Full wwPDB X-ray Structure Validation Report ⓘ

May 27, 2026 – 10:38 am BST

PDB ID	:	9RUL / pdb_00009rul
Title	:	CdmB methyltransferase involved in the anaerobic dehalogenation of haloalkanes soaked with dichloromethane
Authors	:	Wagner, T.; Lemaire, O.N.
Deposited on	:	2025-07-04
Resolution	:	1.62 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:

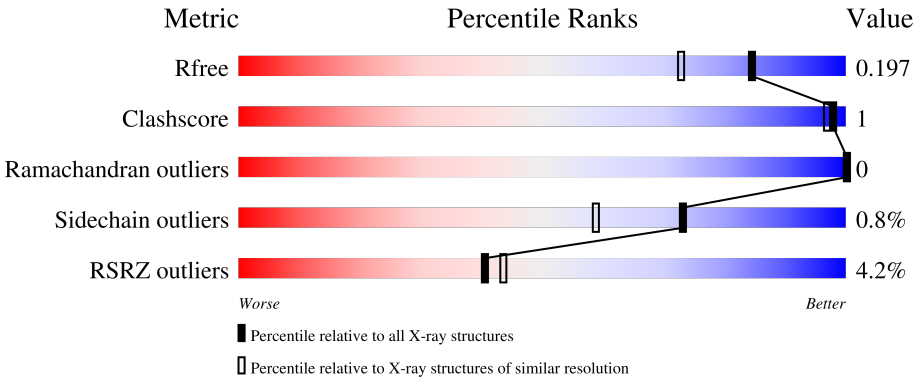
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal 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 (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.62 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	6728 (1.64-1.60)
Clashscore	190562	7023 (1.64-1.60)
Ramachandran outliers	187476	6898 (1.64-1.60)
Sidechain outliers	187428	6896 (1.64-1.60)
RSRZ outliers	180081	6727 (1.64-1.60)

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 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 <=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	429	4% 96%
1	B	429	4% 94%

2 Entry composition

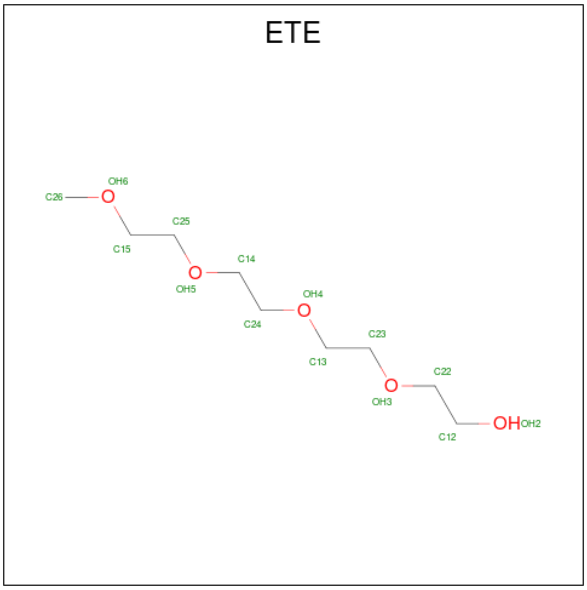
There are 12 unique types of molecules in this entry. The entry contains 7496 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 CdmB from Acetobacterium malicum subsp. dehalogenans.

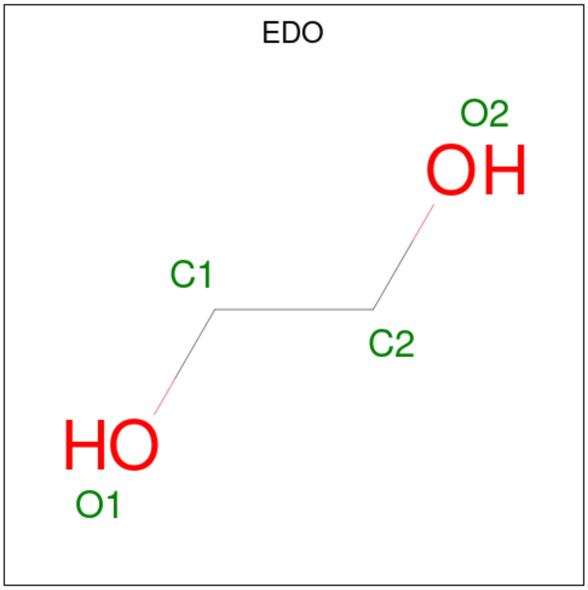
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	423	Total	C	N	O	S	0	4	0
			3390	2199	555	625	11			
1	B	415	Total	C	N	O	S	0	4	0
			3318	2154	540	613	11			

- Molecule 2 is 2-{2-[2-2-(METHOXY-ETHOXY)-ETHOXY]-ETHOXY}-ETHANOL (CCD ID: ETE) (formula: $C_9H_{20}O_5$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			14	9	5		

- Molecule 3 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: $C_2H_6O_2$).



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

Continued on next page...

Continued from previous page...

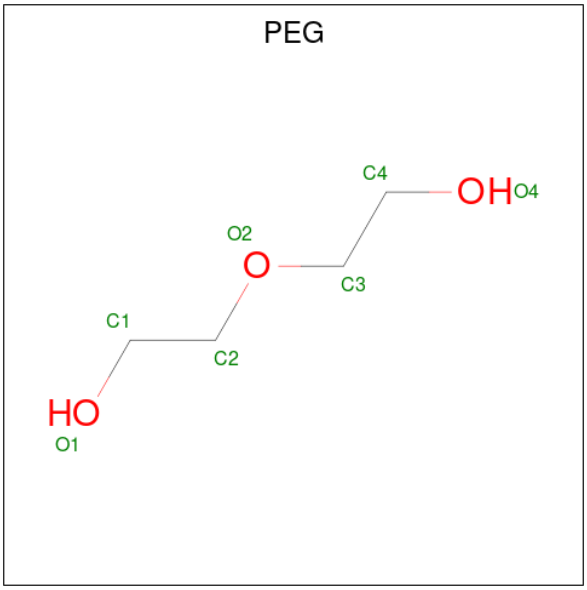
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O 4 2 2	0	0
3	A	1	Total C O 4 2 2	0	0
3	A	1	Total C O 4 2 2	0	0
3	A	1	Total C O 4 2 2	0	0
3	A	1	Total C O 4 2 2	0	0
3	A	1	Total C O 4 2 2	0	0
3	A	1	Total C O 4 2 2	0	0
3	A	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0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

Continued on next page...

Continued from previous page...

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

- Molecule 4 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$).



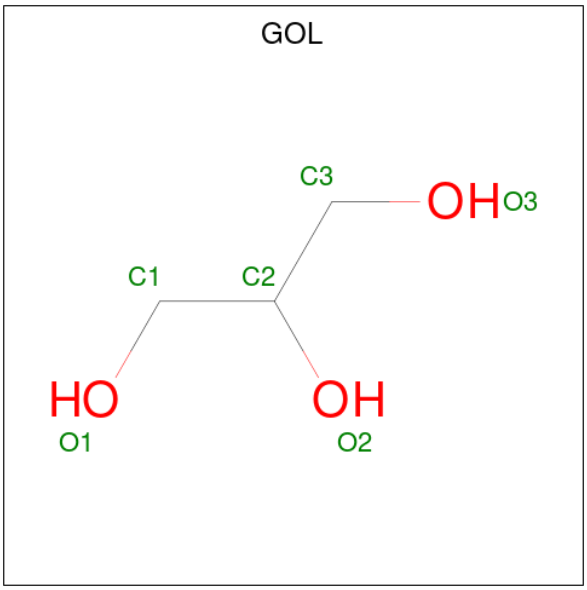
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 7 4 3	0	0
4	A	1	Total C O 7 4 3	0	0
4	A	1	Total C O 7 4 3	0	0
4	A	1	Total C O 7 4 3	0	0
4	A	1	Total C O 7 4 3	0	0
4	A	1	Total C O 7 4 3	0	0
4	A	1	Total C O 7 4 3	0	0
4	A	1	Total C O 7 4 3	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 7 4 3	0	0
4	A	1	Total C O 5 3 2	0	0
4	A	1	Total C O 7 4 3	0	0
4	B	1	Total C O 7 4 3	0	0

- Molecule 5 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



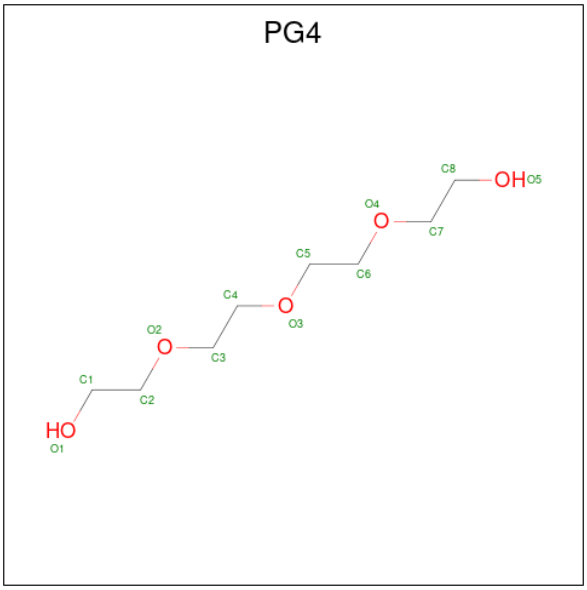
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total C O 6 3 3	0	0
5	A	1	Total C O 6 3 3	0	0
5	A	1	Total C O 6 3 3	0	0
5	A	1	Total C O 6 3 3	0	0
5	A	1	Total C O 6 3 3	0	0
5	A	1	Total C O 6 3 3	0	0
5	B	1	Total C O 6 3 3	0	0

Continued on next page...

Continued from previous page...

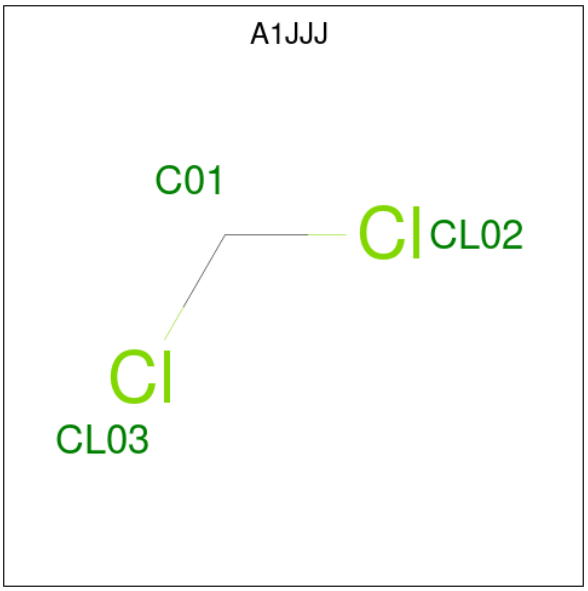
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	1	Total C O 6 3 3	0	0
5	B	1	Total C O 6 3 3	0	0

- Molecule 6 is TETRAETHYLENE GLYCOL (CCD ID: PG4) (formula: $C_8H_{18}O_5$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total C O 13 8 5	0	1

- Molecule 7 is dichloromethane (CCD ID: A1JJJ) (formula: CH_2Cl_2) (labeled as "Ligand of Interest" by depositor).

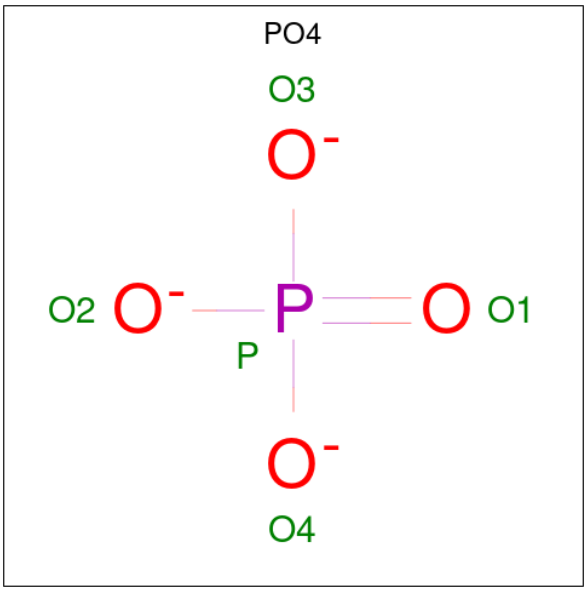


Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	1	Total C Cl 3 1 2	0	0
7	A	1	Total C Cl 3 1 2	0	0
7	B	1	Total C Cl 3 1 2	0	0

- Molecule 8 is POTASSIUM ION (CCD ID: K) (formula: K).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	2	Total K 2 2	0	0
8	B	1	Total K 1 1	0	0

- Molecule 9 is PHOSPHATE ION (CCD ID: PO4) (formula: O_4P).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	A	1	Total O P 5 4 1	0	1
9	A	1	Total O P 5 4 1	0	1
9	A	1	Total O P 5 4 1	0	0

- Molecule 10 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
10	A	1	Total Na 1 1	0	0

- Molecule 11 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
11	B	1	Total Cl 1 1	0	0

- Molecule 12 is water.

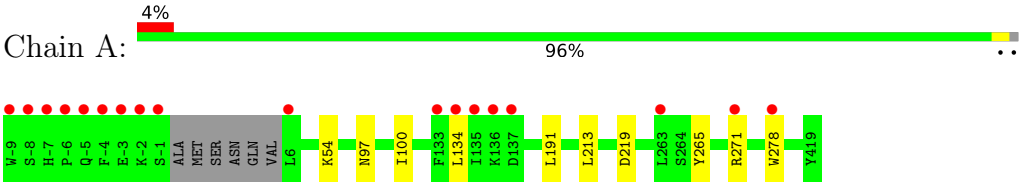
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
12	A	314	Total O 314 314	0	1
12	B	130	Total O 130 130	0	1

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.

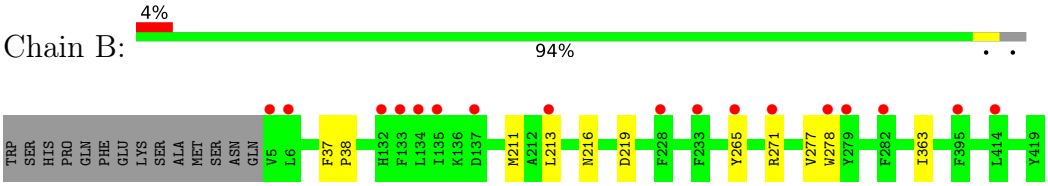
• Molecule 1: CdmB from Acetobacterium malicum subsp. dehalogenans

Chain A:



• Molecule 1: CdmB from Acetobacterium malicum subsp. dehalogenans

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	69.57Å 86.06Å 156.27Å 90.00° 99.29° 90.00°	Depositor
Resolution (Å)	34.33 – 1.62 34.33 – 1.62	Depositor EDS
% Data completeness (in resolution range)	76.8 (34.33-1.62) 76.8 (34.33-1.62)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.67 (at 1.63Å)	Xtriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, R_{free}	0.162 , 0.191 0.171 , 0.197	Depositor DCC
R_{free} test set	4415 reflections (3.86%)	wwPDB-VP
Wilson B-factor (Å^2)	25.9	Xtriage
Anisotropy	0.013	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.38 , 56.0	EDS
L-test for twinning[2]	$< \|L\| > = 0.47$, $< L^2 > = 0.29$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	7496	wwPDB-VP
Average B, all atoms (Å^2)	38.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.23% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: PG4, NA, ETE, EDO, A1JJJ, CL, PO4, GOL, PEG, K

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	0.59	0/3479	0.70	0/4717
1	B	0.48	0/3405	0.63	1/4623 (0.0%)
All	All	0.54	0/6884	0.67	1/9340 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	216	ASN	CB-CA-C	5.13	116.53	108.63

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	3390	0	3377	3	0
1	B	3318	0	3305	6	0
2	A	14	0	20	0	0
3	A	88	0	132	0	0
3	B	64	0	96	0	0
4	A	75	0	105	1	0
4	B	7	0	10	0	0
5	A	36	0	48	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	B	18	0	24	0	0
6	A	13	0	18	0	0
7	A	6	0	0	0	0
7	B	3	0	0	0	0
8	A	2	0	0	0	0
8	B	1	0	0	0	0
9	A	15	0	0	0	0
10	A	1	0	0	0	0
11	B	1	0	0	0	0
12	A	314	0	0	0	0
12	B	130	0	0	1	0
All	All	7496	0	7135	10	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 (10) 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:219:ASP:HB3	1:B:278[A]:TRP:CE3	2.30	0.66
1:B:219:ASP:HB3	1:B:278[A]:TRP:CZ3	2.43	0.53
1:B:37:PHE:HB3	1:B:38:PRO:HD3	1.94	0.48
1:B:211:MET:HE2	12:B:726:HOH:O	2.12	0.48
1:B:219:ASP:OD2	1:B:277:VAL:HA	2.17	0.45
1:A:265:TYR:CD1	1:A:271[A]:ARG:HG2	2.51	0.45
1:B:265:TYR:CD1	1:B:271:ARG:HG3	2.53	0.43
1:A:219:ASP:HB3	1:A:278:TRP:CE3	2.53	0.42
4:A:530:PEG:H31	4:A:530:PEG:H11	1.59	0.41
1:A:97:ASN:HB3	1:A:191:LEU:HD11	2.04	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	423/429 (99%)	413 (98%)	10 (2%)	0	100	100
1	B	417/429 (97%)	408 (98%)	9 (2%)	0	100	100
All	All	840/858 (98%)	821 (98%)	19 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	367/368 (100%)	363 (99%)	4 (1%)	65	46
1	B	359/368 (98%)	357 (99%)	2 (1%)	78	66
All	All	726/736 (99%)	720 (99%)	6 (1%)	73	59

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	54	LYS
1	A	100	ILE
1	A	134	LEU
1	A	213	LEU
1	B	213	LEU
1	B	363	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	177	ASN
1	A	186	GLN
1	B	205	ASN
1	B	375	HIS

5.3.3 RNA

There are no RNA molecules 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 oligosaccharides in this entry.

5.6 Ligand geometry

Of 72 ligands modelled in this entry, 5 are monoatomic - leaving 67 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	PEG	A	514	-	6,6,6	0.06	0	5,5,5	0.16	0
3	EDO	B	507	-	3,3,3	0.59	0	2,2,2	0.07	0
3	EDO	B	505	-	3,3,3	0.43	0	2,2,2	0.46	0
3	EDO	A	517	-	3,3,3	0.42	0	2,2,2	0.26	0
3	EDO	A	504	-	3,3,3	0.52	0	2,2,2	0.47	0
3	EDO	B	516	-	3,3,3	0.06	0	2,2,2	0.19	0
5	GOL	A	508	-	5,5,5	1.17	0	5,5,5	0.67	0
3	EDO	B	509	-	3,3,3	0.49	0	2,2,2	0.36	0
3	EDO	A	512	-	3,3,3	0.43	0	2,2,2	0.29	0
3	EDO	A	502	-	3,3,3	0.82	0	2,2,2	0.18	0
3	EDO	A	511	-	3,3,3	0.48	0	2,2,2	0.65	0
3	EDO	B	519	-	3,3,3	0.06	0	2,2,2	0.25	0
7	A1JJJ	A	528	-	2,2,2	0.66	0	1,1,1	0.35	0
3	EDO	B	518	-	3,3,3	0.05	0	2,2,2	0.19	0
3	EDO	A	503	-	3,3,3	0.47	0	2,2,2	0.26	0
3	EDO	A	539	-	3,3,3	0.05	0	2,2,2	0.23	0
4	PEG	A	542	-	6,6,6	0.10	0	5,5,5	0.08	0
7	A1JJJ	B	514	-	2,2,2	0.65	0	1,1,1	0.36	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
5	GOL	B	503	-	5,5,5	0.82	0	5,5,5	0.88	0
3	EDO	A	507[A]	-	3,3,3	0.50	0	2,2,2	0.27	0
5	GOL	B	502	-	5,5,5	0.09	0	5,5,5	0.34	0
4	PEG	B	506	-	6,6,6	0.15	0	5,5,5	0.09	0
3	EDO	A	533	-	3,3,3	0.07	0	2,2,2	0.15	0
4	PEG	A	506	-	6,6,6	0.12	0	5,5,5	0.09	0
5	GOL	A	543	-	5,5,5	0.10	0	5,5,5	0.34	0
4	PEG	A	540	-	4,4,6	0.26	0	3,3,5	0.23	0
3	EDO	B	510[B]	-	3,3,3	0.06	0	2,2,2	0.19	0
3	EDO	B	513	-	3,3,3	0.45	0	2,2,2	0.46	0
3	EDO	A	516	-	3,3,3	0.55	0	2,2,2	0.21	0
6	PG4	A	510[A]	-	12,12,12	0.13	0	11,11,11	0.21	0
4	PEG	A	530	-	6,6,6	0.11	0	5,5,5	0.09	0
3	EDO	B	504	-	3,3,3	0.61	0	2,2,2	0.14	0
3	EDO	A	522	-	3,3,3	0.47	0	2,2,2	0.29	0
4	PEG	A	515	-	6,6,6	0.13	0	5,5,5	0.19	0
7	A1JJJ	A	527	-	2,2,2	0.66	0	1,1,1	0.34	0
4	PEG	A	509	-	6,6,6	0.12	0	5,5,5	0.09	0
9	PO4	A	548	-	4,4,4	0.74	0	6,6,6	0.48	0
3	EDO	A	523	-	3,3,3	0.49	0	2,2,2	0.37	0
3	EDO	B	517	-	3,3,3	0.06	0	2,2,2	0.17	0
4	PEG	A	505	-	6,6,6	0.12	0	5,5,5	0.14	0
5	GOL	A	529	-	5,5,5	0.09	0	5,5,5	0.33	0
3	EDO	A	537	-	3,3,3	0.06	0	2,2,2	0.25	0
3	EDO	A	541	-	3,3,3	0.06	0	2,2,2	0.19	0
3	EDO	A	520	-	3,3,3	0.49	0	2,2,2	0.37	0
3	EDO	B	520	-	3,3,3	0.36	0	2,2,2	0.09	0
3	EDO	A	532	-	3,3,3	0.06	0	2,2,2	0.25	0
3	EDO	A	538	-	3,3,3	0.05	0	2,2,2	0.22	0
5	GOL	A	534	-	5,5,5	0.09	0	5,5,5	0.35	0
9	PO4	A	547[B]	8	4,4,4	1.61	0	6,6,6	1.20	0
3	EDO	A	518	-	3,3,3	0.49	0	2,2,2	0.21	0
4	PEG	A	513	-	6,6,6	0.12	0	5,5,5	0.23	0
5	GOL	A	519	-	5,5,5	0.10	0	5,5,5	0.33	0
9	PO4	A	546[A]	8	4,4,4	1.54	1 (25%)	6,6,6	0.36	0
3	EDO	A	521	-	3,3,3	0.44	0	2,2,2	0.41	0
3	EDO	B	512	-	3,3,3	0.54	0	2,2,2	0.11	0
3	EDO	A	525	-	3,3,3	0.51	0	2,2,2	0.22	0
3	EDO	B	511	-	3,3,3	0.06	0	2,2,2	0.22	0
4	PEG	A	524	-	6,6,6	0.16	0	5,5,5	0.13	0
3	EDO	B	501	-	3,3,3	0.40	0	2,2,2	0.37	0
5	GOL	A	531	-	5,5,5	0.08	0	5,5,5	0.33	0
5	GOL	B	521	-	5,5,5	0.10	0	5,5,5	0.33	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
2	ETE	A	501	10	13,13,13	0.38	0	12,12,12	0.44	0
4	PEG	A	535	-	6,6,6	0.12	0	5,5,5	0.08	0
3	EDO	B	515	-	3,3,3	0.06	0	2,2,2	0.20	0
3	EDO	A	526	-	3,3,3	0.47	0	2,2,2	0.29	0
3	EDO	B	508	-	3,3,3	0.49	0	2,2,2	0.35	0
3	EDO	A	536	-	3,3,3	0.06	0	2,2,2	0.19	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
4	PEG	A	514	-	-	2/4/4/4	-
3	EDO	B	507	-	-	1/1/1/1	-
3	EDO	B	505	-	-	1/1/1/1	-
3	EDO	A	517	-	-	1/1/1/1	-
3	EDO	A	504	-	-	1/1/1/1	-
3	EDO	B	516	-	-	1/1/1/1	-
5	GOL	A	508	-	-	2/4/4/4	-
3	EDO	B	509	-	-	1/1/1/1	-
3	EDO	A	512	-	-	0/1/1/1	-
3	EDO	A	502	-	-	1/1/1/1	-
3	EDO	A	511	-	-	1/1/1/1	-
3	EDO	B	519	-	-	0/1/1/1	-
3	EDO	B	518	-	-	1/1/1/1	-
3	EDO	A	503	-	-	0/1/1/1	-
3	EDO	A	539	-	-	0/1/1/1	-
4	PEG	A	542	-	-	2/4/4/4	-
5	GOL	B	503	-	-	2/4/4/4	-
3	EDO	A	507[A]	-	-	0/1/1/1	-
5	GOL	B	502	-	-	4/4/4/4	-
4	PEG	B	506	-	-	1/4/4/4	-
3	EDO	A	533	-	-	0/1/1/1	-
4	PEG	A	506	-	-	2/4/4/4	-
5	GOL	A	543	-	-	2/4/4/4	-
4	PEG	A	540	-	-	1/2/2/4	-
3	EDO	B	510[B]	-	-	0/1/1/1	-
3	EDO	B	513	-	-	0/1/1/1	-
3	EDO	A	516	-	-	0/1/1/1	-
6	PG4	A	510[A]	-	-	8/10/10/10	-

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	PEG	A	530	-	-	2/4/4/4	-
3	EDO	B	504	-	-	0/1/1/1	-
3	EDO	A	522	-	-	1/1/1/1	-
4	PEG	A	515	-	-	3/4/4/4	-
4	PEG	A	509	-	-	2/4/4/4	-
3	EDO	A	523	-	-	1/1/1/1	-
3	EDO	B	517	-	-	0/1/1/1	-
4	PEG	A	505	-	-	0/4/4/4	-
5	GOL	A	529	-	-	2/4/4/4	-
3	EDO	A	537	-	-	1/1/1/1	-
3	EDO	A	541	-	-	1/1/1/1	-
3	EDO	A	520	-	-	1/1/1/1	-
3	EDO	B	520	-	-	1/1/1/1	-
3	EDO	A	532	-	-	1/1/1/1	-
3	EDO	A	538	-	-	0/1/1/1	-
5	GOL	A	534	-	-	2/4/4/4	-
3	EDO	A	518	-	-	0/1/1/1	-
4	PEG	A	513	-	-	2/4/4/4	-
5	GOL	A	519	-	-	4/4/4/4	-
3	EDO	A	521	-	-	1/1/1/1	-
3	EDO	B	512	-	-	1/1/1/1	-
3	EDO	A	525	-	-	0/1/1/1	-
3	EDO	B	511	-	-	1/1/1/1	-
4	PEG	A	524	-	-	2/4/4/4	-
3	EDO	B	501	-	-	1/1/1/1	-
5	GOL	A	531	-	-	2/4/4/4	-
5	GOL	B	521	-	-	2/4/4/4	-
2	ETE	A	501	10	-	1/11/11/11	-
4	PEG	A	535	-	-	3/4/4/4	-
3	EDO	B	515	-	-	0/1/1/1	-
3	EDO	A	526	-	-	1/1/1/1	-
3	EDO	B	508	-	-	1/1/1/1	-
3	EDO	A	536	-	-	1/1/1/1	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
9	A	546[A]	PO4	P-O4	-2.81	1.46	1.54

There are no bond angle outliers.

There are no chirality outliers.

All (76) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	508	GOL	O1-C1-C2-C3
5	A	519	GOL	O1-C1-C2-C3
5	A	529	GOL	O1-C1-C2-C3
5	A	531	GOL	C1-C2-C3-O3
5	A	543	GOL	C1-C2-C3-O3
5	A	543	GOL	O2-C2-C3-O3
5	B	502	GOL	O1-C1-C2-C3
5	B	502	GOL	C1-C2-C3-O3
6	A	510[A]	PG4	O3-C5-C6-O4
6	A	510[A]	PG4	O2-C3-C4-O3
5	B	502	GOL	O1-C1-C2-O2
4	A	509	PEG	O2-C3-C4-O4
4	A	530	PEG	C1-C2-O2-C3
4	A	506	PEG	O2-C3-C4-O4
4	A	530	PEG	O1-C1-C2-O2
4	A	540	PEG	O2-C3-C4-O4
5	A	519	GOL	C1-C2-C3-O3
5	A	534	GOL	O1-C1-C2-C3
5	B	521	GOL	O1-C1-C2-C3
4	A	515	PEG	O2-C3-C4-O4
4	A	524	PEG	O1-C1-C2-O2
4	A	542	PEG	O2-C3-C4-O4
5	A	508	GOL	O1-C1-C2-O2
5	B	521	GOL	O1-C1-C2-O2
4	A	535	PEG	O2-C3-C4-O4
3	A	502	EDO	O1-C1-C2-O2
3	A	504	EDO	O1-C1-C2-O2
3	A	517	EDO	O1-C1-C2-O2
3	B	501	EDO	O1-C1-C2-O2
3	B	512	EDO	O1-C1-C2-O2
3	B	516	EDO	O1-C1-C2-O2
3	B	518	EDO	O1-C1-C2-O2
4	A	514	PEG	O1-C1-C2-O2
6	A	510[A]	PG4	O1-C1-C2-O2
5	A	519	GOL	O1-C1-C2-O2
5	A	519	GOL	O2-C2-C3-O3
5	B	502	GOL	O2-C2-C3-O3
3	A	541	EDO	O1-C1-C2-O2
3	B	508	EDO	O1-C1-C2-O2
3	A	520	EDO	O1-C1-C2-O2

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms
3	A	523	EDO	O1-C1-C2-O2
3	B	505	EDO	O1-C1-C2-O2
3	B	509	EDO	O1-C1-C2-O2
3	B	520	EDO	O1-C1-C2-O2
4	A	514	PEG	O2-C3-C4-O4
4	B	506	PEG	C1-C2-O2-C3
4	A	535	PEG	C4-C3-O2-C2
4	A	515	PEG	C1-C2-O2-C3
4	A	509	PEG	C1-C2-O2-C3
6	A	510[A]	PG4	C3-C4-O3-C5
6	A	510[A]	PG4	C8-C7-O4-C6
5	B	503	GOL	O2-C2-C3-O3
4	A	515	PEG	C4-C3-O2-C2
6	A	510[A]	PG4	C4-C3-O2-C2
3	A	537	EDO	O1-C1-C2-O2
3	B	511	EDO	O1-C1-C2-O2
4	A	542	PEG	O1-C1-C2-O2
3	A	526	EDO	O1-C1-C2-O2
3	A	532	EDO	O1-C1-C2-O2
6	A	510[A]	PG4	C6-C5-O3-C4
4	A	513	PEG	O1-C1-C2-O2
4	A	524	PEG	O2-C3-C4-O4
3	A	522	EDO	O1-C1-C2-O2
5	B	503	GOL	C1-C2-C3-O3
6	A	510[A]	PG4	O4-C7-C8-O5
5	A	529	GOL	O1-C1-C2-O2
5	A	534	GOL	O1-C1-C2-O2
3	A	511	EDO	O1-C1-C2-O2
3	A	536	EDO	O1-C1-C2-O2
4	A	506	PEG	C4-C3-O2-C2
5	A	531	GOL	O2-C2-C3-O3
2	A	501	ETE	C25-C15-OH6-C26
4	A	513	PEG	C1-C2-O2-C3
3	A	521	EDO	O1-C1-C2-O2
3	B	507	EDO	O1-C1-C2-O2
4	A	535	PEG	O1-C1-C2-O2

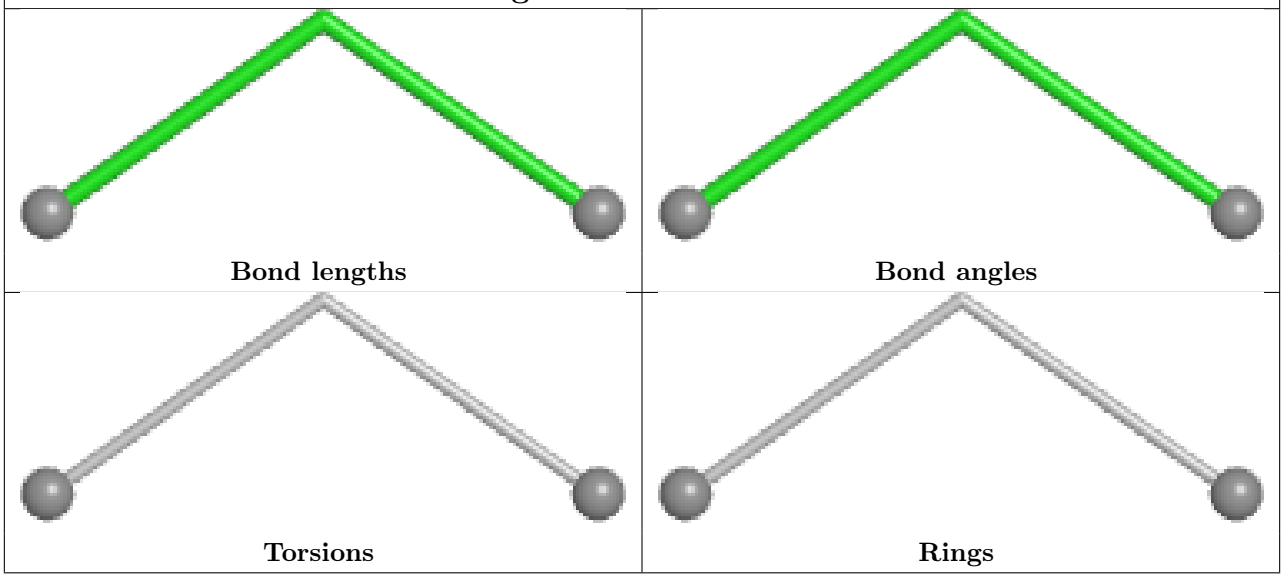
There are no ring outliers.

1 monomer is involved in 1 short contact:

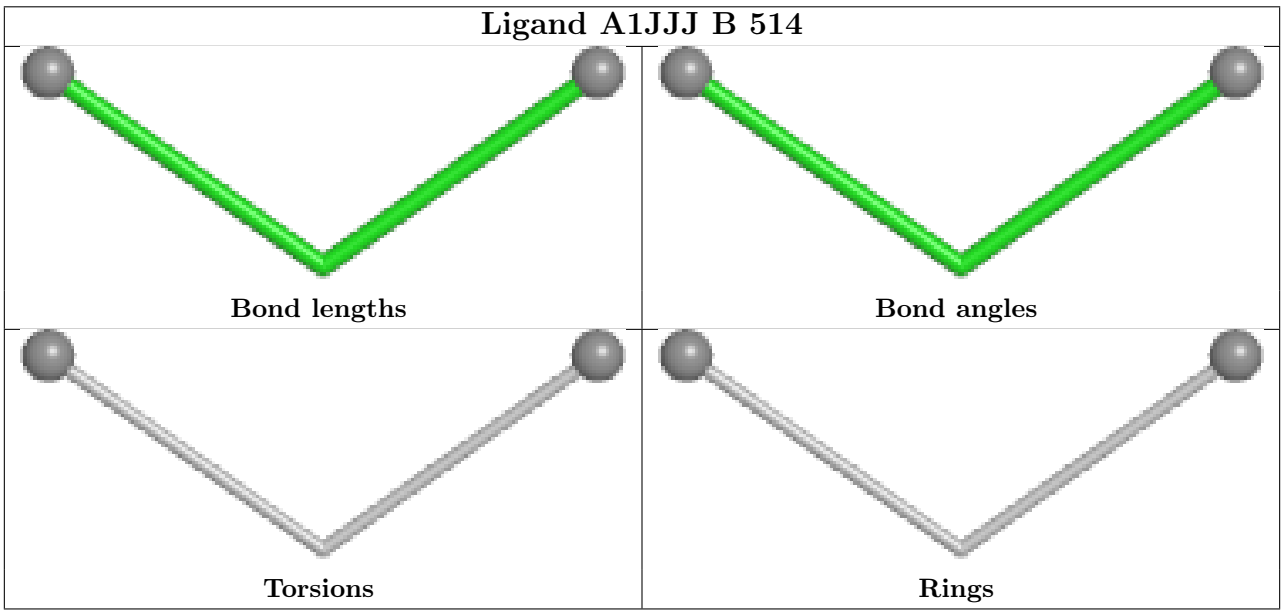
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	530	PEG	1	0

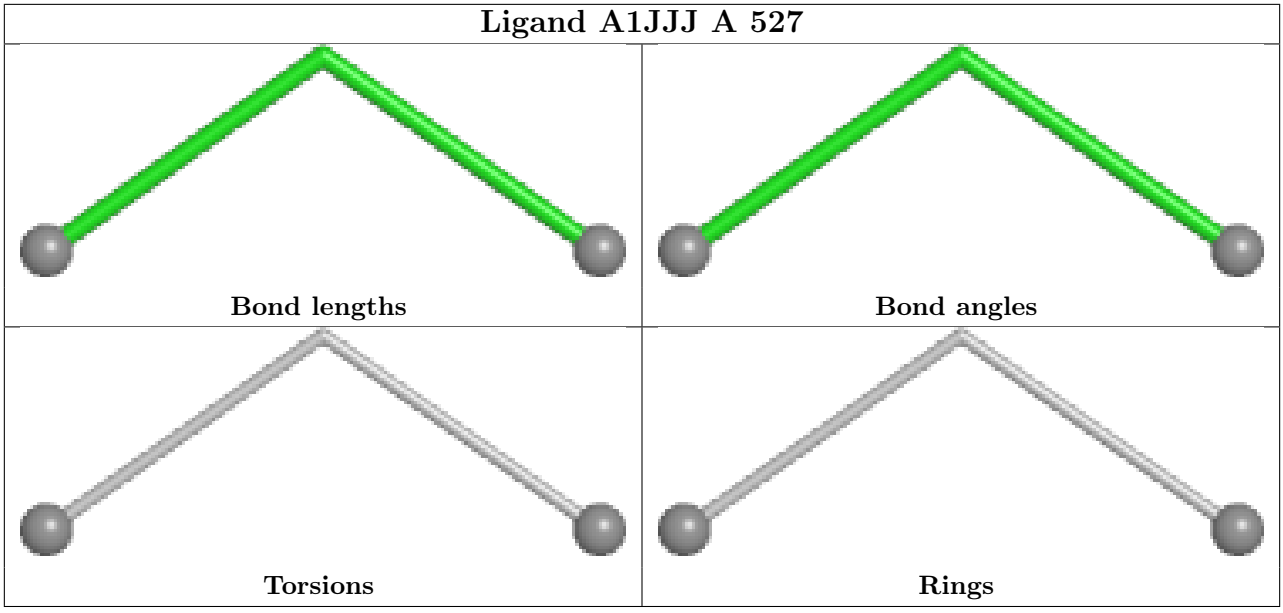
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 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 A1JJJ A 528



Ligand A1JJJ B 514





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, 95^{th} 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	423/429 (98%)	-0.14	18 (4%)	40	43	11, 25, 42, 99	4 (0%)
1	B	415/429 (96%)	0.52	17 (4%)	41	44	16, 45, 69, 122	4 (0%)
All	All	838/858 (97%)	0.19	35 (4%)	40	43	11, 33, 65, 122	8 (0%)

All (35) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	278[A]	TRP	5.7
1	B	5	VAL	5.6
1	A	134	LEU	5.5
1	A	-6	PRO	5.3
1	A	-5	GLN	5.3
1	A	-4	PHE	5.2
1	A	6	LEU	4.7
1	A	-7	HIS	4.6
1	B	135	ILE	4.3
1	A	135	ILE	4.1
1	B	134	LEU	4.0
1	A	-9	TRP	3.9
1	A	-3	GLU	3.6
1	A	278	TRP	3.5
1	B	279	TYR	3.5
1	A	136	LYS	3.3
1	B	133	PHE	3.3
1	A	-8	SER	3.1
1	A	137	ASP	3.1
1	A	-2	LYS	2.9
1	A	271[A]	ARG	2.9
1	B	228	PHE	2.8
1	B	213	LEU	2.8
1	B	271	ARG	2.7

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	233	PHE	2.7
1	A	133	PHE	2.6
1	A	-1	SER	2.4
1	B	137	ASP	2.3
1	A	263	LEU	2.3
1	B	414	LEU	2.3
1	B	395	PHE	2.1
1	B	132	HIS	2.1
1	B	265	TYR	2.1
1	B	6	LEU	2.1
1	B	282	PHE	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, 95^{th} 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(Å^2)	Q<0.9
3	EDO	A	518	4/4	0.68	0.18	52,62,62,70	0
3	EDO	A	538	4/4	0.69	0.17	42,57,60,67	0
3	EDO	A	521	4/4	0.71	0.19	58,59,66,77	0
3	EDO	B	508	4/4	0.71	0.16	63,64,65,79	0
5	GOL	B	503	6/6	0.71	0.15	65,73,74,80	0
3	EDO	A	525	4/4	0.72	0.19	51,55,58,63	0
5	GOL	A	508	6/6	0.73	0.16	40,58,62,68	0
5	GOL	A	529	6/6	0.73	0.20	35,51,54,61	0
3	EDO	B	511	4/4	0.73	0.15	58,61,62,68	0
5	GOL	A	534	6/6	0.74	0.17	47,50,60,61	0
5	GOL	B	502	6/6	0.74	0.24	46,60,64,71	0
5	GOL	A	531	6/6	0.74	0.19	49,57,60,64	0

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	EDO	A	511	4/4	0.75	0.20	47,58,59,61	0
5	GOL	B	521	6/6	0.75	0.12	65,70,72,73	0
4	PEG	A	513	7/7	0.76	0.17	55,56,58,60	0
3	EDO	A	504	4/4	0.76	0.15	47,47,59,65	0
3	EDO	B	518	4/4	0.77	0.15	59,60,71,72	0
3	EDO	A	536	4/4	0.77	0.15	53,55,64,75	0
3	EDO	B	501	4/4	0.77	0.18	53,58,63,66	0
5	GOL	A	543	6/6	0.78	0.14	56,58,61,70	0
3	EDO	A	541	4/4	0.78	0.16	57,59,60,63	0
3	EDO	A	526	4/4	0.79	0.17	50,55,63,67	0
3	EDO	A	539	4/4	0.79	0.14	50,56,58,59	0
3	EDO	B	520	4/4	0.80	0.13	65,71,72,75	0
4	PEG	A	506	7/7	0.80	0.15	46,50,55,65	0
3	EDO	B	507	4/4	0.80	0.16	49,59,61,67	0
4	PEG	B	506	7/7	0.80	0.14	48,54,57,58	0
3	EDO	A	523	4/4	0.81	0.13	55,56,57,60	0
4	PEG	A	530	7/7	0.81	0.17	44,50,63,65	0
4	PEG	A	540	5/7	0.81	0.16	41,41,51,57	0
3	EDO	B	505	4/4	0.82	0.16	46,61,63,78	0
3	EDO	A	516	4/4	0.82	0.14	52,60,65,66	0
4	PEG	A	542	7/7	0.82	0.14	50,53,61,62	0
4	PEG	A	524	7/7	0.82	0.14	44,58,68,69	0
11	CL	B	523	1/1	0.82	0.11	81,81,81,81	0
5	GOL	A	519	6/6	0.83	0.13	41,53,61,67	0
3	EDO	B	510[B]	4/4	0.83	0.13	57,62,63,65	0
3	EDO	B	509	4/4	0.83	0.13	59,60,68,71	0
3	EDO	B	512	4/4	0.84	0.13	57,58,61,62	0
3	EDO	B	516	4/4	0.84	0.13	50,61,64,66	0
4	PEG	A	514	7/7	0.84	0.13	45,51,56,64	0
3	EDO	A	522	4/4	0.84	0.14	44,52,54,57	0
3	EDO	B	519	4/4	0.84	0.12	49,54,55,65	0
7	A1JJJ	A	527	3/3	0.84	0.16	32,32,33,36	3
3	EDO	A	537	4/4	0.84	0.17	45,48,50,55	0
3	EDO	A	520	4/4	0.85	0.14	56,57,57,67	0
3	EDO	A	532	4/4	0.85	0.14	45,46,53,58	0
4	PEG	A	509	7/7	0.85	0.16	30,49,55,57	0
3	EDO	B	517	4/4	0.86	0.11	57,58,60,61	0
3	EDO	B	513	4/4	0.86	0.12	50,54,57,72	0
3	EDO	B	515	4/4	0.86	0.14	33,39,49,57	0
3	EDO	A	517	4/4	0.86	0.14	47,49,54,59	0
3	EDO	A	507[A]	4/4	0.87	0.12	47,49,49,49	4
4	PEG	A	505	7/7	0.88	0.12	37,39,53,55	0

Continued on next page...

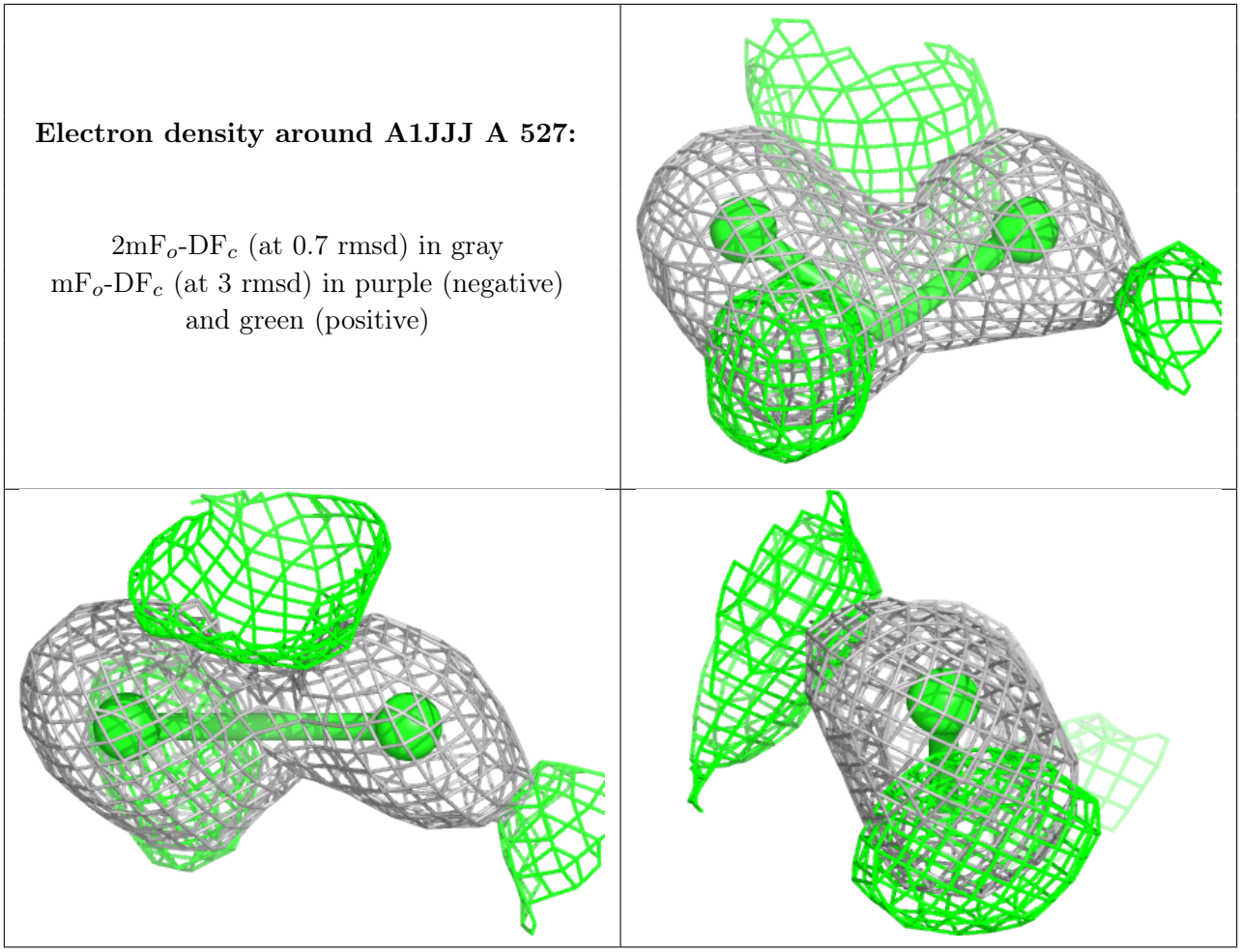
Continued from previous page...

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	EDO	A	502	4/4	0.89	0.14	29,39,45,54	0
3	EDO	B	504	4/4	0.89	0.12	41,50,54,54	0
3	EDO	A	503	4/4	0.89	0.14	46,52,56,64	0
4	PEG	A	515	7/7	0.89	0.14	31,39,50,56	0
4	PEG	A	535	7/7	0.90	0.12	27,44,49,54	0
6	PG4	A	510[A]	13/13	0.90	0.10	36,39,44,47	13
3	EDO	A	512	4/4	0.90	0.11	50,50,54,62	0
9	PO4	A	546[A]	5/5	0.90	0.10	28,31,35,44	5
2	ETE	A	501	14/14	0.90	0.10	27,29,42,49	0
9	PO4	A	548	5/5	0.92	0.08	39,47,58,68	0
9	PO4	A	547[B]	5/5	0.94	0.09	29,29,35,45	5
7	A1JJJ	B	514	3/3	0.94	0.09	43,43,48,53	0
7	A1JJJ	A	528	3/3	0.94	0.14	37,37,38,44	0
3	EDO	A	533	4/4	0.96	0.08	23,29,42,45	0
10	NA	A	549	1/1	0.97	0.06	20,20,20,20	0
8	K	B	522	1/1	0.97	0.08	36,36,36,36	0
8	K	A	544	1/1	0.98	0.04	22,22,22,22	0
8	K	A	545	1/1	0.99	0.03	19,19,19,19	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.

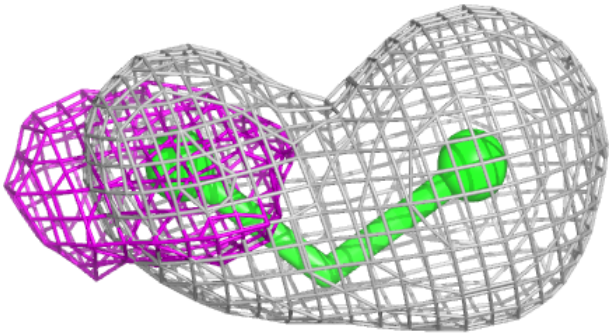
Electron density around A1JJJ A 527:

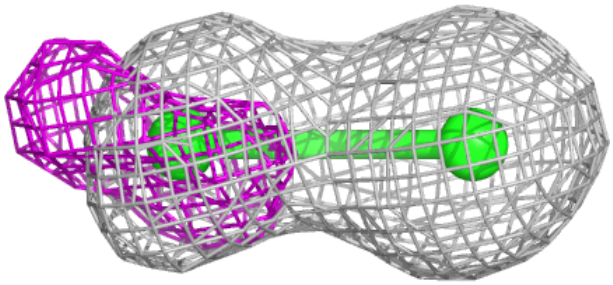
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

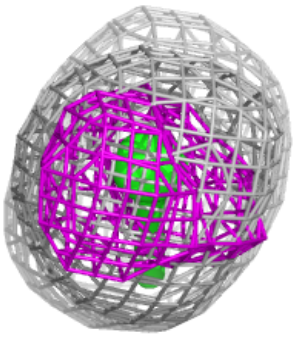


Electron density around A1JJJ B 514:

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

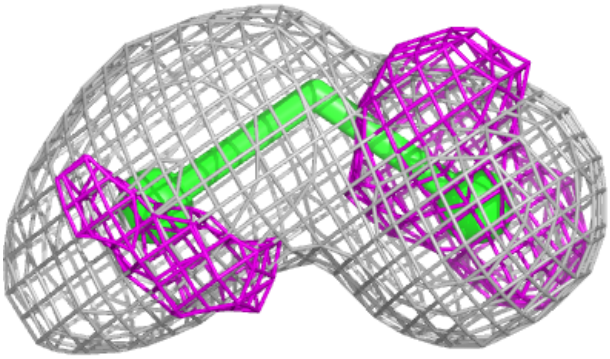


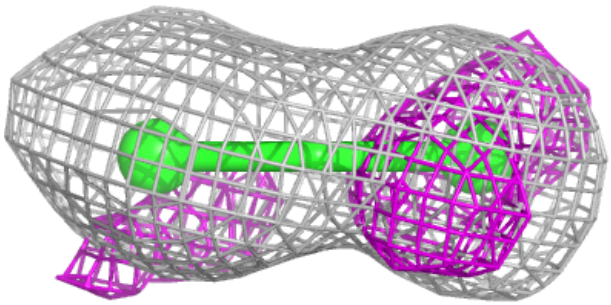


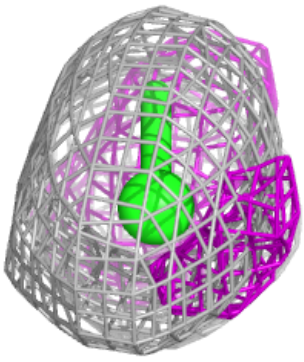


Electron density around A1JJJ A 528:

$2mF_o$-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 (i)

There are no such residues in this entry.