



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 14, 2026 – 04:41 PM UTC

PDB ID : 4Q7L / pdb_00004q7l
Title : Structure of NBD288 of TM287/288
Authors : Bukowska, M.A.; Hohl, M.; Gruetter, M.G.; Seeger, M.A.
Deposited on : 2014-04-25
Resolution : 2.35 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
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

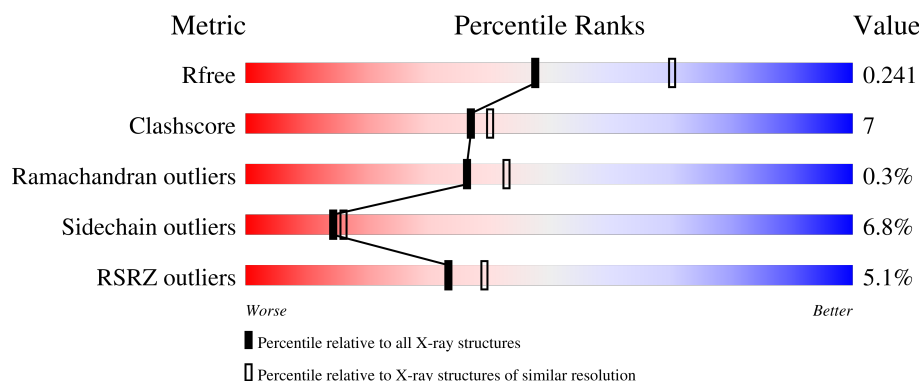
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.35 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	1596 (2.36-2.36)
Clashscore	190562	1663 (2.36-2.36)
Ramachandran outliers	187476	1646 (2.36-2.36)
Sidechain outliers	187428	1646 (2.36-2.36)
RSRZ outliers	180081	1598 (2.36-2.36)

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	256	4% 82% 16% .
1	B	256	7% 76% 18% .
1	C	256	4% 72% 20% .

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 6168 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 Uncharacterized ABC transporter ATP-binding protein TM_0288.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	255	Total	C	N	O	S	0	2	0
			2039	1302	345	388	4			
1	B	248	Total	C	N	O	S	0	0	0
			1976	1267	333	372	4			
1	C	239	Total	C	N	O	S	0	3	0
			1934	1239	327	364	4			

There are 30 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	351	MET	-	initiating methionine	UNP Q9WYC4
A	352	SER	-	expression tag	UNP Q9WYC4
A	599	ALA	-	expression tag	UNP Q9WYC4
A	600	ALA	-	expression tag	UNP Q9WYC4
A	601	LEU	-	expression tag	UNP Q9WYC4
A	602	GLU	-	expression tag	UNP Q9WYC4
A	603	VAL	-	expression tag	UNP Q9WYC4
A	604	LEU	-	expression tag	UNP Q9WYC4
A	605	PHE	-	expression tag	UNP Q9WYC4
A	606	GLN	-	expression tag	UNP Q9WYC4
B	351	MET	-	initiating methionine	UNP Q9WYC4
B	352	SER	-	expression tag	UNP Q9WYC4
B	599	ALA	-	expression tag	UNP Q9WYC4
B	600	ALA	-	expression tag	UNP Q9WYC4
B	601	LEU	-	expression tag	UNP Q9WYC4
B	602	GLU	-	expression tag	UNP Q9WYC4
B	603	VAL	-	expression tag	UNP Q9WYC4
B	604	LEU	-	expression tag	UNP Q9WYC4
B	605	PHE	-	expression tag	UNP Q9WYC4
B	606	GLN	-	expression tag	UNP Q9WYC4
C	351	MET	-	initiating methionine	UNP Q9WYC4
C	352	SER	-	expression tag	UNP Q9WYC4
C	599	ALA	-	expression tag	UNP Q9WYC4

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
C	600	ALA	-	expression tag	UNP Q9WYC4
C	601	LEU	-	expression tag	UNP Q9WYC4
C	602	GLU	-	expression tag	UNP Q9WYC4
C	603	VAL	-	expression tag	UNP Q9WYC4
C	604	LEU	-	expression tag	UNP Q9WYC4
C	605	PHE	-	expression tag	UNP Q9WYC4
C	606	GLN	-	expression tag	UNP Q9WYC4

- Molecule 2 is NICKEL (II) ION (CCD ID: NI) (formula: Ni).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	B	1	Total Ni 1 1	0	0

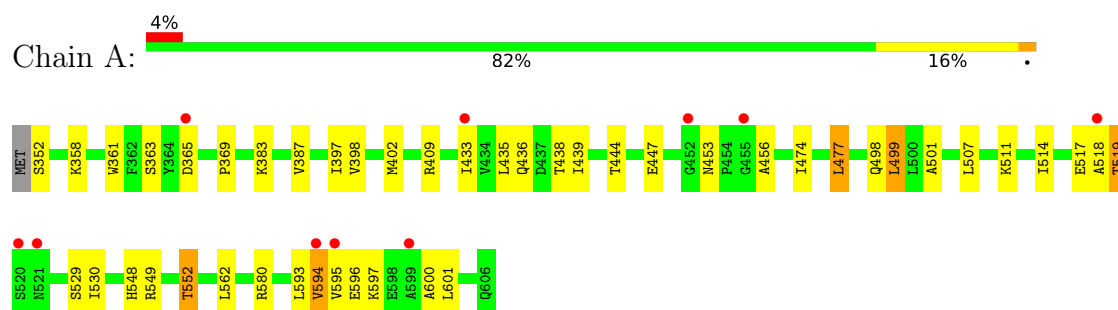
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	111	Total O 111 111	0	0
3	B	47	Total O 47 47	0	0
3	C	60	Total O 60 60	0	0

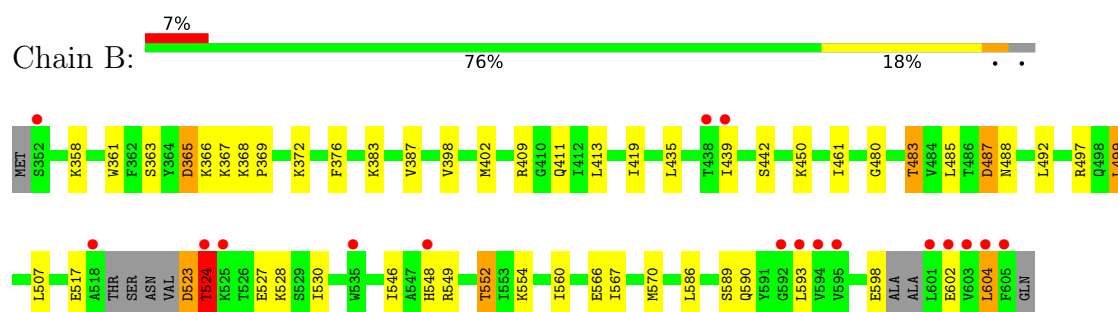
3 Residue-property plots

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.

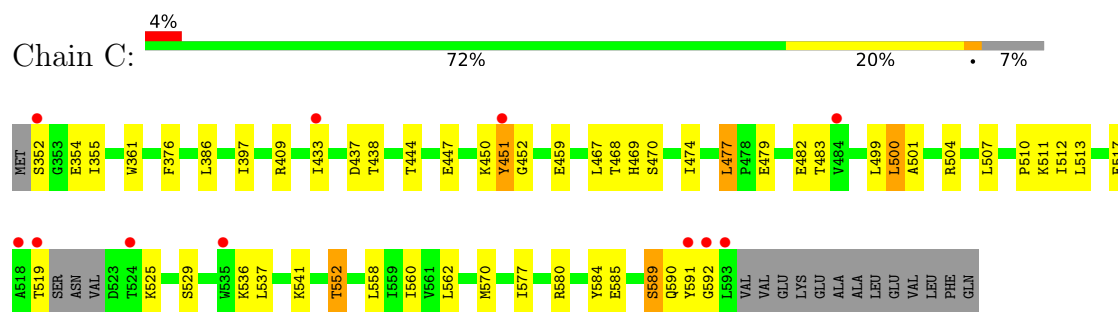
- Molecule 1: Uncharacterized ABC transporter ATP-binding protein TM_0288



- Molecule 1: Uncharacterized ABC transporter ATP-binding protein TM_0288



- Molecule 1: Uncharacterized ABC transporter ATP-binding protein TM_0288



4 Data and refinement statistics

Property	Value	Source
Space group	P 32	Depositor
Cell constants a, b, c, α , β , γ	95.93Å 95.93Å 88.51Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	47.97 – 2.35 47.97 – 2.35	Depositor EDS
% Data completeness (in resolution range)	99.2 (47.97-2.35) 99.3 (47.97-2.35)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.79 (at 2.34Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.9_1678)	Depositor
R, R_{free}	0.193 , 0.236 0.200 , 0.241	Depositor DCC
R_{free} test set	1885 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	44.4	Xtriage
Anisotropy	0.059	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 42.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.005 for -h,-k,l 0.035 for h,-h-k,-l 0.015 for -k,-h,-l	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	6168	wwPDB-VP
Average B, all atoms (Å ²)	56.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 37.06 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 4.5411e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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:
NI

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	0.39	0/2071	0.75	1/2792 (0.0%)
1	B	0.32	0/2006	0.77	1/2699 (0.0%)
1	C	0.35	0/1967	0.69	0/2650
All	All	0.35	0/6044	0.74	2/8141 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	487	ASP	N-CA-C	7.15	121.52	111.52
1	A	594	VAL	N-CA-C	5.88	116.06	110.42

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	2039	0	2090	26	0
1	B	1976	0	2035	30	1
1	C	1934	0	1976	30	0
2	B	1	0	0	0	0
3	A	111	0	0	7	0
3	B	47	0	0	4	1

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	60	0	0	3	0
All	All	6168	0	6101	86	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 7.

The worst 5 of 86 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:548:HIS:ND1	3:A:801:HOH:O	1.95	0.97
1:A:593:LEU:O	3:A:787:HOH:O	2.03	0.76
1:B:524:THR:OG1	3:B:847:HOH:O	2.06	0.73
1:A:580:ARG:HD2	3:A:792:HOH:O	1.90	0.70
1:B:383:LYS:NZ	3:B:837:HOH:O	2.23	0.70

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:589:SER:O	3:B:822:HOH:O[3_575]	1.97	0.23

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	255/256 (100%)	248 (97%)	7 (3%)	0	100	100
1	B	242/256 (94%)	235 (97%)	6 (2%)	1 (0%)	30	34
1	C	238/256 (93%)	228 (96%)	9 (4%)	1 (0%)	30	34
All	All	735/768 (96%)	711 (97%)	22 (3%)	2 (0%)	36	43

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	591	TYR
1	B	524	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	225/224 (100%)	213 (95%)	12 (5%)	20	25
1	B	218/224 (97%)	200 (92%)	18 (8%)	10	11
1	C	212/224 (95%)	197 (93%)	15 (7%)	13	15
All	All	655/672 (98%)	610 (93%)	45 (7%)	14	16

5 of 45 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	602	GLU
1	C	479	GLU
1	B	604	LEU
1	C	451[B]	TYR
1	C	499	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	411	GLN
1	B	436	GLN
1	B	494	GLN
1	B	548	HIS
1	C	411	GLN

5.3.3 RNA [i](#)

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 ⓘ

Of 1 ligands modelled in this entry, 1 is 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 ⓘ

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 [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	255/256 (99%)	0.15	10 (3%) 43 49	23, 44, 87, 119	2 (0%)
1	B	248/256 (96%)	0.67	17 (6%) 23 26	38, 58, 98, 117	0
1	C	239/256 (93%)	0.50	11 (4%) 37 43	27, 52, 92, 109	3 (1%)
All	All	742/768 (96%)	0.44	38 (5%) 33 39	23, 53, 92, 119	5 (0%)

The worst 5 of 38 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	603	VAL	5.8
1	A	595	VAL	5.6
1	C	451[A]	TYR	5.0
1	C	519	THR	4.4
1	B	605	PHE	4.4

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($\text{\AA}^2$)	Q<0.9
2	NI	B	701	1/1	0.99	0.05	64,64,64,64	0

6.5 Other polymers [i](#)

There are no such residues in this entry.