



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 05:05 PM UTC

PDB ID : 4Q4V / pdb_00004q4v
Title : Crystal structure of Cocksackievirus A24v
Authors : Zocher, G.; Stehle, T.
Deposited on : 2014-04-15
Resolution : 2.90 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
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

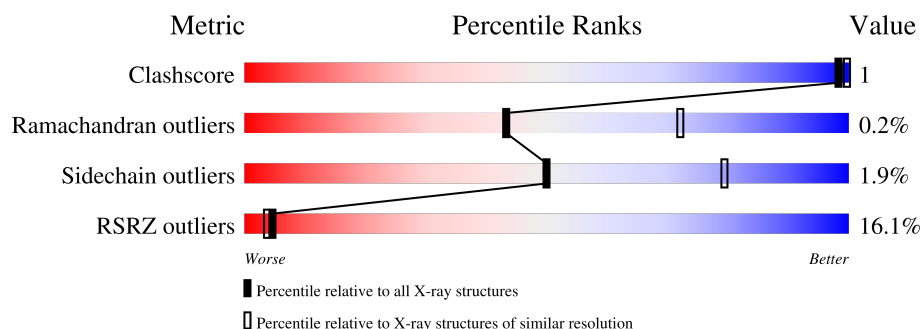
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.90 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))
Clashscore	190562	2690 (2.90-2.90)
Ramachandran outliers	187476	2623 (2.90-2.90)
Sidechain outliers	187428	2625 (2.90-2.90)
RSRZ outliers	180081	2481 (2.90-2.90)

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	1	305	16% 89% 8%
2	2	271	16% 94% ...
3	3	240	11% 96% ..
4	4	69	23% 80% 17%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 6574 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 Cocksackievirus capsid protein VP1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	1	281	Total	C	N	O	S	0	0	0
			2241	1423	381	430	7			

- Molecule 2 is a protein called Cocksackievirus capsid protein VP2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	2	264	Total	C	N	O	S	0	3	0
			2065	1317	343	393	12			

- Molecule 3 is a protein called Cocksackievirus capsid protein VP3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	3	237	Total	C	N	O	S	0	2	0
			1843	1183	295	345	20			

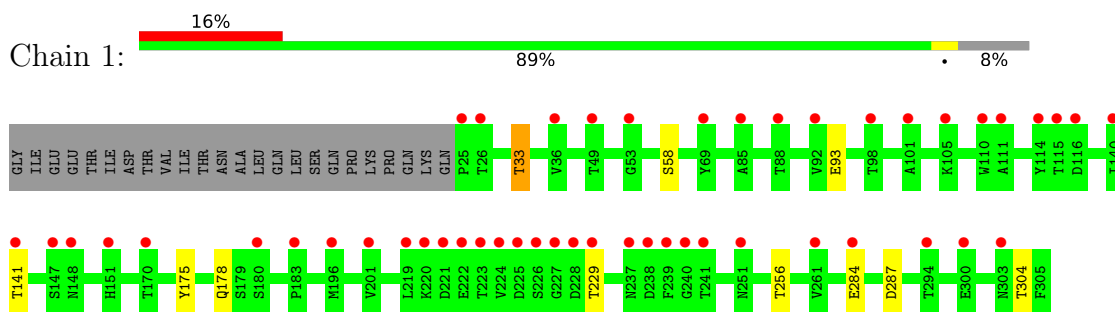
- Molecule 4 is a protein called Cocksackievirus capsid protein VP4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	4	57	Total	C	N	O	S	0	1	0
			425	267	68	89	1			

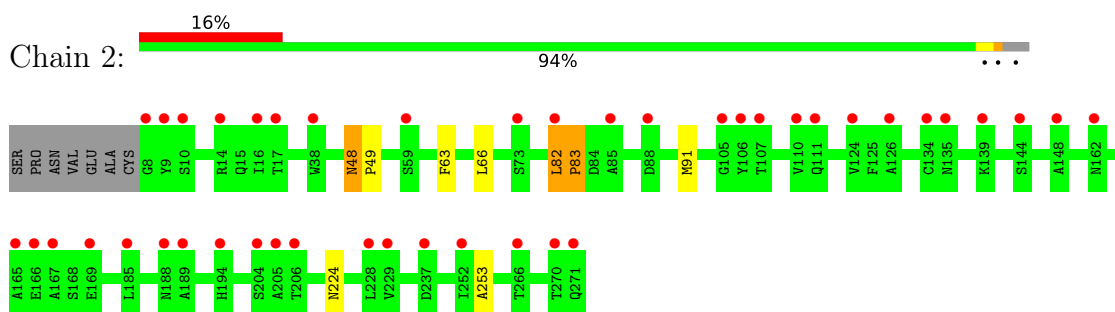
3 Residue-property plots [i](#)

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 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.

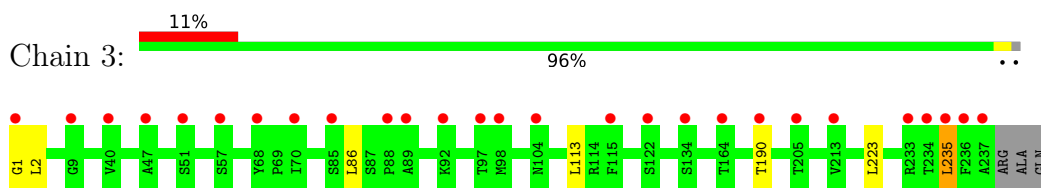
- Molecule 1: Cocksackievirus capsid protein VP1



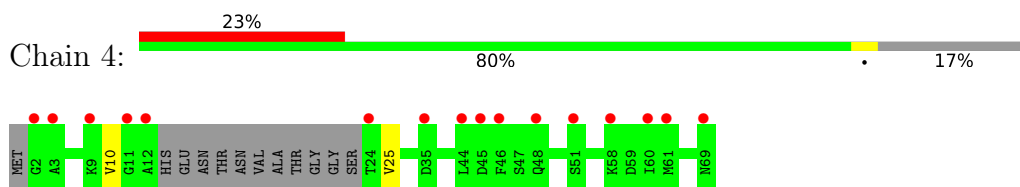
- Molecule 2: Cocksackievirus capsid protein VP2



- Molecule 3: Cocksackievirus capsid protein VP3



- Molecule 4: Cocksackievirus capsid protein VP4



4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	303.26Å 303.26Å 763.59Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	99.26 – 2.90 99.26 – 2.90	Depositor EDS
% Data completeness (in resolution range)	92.7 (99.26-2.90) 92.9 (99.26-2.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.75 (at 2.91Å)	Xtriage
Refinement program	REFMAC 5.8.0049	Depositor
R, R_{free}	0.189 , (Not available) (Not available) , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	56.9	Xtriage
Anisotropy	0.055	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 27.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.000 for -h,-k,l	Xtriage
F_o, F_c correlation	0.32	EDS
Total number of atoms	6574	wwPDB-VP
Average B, all atoms (Å ²)	50.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 1.23% 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](#)

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	1	0.45	0/2304	0.68	0/3147
2	2	0.43	0/2130	0.69	2/2910 (0.1%)
3	3	0.44	1/1900 (0.1%)	0.66	0/2588
4	4	0.51	0/434	0.67	0/588
All	All	0.44	1/6768 (0.0%)	0.68	2/9233 (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
2	2	0	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	3	1	GLY	N-CA	5.02	1.53	1.45

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	2	82	LEU	CA-C-N	5.01	126.10	119.84
2	2	82	LEU	C-N-CA	5.01	126.10	119.84

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	2	82	LEU	Peptide

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	1	2241	0	2159	3	0
2	2	2065	0	1991	3	0
3	3	1843	0	1830	2	0
4	4	425	0	410	0	0
All	All	6574	0	6390	8	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 1.

All (8) 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)
2:2:83:PRO:HD3	2:2:224:ASN:HA	1.84	0.59
2:2:48:ASN:HB3	2:2:49:PRO:CD	2.40	0.51
1:1:175:TYR:O	1:1:178:GLN:HG2	2.14	0.47
3:3:235:LEU:H	3:3:235:LEU:HD23	1.80	0.45
3:3:86:LEU:HD11	3:3:113:LEU:HD12	1.98	0.44
1:1:33:THR:HG21	1:1:58:SER:HB2	1.99	0.44
2:2:63:PHE:CD1	2:2:253:ALA:HB2	2.53	0.44
1:1:93:GLU:OE1	1:1:256:THR:HG22	2.21	0.41

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	1	279/305 (92%)	269 (96%)	10 (4%)	0	100	100
2	2	265/271 (98%)	250 (94%)	13 (5%)	2 (1%)	16	44
3	3	237/240 (99%)	226 (95%)	11 (5%)	0	100	100
4	4	54/69 (78%)	51 (94%)	3 (6%)	0	100	100
All	All	835/885 (94%)	796 (95%)	37 (4%)	2 (0%)	43	72

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	2	83	PRO
2	2	48	ASN

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	1	246/268 (92%)	240 (98%)	6 (2%)	43	75
2	2	222/225 (99%)	220 (99%)	2 (1%)	70	90
3	3	212/212 (100%)	207 (98%)	5 (2%)	43	75
4	4	46/57 (81%)	44 (96%)	2 (4%)	26	60
All	All	726/762 (95%)	711 (98%)	15 (2%)	50	77

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	1	33	THR
1	1	141	THR
1	1	229	THR
1	1	284	GLU
1	1	287	ASP
1	1	304	THR
2	2	66	LEU
2	2	91	MET
3	3	2	LEU

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Mol	Chain	Res	Type
3	3	190[A]	THR
3	3	190[B]	THR
3	3	223	LEU
3	3	235	LEU
4	4	10	VAL
4	4	25	VAL

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

Mol	Chain	Res	Type
2	2	61	ASN
2	2	70	GLN
2	2	135	ASN
3	3	20	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 oligosaccharides 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(Å ²)	Q<0.9
1	1	281/305 (92%)	1.33	49 (17%) 4 3	39, 48, 78, 124	0
2	2	264/271 (97%)	1.31	43 (16%) 4 3	28, 46, 67, 112	3 (1%)
3	3	237/240 (98%)	1.15	27 (11%) 10 8	30, 46, 57, 94	2 (0%)
4	4	57/69 (82%)	1.65	16 (28%) 1 1	31, 53, 91, 102	1 (1%)
All	All	839/885 (94%)	1.30	135 (16%) 4 4	28, 47, 75, 124	6 (0%)

All (135) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	2	8	GLY	7.7
1	1	225	ASP	6.3
1	1	25	PRO	6.1
4	4	12	ALA	5.5
2	2	166	GLU	5.4
1	1	226	SER	5.2
3	3	233	ARG	5.0
1	1	151	HIS	4.9
1	1	148	ASN	4.8
3	3	237	ALA	4.7
4	4	11	GLY	4.7
1	1	229	THR	4.2
4	4	24	THR	4.2
1	1	170	THR	4.1
2	2	124	VAL	4.0
2	2	271	GLN	3.9
1	1	228	ASP	3.8
4	4	46	PHE	3.7
2	2	162	ASN	3.7
1	1	223	THR	3.5
4	4	9	LYS	3.5

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Mol	Chain	Res	Type	RSRZ
1	1	116	ASP	3.5
3	3	122	SER	3.4
3	3	89	ALA	3.4
3	3	236	PHE	3.4
1	1	221	ASP	3.4
4	4	60	ILE	3.3
3	3	164	THR	3.3
3	3	92	LYS	3.3
3	3	234	THR	3.3
4	4	69	ASN	3.2
2	2	73	SER	3.2
3	3	205	THR	3.2
1	1	227	GLY	3.1
1	1	240	GLY	3.1
2	2	169	GLU	3.1
1	1	238	ASP	3.0
2	2	107	THR	3.0
2	2	189	ALA	3.0
4	4	2	GLY	3.0
2	2	105	GLY	2.9
4	4	44	LEU	2.9
4	4	48	GLN	2.9
4	4	3	ALA	2.9
2	2	88[A]	ASP	2.9
1	1	147	SER	2.8
1	1	224	VAL	2.8
2	2	194	HIS	2.8
2	2	188	ASN	2.8
2	2	9	TYR	2.8
4	4	45	ASP	2.8
3	3	51	SER	2.8
2	2	106	TYR	2.7
1	1	88	THR	2.7
1	1	239	PHE	2.7
1	1	114	TYR	2.7
1	1	85	ALA	2.7
3	3	235	LEU	2.7
2	2	204	SER	2.7
1	1	237	ASN	2.6
3	3	9	GLY	2.6
4	4	58	LYS	2.6
2	2	17	THR	2.6

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Mol	Chain	Res	Type	RSRZ
2	2	135	ASN	2.6
1	1	201	VAL	2.6
1	1	241	THR	2.5
2	2	237	ASP	2.5
1	1	53	GLY	2.5
2	2	110	VAL	2.5
2	2	228	LEU	2.5
2	2	270	THR	2.5
3	3	47	ALA	2.5
1	1	140	ILE	2.4
3	3	1	GLY	2.4
2	2	165	ALA	2.4
2	2	206	THR	2.4
2	2	82	LEU	2.4
4	4	61	MET	2.4
2	2	229	VAL	2.4
4	4	51	SER	2.4
1	1	110	TRP	2.3
3	3	98	MET	2.3
3	3	213	VAL	2.3
3	3	104	ASN	2.3
2	2	16	ILE	2.3
1	1	98	THR	2.3
2	2	59	SER	2.3
3	3	85	SER	2.3
2	2	14	ARG	2.2
3	3	40	VAL	2.2
3	3	68	TYR	2.2
1	1	300	GLU	2.2
1	1	36	VAL	2.2
2	2	134	CYS	2.2
3	3	134	SER	2.2
2	2	85	ALA	2.2
1	1	261	VAL	2.2
1	1	294	THR	2.2
2	2	266	THR	2.2
2	2	126	ALA	2.2
2	2	252	ILE	2.2
1	1	303	ASN	2.2
1	1	26	THR	2.2
1	1	141	THR	2.2
3	3	190[A]	THR	2.2

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Mol	Chain	Res	Type	RSRZ
3	3	115	PHE	2.2
1	1	101	ALA	2.2
2	2	167	ALA	2.2
1	1	92	VAL	2.1
1	1	49	THR	2.1
1	1	115	THR	2.1
1	1	69	TYR	2.1
2	2	144	SER	2.1
2	2	185	LEU	2.1
2	2	205	ALA	2.1
1	1	180	SER	2.1
1	1	183	PRO	2.1
2	2	139	LYS	2.1
3	3	97	THR	2.1
4	4	35	ASP	2.1
1	1	111	ALA	2.1
1	1	284	GLU	2.1
2	2	10	SER	2.1
1	1	196	MET	2.1
1	1	220	LYS	2.1
3	3	88	PRO	2.1
2	2	38	TRP	2.1
3	3	70	ILE	2.1
1	1	251	ASN	2.0
1	1	105	LYS	2.0
2	2	111	GLN	2.0
3	3	57	SER	2.0
1	1	219	LEU	2.0
2	2	148	ALA	2.0
1	1	222	GLU	2.0

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

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates ⓘ

There are no oligosaccharides 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.