



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 8, 2026 – 04:14 PM UTC

PDB ID : 3RB7 / pdb_00003rb7
Title : Crystal structure of CBD12 from CALX1.2
Authors : Wu, M.; Zheng, L.
Deposited on : 2011-03-28
Resolution : 2.90 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
Mogul : 2022.3.0, CSD as543be (2022)
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

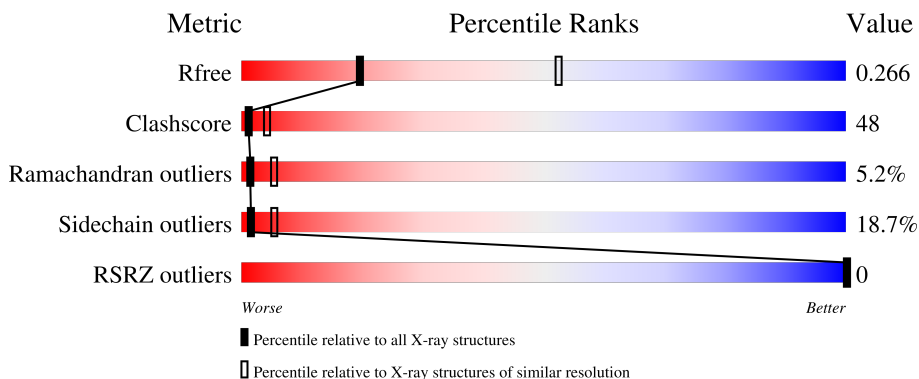
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.90 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	2481 (2.90-2.90)
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	A	298	
1	B	298	
1	E	298	
1	G	298	

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 7969 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 Na/Ca exchange protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	248	2001	1272	329	393	7	0	0	0
1	B	242	1943	1237	319	380	7	0	0	0
1	E	248	1992	1265	328	392	7	0	0	0
1	G	244	1959	1247	321	384	7	0	0	0

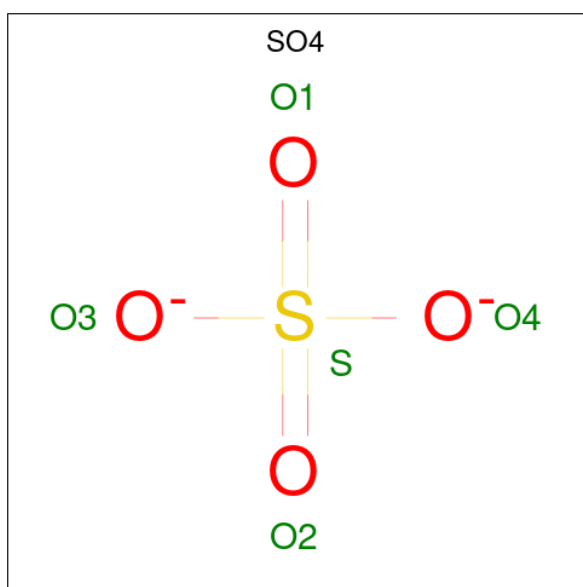
There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	651	SER	ASP	SEE REMARK 999	UNP Q24413
A	652	THR	GLY	SEE REMARK 999	UNP Q24413
A	653	HIS	LEU	SEE REMARK 999	UNP Q24413
A	654	TYR	ALA	SEE REMARK 999	UNP Q24413
A	655	PRO	ALA	SEE REMARK 999	UNP Q24413
B	651	SER	ASP	SEE REMARK 999	UNP Q24413
B	652	THR	GLY	SEE REMARK 999	UNP Q24413
B	653	HIS	LEU	SEE REMARK 999	UNP Q24413
B	654	TYR	ALA	SEE REMARK 999	UNP Q24413
B	655	PRO	ALA	SEE REMARK 999	UNP Q24413
E	651	SER	ASP	SEE REMARK 999	UNP Q24413
E	652	THR	GLY	SEE REMARK 999	UNP Q24413
E	653	HIS	LEU	SEE REMARK 999	UNP Q24413
E	654	TYR	ALA	SEE REMARK 999	UNP Q24413
E	655	PRO	ALA	SEE REMARK 999	UNP Q24413
G	651	SER	ASP	SEE REMARK 999	UNP Q24413
G	652	THR	GLY	SEE REMARK 999	UNP Q24413
G	653	HIS	LEU	SEE REMARK 999	UNP Q24413
G	654	TYR	ALA	SEE REMARK 999	UNP Q24413
G	655	PRO	ALA	SEE REMARK 999	UNP Q24413

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

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	4	Total Ca 4 4	0	0
2	B	4	Total Ca 4 4	0	0
2	E	4	Total Ca 4 4	0	0
2	G	4	Total Ca 4 4	0	0

- Molecule 3 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total O S 5 4 1	0	0
3	B	1	Total O S 5 4 1	0	0
3	E	1	Total O S 5 4 1	0	0
3	G	1	Total O S 5 4 1	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	7	Total O 7 7	0	0

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	7	Total O 7 7	0	0
4	E	14	Total O 14 14	0	0
4	G	10	Total O 10 10	0	0

4 Data and refinement statistics i

Property	Value	Source
Space group	H 3	Depositor
Cell constants a, b, c, α , β , γ	107.53Å 107.53Å 358.65Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	119.50 – 2.90 119.50 – 2.90	Depositor EDS
% Data completeness (in resolution range)	(Not available) (119.50-2.90) 90.9 (119.50-2.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.63 (at 2.91Å)	Xtrriage
Refinement program	PHENIX	Depositor
R, R_{free}	0.231 , 0.278 0.228 , 0.266	Depositor DCC
R_{free} test set	1579 reflections (4.61%)	wwPDB-VP
Wilson B-factor (Å ²)	70.7	Xtrriage
Anisotropy	0.272	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 51.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.57$, $\langle L^2 \rangle = 0.41$	Xtrriage
Estimated twinning fraction	0.427 for -h-k,k,-l	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	7969	wwPDB-VP
Average B, all atoms (Å ²)	63.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.71% 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: SO4, 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	0.50	0/2043	0.92	2/2762 (0.1%)
1	B	0.50	0/1984	0.98	10/2684 (0.4%)
1	E	0.51	0/2033	0.93	4/2749 (0.1%)
1	G	0.51	0/2000	1.00	7/2706 (0.3%)
All	All	0.51	0/8060	0.96	23/10901 (0.2%)

There are no bond length outliers.

The worst 5 of 23 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	652	THR	N-CA-C	8.95	122.00	111.71
1	G	554	ALA	N-CA-C	8.15	121.72	111.69
1	B	469	ASP	N-CA-C	7.29	119.01	111.14
1	B	554	ALA	N-CA-C	6.99	122.11	112.04
1	B	612	VAL	N-CA-C	6.64	117.44	107.75

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	2001	0	1934	196	0
1	B	1943	0	1883	168	1

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	E	1992	0	1929	215	0
1	G	1959	0	1898	195	1
2	A	4	0	0	0	0
2	B	4	0	0	0	0
2	E	4	0	0	0	0
2	G	4	0	0	0	0
3	A	5	0	0	0	0
3	B	5	0	0	0	0
3	E	5	0	0	0	0
3	G	5	0	0	0	0
4	A	7	0	0	0	0
4	B	7	0	0	0	0
4	E	14	0	0	1	0
4	G	10	0	0	0	0
All	All	7969	0	7644	747	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 48.

The worst 5 of 747 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:G:442:ILE:HG23	1:G:443:ARG:HG3	1.32	1.11
1:B:585:GLY:H	1:B:615:ASN:ND2	1.54	1.04
1:B:576:LYS:HD3	1:B:578:MET:HE2	1.46	0.97
1:B:614:GLU:HB2	1:B:617:GLU:HG3	1.48	0.94
1:G:443:ARG:HH11	1:G:467:ARG:HG3	1.31	0.94

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:B:608:ARG:O	1:G:608:ARG:N[8_444]	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	244/298 (82%)	202 (83%)	29 (12%)	13 (5%)	1	5
1	B	238/298 (80%)	197 (83%)	29 (12%)	12 (5%)	1	6
1	E	244/298 (82%)	202 (83%)	32 (13%)	10 (4%)	2	9
1	G	240/298 (80%)	197 (82%)	28 (12%)	15 (6%)	1	3
All	All	966/1192 (81%)	798 (83%)	118 (12%)	50 (5%)	1	5

5 of 50 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	567	THR
1	A	634	LYS
1	A	682	ASN
1	B	501	PRO
1	B	566	ILE

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	219/261 (84%)	175 (80%)	44 (20%)	1	4
1	B	213/261 (82%)	166 (78%)	47 (22%)	1	3
1	E	219/261 (84%)	178 (81%)	41 (19%)	1	5
1	G	215/261 (82%)	185 (86%)	30 (14%)	3	11
All	All	866/1044 (83%)	704 (81%)	162 (19%)	1	5

5 of 162 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	599	THR
1	G	542	MET
1	E	640	VAL
1	E	677	LEU
1	G	619	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 19 such sidechains are listed below:

Mol	Chain	Res	Type
1	E	553	HIS
1	G	615	ASN
1	G	653	HIS
1	E	616	ASN
1	B	595	ASN

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 20 ligands modelled in this entry, 16 are monoatomic - leaving 4 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	SO4	A	731	-	4,4,4	0.29	0	6,6,6	0.29	0
3	SO4	E	731	-	4,4,4	0.20	0	6,6,6	0.35	0
3	SO4	G	731	-	4,4,4	0.30	0	6,6,6	0.14	0
3	SO4	B	2	-	4,4,4	0.27	0	6,6,6	0.20	0

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	248/298 (83%)	-1.52	0 100 100	37, 61, 71, 80	0
1	B	242/298 (81%)	-1.51	0 100 100	41, 63, 83, 104	0
1	E	248/298 (83%)	-1.49	0 100 100	41, 61, 74, 90	0
1	G	244/298 (81%)	-1.52	0 100 100	45, 63, 80, 109	0
All	All	982/1192 (82%)	-1.51	0 100 100	37, 62, 77, 109	0

There are no RSRZ outliers to report.

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
2	CA	E	1	1/1	0.99	0.02	67,67,67,67	0
2	CA	G	3	1/1	0.99	0.02	68,68,68,68	0
3	SO4	E	731	5/5	0.99	0.03	57,61,67,67	0
2	CA	A	4	1/1	1.00	0.02	53,53,53,53	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	CA	B	1	1/1	1.00	0.01	69,69,69,69	0
2	CA	B	731	1/1	1.00	0.01	56,56,56,56	0
2	CA	B	3	1/1	1.00	0.01	52,52,52,52	0
2	CA	B	4	1/1	1.00	0.02	56,56,56,56	0
2	CA	A	1	1/1	1.00	0.02	57,57,57,57	0
2	CA	E	2	1/1	1.00	0.02	57,57,57,57	0
2	CA	E	3	1/1	1.00	0.02	47,47,47,47	0
2	CA	E	4	1/1	1.00	0.02	47,47,47,47	0
2	CA	G	1	1/1	1.00	0.01	51,51,51,51	0
2	CA	G	2	1/1	1.00	0.01	46,46,46,46	0
2	CA	A	2	1/1	1.00	0.02	49,49,49,49	0
2	CA	G	4	1/1	1.00	0.01	51,51,51,51	0
3	SO4	A	731	5/5	1.00	0.02	55,55,59,67	0
3	SO4	B	2	5/5	1.00	0.03	61,62,70,71	0
2	CA	A	3	1/1	1.00	0.01	48,48,48,48	0
3	SO4	G	731	5/5	1.00	0.02	50,58,65,69	0

6.5 Other polymers [i](#)

There are no such residues in this entry.