



wwPDB X-ray Structure Validation Summary Report ⓘ

May 22, 2020 – 01:53 am BST

PDB ID : 6B6I
Title : 2.4A resolution structure of human Norovirus GII.4 protease
Authors : Muzzarelli, K.M.; Kuiper, B.D.; Spellmon, N.S.; Hackett, J.; Brunzelle, J.S.;
Kovari, I.A.; Amblard, F.; Yang, Z.; Schinazi, R.F.; Kovari, L.C.
Deposited on : 2017-10-02
Resolution : 2.44 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

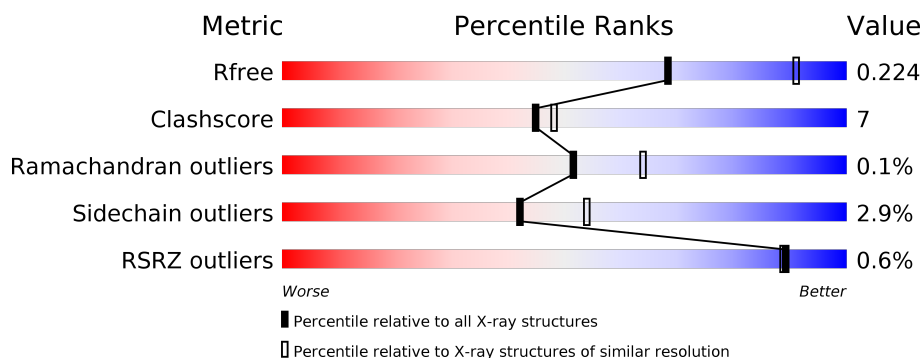
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.44 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	1564 (2.46-2.42)
Clashscore	141614	1631 (2.46-2.42)
Ramachandran outliers	138981	1617 (2.46-2.42)
Sidechain outliers	138945	1617 (2.46-2.42)
RSRZ outliers	127900	1547 (2.46-2.42)

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	181	<div> <div>%</div> <div> <div></div> <div>83%</div> <div>12%</div> <div>• •</div> </div> </div>
1	B	181	<div> <div>80%</div> <div>17%</div> <div>• •</div> </div>
1	C	181	<div> <div>%</div> <div> <div></div> <div>86%</div> <div>8%</div> <div>• •</div> </div> </div>
1	D	181	<div> <div>2%</div> <div> <div></div> <div>83%</div> <div>15%</div> <div>• •</div> </div> </div>
1	E	181	<div> <div>%</div> <div> <div></div> <div>80%</div> <div>16%</div> <div>•</div> </div> </div>
1	F	181	<div> <div>76%</div> <div>22%</div> <div>• •</div> </div>

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
1	G	181	<div><div><div>%</div><div><div></div></div><div>81%</div><div>14%</div><div><div></div><div></div></div></div></div>
1	H	181	<div><div><div>%</div><div><div></div></div><div>87%</div><div>12%</div><div><div></div><div></div></div></div></div>

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 10640 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 3C-like protease.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	173	Total	C	N	O	S	0	2	0
			1309	831	233	235	10			
1	B	179	Total	C	N	O	S	0	1	0
			1343	849	236	248	10			
1	C	173	Total	C	N	O	S	0	0	0
			1292	821	229	232	10			
1	D	178	Total	C	N	O	S	0	0	0
			1329	840	234	245	10			
1	E	174	Total	C	N	O	S	0	0	0
			1296	823	230	233	10			
1	F	178	Total	C	N	O	S	0	0	0
			1329	840	234	245	10			
1	G	173	Total	C	N	O	S	0	0	0
			1292	821	229	232	10			
1	H	181	Total	C	N	O	S	0	0	0
			1348	853	237	248	10			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	139	ALA	CYS	engineered mutation	UNP A0A076EGG6
B	139	ALA	CYS	engineered mutation	UNP A0A076EGG6
C	139	ALA	CYS	engineered mutation	UNP A0A076EGG6
D	139	ALA	CYS	engineered mutation	UNP A0A076EGG6
E	139	ALA	CYS	engineered mutation	UNP A0A076EGG6
F	139	ALA	CYS	engineered mutation	UNP A0A076EGG6
G	139	ALA	CYS	engineered mutation	UNP A0A076EGG6
H	139	ALA	CYS	engineered mutation	UNP A0A076EGG6

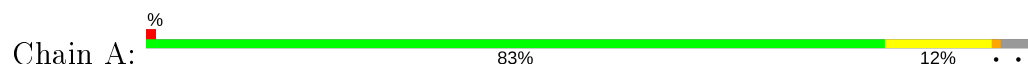
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	17	Total 17	O 17	0	0
2	B	12	Total 12	O 12	0	0
2	C	10	Total 10	O 10	0	0
2	D	14	Total 14	O 14	0	0
2	E	14	Total 14	O 14	0	0
2	F	6	Total 6	O 6	0	0
2	G	14	Total 14	O 14	0	0
2	H	15	Total 15	O 15	0	0

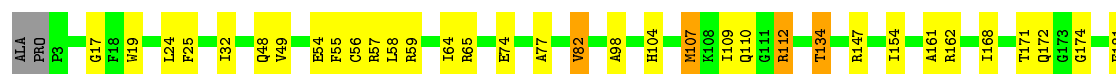
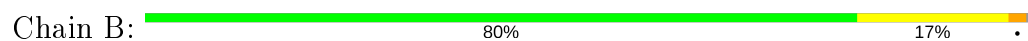
3 Residue-property plots [i](#)

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

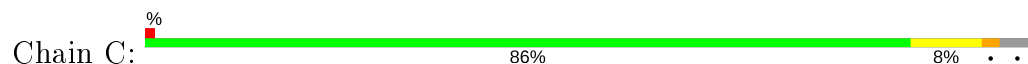
- Molecule 1: 3C-like protease



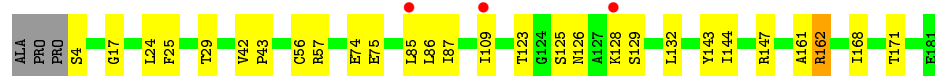
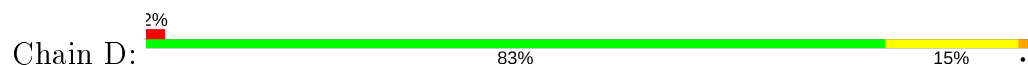
- Molecule 1: 3C-like protease



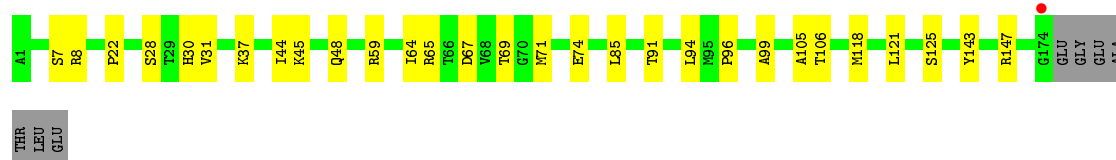
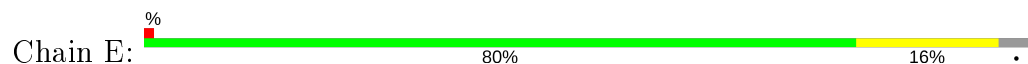
- Molecule 1: 3C-like protease



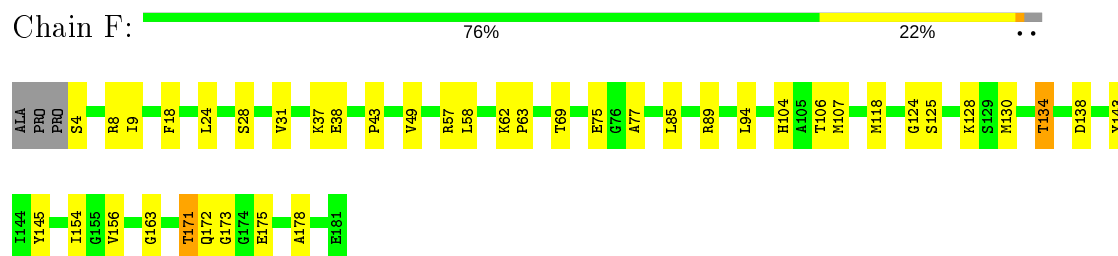
- Molecule 1: 3C-like protease



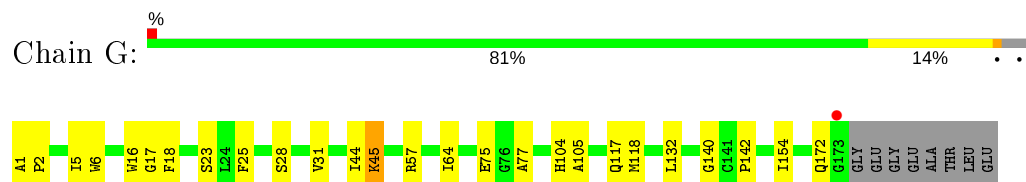
- Molecule 1: 3C-like protease



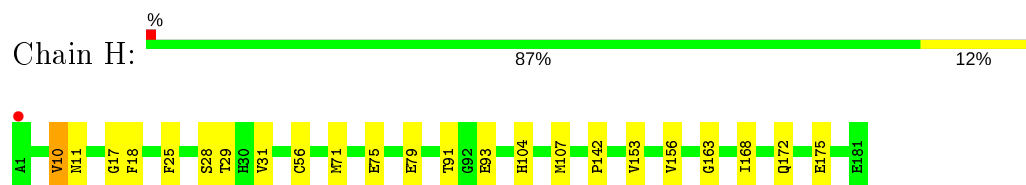
- Molecule 1: 3C-like protease



- Molecule 1: 3C-like protease



- Molecule 1: 3C-like protease



4 Data and refinement statistics

Property	Value	Source
Space group	P 32	Depositor
Cell constants a, b, c, α , β , γ	112.94Å 112.94Å 153.37Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	51.12 – 2.44 52.99 – 2.44	Depositor EDS
% Data completeness (in resolution range)	100.0 (51.12-2.44) 100.0 (52.99-2.44)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.58 (at 2.45Å)	Xtriage
Refinement program	PHENIX 1.9_1692	Depositor
R, R_{free}	0.180 , 0.222 0.185 , 0.224	Depositor DCC
R_{free} test set	3994 reflections (4.91%)	wwPDB-VP
Wilson B-factor (Å ²)	61.3	Xtriage
Anisotropy	0.360	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 42.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	0.019 for -h,-k,l 0.064 for h,-h-k,-l 0.025 for -k,-h,-l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	10640	wwPDB-VP
Average B, all atoms (Å ²)	65.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.47% of the height of the origin peak. No significant pseudotranslation is detected.*

¹ Intensities estimated from amplitudes.

² Theoretical 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	0.40	0/1340	0.57	0/1816
1	B	0.43	0/1372	0.62	0/1855
1	C	0.45	0/1322	0.60	0/1791
1	D	0.42	0/1357	0.59	0/1834
1	E	0.41	0/1326	0.59	0/1796
1	F	0.39	0/1357	0.58	0/1834
1	G	0.41	0/1322	0.61	0/1791
1	H	0.42	0/1378	0.59	0/1865
All	All	0.42	0/10774	0.59	0/14582

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	1309	0	1326	11	0
1	B	1343	0	1353	23	0
1	C	1292	0	1314	10	1
1	D	1329	0	1339	35	0
1	E	1296	0	1317	16	0
1	F	1329	0	1339	26	0
1	G	1292	0	1314	15	0
1	H	1348	0	1361	11	1

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	17	0	0	0	0
2	B	12	0	0	1	0
2	C	10	0	0	0	0
2	D	14	0	0	0	0
2	E	14	0	0	0	0
2	F	6	0	0	1	0
2	G	14	0	0	0	0
2	H	15	0	0	1	0
All	All	10640	0	10663	138	1

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 7.

The worst 5 of 138 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:85:LEU:HD21	1:D:143:TYR:CE1	1.53	1.40
1:D:85:LEU:HD21	1:D:143:TYR:CZ	1.66	1.28
1:D:85:LEU:HD21	1:D:143:TYR:CD1	1.72	1.21
1:D:85:LEU:CD2	1:D:143:TYR:CE1	2.29	1.14
1:D:85:LEU:CD2	1:D:143:TYR:CD1	2.34	1.10

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:166:THR:OG1	1:H:79:GLU:OE2[3_435]	1.90	0.30

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	173/181 (96%)	168 (97%)	5 (3%)	0	100	100
1	B	178/181 (98%)	170 (96%)	8 (4%)	0	100	100
1	C	171/181 (94%)	166 (97%)	5 (3%)	0	100	100
1	D	176/181 (97%)	167 (95%)	8 (4%)	1 (1%)	25	29
1	E	172/181 (95%)	170 (99%)	2 (1%)	0	100	100
1	F	176/181 (97%)	168 (96%)	7 (4%)	1 (1%)	25	29
1	G	171/181 (94%)	164 (96%)	7 (4%)	0	100	100
1	H	179/181 (99%)	176 (98%)	3 (2%)	0	100	100
All	All	1396/1448 (96%)	1349 (97%)	45 (3%)	2 (0%)	51	64

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	F	124	GLY
1	D	86	LEU

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	139/142 (98%)	135 (97%)	4 (3%)	42	54
1	B	142/142 (100%)	138 (97%)	4 (3%)	43	56
1	C	137/142 (96%)	131 (96%)	6 (4%)	28	37
1	D	140/142 (99%)	136 (97%)	4 (3%)	42	54
1	E	137/142 (96%)	132 (96%)	5 (4%)	35	46
1	F	140/142 (99%)	135 (96%)	5 (4%)	35	46
1	G	137/142 (96%)	135 (98%)	2 (2%)	65	76
1	H	142/142 (100%)	140 (99%)	2 (1%)	67	78
All	All	1114/1136 (98%)	1082 (97%)	32 (3%)	42	54

5 of 32 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	4	SER
1	D	162	ARG
1	G	45	LYS
1	D	144	ILE
1	E	91	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 9 such sidechains are listed below:

Mol	Chain	Res	Type
1	E	30	HIS
1	G	172	GLN
1	F	50	HIS
1	C	117	GLN
1	E	172	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](#)

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	173/181 (95%)	0.14	1 (0%) 89 89	47, 64, 88, 100	0
1	B	179/181 (98%)	0.16	0 100 100	48, 60, 80, 89	0
1	C	173/181 (95%)	0.11	1 (0%) 89 89	50, 62, 84, 96	0
1	D	178/181 (98%)	0.14	3 (1%) 70 66	49, 61, 81, 94	0
1	E	174/181 (96%)	0.11	1 (0%) 89 89	50, 62, 84, 111	0
1	F	178/181 (98%)	0.18	0 100 100	51, 72, 92, 110	0
1	G	173/181 (95%)	0.14	1 (0%) 89 89	49, 60, 85, 100	0
1	H	181/181 (100%)	0.12	1 (0%) 89 89	49, 62, 83, 99	0
All	All	1409/1448 (97%)	0.14	8 (0%) 89 89	47, 63, 85, 111	0

The worst 5 of 8 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	50[A]	HIS	3.7
1	E	174	GLY	3.2
1	C	1	ALA	3.0
1	G	173	GLY	2.7
1	H	1	ALA	2.6

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.