



Full wwPDB X-ray Structure Validation Report

Mar 31, 2014 – 03:02 PM BST

PDB ID : 4LM2
Title : Crystal structure of PDE10A2 with fragment ZT462
Authors : Sridhar, V.; Badger, J.; Logan, C.; Chie-Leon, B.; Nienaber, V.
Deposited on : 2013-07-09
Resolution : 1.55 Å(reported)

This is a full wwPDB validation 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/ValidationPDFNotes.html>

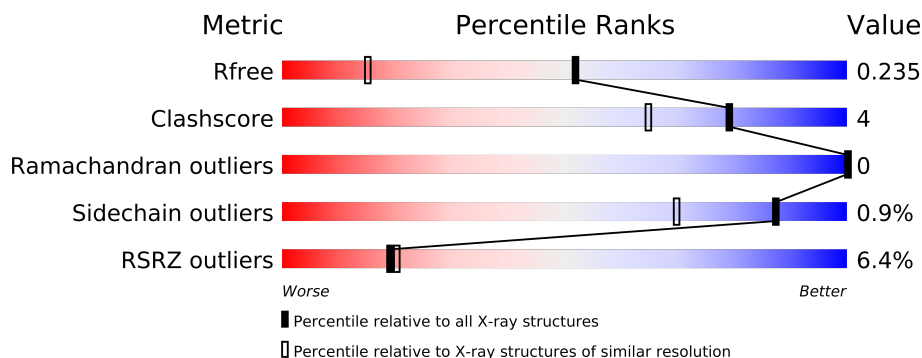
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.15 2013
Xtriage (Phenix) : dev-1323
EDS : stable23004
Percentile statistics : 21963
Refmac : 5.8.0049
CCP4 : 6.3.0 (Settle)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : stable23004

1 Overall quality at a glance

The reported resolution of this entry is 1.55 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}	66092	1117 (1.58-1.54)
Clashscore	79885	1249 (1.58-1.54)
Ramachandran outliers	78287	1212 (1.58-1.54)
Sidechain outliers	78261	1210 (1.58-1.54)
RSRZ outliers	66119	1117 (1.58-1.54)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	345	
1	B	345	

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 5705 atoms, of which 0 are hydrogen and 0 are deuterium.

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.

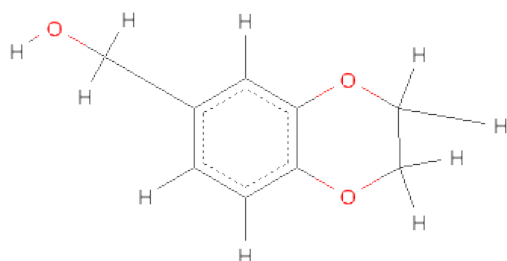
- Molecule 1 is a protein called cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	330	Total	C	N	O	S	0	11	0
			2664	1704	453	483	24			
1	B	327	Total	C	N	O	S	0	9	0
			2635	1683	446	480	26			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	445	GLY	-	EXPRESSION TAG	UNP Q9Y233
A	446	ALA	-	EXPRESSION TAG	UNP Q9Y233
A	447	GLY	-	EXPRESSION TAG	UNP Q9Y233
A	448	THR	-	EXPRESSION TAG	UNP Q9Y233
B	445	GLY	-	EXPRESSION TAG	UNP Q9Y233
B	446	ALA	-	EXPRESSION TAG	UNP Q9Y233
B	447	GLY	-	EXPRESSION TAG	UNP Q9Y233
B	448	THR	-	EXPRESSION TAG	UNP Q9Y233

- Molecule 2 is 2,3-DIHYDRO-1,4-BENZODIOXIN-6-YLMETHANOL (three-letter code: 8ZE) (formula: C₉H₁₀O₃).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			12	9	3		

- Molecule 3 is NICKEL (II) ION (three-letter code: NI) (formula: Ni).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	2	Total	Ni	0	0
			2	2		
3	A	2	Total	Ni	0	0
			2	2		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	217	Total	O	0	0
			217	217		
4	B	173	Total	O	0	0
			173	173		

3 Residue-property plots

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.

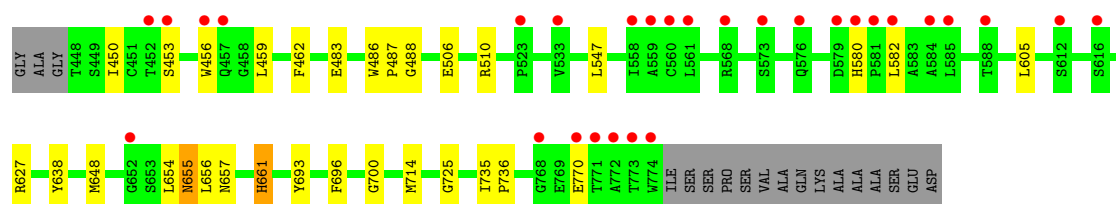
- Molecule 1: cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A

Chain A: 



- Molecule 1: cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A

Chain B: 



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	52.18Å 82.38Å 155.13Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	33.55 – 1.55 33.55 – 1.55	Depositor EDS
% Data completeness (in resolution range)	(Not available) (33.55-1.55) 96.1 (33.55-1.55)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.37 (at 1.55Å)	Xtriage
Refinement program	REFMAC 5.5.0110	Depositor
R, R_{free}	0.207 , 0.244 0.203 , 0.235	Depositor DCC
R_{free} test set	4693 reflections (5.28%)	DCC
Wilson B-factor (Å ²)	21.5	Xtriage
Anisotropy	0.703	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 36.1	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 93625 reflections	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	5705	wwPDB-VP
Average B, all atoms (Å ²)	27.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.83% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: 8ZE, NI

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	0/2785	0.80	6/3777 (0.2%)
1	B	0.71	0/2744	0.71	0/3720
All	All	0.73	0/5529	0.76	6/7497 (0.1%)

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	674	ASP	CB-CG-OD2	10.65	127.89	118.30
1	A	496[A]	ARG	NE-CZ-NH1	6.12	123.36	120.30
1	A	496[B]	ARG	NE-CZ-NH1	6.12	123.36	120.30
1	A	674	ASP	CB-CG-OD1	-5.82	113.07	118.30
1	A	496[A]	ARG	NE-CZ-NH2	-5.54	117.53	120.30
1	A	496[B]	ARG	NE-CZ-NH2	-5.54	117.53	120.30

There are no chirality outliers.

There are no planarity outliers.

5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2664	0	2609	15	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	2635	0	2580	22	0
2	A	12	0	10	0	0
3	A	2	0	0	0	0
3	B	2	0	0	0	0
4	A	217	0	0	0	0
4	B	173	0	0	1	0
All	All	5705	0	5199	37	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 4.

All (37) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:756[B]:ARG:HG2	1:A:756[B]:ARG:HH11	1.19	1.04
1:B:655:ASN:H	1:B:661:HIS:HD2	1.16	0.89
1:A:756[B]:ARG:CG	1:A:756[B]:ARG:HH11	1.94	0.77
1:A:756[B]:ARG:NH1	1:A:756[B]:ARG:HG2	1.99	0.70
1:A:469:CYS:O	1:A:472[A]:ILE:HG22	1.92	0.69
1:B:450:ILE:HG22	1:B:605:LEU:HD13	1.82	0.62
1:A:641:ASN:HD22	1:A:664:ARG:HH11	1.46	0.61
1:B:580:HIS:HD2	1:B:582:LEU:H	1.46	0.61
1:A:765:VAL:HA	1:A:770[B]:GLU:HG3	1.81	0.61
1:B:456:TRP:CZ3	1:B:506:GLU:HG3	2.36	0.61
1:B:506:GLU:OE1	1:B:510:ARG:NH2	2.33	0.59
1:B:655:ASN:H	1:B:661:HIS:CD2	2.08	0.58
1:A:727:LEU:HD11	1:A:763:GLU:HG3	1.87	0.57
1:B:580:HIS:CD2	1:B:582:LEU:H	2.22	0.57
1:B:655:ASN:N	1:B:661:HIS:HD2	1.97	0.56
1:B:483:GLU:HA	1:B:486:TRP:CE2	2.41	0.55
1:B:648:MET:HE2	1:B:654:LEU:HD12	1.90	0.52
1:B:459:LEU:HD13	1:B:487:PRO:HB2	1.93	0.51
1:A:756[B]:ARG:CG	1:A:756[B]:ARG:NH1	2.64	0.49
1:A:580:HIS:CG	1:A:581:PRO:HD2	2.46	0.49
1:A:483:GLU:HA	1:A:486:TRP:CE2	2.48	0.49
1:B:547[B]:LEU:HD11	1:B:656:LEU:HD13	1.95	0.49
1:B:655:ASN:ND2	1:B:657:ASN:H	2.12	0.47
1:A:727:LEU:HD11	1:A:763:GLU:CG	2.44	0.47
1:B:648:MET:HE2	1:B:654:LEU:CD1	2.45	0.46
1:B:627[A]:ARG:HH11	1:B:627[A]:ARG:HG2	1.81	0.45
1:A:464:LEU:HD21	1:A:472[B]:ILE:HD12	1.97	0.44
1:A:575:LEU:HD11	1:A:591:MET:SD	2.58	0.44
1:B:696:PHE:O	1:B:714[B]:MET:HG3	2.18	0.42

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:B:462:PHE:CD2	1:B:488:GLY:HA3	2.54	0.42
1:B:735:ILE:HB	1:B:736:PRO:HD3	2.03	0.41
1:A:472[A]:ILE:HD11	1:A:489:ILE:HG23	2.02	0.41
1:B:627[A]:ARG:HG2	1:B:627[A]:ARG:NH1	2.37	0.40
1:B:693:TYR:OH	1:B:725:GLY:HA3	2.21	0.40
1:A:459:LEU:HD13	1:A:487:PRO:HB2	2.02	0.40
1:B:770:GLU:HG3	4:B:1080:HOH:O	2.22	0.40

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	339/345 (98%)	335 (99%)	4 (1%)	0	100	100
1	B	334/345 (97%)	331 (99%)	3 (1%)	0	100	100
All	All	673/690 (98%)	666 (99%)	7 (1%)	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	295/306 (96%)	293 (99%)	2 (1%)	91	77
1	B	293/306 (96%)	289 (99%)	4 (1%)	78	52
All	All	588/612 (96%)	582 (99%)	6 (1%)	87	66

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	496[A]	ARG
1	A	496[B]	ARG
1	B	453	SER
1	B	638	TYR
1	B	655	ASN
1	B	661	HIS

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

Mol	Chain	Res	Type
1	A	641	ASN
1	B	580	HIS
1	B	655	ASN
1	B	661	HIS

5.3.3 RNA ⓘ

There are no RNA chains 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 carbohydrates in this entry.

5.6 Ligand geometry ⓘ

Of 5 ligands modelled in this entry, 4 are monoatomic - leaving 1 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	8ZE	A	900	-	13,13,13	1.49	2 (15%)	17,17,17	1.67	3 (17%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the chemical component dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	8ZE	A	900	-	-	0/2/9/9	0/0/2/2

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	900	8ZE	O10-C11	-3.40	1.33	1.37
2	A	900	8ZE	O7-C6	-3.31	1.33	1.37

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	900	8ZE	C9-O10-C11	4.38	122.47	114.18
2	A	900	8ZE	C8-O7-C6	3.28	120.38	114.18
2	A	900	8ZE	O10-C11-C12	2.09	119.83	116.59

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

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 ⓘ

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	330/345 (95%)	0.15	13 (3%) 37 39	16, 24, 40, 51	0
1	B	327/345 (94%)	0.39	29 (8%) 10 10	18, 27, 44, 64	0
All	All	657/690 (95%)	0.27	42 (6%) 19 20	16, 25, 42, 64	0

All (42) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	774	TRP	9.4
1	B	773	THR	8.1
1	B	772	ALA	7.8
1	B	585	LEU	6.2
1	A	446	ALA	5.3
1	B	584	ALA	4.5
1	B	456	TRP	4.3
1	B	581	PRO	4.0
1	A	463	THR	4.0
1	B	588	THR	3.2
1	B	523	PRO	3.1
1	B	579	ASP	3.1
1	B	559	ALA	3.0
1	A	773	THR	3.0
1	A	675	LEU	2.9
1	B	770	GLU	2.9
1	A	533	VAL	2.8
1	B	771	THR	2.8
1	A	775	ILE	2.8
1	B	616	SER	2.6
1	B	652	GLY	2.6
1	A	531	VAL	2.5
1	B	576	GLN	2.5
1	B	573	SER	2.4

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	582	LEU	2.4
1	B	768	GLY	2.4
1	A	447	GLY	2.4
1	B	580	HIS	2.3
1	B	453	SER	2.3
1	B	568	ARG	2.3
1	B	561	LEU	2.3
1	A	462	PHE	2.2
1	B	560	CYS	2.2
1	A	501	SER	2.2
1	B	558	ILE	2.2
1	B	452	THR	2.1
1	A	585	LEU	2.1
1	B	612	SER	2.1
1	A	771	THR	2.1
1	B	533	VAL	2.1
1	A	467	ARG	2.1
1	B	457	GLN	2.0

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

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

6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

6.4 Ligands ⓘ

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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	RSR	LLDF	B-factors(Å ²)	Q<0.9
3	NI	B	902	1/1	0.10	0.53	35,35,35,35	0
2	8ZE	A	900	12/12	0.12	0.28	46,47,48,48	0
3	NI	A	902	1/1	0.04	-2.41	30,30,30,30	0

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Atoms	RSR	LLDF	B-factors(\AA^2)	Q<0.9
3	NI	B	901	1/1	0.03	-2.92	28,28,28,28	0
3	NI	A	901	1/1	0.03	-3.27	19,19,19,19	0

6.5 Other polymers ⓘ

There are no such residues in this entry.