



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 12, 2026 – 05:18 PM UTC

PDB ID : 4KQO / pdb_00004kqo
Title : Crystal structure of penicillin-binding protein 3 from pseudomonas aeruginosa
in complex with piperacillin
Authors : Nettleship, J.E.; Stuart, D.I.; Owens, R.J.; Ren, J.
Deposited on : 2013-05-15
Resolution : 2.31 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

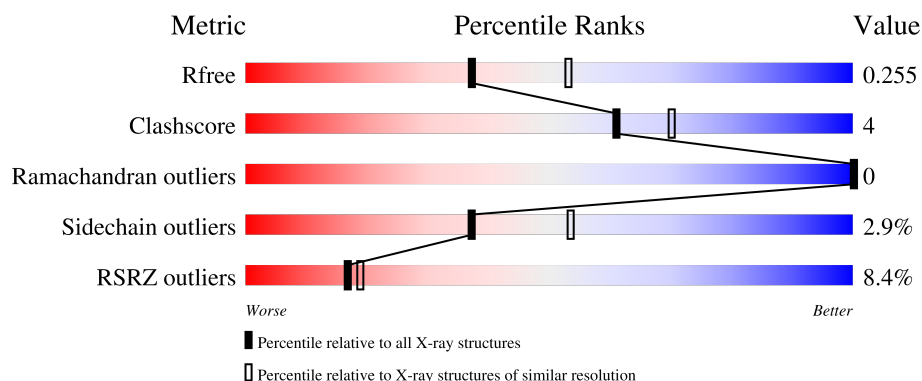
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.31 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	7754 (2.34-2.30)
Clashscore	190562	8383 (2.34-2.30)
Ramachandran outliers	187476	8303 (2.34-2.30)
Sidechain outliers	187428	8303 (2.34-2.30)
RSRZ outliers	180081	7760 (2.34-2.30)

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	564	5% 81% 10% 9%
1	B	564	10% 77% 10% 13%

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 8008 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 Penicillin-binding protein 3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	513	Total	C	N	O	S	0	0	0
			3915	2470	711	722	12			
1	B	490	Total	C	N	O	S	0	0	0
			3720	2352	664	692	12			

There are 38 discrepancies between the modelled and reference sequences:

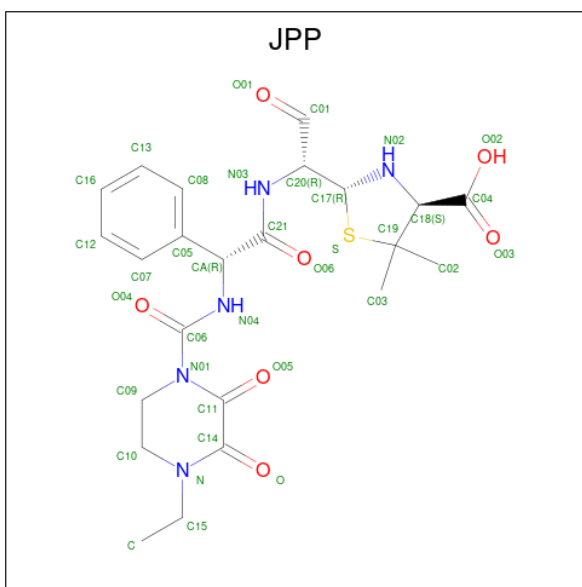
Chain	Residue	Modelled	Actual	Comment	Reference
A	16	MET	-	expression tag	UNP G3XD46
A	17	ALA	-	expression tag	UNP G3XD46
A	18	HIS	-	expression tag	UNP G3XD46
A	19	HIS	-	expression tag	UNP G3XD46
A	20	HIS	-	expression tag	UNP G3XD46
A	21	HIS	-	expression tag	UNP G3XD46
A	22	HIS	-	expression tag	UNP G3XD46
A	23	HIS	-	expression tag	UNP G3XD46
A	24	SER	-	expression tag	UNP G3XD46
A	25	SER	-	expression tag	UNP G3XD46
A	26	GLY	-	expression tag	UNP G3XD46
A	27	LEU	-	expression tag	UNP G3XD46
A	28	GLU	-	expression tag	UNP G3XD46
A	29	VAL	-	expression tag	UNP G3XD46
A	30	LEU	-	expression tag	UNP G3XD46
A	31	PHE	-	expression tag	UNP G3XD46
A	32	GLN	-	expression tag	UNP G3XD46
A	33	GLY	-	expression tag	UNP G3XD46
A	34	PRO	-	expression tag	UNP G3XD46
B	16	MET	-	expression tag	UNP G3XD46
B	17	ALA	-	expression tag	UNP G3XD46
B	18	HIS	-	expression tag	UNP G3XD46
B	19	HIS	-	expression tag	UNP G3XD46
B	20	HIS	-	expression tag	UNP G3XD46
B	21	HIS	-	expression tag	UNP G3XD46

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
B	22	HIS	-	expression tag	UNP G3XD46
B	23	HIS	-	expression tag	UNP G3XD46
B	24	SER	-	expression tag	UNP G3XD46
B	25	SER	-	expression tag	UNP G3XD46
B	26	GLY	-	expression tag	UNP G3XD46
B	27	LEU	-	expression tag	UNP G3XD46
B	28	GLU	-	expression tag	UNP G3XD46
B	29	VAL	-	expression tag	UNP G3XD46
B	30	LEU	-	expression tag	UNP G3XD46
B	31	PHE	-	expression tag	UNP G3XD46
B	32	GLN	-	expression tag	UNP G3XD46
B	33	GLY	-	expression tag	UNP G3XD46
B	34	PRO	-	expression tag	UNP G3XD46

- Molecule 2 is Piperacillin (Open Form) (CCD ID: JPP) (formula: $C_{23}H_{29}N_5O_7S$).



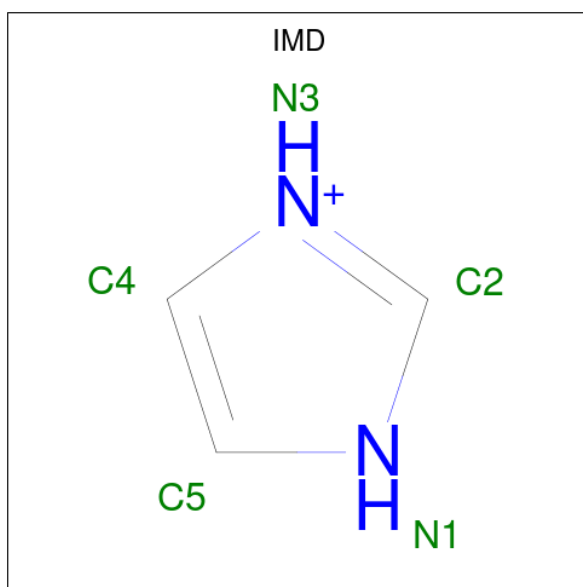
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total 36	C 23	N 5	O 7	S 1	0	0
2	B	1	Total 36	C 23	N 5	O 7	S 1	0	0

- Molecule 3 is GLYCEROL (CCD ID: GOL) (formula: $\text{C}_3\text{H}_8\text{O}_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			6	3	3		
3	A	1	Total	C	O	0	0
			6	3	3		
3	B	1	Total	C	O	0	0
			6	3	3		

- Molecule 4 is IMIDAZOLE (CCD ID: IMD) (formula: $C_3H_5N_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	B	1	Total	C	N	0	0
			5	3	2		

- Molecule 5 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	B	2	Total 2	Cl 2	0	0

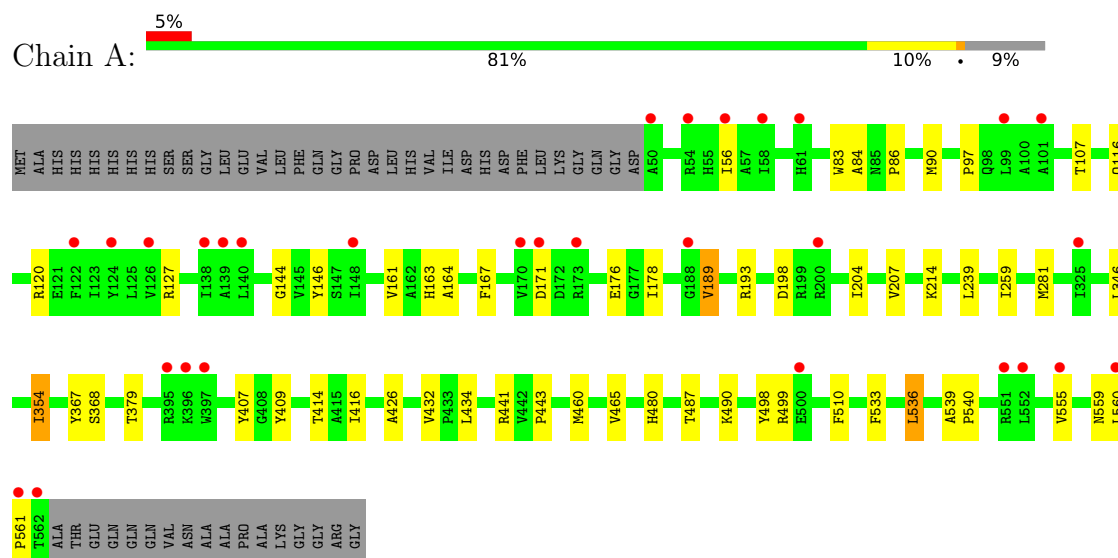
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	149	Total 149	O 149	0	0
6	B	127	Total 127	O 127	0	0

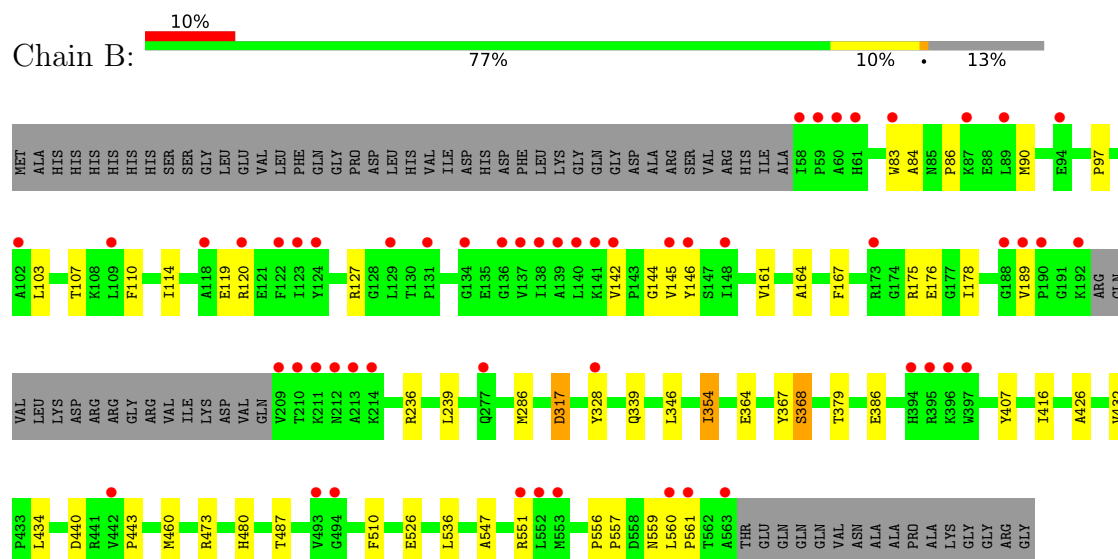
3 Residue-property plots [i](#)

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: Penicillin-binding protein 3



• Molecule 1: Penicillin-binding protein 3



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	57.05Å 74.94Å 82.78Å 71.26° 86.04° 85.59°	Depositor
Resolution (Å)	47.10 – 2.31 47.10 – 2.31	Depositor EDS
% Data completeness (in resolution range)	97.8 (47.10-2.31) 97.8 (47.10-2.31)	Depositor EDS
R_{merge}	0.18	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.76 (at 2.32Å)	Xtriage
Refinement program	REFMAC 5.7.0032	Depositor
R, R_{free}	0.217 , 0.250 0.220 , 0.255	Depositor DCC
R_{free} test set	2804 reflections (4.95%)	wwPDB-VP
Wilson B-factor (Å ²)	28.8	Xtriage
Anisotropy	0.470	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 49.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	8008	wwPDB-VP
Average B, all atoms (Å ²)	42.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.02% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: IMD, GOL, JPP, CL

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	0.64	0/3992	0.83	0/5416
1	B	0.63	0/3795	0.82	0/5153
All	All	0.63	0/7787	0.83	0/10569

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

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	3915	0	3976	32	0
1	B	3720	0	3758	31	0
2	A	36	0	27	5	0
2	B	36	0	27	3	0
3	A	12	0	16	0	0
3	B	6	0	8	0	0
4	B	5	0	5	0	0
5	B	2	0	0	0	0
6	A	149	0	0	6	0
6	B	127	0	0	4	0
All	All	8008	0	7817	65	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 4.

All (65) 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:198:ASP:HB3	1:A:204:ILE:HD11	1.66	0.76
1:B:110:PHE:O	1:B:114:ILE:HD12	1.98	0.64
1:A:490:LYS:NZ	6:A:821:HOH:O	2.33	0.61
1:A:465:VAL:O	6:A:708:HOH:O	2.17	0.58
1:B:317:ASP:OD1	1:B:339:GLN:NE2	2.38	0.57
1:B:286:MET:HE3	1:B:416:ILE:HG13	1.87	0.56
1:A:163:HIS:ND1	6:A:784:HOH:O	2.32	0.56
1:A:499:ARG:HG2	6:A:729:HOH:O	2.05	0.55
1:B:560:LEU:HD23	6:B:823:HOH:O	2.07	0.54
2:A:601:JPP:O05	2:A:601:JPP:N04	2.38	0.54
1:A:281:MET:HE1	1:B:473:ARG:NH2	2.24	0.52
1:B:560:LEU:N	1:B:561:PRO:HD2	2.24	0.52
1:B:432:VAL:HG13	1:B:443:PRO:HG2	1.92	0.51
1:B:526:GLU:HA	6:B:717:HOH:O	2.09	0.51
1:A:432:VAL:HG13	1:A:443:PRO:HG2	1.92	0.51
1:A:56:ILE:HD11	1:A:193:ARG:CZ	2.41	0.50
1:B:328:TYR:OH	2:B:601:JPP:O	2.23	0.50
1:A:346:LEU:HD12	1:A:460:MET:HE2	1.94	0.50
1:A:533:PHE:HB2	1:A:536:LEU:HD22	1.93	0.49
1:B:83:TRP:CE2	1:B:146:TYR:HB2	2.46	0.49
1:A:367:TYR:CD2	1:A:367:TYR:C	2.90	0.49
1:B:354:ILE:HG21	1:B:407:TYR:HB3	1.95	0.49
1:B:346:LEU:HD12	1:B:460:MET:HE2	1.95	0.49
1:A:560:LEU:N	1:A:561:PRO:HD2	2.27	0.49
1:B:164:ALA:O	1:B:178:ILE:HG12	2.13	0.49
1:A:164:ALA:O	1:A:178:ILE:HG12	2.13	0.48
1:A:83:TRP:CE2	1:A:146:TYR:HB2	2.47	0.48
1:B:379:THR:HB	1:B:434:LEU:HD12	1.95	0.48
1:A:379:THR:HB	1:A:434:LEU:HD12	1.95	0.48
1:A:354:ILE:HG21	1:A:407:TYR:HB3	1.96	0.48
1:B:367:TYR:C	1:B:367:TYR:CD2	2.92	0.48
1:B:426:ALA:HB2	1:B:510:PHE:CG	2.49	0.47
1:A:189:VAL:HG23	1:A:214:LYS:HB2	1.96	0.47
1:A:198:ASP:OD1	1:A:198:ASP:C	2.58	0.46
1:A:487:THR:O	2:A:601:JPP:H16	2.16	0.45
1:A:498:TYR:CZ	2:A:601:JPP:H22	2.51	0.45
1:A:259:ILE:CD1	1:A:416:ILE:HD11	2.47	0.45

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:414:THR:OG1	1:A:416:ILE:HG22	2.17	0.45
1:B:110:PHE:CZ	1:B:114:ILE:HD11	2.51	0.45
1:B:536:LEU:HD12	6:B:824:HOH:O	2.17	0.45
1:B:236:ARG:NE	6:B:736:HOH:O	2.49	0.45
1:A:86:PRO:O	1:A:90:MET:HG2	2.17	0.44
1:A:120:ARG:HG3	6:A:812:HOH:O	2.17	0.43
1:B:86:PRO:O	1:B:90:MET:HG2	2.18	0.43
1:A:480:HIS:CD2	1:A:559:ASN:HB2	2.53	0.43
1:A:426:ALA:HB2	1:A:510:PHE:CG	2.54	0.43
1:B:142:VAL:O	1:B:145:VAL:HG12	2.19	0.43
2:B:601:JPP:O05	2:B:601:JPP:N04	2.52	0.42
1:A:167:PHE:CE2	1:A:176:GLU:HG3	2.54	0.42
1:B:487:THR:HB	2:B:601:JPP:H14	2.01	0.42
1:B:440:ASP:C	1:B:440:ASP:OD1	2.61	0.42
1:A:84:ALA:HA	1:A:144:GLY:O	2.20	0.42
1:A:259:ILE:HD11	1:A:416:ILE:HD11	2.01	0.42
1:A:539:ALA:N	1:A:540:PRO:CD	2.82	0.42
1:B:167:PHE:CE2	1:B:176:GLU:HG3	2.55	0.42
1:B:480:HIS:CD2	1:B:559:ASN:HB2	2.55	0.41
1:B:286:MET:HE2	1:B:386:GLU:CD	2.45	0.41
1:A:409:TYR:OH	2:A:601:JPP:C06	2.68	0.41
2:A:601:JPP:C01	6:A:849:HOH:O	2.68	0.41
1:B:84:ALA:HA	1:B:144:GLY:O	2.21	0.41
1:B:556:PRO:HA	1:B:557:PRO:HD3	1.96	0.41
1:A:97:PRO:HA	1:A:107:THR:HG23	2.02	0.41
1:B:97:PRO:HA	1:B:107:THR:HG23	2.03	0.40
1:B:547:ALA:O	1:B:551:ARG:HG2	2.20	0.40
1:B:364:GLU:O	1:B:368:SER:HB3	2.22	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	511/564 (91%)	489 (96%)	22 (4%)	0	100	100
1	B	486/564 (86%)	465 (96%)	21 (4%)	0	100	100
All	All	997/1128 (88%)	954 (96%)	43 (4%)	0	100	100

There are no Ramachandran outliers to report.

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	409/448 (91%)	397 (97%)	12 (3%)	37	53
1	B	388/448 (87%)	377 (97%)	11 (3%)	38	55
All	All	797/896 (89%)	774 (97%)	23 (3%)	37	53

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

Mol	Chain	Res	Type
1	A	116	GLN
1	A	127	ARG
1	A	161	VAL
1	A	171	ASP
1	A	189	VAL
1	A	207	VAL
1	A	239	LEU
1	A	354	ILE
1	A	368	SER
1	A	441	ARG
1	A	536	LEU
1	A	555	VAL
1	B	103	LEU
1	B	119	GLU
1	B	120	ARG
1	B	127	ARG
1	B	161	VAL
1	B	175	ARG

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	B	189	VAL
1	B	239	LEU
1	B	317	ASP
1	B	354	ILE
1	B	368	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	116	GLN
1	A	232	HIS
1	A	275	ASN
1	A	339	GLN
1	A	377	GLN
1	A	501	ASN
1	B	116	GLN
1	B	336	ASN
1	B	377	GLN
1	B	501	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 8 ligands modelled in this entry, 2 are monoatomic - leaving 6 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	$\# Z > 2$
3	GOL	B	602	-	5,5,5	0.56	0	5,5,5	0.47	0
3	GOL	A	602	-	5,5,5	0.38	0	5,5,5	0.60	0
3	GOL	A	603	-	5,5,5	0.44	0	5,5,5	0.11	0
4	IMD	B	603	-	5,5,5	0.58	0	5,5,5	0.46	0
2	JPP	B	601	1	33,38,38	3.21	14 (42%)	41,55,55	1.85	10 (24%)
2	JPP	A	601	1	33,38,38	3.06	16 (48%)	41,55,55	1.81	8 (19%)

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	GOL	B	602	-	-	4/4/4/4	-
3	GOL	A	602	-	-	1/4/4/4	-
3	GOL	A	603	-	-	4/4/4/4	-
4	IMD	B	603	-	-	-	0/1/1/1
2	JPP	B	601	1	-	3/26/64/64	0/3/3/3
2	JPP	A	601	1	-	0/26/64/64	0/3/3/3

All (30) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	601	JPP	C13-C08	7.71	1.52	1.38
2	A	601	JPP	C13-C08	7.05	1.51	1.38
2	B	601	JPP	C14-C11	-6.93	1.42	1.53
2	A	601	JPP	C14-C11	-6.89	1.42	1.53
2	B	601	JPP	C07-C05	6.83	1.49	1.39
2	A	601	JPP	C07-C05	6.38	1.49	1.39
2	A	601	JPP	C14-N	5.84	1.41	1.35
2	B	601	JPP	C14-N	5.81	1.41	1.35
2	A	601	JPP	C16-C12	5.53	1.50	1.38
2	B	601	JPP	C16-C12	5.21	1.49	1.38
2	B	601	JPP	C21-N03	4.62	1.43	1.34
2	A	601	JPP	C06-N04	4.12	1.44	1.35
2	B	601	JPP	C06-N04	4.10	1.44	1.35

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	601	JPP	C19-S	-4.06	1.77	1.85
2	B	601	JPP	C06-N01	4.03	1.49	1.41
2	A	601	JPP	C06-N01	3.89	1.48	1.41
2	A	601	JPP	C21-N03	3.77	1.42	1.34
2	B	601	JPP	C17-S	-3.31	1.77	1.84
2	A	601	JPP	C10-N	3.23	1.52	1.47
2	B	601	JPP	C10-N	3.04	1.52	1.47
2	A	601	JPP	C19-S	-2.80	1.79	1.85
2	A	601	JPP	CA-C21	-2.47	1.48	1.54
2	A	601	JPP	C17-S	-2.41	1.79	1.84
2	A	601	JPP	C09-N01	-2.35	1.44	1.47
2	A	601	JPP	C11-N01	-2.22	1.36	1.40
2	B	601	JPP	C10-C09	2.19	1.59	1.51
2	A	601	JPP	C18-N02	-2.18	1.42	1.46
2	B	601	JPP	C18-N02	-2.17	1.42	1.46
2	B	601	JPP	C11-N01	-2.10	1.36	1.40
2	A	601	JPP	C10-C09	2.08	1.59	1.51

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	601	JPP	C15-N-C14	4.90	125.46	119.59
2	A	601	JPP	C17-C20-N03	4.71	119.89	109.93
2	B	601	JPP	C17-C20-N03	4.51	119.49	109.93
2	A	601	JPP	C01-C20-N03	-4.27	103.06	109.80
2	B	601	JPP	C05-CA-C21	3.87	117.53	108.42
2	A	601	JPP	C15-N-C14	3.78	124.12	119.59
2	B	601	JPP	C01-C20-N03	-3.37	104.48	109.80
2	B	601	JPP	O06-C21-N03	-3.32	117.02	122.96
2	B	601	JPP	O-C14-N	-3.20	119.91	123.55
2	A	601	JPP	C05-CA-C21	3.18	115.91	108.42
2	A	601	JPP	O04-C06-N01	3.05	123.11	119.59
2	A	601	JPP	O-C14-N	-2.90	120.25	123.55
2	B	601	JPP	C20-N03-C21	-2.89	119.77	123.08
2	A	601	JPP	C20-N03-C21	-2.80	119.87	123.08
2	B	601	JPP	CA-C21-N03	2.38	122.93	116.84
2	B	601	JPP	C18-C19-S	-2.15	99.77	103.86
2	A	601	JPP	O01-C01-C20	-2.14	119.19	124.86
2	B	601	JPP	C19-S-C17	2.02	98.55	93.41

There are no chirality outliers.

All (12) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	603	GOL	O1-C1-C2-O2
3	A	603	GOL	O1-C1-C2-C3
3	A	603	GOL	C1-C2-C3-O3
3	B	602	GOL	O1-C1-C2-C3
3	B	602	GOL	C1-C2-C3-O3
3	A	603	GOL	O2-C2-C3-O3
2	B	601	JPP	O02-C04-C18-C19
2	B	601	JPP	O03-C04-C18-C19
3	B	602	GOL	O1-C1-C2-O2
3	A	602	GOL	C1-C2-C3-O3
3	B	602	GOL	O2-C2-C3-O3
2	B	601	JPP	C08-C05-CA-N04

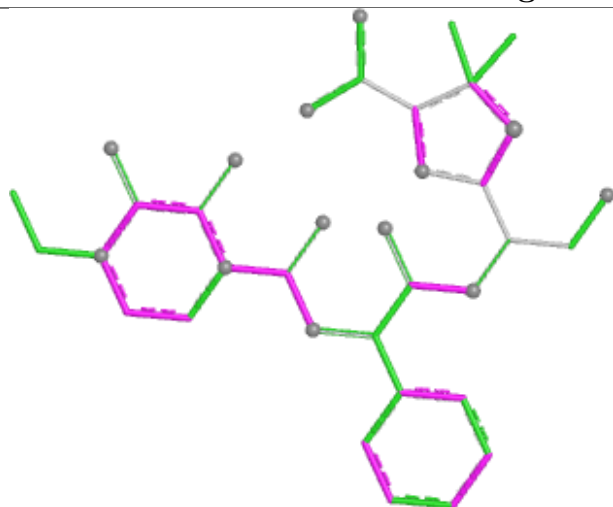
There are no ring outliers.

2 monomers are involved in 8 short contacts:

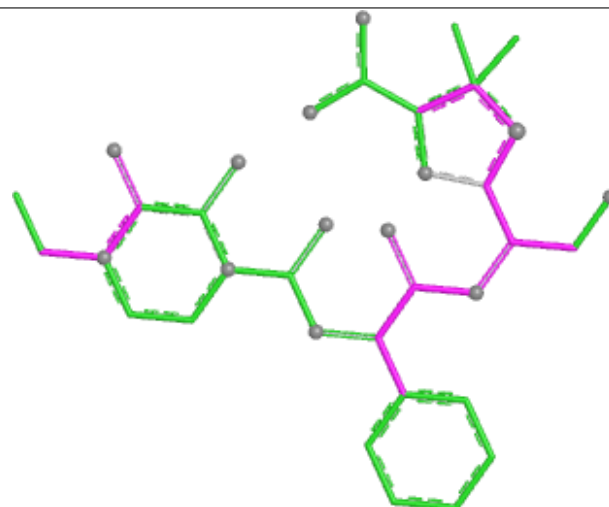
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	601	JPP	3	0
2	A	601	JPP	5	0

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.

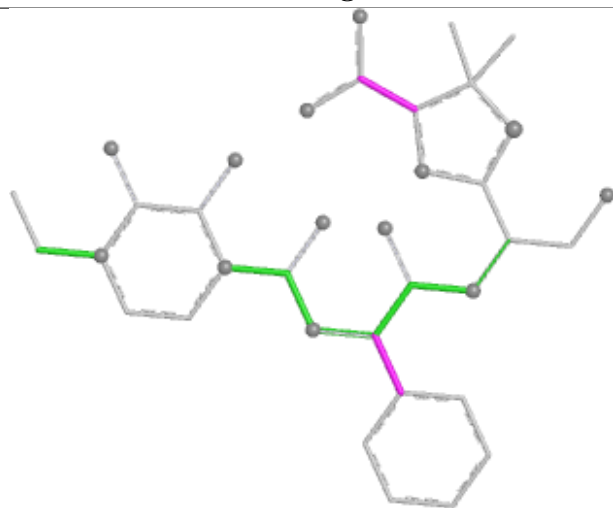
Ligand JPP B 601



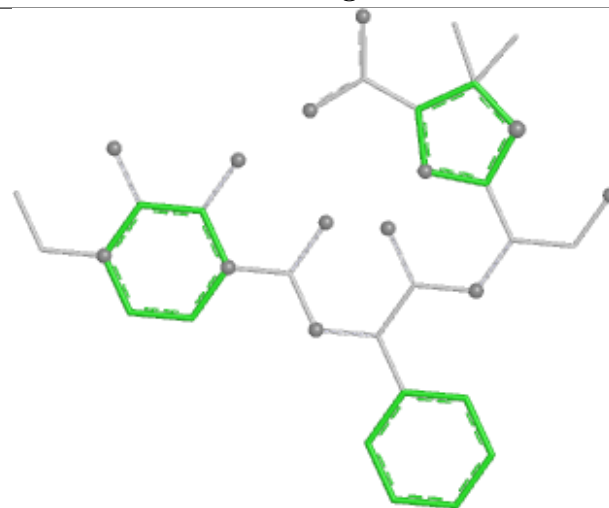
Bond lengths



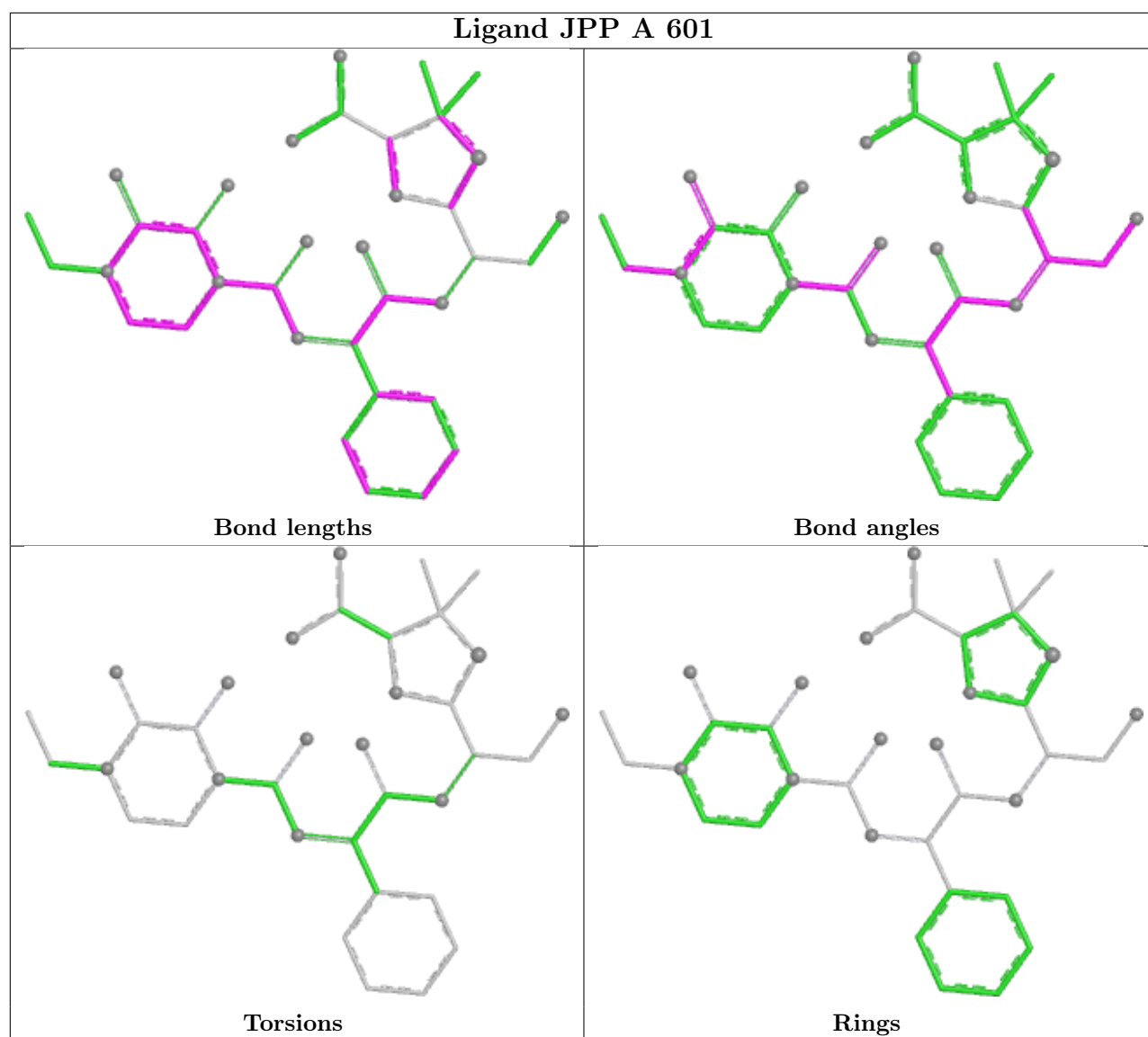
Bond angles



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	513/564 (90%)	0.55	30 (5%) 29 31	15, 36, 72, 90	0
1	B	490/564 (86%)	0.74	54 (11%) 10 12	13, 38, 85, 116	0
All	All	1003/1128 (88%)	0.64	84 (8%) 17 19	13, 37, 79, 116	0

All (84) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	560	LEU	4.9
1	B	209	VAL	4.9
1	A	50	ALA	4.8
1	B	189	VAL	4.4
1	B	563	ALA	4.3
1	B	58	ILE	4.3
1	B	552	LEU	4.3
1	B	192	LYS	4.2
1	B	561	PRO	4.1
1	B	210	THR	3.8
1	A	562	THR	3.6
1	B	148	ILE	3.5
1	B	560	LEU	3.5
1	B	136	GLY	3.5
1	B	59	PRO	3.4
1	B	139	ALA	3.4
1	B	138	ILE	3.4
1	B	212	ASN	3.4
1	B	190	PRO	3.3
1	A	561	PRO	3.3
1	B	142	VAL	3.3
1	A	171	ASP	3.2
1	B	145	VAL	3.2
1	B	395	ARG	3.1

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	122	PHE	3.1
1	B	94	GLU	3.1
1	A	140	LEU	3.0
1	B	120	ARG	3.0
1	B	396	LYS	3.0
1	A	396	LYS	3.0
1	B	328	TYR	2.9
1	B	140	LEU	2.9
1	B	102	ALA	2.9
1	B	137	VAL	2.9
1	B	553	MET	2.9
1	B	146	TYR	2.8
1	B	213	ALA	2.8
1	A	552	LEU	2.8
1	A	122	PHE	2.8
1	A	101	ALA	2.7
1	B	131	PRO	2.7
1	A	395	ARG	2.7
1	B	211	LYS	2.7
1	B	124	TYR	2.6
1	A	124	TYR	2.6
1	B	493	VAL	2.6
1	A	139	ALA	2.6
1	A	551	ARG	2.5
1	B	129	LEU	2.5
1	B	87	LYS	2.5
1	B	214	LYS	2.5
1	B	442	VAL	2.4
1	B	109	LEU	2.4
1	B	188	GLY	2.4
1	A	500	GLU	2.4
1	B	118	ALA	2.4
1	A	56	ILE	2.4
1	B	61	HIS	2.4
1	B	277	GLN	2.4
1	B	89	LEU	2.3
1	A	148	ILE	2.3
1	A	99	LEU	2.3
1	A	126	VAL	2.3
1	B	394	HIS	2.2
1	A	397	TRP	2.2
1	A	188	GLY	2.2

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	60	ALA	2.2
1	B	83	TRP	2.2
1	A	325	ILE	2.2
1	B	173	ARG	2.2
1	A	555	VAL	2.2
1	A	61	HIS	2.2
1	B	134	GLY	2.2
1	B	551	ARG	2.1
1	A	138	ILE	2.1
1	B	141	LYS	2.1
1	B	123	ILE	2.1
1	A	58	ILE	2.1
1	B	494	GLY	2.1
1	A	54	ARG	2.1
1	A	170	VAL	2.0
1	A	200	ARG	2.0
1	B	397	TRP	2.0
1	A	173	ARG	2.0

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	IMD	B	603	5/5	0.59	0.29	66,66,66,66	0
3	GOL	A	603	6/6	0.77	0.19	47,61,62,63	0
3	GOL	A	602	6/6	0.94	0.10	31,32,33,33	0
2	JPP	A	601	36/36	0.94	0.08	23,28,38,39	0
3	GOL	B	602	6/6	0.94	0.10	20,24,26,27	0

Continued on next page...

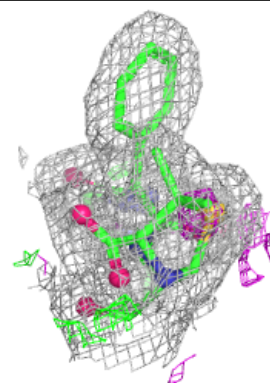
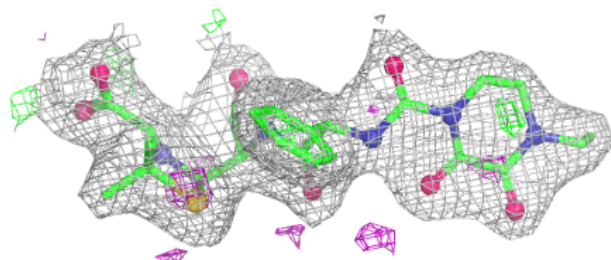
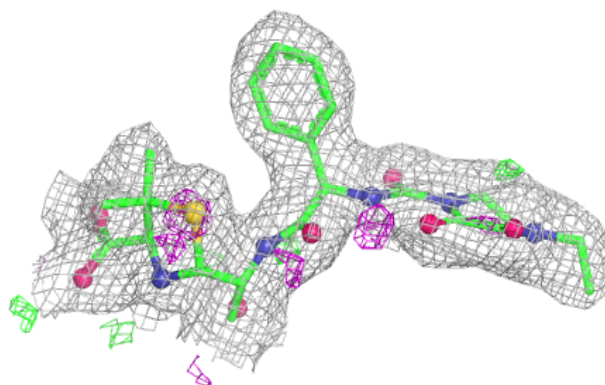
Continued from previous page...

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	JPP	B	601	36/36	0.94	0.09	24,32,37,40	0
5	CL	B	605	1/1	0.95	0.08	66,66,66,66	0
5	CL	B	604	1/1	0.97	0.14	34,34,34,34	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.

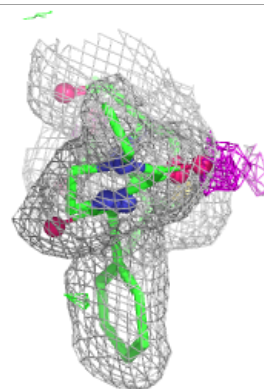
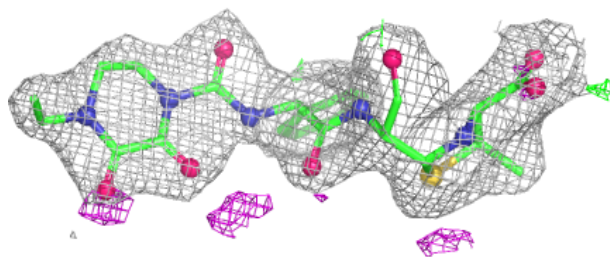
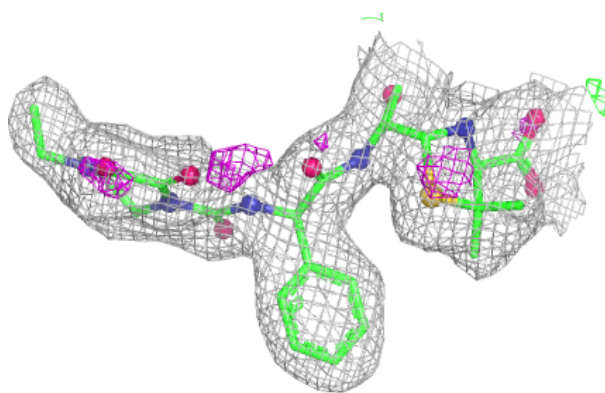
Electron density around JPP A 601:

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 JPP B 601:

$2mF_o-DF_c$ (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.