



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 05:48 PM UTC

PDB ID : 7ALC / pdb_00007alc
Title : human GCH-GFRP stimulatory complex
Authors : Ebenhoch, R.; Nar, H.
Deposited on : 2020-10-06
Resolution : 1.73 Å(reported)

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

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

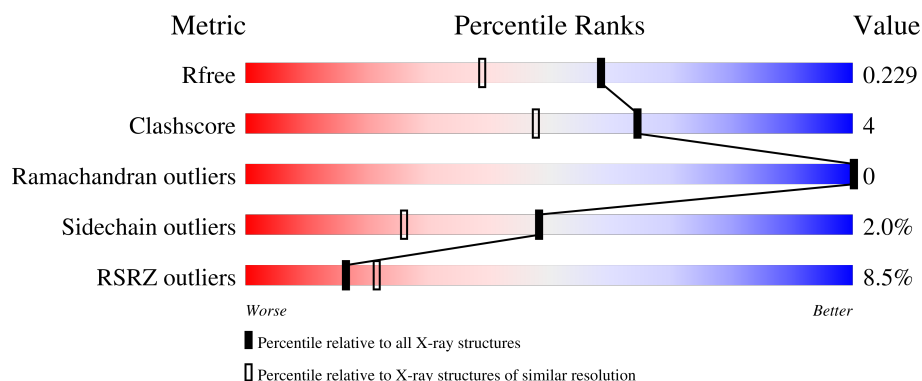
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.73 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}	180053	1039 (1.72-1.72)
Clashscore	190562	1049 (1.72-1.72)
Ramachandran outliers	187476	1041 (1.72-1.72)
Sidechain outliers	187428	1041 (1.72-1.72)
RSRZ outliers	180081	1039 (1.72-1.72)

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	209	5% 81% 6% 12%
1	B	209	11% 71% 9% 21%
1	C	209	11% 69% 9% 22%
1	D	209	9% 80% 5% 13%
1	E	209	7% 72% 9% 18%

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Mol	Chain	Length	Quality of chain
2	F	87	2% 87% 8% 5%
2	G	87	5% 84% 13%
2	H	87	6% 83% 13% 5%
2	I	87	5% 89% 9%
2	J	87	6% 90% 5% 6%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 11273 atoms, of which 55 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 GTP cyclohydrolase 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	184	Total	C	N	O	S	0	0	0
			1452	917	252	274	9			
1	B	166	Total	C	N	O	S	0	0	0
			1304	828	228	240	8			
1	C	162	Total	C	N	O	S	0	0	0
			1271	810	222	230	9			
1	D	182	Total	C	N	O	S	0	0	0
			1436	908	249	271	8			
1	E	171	Total	C	N	O	S	0	0	0
			1350	856	237	247	10			

- Molecule 2 is a protein called GTP cyclohydrolase 1 feedback regulatory protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	F	83	Total	C	N	O	S	0	0	0
			669	424	118	121	6			
2	G	84	Total	C	N	O	S	0	0	0
			678	429	119	124	6			
2	H	83	Total	C	N	O	S	0	0	0
			669	424	118	121	6			
2	I	85	Total	C	N	O	S	0	0	0
			685	433	122	124	6			
2	J	82	Total	C	N	O	S	0	0	0
			660	418	116	120	6			

There are 15 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
F	-2	GLY	-	expression tag	UNP P30047
F	-1	SER	-	expression tag	UNP P30047
F	0	HIS	-	expression tag	UNP P30047
G	-2	GLY	-	expression tag	UNP P30047
G	-1	SER	-	expression tag	UNP P30047

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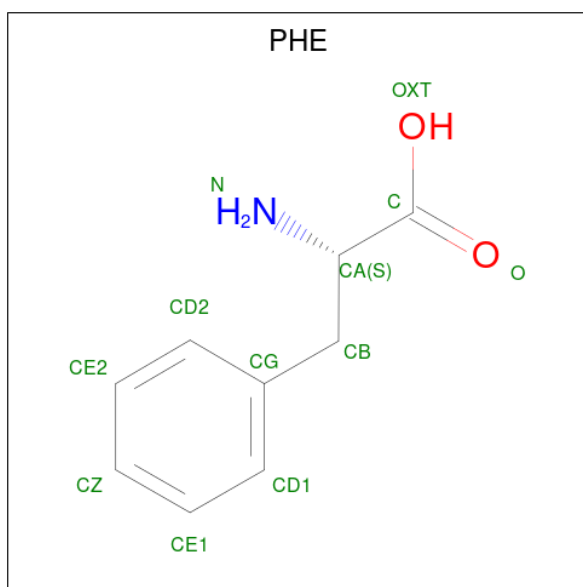
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Chain	Residue	Modelled	Actual	Comment	Reference
G	0	HIS	-	expression tag	UNP P30047
H	-2	GLY	-	expression tag	UNP P30047
H	-1	SER	-	expression tag	UNP P30047
H	0	HIS	-	expression tag	UNP P30047
I	-2	GLY	-	expression tag	UNP P30047
I	-1	SER	-	expression tag	UNP P30047
I	0	HIS	-	expression tag	UNP P30047
J	-2	GLY	-	expression tag	UNP P30047
J	-1	SER	-	expression tag	UNP P30047
J	0	HIS	-	expression tag	UNP P30047

- Molecule 3 is ZINC ION (CCD ID: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

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

- Molecule 4 is PHENYLALANINE (CCD ID: PHE) (formula: C₉H₁₁NO₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	F	1	Total	C	H	N	O	11	1
			23	9	11	1	2		
4	F	1	Total	C	H	N	O	11	0
			23	9	11	1	2		
4	G	1	Total	C	H	N	O	11	1
			23	9	11	1	2		
4	H	1	Total	C	H	N	O	11	0
			23	9	11	1	2		
4	I	1	Total	C	H	N	O	11	0
			23	9	11	1	2		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	148	Total	O	0	0
			148	148		
5	B	92	Total	O	0	0
			92	92		
5	C	95	Total	O	0	0
			95	95		
5	D	135	Total	O	0	0
			135	135		
5	E	98	Total	O	0	0
			98	98		
5	F	87	Total	O	0	0
			87	87		
5	G	81	Total	O	0	0
			81	81		

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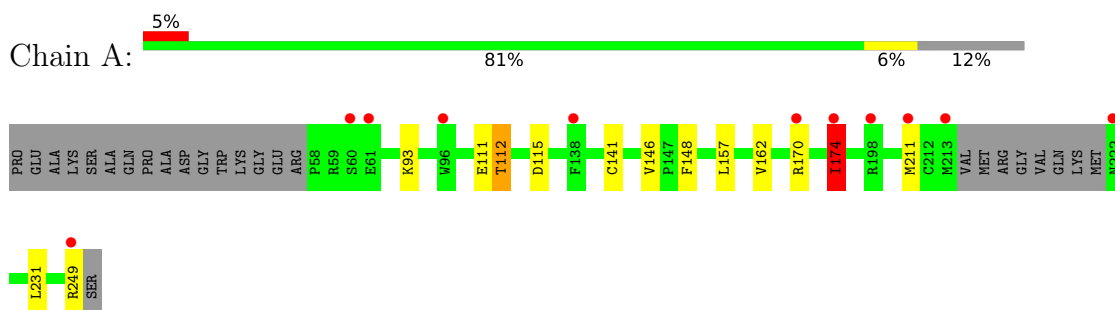
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	H	81	Total 81	O 81	0	0
5	I	81	Total 81	O 81	0	0
5	J	81	Total 81	O 81	0	0

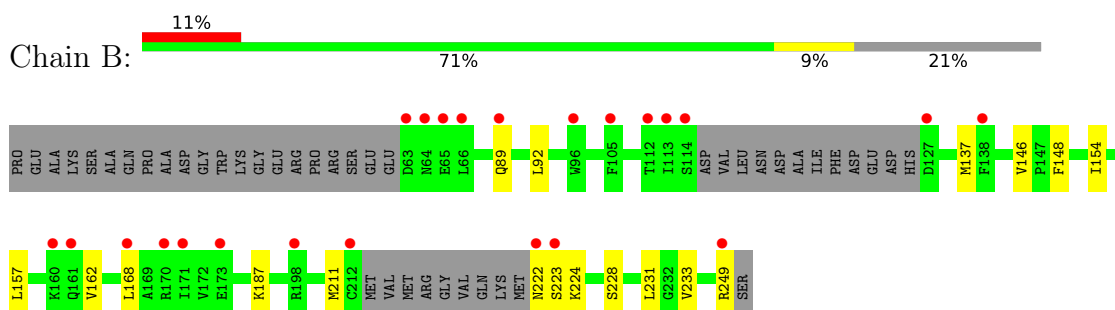
3 Residue-property plots [i](#)

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.

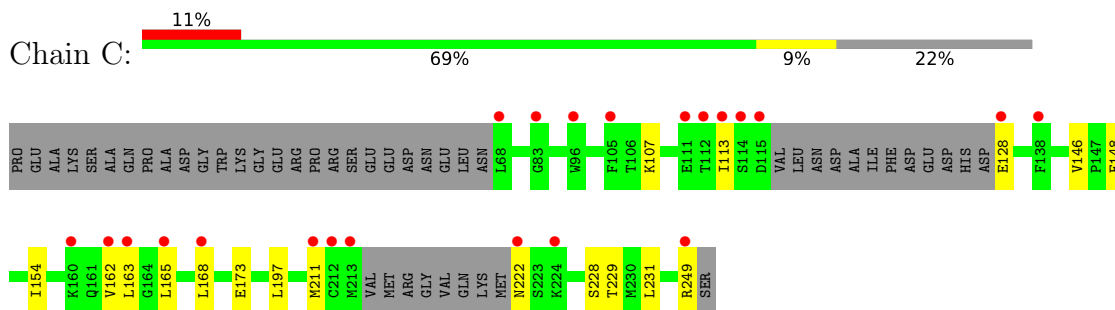
- Molecule 1: GTP cyclohydrolase 1



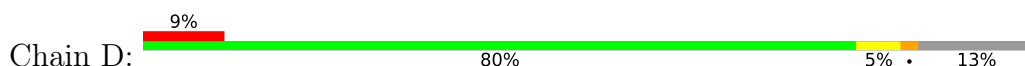
- Molecule 1: GTP cyclohydrolase 1

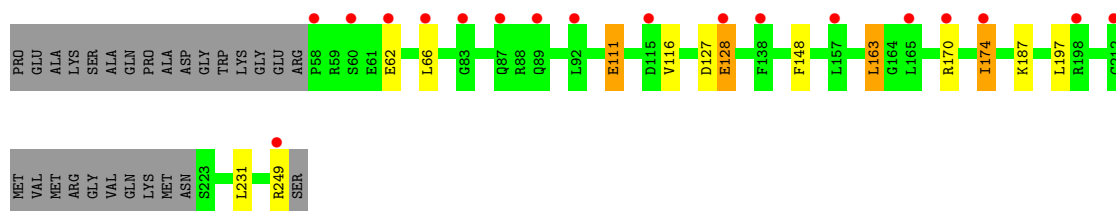


- Molecule 1: GTP cyclohydrolase 1

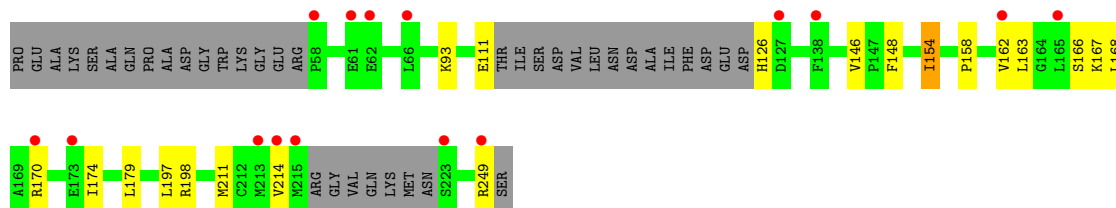
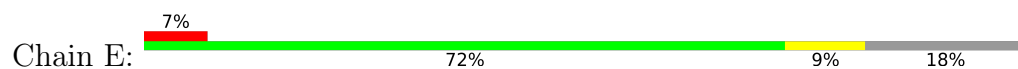


- Molecule 1: GTP cyclohydrolase 1

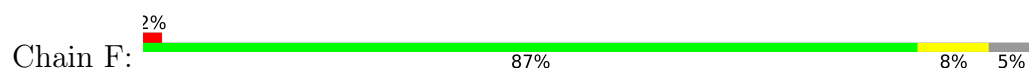




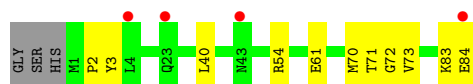
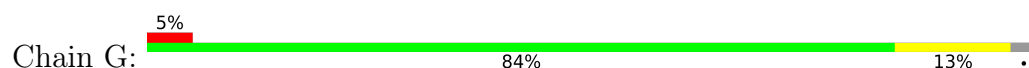
- Molecule 1: GTP cyclohydrolase 1



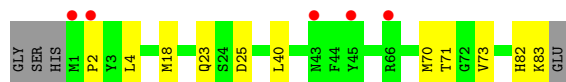
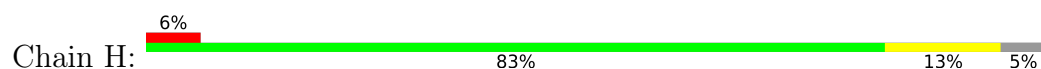
- Molecule 2: GTP cyclohydrolase 1 feedback regulatory protein



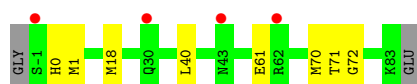
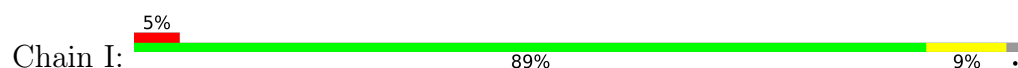
- Molecule 2: GTP cyclohydrolase 1 feedback regulatory protein



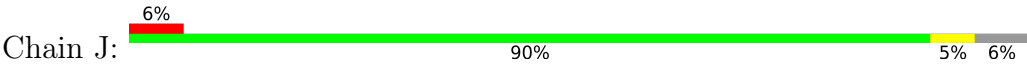
- Molecule 2: GTP cyclohydrolase 1 feedback regulatory protein



- Molecule 2: GTP cyclohydrolase 1 feedback regulatory protein



- Molecule 2: GTP cyclohydrolase 1 feedback regulatory protein



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	163.85Å 113.92Å 113.91Å 90.00° 130.21° 90.00°	Depositor
Resolution (Å)	86.99 – 1.73 86.99 – 1.73	Depositor EDS
% Data completeness (in resolution range)	62.6 (86.99-1.73) 62.7 (86.99-1.73)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.62 (at 1.73Å)	Xtriage
Refinement program	BUSTER 2.11.7 (18-SEP-2020)	Depositor
R, R_{free}	0.197 , 0.227 0.197 , 0.229	Depositor DCC
R_{free} test set	3017 reflections (2.88%)	wwPDB-VP
Wilson B-factor (Å ²)	21.9	Xtriage
Anisotropy	0.039	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 46.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.52$, $\langle L^2 \rangle = 0.35$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	11273	wwPDB-VP
Average B, all atoms (Å ²)	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.74% 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: ZN

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	0.74	0/1476	1.01	2/1994 (0.1%)
1	B	0.67	0/1324	0.99	1/1787 (0.1%)
1	C	0.71	0/1291	0.97	1/1741 (0.1%)
1	D	0.71	0/1460	1.01	2/1973 (0.1%)
1	E	0.72	0/1372	0.98	2/1849 (0.1%)
2	F	0.70	1/683 (0.1%)	0.90	0/922
2	G	0.67	0/692	0.91	0/934
2	H	0.72	0/683	0.92	1/922 (0.1%)
2	I	0.66	0/700	0.90	0/945
2	J	0.70	0/674	0.90	0/911
All	All	0.71	1/10355 (0.0%)	0.97	9/13978 (0.1%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	F	1	MET	SD-CE	-6.04	1.64	1.79

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	148	PHE	CA-CB-CG	7.13	120.93	113.80
1	C	148	PHE	CA-CB-CG	6.72	120.52	113.80
1	B	148	PHE	CA-CB-CG	6.55	120.36	113.80
1	D	128	GLU	CB-CG-CD	6.30	123.32	112.60
1	A	174	ILE	CB-CA-C	-6.18	103.97	111.88
1	A	148	PHE	CA-CB-CG	5.91	119.71	113.80
1	D	148	PHE	CA-CB-CG	5.83	119.63	113.80
1	E	179	LEU	N-CA-C	-5.11	101.42	109.25
2	H	25	ASP	CA-CB-CG	5.07	117.67	112.60

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	1452	0	1465	8	0
1	B	1304	0	1337	14	0
1	C	1271	0	1313	13	0
1	D	1436	0	1450	16	0
1	E	1350	0	1380	17	0
2	F	669	0	674	6	0
2	G	678	0	680	15	0
2	H	669	0	674	10	0
2	I	685	0	686	8	0
2	J	660	0	661	4	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
3	E	1	0	0	0	0
4	F	24	22	8	0	0
4	G	12	11	0	0	0
4	H	12	11	8	0	0
4	I	12	11	8	0	0
5	A	148	0	0	0	0
5	B	92	0	0	1	0
5	C	95	0	0	0	0
5	D	135	0	0	0	0
5	E	98	0	0	0	0
5	F	87	0	0	0	0
5	G	81	0	0	1	0
5	H	81	0	0	0	0
5	I	81	0	0	1	0
5	J	81	0	0	0	0
All	All	11218	55	10344	81	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 (81) 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:E:167:LYS:NZ	1:E:170:ARG:HH12	1.60	0.99
1:D:249:ARG:HE	1:E:249:ARG:NH2	1.63	0.97
2:G:2:PRO:HA	2:G:83:LYS:HD3	1.49	0.92
1:E:154:ILE:HD13	1:E:168:LEU:HD11	1.53	0.90
1:C:154:ILE:HD13	1:C:168:LEU:HD11	1.59	0.83
1:E:167:LYS:NZ	1:E:170:ARG:NH1	2.25	0.83
1:B:154:ILE:HD13	1:B:168:LEU:HD11	1.60	0.83
1:E:167:LYS:HZ2	1:E:170:ARG:NH1	1.75	0.83
1:D:111:GLU:HG3	1:D:174:ILE:HG23	1.65	0.78
1:E:167:LYS:HZ1	1:E:170:ARG:HH12	1.30	0.78
1:D:249:ARG:HE	1:E:249:ARG:HH22	1.31	0.78
2:G:2:PRO:HA	2:G:83:LYS:CD	2.13	0.77
1:A:249:ARG:HE	1:B:249:ARG:NH2	1.85	0.75
1:B:89:GLN:CD	1:B:89:GLN:H	1.94	0.75
1:B:249:ARG:HE	1:C:249:ARG:NH2	1.85	0.74
1:B:228:SER:O	1:C:128:GLU:HB3	1.87	0.73
1:B:154:ILE:CD1	1:B:168:LEU:HD11	2.19	0.72
1:C:163:LEU:HB2	1:C:197:LEU:HD11	1.71	0.71
1:C:228:SER:O	1:D:128:GLU:HB3	1.92	0.70
1:C:154:ILE:CD1	1:C:168:LEU:HD11	2.22	0.69
1:D:116:VAL:HG21	1:D:174:ILE:HD11	1.76	0.68
1:C:229:THR:HA	1:D:128:GLU:HG3	1.74	0.67
1:D:127:ASP:O	1:D:128:GLU:HG2	1.98	0.64
1:A:249:ARG:HE	1:B:249:ARG:HH22	1.45	0.64
2:G:2:PRO:HA	2:G:83:LYS:CG	2.28	0.64
1:D:170:ARG:O	1:D:174:ILE:HG13	2.00	0.62
1:E:146:VAL:HG12	1:E:211:MET:HB2	1.82	0.62
2:G:2:PRO:HA	2:G:83:LYS:HG2	1.82	0.62
1:B:146:VAL:HG12	1:B:211:MET:HB2	1.83	0.61
2:I:0:HIS:CD2	2:I:1:MET:HE2	2.35	0.61
1:A:146:VAL:HG12	1:A:211:MET:HB2	1.84	0.60
2:I:61:GLU:OE1	2:J:82:HIS:NE2	2.38	0.57
1:C:146:VAL:HG12	1:C:211:MET:HB2	1.86	0.56
2:H:2:PRO:HB3	2:H:83:LYS:HD3	1.87	0.55
1:A:112:THR:HG22	1:A:115:ASP:H	1.72	0.54
1:A:170:ARG:O	1:A:174:ILE:HG13	2.07	0.54
2:I:72:GLY:HA3	2:J:73:VAL:HB	1.90	0.54
1:D:249:ARG:NE	1:E:249:ARG:NH2	2.45	0.53
1:B:231:LEU:HD22	2:G:40:LEU:HB3	1.91	0.53
1:E:146:VAL:CG1	1:E:211:MET:HB2	2.39	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:211:MET:HA	1:E:214:VAL:HG22	1.91	0.52
2:G:61:GLU:OE1	2:H:82:HIS:NE2	2.41	0.51
2:I:70:MET:HE3	2:J:71:THR:HG22	1.93	0.49
1:C:229:THR:HA	1:D:128:GLU:CG	2.43	0.48
2:I:0:HIS:NE2	2:I:1:MET:HE2	2.28	0.48
2:F:54:ARG:HD2	2:G:3:TYR:O	2.14	0.48
1:C:107:LYS:NZ	1:C:173:GLU:CD	2.73	0.47
2:G:70:MET:HE3	2:H:71:THR:HG22	1.94	0.47
1:C:231:LEU:HD22	2:H:40:LEU:HB3	1.94	0.47
1:A:231:LEU:HD22	2:F:40:LEU:HB3	1.96	0.46
2:G:72:GLY:HA3	2:H:73:VAL:HB	1.97	0.46
1:E:126:HIS:HB3	1:E:158:PRO:HG2	1.98	0.45
1:B:157:LEU:HD12	1:B:233:VAL:HG21	1.99	0.45
1:B:224:LYS:NZ	5:B:401:HOH:O	2.46	0.45
1:A:111:GLU:HB2	1:A:174:ILE:HG23	1.99	0.44
1:D:116:VAL:HG21	1:D:174:ILE:CD1	2.47	0.44
2:F:73:VAL:HB	2:J:72:GLY:HA3	2.00	0.44
2:H:2:PRO:HB3	2:H:83:LYS:NZ	2.33	0.44
5:G:2211:HOH:O	2:H:18:MET:HB3	2.18	0.43
2:H:70:MET:HE3	2:I:71:THR:HG22	2.01	0.43
1:C:249:ARG:HE	1:D:249:ARG:NH2	2.16	0.43
1:D:187:LYS:HE2	1:D:187:LYS:HB3	1.95	0.43
2:G:54:ARG:HH12	2:H:23:GLN:C	2.26	0.42
1:A:249:ARG:HH22	1:E:249:ARG:HH11	1.67	0.42
1:D:163:LEU:HD22	1:D:197:LEU:HD11	2.01	0.42
2:F:70:MET:HE3	2:G:71:THR:HG22	2.00	0.42
1:D:62:GLU:O	1:D:66:LEU:HD13	2.19	0.42
1:E:163:LEU:HB2	1:E:197:LEU:HD11	2.01	0.42
2:G:2:PRO:O	2:G:83:LYS:HG2	2.20	0.42
2:G:2:PRO:CA	2:G:83:LYS:HD3	2.35	0.42
1:E:111:GLU:HB2	1:E:174:ILE:HG12	2.01	0.42
1:B:249:ARG:NE	1:C:249:ARG:NH2	2.62	0.42
1:E:167:LYS:HZ2	1:E:170:ARG:HH11	1.61	0.42
1:B:187:LYS:HE2	1:B:187:LYS:HB3	1.90	0.41
2:H:2:PRO:HB3	2:H:83:LYS:CD	2.50	0.41
1:B:137:MET:HE3	1:B:137:MET:HB3	1.97	0.41
1:E:166:SER:O	1:E:170:ARG:HD3	2.21	0.41
2:F:58:ASP:CG	2:G:2:PRO:HD2	2.47	0.40
2:F:72:GLY:HA3	2:G:73:VAL:HB	2.03	0.40
1:D:231:LEU:HD22	2:I:40:LEU:HB3	2.04	0.40
2:I:18:MET:HB3	5:I:2218:HOH:O	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	180/209 (86%)	178 (99%)	2 (1%)	0	100	100
1	B	160/209 (77%)	158 (99%)	2 (1%)	0	100	100
1	C	156/209 (75%)	155 (99%)	1 (1%)	0	100	100
1	D	178/209 (85%)	176 (99%)	2 (1%)	0	100	100
1	E	165/209 (79%)	163 (99%)	2 (1%)	0	100	100
2	F	81/87 (93%)	79 (98%)	2 (2%)	0	100	100
2	G	82/87 (94%)	80 (98%)	2 (2%)	0	100	100
2	H	81/87 (93%)	79 (98%)	2 (2%)	0	100	100
2	I	83/87 (95%)	81 (98%)	2 (2%)	0	100	100
2	J	80/87 (92%)	78 (98%)	2 (2%)	0	100	100
All	All	1246/1480 (84%)	1227 (98%)	19 (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	162/181 (90%)	156 (96%)	6 (4%)	30	8
1	B	145/181 (80%)	141 (97%)	4 (3%)	38	15

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	C	141/181 (78%)	137 (97%)	4 (3%)	38	15
1	D	160/181 (88%)	157 (98%)	3 (2%)	50	27
1	E	150/181 (83%)	146 (97%)	4 (3%)	39	17
2	F	74/77 (96%)	74 (100%)	0	100	100
2	G	75/77 (97%)	74 (99%)	1 (1%)	61	43
2	H	74/77 (96%)	73 (99%)	1 (1%)	59	40
2	I	76/77 (99%)	76 (100%)	0	100	100
2	J	73/77 (95%)	73 (100%)	0	100	100
All	All	1130/1290 (88%)	1107 (98%)	23 (2%)	48	26

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	93	LYS
1	A	112	THR
1	A	141	CYS
1	A	157	LEU
1	A	162	VAL
1	A	174	ILE
1	B	92	LEU
1	B	162	VAL
1	B	222	ASN
1	B	223	SER
1	C	113	ILE
1	C	162	VAL
1	C	165	LEU
1	C	222	ASN
1	D	111	GLU
1	D	163	LEU
1	D	174	ILE
1	E	93	LYS
1	E	154	ILE
1	E	162	VAL
1	E	198	ARG
2	G	84	GLU
2	H	4	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	67	ASN
1	A	118	ASN
1	A	161	GLN
1	B	67	ASN
1	B	110	GLN
1	C	110	GLN
1	C	222	ASN
1	D	67	ASN
1	D	159	ASN
1	E	180	GLN
1	E	188	GLN
2	J	31	HIS

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](#)

Of 12 ligands modelled in this entry, 5 are monoatomic - leaving 7 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
4	PHE	H	2101	-	11,12,12	0.78	0	11,15,15	0.23	0
4	PHE	F	2102	-	11,12,12	0.65	0	11,15,15	0.19	0
4	PHE	I	2101	-	11,12,12	0.60	0	11,15,15	0.38	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	PHE	H	2101	-	-	0/8/8/8	0/1/1/1
4	PHE	F	2102	-	-	0/8/8/8	0/1/1/1
4	PHE	I	2101	-	-	0/8/8/8	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

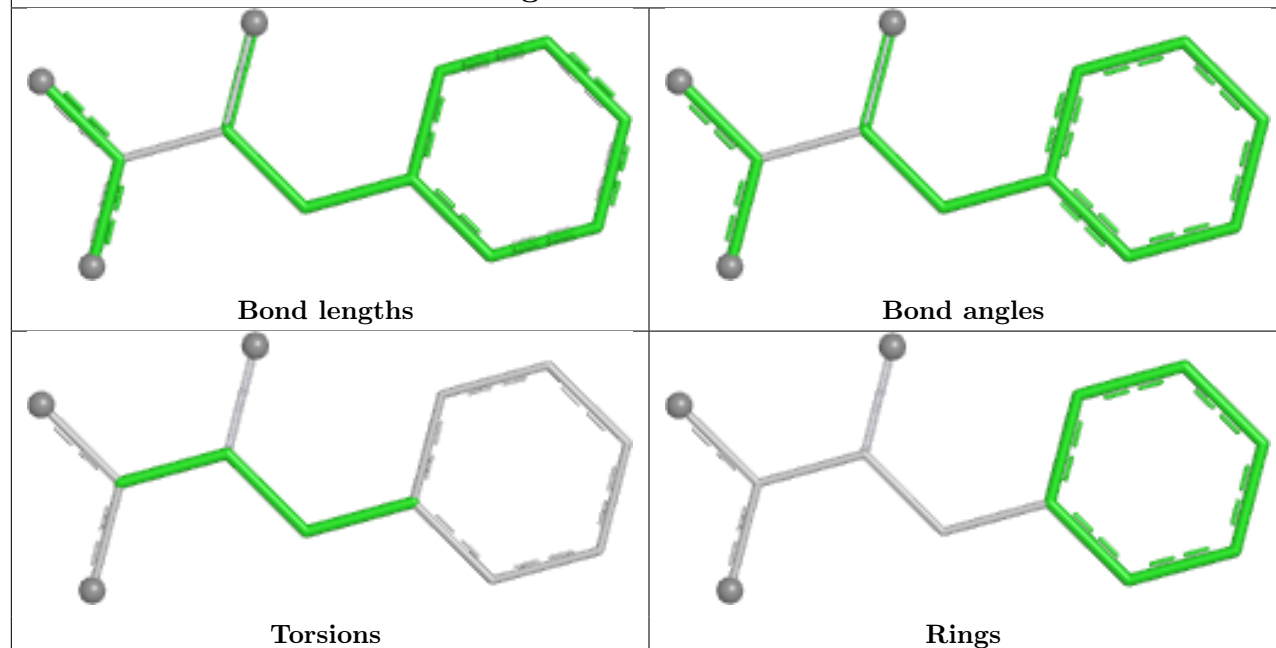
There are no torsion outliers.

There are no ring outliers.

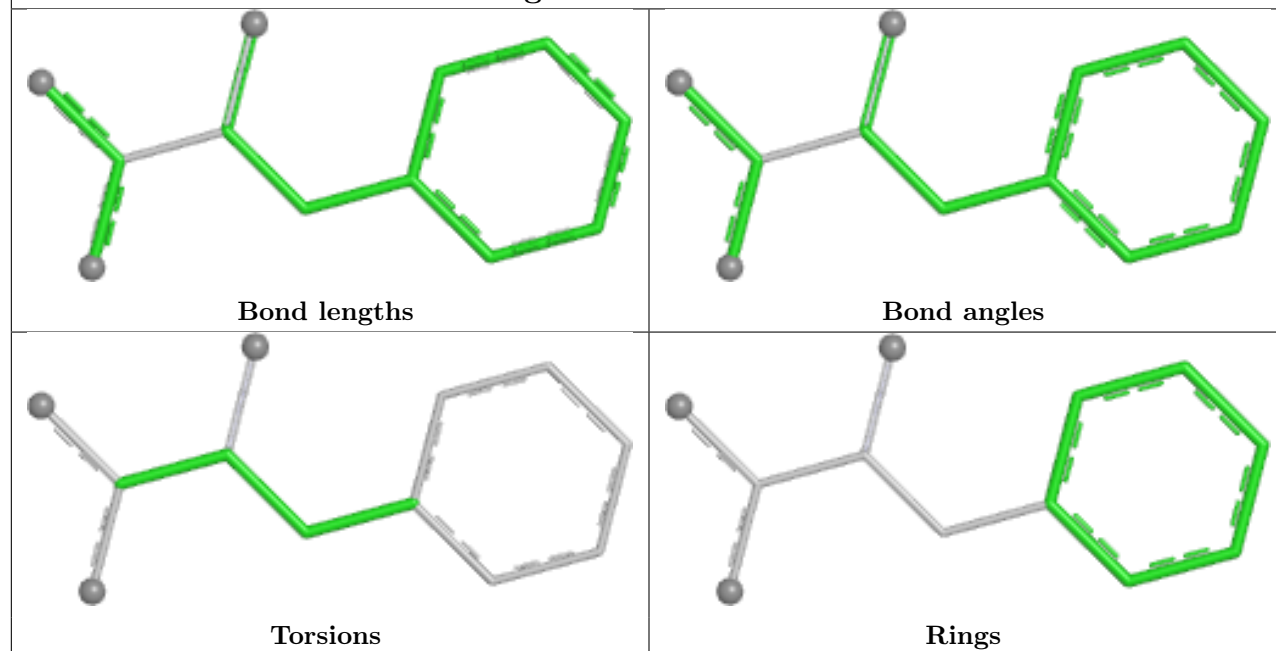
No monomer is involved in short contacts.

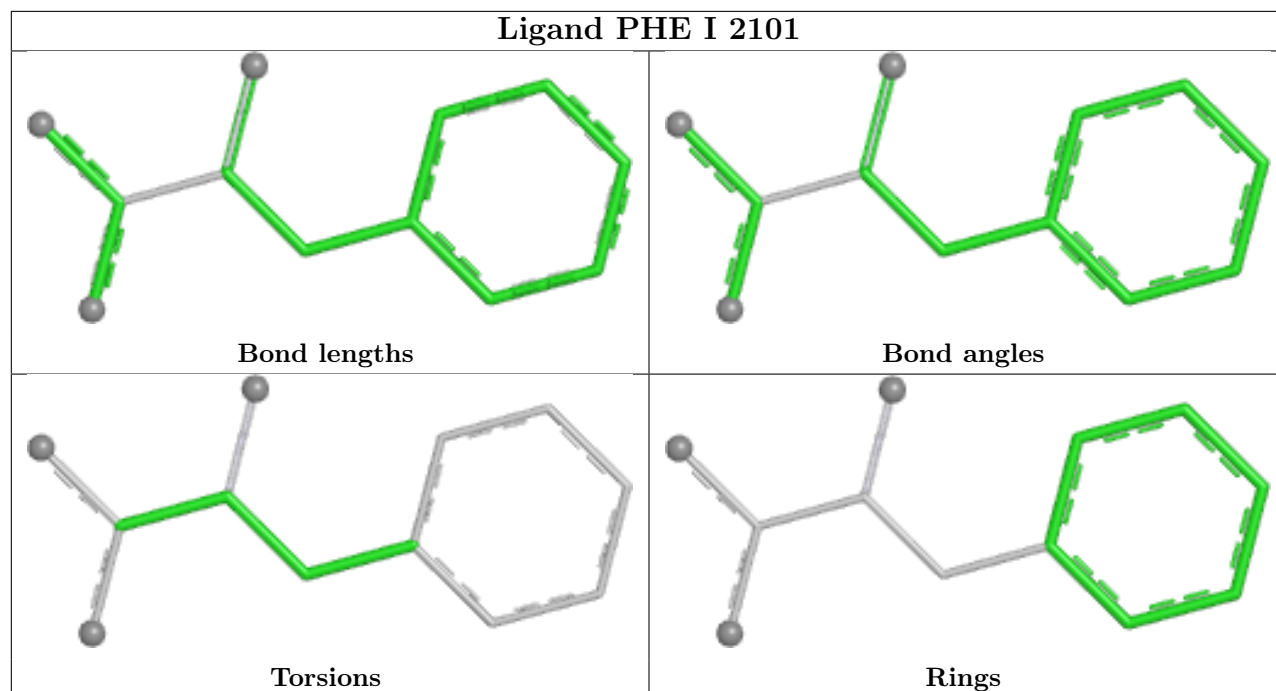
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

Ligand PHE H 2101



Ligand PHE F 2102





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	184/209 (88%)	0.28	11 (5%) 27 33	15, 23, 40, 53	0
1	B	166/209 (79%)	0.73	23 (13%) 6 10	16, 29, 51, 66	0
1	C	162/209 (77%)	0.68	22 (13%) 7 10	15, 25, 47, 71	0
1	D	182/209 (87%)	0.51	18 (9%) 13 18	15, 27, 43, 59	0
1	E	171/209 (81%)	0.55	15 (8%) 15 21	16, 24, 47, 58	0
2	F	83/87 (95%)	0.18	2 (2%) 59 67	14, 24, 38, 45	0
2	G	84/87 (96%)	0.15	4 (4%) 35 42	14, 24, 39, 53	0
2	H	83/87 (95%)	0.09	5 (6%) 27 33	14, 21, 37, 49	0
2	I	85/87 (97%)	0.29	4 (4%) 36 42	13, 25, 39, 48	0
2	J	82/87 (94%)	0.05	5 (6%) 27 33	14, 22, 37, 48	0
All	All	1282/1480 (86%)	0.42	109 (8%) 16 21	13, 25, 44, 71	0

All (109) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	214	VAL	9.4
1	B	113	ILE	6.6
1	E	215	MET	5.3
1	A	213	MET	4.7
1	C	113	ILE	4.7
1	C	160	LYS	4.3
1	C	96	TRP	4.2
1	E	249	ARG	4.1
1	B	138	PHE	4.1
1	A	138	PHE	4.0
1	B	114	SER	4.0
1	D	249	ARG	3.9
1	C	112	THR	3.8

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Mol	Chain	Res	Type	RSRZ
1	D	165	LEU	3.8
2	J	1	MET	3.7
1	D	138	PHE	3.6
1	B	64	ASN	3.5
1	B	96	TRP	3.5
1	B	222	ASN	3.5
1	C	138	PHE	3.4
1	D	128	GLU	3.4
1	E	58	PRO	3.4
1	A	249	ARG	3.4
1	B	66	LEU	3.4
1	C	68	LEU	3.3
1	B	127	ASP	3.3
2	H	43	ASN	3.3
1	E	213	MET	3.2
1	C	249	ARG	3.2
1	C	212	CYS	3.2
1	C	162	VAL	3.2
1	D	198	ARG	3.2
1	C	128	GLU	3.2
2	G	23	GLN	3.1
1	C	211	MET	3.1
1	E	61	GLU	3.1
1	B	249	ARG	3.1
1	E	127	ASP	3.1
1	C	115	ASP	3.1
1	A	60	SER	3.0
1	A	222	ASN	3.0
1	C	114	SER	3.0
1	C	165	LEU	2.9
1	C	168	LEU	2.9
1	D	115	ASP	2.8
1	D	62	GLU	2.8
1	C	163	LEU	2.8
1	A	211	MET	2.8
2	H	1	MET	2.8
1	A	96	TRP	2.7
1	B	170	ARG	2.7
2	I	62	ARG	2.6
2	I	-1	SER	2.6
1	B	160	LYS	2.6
1	D	66	LEU	2.6

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Mol	Chain	Res	Type	RSRZ
1	E	173	GLU	2.6
1	B	161	GLN	2.5
1	A	174	ILE	2.5
1	B	223	SER	2.5
1	B	65	GLU	2.5
1	C	111	GLU	2.5
1	E	170	ARG	2.5
2	G	84	GLU	2.5
1	B	212	CYS	2.5
2	F	62	ARG	2.5
1	B	168	LEU	2.4
1	D	157	LEU	2.4
1	E	138	PHE	2.4
1	D	92	LEU	2.4
1	E	165	LEU	2.4
2	F	43	ASN	2.4
2	G	43	ASN	2.4
1	B	173	GLU	2.4
1	C	213	MET	2.4
1	C	222	ASN	2.4
2	H	2	PRO	2.4
2	H	66	ARG	2.4
1	E	66	LEU	2.3
1	B	89	GLN	2.3
2	J	45	TYR	2.3
2	I	43	ASN	2.3
1	D	212	CYS	2.3
1	C	105	PHE	2.3
1	D	174	ILE	2.3
2	I	30	GLN	2.2
2	J	4	LEU	2.2
1	E	223	SER	2.2
1	D	89	GLN	2.2
1	D	58	PRO	2.2
1	A	198	ARG	2.2
1	D	60	SER	2.2
1	A	170	ARG	2.2
2	J	2	PRO	2.2
1	E	62	GLU	2.1
2	G	4	LEU	2.1
1	D	170	ARG	2.1
1	E	162	VAL	2.1

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Mol	Chain	Res	Type	RSRZ
1	D	87	GLN	2.1
2	J	23	GLN	2.1
1	B	63	ASP	2.1
1	B	198	ARG	2.1
1	B	112	THR	2.1
1	B	171	ILE	2.1
2	H	45	TYR	2.1
1	D	83	GLY	2.0
1	A	61	GLU	2.0
1	C	224	LYS	2.0
1	C	83	GLY	2.0
1	B	105	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 oligosaccharides 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.

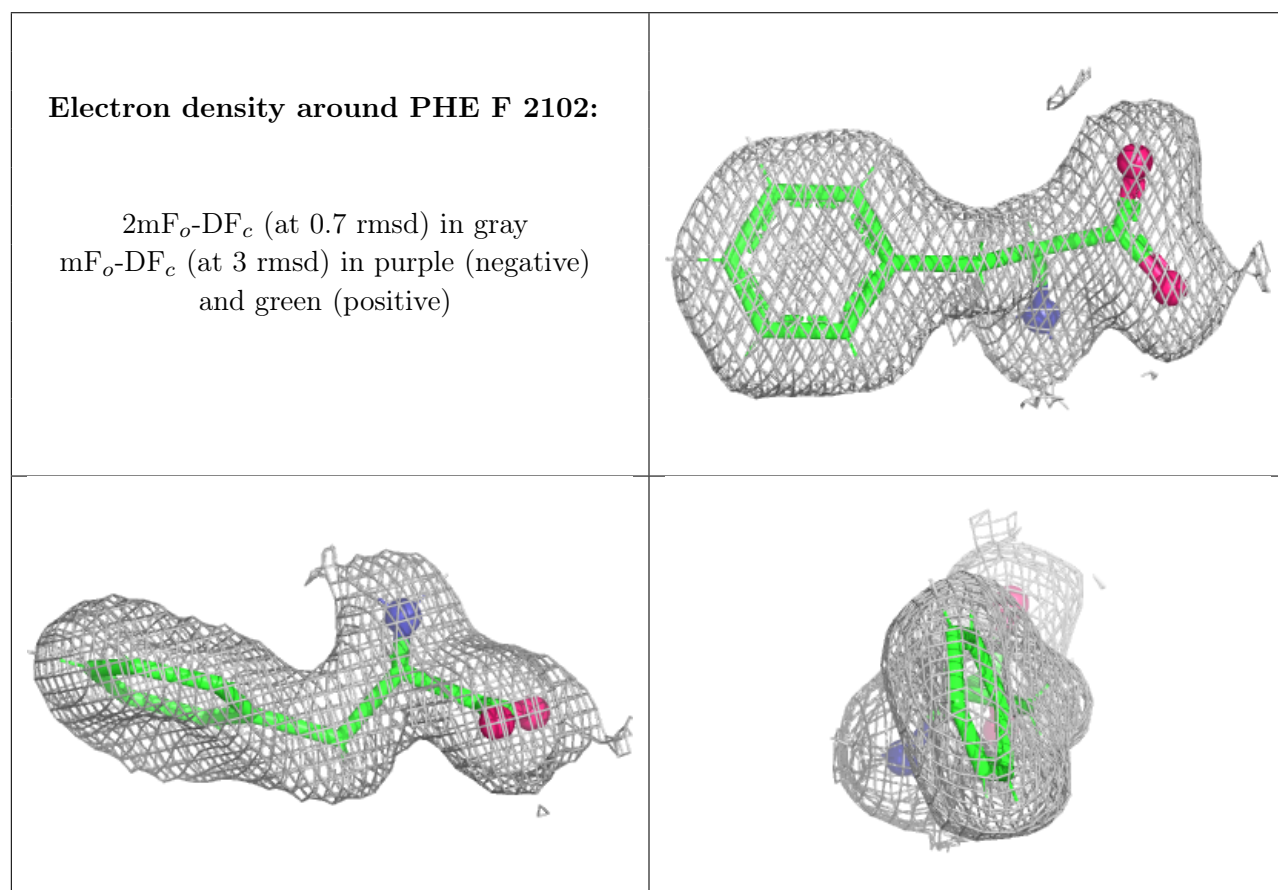
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	PHE	F	2101[A]	12/12	0.96	0.05	13,15,16,17	10
4	PHE	F	2101[B]	12/12	0.96	0.05	13,15,16,17	10
4	PHE	F	2102	12/12	0.96	0.05	12,14,16,17	11
4	PHE	H	2101	12/12	0.96	0.05	12,14,16,17	11
4	PHE	I	2101	12/12	0.97	0.04	13,14,17,17	11
4	PHE	G	2101[A]	12/12	0.98	0.04	13,15,18,19	10
4	PHE	G	2101[B]	12/12	0.98	0.04	13,15,18,19	10
3	ZN	C	301	1/1	0.99	0.06	33,33,33,33	0
3	ZN	D	301	1/1	0.99	0.03	33,33,33,33	0
3	ZN	E	301	1/1	0.99	0.04	28,28,28,28	0
3	ZN	A	301	1/1	0.99	0.03	29,29,29,29	0

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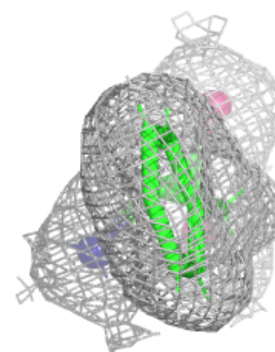
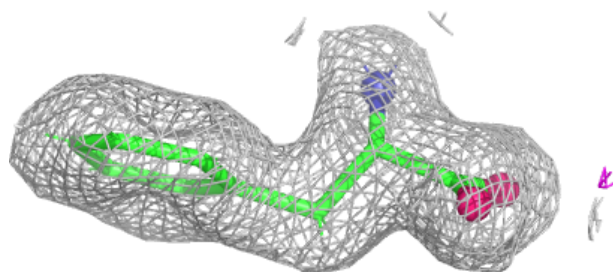
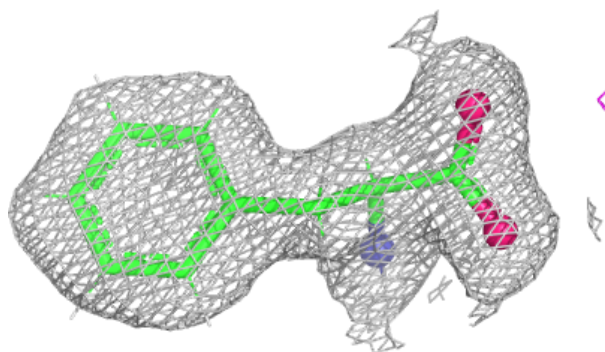
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	ZN	B	301	1/1	0.99	0.03	37,37,37,37	0

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.

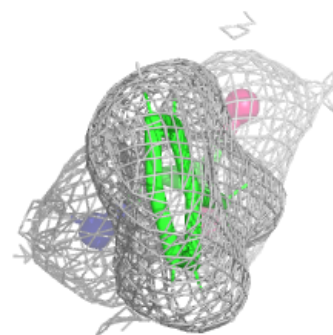
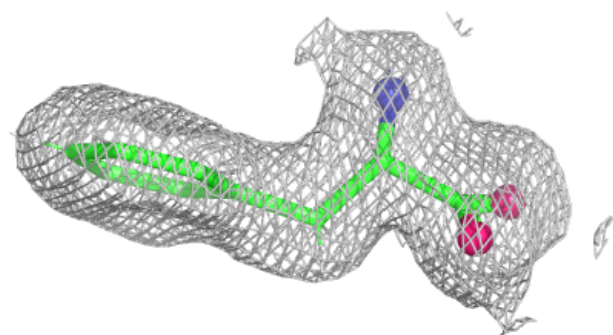
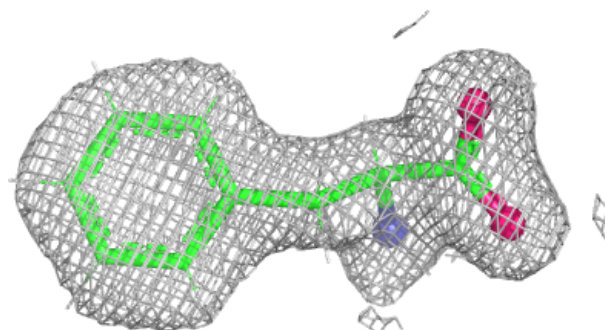


Electron density around PHE H 2101:

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

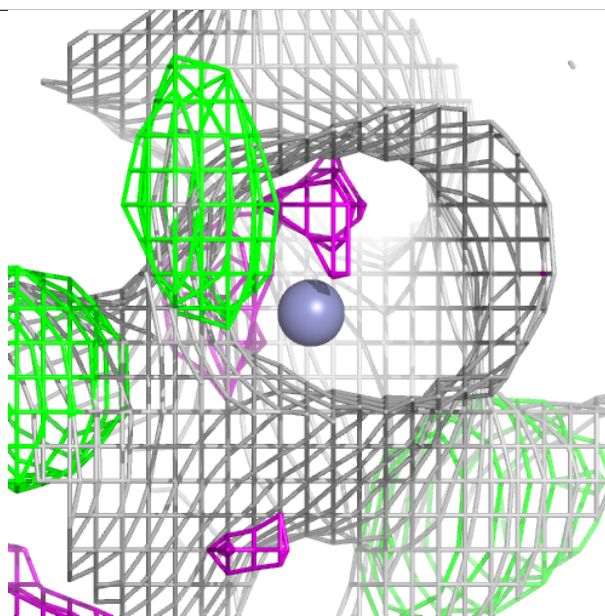
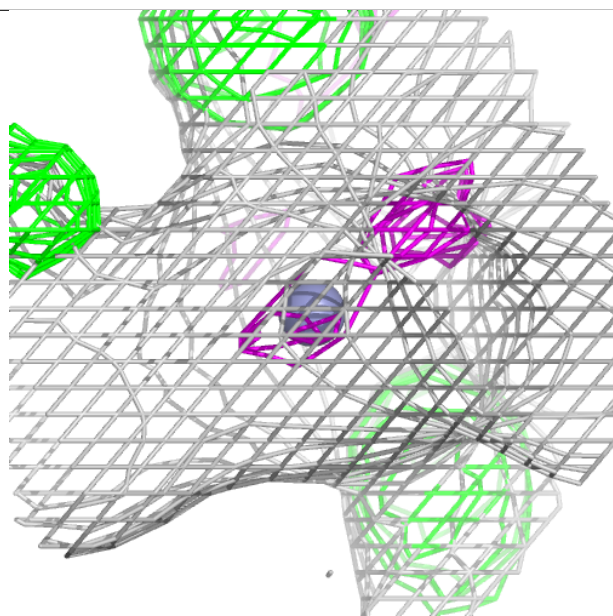
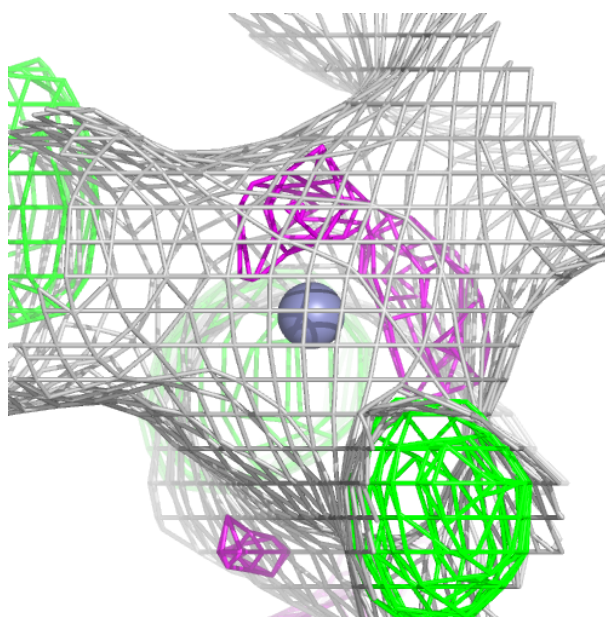
**Electron density around PHE I 2101:**

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



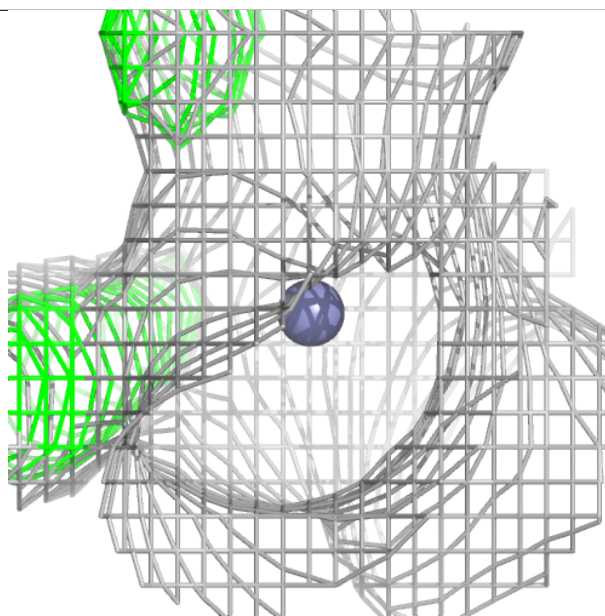
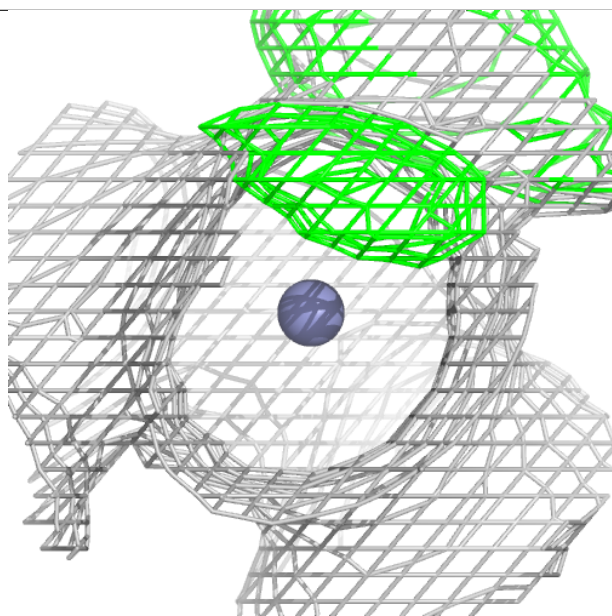
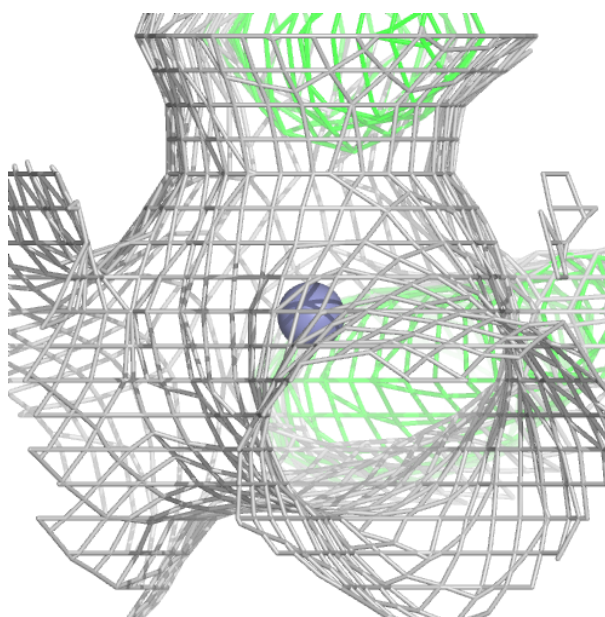
Electron density around ZN C 301:

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



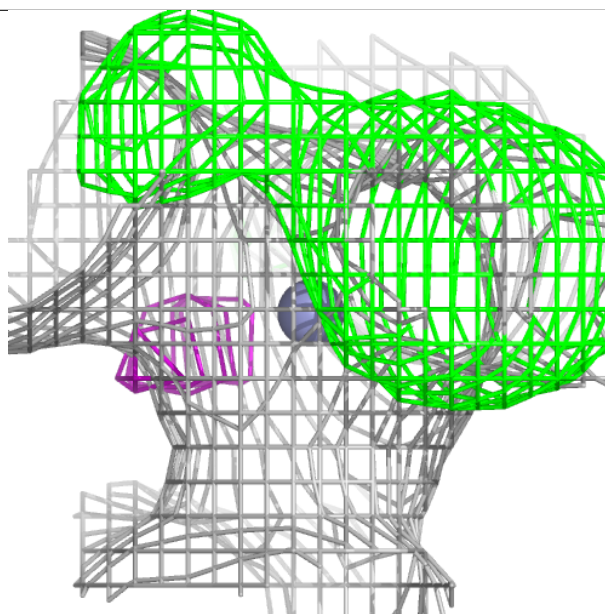
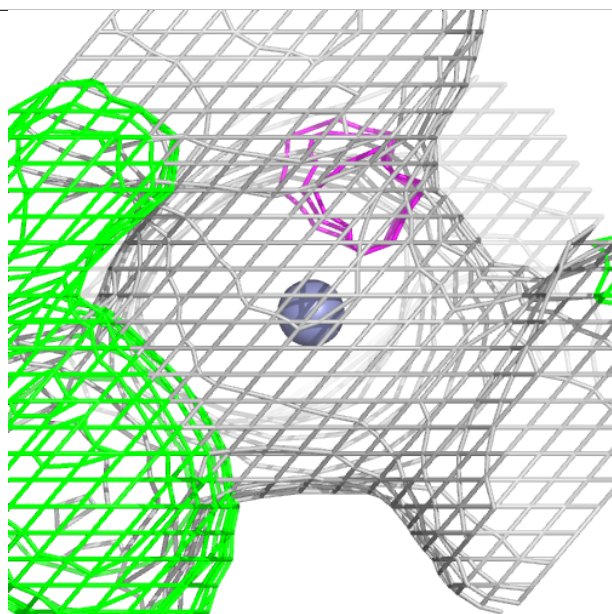
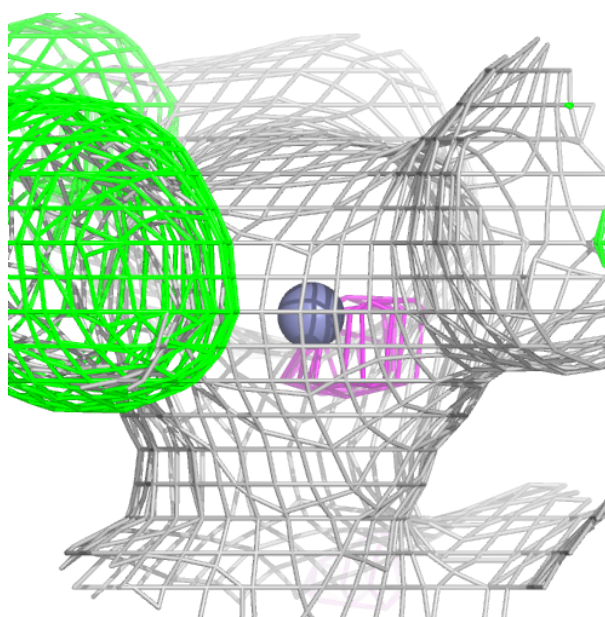
Electron density around ZN D 301:

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



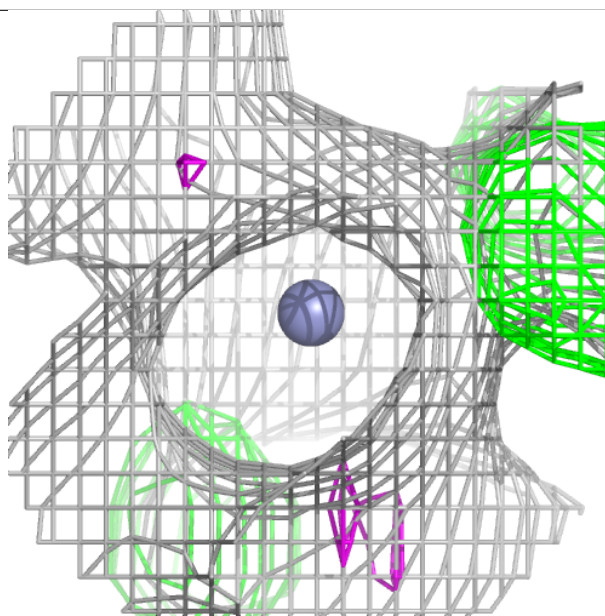
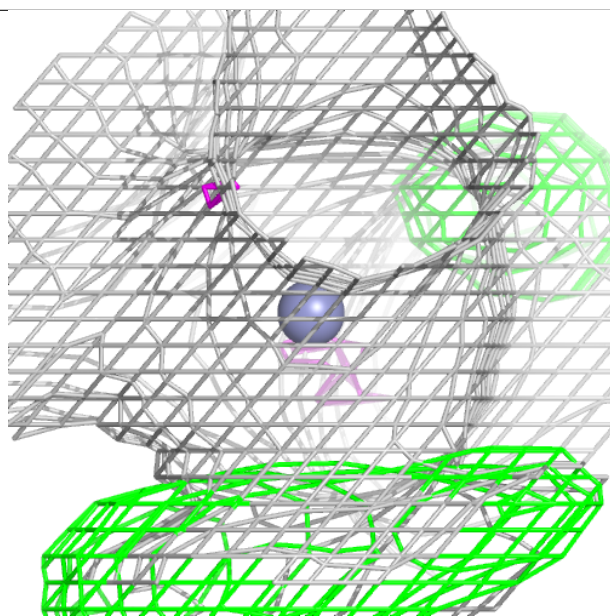
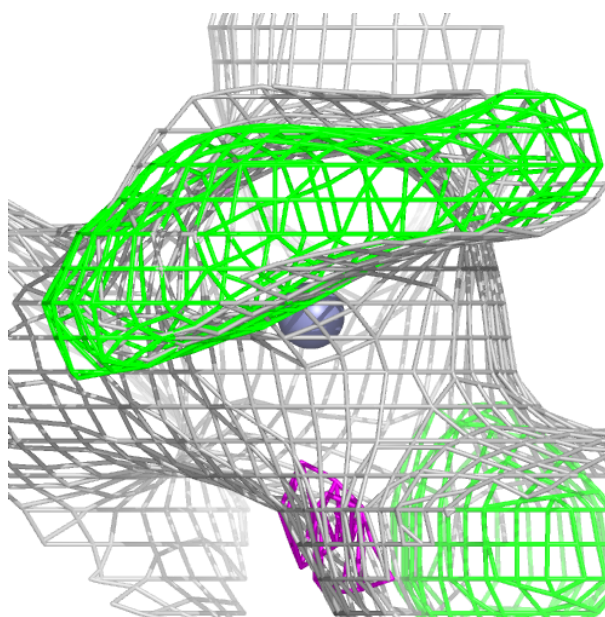
Electron density around ZN E 301:

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



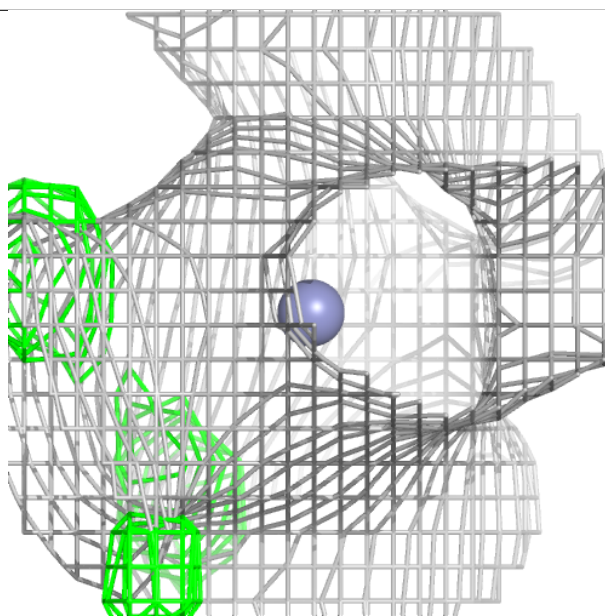
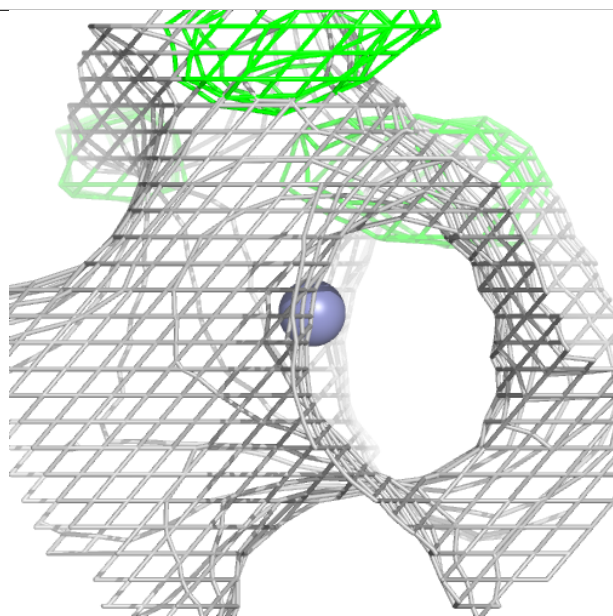
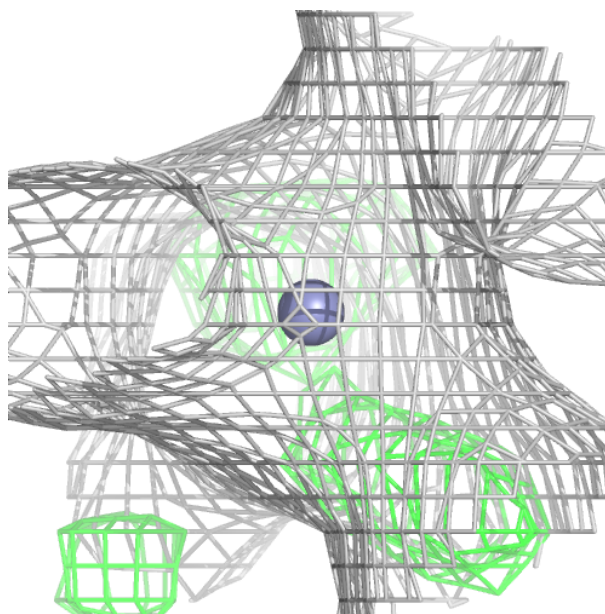
Electron density around ZN A 301:

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



Electron density around ZN B 301:

$2mF_o-DF_c$ (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.