



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 11:16 PM UTC

PDB ID : 7AQ5 / pdb\_00007aq5  
Title : Pseudomonas stutzeri nitrous oxide reductase mutant, H583N  
Authors : Zhang, L.; Bill, E.; Kroneck, P.M.H.; Einsle, O.  
Deposited on : 2020-10-20  
Resolution : 1.70 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](mailto: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>.

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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

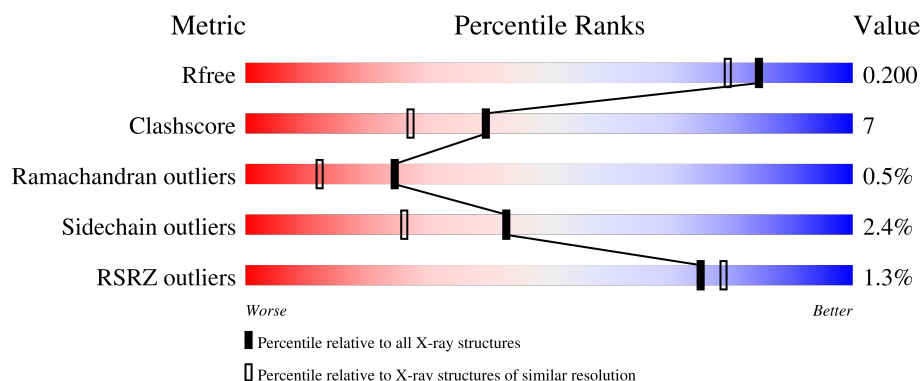
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

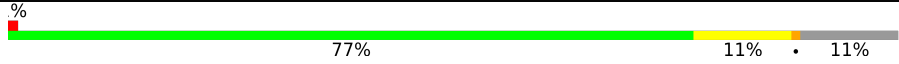

The reported resolution of this entry is 1.70 Å.

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	5551 (1.70-1.70)
Clashscore	190562	5924 (1.70-1.70)
Ramachandran outliers	187476	5846 (1.70-1.70)
Sidechain outliers	187428	5846 (1.70-1.70)
RSRZ outliers	180081	5554 (1.70-1.70)

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  $\geq 3$ , 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	646	
1	B	646	

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
5	FMT	B	705	-	-	X	-
5	FMT	B	706	-	-	X	-
9	TRS	A	710	-	X	-	-

## 2 Entry composition

There are 12 unique types of molecules in this entry. The entry contains 9942 atoms, of which 12 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.

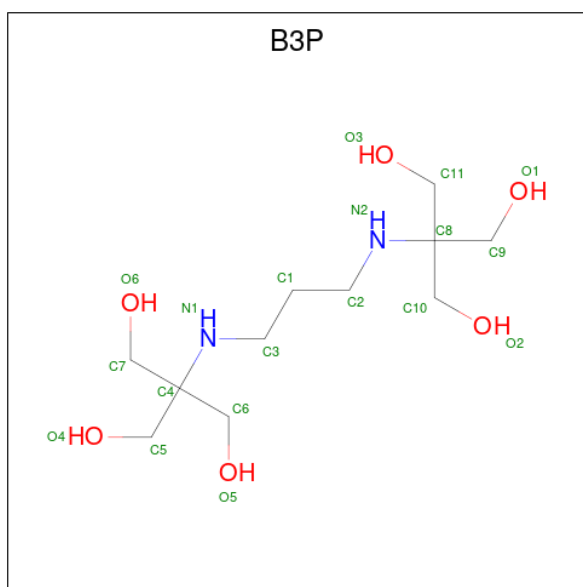
- Molecule 1 is a protein called Nitrous-oxide reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	573	Total	C	N	O	S	0	5	0
			4527	2864	776	856	31			
1	B	586	Total	C	N	O	S	0	2	0
			4619	2921	795	871	32			

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	583	ASN	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	583	ASN	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 2-[3-(2-HYDROXY-1,1-DIHYDROXYMETHYL-ETHYLAMINO)-PROPYLAMINO]-2-HYDROXYMETHYL-PROPANE-1,3-DIOL (CCD ID: B3P) (formula: C<sub>11</sub>H<sub>26</sub>N<sub>2</sub>O<sub>6</sub>).



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

- Molecule 3 is SODIUM ION (CCD ID: NA) (formula: Na).

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

- Molecule 4 is CALCIUM ION (CCD ID: CA) (formula: Ca).

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

- Molecule 5 is FORMIC ACID (CCD ID: FMT) (formula: CH<sub>2</sub>O<sub>2</sub>).

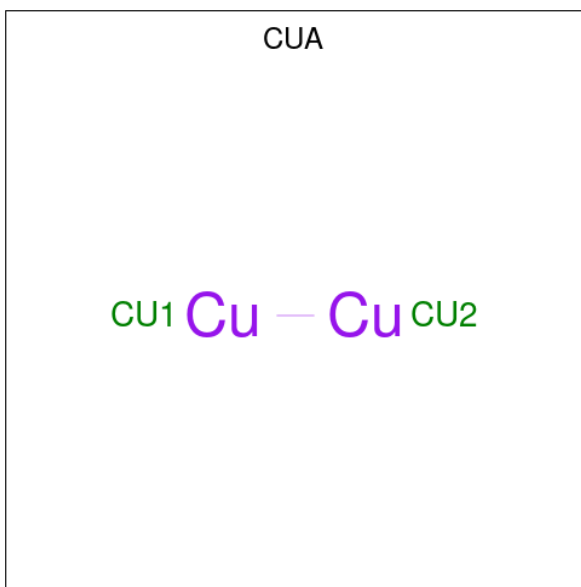


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			3	1	2		
5	A	1	Total	C	O	0	0
			3	1	2		
5	B	1	Total	C	O	0	0
			3	1	2		
5	B	1	Total	C	O	0	0
			3	1	2		

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

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	2	Total	Cl	0	0
			2	2		
6	B	1	Total	Cl	0	0
			1	1		

- Molecule 7 is DINUCLEAR COPPER ION (CCD ID: CUA) (formula: Cu<sub>2</sub>) (labeled as "Ligand of Interest" by depositor).

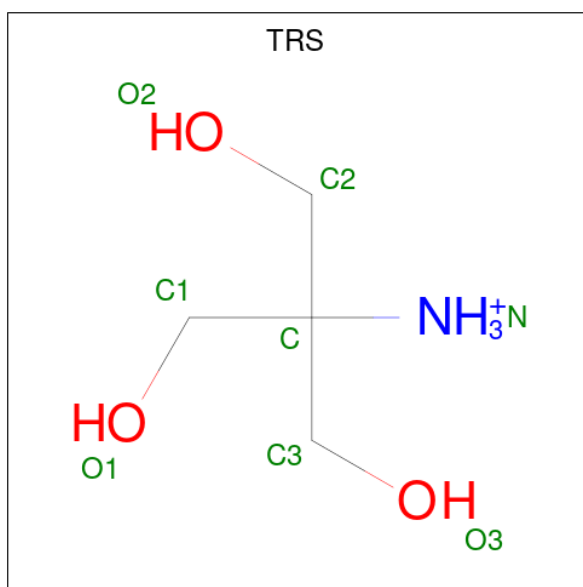


Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	1	Total	Cu	0	0
			2	2		
7	B	1	Total	Cu	0	0
			2	2		

- Molecule 8 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	2	Total	Zn	0	0
			2	2		

- Molecule 9 is 2-AMINO-2-HYDROXYMETHYL-PROPANE-1,3-DIOL (CCD ID: TRS) (formula: C<sub>4</sub>H<sub>12</sub>NO<sub>3</sub>).

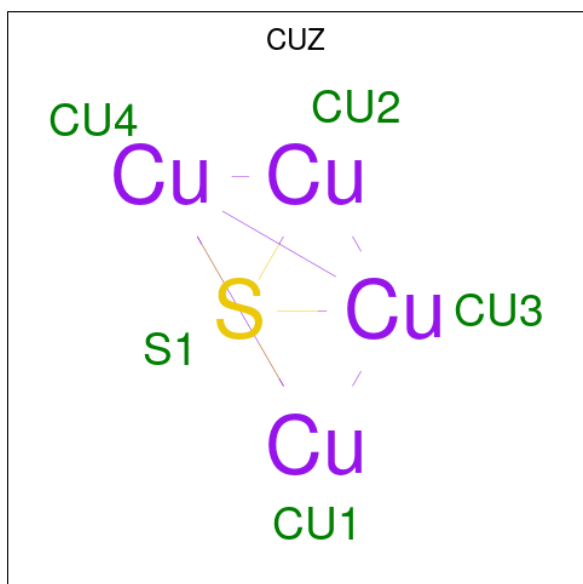


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
9	A	1	Total	C	H	N	O	0	0
			20	4	12	1	3		

- Molecule 10 is POTASSIUM ION (CCD ID: K) (formula: K).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	B	1	Total	K	0	0
			1	1		

- Molecule 11 is (MU-4-SULFIDO)-TETRA-NUCLEAR COPPER ION (CCD ID: CUZ) (formula: Cu<sub>4</sub>S) (labeled as "Ligand of Interest" by depositor).





Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
11	B	1	Total	Cu	S	0	0
			5	4	1		

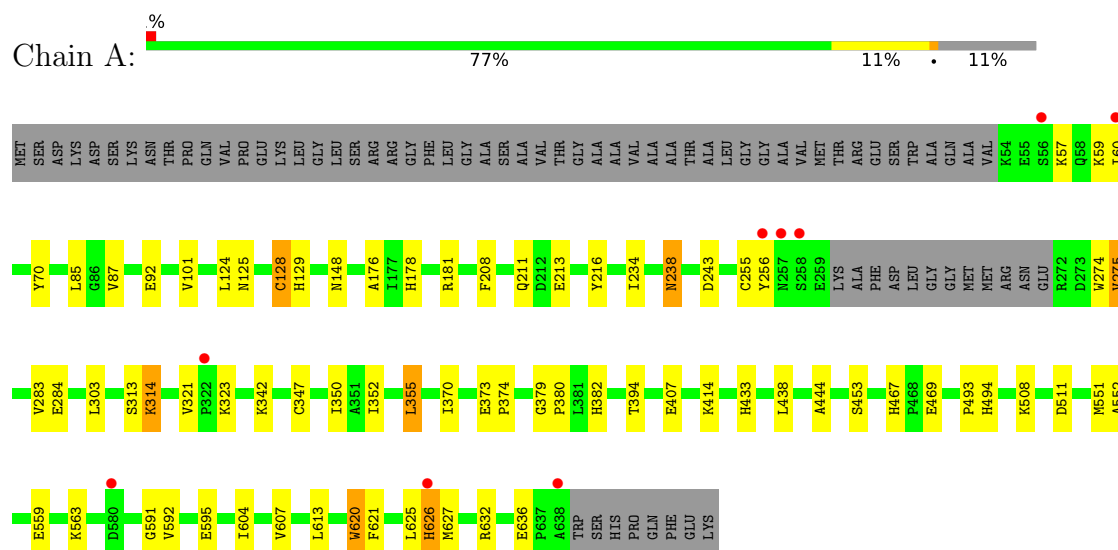
- Molecule 12 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
12	A	402	Total	O	0	0
			402	402		
12	B	305	Total	O	0	0
			305	305		

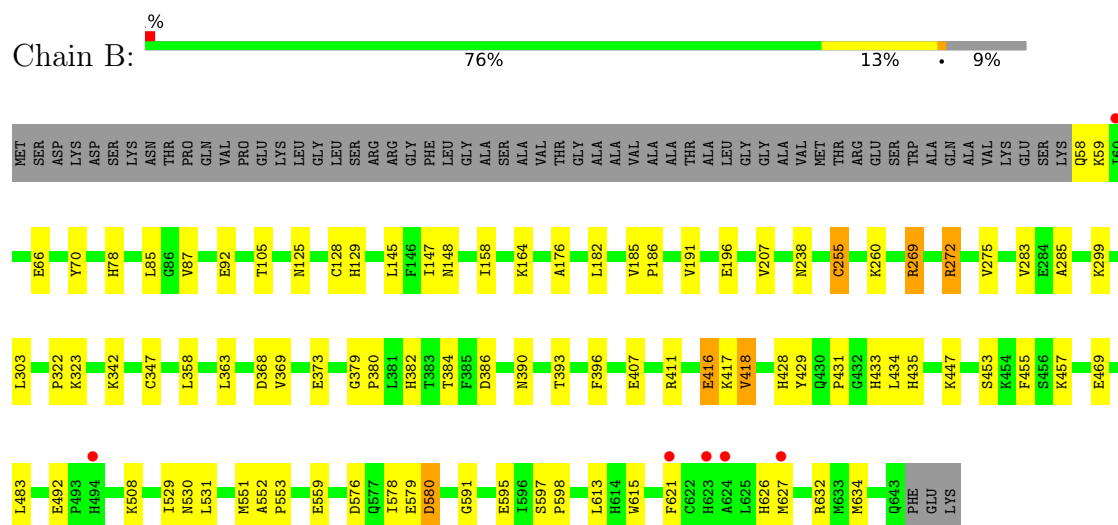
### 3 Residue-property plots [i](#)

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



#### • Molecule 1: Nitrous-oxide reductase



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	69.29Å 76.45Å 109.48Å 90.00° 93.38° 90.00°	Depositor
Resolution (Å)	62.65 – 1.70 62.65 – 1.70	Depositor EDS
% Data completeness (in resolution range)	78.0 (62.65-1.70) 78.1 (62.65-1.70)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.15 (at 1.70Å)	Xtriage
Refinement program	PHENIX 1.13_2998	Depositor
R, $R_{free}$	0.161 , 0.199 0.163 , 0.200	Depositor DCC
$R_{free}$ test set	4848 reflections (3.86%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	31.7	Xtriage
Anisotropy	0.035	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 50.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	9942	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	39.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.23% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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 ⓘ

### 5.1 Standard geometry ⓘ

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

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	0.55	2/4651 (0.0%)	0.62	3/6298 (0.0%)
1	B	0.38	0/4740	0.58	0/6422
All	All	0.47	2/9391 (0.0%)	0.60	3/12720 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	626	HIS	C-N	23.03	1.64	1.34
1	A	625	LEU	C-N	-7.19	1.25	1.33

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	625	LEU	O-C-N	5.03	128.68	122.19
1	A	323	LYS	CA-C-N	-5.00	118.30	123.10
1	A	323	LYS	C-N-CA	-5.00	118.30	123.10

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	4527	0	4412	52	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	4619	0	4482	75	0
2	A	19	0	26	1	0
2	B	19	0	26	2	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
5	A	6	0	2	0	0
5	B	6	0	2	5	0
6	A	2	0	0	0	0
6	B	1	0	0	0	0
7	A	2	0	0	0	0
7	B	2	0	0	0	0
8	A	2	0	0	0	0
9	A	8	12	12	0	0
10	B	1	0	0	0	0
11	B	5	0	0	0	0
12	A	402	0	0	4	0
12	B	305	0	0	12	0
All	All	9930	12	8962	122	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 7.

All (122) 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:B:411:ARG:NH1	12:B:801:HOH:O	2.05	0.84
1:B:559:GLU:HG3	1:B:634:MET:HE1	1.60	0.84
1:B:469:GLU:HG3	1:B:492:GLU:HA	1.60	0.82
1:A:467:HIS:NE2	1:B:508:LYS:HD2	2.04	0.73
1:B:632:ARG:HD3	12:B:803:HOH:O	1.88	0.73
1:A:352:ILE:HA	1:A:355:LEU:HD22	1.70	0.73
1:B:580:ASP:OD2	12:B:802:HOH:O	2.08	0.72
1:B:559:GLU:HG3	1:B:634:MET:CE	2.20	0.71
1:B:260:LYS:HE2	12:B:848:HOH:O	1.91	0.70
1:A:313:SER:O	1:A:314:LYS:HB3	1.91	0.69
2:B:701:B3P:HN2	5:B:706:FMT:H	1.60	0.67
1:B:416:GLU:O	1:B:418:VAL:HG12	1.95	0.65
1:A:208:PHE:CD1	1:B:634:MET:HG2	2.33	0.64
1:A:85:LEU:HD22	1:A:92:GLU:HA	1.80	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:145:LEU:HD22	1:B:158:ILE:HD12	1.81	0.62
1:B:559:GLU:CG	1:B:634:MET:HE1	2.30	0.61
1:B:508:LYS:HG3	1:B:579:GLU:HB3	1.83	0.60
1:A:284:GLU:OE2	12:A:801:HOH:O	2.16	0.60
1:B:508:LYS:HG2	1:B:579:GLU:CD	2.27	0.60
1:A:632:ARG:HD3	12:A:862:HOH:O	2.01	0.60
1:B:269:ARG:CG	1:B:269:ARG:HH21	2.15	0.59
1:A:313:SER:O	1:A:314:LYS:CB	2.50	0.58
2:B:701:B3P:N2	5:B:706:FMT:H	2.17	0.58
1:A:59:LYS:HD2	1:A:59:LYS:O	2.03	0.58
1:A:433:HIS:HB2	1:A:494:HIS:O	2.04	0.57
1:A:101:VAL:HG21	1:A:124:LEU:HD22	1.86	0.57
1:B:417:LYS:N	1:B:417:LYS:HD3	2.20	0.56
1:B:508:LYS:NZ	12:B:810:HOH:O	2.37	0.56
1:B:59:LYS:NZ	1:B:66:GLU:OE1	2.35	0.56
2:A:701:B3P:H32	2:A:701:B3P:O6	2.07	0.55
1:A:128:CYS:HB3	1:A:148:ASN:O	2.06	0.55
1:A:508:LYS:HE3	12:B:828:HOH:O	2.07	0.54
1:B:269:ARG:HH21	1:B:269:ARG:HG3	1.72	0.54
1:B:299:LYS:NZ	1:B:299:LYS:HB2	2.24	0.53
1:A:563:LYS:HE2	1:A:636:GLU:OE1	2.09	0.53
1:B:578:ILE:HG22	1:B:579:GLU:O	2.09	0.52
1:A:255[A]:CYS:HB3	1:A:274:TRP:CD1	2.45	0.52
1:B:182:LEU:HD22	1:B:191:VAL:HG22	1.91	0.52
1:B:85:LEU:HD22	1:B:92:GLU:HA	1.92	0.51
1:B:164:LYS:HE2	12:B:994:HOH:O	2.08	0.51
1:A:178:HIS:NE2	1:B:627:MET:HE1	2.25	0.51
1:A:275:VAL:CG1	1:A:321:VAL:HG21	2.40	0.51
1:B:615:TRP:CH2	1:B:632:ARG:HD2	2.45	0.51
1:A:382:HIS:CE1	1:A:433:HIS:CE1	2.98	0.51
1:B:272:ARG:NH1	12:B:809:HOH:O	2.44	0.50
1:A:70:TYR:HB2	1:A:87:VAL:HB	1.93	0.50
1:B:358:LEU:HD22	1:B:369:VAL:HG11	1.92	0.50
1:A:129:HIS:HB3	1:A:494:HIS:HD2	1.75	0.50
1:B:382:HIS:CE1	1:B:433:HIS:CE1	3.00	0.49
1:A:621:PHE:HB2	1:B:492:GLU:OE2	2.11	0.49
1:A:238:ASN:ND2	1:A:256:TYR:CZ	2.80	0.49
1:B:531:LEU:H	5:B:705:FMT:C	2.25	0.49
1:A:591:GLY:HA2	1:B:125:ASN:OD1	2.13	0.48
1:A:595:GLU:HG3	1:A:620:TRP:CH2	2.47	0.48
1:A:467:HIS:CE1	1:B:508:LYS:HD2	2.48	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:530:ASN:HA	5:B:705:FMT:H	1.95	0.48
1:A:181:ARG:HD3	1:A:243:ASP:OD1	2.14	0.47
1:A:283:VAL:HG13	1:A:303:LEU:HD13	1.96	0.47
1:B:128:CYS:HB3	1:B:148:ASN:O	2.14	0.47
1:B:508:LYS:HG2	1:B:579:GLU:OE1	2.13	0.47
1:A:379:GLY:N	1:A:380:PRO:HD3	2.30	0.47
1:B:272:ARG:HE	1:B:322:PRO:HD3	1.77	0.47
1:B:431:PRO:HA	1:B:453:SER:HA	1.97	0.47
1:B:238:ASN:O	1:B:255:CYS:HB2	2.16	0.46
1:B:70:TYR:HB2	1:B:87:VAL:HB	1.96	0.46
1:B:429:TYR:CD1	1:B:457:LYS:HD2	2.50	0.46
1:A:453:SER:O	1:A:469:GLU:HG3	2.16	0.45
1:B:379:GLY:N	1:B:380:PRO:HD3	2.31	0.45
1:B:435:HIS:HE1	12:B:825:HOH:O	1.98	0.45
1:A:216:TYR:CD1	1:A:234:ILE:HG23	2.52	0.45
1:A:275:VAL:HG12	1:A:321:VAL:HG21	1.98	0.45
1:A:407:GLU:HG2	12:A:1038:HOH:O	2.17	0.45
1:A:613:LEU:HD11	1:A:632:ARG:HG2	1.99	0.45
1:B:529:ILE:O	5:B:705:FMT:H	2.16	0.45
1:A:493:PRO:O	1:A:494:HIS:CB	2.64	0.45
1:B:129:HIS:HD2	1:B:148:ASN:HD21	1.65	0.45
1:B:559:GLU:CD	1:B:634:MET:HE1	2.42	0.45
1:A:438:LEU:HB2	1:A:444:ALA:HA	1.98	0.44
1:A:559:GLU:HA	1:A:632:ARG:O	2.17	0.44
1:A:255[B]:CYS:HG	1:A:274:TRP:CD1	2.36	0.44
1:A:592:VAL:HG13	1:A:604:ILE:HD13	2.00	0.43
1:B:579:GLU:O	1:B:580:ASP:HB2	2.17	0.43
1:B:347:CYS:O	1:B:373:GLU:HA	2.18	0.43
1:B:632:ARG:NH1	12:B:803:HOH:O	2.17	0.43
1:A:380:PRO:HA	1:A:394:THR:O	2.18	0.43
1:B:128:CYS:HB2	1:B:147:ILE:CD1	2.49	0.43
1:B:428:HIS:HA	1:B:429:TYR:CG	2.54	0.43
1:A:347:CYS:O	1:A:373:GLU:HA	2.18	0.43
1:A:350:ILE:HG12	1:A:370:ILE:HD13	2.01	0.43
1:A:414:LYS:HE3	12:A:1091:HOH:O	2.18	0.43
1:B:508:LYS:HA	1:B:508:LYS:HD3	1.88	0.43
1:A:493:PRO:O	1:A:494:HIS:HB3	2.18	0.43
1:A:551:MET:O	1:A:552:ALA:C	2.61	0.42
1:A:125:ASN:OD1	1:B:591:GLY:HA2	2.19	0.42
1:B:58:GLN:OE1	1:B:447:LYS:HD2	2.20	0.42
1:B:379:GLY:N	1:B:380:PRO:CD	2.81	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:185:VAL:HG13	1:B:186:PRO:HA	2.00	0.42
1:B:384:THR:CG2	1:B:434:LEU:HG	2.50	0.42
1:B:283:VAL:HG13	1:B:303:LEU:HD13	2.01	0.42
1:B:455:PHE:HB3	1:B:457:LYS:HZ3	1.85	0.42
1:B:386:ASP:OD2	1:B:390:ASN:HB2	2.20	0.42
1:A:129:HIS:HD2	1:A:494:HIS:CD2	2.37	0.42
1:A:213:GLU:OE2	1:A:213:GLU:N	2.31	0.42
1:B:363:LEU:HD13	1:B:368:ASP:HB2	2.01	0.42
1:B:551:MET:O	1:B:552:ALA:C	2.63	0.42
1:A:627:MET:HE3	1:B:196:GLU:OE2	2.19	0.41
1:B:559:GLU:HA	1:B:632:ARG:O	2.20	0.41
1:B:105:THR:HG22	1:B:595:GLU:HG2	2.03	0.41
1:A:595:GLU:HB2	1:A:620:TRP:CZ3	2.56	0.41
1:B:145:LEU:C	1:B:145:LEU:HD23	2.45	0.41
1:B:382:HIS:O	1:B:393:THR:HA	2.21	0.41
1:B:396:PHE:HA	1:B:431:PRO:HD2	2.03	0.41
1:B:407:GLU:HG2	12:B:873:HOH:O	2.19	0.41
1:A:181:ARG:HD3	1:A:243:ASP:CG	2.46	0.41
1:B:417:LYS:N	1:B:417:LYS:CD	2.85	0.40
1:A:347:CYS:O	1:A:374:PRO:HD2	2.21	0.40
1:B:285:ALA:HA	12:B:1051:HOH:O	2.20	0.40
1:B:597:SER:HB3	1:B:598:PRO:HD2	2.02	0.40
1:A:613:LEU:HD11	1:A:632:ARG:HB3	2.04	0.40
1:B:322:PRO:HA	1:B:323:LYS:HA	1.88	0.40
1:B:552:ALA:HA	1:B:553:PRO:HA	1.87	0.40
1:B:559:GLU:OE2	1:B:632:ARG:NH2	2.53	0.40

There are no symmetry-related clashes.

## 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	574/646 (89%)	553 (96%)	18 (3%)	3 (0%)	24	12
1	B	586/646 (91%)	562 (96%)	21 (4%)	3 (0%)	24	12
All	All	1160/1292 (90%)	1115 (96%)	39 (3%)	6 (0%)	24	12

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	314	LYS
1	A	342	LYS
1	B	342	LYS
1	B	176	ALA
1	B	416	GLU
1	A	176	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	496/545 (91%)	485 (98%)	11 (2%)	45	29
1	B	503/545 (92%)	490 (97%)	13 (3%)	40	23
All	All	999/1090 (92%)	975 (98%)	24 (2%)	43	26

All (24) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	57	LYS
1	A	60	ILE
1	A	128	CYS
1	A	211	GLN
1	A	238	ASN
1	A	275	VAL
1	A	355	LEU
1	A	511	ASP
1	A	607	VAL
1	A	620	TRP

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Mol	Chain	Res	Type
1	A	626	HIS
1	B	78	HIS
1	B	207	VAL
1	B	255	CYS
1	B	269	ARG
1	B	272	ARG
1	B	275	VAL
1	B	418	VAL
1	B	483	LEU
1	B	576	ASP
1	B	580	ASP
1	B	613	LEU
1	B	621	PHE
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	115	HIS
1	A	187	HIS
1	A	232	GLN
1	A	281	HIS
1	B	129	HIS
1	B	232	GLN
1	B	382	HIS
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

Of 20 ligands modelled in this entry, 10 are monoatomic - leaving 10 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
5	FMT	B	705	-	2,2,2	0.70	0	1,1,1	0.20	0
5	FMT	A	705	-	2,2,2	0.72	0	1,1,1	0.22	0
7	CUA	A	708	1	0,1,1	-	-	-	-	-
5	FMT	B	706	-	2,2,2	0.63	0	1,1,1	0.33	0
9	TRS	A	710	-	7,7,7	2.32	3 (42%)	9,9,9	3.15	6 (66%)
2	B3P	B	701	-	18,18,18	0.85	0	23,23,23	0.91	0
11	CUZ	B	708	12,1	0,9,9	-	-	-	-	-
2	B3P	A	701	-	18,18,18	0.90	1 (5%)	23,23,23	1.03	1 (4%)
7	CUA	B	709	1	0,1,1	-	-	-	-	-
5	FMT	A	704	-	2,2,2	0.66	0	1,1,1	0.08	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
9	TRS	A	710	-	-	2/9/9/9	-
2	B3P	B	701	-	-	5/28/28/28	-
2	B3P	A	701	-	-	0/28/28/28	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
9	A	710	TRS	C-N	4.63	1.64	1.49
9	A	710	TRS	C1-C	2.79	1.60	1.53
2	A	701	B3P	C3-N1	2.27	1.49	1.46
9	A	710	TRS	C2-C	2.23	1.59	1.53

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
9	A	710	TRS	C1-C-N	5.11	121.20	108.17
9	A	710	TRS	C2-C-N	4.62	119.95	108.17
9	A	710	TRS	C3-C-C2	-3.95	100.13	110.66
9	A	710	TRS	C2-C-C1	-3.32	101.82	110.66
9	A	710	TRS	C3-C-C1	-3.03	102.59	110.66
9	A	710	TRS	O1-C1-C	2.33	117.37	110.88
2	A	701	B3P	C7-C4-C6	-2.30	104.99	110.02

There are no chirality outliers.

All (7) torsion outliers are listed below:

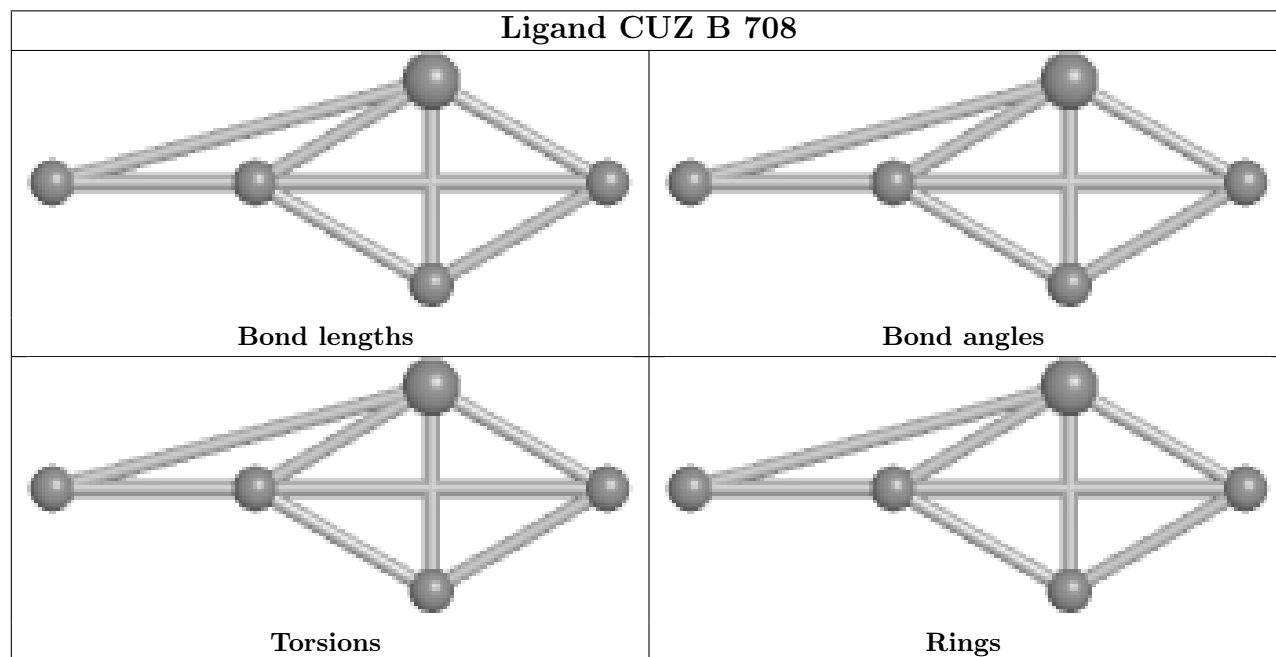
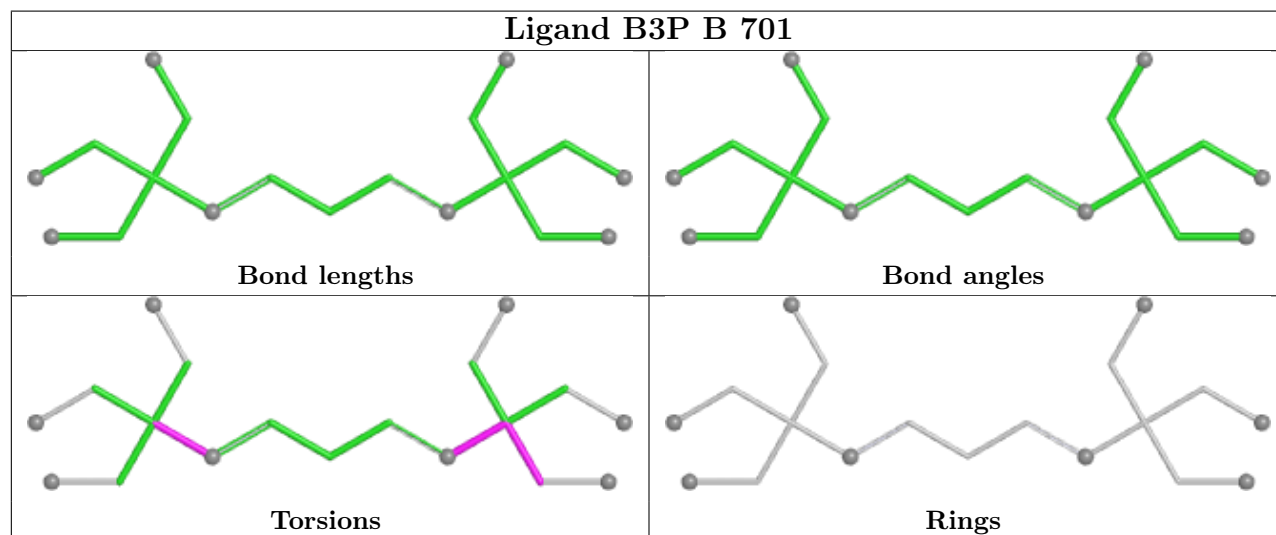
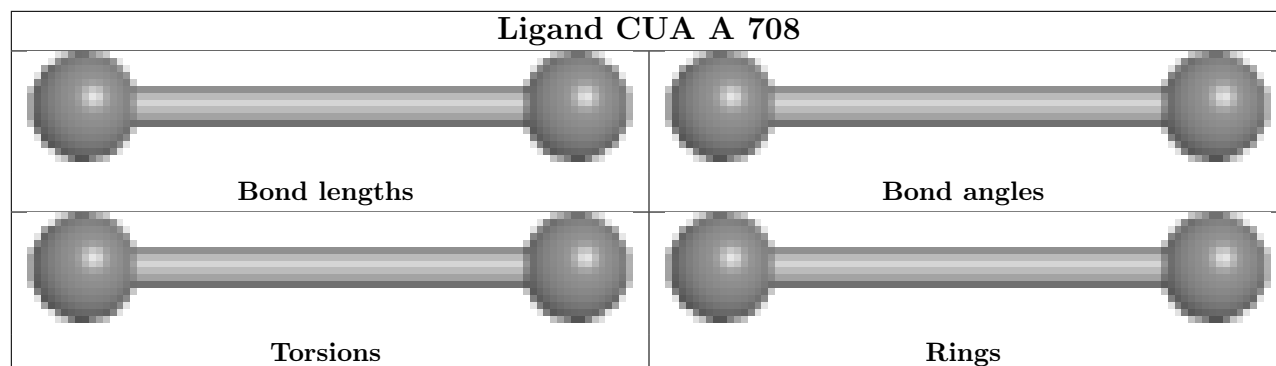
Mol	Chain	Res	Type	Atoms
2	B	701	B3P	C11-C8-N2-C2
9	A	710	TRS	C2-C-C1-O1
2	B	701	B3P	C10-C8-N2-C2
9	A	710	TRS	N-C-C1-O1
2	B	701	B3P	C11-C8-C9-O1
2	B	701	B3P	C9-C8-N2-C2
2	B	701	B3P	C5-C4-N1-C3

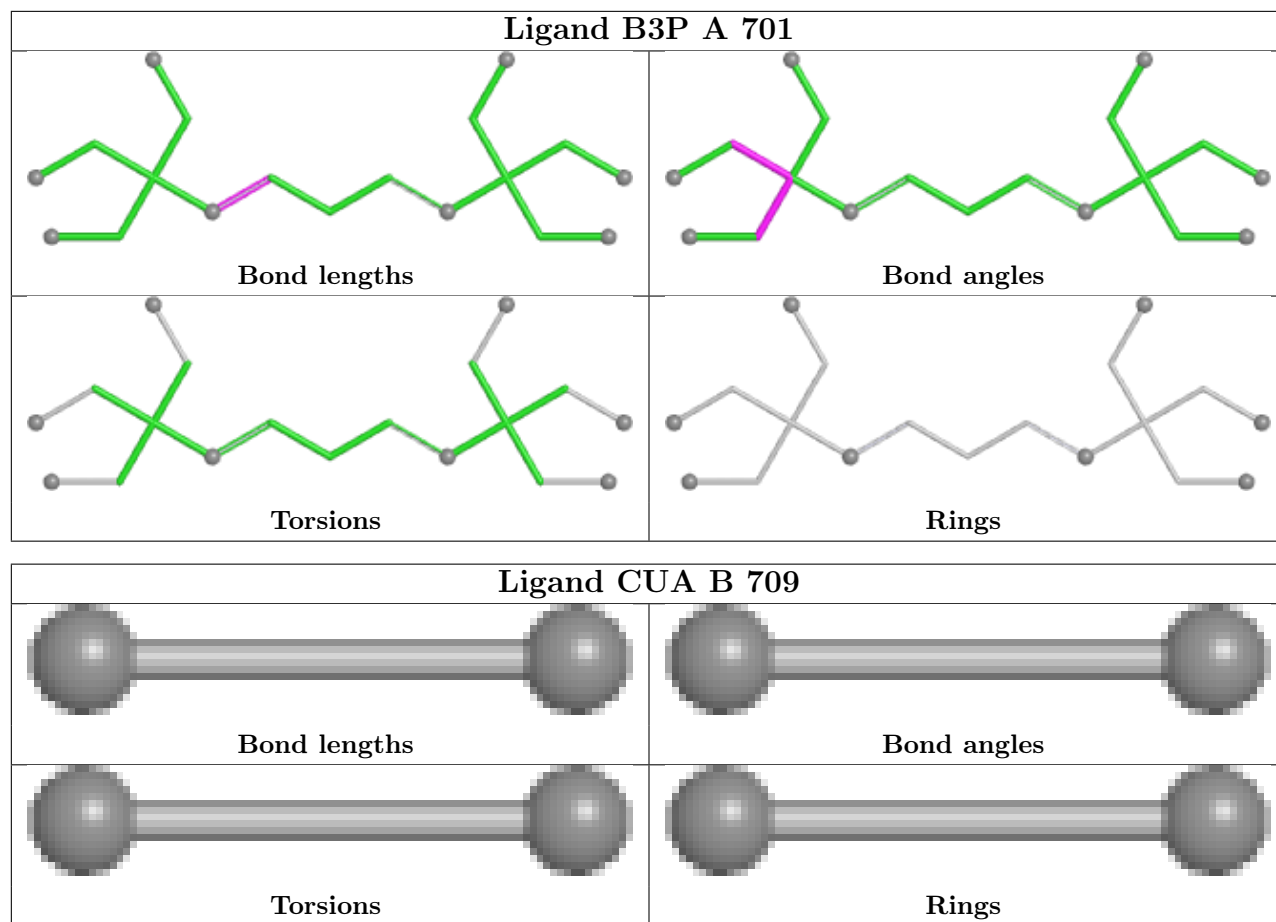
There are no ring outliers.

4 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	B	705	FMT	3	0
5	B	706	FMT	2	0
2	B	701	B3P	2	0
2	A	701	B3P	1	0

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





## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	A	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	626:HIS	C	627:MET	N	1.64

## 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	573/646 (88%)	-0.13	9 (1%) 70 75	16, 33, 57, 94	5 (0%)
1	B	586/646 (90%)	0.06	6 (1%) 79 82	18, 39, 66, 91	2 (0%)
All	All	1159/1292 (89%)	-0.03	15 (1%) 75 79	16, 36, 65, 94	7 (0%)

All (15) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	638	ALA	3.2
1	B	621	PHE	3.2
1	B	494	HIS	3.0
1	B	627	MET	2.9
1	A	256	TYR	2.9
1	B	624	ALA	2.7
1	A	580	ASP	2.7
1	A	60	ILE	2.5
1	B	623	HIS	2.5
1	A	257	ASN	2.4
1	A	626	HIS	2.3
1	A	56	SER	2.3
1	A	258	SER	2.1
1	B	60	ILE	2.1
1	A	322	PRO	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 ⓘ

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, 95<sup>th</sup> 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.

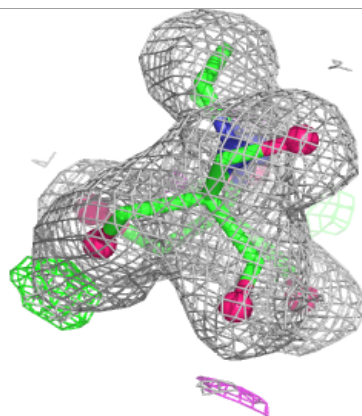
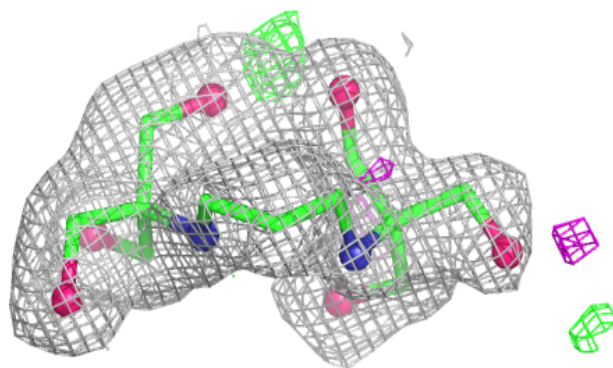
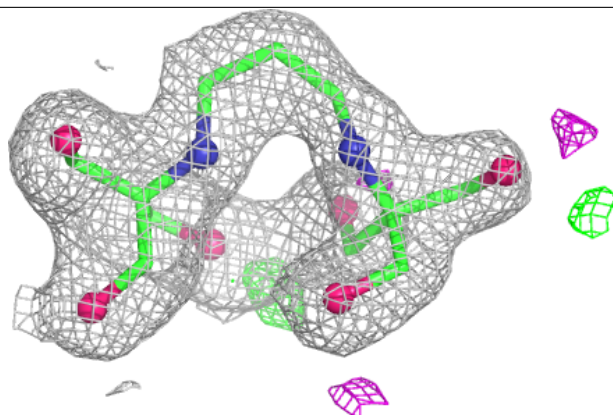
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
5	FMT	A	704	3/3	0.86	0.12	52,52,63,64	0
5	FMT	A	705	3/3	0.88	0.12	73,73,78,80	0
9	TRS	A	710	8/8	0.88	0.07	55,66,69,69	0
2	B3P	A	701	19/19	0.91	0.09	35,44,54,56	0
5	FMT	B	705	3/3	0.92	0.09	55,55,58,64	0
2	B3P	B	701	19/19	0.92	0.08	31,39,46,47	0
5	FMT	B	706	3/3	0.93	0.12	34,34,37,48	0
7	CUA	B	709	2/2	0.94	0.08	61,61,61,62	1
8	ZN	A	709	1/1	0.95	0.11	82,82,82,82	0
7	CUA	A	708	2/2	0.95	0.07	48,48,48,57	0
3	NA	B	702	1/1	0.96	0.07	33,33,33,33	1
4	CA	A	703	1/1	0.96	0.04	39,39,39,39	1
6	CL	A	707	1/1	0.96	0.08	56,56,56,56	1
6	CL	B	707	1/1	0.96	0.06	35,35,35,35	1
11	CUZ	B	708	5/5	0.96	0.09	31,42,57,60	5
6	CL	A	706	1/1	0.97	0.05	24,24,24,24	1
3	NA	A	702	1/1	0.98	0.07	24,24,24,24	1
4	CA	B	703	1/1	0.98	0.05	28,28,28,28	1
10	K	B	704	1/1	0.99	0.03	26,26,26,26	1
8	ZN	A	711	1/1	0.99	0.08	50,50,50,50	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.

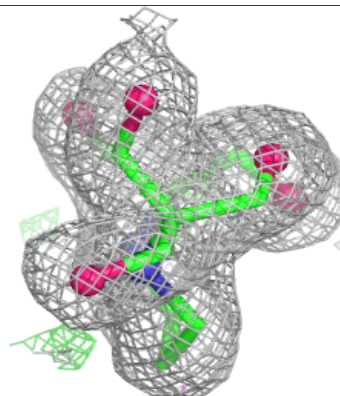
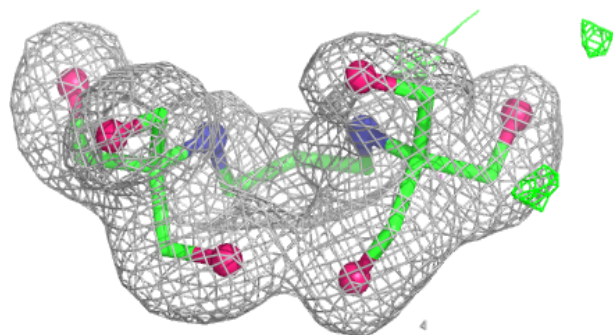
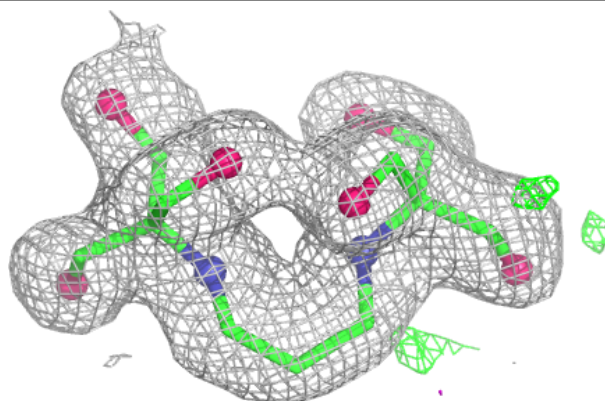


**Electron density around B3P A 701:**

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

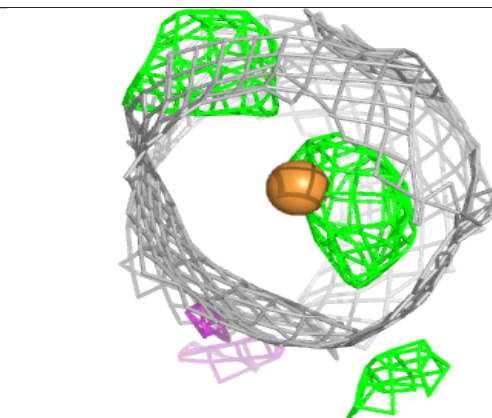
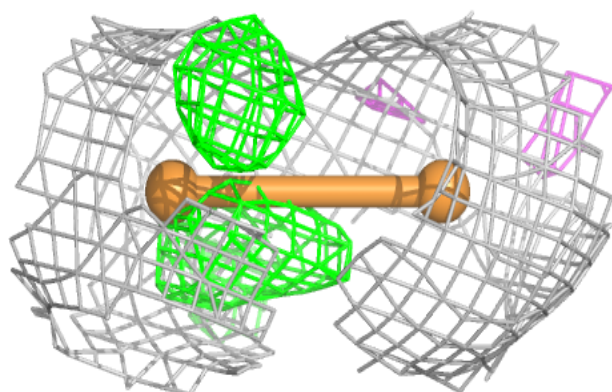
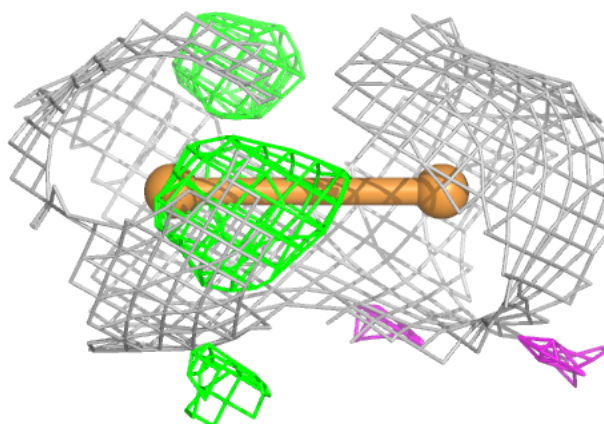
**Electron density around B3P B 701:**

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

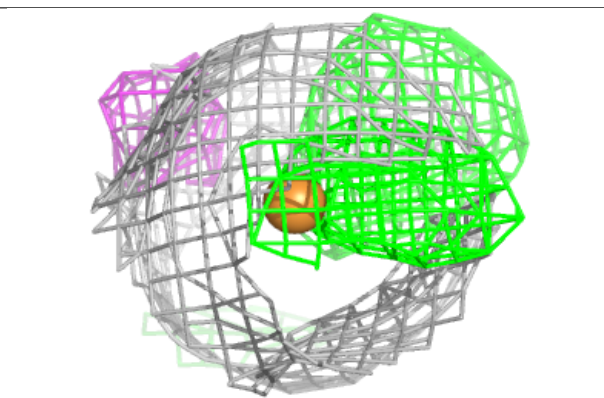
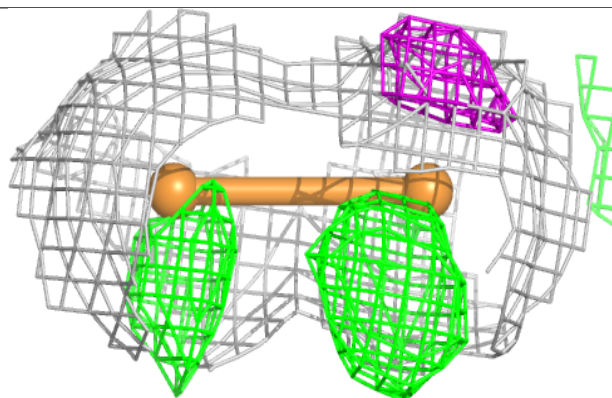
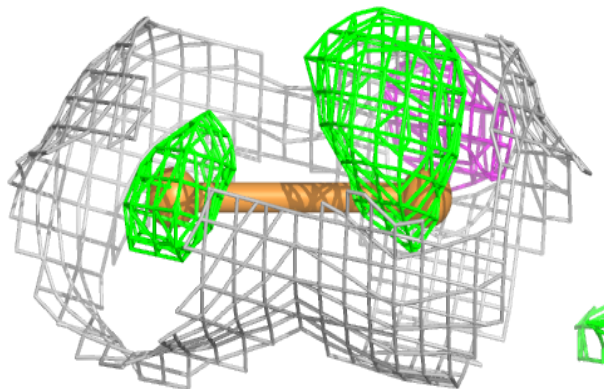


**Electron density around CUA B 709:**

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

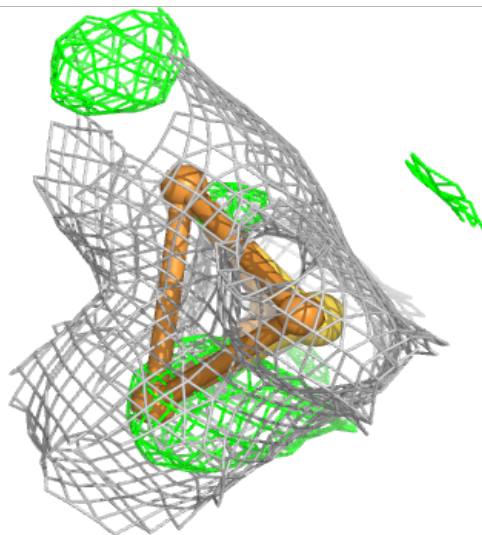
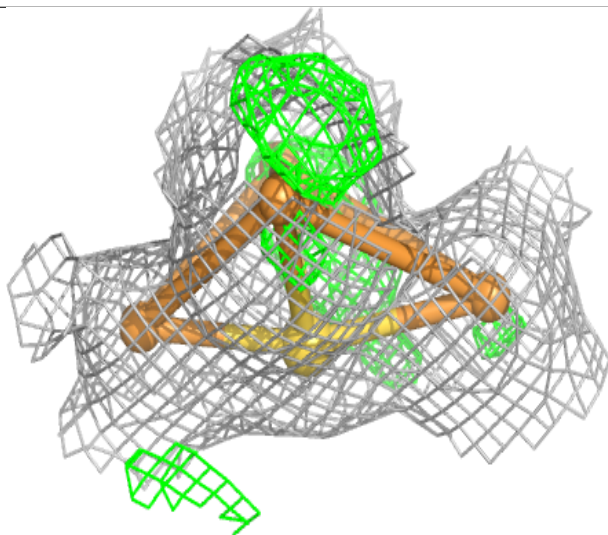
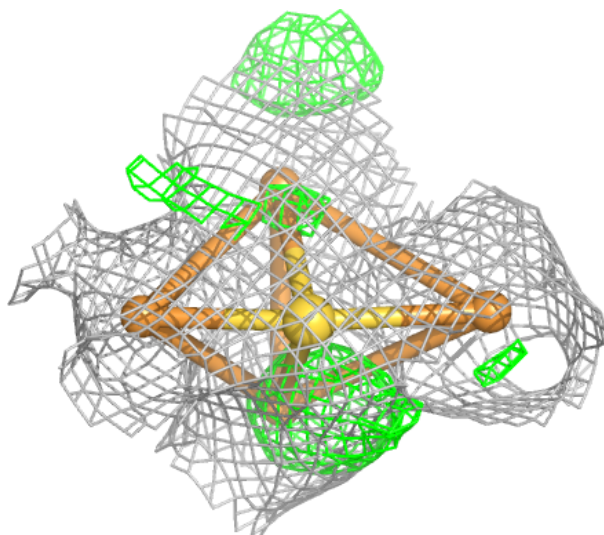
**Electron density around CUA A 708:**

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



**Electron density around CUZ B 708:**

$2mF_o-DF_c$  (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.