



# Full wwPDB X-ray Structure Validation Report i

Feb 28, 2014 – 08:32 AM GMT

PDB ID : 2C3D  
Title : 2.15 ANGSTROM CRYSTAL STRUCTURE OF 2-KETOPROPYL COENZYME M OXIDOREDUCTASE CARBOXYLASE WITH A COENZYME M DISULFIDE BOUND AT THE ACTIVE SITE  
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Deposited on : 2005-10-05  
Resolution : 2.15 Å(reported)

This is a full wwPDB 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 <http://wwpdb.org/ValidationPDFNotes.html>

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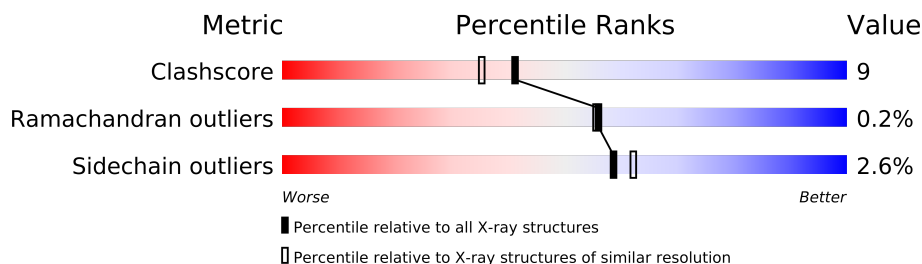
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity	:	4.02b-467
Mogul	:	1.15 2013
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	21963
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP)	:	stable22683

# 1 Overall quality at a glance

The reported resolution of this entry is 2.15 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	79885	1299 (2.18-2.14)
Ramachandran outliers	78287	1272 (2.18-2.14)
Sidechain outliers	78261	1272 (2.18-2.14)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	523	
1	B	523	

## 2 Entry composition i

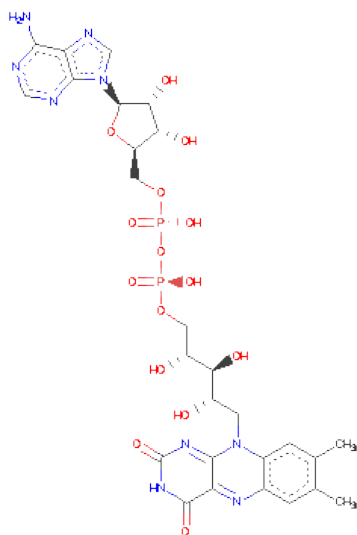
There are 4 unique types of molecules in this entry. The entry contains 8834 atoms, of which 0 are hydrogen and 0 are deuterium.

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 2-OXOPROPYL-COM REDUCTASE.

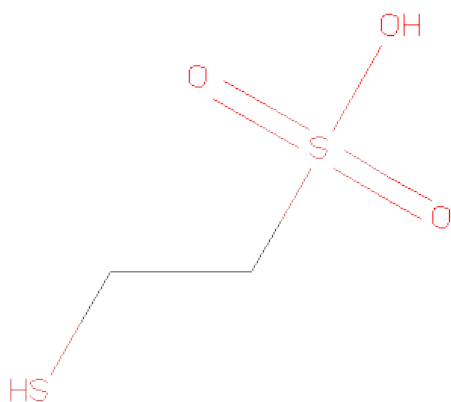
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	522	Total	C	N	O	S	0	0	0
			4023	2546	699	755	23			
1	B	522	Total	C	N	O	S	0	0	0
			4023	2546	699	755	23			

- 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
2	A	1	Total	C	N	O	P	0	0
			53	27	9	15	2		
2	B	1	Total	C	N	O	P	0	0
			53	27	9	15	2		

- Molecule 3 is 1-THIOETHANESULFONIC ACID (three-letter code: COM) (formula:  $C_2H_6O_3S_2$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	O	S	0	0
			7	2	3	2		
3	A	1	Total	C	O	S	0	0
			7	2	3	2		
3	B	1	Total	C	O	S	0	0
			7	2	3	2		
3	B	1	Total	C	O	S	0	0
			7	2	3	2		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	326	Total	O	0	0
			326	326		
4	B	328	Total	O	0	0
			328	328		

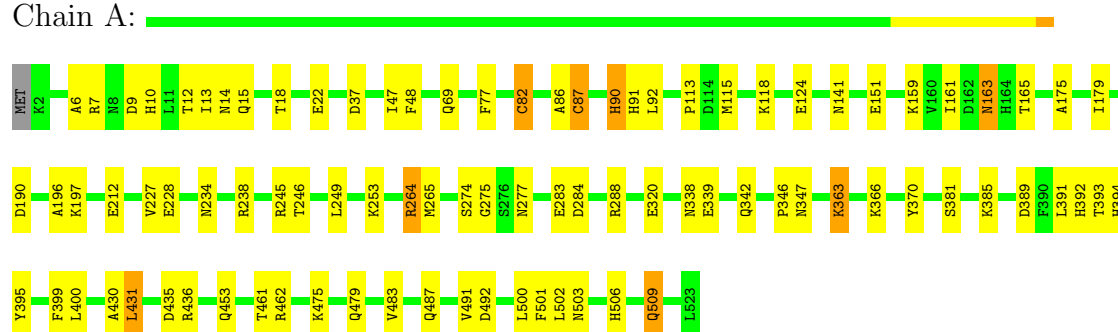
### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

Note EDS was not executed.

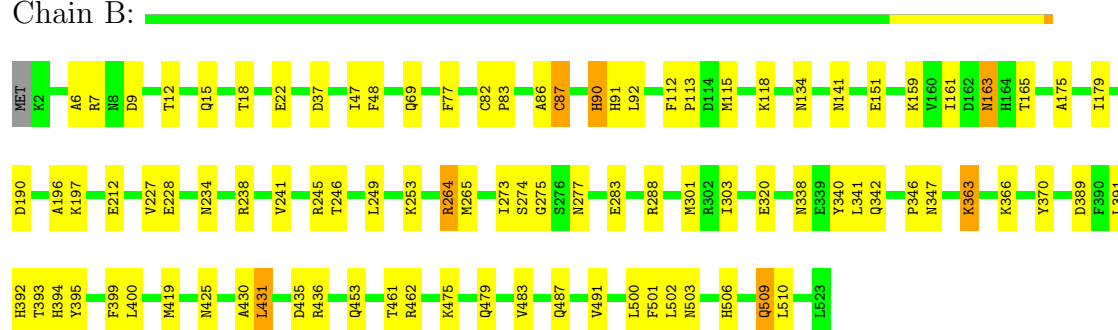
#### • Molecule 1: 2-OXOPROPYL-COM REDUCTASE

Chain A:



#### • Molecule 1: 2-OXOPROPYL-COM REDUCTASE

Chain B:



## 4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section will therefore be incomplete.

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	87.79Å 60.05Å 105.63Å 90.00° 99.91° 90.00°	Depositor
Resolution (Å)	37.70 – 2.15	Depositor
% Data completeness (in resolution range)	96.9 (37.70-2.15)	Depositor
$R_{merge}$	0.08	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	CNS 1.1	Depositor
R, $R_{free}$	0.203 , 0.239	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	8834	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	25.0	wwPDB-VP

## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: COM, FAD

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 5$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z  > 5$	RMSZ	$\# Z  > 5$
1	A	0.33	1/4106 (0.0%)	0.58	1/5556 (0.0%)
1	B	0.32	0/4106	0.58	1/5556 (0.0%)
All	All	0.33	1/8212 (0.0%)	0.58	2/11112 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	82	CYS	CB-SG	5.45	1.91	1.82

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	393	THR	N-CA-C	-6.16	94.38	111.00
1	A	393	THR	N-CA-C	-6.07	94.61	111.00

There are no chirality outliers.

There are no planarity outliers.

### 5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4023	0	3980	78	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	4023	0	3980	84	0
2	A	53	0	31	1	0
2	B	53	0	31	1	0
3	A	14	0	12	4	0
3	B	14	0	12	4	0
4	A	326	0	0	3	0
4	B	328	0	0	7	0
All	All	8834	0	8046	149	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 9.

All (149) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:453:GLN:HE22	1:A:506:HIS:H	1.03	0.96
1:B:453:GLN:HE22	1:B:506:HIS:H	1.04	0.95
1:A:69:GLN:HE22	1:A:151:GLU:H	1.14	0.92
1:A:500:LEU:H	1:B:479:GLN:HE21	1.18	0.89
1:B:69:GLN:HE22	1:B:151:GLU:H	1.15	0.88
1:A:479:GLN:HE22	1:B:503:ASN:HD22	1.22	0.85
1:B:431:LEU:HD21	3:B:1525:COM:H11	1.58	0.84
1:A:503:ASN:HD22	1:B:479:GLN:HE22	1.27	0.81
1:A:479:GLN:HE21	1:B:500:LEU:H	1.27	0.81
1:A:509:GLN:H	1:A:509:GLN:HE21	1.29	0.81
1:B:509:GLN:H	1:B:509:GLN:HE21	1.30	0.78
1:A:453:GLN:NE2	1:A:506:HIS:H	1.83	0.76
1:B:338:ASN:HD21	1:B:342:GLN:HE21	1.35	0.74
1:A:338:ASN:HD21	1:A:342:GLN:HE21	1.36	0.72
1:B:419:MET:HE3	4:B:2327:HOH:O	1.90	0.71
1:B:503:ASN:HD21	1:B:509:GLN:HE22	1.38	0.70
1:A:124:GLU:HG2	4:A:2155:HOH:O	1.92	0.70
1:A:431:LEU:HD21	3:A:1526:COM:H11	1.73	0.69
1:B:453:GLN:NE2	1:B:506:HIS:H	1.84	0.69
1:A:91:HIS:CD2	1:B:502:LEU:HD13	2.26	0.69
1:A:500:LEU:H	1:B:479:GLN:NE2	1.92	0.68
1:A:503:ASN:HD21	1:A:509:GLN:HE22	1.40	0.67
1:A:47:ILE:HG13	1:A:175:ALA:HB2	1.78	0.66
1:A:509:GLN:H	1:A:509:GLN:NE2	1.95	0.65
1:A:453:GLN:HE22	1:A:506:HIS:N	1.86	0.64
1:A:161:ILE:HB	1:A:165:THR:HB	1.80	0.64
1:B:47:ILE:HG13	1:B:175:ALA:HB2	1.79	0.64
1:A:246:THR:O	1:A:274:SER:HB2	1.98	0.64

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:12:THR:OG1	1:A:15:GLN:HG3	1.98	0.64
1:B:161:ILE:HB	1:B:165:THR:HB	1.78	0.64
1:B:483:VAL:O	1:B:487:GLN:HG3	1.99	0.63
1:B:246:THR:O	1:B:274:SER:HB2	2.00	0.62
1:A:500:LEU:N	1:B:479:GLN:HE21	1.93	0.62
3:A:1526:COM:HS1	3:B:1526:COM:HS1	1.36	0.62
1:A:483:VAL:O	1:A:487:GLN:HG3	2.00	0.62
1:B:453:GLN:HE22	1:B:506:HIS:N	1.88	0.61
1:B:12:THR:OG1	1:B:15:GLN:HG3	1.99	0.61
1:B:509:GLN:H	1:B:509:GLN:NE2	1.97	0.61
1:B:18:THR:O	1:B:22:GLU:HG3	2.01	0.60
1:B:196:ALA:HB2	1:B:283:GLU:HG2	1.84	0.59
1:A:436:ARG:HD2	4:B:2050:HOH:O	2.02	0.59
1:B:264:ARG:HG2	1:B:395:TYR:CE1	2.38	0.59
1:A:196:ALA:HB2	1:A:283:GLU:HG2	1.85	0.58
1:A:479:GLN:NE2	1:B:500:LEU:H	2.00	0.58
1:B:436:ARG:NH1	4:B:2050:HOH:O	2.36	0.58
1:A:366:LYS:O	1:A:370:TYR:HD1	1.86	0.58
1:B:366:LYS:O	1:B:370:TYR:HD1	1.86	0.58
1:B:82:CYS:HB3	1:B:83:PRO:HD3	1.87	0.57
1:B:228:GLU:HG2	1:B:392:HIS:HB2	1.87	0.57
1:A:502:LEU:HD13	1:B:91:HIS:CD2	2.40	0.56
1:B:264:ARG:HG2	1:B:395:TYR:HE1	1.71	0.56
1:A:18:THR:O	1:A:22:GLU:HG3	2.04	0.56
1:A:264:ARG:HG2	1:A:395:TYR:CE1	2.41	0.55
1:B:510:LEU:HD11	4:B:2327:HOH:O	2.06	0.55
1:A:113:PRO:HB3	1:B:113:PRO:HB3	1.89	0.55
1:A:163:ASN:N	1:A:163:ASN:HD22	2.04	0.55
1:B:163:ASN:N	1:B:163:ASN:HD22	2.04	0.55
1:A:14:ASN:H	1:B:425:ASN:ND2	2.05	0.55
1:A:228:GLU:HG2	1:A:392:HIS:HB2	1.89	0.54
1:B:338:ASN:HD21	1:B:342:GLN:NE2	2.05	0.53
1:B:82:CYS:HB3	1:B:83:PRO:CD	2.39	0.53
3:A:1525:COM:S1	3:B:1525:COM:S1	2.98	0.52
1:A:113:PRO:HG3	1:B:113:PRO:HD3	1.92	0.52
1:A:461:THR:O	1:A:462:ARG:HB2	2.09	0.52
1:A:479:GLN:HE21	1:B:500:LEU:N	2.02	0.52
1:A:7:ARG:NH2	1:A:37:ASP:HB2	2.25	0.52
1:B:461:THR:O	1:B:462:ARG:HB2	2.09	0.51
1:A:389:ASP:HB3	1:A:399:PHE:CE1	2.44	0.51
1:A:245:ARG:O	1:A:275:GLY:HA2	2.11	0.51
1:A:264:ARG:HG2	1:A:395:TYR:HE1	1.75	0.51

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:13:ILE:HB	1:B:425:ASN:HD22	1.74	0.50
1:B:389:ASP:HB3	1:B:399:PHE:CE1	2.45	0.50
1:A:509:GLN:N	1:A:509:GLN:HE21	2.03	0.50
1:B:115:MET:O	1:B:118:LYS:HB3	2.11	0.50
1:A:113:PRO:HD3	1:B:113:PRO:HG3	1.92	0.50
1:B:48:PHE:CZ	1:B:179:ILE:HD12	2.47	0.49
1:A:245:ARG:HG3	1:A:277:ASN:OD1	2.12	0.49
1:B:77:PHE:HA	1:B:141:ASN:HD21	1.77	0.49
1:B:134:ASN:HB2	4:B:2083:HOH:O	2.12	0.49
1:A:48:PHE:CZ	1:A:179:ILE:HD12	2.47	0.49
1:B:346:PRO:O	1:B:347:ASN:HB2	2.13	0.49
1:B:92:LEU:O	1:B:92:LEU:HD23	2.13	0.49
1:B:245:ARG:O	1:B:275:GLY:HA2	2.13	0.49
1:A:115:MET:O	1:A:118:LYS:HB3	2.13	0.48
1:B:7:ARG:NH2	1:B:37:ASP:HB2	2.27	0.48
1:A:14:ASN:H	1:B:425:ASN:HD21	1.60	0.48
1:B:227:VAL:HG13	1:B:265:MET:HE3	1.94	0.48
1:A:227:VAL:HG13	1:A:265:MET:HE3	1.95	0.48
1:A:77:PHE:HA	1:A:141:ASN:HD21	1.77	0.48
1:A:400:LEU:C	1:A:400:LEU:HD12	2.33	0.48
1:B:245:ARG:HG3	1:B:277:ASN:OD1	2.13	0.48
1:A:462:ARG:HH12	1:A:491:VAL:CG1	2.26	0.48
1:B:462:ARG:HH12	1:B:491:VAL:CG1	2.26	0.48
1:A:462:ARG:NH1	1:A:491:VAL:CG1	2.77	0.47
1:B:288:ARG:HG3	4:B:2192:HOH:O	2.14	0.47
3:A:1526:COM:S1	3:B:1526:COM:S1	2.99	0.47
1:B:462:ARG:NH1	1:B:491:VAL:CG1	2.77	0.47
1:A:82:CYS:SG	1:B:501:PHE:HE2	2.37	0.47
1:A:338:ASN:HD21	1:A:342:GLN:NE2	2.07	0.47
1:A:462:ARG:NH1	1:A:492:ASP:OD1	2.47	0.47
1:A:92:LEU:HD23	1:A:92:LEU:O	2.14	0.47
1:A:87:CYS:O	1:A:91:HIS:HD2	1.98	0.46
1:B:227:VAL:HG21	1:B:249:LEU:HD21	1.96	0.46
1:A:346:PRO:O	1:A:347:ASN:HB2	2.14	0.46
1:A:501:PHE:CD1	1:A:502:LEU:HA	2.50	0.46
1:B:400:LEU:C	1:B:400:LEU:HD12	2.36	0.46
1:B:6:ALA:HA	1:B:9:ASP:OD2	2.16	0.46
1:A:227:VAL:HG21	1:A:249:LEU:HD21	1.97	0.46
1:A:479:GLN:NE2	1:B:503:ASN:HD22	2.01	0.46
1:B:501:PHE:CD1	1:B:502:LEU:HA	2.50	0.46
1:A:435:ASP:O	1:A:436:ARG:HB2	2.16	0.46
1:B:509:GLN:HE21	1:B:509:GLN:N	2.05	0.45

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:234:ASN:HD22	1:A:394:HIS:CE1	2.34	0.45
1:A:197:LYS:HB2	1:A:288:ARG:HD2	1.98	0.45
1:A:163:ASN:HD22	1:A:163:ASN:H	1.64	0.45
1:B:87:CYS:O	1:B:91:HIS:HD2	1.99	0.45
1:B:91:HIS:HE1	1:B:475:LYS:NZ	2.14	0.45
1:B:197:LYS:HB2	1:B:288:ARG:HD2	1.97	0.45
1:A:47:ILE:HG13	1:A:175:ALA:CB	2.46	0.45
2:B:1524:FAD:H1'1	2:B:1524:FAD:H9	1.86	0.45
1:B:435:ASP:O	1:B:436:ARG:HB2	2.16	0.44
1:B:90:HIS:CE1	1:B:392:HIS:HD2	2.35	0.44
1:A:91:HIS:HE1	1:A:475:LYS:NZ	2.16	0.44
1:A:212:GLU:OE2	1:A:238:ARG:NH2	2.50	0.44
1:B:112:PHE:HB3	4:B:2063:HOH:O	2.17	0.44
1:B:47:ILE:HG13	1:B:175:ALA:CB	2.46	0.44
1:A:90:HIS:CE1	1:A:392:HIS:HD2	2.35	0.44
1:B:234:ASN:HD22	1:B:394:HIS:CE1	2.36	0.43
1:A:6:ALA:HA	1:A:9:ASP:OD2	2.18	0.43
1:B:82:CYS:HA	1:B:86:ALA:HB3	2.00	0.43
1:B:340:TYR:O	1:B:341:LEU:HB2	2.19	0.42
1:B:363:LYS:O	1:B:363:LYS:HD2	2.19	0.42
2:A:1524:FAD:H9	2:A:1524:FAD:H1'1	1.78	0.42
1:B:241:VAL:HG11	1:B:303:ILE:CD1	2.49	0.42
1:B:163:ASN:H	1:B:163:ASN:HD22	1.67	0.42
1:A:82:CYS:HA	1:A:86:ALA:HB3	2.01	0.41
1:B:212:GLU:OE2	1:B:238:ARG:NH2	2.53	0.41
1:B:18:THR:HG22	1:B:22:GLU:OE2	2.21	0.41
1:A:363:LYS:HD2	1:A:363:LYS:O	2.20	0.41
1:B:273:ILE:HD13	1:B:301:MET:HE3	2.01	0.41
1:B:391:LEU:C	1:B:391:LEU:HD12	2.41	0.41
1:A:385:LYS:HE3	1:A:385:LYS:HB2	1.88	0.41
1:A:264:ARG:HG3	4:A:2181:HOH:O	2.21	0.41
1:A:339:GLU:HB2	1:A:381:SER:HB2	2.03	0.41
1:A:284:ASP:OD2	1:A:288:ARG:HB3	2.21	0.41
1:B:241:VAL:HG11	1:B:303:ILE:HD13	2.04	0.40
1:B:234:ASN:HD22	1:B:394:HIS:HE1	1.70	0.40
1:A:391:LEU:HD12	1:A:391:LEU:C	2.41	0.40
1:A:10:HIS:HB3	4:A:2120:HOH:O	2.21	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	520/523 (99%)	502 (96%)	17 (3%)	1 (0%)	56	55
1	B	520/523 (99%)	502 (96%)	17 (3%)	1 (0%)	56	55
All	All	1040/1046 (99%)	1004 (96%)	34 (3%)	2 (0%)	56	55

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	430	ALA
1	A	430	ALA

### 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	423/424 (100%)	412 (97%)	11 (3%)	59	62
1	B	423/424 (100%)	412 (97%)	11 (3%)	59	62
All	All	846/848 (100%)	824 (97%)	22 (3%)	59	62

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	87	CYS
1	A	90	HIS
1	A	159	LYS
1	A	163	ASN
1	A	190	ASP
1	A	253	LYS
1	A	264	ARG

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Mol	Chain	Res	Type
1	A	320	GLU
1	A	363	LYS
1	A	431	LEU
1	A	509	GLN
1	B	87	CYS
1	B	90	HIS
1	B	159	LYS
1	B	163	ASN
1	B	190	ASP
1	B	253	LYS
1	B	264	ARG
1	B	320	GLU
1	B	363	LYS
1	B	431	LEU
1	B	509	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (35) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	8	ASN
1	A	14	ASN
1	A	69	GLN
1	A	91	HIS
1	A	141	ASN
1	A	163	ASN
1	A	234	ASN
1	A	255	ASN
1	A	315	GLN
1	A	342	GLN
1	A	374	ASN
1	A	392	HIS
1	A	394	HIS
1	A	425	ASN
1	A	453	GLN
1	A	479	GLN
1	A	509	GLN
1	B	8	ASN
1	B	14	ASN
1	B	69	GLN
1	B	91	HIS
1	B	141	ASN
1	B	163	ASN

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Mol	Chain	Res	Type
1	B	202	HIS
1	B	234	ASN
1	B	255	ASN
1	B	315	GLN
1	B	342	GLN
1	B	374	ASN
1	B	392	HIS
1	B	394	HIS
1	B	425	ASN
1	B	453	GLN
1	B	479	GLN
1	B	509	GLN

### 5.3.3 RNA ⓘ

There are no RNA chains 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 ⓘ

There are no carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

6 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	A	1524	-	58,58,58	2.24	14 (24%)	85,89,89	2.06	19 (22%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	COM	A	1525	-	6,6,6	0.93	0	8,8,8	3.66	4 (50%)
3	COM	A	1526	-	6,6,6	1.09	0	8,8,8	2.07	4 (50%)
2	FAD	B	1524	-	58,58,58	2.20	14 (24%)	85,89,89	1.78	15 (17%)
3	COM	B	1525	-	6,6,6	1.01	1 (16%)	8,8,8	1.90	4 (50%)
3	COM	B	1526	-	6,6,6	1.13	1 (16%)	8,8,8	1.67	4 (50%)

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	A	1524	-	-	0/34/50/50	0/1/6/6
3	COM	A	1525	-	-	0/4/4/4	0/0/0/0
3	COM	A	1526	-	-	0/4/4/4	0/0/0/0
2	FAD	B	1524	-	-	0/34/50/50	0/1/6/6
3	COM	B	1525	-	-	0/4/4/4	0/0/0/0
3	COM	B	1526	-	-	0/4/4/4	0/0/0/0

All (30) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	1524	FAD	C9A-N10	7.92	1.50	1.38
2	A	1524	FAD	C9A-N10	7.28	1.49	1.38
2	B	1524	FAD	C4A-N3A	5.78	1.44	1.35
2	A	1524	FAD	C4A-N3A	5.63	1.44	1.35
2	A	1524	FAD	C2A-N3A	4.66	1.41	1.32
2	B	1524	FAD	C2A-N3A	4.65	1.41	1.32
2	B	1524	FAD	C5X-N5	4.58	1.42	1.35
2	A	1524	FAD	C5X-N5	4.28	1.41	1.35
2	B	1524	FAD	C8A-N9A	4.28	1.43	1.36
2	A	1524	FAD	C4X-N5	4.21	1.45	1.36
2	B	1524	FAD	C4X-N5	4.09	1.44	1.36
2	A	1524	FAD	C5A-C4A	-3.99	1.31	1.40
2	A	1524	FAD	C8A-N9A	3.84	1.42	1.36
2	B	1524	FAD	C5A-C4A	-3.78	1.32	1.40
2	A	1524	FAD	C1'-N10	-3.75	1.43	1.48
2	B	1524	FAD	C1'-N10	-3.70	1.44	1.48
2	A	1524	FAD	PA-O3P	3.35	1.65	1.59
2	A	1524	FAD	C4-N3	3.22	1.42	1.37
2	A	1524	FAD	C5'-C4'	-2.97	1.46	1.51

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	1524	FAD	C4-N3	2.97	1.42	1.37
2	B	1524	FAD	C9A-C5X	2.80	1.48	1.42
2	A	1524	FAD	C9A-C5X	2.68	1.48	1.42
2	A	1524	FAD	P-O3P	2.59	1.64	1.59
2	B	1524	FAD	C5'-C4'	-2.32	1.48	1.51
2	B	1524	FAD	C2B-C3B	-2.22	1.47	1.53
2	B	1524	FAD	C4-C4X	-2.10	1.37	1.41
3	B	1526	COM	C2-S2	2.07	1.80	1.77
2	A	1524	FAD	C2B-C3B	-2.04	1.47	1.53
2	B	1524	FAD	C6-C7	2.04	1.43	1.37
3	B	1525	COM	C2-S2	2.03	1.80	1.77

All (50) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	1524	FAD	C8A-N9A-C4A	-8.64	100.31	106.90
2	A	1524	FAD	C8A-N9A-C4A	-8.53	100.39	106.90
3	A	1525	COM	O2S-S2-C2	6.31	112.22	106.81
3	A	1525	COM	O3S-S2-C2	-6.06	98.26	105.93
2	A	1524	FAD	O2A-PA-O3P	-5.66	78.26	105.14
2	A	1524	FAD	C1'-N10-C9A	-5.54	113.49	118.87
2	A	1524	FAD	N3A-C2A-N1A	-5.17	124.39	128.71
2	B	1524	FAD	N3A-C2A-N1A	-4.91	124.60	128.71
2	A	1524	FAD	O2A-PA-O1A	4.84	139.26	112.21
2	B	1524	FAD	C1'-N10-C9A	-4.44	114.56	118.87
2	A	1524	FAD	O3P-PA-O1A	-4.38	79.85	111.28
3	A	1525	COM	C1-C2-S2	3.85	121.17	111.52
2	A	1524	FAD	C1'-N10-C10	3.63	124.31	119.17
2	A	1524	FAD	N3A-C4A-N9A	-3.57	118.98	125.43
2	B	1524	FAD	N3A-C4A-N9A	-3.52	119.07	125.43
3	A	1526	COM	O3S-S2-C2	-3.32	101.72	105.93
3	A	1525	COM	O3S-S2-O1S	3.27	118.85	111.78
3	B	1525	COM	O3S-S2-C2	-3.06	102.06	105.93
2	B	1524	FAD	C5A-C4A-N9A	3.04	111.55	107.16
2	A	1524	FAD	C4X-C10-N10	-2.98	119.02	120.51
2	A	1524	FAD	C5A-C4A-N9A	2.93	111.40	107.16
3	A	1526	COM	O2S-S2-C2	2.93	109.32	106.81
2	B	1524	FAD	C1'-N10-C10	2.85	123.22	119.17
2	B	1524	FAD	C4X-C10-N10	-2.78	119.12	120.51
2	A	1524	FAD	C2-N1-C10	2.75	117.75	114.98
2	B	1524	FAD	C2-N1-C10	2.75	117.75	114.98
3	B	1525	COM	O2S-S2-C2	2.66	109.09	106.81

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1524	FAD	C8A-N9A-C1B	2.61	131.52	126.38
2	B	1524	FAD	C8A-N9A-C1B	2.54	131.39	126.38
2	B	1524	FAD	O2B-C2B-C3B	2.53	120.06	111.83
3	A	1526	COM	C1-C2-S2	2.49	117.77	111.52
2	A	1524	FAD	O2B-C2B-C3B	2.46	119.84	111.83
2	B	1524	FAD	C10-C4X-N5	2.46	123.44	120.45
2	A	1524	FAD	O5B-C5B-C4B	-2.43	100.03	108.94
2	A	1524	FAD	C10-C4X-N5	2.39	123.36	120.45
2	A	1524	FAD	O4'-C4'-C5'	-2.37	105.25	110.12
3	A	1526	COM	O3S-S2-O1S	2.37	116.91	111.78
2	B	1524	FAD	O3'-C3'-C4'	-2.34	102.81	108.74
3	B	1525	COM	O3S-S2-O1S	2.27	116.69	111.78
3	B	1526	COM	O3S-S2-O1S	2.25	116.66	111.78
3	B	1526	COM	O2S-S2-C2	2.24	108.72	106.81
2	A	1524	FAD	O3'-C3'-C4'	-2.22	103.13	108.74
2	B	1524	FAD	C3B-C2B-C1B	2.20	104.36	100.91
3	B	1525	COM	C1-C2-S2	2.19	117.02	111.52
2	A	1524	FAD	C4-C4X-C10	2.14	120.40	116.95
2	B	1524	FAD	C4-C4X-C10	2.12	120.37	116.95
2	A	1524	FAD	C2'-C1'-N10	2.10	115.23	112.45
2	B	1524	FAD	O4'-C4'-C5'	-2.05	105.91	110.12
3	B	1526	COM	O3S-S2-C2	-2.04	103.34	105.93
3	B	1526	COM	O1S-S2-C2	-2.01	105.09	106.81

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

## 5.7 Other polymers ⓘ

There are no such residues in this entry.

## 5.8 Polymer linkage issues

There are no chain breaks in this entry.

## 6 Fit of model and data ⓘ

### 6.1 Protein, DNA and RNA chains ⓘ

EDS was not executed - this section will therefore be empty.

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

EDS was not executed - this section will therefore be empty.

### 6.3 Carbohydrates ⓘ

EDS was not executed - this section will therefore be empty.

### 6.4 Ligands ⓘ

EDS was not executed - this section will therefore be empty.

### 6.5 Other polymers ⓘ

EDS was not executed - this section will therefore be empty.