Full wwPDB X-ray Structure Validation Report ⓘ

Aug 29, 2023 – 02:38 AM EDT

PDB ID	:	3N0G
Title	:	Crystal Structure of Isoprene Synthase from Grey Poplar Leaves (Populus x canescens) in complex with three Mg2+ ions and dimethylallyl-S-thiolodipho sphate
Authors	:	Koksal, M.; Christianson, D.W.
Deposited on	:	2010-05-14
Resolution	:	2.80 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:

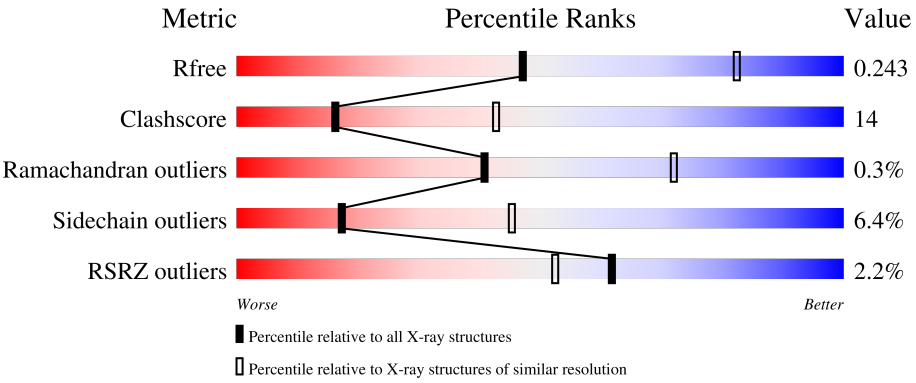
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35

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 2.80 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	3140 (2.80-2.80)
Clashscore	141614	3569 (2.80-2.80)
Ramachandran outliers	138981	3498 (2.80-2.80)
Sidechain outliers	138945	3500 (2.80-2.80)
RSRZ outliers	127900	3078 (2.80-2.80)

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 <=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	555	3% 65% 25% · 6%
1	B	555	2% 64% 28% · 6%

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 8987 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 Isoprene synthase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	521	Total	C	N	O	S	0	7	0
			4315	2747	737	819	12			
1	B	524	Total	C	N	O	S	0	5	0
			4316	2748	735	821	12			

There are 30 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	41	MET	-	expression tag	UNP Q9AR86
A	42	ARG	-	expression tag	UNP Q9AR86
A	43	GLY	-	expression tag	UNP Q9AR86
A	44	SER	-	expression tag	UNP Q9AR86
A	45	HIS	-	expression tag	UNP Q9AR86
A	46	HIS	-	expression tag	UNP Q9AR86
A	47	HIS	-	expression tag	UNP Q9AR86
A	48	HIS	-	expression tag	UNP Q9AR86
A	49	HIS	-	expression tag	UNP Q9AR86
A	50	HIS	-	expression tag	UNP Q9AR86
A	51	GLY	-	expression tag	UNP Q9AR86
A	52	SER	-	expression tag	UNP Q9AR86
A	59	ASP	ASN	engineered mutation	UNP Q9AR86
A	308	ARG	LYS	engineered mutation	UNP Q9AR86
A	533	TRP	CYS	engineered mutation	UNP Q9AR86
B	41	MET	-	expression tag	UNP Q9AR86
B	42	ARG	-	expression tag	UNP Q9AR86
B	43	GLY	-	expression tag	UNP Q9AR86
B	44	SER	-	expression tag	UNP Q9AR86
B	45	HIS	-	expression tag	UNP Q9AR86
B	46	HIS	-	expression tag	UNP Q9AR86
B	47	HIS	-	expression tag	UNP Q9AR86
B	48	HIS	-	expression tag	UNP Q9AR86
B	49	HIS	-	expression tag	UNP Q9AR86
B	50	HIS	-	expression tag	UNP Q9AR86

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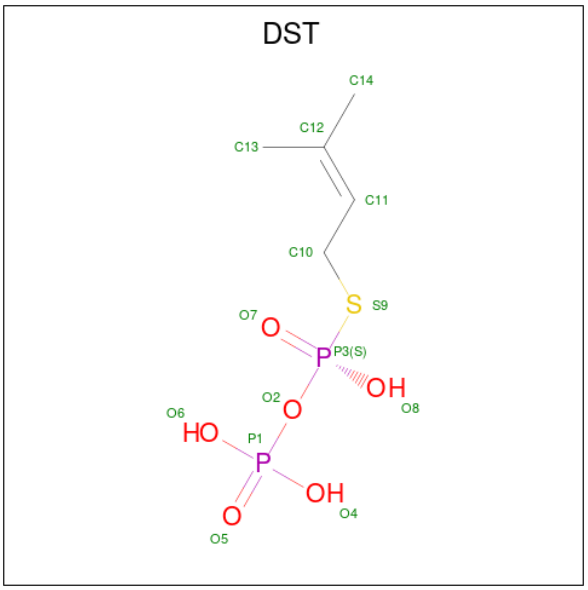
Chain	Residue	Modelled	Actual	Comment	Reference
B	51	GLY	-	expression tag	UNP Q9AR86
B	52	SER	-	expression tag	UNP Q9AR86
B	59	ASP	ASN	engineered mutation	UNP Q9AR86
B	308	ARG	LYS	engineered mutation	UNP Q9AR86
B	533	TRP	CYS	engineered mutation	UNP Q9AR86

- Molecule 2 is DIMETHYLALLYL S-THIOLODIPHOSPHATE (three-letter code: DST) (formula: $C_5H_{12}O_6P_2S$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total C O P S 14 5 6 2 1	0	0
2	B	1	Total C O P S 14 5 6 2 1	0	0

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	3	Total Mg 3 3	0	0
3	B	3	Total Mg 3 3	0	0

- Molecule 4 is water.

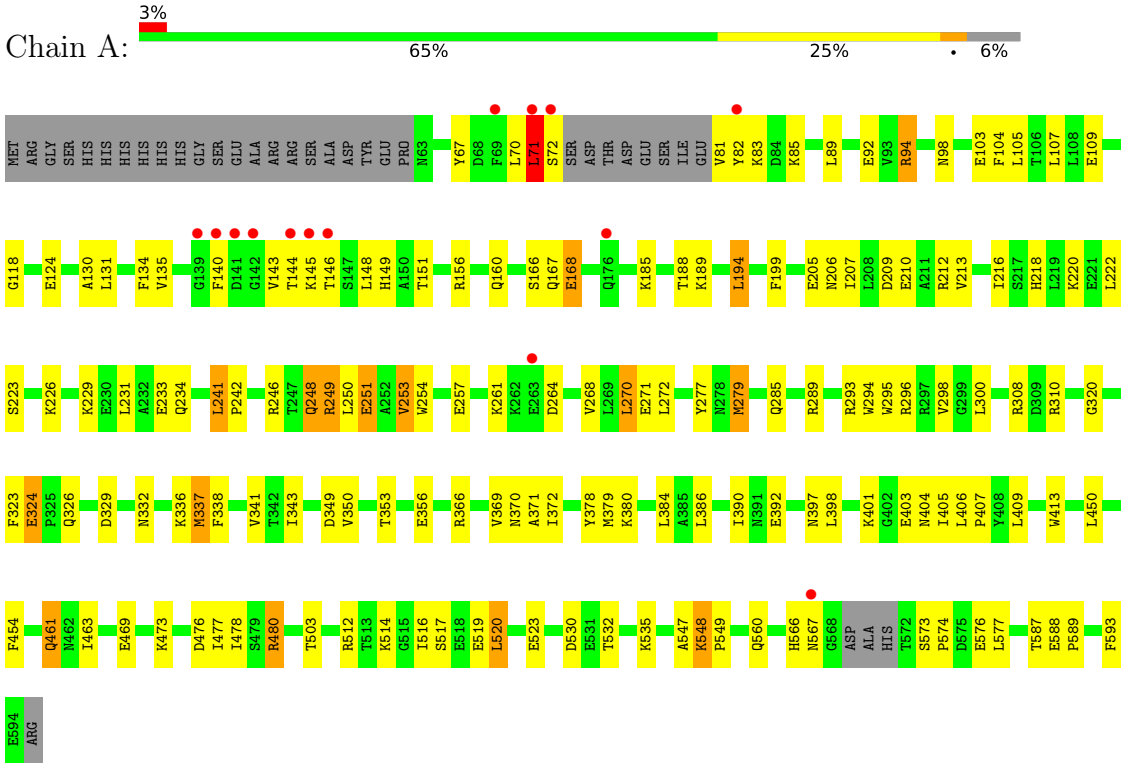
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	169	Total O 169 169	0	0
4	B	153	Total O 153 153	0	0

3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

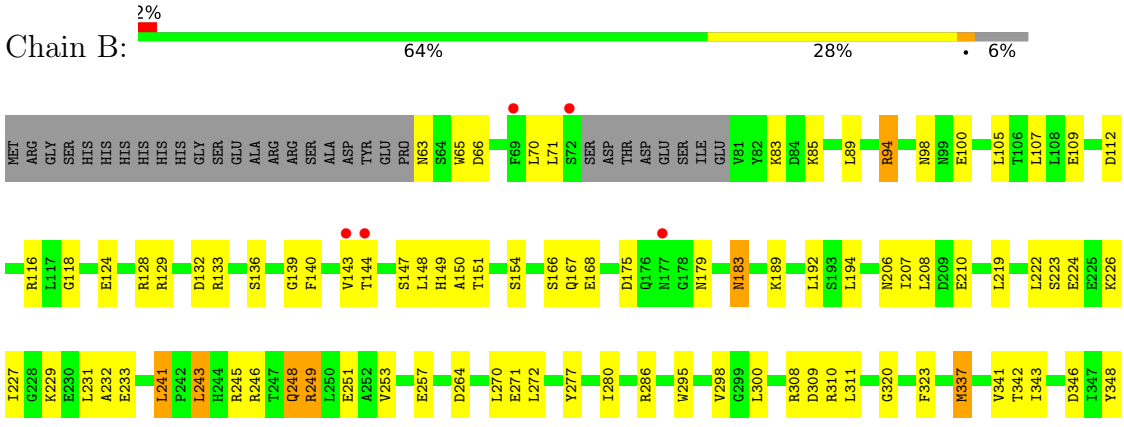
• Molecule 1: Isoprene synthase

Chain A:



• Molecule 1: Isoprene synthase

Chain B:




D349 V350 L357 E358 L359 F360 V369 N370 A371 I372 M379 K380 L381 L384 A385 L386 Y387 N388 T389 I390 N391 E392 N397 L398 G402 E403 N404 I405 W413 L416 F420 L421 P449 L450 Q461 N462 I463 K464 K465 E466 E467 N470 L471 Q472 H475 D476 I477
I478 S479 R480 P481 S482 A496 R500 N505 S508 C509 Y510 M511 R512 T513 I516 L520 A521 T522 M526 W533 M536 K540 S544 A547 K548 P549 F550 V551 Q560 T564 Y565 H566 N567 G568 D569 A570 H571 T572 S573 E576 L577 T578 R579 V582
L583 E588 P589 I590 E594 ARG

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α, β, γ	155.01Å 155.01Å 143.74Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.40 – 2.80 46.40 – 2.80	Depositor EDS
% Data completeness (in resolution range)	95.8 (46.40-2.80) 95.8 (46.40-2.80)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	0.14	Depositor
$< I/\sigma(I) >$ [1]	3.50 (at 2.81Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.198 , 0.246 0.197 , 0.243	Depositor DCC
R_{free} test set	2186 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å^2)	38.1	Xtriage
Anisotropy	0.018	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.30 , 45.9	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	8987	wwPDB-VP
Average B, all atoms (Å^2)	41.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.82% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: DST, MG

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	0.40	0/4402	0.55	0/5946
1	B	0.40	0/4405	0.54	0/5954
All	All	0.40	0/8807	0.55	0/11900

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4315	0	4234	116	0
1	B	4316	0	4229	131	0
2	A	14	0	10	1	0
2	B	14	0	10	0	0
3	A	3	0	0	0	0
3	B	3	0	0	0	0
4	A	169	0	0	2	0
4	B	153	0	0	5	0
All	All	8987	0	8483	247	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 14.

All (247) 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:241:LEU:HD22	1:A:242:PRO:HD2	1.50	0.94
1:A:248:GLN:NE2	1:A:249:ARG:HH21	1.77	0.81
1:A:480[B]:ARG:NH1	1:A:535:LYS:HD2	2.00	0.77
1:B:511:MET:HB3	1:B:521:ALA:HB2	1.67	0.77
1:A:503:THR:HB	1:A:512:ARG:NH1	2.00	0.76
1:A:229:LYS:O	1:A:233:GLU:HG3	1.84	0.76
1:B:246:ARG:HD2	1:B:251:GLU:HG2	1.65	0.76
1:A:573:SER:HB3	1:A:576:GLU:HB2	1.67	0.75
1:B:337:MET:HE2	1:B:413:TRP:HE1	1.52	0.75
1:B:144:THR:HA	1:B:151:THR:OG1	1.88	0.74
1:B:476:ASP:HB3	1:B:480[A]:ARG:HD3	1.69	0.74
1:B:308:ARG:HE	1:B:342:THR:HG23	1.54	0.73
1:B:461:GLN:CD	1:B:461:GLN:H	1.91	0.73
1:A:72:SER:HB2	1:A:83:LYS:HD3	1.70	0.72
1:A:223:SER:OG	1:A:226:LYS:HG3	1.87	0.72
1:B:477:ILE:HG23	1:B:478:ILE:HG23	1.70	0.72
1:A:294:TRP:O	1:A:298:VAL:HG23	1.91	0.70
1:B:144:THR:HG22	1:B:151:THR:HG23	1.73	0.70
1:A:461:GLN:H	1:A:461:GLN:CD	1.97	0.68
1:B:71:LEU:HB3	1:B:83:LYS:HB2	1.76	0.68
1:A:207:ILE:HA	1:A:210:GLU:OE1	1.94	0.68
1:B:249:ARG:O	1:B:253:VAL:HG23	1.94	0.67
1:A:324:GLU:HG2	1:A:326:GLN:NE2	2.10	0.67
1:B:308:ARG:HB2	1:B:310[A]:ARG:NH1	2.10	0.67
1:A:143:VAL:HG13	1:A:146:THR:HB	1.77	0.67
1:B:496:ALA:O	1:B:500:ARG:HD3	1.95	0.66
1:A:403:GLU:HG2	1:A:463:ILE:HD11	1.77	0.66
1:A:105:LEU:O	1:A:109:GLU:HG3	1.96	0.65
1:A:206:ASN:O	1:A:210:GLU:HG3	1.96	0.65
1:A:218:HIS:CE1	1:A:222:LEU:HD11	2.32	0.65
1:B:139:GLY:O	1:B:143:VAL:HG23	1.96	0.65
1:B:249:ARG:HA	1:B:249:ARG:HE	1.61	0.65
1:A:308:ARG:HB2	1:A:310[A]:ARG:NH1	2.11	0.65
1:A:320:GLY:HA3	1:A:560:GLN:OE1	1.96	0.65
1:A:308:ARG:HB2	1:A:310[A]:ARG:HH12	1.62	0.64
1:B:224:GLU:HG3	1:B:229:LYS:HA	1.80	0.64
1:A:337:MET:HE3	1:A:337:MET:HA	1.80	0.63
1:A:148:LEU:HD11	1:A:194:LEU:HG	1.80	0.63
1:B:85:LYS:HE2	1:B:271:GLU:OE1	1.99	0.63
1:B:166:SER:OG	1:B:168:GLU:HG2	2.00	0.62

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:480[B]:ARG:HH11	1:A:535:LYS:HD2	1.65	0.61
1:B:308:ARG:HB2	1:B:310[A]:ARG:HH12	1.67	0.60
1:A:94:ARG:HD2	4:A:14:HOH:O	2.00	0.60
1:B:295:TRP:HH2	1:B:343:ILE:HD11	1.67	0.59
1:B:508:SER:HA	1:B:511:MET:HG2	1.85	0.59
1:A:85:LYS:O	1:A:89:LEU:HG	2.04	0.58
1:A:477:ILE:HG23	1:A:478:ILE:HG23	1.86	0.58
1:B:167:GLN:HG3	1:B:207:ILE:HD12	1.87	0.57
1:A:293:ARG:HA	1:A:296:ARG:NH1	2.19	0.57
1:B:349:ASP:HA	4:B:33:HOH:O	2.03	0.57
1:B:578:THR:O	1:B:582:VAL:HG23	2.05	0.57
1:B:219:LEU:HA	1:B:222:LEU:HD22	1.86	0.57
1:B:116:ARG:HD3	4:B:11:HOH:O	2.06	0.56
1:B:403:GLU:HG2	1:B:463:ILE:HD11	1.86	0.56
1:A:409:LEU:HD22	1:A:454:PHE:CZ	2.41	0.56
1:A:566:HIS:CD2	1:A:577:LEU:HD23	2.41	0.56
1:A:94:ARG:HG2	1:A:98:ASN:ND2	2.19	0.56
1:B:248:GLN:HG2	1:B:323:PHE:CD2	2.40	0.56
1:B:337:MET:HE2	1:B:413:TRP:NE1	2.21	0.56
1:B:566:HIS:CD2	1:B:577:LEU:HD23	2.42	0.55
1:A:143:VAL:HA	1:A:146:THR:HB	1.89	0.55
1:B:337:MET:O	1:B:341:VAL:HG23	2.06	0.55
1:A:209:ASP:O	1:A:213:VAL:HG23	2.07	0.55
1:A:248:GLN:HG2	1:A:323:PHE:CG	2.41	0.55
1:B:248:GLN:HG2	1:B:323:PHE:CE2	2.42	0.55
1:B:223:SER:OG	1:B:226:LYS:HG3	2.06	0.55
1:B:248:GLN:NE2	1:B:249:ARG:HH21	2.03	0.55
1:A:300:LEU:HD23	1:A:343:ILE:CD1	2.37	0.54
1:B:94:ARG:HG2	1:B:98:ASN:ND2	2.21	0.54
1:A:246:ARG:HD2	1:A:251:GLU:HG2	1.89	0.54
1:B:472:GLN:HG3	4:B:720:HOH:O	2.07	0.54
1:A:143:VAL:C	1:A:145:LYS:H	2.11	0.54
1:B:264:ASP:OD2	1:B:264:ASP:N	2.41	0.53
1:B:416:LEU:HD22	1:B:450:LEU:HD13	1.90	0.53
1:A:149:HIS:NE2	1:A:189:LYS:HE2	2.24	0.53
1:A:234:GLN:HE21	1:A:254:TRP:HH2	1.55	0.53
1:B:128:ARG:HB3	1:B:128:ARG:NH1	2.23	0.53
1:B:85:LYS:HE3	1:B:89:LEU:HD21	1.91	0.53
1:B:348:TYR:CD1	1:B:357:LEU:HD22	2.43	0.53
1:B:566:HIS:CD2	1:B:568:GLY:H	2.27	0.53
1:B:94:ARG:HG2	1:B:98:ASN:HD22	1.74	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:63:ASN:HB2	1:B:66:ASP:OD2	2.09	0.53
1:B:229:LYS:O	1:B:233:GLU:HG3	2.10	0.52
1:A:409:LEU:HD22	1:A:454:PHE:CE1	2.45	0.52
1:A:218:HIS:NE2	1:A:222:LEU:HD11	2.24	0.52
1:A:517:SER:OG	1:A:520:LEU:HD22	2.10	0.52
1:A:353:THR:OG1	1:A:356:GLU:HG3	2.10	0.52
1:A:248:GLN:HG2	1:A:323:PHE:CD2	2.45	0.52
1:B:140:PHE:O	1:B:144:THR:HG23	2.10	0.52
1:A:476:ASP:O	1:A:480[A]:ARG:HB2	2.11	0.51
1:B:143:VAL:HG13	1:B:150:ALA:HB1	1.93	0.51
1:B:147:SER:HB3	1:B:150:ALA:HB3	1.93	0.51
1:B:477:ILE:CD1	1:B:551:VAL:HG22	2.40	0.51
1:B:227:ILE:HD11	1:B:232:ALA:HA	1.92	0.51
1:B:516:ILE:HD12	1:B:520:LEU:HB3	1.91	0.51
1:B:579:ARG:O	1:B:583:LEU:HG	2.11	0.51
1:A:337:MET:HE2	1:A:390:ILE:HD11	1.91	0.51
1:A:308:ARG:HH22	2:A:601:DST:H101	1.76	0.50
1:B:63:ASN:HB2	1:B:66:ASP:CG	2.30	0.50
1:B:386:LEU:O	1:B:390:ILE:HG12	2.11	0.50
1:A:140:PHE:HB2	1:A:143:VAL:HB	1.94	0.50
1:A:349:ASP:HA	4:A:748:HOH:O	2.11	0.50
1:B:105:LEU:O	1:B:109:GLU:HG3	2.12	0.50
1:B:476:ASP:HA	1:B:479:SER:OG	2.12	0.50
1:B:477:ILE:HD11	1:B:551:VAL:HA	1.94	0.50
1:A:107:LEU:HD11	1:A:130:ALA:HB1	1.94	0.49
1:A:94:ARG:HG2	1:A:98:ASN:HD22	1.76	0.49
1:B:476:ASP:HB3	1:B:480[A]:ARG:CD	2.40	0.49
1:A:85:LYS:HE2	1:A:89:LEU:HD21	1.95	0.49
1:B:112:ASP:O	1:B:116:ARG:HG3	2.11	0.49
1:A:149:HIS:CE1	1:A:189:LYS:HE2	2.47	0.49
1:A:248:GLN:HG2	1:A:323:PHE:CD1	2.48	0.49
1:A:285:GLN:O	1:A:289:ARG:HB2	2.13	0.49
1:A:480[B]:ARG:HG3	1:A:532:THR:HG23	1.93	0.49
1:A:480[B]:ARG:CG	1:A:532:THR:HG23	2.43	0.49
1:A:293:ARG:HD3	1:A:296:ARG:HH22	1.77	0.49
1:B:107:LEU:HD13	1:B:107:LEU:C	2.33	0.49
1:B:298:VAL:HG12	1:B:300:LEU:HB2	1.95	0.49
1:B:346:ASP:O	1:B:350:VAL:HG23	2.12	0.49
1:B:461:GLN:H	1:B:461:GLN:NE2	2.11	0.49
1:B:573:SER:HB3	1:B:576:GLU:HB2	1.95	0.48
1:A:337:MET:O	1:A:341:VAL:HG23	2.14	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:378:TYR:CZ	1:A:379:MET:HG3	2.48	0.48
1:A:270:LEU:HD13	1:A:593:PHE:CE1	2.49	0.48
1:B:369:VAL:O	1:B:372:ILE:HG23	2.14	0.48
1:B:449:PRO:HD3	1:B:482:SER:OG	2.14	0.48
1:A:469:GLU:O	1:A:473:LYS:HG3	2.13	0.48
1:A:516:ILE:HD12	1:A:520:LEU:HB3	1.96	0.48
1:A:166:SER:OG	1:A:168:GLU:HB2	2.14	0.47
1:A:514:LYS:O	1:A:516:ILE:HG23	2.15	0.47
1:B:116:ARG:CZ	1:B:243:LEU:HD21	2.44	0.47
1:B:183:ASN:ND2	1:B:183:ASN:H	2.11	0.47
1:A:366[B]:ARG:HH22	1:A:371:ALA:CB	2.26	0.47
1:B:398:LEU:O	1:B:402:GLY:HA2	2.15	0.47
1:B:358:GLU:OE2	1:B:421:LEU:HD21	2.14	0.47
1:A:103:GLU:HA	1:A:103:GLU:OE1	2.15	0.47
1:A:218:HIS:O	1:A:222:LEU:HD13	2.14	0.47
1:B:311:LEU:C	1:B:311:LEU:HD13	2.35	0.47
1:B:461:GLN:CD	1:B:461:GLN:N	2.64	0.47
1:A:104:PHE:CZ	1:A:134:PHE:HA	2.50	0.47
1:B:128:ARG:HB3	1:B:128:ARG:CZ	2.45	0.47
1:A:70:LEU:HD13	1:A:279:MET:CE	2.45	0.47
1:A:547:ALA:HB1	1:A:549:PRO:HD2	1.96	0.46
1:B:384:LEU:HD22	1:B:388:ASN:HD21	1.80	0.46
1:B:540:LYS:O	1:B:548:LYS:HE3	2.14	0.46
1:A:144:THR:HA	1:A:151:THR:OG1	2.15	0.46
1:A:372:ILE:O	1:A:380:LYS:HG3	2.15	0.46
1:A:476:ASP:HB3	1:A:480[A]:ARG:HD3	1.97	0.46
1:A:295:TRP:HA	1:A:295:TRP:CE3	2.51	0.46
1:A:548:LYS:N	1:A:549:PRO:CD	2.79	0.46
1:B:253:VAL:HG22	1:B:277:TYR:OH	2.16	0.46
1:A:143:VAL:HG12	1:A:143:VAL:O	2.16	0.46
1:A:257[B]:GLU:O	1:A:261:LYS:HG3	2.16	0.46
1:B:464:LYS:HB2	1:B:467:GLU:HG3	1.98	0.46
1:B:277:TYR:CD2	1:B:590:ILE:HG13	2.51	0.46
1:B:560:GLN:NE2	1:B:564:THR:CG2	2.79	0.46
1:B:129:ARG:O	1:B:133:ARG:HG2	2.16	0.46
1:A:257[A]:GLU:O	1:A:261:LYS:HG3	2.17	0.45
1:B:175:ASP:OD2	1:B:179:ASN:HB2	2.17	0.45
1:A:378:TYR:CE1	1:A:379:MET:HG3	2.51	0.45
1:A:463:ILE:O	1:A:463:ILE:HG13	2.16	0.45
1:B:533:TRP:HA	1:B:536:MET:HE2	1.97	0.45
1:A:270:LEU:HD13	1:A:593:PHE:HE1	1.81	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:253:VAL:HG13	1:A:277:TYR:CZ	2.50	0.45
1:A:337:MET:HE2	1:A:413:TRP:HE1	1.80	0.45
1:A:397:ASN:ND2	1:A:405:ILE:HD11	2.32	0.45
1:B:286:ARG:CZ	4:B:36:HOH:O	2.64	0.45
1:A:480[B]:ARG:HD3	1:A:535:LYS:HB2	1.99	0.45
1:B:384:LEU:HD22	1:B:388:ASN:ND2	2.31	0.45
1:A:450:LEU:HD23	1:A:450:LEU:C	2.37	0.45
1:B:544:SER:HB3	1:B:548:LYS:HZ2	1.82	0.45
1:B:548:LYS:N	1:B:549:PRO:CD	2.80	0.45
1:A:131:LEU:O	1:A:135:VAL:HG23	2.16	0.45
1:B:477:ILE:HD11	1:B:551:VAL:HG22	1.99	0.45
1:B:544:SER:HB3	1:B:548:LYS:NZ	2.32	0.45
1:B:311:LEU:HD13	1:B:311:LEU:O	2.17	0.45
1:B:369:VAL:HG13	1:B:370:ASN:N	2.32	0.45
1:A:81:VAL:HG23	1:A:81:VAL:O	2.18	0.44
1:A:300:LEU:HD23	1:A:343:ILE:HD12	1.99	0.44
1:A:216:ILE:O	1:A:220:LYS:HG2	2.16	0.44
1:A:167:GLN:HG3	1:A:207:ILE:HD12	1.99	0.44
1:B:140:PHE:HE1	1:B:154:SER:HG	1.59	0.44
1:B:510:TYR:C	1:B:512:ARG:H	2.20	0.44
1:B:547:ALA:HB1	1:B:549:PRO:HD2	1.99	0.44
1:A:250:LEU:HD23	1:A:250:LEU:HA	1.86	0.44
1:B:192:LEU:HD23	1:B:192:LEU:HA	1.83	0.44
1:A:167:GLN:NE2	1:A:205:GLU:HA	2.32	0.44
1:A:264:ASP:OD2	1:A:264:ASP:N	2.46	0.44
1:A:461:GLN:N	1:A:461:GLN:OE1	2.51	0.44
1:B:248:GLN:HG2	1:B:323:PHE:CG	2.52	0.44
1:B:588:GLU:HA	1:B:589:PRO:HD3	1.87	0.44
1:A:567:ASN:O	1:A:574:PRO:HG3	2.18	0.44
1:B:505:ASN:O	1:B:509:CYS:HB2	2.16	0.44
1:A:212:ARG:NH1	1:A:530:ASP:OD1	2.46	0.44
1:A:588:GLU:HA	1:A:589:PRO:HD3	1.89	0.44
1:B:149:HIS:CD2	1:B:189:LYS:HZ1	2.36	0.44
1:A:566:HIS:HD2	1:A:577:LEU:HD23	1.79	0.43
1:B:208:LEU:HD23	1:B:208:LEU:HA	1.79	0.43
1:B:522:THR:O	1:B:526:MET:HG2	2.19	0.43
1:A:461:GLN:CD	1:A:461:GLN:N	2.67	0.43
1:B:449:PRO:HG2	4:B:3:HOH:O	2.19	0.43
1:B:480[A]:ARG:N	1:B:481:PRO:HD2	2.34	0.43
1:B:100[A]:GLU:H	1:B:100[A]:GLU:CD	2.22	0.42
1:B:249:ARG:HA	1:B:249:ARG:NE	2.32	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:579:ARG:NH1	1:B:583:LEU:HD11	2.34	0.42
1:A:118:GLY:CA	1:A:248:GLN:HE22	2.32	0.42
1:A:143:VAL:HA	1:A:146:THR:CB	2.49	0.42
1:B:118:GLY:HA2	1:B:248:GLN:HE22	1.84	0.42
1:B:249:ARG:HH12	1:B:280:ILE:HD12	1.84	0.42
1:B:348:TYR:CG	1:B:420:PHE:HB3	2.54	0.42
1:A:85:LYS:NZ	1:A:271:GLU:OE1	2.49	0.42
1:A:519:GLU:O	1:A:523:GLU:HG3	2.20	0.42
1:B:133:ARG:HA	1:B:136:SER:OG	2.20	0.42
1:B:480[B]:ARG:N	1:B:481:PRO:HD2	2.35	0.42
1:B:569:ASP:OD1	1:B:572:THR:N	2.53	0.42
1:A:85:LYS:HA	1:A:85:LYS:HD2	1.82	0.41
1:B:295:TRP:HE1	1:B:309:ASP:CG	2.23	0.41
1:B:470:ASN:HB3	1:B:475:HIS:HB2	2.02	0.41
1:A:249:ARG:HD2	1:A:323:PHE:HB2	2.01	0.41
1:A:67:TYR:HD1	1:A:71:LEU:HD23	1.86	0.41
1:B:71:LEU:HD23	1:B:83:LYS:HA	2.03	0.41
1:B:369:VAL:C	1:B:371:ALA:H	2.22	0.41
1:B:477:ILE:HD12	1:B:551:VAL:HG22	2.02	0.41
1:A:92:GLU:OE2	1:A:268:VAL:HG21	2.20	0.41
1:B:248:GLN:HG2	1:B:323:PHE:CZ	2.56	0.41
1:B:320:GLY:HA3	1:B:560:GLN:OE1	2.20	0.41
1:B:398:LEU:HD23	1:B:398:LEU:HA	1.90	0.41
1:B:397:ASN:ND2	1:B:405:ILE:HD11	2.35	0.41
1:B:465:LYS:HG3	1:B:466:GLU:N	2.35	0.41
1:B:566:HIS:HD2	1:B:568:GLY:H	1.68	0.41
1:A:140:PHE:O	1:A:144:THR:HG23	2.20	0.41
1:A:369:VAL:C	1:A:371:ALA:H	2.24	0.41
1:A:406:LEU:N	1:A:407:PRO:CD	2.84	0.41
1:B:71:LEU:CD2	1:B:83:LYS:HA	2.50	0.41
1:B:227:ILE:HB	1:B:231:LEU:HD23	2.02	0.41
1:A:199:PHE:CE2	1:A:242:PRO:HB3	2.56	0.41
1:B:241:LEU:HD22	1:B:245:ARG:HB2	2.03	0.41
1:B:149:HIS:CD2	1:B:189:LYS:NZ	2.89	0.40
1:A:248:GLN:HG3	1:A:249:ARG:N	2.36	0.40
1:B:107:LEU:HD13	1:B:107:LEU:O	2.21	0.40
1:B:206:ASN:O	1:B:210:GLU:HG3	2.20	0.40
1:B:245:ARG:HG2	1:B:533:TRP:CZ2	2.56	0.40
1:B:360:PHE:HB2	1:B:379:MET:SD	2.61	0.40
1:A:332:ASN:O	1:A:336:LYS:HG3	2.22	0.40
1:B:547:ALA:O	1:B:551:VAL:HG23	2.21	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:156:ARG:O	1:A:160:GLN:HB2	2.22	0.40
1:A:185:LYS:HE2	1:A:218:HIS:HB2	2.03	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	522/555 (94%)	498 (95%)	22 (4%)	2 (0%)	34 66
1	B	525/555 (95%)	494 (94%)	30 (6%)	1 (0%)	47 78
All	All	1047/1110 (94%)	992 (95%)	52 (5%)	3 (0%)	41 72

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	71	LEU
1	A	370	ASN
1	B	350	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	464/486 (96%)	431 (93%)	33 (7%)	14 39

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	B	464/486 (96%)	436 (94%)	28 (6%)	19 48
All	All	928/972 (96%)	867 (93%)	61 (7%)	17 44

All (61) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	71	LEU
1	A	82	TYR
1	A	94	ARG
1	A	124	GLU
1	A	168	GLU
1	A	188	THR
1	A	194	LEU
1	A	231	LEU
1	A	241	LEU
1	A	248	GLN
1	A	249	ARG
1	A	251	GLU
1	A	253	VAL
1	A	270	LEU
1	A	272	LEU
1	A	279	MET
1	A	324	GLU
1	A	329	ASP
1	A	337	MET
1	A	338	PHE
1	A	350	VAL
1	A	384	LEU
1	A	386	LEU
1	A	392	GLU
1	A	398	LEU
1	A	401	LYS
1	A	404	ASN
1	A	461	GLN
1	A	480[A]	ARG
1	A	480[B]	ARG
1	A	520	LEU
1	A	548	LYS
1	A	587	THR
1	B	65	TRP
1	B	70	LEU
1	B	94	ARG

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Mol	Chain	Res	Type
1	B	124	GLU
1	B	132	ASP
1	B	148	LEU
1	B	183	ASN
1	B	194	LEU
1	B	241	LEU
1	B	243	LEU
1	B	248	GLN
1	B	249	ARG
1	B	257	GLU
1	B	270	LEU
1	B	272	LEU
1	B	337	MET
1	B	350	VAL
1	B	381	LEU
1	B	384	LEU
1	B	386	LEU
1	B	392	GLU
1	B	398	LEU
1	B	404	ASN
1	B	461	GLN
1	B	480[A]	ARG
1	B	480[B]	ARG
1	B	513	THR
1	B	572	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	63	ASN
1	A	248	GLN
1	A	370	ASN
1	A	404	ASN
1	B	63	ASN
1	B	177	ASN
1	B	248	GLN
1	B	388	ASN
1	B	404	ASN
1	B	461	GLN
1	B	527	ASN
1	B	566	HIS

5.3.3 RNA

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates

There are no monosaccharides in this entry.

5.6 Ligand geometry

Of 8 ligands modelled in this entry, 6 are monoatomic - leaving 2 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	$\#\|Z\| > 2$
2	DST	A	601	3	9,13,13	1.24	1 (11%)	11,19,19	0.67	0
2	DST	B	612	3	9,13,13	1.26	1 (11%)	11,19,19	0.71	0

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
2	DST	A	601	3	-	1/7/13/13	-
2	DST	B	612	3	-	0/7/13/13	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	601	DST	P3-O8	2.20	1.62	1.56

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	612	DST	P3-O8	2.10	1.62	1.56

There are no bond angle outliers.

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	601	DST	P3-O2-P1-O4

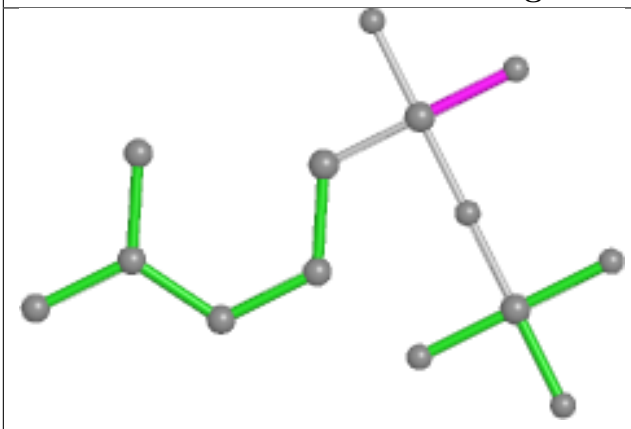
There are no ring outliers.

1 monomer is involved in 1 short contact:

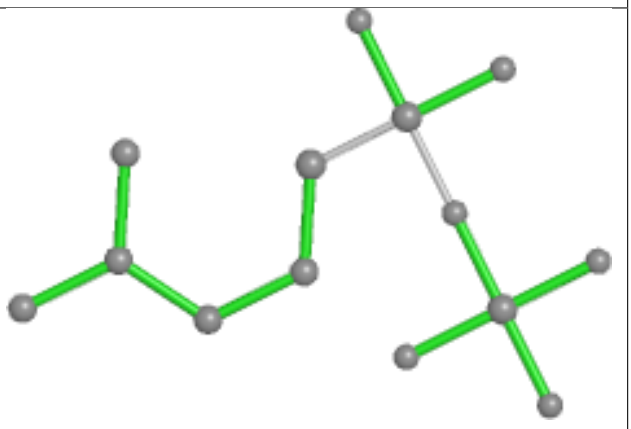
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	601	DST	1	0

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 then 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.

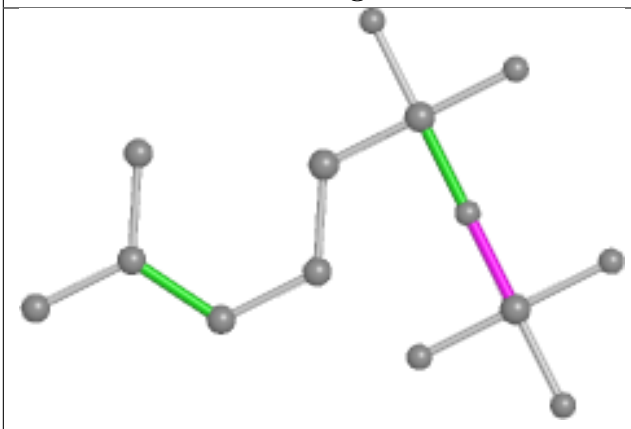
Ligand DST A 601



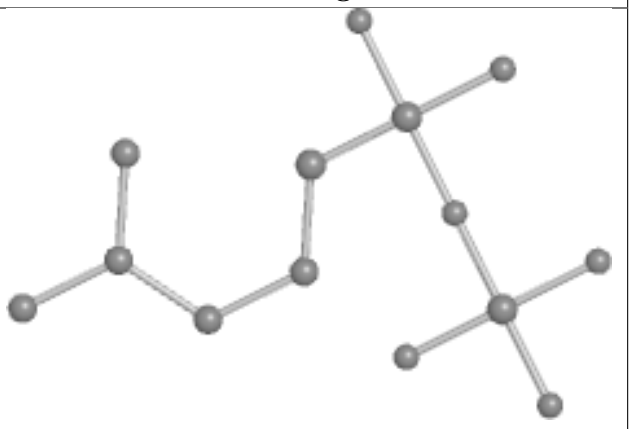
Bond lengths



Bond angles

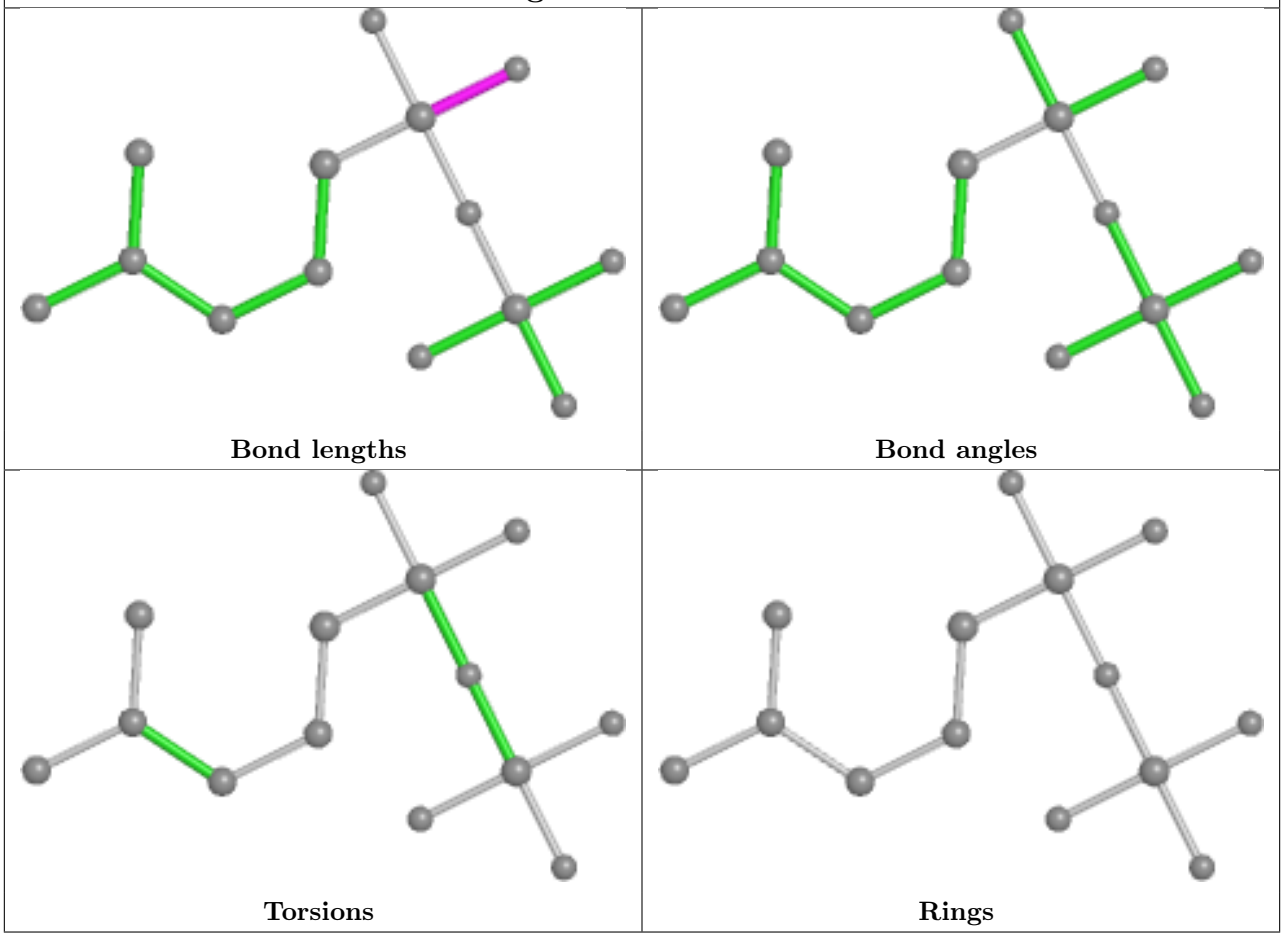


Torsions



Rings

Ligand DST B 612



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, 95^{th} 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	521/555 (93%)	-0.32	14 (2%) 54 44	15, 37, 84, 111	0
1	B	524/555 (94%)	-0.40	9 (1%) 70 63	17, 37, 77, 108	0
All	All	1045/1110 (94%)	-0.36	23 (2%) 62 52	15, 37, 83, 111	0

All (23) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	144	THR	6.3
1	A	142	GLY	5.3
1	B	144	THR	4.6
1	A	141	ASP	4.5
1	A	140	PHE	3.8
1	A	145	LYS	3.6
1	B	570	ALA	3.6
1	A	139	GLY	3.1
1	B	572	THR	2.7
1	B	69	PHE	2.6
1	B	143	VAL	2.5
1	B	177	ASN	2.5
1	A	176	GLN	2.4
1	A	146	THR	2.4
1	A	567	ASN	2.3
1	A	82	TYR	2.3
1	A	69	PHE	2.3
1	B	571	HIS	2.2
1	A	71	LEU	2.1
1	A	263	GLU	2.1
1	A	72	SER	2.1
1	B	72	SER	2.0
1	B	461	GLN	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)

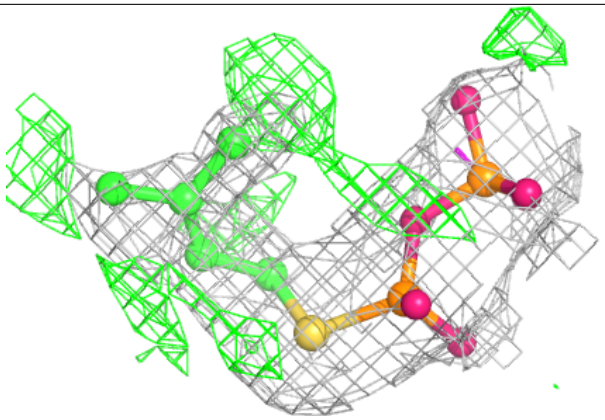
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9'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

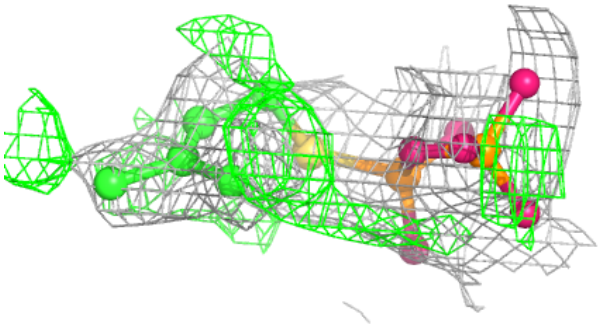
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	MG	B	633	1/1	0.84	0.12	38,38,38,38	0
3	MG	A	623	1/1	0.85	0.26	42,42,42,42	0
3	MG	A	622	1/1	0.85	0.56	46,46,46,46	1
3	MG	B	631	1/1	0.86	0.29	42,42,42,42	1
2	DST	B	612	14/14	0.86	0.34	39,54,57,57	14
3	MG	B	632	1/1	0.89	0.42	38,38,38,38	1
3	MG	A	621	1/1	0.91	0.24	40,40,40,40	1
2	DST	A	601	14/14	0.93	0.23	43,53,56,56	14

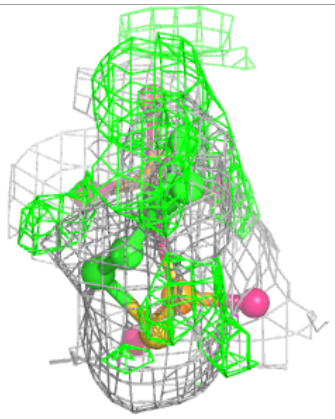
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around DST B 612:

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

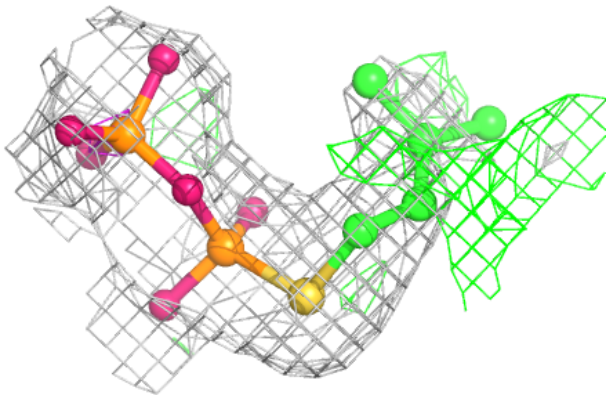


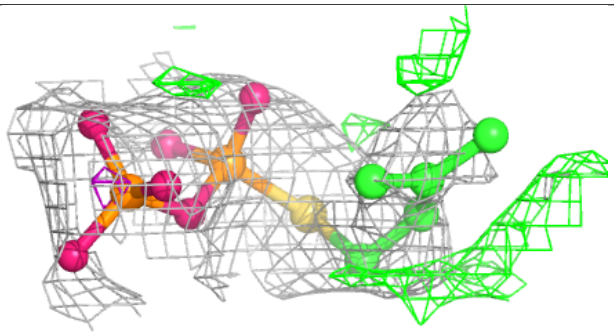


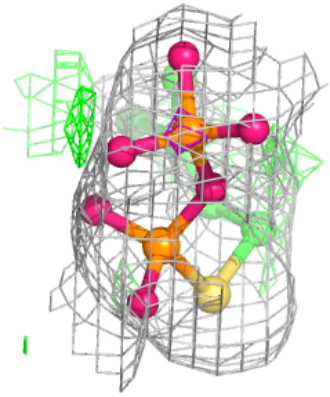


Electron density around DST A 601:

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







6.5 Other polymers (i)

There are no such residues in this entry.