30	0.94	0.20	0.25	22,35,54,55	0
2	DTP	C	301	30/30	0.91	0.18	-0.07	22,35,54,56	0
2	DTP	B	301	30/30	0.91	0.18	-0.16	21,36,55,55	0
2	DTP	E	301	30/30	0.89	0.19	-0.27	22,36,54,56	0
2	DTP	A	301	30/30	0.89	0.18	-0.29	22,35,55,56	0
2	DTP	F	301	30/30	0.93	0.17	-0.31	22,35,54,55	0
2	DTP	H	301	30/30	0.92	0.16	-0.34	22,36,54,55	0
2	DTP	G	301	30/30	0.93	0.15	-0.63	22,36,55,56	0

6.5 Other polymers

There are no such residues in this entry.