



wwPDB X-ray Structure Validation Summary Report ⓘ

Jun 15, 2020 – 11:53 pm BST

PDB ID : 5ZMS
Title : Crystal structure of Zika NS3 protease in complex with 4-guanidinomethyl-p
henylacetyl-Lys-Lys-Arg-H
Authors : Phoo, W.W.; Wirawan, M.
Deposited on : 2018-04-05
Resolution : 1.80 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
Mogul : 1.8.5 (274361), CSD as541be (2020)
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

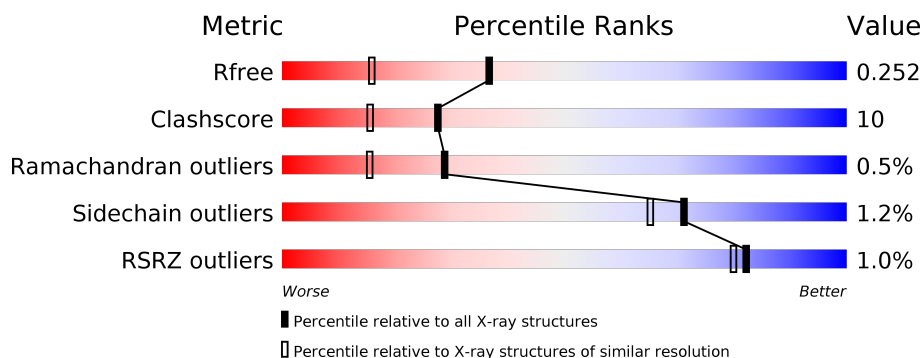
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 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.






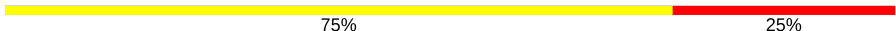
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	5950 (1.80-1.80)
Clashscore	141614	6793 (1.80-1.80)
Ramachandran outliers	138981	6697 (1.80-1.80)
Sidechain outliers	138945	6696 (1.80-1.80)
RSRZ outliers	127900	5850 (1.80-1.80)

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	53	<div> <div>53%</div> <div>19%</div> <div>28%</div> </div>
1	D	53	<div> <div>68%</div> <div>•</div> <div>28%</div> </div>
1	G	53	<div> <div>58%</div> <div>11%</div> <div>•</div> <div>28%</div> </div>
1	J	53	<div> <div>55%</div> <div>15%</div> <div>•</div> <div>28%</div> </div>
2	B	178	<div> <div>67%</div> <div>19%</div> <div>•</div> <div>13%</div> </div>
2	E	178	<div> <div>74%</div> <div>13%</div> <div>13%</div> </div>

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Mol	Chain	Length	Quality of chain
2	H	178	 2% 69% 18% 13%
2	K	178	 3% 67% 20% 13%
3	F	4	 25% 75%
3	I	4	 75% 25%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 6216 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 Serine protease subunit NS2B.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	38	Total	C	N	O	S	0	0	0
			291	179	46	65	1			
1	D	38	Total	C	N	O	S	0	0	0
			291	179	46	65	1			
1	G	38	Total	C	N	O	S	0	0	0
			291	179	46	65	1			
1	J	38	Total	C	N	O	S	0	0	0
			291	179	46	65	1			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	44	MET	-	expression tag	UNP Q32ZE1
A	45	THR	-	expression tag	UNP Q32ZE1
D	44	MET	-	expression tag	UNP Q32ZE1
D	45	THR	-	expression tag	UNP Q32ZE1
G	44	MET	-	expression tag	UNP Q32ZE1
G	45	THR	-	expression tag	UNP Q32ZE1
J	44	MET	-	expression tag	UNP Q32ZE1
J	45	THR	-	expression tag	UNP Q32ZE1

- Molecule 2 is a protein called NS3 protease.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	155	Total	C	N	O	S	0	0	0
			1137	718	198	216	5			
2	E	155	Total	C	N	O	S	0	0	0
			1137	718	198	216	5			
2	H	155	Total	C	N	O	S	0	0	0
			1137	718	198	216	5			
2	K	155	Total	C	N	O	S	0	0	0
			1133	716	198	214	5			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	0	GLY	-	expression tag	UNP H8XX12
E	0	GLY	-	expression tag	UNP H8XX12
H	0	GLY	-	expression tag	UNP H8XX12
K	0	GLY	-	expression tag	UNP H8XX12

- Molecule 3 is a protein called 4-guanidinomethyl-phenylacetyl-Lys-Lys-Arg-H.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	F	4	Total	C	N	O	0	0	0
			44	28	11	5			
3	I	4	Total	C	N	O	0	0	0
			44	28	11	5			

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	38	Total	O	0	0
			38	38		
4	B	123	Total	O	0	0
			123	123		
4	D	34	Total	O	0	0
			34	34		
4	E	91	Total	O	0	0
			91	91		
4	G	28	Total	O	0	0
			28	28		
4	H	51	Total	O	0	0
			51	51		
4	J	9	Total	O	0	0
			9	9		
4	K	42	Total	O	0	0
			42	42		
4	F	3	Total	O	0	0
			3	3		
4	I	1	Total	O	0	0
			1	1		

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: Serine protease subunit NS2B

Chain A: 



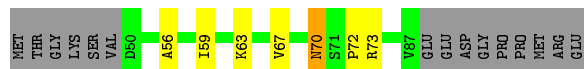
- Molecule 1: Serine protease subunit NS2B

Chain D: 



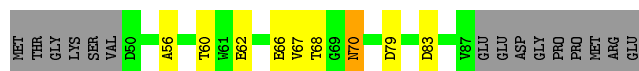
- Molecule 1: Serine protease subunit NS2B

Chain G: 



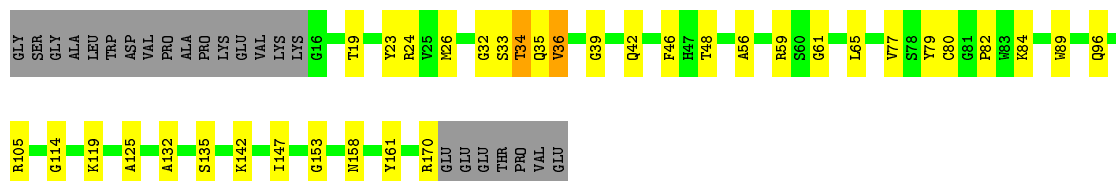
- Molecule 1: Serine protease subunit NS2B

Chain J: 



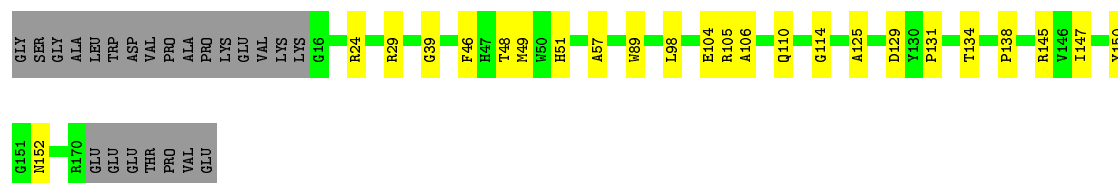
- Molecule 2: NS3 protease

Chain B: 



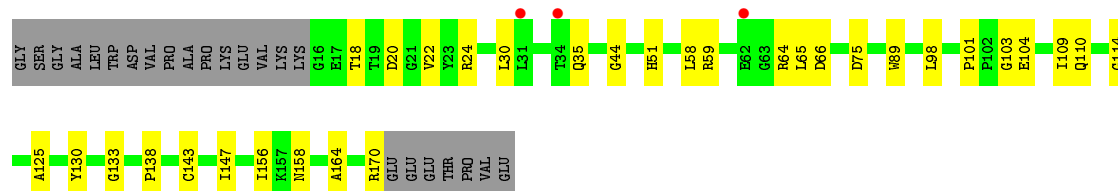
- Molecule 2: NS3 protease

Chain E: 



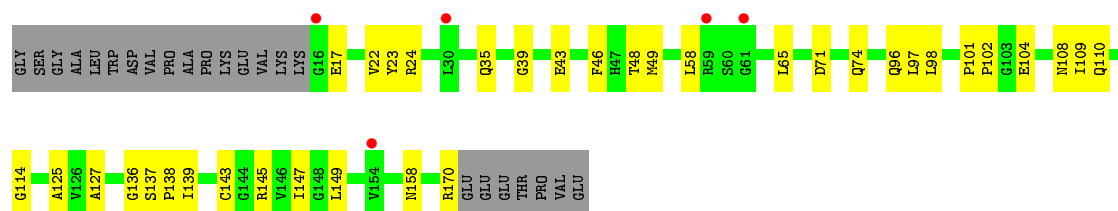
- Molecule 2: NS3 protease

Chain H: 



- Molecule 2: NS3 protease

Chain K: 



- Molecule 3: 4-guanidinomethyl-phenylacetyl-Lys-Lys-Arg-H

Chain F: 



- Molecule 3: 4-guanidinomethyl-phenylacetyl-Lys-Lys-Arg-H

Chain I: 



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	60.33Å 60.35Å 214.68Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	27.42 – 1.80 27.42 – 1.67	Depositor EDS
% Data completeness (in resolution range)	99.8 (27.42-1.80) 99.3 (27.42-1.67)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.41 (at 1.68Å)	Xtriage
Refinement program	PHENIX 1.9_1692	Depositor
R, R_{free}	0.204 , 0.252 0.205 , 0.252	Depositor DCC
R_{free} test set	4518 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å ²)	19.5	Xtriage
Anisotropy	0.322	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 40.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.37$, $\langle L^2 \rangle = 0.19$	Xtriage
Estimated twinning fraction	0.467 for k,h,-l	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	6216	wwPDB-VP
Average B, all atoms (Å ²)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 22.81 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 5.2826e-03.*

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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: DLY, DAR, 2UE

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	0.21	0/295	0.41	0/401
1	D	0.20	0/295	0.41	0/401
1	G	0.23	0/295	0.43	0/401
1	J	0.21	0/295	0.40	0/401
2	B	0.22	0/1161	0.41	0/1581
2	E	0.22	0/1161	0.39	0/1581
2	H	0.21	0/1161	0.40	0/1581
2	K	0.21	0/1157	0.40	0/1575
3	F	0.46	0/8	1.11	0/8
3	I	0.88	0/8	1.49	0/8
All	All	0.22	0/5836	0.41	0/7938

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

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	291	0	260	10	0
1	D	291	0	260	2	0
1	G	291	0	260	6	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	J	291	0	260	7	0
2	B	1137	0	1105	31	0
2	E	1137	0	1105	18	0
2	H	1137	0	1105	20	0
2	K	1133	0	1095	27	0
3	F	44	0	47	8	0
3	I	44	0	47	5	0
4	A	38	0	0	6	0
4	B	123	0	0	12	0
4	D	34	0	0	1	0
4	E	91	0	0	5	0
4	F	3	0	0	1	0
4	G	28	0	0	2	0
4	H	51	0	0	6	0
4	I	1	0	0	0	0
4	J	9	0	0	0	0
4	K	42	0	0	6	0
All	All	6216	0	5544	113	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 10.

The worst 5 of 113 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)
4:A:101:HOH:O	2:B:96:GLN:NE2	2.16	0.78
1:A:62:GLU:O	4:A:101:HOH:O	2.05	0.72
2:B:77:VAL:N	4:B:202:HOH:O	2.22	0.71
2:K:137:SER:O	4:K:201:HOH:O	2.08	0.71
2:E:49:MET:SD	4:E:233:HOH:O	2.47	0.71

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	36/53 (68%)	32 (89%)	3 (8%)	1 (3%)	5	1
1	D	36/53 (68%)	34 (94%)	2 (6%)	0	100	100
1	G	36/53 (68%)	31 (86%)	5 (14%)	0	100	100
1	J	36/53 (68%)	34 (94%)	2 (6%)	0	100	100
2	B	153/178 (86%)	149 (97%)	3 (2%)	1 (1%)	22	10
2	E	153/178 (86%)	142 (93%)	10 (6%)	1 (1%)	22	10
2	H	153/178 (86%)	140 (92%)	13 (8%)	0	100	100
2	K	153/178 (86%)	143 (94%)	10 (6%)	0	100	100
3	F	1/4 (25%)	1 (100%)	0	0	100	100
3	I	1/4 (25%)	0	0	1 (100%)	0	0
All	All	758/932 (81%)	706 (93%)	48 (6%)	4 (0%)	29	15

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	33	SER
1	A	63	LYS
2	E	29	ARG
3	I	3	LYS

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	31/45 (69%)	31 (100%)	0	100	100
1	D	31/45 (69%)	31 (100%)	0	100	100
1	G	31/45 (69%)	30 (97%)	1 (3%)	39	25
1	J	31/45 (69%)	29 (94%)	2 (6%)	17	6
2	B	115/140 (82%)	113 (98%)	2 (2%)	60	51

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	E	115/140 (82%)	115 (100%)	0	100	100
2	H	115/140 (82%)	114 (99%)	1 (1%)	78	75
2	K	113/140 (81%)	113 (100%)	0	100	100
3	F	1/1 (100%)	1 (100%)	0	100	100
3	I	1/1 (100%)	0	1 (100%)	0	0
All	All	584/742 (79%)	577 (99%)	7 (1%)	71	65

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	H	30	LEU
3	I	3	LYS
1	J	60	THR
2	B	36	VAL
1	J	70	ASN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	D	70	ASN
2	K	108	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

4 non-standard protein/DNA/RNA residues are modelled in this entry.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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(Å²)	Q<0.9	
1	A	38/53 (71%)	-0.44	0	100	100	21, 25, 32, 40	0
1	D	38/53 (71%)	-0.36	0	100	100	20, 26, 32, 36	0
1	G	38/53 (71%)	-0.07	0	100	100	28, 36, 46, 52	0
1	J	38/53 (71%)	0.11	0	100	100	33, 46, 56, 63	0
2	B	155/178 (87%)	-0.26	0	100	100	16, 22, 38, 46	0
2	E	155/178 (87%)	-0.38	0	100	100	17, 23, 33, 38	0
2	H	155/178 (87%)	-0.14	3 (1%)	66	63	25, 34, 50, 56	0
2	K	155/178 (87%)	0.02	5 (3%)	47	41	26, 40, 48, 51	0
3	F	1/4 (25%)	-0.48	0	100	100	25, 25, 25, 25	0
3	I	1/4 (25%)	0.30	0	100	100	29, 29, 29, 29	0
All	All	774/932 (83%)	-0.19	8 (1%)	82	80	16, 30, 48, 63	0

The worst 5 of 8 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	H	34	THR	3.2
2	K	61	GLY	2.9
2	H	62	GLU	2.7
2	K	16	GLY	2.3
2	K	30	LEU	2.2

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

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(\AA^2)	Q<0.9
3	DAR	I	4	12/12	0.85	0.16	28,28,28,28	0
3	DLY	I	2	9/10	0.87	0.19	28,28,28,28	0
3	DAR	F	4	12/12	0.87	0.12	25,25,25,25	0
3	DLY	F	2	9/10	0.92	0.13	25,25,25,25	0

6.3 Carbohydrates [i](#)

There are no carbohydrates in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.