



Full wwPDB X-ray Structure Validation Report ⓘ

Nov 21, 2022 – 12:16 PM JST

PDB ID : 8GRU
Title : Crystal structure of a constitutively active mutant of the alpha beta heterodimer of human IDH3 in complex with ICT, NAD and Ca
Authors : Sun, P.; Chen, X.; Ding, J.
Deposited on : 2022-09-02
Resolution : 2.85 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	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.31.3
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)	:	2.31.3

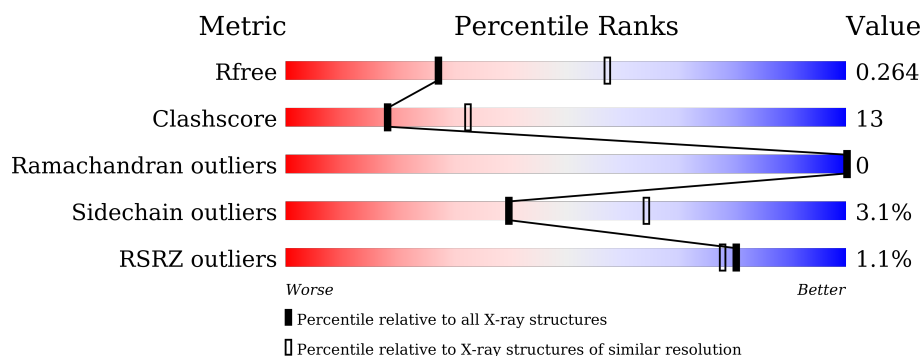
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.85 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	1031 (2.86-2.82)
Clashscore	141614	1078 (2.86-2.82)
Ramachandran outliers	138981	1050 (2.86-2.82)
Sidechain outliers	138945	1051 (2.86-2.82)
RSRZ outliers	127900	1019 (2.86-2.82)

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	339	<div> <div></div> <div>72%</div> <div>27%</div> <div>.</div> </div>
1	C	339	<div> <div></div> <div>70%</div> <div>27%</div> <div>..</div> </div>
2	B	352	<div> <div></div> <div>70%</div> <div>23%</div> <div>6%</div> </div>
2	D	352	<div> <div></div> <div>71%</div> <div>22%</div> <div>6%</div> </div>

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 crite-

ria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
5	ICT	C	403	-	-	X	-

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 10093 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 Human IDH3 alpha subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	334	Total	C	N	O	S	0	0	0
			2441	1533	420	467	21			
1	C	334	Total	C	N	O	S	0	0	0
			2445	1536	421	467	21			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	139	ALA	GLN	engineered mutation	UNP P50213
C	139	ALA	GLN	engineered mutation	UNP P50213

- Molecule 2 is a protein called Isoform A of Isocitrate dehydrogenase [NAD] subunit beta, mitochondrial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	331	Total	C	N	O	S	0	0	0
			2503	1581	434	468	20			
2	D	332	Total	C	N	O	S	0	0	0
			2500	1578	433	469	20			

There are 24 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	341	GLU	-	expression tag	UNP O43837-2
B	342	ILE	-	expression tag	UNP O43837-2
B	343	CYS	-	expression tag	UNP O43837-2
B	344	ARG	-	expression tag	UNP O43837-2
B	345	ARG	-	expression tag	UNP O43837-2
B	346	VAL	-	expression tag	UNP O43837-2
B	347	LYS	-	expression tag	UNP O43837-2
B	348	ASP	-	expression tag	UNP O43837-2
B	349	LEU	-	expression tag	UNP O43837-2

Continued on next page...

Chain	Residue	Modelled	Actual	Comment	Reference
B	350	ASP	-	expression tag	UNP O43837-2
B	351	GLU	-	expression tag	UNP O43837-2
B	352	ASN	-	expression tag	UNP O43837-2
D	341	GLU	-	expression tag	UNP O43837-2
D	342	ILE	-	expression tag	UNP O43837-2
D	343	CYS	-	expression tag	UNP O43837-2
D	344	ARG	-	expression tag	UNP O43837-2
D	345	ARG	-	expression tag	UNP O43837-2
D	346	VAL	-	expression tag	UNP O43837-2
D	347	LYS	-	expression tag	UNP O43837-2
D	348	ASP	-	expression tag	UNP O43837-2
D	349	LEU	-	expression tag	UNP O43837-2
D	350	ASP	-	expression tag	UNP O43837-2
D	351	GLU	-	expression tag	UNP O43837-2
D	352	ASN	-	expression tag	UNP O43837-2

- # NAD

Continued on next page...

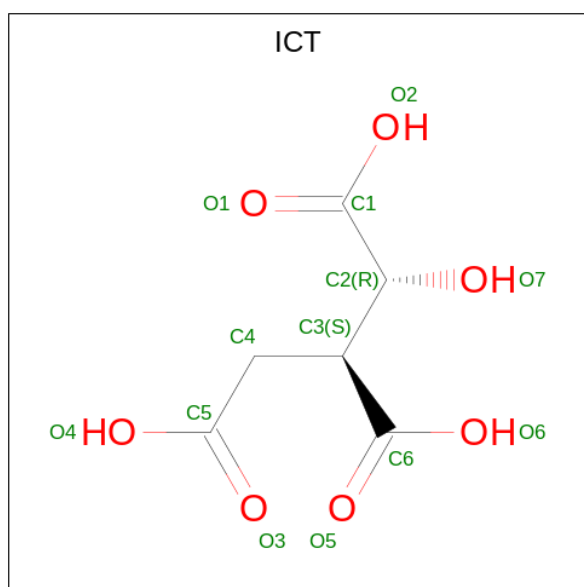
Continued from previous page...

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	D	1	Total	C	N	O	P	0	0
			44	21	7	14	2		

- Molecule 4 is CALCIUM ION (three-letter code: CA) (formula: Ca) (labeled as "Ligand of Interest" by depositor).

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

- Molecule 5 is ISOCITRIC ACID (three-letter code: ICT) (formula: C₆H₈O₇) (labeled as "Ligand of Interest" by depositor).

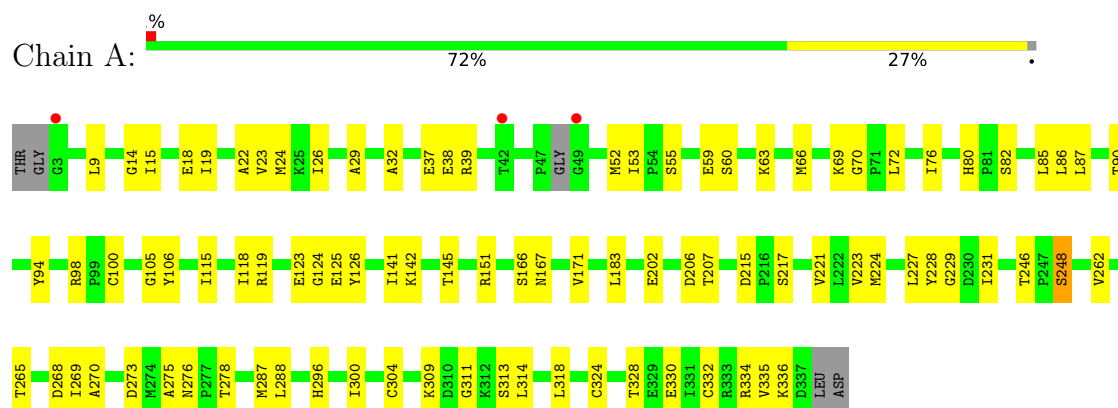


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			13	6	7		
5	C	1	Total	C	O	0	0
			13	6	7		

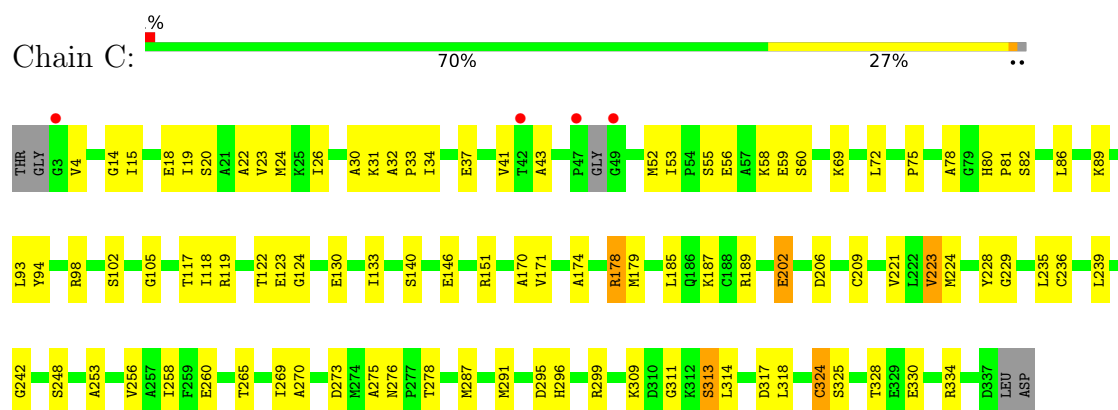
3 Residue-property plots

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.

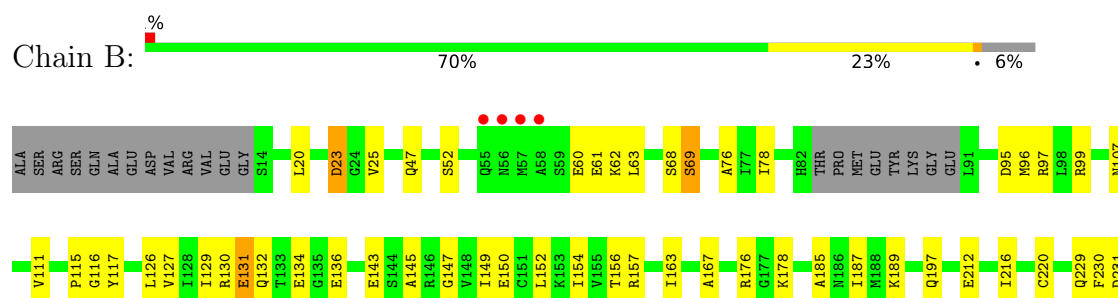
• Molecule 1: Human IDH3 alpha subunit

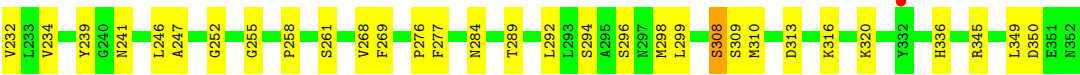


• Molecule 1: Human IDH3 alpha subunit

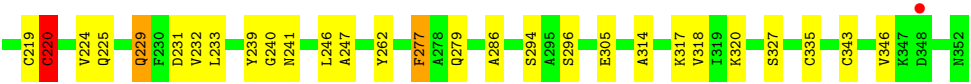
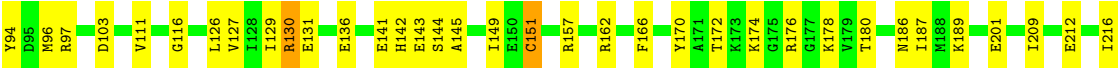
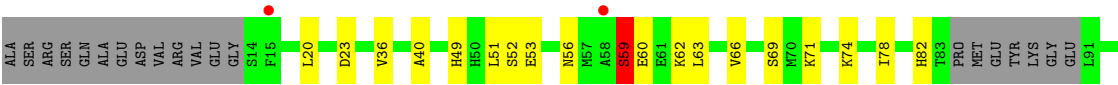


• Molecule 2: Isoform A of Isocitrate dehydrogenase [NAD] subunit beta, mitochondrial





● Molecule 2: Isoform A of Isocitrate dehydrogenase [NAD] subunit beta, mitochondrial



4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	134.04Å 163.83Å 163.13Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	40.96 – 2.85 40.96 – 2.85	Depositor EDS
% Data completeness (in resolution range)	99.3 (40.96-2.85) 99.3 (40.96-2.85)	Depositor EDS
R_{merge}	0.24	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.04 (at 2.86Å)	Xtriage
Refinement program	PHENIX 1.14_3260	Depositor
R, R_{free}	0.208 , 0.263 0.209 , 0.264	Depositor DCC
R_{free} test set	2166 reflections (5.16%)	wwPDB-VP
Wilson B-factor (Å ²)	47.9	Xtriage
Anisotropy	0.267	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 38.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	10093	wwPDB-VP
Average B, all atoms (Å ²)	44.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 12.81% 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: ICT, CA, NAD

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	0.48	0/2482	0.71	0/3370
1	C	0.52	1/2486 (0.0%)	0.69	0/3374
2	B	0.53	1/2546 (0.0%)	0.67	0/3443
2	D	0.53	0/2543	0.72	3/3441 (0.1%)
All	All	0.51	2/10057 (0.0%)	0.70	3/13628 (0.0%)

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
2	D	0	2

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	115	PRO	N-CD	-8.52	1.35	1.47
1	C	223	VAL	CB-CG1	-5.88	1.40	1.52

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	59	SER	O-C-N	-7.78	110.26	122.70
2	D	220	CYS	O-C-N	-5.88	113.29	122.70
2	D	219	CYS	C-N-CA	-5.32	108.40	121.70

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	D	220	CYS	Mainchain
2	D	59	SER	Mainchain

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	2441	0	2351	80	0
1	C	2445	0	2361	76	0
2	B	2503	0	2455	54	0
2	D	2500	0	2438	59	0
3	A	44	0	21	5	0
3	B	44	0	23	1	0
3	C	44	0	22	10	0
3	D	44	0	23	0	0
4	A	1	0	0	0	0
4	C	1	0	0	0	0
5	A	13	0	5	1	0
5	C	13	0	5	9	0
All	All	10093	0	9704	266	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 13.

All (266) 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)
3:A:401:NAD:O4B	3:A:401:NAD:C1B	1.63	1.19
2:D:53:GLU:CB	2:D:82:HIS:CB	2.23	1.15
3:C:401:NAD:O4B	3:C:401:NAD:C1B	1.63	1.14
1:A:311:GLY:HA2	1:A:314:LEU:HD11	1.32	1.08
1:C:80:HIS:O	2:D:189:LYS:NZ	1.90	1.04
1:A:332:CYS:O	1:A:335:VAL:HG22	1.65	0.96
1:A:332:CYS:O	1:A:335:VAL:CG2	2.16	0.94
1:A:14:GLY:HA3	1:A:265:THR:HG23	1.52	0.90
3:C:401:NAD:C4N	5:C:403:ICT:H2	2.04	0.87
2:D:180:THR:HB	2:D:233:LEU:HD23	1.57	0.86

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:171:VAL:HB	1:C:224:MET:HG2	1.60	0.82
2:D:71:LYS:O	2:D:74:LYS:NZ	2.12	0.78
1:A:80:HIS:O	2:B:189:LYS:NZ	2.18	0.77
3:C:401:NAD:C3N	5:C:403:ICT:H41	2.15	0.76
2:B:95:ASP:OD1	2:B:99:ARG:NH1	2.19	0.76
2:D:127:VAL:HB	2:D:232:VAL:HG22	1.67	0.76
3:C:401:NAD:H6N	3:C:401:NAD:H51N	1.65	0.75
2:B:63:LEU:HD21	2:B:97:ARG:HB3	1.69	0.75
2:B:23:ASP:OD1	2:B:52:SER:OG	2.05	0.75
1:A:53:ILE:HD13	1:A:87:LEU:HD23	1.69	0.75
2:D:56:ASN:O	2:D:94:TYR:OH	2.06	0.74
1:A:118:ILE:HD12	1:A:221:VAL:HG13	1.71	0.73
2:B:216:ILE:HD12	2:B:239:TYR:CG	2.23	0.73
1:C:53:ILE:HD11	1:C:58:LYS:CB	2.17	0.73
1:A:105:GLY:HA3	1:A:309:LYS:HA	1.71	0.72
1:C:14:GLY:HA3	1:C:265:THR:HG23	1.71	0.72
2:D:111:VAL:HB	2:D:126:LEU:HB2	1.72	0.71
2:D:220:CYS:HB3	2:D:246:LEU:CD1	2.19	0.71
2:B:299:LEU:HB2	2:B:308:SER:HB2	1.72	0.71
1:C:19:ILE:O	1:C:23:VAL:HG23	1.90	0.70
1:A:37:GLU:OE2	1:A:60:SER:OG	2.09	0.70
1:C:119:ARG:HB2	1:C:229:GLY:HA3	1.73	0.70
2:D:178:LYS:NZ	2:D:229:GLN:O	2.24	0.69
1:C:105:GLY:HA3	1:C:309:LYS:HA	1.75	0.69
1:A:311:GLY:HA2	1:A:314:LEU:CD1	2.16	0.69
1:A:37:GLU:OE1	1:A:63:LYS:NZ	2.23	0.69
1:C:26:ILE:HD11	1:C:328:THR:HG23	1.75	0.69
1:A:335:VAL:HG23	1:A:336:LYS:H	1.59	0.68
2:D:216:ILE:HD12	2:D:239:TYR:CG	2.30	0.67
2:B:76:ALA:HB3	2:B:268:VAL:HG13	1.75	0.66
3:C:401:NAD:H4N	5:C:403:ICT:H2	1.76	0.66
2:D:186:ASN:C	2:D:187:ILE:HD13	2.16	0.66
1:C:98:ARG:NH2	5:C:403:ICT:O1	2.26	0.66
1:A:224:MET:HE1	1:A:229:GLY:HA2	1.79	0.64
1:A:206:ASP:OD1	1:A:206:ASP:N	2.29	0.64
1:C:276:ASN:ND2	1:C:317:ASP:OD2	2.29	0.64
1:A:332:CYS:O	1:A:335:VAL:HG23	1.98	0.64
1:A:171:VAL:HB	1:A:224:MET:HG2	1.80	0.64
1:C:55:SER:O	1:C:59:GLU:HG3	1.98	0.63
1:C:170:ALA:HA	1:C:223:VAL:HG23	1.80	0.62
1:A:332:CYS:C	1:A:335:VAL:HG22	2.20	0.62

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:276:ASN:OD1	1:C:278:THR:HG23	2.00	0.61
2:D:111:VAL:HG21	2:D:247:ALA:HB1	1.83	0.61
1:A:55:SER:O	1:A:59:GLU:HG3	2.00	0.61
1:A:335:VAL:HG23	1:A:336:LYS:N	2.15	0.61
2:B:178:LYS:NZ	2:B:229:GLN:O	2.33	0.61
1:C:146:GLU:HG2	1:C:187:LYS:HE3	1.83	0.61
1:A:69:LYS:HZ1	1:A:72:LEU:HG	1.65	0.61
1:C:206:ASP:OD1	1:C:206:ASP:N	2.34	0.61
3:C:401:NAD:O2D	5:C:403:ICT:O3	2.15	0.61
2:D:176:ARG:HD3	2:D:231:ASP:OD1	2.00	0.60
1:A:227:LEU:O	1:A:231:ILE:HD12	2.01	0.60
1:C:82:SER:OG	5:C:403:ICT:O4	2.19	0.60
2:D:63:LEU:HD11	2:D:97:ARG:HB3	1.84	0.60
1:A:273:ASP:O	1:A:324:CYS:N	2.23	0.59
1:C:32:ALA:HA	1:C:296:HIS:CD2	2.37	0.59
1:A:171:VAL:HB	1:A:224:MET:CG	2.33	0.58
1:A:268:ASP:OD1	3:A:401:NAD:O3B	2.21	0.58
2:B:61:GLU:HG3	2:B:62:LYS:N	2.18	0.58
3:A:401:NAD:C4N	5:A:403:ICT:H2	2.33	0.58
2:B:150:GLU:OE2	2:D:142:HIS:NE2	2.25	0.58
1:C:78:ALA:H	2:D:189:LYS:HE2	1.68	0.58
2:B:129:ILE:HD13	2:B:167:ALA:HA	1.84	0.58
1:A:69:LYS:NZ	1:A:72:LEU:HG	2.19	0.57
2:B:258:PRO:HB2	2:B:294:SER:HB3	1.86	0.57
2:D:286:ALA:O	2:D:335:CYS:HB2	2.04	0.57
2:D:116:GLY:HA3	2:D:320:LYS:HA	1.86	0.57
1:C:118:ILE:HD12	1:C:221:VAL:HG13	1.86	0.57
1:A:100:CYS:N	1:A:115:ILE:O	2.29	0.57
1:A:15:ILE:HD12	1:A:269:ILE:HG13	1.85	0.57
1:A:53:ILE:CD1	1:A:87:LEU:HD23	2.34	0.57
3:A:401:NAD:H6N	3:A:401:NAD:H51N	1.87	0.57
2:D:51:LEU:HG	2:D:51:LEU:O	2.04	0.56
2:D:20:LEU:HB2	2:D:78:ILE:HG22	1.87	0.56
2:D:172:THR:HG22	2:D:209:ILE:HD11	1.87	0.56
1:A:32:ALA:HA	1:A:296:HIS:CD2	2.41	0.56
2:B:216:ILE:HD12	2:B:239:TYR:CD1	2.41	0.56
2:D:187:ILE:HD13	2:D:187:ILE:N	2.18	0.56
1:C:130:GLU:OE2	1:C:140:SER:OG	2.23	0.56
1:C:242:GLY:HA3	2:D:225:GLN:NE2	2.21	0.55
1:A:26:ILE:HD11	1:A:328:THR:HG23	1.87	0.55
2:B:60:GLU:HG2	2:B:97:ARG:NH1	2.22	0.55

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:273:ASP:O	1:C:324:CYS:N	2.32	0.55
1:A:314:LEU:HD12	1:A:314:LEU:H	1.72	0.55
1:A:15:ILE:HD11	1:A:275:ALA:HB2	1.89	0.55
2:B:157:ARG:HH12	2:B:197:GLN:NE2	2.04	0.55
1:A:224:MET:HB3	1:A:228:TYR:HB2	1.88	0.55
3:C:401:NAD:C2N	5:C:403:ICT:H41	2.35	0.55
2:B:134:GLU:OE2	2:B:156:THR:HG23	2.07	0.54
2:B:25:VAL:HG22	2:B:276:PRO:O	2.08	0.54
1:C:242:GLY:HA3	2:D:225:GLN:HE22	1.72	0.54
2:D:20:LEU:HD23	2:D:49:HIS:HB2	1.90	0.53
1:A:119:ARG:HB2	1:A:229:GLY:HA3	1.91	0.53
1:C:242:GLY:CA	2:D:225:GLN:NE2	2.71	0.53
1:C:178:ARG:HA	1:C:178:ARG:NE	2.24	0.53
2:B:131:GLU:HB3	2:B:163:ILE:HG12	1.89	0.53
2:D:36:VAL:HA	2:D:343:CYS:SG	2.49	0.53
3:C:401:NAD:C4N	5:C:403:ICT:C2	2.84	0.52
1:A:86:LEU:O	1:A:90:THR:HG23	2.09	0.52
1:C:174:ALA:O	1:C:178:ARG:HD2	2.09	0.52
1:C:41:VAL:O	1:C:43:ALA:O	2.27	0.52
1:C:52:MET:HA	1:C:86:LEU:HD21	1.90	0.52
2:B:313:ASP:HA	2:B:316:LYS:HG3	1.90	0.52
1:A:66:MET:HE1	1:A:287:MET:HG3	1.91	0.52
1:C:53:ILE:O	1:C:53:ILE:HG13	2.10	0.52
3:C:401:NAD:H51N	3:C:401:NAD:C6N	2.36	0.52
1:A:166:SER:OG	1:A:167:ASN:OD1	2.28	0.52
2:D:141:GLU:HG2	2:D:151:CYS:HB2	1.91	0.52
1:A:125:GLU:HG3	1:A:142:LYS:HB2	1.92	0.51
2:D:59:SER:HB3	2:D:94:TYR:CZ	2.45	0.51
1:A:69:LYS:HG2	1:A:70:GLY:O	2.10	0.51
1:A:215:ASP:OD1	1:A:217:SER:HB3	2.10	0.51
2:D:220:CYS:HB3	2:D:246:LEU:HD12	1.93	0.51
2:D:220:CYS:O	2:D:224:VAL:HG23	2.10	0.51
1:C:22:ALA:O	1:C:26:ILE:HG13	2.09	0.51
3:C:401:NAD:C4N	5:C:403:ICT:H41	2.40	0.51
1:A:19:ILE:O	1:A:23:VAL:HG13	2.11	0.51
2:D:180:THR:HG23	2:D:212:GLU:HG3	1.93	0.51
2:D:277:PHE:O	2:D:279:GLN:N	2.42	0.51
1:A:18:GLU:OE2	1:A:270:ALA:O	2.28	0.50
1:A:311:GLY:CA	1:A:314:LEU:HD11	2.23	0.50
1:C:248:SER:HB3	1:C:260:GLU:O	2.11	0.50
1:A:183:LEU:HD22	2:B:149:ILE:HD12	1.93	0.50

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:216:ILE:HD12	2:D:239:TYR:HB3	1.94	0.50
2:B:258:PRO:CB	2:B:294:SER:HB3	2.43	0.49
1:A:69:LYS:NZ	1:A:70:GLY:O	2.40	0.49
1:A:330:GLU:OE1	1:A:334:ARG:NH1	2.45	0.49
2:B:143:GLU:HG2	2:B:145:ALA:O	2.12	0.49
2:B:255:GLY:O	2:B:289:THR:HB	2.13	0.49
1:C:15:ILE:HD12	1:C:269:ILE:HG13	1.94	0.49
1:C:236:CYS:HB3	1:C:239:LEU:HD12	1.95	0.49
2:D:176:ARG:HD2	2:D:232:VAL:HG23	1.93	0.49
2:B:20:LEU:HB2	2:B:78:ILE:HG22	1.93	0.49
1:C:287:MET:HG2	1:C:291:MET:SD	2.53	0.48
1:A:224:MET:HE1	1:A:229:GLY:CA	2.42	0.48
1:A:332:CYS:HA	1:A:335:VAL:HG22	1.94	0.48
1:C:98:ARG:HB2	1:C:117:THR:HB	1.95	0.48
1:A:82:SER:HB3	1:A:85:LEU:HB2	1.94	0.48
1:C:189:ARG:NH1	1:C:202:GLU:HG2	2.29	0.48
1:C:224:MET:HB3	1:C:228:TYR:HB2	1.96	0.48
1:C:4:VAL:HG23	1:C:33:PRO:O	2.13	0.47
1:C:253:ALA:O	1:C:256:VAL:HG23	2.13	0.47
1:C:311:GLY:O	1:C:313:SER:N	2.46	0.47
2:B:116:GLY:HA3	2:B:320:LYS:HA	1.96	0.47
1:A:94:TYR:CE2	1:A:151:ARG:HG2	2.49	0.47
1:A:118:ILE:O	1:A:223:VAL:HA	2.15	0.47
1:A:207:THR:OG1	3:B:401:NAD:O2N	2.23	0.47
1:C:318:LEU:HA	1:C:318:LEU:HD23	1.72	0.47
1:C:209:CYS:HB3	1:C:235:LEU:CD1	2.45	0.47
1:A:100:CYS:HB3	1:A:115:ILE:HB	1.97	0.47
1:C:37:GLU:OE2	1:C:60:SER:OG	2.32	0.47
2:D:157:ARG:NH2	2:D:201:GLU:OE1	2.47	0.47
1:C:295:ASP:O	1:C:299:ARG:HG3	2.15	0.46
2:D:40:ALA:HB2	2:D:346:VAL:HG11	1.98	0.46
2:D:62:LYS:O	2:D:66:VAL:HG23	2.16	0.46
2:D:170:TYR:CE1	2:D:174:LYS:HG3	2.50	0.46
2:D:314:ALA:O	2:D:318:VAL:HG23	2.15	0.46
2:B:126:LEU:HD21	2:B:230:PHE:HB2	1.96	0.46
2:D:60:GLU:HG2	2:D:97:ARG:NH1	2.30	0.46
1:A:332:CYS:CA	1:A:335:VAL:HG22	2.46	0.46
2:D:143:GLU:HG2	2:D:145:ALA:O	2.16	0.46
1:A:38:GLU:O	1:A:39:ARG:NH2	2.47	0.46
1:C:117:THR:CG2	1:C:224:MET:HE1	2.46	0.46
1:A:145:THR:HA	2:B:147:GLY:O	2.16	0.46

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:284:ASN:HD21	2:B:336:HIS:HB3	1.81	0.46
2:D:136:GLU:OE1	2:D:136:GLU:N	2.43	0.46
2:B:111:VAL:HB	2:B:126:LEU:HB2	1.98	0.45
1:C:311:GLY:HA2	1:C:314:LEU:HD13	1.98	0.45
1:A:9:LEU:HG	1:A:24:MET:CE	2.46	0.45
1:A:53:ILE:HD13	1:A:87:LEU:CD2	2.40	0.45
2:B:47:GLN:OE1	2:B:69:SER:OG	2.28	0.45
1:A:126:TYR:CE1	1:A:227:LEU:HD23	2.50	0.45
1:C:69:LYS:NZ	1:C:72:LEU:HG	2.31	0.45
1:A:15:ILE:CD1	1:A:275:ALA:HB2	2.47	0.45
1:C:94:TYR:CZ	1:C:151:ARG:HD2	2.52	0.45
1:C:56:GLU:CD	1:C:56:GLU:H	2.20	0.44
1:C:94:TYR:HA	1:C:122:THR:HG23	1.98	0.44
2:B:117:TYR:CE2	2:B:252:GLY:HA3	2.52	0.44
1:A:206:ASP:HB3	2:B:241:ASN:OD1	2.16	0.44
2:D:186:ASN:O	2:D:187:ILE:HD13	2.18	0.44
2:D:216:ILE:HD12	2:D:239:TYR:CB	2.46	0.44
1:A:276:ASN:OD1	1:A:278:THR:HG23	2.17	0.44
2:B:129:ILE:O	2:B:234:VAL:HA	2.18	0.44
1:C:18:GLU:OE2	1:C:270:ALA:O	2.35	0.44
2:B:154:ILE:HD12	1:C:133:ILE:HG23	1.98	0.44
2:B:157:ARG:NH1	2:B:197:GLN:NE2	2.64	0.44
1:A:332:CYS:HA	1:A:335:VAL:CG2	2.46	0.44
2:D:130:ARG:HD2	2:D:240:GLY:HA3	1.99	0.44
1:A:288:LEU:HD11	1:A:300:ILE:HD12	2.00	0.44
1:C:123:GLU:HB2	1:C:124:GLY:H	1.62	0.44
1:C:30:ALA:O	1:C:299:ARG:NH1	2.51	0.43
3:A:401:NAD:H51N	3:A:401:NAD:C6N	2.48	0.43
2:B:220:CYS:SG	2:B:246:LEU:HD12	2.57	0.43
2:D:60:GLU:HG2	2:D:97:ARG:HH12	1.83	0.43
1:A:106:TYR:HE1	1:A:318:LEU:O	2.01	0.43
2:B:310:MET:HG3	2:B:349:LEU:HD23	1.98	0.43
2:B:176:ARG:HD3	2:B:231:ASP:OD1	2.18	0.43
1:A:22:ALA:O	1:A:26:ILE:HG13	2.18	0.43
1:A:246:THR:O	1:A:262:VAL:HG23	2.18	0.43
1:C:209:CYS:HB3	1:C:235:LEU:HD11	2.00	0.43
1:A:66:MET:CE	1:A:287:MET:HG3	2.48	0.43
2:B:111:VAL:HG21	2:B:247:ALA:HB1	2.00	0.43
2:D:59:SER:O	2:D:60:GLU:C	2.57	0.43
1:C:117:THR:HG23	1:C:224:MET:HE1	2.01	0.43
1:C:236:CYS:HA	1:C:239:LEU:HG	2.01	0.43

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:185:LEU:O	1:C:189:ARG:HG2	2.19	0.43
1:C:273:ASP:OD2	1:C:325:SER:OG	2.26	0.43
2:D:220:CYS:HB3	2:D:246:LEU:HD11	2.01	0.43
2:D:166:PHE:HZ	2:D:262:TYR:CD2	2.36	0.42
2:B:157:ARG:HH12	2:B:197:GLN:HE22	1.67	0.42
1:C:179:MET:CE	2:D:149:ILE:HD12	2.49	0.42
1:C:223:VAL:C	1:C:224:MET:HG3	2.39	0.42
1:C:275:ALA:O	1:C:324:CYS:HB2	2.19	0.42
2:D:111:VAL:HG21	2:D:247:ALA:CB	2.48	0.42
1:C:224:MET:HB2	1:C:224:MET:HE3	1.85	0.42
1:A:224:MET:HE3	1:A:224:MET:HB2	1.71	0.42
1:C:15:ILE:HD11	1:C:275:ALA:HB2	2.02	0.42
2:D:129:ILE:HD12	2:D:232:VAL:HG13	2.02	0.42
1:A:76:ILE:HG23	2:B:185:ALA:HB3	2.01	0.42
1:A:98:ARG:HG2	1:A:248:SER:HB2	2.02	0.42
1:C:75:PRO:HB2	1:C:78:ALA:HB3	2.00	0.42
1:C:206:ASP:HB3	2:D:241:ASN:OD1	2.20	0.42
1:A:38:GLU:C	1:A:39:ARG:HG2	2.39	0.42
1:A:313:SER:O	1:A:313:SER:OG	2.34	0.41
2:B:132:GLN:NE2	2:B:261:SER:HB3	2.35	0.41
2:B:107:ASN:HB2	2:B:132:GLN:CD	2.40	0.41
2:B:127:VAL:HB	2:B:232:VAL:HG22	2.00	0.41
2:B:178:LYS:HE2	2:B:212:GLU:CD	2.41	0.41
2:B:216:ILE:HD12	2:B:239:TYR:HB3	2.03	0.41
1:C:330:GLU:OE1	1:C:334:ARG:NH1	2.54	0.41
2:D:63:LEU:CD1	2:D:97:ARG:HB3	2.50	0.41
2:D:305:GLU:O	2:D:305:GLU:HG3	2.20	0.41
1:C:20:SER:O	1:C:24:MET:HG3	2.21	0.41
1:C:31:LYS:O	1:C:296:HIS:NE2	2.49	0.41
1:C:178:ARG:NE	1:C:178:ARG:CA	2.83	0.41
2:B:107:ASN:HB2	2:B:132:GLN:NE2	2.35	0.41
2:B:345:ARG:CZ	2:B:349:LEU:HD11	2.51	0.41
1:A:29:ALA:HB1	1:A:335:VAL:HG21	2.03	0.41
2:B:216:ILE:HD12	2:B:239:TYR:CB	2.51	0.41
2:B:292:LEU:HD23	2:B:292:LEU:HA	1.91	0.41
1:A:123:GLU:HB2	1:A:124:GLY:H	1.65	0.40
1:A:52:MET:HA	1:A:86:LEU:HD21	2.03	0.40
1:A:141:ILE:HG13	2:B:152:LEU:HD22	2.03	0.40
2:B:136:GLU:OE1	2:B:136:GLU:N	2.41	0.40
1:C:80:HIS:HA	1:C:81:PRO:HD3	1.75	0.40
2:D:23:ASP:OD1	2:D:52:SER:OG	2.40	0.40

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:103:ASP:OD2	2:D:162:ARG:NH2	2.32	0.40
1:A:335:VAL:CG2	1:A:336:LYS:N	2.80	0.40
1:A:335:VAL:CG2	1:A:336:LYS:H	2.29	0.40
1:A:126:TYR:CD1	2:B:187:ILE:HD11	2.57	0.40
2:B:269:PHE:CZ	2:B:298:MET:HA	2.56	0.40
1:C:93:LEU:HD11	1:C:258:ILE:HG13	2.02	0.40
1:C:15:ILE:CD1	1:C:269:ILE:HG13	2.51	0.40
1:C:34:ILE:HD12	1:C:34:ILE:N	2.36	0.40
1:C:94:TYR:CE2	1:C:151:ARG:HD2	2.57	0.40
1:C:179:MET:HE3	2:D:149:ILE:HD12	2.04	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	330/339 (97%)	314 (95%)	16 (5%)	0	100	100
1	C	330/339 (97%)	318 (96%)	12 (4%)	0	100	100
2	B	327/352 (93%)	311 (95%)	16 (5%)	0	100	100
2	D	328/352 (93%)	310 (94%)	18 (6%)	0	100	100
All	All	1315/1382 (95%)	1253 (95%)	62 (5%)	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	248/276 (90%)	245 (99%)	3 (1%)	71	85
1	C	249/276 (90%)	243 (98%)	6 (2%)	49	72
2	B	261/296 (88%)	250 (96%)	11 (4%)	30	54
2	D	259/296 (88%)	247 (95%)	12 (5%)	27	51
All	All	1017/1144 (89%)	985 (97%)	32 (3%)	40	64

All (32) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	202	GLU
1	A	248	SER
1	A	304	CYS
2	B	23	ASP
2	B	68	SER
2	B	69	SER
2	B	96	MET
2	B	130	ARG
2	B	131	GLU
2	B	277	PHE
2	B	296	SER
2	B	308	SER
2	B	309	SER
2	B	350	ASP
1	C	89	LYS
1	C	102	SER
1	C	178	ARG
1	C	202	GLU
1	C	313	SER
1	C	324	CYS
2	D	69	SER
2	D	96	MET
2	D	130	ARG
2	D	131	GLU
2	D	144	SER
2	D	151	CYS
2	D	229	GLN
2	D	277	PHE
2	D	294	SER
2	D	296	SER

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
2	D	317	LYS
2	D	327	SER

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

Mol	Chain	Res	Type
2	B	197	GLN
2	B	352	ASN
2	D	225	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 monosaccharides 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	NAD	D	401	-	42,48,48	4.74	19 (45%)	50,73,73	1.54	10 (20%)
5	ICT	C	403	4	12,12,12	1.08	0	13,16,16	1.10	0
3	NAD	C	401	1	42,48,48	4.76	20 (47%)	50,73,73	1.88	16 (32%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	NAD	B	401	-	42,48,48	4.75	18 (42%)	50,73,73	1.72	7 (14%)
5	ICT	A	403	4	12,12,12	1.08	0	13,16,16	1.10	0
3	NAD	A	401	-	42,48,48	4.88	18 (42%)	50,73,73	1.80	12 (24%)

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	NAD	D	401	-	-	8/26/62/62	0/5/5/5
5	ICT	C	403	4	-	5/16/16/16	-
3	NAD	C	401	1	-	10/26/62/62	0/5/5/5
3	NAD	B	401	-	-	6/26/62/62	0/5/5/5
5	ICT	A	403	4	-	5/16/16/16	-
3	NAD	A	401	-	-	14/26/62/62	0/5/5/5

All (75) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	401	NAD	C2B-C1B	-17.15	1.27	1.53
3	A	401	NAD	C2B-C1B	-16.30	1.29	1.53
3	A	401	NAD	O4B-C1B	16.27	1.63	1.41
3	D	401	NAD	C2B-C1B	-16.25	1.29	1.53
3	C	401	NAD	O4B-C1B	16.24	1.63	1.41
3	B	401	NAD	C2B-C1B	-15.89	1.29	1.53
3	B	401	NAD	O4B-C1B	15.60	1.62	1.41
3	D	401	NAD	O4B-C1B	15.16	1.62	1.41
3	A	401	NAD	C2D-C3D	-10.28	1.25	1.53
3	D	401	NAD	C2D-C3D	-9.88	1.26	1.53
3	C	401	NAD	C2D-C3D	-9.78	1.26	1.53
3	B	401	NAD	C2D-C3D	-9.47	1.27	1.53
3	A	401	NAD	O4D-C1D	8.02	1.52	1.41
3	B	401	NAD	C7N-N7N	7.98	1.48	1.33
3	D	401	NAD	C7N-N7N	7.94	1.48	1.33
3	A	401	NAD	C7N-N7N	7.91	1.48	1.33
3	C	401	NAD	C7N-N7N	7.35	1.47	1.33
3	D	401	NAD	O4D-C1D	7.31	1.51	1.41
3	B	401	NAD	O4D-C1D	6.99	1.50	1.41
3	D	401	NAD	O4D-C4D	-6.14	1.31	1.45

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	401	NAD	O4D-C4D	-6.09	1.31	1.45
3	B	401	NAD	O4B-C4B	-6.08	1.31	1.45
3	B	401	NAD	C2D-C1D	6.07	1.63	1.53
3	A	401	NAD	O4D-C4D	-6.00	1.31	1.45
3	B	401	NAD	O4D-C4D	-5.91	1.31	1.45
3	D	401	NAD	O4B-C4B	-5.84	1.31	1.45
3	D	401	NAD	C2D-C1D	5.83	1.62	1.53
3	C	401	NAD	O4D-C1D	5.81	1.49	1.41
3	A	401	NAD	O4B-C4B	-5.67	1.32	1.45
3	B	401	NAD	C3D-C4D	5.24	1.66	1.53
3	C	401	NAD	O4B-C4B	-5.12	1.33	1.45
3	A	401	NAD	C3D-C4D	5.05	1.65	1.53
3	A	401	NAD	C2D-C1D	4.80	1.61	1.53
3	D	401	NAD	C3D-C4D	4.68	1.65	1.53
3	B	401	NAD	C3N-C7N	4.60	1.57	1.50
3	C	401	NAD	C3D-C4D	4.41	1.64	1.53
3	D	401	NAD	C3N-C7N	4.34	1.57	1.50
3	A	401	NAD	C3N-C7N	4.24	1.57	1.50
3	C	401	NAD	C2D-C1D	4.24	1.60	1.53
3	B	401	NAD	O2D-C2D	3.99	1.52	1.43
3	C	401	NAD	C3N-C7N	3.83	1.56	1.50
3	A	401	NAD	O2B-C2B	3.76	1.51	1.43
3	D	401	NAD	O2D-C2D	3.71	1.51	1.43
3	A	401	NAD	C6A-N6A	3.54	1.47	1.34
3	B	401	NAD	C6A-N6A	3.39	1.46	1.34
3	D	401	NAD	C6A-N6A	3.31	1.46	1.34
3	C	401	NAD	C6A-N6A	3.29	1.46	1.34
3	A	401	NAD	C2A-N3A	3.18	1.37	1.32
3	B	401	NAD	O3D-C3D	3.13	1.50	1.43
3	C	401	NAD	O2D-C2D	3.09	1.50	1.43
3	A	401	NAD	O3B-C3B	-2.99	1.35	1.43
3	A	401	NAD	O2D-C2D	2.88	1.49	1.43
3	D	401	NAD	O2B-C2B	2.79	1.49	1.43
3	B	401	NAD	O3B-C3B	-2.77	1.36	1.43
3	D	401	NAD	O3B-C3B	-2.72	1.36	1.43
3	D	401	NAD	C2A-N3A	2.68	1.36	1.32
3	C	401	NAD	O3B-C3B	-2.66	1.36	1.43
3	C	401	NAD	PA-O1A	2.65	1.60	1.50
3	C	401	NAD	C5B-C4B	2.64	1.59	1.51
3	A	401	NAD	O7N-C7N	-2.64	1.19	1.24
3	C	401	NAD	O2B-C2B	2.49	1.48	1.43
3	B	401	NAD	O2B-C2B	2.49	1.48	1.43

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	401	NAD	O7N-C7N	-2.47	1.19	1.24
3	C	401	NAD	PA-O5B	2.42	1.69	1.59
3	D	401	NAD	O3D-C3D	2.37	1.48	1.43
3	D	401	NAD	C5A-C4A	-2.34	1.34	1.40
3	B	401	NAD	C5A-C4A	-2.34	1.34	1.40
3	D	401	NAD	O7N-C7N	-2.30	1.19	1.24
3	B	401	NAD	O7N-C7N	-2.29	1.19	1.24
3	C	401	NAD	O5D-C5D	-2.20	1.36	1.44
3	A	401	NAD	C2N-N1N	2.19	1.37	1.35
3	A	401	NAD	O3D-C3D	2.14	1.48	1.43
3	C	401	NAD	C2A-N3A	2.12	1.35	1.32
3	B	401	NAD	C2A-N3A	2.07	1.35	1.32
3	D	401	NAD	O5D-C5D	-2.06	1.36	1.44

All (45) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	401	NAD	C5A-C6A-N6A	5.93	129.36	120.35
3	B	401	NAD	N3A-C2A-N1A	-5.56	119.99	128.68
3	A	401	NAD	N3A-C2A-N1A	-5.31	120.38	128.68
3	D	401	NAD	N3A-C2A-N1A	-4.79	121.19	128.68
3	A	401	NAD	C6N-N1N-C2N	-4.52	117.85	121.97
3	C	401	NAD	C6N-N1N-C2N	-4.52	117.85	121.97
3	C	401	NAD	N3A-C2A-N1A	-4.50	121.64	128.68
3	A	401	NAD	C2B-C3B-C4B	-4.41	94.07	102.64
3	C	401	NAD	C3D-C2D-C1D	4.09	107.14	100.98
3	B	401	NAD	N6A-C6A-N1A	-3.81	110.66	118.57
3	C	401	NAD	C5A-C6A-N6A	3.74	126.04	120.35
3	D	401	NAD	C5A-C6A-N6A	3.60	125.83	120.35
3	A	401	NAD	C5A-C6A-N6A	3.46	125.61	120.35
3	A	401	NAD	C3D-C2D-C1D	3.28	105.91	100.98
3	C	401	NAD	C5N-C4N-C3N	-3.19	116.57	120.34
3	C	401	NAD	O4D-C1D-C2D	-3.16	102.31	106.93
3	B	401	NAD	C3D-C2D-C1D	3.14	105.71	100.98
3	C	401	NAD	O7N-C7N-N7N	-3.10	118.18	122.58
3	C	401	NAD	O3B-C3B-C2B	-2.98	102.17	111.82
3	C	401	NAD	N6A-C6A-N1A	-2.90	112.55	118.57
3	D	401	NAD	C3D-C2D-C1D	2.78	105.17	100.98
3	D	401	NAD	C6N-N1N-C2N	-2.64	119.56	121.97
3	B	401	NAD	O7N-C7N-C3N	2.56	122.70	119.63
3	D	401	NAD	N6A-C6A-N1A	-2.55	113.27	118.57
3	A	401	NAD	O5D-C5D-C4D	2.45	117.42	108.99

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	401	NAD	O4D-C4D-C5D	-2.45	101.33	109.37
3	A	401	NAD	C1B-N9A-C4A	2.38	130.83	126.64
3	C	401	NAD	C2N-C3N-C4N	2.32	120.89	118.26
3	D	401	NAD	C3B-C2B-C1B	2.27	104.40	100.98
3	C	401	NAD	O2D-C2D-C3D	2.26	119.15	111.82
3	C	401	NAD	O2D-C2D-C1D	-2.25	102.54	110.85
3	C	401	NAD	O3D-C3D-C4D	-2.25	104.56	111.05
3	D	401	NAD	O7N-C7N-C3N	2.22	122.29	119.63
3	B	401	NAD	C6N-N1N-C2N	-2.19	119.98	121.97
3	B	401	NAD	C3B-C2B-C1B	2.16	104.23	100.98
3	A	401	NAD	O4B-C1B-C2B	-2.14	103.81	106.93
3	C	401	NAD	O2B-C2B-C3B	-2.13	104.92	111.82
3	C	401	NAD	O7N-C7N-C3N	2.11	122.16	119.63
3	D	401	NAD	PN-O3-PA	-2.10	125.62	132.83
3	A	401	NAD	O7N-C7N-N7N	-2.10	119.60	122.58
3	D	401	NAD	O3D-C3D-C4D	-2.08	105.03	111.05
3	A	401	NAD	O2B-C2B-C3B	-2.07	105.11	111.82
3	A	401	NAD	PN-O5D-C5D	-2.03	109.77	121.68
3	A	401	NAD	N6A-C6A-N1A	-2.02	114.38	118.57
3	D	401	NAD	C5D-C4D-C3D	-2.00	107.67	115.18

There are no chirality outliers.

All (48) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	401	NAD	O4B-C4B-C5B-O5B
3	A	401	NAD	C3B-C4B-C5B-O5B
3	A	401	NAD	C5D-O5D-PN-O3
3	A	401	NAD	C5D-O5D-PN-O1N
3	A	401	NAD	C5D-O5D-PN-O2N
3	A	401	NAD	O4D-C1D-N1N-C2N
3	A	401	NAD	O4D-C1D-N1N-C6N
3	A	401	NAD	C2D-C1D-N1N-C2N
3	A	401	NAD	C2D-C1D-N1N-C6N
3	B	401	NAD	C5B-O5B-PA-O3
3	B	401	NAD	C5D-O5D-PN-O1N
3	B	401	NAD	C2D-C1D-N1N-C6N
3	C	401	NAD	C5D-O5D-PN-O3
3	C	401	NAD	C5D-O5D-PN-O1N
3	C	401	NAD	O4D-C1D-N1N-C2N
3	C	401	NAD	O4D-C1D-N1N-C6N
3	C	401	NAD	C2D-C1D-N1N-C6N

Continued on next page...

Continued from previous page...

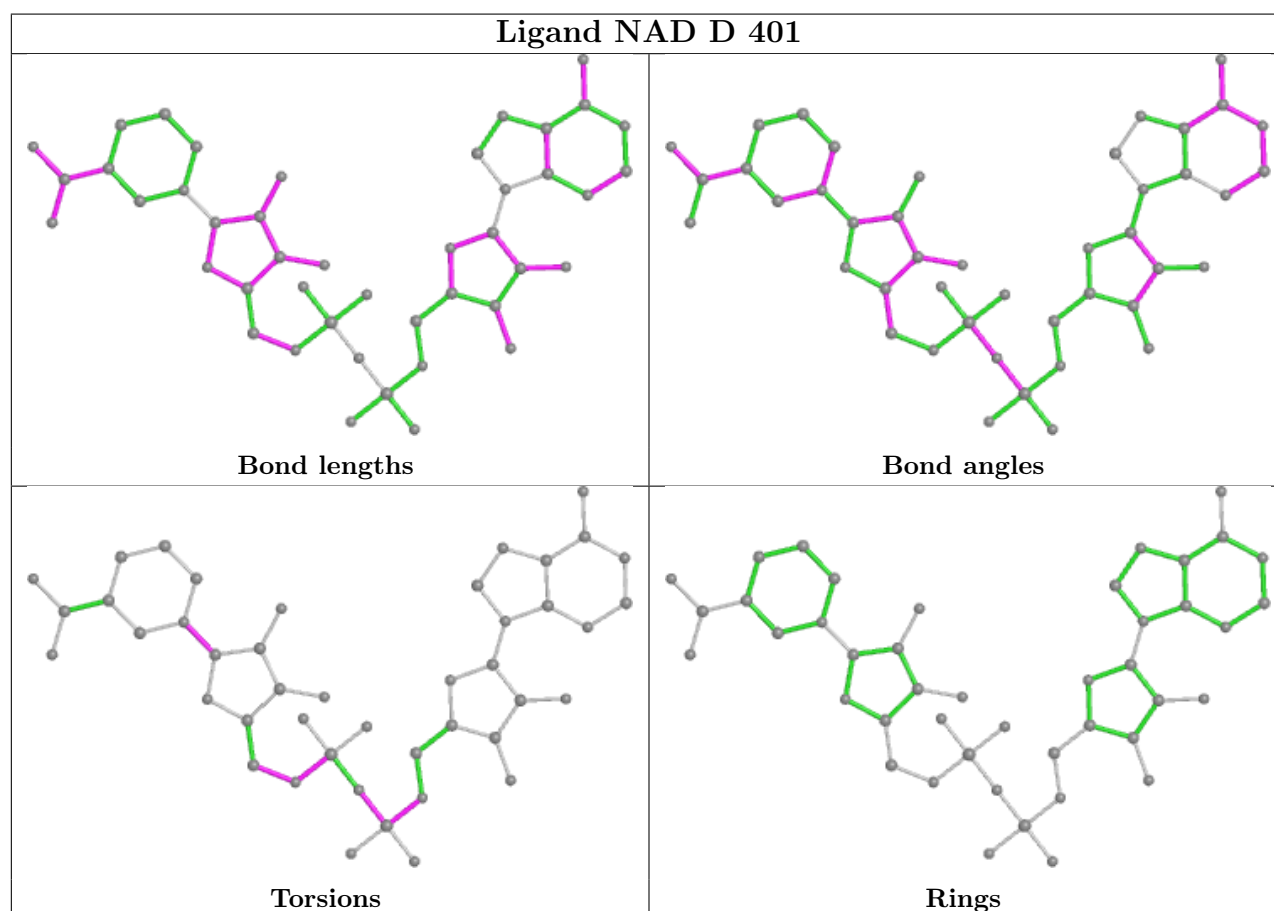
Mol	Chain	Res	Type	Atoms
3	D	401	NAD	C5B-O5B-PA-O2A
3	D	401	NAD	C5B-O5B-PA-O3
3	D	401	NAD	C2D-C1D-N1N-C2N
3	D	401	NAD	C2D-C1D-N1N-C6N
5	A	403	ICT	O1-C1-C2-O7
5	C	403	ICT	O1-C1-C2-O7
5	C	403	ICT	O2-C1-C2-O7
5	A	403	ICT	O2-C1-C2-O7
3	C	401	NAD	O4B-C4B-C5B-O5B
3	C	401	NAD	C3B-C4B-C5B-O5B
3	A	401	NAD	PN-O3-PA-O5B
5	A	403	ICT	O7-C2-C3-C4
3	B	401	NAD	C4D-C5D-O5D-PN
3	D	401	NAD	C4D-C5D-O5D-PN
3	C	401	NAD	C5D-O5D-PN-O2N
3	D	401	NAD	C5B-O5B-PA-O1A
3	A	401	NAD	C4B-C5B-O5B-PA
3	A	401	NAD	O4D-C4D-C5D-O5D
5	A	403	ICT	C6-C3-C4-C5
3	A	401	NAD	PN-O3-PA-O1A
3	D	401	NAD	PN-O3-PA-O1A
5	A	403	ICT	C1-C2-C3-C6
5	C	403	ICT	C4-C3-C6-O5
5	C	403	ICT	C4-C3-C6-O6
3	B	401	NAD	C2D-C1D-N1N-C2N
3	C	401	NAD	C2D-C1D-N1N-C2N
3	C	401	NAD	O4D-C4D-C5D-O5D
3	B	401	NAD	PA-O3-PN-O2N
3	A	401	NAD	C5B-O5B-PA-O1A
3	D	401	NAD	C5D-O5D-PN-O1N
5	C	403	ICT	C3-C4-C5-O4

There are no ring outliers.

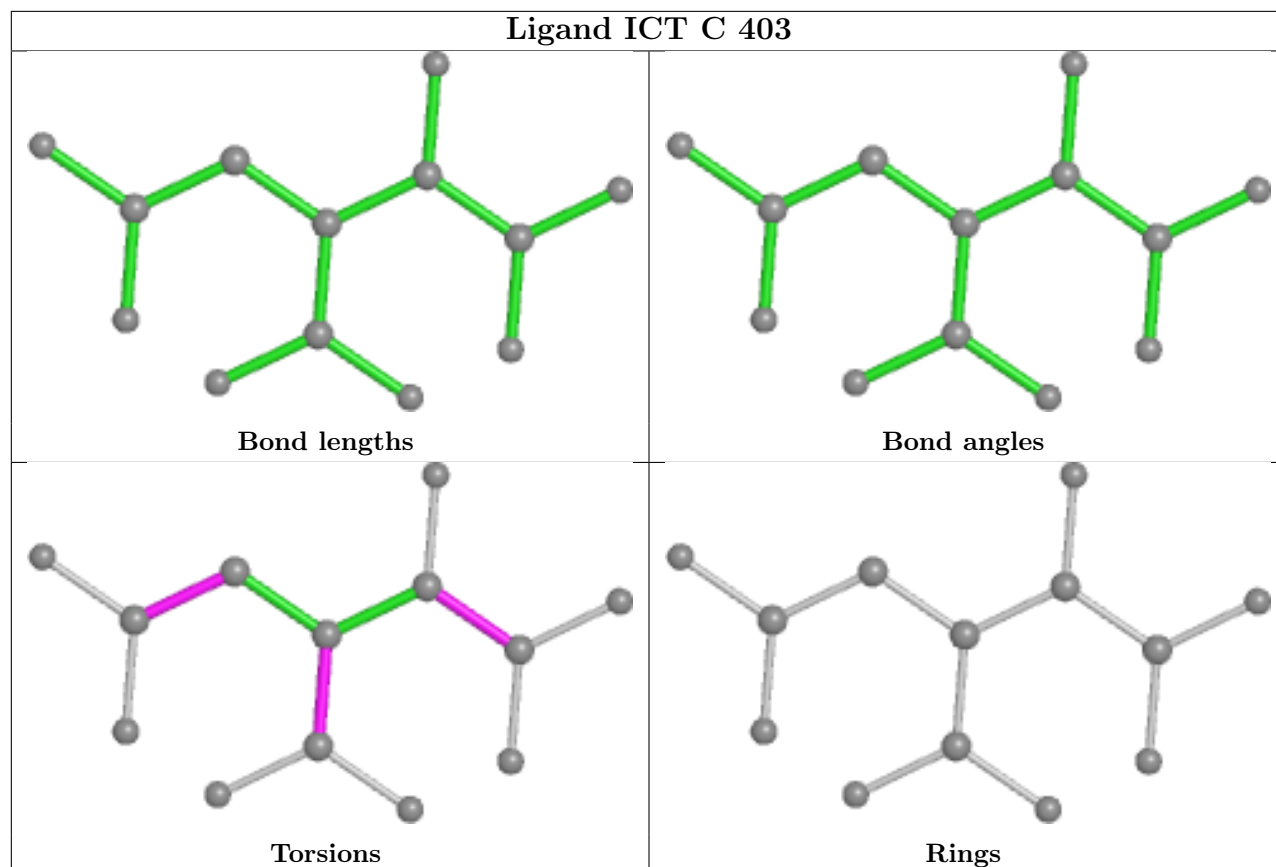
5 monomers are involved in 18 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	C	403	ICT	9	0
3	C	401	NAD	10	0
3	B	401	NAD	1	0
5	A	403	ICT	1	0
3	A	401	NAD	5	0

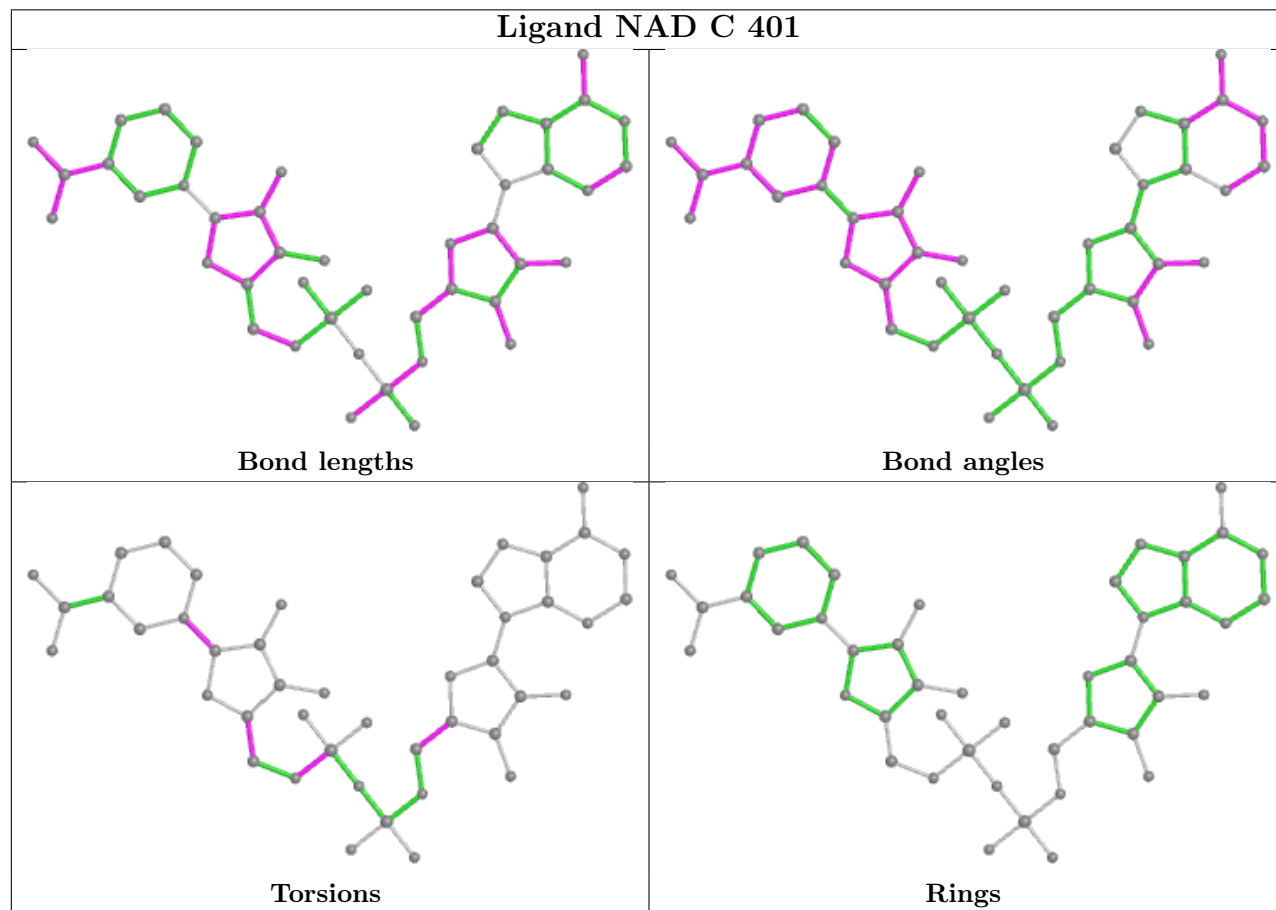
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.

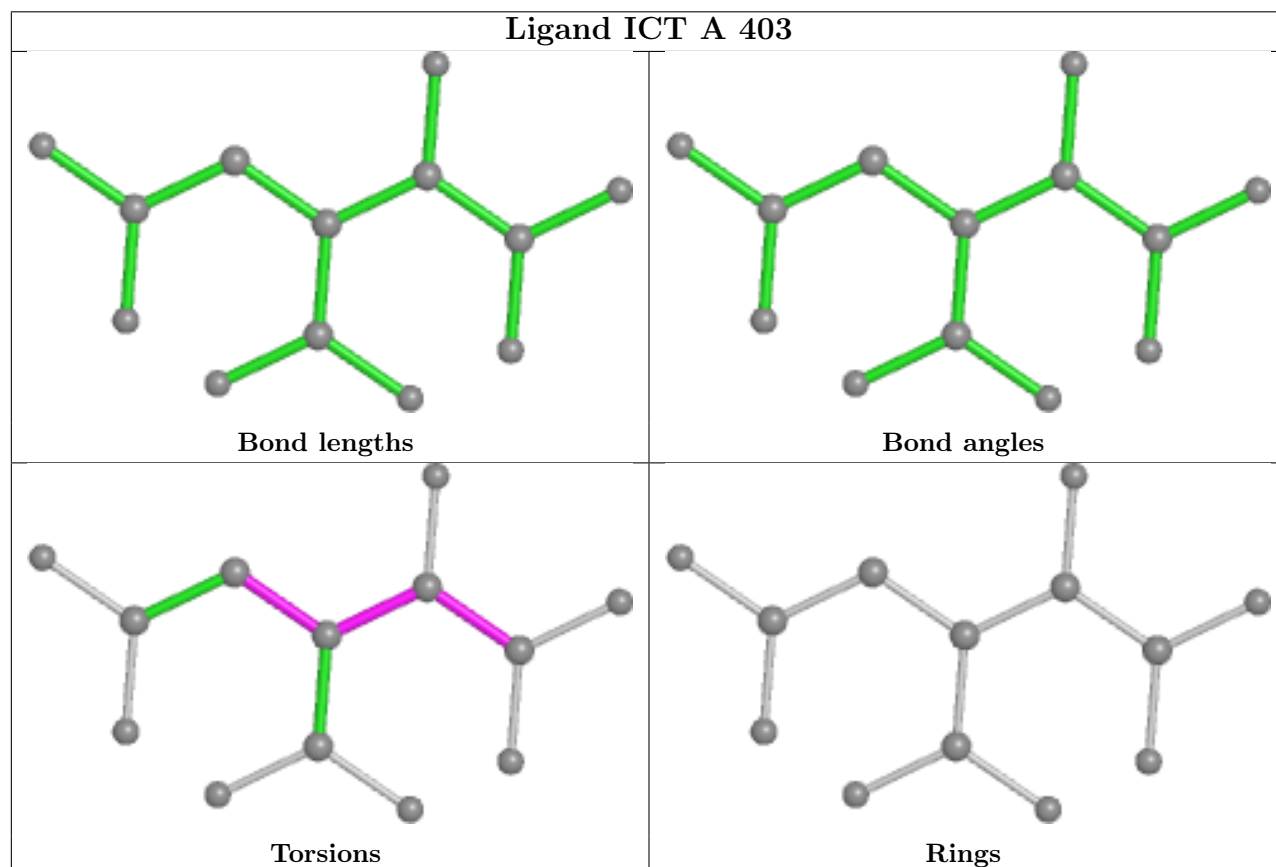
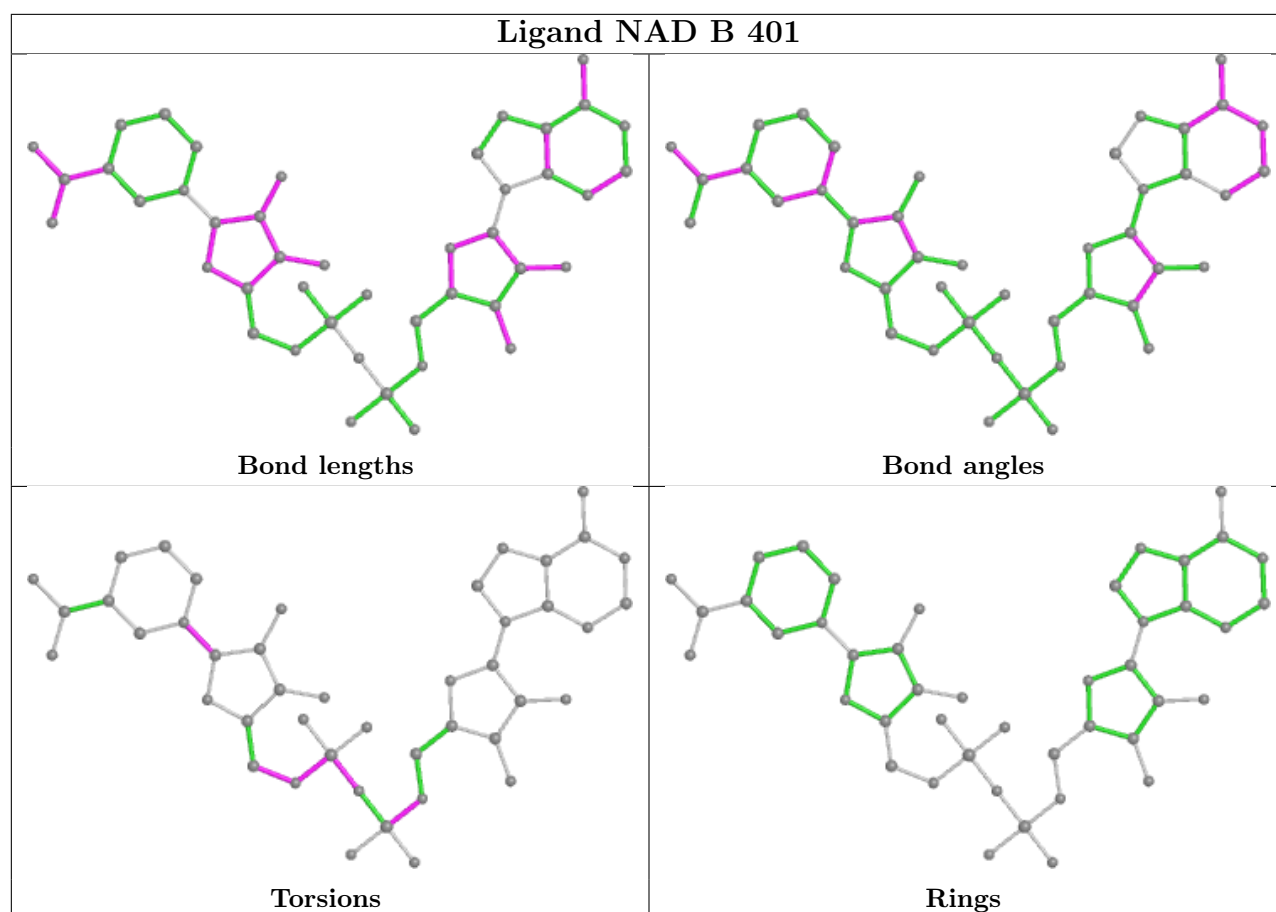


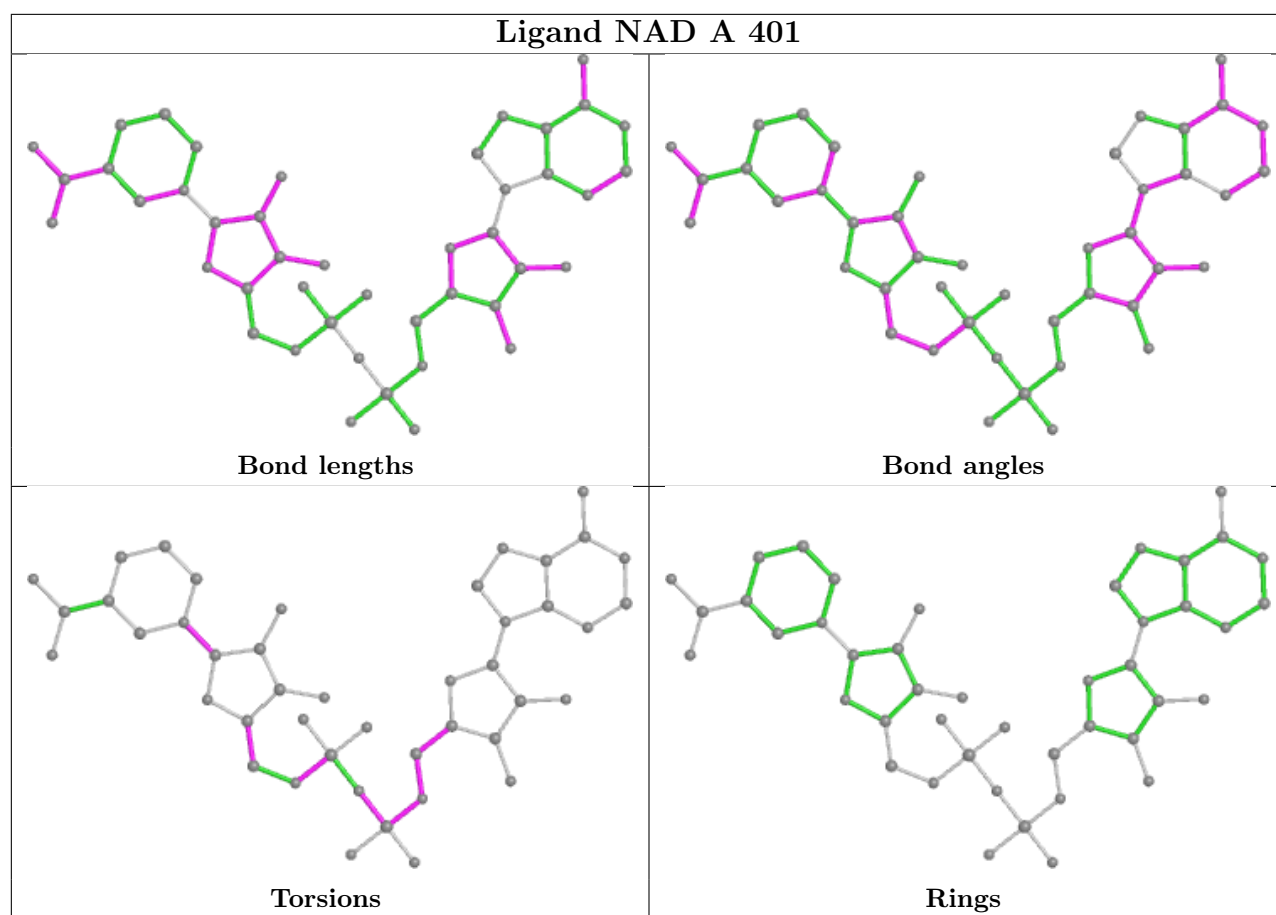
Ligand ICT C 403



Ligand NAD C 401







5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	334/339 (98%)	-0.23	3 (0%) 84 83	28, 43, 64, 92	0
1	C	334/339 (98%)	-0.15	4 (1%) 79 76	30, 46, 70, 95	0
2	B	331/352 (94%)	-0.32	5 (1%) 73 70	25, 38, 61, 85	0
2	D	332/352 (94%)	-0.27	3 (0%) 84 83	28, 41, 63, 92	0
All	All	1331/1382 (96%)	-0.24	15 (1%) 80 78	25, 41, 66, 95	0

All (15) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	3	GLY	5.4
1	C	42	THR	5.1
1	A	42	THR	4.5
2	B	57	MET	4.3
2	D	58	ALA	3.6
2	B	58	ALA	3.4
1	C	47	PRO	3.2
2	B	56	ASN	3.2
2	B	332	TYR	3.1
1	A	49	GLY	2.9
1	A	3	GLY	2.3
1	C	49	GLY	2.2
2	D	348	ASP	2.1
2	B	55	GLN	2.1
2	D	15	PHE	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](#)

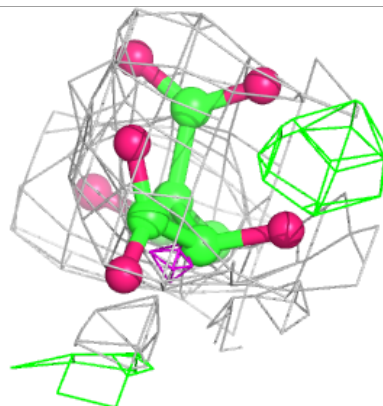
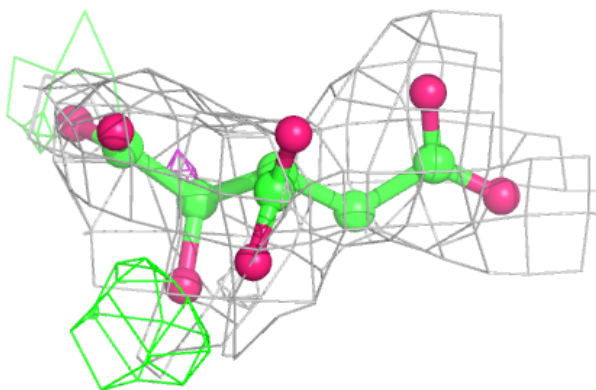
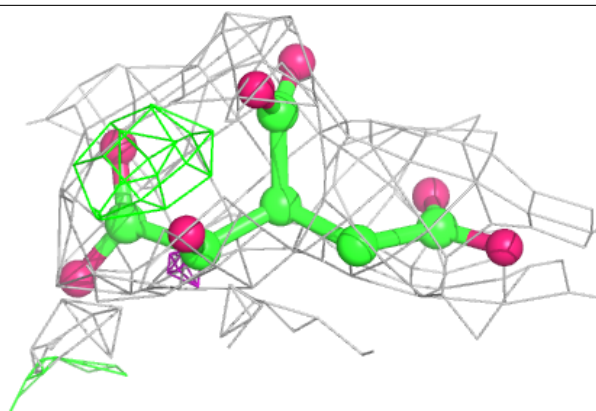
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
5	ICT	C	403	13/13	0.84	0.23	52,57,64,69	0
4	CA	C	402	1/1	0.88	0.25	67,67,67,67	0
4	CA	A	402	1/1	0.88	0.44	73,73,73,73	0
5	ICT	A	403	13/13	0.89	0.27	45,49,68,69	0
3	NAD	B	401	44/44	0.93	0.22	25,39,88,97	0
3	NAD	C	401	44/44	0.94	0.16	37,54,61,75	0
3	NAD	D	401	44/44	0.94	0.19	33,45,96,103	0
3	NAD	A	401	44/44	0.96	0.17	38,46,55,59	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.

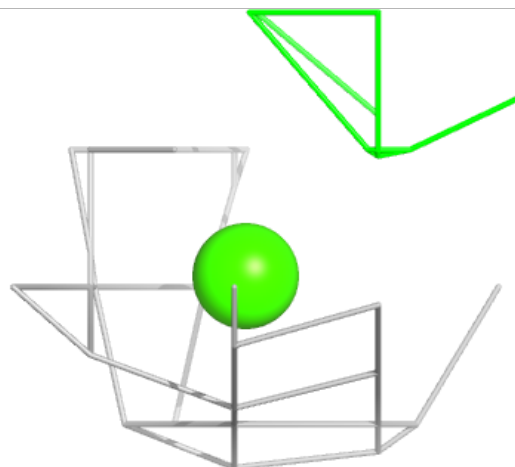
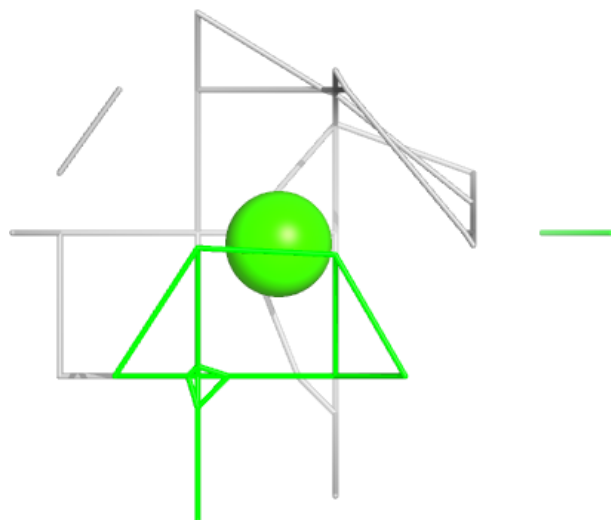
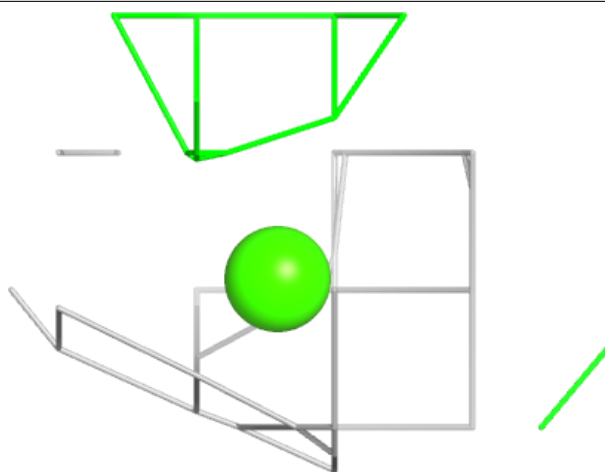
Electron density around ICT C 403:

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



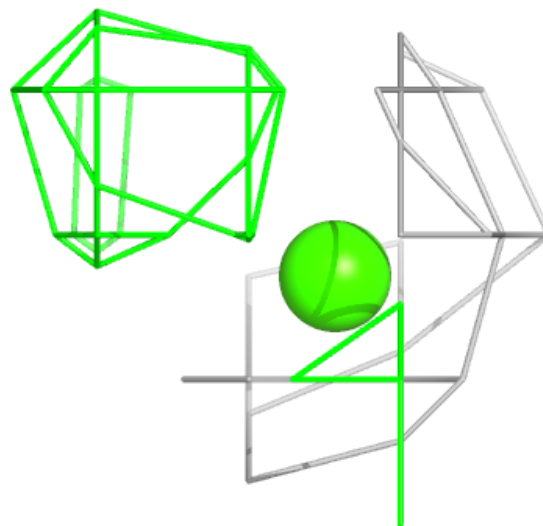
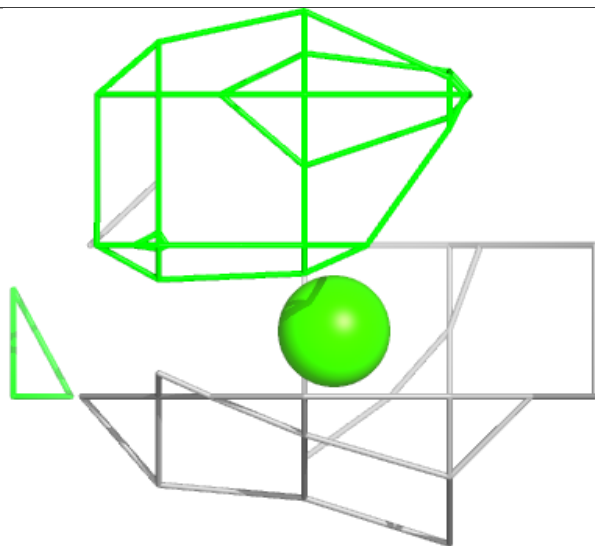
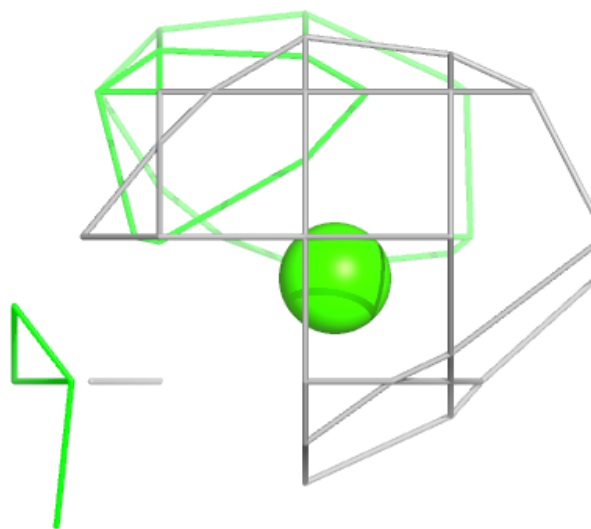
Electron density around CA C 402:

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



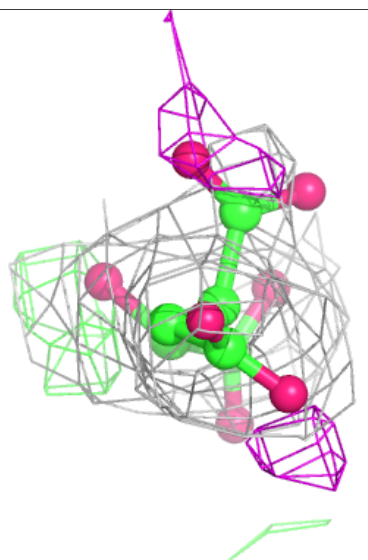
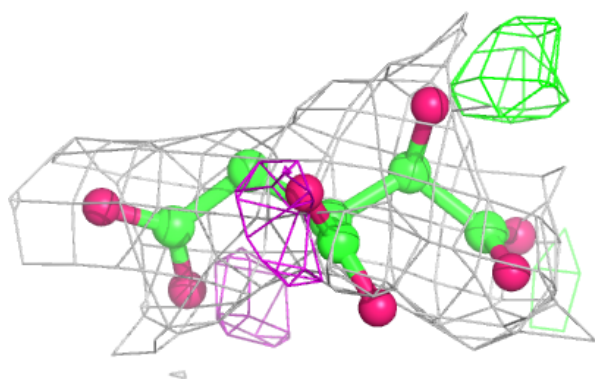
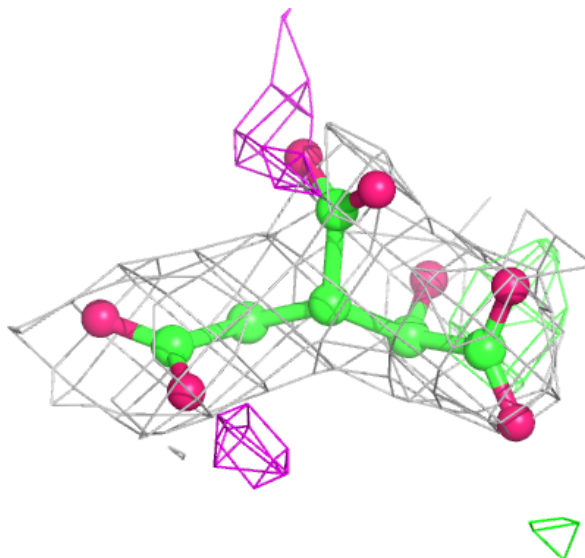
Electron density around CA A 402:

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



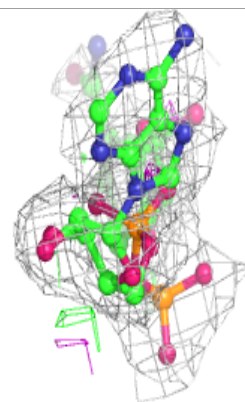
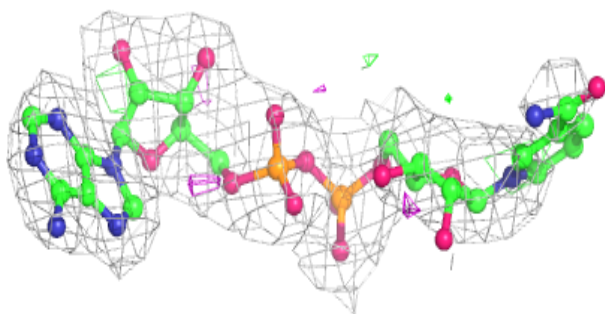
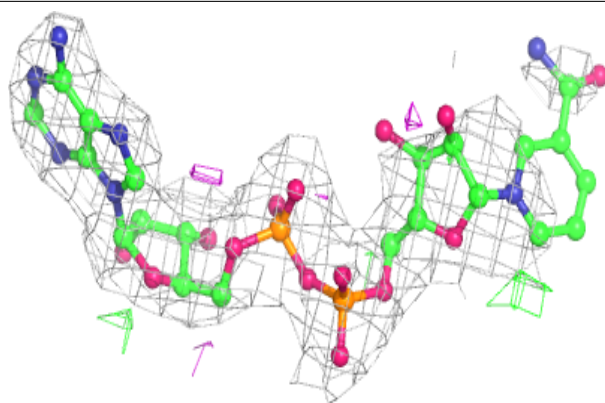
Electron density around ICT A 403:

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

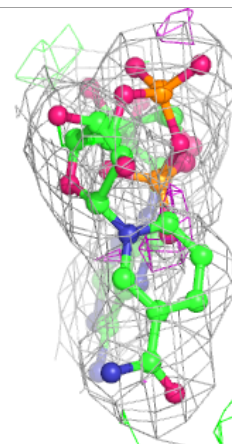
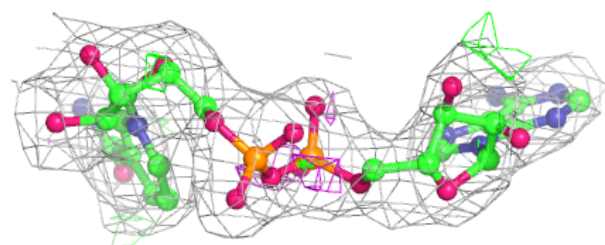
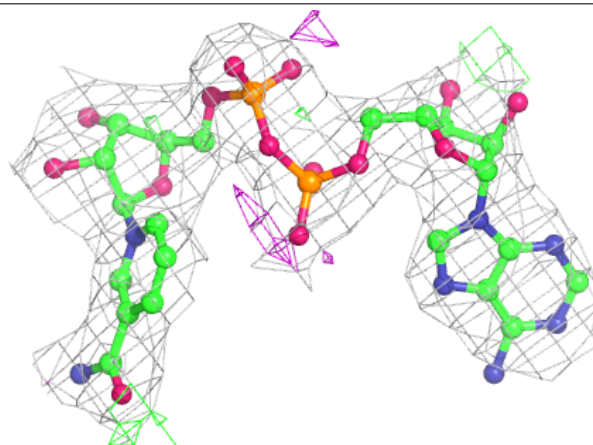


Electron density around NAD B 401:

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

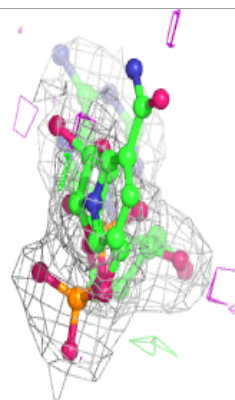
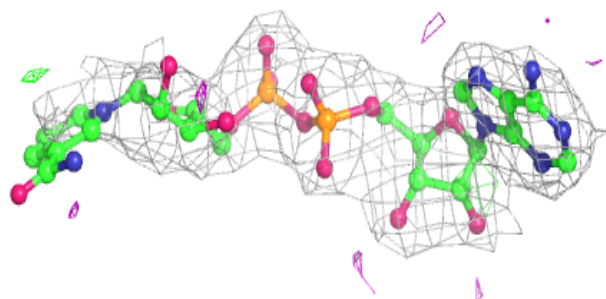
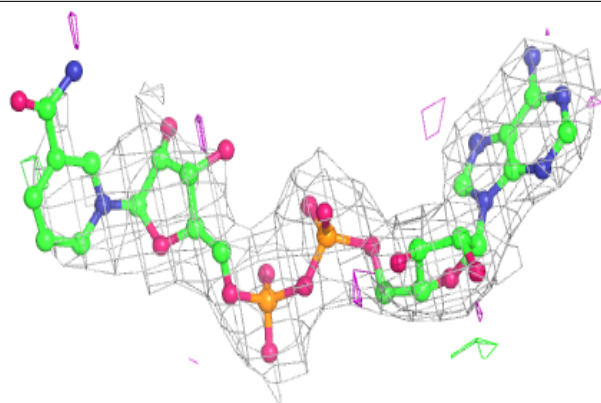
**Electron density around NAD C 401:**

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



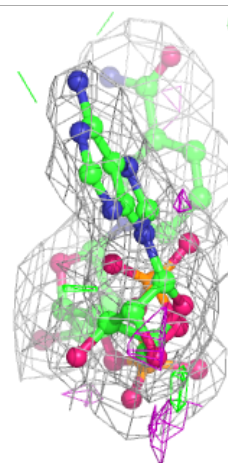
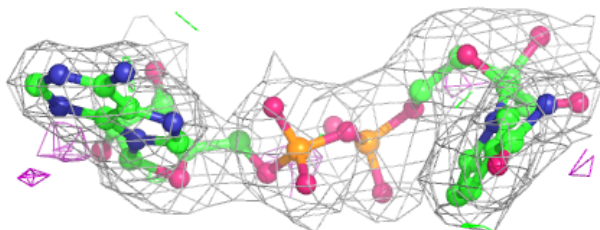
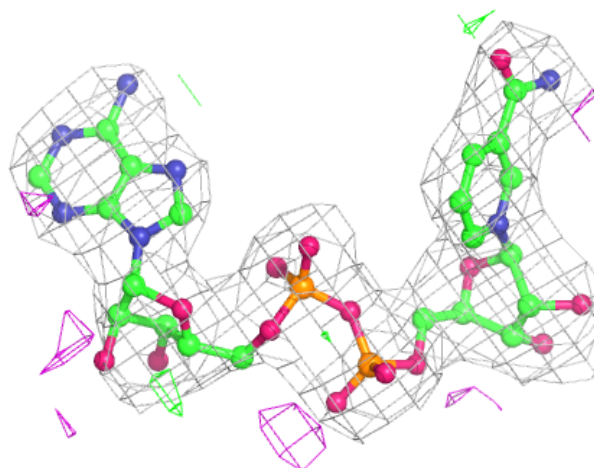
Electron density around NAD D 401:

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



Electron density around NAD A 401:

$2mF_o-DF_c$ (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.