



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 25, 2026 – 03:02 PM EDT

PDB ID : 3CML / pdb_00003cml
Title : Crystal Structure of the DBL3x domain of the Plasmodium falciparum VAR2CSA protein
Authors : Singh, K.; Gittis, A.G.; Nguyen, P.; Gowda, D.C.; Miller, L.H.; Garboczi, D.N.
Deposited on : 2008-03-23
Resolution : 1.90 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

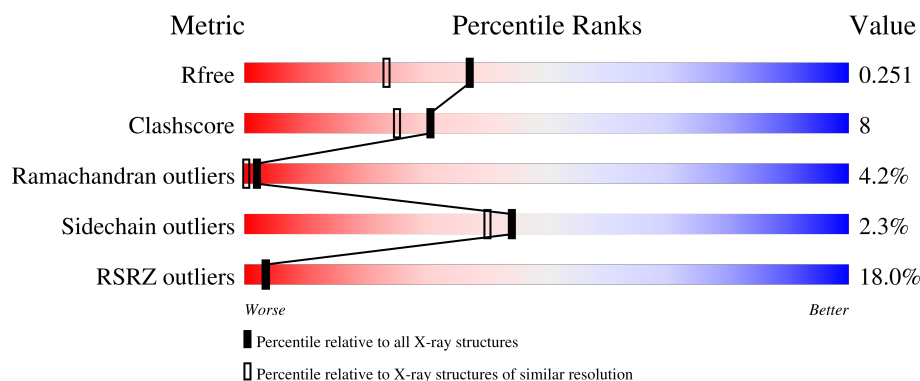
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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))
R_{free}	180053	7789 (1.90-1.90)
Clashscore	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)
RSRZ outliers	180081	7790 (1.90-1.90)

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	A	362	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 2465 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 Erythrocyte membrane protein 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	317	Total	C	N	O	S	0	0	0
			2367	1492	405	455	15			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1219	MET	-	initiating methionine	UNP Q6UDW7

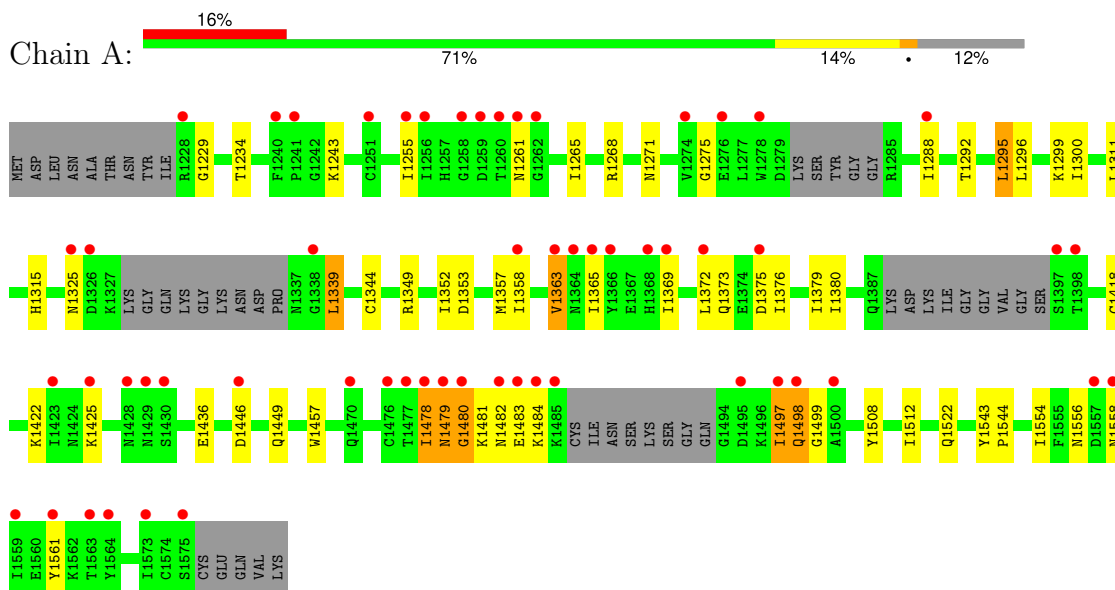
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	98	Total	O	0	0
			98	98		

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: Erythrocyte membrane protein 1



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	40.67Å 84.20Å 86.49Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.80 – 1.90 19.80 – 1.90	Depositor EDS
% Data completeness (in resolution range)	98.9 (19.80-1.90) 98.9 (19.80-1.90)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	0.06	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.03 (at 1.89Å)	Xtriage
Refinement program	CNS 1.2	Depositor
R, R_{free}	0.223 , 0.253 0.221 , 0.251	Depositor DCC
R_{free} test set	1882 reflections (7.87%)	wwPDB-VP
Wilson B-factor (Å ²)	32.7	Xtriage
Anisotropy	0.190	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 46.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	0.031 for -h,l,k	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	2465	wwPDB-VP
Average B, all atoms (Å ²)	43.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.52% 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	A	0.46	0/2413	0.94	5/3259 (0.2%)

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	1479	ASN	O-C-N	7.08	132.01	122.59
1	A	1425	LYS	N-CA-C	-6.95	104.08	114.64
1	A	1265	ILE	CA-C-N	5.57	123.67	119.66
1	A	1265	ILE	C-N-CA	5.57	123.67	119.66
1	A	1482	ASN	N-CA-C	5.13	116.95	110.33

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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	2367	0	2096	37	0
2	A	98	0	0	1	0
All	All	2465	0	2096	37	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 (37) 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:1261:ASN:HA	1:A:1363:VAL:HA	1.36	1.07
1:A:1484:LYS:CB	1:A:1497:ILE:HA	2.13	0.79
1:A:1261:ASN:HA	1:A:1363:VAL:CA	2.16	0.73
1:A:1261:ASN:CA	1:A:1363:VAL:HA	2.18	0.71
1:A:1234:THR:H	1:A:1271:ASN:HD21	1.37	0.70
1:A:1339:LEU:HD23	1:A:1344:CYS:SG	2.34	0.68
1:A:1292:THR:HG23	1:A:1295:LEU:H	1.63	0.63
1:A:1484:LYS:CB	1:A:1498:GLN:H	2.12	0.62
1:A:1556:ASN:HD22	1:A:1561:TYR:HB2	1.65	0.61
1:A:1234:THR:H	1:A:1271:ASN:ND2	2.01	0.57
1:A:1372:LEU:O	1:A:1376:ILE:HG12	2.07	0.55
1:A:1229:GLY:HA3	2:A:498:HOH:O	2.06	0.54
1:A:1556:ASN:HD21	1:A:1558:ASN:HB2	1.73	0.53
1:A:1418:CYS:O	1:A:1422:LYS:HG2	2.10	0.52
1:A:1295:LEU:CD1	1:A:1299:LYS:HE3	2.40	0.51
1:A:1352:ILE:HD13	1:A:1446:ASP:O	2.11	0.51
1:A:1300:ILE:HD13	1:A:1358:ILE:HD13	1.92	0.50
1:A:1357:MET:O	1:A:1373:GLN:HG2	2.13	0.49
1:A:1295:LEU:HD11	1:A:1299:LYS:HE3	1.95	0.48
1:A:1261:ASN:C	1:A:1363:VAL:CB	2.88	0.47
1:A:1508:TYR:CZ	1:A:1512:ILE:HD11	2.50	0.47
1:A:1339:LEU:HD22	1:A:1436:GLU:HB3	1.97	0.46
1:A:1556:ASN:ND2	1:A:1558:ASN:HB2	2.32	0.44
1:A:1543:TYR:HA	1:A:1544:PRO:HD3	1.87	0.44
1:A:1556:ASN:HD21	1:A:1558:ASN:ND2	2.14	0.43
1:A:1556:ASN:HD22	1:A:1561:TYR:CB	2.31	0.43
1:A:1512:ILE:HD13	1:A:1554:ILE:HG23	2.00	0.43
1:A:1268:ARG:NH2	1:A:1349:ARG:HB3	2.34	0.42
1:A:1457:TRP:CG	1:A:1522:GLN:HE22	2.37	0.42
1:A:1497:ILE:H	1:A:1497:ILE:HG12	1.60	0.42
1:A:1311:LEU:O	1:A:1315:HIS:HD2	2.03	0.42
1:A:1478:ILE:O	1:A:1480:GLY:N	2.52	0.42
1:A:1556:ASN:ND2	1:A:1561:TYR:HB2	2.34	0.42
1:A:1288:ILE:O	1:A:1379:ILE:HD11	2.19	0.41
1:A:1376:ILE:O	1:A:1380:ILE:HG12	2.20	0.41
1:A:1353:ASP:HA	1:A:1449:GLN:NE2	2.36	0.41
1:A:1375:ASP:O	1:A:1379:ILE:HG13	2.20	0.40

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	307/362 (85%)	274 (89%)	20 (6%)	13 (4%)	2 0

All (13) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	1275	GLY
1	A	1325	ASN
1	A	1363	VAL
1	A	1478	ILE
1	A	1479	ASN
1	A	1255	ILE
1	A	1365	ILE
1	A	1369	ILE
1	A	1499	GLY
1	A	1483	GLU
1	A	1243	LYS
1	A	1480	GLY
1	A	1481	LYS

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	A	221/318 (70%)	216 (98%)	5 (2%)	44 40

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1295	LEU
1	A	1296	LEU
1	A	1339	LEU
1	A	1497	ILE
1	A	1498	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	1271	ASN
1	A	1302	ASN
1	A	1315	HIS
1	A	1348	GLN
1	A	1498	GLN
1	A	1556	ASN

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 ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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	A	317/362 (87%)	0.91	57 (17%) 3 3	20, 40, 86, 102	0

All (57) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1259	ASP	7.9
1	A	1262	GLY	5.8
1	A	1258	GLY	5.5
1	A	1480	GLY	5.2
1	A	1497	ILE	5.1
1	A	1260	THR	5.0
1	A	1278	TRP	4.8
1	A	1369	ILE	4.5
1	A	1368	HIS	4.5
1	A	1363	VAL	4.4
1	A	1398	THR	4.2
1	A	1561	TYR	4.1
1	A	1365	ILE	4.0
1	A	1575	SER	4.0
1	A	1366	TYR	3.9
1	A	1326	ASP	3.9
1	A	1256	ILE	3.7
1	A	1479	ASN	3.7
1	A	1261	ASN	3.7
1	A	1482	ASN	3.7
1	A	1478	ILE	3.6
1	A	1558	ASN	3.4
1	A	1428	ASN	3.2
1	A	1500	ALA	2.9
1	A	1557	ASP	2.9
1	A	1563	THR	2.8
1	A	1483	GLU	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	1240	PHE	2.6
1	A	1255	ILE	2.6
1	A	1375	ASP	2.6
1	A	1397	SER	2.6
1	A	1364	ASN	2.5
1	A	1423	ILE	2.5
1	A	1573	ILE	2.5
1	A	1276	GLU	2.5
1	A	1430	SER	2.4
1	A	1484	LYS	2.4
1	A	1498	GLN	2.3
1	A	1358	ILE	2.3
1	A	1429	ASN	2.3
1	A	1495	ASP	2.3
1	A	1325	ASN	2.3
1	A	1425	LYS	2.3
1	A	1288	ILE	2.3
1	A	1559	ILE	2.3
1	A	1274	VAL	2.3
1	A	1372	LEU	2.3
1	A	1228	ARG	2.2
1	A	1564	TYR	2.2
1	A	1476	CYS	2.2
1	A	1338	GLY	2.2
1	A	1251	CYS	2.1
1	A	1470	GLN	2.1
1	A	1477	THR	2.1
1	A	1485	LYS	2.1
1	A	1446	ASP	2.1
1	A	1241	PRO	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.