



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 03:03 AM UTC

PDB ID : 8JRD / pdb_00008jrd
Title : Chalcone synthase from Glycine max (L.) Merr (soybean) complexed with naringenin and coenzyme A
Authors : Waki, T.; Imaizumi, R.; Nakata, S.; Yanai, T.; Takeshita, K.; Sakai, N.; Kataoka, K.; Yamamoto, M.; Nakayama, T.; Yamashita, S.
Deposited on : 2023-06-16
Resolution : 1.83 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

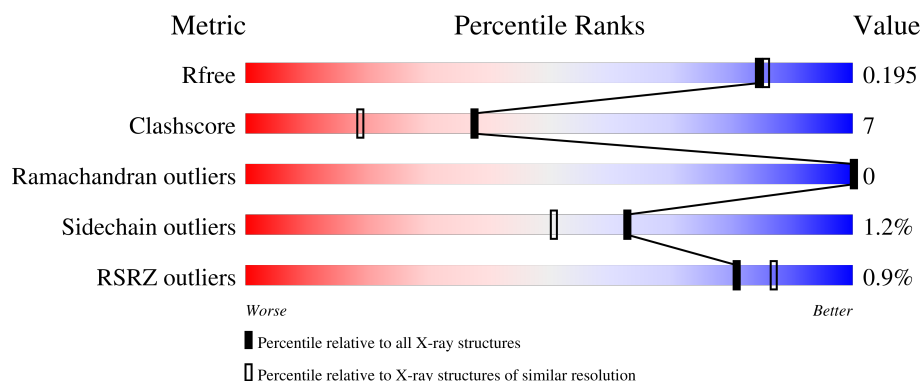
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

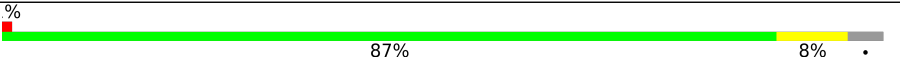
The reported resolution of this entry is 1.83 Å.

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	1296 (1.84-1.84)
Clashscore	190562	1329 (1.84-1.84)
Ramachandran outliers	187476	1318 (1.84-1.84)
Sidechain outliers	187428	1318 (1.84-1.84)
RSRZ outliers	180081	1296 (1.84-1.84)

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	404	
1	B	404	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
1	SME	B	137	-	-	X	-
1	CSD	B	164	-	-	X	-
3	NAR	A	402	-	-	X	-
3	NAR	B	402	-	-	X	-
4	EDO	A	407	-	-	X	-

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 6941 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 chalcone synthase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	389	Total	C	N	O	S	0	4	0
			3028	1926	508	571	23			
1	B	389	Total	C	N	O	S	0	1	0
			3003	1911	505	566	21			

There are 32 discrepancies between the modelled and reference sequences:

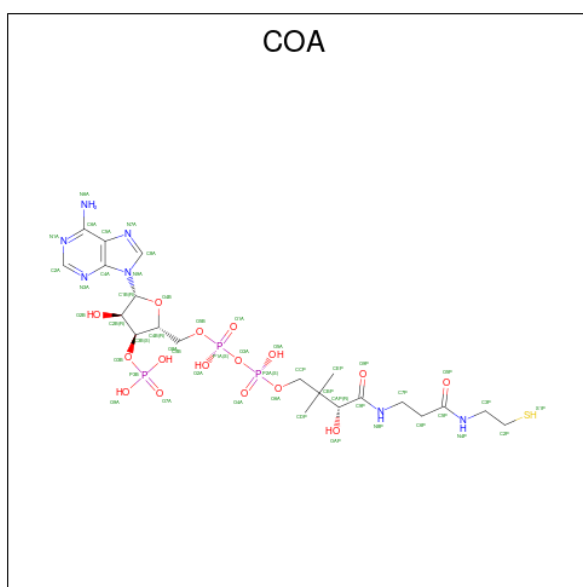
Chain	Residue	Modelled	Actual	Comment	Reference
A	-15	MET	-	initiating methionine	UNP Q6X0M8
A	-14	ASN	-	expression tag	UNP Q6X0M8
A	-13	HIS	-	expression tag	UNP Q6X0M8
A	-12	LYS	-	expression tag	UNP Q6X0M8
A	-11	VAL	-	expression tag	UNP Q6X0M8
A	-10	HIS	-	expression tag	UNP Q6X0M8
A	-9	HIS	-	expression tag	UNP Q6X0M8
A	-8	HIS	-	expression tag	UNP Q6X0M8
A	-7	HIS	-	expression tag	UNP Q6X0M8
A	-6	HIS	-	expression tag	UNP Q6X0M8
A	-5	HIS	-	expression tag	UNP Q6X0M8
A	-4	ILE	-	expression tag	UNP Q6X0M8
A	-3	GLU	-	expression tag	UNP Q6X0M8
A	-2	GLY	-	expression tag	UNP Q6X0M8
A	-1	ARG	-	expression tag	UNP Q6X0M8
A	0	HIS	-	expression tag	UNP Q6X0M8
B	-15	MET	-	initiating methionine	UNP Q6X0M8
B	-14	ASN	-	expression tag	UNP Q6X0M8
B	-13	HIS	-	expression tag	UNP Q6X0M8
B	-12	LYS	-	expression tag	UNP Q6X0M8
B	-11	VAL	-	expression tag	UNP Q6X0M8
B	-10	HIS	-	expression tag	UNP Q6X0M8
B	-9	HIS	-	expression tag	UNP Q6X0M8
B	-8	HIS	-	expression tag	UNP Q6X0M8
B	-7	HIS	-	expression tag	UNP Q6X0M8

Continued on next page...

Continued from previous page...

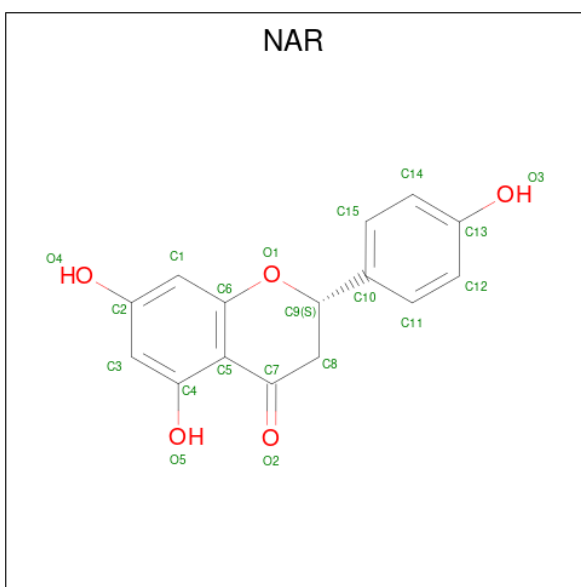
Chain	Residue	Modelled	Actual	Comment	Reference
B	-6	HIS	-	expression tag	UNP Q6X0M8
B	-5	HIS	-	expression tag	UNP Q6X0M8
B	-4	ILE	-	expression tag	UNP Q6X0M8
B	-3	GLU	-	expression tag	UNP Q6X0M8
B	-2	GLY	-	expression tag	UNP Q6X0M8
B	-1	ARG	-	expression tag	UNP Q6X0M8
B	0	HIS	-	expression tag	UNP Q6X0M8

- Molecule 2 is COENZYME A (CCD ID: COA) (formula: $C_{21}H_{36}N_7O_{16}P_3S$) (labeled as "Ligand of Interest" by depositor).



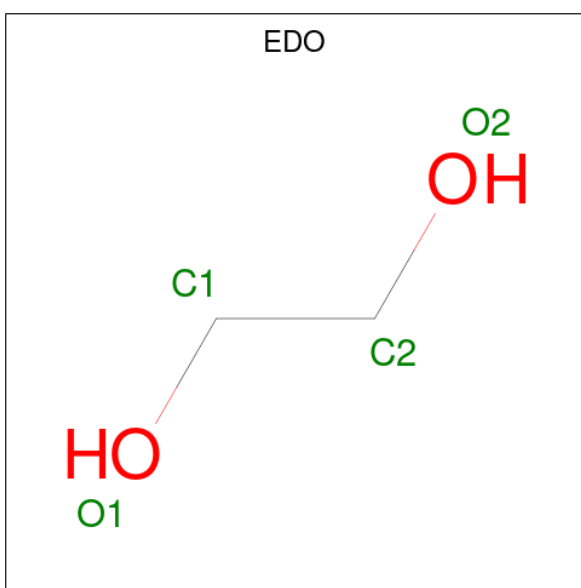
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	S	0	0
			48	21	7	16	3	1		
2	B	1	Total	C	N	O	P	S	0	0
			48	21	7	16	3	1		

- Molecule 3 is NARINGENIN (CCD ID: NAR) (formula: $C_{15}H_{12}O_5$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			20	15	5		
3	B	1	Total	C	O	0	0
			20	15	5		

- Molecule 4 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C₂H₆O₂).



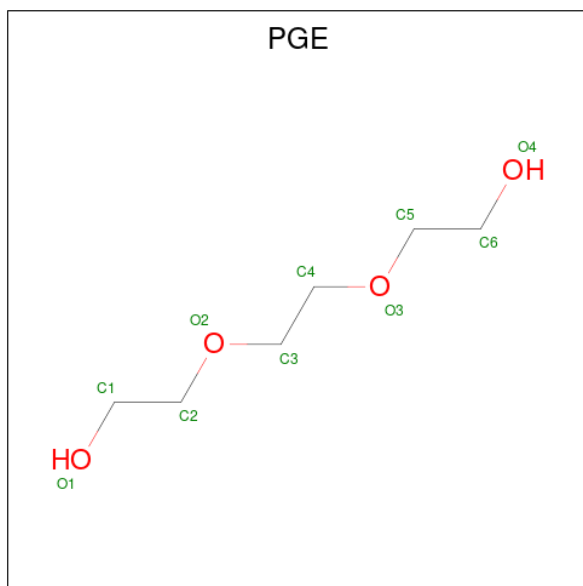
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		

Continued on next page...

Continued from previous page...

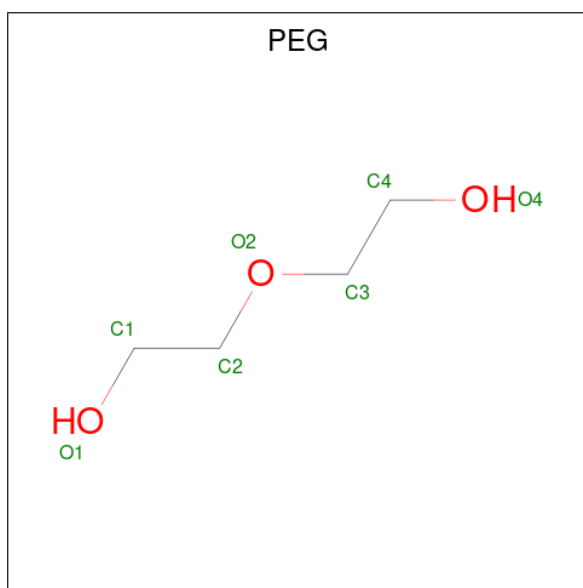
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	B	1	Total	C	O	0	0
			4	2	2		
4	B	1	Total	C	O	0	0
			4	2	2		
4	B	1	Total	C	O	0	0
			4	2	2		
4	B	1	Total	C	O	0	0
			4	2	2		

- Molecule 5 is TRIETHYLENE GLYCOL (CCD ID: PGE) (formula: C₆H₁₄O₄).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	B	1	Total	C	O	0	0
			10	6	4		
5	B	1	Total	C	O	0	0
			10	6	4		

- Molecule 6 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	B	1	Total	C	O	0	0
			7	4	3		

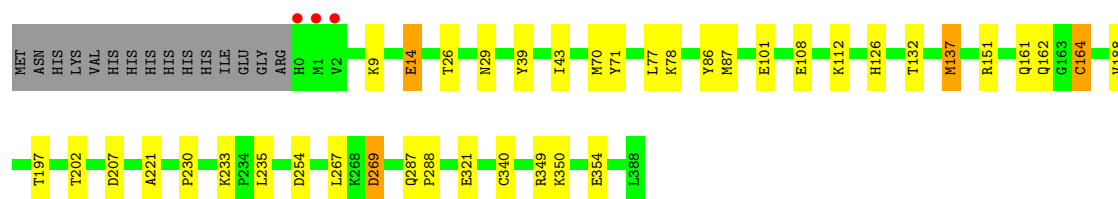
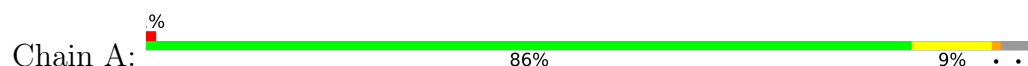
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	337	Total	O	0	0
			337	337		
7	B	366	Total	O	0	0
			366	366		

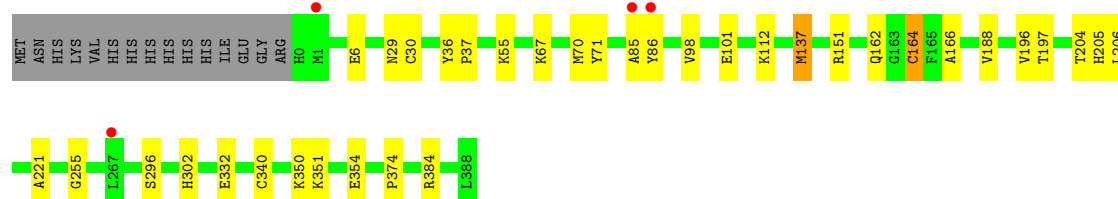
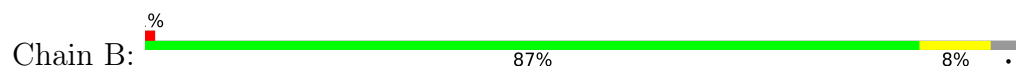
3 Residue-property plots [i](#)

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: chalcone synthase



- Molecule 1: chalcone synthase



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	54.61Å 97.47Å 157.54Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.78 – 1.83 48.78 – 1.83	Depositor EDS
% Data completeness (in resolution range)	100.0 (48.78-1.83) 100.0 (48.78-1.83)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.75 (at 1.83Å)	Xtriage
Refinement program	REFMAC 5.8.0258	Depositor
R, R_{free}	0.150 , 0.185 0.163 , 0.195	Depositor DCC
R_{free} test set	3744 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å ²)	21.1	Xtriage
Anisotropy	0.052	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 35.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	6941	wwPDB-VP
Average B, all atoms (Å ²)	24.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.87% 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: NAR, PEG, CSD, SME, COA, EDO, PGE

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	1.05	2/3070 (0.1%)	1.21	3/4152 (0.1%)
1	B	1.05	1/3045 (0.0%)	1.24	1/4120 (0.0%)
All	All	1.05	3/6115 (0.0%)	1.23	4/8272 (0.0%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	126	HIS	CE1-NE2	5.42	1.38	1.32
1	A	230	PRO	C-O	-5.34	1.17	1.24
1	B	85	ALA	C-O	5.32	1.31	1.23

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	302	HIS	CA-CB-CG	-6.42	107.38	113.80
1	A	14	GLU	CB-CG-CD	6.24	123.21	112.60
1	A	254	ASP	CA-CB-CG	5.07	117.67	112.60
1	A	207	ASP	CA-CB-CG	5.02	117.62	112.60

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	3028	0	3066	45	0
1	B	3003	0	3045	44	0
2	A	48	0	32	0	0
2	B	48	0	32	3	0
3	A	20	0	11	8	0
3	B	20	0	10	13	0
4	A	24	0	36	8	0
4	B	20	0	30	0	0
5	B	20	0	28	7	0
6	B	7	0	10	3	0
7	A	337	0	0	4	0
7	B	366	0	0	5	0
All	All	6941	0	6300	88	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 7.

All (88) 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:132:THR:HG23	1:B:137:SME:HE1	1.32	1.11
1:A:197:THR:HG21	3:A:402:NAR:H82	1.38	1.05
1:A:197:THR:HG21	3:A:402:NAR:C8	1.91	1.00
1:A:197:THR:CG2	3:A:402:NAR:H82	2.08	0.82
1:A:137:SME:HE3	1:B:255:GLY:HA3	1.62	0.81
1:A:132:THR:HG23	1:B:137:SME:CE	2.13	0.73
1:A:197:THR:HG21	3:A:402:NAR:C7	2.19	0.72
1:A:132:THR:CG2	1:B:137:SME:HE1	2.16	0.71
1:A:349:ARG:HH11	4:A:407:EDO:C1	2.05	0.69
1:B:197:THR:HG21	3:B:402:NAR:C8	2.24	0.67
1:A:287:GLN:NE2	7:A:501:HOH:O	2.28	0.66
1:B:29:ASN:HB2	7:B:774:HOH:O	1.98	0.62
1:B:55:LYS:NZ	2:B:401:COA:O8A	2.34	0.61
1:A:197:THR:HG21	3:A:402:NAR:O2	2.00	0.61
1:A:164:CSD:OD1	3:A:402:NAR:H11	2.01	0.61
1:B:112:LYS:HG2	6:B:406:PEG:H31	1.82	0.61
1:A:71:TYR:CE1	1:A:101:GLU:HG3	2.39	0.58
1:A:161:GLN:C	1:B:137:SME:CE	2.77	0.58
1:B:164:CSD:OD1	3:B:402:NAR:O4	2.21	0.58
1:B:151:ARG:NH1	7:B:501:HOH:O	2.36	0.57
1:A:349:ARG:HH11	4:A:407:EDO:H11	1.70	0.57
1:A:151:ARG:HD2	7:A:796:HOH:O	2.03	0.57

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:B:408:PGE:H2	5:B:408:PGE:O3	2.04	0.57
1:A:267:LEU:CB	1:A:269:ASP:OD1	2.52	0.57
1:B:197:THR:CG2	3:B:402:NAR:H82	2.35	0.56
1:B:164:CSD:OD1	3:B:402:NAR:H11	2.06	0.56
1:A:267:LEU:HB2	1:A:269:ASP:OD1	2.06	0.56
1:B:164:CSD:OD1	3:B:402:NAR:C1	2.54	0.55
1:A:39:TYR:CZ	1:A:43:ILE:HD13	2.41	0.54
1:A:43:ILE:HD12	1:A:77:LEU:CD1	2.37	0.54
1:B:296:SER:HB2	5:B:405:PGE:H32	1.89	0.54
1:A:197:THR:CG2	3:A:402:NAR:O2	2.56	0.53
1:A:233:LYS:HE2	4:A:407:EDO:H21	1.90	0.53
1:B:197:THR:HG21	3:B:402:NAR:H82	1.90	0.52
1:B:188:VAL:O	1:B:221:ALA:HA	2.10	0.51
1:B:204:THR:HG23	1:B:205:HIS:ND1	2.25	0.51
1:A:43:ILE:HD12	1:A:77:LEU:HD12	1.93	0.51
1:B:71:TYR:CE1	1:B:101:GLU:HG3	2.46	0.51
1:B:197:THR:HG21	3:B:402:NAR:O2	2.11	0.50
1:B:55:LYS:CE	1:B:206:LEU:HD13	2.42	0.50
1:A:29:ASN:HB3	1:A:70:MET:O	2.11	0.50
4:A:407:EDO:H22	7:A:520:HOH:O	2.11	0.50
1:B:67:LYS:HE3	1:B:332:GLU:OE1	2.12	0.50
5:B:408:PGE:H2	5:B:408:PGE:C5	2.41	0.50
1:A:188:VAL:O	1:A:221:ALA:HA	2.11	0.49
1:A:287:GLN:HB3	1:A:288:PRO:HD3	1.93	0.49
1:A:137:SME:CE	1:B:255:GLY:HA3	2.37	0.49
1:B:30:CYS:SG	1:B:67:LYS:HD2	2.53	0.49
1:A:161:GLN:O	1:B:137:SME:HE3	2.13	0.48
1:B:29:ASN:HB3	1:B:70:MET:O	2.13	0.48
1:A:235:LEU:CD2	4:A:407:EDO:H11	2.44	0.48
1:A:267:LEU:HB3	1:A:269:ASP:OD1	2.13	0.48
1:A:86:TYR:CE2	1:A:87[A]:MET:HG3	2.48	0.48
1:A:108[A]:GLU:HG2	1:A:112:LYS:HE3	1.96	0.48
5:B:408:PGE:H2	5:B:408:PGE:H5	1.96	0.48
1:B:384:ARG:HH11	1:B:384:ARG:HG3	1.79	0.47
1:A:161:GLN:C	1:B:137:SME:HE3	2.40	0.47
1:A:287:GLN:CD	7:A:501:HOH:O	2.56	0.47
5:B:405:PGE:H12	7:B:508:HOH:O	2.15	0.47
1:A:137:SME:HE1	3:B:402:NAR:C4	2.45	0.47
1:B:374:PRO:HD3	3:B:402:NAR:O4	2.15	0.46
1:B:197:THR:HG21	3:B:402:NAR:C7	2.45	0.46
1:B:112:LYS:HD3	6:B:406:PEG:H21	1.97	0.46

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:26:THR:OG1	4:A:405:EDO:H11	2.16	0.45
1:B:86:TYR:HH	1:B:205:HIS:CE1	2.30	0.45
1:A:86:TYR:CZ	1:A:202:THR:HG21	2.52	0.45
1:A:164:CSD:OD1	3:A:402:NAR:C1	2.64	0.45
1:A:161:GLN:C	1:B:137:SME:HE2	2.40	0.45
1:B:55:LYS:HE2	1:B:206:LEU:HD13	1.99	0.44
1:B:164:CSD:SG	3:B:402:NAR:H11	2.56	0.44
1:B:350:LYS:O	1:B:354:GLU:HG3	2.17	0.44
5:B:408:PGE:H6	5:B:408:PGE:H4	1.74	0.44
1:A:233:LYS:HE2	4:A:407:EDO:C2	2.48	0.44
5:B:408:PGE:O3	5:B:408:PGE:C2	2.64	0.44
1:A:321:GLU:H	1:A:321:GLU:CD	2.25	0.43
1:B:164:CSD:OD1	3:B:402:NAR:C2	2.67	0.43
1:A:349:ARG:NH1	4:A:407:EDO:H11	2.33	0.43
1:B:197:THR:CG2	3:B:402:NAR:O2	2.67	0.42
1:A:350:LYS:O	1:A:354:GLU:HG3	2.20	0.42
1:B:162:GLN:HB3	1:B:166:ALA:HB2	2.02	0.42
1:A:161:GLN:O	1:B:137:SME:CE	2.67	0.42
1:B:55:LYS:HE3	1:B:206:LEU:HD13	2.01	0.42
6:B:406:PEG:H12	7:B:745:HOH:O	2.19	0.41
1:B:36:TYR:N	1:B:37:PRO:CD	2.83	0.41
2:B:401:COA:H2B	7:B:750:HOH:O	2.20	0.41
2:B:401:COA:O4A	2:B:401:COA:O2A	2.38	0.41
1:B:98:VAL:HG11	1:B:196:VAL:HG13	2.03	0.41
1:A:162:GLN:C	1:B:137:SME:HE3	2.46	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	389/404 (96%)	380 (98%)	9 (2%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	386/404 (96%)	379 (98%)	7 (2%)	0	100	100
All	All	775/808 (96%)	759 (98%)	16 (2%)	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	328/338 (97%)	323 (98%)	5 (2%)	57	42
1	B	325/338 (96%)	322 (99%)	3 (1%)	70	60
All	All	653/676 (97%)	645 (99%)	8 (1%)	63	51

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	9	LYS
1	A	14	GLU
1	A	78	LYS
1	A	269	ASP
1	A	340	CYS
1	B	6	GLU
1	B	340	CYS
1	B	351	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	161	GLN
1	A	237	GLN
1	A	287	GLN
1	A	311	GLN
1	B	119	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

4 non-standard protein/DNA/RNA residues are modelled in this entry.

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
1	CSD	A	164	1	4,7,8	0.49	0	1,8,10	3.06	1 (100%)
1	SME	B	137	1	6,8,9	0.67	0	3,9,11	2.71	1 (33%)
1	SME	A	137	1	6,8,9	0.88	0	3,9,11	2.56	2 (66%)
1	CSD	B	164	1	4,7,8	0.54	0	1,8,10	3.84	1 (100%)

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
1	CSD	A	164	1	-	0/2/6/8	-
1	SME	B	137	1	-	0/6/7/9	-
1	SME	A	137	1	-	1/6/7/9	-
1	CSD	B	164	1	-	0/2/6/8	-

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	137	SME	OE-S-CG	-4.15	94.99	105.89
1	B	164	CSD	OD1-SG-CB	-3.84	98.53	105.60
1	A	137	SME	CE-S-CG	3.52	106.26	97.45
1	A	164	CSD	OD1-SG-CB	-3.06	99.97	105.60
1	A	137	SME	OE-S-CG	-2.65	98.94	105.89

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	137	SME	CB-CG-S-CE

There are no ring outliers.

4 monomers are involved in 19 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	A	164	CSD	2	0
1	B	137	SME	9	0
1	A	137	SME	3	0
1	B	164	CSD	5	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

18 ligands are modelled in this entry.

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	EDO	B	410	-	3,3,3	0.25	0	2,2,2	0.37	0
4	EDO	A	407	-	3,3,3	0.33	0	2,2,2	0.28	0
4	EDO	A	404	-	3,3,3	0.20	0	2,2,2	0.04	0
4	EDO	B	409	-	3,3,3	0.24	0	2,2,2	0.35	0
5	PGE	B	405	-	9,9,9	0.39	0	8,8,8	0.34	0
2	COA	B	401	-	47,50,50	0.76	2 (4%)	69,75,75	1.18	8 (11%)
4	EDO	A	405	-	3,3,3	0.45	0	2,2,2	0.34	0
4	EDO	B	407	-	3,3,3	0.21	0	2,2,2	0.10	0
4	EDO	A	408	-	3,3,3	0.29	0	2,2,2	0.42	0
6	PEG	B	406	-	6,6,6	0.39	0	5,5,5	0.39	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	NAR	B	402	-	22,22,22	0.57	0	32,32,32	0.54	0
4	EDO	B	403	-	3,3,3	0.17	0	2,2,2	0.08	0
5	PGE	B	408	-	9,9,9	0.53	0	8,8,8	0.80	0
4	EDO	B	404	-	3,3,3	0.16	0	2,2,2	0.14	0
4	EDO	A	403	-	3,3,3	0.16	0	2,2,2	0.12	0
4	EDO	A	406	-	3,3,3	0.31	0	2,2,2	0.30	0
3	NAR	A	402	-	22,22,22	0.56	0	32,32,32	0.98	2 (6%)
2	COA	A	401	-	47,50,50	0.73	1 (2%)	69,75,75	0.76	1 (1%)

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	EDO	B	410	-	-	1/1/1/1	-
4	EDO	A	407	-	-	1/1/1/1	-
4	EDO	A	404	-	-	0/1/1/1	-
4	EDO	B	409	-	-	1/1/1/1	-
5	PGE	B	405	-	-	6/7/7/7	-
2	COA	B	401	-	-	11/48/64/64	0/3/3/3
4	EDO	A	405	-	-	0/1/1/1	-
4	EDO	B	407	-	-	1/1/1/1	-
4	EDO	A	408	-	-	1/1/1/1	-
6	PEG	B	406	-	-	3/4/4/4	-
3	NAR	B	402	-	-	0/4/16/16	0/3/3/3
4	EDO	B	403	-	-	1/1/1/1	-
5	PGE	B	408	-	-	6/7/7/7	-
4	EDO	B	404	-	-	1/1/1/1	-
4	EDO	A	403	-	-	1/1/1/1	-
4	EDO	A	406	-	-	1/1/1/1	-
3	NAR	A	402	-	-	0/4/16/16	0/3/3/3
2	COA	A	401	-	-	3/48/64/64	0/3/3/3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401	COA	P3B-O3B	3.02	1.64	1.59
2	B	401	COA	P3B-O3B	2.91	1.64	1.59
2	B	401	COA	P2A-O3A	-2.49	1.56	1.59

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	401	COA	P3B-O3B-C3B	-4.88	110.41	123.43
2	B	401	COA	O2A-P1A-O3A	3.10	115.66	107.27
2	B	401	COA	O3A-P2A-O4A	-2.76	102.41	110.70
2	A	401	COA	P3B-O3B-C3B	-2.33	117.21	123.43
2	B	401	COA	O5A-P2A-O4A	2.25	122.89	112.44
2	B	401	COA	O2A-P1A-O1A	2.21	122.70	112.44
2	B	401	COA	O3A-P1A-O1A	-2.16	104.21	110.70
2	B	401	COA	C7P-C6P-C5P	-2.14	108.83	112.39
2	B	401	COA	O9A-P3B-O8A	2.10	115.66	107.80
3	A	402	NAR	O4-C2-C1	-2.02	114.57	119.85
3	A	402	NAR	O1-C9-C10	2.02	111.22	107.47

There are no chirality outliers.

All (38) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	401	COA	C5B-O5B-P1A-O1A
2	B	401	COA	C5B-O5B-P1A-O2A
2	B	401	COA	C5B-O5B-P1A-O3A
2	B	401	COA	CCP-O6A-P2A-O4A
2	B	401	COA	CCP-O6A-P2A-O5A
5	B	408	PGE	C6-C5-O3-C4
5	B	405	PGE	C4-C3-O2-C2
5	B	405	PGE	C6-C5-O3-C4
6	B	406	PEG	O2-C3-C4-O4
5	B	405	PGE	O2-C3-C4-O3
4	A	407	EDO	O1-C1-C2-O2
4	A	408	EDO	O1-C1-C2-O2
4	B	404	EDO	O1-C1-C2-O2
4	B	410	EDO	O1-C1-C2-O2
5	B	408	PGE	O3-C5-C6-O4
5	B	408	PGE	O2-C3-C4-O3
5	B	405	PGE	O1-C1-C2-O2
4	B	407	EDO	O1-C1-C2-O2
6	B	406	PEG	C1-C2-O2-C3
6	B	406	PEG	C4-C3-O2-C2
2	B	401	COA	P1A-O3A-P2A-O4A
5	B	405	PGE	O3-C5-C6-O4
5	B	408	PGE	C4-C3-O2-C2
5	B	408	PGE	O1-C1-C2-O2
2	B	401	COA	CCP-O6A-P2A-O3A

Continued on next page...

Continued from previous page...

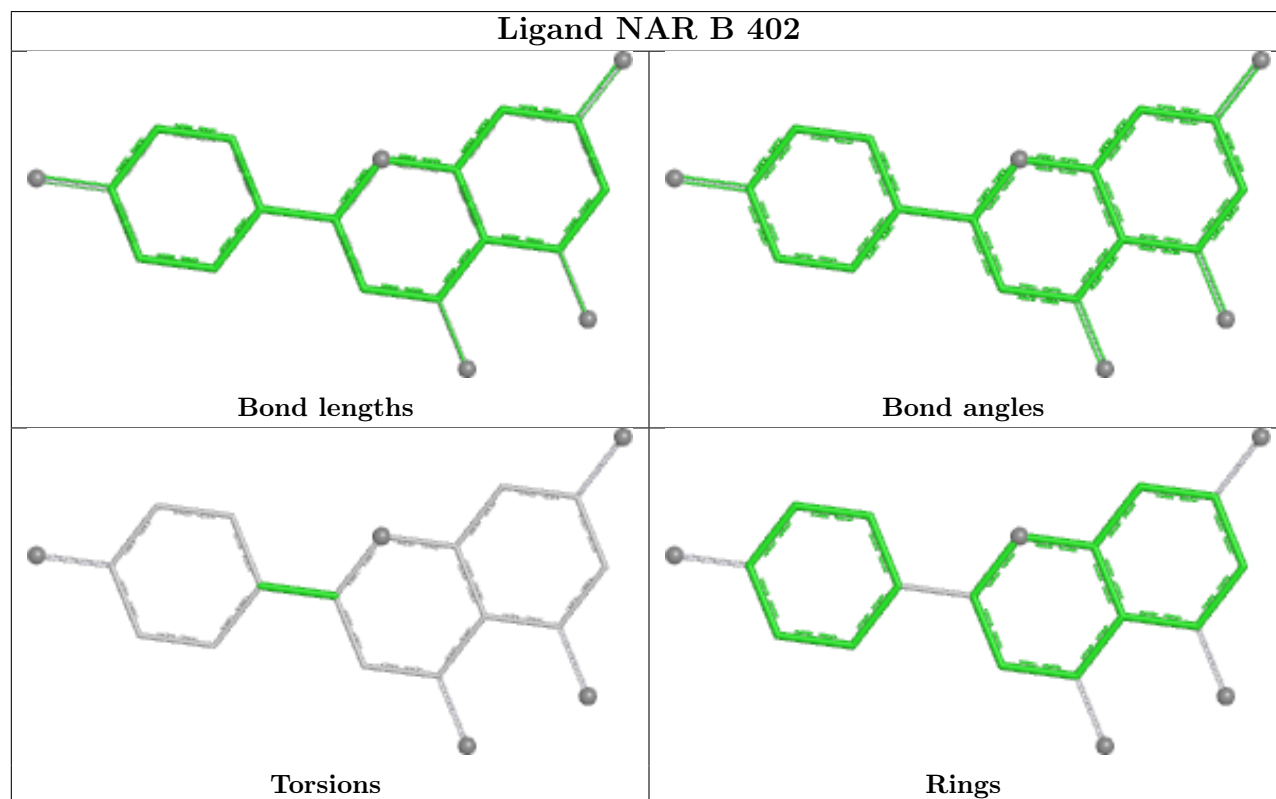
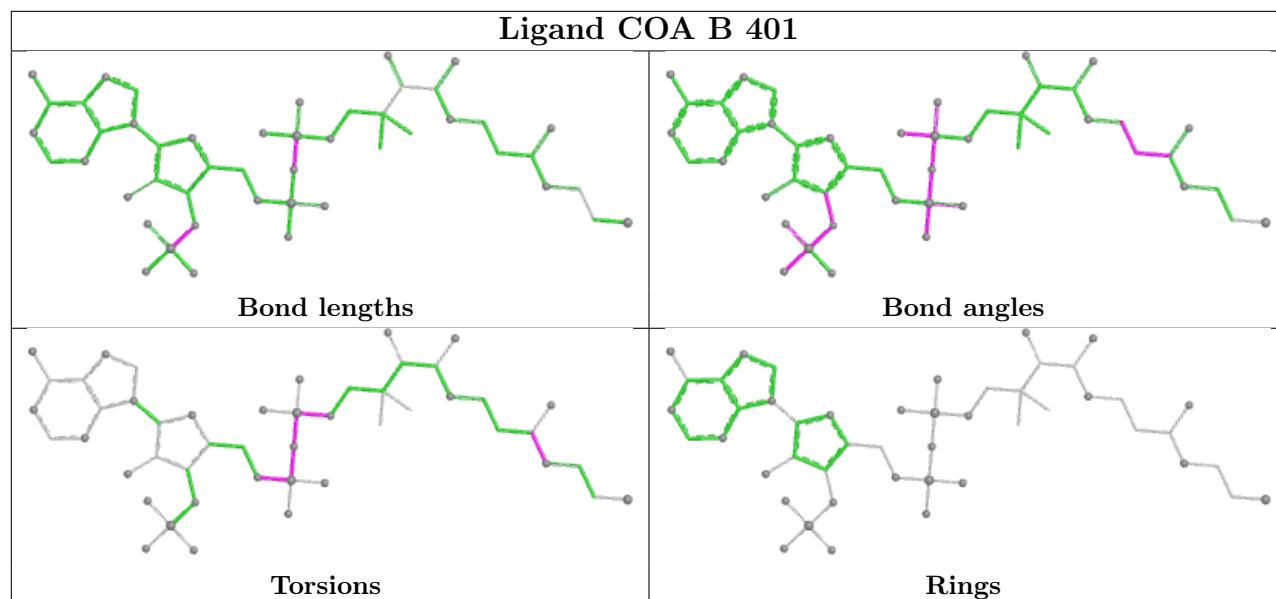
Mol	Chain	Res	Type	Atoms
5	B	408	PGE	C3-C4-O3-C5
2	B	401	COA	O5P-C5P-N4P-C3P
2	A	401	COA	P1A-O3A-P2A-O5A
2	B	401	COA	P2A-O3A-P1A-O2A
4	A	406	EDO	O1-C1-C2-O2
2	A	401	COA	C3B-O3B-P3B-O8A
4	B	403	EDO	O1-C1-C2-O2
4	B	409	EDO	O1-C1-C2-O2
4	A	403	EDO	O1-C1-C2-O2
5	B	405	PGE	C1-C2-O2-C3
2	A	401	COA	P1A-O3A-P2A-O4A
2	B	401	COA	P2A-O3A-P1A-O1A
2	B	401	COA	P1A-O3A-P2A-O5A

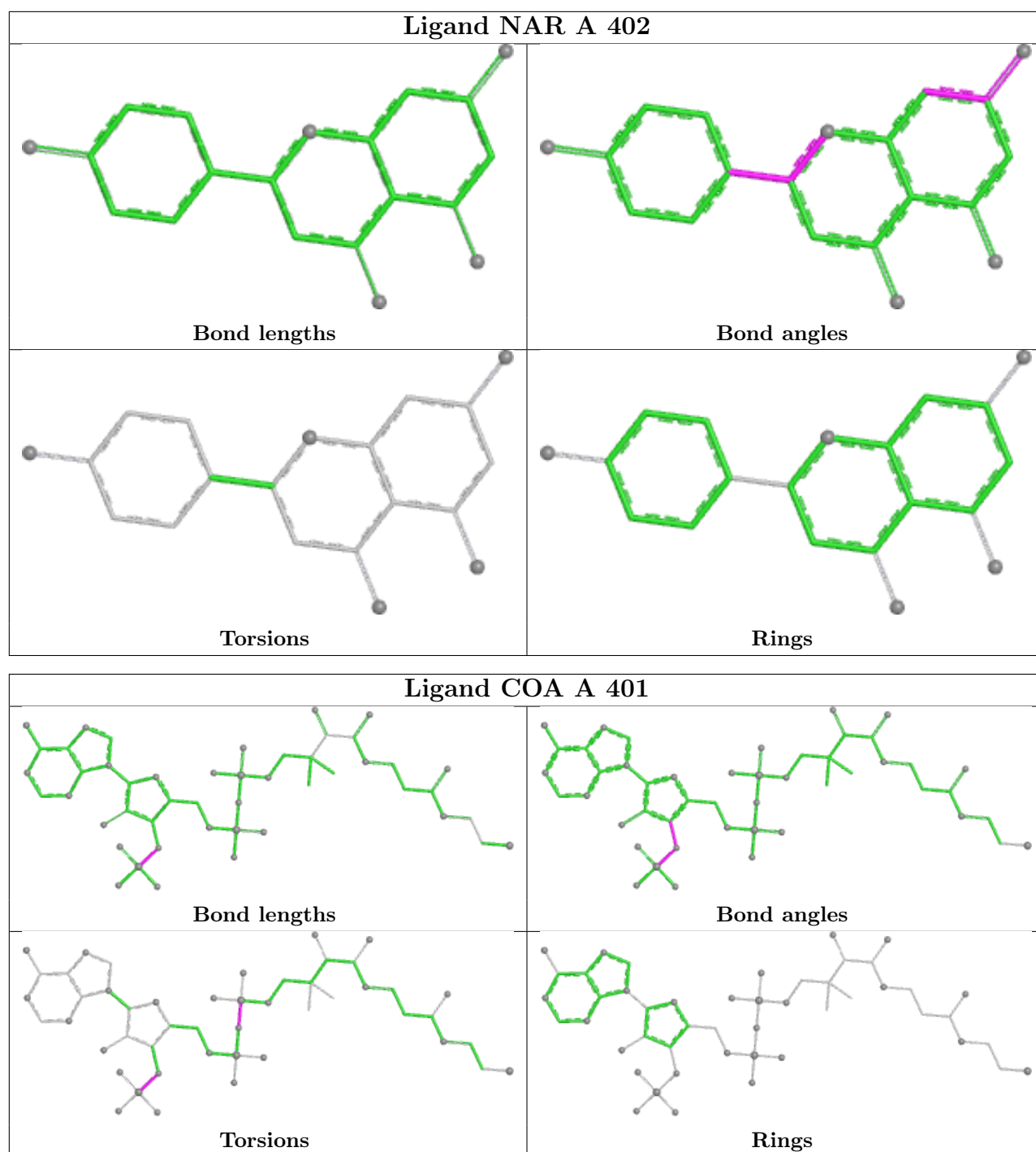
There are no ring outliers.

8 monomers are involved in 42 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	407	EDO	7	0
5	B	405	PGE	2	0
2	B	401	COA	3	0
4	A	405	EDO	1	0
6	B	406	PEG	3	0
3	B	402	NAR	13	0
5	B	408	PGE	5	0
3	A	402	NAR	8	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 ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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	387/404 (95%)	-0.39	3 (0%) 82 88	8, 18, 36, 66	4 (1%)
1	B	387/404 (95%)	-0.29	4 (1%) 79 86	9, 21, 38, 55	1 (0%)
All	All	774/808 (95%)	-0.34	7 (0%) 81 87	8, 20, 37, 66	5 (0%)

All (7) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	0	HIS	3.3
1	B	86	TYR	2.5
1	A	1	MET	2.4
1	B	267	LEU	2.3
1	B	85	ALA	2.2
1	B	1	MET	2.0
1	A	2	VAL	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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
1	SME	B	137	9/10	0.94	0.10	15,16,35,40	0
1	SME	A	137	9/10	0.95	0.10	16,18,33,37	0
1	CSD	A	164	8/9	0.96	0.08	17,21,37,38	0
1	CSD	B	164	8/9	0.96	0.08	18,24,38,39	0

6.3 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

6.4 Ligands ⓘ

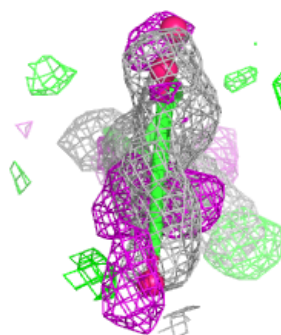
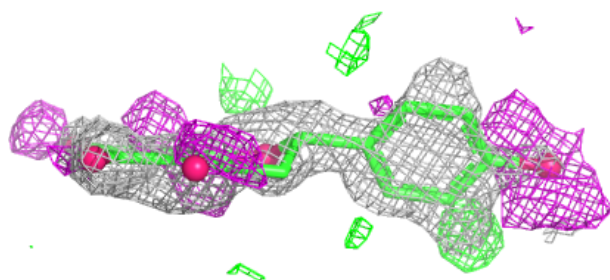
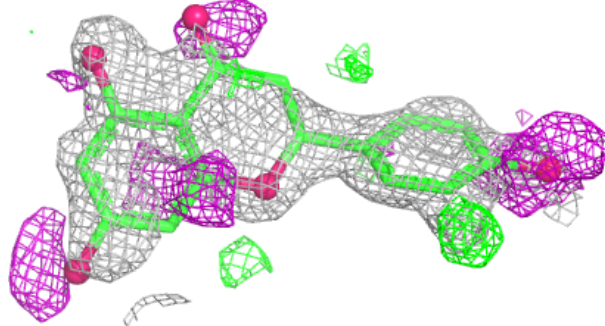
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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	EDO	B	403	4/4	0.65	0.23	64,71,75,79	0
5	PGE	B	405	10/10	0.66	0.20	51,61,66,66	0
4	EDO	A	406	4/4	0.70	0.20	45,50,55,56	0
4	EDO	B	410	4/4	0.73	0.19	56,67,71,76	0
4	EDO	A	405	4/4	0.73	0.19	45,52,54,57	0
4	EDO	A	403	4/4	0.74	0.14	55,59,59,61	0
3	NAR	A	402	20/20	0.76	0.15	43,50,58,58	0
3	NAR	B	402	20/20	0.80	0.15	50,55,59,62	0
5	PGE	B	408	10/10	0.80	0.18	33,51,60,62	0
4	EDO	B	407	4/4	0.81	0.18	51,52,54,56	0
4	EDO	A	408	4/4	0.81	0.15	44,54,57,63	0
4	EDO	B	409	4/4	0.84	0.16	32,50,53,57	0
4	EDO	B	404	4/4	0.85	0.22	40,48,49,53	0
4	EDO	A	404	4/4	0.87	0.15	51,51,60,60	0
4	EDO	A	407	4/4	0.87	0.22	35,36,38,40	0
6	PEG	B	406	7/7	0.89	0.12	33,38,45,52	0
2	COA	A	401	48/48	0.90	0.09	22,35,57,59	0
2	COA	B	401	48/48	0.90	0.09	30,36,52,59	0

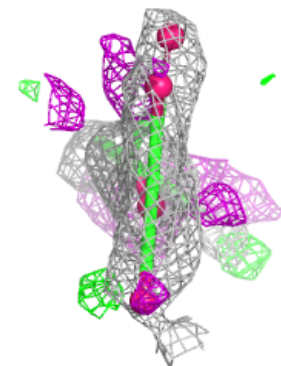
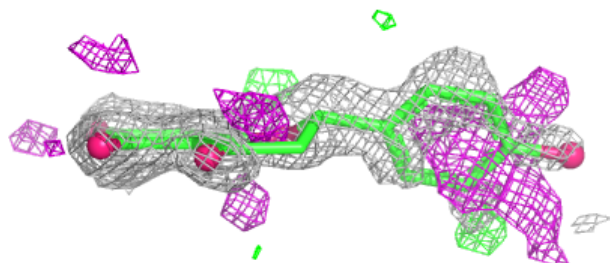
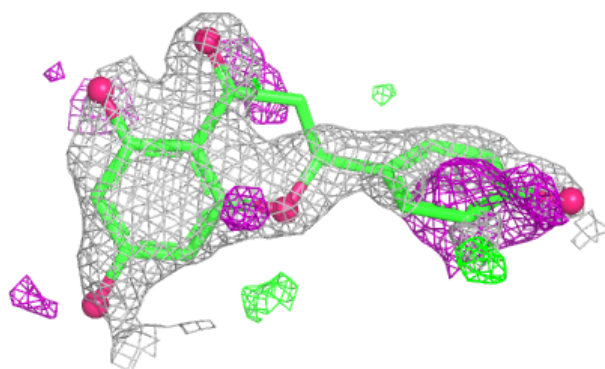
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around NAR 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)

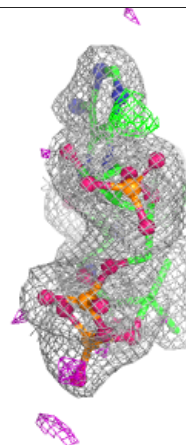
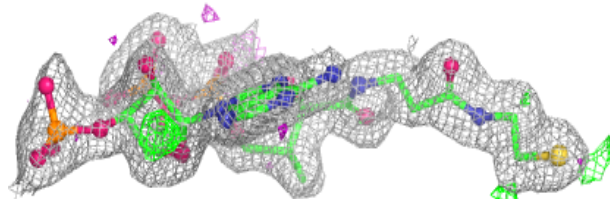
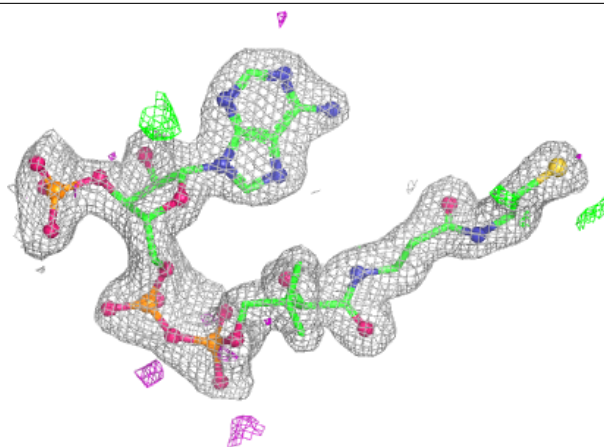
**Electron density around NAR B 402:**

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

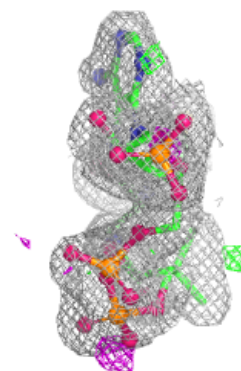
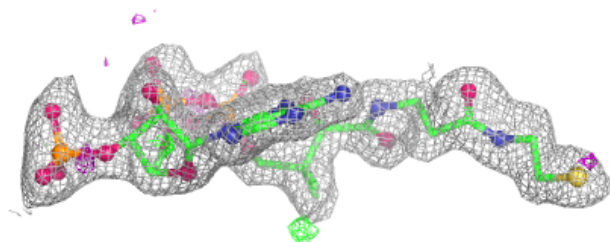
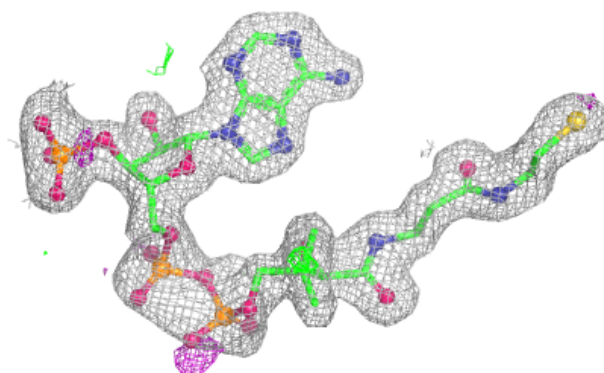


Electron density around COA A 401:

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

**Electron density around COA 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)



6.5 Other polymers [i](#)

There are no such residues in this entry.