WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

Aug 19, 2023 – 04:50 PM EDT

|		
PDB ID	:	2FNE
Title	:	The crystal structure of the 13th PDZ domain of MPDZ
Authors	:	Papagrigoriou, E.; Berridge, G.; Johansson, C.; Colebrook, S.; Salah, E.; Burgess, N.; Smee, C.; Savitsky, P.; Bray, J.; Schoch, G.; Phillips, C.; Gileadi, C.; Soundarajan, M.; Yang, X.; Elkins, J.M.; Gorrec, F.; Turnbull, A.; Edwards, A.; Arrowsmith, C.; Weigelt, J.; Sundstrom, M.; Doyle, D.A.; Structural Genomics Consortium (SGC)
Deposited on	:	2006-01-11
Resolution	:	1.83 Å(reported)

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 1.83 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.
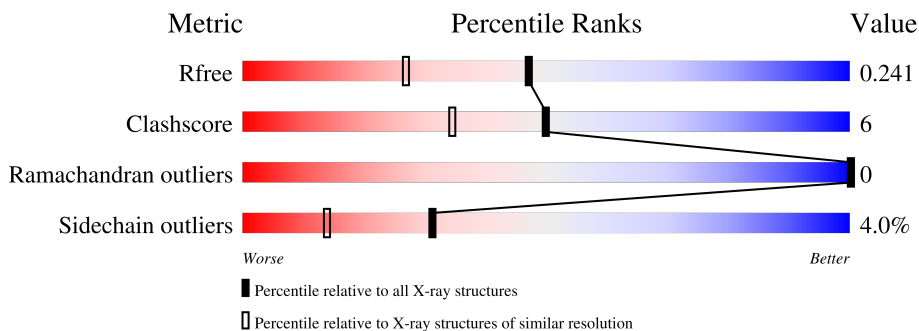
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	4003 (1.86-1.82)
Clashscore	141614	4233 (1.86-1.82)
Ramachandran outliers	138981	4185 (1.86-1.82)
Sidechain outliers	138945	4186 (1.86-1.82)

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 <=5%

Mol	Chain	Length	Quality of chain
1	A	117	74% 5% • 19%
1	B	117	74% 9% • 15%
1	C	117	83% 5% • 11%

2 Entry composition ⓘ

There are 2 unique types of molecules in this entry. The entry contains 2374 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 Multiple PDZ domain protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	95	Total	C	N	O	S	0	2	0
			698	434	120	142	2			
1	B	100	Total	C	N	O	S	0	2	0
			721	448	123	146	4			
1	C	104	Total	C	N	O	S	0	0	0
			756	474	130	149	3			

There are 84 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1932	MET	-	expression tag	UNP Q5VZ62
A	1933	HIS	-	expression tag	UNP Q5VZ62
A	1934	HIS	-	expression tag	UNP Q5VZ62
A	1935	HIS	-	expression tag	UNP Q5VZ62
A	1936	HIS	-	expression tag	UNP Q5VZ62
A	1937	HIS	-	expression tag	UNP Q5VZ62
A	1938	HIS	-	expression tag	UNP Q5VZ62
A	1939	SER	-	cloning artifact	UNP Q5VZ62
A	1940	SER	-	cloning artifact	UNP Q5VZ62
A	1941	GLY	-	cloning artifact	UNP Q5VZ62
A	1942	VAL	-	cloning artifact	UNP Q5VZ62
A	1943	ASP	-	cloning artifact	UNP Q5VZ62
A	1944	LEU	-	cloning artifact	UNP Q5VZ62
A	1945	GLY	-	cloning artifact	UNP Q5VZ62
A	1946	THR	-	cloning artifact	UNP Q5VZ62
A	1947	GLU	-	cloning artifact	UNP Q5VZ62
A	1948	ASN	-	cloning artifact	UNP Q5VZ62
A	1949	LEU	-	cloning artifact	UNP Q5VZ62
A	1950	TYR	-	cloning artifact	UNP Q5VZ62
A	1951	PHE	-	cloning artifact	UNP Q5VZ62
A	1952	GLN	-	cloning artifact	UNP Q5VZ62
A	1953	SER	-	cloning artifact	UNP Q5VZ62
A	2043	SER	-	cloning artifact	UNP Q5VZ62

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
A	2044	ASP	-	cloning artifact	UNP Q5VZ62
A	2045	GLU	-	cloning artifact	UNP Q5VZ62
A	2046	THR	-	cloning artifact	UNP Q5VZ62
A	2047	SER	-	cloning artifact	UNP Q5VZ62
A	2048	VAL	-	cloning artifact	UNP Q5VZ62
B	1932	MET	-	expression tag	UNP Q5VZ62
B	1933	HIS	-	expression tag	UNP Q5VZ62
B	1934	HIS	-	expression tag	UNP Q5VZ62
B	1935	HIS	-	expression tag	UNP Q5VZ62
B	1936	HIS	-	expression tag	UNP Q5VZ62
B	1937	HIS	-	expression tag	UNP Q5VZ62
B	1938	HIS	-	expression tag	UNP Q5VZ62
B	1939	SER	-	cloning artifact	UNP Q5VZ62
B	1940	SER	-	cloning artifact	UNP Q5VZ62
B	1941	GLY	-	cloning artifact	UNP Q5VZ62
B	1942	VAL	-	cloning artifact	UNP Q5VZ62
B	1943	ASP	-	cloning artifact	UNP Q5VZ62
B	1944	LEU	-	cloning artifact	UNP Q5VZ62
B	1945	GLY	-	cloning artifact	UNP Q5VZ62
B	1946	THR	-	cloning artifact	UNP Q5VZ62
B	1947	GLU	-	cloning artifact	UNP Q5VZ62
B	1948	ASN	-	cloning artifact	UNP Q5VZ62
B	1949	LEU	-	cloning artifact	UNP Q5VZ62
B	1950	TYR	-	cloning artifact	UNP Q5VZ62
B	1951	PHE	-	cloning artifact	UNP Q5VZ62
B	1952	GLN	-	cloning artifact	UNP Q5VZ62
B	1953	SER	-	cloning artifact	UNP Q5VZ62
B	2043	SER	-	cloning artifact	UNP Q5VZ62
B	2044	ASP	-	cloning artifact	UNP Q5VZ62
B	2045	GLU	-	cloning artifact	UNP Q5VZ62
B	2046	THR	-	cloning artifact	UNP Q5VZ62
B	2047	SER	-	cloning artifact	UNP Q5VZ62
B	2048	VAL	-	cloning artifact	UNP Q5VZ62
C	1932	MET	-	expression tag	UNP Q5VZ62
C	1933	HIS	-	expression tag	UNP Q5VZ62
C	1934	HIS	-	expression tag	UNP Q5VZ62
C	1935	HIS	-	expression tag	UNP Q5VZ62
C	1936	HIS	-	expression tag	UNP Q5VZ62
C	1937	HIS	-	expression tag	UNP Q5VZ62
C	1938	HIS	-	expression tag	UNP Q5VZ62
C	1939	SER	-	cloning artifact	UNP Q5VZ62
C	1940	SER	-	cloning artifact	UNP Q5VZ62

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
C	1941	GLY	-	cloning artifact	UNP Q5VZ62
C	1942	VAL	-	cloning artifact	UNP Q5VZ62
C	1943	ASP	-	cloning artifact	UNP Q5VZ62
C	1944	LEU	-	cloning artifact	UNP Q5VZ62
C	1945	GLY	-	cloning artifact	UNP Q5VZ62
C	1946	THR	-	cloning artifact	UNP Q5VZ62
C	1947	GLU	-	cloning artifact	UNP Q5VZ62
C	1948	ASN	-	cloning artifact	UNP Q5VZ62
C	1949	LEU	-	cloning artifact	UNP Q5VZ62
C	1950	TYR	-	cloning artifact	UNP Q5VZ62
C	1951	PHE	-	cloning artifact	UNP Q5VZ62
C	1952	GLN	-	cloning artifact	UNP Q5VZ62
C	1953	SER	-	cloning artifact	UNP Q5VZ62
C	2043	SER	-	cloning artifact	UNP Q5VZ62
C	2044	ASP	-	cloning artifact	UNP Q5VZ62
C	2045	GLU	-	cloning artifact	UNP Q5VZ62
C	2046	THR	-	cloning artifact	UNP Q5VZ62
C	2047	SER	-	cloning artifact	UNP Q5VZ62
C	2048	VAL	-	cloning artifact	UNP Q5VZ62

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	84	Total 84	O 84	0	0
2	B	56	Total 56	O 56	0	0
2	C	59	Total 59	O 59	0	0

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.

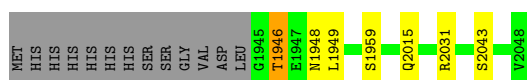• Molecule 1: Multiple PDZ domain protein

Chain A:
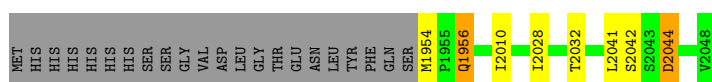
74%   5% •   19%

MET HIS HIS HIS HIS HIS HIS SER SER GLY VAL ASP LEU GLY THR GLU ASN LEU TYR PHE GLN SER M1954 P1955 Q1956 I2010 I2028 T2032 L2041 S2042 S2043 D2044 V2048

• Molecule 1: Multiple PDZ domain protein

Chain B:

74%   9%   •   15%

MET HIS HIS HIS HIS HIS HIS SER SER GLY VAL ASP LEU GLY THR GLU ASN L1949 Y1950 F1951 Q1956 T1961 S1979 G1982 D1983 L1984 P1985 I2010 L2017 V2020 I2028 T2032 T2035 L2041 V2048

• Molecule 1: Multiple PDZ domain protein

Chain C:

83%   5% •   11%

MET HIS HIS HIS HIS HIS HIS SER SER GLY VAL ASP LEU G1945 T1946 E1947 N1948 L1949 S1959 Q2015 R2031 S2043 V2048

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	47.94Å 62.38Å 53.13Å 90.00° 106.26° 90.00°	Depositor
Resolution (Å)	39.50 – 1.83 39.49 – 1.83	Depositor EDS
% Data completeness (in resolution range)	100.0 (39.50-1.83) 100.0 (39.49-1.83)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.88 (at 1.83Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.190 , 0.243 0.237 , 0.241	Depositor DCC
R_{free} test set	2056 reflections (7.73%)	wwPDB-VP
Wilson B-factor (Å^2)	25.9	Xtriage
Anisotropy	0.097	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 49.6	EDS
L-test for twinning [2]	$< |L| > = 0.50, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	2374	wwPDB-VP
Average B, all atoms (Å^2)	45.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.30% of the height of the origin peak. No significant pseudotranslation is detected.*

---

[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ 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	0.76	0/713	0.76	0/964
1	B	0.72	0/735	0.83	2/993 (0.2%)
1	C	0.68	0/767	0.70	0/1036
All	All	0.72	0/2215	0.77	2/2993 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	C	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	B	1951	PHE	CB-CG-CD2	-7.44	115.59	120.80
1	B	1951	PHE	CB-CG-CD1	6.81	125.56	120.80

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	C	1946	THR	Peptide

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	698	0	692	7	0
1	B	721	0	713	12	0
1	C	756	0	747	6	0
2	A	84	0	0	0	0
2	B	56	0	0	1	0
2	C	59	0	0	0	0
All	All	2374	0	2152	25	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.

The worst 5 of 25 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:2028:ILE:O	1:B:2032:THR:HG23	1.69	0.93
1:C:2015:GLN:HE22	1:C:2031:ARG:HH12	1.28	0.82
1:A:2028:ILE:O	1:A:2032:THR:HG23	1.79	0.81
1:C:1946:THR:HA	1:C:1948:ASN:H	1.45	0.81
1:B:2017:LEU:O	1:B:2020:VAL:HG22	1.97	0.64

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	95/117 (81%)	93 (98%)	2 (2%)	0	100	100
1	B	100/117 (86%)	96 (96%)	4 (4%)	0	100	100
1	C	102/117 (87%)	98 (96%)	4 (4%)	0	100	100
All	All	297/351 (85%)	287 (97%)	10 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2   Protein sidechains ⓘ

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	75/96 (78%)	71 (95%)	4 (5%)	22	7
1	B	77/96 (80%)	72 (94%)	5 (6%)	17	4
1	C	79/96 (82%)	76 (96%)	3 (4%)	33	15
All	All	231/288 (80%)	219 (95%)	12 (5%)	31	8

5 of 12 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	2035[A]	THR
1	B	2035[B]	THR
1	C	2043	SER
1	C	1949	LEU
1	A	2044[B]	ASP

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

Mol	Chain	Res	Type
1	C	1952	GLN
1	C	1956	GLN
1	C	2015	GLN

5.3.3   RNA ⓘ

There are no RNA molecules in this entry.

5.4   Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

5.7 Other polymers ⓘ

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 ⓘ

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.