Full wwPDB X-ray Structure Validation Report (i)

Jun 24, 2024 – 07:55 AM EDT

PDB ID	:	6KAJ
Title	:	Crystal structure of FKRP in complex with Ba ion
Authors	:	Kuwabara, N.
Deposited on	:	2019-06-23
Resolution	:	2.22 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:

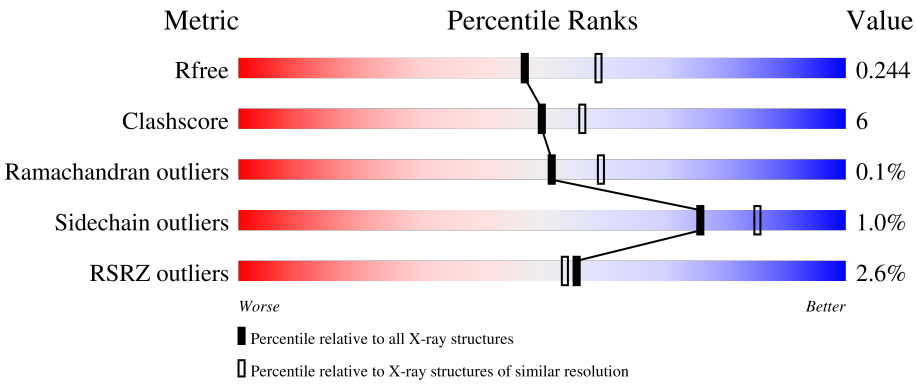
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.37.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

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 2.22 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}	130704	5912 (2.24-2.20)
Clashscore	141614	6646 (2.24-2.20)
Ramachandran outliers	138981	6543 (2.24-2.20)
Sidechain outliers	138945	6544 (2.24-2.20)
RSRZ outliers	127900	5797 (2.24-2.20)

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	455	2% 86% 12% •
1	B	455	2% 87% 11% •
1	C	455	5% 83% 14% • •
1	D	455	% 84% 13% •

2 Entry composition (i)

There are 7 unique types of molecules in this entry. The entry contains 14571 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 Fukutin-related protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	446	3445	2210	610	616	9	0	1	0
1	B	445	3441	2208	606	618	9	0	0	0
1	C	445	3453	2214	612	618	9	0	0	0
1	D	443	3441	2206	610	616	9	0	0	0

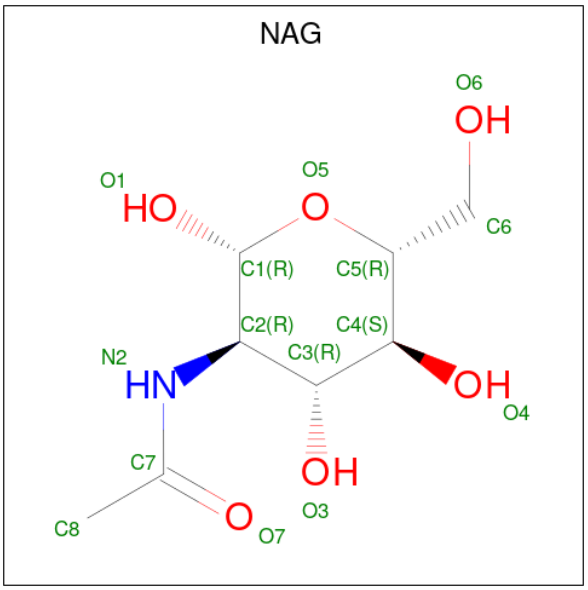
There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	41	GLY	-	expression tag	UNP Q9H9S5
A	42	GLY	-	expression tag	UNP Q9H9S5
A	43	ARG	-	expression tag	UNP Q9H9S5
A	44	PRO	-	expression tag	UNP Q9H9S5
B	41	GLY	-	expression tag	UNP Q9H9S5
B	42	GLY	-	expression tag	UNP Q9H9S5
B	43	ARG	-	expression tag	UNP Q9H9S5
B	44	PRO	-	expression tag	UNP Q9H9S5
C	41	GLY	-	expression tag	UNP Q9H9S5
C	42	GLY	-	expression tag	UNP Q9H9S5
C	43	ARG	-	expression tag	UNP Q9H9S5
C	44	PRO	-	expression tag	UNP Q9H9S5
D	41	GLY	-	expression tag	UNP Q9H9S5
D	42	GLY	-	expression tag	UNP Q9H9S5
D	43	ARG	-	expression tag	UNP Q9H9S5
D	44	PRO	-	expression tag	UNP Q9H9S5

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total Zn 1 1	0	0
2	B	1	Total Zn 1 1	0	0
2	C	1	Total Zn 1 1	0	0
2	D	1	Total Zn 1 1	0	0

- Molecule 3 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).



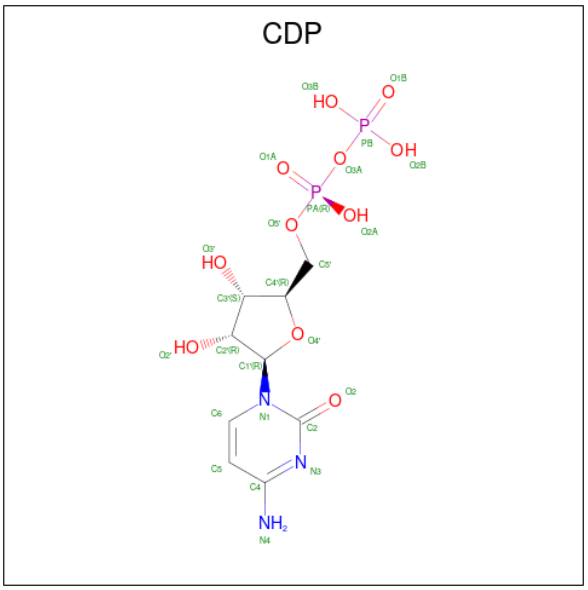
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C N O 14 8 1 5	0	0
3	A	1	Total C N O 14 8 1 5	0	0
3	B	1	Total C N O 14 8 1 5	0	0
3	B	1	Total C N O 14 8 1 5	0	0
3	C	1	Total C N O 14 8 1 5	0	0
3	C	1	Total C N O 14 8 1 5	0	0
3	D	1	Total C N O 14 8 1 5	0	0

Continued on next page...

Continued from previous page...

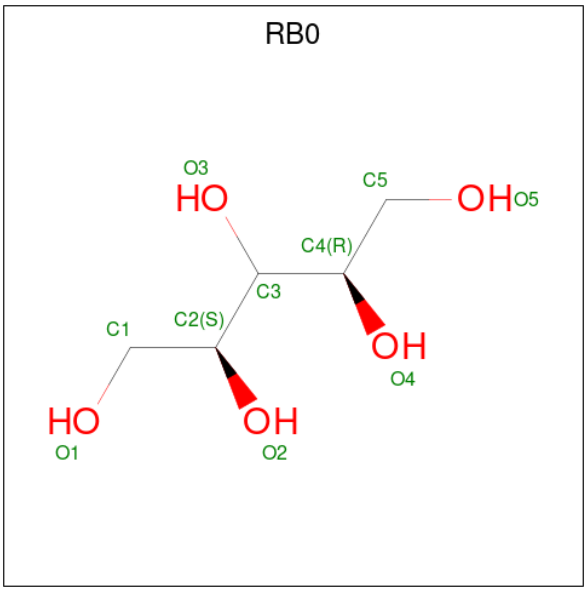
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
3	D	1	14	8	1	5	0	0

- Molecule 4 is CYTIDINE-5'-DIPHOSPHATE (three-letter code: CDP) (formula: $C_9H_{15}N_3O_{11}P_2$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
4	A	1	25	9	3	11	2	0	0
			Total	C	N	O	P		
4	B	1	25	9	3	11	2	0	0
			Total	C	N	O	P		
4	C	1	25	9	3	11	2	0	0
			Total	C	N	O	P		
4	D	1	25	9	3	11	2	0	0

- Molecule 5 is D-ribitol (three-letter code: RB0) (formula: $C_5H_{12}O_5$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total C O 9 5 4	0	0
5	B	1	Total C O 9 5 4	0	0
5	C	1	Total C O 9 5 4	0	0
5	D	1	Total C O 9 5 4	0	0

- Molecule 6 is BARIUM ION (three-letter code: BA) (formula: Ba) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total Ba 1 1	0	0
6	B	1	Total Ba 1 1	0	0
6	C	1	Total Ba 1 1	0	0
6	D	1	Total Ba 1 1	0	0

- Molecule 7 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	136	Total O 136 136	0	0

Continued on next page...

Continued from previous page...

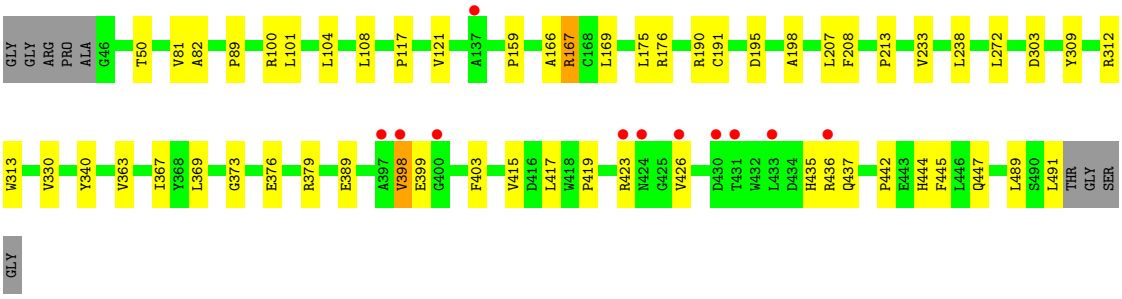
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
7	B	120	120	120	0	0
			Total	O		
7	C	125	125	125	0	0
			Total	O		
7	D	154	154	154	0	0

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.

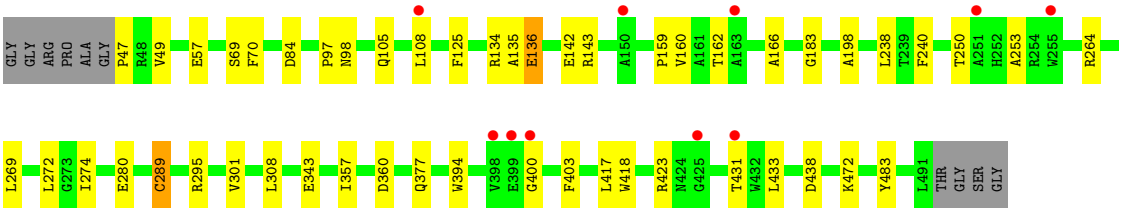
• Molecule 1: Fukutin-related protein

Chain A:



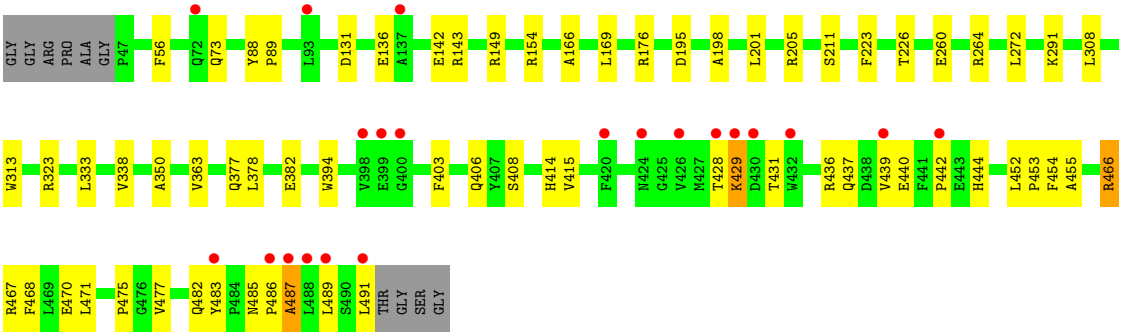
• Molecule 1: Fukutin-related protein

Chain B:



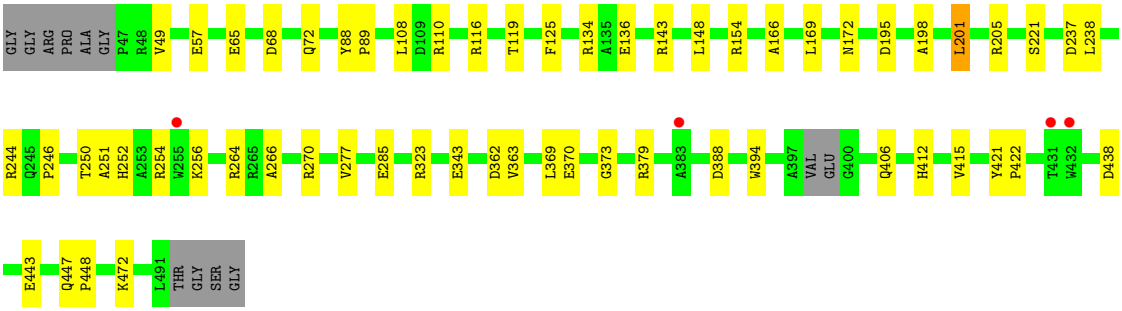
• Molecule 1: Fukutin-related protein

Chain C:



• Molecule 1: Fukutin-related protein

Chain D:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	77.37Å 118.82Å 253.08Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	44.16 – 2.22 44.16 – 2.22	Depositor EDS
% Data completeness (in resolution range)	99.6 (44.16-2.22) 99.6 (44.16-2.22)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.35 (at 2.22Å)	Xtriage
Refinement program	PHENIX 1.13_2998	Depositor
R, R_{free}	0.209 , 0.244 0.208 , 0.244	Depositor DCC
R_{free} test set	5723 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å^2)	39.6	Xtriage
Anisotropy	0.680	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 38.5	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	14571	wwPDB-VP
Average B, all atoms (Å^2)	56.0	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 22.82 % 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 5.2727e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

[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 (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: BA, NAG, ZN, CDP, RB0

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	0.29	0/3544	0.49	0/4858
1	B	0.30	1/3537 (0.0%)	0.49	0/4847
1	C	0.30	0/3549	0.52	0/4861
1	D	0.30	0/3536	0.51	1/4841 (0.0%)
All	All	0.30	1/14166 (0.0%)	0.50	1/19407 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	289	CYS	CB-SG	-5.68	1.72	1.81

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	D	362	ASP	CB-CG-OD1	6.35	124.02	118.30

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	3445	0	3367	46	0
1	B	3441	0	3365	32	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	C	3453	0	3387	54	0
1	D	3441	0	3375	43	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
3	A	28	0	26	0	0
3	B	28	0	26	0	0
3	C	28	0	26	1	0
3	D	28	0	26	2	0
4	A	25	0	12	0	0
4	B	25	0	12	0	0
4	C	25	0	12	3	0
4	D	25	0	12	0	0
5	A	9	0	9	0	0
5	B	9	0	9	1	0
5	C	9	0	9	1	0
5	D	9	0	9	1	0
6	A	1	0	0	0	0
6	B	1	0	0	0	0
6	C	1	0	0	0	0
6	D	1	0	0	0	0
7	A	136	0	0	1	0
7	B	120	0	0	0	0
7	C	125	0	0	0	0
7	D	154	0	0	1	0
All	All	14571	0	13682	161	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 6.

All (161) 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:C:313:TRP:HE1	1:C:483:TYR:HH	1.14	0.91
1:A:176:ARG:NH1	1:C:491:LEU:HD22	1.92	0.84
1:D:252:HIS:CE1	1:D:256:LYS:HZ1	1.97	0.83
1:A:176:ARG:HH12	1:C:491:LEU:HD22	1.46	0.77
1:C:483:TYR:CG	1:C:491:LEU:HD12	2.20	0.76
1:D:252:HIS:CD2	1:D:256:LYS:HZ1	2.04	0.74
1:C:486:PRO:HA	1:C:487:ALA:HB3	1.71	0.72

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:176:ARG:HH12	1:C:491:LEU:HA	1.54	0.71
1:A:398:VAL:HG23	1:A:399:GLU:H	1.54	0.71
1:D:369:LEU:HG	1:D:370:GLU:N	2.07	0.69
1:B:250:THR:HG23	1:B:253:ALA:H	1.58	0.68
1:C:169:LEU:HD11	1:C:195:ASP:HB2	1.74	0.67
1:D:373:GLY:O	1:D:379:ARG:NH1	2.27	0.67
1:B:433:LEU:N	1:B:438:ASP:OD2	2.24	0.66
1:B:160:VAL:HG23	1:B:162:THR:HG23	1.80	0.63
1:A:491:LEU:HD13	1:C:176:ARG:HH22	1.64	0.63
1:A:108:LEU:HD21	1:B:272:LEU:HD13	1.80	0.63
1:B:160:VAL:HG12	1:B:240:PHE:HB2	1.80	0.63
1:C:487:ALA:HB1	1:C:489:LEU:HD23	1.80	0.63
1:D:49:VAL:HG22	1:D:125:PHE:HB2	1.81	0.62
1:C:483:TYR:CE1	1:C:491:LEU:HG	2.35	0.62
1:D:116:ARG:O	1:D:119:THR:HG22	2.00	0.62
1:B:143:ARG:NH1	1:B:238:LEU:HD21	2.16	0.61
1:B:400:GLY:O	1:B:431:THR:HG21	2.00	0.60
1:C:486:PRO:HA	1:C:487:ALA:CB	2.30	0.60
1:A:491:LEU:HB3	1:C:176:ARG:NH2	2.17	0.60
1:C:468:PHE:HA	1:C:471:LEU:HD23	1.84	0.60
1:A:176:ARG:NH1	1:C:491:LEU:HA	2.16	0.60
1:D:323:ARG:NH2	7:D:601:HOH:O	2.23	0.58
1:B:438:ASP:HA	5:B:505:RB0:H1A	1.85	0.58
1:A:376:GLU:OE2	1:A:376:GLU:N	2.35	0.58
1:A:176:ARG:CZ	1:C:491:LEU:HD22	2.33	0.58
1:A:167:ARG:NH1	1:A:195:ASP:OD2	2.37	0.58
1:D:169:LEU:HD11	1:D:195:ASP:HB2	1.85	0.58
1:B:47:PRO:HG2	1:B:142:GLU:HG3	1.87	0.57
1:D:363:VAL:HB	1:D:415:VAL:HG22	1.86	0.57
1:B:183:GLY:HA2	1:B:280:GLU:HG3	1.87	0.57
1:D:343:GLU:OE1	1:D:472:LYS:NZ	2.38	0.57
1:A:423:ARG:O	1:A:426:VAL:HG12	2.05	0.56
1:A:376:GLU:H	1:A:376:GLU:CD	2.08	0.56
1:B:403:PHE:HB2	1:B:417:LEU:HB2	1.87	0.56
1:D:205:ARG:HA	3:D:503:NAG:H83	1.88	0.55
1:A:373:GLY:O	1:A:379:ARG:HD3	2.07	0.55
1:A:169:LEU:HD11	1:A:195:ASP:HB2	1.88	0.54
1:C:363:VAL:HB	1:C:415:VAL:HG22	1.88	0.54
1:B:98:ASN:OD1	1:D:119:THR:OG1	2.26	0.54
1:A:369:LEU:HB2	1:A:419:PRO:HB2	1.89	0.54
1:B:143:ARG:HH11	1:B:143:ARG:HB3	1.73	0.54

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:369:LEU:HD22	1:D:421:TYR:HA	1.90	0.53
1:D:166:ALA:HB2	1:D:198:ALA:HB2	1.90	0.53
1:C:482:GLN:HG3	1:C:483:TYR:O	2.09	0.52
1:A:176:ARG:HH22	1:C:491:LEU:HD13	1.75	0.52
1:C:485:ASN:O	1:C:487:ALA:HB2	2.10	0.51
1:D:438:ASP:OD1	5:D:505:RB0:H1	2.10	0.51
1:B:343:GLU:OE2	1:B:472:LYS:NZ	2.43	0.51
1:C:323:ARG:HG2	1:C:455:ALA:HB1	1.93	0.51
1:B:49:VAL:HG22	1:B:125:PHE:HB2	1.94	0.50
1:B:57:GLU:OE2	1:B:264:ARG:NH2	2.43	0.50
1:C:406:GLN:HG3	1:C:414:HIS:HB3	1.93	0.50
1:D:369:LEU:HD13	1:D:421:TYR:HB3	1.94	0.50
1:C:142:GLU:OE1	1:C:142:GLU:N	2.42	0.49
1:B:134:ARG:NH1	1:B:136:GLU:HB2	2.27	0.49
1:A:442:PRO:HG2	1:A:445:PHE:CE2	2.48	0.49
1:C:483:TYR:CZ	1:C:491:LEU:HG	2.47	0.49
1:D:252:HIS:CE1	1:D:256:LYS:NZ	2.74	0.49
1:D:406:GLN:HG2	1:D:412:HIS:HA	1.95	0.49
1:D:244:ARG:O	1:D:246:PRO:HD3	2.13	0.48
1:D:68:ASP:O	1:D:72:GLN:HG2	2.12	0.48
1:D:143:ARG:NH2	1:D:238:LEU:HD11	2.28	0.48
1:A:159:PRO:HD2	1:A:238:LEU:O	2.13	0.48
1:B:289:CYS:SG	1:B:295:ARG:HA	2.53	0.48
1:A:82:ALA:HB1	1:A:104:LEU:HD11	1.96	0.48
1:C:482:GLN:HB3	4:C:504:CDP:C4	2.49	0.48
1:C:166:ALA:HB2	1:C:198:ALA:HB2	1.96	0.48
1:D:250:THR:O	1:D:254:ARG:HG2	2.14	0.48
1:C:205:ARG:NH1	3:C:503:NAG:O6	2.41	0.47
1:C:483:TYR:CD1	1:C:491:LEU:HD12	2.48	0.47
1:D:277:VAL:HB	1:D:285:GLU:HB2	1.96	0.47
1:A:190:ARG:NH2	7:A:602:HOH:O	2.35	0.47
1:C:470:GLU:HG2	1:C:475:PRO:HA	1.95	0.47
1:A:389:GLU:H	1:A:389:GLU:CD	2.16	0.47
1:A:363:VAL:HB	1:A:415:VAL:HG22	1.95	0.47
1:A:367:ILE:O	1:A:419:PRO:HA	2.15	0.47
1:C:291:LYS:HD2	1:C:408:SER:HB3	1.96	0.47
1:C:377:GLN:HB3	1:C:394:TRP:CD2	2.50	0.47
1:C:308:LEU:HD22	1:C:483:TYR:CE1	2.50	0.46
1:A:166:ALA:HB2	1:A:198:ALA:HB2	1.97	0.46
1:D:57:GLU:OE2	1:D:264:ARG:NH2	2.47	0.46
1:D:166:ALA:CB	1:D:198:ALA:HB2	2.46	0.46

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:100:ARG:HH21	1:A:100:ARG:HG3	1.79	0.46
1:C:428:THR:OG1	1:C:440:GLU:HB3	2.16	0.46
1:B:418:TRP:CH2	1:B:433:LEU:HD11	2.51	0.46
1:C:466:ARG:HE	1:C:466:ARG:HB3	1.61	0.46
1:A:398:VAL:HG23	1:A:399:GLU:N	2.28	0.46
1:A:50:THR:HG21	1:A:121:VAL:HG22	1.98	0.46
1:B:159:PRO:HD2	1:B:238:LEU:O	2.16	0.46
1:D:65:GLU:OE2	1:D:244:ARG:HG2	2.16	0.45
1:A:309:TYR:HA	1:A:489:LEU:HD21	1.99	0.45
1:B:183:GLY:CA	1:B:280:GLU:HG3	2.46	0.45
1:A:389:GLU:OE1	1:A:389:GLU:N	2.41	0.45
1:D:252:HIS:CD2	1:D:256:LYS:NZ	2.82	0.45
1:A:176:ARG:HD2	1:A:313:TRP:CE2	2.51	0.45
1:B:97:PRO:HB2	1:D:119:THR:HG23	1.98	0.45
1:C:483:TYR:CG	1:C:491:LEU:CD1	2.97	0.45
1:D:148:LEU:HD22	1:D:201:LEU:HD23	1.97	0.45
1:A:167:ARG:HG2	1:A:195:ASP:O	2.17	0.45
1:B:269:LEU:HB3	1:B:274:ILE:HB	1.99	0.45
1:C:439:VAL:HG12	1:C:440:GLU:O	2.18	0.44
1:B:69:SER:HB2	1:B:134:ARG:HG3	2.00	0.44
1:C:56:PHE:HB3	1:C:131:ASP:HB2	1.98	0.44
1:A:89:PRO:HB3	1:B:301:VAL:HG21	1.98	0.44
1:A:272:LEU:HD13	1:B:108:LEU:HD21	2.00	0.44
1:A:442:PRO:HG2	1:A:445:PHE:HE2	1.82	0.44
1:C:442:PRO:HB2	1:C:444:HIS:CD2	2.52	0.44
1:D:369:LEU:HD22	1:D:421:TYR:CB	2.48	0.44
1:B:377:GLN:HB3	1:B:394:TRP:CD2	2.52	0.43
1:A:175:LEU:O	1:A:312:ARG:HD3	2.18	0.43
1:C:73:GLN:NE2	1:C:136:GLU:O	2.51	0.43
1:C:467:ARG:O	1:C:470:GLU:N	2.52	0.43
1:D:172:ASN:HB2	3:D:502:NAG:N2	2.33	0.43
1:C:437:GLN:OE1	1:C:437:GLN:N	2.46	0.43
1:C:382:GLU:HG2	1:C:403:PHE:HE1	1.83	0.43
1:D:422:PRO:HB3	1:D:443:GLU:OE2	2.19	0.43
1:B:357:ILE:HB	1:B:360:ASP:HB2	2.00	0.42
1:D:57:GLU:CD	1:D:264:ARG:HH22	2.23	0.42
1:A:330:VAL:HG13	1:A:340:TYR:CZ	2.54	0.42
1:C:223:PHE:HA	1:C:226:THR:OG1	2.20	0.42
1:C:429:LYS:HG3	1:C:431:THR:O	2.18	0.42
1:D:134:ARG:HD3	1:D:136:GLU:HG2	2.02	0.42
1:A:117:PRO:HB2	1:A:208:PHE:CE1	2.54	0.42

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:70:PHE:CE1	1:B:135:ALA:HB2	2.54	0.42
1:A:444:HIS:HA	1:A:447:GLN:OE1	2.20	0.42
1:B:308:LEU:HD22	1:B:483:TYR:CZ	2.55	0.42
1:C:452:LEU:HD23	1:C:453:PRO:HD2	2.00	0.42
1:A:81:VAL:O	1:A:101:LEU:HD23	2.19	0.42
1:C:378:LEU:HD23	1:C:378:LEU:HA	1.88	0.42
1:A:166:ALA:CB	1:A:198:ALA:HB2	2.50	0.42
1:D:251:ALA:HA	1:D:254:ARG:HE	1.85	0.41
1:D:266:ALA:O	1:D:270:ARG:HG3	2.20	0.41
1:D:388:ASP:OD2	1:D:394:TRP:NE1	2.48	0.41
1:A:403:PHE:HB2	1:A:417:LEU:HB2	2.02	0.41
1:C:333:LEU:HB3	1:C:338:VAL:HB	2.02	0.41
1:A:303:ASP:OD2	1:A:435:HIS:NE2	2.51	0.41
1:A:191:CYS:HB2	1:A:233:VAL:HG13	2.01	0.41
1:A:207:LEU:O	1:A:213:PRO:HB3	2.20	0.41
1:C:272:LEU:HD13	1:D:108:LEU:HD21	2.02	0.41
1:B:166:ALA:HB2	1:B:198:ALA:HB2	2.03	0.41
4:C:504:CDP:O1A	5:C:505:RB0:O4	2.38	0.41
1:C:88:TYR:HA	1:C:89:PRO:C	2.41	0.41
1:C:350:ALA:HB2	1:C:454:PHE:CD1	2.56	0.41
1:C:477:VAL:HG23	4:C:504:CDP:N4	2.35	0.41
1:C:483:TYR:CD2	1:C:491:LEU:CD1	3.04	0.41
1:B:84:ASP:O	1:B:105:GLN:HB3	2.21	0.41
1:C:211:SER:HB2	1:D:110:ARG:O	2.21	0.41
1:D:238:LEU:HD22	1:D:238:LEU:H	1.86	0.41
1:D:447:GLN:HA	1:D:448:PRO:HA	1.82	0.41
1:A:437:GLN:OE1	1:A:437:GLN:N	2.47	0.40
1:C:154:ARG:HH21	1:C:154:ARG:HG3	1.86	0.40
1:C:260:GLU:HG3	1:C:264:ARG:NH1	2.37	0.40
1:D:88:TYR:HA	1:D:89:PRO:C	2.41	0.40
1:D:252:HIS:CG	1:D:256:LYS:HZ1	2.37	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	445/455 (98%)	432 (97%)	12 (3%)	1 (0%)	47	54
1	B	443/455 (97%)	433 (98%)	10 (2%)	0	100	100
1	C	443/455 (97%)	427 (96%)	15 (3%)	1 (0%)	47	54
1	D	439/455 (96%)	423 (96%)	16 (4%)	0	100	100
All	All	1770/1820 (97%)	1715 (97%)	53 (3%)	2 (0%)	51	60

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	398	VAL
1	C	487	ALA

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	345/357 (97%)	343 (99%)	2 (1%)	86	92
1	B	346/357 (97%)	344 (99%)	2 (1%)	86	92
1	C	348/357 (98%)	342 (98%)	6 (2%)	60	73
1	D	347/357 (97%)	343 (99%)	4 (1%)	71	82
All	All	1386/1428 (97%)	1372 (99%)	14 (1%)	76	85

All (14) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	167	ARG
1	A	436	ARG
1	B	136	GLU
1	B	423	ARG
1	C	143	ARG
1	C	149	ARG

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	C	201	LEU
1	C	429	LYS
1	C	436	ARG
1	C	466	ARG
1	D	154	ARG
1	D	201	LEU
1	D	221	SER
1	D	237	ASP

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 monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 24 ligands modelled in this entry, 8 are monoatomic - leaving 16 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	$\#\|Z\| > 2$
3	NAG	B	503	1	14,14,15	0.37	0	17,19,21	0.54	0
3	NAG	A	503	1	14,14,15	0.37	0	17,19,21	0.58	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
3	NAG	D	502	1	14,14,15	0.81	1 (7%)	17,19,21	0.64	0
5	RB0	C	505	4	7,8,9	0.32	0	7,10,11	0.63	0
3	NAG	D	503	1	14,14,15	0.32	0	17,19,21	0.45	0
4	CDP	D	504	6,5	24,26,26	0.83	0	37,40,40	0.86	1 (2%)
5	RB0	B	505	4	7,8,9	0.91	0	7,10,11	1.76	3 (42%)
3	NAG	C	503	1	14,14,15	1.59	2 (14%)	17,19,21	1.22	2 (11%)
4	CDP	B	504	6,5	24,26,26	0.81	0	37,40,40	0.93	1 (2%)
5	RB0	A	505	4	7,8,9	0.30	0	7,10,11	0.42	0
3	NAG	A	502	1	14,14,15	0.34	0	17,19,21	0.43	0
4	CDP	C	504	6,5	24,26,26	0.80	0	37,40,40	1.02	3 (8%)
3	NAG	C	502	1	14,14,15	0.58	0	17,19,21	0.93	0
3	NAG	B	502	1	14,14,15	0.39	0	17,19,21	0.42	0
4	CDP	A	504	6,5	24,26,26	0.87	0	37,40,40	0.85	1 (2%)
5	RB0	D	505	4	7,8,9	1.13	1 (14%)	7,10,11	3.15	3 (42%)

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	NAG	B	503	1	-	2/6/23/26	0/1/1/1
3	NAG	A	503	1	-	0/6/23/26	0/1/1/1
3	NAG	D	502	1	-	0/6/23/26	0/1/1/1
5	RB0	C	505	4	-	0/10/10/12	-
3	NAG	D	503	1	-	2/6/23/26	0/1/1/1
4	CDP	D	504	6,5	-	5/16/32/32	0/2/2/2
5	RB0	B	505	4	-	6/10/10/12	-
3	NAG	C	503	1	-	0/6/23/26	0/1/1/1
4	CDP	B	504	6,5	-	3/16/32/32	0/2/2/2
5	RB0	A	505	4	-	0/10/10/12	-
3	NAG	A	502	1	-	0/6/23/26	0/1/1/1
4	CDP	C	504	6,5	-	6/16/32/32	0/2/2/2
3	NAG	C	502	1	-	2/6/23/26	0/1/1/1
3	NAG	B	502	1	-	0/6/23/26	0/1/1/1
4	CDP	A	504	6,5	-	5/16/32/32	0/2/2/2
5	RB0	D	505	4	-	7/10/10/12	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	503	NAG	O5-C1	4.23	1.50	1.43
3	C	503	NAG	C1-C2	3.66	1.57	1.52
3	D	502	NAG	C1-C2	2.81	1.56	1.52
5	D	505	RB0	C2-C3	-2.05	1.49	1.53

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
5	D	505	RB0	C2-C3-C4	5.92	121.75	112.47
5	D	505	RB0	O3-C3-C2	-4.14	98.81	108.81
5	D	505	RB0	C1-C2-C3	-3.22	105.44	112.41
4	C	504	CDP	O2B-PB-O3A	3.17	115.26	104.64
4	B	504	CDP	PA-O3A-PB	-3.13	122.09	132.83
5	B	505	RB0	O1-C1-C2	2.62	116.79	111.07
3	C	503	NAG	C1-O5-C5	2.60	115.71	112.19
5	B	505	RB0	C2-C3-C4	-2.45	108.63	112.47
4	D	504	CDP	O4'-C1'-N1	2.33	113.68	108.36
4	C	504	CDP	PA-O3A-PB	-2.18	125.35	132.83
4	A	504	CDP	O2B-PB-O3A	2.16	111.88	104.64
3	C	503	NAG	O5-C5-C4	-2.11	105.69	110.83
5	B	505	RB0	O2-C2-C1	-2.07	104.30	109.14
4	C	504	CDP	O2B-PB-O3B	2.05	115.45	107.64

There are no chirality outliers.

All (38) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	504	CDP	C5'-O5'-PA-O3A
4	B	504	CDP	C5'-O5'-PA-O3A
4	C	504	CDP	C5'-O5'-PA-O3A
4	C	504	CDP	C5'-O5'-PA-O1A
4	C	504	CDP	C5'-O5'-PA-O2A
4	D	504	CDP	PA-O3A-PB-O3B
4	D	504	CDP	C5'-O5'-PA-O3A
5	B	505	RB0	C1-C2-C3-O3
5	D	505	RB0	C1-C2-C3-C4
5	D	505	RB0	O2-C2-C3-O3
5	D	505	RB0	O2-C2-C3-C4
3	C	502	NAG	O5-C5-C6-O6
5	D	505	RB0	C1-C2-C3-O3
5	B	505	RB0	C1-C2-C3-C4
3	D	503	NAG	C8-C7-N2-C2

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms
3	D	503	NAG	O7-C7-N2-C2
5	B	505	RB0	O2-C2-C3-C4
3	C	502	NAG	C4-C5-C6-O6
5	D	505	RB0	O1-C1-C2-O2
5	B	505	RB0	O2-C2-C3-O3
3	B	503	NAG	C4-C5-C6-O6
3	B	503	NAG	O5-C5-C6-O6
5	B	505	RB0	O1-C1-C2-C3
5	D	505	RB0	O1-C1-C2-C3
5	D	505	RB0	O3-C3-C4-C5
5	B	505	RB0	O1-C1-C2-O2
4	D	504	CDP	PB-O3A-PA-O2A
4	A	504	CDP	C5'-O5'-PA-O2A
4	B	504	CDP	C5'-O5'-PA-O2A
4	D	504	CDP	C5'-O5'-PA-O2A
4	C	504	CDP	PB-O3A-PA-O2A
4	B	504	CDP	O4'-C4'-C5'-O5'
4	A	504	CDP	O4'-C4'-C5'-O5'
4	C	504	CDP	O4'-C4'-C5'-O5'
4	A	504	CDP	PB-O3A-PA-O1A
4	A	504	CDP	PB-O3A-PA-O2A
4	C	504	CDP	PB-O3A-PA-O1A
4	D	504	CDP	O4'-C4'-C5'-O5'

There are no ring outliers.

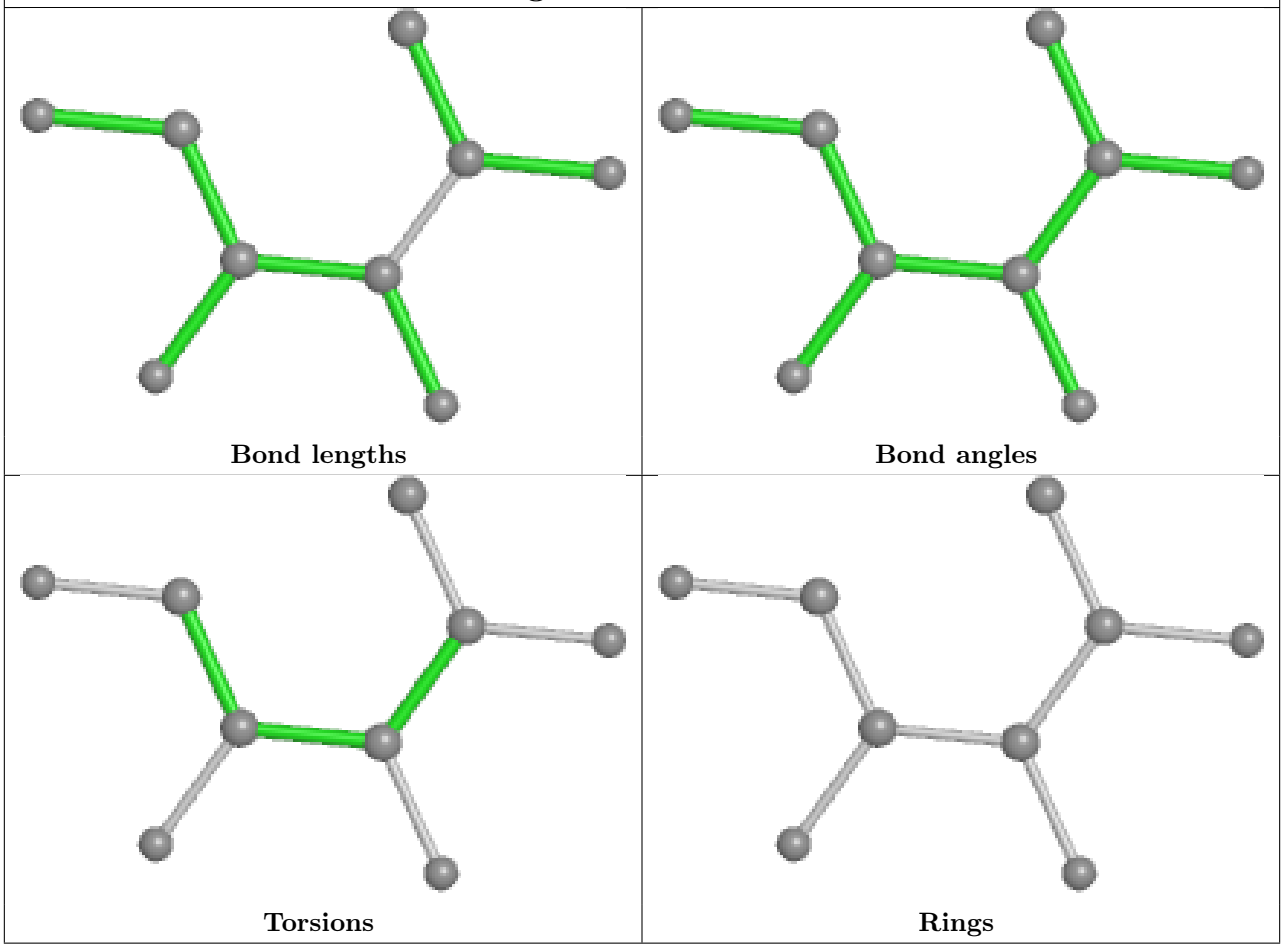
7 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	D	502	NAG	1	0
5	C	505	RB0	1	0
3	D	503	NAG	1	0
5	B	505	RB0	1	0
3	C	503	NAG	1	0
4	C	504	CDP	3	0
5	D	505	RB0	1	0

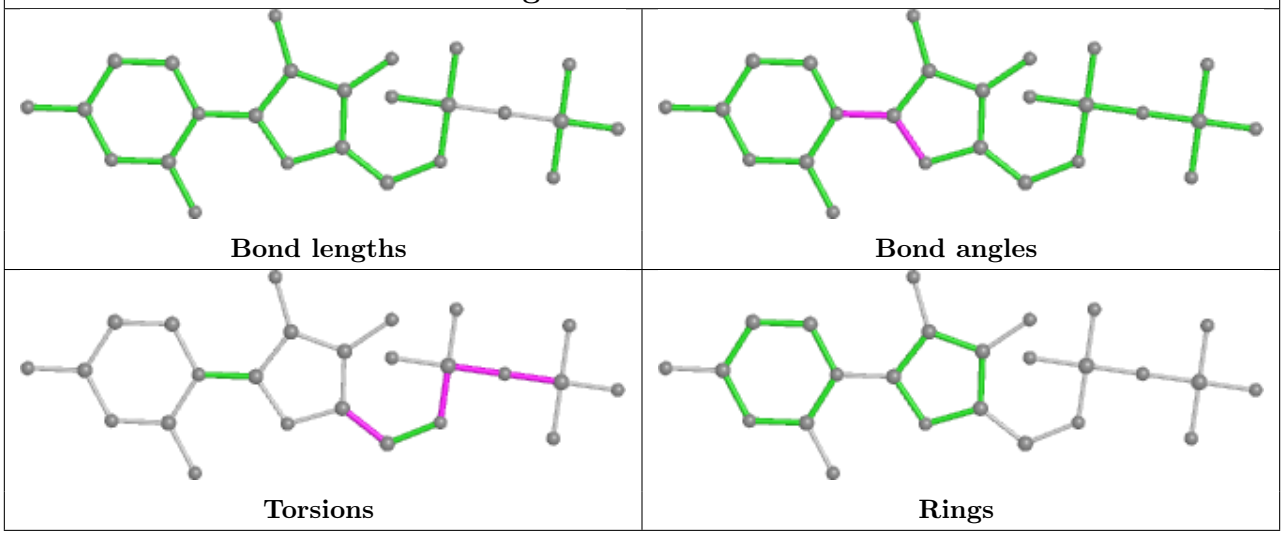
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.

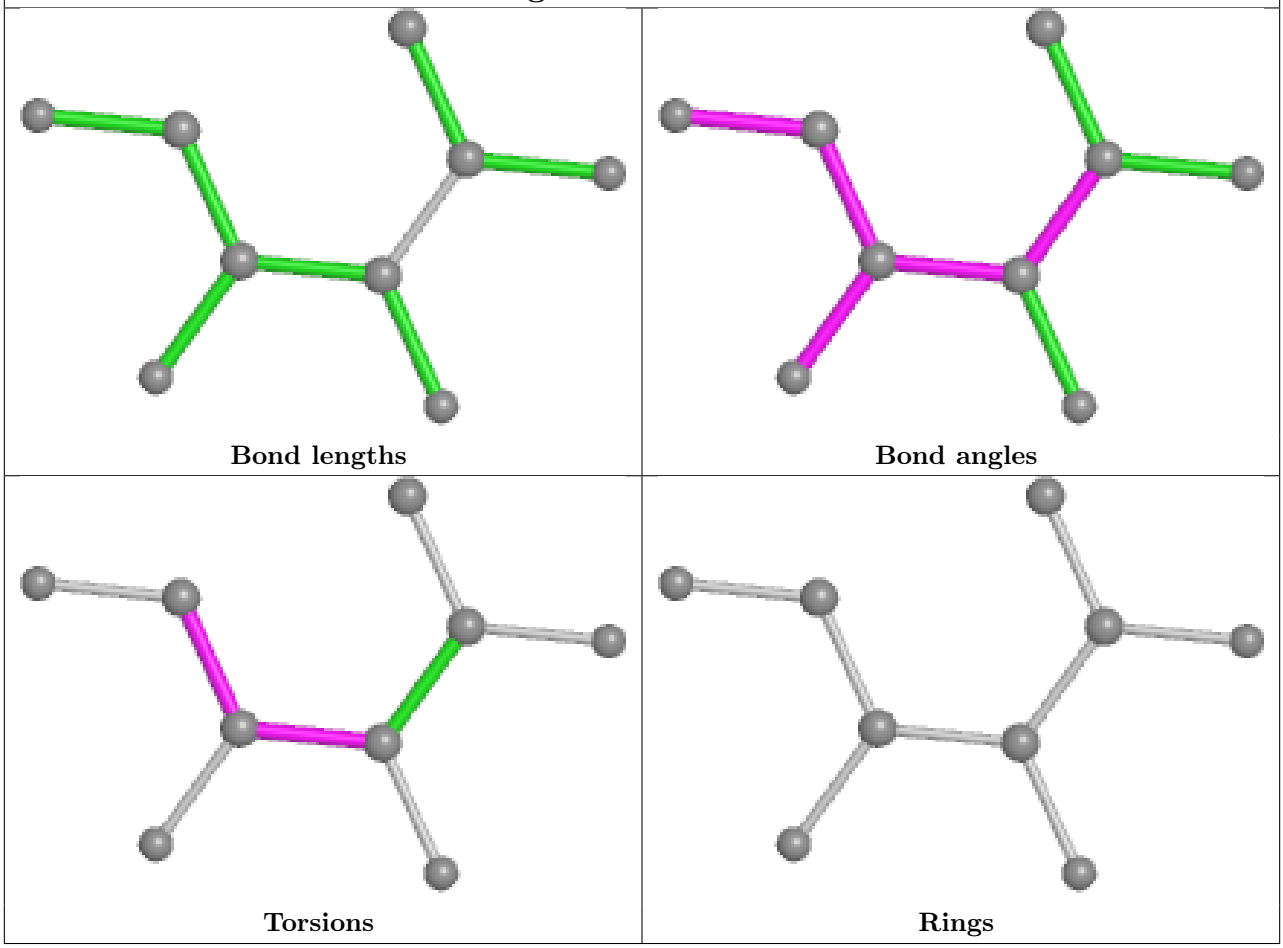
Ligand RB0 C 505



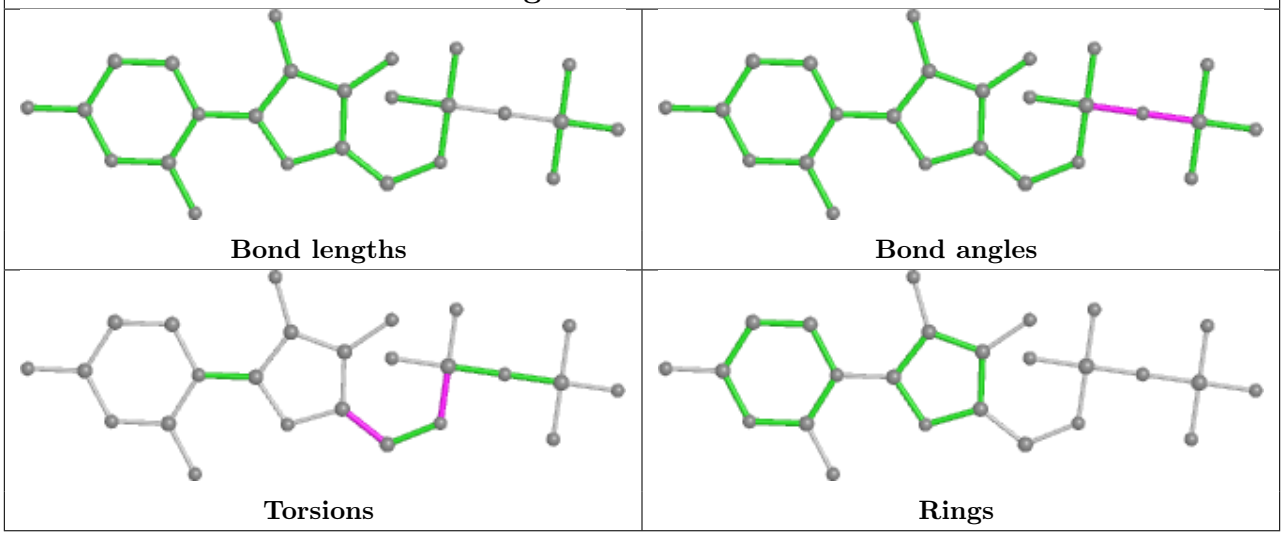
Ligand CDP D 504



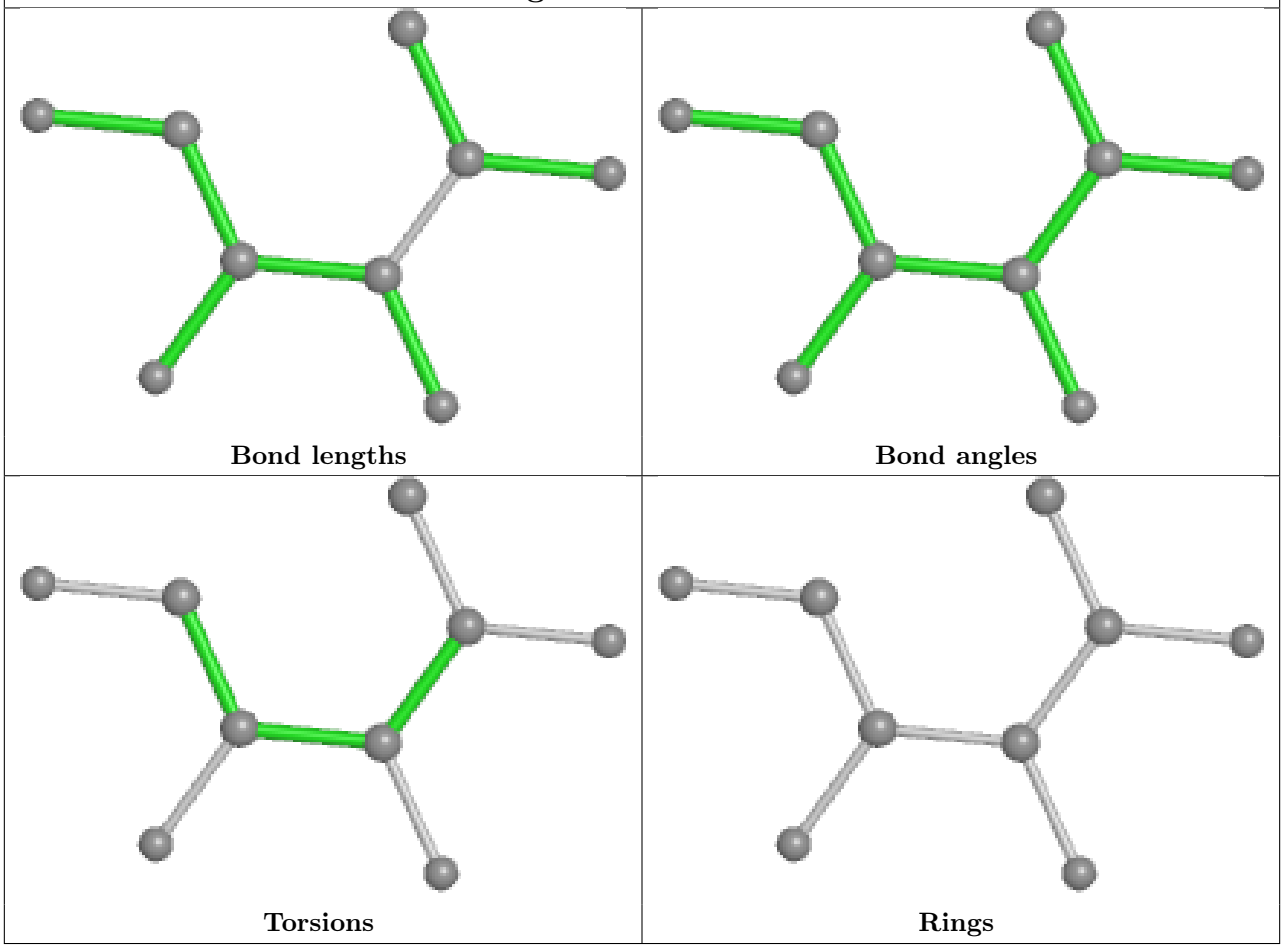
Ligand RB0 B 505



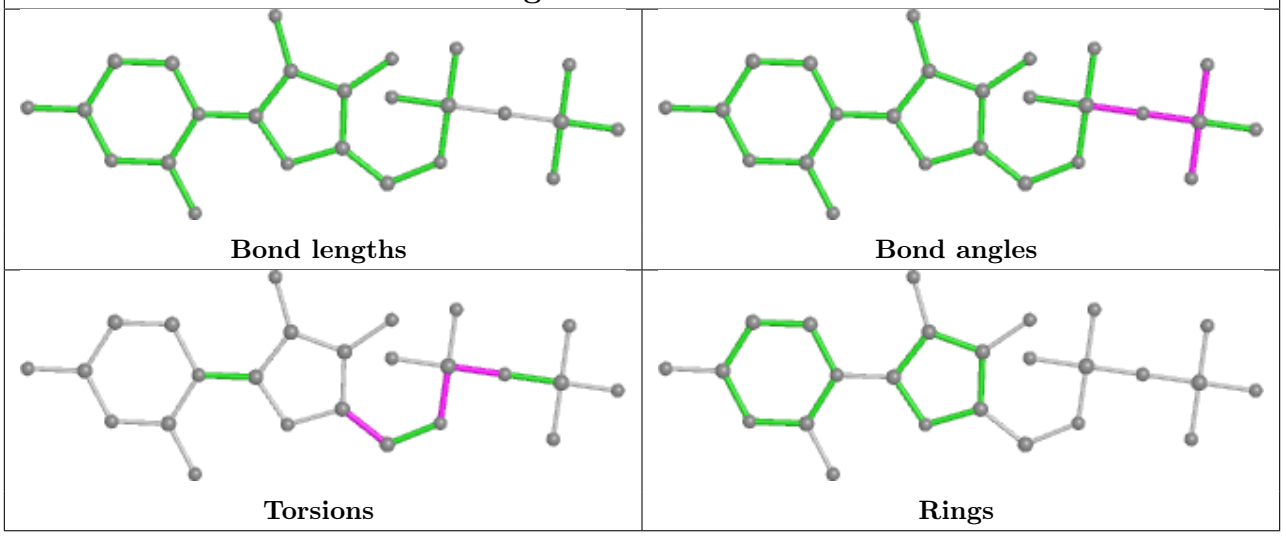
Ligand CDP B 504



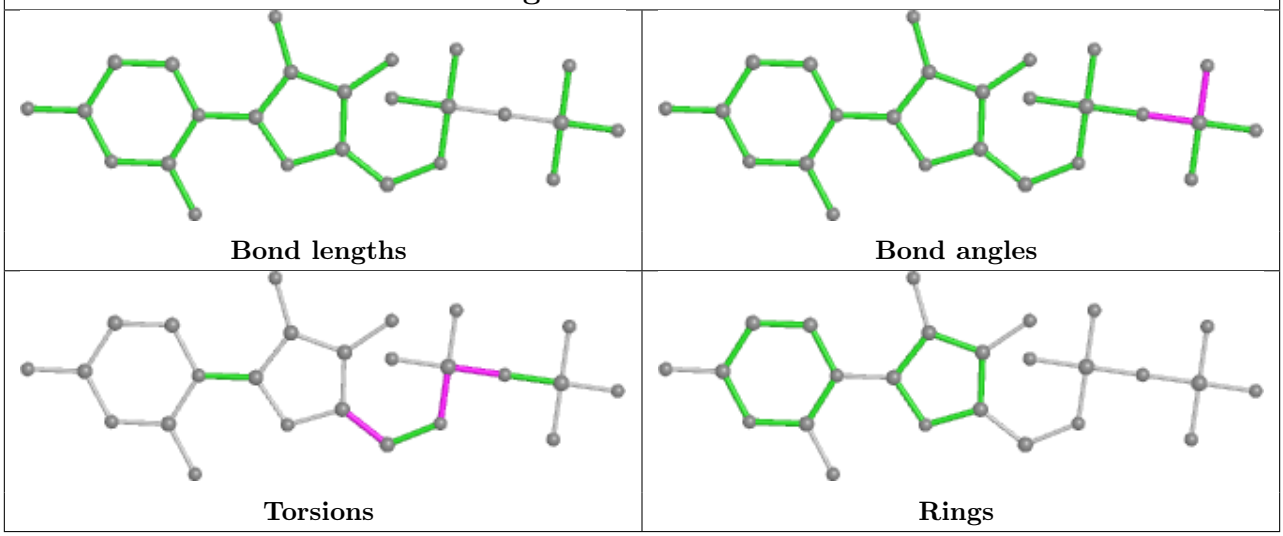
Ligand RB0 A 505



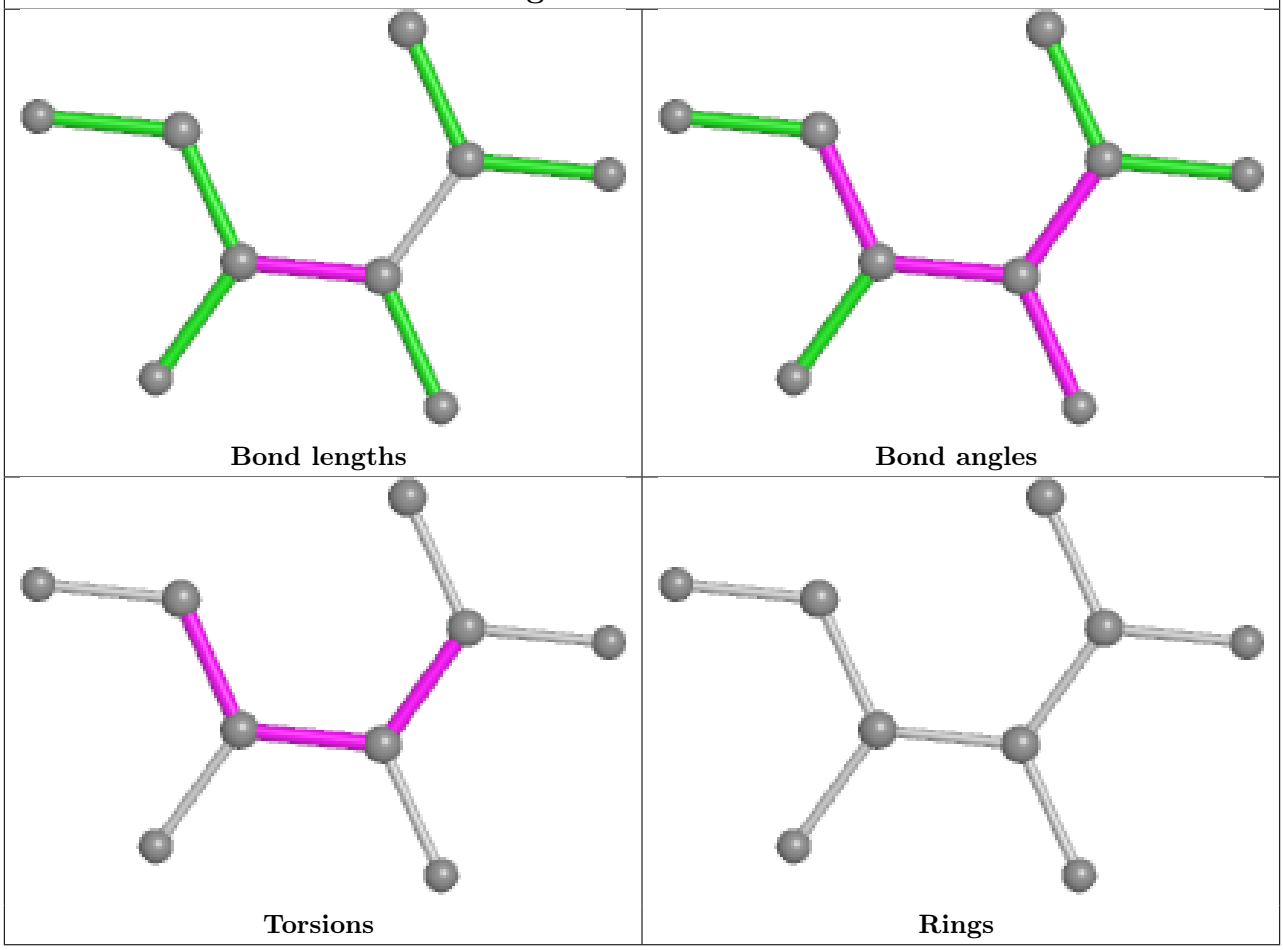
Ligand CDP C 504



Ligand CDP A 504



Ligand RB0 D 505



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	446/455 (98%)	0.00	11 (2%)	57	55	34, 55, 89, 122	0
1	B	445/455 (97%)	-0.04	10 (2%)	62	60	33, 52, 81, 103	0
1	C	445/455 (97%)	0.07	21 (4%)	31	29	34, 54, 93, 120	0
1	D	443/455 (97%)	0.01	4 (0%)	84	83	32, 51, 82, 109	0
All	All	1779/1820 (97%)	0.01	46 (2%)	56	54	32, 53, 87, 122	0

All (46) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	426	VAL	4.6
1	C	398	VAL	4.5
1	C	491	LEU	3.9
1	C	400	GLY	3.9
1	C	426	VAL	3.8
1	C	137	ALA	3.8
1	C	489	LEU	3.8
1	A	433	LEU	3.7
1	B	255	TRP	3.6
1	C	488	LEU	3.5
1	A	423	ARG	3.5
1	A	400	GLY	3.3
1	B	399	GLU	3.3
1	A	430	ASP	3.3
1	B	398	VAL	3.2
1	B	400	GLY	3.2
1	D	432	TRP	3.2
1	C	420	PHE	3.1
1	A	397	ALA	3.0
1	C	439	VAL	3.0
1	C	430	ASP	2.9

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	D	255	TRP	2.8
1	C	428	THR	2.8
1	B	431	THR	2.7
1	B	150	ALA	2.6
1	C	399	GLU	2.6
1	C	442	PRO	2.5
1	C	486	PRO	2.5
1	C	429	LYS	2.5
1	B	425	GLY	2.4
1	B	251	ALA	2.4
1	A	398	VAL	2.4
1	C	432	TRP	2.4
1	B	108	LEU	2.4
1	C	93	LEU	2.3
1	D	431	THR	2.3
1	A	424	ASN	2.2
1	C	424	ASN	2.2
1	A	137	ALA	2.2
1	C	487	ALA	2.2
1	A	431	THR	2.2
1	C	483	TYR	2.1
1	A	436	ARG	2.1
1	D	383	ALA	2.0
1	B	163	ALA	2.0
1	C	72	GLN	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)

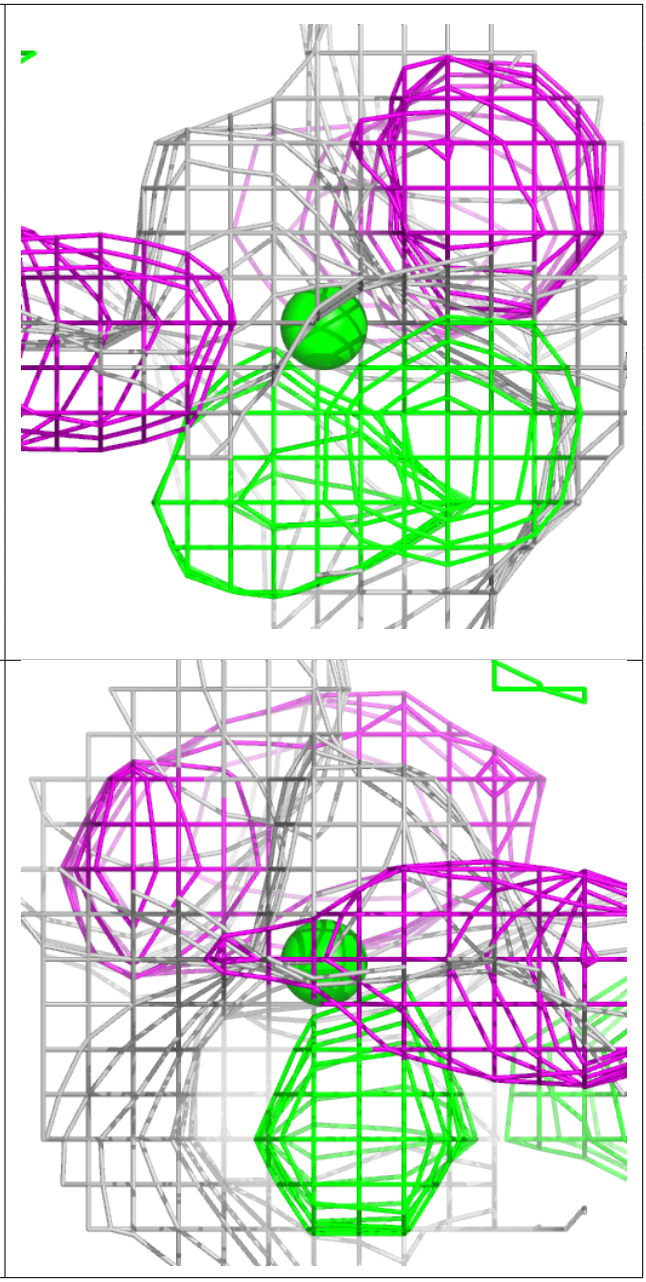
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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	BA	D	506	1/1	0.36	0.37	267,267,267,267	0
6	BA	C	506	1/1	0.45	0.25	274,274,274,274	0
6	BA	B	506	1/1	0.45	0.35	231,231,231,231	0
6	BA	A	506	1/1	0.53	0.22	234,234,234,234	0
3	NAG	D	502	14/15	0.69	0.37	72,79,88,93	0
3	NAG	B	503	14/15	0.70	0.29	72,77,79,80	0
3	NAG	D	503	14/15	0.70	0.29	66,72,74,74	0
3	NAG	B	502	14/15	0.75	0.19	66,73,79,81	0
3	NAG	A	502	14/15	0.79	0.26	57,63,71,75	0
5	RB0	B	505	9/10	0.79	0.19	52,61,64,66	0
5	RB0	A	505	9/10	0.82	0.19	79,87,91,91	0
3	NAG	C	503	14/15	0.86	0.23	71,93,103,105	0
5	RB0	C	505	9/10	0.87	0.15	71,79,80,81	0
5	RB0	D	505	9/10	0.88	0.16	54,62,63,63	0
3	NAG	A	503	14/15	0.89	0.17	53,66,73,80	0
3	NAG	C	502	14/15	0.90	0.12	70,84,98,99	0
4	CDP	A	504	25/25	0.93	0.13	49,59,67,73	0
4	CDP	C	504	25/25	0.95	0.12	45,57,65,68	0
4	CDP	D	504	25/25	0.96	0.10	38,43,51,57	0
4	CDP	B	504	25/25	0.97	0.10	32,40,51,53	0
2	ZN	A	501	1/1	0.99	0.15	45,45,45,45	0
2	ZN	B	501	1/1	0.99	0.12	43,43,43,43	0
2	ZN	C	501	1/1	0.99	0.15	43,43,43,43	0
2	ZN	D	501	1/1	0.99	0.14	37,37,37,37	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.

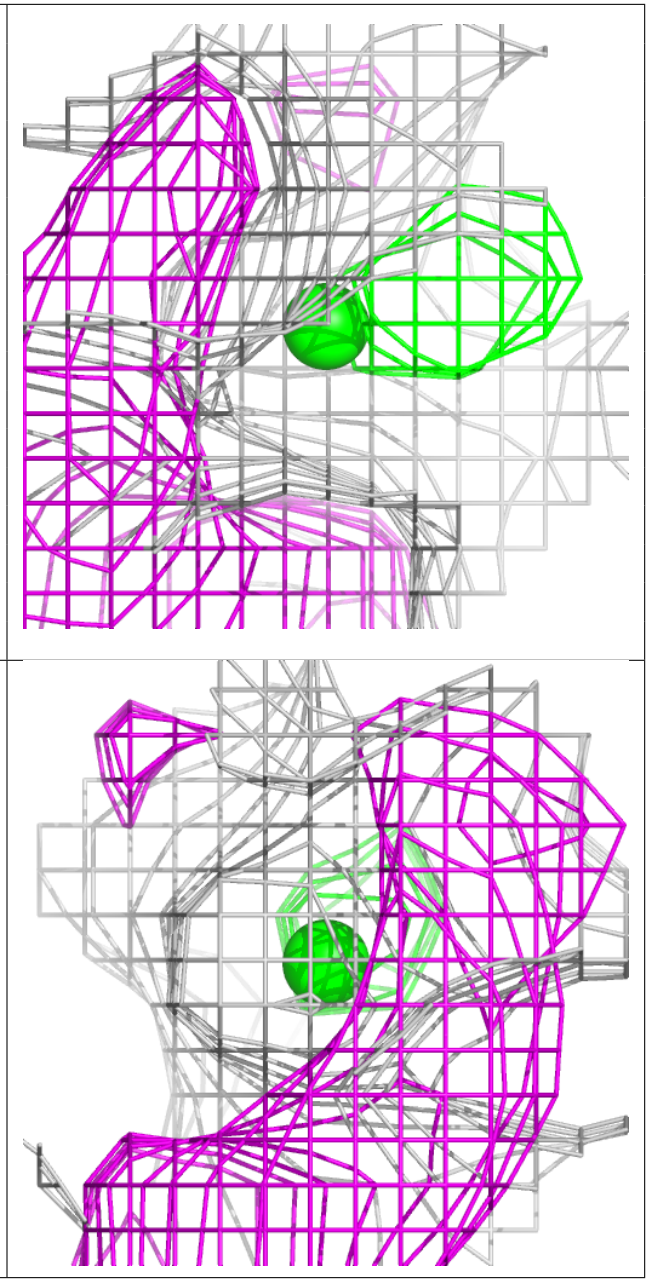
Electron density around BA D 506:

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



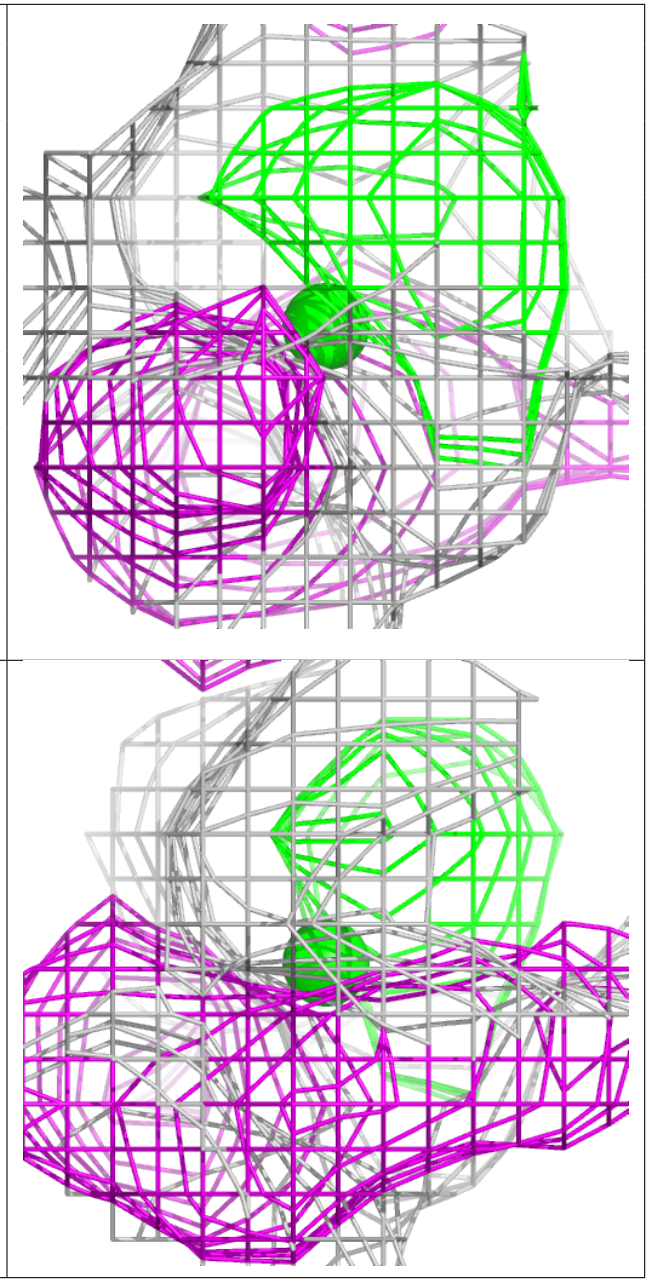
Electron density around BA C 506:

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



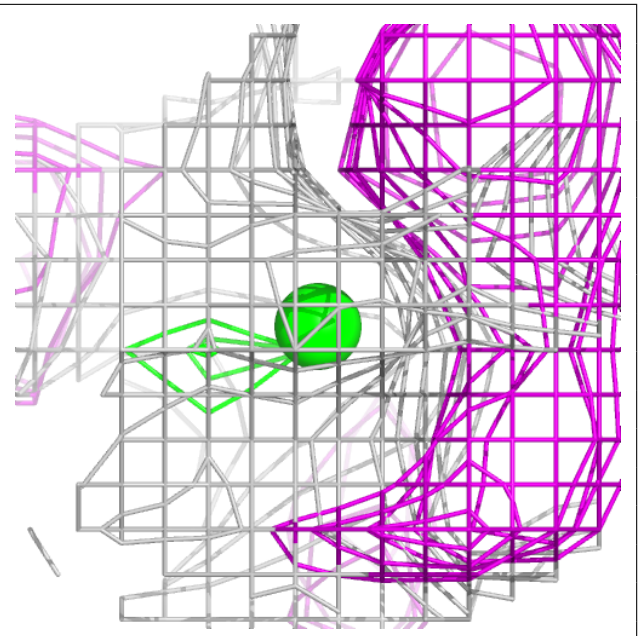
Electron density around BA B 506:

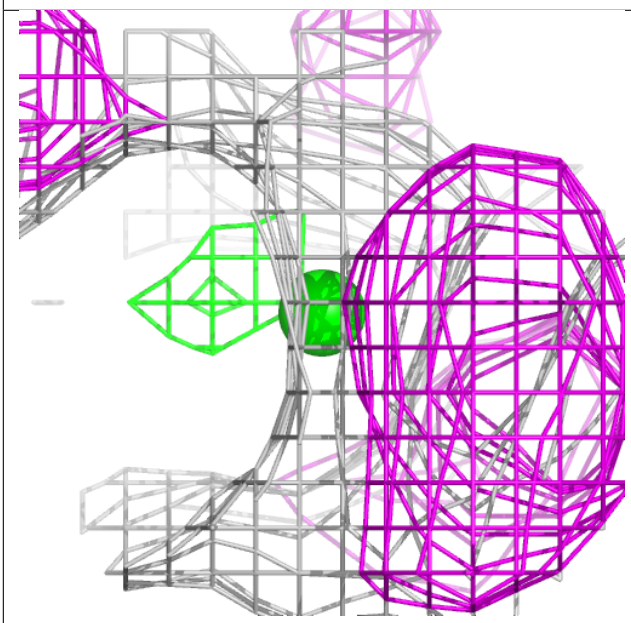
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

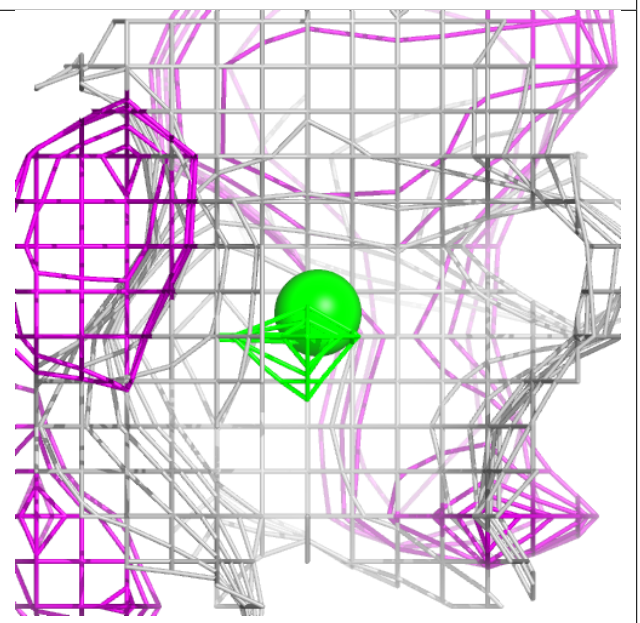


Electron density around BA A 506:

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

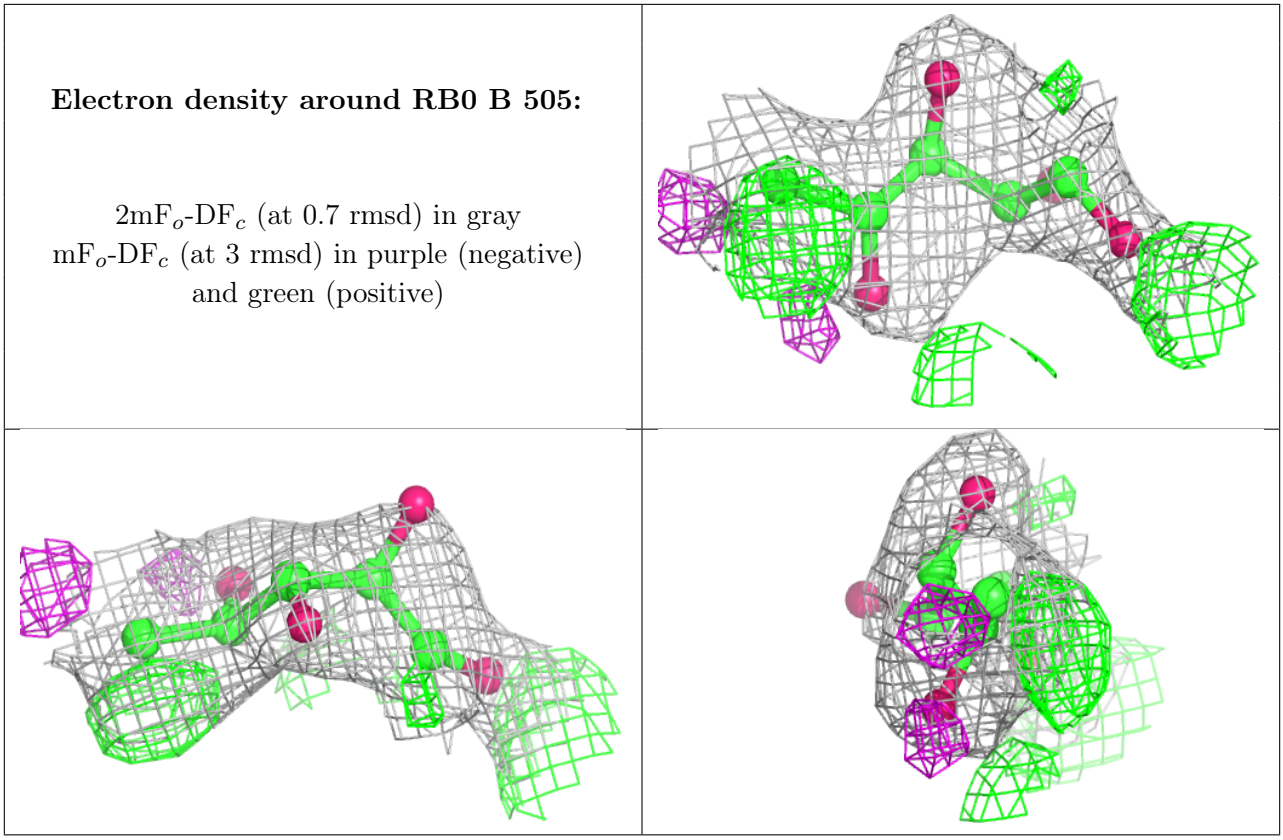






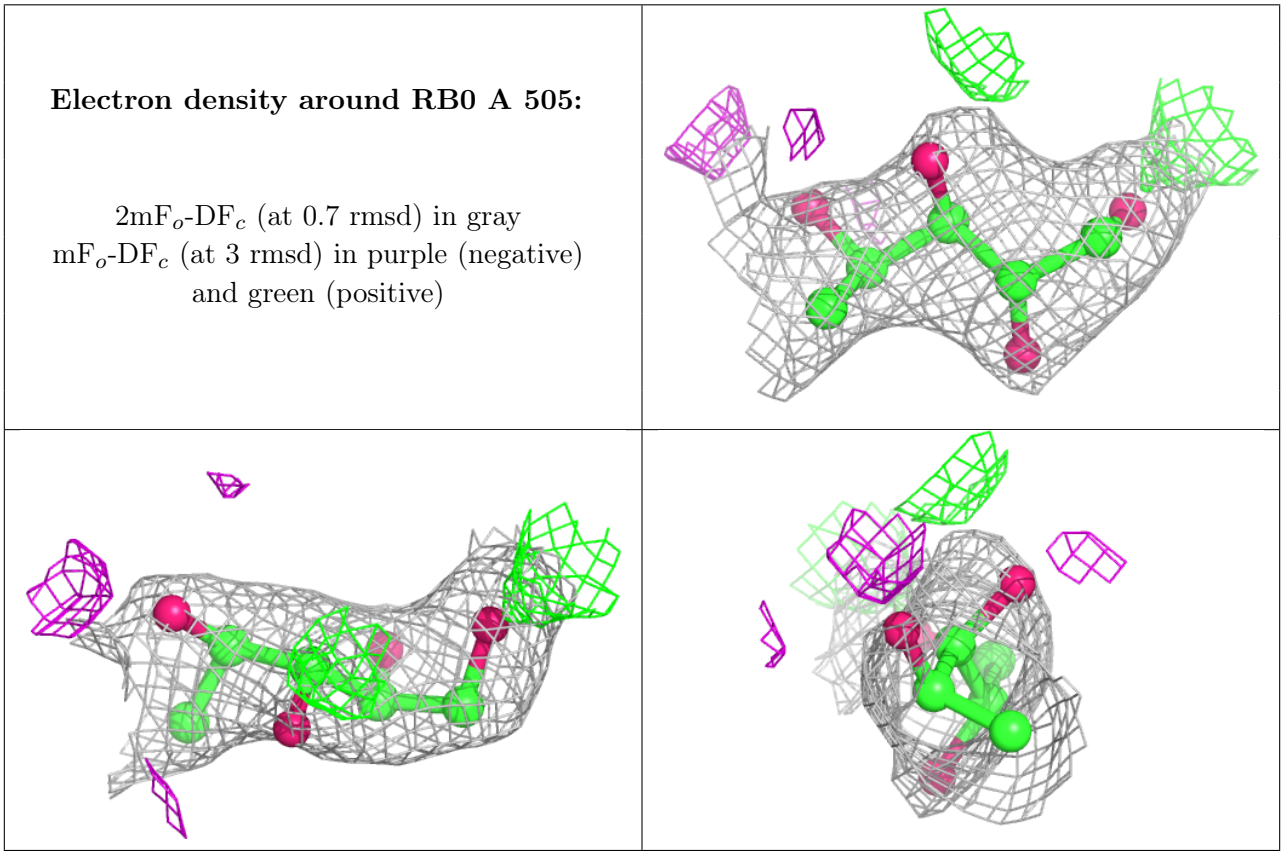
Electron density around RB0 B 505:

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



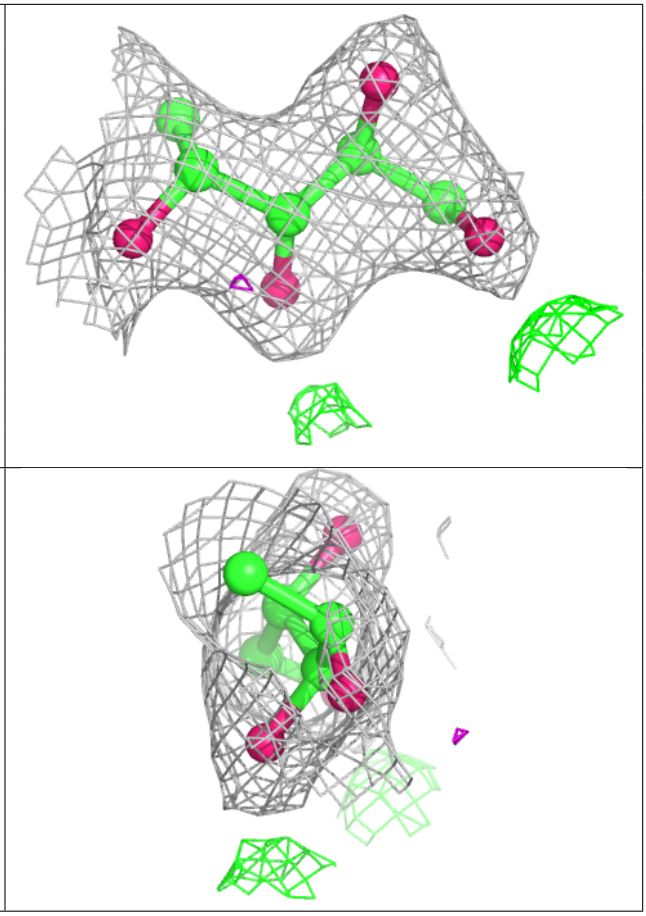
Electron density around RB0 A 505:

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



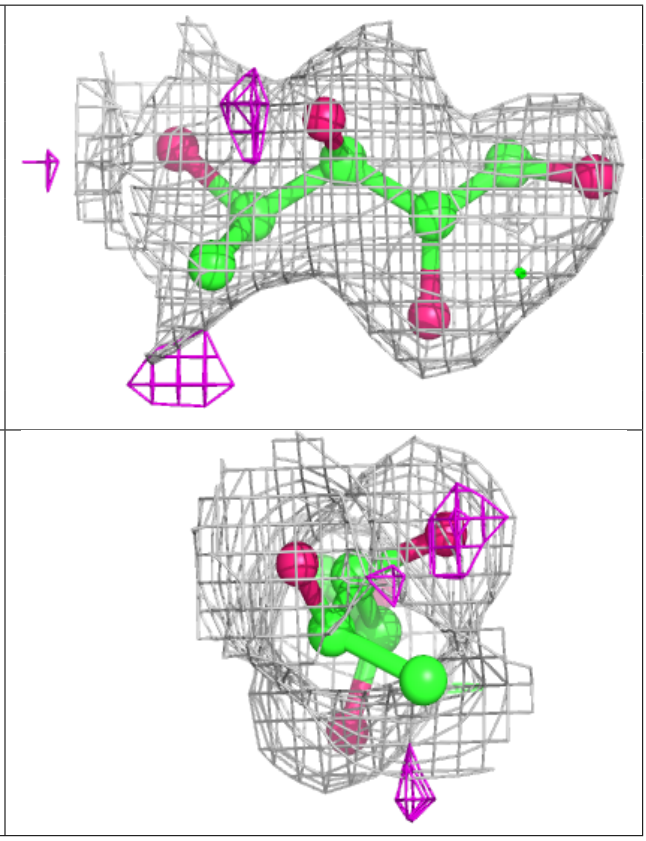
Electron density around RB0 C 505:

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



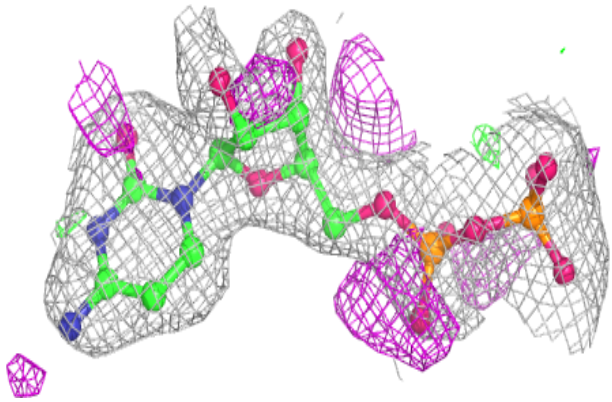
Electron density around RB0 D 505:

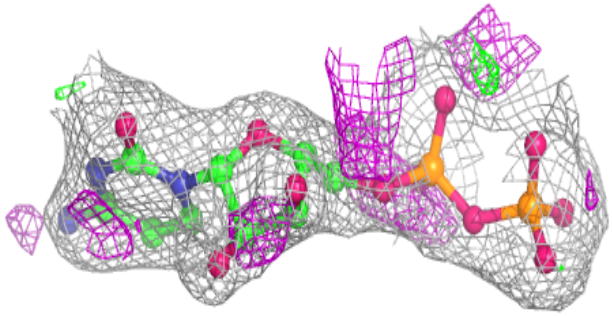
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

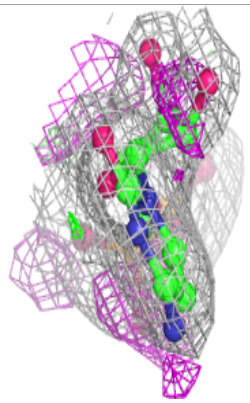


Electron density around CDP A 504:

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

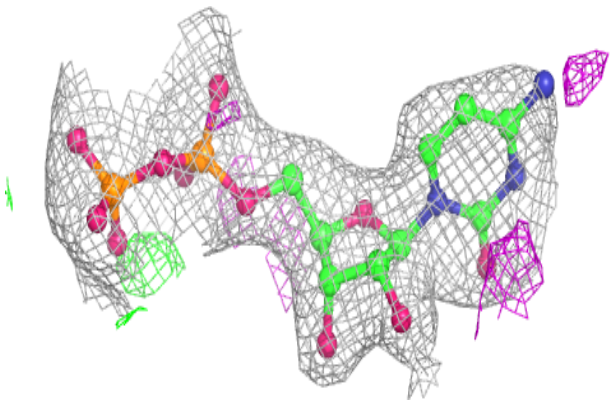


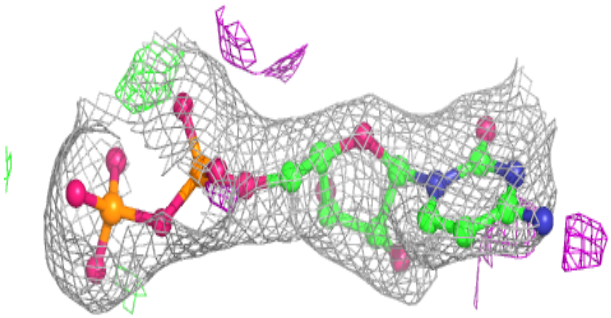


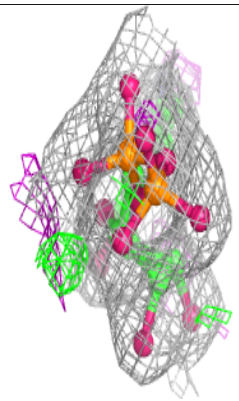


Electron density around CDP C 504:

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

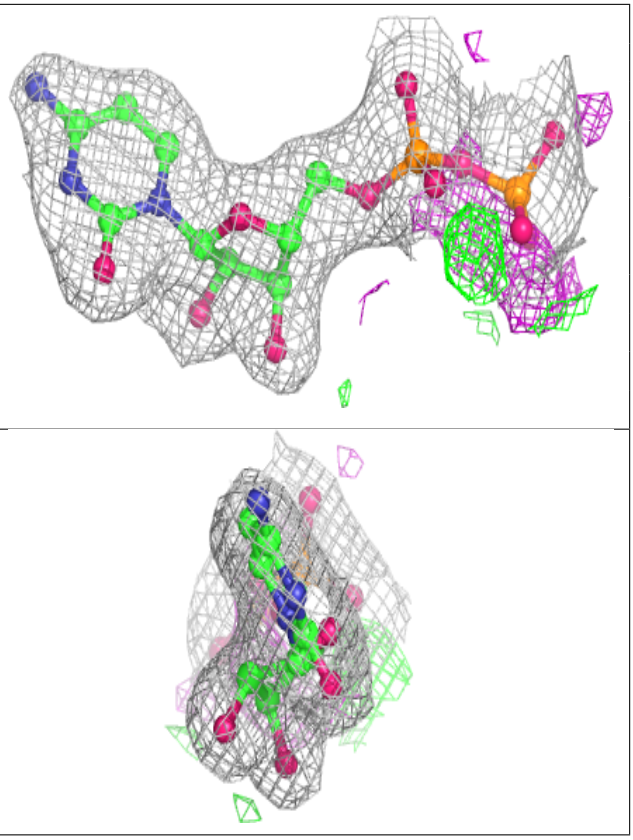






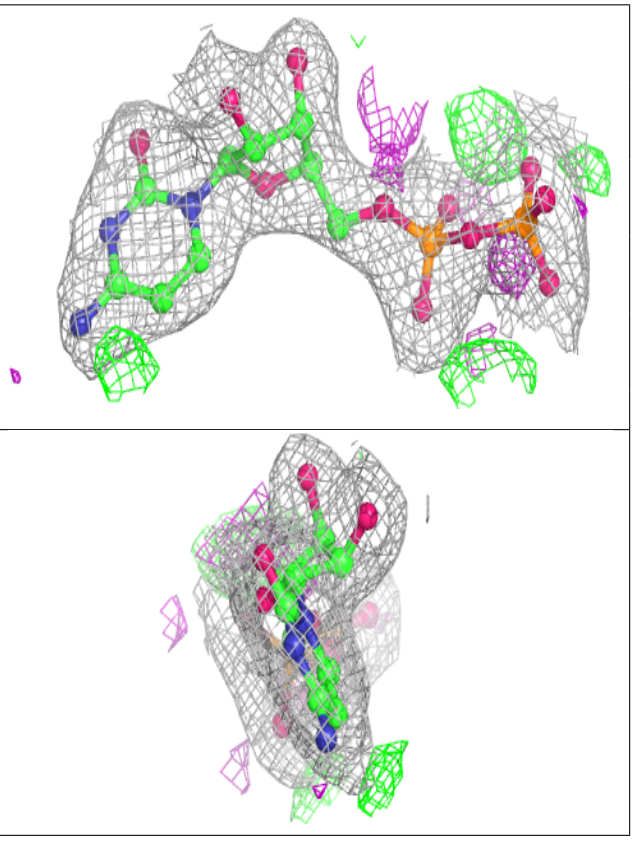
Electron density around CDP D 504:

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



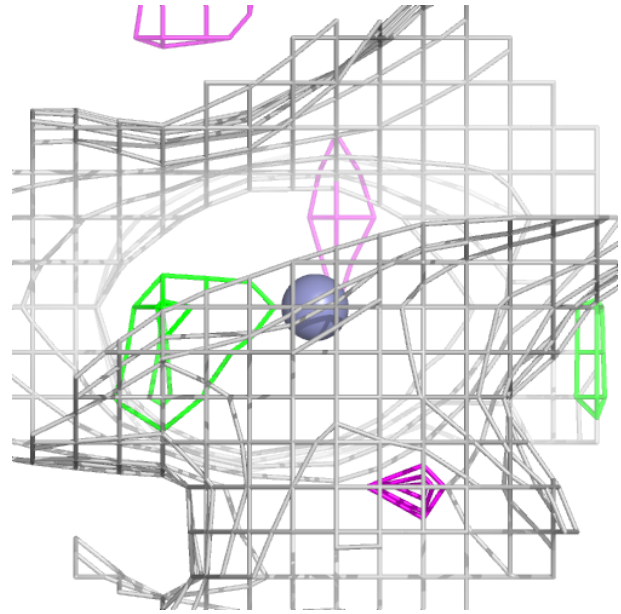
Electron density around CDP B 504:

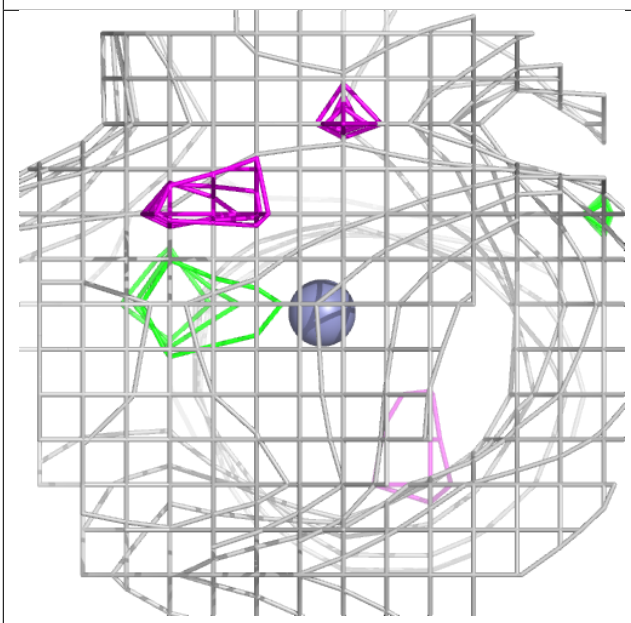
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

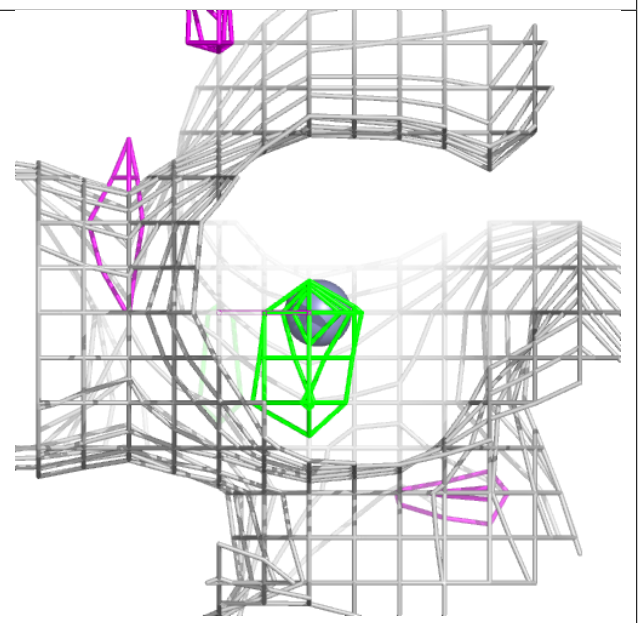


Electron density around ZN A 501:

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

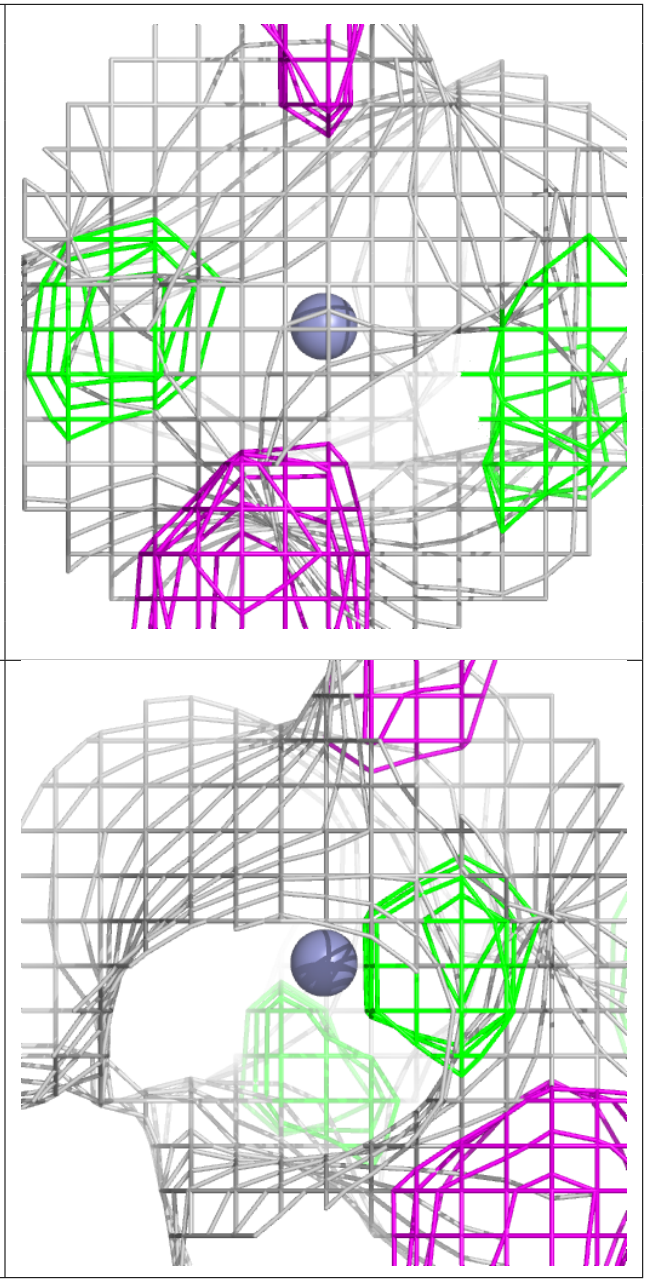






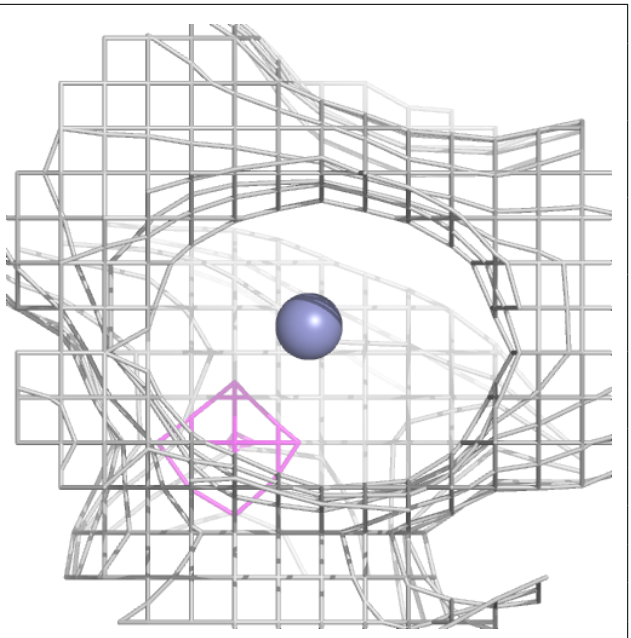
Electron density around ZN B 501:

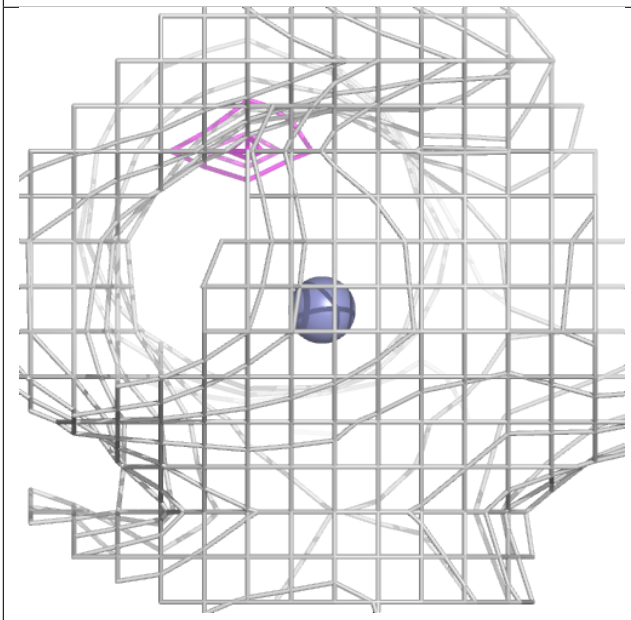
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

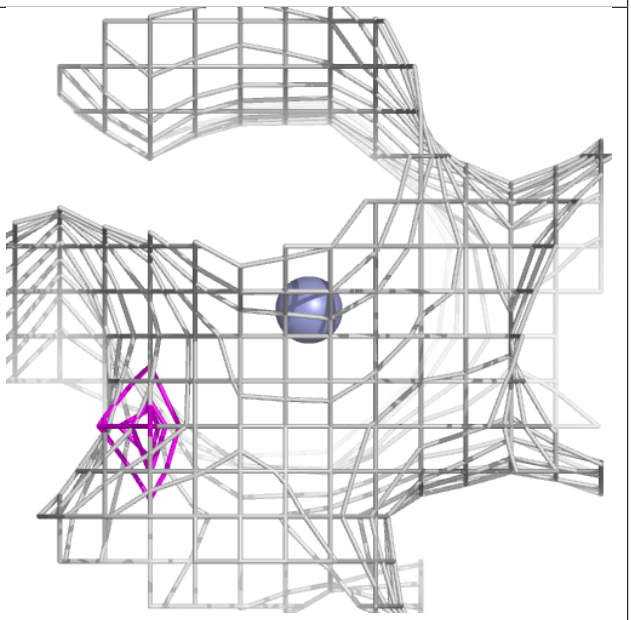


Electron density around ZN C 501:

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

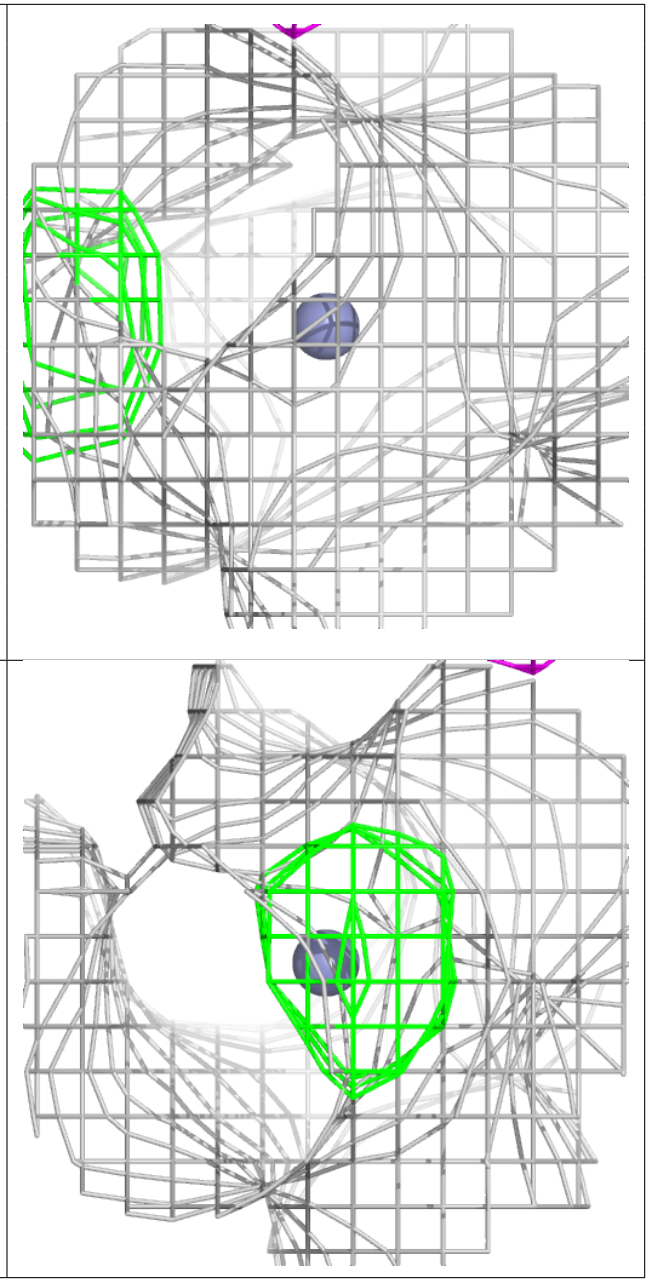






Electron density around ZN D 501:

$2mF_o$-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 (i)

There are no such residues in this entry.