



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 11:22 AM UTC

PDB ID : 6DJ3 / pdb_00006dj3
Title : Crystal structure of CNNM2 cyclic nucleotide-binding homology domain
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Deposited on : 2018-05-24
Resolution : 2.60 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
Mogul : 2022.3.0, CSD as543be (2022)
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

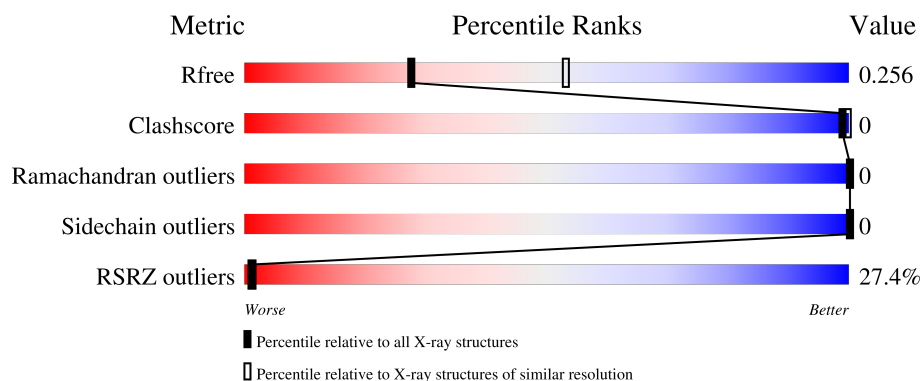
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 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	4008 (2.60-2.60)
Clashscore	190562	4347 (2.60-2.60)
Ramachandran outliers	187476	4277 (2.60-2.60)
Sidechain outliers	187428	4277 (2.60-2.60)
RSRZ outliers	180081	4008 (2.60-2.60)

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	199	15% 71% 27%
1	B	199	27% 79% 21%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4653 atoms, of which 2286 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 Metal transporter CNNM2.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	145	Total	C	H	N	O	S	0	0	0
			2219	729	1093	182	209	6			
1	B	158	Total	C	H	N	O	S	0	0	0
			2381	779	1175	195	226	6			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	580	GLY	-	expression tag	UNP Q9H8M5
A	581	PRO	-	expression tag	UNP Q9H8M5
A	582	LEU	-	expression tag	UNP Q9H8M5
A	583	GLY	-	expression tag	UNP Q9H8M5
A	584	SER	-	expression tag	UNP Q9H8M5
A	767	VAL	-	linker	UNP Q9H8M5
B	580	GLY	-	expression tag	UNP Q9H8M5
B	581	PRO	-	expression tag	UNP Q9H8M5
B	582	LEU	-	expression tag	UNP Q9H8M5
B	583	GLY	-	expression tag	UNP Q9H8M5
B	584	SER	-	expression tag	UNP Q9H8M5
B	723	VAL	-	linker	UNP Q9H8M5

- Molecule 2 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C₂H₆O₂).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	H	O	0	0
			10	2	6	2		
2	B	1	Total	C	H	O	0	0
			10	2	6	2		
2	B	1	Total	C	H	O	0	0
			10	2	6	2		

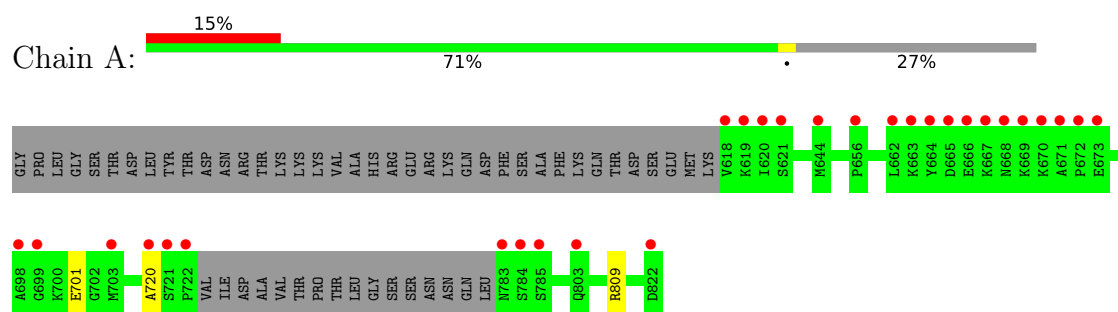
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	13	Total	O	0	0
			13	13		
3	B	10	Total	O	0	0
			10	10		

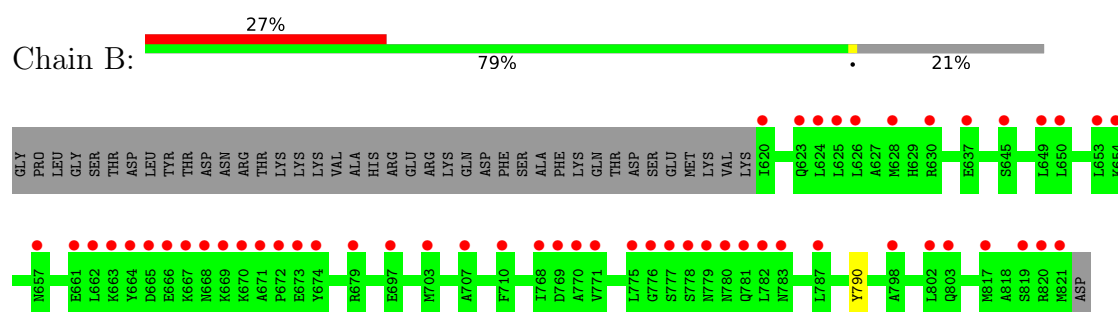
3 Residue-property plots [i](#)

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: Metal transporter CNNM2



• Molecule 1: Metal transporter CNNM2



4 Data and refinement statistics

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α , β , γ	110.58Å 110.58Å 84.60Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	47.90 – 2.60 47.90 – 2.60	Depositor EDS
% Data completeness (in resolution range)	63.3 (47.90-2.60) 51.5 (47.90-2.60)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.09	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.48 (at 2.61Å)	Xtriage
Refinement program	PHENIX 1.12-2829	Depositor
R, R_{free}	0.219 , 0.251 0.221 , 0.256	Depositor DCC
R_{free} test set	1441 reflections (10.00%)	wwPDB-VP
Wilson B-factor (Å ²)	33.5	Xtriage
Anisotropy	0.135	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 53.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.032 for -h,-k,l	Xtriage
F_o, F_c correlation	0.88	EDS
Total number of atoms	4653	wwPDB-VP
Average B, all atoms (Å ²)	57.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.09% 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: EDO

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	0.10	0/1149	0.27	0/1559
1	B	0.09	0/1231	0.28	0/1675
All	All	0.10	0/2380	0.27	0/3234

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

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	1126	1093	1093	2	0
1	B	1206	1175	1174	1	0
2	A	4	6	6	0	0
2	B	8	12	12	0	0
3	A	13	0	0	0	0
3	B	10	0	0	0	0
All	All	2367	2286	2285	2	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 0.

All (2) 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:701:GLU:OE2	1:B:790:TYR:OH	2.10	0.69
1:A:720:ALA:O	1:A:809:ARG:NH2	2.40	0.47

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	141/199 (71%)	137 (97%)	4 (3%)	0	100	100
1	B	156/199 (78%)	151 (97%)	5 (3%)	0	100	100
All	All	297/398 (75%)	288 (97%)	9 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	117/177 (66%)	117 (100%)	0	100	100
1	B	126/177 (71%)	126 (100%)	0	100	100
All	All	243/354 (69%)	243 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	680	ASN
1	B	691	GLN
1	B	781	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](#)

3 ligands are modelled in this entry.

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	$\# Z > 2$
2	EDO	B	902	-	3,3,3	0.43	0	2,2,2	0.35	0
2	EDO	B	901	-	3,3,3	0.40	0	2,2,2	0.39	0
2	EDO	A	901	-	3,3,3	0.46	0	2,2,2	0.28	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	EDO	B	902	-	-	0/1/1/1	-
2	EDO	B	901	-	-	1/1/1/1	-
2	EDO	A	901	-	-	0/1/1/1	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	901	EDO	O1-C1-C2-O2

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

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	145/199 (72%)	1.08	29 (20%)	3 2	17, 38, 105, 193	0
1	B	158/199 (79%)	1.97	54 (34%)	1 1	23, 59, 167, 353	0
All	All	303/398 (76%)	1.54	83 (27%)	1 1	17, 48, 137, 353	0

All (83) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	666	GLU	14.1
1	B	780	ASN	12.2
1	B	779	ASN	11.9
1	A	668	ASN	11.8
1	B	777	SER	10.8
1	B	778	SER	10.2
1	A	666	GLU	10.0
1	A	722	PRO	8.5
1	B	670	LYS	8.1
1	B	817	MET	8.0
1	A	669	LYS	7.9
1	B	668	ASN	7.0
1	B	667	LYS	6.8
1	A	783	ASN	6.6
1	B	776	GLY	6.4
1	B	625	LEU	5.9
1	B	781	GLN	5.5
1	B	623	GLN	5.2
1	B	664	TYR	5.2
1	A	667	LYS	5.1
1	B	782	LEU	5.0
1	B	663	LYS	4.9
1	A	618	VAL	4.7
1	A	619	LYS	4.6

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Mol	Chain	Res	Type	RSRZ
1	B	620	ILE	4.5
1	B	673	GLU	4.5
1	B	671	ALA	4.4
1	B	821	MET	4.3
1	A	663	LYS	4.2
1	B	802	LEU	4.2
1	A	673	GLU	4.0
1	A	672	PRO	3.9
1	B	628	MET	3.8
1	A	721	SER	3.7
1	B	665	ASP	3.6
1	B	674	TYR	3.6
1	B	770	ALA	3.6
1	B	679	ARG	3.5
1	B	637	GLU	3.5
1	A	670	LYS	3.5
1	B	669	LYS	3.5
1	B	769	ASP	3.5
1	B	662	LEU	3.4
1	B	820	ARG	3.4
1	B	626	LEU	3.3
1	B	803	GLN	3.2
1	A	720	ALA	3.2
1	A	698	ALA	3.1
1	A	784	SER	3.0
1	B	661	GLU	3.0
1	A	656	PRO	2.9
1	B	657	ASN	2.8
1	A	785	SER	2.8
1	A	664	TYR	2.7
1	B	649	LEU	2.7
1	B	775	LEU	2.6
1	A	665	ASP	2.6
1	B	654	LYS	2.6
1	B	630	ARG	2.6
1	A	620	ILE	2.5
1	B	697	GLU	2.5
1	A	803	GLN	2.5
1	B	787	LEU	2.4
1	B	703	MET	2.4
1	A	644	MET	2.4
1	A	822	ASP	2.3

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Mol	Chain	Res	Type	RSRZ
1	B	819	SER	2.3
1	A	662	LEU	2.3
1	A	621	SER	2.3
1	B	672	PRO	2.3
1	A	671	ALA	2.3
1	B	771	VAL	2.3
1	B	710	PHE	2.3
1	B	707	ALA	2.2
1	B	624	LEU	2.1
1	B	645	SER	2.1
1	B	653	LEU	2.1
1	B	768	ILE	2.1
1	B	798	ALA	2.1
1	B	783	ASN	2.1
1	A	703	MET	2.1
1	B	650	LEU	2.0
1	A	699	GLY	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 ⓘ

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($\text{\AA}^2$)	Q<0.9
2	EDO	A	901	4/4	0.84	0.23	27,40,53,55	0
2	EDO	B	901	4/4	0.92	0.13	27,33,43,51	0
2	EDO	B	902	4/4	0.96	0.13	59,72,80,80	0

6.5 Other polymers [i](#)

There are no such residues in this entry.