



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 28, 2022 – 10:08 pm BST

PDB ID : 7Q2A
Title : Crystal structure of AphC in complex with 4-ethylcatechol
Authors : Zahn, M.; Grigg, J.C.; Eltis, L.D.; McGeehan, J.E.
Deposited on : 2021-10-25
Resolution : 1.60 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.27
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0267
CCP4 : 7.1.010 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.27

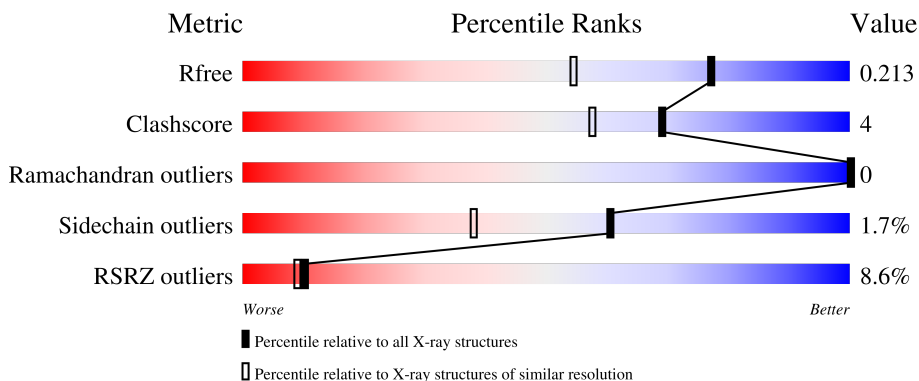
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.60 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	3398 (1.60-1.60)
Clashscore	141614	3665 (1.60-1.60)
Ramachandran outliers	138981	3564 (1.60-1.60)
Sidechain outliers	138945	3563 (1.60-1.60)
RSRZ outliers	127900	3321 (1.60-1.60)

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 $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	381	 10% 84% 7% • 8%
1	B	381	 6% 84% 8% 8%
1	C	381	 7% 84% 7% • 9%
1	D	381	 8% 84% 7% • 8%

2 Entry composition i

There are 5 unique types of molecules in this entry. The entry contains 11975 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 Catechol 2,3-dioxygenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	350	2775	1757	474	534	10	0	1	0
1	B	352	2793	1770	476	537	10	0	1	0
1	C	347	2757	1747	471	529	10	0	2	0
1	D	350	2785	1767	476	532	10	0	2	0

There are 84 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-20	MET	-	initiating methionine	UNP Q0S9X1
A	-19	GLY	-	expression tag	UNP Q0S9X1
A	-18	SER	-	expression tag	UNP Q0S9X1
A	-17	SER	-	expression tag	UNP Q0S9X1
A	-16	HIS	-	expression tag	UNP Q0S9X1
A	-15	HIS	-	expression tag	UNP Q0S9X1
A	-14	HIS	-	expression tag	UNP Q0S9X1
A	-13	HIS	-	expression tag	UNP Q0S9X1
A	-12	HIS	-	expression tag	UNP Q0S9X1
A	-11	SER	-	expression tag	UNP Q0S9X1
A	-10	SER	-	expression tag	UNP Q0S9X1
A	-9	GLY	-	expression tag	UNP Q0S9X1
A	-8	GLU	-	expression tag	UNP Q0S9X1
A	-7	ASN	-	expression tag	UNP Q0S9X1
A	-6	LEU	-	expression tag	UNP Q0S9X1
A	-5	TYR	-	expression tag	UNP Q0S9X1
A	-4	PHE	-	expression tag	UNP Q0S9X1
A	-3	GLN	-	expression tag	UNP Q0S9X1
A	-2	GLY	-	expression tag	UNP Q0S9X1
A	-1	HIS	-	expression tag	UNP Q0S9X1
A	0	MET	-	expression tag	UNP Q0S9X1

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-20	MET	-	initiating methionine	UNP Q0S9X1
B	-19	GLY	-	expression tag	UNP Q0S9X1
B	-18	SER	-	expression tag	UNP Q0S9X1
B	-17	SER	-	expression tag	UNP Q0S9X1
B	-16	HIS	-	expression tag	UNP Q0S9X1
B	-15	HIS	-	expression tag	UNP Q0S9X1
B	-14	HIS	-	expression tag	UNP Q0S9X1
B	-13	HIS	-	expression tag	UNP Q0S9X1
B	-12	HIS	-	expression tag	UNP Q0S9X1
B	-11	SER	-	expression tag	UNP Q0S9X1
B	-10	SER	-	expression tag	UNP Q0S9X1
B	-9	GLY	-	expression tag	UNP Q0S9X1
B	-8	GLU	-	expression tag	UNP Q0S9X1
B	-7	ASN	-	expression tag	UNP Q0S9X1
B	-6	LEU	-	expression tag	UNP Q0S9X1
B	-5	TYR	-	expression tag	UNP Q0S9X1
B	-4	PHE	-	expression tag	UNP Q0S9X1
B	-3	GLN	-	expression tag	UNP Q0S9X1
B	-2	GLY	-	expression tag	UNP Q0S9X1
B	-1	HIS	-	expression tag	UNP Q0S9X1
B	0	MET	-	expression tag	UNP Q0S9X1
C	-20	MET	-	initiating methionine	UNP Q0S9X1
C	-19	GLY	-	expression tag	UNP Q0S9X1
C	-18	SER	-	expression tag	UNP Q0S9X1
C	-17	SER	-	expression tag	UNP Q0S9X1
C	-16	HIS	-	expression tag	UNP Q0S9X1
C	-15	HIS	-	expression tag	UNP Q0S9X1
C	-14	HIS	-	expression tag	UNP Q0S9X1
C	-13	HIS	-	expression tag	UNP Q0S9X1
C	-12	HIS	-	expression tag	UNP Q0S9X1
C	-11	SER	-	expression tag	UNP Q0S9X1
C	-10	SER	-	expression tag	UNP Q0S9X1
C	-9	GLY	-	expression tag	UNP Q0S9X1
C	-8	GLU	-	expression tag	UNP Q0S9X1
C	-7	ASN	-	expression tag	UNP Q0S9X1
C	-6	LEU	-	expression tag	UNP Q0S9X1
C	-5	TYR	-	expression tag	UNP Q0S9X1
C	-4	PHE	-	expression tag	UNP Q0S9X1
C	-3	GLN	-	expression tag	UNP Q0S9X1
C	-2	GLY	-	expression tag	UNP Q0S9X1
C	-1	HIS	-	expression tag	UNP Q0S9X1
C	0	MET	-	expression tag	UNP Q0S9X1

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Chain	Residue	Modelled	Actual	Comment	Reference
D	-20	MET	-	initiating methionine	UNP Q0S9X1
D	-19	GLY	-	expression tag	UNP Q0S9X1
D	-18	SER	-	expression tag	UNP Q0S9X1
D	-17	SER	-	expression tag	UNP Q0S9X1
D	-16	HIS	-	expression tag	UNP Q0S9X1
D	-15	HIS	-	expression tag	UNP Q0S9X1
D	-14	HIS	-	expression tag	UNP Q0S9X1
D	-13	HIS	-	expression tag	UNP Q0S9X1
D	-12	HIS	-	expression tag	UNP Q0S9X1
D	-11	SER	-	expression tag	UNP Q0S9X1
D	-10	SER	-	expression tag	UNP Q0S9X1
D	-9	GLY	-	expression tag	UNP Q0S9X1
D	-8	GLU	-	expression tag	UNP Q0S9X1
D	-7	ASN	-	expression tag	UNP Q0S9X1
D	-6	LEU	-	expression tag	UNP Q0S9X1
D	-5	TYR	-	expression tag	UNP Q0S9X1
D	-4	PHE	-	expression tag	UNP Q0S9X1
D	-3	GLN	-	expression tag	UNP Q0S9X1
D	-2	GLY	-	expression tag	UNP Q0S9X1
D	-1	HIS	-	expression tag	UNP Q0S9X1
D	0	MET	-	expression tag	UNP Q0S9X1

- Molecule 2 is FE (III) ION (three-letter code: FE) (formula: Fe) (labeled as "Ligand of Interest" by depositor).

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

- Molecule 3 is CALCIUM ION (three-letter code: CA) (formula: Ca) (labeled as "Ligand of Interest" by depositor).

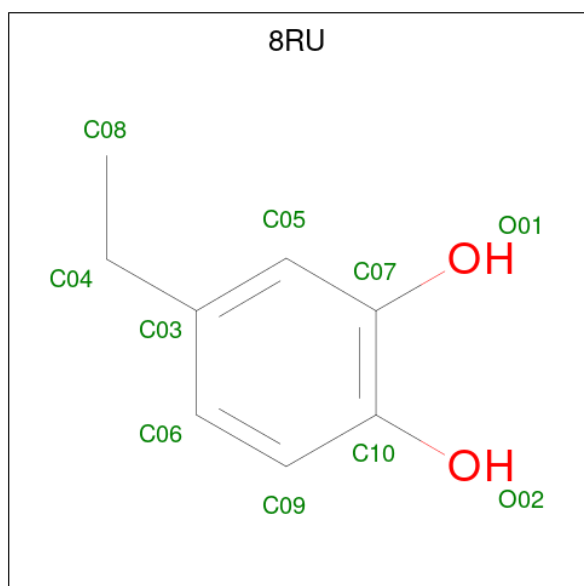
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total Ca 1 1	0	0

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	B	1	Total Ca 1 1	0	0
3	C	2	Total Ca 2 2	0	0
3	D	2	Total Ca 2 2	0	0

- Molecule 4 is 4-ethylbenzene-1,2-diol (three-letter code: 8RU) (formula: C₈H₁₀O₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 10 8 2	0	0
4	B	1	Total C O 10 8 2	0	0
4	C	1	Total C O 10 8 2	0	0
4	D	1	Total C O 10 8 2	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	186	Total O 186 186	0	0
5	B	236	Total O 236 236	0	0

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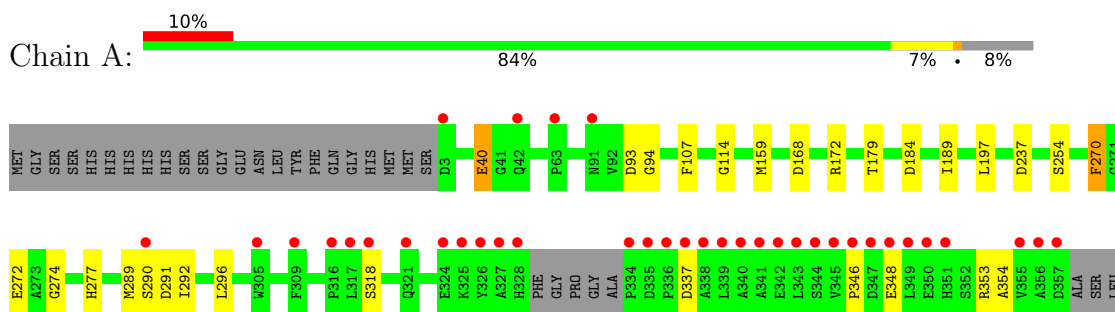
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	C	202	Total 202	O 202	0	0
5	D	191	Total 191	O 191	0	0

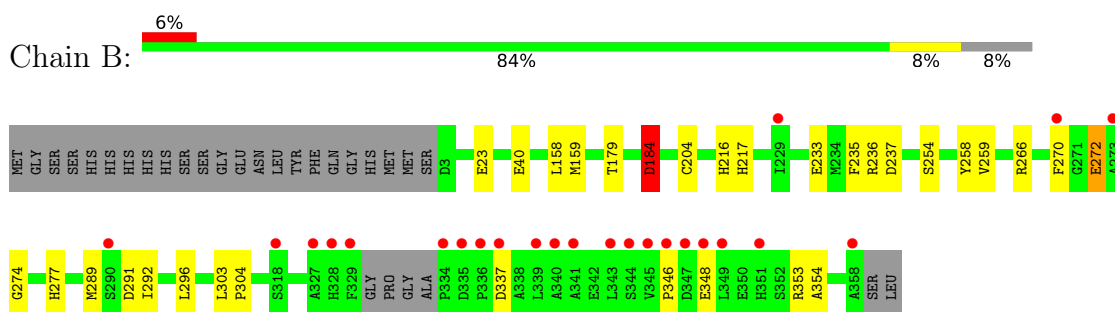
3 Residue-property plots [i](#)

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.

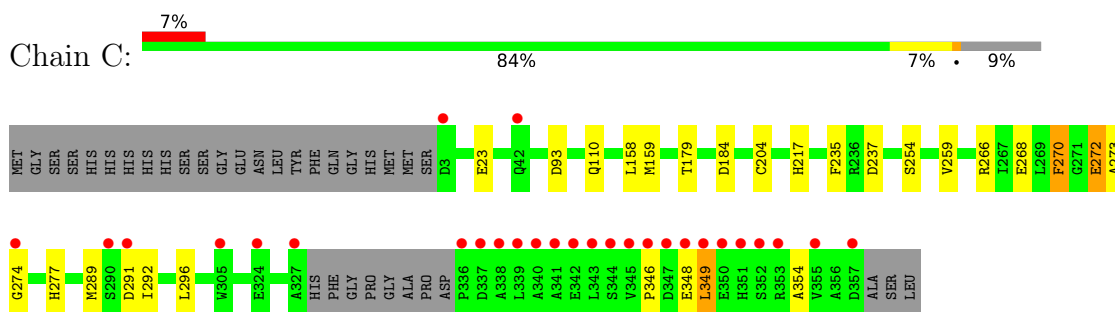
- Molecule 1: Catechol 2,3-dioxygenase



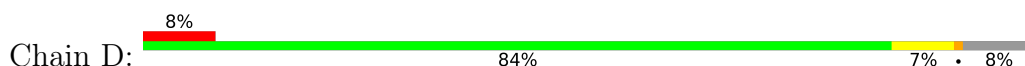
- Molecule 1: Catechol 2,3-dioxygenase

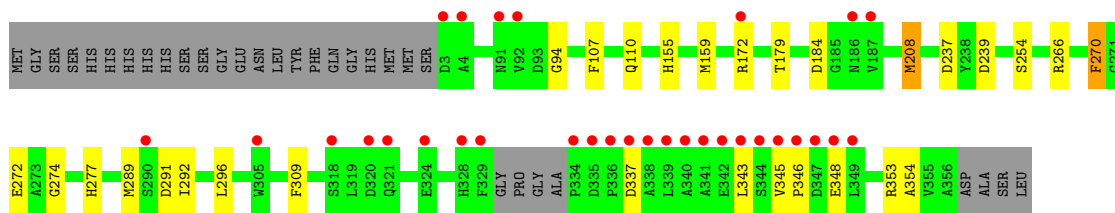


- Molecule 1: Catechol 2,3-dioxygenase



- Molecule 1: Catechol 2,3-dioxygenase





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	81.58Å 119.35Å 84.53Å 90.00° 114.56° 90.00°	Depositor
Resolution (Å)	47.19 – 1.60 47.14 – 1.59	Depositor EDS
% Data completeness (in resolution range)	70.7 (47.19-1.60) 69.5 (47.14-1.59)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.12 (at 1.58Å)	Xtrriage
Refinement program	REFMAC 5.8.0267	Depositor
R, R_{free}	0.179 , 0.209 0.187 , 0.213	Depositor DCC
R_{free} test set	6886 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å ²)	23.9	Xtrriage
Anisotropy	0.026	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	(Not available) , (Not available)	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.017 for l,-k,h	Xtrriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	11975	wwPDB-VP
Average B, all atoms (Å ²)	33.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.03% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: FE, CA, 8RU

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	0.80	2/2855 (0.1%)	0.85	0/3871
1	B	0.85	3/2874 (0.1%)	0.88	2/3897 (0.1%)
1	C	0.84	3/2839 (0.1%)	0.88	2/3848 (0.1%)
1	D	0.83	2/2870 (0.1%)	0.86	2/3891 (0.1%)
All	All	0.83	10/11438 (0.1%)	0.87	6/15507 (0.0%)

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
1	B	0	1
1	C	0	1
1	D	0	1
All	All	0	4

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	272	GLU	CD-OE2	14.49	1.41	1.25
1	B	272	GLU	CD-OE2	13.82	1.40	1.25
1	D	272	GLU	CD-OE1	12.79	1.39	1.25
1	C	274	GLY	C-O	8.84	1.37	1.23
1	A	272	GLU	CD-OE1	-8.34	1.16	1.25
1	D	274	GLY	C-O	8.22	1.36	1.23
1	B	233	GLU	CD-OE2	-7.34	1.17	1.25
1	A	274	GLY	C-O	6.82	1.34	1.23
1	B	274	GLY	C-O	6.54	1.34	1.23
1	C	268	GLU	CD-OE1	-5.18	1.20	1.25

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	266	ARG	NE-CZ-NH1	5.80	123.20	120.30
1	C	93	ASP	CB-CG-OD2	-5.66	113.21	118.30
1	B	353	ARG	NE-CZ-NH2	-5.65	117.47	120.30
1	C	266	ARG	NE-CZ-NH1	5.55	123.07	120.30
1	B	184	ASP	CB-CG-OD1	-5.41	113.43	118.30
1	D	353	ARG	NE-CZ-NH2	-5.34	117.63	120.30

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	291	ASP	Peptide
1	B	291	ASP	Peptide
1	C	291	ASP	Peptide
1	D	291	ASP	Peptide

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	2775	0	2637	19	0
1	B	2793	0	2650	27	0
1	C	2757	0	2626	17	0
1	D	2785	0	2649	19	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	1	0	0	0	0
3	B	1	0	0	0	0
3	C	2	0	0	0	0
3	D	2	0	0	0	0
4	A	10	0	0	0	0
4	B	10	0	0	2	0
4	C	10	0	0	1	0
4	D	10	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	186	0	0	5	0
5	B	236	0	0	6	0
5	C	202	0	0	4	0
5	D	191	0	0	3	0
All	All	11975	0	10562	80	0

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

All (80) 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:110:GLN:NE2	5:C:501:HOH:O	2.09	0.84
1:D:110:GLN:NE2	5:D:501:HOH:O	2.11	0.84
1:B:337:ASP:OD2	5:B:501:HOH:O	2.03	0.77
1:B:184:ASP:OD2	1:B:346:PRO:HB3	1.85	0.74
1:C:289:MET:HB3	1:C:348:GLU:HB2	1.72	0.70
1:A:289:MET:HB3	1:A:348:GLU:HB2	1.77	0.67
1:A:114:GLY:O	5:A:501:HOH:O	2.12	0.67
1:B:289:MET:HB3	1:B:348:GLU:HB2	1.77	0.67
1:D:239:ASP:OD1	5:D:502:HOH:O	2.13	0.66
1:B:272:GLU:O	5:B:503:HOH:O	2.14	0.66
1:B:272:GLU:OE1	5:B:502:HOH:O	2.13	0.64
1:D:289:MET:HB3	1:D:348:GLU:HB2	1.78	0.64
1:C:23:GLU:OE1	5:C:502:HOH:O	2.15	0.63
1:A:296:LEU:HD12	1:A:354:ALA:HB3	1.81	0.62
1:C:292:ILE:HG12	1:C:349:LEU:HD13	1.83	0.61
1:C:272:GLU:OE1	5:C:503:HOH:O	2.15	0.61
1:C:296:LEU:HD12	1:C:354:ALA:HB3	1.82	0.60
1:D:309:PHE:O	5:D:503:HOH:O	2.15	0.60
1:A:93:ASP:OD1	5:A:502:HOH:O	2.16	0.60
1:C:273:ALA:O	5:C:504:HOH:O	2.17	0.60
1:B:184:ASP:OD2	1:B:346:PRO:CB	2.50	0.59
1:B:184:ASP:OD2	1:B:346:PRO:HG3	2.02	0.58
1:D:296:LEU:HD12	1:D:354:ALA:HB3	1.86	0.57
1:D:343:LEU:O	1:D:343:LEU:HD23	2.04	0.57
1:D:208:MET:HG2	1:D:345:VAL:CG2	2.36	0.56
1:B:296:LEU:HD12	1:B:354:ALA:HB3	1.88	0.55
1:B:184:ASP:OD2	1:B:346:PRO:CG	2.56	0.54
1:D:208:MET:CG	1:D:345:VAL:CG2	2.86	0.53
1:B:254:SER:HB2	1:B:270:PHE:CZ	2.45	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:208:MET:HG3	1:D:345:VAL:HG23	1.92	0.51
1:B:184:ASP:HB2	1:B:346:PRO:HG3	1.93	0.51
1:B:40:GLU:HG2	5:B:609:HOH:O	2.10	0.51
1:A:353:ARG:NH2	1:B:236:ARG:CZ	2.75	0.49
1:A:254[A]:SER:HB2	1:A:270:PHE:CZ	2.47	0.49
1:B:258:TYR:OH	4:B:403:8RU:O01	2.30	0.49
1:D:94:GLY:HA3	1:D:107:PHE:CZ	2.47	0.49
1:D:254[A]:SER:HB2	1:D:270:PHE:CZ	2.48	0.49
1:A:168:ASP:O	1:A:172:ARG:HG3	2.12	0.48
1:C:254[A]:SER:HB2	1:C:270:PHE:CZ	2.48	0.48
1:D:254[B]:SER:HB3	1:D:270:PHE:CZ	2.48	0.48
1:B:23:GLU:HG3	5:B:682:HOH:O	2.13	0.48
1:A:254[A]:SER:CB	1:A:270:PHE:CZ	2.98	0.47
1:A:254[B]:SER:CB	1:A:270:PHE:CZ	2.98	0.46
1:D:254[B]:SER:CB	1:D:270:PHE:CZ	2.98	0.46
1:A:40:GLU:HG3	5:A:620:HOH:O	2.15	0.46
1:C:254[A]:SER:CB	1:C:270:PHE:CZ	2.98	0.46
1:A:290:SER:O	5:A:503:HOH:O	2.21	0.46
1:D:254[A]:SER:CB	1:D:270:PHE:CZ	2.99	0.46
1:A:289:MET:O	1:A:292:ILE:HG22	2.15	0.46
1:C:289:MET:O	1:C:292:ILE:HG22	2.15	0.46
1:A:254[B]:SER:HB3	1:A:270:PHE:CZ	2.50	0.45
1:D:289:MET:O	1:D:292:ILE:HG22	2.17	0.45
1:B:179:THR:HB	1:B:277:HIS:CE1	2.52	0.45
1:C:179:THR:HB	1:C:277:HIS:CE1	2.52	0.45
1:A:184:ASP:CG	1:A:346:PRO:HG3	2.37	0.45
1:A:197:LEU:HG	5:A:658:HOH:O	2.17	0.44
1:C:184:ASP:CG	1:C:346:PRO:HG3	2.37	0.44
1:B:304:PRO:HG3	5:B:580:HOH:O	2.18	0.44
1:B:217:HIS:CE1	4:B:403:8RU:O01	2.70	0.44
1:A:353:ARG:CZ	1:B:236:ARG:CZ	2.96	0.44
1:C:254[B]:SER:CB	1:C:270:PHE:CZ	3.01	0.43
1:A:179:THR:HB	1:A:277:HIS:CE1	2.54	0.43
1:A:94:GLY:HA3	1:A:107:PHE:CZ	2.54	0.43
1:C:254[B]:SER:HB3	1:C:270:PHE:CZ	2.54	0.43
1:C:217:HIS:CE1	4:C:404:8RU:O01	2.72	0.42
1:D:179:THR:HB	1:D:277:HIS:CE1	2.54	0.42
1:D:208:MET:HG2	1:D:345:VAL:HG22	2.01	0.42
1:B:254:SER:CB	1:B:270:PHE:CZ	3.02	0.42
1:B:254:SER:HB2	1:B:270:PHE:CE1	2.55	0.42
1:B:289:MET:O	1:B:292:ILE:HG22	2.20	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:303:LEU:HA	1:B:304:PRO:HD3	1.96	0.42
1:D:155:HIS:CE1	1:D:270:PHE:CZ	3.08	0.42
1:D:184:ASP:CG	1:D:346:PRO:HG3	2.40	0.42
1:B:289:MET:CE	1:B:289:MET:HA	2.51	0.41
1:A:289:MET:HE2	1:A:289:MET:HA	2.03	0.41
1:B:216:HIS:O	1:B:266:ARG:HB3	2.21	0.41
1:B:235:PHE:CD2	1:B:259:VAL:HG11	2.56	0.41
1:C:158:LEU:O	1:C:204:CYS:HA	2.21	0.40
1:C:235:PHE:CD2	1:C:259:VAL:HG11	2.56	0.40
1:B:158:LEU:O	1:B:204:CYS:HA	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	347/381 (91%)	338 (97%)	9 (3%)	0	100	100
1	B	349/381 (92%)	340 (97%)	9 (3%)	0	100	100
1	C	345/381 (91%)	336 (97%)	9 (3%)	0	100	100
1	D	348/381 (91%)	340 (98%)	8 (2%)	0	100	100
All	All	1389/1524 (91%)	1354 (98%)	35 (2%)	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	293/316 (93%)	286 (98%)	7 (2%)	49	24
1	B	294/316 (93%)	291 (99%)	3 (1%)	76	61
1	C	291/316 (92%)	287 (99%)	4 (1%)	67	47
1	D	294/316 (93%)	288 (98%)	6 (2%)	55	31
All	All	1172/1264 (93%)	1152 (98%)	20 (2%)	60	38

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	40	GLU
1	A	159	MET
1	A	189	ILE
1	A	237	ASP
1	A	270	PHE
1	A	318	SER
1	A	337	ASP
1	B	159	MET
1	B	184	ASP
1	B	237	ASP
1	C	159	MET
1	C	237	ASP
1	C	270	PHE
1	C	349	LEU
1	D	159	MET
1	D	172	ARG
1	D	208	MET
1	D	237	ASP
1	D	270	PHE
1	D	337	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	186	ASN
1	B	288	GLN
1	D	186	ASN

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 14 ligands modelled in this entry, 10 are monoatomic - leaving 4 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
4	8RU	A	403	2	10,10,10	1.27	1 (10%)	13,13,13	1.11	0
4	8RU	B	403	2	10,10,10	1.09	1 (10%)	13,13,13	0.80	0
4	8RU	C	404	2	10,10,10	1.33	1 (10%)	13,13,13	1.21	1 (7%)
4	8RU	D	404	2	10,10,10	0.99	0	13,13,13	1.04	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
4	8RU	A	403	2	-	0/2/2/2	0/1/1/1
4	8RU	B	403	2	-	0/2/2/2	0/1/1/1
4	8RU	C	404	2	-	0/2/2/2	0/1/1/1
4	8RU	D	404	2	-	1/2/2/2	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	403	8RU	C10-C07	-3.20	1.34	1.40
4	C	404	8RU	O01-C07	2.54	1.41	1.36
4	B	403	8RU	O01-C07	2.13	1.40	1.36

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	404	8RU	O01-C07-C05	2.08	125.03	119.46

There are no chirality outliers.

All (1) torsion outliers are listed below:

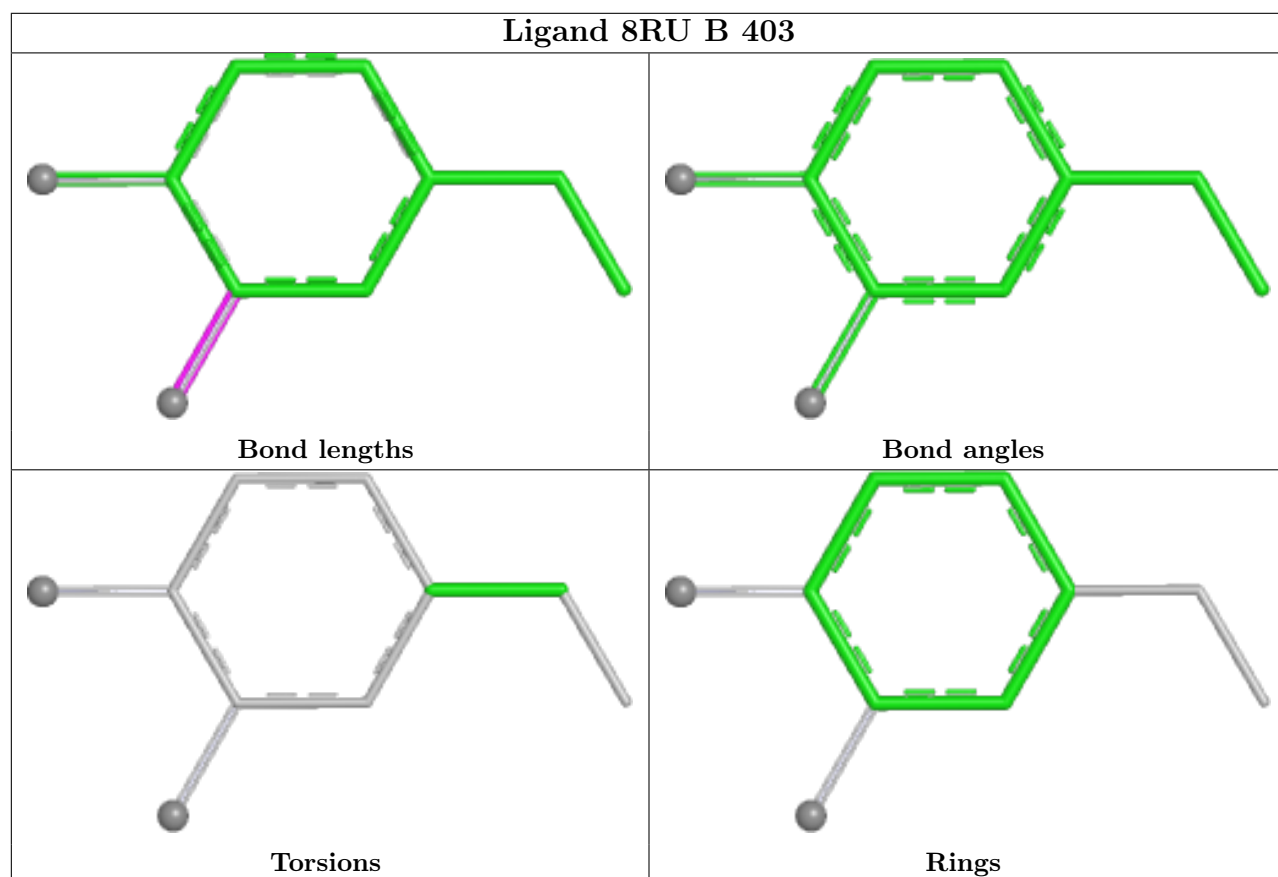
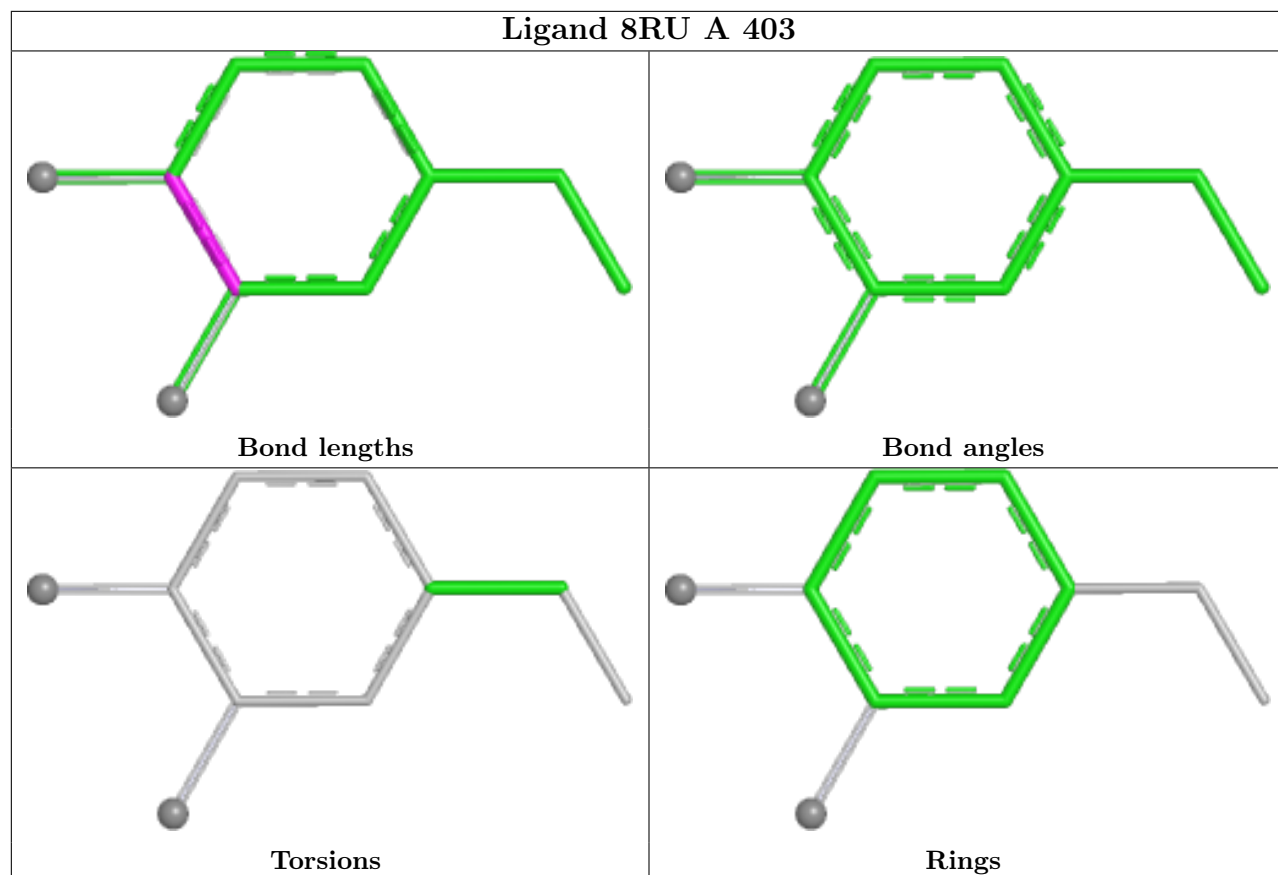
Mol	Chain	Res	Type	Atoms
4	D	404	8RU	C05-C03-C04-C08

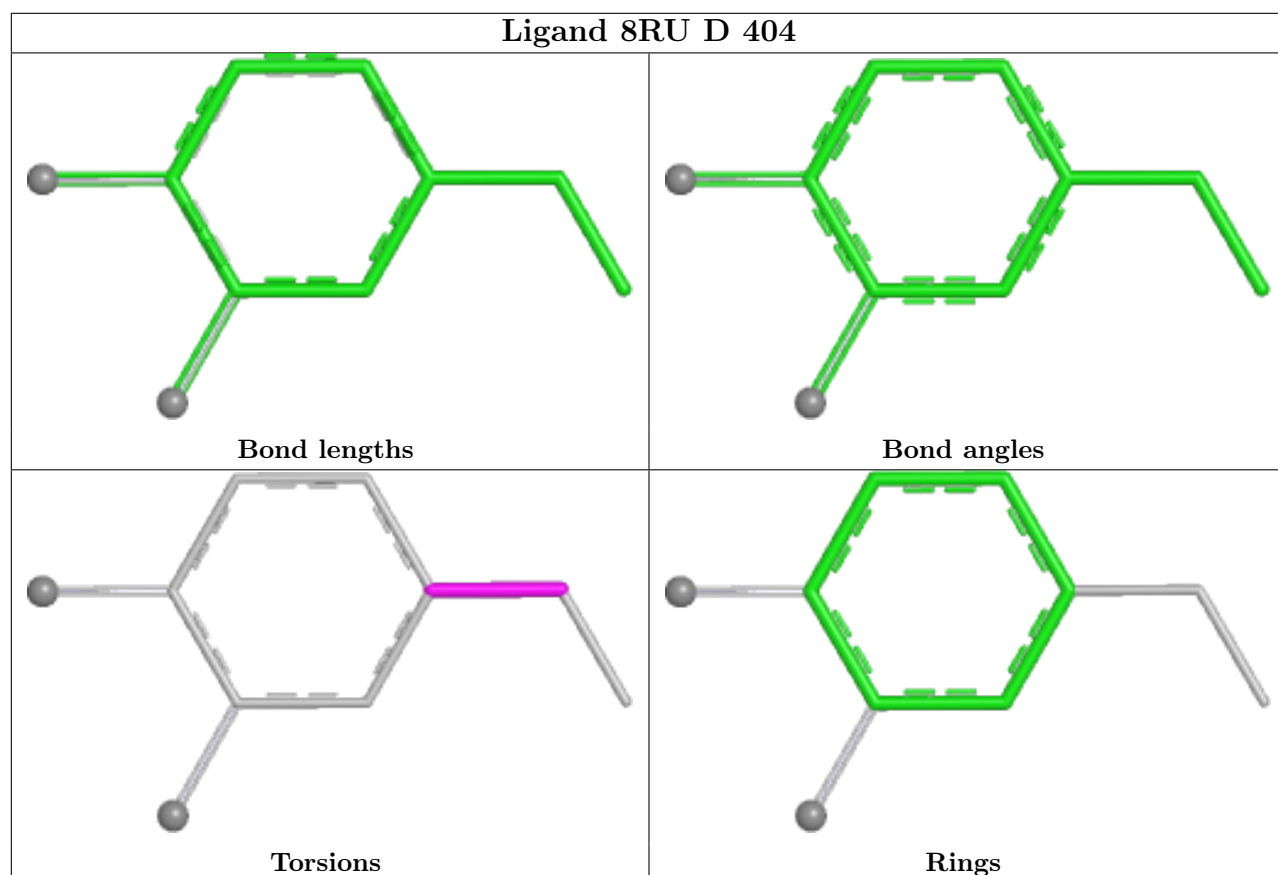
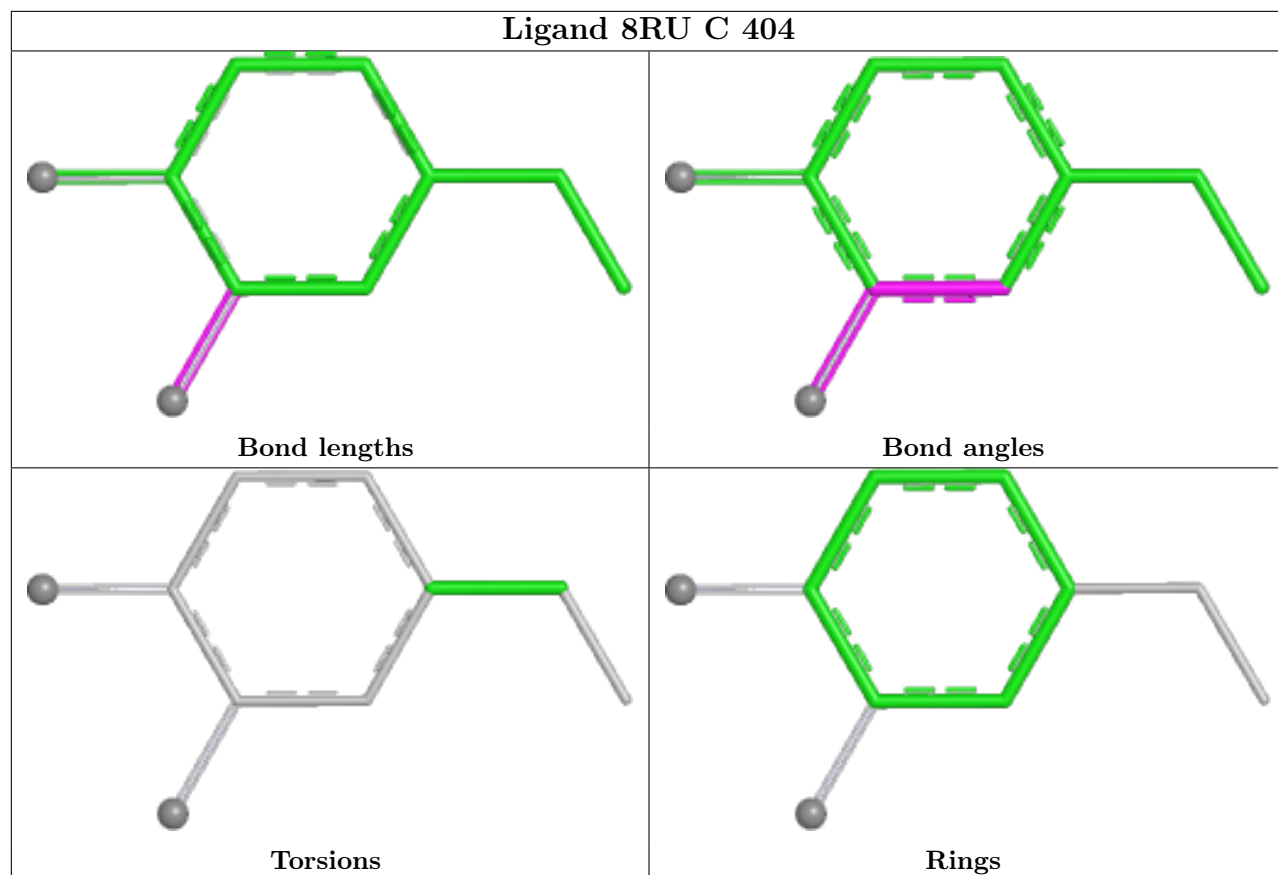
There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	403	8RU	2	0
4	C	404	8RU	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 than 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.





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, 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	350/381 (91%)	0.36	37 (10%) 6 5	18, 30, 76, 104	0
1	B	352/381 (92%)	0.12	24 (6%) 17 16	17, 27, 59, 97	0
1	C	347/381 (91%)	0.12	28 (8%) 12 10	18, 29, 64, 105	0
1	D	350/381 (91%)	0.24	31 (8%) 9 8	17, 28, 64, 96	0
All	All	1399/1524 (91%)	0.21	120 (8%) 10 9	17, 29, 65, 105	0

All (120) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	329	PHE	13.0
1	C	341	ALA	9.6
1	C	345	VAL	8.7
1	A	339	LEU	8.7
1	A	340	ALA	8.5
1	C	343	LEU	8.4
1	C	344	SER	8.2
1	B	329	PHE	7.9
1	A	345	VAL	7.8
1	A	341	ALA	7.8
1	A	337	ASP	7.8
1	A	336	PRO	7.1
1	B	334	PRO	7.0
1	A	351	HIS	6.9
1	C	340	ALA	6.6
1	A	343	LEU	6.3
1	C	336	PRO	6.2
1	C	349	LEU	6.2
1	D	344	SER	6.1
1	A	349	LEU	5.9
1	A	334	PRO	5.8

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Mol	Chain	Res	Type	RSRZ
1	A	338	ALA	5.8
1	D	336	PRO	5.7
1	A	335	ASP	5.7
1	C	348	GLU	5.5
1	C	290	SER	5.5
1	D	341	ALA	5.3
1	C	339	LEU	5.1
1	C	355	VAL	5.0
1	A	346	PRO	4.9
1	D	343	LEU	4.9
1	D	345	VAL	4.8
1	A	321	GLN	4.8
1	C	350	GLU	4.7
1	B	336	PRO	4.7
1	B	337	ASP	4.7
1	D	186	ASN	4.6
1	A	348	GLU	4.6
1	D	339	LEU	4.5
1	A	347	ASP	4.5
1	B	340	ALA	4.4
1	D	349	LEU	4.4
1	C	338	ALA	4.4
1	D	334	PRO	4.3
1	B	339	LEU	4.2
1	C	351	HIS	4.2
1	B	290	SER	4.2
1	A	317	LEU	4.1
1	A	290	SER	4.0
1	B	345	VAL	4.0
1	C	347	ASP	4.0
1	D	335	ASP	4.0
1	A	344	SER	3.9
1	B	344	SER	3.9
1	B	341	ALA	3.9
1	D	324	GLU	3.9
1	C	357	ASP	3.8
1	A	305	TRP	3.8
1	D	3	ASP	3.7
1	A	356	ALA	3.6
1	B	347	ASP	3.5
1	B	348	GLU	3.5
1	D	92	VAL	3.5

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Mol	Chain	Res	Type	RSRZ
1	D	340	ALA	3.5
1	B	349	LEU	3.5
1	A	328	HIS	3.5
1	A	355	VAL	3.3
1	B	343	LEU	3.3
1	C	3	ASP	3.3
1	D	318	SER	3.3
1	D	187	VAL	3.3
1	C	291	ASP	3.2
1	B	358	ALA	3.1
1	A	342	GLU	3.1
1	A	316	PRO	3.1
1	D	321	GLN	3.1
1	D	338	ALA	3.1
1	D	346	PRO	3.0
1	A	318	SER	3.0
1	C	305	TRP	2.9
1	D	347	ASP	2.9
1	D	305	TRP	2.9
1	B	335	ASP	2.9
1	D	328	HIS	2.8
1	A	327	ALA	2.8
1	C	352	SER	2.8
1	A	350	GLU	2.8
1	B	346	PRO	2.8
1	A	91	ASN	2.8
1	B	351	HIS	2.7
1	D	337	ASP	2.7
1	A	357	ASP	2.7
1	A	325	LYS	2.7
1	D	320	ASP	2.7
1	B	328	HIS	2.6
1	B	270	PHE	2.6
1	C	337	ASP	2.6
1	C	346	PRO	2.6
1	C	327	ALA	2.5
1	D	348	GLU	2.5
1	A	3	ASP	2.4
1	A	326	TYR	2.4
1	D	172	ARG	2.4
1	B	229	ILE	2.4
1	D	4	ALA	2.4

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Mol	Chain	Res	Type	RSRZ
1	D	91	ASN	2.3
1	C	342	GLU	2.3
1	C	324	GLU	2.3
1	C	353	ARG	2.3
1	A	42	GLN	2.3
1	A	63	PRO	2.3
1	A	324	GLU	2.2
1	B	318	SER	2.2
1	D	342	GLU	2.2
1	C	42	GLN	2.1
1	C	274	GLY	2.1
1	B	327	ALA	2.1
1	B	273	ALA	2.1
1	D	290	SER	2.0
1	A	309	PHE	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
3	CA	C	402	1/1	0.83	0.19	85,85,85,85	0
4	8RU	D	404	10/10	0.87	0.10	33,35,37,39	0
4	8RU	B	403	10/10	0.88	0.10	29,33,35,35	0
3	CA	D	403	1/1	0.90	0.07	57,57,57,57	0
4	8RU	C	404	10/10	0.90	0.09	29,31,33,34	0
4	8RU	A	403	10/10	0.90	0.10	34,37,40,40	0
3	CA	A	402	1/1	0.94	0.16	84,84,84,84	0
3	CA	B	402	1/1	0.96	0.09	51,51,51,51	0

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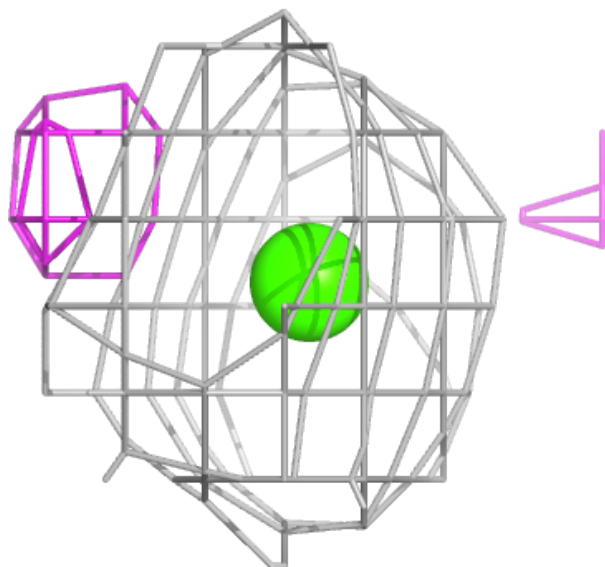
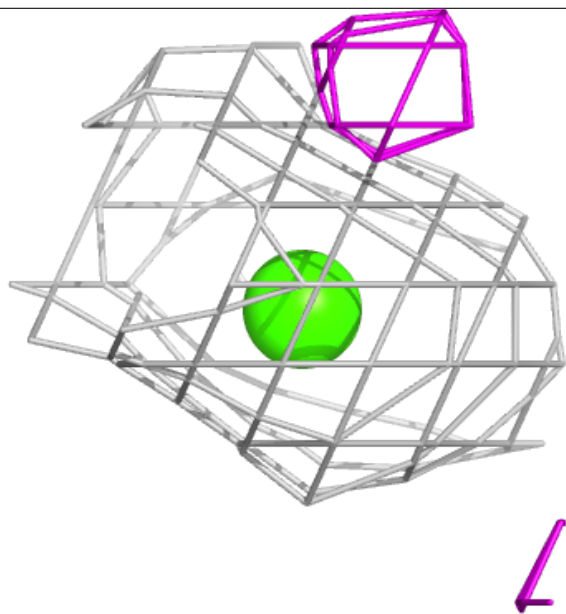
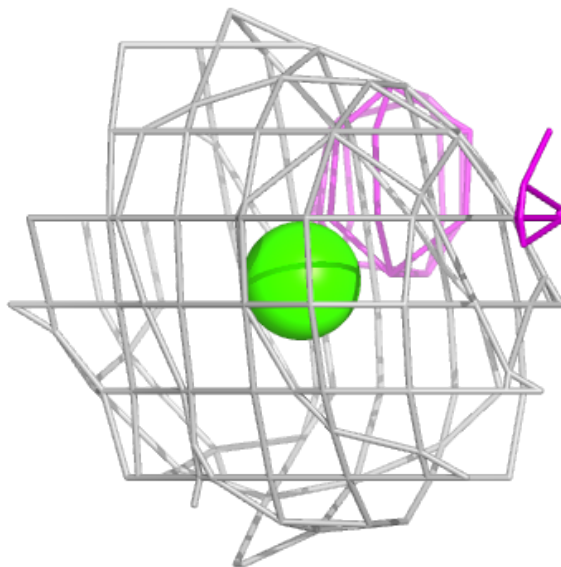
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
3	CA	D	402	1/1	0.98	0.14	62,62,62,62	0
3	CA	C	403	1/1	0.98	0.04	35,35,35,35	0
2	FE	A	401	1/1	0.99	0.03	30,30,30,30	0
2	FE	C	401	1/1	1.00	0.02	28,28,28,28	0
2	FE	D	401	1/1	1.00	0.01	30,30,30,30	0
2	FE	B	401	1/1	1.00	0.02	25,25,25,25	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.

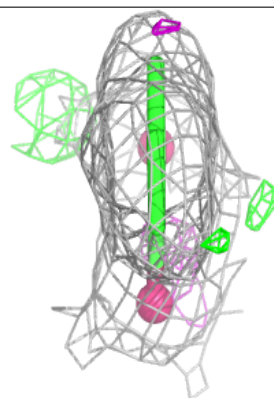
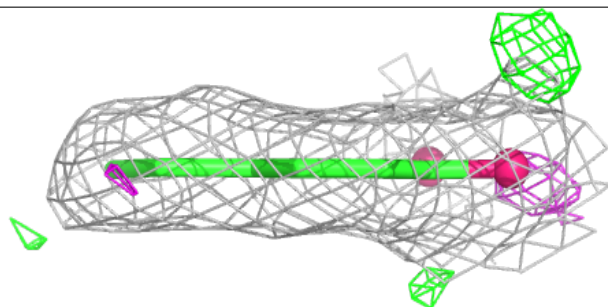
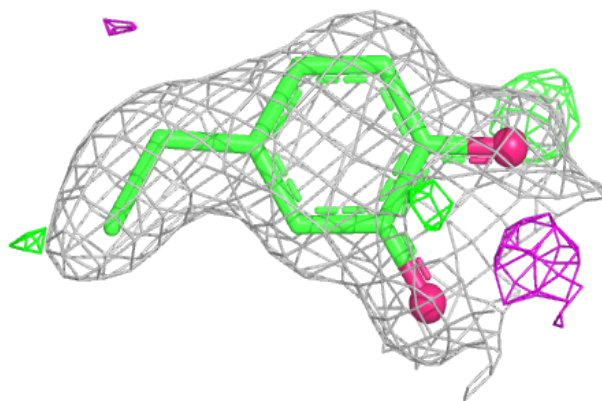
Electron density around CA C 402:

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

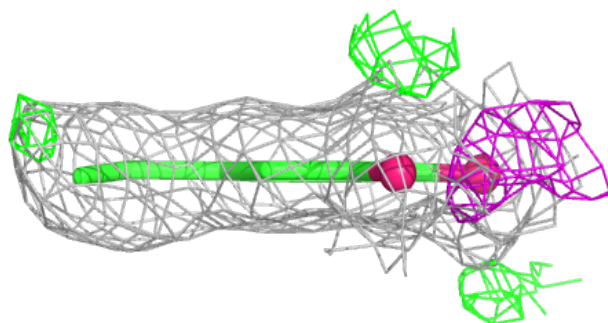
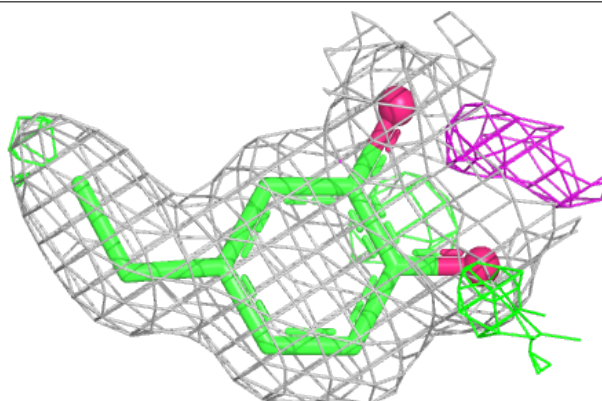


Electron density around 8RU D 404:

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

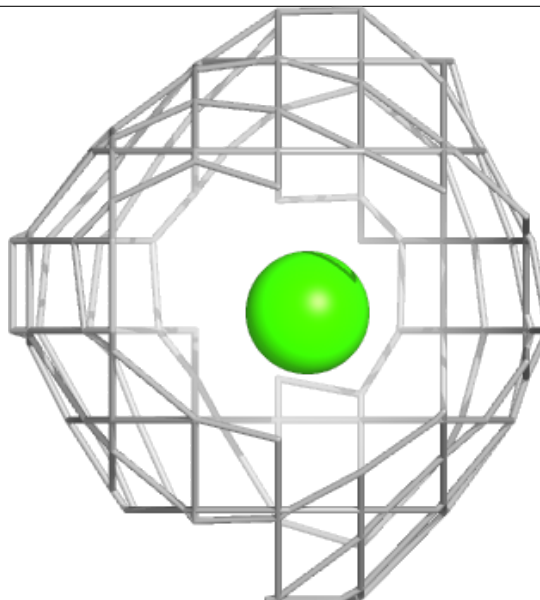
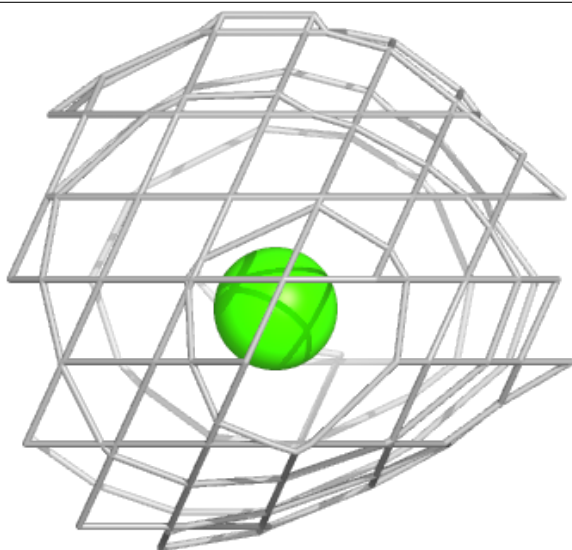
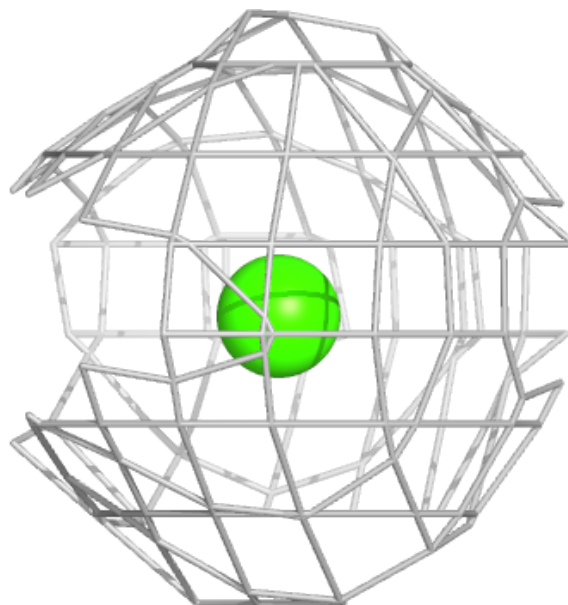
**Electron density around 8RU B 403:**

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



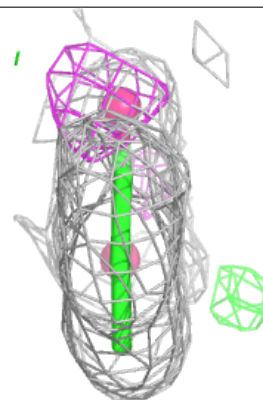
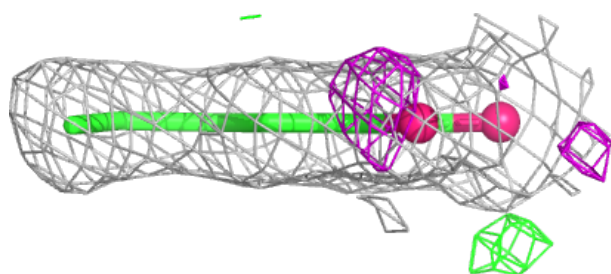
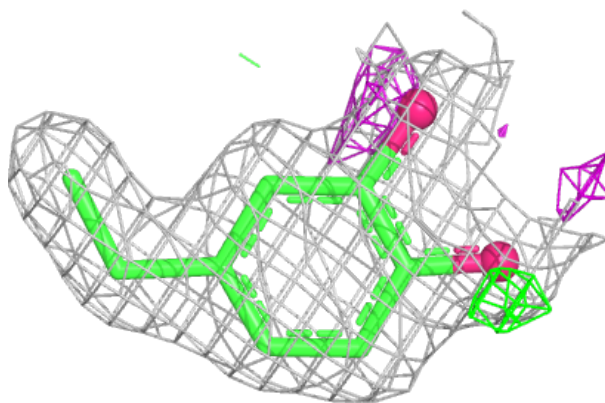
Electron density around CA D 403:

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

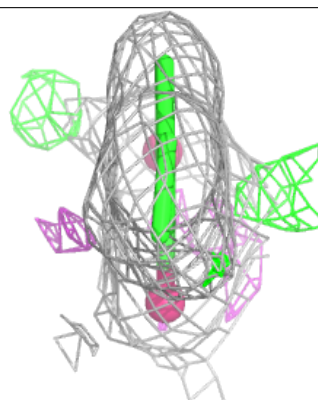
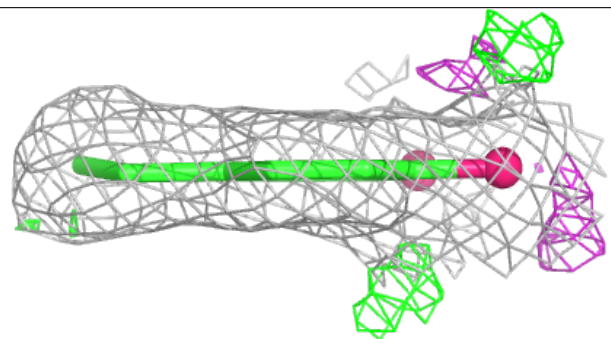
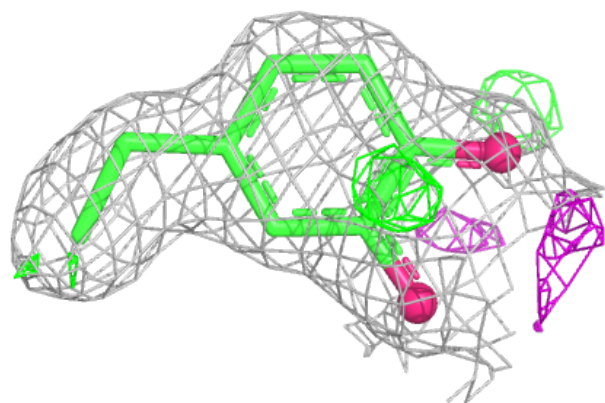


Electron density around 8RU C 404:

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

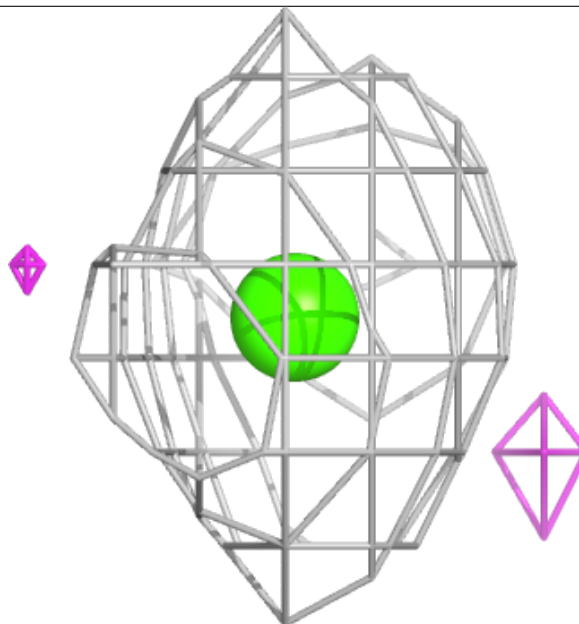
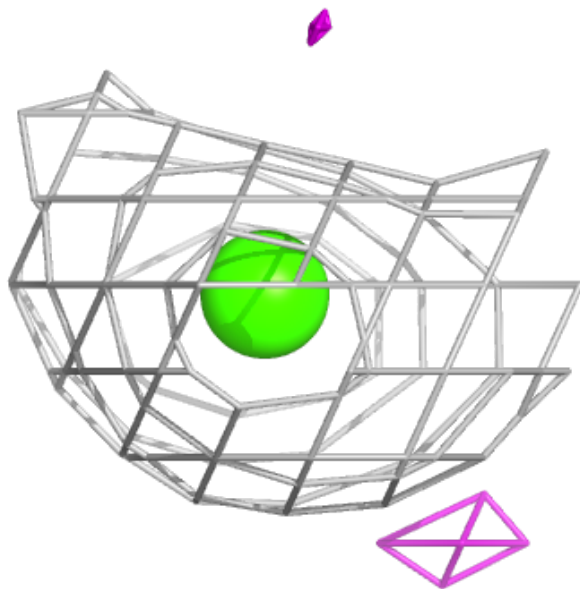
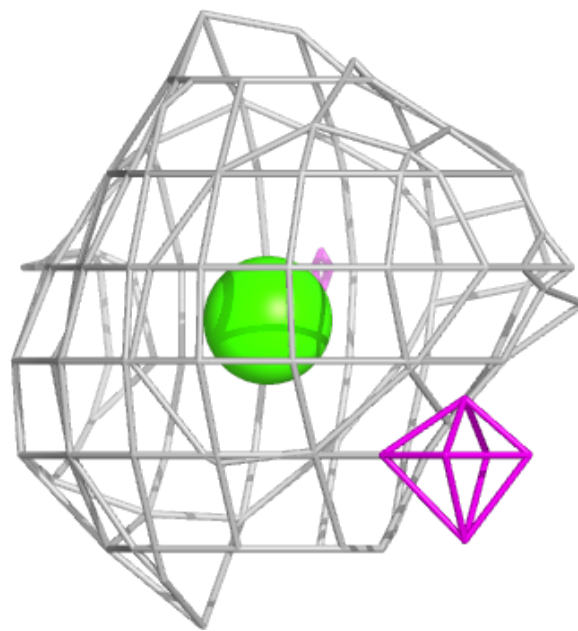
**Electron density around 8RU A 403:**

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



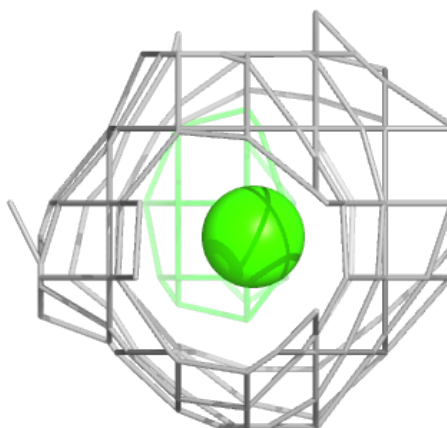
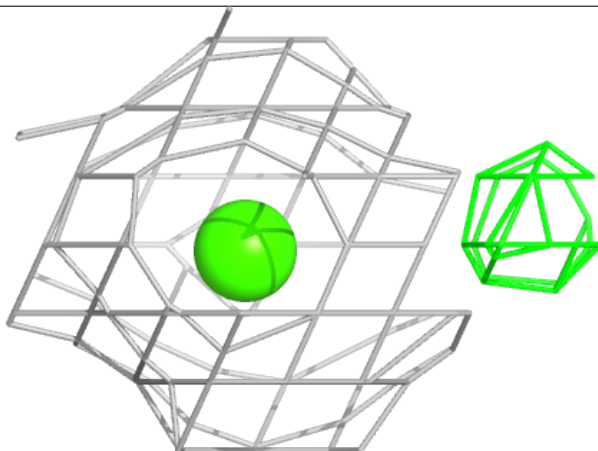
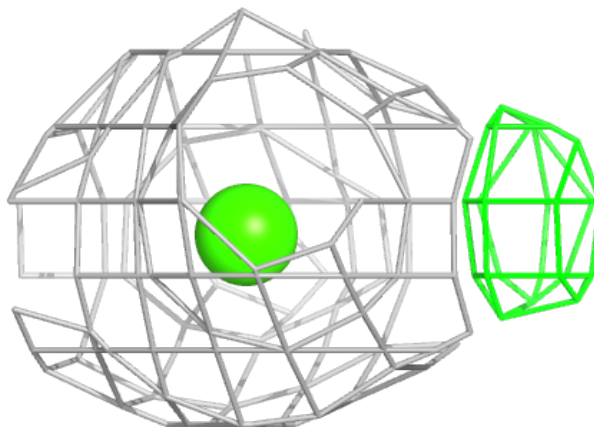
Electron density around CA A 402:

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



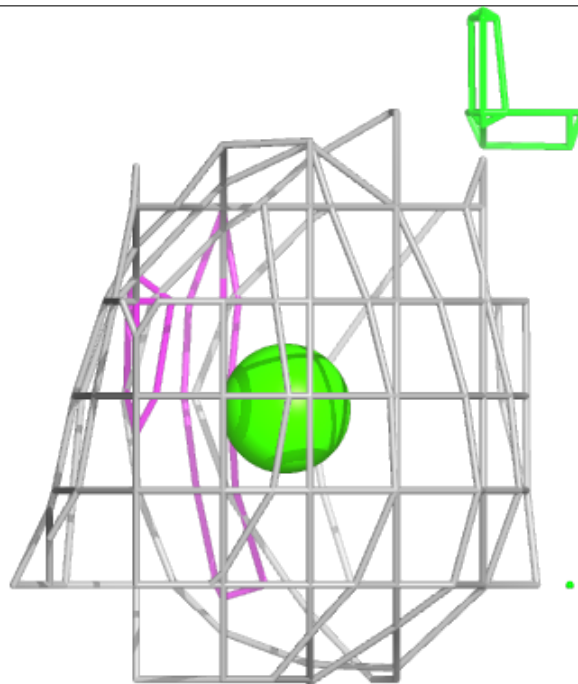
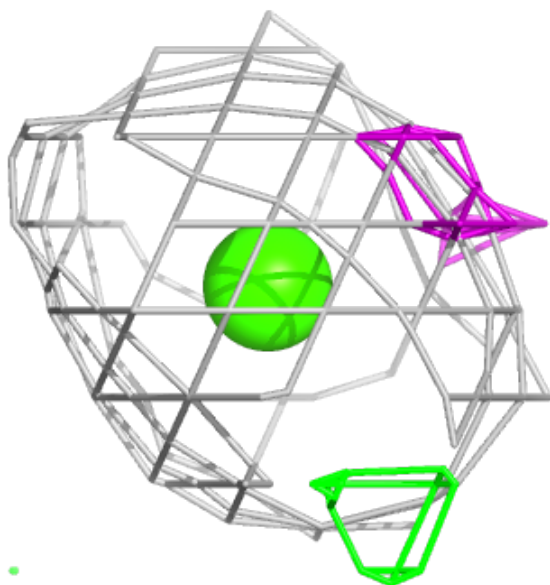
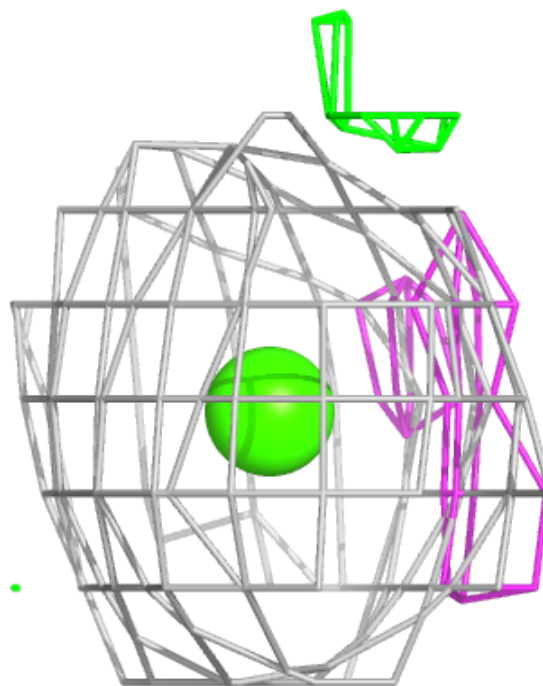
Electron density around CA B 402:

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



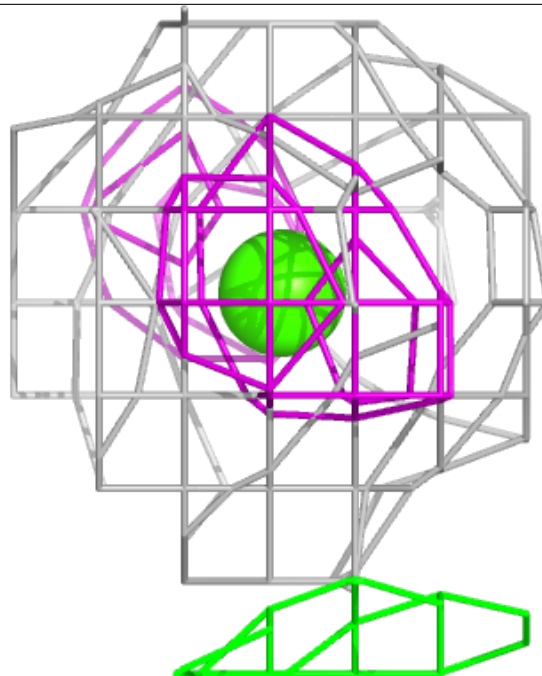
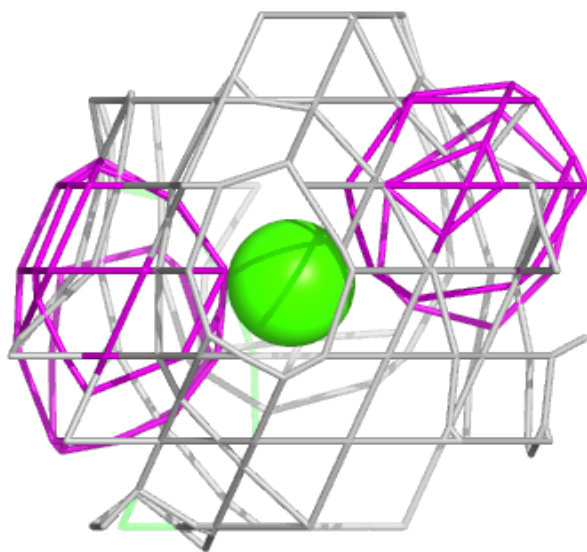
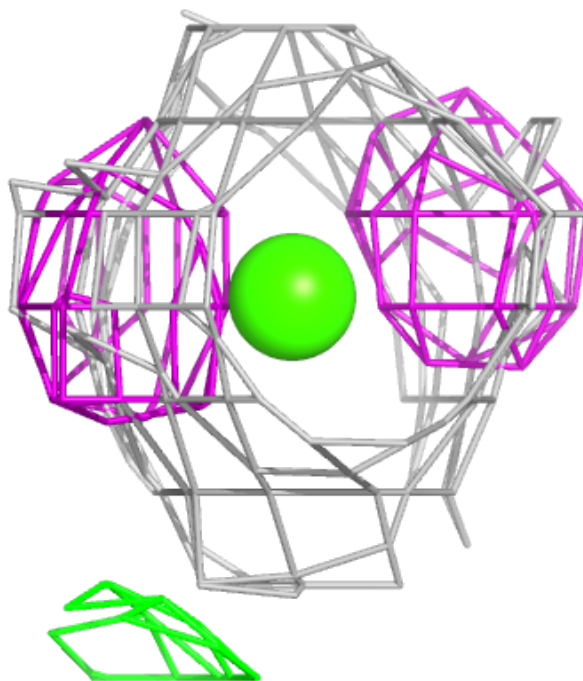
Electron density around CA D 402:

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



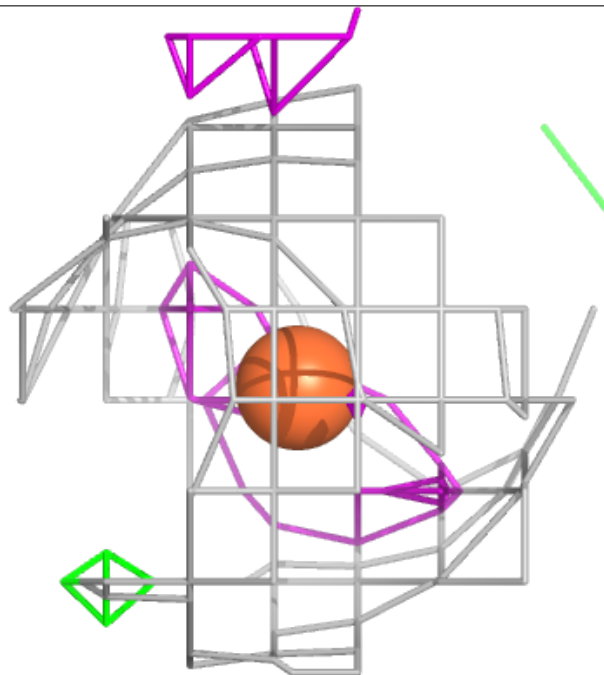
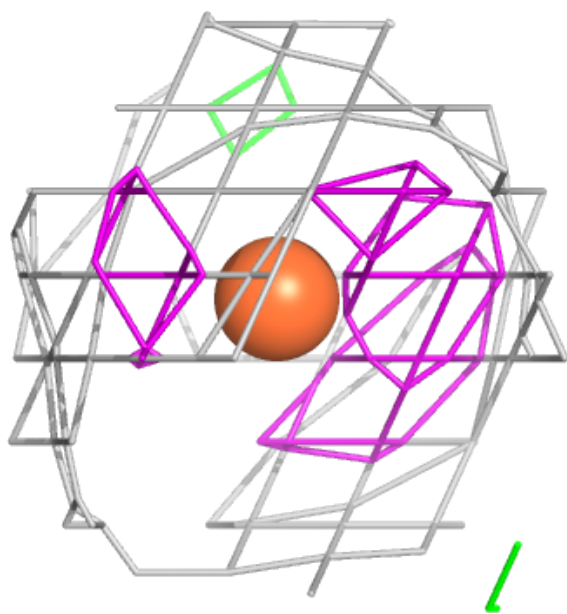
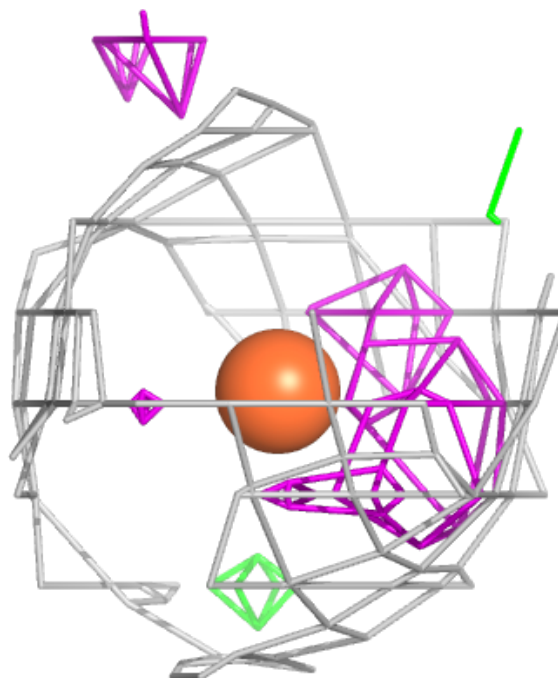
Electron density around CA C 403:

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



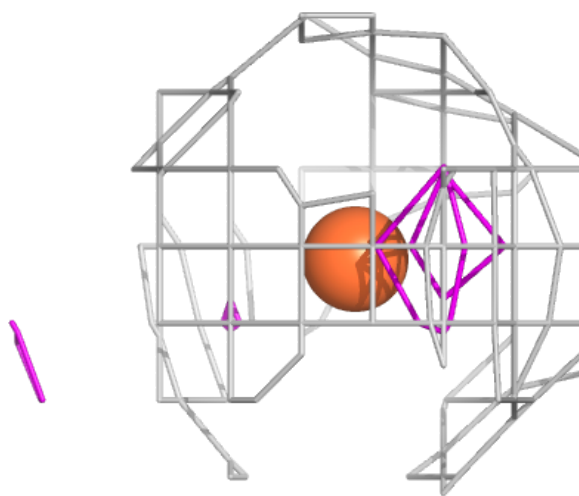
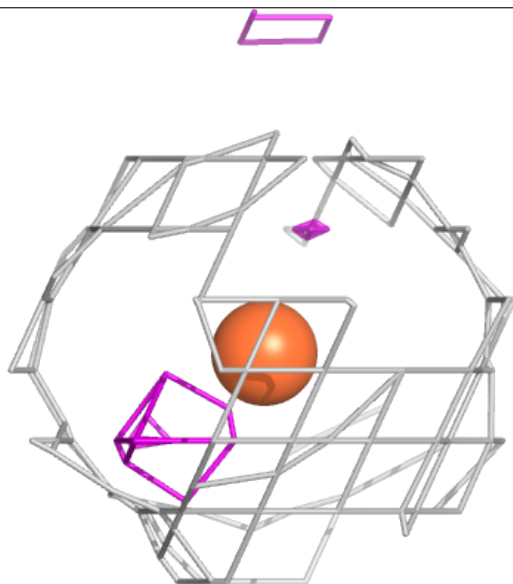
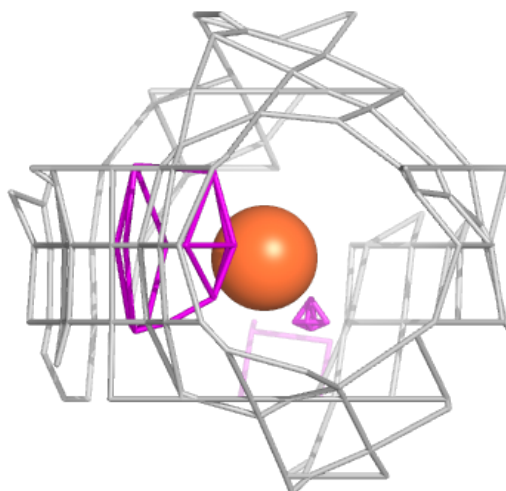
Electron density around FE A 401:

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



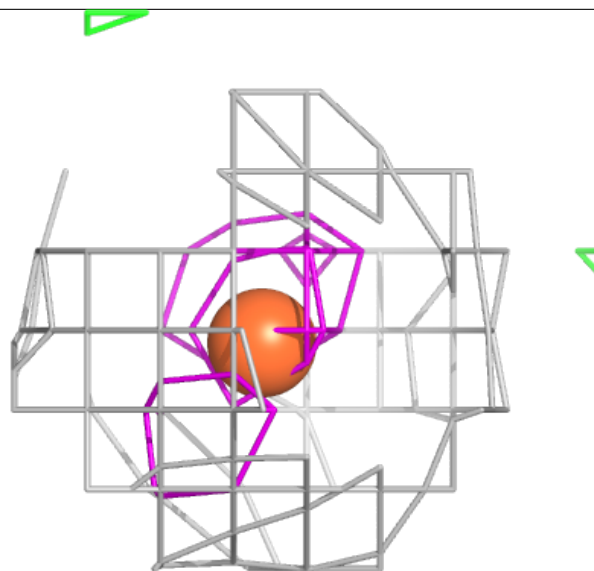
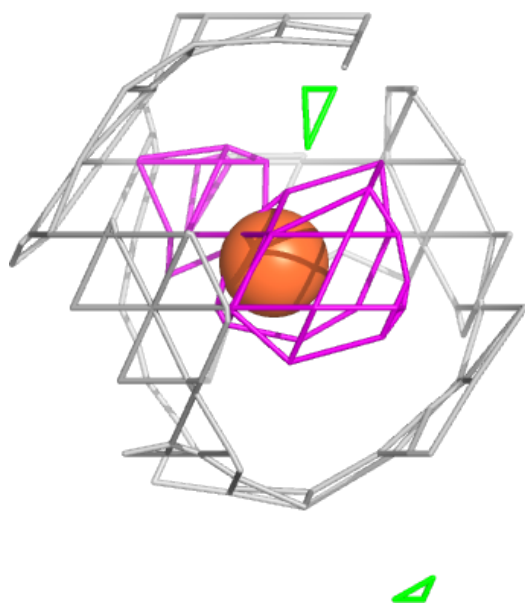
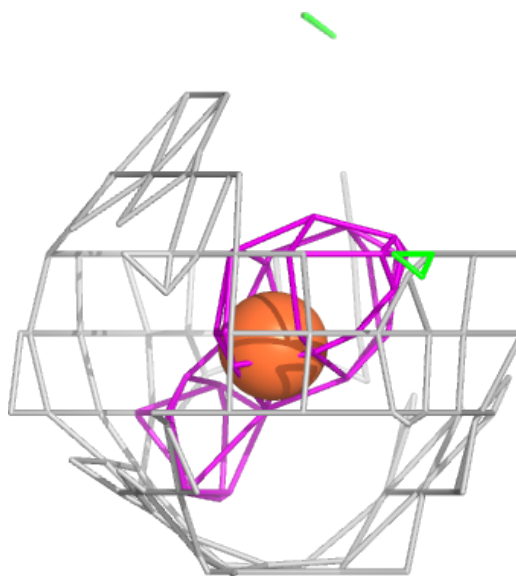
Electron density around FE C 401:

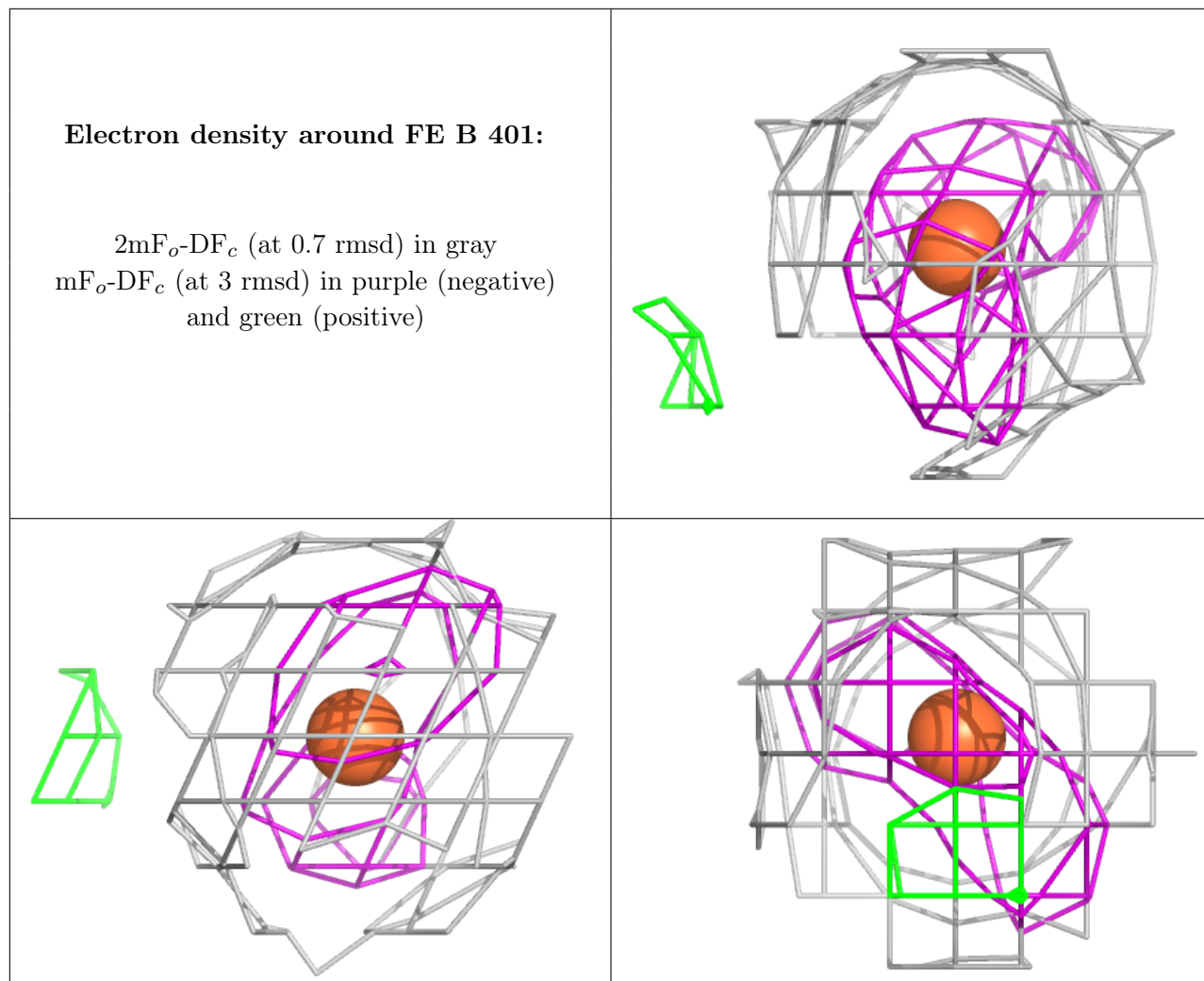
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around FE D 401:

$2mF_o-DF_c$ (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.