Full wwPDB X-ray Structure Validation Report (i)

Sep 10, 2024 – 12:05 PM EDT

PDB ID	:	8UIU
Title	:	Structure of an FMO from Bacillus niacini
Authors	:	Hicks, K.A.; Perry, K.
Deposited on	:	2023-10-10
Resolution	:	3.14 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 (i) 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 (i)) were used in the production of this report:

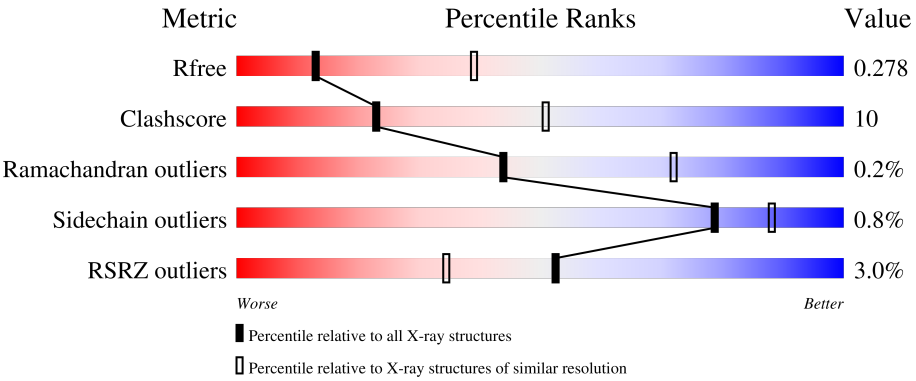
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.002 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.38.3

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 3.14 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}	164625	2149 (3.18-3.10)
Clashscore	180529	2290 (3.18-3.10)
Ramachandran outliers	177936	2178 (3.18-3.10)
Sidechain outliers	177891	2178 (3.18-3.10)
RSRZ outliers	164620	2149 (3.18-3.10)

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	450	2% 76% 16% 8%
1	B	450	4% 74% 17% 9%
1	C	450	3% 73% 17% 10%

2 Entry composition

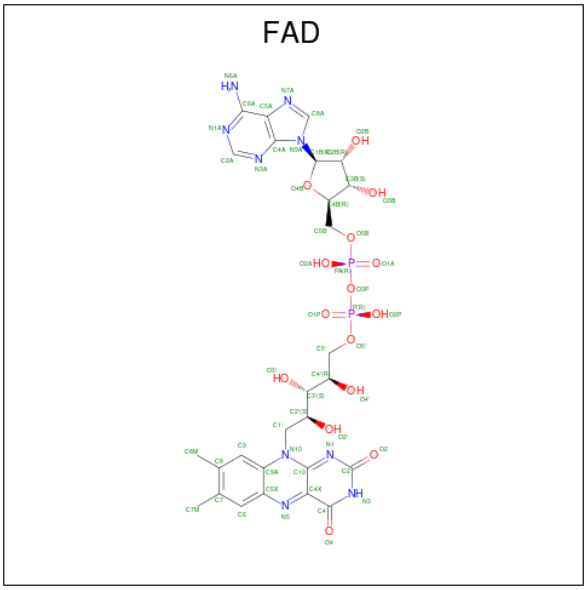
There are 3 unique types of molecules in this entry. The entry contains 8847 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Flavin monooxygenase.

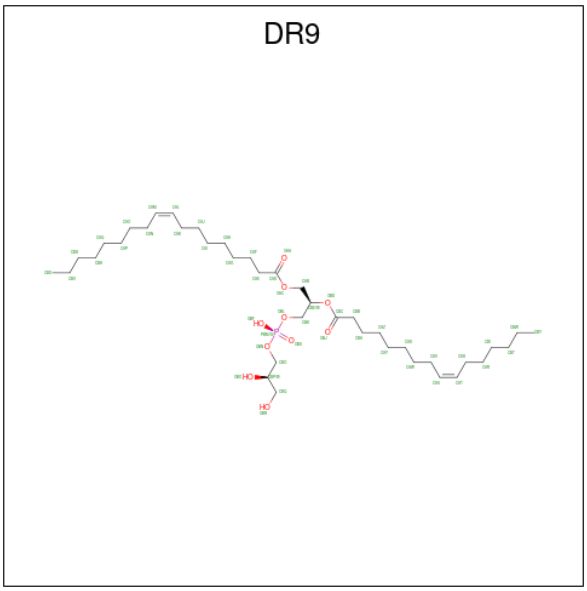
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	412	Total	C	N	O	S	Se	0	0	0
			2963	1914	493	539	6	11			
1	B	410	Total	C	N	O	S	Se	0	0	0
			2836	1815	478	526	6	11			
1	C	406	Total	C	N	O	S	Se	0	0	0
			2842	1829	475	521	6	11			

- Molecule 2 is FLAVIN-ADENINE DINUCLEOTIDE (three-letter code: FAD) (formula: $C_{27}H_{33}N_9O_{15}P_2$) (labeled as "Ligand of Interest" by depositor).



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

- Molecule 3 is 1-CIS-9-OCTADECANOYL-2-CIS-9-HEXADECANOYL PHOSPHATIDYL GLYCEROL (three-letter code: DR9) (formula: $C_{40}H_{75}O_{10}P$) (labeled as "Ligand of Interest" by depositor).



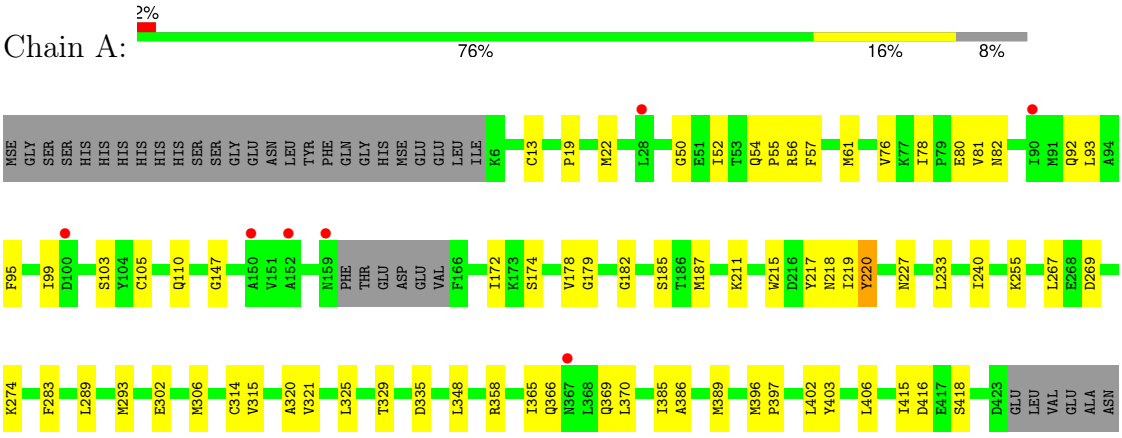
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	O	P	0	0
			51	40	10	1		
3	B	1	Total	C	O	P	0	0
			51	40	10	1		
3	C	1	Total	C	O	P	0	0
			51	40	10	1		

3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

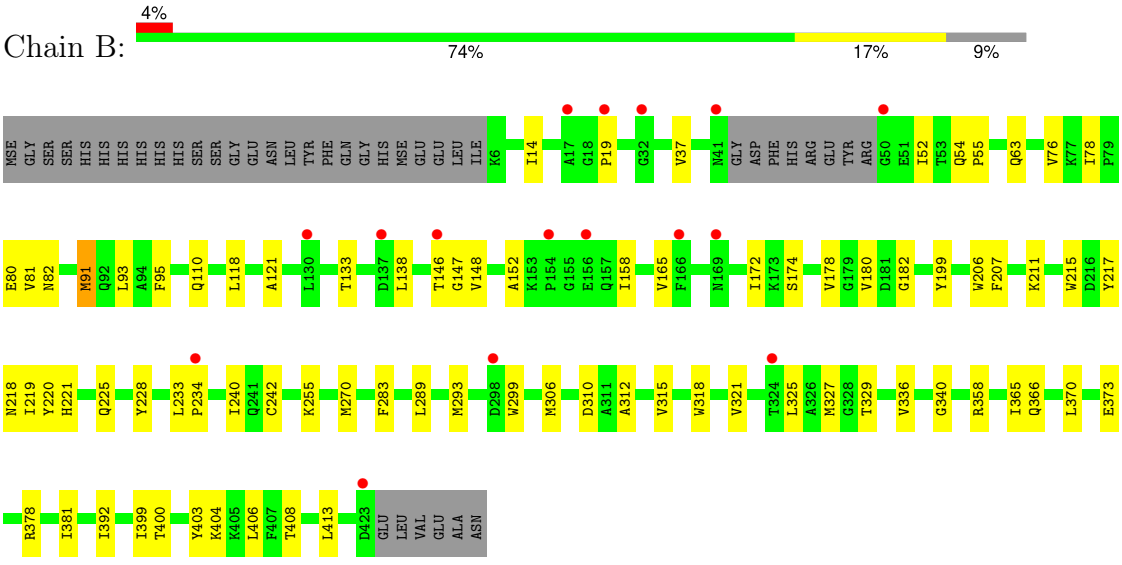
• Molecule 1: Flavin monooxygenase

Chain A:



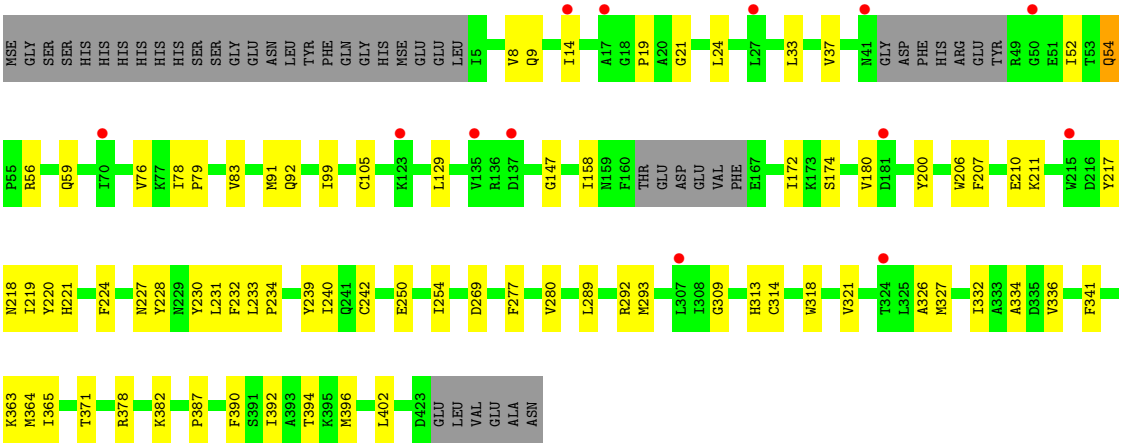
• Molecule 1: Flavin monooxygenase

Chain B:



• Molecule 1: Flavin monooxygenase

Chain C:


MSE GLY SER SER HIS HIS HIS HIS HIS HIS SER SER GLY GLU ASN LEU TYR PHE GLN GLY HIS MSE GLU GLU LEU I5 V8 Q9 I14 A17 G18 P19 A20 G21 L24 L27 L33 V37 N41 GLY ASP PHE HIS ARG GLU TYR R49 G50 E51 I52 T53 Q54
P55 R56 Q59 I70 V76 K77 I78 P79 V83 M91 Q92 I99 C105 K123 L129 V135 R136 D137 G147 I158 N159 F160 THR GLU ASP GLU VAL PHE E167 I172 K173 S174 V180 D181 Y200 W206 F207 E210 K211 W215 D216 Y217
N218 I219 Y220 H221 F224 N227 Y228 N229 Y230 L231 F232 L233 P234 Y239 I240 Q241 C242 E250 I254 D269 F277 V280 L289 R292 M293 L307 I308 G309 H313 C314 W318 V321 T324 L325 A326 M327 I332 A333 A334 D335 V336 F341
K363 M364 I365 T371 R378 K382 P387 F390 S391 I392 A393 T394 K395 M396 L402 D423 GLU LEU VAL GLU ALA ASN

4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	359.67Å 51.58Å 102.67Å 90.00° 90.77° 90.00°	Depositor
Resolution (Å)	68.09 – 3.14 68.09 – 3.14	Depositor EDS
% Data completeness (in resolution range)	98.9 (68.09-3.14) 98.9 (68.09-3.14)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.57 (at 3.13Å)	Xtriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.246 , 0.278 0.246 , 0.278	Depositor DCC
R_{free} test set	2020 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å^2)	128.6	Xtriage
Anisotropy	0.049	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.26 , 90.1	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.000 for -h,-k,l	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	8847	wwPDB-VP
Average B, all atoms (Å^2)	117.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.81% 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: FAD, DR9

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	0.50	1/3014 (0.0%)	0.63	0/4096
1	B	0.43	0/2881	0.62	0/3923
1	C	0.44	0/2888	0.62	0/3927
All	All	0.46	1/8783 (0.0%)	0.62	0/11946

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	314	CYS	CB-SG	-5.09	1.73	1.81

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

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	2963	0	2679	55	0
1	B	2836	0	2426	52	0
1	C	2842	0	2482	58	0
2	A	53	0	31	2	0
3	A	51	0	74	2	0
3	B	51	0	74	7	0
3	C	51	0	74	11	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	8847	0	7840	170	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 10.

All (170) 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:389:MSE:HE1	1:C:392:ILE:HD11	1.55	0.88
1:C:371:THR:HG23	3:C:501:DR9:HAG1	1.56	0.85
1:A:99:ILE:HD11	1:A:103:SER:HB2	1.60	0.83
1:A:80:GLU:OE2	1:A:92:GLN:NE2	2.15	0.78
1:C:83:VAL:HG23	1:C:91:MSE:HE2	1.64	0.77
1:C:83:VAL:HG23	1:C:91:MSE:CE	2.16	0.75
1:C:52:ILE:HD13	1:C:233:LEU:HD13	1.73	0.71
1:A:211:LYS:HE3	1:A:215:TRP:O	1.93	0.68
1:B:400:THR:HG22	1:B:404:LYS:HE2	1.78	0.66
1:A:302:GLU:O	1:A:348:LEU:HD12	1.97	0.65
1:A:50:GLY:HA3	2:A:501:FAD:N5	2.12	0.65
1:A:54:GLN:NE2	1:A:321:VAL:HG22	2.12	0.64
1:A:54:GLN:HG2	1:A:55:PRO:HD2	1.81	0.63
1:A:293:MSE:HE1	1:A:370:LEU:HD22	1.81	0.63
1:C:76:VAL:HG21	1:C:217:TYR:HE2	1.63	0.63
1:C:402:LEU:HD13	3:C:501:DR9:HBK1	1.79	0.63
1:B:81:VAL:HG13	1:B:95:PHE:HZ	1.63	0.62
3:B:501:DR9:HAF1	3:C:501:DR9:HAF2	1.81	0.62
1:A:227:ASN:HB2	1:A:269:ASP:OD2	2.00	0.62
1:C:54:GLN:HG3	1:C:56:ARG:H	1.65	0.62
1:A:385:ILE:HG23	1:B:392:ILE:HG12	1.80	0.62
3:B:501:DR9:HAR2	3:B:501:DR9:HAV2	1.81	0.61
1:B:76:VAL:HG21	1:B:217:TYR:HE2	1.66	0.61
3:C:501:DR9:OBU	3:C:501:DR9:HBQ1	2.02	0.59
1:C:91:MSE:SE	1:C:92:GLN:N	2.86	0.59
1:B:180:VAL:O	1:B:180:VAL:HG12	2.04	0.58
1:B:14:ILE:HD12	1:B:37:VAL:HG22	1.86	0.57
1:B:91:MSE:HE2	1:B:403:TYR:OH	2.04	0.57
1:B:78:ILE:HG23	1:B:218:ASN:O	2.04	0.57
1:A:54:GLN:HE22	1:A:321:VAL:HG22	1.68	0.57
1:A:416:ASP:OD2	1:A:418:SER:OG	2.15	0.57
1:C:321:VAL:HG11	1:C:365:ILE:HG21	1.87	0.56
1:C:371:THR:CG2	3:C:501:DR9:HAG1	2.33	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:382:LYS:HB3	3:C:501:DR9:HAN1	1.87	0.56
1:A:99:ILE:CD1	1:A:103:SER:HB2	2.34	0.56
1:A:335:ASP:HB2	1:A:415:ILE:HG23	1.86	0.56
1:C:228:TYR:HA	1:C:378:ARG:HH12	1.70	0.56
1:A:289:LEU:HD13	2:A:501:FAD:HM73	1.87	0.56
1:B:54:GLN:HG2	1:B:55:PRO:HD2	1.88	0.56
1:B:228:TYR:HA	1:B:378:ARG:HH12	1.71	0.56
1:A:366:GLN:O	1:A:370:LEU:HD23	2.05	0.55
1:B:293:MSE:HG3	1:B:315:VAL:HA	1.88	0.55
1:A:321:VAL:HG11	1:A:365:ILE:HG21	1.88	0.55
1:A:397:PRO:HG3	1:B:381:ILE:HD13	1.87	0.55
1:B:219:ILE:HG23	1:B:221:HIS:CG	2.42	0.55
1:C:8:VAL:O	1:C:172:ILE:HA	2.06	0.54
1:A:80:GLU:CD	1:A:92:GLN:HE21	2.10	0.54
1:B:81:VAL:HG13	1:B:95:PHE:CZ	2.41	0.54
1:C:313:HIS:HE1	1:C:326:ALA:HA	1.73	0.54
1:A:267:LEU:HD11	1:A:274:LYS:HA	1.90	0.54
1:C:227:ASN:HB2	1:C:269:ASP:OD2	2.08	0.53
1:C:78:ILE:HG23	1:C:218:ASN:O	2.09	0.53
1:B:321:VAL:HG11	1:B:365:ILE:HG21	1.91	0.53
1:C:83:VAL:HG11	1:C:390:PHE:CE2	2.44	0.52
1:C:147:GLY:HA3	1:C:172:ILE:O	2.09	0.52
1:C:206:TRP:NE1	1:C:289:LEU:HD12	2.23	0.52
1:C:231:LEU:HD22	1:C:318:TRP:HZ3	1.74	0.52
1:A:76:VAL:HG21	1:A:217:TYR:HE2	1.74	0.52
1:C:59:GLN:NE2	1:C:99:ILE:HD13	2.24	0.52
1:B:225:GLN:HG3	1:B:270:MSE:HE3	1.91	0.51
1:C:250:GLU:O	1:C:254:ILE:HG13	2.10	0.51
1:B:318:TRP:NE1	1:B:373:GLU:OE2	2.44	0.51
1:C:224:PHE:HB3	1:C:387:PRO:HG3	1.93	0.51
1:A:81:VAL:HG22	1:A:220:TYR:CG	2.46	0.50
1:A:329:THR:HG23	1:A:358:ARG:HG3	1.93	0.50
1:A:321:VAL:HG12	1:A:325:LEU:HB2	1.92	0.50
1:B:207:PHE:HE1	1:B:242:CYS:HG	1.57	0.50
3:B:501:DR9:HBX3	3:C:501:DR9:HAE1	1.93	0.50
1:C:231:LEU:HD22	1:C:318:TRP:CZ3	2.46	0.50
1:B:52:ILE:HG12	1:B:233:LEU:HD22	1.93	0.49
1:C:21:GLY:N	1:C:180:VAL:HG11	2.27	0.49
1:C:33:LEU:HD11	1:C:341:PHE:CE2	2.48	0.49
1:A:255:LYS:HA	1:A:283:PHE:CE2	2.48	0.49
1:B:91:MSE:HE2	1:B:403:TYR:CZ	2.48	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:52:ILE:HD13	1:A:233:LEU:HD13	1.95	0.49
1:A:402:LEU:HD12	3:A:502:DR9:HBO2	1.95	0.49
1:B:147:GLY:HA3	1:B:172:ILE:O	2.13	0.49
1:C:217:TYR:O	1:C:234:PRO:HB3	2.12	0.49
1:B:225:GLN:CD	1:B:270:MSE:HE3	2.33	0.48
1:B:133:THR:HG22	1:B:152:ALA:HA	1.95	0.48
1:B:293:MSE:HE1	1:B:370:LEU:HG	1.94	0.48
1:C:14:ILE:HD11	1:C:37:VAL:HG22	1.96	0.48
1:C:200:TYR:HB2	1:C:292:ARG:HG2	1.95	0.48
1:A:56:ARG:NH2	1:A:365:ILE:HD11	2.28	0.48
1:A:56:ARG:CZ	1:A:365:ILE:HD11	2.44	0.47
1:B:178:VAL:HG12	1:B:306:MSE:HE2	1.95	0.47
1:B:55:PRO:HB2	1:B:408:THR:HG22	1.95	0.47
1:B:146:THR:O	1:B:174:SER:N	2.36	0.47
1:C:206:TRP:CD1	1:C:289:LEU:HD12	2.50	0.47
1:A:93:LEU:HD22	1:A:403:TYR:CG	2.50	0.47
1:A:52:ILE:HG12	1:A:233:LEU:HD22	1.97	0.46
1:C:207:PHE:HE1	1:C:242:CYS:HG	1.62	0.46
1:C:277:PHE:HA	1:C:280:VAL:HG23	1.97	0.46
1:C:221:HIS:O	1:C:231:LEU:HD12	2.15	0.46
1:A:80:GLU:HG3	1:A:82:ASN:HD21	1.81	0.46
1:B:218:ASN:N	1:B:218:ASN:OD1	2.43	0.46
1:B:255:LYS:HA	1:B:283:PHE:CZ	2.50	0.46
1:B:233:LEU:O	1:B:240:ILE:HG23	2.16	0.45
1:A:81:VAL:HG23	1:A:95:PHE:CZ	2.52	0.45
1:A:13:CYS:HB2	1:A:174:SER:OG	2.16	0.45
1:A:267:LEU:HD11	1:A:274:LYS:CA	2.45	0.45
1:C:79:PRO:HD3	1:C:218:ASN:HD22	1.80	0.45
1:C:211:LYS:HB2	1:C:240:ILE:HG12	1.98	0.45
1:B:80:GLU:HG3	1:B:82:ASN:HD21	1.80	0.45
1:C:206:TRP:HE1	1:C:289:LEU:HD12	1.81	0.45
1:C:309:GLY:HA2	1:C:326:ALA:HB1	1.99	0.45
1:C:332:ILE:O	1:C:336:VAL:HG23	2.16	0.45
1:A:57:PHE:CE1	1:A:61:MSE:HE3	2.52	0.45
1:A:147:GLY:HA3	1:A:172:ILE:O	2.16	0.45
1:B:219:ILE:O	1:B:234:PRO:HD3	2.17	0.45
1:C:221:HIS:HB2	1:C:232:PHE:HB2	1.99	0.44
1:A:81:VAL:HG23	1:A:95:PHE:HZ	1.81	0.44
1:B:321:VAL:HG12	1:B:325:LEU:HB2	2.00	0.44
1:C:390:PHE:O	1:C:394:THR:HG23	2.17	0.44
1:B:118:LEU:HA	1:B:121:ALA:HB3	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:218:ASN:OD1	1:A:218:ASN:N	2.50	0.44
1:A:178:VAL:HG13	1:A:306:MSE:HE3	2.00	0.44
1:C:83:VAL:CG2	1:C:91:MSE:HE2	2.41	0.44
3:C:501:DR9:HBT2	3:C:501:DR9:HAS1	1.80	0.44
1:B:63:GLN:OE1	1:B:413:LEU:HB2	2.18	0.44
1:A:315:VAL:HG12	1:A:366:GLN:HG2	1.99	0.44
3:C:501:DR9:HBK2	3:C:501:DR9:HBO2	2.00	0.44
1:A:389:MSE:CE	1:C:392:ILE:HD11	2.38	0.44
1:B:182:GLY:HA2	1:B:310:ASP:HB2	2.00	0.44
1:B:329:THR:HG23	1:B:358:ARG:HG3	2.00	0.44
1:A:54:GLN:HB2	1:A:320:ALA:O	2.17	0.43
1:B:19:PRO:HG2	1:B:110:GLN:NE2	2.33	0.43
1:B:299:TRP:NE1	1:B:312:ALA:HB1	2.32	0.43
3:B:501:DR9:HAB1	3:B:501:DR9:HBO2	1.99	0.43
1:C:37:VAL:HB	1:C:129:LEU:HA	2.00	0.43
1:A:182:GLY:O	1:A:185:SER:HB2	2.18	0.43
1:C:19:PRO:HB3	1:C:327:MSE:HE3	2.00	0.43
3:B:501:DR9:OAA	3:C:501:DR9:HAG2	2.18	0.43
1:A:19:PRO:HG2	1:A:110:GLN:NE2	2.34	0.43
3:B:501:DR9:HBO1	1:C:382:LYS:NZ	2.34	0.43
1:C:293:MSE:HG3	1:C:314:CYS:O	2.19	0.43
1:A:56:ARG:NH1	1:A:406:LEU:O	2.52	0.43
1:B:199:TYR:HB3	1:B:293:MSE:HB3	2.01	0.42
1:B:91:MSE:HE2	1:B:403:TYR:CE1	2.54	0.42
3:C:501:DR9:HBH1	3:C:501:DR9:HAO1	1.92	0.42
1:A:78:ILE:HB	1:A:105:CYS:HB2	2.01	0.42
1:C:219:ILE:HG23	1:C:221:HIS:CG	2.54	0.42
1:B:80:GLU:HB2	1:B:93:LEU:O	2.20	0.42
1:B:138:LEU:N	1:B:148:VAL:HA	2.34	0.42
1:B:217:TYR:O	1:B:234:PRO:HB3	2.18	0.42
1:C:228:TYR:HB2	1:C:230:TYR:CZ	2.54	0.42
1:C:33:LEU:HD11	1:C:341:PHE:HE2	1.84	0.42
1:B:211:LYS:HE3	1:B:215:TRP:O	2.20	0.42
1:C:129:LEU:H	1:C:158:ILE:CB	2.33	0.42
1:C:363:LYS:HD2	1:C:363:LYS:HA	1.87	0.42
1:B:336:VAL:O	1:B:340:GLY:N	2.52	0.41
1:C:24:LEU:HD12	1:C:334:ALA:HB2	2.01	0.41
1:B:399:ILE:HG13	1:B:403:TYR:CE2	2.55	0.41
3:B:501:DR9:HBT2	3:B:501:DR9:HAS1	1.69	0.41
1:C:210:GLU:HA	1:C:239:TYR:CD1	2.56	0.41
1:A:219:ILE:HD11	1:A:240:ILE:HD12	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:9:GLN:O	1:C:174:SER:HB3	2.21	0.41
1:B:225:GLN:CG	1:B:270:MSE:HE3	2.50	0.41
1:B:315:VAL:HG12	1:B:366:GLN:HG2	2.02	0.41
1:C:210:GLU:HA	1:C:239:TYR:HD1	1.86	0.41
1:A:396:MSE:HE1	1:C:396:MSE:HE1	2.02	0.41
1:C:78:ILE:N	1:C:105:CYS:O	2.46	0.41
1:A:386:ALA:HB2	3:A:502:DR9:HAP1	2.03	0.41
1:B:54:GLN:NE2	1:B:406:LEU:O	2.54	0.41
1:A:22:MSE:O	1:A:22:MSE:HE3	2.20	0.41
1:A:179:GLY:CA	1:A:187:MSE:HE2	2.51	0.41
1:B:19:PRO:HB3	1:B:327:MSE:HE2	2.03	0.41
1:B:206:TRP:NE1	1:B:289:LEU:HD12	2.36	0.40
1:A:366:GLN:O	1:A:370:LEU:CD2	2.67	0.40
1:A:365:ILE:O	1:A:369:GLN:HG2	2.21	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	408/450 (91%)	390 (96%)	18 (4%)	0	100 100
1	B	406/450 (90%)	384 (95%)	20 (5%)	2 (0%)	25 55
1	C	400/450 (89%)	385 (96%)	15 (4%)	0	100 100
All	All	1214/1350 (90%)	1159 (96%)	53 (4%)	2 (0%)	44 72

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	158	ILE
1	B	165	VAL

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	269/389 (69%)	268 (100%)	1 (0%)	89 94
1	B	237/389 (61%)	235 (99%)	2 (1%)	79 88
1	C	244/389 (63%)	241 (99%)	3 (1%)	67 81
All	All	750/1167 (64%)	744 (99%)	6 (1%)	79 88

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	220	TYR
1	B	91	MSE
1	B	220	TYR
1	C	54	GLN
1	C	220	TYR
1	C	364	MSE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 oligosaccharides in this entry.

5.6 Ligand geometry (i)

4 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
3	DR9	C	501	-	50,50,50	0.51	0	53,56,56	0.54	1 (1%)
3	DR9	B	501	-	50,50,50	0.49	0	53,56,56	0.57	0
2	FAD	A	501	-	54,58,58	1.65	5 (9%)	71,89,89	0.97	3 (4%)
3	DR9	A	502	-	50,50,50	0.50	0	53,56,56	0.51	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	DR9	C	501	-	-	19/55/55/55	-
3	DR9	B	501	-	-	20/55/55/55	-
2	FAD	A	501	-	-	8/30/50/50	0/6/6/6
3	DR9	A	502	-	-	18/55/55/55	-

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	501	FAD	P-O3P	8.03	1.68	1.59
2	A	501	FAD	PA-O3P	6.27	1.66	1.59
2	A	501	FAD	C8A-N7A	-2.28	1.30	1.34
2	A	501	FAD	C5X-N5	-2.08	1.35	1.39
2	A	501	FAD	C1B-N9A	-2.00	1.45	1.49

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	501	FAD	C9-C9A-N10	2.81	125.63	121.85

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	C	501	DR9	CBK-CBE-CAB	2.57	117.79	111.78
2	A	501	FAD	O3P-P-O1P	-2.36	103.60	110.70
2	A	501	FAD	O2P-P-O3P	2.25	113.36	107.27

There are no chirality outliers.

All (65) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	501	FAD	C5B-O5B-PA-O1A
2	A	501	FAD	C3'-C4'-C5'-O5'
2	A	501	FAD	O4'-C4'-C5'-O5'
2	A	501	FAD	C5'-O5'-P-O1P
2	A	501	FAD	PA-O3P-P-O5'
3	A	502	DR9	CBK-OBL-PBM-OBU
3	A	502	DR9	CBK-OBL-PBM-OBF
3	A	502	DR9	CBK-OBL-PBM-OBN
3	B	501	DR9	CBK-OBL-PBM-OBU
3	B	501	DR9	CBK-OBL-PBM-OBF
3	B	501	DR9	CBK-OBL-PBM-OBN
3	B	501	DR9	CBO-OBN-PBM-OBL
3	B	501	DR9	CBO-OBN-PBM-OBU
3	B	501	DR9	CBO-OBN-PBM-OBF
3	C	501	DR9	CBK-OBL-PBM-OBU
3	A	502	DR9	OAA-CAD-OAC-CAB
3	B	501	DR9	OAA-CAD-OAC-CAB
3	A	502	DR9	CAE-CAD-OAC-CAB
3	B	501	DR9	CAE-CAD-OAC-CAB
3	A	502	DR9	CBE-CAB-OAC-CAD
3	A	502	DR9	CBB-CBC-OBD-CBE
3	C	501	DR9	OBN-CBO-CBP-CBQ
3	C	501	DR9	OBN-CBO-CBP-OBG
3	A	502	DR9	OBJ-CBC-OBD-CBE
3	A	502	DR9	CAS-CAR-CBI-CBT
3	B	501	DR9	CAS-CAR-CBI-CBT
3	C	501	DR9	CAN-CAO-CAP-CAQ
3	C	501	DR9	CBE-CAB-OAC-CAD
3	C	501	DR9	CAO-CAP-CAQ-CBH
3	C	501	DR9	CAM-CAN-CAO-CAP
3	A	502	DR9	CAN-CAO-CAP-CAQ
3	C	501	DR9	CAH-CAI-CAJ-CAK
3	B	501	DR9	CAR-CAS-CAT-CAU
3	B	501	DR9	CBI-CAR-CAS-CAT

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Mol	Chain	Res	Type	Atoms
3	C	501	DR9	CAX-CAY-CAZ-CBA
3	A	502	DR9	CBP-CBO-OBN-PBM
3	C	501	DR9	CBE-CBK-OBL-PBM
3	C	501	DR9	CBP-CBO-OBN-PBM
3	C	501	DR9	CAS-CAR-CBI-CBT
3	A	502	DR9	CAV-CAW-CAX-CAY
3	C	501	DR9	CAE-CAF-CAG-CAH
3	B	501	DR9	CAY-CAZ-CBA-CBB
3	A	502	DR9	CAG-CAH-CAI-CAJ
3	C	501	DR9	OBD-CBE-CBK-OBL
3	B	501	DR9	CAE-CAF-CAG-CAH
3	C	501	DR9	CAB-CBE-CBK-OBL
3	C	501	DR9	OAA-CAD-OAC-CAB
3	C	501	DR9	CAE-CAD-OAC-CAB
3	A	502	DR9	CBO-OBN-PBM-OBL
3	A	502	DR9	CBO-OBN-PBM-OBU
3	A	502	DR9	CBO-OBN-PBM-OBF
3	C	501	DR9	CBI-CBT-CBW-CBY
3	B	501	DR9	CBE-CBK-OBL-PBM
2	A	501	FAD	P-O3P-PA-O2A
3	B	501	DR9	OBN-CBO-CBP-CBQ
3	C	501	DR9	OAC-CAB-CBE-CBK
3	A	502	DR9	CAR-CAS-CAT-CAU
3	A	502	DR9	CAO-CAP-CAQ-CBH
2	A	501	FAD	C1'-C2'-C3'-O3'
3	B	501	DR9	OAC-CAB-CBE-OBD
3	B	501	DR9	CBH-CBS-CBV-CBX
2	A	501	FAD	P-O3P-PA-O1A
3	B	501	DR9	CBE-CAB-OAC-CAD
3	B	501	DR9	CAL-CAM-CAN-CAO
3	B	501	DR9	CAJ-CAK-CAL-CAM

There are no ring outliers.

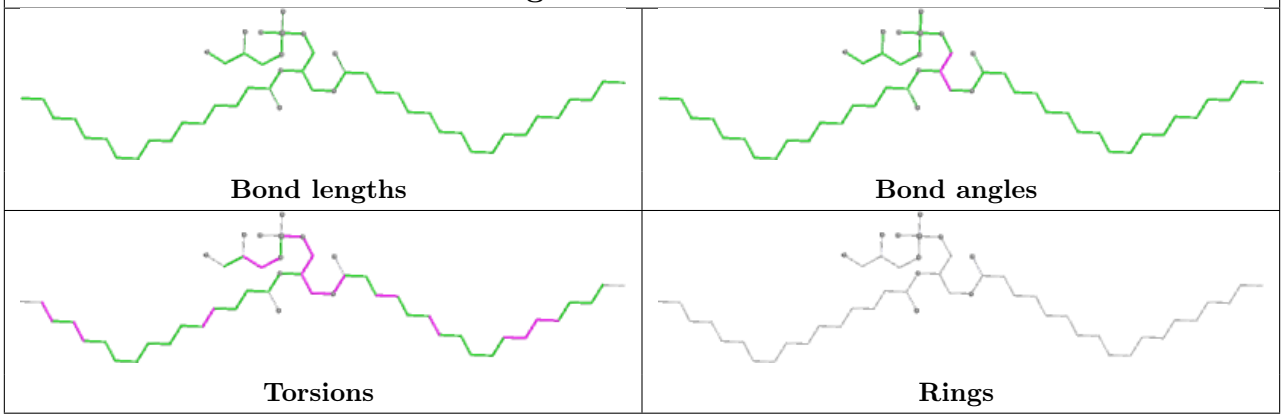
4 monomers are involved in 19 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	501	DR9	11	0
3	B	501	DR9	7	0
2	A	501	FAD	2	0
3	A	502	DR9	2	0

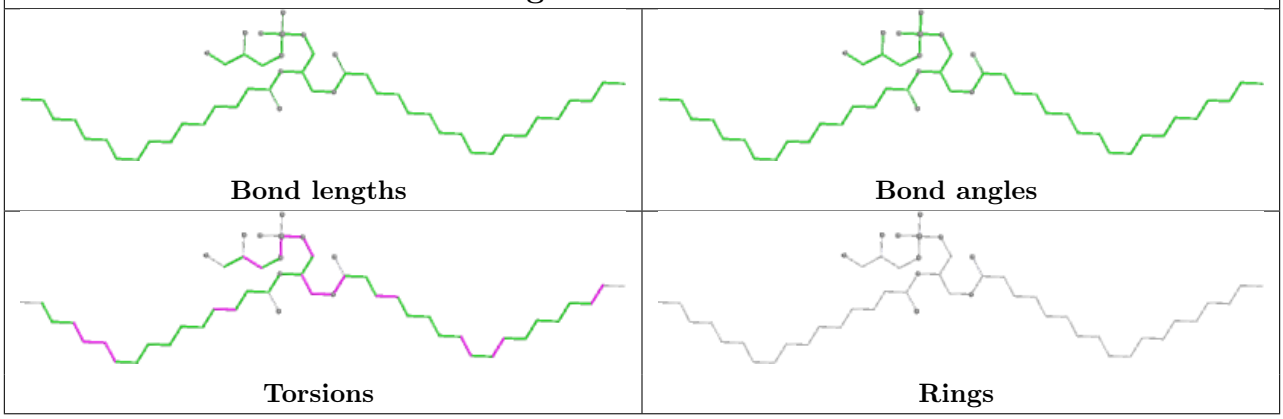
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths,

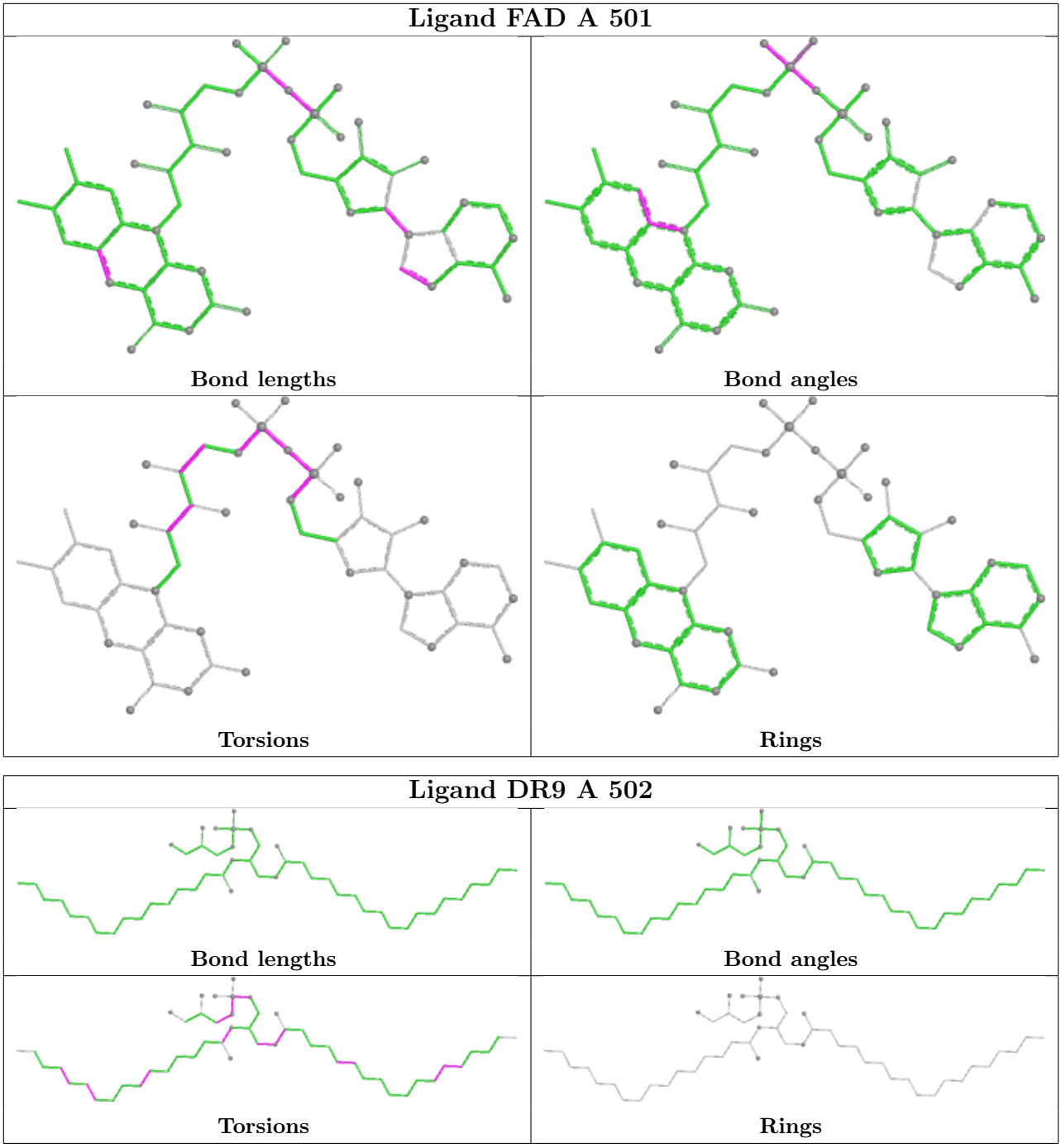
bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 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 DR9 C 501



Ligand DR9 B 501





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^{th} 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	401/450 (89%)	-0.01	7 (1%) 69 51	61, 105, 152, 176	0
1	B	399/450 (88%)	0.14	16 (4%) 43 26	65, 132, 178, 189	0
1	C	395/450 (87%)	0.11	13 (3%) 49 31	67, 126, 173, 186	0
All	All	1195/1350 (88%)	0.08	36 (3%) 52 34	61, 121, 172, 189	0

All (36) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	41	ASN	3.8
1	B	19	PRO	3.8
1	B	234	PRO	3.4
1	A	100	ASP	3.2
1	A	150	ALA	3.2
1	B	32	GLY	3.1
1	C	181	ASP	2.9
1	C	137	ASP	2.8
1	C	324	THR	2.8
1	C	123	LYS	2.8
1	A	159	ASN	2.8
1	A	28	LEU	2.8
1	C	215	TRP	2.8
1	B	17	ALA	2.7
1	B	137	ASP	2.7
1	B	41	ASN	2.7
1	B	298	ASP	2.6
1	A	367	ASN	2.6
1	B	166	PHE	2.5
1	B	50	GLY	2.5
1	B	130	LEU	2.4
1	A	90	ILE	2.4
1	C	27	LEU	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	152	ALA	2.3
1	C	307	LEU	2.3
1	C	70	ILE	2.3
1	B	156	GLU	2.2
1	C	14	ILE	2.2
1	B	146	THR	2.2
1	B	169	ASN	2.2
1	B	324	THR	2.2
1	C	135	VAL	2.2
1	C	50	GLY	2.1
1	B	423	ASP	2.0
1	C	17	ALA	2.0
1	B	154	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)

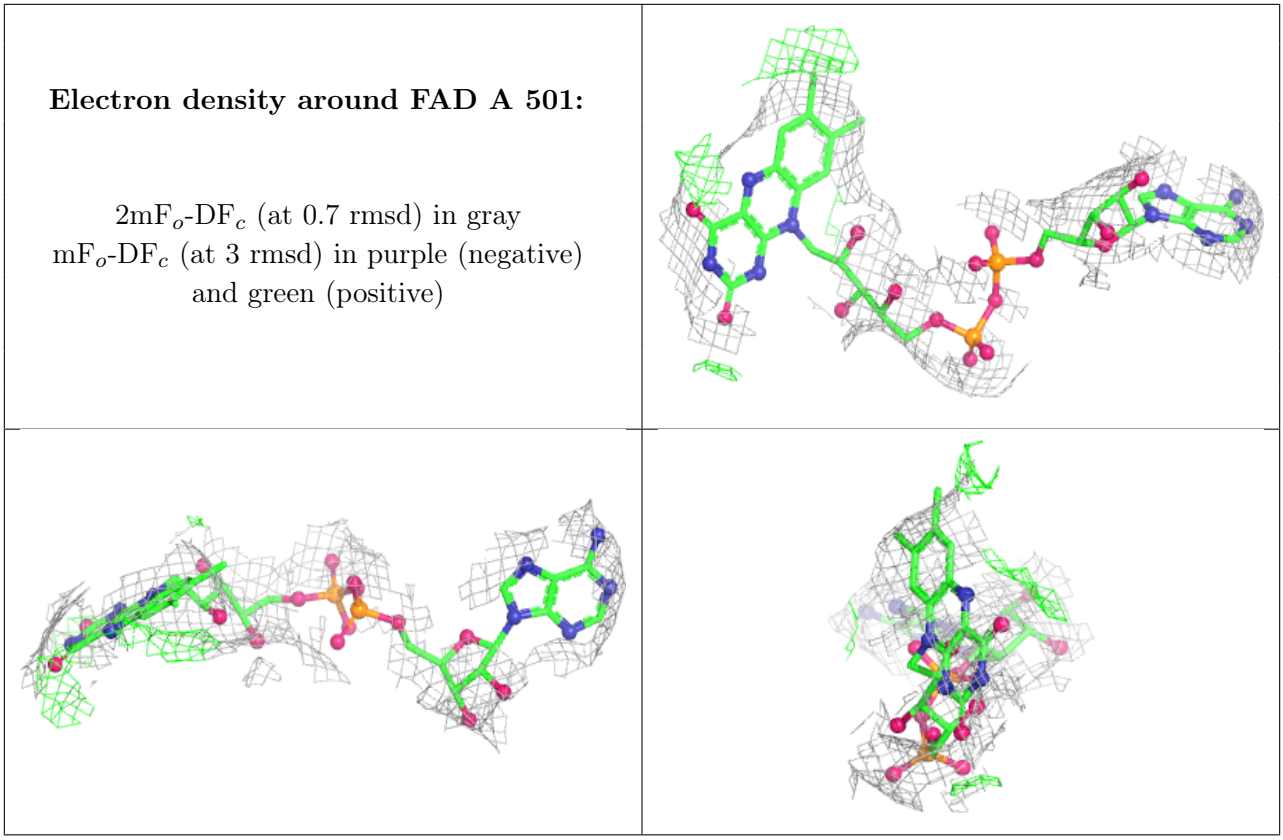
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' 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
2	FAD	A	501	53/53	0.74	0.10	112,131,152,157	0
3	DR9	C	501	51/51	0.90	0.18	61,97,159,169	0
3	DR9	A	502	51/51	0.91	0.18	61,86,154,164	0
3	DR9	B	501	51/51	0.92	0.18	55,102,135,146	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.

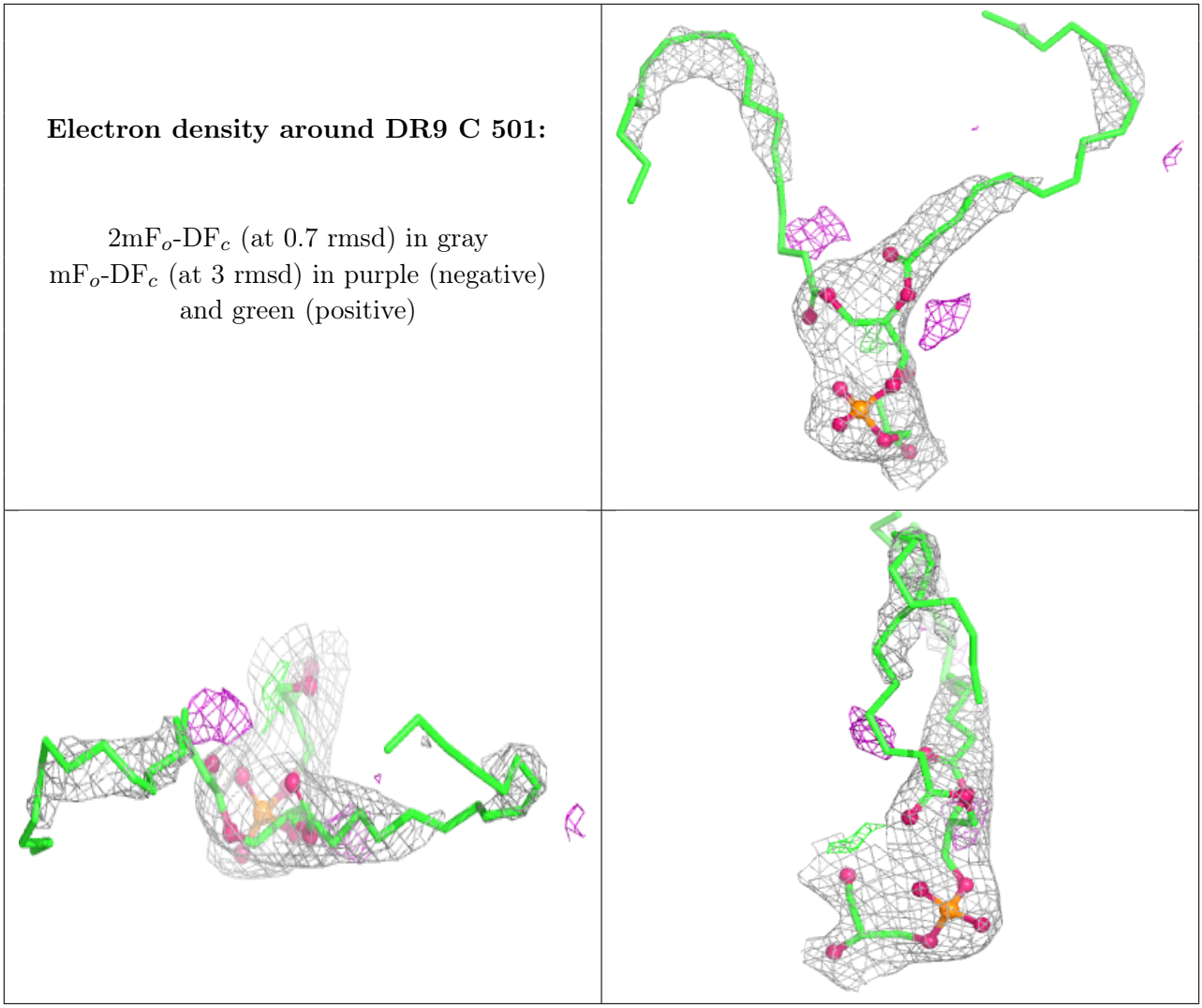
Electron density around FAD A 501:

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



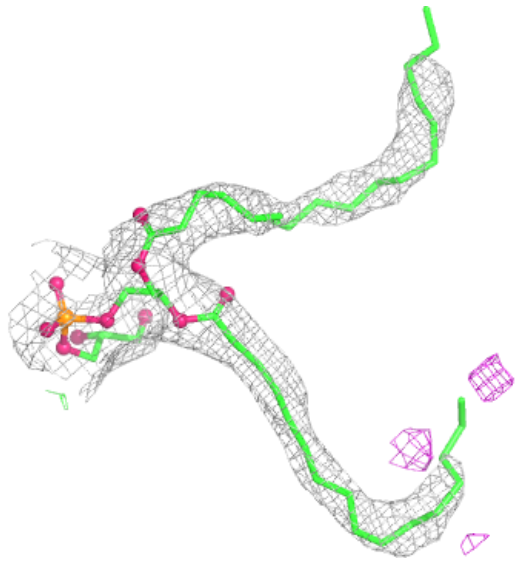
Electron density around DR9 C 501:

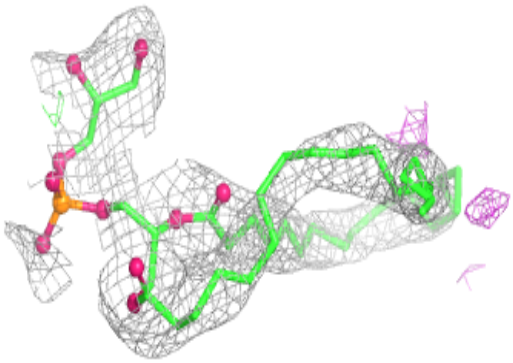
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

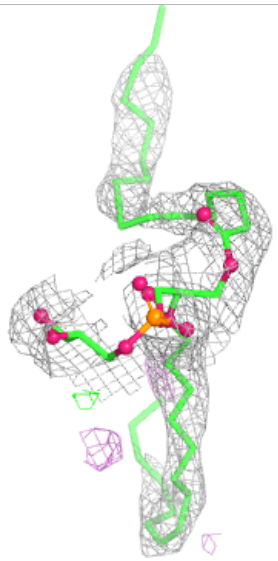


Electron density around DR9 A 502:

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

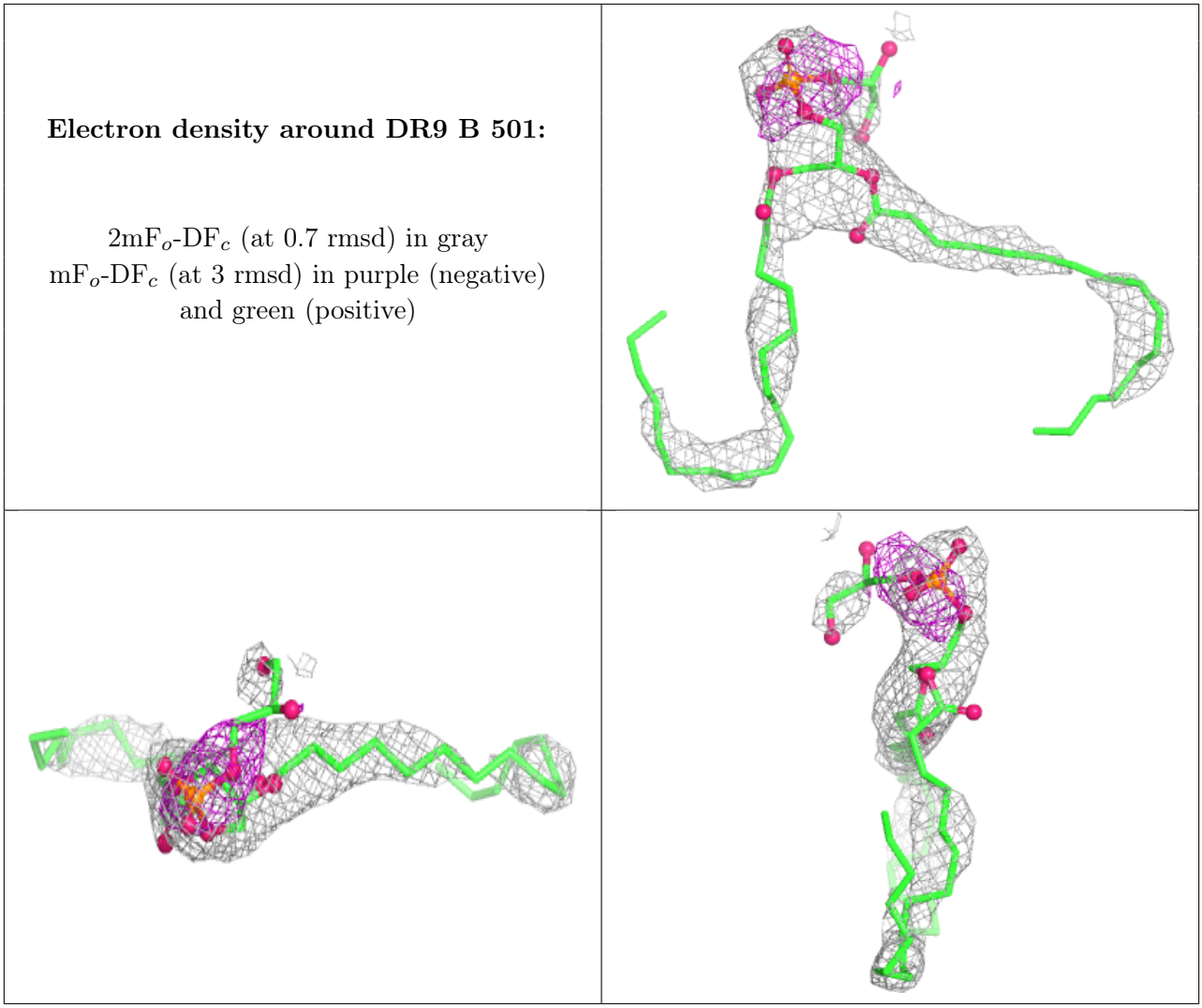






Electron density around DR9 B 501:

$2mF_o$-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.