Full wwPDB X-ray Structure Validation Report ⓘ

Feb 21, 2024 – 09:12 AM EST

PDB ID	:	4OQV
Title	:	High resolution crystal structure of human dihydroorotate dehydrogenase bound with DSM338 (N-[3,5-difluoro-4-(trifluoromethyl)phenyl]-5-methyl-2-(trifluoromethyl)[1,2,4]triazolo[1,5-a]pyrimidin-7-amine)
Authors	:	Deng, X.; Phillips, M.A.
Deposited on	:	2014-02-10
Resolution	:	1.23 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*
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.

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

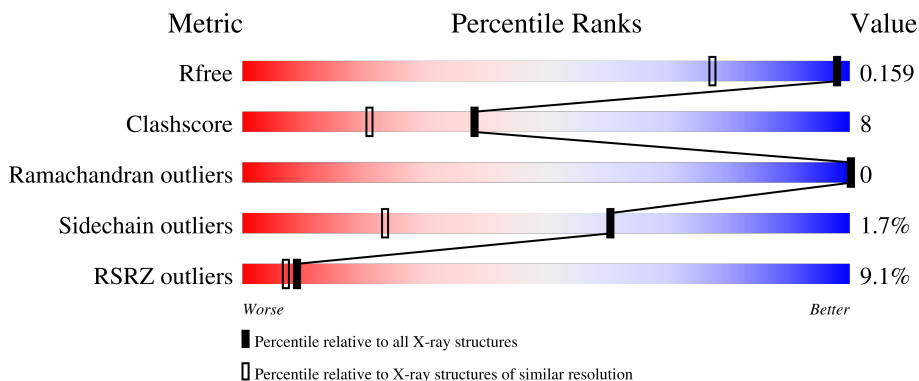|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.23 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	Percentile Ranks	Value
Rfree		0.159
Clashscore		8
Ramachandran outliers		0
Sidechain outliers		1.7%
RSRZ outliers		9.1%

Worse   *Better*

▌Percentile relative to all X-ray structures

⟦⟧ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	2024 (1.28-1.20)
Clashscore	141614	1007 (1.26-1.22)
Ramachandran outliers	138981	2053 (1.28-1.20)
Sidechain outliers	138945	2051 (1.28-1.20)
RSRZ outliers	127900	1987 (1.28-1.20)

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 >=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 <=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	377	8% 79% 12% • 6%

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
5	ACY	A	504	-	X	X	-
5	ACY	A	505	-	X	X	-

2 Entry composition ⓘ

There are 9 unique types of molecules in this entry. The entry contains 3225 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 (quinone), mitochondrial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	353	2777	1758	503	511	5	0	15	0

There are 13 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	397	ASP	-	expression tag	UNP Q02127
A	398	LYS	-	expression tag	UNP Q02127
A	399	LEU	-	expression tag	UNP Q02127
A	400	ALA	-	expression tag	UNP Q02127
A	401	ALA	-	expression tag	UNP Q02127
A	402	LEU	-	expression tag	UNP Q02127
A	403	GLU	-	expression tag	UNP Q02127
A	404	HIS	-	expression tag	UNP Q02127
A	405	HIS	-	expression tag	UNP Q02127
A	406	HIS	-	expression tag	UNP Q02127
A	407	HIS	-	expression tag	UNP Q02127
A	408	HIS	-	expression tag	UNP Q02127
A	409	HIS	-	expression tag	UNP Q02127

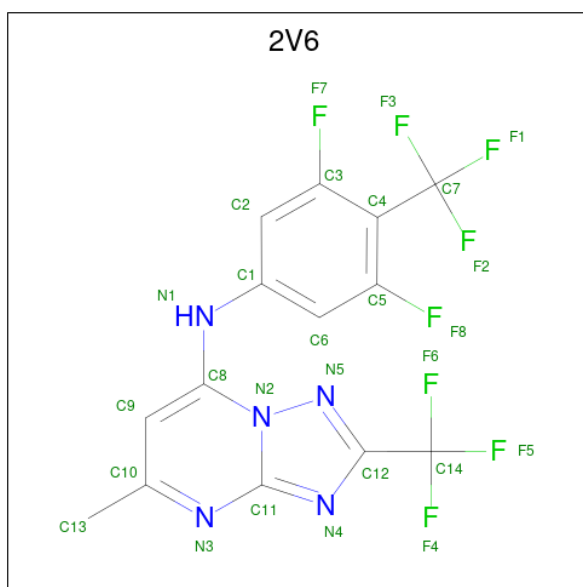- Molecule 2 is FLAVIN MONONUCLEOTIDE (three-letter code: FMN) (formula: $C_{17}H_{21}N_4O_9P$).

FMN

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

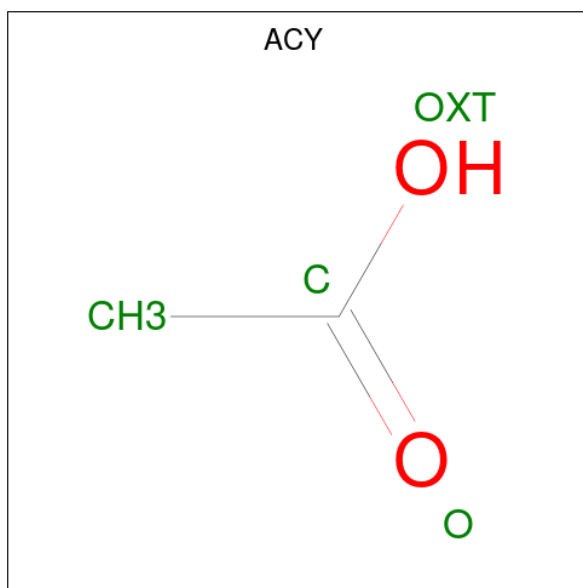- Molecule 3 is OROTIC ACID (three-letter code: ORO) (formula: $C_5H_4N_2O_4$).

ORO

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
3	A	1	11	5	2	4	0	0

- Molecule 4 is N-[3,5-difluoro-4-(trifluoromethyl)phenyl]-5-methyl-2-(trifluoromethyl)[1,2,4]triazolo[1,5-a]pyrimidin-7-amine (three-letter code: 2V6) (formula: $C_{14}H_7F_8N_5$).
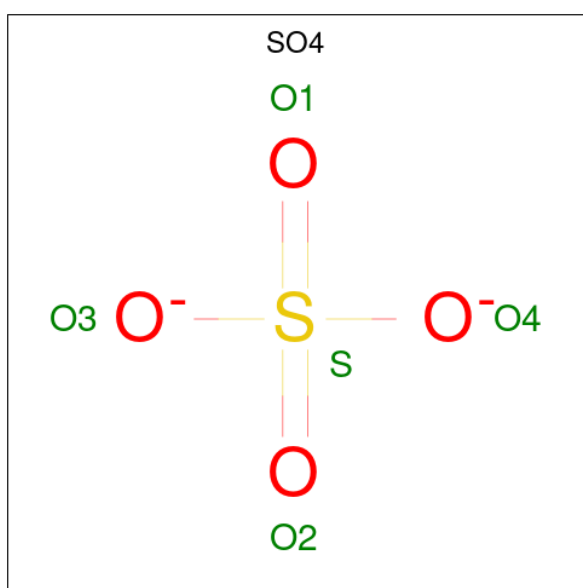
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	F	N		
4	A	1	27	14	8	5	0	0

- Molecule 5 is ACETIC ACID (three-letter code: ACY) (formula: $C_2H_4O_2$).

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
5	A	1	4	2	2	0	0
5	A	1	Total	C	O	0	0
			4	2	2		

- Molecule 6 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).

GOL

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

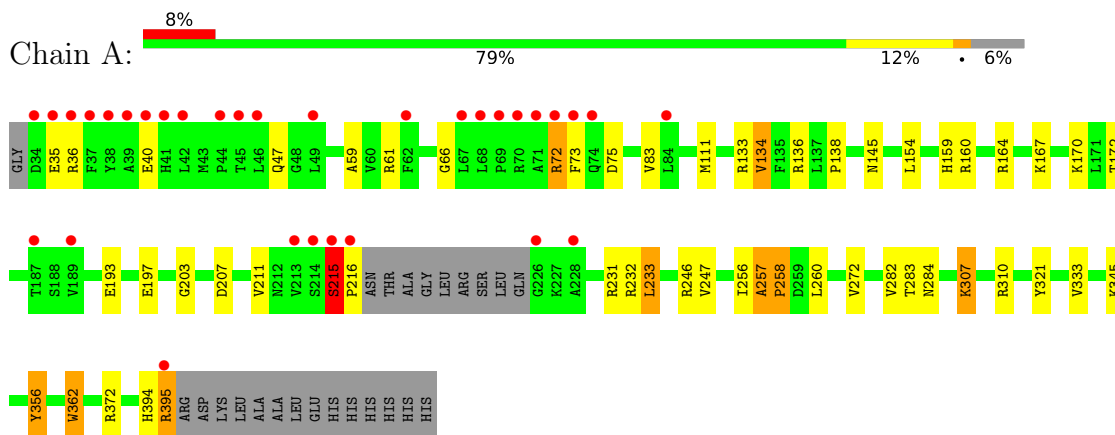- Molecule 7 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	2	Total 2	Na 2	0	0

- Molecule 8 is SULFATE ION (three-letter code: SO4) (formula: O_4S).

SO4

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	A	1	Total 5	O 4	S 1	0	0

• Molecule 9 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	358	Total 358	O 358	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: Dihydroorotate dehydrogenase (quinone), mitochondrial

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α, β, γ	90.94Å 90.94Å 121.94Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	30.00 – 1.23 30.30 – 1.23	Depositor EDS
% Data completeness (in resolution range)	99.7 (30.00-1.23) 99.7 (30.30-1.23)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.06	Depositor
$< I/\sigma(I) >$ [1]	2.74 (at 1.23Å)	Xtriage
Refinement program	REFMAC 5.6.0117	Depositor
R, R_{free}	0.141 , 0.157 0.142 , 0.159	Depositor DCC
R_{free} test set	8445 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å^2)	11.4	Xtriage
Anisotropy	0.192	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.41 , 70.7	EDS
L-test for twinning[2]	$< |L| > = 0.51, < L^2 > = 0.34$	Xtriage
Estimated twinning fraction	0.014 for -h,-k,l	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	3225	wwPDB-VP
Average B, all atoms (Å^2)	21.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.75% of the height of the origin peak. No significant pseudotranslation is detected.*

---

[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5　Model quality ⓘ

5.1　Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: FMN, NA, SO4, ACY, ORO, GOL, 2V6

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	1.28	17/2873 (0.6%)	1.22	22/3884 (0.6%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

All (17) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	258	PRO	N-CD	7.08	1.57	1.47
1	A	257	ALA	C-O	-6.97	1.10	1.23
1	A	203	GLY	C-O	-6.85	1.12	1.23
1	A	134[A]	VAL	N-CA	6.80	1.59	1.46
1	A	134[B]	VAL	N-CA	6.80	1.59	1.46
1	A	211	VAL	C-O	-6.36	1.11	1.23
1	A	138	PRO	N-CD	5.95	1.56	1.47
1	A	232	ARG	CZ-NH1	5.87	1.40	1.33
1	A	136	ARG	CZ-NH2	-5.60	1.25	1.33
1	A	197	GLU	CD-OE2	-5.49	1.19	1.25
1	A	133	ARG	CZ-NH1	-5.45	1.25	1.33
1	A	356	TYR	CE1-CZ	-5.43	1.31	1.38
1	A	362[A]	TRP	CD2-CE3	-5.17	1.32	1.40
1	A	362[B]	TRP	CD2-CE3	-5.17	1.32	1.40
1	A	193	GLU	CD-OE2	-5.12	1.20	1.25
1	A	133	ARG	CZ-NH2	-5.06	1.26	1.33
1	A	216	PRO	N-CD	5.05	1.54	1.47

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	232	ARG	NE-CZ-NH1	14.62	127.61	120.30
1	A	232	ARG	NE-CZ-NH2	-14.11	113.25	120.30
1	A	231	ARG	NE-CZ-NH1	10.57	125.58	120.30
1	A	233	LEU	CB-CG-CD2	-10.14	93.77	111.00
1	A	307	LYS	CG-CD-CE	8.75	138.14	111.90
1	A	395	ARG	NE-CZ-NH1	-8.12	116.24	120.30
1	A	272	VAL	CG1-CB-CG2	8.06	123.79	110.90
1	A	167	LYS	CD-CE-NZ	-7.94	93.43	111.70
1	A	246	ARG	NE-CZ-NH1	6.50	123.55	120.30
1	A	164	ARG	NE-CZ-NH1	6.48	123.54	120.30
1	A	136	ARG	NE-CZ-NH2	-6.27	117.17	120.30
1	A	75	ASP	CB-CG-OD1	-6.23	112.69	118.30
1	A	345	LYS	CD-CE-NZ	6.12	125.78	111.70
1	A	310	ARG	NE-CZ-NH1	-6.11	117.24	120.30
1	A	111	MET	CG-SD-CE	6.00	109.79	100.20
1	A	136	ARG	NE-CZ-NH1	5.77	123.19	120.30
1	A	215	SER	C-N-CD	5.68	140.32	128.40
1	A	231	ARG	NE-CZ-NH2	-5.65	117.47	120.30
1	A	61	ARG	NE-CZ-NH1	5.65	123.12	120.30
1	A	333[A]	VAL	CA-CB-CG1	-5.44	102.75	110.90
1	A	333[B]	VAL	CA-CB-CG1	-5.44	102.75	110.90
1	A	160	ARG	CG-CD-NE	-5.36	100.54	111.80

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	134[B]	VAL	Mainchain

5.2 Too-close contacts ⓘ

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2777	0	2869	41	0
2	A	31	0	19	0	0
3	A	11	0	3	1	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	A	27	0	7	1	0
5	A	8	0	7	5	0
6	A	6	0	8	1	0
7	A	2	0	0	0	0
8	A	5	0	0	0	0
9	A	358	0	0	11	0
All	All	3225	0	2913	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 8.

All (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)
5:A:505:ACY:O	5:A:505:ACY:C	1.69	1.37
1:A:258:PRO:CD	1:A:283[B]:THR:HG21	1.90	1.01
1:A:258:PRO:HD3	1:A:283[B]:THR:CG2	1.94	0.97
1:A:258:PRO:HD3	1:A:283[B]:THR:HG21	1.44	0.97
1:A:207:ASP:OD1	5:A:504:ACY:H3	1.76	0.85
1:A:283[B]:THR:HG22	1:A:284:ASN:N	1.92	0.84
1:A:256:ILE:O	1:A:283[B]:THR:HG23	1.80	0.82
1:A:258:PRO:N	1:A:283[B]:THR:HG21	1.97	0.80
1:A:145:ASN:OD1	3:A:502:ORO:H5	1.86	0.76
1:A:73:PHE:CE1	1:A:372:ARG:HG2	2.22	0.74
1:A:283[B]:THR:CG2	1:A:284:ASN:N	2.51	0.73
1:A:283[B]:THR:HG22	1:A:284:ASN:O	1.90	0.71
1:A:207:ASP:OD1	5:A:504:ACY:CH3	2.39	0.71
1:A:159:HIS:HD2	9:A:708:HOH:O	1.76	0.69
1:A:258:PRO:CD	1:A:283[B]:THR:CG2	2.65	0.66
6:A:506:GOL:O3	9:A:955:HOH:O	2.13	0.66
1:A:321:TYR:OH	1:A:395:ARG:NH1	2.31	0.63
1:A:258:PRO:HD3	1:A:283[B]:THR:HG22	1.81	0.63
1:A:159:HIS:HE1	9:A:792:HOH:O	1.82	0.60
1:A:233:LEU:C	1:A:233:LEU:HD23	2.23	0.59
1:A:73:PHE:CD1	1:A:372:ARG:HG2	2.38	0.58
1:A:66:GLY:HA2	9:A:753:HOH:O	2.03	0.57
1:A:73:PHE:CD1	1:A:372:ARG:CG	2.87	0.57
5:A:505:ACY:O	5:A:505:ACY:CH3	2.48	0.56
1:A:215:SER:HB3	1:A:260:LEU:HD23	1.89	0.53
1:A:72:ARG:HD2	1:A:72:ARG:H	1.74	0.53
1:A:154:LEU:HD21	9:A:749:HOH:O	2.09	0.52

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:73:PHE:CE1	1:A:372:ARG:CG	2.93	0.51
1:A:172:THR:HG21	5:A:504:ACY:H3	1.93	0.51
1:A:170:LYS:NZ	9:A:905:HOH:O	2.44	0.50
1:A:362[B]:TRP:HE3	9:A:801:HOH:O	1.93	0.48
1:A:257:ALA:HA	1:A:283[B]:THR:HG23	1.97	0.47
1:A:394:HIS:O	9:A:877:HOH:O	2.21	0.46
1:A:59:ALA:HB2	4:A:503:2V6:C2	2.46	0.45
1:A:73:PHE:CD1	1:A:372:ARG:HG3	2.51	0.45
1:A:258:PRO:N	1:A:283[B]:THR:CG2	2.76	0.44
1:A:83:VAL:HG23	9:A:843:HOH:O	2.19	0.43
1:A:257:ALA:HA	1:A:283[B]:THR:CG2	2.49	0.42
1:A:73:PHE:HE1	1:A:372:ARG:HG2	1.78	0.42
1:A:35:GLU:HG2	9:A:801:HOH:O	2.19	0.42
1:A:247[A]:VAL:HG22	9:A:900:HOH:O	2.19	0.41
1:A:36:ARG:O	1:A:40:GLU:N	2.50	0.40
1:A:257:ALA:CA	1:A:283[B]:THR:HG23	2.52	0.40
1:A:282:VAL:HA	1:A:283[B]:THR:HA	1.97	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	364/377 (97%)	352 (97%)	12 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	301/305 (99%)	296 (98%)	5 (2%)	60	23

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	47	GLN
1	A	72	ARG
1	A	215	SER
1	A	307	LYS
1	A	356	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	159	HIS
1	A	263	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 ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 9 ligands modelled in this entry, 2 are monoatomic - leaving 7 for Mogul analysis.

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	$\#|Z| > 2$
8	SO4	A	508	-	4,4,4	0.58	0	6,6,6	1.42	1 (16%)
5	ACY	A	504	-	3,3,3	3.11	3 (100%)	3,3,3	2.25	2 (66%)
5	ACY	A	505	-	3,3,3	6.70	2 (66%)	3,3,3	3.80	3 (100%)
2	FMN	A	501	-	33,33,33	1.28	4 (12%)	48,50,50	1.02	1 (2%)
3	ORO	A	502	-	9,11,11	1.57	2 (22%)	8,15,15	5.04	6 (75%)
6	GOL	A	506	-	5,5,5	0.54	0	5,5,5	1.09	0
4	2V6	A	503	-	24,29,29	1.13	1 (4%)	35,46,46	1.79	9 (25%)

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	FMN	A	501	-	-	4/18/18/18	0/3/3/3
6	GOL	A	506	-	-	2/4/4/4	-
3	ORO	A	502	-	-	4/4/4/4	0/1/1/1
4	2V6	A	503	-	-	0/16/16/16	0/3/3/3

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	505	ACY	O-C	10.36	1.69	1.22
5	A	505	ACY	OXT-C	5.12	1.55	1.30
2	A	501	FMN	C4A-N5	4.18	1.38	1.30
5	A	504	ACY	O-C	3.92	1.40	1.22
4	A	503	2V6	C4-C5	3.31	1.43	1.39
3	A	502	ORO	O72-C7	-3.28	1.20	1.30
5	A	504	ACY	CH3-C	-3.06	1.36	1.49
3	A	502	ORO	C4-N3	2.74	1.37	1.33
2	A	501	FMN	C2-N3	-2.41	1.33	1.39
2	A	501	FMN	C6-C5A	2.28	1.43	1.40
5	A	504	ACY	OXT-C	-2.04	1.21	1.30
2	A	501	FMN	O3'-C3'	2.02	1.47	1.43

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	502	ORO	C6-C5-C4	10.99	123.83	116.73
4	A	503	2V6	N1-C8-N2	6.15	124.34	114.69
3	A	502	ORO	C5-C4-N3	-5.12	118.10	124.08
3	A	502	ORO	O71-C7-C6	-4.68	111.76	121.24
5	A	505	ACY	O-C-CH3	-4.65	104.22	122.33
2	A	501	FMN	O2-C2-N1	-3.72	115.67	121.83
3	A	502	ORO	C7-C6-N1	3.67	121.89	116.48
5	A	505	ACY	OXT-C-O	-3.55	108.97	122.05
4	A	503	2V6	C10-N3-C11	-3.21	114.26	117.65
3	A	502	ORO	C5-C6-N1	-3.15	117.70	123.40
5	A	505	ACY	OXT-C-CH3	-3.00	102.77	115.18
5	A	504	ACY	OXT-C-CH3	-2.87	103.32	115.18
4	A	503	2V6	F7-C3-C2	-2.83	112.96	118.61
3	A	502	ORO	O72-C7-C6	2.78	121.02	114.69
5	A	504	ACY	OXT-C-O	2.64	131.78	122.05
4	A	503	2V6	C9-C10-N3	2.59	125.64	122.57
4	A	503	2V6	C9-C8-N1	-2.52	119.53	123.36
4	A	503	2V6	F2-C7-C4	-2.40	106.64	112.34
4	A	503	2V6	F1-C7-F2	2.29	114.14	105.72
8	A	508	SO4	O4-S-O1	-2.20	97.82	109.31
4	A	503	2V6	C2-C1-C6	2.09	122.37	119.57
4	A	503	2V6	C1-C2-C3	-2.00	117.12	118.76

There are no chirality outliers.
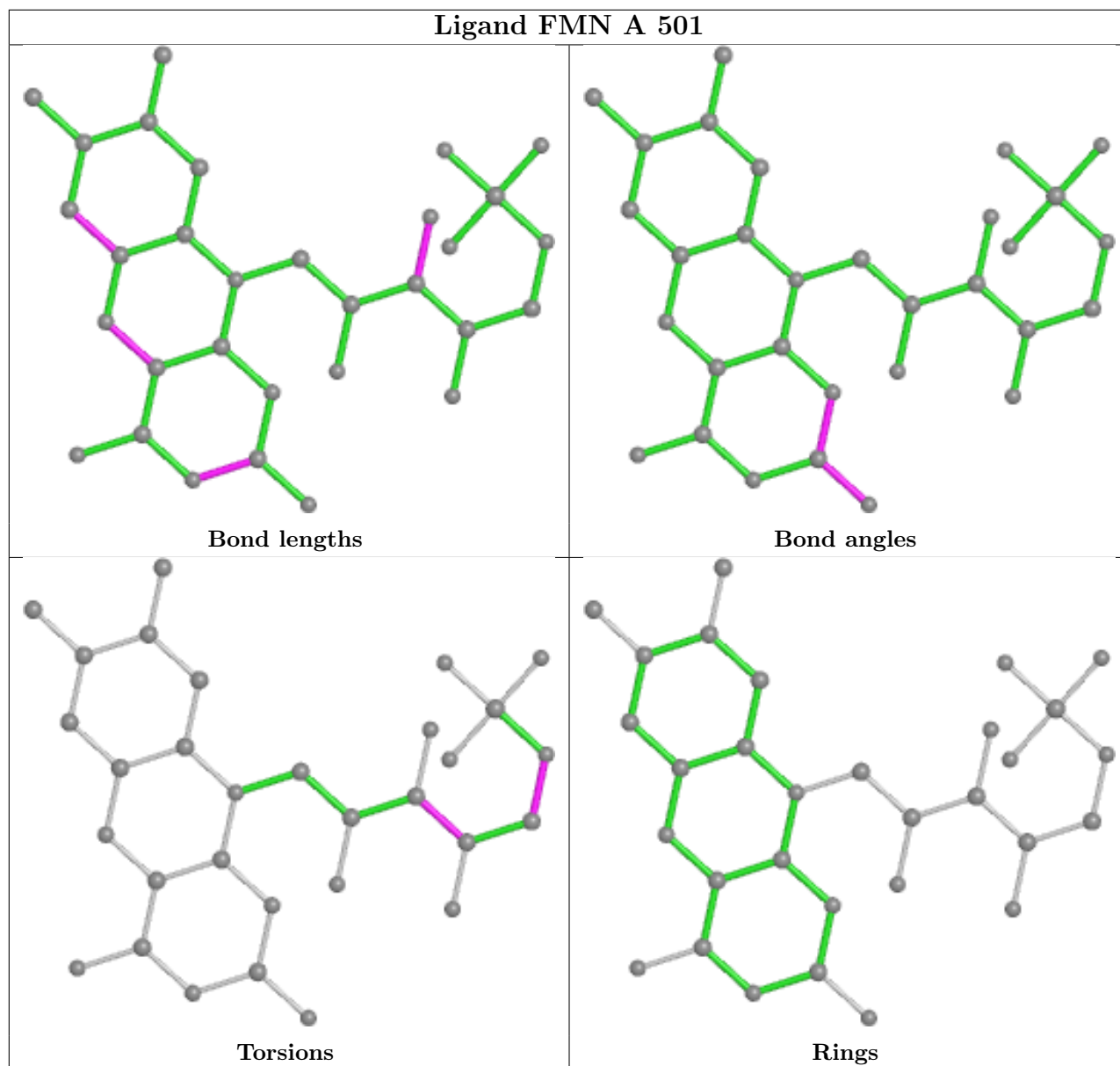
All (10) torsion outliers are listed below:

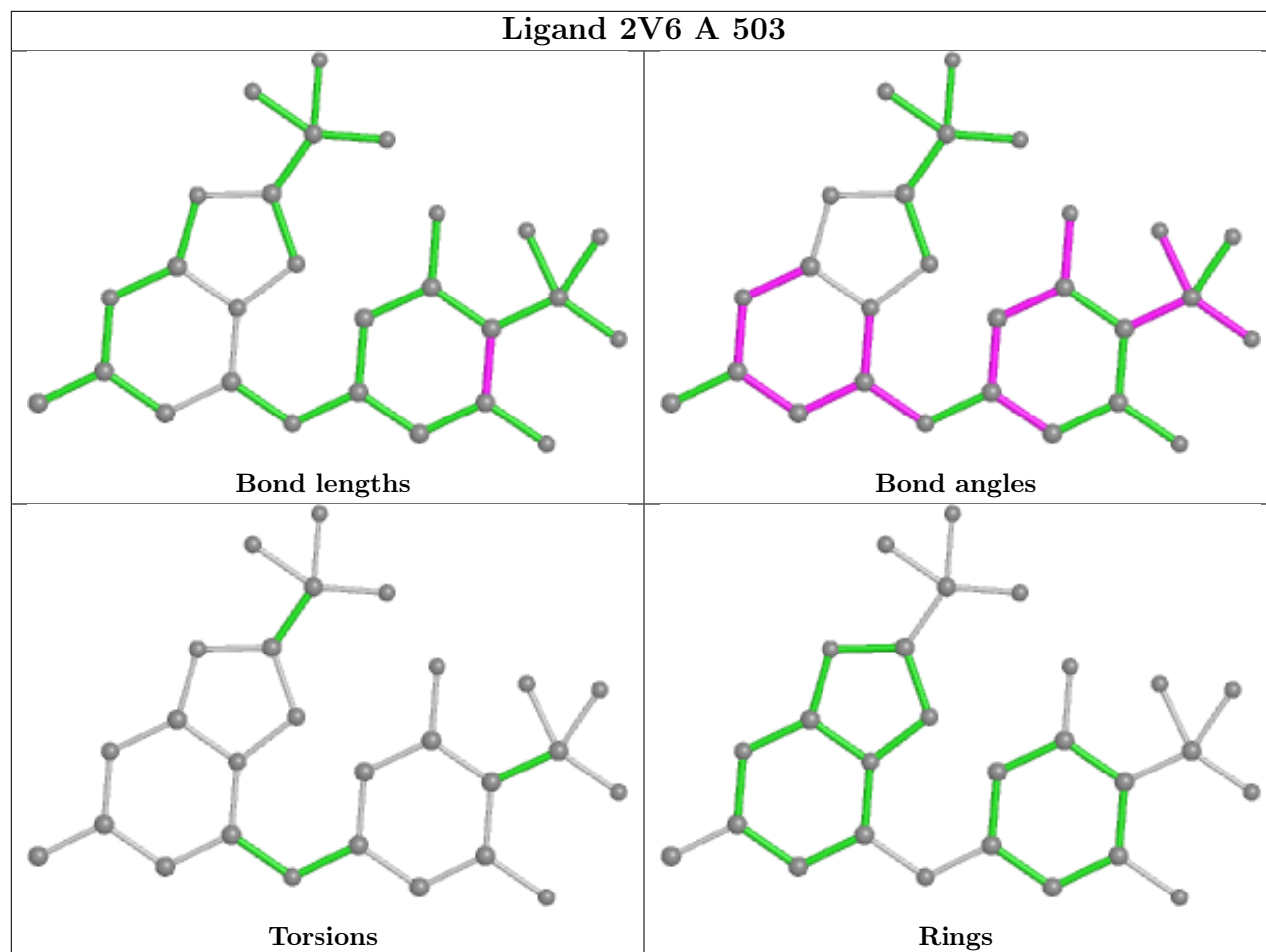| Mol	Chain	Res	Type	Atoms
3	A	502	ORO	N1-C6-C7-O71
3	A	502	ORO	N1-C6-C7-O72
3	A	502	ORO	C5-C6-C7-O71
6	A	506	GOL	O1-C1-C2-C3
2	A	501	FMN	O3'-C3'-C4'-O4'
2	A	501	FMN	C2'-C3'-C4'-O4'
3	A	502	ORO	C5-C6-C7-O72
2	A	501	FMN	O3'-C3'-C4'-C5'
6	A	506	GOL	O1-C1-C2-O2
2	A	501	FMN	C4'-C5'-O5'-P

There are no ring outliers.

5 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	504	ACY	3	0
5	A	505	ACY	2	0
3	A	502	ORO	1	0
6	A	506	GOL	1	0
4	A	503	2V6	1	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 then 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.

Ligand FMN A 501

Bond lengths

Bond angles

Torsions

Rings

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 ⓘ

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	353/377 (93%)	0.36	32 (9%)	9	7	7, 13, 47, 170	0

All (32) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	216	PRO	11.2
1	A	189	VAL	10.3
1	A	34	ASP	8.9
1	A	37	PHE	7.5
1	A	73	PHE	7.0
1	A	215	SER	6.9
1	A	72	ARG	6.6
1	A	67	LEU	6.3
1	A	71	ALA	5.0
1	A	69	PRO	4.6
1	A	42	LEU	4.4
1	A	46	LEU	4.3
1	A	36	ARG	4.1
1	A	39	ALA	4.1
1	A	74	GLN	3.9
1	A	41	HIS	3.9
1	A	44	PRO	3.2
1	A	40	GLU	3.2
1	A	187	THR	3.0
1	A	214	SER	3.0
1	A	38	TYR	2.9
1	A	70	ARG	2.8
1	A	35	GLU	2.8
1	A	45	THR	2.7
1	A	213	VAL	2.6
1	A	84	LEU	2.5
1	A	62	PHE	2.5

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	226	GLY	2.5
1	A	49	LEU	2.2
1	A	228	ALA	2.2
1	A	395	ARG	2.1
1	A	68	LEU	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)

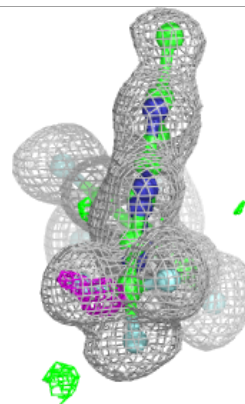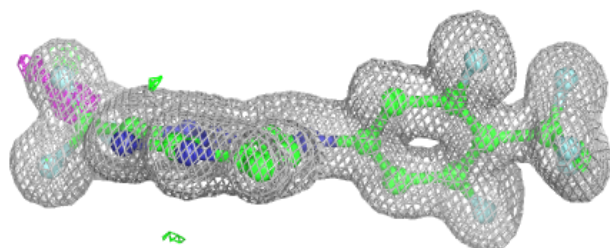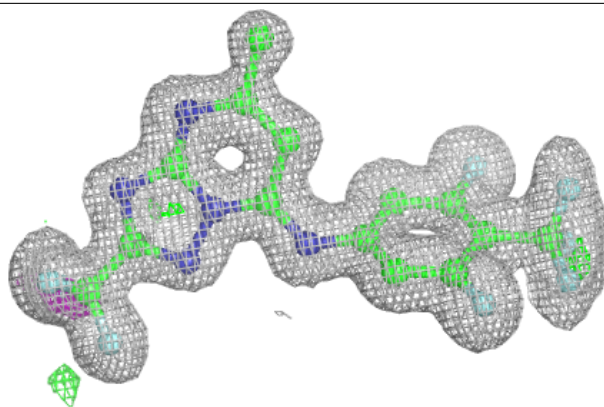There are no monosaccharides in this entry.

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, 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.

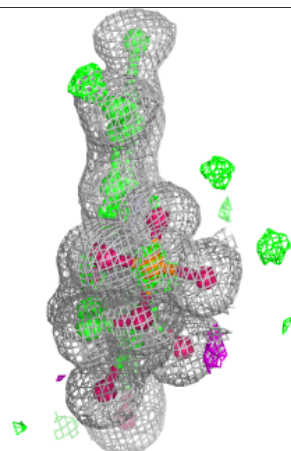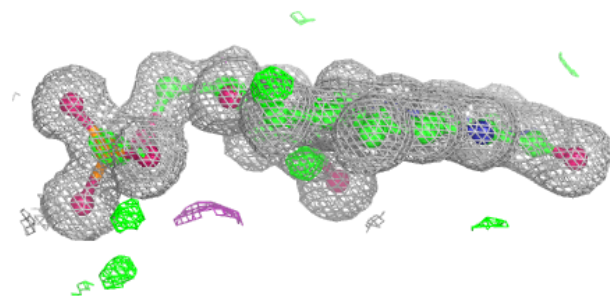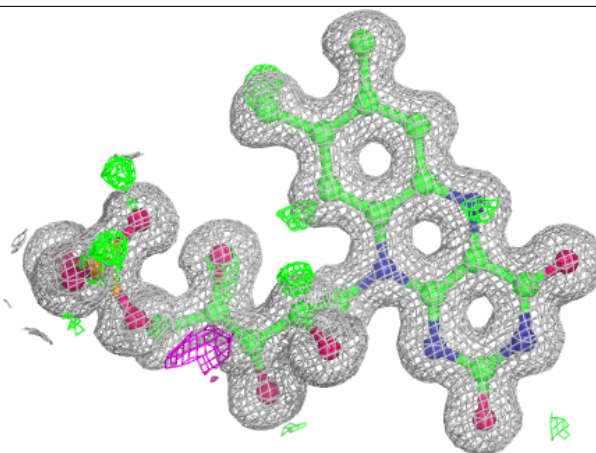| Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
6	GOL	A	506	6/6	0.77	0.15	57,75,95,113	0
7	NA	A	507	1/1	0.88	0.12	36,36,36,36	0
5	ACY	A	504	4/4	0.93	0.10	13,22,23,23	0
5	ACY	A	505	4/4	0.93	0.18	3,17,23,25	0
4	2V6	A	503	27/27	0.94	0.09	17,19,47,81	0
7	NA	A	509	1/1	0.97	0.19	44,44,44,44	0
8	SO4	A	508	5/5	0.97	0.18	20,22,30,41	0
3	ORO	A	502	11/11	0.98	0.07	7,10,13,13	0
2	FMN	A	501	31/31	0.99	0.09	7,8,9,12	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 2V6 A 503:

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

Electron density around FMN A 501:

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

6.5 Other polymers ⓘ

There are no such residues in this entry.