



# Full wwPDB X-ray Structure Validation Report ⓘ

Aug 22, 2023 – 11:52 AM EDT

PDB ID : 2R16  
Title : Crystal Structure of bovine neuexin 1 alpha LNS/LG domain 4 (with no splice insert)  
Authors : Rudenko, G.  
Deposited on : 2007-08-22  
Resolution : 1.04 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](mailto: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>.

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

MolProbity : 4.02b-467  
Xtriage (Phenix) : 1.13  
EDS : 2.35  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.35

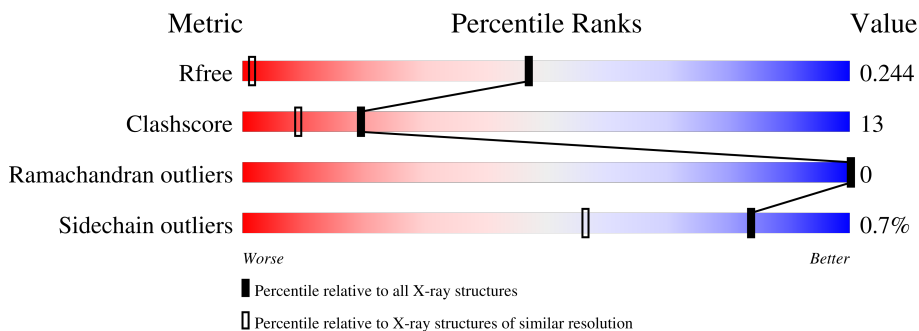
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*


The reported resolution of this entry is 1.04 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))
$R_{free}$	130704	1596 (1.10-0.98)
Clashscore	141614	1677 (1.10-0.98)
Ramachandran outliers	138981	1591 (1.10-0.98)
Sidechain outliers	138945	1589 (1.10-0.98)

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  $\geq 3$ , 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  $\leq 5\%$ .

Mol	Chain	Length	Quality of chain
1	A	182	

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 1607 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 Neurexin-1-alpha.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	175	1476	924	257	281	14	0	23	0

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	719	GLY	-	expression tag	UNP Q28146
A	720	SER	-	expression tag	UNP Q28146
A	?	-	ASP	deletion	UNP Q28146
A	?	-	CYS	deletion	UNP Q28146
A	?	-	ILE	deletion	UNP Q28146
A	?	-	ARG	deletion	UNP Q28146
A	?	-	ILE	deletion	UNP Q28146
A	?	-	ASN	deletion	UNP Q28146
A	?	-	CYS	deletion	UNP Q28146
A	?	-	ASN	deletion	UNP Q28146
A	?	-	SER	deletion	UNP Q28146
A	790	GLY	SER	expression tag	UNP Q28146

- Molecule 2 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Ca	0	0
			1	1		


- Molecule 3 is water.

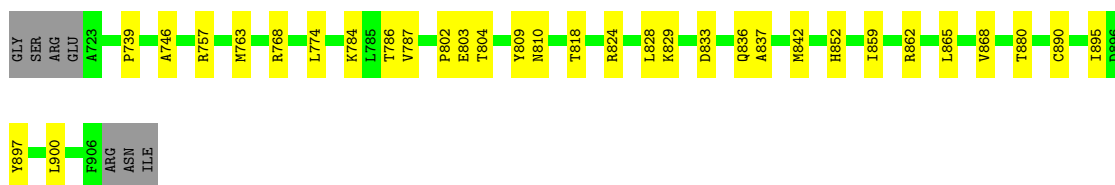
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	130	Total	O	0	0
			130	130		

### 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. 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. 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: Neurexin-1-alpha

Chain A:  79% 18%



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 63	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	90.32Å 90.32Å 39.62Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	23.70 – 1.04 23.70 – 1.04	Depositor EDS
% Data completeness (in resolution range)	100.0 (23.70-1.04) 91.4 (23.70-1.04)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.17 (at 1.04Å)	Xtrriage
Refinement program	REFMAC 5.3, CNS	Depositor
R, $R_{free}$	0.146 , 0.165 0.235 , 0.244	Depositor DCC
$R_{free}$ test set	8108 reflections (10.03%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	9.1	Xtrriage
Anisotropy	0.141	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.41 , 41.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.026 for h,-h-k,-l	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	1607	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	14.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.84% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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:  
CA

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	0.66	0/1558	0.90	2/2100 (0.1%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	763[A]	MET	CG-SD-CE	-7.86	87.62	100.20
1	A	763[B]	MET	CG-SD-CE	-7.86	87.62	100.20

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	1476	0	1455	38	0
2	A	1	0	0	0	0
3	A	130	0	0	6	0
All	All	1607	0	1455	38	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 13.

All (38) 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:803[B]:GLU:HG2	1:A:842[B]:MET:CE	1.65	1.26
1:A:803[B]:GLU:CG	1:A:842[B]:MET:HE1	1.66	1.25
1:A:803[B]:GLU:CD	1:A:842[B]:MET:HE3	1.71	1.11
1:A:890[B]:CYS:SG	1:A:900:LEU:CD2	2.54	0.95
1:A:803[B]:GLU:CD	1:A:842[B]:MET:CE	2.34	0.95
1:A:803[B]:GLU:CG	1:A:842[B]:MET:CE	2.31	0.94
1:A:890[B]:CYS:SG	1:A:900:LEU:HD23	2.08	0.94
1:A:862:ARG:NH1	1:A:868:VAL:HG13	1.97	0.80
1:A:768:ARG:H	1:A:852:HIS:HD2	1.32	0.78
1:A:774[A]:LEU:HD12	1:A:787:VAL:HG22	1.66	0.77
1:A:803[B]:GLU:HG2	1:A:842[B]:MET:HE1	0.82	0.76
1:A:818[B]:THR:HG22	1:A:833:ASP:HA	1.67	0.74
1:A:768:ARG:H	1:A:852:HIS:CD2	2.08	0.71
1:A:774[A]:LEU:CD1	1:A:787:VAL:HG22	2.22	0.70
1:A:786:THR:HG21	3:A:1109:HOH:O	1.93	0.68
1:A:802:PRO:HB3	3:A:1090:HOH:O	2.00	0.61
1:A:803[B]:GLU:OE2	1:A:842[B]:MET:HE3	2.03	0.58
1:A:862:ARG:O	1:A:865:LEU:HB3	2.05	0.56
1:A:746:ALA:HB1	1:A:824:ARG:HE	1.70	0.55
1:A:862:ARG:HH12	1:A:868:VAL:HG13	1.71	0.54
1:A:809:TYR:HD1	1:A:810:ASN:ND2	2.09	0.50
1:A:836[B]:GLN:HG2	1:A:836[B]:GLN:O	2.11	0.50
1:A:836[B]:GLN:O	1:A:836[B]:GLN:CG	2.57	0.49
1:A:890[B]:CYS:SG	1:A:900:LEU:HD21	2.49	0.48
1:A:818[B]:THR:HG23	3:A:1014:HOH:O	2.13	0.48
1:A:895:ILE:HB	1:A:897[B]:TYR:CE2	2.50	0.46
1:A:787:VAL:HG21	1:A:828:LEU:HD11	1.97	0.46
1:A:818[B]:THR:CG2	1:A:833:ASP:HA	2.39	0.46
1:A:784:LYS:HE3	1:A:804[B]:THR:HG21	1.97	0.45
1:A:862:ARG:O	1:A:865:LEU:CB	2.65	0.45
1:A:852:HIS:HE1	3:A:1101:HOH:O	1.99	0.44
1:A:880[B]:THR:HG22	3:A:1098:HOH:O	2.17	0.44
1:A:862:ARG:HA	1:A:865:LEU:HB2	2.02	0.42
1:A:862:ARG:NH2	3:A:1087:HOH:O	2.51	0.41
1:A:829:LYS:CG	1:A:837:ALA:HB1	2.51	0.41
1:A:859:ILE:O	1:A:862:ARG:CZ	2.69	0.41
1:A:739:PRO:HD3	1:A:897[A]:TYR:CE1	2.56	0.40
1:A:895:ILE:HD12	1:A:897[B]:TYR:CE1	2.55	0.40

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	196/182 (108%)	194 (99%)	2 (1%)	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	169/156 (108%)	168 (99%)	1 (1%)	86 61

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	757	ARG

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	743	HIS
1	A	810	ASN
1	A	852	HIS

### 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 monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

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 [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

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.2 Non-standard residues in protein, DNA, RNA chains

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.3 Carbohydrates

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.4 Ligands

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.5 Other polymers

Unable to reproduce the depositors R factor - this section is therefore empty.