



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 06:10 PM UTC

PDB ID : 4GPF / pdb_00004gpf
Title : Structure of the Fe³⁺-biliverdin-HmuO, heme oxygenase from *Corynebacterium diphtheriae* (data set III)
Authors : Unno, M.; Ikeda-Saito, M.
Deposited on : 2012-08-20
Resolution : 1.90 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) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

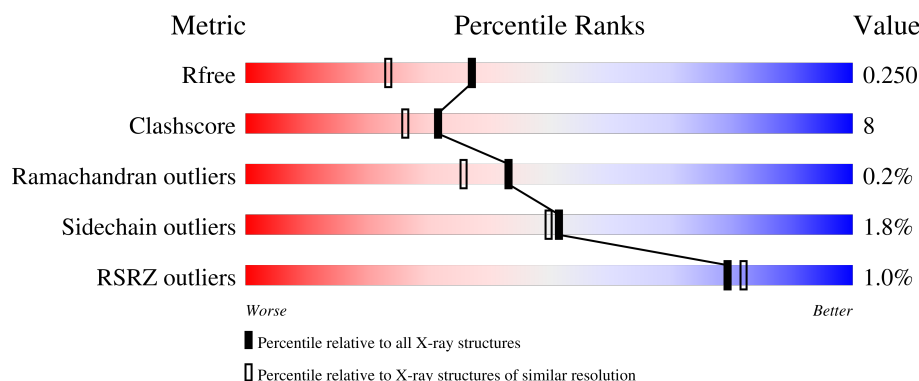
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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}	180053	7789 (1.90-1.90)
Clashscore	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)
RSRZ outliers	180081	7790 (1.90-1.90)

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	215	% 86% 8% • •
1	B	215	% 84% 12% • •
1	C	215	% 81% 15% •

2 Entry composition [i](#)

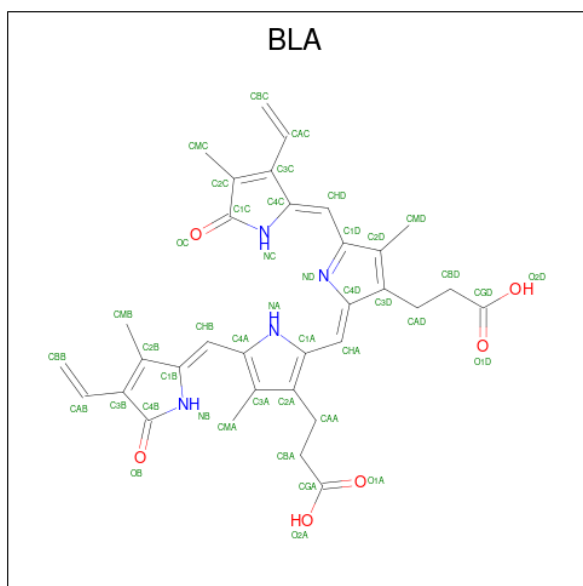
There are 5 unique types of molecules in this entry. The entry contains 5494 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Heme oxygenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	207	Total	C	N	O	S	0	1	0
			1649	1038	294	314	3			
1	B	209	Total	C	N	O	S	0	0	0
			1657	1046	294	314	3			
1	C	208	Total	C	N	O	S	0	1	0
			1650	1039	295	313	3			

- Molecule 2 is BILIVERDINE IX ALPHA (CCD ID: BLA) (formula: $C_{33}H_{34}N_4O_6$).



- Molecule 3 is FE (III) ION (CCD ID: FE) (formula: Fe).

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

- Molecule 4 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total O S 5 4 1	0	0
4	A	1	Total O S 5 4 1	0	0
4	A	1	Total O S 5 4 1	0	0
4	B	1	Total O S 5 4 1	0	0
4	B	1	Total O S 5 4 1	0	0
4	B	1	Total O S 5 4 1	0	0
4	B	1	Total O S 5 4 1	0	0
4	B	1	Total O S 5 4 1	0	0
4	C	1	Total O S 5 4 1	0	0
4	C	1	Total O S 5 4 1	0	0

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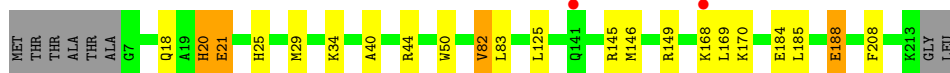
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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	C	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	88	Total	O	0	0
			88	88		
5	B	131	Total	O	0	0
			131	131		
5	C	129	Total	O	0	0
			129	129		

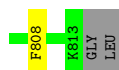
- Molecule 1: Heme oxygenase



- | MET | THR | ALA | THR | ALA |
|------|------|------|------|------|
| G307 | E311 | S315 | Q318 | K322 |
| H325 | A349 | F352 | N378 | E381 |
| K389 | E395 | R399 | V410 | E414 |
| S438 | G439 | V442 | R445 | M446 |
| Q448 | V453 | E456 | K470 | K473 |
| T498 | H505 | F508 | | |



- | MET | THR | ALA | THR |
|------|-----|-----|-----|
| A606 | | | |
| V610 | | | |
| A617 | | | |
| Q618 | | | |
| E621 | | | |
| K622 | | | |
| S626 | | | |
| S630 | | | |
| K634 | | | |
| V639 | | | |
| A640 | | | |
| R644 | | | |
| L645 | | | |
| G646 | | | |
| E647 | | | |
| V682 | | | |
| R699 | | | |
| L700 | | | |
| Q741 | | | |
| Q748 | | | |
| V753 | | | |
| D754 | | | |
| P755 | | | |
| L758 | | | |
| H762 | | | |
| F763 | | | |
| G764 | | | |
| G765 | | | |
| L766 | | | |
| L769 | | | |
| K773 | | | |
| E778 | | | |
| R790 | | | |
| E791 | | | |



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	53.94Å 62.54Å 107.59Å 90.00° 101.09° 90.00°	Depositor
Resolution (Å)	20.00 – 1.90 20.00 – 1.90	Depositor EDS
% Data completeness (in resolution range)	98.0 (20.00-1.90) 98.0 (20.00-1.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.26 (at 1.89Å)	Xtriage
Refinement program	CNS, REFMAC 5.2.0005	Depositor
R, R_{free}	0.185 , 0.239 0.201 , 0.250	Depositor DCC
R_{free} test set	5498 reflections (9.87%)	wwPDB-VP
Wilson B-factor (Å ²)	26.5	Xtriage
Anisotropy	0.287	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 55.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	5494	wwPDB-VP
Average B, all atoms (Å ²)	32.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.87% 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: BLA, SO4, FE

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	1.02	1/1687 (0.1%)	1.06	1/2280 (0.0%)
1	B	1.13	0/1689	1.11	1/2280 (0.0%)
1	C	1.08	0/1688	1.10	3/2282 (0.1%)
All	All	1.08	1/5064 (0.0%)	1.09	5/6842 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	C	0	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	20	HIS	N-CA	5.28	1.52	1.46

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	765	GLY	N-CA-C	-7.84	94.61	113.18
1	B	395	GLU	N-CA-C	6.55	120.37	112.38
1	A	82	VAL	CB-CA-C	-5.87	104.12	112.22
1	C	610	VAL	N-CA-C	5.56	115.76	110.42
1	C	639	VAL	N-CA-C	5.00	115.72	110.62

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	C	764	GLU	Peptide

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	1649	0	1594	22	0
1	B	1657	0	1615	24	0
1	C	1650	0	1595	27	0
2	A	43	0	29	5	0
2	B	43	0	28	5	0
2	C	43	0	28	6	0
3	A	1	0	0	0	0
4	A	15	0	0	0	0
4	B	25	0	0	2	0
4	C	20	0	0	1	0
5	A	88	0	0	4	0
5	B	131	0	0	2	0
5	C	129	0	0	6	0
All	All	5494	0	4889	81	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 8.

All (81) 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:399:ARG:O	1:B:399:ARG:HG2	1.48	1.10
2:C:905:BLA:HHD	2:C:905:BLA:HBC1	1.38	1.03
1:A:145[B]:ARG:HH12	1:A:149:ARG:NH2	1.60	0.99
1:B:442:VAL:HG22	1:B:446:MET:HE3	1.51	0.93
1:A:145[B]:ARG:NH1	1:A:149:ARG:HH21	1.70	0.88
1:C:647:GLU:OE2	1:C:699[B]:ARG:NH1	2.05	0.87
1:A:145[B]:ARG:HH12	1:A:149:ARG:HH21	0.88	0.83
1:B:399:ARG:O	1:B:399:ARG:CG	2.31	0.75
1:C:741:GLN:H	1:C:741:GLN:CD	1.94	0.75
1:A:145[B]:ARG:HG2	1:A:145[B]:ARG:HH11	1.50	0.74

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:790:ARG:NH1	5:C:1123:HOH:O	2.20	0.73
1:C:808:PHE:HE2	2:C:905:BLA:HBB2	1.52	0.73
2:A:901:BLA:HBB1	2:A:901:BLA:HMB3	1.72	0.72
1:C:640:ALA:O	1:C:644:ARG:HD2	1.91	0.70
5:A:1087:HOH:O	1:B:445:ARG:HD3	1.92	0.69
2:C:905:BLA:HHD	2:C:905:BLA:CBC	2.21	0.69
1:A:145[B]:ARG:NH1	1:A:149:ARG:NH2	2.35	0.66
1:A:146:MET:HA	1:A:146:MET:HE2	1.78	0.66
1:B:311:GLU:O	1:B:315:SER:HB2	1.97	0.64
1:A:188:GLU:CD	1:A:188:GLU:H	2.06	0.63
1:C:808:PHE:CE2	2:C:905:BLA:HBB2	2.35	0.62
1:A:168:LYS:HE3	1:A:170:LYS:HB3	1.80	0.62
1:B:442:VAL:CG2	1:B:446:MET:HE3	2.28	0.62
1:A:208:PHE:CE2	2:A:901:BLA:HBB2	2.38	0.59
1:A:20:HIS:CD2	2:A:901:BLA:NB	2.71	0.59
1:C:764:GLU:HG3	5:C:1108:HOH:O	2.04	0.57
1:A:188:GLU:CD	1:A:188:GLU:N	2.63	0.56
1:C:682:VAL:HG23	5:C:1008:HOH:O	2.06	0.56
2:A:901:BLA:HBB1	2:A:901:BLA:CMB	2.36	0.56
2:B:606:BLA:HBB1	2:B:606:BLA:OB	2.04	0.56
1:A:184:GLU:O	1:A:185:LEU:HD23	2.07	0.54
1:A:29:MET:HE3	1:A:208:PHE:CE1	2.44	0.53
2:B:606:BLA:HA	2:B:606:BLA:HB	1.57	0.53
1:B:439:GLY:O	1:B:442:VAL:HG12	2.08	0.52
1:C:646:GLN:HE21	1:C:646:GLN:HA	1.74	0.52
1:C:630:SER:O	1:C:634:LYS:HG3	2.09	0.52
1:B:448:GLN:HG2	1:B:453:VAL:O	2.09	0.52
1:B:389:LYS:HD2	1:B:456:GLU:O	2.11	0.51
1:C:758:LEU:O	1:C:762:HIS:HD2	1.94	0.51
1:B:381:GLU:HG2	5:B:759:HOH:O	2.11	0.51
1:C:646:GLN:HA	1:C:646:GLN:NE2	2.26	0.50
1:C:626:SER:HB2	4:C:901:SO4:O2	2.12	0.50
1:B:438:SER:HB3	2:B:606:BLA:CAD	2.42	0.49
1:B:399:ARG:HD3	4:B:605:SO4:O3	2.12	0.48
1:C:741:GLN:CD	1:C:741:GLN:N	2.69	0.48
1:A:40:ALA:O	1:A:44:ARG:HG2	2.13	0.47
1:A:34:LYS:NZ	5:A:1084:HOH:O	2.47	0.47
1:B:509:ALA:O	1:B:513:LYS:HG3	2.15	0.46
1:A:29:MET:HA	1:A:29:MET:HE2	1.98	0.46
1:B:318:GLN:O	1:B:322:LYS:HG2	2.16	0.46
1:B:378:ASN:ND2	5:B:713:HOH:O	2.49	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:389:LYS:HD3	1:B:456:GLU:HB2	1.98	0.46
2:A:901:BLA:HBD1	5:A:1069:HOH:O	2.16	0.45
2:C:905:BLA:HBC1	2:C:905:BLA:CHD	2.28	0.45
1:C:763:PHE:HB3	1:C:766:ILE:HD12	1.98	0.45
1:C:618:GLN:HA	1:C:621:GLU:HG2	1.98	0.45
1:A:168:LYS:HD2	1:A:169:LEU:N	2.33	0.44
1:B:508:PHE:CE2	2:B:606:BLA:HBB2	2.53	0.44
1:A:50:TRP:HA	1:A:83:LEU:HD13	1.99	0.44
1:C:791:GLU:HG3	1:C:795:LYS:NZ	2.33	0.44
1:B:410:VAL:O	1:B:414:GLU:HG3	2.18	0.43
1:C:791:GLU:OE2	1:C:795:LYS:HE3	2.19	0.43
1:C:778:GLU:HG2	5:C:1093:HOH:O	2.19	0.43
1:B:445:ARG:HD2	1:B:445:ARG:HA	1.54	0.43
1:A:125:LEU:C	1:A:125:LEU:HD13	2.43	0.42
1:C:754:ASP:HA	1:C:755:PRO:HD2	1.81	0.42
1:C:699[A]:ARG:NH1	5:C:1127:HOH:O	2.34	0.42
5:A:1087:HOH:O	1:B:445:ARG:CD	2.58	0.42
1:C:808:PHE:HE2	2:C:905:BLA:CBB	2.25	0.41
1:B:349:ALA:HA	1:B:352:PHE:CE2	2.55	0.41
1:A:21:GLU:OE2	1:A:25:HIS:CE1	2.74	0.41
1:B:508:PHE:HE2	2:B:606:BLA:HBB2	1.86	0.41
1:C:618:GLN:O	1:C:621:GLU:HG3	2.21	0.41
1:C:748:GLN:HG2	1:C:753:VAL:O	2.21	0.41
1:B:470:LYS:HA	1:B:473:LYS:HZ2	1.85	0.40
1:B:505:HIS:HE1	4:B:601:SO4:S	2.44	0.40
1:C:621:GLU:HG3	1:C:622:LYS:N	2.36	0.40
1:C:617:ALA:HA	5:C:1094:HOH:O	2.22	0.40
1:C:769:LEU:HG	1:C:773:LYS:HE2	2.03	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	206/215 (96%)	202 (98%)	4 (2%)	0	100	100
1	B	207/215 (96%)	204 (99%)	3 (1%)	0	100	100
1	C	207/215 (96%)	200 (97%)	6 (3%)	1 (0%)	24	16
All	All	620/645 (96%)	606 (98%)	13 (2%)	1 (0%)	43	36

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	764	GLU

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	169/175 (97%)	165 (98%)	4 (2%)	43	38
1	B	169/175 (97%)	166 (98%)	3 (2%)	51	50
1	C	168/175 (96%)	166 (99%)	2 (1%)	63	63
All	All	506/525 (96%)	497 (98%)	9 (2%)	51	50

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	18	GLN
1	A	21	GLU
1	A	82	VAL
1	A	188	GLU
1	B	315	SER
1	B	395	GLU
1	B	498	THR
1	C	644	ARG
1	C	700	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	18	GLN
1	A	25	HIS
1	A	78	ASN
1	A	150	HIS
1	A	182	ASN
1	B	346	GLN
1	B	378	ASN
1	C	618	GLN
1	C	625	HIS
1	C	646	GLN
1	C	678	ASN
1	C	762	HIS

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 16 ligands modelled in this entry, 1 is monoatomic - leaving 15 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	SO4	A	905	-	4,4,4	0.27	0	6,6,6	1.35	1 (16%)
4	SO4	C	902	-	4,4,4	0.31	0	6,6,6	0.82	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	BLA	C	905	-	46,46,46	3.48	23 (50%)	66,67,67	4.31	35 (53%)
4	SO4	B	605	-	4,4,4	0.26	0	6,6,6	0.47	0
4	SO4	C	903	-	4,4,4	0.42	0	6,6,6	1.16	0
4	SO4	B	603	-	4,4,4	0.50	0	6,6,6	1.03	0
4	SO4	C	901	-	4,4,4	0.28	0	6,6,6	0.58	0
4	SO4	C	904	-	4,4,4	0.27	0	6,6,6	0.17	0
4	SO4	B	604	-	4,4,4	0.34	0	6,6,6	0.99	0
4	SO4	B	601	-	4,4,4	0.30	0	6,6,6	1.32	1 (16%)
4	SO4	B	602	-	4,4,4	0.31	0	6,6,6	0.74	0
4	SO4	A	904	-	4,4,4	0.30	0	6,6,6	1.23	0
2	BLA	A	901	3	46,46,46	2.40	17 (36%)	66,67,67	2.58	26 (39%)
2	BLA	B	606	-	46,46,46	3.42	26 (56%)	66,67,67	3.65	36 (54%)
4	SO4	A	903	-	4,4,4	0.28	0	6,6,6	0.56	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
2	BLA	A	901	3	-	3/26/74/74	0/4/4/4
2	BLA	B	606	-	-	11/26/74/74	0/4/4/4
2	BLA	C	905	-	-	9/26/74/74	0/4/4/4

All (66) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	606	BLA	CBD-CGD	-9.71	1.28	1.50
2	C	905	BLA	CBD-CGD	-7.93	1.32	1.50
2	B	606	BLA	CBD-CAD	-7.46	1.26	1.51
2	C	905	BLA	OB-C4B	7.10	1.37	1.23
2	C	905	BLA	CBD-CAD	-6.75	1.28	1.51
2	C	905	BLA	CBA-CGA	-6.46	1.35	1.50
2	C	905	BLA	CHD-C4C	6.33	1.53	1.37
2	B	606	BLA	CBA-CGA	-6.17	1.36	1.50
2	C	905	BLA	C3C-C2C	6.12	1.49	1.37
2	C	905	BLA	OC-C1C	6.03	1.35	1.23
2	A	901	BLA	C3B-C2B	5.78	1.48	1.37
2	B	606	BLA	C3B-C2B	5.50	1.48	1.37
2	A	901	BLA	C3C-C2C	5.38	1.48	1.37
2	C	905	BLA	CHA-C4D	5.38	1.48	1.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	901	BLA	C3D-C2D	5.16	1.47	1.36
2	B	606	BLA	C3C-C2C	5.10	1.47	1.37
2	B	606	BLA	CBB-CAB	4.98	1.54	1.30
2	A	901	BLA	CHA-C4D	4.94	1.48	1.38
2	C	905	BLA	C3B-C2B	4.94	1.47	1.37
2	B	606	BLA	OB-C4B	4.82	1.32	1.23
2	B	606	BLA	CHA-C4D	4.62	1.47	1.38
2	B	606	BLA	C1D-C2D	-4.60	1.35	1.45
2	A	901	BLA	CHD-C4C	4.43	1.48	1.37
2	B	606	BLA	CHD-C4C	4.20	1.47	1.37
2	C	905	BLA	C3D-C2D	4.20	1.45	1.36
2	C	905	BLA	CBC-CAC	4.14	1.50	1.30
2	C	905	BLA	CBB-CAB	4.06	1.49	1.30
2	C	905	BLA	CHD-C1D	4.05	1.50	1.40
2	B	606	BLA	CHB-C4A	3.99	1.49	1.40
2	B	606	BLA	C1B-C2B	3.97	1.52	1.45
2	B	606	BLA	CBC-CAC	3.91	1.49	1.30
2	B	606	BLA	C3D-C2D	3.86	1.45	1.36
2	A	901	BLA	CHD-C1D	3.69	1.49	1.40
2	C	905	BLA	CHB-C4A	3.65	1.48	1.40
2	C	905	BLA	C1D-C2D	-3.64	1.37	1.45
2	A	901	BLA	C2A-C3A	3.55	1.48	1.38
2	A	901	BLA	CHA-C1A	3.48	1.48	1.40
2	B	606	BLA	CHB-C1B	3.46	1.46	1.37
2	B	606	BLA	O1A-CGA	3.44	1.33	1.22
2	B	606	BLA	C1C-C2C	-3.43	1.39	1.48
2	B	606	BLA	CHD-C1D	3.41	1.48	1.40
2	B	606	BLA	CHA-C1A	3.31	1.47	1.40
2	C	905	BLA	CHA-C1A	3.24	1.47	1.40
2	C	905	BLA	CHB-C1B	3.23	1.45	1.37
2	B	606	BLA	C1A-C2A	-3.15	1.35	1.42
2	A	901	BLA	C4A-C3A	3.03	1.48	1.41
2	C	905	BLA	C1C-C2C	-3.01	1.41	1.48
2	A	901	BLA	CHB-C1B	2.91	1.44	1.37
2	B	606	BLA	C3C-C4C	-2.83	1.40	1.45
2	A	901	BLA	OB-C4B	2.82	1.28	1.23
2	C	905	BLA	O1D-CGD	2.78	1.31	1.22
2	B	606	BLA	OC-C1C	2.73	1.28	1.23
2	B	606	BLA	CBA-CAA	-2.70	1.42	1.51
2	A	901	BLA	OC-C1C	2.69	1.28	1.23
2	A	901	BLA	CHB-C4A	2.68	1.46	1.40
2	C	905	BLA	O1A-CGA	2.64	1.30	1.22

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	901	BLA	C1B-NB	-2.47	1.33	1.37
2	C	905	BLA	C1A-C2A	-2.46	1.37	1.42
2	A	901	BLA	C1A-C2A	2.40	1.48	1.42
2	A	901	BLA	C1D-C2D	2.38	1.51	1.45
2	B	606	BLA	O1D-CGD	2.20	1.29	1.22
2	B	606	BLA	C1D-ND	2.17	1.41	1.36
2	C	905	BLA	CBA-CAA	-2.03	1.44	1.51
2	C	905	BLA	C1B-C2B	2.03	1.48	1.45
2	B	606	BLA	C1A-NA	-2.02	1.34	1.37
2	A	901	BLA	C4D-C3D	2.00	1.48	1.45

All (99) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	905	BLA	CAD-CBD-CGD	18.54	162.83	113.67
2	B	606	BLA	CAD-CBD-CGD	15.82	155.63	113.67
2	C	905	BLA	CHD-C1D-ND	-13.43	95.93	124.95
2	C	905	BLA	CHD-C1D-C2D	11.22	153.68	124.87
2	C	905	BLA	CBD-CAD-C3D	8.55	136.17	112.53
2	C	905	BLA	C3B-C2B-C1B	-7.80	99.23	107.92
2	C	905	BLA	CMB-C2B-C1B	7.46	133.24	124.16
2	C	905	BLA	C2B-C1B-NB	6.92	117.06	106.97
2	A	901	BLA	C3B-C2B-C1B	-6.47	100.71	107.92
2	B	606	BLA	C3B-C4B-NB	6.21	113.94	106.13
2	B	606	BLA	C4C-NC-C1C	-6.18	103.07	110.66
2	A	901	BLA	C2B-C1B-NB	6.07	115.82	106.97
2	B	606	BLA	CMB-C2B-C1B	6.00	131.45	124.16
2	B	606	BLA	C3B-C2B-C1B	-5.78	101.49	107.92
2	C	905	BLA	C4C-CHD-C1D	5.67	141.98	128.06
2	B	606	BLA	C2B-C1B-NB	5.55	115.05	106.97
2	B	606	BLA	CBD-CAD-C3D	5.50	127.75	112.53
2	A	901	BLA	C3B-C4B-NB	5.48	113.02	106.13
2	B	606	BLA	C2A-C1A-NA	5.33	114.26	107.57
2	C	905	BLA	C2A-C1A-NA	5.25	114.16	107.57
2	B	606	BLA	C1B-NB-C4B	-4.93	104.61	110.66
2	B	606	BLA	C3C-C4C-NC	4.74	114.37	106.64
2	C	905	BLA	C1B-NB-C4B	-4.62	104.98	110.66
2	B	606	BLA	CHD-C4C-NC	-4.59	116.26	126.06
2	A	901	BLA	C3A-C4A-NA	4.56	113.64	107.43
2	A	901	BLA	C2C-C1C-NC	4.52	116.67	106.55
2	B	606	BLA	C3A-C4A-NA	4.51	113.58	107.43
2	B	606	BLA	CBC-CAC-C3C	-4.48	105.16	127.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	606	BLA	OC-C1C-NC	-4.43	114.70	125.08
2	B	606	BLA	C2C-C1C-NC	4.42	116.45	106.55
2	A	901	BLA	C4C-NC-C1C	-4.39	105.27	110.66
2	A	901	BLA	C3D-C4D-ND	4.21	116.00	110.04
2	C	905	BLA	C3A-C4A-NA	4.18	113.13	107.43
2	A	901	BLA	C2A-C1A-NA	4.18	112.81	107.57
2	B	606	BLA	C4A-NA-C1A	-4.17	102.46	109.78
2	B	606	BLA	CHB-C1B-NB	-4.13	117.25	126.06
2	A	901	BLA	C4A-C3A-C2A	-4.00	102.75	107.76
2	B	606	BLA	CBA-CAA-C2A	4.00	123.60	112.53
2	C	905	BLA	CAA-C2A-C1A	-4.00	119.42	125.77
2	C	905	BLA	C4A-NA-C1A	-4.00	102.76	109.78
2	A	901	BLA	C4D-C3D-C2D	-3.96	102.44	106.73
2	B	606	BLA	CHD-C1D-ND	-3.94	116.44	124.95
2	A	901	BLA	C1B-NB-C4B	-3.91	105.86	110.66
2	C	905	BLA	CBB-CAB-C3B	-3.87	108.21	127.53
2	B	606	BLA	CMC-C2C-C1C	3.86	129.29	121.21
2	A	901	BLA	CMC-C2C-C1C	3.84	129.24	121.21
2	A	901	BLA	CMD-C2D-C1D	3.77	130.95	125.10
2	C	905	BLA	CMC-C2C-C1C	3.73	129.02	121.21
2	B	606	BLA	CHA-C1A-NA	-3.71	116.92	125.29
2	B	606	BLA	C4C-CHD-C1D	-3.66	119.07	128.06
2	C	905	BLA	C4D-C3D-C2D	-3.62	102.81	106.73
2	C	905	BLA	CAB-C3B-C2B	-3.61	116.69	128.43
2	A	901	BLA	C3C-C4C-NC	3.51	112.36	106.64
2	B	606	BLA	C1D-C2D-C3D	-3.49	102.52	106.48
2	C	905	BLA	CAA-C2A-C3A	3.48	134.87	127.07
2	B	606	BLA	C4A-C3A-C2A	-3.38	103.53	107.76
2	B	606	BLA	C4A-CHB-C1B	-3.36	121.16	130.82
2	A	901	BLA	CAA-CBA-CGA	-3.34	104.82	113.67
2	C	905	BLA	CHB-C1B-NB	-3.28	119.06	126.06
2	B	606	BLA	C2D-C1D-ND	3.20	117.59	110.58
2	A	901	BLA	C1A-C2A-C3A	-3.18	103.92	107.62
2	C	905	BLA	C4C-NC-C1C	-3.12	106.84	110.66
2	A	901	BLA	C1D-C2D-C3D	-3.04	103.03	106.48
2	A	901	BLA	CHD-C4C-NC	-3.00	119.65	126.06
2	B	606	BLA	CAD-C3D-C4D	2.95	130.19	125.02
2	C	905	BLA	C4A-C3A-C2A	-2.81	104.25	107.76
2	B	606	BLA	OB-C4B-C3B	-2.79	122.98	129.71
2	B	606	BLA	CBB-CAB-C3B	-2.78	113.63	127.53
2	A	901	BLA	CHD-C1D-ND	-2.78	118.95	124.95
2	C	905	BLA	CAA-CBA-CGA	2.72	120.87	113.67

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	905	BLA	OC-C1C-C2C	-2.67	117.73	128.04
2	B	606	BLA	CAA-C2A-C1A	-2.67	121.53	125.77
2	B	606	BLA	CAD-C3D-C2D	-2.66	122.88	127.87
2	C	905	BLA	CHA-C1A-NA	-2.65	119.30	125.29
2	C	905	BLA	C2C-C1C-NC	2.63	112.44	106.55
2	A	901	BLA	CMB-C2B-C1B	2.63	127.35	124.16
2	C	905	BLA	CAC-C3C-C4C	2.63	131.36	123.66
2	A	901	BLA	CHA-C1A-C2A	-2.62	121.59	127.22
2	A	901	BLA	C4B-C3B-C2B	-2.61	104.58	107.92
2	C	905	BLA	CAD-C3D-C4D	2.59	129.57	125.02
2	B	606	BLA	C1A-CHA-C4D	2.54	133.77	128.22
2	A	901	BLA	CHB-C1B-NB	-2.51	120.70	126.06
2	C	905	BLA	O2D-CGD-O1D	-2.45	117.02	123.33
4	A	905	SO4	O4-S-O2	-2.36	97.22	109.56
2	C	905	BLA	C3B-C4B-NB	2.36	109.10	106.13
2	B	606	BLA	C4B-C3B-C2B	-2.35	104.91	107.92
2	C	905	BLA	CHB-C4A-NA	-2.34	120.00	125.29
2	B	606	BLA	CAA-C2A-C3A	2.33	132.30	127.07
4	B	601	SO4	O4-S-O1	2.26	121.36	109.56
2	C	905	BLA	CBC-CAC-C3C	-2.24	116.34	127.53
2	C	905	BLA	O2D-CGD-CBD	2.21	120.98	114.00
2	A	901	BLA	CHB-C4A-C3A	-2.20	122.14	127.53
2	A	901	BLA	OB-C4B-C3B	-2.20	124.40	129.71
2	B	606	BLA	C4D-ND-C1D	-2.15	102.56	106.52
2	A	901	BLA	O2D-CGD-CBD	2.15	120.79	114.00
2	C	905	BLA	CBA-CAA-C2A	2.14	118.45	112.53
2	B	606	BLA	CHB-C4A-NA	-2.08	120.59	125.29
2	C	905	BLA	CAC-C3C-C2C	-2.04	121.81	128.43
2	C	905	BLA	OC-C1C-NC	2.03	129.84	125.08

There are no chirality outliers.

All (23) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	606	BLA	C2C-C3C-CAC-CBC
2	B	606	BLA	ND-C1D-CHD-C4C
2	B	606	BLA	C2D-C1D-CHD-C4C
2	B	606	BLA	C3D-CAD-CBD-CGD
2	A	901	BLA	C3D-CAD-CBD-CGD
2	C	905	BLA	ND-C1D-CHD-C4C
2	C	905	BLA	C4D-C3D-CAD-CBD
2	B	606	BLA	ND-C4D-CHA-C1A

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Mol	Chain	Res	Type	Atoms
2	C	905	BLA	C2D-C1D-CHD-C4C
2	C	905	BLA	C2D-C3D-CAD-CBD
2	B	606	BLA	C4C-C3C-CAC-CBC
2	C	905	BLA	C4C-C3C-CAC-CBC
2	B	606	BLA	C3D-C4D-CHA-C1A
2	A	901	BLA	CAA-CBA-CGA-O1A
2	B	606	BLA	CAA-CBA-CGA-O2A
2	A	901	BLA	CAA-CBA-CGA-O2A
2	C	905	BLA	CAD-CBD-CGD-O2D
2	B	606	BLA	CAA-CBA-CGA-O1A
2	C	905	BLA	CAD-CBD-CGD-O1D
2	C	905	BLA	CAA-CBA-CGA-O2A
2	C	905	BLA	CAA-CBA-CGA-O1A
2	B	606	BLA	C3A-C4A-CHB-C1B
2	B	606	BLA	NA-C4A-CHB-C1B

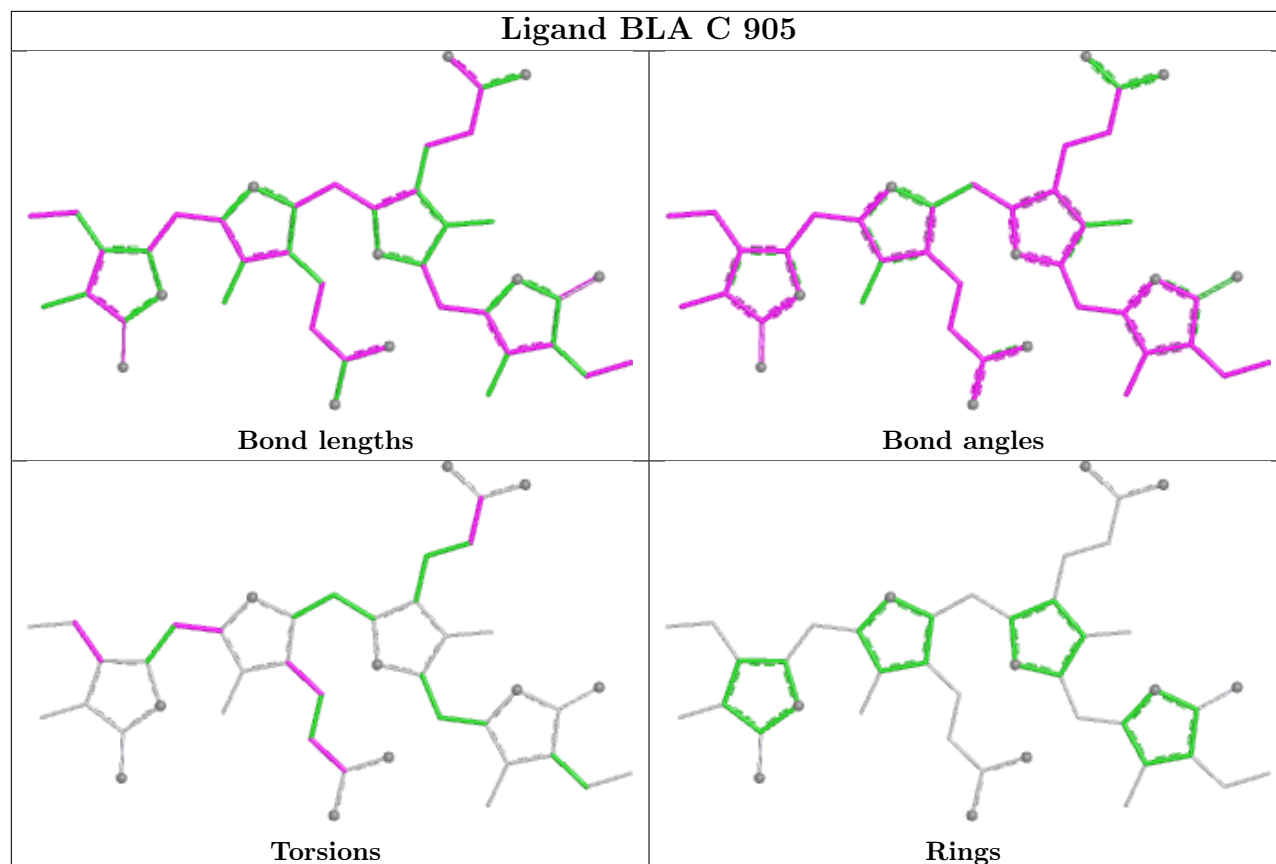
There are no ring outliers.

6 monomers are involved in 19 short contacts:

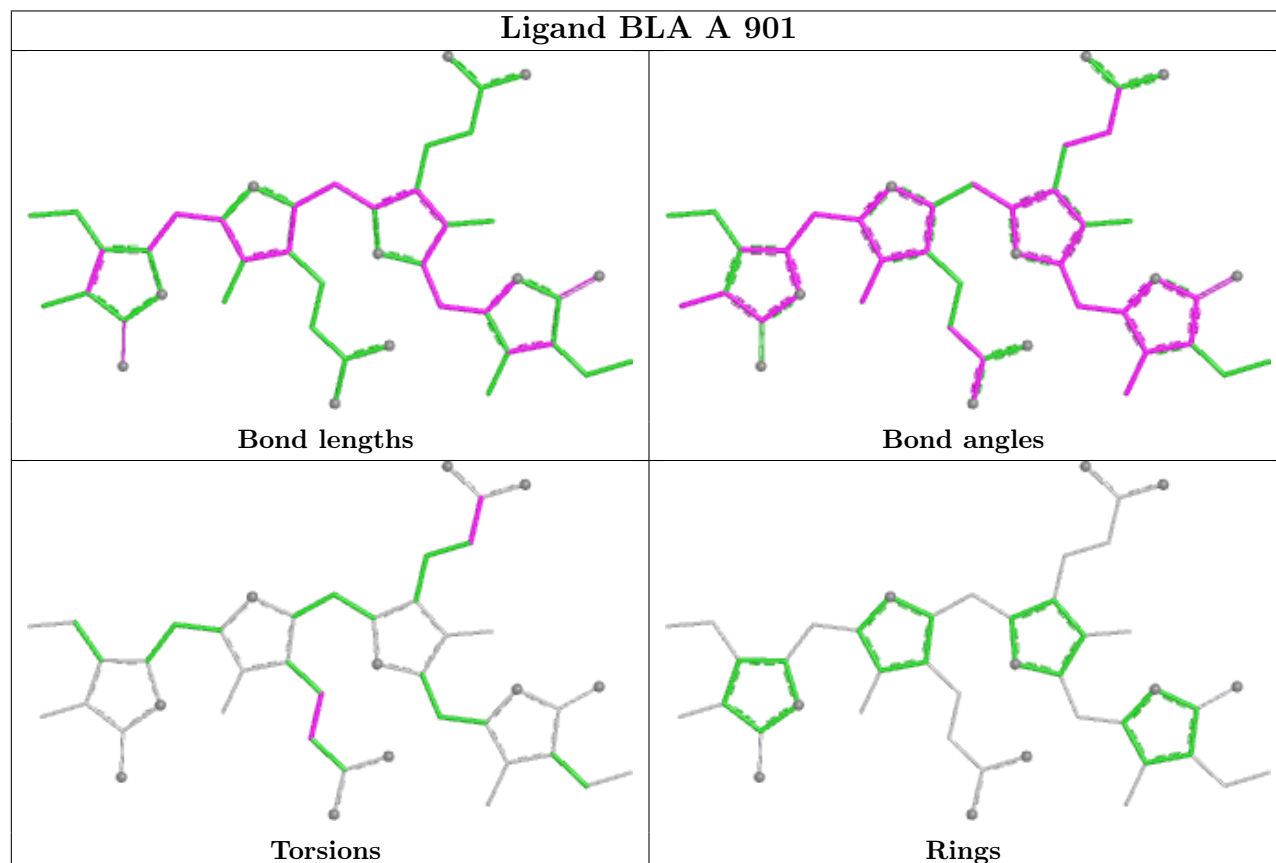
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	905	BLA	6	0
4	B	605	SO4	1	0
4	C	901	SO4	1	0
4	B	601	SO4	1	0
2	A	901	BLA	5	0
2	B	606	BLA	5	0

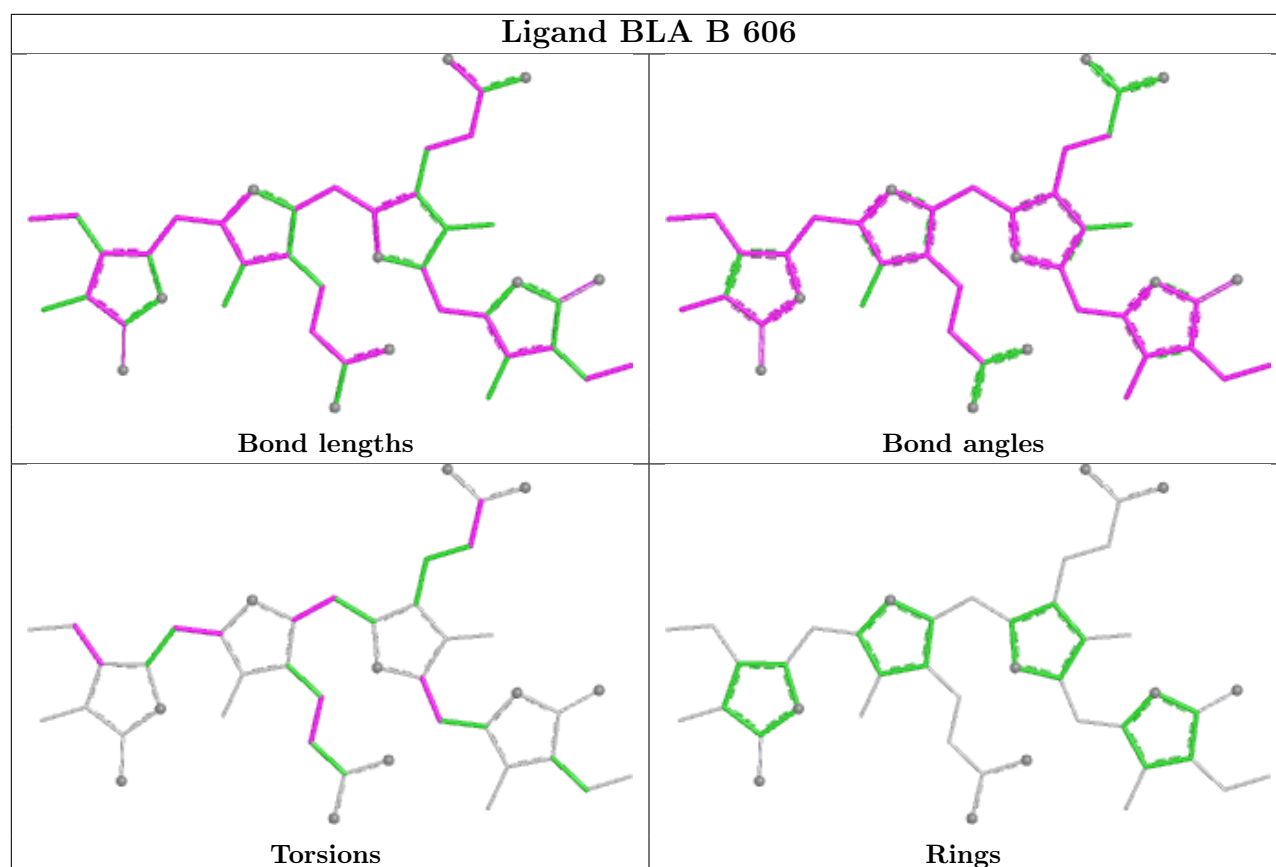
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.

Ligand BLA C 905



Ligand BLA A 901





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	207/215 (96%)	-0.19	2 (0%) 79 82	21, 30, 46, 52	1 (0%)
1	B	209/215 (97%)	-0.21	2 (0%) 79 82	18, 27, 44, 50	0
1	C	208/215 (96%)	-0.21	2 (0%) 79 82	19, 29, 47, 56	1 (0%)
All	All	624/645 (96%)	-0.20	6 (0%) 79 82	18, 29, 46, 56	2 (0%)

All (6) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	606	ALA	3.1
1	B	439	GLY	2.6
1	A	141	GLN	2.6
1	C	765	GLY	2.2
1	B	325	HIS	2.1
1	A	168	LYS	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 oligosaccharides in this entry.

6.4 Ligands [i](#)

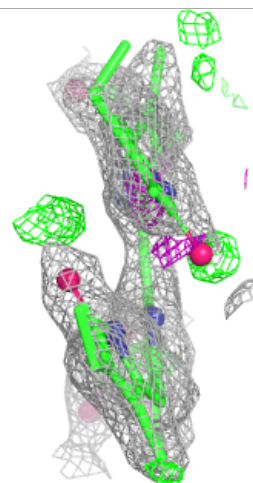
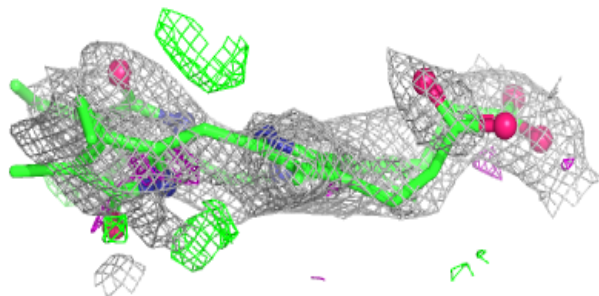
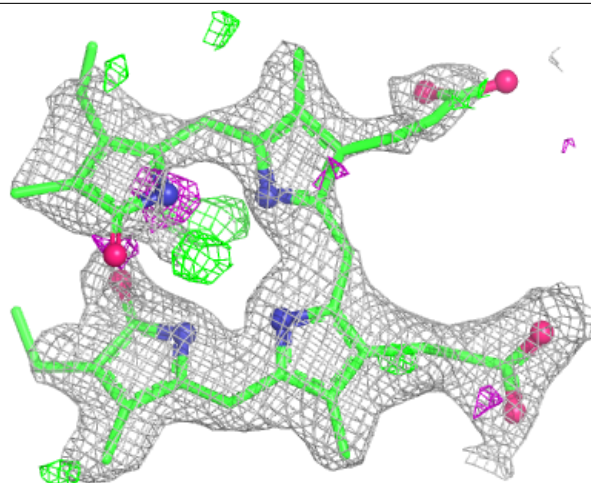
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q< 0.9’ lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	BLA	B	606	43/43	0.73	0.15	53,57,68,70	0
4	SO4	B	605	5/5	0.77	0.11	82,82,83,83	0
4	SO4	A	905	5/5	0.78	0.14	95,96,96,96	0
4	SO4	C	902	5/5	0.78	0.15	46,47,49,50	5
2	BLA	C	905	43/43	0.79	0.13	31,38,51,59	0
4	SO4	A	903	5/5	0.83	0.10	79,80,81,82	0
4	SO4	C	901	5/5	0.84	0.10	85,86,86,86	0
4	SO4	B	603	5/5	0.84	0.10	53,54,59,60	0
4	SO4	C	903	5/5	0.84	0.10	58,60,62,64	0
4	SO4	B	602	5/5	0.87	0.09	70,71,73,73	0
2	BLA	A	901	43/43	0.87	0.11	29,41,50,54	0
4	SO4	B	604	5/5	0.88	0.09	63,63,66,66	0
4	SO4	B	601	5/5	0.89	0.09	65,65,67,67	0
4	SO4	A	904	5/5	0.94	0.06	65,65,66,68	0
4	SO4	C	904	5/5	0.94	0.06	66,66,67,68	0
3	FE	A	902	1/1	0.99	0.11	41,41,41,41	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.

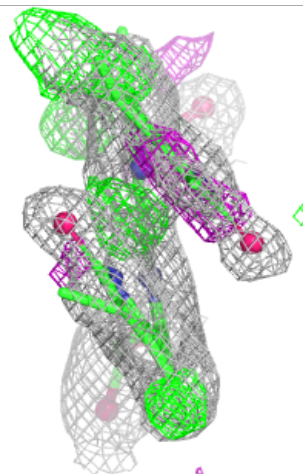
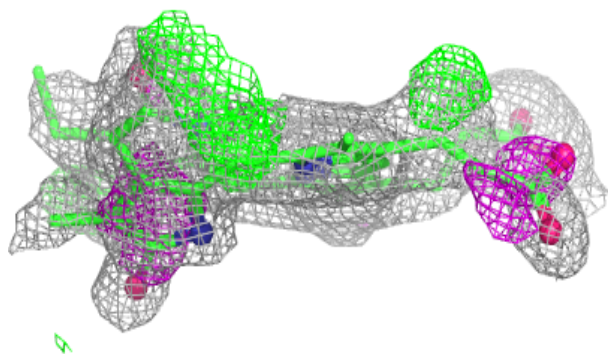
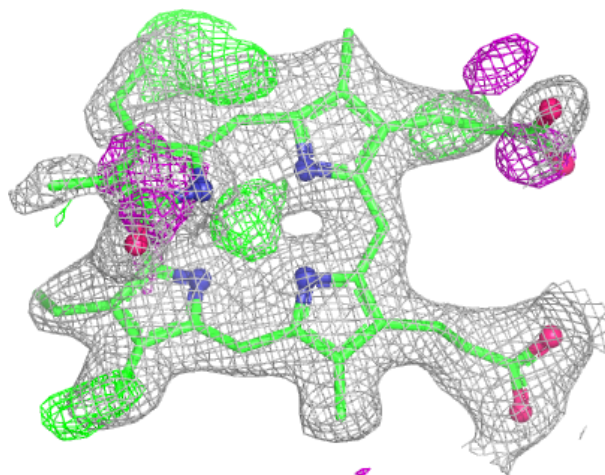
Electron density around BLA B 606:

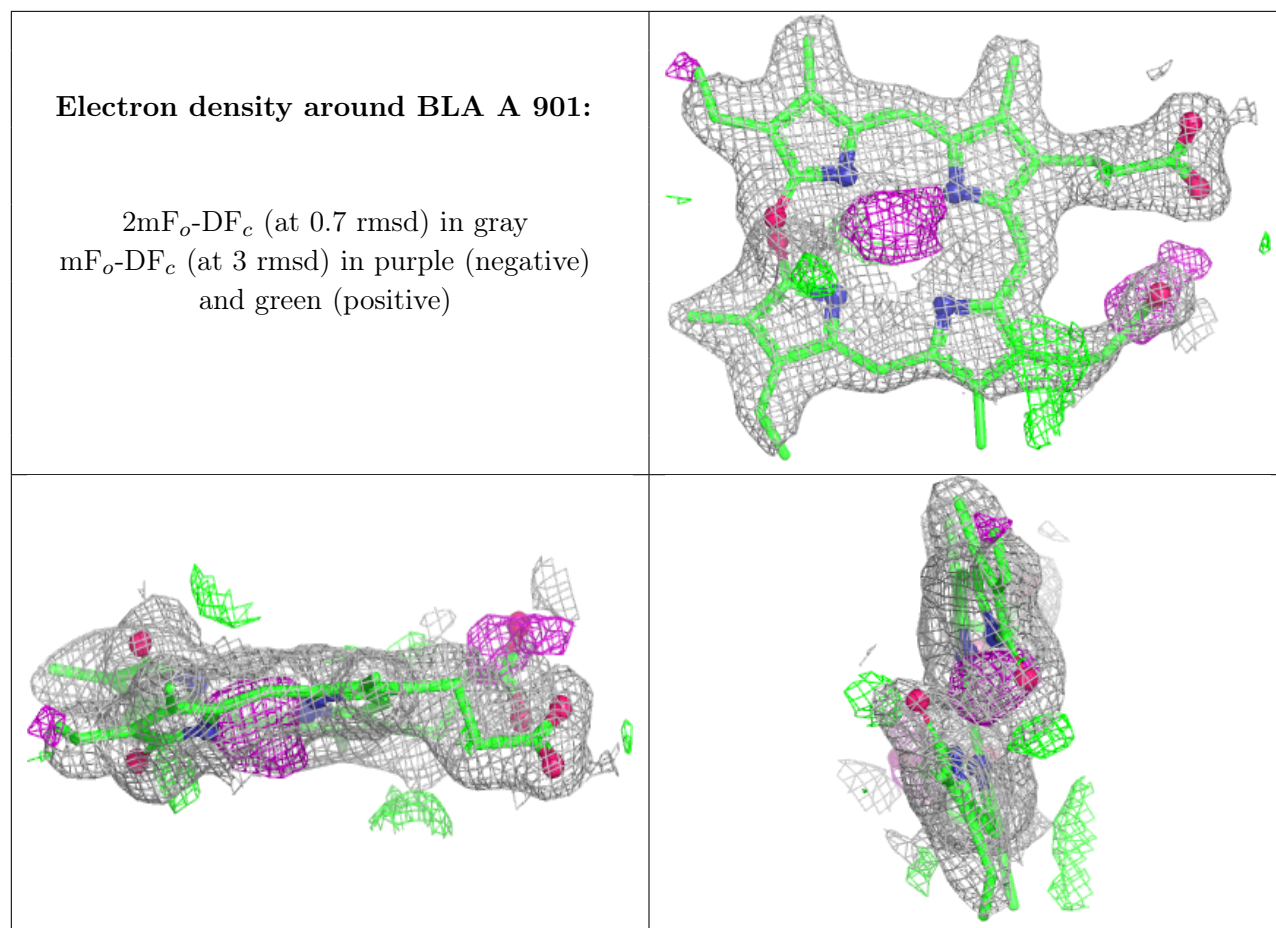
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around BLA C 905:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





6.5 Other polymers ⓘ

There are no such residues in this entry.