



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 15, 2026 – 02:56 AM UTC

PDB ID : 4NPP / pdb_00004npp
Title : The GLIC-His10 wild-type structure in equilibrium between the open and locally-closed (LC) forms
Authors : Sauguet, L.; Shahsavar, A.; Poitevin, F.; Huon, C.; Menny, A.; Nemezc, A.; Haouz, A.; Changeux, J.P.; Corringer, P.J.; Delarue, M.
Deposited on : 2013-11-22
Resolution : 3.35 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

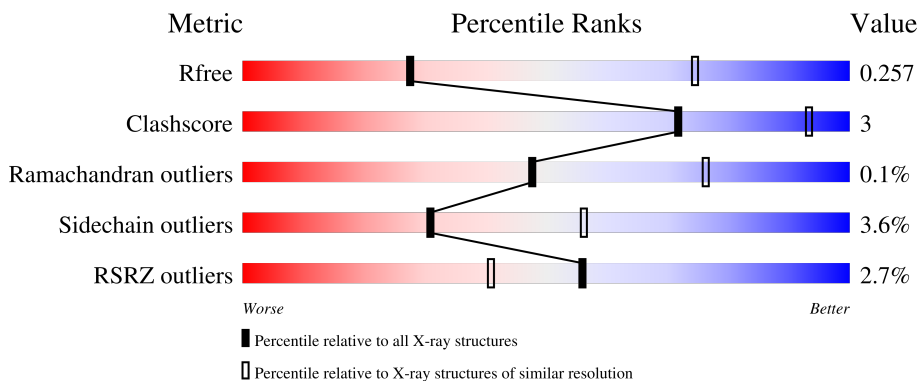
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.35 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	1099 (3.40-3.32)
Clashscore	190562	1116 (3.40-3.32)
Ramachandran outliers	187476	1101 (3.40-3.32)
Sidechain outliers	187428	1101 (3.40-3.32)
RSRZ outliers	180081	1099 (3.40-3.32)

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	329	
1	B	329	
1	C	329	
1	D	329	
1	E	329	

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 13465 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 Proton-gated ion channel.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	311	2692	1775	430	482	5	0	21	0
1	B	311	2692	1775	430	482	5	0	21	0
1	C	311	2692	1775	430	482	5	0	21	0
1	D	311	2692	1775	430	482	5	0	21	0
1	E	311	2692	1775	430	482	5	0	21	0

There are 65 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	ALA	-	expression tag	UNP Q7NDN8
A	318	GLY	-	expression tag	UNP Q7NDN8
A	319	GLY	-	expression tag	UNP Q7NDN8
A	320	HIS	-	expression tag	UNP Q7NDN8
A	321	HIS	-	expression tag	UNP Q7NDN8
A	322	HIS	-	expression tag	UNP Q7NDN8
A	323	HIS	-	expression tag	UNP Q7NDN8
A	324	HIS	-	expression tag	UNP Q7NDN8
A	325	HIS	-	expression tag	UNP Q7NDN8
A	326	HIS	-	expression tag	UNP Q7NDN8
A	327	HIS	-	expression tag	UNP Q7NDN8
A	328	HIS	-	expression tag	UNP Q7NDN8
A	329	HIS	-	expression tag	UNP Q7NDN8
B	1	ALA	-	expression tag	UNP Q7NDN8
B	318	GLY	-	expression tag	UNP Q7NDN8
B	319	GLY	-	expression tag	UNP Q7NDN8
B	320	HIS	-	expression tag	UNP Q7NDN8
B	321	HIS	-	expression tag	UNP Q7NDN8
B	322	HIS	-	expression tag	UNP Q7NDN8

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Chain	Residue	Modelled	Actual	Comment	Reference
B	323	HIS	-	expression tag	UNP Q7NDN8
B	324	HIS	-	expression tag	UNP Q7NDN8
B	325	HIS	-	expression tag	UNP Q7NDN8
B	326	HIS	-	expression tag	UNP Q7NDN8
B	327	HIS	-	expression tag	UNP Q7NDN8
B	328	HIS	-	expression tag	UNP Q7NDN8
B	329	HIS	-	expression tag	UNP Q7NDN8
C	1	ALA	-	expression tag	UNP Q7NDN8
C	318	GLY	-	expression tag	UNP Q7NDN8
C	319	GLY	-	expression tag	UNP Q7NDN8
C	320	HIS	-	expression tag	UNP Q7NDN8
C	321	HIS	-	expression tag	UNP Q7NDN8
C	322	HIS	-	expression tag	UNP Q7NDN8
C	323	HIS	-	expression tag	UNP Q7NDN8
C	324	HIS	-	expression tag	UNP Q7NDN8
C	325	HIS	-	expression tag	UNP Q7NDN8
C	326	HIS	-	expression tag	UNP Q7NDN8
C	327	HIS	-	expression tag	UNP Q7NDN8
C	328	HIS	-	expression tag	UNP Q7NDN8
C	329	HIS	-	expression tag	UNP Q7NDN8
D	1	ALA	-	expression tag	UNP Q7NDN8
D	318	GLY	-	expression tag	UNP Q7NDN8
D	319	GLY	-	expression tag	UNP Q7NDN8
D	320	HIS	-	expression tag	UNP Q7NDN8
D	321	HIS	-	expression tag	UNP Q7NDN8
D	322	HIS	-	expression tag	UNP Q7NDN8
D	323	HIS	-	expression tag	UNP Q7NDN8
D	324	HIS	-	expression tag	UNP Q7NDN8
D	325	HIS	-	expression tag	UNP Q7NDN8
D	326	HIS	-	expression tag	UNP Q7NDN8
D	327	HIS	-	expression tag	UNP Q7NDN8
D	328	HIS	-	expression tag	UNP Q7NDN8
D	329	HIS	-	expression tag	UNP Q7NDN8
E	1	ALA	-	expression tag	UNP Q7NDN8
E	318	GLY	-	expression tag	UNP Q7NDN8
E	319	GLY	-	expression tag	UNP Q7NDN8
E	320	HIS	-	expression tag	UNP Q7NDN8
E	321	HIS	-	expression tag	UNP Q7NDN8
E	322	HIS	-	expression tag	UNP Q7NDN8
E	323	HIS	-	expression tag	UNP Q7NDN8
E	324	HIS	-	expression tag	UNP Q7NDN8
E	325	HIS	-	expression tag	UNP Q7NDN8

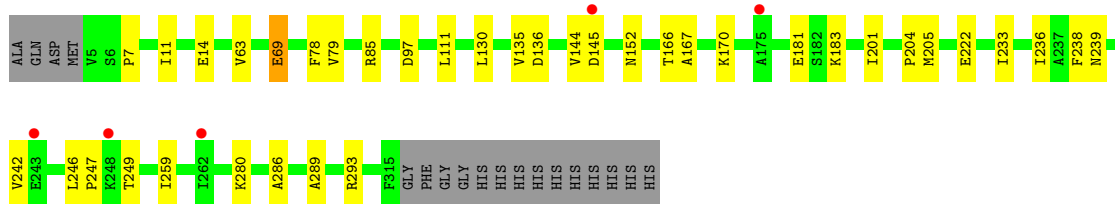
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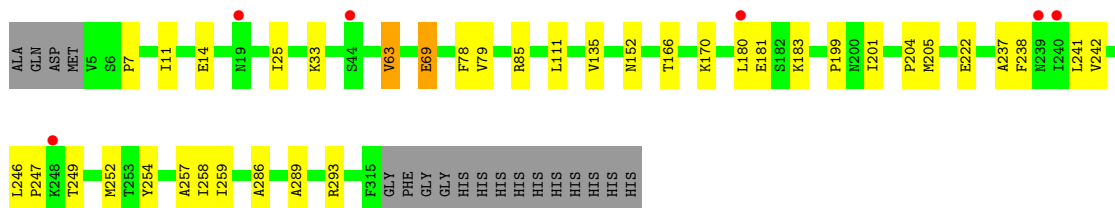
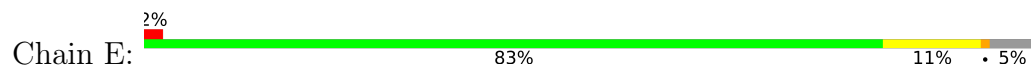
Chain	Residue	Modelled	Actual	Comment	Reference
E	326	HIS	-	expression tag	UNP Q7NDN8
E	327	HIS	-	expression tag	UNP Q7NDN8
E	328	HIS	-	expression tag	UNP Q7NDN8
E	329	HIS	-	expression tag	UNP Q7NDN8

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

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total Ni 1 1	0	0
2	B	1	Total Ni 1 1	0	0
2	C	1	Total Ni 1 1	0	0
2	D	1	Total Ni 1 1	0	0
2	E	1	Total Ni 1 1	0	0



- Molecule 1: Proton-gated ion channel



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	113.55Å 127.62Å 185.81Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.16 – 3.35 19.16 – 3.35	Depositor EDS
% Data completeness (in resolution range)	99.8 (19.16-3.35) 99.2 (19.16-3.35)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	0.05	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.14 (at 3.36Å)	Xtrriage
Refinement program	BUSTER 2.11.4	Depositor
R, R_{free}	0.227 , 0.248 0.235 , 0.257	Depositor DCC
R_{free} test set	1969 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	108.2	Xtrriage
Anisotropy	0.454	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.28 , 50.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.28$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	13465	wwPDB-VP
Average B, all atoms (Å ²)	116.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.66% 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:
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	0.76	0/2765	1.20	5/3782 (0.1%)
1	B	0.74	0/2765	1.19	3/3782 (0.1%)
1	C	0.73	0/2765	1.18	3/3782 (0.1%)
1	D	0.74	0/2765	1.20	3/3782 (0.1%)
1	E	0.73	0/2765	1.20	4/3782 (0.1%)
All	All	0.74	0/13825	1.19	18/18910 (0.1%)

There are no bond length outliers.

The worst 5 of 18 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	A	152	ASN	CA-CB-CG	6.41	119.01	112.60
1	B	152	ASN	CA-CB-CG	6.33	118.93	112.60
1	C	152	ASN	CA-CB-CG	6.30	118.90	112.60
1	E	152	ASN	CA-CB-CG	6.22	118.82	112.60
1	D	152	ASN	CA-CB-CG	6.15	118.75	112.60

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	2692	0	2718	21	2

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	2692	0	2717	20	0
1	C	2692	0	2718	20	0
1	D	2692	0	2718	20	2
1	E	2692	0	2718	21	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
2	E	1	0	0	0	0
All	All	13465	0	13589	89	2

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 3.

The worst 5 of 89 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:B:205:MET:HE2	1:B:238[A]:PHE:HB3	1.57	0.84
1:B:201:ILE:HG12	1:B:242[B]:VAL:HG11	1.65	0.79
1:C:63:VAL:HG21	1:D:136:ASP:CG	2.10	0.77
1:A:205:MET:HE2	1:A:238[A]:PHE:HB3	1.72	0.72
1:B:201:ILE:HG12	1:B:242[B]:VAL:CG1	2.20	0.70

All (2) 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:A:145:ASP:OD2	1:D:145:ASP:OD2[3_555]	1.85	0.35
1:A:166:THR:CG2	1:D:97:ASP:OD2[3_555]	2.18	0.02

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	330/329 (100%)	317 (96%)	13 (4%)	0	100	100
1	B	330/329 (100%)	319 (97%)	9 (3%)	2 (1%)	21	49
1	C	330/329 (100%)	318 (96%)	12 (4%)	0	100	100
1	D	330/329 (100%)	323 (98%)	7 (2%)	0	100	100
1	E	330/329 (100%)	316 (96%)	14 (4%)	0	100	100
All	All	1650/1645 (100%)	1593 (96%)	55 (3%)	2 (0%)	48	76

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	244[A]	THR
1	B	244[B]	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	299/294 (102%)	285 (95%)	14 (5%)	23	50
1	B	299/294 (102%)	290 (97%)	9 (3%)	36	60
1	C	299/294 (102%)	289 (97%)	10 (3%)	33	58
1	D	299/294 (102%)	290 (97%)	9 (3%)	36	60
1	E	299/294 (102%)	289 (97%)	10 (3%)	33	58
All	All	1495/1470 (102%)	1443 (96%)	52 (4%)	31	57

5 of 52 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	170	LYS
1	D	111	LEU
1	E	181	GLU
1	C	181	GLU
1	C	280	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 9 such sidechains are listed below:

Mol	Chain	Res	Type
1	E	193	GLN
1	E	277	HIS
1	C	193	GLN
1	C	277	HIS
1	D	193	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](#)

Of 5 ligands modelled in this entry, 5 are 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 [i](#)

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	311/329 (94%)	0.06	10 (3%) 50 36	42, 107, 154, 219	21 (6%)
1	B	311/329 (94%)	0.10	12 (3%) 43 30	42, 116, 162, 222	21 (6%)
1	C	311/329 (94%)	0.21	9 (2%) 53 39	45, 121, 165, 213	21 (6%)
1	D	311/329 (94%)	0.08	5 (1%) 70 55	48, 107, 150, 193	21 (6%)
1	E	311/329 (94%)	0.01	6 (1%) 66 49	43, 107, 153, 183	21 (6%)
All	All	1555/1645 (94%)	0.09	42 (2%) 56 41	42, 112, 158, 222	105 (6%)

The worst 5 of 42 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	145	ASP	5.3
1	C	248[A]	LYS	5.2
1	E	248[A]	LYS	4.9
1	D	243[A]	GLU	4.8
1	A	248[A]	LYS	3.9

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	NI	B	401	1/1	0.92	0.05	141,141,141,141	0
2	NI	C	401	1/1	0.95	0.05	116,116,116,116	0
2	NI	E	401	1/1	0.95	0.04	119,119,119,119	0
2	NI	A	401	1/1	0.96	0.03	135,135,135,135	0
2	NI	D	401	1/1	0.97	0.03	110,110,110,110	0

6.5 Other polymers [i](#)

There are no such residues in this entry.