



wwPDB X-ray Structure Validation Summary Report ⓘ

Jun 15, 2020 – 03:01 am BST

PDB ID : 3NAI
Title : Crystal structures and functional analysis of murine norovirus RNA-dependent RNA polymerase
Authors : Kim, K.H.; Lee, J.H.; Alam, I.; Park, Y.; Kang, S.
Deposited on : 2010-06-02
Resolution : 2.56 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

<https://www.wwpdb.org/validation/2017/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	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.11
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

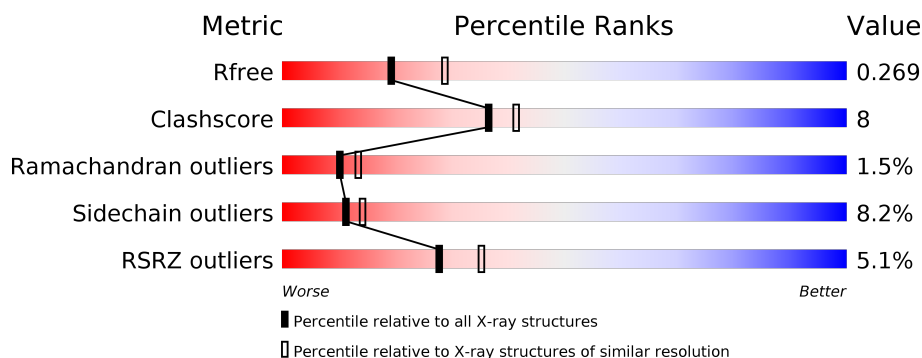
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.56 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1279 (2.58-2.54)
Clashscore	141614	1327 (2.58-2.54)
Ramachandran outliers	138981	1312 (2.58-2.54)
Sidechain outliers	138945	1312 (2.58-2.54)
RSRZ outliers	127900	1269 (2.58-2.54)

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 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	517	<div> <div>5%</div> <div> <div></div> <div>73%</div> <div>17%</div> <div>• 6%</div> </div> </div>
1	B	517	<div> <div>4%</div> <div> <div></div> <div>74%</div> <div>18%</div> <div>• 6%</div> </div> </div>
1	C	517	<div> <div>5%</div> <div> <div></div> <div>74%</div> <div>16%</div> <div>• 6%</div> </div> </div>

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 12037 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 RNA dependent RNA polymerase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	486	Total	C	N	O	S	0	0	0
			3857	2437	679	716	25			
1	B	486	Total	C	N	O	S	0	0	0
			3857	2437	679	716	25			
1	C	486	Total	C	N	O	S	0	0	0
			3857	2437	679	716	25			

There are 33 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	510	ALA	-	EXPRESSION TAG	UNP Q80J95
A	511	ALA	-	EXPRESSION TAG	UNP Q80J95
A	512	ALA	-	EXPRESSION TAG	UNP Q80J95
A	513	LEU	-	EXPRESSION TAG	UNP Q80J95
A	514	GLU	-	EXPRESSION TAG	UNP Q80J95
A	515	HIS	-	EXPRESSION TAG	UNP Q80J95
A	516	HIS	-	EXPRESSION TAG	UNP Q80J95
A	517	HIS	-	EXPRESSION TAG	UNP Q80J95
A	518	HIS	-	EXPRESSION TAG	UNP Q80J95
A	519	HIS	-	EXPRESSION TAG	UNP Q80J95
A	520	HIS	-	EXPRESSION TAG	UNP Q80J95
B	510	ALA	-	EXPRESSION TAG	UNP Q80J95
B	511	ALA	-	EXPRESSION TAG	UNP Q80J95
B	512	ALA	-	EXPRESSION TAG	UNP Q80J95
B	513	LEU	-	EXPRESSION TAG	UNP Q80J95
B	514	GLU	-	EXPRESSION TAG	UNP Q80J95
B	515	HIS	-	EXPRESSION TAG	UNP Q80J95
B	516	HIS	-	EXPRESSION TAG	UNP Q80J95
B	517	HIS	-	EXPRESSION TAG	UNP Q80J95
B	518	HIS	-	EXPRESSION TAG	UNP Q80J95
B	519	HIS	-	EXPRESSION TAG	UNP Q80J95
B	520	HIS	-	EXPRESSION TAG	UNP Q80J95
C	510	ALA	-	EXPRESSION TAG	UNP Q80J95

Continued on next page...

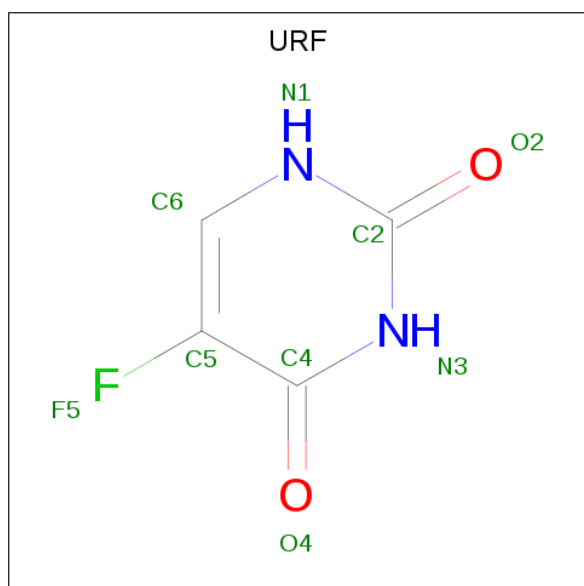
Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
C	511	ALA	-	EXPRESSION TAG	UNP Q80J95
C	512	ALA	-	EXPRESSION TAG	UNP Q80J95
C	513	LEU	-	EXPRESSION TAG	UNP Q80J95
C	514	GLU	-	EXPRESSION TAG	UNP Q80J95
C	515	HIS	-	EXPRESSION TAG	UNP Q80J95
C	516	HIS	-	EXPRESSION TAG	UNP Q80J95
C	517	HIS	-	EXPRESSION TAG	UNP Q80J95
C	518	HIS	-	EXPRESSION TAG	UNP Q80J95
C	519	HIS	-	EXPRESSION TAG	UNP Q80J95
C	520	HIS	-	EXPRESSION TAG	UNP Q80J95

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

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

- Molecule 3 is 5-FLUOROURACIL (three-letter code: URF) (formula: C₄H₃FN₂O₂).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C F N O 9 4 1 2 2	0	0

Continued on next page...

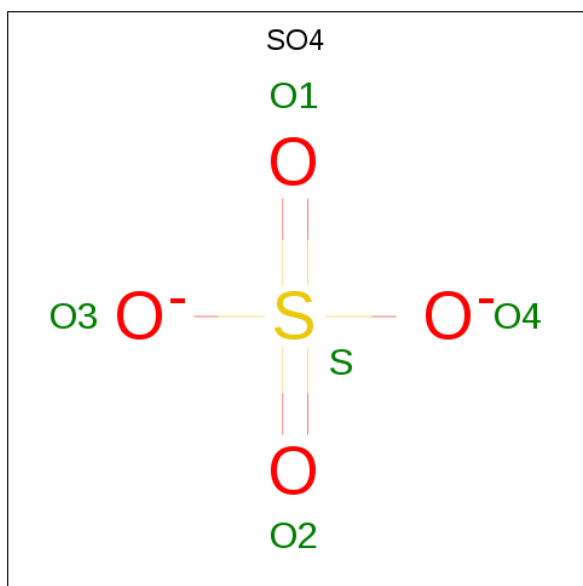
Continued from previous page...

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	B	1	Total	C	F	N	O	0	0
			9	4	1	2	2		
3	C	1	Total	C	F	N	O	0	0
			9	4	1	2	2		

- Molecule 4 is MANGANESE (III) ION (three-letter code: MN3) (formula: Mn).

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

- Molecule 5 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



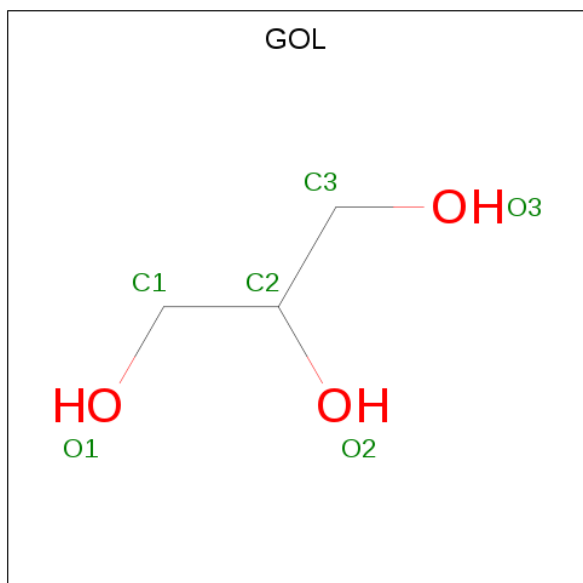
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	O	S	0	0
			5	4	1		
5	A	1	Total	O	S	0	0
			5	4	1		
5	A	1	Total	O	S	0	0
			5	4	1		
5	A	1	Total	O	S	0	0
			5	4	1		

Continued on next page...

Continued from previous page...

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

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



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

Continued on next page...

Continued from previous page...

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

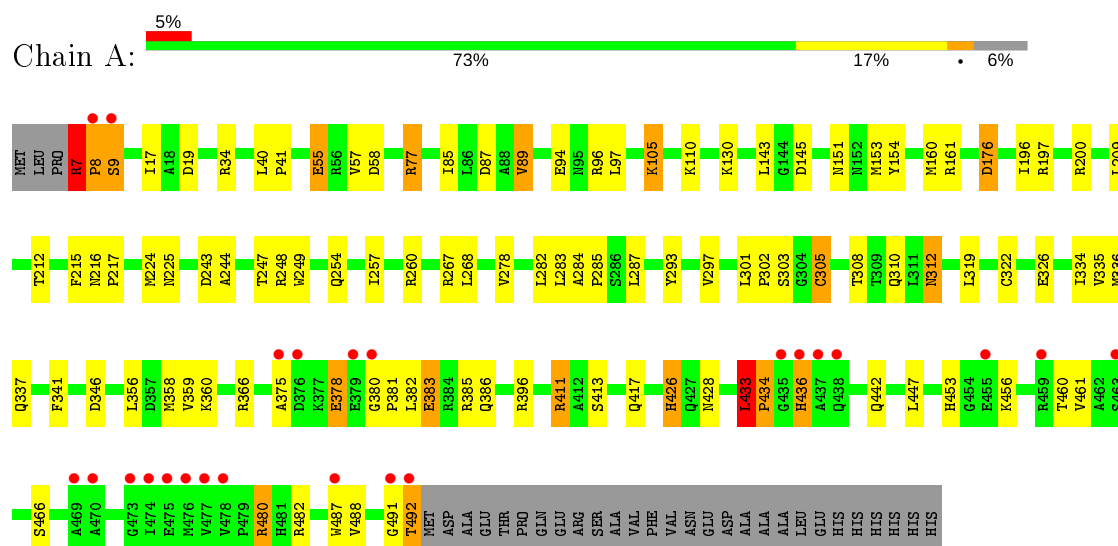
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	130	Total	O	0	0
			130	130		
7	B	106	Total	O	0	0
			106	106		
7	C	112	Total	O	0	0
			112	112		

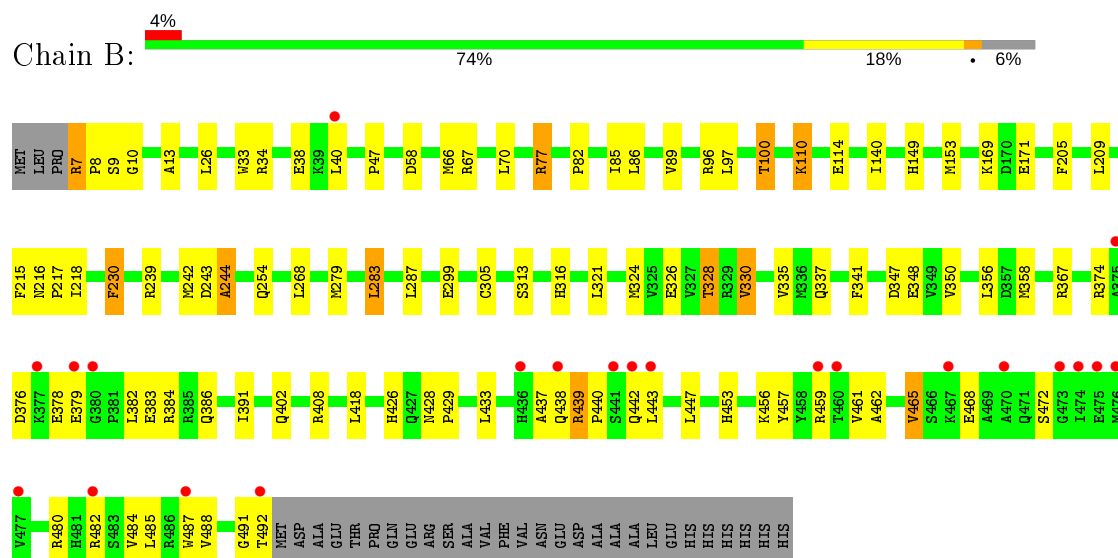
3 Residue-property plots

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 ($RSRZ > 2$). 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.

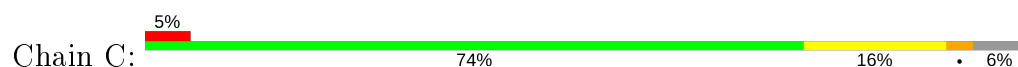
• Molecule 1: RNA dependent RNA polymerase

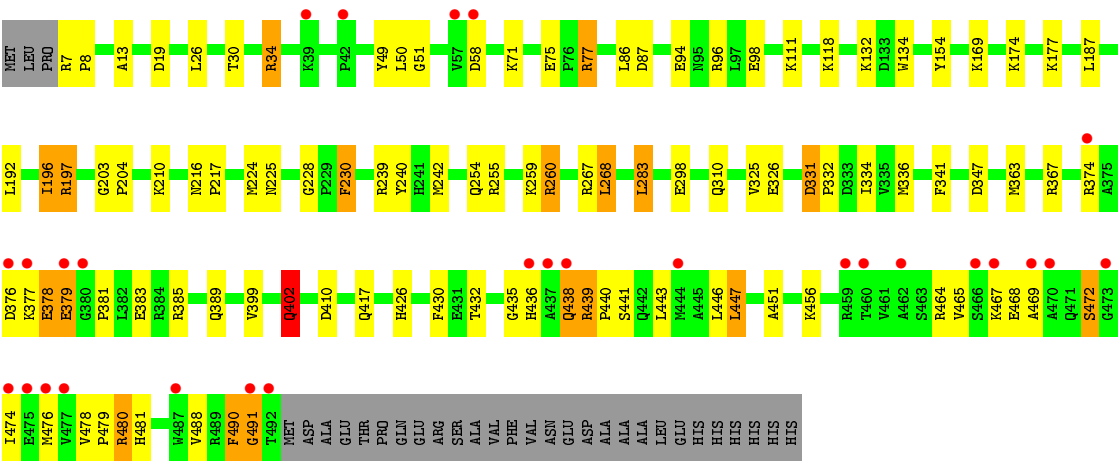


• Molecule 1: RNA dependent RNA polymerase



• Molecule 1: RNA dependent RNA polymerase





4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	121.25Å 196.56Å 109.60Å 90.00° 114.81° 90.00°	Depositor
Resolution (Å)	39.53 – 2.56 39.53 – 2.55	Depositor EDS
% Data completeness (in resolution range)	98.7 (39.53-2.56) 98.7 (39.53-2.55)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.88 (at 2.54Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.203 , 0.268 0.203 , 0.269	Depositor DCC
R_{free} test set	3738 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	27.7	Xtriage
Anisotropy	0.054	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 43.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.28$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	12037	wwPDB-VP
Average B, all atoms (Å ²)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.20% 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: GOL, MG, MN3, URF, SO4

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	0.49	0/3952	0.64	1/5355 (0.0%)
1	B	0.48	0/3952	0.61	0/5355
1	C	0.48	0/3952	0.60	0/5355
All	All	0.48	0/11856	0.62	1/16065 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	7	ARG	C-N-CD	-5.01	109.58	120.60

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	3857	0	3812	66	0
1	B	3857	0	3812	59	0
1	C	3857	0	3812	58	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
3	A	9	0	3	1	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	9	0	3	0	0
3	C	9	0	3	1	0
4	A	2	0	0	0	0
4	B	2	0	0	0	0
4	C	2	0	0	0	0
5	A	30	0	0	1	0
5	B	25	0	0	0	0
5	C	15	0	0	0	0
6	A	6	0	8	3	0
6	C	6	0	8	1	0
7	A	130	0	0	10	0
7	B	106	0	0	5	0
7	C	112	0	0	7	0
All	All	12037	0	11461	183	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 8.

The worst 5 of 183 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:305:CYS:HB2	7:A:561:HOH:O	1.40	1.21
1:B:328:THR:HG23	1:B:330:VAL:HG13	1.36	1.04
1:A:366:ARG:HD3	7:A:583:HOH:O	1.63	0.96
1:B:100:THR:CG2	1:B:216:ASN:HD21	1.84	0.90
1:A:487:TRP:HB2	7:A:606:HOH:O	1.70	0.90

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	484/517 (94%)	460 (95%)	18 (4%)	6 (1%)	13	17
1	B	484/517 (94%)	465 (96%)	13 (3%)	6 (1%)	13	17
1	C	484/517 (94%)	454 (94%)	20 (4%)	10 (2%)	7	8
All	All	1452/1551 (94%)	1379 (95%)	51 (4%)	22 (2%)	10	13

5 of 22 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	8	PRO
1	A	244	ALA
1	B	440	PRO
1	B	438	GLN
1	C	376	ASP

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	414/440 (94%)	377 (91%)	37 (9%)	9	12
1	B	414/440 (94%)	384 (93%)	30 (7%)	14	18
1	C	414/440 (94%)	379 (92%)	35 (8%)	10	13
All	All	1242/1320 (94%)	1140 (92%)	102 (8%)	11	14

5 of 102 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	110	LYS
1	B	382	LEU
1	C	447	LEU
1	B	140	ILE
1	B	283	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 30 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	63	GLN
1	B	237	ASN
1	C	436	HIS
1	B	216	ASN
1	B	253	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

5.6 Ligand geometry [i](#)

Of 28 ligands modelled in this entry, 9 are monoatomic - leaving 19 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	SO4	A	526	-	4,4,4	0.14	0	6,6,6	0.30	0
5	SO4	B	526	-	4,4,4	0.12	0	6,6,6	0.12	0
5	SO4	C	525	-	4,4,4	0.14	0	6,6,6	0.17	0
6	GOL	A	528	-	5,5,5	0.42	0	5,5,5	0.37	0
5	SO4	B	528	-	4,4,4	0.12	0	6,6,6	0.23	0
5	SO4	B	525	-	4,4,4	0.11	0	6,6,6	0.27	0
6	GOL	C	2	-	5,5,5	0.35	0	5,5,5	0.22	0
5	SO4	A	524	-	4,4,4	0.16	0	6,6,6	0.31	0
3	URF	B	521	2	8,9,9	3.36	1 (12%)	7,12,12	4.50	5 (71%)
5	SO4	C	524	-	4,4,4	0.10	0	6,6,6	0.26	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	SO4	A	2	-	4,4,4	0.15	0	6,6,6	0.17	0
5	SO4	A	3	-	4,4,4	0.14	0	6,6,6	0.12	0
3	URF	A	521	2	8,9,9	3.22	2 (25%)	7,12,12	4.85	5 (71%)
5	SO4	B	527	-	4,4,4	0.14	0	6,6,6	0.11	0
5	SO4	A	527	-	4,4,4	0.16	0	6,6,6	0.14	0
5	SO4	A	525	-	4,4,4	0.18	0	6,6,6	0.12	0
5	SO4	B	524	-	4,4,4	0.15	0	6,6,6	0.17	0
3	URF	C	521	-	8,9,9	3.34	2 (25%)	7,12,12	4.75	5 (71%)
5	SO4	C	526	-	4,4,4	0.12	0	6,6,6	0.23	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	URF	A	521	2	-	-	0/1/1/1
3	URF	C	521	-	-	-	0/1/1/1
6	GOL	C	2	-	-	2/4/4/4	-
6	GOL	A	528	-	-	2/4/4/4	-
3	URF	B	521	2	-	-	0/1/1/1

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	521	URF	C4-C5	9.07	1.49	1.38
3	C	521	URF	C4-C5	9.01	1.49	1.38
3	A	521	URF	C4-C5	8.53	1.49	1.38
3	A	521	URF	C2-N3	-2.26	1.33	1.38
3	C	521	URF	C2-N3	-2.08	1.34	1.38

The worst 5 of 15 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	521	URF	N1-C2-N3	-8.07	122.02	128.43
3	A	521	URF	N1-C2-N3	-7.91	122.14	128.43
3	B	521	URF	N1-C2-N3	-7.19	122.72	128.43
3	A	521	URF	C4-N3-C2	7.15	121.18	115.14
3	B	521	URF	C4-N3-C2	6.42	120.56	115.14

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	528	GOL	O1-C1-C2-C3
6	C	2	GOL	O1-C1-C2-C3
6	A	528	GOL	O1-C1-C2-O2
6	C	2	GOL	O1-C1-C2-O2

There are no ring outliers.

5 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	528	GOL	3	0
6	C	2	GOL	1	0
5	A	3	SO4	1	0
3	A	521	URF	1	0
3	C	521	URF	1	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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	486/517 (94%)	0.06	24 (4%)	29 37	12, 24, 57, 76	2 (0%)
1	B	486/517 (94%)	0.09	22 (4%)	33 42	15, 28, 62, 78	1 (0%)
1	C	486/517 (94%)	0.17	28 (5%)	23 29	17, 29, 63, 81	1 (0%)
All	All	1458/1551 (94%)	0.11	74 (5%)	28 35	12, 28, 61, 81	4 (0%)

The worst 5 of 74 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	8	PRO	7.0
1	B	476	MET	6.5
1	A	474	ILE	6.3
1	C	492	THR	6.2
1	C	438	GLN	5.2

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. 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(\AA^2)	Q<0.9
3	URF	B	521	9/9	0.77	0.26	56,56,57,58	9
3	URF	A	521	9/9	0.79	0.27	70,71,71,72	0
5	SO4	A	527	5/5	0.79	0.24	104,104,104,104	0
3	URF	C	521	9/9	0.83	0.26	71,71,72,72	0
5	SO4	C	525	5/5	0.88	0.22	70,70,71,71	0
2	MG	B	2	1/1	0.89	0.13	33,33,33,33	0
6	GOL	C	2	6/6	0.90	0.15	53,54,55,55	0
5	SO4	A	2	5/5	0.91	0.20	80,80,80,80	0
6	GOL	A	528	6/6	0.91	0.19	37,39,39,40	0
5	SO4	A	526	5/5	0.92	0.21	69,70,70,70	0
5	SO4	C	526	5/5	0.92	0.17	77,77,78,78	0
5	SO4	A	3	5/5	0.92	0.19	75,76,76,76	0
5	SO4	B	528	5/5	0.92	0.23	87,87,87,88	0
2	MG	C	3	1/1	0.93	0.20	48,48,48,48	0
5	SO4	B	527	5/5	0.94	0.32	86,86,86,86	0
5	SO4	B	526	5/5	0.95	0.18	70,71,71,71	0
5	SO4	B	525	5/5	0.95	0.14	52,52,53,53	0
5	SO4	A	525	5/5	0.96	0.21	52,53,53,53	0
4	MN3	C	523	1/1	0.96	0.11	55,55,55,55	0
5	SO4	C	524	5/5	0.97	0.12	46,46,47,47	0
5	SO4	B	524	5/5	0.97	0.14	46,46,47,47	0
2	MG	A	1	1/1	0.97	0.15	26,26,26,26	0
5	SO4	A	524	5/5	0.98	0.10	40,40,40,41	0
4	MN3	B	523	1/1	0.98	0.09	40,40,40,40	0
4	MN3	A	522	1/1	0.98	0.08	47,47,47,47	0
4	MN3	C	522	1/1	0.98	0.08	46,46,46,46	0
4	MN3	A	523	1/1	0.99	0.12	40,40,40,40	0
4	MN3	B	522	1/1	1.00	0.07	42,42,42,42	0

6.5 Other polymers [i](#)

There are no such residues in this entry.