Full wwPDB X-ray Structure Validation Report (i)

Oct 11, 2021 – 06:59 PM EDT

PDB ID	:	2OUV
Title	:	crystal structure of pde10a2 mutant of D564N
Authors	:	Wang, H.C.; Liu, Y.D.; Hou, J.; Zheng, M.Y.; Robinson, H.
Deposited on	:	2007-02-12
Resolution	:	1.56 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 (i) symbol.

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

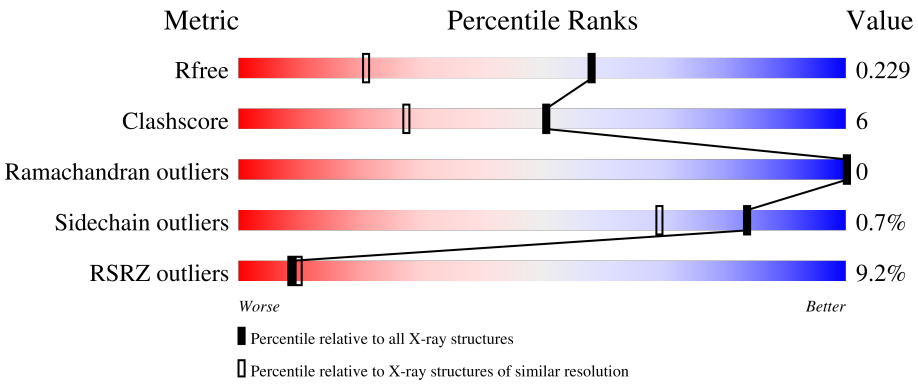
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.23.2
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.23.2

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 1.56 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	1483 (1.56-1.56)
Clashscore	141614	1529 (1.56-1.56)
Ramachandran outliers	138981	1498 (1.56-1.56)
Sidechain outliers	138945	1495 (1.56-1.56)
RSRZ outliers	127900	1465 (1.56-1.56)

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% 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	331	7% 85% 12% • •
1	B	331	11% 85% 13% • •

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	ZN	B	777	-	-	-	X

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 5752 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 cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	325	2636	1682	449	480	25	0	0	0
1	B	328	2654	1692	452	485	25	0	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	446	SER	-	cloning artifact	UNP Q9Y233
A	447	HIS	-	cloning artifact	UNP Q9Y233
A	448	MET	-	cloning artifact	UNP Q9Y233
A	564	ASN	ASP	engineered mutation	UNP Q9Y233
B	446	SER	-	cloning artifact	UNP Q9Y233
B	447	HIS	-	cloning artifact	UNP Q9Y233
B	448	MET	-	cloning artifact	UNP Q9Y233
B	564	ASN	ASP	engineered mutation	UNP Q9Y233

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Zn		
2	A	1	1	1	0	0
2	B	1	1	1	0	0

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mg		
3	A	1	1	1	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mg		
3	B	1	1	1	0	0

- Molecule 4 is water.

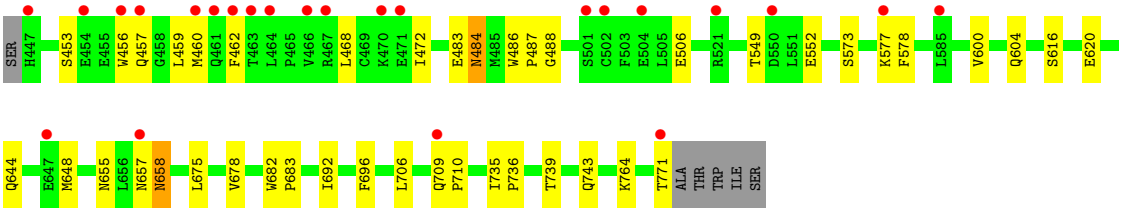
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
4	A	252	252	252	0	0
			Total	O		
4	B	206	206	206	0	0

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.

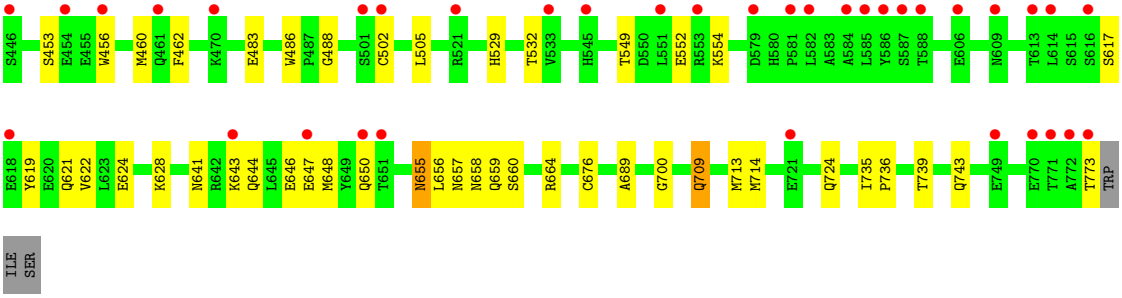
• Molecule 1: cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A

Chain A:



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

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	51.44Å 82.20Å 155.24Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 1.56 29.67 – 1.56	Depositor EDS
% Data completeness (in resolution range)	(Not available) (30.00-1.56) 94.8 (29.67-1.56)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.65 (at 1.56Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.209 , 0.228 0.209 , 0.229	Depositor DCC
R_{free} test set	9155 reflections (10.00%)	wwPDB-VP
Wilson B-factor (Å^2)	16.1	Xtriage
Anisotropy	0.522	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 42.3	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	5752	wwPDB-VP
Average B, all atoms (Å^2)	20.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.40% 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 (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: ZN, MG

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	0.30	0/2701	0.54	0/3657
1	B	0.30	0/2719	0.53	0/3682
All	All	0.30	0/5420	0.53	0/7339

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	2636	0	2597	28	0
1	B	2654	0	2614	33	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	252	0	0	0	0
4	B	206	0	0	3	0
All	All	5752	0	5211	60	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.

All (60) 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:646:GLU:HG2	1:B:650:GLN:HE21	1.36	0.89
1:B:709:GLN:HE21	1:B:709:GLN:HA	1.41	0.84
1:B:641:ASN:HD22	1:B:664:ARG:HH11	1.40	0.68
1:B:644:GLN:O	1:B:648:MET:HG3	1.94	0.68
1:A:655:ASN:ND2	1:A:657:ASN:OD1	2.31	0.63
1:B:646:GLU:HG2	1:B:650:GLN:NE2	2.12	0.63
1:B:689:ALA:HB2	1:B:773:THR:HG21	1.80	0.62
1:B:724:GLN:HG3	4:B:895:HOH:O	2.00	0.60
1:A:578:PHE:CD2	1:A:706:LEU:HD13	2.37	0.59
1:A:709:GLN:NE2	1:A:710:PRO:HD2	2.17	0.59
1:A:453:SER:HA	1:A:456:TRP:NE1	2.17	0.58
1:A:658:ASN:HD22	1:A:658:ASN:C	2.08	0.58
1:B:483:GLU:HA	1:B:486:TRP:CE2	2.38	0.57
1:B:617:SER:O	1:B:621:GLN:HG3	2.05	0.57
1:B:655:ASN:ND2	1:B:657:ASN:H	2.02	0.57
1:A:573:SER:O	1:A:577:LYS:HG3	2.05	0.56
1:A:616:SER:O	1:A:620:GLU:HG3	2.06	0.56
1:A:483:GLU:HA	1:A:486:TRP:CE2	2.42	0.55
1:B:739:THR:O	1:B:743:GLN:HG3	2.08	0.53
1:B:483:GLU:HG3	1:B:486:TRP:CZ3	2.44	0.53
1:B:689:ALA:CB	1:B:773:THR:HG21	2.39	0.52
1:A:468:LEU:O	1:A:472:ILE:HG13	2.09	0.52
1:B:659:GLN:HG3	4:B:853:HOH:O	2.09	0.51
1:B:643:LYS:O	1:B:647:GLU:HG3	2.11	0.51
1:B:735:ILE:HB	1:B:736:PRO:HD3	1.94	0.50
1:B:549:THR:OG1	1:B:552:GLU:HG3	2.11	0.50
1:B:532:THR:HG22	1:B:676:CYS:SG	2.52	0.50
1:B:453:SER:HA	1:B:456:TRP:NE1	2.27	0.50
1:A:456:TRP:CZ3	1:A:506:GLU:HG3	2.45	0.49
1:A:459:LEU:HD13	1:A:487:PRO:HB2	1.95	0.49
1:B:655:ASN:HD22	1:B:656:LEU:N	2.10	0.49
1:A:600:VAL:O	1:A:604:GLN:HG3	2.12	0.49
1:A:644:GLN:O	1:A:648:MET:HG3	2.14	0.48
1:B:624:GLU:HG2	1:B:628:LYS:HE3	1.96	0.47
1:B:502:CYS:SG	1:B:554:LYS:HE2	2.54	0.47
1:A:453:SER:O	1:A:457:GLN:HG3	2.14	0.47
1:A:682:TRP:HB3	1:A:683:PRO:HD3	1.97	0.46
1:A:735:ILE:HB	1:A:736:PRO:HD3	1.98	0.46
1:B:529:HIS:HD2	4:B:810:HOH:O	1.98	0.45
1:B:655:ASN:HD22	1:B:655:ASN:C	2.19	0.45

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:709:GLN:HA	1:B:709:GLN:NE2	2.21	0.45
1:A:483:GLU:HG3	1:A:486:TRP:CZ3	2.53	0.44
1:A:484:ASN:HD22	1:A:484:ASN:H	1.65	0.44
1:B:460:MET:HG2	1:B:505:LEU:HG	1.99	0.44
1:B:624:GLU:CG	1:B:628:LYS:HE3	2.49	0.43
1:A:453:SER:HB2	1:A:457:GLN:HE21	1.83	0.43
1:A:739:THR:O	1:A:743:GLN:HG3	2.18	0.43
1:A:573:SER:HB3	1:A:577:LYS:HE3	2.00	0.43
1:B:453:SER:HA	1:B:456:TRP:CD1	2.54	0.43
1:A:549:THR:OG1	1:A:552:GLU:HG3	2.19	0.43
1:B:619:TYR:O	1:B:622:VAL:HG12	2.18	0.42
1:A:771:THR:HA	1:B:713:MET:HB3	2.00	0.42
1:B:658:ASN:OD1	1:B:660:SER:HB3	2.19	0.42
1:A:675:LEU:O	1:A:678:VAL:HG22	2.20	0.42
1:A:456:TRP:O	1:A:460:MET:HG3	2.20	0.41
1:B:700:GLY:HA3	1:B:714:MET:O	2.20	0.41
1:A:692:ILE:HG22	1:A:696:PHE:CE2	2.55	0.41
1:A:764:LYS:HB3	1:A:764:LYS:NZ	2.35	0.41
1:A:462:PHE:CD2	1:A:488:GLY:HA3	2.57	0.40
1:B:462:PHE:CD2	1:B:488:GLY:HA3	2.57	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	323/331 (98%)	316 (98%)	7 (2%)	0	100	100
1	B	326/331 (98%)	321 (98%)	5 (2%)	0	100	100
All	All	649/662 (98%)	637 (98%)	12 (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	294/299 (98%)	292 (99%)	2 (1%)	84	69
1	B	296/299 (99%)	294 (99%)	2 (1%)	84	69
All	All	590/598 (99%)	586 (99%)	4 (1%)	84	69

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	484	ASN
1	A	658	ASN
1	B	655	ASN
1	B	709	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	457	GLN
1	A	484	ASN
1	A	655	ASN
1	A	658	ASN
1	A	690	ASN
1	A	709	GLN
1	B	457	GLN
1	B	593	GLN
1	B	609	ASN
1	B	641	ASN
1	B	650	GLN
1	B	655	ASN
1	B	709	GLN
1	B	724	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 monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 4 ligands modelled in this entry, 4 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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	325/331 (98%)	0.42	24 (7%) 14 17	11, 17, 32, 36	0
1	B	328/331 (99%)	0.62	36 (10%) 5 5	11, 19, 32, 36	0
All	All	653/662 (98%)	0.52	60 (9%) 9 10	11, 18, 32, 36	0

All (60) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	585	LEU	5.3
1	B	502	CYS	4.8
1	B	772	ALA	4.6
1	A	463	THR	4.6
1	A	501	SER	4.6
1	A	447	HIS	4.6
1	B	446	SER	4.5
1	A	771	THR	4.5
1	B	773	THR	4.3
1	B	456	TRP	4.2
1	B	501	SER	4.2
1	A	521	ARG	4.2
1	B	521	ARG	4.0
1	A	461	GLN	4.0
1	B	613	THR	3.9
1	A	454	GLU	3.9
1	A	657	ASN	3.5
1	A	577	LYS	3.4
1	B	584	ALA	3.4
1	B	616	SER	3.3
1	A	456	TRP	3.3
1	B	579	ASP	3.3
1	B	770	GLU	3.2
1	B	461	GLN	3.0

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	462	PHE	3.0
1	B	647	GLU	3.0
1	A	466	VAL	2.9
1	A	502	CYS	2.8
1	B	581	PRO	2.7
1	A	470	LYS	2.7
1	A	647	GLU	2.7
1	B	587	SER	2.7
1	B	618	GLU	2.6
1	B	588	THR	2.4
1	B	721	GLU	2.4
1	A	464	LEU	2.4
1	A	471	GLU	2.3
1	B	586	TYR	2.3
1	B	551	LEU	2.2
1	B	771	THR	2.2
1	A	467	ARG	2.2
1	A	550	ASP	2.2
1	A	504	GLU	2.2
1	B	606	GLU	2.2
1	B	650	GLN	2.2
1	B	533	VAL	2.1
1	B	470	LYS	2.1
1	B	749	GLU	2.1
1	B	609	ASN	2.1
1	B	454	GLU	2.1
1	A	457	GLN	2.1
1	B	643	LYS	2.1
1	A	585	LEU	2.1
1	B	582	LEU	2.1
1	B	614	LEU	2.1
1	A	460	MET	2.0
1	B	545	HIS	2.0
1	A	709	GLN	2.0
1	B	553	ARG	2.0
1	B	651	THR	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)

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. 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	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	ZN	B	777	1/1	0.77	0.57	30,30,30,30	0
3	MG	A	778	1/1	0.79	0.35	24,24,24,24	0
2	ZN	A	777	1/1	0.99	0.21	22,22,22,22	0
3	MG	B	778	1/1	1.00	0.04	14,14,14,14	0

6.5 Other polymers (i)

There are no such residues in this entry.