



# Full wwPDB X-ray Structure Validation Report ⓘ

Dec 4, 2023 – 02:21 am GMT

PDB ID : 2VIG  
Title : Crystal structure of human short-chain acyl CoA dehydrogenase  
Authors : Pike, A.C.W.; Pantic, N.; Parizotto, E.; Gileadi, O.; Ugochukwu, E.; von Delft, F.; Weigelt, J.; Arrowsmith, C.H.; Edwards, A.; Oppermann, U.  
Deposited on : 2007-11-30  
Resolution : 1.90 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 : 1.8.4, CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
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) : 2.36

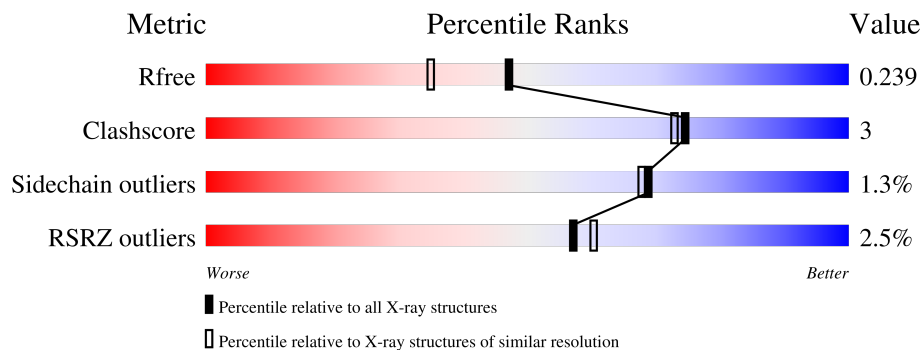
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.90 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.



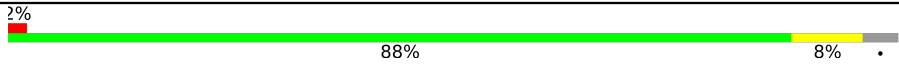
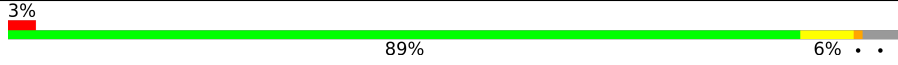
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	6207 (1.90-1.90)
Clashscore	141614	6847 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)
RSRZ outliers	127900	6082 (1.90-1.90)

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	391	 2% 90% 7% •
1	B	391	 4% 86% 8% 5%
1	C	391	 3% 86% 11% •
1	D	391	 3% 87% 9% •
1	E	391	 % 88% 9% •
1	F	391	 2% 89% 7% •

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Mol	Chain	Length	Quality of chain
1	G	391	 2% 88% 8% •
1	H	391	 3% 89% 6% ••

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 24035 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 SHORT-CHAIN SPECIFIC ACYL-COA DEHYDROGENASE,.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	379	Total 2823	C 1790	N 482	O 532	S 19	0	0	0
1	B	371	Total 2748	C 1746	N 467	O 515	S 20	0	0	0
1	C	379	Total 2824	C 1795	N 482	O 528	S 19	0	2	0
1	D	375	Total 2781	C 1769	N 472	O 520	S 20	0	0	0
1	E	380	Total 2813	C 1785	N 482	O 527	S 19	0	1	0
1	F	374	Total 2776	C 1765	N 471	O 521	S 19	0	1	0
1	G	375	Total 2776	C 1762	N 475	O 520	S 19	0	1	0
1	H	374	Total 2760	C 1753	N 471	O 517	S 19	0	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	209	SER	GLY	conflict	UNP P16219
B	209	SER	GLY	conflict	UNP P16219
C	209	SER	GLY	conflict	UNP P16219
D	209	SER	GLY	conflict	UNP P16219
E	209	SER	GLY	conflict	UNP P16219
F	209	SER	GLY	conflict	UNP P16219
G	209	SER	GLY	conflict	UNP P16219
H	209	SER	GLY	conflict	UNP P16219

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



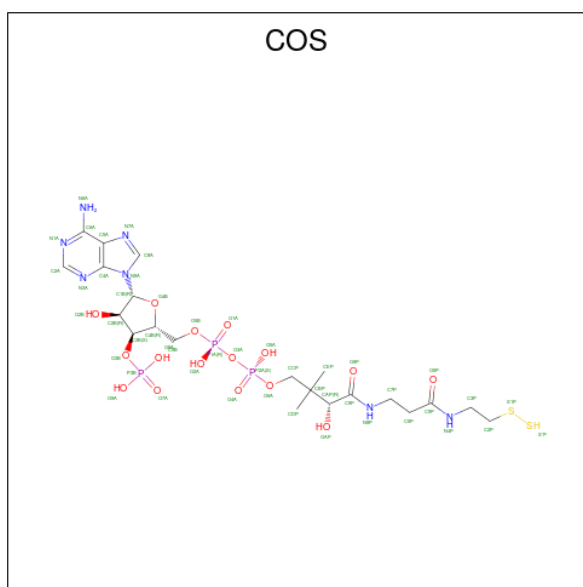
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	N	O			P
2	A	1	53	27	9	15	2	0	0
2	B	1	53	27	9	15	2	0	0
2	C	1	53	27	9	15	2	0	0
2	D	1	53	27	9	15	2	0	0
2	E	1	53	27	9	15	2	0	0
2	F	1	53	27	9	15	2	0	0
2	G	1	53	27	9	15	2	0	0
2	H	1	53	27	9	15	2	0	0

- Molecule 3 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	D	1	Total C O 4 2 2	0	0
3	D	1	Total C O 4 2 2	0	0
3	E	1	Total C O 4 2 2	0	0
3	E	1	Total C O 4 2 2	0	0
3	E	1	Total C O 4 2 2	0	0
3	F	1	Total C O 4 2 2	0	0
3	F	1	Total C O 4 2 2	0	0
3	F	1	Total C O 4 2 2	0	0
3	H	1	Total C O 4 2 2	0	0
3	H	1	Total C O 4 2 2	0	0

- Molecule 4 is COENZYME A PERSULFIDE (three-letter code: COS) (formula: C<sub>21</sub>H<sub>36</sub>N<sub>7</sub>O<sub>16</sub>P<sub>3</sub>S<sub>2</sub>).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	N	O	P			S
4	B	1	49	21	7	16	3	2	0	0
4	C	1	10	5	2	1	2		0	0
4	D	1	10	5	2	1	2		0	0
4	F	1	10	5	2	1	2		0	0
4	G	1	49	21	7	16	3	2	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
5	A	179	179	179	0	0
5	B	122	122	122	0	0
5	C	111	111	111	0	0
5	D	124	124	124	0	0
5	E	159	164	164	0	5
5	F	164	165	165	0	1
5	G	131	131	131	0	0

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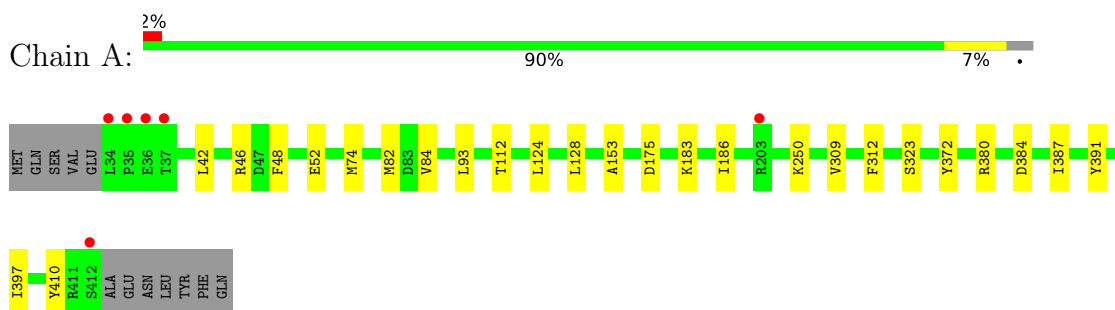
<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
5	H	138	Total 138	O 138	0	0



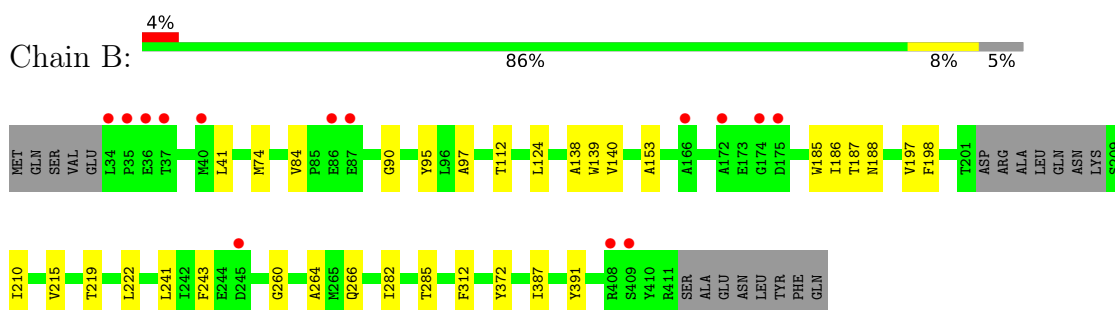
### 3 Residue-property plots [\(i\)](#)

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.

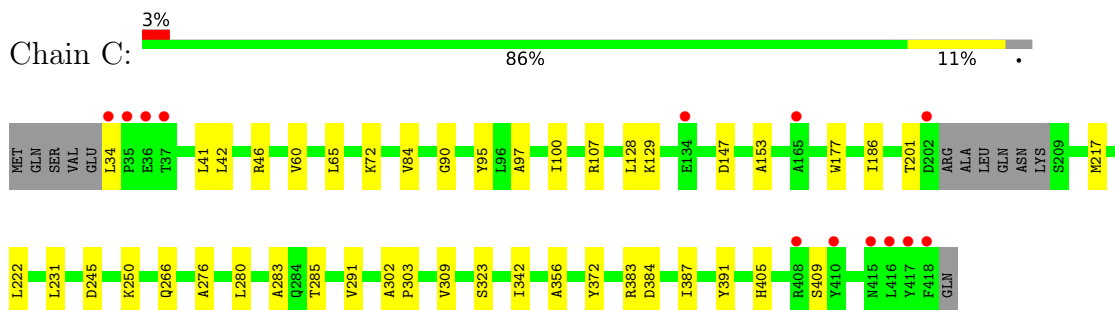
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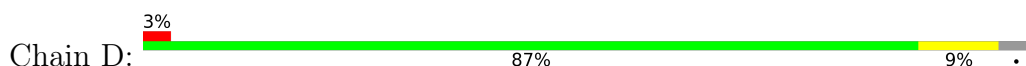
- Molecule 1: SHORT-CHAIN SPECIFIC ACYL-COA DEHYDROGENASE,



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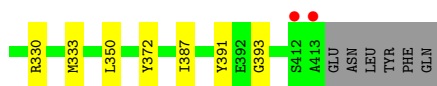
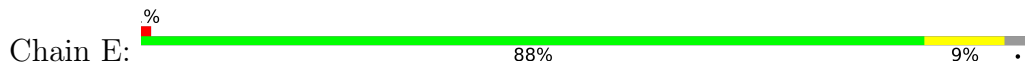


- Molecule 1: SHORT-CHAIN SPECIFIC ACYL-COA DEHYDROGENASE,

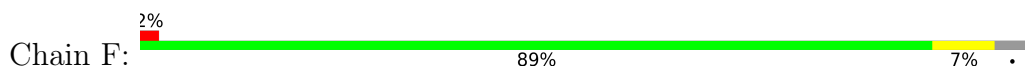




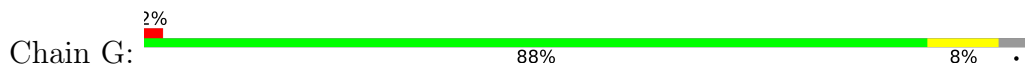
● Molecule 1: SHORT-CHAIN SPECIFIC ACYL-COA DEHYDROGENASE,



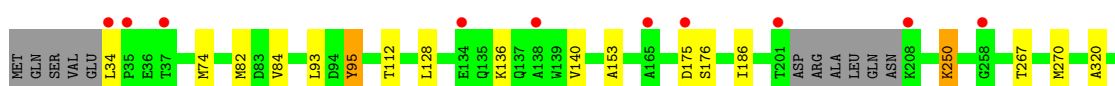
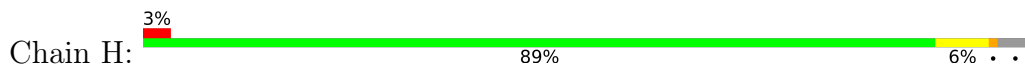
● Molecule 1: SHORT-CHAIN SPECIFIC ACYL-COA DEHYDROGENASE,



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● Molecule 1: SHORT-CHAIN SPECIFIC ACYL-COA DEHYDROGENASE,



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	85.71Å 157.62Å 260.84Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	17.89 – 1.90 17.79 – 1.90	Depositor EDS
% Data completeness (in resolution range)	99.6 (17.89-1.90) 99.6 (17.79-1.90)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.40 (at 1.90Å)	Xtrriage
Refinement program	REFMAC 5.3.0040	Depositor
R, $R_{free}$	0.198 , 0.231 0.205 , 0.239	Depositor DCC
$R_{free}$ test set	1730 reflections (0.63%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	27.5	Xtrriage
Anisotropy	0.143	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 48.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	24035	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	30.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.70% 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: COS, FAD, EDO

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	0.61	0/2873	0.69	1/3887 (0.0%)
1	B	0.58	0/2797	0.64	0/3785
1	C	0.60	0/2888	0.65	0/3908
1	D	0.59	1/2830 (0.0%)	0.66	1/3827 (0.0%)
1	E	0.59	0/2868	0.65	0/3883
1	F	0.61	0/2830	0.68	0/3830
1	G	0.65	1/2830 (0.0%)	0.68	0/3832
1	H	0.61	1/2809 (0.0%)	0.66	0/3805
All	All	0.61	3/22725 (0.0%)	0.66	2/30757 (0.0%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	246	CYS	CB-SG	-5.29	1.73	1.81
1	G	279	ALA	CA-CB	5.23	1.63	1.52
1	H	320	ALA	CA-CB	5.07	1.63	1.52

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	380	ARG	NE-CZ-NH1	-5.65	117.47	120.30
1	D	102	MET	CG-SD-CE	-5.48	91.43	100.20

There are no chirality outliers.

There are no planarity outliers.

## 5.2 Too-close contacts

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2823	0	2833	17	0
1	B	2748	0	2748	18	0
1	C	2824	0	2823	25	0
1	D	2781	0	2792	20	0
1	E	2813	0	2815	25	0
1	F	2776	0	2780	15	0
1	G	2776	0	2763	19	0
1	H	2760	0	2745	16	0
2	A	53	0	31	0	0
2	B	53	0	31	2	0
2	C	53	0	31	0	0
2	D	53	0	31	2	0
2	E	53	0	31	0	0
2	F	53	0	31	2	0
2	G	53	0	31	1	0
2	H	53	0	31	0	0
3	A	4	0	6	0	0
3	B	4	0	6	0	0
3	D	8	0	12	0	0
3	E	12	0	18	1	0
3	F	12	0	18	0	0
3	H	8	0	12	0	0
4	B	49	0	32	6	0
4	C	10	0	10	0	0
4	D	10	0	10	0	0
4	F	10	0	10	1	0
4	G	49	0	32	6	0
5	A	179	0	0	0	0
5	B	122	0	0	0	0
5	C	111	0	0	0	0
5	D	124	0	0	0	0
5	E	164	0	0	3	0
5	F	165	0	0	2	0
5	G	131	0	0	0	0
5	H	138	0	0	0	0
All	All	24035	0	22713	148	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 3.

All (148) 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:E:84:VAL:HG22	1:E:128:LEU:HD11	1.50	0.93
1:H:84:VAL:HG22	1:H:128:LEU:HD11	1.59	0.83
1:G:84:VAL:HG22	1:G:128:LEU:HD11	1.66	0.77
1:C:129:LYS:NZ	1:C:266:GLN:OE1	2.18	0.77
1:A:84:VAL:HG22	1:A:128:LEU:HD11	1.66	0.76
1:C:42:LEU:HD21	1:C:46:ARG:HH21	1.53	0.72
1:D:84:VAL:HG22	1:D:128:LEU:HD11	1.71	0.72
1:A:323:SER:OG	1:C:323:SER:OG	2.09	0.71
1:H:153:ALA:HA	1:H:186:ILE:HD12	1.72	0.70
1:F:84:VAL:HG22	1:F:128:LEU:HD11	1.76	0.68
1:E:309:VAL:HG21	2:F:501:FAD:H2A	1.78	0.66
1:E:205:LEU:O	1:E:209:SER:HB3	1.95	0.65
4:G:502:COS:N8P	4:G:502:COS:H141	2.09	0.65
4:F:502:COS:H22	5:F:610:HOH:O	1.99	0.61
1:B:266:GLN:HE21	4:B:502:COS:H2A	1.66	0.60
1:C:309:VAL:HG21	2:D:501:FAD:H2A	1.83	0.60
1:B:153:ALA:HA	1:B:186:ILE:HD12	1.84	0.59
1:B:312:PHE:CZ	1:C:309:VAL:HG11	2.36	0.59
4:G:502:COS:N8P	4:G:502:COS:CEP	2.65	0.59
4:B:502:COS:N8P	4:B:502:COS:CEP	2.66	0.58
1:E:308:GLN:HG2	5:E:738:HOH:O	2.03	0.58
1:C:84:VAL:HG22	1:C:128:LEU:HD11	1.87	0.57
1:E:159:ASN:ND2	5:E:604:HOH:O	2.37	0.57
1:F:153:ALA:HA	1:F:186:ILE:HD12	1.86	0.56
1:G:392:GLU:HA	4:G:502:COS:H31	1.88	0.56
1:C:72:LYS:NZ	1:C:147:ASP:OD1	2.31	0.56
1:C:84:VAL:HB	1:C:90:GLY:HA3	1.87	0.55
1:G:74:MET:SD	1:G:112:THR:CG2	2.95	0.55
1:E:172:ALA:HB1	1:E:250:LYS:HE2	1.88	0.55
1:E:309:VAL:CG2	2:F:501:FAD:H2A	2.38	0.54
1:E:172:ALA:HB1	1:E:250:LYS:CE	2.37	0.54
4:B:502:COS:N8P	4:B:502:COS:H141	2.23	0.54
1:D:84:VAL:HB	1:D:90:GLY:HA3	1.90	0.54
1:D:102:MET:HE1	1:D:117:SER:HB2	1.90	0.53
1:A:372:TYR:CZ	1:B:387:ILE:HB	2.43	0.53
1:E:74:MET:SD	1:E:112:THR:CG2	2.96	0.53
4:G:502:COS:H141	4:G:502:COS:HN8	1.72	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:82:MET:HE1	1:A:93:LEU:HD12	1.89	0.53
1:A:384:ASP:O	1:A:387:ILE:HG22	2.09	0.52
1:E:167:SER:OG	3:E:504:EDO:H11	2.10	0.52
1:A:312:PHE:CZ	1:D:309:VAL:HG21	2.44	0.52
1:C:384:ASP:O	1:C:387:ILE:HG22	2.11	0.51
1:D:102:MET:HE1	1:D:113:GLY:O	2.10	0.51
1:C:387:ILE:HB	1:D:372:TYR:CZ	2.45	0.51
1:B:124:LEU:HD22	1:B:140:VAL:HG13	1.92	0.51
1:D:153:ALA:HA	1:D:186:ILE:HD12	1.93	0.51
1:E:330:ARG:HA	1:E:333:MET:HE3	1.90	0.51
1:A:175:ASP:O	1:A:250:LYS:HB3	2.10	0.51
1:G:372:TYR:CZ	1:H:387:ILE:HB	2.46	0.50
1:G:139:TRP:CD1	1:G:214:LEU:HD13	2.47	0.50
1:E:248:ILE:HD12	1:E:252:SER:CB	2.42	0.50
1:H:370:MET:CE	1:H:376:MET:HG2	2.42	0.50
1:A:82:MET:CE	1:A:93:LEU:HD12	2.41	0.49
1:B:198:PHE:CE1	1:B:264:ALA:HB2	2.46	0.49
1:D:107:ARG:HG3	1:D:285:THR:HB	1.94	0.49
1:E:153:ALA:HA	1:E:186:ILE:HD12	1.94	0.49
1:G:48:PHE:CE1	1:G:52:GLU:HG3	2.47	0.49
1:E:248:ILE:HD12	1:E:252:SER:HB3	1.94	0.49
1:H:74:MET:SD	1:H:112:THR:CG2	3.00	0.49
1:F:187:THR:O	1:F:188:ASN:HB2	2.12	0.49
1:G:74:MET:SD	1:G:112:THR:HG21	2.53	0.49
1:H:82:MET:HE3	1:H:93:LEU:HD12	1.94	0.49
1:B:41:LEU:CD2	1:B:97:ALA:HB1	2.43	0.48
1:A:153:ALA:HA	1:A:186:ILE:HD12	1.95	0.48
1:B:74:MET:SD	1:B:112:THR:CG2	3.01	0.48
1:G:207:ASN:HD22	4:G:502:COS:H52A	1.78	0.48
1:E:126:PRO:HD3	1:E:267:THR:HG23	1.96	0.48
1:A:48:PHE:CE1	1:A:52:GLU:HG3	2.49	0.48
1:E:350:LEU:HD23	1:G:319:LEU:HD22	1.96	0.48
1:E:387:ILE:HB	1:F:372:TYR:CZ	2.49	0.47
1:A:387:ILE:HB	1:B:372:TYR:CZ	2.49	0.47
1:C:217:MET:HG2	1:C:222:LEU:HD21	1.97	0.47
1:E:323:SER:OG	1:G:323:SER:HB2	2.15	0.47
2:G:501:FAD:O2'	4:G:502:COS:H32	2.12	0.47
1:A:74:MET:SD	1:A:112:THR:CG2	3.03	0.47
1:A:309:VAL:HG11	1:D:312:PHE:CE2	2.50	0.47
1:G:94:ASP:HB2	1:G:336:ASP:OD1	2.14	0.47
1:D:136:LYS:O	1:D:140:VAL:HB	2.15	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:95:TYR:CD2	1:G:335:LYS:HE3	2.50	0.47
1:H:384:ASP:O	1:H:387:ILE:HG22	2.15	0.47
1:G:222:LEU:HD13	1:G:243:PHE:CE1	2.50	0.46
1:B:282:ILE:O	1:B:285:THR:HG22	2.16	0.46
1:H:95:TYR:CD2	1:H:335:LYS:HE3	2.49	0.46
1:B:222:LEU:HD13	1:B:243:PHE:CE1	2.51	0.46
1:C:372:TYR:CZ	1:D:387:ILE:HB	2.50	0.46
1:B:187:THR:O	1:B:188:ASN:HB2	2.16	0.46
1:G:370:MET:HE1	1:G:375:GLU:HG2	1.97	0.46
1:C:276:ALA:O	1:C:280:LEU:HG	2.17	0.45
1:F:159:ASN:ND2	5:F:609:HOH:O	2.48	0.45
1:E:74:MET:SD	1:E:112:THR:HG21	2.55	0.45
1:D:48:PHE:CE1	1:D:52:GLU:HG3	2.50	0.45
1:F:80[B]:LEU:CD2	1:F:146:GLY:HA2	2.47	0.45
1:G:177:TRP:CD1	1:G:250:LYS:HA	2.52	0.45
1:E:187:THR:O	1:E:188:ASN:HB2	2.18	0.44
4:B:502:COS:H141	4:B:502:COS:HN8	1.83	0.44
1:D:384:ASP:O	1:D:387:ILE:HG22	2.18	0.44
1:E:372:TYR:CZ	1:F:387:ILE:HB	2.52	0.44
2:B:501:FAD:O2'	4:B:502:COS:H32	2.17	0.44
1:F:312:PHE:CZ	1:G:309:VAL:HG21	2.53	0.44
1:C:153:ALA:HA	1:C:186:ILE:HD12	1.99	0.43
1:D:124:LEU:HD22	1:D:140:VAL:HG13	1.98	0.43
1:D:187:THR:O	1:D:188:ASN:HB2	2.19	0.43
1:A:410:TYR:CG	1:C:291:VAL:HG11	2.54	0.43
1:C:107:ARG:HG3	1:C:285:THR:HB	1.99	0.43
1:D:82:MET:HE2	1:D:93:LEU:HD12	2.00	0.43
1:H:34:LEU:HD21	1:H:329:TRP:CH2	2.53	0.43
1:H:34:LEU:HD21	1:H:329:TRP:CZ3	2.53	0.43
1:H:176:SER:O	1:H:250:LYS:NZ	2.52	0.43
1:B:84:VAL:HB	1:B:90:GLY:HA3	2.01	0.43
1:C:231:LEU:HD11	1:C:383:ARG:HG2	2.01	0.43
1:F:107:ARG:HG3	1:F:285:THR:HB	2.01	0.43
1:B:138:ALA:HB3	1:B:139:TRP:CD1	2.54	0.42
1:H:370:MET:HE2	1:H:376:MET:CG	2.49	0.42
1:A:42:LEU:HD21	1:A:46:ARG:HH21	1.85	0.42
1:C:309:VAL:CG2	2:D:501:FAD:H2A	2.47	0.42
1:D:262:LYS:CG	1:D:266:GLN:HE21	2.33	0.42
1:C:302:ALA:HB1	1:C:303:PRO:HD2	2.02	0.42
1:A:153:ALA:HB1	1:A:183:LYS:HG3	2.02	0.42
1:C:60:VAL:HG13	1:C:65:LEU:O	2.20	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:270:MET:SD	1:D:335:LYS:NZ	2.85	0.42
1:B:210:ILE:HG22	1:B:260:GLY:HA3	2.01	0.41
1:F:84:VAL:HG22	1:F:128:LEU:CD1	2.46	0.41
1:F:123:TYR:CG	1:F:150:GLY:HA3	2.55	0.41
1:G:42:LEU:HD12	1:G:100:ILE:HG23	2.01	0.41
1:G:107:ARG:HG3	1:G:285:THR:HB	2.01	0.41
1:B:185:TRP:O	2:B:501:FAD:C4X	2.69	0.41
1:C:41:LEU:HD22	1:C:97:ALA:HB1	2.01	0.41
1:G:387:ILE:HB	1:H:372:TYR:CZ	2.56	0.41
1:A:84:VAL:HG21	1:A:124:LEU:HD13	2.03	0.41
1:B:197:VAL:HG21	1:B:215:VAL:HG21	2.03	0.41
1:C:342:ILE:HG21	1:C:405:HIS:CE1	2.56	0.41
1:F:42:LEU:HD21	1:F:46:ARG:HH11	1.86	0.41
1:F:177:TRP:CD1	1:F:250:LYS:HA	2.56	0.41
1:F:327:LEU:HD11	1:H:323:SER:OG	2.21	0.41
1:C:177:TRP:CD1	1:C:250:LYS:HA	2.56	0.41
1:E:124:LEU:HD22	1:E:140:VAL:HG13	2.03	0.41
4:B:502:COS:O5A	4:B:502:COS:H133	2.21	0.41
1:D:82:MET:CE	1:D:93:LEU:HD12	2.51	0.41
1:B:186:ILE:HG13	1:B:241:LEU:HG	2.03	0.40
1:D:74:MET:SD	1:D:112:THR:CG2	3.09	0.40
1:H:267:THR:HA	1:H:270:MET:HE2	2.03	0.40
1:H:136:LYS:O	1:H:140:VAL:HB	2.21	0.40
1:F:84:VAL:HB	1:F:90:GLY:HA3	2.03	0.40
1:C:283:ALA:HB2	1:C:356:ALA:HA	2.04	0.40
1:C:34:LEU:HD21	1:C:100:ILE:HD11	2.03	0.40
1:E:136:LYS:O	1:E:140:VAL:HB	2.21	0.40
1:E:294:ALA:HB1	1:E:305:THR:HG23	2.03	0.40
1:E:393:GLY:HA2	5:E:688:HOH:O	2.21	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

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

There are no protein backbone outliers to report in this entry.

### 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	284/303 (94%)	282 (99%)	2 (1%)	84	84
1	B	274/303 (90%)	271 (99%)	3 (1%)	73	73
1	C	283/303 (93%)	278 (98%)	5 (2%)	59	55
1	D	277/303 (91%)	273 (99%)	4 (1%)	67	65
1	E	280/303 (92%)	277 (99%)	3 (1%)	73	73
1	F	277/303 (91%)	271 (98%)	6 (2%)	52	47
1	G	275/303 (91%)	273 (99%)	2 (1%)	84	84
1	H	272/303 (90%)	268 (98%)	4 (2%)	65	62
All	All	2222/2424 (92%)	2193 (99%)	29 (1%)	69	68

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	391	TYR
1	A	397	ILE
1	B	95	TYR
1	B	219	THR
1	B	391	TYR
1	C	95	TYR
1	C	201	THR
1	C	245	ASP
1	C	391	TYR
1	C	409	SER
1	D	95	TYR
1	D	201	THR
1	D	391	TYR
1	D	412	SER
1	E	95	TYR
1	E	176	SER
1	E	391	TYR
1	F	95	TYR
1	F	201	THR

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Mol	Chain	Res	Type
1	F	387	ILE
1	F	391	TYR
1	F	397	ILE
1	F	409	SER
1	G	201	THR
1	G	391	TYR
1	H	95	TYR
1	H	175	ASP
1	H	250	LYS
1	H	391	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	159	ASN
1	A	405	HIS
1	D	266	GLN
1	G	207	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](#)

25 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	EDO	F	505	-	3,3,3	0.63	0	2,2,2	0.09	0
2	FAD	E	501	-	53,58,58	1.45	9 (16%)	68,89,89	1.43	11 (16%)
2	FAD	G	501	-	53,58,58	1.21	5 (9%)	68,89,89	1.59	15 (22%)
4	COS	C	502	-	8,9,51	0.49	0	9,9,76	0.96	1 (11%)
2	FAD	C	501	-	53,58,58	1.37	6 (11%)	68,89,89	1.47	11 (16%)
2	FAD	F	501	-	53,58,58	1.20	7 (13%)	68,89,89	1.56	17 (25%)
3	EDO	E	503	-	3,3,3	0.52	0	2,2,2	0.43	0
3	EDO	F	504	-	3,3,3	0.38	0	2,2,2	0.70	0
3	EDO	E	504	-	3,3,3	0.56	0	2,2,2	0.24	0
3	EDO	A	502	-	3,3,3	0.44	0	2,2,2	0.24	0
4	COS	D	502	-	8,9,51	0.65	0	9,9,76	0.59	0
4	COS	F	502	-	8,9,51	0.44	0	9,9,76	0.67	0
3	EDO	D	503	-	3,3,3	0.66	0	2,2,2	0.13	0
2	FAD	D	501	-	53,58,58	1.08	2 (3%)	68,89,89	1.43	11 (16%)
3	EDO	F	503	-	3,3,3	0.62	0	2,2,2	0.12	0
2	FAD	B	501	-	53,58,58	1.29	3 (5%)	68,89,89	1.42	9 (13%)
3	EDO	H	503	-	3,3,3	0.55	0	2,2,2	0.19	0
3	EDO	E	502	-	3,3,3	0.62	0	2,2,2	0.14	0
4	COS	B	502	-	42,51,51	1.18	5 (11%)	54,76,76	1.38	9 (16%)
2	FAD	H	501	-	53,58,58	1.28	6 (11%)	68,89,89	1.47	11 (16%)
3	EDO	D	504	-	3,3,3	0.52	0	2,2,2	0.34	0
4	COS	G	502	-	42,51,51	1.31	5 (11%)	54,76,76	1.27	6 (11%)
3	EDO	B	503	-	3,3,3	0.56	0	2,2,2	0.10	0
3	EDO	H	502	-	3,3,3	0.57	0	2,2,2	0.15	0
2	FAD	A	501	-	53,58,58	1.14	2 (3%)	68,89,89	1.50	14 (20%)

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	EDO	F	505	-	-	1/1/1/1	-
2	FAD	E	501	-	-	5/30/50/50	0/6/6/6
2	FAD	G	501	-	-	2/30/50/50	0/6/6/6
4	COS	C	502	-	-	1/7/8/65	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	FAD	C	501	-	-	4/30/50/50	0/6/6/6
2	FAD	F	501	-	-	3/30/50/50	0/6/6/6
3	EDO	E	503	-	-	1/1/1/1	-
3	EDO	F	504	-	-	1/1/1/1	-
3	EDO	E	504	-	-	1/1/1/1	-
3	EDO	A	502	-	-	1/1/1/1	-
4	COS	D	502	-	-	2/7/8/65	-
4	COS	F	502	-	-	2/7/8/65	-
3	EDO	D	503	-	-	1/1/1/1	-
2	FAD	D	501	-	-	3/30/50/50	0/6/6/6
3	EDO	F	503	-	-	1/1/1/1	-
2	FAD	B	501	-	-	3/30/50/50	0/6/6/6
3	EDO	H	503	-	-	0/1/1/1	-
3	EDO	E	502	-	-	1/1/1/1	-
4	COS	B	502	-	-	18/44/65/65	0/3/3/3
2	FAD	H	501	-	-	3/30/50/50	0/6/6/6
3	EDO	D	504	-	-	1/1/1/1	-
4	COS	G	502	-	-	18/44/65/65	0/3/3/3
3	EDO	B	503	-	-	0/1/1/1	-
3	EDO	H	502	-	-	1/1/1/1	-
2	FAD	A	501	-	-	2/30/50/50	0/6/6/6

All (50) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	E	501	FAD	O4B-C1B	5.45	1.48	1.41
2	C	501	FAD	O4B-C1B	5.32	1.48	1.41
2	B	501	FAD	O4B-C1B	4.48	1.47	1.41
4	G	502	COS	O4B-C1B	4.09	1.46	1.41
4	G	502	COS	P3B-O7A	4.02	1.63	1.50
2	C	501	FAD	C10-N1	3.69	1.40	1.33
4	B	502	COS	P3B-O7A	3.60	1.62	1.50
4	G	502	COS	P1A-O1A	3.57	1.63	1.50
2	B	501	FAD	C10-N1	3.57	1.40	1.33
2	H	501	FAD	C10-N1	3.48	1.40	1.33
4	B	502	COS	P1A-O1A	3.28	1.62	1.50
2	C	501	FAD	C4X-N5	2.89	1.36	1.30
2	G	501	FAD	PA-O1A	2.88	1.61	1.50
2	E	501	FAD	C10-N1	2.84	1.39	1.33
2	H	501	FAD	PA-O1A	2.82	1.60	1.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	501	FAD	C10-N1	2.81	1.39	1.33
2	H	501	FAD	C4X-N5	2.77	1.36	1.30
2	H	501	FAD	O4B-C1B	2.75	1.44	1.41
2	E	501	FAD	PA-O1A	2.74	1.60	1.50
4	B	502	COS	O4B-C1B	2.61	1.44	1.41
2	F	501	FAD	C5'-C4'	2.60	1.55	1.51
2	D	501	FAD	C10-N1	2.52	1.38	1.33
2	H	501	FAD	C5'-C4'	2.47	1.55	1.51
2	B	501	FAD	C8M-C8	2.44	1.55	1.51
2	F	501	FAD	O4B-C1B	2.43	1.44	1.41
2	F	501	FAD	C10-N1	2.38	1.38	1.33
2	F	501	FAD	C1'-C2'	2.36	1.56	1.52
2	H	501	FAD	C7M-C7	2.36	1.55	1.51
2	G	501	FAD	C5'-C4'	2.33	1.55	1.51
2	E	501	FAD	C4X-N5	2.32	1.35	1.30
2	G	501	FAD	C4X-N5	2.32	1.35	1.30
2	C	501	FAD	P-O1P	2.29	1.59	1.50
2	E	501	FAD	C4'-C3'	2.29	1.57	1.53
2	F	501	FAD	C4X-N5	2.28	1.35	1.30
2	E	501	FAD	C2B-C1B	-2.24	1.50	1.53
2	A	501	FAD	C4X-N5	2.22	1.35	1.30
2	F	501	FAD	O5'-C5'	-2.21	1.36	1.44
2	E	501	FAD	C5X-N5	-2.20	1.35	1.39
2	E	501	FAD	O5'-C5'	-2.19	1.36	1.44
2	C	501	FAD	O3'-C3'	2.18	1.48	1.43
2	G	501	FAD	P-O1P	2.18	1.58	1.50
4	G	502	COS	P3B-O8A	2.16	1.63	1.54
2	D	501	FAD	P-O1P	2.15	1.58	1.50
2	C	501	FAD	PA-O1A	2.14	1.58	1.50
2	F	501	FAD	PA-O1A	2.14	1.58	1.50
4	B	502	COS	C5B-C4B	2.09	1.58	1.51
2	E	501	FAD	P-O2P	-2.08	1.45	1.55
2	G	501	FAD	C5A-N7A	-2.07	1.32	1.39
4	G	502	COS	P3B-O3B	2.05	1.63	1.59
4	B	502	COS	P3B-O8A	2.03	1.62	1.54

All (115) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	G	501	FAD	N3A-C2A-N1A	-5.12	120.68	128.68
2	F	501	FAD	N3A-C2A-N1A	-4.96	120.92	128.68
2	A	501	FAD	N3A-C2A-N1A	-4.83	121.13	128.68

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	501	FAD	N3A-C2A-N1A	-4.61	121.47	128.68
2	D	501	FAD	N3A-C2A-N1A	-4.54	121.58	128.68
4	B	502	COS	N3A-C2A-N1A	-4.53	121.59	128.68
2	B	501	FAD	N3A-C2A-N1A	-4.45	121.73	128.68
4	G	502	COS	N3A-C2A-N1A	-4.34	121.89	128.68
2	H	501	FAD	N3A-C2A-N1A	-4.33	121.92	128.68
2	E	501	FAD	N3A-C2A-N1A	-4.25	122.03	128.68
2	C	501	FAD	C4-C4X-N5	4.11	124.08	118.23
2	H	501	FAD	P-O3P-PA	-3.91	119.42	132.83
2	B	501	FAD	P-O3P-PA	-3.80	119.78	132.83
2	E	501	FAD	C4-C4X-N5	3.60	123.36	118.23
2	F	501	FAD	C9A-N10-C10	-3.36	115.52	120.77
4	B	502	COS	C7P-C6P-C5P	-3.32	106.82	112.36
2	G	501	FAD	C4-N3-C2	-3.32	119.51	125.64
2	E	501	FAD	C9A-C5X-N5	-3.29	118.85	122.43
2	F	501	FAD	C10-C4X-N5	-3.27	117.92	124.86
2	C	501	FAD	C10-C4X-N5	-3.26	117.94	124.86
2	D	501	FAD	C9A-N10-C10	-3.26	115.69	120.77
4	G	502	COS	C7P-C6P-C5P	-3.15	107.11	112.36
2	F	501	FAD	C4-C4X-N5	3.11	122.66	118.23
2	D	501	FAD	C10-C4X-N5	-3.08	118.33	124.86
2	A	501	FAD	C9A-N10-C10	-3.05	116.02	120.77
2	A	501	FAD	C4-N3-C2	-3.05	120.01	125.64
2	B	501	FAD	C10-C4X-N5	-3.01	118.47	124.86
2	A	501	FAD	O2'-C2'-C3'	3.00	116.39	109.10
2	G	501	FAD	O4-C4-C4X	-2.98	118.69	126.60
2	B	501	FAD	C4-C4X-N5	2.96	122.45	118.23
2	E	501	FAD	C10-C4X-N5	-2.96	118.58	124.86
2	F	501	FAD	C4-N3-C2	-2.94	120.20	125.64
2	E	501	FAD	C4X-C4-N3	2.91	120.58	113.19
2	D	501	FAD	P-O3P-PA	-2.90	122.87	132.83
2	G	501	FAD	C10-C4X-N5	-2.89	118.73	124.86
2	A	501	FAD	P-O3P-PA	-2.86	123.01	132.83
2	F	501	FAD	C4X-C10-N10	2.85	120.65	116.48
2	H	501	FAD	C10-C4X-N5	-2.84	118.84	124.86
2	G	501	FAD	P-O3P-PA	-2.83	123.10	132.83
2	C	501	FAD	C9A-C5X-N5	-2.83	119.35	122.43
4	B	502	COS	P2A-O3A-P1A	-2.79	123.26	132.83
2	A	501	FAD	C10-C4X-N5	-2.79	118.94	124.86
2	H	501	FAD	C9A-C5X-N5	-2.78	119.41	122.43
2	G	501	FAD	O2-C2-N1	-2.70	117.35	121.83
2	G	501	FAD	C4A-C5A-N7A	-2.70	106.59	109.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	501	FAD	C4X-C4-N3	2.66	119.94	113.19
2	D	501	FAD	C4-C4X-N5	2.66	122.01	118.23
2	E	501	FAD	C9A-N10-C10	-2.65	116.63	120.77
2	F	501	FAD	O2'-C2'-C1'	2.65	116.21	109.80
2	A	501	FAD	C4X-C4-N3	2.64	119.89	113.19
2	F	501	FAD	O2-C2-N1	-2.63	117.47	121.83
2	G	501	FAD	C4-C4X-N5	2.62	121.96	118.23
2	F	501	FAD	C1B-N9A-C4A	-2.62	122.04	126.64
2	G	501	FAD	C4X-C4-N3	2.62	119.84	113.19
2	C	501	FAD	C4A-C5A-N7A	-2.60	106.69	109.40
2	H	501	FAD	C4-N3-C2	-2.60	120.84	125.64
2	A	501	FAD	C4X-C10-N10	2.58	120.25	116.48
2	A	501	FAD	C4-C4X-N5	2.56	121.87	118.23
2	A	501	FAD	C5B-C4B-C3B	-2.53	105.68	115.18
2	D	501	FAD	C4X-C10-N10	2.53	120.18	116.48
2	F	501	FAD	C4X-C4-N3	2.53	119.61	113.19
2	E	501	FAD	C4-N3-C2	-2.52	120.98	125.64
2	H	501	FAD	C4X-C4-N3	2.51	119.56	113.19
4	B	502	COS	CDP-CBP-CCP	2.50	112.32	108.23
2	C	501	FAD	C9A-N10-C10	-2.50	116.88	120.77
2	G	501	FAD	C9A-C5X-N5	-2.49	119.72	122.43
2	H	501	FAD	C6-C5X-N5	2.48	122.85	118.51
2	G	501	FAD	C9A-N10-C10	-2.48	116.90	120.77
2	A	501	FAD	O4'-C4'-C5'	-2.45	104.42	109.92
2	B	501	FAD	C4X-C4-N3	2.44	119.38	113.19
2	H	501	FAD	C9A-N10-C10	-2.43	116.98	120.77
4	G	502	COS	O4B-C1B-C2B	-2.43	103.38	106.93
4	C	502	COS	C2P-C3P-N4P	-2.42	107.33	112.42
2	G	501	FAD	O3'-C3'-C4'	2.40	114.61	108.81
4	G	502	COS	P2A-O3A-P1A	-2.39	124.61	132.83
2	H	501	FAD	C4A-C5A-N7A	-2.38	106.92	109.40
2	F	501	FAD	C4A-C5A-N7A	-2.38	106.92	109.40
2	B	501	FAD	C4-N3-C2	-2.37	121.27	125.64
2	H	501	FAD	C4-C4X-N5	2.36	121.59	118.23
2	F	501	FAD	C2A-N1A-C6A	2.35	122.78	118.75
2	G	501	FAD	C4X-C10-N10	2.35	119.91	116.48
2	G	501	FAD	C10-N1-C2	2.34	121.59	116.90
2	D	501	FAD	C4-N3-C2	-2.34	121.32	125.64
2	G	501	FAD	O2-C2-N3	2.33	123.18	118.65
2	H	501	FAD	O4B-C1B-C2B	-2.31	103.55	106.93
2	F	501	FAD	C9A-C5X-N5	-2.29	119.95	122.43
2	E	501	FAD	O4-C4-N3	-2.26	115.78	120.12

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	501	FAD	C4X-C4-N3	2.26	118.93	113.19
2	F	501	FAD	P-O3P-PA	-2.24	125.12	132.83
2	D	501	FAD	C10-N1-C2	2.24	121.39	116.90
4	B	502	COS	O4B-C1B-C2B	-2.23	103.66	106.93
4	B	502	COS	C6P-C7P-N8P	-2.22	107.41	111.90
2	B	501	FAD	C1B-N9A-C4A	-2.21	122.76	126.64
2	E	501	FAD	C10-N1-C2	2.20	121.30	116.90
4	G	502	COS	C6P-C7P-N8P	-2.19	107.48	111.90
2	E	501	FAD	O4B-C1B-C2B	-2.19	103.73	106.93
2	D	501	FAD	O2'-C2'-C3'	2.19	114.41	109.10
4	B	502	COS	CAP-C9P-N8P	-2.16	112.28	116.58
2	B	501	FAD	O5B-PA-O1A	-2.15	100.66	109.07
2	F	501	FAD	O2-C2-N3	2.13	122.80	118.65
2	C	501	FAD	C4-N3-C2	-2.12	121.72	125.64
4	G	502	COS	C5B-C4B-C3B	-2.12	107.39	114.40
2	C	501	FAD	C4X-C10-N10	2.11	119.57	116.48
2	A	501	FAD	O2-C2-N1	-2.11	118.33	121.83
2	C	501	FAD	C5B-C4B-C3B	-2.11	107.28	115.18
2	F	501	FAD	C10-N1-C2	2.09	121.07	116.90
2	A	501	FAD	C4X-C10-N1	-2.08	119.89	124.73
2	B	501	FAD	C4A-C5A-N7A	-2.08	107.23	109.40
2	D	501	FAD	O2-C2-N3	2.07	122.66	118.65
4	B	502	COS	CEP-CBP-CAP	2.07	112.40	108.82
2	F	501	FAD	C4X-C10-N1	-2.06	119.95	124.73
2	E	501	FAD	C6-C5X-N5	2.05	122.10	118.51
2	C	501	FAD	P-O3P-PA	-2.03	125.85	132.83
2	A	501	FAD	C1B-N9A-C4A	-2.02	123.09	126.64
4	B	502	COS	C2P-C3P-N4P	-2.01	108.18	112.42

There are no chirality outliers.

All (76) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	501	FAD	C2'-C1'-N10-C10
2	B	501	FAD	C2'-C1'-N10-C10
2	C	501	FAD	C2'-C1'-N10-C10
2	C	501	FAD	C1'-C2'-C3'-C4'
2	D	501	FAD	C2'-C1'-N10-C10
2	E	501	FAD	C2'-C1'-N10-C10
2	F	501	FAD	C2'-C1'-N10-C10
2	G	501	FAD	C2'-C1'-N10-C10
2	H	501	FAD	C2'-C1'-N10-C10

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Mol	Chain	Res	Type	Atoms
4	B	502	COS	CEP-CBP-CCP-O6A
4	B	502	COS	CAP-CBP-CCP-O6A
4	B	502	COS	OAP-CAP-CBP-CCP
4	B	502	COS	C9P-CAP-CBP-CCP
4	B	502	COS	OAP-CAP-CBP-CDP
4	B	502	COS	C9P-CAP-CBP-CDP
4	B	502	COS	OAP-CAP-CBP-CEP
4	B	502	COS	C9P-CAP-CBP-CEP
4	B	502	COS	O9P-C9P-CAP-CBP
4	C	502	COS	C5P-C6P-C7P-N8P
4	D	502	COS	C5P-C6P-C7P-N8P
4	D	502	COS	S1P-C2P-C3P-N4P
4	F	502	COS	S1P-C2P-C3P-N4P
4	G	502	COS	CCP-O6A-P2A-O3A
4	G	502	COS	CAP-CBP-CCP-O6A
4	G	502	COS	OAP-CAP-CBP-CCP
4	G	502	COS	C9P-CAP-CBP-CCP
4	G	502	COS	OAP-CAP-CBP-CDP
4	G	502	COS	C9P-CAP-CBP-CDP
4	G	502	COS	OAP-CAP-CBP-CEP
4	G	502	COS	C9P-CAP-CBP-CEP
4	G	502	COS	O9P-C9P-CAP-CBP
4	G	502	COS	N8P-C9P-CAP-CBP
4	B	502	COS	C3B-C4B-C5B-O5B
4	B	502	COS	O4B-C4B-C5B-O5B
3	E	503	EDO	O1-C1-C2-O2
4	B	502	COS	CDP-CBP-CCP-O6A
4	G	502	COS	CDP-CBP-CCP-O6A
4	G	502	COS	CEP-CBP-CCP-O6A
2	C	501	FAD	O2'-C2'-C3'-C4'
2	B	501	FAD	O2'-C2'-C3'-C4'
2	F	501	FAD	O2'-C2'-C3'-C4'
2	G	501	FAD	O2'-C2'-C3'-C4'
2	A	501	FAD	O2'-C2'-C3'-C4'
2	E	501	FAD	O2'-C2'-C3'-C4'
4	B	502	COS	N8P-C9P-CAP-CBP
3	A	502	EDO	O1-C1-C2-O2
3	D	504	EDO	O1-C1-C2-O2
4	B	502	COS	N8P-C9P-CAP-OAP
4	G	502	COS	N8P-C9P-CAP-OAP
4	G	502	COS	C5P-C6P-C7P-N8P
2	D	501	FAD	O2'-C2'-C3'-C4'

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Mol	Chain	Res	Type	Atoms
4	G	502	COS	P1A-O3A-P2A-O4A
4	B	502	COS	CBP-CCP-O6A-P2A
4	B	502	COS	C4B-C5B-O5B-P1A
2	E	501	FAD	C5B-O5B-PA-O1A
2	E	501	FAD	C5B-O5B-PA-O2A
3	E	504	EDO	O1-C1-C2-O2
3	D	503	EDO	O1-C1-C2-O2
3	H	502	EDO	O1-C1-C2-O2
4	B	502	COS	P2A-O3A-P1A-O2A
2	H	501	FAD	O2'-C2'-C3'-O3'
4	F	502	COS	C5P-C6P-C7P-N8P
3	E	502	EDO	O1-C1-C2-O2
2	C	501	FAD	O2'-C2'-C3'-O3'
2	D	501	FAD	O2'-C2'-C3'-O3'
2	E	501	FAD	O2'-C2'-C3'-O3'
2	F	501	FAD	O2'-C2'-C3'-O3'
3	F	503	EDO	O1-C1-C2-O2
3	F	504	EDO	O1-C1-C2-O2
4	G	502	COS	P1A-O3A-P2A-O5A
2	B	501	FAD	O2'-C2'-C3'-O3'
2	H	501	FAD	O3'-C3'-C4'-O4'
4	B	502	COS	C5B-O5B-P1A-O1A
4	G	502	COS	CCP-O6A-P2A-O4A
4	G	502	COS	CCP-O6A-P2A-O5A
3	F	505	EDO	O1-C1-C2-O2

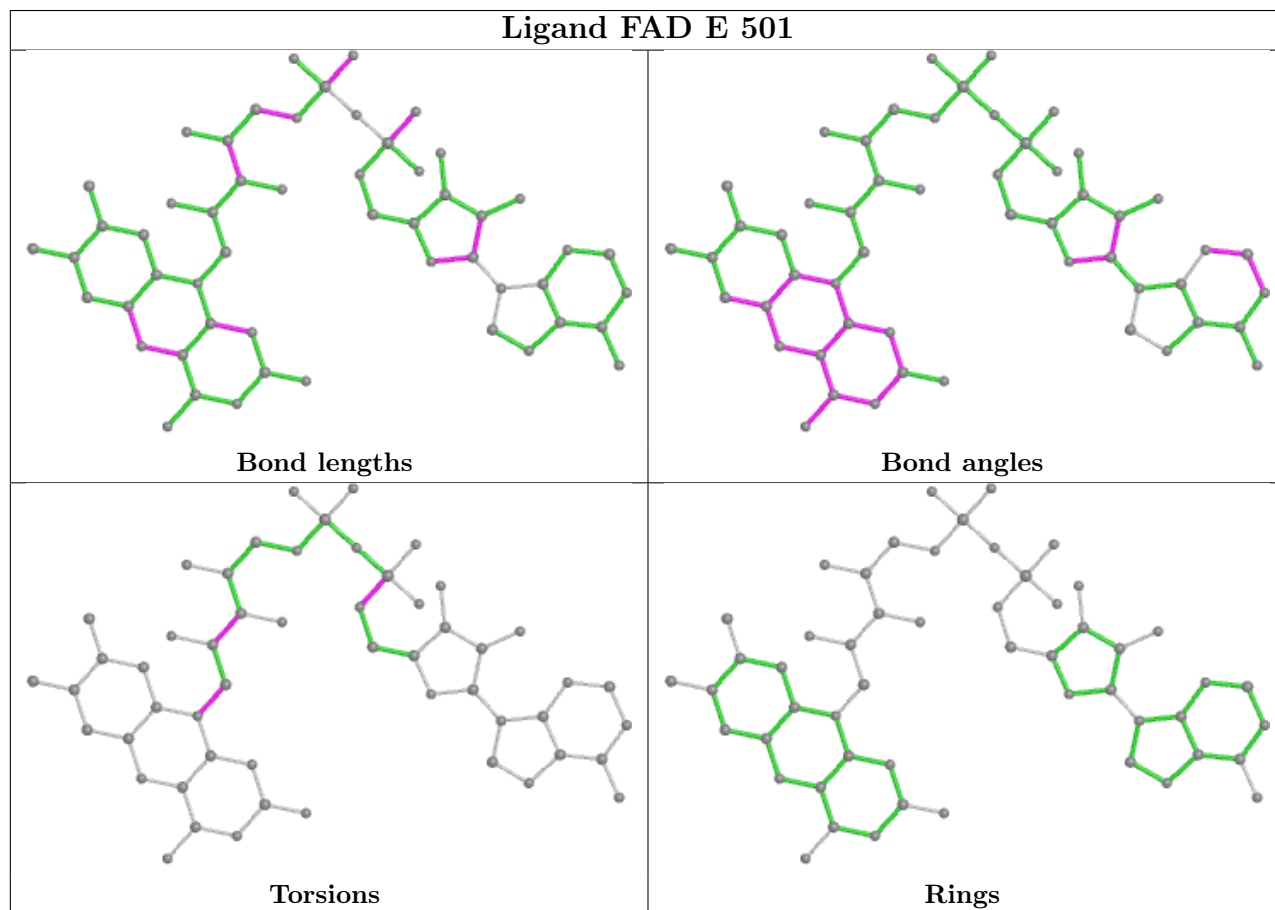
There are no ring outliers.

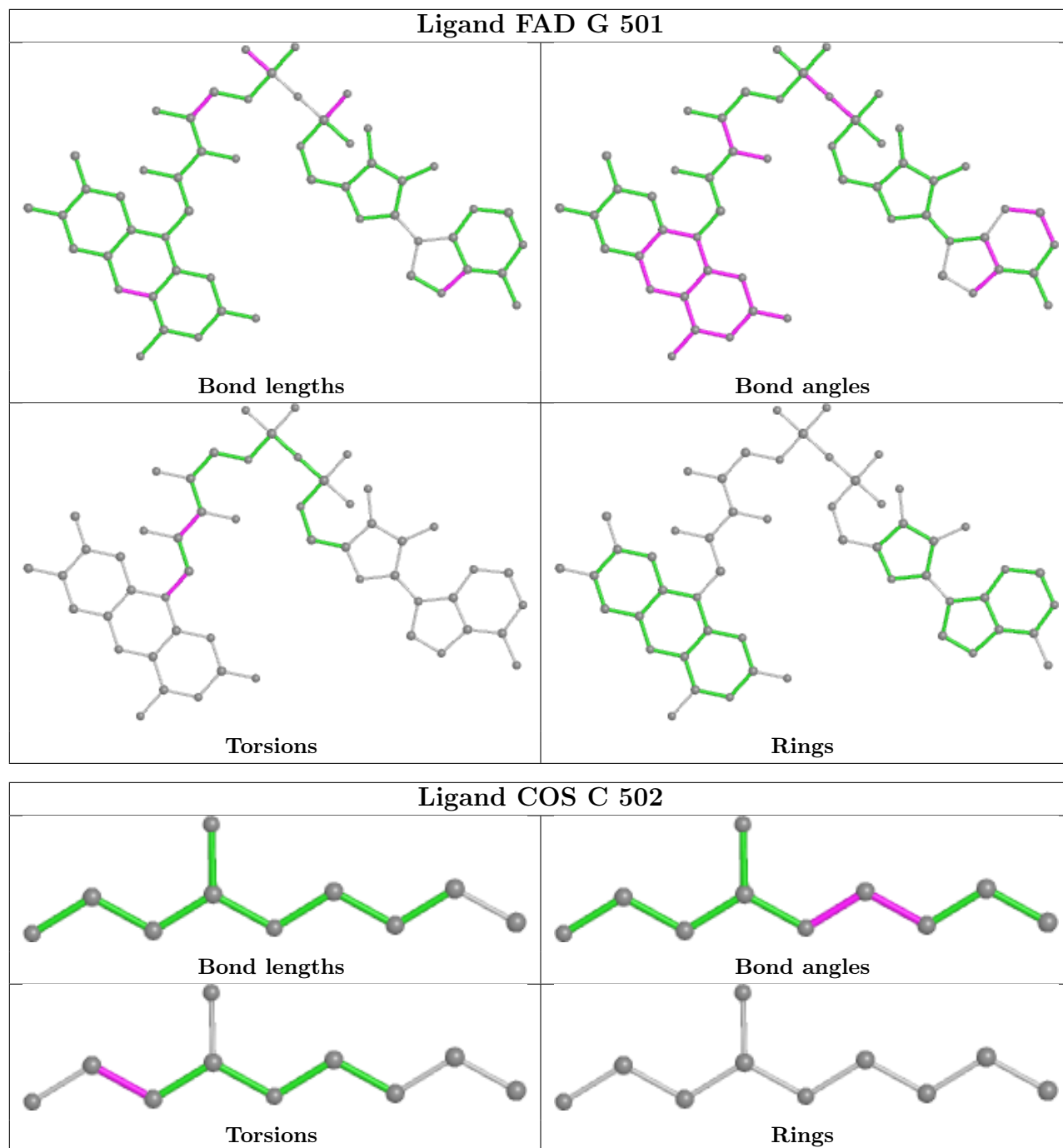
8 monomers are involved in 19 short contacts:

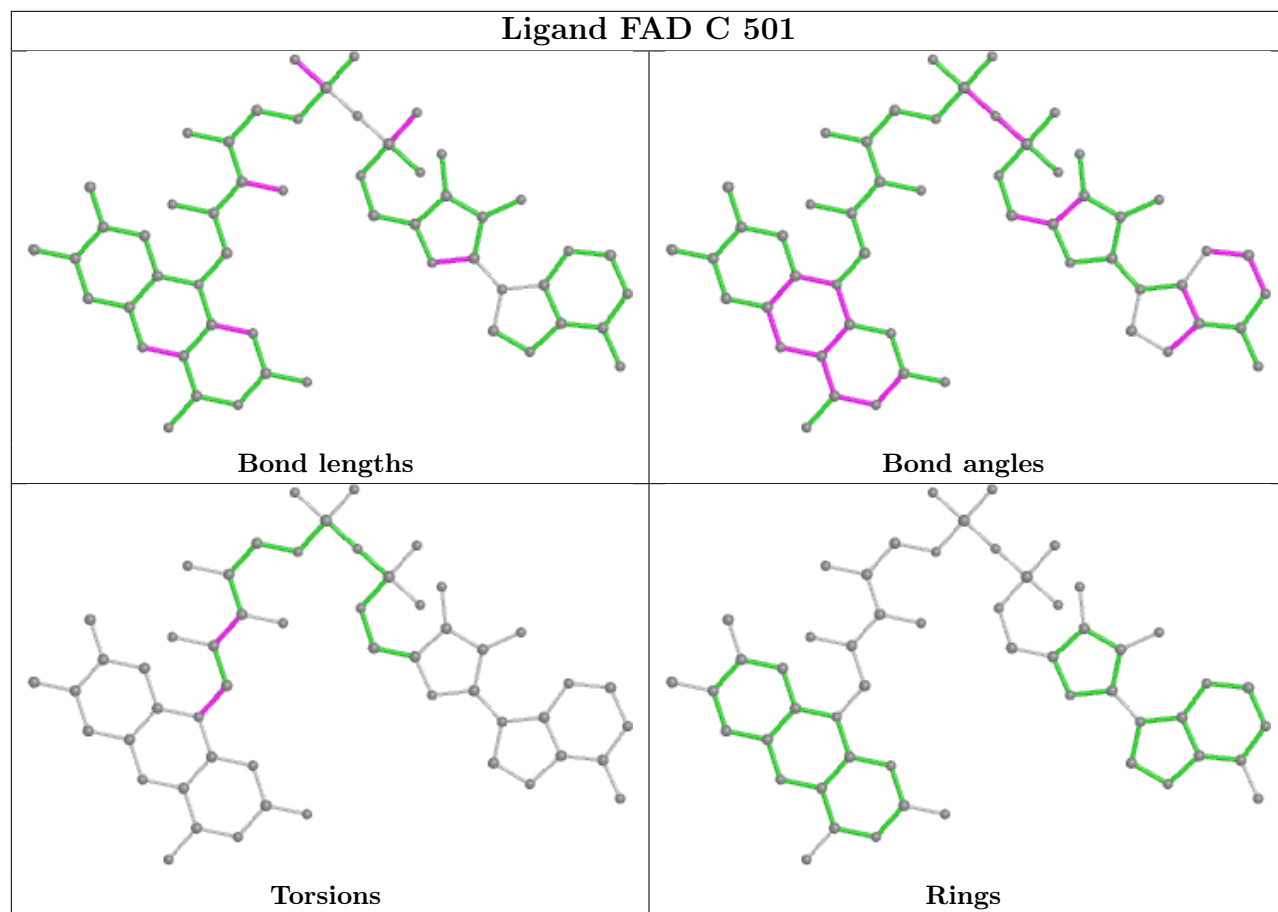
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	G	501	FAD	1	0
2	F	501	FAD	2	0
3	E	504	EDO	1	0
4	F	502	COS	1	0
2	D	501	FAD	2	0
2	B	501	FAD	2	0
4	B	502	COS	6	0
4	G	502	COS	6	0

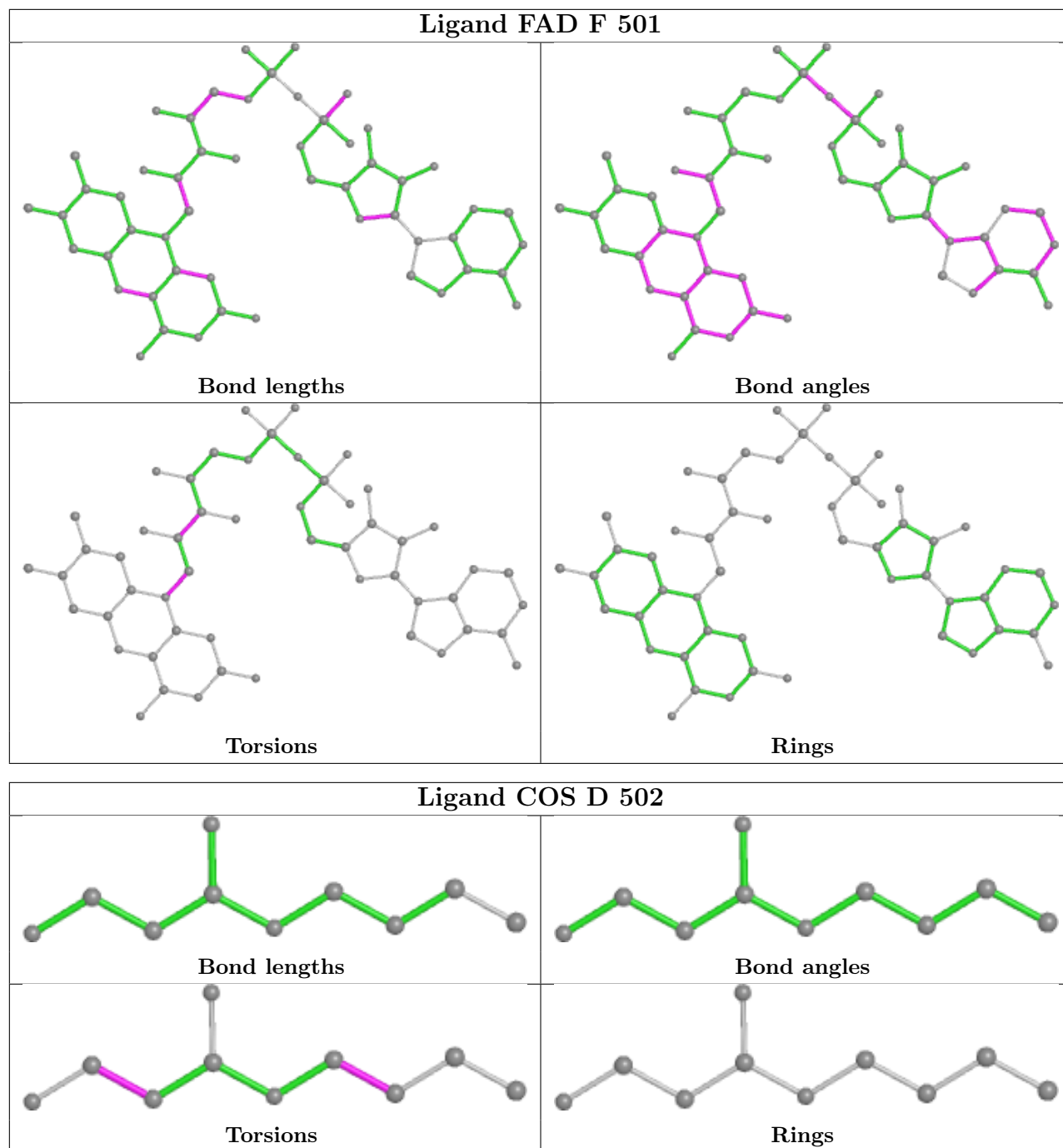
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will

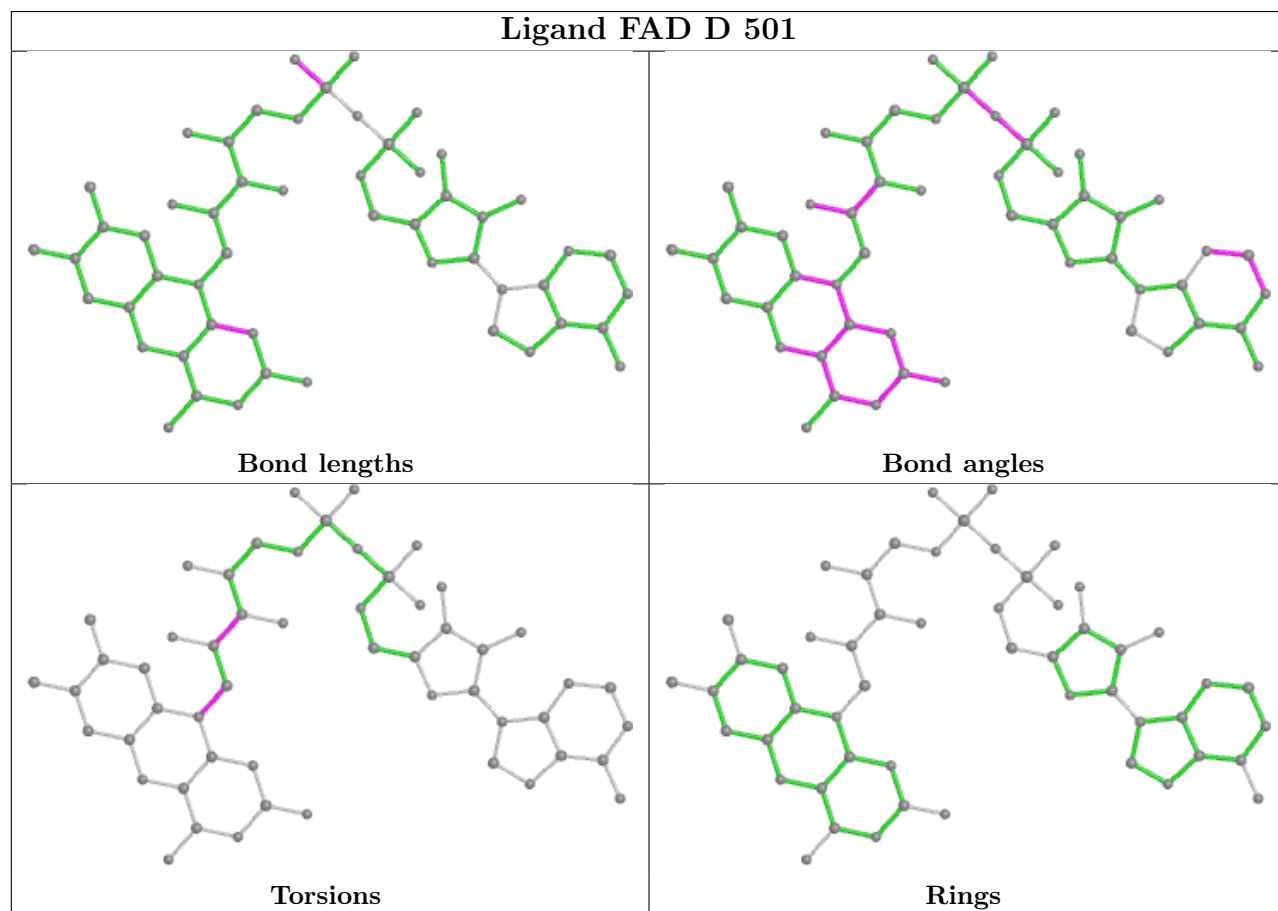
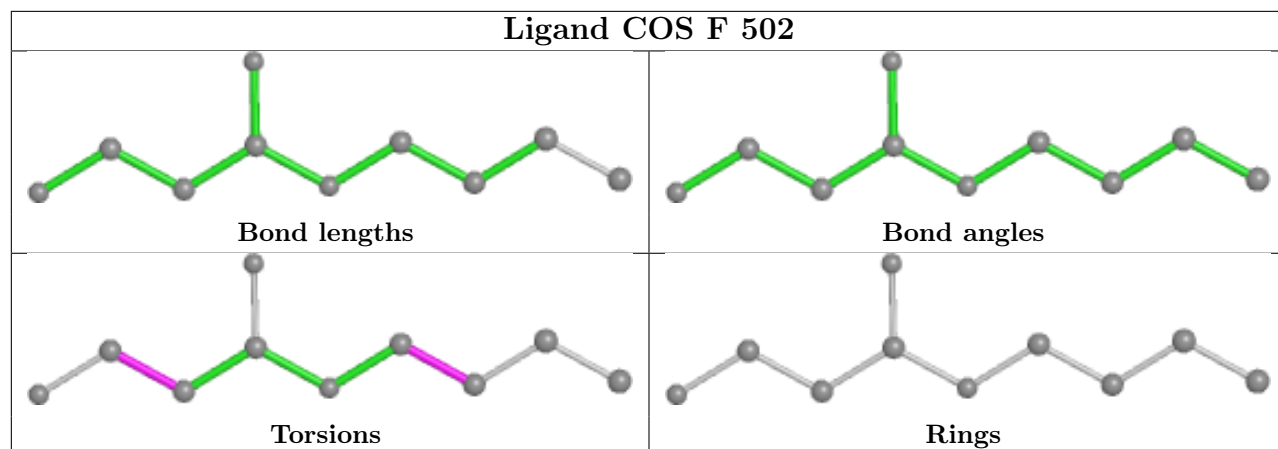
also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted 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.



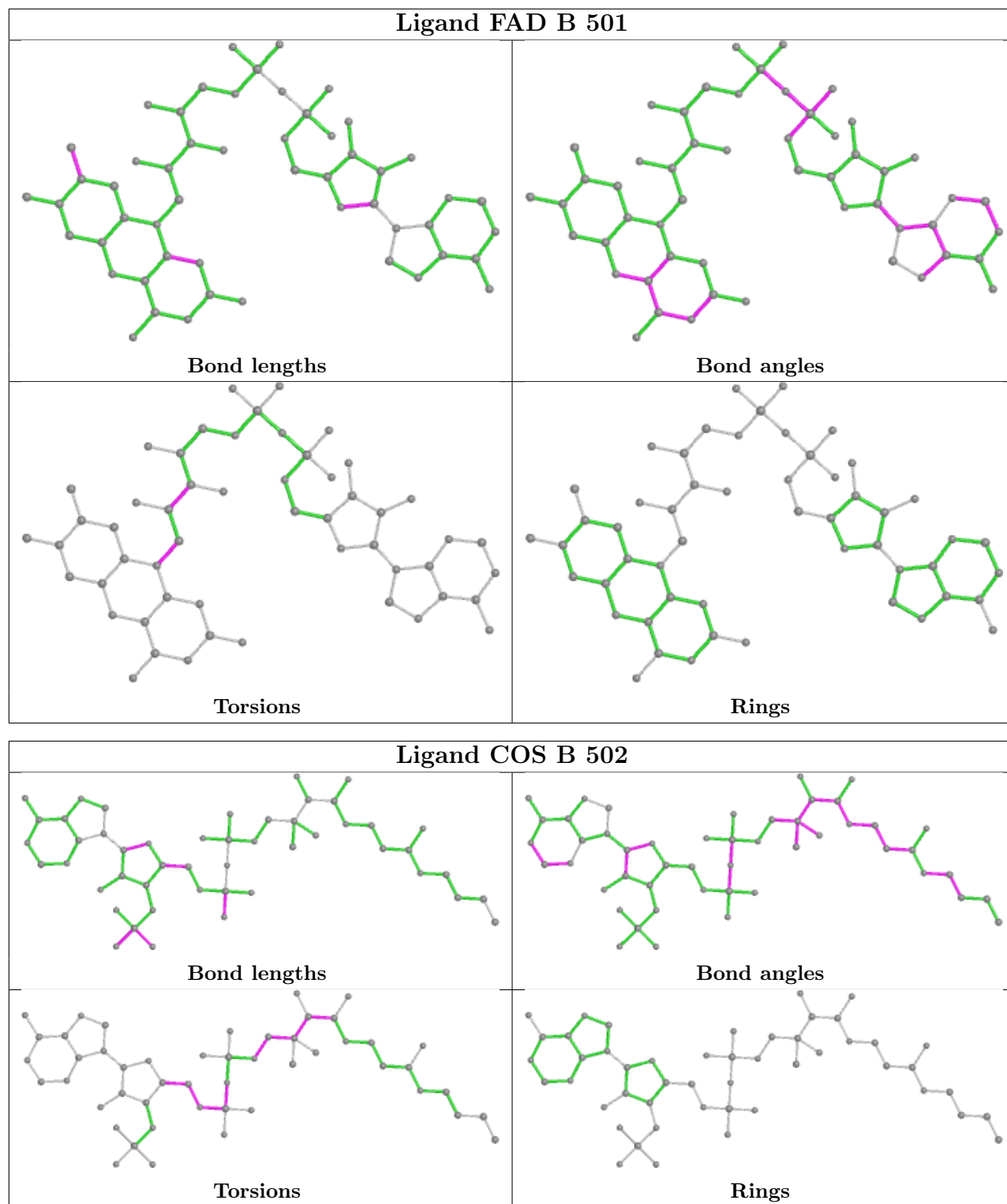


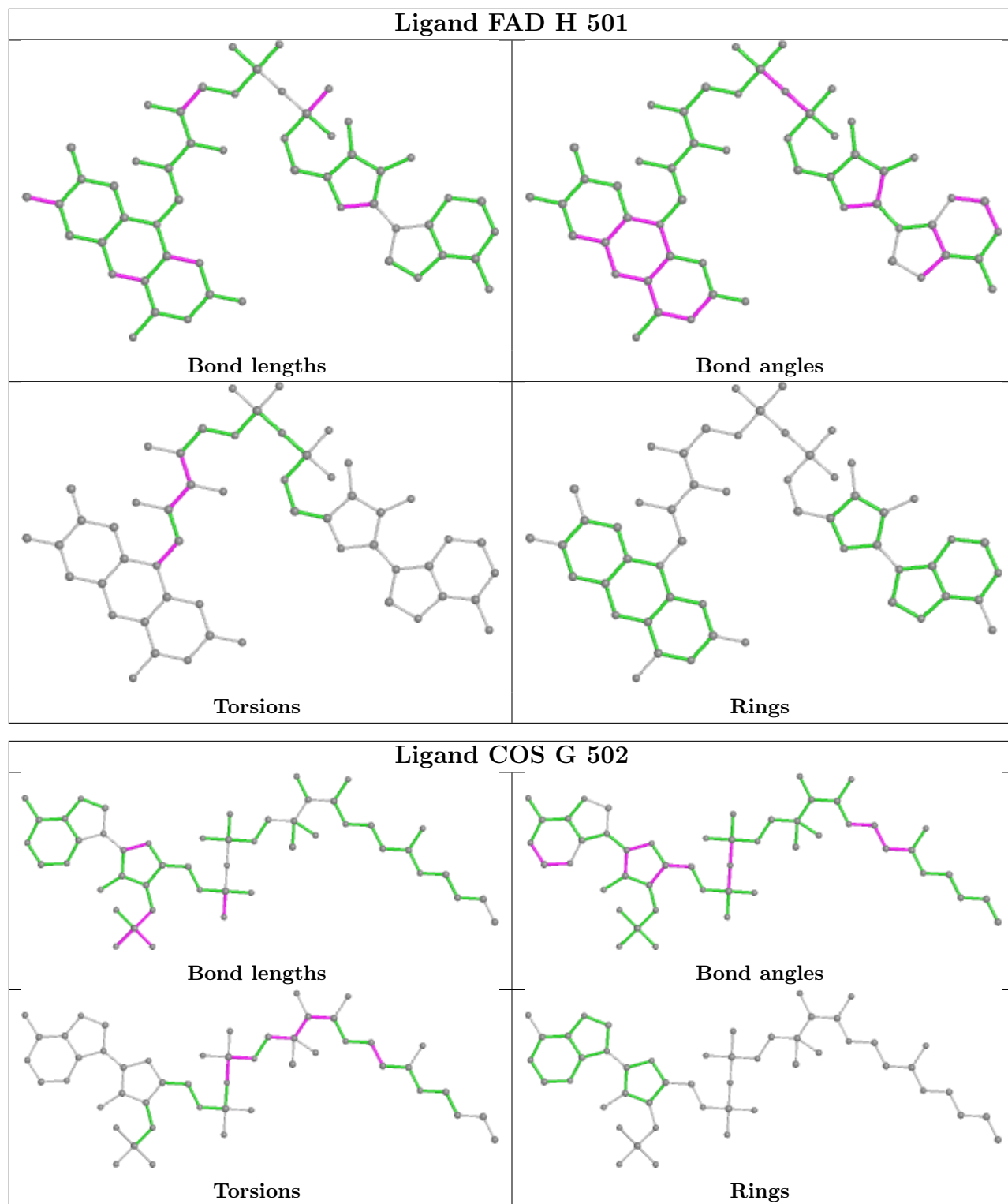


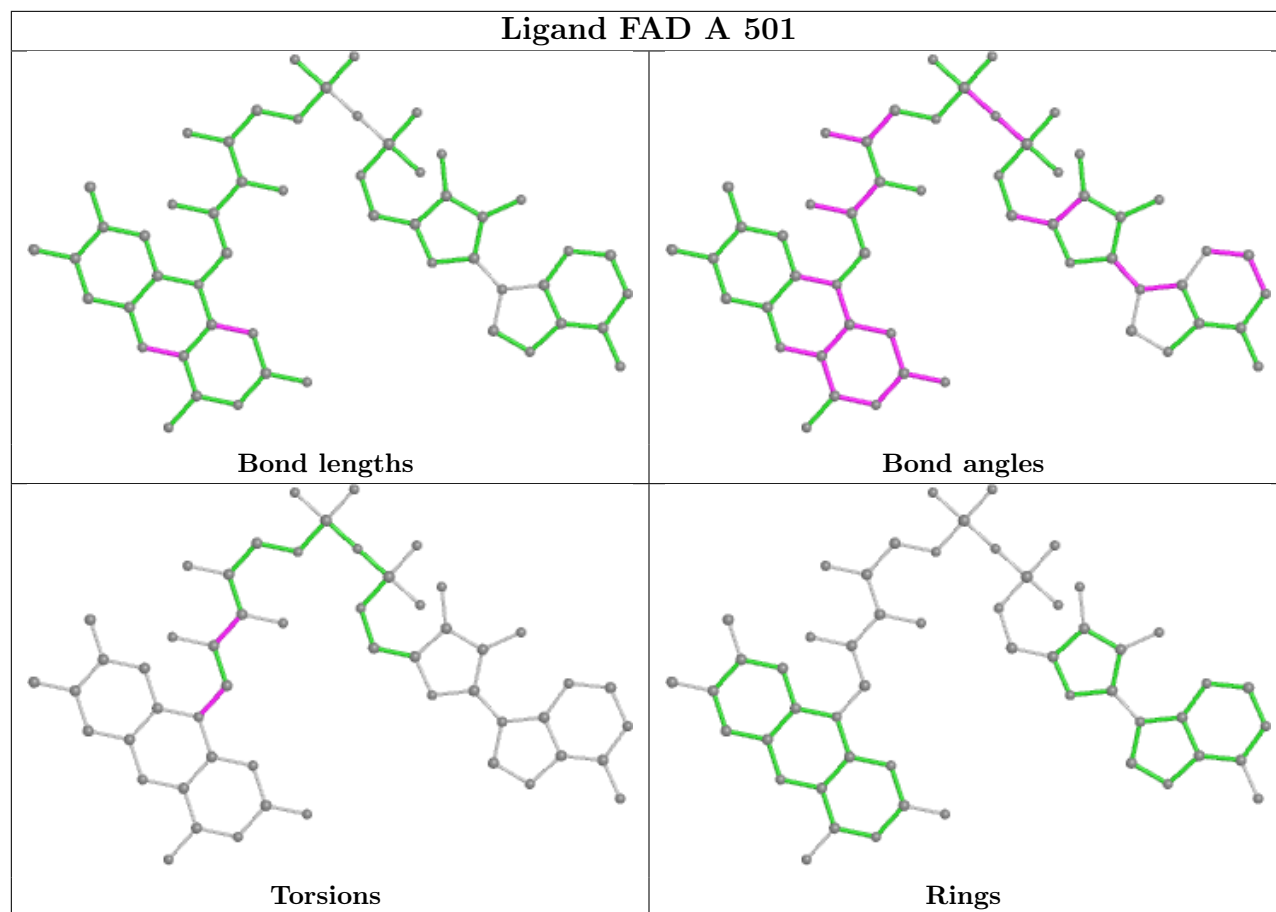












## 5.7 Other polymers [i](#)

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	379/391 (96%)	-0.08	6 (1%) 72 74	18, 27, 42, 53	0
1	B	371/391 (94%)	-0.03	14 (3%) 40 43	20, 29, 42, 59	0
1	C	379/391 (96%)	0.03	13 (3%) 45 48	19, 28, 44, 72	1 (0%)
1	D	375/391 (95%)	-0.05	11 (2%) 51 54	20, 29, 43, 58	0
1	E	380/391 (97%)	-0.09	4 (1%) 80 82	17, 28, 42, 64	0
1	F	374/391 (95%)	-0.05	7 (1%) 66 69	18, 27, 43, 57	0
1	G	375/391 (95%)	0.04	8 (2%) 63 66	18, 29, 43, 66	0
1	H	374/391 (95%)	0.03	11 (2%) 51 54	18, 29, 42, 60	0
All	All	3007/3128 (96%)	-0.02	74 (2%) 57 60	17, 28, 43, 72	1 (0%)

All (74) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	413	ALA	6.2
1	D	413	ALA	6.1
1	F	413	ALA	5.2
1	E	34	LEU	5.2
1	C	417	TYR	4.7
1	A	35	PRO	4.6
1	E	412	SER	4.5
1	C	35	PRO	4.3
1	D	412	SER	4.3
1	G	34	LEU	4.2
1	B	175	ASP	4.2
1	D	35	PRO	4.0
1	H	35	PRO	3.8
1	H	413	ALA	3.8
1	D	36	GLU	3.8
1	F	412	SER	3.7

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	E	35	PRO	3.6
1	H	34	LEU	3.4
1	D	40	MET	3.4
1	F	36	GLU	3.3
1	H	175	ASP	3.3
1	H	37	THR	3.2
1	C	416	LEU	3.2
1	G	37	THR	3.0
1	B	35	PRO	3.0
1	C	36	GLU	3.0
1	G	35	PRO	3.0
1	G	206	GLN	3.0
1	C	202	ASP	3.0
1	B	172	ALA	2.9
1	H	208	LYS	2.9
1	A	412	SER	2.9
1	D	202	ASP	2.9
1	C	165	ALA	2.8
1	F	202	ASP	2.8
1	A	36	GLU	2.8
1	D	34	LEU	2.7
1	A	37	THR	2.7
1	F	34	LEU	2.7
1	C	418	PHE	2.7
1	D	37	THR	2.6
1	G	201	THR	2.5
1	H	165	ALA	2.5
1	C	410	TYR	2.5
1	B	40	MET	2.5
1	B	87	GLU	2.4
1	F	165	ALA	2.4
1	H	201	THR	2.4
1	C	37	THR	2.4
1	B	174	GLY	2.4
1	B	34	LEU	2.3
1	B	86	GLU	2.3
1	B	409	SER	2.3
1	B	36	GLU	2.3
1	G	174	GLY	2.3
1	H	134	GLU	2.3
1	C	415	ASN	2.3
1	B	37	THR	2.2

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Mol	Chain	Res	Type	RSRZ
1	D	172	ALA	2.2
1	D	208	LYS	2.2
1	A	203	ARG	2.1
1	B	245	ASP	2.1
1	F	37	THR	2.1
1	A	34	LEU	2.1
1	C	34	LEU	2.1
1	G	202	ASP	2.1
1	H	258	GLY	2.1
1	D	173	GLU	2.1
1	B	166	ALA	2.1
1	G	409	SER	2.0
1	C	134	GLU	2.0
1	H	138	ALA	2.0
1	B	408	ARG	2.0
1	C	408	ARG	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	COS	B	502	49/49	0.66	0.38	56,114,131,134	0
4	COS	D	502	10/49	0.70	0.28	44,74,102,105	0
4	COS	C	502	10/49	0.82	0.21	51,65,78,109	0
4	COS	F	502	10/49	0.82	0.19	41,69,75,97	0
4	COS	G	502	49/49	0.82	0.28	26,70,88,92	0
3	EDO	B	503	4/4	0.86	0.14	47,51,54,57	0
3	EDO	D	503	4/4	0.87	0.12	44,44,50,53	0

*Continued on next page...*

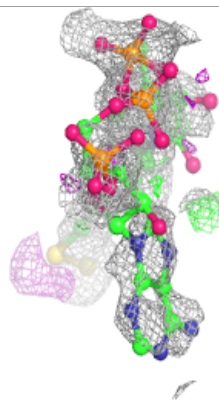
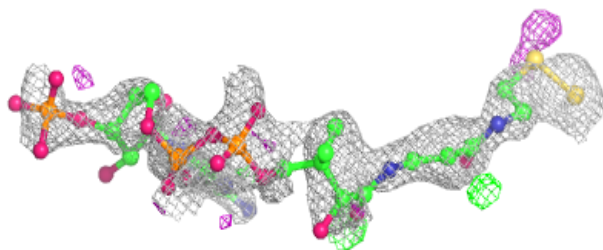
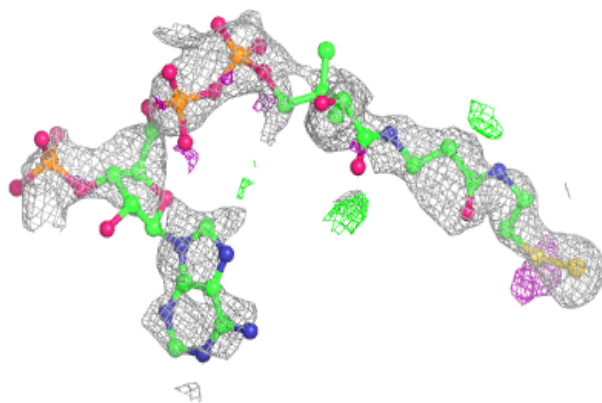
*Continued from previous page...*

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
3	EDO	F	505	4/4	0.88	0.26	35,37,40,47	0
3	EDO	E	502	4/4	0.89	0.19	37,41,45,49	0
3	EDO	D	504	4/4	0.91	0.16	29,34,39,57	0
3	EDO	F	503	4/4	0.91	0.14	35,36,36,36	0
3	EDO	H	502	4/4	0.92	0.22	32,40,47,48	0
3	EDO	F	504	4/4	0.92	0.21	34,36,43,50	0
3	EDO	E	504	4/4	0.93	0.33	31,31,34,36	0
3	EDO	A	502	4/4	0.93	0.11	29,48,52,58	0
3	EDO	H	503	4/4	0.94	0.14	32,39,44,45	0
3	EDO	E	503	4/4	0.96	0.13	21,28,38,43	0
2	FAD	D	501	53/53	0.97	0.09	17,26,38,46	0
2	FAD	E	501	53/53	0.97	0.09	14,22,30,37	0
2	FAD	G	501	53/53	0.97	0.10	15,21,30,35	0
2	FAD	H	501	53/53	0.97	0.09	17,25,31,31	0
2	FAD	A	501	53/53	0.97	0.09	14,22,29,33	0
2	FAD	B	501	53/53	0.97	0.09	18,26,33,42	0
2	FAD	C	501	53/53	0.97	0.10	18,26,35,39	0
2	FAD	F	501	53/53	0.98	0.10	14,22,30,33	0

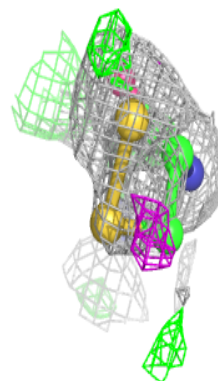
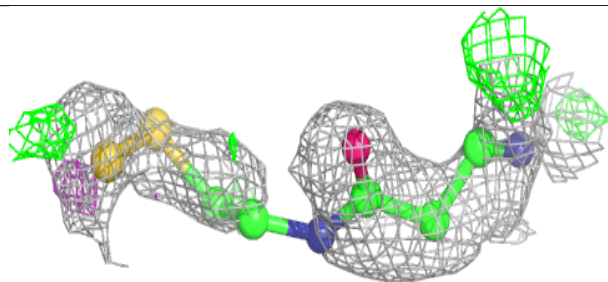
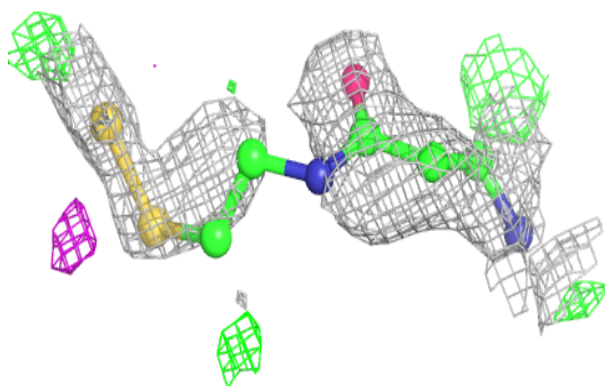
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

**Electron density around COS B 502:**

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

**Electron density around COS D 502:**

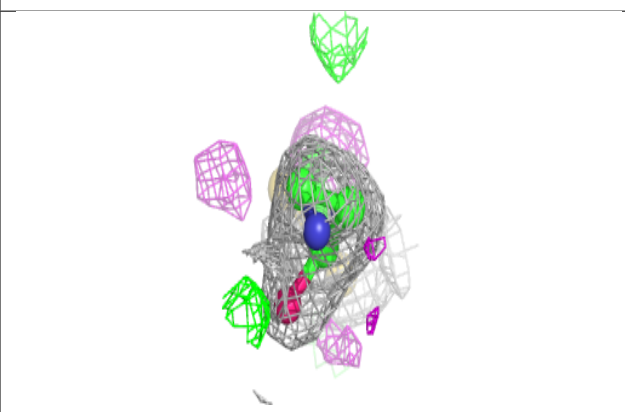
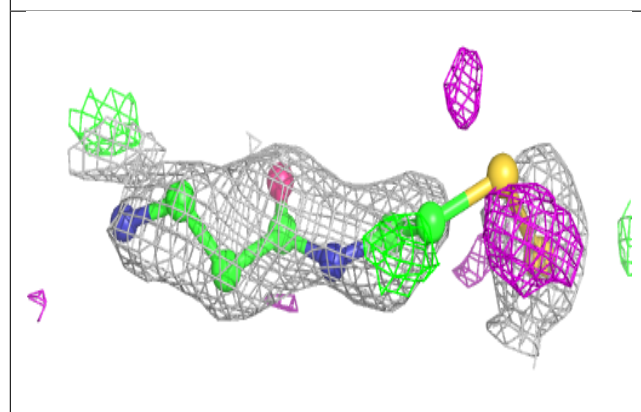
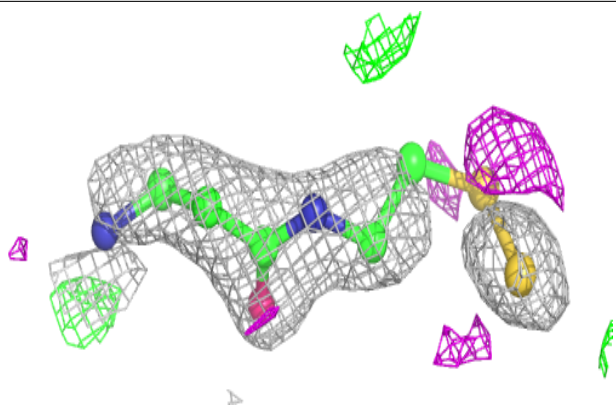
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



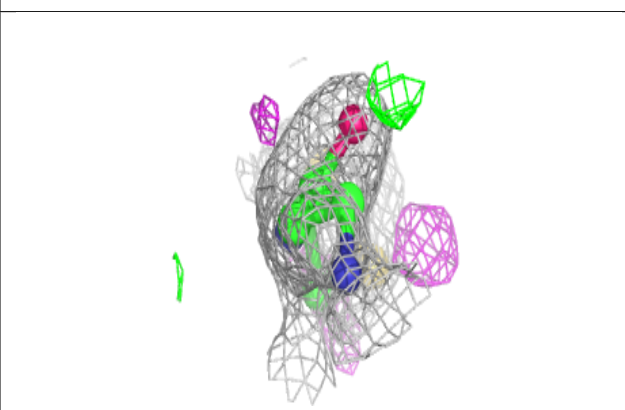
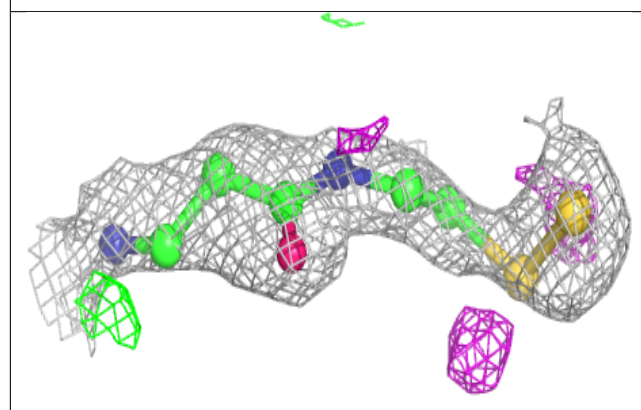
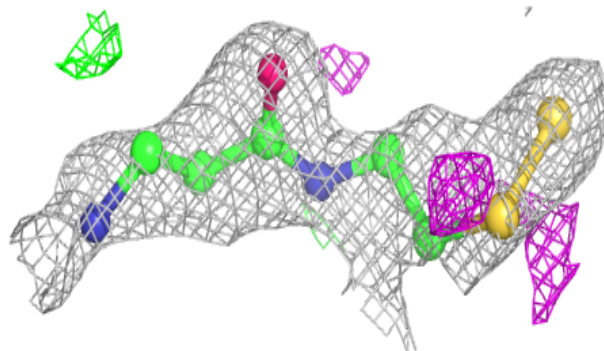


**Electron density around COS C 502:**

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

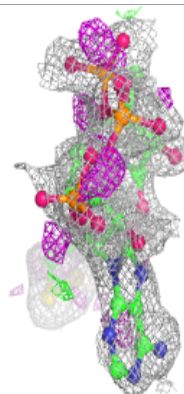
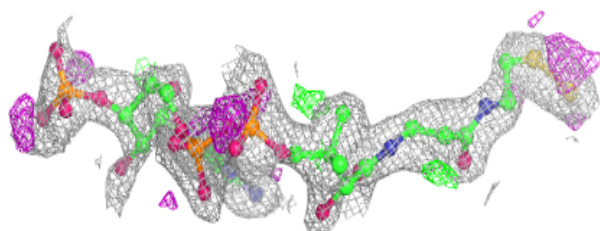
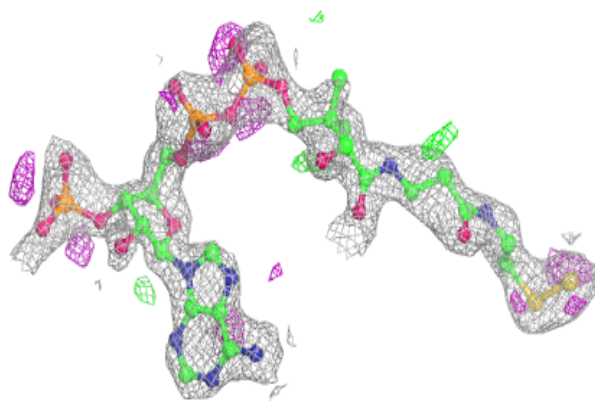
**Electron density around COS F 502:**

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

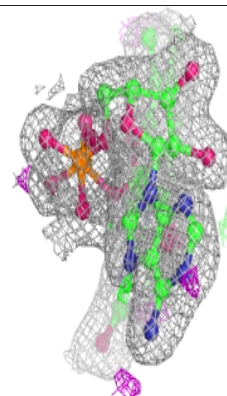
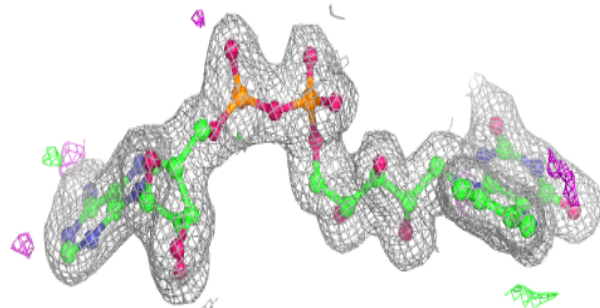
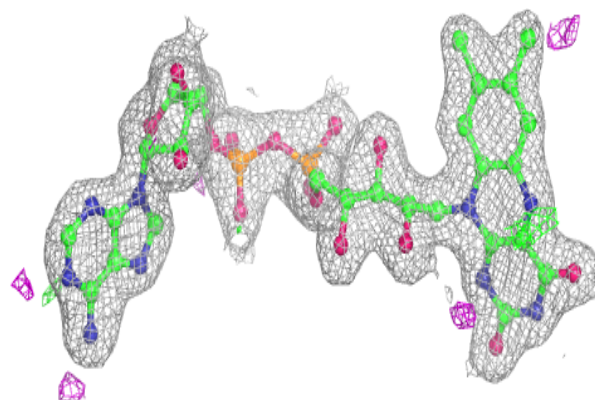


**Electron density around COS G 502:**

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

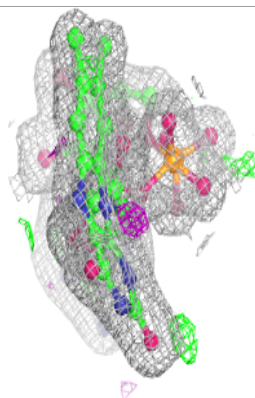
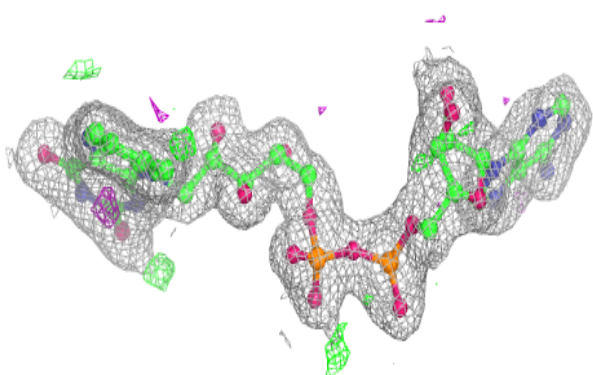
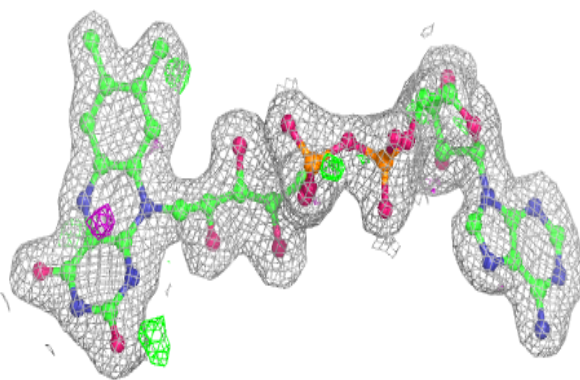
**Electron density around FAD D 501:**

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

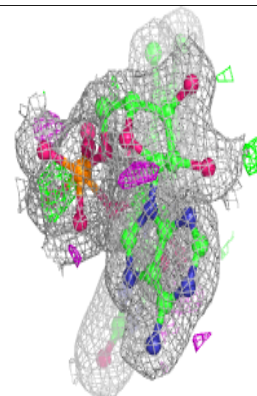
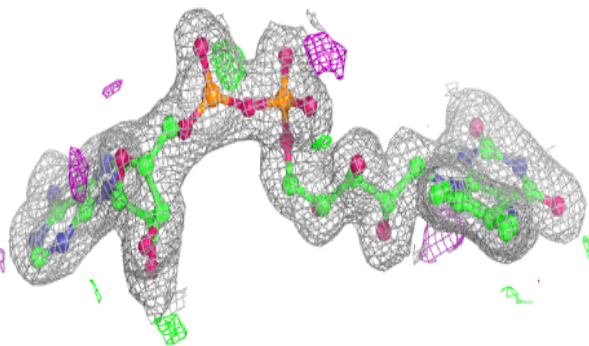
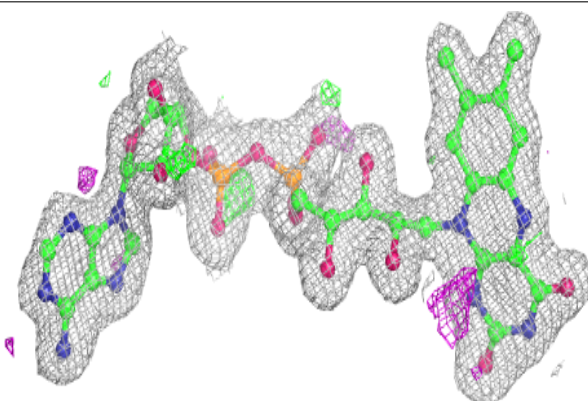


**Electron density around FAD E 501:**

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

**Electron density around FAD G 501:**

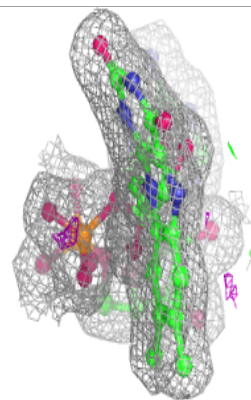
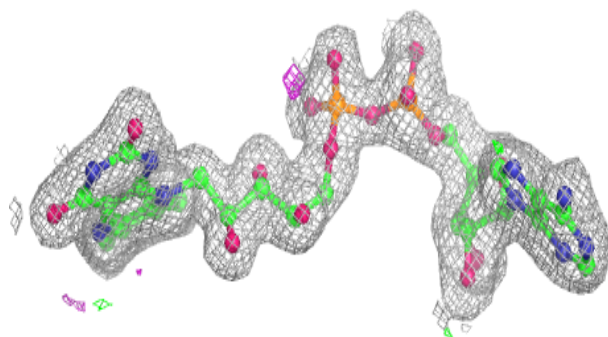
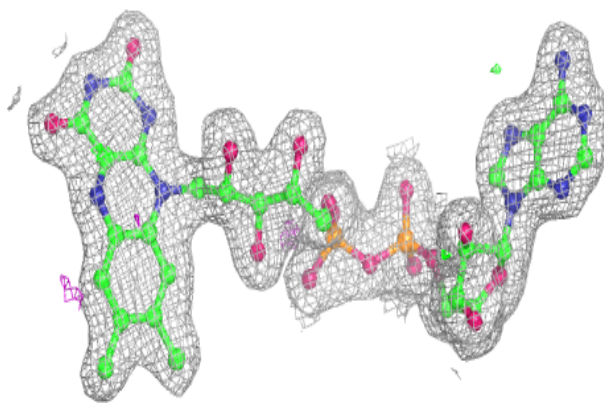
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



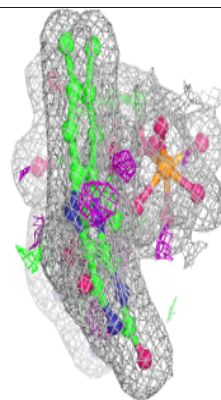
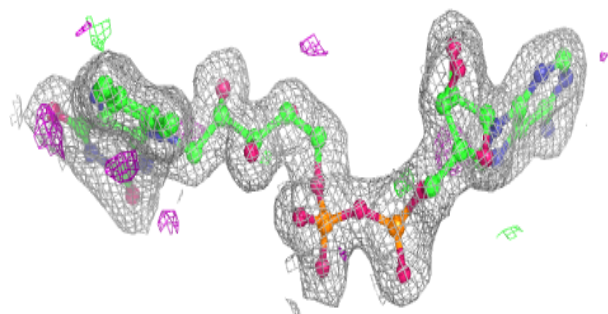
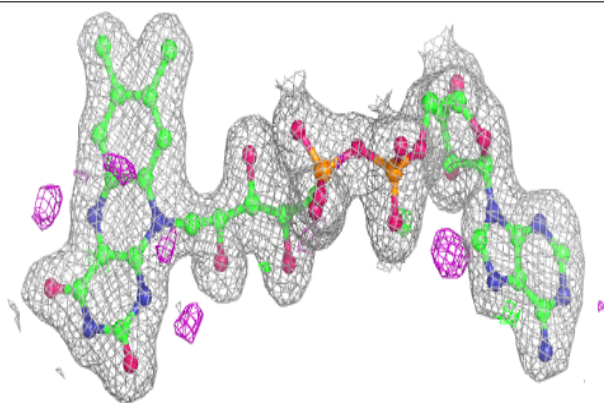


**Electron density around FAD H 501:**

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

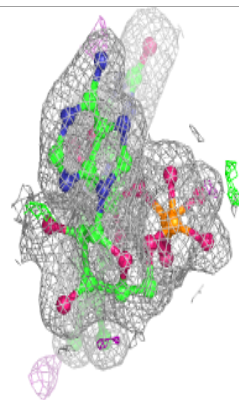
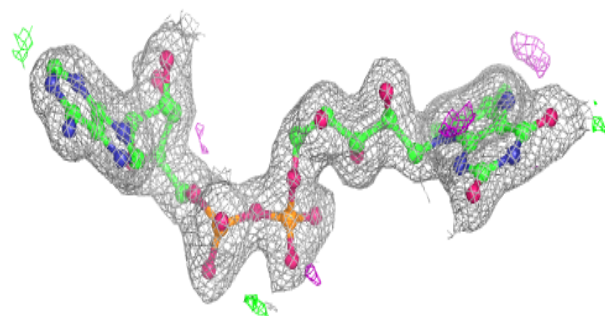
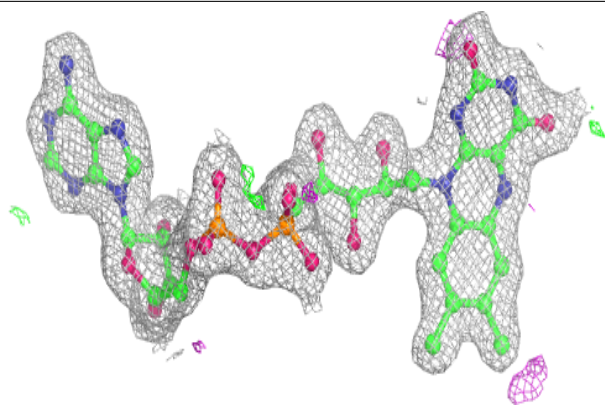
**Electron density around FAD A 501:**

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

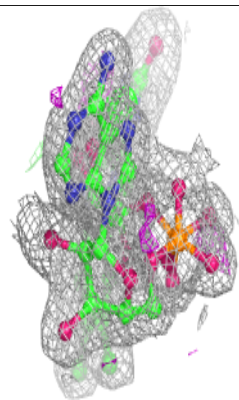
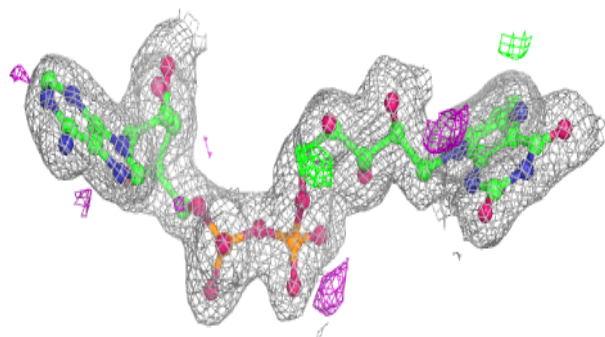
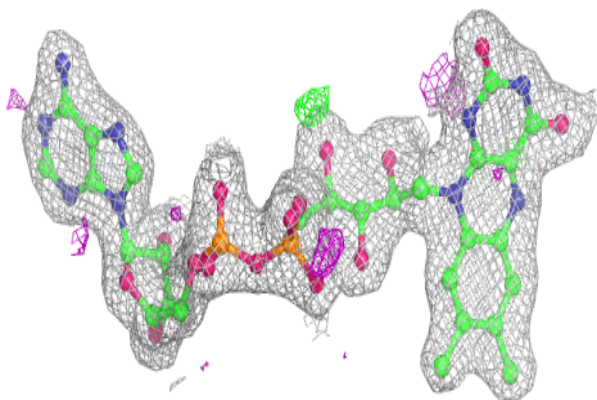


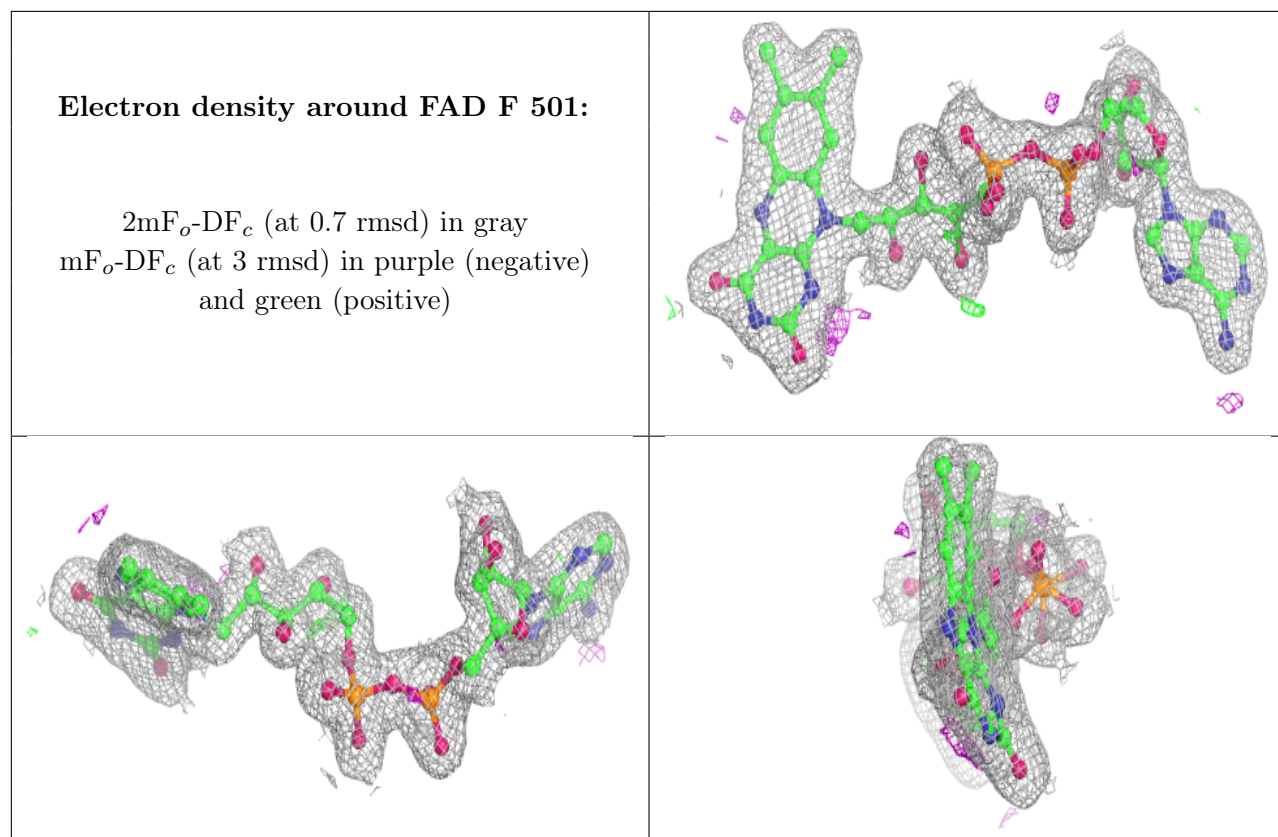
**Electron density around FAD B 501:**

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

**Electron density around FAD C 501:**

$2mF_o-DF_c$  (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.