



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 26, 2024 – 07:46 AM EDT

PDB ID : 7APR  
Title : Bacillithiol Disulfide Reductase Bdr (YpdA) from Staphylococcus aureus  
Authors : Hammerstad, M.; Hersleth, H.-P.  
Deposited on : 2020-10-19  
Resolution : 3.10 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](mailto: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>.

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The following versions of software and data (see [references ⓘ](#)) 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 : 2.37.1  
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) : 2.37.1

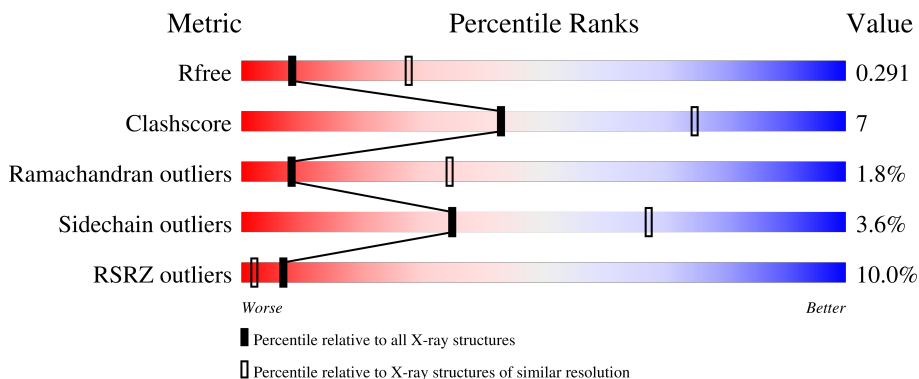
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.10 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	1094 (3.10-3.10)
Clashscore	141614	1184 (3.10-3.10)
Ramachandran outliers	138981	1141 (3.10-3.10)
Sidechain outliers	138945	1141 (3.10-3.10)
RSRZ outliers	127900	1067 (3.10-3.10)

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  $\geq 3$ , 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  $\leq 5\%$ . 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	328	
1	B	328	
1	C	328	
1	D	328	
1	E	328	

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Mol	Chain	Length	Quality of chain
1	F	328	
1	G	328	
1	H	328	

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	NAP	D	402[A]	-	-	-	X
3	NAP	D	402[B]	-	-	-	X
3	NAP	F	402[A]	-	-	-	X
3	NAP	F	402[B]	-	-	-	X

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 20960 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 YpdA family putative bacillithiol disulfide reductase Bdr.

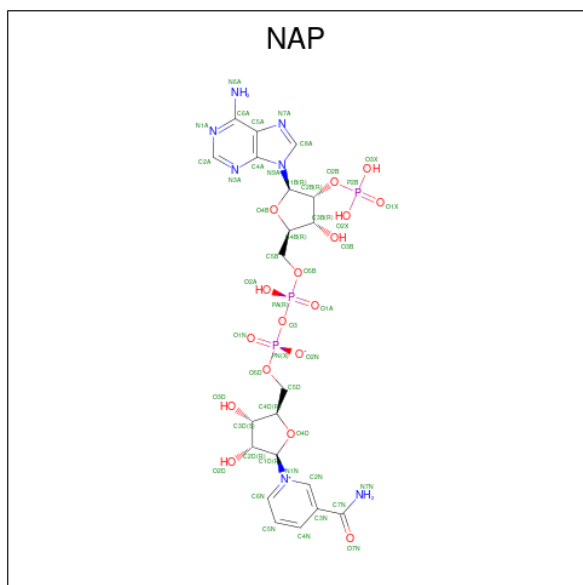
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	323	2582	1650	427	496	9	0	3	0
1	B	322	2555	1634	421	491	9	0	1	0
1	C	323	2593	1661	426	497	9	0	4	0
1	D	323	2575	1648	424	494	9	0	2	0
1	E	323	2569	1642	424	494	9	0	2	0
1	F	323	2576	1649	421	497	9	0	3	0
1	G	293	2308	1473	378	449	8	0	0	0
1	H	318	2514	1607	412	486	9	0	0	0

- Molecule 2 is FLAVIN-ADENINE DINUCLEOTIDE (three-letter code: FAD) (formula:  $C_{27}H_{33}N_9O_{15}P_2$ ) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	N	O			P
2	A	1	53	27	9	15	2	0	0
2	B	1	53	27	9	15	2	0	0
2	C	1	53	27	9	15	2	0	0
2	D	1	53	27	9	15	2	0	0
2	E	1	53	27	9	15	2	0	0
2	F	1	53	27	9	15	2	0	0
2	G	1	53	27	9	15	2	0	0
2	H	1	53	27	9	15	2	0	0

- Molecule 3 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NAP) (formula:  $C_{21}H_{28}N_7O_{17}P_3$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf		
			Total	C	N	O			P	
3	C	1	Total	48	21	7	17	3	0	0
3	D	1	Total	96	42	14	34	6	0	1
3	F	1	Total	96	42	14	34	6	0	1

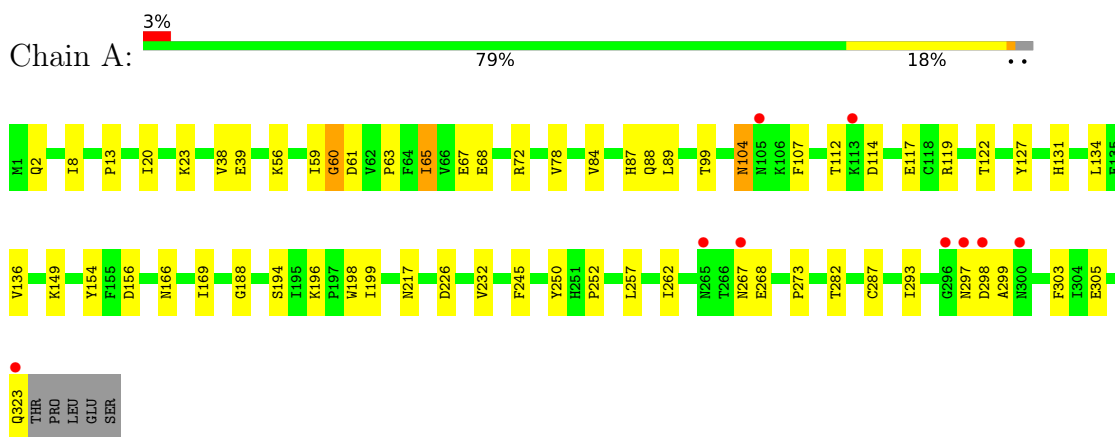
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf	
4	A	4	Total	4	4	0	0
4	C	4	Total	4	4	0	0
4	D	5	Total	5	5	0	0
4	E	4	Total	4	4	0	0
4	F	4	Total	4	4	0	0
4	G	2	Total	2	2	0	0
4	H	1	Total	1	1	0	0

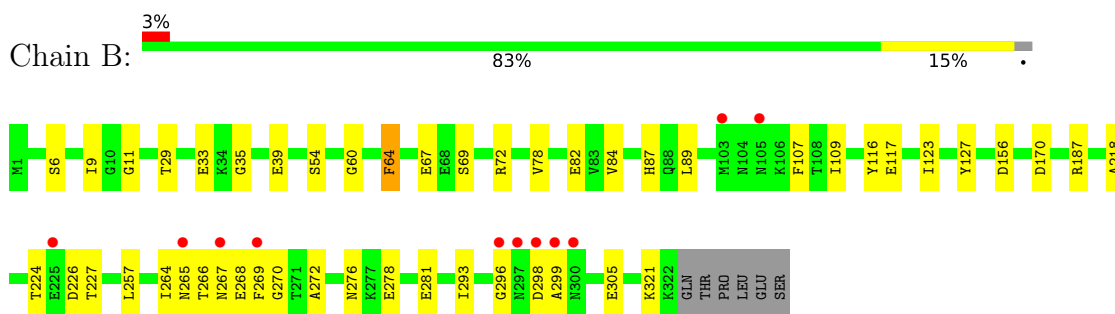
### 3 Residue-property plots [i](#)

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.

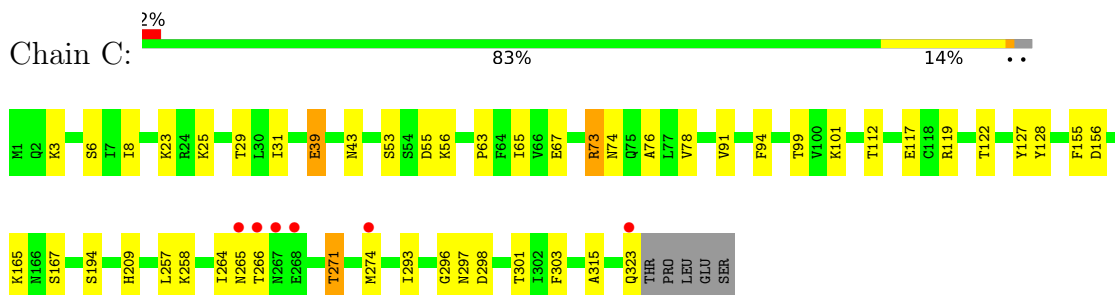
- Molecule 1: YpdA family putative bacillithiol disulfide reductase Bdr



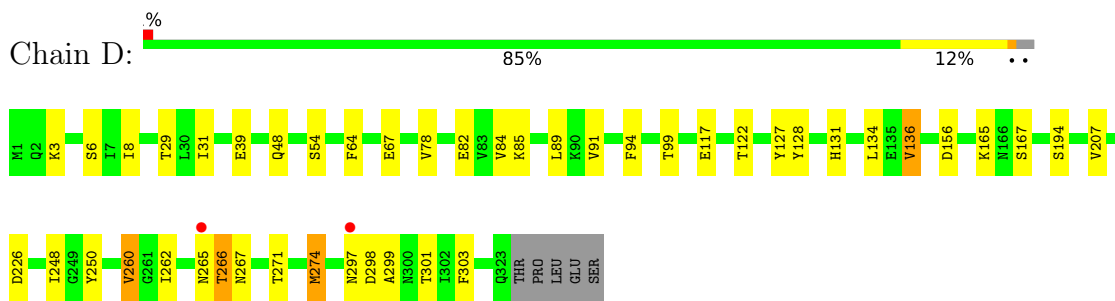
- Molecule 1: YpdA family putative bacillithiol disulfide reductase Bdr



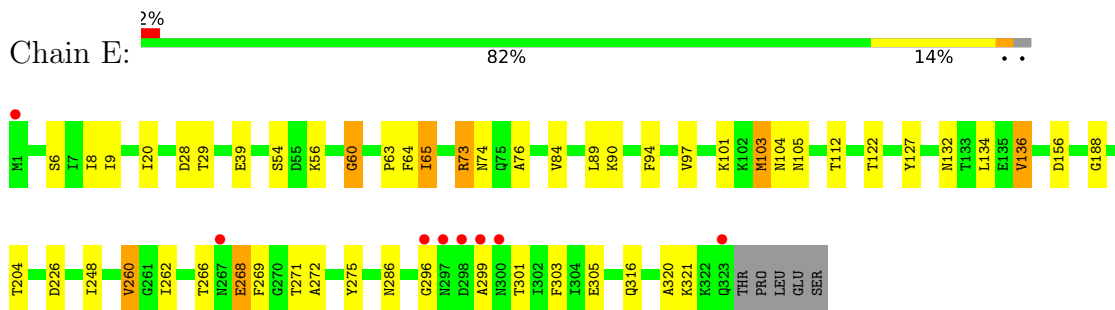
- Molecule 1: YpdA family putative bacillithiol disulfide reductase Bdr



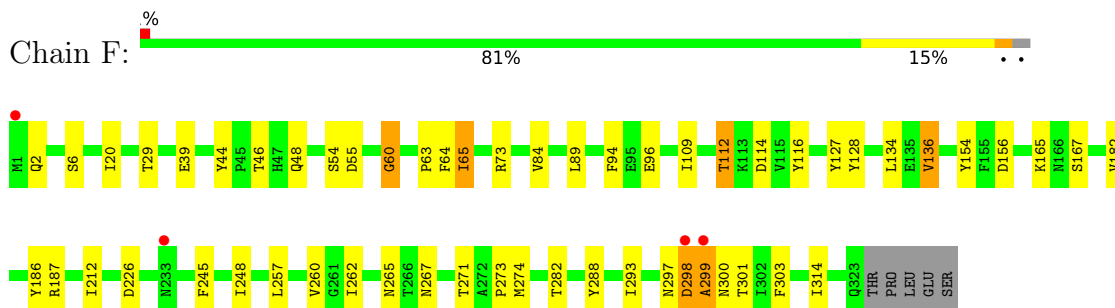
- Molecule 1: YpdA family putative bacillithiol disulfide reductase Bdr



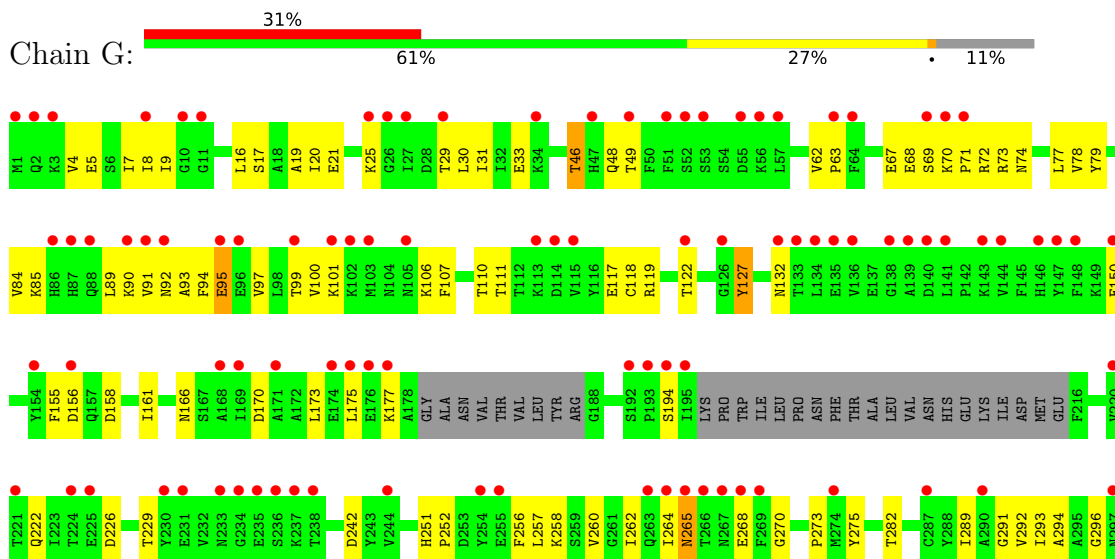
• Molecule 1: YpdA family putative bacillithiol disulfide reductase Bdr



• Molecule 1: YpdA family putative bacillithiol disulfide reductase Bdr



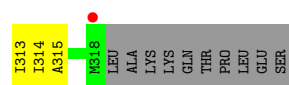
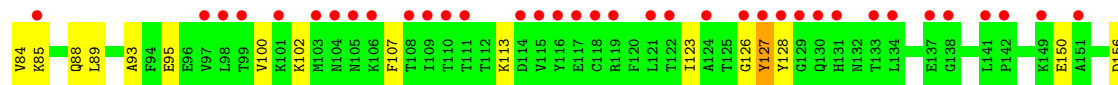
• Molecule 1: YpdA family putative bacillithiol disulfide reductase Bdr







- Molecule 1: YpdA family putative bacillithiol disulfide reductase Bdr



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 61 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	180.31Å 180.31Å 350.46Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	29.94 – 3.10 29.94 – 3.10	Depositor EDS
% Data completeness (in resolution range)	100.0 (29.94-3.10) 100.0 (29.94-3.10)	Depositor EDS
$R_{merge}$	0.12	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.36 (at 3.11Å)	Xtrriage
Refinement program	PHENIX 1.18.2_3874, REFMAC 5.8.0253	Depositor
R, $R_{free}$	0.244 , 0.291 0.244 , 0.291	Depositor DCC
$R_{free}$ test set	3107 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	63.2	Xtrriage
Anisotropy	0.216	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 45.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.89	EDS
Total number of atoms	20960	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	68.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.97% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: FAD, NAP

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	0.26	0/2639	0.47	0/3575
1	B	0.25	0/2612	0.45	0/3540
1	C	0.27	0/2655	0.45	0/3598
1	D	0.26	0/2633	0.46	0/3568
1	E	0.26	0/2629	0.45	0/3563
1	F	0.26	0/2639	0.46	0/3576
1	G	0.27	0/2355	0.51	0/3185
1	H	0.26	0/2570	0.48	0/3485
All	All	0.26	0/20732	0.47	0/28090

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 [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	2582	0	2531	38	0
1	B	2555	0	2504	25	0
1	C	2593	0	2536	30	0
1	D	2575	0	2520	28	0
1	E	2569	0	2518	24	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	F	2576	0	2524	31	0
1	G	2308	0	2256	62	0
1	H	2514	0	2456	56	0
2	A	53	0	31	1	0
2	B	53	0	31	0	0
2	C	53	0	31	4	0
2	D	53	0	31	2	0
2	E	53	0	31	0	0
2	F	53	0	31	3	0
2	G	53	0	31	0	0
2	H	53	0	31	4	0
3	C	48	0	23	1	0
3	D	96	0	50	7	0
3	F	96	0	50	8	0
4	A	4	0	0	0	0
4	C	4	0	0	0	0
4	D	5	0	0	0	0
4	E	4	0	0	0	0
4	F	4	0	0	0	0
4	G	2	0	0	0	0
4	H	1	0	0	0	0
All	All	20960	0	20216	278	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 (278) 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:H:21:GLU:HG3	1:H:310:HIS:HB3	1.57	0.84
1:A:297:ASN:O	1:A:299:ALA:N	2.14	0.80
1:C:301:THR:HG23	1:E:188:GLY:HA2	1.68	0.75
1:D:299:ALA:O	3:D:402[A]:NAP:O2D	2.06	0.73
1:H:84:VAL:HG13	1:H:89:LEU:HB2	1.71	0.72
1:H:261:GLY:O	1:H:283:ASN:ND2	2.19	0.72
1:H:292:VAL:HG13	1:H:304:ILE:HD12	1.71	0.71
1:E:272:ALA:HB2	1:E:296:GLY:HA3	1.71	0.71
1:G:265:ASN:HB3	1:G:268:GLU:H	1.56	0.71
1:A:63:PRO:HB2	1:A:65:ILE:HD12	1.75	0.69
1:E:20:ILE:HD13	1:E:60:GLY:HA3	1.74	0.69
1:G:7:ILE:HG12	1:G:30:LEU:HD23	1.75	0.69

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:266:THR:HG21	1:E:271:THR:H	1.58	0.69
1:G:74:ASN:HA	1:G:77:LEU:HB3	1.75	0.69
1:G:73:ARG:NH2	1:H:150:GLU:OE2	2.21	0.68
1:A:134:LEU:HG	1:A:136:VAL:HG13	1.76	0.67
1:D:84:VAL:HG13	1:D:89:LEU:HB2	1.76	0.67
1:H:52:SER:HB3	1:H:56:LYS:HB2	1.77	0.67
1:H:311:GLY:O	1:H:313:ILE:N	2.27	0.66
1:E:28:ASP:OD1	1:E:90:LYS:NZ	2.29	0.66
1:G:8:ILE:N	1:G:30:LEU:O	2.29	0.66
1:H:100:VAL:HB	1:H:260:VAL:HG12	1.78	0.66
1:H:44:TYR:HH	2:H:401:FAD:HO2'	1.37	0.65
1:H:165:LYS:O	1:H:167:SER:N	2.25	0.65
1:B:109:ILE:HB	1:B:116:TYR:HB2	1.78	0.65
1:E:134:LEU:HG	1:E:136:VAL:HG13	1.78	0.65
1:F:165:LYS:HD2	3:F:402[B]:NAP:H3B	1.78	0.64
1:H:62:VAL:HG21	1:H:83:VAL:HG22	1.80	0.64
1:G:9:ILE:HD13	1:G:97:VAL:HG11	1.79	0.63
1:A:119:ARG:HH12	1:A:323:GLN:HA	1.62	0.63
1:C:258:LYS:HE3	1:C:264:ILE:HD12	1.79	0.63
1:E:63:PRO:HB2	1:E:65:ILE:HD12	1.81	0.63
1:A:67:GLU:HA	1:D:78:VAL:HG21	1.81	0.62
1:G:31:ILE:O	1:G:91:VAL:HA	1.99	0.61
1:A:65:ILE:HG12	1:D:82:GLU:HG3	1.82	0.61
1:G:99:THR:HB	1:G:110:THR:HB	1.81	0.61
1:A:188:GLY:HA2	1:F:301:THR:HG23	1.83	0.61
1:F:134:LEU:HG	1:F:136:VAL:HG13	1.84	0.60
1:G:166:ASN:ND2	1:G:194:SER:O	2.34	0.60
1:G:132:ASN:OD1	1:G:251:HIS:ND1	2.35	0.60
1:B:60:GLY:O	1:B:87:HIS:NE2	2.19	0.59
1:D:128:TYR:OH	2:D:401:FAD:H9	2.02	0.59
1:D:54:SER:OG	1:D:64:PHE:O	2.20	0.59
1:F:265:ASN:HD21	1:F:274:MET:HG3	1.68	0.59
1:F:20:ILE:HD13	1:F:60:GLY:HA3	1.83	0.59
1:A:196:LYS:HB2	1:A:199:ILE:HD12	1.85	0.59
1:A:56:LYS:HB3	1:A:305:GLU:HG2	1.85	0.59
1:G:70:LYS:C	1:G:72:ARG:H	2.07	0.58
1:H:1:MET:HG2	1:H:2:GLN:H	1.67	0.58
1:G:62:VAL:HG22	1:G:79:TYR:CE1	2.38	0.58
1:C:265:ASN:ND2	1:C:274:MET:SD	2.76	0.57
1:H:44:TYR:OH	2:H:401:FAD:O2'	2.13	0.57
1:G:25:LYS:HG3	1:G:315:ALA:HB1	1.85	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:298:ASP:OD2	1:G:301:THR:OG1	2.20	0.57
1:D:48:GLN:HG2	2:D:401:FAD:HM72	1.84	0.57
1:H:72:ARG:HG3	1:H:74:ASN:H	1.68	0.57
1:D:165:LYS:HD2	3:D:402[B]:NAP:H3B	1.87	0.56
1:F:154:TYR:CE2	1:F:245:PHE:HZ	2.23	0.56
1:G:46:THR:HG23	1:G:73:ARG:HH21	1.70	0.56
1:A:20:ILE:HD13	1:A:60:GLY:HA3	1.88	0.56
1:G:8:ILE:HG12	1:G:122:THR:HB	1.88	0.56
1:F:44:TYR:HB2	1:F:73:ARG:HD2	1.88	0.55
1:G:29:THR:O	1:G:90:LYS:HD2	2.05	0.55
1:G:8:ILE:HB	1:G:31:ILE:HG12	1.89	0.55
1:G:5:GLU:HG3	1:G:119:ARG:HD2	1.88	0.55
1:D:167:SER:HG	3:D:402[B]:NAP:PN	2.29	0.55
1:C:53:SER:OG	1:C:55:ASP:OD1	2.21	0.55
1:H:252:PRO:HB3	1:H:293:ILE:HD12	1.89	0.54
1:G:67:GLU:HB2	1:G:78:VAL:HG11	1.90	0.54
1:G:150:GLU:OE2	1:H:73:ARG:NH2	2.40	0.54
1:C:8:ILE:HG12	1:C:122:THR:HB	1.90	0.54
1:F:84:VAL:HG13	1:F:89:LEU:HB2	1.89	0.54
1:H:56:LYS:HG2	1:H:306:ASN:HD22	1.72	0.54
1:E:56:LYS:HB3	1:E:305:GLU:HG2	1.88	0.54
1:B:257:LEU:HD11	1:B:293:ILE:HD11	1.90	0.54
1:A:154:TYR:CE2	1:A:245:PHE:HZ	2.27	0.53
1:A:78:VAL:HG21	1:D:67:GLU:HA	1.90	0.53
1:G:95:GLU:OE1	1:G:111:THR:OG1	2.19	0.53
1:G:70:LYS:O	1:G:72:ARG:N	2.40	0.53
1:H:43:ASN:ND2	1:H:128:TYR:OH	2.41	0.53
1:H:300:ASN:OD1	1:H:308:LYS:NZ	2.39	0.53
1:A:104:ASN:OD1	1:A:104:ASN:N	2.42	0.53
1:H:56:LYS:HB3	1:H:306:ASN:HB2	1.89	0.53
1:A:23:LYS:NZ	1:A:88:GLN:O	2.41	0.53
1:H:9:ILE:HD12	1:H:123:ILE:HG12	1.89	0.53
1:G:252:PRO:HB3	1:G:293:ILE:HD12	1.92	0.52
1:E:8:ILE:HG12	1:E:122:THR:HB	1.90	0.52
1:F:187:ARG:NE	3:F:402[A]:NAP:O2B	2.42	0.52
1:F:186:TYR:HE1	3:F:402[A]:NAP:HO3A	1.58	0.52
1:B:224:THR:HG1	1:B:227:THR:HG1	1.56	0.52
1:B:9:ILE:HD12	1:B:123:ILE:HG13	1.92	0.52
1:B:6:SER:HB3	1:B:29:THR:HG22	1.92	0.52
1:A:262:ILE:HD13	1:A:282:THR:HG21	1.93	0.51
1:C:155:PHE:HE1	1:D:85:LYS:HE3	1.75	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:4:VAL:O	1:G:118:CYS:HA	2.11	0.51
1:D:8:ILE:HG12	1:D:122:THR:HB	1.91	0.51
1:H:73:ARG:HH11	1:H:77:LEU:HD11	1.74	0.51
1:H:25:LYS:HG3	1:H:315:ALA:HB1	1.93	0.51
1:C:128[A]:TYR:OH	2:C:401:FAD:H1'1	2.10	0.51
1:G:107:PHE:O	1:G:117:GLU:HA	2.10	0.51
1:A:60:GLY:O	1:A:87:HIS:NE2	2.32	0.50
1:A:252:PRO:HB3	1:A:293:ILE:HG13	1.93	0.50
1:H:226:ASP:N	1:H:226:ASP:OD1	2.42	0.50
1:A:131:HIS:HA	1:A:250:TYR:HD1	1.77	0.50
1:C:128[A]:TYR:CE1	2:C:401:FAD:HM81	2.47	0.49
1:H:256:PHE:O	1:H:260:VAL:HG13	2.11	0.49
1:A:297:ASN:C	1:A:299:ALA:H	2.14	0.49
1:E:73:ARG:O	1:E:76:ALA:N	2.42	0.49
1:C:119:ARG:NH2	1:C:323:GLN:HB3	2.28	0.49
1:B:272:ALA:HB2	1:B:296:GLY:HA3	1.94	0.49
1:D:134:LEU:HG	1:D:136:VAL:HG13	1.95	0.49
1:E:272:ALA:HB2	1:E:296:GLY:CA	2.43	0.49
1:B:226:ASP:OD1	1:B:226:ASP:N	2.45	0.49
1:H:305:GLU:HB2	1:H:308:LYS:HE3	1.95	0.49
1:C:6:SER:HB3	1:C:29:THR:HG22	1.94	0.48
1:A:84:VAL:HG13	1:A:89:LEU:HB2	1.95	0.48
1:H:232:VAL:HB	1:H:237:LYS:HE3	1.95	0.48
1:G:72:ARG:NH2	1:H:69:SER:O	2.46	0.48
1:A:257:LEU:HD13	1:A:273:PRO:HG3	1.95	0.48
1:G:33:GLU:O	1:G:94:PHE:HB2	2.13	0.48
1:H:127:TYR:HE2	1:H:303:PHE:HE1	1.62	0.48
1:A:107:PHE:O	1:A:117:GLU:HA	2.14	0.48
1:F:54:SER:OG	1:F:64:PHE:O	2.30	0.48
1:G:70:LYS:HB3	1:G:71:PRO:HD2	1.94	0.48
1:A:72:ARG:NH1	1:D:67:GLU:OE2	2.48	0.47
1:C:3:LYS:HG2	1:C:117:GLU:HB3	1.95	0.47
1:F:63:PRO:HB2	1:F:65:ILE:HD12	1.96	0.47
1:A:257:LEU:HD11	1:A:293:ILE:HD11	1.96	0.47
1:D:3:LYS:HG2	1:D:117:GLU:HB3	1.96	0.47
1:E:268:GLU:HB2	1:E:269:PHE:H	1.54	0.47
1:F:167:SER:HG	3:F:402[B]:NAP:PN	2.37	0.47
1:G:84:VAL:HG22	1:G:89:LEU:HD12	1.96	0.47
1:B:72:ARG:NH2	1:C:67:GLU:OE2	2.47	0.47
1:F:96:GLU:H	1:F:112:THR:HG1	1.62	0.47
1:H:102:LYS:HD3	1:H:107:PHE:CE2	2.49	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:H:231:GLU:HG2	1:H:236:SER:HA	1.96	0.47
1:C:271:THR:OG1	1:C:297:ASN:OD1	2.33	0.47
1:G:19:ALA:HB2	1:G:31:ILE:HD11	1.95	0.47
1:G:275:TYR:OH	1:G:294:ALA:HB1	2.15	0.47
1:B:276:ASN:O	1:B:278:GLU:N	2.42	0.47
1:B:281:GLU:CD	1:B:321:LYS:HZ1	2.18	0.47
1:C:128[A]:TYR:OH	2:C:401:FAD:H9	2.14	0.47
1:G:7:ILE:HG13	1:G:118:CYS:HB3	1.97	0.47
1:E:6:SER:HB3	1:E:29:THR:HG22	1.96	0.46
1:H:218:ALA:HB2	1:H:232:VAL:HG22	1.97	0.46
1:B:264:ILE:HG22	1:B:265:ASN:H	1.80	0.46
1:H:38:VAL:HG11	1:H:80:TYR:CD2	2.50	0.46
1:H:50:PHE:HE1	1:H:73:ARG:HA	1.81	0.46
3:F:402[B]:NAP:O1A	3:F:402[B]:NAP:H52N	2.16	0.46
1:G:256:PHE:O	1:G:260:VAL:HG13	2.15	0.46
1:H:195:ILE:HG21	1:H:200:LEU:HD13	1.97	0.46
1:A:303:PHE:HB3	2:A:401:FAD:O2	2.16	0.46
1:B:267:ASN:O	1:B:269:PHE:N	2.49	0.46
1:F:109:ILE:HB	1:F:116:TYR:HB2	1.98	0.46
1:F:248:ILE:HA	3:F:402[B]:NAP:O4B	2.16	0.46
1:F:48:GLN:HG2	2:F:401:FAD:HM72	1.99	0.45
1:D:248:ILE:HA	3:D:402[B]:NAP:O4B	2.17	0.45
1:E:84:VAL:HG13	1:E:89:LEU:HB2	1.99	0.45
1:B:54:SER:O	1:B:64:PHE:HB3	2.16	0.45
1:G:275:TYR:HB3	1:G:282:THR:HG22	1.98	0.45
1:H:297:ASN:O	1:H:299:ALA:N	2.48	0.45
1:G:48:GLN:NE2	1:G:170:ASP:OD2	2.41	0.45
1:B:11:GLY:N	1:B:33:GLU:OE1	2.46	0.45
1:B:84:VAL:HG13	1:B:89:LEU:HB2	1.98	0.45
1:B:187:ARG:HG3	1:B:218:ALA:O	2.16	0.45
1:G:16:LEU:HD22	1:G:89:LEU:HD12	1.99	0.45
1:A:59:ILE:O	1:A:61:ASP:N	2.50	0.45
1:A:166:ASN:ND2	1:A:194:SER:O	2.49	0.45
1:G:21:GLU:O	1:G:25:LYS:HG2	2.17	0.45
1:D:260:VAL:HG22	1:D:262:ILE:HG13	1.99	0.45
1:F:182:VAL:HB	1:F:212:ILE:HG23	1.99	0.45
1:G:100:VAL:HB	1:G:260:VAL:HG12	1.98	0.44
1:D:167:SER:H	3:D:402[A]:NAP:H51N	1.83	0.44
1:E:104[B]:ASN:OD1	1:E:105:ASN:N	2.50	0.44
1:C:55:ASP:OD1	1:C:56:LYS:N	2.50	0.44
1:G:257:LEU:O	1:G:260:VAL:HG22	2.17	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:H:93:ALA:O	1:H:113:LYS:NZ	2.30	0.44
1:D:165:LYS:HD3	3:D:402[A]:NAP:O3D	2.17	0.44
1:E:103:MET:HE3	1:E:103:MET:HB3	1.85	0.44
1:B:107:PHE:O	1:B:117:GLU:HA	2.18	0.44
1:G:275:TYR:HA	1:G:282:THR:HA	1.99	0.44
1:G:291:GLY:H	1:G:310:HIS:CE1	2.36	0.44
1:C:73:ARG:O	1:C:76:ALA:N	2.49	0.44
1:G:97:VAL:HG22	1:G:111:THR:HG22	2.00	0.44
1:B:266:THR:HA	1:B:270:GLY:O	2.17	0.44
1:D:265:ASN:ND2	1:D:274:MET:HG3	2.33	0.44
1:G:258:LYS:HE3	1:G:264:ILE:HD12	1.98	0.44
1:H:201:PRO:HA	1:H:204:THR:HB	1.99	0.44
1:F:257:LEU:HD13	1:F:273:PRO:HG3	2.00	0.44
1:G:222:GLN:HB3	1:G:229:THR:HB	1.99	0.44
1:H:257:LEU:O	1:H:260:VAL:HG22	2.18	0.43
1:G:8:ILE:O	1:G:31:ILE:HA	2.18	0.43
1:A:169:ILE:HD13	1:A:169:ILE:HA	1.86	0.43
1:C:31:ILE:HB	1:C:91:VAL:HG22	2.01	0.43
1:G:17:SER:HA	1:G:20:ILE:HD12	2.00	0.43
1:C:99:THR:HG23	1:C:101:LYS:HE2	2.01	0.43
1:C:165:LYS:HE3	1:C:194:SER:OG	2.19	0.43
1:B:298:ASP:OD1	1:B:299:ALA:N	2.52	0.43
1:G:4:VAL:HG21	1:G:30:LEU:HD22	2.00	0.43
1:G:289:ILE:HD12	1:G:293:ILE:HG23	1.99	0.43
1:A:262:ILE:HD11	1:A:287:CYS:SG	2.58	0.43
1:D:265:ASN:O	1:D:266:THR:OG1	2.28	0.43
1:H:304:ILE:N	1:H:308:LYS:HZ2	2.16	0.43
1:G:155:PHE:HE1	1:H:85:LYS:HZ1	1.67	0.43
1:A:217:ASN:O	1:A:232:VAL:HA	2.18	0.43
1:E:226:ASP:OD1	1:E:226:ASP:N	2.50	0.43
1:A:13:PRO:HD3	1:A:38:VAL:HG12	2.00	0.43
1:F:165:LYS:HD3	3:F:402[A]:NAP:O3D	2.18	0.43
1:G:161:ILE:HD11	1:G:175:LEU:HD12	1.99	0.43
1:H:63:PRO:HG2	1:H:64:PHE:CE2	2.54	0.43
2:H:401:FAD:H9	2:H:401:FAD:H1'1	1.85	0.43
1:G:127:TYR:CE2	1:G:292:VAL:HB	2.54	0.42
1:C:128[A]:TYR:CZ	2:C:401:FAD:H9	2.54	0.42
1:G:94:PHE:HZ	1:H:243:TYR:HH	1.67	0.42
1:B:67:GLU:HA	1:C:78:VAL:HG21	2.01	0.42
1:H:56:LYS:CB	1:H:306:ASN:HB2	2.48	0.42
1:C:257:LEU:HD11	1:C:293:ILE:HD11	2.00	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:54:SER:OG	1:E:64:PHE:O	2.28	0.42
1:H:23:LYS:NZ	1:H:88:GLN:O	2.52	0.42
1:D:226:ASP:OD1	1:D:226:ASP:N	2.52	0.42
1:E:101:LYS:HA	1:E:101:LYS:HD3	1.92	0.42
1:F:298:ASP:C	1:F:300:ASN:H	2.22	0.42
1:G:226:ASP:OD1	1:G:226:ASP:N	2.53	0.42
1:C:25:LYS:HG3	1:C:315:ALA:HB1	2.02	0.42
1:F:6:SER:HB3	1:F:29:THR:HG22	2.02	0.42
1:H:160:VAL:HB	1:H:244:VAL:HG22	2.02	0.42
1:A:149:LYS:HD2	1:A:149:LYS:HA	1.95	0.42
1:D:6:SER:HB3	1:D:29:THR:HG22	2.00	0.42
1:D:165:LYS:HB3	3:D:402[A]:NAP:O3D	2.20	0.42
1:F:262:ILE:HD13	1:F:282:THR:HG21	2.01	0.42
1:A:8:ILE:HG12	1:A:122:THR:HB	2.02	0.41
1:E:286:ASN:OD1	1:E:321:LYS:NZ	2.38	0.41
1:G:257:LEU:HD23	1:G:257:LEU:HA	1.93	0.41
1:H:166:ASN:ND2	1:H:194:SER:O	2.52	0.41
1:A:226:ASP:N	1:A:226:ASP:OD1	2.53	0.41
1:F:288:TYR:CD2	1:F:314:ILE:HG23	2.55	0.41
1:G:49:THR:OG1	1:G:72:ARG:HG2	2.19	0.41
1:G:173:LEU:O	1:G:177:LYS:HG2	2.19	0.41
1:G:262:ILE:HG21	1:G:273:PRO:HB3	2.02	0.41
1:H:11:GLY:N	1:H:33:GLU:OE1	2.34	0.41
1:H:126:GLY:HA2	1:H:292:VAL:HG23	2.01	0.41
2:H:401:FAD:HO2A	2:H:401:FAD:HO3A	1.58	0.41
1:F:128:TYR:OH	2:F:401:FAD:H9	2.20	0.41
1:F:187:ARG:HH21	3:F:402[A]:NAP:P2B	2.43	0.41
1:F:226:ASP:N	1:F:226:ASP:OD1	2.53	0.41
1:D:131:HIS:HA	1:D:250:TYR:HD1	1.86	0.41
1:H:304:ILE:H	1:H:308:LYS:HZ2	1.67	0.41
1:A:65:ILE:CG1	1:D:82:GLU:HG3	2.47	0.41
1:B:35:GLY:HA3	1:B:39:GLU:HG3	2.03	0.41
1:G:275:TYR:CE2	1:G:289:ILE:HD11	2.55	0.41
1:B:276:ASN:C	1:B:278:GLU:H	2.23	0.41
1:E:9:ILE:HD13	1:E:97:VAL:HG11	2.03	0.41
1:F:2:GLN:HG3	1:F:114:ASP:OD2	2.20	0.41
1:H:95:GLU:HB2	1:H:113:LYS:HD2	2.01	0.41
1:A:2:GLN:HG3	1:A:114:ASP:OD2	2.21	0.41
1:D:31:ILE:HB	1:D:91:VAL:HG22	2.01	0.41
1:B:82:GLU:HG3	1:C:65:ILE:HG12	2.03	0.41
1:B:78:VAL:HG21	1:C:67:GLU:HA	2.03	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:63:PRO:HB2	1:C:65:ILE:HD12	2.03	0.40
1:E:132:ASN:HB2	1:E:248:ILE:HG13	2.03	0.40
1:G:262:ILE:HD13	1:G:282:THR:HG21	2.02	0.40
1:H:158:ASP:HB3	1:H:241:ASN:HA	2.01	0.40
1:H:164:GLY:HA3	1:H:186:TYR:CE2	2.56	0.40
1:C:39:GLU:OE2	1:C:43:ASN:ND2	2.55	0.40
1:D:165:LYS:HE3	1:D:194:SER:OG	2.22	0.40
1:E:316:GLN:O	1:E:320:ALA:N	2.54	0.40
1:H:73:ARG:H	1:H:73:ARG:HG3	1.48	0.40
1:H:158:ASP:HA	1:H:181:ASN:HB2	2.03	0.40
1:E:260:VAL:HG22	1:E:262:ILE:HG13	2.03	0.40
1:G:106:LYS:NZ	1:G:119:ARG:HG2	2.35	0.40
1:H:288:TYR:CD2	1:H:314:ILE:HG23	2.56	0.40
1:A:198:TRP:CD1	1:A:199:ILE:HG13	2.57	0.40
1:A:267:ASN:O	1:F:271:THR:HG21	2.21	0.40
1:C:167:SER:HA	3:C:402:NAP:H5N	2.03	0.40
1:F:128:TYR:OH	2:F:401:FAD:H1'1	2.22	0.40
1:F:297:ASN:O	1:F:299:ALA:N	2.55	0.40
1:G:97:VAL:HA	1:G:111:THR:HG22	2.03	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	A	324/328 (99%)	301 (93%)	21 (6%)	2 (1%)	25 59
1	B	321/328 (98%)	305 (95%)	15 (5%)	1 (0%)	41 73
1	C	325/328 (99%)	302 (93%)	17 (5%)	6 (2%)	8 34
1	D	323/328 (98%)	304 (94%)	15 (5%)	4 (1%)	13 44
1	E	323/328 (98%)	297 (92%)	21 (6%)	5 (2%)	10 39

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	F	324/328 (99%)	303 (94%)	16 (5%)	5 (2%)	10	39
1	G	287/328 (88%)	254 (88%)	27 (9%)	6 (2%)	7	30
1	H	316/328 (96%)	275 (87%)	25 (8%)	16 (5%)	2	13
All	All	2543/2624 (97%)	2341 (92%)	157 (6%)	45 (2%)	8	34

All (45) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	60	GLY
1	A	298	ASP
1	C	73	ARG
1	C	271	THR
1	E	73	ARG
1	E	299	ALA
1	F	298	ASP
1	H	165	LYS
1	H	166	ASN
1	H	297	ASN
1	H	312	GLY
1	C	74	ASN
1	C	296	GLY
1	E	60	GLY
1	E	74	ASN
1	F	60	GLY
1	G	92	ASN
1	G	265	ASN
1	G	296	GLY
1	H	72	ARG
1	H	164	GLY
1	H	264	ILE
1	H	304	ILE
1	D	266	THR
1	D	298	ASP
1	F	299	ALA
1	G	93	ALA
1	H	299	ALA
1	C	94	PHE
1	C	298	ASP
1	D	94	PHE
1	D	267	ASN
1	F	94	PHE

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Mol	Chain	Res	Type
1	H	50	PHE
1	H	63	PRO
1	H	277	LYS
1	B	268	GLU
1	E	94	PHE
1	F	267	ASN
1	G	63	PRO
1	G	270	GLY
1	H	61	ASP
1	H	64	PHE
1	H	309	PHE
1	H	66	VAL

### 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	280/282 (99%)	271 (97%)	9 (3%)	39 69
1	B	277/282 (98%)	271 (98%)	6 (2%)	52 78
1	C	281/282 (100%)	275 (98%)	6 (2%)	53 79
1	D	279/282 (99%)	267 (96%)	12 (4%)	29 62
1	E	279/282 (99%)	265 (95%)	14 (5%)	24 57
1	F	280/282 (99%)	269 (96%)	11 (4%)	32 65
1	G	250/282 (89%)	239 (96%)	11 (4%)	28 61
1	H	273/282 (97%)	264 (97%)	9 (3%)	38 69
All	All	2199/2256 (98%)	2121 (96%)	78 (4%)	35 68

All (78) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	39	GLU
1	A	65	ILE
1	A	68	GLU

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	A	99	THR
1	A	104	ASN
1	A	112	THR
1	A	127	TYR
1	A	156	ASP
1	A	268	GLU
1	B	64	PHE
1	B	69	SER
1	B	127	TYR
1	B	156	ASP
1	B	170	ASP
1	B	305	GLU
1	C	39	GLU
1	C	112	THR
1	C	127	TYR
1	C	156	ASP
1	C	209	HIS
1	C	303	PHE
1	D	39	GLU
1	D	99	THR
1	D	127	TYR
1	D	136	VAL
1	D	156	ASP
1	D	207	VAL
1	D	260	VAL
1	D	271	THR
1	D	274	MET
1	D	297	ASN
1	D	301	THR
1	D	303	PHE
1	E	39	GLU
1	E	65	ILE
1	E	103	MET
1	E	112	THR
1	E	127	TYR
1	E	136	VAL
1	E	156	ASP
1	E	204	THR
1	E	260	VAL
1	E	266	THR
1	E	268	GLU
1	E	275	TYR

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Mol	Chain	Res	Type
1	E	301	THR
1	E	303	PHE
1	F	39	GLU
1	F	46	THR
1	F	55	ASP
1	F	65	ILE
1	F	112	THR
1	F	127	TYR
1	F	136	VAL
1	F	156	ASP
1	F	260	VAL
1	F	293	ILE
1	F	303	PHE
1	G	46	THR
1	G	68	GLU
1	G	69	SER
1	G	85	LYS
1	G	95	GLU
1	G	101	LYS
1	G	127	TYR
1	G	156	ASP
1	G	158	ASP
1	G	242	ASP
1	G	303	PHE
1	H	47	HIS
1	H	51	PHE
1	H	73	ARG
1	H	127	TYR
1	H	156	ASP
1	H	186	TYR
1	H	213	ASP
1	H	303	PHE
1	H	310	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	H	43	ASN
1	H	75	GLN
1	H	306	ASN

### 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](#)

13 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
3	NAP	C	402	1	45,52,52	0.68	1 (2%)	56,80,80	0.79	3 (5%)
3	NAP	F	402[A]	-	45,52,52	0.69	1 (2%)	56,80,80	0.74	2 (3%)
2	FAD	F	401	-	53,58,58	0.47	0	68,89,89	0.54	1 (1%)
2	FAD	G	401	-	53,58,58	0.46	0	68,89,89	0.50	2 (2%)
2	FAD	E	401	-	53,58,58	0.47	0	68,89,89	0.52	1 (1%)
2	FAD	A	401	-	53,58,58	0.46	0	68,89,89	0.57	2 (2%)
2	FAD	D	401	-	53,58,58	0.47	0	68,89,89	0.55	1 (1%)
3	NAP	D	402[B]	-	45,52,52	0.67	1 (2%)	56,80,80	0.88	3 (5%)
3	NAP	D	402[A]	-	45,52,52	0.67	1 (2%)	56,80,80	0.80	3 (5%)
2	FAD	C	401	-	53,58,58	0.46	0	68,89,89	0.53	1 (1%)
3	NAP	F	402[B]	-	45,52,52	0.70	1 (2%)	56,80,80	0.98	3 (5%)
2	FAD	H	401	-	53,58,58	0.45	0	68,89,89	0.57	2 (2%)
2	FAD	B	401	-	53,58,58	0.46	0	68,89,89	0.54	2 (2%)



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
3	NAP	C	402	1	-	7/31/67/67	0/5/5/5
3	NAP	F	402[A]	-	-	6/31/67/67	0/5/5/5
2	FAD	F	401	-	-	4/30/50/50	0/6/6/6
2	FAD	G	401	-	-	16/30/50/50	0/6/6/6
2	FAD	E	401	-	-	3/30/50/50	0/6/6/6
2	FAD	A	401	-	-	3/30/50/50	0/6/6/6
2	FAD	D	401	-	-	3/30/50/50	0/6/6/6
3	NAP	D	402[B]	-	-	17/31/67/67	0/5/5/5
3	NAP	D	402[A]	-	-	6/31/67/67	0/5/5/5
2	FAD	C	401	-	-	3/30/50/50	0/6/6/6
3	NAP	F	402[B]	-	-	10/31/67/67	0/5/5/5
2	FAD	H	401	-	-	9/30/50/50	0/6/6/6
2	FAD	B	401	-	-	2/30/50/50	0/6/6/6

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	F	402[B]	NAP	C2N-N1N	2.55	1.38	1.35
3	F	402[A]	NAP	C2N-N1N	2.18	1.37	1.35
3	D	402[A]	NAP	C2N-N1N	2.12	1.37	1.35
3	C	402	NAP	C2N-N1N	2.07	1.37	1.35
3	D	402[B]	NAP	C2N-N1N	2.06	1.37	1.35

All (26) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	F	402[B]	NAP	O4D-C1D-C2D	-5.04	99.56	106.93
3	D	402[B]	NAP	O4D-C1D-C2D	-3.61	101.65	106.93
3	C	402	NAP	C6N-N1N-C2N	-2.58	119.62	121.97
3	D	402[A]	NAP	C6N-N1N-C2N	-2.52	119.68	121.97
2	H	401	FAD	P-O3P-PA	-2.49	124.28	132.83
3	F	402[B]	NAP	C6N-N1N-C2N	-2.45	119.75	121.97
2	A	401	FAD	P-O3P-PA	-2.44	124.44	132.83
3	D	402[A]	NAP	C5A-C6A-N6A	2.43	124.04	120.35
3	D	402[A]	NAP	C3D-C2D-C1D	2.37	104.55	100.98

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	402	NAP	O4D-C1D-C2D	-2.37	103.47	106.93
2	B	401	FAD	C5A-C6A-N6A	2.34	123.91	120.35
2	C	401	FAD	C5A-C6A-N6A	2.33	123.90	120.35
2	D	401	FAD	C5A-C6A-N6A	2.33	123.89	120.35
3	F	402[A]	NAP	C5A-C6A-N6A	2.33	123.89	120.35
2	G	401	FAD	C5A-C6A-N6A	2.30	123.85	120.35
2	A	401	FAD	C5A-C6A-N6A	2.29	123.83	120.35
2	F	401	FAD	C5A-C6A-N6A	2.28	123.82	120.35
2	G	401	FAD	P-O3P-PA	-2.27	125.03	132.83
2	B	401	FAD	P-O3P-PA	-2.27	125.03	132.83
2	H	401	FAD	C5A-C6A-N6A	2.26	123.79	120.35
2	E	401	FAD	C5A-C6A-N6A	2.26	123.79	120.35
3	F	402[B]	NAP	C5A-C6A-N6A	2.26	123.79	120.35
3	C	402	NAP	C5A-C6A-N6A	2.26	123.78	120.35
3	F	402[A]	NAP	C6N-N1N-C2N	-2.20	119.97	121.97
3	D	402[B]	NAP	C5A-C6A-N6A	2.16	123.64	120.35
3	D	402[B]	NAP	C6N-N1N-C2N	-2.07	120.09	121.97

There are no chirality outliers.

All (89) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	G	401	FAD	C5B-O5B-PA-O1A
2	G	401	FAD	C5B-O5B-PA-O2A
2	G	401	FAD	C3B-C4B-C5B-O5B
2	G	401	FAD	C2'-C3'-C4'-O4'
2	G	401	FAD	C2'-C3'-C4'-C5'
2	G	401	FAD	O3'-C3'-C4'-O4'
2	G	401	FAD	O3'-C3'-C4'-C5'
2	G	401	FAD	C5'-O5'-P-O2P
2	H	401	FAD	N10-C1'-C2'-O2'
2	H	401	FAD	C2'-C3'-C4'-O4'
2	H	401	FAD	C2'-C3'-C4'-C5'
2	H	401	FAD	O3'-C3'-C4'-O4'
2	H	401	FAD	O3'-C3'-C4'-C5'
2	H	401	FAD	C3'-C4'-C5'-O5'
2	H	401	FAD	O4'-C4'-C5'-O5'
3	C	402	NAP	C2N-C3N-C7N-O7N
3	C	402	NAP	C2N-C3N-C7N-N7N
3	D	402[A]	NAP	O4D-C4D-C5D-O5D
3	D	402[B]	NAP	C5B-O5B-PA-O2A
3	D	402[B]	NAP	C5D-O5D-PN-O3

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Mol	Chain	Res	Type	Atoms
3	D	402[B]	NAP	O4D-C4D-C5D-O5D
3	D	402[B]	NAP	C3D-C4D-C5D-O5D
3	D	402[B]	NAP	C2N-C3N-C7N-O7N
3	D	402[B]	NAP	C2N-C3N-C7N-N7N
3	F	402[A]	NAP	C3B-C2B-O2B-P2B
3	F	402[B]	NAP	O4D-C4D-C5D-O5D
3	F	402[B]	NAP	C3D-C4D-C5D-O5D
3	C	402	NAP	C4N-C3N-C7N-N7N
3	C	402	NAP	C4N-C3N-C7N-O7N
3	D	402[B]	NAP	C4N-C3N-C7N-O7N
3	D	402[B]	NAP	C4N-C3N-C7N-N7N
2	A	401	FAD	O4B-C4B-C5B-O5B
2	A	401	FAD	C3B-C4B-C5B-O5B
2	G	401	FAD	O4B-C4B-C5B-O5B
3	D	402[A]	NAP	C3D-C4D-C5D-O5D
3	D	402[B]	NAP	O4B-C4B-C5B-O5B
3	D	402[B]	NAP	C3B-C4B-C5B-O5B
3	F	402[A]	NAP	O4D-C4D-C5D-O5D
3	F	402[A]	NAP	C3D-C4D-C5D-O5D
3	F	402[B]	NAP	C2N-C3N-C7N-O7N
3	F	402[B]	NAP	C2N-C3N-C7N-N7N
3	D	402[A]	NAP	C3B-C2B-O2B-P2B
3	F	402[B]	NAP	C4N-C3N-C7N-N7N
3	D	402[B]	NAP	C1B-C2B-O2B-P2B
3	C	402	NAP	C3B-C2B-O2B-P2B
3	D	402[B]	NAP	C3B-C2B-O2B-P2B
3	F	402[B]	NAP	C3B-C2B-O2B-P2B
3	F	402[B]	NAP	C4N-C3N-C7N-O7N
3	C	402	NAP	C1B-C2B-O2B-P2B
3	D	402[A]	NAP	C1B-C2B-O2B-P2B
3	F	402[A]	NAP	C1B-C2B-O2B-P2B
3	F	402[B]	NAP	C1B-C2B-O2B-P2B
3	D	402[A]	NAP	C4D-C5D-O5D-PN
3	D	402[B]	NAP	PA-O3-PN-O1N
3	F	402[A]	NAP	C4D-C5D-O5D-PN
2	H	401	FAD	C4'-C5'-O5'-P
2	A	401	FAD	PA-O3P-P-O5'
2	B	401	FAD	PA-O3P-P-O5'
2	C	401	FAD	PA-O3P-P-O5'
2	D	401	FAD	PA-O3P-P-O5'
2	E	401	FAD	PA-O3P-P-O5'
2	F	401	FAD	PA-O3P-P-O5'

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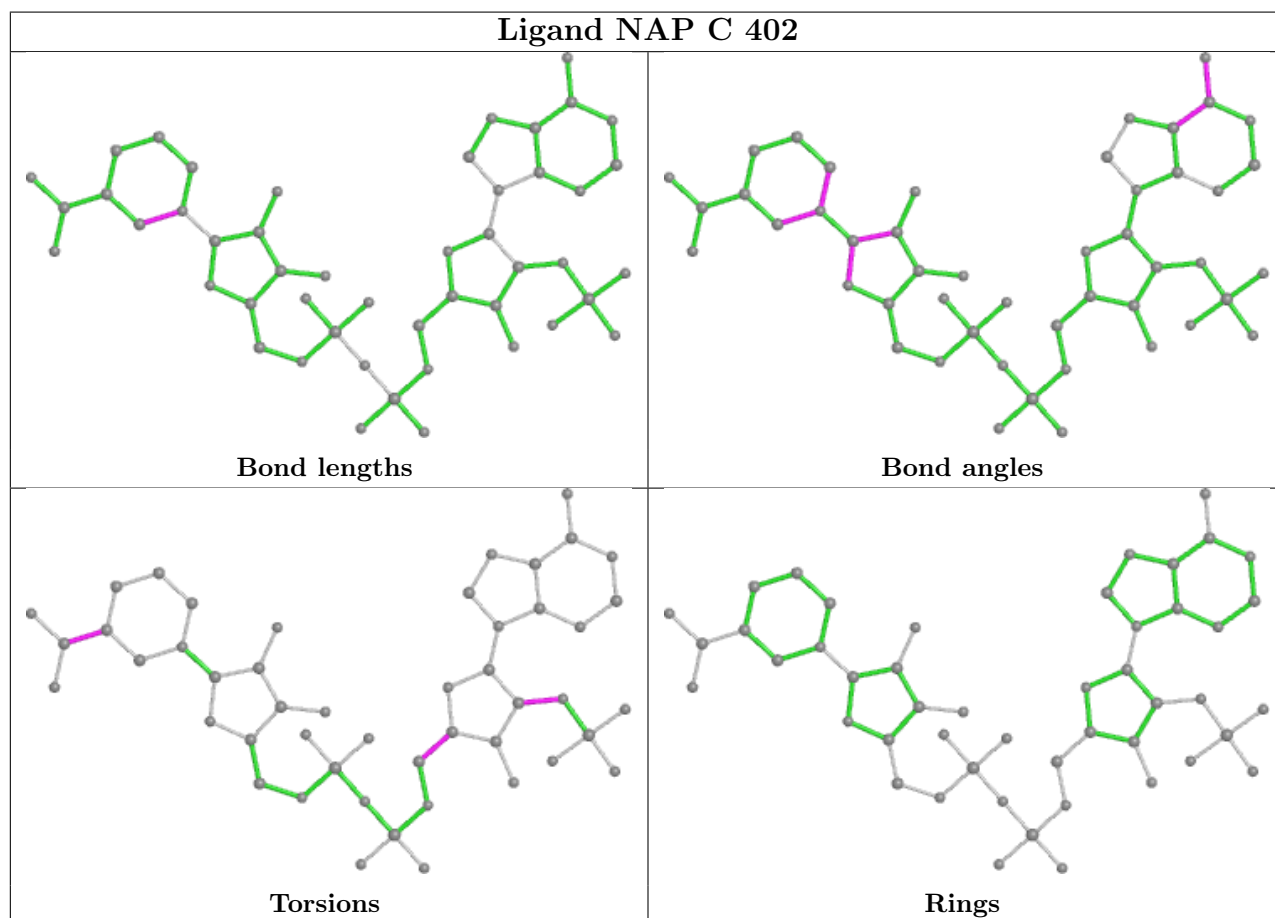
Mol	Chain	Res	Type	Atoms
2	G	401	FAD	PA-O3P-P-O5'
2	G	401	FAD	C5'-O5'-P-O3P
3	D	402[B]	NAP	C5B-O5B-PA-O3
2	G	401	FAD	C5'-O5'-P-O1P
3	D	402[B]	NAP	C5B-O5B-PA-O1A
3	D	402[B]	NAP	PA-O3-PN-O2N
3	F	402[B]	NAP	O4B-C4B-C5B-O5B
3	F	402[B]	NAP	C4D-C5D-O5D-PN
2	E	401	FAD	P-O3P-PA-O2A
2	G	401	FAD	C5B-O5B-PA-O3P
2	B	401	FAD	O4B-C4B-C5B-O5B
2	C	401	FAD	O4B-C4B-C5B-O5B
2	E	401	FAD	O4B-C4B-C5B-O5B
3	C	402	NAP	O4B-C4B-C5B-O5B
3	D	402[A]	NAP	O4B-C4B-C5B-O5B
2	C	401	FAD	P-O3P-PA-O2A
2	D	401	FAD	P-O3P-PA-O2A
2	F	401	FAD	P-O3P-PA-O1A
2	F	401	FAD	P-O3P-PA-O2A
2	H	401	FAD	C5B-O5B-PA-O1A
3	D	402[B]	NAP	C5D-O5D-PN-O1N
2	D	401	FAD	O4B-C4B-C5B-O5B
2	F	401	FAD	O4B-C4B-C5B-O5B
3	F	402[A]	NAP	O4B-C4B-C5B-O5B
2	G	401	FAD	C1'-C2'-C3'-O3'
2	G	401	FAD	O2'-C2'-C3'-O3'
2	G	401	FAD	N10-C1'-C2'-O2'

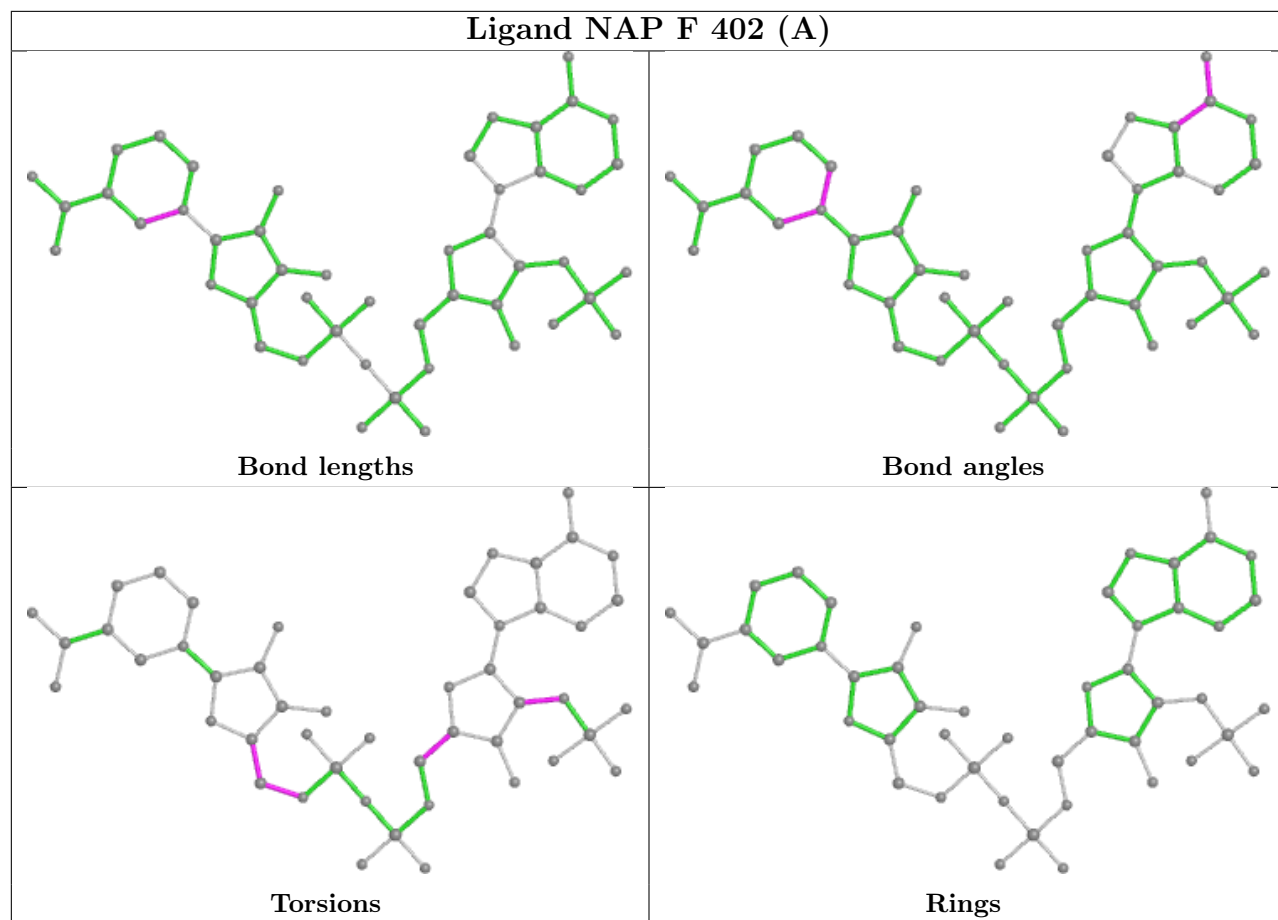
There are no ring outliers.

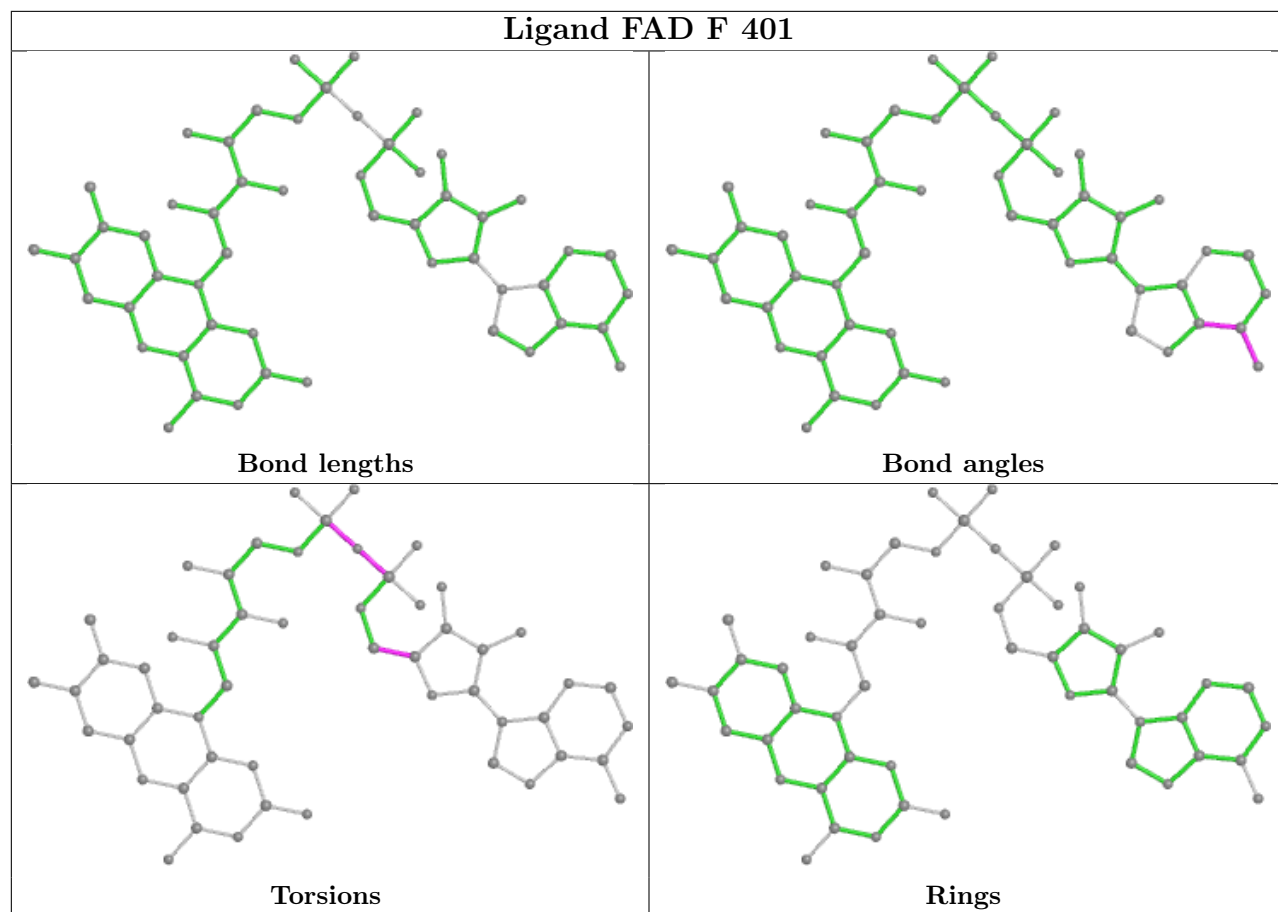
10 monomers are involved in 30 short contacts:

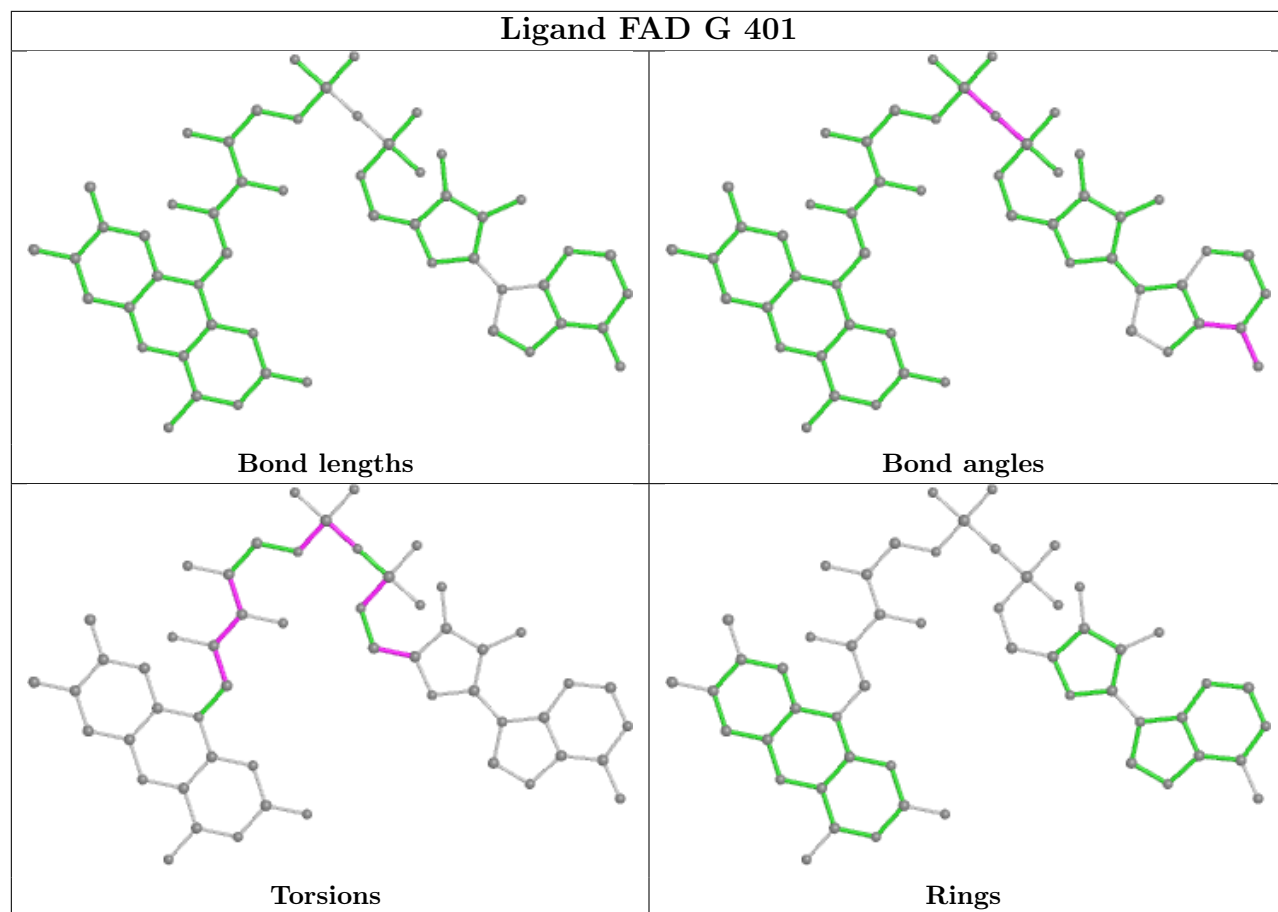
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	402	NAP	1	0
3	F	402[A]	NAP	4	0
2	F	401	FAD	3	0
2	A	401	FAD	1	0
2	D	401	FAD	2	0
3	D	402[B]	NAP	3	0
3	D	402[A]	NAP	4	0
2	C	401	FAD	4	0
3	F	402[B]	NAP	4	0
2	H	401	FAD	4	0

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 than 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.

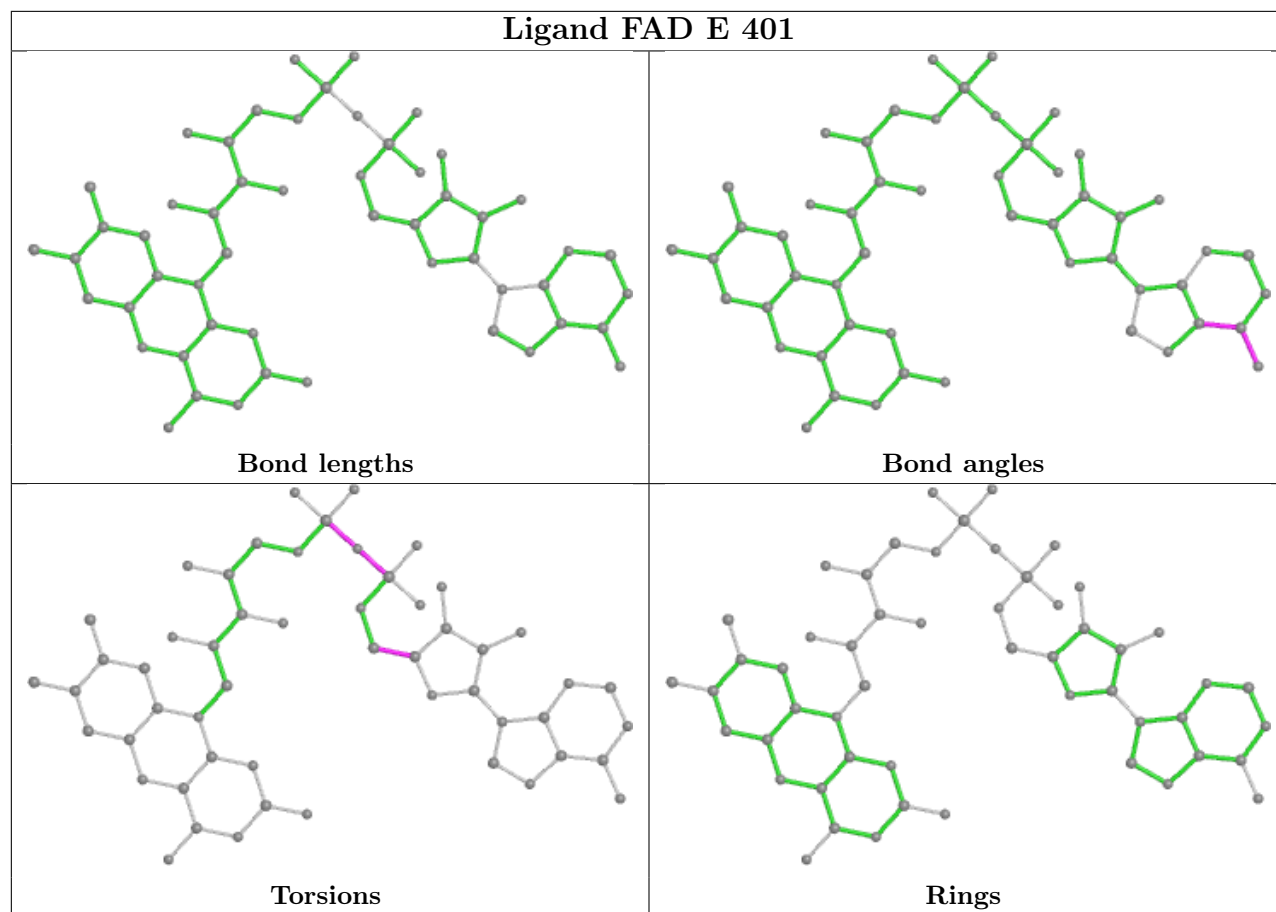


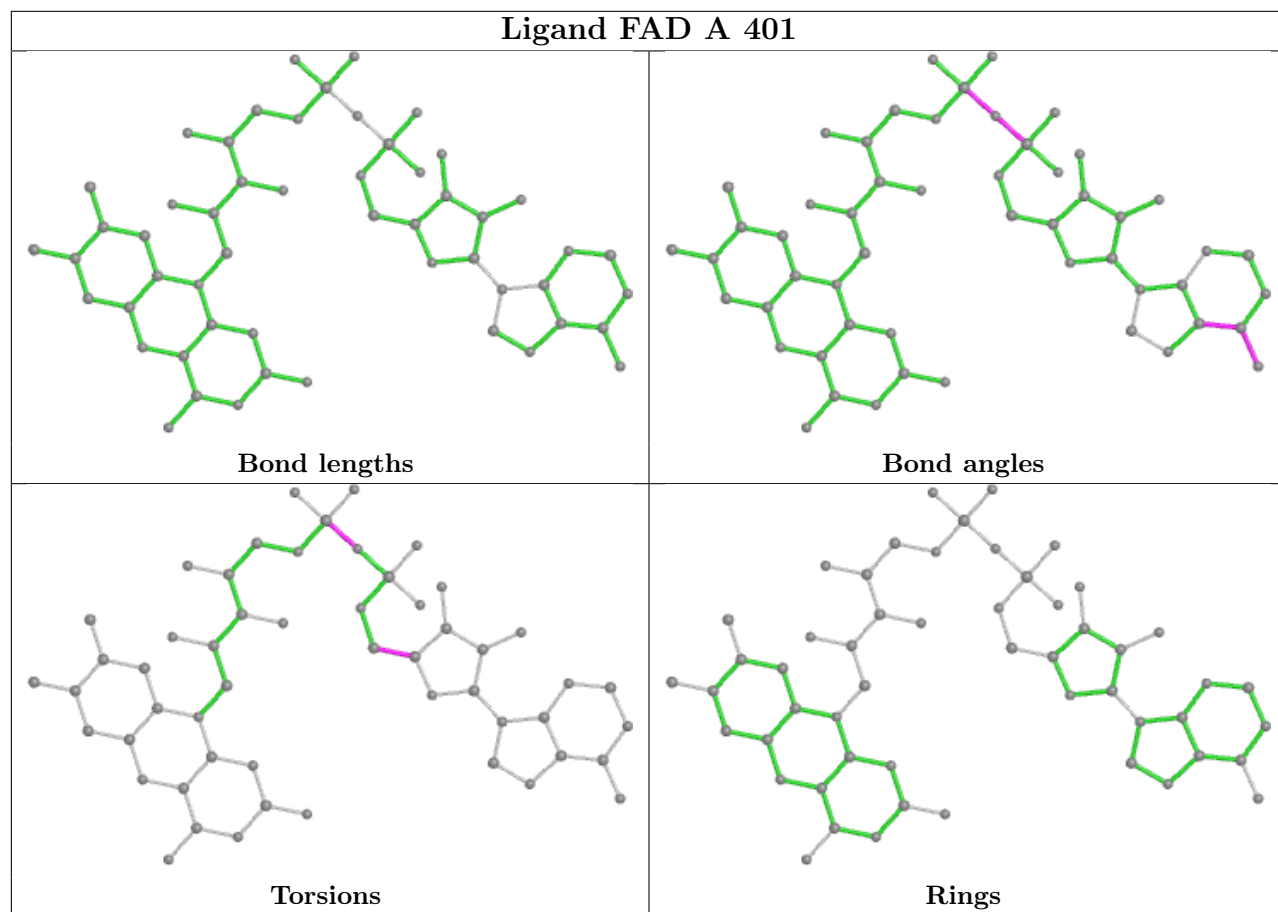


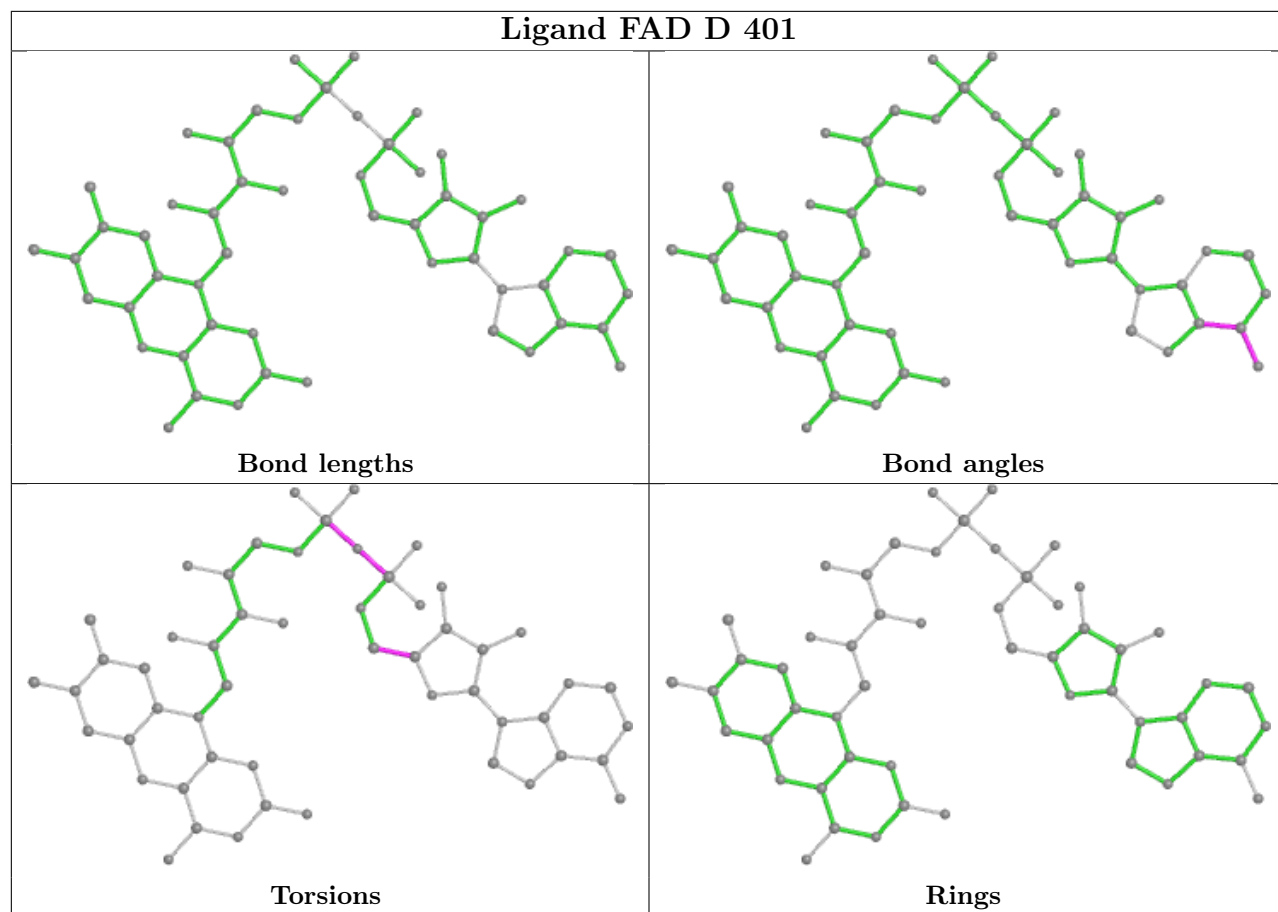


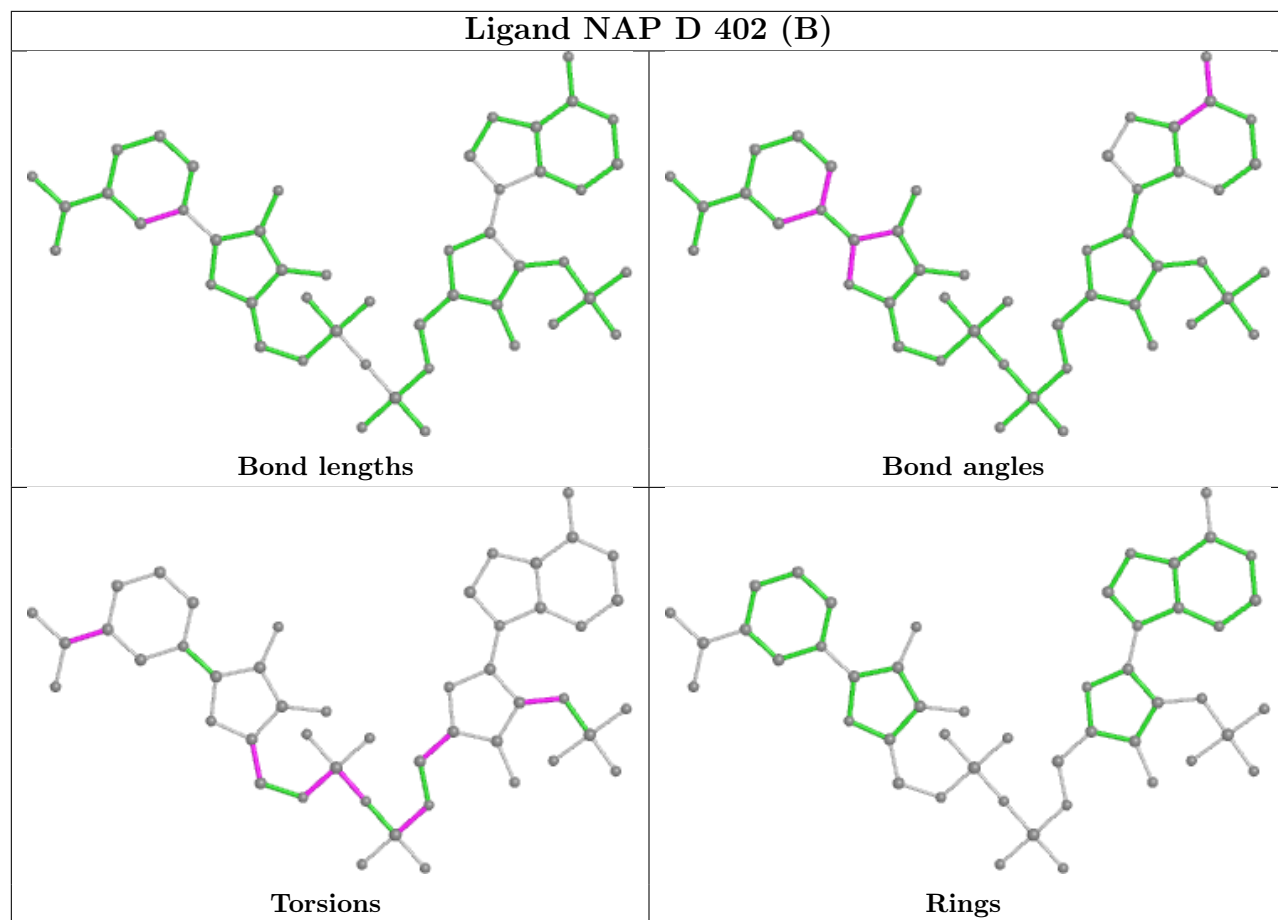


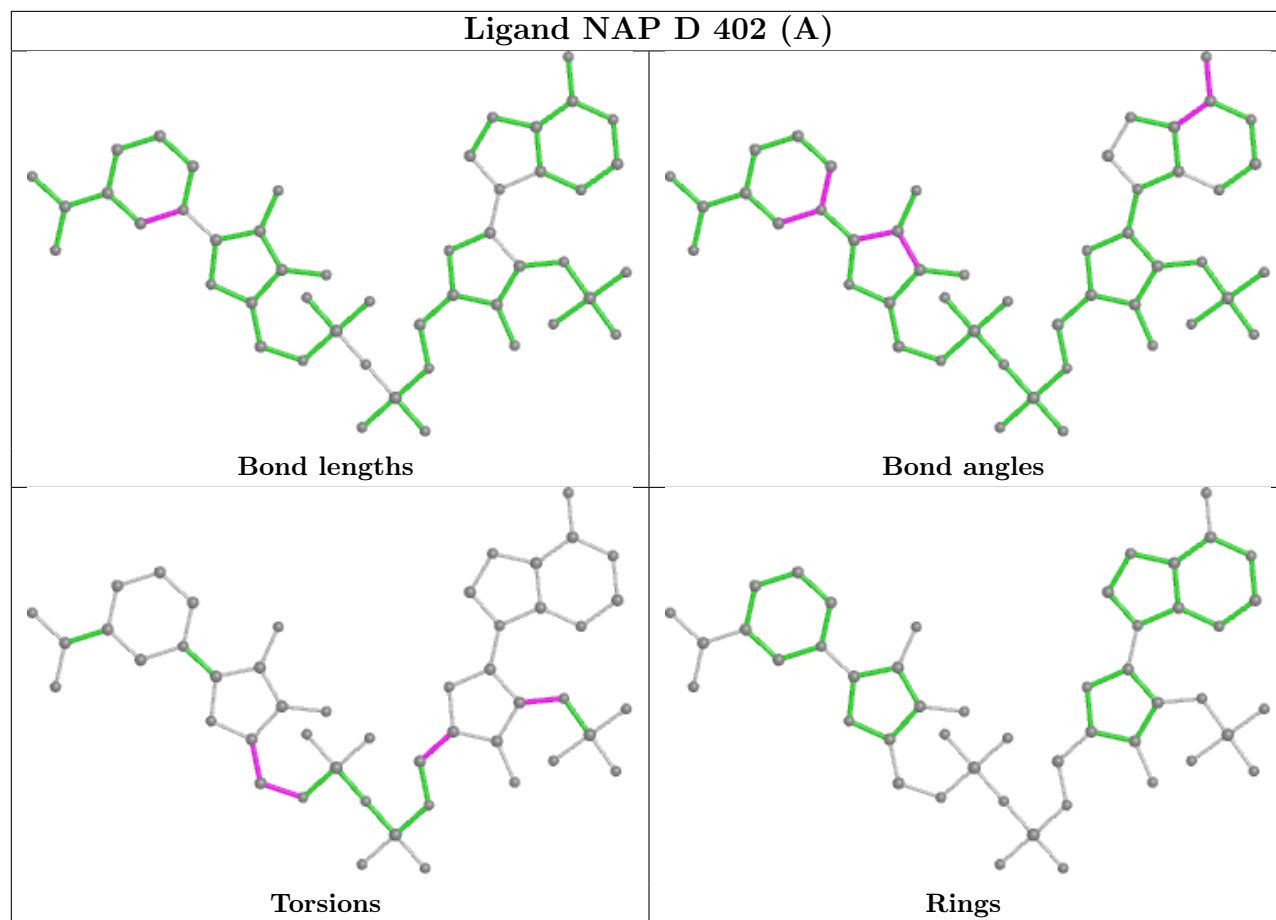


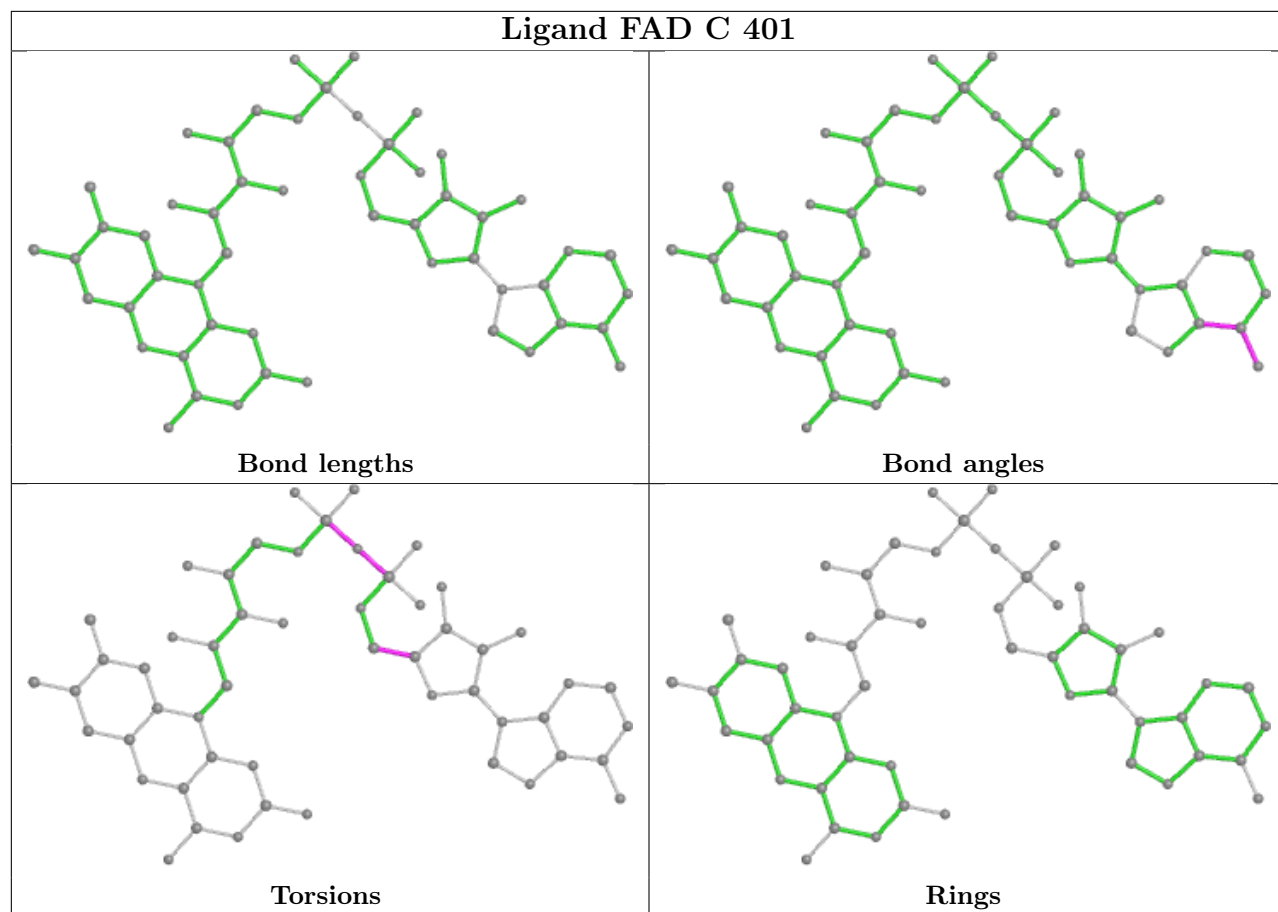


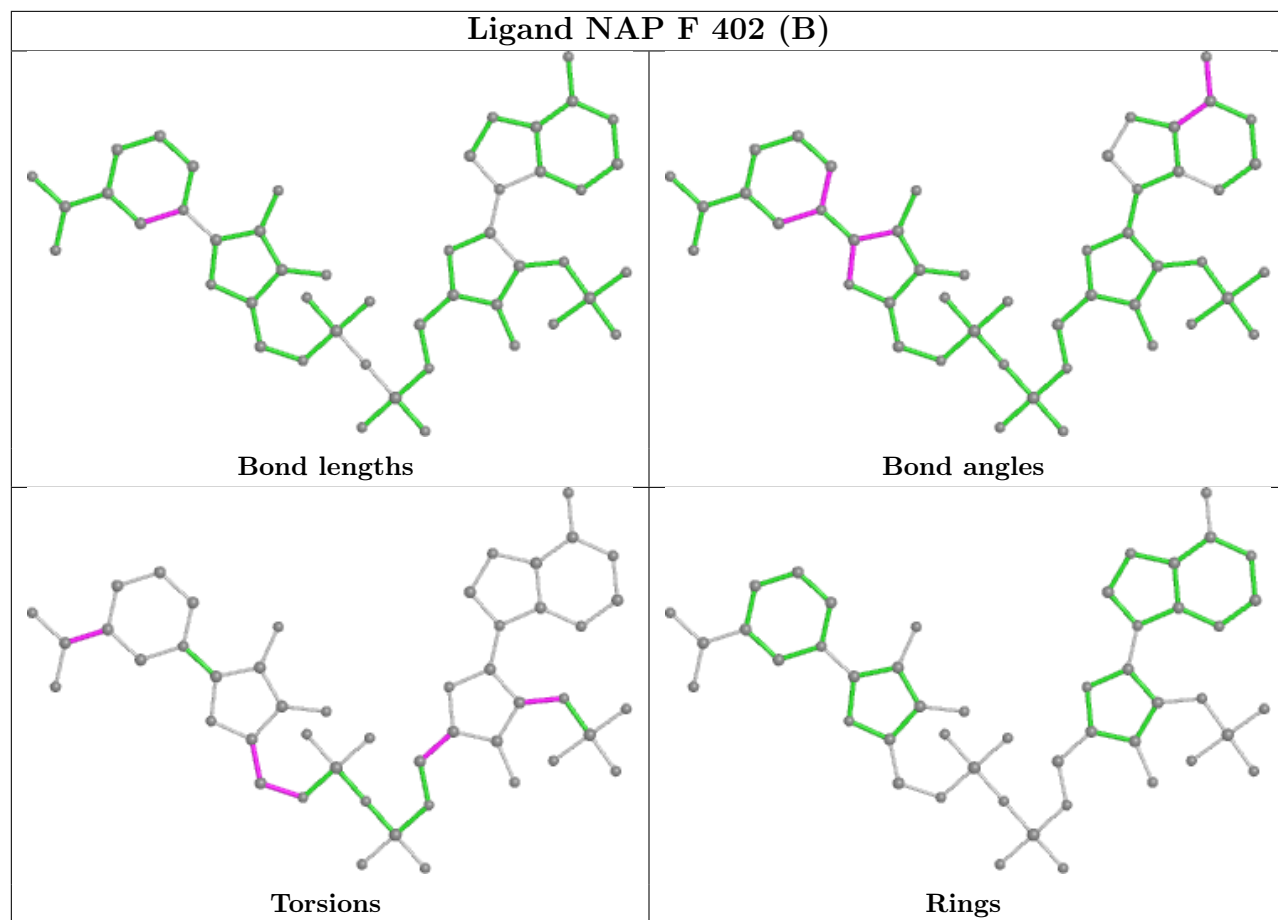


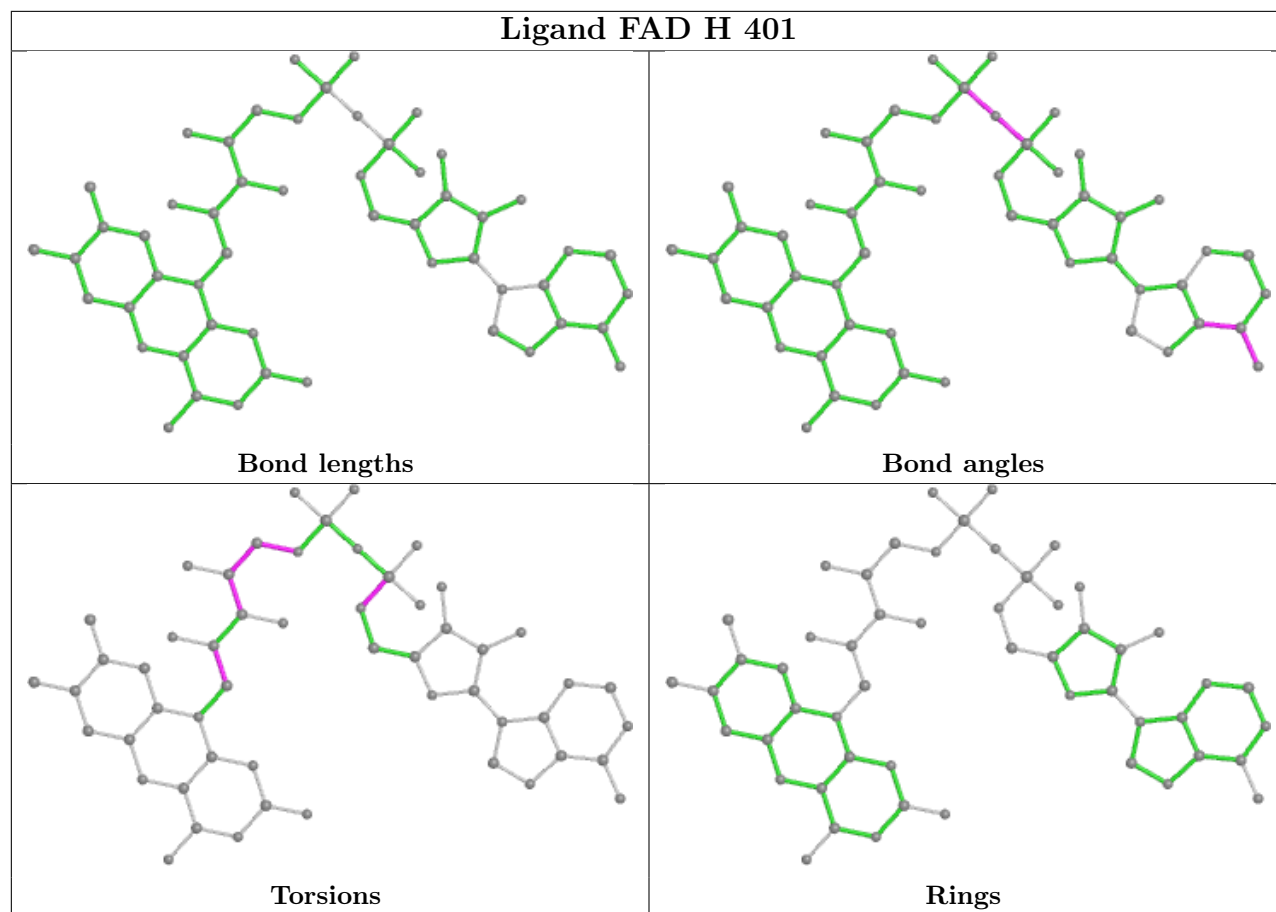




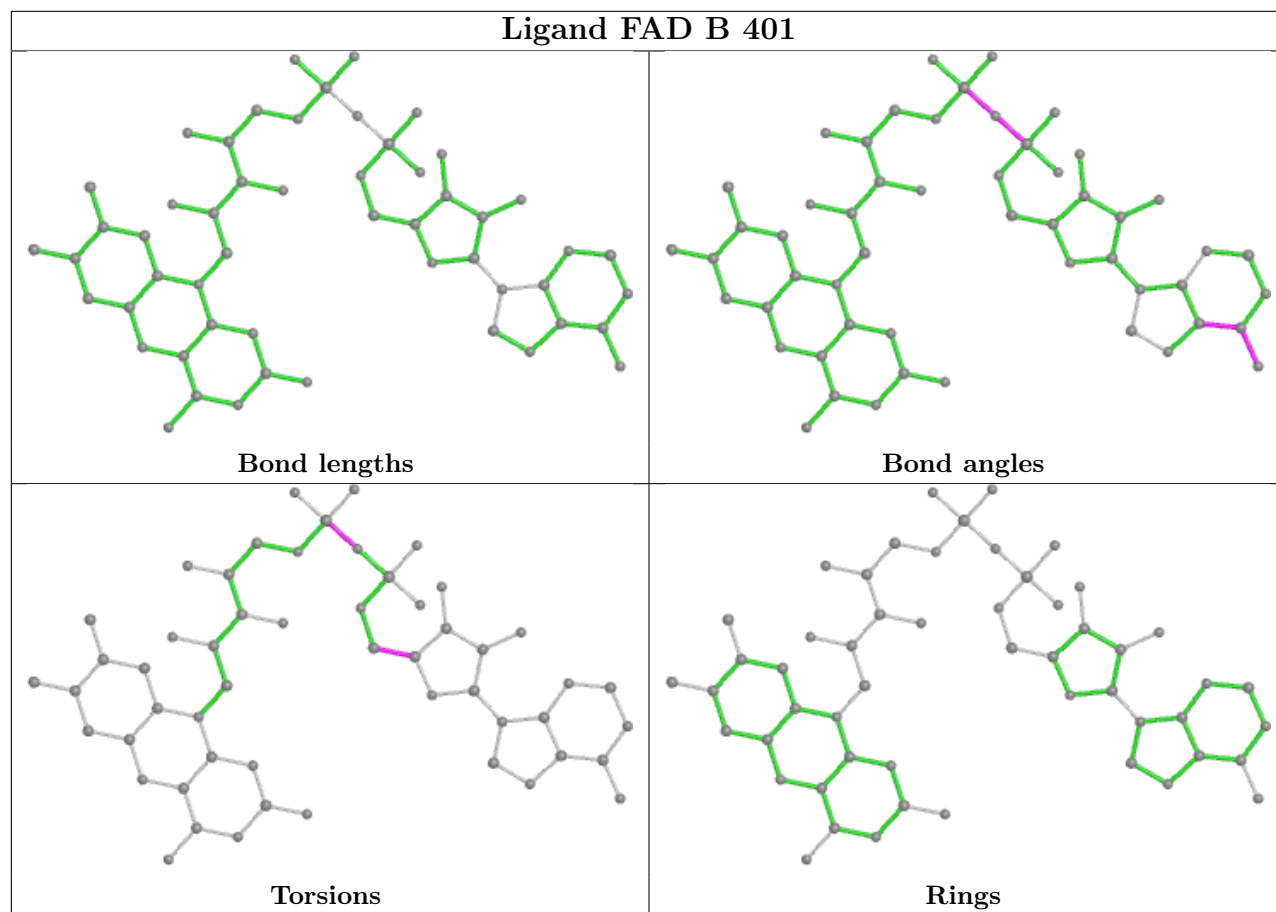












## 5.7 Other polymers [i](#)

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<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	323/328 (98%)	-0.16	9 (2%) 53 30	29, 55, 87, 117	0
1	B	322/328 (98%)	-0.16	11 (3%) 45 24	29, 55, 98, 130	0
1	C	323/328 (98%)	-0.37	6 (1%) 66 46	25, 44, 73, 108	0
1	D	323/328 (98%)	-0.36	2 (0%) 89 78	27, 46, 80, 114	0
1	E	323/328 (98%)	-0.31	8 (2%) 57 34	25, 44, 79, 116	0
1	F	323/328 (98%)	-0.28	4 (1%) 79 61	25, 48, 88, 112	0
1	G	293/328 (89%)	1.79	101 (34%) 0 0	70, 122, 148, 169	0
1	H	318/328 (96%)	1.76	113 (35%) 0 0	77, 118, 163, 176	0
All	All	2548/2624 (97%)	0.22	254 (9%) 7 2	25, 56, 138, 176	0

All (254) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	G	63	PRO	10.9
1	H	63	PRO	10.0
1	H	274	MET	9.3
1	H	71	PRO	9.1
1	G	236	SER	7.7
1	G	91	VAL	7.7
1	G	114	ASP	6.5
1	G	1	MET	6.4
1	G	267	ASN	6.3
1	H	115	VAL	6.3
1	H	42	TYR	6.3
1	H	268	GLU	6.1
1	H	1	MET	6.1
1	E	300	ASN	6.0
1	G	266	THR	5.8
1	G	71	PRO	5.7

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	B	300	ASN	5.6
1	H	300	ASN	5.4
1	H	216	PHE	5.3
1	G	133	THR	5.3
1	H	114	ASP	5.2
1	G	194	SER	5.2
1	G	231	GLU	5.0
1	G	238	THR	4.9
1	G	113	LYS	4.9
1	G	69	SER	4.9
1	G	132	ASN	4.8
1	G	177	LYS	4.8
1	H	158	ASP	4.6
1	E	323	GLN	4.6
1	E	267	ASN	4.6
1	G	169	ILE	4.5
1	H	271	THR	4.5
1	H	129	GLY	4.5
1	H	104	ASN	4.5
1	H	105	ASN	4.5
1	G	234	GLY	4.5
1	H	110	THR	4.5
1	G	51	PHE	4.5
1	H	270	GLY	4.4
1	G	176	GLU	4.4
1	H	10	GLY	4.4
1	H	116	TYR	4.3
1	H	99	THR	4.3
1	G	122	THR	4.3
1	G	64	PHE	4.2
1	G	263	GLN	4.2
1	G	147	TYR	4.1
1	G	95	GLU	4.1
1	H	302	ILE	4.1
1	H	137	GLU	4.0
1	G	254	TYR	4.0
1	H	26	GLY	4.0
1	H	233	ASN	4.0
1	G	134	LEU	3.9
1	H	224	THR	3.9
1	H	318	MET	3.9
1	G	265	ASN	3.9

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	C	266	THR	3.9
1	H	108	THR	3.9
1	G	25	LYS	3.8
1	H	288	TYR	3.8
1	H	281	GLU	3.8
1	H	188	GLY	3.7
1	H	70	LYS	3.7
1	H	128	TYR	3.7
1	B	298	ASP	3.6
1	G	96	GLU	3.6
1	H	189	GLY	3.6
1	H	98	LEU	3.6
1	H	118	CYS	3.6
1	H	103	MET	3.6
1	H	217	ASN	3.6
1	H	223	ILE	3.6
1	B	296	GLY	3.6
1	H	23	LYS	3.5
1	H	186	TYR	3.5
1	G	52	SER	3.5
1	G	29	THR	3.5
1	H	275	TYR	3.5
1	G	171	ALA	3.5
1	A	105	ASN	3.4
1	G	221	THR	3.4
1	H	295	ALA	3.4
1	G	88	GLN	3.4
1	H	61	ASP	3.4
1	G	235	GLU	3.4
1	G	140	ASP	3.3
1	G	237	LYS	3.3
1	H	285	GLU	3.3
1	H	133	THR	3.3
1	G	27	ILE	3.3
1	E	296	GLY	3.3
1	G	264	ILE	3.2
1	G	148	PHE	3.2
1	H	121	LEU	3.2
1	G	303	PHE	3.2
1	H	264	ILE	3.2
1	H	299	ALA	3.2
1	G	168	ALA	3.2

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	B	265	ASN	3.2
1	H	276	ASN	3.2
1	G	146	HIS	3.2
1	B	267	ASN	3.2
1	A	298	ASP	3.2
1	A	296	GLY	3.2
1	G	3	LYS	3.2
1	G	115	VAL	3.2
1	G	8	ILE	3.1
1	H	142	PRO	3.1
1	A	265	ASN	3.1
1	G	309	PHE	3.1
1	H	175	LEU	3.1
1	H	291	GLY	3.1
1	A	297	ASN	3.1
1	D	265	ASN	3.1
1	H	272	ALA	3.1
1	H	109	ILE	3.0
1	G	57	LEU	3.0
1	G	268	GLU	3.0
1	F	299	ALA	3.0
1	G	103	MET	3.0
1	G	224	THR	3.0
1	G	193	PRO	3.0
1	H	2	GLN	3.0
1	H	151	ALA	3.0
1	G	2	GLN	3.0
1	H	126	GLY	2.9
1	G	150	GLU	2.9
1	G	305	GLU	2.9
1	G	269	PHE	2.9
1	G	135	GLU	2.9
1	H	122	THR	2.9
1	F	1	MET	2.9
1	G	139	ALA	2.9
1	G	90	LYS	2.9
1	H	75	GLN	2.9
1	G	10	GLY	2.8
1	G	102	LYS	2.8
1	G	87	HIS	2.8
1	G	70	LYS	2.8
1	G	220	VAL	2.8

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	H	304	ILE	2.8
1	B	105	ASN	2.8
1	G	301	THR	2.8
1	H	55	ASP	2.8
1	B	225	GLU	2.7
1	G	56	LYS	2.7
1	G	143	LYS	2.7
1	G	290	ALA	2.7
1	H	208	ASN	2.7
1	H	267	ASN	2.7
1	H	131	HIS	2.7
1	H	62	VAL	2.7
1	H	11	GLY	2.7
1	C	323	GLN	2.7
1	H	54	SER	2.7
1	G	101	LYS	2.7
1	B	103	MET	2.7
1	A	300	ASN	2.7
1	G	47	HIS	2.7
1	G	49	THR	2.6
1	H	160	VAL	2.6
1	H	101	LYS	2.6
1	H	282	THR	2.6
1	G	92	ASN	2.6
1	H	181	ASN	2.6
1	G	287	CYS	2.6
1	H	234	GLY	2.6
1	G	225	GLU	2.6
1	H	111	THR	2.6
1	B	269	PHE	2.6
1	H	17	SER	2.6
1	H	239	ILE	2.6
1	H	138	GLY	2.6
1	G	192	SER	2.5
1	G	233	ASN	2.5
1	H	278	GLU	2.5
1	H	85	LYS	2.5
1	G	297	ASN	2.5
1	H	77	LEU	2.5
1	G	230	TYR	2.5
1	H	127	TYR	2.5
1	G	105	ASN	2.5

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	G	156	ASP	2.5
1	G	136	VAL	2.5
1	G	144	VAL	2.5
1	H	106	LYS	2.4
1	E	298	ASP	2.4
1	H	289	ILE	2.4
1	H	149	LYS	2.4
1	H	117	GLU	2.4
1	E	299	ALA	2.4
1	G	174	GLU	2.4
1	G	141	LEU	2.4
1	H	182	VAL	2.3
1	H	261	GLY	2.3
1	G	34	LYS	2.3
1	H	222	GLN	2.3
1	G	53	SER	2.3
1	G	55	ASP	2.3
1	A	323	GLN	2.3
1	H	308	LYS	2.3
1	H	141	LEU	2.3
1	H	265	ASN	2.3
1	H	206	LEU	2.3
1	A	267	ASN	2.3
1	G	138	GLY	2.2
1	G	26	GLY	2.2
1	H	180	ALA	2.2
1	H	297	ASN	2.2
1	H	301	THR	2.2
1	B	299	ALA	2.2
1	C	265	ASN	2.2
1	G	99	THR	2.2
1	H	72	ARG	2.2
1	G	86	HIS	2.2
1	F	233	ASN	2.2
1	H	29	THR	2.2
1	G	255	GLU	2.2
1	H	21	GLU	2.2
1	H	130	GLN	2.2
1	C	274	MET	2.2
1	H	232	VAL	2.2
1	G	11	GLY	2.2
1	G	175	LEU	2.2

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Mol	Chain	Res	Type	RSRZ
1	H	124	ALA	2.2
1	B	297	ASN	2.2
1	G	126	GLY	2.2
1	H	53	SER	2.1
1	E	1	MET	2.1
1	H	119	ARG	2.1
1	H	178	ALA	2.1
1	G	274	MET	2.1
1	H	183	THR	2.1
1	H	238	THR	2.1
1	G	154	TYR	2.1
1	F	298	ASP	2.1
1	G	244	VAL	2.1
1	E	297	ASN	2.1
1	G	298	ASP	2.1
1	H	213	ASP	2.1
1	A	113	LYS	2.0
1	C	267	ASN	2.0
1	H	134	LEU	2.0
1	H	40	SER	2.0
1	D	297	ASN	2.0
1	H	7	ILE	2.0
1	G	195	ILE	2.0
1	C	268	GLU	2.0
1	H	65	ILE	2.0
1	H	97	VAL	2.0
1	H	192	SER	2.0
1	H	179	GLY	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](#)

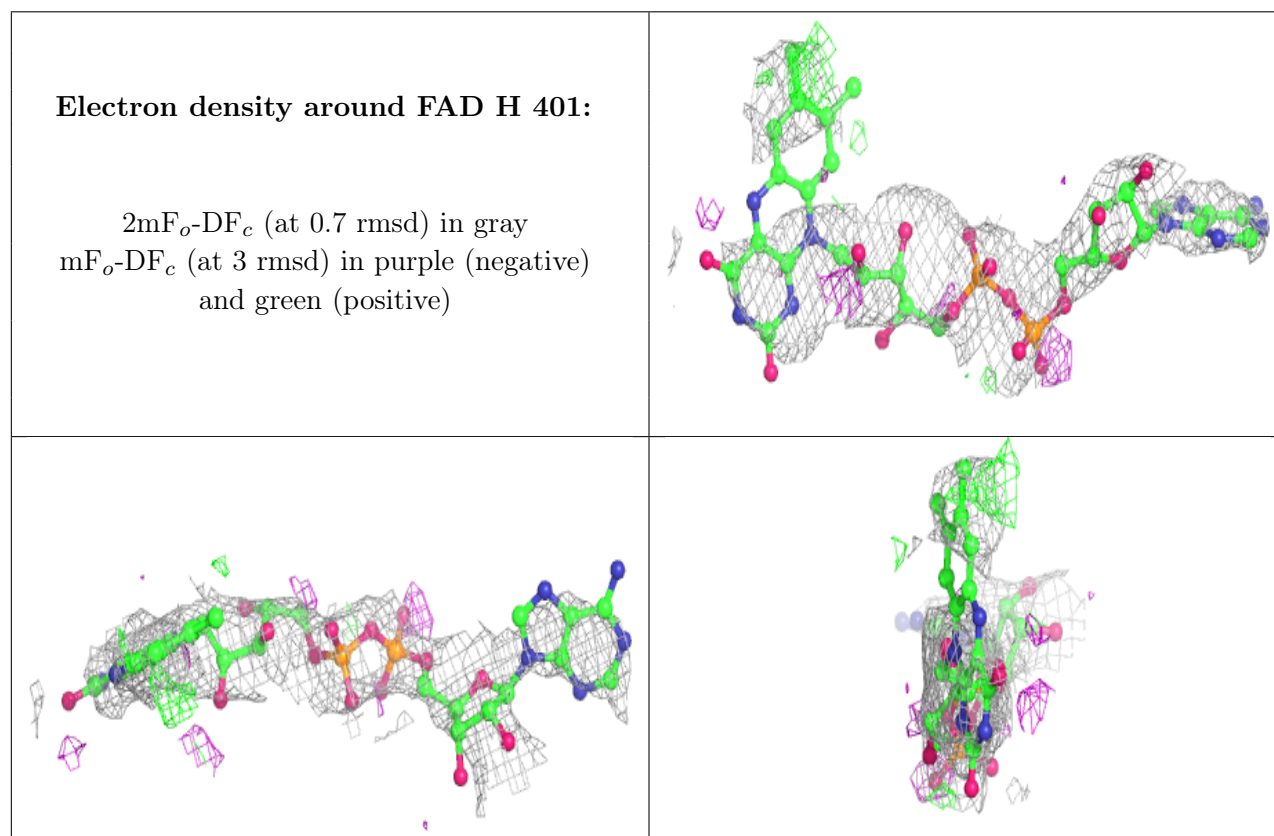
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum,



median, 95<sup>th</sup> 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.

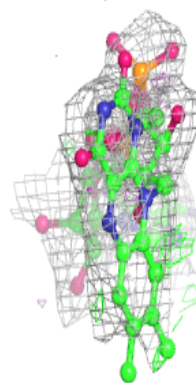
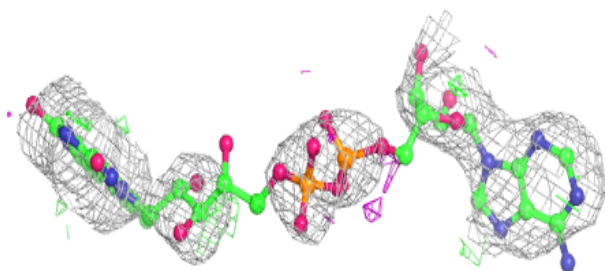
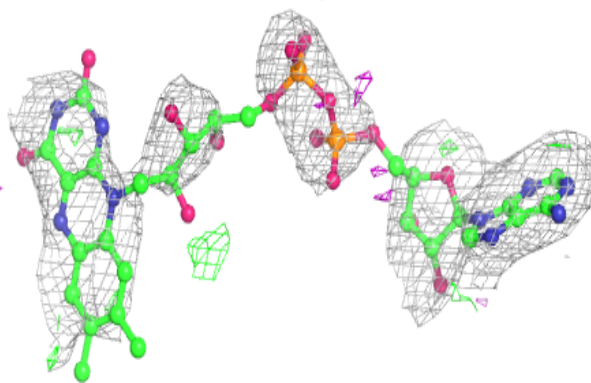
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
2	FAD	H	401	53/53	0.70	0.40	102,127,143,158	0
2	FAD	G	401	53/53	0.72	0.39	93,121,137,150	0
3	NAP	F	402[A]	48/48	0.74	0.45	54,72,83,87	48
3	NAP	F	402[B]	48/48	0.74	0.45	52,72,83,89	48
3	NAP	D	402[A]	48/48	0.77	0.40	45,70,82,89	48
3	NAP	D	402[B]	48/48	0.77	0.40	49,72,82,86	48
3	NAP	C	402	48/48	0.87	0.28	50,67,79,85	0
2	FAD	B	401	53/53	0.92	0.20	40,52,68,87	0
2	FAD	C	401	53/53	0.94	0.20	30,41,52,54	0
2	FAD	F	401	53/53	0.94	0.20	36,48,58,67	0
2	FAD	A	401	53/53	0.94	0.17	42,51,61,63	0
2	FAD	E	401	53/53	0.95	0.16	30,39,48,51	0
2	FAD	D	401	53/53	0.96	0.19	28,40,48,55	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.

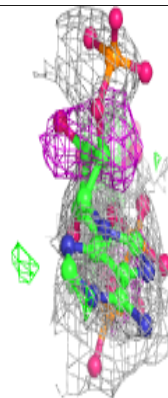
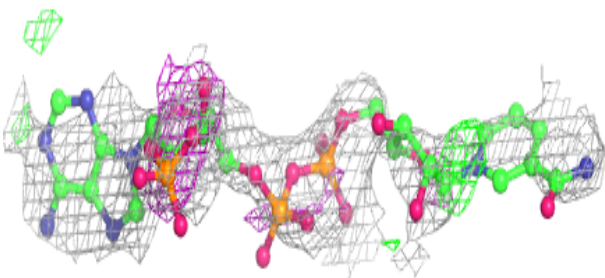
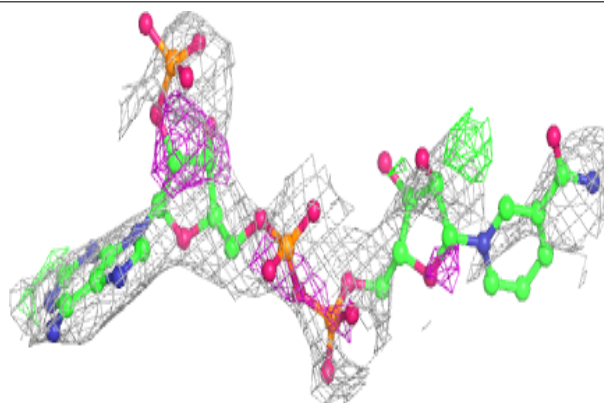


**Electron density around FAD G 401:**

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

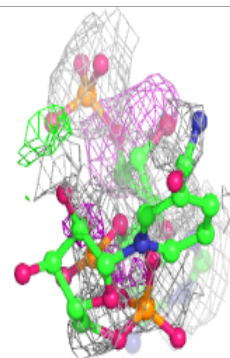
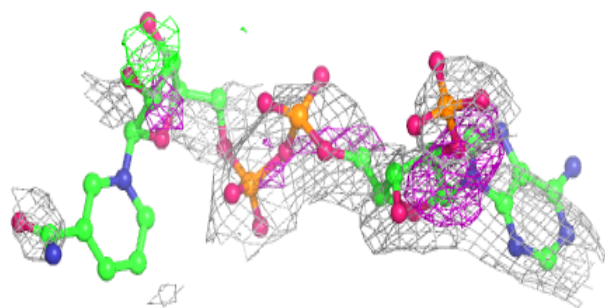
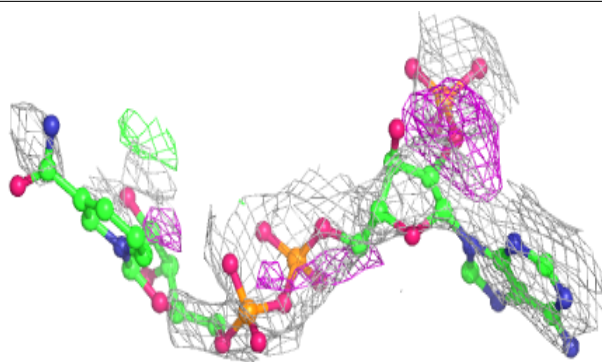
**Electron density around NAP F 402 (A):**

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

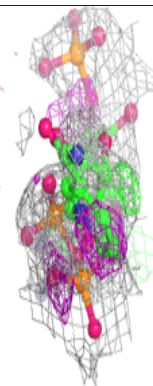
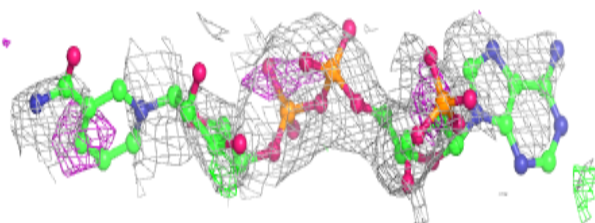
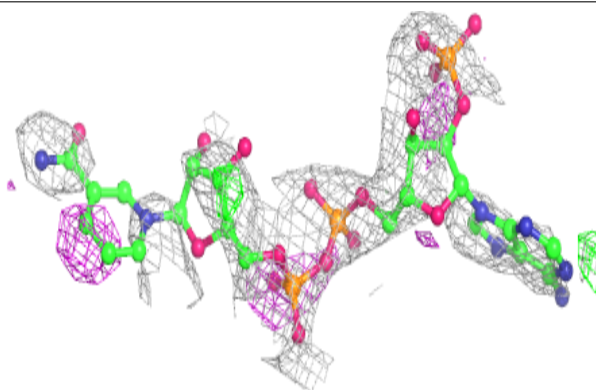


**Electron density around NAP F 402 (B):**

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

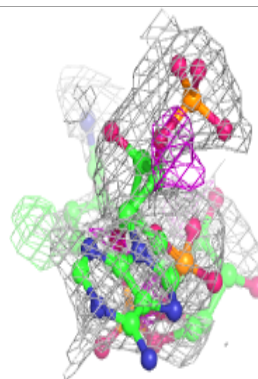
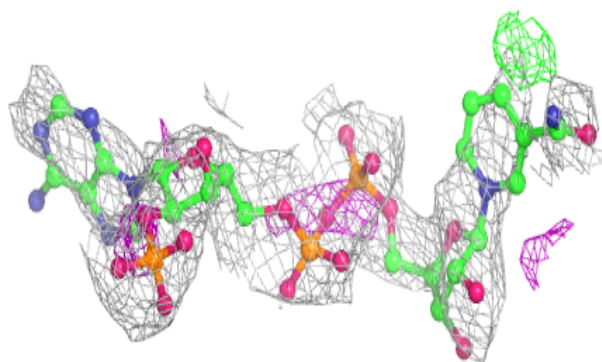
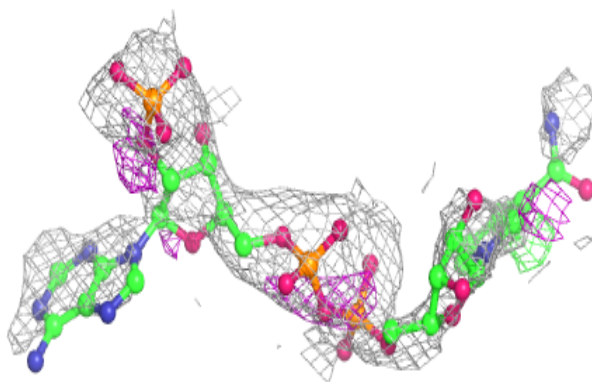
**Electron density around NAP D 402 (A):**

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

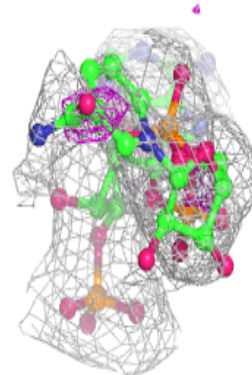
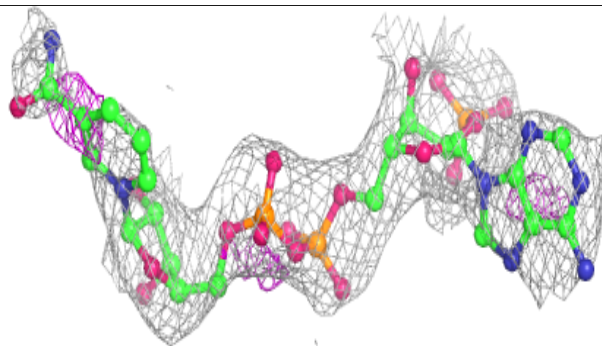
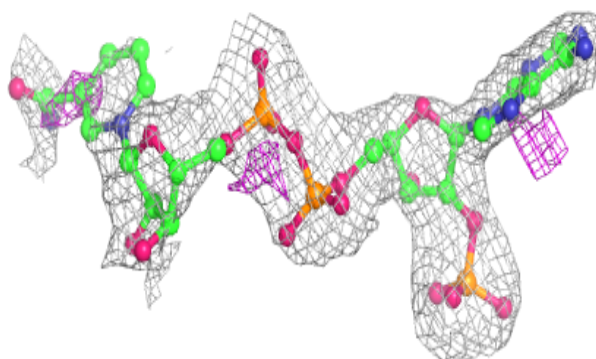


**Electron density around NAP D 402 (B):**

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

**Electron density around NAP C 402:**

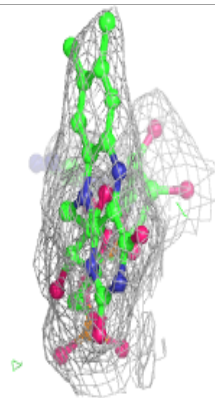
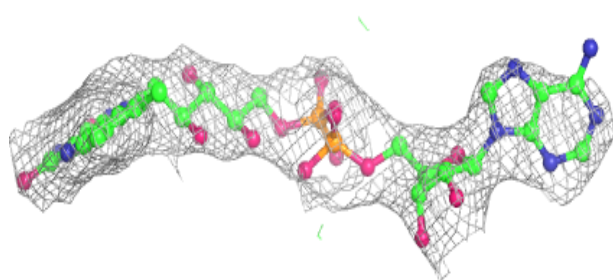
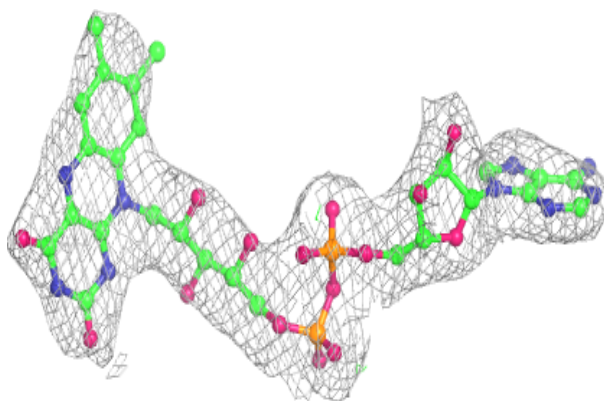
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



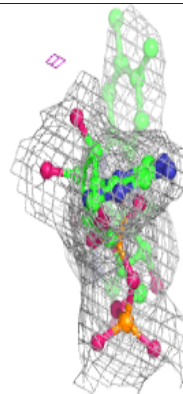
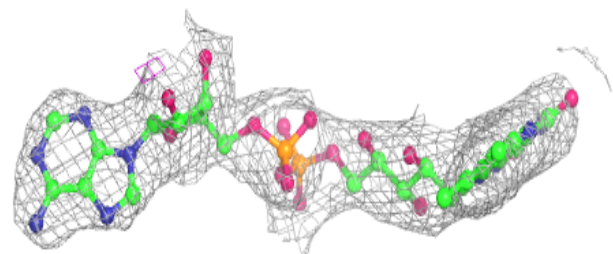
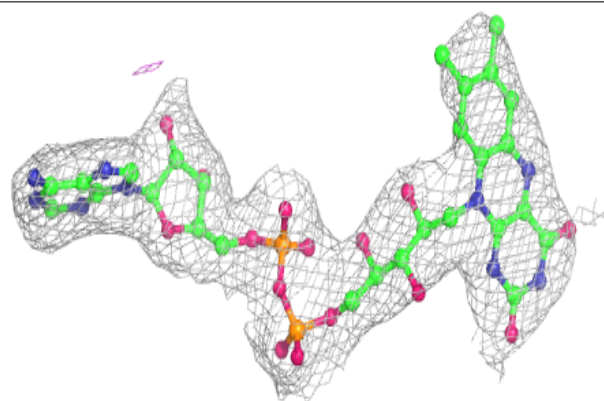


**Electron density around FAD B 401:**

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

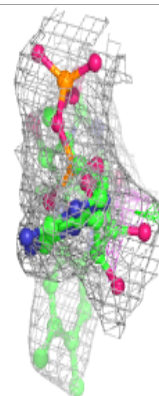
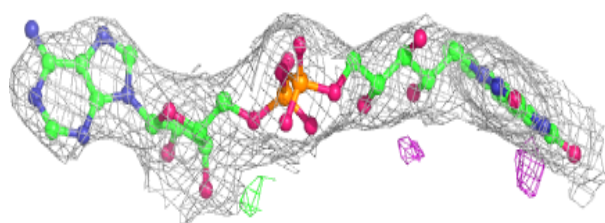
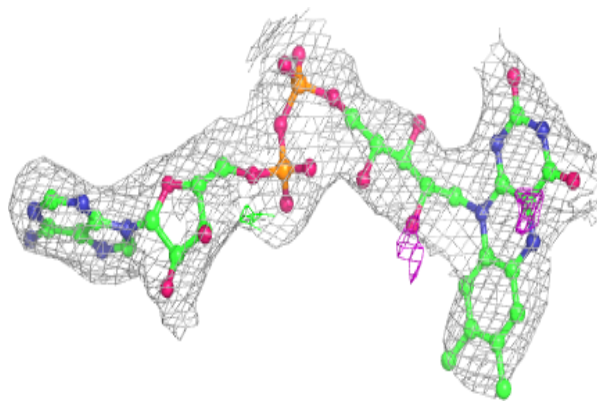
**Electron density around FAD C 401:**

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

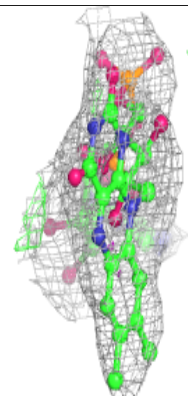
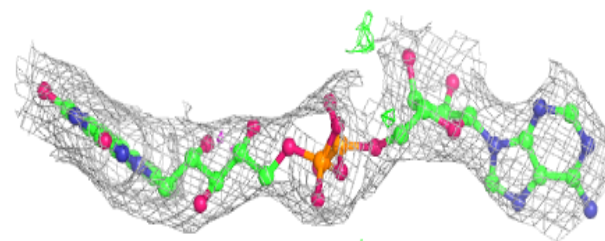
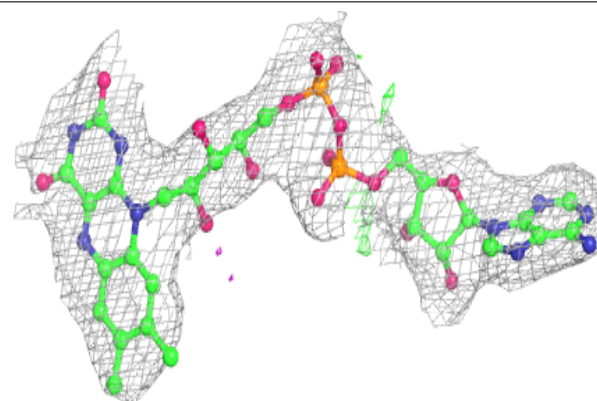


**Electron density around FAD F 401:**

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

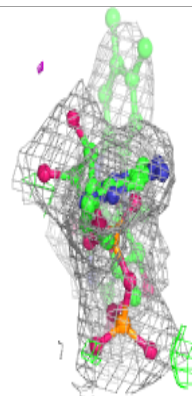
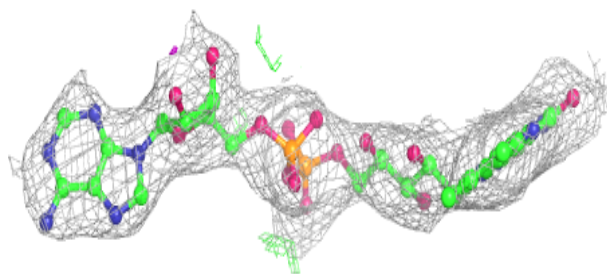
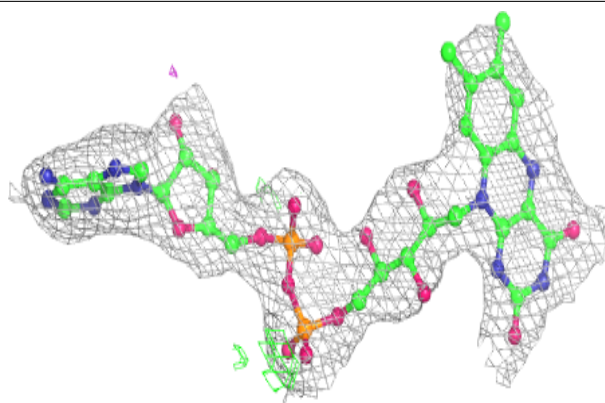
**Electron density around FAD A 401:**

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

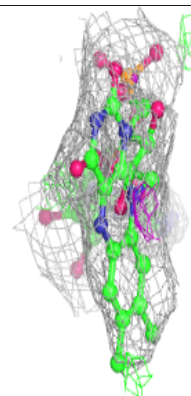
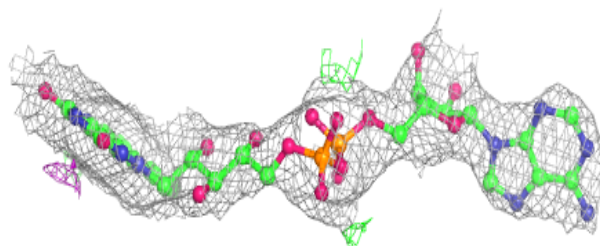
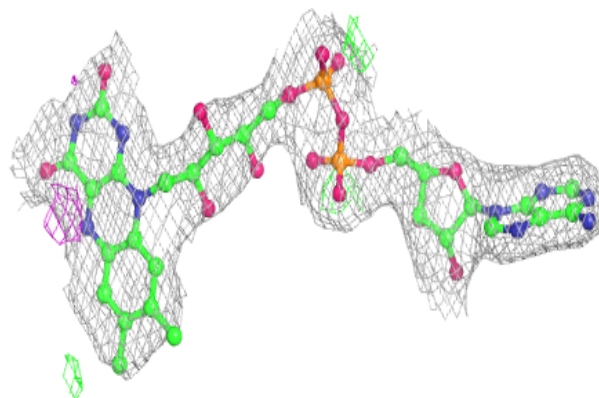


**Electron density around FAD E 401:**

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

**Electron density around FAD 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 [i](#)

There are no such residues in this entry.