



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 12:34 AM GMT

PDB ID : 2ATX
Title : Crystal Structure of the TC10 GppNHp complex
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Deposited on : 2005-08-26
Resolution : 2.65 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
<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 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
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) : trunk26865

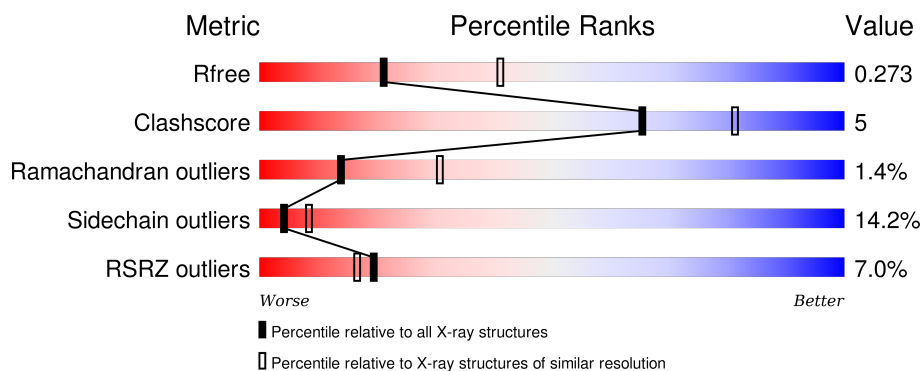
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.65 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}	91344	3152 (2.70-2.62)
Clashscore	102246	3524 (2.70-2.62)
Ramachandran outliers	100387	3469 (2.70-2.62)
Sidechain outliers	100360	3469 (2.70-2.62)
RSRZ outliers	91569	3161 (2.70-2.62)

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	194	<div> <div>7%</div> <div>70%</div> <div>23%</div> <div>• •</div> </div>
1	B	194	<div> <div>6%</div> <div>71%</div> <div>22%</div> <div>• • •</div> </div>

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 2935 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 small GTP binding protein TC10.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	186	Total	C	N	O	S	0	0	0
			1428	917	227	272	12			
1	B	186	Total	C	N	O	S	0	0	0
			1428	917	227	272	12			

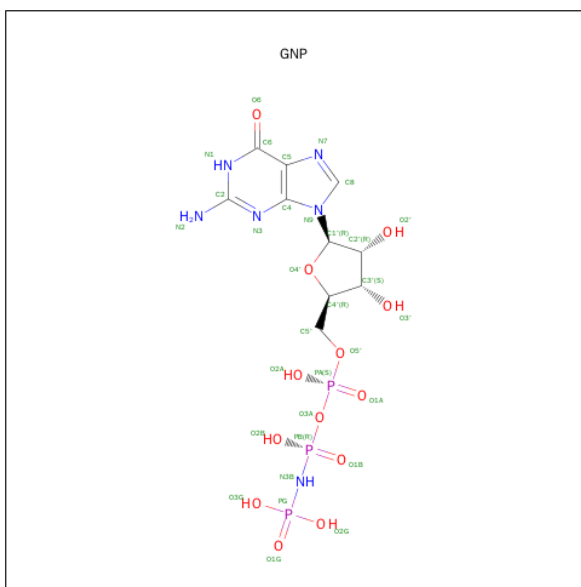
There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	GLY	-	CLONING ARTIFACT	UNP P17081
A	1	SER	-	CLONING ARTIFACT	UNP P17081
B	0	GLY	-	CLONING ARTIFACT	UNP P17081
B	1	SER	-	CLONING ARTIFACT	UNP P17081

- Molecule 2 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	1	Total	Mg	0	0
			1	1		
2	A	1	Total	Mg	0	0
			1	1		

- Molecule 3 is PHOSPHOAMINOPHOSPHONIC ACID-GUANYLATE ESTER (three-letter code: GNP) (formula: C₁₀H₁₇N₆O₁₃P₃).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total 32	C 10	N 6	O 13	P 3	0	0
3	B	1	Total 32	C 10	N 6	O 13	P 3	0	0

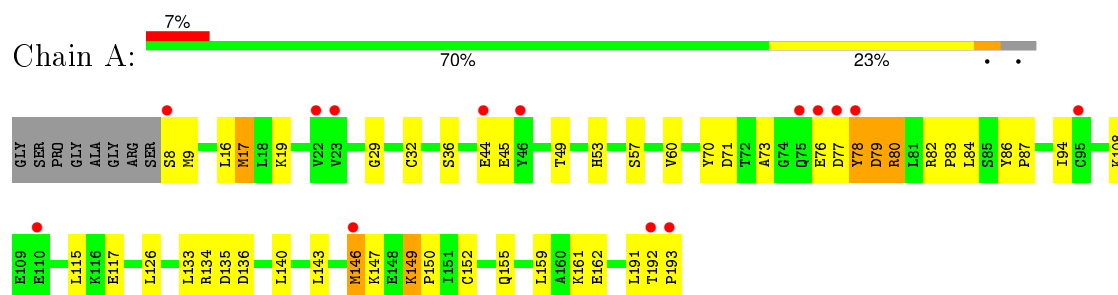
- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	8	Total O 8 8	0	0
4	B	5	Total O 5 5	0	0

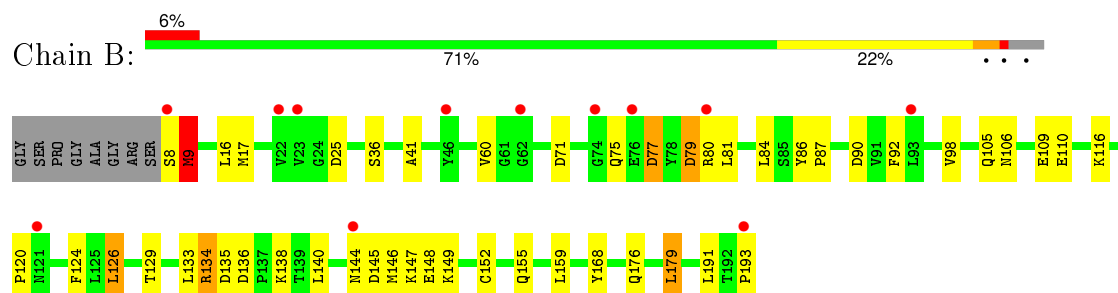
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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: small GTP binding protein TC10



- Molecule 1: small GTP binding protein TC10



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	43.69 Å 82.20 Å 114.31 Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.84 – 2.65 19.82 – 2.50	Depositor EDS
% Data completeness (in resolution range)	100.0 (19.84-2.65) 99.7 (19.82-2.50)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.05	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.76 (at 2.50 Å)	Xtriage
Refinement program	REFMAC 5.1.24	Depositor
R, R_{free}	0.210 , 0.260 0.226 , 0.273	Depositor DCC
R_{free} test set	623 reflections (5.26%)	DCC
Wilson B-factor (Å ²)	54.8	Xtriage
Anisotropy	0.244	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 47.8	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Outliers	0 of 14770 reflections	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	2935	wwPDB-VP
Average B, all atoms (Å ²)	33.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 29.82 % of the origin peak, indicating pseudo translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo translational symmetry is equal to 1.4516e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹ Intensities estimated from amplitudes.

² Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.375 respectively for untwinned datasets, and 0.333, 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: GNP, 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	0.83	1/1458 (0.1%)	0.97	7/1980 (0.4%)
1	B	0.84	0/1458	0.97	9/1980 (0.5%)
All	All	0.84	1/2916 (0.0%)	0.97	16/3960 (0.4%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	8	SER	CA-CB	5.53	1.61	1.52

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	193	PRO	N-CA-CB	7.02	111.72	103.30
1	B	136	ASP	CB-CG-OD2	6.53	124.18	118.30
1	A	136	ASP	CB-CG-OD2	6.48	124.14	118.30
1	B	193	PRO	N-CA-CB	5.96	110.45	103.30
1	B	79	ASP	CB-CG-OD2	5.88	123.59	118.30
1	A	135	ASP	CB-CG-OD2	5.83	123.55	118.30
1	A	77	ASP	CB-CG-OD2	5.78	123.50	118.30
1	A	71	ASP	CB-CG-OD2	5.78	123.50	118.30
1	B	77	ASP	CB-CG-OD1	5.75	123.47	118.30
1	B	135	ASP	CB-CG-OD2	5.75	123.47	118.30
1	B	90	ASP	CB-CG-OD2	5.59	123.33	118.30
1	A	17	MET	CG-SD-CE	5.57	109.11	100.20
1	A	79	ASP	CB-CG-OD2	5.55	123.30	118.30
1	B	71	ASP	CB-CG-OD1	5.48	123.23	118.30
1	B	25	ASP	CB-CG-OD2	5.19	122.97	118.30
1	B	145	ASP	CB-CG-OD2	5.18	122.96	118.30

There are no chirality outliers.

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	A	1428	0	1416	18	0
1	B	1428	0	1416	11	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	32	0	13	2	0
3	B	32	0	12	0	0
4	A	8	0	0	0	0
4	B	5	0	0	2	0
All	All	2935	0	2857	29	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 5.

All (29) 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:53:HIS:HD2	4:B:1205:HOH:O	1.78	0.67
1:A:80:ARG:NH1	1:A:80:ARG:HA	2.11	0.65
1:B:176:GLN:HA	1:B:179:LEU:HD22	1.81	0.63
1:A:133:LEU:HD11	3:A:200:GNP:N2	2.17	0.60
1:A:53:HIS:CD2	4:B:1205:HOH:O	2.56	0.55
1:B:134:ARG:O	1:B:140:LEU:HD21	2.10	0.51
1:A:32:CYS:O	1:A:36:SER:HB2	2.10	0.51
1:A:152:CYS:SG	1:A:155:GLN:HG3	2.52	0.49
1:B:36:SER:HA	1:B:41:ALA:O	2.11	0.49
1:B:8:SER:O	1:B:9:MET:CB	2.62	0.48
1:A:149:LYS:HB2	1:A:150:PRO:HD2	1.94	0.48
1:B:152:CYS:H	1:B:155:GLN:HE21	1.62	0.48
1:A:73:ALA:HB3	1:A:78:TYR:CB	2.44	0.48
1:B:146:MET:HG3	1:B:146:MET:O	2.13	0.47
1:B:98:VAL:HG22	1:B:129:THR:O	2.16	0.46
1:A:94:ILE:HD11	1:A:115:LEU:HD12	1.97	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:146:MET:HG3	1:A:146:MET:O	2.16	0.46
1:B:86:TYR:N	1:B:87:PRO:CD	2.79	0.44
1:A:49:THR:HG21	1:A:78:TYR:CE2	2.52	0.43
1:A:73:ALA:HB3	1:A:78:TYR:CG	2.54	0.43
1:B:116:LYS:HA	1:B:120:PRO:HA	2.00	0.43
1:A:108:LYS:NZ	1:A:162:GLU:OE1	2.52	0.43
1:A:19:LYS:HG3	1:A:70:TYR:CE1	2.54	0.43
1:A:86:TYR:N	1:A:87:PRO:CD	2.82	0.42
1:B:92:PHE:O	1:B:124:PHE:HA	2.20	0.42
1:A:134:ARG:O	1:A:134:ARG:HG2	2.21	0.41
1:A:29:GLY:HA2	3:A:200:GNP:O1A	2.21	0.41
1:A:82:ARG:HB3	1:A:83:PRO:HD3	2.03	0.41
1:B:126:LEU:O	1:B:168:TYR:HA	2.20	0.40

There are no symmetry-related clashes.

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	184/194 (95%)	170 (92%)	11 (6%)	3 (2%)	12	26
1	B	184/194 (95%)	175 (95%)	7 (4%)	2 (1%)	17	38
All	All	368/388 (95%)	345 (94%)	18 (5%)	5 (1%)	14	31

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	9	MET
1	A	45	GLU
1	A	192	THR
1	A	60	VAL
1	B	60	VAL

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	155/162 (96%)	135 (87%)	20 (13%)	5	11
1	B	155/162 (96%)	131 (84%)	24 (16%)	3	7
All	All	310/324 (96%)	266 (86%)	44 (14%)	4	8

All (44) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	9	MET
1	A	16	LEU
1	A	17	MET
1	A	44	GLU
1	A	57	SER
1	A	76	GLU
1	A	78	TYR
1	A	79	ASP
1	A	80	ARG
1	A	84	LEU
1	A	117	GLU
1	A	126	LEU
1	A	140	LEU
1	A	143	LEU
1	A	146	MET
1	A	147	LYS
1	A	149	LYS
1	A	159	LEU
1	A	161	LYS
1	A	191	LEU
1	B	9	MET
1	B	16	LEU
1	B	17	MET
1	B	75	GLN
1	B	77	ASP
1	B	79	ASP
1	B	80	ARG

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Mol	Chain	Res	Type
1	B	81	LEU
1	B	84	LEU
1	B	105	GLN
1	B	106	ASN
1	B	109	GLU
1	B	110	GLU
1	B	126	LEU
1	B	133	LEU
1	B	134	ARG
1	B	138	LYS
1	B	144	ASN
1	B	147	LYS
1	B	148	GLU
1	B	149	LYS
1	B	159	LEU
1	B	179	LEU
1	B	191	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	157	GLN
1	B	64	GLN
1	B	144	ASN
1	B	155	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

5.6 Ligand geometry

Of 4 ligands modelled in this entry, 2 are monoatomic - leaving 2 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	$\# Z > 2$
3	GNP	A	200	2	28,34,34	1.61	7 (25%)	33,54,54	2.14	8 (24%)
3	GNP	B	1200	2	28,34,34	1.48	6 (21%)	33,54,54	2.46	7 (21%)

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	GNP	A	200	2	-	0/12/38/38	0/3/3/3
3	GNP	B	1200	2	-	1/12/38/38	0/3/3/3

All (13) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	200	GNP	PG-O2G	-3.34	1.47	1.56
3	B	1200	GNP	O3'-C3'	-3.07	1.35	1.43
3	A	200	GNP	PB-O3A	-3.03	1.55	1.59
3	A	200	GNP	PB-O2B	-2.62	1.49	1.56
3	B	1200	GNP	C4-N3	-2.22	1.32	1.35
3	B	1200	GNP	PB-O2B	-2.10	1.50	1.56
3	A	200	GNP	C2-N1	2.06	1.39	1.35
3	B	1200	GNP	PG-O1G	2.35	1.48	1.46
3	A	200	GNP	PG-O1G	2.52	1.49	1.46
3	A	200	GNP	PB-O1B	3.00	1.49	1.46
3	B	1200	GNP	C6-N1	3.00	1.38	1.33
3	B	1200	GNP	PB-O1B	3.19	1.49	1.46
3	A	200	GNP	C6-N1	3.44	1.39	1.33

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
3	B	1200	GNP	C5-C6-N1	-8.76	111.61	123.59
3	A	200	GNP	C5-C6-N1	-7.06	113.93	123.59
3	B	1200	GNP	O3G-PG-O1G	-5.71	98.30	113.49
3	A	200	GNP	O3G-PG-O1G	-4.13	102.51	113.49
3	B	1200	GNP	O4'-C1'-N9	-2.42	103.02	108.10
3	A	200	GNP	C4-C5-N7	2.00	111.32	109.48
3	B	1200	GNP	O2G-PG-O1G	2.03	118.90	113.49
3	A	200	GNP	O2B-PB-O1B	2.59	115.40	110.00
3	B	1200	GNP	O2B-PB-O1B	2.70	115.64	110.00
3	A	200	GNP	O3A-PB-N3B	2.85	114.27	106.44
3	A	200	GNP	C2'-C1'-N9	3.26	119.28	114.29
3	B	1200	GNP	O3A-PA-O5'	3.30	111.70	102.94
3	A	200	GNP	O3A-PA-O5'	3.85	113.15	102.94
3	A	200	GNP	C6-N1-C2	3.98	121.46	115.94
3	B	1200	GNP	C6-N1-C2	5.82	124.02	115.94

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	1200	GNP	O1B-PB-N3B-PG

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	200	GNP	2	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 ⓘ

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	186/194 (95%)	0.25	14 (7%)	17 14	24, 32, 46, 56	0
1	B	186/194 (95%)	0.28	12 (6%)	22 20	24, 32, 46, 55	0
All	All	372/388 (95%)	0.26	26 (6%)	19 17	24, 32, 46, 56	0

All (26) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	193	PRO	8.0
1	A	78	TYR	7.0
1	A	77	ASP	6.2
1	B	76	GLU	5.6
1	B	74	GLY	4.9
1	B	193	PRO	4.2
1	A	76	GLU	4.1
1	B	46	TYR	3.8
1	B	80	ARG	3.7
1	A	146	MET	2.9
1	B	121	ASN	2.8
1	A	23	VAL	2.7
1	B	8	SER	2.7
1	A	110	GLU	2.6
1	B	93	LEU	2.5
1	A	75	GLN	2.5
1	A	8	SER	2.5
1	A	22	VAL	2.4
1	A	192	THR	2.4
1	A	95	CYS	2.3
1	B	23	VAL	2.3
1	A	44	GLU	2.3
1	B	144	ASN	2.2
1	A	46	TYR	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	22	VAL	2.2
1	B	62	GLY	2.1

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

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

6.3 Carbohydrates [i](#)

There are no carbohydrates 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. 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
3	GNP	A	200	32/32	0.91	0.23	0.88	17,26,30,32	0
3	GNP	B	1200	32/32	0.93	0.23	0.44	15,25,36,38	0
2	MG	A	201	1/1	0.74	0.14	-0.73	19,19,19,19	0
2	MG	B	1201	1/1	0.86	0.10	-1.74	19,19,19,19	0

6.5 Other polymers [i](#)

There are no such residues in this entry.