



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 05:40 PM GMT

PDB ID : 4IY3
Title : Structural and ligand binding properties of the Bateman domain of human magnesium transporters CNNM2 and CNNM4
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Deposited on : 2013-01-28
Resolution : 3.60 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
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

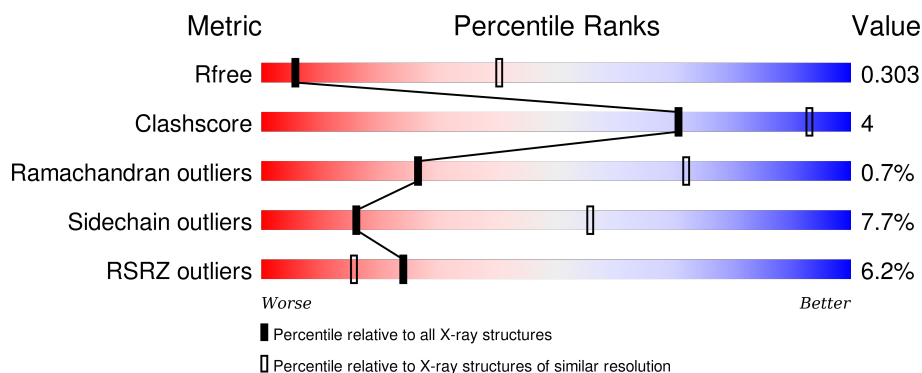
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.60 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}	91344	1408 (3.80-3.40)
Clashscore	102246	1010 (3.74-3.46)
Ramachandran outliers	100387	1007 (3.76-3.44)
Sidechain outliers	100360	1007 (3.76-3.44)
RSRZ outliers	91569	1003 (3.78-3.42)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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	153	<div> <div>4%</div> <div>73% 18% • 5%</div> </div>
1	B	153	<div> <div>7%</div> <div>78% 14% • 6%</div> </div>
1	C	153	<div> <div>7%</div> <div>81% 13% • •</div> </div>
1	D	153	<div> <div>7%</div> <div>81% 12% • 5%</div> </div>

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 4667 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 Metal transporter CNNM4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	B	144	Total	C	N	O	S	0	0	0
			1159	743	184	224	8			
1	C	147	Total	C	N	O	S	0	0	0
			1179	755	184	232	8			
1	D	145	Total	C	N	O	S	0	0	0
			1162	744	182	228	8			
1	A	145	Total	C	N	O	S	0	0	0
			1167	749	185	225	8			

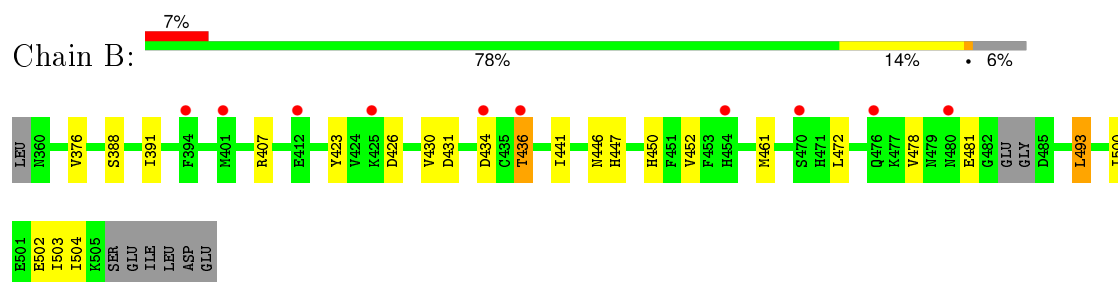
There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	376	VAL	ILE	CONFLICT	UNP Q6P4Q7
C	376	VAL	ILE	CONFLICT	UNP Q6P4Q7
D	376	VAL	ILE	CONFLICT	UNP Q6P4Q7
A	376	VAL	ILE	CONFLICT	UNP Q6P4Q7

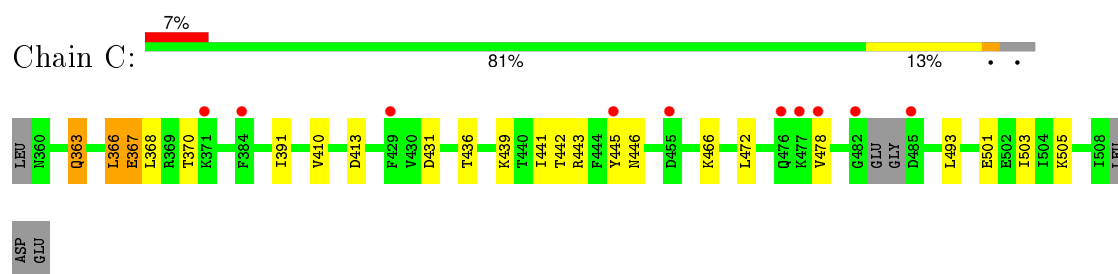
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

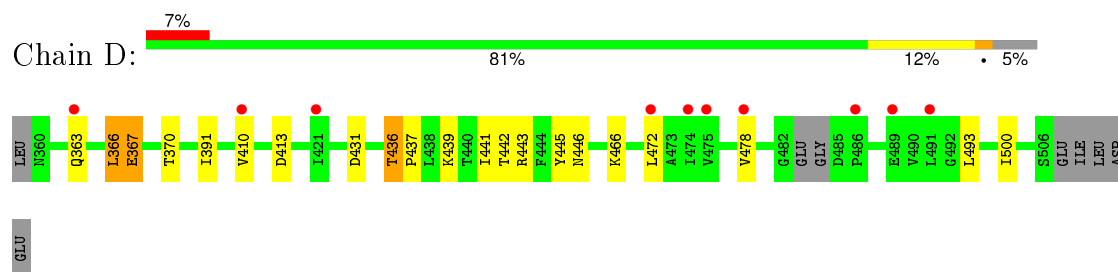
- Molecule 1: Metal transporter CNNM4



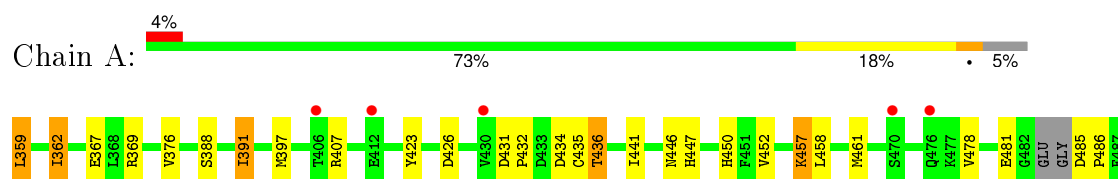
- Molecule 1: Metal transporter CNNM4



- Molecule 1: Metal transporter CNNM4



- Molecule 1: Metal transporter CNNM4





4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	91.41Å 141.89Å 87.88Å 90.00° 90.23° 90.00°	Depositor
Resolution (Å)	80.00 – 3.60 76.84 – 3.60	Depositor EDS
% Data completeness (in resolution range)	82.8 (80.00-3.60) 82.0 (76.84-3.60)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.54 (at 3.58Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.287 , 0.309 0.282 , 0.303	Depositor DCC
R_{free} test set	638 reflections (6.22%)	DCC
Wilson B-factor (Å ²)	96.3	Xtriage
Anisotropy	0.246	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 48.9	EDS
Estimated twinning fraction	0.450 for -h,-k,l	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.29$	Xtriage
Outliers	1 of 10808 reflections (0.009%)	Xtriage
F_o, F_c correlation	0.87	EDS
Total number of atoms	4667	wwPDB-VP
Average B, all atoms (Å ²)	101.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.93% 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, 0.375 respectively for untwinned datasets, and 0.333, 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	0.38	0/1187	0.48	0/1605
1	B	0.38	0/1179	0.47	0/1594
1	C	0.38	0/1199	0.47	0/1622
1	D	0.36	0/1182	0.47	0/1599
All	All	0.38	0/4747	0.47	0/6420

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 [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	1167	0	1155	15	0
1	B	1159	0	1144	9	0
1	C	1179	0	1157	11	0
1	D	1162	0	1140	11	0
All	All	4667	0	4596	41	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 4.

All (41) 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:C:366:LEU:HD22	1:D:363:GLN:HG3	1.73	0.70
1:A:500:ILE:HA	1:A:503:ILE:HD12	1.74	0.69
1:B:500:ILE:HA	1:B:503:ILE:HD12	1.77	0.67
1:D:472:LEU:HD21	1:D:493:LEU:HD11	1.81	0.62
1:C:439:LYS:HD3	1:C:443:ARG:CZ	2.30	0.61
1:B:426:ASP:OD2	1:B:447:HIS:NE2	2.35	0.59
1:C:410:VAL:HG11	1:C:442:THR:HG21	1.86	0.58
1:D:439:LYS:HD3	1:D:443:ARG:CZ	2.34	0.57
1:D:410:VAL:HG11	1:D:442:THR:HG21	1.86	0.57
1:C:368:LEU:HD11	1:C:503:ILE:HA	1.85	0.56
1:B:452:VAL:HG11	1:B:461:MET:HE1	1.87	0.55
1:A:426:ASP:OD2	1:A:447:HIS:NE2	2.40	0.55
1:C:366:LEU:HD13	1:D:363:GLN:CD	2.27	0.54
1:A:452:VAL:HG11	1:A:461:MET:HE1	1.89	0.53
1:C:366:LEU:O	1:C:370:THR:OG1	2.25	0.53
1:B:434:ASP:HB2	1:B:436:THR:HG22	1.90	0.53
1:C:439:LYS:HD3	1:C:443:ARG:NH1	2.24	0.52
1:A:434:ASP:HB2	1:A:436:THR:HG22	1.92	0.51
1:D:472:LEU:HG	1:D:493:LEU:HD21	1.93	0.51
1:D:500:ILE:HD12	1:A:503:ILE:HG21	1.97	0.47
1:C:501:GLU:HB3	1:C:505:LYS:HZ2	1.79	0.47
1:B:376:VAL:HG22	1:B:502:GLU:HG3	1.97	0.46
1:B:407:ARG:HE	1:B:423:TYR:HE1	1.63	0.45
1:B:504:ILE:O	1:C:466:LYS:HG3	2.17	0.44
1:A:391:ILE:HD12	1:A:435:CYS:HB3	1.98	0.44
1:D:466:LYS:HG3	1:A:504:ILE:O	2.18	0.43
1:D:363:GLN:O	1:D:367:GLU:HB3	2.17	0.43
1:A:376:VAL:HG22	1:A:502:GLU:HG3	2.00	0.43
1:D:366:LEU:O	1:D:370:THR:OG1	2.29	0.43
1:A:359:LEU:O	1:A:362:ILE:HG22	2.19	0.43
1:A:407:ARG:HE	1:A:423:TYR:HE1	1.64	0.43
1:A:397:MET:HG3	1:A:432:PRO:HB3	2.01	0.42
1:C:472:LEU:HD21	1:C:493:LEU:HD13	2.00	0.42
1:D:436:THR:HA	1:D:437:PRO:HD3	1.88	0.42
1:C:363:GLN:O	1:C:367:GLU:HB3	2.20	0.41
1:B:472:LEU:HD11	1:B:493:LEU:HD13	2.02	0.41
1:A:369:ARG:O	1:A:457:LYS:HG2	2.21	0.41
1:A:376:VAL:HG13	1:A:502:GLU:HG3	2.03	0.41
1:A:485:ASP:HA	1:A:486:PRO:HD3	1.92	0.41
1:A:376:VAL:HG21	1:A:458:LEU:HD11	2.04	0.40
1:B:430:VAL:HG13	1:B:436:THR:HG21	2.03	0.40

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	A	141/153 (92%)	136 (96%)	4 (3%)	1 (1%)	26	72
1	B	140/153 (92%)	137 (98%)	2 (1%)	1 (1%)	26	72
1	C	143/153 (94%)	134 (94%)	8 (6%)	1 (1%)	26	72
1	D	141/153 (92%)	133 (94%)	7 (5%)	1 (1%)	26	72
All	All	565/612 (92%)	540 (96%)	21 (4%)	4 (1%)	26	72

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	481	GLU
1	C	413	ASP
1	D	413	ASP
1	A	481	GLU

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	A	133/142 (94%)	120 (90%)	13 (10%)	10	44
1	B	132/142 (93%)	123 (93%)	9 (7%)	20	61
1	C	135/142 (95%)	125 (93%)	10 (7%)	17	57
1	D	133/142 (94%)	124 (93%)	9 (7%)	20	61
All	All	533/568 (94%)	492 (92%)	41 (8%)	16	56

All (41) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	388	SER
1	B	391	ILE
1	B	431	ASP
1	B	436	THR
1	B	441	ILE
1	B	446	ASN
1	B	450	HIS
1	B	478	VAL
1	B	493	LEU
1	C	363	GLN
1	C	366	LEU
1	C	367	GLU
1	C	391	ILE
1	C	431	ASP
1	C	436	THR
1	C	441	ILE
1	C	445	TYR
1	C	446	ASN
1	C	478	VAL
1	D	366	LEU
1	D	367	GLU
1	D	391	ILE
1	D	431	ASP
1	D	436	THR
1	D	441	ILE
1	D	445	TYR
1	D	446	ASN
1	D	478	VAL
1	A	359	LEU
1	A	362	ILE
1	A	367	GLU
1	A	388	SER
1	A	391	ILE
1	A	431	ASP
1	A	436	THR
1	A	441	ILE
1	A	446	ASN
1	A	450	HIS
1	A	457	LYS
1	A	478	VAL
1	A	493	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	C	363	GLN
1	D	363	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 carbohydrates 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	A	145/153 (94%)	0.72	6 (4%) 41 29	69, 94, 114, 126	0
1	B	144/153 (94%)	0.73	10 (6%) 20 13	69, 94, 115, 127	0
1	C	147/153 (96%)	0.76	10 (6%) 20 13	81, 109, 137, 139	0
1	D	145/153 (94%)	0.73	10 (6%) 20 13	80, 108, 137, 139	0
All	All	581/612 (94%)	0.73	36 (6%) 24 16	69, 100, 132, 139	0

All (36) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	482	GLY	4.2
1	C	476	GLN	3.7
1	D	363	GLN	3.7
1	C	477	LYS	3.2
1	D	489	GLU	3.1
1	C	429	PHE	2.9
1	D	410	VAL	2.9
1	B	476	GLN	2.8
1	D	475	VAL	2.8
1	A	470	SER	2.7
1	A	412	GLU	2.6
1	C	485	ASP	2.6
1	A	406	THR	2.5
1	A	430	VAL	2.5
1	D	486	PRO	2.5
1	D	491	LEU	2.4
1	C	455	ASP	2.4
1	B	480	ASN	2.4
1	C	445	TYR	2.4
1	C	478	VAL	2.4
1	C	384	PHE	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	476	GLN	2.3
1	D	421	ILE	2.3
1	B	394	PHE	2.3
1	C	371	LYS	2.3
1	B	434	ASP	2.2
1	A	488	TYR	2.2
1	D	472	LEU	2.2
1	B	425	LYS	2.2
1	D	478	VAL	2.2
1	B	401	MET	2.2
1	D	474	ILE	2.2
1	B	436	THR	2.1
1	B	470	SER	2.1
1	B	412	GLU	2.1
1	B	454	HIS	2.0

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 carbohydrates 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.