



# Full wwPDB X-ray Structure Validation Report ⓘ

Jan 23, 2021 – 05:00 PM EST

PDB ID : 2GVC  
Title : Crystal structure of flavin-containing monooxygenase (FMO) from *S. pombe* and substrate (methimazole) complex  
Authors : Eswaramoorthy, S.; Swaminathan, S.; Burley, S.K.; New York SGX Research Center for Structural Genomics (NYSGXRC)  
Deposited on : 2006-05-02  
Resolution : 2.22 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.

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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 : 2.16  
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) : 2.16

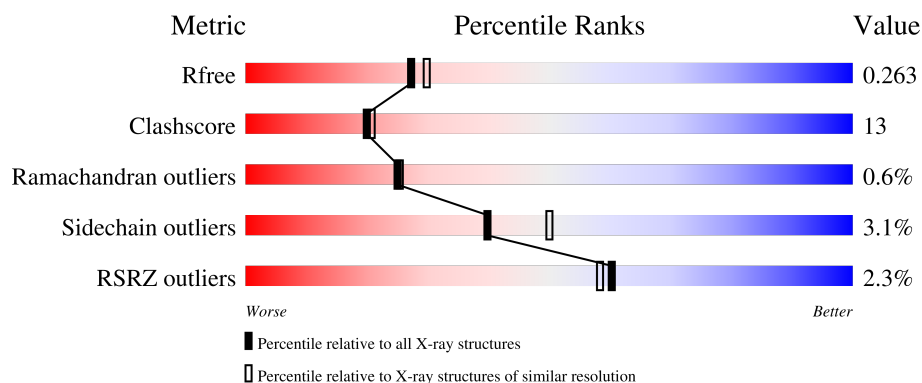
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.22 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	5912 (2.24-2.20)
Clashscore	141614	6646 (2.24-2.20)
Ramachandran outliers	138981	6543 (2.24-2.20)
Sidechain outliers	138945	6544 (2.24-2.20)
RSRZ outliers	127900	5797 (2.24-2.20)

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	447	<div> <div>2%</div> <div> <div></div> <div>72%</div> <div>24%</div> <div>..</div> </div> </div>
1	B	447	<div> <div>3%</div> <div> <div></div> <div>77%</div> <div>20%</div> <div>..</div> </div> </div>
1	D	447	<div> <div>2%</div> <div> <div></div> <div>74%</div> <div>23%</div> <div>..</div> </div> </div>
1	E	447	<div> <div>2%</div> <div> <div></div> <div>77%</div> <div>21%</div> <div>..</div> </div> </div>

## 2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 14753 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.

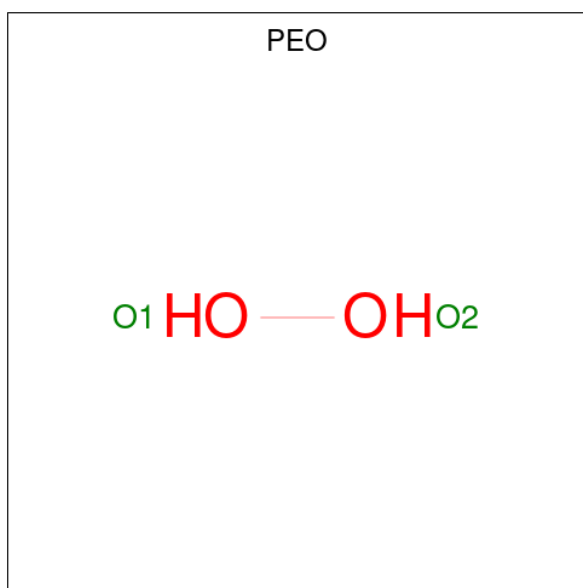
- Molecule 1 is a protein called monooxygenase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	442	Total	C	N	O	S	Se	0	0	0
			3486	2259	578	641	4	4			
1	B	442	Total	C	N	O	S	Se	0	0	0
			3486	2259	578	641	4	4			
1	D	442	Total	C	N	O	S	Se	0	0	0
			3486	2259	578	641	4	4			
1	E	442	Total	C	N	O	S	Se	0	0	0
			3486	2259	578	641	4	4			

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MSE	MET	modified residue	UNP Q9HFE4
A	97	MSE	MET	modified residue	UNP Q9HFE4
A	377	MSE	MET	modified residue	UNP Q9HFE4
A	386	MSE	MET	modified residue	UNP Q9HFE4
A	433	MSE	MET	modified residue	UNP Q9HFE4
B	1	MSE	MET	modified residue	UNP Q9HFE4
B	97	MSE	MET	modified residue	UNP Q9HFE4
B	377	MSE	MET	modified residue	UNP Q9HFE4
B	386	MSE	MET	modified residue	UNP Q9HFE4
B	433	MSE	MET	modified residue	UNP Q9HFE4
D	1	MSE	MET	modified residue	UNP Q9HFE4
D	97	MSE	MET	modified residue	UNP Q9HFE4
D	377	MSE	MET	modified residue	UNP Q9HFE4
D	386	MSE	MET	modified residue	UNP Q9HFE4
D	433	MSE	MET	modified residue	UNP Q9HFE4
E	1	MSE	MET	modified residue	UNP Q9HFE4
E	97	MSE	MET	modified residue	UNP Q9HFE4
E	377	MSE	MET	modified residue	UNP Q9HFE4
E	386	MSE	MET	modified residue	UNP Q9HFE4
E	433	MSE	MET	modified residue	UNP Q9HFE4

- Molecule 2 is HYDROGEN PEROXIDE (three-letter code: PEO) (formula:  $\text{H}_2\text{O}_2$ ).



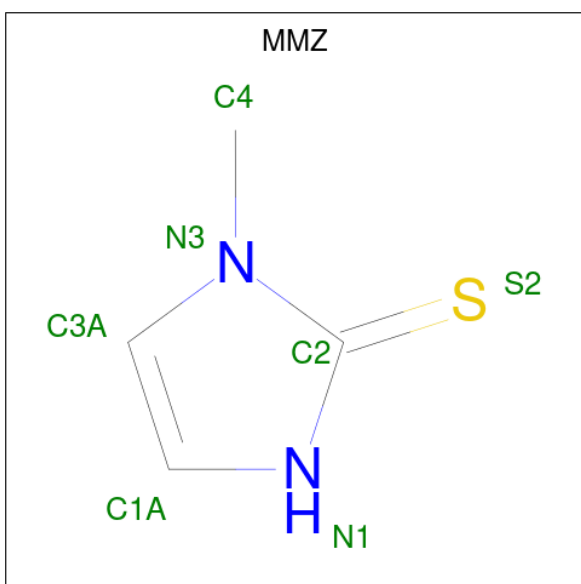
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	O	0	0
			2	2		
2	B	1	Total	O	0	0
			2	2		
2	D	1	Total	O	0	0
			2	2		
2	E	1	Total	O	0	0
			2	2		

- Molecule 3 is FLAVIN-ADENINE DINUCLEOTIDE (three-letter code: FAD) (formula:  $\text{C}_{27}\text{H}_{33}\text{N}_9\text{O}_{15}\text{P}_2$ ).



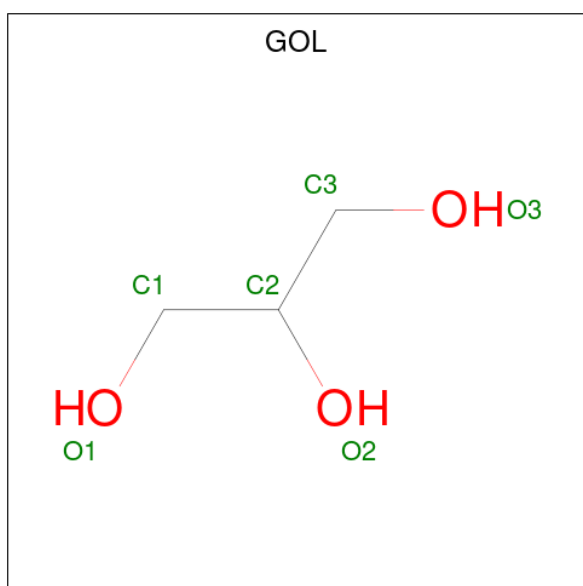
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total 53	C 27	N 9	O 15	P 2	0	0
3	B	1	Total 53	C 27	N 9	O 15	P 2	0	0
3	D	1	Total 53	C 27	N 9	O 15	P 2	0	0
3	E	1	Total 53	C 27	N 9	O 15	P 2	0	0

- Molecule 4 is 1-METHYL-1,3-DIHYDRO-2H-IMIDAZOLE-2-THIONE (three-letter code: MMZ) (formula:  $\text{C}_4\text{H}_6\text{N}_2\text{S}$ ).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C N S 7 4 2 1	0	0
4	B	1	Total C N S 7 4 2 1	0	0
4	D	1	Total C N S 7 4 2 1	0	0
4	E	1	Total C N S 7 4 2 1	0	0

- Molecule 5 is GLYCEROL (three-letter code: GOL) (formula:  $C_3H_8O_3$ ).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total C O 6 3 3	0	0
5	B	1	Total C O 6 3 3	0	0
5	D	1	Total C O 6 3 3	0	0
5	E	1	Total C O 6 3 3	0	0

- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	146	Total O 146 146	0	0
6	B	114	Total O 114 114	0	0

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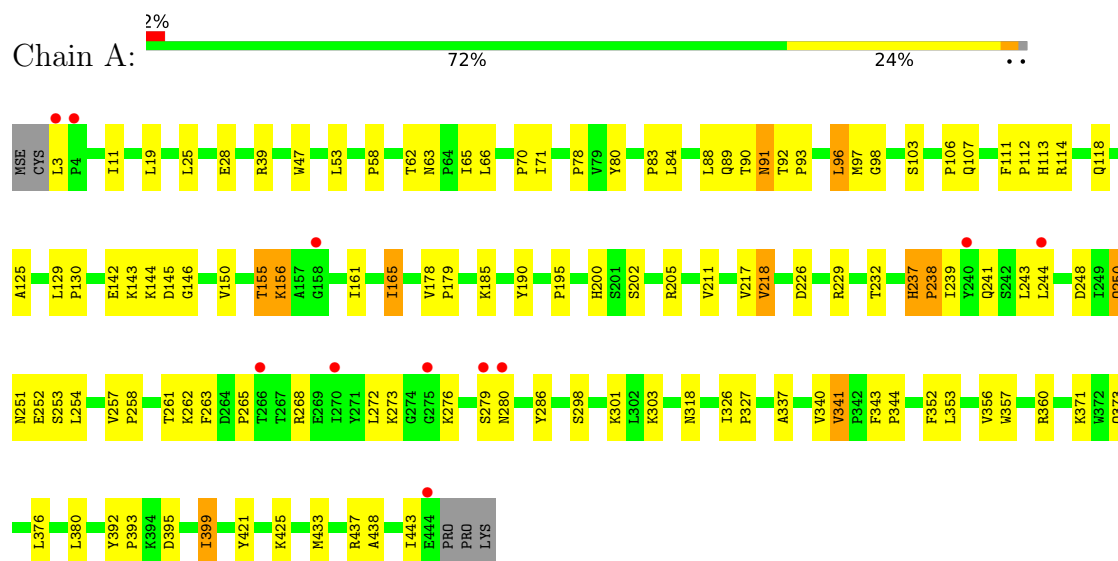
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	D	135	Total 135	O 135	0	0
6	E	142	Total 142	O 142	0	0

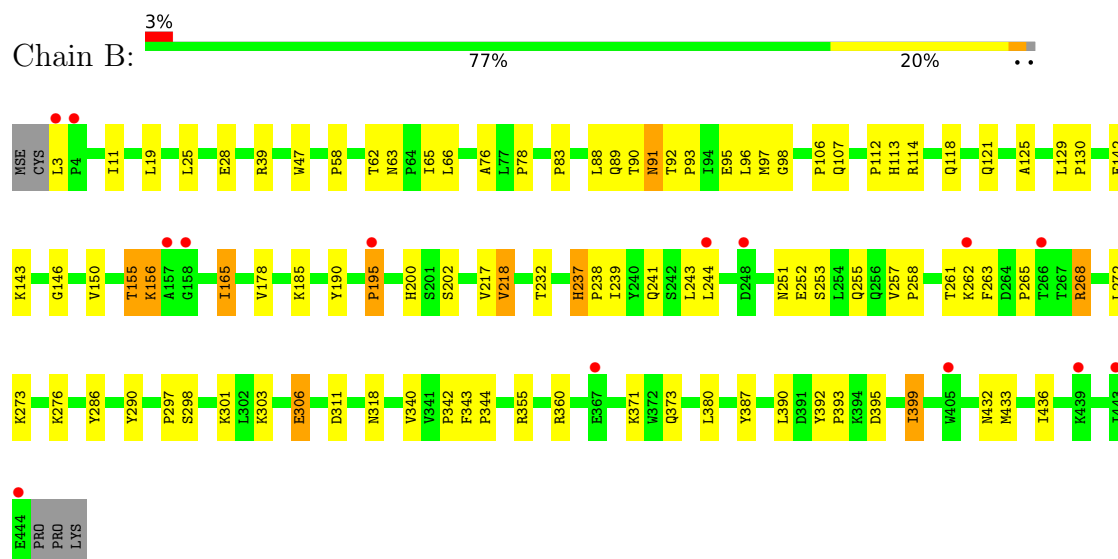
### 3 Residue-property plots [i](#)

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: monooxygenase

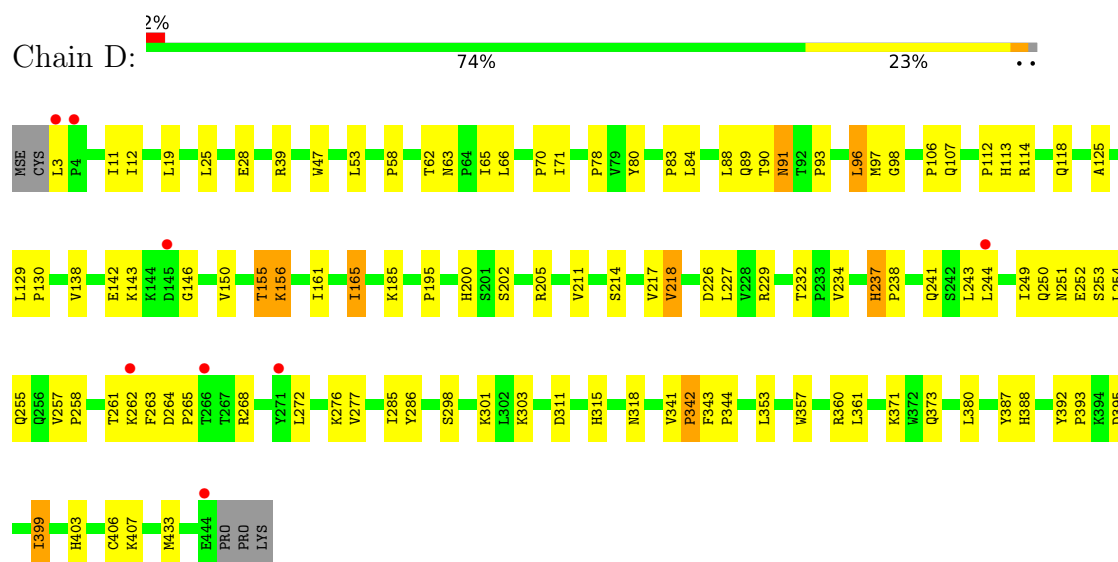


#### • Molecule 1: monooxygenase

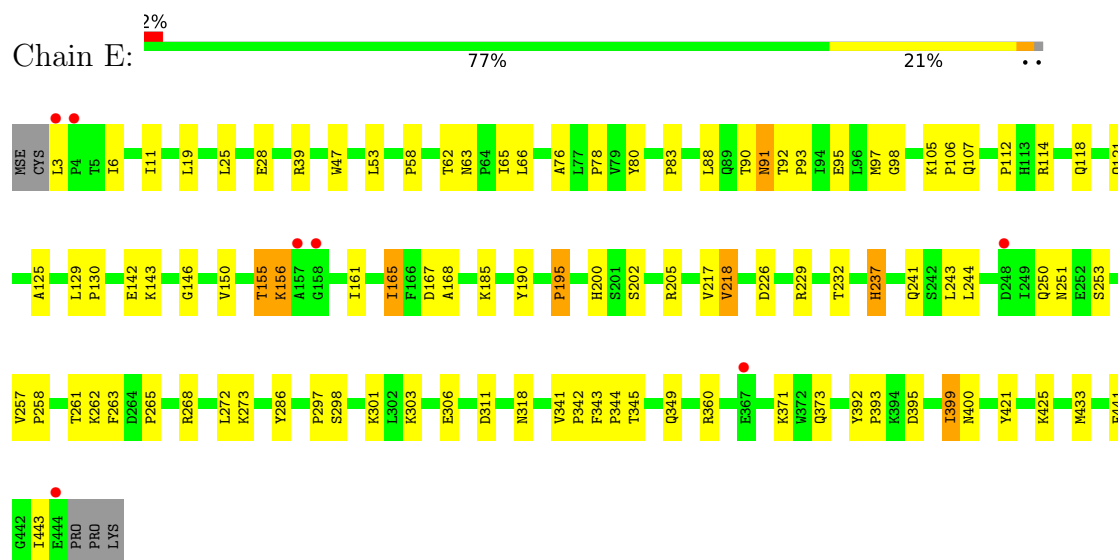


#### • Molecule 1: monooxygenase





• Molecule 1: monooxygenase



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	72.70Å 84.45Å 113.51Å 107.73° 90.76° 106.50°	Depositor
Resolution (Å)	50.00 – 2.22 45.07 – 2.22	Depositor EDS
% Data completeness (in resolution range)	(Not available) (50.00-2.22) 86.8 (45.07-2.22)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.89 (at 2.22Å)	Xtrriage
Refinement program	CNS 1.1	Depositor
R, $R_{free}$	0.230 , 0.265 0.229 , 0.263	Depositor DCC
$R_{free}$ test set	4516 reflections (4.03%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	21.2	Xtrriage
Anisotropy	0.119	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 39.3	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	0.93	EDS
Total number of atoms	14753	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	26.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 73.87 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.6986e-06. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<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: GOL, PEO, FAD, MMZ

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	0.38	0/3583	0.64	1/4880 (0.0%)
1	B	0.38	0/3583	0.62	0/4880
1	D	0.37	0/3583	0.62	0/4880
1	E	0.37	0/3583	0.63	0/4880
All	All	0.38	0/14332	0.63	1/19520 (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	A	341	VAL	N-CA-C	-5.05	97.37	111.00

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	3486	0	3483	96	0
1	B	3486	0	3483	85	0
1	D	3486	0	3483	96	0
1	E	3486	0	3483	86	0
2	A	2	0	0	0	0
2	B	2	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	D	2	0	0	0	0
2	E	2	0	0	0	0
3	A	53	0	31	3	0
3	B	53	0	31	2	0
3	D	53	0	31	3	0
3	E	53	0	31	2	0
4	A	7	0	6	0	0
4	B	7	0	6	0	0
4	D	7	0	6	0	0
4	E	7	0	6	0	0
5	A	6	0	8	0	0
5	B	6	0	8	0	0
5	D	6	0	8	0	0
5	E	6	0	8	0	0
6	A	146	0	0	4	0
6	B	114	0	0	3	0
6	D	135	0	0	4	0
6	E	142	0	0	3	0
All	All	14753	0	14112	358	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 13.

All (358) 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:155:THR:HG21	6:B:615:HOH:O	1.57	1.02
1:B:114:ARG:HH11	1:B:118:GLN:HE22	1.05	1.00
1:A:114:ARG:HH11	1:A:118:GLN:HE22	1.13	0.95
1:D:155:THR:HG21	6:D:634:HOH:O	1.64	0.95
1:E:114:ARG:HH11	1:E:118:GLN:HE22	1.16	0.93
1:A:155:THR:HG21	6:A:645:HOH:O	1.75	0.86
1:D:39:ARG:HD2	6:D:521:HOH:O	1.74	0.86
1:D:218:VAL:HG13	1:D:286:TYR:HA	1.58	0.86
1:D:93:PRO:HD2	1:D:433:MSE:HE2	1.58	0.85
1:E:155:THR:HG21	6:E:637:HOH:O	1.75	0.85
1:E:39:ARG:HD2	6:E:521:HOH:O	1.77	0.85
1:E:251:ASN:HD22	1:E:253:SER:H	1.22	0.84
1:E:218:VAL:HG13	1:E:286:TYR:HA	1.59	0.84
1:D:63:ASN:OD1	1:D:65:ILE:HG22	1.78	0.83
1:E:261:THR:HG22	1:E:262:LYS:HG3	1.60	0.83

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:114:ARG:HH11	1:D:118:GLN:HE22	1.22	0.82
1:E:395:ASP:O	1:E:399:ILE:HG23	1.79	0.82
1:E:185:LYS:HG2	1:E:262:LYS:HZ2	1.44	0.82
1:B:39:ARG:HD2	6:B:523:HOH:O	1.81	0.81
1:D:47:TRP:O	1:D:118:GLN:HG2	1.81	0.80
1:B:218:VAL:HG13	1:B:286:TYR:HA	1.62	0.79
1:B:251:ASN:HD22	1:B:253:SER:H	1.33	0.77
1:A:218:VAL:HG13	1:A:286:TYR:HA	1.68	0.76
1:B:63:ASN:OD1	1:B:65:ILE:HG22	1.86	0.76
1:B:93:PRO:HD2	1:B:433:MSE:HE2	1.67	0.76
1:E:251:ASN:ND2	1:E:253:SER:H	1.83	0.76
1:A:3:LEU:HD22	6:A:565:HOH:O	1.86	0.74
1:A:47:TRP:O	1:A:118:GLN:HG2	1.87	0.74
1:A:39:ARG:HD2	6:A:545:HOH:O	1.86	0.74
1:A:142:GLU:HB3	1:A:298:SER:CB	2.18	0.74
1:B:114:ARG:HH11	1:B:118:GLN:NE2	1.82	0.74
1:B:114:ARG:NH1	1:B:118:GLN:HE22	1.82	0.74
1:B:155:THR:O	1:B:156:LYS:HB2	1.88	0.74
1:D:263:PHE:O	1:D:265:PRO:HD3	1.89	0.73
1:D:142:GLU:HB3	1:D:298:SER:CB	2.17	0.73
1:E:93:PRO:HD2	1:E:433:MSE:HE2	1.71	0.72
1:B:261:THR:HG22	1:B:262:LYS:HG3	1.71	0.71
1:A:106:PRO:HG2	1:B:106:PRO:HG2	1.71	0.71
1:E:185:LYS:HG2	1:E:262:LYS:NZ	2.04	0.71
1:D:3:LEU:HD13	1:D:146:GLY:O	1.91	0.71
1:A:28:GLU:OE1	1:A:360:ARG:HD3	1.91	0.70
1:B:251:ASN:ND2	1:B:253:SER:H	1.88	0.70
1:E:47:TRP:O	1:E:118:GLN:HG2	1.92	0.70
1:A:155:THR:O	1:A:156:LYS:CB	2.39	0.69
1:A:155:THR:O	1:A:156:LYS:HB2	1.91	0.69
1:D:261:THR:HG22	1:D:262:LYS:HG3	1.74	0.69
1:E:318:ASN:H	1:E:373:GLN:HE22	1.40	0.69
1:E:91:ASN:C	1:E:91:ASN:HD22	1.94	0.69
1:A:97:MSE:HE1	1:A:112:PRO:HD2	1.75	0.69
1:A:318:ASN:H	1:A:373:GLN:HE22	1.40	0.69
1:E:155:THR:O	1:E:156:LYS:HB2	1.91	0.69
1:E:114:ARG:HH11	1:E:118:GLN:NE2	1.89	0.68
1:D:155:THR:O	1:D:156:LYS:CB	2.41	0.68
1:D:155:THR:O	1:D:156:LYS:HB2	1.93	0.68
1:A:395:ASP:O	1:A:399:ILE:HG23	1.93	0.68
1:E:244:LEU:H	1:E:244:LEU:HD12	1.58	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:395:ASP:O	1:D:399:ILE:HG23	1.94	0.68
1:B:3:LEU:HD13	1:B:146:GLY:O	1.93	0.68
1:B:200:HIS:HD2	1:B:202:SER:OG	1.77	0.67
1:A:251:ASN:HD22	1:A:253:SER:H	1.43	0.67
1:A:98:GLY:HA2	1:A:343:PHE:HD2	1.60	0.67
1:A:232:THR:O	1:A:237:HIS:HE1	1.78	0.66
1:B:318:ASN:HA	1:B:373:GLN:HE22	1.60	0.66
1:D:251:ASN:O	1:D:255:GLN:NE2	2.27	0.66
1:A:261:THR:HG22	1:A:262:LYS:HG3	1.78	0.66
1:B:165:ILE:HD13	1:B:165:ILE:H	1.61	0.66
1:D:238:PRO:HB3	1:D:252:GLU:O	1.96	0.66
1:B:395:ASP:O	1:B:399:ILE:HG23	1.95	0.66
1:D:106:PRO:HG2	1:E:106:PRO:HG2	1.76	0.66
1:E:3:LEU:HD13	1:E:146:GLY:O	1.95	0.66
1:B:155:THR:O	1:B:156:LYS:CB	2.44	0.66
1:D:232:THR:O	1:D:237:HIS:HE1	1.80	0.65
1:B:241:GLN:HG2	1:B:243:LEU:HD22	1.77	0.65
1:E:155:THR:O	1:E:156:LYS:CB	2.45	0.64
1:B:106:PRO:O	1:B:107:GLN:HB2	1.96	0.64
1:D:241:GLN:HG2	1:D:243:LEU:HD22	1.79	0.63
1:B:232:THR:O	1:B:237:HIS:HE1	1.82	0.63
1:E:341:VAL:O	1:E:344:PRO:HD2	1.97	0.63
1:B:241:GLN:HG2	1:B:243:LEU:CD2	2.29	0.63
1:D:241:GLN:HG2	1:D:243:LEU:CD2	2.29	0.62
1:E:63:ASN:OD1	1:E:65:ILE:HG22	1.99	0.62
1:E:244:LEU:N	1:E:244:LEU:HD12	2.14	0.62
1:D:93:PRO:CD	1:D:433:MSE:HE2	2.29	0.61
1:A:3:LEU:HD13	1:A:146:GLY:O	1.99	0.61
1:D:244:LEU:HD12	1:D:244:LEU:H	1.64	0.61
1:E:165:ILE:H	1:E:165:ILE:HD13	1.64	0.61
1:D:185:LYS:HB3	1:D:262:LYS:HG2	1.82	0.61
1:D:318:ASN:H	1:D:373:GLN:HE22	1.47	0.61
1:B:343:PHE:HB2	1:B:344:PRO:HD3	1.82	0.60
1:B:142:GLU:HB3	1:B:298:SER:CB	2.31	0.60
1:E:142:GLU:HB3	1:E:298:SER:CB	2.30	0.60
1:D:97:MSE:HE1	1:D:112:PRO:HD2	1.83	0.60
1:E:106:PRO:O	1:E:107:GLN:HB2	2.02	0.60
1:A:392:TYR:CD1	1:A:393:PRO:HA	2.37	0.60
1:B:263:PHE:O	1:B:265:PRO:HD3	2.01	0.59
1:D:84:LEU:HD22	1:D:88:LEU:HD13	1.83	0.59
1:A:185:LYS:HG2	1:A:262:LYS:NZ	2.17	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:232:THR:O	1:E:237:HIS:HE1	1.85	0.59
1:A:337:ALA:HB1	1:A:340:VAL:HG11	1.85	0.59
1:D:53:LEU:HD11	1:E:76:ALA:HB2	1.84	0.59
1:D:257:VAL:HB	1:D:258:PRO:HD2	1.85	0.59
1:B:93:PRO:CD	1:B:433:MSE:HE2	2.31	0.59
1:A:244:LEU:HD12	1:A:244:LEU:H	1.67	0.59
1:A:185:LYS:HB3	1:A:262:LYS:HG2	1.85	0.59
1:A:93:PRO:HD2	1:A:433:MSE:HE2	1.83	0.59
1:B:19:LEU:HD13	1:B:125:ALA:HB2	1.85	0.58
1:D:343:PHE:HB2	1:D:344:PRO:HD3	1.85	0.58
1:B:392:TYR:CD1	1:B:393:PRO:HA	2.38	0.58
1:B:98:GLY:HA2	1:B:343:PHE:HD2	1.68	0.58
1:E:97:MSE:HE1	1:E:112:PRO:HD2	1.85	0.58
1:E:190:TYR:O	1:E:268:ARG:NH2	2.37	0.58
1:E:244:LEU:CD1	1:E:244:LEU:H	2.17	0.58
1:D:19:LEU:HD13	1:D:125:ALA:HB2	1.86	0.57
1:A:62:THR:O	1:A:62:THR:HG22	2.04	0.57
1:D:392:TYR:CD1	1:D:393:PRO:HA	2.39	0.57
1:A:343:PHE:HB2	1:A:344:PRO:HD3	1.85	0.57
1:A:251:ASN:ND2	1:A:253:SER:H	2.02	0.57
1:A:91:ASN:C	1:A:91:ASN:HD22	2.08	0.57
1:A:258:PRO:HG2	1:A:272:LEU:HB3	1.87	0.56
1:A:341:VAL:O	1:A:344:PRO:HD2	2.06	0.56
1:A:71:ILE:HD12	1:A:71:ILE:N	2.21	0.56
1:D:244:LEU:HD12	1:D:244:LEU:N	2.20	0.56
1:D:106:PRO:O	1:D:107:GLN:HB2	2.04	0.56
1:D:272:LEU:HD12	1:D:276:LYS:HG3	1.88	0.56
1:D:91:ASN:HD22	1:D:91:ASN:C	2.09	0.56
1:A:257:VAL:HB	1:A:258:PRO:HD2	1.87	0.56
1:D:28:GLU:OE1	1:D:360:ARG:HD3	2.05	0.56
1:E:98:GLY:HA2	1:E:343:PHE:HD2	1.70	0.56
1:E:318:ASN:N	1:E:373:GLN:HE22	2.04	0.56
1:B:47:TRP:O	1:B:118:GLN:HG2	2.05	0.56
1:A:165:ILE:H	1:A:165:ILE:HD13	1.70	0.55
1:A:263:PHE:O	1:A:265:PRO:HD3	2.07	0.55
1:A:96:LEU:HD23	1:A:433:MSE:CE	2.36	0.55
1:A:92:THR:O	1:A:97:MSE:HE2	2.05	0.55
1:A:244:LEU:N	1:A:244:LEU:HD12	2.20	0.55
1:D:251:ASN:HD22	1:D:253:SER:H	1.53	0.55
1:B:244:LEU:HD12	1:B:244:LEU:N	2.22	0.55
1:E:114:ARG:NH1	1:E:118:GLN:HE22	1.94	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:19:LEU:HD12	1:E:121:GLN:HE22	1.72	0.55
1:B:185:LYS:HB3	1:B:262:LYS:HG2	1.89	0.54
1:E:392:TYR:CD1	1:E:393:PRO:HA	2.41	0.54
1:B:78:PRO:HD2	1:B:155:THR:CG2	2.37	0.54
1:A:84:LEU:HD22	1:A:88:LEU:HD13	1.89	0.54
1:B:93:PRO:HB2	1:B:95:GLU:OE1	2.07	0.54
1:E:200:HIS:CD2	1:E:202:SER:H	2.25	0.54
1:A:190:TYR:O	1:A:268:ARG:NH2	2.40	0.53
1:B:97:MSE:HE1	1:B:112:PRO:HD2	1.89	0.53
1:D:62:THR:O	1:D:62:THR:HG22	2.08	0.53
1:B:258:PRO:HG2	1:B:272:LEU:HB3	1.90	0.53
1:A:226:ASP:OD1	1:A:229:ARG:NH2	2.41	0.53
1:E:371:LYS:NZ	1:E:371:LYS:HB3	2.24	0.53
1:D:58:PRO:HG3	1:D:66:LEU:CD2	2.39	0.52
1:E:301:LYS:O	1:E:303:LYS:HG3	2.09	0.52
1:A:318:ASN:N	1:A:373:GLN:HE22	2.06	0.52
1:B:318:ASN:H	1:B:373:GLN:HE22	1.55	0.52
1:E:88:LEU:C	1:E:88:LEU:HD23	2.30	0.52
1:E:226:ASP:OD1	1:E:229:ARG:NH2	2.42	0.52
1:D:343:PHE:N	1:D:343:PHE:CD1	2.78	0.52
1:A:142:GLU:HB3	1:A:298:SER:HB3	1.92	0.52
1:D:107:GLN:HB3	1:E:105:LYS:HD2	1.90	0.52
1:B:238:PRO:HB3	1:B:252:GLU:O	2.10	0.52
1:B:272:LEU:HD12	1:B:276:LYS:HG3	1.92	0.52
1:D:341:VAL:O	1:D:344:PRO:HD2	2.10	0.52
1:E:241:GLN:HG2	1:E:243:LEU:HD22	1.92	0.52
1:A:217:VAL:O	1:A:241:GLN:HA	2.09	0.51
1:D:244:LEU:H	1:D:244:LEU:CD1	2.23	0.51
1:B:306:GLU:OE1	1:B:306:GLU:N	2.33	0.51
1:E:19:LEU:HD13	1:E:125:ALA:HB2	1.91	0.51
1:E:62:THR:HG22	1:E:62:THR:O	2.09	0.51
1:B:19:LEU:HD12	1:B:121:GLN:HE22	1.75	0.51
1:A:244:LEU:H	1:A:244:LEU:CD1	2.23	0.51
1:D:78:PRO:HD2	1:D:155:THR:CG2	2.40	0.51
1:B:91:ASN:C	1:B:91:ASN:HD22	2.13	0.51
1:A:399:ILE:HD11	1:A:421:TYR:HA	1.93	0.51
1:D:200:HIS:HD2	1:D:202:SER:OG	1.94	0.51
1:E:91:ASN:C	1:E:91:ASN:ND2	2.64	0.51
1:A:238:PRO:HB3	1:A:252:GLU:O	2.11	0.50
1:E:318:ASN:HA	1:E:373:GLN:HE22	1.76	0.50
1:E:91:ASN:ND2	1:E:92:THR:HG23	2.25	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:78:PRO:HD2	1:E:155:THR:CG2	2.41	0.50
1:B:165:ILE:HG12	6:B:555:HOH:O	2.10	0.50
1:E:343:PHE:HB2	1:E:344:PRO:HD3	1.93	0.50
1:B:165:ILE:H	1:B:165:ILE:CD1	2.24	0.50
1:D:89:GLN:HG2	1:D:113:HIS:HA	1.94	0.50
1:A:106:PRO:O	1:A:107:GLN:HB2	2.11	0.50
1:A:376:LEU:O	1:A:380:LEU:HG	2.12	0.50
1:D:342:PRO:HG2	3:D:500:FAD:N1	2.27	0.50
1:A:90:THR:HA	3:A:500:FAD:O4	2.11	0.50
1:D:78:PRO:HG2	1:D:155:THR:HG23	1.94	0.50
1:D:399:ILE:HD12	1:D:399:ILE:C	2.32	0.50
1:E:441:PHE:O	1:E:443:ILE:HG23	2.12	0.50
1:E:39:ARG:HD3	1:E:80:TYR:CE1	2.47	0.50
1:A:53:LEU:HD11	1:B:76:ALA:HB2	1.93	0.50
1:B:301:LYS:O	1:B:303:LYS:HG3	2.12	0.50
1:B:432:ASN:O	1:B:436:ILE:HG13	2.12	0.50
1:D:165:ILE:H	1:D:165:ILE:HD13	1.77	0.49
1:A:200:HIS:CD2	1:A:202:SER:H	2.31	0.49
1:E:11:ILE:HD11	1:E:25:LEU:HD12	1.94	0.49
1:A:111:PHE:CE2	1:A:437:ARG:HA	2.48	0.49
1:B:340:VAL:O	1:B:342:PRO:HD3	2.12	0.49
1:B:62:THR:HG22	1:B:62:THR:O	2.10	0.49
1:D:142:GLU:HB3	1:D:298:SER:HB3	1.94	0.49
1:E:93:PRO:HB2	1:E:95:GLU:OE1	2.13	0.49
1:B:200:HIS:CD2	1:B:202:SER:H	2.30	0.49
1:A:241:GLN:HG2	1:A:243:LEU:HD22	1.95	0.49
1:A:239:ILE:O	1:A:254:LEU:HD12	2.12	0.49
1:B:318:ASN:CA	1:B:373:GLN:HE22	2.24	0.49
1:D:257:VAL:HB	1:D:272:LEU:HD13	1.94	0.49
1:A:11:ILE:HD11	1:A:25:LEU:HD12	1.95	0.49
1:B:257:VAL:HB	1:B:258:PRO:HD2	1.95	0.49
1:B:190:TYR:O	1:B:268:ARG:NH2	2.45	0.49
1:D:226:ASP:OD1	1:D:229:ARG:NH2	2.46	0.49
1:A:53:LEU:HD21	1:A:205:ARG:HG3	1.95	0.48
1:B:318:ASN:N	1:B:373:GLN:HE22	2.11	0.48
1:B:343:PHE:N	1:B:343:PHE:CD1	2.82	0.48
1:D:165:ILE:HD13	6:D:637:HOH:O	2.12	0.48
1:B:244:LEU:HD12	1:B:244:LEU:H	1.76	0.48
1:E:93:PRO:CD	1:E:433:MSE:HE2	2.41	0.48
1:D:39:ARG:HB2	1:D:80:TYR:CE2	2.48	0.48
1:E:6:ILE:HG23	1:E:167:ASP:HB2	1.95	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:11:ILE:HD11	1:D:25:LEU:HD12	1.95	0.48
1:E:165:ILE:CD1	1:E:165:ILE:H	2.27	0.48
1:E:306:GLU:OE1	1:E:306:GLU:N	2.36	0.48
1:B:258:PRO:HG3	1:B:273:LYS:O	2.14	0.48
1:D:249:ILE:HG21	1:D:254:LEU:HD23	1.96	0.48
1:A:185:LYS:HG2	1:A:262:LYS:HZ2	1.78	0.48
1:B:83:PRO:HG2	3:B:500:FAD:HM82	1.95	0.48
1:D:251:ASN:ND2	1:D:253:SER:H	2.12	0.47
1:E:343:PHE:CD1	1:E:343:PHE:N	2.82	0.47
1:A:371:LYS:NZ	1:A:371:LYS:HB3	2.29	0.47
1:B:185:LYS:HG2	1:B:262:LYS:NZ	2.29	0.47
1:D:83:PRO:HG2	3:D:500:FAD:HM82	1.96	0.47
1:B:290:TYR:CD1	1:B:290:TYR:N	2.82	0.47
1:D:361:LEU:HD11	1:D:406:CYS:HA	1.96	0.47
1:B:19:LEU:CD1	1:B:125:ALA:HB2	2.44	0.47
1:B:258:PRO:O	1:B:272:LEU:HD22	2.14	0.47
1:D:88:LEU:C	1:D:88:LEU:HD23	2.34	0.47
1:B:390:LEU:O	1:B:395:ASP:HB3	2.14	0.47
1:E:58:PRO:HG3	1:E:66:LEU:CD2	2.44	0.47
1:A:257:VAL:HB	1:A:272:LEU:HD13	1.96	0.47
1:D:343:PHE:N	1:D:343:PHE:HD1	2.12	0.47
1:A:399:ILE:C	1:A:399:ILE:HD12	2.34	0.47
1:D:39:ARG:HD3	1:D:80:TYR:CE1	2.50	0.47
1:A:63:ASN:OD1	1:A:65:ILE:HG22	2.15	0.46
1:B:217:VAL:O	1:B:241:GLN:HA	2.15	0.46
1:A:39:ARG:HB2	1:A:80:TYR:CE2	2.50	0.46
1:B:11:ILE:HD11	1:B:25:LEU:HD12	1.97	0.46
1:B:355:ARG:HG3	1:B:355:ARG:HH11	1.80	0.46
1:B:380:LEU:HD11	1:B:387:TYR:HA	1.96	0.46
1:B:371:LYS:HB3	1:B:371:LYS:NZ	2.30	0.46
1:A:258:PRO:HG3	1:A:273:LYS:O	2.15	0.46
1:D:211:VAL:O	1:D:211:VAL:HG23	2.15	0.46
1:A:114:ARG:HB2	1:A:118:GLN:HE21	1.81	0.46
1:D:19:LEU:CD1	1:D:125:ALA:HB2	2.45	0.46
1:A:144:LYS:O	1:A:145:ASP:HB2	2.15	0.46
1:E:78:PRO:HG2	1:E:155:THR:HG23	1.97	0.46
1:E:263:PHE:O	1:E:265:PRO:HD3	2.15	0.46
1:A:318:ASN:HA	1:A:373:GLN:HE22	1.81	0.46
1:B:178:VAL:O	1:B:290:TYR:HB3	2.17	0.45
1:B:89:GLN:HG2	1:B:113:HIS:HA	1.98	0.45
1:B:244:LEU:CD1	1:B:244:LEU:H	2.29	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:200:HIS:HD2	1:A:202:SER:OG	2.00	0.45
1:A:88:LEU:HD11	3:A:500:FAD:H6	1.99	0.45
1:D:214:SER:HA	6:D:545:HOH:O	2.15	0.45
1:E:90:THR:HA	3:E:500:FAD:O4	2.16	0.45
1:A:301:LYS:O	1:A:303:LYS:HG3	2.17	0.45
1:A:343:PHE:N	1:A:343:PHE:CD1	2.85	0.45
1:E:6:ILE:HD13	1:E:168:ALA:HB2	1.98	0.45
1:E:83:PRO:HG2	3:E:500:FAD:HM82	1.98	0.45
1:A:279:SER:O	1:A:280:ASN:HB2	2.16	0.45
1:B:92:THR:O	1:B:97:MSE:HE2	2.17	0.45
1:E:28:GLU:OE1	1:E:360:ARG:HD3	2.17	0.45
1:E:78:PRO:HD2	1:E:155:THR:HG22	1.99	0.45
1:A:272:LEU:HD12	1:A:276:LYS:HG3	1.98	0.44
1:D:217:VAL:O	1:D:241:GLN:HA	2.17	0.44
1:B:88:LEU:HD23	1:B:88:LEU:C	2.38	0.44
1:D:315:HIS:HB2	1:D:388:HIS:CD2	2.52	0.44
1:D:90:THR:HA	3:D:500:FAD:O4	2.17	0.44
1:A:326:ILE:HB	1:A:327:PRO:HD3	2.00	0.44
1:D:53:LEU:HD21	1:D:205:ARG:HG3	1.99	0.44
1:E:425:LYS:HB2	1:E:425:LYS:HE3	1.79	0.44
1:A:226:ASP:OD1	1:A:437:ARG:NH2	2.51	0.44
1:D:98:GLY:HA2	1:D:343:PHE:HD2	1.81	0.44
1:E:399:ILE:HG13	1:E:400:ASN:N	2.32	0.44
1:D:237:HIS:HD2	1:D:252:GLU:OE2	2.01	0.44
1:E:217:VAL:O	1:E:241:GLN:HA	2.17	0.44
1:A:89:GLN:HG2	1:A:113:HIS:HA	2.00	0.44
1:D:237:HIS:CD2	1:D:252:GLU:OE2	2.71	0.44
1:E:161:ILE:N	1:E:161:ILE:HD12	2.32	0.43
1:E:39:ARG:HD3	1:E:80:TYR:CD1	2.52	0.43
1:D:318:ASN:N	1:D:373:GLN:HE22	2.15	0.43
1:E:318:ASN:H	1:E:373:GLN:NE2	2.13	0.43
1:A:352:PHE:O	1:A:356:VAL:HG23	2.18	0.43
1:A:71:ILE:N	1:A:71:ILE:CD1	2.81	0.43
1:B:257:VAL:HB	1:B:272:LEU:HD13	1.99	0.43
1:B:28:GLU:OE1	1:B:360:ARG:HD3	2.18	0.43
1:A:78:PRO:HG2	1:A:155:THR:HG23	1.99	0.43
1:A:90:THR:HG23	1:A:112:PRO:O	2.18	0.43
1:E:268:ARG:NH1	6:E:537:HOH:O	2.52	0.43
1:A:103:SER:HB2	6:A:559:HOH:O	2.19	0.43
1:D:96:LEU:HD23	1:D:433:MSE:CE	2.49	0.43
1:B:58:PRO:HG3	1:B:66:LEU:CD2	2.49	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:244:LEU:CD1	1:E:244:LEU:N	2.80	0.43
1:D:200:HIS:CD2	1:D:202:SER:H	2.37	0.42
1:D:71:ILE:N	1:D:71:ILE:HD12	2.34	0.42
1:B:129:LEU:N	1:B:130:PRO:HD2	2.34	0.42
1:B:185:LYS:HG2	1:B:262:LYS:HZ2	1.84	0.42
1:D:403:HIS:O	1:D:407:LYS:HG2	2.20	0.42
1:D:113:HIS:CE1	1:D:114:ARG:HG2	2.54	0.42
1:E:318:ASN:CA	1:E:373:GLN:HE22	2.31	0.42
1:A:248:ASP:C	1:A:250:GLN:HE21	2.22	0.42
1:A:58:PRO:HG3	1:A:66:LEU:CD2	2.50	0.42
1:B:98:GLY:HA2	1:B:343:PHE:CD2	2.53	0.42
1:E:200:HIS:HD2	1:E:202:SER:H	1.65	0.42
1:D:161:ILE:N	1:D:161:ILE:HD12	2.34	0.42
1:D:264:ASP:O	1:D:268:ARG:N	2.51	0.42
1:A:70:PRO:HB3	1:A:80:TYR:CE1	2.54	0.42
1:A:353:LEU:HD11	1:A:357:TRP:CE2	2.55	0.42
1:E:258:PRO:HG2	1:E:272:LEU:HB3	2.01	0.42
1:A:19:LEU:HD13	1:A:125:ALA:HB2	2.02	0.42
1:A:83:PRO:HG2	3:A:500:FAD:HM82	2.01	0.42
1:D:12:ILE:HD12	1:D:138:VAL:HG21	2.01	0.42
1:B:343:PHE:HD1	1:B:343:PHE:N	2.18	0.41
1:D:371:LYS:HB3	1:D:371:LYS:NZ	2.35	0.41
1:D:392:TYR:HA	1:D:395:ASP:OD1	2.20	0.41
1:D:380:LEU:HD11	1:D:387:TYR:HA	2.01	0.41
1:E:53:LEU:HD21	1:E:205:ARG:HG3	2.02	0.41
1:A:425:LYS:HE3	1:A:425:LYS:HB2	1.67	0.41
1:D:114:ARG:HG3	1:D:118:GLN:NE2	2.35	0.41
1:D:58:PRO:HG3	1:D:66:LEU:HD21	2.01	0.41
1:A:96:LEU:HD23	1:A:433:MSE:HE3	2.02	0.41
1:A:129:LEU:N	1:A:130:PRO:HD2	2.35	0.41
1:A:218:VAL:HG22	1:A:218:VAL:O	2.19	0.41
1:E:114:ARG:O	1:E:118:GLN:HG3	2.19	0.41
1:E:257:VAL:HB	1:E:272:LEU:HD13	2.02	0.41
1:A:178:VAL:HA	1:A:179:PRO:HD3	1.95	0.41
1:B:62:THR:CG2	1:B:62:THR:O	2.68	0.41
1:D:257:VAL:CG2	1:D:272:LEU:HD13	2.50	0.41
1:E:258:PRO:HG3	1:E:273:LYS:O	2.20	0.41
1:E:345:THR:O	1:E:349:GLN:HG3	2.21	0.41
1:D:353:LEU:HD11	1:D:357:TRP:CE2	2.55	0.41
1:A:161:ILE:HD12	1:A:161:ILE:N	2.36	0.41
1:B:90:THR:HA	3:B:500:FAD:O4	2.20	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:129:LEU:N	1:D:130:PRO:HD2	2.36	0.41
1:E:399:ILE:HD11	1:E:421:TYR:HA	2.02	0.41
1:A:438:ALA:HA	1:A:443:ILE:HG12	2.02	0.41
1:B:232:THR:HA	1:B:239:ILE:HD11	2.02	0.41
1:D:227:LEU:HD21	1:D:285:ILE:HG21	2.02	0.41
1:E:129:LEU:N	1:E:130:PRO:HD2	2.36	0.40
1:A:211:VAL:O	1:A:211:VAL:HG23	2.20	0.40
1:A:62:THR:CG2	1:A:62:THR:O	2.68	0.40
1:D:70:PRO:HB3	1:D:80:TYR:CE1	2.56	0.40
1:D:211:VAL:HA	1:D:234:VAL:O	2.22	0.40
1:E:200:HIS:HD2	1:E:202:SER:OG	2.03	0.40
1:D:277:VAL:HG13	1:D:277:VAL:O	2.22	0.40
1:D:301:LYS:O	1:D:303:LYS:HG3	2.21	0.40
1:B:251:ASN:O	1:B:255:GLN:NE2	2.43	0.40
1:D:78:PRO:CG	1:D:155:THR:HG23	2.51	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles

### 5.3.1 Protein backbone

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	440/447 (98%)	417 (95%)	22 (5%)	1 (0%)	47	54
1	B	440/447 (98%)	419 (95%)	18 (4%)	3 (1%)	22	21
1	D	440/447 (98%)	419 (95%)	19 (4%)	2 (0%)	29	30
1	E	440/447 (98%)	421 (96%)	15 (3%)	4 (1%)	17	15
All	All	1760/1788 (98%)	1676 (95%)	74 (4%)	10 (1%)	25	25

All (10) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	156	LYS
1	B	156	LYS
1	D	156	LYS
1	E	156	LYS
1	E	195	PRO
1	D	342	PRO
1	E	342	PRO
1	B	195	PRO
1	B	297	PRO
1	E	297	PRO

### 5.3.2 Protein sidechains ⓘ

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	384/385 (100%)	372 (97%)	12 (3%)	40	50
1	B	384/385 (100%)	371 (97%)	13 (3%)	37	46
1	D	384/385 (100%)	372 (97%)	12 (3%)	40	50
1	E	384/385 (100%)	373 (97%)	11 (3%)	42	53
All	All	1536/1540 (100%)	1488 (97%)	48 (3%)	40	50

All (48) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	91	ASN
1	A	96	LEU
1	A	143	LYS
1	A	150	VAL
1	A	155	THR
1	A	165	ILE
1	A	195	PRO
1	A	218	VAL
1	A	237	HIS
1	A	238	PRO
1	A	250	GLN
1	A	399	ILE

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Mol	Chain	Res	Type
1	B	91	ASN
1	B	96	LEU
1	B	143	LYS
1	B	150	VAL
1	B	155	THR
1	B	165	ILE
1	B	195	PRO
1	B	218	VAL
1	B	237	HIS
1	B	268	ARG
1	B	306	GLU
1	B	311	ASP
1	B	399	ILE
1	D	91	ASN
1	D	96	LEU
1	D	143	LYS
1	D	150	VAL
1	D	155	THR
1	D	165	ILE
1	D	195	PRO
1	D	218	VAL
1	D	237	HIS
1	D	250	GLN
1	D	311	ASP
1	D	399	ILE
1	E	91	ASN
1	E	143	LYS
1	E	150	VAL
1	E	155	THR
1	E	165	ILE
1	E	195	PRO
1	E	218	VAL
1	E	237	HIS
1	E	250	GLN
1	E	311	ASP
1	E	399	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (36) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	48	ASN
1	A	91	ASN

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Mol	Chain	Res	Type
1	A	118	GLN
1	A	121	GLN
1	A	200	HIS
1	A	237	HIS
1	A	250	GLN
1	A	251	ASN
1	A	373	GLN
1	B	48	ASN
1	B	91	ASN
1	B	118	GLN
1	B	121	GLN
1	B	200	HIS
1	B	237	HIS
1	B	250	GLN
1	B	251	ASN
1	B	373	GLN
1	D	48	ASN
1	D	91	ASN
1	D	118	GLN
1	D	121	GLN
1	D	200	HIS
1	D	237	HIS
1	D	250	GLN
1	D	251	ASN
1	D	373	GLN
1	E	48	ASN
1	E	91	ASN
1	E	118	GLN
1	E	121	GLN
1	E	200	HIS
1	E	237	HIS
1	E	250	GLN
1	E	251	ASN
1	E	373	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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](#)

16 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	FAD	B	500	-	51,58,58	2.87	16 (31%)	60,89,89	2.31	13 (21%)
3	FAD	D	500	-	51,58,58	2.88	16 (31%)	60,89,89	2.34	12 (20%)
5	GOL	B	502	-	5,5,5	0.37	0	5,5,5	0.69	0
4	MMZ	A	501	-	6,7,7	3.11	3 (50%)	5,9,9	4.27	3 (60%)
2	PEO	D	503	-	1,1,1	0.48	0	-		
2	PEO	E	503	-	1,1,1	0.66	0	-		
4	MMZ	D	501	-	6,7,7	3.49	3 (50%)	5,9,9	4.52	3 (60%)
4	MMZ	E	501	-	6,7,7	3.03	3 (50%)	5,9,9	3.63	3 (60%)
4	MMZ	B	501	-	6,7,7	3.42	3 (50%)	5,9,9	3.57	3 (60%)
2	PEO	A	503	-	1,1,1	0.72	0	-		
3	FAD	E	500	-	51,58,58	2.75	16 (31%)	60,89,89	2.35	12 (20%)
5	GOL	E	502	-	5,5,5	0.22	0	5,5,5	0.61	0
2	PEO	B	503	-	1,1,1	0.53	0	-		
5	GOL	A	502	-	5,5,5	0.27	0	5,5,5	0.58	0
3	FAD	A	500	-	51,58,58	2.81	16 (31%)	60,89,89	2.34	11 (18%)
5	GOL	D	502	-	5,5,5	0.34	0	5,5,5	0.63	0

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	FAD	B	500	-	-	11/30/50/50	0/6/6/6

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	FAD	D	500	-	-	12/30/50/50	0/6/6/6
5	GOL	B	502	-	-	0/4/4/4	-
4	MMZ	A	501	-	-	-	0/1/1/1
4	MMZ	B	501	-	-	-	0/1/1/1
4	MMZ	D	501	-	-	-	0/1/1/1
4	MMZ	E	501	-	-	-	0/1/1/1
3	FAD	A	500	-	-	12/30/50/50	0/6/6/6
3	FAD	E	500	-	-	12/30/50/50	0/6/6/6
5	GOL	E	502	-	-	0/4/4/4	-
5	GOL	A	502	-	-	0/4/4/4	-
5	GOL	D	502	-	-	0/4/4/4	-

All (76) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	500	FAD	C9A-N10	8.79	1.50	1.38
3	E	500	FAD	C9A-N10	8.40	1.49	1.38
3	D	500	FAD	C9A-N10	8.36	1.49	1.38
3	A	500	FAD	C9A-N10	7.79	1.49	1.38
3	D	500	FAD	C4X-N5	7.65	1.44	1.33
3	A	500	FAD	C4X-N5	7.54	1.44	1.33
3	B	500	FAD	C4X-N5	7.48	1.44	1.33
3	E	500	FAD	C4X-N5	7.29	1.43	1.33
4	B	501	MMZ	C3A-C1A	-7.00	1.40	1.52
4	D	501	MMZ	C3A-C1A	-6.97	1.40	1.52
3	D	500	FAD	C4A-N3A	6.86	1.45	1.35
3	B	500	FAD	C4A-N3A	6.80	1.45	1.35
4	E	501	MMZ	C3A-C1A	-6.48	1.41	1.52
3	A	500	FAD	C4A-N3A	6.45	1.44	1.35
4	A	501	MMZ	C3A-C1A	-6.26	1.41	1.52
3	E	500	FAD	C4A-N3A	6.13	1.44	1.35
3	B	500	FAD	C2A-N3A	6.07	1.41	1.32
3	D	500	FAD	C2A-N3A	5.95	1.41	1.32
3	E	500	FAD	C2A-N3A	5.73	1.41	1.32
3	A	500	FAD	C2A-N3A	5.72	1.41	1.32
3	D	500	FAD	C4-N3	5.56	1.42	1.33
3	D	500	FAD	P-O5'	5.49	1.81	1.59
3	A	500	FAD	C4-N3	5.47	1.42	1.33
3	B	500	FAD	C4-N3	5.26	1.42	1.33
3	A	500	FAD	P-O5'	5.19	1.80	1.59
3	E	500	FAD	P-O5'	5.14	1.80	1.59
3	B	500	FAD	P-O5'	5.10	1.80	1.59

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	E	500	FAD	C4-N3	5.03	1.41	1.33
3	A	500	FAD	C1'-N10	-4.80	1.43	1.48
3	B	500	FAD	C1'-N10	-4.65	1.43	1.48
3	A	500	FAD	C5X-N5	4.45	1.42	1.35
3	D	500	FAD	C5X-N5	4.40	1.42	1.35
3	D	500	FAD	C10-N1	4.29	1.38	1.33
3	D	500	FAD	C1'-N10	-4.28	1.43	1.48
3	B	500	FAD	C5X-N5	4.21	1.42	1.35
3	E	500	FAD	C5X-N5	4.14	1.42	1.35
3	D	500	FAD	C4X-C10	4.13	1.43	1.38
3	E	500	FAD	C1'-N10	-4.11	1.44	1.48
3	B	500	FAD	C10-N1	3.98	1.38	1.33
3	E	500	FAD	C4X-C10	3.85	1.42	1.38
4	D	501	MMZ	C2-S2	3.81	1.74	1.67
4	B	501	MMZ	C2-S2	3.80	1.74	1.67
3	E	500	FAD	C10-N1	3.79	1.38	1.33
3	A	500	FAD	C10-N1	3.70	1.38	1.33
3	A	500	FAD	C4X-C10	3.62	1.42	1.38
3	B	500	FAD	C5A-C4A	-3.50	1.31	1.40
3	A	500	FAD	C5A-C4A	-3.47	1.31	1.40
3	A	500	FAD	C5'-C4'	-3.46	1.46	1.51
3	E	500	FAD	C5A-C4A	-3.35	1.32	1.40
3	B	500	FAD	C4X-C10	3.30	1.42	1.38
3	D	500	FAD	C5A-C4A	-3.22	1.32	1.40
3	B	500	FAD	C5'-C4'	-3.17	1.47	1.51
4	A	501	MMZ	C1A-N1	-3.15	1.39	1.46
3	D	500	FAD	C5'-C4'	-3.14	1.47	1.51
3	D	500	FAD	C9A-C5X	3.05	1.48	1.42
3	E	500	FAD	C9A-C5X	2.92	1.48	1.42
3	B	500	FAD	C9A-C5X	2.79	1.48	1.42
3	A	500	FAD	C9A-C5X	2.73	1.48	1.42
3	A	500	FAD	C2B-C3B	-2.55	1.46	1.53
3	B	500	FAD	C2B-C3B	-2.54	1.46	1.53
3	E	500	FAD	C5'-C4'	-2.50	1.48	1.51
3	E	500	FAD	C2B-C3B	-2.47	1.46	1.53
4	D	501	MMZ	C1A-N1	-2.40	1.41	1.46
4	E	501	MMZ	C1A-N1	-2.29	1.41	1.46
3	D	500	FAD	C2B-C3B	-2.28	1.47	1.53
4	A	501	MMZ	C2-S2	2.22	1.71	1.67
3	A	500	FAD	C8A-N7A	-2.21	1.30	1.34
4	E	501	MMZ	C2-S2	2.19	1.71	1.67
3	E	500	FAD	C8A-N7A	-2.19	1.30	1.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	E	500	FAD	C6-C7	2.17	1.43	1.37
3	D	500	FAD	C8A-N7A	-2.15	1.30	1.34
3	D	500	FAD	C6-C7	2.14	1.43	1.37
3	B	500	FAD	C2'-C3'	-2.12	1.49	1.53
3	B	500	FAD	C8A-N7A	-2.08	1.31	1.34
4	B	501	MMZ	C1A-N1	-2.08	1.41	1.46
3	A	500	FAD	C6-C7	2.01	1.42	1.37

All (60) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	E	500	FAD	C4-N3-C2	12.67	125.84	115.14
3	D	500	FAD	C4-N3-C2	12.51	125.71	115.14
3	A	500	FAD	C4-N3-C2	12.46	125.66	115.14
3	B	500	FAD	C4-N3-C2	12.19	125.43	115.14
4	D	501	MMZ	C4-N3-C2	8.02	133.04	126.52
4	A	501	MMZ	C4-N3-C2	7.43	132.57	126.52
3	A	500	FAD	C4X-C4-N3	-6.64	114.36	123.43
3	D	500	FAD	C4X-C4-N3	-6.45	114.60	123.43
3	E	500	FAD	C4X-C4-N3	-6.40	114.68	123.43
3	B	500	FAD	C4X-C4-N3	-6.16	115.01	123.43
4	E	501	MMZ	C4-N3-C2	5.88	131.31	126.52
4	B	501	MMZ	C4-N3-C2	5.60	131.08	126.52
4	D	501	MMZ	C3A-C1A-N1	5.48	108.62	102.54
4	B	501	MMZ	C3A-C1A-N1	5.20	108.31	102.54
4	A	501	MMZ	C3A-C1A-N1	5.14	108.24	102.54
4	E	501	MMZ	C3A-C1A-N1	4.88	107.95	102.54
3	B	500	FAD	C5X-C9A-N10	-4.72	114.29	117.72
3	E	500	FAD	C5X-C9A-N10	-4.42	114.51	117.72
3	A	500	FAD	C5X-C9A-N10	-4.38	114.54	117.72
3	D	500	FAD	C5X-C9A-N10	-4.20	114.67	117.72
3	D	500	FAD	P-O5'-C5'	4.06	145.50	121.68
3	E	500	FAD	P-O5'-C5'	3.80	143.97	121.68
3	A	500	FAD	P-O5'-C5'	3.79	143.90	121.68
3	B	500	FAD	P-O5'-C5'	3.65	143.07	121.68
3	E	500	FAD	O5'-P-O1P	3.10	121.19	109.07
3	D	500	FAD	O3'-C3'-C4'	-3.09	101.34	108.81
3	A	500	FAD	O5'-P-O1P	3.05	120.98	109.07
3	B	500	FAD	O5'-P-O1P	3.04	120.95	109.07
3	D	500	FAD	O5'-P-O1P	3.00	120.79	109.07
3	E	500	FAD	O3'-C3'-C4'	-2.97	101.65	108.81
3	A	500	FAD	O3'-C3'-C4'	-2.95	101.68	108.81

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	500	FAD	O3'-C3'-C4'	-2.95	101.68	108.81
3	B	500	FAD	O2B-C2B-C3B	2.86	121.06	111.82
4	A	501	MMZ	C1A-C3A-N3	2.80	105.16	103.06
3	A	500	FAD	C3B-C2B-C1B	2.73	105.09	100.98
3	E	500	FAD	O2B-C2B-C3B	2.71	120.58	111.82
3	B	500	FAD	N3A-C2A-N1A	-2.66	124.53	128.68
4	E	501	MMZ	C1A-C3A-N3	2.60	105.00	103.06
4	D	501	MMZ	C1A-C3A-N3	2.57	104.99	103.06
3	A	500	FAD	O2B-C2B-C3B	2.55	120.08	111.82
3	D	500	FAD	N3A-C2A-N1A	-2.54	124.70	128.68
3	E	500	FAD	O2'-C2'-C1'	-2.54	103.48	109.59
3	A	500	FAD	N3A-C2A-N1A	-2.53	124.72	128.68
3	B	500	FAD	C4'-C3'-C2'	2.53	118.62	113.36
3	B	500	FAD	C10-C4X-N5	2.52	123.00	121.26
3	D	500	FAD	O2'-C2'-C1'	-2.51	103.54	109.59
3	E	500	FAD	C4'-C3'-C2'	2.48	118.51	113.36
3	E	500	FAD	C10-C4X-N5	2.44	122.94	121.26
3	E	500	FAD	C3B-C2B-C1B	2.39	104.58	100.98
3	B	500	FAD	O2'-C2'-C1'	-2.39	103.84	109.59
3	A	500	FAD	O2'-C2'-C1'	-2.39	103.84	109.59
3	E	500	FAD	N3A-C2A-N1A	-2.38	124.95	128.68
3	D	500	FAD	C10-C4X-N5	2.36	122.89	121.26
3	D	500	FAD	O2B-C2B-C3B	2.36	119.46	111.82
3	D	500	FAD	C4'-C3'-C2'	2.27	118.08	113.36
4	B	501	MMZ	C1A-C3A-N3	2.20	104.70	103.06
3	D	500	FAD	C3B-C2B-C1B	2.18	104.26	100.98
3	B	500	FAD	C3B-C2B-C1B	2.12	104.17	100.98
3	B	500	FAD	O4B-C1B-C2B	-2.11	103.84	106.93
3	A	500	FAD	C4'-C3'-C2'	2.09	117.71	113.36

There are no chirality outliers.

All (47) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	500	FAD	N10-C1'-C2'-O2'
3	B	500	FAD	N10-C1'-C2'-C3'
3	B	500	FAD	C5'-O5'-P-O2P
3	D	500	FAD	N10-C1'-C2'-O2'
3	D	500	FAD	N10-C1'-C2'-C3'
3	D	500	FAD	O4'-C4'-C5'-O5'
3	D	500	FAD	C5'-O5'-P-O1P
3	D	500	FAD	C5'-O5'-P-O2P

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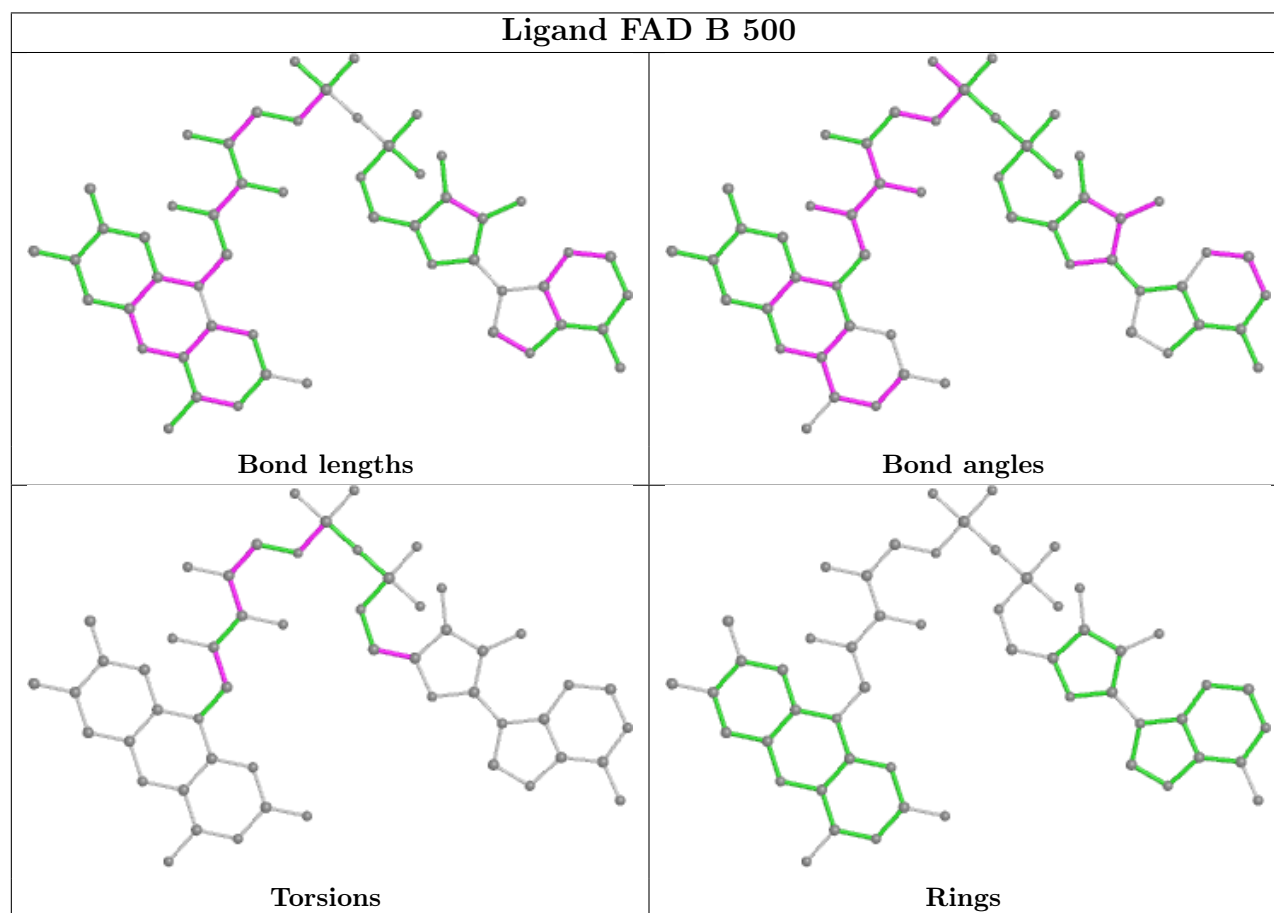
Mol	Chain	Res	Type	Atoms
3	A	500	FAD	N10-C1'-C2'-O2'
3	A	500	FAD	N10-C1'-C2'-C3'
3	A	500	FAD	O4'-C4'-C5'-O5'
3	A	500	FAD	C5'-O5'-P-O1P
3	A	500	FAD	C5'-O5'-P-O2P
3	E	500	FAD	N10-C1'-C2'-O2'
3	E	500	FAD	N10-C1'-C2'-C3'
3	E	500	FAD	O4'-C4'-C5'-O5'
3	E	500	FAD	C5'-O5'-P-O1P
3	E	500	FAD	C5'-O5'-P-O2P
3	D	500	FAD	O3'-C3'-C4'-O4'
3	D	500	FAD	C2'-C3'-C4'-O4'
3	D	500	FAD	O3'-C3'-C4'-C5'
3	A	500	FAD	O3'-C3'-C4'-C5'
3	D	500	FAD	C2'-C3'-C4'-C5'
3	A	500	FAD	C2'-C3'-C4'-C5'
3	A	500	FAD	C2'-C3'-C4'-O4'
3	A	500	FAD	O3'-C3'-C4'-O4'
3	E	500	FAD	O3'-C3'-C4'-O4'
3	B	500	FAD	O3'-C3'-C4'-O4'
3	E	500	FAD	O3'-C3'-C4'-C5'
3	D	500	FAD	C3'-C4'-C5'-O5'
3	A	500	FAD	C3'-C4'-C5'-O5'
3	B	500	FAD	O3'-C3'-C4'-C5'
3	B	500	FAD	O4'-C4'-C5'-O5'
3	B	500	FAD	C2'-C3'-C4'-C5'
3	E	500	FAD	C2'-C3'-C4'-C5'
3	B	500	FAD	C5'-O5'-P-O3P
3	E	500	FAD	C5'-O5'-P-O3P
3	B	500	FAD	C5'-O5'-P-O1P
3	E	500	FAD	C2'-C3'-C4'-O4'
3	A	500	FAD	O4B-C4B-C5B-O5B
3	B	500	FAD	O4B-C4B-C5B-O5B
3	D	500	FAD	C5'-O5'-P-O3P
3	A	500	FAD	C5'-O5'-P-O3P
3	E	500	FAD	C3'-C4'-C5'-O5'
3	D	500	FAD	O4B-C4B-C5B-O5B
3	E	500	FAD	O4B-C4B-C5B-O5B
3	B	500	FAD	C2'-C3'-C4'-O4'

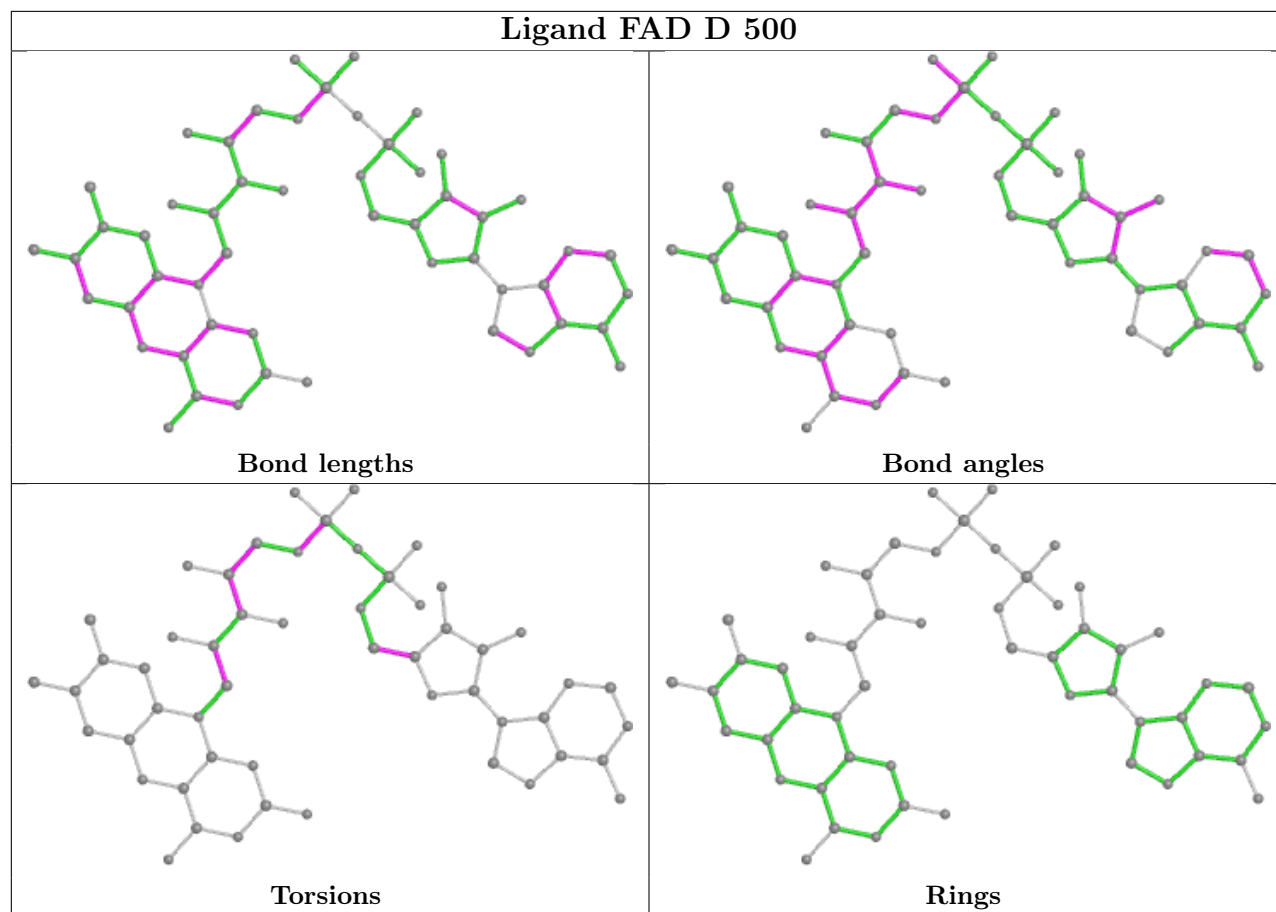
There are no ring outliers.

4 monomers are involved in 10 short contacts:

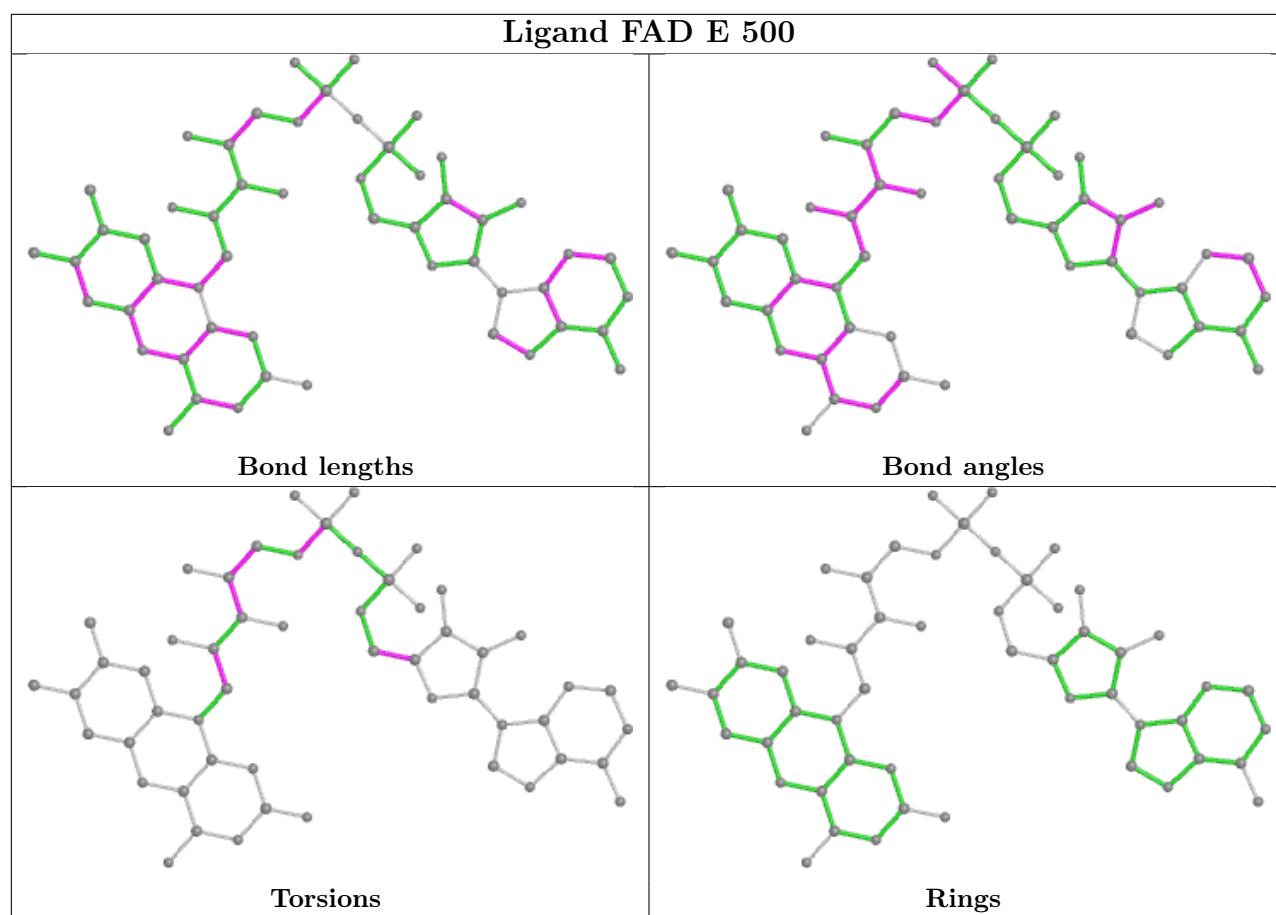
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	500	FAD	2	0
3	D	500	FAD	3	0
3	E	500	FAD	2	0
3	A	500	FAD	3	0

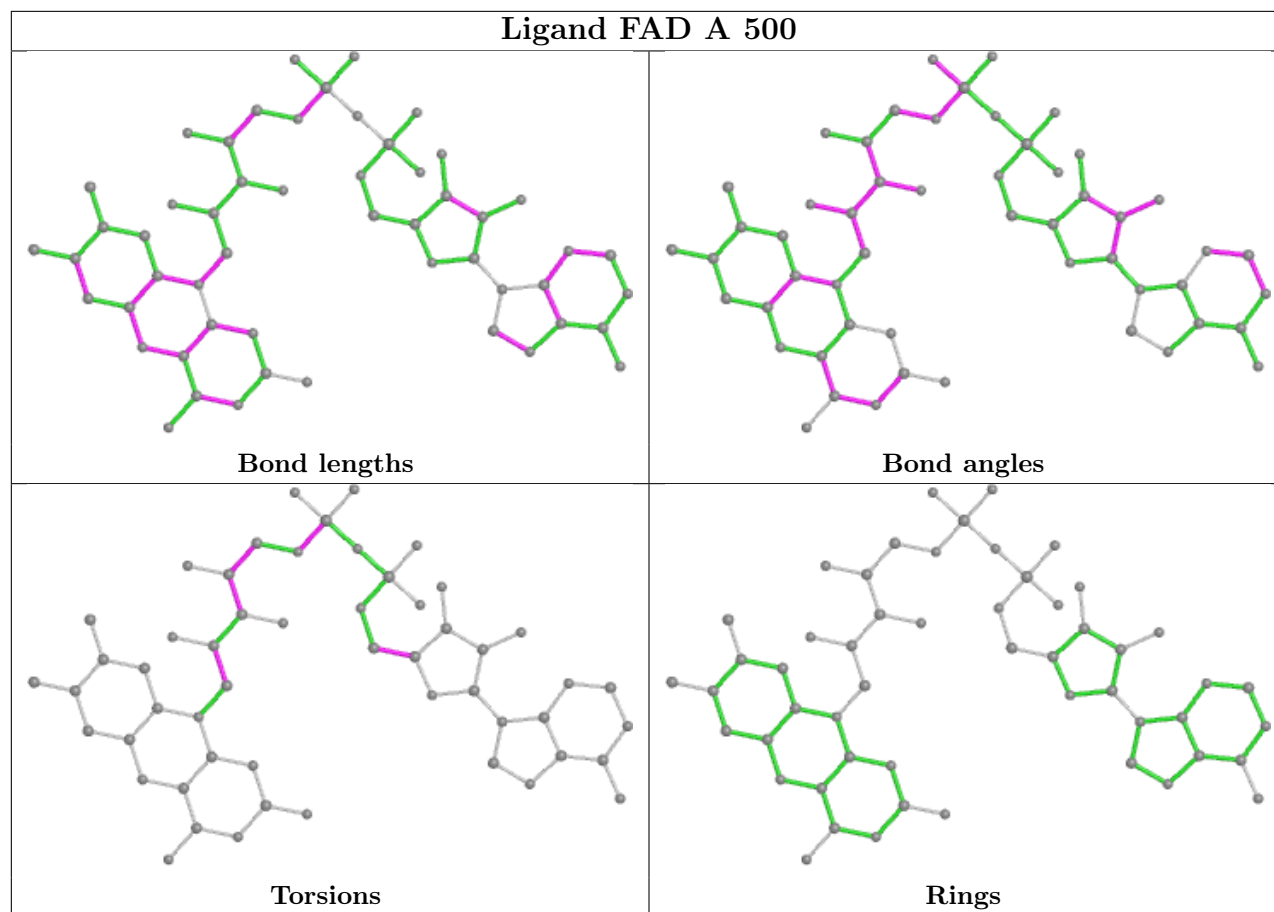
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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	438/447 (97%)	0.06	11 (2%) 57 55	9, 26, 41, 50	0
1	B	438/447 (97%)	0.02	14 (3%) 47 45	11, 27, 41, 50	0
1	D	438/447 (97%)	-0.04	8 (1%) 68 66	11, 26, 40, 50	0
1	E	438/447 (97%)	-0.06	7 (1%) 72 70	10, 26, 40, 50	0
All	All	1752/1788 (97%)	-0.01	40 (2%) 60 58	9, 26, 41, 50	0

All (40) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	3	LEU	6.6
1	B	3	LEU	6.4
1	D	3	LEU	5.7
1	E	3	LEU	5.4
1	D	4	PRO	4.6
1	D	244	LEU	4.4
1	A	4	PRO	4.1
1	B	4	PRO	4.0
1	E	4	PRO	4.0
1	B	244	LEU	3.8
1	D	262	LYS	3.4
1	D	271	TYR	3.3
1	A	275	GLY	3.3
1	E	444	GLU	3.1
1	B	158	GLY	3.1
1	E	157	ALA	3.0
1	B	367	GLU	2.9
1	B	444	GLU	2.8
1	A	270	ILE	2.8
1	A	244	LEU	2.7
1	B	443	ILE	2.7

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Mol	Chain	Res	Type	RSRZ
1	D	444	GLU	2.7
1	D	266	THR	2.7
1	A	279	SER	2.7
1	A	240	TYR	2.6
1	B	248	ASP	2.5
1	B	262	LYS	2.5
1	B	266	THR	2.5
1	B	157	ALA	2.4
1	B	405	TRP	2.4
1	E	248	ASP	2.4
1	A	280	ASN	2.3
1	D	145	ASP	2.3
1	E	158	GLY	2.3
1	B	439	LYS	2.3
1	E	367	GLU	2.3
1	B	195	PRO	2.2
1	A	158	GLY	2.1
1	A	444	GLU	2.1
1	A	266	THR	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( $\text{\AA}^2$ )	Q<0.9
4	MMZ	E	501	7/7	0.77	0.24	48,50,51,52	0
4	MMZ	A	501	7/7	0.78	0.26	48,50,51,52	0
2	PEO	E	503	2/2	0.81	0.40	43,43,43,43	0
2	PEO	D	503	2/2	0.82	0.34	43,43,43,44	0

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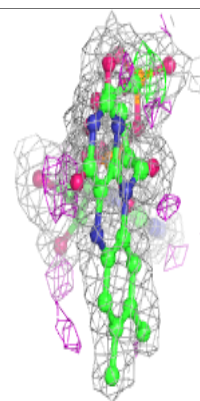
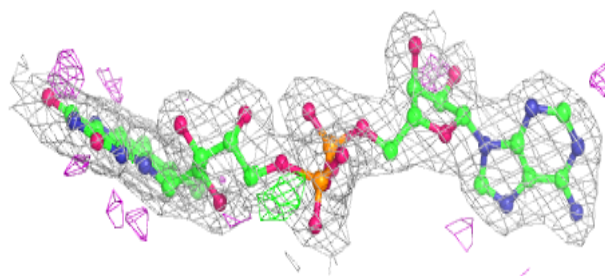
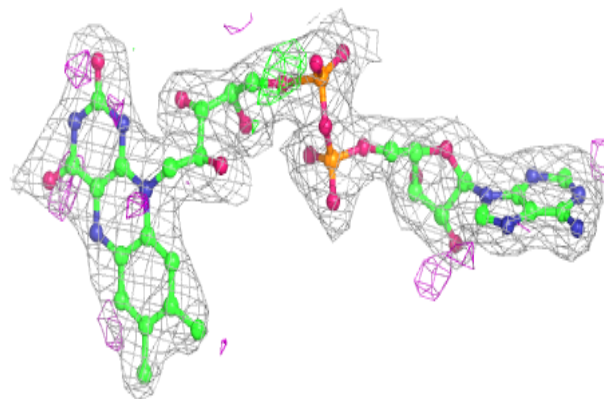
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
2	PEO	B	503	2/2	0.82	0.35	41,41,41,43	0
2	PEO	A	503	2/2	0.84	0.36	45,45,45,46	0
4	MMZ	D	501	7/7	0.86	0.23	48,50,52,52	0
4	MMZ	B	501	7/7	0.87	0.18	49,50,52,53	0
5	GOL	B	502	6/6	0.93	0.17	15,16,17,18	0
5	GOL	E	502	6/6	0.96	0.18	15,16,17,20	0
5	GOL	A	502	6/6	0.96	0.17	18,18,19,20	0
3	FAD	E	500	53/53	0.96	0.17	10,18,22,23	0
3	FAD	A	500	53/53	0.97	0.17	12,19,21,22	0
3	FAD	B	500	53/53	0.97	0.17	11,19,23,24	0
3	FAD	D	500	53/53	0.97	0.17	11,18,22,22	0
5	GOL	D	502	6/6	0.97	0.16	15,15,17,18	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.

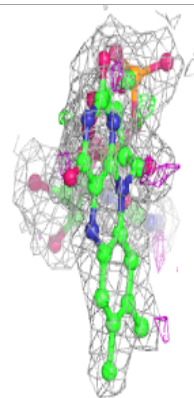
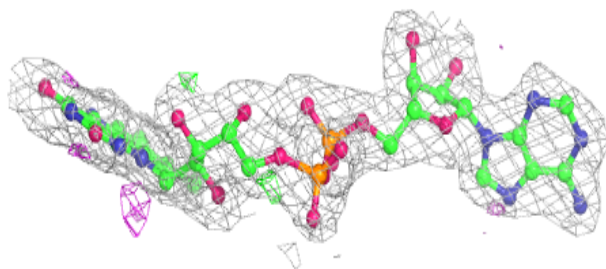
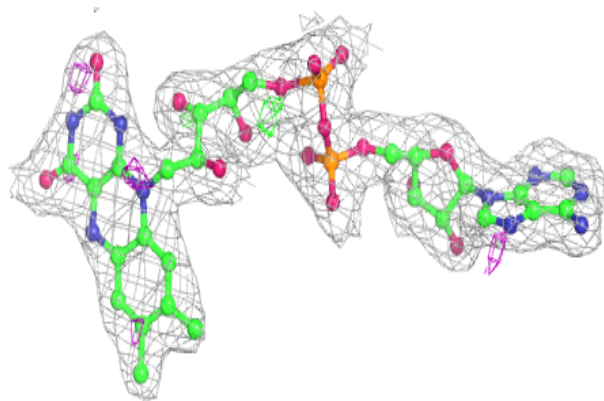
#### Electron density around FAD E 500:

2mF<sub>o</sub>-DF<sub>c</sub> (at 0.7 rmsd) in gray  
mF<sub>o</sub>-DF<sub>c</sub> (at 3 rmsd) in purple (negative)  
and green (positive)

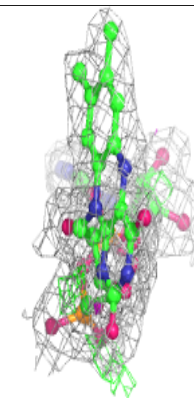
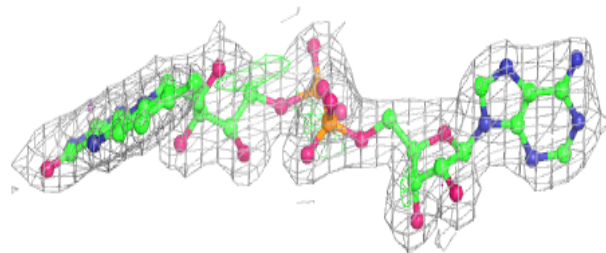
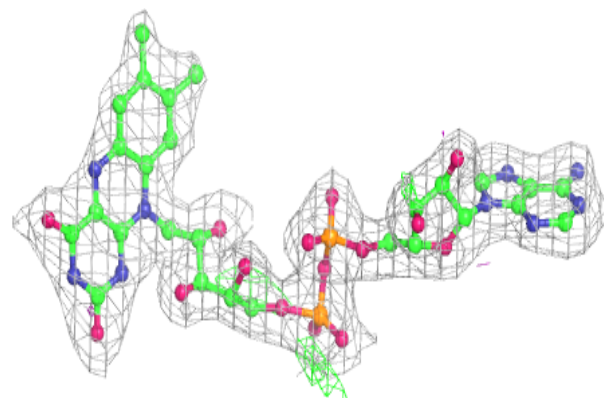


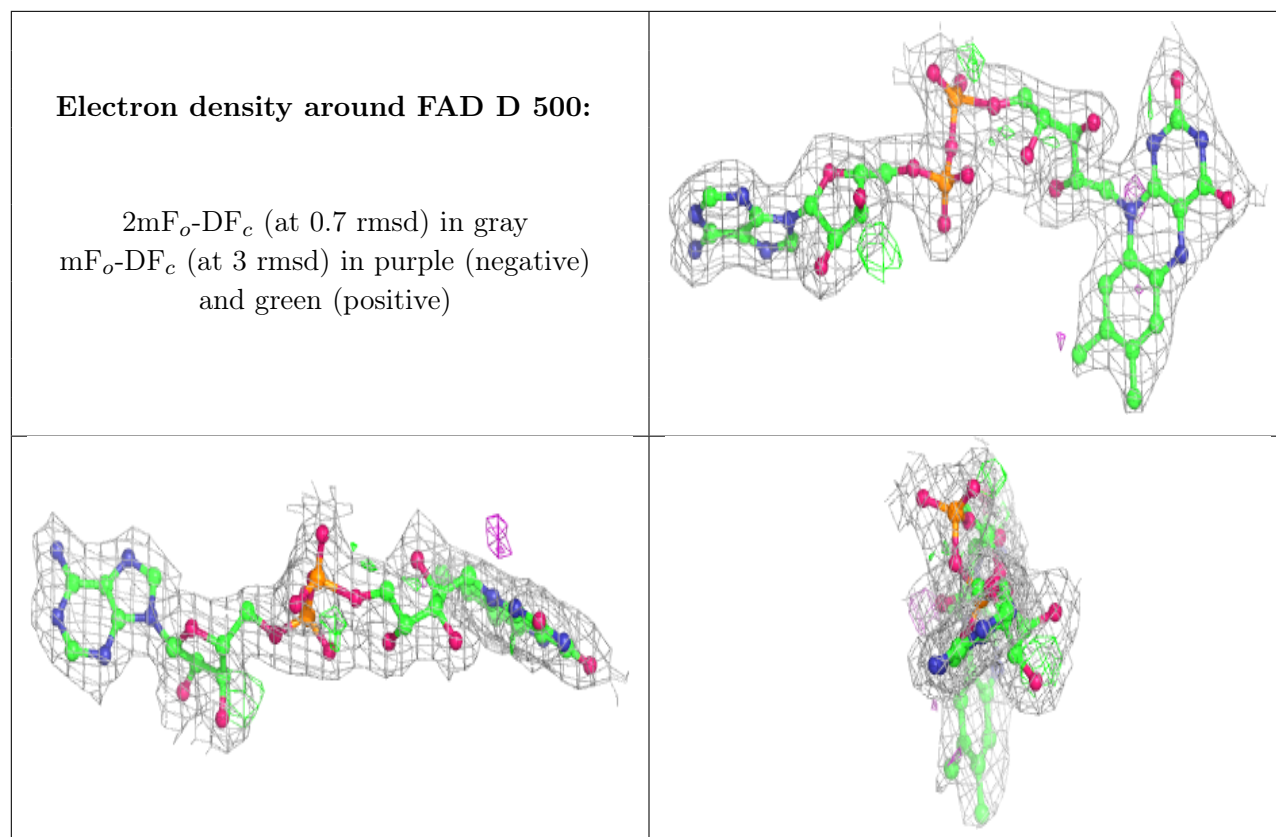
**Electron density around FAD A 500:**

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

**Electron density around FAD B 500:**

$2mF_o-DF_c$  (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.