



wwPDB X-ray Structure Validation Summary Report i

Feb 28, 2014 – 10:18 PM GMT

PDB ID : 2PO3
Title : Crystal Structure Analysis of DesI in the presence of its TDP-sugar product
Authors : Burgie, E.S.; Holden, H.M.
Deposited on : 2007-04-25
Resolution : 2.10 Å(reported)

This is a wwPDB 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/ValidationPDFNotes.html>

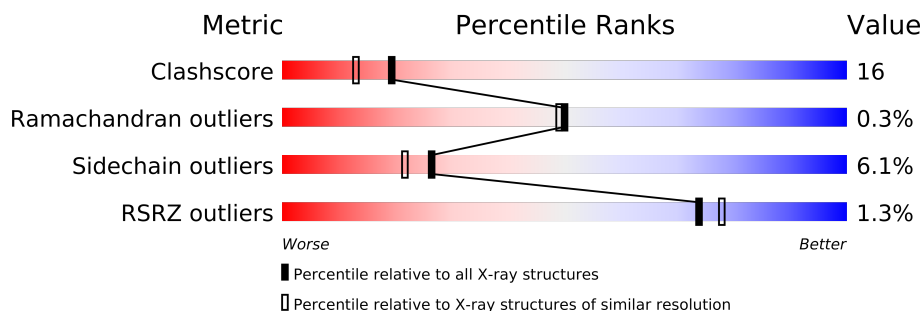
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity	:	4.02b-467
Mogul	:	1.15 2013
Xtriage (Phenix)	:	dev-1323
EDS	:	stable22639
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)	:	stable22683

1 Overall quality at a glance

The reported resolution of this entry is 2.10 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))
Clashscore	79885	3649 (2.10-2.10)
Ramachandran outliers	78287	3610 (2.10-2.10)
Sidechain outliers	78261	3611 (2.10-2.10)
RSRZ outliers	66119	3013 (2.10-2.10)

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	424	
1	B	424	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 6635 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.

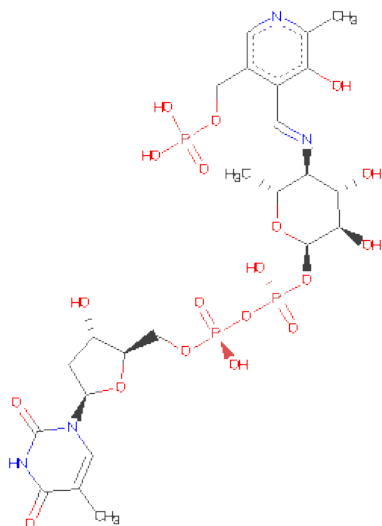
- Molecule 1 is a protein called 4-dehydrase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	393	Total	C	N	O	S	0	1	0
			2969	1847	561	551	10			
1	B	392	Total	C	N	O	S	0	3	0
			2973	1850	561	552	10			

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1416	GLY	-	EXPRESSION TAG	UNP Q9ZGH0
A	1417	LEU	-	EXPRESSION TAG	UNP Q9ZGH0
A	1418	GLU	-	EXPRESSION TAG	UNP Q9ZGH0
A	1419	HIS	-	EXPRESSION TAG	UNP Q9ZGH0
A	1420	HIS	-	EXPRESSION TAG	UNP Q9ZGH0
A	1421	HIS	-	EXPRESSION TAG	UNP Q9ZGH0
A	1422	HIS	-	EXPRESSION TAG	UNP Q9ZGH0
A	1423	HIS	-	EXPRESSION TAG	UNP Q9ZGH0
A	1424	HIS	-	EXPRESSION TAG	UNP Q9ZGH0
B	2416	GLY	-	EXPRESSION TAG	UNP Q9ZGH0
B	2417	LEU	-	EXPRESSION TAG	UNP Q9ZGH0
B	2418	GLU	-	EXPRESSION TAG	UNP Q9ZGH0
B	2419	HIS	-	EXPRESSION TAG	UNP Q9ZGH0
B	2420	HIS	-	EXPRESSION TAG	UNP Q9ZGH0
B	2421	HIS	-	EXPRESSION TAG	UNP Q9ZGH0
B	2422	HIS	-	EXPRESSION TAG	UNP Q9ZGH0
B	2423	HIS	-	EXPRESSION TAG	UNP Q9ZGH0
B	2424	HIS	-	EXPRESSION TAG	UNP Q9ZGH0

- Molecule 2 is (2R,3R,4S,5S,6R)-3,4-DIHYDROXY-5-[(3-HYDROXY-2-METHYL-5-[(PHOSPHONOXY)METHYL]PYRIDIN-4-YL}METHYL)IMINO]-6-METHYLTETRAHYDRO-2H-PYRAN-2-YL[(2R,3S,5R)-3-HYDROXY-5-(5-METHYL-2,4-DIOXO-3,4-DIHYDROPYRIMIDIN-1(2H)-YL)TETRAHYDROFURAN-2-YL]METHYLDIHYDROGEN DIPHOSPHATE (three-letter code: T4K) (formula: C₂₄H₃₅N₄O₁₉P₃).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			50	24	4	19	3		
2	B	1	Total	C	N	O	P	0	0
			50	24	4	19	3		

- Molecule 3 is water.

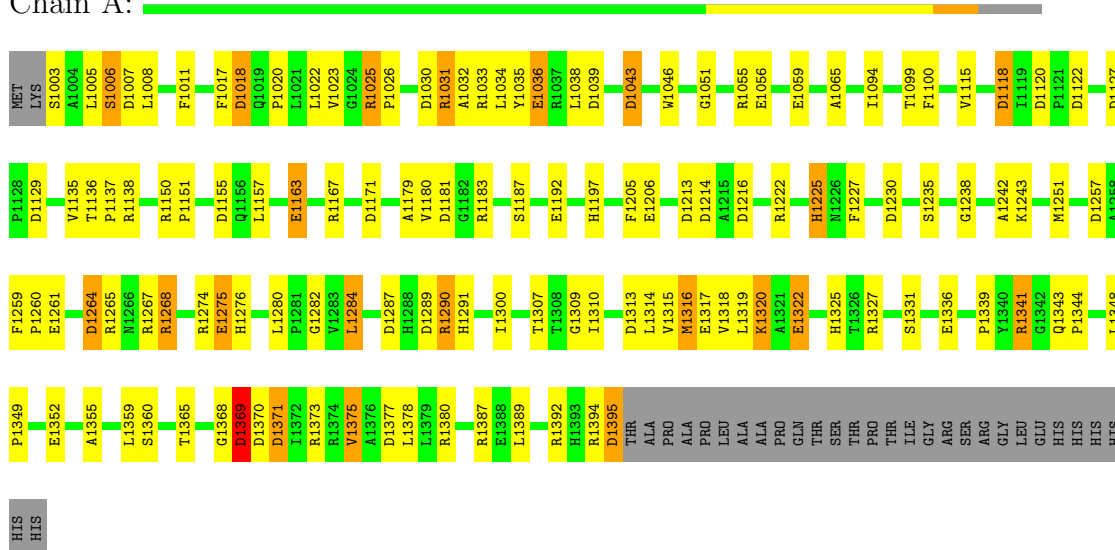
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	342	Total	O	0	0
			342	342		
3	B	251	Total	O	0	0
			251	251		

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.

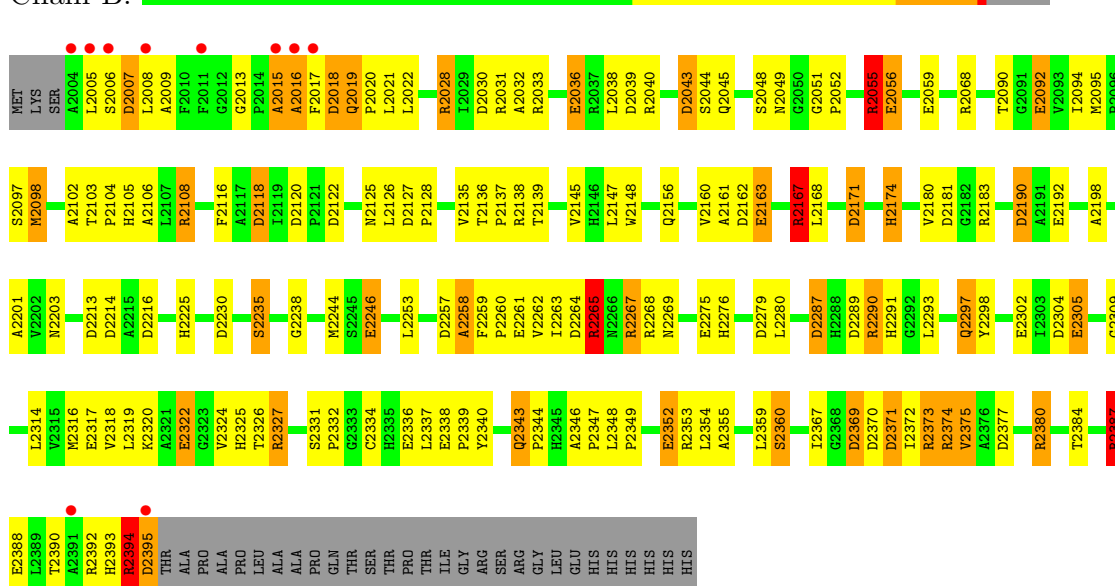
- Molecule 1: 4-dehydrase

Chain A:



- Molecule 1: 4-dehydrase

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	59.50Å 66.80Å 242.00Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	44.84 – 2.10 44.84 – 2.10	Depositor EDS
% Data completeness (in resolution range)	97.2 (44.84-2.10) 97.3 (44.84-2.10)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	0.06	Depositor
$\langle I/\sigma(I) \rangle$ ¹	0.63 (at 2.10Å)	Xtriage
Refinement program	TNT	Depositor
R, R_{free}	0.180 , 0.248 0.177 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	DCC
Wilson B-factor (Å ²)	25.2	Xtriage
Anisotropy	0.634	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 108.8	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.31$	Xtriage
Outliers	0 of 55830 reflections	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	6635	wwPDB-VP
Average B, all atoms (Å ²)	35.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.03% 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: T4K

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	0.87	10/3041 (0.3%)	1.41	58/4140 (1.4%)
1	B	0.91	18/3053 (0.6%)	1.51	73/4156 (1.8%)
All	All	0.89	28/6094 (0.5%)	1.46	131/8296 (1.6%)

The worst 5 of 28 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	2056	GLU	CD-OE2	7.08	1.33	1.25
1	B	2163	GLU	CD-OE2	6.65	1.32	1.25
1	A	1261	GLU	CD-OE2	6.41	1.32	1.25
1	A	1059	GLU	CD-OE2	6.30	1.32	1.25
1	A	1275	GLU	CD-OE2	6.26	1.32	1.25

The worst 5 of 131 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	2394	ARG	NE-CZ-NH1	9.44	125.02	120.30
1	B	2214	ASP	CB-CG-OD2	-9.14	110.08	118.30
1	A	1043	ASP	CB-CG-OD2	-8.91	110.28	118.30
1	B	2214	ASP	CB-CG-OD1	8.84	126.26	118.30
1	B	2127	ASP	CB-CG-OD2	-8.64	110.52	118.30

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	2969	0	2896	71	0
1	B	2973	0	2901	126	0
2	A	50	0	31	6	0
2	B	50	0	31	1	0
3	A	342	0	0	11	0
3	B	251	0	0	13	0
All	All	6635	0	5859	194	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 16.

The worst 5 of 194 close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:B:2201:ALA:HB2	1:B:2297[B]:GLN:HG3	1.41	1.02
1:B:2009:ALA:HA	1:B:2013:GLY:O	1.67	0.94
1:B:2017:PHE:HB2	1:B:2374:ARG:CZ	1.99	0.93
1:A:1022:LEU:HD23	1:A:1325:HIS:HB2	1.55	0.89
1:B:2167:ARG:HG3	1:B:2167:ARG:HH11	1.42	0.82

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	392/424 (92%)	379 (97%)	13 (3%)	0	100	100
1	B	393/424 (93%)	372 (95%)	19 (5%)	2 (0%)	38	33
All	All	785/848 (93%)	751 (96%)	32 (4%)	2 (0%)	50	49

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	2394	ARG
1	B	2198	ALA

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	297/321 (92%)	281 (95%)	16 (5%)	31	27
1	B	298/321 (93%)	277 (93%)	21 (7%)	21	17
All	All	595/642 (93%)	558 (94%)	37 (6%)	26	21

5 of 37 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	2006	SER
1	B	2098	MET
1	B	2374	ARG
1	B	2018	ASP
1	B	2019	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 7 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	2019	GLN
1	B	2276	HIS
1	B	2130	GLN
1	A	1325	HIS
1	B	2156	GLN

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 ⓘ

2 ligands are modelled in this entry.

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	T4K	A	1500	-	53,53,53	1.86	10 (18%)	76,81,81	1.77	11 (14%)
2	T4K	B	2500	-	53,53,53	1.89	8 (15%)	76,81,81	1.96	15 (19%)

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	T4K	A	1500	-	-	1/29/64/64	0/4/4/4
2	T4K	B	2500	-	-	1/29/64/64	0/4/4/4

The worst 5 of 18 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	2500	T4K	C4G-N4A	-9.11	1.39	1.46
2	A	1500	T4K	C4G-N4A	-7.36	1.41	1.46
2	A	1500	T4K	P2-OPP	4.34	1.67	1.59
2	A	1500	T4K	C4L-C3L	3.67	1.45	1.40
2	A	1500	T4K	C4A-N4A	3.52	1.34	1.27

The worst 5 of 26 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	2500	T4K	C61-N11-C21	-8.66	119.95	122.41
2	A	1500	T4K	C61-N11-C21	-6.95	120.43	122.41

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	2500	T4K	P-OPP-P2	-6.95	111.30	131.68
2	B	2500	T4K	N31-C21-N11	5.76	120.78	115.97
2	A	1500	T4K	N31-C21-N11	5.45	120.52	115.97

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	2500	T4K	C3G-C4G-N4A-C4A
2	A	1500	T4K	C3G-C4G-N4A-C4A

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	393/424 (92%)	-0.59	0 100 100	13, 27, 59, 93	0
1	B	392/424 (92%)	-0.29	10 (2%) 53 58	12, 32, 69, 99	0
All	All	785/848 (92%)	-0.44	10 (1%) 74 78	12, 30, 63, 99	0

The worst 5 of 10 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	2005	LEU	4.0
1	B	2011	PHE	3.8
1	B	2017	PHE	3.2
1	B	2008	LEU	2.4
1	B	2015	ALA	2.4

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(\AA^2)	Q<0.9
2	T4K	B	2500	50/50	0.12	0.62	14,54,100,100	0
2	T4K	A	1500	50/50	0.09	-0.27	13,28,67,100	0

6.5 Other polymers ⓘ

There are no such residues in this entry.