



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 15, 2023 – 03:32 PM EDT

PDB ID : 8D34
Title : Crystal Structure of SARS CoV-2 NSP15 Endroribonuclease H250A
Authors : Farraj, R.A.; Edwards, R.A.; Glover, J.N.M.
Deposited on : 2022-05-31
Resolution : 2.91 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 : 4.02b-467
Xtriage (Phenix) : 1.13
EDS : 2.36
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) : 2.36

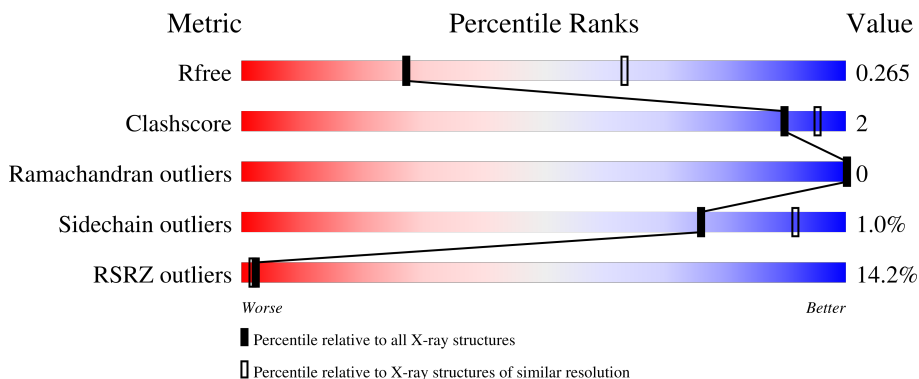
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.91 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	2307 (2.94-2.90)
Clashscore	141614	2531 (2.94-2.90)
Ramachandran outliers	138981	2462 (2.94-2.90)
Sidechain outliers	138945	2464 (2.94-2.90)
RSRZ outliers	127900	2248 (2.94-2.90)

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	373	
1	B	373	

2 Entry composition i

There is only 1 type of molecule in this entry. The entry contains 5488 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 Uridylate-specific endoribonuclease nsp15.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	348	2744	1764	445	524	11	0	0	0
1	B	348	2744	1764	445	524	11	0	0	0

There are 56 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-25	MET	-	initiating methionine	UNP P0DTD1
A	-24	GLY	-	expression tag	UNP P0DTD1
A	-23	SER	-	expression tag	UNP P0DTD1
A	-22	SER	-	expression tag	UNP P0DTD1
A	-21	HIS	-	expression tag	UNP P0DTD1
A	-20	HIS	-	expression tag	UNP P0DTD1
A	-19	HIS	-	expression tag	UNP P0DTD1
A	-18	HIS	-	expression tag	UNP P0DTD1
A	-17	HIS	-	expression tag	UNP P0DTD1
A	-16	HIS	-	expression tag	UNP P0DTD1
A	-15	SER	-	expression tag	UNP P0DTD1
A	-14	SER	-	expression tag	UNP P0DTD1
A	-13	GLY	-	expression tag	UNP P0DTD1
A	-12	VAL	-	expression tag	UNP P0DTD1
A	-11	ASP	-	expression tag	UNP P0DTD1
A	-10	LEU	-	expression tag	UNP P0DTD1
A	-9	GLY	-	expression tag	UNP P0DTD1
A	-8	THR	-	expression tag	UNP P0DTD1
A	-7	GLU	-	expression tag	UNP P0DTD1
A	-6	ASN	-	expression tag	UNP P0DTD1
A	-5	LEU	-	expression tag	UNP P0DTD1
A	-4	TYR	-	expression tag	UNP P0DTD1
A	-3	PHE	-	expression tag	UNP P0DTD1
A	-2	GLN	-	expression tag	UNP P0DTD1
A	-1	SER	-	expression tag	UNP P0DTD1

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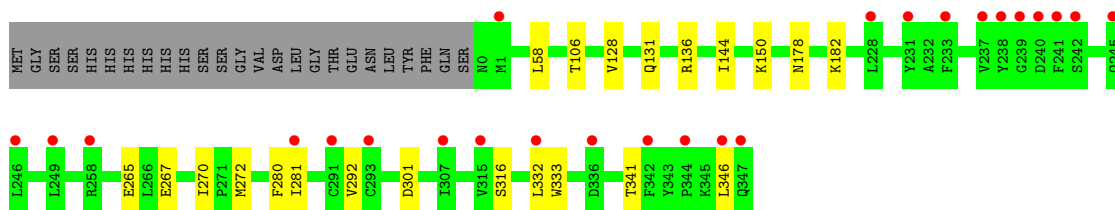
Chain	Residue	Modelled	Actual	Comment	Reference
A	0	ASN	-	expression tag	UNP P0DTD1
A	1	MET	-	expression tag	UNP P0DTD1
A	250	ALA	HIS	engineered mutation	UNP P0DTD1
B	-25	MET	-	initiating methionine	UNP P0DTD1
B	-24	GLY	-	expression tag	UNP P0DTD1
B	-23	SER	-	expression tag	UNP P0DTD1
B	-22	SER	-	expression tag	UNP P0DTD1
B	-21	HIS	-	expression tag	UNP P0DTD1
B	-20	HIS	-	expression tag	UNP P0DTD1
B	-19	HIS	-	expression tag	UNP P0DTD1
B	-18	HIS	-	expression tag	UNP P0DTD1
B	-17	HIS	-	expression tag	UNP P0DTD1
B	-16	HIS	-	expression tag	UNP P0DTD1
B	-15	SER	-	expression tag	UNP P0DTD1
B	-14	SER	-	expression tag	UNP P0DTD1
B	-13	GLY	-	expression tag	UNP P0DTD1
B	-12	VAL	-	expression tag	UNP P0DTD1
B	-11	ASP	-	expression tag	UNP P0DTD1
B	-10	LEU	-	expression tag	UNP P0DTD1
B	-9	GLY	-	expression tag	UNP P0DTD1
B	-8	THR	-	expression tag	UNP P0DTD1
B	-7	GLU	-	expression tag	UNP P0DTD1
B	-6	ASN	-	expression tag	UNP P0DTD1
B	-5	LEU	-	expression tag	UNP P0DTD1
B	-4	TYR	-	expression tag	UNP P0DTD1
B	-3	PHE	-	expression tag	UNP P0DTD1
B	-2	GLN	-	expression tag	UNP P0DTD1
B	-1	SER	-	expression tag	UNP P0DTD1
B	0	ASN	-	expression tag	UNP P0DTD1
B	1	MET	-	expression tag	UNP P0DTD1
B	250	ALA	HIS	engineered mutation	UNP P0DTD1

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.

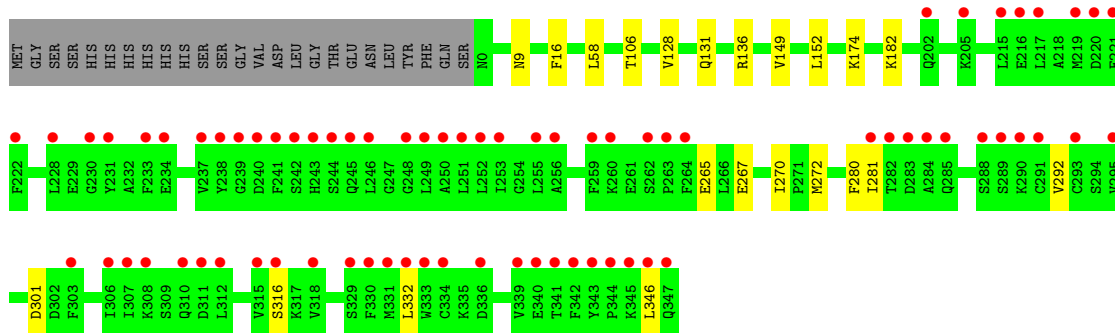
- Molecule 1: Uridylate-specific endoribonuclease nsp15

Chain A: 



- Molecule 1: Uridylate-specific endoribonuclease nsp15

Chain B: 



4 Data and refinement statistics

Property	Value	Source
Space group	P 63	Depositor
Cell constants a, b, c, α , β , γ	152.53Å 152.53Å 109.64Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	38.13 – 2.91 38.13 – 2.91	Depositor EDS
% Data completeness (in resolution range)	97.7 (38.13-2.91) 98.5 (38.13-2.91)	Depositor EDS
R_{merge}	0.26	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.87 (at 2.90Å)	Xtrriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.246 , 0.263 0.248 , 0.265	Depositor DCC
R_{free} test set	1554 reflections (4.92%)	wwPDB-VP
Wilson B-factor (Å ²)	51.8	Xtrriage
Anisotropy	0.236	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 21.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	0.254 for h,-h-k,-l	Xtrriage
F_o, F_c correlation	0.88	EDS
Total number of atoms	5488	wwPDB-VP
Average B, all atoms (Å ²)	71.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.61% 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](#)

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	0.24	0/2800	0.44	0/3798
1	B	0.24	0/2800	0.45	0/3798
All	All	0.24	0/5600	0.45	0/7596

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	2744	0	2740	10	0
1	B	2744	0	2740	10	0
All	All	5488	0	5480	20	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 2.

All (20) 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:136:ARG:NH2	1:A:150:LYS:O	2.29	0.66
1:A:128:VAL:HB	1:A:131:GLN:HG3	1.81	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:128:VAL:HB	1:B:131:GLN:HG3	1.83	0.60
1:B:136:ARG:O	1:B:182:LYS:NZ	2.47	0.47
1:B:58:LEU:HD11	1:B:106:THR:HG21	1.96	0.47
1:B:149:VAL:HG11	1:B:152:LEU:HD12	1.97	0.46
1:A:58:LEU:HD11	1:A:106:THR:HG21	1.98	0.45
1:B:9:ASN:HB3	1:B:16:PHE:HA	2.00	0.44
1:B:270:ILE:HG22	1:B:272:MET:HG2	1.99	0.44
1:A:265:GLU:O	1:A:281:ILE:HA	2.18	0.43
1:A:270:ILE:HG22	1:A:272:MET:HG2	2.00	0.43
1:A:316:SER:HA	1:A:332:LEU:O	2.19	0.42
1:B:292:VAL:HG11	1:B:346:LEU:HD21	2.02	0.42
1:A:136:ARG:O	1:A:182:LYS:NZ	2.53	0.42
1:A:144:ILE:HA	1:A:178:ASN:O	2.20	0.41
1:B:316:SER:HA	1:B:332:LEU:O	2.21	0.41
1:A:333:TRP:HB2	1:A:341:THR:HG22	2.02	0.41
1:A:292:VAL:HG11	1:A:346:LEU:HD21	2.02	0.41
1:B:174:LYS:HB2	1:B:174:LYS:HE3	1.81	0.41
1:B:265:GLU:O	1:B:281:ILE:HA	2.20	0.41

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	346/373 (93%)	338 (98%)	8 (2%)	0	100	100
1	B	346/373 (93%)	338 (98%)	8 (2%)	0	100	100
All	All	692/746 (93%)	676 (98%)	16 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	308/331 (93%)	305 (99%)	3 (1%)	76	91
1	B	308/331 (93%)	305 (99%)	3 (1%)	76	91
All	All	616/662 (93%)	610 (99%)	6 (1%)	76	91

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	267	GLU
1	A	280	PHE
1	A	301	ASP
1	B	267	GLU
1	B	280	PHE
1	B	301	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

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	348/373 (93%)	0.56	25 (7%) 15 12	26, 52, 113, 175	0
1	B	348/373 (93%)	1.40	74 (21%) 0 0	23, 53, 185, 263	0
All	All	696/746 (93%)	0.98	99 (14%) 2 2	23, 53, 165, 263	0

All (99) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	249	LEU	18.7
1	B	342	PHE	17.6
1	B	346	LEU	14.2
1	B	238	TYR	12.1
1	B	344	PRO	11.8
1	B	343	TYR	10.5
1	B	239	GLY	10.5
1	B	345	LYS	9.6
1	B	347	GLN	9.5
1	B	228	LEU	8.8
1	B	244	SER	8.8
1	B	291	CYS	8.6
1	A	249	LEU	8.5
1	B	241	PHE	8.4
1	B	307	ILE	7.9
1	B	233	PHE	7.8
1	B	237	VAL	7.0
1	B	310	GLN	6.8
1	B	245	GLN	6.5
1	B	221	GLU	6.4
1	B	329	SER	6.3
1	B	339	VAL	6.2
1	A	346	LEU	6.1
1	A	347	GLN	6.1

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Mol	Chain	Res	Type	RSRZ
1	B	246	LEU	5.8
1	B	222	PHE	5.4
1	B	336	ASP	5.4
1	A	241	PHE	5.2
1	B	341	THR	5.2
1	B	242	SER	5.1
1	A	342	PHE	5.0
1	B	285	GLN	4.8
1	A	344	PRO	4.6
1	B	316	SER	4.6
1	B	248	GLY	4.6
1	B	330	PHE	4.5
1	B	312	LEU	4.5
1	B	234	GLU	4.5
1	B	331	MET	4.4
1	B	243	HIS	4.4
1	B	318	VAL	4.3
1	B	290	LYS	4.0
1	B	289	SER	4.0
1	B	256	ALA	4.0
1	B	215	LEU	3.8
1	B	333	TRP	3.7
1	B	293	CYS	3.7
1	B	260	LYS	3.6
1	B	259	PHE	3.6
1	B	240	ASP	3.5
1	B	306	ILE	3.5
1	B	231	TYR	3.5
1	B	217	LEU	3.4
1	B	303	PHE	3.4
1	A	240	ASP	3.4
1	A	291	CYS	3.3
1	B	288	SER	3.3
1	B	216	GLU	3.3
1	B	311	ASP	3.3
1	B	205	LYS	3.2
1	A	307	ILE	3.2
1	A	238	TYR	3.2
1	B	219	MET	3.1
1	B	250	ALA	3.1
1	B	284	ALA	3.1
1	A	231	TYR	3.1

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Mol	Chain	Res	Type	RSRZ
1	A	315	VAL	3.0
1	B	255	LEU	3.0
1	A	1	MET	2.9
1	A	228	LEU	2.9
1	B	264	PHE	2.9
1	B	332	LEU	2.9
1	B	251	LEU	2.7
1	B	282	THR	2.7
1	B	334	CYS	2.7
1	A	332	LEU	2.7
1	B	230	GLY	2.6
1	B	340	GLU	2.5
1	A	246	LEU	2.5
1	B	308	LYS	2.5
1	A	245	GLN	2.5
1	B	281	ILE	2.5
1	A	293	CYS	2.4
1	B	252	LEU	2.4
1	B	263	PRO	2.2
1	A	233	PHE	2.2
1	B	253	ILE	2.2
1	A	258	ARG	2.2
1	A	242	SER	2.1
1	B	202	GLN	2.1
1	B	283	ASP	2.1
1	B	295	VAL	2.1
1	B	262	SER	2.1
1	B	315	VAL	2.1
1	A	237	VAL	2.1
1	A	336	ASP	2.0
1	A	239	GLY	2.0
1	A	281	ILE	2.0
1	B	220	ASP	2.0

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

There are no ligands in this entry.

6.5 Other polymers

There are no such residues in this entry.