Full wwPDB X-ray Structure Validation Report (i)

Feb 15, 2023 – 04:06 PM EST

PDB ID	:	7UF8
Title	:	Structure of CtdP in complex with penicimutamide E and NADP+
Authors	:	Rivera, S.; Liu, Z.; Newmister, S.A.; Gao, X.; Sherman, D.H.
Deposited on	:	2022-03-22
Resolution	:	2.50 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:

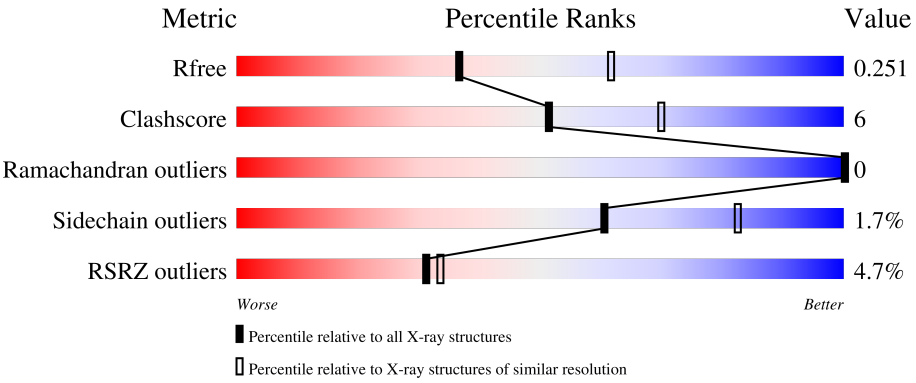
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.32.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.32.1

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 2.50 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}	130704	4661 (2.50-2.50)
Clashscore	141614	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)
RSRZ outliers	127900	4559 (2.50-2.50)

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	348	4% 84% 13% ·
1	B	348	5% 83% 14% ·
1	C	348	7% 81% 11% · 7%
1	D	348	2% 77% 15% · 8%

2 Entry composition

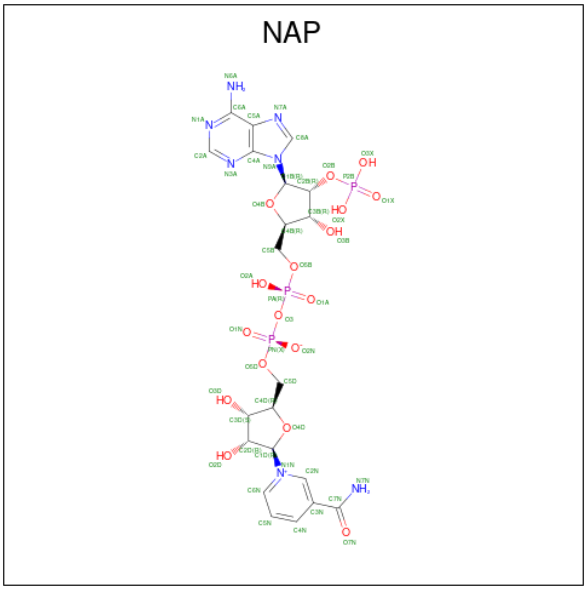
There are 5 unique types of molecules in this entry. The entry contains 20962 atoms, of which 10199 are hydrogens and 0 are deuteriums.

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 CtdP.

Mol	Chain	Residues	Atoms							ZeroOcc	AltConf	Trace
1	A	341	Total	C	H	N	O	S	Se	0	0	0
			5250	1700	2580	460	501	5	4			
1	B	336	Total	C	H	N	O	S	Se	0	0	0
			5180	1680	2546	449	496	5	4			
1	C	325	Total	C	H	N	O	S	Se	0	0	0
			5008	1628	2457	434	480	5	4			
1	D	321	Total	C	H	N	O	S	Se	0	0	0
			4947	1610	2429	427	472	5	4			

- Molecule 2 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NAP) (formula: $C_{21}H_{28}N_7O_{17}P_3$) (labeled as "Ligand of Interest" by depositor).



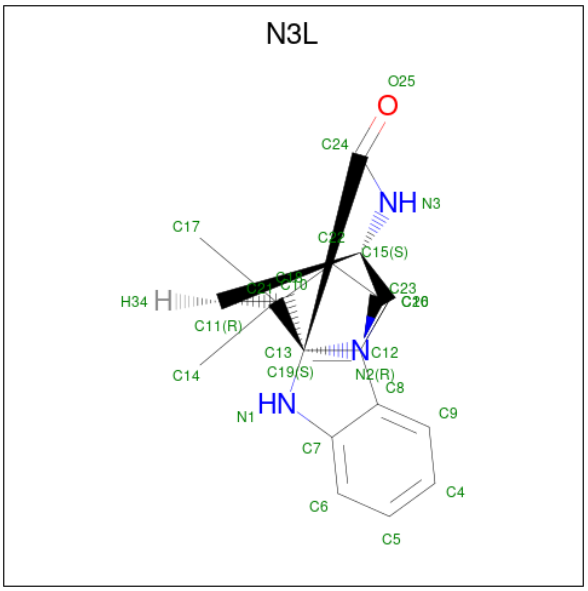
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total	C	H	N	O	P	0	0
			73	21	25	7	17	3		
2	B	1	Total	C	H	N	O	P	0	0
			73	21	25	7	17	3		

Continued on next page...

Continued from previous page...

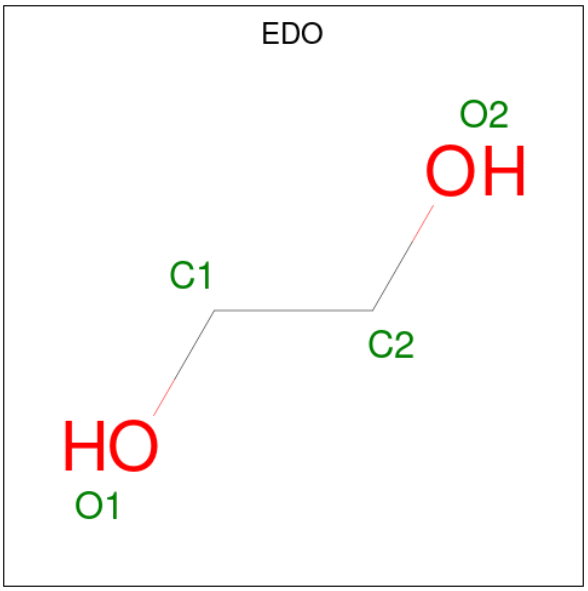
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	C	1	Total	C	H	N	O	P	0	0
			73	21	25	7	17	3		
2	D	1	Total	C	H	N	O	P	0	0
			73	21	25	7	17	3		

- Molecule 3 is Penicimutamide E (three-letter code: N3L) (formula: $C_{21}H_{25}N_3O$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	H	N	O	0	0
			50	21	25	3	1		
3	B	1	Total	C	H	N	O	0	0
			50	21	25	3	1		
3	D	1	Total	C	H	N	O	0	0
			50	21	25	3	1		

- Molecule 4 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: $C_2H_6O_2$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	1	Total C H O 10 2 6 2	0	0
4	C	1	Total C H O 10 2 6 2	0	0

- Molecule 5 is water.

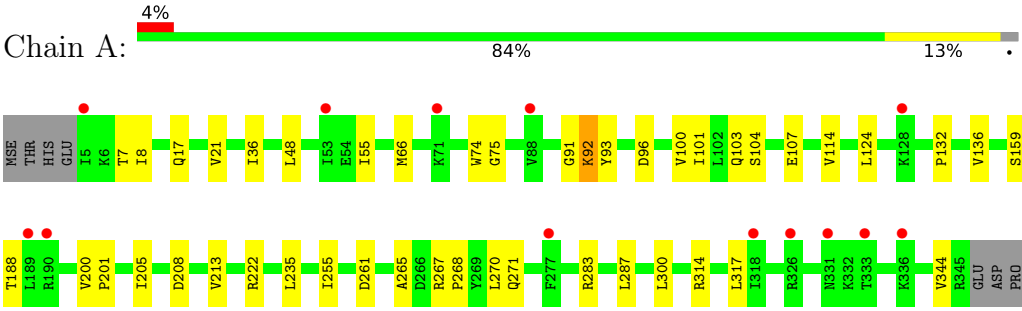
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	13	Total O 13 13	0	0
5	B	44	Total O 44 44	0	0
5	C	16	Total O 16 16	0	0
5	D	42	Total O 42 42	0	0

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.

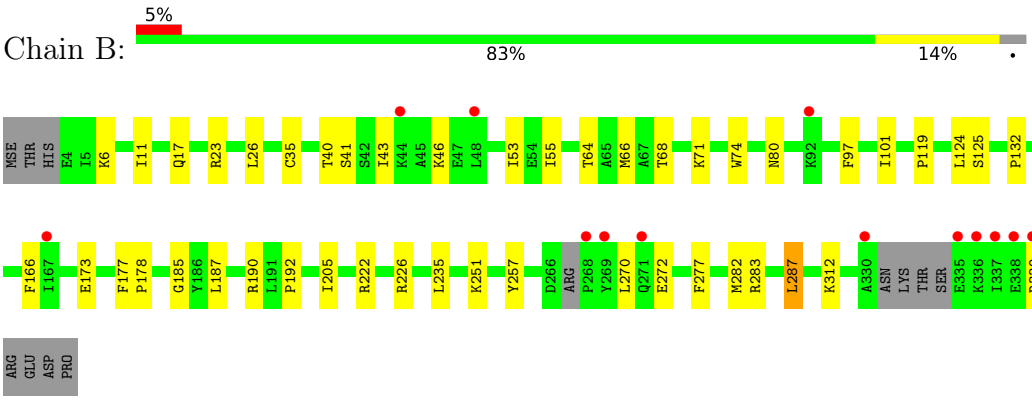
• Molecule 1: CtdP

Chain A:



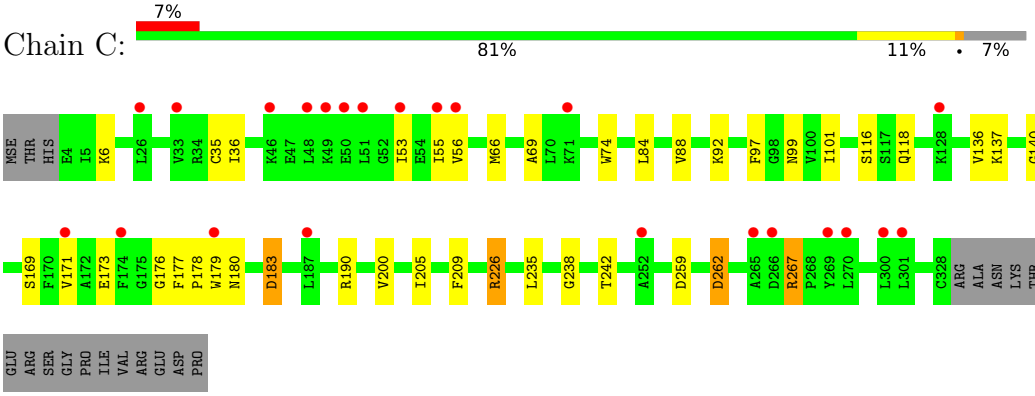
• Molecule 1: CtdP

Chain B:



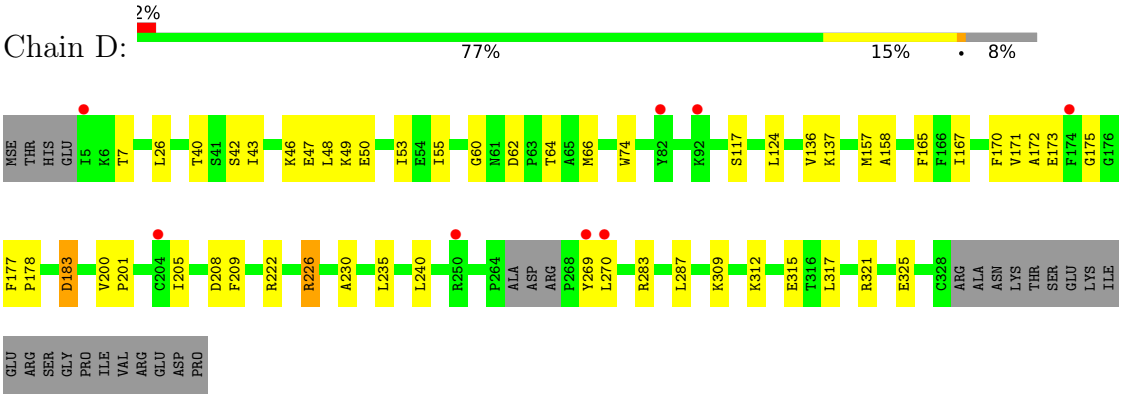
• Molecule 1: CtdP

Chain C:



• Molecule 1: CtdP

Chain D:


2%
77%
15%
8%
MSE THR HIS GLU I5 K6 T7 L26 T40 S41 S42 I43 K46 E47 L48 K49 E50 I53 E54 I55 G60 N61 D62 P63 T64 A65 M66 W74 Y82 K92 S117 L124 V136 K137 M157 A158 F165 F166 I167 F170 V171 A172 E173 F174 G175 G176
F177 P178 D183 V200 P201 C204 I205 D208 F209 R222 R226 A230 L235 L240 R250 P264 ALA ASP ARG P268 Y269 L270 R283 L287 K309 K312 E315 T316 L317 R321 E325 C328 ARG ALA ASN LYS THR SER GLU LYS ILE
GLU ARG SER GLY PRO ILE VAL ARG GLU ASP PRO

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 61 2 2	Depositor
Cell constants a, b, c, α, β, γ	166.76Å 166.76Å 195.38Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	48.36 – 2.50 48.36 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.6 (48.36-2.50) 99.8 (48.36-2.50)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.43 (at 2.51Å)	Xtriage
Refinement program	PHENIX 1.19.2_4158	Depositor
R, R_{free}	0.224 , 0.258 0.219 , 0.251	Depositor DCC
R_{free} test set	2000 reflections (3.58%)	wwPDB-VP
Wilson B-factor (Å^2)	59.9	Xtriage
Anisotropy	0.543	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 42.4	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	20962	wwPDB-VP
Average B, all atoms (Å^2)	80.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.66% 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: NAP, EDO, N3L

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	0.45	0/2735	0.62	0/3705
1	B	0.33	0/2697	0.55	0/3650
1	C	0.46	0/2615	0.59	0/3544
1	D	0.35	0/2581	0.58	0/3496
All	All	0.40	0/10628	0.59	0/14395

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	2670	2580	2582	32	0
1	B	2634	2546	2545	29	1
1	C	2551	2457	2457	24	0
1	D	2518	2429	2429	36	0
2	A	48	25	25	0	0
2	B	48	25	25	0	0
2	C	48	25	25	0	0
2	D	48	25	25	0	0
3	A	25	25	0	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	25	25	0	0	0
3	D	25	25	0	0	0
4	B	4	6	6	0	0
4	C	4	6	6	0	0
5	A	13	0	0	0	0
5	B	44	0	0	0	0
5	C	16	0	0	0	0
5	D	42	0	0	0	0
All	All	10763	10199	10125	117	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 (117) 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:43:ILE:HD12	1:B:43:ILE:H	1.40	0.87
1:C:55:ILE:HD12	1:C:55:ILE:O	1.81	0.80
1:A:36:ILE:HG21	1:A:66:MSE:HE1	1.68	0.75
1:B:124:LEU:HD23	1:B:283:ARG:CZ	2.27	0.65
1:A:132:PRO:O	1:A:136:VAL:HG12	1.96	0.65
1:D:173:GLU:HA	1:D:269:TYR:CD2	2.33	0.64
1:D:173:GLU:HA	1:D:269:TYR:HD2	1.62	0.63
1:A:265:ALA:HB1	1:A:271:GLN:HG3	1.79	0.63
1:C:36:ILE:HG21	1:C:66:MSE:HE1	1.80	0.62
1:D:309:LYS:O	1:D:312:LYS:HG3	1.99	0.62
1:C:99:ASN:OD1	1:C:140:GLY:HA3	2.00	0.62
1:C:97:PHE:O	1:C:101:ILE:HG13	2.01	0.61
1:D:40:THR:HG22	1:D:55:ILE:HG22	1.83	0.59
1:A:124:LEU:HD23	1:A:283:ARG:CZ	2.33	0.59
1:B:35:CYS:HB2	1:B:55:ILE:HD13	1.84	0.58
1:A:66:MSE:HG2	1:A:101:ILE:HG12	1.86	0.58
1:B:64:THR:O	1:B:68:THR:HG23	2.04	0.58
1:D:205:ILE:HD12	1:D:209:PHE:CB	2.34	0.57
1:A:7:THR:O	1:A:74:TRP:N	2.37	0.57
1:B:23:ARG:HG3	1:B:23:ARG:HH11	1.69	0.57
1:B:226:ARG:HB2	1:D:283:ARG:HH22	1.70	0.57
1:B:17:GLN:HA	1:B:205:ILE:HD11	1.88	0.56
1:C:176:GLY:HA3	1:C:180:ASN:O	2.06	0.56
1:A:161:TYR:CE1	1:A:205:ILE:HD13	2.42	0.55
1:C:84:LEU:HD13	1:C:88:VAL:HG12	1.88	0.55

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:166:PHE:HB2	1:B:339:ARG:HD3	1.90	0.54
1:A:265:ALA:O	1:A:271:GLN:NE2	2.41	0.54
1:C:99:ASN:OD1	1:C:140:GLY:CA	2.56	0.54
1:D:205:ILE:HD12	1:D:209:PHE:HB3	1.90	0.54
1:A:92:LYS:N	1:A:92:LYS:HD2	2.24	0.53
1:A:48:LEU:HB2	1:A:55:ILE:HD11	1.90	0.53
1:A:104:SER:O	1:A:107:GLU:HB2	2.09	0.53
1:A:265:ALA:HB1	1:A:271:GLN:CG	2.39	0.52
1:C:169:SER:O	1:C:173:GLU:HG2	2.10	0.52
1:B:132:PRO:O	1:B:136:VAL:HG12	2.10	0.51
1:A:92:LYS:HD2	1:A:92:LYS:H	1.76	0.51
1:A:96:ASP:O	1:A:100:VAL:HG23	2.10	0.51
1:B:287:LEU:H	1:B:287:LEU:HD23	1.76	0.51
1:D:60:GLY:HA2	1:D:66:MSE:HE3	1.93	0.51
1:A:188:THR:HG23	1:A:255:ILE:HD12	1.93	0.51
1:A:104:SER:HA	1:A:107:GLU:HB2	1.91	0.50
1:A:283:ARG:NH2	1:C:226:ARG:HB2	2.26	0.50
1:C:205:ILE:HD12	1:C:209:PHE:HB2	1.92	0.50
1:D:124:LEU:HD23	1:D:283:ARG:CZ	2.42	0.50
1:A:173:GLU:HG3	1:A:270:LEU:HD21	1.92	0.50
1:B:35:CYS:SG	1:B:53:ILE:HG21	2.52	0.49
1:C:200:VAL:HB	1:C:235:LEU:O	2.12	0.49
1:A:36:ILE:HD12	1:A:66:MSE:HE1	1.95	0.49
1:B:125:SER:CB	1:B:282:MSE:HE1	2.43	0.48
1:A:314:ARG:NH2	1:D:315:GLU:OE2	2.46	0.48
1:B:41:SER:HA	1:B:46:LYS:HE3	1.93	0.48
1:D:208:ASP:HB3	1:D:317:LEU:HD23	1.95	0.48
1:A:159:SER:OG	1:A:201:PRO:HB2	2.14	0.48
1:C:118:GLN:C	1:C:157:MSE:HE2	2.35	0.47
1:D:62:ASP:OD1	1:D:64:THR:HG22	2.14	0.47
1:D:183:ASP:N	1:D:183:ASP:OD1	2.47	0.47
1:A:17:GLN:O	1:A:21:VAL:HG23	2.15	0.47
1:D:321:ARG:O	1:D:325:GLU:HG3	2.15	0.47
1:D:270:LEU:N	1:D:270:LEU:HD12	2.30	0.47
1:B:43:ILE:H	1:B:43:ILE:CD1	2.15	0.46
1:A:267:ARG:HB3	1:A:268:PRO:HD2	1.96	0.46
1:D:40:THR:HG22	1:D:55:ILE:CG2	2.45	0.46
1:C:35:CYS:SG	1:C:53:ILE:HG21	2.55	0.46
1:D:46:LYS:O	1:D:50:GLU:HG2	2.15	0.46
1:A:8:ILE:HA	1:A:75:GLY:O	2.16	0.46
1:D:49:LYS:HG3	1:D:55:ILE:HD12	1.97	0.46

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:6:LYS:HG2	1:C:74:TRP:CG	2.51	0.46
1:D:42:SER:O	1:D:46:LYS:HG2	2.16	0.46
1:B:11:ILE:HD12	1:B:101:ILE:HD13	1.99	0.45
1:D:7:THR:O	1:D:74:TRP:N	2.47	0.45
1:C:163:GLN:OE1	1:C:163:GLN:N	2.41	0.45
1:D:165:PHE:HZ	1:D:240:LEU:HD21	1.82	0.45
1:B:190:ARG:HD2	1:B:257:TYR:OH	2.18	0.44
1:B:40:THR:HG22	1:B:55:ILE:HG22	2.00	0.44
1:A:270:LEU:HD21	1:A:344:VAL:HG11	1.99	0.44
1:C:183:ASP:OD1	1:C:183:ASP:N	2.50	0.44
1:C:238:GLY:O	1:C:242:THR:HG23	2.18	0.44
1:B:6:LYS:HD3	1:B:74:TRP:CE2	2.53	0.44
1:D:172:ALA:O	1:D:269:TYR:HE2	2.01	0.44
1:A:200:VAL:HB	1:A:235:LEU:O	2.18	0.43
1:D:158:ALA:HA	1:D:230:ALA:HB3	1.98	0.43
1:C:173:GLU:OE1	1:C:267:ARG:HB3	2.18	0.43
1:B:185:GLY:O	1:B:251:LYS:HE3	2.18	0.43
1:D:177:PHE:HA	1:D:178:PRO:HA	1.79	0.43
1:C:56:VAL:HG11	1:C:69:ALA:HB1	2.01	0.43
1:C:177:PHE:HA	1:C:178:PRO:HA	1.78	0.43
1:D:43:ILE:O	1:D:47:GLU:HG3	2.18	0.43
1:B:66:MSE:HG2	1:B:101:ILE:HG12	2.00	0.43
1:D:48:LEU:HB2	1:D:55:ILE:HD11	2.01	0.43
1:D:167:ILE:HG22	1:D:170:PHE:H	1.84	0.43
1:B:136:VAL:HG13	1:B:137:LYS:N	2.34	0.42
1:B:177:PHE:HA	1:B:178:PRO:HA	1.80	0.42
1:D:117:SER:O	1:D:157:MSE:HG2	2.19	0.42
1:D:201:PRO:HG3	1:D:287:LEU:HD21	1.99	0.42
1:C:171:VAL:HG21	1:C:179:TRP:HD1	1.84	0.42
1:A:208:ASP:HB3	1:A:317:LEU:HD23	2.01	0.42
1:B:192:PRO:HG2	1:B:277:PHE:CD2	2.55	0.42
1:C:136:VAL:HG13	1:C:137:LYS:N	2.34	0.41
1:A:91:GLY:O	1:A:93:TYR:N	2.50	0.41
1:B:80:ASN:HA	1:B:97:PHE:CZ	2.55	0.41
1:B:173:GLU:HG2	1:B:270:LEU:HD21	2.01	0.41
1:B:178:PRO:C	1:B:187:LEU:HD22	2.40	0.41
1:C:259:ASP:HB3	1:C:262:ASP:HB2	2.02	0.41
1:D:171:VAL:O	1:D:175:GLY:O	2.38	0.41
1:B:132:PRO:HD2	1:B:272:GLU:OE2	2.20	0.41
1:A:103:GLN:O	1:A:107:GLU:HG2	2.19	0.41
1:D:136:VAL:HG13	1:D:137:LYS:N	2.36	0.41

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:118:GLN:CA	1:C:157:MSE:HE2	2.51	0.41
1:B:119:PRO:HG3	1:B:287:LEU:O	2.20	0.41
1:A:17:GLN:HG2	1:A:205:ILE:HD11	2.02	0.41
1:D:170:PHE:CD1	1:D:170:PHE:C	2.94	0.41
1:D:200:VAL:HB	1:D:235:LEU:O	2.20	0.41
1:D:26:LEU:HD22	1:D:53:ILE:HD11	2.04	0.40
1:A:114:VAL:HG11	1:A:213:VAL:HG13	2.02	0.40
1:B:283:ARG:NH2	1:D:226:ARG:HB2	2.36	0.40
1:A:124:LEU:HD23	1:A:283:ARG:NH2	2.36	0.40
1:D:205:ILE:HD12	1:D:209:PHE:HB2	2.03	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:B:26:LEU:O	1:B:312:LYS:HZ3[10_665]	1.56	0.04

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	339/348 (97%)	329 (97%)	10 (3%)	0	100	100
1	B	330/348 (95%)	324 (98%)	6 (2%)	0	100	100
1	C	323/348 (93%)	319 (99%)	4 (1%)	0	100	100
1	D	317/348 (91%)	311 (98%)	6 (2%)	0	100	100
All	All	1309/1392 (94%)	1283 (98%)	26 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains (i)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	279/283 (99%)	274 (98%)	5 (2%)	59	81
1	B	276/283 (98%)	272 (99%)	4 (1%)	67	86
1	C	267/283 (94%)	260 (97%)	7 (3%)	46	72
1	D	264/283 (93%)	261 (99%)	3 (1%)	73	89
All	All	1086/1132 (96%)	1067 (98%)	19 (2%)	60	82

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	92	LYS
1	A	222	ARG
1	A	261	ASP
1	A	287	LEU
1	A	300	LEU
1	B	71	LYS
1	B	222	ARG
1	B	235	LEU
1	B	287	LEU
1	C	92	LYS
1	C	116	SER
1	C	183	ASP
1	C	190	ARG
1	C	226	ARG
1	C	262	ASP
1	C	267	ARG
1	D	183	ASP
1	D	222	ARG
1	D	226	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	271	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 monosaccharides in this entry.

5.6 Ligand geometry (i)

9 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	NAP	C	401	-	45,52,52	0.81	1 (2%)	56,80,80	1.27	5 (8%)
2	NAP	A	402	-	45,52,52	0.78	1 (2%)	56,80,80	1.28	4 (7%)
3	N3L	B	403	-	26,30,30	2.88	9 (34%)	30,51,51	2.15	8 (26%)
4	EDO	C	402	-	3,3,3	0.50	0	2,2,2	0.34	0
4	EDO	B	402	-	3,3,3	0.47	0	2,2,2	0.24	0
3	N3L	D	402	-	26,30,30	2.70	11 (42%)	30,51,51	2.38	11 (36%)
2	NAP	B	401	-	45,52,52	0.88	1 (2%)	56,80,80	1.65	7 (12%)
2	NAP	D	401	-	45,52,52	0.84	2 (4%)	56,80,80	1.18	4 (7%)
3	N3L	A	403	-	26,30,30	2.72	10 (38%)	30,51,51	2.24	10 (33%)

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	NAP	C	401	-	-	12/31/67/67	0/5/5/5
2	NAP	A	402	-	-	8/31/67/67	0/5/5/5
4	EDO	C	402	-	-	0/1/1/1	-
4	EDO	B	402	-	-	0/1/1/1	-
2	NAP	B	401	-	-	9/31/67/67	0/5/5/5
2	NAP	D	401	-	-	9/31/67/67	0/5/5/5

All (35) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	403	N3L	C20-C15	7.73	1.63	1.53
3	B	403	N3L	C24-N3	7.14	1.42	1.34
3	D	402	N3L	C24-N3	6.82	1.42	1.34
3	A	403	N3L	C24-N3	6.26	1.41	1.34
3	A	403	N3L	C20-C15	5.78	1.61	1.53
3	D	402	N3L	C20-C15	5.57	1.60	1.53
3	D	402	N3L	C18-C19	5.14	1.59	1.54
3	B	403	N3L	C18-C11	4.48	1.62	1.54
3	A	403	N3L	C18-C19	4.39	1.59	1.54
3	A	403	N3L	C17-C10	4.19	1.62	1.54
3	A	403	N3L	C18-C11	4.11	1.62	1.54
2	B	401	NAP	C2N-N1N	4.03	1.39	1.35
3	A	403	N3L	C16-C12	-3.94	1.46	1.51
3	D	402	N3L	C10-C11	3.68	1.62	1.56
3	D	402	N3L	C18-C11	3.52	1.61	1.54
3	B	403	N3L	C10-C11	3.49	1.61	1.56
3	D	402	N3L	C16-C12	-3.46	1.46	1.51
3	B	403	N3L	C15-C11	3.38	1.60	1.55
3	B	403	N3L	C14-C10	3.33	1.60	1.54
3	B	403	N3L	C16-C12	-3.19	1.46	1.51
3	D	402	N3L	C14-C10	3.10	1.60	1.54
3	A	403	N3L	C23-N2	3.04	1.51	1.47
2	D	401	NAP	C2N-N1N	2.96	1.38	1.35
3	A	403	N3L	C14-C10	2.88	1.59	1.54
2	C	401	NAP	C2N-N1N	2.87	1.38	1.35
3	B	403	N3L	C17-C10	2.85	1.59	1.54
3	B	403	N3L	C18-C19	2.71	1.57	1.54
3	D	402	N3L	C21-C22	2.64	1.61	1.52
3	A	403	N3L	C21-C22	2.48	1.60	1.52
2	A	402	NAP	C2N-N1N	2.45	1.37	1.35

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	402	N3L	C23-N2	2.37	1.50	1.47
3	D	402	N3L	C15-N3	2.30	1.50	1.47
3	D	402	N3L	C9-C8	-2.13	1.37	1.42
3	A	403	N3L	C15-N3	2.11	1.50	1.47
2	D	401	NAP	C8A-N7A	-2.04	1.31	1.34

All (49) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	401	NAP	O2B-P2B-O1X	-7.09	82.01	109.39
3	D	402	N3L	C18-C19-N2	6.15	115.19	107.97
2	A	402	NAP	C6N-N1N-C2N	-6.14	116.38	121.97
3	D	402	N3L	C21-C19-N2	-6.13	97.02	104.33
3	A	403	N3L	C21-C19-N2	-6.00	97.19	104.33
2	C	401	NAP	C6N-N1N-C2N	-5.96	116.54	121.97
3	B	403	N3L	C24-C19-N2	5.42	114.92	106.74
2	D	401	NAP	C6N-N1N-C2N	-5.19	117.25	121.97
3	B	403	N3L	C21-C19-C18	5.03	120.47	116.63
2	B	401	NAP	C6N-N1N-C2N	-4.63	117.75	121.97
3	A	403	N3L	C18-C19-N2	4.48	113.24	107.97
2	B	401	NAP	O3X-P2B-O2B	4.37	125.57	105.99
3	A	403	N3L	C21-C19-C18	4.04	119.71	116.63
3	D	402	N3L	C22-C21-C19	3.75	110.12	104.05
3	B	403	N3L	C21-C19-N2	-3.74	99.87	104.33
3	D	402	N3L	C18-C11-C10	3.74	118.02	114.21
3	A	403	N3L	C18-C11-C10	3.40	117.67	114.21
3	D	402	N3L	C18-C19-C24	-3.38	98.73	106.47
3	B	403	N3L	C18-C19-C24	-3.24	99.06	106.47
3	A	403	N3L	C18-C19-C24	-3.21	99.12	106.47
3	D	402	N3L	C21-C19-C18	3.16	119.04	116.63
2	C	401	NAP	O2B-P2B-O1X	-3.10	97.44	109.39
2	C	401	NAP	C3N-C2N-N1N	-3.05	117.44	120.43
3	B	403	N3L	C22-C23-N2	-3.01	99.58	103.95
2	B	401	NAP	C3N-C2N-N1N	-2.85	117.64	120.43
2	B	401	NAP	C5N-C4N-C3N	-2.74	117.10	120.34
3	A	403	N3L	C22-C21-C19	2.71	108.44	104.05
2	A	402	NAP	O2B-C2B-C3B	2.66	121.34	111.68
3	B	403	N3L	C18-C19-N2	-2.64	104.87	107.97
3	D	402	N3L	C15-C16-C12	2.63	115.99	112.03
2	D	401	NAP	C5A-C6A-N6A	2.61	124.32	120.35
2	A	402	NAP	O3X-P2B-O2B	-2.59	94.37	105.99
2	D	401	NAP	C3N-C2N-N1N	-2.57	117.92	120.43

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	401	NAP	C5A-C6A-N6A	2.56	124.25	120.35
3	A	403	N3L	C24-C19-N2	2.52	110.55	106.74
2	C	401	NAP	C5A-C6A-N6A	2.51	124.17	120.35
3	A	403	N3L	C14-C10-C11	2.48	116.65	110.17
3	A	403	N3L	C15-C16-C12	2.47	115.75	112.03
3	D	402	N3L	C14-C10-C11	2.44	116.55	110.17
3	D	402	N3L	C21-C19-C24	2.36	118.78	115.36
3	B	403	N3L	C9-C8-C12	2.36	138.25	134.17
3	D	402	N3L	C17-C10-C14	-2.33	105.96	109.06
3	D	402	N3L	C22-C23-N2	-2.33	100.57	103.95
3	A	403	N3L	C9-C8-C12	2.31	138.16	134.17
2	C	401	NAP	C5N-C4N-C3N	-2.24	117.69	120.34
2	B	401	NAP	O2B-C2B-C3B	-2.11	104.04	111.68
2	A	402	NAP	C5A-C6A-N6A	2.08	123.52	120.35
2	D	401	NAP	O2B-C2B-C1B	2.02	117.36	110.10
3	B	403	N3L	C14-C10-C11	2.01	115.42	110.17

There are no chirality outliers.

All (38) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	402	NAP	C2B-O2B-P2B-O1X
2	A	402	NAP	O4D-C1D-N1N-C2N
2	A	402	NAP	O4D-C1D-N1N-C6N
2	A	402	NAP	C2D-C1D-N1N-C2N
2	A	402	NAP	C2D-C1D-N1N-C6N
2	B	401	NAP	C5D-O5D-PN-O3
2	B	401	NAP	C5D-O5D-PN-O1N
2	B	401	NAP	O4D-C1D-N1N-C2N
2	B	401	NAP	O4D-C1D-N1N-C6N
2	C	401	NAP	C2B-O2B-P2B-O3X
2	C	401	NAP	O4D-C1D-N1N-C2N
2	C	401	NAP	O4D-C1D-N1N-C6N
2	C	401	NAP	C2D-C1D-N1N-C6N
2	C	401	NAP	C2N-C3N-C7N-N7N
2	D	401	NAP	C1B-C2B-O2B-P2B
2	D	401	NAP	C5D-O5D-PN-O1N
2	D	401	NAP	O4D-C1D-N1N-C2N
2	D	401	NAP	O4D-C1D-N1N-C6N
2	D	401	NAP	C2D-C1D-N1N-C2N
2	D	401	NAP	C2D-C1D-N1N-C6N
2	C	401	NAP	C4N-C3N-C7N-N7N

Continued on next page...

Continued from previous page...

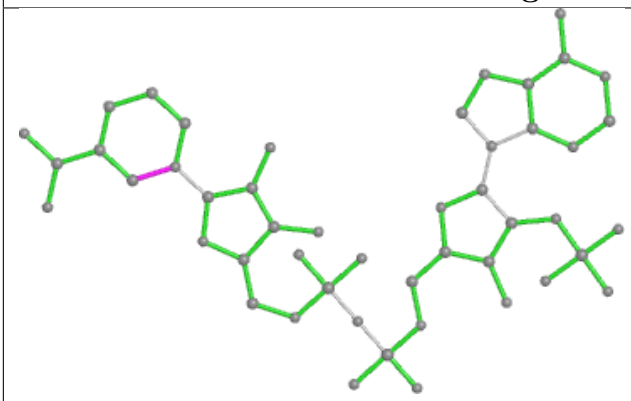
Mol	Chain	Res	Type	Atoms
2	C	401	NAP	C4N-C3N-C7N-O7N
2	C	401	NAP	C2N-C3N-C7N-O7N
2	A	402	NAP	C3B-C2B-O2B-P2B
2	D	401	NAP	C5D-O5D-PN-O3
2	A	402	NAP	O4B-C4B-C5B-O5B
2	C	401	NAP	C2B-O2B-P2B-O1X
2	A	402	NAP	C2B-O2B-P2B-O2X
2	B	401	NAP	C2D-C1D-N1N-C2N
2	B	401	NAP	C2D-C1D-N1N-C6N
2	C	401	NAP	C2D-C1D-N1N-C2N
2	C	401	NAP	O4B-C4B-C5B-O5B
2	D	401	NAP	O4B-C4B-C5B-O5B
2	D	401	NAP	C4N-C3N-C7N-O7N
2	B	401	NAP	C5D-O5D-PN-O2N
2	B	401	NAP	O4B-C4B-C5B-O5B
2	C	401	NAP	C1B-C2B-O2B-P2B
2	B	401	NAP	C4N-C3N-C7N-O7N

There are no ring outliers.

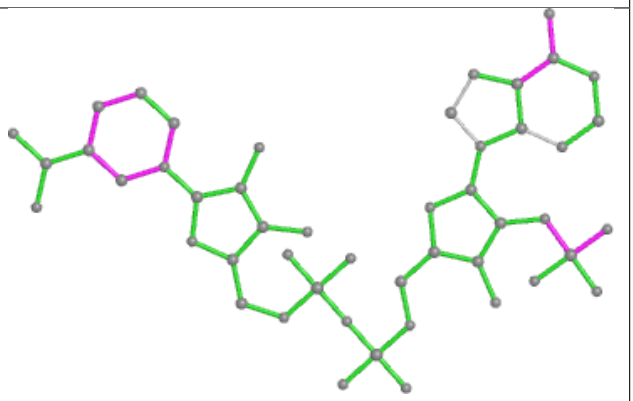
No monomer is involved in short contacts.

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.

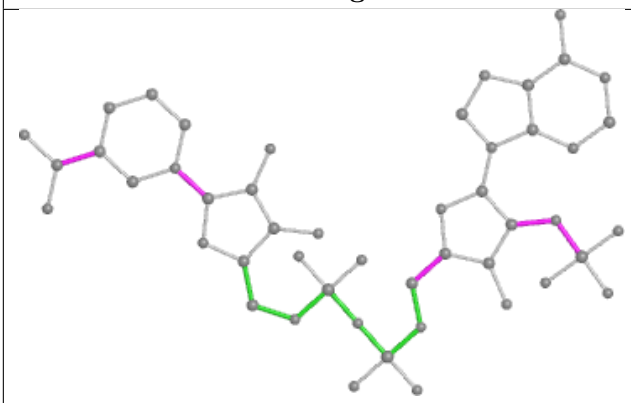
Ligand NAP C 401



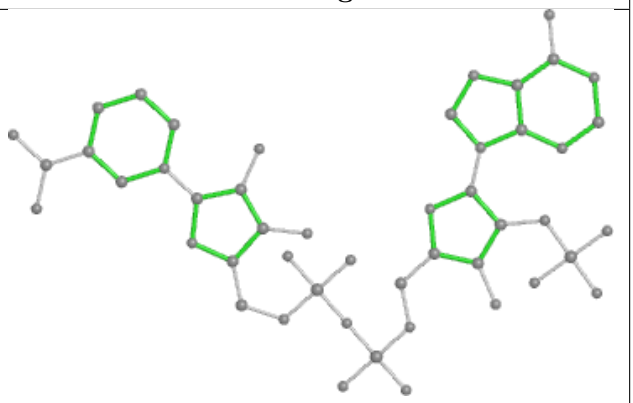
Bond lengths



Bond angles

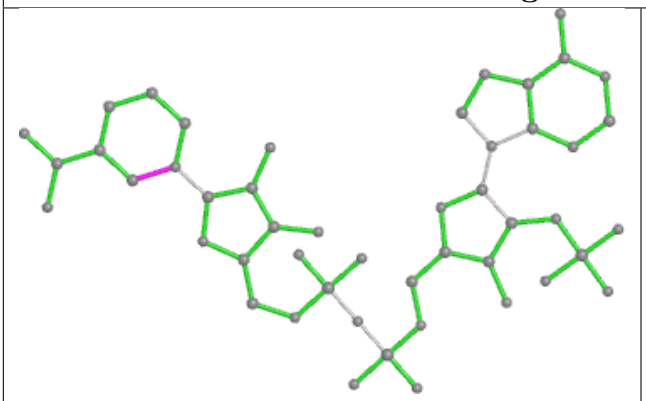


Torsions

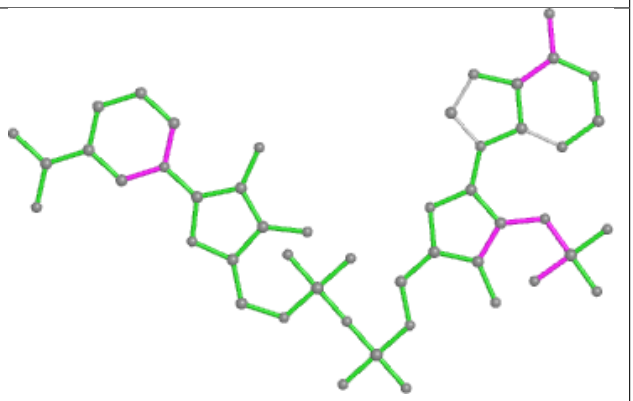


Rings

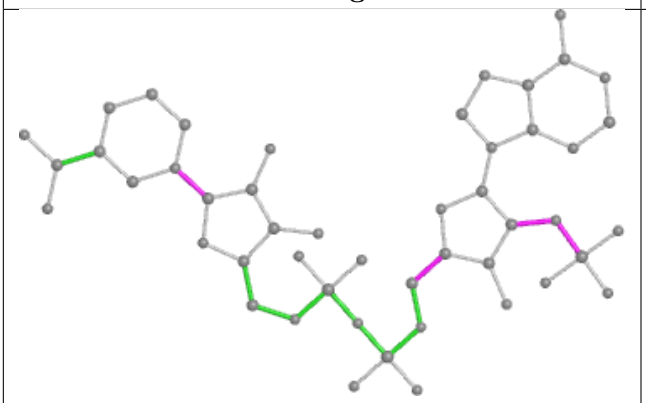
Ligand NAP A 402



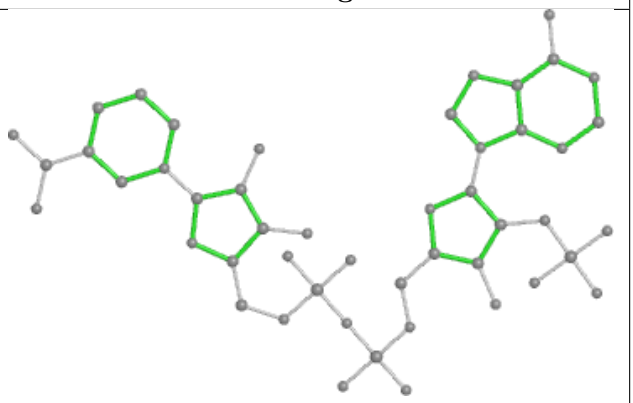
Bond lengths



Bond angles

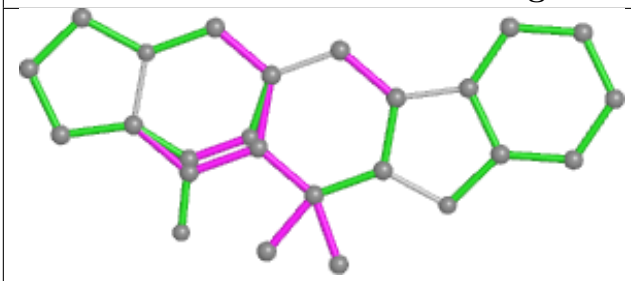


Torsions

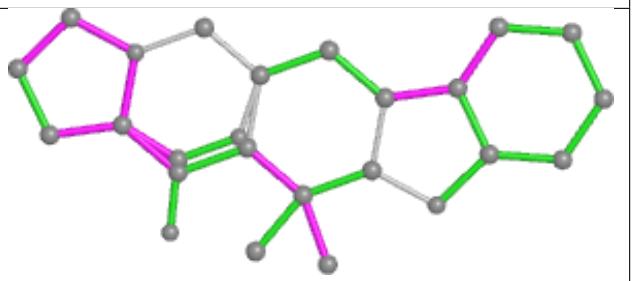


Rings

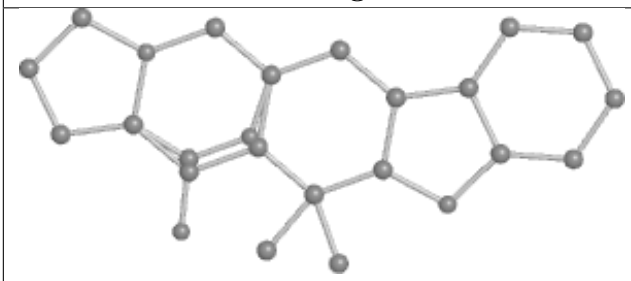
Ligand N3L B 403



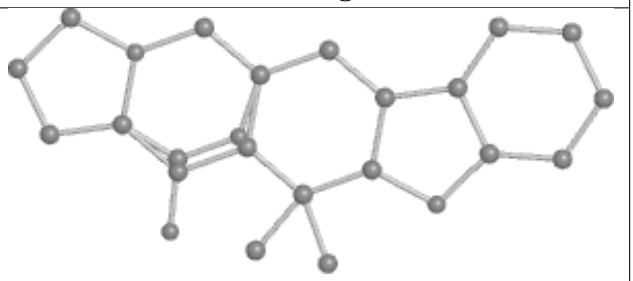
Bond lengths



Bond angles

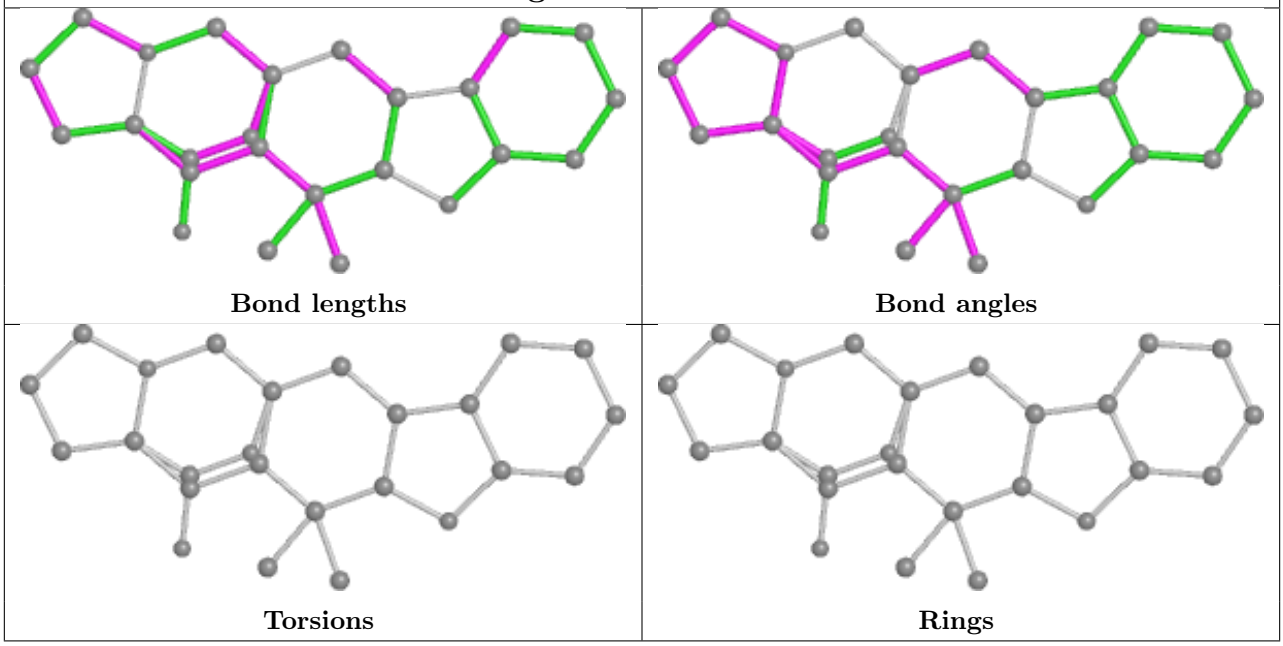


Torsions

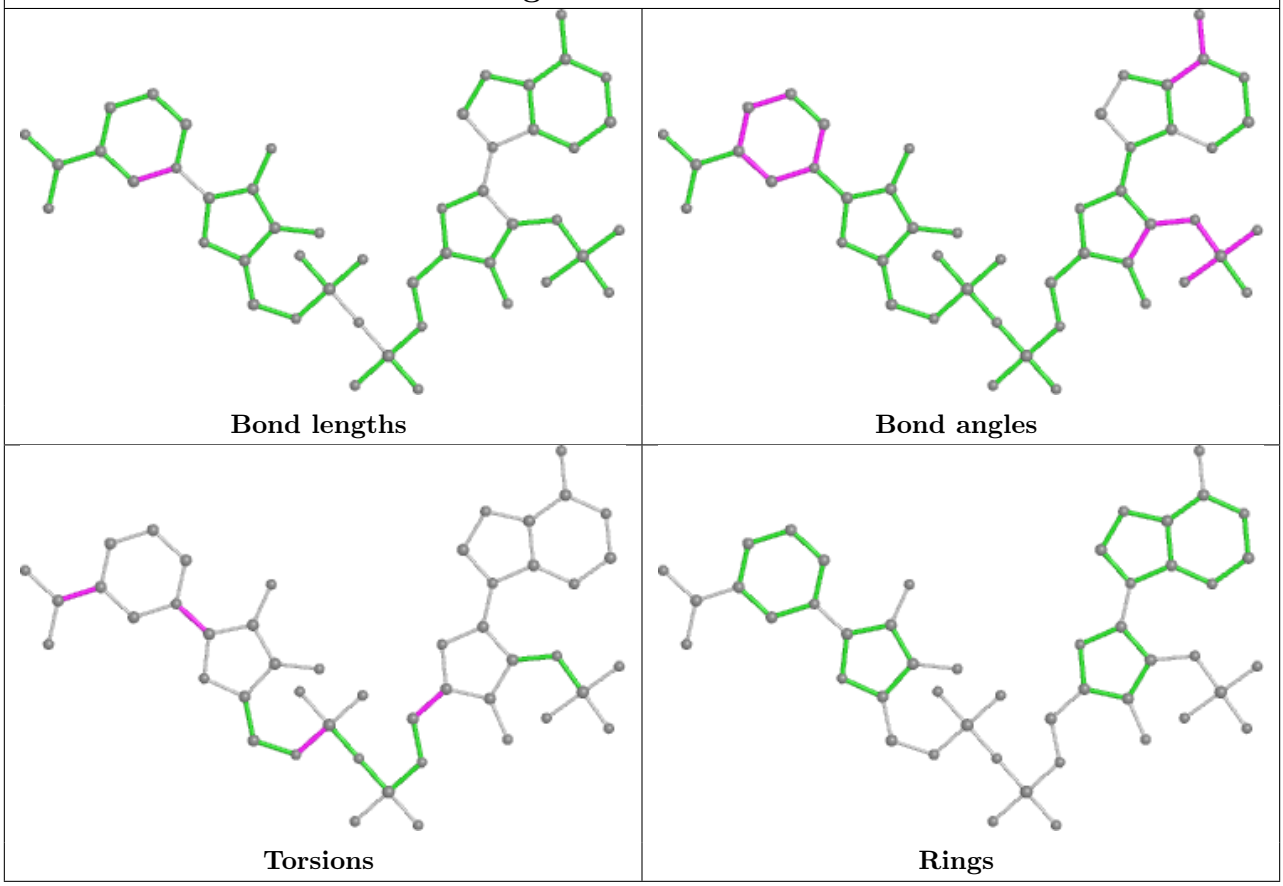


Rings

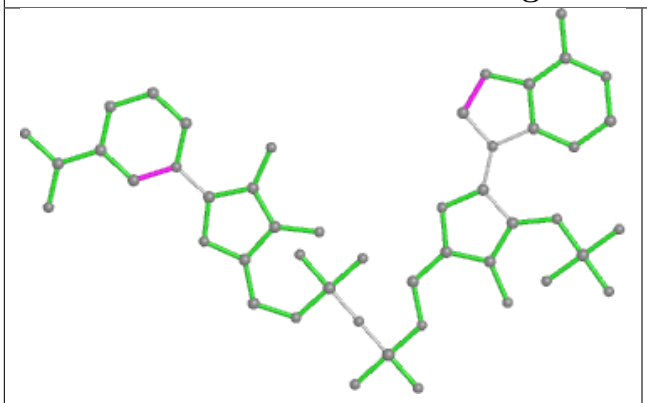
Ligand N3L D 402



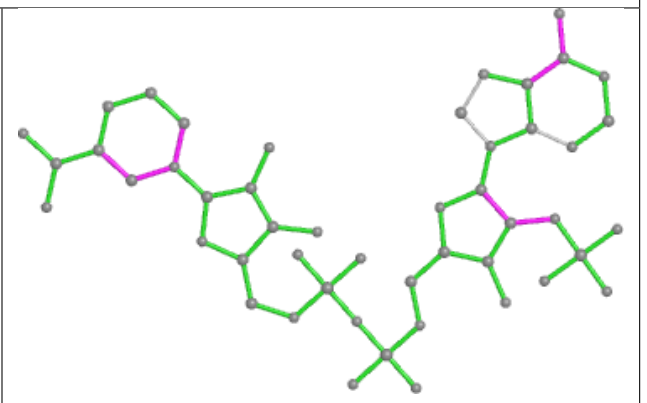
Ligand NAP B 401



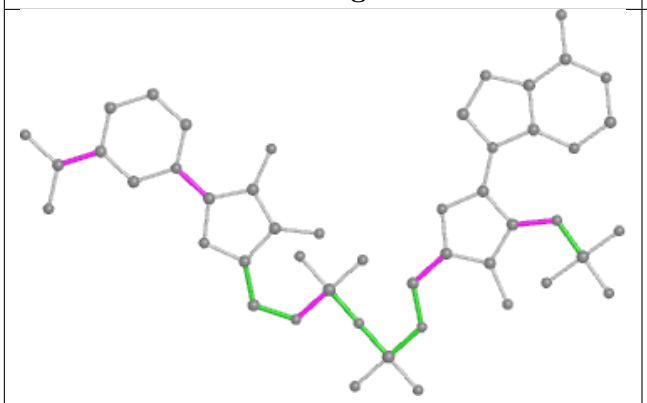
Ligand NAP D 401



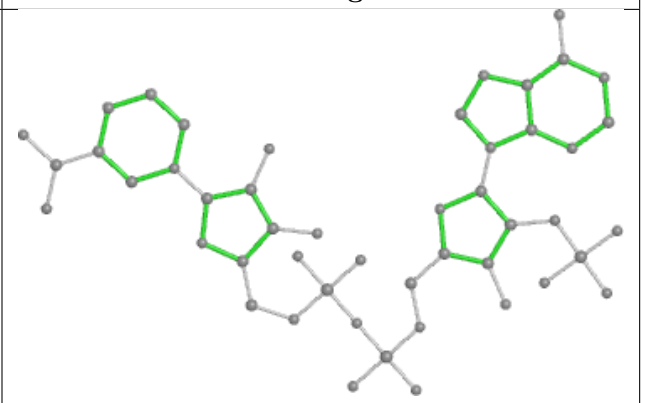
Bond lengths



Bond angles

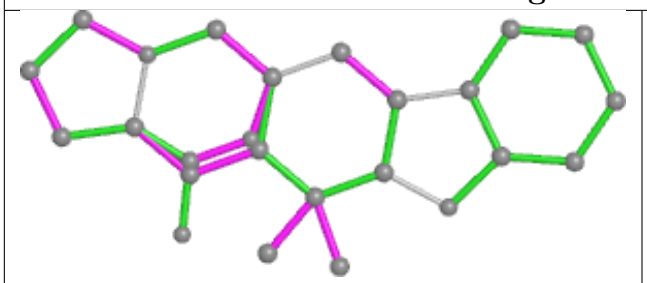


Torsions

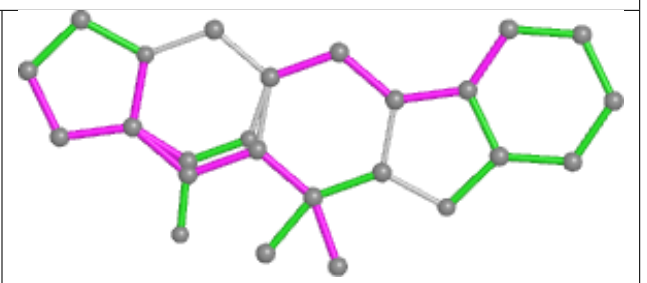


Rings

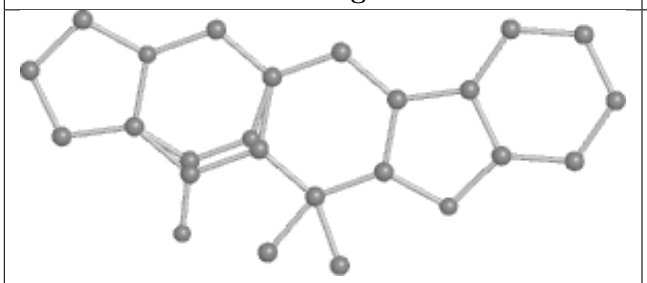
Ligand N3L A 403



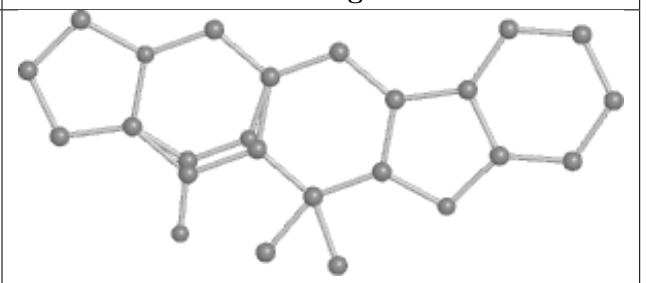
Bond lengths



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	337/348 (96%)	0.29	13 (3%)	39	42	55, 74, 98, 241	0
1	B	332/348 (95%)	0.31	17 (5%)	28	29	47, 66, 100, 122	0
1	C	321/348 (92%)	0.45	23 (7%)	15	16	56, 75, 98, 113	0
1	D	317/348 (91%)	0.26	8 (2%)	57	61	50, 63, 88, 112	0
All	All	1307/1392 (93%)	0.33	61 (4%)	31	33	47, 70, 98, 241	0

All (61) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	337	ILE	5.3
1	B	335	GLU	5.0
1	B	330	ALA	4.4
1	C	269	TYR	4.3
1	B	343	ILE	4.2
1	C	48	LEU	4.2
1	C	51	LEU	4.1
1	C	270	LEU	3.7
1	C	53	ILE	3.2
1	C	56	VAL	3.2
1	B	271	GLN	3.0
1	A	128	LYS	3.0
1	B	336	LYS	3.0
1	D	270	LEU	3.0
1	C	33	VAL	2.9
1	C	128	LYS	2.9
1	B	338	GLU	2.8
1	D	204	CYS	2.8
1	C	179	TRP	2.8
1	B	48	LEU	2.8
1	A	5	ILE	2.7

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	C	266	ASP	2.7
1	C	71	LYS	2.7
1	A	326	ARG	2.7
1	B	167	ILE	2.7
1	B	160	TRP	2.7
1	A	189	LEU	2.7
1	A	277	PHE	2.6
1	B	339	ARG	2.6
1	C	300	LEU	2.6
1	B	92	LYS	2.6
1	A	318	ILE	2.6
1	A	336	LYS	2.6
1	D	250	ARG	2.6
1	C	26	LEU	2.4
1	C	49	LYS	2.4
1	B	268	PRO	2.4
1	C	174	PHE	2.4
1	C	187	LEU	2.3
1	A	88	VAL	2.3
1	C	252	ALA	2.3
1	C	50	GLU	2.2
1	A	71	LYS	2.2
1	B	344	VAL	2.2
1	C	301	LEU	2.2
1	B	44	LYS	2.2
1	A	190	ARG	2.2
1	A	331	ASN	2.2
1	B	340	SER	2.2
1	D	174	PHE	2.2
1	D	92	LYS	2.1
1	D	269	TYR	2.1
1	A	53	ILE	2.1
1	C	55	ILE	2.1
1	C	265	ALA	2.1
1	C	46	LYS	2.1
1	A	333	THR	2.1
1	C	171	VAL	2.1
1	B	269	TYR	2.0
1	D	82	TYR	2.0
1	D	5	ILE	2.0

6.2 Non-standard residues in protein, DNA, RNA chains (i)

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

6.3 Carbohydrates (i)

There are no monosaccharides in this entry.

6.4 Ligands (i)

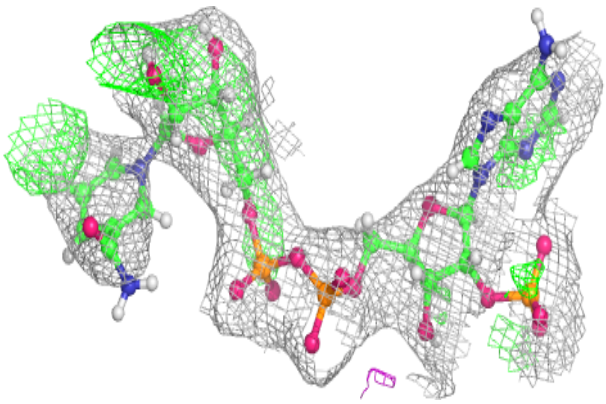
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9'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

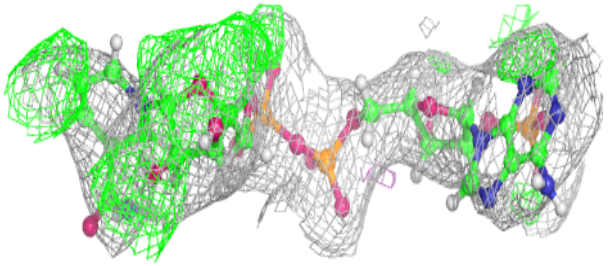
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	EDO	C	402	4/4	0.67	0.25	67,84,101,101	0
2	NAP	C	401	48/48	0.82	0.17	56,88,111,123	0
4	EDO	B	402	4/4	0.84	0.37	65,80,97,97	0
3	N3L	D	402	25/25	0.86	0.31	88,109,130,134	0
2	NAP	A	402	48/48	0.88	0.20	51,80,105,113	0
2	NAP	B	401	48/48	0.88	0.19	46,76,100,128	0
3	N3L	B	403	25/25	0.92	0.18	67,88,101,111	0
2	NAP	D	401	48/48	0.92	0.21	55,82,102,108	0
3	N3L	A	403	25/25	0.95	0.20	59,76,90,96	0

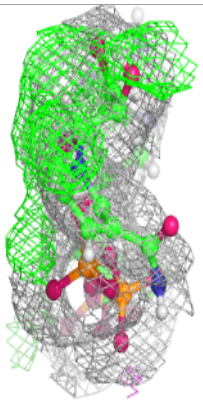
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around NAP C 401:

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

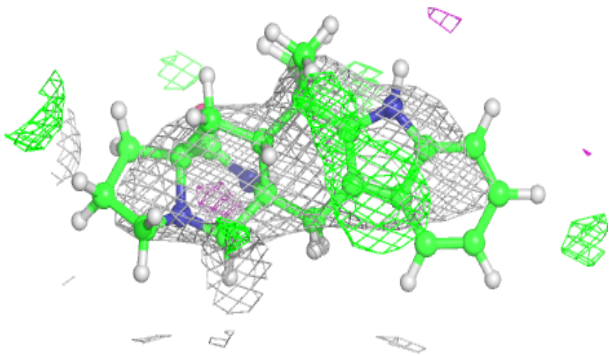


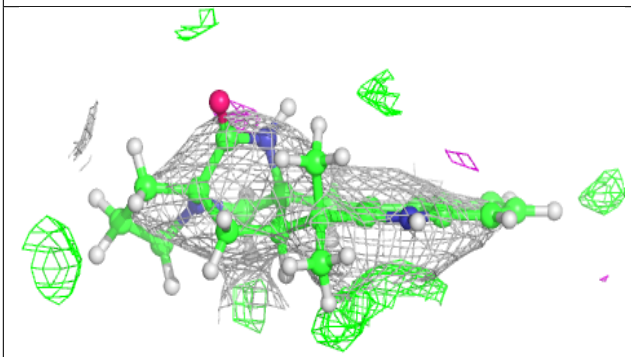


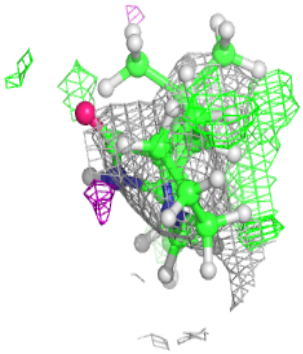


Electron density around N3L D 402:

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

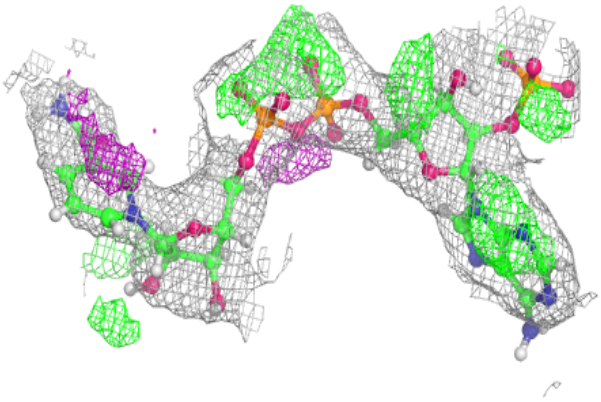


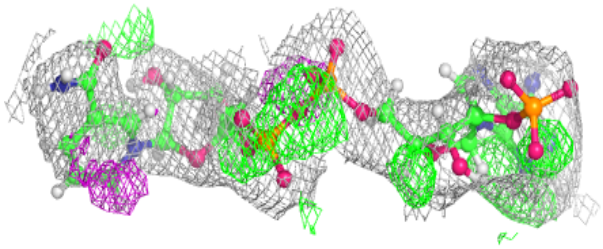


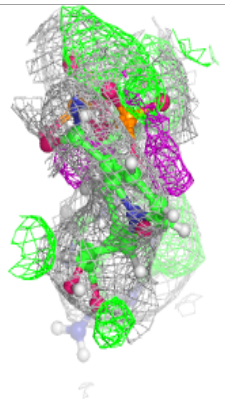


Electron density around NAP A 402:

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

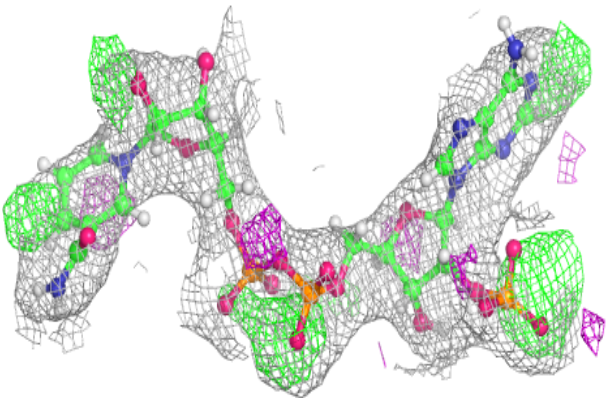


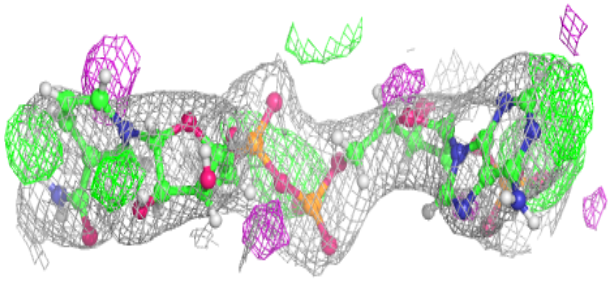


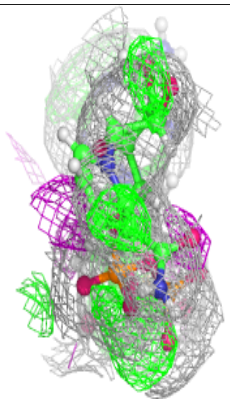


Electron density around NAP B 401:

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

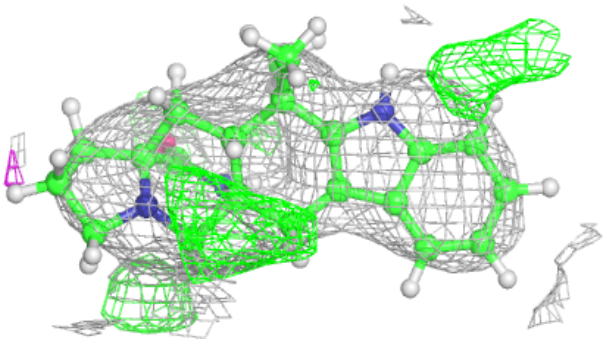


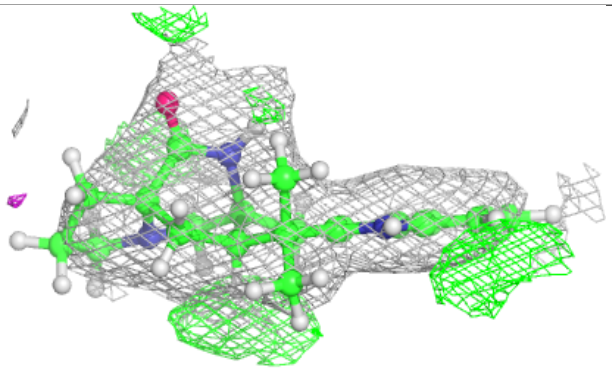


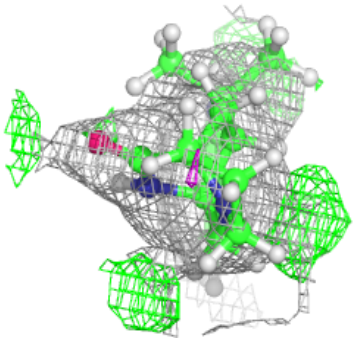


Electron density around N3L B 403:

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

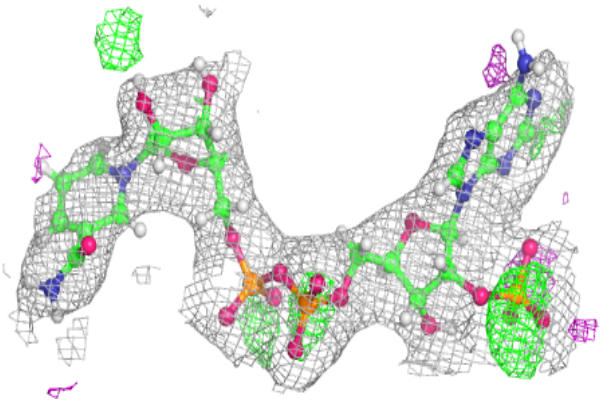


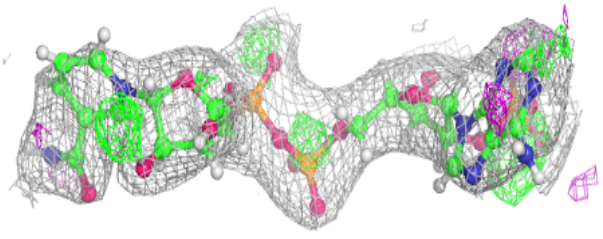


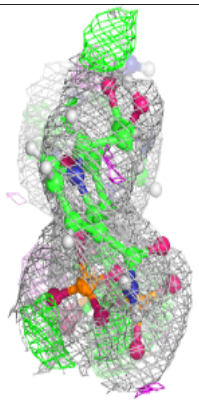


Electron density around NAP D 401:

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

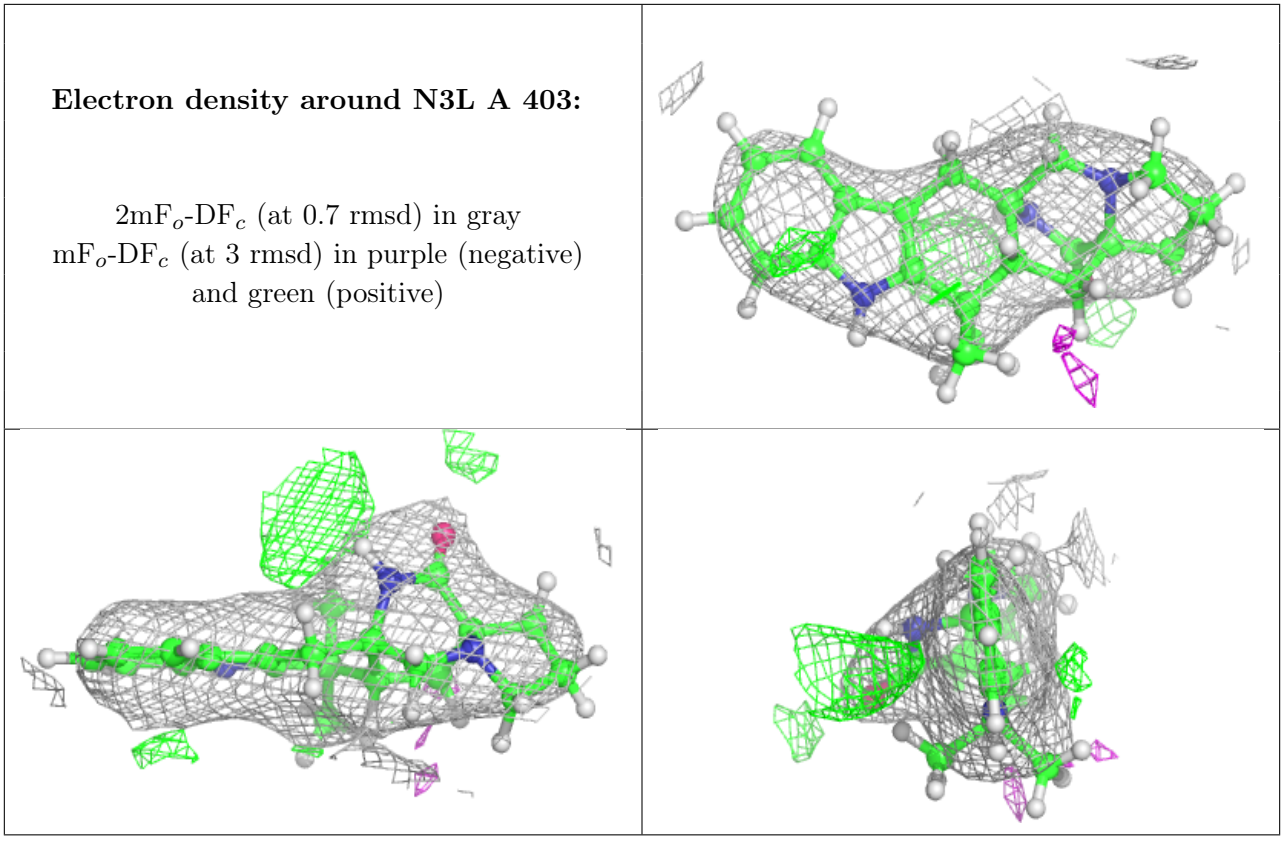






Electron density around N3L A 403:

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



6.5 Other polymers (i)

There are no such residues in this entry.