



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 13, 2018 – 12:39 PM EDT

PDB ID : 5IP2
Title : Tomato spotted wilt tospovirus nucleocapsid protein-ssRNA complex
Authors : Komoda, K.; Narita, M.; Yamashita, K.; Tanaka, I.; Yao, M.
Deposited on : 2016-03-09
Resolution : 3.30 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

<http://wwpdb.org/validation/2016/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)	:	1.9-1692
EDS	:	rb-20030736
Percentile statistics	:	20161228.v01 (using entries in the PDB archive December 28th 2016)
Refmac	:	5.8.0135
CCP4	:	6.5.0
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	rb-20030736

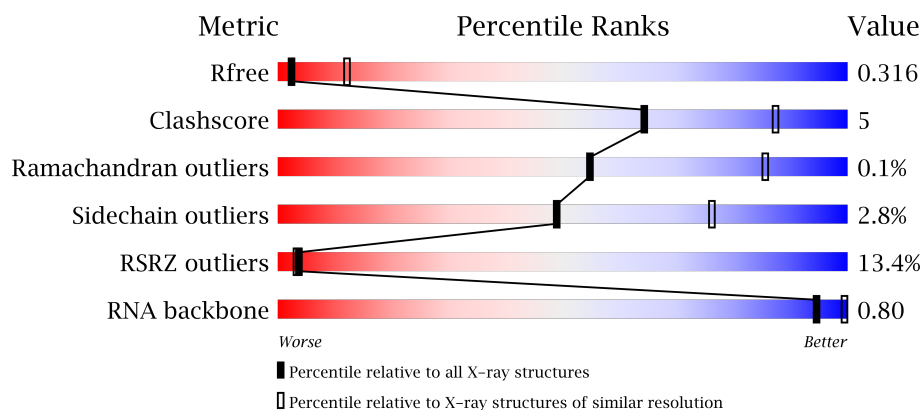
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.30 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}	100719	1034 (3.36-3.24)
Clashscore	112137	1100 (3.36-3.24)
Ramachandran outliers	110173	1081 (3.36-3.24)
Sidechain outliers	110143	1080 (3.36-3.24)
RSRZ outliers	101464	1039 (3.36-3.24)
RNA backbone	2435	1111 (3.80-2.80)

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. 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	279	<div> <div>8%</div> <div>68%</div> <div>14%</div> <div>•</div> <div>18%</div> </div>
1	B	279	<div> <div>16%</div> <div>72%</div> <div>11%</div> <div>•</div> <div>16%</div> </div>
1	C	279	<div> <div>9%</div> <div>69%</div> <div>13%</div> <div>18%</div> </div>
2	E	19	<div> <div>11%</div> <div>16%</div> <div>74%</div> </div>

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Mol	Chain	Length	Quality of chain
3	D	3	<div><div></div><div>33%</div><div>67%</div></div>
3	F	3	<div><div></div><div>33%</div><div>100%</div></div>

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 5659 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 Nucleoprotein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	B	233	Total	C	N	O	S	0	0	0
			1833	1171	303	348	11			
1	C	229	Total	C	N	O	S	0	0	0
			1803	1150	299	344	10			
1	A	229	Total	C	N	O	S	0	0	0
			1803	1150	299	344	10			

There are 63 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-20	MET	-	expression tag	UNP F4ZD19
B	-19	ASN	-	expression tag	UNP F4ZD19
B	-18	HIS	-	expression tag	UNP F4ZD19
B	-17	LYS	-	expression tag	UNP F4ZD19
B	-16	HIS	-	expression tag	UNP F4ZD19
B	-15	HIS	-	expression tag	UNP F4ZD19
B	-14	HIS	-	expression tag	UNP F4ZD19
B	-13	HIS	-	expression tag	UNP F4ZD19
B	-12	HIS	-	expression tag	UNP F4ZD19
B	-11	HIS	-	expression tag	UNP F4ZD19
B	-10	SER	-	expression tag	UNP F4ZD19
B	-9	SER	-	expression tag	UNP F4ZD19
B	-8	GLY	-	expression tag	UNP F4ZD19
B	-7	GLU	-	expression tag	UNP F4ZD19
B	-6	ASN	-	expression tag	UNP F4ZD19
B	-5	LEU	-	expression tag	UNP F4ZD19
B	-4	TYR	-	expression tag	UNP F4ZD19
B	-3	PHE	-	expression tag	UNP F4ZD19
B	-2	GLN	-	expression tag	UNP F4ZD19
B	-1	GLY	-	expression tag	UNP F4ZD19
B	0	HIS	-	expression tag	UNP F4ZD19
C	-20	MET	-	expression tag	UNP F4ZD19
C	-19	ASN	-	expression tag	UNP F4ZD19

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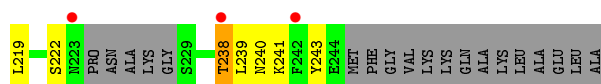
Chain	Residue	Modelled	Actual	Comment	Reference
C	-18	HIS	-	expression tag	UNP F4ZD19
C	-17	LYS	-	expression tag	UNP F4ZD19
C	-16	HIS	-	expression tag	UNP F4ZD19
C	-15	HIS	-	expression tag	UNP F4ZD19
C	-14	HIS	-	expression tag	UNP F4ZD19
C	-13	HIS	-	expression tag	UNP F4ZD19
C	-12	HIS	-	expression tag	UNP F4ZD19
C	-11	HIS	-	expression tag	UNP F4ZD19
C	-10	SER	-	expression tag	UNP F4ZD19
C	-9	SER	-	expression tag	UNP F4ZD19
C	-8	GLY	-	expression tag	UNP F4ZD19
C	-7	GLU	-	expression tag	UNP F4ZD19
C	-6	ASN	-	expression tag	UNP F4ZD19
C	-5	LEU	-	expression tag	UNP F4ZD19
C	-4	TYR	-	expression tag	UNP F4ZD19
C	-3	PHE	-	expression tag	UNP F4ZD19
C	-2	GLN	-	expression tag	UNP F4ZD19
C	-1	GLY	-	expression tag	UNP F4ZD19
C	0	HIS	-	expression tag	UNP F4ZD19
A	-20	MET	-	expression tag	UNP F4ZD19
A	-19	ASN	-	expression tag	UNP F4ZD19
A	-18	HIS	-	expression tag	UNP F4ZD19
A	-17	LYS	-	expression tag	UNP F4ZD19
A	-16	HIS	-	expression tag	UNP F4ZD19
A	-15	HIS	-	expression tag	UNP F4ZD19
A	-14	HIS	-	expression tag	UNP F4ZD19
A	-13	HIS	-	expression tag	UNP F4ZD19
A	-12	HIS	-	expression tag	UNP F4ZD19
A	-11	HIS	-	expression tag	UNP F4ZD19
A	-10	SER	-	expression tag	UNP F4ZD19
A	-9	SER	-	expression tag	UNP F4ZD19
A	-8	GLY	-	expression tag	UNP F4ZD19
A	-7	GLU	-	expression tag	UNP F4ZD19
A	-6	ASN	-	expression tag	UNP F4ZD19
A	-5	LEU	-	expression tag	UNP F4ZD19
A	-4	TYR	-	expression tag	UNP F4ZD19
A	-3	PHE	-	expression tag	UNP F4ZD19
A	-2	GLN	-	expression tag	UNP F4ZD19
A	-1	GLY	-	expression tag	UNP F4ZD19
A	0	HIS	-	expression tag	UNP F4ZD19

- Molecule 2 is a RNA chain called RNA (5'-R(P*UP*UP*UP*UP*UP*UP*UP*UP*UP*UP*UP*UP*UP*UP*UP*UP*U)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	E	5	Total	C	N	O	P	0	0	0
			100	45	10	40	5			

- Molecule 3 is a RNA chain called RNA (5'-D(P*UP*UP*U)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	F	3	Total	C	N	O	P	0	0	0
			60	27	6	24	3			
3	D	3	Total	C	N	O	P	0	0	0
			60	27	6	24	3			



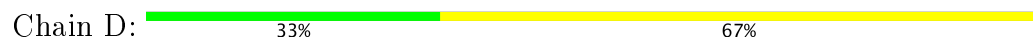
- Molecule 2: RNA (5'-R(P*U P*UP*UP*U)-3')



- Molecule 3: RNA (5'-D(P*UP*UP*U)-3')



- Molecule 3: RNA (5'-D(P*UP*UP*U)-3')



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	68.21Å 94.73Å 70.92Å 90.00° 112.60° 90.00°	Depositor
Resolution (Å)	38.58 – 3.30 38.58 – 3.30	Depositor EDS
% Data completeness (in resolution range)	99.4 (38.58-3.30) 99.4 (38.58-3.30)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.61 (at 3.32Å)	Xtriage
Refinement program	PHENIX dev_1426	Depositor
R, R_{free}	0.282 , 0.317 0.282 , 0.316	Depositor DCC
R_{free} test set	919 reflections (7.31%)	DCC
Wilson B-factor (Å ²)	134.8	Xtriage
Anisotropy	0.416	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 71.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	0.039 for l,-k,h	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	5659	wwPDB-VP
Average B, all atoms (Å ²)	139.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.59% 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

5.1 Standard geometry

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	0/1823	0.37	0/2441
1	B	0.21	0/1854	0.36	0/2482
1	C	0.21	0/1823	0.36	0/2441
2	E	0.11	0/109	0.66	0/166
3	D	0.08	0/65	0.66	0/98
3	F	0.13	0/65	0.80	0/98
All	All	0.21	0/5739	0.39	0/7726

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	1803	0	1885	22	1
1	B	1833	0	1915	17	0
1	C	1803	0	1885	22	0
2	E	100	0	51	4	0
3	D	60	0	31	2	0
3	F	60	0	31	0	0
All	All	5659	0	5798	55	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 5.

The worst 5 of 55 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:5:LYS:O	1:A:10:ASN:ND2	2.30	0.63
1:C:184:TYR:HD1	2:E:4:U:H3	1.48	0.60
1:C:68:LYS:NZ	2:E:4:U:OP1	2.36	0.58
1:B:5:LYS:O	1:B:10:ASN:ND2	2.32	0.57
1:B:171:ASP:OD2	1:A:243:TYR:OH	2.22	0.57

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:A:17:GLN:NE2	1:A:111:SER:OG[2_546]	2.19	0.01

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	223/279 (80%)	220 (99%)	3 (1%)	0	100	100
1	B	227/279 (81%)	223 (98%)	3 (1%)	1 (0%)	38	71
1	C	223/279 (80%)	218 (98%)	5 (2%)	0	100	100
All	All	673/837 (80%)	661 (98%)	11 (2%)	1 (0%)	55	85

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	71	ASP

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	205/246 (83%)	200 (98%)	5 (2%)	54	79
1	B	208/246 (85%)	203 (98%)	5 (2%)	54	79
1	C	205/246 (83%)	198 (97%)	7 (3%)	42	73
All	All	618/738 (84%)	601 (97%)	17 (3%)	49	76

5 of 17 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	114	LEU
1	C	126	LEU
1	A	103	ARG
1	C	103	ARG
1	A	114	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
2	E	4/19 (21%)	0	0
3	D	2/3 (66%)	0	0
3	F	2/3 (66%)	0	0
All	All	8/25 (32%)	0	0

There are no RNA backbone outliers to report.

There are no RNA pucker outliers to report.

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

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	229/279 (82%)	0.57	23 (10%) 8 7	100, 129, 163, 184	0
1	B	233/279 (83%)	0.96	46 (19%) 1 1	117, 138, 179, 201	0
1	C	229/279 (82%)	0.66	24 (10%) 7 6	88, 124, 194, 225	0
2	E	5/19 (26%)	1.11	0 100 100	203, 212, 215, 217	0
3	D	3/3 (100%)	1.42	0 100 100	254, 254, 261, 263	0
3	F	3/3 (100%)	1.45	1 (33%) 0 1	205, 205, 229, 235	0
All	All	702/862 (81%)	0.74	94 (13%) 4 3	88, 132, 184, 263	0

The worst 5 of 94 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	23	PHE	7.0
1	B	4	VAL	6.6
1	A	83	SER	6.4
1	B	83	SER	6.2
1	C	74	PHE	5.9

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 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.