



Full wwPDB X-ray Structure Validation Report

Oct 1, 2014 – 06:18 PM EDT

PDB ID : 3PYX
Title : Crystals Structure of Aspartate beta-Semialdehyde Dehydrogenase complex
with NADP and 2-aminoterephthalate
Authors : Pavlovsky, A.G.; Viola, R.E.
Deposited on : 2010-12-13
Resolution : 1.60 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>

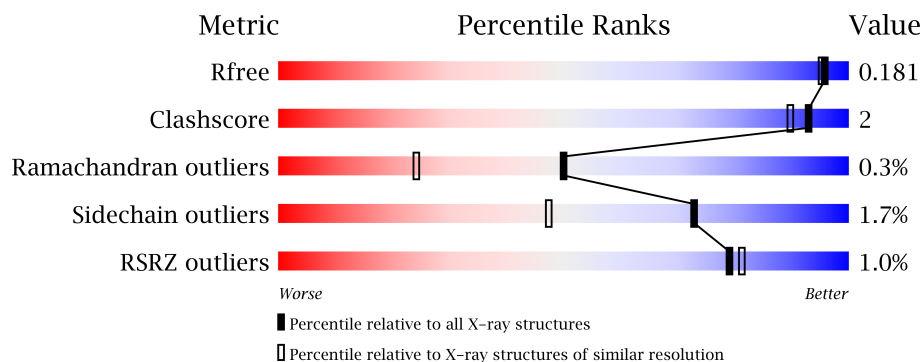
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.16 November 2013
Xtriage (Phenix) : dev-1439
EDS : stable23828
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) : stable23828

1 Overall quality at a glance

The reported resolution of this entry is 1.60 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	1872 (1.60-1.60)
Clashscore	79885	2199 (1.60-1.60)
Ramachandran outliers	78287	2126 (1.60-1.60)
Sidechain outliers	78261	2125 (1.60-1.60)
RSRZ outliers	66119	1872 (1.60-1.60)

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	366	
1	B	366	

The following table lists non-polymeric compounds that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Geometry	Electron density
3	NA	A	368	-	X
4	EDO	A	369	-	X
4	EDO	B	368	-	X
5	12T	B	371	-	X

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 6334 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.

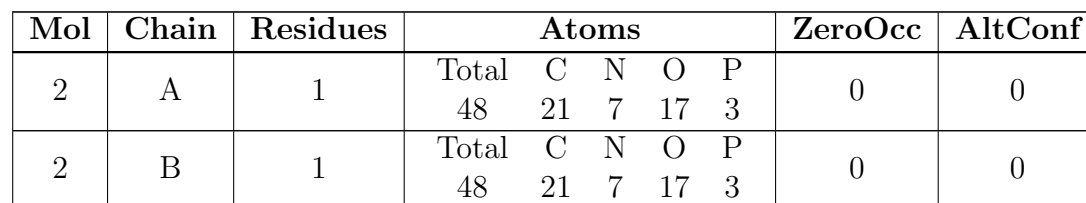
- Molecule 1 is a protein called Aspartate-semialdehydedehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	357	Total	C	N	O	S	0	2	0
			2730	1726	459	531	14			
1	B	359	Total	C	N	O	S	0	4	0
			2757	1745	461	534	17			


There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	359	LEU	-	EXPRESSION TAG	UNP A5MTN0
A	360	GLU	-	EXPRESSION TAG	UNP A5MTN0
A	361	HIS	-	EXPRESSION TAG	UNP A5MTN0
A	362	HIS	-	EXPRESSION TAG	UNP A5MTN0
A	363	HIS	-	EXPRESSION TAG	UNP A5MTN0
A	364	HIS	-	EXPRESSION TAG	UNP A5MTN0
A	365	HIS	-	EXPRESSION TAG	UNP A5MTN0
A	366	HIS	-	EXPRESSION TAG	UNP A5MTN0
B	359	LEU	-	EXPRESSION TAG	UNP A5MTN0
B	360	GLU	-	EXPRESSION TAG	UNP A5MTN0
B	361	HIS	-	EXPRESSION TAG	UNP A5MTN0
B	362	HIS	-	EXPRESSION TAG	UNP A5MTN0
B	363	HIS	-	EXPRESSION TAG	UNP A5MTN0
B	364	HIS	-	EXPRESSION TAG	UNP A5MTN0
B	365	HIS	-	EXPRESSION TAG	UNP A5MTN0
B	366	HIS	-	EXPRESSION TAG	UNP A5MTN0

- Molecule 2 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDEPHOSPHATE (three-letter code: NAP) (formula: $C_{21}H_{28}N_7O_{17}P_3$).

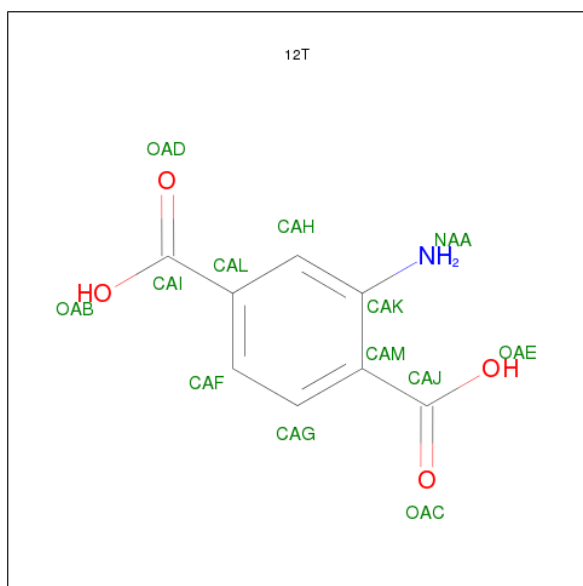


- | Mol | Chain | Residues | Atoms | ZeroOcc | AltConf |
|-----|-------|----------|-----------------|---------|---------|
| 3 | A | 1 | Total Na
1 1 | 0 | 0 |

- EDO
- 
- Chemical structure of Ethane-1,2-diol (EDO) is shown, featuring a zigzag chain of two carbon atoms (C1, C2) in green. Each carbon is bonded to a hydroxyl group (OH) in red. The hydroxyl group on the left is labeled O1 in green, and the hydroxyl group on the right is labeled O2 in green.

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	B	1	Total	C	O	0	0
			4	2	2		
4	B	1	Total	C	O	0	0
			4	2	2		
4	B	1	Total	C	O	0	0
			4	2	2		

- Molecule 5 is 2-AMINOBENZENE-1,4-DICARBOXYLICACID (three-letter code: 12T) (formula: $C_8H_7NO_4$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	B	1	Total	C	N	O	0	0
			13	8	1	4		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	323	Total	O	0	0
			323	323		

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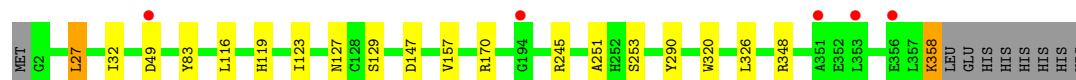
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	B	386	Total 386	O 386	0	0

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: Aspartate-semialdehydedehydrogenase

Chain A: 



- Molecule 1: Aspartate-semialdehydedehydrogenase

Chain B: 



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	60.10Å 99.28Å 64.54Å 90.00° 101.02° 90.00°	Depositor
Resolution (Å)	29.33 – 1.60 29.33 – 1.60	Depositor EDS
% Data completeness (in resolution range)	92.2 (29.33-1.60) 92.3 (29.33-1.60)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.06	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.76 (at 1.60Å)	Xtriage
Refinement program	REFMAC 5.5.0102	Depositor
R, R_{free}	0.160 , 0.182 0.159 , 0.181	Depositor DCC
R_{free} test set	4493 reflections (5.22%)	DCC
Wilson B-factor (Å ²)	17.3	Xtriage
Anisotropy	0.672	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 37.5	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 90545 reflections	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	6334	wwPDB-VP
Average B, all atoms (Å ²)	21.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.81% 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: NA, NAP, 12T, EDO

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	0.55	0/2785	0.66	2/3784 (0.1%)
1	B	0.61	2/2818 (0.1%)	0.67	0/3827
All	All	0.58	2/5603 (0.0%)	0.67	2/7611 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	183[A]	CYS	CB-SG	-5.38	1.73	1.81
1	B	183[B]	CYS	CB-SG	-5.38	1.73	1.81

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	170	ARG	NE-CZ-NH2	-5.34	117.63	120.30
1	A	27	LEU	CA-CB-CG	5.19	127.24	115.30

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	2730	0	2740	8	0
1	B	2757	0	2775	10	0
2	A	48	0	25	0	0
2	B	48	0	25	0	0
3	A	1	0	0	0	0
4	A	16	0	24	1	0
4	B	12	0	18	0	0
5	B	13	0	5	1	0
6	A	323	0	0	0	0
6	B	386	0	0	2	0
All	All	6334	0	5612	19	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 2.

All (19) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
5:B:371:12T:OAC	6:B:630:HOH:O	1.62	1.16
1:B:18[B]:MET:CE	1:B:94:ASN:ND2	2.33	0.92
1:B:18[B]:MET:CE	1:B:94:ASN:HD21	1.86	0.87
1:B:18[B]:MET:HE3	1:B:94:ASN:HD21	1.39	0.86
1:B:18[B]:MET:HE1	1:B:94:ASN:ND2	1.93	0.84
1:B:18[B]:MET:HE1	1:B:94:ASN:HD22	1.55	0.71
1:B:18[B]:MET:HE3	1:B:94:ASN:ND2	2.00	0.69
1:B:127:ASN:OD1	1:B:129:SER:OG	2.20	0.53
1:A:116:LEU:HD23	1:A:123:ILE:HD12	1.92	0.52
1:A:119:HIS:CB	1:A:123:ILE:HD11	2.45	0.47
1:A:119:HIS:HB3	1:A:123:ILE:HD11	1.97	0.46
1:B:162[B]:MET:HE3	6:B:618:HOH:O	2.17	0.45
1:B:127:ASN:HB3	1:B:227:GLU:OE1	2.17	0.45
1:A:83:TYR:OH	1:A:358:LYS:HE2	2.17	0.44
1:A:253:SER:HB3	1:A:320:TRP:CZ2	2.52	0.44
1:A:326:LEU:HD12	4:A:370:EDO:H22	1.99	0.44
1:A:127:ASN:OD1	1:A:129[A]:SER:OG	2.25	0.42
1:A:157:VAL:HA	1:A:245:ARG:HD2	2.02	0.41
1:B:29:ILE:HG21	1:B:32:ILE:HG12	2.02	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	357/366 (98%)	341 (96%)	15 (4%)	1 (0%)	50	24
1	B	361/366 (99%)	347 (96%)	13 (4%)	1 (0%)	50	24
All	All	718/732 (98%)	688 (96%)	28 (4%)	2 (0%)	50	24

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	251	ALA
1	B	251	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	295/302 (98%)	288 (98%)	7 (2%)	61	31
1	B	299/302 (99%)	296 (99%)	3 (1%)	85	70
All	All	594/604 (98%)	584 (98%)	10 (2%)	73	47

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	27	LEU
1	A	32	ILE
1	A	49	ASP
1	A	147	ASP
1	A	290	TYR

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Mol	Chain	Res	Type
1	A	348	ARG
1	A	358	LYS
1	B	27	LEU
1	B	290	TYR
1	B	348	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	94	ASN
1	A	114	HIS
1	A	132	GLN
1	B	94	ASN
1	B	114	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 11 ligands modelled in this entry, 1 is monoatomic - leaving 10 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	NAP	A	367	-	52,52,52	1.49	4 (7%)	80,80,80	1.69	7 (8%)
4	EDO	A	369	-	3,3,3	0.58	0	2,2,2	0.14	0
4	EDO	A	370	-	3,3,3	0.55	0	2,2,2	0.33	0
4	EDO	A	371	-	3,3,3	0.64	0	2,2,2	0.23	0
4	EDO	A	372	-	3,3,3	0.56	0	2,2,2	0.31	0
2	NAP	B	367	-	52,52,52	1.58	6 (11%)	80,80,80	1.57	7 (8%)
4	EDO	B	368	-	3,3,3	0.62	0	2,2,2	0.27	0
4	EDO	B	369	-	3,3,3	0.57	0	2,2,2	0.34	0
4	EDO	B	370	-	3,3,3	0.49	0	2,2,2	0.39	0
5	12T	B	371	-	13,13,13	0.99	0	18,18,18	1.13	1 (5%)

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	NAP	A	367	-	-	0/35/67/67	0/5/5/5
4	EDO	A	369	-	-	0/1/1/1	0/0/0/0
4	EDO	A	370	-	-	0/1/1/1	0/0/0/0
4	EDO	A	371	-	-	0/1/1/1	0/0/0/0
4	EDO	A	372	-	-	0/1/1/1	0/0/0/0
2	NAP	B	367	-	-	0/35/67/67	0/5/5/5
4	EDO	B	368	-	-	0/1/1/1	0/0/0/0
4	EDO	B	369	-	-	0/1/1/1	0/0/0/0
4	EDO	B	370	-	-	0/1/1/1	0/0/0/0
5	12T	B	371	-	-	0/8/8/8	0/1/1/1

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	367	NAP	O7N-C7N	8.33	1.42	1.24
2	A	367	NAP	O7N-C7N	8.27	1.42	1.24
2	A	367	NAP	C2A-N3A	3.58	1.38	1.32
2	B	367	NAP	C2A-N3A	3.54	1.38	1.32
2	B	367	NAP	PN-O3	2.93	1.66	1.60
2	A	367	NAP	C2A-N1A	2.55	1.38	1.33
2	B	367	NAP	C2A-N1A	2.37	1.38	1.33
2	B	367	NAP	C2N-N1N	2.31	1.38	1.35
2	A	367	NAP	C2N-N1N	2.24	1.38	1.35
2	B	367	NAP	PA-O2A	-2.01	1.46	1.55

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	367	NAP	N3A-C2A-N1A	-10.49	119.67	128.89
2	B	367	NAP	N3A-C2A-N1A	-8.97	121.00	128.89
2	A	367	NAP	C5A-C4A-N3A	-4.63	121.46	125.98
2	B	367	NAP	C5A-C4A-N3A	-4.04	122.04	125.98
2	A	367	NAP	N3A-C4A-N9A	3.83	131.96	125.39
2	B	367	NAP	O7N-C7N-C3N	-3.12	116.10	119.59
2	A	367	NAP	O7N-C7N-C3N	-3.04	116.19	119.59
2	A	367	NAP	O4D-C1D-N1N	2.93	111.35	108.13
2	B	367	NAP	N3A-C4A-N9A	2.75	130.11	125.39
2	B	367	NAP	O4D-C1D-N1N	2.71	111.11	108.13
2	B	367	NAP	C4A-C5A-N7A	-2.52	106.97	109.41
2	A	367	NAP	O4B-C1B-N9A	2.32	113.15	108.10
2	A	367	NAP	C2A-N3A-C4A	2.29	119.86	113.27
2	B	367	NAP	C1B-N9A-C4A	-2.17	122.89	126.64
5	B	371	12T	CAG-CAM-CAK	2.01	121.38	118.98

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	357/366 (97%)	-0.27	5 (1%) 72 73	12, 20, 36, 47	0
1	B	359/366 (98%)	-0.39	2 (0%) 86 89	12, 17, 28, 35	0
All	All	716/732 (97%)	-0.33	7 (0%) 79 81	12, 18, 33, 47	0

All (7) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	49	ASP	3.7
1	B	49	ASP	3.5
1	B	194	GLY	3.1
1	A	356	GLU	2.6
1	A	194	GLY	2.5
1	A	353	LEU	2.5
1	A	351	ALA	2.3

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
5	12T	B	371	13/13	0.35	16.07	24,27,28,29	13
4	EDO	A	369	4/4	0.12	6.98	18,18,19,20	0
4	EDO	B	368	4/4	0.15	4.59	17,18,18,20	0
3	NA	A	368	1/1	0.13	4.47	19,19,19,19	0
4	EDO	A	371	4/4	0.12	1.37	34,36,37,37	0
4	EDO	A	372	4/4	0.10	1.11	50,50,50,52	0
4	EDO	B	370	4/4	0.11	0.92	47,47,49,49	0
4	EDO	A	370	4/4	0.07	0.54	30,32,33,33	0
4	EDO	B	369	4/4	0.08	0.41	24,26,27,28	0
2	NAP	B	367	48/48	0.08	0.39	18,25,36,37	0
2	NAP	A	367	48/48	0.08	-0.08	27,35,39,40	0

6.5 Other polymers ⓘ

There are no such residues in this entry.