



Full wwPDB X-ray Structure Validation Report ⓘ

Nov 8, 2021 – 12:07 pm GMT

PDB ID : 7O6Z
Title : Structure of a neodymium-containing, XoxF1-type methanol dehydrogenase
Authors : Schmitz, R.; Dietl, A.; Op den Camp, H.; Barends, T.
Deposited on : 2021-04-12
Resolution : 2.30 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467
Mogul : 1.8.4 (270009), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.23.2
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0267
CCP4 : 7.1.010 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.23.2

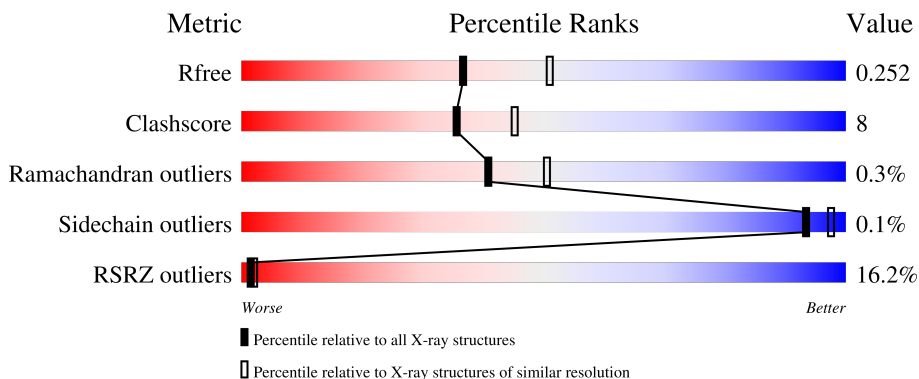
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

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	620	
1	B	620	

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 9546 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

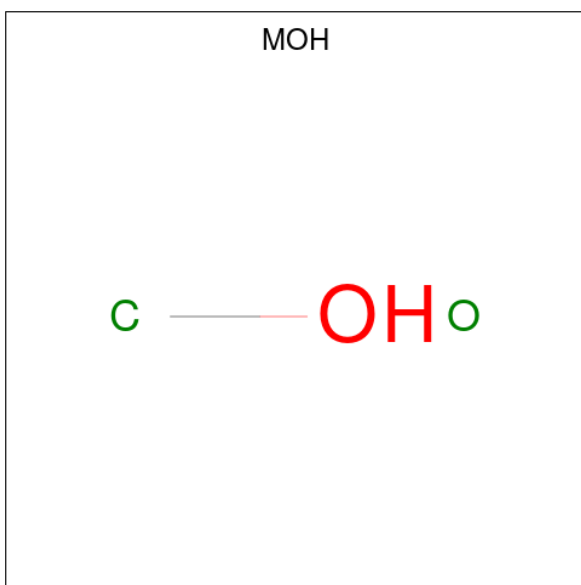
- Molecule 1 is a protein called Methanol dehydrogenase (Cytochrome c) subunit 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	588	4599	2944	774	860	21	0	1	0
1	B	588	4599	2944	774	860	21	0	1	0

- Molecule 2 is Neodymium Ion (three-letter code: ND) (formula: Nd) (labeled as "Ligand of Interest" by depositor).

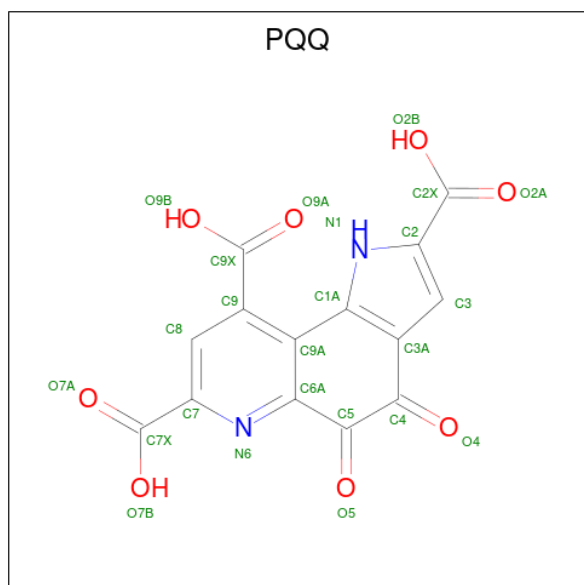
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Nd	0	0
			1	1		
2	B	1	Total	Nd	0	0
			1	1		

- Molecule 3 is METHANOL (three-letter code: MOH) (formula: CH₄O) (labeled as "Ligand of Interest" by depositor).



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

- Molecule 4 is PYRROLOQUINOLINE QUINONE (three-letter code: PQQ) (formula: C₁₄H₆N₂O₈) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	B	1	Total	C	N	O	0	0
			24	14	2	8		

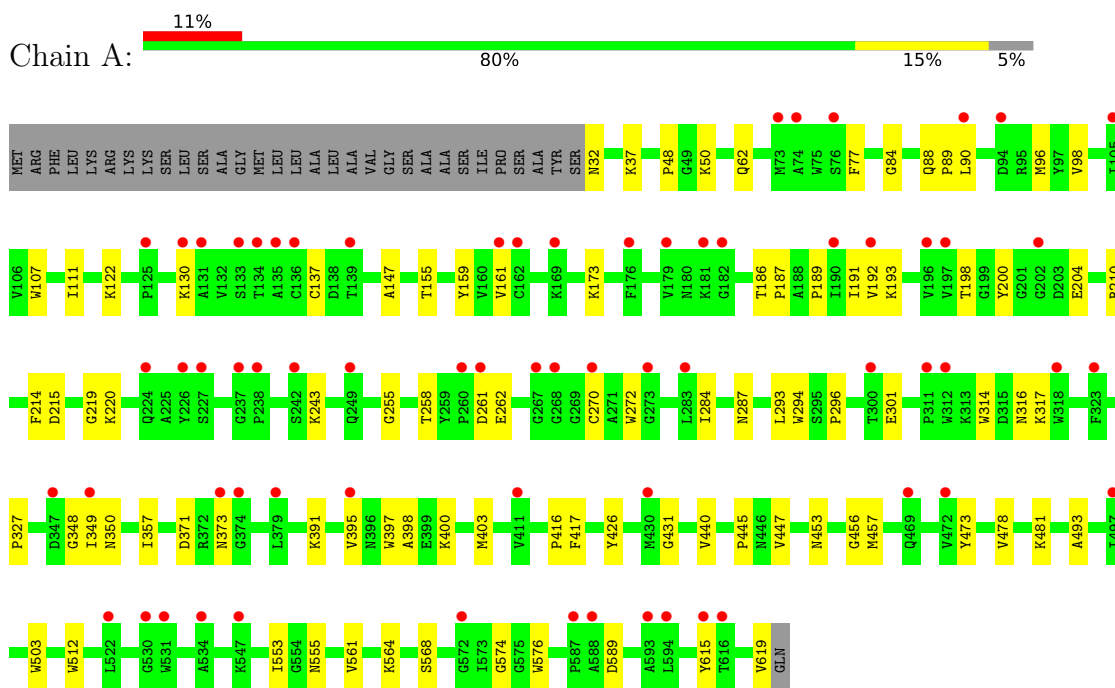
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	182	Total	O	0	0
			182	182		
5	B	136	Total	O	0	0
			136	136		

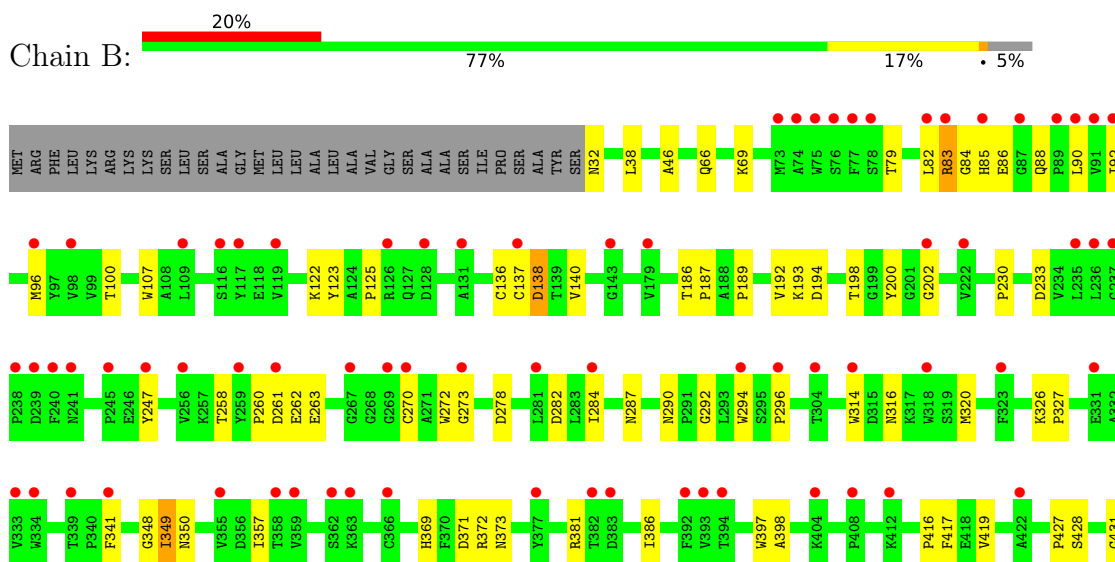
3 Residue-property plots [i](#)

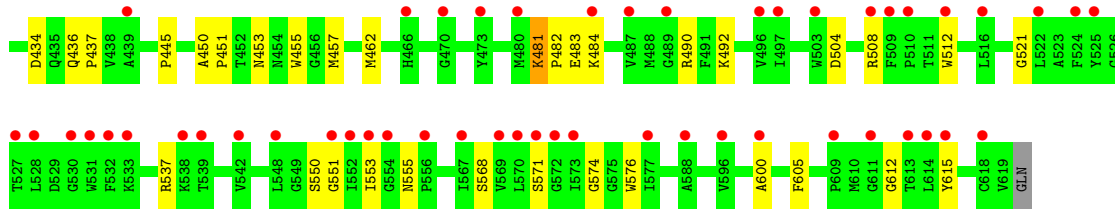
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: Methanol dehydrogenase (Cytochrome c) subunit 1



- Molecule 1: Methanol dehydrogenase (Cytochrome c) subunit 1





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	89.87Å 70.18Å 97.23Å 90.00° 91.39° 90.00°	Depositor
Resolution (Å)	48.60 – 2.30 48.60 – 2.30	Depositor EDS
% Data completeness (in resolution range)	94.7 (48.60-2.30) 94.8 (48.60-2.30)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.59 (at 2.29Å)	Xtrriage
Refinement program	PHENIX 1.18.2_3874, PHENIX 1.18.2_3874	Depositor
R, R_{free}	0.195 , 0.252 0.195 , 0.252	Depositor DCC
R_{free} test set	1959 reflections (3.82%)	wwPDB-VP
Wilson B-factor (Å ²)	42.4	Xtrriage
Anisotropy	0.639	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	(Not available) , (Not available)	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	0.007 for h,-k,-l	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	9546	wwPDB-VP
Average B, all atoms (Å ²)	53.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.50% 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: PQQ, MOH, ND

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	0.31	0/4740	0.64	2/6452 (0.0%)
1	B	0.32	0/4740	0.65	4/6452 (0.1%)
All	All	0.32	0/9480	0.64	6/12904 (0.0%)

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	481	LYS	CD-CE-NZ	-8.90	91.23	111.70
1	B	481	LYS	N-CA-C	-7.06	91.94	111.00
1	B	481	LYS	N-CA-CB	6.76	122.77	110.60
1	B	349	ILE	CB-CA-C	-5.17	101.25	111.60
1	A	62	GLN	CA-CB-CG	5.09	124.59	113.40
1	A	403	MET	CA-CB-CG	5.04	121.86	113.30

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	4599	0	4427	63	0
1	B	4599	0	4425	82	0
2	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	1	0	0	0	0
3	A	2	0	0	0	0
3	B	2	0	0	0	0
4	B	24	0	3	2	0
5	A	182	0	0	7	0
5	B	136	0	0	6	0
All	All	9546	0	8855	145	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 8.

All (145) 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:138:ASP:HB3	1:B:140:VAL:HG13	1.62	0.81
1:B:287:ASN:HB2	1:B:349:ILE:HA	1.63	0.80
1:B:189:PRO:HB3	1:B:198:THR:HB	1.65	0.79
1:A:189:PRO:HB3	1:A:198:THR:HB	1.66	0.78
1:A:589:ASP:OD1	5:A:901:HOH:O	2.02	0.76
1:A:137:CYS:HB3	1:A:576:TRP:HB2	1.72	0.71
1:B:82:LEU:O	1:B:83:ARG:HG3	1.93	0.68
1:B:261:ASP:OD1	1:B:262:GLU:N	2.25	0.67
1:A:37:LYS:N	1:A:37:LYS:HD2	2.09	0.67
1:A:258:THR:HB	1:A:316:ASN:H	1.61	0.66
1:B:86:GLU:HG3	1:B:553:ILE:HD12	1.77	0.66
1:A:32:ASN:HA	1:A:193:LYS:HA	1.80	0.63
1:A:261:ASP:OD1	1:A:262:GLU:N	2.32	0.63
1:B:428:SER:HB2	1:B:457:MET:HB3	1.79	0.62
1:B:483:GLU:HG2	1:B:484:LYS:HG2	1.80	0.62
1:A:204:GLU:OE1	5:A:902:HOH:O	2.16	0.62
1:B:481:LYS:HG3	1:B:482:PRO:HD2	1.82	0.61
1:B:136:CYS:SG	1:B:137:CYS:N	2.74	0.60
1:B:137:CYS:O	1:B:138:ASP:HB2	2.03	0.59
1:A:478:VAL:HG13	5:A:1013:HOH:O	2.02	0.59
1:A:192:VAL:HG12	1:A:193:LYS:H	1.68	0.58
1:B:357:ILE:HG12	1:B:445:PRO:HB2	1.84	0.58
1:B:373:ASN:HB2	1:B:397:TRP:CZ2	2.40	0.57
1:B:38:LEU:HD13	1:B:92:ILE:HD12	1.86	0.57
1:B:272:TRP:CE2	1:B:349:ILE:HD13	2.40	0.56
1:B:455:TRP:HB3	1:B:482:PRO:HA	1.86	0.56
1:B:88:GLN:OE1	1:B:555:ASN:ND2	2.31	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:273:GLY:HA3	1:B:349:ILE:HB	1.89	0.55
1:B:349:ILE:HG13	1:B:350:ASN:N	2.22	0.54
1:A:200:TYR:OH	1:A:210:ARG:HD3	2.07	0.54
1:A:293:LEU:HD23	1:A:473:TYR:CZ	2.42	0.54
1:A:192:VAL:HG11	1:A:327:PRO:HB3	1.91	0.53
1:A:215:ASP:HB3	1:A:219:GLY:H	1.73	0.53
1:B:202:GLY:N	4:B:701:PQQ:O7A	2.38	0.53
1:B:427:PRO:HB2	1:B:431:GLY:HA2	1.90	0.52
1:B:272:TRP:CD2	1:B:349:ILE:HD13	2.44	0.52
1:B:84:GLY:CA	1:B:574:GLY:HA3	2.40	0.52
1:A:272:TRP:CE2	1:A:349:ILE:HD13	2.45	0.52
1:A:348:GLY:HA2	1:A:371:ASP:OD1	2.10	0.51
1:B:348:GLY:HA2	1:B:371:ASP:OD1	2.11	0.51
1:A:48:PRO:HA	1:A:88:GLN:HE21	1.76	0.51
1:A:89:PRO:HB3	1:A:98:VAL:HG22	1.93	0.50
1:B:46:ALA:HA	5:B:886:HOH:O	2.12	0.50
1:B:284:ILE:HG13	1:B:327:PRO:HG3	1.94	0.50
1:B:32:ASN:HA	1:B:193:LYS:HA	1.93	0.50
1:A:564:LYS:NZ	1:A:619:VAL:O	2.29	0.50
1:B:484:LYS:HA	1:B:484:LYS:HE2	1.94	0.49
1:B:550:SER:OG	1:B:551:GLY:N	2.45	0.49
1:B:187:PRO:HG3	1:B:272:TRP:HA	1.94	0.49
1:B:455:TRP:CB	1:B:482:PRO:HA	2.42	0.49
1:A:294:TRP:O	1:A:296:PRO:HD3	2.13	0.49
1:A:357:ILE:HG12	1:A:445:PRO:HB2	1.94	0.49
1:A:391:LYS:HD3	1:A:395:VAL:HB	1.95	0.48
1:A:272:TRP:CD2	1:A:349:ILE:HD13	2.48	0.48
1:B:521:GLY:HA2	1:B:537:ARG:HD3	1.95	0.48
1:A:373:ASN:HB2	1:A:397:TRP:CZ2	2.49	0.48
1:B:296:PRO:HG2	1:B:416:PRO:O	2.13	0.48
1:B:483:GLU:O	1:B:484:LYS:HE2	2.13	0.48
1:A:84:GLY:CA	1:A:574:GLY:HA3	2.44	0.48
1:B:137:CYS:HB3	1:B:576:TRP:HB2	1.95	0.48
1:B:66:GLN:O	1:B:69:LYS:NZ	2.46	0.47
1:A:301:GLU:HG2	1:A:314:TRP:CZ2	2.49	0.47
1:A:137:CYS:HB3	1:A:576:TRP:CB	2.42	0.47
1:B:200:TYR:O	1:B:270:CYS:HB3	2.14	0.47
1:B:481:LYS:HG3	1:B:482:PRO:CD	2.45	0.47
1:B:455:TRP:HA	1:B:483:GLU:H	1.80	0.47
1:B:492:LYS:HE2	1:B:504:ASP:OD2	2.15	0.47
1:B:373:ASN:HB2	1:B:397:TRP:HZ2	1.79	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:350:ASN:HB2	1:B:369:HIS:CE1	2.50	0.47
1:A:192:VAL:HG12	1:A:193:LYS:N	2.29	0.46
1:A:512:TRP:HB3	1:A:553:ILE:HG22	1.96	0.46
1:B:490:ARG:NH1	1:B:504:ASP:OD1	2.44	0.46
1:A:130:LYS:HA	1:A:130:LYS:HE2	1.97	0.46
1:B:326:LYS:HA	1:B:326:LYS:HD2	1.75	0.46
1:B:192:VAL:HG12	1:B:193:LYS:HG3	1.97	0.46
1:A:48:PRO:HA	1:A:88:GLN:NE2	2.30	0.46
1:A:88:GLN:HB3	1:A:555:ASN:HB2	1.99	0.45
1:B:258:THR:HB	1:B:316:ASN:H	1.82	0.45
1:B:272:TRP:CZ2	4:B:701:PQQ:C6A	2.99	0.45
1:B:84:GLY:HA3	1:B:574:GLY:HA3	1.98	0.45
1:A:186:THR:N	1:A:187:PRO:CD	2.80	0.45
1:A:287:ASN:HB2	1:A:349:ILE:HA	1.99	0.44
1:A:258:THR:HB	1:A:316:ASN:N	2.31	0.44
1:A:192:VAL:HG21	1:A:284:ILE:HD11	2.00	0.44
1:B:90:LEU:HB3	5:B:886:HOH:O	2.17	0.44
1:B:107:TRP:CH2	1:B:122:LYS:HD2	2.52	0.44
1:B:230:PRO:HD2	1:B:233:ASP:OD2	2.18	0.44
1:B:278:ASP:OD2	1:B:381:ARG:NE	2.41	0.44
1:A:400:LYS:NZ	5:A:926:HOH:O	2.50	0.44
1:A:200:TYR:O	1:A:270:CYS:HB3	2.17	0.44
1:A:349:ILE:HG13	1:A:350:ASN:N	2.30	0.44
1:B:512:TRP:HB3	1:B:553:ILE:HG22	2.00	0.44
1:A:431:GLY:O	1:A:453:ASN:HB2	2.18	0.44
1:B:290:ASN:HA	1:B:320:MET:CE	2.48	0.43
1:B:462:MET:HG3	5:B:933:HOH:O	2.18	0.43
1:A:111:ILE:O	1:A:561:VAL:HG11	2.17	0.43
1:A:417:PHE:N	5:A:928:HOH:O	2.51	0.43
1:A:147:ALA:HB3	1:A:191:ILE:HD13	1.99	0.43
1:A:493:ALA:HB2	1:A:503:TRP:CE2	2.53	0.43
1:A:568:SER:HA	1:A:615:TYR:O	2.19	0.43
1:A:284:ILE:HG13	1:A:327:PRO:HG3	2.01	0.43
1:A:192:VAL:HG11	1:A:327:PRO:CB	2.49	0.43
1:A:481:LYS:NZ	5:A:907:HOH:O	2.37	0.43
1:A:397:TRP:CE3	1:A:398:ALA:HB2	2.54	0.43
1:B:85:HIS:CE1	1:B:612:GLY:HA3	2.54	0.43
1:B:290:ASN:HA	1:B:320:MET:HE2	2.01	0.43
1:B:282:ASP:HB3	1:B:326:LYS:NZ	2.34	0.42
1:B:436:GLN:HA	1:B:437:PRO:HD3	1.94	0.42
1:B:290:ASN:ND2	1:B:292:GLY:H	2.17	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:260:PRO:HG2	1:B:263:GLU:HB2	2.01	0.42
1:B:436:GLN:O	1:B:436:GLN:HG2	2.20	0.42
1:A:440:VAL:HG23	1:A:447:VAL:O	2.20	0.42
1:B:571:SER:O	1:B:612:GLY:HA2	2.20	0.42
1:B:92:ILE:HD11	5:B:886:HOH:O	2.20	0.42
1:B:186:THR:N	1:B:187:PRO:CD	2.83	0.42
1:A:90:LEU:O	1:A:96:MET:HA	2.20	0.42
1:A:397:TRP:CZ3	1:A:398:ALA:HB2	2.55	0.42
1:B:419:VAL:HG23	5:B:890:HOH:O	2.19	0.42
1:A:50:LYS:HD3	1:A:50:LYS:O	2.19	0.41
1:B:79:THR:HB	1:B:100:THR:CG2	2.50	0.41
1:B:397:TRP:CE3	1:B:398:ALA:HB2	2.55	0.41
1:B:417:PHE:N	5:B:813:HOH:O	2.48	0.41
1:B:600:ALA:HB1	1:B:605:PHE:HB2	2.01	0.41
1:B:431:GLY:O	1:B:453:ASN:HB2	2.20	0.41
1:B:568:SER:HA	1:B:615:TYR:O	2.20	0.41
1:A:255:GLY:HA2	1:A:317:LYS:O	2.21	0.41
1:B:372:ARG:HD3	1:B:434:ASP:HA	2.02	0.41
1:A:77:PHE:HZ	1:A:107:TRP:CD2	2.38	0.41
1:A:426:TYR:CE1	1:A:456:GLY:HA3	2.56	0.41
1:B:90:LEU:O	1:B:96:MET:HA	2.20	0.41
1:B:247:TYR:OH	1:B:386:ILE:HG13	2.21	0.41
1:A:155:THR:OG1	1:A:159:TYR:HB2	2.21	0.41
1:A:161:VAL:HG22	1:A:173:LYS:HG3	2.03	0.41
1:A:296:PRO:HG2	1:A:416:PRO:O	2.20	0.41
1:B:79:THR:HB	1:B:100:THR:HG22	2.01	0.41
1:B:123:TYR:CE2	1:B:125:PRO:HG3	2.56	0.41
1:B:450:ALA:HA	1:B:451:PRO:HD3	1.88	0.41
1:A:243:LYS:HD2	1:A:243:LYS:N	2.36	0.41
1:A:457:MET:HB2	5:A:1013:HOH:O	2.21	0.41
1:B:314:TRP:O	1:B:341:PHE:HB2	2.21	0.41
1:B:481:LYS:HZ1	1:B:481:LYS:HG2	1.74	0.40
1:B:32:ASN:CA	1:B:193:LYS:HA	2.52	0.40
1:A:107:TRP:CH2	1:A:122:LYS:HD2	2.56	0.40
1:B:294:TRP:O	1:B:296:PRO:HD3	2.22	0.40
1:A:214:PHE:HA	1:A:220:LYS:O	2.21	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	587/620 (95%)	545 (93%)	42 (7%)	0	100	100
1	B	587/620 (95%)	551 (94%)	33 (6%)	3 (0%)	29	35
All	All	1174/1240 (95%)	1096 (93%)	75 (6%)	3 (0%)	41	50

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	83	ARG
1	B	138	ASP
1	B	194	ASP

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	481/504 (95%)	481 (100%)	0	100	100
1	B	481/504 (95%)	480 (100%)	1 (0%)	93	97
All	All	962/1008 (95%)	961 (100%)	1 (0%)	93	97

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	508	ARG

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

sidechains are listed below:

Mol	Chain	Res	Type
1	A	369	HIS
1	B	290	ASN
1	B	477	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 5 ligands modelled in this entry, 2 are monoatomic - leaving 3 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.





There are no torsion outliers.





There are no ring outliers.

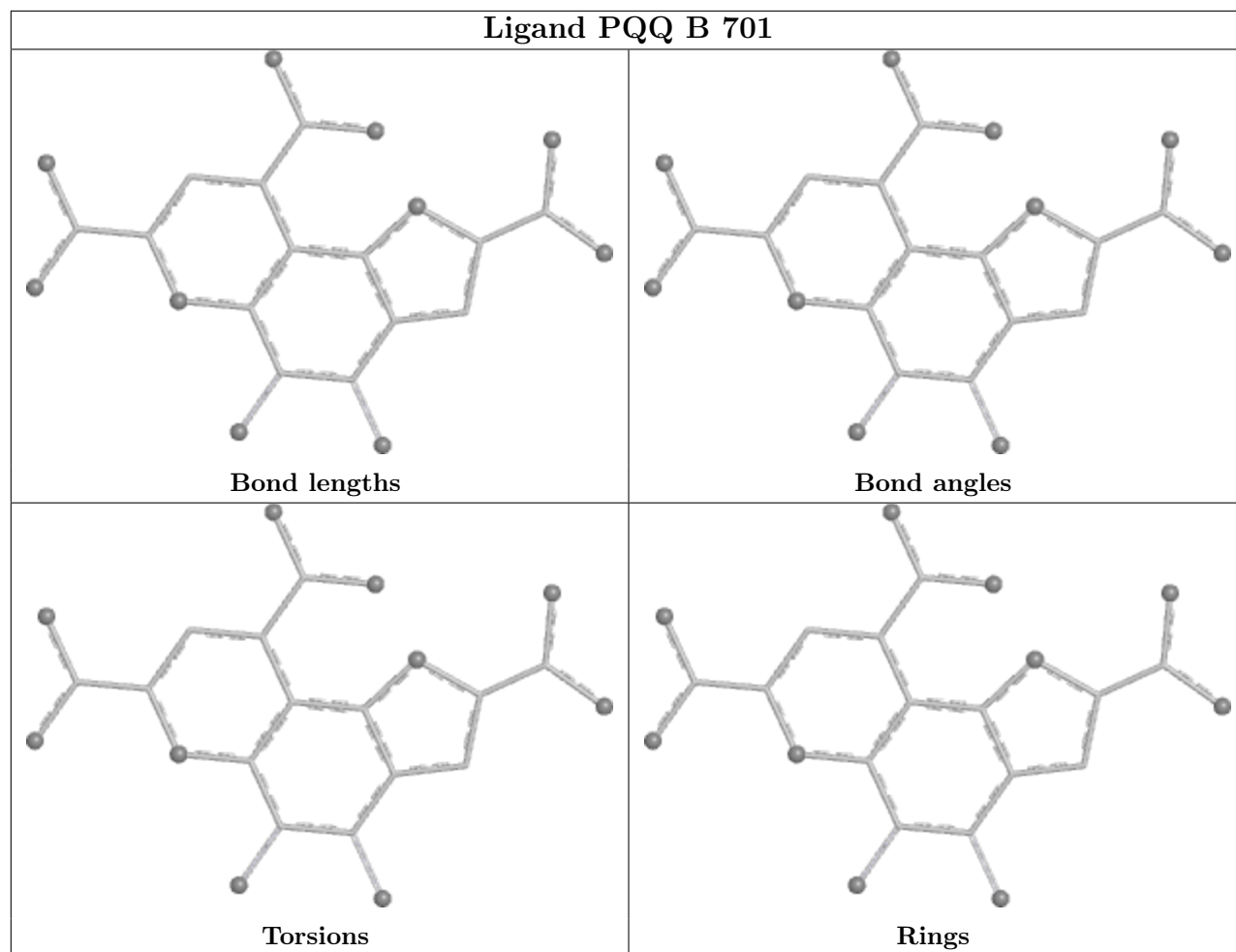
No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier.

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

Ligand MOH A 802	
 Bond lengths	 Bond angles
 Torsions	 Rings

Ligand MOH B 703	
 Bond lengths	 Bond angles
 Torsions	 Rings



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	588/620 (94%)	1.02	68 (11%) 4 6	39, 50, 64, 97	0
1	B	588/620 (94%)	1.27	123 (20%) 1 1	42, 54, 69, 96	0
All	All	1176/1240 (94%)	1.15	191 (16%) 1 2	39, 52, 67, 97	0

All (191) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	238	PRO	6.4
1	B	294	TRP	5.4
1	B	237	GLY	5.3
1	A	270	CYS	5.0
1	A	594	LEU	4.7
1	B	496	VAL	4.7
1	B	333	VAL	4.6
1	B	362	SER	4.4
1	B	137	CYS	4.4
1	A	190	ILE	4.3
1	A	176	PHE	4.2
1	B	570	LEU	4.1
1	A	323	PHE	4.1
1	A	318	TRP	4.1
1	B	74	ALA	3.8
1	A	349	ILE	3.8
1	B	554	GLY	3.8
1	B	269	GLY	3.7
1	B	548	LEU	3.7
1	B	527	THR	3.7
1	A	131	ALA	3.6
1	A	374	GLY	3.5
1	B	82	LEU	3.5
1	A	130	LYS	3.5

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Mol	Chain	Res	Type	RSRZ
1	B	273	GLY	3.5
1	B	503	TRP	3.5
1	B	473	TYR	3.5
1	B	528	LEU	3.4
1	A	192	VAL	3.4
1	B	245	PRO	3.4
1	B	552	ILE	3.4
1	B	281	LEU	3.3
1	B	588	ALA	3.3
1	B	323	PHE	3.3
1	B	239	ASP	3.3
1	B	553	ILE	3.3
1	B	358	THR	3.2
1	A	202	GLY	3.2
1	B	359	VAL	3.2
1	B	466	HIS	3.2
1	A	593	ALA	3.2
1	B	377	TYR	3.2
1	B	363	LYS	3.2
1	B	613	THR	3.1
1	A	572	GLY	3.1
1	B	247	TYR	3.1
1	B	542	VAL	3.1
1	A	237	GLY	3.1
1	B	318	TRP	3.1
1	B	569	VAL	3.1
1	B	339	THR	3.1
1	A	260	PRO	3.1
1	B	117	TYR	3.0
1	B	525	TYR	3.0
1	B	92	ILE	3.0
1	B	551	GLY	2.9
1	B	238	PRO	2.9
1	B	304	THR	2.9
1	B	261	ASP	2.9
1	A	133	SER	2.9
1	B	615	TYR	2.9
1	B	522	LEU	2.9
1	A	273	GLY	2.8
1	B	530	GLY	2.8
1	B	222	VAL	2.8
1	A	196	VAL	2.8

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Mol	Chain	Res	Type	RSRZ
1	B	366	CYS	2.8
1	A	300	THR	2.8
1	B	383	ASP	2.8
1	A	169	LYS	2.8
1	B	404	LYS	2.8
1	B	571	SER	2.8
1	B	577	ILE	2.8
1	B	509	PHE	2.8
1	B	96	MET	2.8
1	B	109	LEU	2.8
1	B	538	LYS	2.8
1	B	392	PHE	2.7
1	B	382	THR	2.7
1	B	412	LYS	2.7
1	B	128	ASP	2.7
1	A	588	ALA	2.7
1	A	179	VAL	2.7
1	A	411	VAL	2.7
1	B	524	PHE	2.7
1	A	311	PRO	2.7
1	B	235	LEU	2.7
1	A	136	CYS	2.7
1	A	268	GLY	2.7
1	A	73[A]	MET	2.7
1	B	91	VAL	2.7
1	B	76	SER	2.6
1	A	616	THR	2.6
1	B	539	THR	2.6
1	B	85	HIS	2.6
1	A	347	ASP	2.6
1	A	373	ASN	2.6
1	A	587	PRO	2.6
1	B	87	GLY	2.6
1	A	395	VAL	2.6
1	B	90	LEU	2.6
1	B	131	ALA	2.6
1	B	75	TRP	2.5
1	B	314	TRP	2.5
1	B	614	LEU	2.5
1	A	472	VAL	2.5
1	A	74	ALA	2.5
1	B	241	ASN	2.5

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Mol	Chain	Res	Type	RSRZ
1	B	487	VAL	2.5
1	B	267	GLY	2.5
1	B	98	VAL	2.5
1	A	531	TRP	2.5
1	B	572	GLY	2.5
1	B	516	LEU	2.5
1	B	116	SER	2.4
1	B	484	LYS	2.4
1	B	179	VAL	2.4
1	A	139	THR	2.4
1	B	512	TRP	2.4
1	B	393	VAL	2.4
1	A	134	THR	2.4
1	A	534	ALA	2.4
1	B	270	CYS	2.4
1	A	76	SER	2.4
1	A	497	ILE	2.4
1	B	439	ALA	2.4
1	B	236	LEU	2.4
1	B	556	PRO	2.4
1	B	240	PHE	2.4
1	B	341	PHE	2.4
1	B	573	ILE	2.3
1	B	334	TRP	2.3
1	B	531	TRP	2.3
1	B	83	ARG	2.3
1	A	261	ASP	2.3
1	B	331	GLU	2.3
1	A	249	GLN	2.3
1	A	522	LEU	2.3
1	B	259	TYR	2.3
1	B	78	SER	2.3
1	A	197	VAL	2.3
1	A	530	GLY	2.3
1	B	89	PRO	2.3
1	B	618	CYS	2.3
1	B	202	GLY	2.3
1	B	422	ALA	2.3
1	B	77	PHE	2.3
1	B	532	PHE	2.3
1	A	90	LEU	2.2
1	B	489	GLY	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	161	VAL	2.2
1	B	143	GLY	2.2
1	A	181	LYS	2.2
1	A	547	LYS	2.2
1	A	105	ILE	2.2
1	A	226	TYR	2.2
1	A	267	GLY	2.2
1	A	125	PRO	2.2
1	B	611	GLY	2.2
1	B	355	VAL	2.1
1	B	596	VAL	2.1
1	A	162	CYS	2.1
1	A	379	LEU	2.1
1	A	227	SER	2.1
1	B	256	VAL	2.1
1	B	510	PRO	2.1
1	A	182	GLY	2.1
1	B	284	ILE	2.1
1	B	508	ARG	2.1
1	B	567	ILE	2.1
1	A	283	LEU	2.1
1	B	609	PRO	2.1
1	A	469	GLN	2.1
1	B	394	THR	2.1
1	B	470	GLY	2.1
1	A	94	ASP	2.1
1	A	224	GLN	2.1
1	A	135	ALA	2.1
1	A	615	TYR	2.1
1	B	296	PRO	2.1
1	B	408	PRO	2.1
1	B	533	LYS	2.1
1	B	119	VAL	2.1
1	A	430	MET	2.0
1	B	73[A]	MET	2.0
1	B	480	MET	2.0
1	B	126	ARG	2.0
1	B	497	ILE	2.0
1	A	242	SER	2.0
1	B	600	ALA	2.0
1	A	312	TRP	2.0

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

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

6.3 Carbohydrates [i](#)

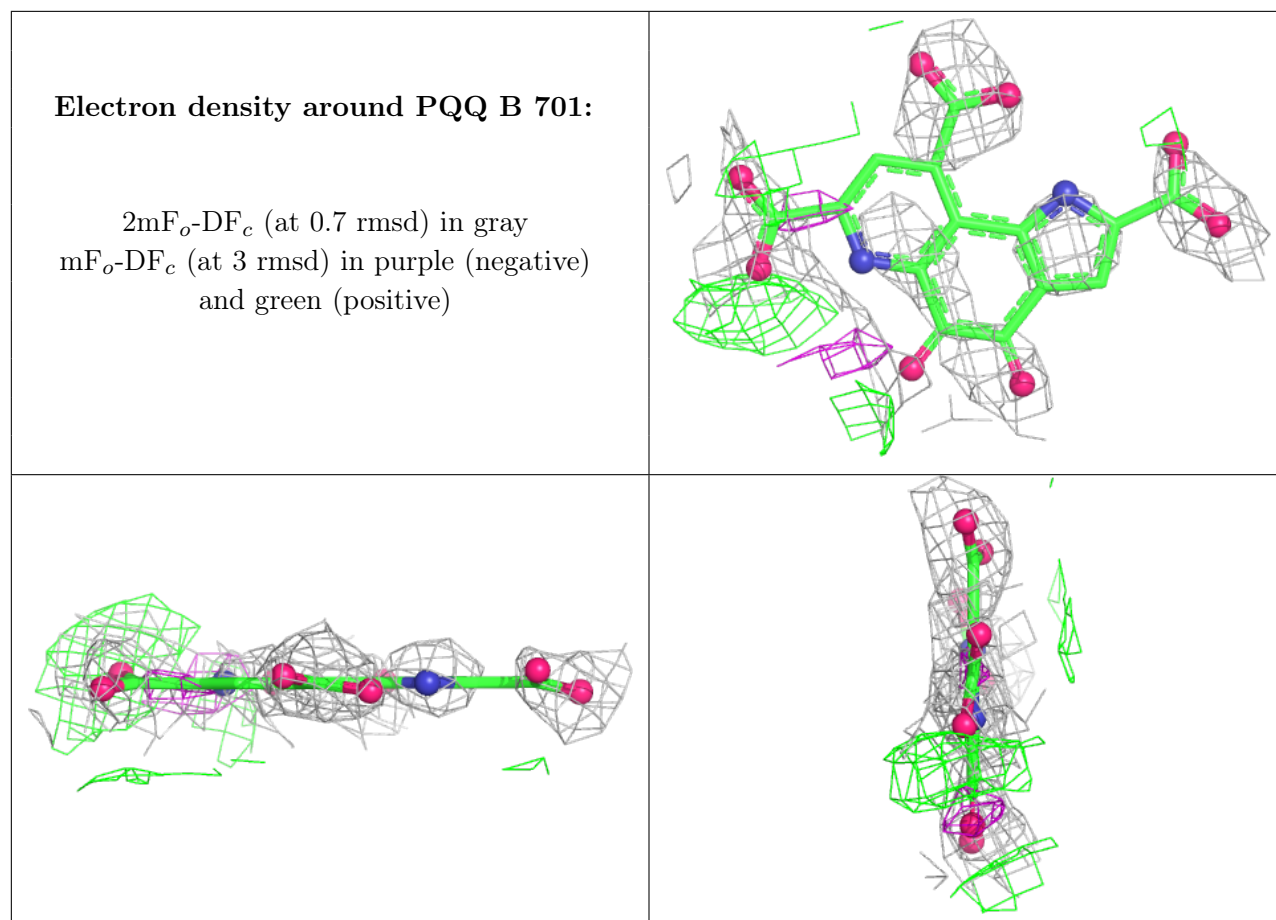
There are no monosaccharides in this entry.

6.4 Ligands [i](#)

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

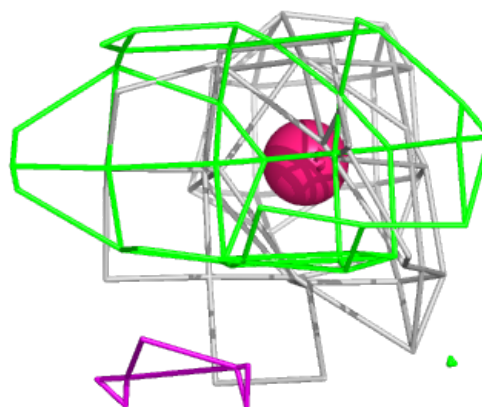
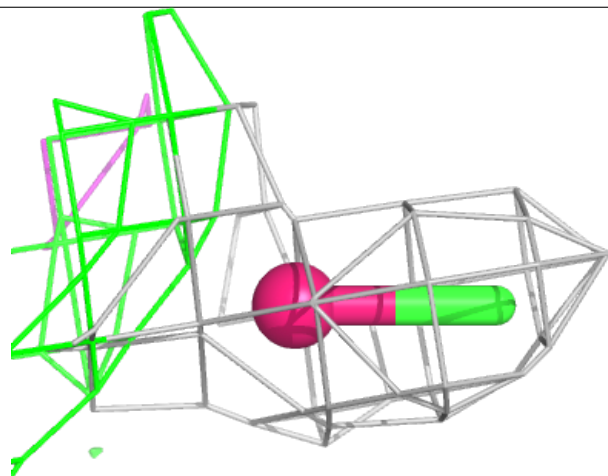
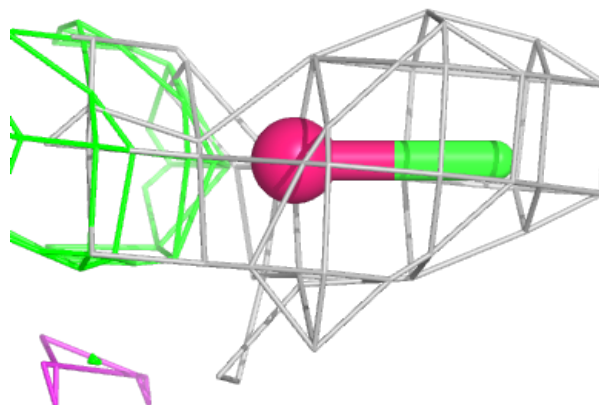
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	PQQ	B	701	24/24	0.64	0.40	50,55,57,60	24
3	MOH	A	802	2/2	0.67	0.32	55,55,55,57	0
3	MOH	B	703	2/2	0.87	0.32	55,55,55,56	0
2	ND	A	801	1/1	0.93	0.08	54,54,54,54	1
2	ND	B	702	1/1	0.95	0.11	56,56,56,56	1

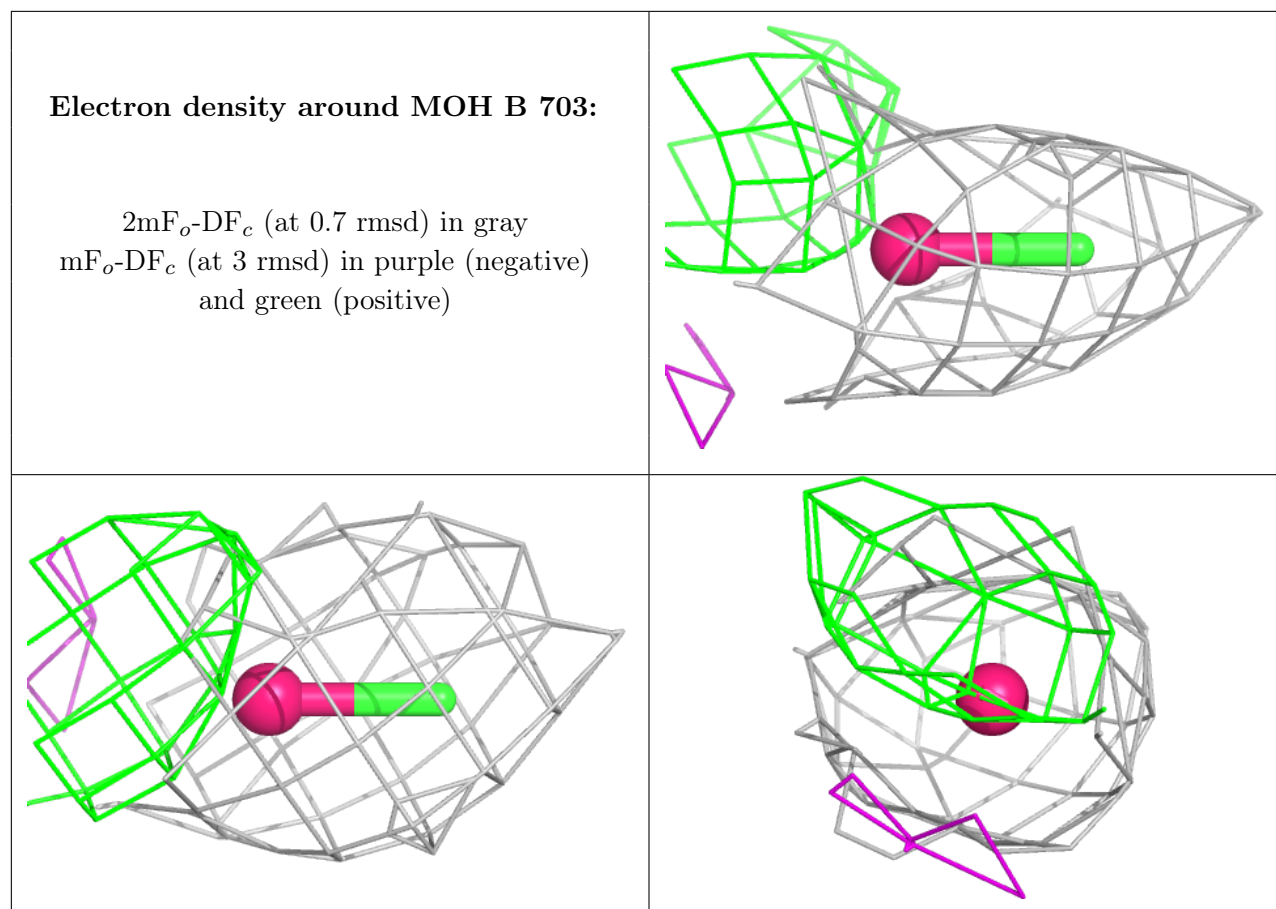
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.



Electron density around MOH A 802:

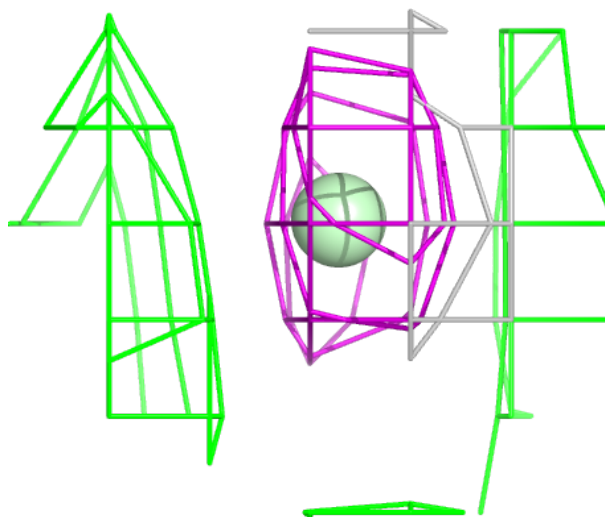
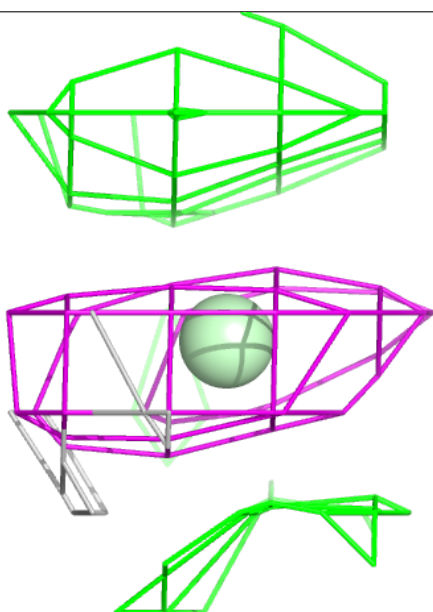
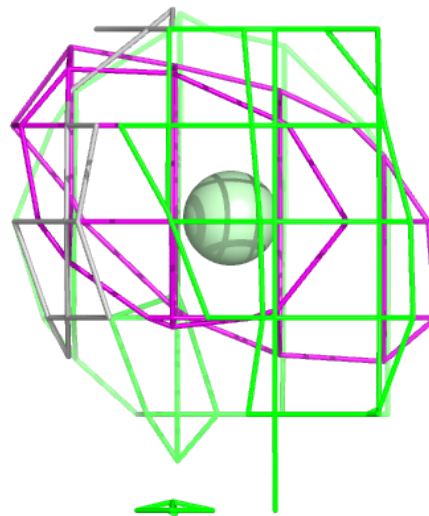
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

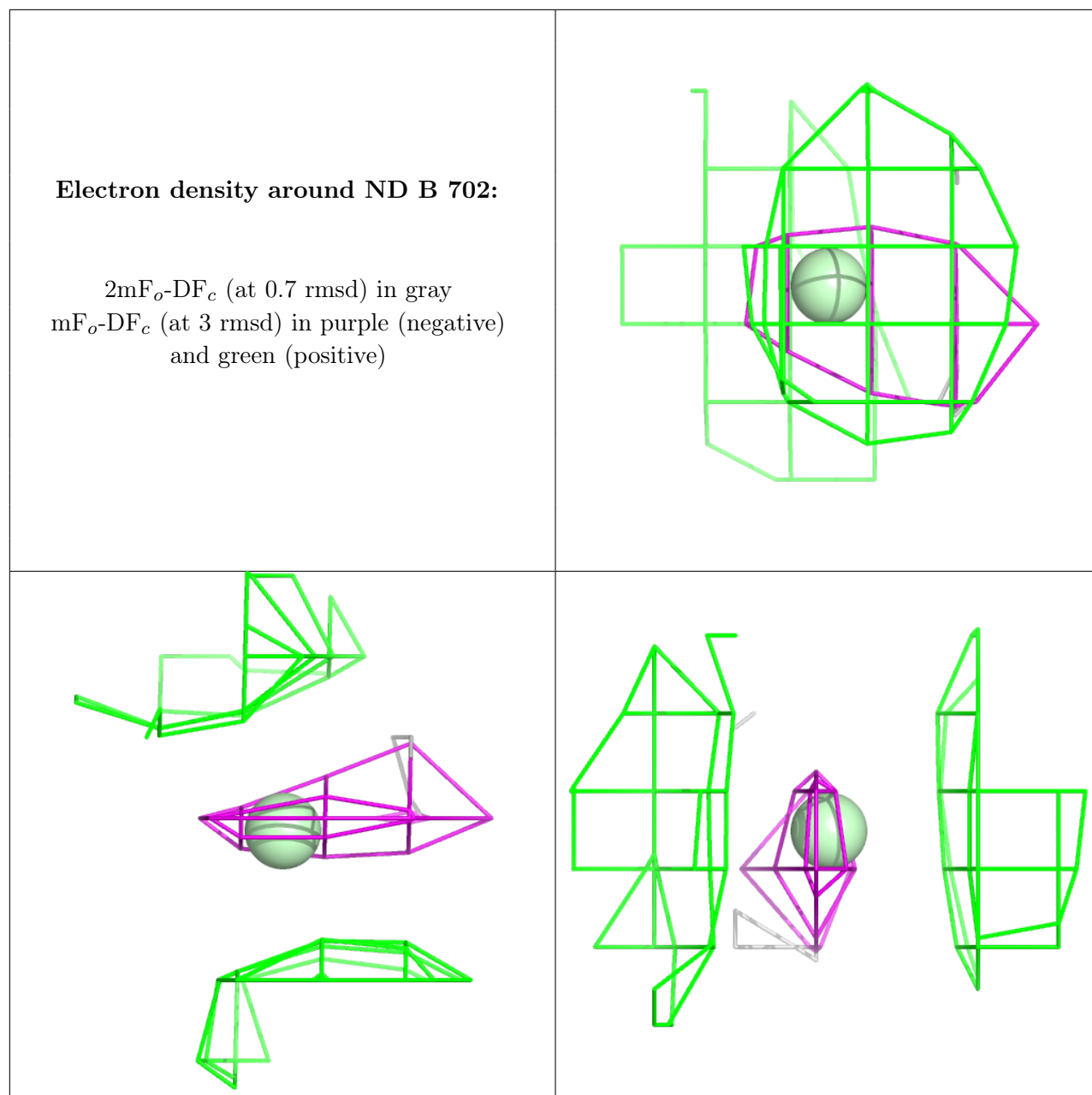




Electron density around ND A 801:

$2mF_o-DF_c$ (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.