Full wwPDB X-ray Structure Validation Report (i)

Oct 28, 2026 – 05:16 PM JST

PDB ID	:	26HN / pdb_000026hn
Title	:	Crystal structure of PaALDH variant
Authors	:	Yang, J.; Qiu, X.
Deposited on	:	2026-04-30
Resolution	:	2.38 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 (i) 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 (i)) were used in the production of this report:

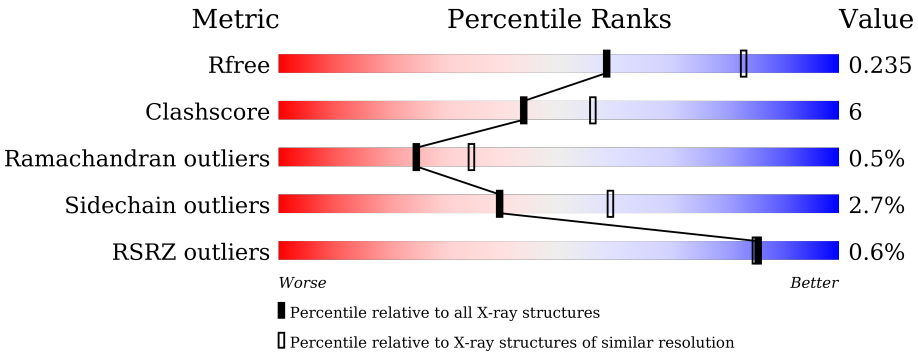
MolProbity	:	4-5-2 with Phenix2.2
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	2.2
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.51

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 2.38 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	7164 (2.40-2.36)
Clashscore	190562	7722 (2.40-2.36)
Ramachandran outliers	187476	7626 (2.40-2.36)
Sidechain outliers	187428	7627 (2.40-2.36)
RSRZ outliers	180081	7170 (2.40-2.36)

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	517	82% 12% 6%
1	B	517	81% 12% • 6%
1	C	517	% 80% 13% 6%
1	D	517	% 76% 17% • 6%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 15028 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 dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	487	Total	C	N	O	S	0	0	0
			3678	2326	669	678	5			
1	B	486	Total	C	N	O	S	0	0	0
			3681	2327	668	681	5			
1	C	486	Total	C	N	O	S	0	0	0
			3679	2326	671	677	5			
1	D	486	Total	C	N	O	S	0	0	0
			3633	2301	663	664	5			

There are 132 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-27	MET	-	initiating methionine	UNP A0A069Q1D5
A	-26	GLY	-	expression tag	UNP A0A069Q1D5
A	-25	SER	-	expression tag	UNP A0A069Q1D5
A	-24	HIS	-	expression tag	UNP A0A069Q1D5
A	-23	HIS	-	expression tag	UNP A0A069Q1D5
A	-22	HIS	-	expression tag	UNP A0A069Q1D5
A	-21	HIS	-	expression tag	UNP A0A069Q1D5
A	-20	HIS	-	expression tag	UNP A0A069Q1D5
A	-19	HIS	-	expression tag	UNP A0A069Q1D5
A	-18	HIS	-	expression tag	UNP A0A069Q1D5
A	-17	HIS	-	expression tag	UNP A0A069Q1D5
A	-16	GLY	-	expression tag	UNP A0A069Q1D5
A	-15	SER	-	expression tag	UNP A0A069Q1D5
A	-14	ASP	-	expression tag	UNP A0A069Q1D5
A	-13	TYR	-	expression tag	UNP A0A069Q1D5
A	-12	ASP	-	expression tag	UNP A0A069Q1D5
A	-11	ILE	-	expression tag	UNP A0A069Q1D5
A	-10	PRO	-	expression tag	UNP A0A069Q1D5
A	-9	THR	-	expression tag	UNP A0A069Q1D5
A	-8	THR	-	expression tag	UNP A0A069Q1D5
A	-7	GLU	-	expression tag	UNP A0A069Q1D5

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-6	ASN	-	expression tag	UNP A0A069Q1D5
A	-5	LEU	-	expression tag	UNP A0A069Q1D5
A	-4	TYR	-	expression tag	UNP A0A069Q1D5
A	-3	PHE	-	expression tag	UNP A0A069Q1D5
A	-2	GLN	-	expression tag	UNP A0A069Q1D5
A	-1	GLY	-	expression tag	UNP A0A069Q1D5
A	0	SER	-	expression tag	UNP A0A069Q1D5
A	161	GLY	LEU	conflict	UNP A0A069Q1D5
A	164	ILE	ARG	conflict	UNP A0A069Q1D5
A	232	GLY	THR	conflict	UNP A0A069Q1D5
A	257	LEU	GLU	conflict	UNP A0A069Q1D5
A	452	HIS	PHE	conflict	UNP A0A069Q1D5
B	-27	MET	-	initiating methionine	UNP A0A069Q1D5
B	-26	GLY	-	expression tag	UNP A0A069Q1D5
B	-25	SER	-	expression tag	UNP A0A069Q1D5
B	-24	HIS	-	expression tag	UNP A0A069Q1D5
B	-23	HIS	-	expression tag	UNP A0A069Q1D5
B	-22	HIS	-	expression tag	UNP A0A069Q1D5
B	-21	HIS	-	expression tag	UNP A0A069Q1D5
B	-20	HIS	-	expression tag	UNP A0A069Q1D5
B	-19	HIS	-	expression tag	UNP A0A069Q1D5
B	-18	HIS	-	expression tag	UNP A0A069Q1D5
B	-17	HIS	-	expression tag	UNP A0A069Q1D5
B	-16	GLY	-	expression tag	UNP A0A069Q1D5
B	-15	SER	-	expression tag	UNP A0A069Q1D5
B	-14	ASP	-	expression tag	UNP A0A069Q1D5
B	-13	TYR	-	expression tag	UNP A0A069Q1D5
B	-12	ASP	-	expression tag	UNP A0A069Q1D5
B	-11	ILE	-	expression tag	UNP A0A069Q1D5
B	-10	PRO	-	expression tag	UNP A0A069Q1D5
B	-9	THR	-	expression tag	UNP A0A069Q1D5
B	-8	THR	-	expression tag	UNP A0A069Q1D5
B	-7	GLU	-	expression tag	UNP A0A069Q1D5
B	-6	ASN	-	expression tag	UNP A0A069Q1D5
B	-5	LEU	-	expression tag	UNP A0A069Q1D5
B	-4	TYR	-	expression tag	UNP A0A069Q1D5
B	-3	PHE	-	expression tag	UNP A0A069Q1D5
B	-2	GLN	-	expression tag	UNP A0A069Q1D5
B	-1	GLY	-	expression tag	UNP A0A069Q1D5
B	0	SER	-	expression tag	UNP A0A069Q1D5
B	161	GLY	LEU	conflict	UNP A0A069Q1D5
B	164	ILE	ARG	conflict	UNP A0A069Q1D5

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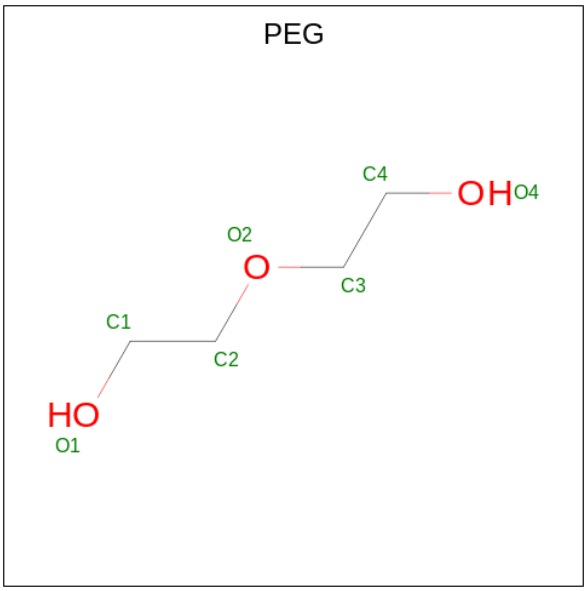
Chain	Residue	Modelled	Actual	Comment	Reference
B	232	GLY	THR	conflict	UNP A0A069Q1D5
B	257	LEU	GLU	conflict	UNP A0A069Q1D5
B	452	HIS	PHE	conflict	UNP A0A069Q1D5
C	-27	MET	-	initiating methionine	UNP A0A069Q1D5
C	-26	GLY	-	expression tag	UNP A0A069Q1D5
C	-25	SER	-	expression tag	UNP A0A069Q1D5
C	-24	HIS	-	expression tag	UNP A0A069Q1D5
C	-23	HIS	-	expression tag	UNP A0A069Q1D5
C	-22	HIS	-	expression tag	UNP A0A069Q1D5
C	-21	HIS	-	expression tag	UNP A0A069Q1D5
C	-20	HIS	-	expression tag	UNP A0A069Q1D5
C	-19	HIS	-	expression tag	UNP A0A069Q1D5
C	-18	HIS	-	expression tag	UNP A0A069Q1D5
C	-17	HIS	-	expression tag	UNP A0A069Q1D5
C	-16	GLY	-	expression tag	UNP A0A069Q1D5
C	-15	SER	-	expression tag	UNP A0A069Q1D5
C	-14	ASP	-	expression tag	UNP A0A069Q1D5
C	-13	TYR	-	expression tag	UNP A0A069Q1D5
C	-12	ASP	-	expression tag	UNP A0A069Q1D5
C	-11	ILE	-	expression tag	UNP A0A069Q1D5
C	-10	PRO	-	expression tag	UNP A0A069Q1D5
C	-9	THR	-	expression tag	UNP A0A069Q1D5
C	-8	THR	-	expression tag	UNP A0A069Q1D5
C	-7	GLU	-	expression tag	UNP A0A069Q1D5
C	-6	ASN	-	expression tag	UNP A0A069Q1D5
C	-5	LEU	-	expression tag	UNP A0A069Q1D5
C	-4	TYR	-	expression tag	UNP A0A069Q1D5
C	-3	PHE	-	expression tag	UNP A0A069Q1D5
C	-2	GLN	-	expression tag	UNP A0A069Q1D5
C	-1	GLY	-	expression tag	UNP A0A069Q1D5
C	0	SER	-	expression tag	UNP A0A069Q1D5
C	161	GLY	LEU	conflict	UNP A0A069Q1D5
C	164	ILE	ARG	conflict	UNP A0A069Q1D5
C	232	GLY	THR	conflict	UNP A0A069Q1D5
C	257	LEU	GLU	conflict	UNP A0A069Q1D5
C	452	HIS	PHE	conflict	UNP A0A069Q1D5
D	-27	MET	-	initiating methionine	UNP A0A069Q1D5
D	-26	GLY	-	expression tag	UNP A0A069Q1D5
D	-25	SER	-	expression tag	UNP A0A069Q1D5
D	-24	HIS	-	expression tag	UNP A0A069Q1D5
D	-23	HIS	-	expression tag	UNP A0A069Q1D5
D	-22	HIS	-	expression tag	UNP A0A069Q1D5

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Chain	Residue	Modelled	Actual	Comment	Reference
D	-21	HIS	-	expression tag	UNP A0A069Q1D5
D	-20	HIS	-	expression tag	UNP A0A069Q1D5
D	-19	HIS	-	expression tag	UNP A0A069Q1D5
D	-18	HIS	-	expression tag	UNP A0A069Q1D5
D	-17	HIS	-	expression tag	UNP A0A069Q1D5
D	-16	GLY	-	expression tag	UNP A0A069Q1D5
D	-15	SER	-	expression tag	UNP A0A069Q1D5
D	-14	ASP	-	expression tag	UNP A0A069Q1D5
D	-13	TYR	-	expression tag	UNP A0A069Q1D5
D	-12	ASP	-	expression tag	UNP A0A069Q1D5
D	-11	ILE	-	expression tag	UNP A0A069Q1D5
D	-10	PRO	-	expression tag	UNP A0A069Q1D5
D	-9	THR	-	expression tag	UNP A0A069Q1D5
D	-8	THR	-	expression tag	UNP A0A069Q1D5
D	-7	GLU	-	expression tag	UNP A0A069Q1D5
D	-6	ASN	-	expression tag	UNP A0A069Q1D5
D	-5	LEU	-	expression tag	UNP A0A069Q1D5
D	-4	TYR	-	expression tag	UNP A0A069Q1D5
D	-3	PHE	-	expression tag	UNP A0A069Q1D5
D	-2	GLN	-	expression tag	UNP A0A069Q1D5
D	-1	GLY	-	expression tag	UNP A0A069Q1D5
D	0	SER	-	expression tag	UNP A0A069Q1D5
D	161	GLY	LEU	conflict	UNP A0A069Q1D5
D	164	ILE	ARG	conflict	UNP A0A069Q1D5
D	232	GLY	THR	conflict	UNP A0A069Q1D5
D	257	LEU	GLU	conflict	UNP A0A069Q1D5
D	452	HIS	PHE	conflict	UNP A0A069Q1D5

- Molecule 2 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$) (labeled as "Ligand of Interest" by depositor).



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

- Molecule 3 is water.

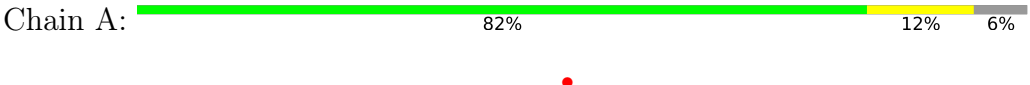
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	90	Total O 90 90	0	0
3	B	91	Total O 91 91	0	0
3	C	105	Total O 105 105	0	0
3	D	43	Total O 43 43	0	0

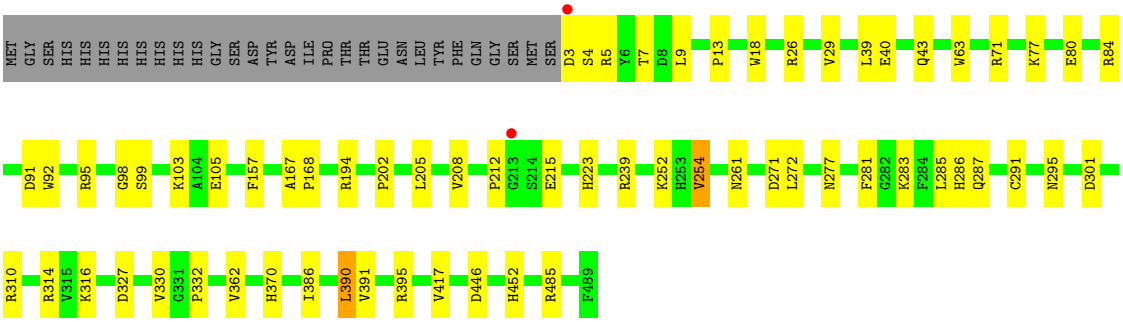
3 Residue-property plots (i)

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: Aldehyde dehydrogenase

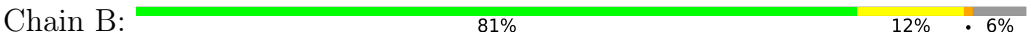
Chain A:

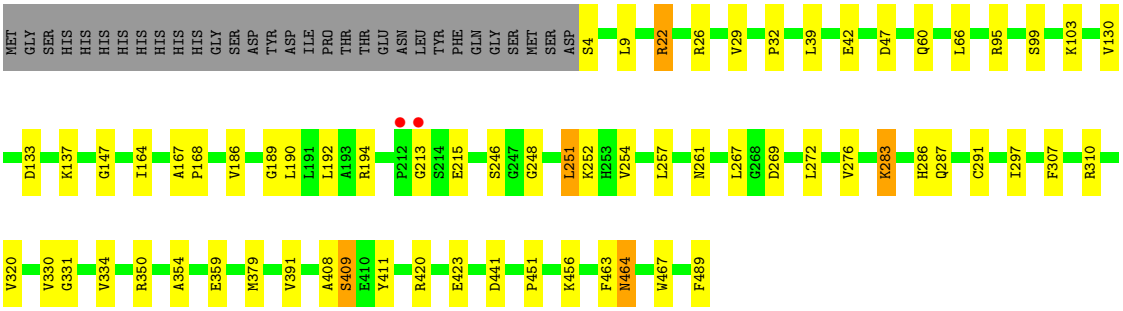




• Molecule 1: Aldehyde dehydrogenase

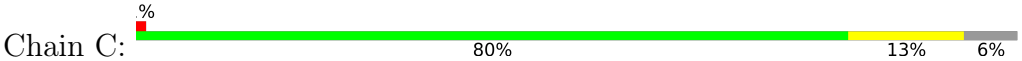
Chain B:

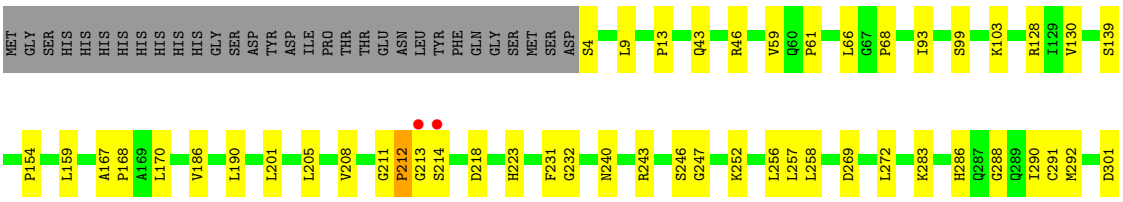


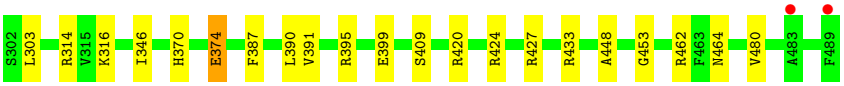


• Molecule 1: Aldehyde dehydrogenase

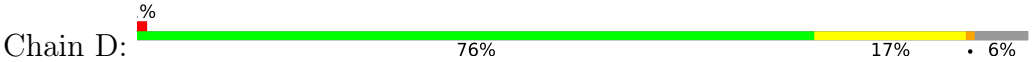
Chain C:



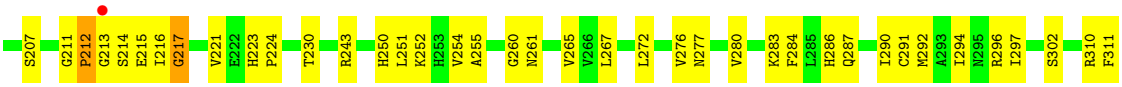


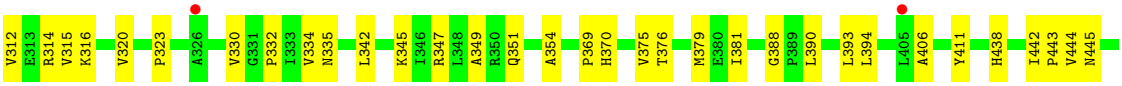


• Molecule 1: Aldehyde dehydrogenase











4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	144.61Å 151.06Å 100.99Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	24.64 – 2.38 24.64 – 2.38	Depositor EDS
% Data completeness (in resolution range)	98.6 (24.64-2.38) 98.5 (24.64-2.38)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.06 (at 2.39Å)	Xtriage
Refinement program	PHENIX (1.20.1_4487-000), PHENIX (1.20.1_4487-000)	Depositor
R, R_{free}	0.187 , 0.235 0.187 , 0.235	Depositor DCC
R_{free} test set	1992 reflections (2.22%)	wwPDB-VP
Wilson B-factor (Å^2)	45.3	Xtriage
Anisotropy	0.075	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 30.8	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.015 for k,h,-l	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	15028	wwPDB-VP
Average B, all atoms (Å^2)	48.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.67% 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: PEG

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	0.37	0/3759	0.54	0/5108
1	B	0.35	0/3762	0.51	0/5111
1	C	0.38	0/3760	0.55	0/5108
1	D	0.31	0/3714	0.49	0/5052
All	All	0.36	0/14995	0.52	0/20379

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	3678	0	3635	40	1
1	B	3681	0	3641	41	0
1	C	3679	0	3644	44	1
1	D	3633	0	3574	57	0
2	A	7	0	10	1	0
2	B	7	0	10	1	0
2	C	7	0	10	2	0
2	D	7	0	10	0	0
3	A	90	0	0	4	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	91	0	0	9	0
3	C	105	0	0	6	0
3	D	43	0	0	6	0
All	All	15028	0	14534	177	1

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 (177) 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:C:314:ARG:NH1	3:C:601:HOH:O	1.83	1.10
1:C:290:ILE:O	3:C:602:HOH:O	1.89	0.91
1:C:99:SER:HB3	1:C:103:LYS:HD2	1.53	0.91
1:A:316:LYS:NZ	3:A:601:HOH:O	2.07	0.88
1:A:283:LYS:HD3	1:A:391:VAL:HB	1.58	0.86
1:B:215:GLU:OE2	3:B:601:HOH:O	1.93	0.85
1:D:342:LEU:HD21	1:D:388:GLY:HA3	1.63	0.79
1:D:291:CYS:SG	3:D:627:HOH:O	2.41	0.77
1:A:99:SER:HB3	1:A:103:LYS:HD2	1.66	0.77
1:D:323:PRO:HG3	1:D:332:PRO:HD3	1.67	0.75
1:D:223:HIS:O	1:D:252:LYS:NZ	2.22	0.72
1:D:334:VAL:O	3:D:601:HOH:O	2.06	0.72
1:B:283:LYS:HD3	1:B:391:VAL:HB	1.73	0.71
1:C:272:LEU:HD13	1:C:303:LEU:HD22	1.75	0.69
1:A:105:GLU:OE1	3:A:602:HOH:O	2.13	0.67
1:B:213:GLY:N	3:B:605:HOH:O	2.20	0.66
1:C:288:GLY:O	3:C:604:HOH:O	2.12	0.66
1:B:269:ASP:O	1:B:420:ARG:HG3	1.96	0.66
1:C:246:SER:OG	3:C:603:HOH:O	2.12	0.66
1:C:61:PRO:O	3:C:605:HOH:O	2.14	0.65
1:D:157:PHE:HE1	1:D:290:ILE:HG12	1.61	0.65
1:A:7:THR:O	1:A:194:ARG:NH2	2.29	0.65
1:C:103:LYS:HG3	1:C:286:HIS:HB2	1.79	0.65
1:B:408:ALA:O	3:B:602:HOH:O	2.14	0.64
1:A:103:LYS:HG3	1:A:286:HIS:HB2	1.79	0.64
1:A:43:GLN:NE2	3:A:606:HOH:O	2.31	0.64
1:A:314:ARG:NH2	1:B:489:PHE:O	2.32	0.62
1:C:223:HIS:O	1:C:252:LYS:NZ	2.32	0.62
1:B:95:ARG:NH2	3:B:611:HOH:O	2.33	0.61
1:D:212:PRO:O	1:D:214:SER:N	2.23	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:423:GLU:OE2	3:B:603:HOH:O	2.16	0.60
1:D:212:PRO:C	1:D:214:SER:H	2.08	0.60
1:C:283:LYS:HD3	1:C:391:VAL:HB	1.84	0.60
1:D:130:VAL:O	3:D:602:HOH:O	2.17	0.60
1:A:485:ARG:NH1	1:B:441:ASP:OD2	2.33	0.59
1:A:212:PRO:HB2	1:A:215:GLU:HG2	1.85	0.58
1:D:347:ARG:HD3	1:D:351:GLN:NE2	2.18	0.58
1:D:283:LYS:O	1:D:283:LYS:HD3	2.04	0.57
1:A:291:CYS:H	2:A:501:PEG:C4	2.17	0.57
1:A:277:ASN:OD1	1:A:314:ARG:NH1	2.38	0.57
1:D:103:LYS:HD2	1:D:286:HIS:CD2	2.40	0.57
1:D:370:HIS:HB2	1:D:390:LEU:HD22	1.87	0.56
1:A:91:ASP:O	1:A:95:ARG:HG3	2.05	0.56
1:B:22:ARG:HH11	1:B:22:ARG:HB2	1.71	0.56
1:C:433:ARG:CZ	1:C:433:ARG:HB2	2.36	0.55
1:D:292:MET:HE1	1:D:445:ASN:O	2.06	0.55
1:D:230:THR:HG22	1:D:255:ALA:HB3	1.89	0.55
1:C:370:HIS:HB2	1:C:390:LEU:HD22	1.88	0.55
1:C:247:GLY:HA3	1:D:243:ARG:HB2	1.87	0.55
1:A:254:VAL:HG23	3:A:619:HOH:O	2.06	0.55
1:A:223:HIS:O	1:A:252:LYS:NZ	2.39	0.54
1:C:256:LEU:HB3	1:C:258:LEU:HD21	1.89	0.54
1:C:170:LEU:HD22	1:C:201:LEU:HD11	1.90	0.54
1:A:295:ASN:HD21	1:A:386:ILE:H	1.54	0.54
1:B:103:LYS:HG3	1:B:286:HIS:HB2	1.89	0.54
1:D:43:GLN:HB3	1:D:211:GLY:HA2	1.90	0.53
1:B:133:ASP:OD1	1:C:68:PRO:HD2	2.08	0.53
1:B:99:SER:HB3	1:B:103:LYS:HD2	1.91	0.53
1:A:18:TRP:CH2	1:A:194:ARG:HD3	2.44	0.53
1:D:212:PRO:HG2	1:D:215:GLU:HB3	1.91	0.53
1:D:296:ARG:HH12	1:D:406:ALA:HA	1.74	0.53
1:A:295:ASN:ND2	1:A:386:ILE:H	2.06	0.52
1:B:451:PRO:HD3	1:B:467:TRP:CH2	2.44	0.52
1:C:59:VAL:HG23	1:C:205:LEU:HD23	1.90	0.52
1:B:29:VAL:HB	1:B:39:LEU:HD23	1.90	0.52
1:D:283:LYS:HE2	1:D:294:ILE:O	2.10	0.52
1:C:212:PRO:O	1:C:214:SER:N	2.43	0.52
1:D:103:LYS:HD2	1:D:286:HIS:CG	2.44	0.52
1:D:99:SER:HB3	1:D:103:LYS:HD3	1.92	0.51
1:D:476:HIS:ND1	3:D:605:HOH:O	2.34	0.51
1:A:26:ARG:NH2	1:A:40:GLU:OE1	2.44	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:354:ALA:N	1:D:379:MET:HE1	2.25	0.51
1:C:93:ILE:HD11	1:C:159:LEU:HD22	1.93	0.50
1:C:154:PRO:HB3	1:C:232:GLY:O	2.10	0.50
1:D:261:ASN:HB2	1:D:411:TYR:CD2	2.46	0.50
1:D:277:ASN:OD1	1:D:314:ARG:NH1	2.41	0.50
1:C:453:GLY:HA3	1:C:462:ARG:HD3	1.92	0.50
1:D:216:ILE:HG13	1:D:217:GLY:N	2.26	0.50
1:B:167:ALA:HB3	1:B:168:PRO:HD3	1.94	0.50
1:B:489:PHE:OXT	3:B:604:HOH:O	2.20	0.50
1:B:261:ASN:HB2	1:B:411:TYR:CD1	2.47	0.50
1:B:22:ARG:HH12	1:B:47:ASP:HB2	1.77	0.49
1:B:291:CYS:H	2:B:501:PEG:C1	2.26	0.49
1:C:212:PRO:C	1:C:214:SER:H	2.20	0.49
1:D:207:SER:OG	3:D:603:HOH:O	2.20	0.49
1:A:446:ASP:OD1	1:A:452:HIS:HD2	1.96	0.49
1:B:350:ARG:NH2	1:B:359:GLU:OE2	2.46	0.48
1:D:312:VAL:O	1:D:316:LYS:HG3	2.13	0.48
1:C:292:MET:HE2	2:C:501:PEG:H42	1.95	0.48
1:D:376:THR:O	1:D:379:MET:HG3	2.12	0.48
1:A:29:VAL:HB	1:A:39:LEU:HD23	1.95	0.48
1:C:9:LEU:O	1:C:190:LEU:HD13	2.14	0.48
1:B:215:GLU:CD	3:B:601:HOH:O	2.51	0.47
1:D:215:GLU:HG3	1:D:215:GLU:O	2.15	0.47
1:D:276:VAL:O	1:D:280:VAL:HG13	2.14	0.47
1:B:409:SER:O	1:B:456:LYS:NZ	2.45	0.47
1:B:354:ALA:HB2	1:B:379:MET:HE1	1.97	0.47
1:D:311:PHE:O	1:D:315:VAL:HG23	2.15	0.46
1:A:287:GLN:HG3	1:A:330:VAL:HG13	1.96	0.46
1:C:269:ASP:O	1:C:420:ARG:HG3	2.16	0.46
1:B:287:GLN:HG2	1:B:331:GLY:O	2.15	0.46
1:D:137:LYS:NZ	3:D:608:HOH:O	2.46	0.46
1:D:375:VAL:HB	1:D:394:LEU:HG	1.98	0.46
1:A:13:PRO:HD2	1:A:208:VAL:HB	1.98	0.46
1:A:239:ARG:HD3	1:B:248:GLY:O	2.16	0.46
1:D:97:SER:HG	1:D:99:SER:HG	1.62	0.46
1:D:297:ILE:HD12	1:D:393:LEU:HD11	1.98	0.45
1:A:98:GLY:O	1:A:332:PRO:HD2	2.16	0.45
1:C:424:ARG:O	1:C:427:ARG:HG3	2.16	0.45
1:B:463:PHE:O	1:B:464:ASN:HB2	2.17	0.45
1:A:301:ASP:OD1	1:A:395:ARG:HD3	2.17	0.45
1:C:212:PRO:C	1:C:214:SER:N	2.75	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:272:LEU:HD12	1:A:272:LEU:HA	1.76	0.45
1:C:13:PRO:HD2	1:C:208:VAL:HB	2.00	0.45
1:C:46:ARG:HE	1:C:46:ARG:HB2	1.67	0.45
1:D:283:LYS:HD3	1:D:283:LYS:C	2.42	0.45
1:A:9:LEU:HD12	1:A:92:TRP:CZ2	2.52	0.44
1:B:186:VAL:HA	1:B:190:LEU:HB2	1.98	0.44
1:B:60:GLN:HG3	1:B:147:GLY:O	2.18	0.44
1:C:130:VAL:HG22	1:C:139:SER:HB3	1.98	0.44
1:C:218:ASP:OD1	3:C:606:HOH:O	2.21	0.44
1:D:442:ILE:HD12	1:D:444:VAL:HB	1.99	0.44
1:A:261:ASN:OD1	1:A:295:ASN:HB3	2.18	0.44
1:B:137:LYS:NZ	3:B:622:HOH:O	2.51	0.44
1:C:231:PHE:HB3	1:C:256:LEU:HD23	2.00	0.44
1:D:453:GLY:HA3	1:D:462:ARG:HD3	2.00	0.44
1:D:320:VAL:HG22	1:D:330:VAL:HB	2.00	0.43
1:B:354:ALA:N	1:B:379:MET:HE1	2.33	0.43
1:A:3:ASP:C	1:A:5:ARG:H	2.26	0.43
1:A:9:LEU:HD23	1:A:9:LEU:HA	1.82	0.43
1:A:271:ASP:OD1	1:A:271:ASP:C	2.61	0.43
1:C:301:ASP:OD1	1:C:395:ARG:HD3	2.19	0.43
1:D:284:PHE:CE1	1:D:369:PRO:HB3	2.53	0.43
1:B:32:PRO:HB3	1:B:334:VAL:O	2.18	0.43
1:D:250:HIS:O	1:D:252:LYS:HE3	2.18	0.43
1:C:399:GLU:OE2	1:C:424:ARG:NE	2.50	0.43
1:A:370:HIS:HB2	1:A:390:LEU:HD22	2.00	0.42
1:C:43:GLN:HB3	1:C:211:GLY:HA2	2.00	0.42
1:D:223:HIS:CG	1:D:224:PRO:HD2	2.54	0.42
1:A:202:PRO:HD2	1:A:205:LEU:HD12	2.00	0.42
1:B:251:LEU:HD22	1:B:251:LEU:HA	1.87	0.42
1:B:320:VAL:HG22	1:B:330:VAL:HB	2.01	0.42
1:B:194:ARG:HA	1:B:194:ARG:HD2	1.89	0.42
1:D:283:LYS:HE3	1:D:390:LEU:O	2.19	0.42
1:D:438:HIS:HD2	1:D:443:PRO:HA	1.84	0.42
1:A:63:TRP:HB2	1:A:205:LEU:HD11	2.01	0.42
1:B:246:SER:OG	3:B:606:HOH:O	2.22	0.42
1:A:63:TRP:CH2	1:A:71:ARG:HG2	2.54	0.42
1:D:86:HIS:CD2	1:D:86:HIS:C	2.98	0.42
1:C:291:CYS:HB2	2:C:501:PEG:H31	2.01	0.42
1:D:265:VAL:HG12	1:D:267:LEU:HD22	2.02	0.42
1:C:283:LYS:O	1:C:283:LYS:HE3	2.20	0.42
1:B:192:LEU:HD23	1:B:192:LEU:HA	1.95	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:240:ASN:HA	1:C:243:ARG:NH2	2.35	0.41
1:D:323:PRO:HG3	1:D:332:PRO:CD	2.45	0.41
1:C:186:VAL:HA	1:C:190:LEU:HB2	2.02	0.41
1:C:66:LEU:HA	1:C:66:LEU:HD23	1.65	0.41
1:C:346:ILE:HD11	1:C:390:LEU:HD21	2.02	0.41
1:D:183:ASP:OD2	1:D:335:ASN:ND2	2.54	0.41
1:A:167:ALA:HB3	1:A:168:PRO:HD3	2.03	0.41
1:D:66:LEU:HD23	1:D:66:LEU:HA	1.89	0.41
1:D:349:ALA:HB2	1:D:381:ILE:HD13	2.02	0.41
1:B:26:ARG:NE	1:B:42:GLU:OE2	2.53	0.41
1:D:179:LYS:HD2	1:D:216:ILE:HD12	2.03	0.41
1:A:281:PHE:CE1	1:A:285:LEU:HD13	2.56	0.41
1:C:448:ALA:O	1:C:464:ASN:HB3	2.21	0.41
1:D:260:GLY:HA3	1:D:291:CYS:O	2.21	0.41
1:A:103:LYS:HE2	1:A:157:PHE:CE2	2.55	0.41
1:D:272:LEU:O	1:D:276:VAL:HG13	2.21	0.41
1:D:276:VAL:HG11	1:D:310:ARG:HG2	2.02	0.41
1:D:290:ILE:HG22	1:D:292:MET:H	1.86	0.41
1:B:276:VAL:HG11	1:B:310:ARG:HG3	2.02	0.40
1:B:297:ILE:HG21	1:B:307:PHE:CE1	2.56	0.40
1:A:80:GLU:O	1:A:84:ARG:HG3	2.22	0.40
1:C:232:GLY:HA2	1:C:257:LEU:O	2.21	0.40
1:B:66:LEU:HD23	1:B:66:LEU:HA	1.86	0.40
1:C:167:ALA:HB3	1:C:168:PRO:HD3	2.04	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:310:ARG:NH2	1:C:374:GLU:O[3_544]	2.15	0.05

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	485/517 (94%)	468 (96%)	17 (4%)	0	100	100
1	B	484/517 (94%)	470 (97%)	12 (2%)	2 (0%)	30	40
1	C	484/517 (94%)	462 (96%)	20 (4%)	2 (0%)	30	40
1	D	484/517 (94%)	466 (96%)	13 (3%)	5 (1%)	12	17
All	All	1937/2068 (94%)	1866 (96%)	62 (3%)	9 (0%)	24	34

All (9) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	213	GLY
1	D	213	GLY
1	D	217	GLY
1	D	212	PRO
1	B	464	ASN
1	C	212	PRO
1	D	302	SER
1	D	189	GLY
1	B	189	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	368/400 (92%)	361 (98%)	7 (2%)	50	69
1	B	370/400 (92%)	357 (96%)	13 (4%)	32	50
1	C	369/400 (92%)	362 (98%)	7 (2%)	50	69
1	D	358/400 (90%)	346 (97%)	12 (3%)	32	51
All	All	1465/1600 (92%)	1426 (97%)	39 (3%)	39	59

All (39) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	4	SER
1	A	77	LYS
1	A	254	VAL
1	A	327	ASP
1	A	362	VAL
1	A	390	LEU
1	A	417	VAL
1	B	4	SER
1	B	9	LEU
1	B	22	ARG
1	B	130	VAL
1	B	164	ILE
1	B	251	LEU
1	B	252	LYS
1	B	254	VAL
1	B	257	LEU
1	B	267	LEU
1	B	272	LEU
1	B	283	LYS
1	B	409	SER
1	C	4	SER
1	C	128	ARG
1	C	316	LYS
1	C	374	GLU
1	C	387	PHE
1	C	409	SER
1	C	480	VAL
1	D	4	SER
1	D	103	LYS
1	D	130	VAL
1	D	144	SER
1	D	153	SER
1	D	221	VAL
1	D	251	LEU
1	D	254	VAL
1	D	287	GLN
1	D	345	LYS
1	D	473	THR
1	D	479	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	126	HIS
1	A	160	HIS
1	A	295	ASN
1	A	452	HIS
1	B	43	GLN
1	B	289	GLN
1	C	250	HIS
1	C	253	HIS
1	D	253	HIS
1	D	289	GLN
1	D	351	GLN

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

4 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	$\#\|Z\| > 2$
2	PEG	C	501	-	6,6,6	0.48	0	5,5,5	0.75	0
2	PEG	D	501	-	6,6,6	0.48	0	5,5,5	0.42	0
2	PEG	B	501	-	6,6,6	0.44	0	5,5,5	1.05	0
2	PEG	A	501	-	6,6,6	0.36	0	5,5,5	0.91	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	PEG	C	501	-	-	2/4/4/4	-
2	PEG	D	501	-	-	3/4/4/4	-
2	PEG	B	501	-	-	3/4/4/4	-
2	PEG	A	501	-	-	2/4/4/4	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (10) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	501	PEG	C1-C2-O2-C3
2	C	501	PEG	C4-C3-O2-C2
2	B	501	PEG	O1-C1-C2-O2
2	D	501	PEG	O1-C1-C2-O2
2	D	501	PEG	C4-C3-O2-C2
2	A	501	PEG	O2-C3-C4-O4
2	C	501	PEG	O1-C1-C2-O2
2	B	501	PEG	C4-C3-O2-C2
2	D	501	PEG	O2-C3-C4-O4
2	B	501	PEG	C1-C2-O2-C3

There are no ring outliers.

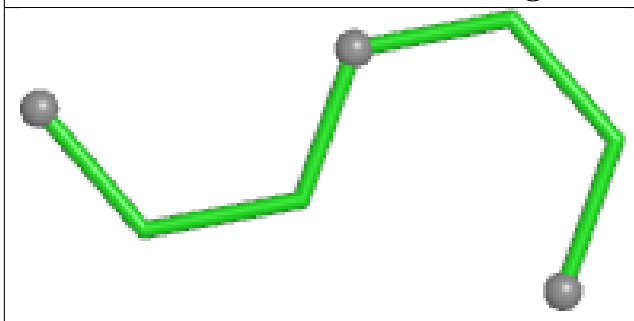
3 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	501	PEG	2	0
2	B	501	PEG	1	0
2	A	501	PEG	1	0

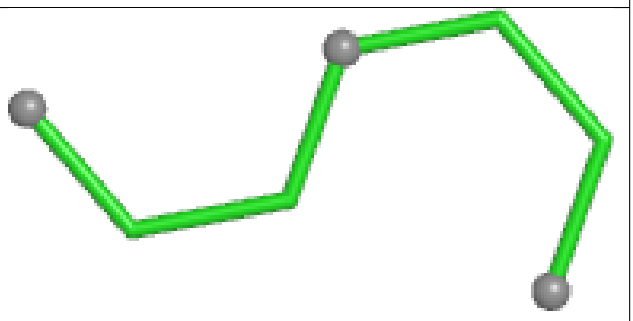
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

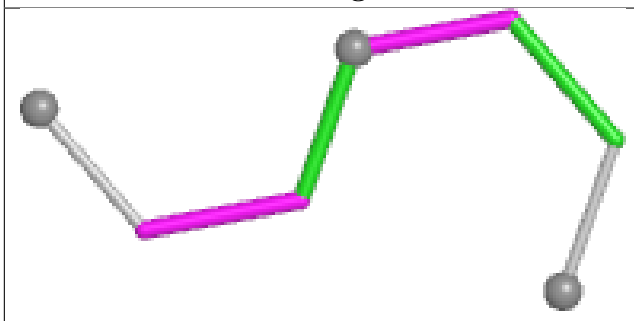
Ligand PEG C 501



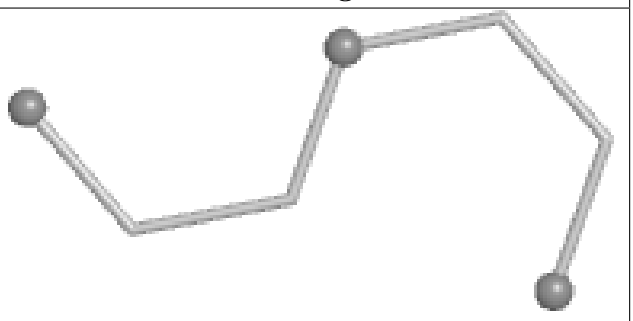
Bond lengths



Bond angles

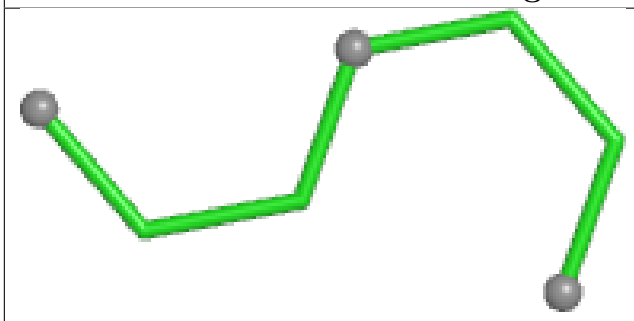


Torsions

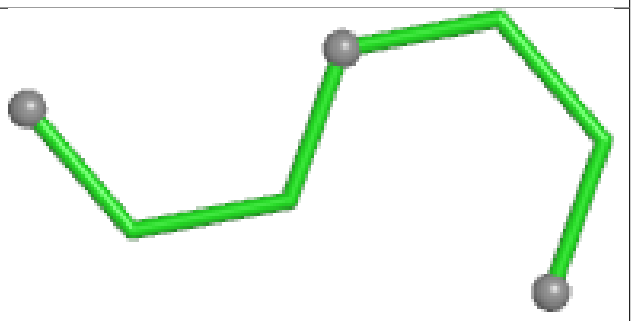


Rings

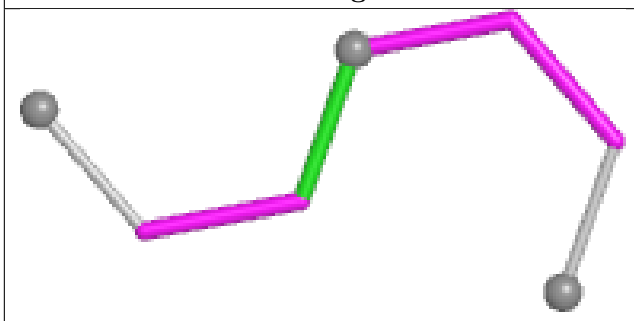
Ligand PEG D 501



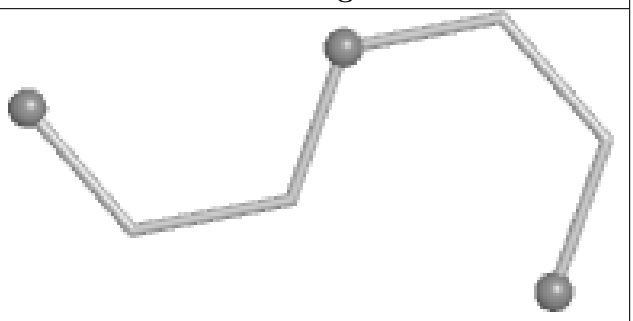
Bond lengths



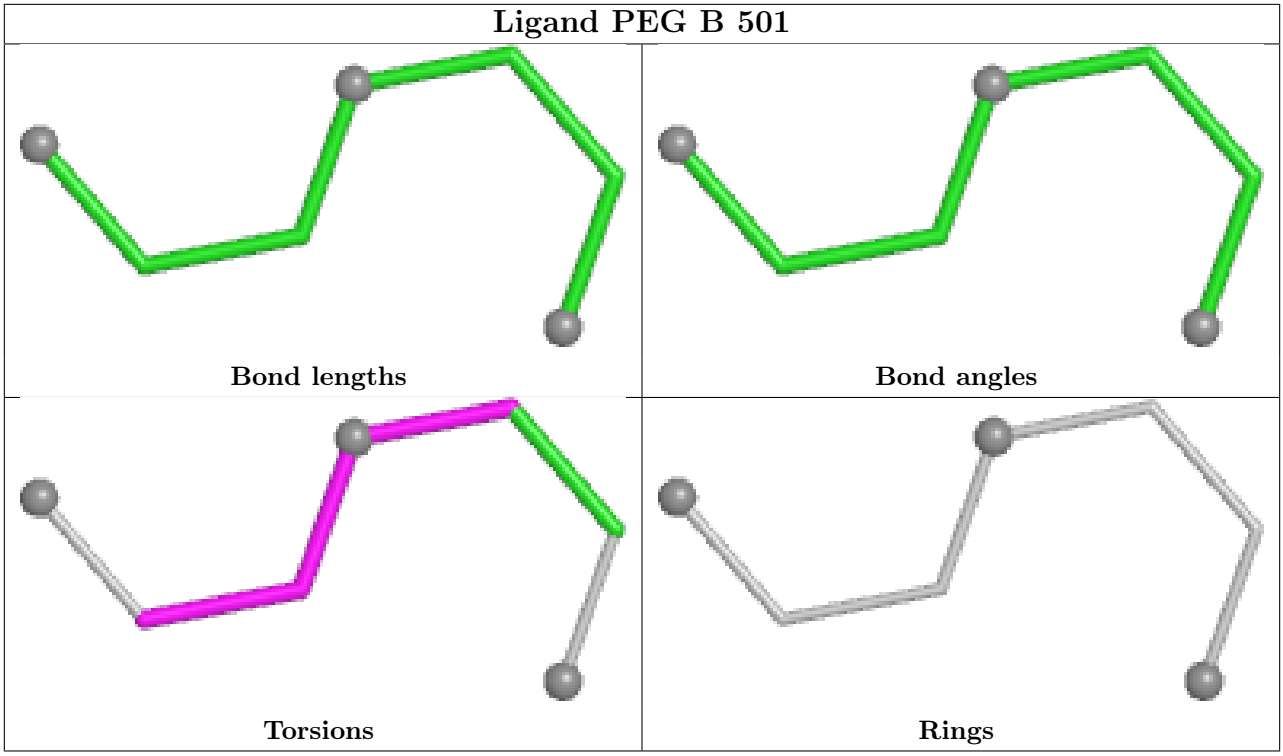
Bond angles

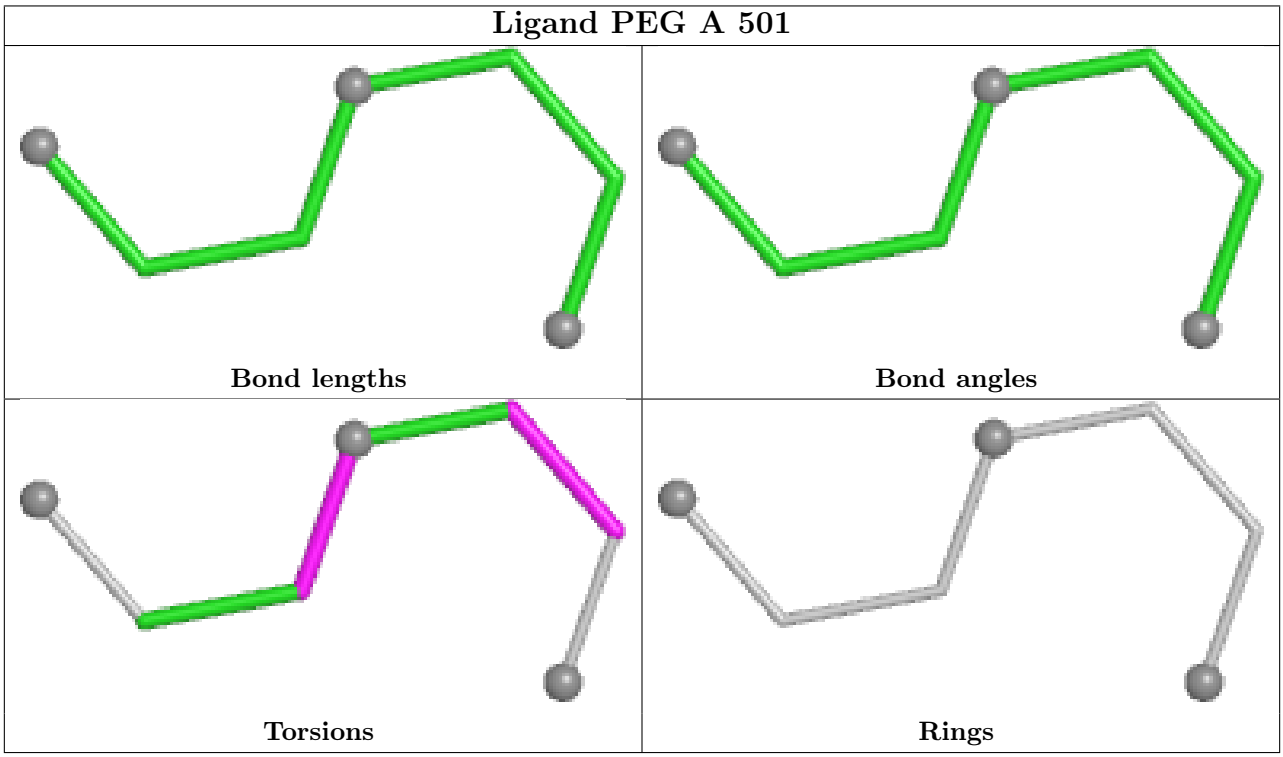


Torsions



Rings





5.7 Other polymers

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	487/517 (94%)	-0.18	2 (0%)	88	88	30, 43, 57, 66	0
1	B	486/517 (94%)	-0.19	2 (0%)	88	88	31, 45, 61, 69	0
1	C	486/517 (94%)	-0.11	4 (0%)	82	82	31, 43, 60, 77	0
1	D	486/517 (94%)	0.30	3 (0%)	85	85	38, 59, 76, 88	0
All	All	1945/2068 (94%)	-0.05	11 (0%)	85	85	30, 47, 71, 88	0

All (11) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	213	GLY	3.7
1	B	212	PRO	3.7
1	A	3	ASP	2.9
1	A	213	GLY	2.3
1	D	213	GLY	2.3
1	C	483	ALA	2.2
1	B	213	GLY	2.2
1	C	489	PHE	2.1
1	C	214	SER	2.1
1	D	326	ALA	2.1
1	D	405	LEU	2.0

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

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates

There are no oligosaccharides in this entry.

6.4 Ligands (i)

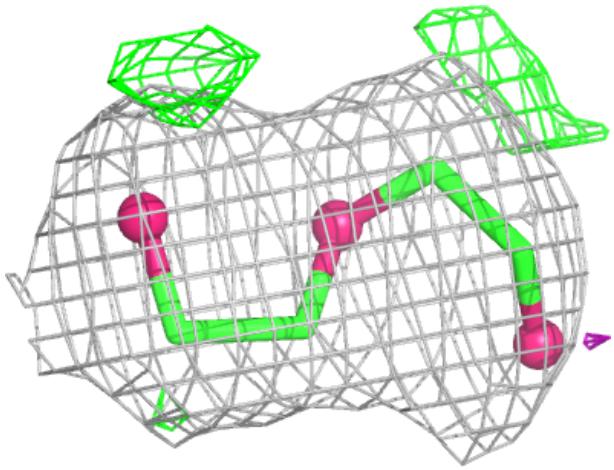
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9'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

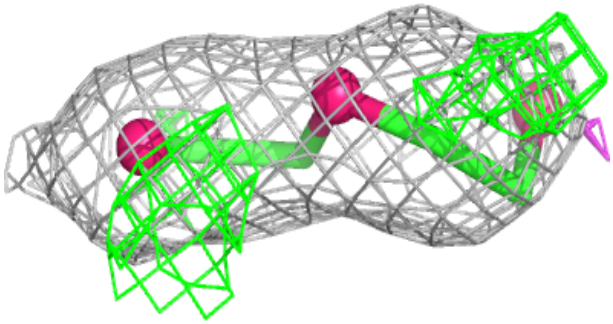
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	PEG	A	501	7/7	0.81	0.15	42,47,52,54	0
2	PEG	B	501	7/7	0.82	0.14	45,50,53,57	0
2	PEG	C	501	7/7	0.85	0.11	49,52,55,57	0
2	PEG	D	501	7/7	0.86	0.14	58,64,66,69	0

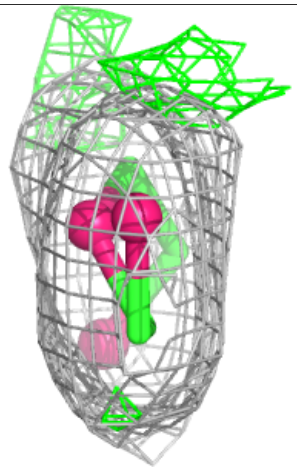
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around PEG A 501:

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

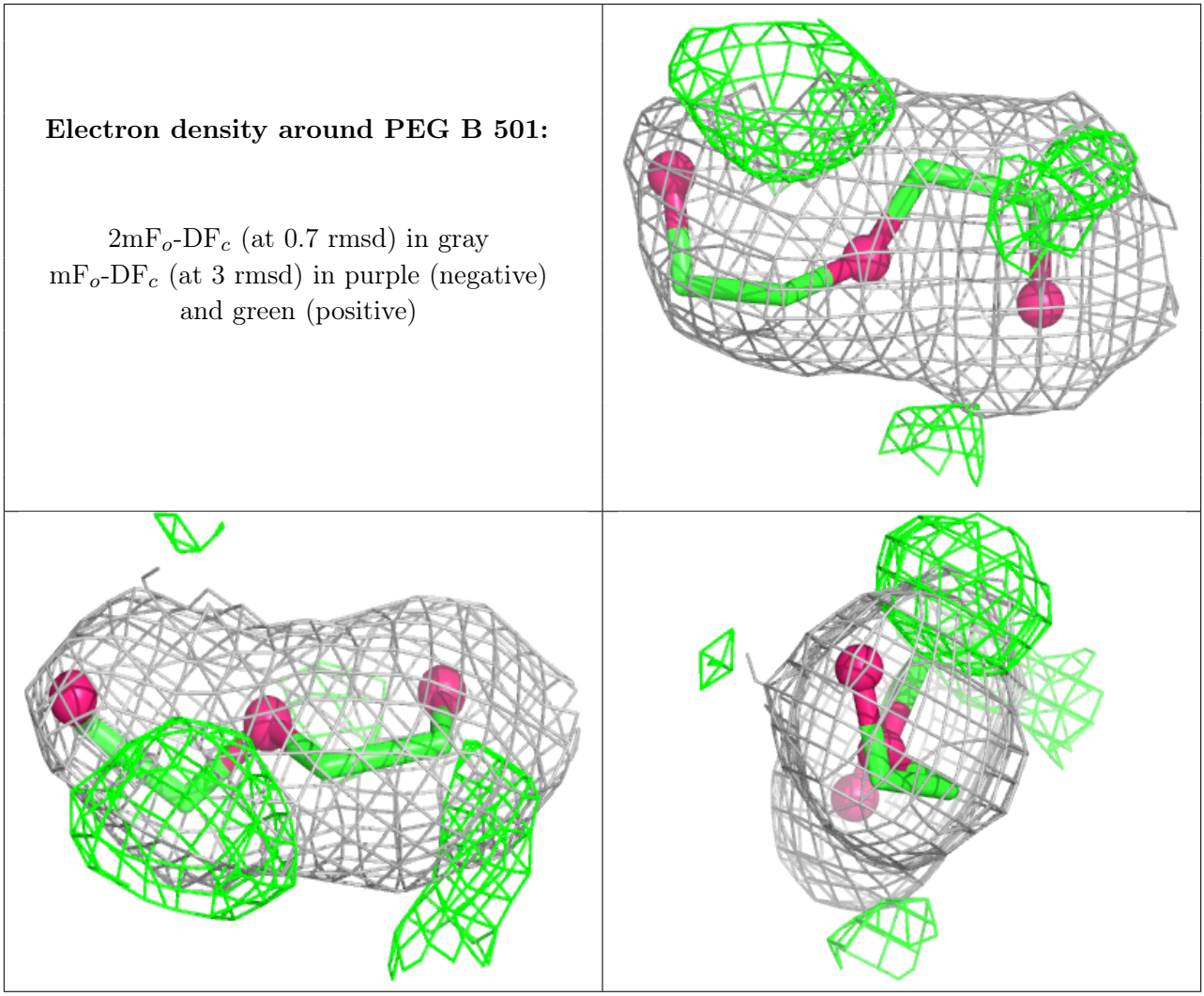






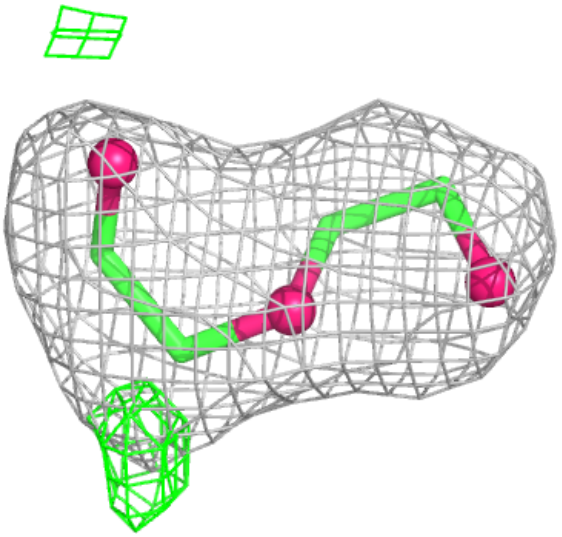
Electron density around PEG B 501:

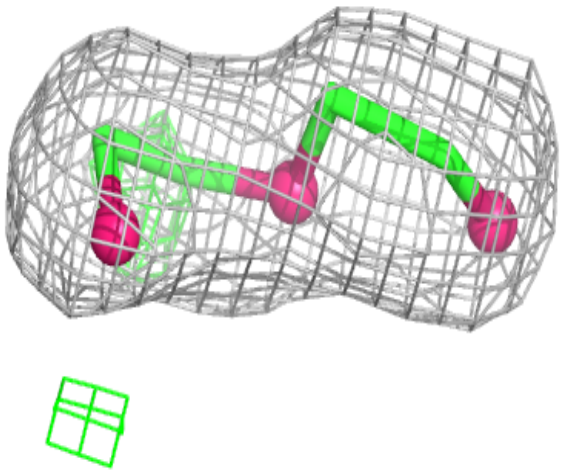
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

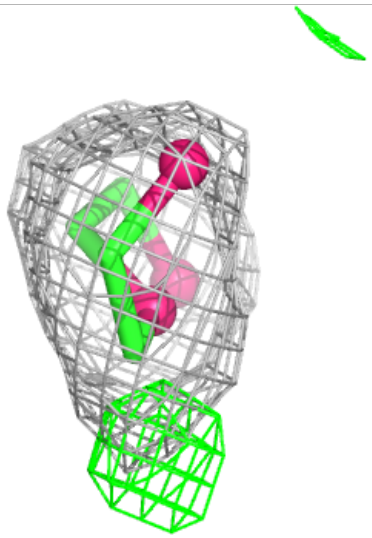


Electron density around PEG C 501:

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

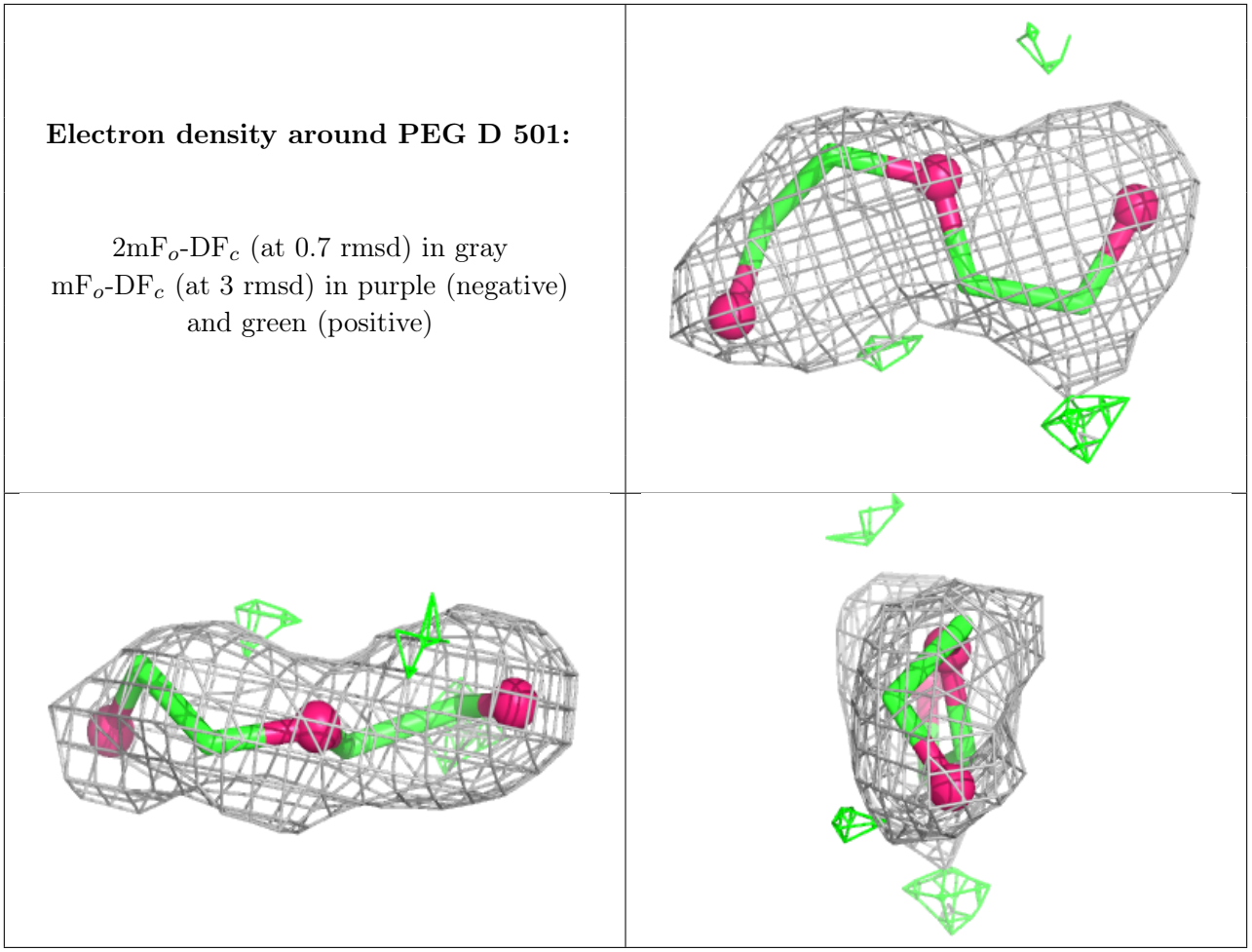






Electron density around PEG D 501:

$2mF_o$-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.