



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 5, 2026 – 03:04 PM EDT

PDB ID : 1VLB / pdb_00001vlb
Title : STRUCTURE REFINEMENT OF THE ALDEHYDE OXIDOREDUCTASE
FROM DESULFOVIBRIO GIGAS AT 1.28 Å
Authors : Rebelo, J.M.; Dias, J.M.; Huber, R.; Moura, J.J.G.; Romao, M.J.
Deposited on : 2004-07-20
Resolution : 1.28 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 ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.50

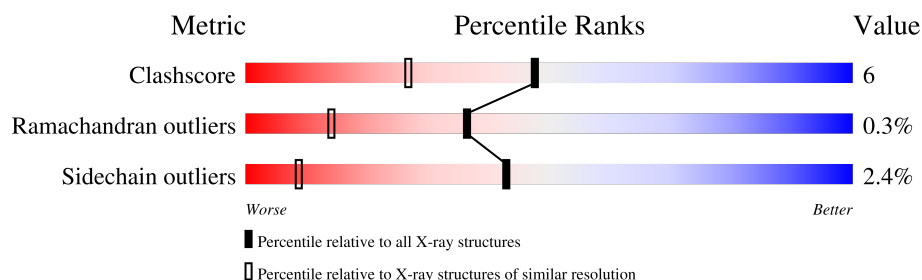
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.28 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	190562	2911 (1.30-1.26)
Ramachandran outliers	187476	2841 (1.30-1.26)
Sidechain outliers	187428	2840 (1.30-1.26)

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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	907	

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
6	IPA	A	915	-	X	-	-

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 8192 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 ALDEHYDE OXIDOREDUCTASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	907	Total	C	N	O	S	12	17	0
			6885	4357	1172	1310	46			

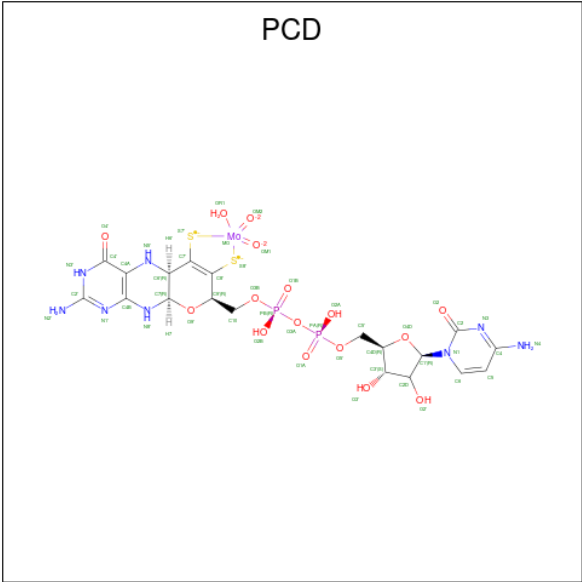
- Molecule 2 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	3	Total	Cl	0	0
			3	3		

- Molecule 3 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

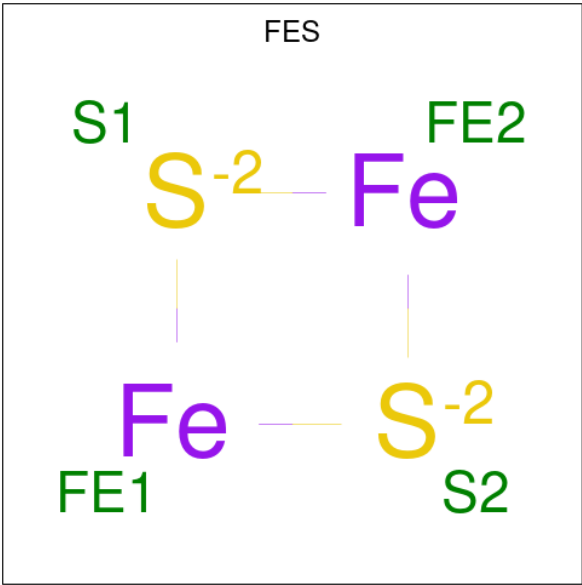
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	2	Total	Mg	0	0
			2	2		

- Molecule 4 is (MOLYBDOPTERIN-CYTOSINE DINUCLEOTIDE-S,S)-DIOXO-AQUA-MOLYBDENUM(V) (CCD ID: PCD) (formula: C₁₉H₂₆MoN₈O₁₆P₂S₂).



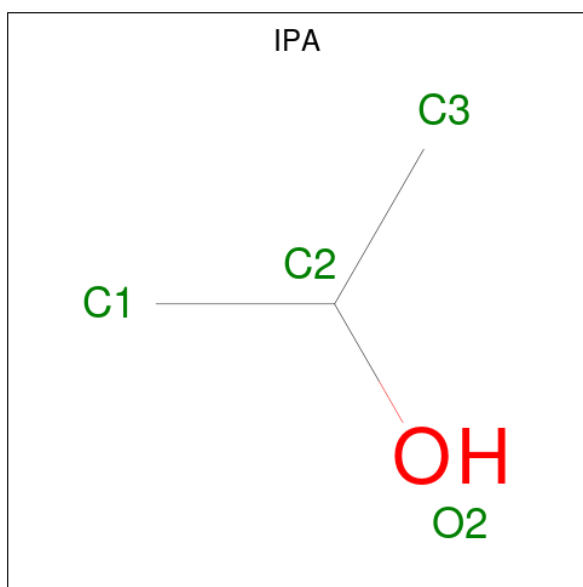
Mol	Chain	Residues	Atoms							ZeroOcc	AltConf
4	A	1	Total 48	C 19	Mo 1	N 8	O 16	P 2	S 2	0	0

- Molecule 5 is FE2/S2 (INORGANIC) CLUSTER (CCD ID: FES) (formula: Fe₂S₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	Fe	S		
5	A	1	4	2	2	0	0
5	A	1	4	2	2	0	0

- Molecule 6 is ISOPROPYL ALCOHOL (CCD ID: IPA) (formula: C₃H₈O).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	0
			4	3	1		
6	A	1	Total	C	O	0	0
			4	3	1		

- Molecule 7 is water.

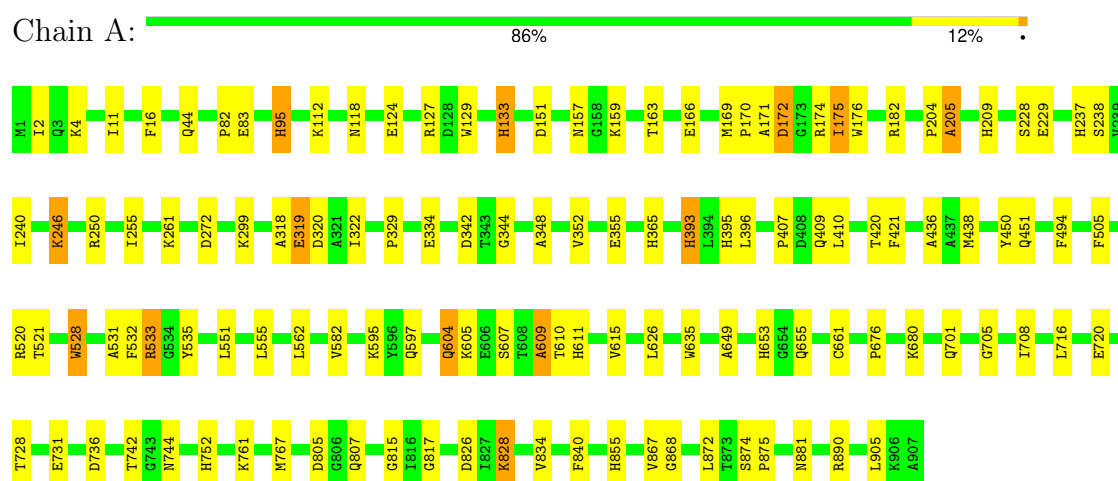
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	1238	Total	O	0	0
			1238	1238		

3 Residue-property plots

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. 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. 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.

Note EDS was not executed.

• Molecule 1: ALDEHYDE OXIDOREDUCTASE



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 61 2 2	Depositor
Cell constants a, b, c, α , β , γ	141.78Å 141.78Å 160.87Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	24.40 – 1.28	Depositor
% Data completeness (in resolution range)	(Not available) (24.40-1.28)	Depositor
R_{merge}	0.09	Depositor
R_{sym}	0.04	Depositor
Refinement program	SHELXL-97	Depositor
R, R_{free}	0.145 , 0.193	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	8192	wwPDB-VP
Average B, all atoms (Å ²)	25.0	wwPDB-VP

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: IPA, CL, MG, FES, PCD

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	0.82	1/7104 (0.0%)	1.50	50/9650 (0.5%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	83	GLU	N-CA	8.71	1.55	1.46

All (50) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	82	PRO	CA-C-N	-17.39	96.04	122.83
1	A	82	PRO	C-N-CA	-17.39	96.04	122.83
1	A	82	PRO	O-C-N	-11.72	108.76	122.24
1	A	615	VAL	CA-C-N	-9.40	112.53	121.46
1	A	615	VAL	C-N-CA	-9.40	112.53	121.46
1	A	653	HIS	CA-CB-CG	8.99	122.79	113.80
1	A	272	ASP	CA-CB-CG	8.36	120.96	112.60
1	A	16	PHE	CA-CB-CG	-8.10	105.70	113.80
1	A	157	ASN	CA-CB-CG	-7.93	104.67	112.60
1	A	205	ALA	O-C-N	-7.81	112.82	122.82
1	A	395	HIS	CA-CB-CG	-7.61	106.19	113.80
1	A	209	HIS	CA-CB-CG	-7.47	106.33	113.80
1	A	205	ALA	CA-C-N	-7.45	106.81	121.41
1	A	205	ALA	C-N-CA	-7.45	106.81	121.41
1	A	595	LYS	CA-C-O	6.96	127.80	120.42
1	A	505	PHE	CA-CB-CG	-6.84	106.96	113.80
1	A	607	SER	CA-C-O	-6.72	114.43	121.55
1	A	133	HIS	CA-CB-CG	-6.67	107.12	113.80
1	A	118	ASN	CA-CB-CG	6.62	119.22	112.60
1	A	840	PHE	CA-CB-CG	-6.37	107.43	113.80

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	127	ARG	NE-CZ-NH2	6.34	124.91	119.20
1	A	450	TYR	CA-CB-CG	-6.23	102.68	113.90
1	A	528	TRP	CA-CB-CG	5.98	124.96	113.60
1	A	582	VAL	CA-C-O	-5.96	115.73	121.63
1	A	95	HIS	CA-CB-CG	-5.93	107.87	113.80
1	A	228	SER	CA-C-N	-5.88	111.93	120.29
1	A	228	SER	C-N-CA	-5.88	111.93	120.29
1	A	767	MET	CA-C-O	-5.86	114.50	120.71
1	A	83	GLU	CB-CA-C	5.66	119.84	111.06
1	A	393	HIS	CB-CG-CD2	-5.59	123.93	131.20
1	A	182	ARG	NE-CZ-NH1	-5.54	115.96	121.50
1	A	421	PHE	CA-CB-CG	-5.52	108.28	113.80
1	A	409	GLN	OE1-CD-NE2	-5.38	117.22	122.60
1	A	421	PHE	CA-C-N	-5.37	117.61	123.30
1	A	421	PHE	C-N-CA	-5.37	117.61	123.30
1	A	344	GLY	O-C-N	-5.35	116.42	121.77
1	A	609	ALA	CA-C-N	-5.34	113.84	122.23
1	A	609	ALA	C-N-CA	-5.34	113.84	122.23
1	A	175	ILE	N-CA-CB	5.34	121.22	111.98
1	A	532	PHE	O-C-N	5.29	129.46	123.27
1	A	611	HIS	CA-CB-CG	-5.28	108.52	113.80
1	A	817	GLY	O-C-N	-5.26	117.14	122.19
1	A	204	PRO	O-C-N	5.23	129.38	123.00
1	A	348	ALA	CA-C-N	-5.22	114.33	122.37
1	A	348	ALA	C-N-CA	-5.22	114.33	122.37
1	A	805	ASP	CA-CB-CG	5.19	117.79	112.60
1	A	607	SER	O-C-N	5.17	129.17	122.81
1	A	451	GLN	OE1-CD-NE2	5.13	127.73	122.60
1	A	494	PHE	CA-CB-CG	-5.09	108.71	113.80
1	A	250	ARG	O-C-N	5.01	129.27	123.41

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-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 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	6885	0	6797	75	0
2	A	3	0	0	1	0
3	A	2	0	0	0	0
4	A	48	0	21	2	0
5	A	8	0	0	0	0
6	A	8	0	14	2	0
7	A	1238	0	0	30	0
All	All	8192	0	6832	77	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 (77) 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)
6:A:915:IPA:C1	6:A:915:IPA:C2	1.76	1.62
1:A:807:GLN:HE22	4:A:921:PCD:H8'	1.08	1.01
1:A:169:MET:HE3	1:A:170:PRO:HD2	1.63	0.81
1:A:163:THR:HA	1:A:166:GLU:OE1	1.84	0.78
6:A:915:IPA:C1	6:A:915:IPA:O2	2.32	0.76
1:A:626:LEU:HD12	7:A:5144:HOH:O	1.88	0.74
1:A:716:LEU:O	1:A:720:GLU:HG3	1.94	0.68
1:A:396[B]:LEU:HD11	1:A:410[B]:LEU:HD13	1.75	0.67
1:A:604:GLN:HB3	7:A:5076:HOH:O	1.96	0.66
1:A:261:LYS:HD3	1:A:329:PRO:HG3	1.78	0.66
1:A:255:ILE:HD13	7:A:5145:HOH:O	1.99	0.62
1:A:261:LYS:HD3	1:A:329:PRO:CG	2.34	0.58
1:A:365:HIS:HE1	1:A:531:ALA:O	1.88	0.57
1:A:318:ALA:HB1	1:A:320:ASP:OD1	2.04	0.57
1:A:95:HIS:HE1	1:A:151:ASP:OD2	1.87	0.57
1:A:520:ARG:HD2	7:A:4723:HOH:O	2.04	0.56
1:A:396[B]:LEU:CD1	1:A:410[B]:LEU:HD13	2.35	0.56
1:A:95:HIS:HD2	7:A:4428:HOH:O	1.90	0.54
1:A:170:PRO:HB2	1:A:172:ASP:OD1	2.07	0.54
1:A:237:HIS:HD2	1:A:238:SER:OG	1.90	0.54
1:A:240[B]:ILE:HD13	1:A:436:ALA:HA	1.89	0.54
1:A:826:ASP:HB3	7:A:5011:HOH:O	2.08	0.54
1:A:246:LYS:HE3	7:A:4902:HOH:O	2.08	0.54
1:A:635:TRP:CD1	1:A:742[B]:THR:HG22	2.43	0.53
1:A:246:LYS:N	1:A:246:LYS:HD3	2.24	0.53
1:A:163:THR:HG23	7:A:4763:HOH:O	2.09	0.53
1:A:246:LYS:HE2	1:A:438:MET:HE2	1.91	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:334:GLU:HG2	1:A:520:ARG:HG2	1.92	0.51
1:A:680:LYS:HD3	7:A:4859:HOH:O	2.09	0.51
1:A:319:GLU:HG2	7:A:5074:HOH:O	2.11	0.51
1:A:728:THR:OG1	1:A:731:GLU:HG3	2.10	0.51
1:A:205:ALA:HA	7:A:5137:HOH:O	2.11	0.51
1:A:169:MET:CE	1:A:170:PRO:HD2	2.39	0.50
1:A:112:LYS:HE3	7:A:4865:HOH:O	2.11	0.49
1:A:112:LYS:HE2	7:A:4648:HOH:O	2.13	0.49
1:A:174:ARG:NH1	1:A:176:TRP:HD1	2.11	0.48
1:A:352:VAL:HG21	1:A:555:LEU:CD2	2.43	0.48
1:A:609:ALA:N	7:A:4966:HOH:O	2.46	0.48
1:A:609:ALA:HB3	7:A:4966:HOH:O	2.12	0.48
1:A:393:HIS:HE1	7:A:4082:HOH:O	1.96	0.47
1:A:365:HIS:HD2	7:A:4199:HOH:O	1.96	0.47
1:A:407:PRO:HA	1:A:410[B]:LEU:CD1	2.45	0.47
1:A:393:HIS:HD2	7:A:4077:HOH:O	1.97	0.47
1:A:661[B]:CYS:SG	1:A:708:ILE:HD11	2.55	0.47
1:A:533:ARG:HD3	1:A:872[B]:LEU:HD12	1.97	0.47
1:A:129:TRP:O	1:A:133:HIS:HD2	1.98	0.47
1:A:229:GLU:OE1	1:A:299:LYS:HE3	2.14	0.47
1:A:170:PRO:HG3	7:A:5170:HOH:O	2.15	0.47
1:A:807:GLN:HE21	1:A:868:GLY:HA2	1.80	0.46
1:A:237:HIS:HE1	7:A:4899:HOH:O	1.98	0.45
1:A:744[A]:ASN:ND2	7:A:4535:HOH:O	2.49	0.45
1:A:319:GLU:OE1	1:A:319:GLU:N	2.50	0.45
1:A:171:ALA:O	1:A:172:ASP:HB3	2.17	0.45
1:A:649:ALA:O	7:A:5139:HOH:O	2.21	0.44
1:A:44[A]:GLN:NE2	7:A:4459:HOH:O	2.49	0.44
1:A:610:THR:N	7:A:4966:HOH:O	2.50	0.44
1:A:761:LYS:NZ	7:A:4996:HOH:O	2.49	0.44
1:A:535:TYR:HA	2:A:916:CL:CL	2.55	0.43
1:A:551:LEU:HD23	1:A:562:LEU:HD21	2.00	0.43
1:A:170:PRO:O	1:A:171:ALA:HB3	2.18	0.43
1:A:655:GLN:HG3	4:A:921:PCD:H5'2	2.00	0.43
1:A:175:ILE:HD13	1:A:676:PRO:HB3	2.00	0.42
1:A:867:VAL:O	1:A:867:VAL:HG22	2.19	0.42
1:A:365:HIS:CD2	1:A:365:HIS:H	2.37	0.42
1:A:815:GLY:HA3	1:A:875:PRO:HG2	2.01	0.42
1:A:881:ASN:ND2	1:A:890:ARG:HH22	2.18	0.42
1:A:610:THR:HG23	7:A:4966:HOH:O	2.20	0.42
1:A:752:HIS:HD2	7:A:4342:HOH:O	2.03	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:597:GLN:HE21	1:A:597:GLN:HB3	1.53	0.41
1:A:352:VAL:HG21	1:A:555:LEU:HD23	2.01	0.41
1:A:855:HIS:HD2	7:A:4385:HOH:O	2.02	0.41
1:A:174:ARG:NH2	7:A:5167:HOH:O	2.49	0.41
1:A:701:GLN:O	1:A:705:GLY:HA3	2.21	0.40
1:A:828[B]:LYS:HA	1:A:828[B]:LYS:HD2	1.73	0.40
1:A:322[A]:ILE:HD12	7:A:4777:HOH:O	2.20	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	922/907 (102%)	896 (97%)	23 (2%)	3 (0%)	36 14

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	172	ASP
1	A	533	ARG
1	A	874	SER

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	728/711 (102%)	708 (97%)	20 (3%)	39 7

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2[A]	ILE
1	A	2[B]	ILE
1	A	4	LYS
1	A	11	ILE
1	A	124	GLU
1	A	159	LYS
1	A	246	LYS
1	A	319	GLU
1	A	342	ASP
1	A	355	GLU
1	A	420	THR
1	A	521	THR
1	A	528	TRP
1	A	604	GLN
1	A	605	LYS
1	A	828[A]	LYS
1	A	828[B]	LYS
1	A	834[A]	VAL
1	A	834[B]	VAL
1	A	905	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	13	GLN
1	A	29	GLN
1	A	95	HIS
1	A	131	GLN
1	A	133	HIS
1	A	237	HIS
1	A	365	HIS
1	A	393	HIS
1	A	591	GLN
1	A	597	GLN
1	A	701	GLN
1	A	752	HIS
1	A	801	GLN

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Mol	Chain	Res	Type
1	A	807	GLN
1	A	855	HIS
1	A	881	ASN

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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 10 ligands modelled in this entry, 5 are monoatomic - leaving 5 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	$\# Z > 2$
4	PCD	A	921	-	43,53,53	2.30	11 (25%)	54,86,86	1.90	14 (25%)
5	FES	A	909	1	0,4,4	-	-	-		
6	IPA	A	914	-	3,3,3	1.48	1 (33%)	3,3,3	0.84	0
6	IPA	A	915	-	3,3,3	3.52	3 (100%)	3,3,3	2.16	1 (33%)
5	FES	A	908	1	0,4,4	-	-	-		

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
4	PCD	A	921	-	-	1/22/78/78	0/6/6/6
5	FES	A	909	1	-	-	0/1/1/1
5	FES	A	908	1	-	-	0/1/1/1

All (15) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	921	PCD	C7-C6'	6.90	1.59	1.53
4	A	921	PCD	PB-O3A	5.87	1.65	1.59
4	A	921	PCD	C10-C9'	4.69	1.58	1.51
4	A	921	PCD	C4A-N5'	4.43	1.48	1.37
6	A	915	IPA	C1-C2	4.25	1.76	1.48
4	A	921	PCD	C5-C4	4.14	1.52	1.42
6	A	915	IPA	O2-C2	-3.66	1.20	1.42
4	A	921	PCD	C4-N3	-3.36	1.28	1.34
4	A	921	PCD	C3'-C4D	3.09	1.60	1.53
4	A	921	PCD	C2'-N3'	2.78	1.44	1.37
4	A	921	PCD	O4'-C4'	2.70	1.28	1.23
4	A	921	PCD	O5'-C5'	2.54	1.54	1.44
6	A	915	IPA	C3-C2	2.40	1.64	1.48
6	A	914	IPA	C1-C2	2.20	1.63	1.48
4	A	921	PCD	C2'-N2'	2.09	1.39	1.34

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	921	PCD	C5-C4-N4	-4.96	111.95	120.63
4	A	921	PCD	N2'-C2'-N1'	4.80	129.05	119.67
4	A	921	PCD	C2'-N1'-C4B	4.47	121.25	113.36
4	A	921	PCD	N4-C4-N3	4.24	125.48	117.91
6	A	915	IPA	O2-C2-C3	3.48	132.62	110.28
4	A	921	PCD	N3'-C2'-N1'	-3.00	117.83	123.32
4	A	921	PCD	O9'-C7-C6'	2.98	110.95	108.96
4	A	921	PCD	C4A-C4'-N3'	2.56	119.16	112.13
4	A	921	PCD	C8'-C7'-S7'	2.47	121.55	120.15
4	A	921	PCD	C2'-N3'-C4'	-2.44	120.69	125.11
4	A	921	PCD	O4'-C4'-N3'	-2.35	115.70	120.11
4	A	921	PCD	C6-C5-C4	-2.34	113.69	117.53
4	A	921	PCD	O9'-C7-N8'	2.14	110.55	108.61
4	A	921	PCD	O4D-C4D-C5'	2.06	115.92	109.33
4	A	921	PCD	O2B-PB-O1B	2.01	121.81	112.44

There are no chirality outliers.

All (1) torsion outliers are listed below:

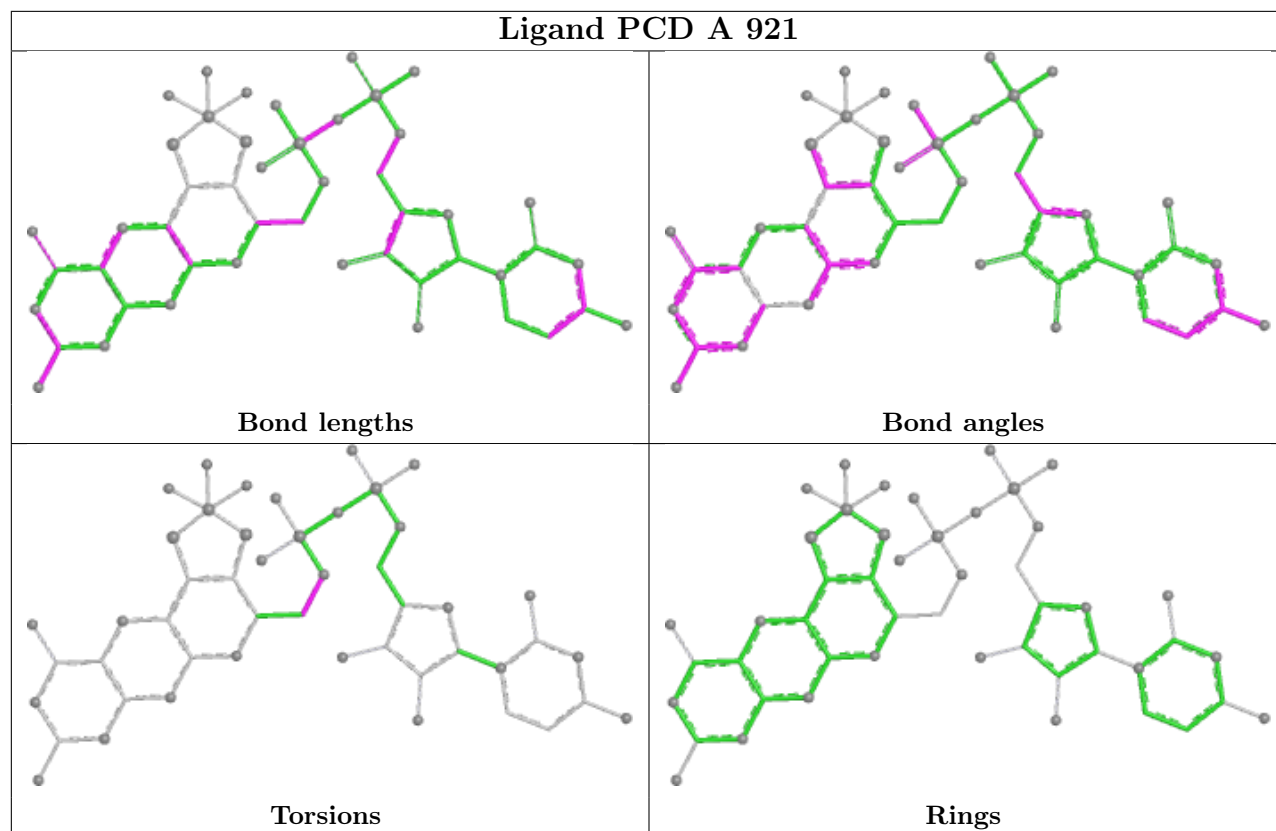
Mol	Chain	Res	Type	Atoms
4	A	921	PCD	C9'-C10-O3B-PB

There are no ring outliers.

2 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	921	PCD	2	0
6	A	915	IPA	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



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

6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.