



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 12, 2024 – 11:50 PM EDT

PDB ID : 2DDU
Title : Crystal structure of the third repeat domain of reelin
Authors : Nogi, T.; Yasui, N.; Takagi, J.
Deposited on : 2006-02-03
Resolution : 2.05 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

<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 : 4.02b-467
Xtrriage (Phenix) : 1.20.1
EDS : 3.0
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.003 (Gargrove)
Density-Fitness : 1.0.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.39

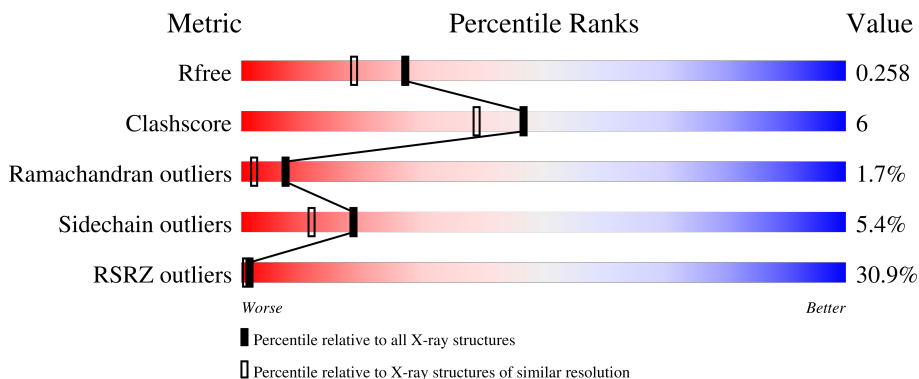
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.05 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}	164625	2096 (2.04-2.04)
Clashscore	180529	2229 (2.04-2.04)
Ramachandran outliers	177936	2217 (2.04-2.04)
Sidechain outliers	177891	2217 (2.04-2.04)
RSRZ outliers	164620	2096 (2.04-2.04)

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	387	

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 2465 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 reelin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	301	2362	1504	407	437	14	0	0	0

There are 11 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1220	GLY	-	cloning artifact	UNP Q64FW1
A	1221	ARG	-	cloning artifact	UNP Q64FW1
A	1598	SER	-	cloning artifact	UNP Q64FW1
A	1599	ARG	-	cloning artifact	UNP Q64FW1
A	1600	LEU	-	cloning artifact	UNP Q64FW1
A	1601	GLU	-	cloning artifact	UNP Q64FW1
A	1602	ASN	-	cloning artifact	UNP Q64FW1
A	1603	LEU	-	cloning artifact	UNP Q64FW1
A	1604	TYR	-	cloning artifact	UNP Q64FW1
A	1605	PHE	-	cloning artifact	UNP Q64FW1
A	1606	GLN	-	cloning artifact	UNP Q64FW1

- 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 CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Cl	0	0
			1	1		

- Molecule 4 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Mg	0	0
			1	1		

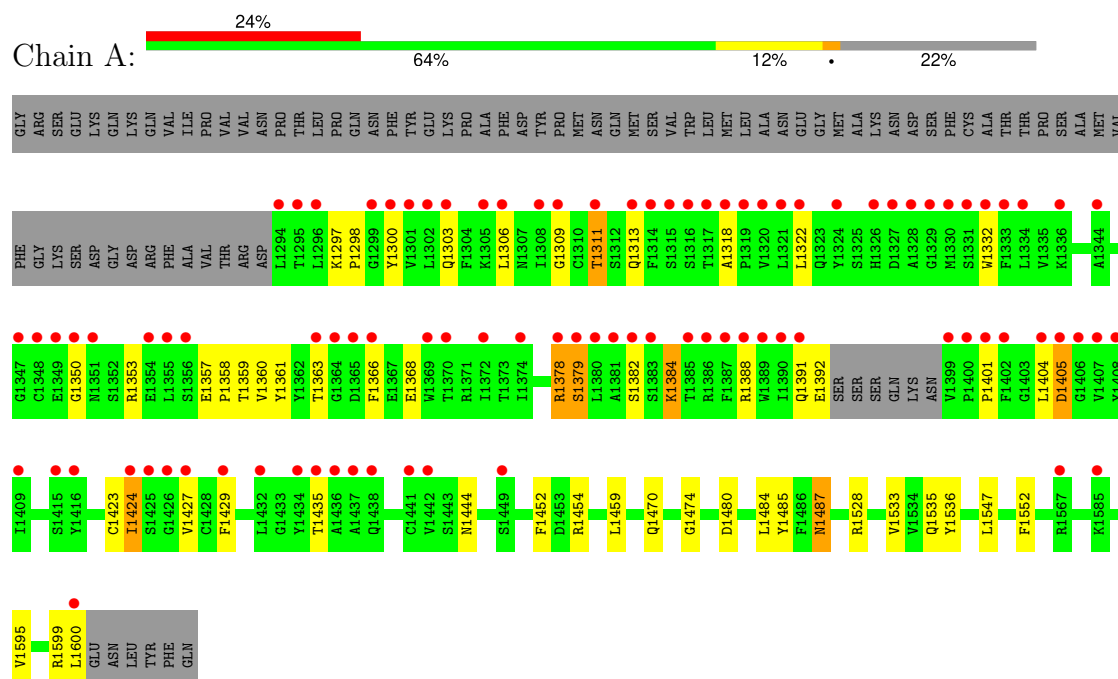
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	100	Total	O	0	0
			100	100		

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: reelin



4 Data and refinement statistics

Property	Value	Source
Space group	H 3 2	Depositor
Cell constants a, b, c, α , β , γ	129.93Å 129.93Å 122.48Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	50.00 – 2.05 50.00 – 2.05	Depositor EDS
% Data completeness (in resolution range)	100.0 (50.00-2.05) 100.0 (50.00-2.05)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.48 (at 2.05Å)	Xtrriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.234 , 0.265 0.233 , 0.258	Depositor DCC
R_{free} test set	1254 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	37.5	Xtrriage
Anisotropy	0.189	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 48.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	2465	wwPDB-VP
Average B, all atoms (Å ²)	50.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.05% 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: CA, CL, MG

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	0.52	0/2425	0.62	0/3291

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	2362	0	2292	26	0
2	A	1	0	0	0	0
3	A	1	0	0	0	0
4	A	1	0	0	0	0
5	A	100	0	0	0	0
All	All	2465	0	2292	26	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 6.

All (26) 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:1424:ILE:HG13	1:A:1429:PHE:HD1	1.50	0.75
1:A:1332:TRP:CZ3	1:A:1388:ARG:HB2	2.24	0.73
1:A:1424:ILE:HG13	1:A:1429:PHE:CD1	2.25	0.71
1:A:1318:ALA:HB1	1:A:1391:GLN:O	2.03	0.57
1:A:1297:LYS:HB2	1:A:1300:TYR:CE1	2.39	0.57
1:A:1404:LEU:O	1:A:1405:ASP:HB2	2.05	0.55
1:A:1487:ASN:HD22	1:A:1487:ASN:H	1.57	0.52
1:A:1378:ARG:HD3	1:A:1378:ARG:H	1.75	0.51
1:A:1350:GLY:O	1:A:1353:ARG:HD2	2.14	0.47
1:A:1454:ARG:NH2	1:A:1480:ASP:OD2	2.48	0.47
1:A:1474:GLY:HA3	1:A:1485:TYR:CZ	2.51	0.46
1:A:1391:GLN:HE22	1:A:1401:PRO:HA	1.81	0.46
1:A:1536:TYR:HD2	1:A:1547:LEU:HG	1.80	0.46
1:A:1361:TYR:HB3	1:A:1366:PHE:CE2	2.50	0.46
1:A:1528:ARG:HG2	1:A:1552:PHE:CE2	2.53	0.44
1:A:1452:PHE:HA	1:A:1595:VAL:O	2.18	0.44
1:A:1435:THR:HG23	1:A:1444:ASN:HD21	1.82	0.44
1:A:1533:VAL:HG12	1:A:1535:GLN:HG3	2.02	0.42
1:A:1322:LEU:HB3	1:A:1359:THR:HB	2.00	0.42
1:A:1303:GLN:HE22	1:A:1423:CYS:HB3	1.84	0.42
1:A:1384:LYS:HG2	1:A:1384:LYS:O	2.20	0.42
1:A:1391:GLN:O	1:A:1392:GLU:HB2	2.19	0.42
1:A:1459:LEU:HD21	1:A:1484:LEU:HD13	2.02	0.42
1:A:1311:THR:HG22	1:A:1313:GLN:H	1.83	0.41
1:A:1487:ASN:HD22	1:A:1487:ASN:N	2.16	0.41
1:A:1358:PRO:HB2	1:A:1360:VAL:HG23	2.02	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	297/387 (77%)	276 (93%)	16 (5%)	5 (2%)	7 2

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	1379	SER
1	A	1298	PRO
1	A	1382	SER
1	A	1405	ASP
1	A	1309	GLY

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	257/333 (77%)	243 (95%)	14 (5%)	18 11

All (14) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1306	LEU
1	A	1311	THR
1	A	1357	GLU
1	A	1363	THR
1	A	1368	GLU
1	A	1378	ARG
1	A	1379	SER
1	A	1384	LYS
1	A	1424	ILE
1	A	1427	VAL
1	A	1470	GLN
1	A	1487	ASN
1	A	1599	ARG
1	A	1600	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	1391	GLN

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Mol	Chain	Res	Type
1	A	1444	ASN
1	A	1448	HIS
1	A	1470	GLN
1	A	1487	ASN

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 3 ligands modelled in this entry, 3 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 [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	301/387 (77%)	1.26	93 (30%) 1 1	24, 46, 84, 87	0

All (93) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1314	PHE	6.0
1	A	1294	LEU	5.8
1	A	1429	PHE	5.5
1	A	1387	PHE	5.4
1	A	1364	GLY	5.2
1	A	1296	LEU	4.5
1	A	1328	ALA	4.5
1	A	1321	LEU	4.4
1	A	1404	LEU	4.4
1	A	1381	ALA	4.3
1	A	1350	GLY	4.3
1	A	1318	ALA	4.3
1	A	1389	TRP	4.2
1	A	1402	PHE	4.2
1	A	1405	ASP	4.1
1	A	1432	LEU	4.0
1	A	1363	THR	4.0
1	A	1308	ILE	3.9
1	A	1324	TYR	3.9
1	A	1401	PRO	3.8
1	A	1427	VAL	3.8
1	A	1317	THR	3.8
1	A	1320	VAL	3.7
1	A	1333	PHE	3.6
1	A	1407	VAL	3.6
1	A	1409	ILE	3.6
1	A	1306	LEU	3.6

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Mol	Chain	Res	Type	RSRZ
1	A	1301	VAL	3.5
1	A	1600	LEU	3.3
1	A	1344	ALA	3.3
1	A	1351	ASN	3.3
1	A	1355	LEU	3.3
1	A	1388	ARG	3.2
1	A	1435	THR	3.2
1	A	1311	THR	3.2
1	A	1309	GLY	3.2
1	A	1449	SER	3.2
1	A	1386	ARG	3.2
1	A	1334	LEU	3.1
1	A	1434	TYR	3.1
1	A	1354	GLU	3.1
1	A	1322	LEU	3.0
1	A	1406	GLY	3.0
1	A	1332	TRP	3.0
1	A	1302	LEU	3.0
1	A	1425	SER	2.9
1	A	1399	VAL	2.9
1	A	1379	SER	2.9
1	A	1365	ASP	2.9
1	A	1315	SER	2.9
1	A	1437	ALA	2.8
1	A	1390	ILE	2.8
1	A	1426	GLY	2.8
1	A	1313	GLN	2.8
1	A	1380	LEU	2.8
1	A	1366	PHE	2.7
1	A	1299	GLY	2.7
1	A	1319	PRO	2.7
1	A	1331	SER	2.7
1	A	1416	TYR	2.7
1	A	1374	ILE	2.6
1	A	1424	ILE	2.6
1	A	1408	TYR	2.5
1	A	1567	ARG	2.5
1	A	1382	SER	2.5
1	A	1378	ARG	2.5
1	A	1326	HIS	2.4
1	A	1385	THR	2.4
1	A	1327	ASP	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	1585	LYS	2.3
1	A	1349	GLU	2.3
1	A	1370	THR	2.3
1	A	1348	CYS	2.3
1	A	1436	ALA	2.3
1	A	1438	GLN	2.3
1	A	1369	TRP	2.2
1	A	1330	MET	2.2
1	A	1300	TYR	2.2
1	A	1415	SER	2.2
1	A	1400	PRO	2.2
1	A	1336	LYS	2.1
1	A	1303	GLN	2.1
1	A	1295	THR	2.1
1	A	1383	SER	2.1
1	A	1347	GLY	2.1
1	A	1391	GLN	2.1
1	A	1305	LYS	2.1
1	A	1316	SER	2.1
1	A	1329	GLY	2.0
1	A	1441	CYS	2.0
1	A	1356	SER	2.0
1	A	1372	ILE	2.0
1	A	1442	VAL	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 monosaccharides 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(\AA^2)	Q<0.9
4	MG	A	3	1/1	0.95	0.09	45,45,45,45	1
2	CA	A	1	1/1	0.98	0.04	31,31,31,31	0
3	CL	A	2	1/1	0.99	0.02	25,25,25,25	1

6.5 Other polymers [i](#)

There are no such residues in this entry.