



Full wwPDB X-ray Structure Validation Report ⓘ

Jul 12, 2021 – 10:05 am BST

PDB ID : 6TUY
Title : Human LSD1/CoREST bound to the quinazoline inhibitor MC4106
Authors : Mattevi, A.; Marrocco, B.
Deposited on : 2020-01-08
Resolution : 2.60 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 : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.22
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.22

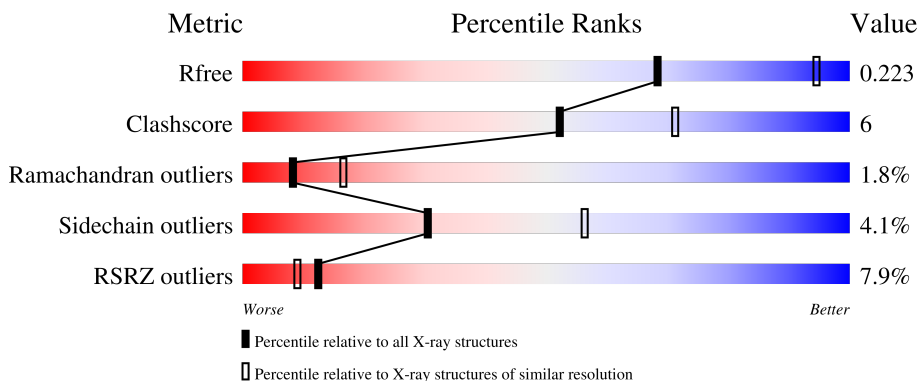
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 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	3163 (2.60-2.60)
Clashscore	141614	3518 (2.60-2.60)
Ramachandran outliers	138981	3455 (2.60-2.60)
Sidechain outliers	138945	3455 (2.60-2.60)
RSRZ outliers	127900	3104 (2.60-2.60)

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	853	
2	B	485	

2 Entry composition [i](#)

There are 9 unique types of molecules in this entry. The entry contains 6536 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 Lysine-specific histone demethylase 1A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	667	5224	3329	907	968	20	0	0	0

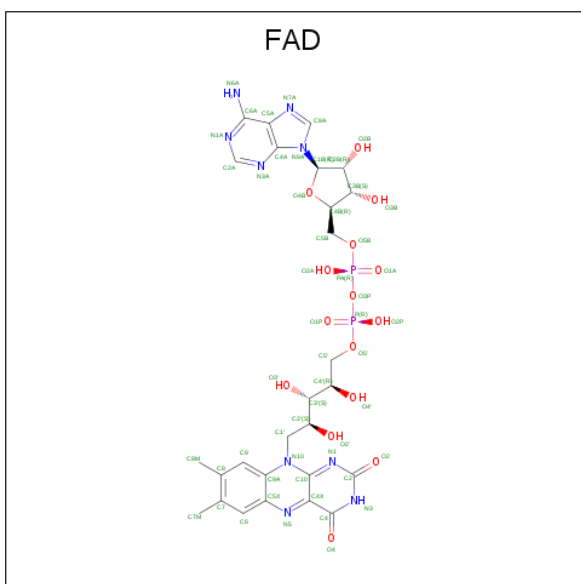
There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	869	PRO	-	expression tag	UNP O60341

- Molecule 2 is a protein called REST corepressor 1.

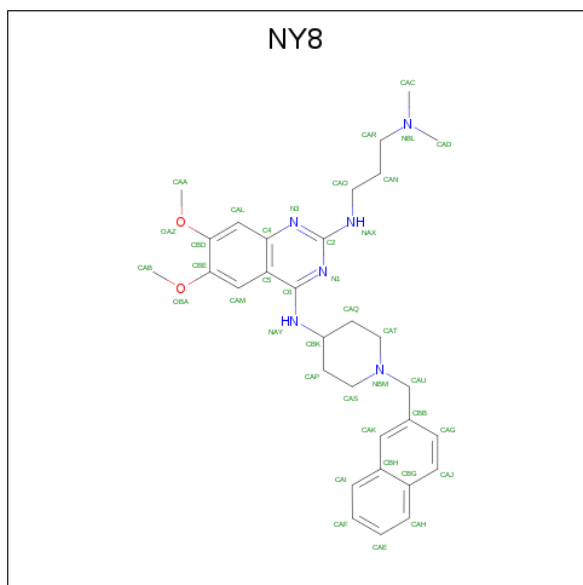
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	134	1086	682	197	204	3	0	0	0

- Molecule 3 is FLAVIN-ADENINE DINUCLEOTIDE (three-letter code: FAD) (formula: $C_{27}H_{33}N_9O_{15}P_2$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	N	O			P
3	A	1	53	27	9	15	2	0	0

- Molecule 4 is {N}2-[3-(dimethylamino)propyl]-6,7-dimethoxy- {N}4-[1-(naphthalen-2-ylmethyl)piperidin-4-yl]quinazoline-2,4-diamine (three-letter code: NY8) (formula: C₃₁H₄₀N₆O₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
4	A	1	39	31	6	2	0	0
4	A	1	39	31	6	2	0	0
4	A	1	39	31	6	2	0	0

- Molecule 5 is PHOSPHATE ION (three-letter code: PO4) (formula: O₄P).

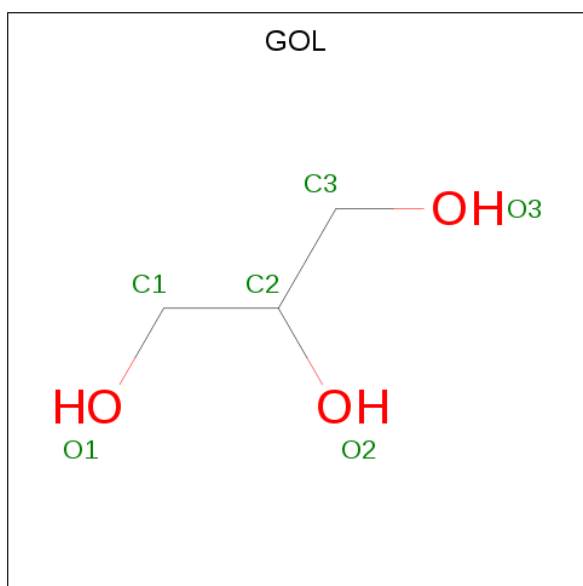


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	O	P	0	0
			5	4	1		

- Molecule 6 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

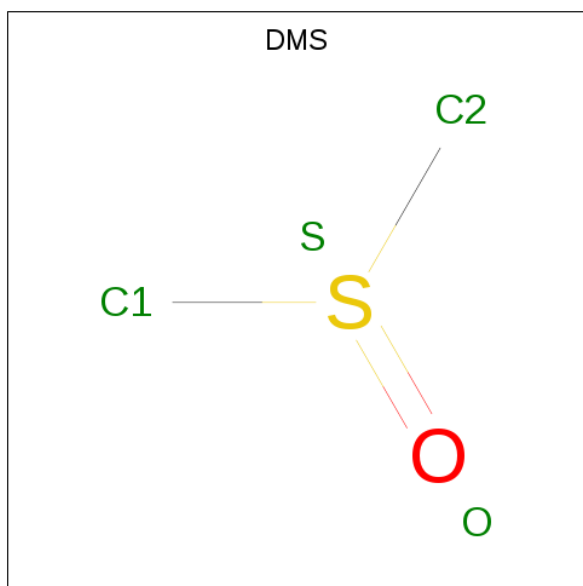
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	5	Total	Cl	0	0
			5	5		

- Molecule 7 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).



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

- Molecule 8 is DIMETHYL SULFOXIDE (three-letter code: DMS) (formula: C₂H₆OS).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
8	A	1	Total	C	O	S	0	0
			4	2	1	1		

- Molecule 9 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	35	Total	O	0	0
			35	35		
9	B	1	Total	O	0	0
			1	1		

4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	121.58Å 176.86Å 233.50Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.00 – 2.60 48.72 – 2.60	Depositor EDS
% Data completeness (in resolution range)	99.5 (48.00-2.60) 99.6 (48.72-2.60)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.32 (at 2.61Å)	Xtrriage
Refinement program	REFMAC 5.8.0158	Depositor
R, R_{free}	0.204 , 0.223 0.213 , 0.223	Depositor DCC
R_{free} test set	1478 reflections (1.92%)	wwPDB-VP
Wilson B-factor (Å ²)	66.2	Xtrriage
Anisotropy	0.044	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 64.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	6536	wwPDB-VP
Average B, all atoms (Å ²)	82.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.36% 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: NY8, DMS, CL, GOL, PO4, FAD

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	1.09	10/5339 (0.2%)	1.22	28/7244 (0.4%)
2	B	0.91	0/1102	1.04	0/1486
All	All	1.06	10/6441 (0.2%)	1.19	28/8730 (0.3%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	413	GLU	CD-OE2	9.54	1.36	1.25
1	A	690	GLU	CD-OE1	7.56	1.33	1.25
1	A	598	SER	CB-OG	6.73	1.51	1.42
1	A	559	GLU	CD-OE1	6.70	1.33	1.25
1	A	645	GLU	CG-CD	6.20	1.61	1.51
1	A	314	GLY	N-CA	5.53	1.54	1.46
1	A	597	ALA	C-O	-5.29	1.13	1.23
1	A	795	ARG	CZ-NH2	-5.22	1.26	1.33
1	A	710	GLU	CD-OE2	5.14	1.31	1.25
1	A	695	TRP	CZ3-CH2	5.11	1.48	1.40

All (28) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	795	ARG	NE-CZ-NH1	15.28	127.94	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	303	ASP	CB-CG-OD1	11.61	128.75	118.30
1	A	295	ARG	NE-CZ-NH1	-10.67	114.96	120.30
1	A	795	ARG	NE-CZ-NH2	-9.76	115.42	120.30
1	A	805	ARG	NE-CZ-NH2	-8.61	115.99	120.30
1	A	805	ARG	NE-CZ-NH1	8.27	124.44	120.30
1	A	688	ARG	NE-CZ-NH1	7.87	124.23	120.30
1	A	820	ARG	NE-CZ-NH1	7.67	124.14	120.30
1	A	557	ASP	CB-CG-OD1	7.64	125.17	118.30
1	A	303	ASP	CB-CG-OD2	-6.92	112.07	118.30
1	A	377	MET	CG-SD-CE	6.86	111.18	100.20
1	A	425	ASP	CB-CG-OD1	6.62	124.26	118.30
1	A	214	ARG	NE-CZ-NH2	-6.60	117.00	120.30
1	A	485	ARG	NE-CZ-NH1	-6.12	117.24	120.30
1	A	557	ASP	CB-CG-OD2	-5.97	112.93	118.30
1	A	645	GLU	OE1-CD-OE2	-5.67	116.49	123.30
1	A	295	ARG	NE-CZ-NH2	5.62	123.11	120.30
1	A	732	LYS	CA-CB-CG	5.59	125.71	113.40
1	A	313	VAL	C-N-CA	-5.57	110.60	122.30
1	A	299	SER	CA-CB-OG	5.57	126.22	111.20
1	A	245	ASP	CB-CG-OD1	5.54	123.29	118.30
1	A	182	ARG	NE-CZ-NH2	-5.49	117.55	120.30
1	A	820	ARG	NE-CZ-NH2	-5.49	117.56	120.30
1	A	752	ARG	NE-CZ-NH1	5.38	122.99	120.30
1	A	425	ASP	CB-CG-OD2	-5.28	113.55	118.30
1	A	526	ARG	NE-CZ-NH1	5.15	122.87	120.30
1	A	216	ARG	NE-CZ-NH1	5.02	122.81	120.30
1	A	594	ARG	CG-CD-NE	-5.00	101.29	111.80

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	792	PRO	Peptide

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	5224	0	5259	62	0
2	B	1086	0	1098	11	0
3	A	53	0	31	4	0
4	A	117	0	0	1	0
5	A	5	0	0	0	0
6	A	5	0	0	0	0
7	A	6	0	8	0	0
8	A	4	0	6	0	0
9	A	35	0	0	0	0
9	B	1	0	0	0	0
All	All	6536	0	6402	71	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 6.

All (71) 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:380:GLN:HE21	1:A:384:ARG:HD2	1.49	0.77
1:A:760:SER:HB2	3:A:901:FAD:HM83	1.68	0.75
1:A:760:SER:CB	3:A:901:FAD:HM83	2.25	0.66
1:A:296:GLN:O	1:A:299:SER:HB3	2.01	0.60
1:A:205:GLN:O	1:A:209:VAL:HG23	2.02	0.59
1:A:331:ALA:HA	3:A:901:FAD:N5	2.18	0.59
1:A:808:PRO:O	1:A:810:THR:HG23	2.03	0.57
1:A:196:PHE:N	1:A:197:PRO:HD3	2.19	0.57
1:A:380:GLN:NE2	1:A:384:ARG:HD2	2.19	0.56
2:B:417:VAL:O	2:B:420:PHE:HB3	2.07	0.54
1:A:675:VAL:O	1:A:696:ASN:ND2	2.41	0.53
1:A:485:ARG:HD3	1:A:486:ASP:N	2.24	0.53
1:A:385:LEU:O	1:A:388:ALA:HB3	2.08	0.53
1:A:391:TYR:CD2	1:A:395:GLN:HG3	2.45	0.52
1:A:196:PHE:N	1:A:197:PRO:CD	2.74	0.51
1:A:485:ARG:HD3	1:A:485:ARG:C	2.31	0.51
2:B:423:ASN:O	2:B:426:ARG:NH1	2.44	0.50
2:B:317:SER:HB3	2:B:320:ASP:OD2	2.11	0.50
1:A:260:GLY:O	1:A:264:PHE:CD2	2.65	0.50
1:A:340:ASN:HB2	1:A:560:PHE:CD2	2.47	0.50
2:B:413:SER:OG	2:B:416:GLN:HG3	2.12	0.49
2:B:350:GLN:HA	2:B:350:GLN:OE1	2.13	0.49
1:A:707:VAL:HG12	1:A:712:ALA:HA	1.93	0.48
1:A:671:TRP:O	1:A:673:PRO:HD3	2.13	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:255:TYR:CE2	1:A:256:LEU:HD23	2.49	0.48
1:A:385:LEU:HD23	1:A:415:VAL:HG12	1.95	0.47
1:A:265:GLY:O	1:A:295:ARG:HD3	2.14	0.47
1:A:807:TYR:N	1:A:808:PRO:CD	2.78	0.47
1:A:660:ASN:OD1	1:A:749:SER:OG	2.31	0.47
1:A:761:TYR:CD1	1:A:809:ALA:HB1	2.50	0.46
1:A:632:GLN:O	1:A:633:GLN:NE2	2.47	0.46
1:A:612:GLN:HG2	1:A:614:PHE:CE1	2.51	0.46
1:A:535:ASN:O	1:A:538:PHE:HB3	2.16	0.45
1:A:606:ASN:HD22	1:A:609:SER:HB3	1.82	0.44
1:A:671:TRP:HA	1:A:735:PHE:CE2	2.53	0.44
1:A:451:LEU:HD23	1:A:494:TYR:HB2	1.98	0.44
2:B:424:TYR:O	2:B:425:ARG:C	2.54	0.44
1:A:385:LEU:CD2	1:A:415:VAL:HG12	2.48	0.44
1:A:836:LEU:HA	1:A:853:PRO:HD2	1.93	0.44
1:A:331:ALA:HA	3:A:901:FAD:C4X	2.48	0.43
1:A:435:VAL:HG23	1:A:436:LYS:N	2.33	0.43
1:A:538:PHE:CE1	1:A:706:LEU:HD13	2.53	0.43
1:A:188:MET:SD	1:A:200:ILE:HG13	2.58	0.43
1:A:278:THR:O	1:A:302:MET:HA	2.18	0.43
1:A:441:LEU:HD23	2:B:356:ASN:HD22	1.84	0.43
1:A:553:ASP:HB2	1:A:556:ASP:OD2	2.19	0.43
1:A:538:PHE:CE2	4:A:902:NY8:CAJ	3.01	0.43
1:A:282:ILE:HG21	1:A:602:VAL:HG21	2.01	0.43
1:A:654:MET:HE1	1:A:773:TYR:CE1	2.54	0.43
1:A:594:ARG:HA	1:A:640:VAL:O	2.19	0.42
1:A:174:VAL:HG12	1:A:219:GLN:OE1	2.19	0.42
1:A:424:LYS:O	1:A:425:ASP:C	2.58	0.42
1:A:185:HIS:CE1	1:A:186:ASP:HB3	2.55	0.42
1:A:386:LEU:O	1:A:387:GLU:C	2.58	0.42
1:A:182:ARG:NH1	1:A:341:PRO:HD3	2.34	0.42
1:A:238:LEU:O	1:A:243:ASN:ND2	2.53	0.42
1:A:750:ARG:HH11	1:A:750:ARG:HG3	1.84	0.42
2:B:401:ASP:C	2:B:401:ASP:OD1	2.58	0.42
1:A:654:MET:HE2	1:A:654:MET:HB3	1.85	0.41
1:A:172:SER:OG	1:A:173:GLY:N	2.54	0.41
1:A:385:LEU:HD23	1:A:415:VAL:CG1	2.51	0.41
1:A:594:ARG:HB2	1:A:601:GLU:O	2.20	0.41
1:A:507:LYS:O	1:A:511:LEU:HG	2.20	0.41
1:A:633:GLN:HA	1:A:634:PRO:HA	1.94	0.41
1:A:435:VAL:CG1	2:B:349:ILE:HG13	2.51	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:325:SER:O	2:B:327:ASN:N	2.51	0.40
1:A:594:ARG:HD2	1:A:601:GLU:HG3	2.02	0.40
1:A:640:VAL:HA	1:A:641:PRO:HA	1.92	0.40
1:A:694:PHE:HA	1:A:704:LEU:O	2.21	0.40
1:A:504:LEU:HD23	1:A:504:LEU:HA	1.99	0.40
2:B:379:CYS:HB3	2:B:416:GLN:NE2	2.37	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	665/853 (78%)	599 (90%)	58 (9%)	8 (1%)	13	27
2	B	132/485 (27%)	116 (88%)	10 (8%)	6 (4%)	2	3
All	All	797/1338 (60%)	715 (90%)	68 (8%)	14 (2%)	8	16

All (14) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	793	ILE
2	B	401	ASP
2	B	429	ASN
2	B	326	ALA
1	A	428	ILE
1	A	429	GLU
1	A	507	LYS
1	A	834	TYR
2	B	379	CYS
1	A	541	ALA
2	B	369	PRO
1	A	425	ASP

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Mol	Chain	Res	Type
1	A	709	GLY
2	B	375	VAL

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	567/700 (81%)	543 (96%)	24 (4%)	30 55
2	B	118/397 (30%)	114 (97%)	4 (3%)	37 63
All	All	685/1097 (62%)	657 (96%)	28 (4%)	30 56

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	172	SER
1	A	190	SER
1	A	200	ILE
1	A	357	LYS
1	A	377	MET
1	A	407	SER
1	A	449	VAL
1	A	467	GLU
1	A	482	SER
1	A	517	SER
1	A	543	PRO
1	A	568	ARG
1	A	571	TYR
1	A	598	SER
1	A	626	PRO
1	A	638	GLN
1	A	674	SER
1	A	675	VAL
1	A	692	PHE
1	A	719	SER
1	A	755	PRO

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Mol	Chain	Res	Type
1	A	778	GLN
1	A	793	ILE
1	A	815	LEU
2	B	317	SER
2	B	327	ASN
2	B	357	SER
2	B	406	SER

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	191	GLN
1	A	259	HIS
1	A	298	GLN
1	A	380	GLN
1	A	410	GLN
1	A	771	ASN
2	B	416	GLN
2	B	423	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 12 ligands modelled in this entry, 5 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
4	NY8	A	903	-	42,43,43	1.73	11 (26%)	59,59,59	2.36	22 (37%)
3	FAD	A	901	-	51,58,58	1.64	9 (17%)	60,89,89	2.24	20 (33%)
5	PO4	A	905	-	4,4,4	0.66	0	6,6,6	1.15	1 (16%)
4	NY8	A	902	-	42,43,43	1.94	11 (26%)	59,59,59	2.46	22 (37%)
8	DMS	A	912	-	3,3,3	0.93	0	3,3,3	2.27	1 (33%)
7	GOL	A	911	-	5,5,5	1.18	0	5,5,5	1.02	0
4	NY8	A	904	-	42,43,43	1.72	8 (19%)	59,59,59	3.29	23 (38%)

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
4	NY8	A	903	-	-	5/19/41/41	0/5/5/5
3	FAD	A	901	-	-	3/30/50/50	0/6/6/6
4	NY8	A	902	-	-	8/19/41/41	0/5/5/5
7	GOL	A	911	-	-	4/4/4/4	-
4	NY8	A	904	-	-	11/19/41/41	0/5/5/5

All (39) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	901	FAD	C4X-C10	6.36	1.45	1.38
4	A	902	NY8	C6-C5	-5.61	1.37	1.44
4	A	904	NY8	CAU-CBB	-4.56	1.43	1.51
4	A	902	NY8	CAU-CBB	-4.31	1.43	1.51
4	A	902	NY8	CAP-CAS	4.23	1.64	1.52
4	A	903	NY8	CAL-CBD	4.19	1.44	1.36
4	A	904	NY8	CAL-CBD	4.05	1.43	1.36
4	A	903	NY8	CAU-CBB	-3.89	1.44	1.51
4	A	902	NY8	CAM-CBE	3.79	1.43	1.36
3	A	901	FAD	C6-C5X	-3.48	1.36	1.41
4	A	903	NY8	CAO-NAX	3.28	1.52	1.45
3	A	901	FAD	C1'-N10	-3.10	1.45	1.48

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	903	NY8	OAZ-CAA	2.87	1.51	1.42
3	A	901	FAD	C8-C7	2.87	1.48	1.40
4	A	903	NY8	OAZ-CBD	2.78	1.41	1.37
4	A	903	NY8	CAK-CBB	2.72	1.43	1.37
4	A	904	NY8	CAO-NAX	2.71	1.51	1.45
4	A	904	NY8	C6-N1	2.70	1.36	1.32
4	A	903	NY8	CAF-CAI	2.54	1.42	1.36
4	A	904	NY8	OBA-CBE	2.53	1.41	1.37
4	A	902	NY8	CAI-CBH	-2.50	1.35	1.41
4	A	902	NY8	CAL-C4	-2.48	1.38	1.41
4	A	902	NY8	CAQ-CAT	2.47	1.59	1.52
3	A	901	FAD	C2-N3	-2.43	1.33	1.38
4	A	902	NY8	CAO-NAX	2.40	1.50	1.45
4	A	904	NY8	CAG-CBB	2.33	1.43	1.38
4	A	903	NY8	C6-C5	-2.33	1.41	1.44
4	A	902	NY8	CAQ-CBK	-2.23	1.46	1.52
4	A	902	NY8	CAJ-CBG	-2.21	1.36	1.41
4	A	904	NY8	CAJ-CAG	2.21	1.41	1.36
4	A	902	NY8	CAU-NBM	2.19	1.51	1.47
4	A	903	NY8	CAJ-CAG	2.18	1.41	1.36
4	A	904	NY8	OAZ-CBD	2.18	1.40	1.37
3	A	901	FAD	C9A-C5X	2.10	1.46	1.42
3	A	901	FAD	C10-N1	2.10	1.36	1.33
3	A	901	FAD	C2A-N1A	2.09	1.37	1.33
4	A	903	NY8	OBA-CBE	2.05	1.40	1.37
3	A	901	FAD	C2B-C1B	-2.01	1.50	1.53
4	A	903	NY8	C2-NAX	2.01	1.37	1.34

All (89) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	904	NY8	CAB-OBA-CBE	10.79	133.81	117.53
3	A	901	FAD	C4-N3-C2	8.39	122.23	115.14
4	A	904	NY8	OBA-CBE-CAM	-7.88	115.05	125.24
4	A	904	NY8	CAA-OAZ-CBD	7.58	128.98	117.53
4	A	904	NY8	OBA-CBE-CBD	7.55	125.93	115.41
4	A	904	NY8	C6-C5-C4	7.04	120.31	115.88
4	A	902	NY8	CBB-CAU-NBM	-6.66	100.20	113.12
4	A	903	NY8	C6-C5-C4	6.47	119.95	115.88
4	A	904	NY8	C5-C4-N3	-6.16	116.27	122.81
4	A	903	NY8	NAX-C2-N3	5.65	126.95	117.19
4	A	902	NY8	CAU-NBM-CAS	5.25	122.75	111.06

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	903	NY8	CAB-OBA-CBE	5.23	125.42	117.53
4	A	902	NY8	CAH-CBG-CBH	5.22	128.27	118.92
4	A	902	NY8	C6-NAY-CBK	5.02	133.72	124.16
4	A	903	NY8	N3-C2-N1	-4.95	118.41	126.23
3	A	901	FAD	C10-C4X-N5	4.84	124.61	121.26
4	A	904	NY8	C2-N3-C4	4.67	123.21	115.60
4	A	903	NY8	CAM-C5-C6	-4.66	120.68	124.88
4	A	904	NY8	NAX-C2-N3	4.59	125.14	117.19
4	A	903	NY8	C5-C4-N3	-4.58	117.95	122.81
4	A	904	NY8	N3-C2-N1	-4.57	119.01	126.23
3	A	901	FAD	C5'-C4'-C3'	-4.48	103.54	112.20
4	A	904	NY8	CAL-C4-N3	4.45	125.50	118.72
3	A	901	FAD	N3A-C2A-N1A	-4.45	121.72	128.68
4	A	902	NY8	CAC-NBL-CAR	-4.33	93.58	110.74
4	A	904	NY8	CAQ-CBK-NAY	4.17	117.09	110.60
4	A	904	NY8	C6-NAY-CBK	4.14	132.03	124.16
4	A	904	NY8	CAP-CBK-NAY	-4.11	104.20	110.60
3	A	901	FAD	O4B-C1B-C2B	-4.01	101.07	106.93
4	A	902	NY8	CAE-CAH-CBG	-3.97	114.23	120.44
3	A	901	FAD	C1'-N10-C9A	3.86	121.33	118.29
3	A	901	FAD	C4X-C10-N10	-3.82	116.37	120.30
4	A	902	NY8	CAQ-CBK-NAY	3.68	116.33	110.60
4	A	902	NY8	CAJ-CBG-CAH	-3.64	114.69	123.19
4	A	903	NY8	C2-N1-C6	3.63	124.69	116.39
4	A	902	NY8	CAU-CBB-CAG	-3.61	113.98	120.77
4	A	902	NY8	OAZ-CBD-CAL	-3.58	120.61	125.24
4	A	903	NY8	C2-N3-C4	3.58	121.43	115.60
8	A	912	DMS	O-S-C1	3.55	124.67	106.54
4	A	902	NY8	N3-C2-N1	-3.55	120.62	126.23
4	A	902	NY8	CAK-CBH-CBG	3.50	123.95	118.96
3	A	901	FAD	C4X-C4-N3	-3.45	118.71	123.43
4	A	904	NY8	CAL-CBD-CBE	-3.44	116.67	120.07
4	A	903	NY8	CBB-CAU-NBM	3.38	119.69	113.12
4	A	902	NY8	CAD-NBL-CAC	3.36	118.41	109.73
4	A	903	NY8	CAU-NBM-CAT	-3.23	103.87	111.06
3	A	901	FAD	O5'-P-O1P	-3.23	96.44	109.07
4	A	902	NY8	CAU-CBB-CAK	3.23	129.14	121.30
4	A	902	NY8	CAE-CAF-CAI	3.18	124.89	120.44
4	A	902	NY8	CAD-NBL-CAR	-3.15	98.24	110.74
3	A	901	FAD	C4X-N5-C5X	3.03	119.80	116.77
4	A	903	NY8	CAL-C4-N3	2.99	123.28	118.72
4	A	904	NY8	C5-C6-NAY	-2.99	117.81	120.63

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	902	NY8	OAZ-CBD-CBE	2.98	119.56	115.41
3	A	901	FAD	O2P-P-O1P	2.98	126.95	112.24
4	A	904	NY8	CBE-CAM-C5	2.88	125.93	120.58
4	A	902	NY8	C2-N1-C6	2.87	122.97	116.39
4	A	902	NY8	NAX-C2-N3	2.85	122.12	117.19
4	A	903	NY8	C5-C6-N1	-2.72	117.51	121.98
4	A	904	NY8	CAS-CAP-CBK	-2.72	105.73	110.50
4	A	904	NY8	CBD-CAL-C4	2.65	123.10	120.12
4	A	903	NY8	CAA-OAZ-CBD	2.64	121.52	117.53
4	A	903	NY8	CAP-CBK-CAQ	2.62	115.37	110.82
3	A	901	FAD	C1B-N9A-C4A	-2.59	122.09	126.64
3	A	901	FAD	C4-C4X-C10	-2.59	118.24	119.95
3	A	901	FAD	O2B-C2B-C3B	2.56	120.11	111.82
3	A	901	FAD	P-O3P-PA	-2.52	124.17	132.83
4	A	904	NY8	CAM-C5-C6	-2.50	122.62	124.88
4	A	903	NY8	CAO-NAX-C2	-2.44	119.53	123.75
4	A	903	NY8	CAN-CAO-NAX	2.43	118.02	111.49
4	A	903	NY8	CAN-CAR-NBL	-2.43	107.22	113.79
5	A	905	PO4	O4-P-O2	2.38	115.61	107.97
4	A	904	NY8	CAC-NBL-CAR	2.34	120.02	110.74
4	A	904	NY8	CAF-CAE-CAH	2.33	123.71	120.44
3	A	901	FAD	O3'-C3'-C2'	2.30	114.38	108.81
4	A	904	NY8	C2-N1-C6	2.30	121.66	116.39
4	A	904	NY8	OAZ-CBD-CAL	2.29	128.19	125.24
4	A	903	NY8	CAP-CBK-NAY	-2.27	107.07	110.60
4	A	903	NY8	CAT-CAQ-CBK	2.18	114.32	110.50
4	A	903	NY8	OBA-CBE-CBD	2.17	118.43	115.41
4	A	902	NY8	CAI-CBH-CBG	-2.16	115.05	118.92
3	A	901	FAD	C6-C5X-C9A	2.15	121.87	119.05
3	A	901	FAD	C2A-N1A-C6A	2.13	122.39	118.75
4	A	903	NY8	OBA-CBE-CAM	-2.12	122.49	125.24
4	A	903	NY8	CAS-NBM-CAT	2.12	113.59	108.83
4	A	902	NY8	CAQ-CAT-NBM	-2.09	107.87	111.11
3	A	901	FAD	C1'-C2'-C3'	-2.08	103.97	109.79
3	A	901	FAD	O4B-C4B-C5B	-2.04	102.65	109.37
4	A	902	NY8	CAS-CAP-CBK	-2.02	106.95	110.50

There are no chirality outliers.

All (31) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	902	NY8	C5-C6-NAY-CBK

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Mol	Chain	Res	Type	Atoms
4	A	902	NY8	N1-C6-NAY-CBK
4	A	902	NY8	CAQ-CBK-NAY-C6
4	A	902	NY8	CBB-CAU-NBM-CAS
4	A	904	NY8	N1-C6-NAY-CBK
4	A	904	NY8	N1-C2-NAX-CAO
4	A	904	NY8	N3-C2-NAX-CAO
4	A	904	NY8	CAQ-CBK-NAY-C6
7	A	911	GOL	C1-C2-C3-O3
4	A	902	NY8	CBB-CAU-NBM-CAT
4	A	904	NY8	CAM-CBE-OBA-CAB
4	A	904	NY8	CBD-CBE-OBA-CAB
4	A	903	NY8	CBB-CAU-NBM-CAS
4	A	904	NY8	CAN-CAR-NBL-CAC
4	A	904	NY8	CAN-CAR-NBL-CAD
4	A	903	NY8	CAL-CBD-OAZ-CAA
4	A	903	NY8	CBE-CBD-OAZ-CAA
7	A	911	GOL	O1-C1-C2-C3
7	A	911	GOL	O2-C2-C3-O3
4	A	904	NY8	CBE-CBD-OAZ-CAA
4	A	903	NY8	CBB-CAU-NBM-CAT
4	A	902	NY8	CBE-CBD-OAZ-CAA
4	A	904	NY8	C5-C6-NAY-CBK
4	A	904	NY8	CAL-CBD-OAZ-CAA
4	A	903	NY8	CAO-CAN-CAR-NBL
3	A	901	FAD	C2'-C3'-C4'-C5'
4	A	902	NY8	CAL-CBD-OAZ-CAA
3	A	901	FAD	C2'-C3'-C4'-O4'
7	A	911	GOL	O1-C1-C2-O2
4	A	902	NY8	CAO-CAN-CAR-NBL
3	A	901	FAD	O4B-C4B-C5B-O5B

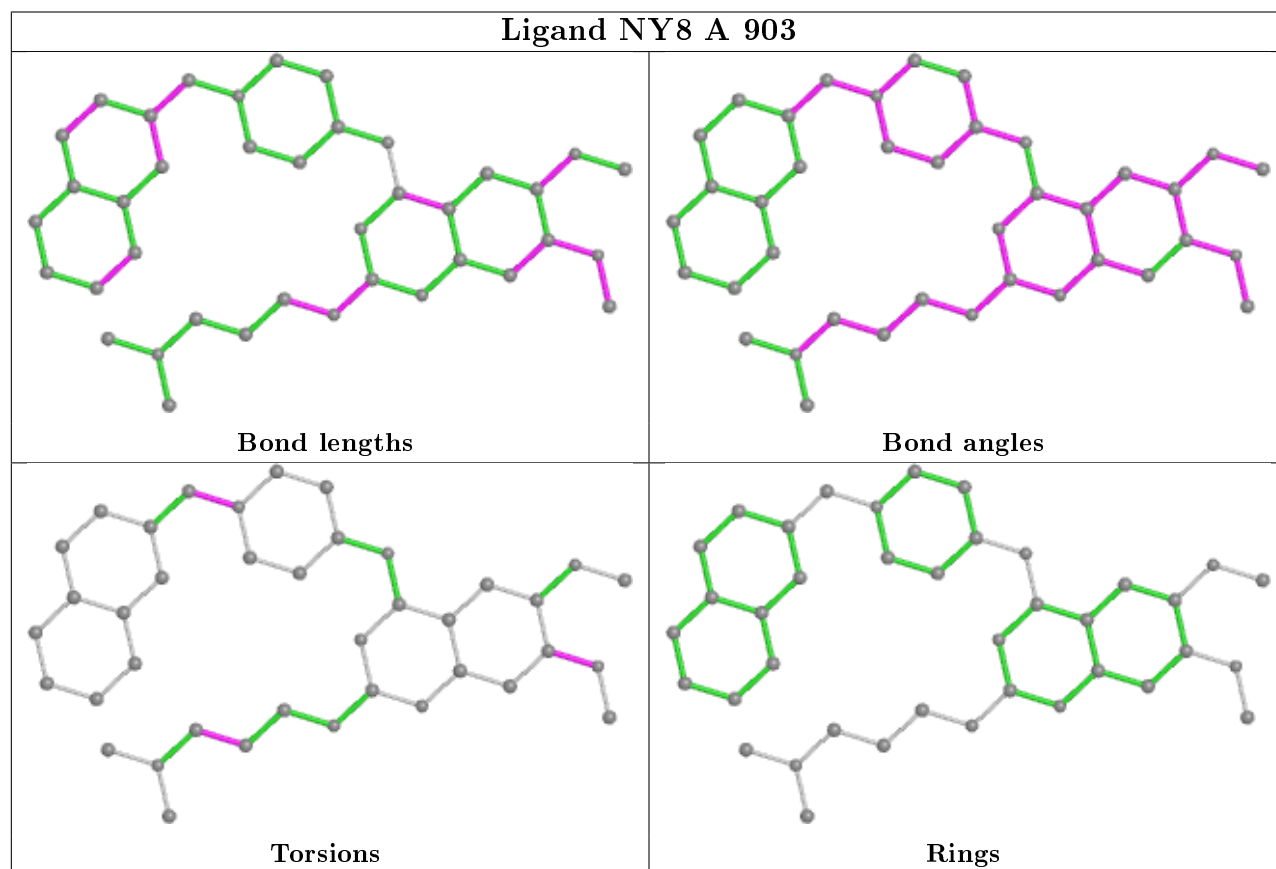
There are no ring outliers.

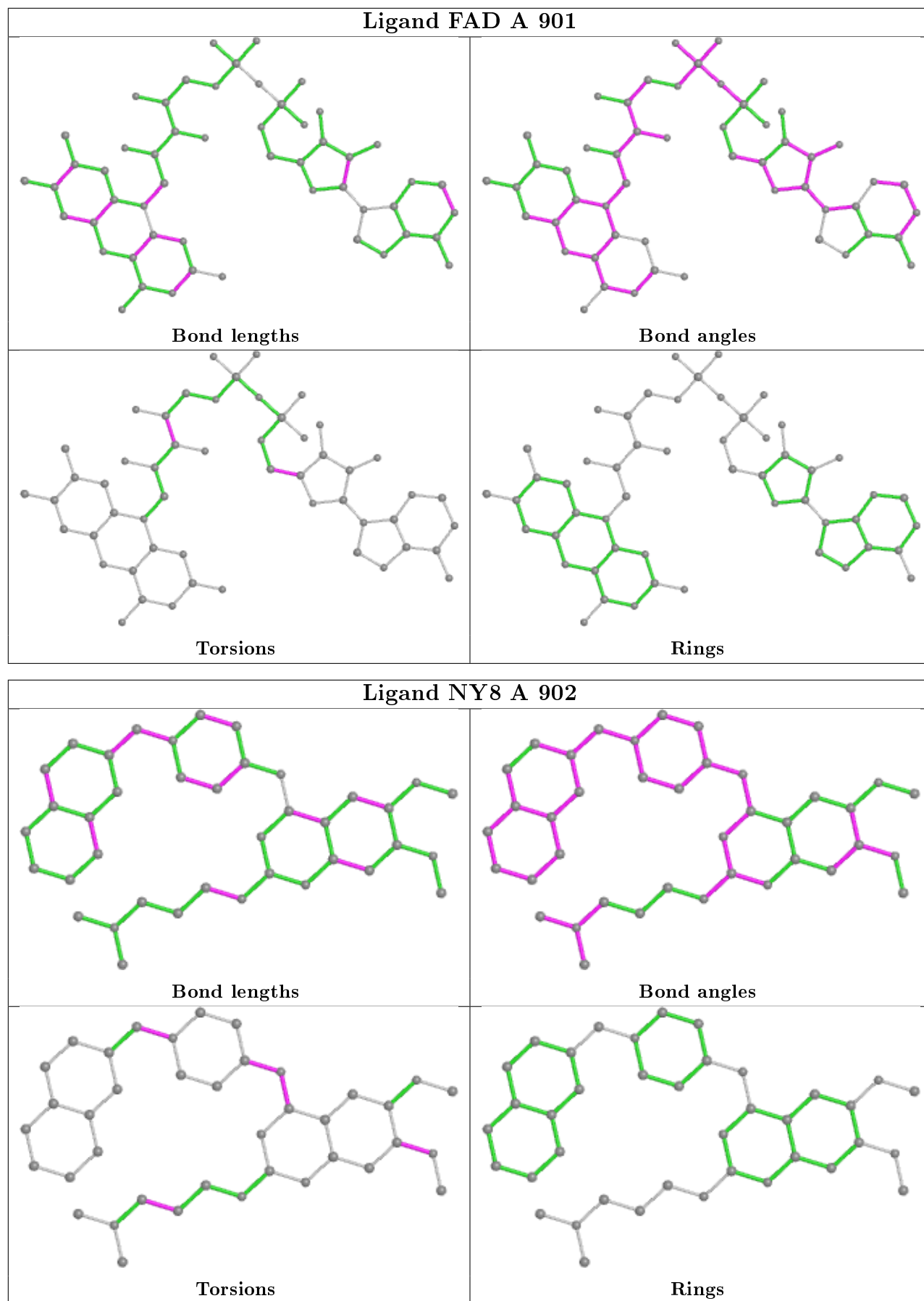
2 monomers are involved in 5 short contacts:

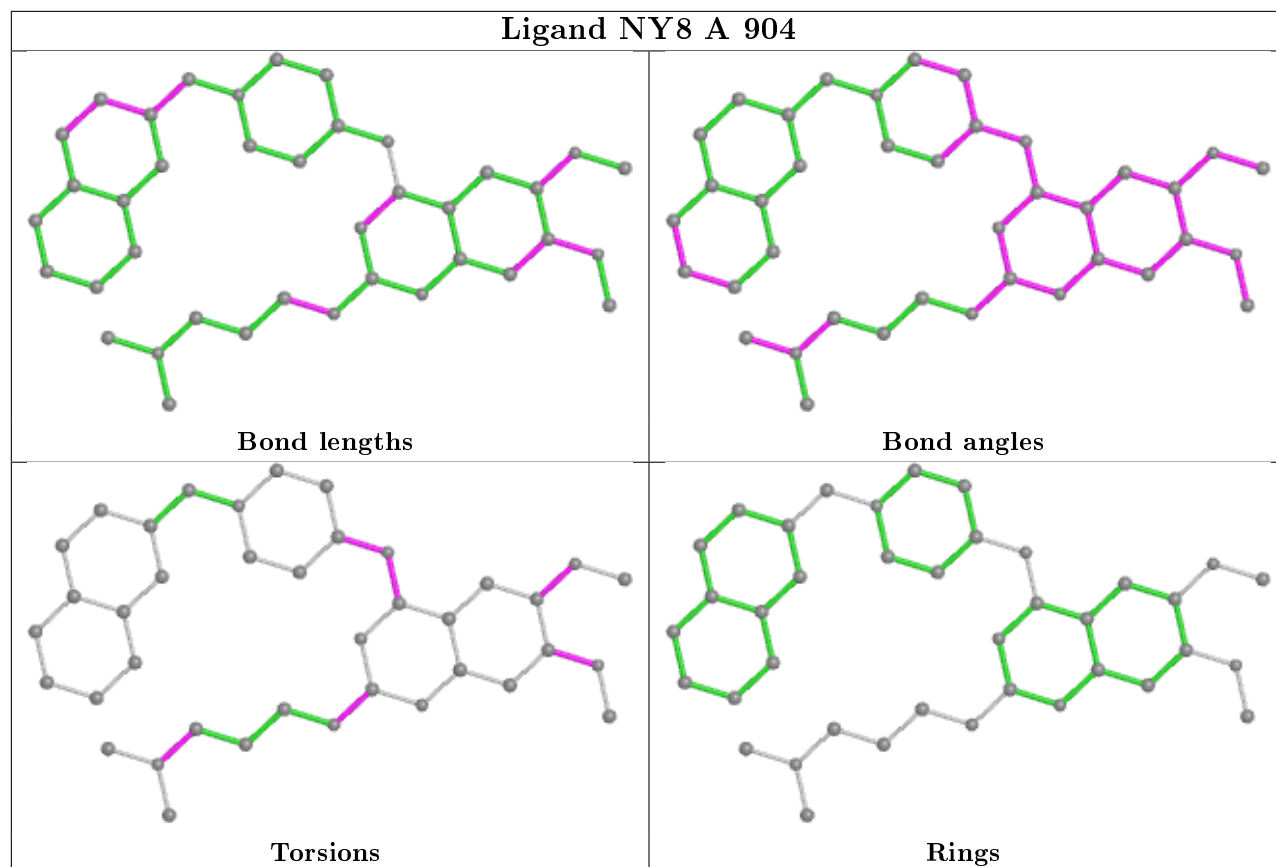
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	901	FAD	4	0
4	A	902	NY8	1	0

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](#)

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	667/853 (78%)	0.45	42 (6%) 20 15	43, 74, 112, 147	0
2	B	134/485 (27%)	0.99	21 (15%) 2 1	71, 105, 132, 161	0
All	All	801/1338 (59%)	0.54	63 (7%) 12 9	43, 79, 122, 161	0

All (63) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	375	VAL	6.3
2	B	308	ARG	5.2
2	B	402	PHE	4.4
2	B	376	ILE	4.1
2	B	400	ARG	3.9
2	B	415	VAL	3.8
1	A	236	GLN	3.8
2	B	420	PHE	3.6
2	B	374	GLU	3.6
1	A	668	ARG	3.5
1	A	239	GLU	3.5
1	A	171	PRO	3.5
1	A	273	LEU	3.4
1	A	174	VAL	3.3
1	A	242	TYR	3.3
2	B	399	GLY	3.3
1	A	241	PRO	3.3
1	A	235	LEU	3.2
1	A	497	LEU	3.1
1	A	238	LEU	3.1
2	B	422	VAL	3.1
1	A	503	LYS	3.0
1	A	509	GLN	3.0
1	A	739	ALA	3.0

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Mol	Chain	Res	Type	RSRZ
2	B	369	PRO	3.0
1	A	513	ALA	2.9
1	A	275	THR	2.9
2	B	312	LYS	2.9
1	A	699	LYS	2.8
1	A	853	PRO	2.8
1	A	504	LEU	2.8
2	B	372	LEU	2.8
1	A	698	TYR	2.8
2	B	381	ALA	2.6
1	A	508	LEU	2.6
2	B	309	LYS	2.6
1	A	436	LYS	2.6
1	A	212	PHE	2.6
1	A	172	SER	2.5
1	A	373	GLU	2.5
1	A	431	TRP	2.4
2	B	421	PHE	2.4
2	B	365	GLY	2.4
1	A	398	PHE	2.3
1	A	359	LYS	2.3
1	A	271	LYS	2.3
1	A	808	PRO	2.3
1	A	274	PRO	2.3
1	A	372	LYS	2.2
1	A	395	GLN	2.2
1	A	763	TYR	2.2
1	A	270	ILE	2.2
1	A	499	GLU	2.1
2	B	349	ILE	2.1
2	B	367	ILE	2.1
1	A	510	GLU	2.1
1	A	809	ALA	2.1
1	A	244	SER	2.1
1	A	240	ALA	2.1
2	B	318	GLN	2.0
2	B	368	GLU	2.0
1	A	492	LYS	2.0
1	A	512	GLU	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(\AA^2)	Q<0.9
7	GOL	A	911	6/6	0.71	0.23	79,96,97,104	0
6	CL	A	907	1/1	0.82	0.44	86,86,86,86	0
6	CL	A	908	1/1	0.84	0.19	89,89,89,89	0
6	CL	A	910	1/1	0.86	0.17	87,87,87,87	0
4	NY8	A	904	39/39	0.87	0.32	86,133,164,174	0
6	CL	A	909	1/1	0.88	0.28	78,78,78,78	0
4	NY8	A	903	39/39	0.90	0.19	76,94,117,122	0
6	CL	A	906	1/1	0.92	0.28	80,80,80,80	0
5	PO4	A	905	5/5	0.92	0.23	85,93,103,109	0
4	NY8	A	902	39/39	0.95	0.21	46,79,101,123	0
8	DMS	A	912	4/4	0.95	0.20	70,77,81,82	0
3	FAD	A	901	53/53	0.97	0.24	37,52,70,79	0

6.5 Other polymers [i](#)

There are no such residues in this entry.