



wwPDB X-ray Structure Validation Summary Report ⓘ

May 26, 2026 – 10:07 AM EDT

PDB ID : 9Z7O / pdb_00009z7o
Title : Structure of Escherichia VapS-VapC complex
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Deposited on : 2025-11-17
Resolution : 3.40 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 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
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

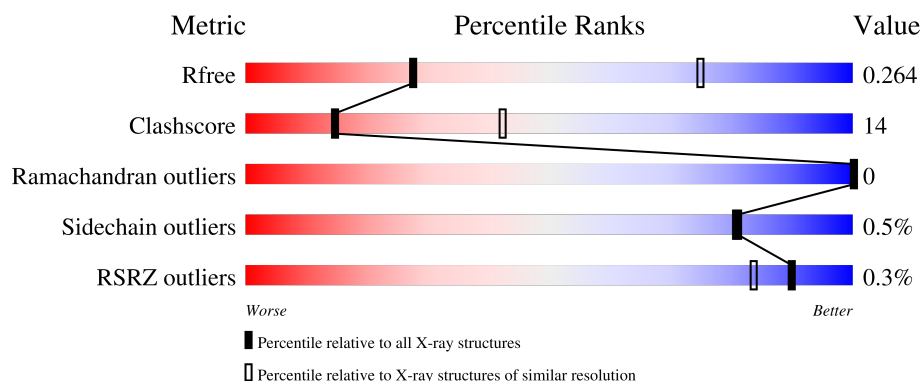
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.40 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	1001 (3.44-3.36)
Clashscore	190562	1022 (3.44-3.36)
Ramachandran outliers	187476	1012 (3.44-3.36)
Sidechain outliers	187428	1012 (3.44-3.36)
RSRZ outliers	180081	1001 (3.44-3.36)

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	134	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 1%, orange 1%, yellow 60%, green 27%, grey 13%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> % 60% 27% 13% </div> </div>
1	B	134	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 1%, orange 1%, yellow 62%, green 26%, grey 9%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> % 62% 26% 9% </div> </div>
1	E	134	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 1%, orange 1%, yellow 60%, green 26%, grey 13%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> % 60% 26% 13% </div> </div>
1	F	134	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, yellow 62%, green 25%, orange 1%, grey 9%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> 62% 25% 9% </div> </div>
2	C	203	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, yellow 71%, green 28%, orange 1%, grey 0%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> 71% 28% </div> </div>

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Mol	Chain	Length	Quality of chain
2	D	203	 74% 25% •
2	G	203	 71% 28% •
2	H	203	 69% 30% •

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 10400 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 Escherichia VapS.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	116	Total	C	N	O	S	0	0	0
			956	606	162	186	2			
1	B	122	Total	C	N	O	S	0	0	0
			1000	636	168	194	2			
1	E	116	Total	C	N	O	S	0	0	0
			956	606	162	186	2			
1	F	122	Total	C	N	O	S	0	0	0
			1000	636	168	194	2			

- Molecule 2 is a protein called Escherichia VapC.

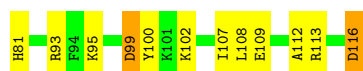
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	203	Total	C	N	O	S	0	0	0
			1621	1030	267	313	11			
2	D	203	Total	C	N	O	S	0	0	0
			1621	1030	267	313	11			
2	G	203	Total	C	N	O	S	0	0	0
			1621	1030	267	313	11			
2	H	203	Total	C	N	O	S	0	0	0
			1621	1030	267	313	11			

- Molecule 3 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	C	1	Total	Mg	0	0
			1	1		
3	D	1	Total	Mg	0	0
			1	1		
3	G	1	Total	Mg	0	0
			1	1		
3	H	1	Total	Mg	0	0
			1	1		

- Molecule 1: Escherichia VapS





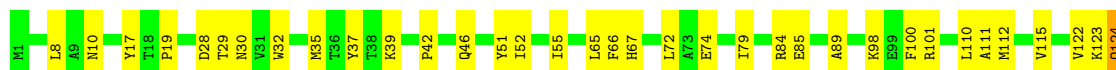
• Molecule 2: Escherichia VapC



• Molecule 2: Escherichia VapC



• Molecule 2: Escherichia VapC



• Molecule 2: Escherichia VapC



4 Data and refinement statistics

Property	Value	Source
Space group	H 3	Depositor
Cell constants a, b, c, α , β , γ	159.08Å 159.08Å 176.20Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	74.22 – 3.40 74.22 – 3.40	Depositor EDS
% Data completeness (in resolution range)	57.4 (74.22-3.40) 57.5 (74.22-3.40)	Depositor EDS
R_{merge}	0.35	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.59 (at 3.41Å)	Xtriage
Refinement program	PHENIX 1.21.1_5286	Depositor
R, R_{free}	0.240 , 0.264 0.239 , 0.264	Depositor DCC
R_{free} test set	647 reflections (4.79%)	wwPDB-VP
Wilson B-factor (Å ²)	70.3	Xtriage
Anisotropy	0.094	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 27.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.44$, $\langle L^2 \rangle = 0.27$	Xtriage
Estimated twinning fraction	0.055 for h,-h-k,-l	Xtriage
F_o, F_c correlation	0.88	EDS
Total number of atoms	10400	wwPDB-VP
Average B, all atoms (Å ²)	62.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.93% 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

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

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	0.83	0/970	1.19	0/1298
1	B	1.08	1/1016 (0.1%)	1.40	4/1361 (0.3%)
1	E	0.83	0/970	1.19	0/1298
1	F	1.08	1/1016 (0.1%)	1.40	4/1361 (0.3%)
2	C	0.82	2/1651 (0.1%)	1.13	2/2233 (0.1%)
2	D	0.82	2/1651 (0.1%)	1.13	2/2233 (0.1%)
2	G	0.82	2/1651 (0.1%)	1.13	2/2233 (0.1%)
2	H	0.82	2/1651 (0.1%)	1.13	2/2233 (0.1%)
All	All	0.88	10/10576 (0.1%)	1.19	16/14250 (0.1%)

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	B	0	1
1	F	0	1
All	All	0	2

The worst 5 of 10 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	F	13	CYS	CA-CB	-5.57	1.43	1.53
1	B	13	CYS	CA-CB	-5.54	1.43	1.53
2	H	124	GLN	CB-CG	-5.36	1.36	1.52
2	D	124	GLN	CB-CG	-5.35	1.36	1.52
2	G	124	GLN	CB-CG	-5.34	1.36	1.52

The worst 5 of 16 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	99	ASP	CB-CA-C	-6.62	99.59	110.85
1	F	99	ASP	CB-CA-C	-6.61	99.61	110.85
2	C	173	ASP	N-CA-C	-6.33	100.04	109.15
2	D	173	ASP	N-CA-C	-6.33	100.04	109.15
2	H	173	ASP	N-CA-C	-6.32	100.05	109.15

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	69	ASN	Mainchain
1	F	69	ASN	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	A	956	0	950	31	0
1	B	1000	0	979	31	0
1	E	956	0	950	27	0
1	F	1000	0	979	44	0
2	C	1621	0	1623	67	0
2	D	1621	0	1623	47	0
2	G	1621	0	1623	57	0
2	H	1621	0	1623	62	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
3	G	1	0	0	0	0
3	H	1	0	0	0	0
All	All	10400	0	10350	288	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 14.

The worst 5 of 288 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:C:94:ARG:NH1	1:F:99:ASP:OD1	1.70	1.22
2:C:92:LYS:HZ2	1:F:60:ASN:HB3	1.26	0.98
2:C:92:LYS:NZ	1:F:60:ASN:O	2.00	0.94
1:F:35:GLU:HG2	1:F:70:ASN:HA	1.49	0.94
1:B:35:GLU:HG2	1:B:70:ASN:HA	1.49	0.92

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	114/134 (85%)	113 (99%)	1 (1%)	0	100	100
1	B	120/134 (90%)	117 (98%)	3 (2%)	0	100	100
1	E	114/134 (85%)	113 (99%)	1 (1%)	0	100	100
1	F	120/134 (90%)	117 (98%)	3 (2%)	0	100	100
2	C	201/203 (99%)	199 (99%)	2 (1%)	0	100	100
2	D	201/203 (99%)	199 (99%)	2 (1%)	0	100	100
2	G	201/203 (99%)	199 (99%)	2 (1%)	0	100	100
2	H	201/203 (99%)	199 (99%)	2 (1%)	0	100	100
All	All	1272/1348 (94%)	1256 (99%)	16 (1%)	0	100	100

There are no Ramachandran outliers to report.

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	108/126 (86%)	107 (99%)	1 (1%)	70	76
1	B	111/126 (88%)	109 (98%)	2 (2%)	51	67
1	E	108/126 (86%)	107 (99%)	1 (1%)	70	76
1	F	111/126 (88%)	109 (98%)	2 (2%)	51	67
2	C	183/183 (100%)	183 (100%)	0	100	100
2	D	183/183 (100%)	183 (100%)	0	100	100
2	G	183/183 (100%)	183 (100%)	0	100	100
2	H	183/183 (100%)	183 (100%)	0	100	100
All	All	1170/1236 (95%)	1164 (100%)	6 (0%)	81	81

5 of 6 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	116	ASP
1	F	-4	TYR
1	F	116	ASP
1	B	-4	TYR
1	A	116	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 21 such sidechains are listed below:

Mol	Chain	Res	Type
1	F	81	HIS
2	G	121	GLN
2	H	87	HIS
2	H	44	ASN
2	G	87	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 4 ligands modelled in this entry, 4 are monoatomic - leaving 0 for Mogul analysis.

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.

5.7 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	116/134 (86%)	0.02	2 (1%) 69 54	66, 75, 86, 90	0
1	B	122/134 (91%)	-0.26	1 (0%) 82 71	36, 43, 62, 69	0
1	E	116/134 (86%)	0.16	1 (0%) 81 68	72, 85, 95, 99	0
1	F	122/134 (91%)	-0.28	0 100 100	37, 42, 55, 67	0
2	C	203/203 (100%)	-0.07	0 100 100	52, 64, 78, 90	0
2	D	203/203 (100%)	-0.20	0 100 100	45, 58, 73, 83	0
2	G	203/203 (100%)	-0.13	0 100 100	56, 69, 83, 87	0
2	H	203/203 (100%)	-0.22	0 100 100	40, 54, 68, 89	0
All	All	1288/1348 (95%)	-0.13	4 (0%) 90 84	36, 62, 86, 99	0

All (4) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	73	LEU	2.2
1	A	3	ILE	2.2
1	B	-3	PHE	2.2
1	A	36	VAL	2.2

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(Å ²)	Q<0.9
3	MG	C	301	1/1	0.76	0.17	58,58,58,58	0
3	MG	G	301	1/1	0.89	0.13	57,57,57,57	0
3	MG	H	301	1/1	0.94	0.09	58,58,58,58	0
3	MG	D	301	1/1	0.97	0.09	54,54,54,54	0

6.5 Other polymers [i](#)

There are no such residues in this entry.