



wwPDB X-ray Structure Validation Summary Report ⓘ

May 17, 2020 – 09:12 pm BST

PDB ID : 6URV
Title : Crystal structure of Yellow Fever Virus NS2B-NS3 protease domain
Authors : Noske, G.D.; Gawriljuk, V.F.O.; Fernandes, R.S.; Oliva, G.; Godoy, A.S.
Deposited on : 2019-10-24
Resolution : 2.90 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
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

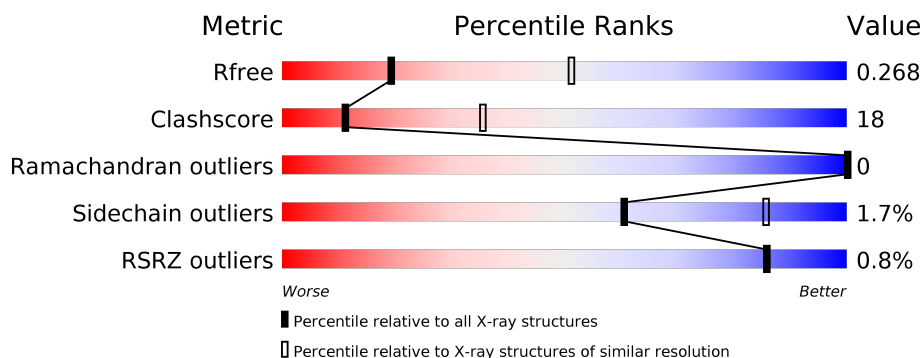
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.90 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	1957 (2.90-2.90)
Clashscore	141614	2172 (2.90-2.90)
Ramachandran outliers	138981	2115 (2.90-2.90)
Sidechain outliers	138945	2117 (2.90-2.90)
RSRZ outliers	127900	1906 (2.90-2.90)

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 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	57	<div> <div></div> <div>61% 7% 32%</div> </div>
1	C	57	<div> <div>4%</div> <div>51% 18% 32%</div> </div>
1	E	57	<div> <div>2%</div> <div>46% 21% 33%</div> </div>
1	G	57	<div> <div></div> <div>49% 18% 33%</div> </div>
2	B	171	<div> <div></div> <div>71% 19% 10%</div> </div>
2	D	171	<div> <div>%</div> <div>68% 21% 11%</div> </div>

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Mol	Chain	Length	Quality of chain
2	F	171	<div><div></div><div>62%26%9%</div></div>
2	H	171	<div>%<div><div></div><div>61%29%10%</div></div></div>

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 5479 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 NS2B.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
1	A	39	Total	C	N	O	0	0	0
			288	179	48	61			
1	G	38	Total	C	N	O	0	0	0
			266	164	43	59			
1	E	38	Total	C	N	O	0	0	0
			268	167	47	54			
1	C	39	Total	C	N	O	0	0	0
			273	169	47	57			

There are 40 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	48	MET	-	initiating methionine	UNP A0A2S1IYJ2
A	96	GLY	-	expression tag	UNP A0A2S1IYJ2
A	97	GLY	-	expression tag	UNP A0A2S1IYJ2
A	98	GLY	-	expression tag	UNP A0A2S1IYJ2
A	99	GLY	-	expression tag	UNP A0A2S1IYJ2
A	100	SER	-	expression tag	UNP A0A2S1IYJ2
A	101	GLY	-	expression tag	UNP A0A2S1IYJ2
A	102	GLY	-	expression tag	UNP A0A2S1IYJ2
A	103	GLY	-	expression tag	UNP A0A2S1IYJ2
A	104	GLY	-	expression tag	UNP A0A2S1IYJ2
G	48	MET	-	initiating methionine	UNP A0A2S1IYJ2
G	96	GLY	-	expression tag	UNP A0A2S1IYJ2
G	97	GLY	-	expression tag	UNP A0A2S1IYJ2
G	98	GLY	-	expression tag	UNP A0A2S1IYJ2
G	99	GLY	-	expression tag	UNP A0A2S1IYJ2
G	100	SER	-	expression tag	UNP A0A2S1IYJ2
G	101	GLY	-	expression tag	UNP A0A2S1IYJ2
G	102	GLY	-	expression tag	UNP A0A2S1IYJ2
G	103	GLY	-	expression tag	UNP A0A2S1IYJ2
G	104	GLY	-	expression tag	UNP A0A2S1IYJ2
E	48	MET	-	initiating methionine	UNP A0A2S1IYJ2

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Chain	Residue	Modelled	Actual	Comment	Reference
E	96	GLY	-	expression tag	UNP A0A2S1IYJ2
E	97	GLY	-	expression tag	UNP A0A2S1IYJ2
E	98	GLY	-	expression tag	UNP A0A2S1IYJ2
E	99	GLY	-	expression tag	UNP A0A2S1IYJ2
E	100	SER	-	expression tag	UNP A0A2S1IYJ2
E	101	GLY	-	expression tag	UNP A0A2S1IYJ2
E	102	GLY	-	expression tag	UNP A0A2S1IYJ2
E	103	GLY	-	expression tag	UNP A0A2S1IYJ2
E	104	GLY	-	expression tag	UNP A0A2S1IYJ2
C	48	MET	-	initiating methionine	UNP A0A2S1IYJ2
C	96	GLY	-	expression tag	UNP A0A2S1IYJ2
C	97	GLY	-	expression tag	UNP A0A2S1IYJ2
C	98	GLY	-	expression tag	UNP A0A2S1IYJ2
C	99	GLY	-	expression tag	UNP A0A2S1IYJ2
C	100	SER	-	expression tag	UNP A0A2S1IYJ2
C	101	GLY	-	expression tag	UNP A0A2S1IYJ2
C	102	GLY	-	expression tag	UNP A0A2S1IYJ2
C	103	GLY	-	expression tag	UNP A0A2S1IYJ2
C	104	GLY	-	expression tag	UNP A0A2S1IYJ2

- Molecule 2 is a protein called NS3 protease.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	H	154	Total	C	N	O	S	0	0	0
			1079	689	185	204	1			
2	F	155	Total	C	N	O	S	0	0	0
			1115	710	193	210	2			
2	D	153	Total	C	N	O	S	0	0	0
			1088	695	186	206	1			
2	B	154	Total	C	N	O	S	0	0	0
			1086	692	187	206	1			

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	O	0	0
			1	1		
3	H	4	Total	O	0	0
			4	4		
3	G	1	Total	O	0	0
			1	1		
3	F	3	Total	O	0	0
			3	3		

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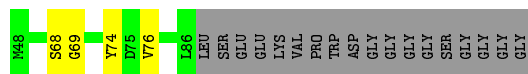
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	C	2	Total	O	0	0
			2	2		
3	D	3	Total	O	0	0
			3	3		
3	B	2	Total	O	0	0
			2	2		

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 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.

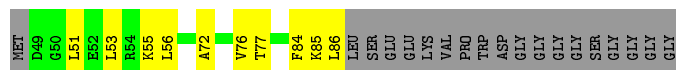
- Molecule 1: NS2B

Chain A: 



- Molecule 1: NS2B

Chain G: 



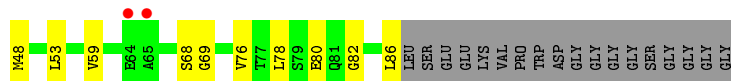
- Molecule 1: NS2B

Chain E: 



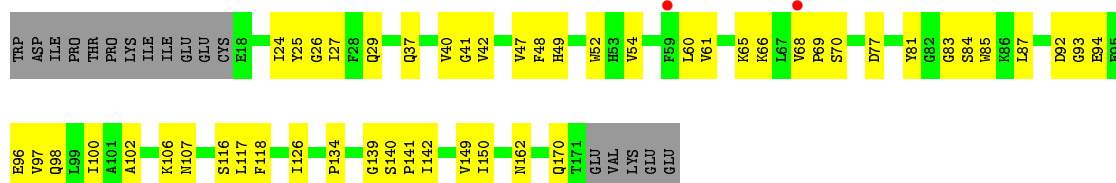
- Molecule 1: NS2B

Chain C: 



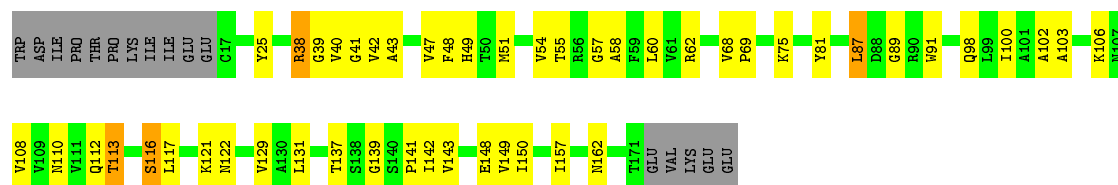
- Molecule 2: NS3 protease

Chain H: 



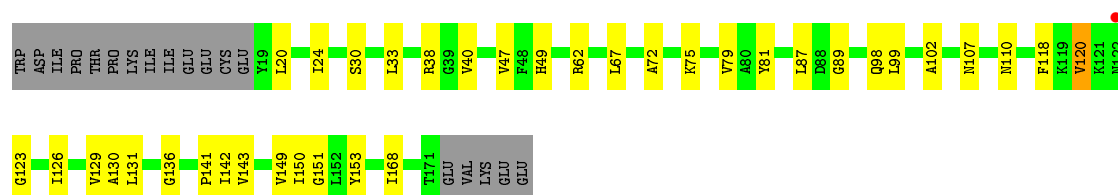
- Molecule 2: NS3 protease

Chain F:  62% 26% 9%



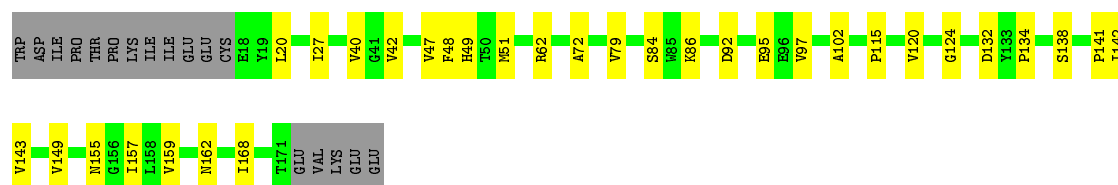
- Molecule 2: NS3 protease

Chain D:  68% 21% 11%



- Molecule 2: NS3 protease

Chain B:  71% 19% 10%



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	60.02Å 151.67Å 60.26Å 90.00° 111.27° 90.00°	Depositor
Resolution (Å)	29.20 – 2.90 29.70 – 2.90	Depositor EDS
% Data completeness (in resolution range)	98.0 (29.20-2.90) 98.0 (29.70-2.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.12 (at 2.90Å)	Xtriage
Refinement program	PHENIX 1.17.1_3660, PHENIX 1.17.1_3660	Depositor
R, R_{free}	0.252 , 0.268 0.252 , 0.268	Depositor DCC
R_{free} test set	1153 reflections (5.28%)	wwPDB-VP
Wilson B-factor (Å ²)	82.7	Xtriage
Anisotropy	0.114	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 65.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	0.033 for l,-k,h	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	5479	wwPDB-VP
Average B, all atoms (Å ²)	98.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.23% 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	0.31	0/291	0.52	0/392
1	C	0.29	0/276	0.48	0/374
1	E	0.46	0/271	0.66	0/366
1	G	0.41	0/269	0.65	0/365
2	B	0.33	0/1110	0.59	0/1518
2	D	0.38	0/1113	0.62	0/1522
2	F	0.45	0/1140	0.68	0/1554
2	H	0.40	0/1104	0.59	0/1512
All	All	0.39	0/5574	0.62	0/7603

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	288	0	260	4	0
1	C	273	0	232	7	0
1	E	268	0	237	13	0
1	G	266	0	215	16	0
2	B	1086	0	1014	21	0
2	D	1088	0	1019	45	0
2	F	1115	0	1056	66	0
2	H	1079	0	993	54	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	A	1	0	0	0	0
3	B	2	0	0	0	0
3	C	2	0	0	0	0
3	D	3	0	0	0	0
3	F	3	0	0	0	0
3	G	1	0	0	0	0
3	H	4	0	0	0	0
All	All	5479	0	5026	188	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 18.

The worst 5 of 188 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)
2:H:42:VAL:CG2	2:H:141:PRO:HG3	1.67	1.24
2:H:41:GLY:HA3	2:H:48:PHE:CZ	1.80	1.17
2:H:42:VAL:HG21	2:H:141:PRO:HG3	1.38	1.06
2:F:100:ILE:HD12	2:F:141:PRO:HG2	1.06	1.05
2:H:60:LEU:HB3	1:G:53:LEU:HD11	1.41	1.00

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	37/57 (65%)	37 (100%)	0	0	100	100
1	C	37/57 (65%)	37 (100%)	0	0	100	100
1	E	36/57 (63%)	35 (97%)	1 (3%)	0	100	100
1	G	36/57 (63%)	36 (100%)	0	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	B	152/171 (89%)	149 (98%)	3 (2%)	0	100	100
2	D	151/171 (88%)	145 (96%)	6 (4%)	0	100	100
2	F	153/171 (90%)	148 (97%)	5 (3%)	0	100	100
2	H	152/171 (89%)	147 (97%)	5 (3%)	0	100	100
All	All	754/912 (83%)	734 (97%)	20 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	28/43 (65%)	28 (100%)	0	100	100
1	C	24/43 (56%)	24 (100%)	0	100	100
1	E	24/43 (56%)	24 (100%)	0	100	100
1	G	23/43 (54%)	23 (100%)	0	100	100
2	B	104/136 (76%)	102 (98%)	2 (2%)	57	84
2	D	105/136 (77%)	104 (99%)	1 (1%)	76	92
2	F	109/136 (80%)	105 (96%)	4 (4%)	34	68
2	H	101/136 (74%)	99 (98%)	2 (2%)	55	82
All	All	518/716 (72%)	509 (98%)	9 (2%)	60	86

5 of 9 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	F	113	THR
2	B	138	SER
2	D	120	VAL
2	F	38	ARG
2	F	116	SER

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
2	F	29	GLN
2	D	29	GLN
2	D	110	ASN
2	D	122	ASN
2	B	162	ASN

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](#)

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	39/57 (68%)	-0.05	0 100 100	65, 102, 129, 139	0
1	C	39/57 (68%)	0.36	2 (5%) 28 24	70, 105, 160, 189	0
1	E	38/57 (66%)	0.26	1 (2%) 56 52	72, 113, 145, 152	0
1	G	38/57 (66%)	0.11	0 100 100	80, 123, 149, 151	0
2	B	154/171 (90%)	0.05	0 100 100	47, 82, 145, 172	0
2	D	153/171 (89%)	-0.04	1 (0%) 87 87	57, 92, 135, 159	0
2	F	155/171 (90%)	-0.01	0 100 100	60, 88, 134, 199	0
2	H	154/171 (90%)	0.21	2 (1%) 77 77	71, 106, 155, 175	0
All	All	770/912 (84%)	0.08	6 (0%) 86 86	47, 96, 147, 199	0

The worst 5 of 6 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	64	GLU	4.4
1	C	65	ALA	4.3
2	D	122	ASN	2.8
2	H	68	VAL	2.7
2	H	59	PHE	2.3

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

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

6.3 Carbohydrates ⓘ

There are no carbohydrates 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.