Full wwPDB X-ray Structure Validation Report (i)

Mar 20, 2026 – 09:14 AM UTC

PDB ID	:	6Y71 / pdb_00006y71
Title	:	Pseudomonas stutzeri nitrous oxide reductase mutant, H130A
Authors	:	Zhang, L.; Kroneck, P.M.H.; Einsle, O.
Deposited on	:	2020-02-27
Resolution	:	1.64 Å(reported)

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

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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

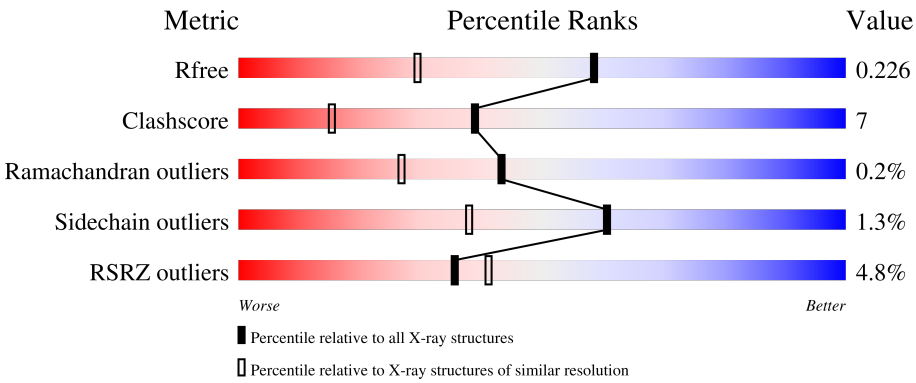
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal 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 (i)

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

The reported resolution of this entry is 1.64 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	1141 (1.64-1.64)
Clashscore	190562	1171 (1.64-1.64)
Ramachandran outliers	187476	1151 (1.64-1.64)
Sidechain outliers	187428	1150 (1.64-1.64)
RSRZ outliers	180081	1141 (1.64-1.64)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5% The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	646	2% 77% 13% 10%
1	B	646	6% 78% 12% • 9%

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
2	FMT	A	702	-	-	X	-
2	FMT	B	702	-	-	X	-
6	CL	B	705	-	-	X	-

2 Entry composition (i)

There are 8 unique types of molecules in this entry. The entry contains 10233 atoms, of which 6 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.

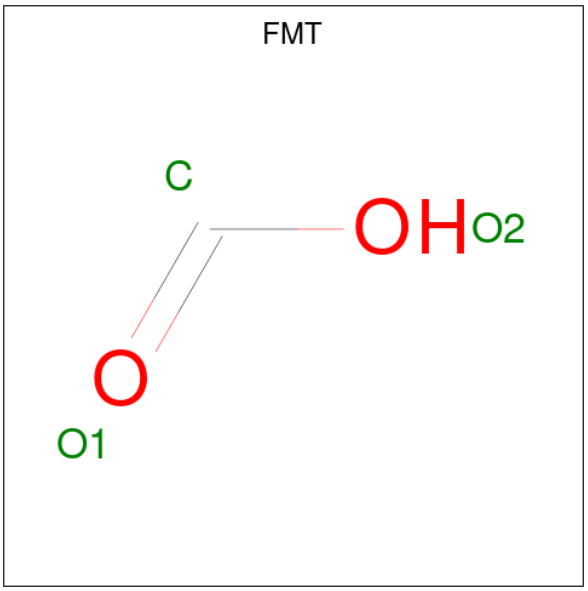
- Molecule 1 is a protein called Nitrous-oxide reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	584	4612	2918	790	872	32	0	5	0
1	B	588	4631	2931	796	872	32	0	1	0

There are 18 discrepancies between the modelled and reference sequences:

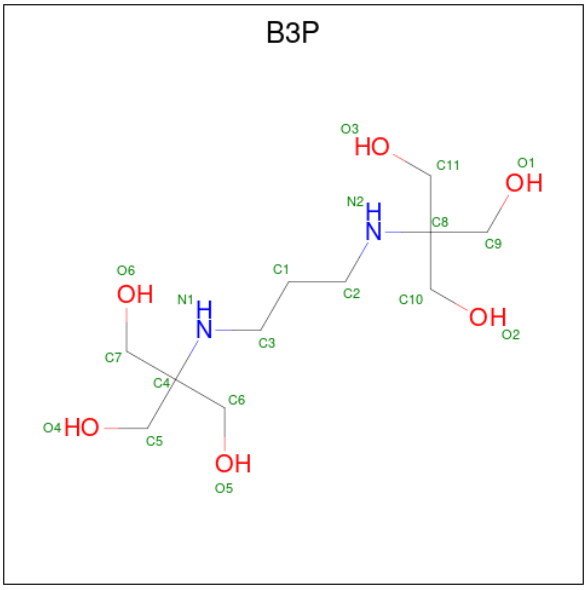
Chain	Residue	Modelled	Actual	Comment	Reference
A	130	ALA	HIS	engineered mutation	UNP P19573
A	639	TRP	-	expression tag	UNP P19573
A	640	SER	-	expression tag	UNP P19573
A	641	HIS	-	expression tag	UNP P19573
A	642	PRO	-	expression tag	UNP P19573
A	643	GLN	-	expression tag	UNP P19573
A	644	PHE	-	expression tag	UNP P19573
A	645	GLU	-	expression tag	UNP P19573
A	646	LYS	-	expression tag	UNP P19573
B	130	ALA	HIS	engineered mutation	UNP P19573
B	639	TRP	-	expression tag	UNP P19573
B	640	SER	-	expression tag	UNP P19573
B	641	HIS	-	expression tag	UNP P19573
B	642	PRO	-	expression tag	UNP P19573
B	643	GLN	-	expression tag	UNP P19573
B	644	PHE	-	expression tag	UNP P19573
B	645	GLU	-	expression tag	UNP P19573
B	646	LYS	-	expression tag	UNP P19573

- Molecule 2 is FORMIC ACID (CCD ID: FMT) (formula: CH_2O_2).



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

- Molecule 3 is 2-[3-(2-HYDROXY-1,1-DIHYDROXYMETHYL-ETHYLAMINO)-PROPYLAMINO]-2-HYDROXYMETHYL-PROPANE-1,3-DIOL (CCD ID: B3P) (formula: $C_{11}H_{26}N_2O_6$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
3	A	1	19	11	2	6	0	0
3	B	1	19	11	2	6	0	0

- Molecule 4 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Na		
4	A	1	1	1	0	0
4	B	1	1	1	0	0

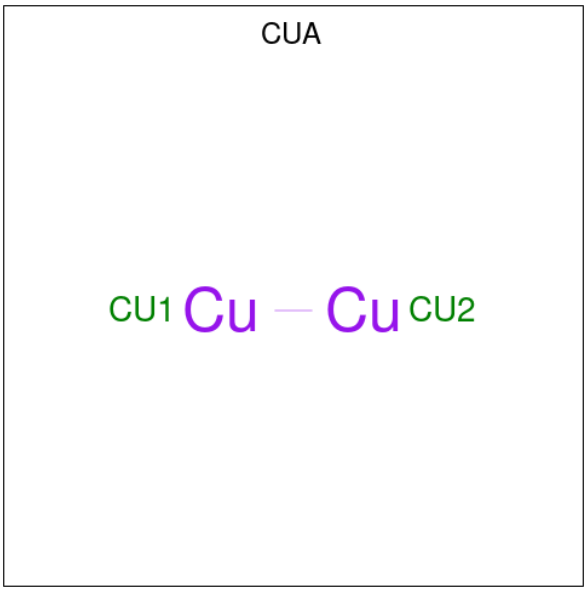
- Molecule 5 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Ca		
5	A	1	1	1	0	0
5	B	1	1	1	0	0

- Molecule 6 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Cl		
6	A	1	1	1	0	0
6	B	1	1	1	0	0

- Molecule 7 is DINUCLEAR COPPER ION (CCD ID: CUA) (formula: Cu_2) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	1	Total Cu 2 2	0	0
7	B	1	Total Cu 2 2	0	0

- Molecule 8 is water.

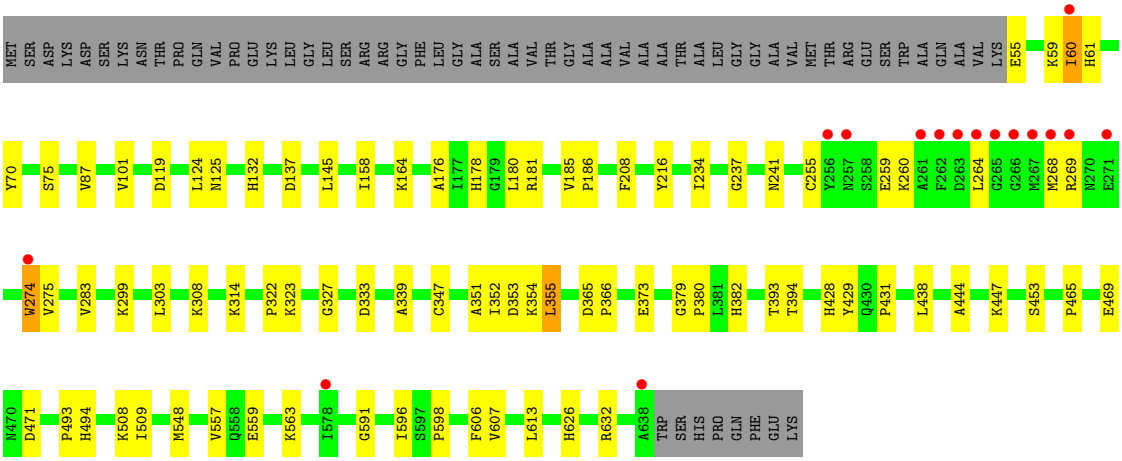
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	497	Total O 497 497	0	0
8	B	430	Total O 430 430	0	0

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.

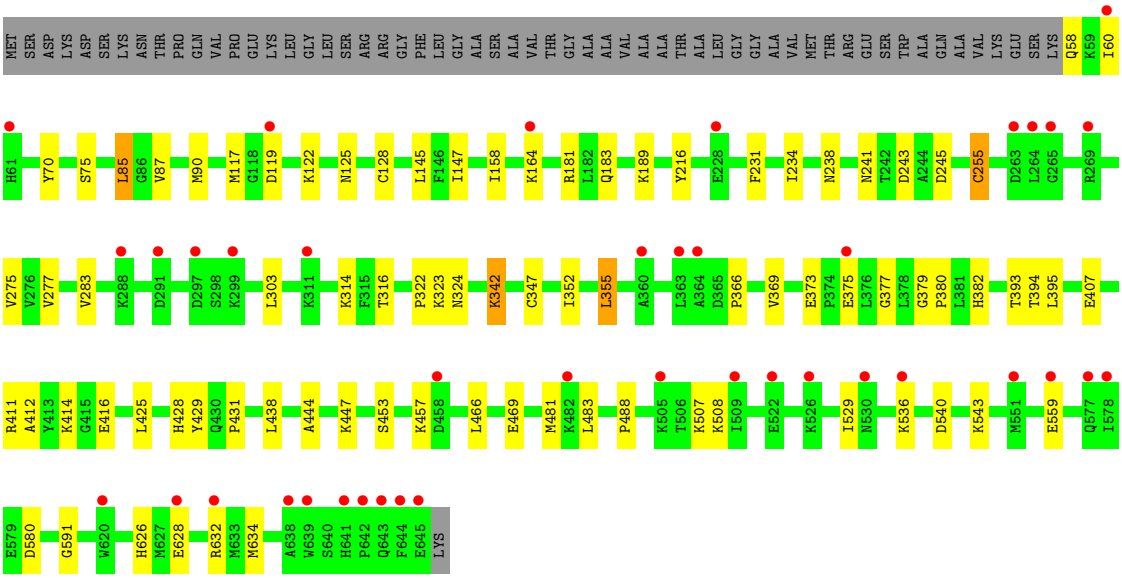
• Molecule 1: Nitrous-oxide reductase

Chain A:



• Molecule 1: Nitrous-oxide reductase

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	69.16Å 76.21Å 109.02Å 90.00° 93.21° 90.00°	Depositor
Resolution (Å)	76.21 – 1.64 76.21 – 1.64	Depositor EDS
% Data completeness (in resolution range)	73.5 (76.21-1.64) 65.1 (76.21-1.64)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.48 (at 1.63Å)	Xtriage
Refinement program	PHENIX 1.17.1-3660	Depositor
R, R_{free}	0.169 , 0.211 0.193 , 0.226	Depositor DCC
R_{free} test set	4480 reflections (3.23%)	wwPDB-VP
Wilson B-factor (Å^2)	21.5	Xtriage
Anisotropy	0.063	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.31 , 39.9	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	10233	wwPDB-VP
Average B, all atoms (Å^2)	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.22% of the height of the origin peak. No significant pseudotranslation is detected.*

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: CL, CA, FMT, NA, B3P, CUA

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	0.35	2/4738 (0.0%)	0.56	1/6415 (0.0%)
1	B	0.30	0/4750	0.52	0/6435
All	All	0.33	2/9488 (0.0%)	0.54	1/12850 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	274	TRP	C-O	-5.55	1.17	1.23
1	A	275	VAL	C-O	-5.07	1.18	1.24

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	275	VAL	N-CA-C	-5.45	99.90	107.80

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	4612	0	4495	62	0
1	B	4631	0	4492	64	0
2	A	6	4	2	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	3	2	1	2	0
3	A	19	0	26	1	0
3	B	19	0	26	3	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
6	A	1	0	0	1	0
6	B	1	0	0	2	0
7	A	2	0	0	0	0
7	B	2	0	0	0	0
8	A	497	0	0	13	2
8	B	430	0	0	18	3
All	All	10227	6	9042	125	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 7.

All (125) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:563:LYS:NZ	8:A:801:HOH:O	1.95	1.00
1:A:119:ASP:HB2	8:A:1159:HOH:O	1.74	0.88
1:B:241:ASN:ND2	6:B:705:CL:CL	2.43	0.88
1:A:308:LYS:NZ	8:A:802:HOH:O	2.06	0.87
1:A:352:ILE:HA	1:A:355:LEU:HD22	1.57	0.85
1:B:117:MET:HE1	8:B:1145:HOH:O	1.80	0.82
1:B:283:VAL:HG13	1:B:303:LEU:HD13	1.63	0.79
3:B:701:B3P:HN2	2:B:702:FMT:H	1.49	0.78
1:A:260:LYS:HD3	8:A:822:HOH:O	1.88	0.74
1:A:241:ASN:ND2	6:A:706:CL:CL	2.53	0.73
1:B:529:ILE:HD13	1:B:536:LYS:HE3	1.70	0.72
3:A:703:B3P:O6	3:A:703:B3P:H32	1.91	0.70
1:A:60:ILE:HG22	8:A:1075:HOH:O	1.91	0.70
1:A:283:VAL:HG13	1:A:303:LEU:HD13	1.78	0.65
1:B:632:ARG:HD3	8:B:801:HOH:O	1.97	0.65
1:A:137[A]:ASP:OD1	8:A:804:HOH:O	2.14	0.65
1:A:178:HIS:HB3	8:A:953:HOH:O	1.95	0.65
1:B:90:MET:HE2	8:B:1106:HOH:O	1.96	0.65
1:A:208:PHE:CD1	1:B:634:MET:HG3	2.32	0.64
1:A:333:ASP:HB3	8:A:891:HOH:O	1.97	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:507:LYS:HE3	8:B:942:HOH:O	1.96	0.64
1:B:164:LYS:HE3	8:B:1047:HOH:O	1.97	0.64
1:B:407:GLU:HB3	8:B:1012:HOH:O	1.99	0.62
1:B:58:GLN:O	1:B:60:ILE:HG13	1.99	0.62
1:B:90:MET:HG3	8:B:1106:HOH:O	2.00	0.61
1:B:466:LEU:HD12	8:B:1004:HOH:O	2.00	0.61
1:B:352:ILE:HA	1:B:355:LEU:HD22	1.83	0.61
1:A:101:VAL:HG21	1:A:124:LEU:HD22	1.83	0.61
1:A:55:GLU:N	8:A:811:HOH:O	2.32	0.60
1:B:407:GLU:HG2	8:B:990:HOH:O	2.03	0.59
1:A:70:TYR:OH	1:A:447[B]:LYS:HE3	2.03	0.59
1:A:509:ILE:HD12	1:A:598:PRO:HB2	1.83	0.59
1:B:429:TYR:CD1	1:B:457:LYS:HD2	2.38	0.58
1:B:181:ARG:HG2	1:B:243:ASP:HA	1.86	0.58
1:B:119:ASP:HB2	8:B:832:HOH:O	2.02	0.57
1:B:529:ILE:CD1	1:B:536:LYS:HE3	2.35	0.57
1:A:508:LYS:HD2	8:A:808:HOH:O	2.05	0.57
1:B:145:LEU:HD22	1:B:158:ILE:HD12	1.86	0.56
1:A:255:CYS:HB3	1:A:274:TRP:CD1	2.41	0.56
1:B:238:ASN:O	1:B:255:CYS:HB2	2.06	0.56
1:B:559:GLU:OE2	1:B:632:ARG:NH2	2.38	0.56
1:B:379:GLY:N	1:B:380:PRO:HD3	2.21	0.56
1:A:145:LEU:HD22	1:A:158[A]:ILE:HD12	1.88	0.55
1:B:428:HIS:HA	1:B:429:TYR:CG	2.42	0.54
1:A:237:GLY:H	1:A:260:LYS:HE3	1.72	0.54
3:B:701:B3P:O1	3:B:701:B3P:H22	2.09	0.53
1:A:379:GLY:N	1:A:380:PRO:HD3	2.25	0.51
1:A:606:PHE:HA	2:A:702:FMT:H	1.91	0.51
1:B:347:CYS:O	1:B:373:GLU:HA	2.10	0.51
1:A:380:PRO:HA	1:A:394:THR:O	2.10	0.51
1:A:264:LEU:HG	1:A:268:MET:HE2	1.93	0.50
1:B:380:PRO:HA	1:B:394:THR:O	2.11	0.50
1:B:425:LEU:HB2	1:B:481:MET:HE3	1.93	0.49
1:B:128:CYS:HB3	1:B:147:ILE:HD11	1.94	0.49
1:A:314:LYS:HG3	1:A:314:LYS:O	2.12	0.49
1:A:61:HIS:HE1	8:B:1083:HOH:O	1.95	0.48
1:B:314:LYS:HZ3	1:B:314:LYS:HB2	1.78	0.48
1:B:559:GLU:OE2	1:B:632:ARG:NH1	2.47	0.48
1:B:216:TYR:CD1	1:B:234:ILE:HG23	2.48	0.48
1:A:365:ASP:OD1	1:A:366:PRO:HD2	2.12	0.48
1:A:164:LYS:HE2	8:A:1070:HOH:O	2.14	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:122:LYS:NZ	8:B:818:HOH:O	2.47	0.48
1:A:259:GLU:HG2	1:A:269:ARG:HB3	1.94	0.47
1:B:431:PRO:HA	1:B:453:SER:HA	1.95	0.47
1:A:606:PHE:HA	2:A:702:FMT:C	2.44	0.47
1:B:145:LEU:C	1:B:145:LEU:HD23	2.40	0.47
1:A:70:TYR:HB2	1:A:87:VAL:HB	1.96	0.47
1:A:548:MET:HE2	1:A:557:VAL:HB	1.97	0.47
1:B:314:LYS:HB2	1:B:314:LYS:NZ	2.30	0.46
1:B:366:PRO:O	1:B:369:VAL:HG22	2.15	0.46
1:A:428:HIS:HA	1:A:429:TYR:CG	2.51	0.46
1:B:324:ASN:O	1:B:342:LYS:HE2	2.15	0.46
1:B:543:LYS:HD2	8:B:1196:HOH:O	2.16	0.46
1:B:70:TYR:HB2	1:B:87:VAL:HB	1.98	0.46
1:A:465:PRO:HD2	8:B:1027:HOH:O	2.15	0.45
1:B:382:HIS:O	1:B:393:THR:HA	2.17	0.45
1:A:264:LEU:HD13	1:B:628:GLU:HB2	1.99	0.45
1:B:508:LYS:NZ	1:B:580:ASP:OD1	2.44	0.45
1:A:59:LYS:O	1:A:59:LYS:HG3	2.17	0.45
1:B:245:ASP:OD1	1:B:245:ASP:C	2.59	0.45
1:A:308:LYS:HG2	8:A:820:HOH:O	2.17	0.44
1:A:322:PRO:HA	1:A:323:LYS:HA	1.88	0.44
1:A:353[B]:ASP:OD1	1:A:354:LYS:HG3	2.17	0.44
1:B:412:ALA:HA	1:B:416:GLU:O	2.18	0.44
1:A:431:PRO:HA	1:A:453:SER:HA	1.99	0.44
1:A:613:LEU:HD11	1:A:632:ARG:HG2	2.00	0.44
1:B:231:PHE:CE1	1:B:283:VAL:HG11	2.53	0.44
1:B:322:PRO:HA	1:B:323:LYS:HA	1.84	0.44
1:B:508:LYS:HD3	1:B:508:LYS:HA	1.89	0.44
1:A:509:ILE:CD1	1:A:598:PRO:HB2	2.48	0.43
1:B:529:ILE:HD13	1:B:536:LYS:CE	2.45	0.43
1:A:438:LEU:HB2	1:A:444:ALA:HA	1.99	0.43
3:B:701:B3P:N2	2:B:702:FMT:H	2.27	0.43
1:A:185:VAL:HG13	1:A:186:PRO:HA	2.00	0.43
1:B:119:ASP:CB	8:B:832:HOH:O	2.65	0.43
1:A:59:LYS:O	8:A:805:HOH:O	2.21	0.43
1:A:299:LYS:N	1:A:299:LYS:HD3	2.34	0.43
1:A:379:GLY:H	1:A:380:PRO:HD3	1.84	0.43
1:B:469:GLU:O	1:B:488:PRO:HA	2.19	0.43
1:B:85:LEU:HD23	1:B:85:LEU:N	2.34	0.43
1:A:180:LEU:C	1:A:180:LEU:HD23	2.43	0.42
1:A:493:PRO:O	1:A:494:HIS:HB3	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:277:VAL:O	1:B:316:THR:HA	2.19	0.42
1:A:216:TYR:CD1	1:A:234:ILE:HG23	2.53	0.42
1:B:377:GLY:HA3	1:B:395:LEU:HD13	2.01	0.42
1:B:414:LYS:HE3	8:B:903:HOH:O	2.20	0.42
1:B:540:ASP:OD1	8:B:802:HOH:O	2.21	0.42
1:A:208:PHE:CD1	1:B:634:MET:CG	3.03	0.42
1:B:447:LYS:HG3	8:B:1017:HOH:O	2.19	0.41
1:B:559:GLU:HA	1:B:632:ARG:O	2.20	0.41
1:A:327:GLY:O	1:A:339:ALA:HA	2.21	0.41
1:A:559:GLU:HA	1:A:632:ARG:O	2.20	0.41
1:A:75:SER:O	1:A:493:PRO:HB3	2.21	0.41
1:A:591:GLY:HA2	1:B:125:ASN:OD1	2.21	0.41
1:A:308:LYS:HA	1:A:308:LYS:HD3	1.81	0.41
1:A:125:ASN:OD1	1:B:591:GLY:HA2	2.21	0.41
1:A:351:ALA:HB1	1:A:353[B]:ASP:OD1	2.21	0.41
1:B:438:LEU:HB2	1:B:444:ALA:HA	2.03	0.41
1:A:132:HIS:CE1	1:A:181:ARG:HD2	2.56	0.41
1:A:347:CYS:O	1:A:373:GLU:HA	2.20	0.41
1:B:183:GLN:OE1	1:B:189:LYS:HB3	2.20	0.41
1:B:407:GLU:O	1:B:411:ARG:HG3	2.21	0.41
1:B:181:ARG:NH1	6:B:705:CL:CL	2.91	0.40
1:A:469:GLU:OE1	1:A:471:ASP:OD1	2.40	0.40
1:A:382:HIS:O	1:A:393:THR:HA	2.21	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)
8:A:1282:HOH:O	8:B:802:HOH:O[1_455]	1.83	0.37
8:A:1276:HOH:O	8:B:1098:HOH:O[1_455]	2.09	0.11
8:B:1148:HOH:O	8:B:1208:HOH:O[2_655]	2.16	0.04

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	587/646 (91%)	563 (96%)	23 (4%)	1 (0%)	43	27
1	B	587/646 (91%)	564 (96%)	22 (4%)	1 (0%)	43	27
All	All	1174/1292 (91%)	1127 (96%)	45 (4%)	2 (0%)	43	27

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	342	LYS
1	A	176	ALA

5.3.2 Protein sidechains (i)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	503/544 (92%)	498 (99%)	5 (1%)	68	49
1	B	503/544 (92%)	495 (98%)	8 (2%)	55	30
All	All	1006/1088 (92%)	993 (99%)	13 (1%)	61	38

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	60	ILE
1	A	355	LEU
1	A	596	ILE
1	A	607	VAL
1	A	626	HIS
1	B	75	SER
1	B	85	LEU
1	B	255	CYS
1	B	275	VAL
1	B	355	LEU
1	B	375	GLU

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Mol	Chain	Res	Type
1	B	483	LEU
1	B	626	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	111	ASN
1	A	178	HIS
1	A	270	ASN
1	A	390	ASN
1	A	599	GLN
1	B	115	HIS
1	B	530	ASN
1	B	599	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)

Of 13 ligands modelled in this entry, 6 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	$\#\|Z\| > 2$
7	CUA	B	706	1	0,1,1	-	-	-		
2	FMT	A	702	-	2,2,2	0.71	0	1,1,1	0.43	0
7	CUA	A	707	1	0,1,1	-	-	-		
3	B3P	B	701	-	18,18,18	0.84	0	23,23,23	0.85	1 (4%)
2	FMT	A	701	-	2,2,2	0.73	0	1,1,1	0.44	0
3	B3P	A	703	-	18,18,18	0.90	0	23,23,23	0.75	0
2	FMT	B	702	-	2,2,2	0.74	0	1,1,1	0.36	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	B3P	A	703	-	-	0/28/28/28	-
3	B3P	B	701	-	-	1/28/28/28	-

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	B	701	B3P	O3-C11-C8	-2.10	107.40	111.68

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	701	B3P	C11-C8-N2-C2

There are no ring outliers.

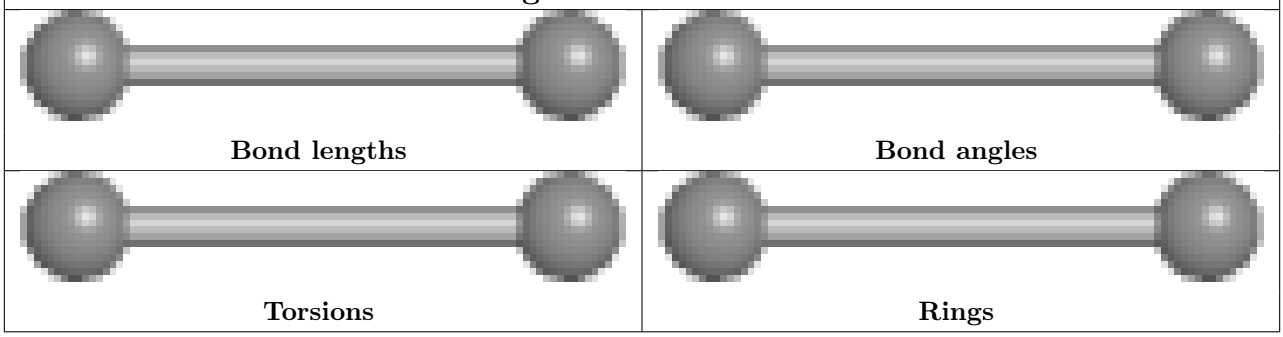
4 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	702	FMT	2	0
3	B	701	B3P	3	0
3	A	703	B3P	1	0
2	B	702	FMT	2	0

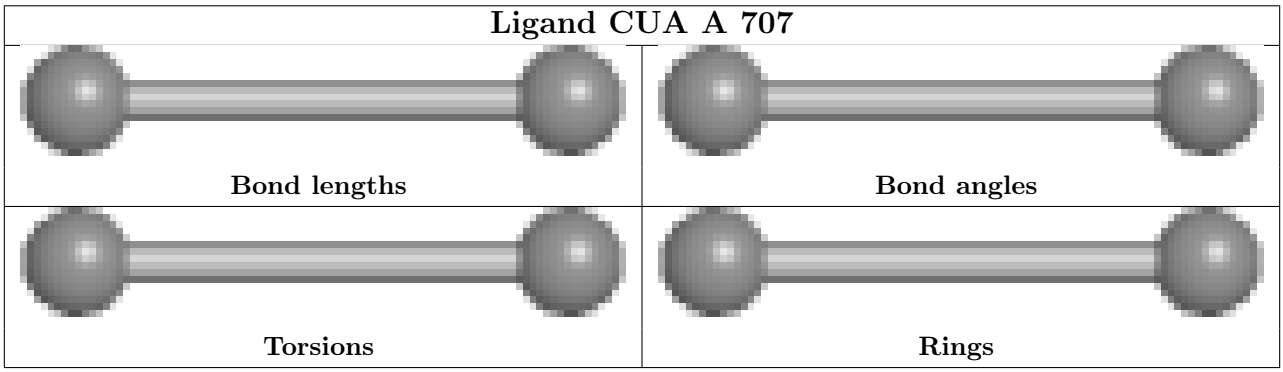
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In

addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

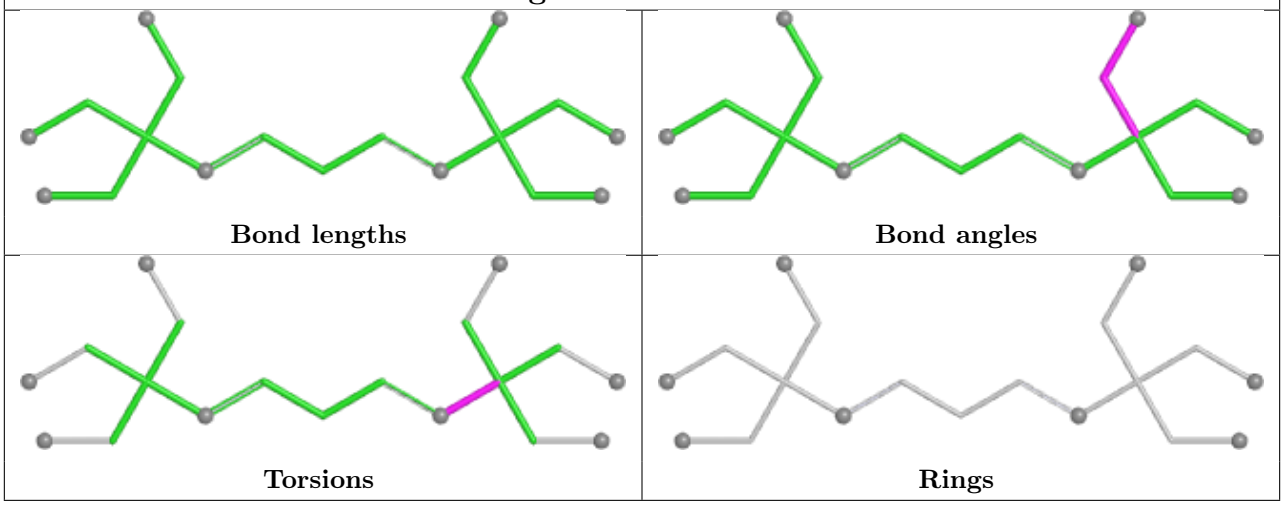
Ligand CUA B 706



Ligand CUA A 707



Ligand B3P B 701



5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data (i)

6.1 Protein, DNA and RNA chains (i)

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	A	584/646 (90%)	-0.11	16 (2%)	56	61	8, 22, 47, 74	5 (0%)
1	B	588/646 (91%)	0.48	40 (6%)	23	26	11, 26, 46, 73	1 (0%)
All	All	1172/1292 (90%)	0.19	56 (4%)	35	41	8, 24, 47, 74	6 (0%)

All (56) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	266	GLY	6.5
1	A	262	PHE	5.2
1	B	644	PHE	5.0
1	A	638	ALA	4.6
1	A	265	GLY	4.5
1	B	645	GLU	4.5
1	B	642	PRO	4.4
1	A	264	LEU	4.3
1	A	263	ASP	4.3
1	B	363	LEU	4.3
1	A	60	ILE	3.9
1	B	61	HIS	3.7
1	B	458	ASP	3.6
1	B	119	ASP	3.6
1	B	632	ARG	3.5
1	B	522	GLU	3.3
1	B	505	LYS	3.2
1	B	269	ARG	3.1
1	B	551	MET	3.1
1	B	641	HIS	3.0
1	B	628	GLU	3.0
1	A	274	TRP	3.0
1	B	530	ASN	2.9
1	A	261	ALA	2.8

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Mol	Chain	Res	Type	RSRZ
1	B	364	ALA	2.8
1	B	578	ILE	2.8
1	B	375	GLU	2.8
1	A	257	ASN	2.8
1	B	620	TRP	2.7
1	B	288	LYS	2.7
1	B	164	LYS	2.6
1	B	264	LEU	2.6
1	A	271	GLU	2.6
1	B	577	GLN	2.5
1	B	291	ASP	2.5
1	A	578	ILE	2.5
1	A	256	TYR	2.4
1	B	360	ALA	2.4
1	A	268	MET	2.4
1	B	559	GLU	2.3
1	B	299	LYS	2.3
1	B	526	LYS	2.3
1	B	60	ILE	2.3
1	B	639	TRP	2.3
1	B	482	LYS	2.3
1	B	263	ASP	2.3
1	B	228	GLU	2.2
1	B	311	LYS	2.2
1	B	297	ASP	2.2
1	A	269	ARG	2.2
1	A	267	MET	2.2
1	B	536	LYS	2.2
1	B	509	ILE	2.1
1	B	265	GLY	2.1
1	B	638	ALA	2.1
1	B	643	GLN	2.0

6.2 Non-standard residues in protein, DNA, RNA chains (i)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates (i)

There are no oligosaccharides in this entry.

6.4 Ligands (i)

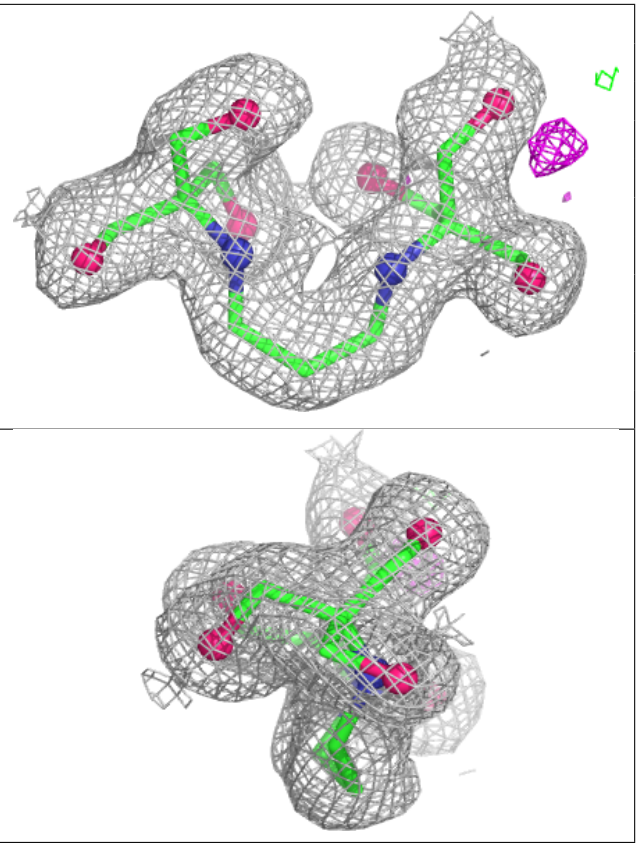
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	FMT	A	702	3/3	0.76	0.20	23,40,49,53	0
2	FMT	A	701	3/3	0.77	0.12	41,43,50,56	0
4	NA	B	703	1/1	0.80	0.17	21,21,21,21	1
2	FMT	B	702	3/3	0.82	0.14	21,22,34,41	0
4	NA	A	704	1/1	0.88	0.15	16,16,16,16	1
3	B3P	A	703	19/19	0.89	0.10	18,28,32,33	0
3	B3P	B	701	19/19	0.91	0.08	16,24,27,29	0
7	CUA	A	707	2/2	0.94	0.10	35,35,35,44	0
7	CUA	B	706	2/2	0.94	0.09	35,35,35,44	0
6	CL	B	705	1/1	0.96	0.09	29,29,29,29	1
5	CA	A	705	1/1	0.96	0.11	18,18,18,18	1
5	CA	B	704	1/1	0.96	0.19	22,22,22,22	1
6	CL	A	706	1/1	0.97	0.04	19,19,19,19	1

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.

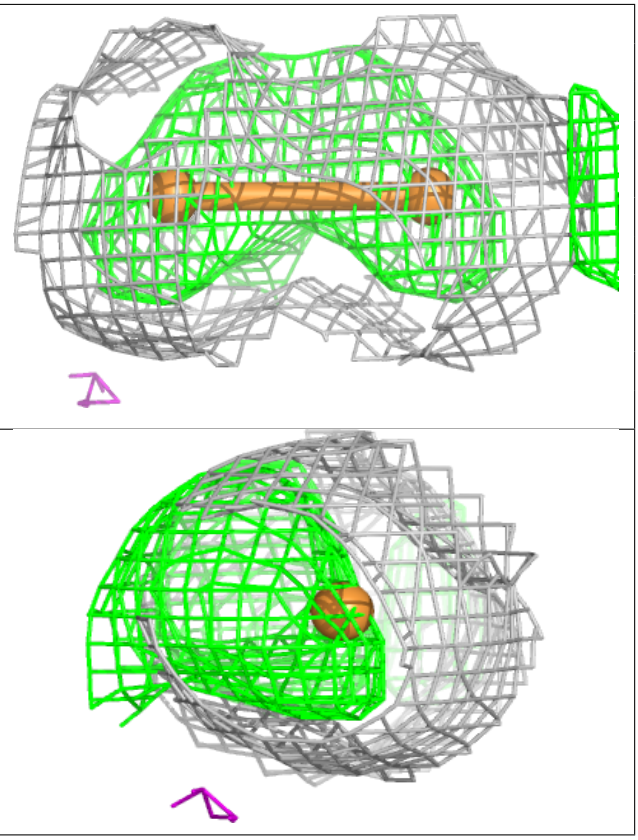
Electron density around B3P B 701:

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



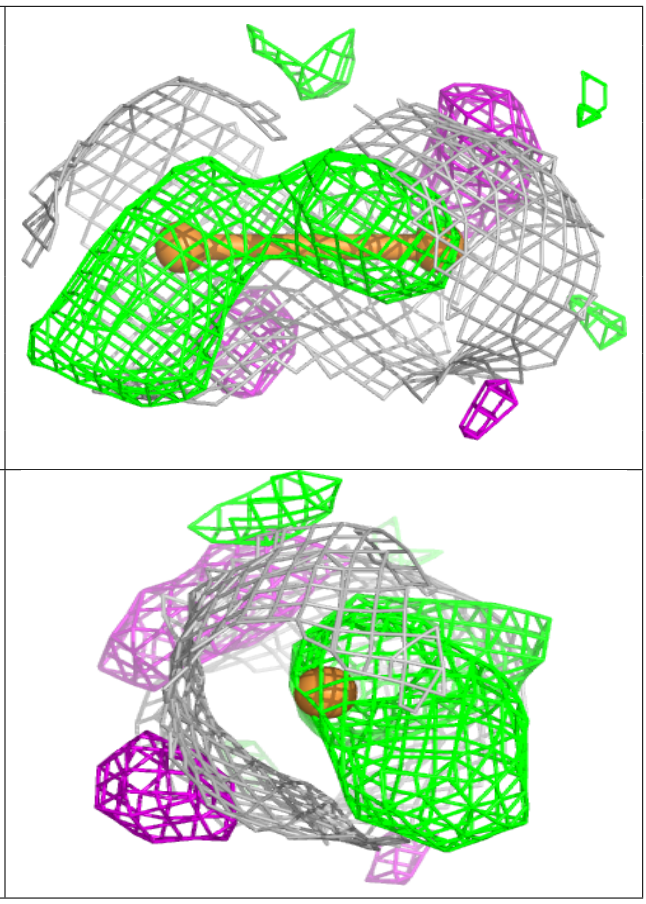
Electron density around CUA A 707:

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



Electron density around CUA B 706:

$2mF_o$-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.