



# Full wwPDB X-ray Structure Validation Report ⓘ

Aug 23, 2023 – 11:10 AM EDT

PDB ID : 3CNP  
Title : Crystal structure of fms1 in complex with S-N1-AcMeSpermidine  
Authors : Huang, Q.; Hao, Q.  
Deposited on : 2008-03-26  
Resolution : 2.50 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.35  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.35

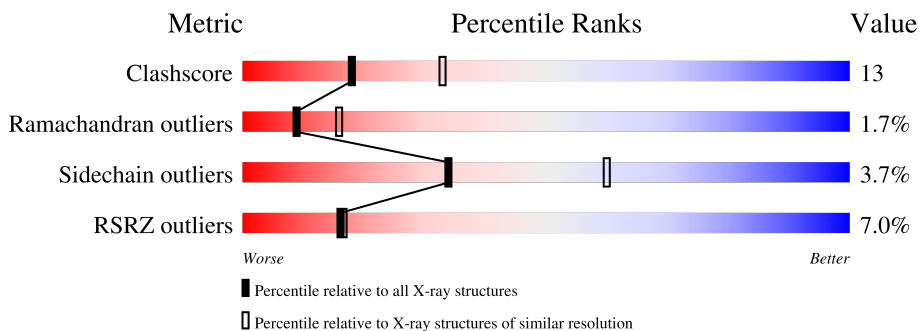
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.50 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))
Clashscore	141614	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)
RSRZ outliers	127900	4559 (2.50-2.50)

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	516	 5% 72% 22% . .
1	B	516	 8% 68% 26% . .

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	SP7	A	518	-	-	X	-
3	SP7	B	518	-	-	X	-

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<b>Mol</b>	<b>Type</b>	<b>Chain</b>	<b>Res</b>	<b>Chirality</b>	<b>Geometry</b>	<b>Clashes</b>	<b>Electron density</b>
4	GOL	A	519	-	-	X	-

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 8095 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 fms1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	B	499	3914	2472	680	740	22	0	0	0
1	A	493	3886	2458	675	731	22	0	0	0

There are 16 discrepancies between the modelled and reference sequences:

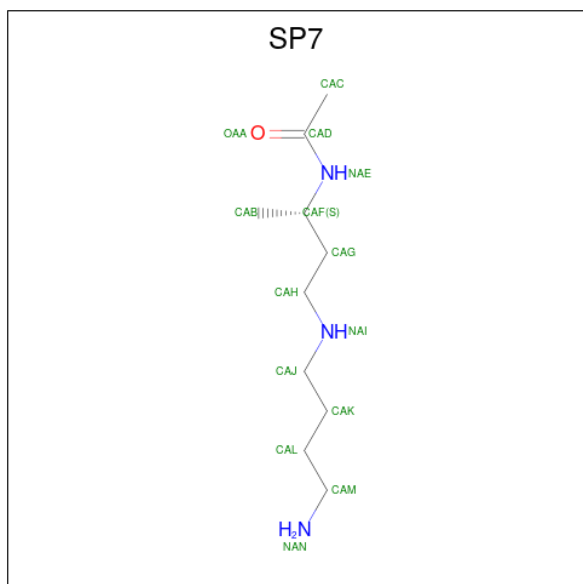
Chain	Residue	Modelled	Actual	Comment	Reference
B	509	LEU	-	insertion	UNP P50264
B	510	GLU	-	insertion	UNP P50264
B	511	HIS	-	insertion	UNP P50264
B	512	HIS	-	insertion	UNP P50264
B	513	HIS	-	insertion	UNP P50264
B	514	HIS	-	insertion	UNP P50264
B	515	HIS	-	insertion	UNP P50264
B	516	HIS	-	insertion	UNP P50264
A	509	LEU	-	insertion	UNP P50264
A	510	GLU	-	insertion	UNP P50264
A	511	HIS	-	insertion	UNP P50264
A	512	HIS	-	insertion	UNP P50264
A	513	HIS	-	insertion	UNP P50264
A	514	HIS	-	insertion	UNP P50264
A	515	HIS	-	insertion	UNP P50264
A	516	HIS	-	insertion	UNP P50264

- 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	B	1	53	27	9	15	2	0	0
2	A	1	53	27	9	15	2	0	0

- Molecule 3 is N-{(1S)-3-[(4-aminobutyl)amino]-1-methylpropyl}acetamide (three-letter code: SP7) (formula: C<sub>10</sub>H<sub>23</sub>N<sub>3</sub>O).



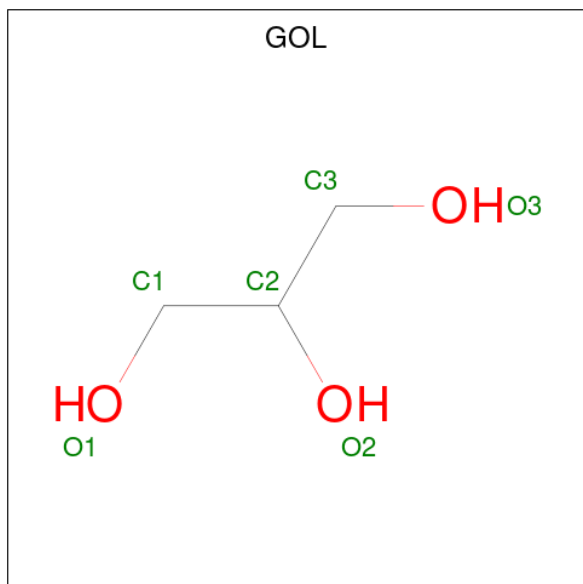
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
3	B	1	14	10	3	1	0	0

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
3	A	1	14	10	3	1	0	0

- Molecule 4 is GLYCEROL (three-letter code: GOL) (formula:  $C_3H_8O_3$ ).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
4	A	1	6	3	3	0	0

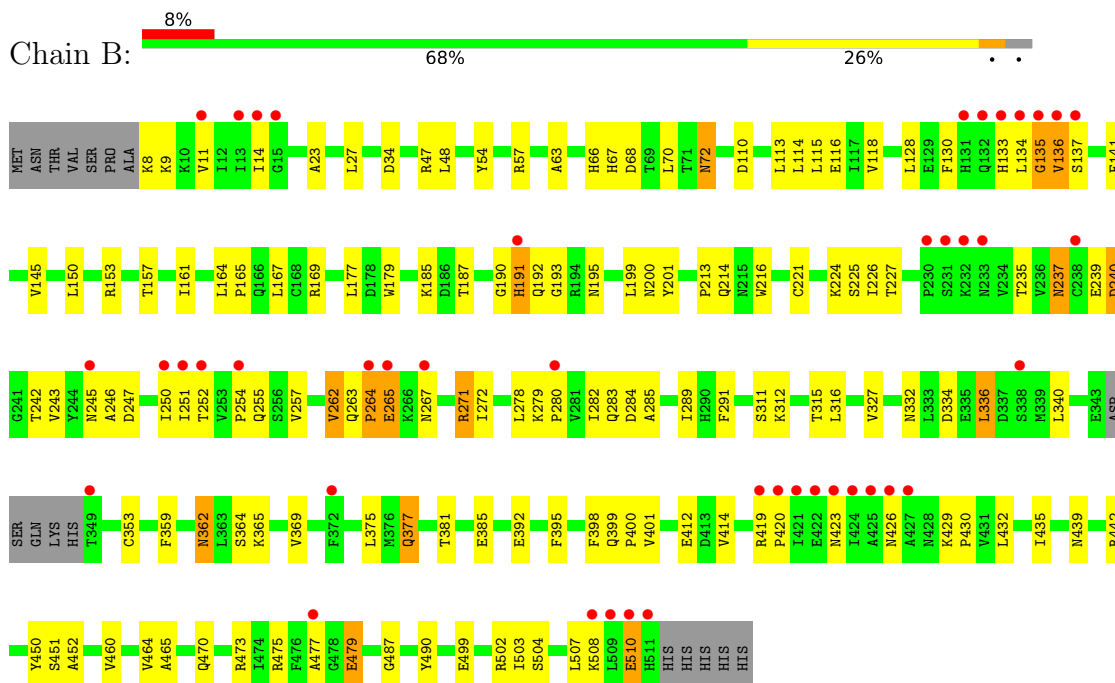
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
5	B	68	68	68	0	0
5	A	87	87	87	0	0

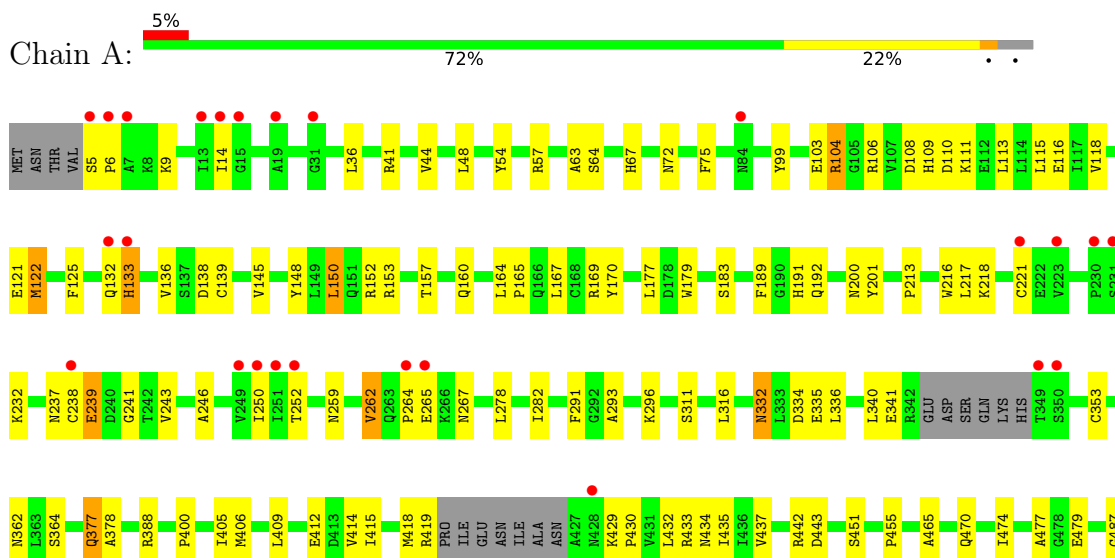
### 3 Residue-property plots

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: fms1



- Molecule 1: fms1



I503	K508	L509	E510	HIS	HIS	HIS	HIS	HIS	HIS
S504									



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	102.21Å 215.20Å 117.59Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	31.70 – 2.50 31.68 – 1.95	Depositor EDS
% Data completeness (in resolution range)	99.6 (31.70-2.50) 99.0 (31.68-1.95)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	0.08	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.92 (at 1.95Å)	Xtrriage
Refinement program	CNS, REFMAC	Depositor
R, $R_{free}$	0.216 , 0.267 0.210 , (Not available)	Depositor DCC
$R_{free}$ test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	36.8	Xtrriage
Anisotropy	0.716	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 45.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	8095	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	42.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.36% 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: GOL, FAD, SP7

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	0/3965	0.61	1/5361 (0.0%)
1	B	0.36	0/3995	0.59	1/5405 (0.0%)
All	All	0.37	0/7960	0.60	2/10766 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	238	CYS	CA-CB-SG	5.52	123.93	114.00
1	B	66	HIS	N-CA-C	-5.26	96.80	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	3886	0	3772	91	0
1	B	3914	0	3759	116	0
2	A	53	0	31	3	0
2	B	53	0	31	2	0
3	A	14	0	23	14	0
3	B	14	0	23	8	0
4	A	6	0	8	4	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	87	0	0	0	0
5	B	68	0	0	0	0
All	All	8095	0	7647	210	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 (210) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:487:GLY:O	3:A:518:SP7:HAB	1.50	1.12
1:B:451:SER:O	3:B:518:SP7:HABB	1.55	1.04
1:A:487:GLY:C	3:A:518:SP7:HAB	1.82	0.98
1:A:103:GLU:HG3	1:A:104:ARG:H	1.33	0.93
1:B:451:SER:O	3:B:518:SP7:CAB	2.18	0.91
1:B:278:LEU:HA	1:B:470:GLN:HE22	1.37	0.88
1:B:224:LYS:HE2	1:B:224:LYS:HA	1.55	0.88
1:A:353:CYS:SG	1:A:400:PRO:HG2	2.17	0.85
1:B:237:ASN:HB3	1:B:243:VAL:HG22	1.58	0.84
1:A:487:GLY:O	3:A:518:SP7:CAB	2.28	0.81
1:B:353:CYS:SG	1:B:400:PRO:HG2	2.25	0.76
1:B:423:ASN:HD22	1:B:426:ASN:ND2	1.84	0.76
3:A:518:SP7:HACA	4:A:519:GOL:O2	1.86	0.76
1:B:252:THR:HG22	1:B:477:ALA:HB3	1.68	0.75
1:A:150:LEU:O	1:A:153:ARG:HD2	1.87	0.74
3:A:518:SP7:HAC	3:A:518:SP7:HABB	1.69	0.74
1:B:8:LYS:N	1:B:245:ASN:HD21	1.86	0.73
1:B:315:THR:HG21	1:B:401:VAL:CG2	2.18	0.72
1:A:418:MET:O	1:A:419:ARG:HG3	1.91	0.70
1:B:278:LEU:HA	1:B:470:GLN:NE2	2.07	0.70
1:A:377:GLN:NE2	1:A:377:GLN:H	1.90	0.69
1:B:67:HIS:NE2	3:B:518:SP7:HAL	2.07	0.69
1:B:315:THR:HG21	1:B:401:VAL:HG22	1.74	0.69
1:A:332:ASN:ND2	1:A:335:GLU:H	1.92	0.68
1:A:213:PRO:O	1:A:216:TRP:HB2	1.95	0.66
1:A:264:PRO:O	1:A:265:GLU:HB3	1.95	0.66
1:B:247:ASP:O	1:B:473:ARG:HD2	1.95	0.65
1:B:9:LYS:O	1:B:246:ALA:HA	1.96	0.65
1:A:442:ARG:HG2	1:A:442:ARG:HH11	1.62	0.65
1:B:48:LEU:CD2	1:B:63:ALA:HB3	2.28	0.64
1:B:332:ASN:HD21	1:B:334:ASP:HB2	1.62	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:133:HIS:O	1:A:136:VAL:HG23	1.98	0.64
1:B:412:GLU:HB2	1:B:429:LYS:HD3	1.79	0.64
1:A:157:THR:OG1	1:A:160:GLN:HG3	1.98	0.63
1:B:311:SER:HA	1:B:362:ASN:HB3	1.81	0.62
1:A:103:GLU:HG3	1:A:104:ARG:N	2.10	0.62
1:B:377:GLN:H	1:B:377:GLN:NE2	1.97	0.62
1:B:271:ARG:HG3	1:B:271:ARG:HH11	1.63	0.62
1:B:227:THR:HB	1:B:235:THR:HB	1.83	0.61
1:B:264:PRO:HG2	1:B:265:GLU:OE2	2.00	0.61
1:B:133:HIS:HB3	1:B:136:VAL:HG21	1.83	0.60
1:A:451:SER:OG	4:A:519:GOL:H12	2.00	0.60
1:A:167:LEU:O	1:A:170:TYR:HD2	1.84	0.60
1:A:487:GLY:C	3:A:518:SP7:CAB	2.65	0.60
1:B:14:ILE:CD1	1:B:226:ILE:HD11	2.32	0.60
1:A:412:GLU:OE1	1:A:429:LYS:HG2	2.02	0.60
1:A:414:VAL:HA	1:A:430:PRO:HG2	1.84	0.60
1:A:415:ILE:HD11	1:A:429:LYS:HD3	1.83	0.60
1:B:153:ARG:NH1	1:B:327:VAL:O	2.34	0.60
1:B:68:ASP:HB3	1:B:192:GLN:HB2	1.83	0.59
1:A:406:MET:HE2	1:A:406:MET:HA	1.83	0.59
1:A:451:SER:OG	4:A:519:GOL:C1	2.50	0.59
1:B:336:LEU:HD22	1:B:340:LEU:HD11	1.85	0.58
1:B:250:ILE:HD11	1:B:503:ILE:HD12	1.85	0.58
1:B:14:ILE:HD12	1:B:251:ILE:HG12	1.84	0.58
1:B:23:ALA:O	1:B:27:LEU:HG	2.04	0.58
3:A:518:SP7:HABB	3:A:518:SP7:CAC	2.34	0.58
1:B:67:HIS:NE2	3:B:518:SP7:CAL	2.67	0.57
1:A:479:GLU:OE1	1:A:487:GLY:HA2	2.04	0.57
1:B:254:PRO:HD3	2:B:517:FAD:H51A	1.86	0.57
1:A:259:ASN:O	1:A:262:VAL:HG22	2.04	0.57
1:B:54:TYR:O	1:B:57:ARG:HG3	2.04	0.57
1:B:213:PRO:O	1:B:216:TRP:HB2	2.04	0.57
1:A:487:GLY:HA3	3:A:518:SP7:HABB	1.86	0.56
1:B:63:ALA:HA	2:B:517:FAD:N5	2.20	0.56
1:A:64:SER:OG	1:A:296:LYS:NZ	2.38	0.56
1:A:504:SER:O	1:A:508:LYS:HG2	2.06	0.56
1:B:128:LEU:HD21	1:A:192:GLN:NE2	2.21	0.56
1:A:252:THR:HG22	1:A:477:ALA:HB3	1.88	0.55
1:B:392:GLU:HG2	1:B:419:ARG:NH1	2.21	0.55
1:B:48:LEU:HD23	1:B:63:ALA:HB3	1.89	0.55
1:A:48:LEU:CD2	1:A:63:ALA:HB3	2.37	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:165:PRO:O	1:A:169:ARG:HG3	2.06	0.55
1:B:311:SER:O	1:B:312:LYS:HE3	2.06	0.55
1:B:381:THR:O	1:B:385:GLU:HG3	2.07	0.55
1:B:392:GLU:HG2	1:B:419:ARG:HH12	1.71	0.55
1:B:479:GLU:OE1	1:B:487:GLY:HA2	2.07	0.54
1:A:189:PHE:CZ	1:A:191:HIS:NE2	2.76	0.54
1:B:190:GLY:O	1:B:191:HIS:C	2.45	0.54
1:A:164:LEU:N	1:A:165:PRO:HD2	2.22	0.53
1:B:240:ASP:OD1	1:B:242:THR:HG23	2.09	0.53
1:B:285:ALA:O	1:B:289:ILE:HG22	2.09	0.53
1:B:8:LYS:N	1:B:245:ASN:ND2	2.56	0.53
1:B:72:ASN:C	1:B:72:ASN:HD22	2.12	0.53
1:A:150:LEU:HD13	1:A:336:LEU:HD22	1.91	0.53
1:B:57:ARG:HD3	1:B:369:VAL:CG1	2.38	0.53
1:B:255:GLN:HE22	1:B:289:ILE:HG13	1.74	0.53
1:B:452:ALA:HA	3:B:518:SP7:HABB	1.90	0.52
1:B:271:ARG:HG3	1:B:271:ARG:NH1	2.24	0.52
1:B:47:ARG:NH2	1:B:254:PRO:HB3	2.24	0.52
1:A:122:MET:HG2	1:A:148:TYR:CG	2.45	0.52
1:B:362:ASN:C	1:B:362:ASN:HD22	2.13	0.52
1:A:213:PRO:HB2	1:A:216:TRP:CD1	2.45	0.52
1:A:293:ALA:HB3	1:A:378:ALA:HB2	1.89	0.52
1:A:332:ASN:C	1:A:332:ASN:HD22	2.13	0.52
1:A:487:GLY:HA3	3:A:518:SP7:CAB	2.40	0.52
1:A:278:LEU:HA	1:A:470:GLN:NE2	2.25	0.51
1:B:423:ASN:HB3	1:B:426:ASN:HD22	1.76	0.51
1:A:442:ARG:HG2	1:A:442:ARG:NH1	2.25	0.51
1:B:165:PRO:O	1:B:169:ARG:HG3	2.10	0.51
1:B:263:GLN:HG3	1:B:264:PRO:HD2	1.92	0.51
3:A:518:SP7:CAC	4:A:519:GOL:O2	2.57	0.51
1:B:136:VAL:O	1:B:136:VAL:HG23	2.11	0.51
1:B:191:HIS:HE1	1:B:195:ASN:HD21	1.57	0.50
1:B:362:ASN:C	1:B:362:ASN:ND2	2.64	0.50
1:A:67:HIS:NE2	3:A:518:SP7:NAI	2.44	0.50
1:A:54:TYR:O	1:A:57:ARG:HG3	2.11	0.50
1:B:110:ASP:HB3	1:B:113:LEU:HB2	1.93	0.50
1:A:5:SER:N	1:A:6:PRO:HD2	2.27	0.49
1:A:14:ILE:HD12	1:A:14:ILE:N	2.28	0.49
1:B:254:PRO:HG2	1:B:257:VAL:HG23	1.93	0.49
1:B:439:ASN:HD21	1:B:442:ARG:HD3	1.78	0.49
1:B:398:PHE:O	1:B:401:VAL:HG12	2.12	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:439:ASN:HD21	1:B:442:ARG:HH11	1.59	0.49
1:B:190:GLY:O	1:B:192:GLN:N	2.45	0.49
1:B:224:LYS:HA	1:B:224:LYS:CE	2.38	0.49
1:B:116:GLU:OE1	1:B:116:GLU:N	2.36	0.48
1:B:141:PHE:O	1:B:145:VAL:HG23	2.13	0.48
1:A:72:ASN:HB3	1:A:75:PHE:HB3	1.94	0.48
2:A:517:FAD:C4X	3:A:518:SP7:HAJA	2.43	0.48
1:B:451:SER:HB3	3:B:518:SP7:HACA	1.96	0.48
1:A:362:ASN:HD21	1:A:364:SER:HB3	1.78	0.48
1:A:116:GLU:OE2	1:A:116:GLU:N	2.36	0.47
1:B:130:PHE:CD2	1:B:185:LYS:HG3	2.49	0.47
1:B:450:TYR:CE2	3:B:518:SP7:HAH	2.48	0.47
1:B:412:GLU:CB	1:B:429:LYS:HD3	2.43	0.47
1:A:138:ASP:OD2	1:A:455:PRO:HA	2.15	0.47
1:A:432:LEU:HD21	1:A:435:ILE:HD11	1.96	0.47
1:A:282:ILE:HG12	1:A:465:ALA:HB1	1.96	0.47
1:A:388:ARG:HB2	1:A:437:VAL:HB	1.97	0.47
1:A:239:GLU:C	1:A:241:GLY:H	2.17	0.47
1:A:250:ILE:HD11	1:A:503:ILE:HD12	1.96	0.47
1:B:282:ILE:HD13	1:B:465:ALA:HB1	1.96	0.47
1:A:278:LEU:HA	1:A:470:GLN:HE22	1.80	0.47
1:A:63:ALA:HA	2:A:517:FAD:N5	2.30	0.47
1:B:279:LYS:HE2	1:B:470:GLN:HA	1.97	0.46
1:B:395:PHE:O	1:B:399:GLN:HB2	2.15	0.46
1:A:44:VAL:CG1	1:A:217:LEU:HD21	2.45	0.46
1:B:141:PHE:CD1	1:B:187:THR:HG21	2.50	0.46
1:B:265:GLU:C	1:B:267:ASN:H	2.19	0.46
1:B:439:ASN:ND2	1:B:442:ARG:HD3	2.30	0.46
1:B:504:SER:O	1:B:508:LYS:HG3	2.15	0.46
1:B:460:VAL:O	1:B:464:VAL:HG23	2.16	0.46
1:A:122:MET:HE1	1:A:145:VAL:HG22	1.98	0.46
1:A:336:LEU:O	1:A:340:LEU:HG	2.16	0.46
1:B:502:ARG:HG2	1:B:502:ARG:HH11	1.80	0.46
1:A:9:LYS:O	1:A:246:ALA:HA	2.15	0.46
1:A:108:ASP:O	1:A:109:HIS:C	2.53	0.46
1:B:502:ARG:HG2	1:B:502:ARG:NH1	2.32	0.45
1:B:262:VAL:HG12	1:B:283:GLN:HG2	1.97	0.45
1:B:362:ASN:ND2	1:B:364:SER:H	2.14	0.45
1:A:189:PHE:CE1	1:A:191:HIS:CD2	3.04	0.45
1:B:359:PHE:HD2	1:B:375:LEU:HD22	1.81	0.45
1:A:118:VAL:HG23	1:A:164:LEU:HD13	1.97	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:199:LEU:HD23	1:B:199:LEU:HA	1.84	0.45
1:B:432:LEU:HD21	1:B:435:ILE:HD11	1.99	0.45
1:A:122:MET:CE	1:A:145:VAL:HG22	2.47	0.45
1:B:110:ASP:O	1:B:114:LEU:HD23	2.17	0.45
2:A:517:FAD:N5	3:A:518:SP7:HAJA	2.31	0.45
1:B:8:LYS:HB2	1:B:245:ASN:OD1	2.16	0.44
1:B:11:VAL:HG11	1:B:27:LEU:HD11	1.99	0.44
1:B:68:ASP:CB	1:B:192:GLN:HB2	2.46	0.44
1:A:122:MET:HG2	1:A:148:TYR:CD2	2.51	0.44
1:A:167:LEU:O	1:A:170:TYR:CD2	2.68	0.44
1:A:167:LEU:HA	1:A:316:LEU:CD2	2.47	0.44
1:B:115:LEU:HB3	1:B:167:LEU:HD13	1.99	0.44
1:B:191:HIS:HE1	1:B:195:ASN:ND2	2.16	0.44
1:B:280:PRO:O	1:B:284:ASP:OD2	2.36	0.44
1:B:225:SER:HA	1:B:272:ILE:HG23	2.00	0.43
1:A:470:GLN:HB3	1:A:474:ILE:HB	2.00	0.43
1:A:150:LEU:CD1	1:A:336:LEU:HD22	2.48	0.43
1:A:189:PHE:CD2	1:A:189:PHE:N	2.87	0.43
1:A:418:MET:HA	1:A:433:ARG:O	2.18	0.43
1:A:41:ARG:NH1	1:A:443:ASP:OD2	2.50	0.43
1:A:122:MET:O	1:A:125:PHE:HB3	2.19	0.43
1:A:311:SER:HA	1:A:362:ASN:HB3	2.00	0.43
1:B:414:VAL:HA	1:B:430:PRO:HG2	2.02	0.42
1:B:475:ARG:HB3	1:B:499:GLU:OE1	2.19	0.42
1:B:135:GLY:O	1:B:136:VAL:C	2.58	0.42
1:B:507:LEU:O	1:B:510:GLU:HB2	2.20	0.42
1:A:213:PRO:HB2	1:A:216:TRP:CG	2.54	0.42
1:B:316:LEU:N	1:B:316:LEU:CD1	2.82	0.42
1:B:362:ASN:HD21	1:B:364:SER:HB3	1.84	0.42
1:A:110:ASP:HB3	1:A:113:LEU:HB2	2.02	0.42
1:A:332:ASN:HD21	1:A:335:GLU:H	1.64	0.42
1:A:470:GLN:OE1	1:A:470:GLN:HA	2.20	0.42
1:A:487:GLY:CA	3:A:518:SP7:CAB	2.97	0.42
1:B:316:LEU:N	1:B:316:LEU:HD12	2.34	0.42
1:B:365:LYS:NZ	1:A:111:LYS:HB2	2.35	0.42
1:B:451:SER:O	3:B:518:SP7:CAF	2.67	0.41
1:A:434:ASN:ND2	1:A:435:ILE:H	2.17	0.41
1:B:150:LEU:O	1:B:153:ARG:HG2	2.21	0.41
1:B:164:LEU:N	1:B:165:PRO:HD2	2.35	0.41
1:B:278:LEU:CA	1:B:470:GLN:HE22	2.20	0.41
1:B:312:LYS:HD3	1:B:359:PHE:CZ	2.55	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:70:LEU:HB2	1:B:192:GLN:O	2.20	0.41
1:B:141:PHE:CE1	1:B:187:THR:HG21	2.56	0.41
1:A:218:LYS:HE2	1:A:218:LYS:HB3	1.88	0.41
1:B:193:GLY:HA2	1:A:121:GLU:HG3	2.02	0.41
1:A:113:LEU:HB3	1:A:115:LEU:HG	2.03	0.41
1:A:183:SER:HB2	1:A:455:PRO:HA	2.01	0.41
1:B:72:ASN:HD21	1:B:490:TYR:HB3	1.86	0.40
1:A:148:TYR:CE1	1:A:152:ARG:HG3	2.56	0.40
1:A:237:ASN:OD1	1:A:243:VAL:HG22	2.21	0.40
1:A:405:ILE:O	1:A:409:LEU:HG	2.22	0.40
1:B:214:GLN:HA	1:B:214:GLN:OE1	2.22	0.40
1:B:113:LEU:O	1:B:114:LEU:C	2.60	0.40
1:B:157:THR:O	1:B:161:ILE:HG13	2.22	0.40
1:A:99:TYR:O	1:A:106:ARG:HA	2.22	0.40
1:A:167:LEU:HA	1:A:316:LEU:HD22	2.02	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

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

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	A	487/516 (94%)	450 (92%)	30 (6%)	7 (1%)	11 20
1	B	495/516 (96%)	447 (90%)	38 (8%)	10 (2%)	7 12
All	All	982/1032 (95%)	897 (91%)	68 (7%)	17 (2%)	9 16

All (17) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	136	VAL
1	B	191	HIS
1	B	200	ASN

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Mol	Chain	Res	Type
1	A	200	ASN
1	B	137	SER
1	B	510	GLU
1	B	479	GLU
1	A	104	ARG
1	A	132	GLN
1	A	139	CYS
1	B	420	PRO
1	A	262	VAL
1	B	135	GLY
1	A	232	LYS
1	A	341	GLU
1	B	262	VAL
1	B	264	PRO

### 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	420/457 (92%)	406 (97%)	14 (3%)	38	64
1	B	420/457 (92%)	403 (96%)	17 (4%)	31	56
All	All	840/914 (92%)	809 (96%)	31 (4%)	34	60

All (31) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	34	ASP
1	B	72	ASN
1	B	118	VAL
1	B	134	LEU
1	B	177	LEU
1	B	179	TRP
1	B	201	TYR
1	B	221	CYS
1	B	237	ASN

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Mol	Chain	Res	Type
1	B	239	GLU
1	B	240	ASP
1	B	265	GLU
1	B	271	ARG
1	B	291	PHE
1	B	336	LEU
1	B	362	ASN
1	B	377	GLN
1	A	36	LEU
1	A	122	MET
1	A	133	HIS
1	A	150	LEU
1	A	177	LEU
1	A	179	TRP
1	A	201	TYR
1	A	221	CYS
1	A	239	GLU
1	A	267	ASN
1	A	291	PHE
1	A	332	ASN
1	A	334	ASP
1	A	377	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (26) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	29	GLN
1	B	30	ASN
1	B	72	ASN
1	B	133	HIS
1	B	191	HIS
1	B	255	GLN
1	B	283	GLN
1	B	290	HIS
1	B	329	ASN
1	B	332	ASN
1	B	362	ASN
1	B	377	GLN
1	B	426	ASN
1	B	434	ASN
1	B	439	ASN
1	B	468	ASN

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Mol	Chain	Res	Type
1	A	28	HIS
1	A	29	GLN
1	A	33	GLN
1	A	259	ASN
1	A	267	ASN
1	A	332	ASN
1	A	362	ASN
1	A	377	GLN
1	A	434	ASN
1	A	439	ASN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

5 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# $ Z  > 2$	Counts	RMSZ	# $ Z  > 2$
2	FAD	B	517	-	53,58,58	1.28	4 (7%)	68,89,89	1.38	9 (13%)
3	SP7	B	518	-	13,13,13	0.61	0	12,14,14	1.03	0
2	FAD	A	517	-	53,58,58	1.29	5 (9%)	68,89,89	1.39	10 (14%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	SP7	A	518	-	13,13,13	0.60	0	12,14,14	1.03	0
4	GOL	A	519	-	5,5,5	0.43	0	5,5,5	0.09	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
2	FAD	B	517	-	-	1/30/50/50	0/6/6/6
3	SP7	B	518	-	-	8/12/12/12	-
2	FAD	A	517	-	-	1/30/50/50	0/6/6/6
3	SP7	A	518	-	-	11/12/12/12	-
4	GOL	A	519	-	-	4/4/4/4	-

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	517	FAD	C4X-N5	5.01	1.40	1.30
2	A	517	FAD	C4X-N5	5.01	1.40	1.30
2	B	517	FAD	C10-N1	3.54	1.40	1.33
2	A	517	FAD	C10-N1	3.51	1.40	1.33
2	A	517	FAD	P-O1P	2.98	1.61	1.50
2	A	517	FAD	PA-O1A	2.95	1.61	1.50
2	B	517	FAD	P-O1P	2.94	1.61	1.50
2	B	517	FAD	PA-O1A	2.92	1.61	1.50
2	A	517	FAD	O4B-C1B	2.04	1.43	1.41

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	517	FAD	N3A-C2A-N1A	-4.36	121.87	128.68
2	A	517	FAD	N3A-C2A-N1A	-4.33	121.91	128.68
2	A	517	FAD	O4B-C1B-C2B	-4.23	100.74	106.93
2	B	517	FAD	O4B-C1B-C2B	-4.17	100.83	106.93
2	B	517	FAD	P-O3P-PA	-3.33	121.40	132.83
2	A	517	FAD	P-O3P-PA	-3.31	121.47	132.83
2	B	517	FAD	C4-N3-C2	-3.06	119.99	125.64
2	A	517	FAD	C4-N3-C2	-2.88	120.32	125.64
2	B	517	FAD	C4X-C4-N3	2.75	120.17	113.19
2	A	517	FAD	C4X-C4-N3	2.75	120.16	113.19

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	517	FAD	O4-C4-C4X	-2.66	119.55	126.60
2	A	517	FAD	C9A-C5X-N5	-2.65	119.55	122.43
2	B	517	FAD	C9A-C5X-N5	-2.62	119.59	122.43
2	B	517	FAD	O4-C4-C4X	-2.48	120.01	126.60
2	B	517	FAD	C10-C4X-N5	-2.43	119.70	124.86
2	A	517	FAD	C10-C4X-N5	-2.36	119.85	124.86
2	A	517	FAD	C4X-C10-N10	2.35	119.92	116.48
2	B	517	FAD	C4X-C10-N10	2.34	119.90	116.48
2	A	517	FAD	C5'-C4'-C3'	-2.31	107.73	112.20

There are no chirality outliers.

All (25) torsion outliers are listed below:

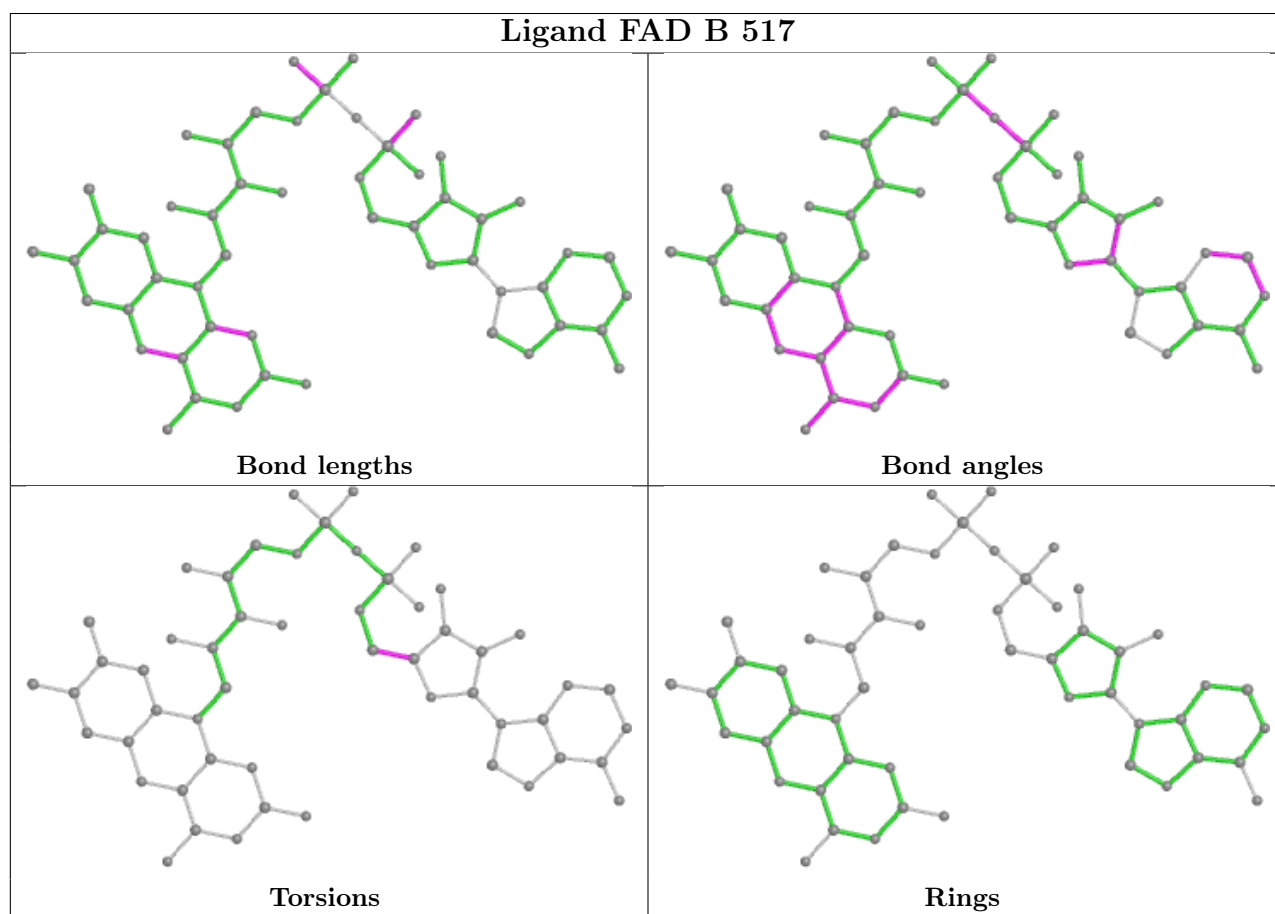
Mol	Chain	Res	Type	Atoms
3	B	518	SP7	CAC-CAD-NAE-CAF
3	B	518	SP7	OAA-CAD-NAE-CAF
3	B	518	SP7	CAB-CAF-NAE-CAD
3	B	518	SP7	NAE-CAF-CAG-CAH
3	A	518	SP7	CAG-CAF-NAE-CAD
3	A	518	SP7	NAE-CAF-CAG-CAH
3	A	518	SP7	CAB-CAF-CAG-CAH
4	A	519	GOL	C1-C2-C3-O3
4	A	519	GOL	O2-C2-C3-O3
3	B	518	SP7	NAI-CAJ-CAK-CAL
3	A	518	SP7	CAC-CAD-NAE-CAF
3	A	518	SP7	OAA-CAD-NAE-CAF
3	A	518	SP7	CAK-CAJ-NAI-CAH
3	A	518	SP7	NAI-CAJ-CAK-CAL
4	A	519	GOL	O1-C1-C2-C3
4	A	519	GOL	O1-C1-C2-O2
3	A	518	SP7	CAJ-CAK-CAL-CAM
3	B	518	SP7	CAB-CAF-CAG-CAH
3	B	518	SP7	CAK-CAL-CAM-NAN
3	A	518	SP7	CAK-CAL-CAM-NAN
3	B	518	SP7	CAK-CAJ-NAI-CAH
2	B	517	FAD	O4B-C4B-C5B-O5B
2	A	517	FAD	O4B-C4B-C5B-O5B
3	A	518	SP7	CAB-CAF-NAE-CAD
3	A	518	SP7	CAG-CAH-NAI-CAJ

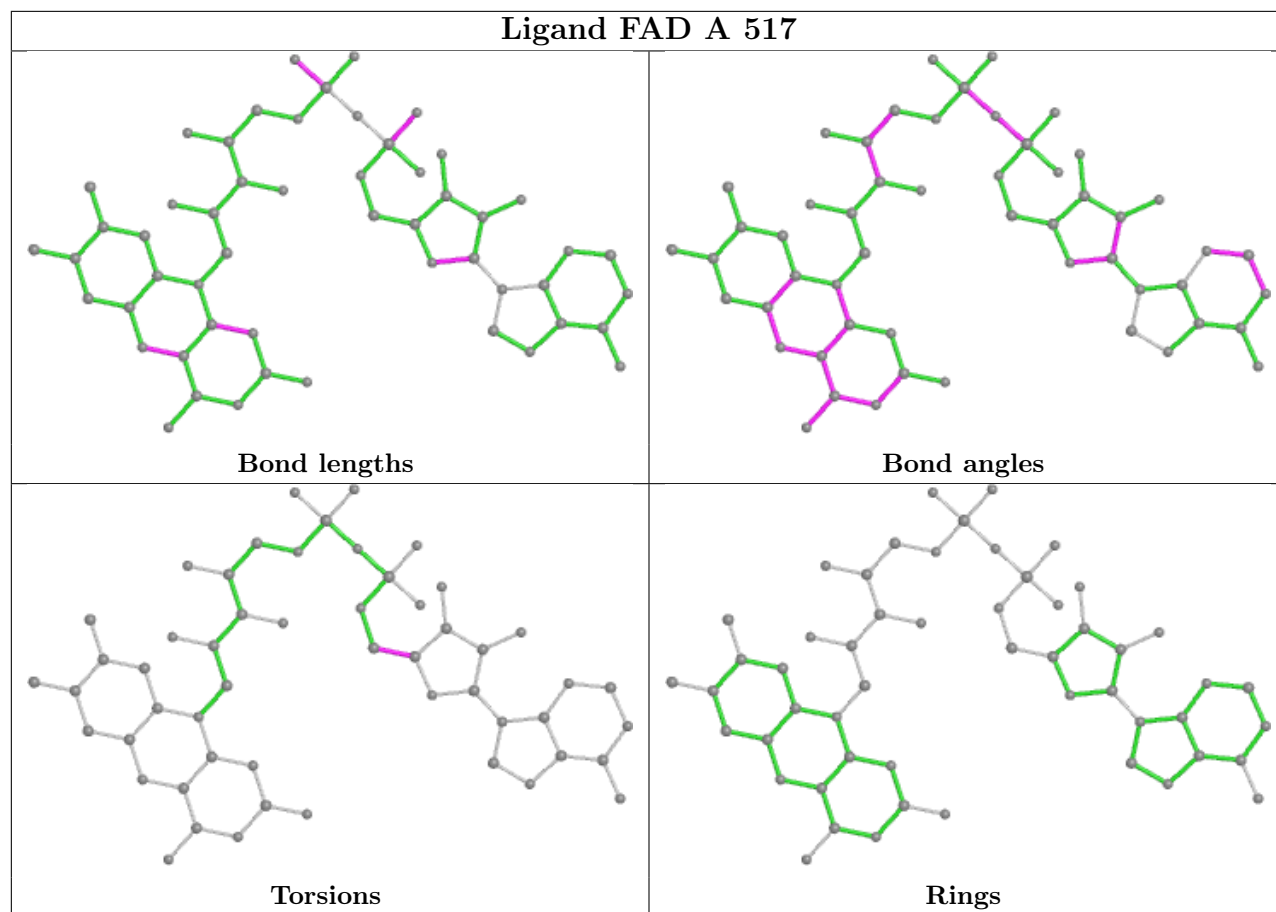
There are no ring outliers.

5 monomers are involved in 27 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	517	FAD	2	0
3	B	518	SP7	8	0
2	A	517	FAD	3	0
3	A	518	SP7	14	0
4	A	519	GOL	4	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Fit of model and data

### 6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	493/516 (95%)	0.08	26 (5%) 26 28	22, 38, 61, 83	0
1	B	499/516 (96%)	0.32	43 (8%) 10 10	26, 41, 75, 99	0
All	All	992/1032 (96%)	0.20	69 (6%) 16 16	22, 39, 69, 99	0

All (69) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	135	GLY	13.0
1	B	509	LEU	9.5
1	B	423	ASN	7.8
1	B	134	LEU	7.7
1	A	5	SER	6.7
1	B	425	ALA	6.4
1	B	133	HIS	6.2
1	B	426	ASN	6.1
1	B	136	VAL	6.1
1	B	420	PRO	5.9
1	B	422	GLU	5.9
1	B	424	ILE	5.8
1	B	132	GLN	5.1
1	B	230	PRO	4.7
1	B	427	ALA	4.7
1	A	231	SER	4.7
1	B	508	LYS	4.6
1	B	511	HIS	4.5
1	A	230	PRO	4.4
1	B	264	PRO	4.2
1	B	349	THR	4.1
1	B	421	ILE	3.7
1	A	14	ILE	3.6
1	B	250	ILE	3.6

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	A	6	PRO	3.5
1	B	137	SER	3.5
1	A	510	GLU	3.5
1	A	252	THR	3.5
1	B	14	ILE	3.3
1	A	133	HIS	3.2
1	A	15	GLY	3.2
1	A	249	VAL	3.2
1	A	251	ILE	3.2
1	B	267	ASN	3.1
1	A	13	ILE	3.1
1	B	13	ILE	3.1
1	B	238	CYS	3.1
1	A	428	ASN	3.0
1	B	252	THR	3.0
1	B	131	HIS	3.0
1	B	419	ARG	3.0
1	A	250	ILE	2.9
1	B	191	HIS	2.8
1	B	231	SER	2.7
1	B	338	SER	2.6
1	A	7	ALA	2.6
1	B	15	GLY	2.6
1	B	233	ASN	2.6
1	B	251	ILE	2.5
1	A	132	GLN	2.5
1	B	510	GLU	2.5
1	B	265	GLU	2.4
1	B	280	PRO	2.4
1	A	265	GLU	2.4
1	A	349	THR	2.4
1	B	232	LYS	2.3
1	B	245	ASN	2.3
1	B	477	ALA	2.3
1	A	221	CYS	2.3
1	A	84	ASN	2.2
1	A	350	SER	2.2
1	A	31	GLY	2.2
1	A	264	PRO	2.2
1	A	19	ALA	2.2
1	B	11	VAL	2.1
1	A	223	VAL	2.1

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	RSRZ
1	B	372	PHE	2.1
1	A	238	CYS	2.1
1	B	254	PRO	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](#)

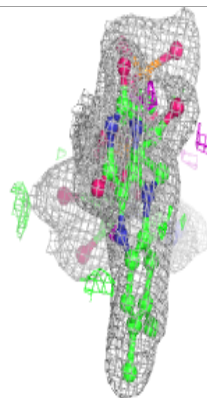
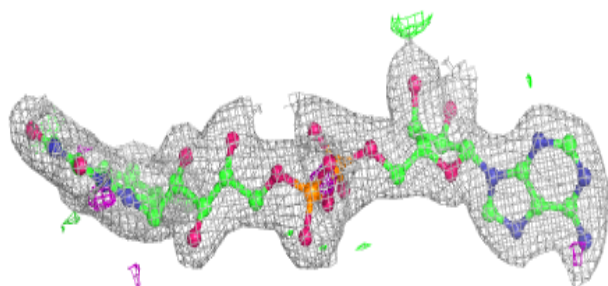
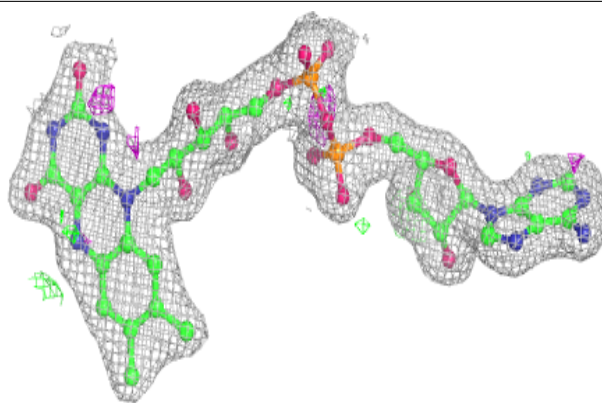
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 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
3	SP7	B	518	14/14	0.56	0.33	20,20,20,20	0
3	SP7	A	518	14/14	0.66	0.33	20,20,20,20	0
4	GOL	A	519	6/6	0.85	0.27	20,20,20,20	0
2	FAD	B	517	53/53	0.94	0.19	27,32,38,39	0
2	FAD	A	517	53/53	0.96	0.17	15,25,30,32	0

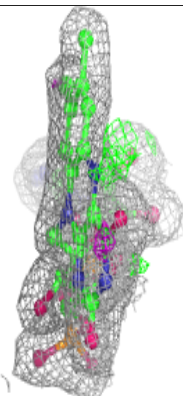
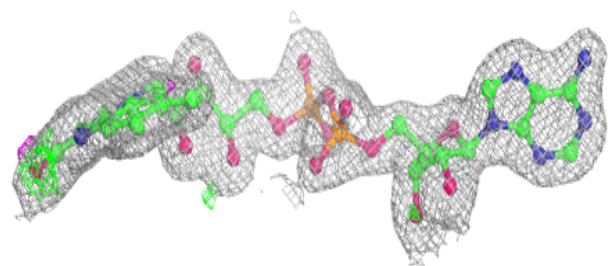
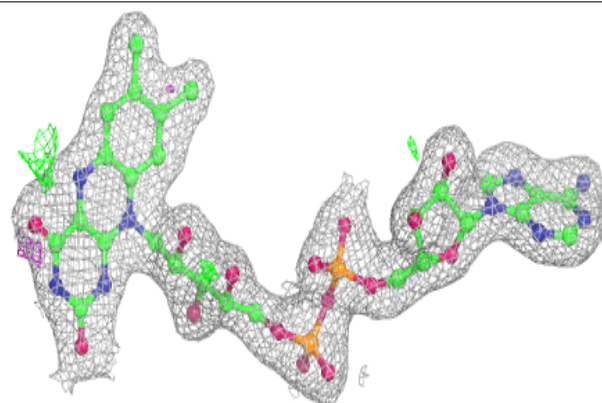
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

**Electron density around FAD B 517:**

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

**Electron density around FAD A 517:**

$2mF_o-DF_c$  (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.