



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 18, 2026 – 12:24 AM UTC

PDB ID : 9ENK / pdb_00009enk
Title : L-amino acid oxidase 4 (HcLAAO4) from the fungus Hebeloma cylindrosporum
in complex with L-phenylalanine
Authors : Gilzer, D.; Koopmeiners, S.; Fischer von Mollard, G.; Niemann, H.H.
Deposited on : 2024-03-13
Resolution : 2.20 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

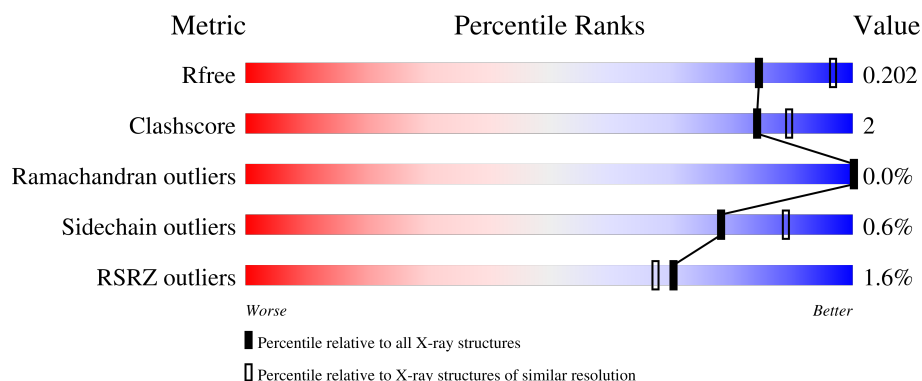
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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	6164 (2.20-2.20)
Clashscore	190562	6851 (2.20-2.20)
Ramachandran outliers	187476	6768 (2.20-2.20)
Sidechain outliers	187428	6769 (2.20-2.20)
RSRZ outliers	180081	6166 (2.20-2.20)

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 $\leq 5\%$. 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	562	2% 91% 5%
1	B	562	% 91% 6%
1	C	562	% 91% 6%
1	D	562	2% 92% 5%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	SO4	C	705	-	-	X	-

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 35094 atoms, of which 16650 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.

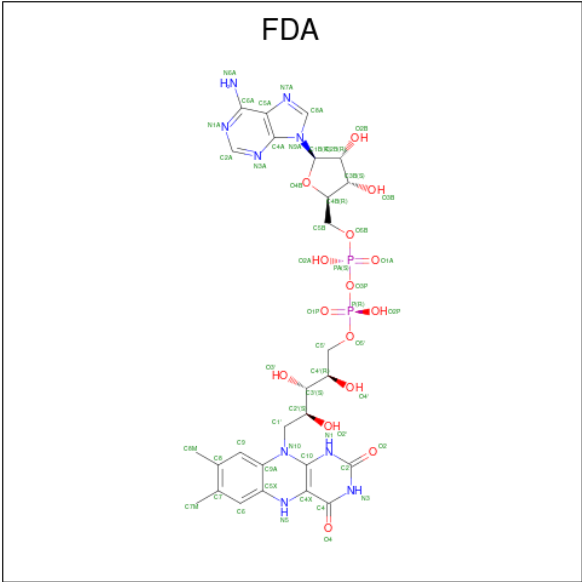
- Molecule 1 is a protein called L-amino acid oxidase 4.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	537	Total	C	H	N	O	S	0	9	0
			8401	2746	4132	716	796	11			
1	B	528	Total	C	H	N	O	S	0	9	0
			8315	2724	4093	704	783	11			
1	C	530	Total	C	H	N	O	S	0	6	0
			8291	2713	4078	705	784	11			
1	D	533	Total	C	H	N	O	S	0	10	0
			8360	2732	4115	711	791	11			

There are 8 discrepancies between the modelled and reference sequences:

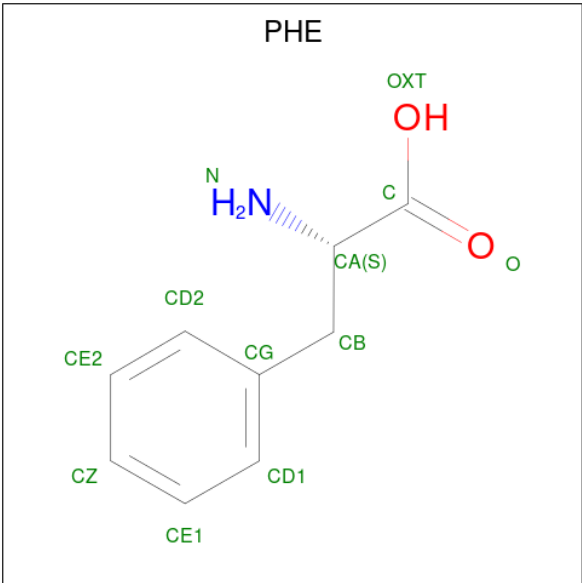
Chain	Residue	Modelled	Actual	Comment	Reference
A	474	ALA	LYS	engineered mutation	UNP S4S6Z0
A	475	ALA	LYS	engineered mutation	UNP S4S6Z0
B	474	ALA	LYS	engineered mutation	UNP S4S6Z0
B	475	ALA	LYS	engineered mutation	UNP S4S6Z0
C	474	ALA	LYS	engineered mutation	UNP S4S6Z0
C	475	ALA	LYS	engineered mutation	UNP S4S6Z0
D	474	ALA	LYS	engineered mutation	UNP S4S6Z0
D	475	ALA	LYS	engineered mutation	UNP S4S6Z0

- Molecule 2 is DIHYDROFLAVINE-ADENINE DINUCLEOTIDE (CCD ID: FDA) (formula: $C_{27}H_{35}N_9O_{15}P_2$) (labeled as "Ligand of Interest" by depositor).



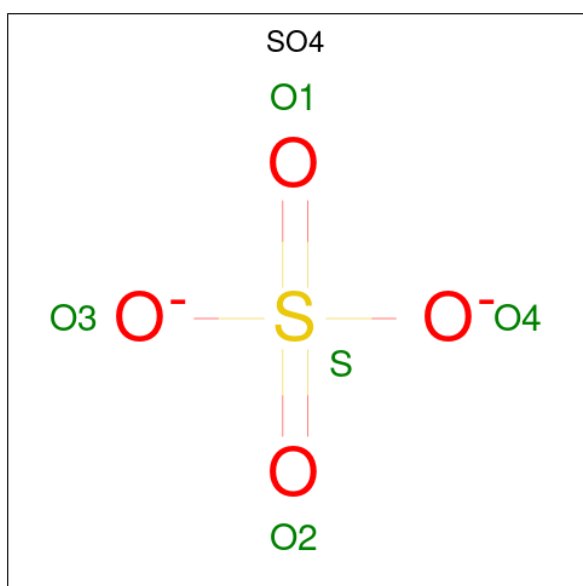
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total	C	H	N	O	P	0	0
			85	27	32	9	15	2		
2	B	1	Total	C	H	N	O	P	0	0
			85	27	32	9	15	2		
2	C	1	Total	C	H	N	O	P	0	0
			85	27	32	9	15	2		
2	D	1	Total	C	H	N	O	P	0	0
			85	27	32	9	15	2		

- Molecule 3 is PHENYLALANINE (CCD ID: PHE) (formula: C₉H₁₁NO₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	H	N	O	0	0
			20	9	8	1	2		
3	B	1	Total	C	H	N	O	0	0
			20	9	8	1	2		
3	C	1	Total	C	H	N	O	0	0
			20	9	8	1	2		
3	D	1	Total	C	H	N	O	0	0
			20	9	8	1	2		

- Molecule 4 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



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

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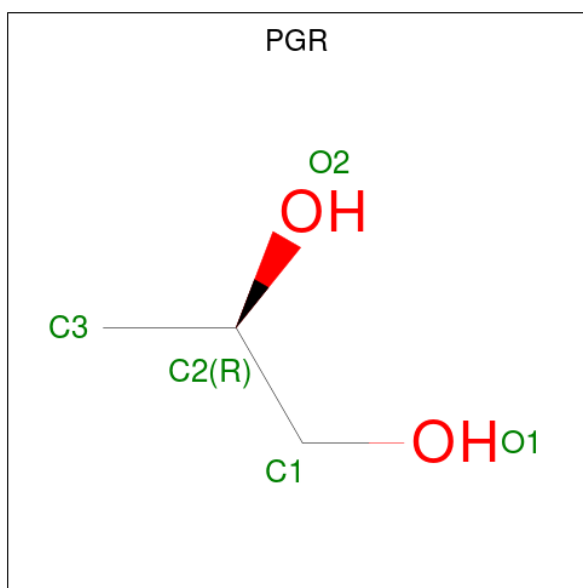
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		

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

- Molecule 5 is R-1,2-PROPANEDIOL (CCD ID: PGR) (formula: $C_3H_8O_2$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total C H O 13 3 8 2	0	0
5	A	1	Total C H O 13 3 8 2	0	0
5	A	1	Total C H O 13 3 8 2	0	0
5	B	1	Total C H O 13 3 8 2	0	0
5	B	1	Total C H O 13 3 8 2	0	0
5	C	1	Total C H O 13 3 8 2	0	0
5	C	1	Total C H O 13 3 8 2	0	0
5	D	1	Total C H O 13 3 8 2	0	0
5	D	1	Total C H O 13 3 8 2	0	0

- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	318	Total O 319 319	0	1
6	B	278	Total O 281 281	0	3
6	C	187	Total O 188 188	0	1
6	D	197	Total O 197 197	0	0

ASN
SER
ASP
ASN
SER
LEU
LEU
GLU
LYS

4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	84.70Å 131.73Å 107.46Å 90.00° 96.04° 90.00°	Depositor
Resolution (Å)	40.67 – 2.20 40.67 – 2.20	Depositor EDS
% Data completeness (in resolution range)	98.6 (40.67-2.20) 98.6 (40.67-2.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.15 (at 2.20Å)	Xtriage
Refinement program	PHENIX 1.21_5207	Depositor
R, R_{free}	0.170 , 0.202 0.170 , 0.202	Depositor DCC
R_{free} test set	5859 reflections (3.85%)	wwPDB-VP
Wilson B-factor (Å ²)	42.5	Xtriage
Anisotropy	0.189	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.41 , 37.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	35094	wwPDB-VP
Average B, all atoms (Å ²)	52.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.39% 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: FDA, PGR, SO4

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	0.23	0/4420	0.36	0/6011
1	B	0.23	0/4369	0.35	0/5938
1	C	0.20	0/4350	0.32	0/5914
1	D	0.20	0/4395	0.32	0/5975
All	All	0.22	0/17534	0.34	0/23838

There are no bond length outliers.

There are no bond angle outliers.

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	4269	4132	4132	24	1
1	B	4222	4093	4102	15	0
1	C	4213	4078	4084	14	0
1	D	4245	4115	4121	9	3
2	A	53	32	33	3	0
2	B	53	32	33	4	0
2	C	53	32	33	2	0
2	D	53	32	33	3	0
3	A	12	8	8	4	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	12	8	8	4	0
3	C	12	8	8	3	0
3	D	12	8	8	4	0
4	A	35	0	0	0	0
4	B	65	0	0	5	0
4	C	45	0	0	1	2
4	D	60	0	0	0	0
5	A	15	24	24	2	0
5	B	10	16	16	0	0
5	C	10	16	16	1	0
5	D	10	16	16	0	0
6	A	319	0	0	1	0
6	B	281	0	0	3	0
6	C	188	0	0	0	0
6	D	197	0	0	1	0
All	All	18444	16650	16675	78	3

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 2.

All (78) 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:86:LEU:O	1:C:582:LYS:NZ	2.16	0.78
1:A:553:LEU:HD12	1:A:553:LEU:N	2.08	0.69
1:B:473:GLY:HA3	1:C:248:LEU:HD12	1.77	0.64
1:C:379:ASN:N	4:C:704:SO4:O4	2.27	0.64
2:C:701:FDA:N5	3:C:702:PHE:HA	2.13	0.63
2:A:701:FDA:N5	3:A:702:PHE:HA	2.14	0.62
2:B:701:FDA:N5	3:B:702:PHE:HA	2.15	0.62
1:A:457:TYR:O	5:A:710:PGR:H32	2.01	0.61
1:A:548:PHE:C	1:A:553:LEU:CD2	2.75	0.60
1:A:577:VAL:HG23	1:A:578:THR:HG23	1.84	0.60
1:D:294:GLU:O	1:D:295:VAL:HG23	2.02	0.59
1:A:548:PHE:O	1:A:553:LEU:CD2	2.50	0.59
1:B:511:ASP:OD2	1:B:514[B]:HIS:ND1	2.37	0.58
4:B:712:SO4:O3	6:B:801:HOH:O	2.16	0.58
1:B:321:HIS:ND1	6:B:805:HOH:O	2.32	0.58
1:D:537:LEU:HB2	1:D:553:LEU:HD11	1.86	0.57
1:C:234:ASN:OD1	1:C:246:LYS:NZ	2.38	0.57
1:C:223:HIS:NE2	1:C:597:PHE:O	2.35	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:549:ALA:CA	1:A:553:LEU:HD22	2.35	0.56
1:C:121:ALA:HA	2:C:701:FDA:C4X	2.36	0.56
1:A:548:PHE:C	1:A:553:LEU:HD22	2.32	0.55
3:A:702:PHE:CD1	3:A:702:PHE:N	2.76	0.54
1:D:121:ALA:HA	2:D:701:FDA:C4X	2.37	0.54
2:A:701:FDA:C4X	3:A:702:PHE:HA	2.38	0.53
1:B:217[A]:PHE:CZ	1:B:221:GLN:NE2	2.76	0.53
4:B:710:SO4:O1	6:B:802:HOH:O	2.19	0.53
1:C:77:LEU:HB3	1:C:316:ILE:HG21	1.90	0.53
3:A:702:PHE:N	3:A:702:PHE:HD1	2.07	0.53
1:C:511:ASP:OD2	1:C:514[A]:HIS:ND1	2.42	0.52
3:B:702:PHE:CD1	3:B:702:PHE:N	2.77	0.52
1:A:121:ALA:HA	2:A:701:FDA:C4X	2.40	0.52
1:D:230:ASP:OD2	6:D:801:HOH:O	2.19	0.51
1:B:121:ALA:HA	2:B:701:FDA:C4X	2.40	0.51
1:A:548:PHE:HB3	1:A:553:LEU:HD21	1.93	0.51
1:A:549:ALA:HA	1:A:553:LEU:HD22	1.93	0.51
3:B:702:PHE:N	3:B:702:PHE:HD1	2.08	0.51
1:A:548:PHE:O	1:A:553:LEU:HD23	2.11	0.50
2:D:701:FDA:N5	3:D:702:PHE:HA	2.26	0.50
1:B:508:HIS:NE2	4:B:708:SO4:O2	2.40	0.49
1:A:340:GLU:OE2	1:A:359:LYS:NZ	2.31	0.49
1:A:553:LEU:N	1:A:553:LEU:CD1	2.75	0.49
1:B:217[B]:PHE:CE1	1:B:290:ILE:HG23	2.47	0.49
1:B:161:PHE:N	4:B:706:SO4:O3	2.44	0.48
1:C:577:VAL:HG23	1:C:578:THR:HG23	1.96	0.48
1:A:548:PHE:CB	1:A:553:LEU:HD21	2.43	0.48
1:C:459:TRP:CE2	5:C:712:PGR:H33	2.49	0.48
1:C:86:LEU:HB3	1:C:582:LYS:HD3	1.95	0.47
1:B:577:VAL:HG23	1:B:578:THR:HG23	1.97	0.47
2:B:701:FDA:C4X	3:B:702:PHE:HA	2.45	0.47
2:D:701:FDA:C4X	3:D:702:PHE:HA	2.44	0.47
1:A:323:LYS:O	1:A:325:GLY:N	2.47	0.46
1:D:577:VAL:HG23	1:D:578:THR:HG23	1.97	0.46
1:A:549:ALA:N	1:A:553:LEU:HD22	2.31	0.46
1:B:447:ASN:N	4:B:715:SO4:O4	2.39	0.45
1:A:233:LYS:NZ	6:A:801:HOH:O	2.11	0.44
1:A:318:ALA:O	1:A:322:LYS:HG3	2.17	0.44
1:A:77:LEU:HB3	1:A:316:ILE:HG21	2.00	0.44
1:B:217[A]:PHE:CE2	1:B:221:GLN:NE2	2.85	0.44
1:D:77:LEU:HB3	1:D:316:ILE:HG21	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:410:TRP:CD1	1:D:411:THR:HG1	2.36	0.44
1:C:548:PHE:O	1:C:553:LEU:HD22	2.18	0.43
3:D:702:PHE:CD1	3:D:702:PHE:N	2.86	0.43
3:C:702:PHE:N	3:C:702:PHE:CD1	2.87	0.43
3:D:702:PHE:N	3:D:702:PHE:HD1	2.17	0.43
1:C:86:LEU:O	1:C:582:LYS:CE	2.66	0.43
1:A:399:ILE:C	1:A:399:ILE:HD12	2.43	0.43
1:A:459:TRP:CZ3	5:A:710:PGR:H2	2.55	0.42
1:A:230:ASP:HA	1:A:233:LYS:HE2	2.01	0.42
3:C:702:PHE:N	3:C:702:PHE:HD1	2.17	0.42
1:C:210:GLY:N	1:C:211:PRO:HD2	2.35	0.42
1:A:60:SER:N	1:A:61:PRO:HD2	2.36	0.41
1:B:328:PHE:N	1:B:328:PHE:CD1	2.89	0.41
1:D:294:GLU:O	1:D:295:VAL:CG2	2.68	0.41
1:A:552:ALA:C	1:A:553:LEU:HD12	2.46	0.41
1:B:399:ILE:HD12	1:B:399:ILE:C	2.46	0.41
1:D:399:ILE:HD12	1:D:399:ILE:C	2.46	0.40
1:B:309:SER:O	1:B:313:PRO:HD2	2.21	0.40
1:B:558:ALA:C	2:B:701:FDA:H1'2	2.47	0.40

All (3) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:576:TYR:O	1:D:576:TYR:OH[2_656]	2.05	0.15
1:D:66:ARG:NH1	4:C:705:SO4:O3[2_647]	2.08	0.12
1:D:66:ARG:HH12	4:C:705:SO4:O3[2_647]	1.54	0.06

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	542/562 (96%)	522 (96%)	20 (4%)	0	100	100
1	B	531/562 (94%)	514 (97%)	17 (3%)	0	100	100
1	C	530/562 (94%)	514 (97%)	16 (3%)	0	100	100
1	D	539/562 (96%)	520 (96%)	18 (3%)	1 (0%)	43	51
All	All	2142/2248 (95%)	2070 (97%)	71 (3%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	327	ALA

5.3.2 Protein sidechains ⓘ

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	455/467 (97%)	450 (99%)	5 (1%)	65	79
1	B	450/467 (96%)	449 (100%)	1 (0%)	87	94
1	C	448/467 (96%)	448 (100%)	0	100	100
1	D	452/467 (97%)	452 (100%)	0	100	100
All	All	1805/1868 (97%)	1799 (100%)	6 (0%)	78	93

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

Mol	Chain	Res	Type
1	A	286	VAL
1	A	295	VAL
1	A	300	VAL
1	A	350	VAL
1	A	599	GLN
1	B	328	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (19) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	173	ASN
1	A	388	ASN
1	A	414	GLN
1	B	106	HIS
1	B	221	GLN
1	B	388	ASN
1	B	593	ASN
1	C	155	GLN
1	C	173	ASN
1	C	321	HIS
1	C	388	ASN
1	C	515	ASN
1	D	106	HIS
1	D	153	HIS
1	D	173	ASN
1	D	234	ASN
1	D	321	HIS
1	D	388	ASN
1	D	414	GLN

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](#)

58 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the

expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	FDA	B	701	-	57,58,58	0.57	0	78,89,89	0.66	0
4	SO4	D	708	-	4,4,4	0.68	0	6,6,6	0.06	0
4	SO4	D	707	-	4,4,4	0.66	0	6,6,6	0.10	0
3	PHE	C	702	-	11,12,12	0.76	1 (9%)	11,15,15	0.74	1 (9%)
2	FDA	A	701	-	57,58,58	0.59	0	78,89,89	0.65	0
5	PGR	C	712	-	4,4,4	0.59	0	4,4,4	0.57	0
4	SO4	C	711	-	4,4,4	0.71	0	6,6,6	0.10	0
4	SO4	A	705	-	4,4,4	0.67	0	6,6,6	0.11	0
5	PGR	D	716	-	4,4,4	0.61	0	4,4,4	0.58	0
2	FDA	D	701	-	57,58,58	0.59	0	78,89,89	0.65	0
4	SO4	B	712	-	4,4,4	0.68	0	6,6,6	0.05	0
4	SO4	D	706	-	4,4,4	0.70	0	6,6,6	0.11	0
5	PGR	A	711	-	4,4,4	0.61	0	4,4,4	0.58	0
3	PHE	D	702	-	11,12,12	0.72	1 (9%)	11,15,15	0.73	1 (9%)
4	SO4	C	709	-	4,4,4	0.71	0	6,6,6	0.10	0
5	PGR	C	713	-	4,4,4	0.61	0	4,4,4	0.58	0
4	SO4	B	715	-	4,4,4	0.70	0	6,6,6	0.09	0
4	SO4	B	711	-	4,4,4	0.70	0	6,6,6	0.07	0
4	SO4	D	714	-	4,4,4	0.72	0	6,6,6	0.13	0
4	SO4	B	707	-	4,4,4	0.72	0	6,6,6	0.08	0
4	SO4	D	703	-	4,4,4	0.74	0	6,6,6	0.12	0
5	PGR	D	715	-	4,4,4	0.58	0	4,4,4	0.59	0
4	SO4	A	706	-	4,4,4	0.70	0	6,6,6	0.20	0
4	SO4	B	708	-	4,4,4	0.64	0	6,6,6	0.10	0
4	SO4	B	710	-	4,4,4	0.66	0	6,6,6	0.15	0
5	PGR	B	716	-	4,4,4	0.61	0	4,4,4	0.55	0
4	SO4	D	712	-	4,4,4	0.68	0	6,6,6	0.06	0
4	SO4	C	705	-	4,4,4	0.69	0	6,6,6	0.11	0
4	SO4	D	711	-	4,4,4	0.71	0	6,6,6	0.11	0
5	PGR	B	717	-	4,4,4	0.62	0	4,4,4	0.49	0
4	SO4	B	704	-	4,4,4	0.70	0	6,6,6	0.10	0
4	SO4	A	709	-	4,4,4	0.70	0	6,6,6	0.07	0
4	SO4	B	714	-	4,4,4	0.72	0	6,6,6	0.08	0
5	PGR	A	710	-	4,4,4	0.61	0	4,4,4	0.47	0
4	SO4	D	709	-	4,4,4	0.71	0	6,6,6	0.09	0
4	SO4	B	713	-	4,4,4	0.66	0	6,6,6	0.10	0
3	PHE	A	702	-	11,12,12	0.79	1 (9%)	11,15,15	0.78	1 (9%)
4	SO4	B	703	-	4,4,4	0.73	0	6,6,6	0.19	0
4	SO4	C	710	-	4,4,4	0.71	0	6,6,6	0.07	0
4	SO4	C	706	-	4,4,4	0.71	0	6,6,6	0.09	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	SO4	C	704	-	4,4,4	0.67	0	6,6,6	0.05	0
4	SO4	C	707	-	4,4,4	0.72	0	6,6,6	0.08	0
4	SO4	C	708	-	4,4,4	0.71	0	6,6,6	0.10	0
5	PGR	A	712	-	4,4,4	0.58	0	4,4,4	0.47	0
4	SO4	A	703	-	4,4,4	0.69	0	6,6,6	0.17	0
4	SO4	B	706	-	4,4,4	0.71	0	6,6,6	0.20	0
3	PHE	B	702	-	11,12,12	0.75	0	11,15,15	0.75	1 (9%)
4	SO4	D	710	-	4,4,4	0.72	0	6,6,6	0.08	0
2	FDA	C	701	-	57,58,58	0.58	0	78,89,89	0.67	0
4	SO4	B	705	-	4,4,4	0.69	0	6,6,6	0.07	0
4	SO4	D	704	-	4,4,4	0.66	0	6,6,6	0.09	0
4	SO4	A	708	-	4,4,4	0.69	0	6,6,6	0.08	0
4	SO4	B	709	-	4,4,4	0.71	0	6,6,6	0.09	0
4	SO4	C	703	-	4,4,4	0.69	0	6,6,6	0.09	0
4	SO4	A	704	-	4,4,4	0.66	0	6,6,6	0.16	0
4	SO4	D	713	-	4,4,4	0.69	0	6,6,6	0.08	0
4	SO4	D	705	-	4,4,4	0.67	0	6,6,6	0.15	0
4	SO4	A	707	-	4,4,4	0.69	0	6,6,6	0.14	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
2	FDA	B	701	-	-	2/34/50/50	0/6/6/6
3	PHE	C	702	-	-	2/8/8/8	0/1/1/1
2	FDA	A	701	-	-	3/34/50/50	0/6/6/6
2	FDA	C	701	-	-	2/34/50/50	0/6/6/6
5	PGR	B	716	-	-	0/2/2/2	-
5	PGR	C	712	-	-	0/2/2/2	-
5	PGR	B	717	-	-	2/2/2/2	-
5	PGR	D	716	-	-	1/2/2/2	-
2	FDA	D	701	-	-	3/34/50/50	0/6/6/6
3	PHE	D	702	-	-	2/8/8/8	0/1/1/1
5	PGR	A	710	-	-	0/2/2/2	-
5	PGR	C	713	-	-	2/2/2/2	-
5	PGR	D	715	-	-	1/2/2/2	-
5	PGR	A	712	-	-	2/2/2/2	-
3	PHE	A	702	-	-	2/8/8/8	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	PHE	B	702	-	-	2/8/8/8	0/1/1/1
5	PGR	A	711	-	-	2/2/2/2	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	702	PHE	OXT-C	-2.27	1.23	1.30
3	A	702	PHE	OXT-C	-2.24	1.23	1.30
3	D	702	PHE	OXT-C	-2.21	1.23	1.30

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	702	PHE	OXT-C-O	-2.19	119.11	124.08
3	C	702	PHE	OXT-C-O	-2.19	119.11	124.08
3	B	702	PHE	OXT-C-O	-2.08	119.35	124.08
3	A	702	PHE	OXT-C-O	-2.05	119.42	124.08

There are no chirality outliers.

All (28) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	711	PGR	O1-C1-C2-C3
5	A	711	PGR	O1-C1-C2-O2
5	A	712	PGR	O1-C1-C2-C3
5	A	712	PGR	O1-C1-C2-O2
5	B	717	PGR	O1-C1-C2-C3
5	C	713	PGR	O1-C1-C2-C3
5	C	713	PGR	O1-C1-C2-O2
5	D	715	PGR	O1-C1-C2-C3
3	C	702	PHE	CA-CB-CG-CD2
3	D	702	PHE	CA-CB-CG-CD2
3	C	702	PHE	CA-CB-CG-CD1
2	A	701	FDA	PA-O3P-P-O5'
2	B	701	FDA	PA-O3P-P-O5'
2	C	701	FDA	PA-O3P-P-O5'
2	D	701	FDA	PA-O3P-P-O5'
3	A	702	PHE	CA-CB-CG-CD2
3	D	702	PHE	CA-CB-CG-CD1
3	A	702	PHE	CA-CB-CG-CD1
3	B	702	PHE	CA-CB-CG-CD2

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Mol	Chain	Res	Type	Atoms
3	B	702	PHE	CA-CB-CG-CD1
5	B	717	PGR	O1-C1-C2-O2
5	D	716	PGR	O1-C1-C2-O2
2	B	701	FDA	C2B-C1B-N9A-C8A
2	A	701	FDA	C2B-C1B-N9A-C8A
2	C	701	FDA	C2B-C1B-N9A-C8A
2	D	701	FDA	C2B-C1B-N9A-C8A
2	A	701	FDA	O4B-C4B-C5B-O5B
2	D	701	FDA	O4B-C4B-C5B-O5B

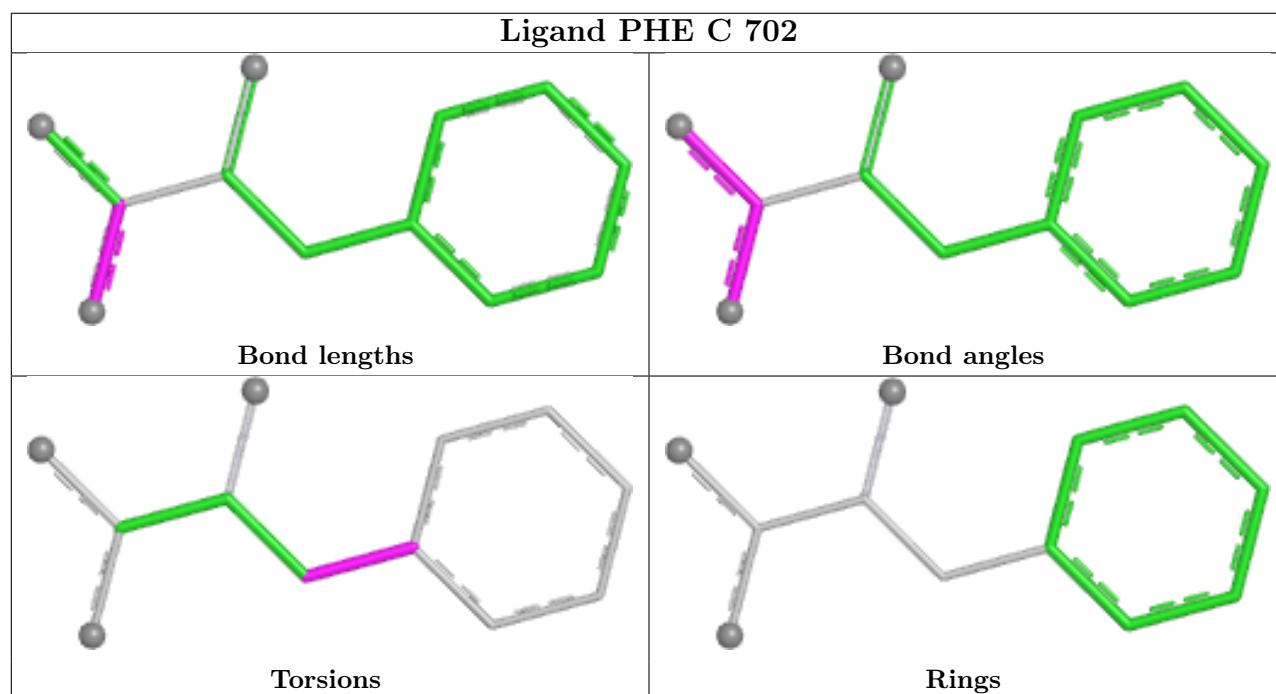
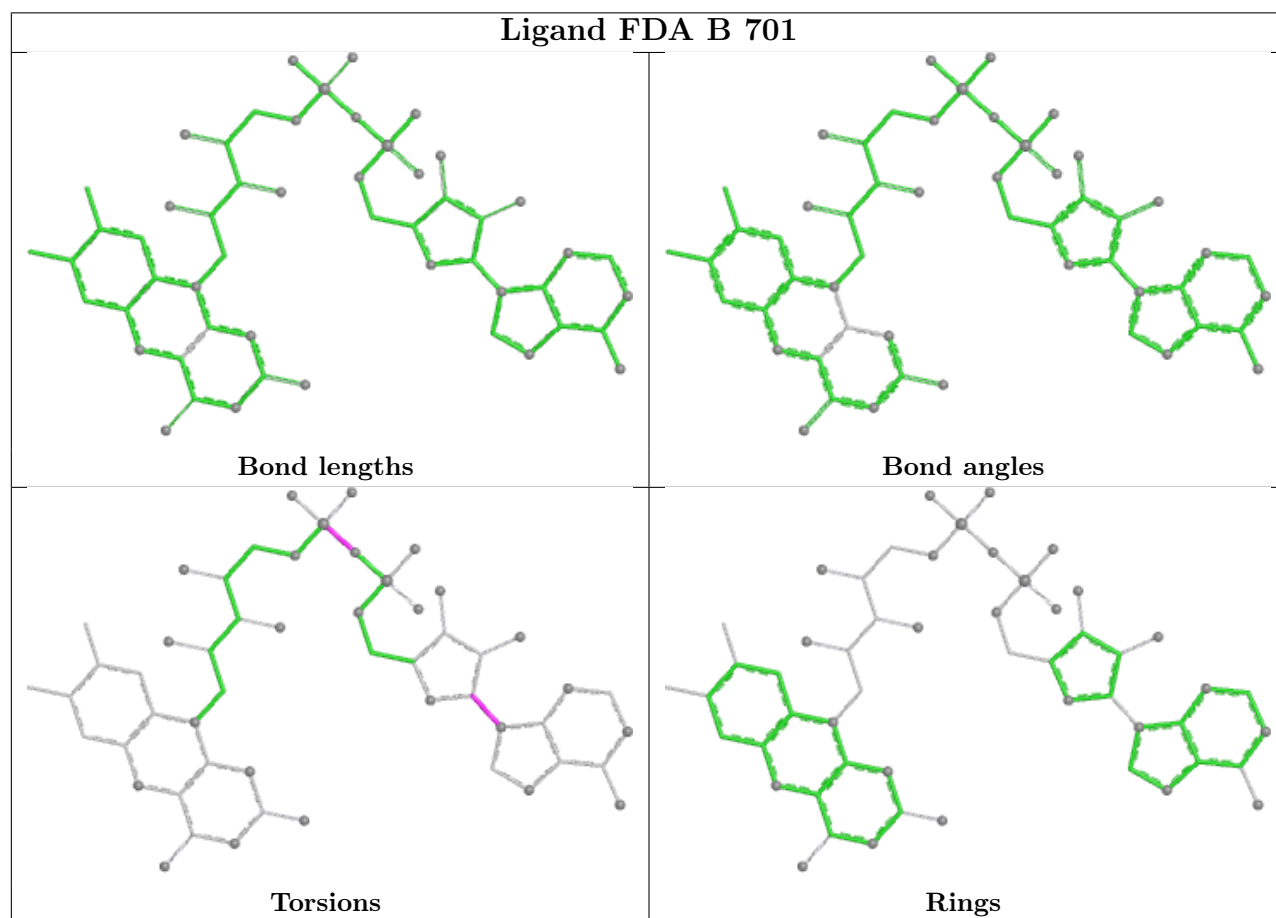
There are no ring outliers.

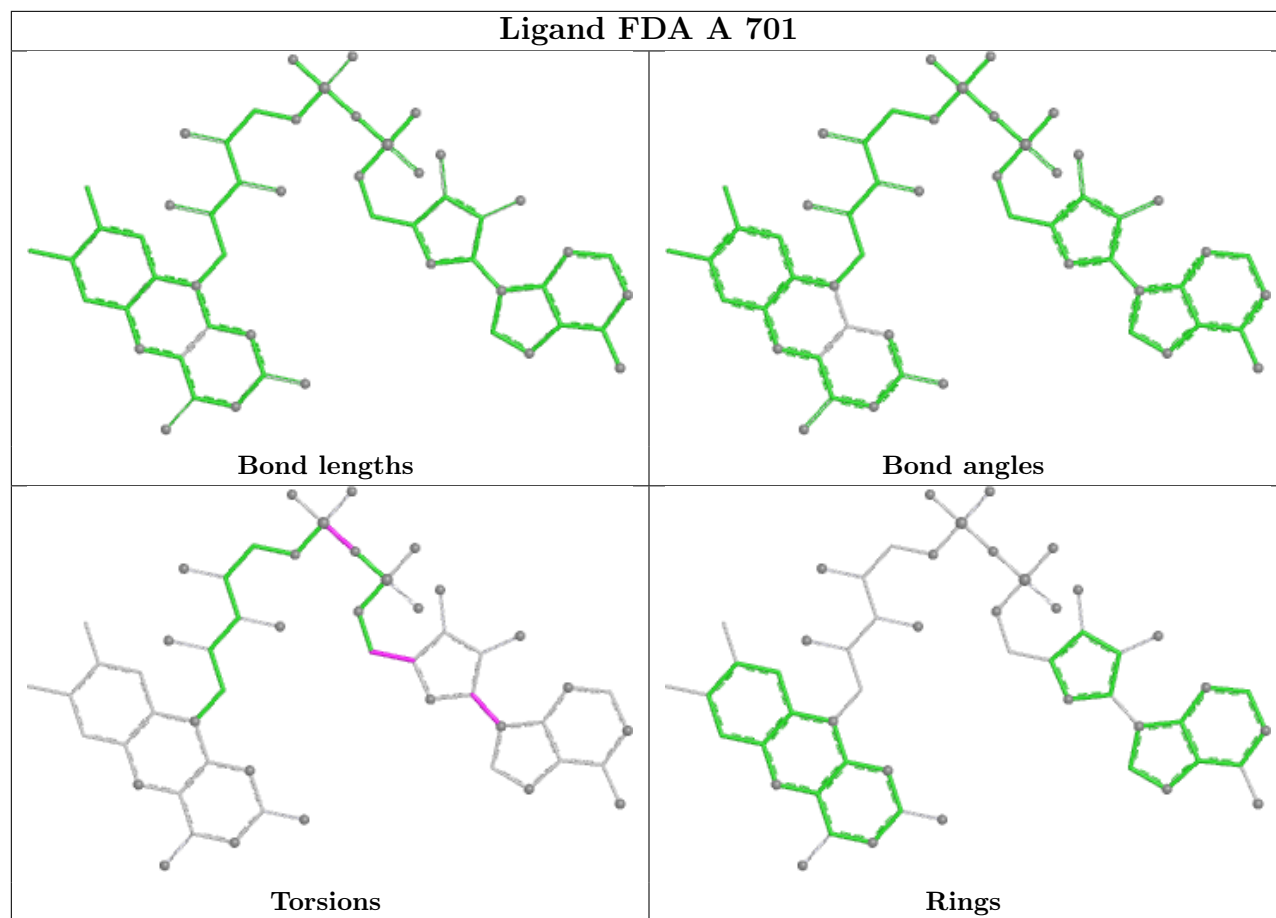
17 monomers are involved in 31 short contacts:

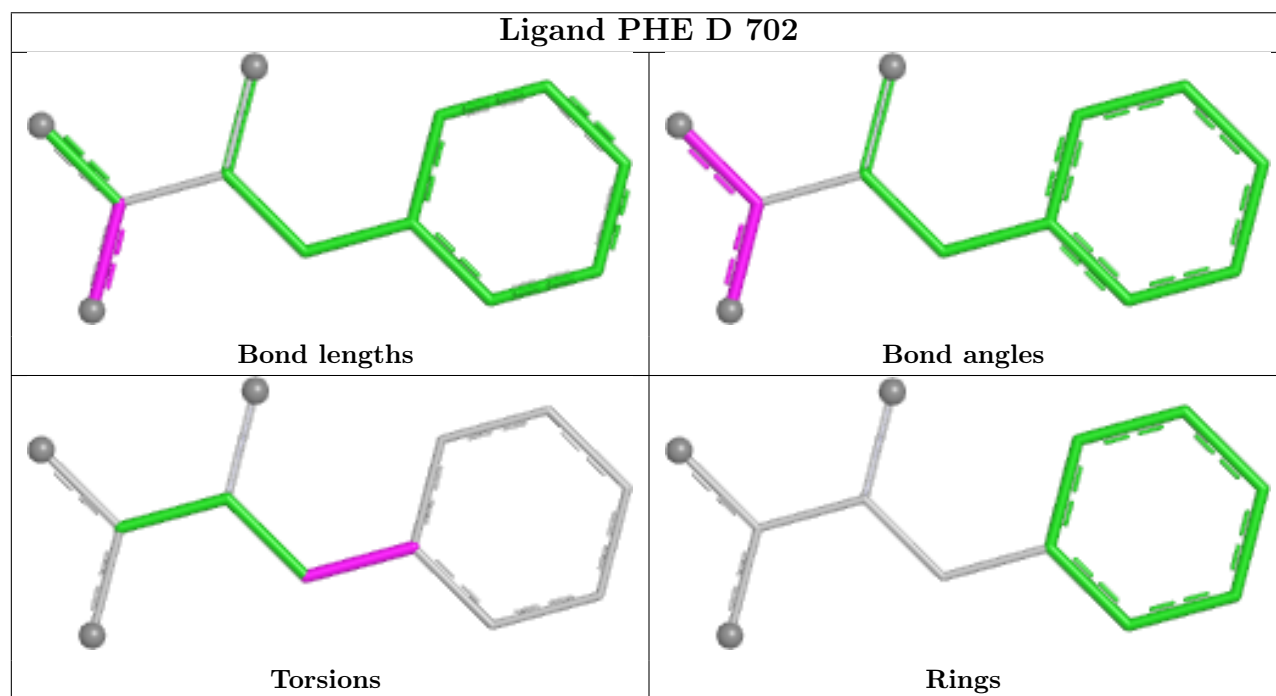
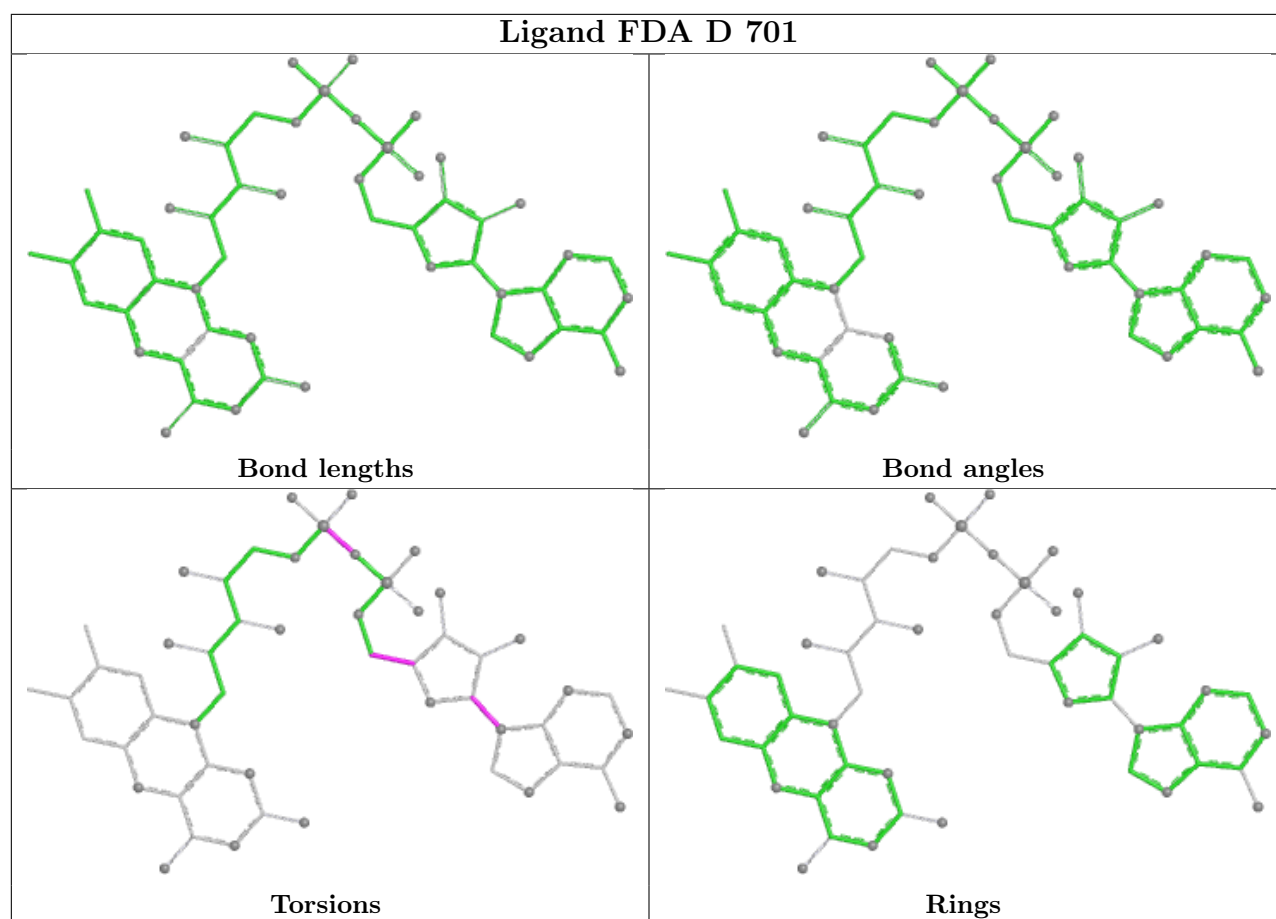
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	701	FDA	4	0
3	C	702	PHE	3	0
2	A	701	FDA	3	0
5	C	712	PGR	1	0
2	D	701	FDA	3	0
4	B	712	SO4	1	0
3	D	702	PHE	4	0
4	B	715	SO4	1	0
4	B	708	SO4	1	0
4	B	710	SO4	1	0
4	C	705	SO4	0	2
5	A	710	PGR	2	0
3	A	702	PHE	4	0
4	C	704	SO4	1	0
4	B	706	SO4	1	0
3	B	702	PHE	4	0
2	C	701	FDA	2	0

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

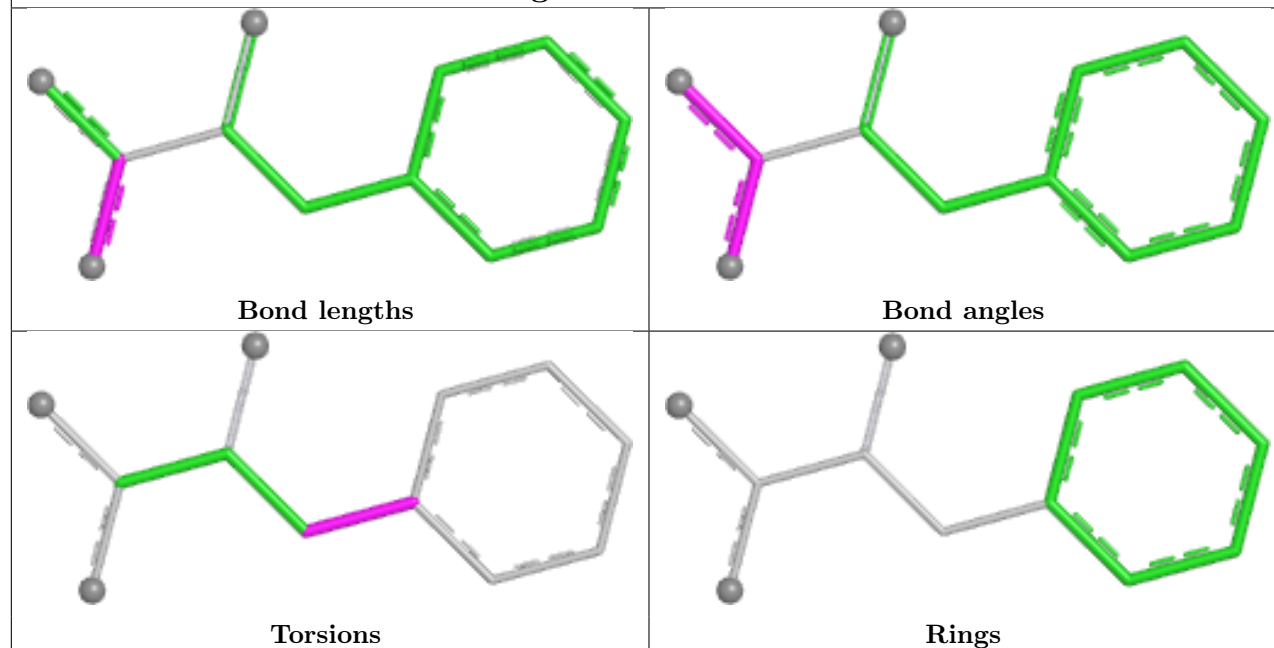
The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



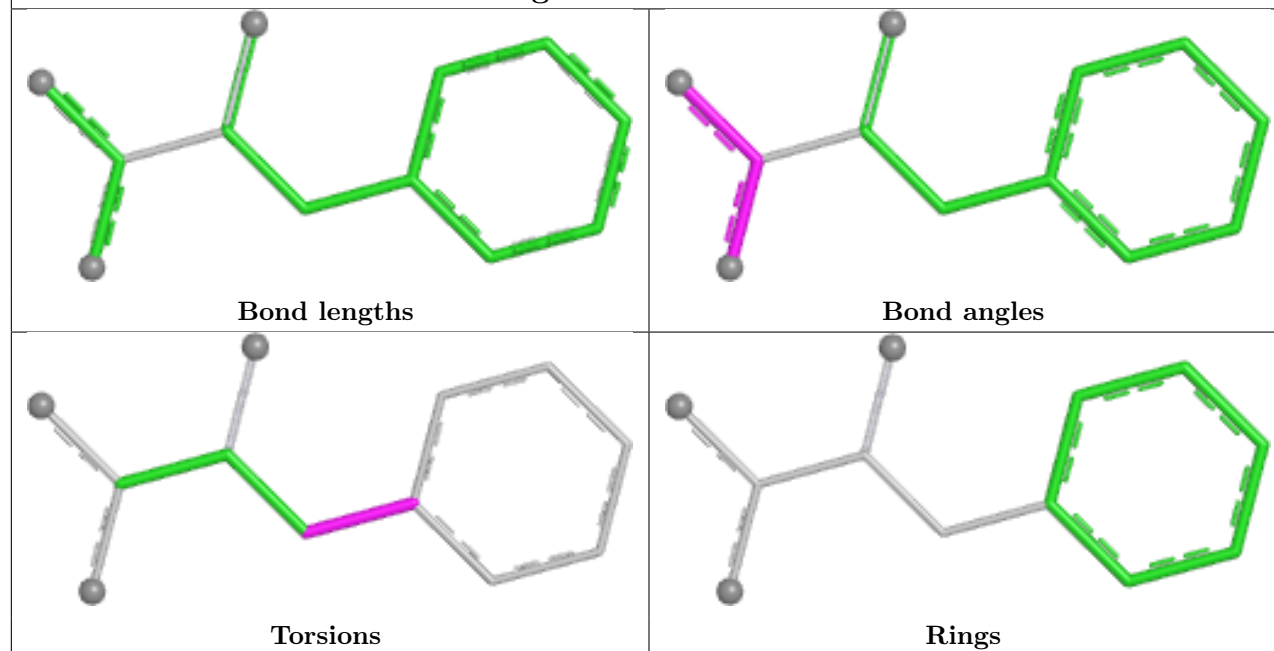


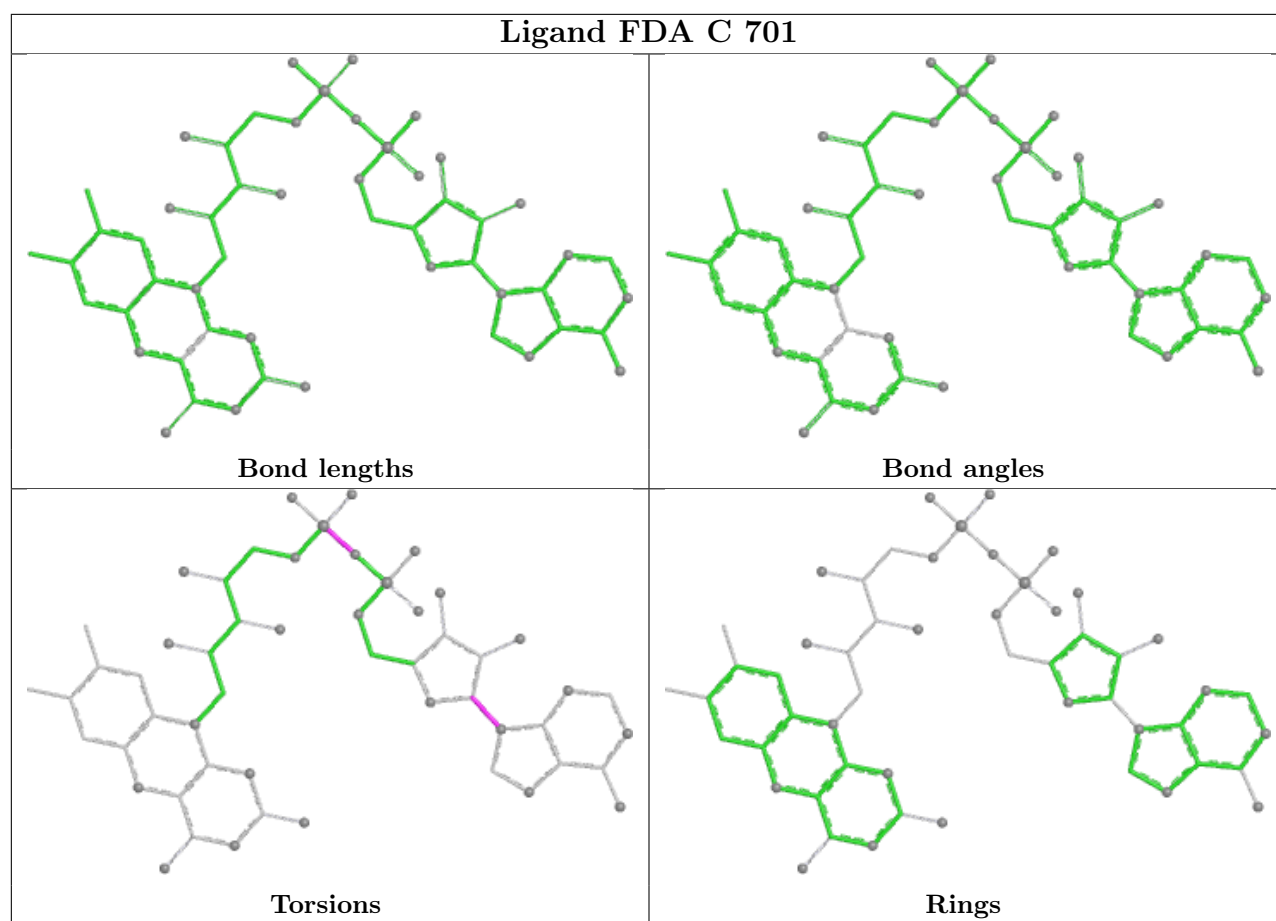


Ligand PHE A 702



Ligand PHE B 702





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	537/562 (95%)	-0.30	9 (1%) 69 66	20, 46, 68, 156	8 (1%)
1	B	528/562 (93%)	-0.33	6 (1%) 78 76	22, 45, 66, 112	9 (1%)
1	C	530/562 (94%)	-0.10	5 (0%) 81 79	22, 53, 83, 134	6 (1%)
1	D	533/562 (94%)	-0.06	13 (2%) 59 56	23, 53, 83, 135	10 (1%)
All	All	2128/2248 (94%)	-0.20	33 (1%) 70 67	20, 49, 79, 156	33 (1%)

All (33) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	296	GLY	6.0
1	B	295	VAL	5.2
1	C	326	ASN	4.8
1	C	295	VAL	4.6
1	B	327	ALA	4.5
1	A	295	VAL	4.4
1	C	327	ALA	4.2
1	B	217[A]	PHE	3.9
1	B	321	HIS	3.8
1	D	326	ASN	3.5
1	A	324	GLY	3.3
1	D	327	ALA	3.3
1	D	325	GLY	3.2
1	A	599	GLN	3.2
1	D	553	LEU	3.1
1	A	322	LYS	3.0
1	C	598	GLU	3.0
1	D	110	ASN	3.0
1	D	299	GLU	3.0
1	A	553	LEU	2.7
1	A	323	LYS	2.7

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Mol	Chain	Res	Type	RSRZ
1	B	299	GLU	2.7
1	D	598	GLU	2.6
1	D	293	GLY	2.6
1	D	295	VAL	2.6
1	C	599	GLN	2.5
1	D	323	LYS	2.5
1	D	294	GLU	2.4
1	A	299	GLU	2.3
1	B	110	ASN	2.3
1	D	324	GLY	2.2
1	A	60	SER	2.1
1	A	325	GLY	2.1

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	SO4	C	710	5/5	0.41	0.14	94,100,105,116	5
4	SO4	A	709	5/5	0.42	0.15	94,95,101,102	5
4	SO4	D	711	5/5	0.63	0.15	84,84,94,105	5
4	SO4	D	712	5/5	0.69	0.12	89,91,96,110	5
4	SO4	B	714	5/5	0.70	0.11	69,70,74,77	5
4	SO4	C	711	5/5	0.70	0.18	57,61,62,67	5
4	SO4	C	708	5/5	0.71	0.20	56,58,62,64	5
4	SO4	C	707	5/5	0.72	0.11	82,84,94,98	5
4	SO4	D	714	5/5	0.72	0.23	53,53,57,59	5
4	SO4	D	709	5/5	0.73	0.13	72,74,83,85	5
4	SO4	B	708	5/5	0.75	0.20	42,43,45,48	5

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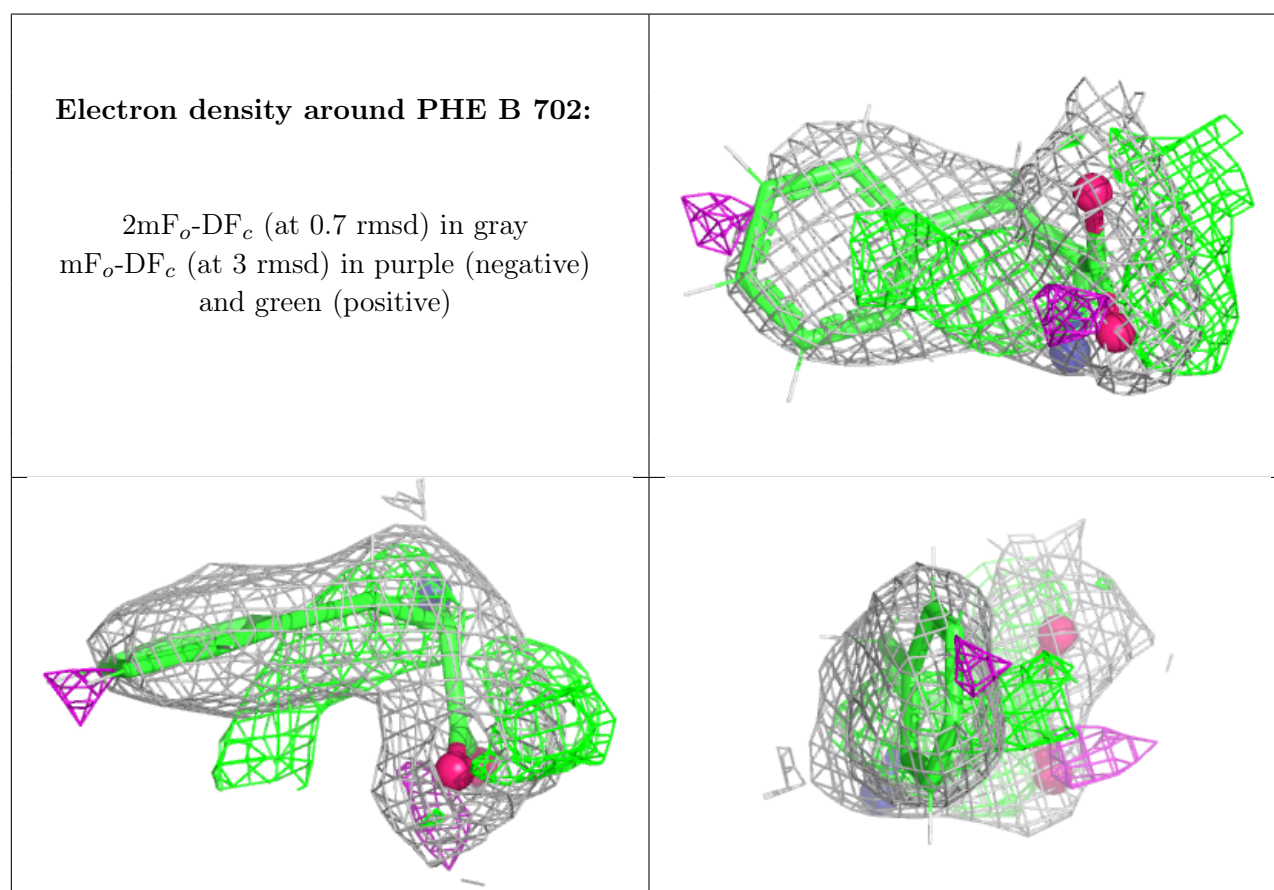
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
5	PGR	A	710	5/5	0.75	0.22	39,47,49,49	13
4	SO4	C	709	5/5	0.76	0.12	74,75,85,88	5
4	SO4	B	709	5/5	0.76	0.15	57,62,65,66	5
4	SO4	B	713	5/5	0.77	0.12	69,71,74,75	5
4	SO4	C	705	5/5	0.77	0.15	70,71,77,77	5
4	SO4	D	706	5/5	0.78	0.12	56,57,62,63	5
4	SO4	B	711	5/5	0.78	0.15	51,52,60,62	5
4	SO4	B	712	5/5	0.78	0.17	51,51,52,55	5
5	PGR	B	716	5/5	0.78	0.20	39,47,49,50	13
4	SO4	B	715	5/5	0.79	0.13	64,65,70,73	5
5	PGR	D	715	5/5	0.79	0.24	45,54,55,56	13
4	SO4	D	710	5/5	0.81	0.17	45,47,51,55	5
4	SO4	A	703	5/5	0.82	0.18	44,47,51,54	5
5	PGR	C	712	5/5	0.82	0.20	45,55,56,58	13
4	SO4	B	704	5/5	0.82	0.17	45,50,51,53	5
4	SO4	B	707	5/5	0.83	0.16	56,57,62,66	5
4	SO4	B	703	5/5	0.83	0.18	43,46,51,53	5
4	SO4	D	713	5/5	0.83	0.12	70,76,80,85	5
4	SO4	C	703	5/5	0.83	0.13	58,59,65,66	5
5	PGR	A	711	5/5	0.84	0.16	34,44,47,53	13
4	SO4	B	706	5/5	0.84	0.16	42,44,48,51	5
4	SO4	D	708	5/5	0.85	0.13	50,54,57,59	5
5	PGR	C	713	5/5	0.85	0.15	47,58,70,70	0
4	SO4	D	703	5/5	0.85	0.15	58,59,61,61	5
3	PHE	B	702	12/12	0.86	0.21	37,43,52,54	20
3	PHE	D	702	12/12	0.86	0.19	43,49,59,60	20
3	PHE	A	702	12/12	0.86	0.20	35,43,52,55	20
5	PGR	A	712	5/5	0.86	0.13	49,59,65,71	0
5	PGR	D	716	5/5	0.86	0.14	51,62,64,64	0
4	SO4	D	705	5/5	0.87	0.14	49,50,52,54	5
4	SO4	A	708	5/5	0.87	0.10	50,50,56,58	5
4	SO4	D	707	5/5	0.87	0.14	53,55,57,57	5
4	SO4	B	710	5/5	0.88	0.13	49,51,53,55	5
4	SO4	A	706	5/5	0.88	0.11	47,52,56,58	5
3	PHE	C	702	12/12	0.88	0.18	41,48,58,61	20
4	SO4	C	704	5/5	0.88	0.11	56,59,62,66	5
4	SO4	A	705	5/5	0.88	0.14	41,47,48,50	5
4	SO4	C	706	5/5	0.88	0.15	54,56,64,66	5
4	SO4	D	704	5/5	0.89	0.10	50,52,55,57	5
5	PGR	B	717	5/5	0.89	0.11	46,56,61,61	0
4	SO4	B	705	5/5	0.91	0.11	51,52,52,59	5
4	SO4	A	707	5/5	0.92	0.11	41,42,45,46	5

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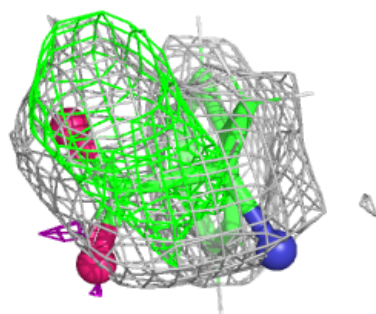
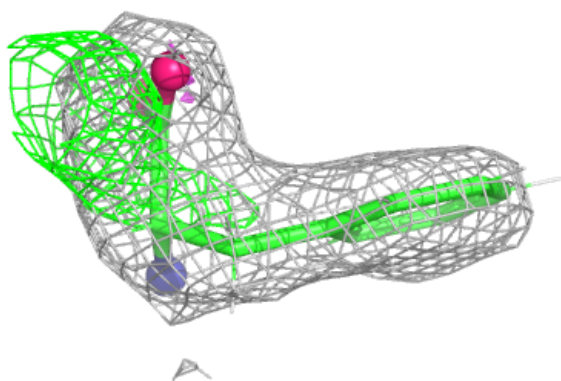
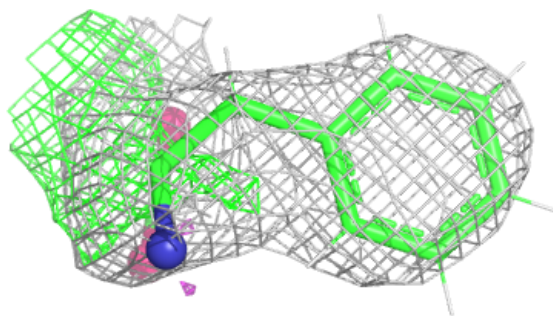
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	SO4	A	704	5/5	0.95	0.09	47,53,54,55	5
2	FDA	D	701	53/53	0.96	0.07	35,41,50,51	0
2	FDA	C	701	53/53	0.97	0.07	35,41,50,50	0
2	FDA	A	701	53/53	0.97	0.06	33,36,44,45	0
2	FDA	B	701	53/53	0.98	0.06	29,36,44,46	0

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.

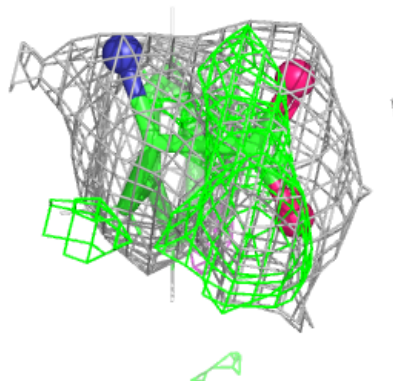
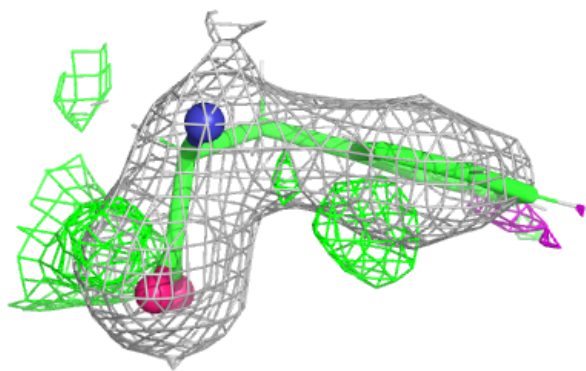
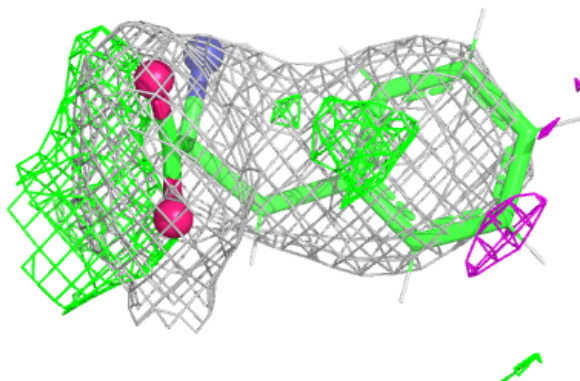


Electron density around PHE D 702:

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

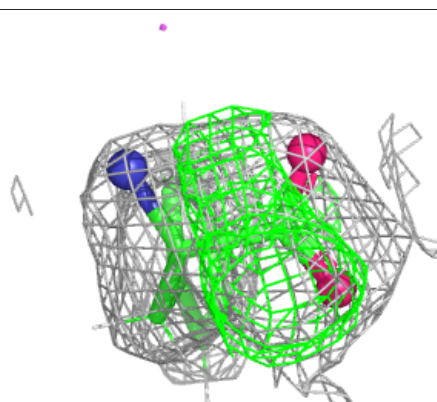
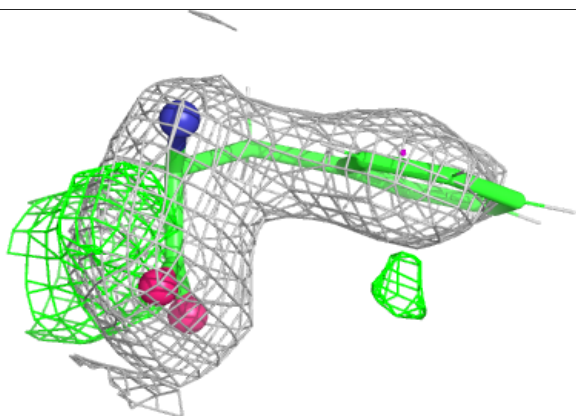
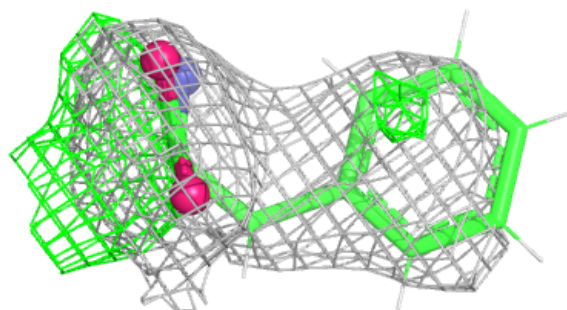
**Electron density around PHE A 702:**

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

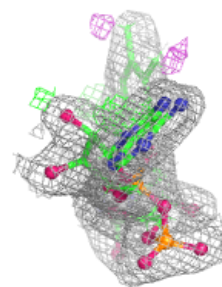
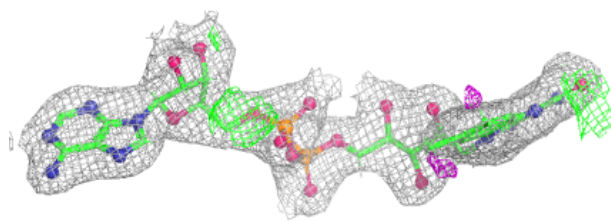
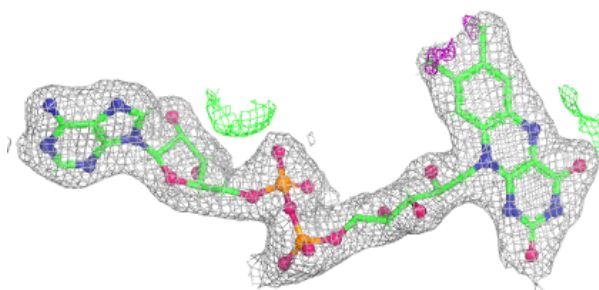


Electron density around PHE C 702:

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

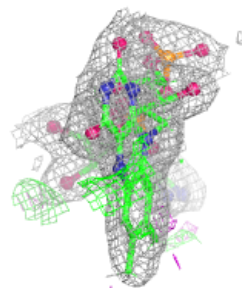
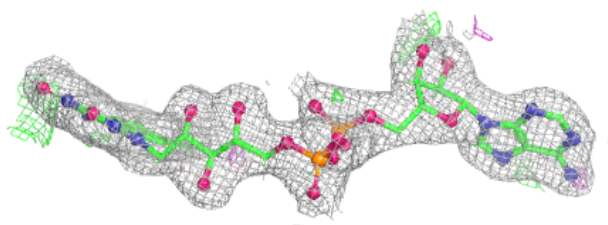
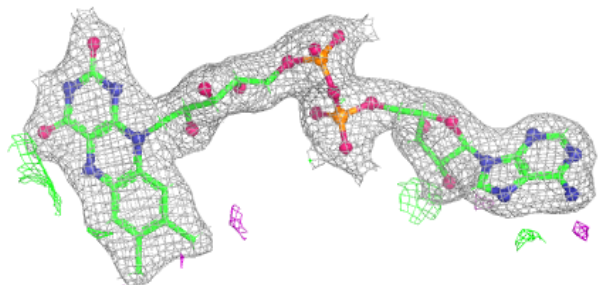
**Electron density around FDA D 701:**

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

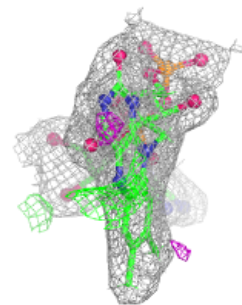
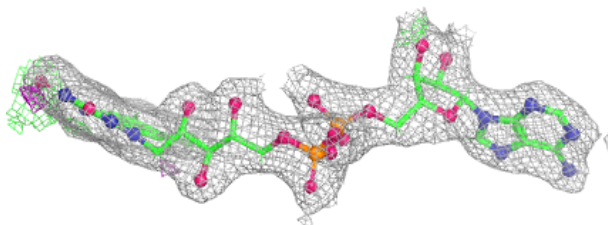
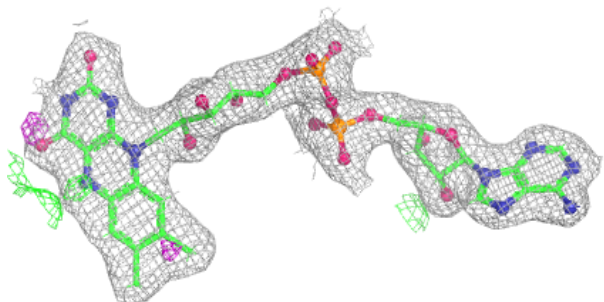


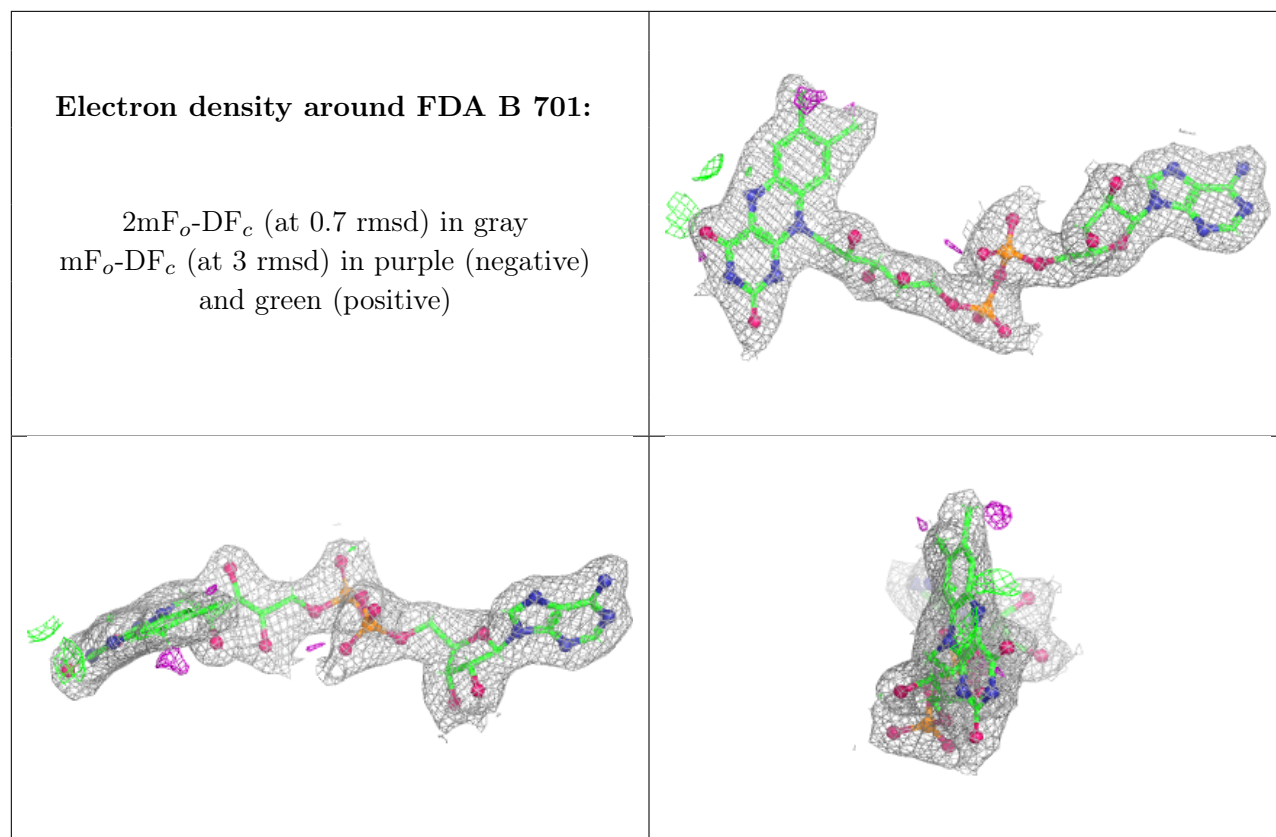
Electron density around FDA C 701:

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

**Electron density around FDA A 701:**

$2mF_o-DF_c$ (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.