WORLDWIDE PDB PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report ⓘ

Dec 2, 2025 – 02:05 am GMT

PDB ID	:	7PHF / pdb_00007phf
Title	:	Chimeric carminomycin-4-O-methyltransferase (DnrK) with regions from 10-hydroxylase RdmB and 10-decarboxylase TamK
Authors	:	Dinis, P.; MetsaKetela, M.
Deposited on	:	2021-08-17
Resolution	:	2.21 Å(reported)

The following versions of software and data (see references ⓘ) were used in the production of this report:

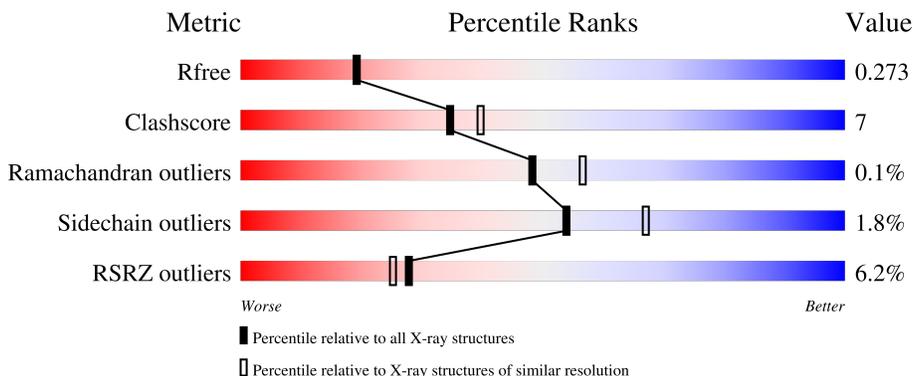|		
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.46

1 Overall quality at a glance ⓘ

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

The reported resolution of this entry is 2.21 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	Percentile Ranks	Value
Rfree		0.273
Clashscore		7
Ramachandran outliers		0.1%
Sidechain outliers		1.8%
RSRZ outliers		6.2%

Worse *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	164625	7167 (2.24-2.20)
Clashscore	180529	8096 (2.24-2.20)
Ramachandran outliers	177936	8010 (2.24-2.20)
Sidechain outliers	177891	8011 (2.24-2.20)
RSRZ outliers	164620	7166 (2.24-2.20)

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	368	3% / 77% / 13% / 10%
1	B	368	9% / 64% / 8% / • / 27%
1	C	368	4% / 79% / 11% / 11%
1	D	368	5% / 76% / 14% / 10%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	VAK	C	402	-	-	X	-
3	VAK	D	402	-	-	X	-

2 Entry composition ⓘ

There are 4 unique types of molecules in this entry. The entry contains 9818 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 Carminomycin 4-O-methyltransferase DnrK,Methyltransferase domain-containing protein,Aclacinomycin 10-hydroxylase RdmB.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	333	Total	C	N	O	S	0	2	1
			2497	1587	445	459	6			
1	B	270	Total	C	N	O	S	8	1	0
			1966	1259	346	356	5			
1	C	329	Total	C	N	O	S	4	3	1
			2488	1583	448	451	6			
1	D	331	Total	C	N	O	S	0	0	1
			2450	1564	436	444	6			

There are 48 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-9	MET	-	initiating methionine	UNP Q06528
A	-8	ALA	-	expression tag	UNP Q06528
A	-7	HIS	-	expression tag	UNP Q06528
A	-6	HIS	-	expression tag	UNP Q06528
A	-5	HIS	-	expression tag	UNP Q06528
A	-4	HIS	-	expression tag	UNP Q06528
A	-3	HIS	-	expression tag	UNP Q06528
A	-2	HIS	-	expression tag	UNP Q06528
A	-1	HIS	-	expression tag	UNP Q06528
A	0	ARG	-	expression tag	UNP Q06528
A	1	SER	-	expression tag	UNP Q06528
A	190	ASN	LYS	engineered mutation	UNP Q06528
B	-9	MET	-	initiating methionine	UNP Q06528
B	-8	ALA	-	expression tag	UNP Q06528
B	-7	HIS	-	expression tag	UNP Q06528
B	-6	HIS	-	expression tag	UNP Q06528
B	-5	HIS	-	expression tag	UNP Q06528
B	-4	HIS	-	expression tag	UNP Q06528
B	-3	HIS	-	expression tag	UNP Q06528
B	-2	HIS	-	expression tag	UNP Q06528

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-1	HIS	-	expression tag	UNP Q06528
B	0	ARG	-	expression tag	UNP Q06528
B	1	SER	-	expression tag	UNP Q06528
B	190	ASN	LYS	engineered mutation	UNP Q06528
C	-9	MET	-	initiating methionine	UNP Q06528
C	-8	ALA	-	expression tag	UNP Q06528
C	-7	HIS	-	expression tag	UNP Q06528
C	-6	HIS	-	expression tag	UNP Q06528
C	-5	HIS	-	expression tag	UNP Q06528
C	-4	HIS	-	expression tag	UNP Q06528
C	-3	HIS	-	expression tag	UNP Q06528
C	-2	HIS	-	expression tag	UNP Q06528
C	-1	HIS	-	expression tag	UNP Q06528
C	0	ARG	-	expression tag	UNP Q06528
C	1	SER	-	expression tag	UNP Q06528
C	190	ASN	LYS	engineered mutation	UNP Q06528
D	-9	MET	-	initiating methionine	UNP Q06528
D	-8	ALA	-	expression tag	UNP Q06528
D	-7	HIS	-	expression tag	UNP Q06528
D	-6	HIS	-	expression tag	UNP Q06528
D	-5	HIS	-	expression tag	UNP Q06528
D	-4	HIS	-	expression tag	UNP Q06528
D	-3	HIS	-	expression tag	UNP Q06528
D	-2	HIS	-	expression tag	UNP Q06528
D	-1	HIS	-	expression tag	UNP Q06528
D	0	ARG	-	expression tag	UNP Q06528
D	1	SER	-	expression tag	UNP Q06528
D	190	ASN	LYS	engineered mutation	UNP Q06528

- Molecule 2 is S-ADENOSYL-L-HOMOCYSTEINE (CCD ID: SAH) (formula: $C_{14}H_{20}N_6O_5S$) (labeled as "Ligand of Interest" by depositor).

SAH

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	S	0	0
			26	14	6	5	1		
2	B	1	Total	C	N	O	S	0	0
			26	14	6	5	1		
2	C	1	Total	C	N	O	S	0	0
			26	14	6	5	1		
2	D	1	Total	C	N	O	S	0	0
			26	14	6	5	1		

- Molecule 3 is methyl (1R,2R,4S)-2-ethyl-2,4,5,7-tetrahydroxy-6,11-dioxo-1,2,3,4,6,11-hexa hydrotetracene-1-carboxylate (CCD ID: VAK) (formula: $C_{22}H_{20}O_8$) (labeled as "Ligand of Interest" by depositor).

VAK

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	B	1	Total 30	C 22	O 8	0	0
3	C	1	Total 30	C 22	O 8	0	0
3	D	1	Total 30	C 22	O 8	0	0

- Molecule 4 is water.

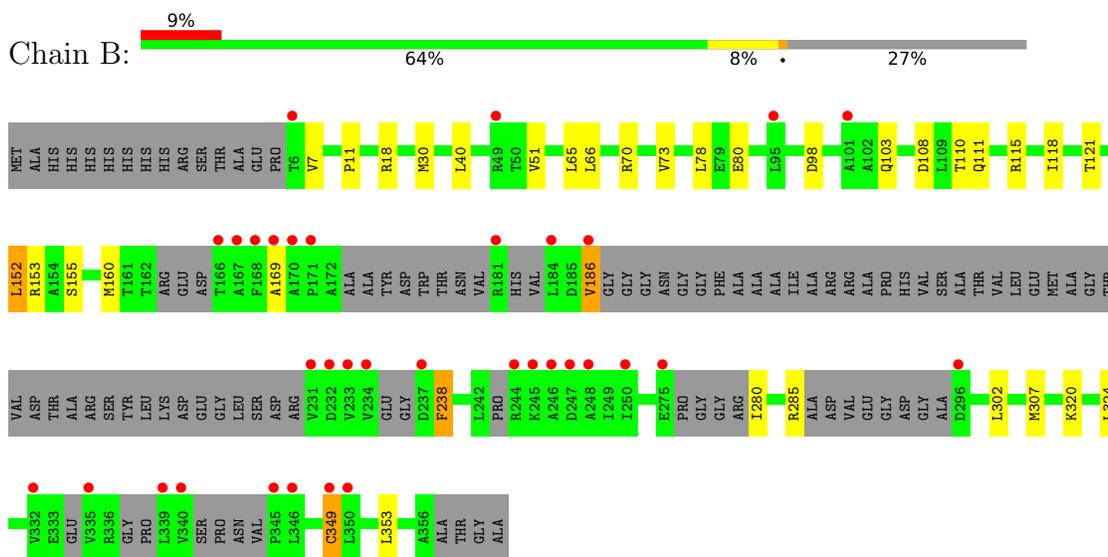| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	51	Total 51	O 51	0	0
4	B	40	Total 40	O 40	0	0
4	C	61	Total 61	O 61	0	0
4	D	71	Total 71	O 71	0	0

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3 Residue-property plots ⓘ

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: Carminomycin 4-O-methyltransferase DnrK,Methyltransferase domain-containing protein,Aclacinomycin 10-hydroxylase RdmB

• Molecule 1: Carminomycin 4-O-methyltransferase DnrK,Methyltransferase domain-containing protein,Aclacinomycin 10-hydroxylase RdmB
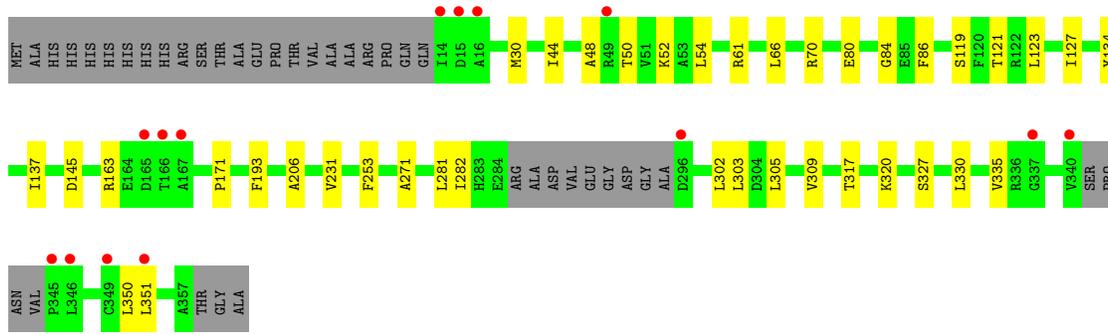

• Molecule 1: Carminomycin 4-O-methyltransferase DnrK,Methyltransferase domain-containing protein,Aclacinomycin 10-hydroxylase RdmB

● Molecule 1: Carminomycin 4-O-methyltransferase DnrK,Methyltransferase domain-containing protein,Aclacinomycin 10-hydroxylase RdmB
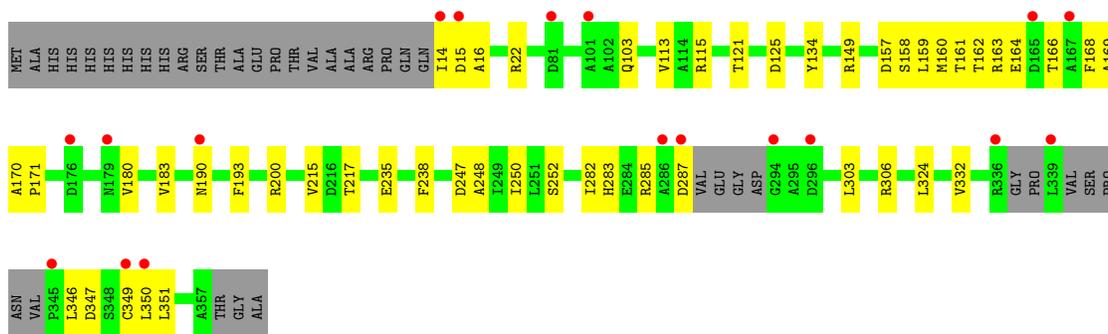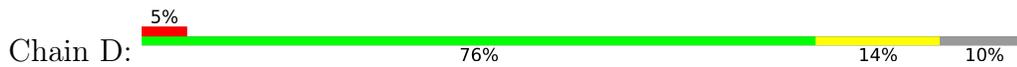
Chain D:

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	60.01Å 102.42Å 122.19Å 90.00° 99.30° 90.00°	Depositor
Resolution (Å)	47.13 – 2.21 47.13 – 2.21	Depositor EDS
% Data completeness (in resolution range)	99.5 (47.13-2.21) 99.5 (47.13-2.21)	Depositor EDS
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.20 (at 2.22Å)	Xtriage
Refinement program	PHENIX 1.19.2_4158, PHENIX 1.19.2_4158	Depositor
R, R_{free}	0.235 , 0.274 0.237 , 0.273	Depositor DCC
R_{free} test set	1999 reflections (2.75%)	wwPDB-VP
Wilson B-factor (Å^2)	44.6	Xtriage
Anisotropy	0.394	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 46.8	EDS
L-test for twinning[2]	$< |L| > = 0.48, < L^2 > = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	9818	wwPDB-VP
Average B, all atoms (Å^2)	48.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 39.08 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 3.3466e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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[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: SAH, VAK

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	0.31	0/2554	0.53	1/3489 (0.0%)
1	B	0.44	1/1994 (0.1%)	0.63	1/2718 (0.0%)
1	C	0.38	0/2547	0.55	0/3470
1	D	0.44	0/2497	0.58	0/3406
All	All	0.39	1/9592 (0.0%)	0.57	2/13083 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	152	LEU	C-N	5.45	1.41	1.34

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	81	ASP	N-CA-C	6.25	121.13	111.56
1	B	153	ARG	CA-C-O	5.43	126.22	119.97

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	2497	0	2483	27	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	1966	0	1901	26	0
1	C	2488	0	2498	40	0
1	D	2450	0	2431	50	0
2	A	26	0	19	0	0
2	B	26	0	19	1	0
2	C	26	0	19	0	0
2	D	26	0	19	0	0
3	B	30	0	20	1	0
3	C	30	0	19	22	0
3	D	30	0	18	20	0
4	A	51	0	0	3	0
4	B	40	0	0	4	0
4	C	61	0	0	0	0
4	D	71	0	0	5	0
All	All	9818	0	9446	140	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 7.

All (140) 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:303:LEU:HD22	3:C:402:VAK:C22	1.41	1.48
1:D:346:LEU:HD22	3:D:402:VAK:C22	1.67	1.22
1:C:303:LEU:HD22	3:C:402:VAK:H22B	1.18	1.12
1:C:303:LEU:CD2	3:C:402:VAK:C22	2.27	1.11
1:D:346:LEU:HD22	3:D:402:VAK:H22	1.11	1.07
1:D:306:ARG:NH1	3:D:402:VAK:H15B	1.70	1.06
1:D:306:ARG:HH11	3:D:402:VAK:H15B	0.94	1.05
1:D:346:LEU:CD2	3:D:402:VAK:C22	2.38	1.02
1:D:346:LEU:CD2	3:D:402:VAK:H22	1.92	0.99
1:D:306:ARG:HH11	3:D:402:VAK:C15	1.77	0.98
1:C:303:LEU:HD22	3:C:402:VAK:H22	1.51	0.91
1:C:303:LEU:CD2	3:C:402:VAK:H22	2.02	0.88
1:C:303:LEU:HD22	3:C:402:VAK:H22A	1.56	0.86
1:A:223:LYS:HA	1:A:228:SER:OG	1.77	0.85
1:D:306:ARG:HD2	3:D:402:VAK:H15B	1.60	0.83
1:D:306:ARG:HD2	3:D:402:VAK:C15	2.09	0.81
1:C:302:LEU:HD23	3:C:402:VAK:H15A	1.66	0.77
1:C:163:ARG:HD2	3:C:402:VAK:O22	1.87	0.75
1:D:346:LEU:CD2	3:D:402:VAK:H22B	2.15	0.74

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:302:LEU:HD23	3:C:402:VAK:C15	2.17	0.74
1:B:111:GLN:HB3	1:B:155:SER:OG	1.87	0.74
1:D:14:ILE:HG23	1:D:16:ALA:H	1.56	0.71
1:C:303:LEU:CB	3:C:402:VAK:H22	2.22	0.70
1:C:317:THR:HG23	1:C:320:LYS:H	1.57	0.67
1:D:160:MET:HE3	1:D:163:ARG:HE	1.58	0.67
1:C:303:LEU:HB2	3:C:402:VAK:H22	1.76	0.66
1:D:22:ARG:HD2	4:D:506:HOH:O	1.95	0.66
1:D:163:ARG:HD2	3:D:402:VAK:O22	1.97	0.64
1:C:303:LEU:CD2	3:C:402:VAK:H22B	2.07	0.62
1:A:296:ASP:HB3	1:B:18:ARG:HH22	1.64	0.61
1:D:215:VAL:HG11	1:D:235:GLU:HB2	1.83	0.61
1:D:190:ASN:OD1	1:D:217:THR:OG1	2.20	0.59
1:B:108:ASP:HB3	1:B:111:GLN:HG3	1.84	0.59
1:C:303:LEU:HB2	3:C:402:VAK:C22	2.34	0.58
1:A:206:ALA:HB3	1:A:231:VAL:HG22	1.85	0.58
1:A:268:THR:O	1:A:272:GLU:HG3	2.04	0.58
3:B:402:VAK:H15B	3:B:402:VAK:H22A	1.86	0.57
1:B:307:MET:HA	1:B:307:MET:HE2	1.86	0.56
1:D:346:LEU:CB	3:D:402:VAK:H22B	2.35	0.56
1:D:160:MET:CE	1:D:163:ARG:HE	2.18	0.56
3:D:402:VAK:O16	3:D:402:VAK:H13A	2.05	0.56
1:C:163:ARG:CD	3:C:402:VAK:O22	2.54	0.56
1:A:121:THR:HA	1:B:30:MET:HE2	1.88	0.55
1:D:346:LEU:HB3	3:D:402:VAK:H22B	1.89	0.55
1:D:149:ARG:HD3	4:D:502:HOH:O	2.06	0.54
1:C:163:ARG:CG	3:C:402:VAK:O22	2.56	0.54
1:D:285:ARG:HD2	1:D:347:ASP:O	2.07	0.54
1:B:108:ASP:OD1	1:B:110:THR:OG1	2.22	0.54
1:A:342:PRO:HD3	1:B:7:VAL:HG22	1.89	0.54
1:C:163:ARG:HD2	3:C:402:VAK:O21	2.09	0.53
1:A:282:ILE:HB	1:A:351:LEU:HB2	1.93	0.51
1:A:221:TYR:O	1:A:225:GLU:HG2	2.11	0.51
1:A:25:SER:OG	1:A:27:HIS:ND1	2.43	0.51
1:D:113:VAL:HG23	1:D:159:LEU:HD13	1.93	0.51
1:D:346:LEU:HD23	3:D:402:VAK:H22B	1.92	0.50
1:D:168:PHE:C	1:D:171:PRO:HD2	2.37	0.50
1:D:303:LEU:HA	3:D:402:VAK:H15	1.93	0.50
3:C:402:VAK:C15	3:C:402:VAK:H13	2.41	0.50
1:D:285:ARG:HG2	1:D:285:ARG:HH11	1.77	0.50
1:C:302:LEU:HD23	3:C:402:VAK:H15	1.94	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:80:GLU:CB	4:B:507:HOH:O	2.61	0.49
1:A:20:LEU:HD23	1:B:103:GLN:HG3	1.95	0.49
1:C:305:LEU:O	1:C:309:VAL:HG22	2.13	0.49
1:B:320:LYS:HA	1:B:320:LYS:HD2	1.63	0.48
3:D:402:VAK:H15A	3:D:402:VAK:C11	2.43	0.48
1:B:111:GLN:HB2	4:B:512:HOH:O	2.12	0.48
1:B:160:MET:HA	1:B:160:MET:HE2	1.94	0.48
1:D:22:ARG:CD	4:D:506:HOH:O	2.58	0.47
1:C:206:ALA:HB3	1:C:231:VAL:HG22	1.96	0.47
1:A:121:THR:HG21	1:B:121:THR:HG21	1.96	0.47
1:A:177:TRP:CZ2	1:A:197:ILE:HG12	2.49	0.47
1:A:261:HIS:O	1:A:265:ARG:HD3	2.15	0.47
1:C:44:ILE:HG13	1:C:54:LEU:HD21	1.97	0.47
1:C:163:ARG:HD2	3:C:402:VAK:C6	2.45	0.47
1:A:94:LEU:HD22	1:A:99:HIS:NE2	2.30	0.47
1:B:80:GLU:HB3	4:B:507:HOH:O	2.14	0.46
1:B:285:ARG:HA	1:B:349:CYS:SG	2.55	0.46
1:C:66:LEU:O	1:C:70:ARG:HG2	2.16	0.46
1:D:22:ARG:NE	4:D:506:HOH:O	2.47	0.46
1:D:115:ARG:NH1	1:D:134:TYR:OH	2.48	0.46
1:D:164:GLU:HB3	1:D:168:PHE:H	1.80	0.46
1:C:335:VAL:HG22	1:C:351:LEU:HG	1.98	0.45
1:A:344:VAL:HG12	1:A:346:LEU:H	1.80	0.45
1:C:80:GLU:HG3	1:C:86:PHE:CE1	2.51	0.45
1:A:251:LEU:HD13	1:A:255:LEU:HD21	1.99	0.45
1:B:111:GLN:OE1	1:B:155:SER:OG	2.29	0.45
1:D:306:ARG:CD	3:D:402:VAK:H15B	2.37	0.45
1:D:200:ARG:HH11	1:D:200:ARG:HG3	1.82	0.45
1:D:14:ILE:HG12	1:D:15:ASP:H	1.82	0.44
1:B:11:PRO:HG2	1:D:332:VAL:O	2.18	0.44
1:B:40:LEU:HD11	1:B:65:LEU:HD11	1.98	0.44
1:D:158:SER:O	1:D:162:THR:HG23	2.17	0.44
3:C:402:VAK:H13	3:C:402:VAK:H15B	1.99	0.44
1:C:44:ILE:HA	1:C:48:ALA:O	2.17	0.44
1:A:296:ASP:HA	1:A:299:PHE:HD1	1.84	0.43
1:B:118:ILE:O	1:B:121:THR:OG1	2.32	0.43
1:A:82:ALA:HB3	1:A:85:GLU:HG3	2.00	0.43
1:D:170:ALA:HB3	1:D:171:PRO:HD3	2.00	0.43
1:A:181:ARG:HB2	1:A:247:ASP:OD2	2.19	0.43
1:C:171[B]:PRO:HB2	1:C:193:PHE:CZ	2.53	0.43
1:B:51:VAL:HG23	4:B:511:HOH:O	2.18	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:401:SAH:HN1	2:B:401:SAH:HG2	1.69	0.43
1:D:282:ILE:HB	1:D:351:LEU:HB2	2.01	0.43
1:C:271:ALA:HB2	1:C:330:LEU:HD21	2.01	0.43
1:D:183:VAL:HG22	1:D:248:ALA:HB3	2.01	0.43
1:C:30:MET:HE2	1:D:121:THR:HA	2.01	0.42
1:D:285:ARG:NH1	1:D:287:ASP:HA	2.34	0.42
1:A:199:ARG:NH2	4:A:502:HOH:O	2.37	0.42
1:C:134:TYR:OH	1:C:145:ASP:OD2	2.36	0.42
1:D:157:ASP:O	1:D:161:THR:HG23	2.19	0.42
1:D:180:VAL:HG13	1:D:247:ASP:HB2	2.01	0.42
1:D:252:SER:HA	1:D:283:HIS:HB3	2.02	0.42
1:C:282:ILE:HB	1:C:351:LEU:HB2	2.01	0.42
1:A:357:ALA:N	4:A:506:HOH:O	2.51	0.42
1:A:335:VAL:HG22	1:A:351:LEU:HG	2.01	0.42
1:B:66:LEU:O	1:B:70:ARG:HG2	2.20	0.42
1:C:44:ILE:HG12	1:C:54:LEU:HD11	2.01	0.42
1:D:125:ASP:OD1	1:D:125:ASP:N	2.52	0.41
1:A:27:HIS:ND1	1:B:302:LEU:HD13	2.35	0.41
1:A:158:SER:O	1:A:162:THR:HG23	2.21	0.41
1:C:50:THR:HA	1:C:84:GLY:O	2.20	0.41
1:B:73:VAL:HA	1:B:78:LEU:O	2.21	0.41
1:C:121:THR:HG21	1:D:121:THR:HG21	2.02	0.41
1:C:253:PHE:CD2	3:C:402:VAK:O21	2.74	0.41
1:D:103:GLN:HB2	4:D:503:HOH:O	2.21	0.41
1:D:346:LEU:CB	3:D:402:VAK:C22	2.98	0.41
1:C:119:SER:HA	1:C:137:ILE:HD12	2.02	0.41
1:A:164:GLU:OE1	1:A:341:SER:OG	2.28	0.41
1:C:123:LEU:O	1:C:127:ILE:HG12	2.21	0.41
1:A:111:GLN:OE1	1:A:155[A]:SER:HB2	2.21	0.41
1:B:115:ARG:HD3	1:B:152:LEU:HD11	2.03	0.41
1:B:280:ILE:O	1:B:353:LEU:N	2.32	0.41
1:C:52:LYS:N	1:C:52:LYS:HD3	2.36	0.40
1:D:166:THR:HB	1:D:169:ALA:HB3	2.03	0.40
1:C:163:ARG:HD2	3:C:402:VAK:HO22	1.84	0.40
1:D:346:LEU:HD23	3:D:402:VAK:C22	2.40	0.40
1:A:103:GLN:HB2	4:A:510:HOH:O	2.21	0.40
1:C:281:LEU:HB3	1:C:350:LEU:HD11	2.03	0.40
1:B:186:VAL:HG23	1:B:238:PHE:CD2	2.56	0.40
1:D:193:PHE:CD2	1:D:250:ILE:HG21	2.57	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	331/368 (90%)	322 (97%)	9 (3%)	0	100	100
1	B	248/368 (67%)	239 (96%)	8 (3%)	1 (0%)	30	33
1	C	326/368 (89%)	319 (98%)	7 (2%)	0	100	100
1	D	324/368 (88%)	317 (98%)	7 (2%)	0	100	100
All	All	1229/1472 (84%)	1197 (97%)	31 (2%)	1 (0%)	48	56

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	169	ALA

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	251/288 (87%)	245 (98%)	6 (2%)	44	56
1	B	186/288 (65%)	181 (97%)	5 (3%)	40	51
1	C	250/288 (87%)	248 (99%)	2 (1%)	79	87
1	D	239/288 (83%)	235 (98%)	4 (2%)	56	69
All	All	926/1152 (80%)	909 (98%)	17 (2%)	54	67

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	26	LEU
1	A	66	LEU
1	A	166	THR
1	A	238	PHE
1	A	250	ILE
1	A	340	VAL
1	B	98	ASP
1	B	186	VAL
1	B	238	PHE
1	B	324	LEU
1	B	349	CYS
1	C	61	ARG
1	C	327	SER
1	D	238	PHE
1	D	324	LEU
1	D	349	CYS
1	D	350	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	12	GLN
1	C	179	ASN

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 ⓘ

7 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	SAH	D	401	-	24,28,28	1.27	2 (8%)	25,40,40	1.70	5 (20%)
3	VAK	B	402	-	32,33,33	2.47	8 (25%)	44,52,52	1.24	4 (9%)
3	VAK	D	402	-	32,33,33	2.46	7 (21%)	44,52,52	1.61	5 (11%)
2	SAH	B	401	-	24,28,28	0.98	1 (4%)	25,40,40	1.39	3 (12%)
2	SAH	C	401	-	24,28,28	1.09	3 (12%)	25,40,40	1.93	7 (28%)
2	SAH	A	401	-	24,28,28	1.19	3 (12%)	25,40,40	1.67	5 (20%)
3	VAK	C	402	-	32,33,33	2.40	8 (25%)	44,52,52	1.76	7 (15%)

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	SAH	D	401	-	-	0/11/31/31	0/3/3/3
3	VAK	B	402	-	-	2/9/44/44	0/4/4/4
3	VAK	D	402	-	-	3/9/44/44	0/4/4/4
2	SAH	B	401	-	-	4/11/31/31	0/3/3/3
2	SAH	C	401	-	-	2/11/31/31	0/3/3/3
2	SAH	A	401	-	-	1/11/31/31	0/3/3/3
3	VAK	C	402	-	-	7/9/44/44	0/4/4/4

All (32) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	402	VAK	C20-C19	7.07	1.49	1.40
3	B	402	VAK	C20-C19	6.57	1.49	1.40
3	C	402	VAK	C20-C19	6.32	1.48	1.40
3	D	402	VAK	O16-C14	5.78	1.47	1.33
3	B	402	VAK	O16-C14	5.63	1.46	1.33
3	C	402	VAK	O16-C14	5.48	1.46	1.33
3	C	402	VAK	C18-C17	5.19	1.49	1.41

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	402	VAK	C18-C17	5.14	1.48	1.41
3	D	402	VAK	C18-C17	5.02	1.48	1.41
3	D	402	VAK	C21-C16	4.92	1.48	1.41
3	C	402	VAK	C21-C16	4.85	1.48	1.41
3	B	402	VAK	C21-C16	4.72	1.48	1.41
3	B	402	VAK	C6-C20	4.51	1.48	1.40
3	D	402	VAK	C16-C4	4.37	1.48	1.41
3	D	402	VAK	C6-C20	4.23	1.47	1.40
3	B	402	VAK	C16-C4	4.22	1.48	1.41
3	C	402	VAK	C16-C4	4.19	1.48	1.41
2	D	401	SAH	C2-N3	4.01	1.38	1.32
3	C	402	VAK	C6-C20	3.71	1.46	1.40
2	A	401	SAH	C2-N3	3.64	1.38	1.32
2	C	401	SAH	C2-N3	3.39	1.37	1.32
3	B	402	VAK	C17-C6	3.39	1.48	1.41
3	C	402	VAK	C19-C10	-3.29	1.47	1.51
3	D	402	VAK	C17-C6	3.28	1.47	1.41
3	C	402	VAK	C17-C6	3.15	1.47	1.41
3	B	402	VAK	C19-C10	-3.09	1.47	1.51
2	A	401	SAH	C2-N1	2.53	1.38	1.33
2	B	401	SAH	C5-C4	2.28	1.47	1.40
2	D	401	SAH	C2-N1	2.27	1.38	1.33
2	A	401	SAH	OXT-C	-2.11	1.23	1.30
2	C	401	SAH	C2-N1	2.10	1.37	1.33
2	C	401	SAH	OXT-C	-2.09	1.23	1.30

All (36) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	402	VAK	O16-C14-C10	5.98	124.34	110.86
3	C	402	VAK	C22-C13-C9	5.95	124.59	115.20
2	A	401	SAH	N3-C2-N1	-5.18	120.58	128.68
3	C	402	VAK	O16-C14-C10	5.05	122.26	110.86
2	D	401	SAH	N3-C2-N1	-5.00	120.86	128.68
2	C	401	SAH	N3-C2-N1	-4.38	121.83	128.68
3	D	402	VAK	C15-O16-C14	4.01	125.01	115.94
2	C	401	SAH	C5'-SD-CG	-3.93	90.48	102.27
3	B	402	VAK	O16-C14-C10	3.83	119.51	110.86
3	D	402	VAK	O16-C14-O17	-3.61	116.78	123.84
2	D	401	SAH	C5'-SD-CG	-3.52	91.70	102.27
3	D	402	VAK	O17-C14-C10	-3.31	118.84	125.06
2	B	401	SAH	N3-C2-N1	-3.21	123.67	128.68

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	401	SAH	OXT-C-O	-3.13	116.97	124.09
3	C	402	VAK	O16-C14-O17	-3.09	117.79	123.84
2	A	401	SAH	C5'-SD-CG	-3.09	93.00	102.27
3	D	402	VAK	C9-C10-C14	-2.95	108.02	112.45
2	C	401	SAH	C4-C5-N7	-2.83	106.45	109.40
2	B	401	SAH	C4-C5-N7	-2.73	106.55	109.40
3	C	402	VAK	O17-C14-C10	-2.72	119.96	125.06
2	C	401	SAH	O4'-C1'-C2'	-2.69	103.00	106.93
2	C	401	SAH	OXT-C-CA	2.67	122.46	113.38
2	A	401	SAH	C4-C5-N7	-2.66	106.62	109.40
2	D	401	SAH	OXT-C-O	-2.63	118.12	124.09
2	C	401	SAH	O4'-C4'-C5'	2.54	115.37	108.83
3	B	402	VAK	O17-C14-C10	-2.54	120.29	125.06
3	B	402	VAK	C15-O16-C14	2.33	121.20	115.94
2	A	401	SAH	OXT-C-O	-2.31	118.85	124.09
2	A	401	SAH	OXT-C-CA	2.30	121.23	113.38
2	B	401	SAH	OXT-C-CA	2.26	121.10	113.38
3	C	402	VAK	C6-C17-C5	-2.21	116.74	120.45
2	D	401	SAH	C4-C5-N7	-2.20	107.11	109.40
3	C	402	VAK	C11-C19-C20	2.19	122.58	119.46
2	D	401	SAH	OXT-C-CA	2.17	120.77	113.38
3	B	402	VAK	C22-C13-C9	-2.16	111.80	115.20
3	C	402	VAK	C11-C18-C12	2.05	122.69	119.13

There are no chirality outliers.

All (19) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	402	VAK	C10-C14-O16-C15
3	C	402	VAK	C22-C13-C9-C10
3	C	402	VAK	C22-C13-C9-O23
3	D	402	VAK	C10-C14-O16-C15
3	C	402	VAK	O17-C14-O16-C15
3	C	402	VAK	C10-C14-O16-C15
3	B	402	VAK	O17-C14-O16-C15
3	D	402	VAK	O17-C14-O16-C15
2	B	401	SAH	C-CA-CB-CG
3	C	402	VAK	C22-C13-C9-C8
2	B	401	SAH	N-CA-CB-CG
3	C	402	VAK	C9-C10-C14-O16
3	C	402	VAK	C9-C10-C14-O17
2	C	401	SAH	CB-CG-SD-C5'

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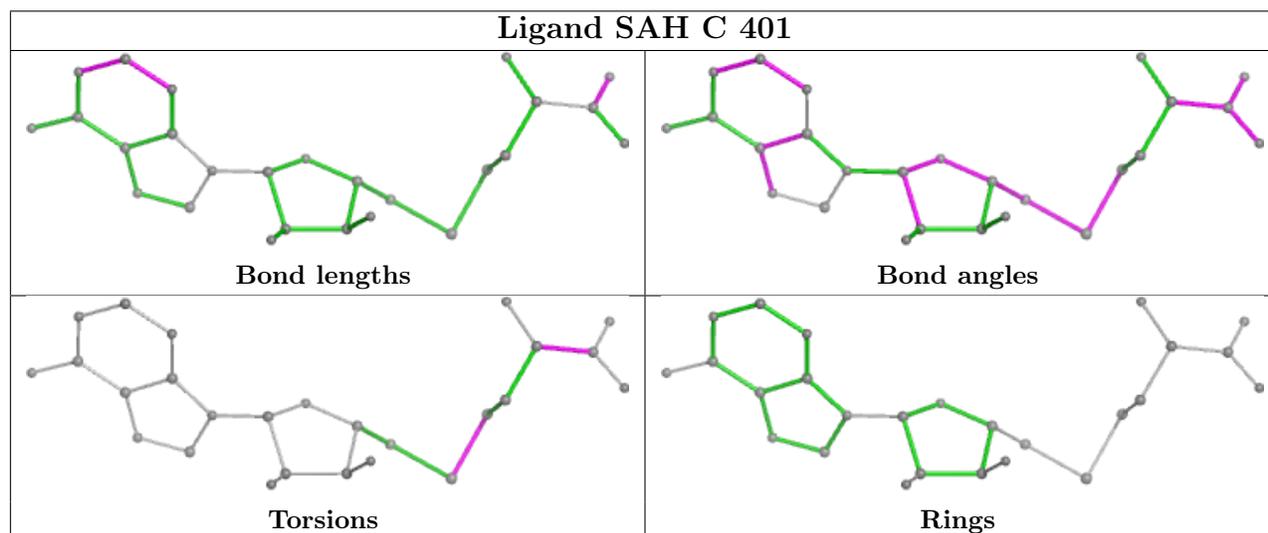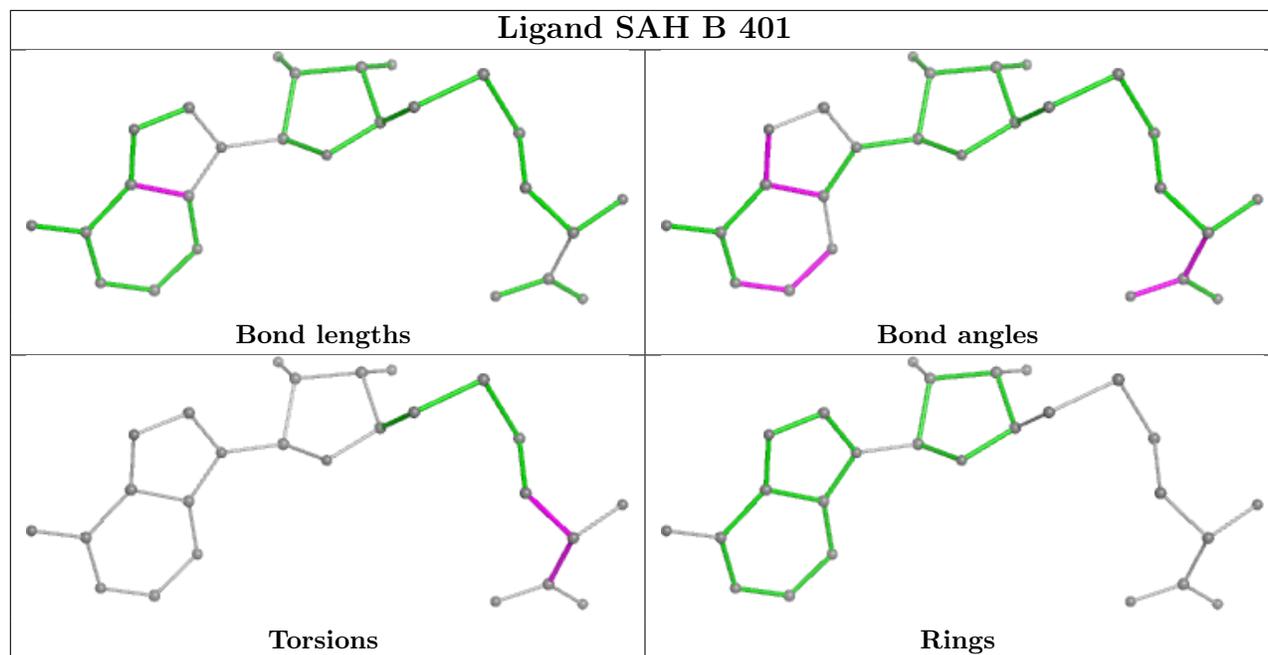| Mol	Chain	Res	Type	Atoms
2	C	401	SAH	O-C-CA-N
2	B	401	SAH	OXT-C-CA-CB
2	A	401	SAH	CB-CG-SD-C5'
2	B	401	SAH	O-C-CA-CB
3	D	402	VAK	C9-C10-C14-O17

There are no ring outliers.

4 monomers are involved in 44 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	402	VAK	1	0
3	D	402	VAK	20	0
2	B	401	SAH	1	0
3	C	402	VAK	22	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 SAH D 401

Bond lengths　　　Bond angles

Torsions　　　Rings

Ligand VAK B 402

Bond lengths

Bond angles

Torsions

Rings

Ligand VAK D 402

Bond lengths

Bond angles

Torsions

Rings

Ligand SAH B 401

Bond lengths

Bond angles

Torsions

Rings

Ligand SAH C 401

Bond lengths

Bond angles

Torsions

Rings

Ligand SAH A 401

Bond lengths

Bond angles

Torsions

Rings

Ligand VAK C 402

Bond lengths

Bond angles

Torsions

Rings
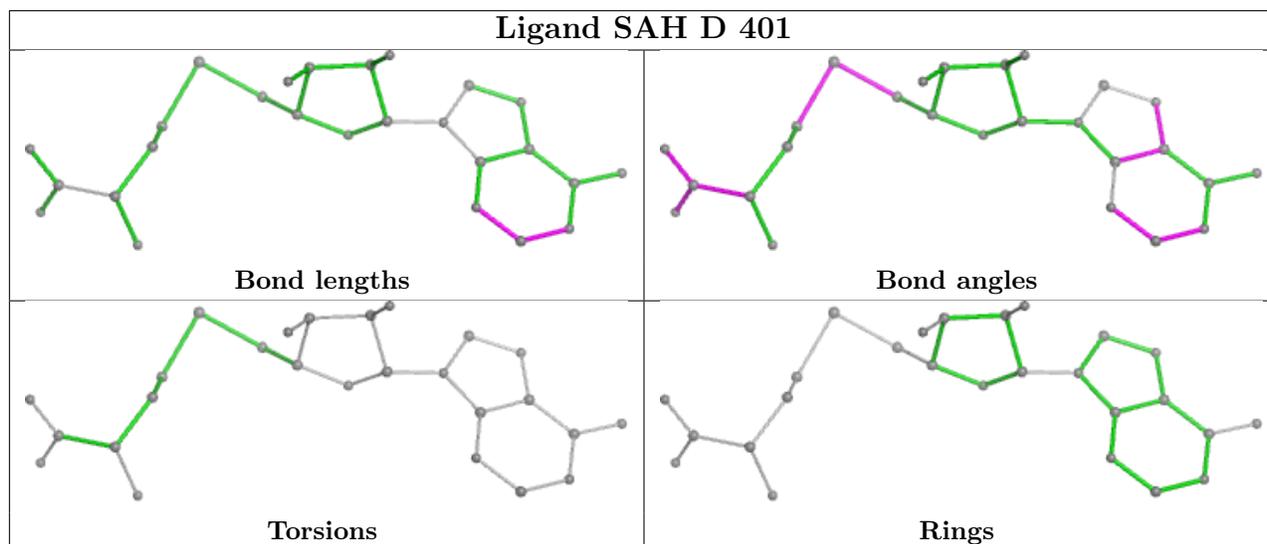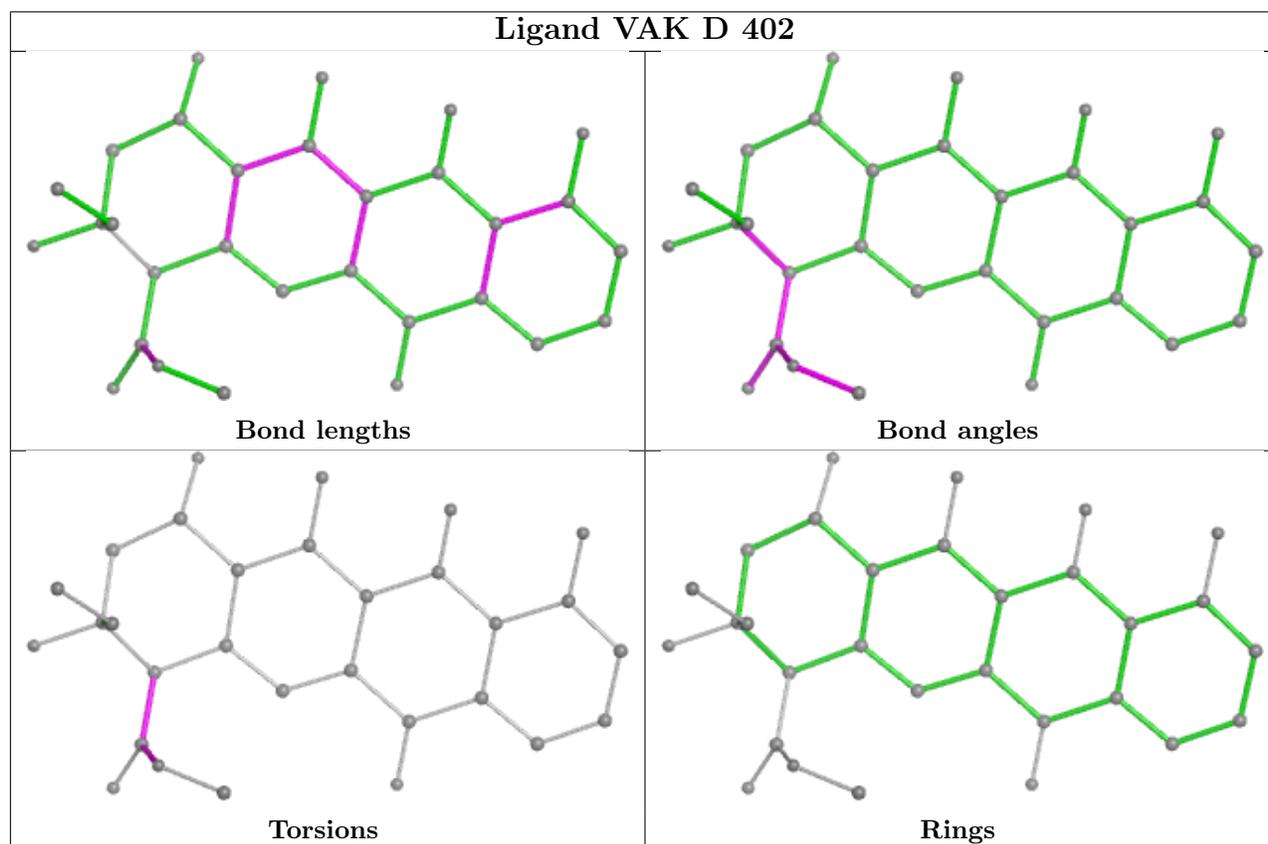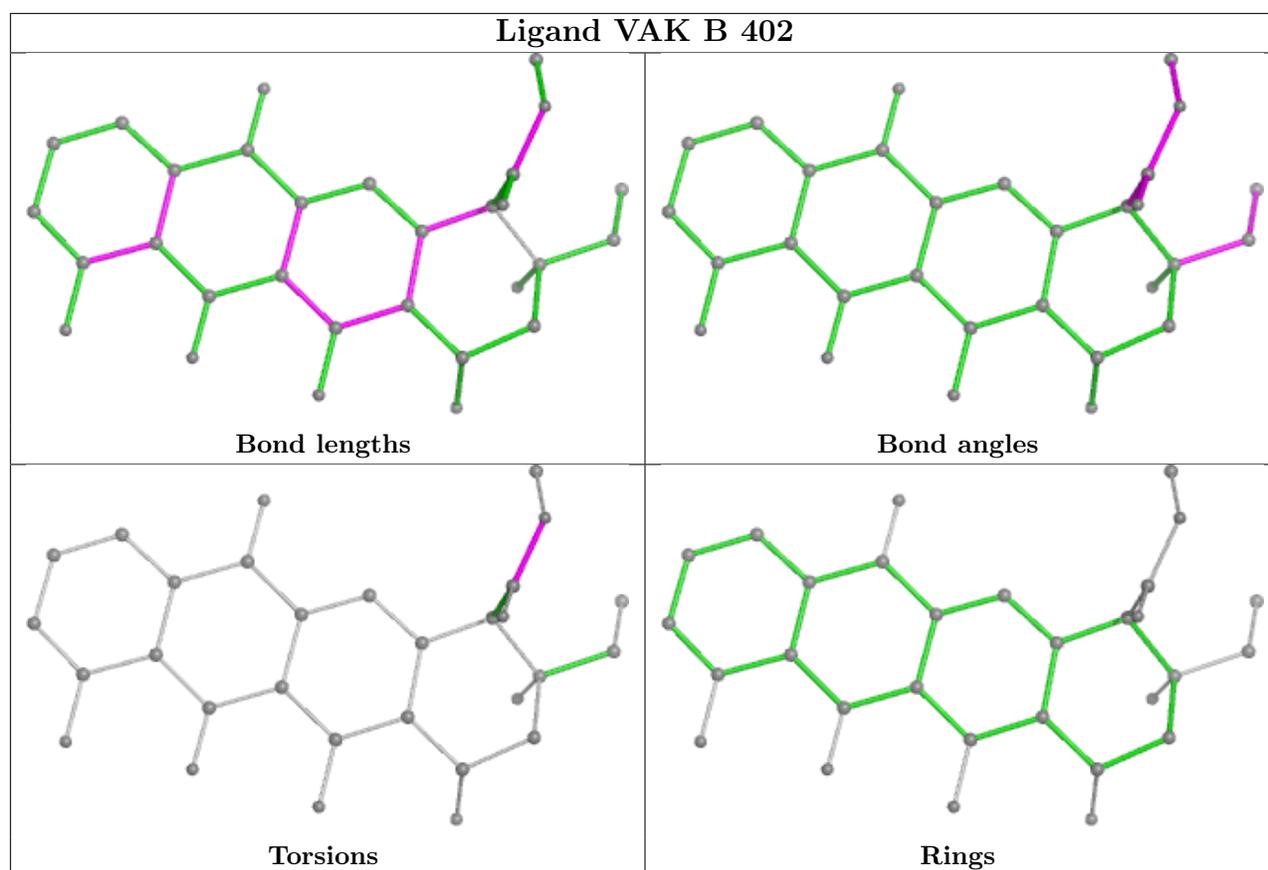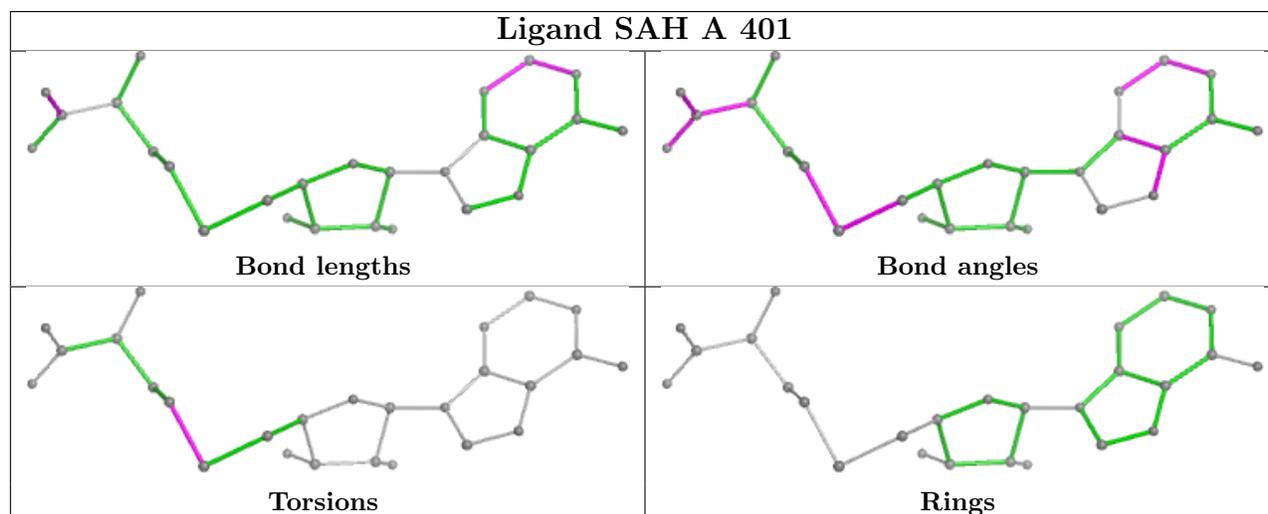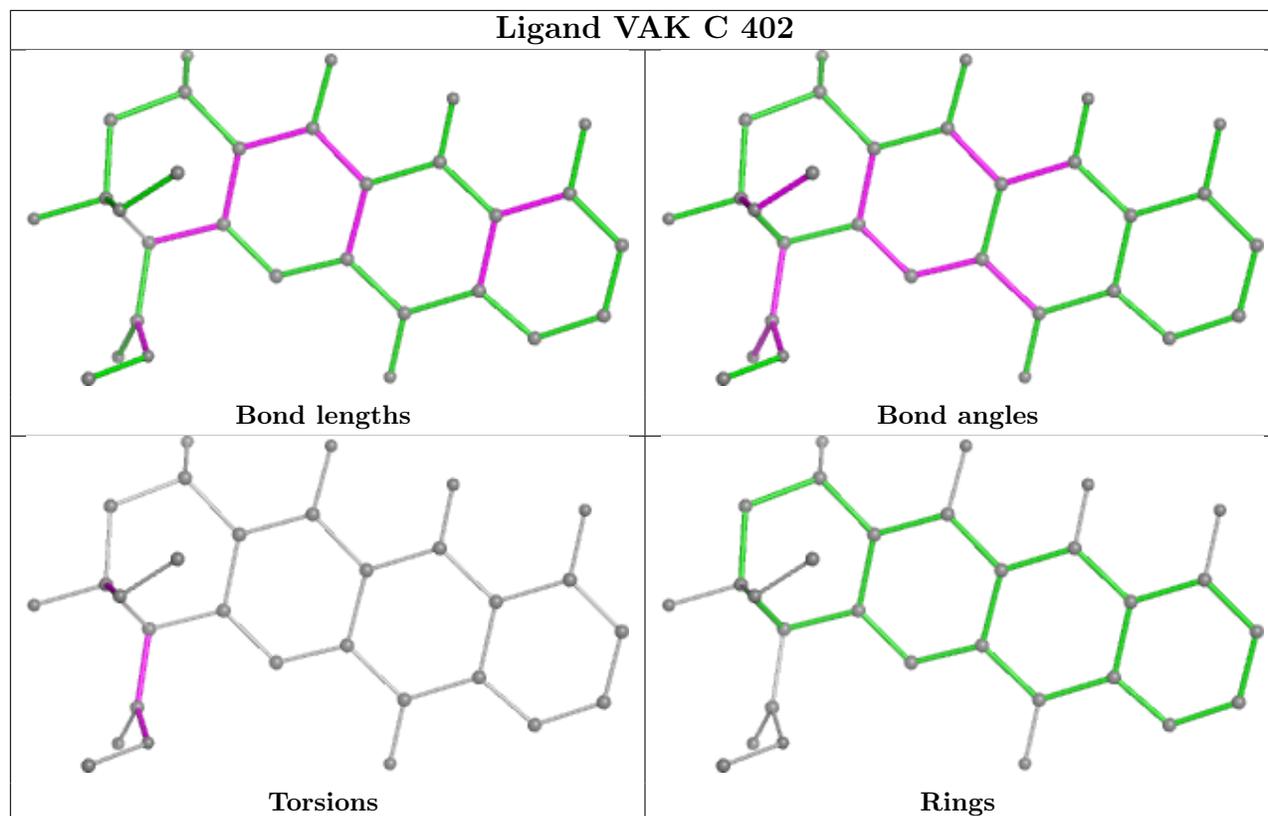
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	A	333/368 (90%)	0.30	12 (3%)	46	43	30, 50, 71, 81	2 (0%)
1	B	270/368 (73%)	0.77	34 (12%)	9	7	28, 55, 71, 85	1 (0%)
1	C	329/368 (89%)	0.21	14 (4%)	40	37	25, 43, 65, 76	3 (0%)
1	D	331/368 (89%)	0.25	18 (5%)	32	29	31, 43, 63, 80	0
All	All	1263/1472 (85%)	0.36	78 (6%)	28	25	25, 47, 69, 85	6 (0%)

All (78) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	349	CYS	4.5
1	D	14	ILE	4.2
1	B	166	THR	4.1
1	C	337	GLY	3.9
1	A	337	GLY	3.9
1	B	170	ALA	3.9
1	B	171	PRO	3.8
1	D	286	ALA	3.7
1	B	340	VAL	3.7
1	B	349	CYS	3.7
1	A	349	CYS	3.6
1	B	181	ARG	3.6
1	B	234	VAL	3.5
1	D	101	ALA	3.5
1	B	169	ALA	3.4
1	C	14	ILE	3.4
1	B	275	GLU	3.4
1	B	339	LEU	3.3
1	A	15	ASP	3.3
1	A	163	ARG	3.3
1	B	184	LEU	3.3

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Mol	Chain	Res	Type	RSRZ
1	B	49	ARG	3.2
1	D	345	PRO	3.2
1	A	167	ALA	3.2
1	A	165	ASP	3.1
1	B	296	ASP	3.1
1	A	342	PRO	3.1
1	B	168	PHE	3.0
1	B	232	ASP	3.0
1	D	81	ASP	3.0
1	B	245	LYS	2.9
1	B	247	ASP	2.9
1	D	165	ASP	2.8
1	C	345	PRO	2.8
1	C	166	THR	2.8
1	B	237	ASP	2.8
1	B	167	ALA	2.7
1	B	246	ALA	2.7
1	C	165	ASP	2.7
1	D	167	ALA	2.7
1	D	176	ASP	2.6
1	B	350	LEU	2.5
1	B	186	VAL	2.5
1	A	166	THR	2.5
1	B	244	ARG	2.5
1	D	349	CYS	2.4
1	B	101	ALA	2.4
1	A	16	ALA	2.4
1	D	287	ASP	2.4
1	B	233	VAL	2.4
1	A	162	THR	2.4
1	B	6	THR	2.4
1	C	296	ASP	2.4
1	D	350	LEU	2.4
1	B	231	VAL	2.3
1	B	248	ALA	2.3
1	D	179	ASN	2.3
1	B	346	LEU	2.3
1	C	346	LEU	2.3
1	C	167	ALA	2.3
1	B	332	VAL	2.3
1	A	22	ARG	2.3
1	D	296	ASP	2.3

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Mol	Chain	Res	Type	RSRZ
1	D	339	LEU	2.2
1	B	345	PRO	2.2
1	D	336	ARG	2.2
1	B	335	VAL	2.2
1	C	340	VAL	2.2
1	D	294	GLY	2.1
1	C	15	ASP	2.1
1	D	15	ASP	2.1
1	B	95	LEU	2.1
1	C	351	LEU	2.1
1	A	357	ALA	2.1
1	C	49	ARG	2.1
1	B	250	ILE	2.0
1	C	16	ALA	2.0
1	D	190	ASN	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, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	VAK	C	402	30/30	0.67	0.19	12,23,43,49	30
3	VAK	D	402	30/30	0.68	0.18	13,26,47,54	30
2	SAH	B	401	26/26	0.74	0.15	59,71,79,81	0
3	VAK	B	402	30/30	0.76	0.18	49,61,76,76	30
2	SAH	C	401	26/26	0.94	0.08	29,37,42,44	0
2	SAH	A	401	26/26	0.94	0.08	35,41,46,47	0
2	SAH	D	401	26/26	0.96	0.06	29,35,40,43	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 VAK C 402:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
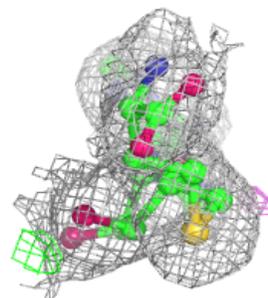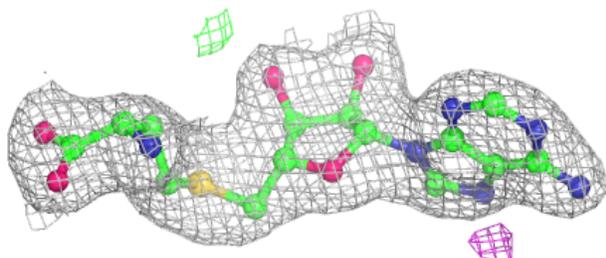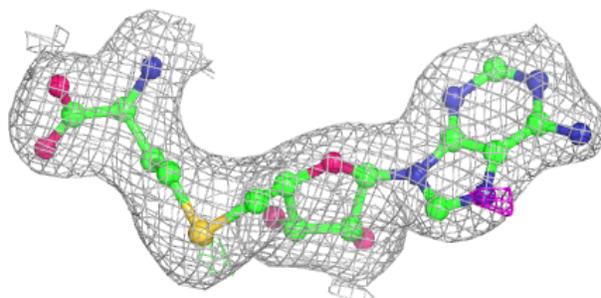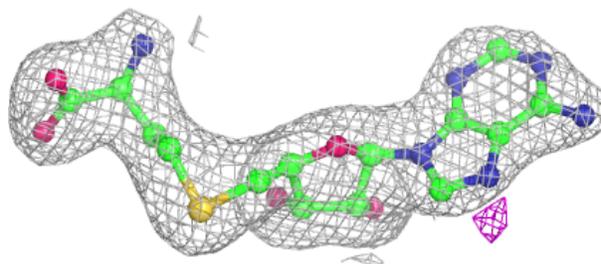mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)
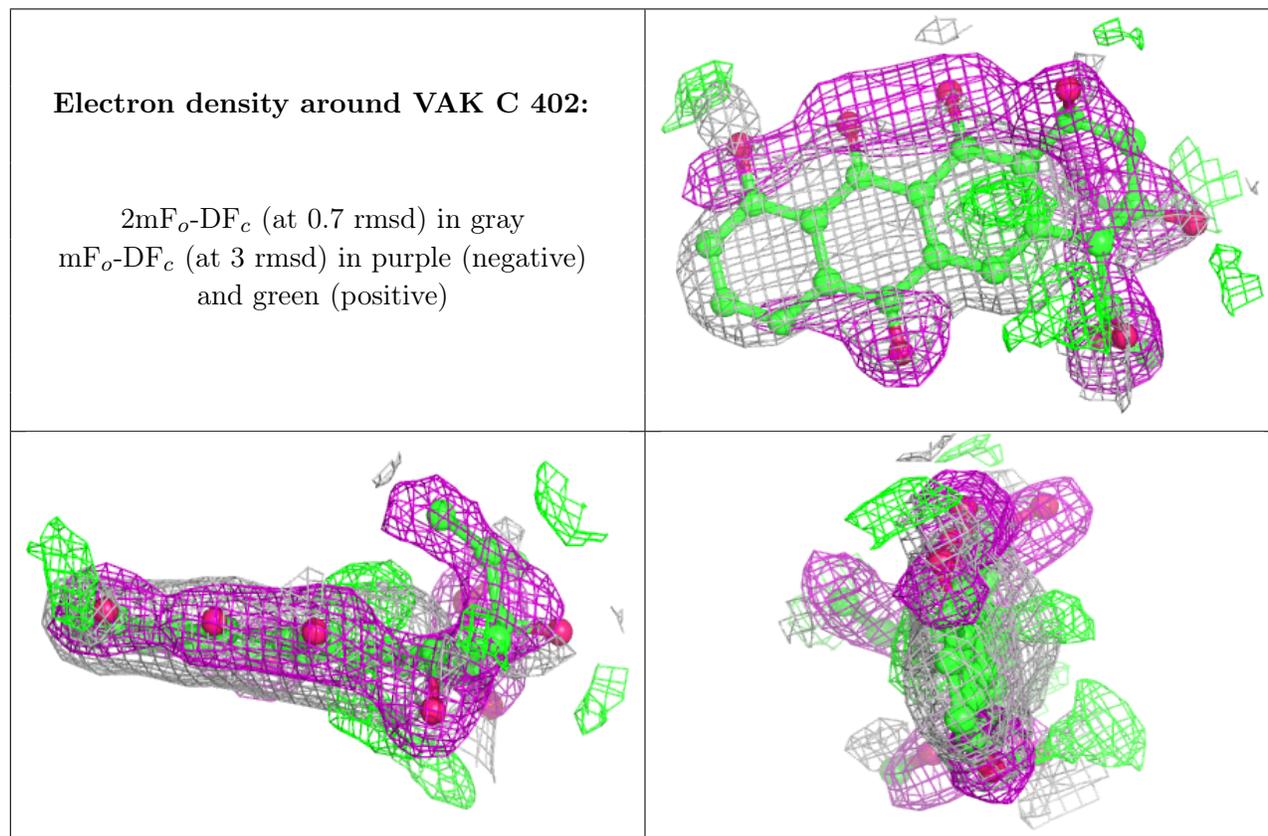
Electron density around VAK D 402:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
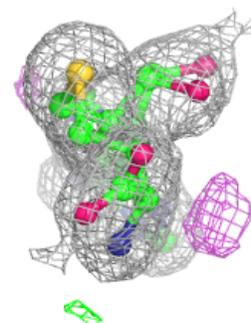mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
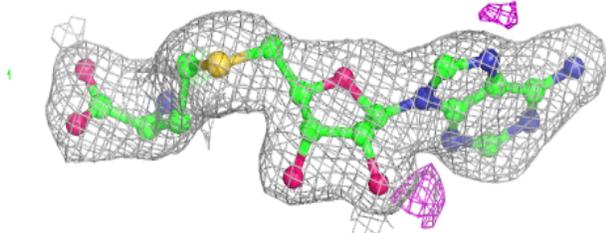and green (positive)
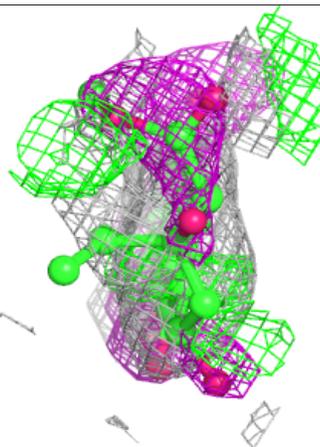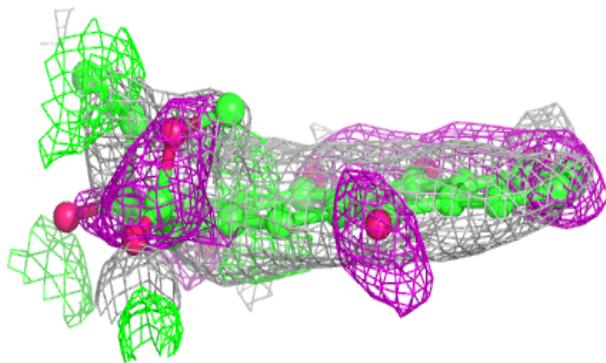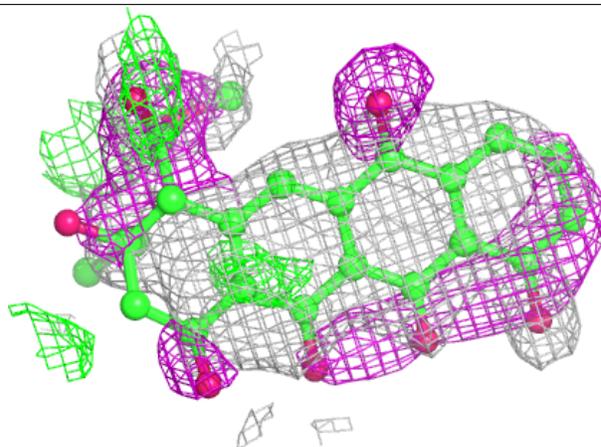
Electron density around SAH B 401:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)
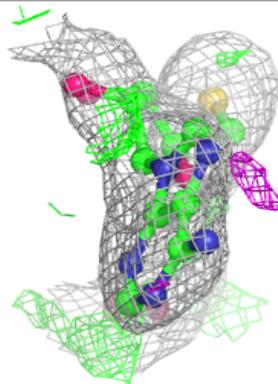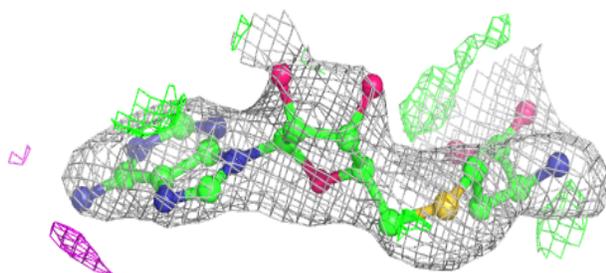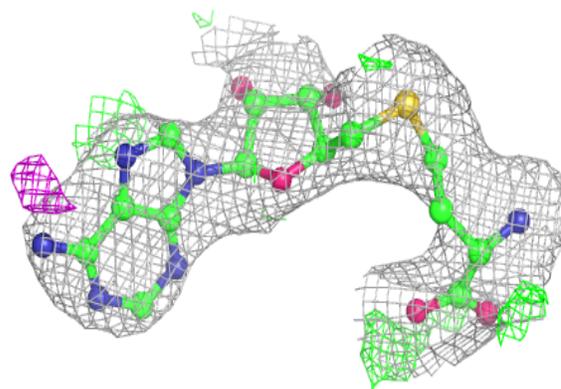
Electron density around VAK B 402:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
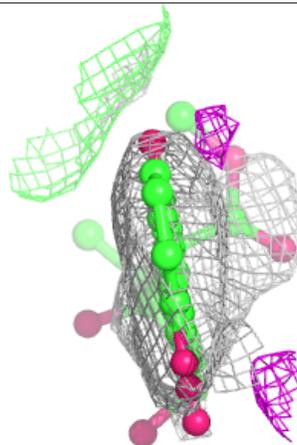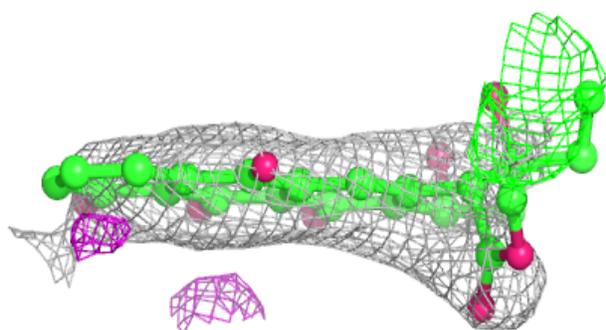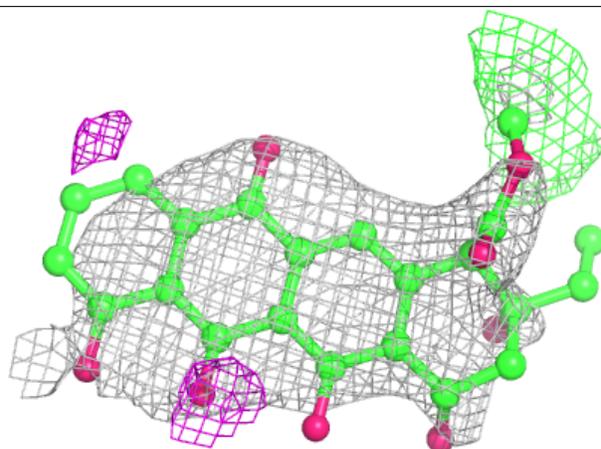
Electron density around SAH C 401:

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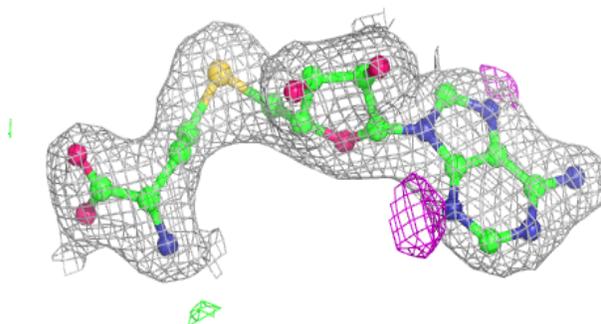$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around SAH A 401:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
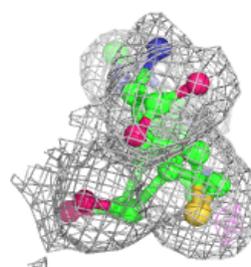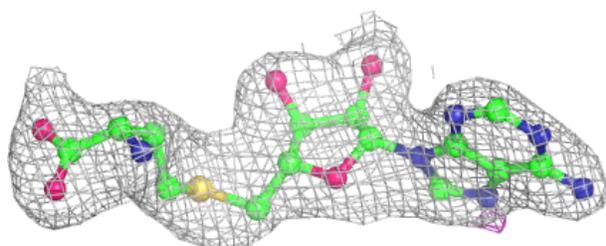
Electron density around SAH D 401:

$2mF_o-DF_c$ (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.