wwPDB X-ray Structure Validation Summary Report (i)

Feb 1, 2016 – 02:06 AM GMT

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)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at
http://wwpdb.org/validation/2016/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The following versions of software and data (see references (1)) were used in the production of this report:

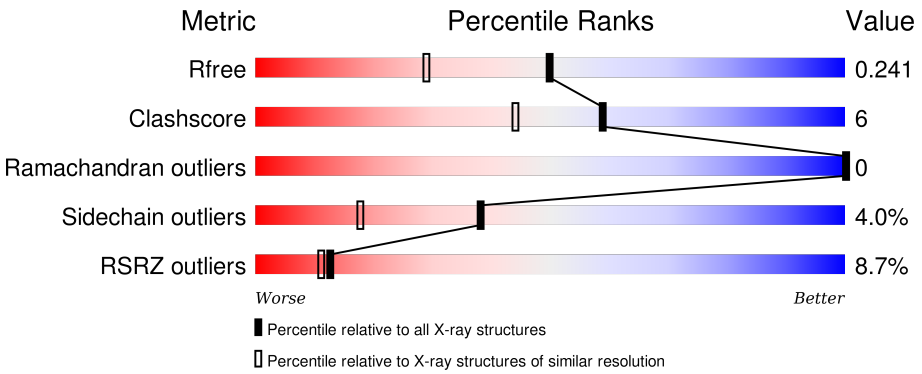
MolProbity	:	4.02b-467
Mogul	:	1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix)	:	1.9-1692
EDS	:	rb-20026688
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac	:	5.8.0135
CCP4	:	6.5.0
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	trunk26865

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 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}	91344	2634 (1.86-1.82)
Clashscore	102246	2862 (1.86-1.82)
Ramachandran outliers	100387	2831 (1.86-1.82)
Sidechain outliers	100360	2832 (1.86-1.82)
RSRZ outliers	91569	2639 (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 on the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria. 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% 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	117	5%, 74%, 5%, •, 19%
1	B	117	9%, 74%, 9%, •, 15%
1	C	117	8%, 83%, 5%, •, 11%

2 Entry composition (i)

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
			Total	C	N	O	S			
1	A	95	698	434	120	142	2	0	2	0
1	B	100	721	448	123	146	4	0	2	0
1	C	104	756	474	130	149	3	0	0	0

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

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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

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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.

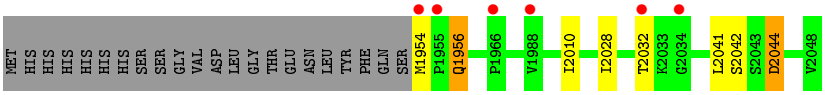
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	A	84	84	84	0	0
			Total	O		
2	B	56	56	56	0	0
			Total	O		
2	C	59	59	59	0	0

3 Residue-property plots (i)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

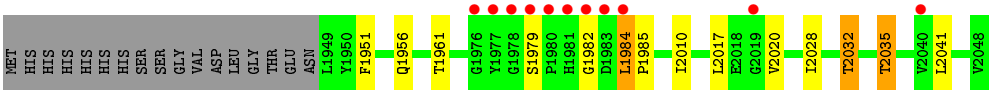
- Molecule 1: Multiple PDZ domain protein

Chain A:



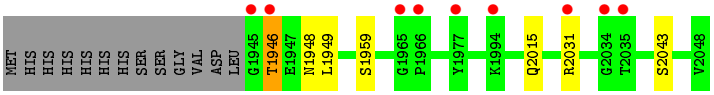
- Molecule 1: Multiple PDZ domain protein

Chain B:



- Molecule 1: Multiple PDZ domain protein

Chain C:



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 (8.38%)	DCC
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
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Outliers	1 of 26603 reflections (0.004%)	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, 0.375 respectively for untwinned datasets, and 0.333, 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	0.76	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(^{o})	Ideal(^{o})
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 (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	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 (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	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 (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	75/96 (78%)	71 (95%)	4 (5%)	28 10
1	B	77/96 (80%)	72 (94%)	5 (6%)	21 5
1	C	79/96 (82%)	76 (96%)	3 (4%)	40 19
All	All	231/288 (80%)	219 (95%)	12 (5%)	38 10

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

Mol	Chain	Res	Type
1	B	1984	LEU
1	B	2032	THR
1	C	1949	LEU
1	B	1979	SER
1	B	2035[B]	THR

Some 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 (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 (i)

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	95/117 (81%)	0.63	6 (6%) 23 20	33, 41, 58, 71	0
1	B	100/117 (85%)	0.74	11 (11%) 7 6	33, 44, 56, 66	0
1	C	104/117 (88%)	0.61	9 (8%) 13 11	35, 45, 59, 66	0
All	All	299/351 (85%)	0.66	26 (8%) 13 11	33, 44, 58, 71	0

The worst 5 of 26 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	1980	PRO	6.8
1	C	1966	PRO	6.7
1	B	1977	TYR	6.0
1	C	1977	TYR	4.8
1	B	1981	HIS	4.8

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 (i)

There are no ligands in this entry.

6.5 Other polymers (i)

There are no such residues in this entry.