



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 21, 2023 – 10:44 AM EDT

PDB ID : 8EN0  
Title : Structure of GII.17 norovirus in complex with Nanobody 7  
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Deposited on : 2022-09-28  
Resolution : 2.99 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](mailto: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>.

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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 : 2.35.1  
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) : 2.35.1

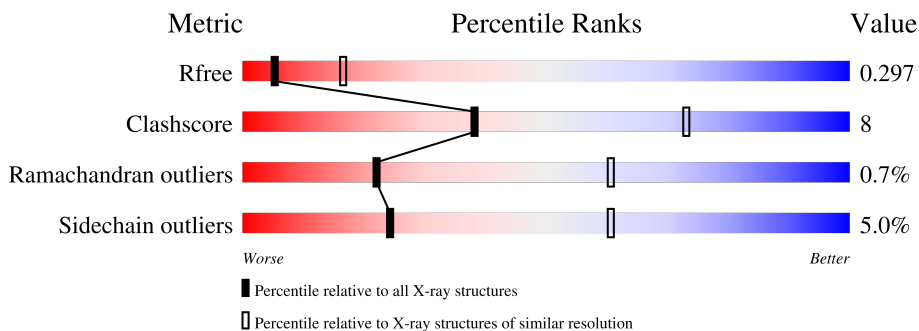
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.99 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	2092 (3.00-3.00)
Clashscore	141614	2416 (3.00-3.00)
Ramachandran outliers	138981	2333 (3.00-3.00)
Sidechain outliers	138945	2336 (3.00-3.00)

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  $\geq 3$ , 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  $\leq 5\%$ .

Mol	Chain	Length	Quality of chain
1	D	136	 57% 29% .. 13%
2	A	308	 81% 18% .

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3317 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 Nanobody 7.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	D	118	878	541	160	173	4	0	0	0

- Molecule 2 is a protein called Capsid protein VP1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	A	307	2418	1534	418	457	9	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	223	GLY	-	expression tag	UNP A0A0S1Z370
A	224	SER	-	expression tag	UNP A0A0S1Z370

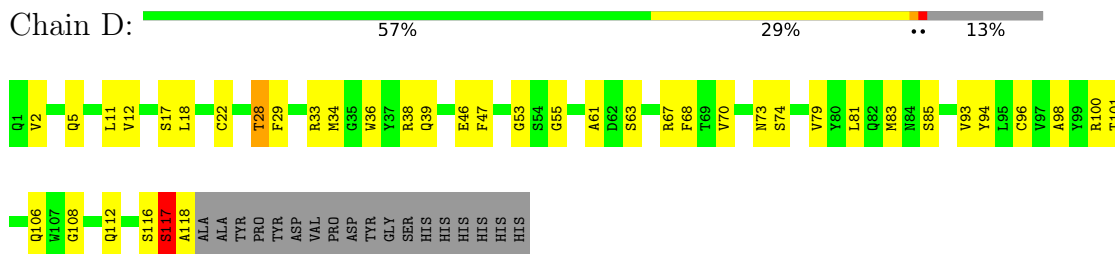
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	D	6	Total	O	0	0
			6	6		
3	A	15	Total	O	0	0
			15	15		

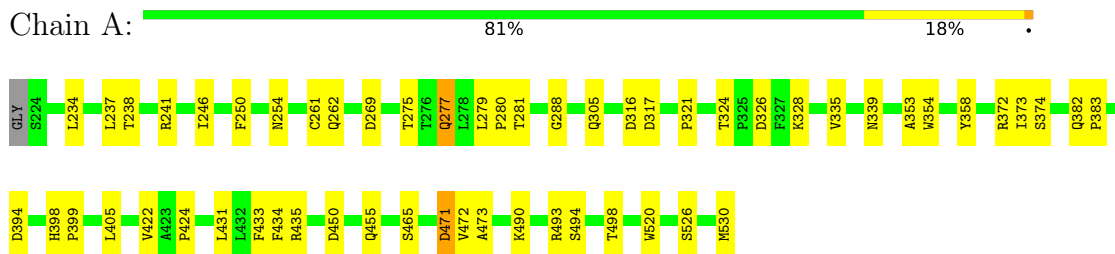
### 3 Residue-property plots

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. 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. 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: Nanobody 7



- Molecule 2: Capsid protein VP1



## 4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	74.82Å 85.46Å 223.85Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	70.96 – 2.99 70.96 – 2.99	Depositor EDS
% Data completeness (in resolution range)	94.5 (70.96-2.99) 95.4 (70.96-2.99)	Depositor EDS
$R_{merge}$	0.29	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.19 (at 3.01Å)	Xtrriage
Refinement program	PHENIX 1.19.2_4158	Depositor
R, $R_{free}$	0.249 , 0.306 0.245 , 0.297	Depositor DCC
$R_{free}$ test set	714 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	61.8	Xtrriage
Anisotropy	0.132	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.30 , 21.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.52$ , $\langle L^2 \rangle = 0.36$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.66	EDS
Total number of atoms	3317	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	67.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.55% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>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	D	0.44	1/894 (0.1%)	0.71	2/1209 (0.2%)
2	A	0.32	0/2489	0.57	0/3403
All	All	0.36	1/3383 (0.0%)	0.61	2/4612 (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	D	0	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	117	SER	C-O	-7.02	1.10	1.23

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	117	SER	O-C-N	-10.60	105.74	122.70
1	D	117	SER	CA-C-N	-5.01	106.19	117.20

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	D	117	SER	Mainchain

## 5.2 Too-close contacts

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	D	878	0	850	20	0
2	A	2418	0	2307	29	0
3	A	15	0	0	0	0
3	D	6	0	0	0	0
All	All	3317	0	3157	49	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 8.

All (49) 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:A:339:ASN:HA	2:A:382:GLN:HG2	1.54	0.88
2:A:288:GLY:HA2	2:A:305:GLN:HG3	1.70	0.73
1:D:93:VAL:HG22	1:D:112:GLN:HG2	1.72	0.71
2:A:382:GLN:HG3	2:A:383:PRO:HD2	1.75	0.68
2:A:277:GLN:HG2	2:A:279:LEU:H	1.60	0.65
2:A:394:ASP:HB3	2:A:398:HIS:HB2	1.80	0.63
1:D:12:VAL:HG11	1:D:18:LEU:HD21	1.81	0.63
2:A:473:ALA:HB2	2:A:520:TRP:CZ3	2.36	0.61
2:A:254:ASN:HD21	2:A:424:PRO:HD2	1.64	0.60
2:A:433:PHE:HB3	2:A:450:ASP:HB3	1.84	0.59
1:D:2:VAL:HG21	1:D:28:THR:HB	1.86	0.56
1:D:11:LEU:HD12	1:D:12:VAL:H	1.72	0.53
2:A:241:ARG:NH1	2:A:326:ASP:OD1	2.42	0.51
1:D:67:ARG:HD2	1:D:85:SER:HB2	1.92	0.51
1:D:22:CYS:HB3	1:D:79:VAL:HG13	1.93	0.51
2:A:262:GLN:HE21	2:A:405:LEU:HD21	1.75	0.50
2:A:321:PRO:O	2:A:324:THR:OG1	2.29	0.49
2:A:354:TRP:HB2	2:A:372:ARG:HB2	1.95	0.49
2:A:234:LEU:HA	2:A:237:LEU:HD12	1.96	0.48
2:A:250:PHE:HD2	2:A:435:ARG:CZ	2.26	0.48
2:A:422:VAL:HG23	2:A:431:LEU:HD11	1.96	0.48
2:A:335:VAL:HG21	2:A:373:ILE:HD11	1.95	0.47
1:D:117:SER:O	1:D:118:ALA:C	2.52	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:472:VAL:CG1	2:A:490:LYS:HG2	2.44	0.47
2:A:431:LEU:HD23	2:A:498:THR:HG22	1.97	0.46
2:A:250:PHE:CD2	2:A:435:ARG:CZ	2.98	0.46
2:A:280:PRO:HG3	2:A:455:GLN:HG2	1.96	0.46
1:D:34:MET:HG3	1:D:74:SER:HB3	1.97	0.46
2:A:237:LEU:HB3	2:A:246:ILE:HD13	1.96	0.46
1:D:34:MET:HE2	1:D:98:ALA:HB2	1.98	0.46
2:A:328:LYS:HB3	2:A:358:TYR:CE1	2.50	0.46
2:A:246:ILE:HG12	2:A:434:PHE:HB3	1.99	0.45
1:D:28:THR:OG1	1:D:29:PHE:N	2.50	0.45
1:D:36:TRP:NE1	1:D:81:LEU:HB2	2.32	0.45
1:D:70:VAL:HG22	1:D:81:LEU:HD12	1.99	0.45
1:D:47:PHE:HD2	1:D:61:ALA:HB2	1.82	0.44
2:A:471:ASP:OD1	2:A:471:ASP:N	2.41	0.44
1:D:53:GLY:O	1:D:73:ASN:HA	2.18	0.43
1:D:17:SER:O	1:D:18:LEU:HD13	2.19	0.42
2:A:238:THR:HG21	2:A:280:PRO:HB3	2.01	0.42
1:D:36:TRP:CD1	1:D:81:LEU:HB2	2.54	0.42
1:D:96:CYS:O	1:D:108:GLY:N	2.52	0.41
2:A:335:VAL:HG22	2:A:353:ALA:HB2	2.03	0.41
1:D:5:GLN:O	1:D:22:CYS:HA	2.20	0.41
1:D:68:PHE:CZ	1:D:83:MET:HG2	2.55	0.41
1:D:38:ARG:HD3	1:D:94:TYR:CZ	2.55	0.41
2:A:262:GLN:HB3	2:A:275:THR:HG23	2.01	0.41
2:A:269:ASP:O	2:A:465:SER:HA	2.21	0.41
2:A:358:TYR:OH	2:A:399:PRO:O	2.33	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	D	116/136 (85%)	108 (93%)	5 (4%)	3 (3%)	5	27
2	A	305/308 (99%)	293 (96%)	12 (4%)	0	100	100
All	All	421/444 (95%)	401 (95%)	17 (4%)	3 (1%)	22	60

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	63	SER
1	D	28	THR
1	D	55	GLY

### 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	D	91/106 (86%)	84 (92%)	7 (8%)	13	42
2	A	269/269 (100%)	258 (96%)	11 (4%)	30	67
All	All	360/375 (96%)	342 (95%)	18 (5%)	24	60

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	33	ARG
1	D	39	GLN
1	D	46	GLU
1	D	100	ARG
1	D	101	THR
1	D	106	GLN
1	D	116	SER
2	A	261	CYS
2	A	277	GLN
2	A	281	THR
2	A	316	ASP
2	A	317	ASP
2	A	374	SER

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Mol	Chain	Res	Type
2	A	471	ASP
2	A	493	ARG
2	A	494	SER
2	A	526	SER
2	A	530	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	D	5	GLN
2	A	254	ASN
2	A	277	GLN
2	A	382	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 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

Unable to reproduce the depositors R factor - this section is therefore empty.

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

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.3 Carbohydrates

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.4 Ligands

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.5 Other polymers

Unable to reproduce the depositors R factor - this section is therefore empty.