Full wwPDB X-ray Structure Validation Report ⓘ

Oct 28, 2026 – 05:09 PM JST

PDB ID	:	26IY / pdb_000026iy
Title	:	Co-crystal structure of PHBDD variant L163G-T234A-R166M-E259L with N -(2-hydroxyethyl)-4-methylbenzamide
Authors	:	Yang, J.; Qiu, X.
Deposited on	:	2026-05-01
Resolution	:	2.25 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:

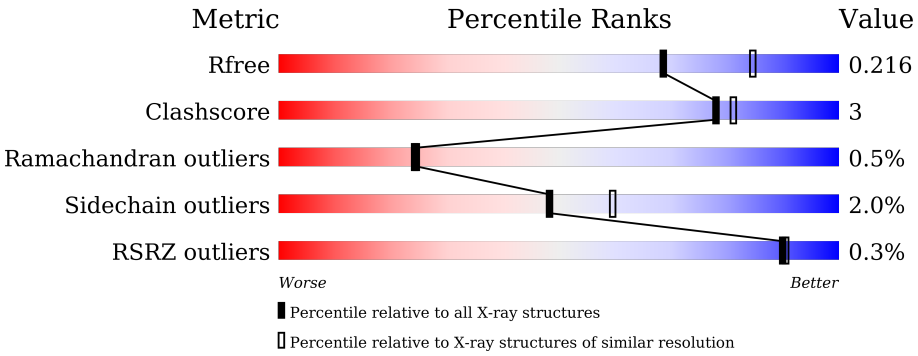
MolProbity	:	4-5-2 with Phenix2.2
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	2.2
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
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 2.25 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	1898 (2.26-2.26)
Clashscore	190562	2005 (2.26-2.26)
Ramachandran outliers	187476	1965 (2.26-2.26)
Sidechain outliers	187428	1966 (2.26-2.26)
RSRZ outliers	180081	1898 (2.26-2.26)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=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	513	89% 6% 5%
1	B	513	87% 7% • 5%
1	C	513	86% 10% •
1	D	513	88% 7% 5%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 15873 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 4-hydroxybenzaldehyde dehydrogenase (NADP(+)).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	488	Total	C	N	O	S	0	0	0
			3710	2337	662	701	10			
1	B	487	Total	C	N	O	S	0	0	0
			3696	2328	658	700	10			
1	C	491	Total	C	N	O	S	0	0	0
			3724	2345	663	706	10			
1	D	487	Total	C	N	O	S	0	0	0
			3699	2331	658	700	10			

There are 104 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-21	MET	-	initiating methionine	UNP Q59702
A	-20	GLY	-	expression tag	UNP Q59702
A	-19	SER	-	expression tag	UNP Q59702
A	-18	SER	-	expression tag	UNP Q59702
A	-17	HIS	-	expression tag	UNP Q59702
A	-16	HIS	-	expression tag	UNP Q59702
A	-15	HIS	-	expression tag	UNP Q59702
A	-14	HIS	-	expression tag	UNP Q59702
A	-13	HIS	-	expression tag	UNP Q59702
A	-12	HIS	-	expression tag	UNP Q59702
A	-11	SER	-	expression tag	UNP Q59702
A	-10	SER	-	expression tag	UNP Q59702
A	-9	GLY	-	expression tag	UNP Q59702
A	-8	GLU	-	expression tag	UNP Q59702
A	-7	ASN	-	expression tag	UNP Q59702
A	-6	LEU	-	expression tag	UNP Q59702
A	-5	TYR	-	expression tag	UNP Q59702
A	-4	PHE	-	expression tag	UNP Q59702
A	-3	GLN	-	expression tag	UNP Q59702
A	-2	GLY	-	expression tag	UNP Q59702
A	-1	SER	-	expression tag	UNP Q59702

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	SER	-	expression tag	UNP Q59702
A	163	GLY	LEU	engineered mutation	UNP Q59702
A	166	MET	ARG	engineered mutation	UNP Q59702
A	234	ALA	THR	engineered mutation	UNP Q59702
A	259	LEU	GLU	engineered mutation	UNP Q59702
B	-21	MET	-	initiating methionine	UNP Q59702
B	-20	GLY	-	expression tag	UNP Q59702
B	-19	SER	-	expression tag	UNP Q59702
B	-18	SER	-	expression tag	UNP Q59702
B	-17	HIS	-	expression tag	UNP Q59702
B	-16	HIS	-	expression tag	UNP Q59702
B	-15	HIS	-	expression tag	UNP Q59702
B	-14	HIS	-	expression tag	UNP Q59702
B	-13	HIS	-	expression tag	UNP Q59702
B	-12	HIS	-	expression tag	UNP Q59702
B	-11	SER	-	expression tag	UNP Q59702
B	-10	SER	-	expression tag	UNP Q59702
B	-9	GLY	-	expression tag	UNP Q59702
B	-8	GLU	-	expression tag	UNP Q59702
B	-7	ASN	-	expression tag	UNP Q59702
B	-6	LEU	-	expression tag	UNP Q59702
B	-5	TYR	-	expression tag	UNP Q59702
B	-4	PHE	-	expression tag	UNP Q59702
B	-3	GLN	-	expression tag	UNP Q59702
B	-2	GLY	-	expression tag	UNP Q59702
B	-1	SER	-	expression tag	UNP Q59702
B	0	SER	-	expression tag	UNP Q59702
B	163	GLY	LEU	engineered mutation	UNP Q59702
B	166	MET	ARG	engineered mutation	UNP Q59702
B	234	ALA	THR	engineered mutation	UNP Q59702
B	259	LEU	GLU	engineered mutation	UNP Q59702
C	-21	MET	-	initiating methionine	UNP Q59702
C	-20	GLY	-	expression tag	UNP Q59702
C	-19	SER	-	expression tag	UNP Q59702
C	-18	SER	-	expression tag	UNP Q59702
C	-17	HIS	-	expression tag	UNP Q59702
C	-16	HIS	-	expression tag	UNP Q59702
C	-15	HIS	-	expression tag	UNP Q59702
C	-14	HIS	-	expression tag	UNP Q59702
C	-13	HIS	-	expression tag	UNP Q59702
C	-12	HIS	-	expression tag	UNP Q59702
C	-11	SER	-	expression tag	UNP Q59702

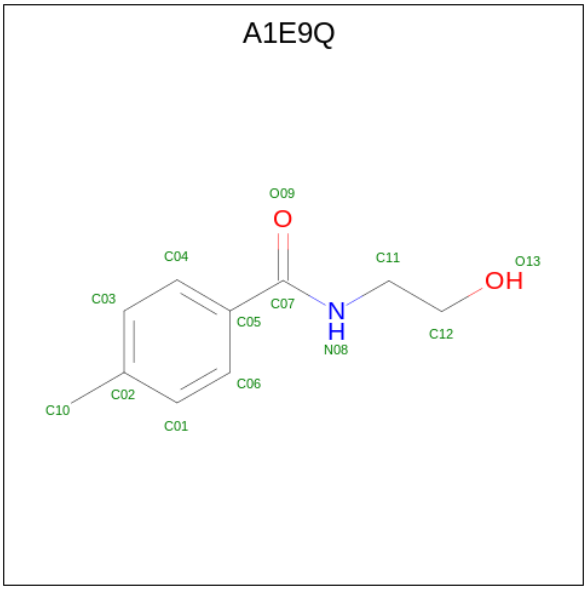
Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
C	-10	SER	-	expression tag	UNP Q59702
C	-9	GLY	-	expression tag	UNP Q59702
C	-8	GLU	-	expression tag	UNP Q59702
C	-7	ASN	-	expression tag	UNP Q59702
C	-6	LEU	-	expression tag	UNP Q59702
C	-5	TYR	-	expression tag	UNP Q59702
C	-4	PHE	-	expression tag	UNP Q59702
C	-3	GLN	-	expression tag	UNP Q59702
C	-2	GLY	-	expression tag	UNP Q59702
C	-1	SER	-	expression tag	UNP Q59702
C	0	SER	-	expression tag	UNP Q59702
C	163	GLY	LEU	engineered mutation	UNP Q59702
C	166	MET	ARG	engineered mutation	UNP Q59702
C	234	ALA	THR	engineered mutation	UNP Q59702
C	259	LEU	GLU	engineered mutation	UNP Q59702
D	-21	MET	-	initiating methionine	UNP Q59702
D	-20	GLY	-	expression tag	UNP Q59702
D	-19	SER	-	expression tag	UNP Q59702
D	-18	SER	-	expression tag	UNP Q59702
D	-17	HIS	-	expression tag	UNP Q59702
D	-16	HIS	-	expression tag	UNP Q59702
D	-15	HIS	-	expression tag	UNP Q59702
D	-14	HIS	-	expression tag	UNP Q59702
D	-13	HIS	-	expression tag	UNP Q59702
D	-12	HIS	-	expression tag	UNP Q59702
D	-11	SER	-	expression tag	UNP Q59702
D	-10	SER	-	expression tag	UNP Q59702
D	-9	GLY	-	expression tag	UNP Q59702
D	-8	GLU	-	expression tag	UNP Q59702
D	-7	ASN	-	expression tag	UNP Q59702
D	-6	LEU	-	expression tag	UNP Q59702
D	-5	TYR	-	expression tag	UNP Q59702
D	-4	PHE	-	expression tag	UNP Q59702
D	-3	GLN	-	expression tag	UNP Q59702
D	-2	GLY	-	expression tag	UNP Q59702
D	-1	SER	-	expression tag	UNP Q59702
D	0	SER	-	expression tag	UNP Q59702
D	163	GLY	LEU	engineered mutation	UNP Q59702
D	166	MET	ARG	engineered mutation	UNP Q59702
D	234	ALA	THR	engineered mutation	UNP Q59702
D	259	LEU	GLU	engineered mutation	UNP Q59702

- Molecule 2 is {N}-(2-hydroxyethyl)-4-methyl-benzamide (CCD ID: A1E9Q) (formula:

$C_{10}H_{13}NO_2$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total C N O 13 10 1 2	0	0
2	B	1	Total C N O 13 10 1 2	0	0
2	C	1	Total C N O 13 10 1 2	0	0
2	D	1	Total C N O 13 10 1 2	0	0

- Molecule 3 is water.

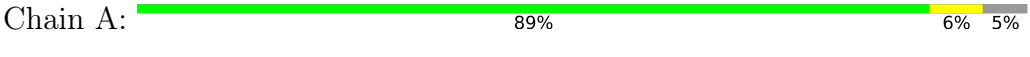
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	273	Total O 273 273	0	0
3	B	266	Total O 266 266	0	0
3	C	219	Total O 219 219	0	0
3	D	234	Total O 234 234	0	0

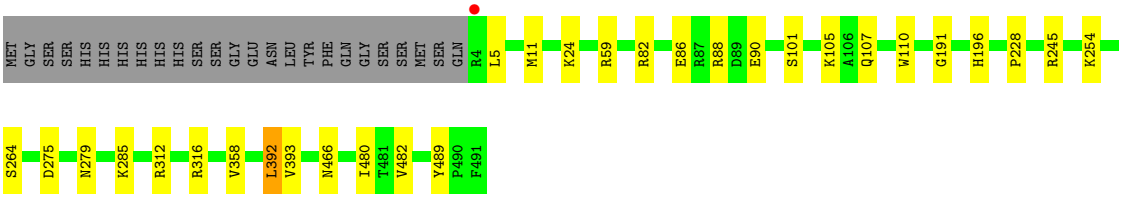
3 Residue-property plots (i)

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: 4-hydroxybenzaldehyde dehydrogenase (NADP(+))

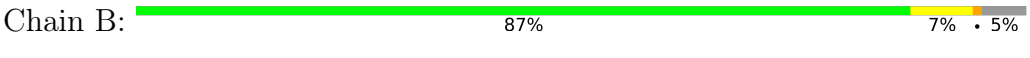
Chain A:

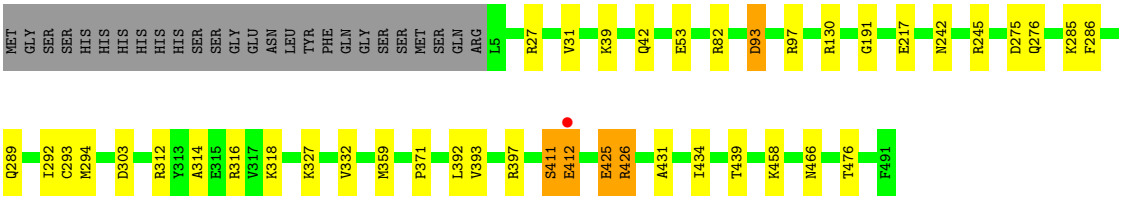




• Molecule 1: 4-hydroxybenzaldehyde dehydrogenase (NADP(+))

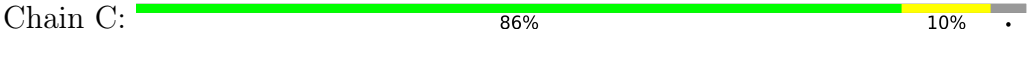
Chain B:

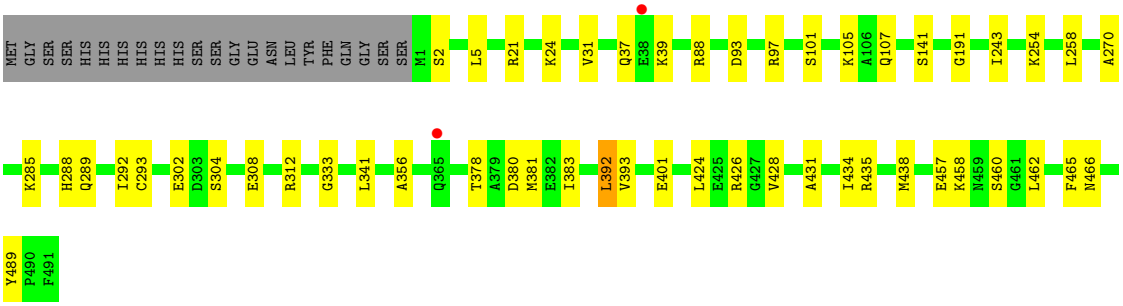




• Molecule 1: 4-hydroxybenzaldehyde dehydrogenase (NADP(+))

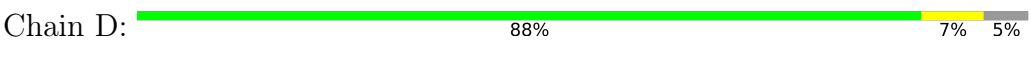
Chain C:

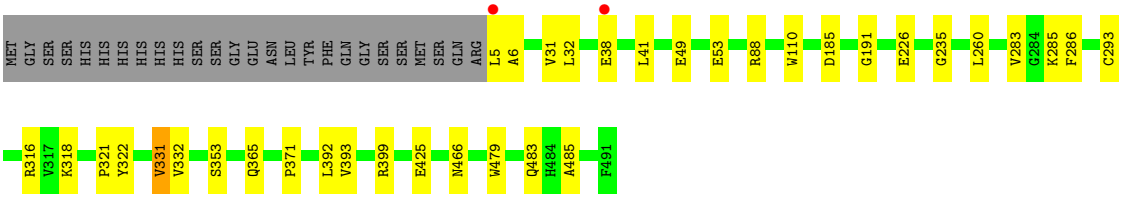




• Molecule 1: 4-hydroxybenzaldehyde dehydrogenase (NADP(+))

Chain D:




MET GLY SER SER HIS HIS HIS HIS HIS HIS SER SER GLY GLU ASN LEU TYR PHE GLN GLY SER SER MET SER GLN ARG L5 A6 V31 L32 E38 L41 E49 E53 R88 W110 D185 G191 E226 G235 L260 V283 G284 K285 F286 C293
R316 V317 K318 P321 Y322 V331 V332 S353 Q365 P371 L392 V393 R399 E425 N466 W479 Q483 H484 A485 F491

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	90.66Å 124.95Å 91.44Å 90.00° 105.55° 90.00°	Depositor
Resolution (Å)	44.05 – 2.25 44.05 – 2.25	Depositor EDS
% Data completeness (in resolution range)	97.9 (44.05-2.25) 98.0 (44.05-2.25)	Depositor EDS
R_{merge}	0.16	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.78 (at 2.24Å)	Xtriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, R_{free}	0.173 , 0.214 0.174 , 0.216	Depositor DCC
R_{free} test set	2002 reflections (2.15%)	wwPDB-VP
Wilson B-factor (Å^2)	30.2	Xtriage
Anisotropy	0.152	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 42.3	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.016 for l,-k,h	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	15873	wwPDB-VP
Average B, all atoms (Å^2)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.58% 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: A1E9Q

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	0.46	0/3787	0.56	0/5142
1	B	0.42	0/3773	0.56	0/5124
1	C	0.40	0/3801	0.53	0/5162
1	D	0.40	0/3776	0.52	0/5128
All	All	0.42	0/15137	0.54	0/20556

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	A	0	1
1	B	0	1
All	All	0	2

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	59	ARG	Sidechain
1	B	412	GLU	Peptide

5.2 Too-close contacts (i)

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	3710	0	3668	18	0
1	B	3696	0	3646	26	0
1	C	3724	0	3675	26	0
1	D	3699	0	3655	18	0
2	A	13	0	0	0	0
2	B	13	0	0	0	0
2	C	13	0	0	0	0
2	D	13	0	0	0	0
3	A	273	0	0	5	1
3	B	266	0	0	6	1
3	C	219	0	0	4	0
3	D	234	0	0	6	0
All	All	15873	0	14644	82	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 3.

All (82) 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:293:CYS:SG	3:B:782:HOH:O	2.10	1.07
1:B:276:GLN:NE2	3:B:602:HOH:O	1.98	0.94
1:B:82:ARG:NH2	3:B:603:HOH:O	2.03	0.91
1:B:53:GLU:OE1	3:B:601:HOH:O	1.94	0.84
1:A:275:ASP:OD1	1:A:312:ARG:NH2	2.10	0.84
1:A:88:ARG:HH21	1:A:107:GLN:HE21	1.30	0.78
1:C:88:ARG:NH2	3:C:601:HOH:O	2.19	0.76
1:B:217:GLU:OE2	3:B:604:HOH:O	2.07	0.73
1:C:435:ARG:HG2	1:C:458:LYS:HD2	1.73	0.70
1:D:185:ASP:OD1	3:D:602:HOH:O	2.08	0.70
1:D:316:ARG:NH1	3:D:601:HOH:O	2.03	0.68
1:D:365:GLN:OE1	3:D:603:HOH:O	2.11	0.68
1:A:489:TYR:O	3:A:602:HOH:O	2.12	0.67
1:B:285:LYS:HD3	1:B:393:VAL:HB	1.77	0.66
1:B:412:GLU:HA	1:B:458:LYS:HE2	1.78	0.66

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:39:LYS:HE2	1:B:42:GLN:HE21	1.63	0.64
1:D:285:LYS:HD3	1:D:393:VAL:HB	1.80	0.63
1:C:258:LEU:HD12	1:C:462:LEU:HD12	1.81	0.62
1:B:425:GLU:HB2	1:C:424:LEU:HD12	1.85	0.59
1:C:308:GLU:OE2	1:C:312:ARG:NH2	2.36	0.59
1:A:245:ARG:HG2	1:B:245:ARG:HG2	1.87	0.56
1:D:88:ARG:HG3	1:D:110:TRP:CE2	2.40	0.56
1:C:431:ALA:HA	1:C:434:ILE:HD12	1.89	0.54
1:A:24:LYS:NZ	3:A:610:HOH:O	2.41	0.53
1:C:285:LYS:HD3	1:C:393:VAL:HB	1.91	0.53
1:D:53:GLU:OE2	3:D:604:HOH:O	2.19	0.53
1:C:356:ALA:HB2	1:C:381:MET:HE1	1.90	0.53
1:B:289:GLN:NE2	3:B:605:HOH:O	2.15	0.53
1:C:107:GLN:NE2	3:C:605:HOH:O	2.35	0.51
1:D:31:VAL:HB	1:D:41:LEU:HD23	1.93	0.50
1:A:11:MET:HE1	1:A:196:HIS:CD2	2.47	0.50
1:A:285:LYS:HD3	1:A:393:VAL:HB	1.93	0.50
1:A:264:SER:OG	3:A:601:HOH:O	2.09	0.49
1:C:401:GLU:OE1	1:C:426:ARG:HD2	2.13	0.49
1:B:425:GLU:HG3	1:B:426:ARG:N	2.25	0.49
1:B:242:ASN:OD1	1:B:245:ARG:NH1	2.46	0.48
1:A:88:ARG:HG3	1:A:110:TRP:CE2	2.48	0.48
1:C:93:ASP:HB3	1:C:97:ARG:NH1	2.28	0.48
1:B:93:ASP:OD1	1:B:97:ARG:CZ	2.62	0.47
1:C:378:THR:OG1	1:C:380:ASP:OD1	2.26	0.47
1:C:293:CYS:SG	3:C:726:HOH:O	2.34	0.47
1:D:293:CYS:SG	3:D:710:HOH:O	2.02	0.47
1:B:275:ASP:OD1	1:B:312:ARG:NH1	2.48	0.47
1:A:90:GLU:OE2	3:A:604:HOH:O	2.20	0.47
1:A:279:ASN:OD1	1:A:316:ARG:NH1	2.30	0.46
1:A:285:LYS:NZ	3:A:616:HOH:O	2.48	0.46
1:A:82:ARG:NH1	1:A:86:GLU:OE2	2.49	0.46
1:B:316:ARG:HE	1:B:316:ARG:HB3	1.63	0.46
1:C:424:LEU:O	1:C:428:VAL:HG13	2.16	0.46
1:B:286:PHE:CE1	1:B:371:PRO:HB3	2.52	0.45
1:C:101:SER:HB3	1:C:105:LYS:HD2	1.98	0.45
1:C:438:MET:HG2	1:D:479:TRP:HE3	1.81	0.45
1:A:228:PRO:HG2	1:A:254:LYS:HE2	1.98	0.45
1:D:483:GLN:HG3	1:D:485:ALA:O	2.17	0.45
1:B:289:GLN:HG3	1:B:332:VAL:HA	1.97	0.45
1:C:383:ILE:HD11	1:C:392:LEU:HD12	1.99	0.44

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:431:ALA:HA	1:B:434:ILE:HD12	2.00	0.44
1:C:457:GLU:O	1:C:460:SER:HB2	2.18	0.44
1:B:314:ALA:O	1:B:318:LYS:HG3	2.18	0.44
1:B:327:LYS:HB3	1:B:327:LYS:HE3	1.81	0.44
1:A:101:SER:HB3	1:A:105:LYS:HD2	1.99	0.44
1:D:286:PHE:CE1	1:D:371:PRO:HB3	2.53	0.43
1:D:322:TYR:HB3	1:D:332:VAL:HB	1.99	0.43
1:A:285:LYS:HE2	1:A:392:LEU:O	2.18	0.43
1:A:5:LEU:HA	1:A:5:LEU:HD12	1.72	0.43
1:B:292:ILE:HG22	1:B:294:MET:H	1.83	0.42
1:B:425:GLU:CB	1:C:424:LEU:HD12	2.49	0.42
1:C:465:PHE:O	1:C:466:ASN:HB2	2.19	0.42
1:D:49:GLU:HG3	3:D:811:HOH:O	2.19	0.42
1:C:21:ARG:NH1	1:C:24:LYS:HE3	2.34	0.42
1:B:303:ASP:OD1	1:B:397:ARG:NH1	2.53	0.42
1:C:489:TYR:HB3	1:D:283:VAL:HG21	2.02	0.42
1:D:32:LEU:HA	1:D:38:GLU:O	2.19	0.42
1:D:235:GLY:O	1:D:260:LEU:HA	2.20	0.41
1:C:289:GLN:HG2	1:C:333:GLY:O	2.19	0.41
1:B:359:MET:HE3	1:B:359:MET:HB3	1.89	0.41
1:C:288:HIS:HA	3:C:606:HOH:O	2.20	0.41
1:D:331:VAL:HG23	1:D:332:VAL:HG23	2.02	0.41
1:C:401:GLU:OE1	1:C:426:ARG:NH1	2.47	0.41
1:A:480:ILE:HA	1:B:439:THR:O	2.20	0.40
1:D:321:PRO:HD2	1:D:331:VAL:HG13	2.04	0.40
1:C:270:ALA:HB2	1:C:302:GLU:HG2	2.02	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)
3:A:701:HOH:O	3:B:825:HOH:O[2_555]	2.01	0.19

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	486/513 (95%)	477 (98%)	7 (1%)	2 (0%)	30	31
1	B	485/513 (94%)	472 (97%)	10 (2%)	3 (1%)	21	21
1	C	489/513 (95%)	473 (97%)	15 (3%)	1 (0%)	43	50
1	D	485/513 (94%)	470 (97%)	11 (2%)	4 (1%)	16	14
All	All	1945/2052 (95%)	1892 (97%)	43 (2%)	10 (0%)	24	24

All (10) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	425	GLU
1	B	466	ASN
1	A	466	ASN
1	D	191	GLY
1	D	466	ASN
1	B	411	SER
1	C	191	GLY
1	D	6	ALA
1	B	191	GLY
1	A	191	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	383/406 (94%)	380 (99%)	3 (1%)	73	80
1	B	381/406 (94%)	372 (98%)	9 (2%)	43	54
1	C	384/406 (95%)	372 (97%)	12 (3%)	35	44
1	D	382/406 (94%)	375 (98%)	7 (2%)	51	63
All	All	1530/1624 (94%)	1499 (98%)	31 (2%)	48	59

All (31) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	358	VAL
1	A	392	LEU
1	A	482	VAL
1	B	27	ARG
1	B	31	VAL
1	B	93	ASP
1	B	130	ARG
1	B	392	LEU
1	B	411	SER
1	B	425	GLU
1	B	426	ARG
1	B	476	THR
1	C	2	SER
1	C	5	LEU
1	C	31	VAL
1	C	37	GLN
1	C	39	LYS
1	C	141	SER
1	C	243	ILE
1	C	254	LYS
1	C	292	ILE
1	C	304	SER
1	C	341	LEU
1	C	392	LEU
1	D	5	LEU
1	D	226	GLU
1	D	318	LYS
1	D	331	VAL
1	D	353	SER
1	D	392	LEU
1	D	399	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (19) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	107	GLN
1	A	118	GLN
1	A	291	GLN
1	A	345	GLN
1	A	365	GLN
1	A	396	GLN
1	B	42	GLN
1	B	128	HIS

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	B	196	HIS
1	C	60	GLN
1	C	75	GLN
1	C	255	HIS
1	C	291	GLN
1	C	345	GLN
1	C	478	HIS
1	D	107	GLN
1	D	252	HIS
1	D	291	GLN
1	D	396	GLN

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)

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	A1E9Q	C	501	-	13,13,13	1.77	1 (7%)	16,16,16	0.71	0
2	A1E9Q	A	501	-	13,13,13	1.64	2 (15%)	16,16,16	0.82	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
2	A1E9Q	B	501	-	13,13,13	1.58	2 (15%)	16,16,16	1.56	3 (18%)
2	A1E9Q	D	501	-	13,13,13	1.73	2 (15%)	16,16,16	1.15	1 (6%)

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	A1E9Q	C	501	-	-	0/8/8/8	0/1/1/1
2	A1E9Q	A	501	-	-	0/8/8/8	0/1/1/1
2	A1E9Q	B	501	-	-	0/8/8/8	0/1/1/1
2	A1E9Q	D	501	-	-	1/8/8/8	0/1/1/1

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	501	A1E9Q	C07-N08	5.71	1.46	1.33
2	D	501	A1E9Q	C07-N08	5.46	1.45	1.33
2	A	501	A1E9Q	C07-N08	5.11	1.45	1.33
2	B	501	A1E9Q	C07-N08	5.01	1.44	1.33
2	A	501	A1E9Q	O09-C07	-2.51	1.18	1.23
2	D	501	A1E9Q	C05-C07	2.15	1.54	1.50
2	B	501	A1E9Q	O09-C07	-2.08	1.19	1.23

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	501	A1E9Q	C05-C07-N08	3.23	124.02	117.09
2	D	501	A1E9Q	O09-C07-N08	-2.63	117.36	122.61
2	B	501	A1E9Q	O09-C07-C05	-2.36	116.74	120.94
2	B	501	A1E9Q	C11-N08-C07	-2.32	116.78	122.08

There are no chirality outliers.

All (1) torsion outliers are listed below:

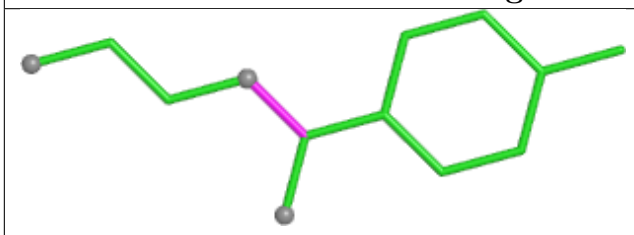
Mol	Chain	Res	Type	Atoms
2	D	501	A1E9Q	N08-C11-C12-O13

There are no ring outliers.

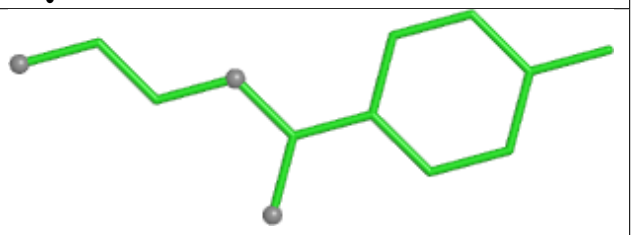
No monomer is involved in short contacts.

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

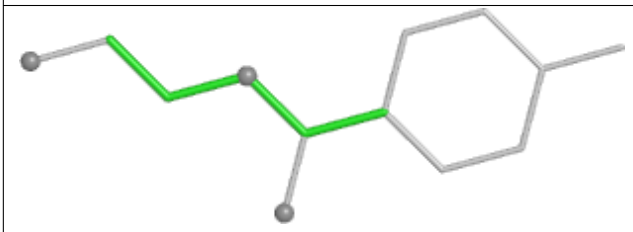
Ligand A1E9Q C 501



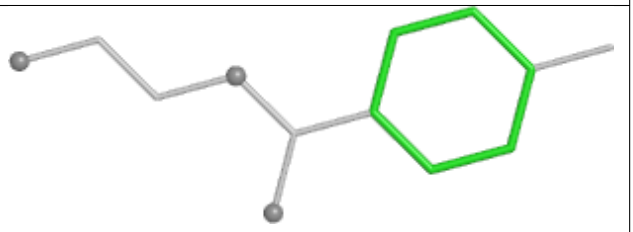
Bond lengths



Bond angles

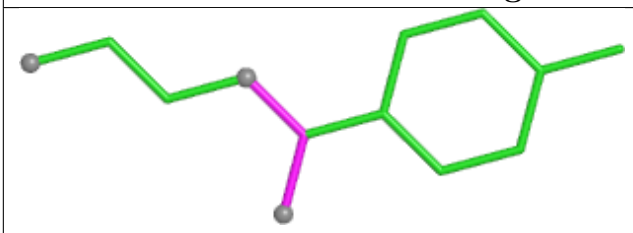


Torsions

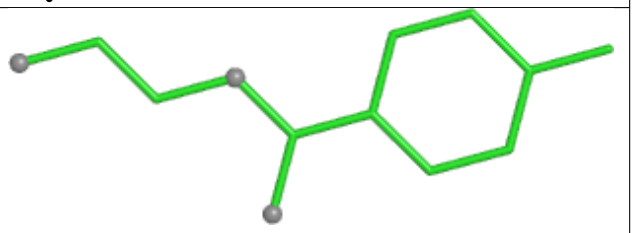


Rings

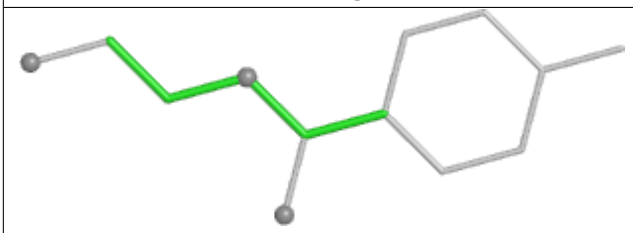
Ligand A1E9Q A 501



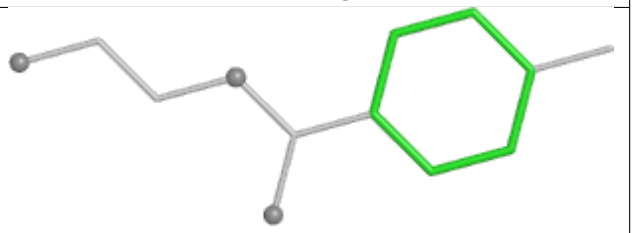
Bond lengths



Bond angles

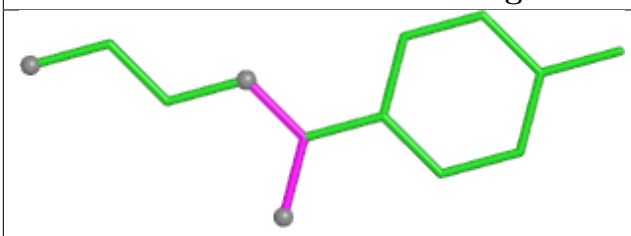


Torsions

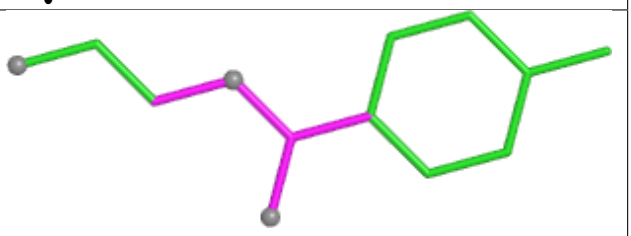


Rings

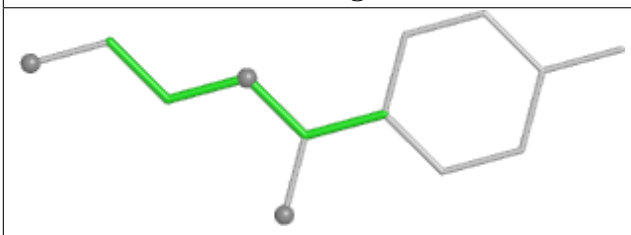
Ligand A1E9Q B 501



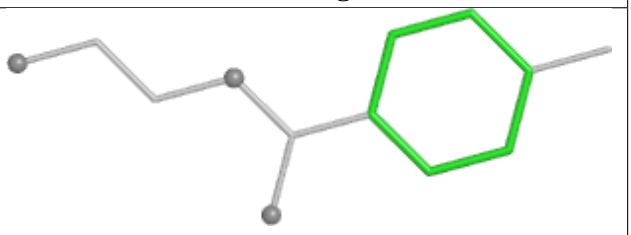
Bond lengths



Bond angles

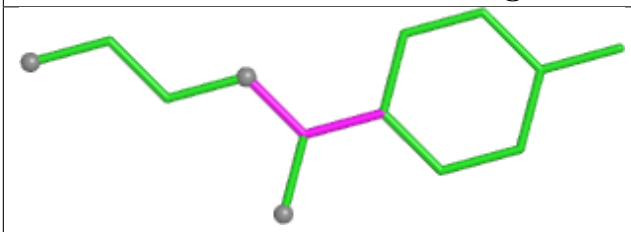


Torsions

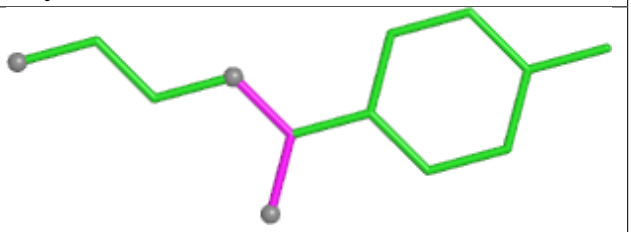


Rings

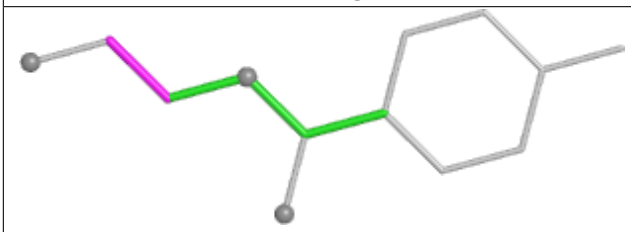
Ligand A1E9Q D 501



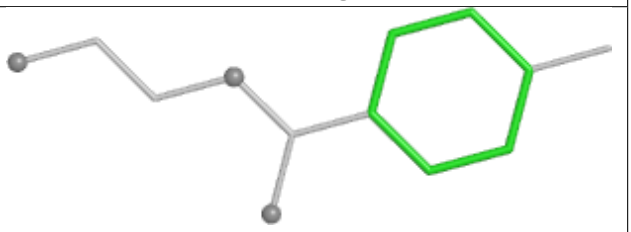
Bond lengths



Bond angles



Torsions



Rings

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	488/513 (95%)	-0.52	1 (0%)	91	92	20, 27, 37, 54	0
1	B	487/513 (94%)	-0.46	1 (0%)	91	92	21, 29, 39, 45	0
1	C	491/513 (95%)	-0.35	2 (0%)	88	89	21, 31, 43, 55	0
1	D	487/513 (94%)	-0.37	2 (0%)	88	89	21, 31, 44, 55	0
All	All	1953/2052 (95%)	-0.43	6 (0%)	90	90	20, 29, 41, 55	0

All (6) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	412	GLU	3.1
1	D	38	GLU	2.3
1	C	38	GLU	2.3
1	D	5	LEU	2.2
1	A	4	ARG	2.2
1	C	365	GLN	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

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,

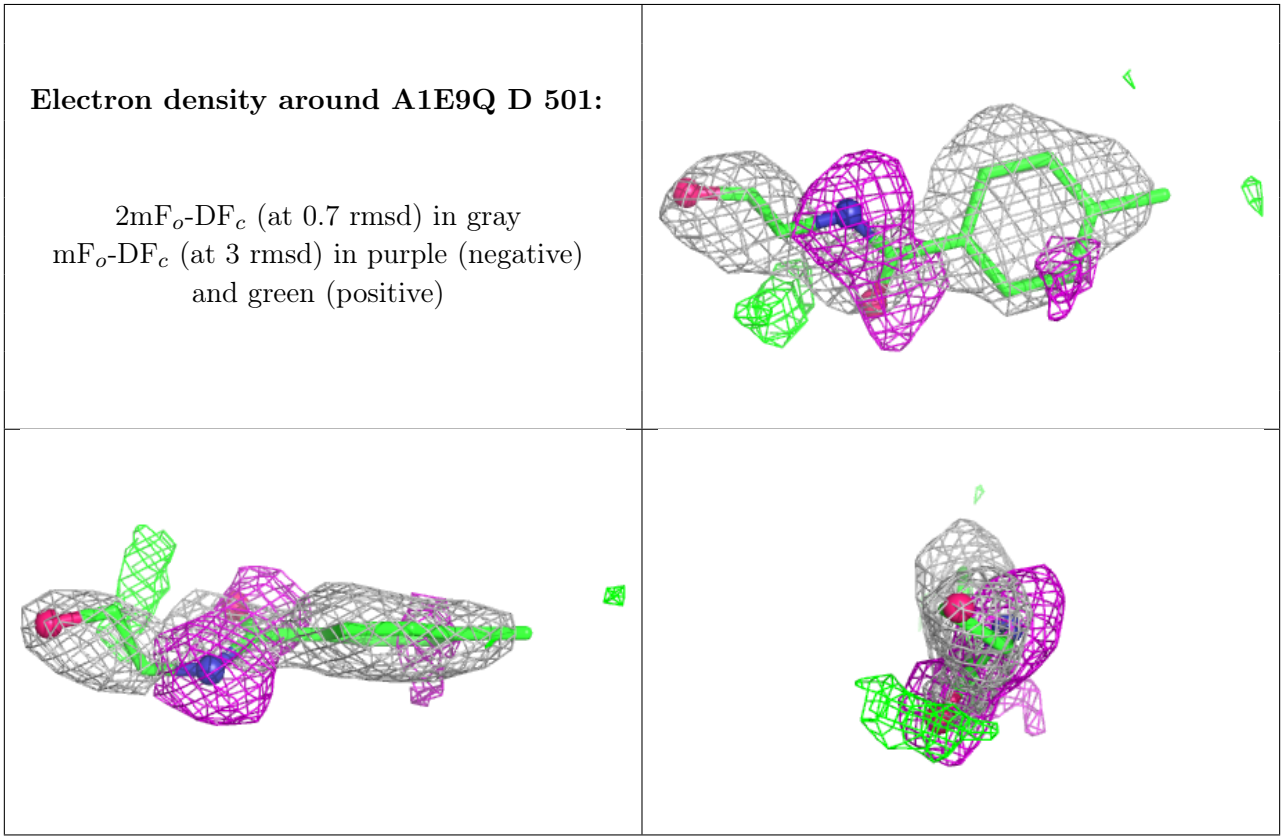
median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	A1E9Q	D	501	13/13	0.73	0.17	36,41,48,48	0
2	A1E9Q	B	501	13/13	0.77	0.14	33,37,42,42	0
2	A1E9Q	C	501	13/13	0.81	0.14	38,41,44,45	0
2	A1E9Q	A	501	13/13	0.81	0.14	32,36,47,53	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.

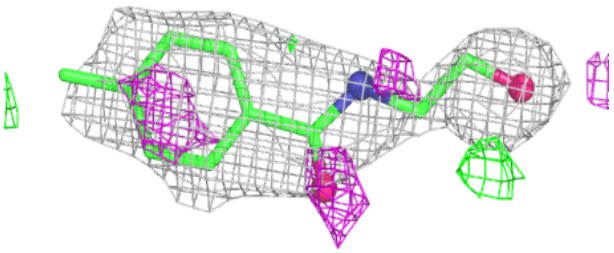
Electron density around A1E9Q D 501:

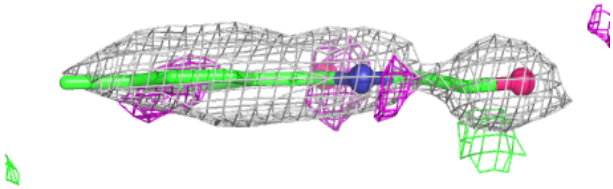
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

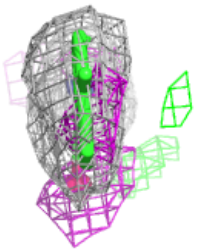


Electron density around A1E9Q B 501:

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

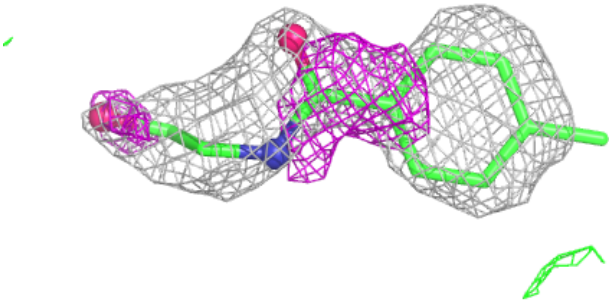


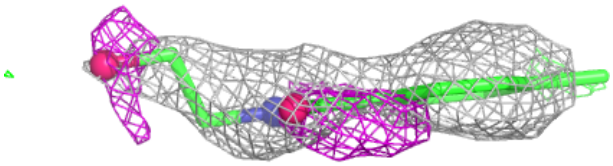


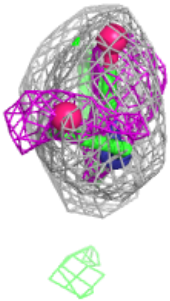


Electron density around A1E9Q C 501:

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

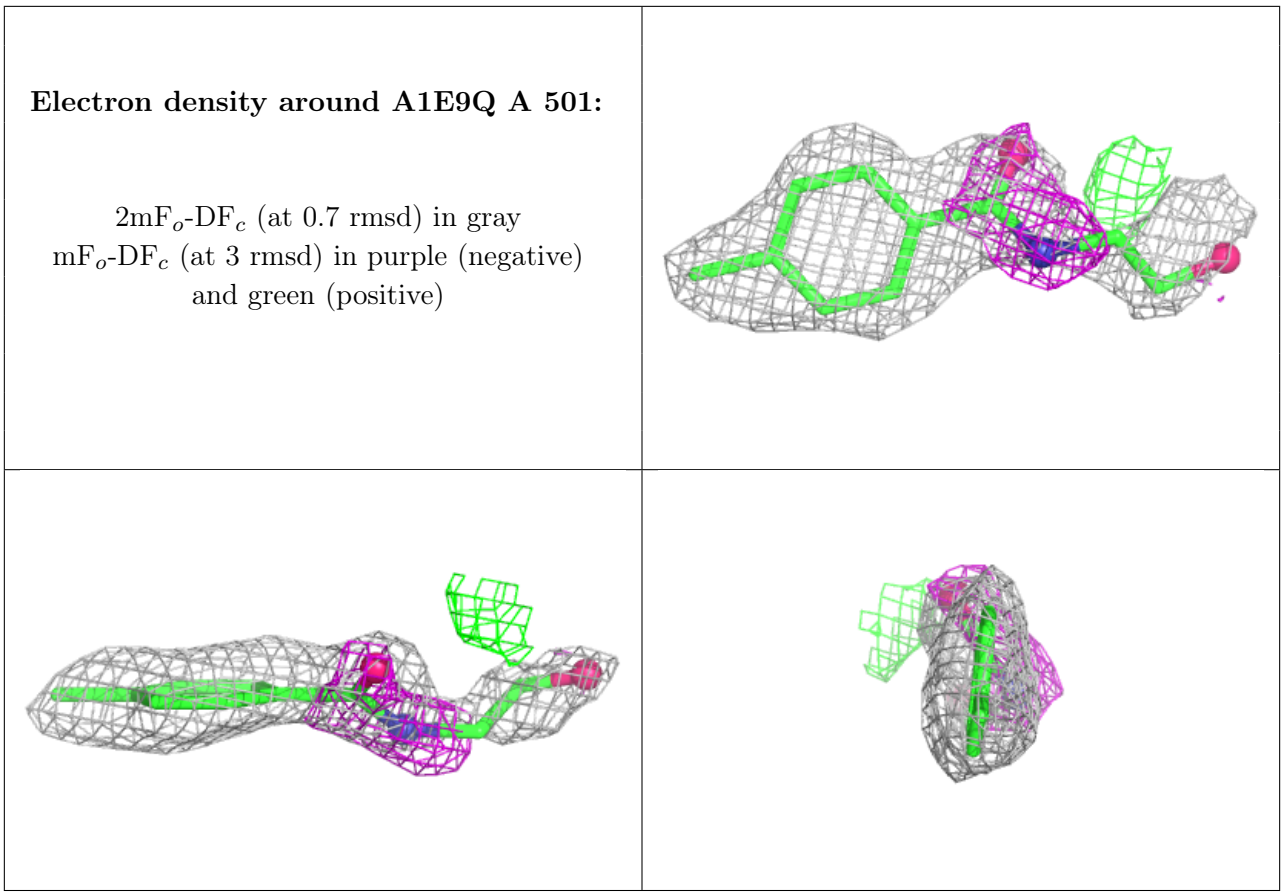






Electron density around A1E9Q A 501:

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



6.5 Other polymers

There are no such residues in this entry.