wwPDB X-ray Structure Validation Summary Report ⓘ

Nov 4, 2024 – 01:52 PM EST

PDB ID	:	2ID0
Title	:	Escherichia coli RNase II
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Deposited on	:	2006-09-13
Resolution	:	2.35 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 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:

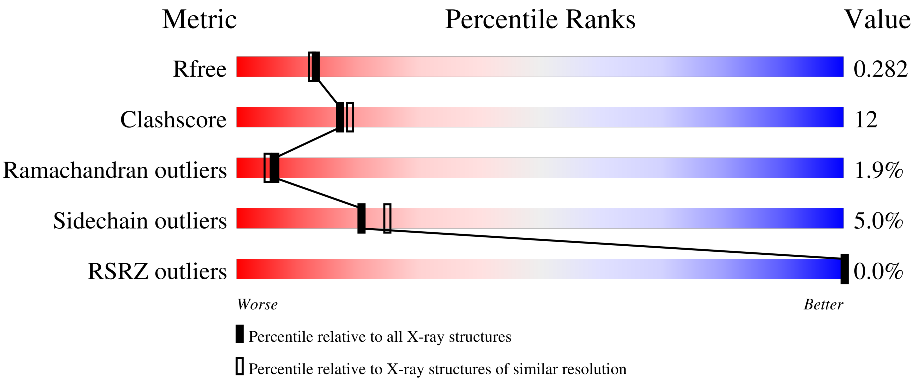
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.35 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}	164625	1460 (2.36-2.36)
Clashscore	180529	1571 (2.36-2.36)
Ramachandran outliers	177936	1559 (2.36-2.36)
Sidechain outliers	177891	1559 (2.36-2.36)
RSRZ outliers	164620	1460 (2.36-2.36)

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 <=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	644	64% 31% • •
1	B	644	74% 24% ••
1	C	644	75% 21% • •
1	D	644	68% 27% • •

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 19820 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 Exoribonuclease 2.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	636	Total 4838	C 3078	N 860	O 879	S 7	Se 14	0	0	0
1	B	636	Total 4937	C 3128	N 879	O 909	S 7	Se 14	0	0	0
1	C	636	Total 4930	C 3129	N 876	O 904	S 7	Se 14	0	0	0
1	D	636	Total 4824	C 3072	N 853	O 878	S 7	Se 14	0	0	0

There are 60 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MSE	MET	modified residue	UNP P30850
A	51	MSE	MET	modified residue	UNP P30850
A	55	MSE	MET	modified residue	UNP P30850
A	132	MSE	MET	modified residue	UNP P30850
A	182	MSE	MET	modified residue	UNP P30850
A	208	MSE	MET	modified residue	UNP P30850
A	261	MSE	MET	modified residue	UNP P30850
A	286	MSE	MET	modified residue	UNP P30850
A	393	MSE	MET	modified residue	UNP P30850
A	417	MSE	MET	modified residue	UNP P30850
A	505	MSE	MET	modified residue	UNP P30850
A	531	MSE	MET	modified residue	UNP P30850
A	540	MSE	MET	modified residue	UNP P30850
A	576	MSE	MET	modified residue	UNP P30850
A	633	MSE	MET	modified residue	UNP P30850
B	1	MSE	MET	modified residue	UNP P30850
B	51	MSE	MET	modified residue	UNP P30850
B	55	MSE	MET	modified residue	UNP P30850
B	132	MSE	MET	modified residue	UNP P30850
B	182	MSE	MET	modified residue	UNP P30850
B	208	MSE	MET	modified residue	UNP P30850

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Chain	Residue	Modelled	Actual	Comment	Reference
B	261	MSE	MET	modified residue	UNP P30850
B	286	MSE	MET	modified residue	UNP P30850
B	393	MSE	MET	modified residue	UNP P30850
B	417	MSE	MET	modified residue	UNP P30850
B	505	MSE	MET	modified residue	UNP P30850
B	531	MSE	MET	modified residue	UNP P30850
B	540	MSE	MET	modified residue	UNP P30850
B	576	MSE	MET	modified residue	UNP P30850
B	633	MSE	MET	modified residue	UNP P30850
C	1	MSE	MET	modified residue	UNP P30850
C	51	MSE	MET	modified residue	UNP P30850
C	55	MSE	MET	modified residue	UNP P30850
C	132	MSE	MET	modified residue	UNP P30850
C	182	MSE	MET	modified residue	UNP P30850
C	208	MSE	MET	modified residue	UNP P30850
C	261	MSE	MET	modified residue	UNP P30850
C	286	MSE	MET	modified residue	UNP P30850
C	393	MSE	MET	modified residue	UNP P30850
C	417	MSE	MET	modified residue	UNP P30850
C	505	MSE	MET	modified residue	UNP P30850
C	531	MSE	MET	modified residue	UNP P30850
C	540	MSE	MET	modified residue	UNP P30850
C	576	MSE	MET	modified residue	UNP P30850
C	633	MSE	MET	modified residue	UNP P30850
D	1	MSE	MET	modified residue	UNP P30850
D	51	MSE	MET	modified residue	UNP P30850
D	55	MSE	MET	modified residue	UNP P30850
D	132	MSE	MET	modified residue	UNP P30850
D	182	MSE	MET	modified residue	UNP P30850
D	208	MSE	MET	modified residue	UNP P30850
D	261	MSE	MET	modified residue	UNP P30850
D	286	MSE	MET	modified residue	UNP P30850
D	393	MSE	MET	modified residue	UNP P30850
D	417	MSE	MET	modified residue	UNP P30850
D	505	MSE	MET	modified residue	UNP P30850
D	531	MSE	MET	modified residue	UNP P30850
D	540	MSE	MET	modified residue	UNP P30850
D	576	MSE	MET	modified residue	UNP P30850
D	633	MSE	MET	modified residue	UNP P30850

- Molecule 2 is MANGANESE (II) ION (three-letter code: MN) (formula: Mn).

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

- Molecule 3 is water.

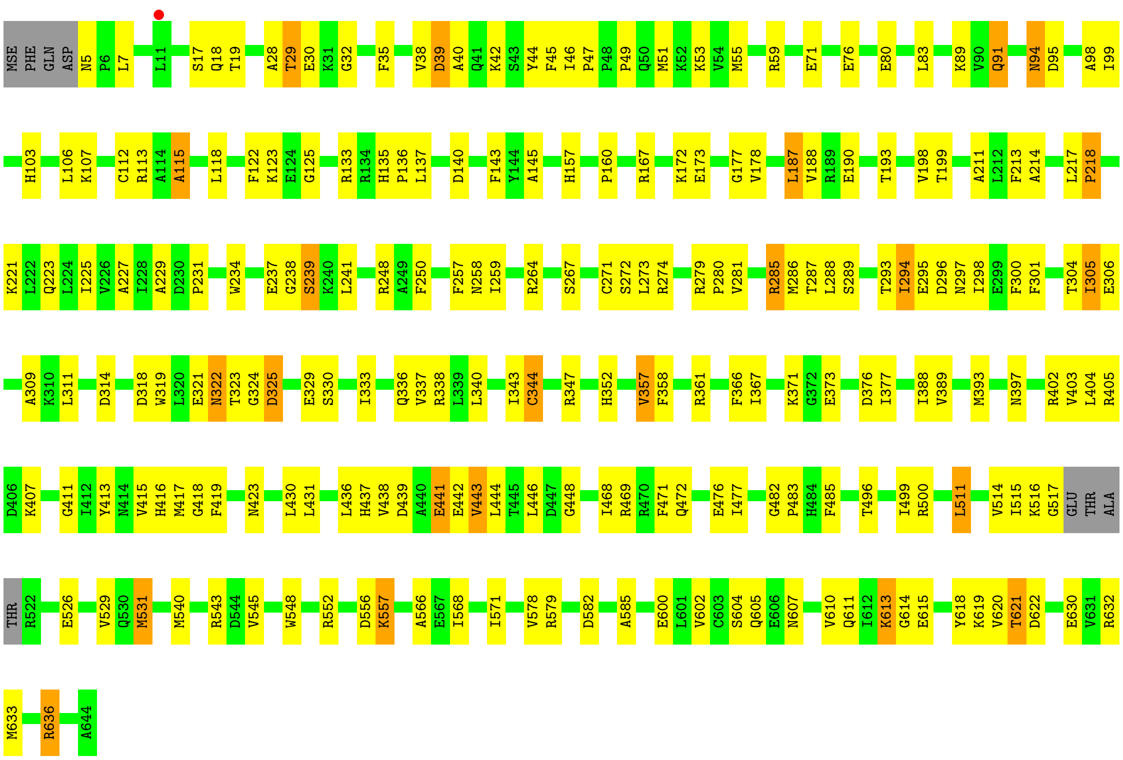
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	50	Total O 50 50	0	0
3	B	96	Total O 96 96	0	0
3	C	82	Total O 82 82	0	0
3	D	59	Total O 59 59	0	0

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.

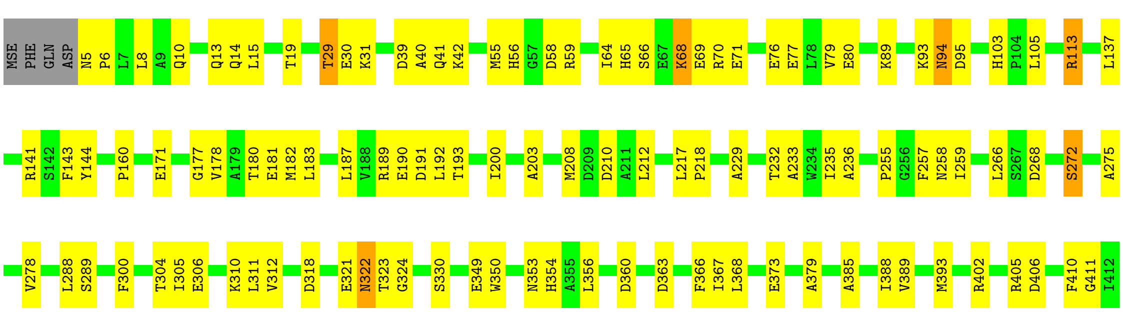
- Molecule 1: Exoribonuclease 2

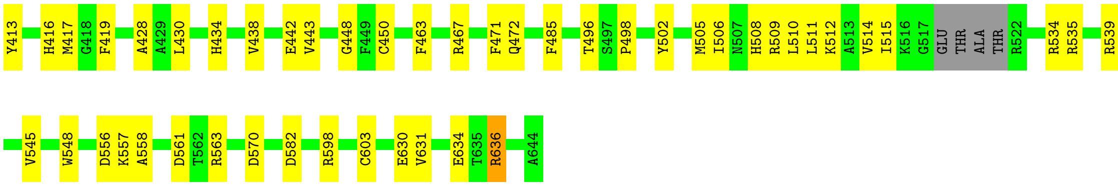
Chain A:



- Molecule 1: Exoribonuclease 2

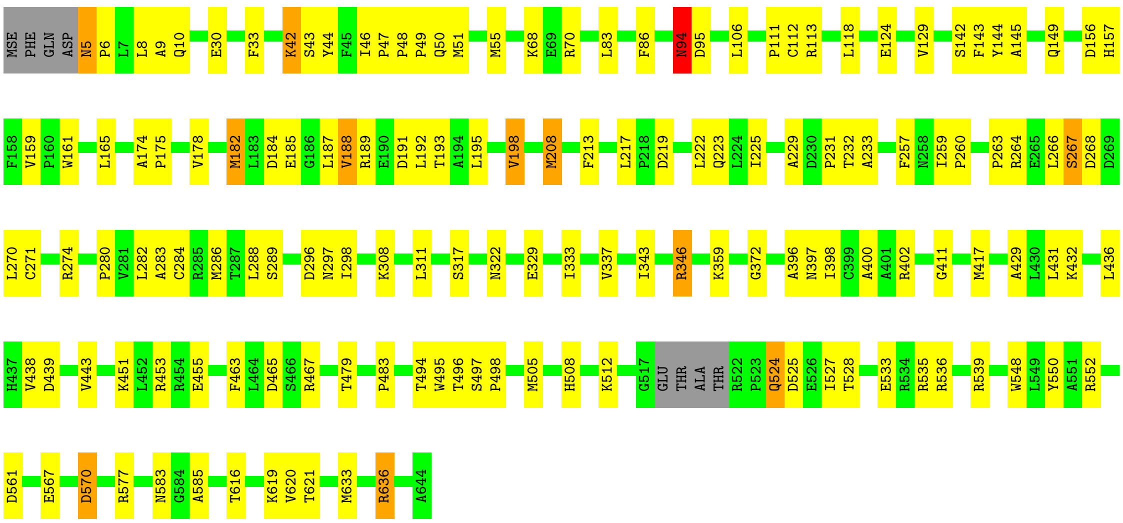
Chain B:





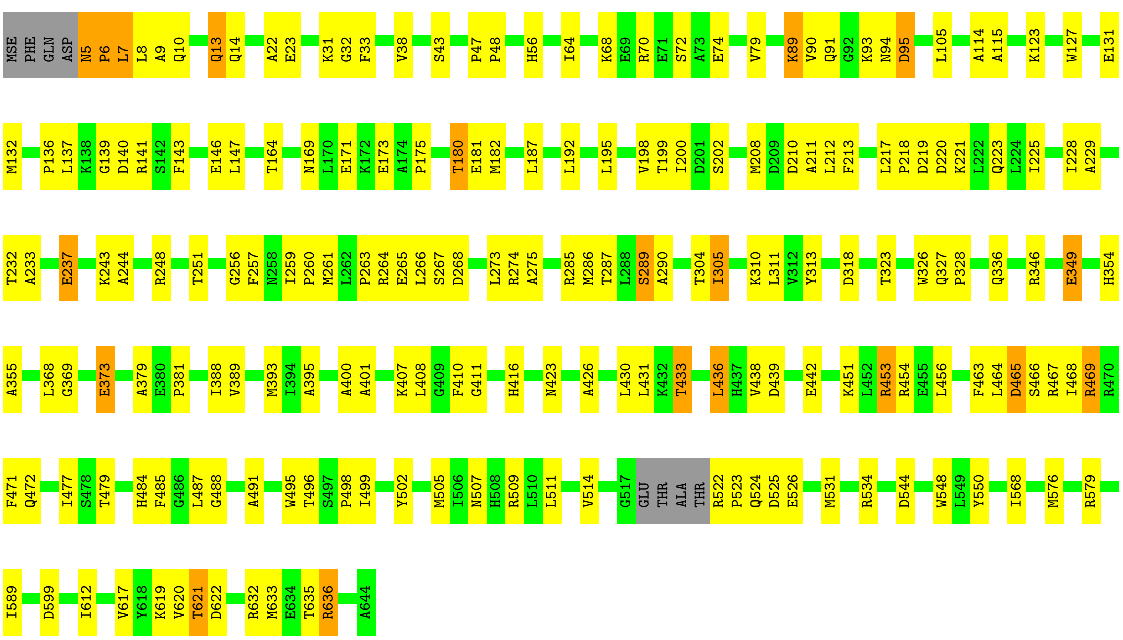
• Molecule 1: Exoribonuclease 2

Chain C:



• Molecule 1: Exoribonuclease 2

Chain D:



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α, β, γ	55.76Å 118.43Å 122.38Å 107.80° 98.36° 91.40°	Depositor
Resolution (Å)	17.95 – 2.35 17.95 – 2.35	Depositor EDS
% Data completeness (in resolution range)	82.3 (17.95-2.35) 82.4 (17.95-2.35)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	7.80 (at 2.35Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.223 , 0.286 0.221 , 0.282	Depositor DCC
R_{free} test set	5045 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	48.5	Xtriage
Anisotropy	0.058	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.28 , 37.9	EDS
L-test for twinning[2]	$< \|L\| > = 0.47$, $< L^2 > = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	19820	wwPDB-VP
Average B, all atoms (Å^2)	56.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 10.14% of the height of the origin peak. No significant pseudotranslation is detected.*

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ 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

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	0.81	9/4925 (0.2%)	0.78	2/6674 (0.0%)
1	B	0.83	3/5025 (0.1%)	0.80	3/6800 (0.0%)
1	C	0.80	0/5018	0.80	2/6788 (0.0%)
1	D	0.86	8/4911 (0.2%)	0.83	3/6659 (0.0%)
All	All	0.82	20/19879 (0.1%)	0.80	10/26921 (0.0%)

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
1	A	0	1

The worst 5 of 20 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	285	ARG	CZ-NH1	16.16	1.54	1.33
1	B	190	GLU	CD-OE1	15.89	1.43	1.25
1	B	190	GLU	CD-OE2	15.08	1.42	1.25
1	D	5	ASN	CG-ND2	14.79	1.69	1.32
1	D	285	ARG	NE-CZ	13.06	1.50	1.33

The worst 5 of 10 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	D	285	ARG	NE-CZ-NH2	-15.12	112.74	120.30
1	A	285	ARG	NE-CZ-NH2	-13.85	113.38	120.30
1	D	285	ARG	NE-CZ-NH1	12.31	126.46	120.30
1	C	535	ARG	NE-CZ-NH2	-7.47	116.56	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	58	ASP	CB-CG-OD1	7.00	124.60	118.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	5	ASN	Peptide

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	4838	0	4707	142	0
1	B	4937	0	4850	98	0
1	C	4930	0	4860	99	0
1	D	4824	0	4698	142	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
3	A	50	0	0	5	0
3	B	96	0	0	3	0
3	C	82	0	0	2	0
3	D	59	0	0	3	0
All	All	19820	0	19115	481	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 12.

The worst 5 of 481 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:D:5:ASN:ND2	1:D:5:ASN:CG	1.69	1.44
1:A:431:LEU:HD13	1:A:438:VAL:HG21	1.30	1.12
1:D:217:LEU:HB3	1:D:218:PRO:HD2	1.30	1.07

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:5:ASN:HB2	1:D:6:PRO:HD3	1.44	0.99
1:D:393:MSE:SE	1:D:496:THR:HG21	2.16	0.95

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	632/644 (98%)	546 (86%)	68 (11%)	18 (3%)	4	2
1	B	632/644 (98%)	577 (91%)	47 (7%)	8 (1%)	10	8
1	C	632/644 (98%)	580 (92%)	45 (7%)	7 (1%)	12	11
1	D	632/644 (98%)	557 (88%)	61 (10%)	14 (2%)	5	4
All	All	2528/2576 (98%)	2260 (89%)	221 (9%)	47 (2%)	6	5

5 of 47 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	94	ASN
1	A	218	PRO
1	A	274	ARG
1	A	322	ASN
1	A	325	ASP

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	480/522 (92%)	445 (93%)	35 (7%)	11	12
1	B	505/522 (97%)	485 (96%)	20 (4%)	27	34
1	C	504/522 (97%)	483 (96%)	21 (4%)	25	32
1	D	479/522 (92%)	456 (95%)	23 (5%)	21	26
All	All	1968/2088 (94%)	1869 (95%)	99 (5%)	20	25

5 of 99 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	43	SER
1	C	505	MSE
1	C	113	ARG
1	C	267	SER
1	C	636	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 21 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	169	ASN
1	D	437	HIS
1	D	611	GLN
1	D	472	GLN
1	D	342	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 oligosaccharides in this entry.

5.6 Ligand geometry (i)

Of 4 ligands modelled in this entry, 4 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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^{th} 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	622/644 (96%)	-1.28	1 (0%)	92	92	31, 57, 80, 89	0
1	B	622/644 (96%)	-1.41	0	100	100	33, 54, 74, 84	0
1	C	622/644 (96%)	-1.43	0	100	100	41, 53, 72, 84	0
1	D	622/644 (96%)	-1.36	0	100	100	31, 53, 74, 85	0
All	All	2488/2576 (96%)	-1.37	1 (0%)	100	100	31, 54, 76, 89	0

All (1) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	11	LEU	3.4

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 monosaccharides 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^{th} 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
2	MN	A	1001	1/1	0.99	0.03	100,100,100,100	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($Å^2$)	Q<0.9
2	MN	B	1002	1/1	0.99	0.03	83,83,83,83	0
2	MN	C	1003	1/1	0.99	0.03	88,88,88,88	0
2	MN	D	1004	1/1	0.99	0.02	94,94,94,94	0

6.5 Other polymers (i)

There are no such residues in this entry.