



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 5, 2023 – 04:00 AM EDT

PDB ID : 3UP5  
Title : Crystal Structure of OTEMO complex with FAD and NADP (form 4)  
Authors : Shi, R.; Matte, A.; Cygler, M.; Lau, P.  
Deposited on : 2011-11-17  
Resolution : 2.45 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>.

---

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 : 2.35  
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) : 2.35

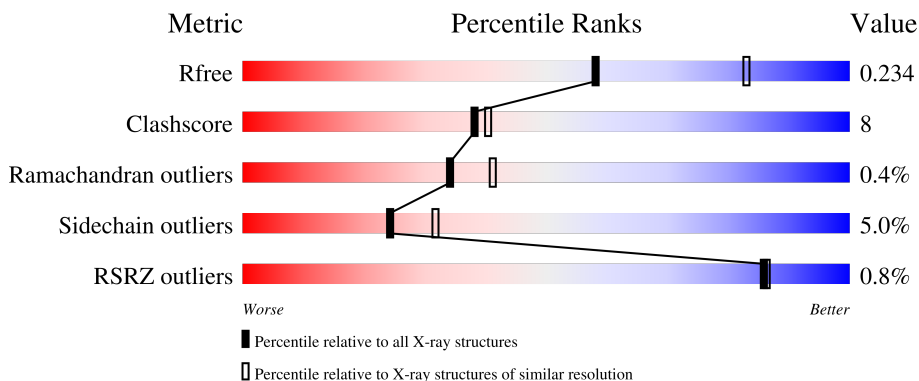
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*


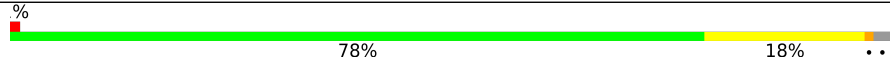
The reported resolution of this entry is 2.45 Å.

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	1544 (2.48-2.44)
Clashscore	141614	1613 (2.48-2.44)
Ramachandran outliers	138981	1598 (2.48-2.44)
Sidechain outliers	138945	1598 (2.48-2.44)
RSRZ outliers	127900	1523 (2.48-2.44)

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	545	 81% 15% ..
1	B	545	 78% 18% ..

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 9004 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 OTEMO.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	537	Total	C	N	O	S	0	1	0
			4269	2712	736	807	14			
1	B	532	Total	C	N	O	S	0	2	0
			4235	2692	730	798	15			

- Molecule 2 is FLAVIN-ADENINE DINUCLEOTIDE (three-letter code: FAD) (formula:  $C_{27}H_{33}N_9O_{15}P_2$ ).



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

- 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	A	1	48	21	7	17	3	0	0
3	B	1	48	21	7	17	3	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
4	A	134	134	134	0	0
4	B	164	164	164	0	0



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	66.84Å 94.39Å 93.14Å 90.00° 102.38° 90.00°	Depositor
Resolution (Å)	48.35 – 2.45 48.35 – 2.45	Depositor EDS
% Data completeness (in resolution range)	96.2 (48.35-2.45) 96.2 (48.35-2.45)	Depositor EDS
$R_{merge}$	0.10	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.99 (at 2.45Å)	Xtrriage
Refinement program	REFMAC	Depositor
R, $R_{free}$	0.185 , 0.236 0.184 , 0.234	Depositor DCC
$R_{free}$ test set	2017 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	25.9	Xtrriage
Anisotropy	0.904	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 32.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	9004	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	25.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.82% 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: NAP, FAD

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	0.94	1/4382 (0.0%)	0.87	1/5953 (0.0%)
1	B	0.95	0/4350	0.93	6/5909 (0.1%)
All	All	0.94	1/8732 (0.0%)	0.90	7/11862 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	B	0	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	444	CYS	CB-SG	-5.57	1.72	1.81

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	397	ASP	CB-CG-OD1	8.02	125.52	118.30
1	B	307	ASP	CB-CG-OD1	7.34	124.91	118.30
1	B	281	ARG	NE-CZ-NH2	-6.11	117.25	120.30
1	A	273	ASP	CB-CG-OD2	-5.95	112.94	118.30
1	B	147	SER	N-CA-C	-5.15	97.09	111.00
1	B	397	ASP	CB-CG-OD2	-5.13	113.68	118.30
1	B	435	VAL	CB-CA-C	5.13	121.14	111.40

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	444	CYS	Peptide

## 5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4269	0	4113	63	0
1	B	4235	0	4085	61	0
2	A	53	0	31	1	0
2	B	53	0	31	4	0
3	A	48	0	25	2	0
3	B	48	0	25	5	0
4	A	134	0	0	7	0
4	B	164	0	0	8	0
All	All	9004	0	8310	129	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 8.

All (129) 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:A:94:ASN:HD22	1:A:103:ARG:HH21	1.07	0.98
2:B:551:FAD:O1P	4:B:685:HOH:O	1.84	0.96
1:A:367:THR:HG22	1:A:369:GLU:H	1.30	0.94
1:A:149:SER:HB3	1:A:168:SER:OG	1.71	0.90
1:B:537:ASN:HB2	4:B:612:HOH:O	1.71	0.89
1:B:424:GLN:HE21	1:B:474:PRO:HD3	1.40	0.86
1:A:181:VAL:N	4:A:646:HOH:O	2.14	0.79
1:A:424:GLN:HE21	1:A:474:PRO:HD3	1.48	0.77
1:B:259:ARG:HH22	1:B:296:LEU:HD22	1.49	0.77
1:B:96:ALA:O	1:B:100:MET:HG3	1.88	0.74
1:B:94:ASN:HD22	1:B:103:ARG:HH21	1.34	0.74
1:B:18:GLY:CA	4:B:685:HOH:O	2.36	0.73
1:B:199:GLN:OE1	3:B:552:NAP:H4N	1.90	0.72
1:B:42:GLU:HG2	1:B:109:ASN:HD21	1.55	0.71
1:B:131:GLU:HG2	1:B:132:GLU:N	2.02	0.71

*Continued on next page...*



*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:481:ARG:NH1	4:B:701:HOH:O	2.25	0.69
1:A:424:GLN:NE2	1:A:474:PRO:HD3	2.08	0.69
1:A:147:SER:O	1:A:389:PHE:HB3	1.92	0.69
1:A:94:ASN:HD22	1:A:103:ARG:NH2	1.86	0.68
1:B:18:GLY:HA3	4:B:685:HOH:O	1.93	0.67
1:B:424:GLN:NE2	1:B:474:PRO:HD3	2.10	0.66
1:B:147:SER:O	1:B:148:ALA:HB3	1.95	0.66
1:A:367:THR:HG22	1:A:369:GLU:N	2.07	0.65
1:A:94:ASN:ND2	1:A:103:ARG:HH21	1.88	0.64
1:B:287:ILE:HD11	1:B:305:LEU:HD11	1.78	0.64
1:A:530:ARG:HB3	1:A:530:ARG:NH2	2.13	0.64
1:A:469:PHE:O	4:A:679:HOH:O	2.14	0.63
1:B:51:ASN:O	1:B:86:GLN:HG3	1.99	0.63
1:A:166:HIS:CD2	1:A:168:SER:H	2.17	0.63
1:A:331:HIS:HB2	1:A:332:PRO:HD2	1.79	0.63
1:A:354:HIS:HA	4:A:563:HOH:O	1.98	0.62
1:A:187:ARG:NH1	1:A:379:ASP:O	2.33	0.62
1:B:59:ASP:HB2	1:B:340:MET:CE	2.31	0.61
2:B:551:FAD:HM73	3:B:552:NAP:C5N	2.29	0.61
1:A:96:ALA:O	1:A:100:MET:HG3	2.01	0.60
1:A:508:LYS:HE3	1:A:514:VAL:HG21	1.82	0.60
2:A:551:FAD:HM73	3:A:552:NAP:C5N	2.32	0.60
1:A:51:ASN:O	1:A:86:GLN:HG3	2.01	0.60
1:A:220:TRP:O	1:A:339:PRO:HD2	2.03	0.59
1:B:337:ARG:O	1:B:339:PRO:HD3	2.02	0.59
1:B:116:ARG:NH1	4:B:602:HOH:O	2.33	0.59
1:B:173:ASP:OD2	1:B:177:ALA:HB3	2.03	0.59
1:A:318:LYS:O	1:A:320:PRO:HD3	2.04	0.58
1:B:172:THR:HA	1:B:177:ALA:O	2.03	0.58
1:B:24:GLN:HE21	1:B:434:LEU:HD11	1.69	0.57
1:B:166:HIS:HD2	1:B:168:SER:H	1.51	0.57
1:B:166:HIS:CD2	1:B:168:SER:H	2.23	0.57
1:A:180:GLY:CA	4:A:646:HOH:O	2.53	0.56
1:B:45:GLY:HA3	1:B:49:TYR:HB2	1.87	0.56
1:A:166:HIS:HD2	1:A:168:SER:H	1.54	0.56
1:A:116:ARG:HG2	1:A:402:ARG:HB2	1.89	0.55
1:A:507:THR:HG22	1:A:513:VAL:HG22	1.88	0.55
1:B:501:TRP:HE1	3:B:552:NAP:HO3N	1.55	0.55
1:B:202:PRO:HG3	1:B:344:TYR:HA	1.88	0.54
1:B:165:PHE:HE2	1:B:170:TRP:CZ3	2.26	0.54
1:B:172:THR:HB	1:B:176:GLY:HA2	1.90	0.54

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:18:GLY:N	4:B:685:HOH:O	2.41	0.53
1:B:131:GLU:HG2	1:B:132:GLU:H	1.71	0.53
1:A:85:SER:OG	1:A:87:PRO:HD2	2.09	0.53
1:B:187:ARG:NH1	1:B:379:ASP:O	2.39	0.53
1:A:165:PHE:HD1	1:A:171:PRO:HD2	1.74	0.51
1:A:418:SER:HB2	1:A:516:ARG:NH1	2.25	0.51
1:A:215:GLN:HG2	4:A:610:HOH:O	2.11	0.50
2:B:551:FAD:C6	3:B:552:NAP:C2N	2.90	0.50
1:B:74:ILE:HG21	1:B:95:ARG:HG3	1.94	0.50
1:B:94:ASN:ND2	1:B:103:ARG:HH21	2.05	0.50
1:A:520:HIS:CD2	1:A:520:HIS:C	2.86	0.49
1:A:490:PHE:CE2	1:A:496:ALA:HA	2.48	0.49
1:A:508:LYS:HB3	1:A:509:PRO:HD2	1.95	0.48
1:B:440:GLY:HA2	1:B:520:HIS:CD2	2.48	0.48
1:A:379:ASP:O	1:A:380:LEU:HD23	2.13	0.48
1:B:53:TYR:HB2	1:B:54:PRO:HD2	1.97	0.47
1:A:147:SER:O	1:A:147:SER:OG	2.30	0.47
1:B:265:THR:C	1:B:267:VAL:H	2.17	0.47
1:B:295:LEU:HD11	1:B:305:LEU:HD23	1.97	0.47
1:B:515:ARG:O	1:B:516:ARG:HG2	2.14	0.47
1:B:220:TRP:O	1:B:339:PRO:HD2	2.16	0.46
1:A:12:ALA:O	1:A:35:VAL:HA	2.16	0.46
1:A:13:VAL:HA	1:A:36:LEU:O	2.16	0.46
1:A:255:PHE:CE1	1:A:285:TYR:HD2	2.34	0.46
1:B:147:SER:O	1:B:148:ALA:CB	2.62	0.46
1:A:331:HIS:HB2	1:A:332:PRO:CD	2.46	0.45
1:B:490:PHE:CE1	1:B:517:THR:HG23	2.51	0.45
1:A:324:GLU:O	1:A:329:LYS:NZ	2.49	0.45
1:B:332:PRO:HG2	1:B:335:ALA:HB2	1.98	0.45
1:B:502:TRP:CD1	1:B:503:VAL:HG23	2.51	0.45
1:A:263:LYS:HD3	1:A:293:ARG:HH12	1.82	0.44
1:A:96:ALA:HB1	1:A:100:MET:HE3	1.99	0.44
2:B:551:FAD:HM73	3:B:552:NAP:C6N	2.47	0.44
1:A:217:THR:OG1	3:A:552:NAP:O2X	2.35	0.44
1:B:458:LEU:O	1:B:458:LEU:HG	2.12	0.44
1:A:458:LEU:C	1:A:458:LEU:HD13	2.38	0.44
1:B:146:LEU:HA	1:B:146:LEU:HD23	1.76	0.44
1:A:54:PRO:HG3	1:A:181:VAL:HG12	2.00	0.43
1:B:426:ARG:HH11	1:B:426:ARG:HG3	1.83	0.43
1:A:149:SER:HB3	1:A:168:SER:HG	1.74	0.43
1:B:421:LEU:HA	1:B:482:TRP:CE2	2.52	0.43

*Continued on next page...*

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:45:GLY:HA2	1:A:93:VAL:HG11	2.00	0.43
1:A:13:VAL:HG22	1:A:36:LEU:HB3	2.00	0.43
1:B:62:SER:HB3	1:B:79:TRP:CD2	2.54	0.43
1:B:423:LEU:O	1:B:432:PHE:HA	2.18	0.43
1:B:220:TRP:CD1	1:B:333:PHE:HA	2.54	0.42
1:A:17:ALA:HB2	1:A:106:TYR:CE2	2.55	0.42
1:B:369:GLU:HB2	4:B:704:HOH:O	2.18	0.42
1:B:94:ASN:HD22	1:B:103:ARG:NH2	2.07	0.42
1:A:42:GLU:HG2	1:A:109:ASN:HD21	1.84	0.42
1:B:53:TYR:CZ	1:B:196:THR:HG23	2.55	0.42
1:B:67:TYR:CE2	1:B:71:LYS:HG3	2.55	0.42
1:A:342:THR:HB	4:A:577:HOH:O	2.18	0.41
1:B:165:PHE:HE2	1:B:170:TRP:CE3	2.37	0.41
1:A:426:ARG:NH1	1:A:474:PRO:O	2.50	0.41
1:B:59:ASP:HB2	1:B:340:MET:HE3	2.01	0.41
1:B:129:ASP:C	1:B:130[A]:ASN:OD1	2.59	0.41
1:B:218:PRO:O	1:B:328:PRO:HG3	2.21	0.41
1:A:166:HIS:HD2	1:A:168:SER:OG	2.04	0.41
1:B:173:ASP:HB2	1:B:174:ALA:H	1.67	0.41
1:B:347:THR:HG22	1:B:353:VAL:HG21	2.02	0.41
1:A:79:TRP:O	1:A:229:MET:HG2	2.20	0.41
1:A:267:VAL:HG23	1:A:272:ARG:HG2	2.01	0.41
1:A:195:ALA:HA	1:A:339:PRO:HB3	2.02	0.41
1:A:389:PHE:N	1:A:389:PHE:CD2	2.89	0.41
1:A:530:ARG:HB3	1:A:530:ARG:HH21	1.83	0.41
1:A:324:GLU:HG3	1:A:329:LYS:NZ	2.36	0.41
1:A:154:ILE:HD13	1:A:154:ILE:HA	1.81	0.40
1:A:185:GLY:HA2	1:A:209:LYS:HB2	2.04	0.40
1:A:119:GLU:HG2	4:A:567:HOH:O	2.21	0.40
1:A:165:PHE:CD1	1:A:171:PRO:HD2	2.54	0.40
1:A:163:GLU:HB2	1:A:382:VAL:HG22	2.03	0.40
1:B:390:ASP:HB3	1:B:394:GLY:HA3	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	534/545 (98%)	511 (96%)	21 (4%)	2 (0%)	34	41
1	B	530/545 (97%)	498 (94%)	30 (6%)	2 (0%)	34	41
All	All	1064/1090 (98%)	1009 (95%)	51 (5%)	4 (0%)	34	41

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	148	ALA
1	A	435	VAL
1	B	148	ALA
1	B	445	ASN

### 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	446/454 (98%)	424 (95%)	22 (5%)	25	32
1	B	442/454 (97%)	419 (95%)	23 (5%)	23	30
All	All	888/908 (98%)	843 (95%)	45 (5%)	24	31

All (45) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	7	SER
1	A	111	ARG
1	A	119	GLU
1	A	131	GLU
1	A	147	SER
1	A	164	SER
1	A	215	GLN
1	A	216	ARG

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type
1	A	217	THR
1	A	259	ARG
1	A	263	LYS
1	A	273	ASP
1	A	285	TYR
1	A	293	ARG
1	A	296	LEU
1	A	330	ASP
1	A	359	ARG
1	A	363	ILE
1	A	389	PHE
1	A	444	CYS
1	A	465	LYS
1	A	520	HIS
1	B	102	VAL
1	B	130[A]	ASN
1	B	130[B]	ASN
1	B	131	GLU
1	B	147	SER
1	B	149	SER
1	B	150	ARG
1	B	273	ASP
1	B	285	TYR
1	B	293	ARG
1	B	296	LEU
1	B	325	LYS
1	B	372	LYS
1	B	390	ASP
1	B	435	VAL
1	B	441	SER
1	B	444	CYS
1	B	465	LYS
1	B	471	TYR
1	B	499	ASN
1	B	504	LYS
1	B	517	THR
1	B	543	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (21) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	24	GLN

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type
1	A	82	ASN
1	A	94	ASN
1	A	109	ASN
1	A	166	HIS
1	A	215	GLN
1	A	315	GLN
1	A	424	GLN
1	A	520	HIS
1	B	24	GLN
1	B	51	ASN
1	B	82	ASN
1	B	94	ASN
1	B	105	HIS
1	B	109	ASN
1	B	166	HIS
1	B	315	GLN
1	B	424	GLN
1	B	467	ASN
1	B	480	ASN
1	B	520	HIS

### 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](#)

4 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond

length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	FAD	B	551	-	53,58,58	1.29	6 (11%)	68,89,89	1.60	10 (14%)
3	NAP	B	552	-	45,52,52	1.98	8 (17%)	56,80,80	1.45	7 (12%)
3	NAP	A	552	-	45,52,52	2.21	6 (13%)	56,80,80	1.41	7 (12%)
2	FAD	A	551	-	53,58,58	1.43	5 (9%)	68,89,89	1.62	9 (13%)

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	FAD	B	551	-	-	6/30/50/50	0/6/6/6
3	NAP	B	552	-	-	1/31/67/67	0/5/5/5
3	NAP	A	552	-	-	12/31/67/67	0/5/5/5
2	FAD	A	551	-	-	4/30/50/50	0/6/6/6

All (25) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	552	NAP	O7N-C7N	11.27	1.45	1.24
3	B	552	NAP	O7N-C7N	8.63	1.40	1.24
3	A	552	NAP	C2A-N3A	5.62	1.41	1.32
2	A	551	FAD	C4X-N5	5.42	1.41	1.30
2	B	551	FAD	C4X-N5	4.79	1.40	1.30
2	A	551	FAD	C2A-N3A	4.59	1.39	1.32
3	B	552	NAP	C2A-N3A	4.48	1.39	1.32
3	A	552	NAP	C2N-N1N	4.07	1.39	1.35
3	B	552	NAP	C2N-N1N	4.04	1.39	1.35
3	B	552	NAP	O4D-C1D	3.55	1.46	1.41
2	A	551	FAD	C2A-N1A	3.20	1.39	1.33
3	A	552	NAP	C2A-N1A	3.20	1.39	1.33
2	B	551	FAD	C2A-N1A	2.95	1.39	1.33
3	A	552	NAP	O4B-C1B	2.91	1.45	1.41
2	A	551	FAD	O4B-C1B	2.89	1.45	1.41
2	B	551	FAD	C2A-N3A	2.82	1.36	1.32
2	A	551	FAD	C10-N1	2.61	1.38	1.33
2	B	551	FAD	C10-N1	2.58	1.38	1.33

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	551	FAD	O4'-C4'	-2.40	1.38	1.43
3	B	552	NAP	C2A-N1A	2.36	1.38	1.33
3	B	552	NAP	C2D-C1D	2.23	1.57	1.53
3	A	552	NAP	O4D-C1D	2.21	1.44	1.41
3	B	552	NAP	P2B-O2B	2.03	1.63	1.59
3	B	552	NAP	C5N-C4N	2.02	1.43	1.38
2	B	551	FAD	C1'-N10	2.01	1.53	1.48

All (33) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	551	FAD	N3A-C2A-N1A	-6.58	118.39	128.68
3	B	552	NAP	C3N-C7N-N7N	5.34	124.16	117.75
2	B	551	FAD	N3A-C2A-N1A	-5.07	120.75	128.68
3	A	552	NAP	N3A-C2A-N1A	-4.24	122.05	128.68
3	A	552	NAP	C3N-C7N-N7N	-4.23	112.68	117.75
3	B	552	NAP	O7N-C7N-C3N	-4.22	114.58	119.63
2	B	551	FAD	C4-N3-C2	-3.87	118.48	125.64
3	B	552	NAP	N3A-C2A-N1A	-3.82	122.70	128.68
2	B	551	FAD	C4-C4X-N5	3.66	123.44	118.23
3	A	552	NAP	C3D-C2D-C1D	3.56	106.34	100.98
2	A	551	FAD	O3B-C3B-C4B	-3.55	100.78	111.05
2	A	551	FAD	C10-N1-C2	3.41	123.71	116.90
2	B	551	FAD	C4X-C4-N3	3.39	121.80	113.19
2	A	551	FAD	C4X-C4-N3	3.38	121.77	113.19
2	A	551	FAD	C4-N3-C2	-3.22	119.69	125.64
2	B	551	FAD	C4X-C10-N10	3.20	121.15	116.48
2	A	551	FAD	C4-C4X-N5	3.17	122.75	118.23
3	A	552	NAP	C4A-C5A-N7A	-3.14	106.12	109.40
2	B	551	FAD	O3B-C3B-C4B	-3.13	102.00	111.05
2	B	551	FAD	C10-C4X-N5	-3.12	118.23	124.86
2	A	551	FAD	C4X-C10-N1	-3.08	117.58	124.73
3	A	552	NAP	C3N-C2N-N1N	-3.04	117.45	120.43
2	B	551	FAD	C10-N1-C2	3.04	122.97	116.90
2	A	551	FAD	C4X-C10-N10	2.94	120.78	116.48
2	A	551	FAD	C10-C4X-N5	-2.89	118.72	124.86
2	B	551	FAD	C4X-C10-N1	-2.72	118.41	124.73
3	B	552	NAP	C4A-C5A-N7A	-2.58	106.71	109.40
3	A	552	NAP	O7N-C7N-C3N	2.41	122.52	119.63
3	B	552	NAP	O4D-C1D-C2D	2.26	110.22	106.93
2	B	551	FAD	O4'-C4'-C3'	-2.22	103.71	109.10
3	B	552	NAP	C5B-C4B-C3B	-2.18	107.02	115.18

*Continued on next page...*



Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	552	NAP	C2N-C3N-C4N	2.16	120.71	118.26
3	B	552	NAP	C5N-C6N-N1N	-2.15	117.32	120.40

There are no chirality outliers.

All (23) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	551	FAD	N10-C1'-C2'-O2'
2	A	551	FAD	N10-C1'-C2'-C3'
2	B	551	FAD	N10-C1'-C2'-O2'
2	B	551	FAD	N10-C1'-C2'-C3'
2	B	551	FAD	PA-O3P-P-O5'
3	A	552	NAP	C5B-O5B-PA-O3
3	A	552	NAP	C2N-C3N-C7N-O7N
3	A	552	NAP	C2N-C3N-C7N-N7N
3	A	552	NAP	C4N-C3N-C7N-O7N
3	A	552	NAP	C4N-C3N-C7N-N7N
2	A	551	FAD	O4B-C4B-C5B-O5B
3	A	552	NAP	O4B-C4B-C5B-O5B
3	A	552	NAP	C3B-C4B-C5B-O5B
3	A	552	NAP	PA-O3-PN-O5D
3	A	552	NAP	PN-O3-PA-O2A
3	A	552	NAP	C5B-O5B-PA-O1A
3	A	552	NAP	C5B-O5B-PA-O2A
2	A	551	FAD	C3B-C4B-C5B-O5B
2	B	551	FAD	P-O3P-PA-O1A
2	B	551	FAD	O4B-C4B-C5B-O5B
2	B	551	FAD	P-O3P-PA-O2A
3	B	552	NAP	O4B-C4B-C5B-O5B
3	A	552	NAP	PN-O3-PA-O1A

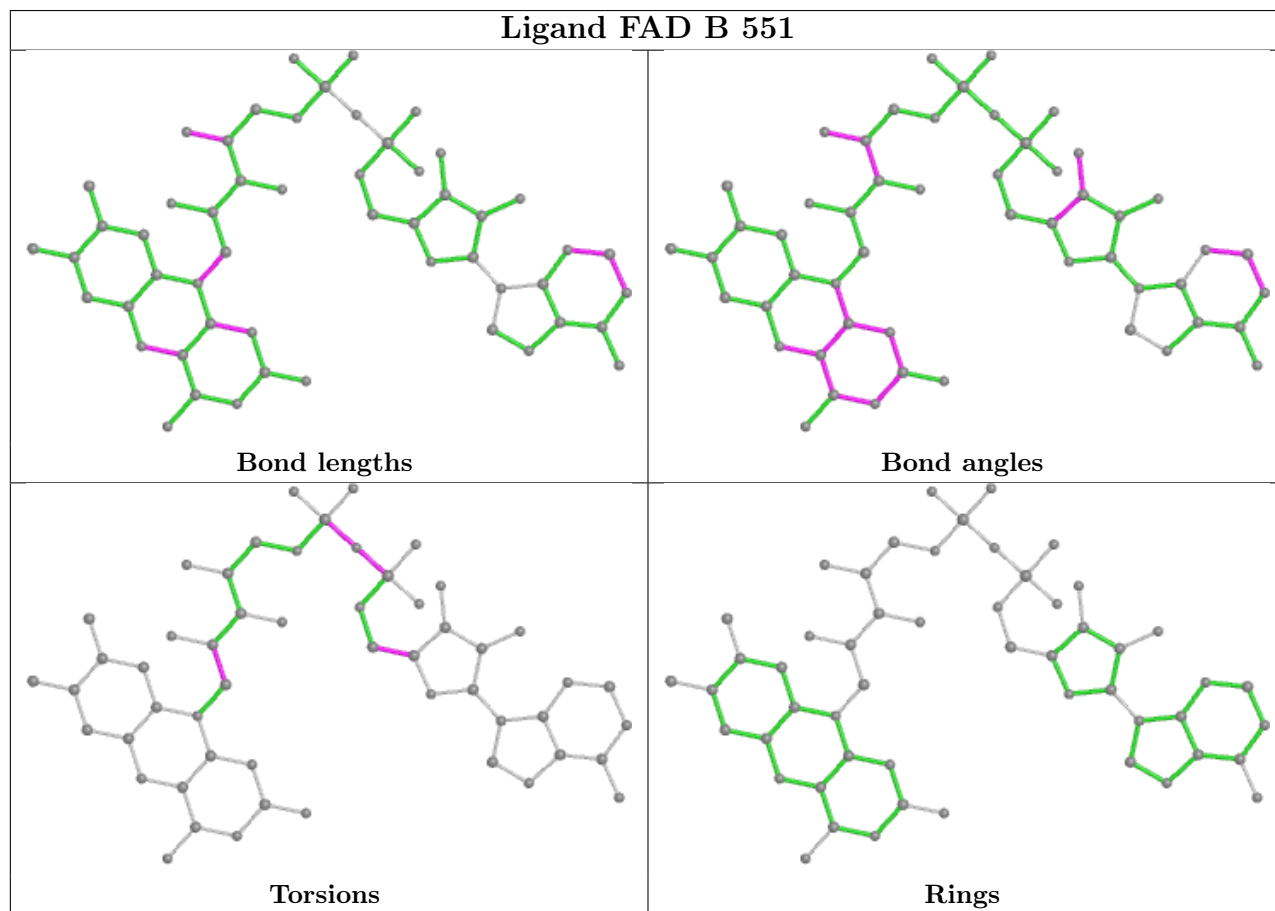
There are no ring outliers.

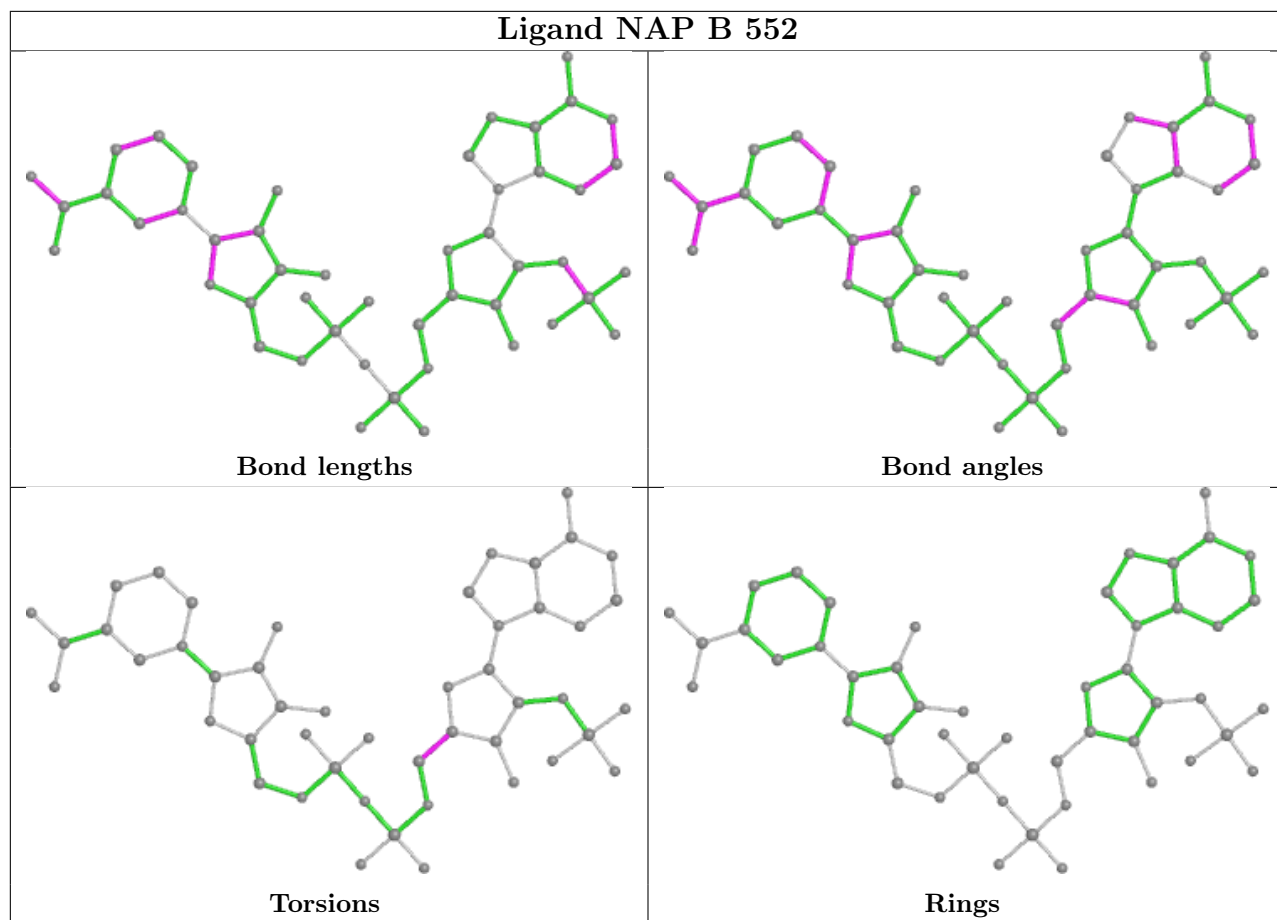
4 monomers are involved in 8 short contacts:

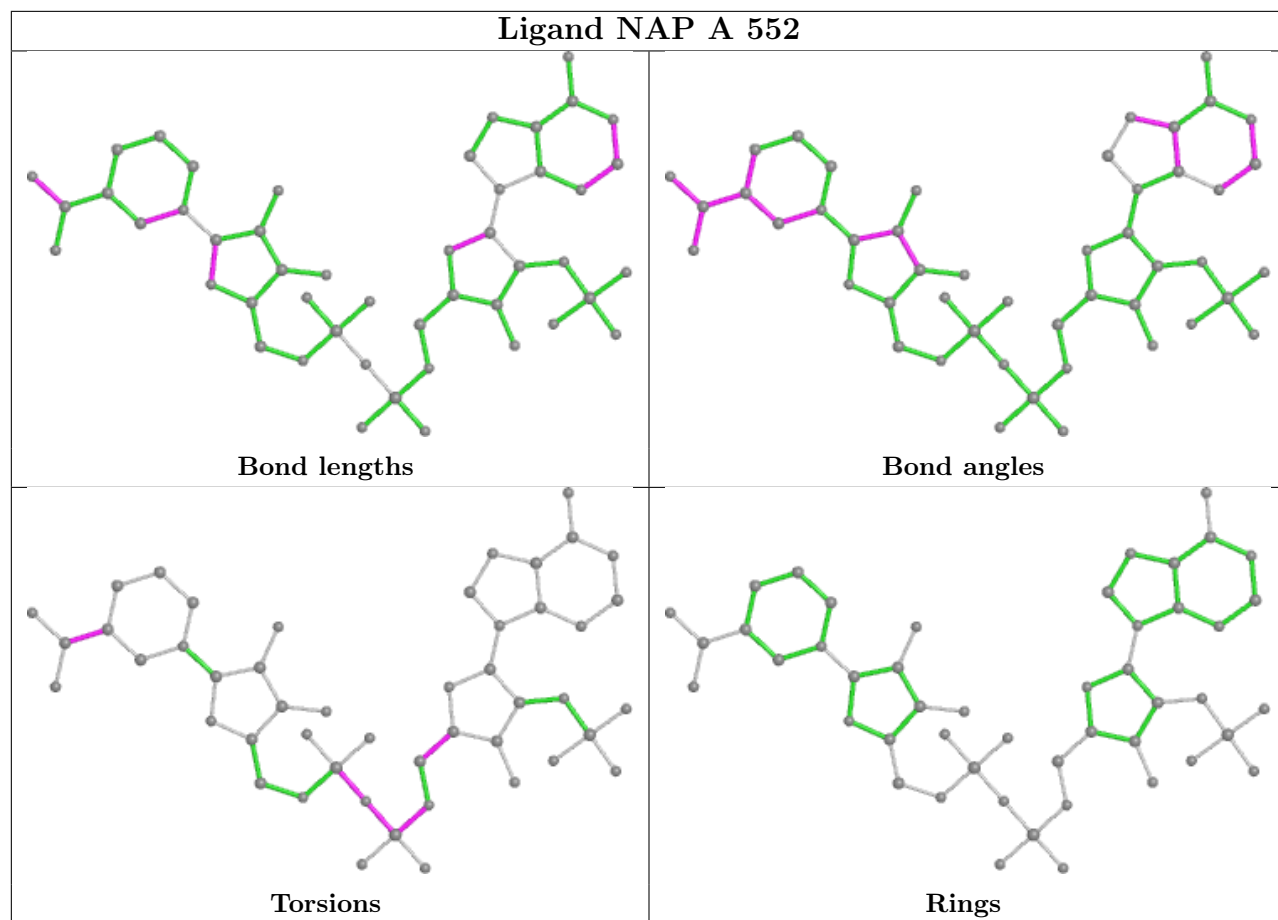
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	551	FAD	4	0
3	B	552	NAP	5	0
3	A	552	NAP	2	0
2	A	551	FAD	1	0

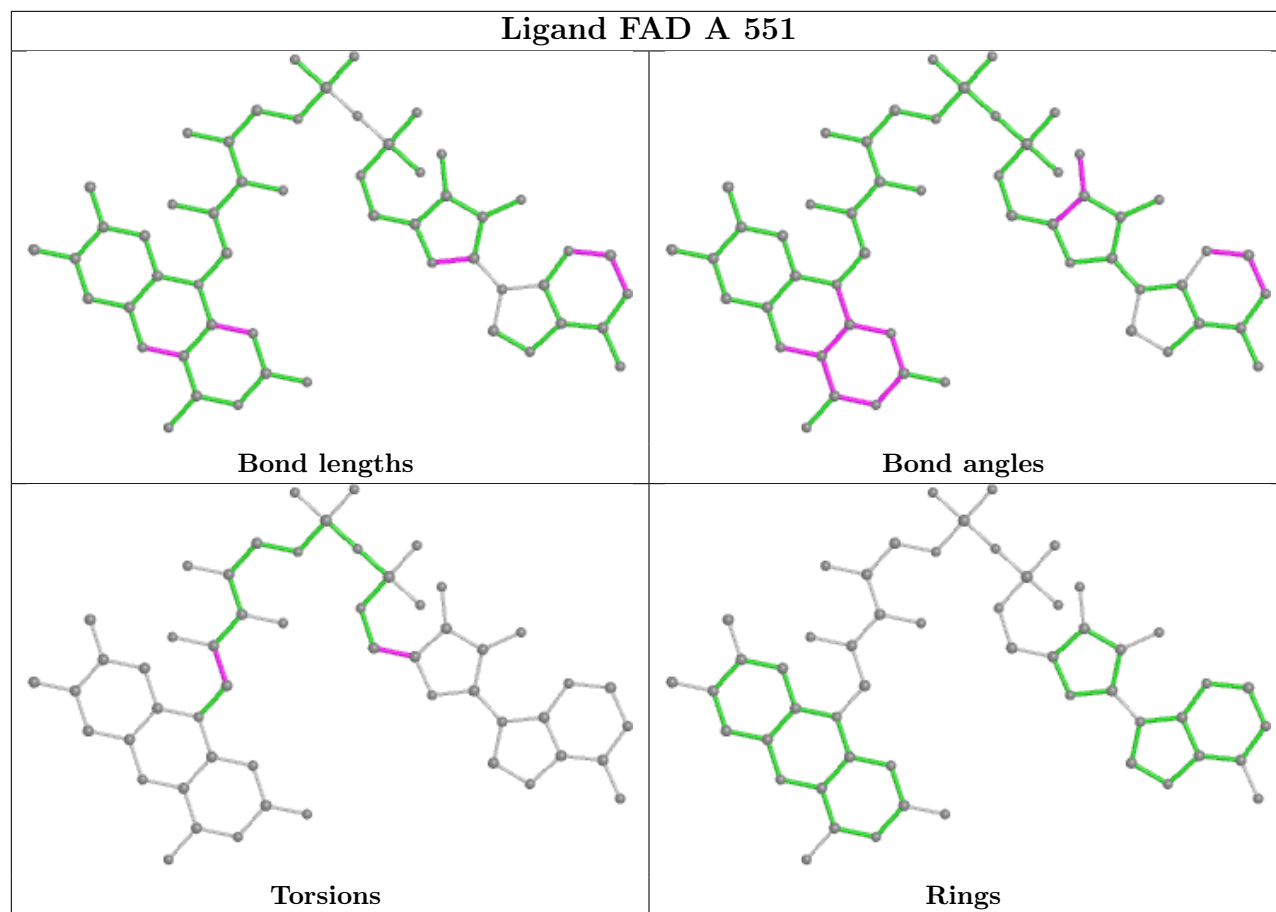
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths,

bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less 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 [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

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	537/545 (98%)	-0.33	5 (0%) 84 85	16, 27, 41, 52	0
1	B	532/545 (97%)	-0.39	4 (0%) 86 86	16, 23, 35, 44	0
All	All	1069/1090 (98%)	-0.36	9 (0%) 86 86	16, 25, 39, 52	0

All (9) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	180	GLY	4.0
1	A	509	PRO	3.3
1	B	506	THR	3.1
1	B	175	GLU	3.0
1	A	150	ARG	2.6
1	A	149	SER	2.5
1	B	179	LYS	2.4
1	A	512	SER	2.3
1	A	130	ASN	2.2

### 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.

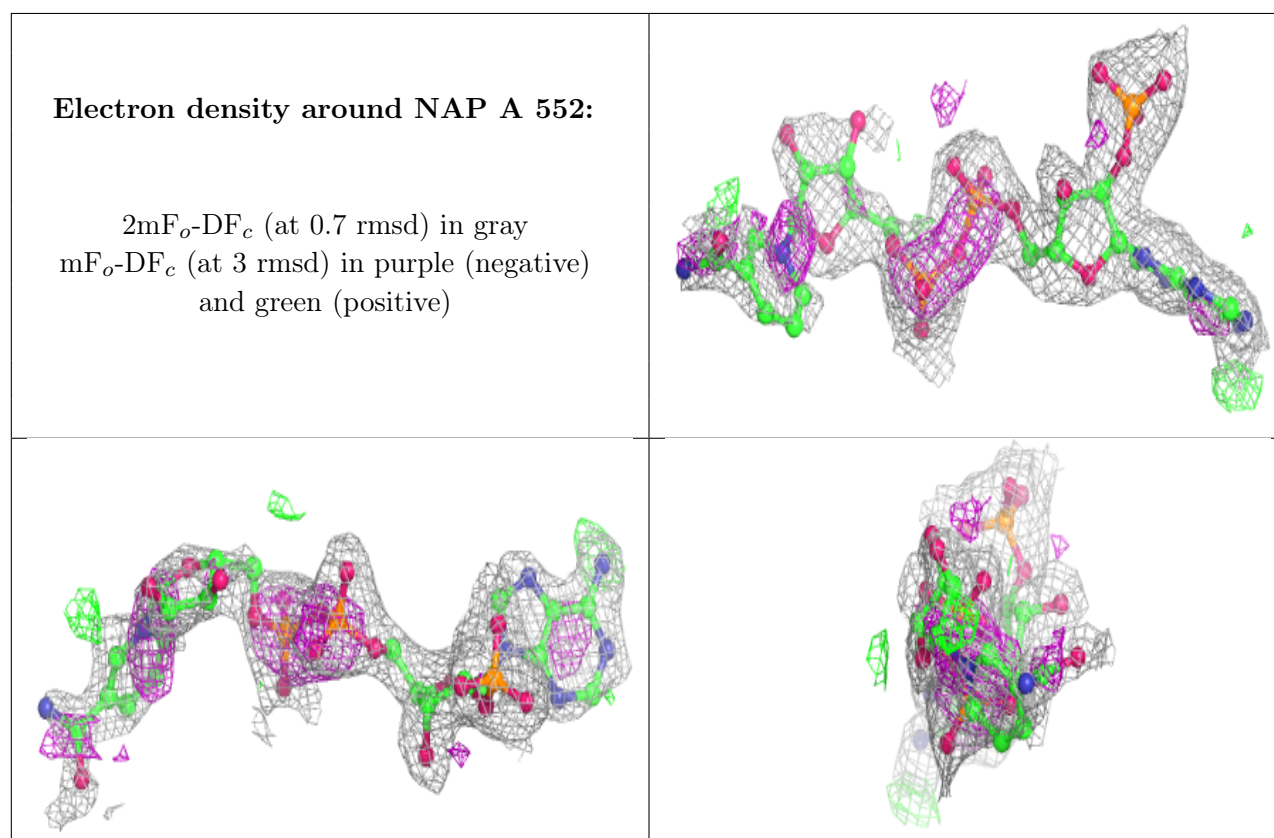
### 6.4 Ligands [i](#)

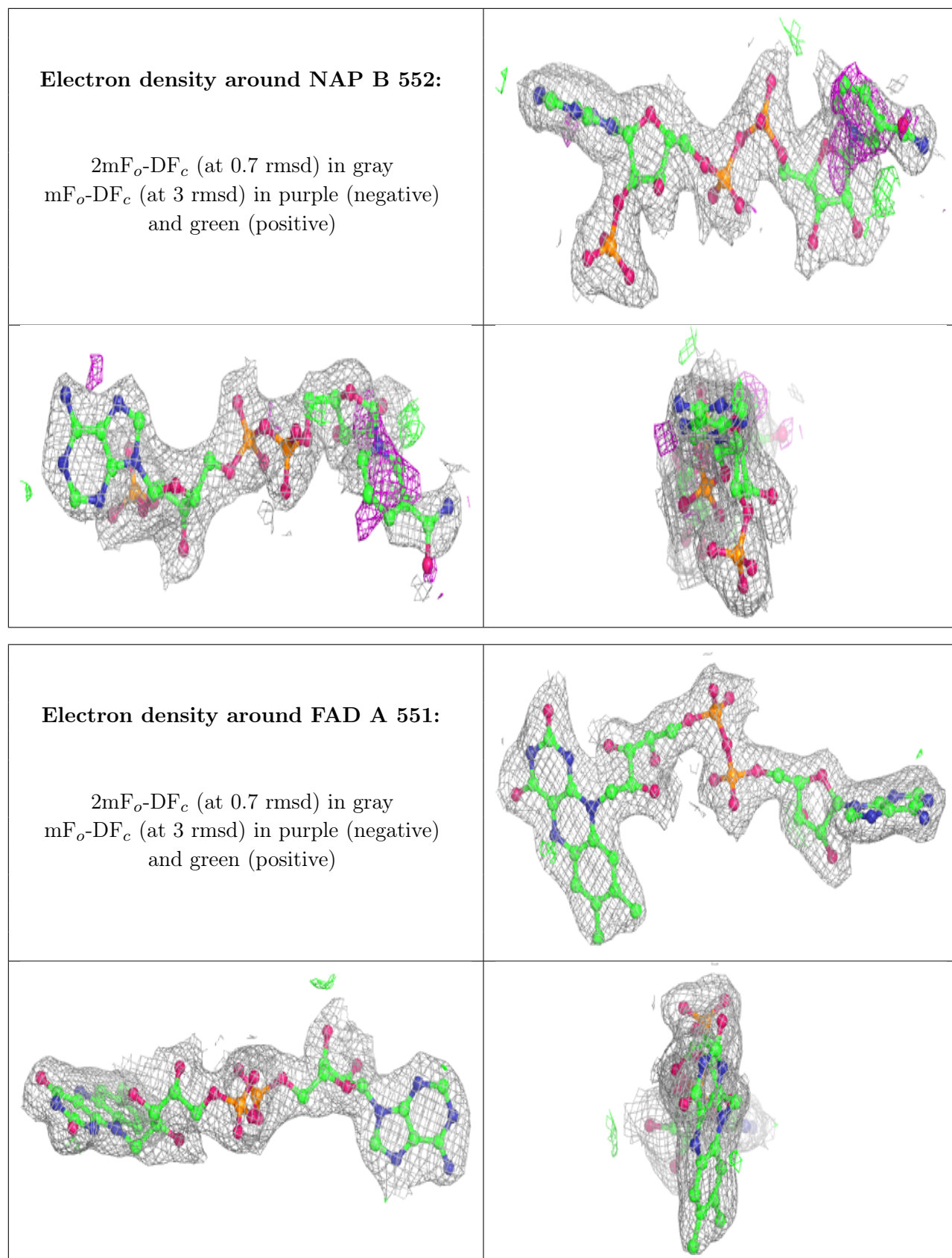
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum,

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.

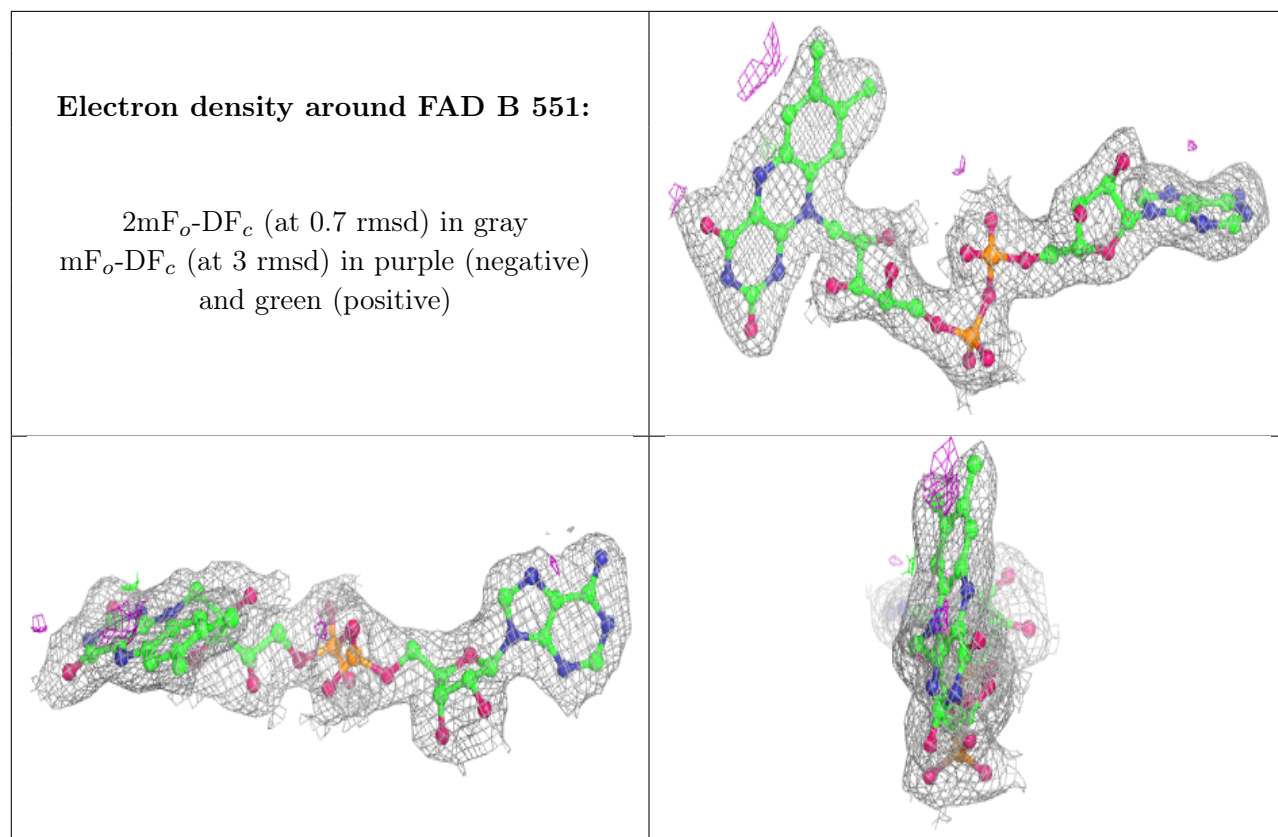
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
3	NAP	A	552	48/48	0.93	0.31	32,39,49,50	0
3	NAP	B	552	48/48	0.96	0.14	16,23,36,41	0
2	FAD	A	551	53/53	0.98	0.11	16,23,27,29	0
2	FAD	B	551	53/53	0.98	0.11	10,16,21,22	0

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.









## 6.5 Other polymers [i](#)

There are no such residues in this entry.