



Full wwPDB X-ray Structure Validation Report ⓘ

May 12, 2021 – 06:10 am BST

PDB ID : 6ZOE
Title : AcrB-F563A symmetric T protomer
Authors : Tam, H.K.; Foong, W.E.; Pos, K.M.
Deposited on : 2020-07-07
Resolution : 2.85 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.18
buster-report : 1.1.7 (2018)
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) : 2.18

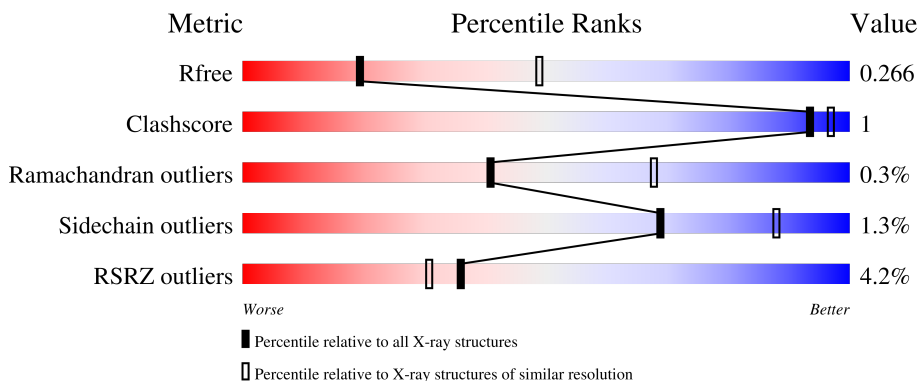
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.85 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	3168 (2.90-2.82)
Clashscore	141614	3438 (2.90-2.82)
Ramachandran outliers	138981	3348 (2.90-2.82)
Sidechain outliers	138945	3351 (2.90-2.82)
RSRZ outliers	127900	3103 (2.90-2.82)

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 $\leq 5\%$. 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	1057	
2	B	169	

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
4	EDO	A	1102	-	-	-	X

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 9224 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 Multidrug efflux pump subunit AcrB.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	1040	7918	5090	1313	1471	44	0	2	0

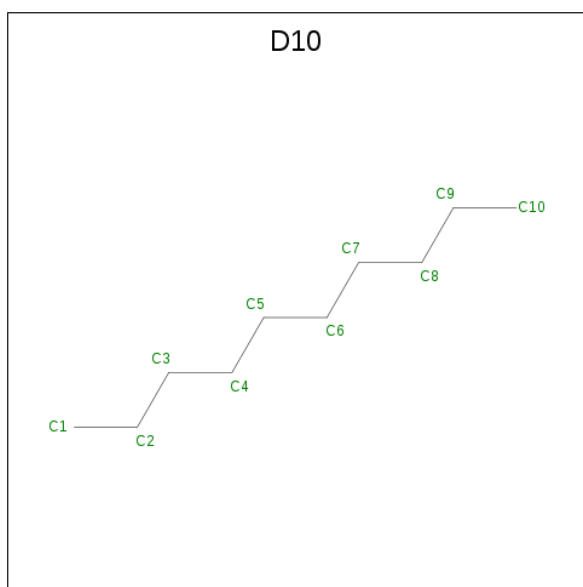
There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	563	ALA	PHE	engineered mutation	UNP P31224
A	1050	LEU	-	expression tag	UNP P31224
A	1051	GLU	-	expression tag	UNP P31224
A	1052	HIS	-	expression tag	UNP P31224
A	1053	HIS	-	expression tag	UNP P31224
A	1054	HIS	-	expression tag	UNP P31224
A	1055	HIS	-	expression tag	UNP P31224
A	1056	HIS	-	expression tag	UNP P31224
A	1057	HIS	-	expression tag	UNP P31224

- Molecule 2 is a protein called DARPIN.

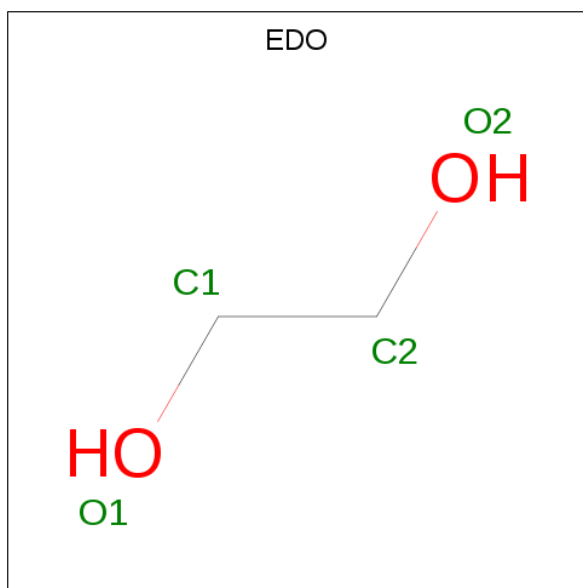
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	156	1177	741	206	229	1	0	0	0

- Molecule 3 is DECANE (three-letter code: D10) (formula: C₁₀H₂₂).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C 10 10	0	0

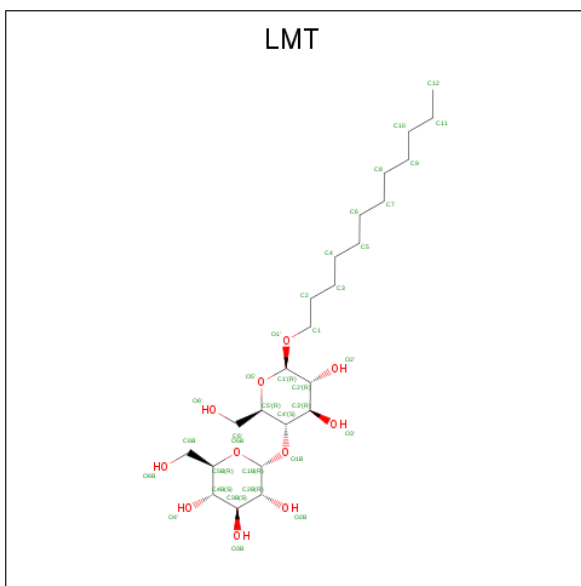
- Molecule 4 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: $C_2H_6O_2$).



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

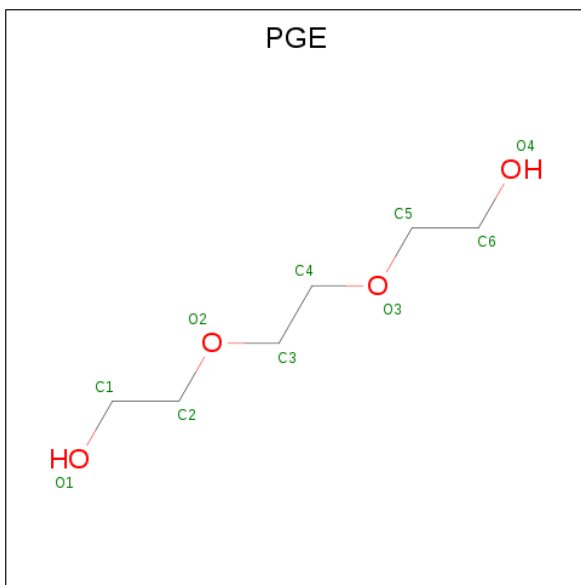
- Molecule 5 is DODECYL-BETA-D-MALTOSE (three-letter code: LMT) (formula:

C₂₄H₄₆O₁₁).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			35	24	11		

- Molecule 6 is TRIETHYLENE GLYCOL (three-letter code: PGE) (formula: C₆H₁₄O₄).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	0
			10	6	4		
6	A	1	Total	C	O	0	0
			10	6	4		

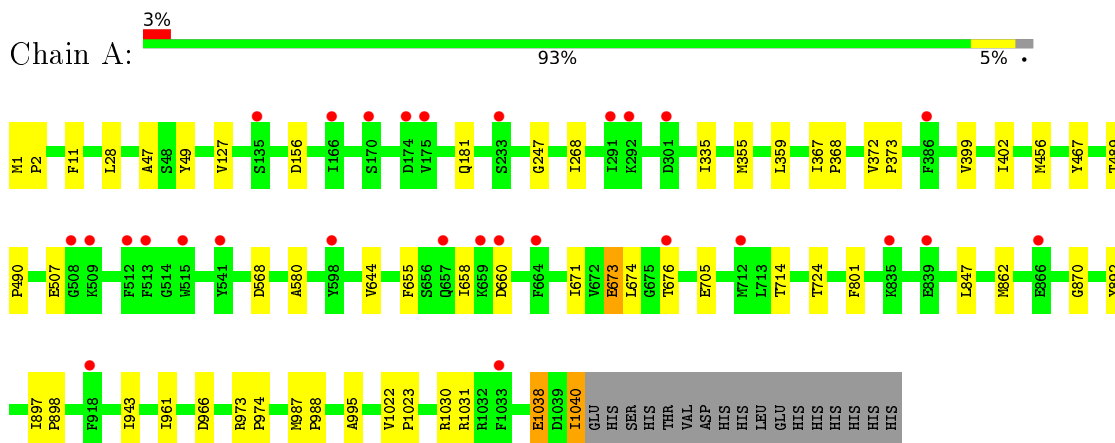
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	41	Total 43	O 43	0	2
7	B	13	Total 13	O 13	0	0

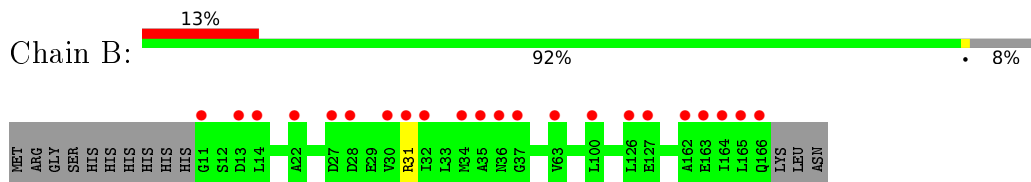
3 Residue-property plots [i](#)

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: Multidrug efflux pump subunit AcrB



- Molecule 2: DARPIN



4 Data and refinement statistics

Property	Value	Source
Space group	I 2 3	Depositor
Cell constants a, b, c, α , β , γ	226.61Å 226.61Å 226.61Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.26 – 2.85 46.26 – 2.85	Depositor EDS
% Data completeness (in resolution range)	100.0 (46.26-2.85) 100.0 (46.26-2.85)	Depositor EDS
R_{merge}	0.20	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.17 (at 2.86Å)	Xtrriage
Refinement program	REFMAC 5.8.0253	Depositor
R, R_{free}	0.223 , 0.265 0.226 , 0.266	Depositor DCC
R_{free} test set	2320 reflections (5.14%)	wwPDB-VP
Wilson B-factor (Å ²)	70.5	Xtrriage
Anisotropy	0.000	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 50.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.52$, $\langle L^2 \rangle = 0.35$	Xtrriage
Estimated twinning fraction	0.004 for -l,-k,-h	Xtrriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	9224	wwPDB-VP
Average B, all atoms (Å ²)	80.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.12% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: D10, EDO, LMT, PGE

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	0.66	0/8073	0.70	0/10960
2	B	0.68	0/1196	0.71	0/1626
All	All	0.67	0/9269	0.71	0/12586

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

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	7918	0	8081	26	0
2	B	1177	0	1159	0	0
3	A	10	0	22	0	0
4	A	4	0	6	0	0
4	B	4	0	6	0	0
5	A	35	0	46	0	0
6	A	20	0	28	0	0
7	A	43	0	0	0	0
7	B	13	0	0	0	0
All	All	9224	0	9348	26	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 1.

All (26) 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:A:580:ALA:HB1	1:A:724:THR:HG22	1.87	0.57
1:A:1:MET:HB3	1:A:2:PRO:HD3	1.90	0.52
1:A:335:ILE:HG21	1:A:995:ALA:HB3	1.93	0.51
1:A:372:VAL:HB	1:A:373:PRO:HD3	1.94	0.51
1:A:1022:VAL:N	1:A:1023:PRO:HD2	2.29	0.48
1:A:705:GLU:HB3	1:A:847:LEU:HD22	1.96	0.47
1:A:367:ILE:HB	1:A:368:PRO:HD3	1.97	0.47
1:A:399:VAL:O	1:A:402:ILE:HG22	2.15	0.47
1:A:456:MET:HG2	1:A:467:TYR:HB3	1.98	0.46
1:A:671:ILE:HG22	1:A:673:GLU:HG3	1.97	0.46
1:A:489:THR:N	1:A:490:PRO:CD	2.79	0.46
1:A:961:ILE:HD11	1:A:1031:ARG:NH2	2.33	0.44
1:A:355:MET:HE3	1:A:359:LEU:HD12	1.99	0.43
1:A:489:THR:OG1	1:A:490:PRO:HD3	2.18	0.43
1:A:47:ALA:HB2	1:A:127:VAL:HG13	2.00	0.42
1:A:973:ARG:N	1:A:974:PRO:HD2	2.34	0.42
1:A:156:ASP:HA	1:A:181:GLN:HA	2.01	0.42
1:A:987:MET:N	1:A:988:PRO:CD	2.83	0.42
1:A:247:GLY:HA2	1:A:268:ILE:CD1	2.50	0.42
1:A:655:PHE:HA	1:A:658:ILE:HG12	2.02	0.41
1:A:892:TYR:OH	1:A:943:ILE:HA	2.20	0.41
1:A:897:ILE:N	1:A:898:PRO:CD	2.83	0.41
1:A:568:ASP:CG	1:A:644:VAL:HG23	2.41	0.41
1:A:580:ALA:CB	1:A:724:THR:HG22	2.50	0.41
1:A:674:LEU:HD12	1:A:674:LEU:HA	1.89	0.41
1:A:1038:GLU:HG3	1:A:1040:ILE:H	1.86	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	1040/1057 (98%)	1000 (96%)	37 (4%)	3 (0%)	41	68
2	B	154/169 (91%)	152 (99%)	2 (1%)	0	100	100
All	All	1194/1226 (97%)	1152 (96%)	39 (3%)	3 (0%)	41	68

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	676	THR
1	A	660	ASP
1	A	870	GLY

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	847/862 (98%)	835 (99%)	12 (1%)	67	86
2	B	120/132 (91%)	119 (99%)	1 (1%)	81	93
All	All	967/994 (97%)	954 (99%)	13 (1%)	69	88

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	11	PHE
1	A	28	LEU
1	A	49	TYR
1	A	507	GLU
1	A	673	GLU
1	A	714	THR
1	A	801	PHE
1	A	862	MET
1	A	966	ASP
1	A	1030	ARG
1	A	1038	GLU

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	1040	ILE
2	B	31	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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](#)

6 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	$\# Z > 2$
5	LMT	A	1103	-	36,36,36	0.44	0	47,47,47	0.63	0
6	PGE	A	1105	-	9,9,9	0.18	0	8,8,8	0.11	0
6	PGE	A	1104	-	9,9,9	0.20	0	8,8,8	0.09	0
4	EDO	B	301	-	3,3,3	0.06	0	2,2,2	0.13	0
3	D10	A	1101	-	9,9,9	0.10	0	8,8,8	0.07	0
4	EDO	A	1102	-	3,3,3	0.06	0	2,2,2	0.17	0

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
5	LMT	A	1103	-	-	9/21/61/61	0/2/2/2
6	PGE	A	1105	-	-	3/7/7/7	-
6	PGE	A	1104	-	-	3/7/7/7	-
4	EDO	B	301	-	-	1/1/1/1	-
3	D10	A	1101	-	-	3/7/7/7	-
4	EDO	A	1102	-	-	1/1/1/1	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (20) torsion outliers are listed below:

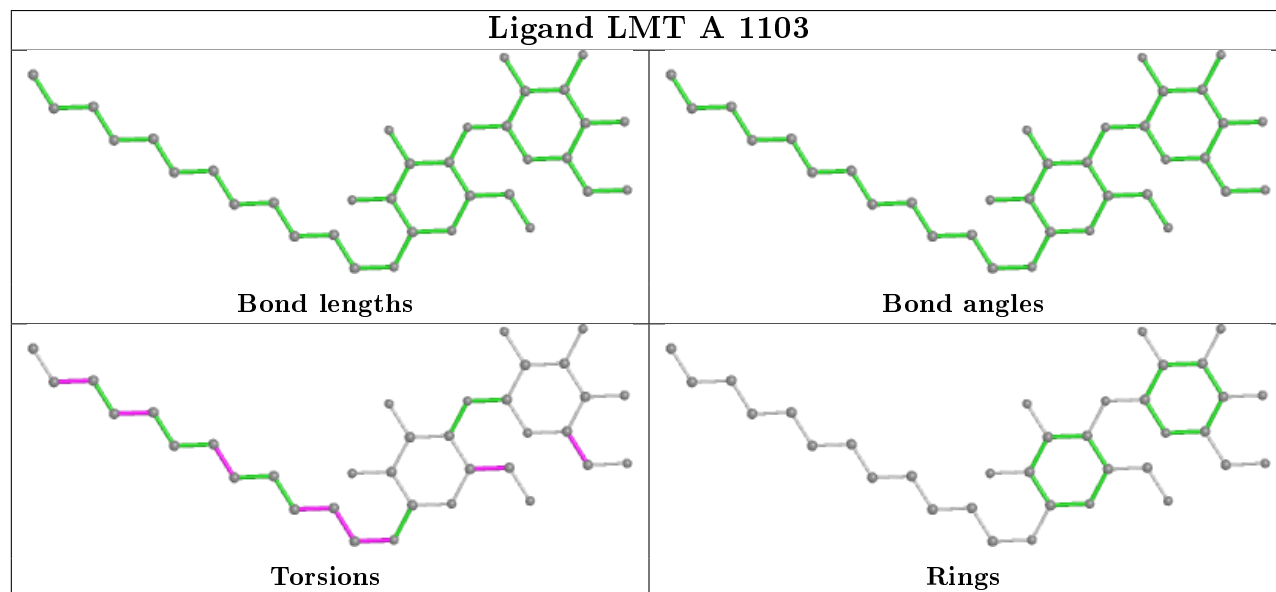
Mol	Chain	Res	Type	Atoms
5	A	1103	LMT	O5B-C5B-C6B-O6B
5	A	1103	LMT	O1'-C1-C2-C3
5	A	1103	LMT	C7-C8-C9-C10
6	A	1104	PGE	O1-C1-C2-O2
4	A	1102	EDO	O1-C1-C2-O2
5	A	1103	LMT	C4-C5-C6-C7
5	A	1103	LMT	C1-C2-C3-C4
5	A	1103	LMT	C9-C10-C11-C12
6	A	1105	PGE	O1-C1-C2-O2
5	A	1103	LMT	C2-C1-O1'-C1'
6	A	1104	PGE	O2-C3-C4-O3
6	A	1104	PGE	C6-C5-O3-C4
3	A	1101	D10	C1-C2-C3-C4
5	A	1103	LMT	O5'-C5'-C6'-O6'
6	A	1105	PGE	O2-C3-C4-O3
3	A	1101	D10	C3-C4-C5-C6
6	A	1105	PGE	C4-C3-O2-C2
5	A	1103	LMT	C4B-C5B-C6B-O6B
3	A	1101	D10	C5-C6-C7-C8
4	B	301	EDO	O1-C1-C2-O2

There are no ring outliers.

No monomer is involved in short contacts.

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

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	1040/1057 (98%)	0.05	28 (2%) 54 50	47, 83, 109, 125	0
2	B	156/169 (92%)	0.73	22 (14%) 2 2	54, 74, 123, 140	0
All	All	1196/1226 (97%)	0.14	50 (4%) 36 31	47, 82, 110, 140	0

All (50) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	28	ASP	4.9
2	B	166	GLN	4.6
1	A	174	ASP	4.5
2	B	34	MET	4.5
2	B	31	ARG	4.1
1	A	512	PHE	3.8
2	B	13	ASP	3.6
1	A	508	GLY	3.6
1	A	1033	PHE	3.4
1	A	541	TYR	3.3
1	A	513	PHE	3.3
2	B	27	ASP	3.3
1	A	839	GLU	3.2
2	B	163	GLU	3.2
1	A	918	PHE	3.2
2	B	164	ILE	3.0
2	B	32	ILE	3.0
2	B	30	VAL	2.9
1	A	657	GLN	2.8
2	B	22	ALA	2.8
2	B	11	GLY	2.8
2	B	14	LEU	2.7
1	A	386	PHE	2.6
1	A	509	LYS	2.6

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
2	B	35	ALA	2.6
1	A	135	SER	2.5
2	B	36	ASN	2.5
2	B	100	LEU	2.5
1	A	866	GLU	2.5
2	B	126	LEU	2.5
1	A	292	LYS	2.4
1	A	676	THR	2.4
1	A	835	LYS	2.4
1	A	301	ASP	2.4
1	A	515	TRP	2.4
1	A	664	PHE	2.4
1	A	712	MET	2.4
2	B	63	VAL	2.3
1	A	660	ASP	2.3
1	A	291	ILE	2.3
1	A	175	VAL	2.2
2	B	127	GLU	2.2
2	B	165	LEU	2.2
1	A	166	ILE	2.2
1	A	659	LYS	2.2
1	A	170	SER	2.1
2	B	162	ALA	2.1
1	A	598	TYR	2.1
2	B	37	GLY	2.1
1	A	233	SER	2.1

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](#)

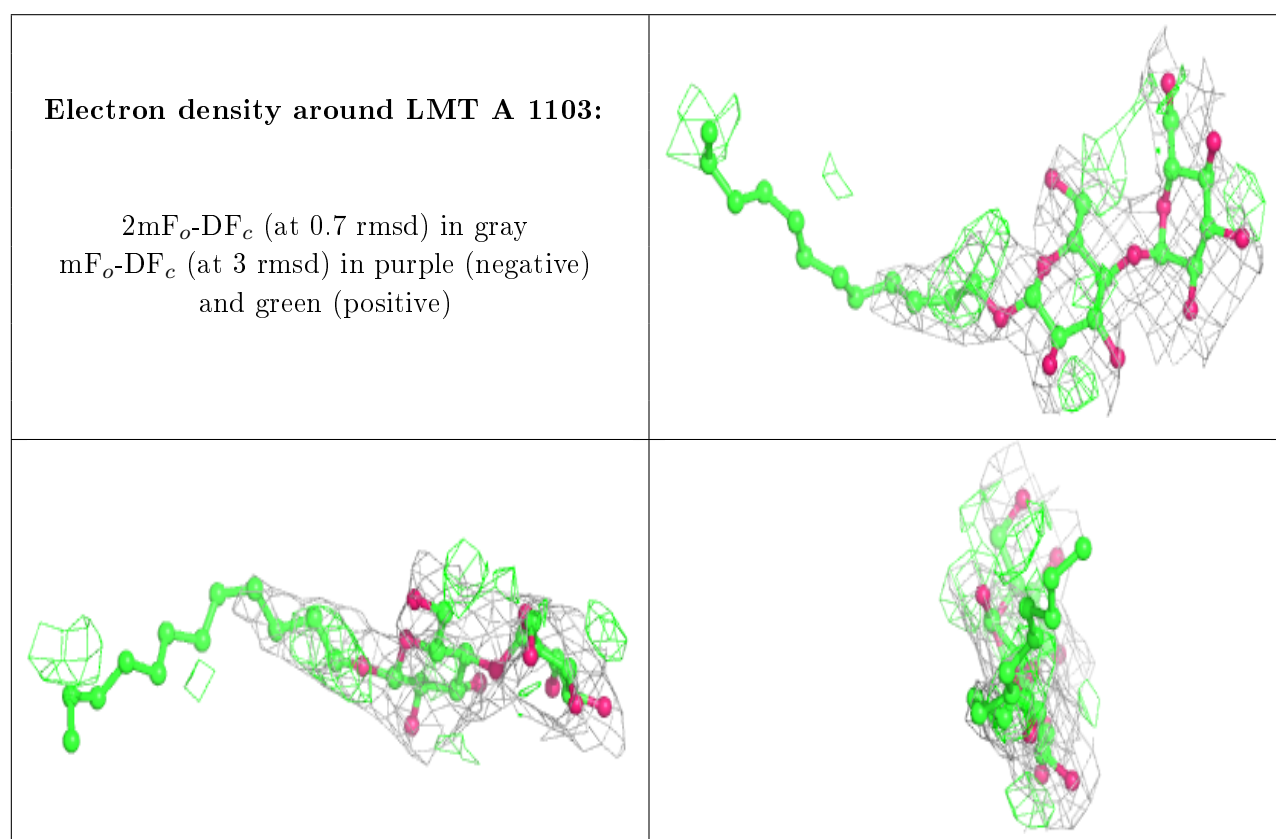
There are no monosaccharides in this entry.

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(\AA^2)	Q<0.9
5	LMT	A	1103	35/35	0.77	0.29	88,91,93,94	35
4	EDO	A	1102	4/4	0.78	0.47	88,89,90,91	0
6	PGE	A	1104	10/10	0.79	0.35	90,94,96,96	0
3	D10	A	1101	10/10	0.84	0.19	100,103,106,106	0
4	EDO	B	301	4/4	0.84	0.22	100,101,103,105	0
6	PGE	A	1105	10/10	0.88	0.35	89,92,96,100	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.



6.5 Other polymers [i](#)

There are no such residues in this entry.