



# Full wwPDB X-ray Structure Validation Report ⓘ

Aug 27, 2023 – 10:47 AM EDT

PDB ID : 3ICS  
Title : Crystal structure of partially reduced Bacillus anthracis CoADR-RHD  
Authors : Wallen, J.R.; Claiborne, A.  
Deposited on : 2009-07-18  
Resolution : 1.94 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 : 2.35  
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

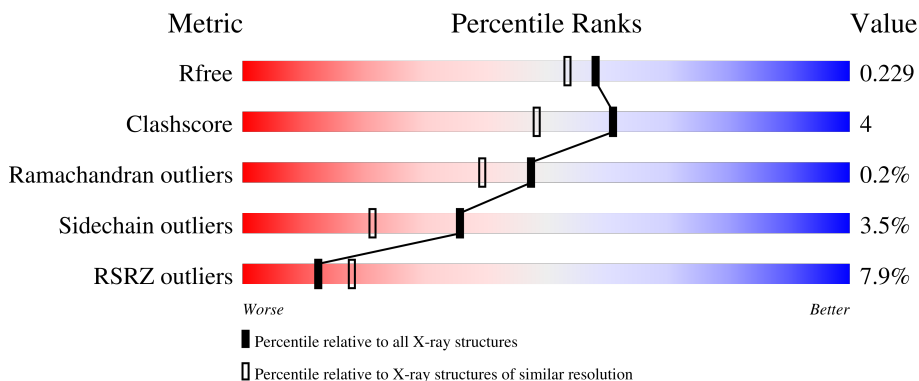
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*


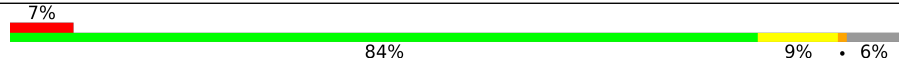
The reported resolution of this entry is 1.94 Å.

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	4310 (1.96-1.92)
Clashscore	141614	1023 (1.94-1.94)
Ramachandran outliers	138981	1007 (1.94-1.94)
Sidechain outliers	138945	1007 (1.94-1.94)
RSRZ outliers	127900	4250 (1.96-1.92)

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	588	 8% 85% 8% • 6%
1	B	588	 7% 84% 9% • 6%

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 9559 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 Coenzyme A-Disulfide Reductase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	S	Se			
1	A	555	4303	2731	733	820	3	16	0	1	0
1	B	554	4299	2729	732	819	3	16	0	1	0

There are 70 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-33	MSE	-	expression tag	UNP Q81UT5
A	-32	GLY	-	expression tag	UNP Q81UT5
A	-31	GLY	-	expression tag	UNP Q81UT5
A	-30	SER	-	expression tag	UNP Q81UT5
A	-29	HIS	-	expression tag	UNP Q81UT5
A	-28	HIS	-	expression tag	UNP Q81UT5
A	-27	HIS	-	expression tag	UNP Q81UT5
A	-26	HIS	-	expression tag	UNP Q81UT5
A	-25	HIS	-	expression tag	UNP Q81UT5
A	-24	HIS	-	expression tag	UNP Q81UT5
A	-23	GLY	-	expression tag	UNP Q81UT5
A	-22	MSE	-	expression tag	UNP Q81UT5
A	-21	ALA	-	expression tag	UNP Q81UT5
A	-20	SER	-	expression tag	UNP Q81UT5
A	-19	MSE	-	expression tag	UNP Q81UT5
A	-18	THR	-	expression tag	UNP Q81UT5
A	-17	GLY	-	expression tag	UNP Q81UT5
A	-16	GLY	-	expression tag	UNP Q81UT5
A	-15	GLN	-	expression tag	UNP Q81UT5
A	-14	GLN	-	expression tag	UNP Q81UT5
A	-13	MSE	-	expression tag	UNP Q81UT5
A	-12	GLY	-	expression tag	UNP Q81UT5
A	-11	ARG	-	expression tag	UNP Q81UT5
A	-10	THR	-	expression tag	UNP Q81UT5
A	-9	LEU	-	expression tag	UNP Q81UT5

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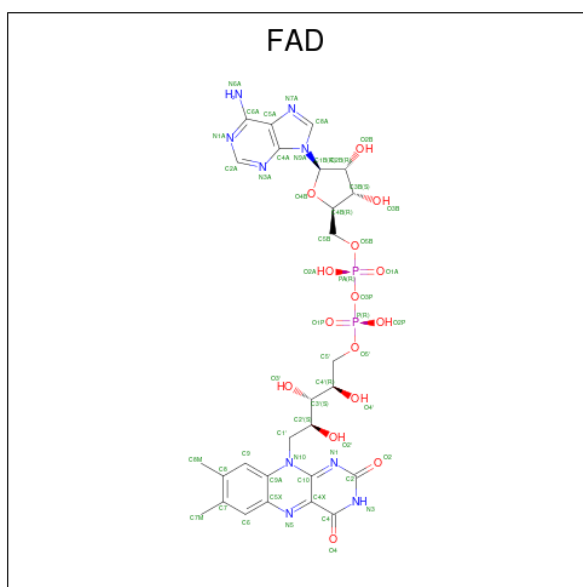
Chain	Residue	Modelled	Actual	Comment	Reference
A	-8	TYR	-	expression tag	UNP Q81UT5
A	-7	ASP	-	expression tag	UNP Q81UT5
A	-6	ASP	-	expression tag	UNP Q81UT5
A	-5	ASP	-	expression tag	UNP Q81UT5
A	-4	ASP	-	expression tag	UNP Q81UT5
A	-3	LYS	-	expression tag	UNP Q81UT5
A	-2	ASP	-	expression tag	UNP Q81UT5
A	-1	ARG	-	expression tag	UNP Q81UT5
A	0	TRP	-	expression tag	UNP Q81UT5
A	1	GLY	-	expression tag	UNP Q81UT5
B	-33	MSE	-	expression tag	UNP Q81UT5
B	-32	GLY	-	expression tag	UNP Q81UT5
B	-31	GLY	-	expression tag	UNP Q81UT5
B	-30	SER	-	expression tag	UNP Q81UT5
B	-29	HIS	-	expression tag	UNP Q81UT5
B	-28	HIS	-	expression tag	UNP Q81UT5
B	-27	HIS	-	expression tag	UNP Q81UT5
B	-26	HIS	-	expression tag	UNP Q81UT5
B	-25	HIS	-	expression tag	UNP Q81UT5
B	-24	HIS	-	expression tag	UNP Q81UT5
B	-23	GLY	-	expression tag	UNP Q81UT5
B	-22	MSE	-	expression tag	UNP Q81UT5
B	-21	ALA	-	expression tag	UNP Q81UT5
B	-20	SER	-	expression tag	UNP Q81UT5
B	-19	MSE	-	expression tag	UNP Q81UT5
B	-18	THR	-	expression tag	UNP Q81UT5
B	-17	GLY	-	expression tag	UNP Q81UT5
B	-16	GLY	-	expression tag	UNP Q81UT5
B	-15	GLN	-	expression tag	UNP Q81UT5
B	-14	GLN	-	expression tag	UNP Q81UT5
B	-13	MSE	-	expression tag	UNP Q81UT5
B	-12	GLY	-	expression tag	UNP Q81UT5
B	-11	ARG	-	expression tag	UNP Q81UT5
B	-10	THR	-	expression tag	UNP Q81UT5
B	-9	LEU	-	expression tag	UNP Q81UT5
B	-8	TYR	-	expression tag	UNP Q81UT5
B	-7	ASP	-	expression tag	UNP Q81UT5
B	-6	ASP	-	expression tag	UNP Q81UT5
B	-5	ASP	-	expression tag	UNP Q81UT5
B	-4	ASP	-	expression tag	UNP Q81UT5
B	-3	LYS	-	expression tag	UNP Q81UT5
B	-2	ASP	-	expression tag	UNP Q81UT5

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-1	ARG	-	expression tag	UNP Q81UT5
B	0	TRP	-	expression tag	UNP Q81UT5
B	1	GLY	-	expression tag	UNP Q81UT5

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



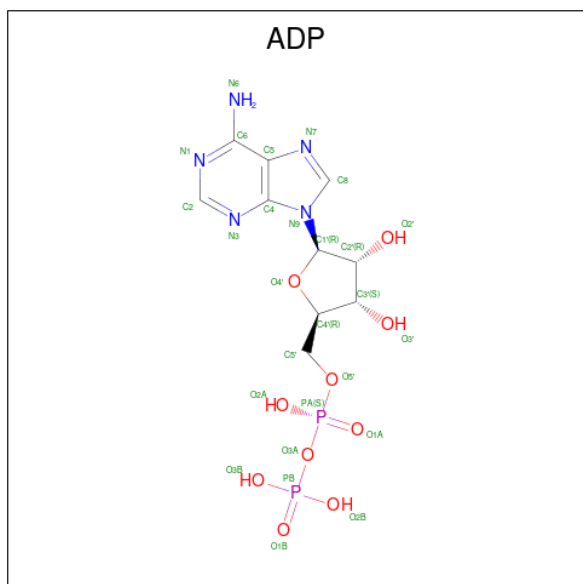
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
2	A	1	Total	C	N	O	P	0	0
			53	27	9	15	2		
2	B	1	Total	C	N	O	P	0	0
			53	27	9	15	2		

- Molecule 3 is COENZYME A (three-letter code: COA) (formula:  $C_{21}H_{36}N_7O_{16}P_3S$ ).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	N	O	P			S
3	A	1	48	21	7	16	3	1	0	0
3	B	1	48	21	7	16	3	1	0	0

- Molecule 4 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula:  $C_{10}H_{15}N_5O_{10}P_2$ ).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
4	B	1	27	10	5	10	2	0	0

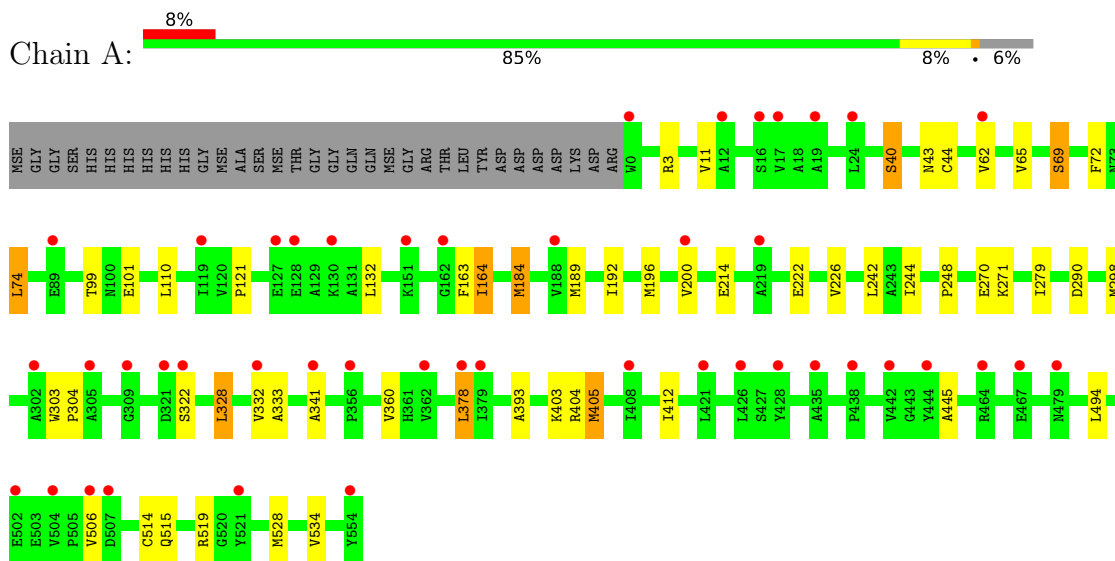
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	360	Total 360	O 360	0	0
5	B	368	Total 368	O 368	0	0

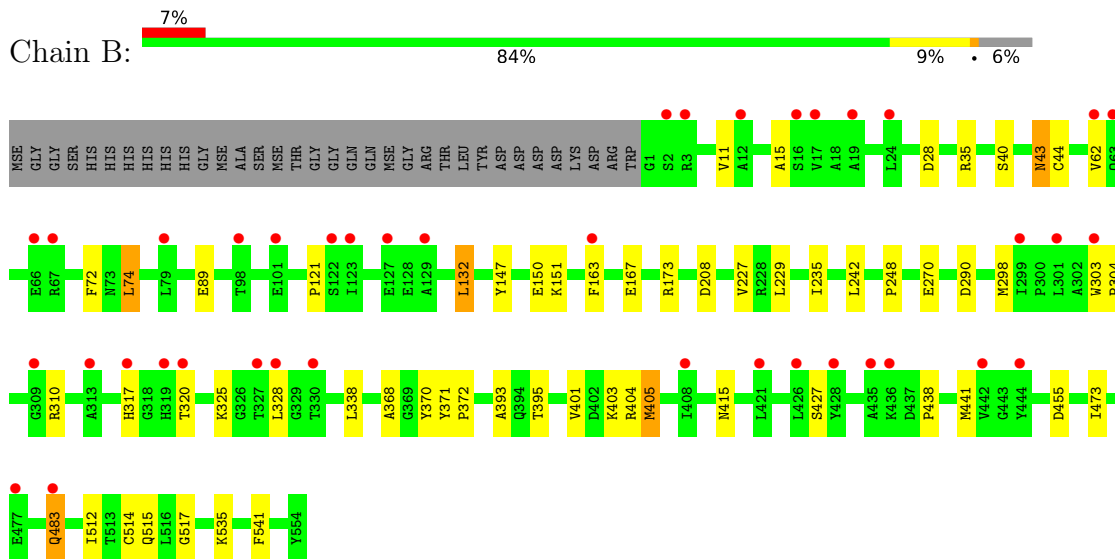
### 3 Residue-property plots [i](#)

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: Coenzyme A-Disulfide Reductase



- Molecule 1: Coenzyme A-Disulfide Reductase





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	67.37Å 110.47Å 80.02Å 90.00° 101.87° 90.00°	Depositor
Resolution (Å)	39.16 – 1.94 39.15 – 1.94	Depositor EDS
% Data completeness (in resolution range)	99.0 (39.16-1.94) 99.0 (39.15-1.94)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.57 (at 1.94Å)	Xtrriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.183 , 0.228 0.184 , 0.229	Depositor DCC
$R_{free}$ test set	4223 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	26.6	Xtrriage
Anisotropy	0.279	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 40.5	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	9559	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	40.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.59% 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, COA, ADP

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	0/4361	0.59	0/5881
1	B	0.45	0/4357	0.58	1/5876 (0.0%)
All	All	0.45	0/8718	0.58	1/11757 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	132	LEU	CA-CB-CG	5.65	128.30	115.30

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	4303	0	4387	42	0
1	B	4299	0	4386	39	0
2	A	53	0	31	1	0
2	B	53	0	31	0	0
3	A	48	0	32	6	0
3	B	48	0	32	9	0
4	B	27	0	12	0	0
5	A	360	0	0	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	B	368	0	0	1	0
All	All	9559	0	8911	79	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 4.

All (79) 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:44:CYS:SG	3:B:556:COA:H21	2.00	1.01
1:A:189:MSE:HE1	1:A:200:VAL:HG21	1.47	0.96
1:A:44:CYS:SG	3:A:556:COA:H21	2.10	0.91
1:A:44:CYS:SG	3:A:556:COA:S1P	2.72	0.87
1:B:44:CYS:SG	3:B:556:COA:C2P	2.68	0.82
1:A:44:CYS:SG	3:A:556:COA:C2P	2.71	0.78
1:A:405:MSE:HE3	1:A:405:MSE:HA	1.65	0.77
1:B:483:GLN:HG2	1:B:541:PHE:HE2	1.52	0.75
1:B:44:CYS:SG	3:B:556:COA:S1P	2.86	0.73
1:B:28:ASP:OD2	1:B:317:HIS:CE1	2.41	0.73
1:B:405:MSE:HE3	1:B:405:MSE:HA	1.72	0.72
1:A:99:THR:OG1	1:A:101:GLU:HG2	1.91	0.70
1:A:189:MSE:HE3	1:A:192:ILE:CD1	2.22	0.70
1:A:121:PRO:HD3	1:A:244:ILE:HD11	1.74	0.69
1:A:40:SER:HB3	3:A:556:COA:O9P	1.92	0.69
1:A:189:MSE:CE	1:A:200:VAL:HG21	2.26	0.64
1:B:270:GLU:H	1:B:270:GLU:CD	2.01	0.62
1:B:121:PRO:HD2	1:B:242:LEU:HD21	1.83	0.61
1:B:473:ILE:HB	1:B:512:ILE:HD13	1.83	0.61
1:B:44:CYS:HG	3:B:556:COA:C2P	2.11	0.60
1:A:189:MSE:HE3	1:A:192:ILE:HD11	1.84	0.59
1:A:44:CYS:HG	3:A:556:COA:C2P	2.13	0.59
1:B:44:CYS:HG	3:B:556:COA:H21	1.67	0.59
1:A:405:MSE:HA	1:A:405:MSE:CE	2.32	0.59
1:A:65:VAL:O	1:A:69:SER:OG	2.22	0.57
1:A:270:GLU:H	1:A:270:GLU:CD	2.08	0.56
1:A:40:SER:O	1:A:62:VAL:HB	2.05	0.56
1:A:393:ALA:HB3	1:A:405:MSE:HE1	1.89	0.54
1:B:163:PHE:O	1:B:167:GLU:HG3	2.08	0.53
1:A:514[B]:CYS:SG	1:A:515:GLN:N	2.81	0.53
1:A:332:VAL:HB	1:B:427:SER:HB3	1.91	0.52
1:A:271:LYS:HE2	5:A:562:HOH:O	2.09	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:528:MSE:HG3	1:A:534:VAL:CG1	2.41	0.50
1:B:229:LEU:HD11	1:B:235:ILE:HD11	1.95	0.48
1:B:483:GLN:CD	1:B:483:GLN:H	2.17	0.48
1:A:189:MSE:HE3	1:A:192:ILE:HD13	1.93	0.48
1:B:248:PRO:HD3	1:B:298:MSE:SE	2.64	0.48
1:A:72:PHE:O	1:A:74:LEU:HD13	2.14	0.48
1:A:72:PHE:HB2	1:A:74:LEU:HD22	1.96	0.47
1:B:415:ASN:ND2	5:B:839:HOH:O	2.42	0.47
1:B:303:TRP:HB3	1:B:304:PRO:HD3	1.95	0.47
1:A:514[B]:CYS:SG	1:A:519:ARG:HB2	2.55	0.47
1:B:483:GLN:HG2	1:B:541:PHE:CE2	2.41	0.47
1:B:455:ASP:HB3	1:B:535:LYS:HG2	1.97	0.47
1:A:298:MSE:HG3	5:A:848:HOH:O	2.15	0.46
1:A:332:VAL:HG23	1:A:341:ALA:HB2	1.98	0.46
1:B:368:ALA:HB1	1:B:370:TYR:CE2	2.50	0.46
1:A:163:PHE:CD1	1:A:333:ALA:HB2	2.50	0.46
1:B:147:TYR:CE1	1:B:151:LYS:HG3	2.50	0.46
1:B:514[B]:CYS:SG	1:B:515:GLN:N	2.90	0.45
1:B:393:ALA:HB3	1:B:405:MSE:HE1	1.98	0.45
1:B:40:SER:O	1:B:62:VAL:HB	2.17	0.45
1:A:393:ALA:CB	1:A:405:MSE:HE1	2.47	0.45
1:A:528:MSE:HG3	1:A:534:VAL:HG12	1.99	0.45
1:B:44:CYS:HB2	3:B:556:COA:HS1	1.81	0.45
1:B:227:VAL:HB	1:B:235:ILE:HB	1.98	0.45
1:B:43:ASN:OD1	3:B:556:COA:H22	2.17	0.44
1:A:132:LEU:HD11	1:A:242:LEU:HD12	1.98	0.44
1:B:405:MSE:HA	1:B:405:MSE:CE	2.42	0.44
1:A:164:ILE:HG13	2:A:555:FAD:HM73	1.98	0.43
1:A:222:GLU:HG3	1:A:226:VAL:CG2	2.48	0.43
1:B:371:TYR:CG	1:B:372:PRO:HD2	2.53	0.43
1:B:270:GLU:CD	1:B:270:GLU:N	2.71	0.43
1:B:395:THR:HG23	1:B:401:VAL:HG13	2.00	0.42
1:B:514[A]:CYS:SG	1:B:517:GLY:N	2.91	0.42
1:A:189:MSE:CE	1:A:192:ILE:HD11	2.48	0.42
1:A:328:LEU:HD21	1:A:412:ILE:HG21	2.01	0.42
1:B:44:CYS:CB	3:B:556:COA:HS1	2.31	0.42
1:B:72:PHE:O	1:B:74:LEU:HD13	2.19	0.42
1:A:110:LEU:HB3	1:A:279:ILE:HG12	2.02	0.41
1:A:303:TRP:HB3	1:A:304:PRO:HD3	2.02	0.41
1:A:360:VAL:HG21	1:A:445:ALA:HB1	2.02	0.41
1:A:196:MSE:SE	1:A:378:LEU:HD13	2.71	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:556:COA:H51A	1:B:441:MSE:SE	2.71	0.41
1:A:248:PRO:HG3	1:A:298:MSE:SE	2.71	0.41
1:B:455:ASP:OD2	1:B:535:LYS:HE2	2.21	0.40
1:A:403:LYS:HA	1:B:403:LYS:HG3	2.02	0.40
1:B:15:ALA:HB1	3:B:556:COA:H142	2.03	0.40
1:A:184:MSE:O	1:A:214:GLU:HA	2.21	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	554/588 (94%)	541 (98%)	12 (2%)	1 (0%)	47 39
1	B	553/588 (94%)	536 (97%)	16 (3%)	1 (0%)	47 39
All	All	1107/1176 (94%)	1077 (97%)	28 (2%)	2 (0%)	47 39

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	11	VAL
1	A	11	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	468/474 (99%)	453 (97%)	15 (3%)	39	25
1	B	468/474 (99%)	450 (96%)	18 (4%)	33	18
All	All	936/948 (99%)	903 (96%)	33 (4%)	36	21

All (33) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	3	ARG
1	A	40	SER
1	A	43	ASN
1	A	69	SER
1	A	74	LEU
1	A	164	ILE
1	A	184	MSE
1	A	290	ASP
1	A	322	SER
1	A	328	LEU
1	A	378	LEU
1	A	404	ARG
1	A	405	MSE
1	A	494	LEU
1	A	506	VAL
1	B	35	ARG
1	B	43	ASN
1	B	74	LEU
1	B	89	GLU
1	B	132	LEU
1	B	150	GLU
1	B	173	ARG
1	B	208	ASP
1	B	290	ASP
1	B	310	ARG
1	B	320	THR
1	B	325	LYS
1	B	328	LEU
1	B	338	LEU
1	B	404	ARG
1	B	405	MSE
1	B	438	PRO
1	B	483	GLN

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

Mol	Chain	Res	Type
1	A	273	GLN
1	B	415	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](#)

5 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	COA	A	556	-	41,50,50	0.74	1 (2%)	52,75,75	1.36	5 (9%)
3	COA	B	556	-	41,50,50	0.75	0	52,75,75	1.39	6 (11%)
4	ADP	B	600	-	24,29,29	1.05	2 (8%)	29,45,45	1.35	3 (10%)
2	FAD	B	555	-	53,58,58	0.93	3 (5%)	68,89,89	1.34	8 (11%)
2	FAD	A	555	-	53,58,58	0.90	2 (3%)	68,89,89	1.32	7 (10%)

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	COA	A	556	-	-	8/44/64/64	0/3/3/3
3	COA	B	556	-	-	7/44/64/64	0/3/3/3
4	ADP	B	600	-	-	3/12/32/32	0/3/3/3
2	FAD	B	555	-	-	2/30/50/50	0/6/6/6
2	FAD	A	555	-	-	2/30/50/50	0/6/6/6

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	555	FAD	C4X-N5	2.82	1.36	1.30
4	B	600	ADP	C5-C4	2.73	1.48	1.40
3	A	556	COA	O4B-C1B	2.50	1.44	1.41
2	A	555	FAD	C4X-N5	2.37	1.35	1.30
2	B	555	FAD	C10-N10	2.23	1.42	1.37
4	B	600	ADP	C2-N3	2.18	1.35	1.32
2	B	555	FAD	C2A-N3A	2.14	1.35	1.32
2	A	555	FAD	C10-N10	2.11	1.41	1.37

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	555	FAD	N3A-C2A-N1A	-5.43	120.19	128.68
3	A	556	COA	N3A-C2A-N1A	-4.99	120.89	128.68
2	B	555	FAD	N3A-C2A-N1A	-4.85	121.10	128.68
3	B	556	COA	N3A-C2A-N1A	-4.71	121.32	128.68
3	B	556	COA	C7P-N8P-C9P	4.14	129.97	122.59
4	B	600	ADP	N3-C2-N1	-3.70	122.90	128.68
3	A	556	COA	C7P-N8P-C9P	3.40	128.65	122.59
3	B	556	COA	C2P-C3P-N4P	-3.05	105.34	112.31
3	B	556	COA	C3P-N4P-C5P	2.79	128.01	122.84
2	B	555	FAD	C4-N3-C2	-2.76	120.53	125.64
2	B	555	FAD	O4-C4-C4X	-2.64	119.59	126.60
4	B	600	ADP	PA-O3A-PB	-2.48	124.30	132.83
2	B	555	FAD	C4X-C4-N3	2.44	119.39	113.19
3	B	556	COA	P2A-O3A-P1A	-2.42	124.51	132.83
2	A	555	FAD	C4X-C10-N10	2.39	119.98	116.48
3	A	556	COA	C3P-N4P-C5P	2.31	127.13	122.84
3	B	556	COA	O2A-P1A-O1A	2.27	123.44	112.24
2	A	555	FAD	C4-N3-C2	-2.24	121.50	125.64
3	A	556	COA	C2P-C3P-N4P	-2.23	107.22	112.31
2	A	555	FAD	C10-C4X-N5	-2.18	120.24	124.86
2	A	555	FAD	O2-C2-N1	-2.17	118.24	121.83

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	555	FAD	C5'-C4'-C3'	-2.15	108.04	112.20
2	B	555	FAD	C4X-C10-N1	-2.12	119.80	124.73
2	B	555	FAD	C4X-C10-N10	2.10	119.56	116.48
2	A	555	FAD	C5X-N5-C4X	2.09	121.55	118.07
4	B	600	ADP	C2-N1-C6	2.08	122.31	118.75
3	A	556	COA	C4A-C5A-N7A	-2.06	107.25	109.40
2	B	555	FAD	C5X-N5-C4X	2.06	121.49	118.07
2	B	555	FAD	C4A-C5A-N7A	-2.01	107.31	109.40

There are no chirality outliers.

All (22) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	555	FAD	O4B-C4B-C5B-O5B
3	A	556	COA	C5B-O5B-P1A-O2A
3	A	556	COA	C5B-O5B-P1A-O3A
3	A	556	COA	CAP-CBP-CCP-O6A
3	B	556	COA	C5B-O5B-P1A-O2A
3	B	556	COA	P2A-O3A-P1A-O5B
2	B	555	FAD	C3B-C4B-C5B-O5B
3	A	556	COA	CEP-CBP-CCP-O6A
2	A	555	FAD	O4B-C4B-C5B-O5B
3	B	556	COA	C5B-O5B-P1A-O3A
4	B	600	ADP	C5'-O5'-PA-O3A
3	B	556	COA	C5B-O5B-P1A-O1A
3	A	556	COA	P1A-O3A-P2A-O4A
3	A	556	COA	CDP-CBP-CCP-O6A
2	A	555	FAD	C3B-C4B-C5B-O5B
3	A	556	COA	C3B-O3B-P3B-O7A
3	A	556	COA	C3B-O3B-P3B-O9A
3	B	556	COA	C6P-C7P-N8P-C9P
4	B	600	ADP	O4'-C4'-C5'-O5'
4	B	600	ADP	C5'-O5'-PA-O1A
3	B	556	COA	O4B-C4B-C5B-O5B
3	B	556	COA	CEP-CBP-CCP-O6A

There are no ring outliers.

3 monomers are involved in 16 short contacts:

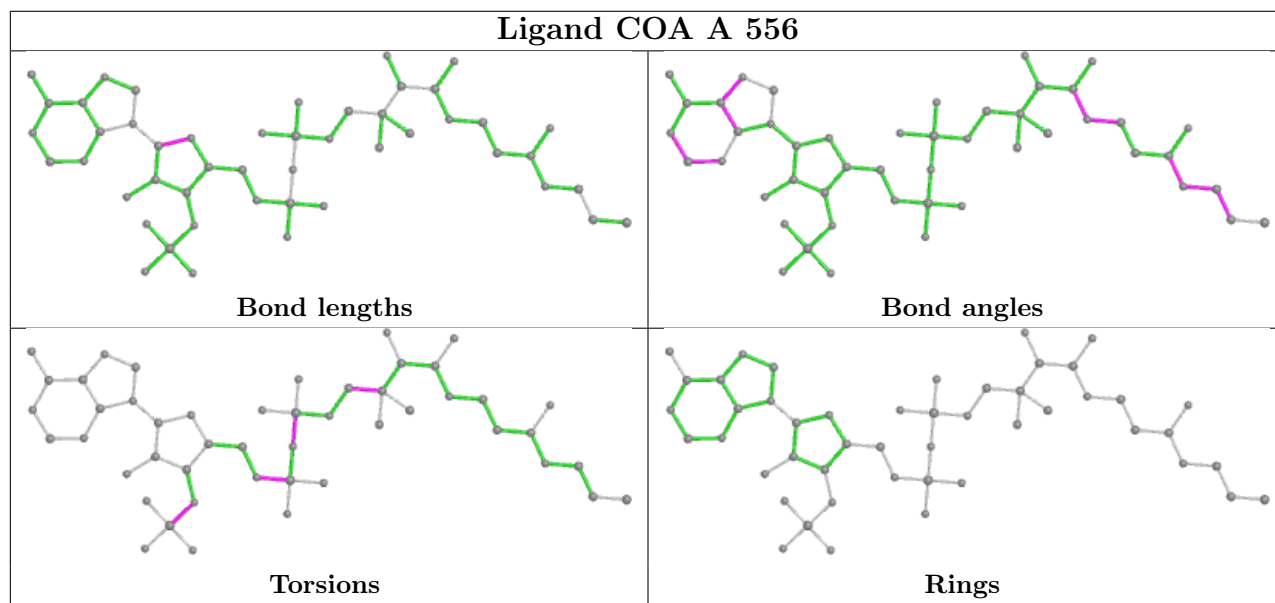
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	556	COA	6	0

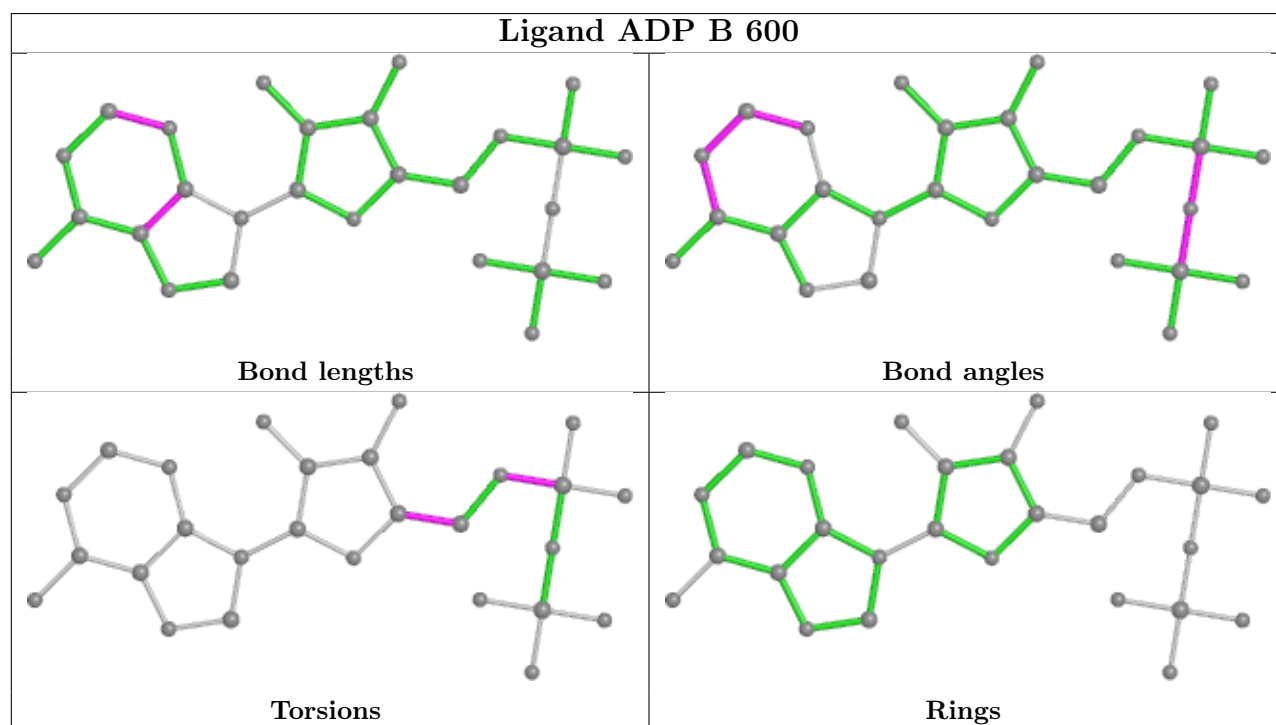
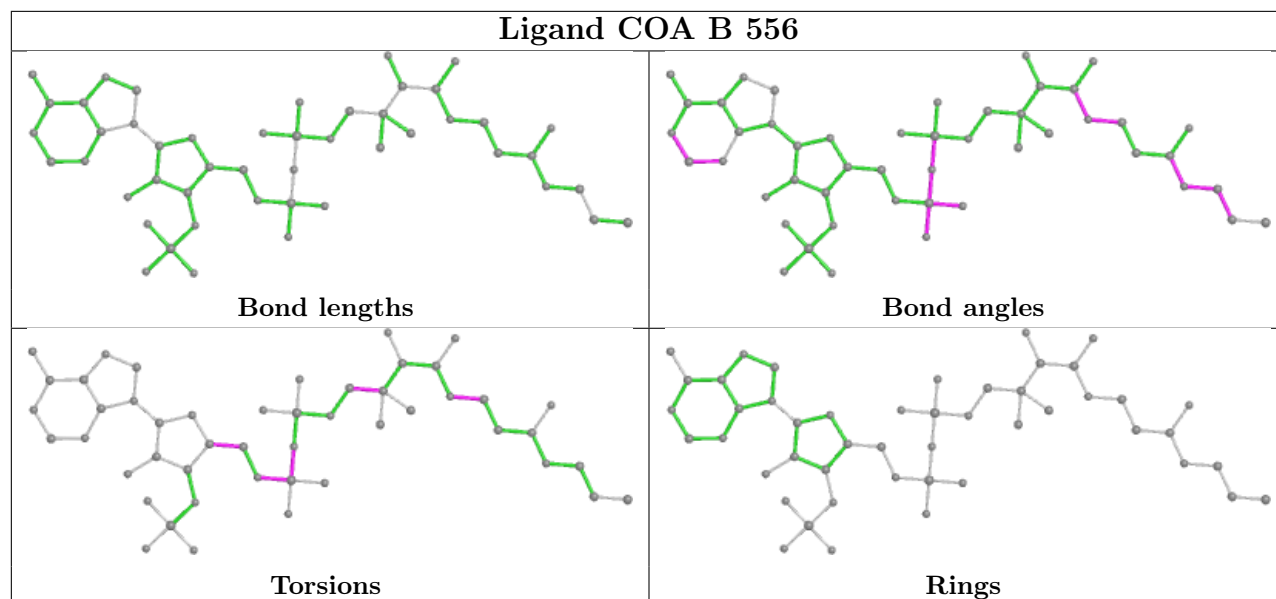
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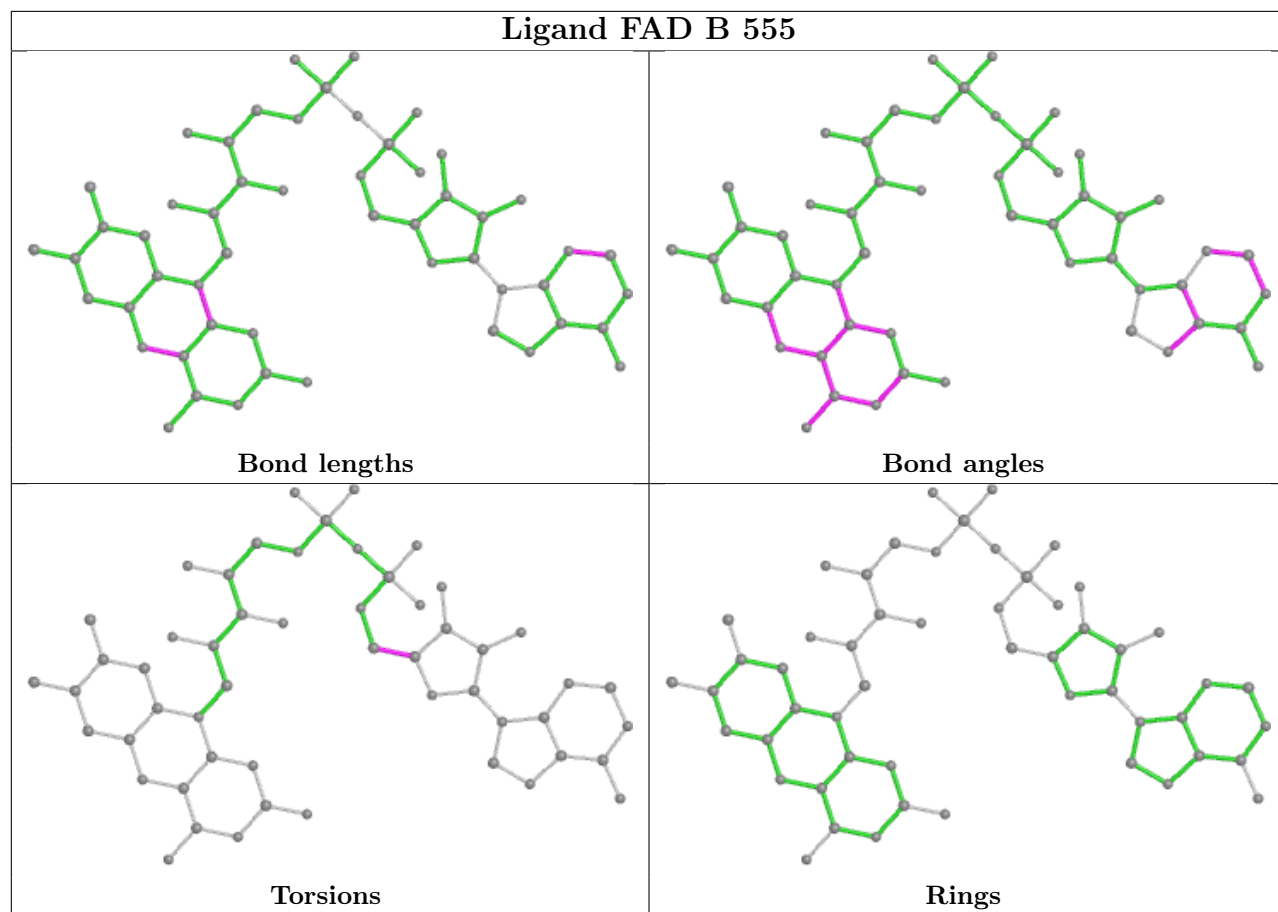
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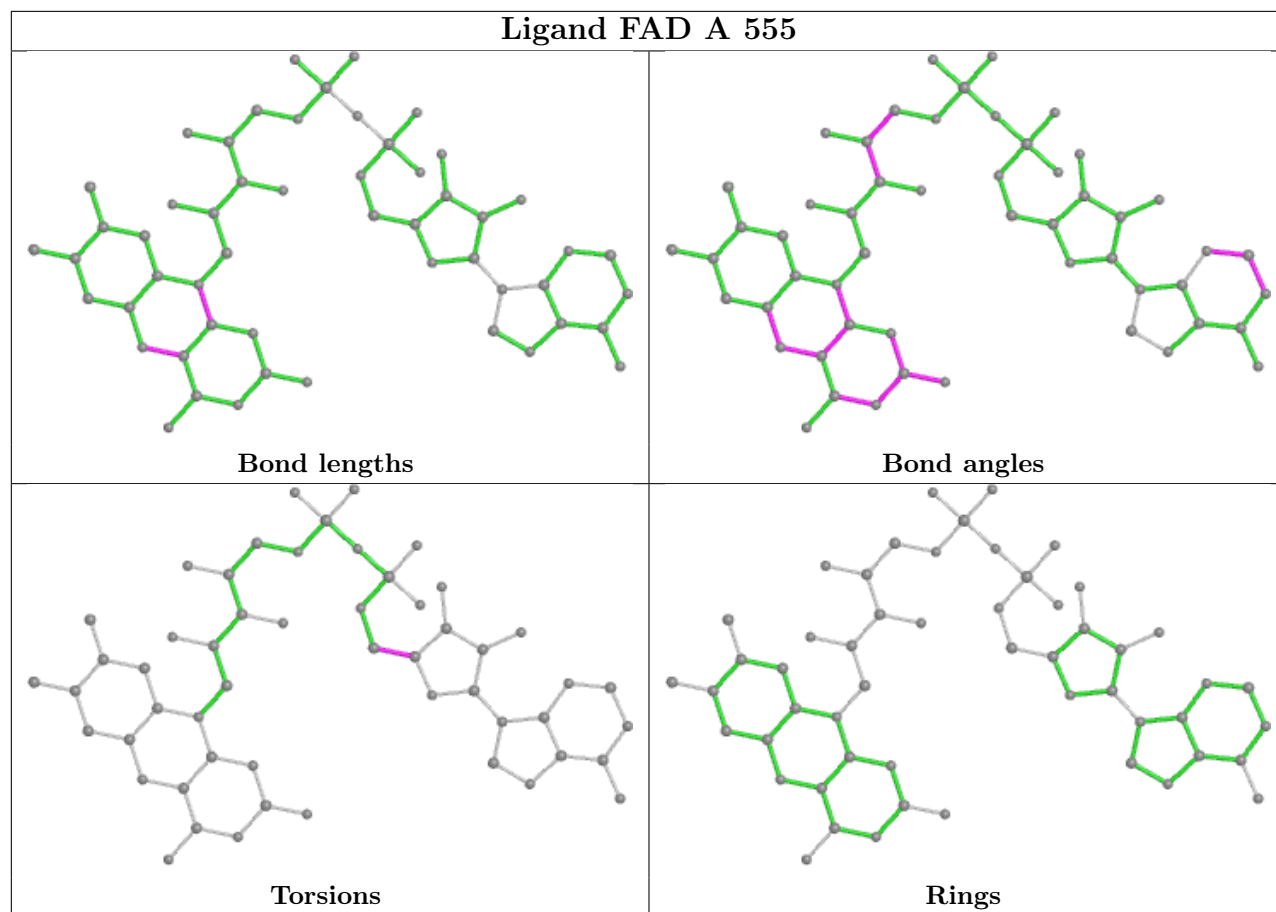
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	556	COA	9	0
2	A	555	FAD	1	0

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

### 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	539/588 (91%)	0.74	45 (8%) <b>11</b> <b>16</b>	33, 40, 52, 61	0
1	B	538/588 (91%)	0.67	40 (7%) <b>14</b> <b>20</b>	32, 39, 52, 61	0
All	All	1077/1176 (91%)	0.70	85 (7%) <b>12</b> <b>18</b>	32, 39, 52, 61	0

All (85) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	320	THR	5.6
1	B	98	THR	4.9
1	A	130	LYS	4.5
1	A	479	ASN	4.4
1	A	62	VAL	4.1
1	A	464	ARG	4.1
1	B	62	VAL	4.1
1	B	163	PHE	3.9
1	A	0	TRP	3.7
1	A	426	LEU	3.4
1	B	483	GLN	3.3
1	B	317	HIS	3.3
1	A	305	ALA	3.3
1	A	12	ALA	3.2
1	B	319	HIS	3.2
1	A	332	VAL	3.2
1	A	506	VAL	3.2
1	A	504	VAL	3.1
1	B	303	TRP	3.1
1	B	3	ARG	2.9
1	A	502	GLU	2.9
1	A	356	PRO	2.9
1	B	2	SER	2.9
1	A	442	VAL	2.8

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	A	151	LYS	2.8
1	A	507	ASP	2.8
1	B	17	VAL	2.8
1	B	309	GLY	2.7
1	A	321	ASP	2.7
1	B	101	GLU	2.7
1	B	79	LEU	2.7
1	A	378	LEU	2.6
1	B	129	ALA	2.6
1	B	435	ALA	2.6
1	A	408	ILE	2.6
1	B	123	ILE	2.5
1	A	435	ALA	2.5
1	A	309	GLY	2.5
1	B	408	ILE	2.5
1	A	19	ALA	2.5
1	B	313	ALA	2.5
1	A	521	TYR	2.5
1	B	16	SER	2.5
1	A	322	SER	2.4
1	A	421	LEU	2.4
1	B	24	LEU	2.4
1	A	302	ALA	2.4
1	A	17	VAL	2.4
1	B	442	VAL	2.4
1	A	127	GLU	2.4
1	A	219	ALA	2.3
1	A	428	TYR	2.3
1	B	12	ALA	2.3
1	A	119	ILE	2.3
1	B	426	LEU	2.3
1	A	554	TYR	2.3
1	B	436	LYS	2.2
1	B	299	ILE	2.2
1	A	162	GLY	2.2
1	A	89	GLU	2.2
1	A	341	ALA	2.2
1	A	188	VAL	2.2
1	A	362	VAL	2.2
1	B	127	GLU	2.2
1	A	438	PRO	2.2
1	A	444	TYR	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	63	GLN	2.2
1	B	19	ALA	2.2
1	B	328	LEU	2.2
1	B	477	GLU	2.1
1	B	301	LEU	2.1
1	A	467	GLU	2.1
1	B	421	LEU	2.1
1	A	128	GLU	2.1
1	B	444	TYR	2.1
1	B	330	THR	2.1
1	A	200	VAL	2.1
1	B	67	ARG	2.0
1	B	122	SER	2.0
1	A	379	ILE	2.0
1	B	428	TYR	2.0
1	A	24	LEU	2.0
1	A	16	SER	2.0
1	B	327	THR	2.0
1	B	66	GLU	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
4	ADP	B	600	27/27	0.84	0.23	41,43,50,51	9
3	COA	B	556	48/48	0.93	0.15	25,39,57,59	0
3	COA	A	556	48/48	0.95	0.11	21,29,43,48	0
2	FAD	B	555	53/53	0.96	0.10	23,25,29,30	0

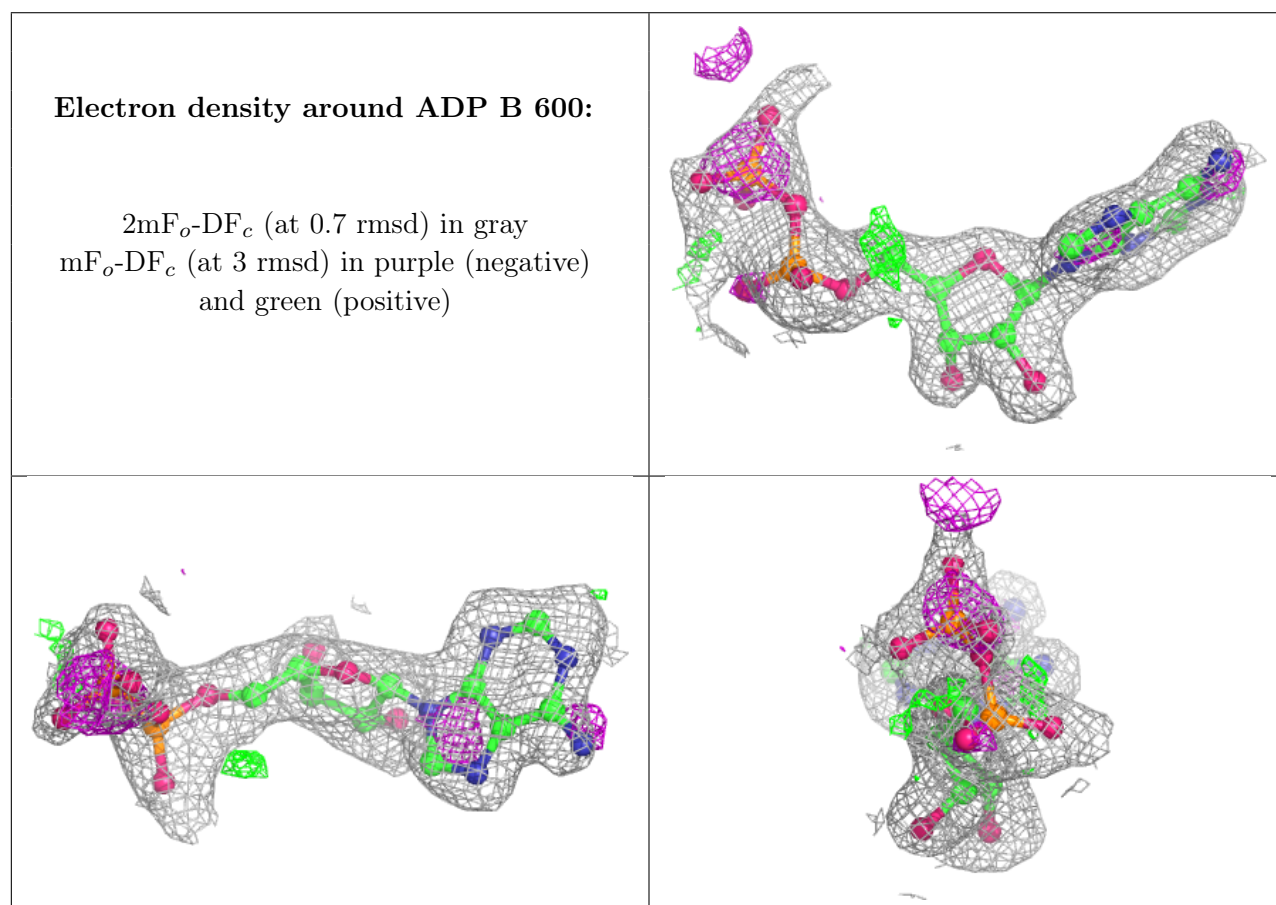
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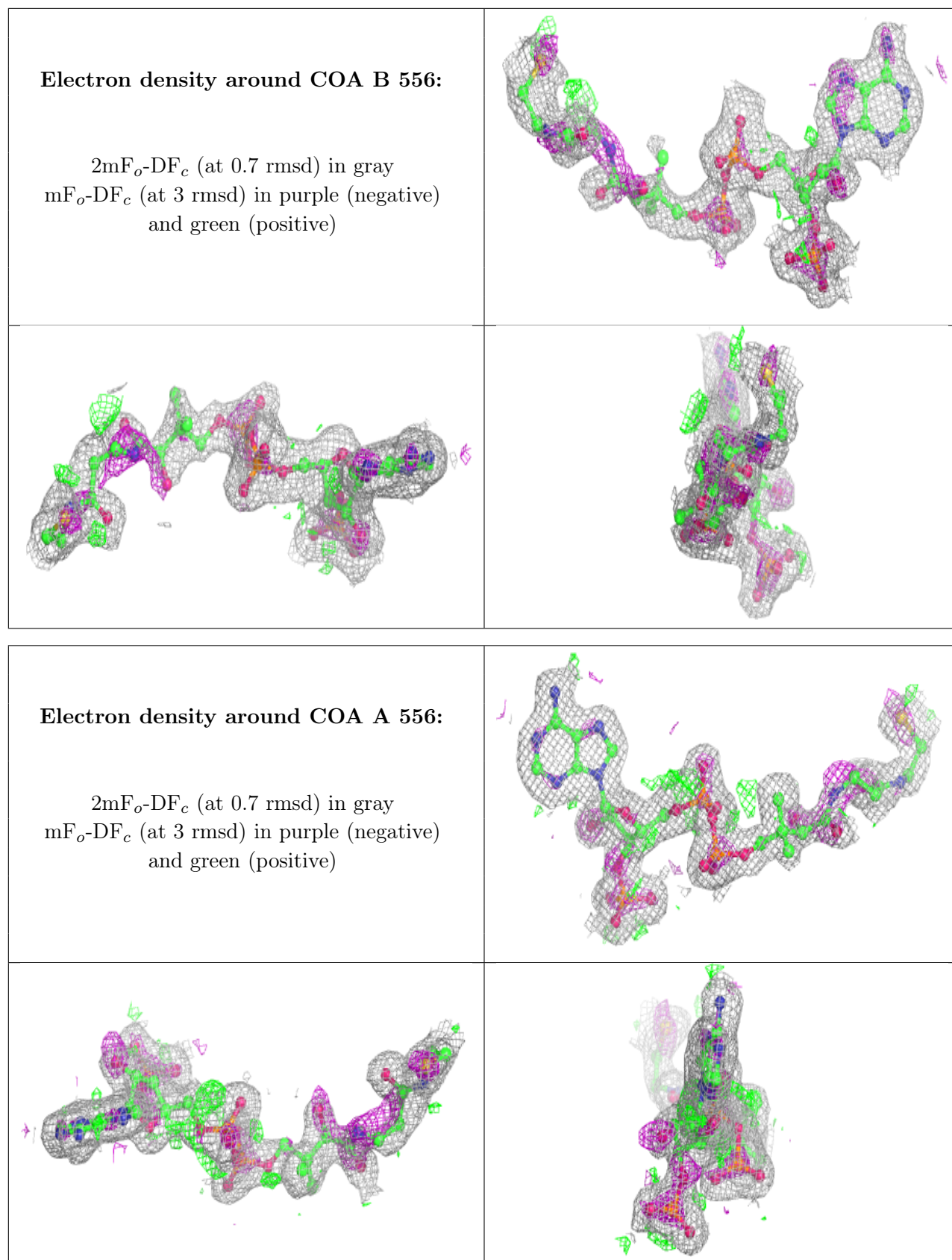


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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
2	FAD	A	555	53/53	0.98	0.09	21,23,24,26	0

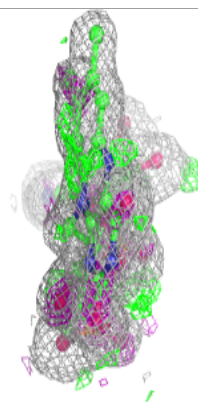
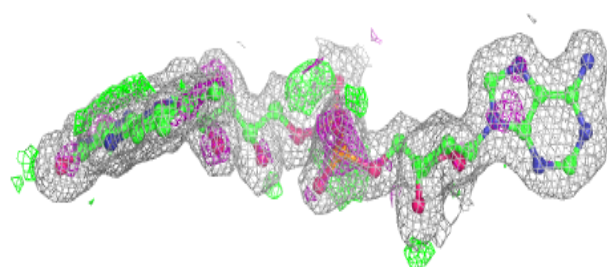
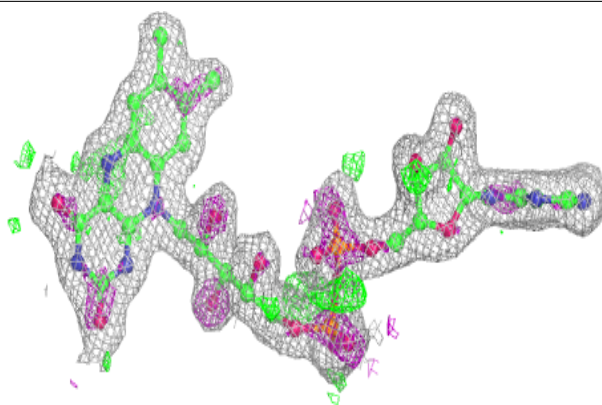
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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



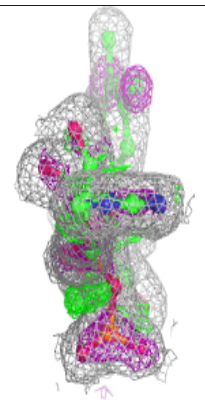
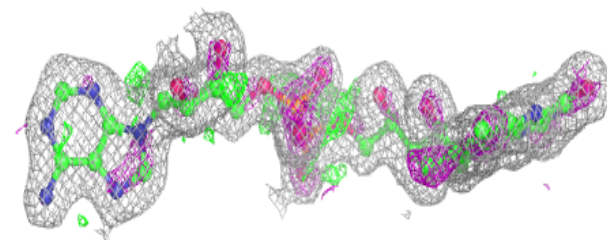
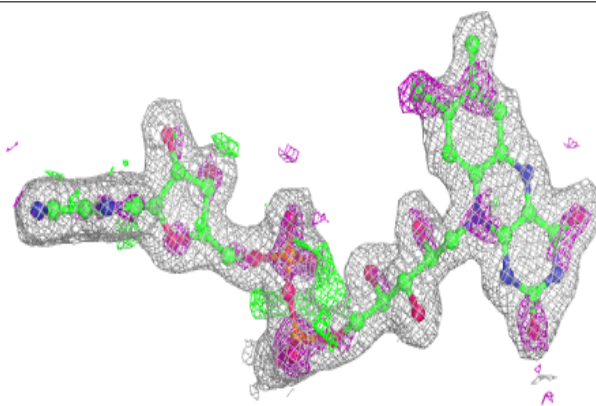


**Electron density around FAD B 555:**

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

**Electron density around FAD A 555:**

$2mF_o-DF_c$  (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.