



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 26, 2023 – 11:01 PM EDT

PDB ID : 6D8Z  
Title : Crystal Structure of the C-terminal Guanine Nucleotide Exchange Factor Module of Human Trio  
Authors : Bandekar, S.; Tesmer, J.J.  
Deposited on : 2018-04-27  
Resolution : 2.65 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 : 2.35.1  
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

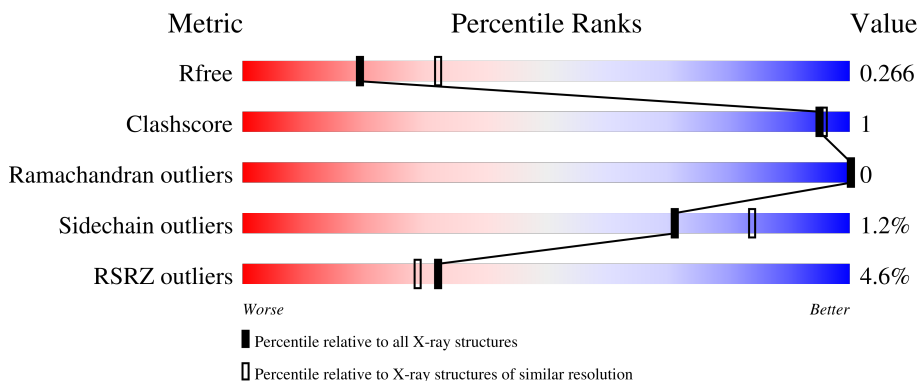
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.65 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	1332 (2.68-2.64)
Clashscore	141614	1374 (2.68-2.64)
Ramachandran outliers	138981	1349 (2.68-2.64)
Sidechain outliers	138945	1349 (2.68-2.64)
RSRZ outliers	127900	1318 (2.68-2.64)

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  $\leq 5\%$ . 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	319	 5% 88% 6% 6%
1	B	319	 3% 91% 5% .
1	C	319	 5% 91% . 6%

## 2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 7525 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 Triple functional domain protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	300	2480	1585	428	450	17	0	0	0
1	B	308	2547	1625	440	465	17	0	0	0
1	C	299	2472	1578	427	450	17	0	0	0

There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1957	GLY	-	cloning artifact	UNP O75962
A	1958	GLU	-	cloning artifact	UNP O75962
A	1959	PHE	-	cloning artifact	UNP O75962
B	1957	GLY	-	cloning artifact	UNP O75962
B	1958	GLU	-	cloning artifact	UNP O75962
B	1959	PHE	-	cloning artifact	UNP O75962
C	1957	GLY	-	cloning artifact	UNP O75962
C	1958	GLU	-	cloning artifact	UNP O75962
C	1959	PHE	-	cloning artifact	UNP O75962

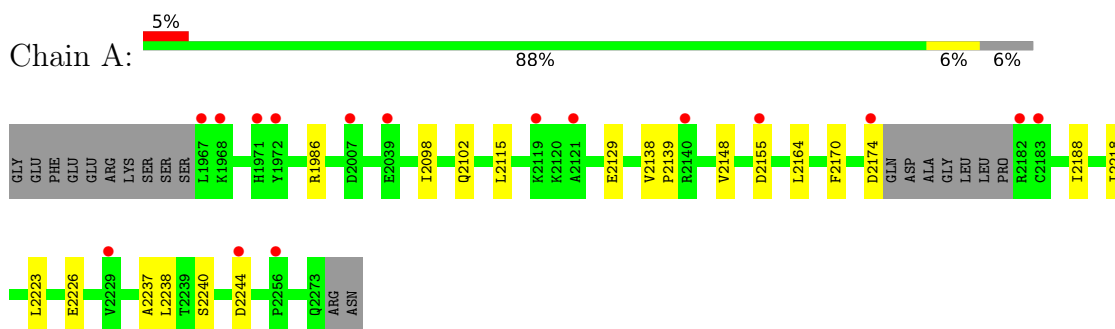
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	11	Total 11	O 11	0	0
2	B	6	Total 6	O 6	0	0
2	C	9	Total 9	O 9	0	0

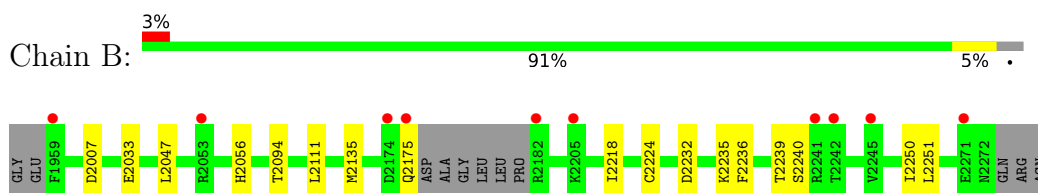
### 3 Residue-property plots [i](#)

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.

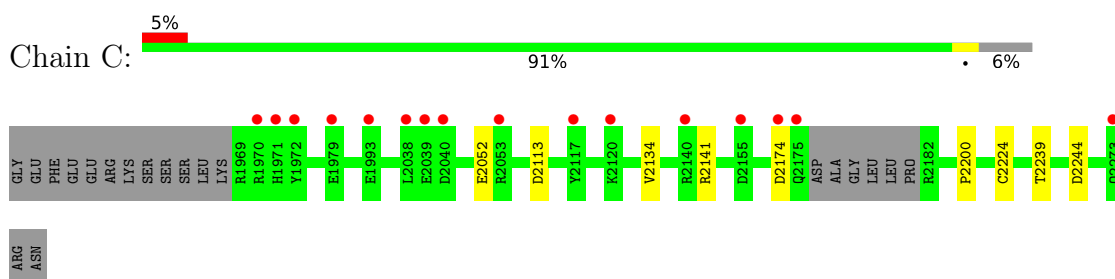
- Molecule 1: Triple functional domain protein



- Molecule 1: Triple functional domain protein



- Molecule 1: Triple functional domain protein



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	59.18Å 95.79Å 182.43Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	15.00 – 2.65 14.97 – 2.65	Depositor EDS
% Data completeness (in resolution range)	98.0 (15.00-2.65) 98.8 (14.97-2.65)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.09	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.89 (at 2.65Å)	Xtrriage
Refinement program	REFMAC 5.8.0158	Depositor
R, $R_{free}$	0.225 , 0.266 0.225 , 0.266	Depositor DCC
$R_{free}$ test set	1504 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	56.0	Xtrriage
Anisotropy	0.490	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.27 , 19.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	7525	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	75.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 14.94% 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](#)

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	0.41	0/2527	0.60	0/3393
1	B	0.42	0/2595	0.62	0/3482
1	C	0.43	0/2519	0.63	0/3383
All	All	0.42	0/7641	0.62	0/10258

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	2480	0	2505	9	0
1	B	2547	0	2567	7	0
1	C	2472	0	2489	3	0
2	A	11	0	0	0	0
2	B	6	0	0	0	0
2	C	9	0	0	0	0
All	All	7525	0	7561	18	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 1.

All (18) 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:2224:CYS:HB2	1:B:2239:THR:HB	1.89	0.54
1:C:2224:CYS:HB2	1:C:2239:THR:HB	1.89	0.53
1:B:2175:GLN:HE21	1:B:2250:ILE:HD11	1.73	0.52
1:A:2218:ILE:HG12	1:A:2240:SER:HB2	1.93	0.51
1:A:2226:GLU:HB3	1:A:2237:ALA:HB3	1.94	0.49
1:A:2223:LEU:HD11	1:A:2238:LEU:HD22	1.97	0.46
1:B:2218:ILE:HG12	1:B:2240:SER:HB2	1.97	0.46
1:B:2236:PHE:CZ	1:B:2251:LEU:HD12	2.52	0.45
1:B:2111:LEU:HD12	1:B:2135:MET:HG3	1.99	0.44
1:A:1986:ARG:HD2	1:C:2200:PRO:HB2	2.00	0.44
1:B:2033:GLU:HB3	1:B:2047:LEU:HD21	1.99	0.44
1:A:2098:ILE:HG22	1:A:2102:GLN:HG3	2.00	0.43
1:A:2138:VAL:HB	1:A:2139:PRO:HD3	1.99	0.43
1:A:2148:VAL:HG21	1:A:2164:LEU:HD22	2.02	0.42
1:A:2170:PHE:CD1	1:A:2188:ILE:HD12	2.54	0.42
1:B:2232:ASP:HB3	1:B:2235:LYS:HB2	2.01	0.41
1:A:2115:LEU:HD11	1:A:2129:GLU:HG3	2.03	0.41
1:C:2052:GLU:HG3	1:C:2134:VAL:HG13	2.02	0.41

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	296/319 (93%)	289 (98%)	7 (2%)	0	100	100
1	B	304/319 (95%)	297 (98%)	7 (2%)	0	100	100
1	C	295/319 (92%)	289 (98%)	6 (2%)	0	100	100
All	All	895/957 (94%)	875 (98%)	20 (2%)	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	279/295 (95%)	276 (99%)	3 (1%)	73	85
1	B	287/295 (97%)	284 (99%)	3 (1%)	76	86
1	C	278/295 (94%)	274 (99%)	4 (1%)	67	81
All	All	844/885 (95%)	834 (99%)	10 (1%)	71	84

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2155	ASP
1	A	2174	ASP
1	A	2244	ASP
1	B	2007	ASP
1	B	2056	HIS
1	B	2094	THR
1	C	2113	ASP
1	C	2141	ARG
1	C	2174	ASP
1	C	2244	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	2089	HIS
1	B	2175	GLN
1	C	2089	HIS
1	C	2272	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 monosaccharides 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

### 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	300/319 (94%)	0.20	16 (5%) 26 23	44, 75, 133, 176	0
1	B	308/319 (96%)	0.03	10 (3%) 47 44	43, 69, 104, 150	0
1	C	299/319 (93%)	0.11	16 (5%) 25 23	44, 69, 139, 176	0
All	All	907/957 (94%)	0.11	42 (4%) 32 29	43, 70, 128, 176	0

All (42) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	2182	ARG	6.2
1	C	1972	TYR	5.4
1	B	2174	ASP	5.1
1	A	1968	LYS	4.6
1	C	1971	HIS	4.6
1	B	2245	VAL	4.4
1	B	1959	PHE	4.3
1	C	2175	GLN	3.7
1	C	2155	ASP	3.7
1	A	2007	ASP	3.6
1	A	2256	PRO	3.3
1	C	1970	ARG	3.3
1	C	2140	ARG	3.3
1	B	2182	ARG	3.2
1	C	2039	GLU	3.2
1	B	2175	GLN	3.1
1	C	2120	LYS	3.1
1	A	1967	LEU	3.0
1	B	2271	GLU	2.9
1	A	2039	GLU	2.8
1	A	2174	ASP	2.8
1	C	2273	GLN	2.7
1	A	2244	ASP	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	2121	ALA	2.6
1	A	2119	LYS	2.5
1	B	2241	ARG	2.5
1	A	1972	TYR	2.5
1	C	2053	ARG	2.4
1	A	2183	CYS	2.3
1	C	2040	ASP	2.3
1	A	1971	HIS	2.3
1	B	2205	LYS	2.2
1	C	2117	TYR	2.2
1	A	2140	ARG	2.2
1	C	1979	GLU	2.1
1	B	2242	THR	2.1
1	A	2229	VAL	2.1
1	C	2038	LEU	2.1
1	A	2155	ASP	2.1
1	C	2174	ASP	2.1
1	C	1993	GLU	2.0
1	B	2053	ARG	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](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.