



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 14, 2018 – 04:08 am GMT

PDB ID : 3W2N
Title : Structure of Trypanosoma cruzi dihydroorotate dehydrogenase in complex with MII-3-185
Authors : Inaoka, D.K.; Iida, M.; Tabuchi, T.; Lee, N.; Matsuoka, S.; Shiba, T.; Sakamoto, K.; Suzuki, S.; Balogun, E.O.; Nara, T.; Aoki, T.; Inoue, M.; Honma, T.; Tanaka, A.; Harada, S.; Kita, K.
Deposited on : 2012-12-03
Resolution : 1.96 Å(reported)

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

We welcome your comments at 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.7.3 (157068), CSD as539be (2018)
Xtriage (Phenix) : 1.13
EDS : trunk31020
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)
Refmac : 5.8.0158
CCP4 : 7.0 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk31020

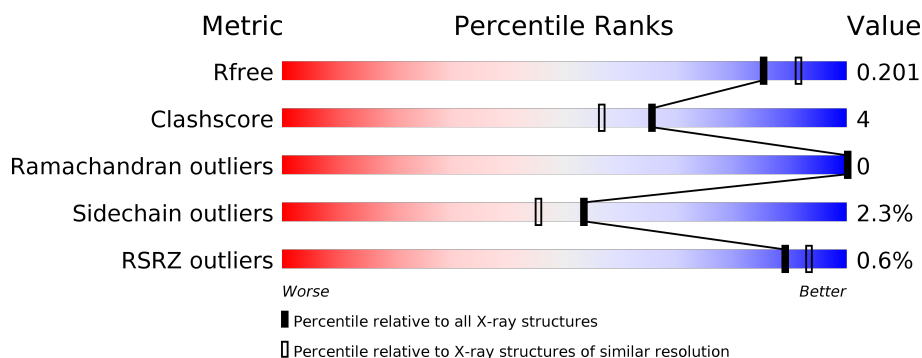
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.96 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}	111664	2220 (1.96-1.96)
Clashscore	122126	2333 (1.96-1.96)
Ramachandran outliers	120053	2314 (1.96-1.96)
Sidechain outliers	120020	2314 (1.96-1.96)
RSRZ outliers	108989	2174 (1.96-1.96)

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 ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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	313	<div> <div style="width: 87%;"></div> <div style="width: 11%;"></div> <div style="width: 2%;"></div> </div> <div>87% 11% .</div>
1	B	313	<div> <div style="width: 86%;"></div> <div style="width: 13%;"></div> <div style="width: 1%;"></div> </div> <div>% 86% 13%</div>

2 Entry composition [i](#)

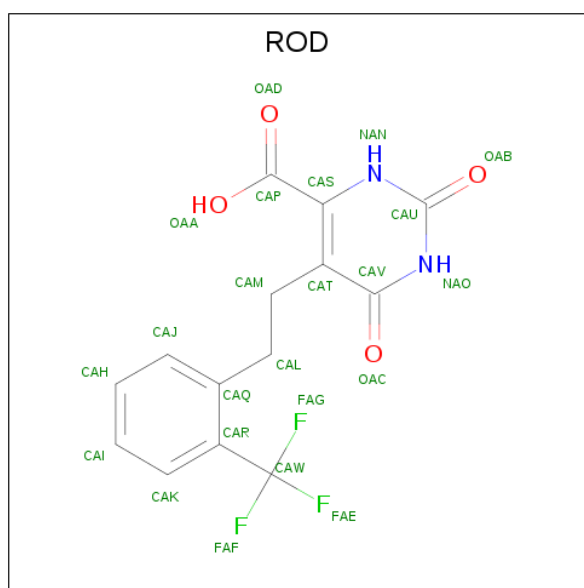
There are 6 unique types of molecules in this entry. The entry contains 5399 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Dihydroorotate dehydrogenase (fumarate).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	313	Total	C	N	O	S	0	0	0
			2388	1530	396	444	18			
1	B	313	Total	C	N	O	S	0	0	0
			2388	1530	396	444	18			

- Molecule 2 is 2,6-dioxo-5-{2-[2-(trifluoromethyl)phenyl]ethyl}-1,2,3,6-tetrahydropyrimidine-4-carboxylic acid (three-letter code: ROD) (formula: $C_{14}H_{11}F_3N_2O_4$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	F	N	O	0
			23	14	3	2	4	
2	B	1	Total	C	F	N	O	0
			23	14	3	2	4	

- Molecule 3 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



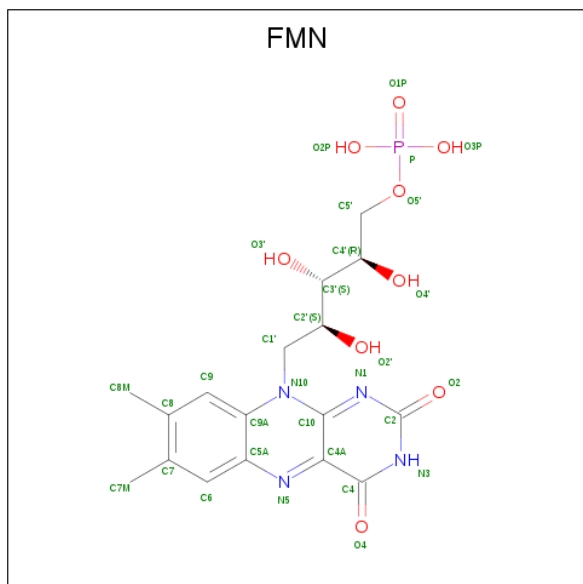
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			6	3	3		
3	A	1	Total	C	O	0	0
			6	3	3		
3	A	1	Total	C	O	0	0
			6	3	3		
3	A	1	Total	C	O	0	0
			6	3	3		
3	A	1	Total	C	O	0	0
			6	3	3		
3	A	1	Total	C	O	0	0
			6	3	3		
3	A	1	Total	C	O	0	0
			6	3	3		
3	A	1	Total	C	O	0	0
			6	3	3		
3	B	1	Total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

Continued on next page...

Continued from previous page...

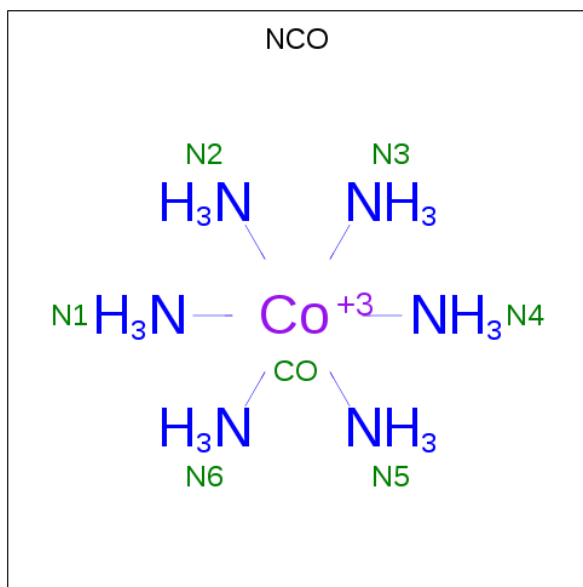
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	B	1	Total	C	O	0	0
			6	3	3		

- Molecule 4 is FLAVIN MONONUCLEOTIDE (three-letter code: FMN) (formula: $C_{17}H_{21}N_4O_9P$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
4	B	1	Total	C	N	O	P	0	0
			31	17	4	9	1		

- Molecule 5 is COBALT HEXAMMINE(III) (three-letter code: NCO) (formula: $CoH_{18}N_6$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	Co	N	0	0
			7	1	6		

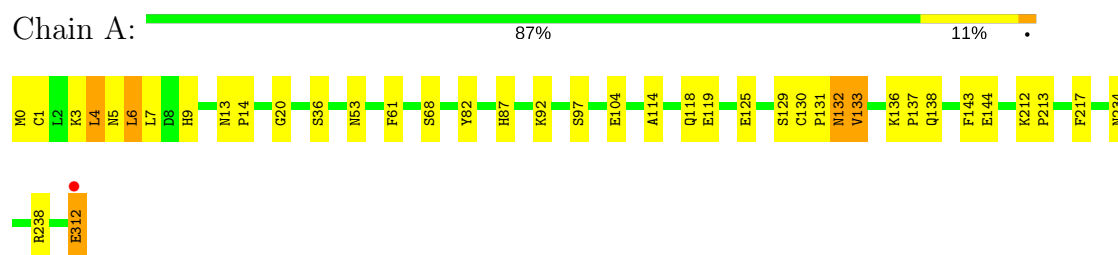
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	208	Total	O	0	0
			208	208		
6	B	210	Total	O	0	0
			210	210		

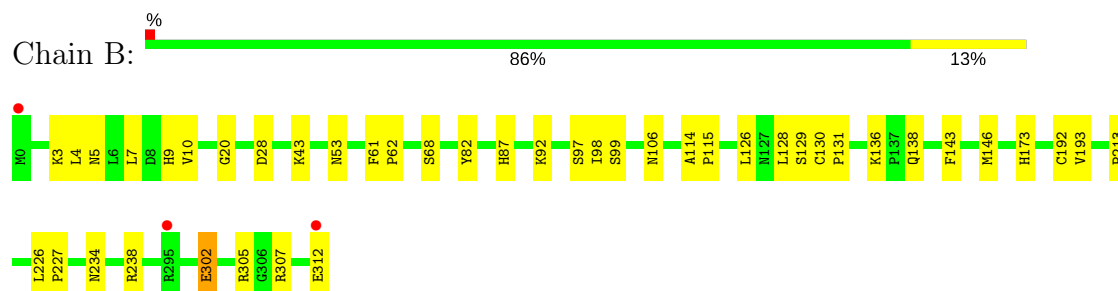
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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: Dihydroorotate dehydrogenase (fumarate)



- Molecule 1: Dihydroorotate dehydrogenase (fumarate)



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	68.12Å 71.89Å 128.94Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	34.06 – 1.96 34.06 – 1.96	Depositor EDS
% Data completeness (in resolution range)	98.8 (34.06-1.96) 98.8 (34.06-1.96)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.97 (at 1.97Å)	Xtriage
Refinement program	REFMAC 5.7.0029	Depositor
R, R_{free}	0.146 , 0.194 0.161 , 0.201	Depositor DCC
R_{free} test set	2326 reflections (5.10%)	wwPDB-VP
Wilson B-factor (Å ²)	13.4	Xtriage
Anisotropy	0.156	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.39 , 51.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	5399	wwPDB-VP
Average B, all atoms (Å ²)	15.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 22.32 % 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 5.8368e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹Intensities estimated from amplitudes.

²Theoretical 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: FMN, GOL, ROD, NCO

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	1.17	7/2440 (0.3%)	1.02	7/3305 (0.2%)
1	B	1.10	3/2440 (0.1%)	0.98	4/3305 (0.1%)
All	All	1.13	10/4880 (0.2%)	1.00	11/6610 (0.2%)

The worst 5 of 10 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	36	SER	CB-OG	-6.74	1.33	1.42
1	B	302	GLU	CD-OE2	5.92	1.32	1.25
1	B	97	SER	CB-OG	-5.81	1.34	1.42
1	A	144	GLU	CG-CD	5.78	1.60	1.51
1	A	104	GLU	CG-CD	5.71	1.60	1.51

The worst 5 of 11 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	4	LEU	CA-CB-CG	7.48	132.51	115.30
1	A	3	LYS	CD-CE-NZ	7.41	128.75	111.70
1	B	305	ARG	NE-CZ-NH1	5.92	123.26	120.30
1	A	104	GLU	OE1-CD-OE2	-5.81	116.33	123.30
1	A	68	SER	CB-CA-C	5.65	120.84	110.10

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	2388	0	2391	22	0
1	B	2388	0	2391	23	0
2	A	23	0	10	0	0
2	B	23	0	10	0	0
3	A	72	0	96	5	0
3	B	18	0	24	2	0
4	A	31	0	19	0	0
4	B	31	0	19	1	0
5	A	7	0	0	0	0
6	A	208	0	0	0	0
6	B	210	0	0	1	0
All	All	5399	0	4960	44	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 4.

The worst 5 of 44 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:234:ASN:HD21	1:B:238:ARG:HE	1.37	0.70
1:A:7:LEU:O	1:A:9:HIS:HD2	1.75	0.70
1:A:234:ASN:HD21	1:A:238:ARG:HE	1.43	0.67
1:B:98:ILE:HD11	1:B:126:LEU:CD1	2.28	0.64
1:B:7:LEU:O	1:B:9:HIS:HD2	1.82	0.63

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	311/313 (99%)	303 (97%)	8 (3%)	0	100	100
1	B	311/313 (99%)	305 (98%)	6 (2%)	0	100	100
All	All	622/626 (99%)	608 (98%)	14 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	258/258 (100%)	252 (98%)	6 (2%)	53	45
1	B	258/258 (100%)	252 (98%)	6 (2%)	53	45
All	All	516/516 (100%)	504 (98%)	12 (2%)	53	45

5 of 12 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	312	GLU
1	B	3	LYS
1	B	99	SER
1	A	132	ASN
1	B	68	SER

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 13 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	234	ASN
1	A	275	GLN
1	B	138	GLN
1	A	215	GLN
1	B	87	HIS

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 ⓘ

There are no carbohydrates in this entry.

5.6 Ligand geometry ⓘ

20 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	ROD	A	401	-	19,24,24	2.61	8 (42%)	20,35,35	2.36	6 (30%)
3	GOL	A	402	-	5,5,5	0.59	0	5,5,5	0.70	0
3	GOL	A	403	-	5,5,5	0.21	0	5,5,5	0.42	0
3	GOL	A	404	-	5,5,5	0.48	0	5,5,5	0.89	0
3	GOL	A	405	-	5,5,5	0.68	0	5,5,5	0.98	0
3	GOL	A	406	-	5,5,5	0.35	0	5,5,5	0.55	0
3	GOL	A	407	-	5,5,5	0.24	0	5,5,5	0.65	0
3	GOL	A	408	-	5,5,5	0.30	0	5,5,5	0.61	0
3	GOL	A	409	-	5,5,5	0.69	0	5,5,5	0.36	0
3	GOL	A	410	-	5,5,5	0.68	0	5,5,5	1.17	1 (20%)
3	GOL	A	411	-	5,5,5	1.26	0	5,5,5	0.83	0
3	GOL	A	412	-	5,5,5	0.35	0	5,5,5	0.66	0
3	GOL	A	413	-	5,5,5	0.29	0	5,5,5	0.55	0
4	FMN	A	414	-	31,33,33	1.77	7 (22%)	39,50,50	2.46	8 (20%)
5	NCO	A	415	-	6,6,6	1.43	2 (33%)	0,15,15	0.00	-
2	ROD	B	401	-	19,24,24	1.84	3 (15%)	20,35,35	2.71	4 (20%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	GOL	B	402	-	5,5,5	0.61	0	5,5,5	1.40	1 (20%)
3	GOL	B	403	-	5,5,5	0.30	0	5,5,5	0.55	0
3	GOL	B	404	-	5,5,5	0.65	0	5,5,5	0.98	0
4	FMN	B	405	-	31,33,33	1.56	6 (19%)	39,50,50	2.47	11 (28%)

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	ROD	A	401	-	-	0/11/15/15	0/2/2/2
3	GOL	A	402	-	-	0/4/4/4	0/0/0/0
3	GOL	A	403	-	-	0/4/4/4	0/0/0/0
3	GOL	A	404	-	-	0/4/4/4	0/0/0/0
3	GOL	A	405	-	-	0/4/4/4	0/0/0/0
3	GOL	A	406	-	-	0/4/4/4	0/0/0/0
3	GOL	A	407	-	-	0/4/4/4	0/0/0/0
3	GOL	A	408	-	-	0/4/4/4	0/0/0/0
3	GOL	A	409	-	-	0/4/4/4	0/0/0/0
3	GOL	A	410	-	-	0/4/4/4	0/0/0/0
3	GOL	A	411	-	-	0/4/4/4	0/0/0/0
3	GOL	A	412	-	-	0/4/4/4	0/0/0/0
3	GOL	A	413	-	-	0/4/4/4	0/0/0/0
4	FMN	A	414	-	-	0/16/18/18	0/3/3/3
5	NCO	A	415	-	-	0/0/0/0	0/0/0/0
2	ROD	B	401	-	-	0/11/15/15	0/2/2/2
3	GOL	B	402	-	-	0/4/4/4	0/0/0/0
3	GOL	B	403	-	-	0/4/4/4	0/0/0/0
3	GOL	B	404	-	-	0/4/4/4	0/0/0/0
4	FMN	B	405	-	-	0/16/18/18	0/3/3/3

The worst 5 of 26 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401	ROD	CAM-CAT	-6.79	1.40	1.52
4	A	414	FMN	C1'-N10	-3.64	1.44	1.48
2	A	401	ROD	CAU-NAO	2.04	1.42	1.38
2	A	401	ROD	CAK-CAR	2.09	1.42	1.39
5	A	415	NCO	CO-N6	2.11	2.04	1.97

The worst 5 of 31 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	414	FMN	C4A-C4-N3	-5.37	115.84	123.47
4	B	405	FMN	C4A-C4-N3	-4.65	116.86	123.47
4	A	414	FMN	C4A-C10-N10	-4.43	116.28	120.40
2	B	401	ROD	CAL-CAM-CAT	-3.91	105.00	112.47
4	A	414	FMN	C4-C4A-C10	-3.34	117.45	119.95

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

6 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	404	GOL	1	0
3	A	406	GOL	1	0
3	A	412	GOL	2	0
3	A	413	GOL	1	0
3	B	404	GOL	2	0
4	B	405	FMN	1	0

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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, 95th 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 ²)	Q<0.9
1	A	313/313 (100%)	-0.18	1 (0%) 93 96	7, 12, 24, 55	0
1	B	313/313 (100%)	-0.17	3 (0%) 82 87	6, 12, 27, 52	0
All	All	626/626 (100%)	-0.18	4 (0%) 89 93	6, 12, 26, 55	0

All (4) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	0	MET	4.8
1	B	312	GLU	4.4
1	A	312	GLU	4.1
1	B	295	ARG	2.3

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 carbohydrates 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, 95th 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 ²)	Q<0.9
3	GOL	A	411	6/6	0.71	0.23	24,30,33,35	0

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
3	GOL	A	413	6/6	0.81	0.32	38,40,40,40	0
3	GOL	A	407	6/6	0.83	0.16	41,47,50,57	0
3	GOL	A	408	6/6	0.85	0.23	35,41,42,44	0
3	GOL	A	402	6/6	0.88	0.16	18,22,25,26	0
3	GOL	A	409	6/6	0.88	0.14	35,39,39,39	0
3	GOL	A	412	6/6	0.88	0.26	30,31,34,34	0
3	GOL	B	403	6/6	0.88	0.18	41,46,52,60	0
3	GOL	B	404	6/6	0.88	0.15	32,35,38,39	0
3	GOL	A	410	6/6	0.88	0.12	29,32,33,34	0
3	GOL	B	402	6/6	0.91	0.17	21,23,24,26	0
3	GOL	A	404	6/6	0.92	0.11	22,25,27,30	0
3	GOL	A	406	6/6	0.93	0.22	41,43,45,46	0
3	GOL	A	405	6/6	0.94	0.12	19,19,21,23	0
3	GOL	A	403	6/6	0.94	0.10	19,19,20,22	0
2	ROD	B	401	23/23	0.96	0.09	8,10,14,16	0
2	ROD	A	401	23/23	0.96	0.08	8,9,13,14	0
4	FMN	B	405	31/31	0.97	0.10	5,8,9,10	0
4	FMN	A	414	31/31	0.97	0.12	5,7,9,11	0
5	NCO	A	415	7/7	0.99	0.10	10,11,11,12	0

6.5 Other polymers [i](#)

There are no such residues in this entry.