wwPDB X-ray Structure Validation Summary Report (i)

Sep 2, 2023 – 10:52 PM EDT

PDB ID	:	3RG2
Title	:	Structure of a two-domain NRPS fusion protein containing the EntE adenylation domain and EntB aryl-carrier protein from enterobactin biosynthesis
Authors	:	Sundlov, J.A.; Gulick, A.M.
Deposited on	:	2011-04-07
Resolution	:	3.10 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 (i) 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 (i)) were used in the production of this report:

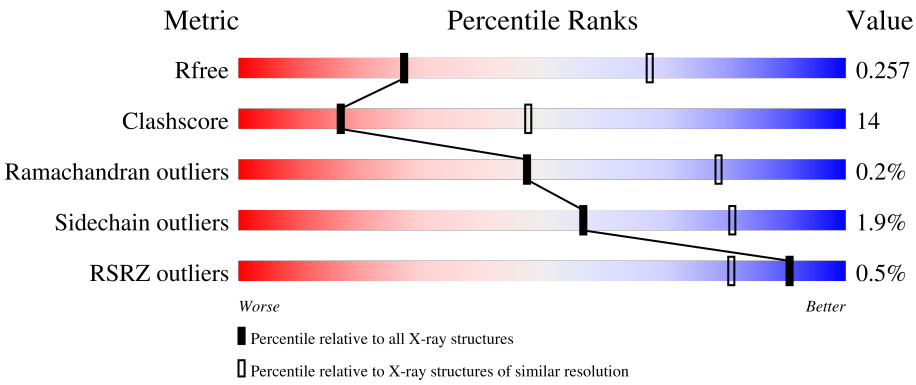
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (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 3.10 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	1094 (3.10-3.10)
Clashscore	141614	1184 (3.10-3.10)
Ramachandran outliers	138981	1141 (3.10-3.10)
Sidechain outliers	138945	1141 (3.10-3.10)
RSRZ outliers	127900	1067 (3.10-3.10)

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	617	70% 28% ••
1	B	617	69% 28% ••
1	C	617	73% 25% ••
1	D	617	69% 29% •
1	E	617	74% 24% ••

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Mol	Chain	Length	Quality of chain
1	F	617	71% 26%
1	G	617	% 76% 21%
1	H	617	75% 24%
1	I	617	75% 23%
1	J	617	2% 79% 18%

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
4	IOD	D	618	-	-	X	-
4	IOD	I	616	-	-	X	-

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 45112 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 Enterobactin synthase component E (entE), 2,3-dihydro-2,3-dihydroxybenzoate synthetase, isochroismatase (Entb).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	611	4622	2937	800	867	18	0	0	0
1	B	606	4552	2900	785	849	18	0	0	0
1	C	613	4530	2881	776	854	19	0	0	0
1	D	607	4547	2896	775	858	18	0	0	0
1	E	610	4490	2853	768	851	18	0	0	0
1	F	604	4498	2856	766	858	18	0	0	0
1	G	602	4262	2690	738	817	17	0	0	0
1	H	611	4452	2816	774	844	18	0	0	0
1	I	608	4409	2799	759	833	18	0	0	0
1	J	606	4205	2666	715	810	14	0	0	0

There are 42 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	expression tag	UNP P10378
A	0	HIS	-	expression tag	UNP P10378
A	537	GLY	-	linker	UNP P10378
A	538	ARG	-	linker	UNP P10378
A	539	ALA	-	linker	UNP P10378
A	540	SER	-	linker	UNP P10378
B	-1	GLY	-	expression tag	UNP P10378
B	0	HIS	-	expression tag	UNP P10378

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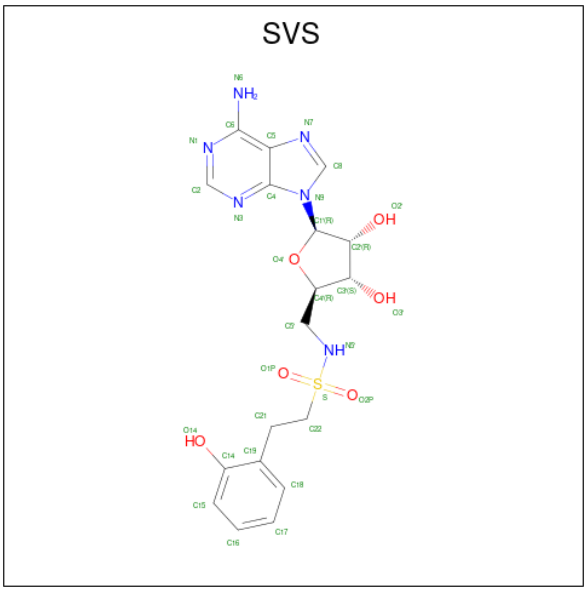
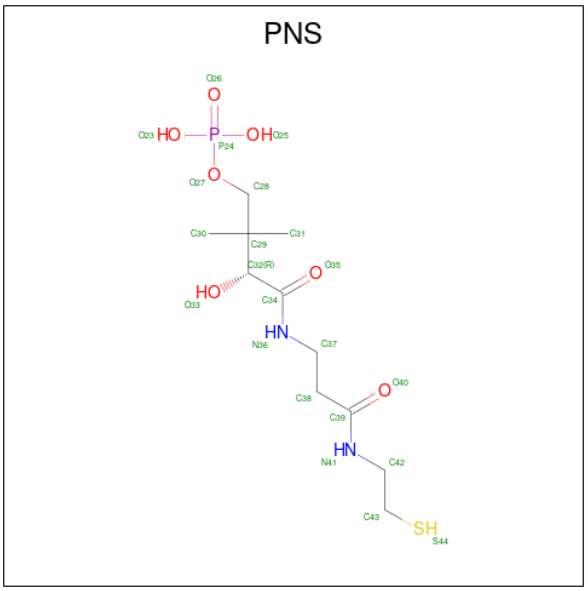
Chain	Residue	Modelled	Actual	Comment	Reference
B	537	GLY	-	linker	UNP P10378
B	538	ARG	-	linker	UNP P10378
B	539	ALA	-	linker	UNP P10378
B	540	SER	-	linker	UNP P10378
D	-1	GLY	-	expression tag	UNP P10378
D	0	HIS	-	expression tag	UNP P10378
D	537	GLY	-	linker	UNP P10378
D	538	ARG	-	linker	UNP P10378
D	539	ALA	-	linker	UNP P10378
D	540	SER	-	linker	UNP P10378
F	-1	GLY	-	expression tag	UNP P10378
F	0	HIS	-	expression tag	UNP P10378
F	537	GLY	-	linker	UNP P10378
F	538	ARG	-	linker	UNP P10378
F	539	ALA	-	linker	UNP P10378
F	540	SER	-	linker	UNP P10378
H	-1	GLY	-	expression tag	UNP P10378
H	0	HIS	-	expression tag	UNP P10378
H	537	GLY	-	linker	UNP P10378
H	538	ARG	-	linker	UNP P10378
H	539	ALA	-	linker	UNP P10378
H	540	SER	-	linker	UNP P10378
I	-1	GLY	-	expression tag	UNP P10378
I	0	HIS	-	expression tag	UNP P10378
I	537	GLY	-	linker	UNP P10378
I	538	ARG	-	linker	UNP P10378
I	539	ALA	-	linker	UNP P10378
I	540	SER	-	linker	UNP P10378
J	-1	GLY	-	expression tag	UNP P10378
J	0	HIS	-	expression tag	UNP P10378
J	537	GLY	-	linker	UNP P10378
J	538	ARG	-	linker	UNP P10378
J	539	ALA	-	linker	UNP P10378
J	540	SER	-	linker	UNP P10378

- Molecule 2 is 5'-deoxy-5'-({[2-(2-hydroxyphenyl)ethyl]sulfonyl}amino)adenosine (three-letter code: SVS) (formula: $C_{18}H_{22}N_6O_6S$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
2	A	1	31	18	6	6	1	0	0
2	B	1	31	18	6	6	1	0	0
2	C	1	31	18	6	6	1	0	0
2	D	1	31	18	6	6	1	0	0
2	E	1	31	18	6	6	1	0	0
2	F	1	31	18	6	6	1	0	0
2	G	1	31	18	6	6	1	0	0
2	H	1	31	18	6	6	1	0	0
2	I	1	31	18	6	6	1	0	0
2	J	1	31	18	6	6	1	0	0

- Molecule 3 is 4'-PHOSPHOPANTETHEINE (three-letter code: PNS) (formula: $C_{11}H_{23}N_2O_7PS$).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
			Total	C	N	O	P	S		
3	A	1	21	11	2	6	1	1	0	0
3	B	1	21	11	2	6	1	1	0	0
3	C	1	21	11	2	6	1	1	0	0
3	D	1	21	11	2	6	1	1	0	0
3	E	1	21	11	2	6	1	1	0	0
3	F	1	21	11	2	6	1	1	0	0
3	G	1	21	11	2	6	1	1	0	0
3	H	1	21	11	2	6	1	1	0	0
3	I	1	21	11	2	6	1	1	0	0
3	J	1	21	11	2	6	1	1	0	0

- Molecule 4 is IODIDE ION (three-letter code: IOD) (formula: I).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	I		
4	A	4	4	4	0	0
4	B	5	5	5	0	0

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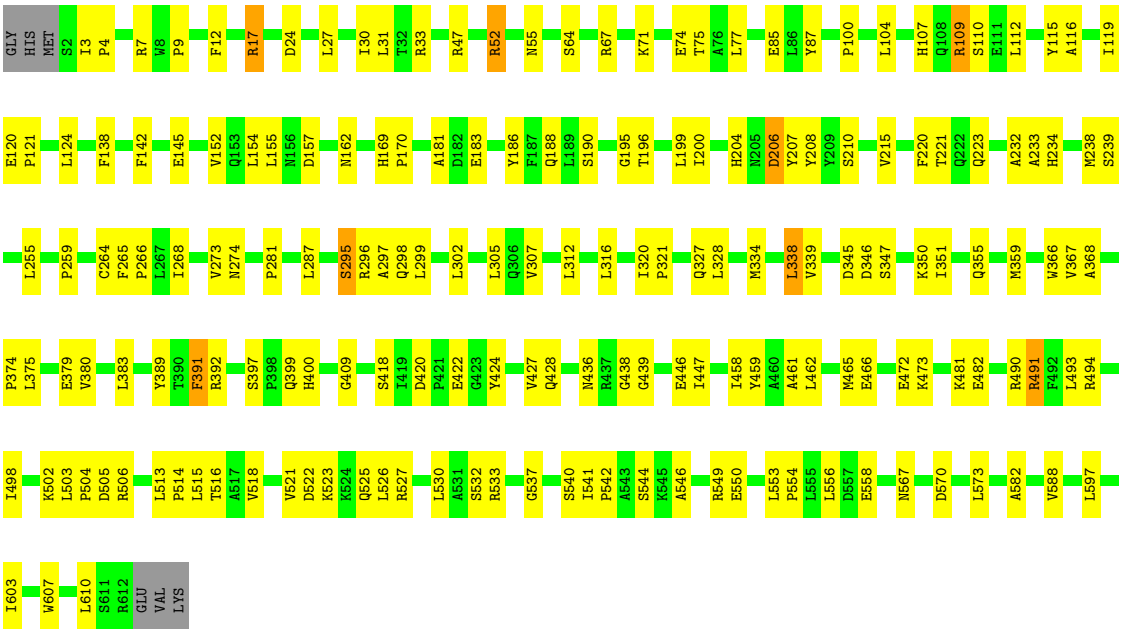
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	C	1	Total I 1 1	0	0
4	D	4	Total I 4 4	0	0
4	E	3	Total I 3 3	0	0
4	F	1	Total I 1 1	0	0
4	G	1	Total I 1 1	0	0
4	H	1	Total I 1 1	0	0
4	I	3	Total I 3 3	0	0
4	J	2	Total I 2 2	0	0

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.

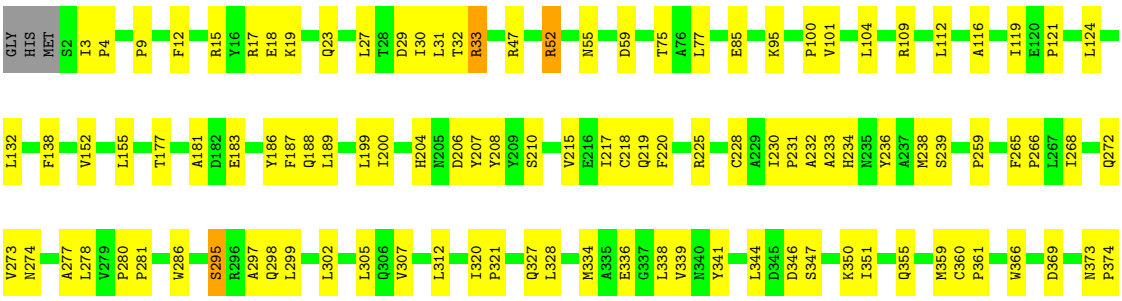
• Molecule 1: Enterobactin synthase component E (entE), 2,3-dihydro-2,3-dihydroxybenzoate synthetase, isochroismatase (Entb)

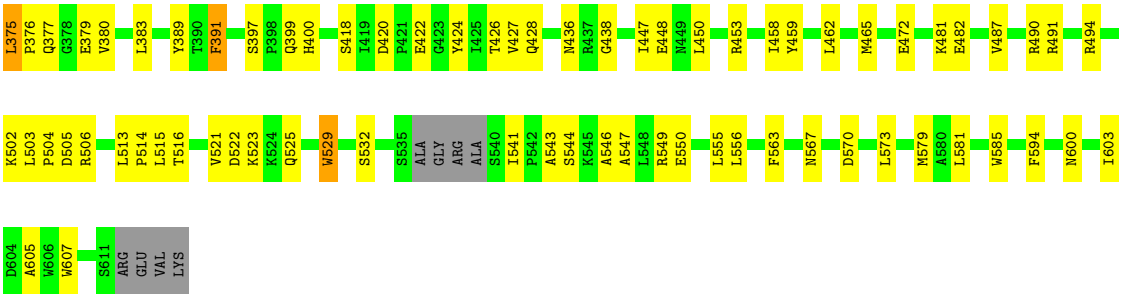
Chain A: 70% 28%



• Molecule 1: Enterobactin synthase component E (entE), 2,3-dihydro-2,3-dihydroxybenzoate synthetase, isochroismatase (Entb)

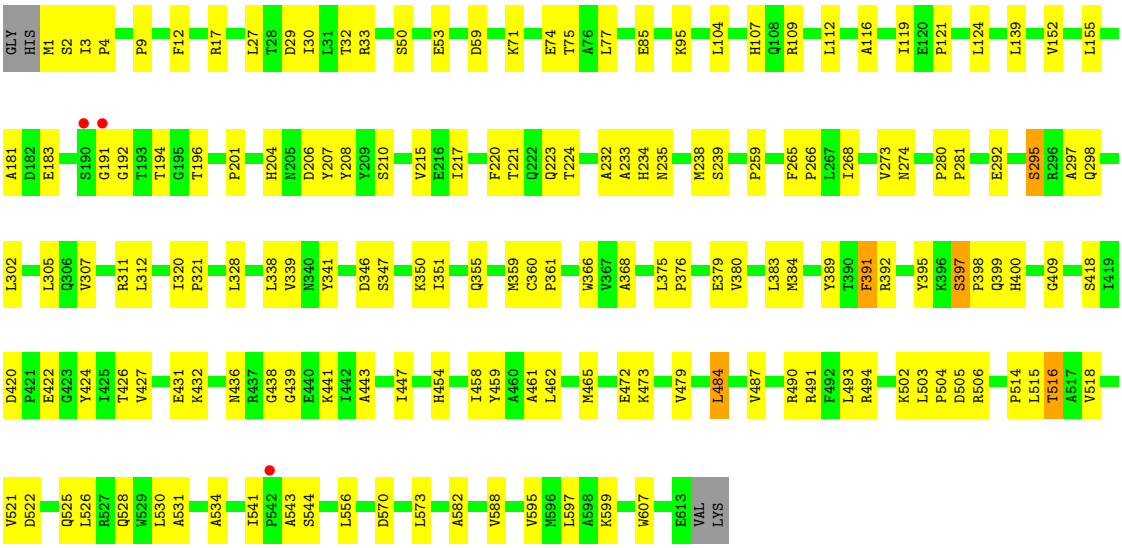
Chain B: 69% 28%





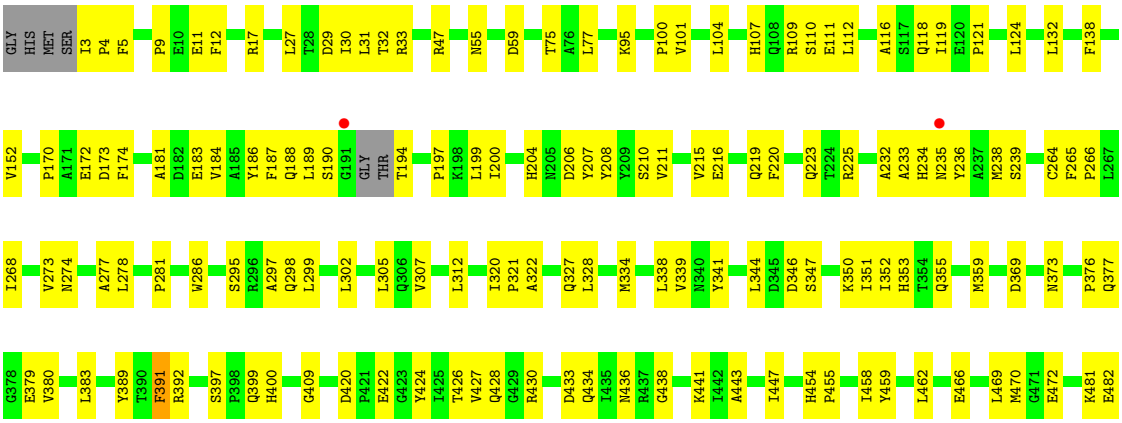
• Molecule 1: Enterobactin synthase component E (entE), 2,3-dihydro-2,3-dihydroxybenzoate synthetase, isochroismatase (Entb)

Chain C:



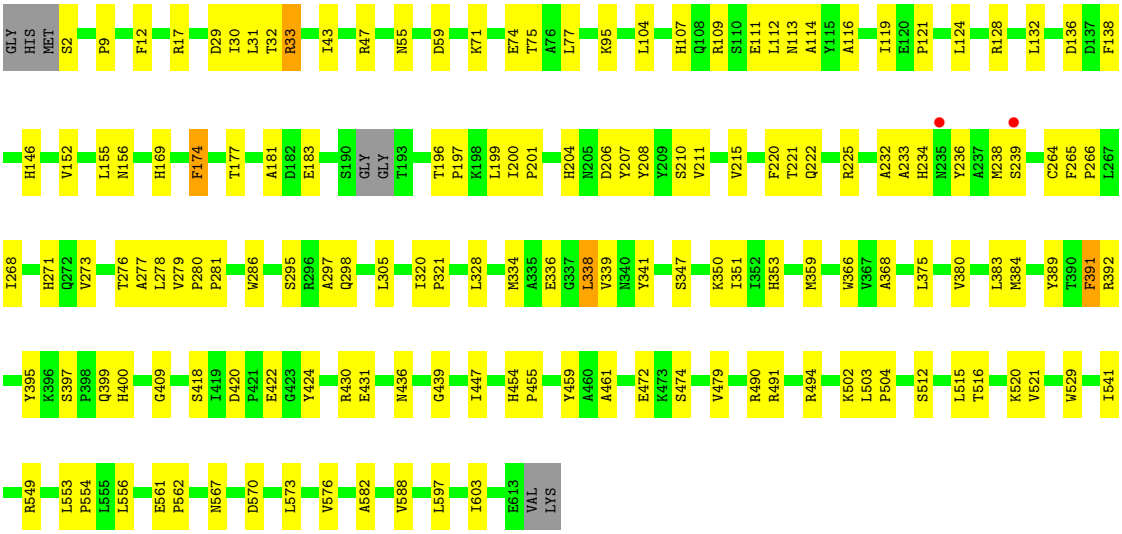
• Molecule 1: Enterobactin synthase component E (entE), 2,3-dihydro-2,3-dihydroxybenzoate synthetase, isochroismatase (Entb)

Chain D:



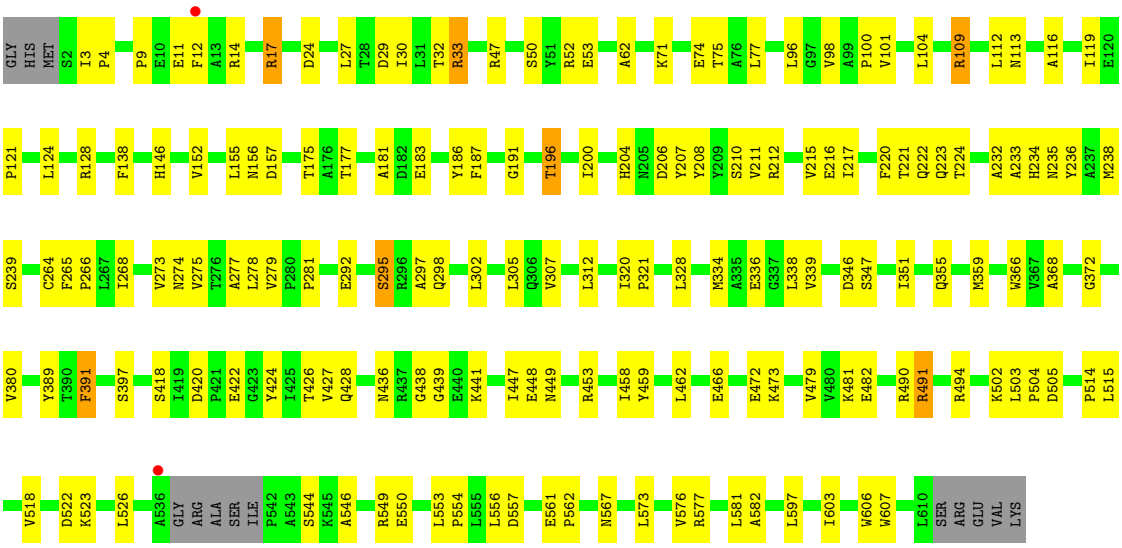
• Molecule 1: Enterobactin synthase component E (entE), 2,3-dihydro-2,3-dihydroxybenzoate synthetase, isochroismatase (Entb)

Chain E:



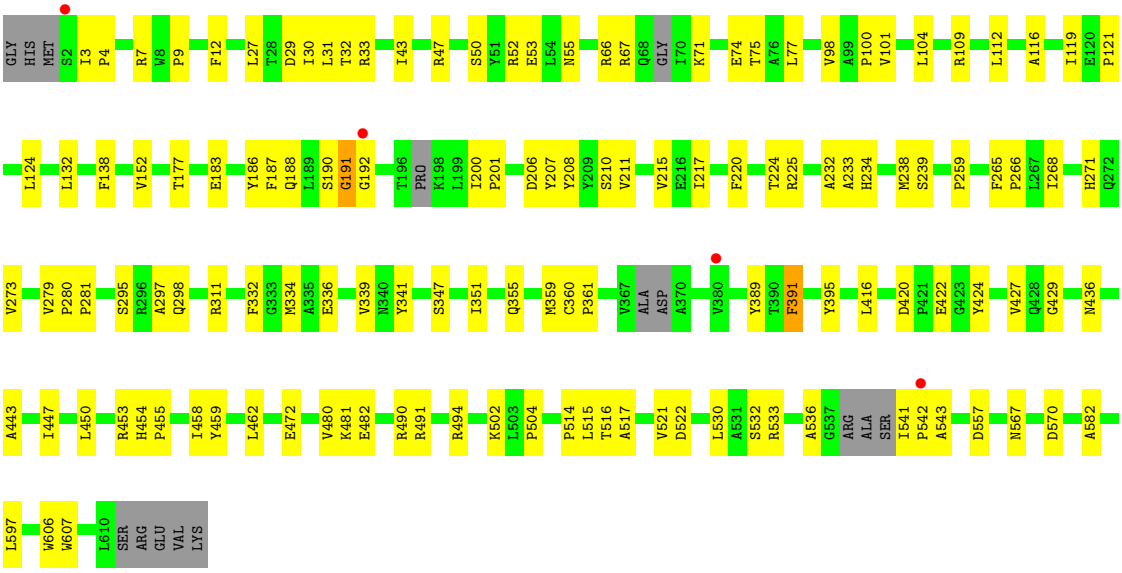
• Molecule 1: Enterobactin synthase component E (entE), 2,3-dihydro-2,3-dihydroxybenzoate synthetase, isochroismatase (Entb)

Chain F:



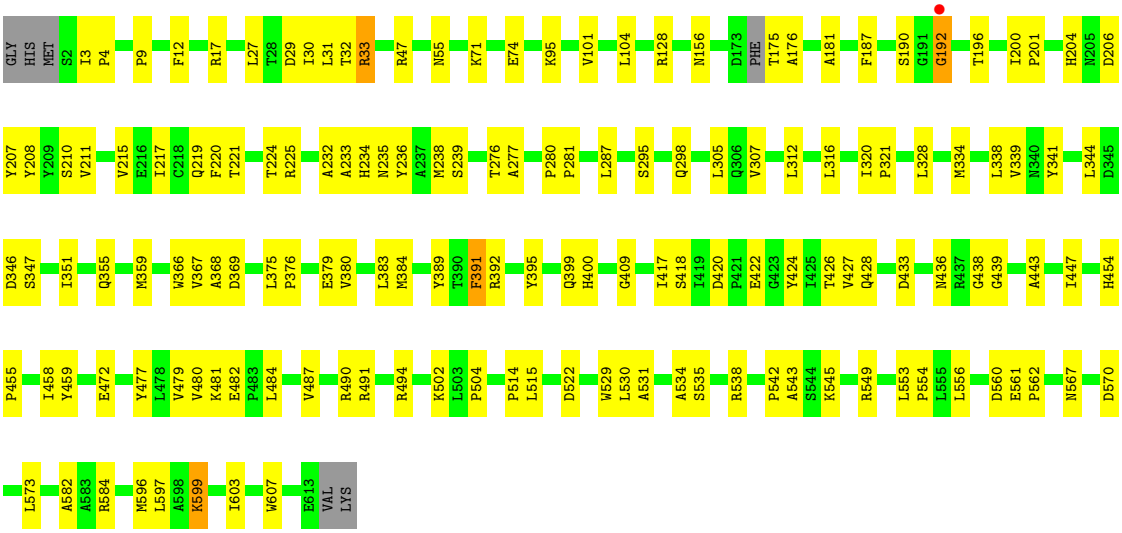
• Molecule 1: Enterobactin synthase component E (entE), 2,3-dihydro-2,3-dihydroxybenzoate synthetase, isochroismatase (Entb)

Chain G:



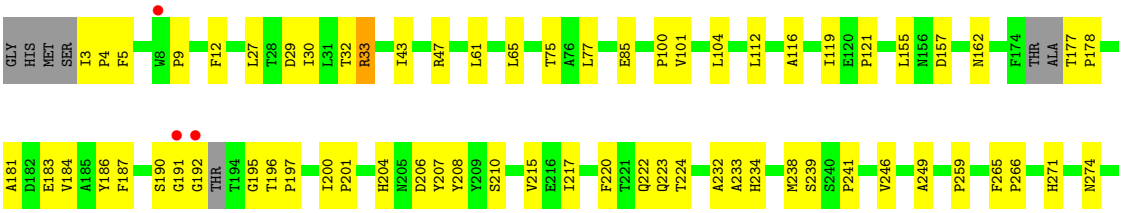
• Molecule 1: Enterobactin synthase component E (entE), 2,3-dihydro-2,3-dihydroxybenzoate synthetase, isochroismatase (Entb)

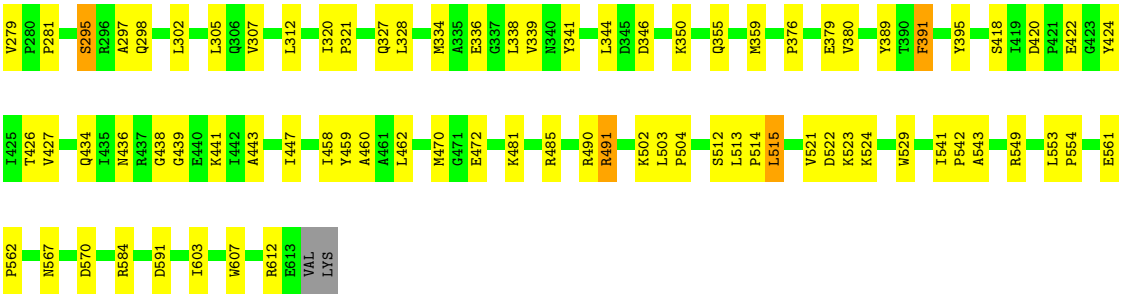
Chain H:



• Molecule 1: Enterobactin synthase component E (entE), 2,3-dihydro-2,3-dihydroxybenzoate synthetase, isochroismatase (Entb)

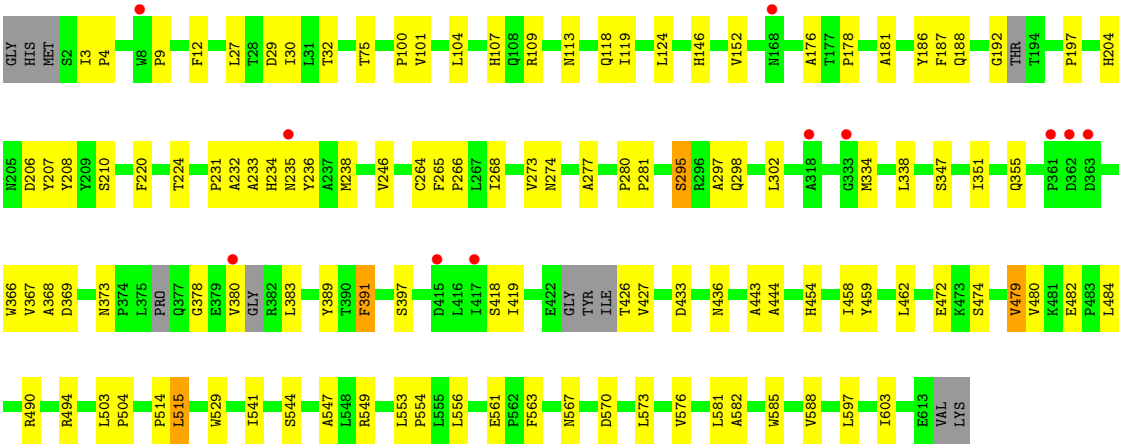
Chain I:





• Molecule 1: Enterobactin synthase component E (entE), 2,3-dihydro-2,3-dihydroxybenzoate synthetase, isochroismatase (Entb)

Chain J:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	160.57Å 101.77Å 240.68Å 90.00° 107.06° 90.00°	Depositor
Resolution (Å)	39.27 – 3.10 39.27 – 3.10	Depositor EDS
% Data completeness (in resolution range)	99.0 (39.27-3.10) 99.0 (39.27-3.10)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.78 (at 3.12Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.7_637), REFMAC	Depositor
R, R_{free}	0.218 , 0.264 0.210 , 0.257	Depositor DCC
R_{free} test set	6385 reflections (4.75%)	wwPDB-VP
Wilson B-factor (Å^2)	87.5	Xtriage
Anisotropy	0.131	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.25 , 70.0	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.010 for h,-k,-h-l	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	45112	wwPDB-VP
Average B, all atoms (Å^2)	101.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 1.89% 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 (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: SVS, IOD, PNS

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	0.58	0/4725	0.94	16/6450 (0.2%)
1	B	0.57	2/4654 (0.0%)	0.78	10/6358 (0.2%)
1	C	0.50	0/4633	0.75	9/6341 (0.1%)
1	D	0.55	0/4648	0.80	10/6354 (0.2%)
1	E	0.47	0/4591	0.73	7/6286 (0.1%)
1	F	0.47	0/4598	0.86	14/6287 (0.2%)
1	G	0.44	0/4352	0.77	9/5967 (0.2%)
1	H	0.43	0/4550	0.68	6/6229 (0.1%)
1	I	0.43	0/4507	0.72	7/6173 (0.1%)
1	J	0.40	0/4297	0.59	2/5907 (0.0%)
All	All	0.49	2/45555 (0.0%)	0.77	90/62352 (0.1%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
1	B	0	1
1	H	0	1
All	All	0	2

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	228	CYS	CB-SG	-6.42	1.71	1.82
1	B	529	TRP	CB-CG	5.53	1.60	1.50

The worst 5 of 90 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	F	109	ARG	NE-CZ-NH1	-19.60	110.50	120.30
1	G	109	ARG	NE-CZ-NH1	-19.03	110.78	120.30
1	G	109	ARG	NE-CZ-NH2	18.53	129.56	120.30
1	F	109	ARG	NE-CZ-NH2	18.41	129.51	120.30
1	A	17	ARG	NE-CZ-NH1	-17.36	111.62	120.30

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	377	GLN	Peptide
1	H	192	GLY	Peptide

5.2 Too-close contacts (i)

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	4622	0	4451	145	1
1	B	4552	0	4352	140	1
1	C	4530	0	4267	128	0
1	D	4547	0	4340	150	0
1	E	4490	0	4172	132	0
1	F	4498	0	4233	123	0
1	G	4262	0	3789	100	0
1	H	4452	0	4102	120	0
1	I	4409	0	4038	128	0
1	J	4205	0	3651	105	0
2	A	31	0	20	1	0
2	B	31	0	20	1	0
2	C	31	0	20	1	0
2	D	31	0	20	2	0
2	E	31	0	21	4	0
2	F	31	0	20	2	0
2	G	31	0	20	3	0
2	H	31	0	20	2	0
2	I	31	0	20	1	0
2	J	31	0	20	2	0
3	A	21	0	20	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	21	0	20	0	0
3	C	21	0	20	1	0
3	D	21	0	20	7	0
3	E	21	0	20	1	0
3	F	21	0	20	2	0
3	G	21	0	20	6	0
3	H	21	0	20	1	0
3	I	21	0	20	2	0
3	J	21	0	20	4	0
4	A	4	0	0	2	0
4	B	5	0	0	1	0
4	C	1	0	0	0	0
4	D	4	0	0	2	0
4	E	3	0	0	0	0
4	F	1	0	0	0	0
4	G	1	0	0	1	0
4	H	1	0	0	1	0
4	I	3	0	0	3	0
4	J	2	0	0	0	0
All	All	45112	0	41796	1227	1

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.

The worst 5 of 1227 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:E:114:ALA:HB1	1:E:197:PRO:HG3	1.26	1.13
1:C:516:THR:HG23	1:C:522:ASP:HB2	1.20	1.09
1:I:197:PRO:HB3	4:I:616:IOD:I	2.33	0.98
1:B:529:TRP:HE3	1:D:529:TRP:CE3	1.81	0.98
3:D:991:PNS:H432	1:E:234:HIS:HD1	1.29	0.97

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:345:ASP:CB	1:B:23:GLN:NE2[2_446]	2.10	0.10

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	609/617 (99%)	593 (97%)	14 (2%)	2 (0%)	41	73
1	B	602/617 (98%)	582 (97%)	18 (3%)	2 (0%)	41	73
1	C	611/617 (99%)	592 (97%)	17 (3%)	2 (0%)	41	73
1	D	603/617 (98%)	590 (98%)	10 (2%)	3 (0%)	29	64
1	E	606/617 (98%)	587 (97%)	18 (3%)	1 (0%)	47	79
1	F	600/617 (97%)	587 (98%)	12 (2%)	1 (0%)	47	79
1	G	592/617 (96%)	575 (97%)	16 (3%)	1 (0%)	47	79
1	H	607/617 (98%)	590 (97%)	17 (3%)	0	100	100
1	I	602/617 (98%)	585 (97%)	15 (2%)	2 (0%)	41	73
1	J	596/617 (97%)	583 (98%)	12 (2%)	1 (0%)	47	79
All	All	6028/6170 (98%)	5864 (97%)	149 (2%)	15 (0%)	47	79

5 of 15 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	173	ASP
1	B	338	LEU
1	C	338	LEU
1	D	338	LEU
1	A	338	LEU

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	466/509 (92%)	455 (98%)	11 (2%)	49	76
1	B	452/509 (89%)	442 (98%)	10 (2%)	52	78
1	C	443/509 (87%)	434 (98%)	9 (2%)	55	80
1	D	454/509 (89%)	446 (98%)	8 (2%)	59	82
1	E	432/509 (85%)	424 (98%)	8 (2%)	57	81
1	F	444/509 (87%)	436 (98%)	8 (2%)	59	82
1	G	381/509 (75%)	374 (98%)	7 (2%)	59	82
1	H	419/509 (82%)	411 (98%)	8 (2%)	57	81
1	I	411/509 (81%)	405 (98%)	6 (2%)	65	85
1	J	362/509 (71%)	355 (98%)	7 (2%)	57	81
All	All	4264/5090 (84%)	4182 (98%)	82 (2%)	57	81

5 of 82 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	G	225	ARG
1	I	298	GLN
1	G	391	PHE
1	H	298	GLN
1	J	188	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 38 such sidechains are listed below:

Mol	Chain	Res	Type
1	G	188	GLN
1	J	146	HIS
1	G	355	GLN
1	I	146	HIS
1	J	355	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 45 ligands modelled in this entry, 25 are monoatomic - leaving 20 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	SVS	J	698	3	31,34,34	0.88	2 (6%)	33,50,50	1.92	5 (15%)
2	SVS	A	698	3	31,34,34	0.92	1 (3%)	33,50,50	1.98	8 (24%)
3	PNS	D	991	2,1	13,20,21	0.55	0	18,26,29	1.56	3 (16%)
2	SVS	G	698	3	31,34,34	0.98	1 (3%)	33,50,50	1.87	5 (15%)
3	PNS	H	991	2,1	13,20,21	0.56	0	18,26,29	1.47	4 (22%)
3	PNS	B	991	2,1	13,20,21	0.72	0	18,26,29	1.64	4 (22%)
2	SVS	E	698	3	31,34,34	0.95	1 (3%)	33,50,50	2.11	8 (24%)
3	PNS	C	991	2,1	13,20,21	0.45	0	18,26,29	1.46	3 (16%)
3	PNS	J	991	2,1	13,20,21	0.49	0	18,26,29	1.59	4 (22%)
3	PNS	F	991	2,1	13,20,21	0.60	0	18,26,29	1.27	1 (5%)
2	SVS	B	698	3	31,34,34	1.03	2 (6%)	33,50,50	1.98	6 (18%)
3	PNS	A	991	2,1	13,20,21	0.40	0	18,26,29	1.84	5 (27%)
2	SVS	D	698	3	31,34,34	1.02	2 (6%)	33,50,50	2.15	10 (30%)
2	SVS	C	698	3	31,34,34	0.98	1 (3%)	33,50,50	1.87	6 (18%)
3	PNS	E	991	2,1	13,20,21	0.57	0	18,26,29	1.92	4 (22%)
3	PNS	I	991	2,1	13,20,21	0.71	0	18,26,29	2.17	8 (44%)
2	SVS	I	698	3	31,34,34	1.01	1 (3%)	33,50,50	1.90	6 (18%)
2	SVS	H	698	3	31,34,34	0.89	2 (6%)	33,50,50	1.74	7 (21%)
3	PNS	G	991	2,1	13,20,21	0.68	0	18,26,29	1.36	2 (11%)
2	SVS	F	698	3	31,34,34	0.97	3 (9%)	33,50,50	2.12	4 (12%)

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	SVS	J	698	3	-	1/12/32/32	0/4/4/4
2	SVS	A	698	3	-	4/12/32/32	0/4/4/4
3	PNS	D	991	2,1	-	2/24/26/27	-
2	SVS	G	698	3	-	3/12/32/32	0/4/4/4
3	PNS	H	991	2,1	-	7/24/26/27	-
3	PNS	B	991	2,1	-	2/24/26/27	-
2	SVS	E	698	3	-	7/12/32/32	0/4/4/4
3	PNS	C	991	2,1	-	0/24/26/27	-
3	PNS	J	991	2,1	-	1/24/26/27	-
3	PNS	F	991	2,1	-	6/24/26/27	-
2	SVS	B	698	3	-	6/12/32/32	0/4/4/4
3	PNS	A	991	2,1	-	0/24/26/27	-
2	SVS	D	698	3	-	4/12/32/32	0/4/4/4
2	SVS	C	698	3	-	5/12/32/32	0/4/4/4
3	PNS	E	991	2,1	-	9/24/26/27	-
3	PNS	I	991	2,1	-	6/24/26/27	-
2	SVS	I	698	3	-	2/12/32/32	0/4/4/4
2	SVS	H	698	3	-	2/12/32/32	0/4/4/4
3	PNS	G	991	2,1	-	3/24/26/27	-
2	SVS	F	698	3	-	5/12/32/32	0/4/4/4

The worst 5 of 16 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	698	SVS	C22-S	-3.50	1.66	1.78
2	I	698	SVS	C22-S	-3.44	1.66	1.78
2	C	698	SVS	C22-S	-3.43	1.66	1.78
2	A	698	SVS	C22-S	-3.27	1.67	1.78
2	B	698	SVS	C22-S	-3.19	1.67	1.78

The worst 5 of 103 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	F	698	SVS	O2P-S-O1P	-8.19	107.48	119.35
2	J	698	SVS	O2P-S-O1P	-8.00	107.75	119.35
2	D	698	SVS	O2P-S-O1P	-7.47	108.53	119.35

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	698	SVS	O2P-S-O1P	-7.47	108.53	119.35
2	E	698	SVS	O2P-S-O1P	-7.46	108.54	119.35

There are no chirality outliers.

5 of 75 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	698	SVS	C18-C19-C21-C22
2	B	698	SVS	C18-C19-C21-C22
2	B	698	SVS	C3'-C4'-C5'-N5'
2	C	698	SVS	C18-C19-C21-C22
2	C	698	SVS	C3'-C4'-C5'-N5'

There are no ring outliers.

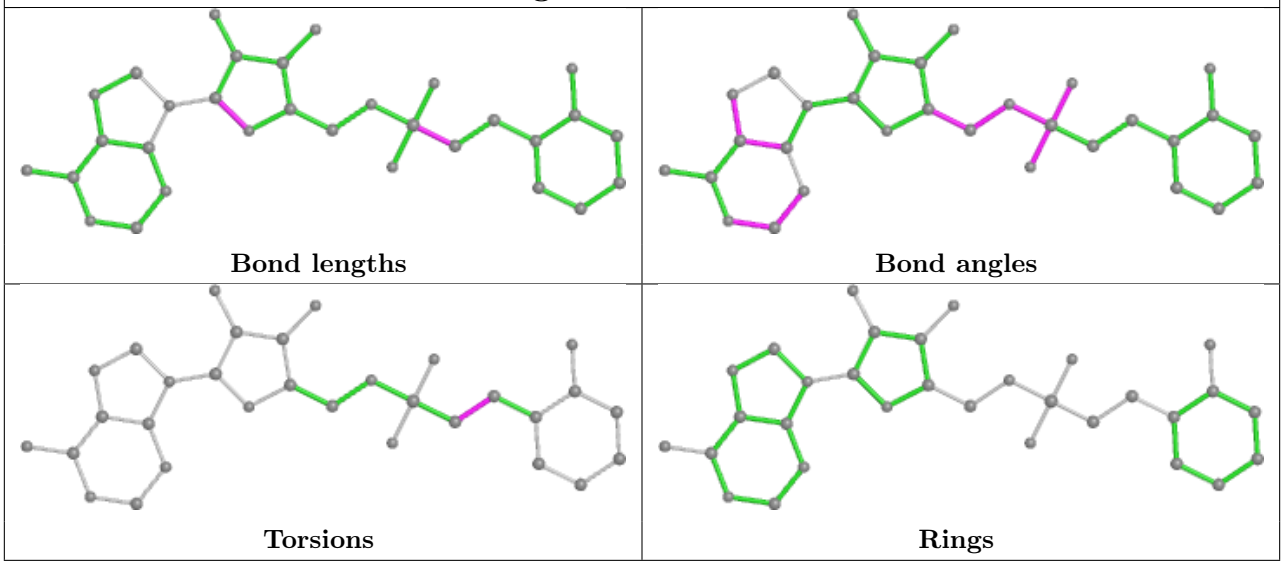
18 monomers are involved in 42 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	J	698	SVS	2	0
2	A	698	SVS	1	0
3	D	991	PNS	7	0
2	G	698	SVS	3	0
3	H	991	PNS	1	0
2	E	698	SVS	4	0
3	C	991	PNS	1	0
3	J	991	PNS	4	0
3	F	991	PNS	2	0
2	B	698	SVS	1	0
2	D	698	SVS	2	0
2	C	698	SVS	1	0
3	E	991	PNS	1	0
3	I	991	PNS	2	0
2	I	698	SVS	1	0
2	H	698	SVS	2	0
3	G	991	PNS	6	0
2	F	698	SVS	2	0

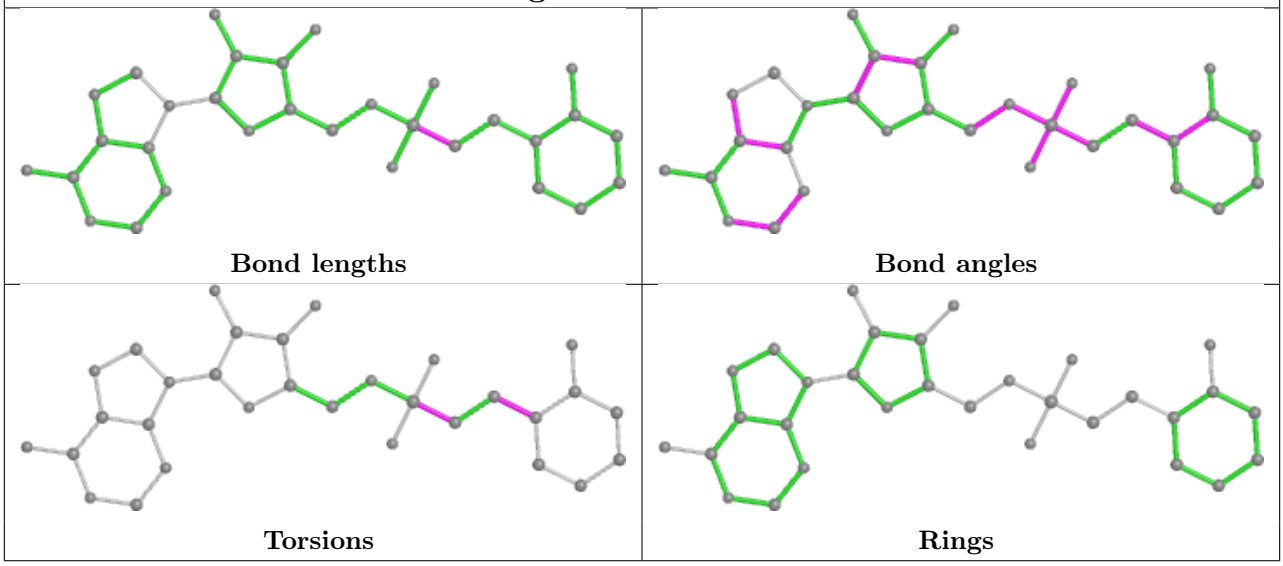
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

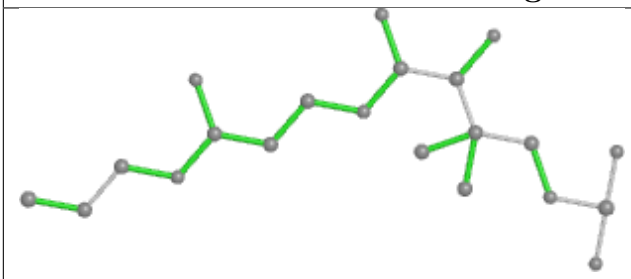
Ligand SVS J 698



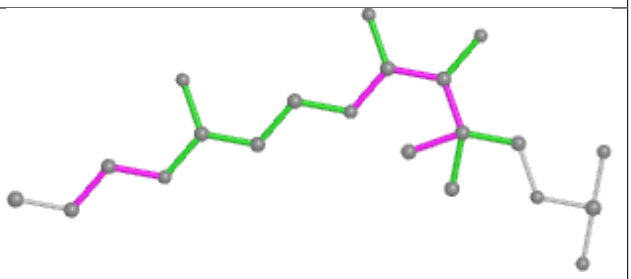
Ligand SVS A 698



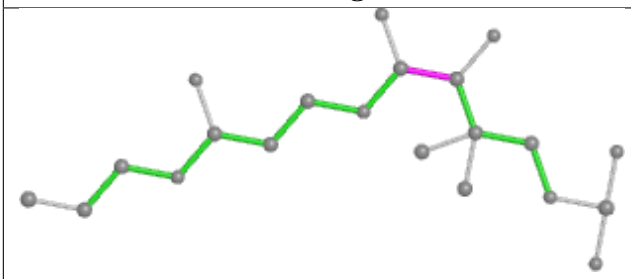
Ligand PNS D 991



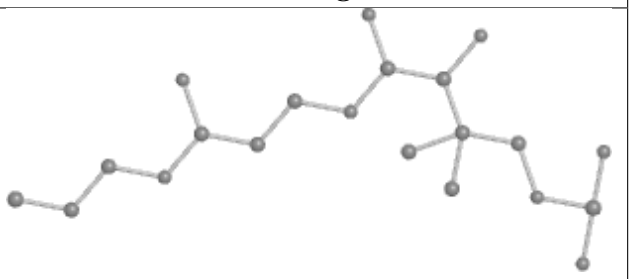
Bond lengths



Bond angles

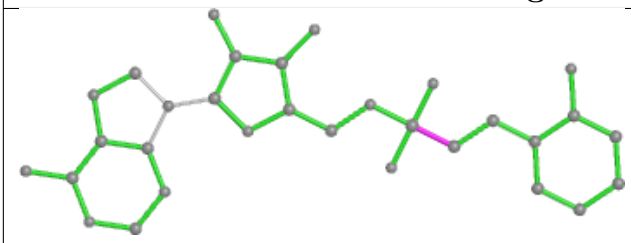


Torsions



Rings

Ligand SVS G 698



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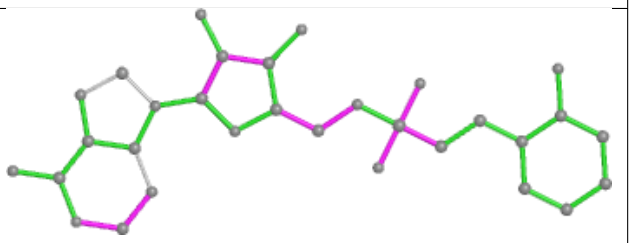

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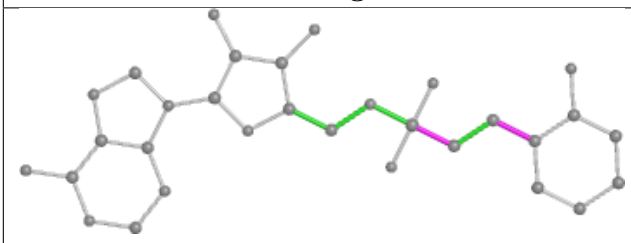

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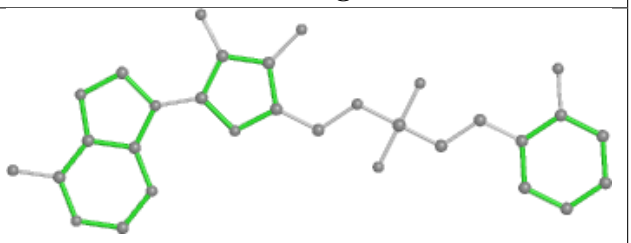
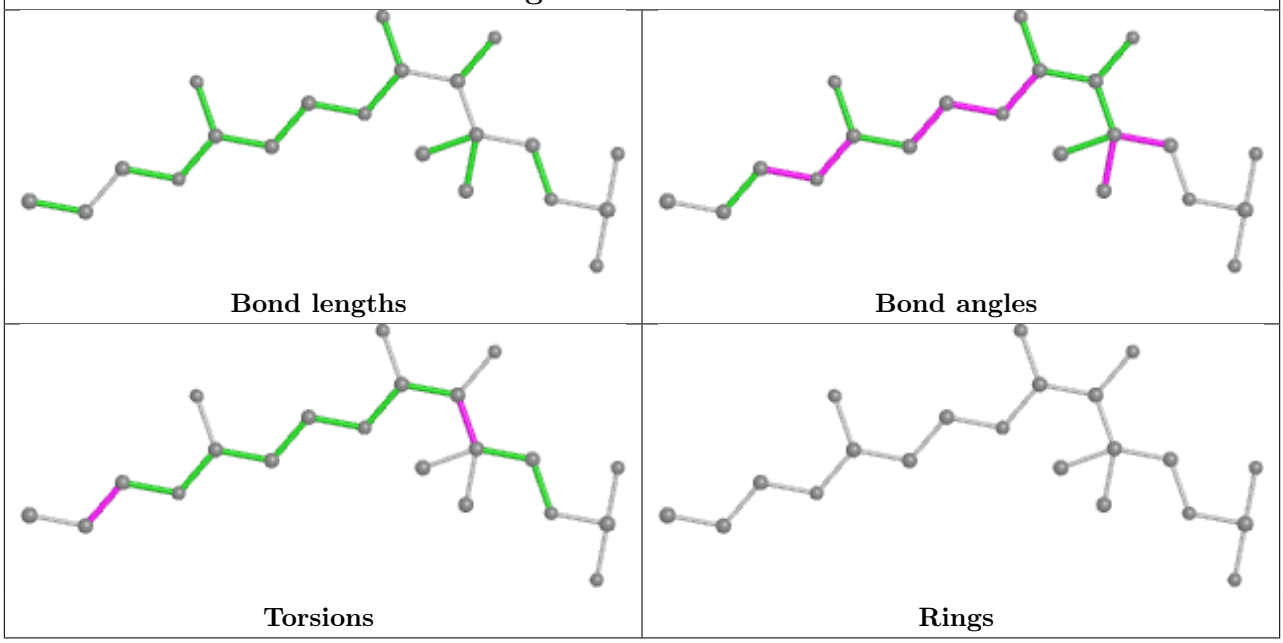
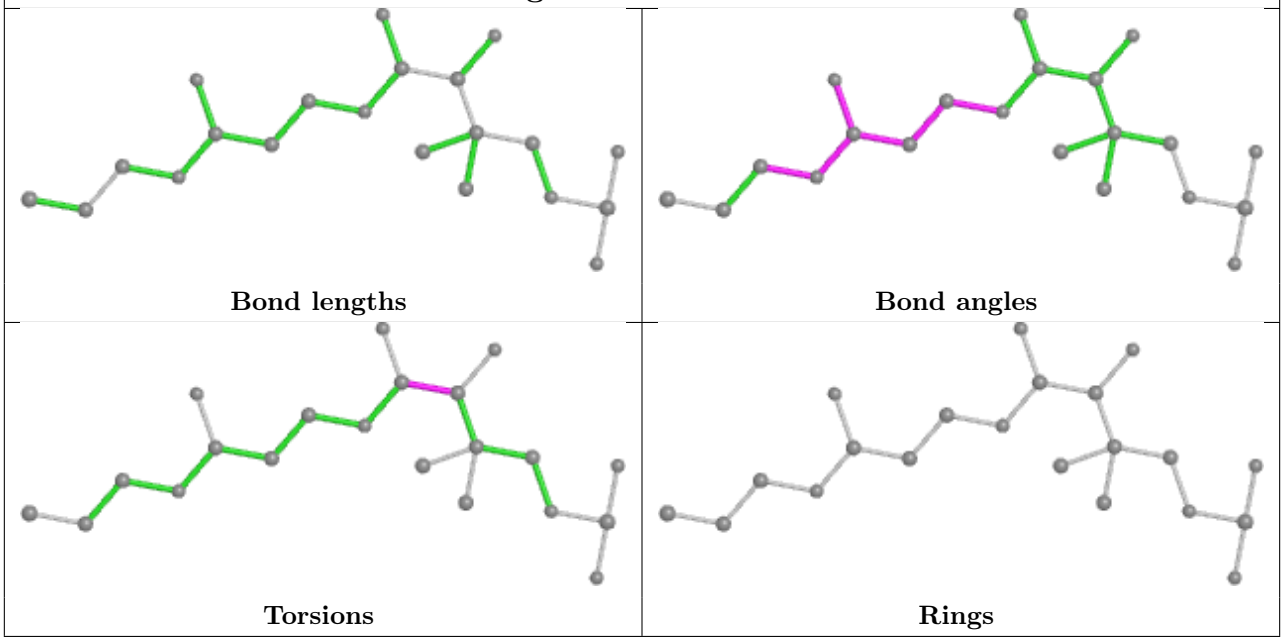


Rings

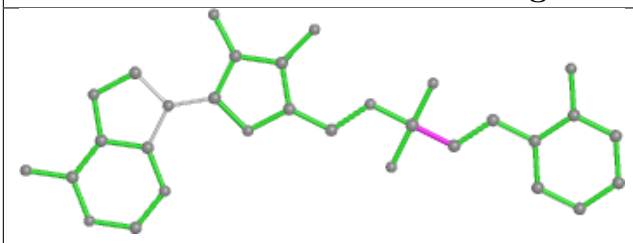
Ligand PNS H 991



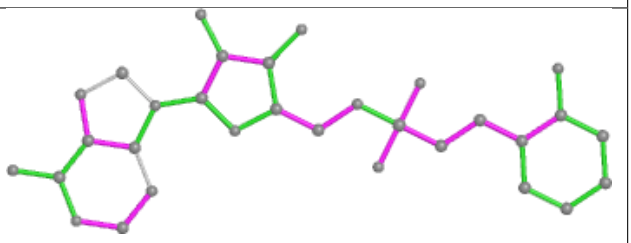
Ligand PNS B 991



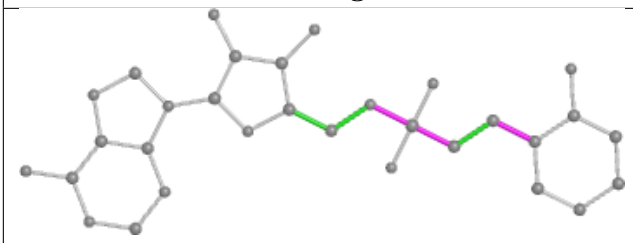
Ligand SVS E 698



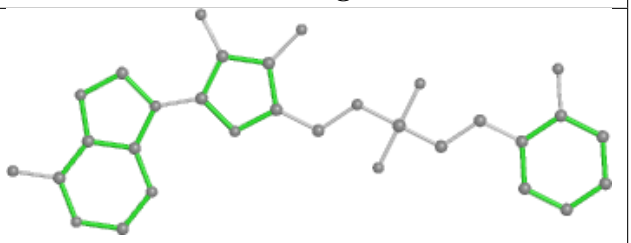
Bond lengths



Bond angles

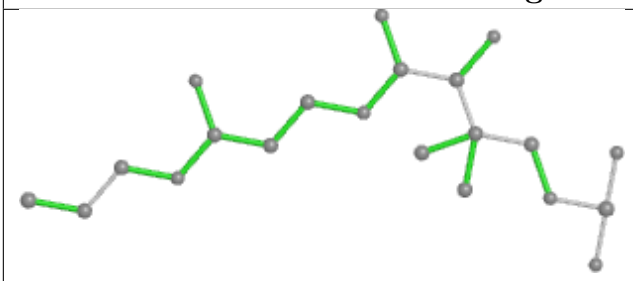


Torsions

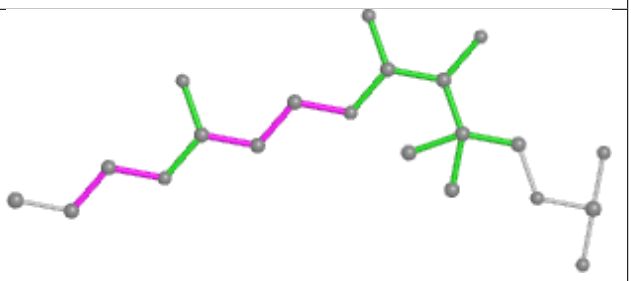


Rings

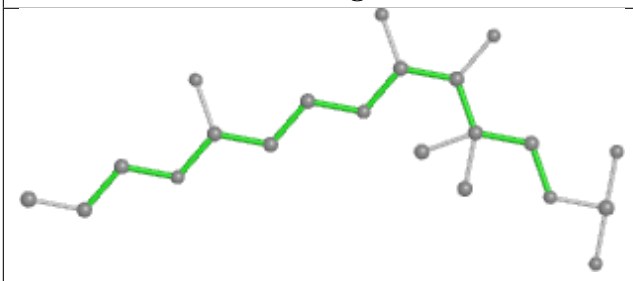
Ligand PNS C 991



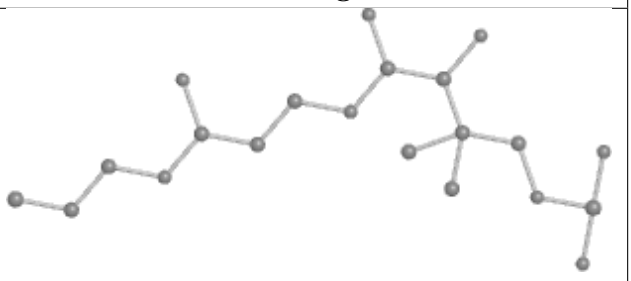
Bond lengths



Bond angles

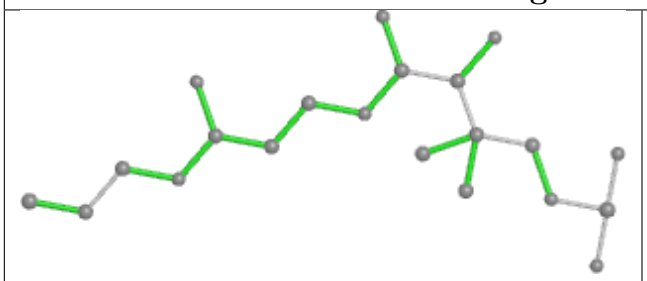


Torsions



Rings

Ligand PNS J 991



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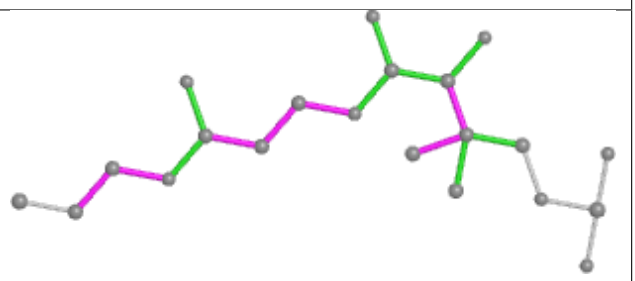
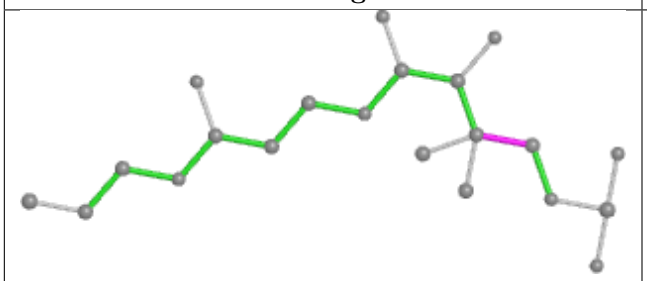
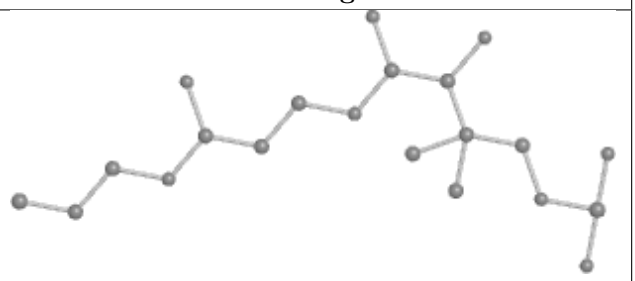


Bond angles

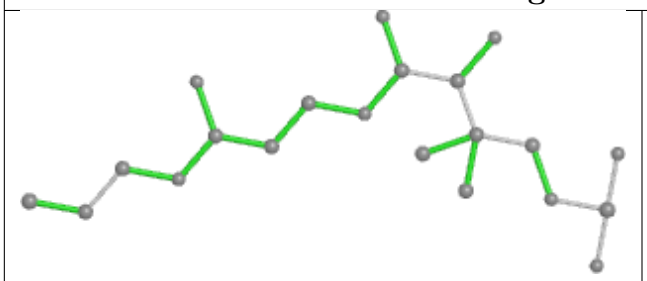


Torsions

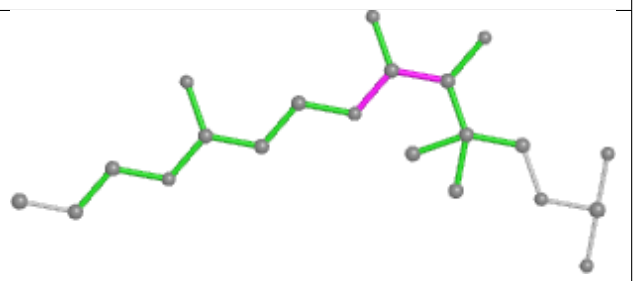


Rings

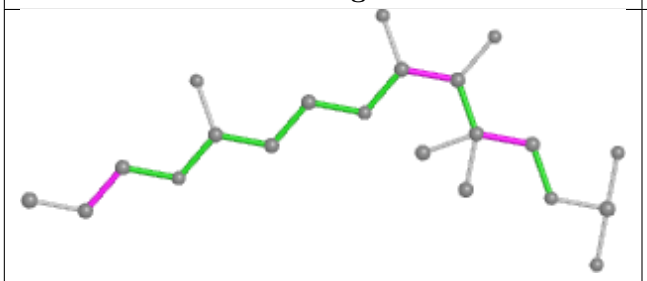
Ligand PNS F 991



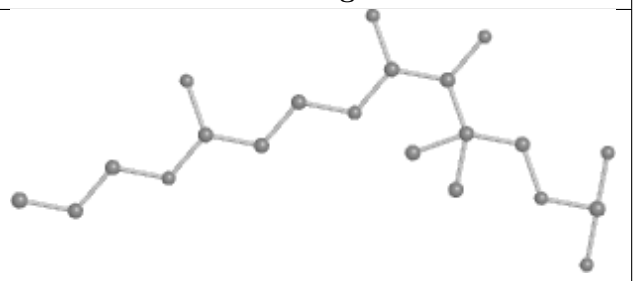
Bond lengths



Bond angles

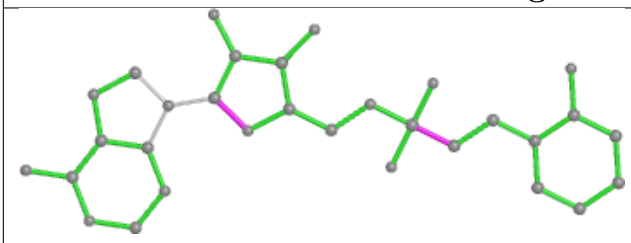


Torsions

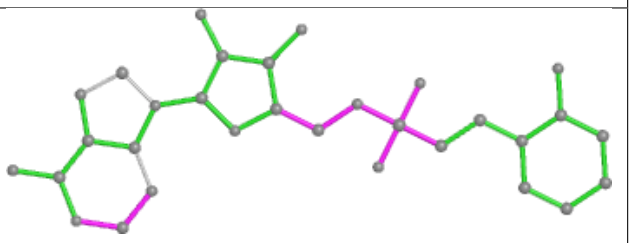


Rings

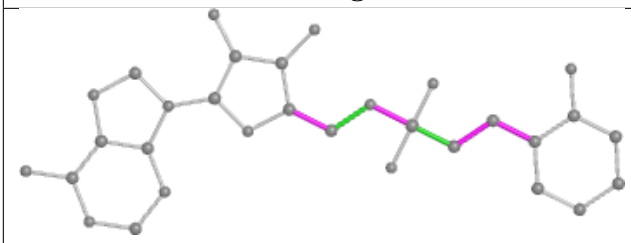
Ligand SVS B 698



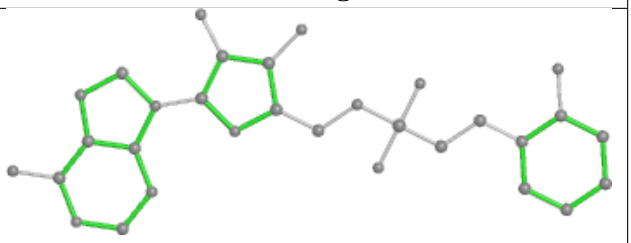
Bond lengths



Bond angles

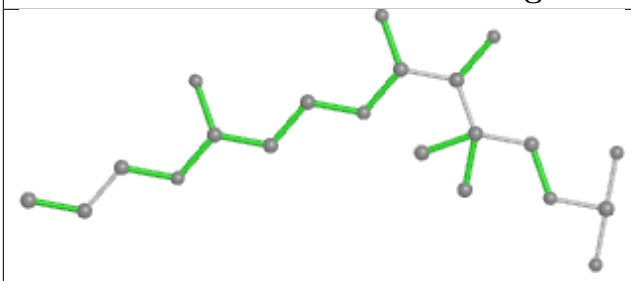


Torsions



Rings

Ligand PNS A 991



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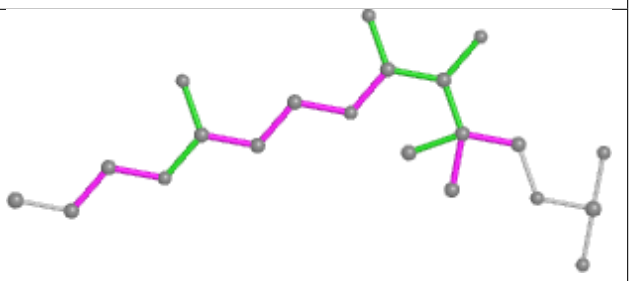
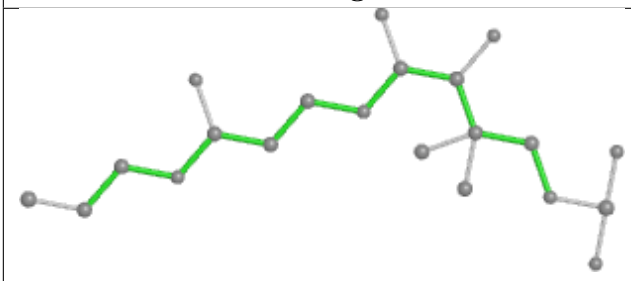


Bond angles



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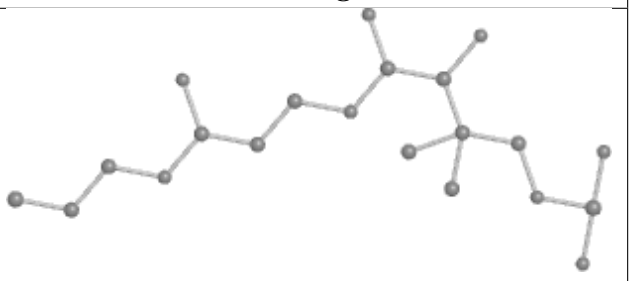
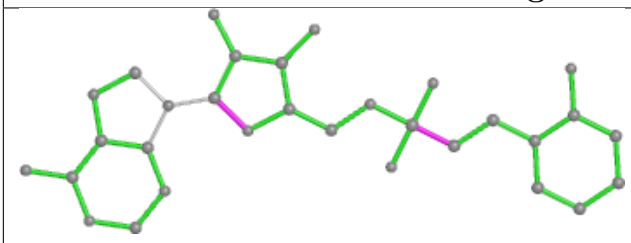
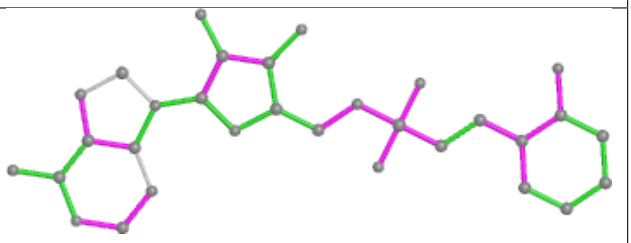


Rings

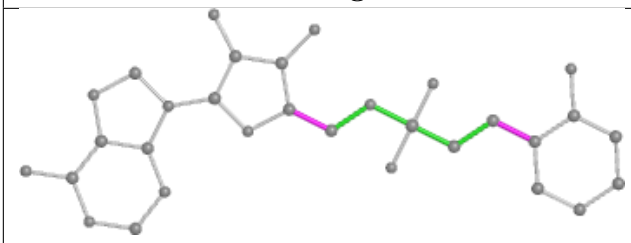
Ligand SVS D 698



Bond lengths



Bond angles



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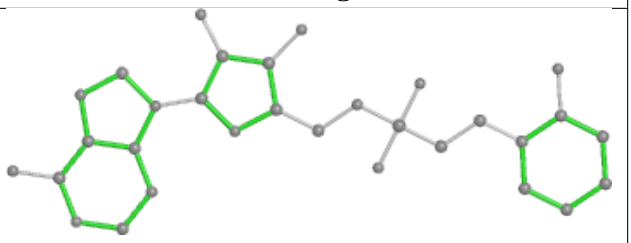
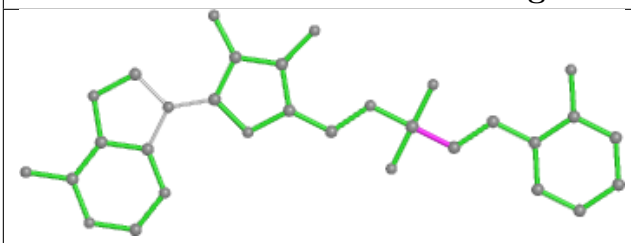
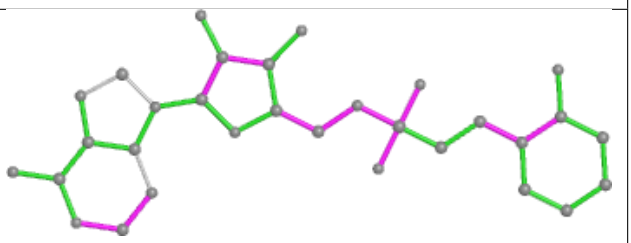


Rings

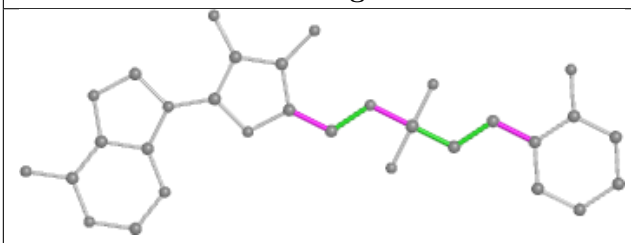
Ligand SVS C 698



Bond lengths



Bond angles



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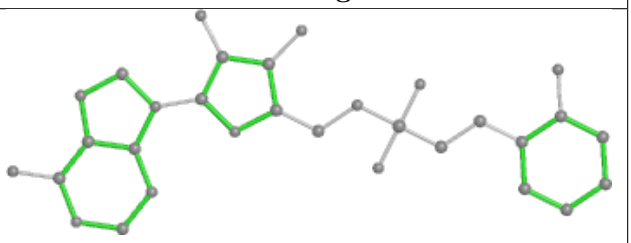
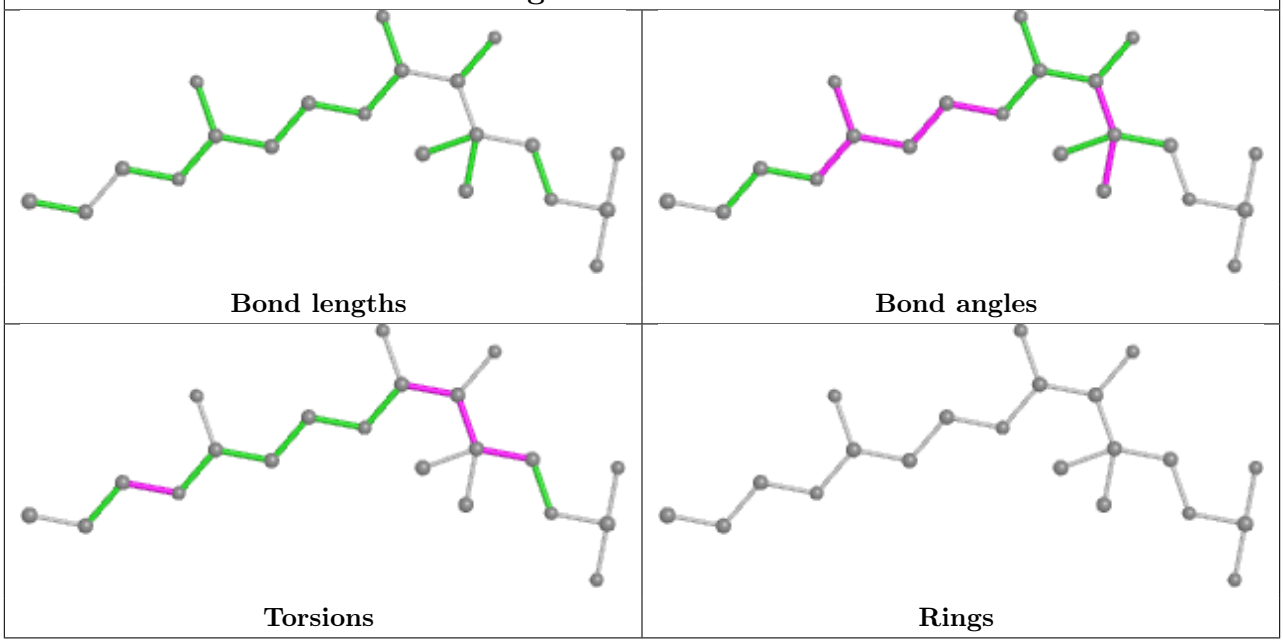


Rings

Ligand PNS E 991



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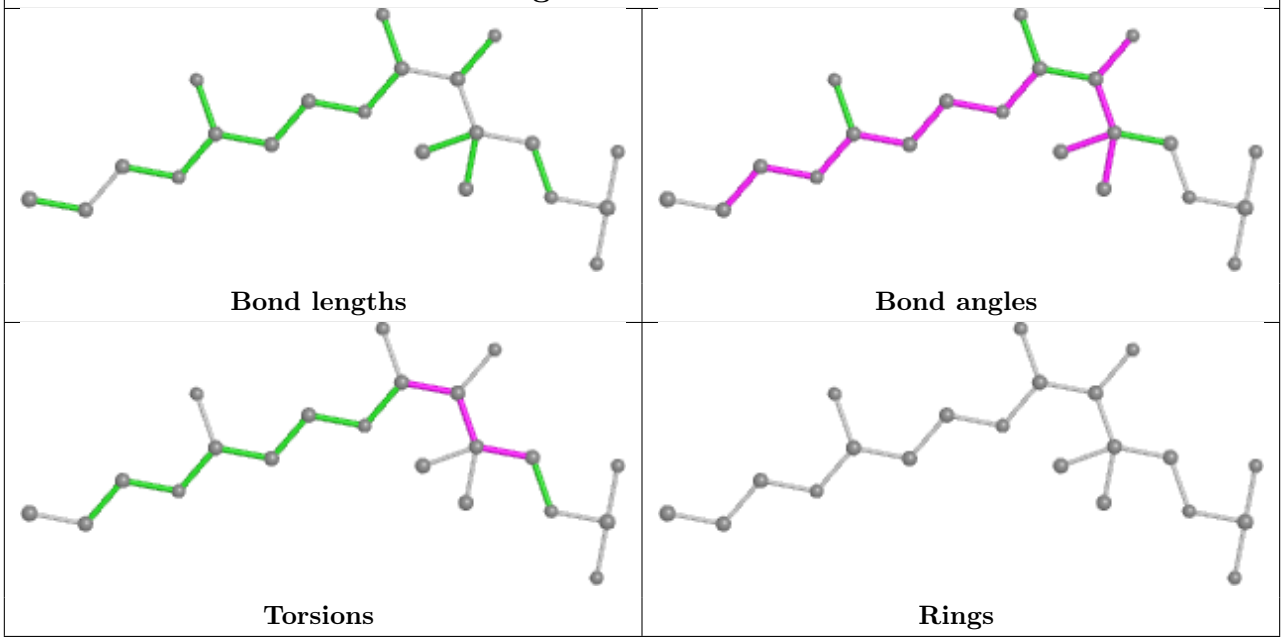

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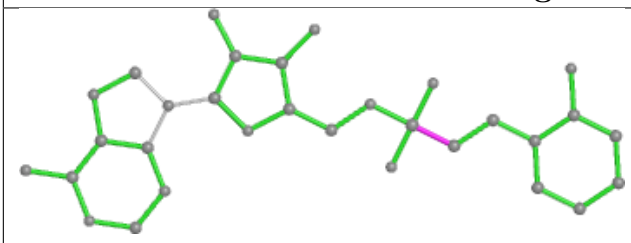
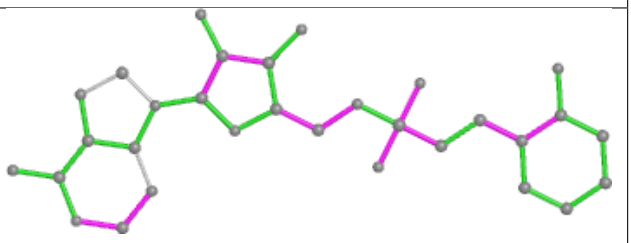
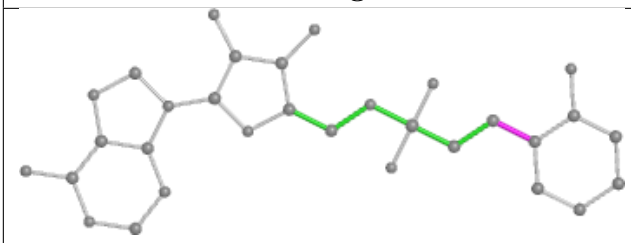


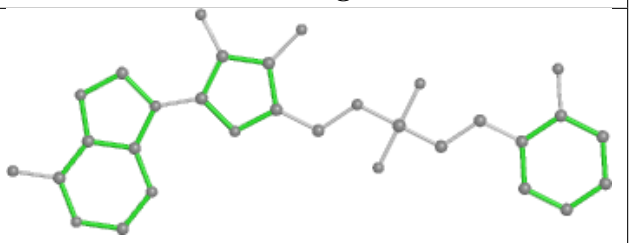
Bond lengths



Bond angles

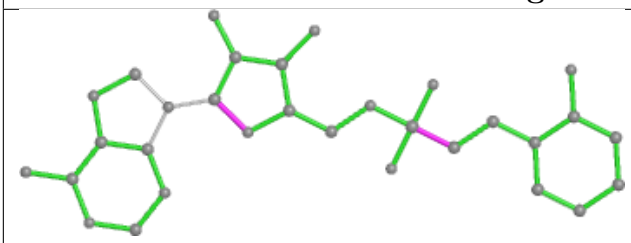


Torsions

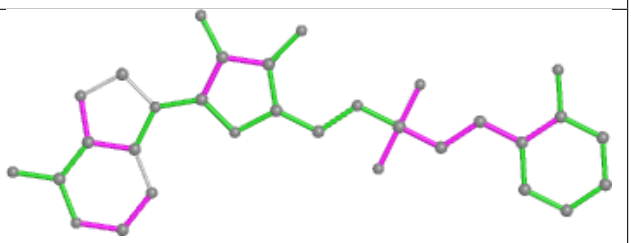


Rings

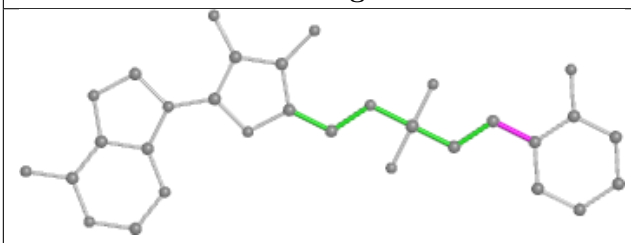
Ligand SVS H 698



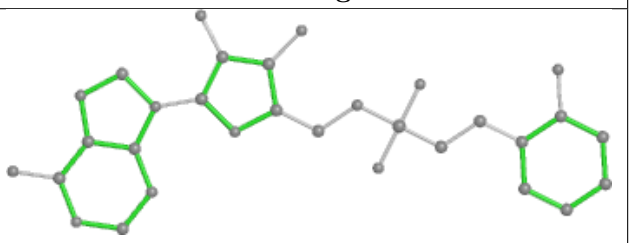
Bond lengths



Bond angles

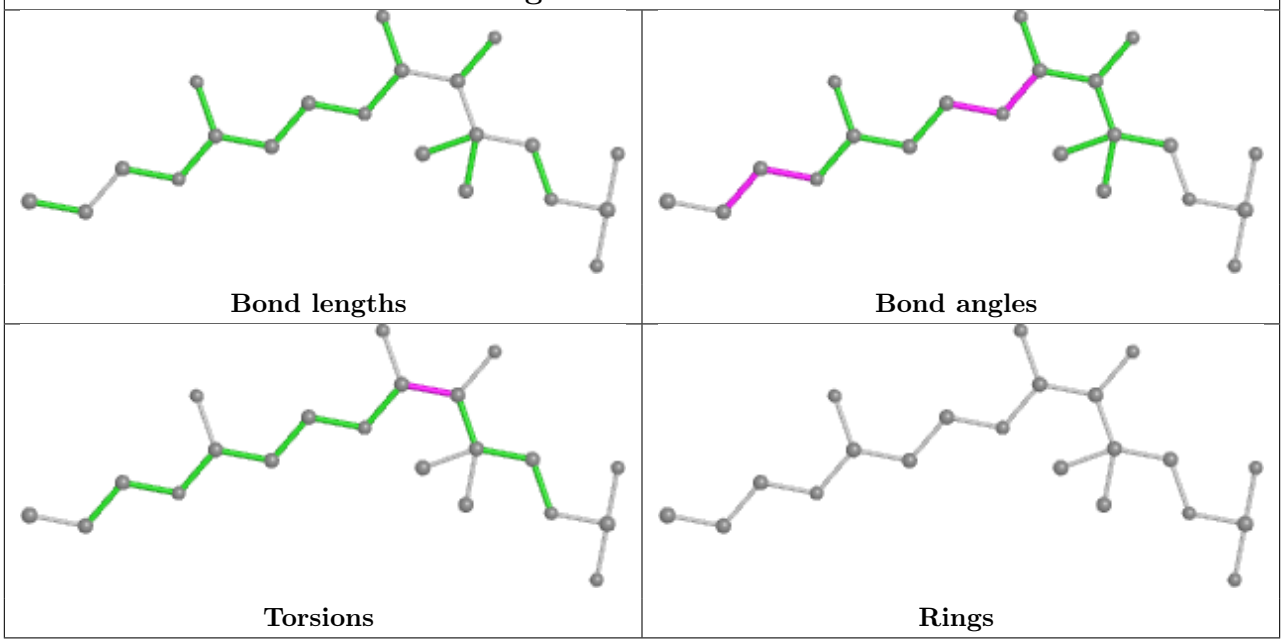


Torsions

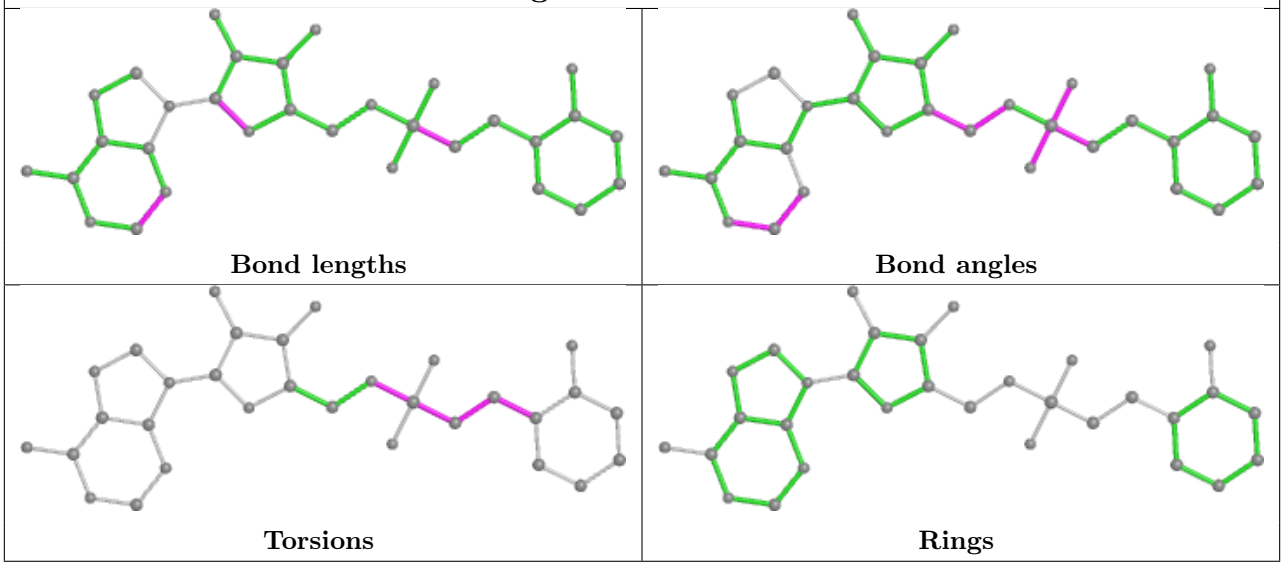


Rings

Ligand PNS G 991



Ligand SVS F 698



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	611/617 (99%)	-0.53	0	100	100	44, 78, 112, 169	0
1	B	606/617 (98%)	-0.50	0	100	100	41, 82, 129, 192	0
1	C	613/617 (99%)	-0.46	3 (0%)	91	81	51, 92, 138, 172	0
1	D	607/617 (98%)	-0.40	2 (0%)	94	88	48, 89, 135, 177	0
1	E	610/617 (98%)	-0.40	2 (0%)	94	88	66, 101, 140, 167	0
1	F	604/617 (97%)	-0.41	2 (0%)	94	88	61, 99, 140, 197	0
1	G	602/617 (97%)	-0.37	4 (0%)	87	75	67, 111, 165, 204	0
1	H	611/617 (99%)	-0.38	1 (0%)	95	90	66, 109, 145, 191	0
1	I	608/617 (98%)	-0.37	3 (0%)	91	81	56, 109, 154, 222	0
1	J	606/617 (98%)	-0.27	11 (1%)	68	47	73, 120, 165, 373	0
All	All	6078/6170 (98%)	-0.41	28 (0%)	91	81	41, 99, 149, 373	0

The worst 5 of 28 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	G	192	GLY	4.4
1	D	191	GLY	3.9
1	H	192	GLY	3.5
1	J	8	TRP	3.1
1	J	380	VAL	3.1

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(Å^2)	Q<0.9
2	SVS	J	698	31/31	0.90	0.17	58,135,156,165	0
4	IOD	I	618	1/1	0.90	0.07	197,197,197,197	0
2	SVS	G	698	31/31	0.94	0.19	73,107,132,138	0
2	SVS	I	698	31/31	0.94	0.22	62,110,139,149	0
3	PNS	G	991	21/22	0.95	0.24	69,107,142,200	0
3	PNS	I	991	21/22	0.95	0.22	43,76,100,127	0
4	IOD	D	618	1/1	0.95	0.06	154,154,154,154	0
4	IOD	G	616	1/1	0.95	0.05	195,195,195,195	0
3	PNS	C	991	21/22	0.95	0.34	63,99,123,146	0
2	SVS	E	698	31/31	0.96	0.29	54,99,130,141	0
2	SVS	F	698	31/31	0.96	0.27	61,96,115,144	0
4	IOD	B	616	1/1	0.96	0.11	174,174,174,174	0
4	IOD	B	617	1/1	0.96	0.09	124,124,124,124	0
4	IOD	B	618	1/1	0.96	0.05	195,195,195,195	0
3	PNS	D	991	21/22	0.96	0.32	53,106,132,190	0
3	PNS	E	991	21/22	0.96	0.24	36,78,107,126	0
3	PNS	F	991	21/22	0.96	0.25	40,84,109,142	0
4	IOD	A	617	1/1	0.97	0.06	127,127,127,127	0
2	SVS	B	698	31/31	0.97	0.18	39,63,105,110	0
2	SVS	C	698	31/31	0.97	0.20	52,74,117,128	0
2	SVS	H	698	31/31	0.97	0.20	62,104,125,154	0
2	SVS	D	698	31/31	0.97	0.25	39,72,92,123	0
4	IOD	E	616	1/1	0.97	0.10	166,166,166,166	0
4	IOD	E	617	1/1	0.97	0.07	172,172,172,172	0
4	IOD	F	616	1/1	0.97	0.10	168,168,168,168	0
2	SVS	A	698	31/31	0.97	0.19	34,64,93,137	0
3	PNS	B	991	21/22	0.97	0.20	45,71,92,130	0
4	IOD	J	616	1/1	0.97	0.15	124,124,124,124	0
3	PNS	A	991	21/22	0.98	0.19	29,56,77,100	0
3	PNS	J	991	21/22	0.98	0.21	34,62,107,148	0
3	PNS	H	991	21/22	0.98	0.25	37,58,77,143	0
4	IOD	B	620	1/1	0.98	0.07	127,127,127,127	0

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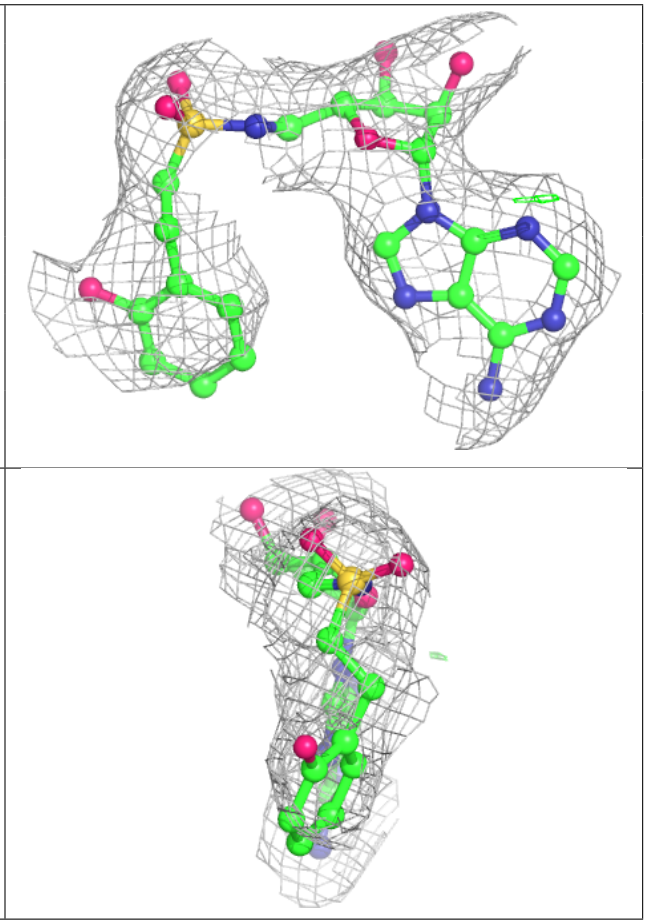
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	IOD	I	617	1/1	0.98	0.03	173,173,173,173	0
4	IOD	A	619	1/1	0.98	0.06	162,162,162,162	0
4	IOD	D	619	1/1	0.98	0.05	149,149,149,149	0
4	IOD	J	617	1/1	0.98	0.05	124,124,124,124	0
4	IOD	A	618	1/1	0.99	0.13	94,94,94,94	0
4	IOD	H	616	1/1	0.99	0.03	145,145,145,145	0
4	IOD	I	616	1/1	0.99	0.11	140,140,140,140	0
4	IOD	B	619	1/1	0.99	0.04	132,132,132,132	0
4	IOD	A	616	1/1	0.99	0.04	131,131,131,131	0
4	IOD	D	616	1/1	0.99	0.15	110,110,110,110	0
4	IOD	D	617	1/1	0.99	0.09	115,115,115,115	0
4	IOD	C	616	1/1	1.00	0.09	104,104,104,104	0
4	IOD	E	618	1/1	1.00	0.05	114,114,114,114	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.

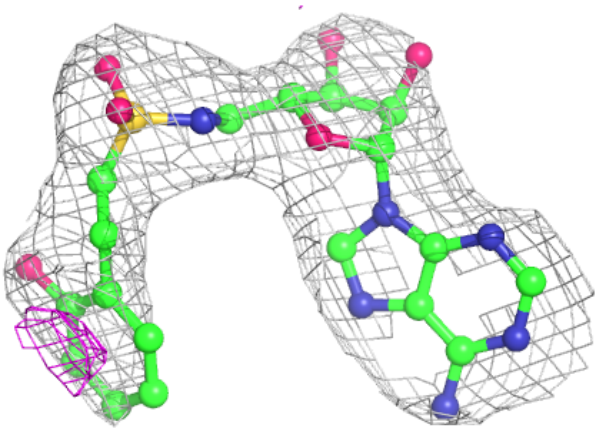
Electron density around SVS J 698:

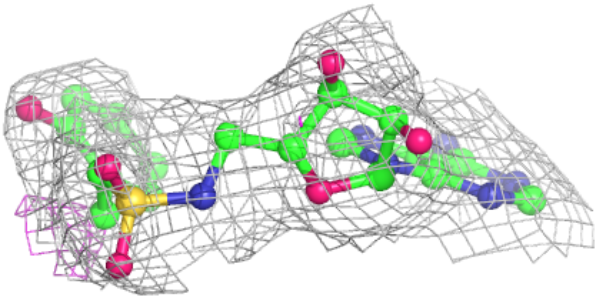
2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative) and green (positive)



Electron density around SVS G 698:

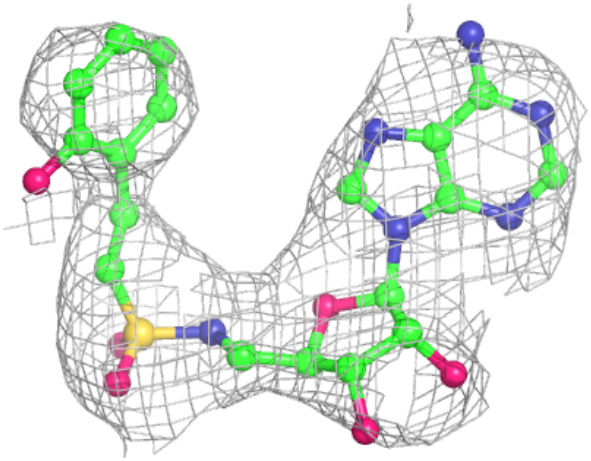
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

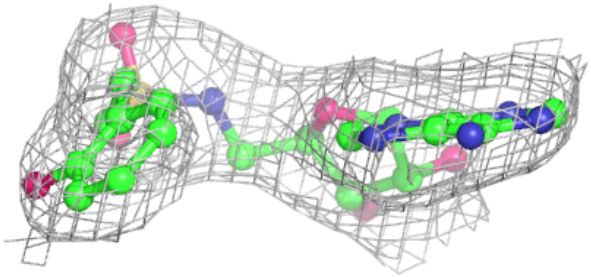




Electron density around SVS I 698:

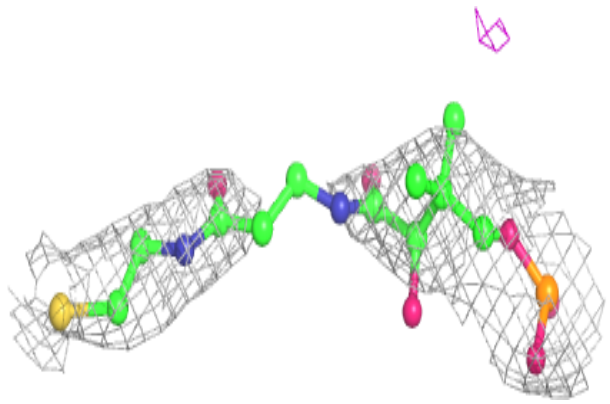
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

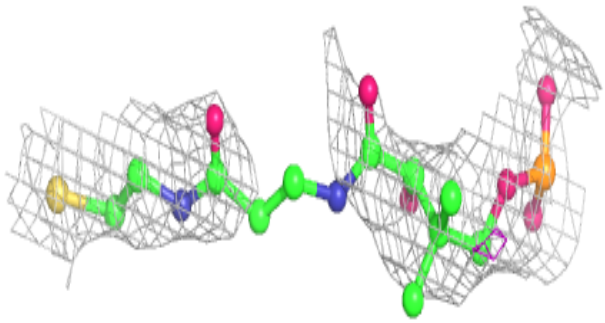


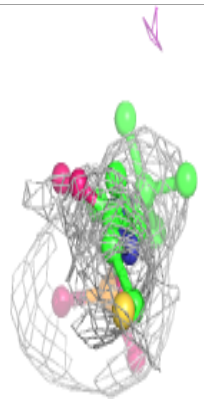


Electron density around PNS G 991:

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

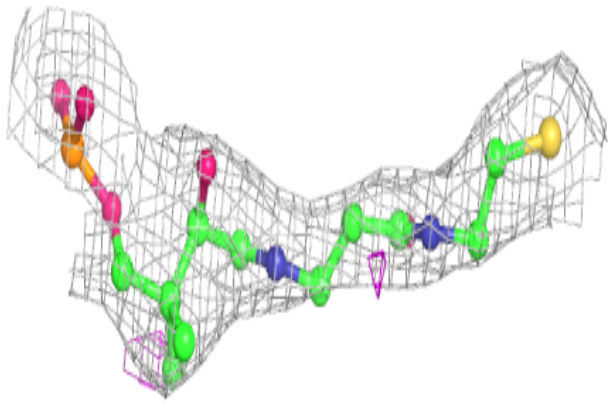


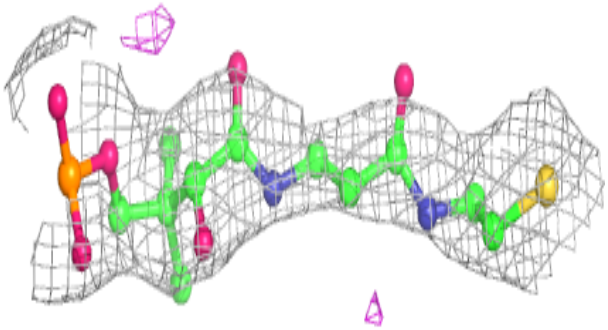


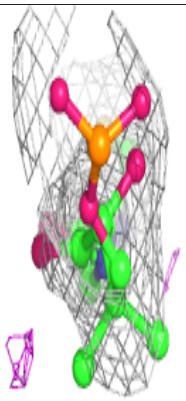


Electron density around PNS I 991:

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

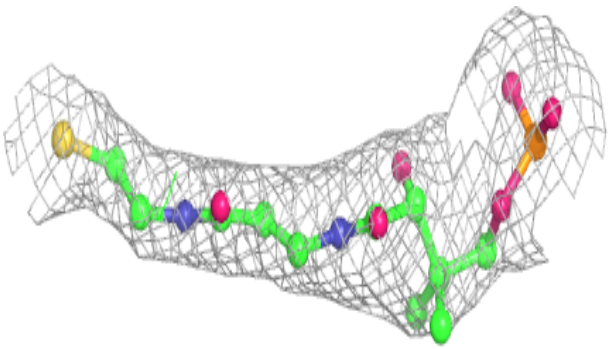


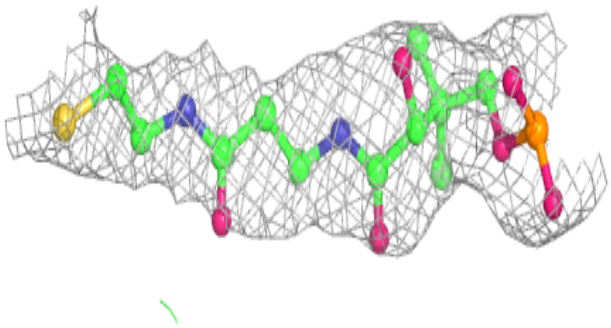


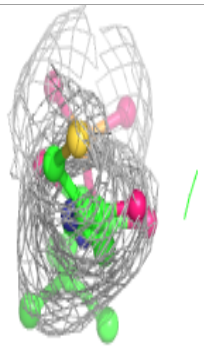


Electron density around PNS C 991:

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

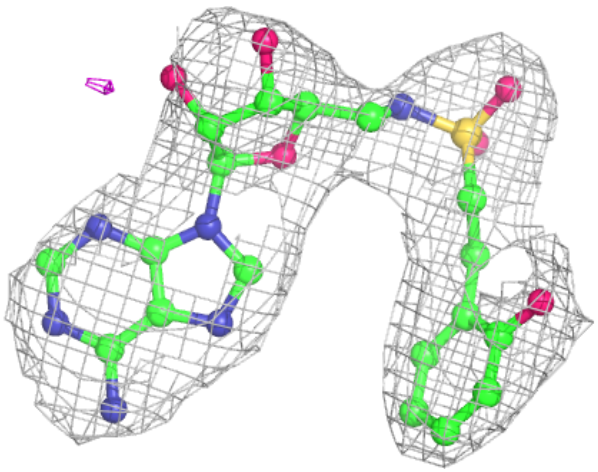


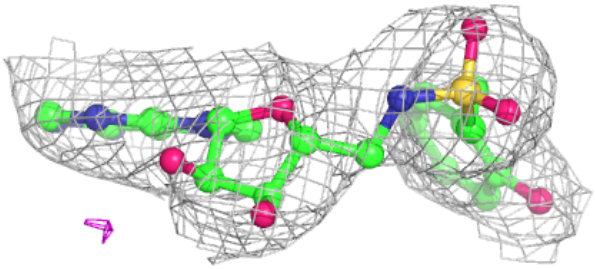


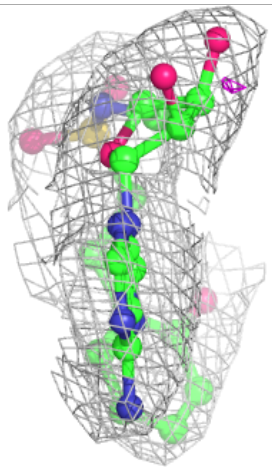


Electron density around SVS E 698:

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

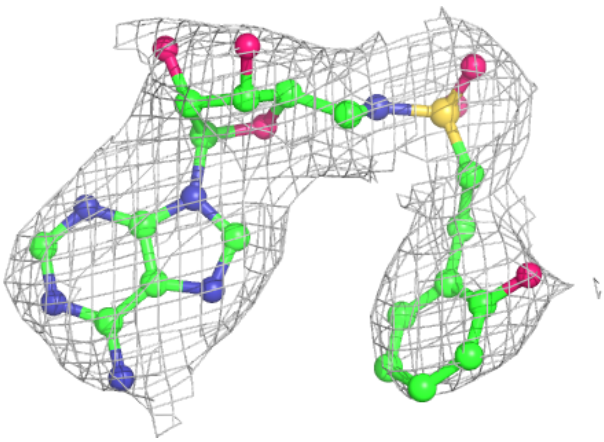


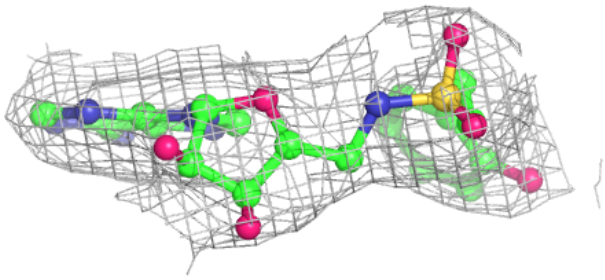


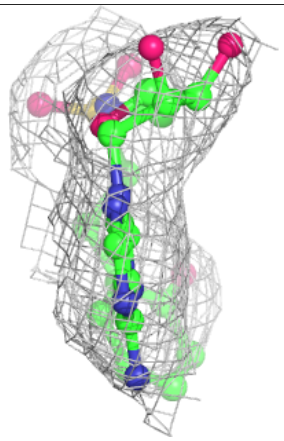


Electron density around SVS F 698:

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

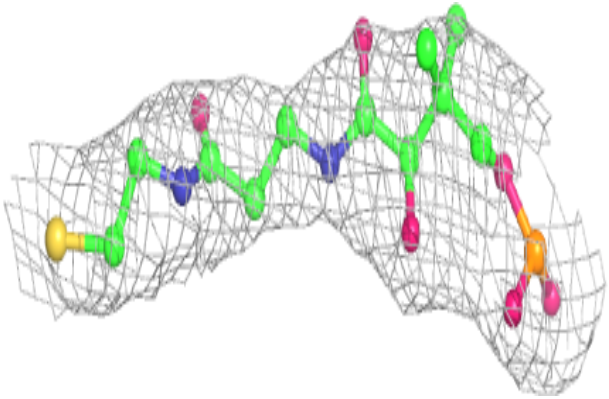


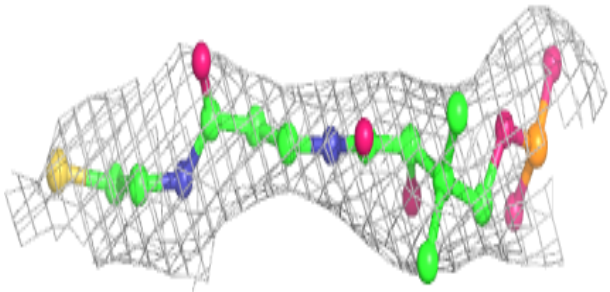


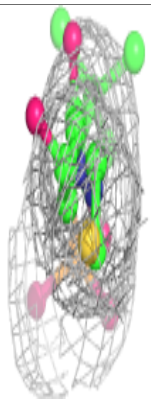


Electron density around PNS D 991:

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

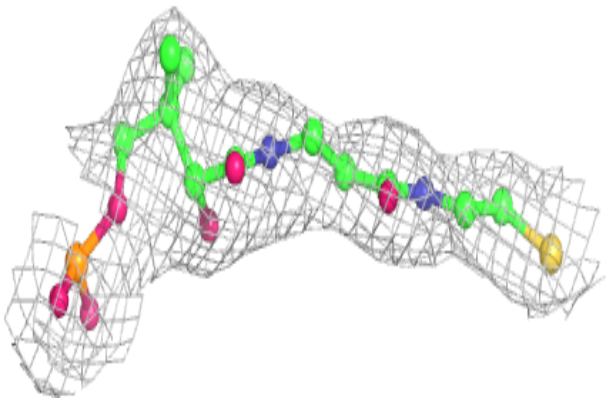


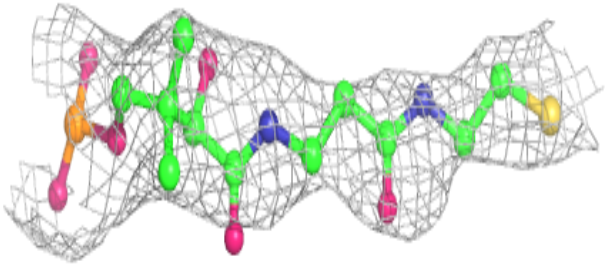


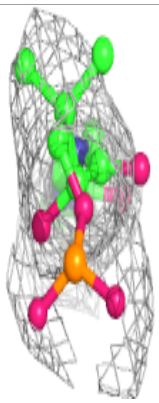


Electron density around PNS E 991:

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

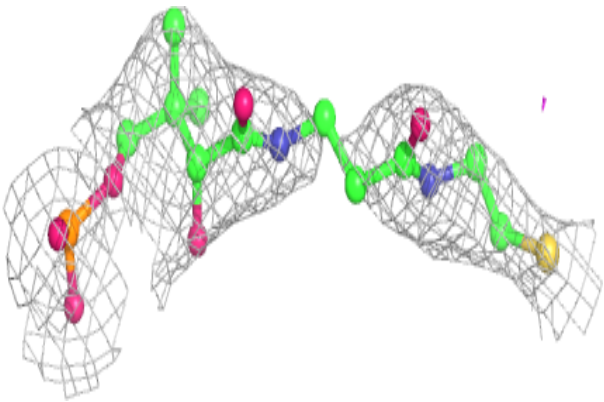


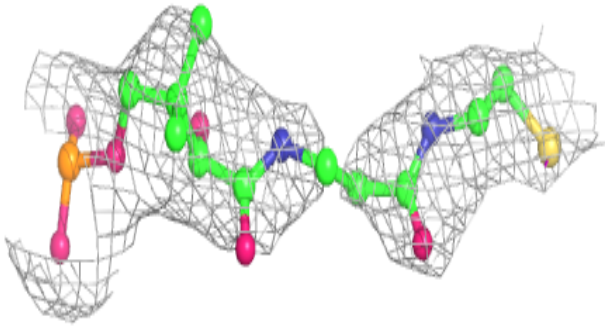


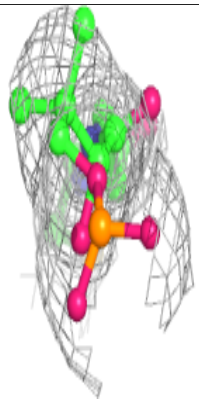


Electron density around PNS F 991:

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

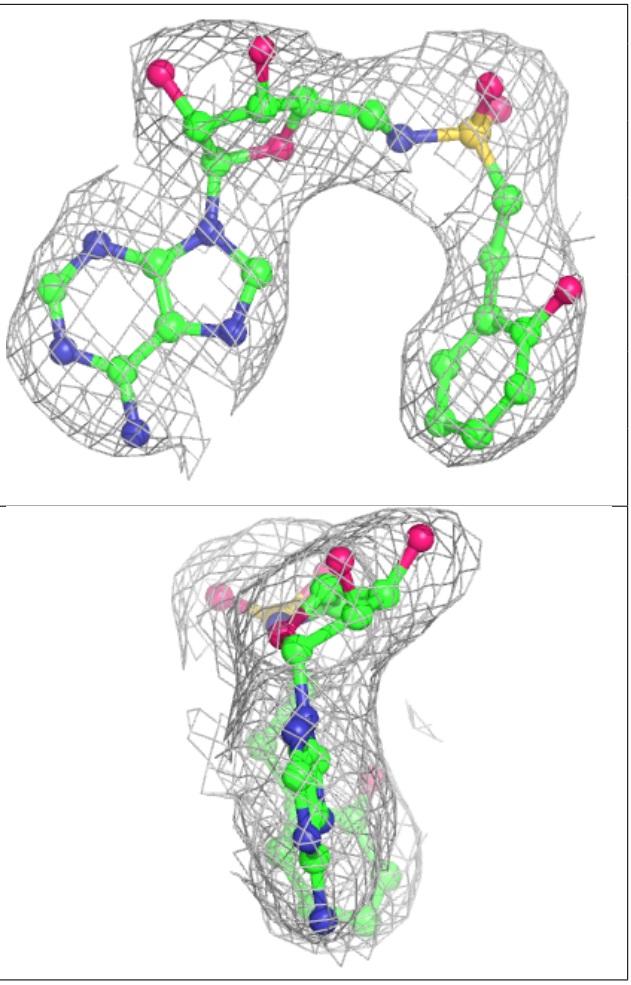






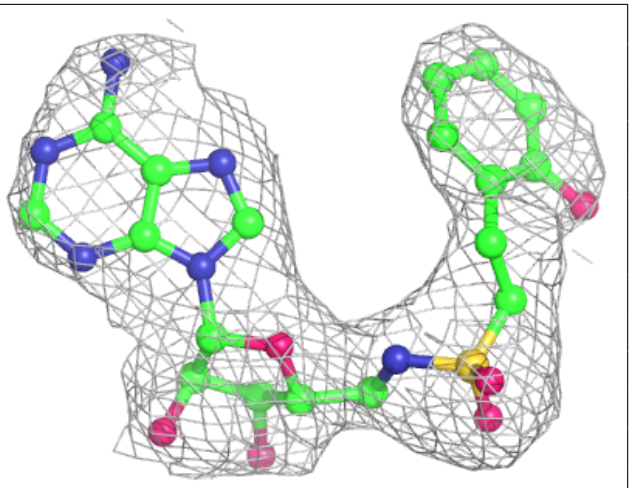
Electron density around SVS B 698:

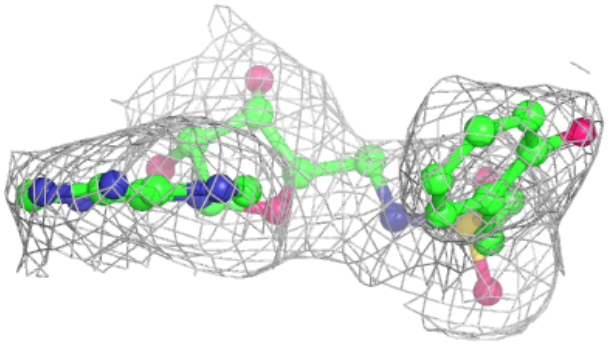
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

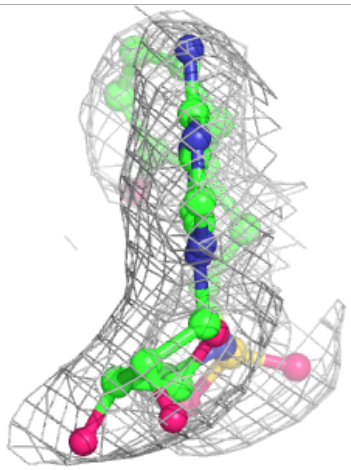


Electron density around SVS C 698:

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

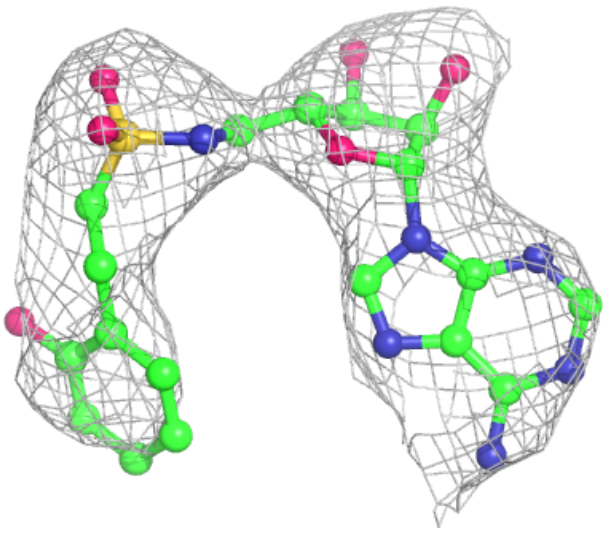


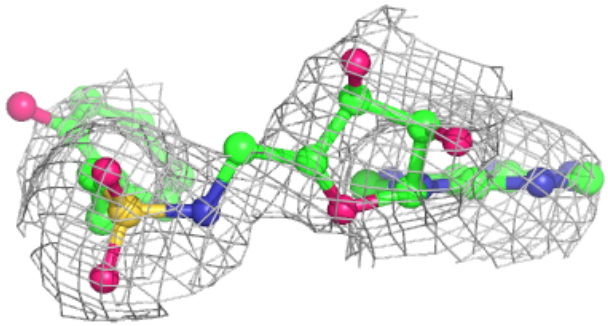


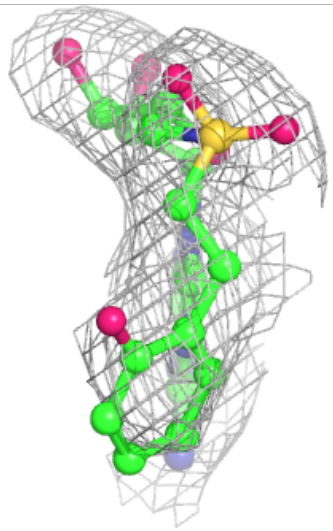


Electron density around SVS H 698:

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

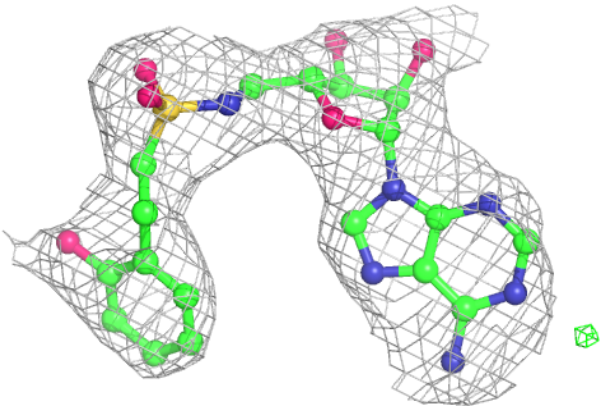


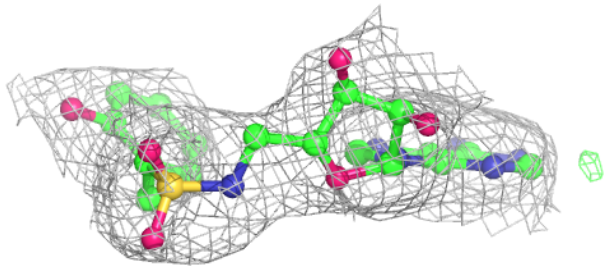


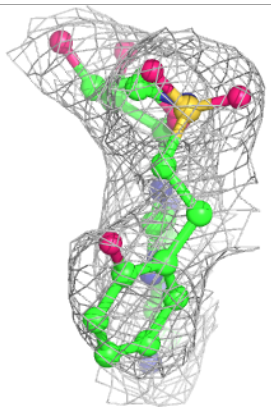


Electron density around SVS D 698:

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

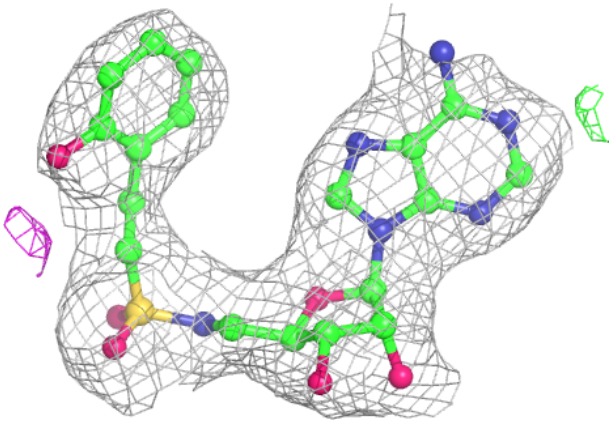


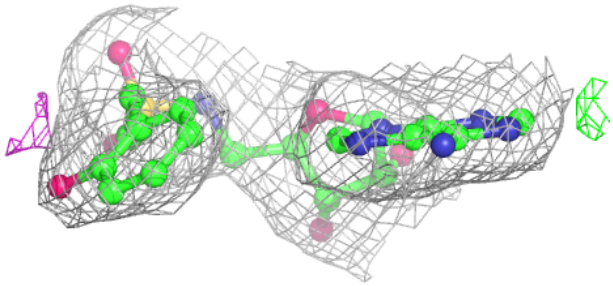


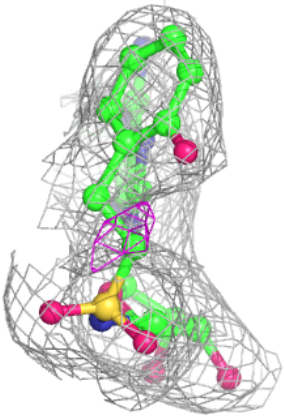


Electron density around SVS A 698:

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

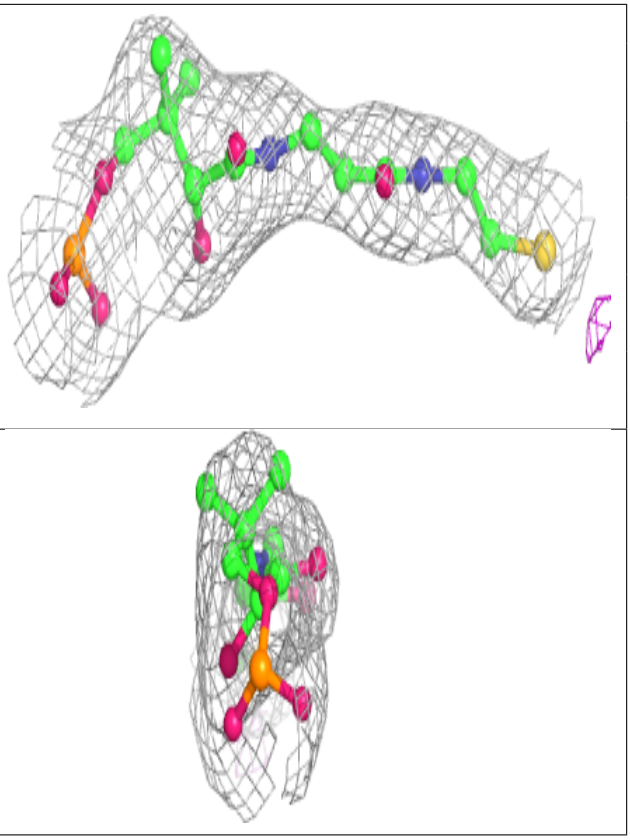






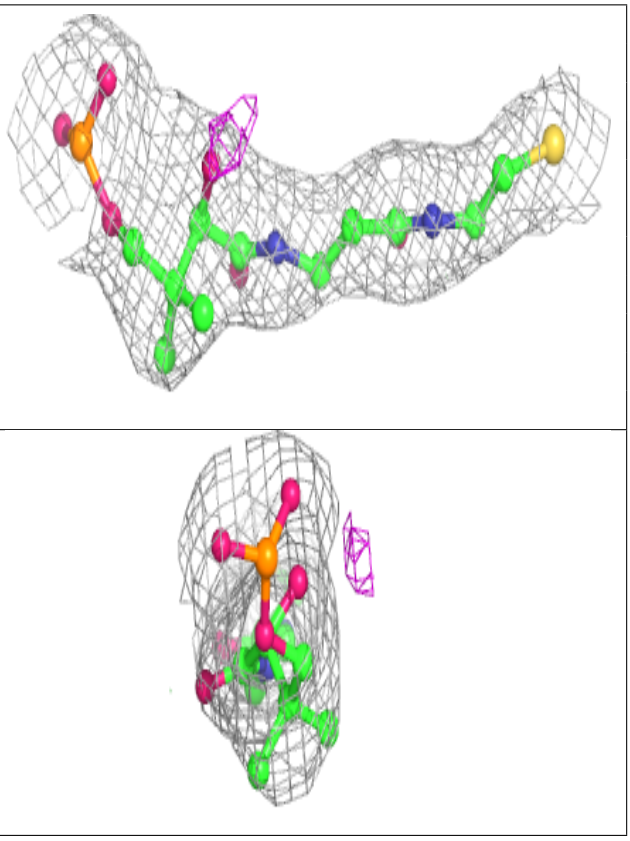
Electron density around PNS B 991:

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



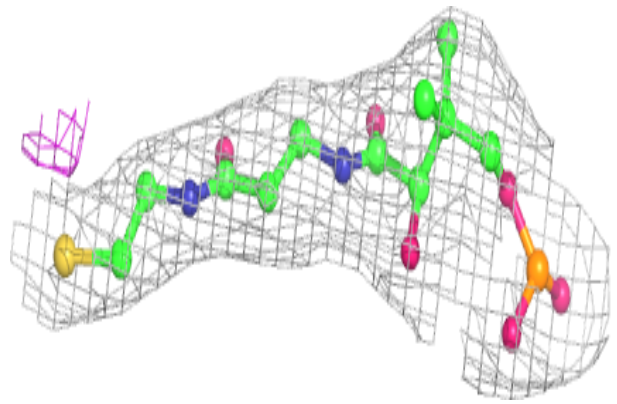
Electron density around PNS A 991:

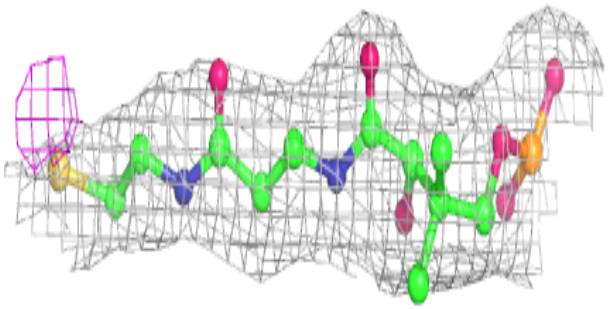
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

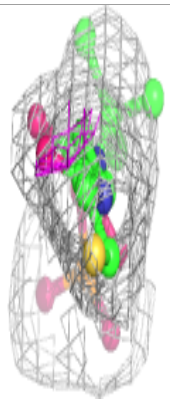


Electron density around PNS J 991:

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

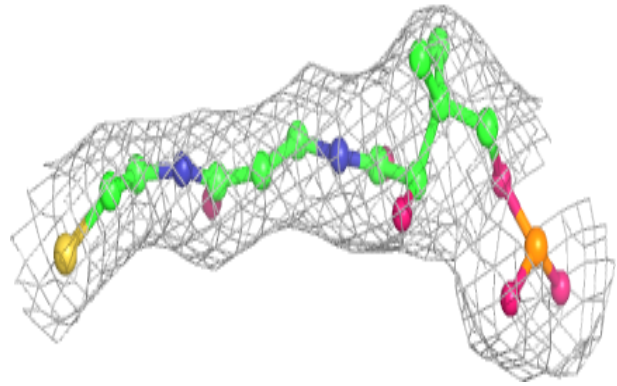


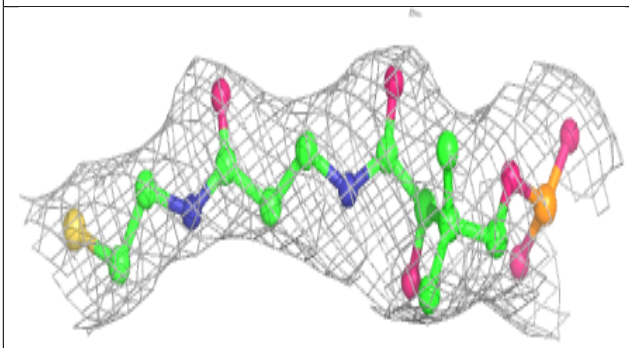


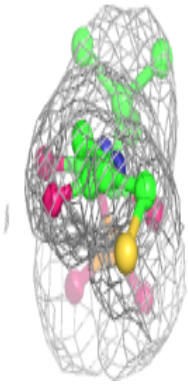


Electron density around PNS H 991:

$2mF_o$-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.