



wwPDB X-ray Structure Validation Summary Report ⓘ

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PDB ID : 4MDV / pdb_00004mdv
Title : Crystal structure of calcium-bound annexin (Sm)1
Authors : Hofmann, A.
Deposited on : 2013-08-23
Resolution : 2.50 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
Xtrriage (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

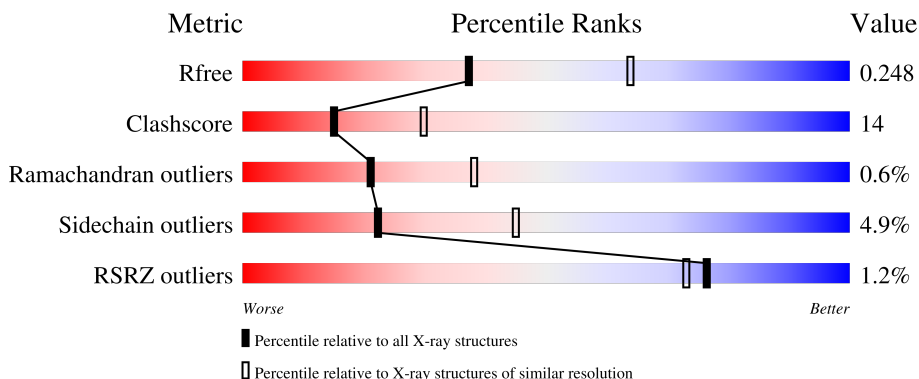
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.50 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	5829 (2.50-2.50)
Clashscore	190562	6492 (2.50-2.50)
Ramachandran outliers	187476	6378 (2.50-2.50)
Sidechain outliers	187428	6380 (2.50-2.50)
RSRZ outliers	180081	5833 (2.50-2.50)

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	375	 67% 25% 6%
1	B	375	 63% 27% 7%

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 5780 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 Annexin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	351	2831	1789	477	546	19	125	4	0
1	B	349	2815	1781	474	542	18	166	3	0

There are 22 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MET	-	expression tag	UNP C4QH88
A	2	ALA	-	expression tag	UNP C4QH88
A	8	GLU	GLY	conflict	UNP C4QH88
A	368	LEU	-	expression tag	UNP C4QH88
A	369	GLU	-	expression tag	UNP C4QH88
A	370	HIS	-	expression tag	UNP C4QH88
A	371	HIS	-	expression tag	UNP C4QH88
A	372	HIS	-	expression tag	UNP C4QH88
A	373	HIS	-	expression tag	UNP C4QH88
A	374	HIS	-	expression tag	UNP C4QH88
A	375	HIS	-	expression tag	UNP C4QH88
B	1	MET	-	expression tag	UNP C4QH88
B	2	ALA	-	expression tag	UNP C4QH88
B	8	GLU	GLY	conflict	UNP C4QH88
B	368	LEU	-	expression tag	UNP C4QH88
B	369	GLU	-	expression tag	UNP C4QH88
B	370	HIS	-	expression tag	UNP C4QH88
B	371	HIS	-	expression tag	UNP C4QH88
B	372	HIS	-	expression tag	UNP C4QH88
B	373	HIS	-	expression tag	UNP C4QH88
B	374	HIS	-	expression tag	UNP C4QH88
B	375	HIS	-	expression tag	UNP C4QH88

- Molecule 2 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	6	Total Ca 6 6	0	0
2	B	7	Total Ca 7 7	0	2

- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	62	Total O 64 64	0	2
3	B	55	Total O 57 57	0	2

4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	67.82Å 88.49Å 68.47Å 90.00° 111.18° 90.00°	Depositor
Resolution (Å)	24.10 – 2.50 24.10 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.6 (24.10-2.50) 99.8 (24.10-2.50)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.04	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.29 (at 2.41Å)	Xtrriage
Refinement program	PHENIX (phenix.refine: 1.6.4_486)	Depositor
R, R_{free}	0.190 , 0.257 0.181 , 0.248	Depositor DCC
R_{free} test set	1443 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å ²)	61.0	Xtrriage
Anisotropy	0.142	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 66.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	0.014 for l,-k,h	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	5780	wwPDB-VP
Average B, all atoms (Å ²)	70.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.01% 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](#)

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

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	0.56	0/2890	0.91	3/3895 (0.1%)
1	B	0.52	1/2870 (0.0%)	0.85	0/3868
All	All	0.54	1/5760 (0.0%)	0.88	3/7763 (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
1	A	0	2
1	B	0	2
All	All	0	4

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	201	ILE	CA-CB	6.81	1.57	1.54

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	308	LYS	N-CA-C	-7.54	99.20	109.54
1	A	306	GLY	N-CA-C	5.32	125.78	113.18
1	A	334	ILE	CB-CA-C	-5.26	105.31	111.94

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	306	GLY	Peptide
1	A	307	THR	Peptide
1	B	306	GLY	Peptide
1	B	307	THR	Peptide

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	2831	0	2850	60	0
1	B	2815	0	2838	86	0
2	A	6	0	0	0	0
2	B	7	0	0	0	0
3	A	64	0	0	1	0
3	B	57	0	0	0	0
All	All	5780	0	5688	145	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 145 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:B:174:THR:HG22	1:B:179:GLU:HB2	1.55	0.87
1:B:210:ILE:HD12	1:B:251:LEU:HD22	1.58	0.84
1:B:121:MET:HG2	1:B:173:GLU:HG2	1.70	0.74
1:B:294:ILE:HG21	1:B:327:ILE:HD13	1.69	0.74
1:A:170:MET:O	1:A:174:THR:HG22	1.90	0.72

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	351/375 (94%)	335 (95%)	14 (4%)	2 (1%)	21	38
1	B	348/375 (93%)	333 (96%)	13 (4%)	2 (1%)	21	38
All	All	699/750 (93%)	668 (96%)	27 (4%)	4 (1%)	21	38

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	306	GLY
1	B	306	GLY
1	A	307	THR
1	B	307	THR

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	313/327 (96%)	298 (95%)	15 (5%)	23	46
1	B	310/327 (95%)	294 (95%)	16 (5%)	21	42
All	All	623/654 (95%)	592 (95%)	31 (5%)	22	44

5 of 31 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	364	ASN
1	B	333	SER
1	B	24	LYS
1	B	359[A]	MET
1	B	209	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 6 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	197	GLN
1	B	243	ASN
1	B	325	GLN
1	A	104	GLN
1	A	72	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](#)

Of 13 ligands modelled in this entry, 13 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	350/375 (93%)	-0.29	5 (1%) 73 70	31, 62, 97, 127	36 (10%)
1	B	345/375 (92%)	-0.31	3 (0%) 81 78	15, 65, 99, 127	38 (11%)
All	All	695/750 (92%)	-0.30	8 (1%) 76 73	15, 64, 99, 127	74 (10%)

The worst 5 of 8 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	306	GLY	4.4
1	A	6	ILE	2.8
1	A	307	THR	2.3
1	A	225	SER	2.2
1	B	6	ILE	2.1

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(\AA^2)	Q<0.9
2	CA	B	407	1/1	0.63	0.14	135,135,135,135	0
2	CA	A	403	1/1	0.73	0.09	120,120,120,120	0
2	CA	A	406	1/1	0.81	0.12	118,118,118,118	0
2	CA	B	401[A]	1/1	0.83	0.14	61,61,61,61	1
2	CA	B	406	1/1	0.86	0.10	93,93,93,93	0
2	CA	A	405	1/1	0.88	0.08	99,99,99,99	0
2	CA	B	405[B]	1/1	0.94	0.21	64,64,64,64	1
2	CA	A	401	1/1	0.96	0.04	104,104,104,104	0
2	CA	B	402	1/1	0.96	0.08	91,91,91,91	0
2	CA	A	404	1/1	0.97	0.04	74,74,74,74	0
2	CA	A	402	1/1	0.97	0.04	72,72,72,72	0
2	CA	B	403	1/1	0.97	0.04	70,70,70,70	0
2	CA	B	404	1/1	0.97	0.04	86,86,86,86	0

6.5 Other polymers [i](#)

There are no such residues in this entry.