



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 5, 2026 – 09:59 PM UTC

PDB ID : 4Q28 / pdb_00004q28
Title : Crystal Structure of the Plectin 1 and 2 Repeats of the Human Periplakin.
Northeast Structural Genomics Consortium (NESG) Target HR9083A
Authors : Vorobiev, S.; Lew, S.; Seetharaman, J.; Janjua, H.; Xiao, R.; O'Connell, P.T.;
Maglaqui, M.; Wang, D.; Everett, J.K.; Acton, T.B.; Montelione, G.T.; Tong,
L.; Hunt, J.F.; Northeast Structural Genomics Consortium (NESG)
Deposited on : 2014-04-07
Resolution : 2.64 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)
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

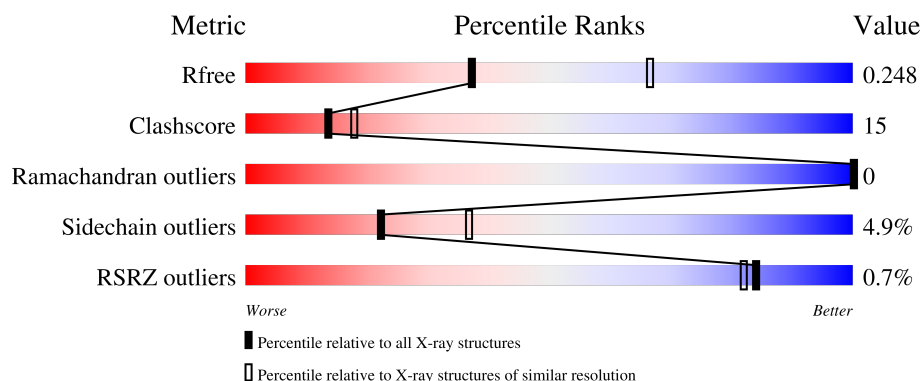
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.64 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	2053 (2.66-2.62)
Clashscore	190562	2097 (2.66-2.62)
Ramachandran outliers	187476	2066 (2.66-2.62)
Sidechain outliers	187428	2066 (2.66-2.62)
RSRZ outliers	180081	2052 (2.66-2.62)

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	113	% 58% 38% ..
1	B	113	% 61% 32% ...
1	C	113	% 66% 27% ..
1	D	113	69% 26% ..

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 3575 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 Periplakin.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	110	Total	C	N	O	S	Se	0	0	0
			883	545	169	165	1	3			
1	B	110	Total	C	N	O	S	Se	0	0	0
			883	545	169	165	1	3			
1	C	109	Total	C	N	O	S	Se	0	0	0
			879	543	168	164	1	3			
1	D	109	Total	C	N	O	S	Se	0	0	0
			879	543	168	164	1	3			

There are 44 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1644	MSE	-	expression tag	UNP O60437
A	1645	GLY	-	expression tag	UNP O60437
A	1646	HIS	-	expression tag	UNP O60437
A	1647	HIS	-	expression tag	UNP O60437
A	1648	HIS	-	expression tag	UNP O60437
A	1649	HIS	-	expression tag	UNP O60437
A	1650	HIS	-	expression tag	UNP O60437
A	1651	HIS	-	expression tag	UNP O60437
A	1652	SER	-	expression tag	UNP O60437
A	1653	HIS	-	expression tag	UNP O60437
A	1654	MSE	-	expression tag	UNP O60437
B	1644	MSE	-	expression tag	UNP O60437
B	1645	GLY	-	expression tag	UNP O60437
B	1646	HIS	-	expression tag	UNP O60437
B	1647	HIS	-	expression tag	UNP O60437
B	1648	HIS	-	expression tag	UNP O60437
B	1649	HIS	-	expression tag	UNP O60437
B	1650	HIS	-	expression tag	UNP O60437
B	1651	HIS	-	expression tag	UNP O60437
B	1652	SER	-	expression tag	UNP O60437
B	1653	HIS	-	expression tag	UNP O60437

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Chain	Residue	Modelled	Actual	Comment	Reference
B	1654	MSE	-	expression tag	UNP O60437
C	1644	MSE	-	expression tag	UNP O60437
C	1645	GLY	-	expression tag	UNP O60437
C	1646	HIS	-	expression tag	UNP O60437
C	1647	HIS	-	expression tag	UNP O60437
C	1648	HIS	-	expression tag	UNP O60437
C	1649	HIS	-	expression tag	UNP O60437
C	1650	HIS	-	expression tag	UNP O60437
C	1651	HIS	-	expression tag	UNP O60437
C	1652	SER	-	expression tag	UNP O60437
C	1653	HIS	-	expression tag	UNP O60437
C	1654	MSE	-	expression tag	UNP O60437
D	1644	MSE	-	expression tag	UNP O60437
D	1645	GLY	-	expression tag	UNP O60437
D	1646	HIS	-	expression tag	UNP O60437
D	1647	HIS	-	expression tag	UNP O60437
D	1648	HIS	-	expression tag	UNP O60437
D	1649	HIS	-	expression tag	UNP O60437
D	1650	HIS	-	expression tag	UNP O60437
D	1651	HIS	-	expression tag	UNP O60437
D	1652	SER	-	expression tag	UNP O60437
D	1653	HIS	-	expression tag	UNP O60437
D	1654	MSE	-	expression tag	UNP O60437

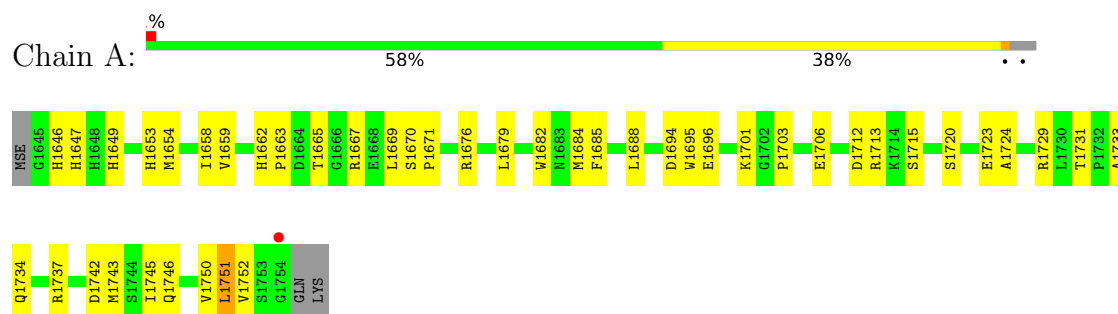
- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	12	Total O 12 12	0	0
2	B	10	Total O 10 10	0	0
2	C	13	Total O 13 13	0	0
2	D	16	Total O 16 16	0	0

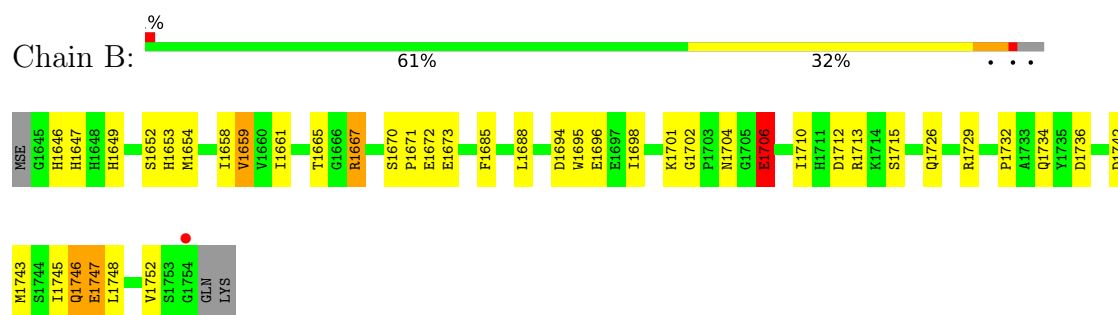
3 Residue-property plots [i](#)

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.

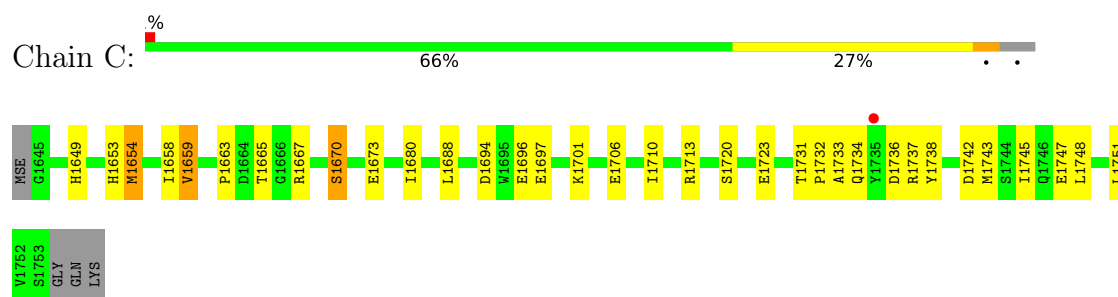
• Molecule 1: Periplakin



• Molecule 1: Periplakin



• Molecule 1: Periplakin



• Molecule 1: Periplakin



MSF	G1645	H1646	H1647	M1654	V1659	H1662	P1663	S1670	P1671	L1679	V1682	V1686	D1694	E1697	K1701	G1702	P1703	N1704	G1705	E1706	I1710	R1713	S1720	I1721	E1722	E1723	A1724	R1729	Y1735	V1739	S1744	I1745	Q1746	E1747	S1753	GLY	GLN	LYS
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4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	68.24Å 68.24Å 192.59Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	34.12 – 2.64 34.12 – 2.64	Depositor EDS
% Data completeness (in resolution range)	99.4 (34.12-2.64) 99.2 (34.12-2.64)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.77 (at 2.65Å)	Xtriage
Refinement program	PHENIX 1.7.2_869	Depositor
R, R_{free}	0.214 , 0.257 0.212 , 0.248	Depositor DCC
R_{free} test set	793 reflections (4.96%)	wwPDB-VP
Wilson B-factor (Å ²)	62.8	Xtriage
Anisotropy	0.198	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.28 , 36.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.038 for -h,-k,l	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	3575	wwPDB-VP
Average B, all atoms (Å ²)	73.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.88% 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](#)

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	0.48	0/901	0.98	1/1208 (0.1%)
1	B	0.42	0/901	0.94	1/1208 (0.1%)
1	C	0.42	0/897	0.95	1/1203 (0.1%)
1	D	0.45	0/897	0.96	3/1203 (0.2%)
All	All	0.44	0/3596	0.96	6/4822 (0.1%)

There are no bond length outliers.

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	1670	SER	N-CA-C	-6.27	100.98	110.39
1	D	1702	GLY	CA-C-N	6.27	125.76	119.24
1	D	1702	GLY	C-N-CA	6.27	125.76	119.24
1	B	1706	GLU	N-CA-C	6.21	118.64	108.52
1	A	1684	MSE	N-CA-C	-5.81	104.91	112.23

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	883	0	850	32	0
1	B	883	0	850	30	0
1	C	879	0	847	24	0
1	D	879	0	847	27	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	12	0	0	0	0
2	B	10	0	0	1	0
2	C	13	0	0	1	0
2	D	16	0	0	1	0
All	All	3575	0	3394	101	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 15.

The worst 5 of 101 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:1654:MSE:HB3	1:A:1745:ILE:HD12	1.59	0.85
1:A:1734:GLN:HB3	1:A:1743:MSE:HE1	1.69	0.74
1:B:1734:GLN:HB3	1:B:1743:MSE:HE1	1.69	0.74
1:C:1701:LYS:HG2	1:C:1706:GLU:HG2	1.71	0.71
1:D:1694:ASP:HB3	1:D:1713:ARG:HB2	1.73	0.70

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	108/113 (96%)	102 (94%)	6 (6%)	0	100	100
1	B	108/113 (96%)	104 (96%)	4 (4%)	0	100	100
1	C	107/113 (95%)	105 (98%)	2 (2%)	0	100	100
1	D	107/113 (95%)	101 (94%)	6 (6%)	0	100	100
All	All	430/452 (95%)	412 (96%)	18 (4%)	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	97/96 (101%)	93 (96%)	4 (4%)	27	44
1	B	97/96 (101%)	88 (91%)	9 (9%)	8	12
1	C	97/96 (101%)	92 (95%)	5 (5%)	21	34
1	D	97/96 (101%)	96 (99%)	1 (1%)	68	80
All	All	388/384 (101%)	369 (95%)	19 (5%)	22	37

5 of 19 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	1659	VAL
1	C	1751	LEU
1	D	1659	VAL
1	C	1742	ASP
1	B	1726	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 13 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	1653	HIS
1	C	1691	GLN
1	D	1711	HIS
1	D	1649	HIS
1	D	1691	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](#)

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 [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	107/113 (94%)	-0.11	1 (0%) 81 78	43, 65, 99, 116	0
1	B	107/113 (94%)	-0.07	1 (0%) 81 78	46, 70, 104, 127	0
1	C	106/113 (93%)	-0.14	1 (0%) 81 78	48, 69, 116, 133	0
1	D	106/113 (93%)	-0.11	0 100 100	45, 69, 112, 125	0
All	All	426/452 (94%)	-0.11	3 (0%) 84 82	43, 68, 110, 133	0

All (3) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1754	GLY	2.5
1	C	1735	TYR	2.4
1	B	1754	GLY	2.3

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](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.