



Full wwPDB X-ray Structure Validation Report ⓘ

May 16, 2020 – 07:42 am BST

PDB ID : 4C9U
Title : Xenopus ZNRF3 ectodomain in complex with Xenopus RSPO2 Fu1-Fu2 crystal form II
Authors : Zebisch, M.; Jones, E.Y.
Deposited on : 2013-10-03
Resolution : 3.00 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Xtrriage (Phenix) : 1.13
EDS : 2.11
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) : 2.11

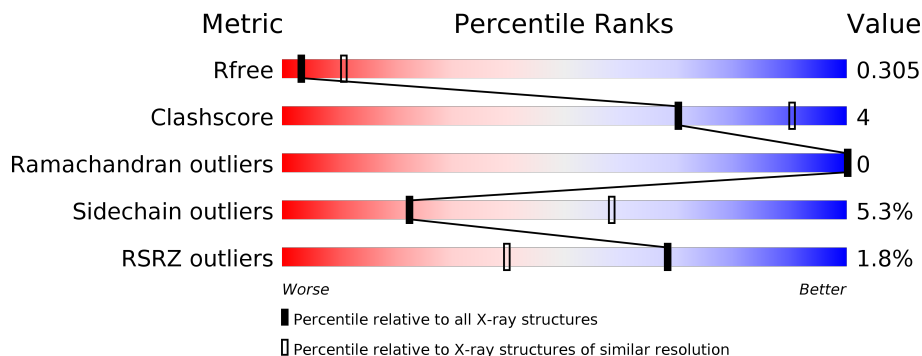
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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	2092 (3.00-3.00)
Clashscore	141614	2416 (3.00-3.00)
Ramachandran outliers	138981	2333 (3.00-3.00)
Sidechain outliers	138945	2336 (3.00-3.00)
RSRZ outliers	127900	1990 (3.00-3.00)

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 on 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	182	
1	C	182	
2	B	121	
2	D	121	

2 Entry composition i

There are 2 unique types of molecules in this entry. The entry contains 3856 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 E3 UBIQUITIN-PROTEIN LIGASE ZNR3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	161	1231	771	216	237	7	0	0	0
1	C	155	1188	747	210	224	7	0	0	0

There are 28 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	22	GLU	-	expression tag	UNP Q08D68
A	23	THR	-	expression tag	UNP Q08D68
A	192	GLY	-	expression tag	UNP Q08D68
A	193	THR	-	expression tag	UNP Q08D68
A	194	HIS	-	expression tag	UNP Q08D68
A	195	HIS	-	expression tag	UNP Q08D68
A	196	HIS	-	expression tag	UNP Q08D68
A	197	HIS	-	expression tag	UNP Q08D68
A	198	HIS	-	expression tag	UNP Q08D68
A	199	HIS	-	expression tag	UNP Q08D68
A	200	HIS	-	expression tag	UNP Q08D68
A	201	HIS	-	expression tag	UNP Q08D68
A	202	HIS	-	expression tag	UNP Q08D68
A	203	HIS	-	expression tag	UNP Q08D68
C	22	GLU	-	expression tag	UNP Q08D68
C	23	THR	-	expression tag	UNP Q08D68
C	192	GLY	-	expression tag	UNP Q08D68
C	193	THR	-	expression tag	UNP Q08D68
C	194	HIS	-	expression tag	UNP Q08D68
C	195	HIS	-	expression tag	UNP Q08D68
C	196	HIS	-	expression tag	UNP Q08D68
C	197	HIS	-	expression tag	UNP Q08D68
C	198	HIS	-	expression tag	UNP Q08D68
C	199	HIS	-	expression tag	UNP Q08D68
C	200	HIS	-	expression tag	UNP Q08D68

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Chain	Residue	Modelled	Actual	Comment	Reference
C	201	HIS	-	expression tag	UNP Q08D68
C	202	HIS	-	expression tag	UNP Q08D68
C	203	HIS	-	expression tag	UNP Q08D68

- Molecule 2 is a protein called R-SPONDIN-2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	103	Total 810	C 498	N 145	O 148	S 19	0	0	0
2	D	86	Total 627	C 379	N 119	O 113	S 16	0	0	0

There are 22 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	32	GLU	-	expression tag	UNP Q5M7L6
B	33	THR	-	expression tag	UNP Q5M7L6
B	34	GLY	-	expression tag	UNP Q5M7L6
B	145	THR	-	expression tag	UNP Q5M7L6
B	146	LYS	-	expression tag	UNP Q5M7L6
B	147	HIS	-	expression tag	UNP Q5M7L6
B	148	HIS	-	expression tag	UNP Q5M7L6
B	149	HIS	-	expression tag	UNP Q5M7L6
B	150	HIS	-	expression tag	UNP Q5M7L6
B	151	HIS	-	expression tag	UNP Q5M7L6
B	152	HIS	-	expression tag	UNP Q5M7L6
D	32	GLU	-	expression tag	UNP Q5M7L6
D	33	THR	-	expression tag	UNP Q5M7L6
D	34	GLY	-	expression tag	UNP Q5M7L6
D	145	THR	-	expression tag	UNP Q5M7L6
D	146	LYS	-	expression tag	UNP Q5M7L6
D	147	HIS	-	expression tag	UNP Q5M7L6
D	148	HIS	-	expression tag	UNP Q5M7L6
D	149	HIS	-	expression tag	UNP Q5M7L6
D	150	HIS	-	expression tag	UNP Q5M7L6
D	151	HIS	-	expression tag	UNP Q5M7L6
D	152	HIS	-	expression tag	UNP Q5M7L6

4 Data and refinement statistics i

Property	Value	Source
Space group	P 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	57.55Å 57.62Å 208.91Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.50 – 3.00 44.39 – 3.00	Depositor EDS
% Data completeness (in resolution range)	92.6 (50.50-3.00) 92.7 (44.39-3.00)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.72 (at 3.01Å)	Xtrriage
Refinement program	REFMAC 5.7.0029	Depositor
R, R_{free}	0.227 , 0.310 0.229 , 0.305	Depositor DCC
R_{free} test set	677 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	66.8	Xtrriage
Anisotropy	0.147	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.27 , 35.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.054 for k,h,-l	Xtrriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	3856	wwPDB-VP
Average B, all atoms (Å ²)	68.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.63% 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

5.1 Standard geometry

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	0/1252	0.79	0/1694
1	C	0.63	0/1209	0.79	0/1635
2	B	0.66	0/828	0.83	0/1105
2	D	0.60	0/637	0.86	0/852
All	All	0.64	0/3926	0.81	0/5286

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

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	1231	0	1218	8	0
1	C	1188	0	1181	9	0
2	B	810	0	751	5	0
2	D	627	0	558	7	0
All	All	3856	0	3708	27	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 4.

All (27) 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:101:GLN:HG2	2:D:48:LYS:HE3	1.77	0.66
1:A:98:LYS:NZ	1:A:133:ASP:OD2	2.28	0.66
2:B:133:ALA:HB1	2:B:134:PRO:HD2	1.75	0.66
1:A:101:GLN:HG2	2:D:48:LYS:CE	2.28	0.63
1:C:64:THR:HG22	1:C:64:THR:O	1.99	0.61
1:C:42:SER:HB2	1:C:44:ASN:HB3	1.83	0.60
2:D:40:CYS:SG	2:D:40:CYS:O	2.66	0.54
2:B:133:ALA:HB1	2:B:134:PRO:CD	2.39	0.52
2:B:138:THR:HG22	2:B:140:VAL:HG13	1.91	0.52
2:B:39:ILE:CG1	2:B:40:CYS:H	2.25	0.49
2:D:117:PHE:HB3	2:D:124:CYS:O	2.11	0.49
1:A:35:GLU:HG3	1:A:51:THR:CG2	2.41	0.49
2:D:120:HIS:N	2:D:123:GLN:O	2.35	0.49
1:A:35:GLU:HG3	1:A:51:THR:HG23	1.95	0.48
1:C:35:GLU:HG3	1:C:51:THR:HG23	1.96	0.47
1:C:130:ASP:C	1:C:130:ASP:OD1	2.53	0.47
1:C:35:GLU:HG3	1:C:51:THR:CG2	2.45	0.47
2:D:95:ARG:HG2	2:D:96:CYS:N	2.33	0.43
1:C:100:GLU:O	1:C:101:GLN:C	2.56	0.43
1:A:82:ASN:HB2	1:A:84:ASP:H	1.82	0.43
2:B:138:THR:O	2:B:139:MET:HB2	2.18	0.43
2:D:83:TYR:CZ	2:D:94:SER:HB3	2.53	0.43
1:A:82:ASN:O	1:A:83:ASN:HB2	2.19	0.43
1:C:103:GLU:H	1:C:103:GLU:CD	2.23	0.42
1:A:38:LEU:HD22	1:A:171:GLN:HG3	2.01	0.42
1:C:169:ASN:HB3	1:C:170:LYS:HG3	2.02	0.40
1:C:130:ASP:OD1	1:C:132:SER:N	2.54	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	159/182 (87%)	149 (94%)	10 (6%)	0	100	100
1	C	153/182 (84%)	144 (94%)	9 (6%)	0	100	100
2	B	101/121 (84%)	94 (93%)	7 (7%)	0	100	100
2	D	84/121 (69%)	77 (92%)	7 (8%)	0	100	100
All	All	497/606 (82%)	464 (93%)	33 (7%)	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	131/155 (84%)	127 (97%)	4 (3%)	40	75
1	C	125/155 (81%)	121 (97%)	4 (3%)	39	74
2	B	92/107 (86%)	83 (90%)	9 (10%)	8	30
2	D	65/107 (61%)	60 (92%)	5 (8%)	13	42
All	All	413/524 (79%)	391 (95%)	22 (5%)	22	58

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	27	LEU
1	A	41	SER
1	A	48	LYS
1	A	82	ASN
2	B	39	ILE
2	B	65	ARG
2	B	86	ARG
2	B	89	ASP
2	B	94	SER
2	B	103	SER
2	B	107	ARG
2	B	128	CYS
2	B	132	PHE

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Mol	Chain	Res	Type
1	C	48	LYS
1	C	147	ASP
1	C	163	LYS
1	C	169	ASN
2	D	40	CYS
2	D	48	LYS
2	D	94	SER
2	D	96	CYS
2	D	104	CYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	166	ASN
2	B	100	ASN
1	C	166	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 carbohydrates 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

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	161/182 (88%)	-0.54	0	100	100	32, 56, 94, 119	0
1	C	155/182 (85%)	-0.47	0	100	100	36, 62, 104, 134	0
2	B	103/121 (85%)	-0.21	4 (3%)	39	15	38, 65, 111, 150	0
2	D	86/121 (71%)	0.04	5 (5%)	23	7	44, 80, 149, 157	0
All	All	505/606 (83%)	-0.35	9 (1%)	68	40	32, 64, 119, 157	0

All (9) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	D	120	HIS	4.4
2	B	138	THR	4.2
2	B	137	ASP	3.5
2	D	102	ASP	2.7
2	B	89	ASP	2.2
2	D	121	LYS	2.2
2	B	136	ASP	2.1
2	D	113	CYS	2.0
2	D	122	GLY	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 carbohydrates in this entry.

6.4 Ligands

There are no ligands in this entry.

6.5 Other polymers

There are no such residues in this entry.