



Full wwPDB X-ray Structure Validation Report ⓘ

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PDB ID : 8V96 / pdb_00008v96
Title : GII.14 M7 norovirus protruding domain
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Deposited on : 2023-12-07
Resolution : 1.44 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	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

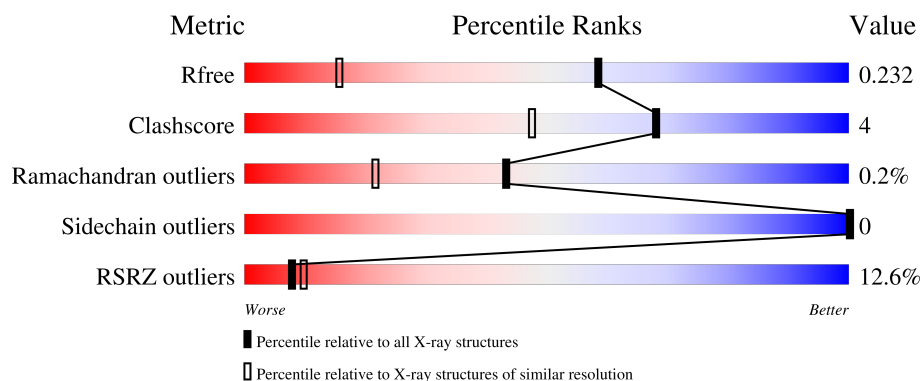
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.44 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}	180053	3234 (1.46-1.42)
Clashscore	190562	3289 (1.46-1.42)
Ramachandran outliers	187476	3248 (1.46-1.42)
Sidechain outliers	187428	3248 (1.46-1.42)
RSRZ outliers	180081	3234 (1.46-1.42)

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 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	536	4% 53% 44%
1	B	536	10% 51% 5% 44%

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 8939 atoms, of which 3631 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 Capsid protein VP1.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	301	Total	C	H	N	O	S	0	1	0
			4177	1490	1817	412	449	9			
1	B	301	Total	C	H	N	O	S	0	0	0
			4147	1485	1796	410	447	9			

- Molecule 2 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C₂H₆O₂).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	H	O	0	0
			10	2	6	2		
2	A	1	Total	C	H	O	0	0
			10	2	6	2		
2	B	1	Total	C	H	O	0	0
			10	2	6	2		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	320	Total 320	O 320	0	0
3	B	265	Total 265	O 265	0	0



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	105.82Å 91.83Å 67.11Å 90.00° 92.98° 90.00°	Depositor
Resolution (Å)	42.58 – 1.44 42.58 – 1.44	Depositor EDS
% Data completeness (in resolution range)	98.4 (42.58-1.44) 98.4 (42.58-1.44)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.07 (at 1.44Å)	Xtriage
Refinement program	PHENIX (1.19.2_4158: ???)	Depositor
R, R_{free}	0.207 , 0.231 0.207 , 0.232	Depositor DCC
R_{free} test set	5692 reflections (4.93%)	wwPDB-VP
Wilson B-factor (Å ²)	16.5	Xtriage
Anisotropy	0.215	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 34.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.025 for -h,-k,l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	8939	wwPDB-VP
Average B, all atoms (Å ²)	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.96% 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](#)

Bond lengths and bond angles in the following residue types are not validated in this section: EDO

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	0.42	0/2428	0.61	0/3315
1	B	0.44	0/2416	0.60	0/3298
All	All	0.43	0/4844	0.61	0/6613

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	2360	1817	2265	11	0
1	B	2351	1796	2253	23	0
2	A	8	12	12	1	0
2	B	4	6	6	0	0
3	A	320	0	0	3	0
3	B	265	0	0	4	0
All	All	5308	3631	4536	33	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 4.

All (33) 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:317:ASP:HA	1:A:413:HIS:CD2	2.20	0.77
1:A:231:VAL:HG22	1:B:459:GLN:OE1	1.85	0.76
1:A:386:ILE:HD11	1:B:386:ILE:HD11	1.71	0.71
1:B:474:ILE:HG21	1:B:512:ARG:NE	2.09	0.68
1:B:330:MET:HE3	1:B:352:ILE:C	2.19	0.67
1:B:474:ILE:HG23	3:B:824:HOH:O	1.94	0.67
1:B:313:ASP:HB2	1:B:316:ASP:OD2	1.95	0.67
1:A:317:ASP:HA	1:A:413:HIS:NE2	2.16	0.61
1:B:330:MET:HE2	1:B:351:GLN:HB3	1.82	0.60
1:B:225:LYS:HE3	1:B:460:GLU:O	2.04	0.57
1:B:518:ASN:HB3	1:B:519:PRO:CD	2.37	0.54
1:A:512:ARG:NH1	3:A:710:HOH:O	2.44	0.51
1:B:467:ASP:OD1	1:B:489:LYS:HD3	2.11	0.51
1:B:313:ASP:O	1:B:316:ASP:HB2	2.15	0.47
1:B:295:ASN:HA	3:B:717:HOH:O	2.15	0.46
1:B:472:ARG:HG2	1:B:484:GLU:HG2	1.97	0.46
1:B:518:ASN:HB3	1:B:519:PRO:HD3	1.97	0.46
1:A:363:ILE:HG13	1:A:365:GLN:HG3	1.98	0.45
1:B:242:PHE:CG	1:B:243:PRO:HD2	2.52	0.45
1:B:474:ILE:HD13	1:B:512:ARG:CZ	2.48	0.44
1:B:330:MET:HE3	1:B:353:ASP:N	2.33	0.44
1:A:419:THR:OG1	1:A:420:PRO:HD2	2.18	0.43
1:B:292:ALA:HA	1:B:377:LEU:HD11	2.00	0.43
1:B:330:MET:HE2	1:B:351:GLN:C	2.44	0.43
1:B:242:PHE:CD2	1:B:243:PRO:HD2	2.54	0.42
1:A:486:LYS:O	1:A:493:LEU:HA	2.19	0.42
2:A:602:EDO:H11	3:B:919:HOH:O	2.19	0.42
3:A:782:HOH:O	1:B:455:GLU:HG2	2.18	0.42
1:B:301:GLN:HA	1:B:367:ARG:HG2	2.02	0.41
1:A:362:LYS:NZ	3:A:712:HOH:O	2.45	0.41
1:A:524:ALA:HA	1:A:525:PRO:HD3	1.92	0.41
1:B:349:ASP:HB2	3:B:891:HOH:O	2.21	0.41
1:A:225:LYS:HB2	1:A:225:LYS:HE3	1.76	0.40

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	300/536 (56%)	290 (97%)	9 (3%)	1 (0%)	36	17
1	B	299/536 (56%)	294 (98%)	5 (2%)	0	100	100
All	All	599/1072 (56%)	584 (98%)	14 (2%)	1 (0%)	43	22

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	316	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	259/456 (57%)	259 (100%)	0	100	100
1	B	257/456 (56%)	257 (100%)	0	100	100
All	All	516/912 (57%)	516 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	226	ASN
1	A	285	ASN
1	A	297	GLN

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Mol	Chain	Res	Type
1	A	412	ASN
1	B	254	ASN
1	B	291	GLN
1	B	306	ASN
1	B	389	ASN
1	B	412	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

3 ligands are modelled in this entry.

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	$\# Z > 2$
2	EDO	A	602	-	3,3,3	0.46	0	2,2,2	0.81	0
2	EDO	A	601	-	3,3,3	0.34	0	2,2,2	1.00	0
2	EDO	B	601	-	3,3,3	0.34	0	2,2,2	0.57	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
2	EDO	A	602	-	-	1/1/1/1	-
2	EDO	A	601	-	-	0/1/1/1	-
2	EDO	B	601	-	-	0/1/1/1	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	602	EDO	O1-C1-C2-O2

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	602	EDO	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

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	301/536 (56%)	0.39	24 (7%)	18 20	10, 21, 41, 59	1 (0%)
1	B	301/536 (56%)	0.75	52 (17%)	4 4	10, 22, 43, 66	0
All	All	602/1072 (56%)	0.57	76 (12%)	8 10	10, 22, 43, 66	1 (0%)

All (76) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	525	PRO	6.1
1	A	410	LEU	5.7
1	B	524	ALA	5.6
1	A	409	ALA	4.1
1	B	312	ILE	4.1
1	B	313	ASP	3.9
1	B	294	LEU	3.8
1	B	421	LEU	3.8
1	B	314	PRO	3.8
1	B	315	THR	3.7
1	A	314	PRO	3.6
1	B	408	LEU	3.6
1	A	407	HIS	3.5
1	B	520	PHE	3.5
1	B	507	THR	3.4
1	A	524	ALA	3.3
1	B	504	VAL	3.2
1	B	377	LEU	3.1
1	B	519	PRO	3.1
1	B	256	ASN	3.1
1	B	298	PRO	3.0
1	A	294	LEU	2.9
1	B	296	GLU	2.9
1	B	357	ASP	2.8

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Mol	Chain	Res	Type	RSRZ
1	A	408	LEU	2.8
1	A	525	PRO	2.7
1	A	315	THR	2.7
1	B	311	PRO	2.7
1	B	405	GLY	2.7
1	B	474	ILE	2.7
1	B	317	ASP	2.6
1	A	344	ALA	2.6
1	B	292	ALA	2.6
1	A	412	ASN	2.6
1	B	340	SER	2.6
1	B	358	THR	2.5
1	B	359	PHE	2.5
1	B	258	ILE	2.5
1	B	309	GLY	2.5
1	B	304	LEU	2.5
1	B	423	PRO	2.5
1	A	295	ASN	2.4
1	A	421	LEU	2.4
1	B	407	HIS	2.4
1	B	356	GLY	2.4
1	B	440	HIS	2.3
1	A	363	ILE	2.3
1	A	507	THR	2.3
1	A	312	ILE	2.3
1	B	257	ILE	2.3
1	A	357	ASP	2.2
1	B	310	SER	2.2
1	A	292	ALA	2.2
1	B	316	ASP	2.2
1	B	360	ALA	2.2
1	B	393	GLN	2.2
1	B	392	ASP	2.2
1	A	311	PRO	2.2
1	A	316	ASP	2.2
1	A	504	VAL	2.2
1	B	413	HIS	2.2
1	B	302	LEU	2.1
1	B	441	THR	2.1
1	B	412	ASN	2.1
1	B	422	PHE	2.1
1	A	406	GLY	2.1

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Mol	Chain	Res	Type	RSRZ
1	B	403	ASN	2.1
1	B	305	THR	2.1
1	B	409	ALA	2.1
1	A	378	HIS	2.1
1	B	303	GLN	2.1
1	B	378	HIS	2.0
1	B	291	GLN	2.0
1	B	439	GLY	2.0
1	B	499	GLY	2.0
1	A	231	VAL	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 oligosaccharides 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($\text{\AA}^2$)	Q<0.9
2	EDO	A	601	4/4	0.74	0.16	28,33,36,39	0
2	EDO	A	602	4/4	0.81	0.14	23,32,38,44	0
2	EDO	B	601	4/4	0.93	0.16	21,25,32,32	0

6.5 Other polymers [i](#)

There are no such residues in this entry.