Full wwPDB X-ray Structure Validation Report ⓘ

Jun 12, 2024 – 09:40 AM EDT

PDB ID	:	1V7C
Title	:	Crystal structure of threonine synthase from thermus thermophilus hb8 in complex with a substrate analogue
Authors	:	Omi, R.; RIKEN Structural Genomics/Proteomics Initiative (RSGI)
Deposited on	:	2003-12-16
Resolution	:	2.00 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:

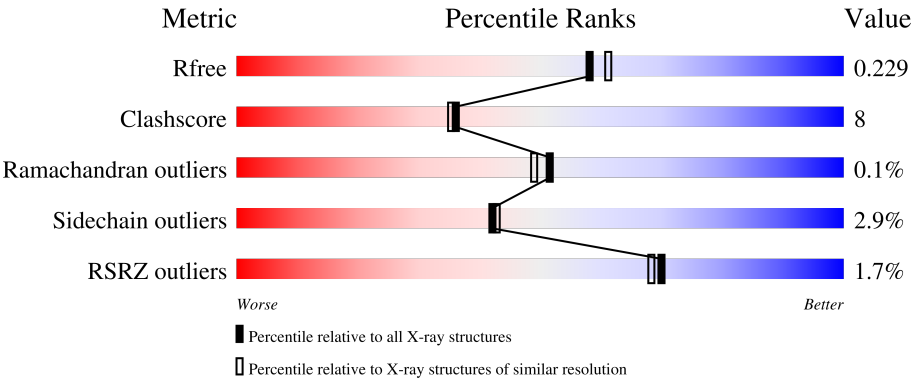
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	2.36.2
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

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 2.00 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	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

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	351	85% 14%
1	B	351	88% 11%
1	C	351	2% 83% 17%
1	D	351	3% 82% 17%

2 Entry composition (i)

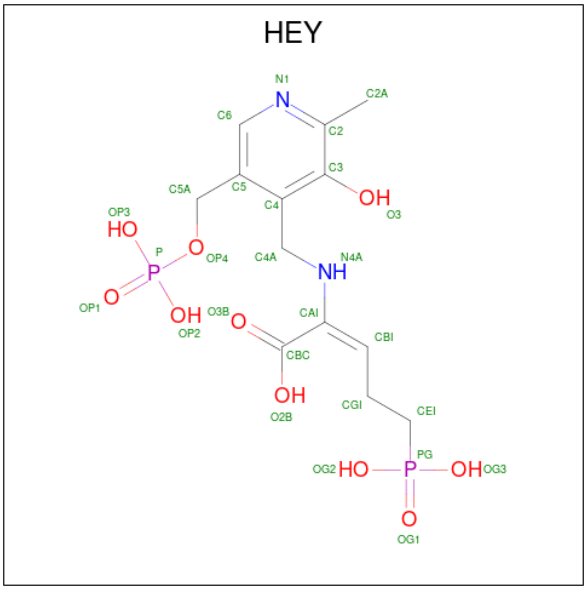
There are 3 unique types of molecules in this entry. The entry contains 11425 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 THREONINE SYNTHASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	351	Total	C	N	O	S	0	0	0
			2608	1659	465	477	7			
1	B	351	Total	C	N	O	S	0	0	0
			2608	1659	465	477	7			
1	C	351	Total	C	N	O	S	0	0	0
			2608	1659	465	477	7			
1	D	351	Total	C	N	O	S	0	0	0
			2608	1659	465	477	7			

- Molecule 2 is (2E)-2-[({3-HYDROXY-2-METHYL-5-[(PHOSPHONOOXY)METHYL]PYRIDIN-4-YL}METHYL)AMINO]-5-PHOSPHONOPENT-2-ENOIC ACID (three-letter code: HEY) (formula: $C_{13}H_{20}N_2O_{10}P_2$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			27	13	2	10	2		

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	B	1	Total	C	N	O	P	0	0
			27	13	2	10	2		
2	C	1	Total	C	N	O	P	0	0
			27	13	2	10	2		
2	D	1	Total	C	N	O	P	0	0
			27	13	2	10	2		

- Molecule 3 is water.

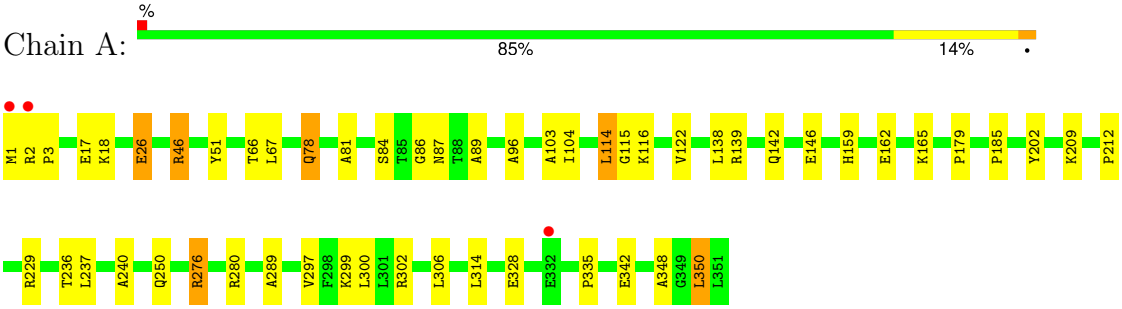
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	259	Total	O	0	0
			259	259		
3	B	241	Total	O	0	0
			241	241		
3	C	200	Total	O	0	0
			200	200		
3	D	185	Total	O	0	0
			185	185		

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.

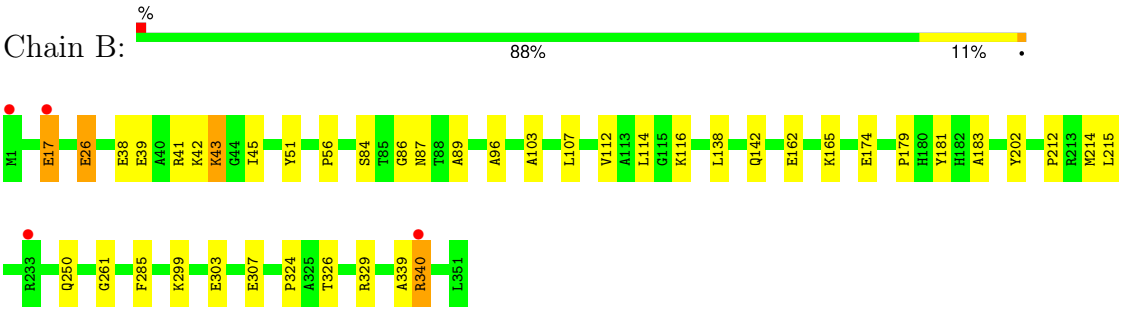
• Molecule 1: THREONINE SYNTHASE

Chain A:



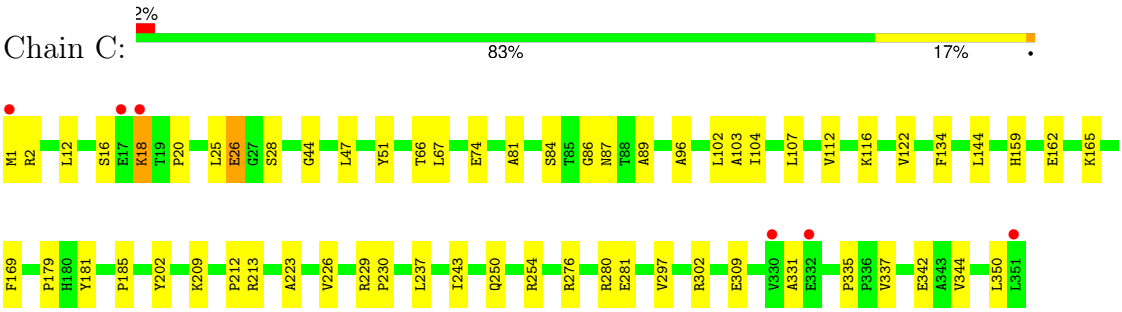
• Molecule 1: THREONINE SYNTHASE

Chain B:



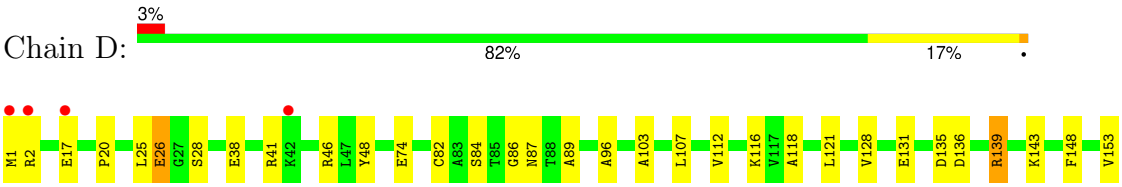
• Molecule 1: THREONINE SYNTHASE

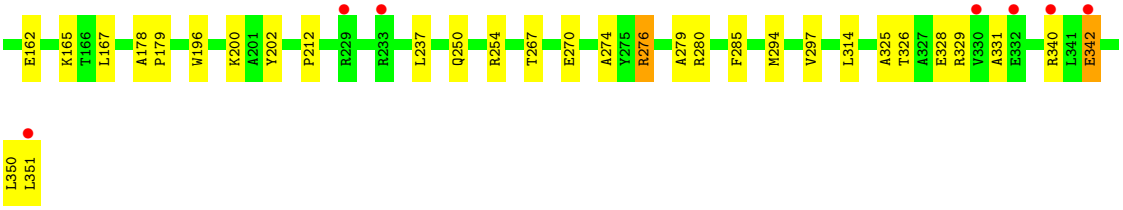
Chain C:



• Molecule 1: THREONINE SYNTHASE

Chain D:




E162
K165
T166
L167
A178
P179
W196
K200
A201
Y202
P212
R229
R233
L237
Q250
R254
T267
E270
A274
Y275
R276
A279
R280
F285
M294
V297
L314
A325
T326
A327
E328
R329
V330
A331
E332
R340
L341
E342
L350
L351

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α, β, γ	116.59Å 119.45Å 123.42Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	10.00 – 2.00 20.00 – 2.00	Depositor EDS
% Data completeness (in resolution range)	(Not available) (10.00-2.00) 94.8 (20.00-2.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	6.28 (at 2.01Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.196 , 0.230 0.194 , 0.229	Depositor DCC
R_{free} test set	10913 reflections (9.93%)	wwPDB-VP
Wilson B-factor (Å^2)	15.8	Xtriage
Anisotropy	0.203	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.42 , 56.5	EDS
L-test for twinning[2]	$< \|L\| > = 0.51$, $< L^2 > = 0.34$	Xtriage
Estimated twinning fraction	0.006 for k,h,-l	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	11425	wwPDB-VP
Average B, all atoms (Å^2)	17.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.54% 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: HEY

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	0.33	0/2661	0.61	0/3620
1	B	0.33	0/2661	0.61	0/3620
1	C	0.32	0/2661	0.61	0/3620
1	D	0.32	0/2661	0.60	0/3620
All	All	0.33	0/10644	0.61	0/14480

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	2608	0	2680	44	0
1	B	2608	0	2680	35	0
1	C	2608	0	2680	54	0
1	D	2608	0	2680	49	0
2	A	27	0	13	2	0
2	B	27	0	13	1	0
2	C	27	0	13	2	0
2	D	27	0	13	1	0
3	A	259	0	0	3	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	241	0	0	5	0
3	C	200	0	0	3	0
3	D	185	0	0	0	0
All	All	11425	0	10772	170	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 8.

All (170) 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:C:276:ARG:HE	1:C:280:ARG:NE	1.62	0.97
1:C:276:ARG:HE	1:C:280:ARG:HE	1.16	0.92
1:A:114:LEU:HD12	1:A:115:GLY:N	1.88	0.89
1:D:38:GLU:HA	1:D:41:ARG:HD2	1.60	0.84
1:B:326:THR:O	1:B:329:ARG:HG2	1.81	0.81
1:C:276:ARG:HE	1:C:280:ARG:CZ	1.96	0.79
1:A:209:LYS:HD2	1:A:209:LYS:N	1.98	0.79
1:D:2:ARG:HD2	1:D:25:LEU:O	1.86	0.75
1:A:142:GLN:O	1:A:146:GLU:HG3	1.88	0.72
1:C:276:ARG:NE	1:C:280:ARG:HE	1.86	0.72
1:C:276:ARG:HG2	1:C:280:ARG:HH21	1.56	0.71
1:D:276:ARG:HG2	1:D:280:ARG:NH1	2.06	0.70
1:B:41:ARG:HH11	1:B:41:ARG:HB2	1.57	0.69
1:C:276:ARG:NE	1:C:280:ARG:HH21	1.91	0.68
1:A:26:GLU:CD	1:A:26:GLU:H	1.98	0.67
1:C:2:ARG:HD2	1:C:25:LEU:O	1.95	0.66
1:A:138:LEU:O	1:A:142:GLN:HG3	1.95	0.66
1:D:325:ALA:O	1:D:328:GLU:HG2	1.96	0.66
1:A:297:VAL:HG21	1:A:314:LEU:HD21	1.78	0.66
1:B:26:GLU:H	1:B:26:GLU:CD	2.00	0.65
1:B:181:TYR:OH	1:B:307:GLU:HG3	1.96	0.65
1:C:276:ARG:HE	1:C:280:ARG:NH2	1.95	0.64
1:D:26:GLU:H	1:D:26:GLU:CD	2.00	0.64
1:D:342:GLU:OE1	1:D:351:LEU:HD12	1.97	0.64
1:B:86:GLY:HA3	1:B:116:LYS:HD3	1.81	0.63
1:D:196:TRP:NE1	1:D:200:LYS:HD2	2.12	0.63
1:C:276:ARG:CG	1:C:280:ARG:HH21	2.11	0.63
1:B:38:GLU:OE1	1:B:42:LYS:HE3	1.99	0.62
1:C:276:ARG:NE	1:C:280:ARG:NH2	2.48	0.62
1:C:26:GLU:H	1:C:26:GLU:CD	2.02	0.62

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:87:ASN:ND2	2:D:4400:HEY:H2A1	2.14	0.62
1:B:340:ARG:N	1:B:340:ARG:HD2	2.15	0.62
1:D:267:THR:OG1	1:D:270:GLU:HG3	2.00	0.62
1:C:20:PRO:HD2	1:C:74:GLU:HB2	1.81	0.61
1:D:276:ARG:HG2	1:D:280:ARG:HH11	1.66	0.60
1:D:136:ASP:HA	1:D:139:ARG:HH11	1.64	0.60
1:C:144:LEU:HD11	1:D:350:LEU:HD12	1.83	0.59
1:D:276:ARG:CZ	1:D:280:ARG:HD2	2.32	0.59
1:C:276:ARG:NH1	1:C:331:ALA:HB2	2.17	0.59
1:D:135:ASP:O	1:D:139:ARG:HG2	2.03	0.59
1:B:250:GLN:NE2	1:B:250:GLN:HA	2.18	0.57
1:B:17:GLU:H	1:B:17:GLU:CD	2.08	0.57
1:C:181:TYR:CE2	1:C:213:ARG:HD3	2.39	0.57
1:A:342:GLU:HB2	3:A:1557:HOH:O	2.04	0.57
1:D:20:PRO:HD2	1:D:74:GLU:HB2	1.87	0.56
1:D:276:ARG:CG	1:D:280:ARG:NH1	2.68	0.56
1:B:326:THR:HG23	1:B:329:ARG:HD3	1.86	0.56
1:A:2:ARG:HG2	3:B:2636:HOH:O	2.04	0.56
1:A:96:ALA:CB	1:A:103:ALA:HB2	2.35	0.56
1:A:276:ARG:HD3	1:A:280:ARG:CZ	2.36	0.56
1:C:229:ARG:HG2	1:C:230:PRO:HD2	1.88	0.55
1:D:46:ARG:NH1	1:D:46:ARG:HB3	2.21	0.55
1:C:276:ARG:HG2	1:C:280:ARG:NH2	2.21	0.55
1:D:96:ALA:CB	1:D:103:ALA:HB2	2.37	0.55
1:C:276:ARG:HH12	1:C:331:ALA:HB2	1.69	0.54
1:B:41:ARG:HB2	1:B:41:ARG:NH1	2.22	0.54
1:A:162:GLU:O	1:A:165:LYS:HG2	2.06	0.54
1:A:114:LEU:HD13	1:B:324:PRO:CB	2.37	0.54
1:C:12:LEU:HD13	1:C:169:PHE:CE1	2.43	0.54
1:A:209:LYS:N	1:A:209:LYS:CD	2.70	0.53
1:A:87:ASN:ND2	2:A:1400:HEY:H2A1	2.23	0.53
1:D:276:ARG:NH1	1:D:280:ARG:HD2	2.24	0.53
1:A:17:GLU:H	1:A:17:GLU:CD	2.12	0.53
1:D:280:ARG:HH22	1:D:331:ALA:HB2	1.74	0.52
1:B:162:GLU:HG3	3:B:2545:HOH:O	2.10	0.52
1:C:86:GLY:HA3	1:C:116:LYS:HD3	1.90	0.52
1:D:2:ARG:O	1:D:25:LEU:HD22	2.10	0.52
1:C:342:GLU:H	1:C:342:GLU:CD	2.13	0.52
1:D:340:ARG:HG2	1:D:340:ARG:HH11	1.74	0.52
1:A:86:GLY:HA3	1:A:116:LYS:HD3	1.92	0.52
1:D:162:GLU:O	1:D:165:LYS:HG2	2.09	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:87:ASN:ND2	2:B:2400:HEY:H2A1	2.25	0.52
1:B:162:GLU:O	1:B:165:LYS:HG2	2.10	0.52
1:A:250:GLN:HA	1:A:250:GLN:NE2	2.25	0.51
1:B:138:LEU:O	1:B:142:GLN:HG3	2.10	0.51
1:C:18:LYS:N	1:C:18:LYS:HE2	2.24	0.51
1:B:56:PRO:HG3	3:B:2566:HOH:O	2.11	0.51
1:B:84:SER:HB3	1:B:89:ALA:HB2	1.93	0.51
1:A:159:HIS:HE1	3:A:1617:HOH:O	1.94	0.50
1:A:348:ALA:O	1:A:350:LEU:HD13	2.11	0.50
1:A:66:THR:HG23	1:A:67:LEU:N	2.27	0.50
1:B:214:MET:O	1:B:261:GLY:HA3	2.12	0.50
1:A:114:LEU:HD11	1:B:324:PRO:HG3	1.93	0.50
1:D:46:ARG:NH1	1:D:48:TYR:OH	2.45	0.50
1:A:114:LEU:HD12	1:A:114:LEU:C	2.32	0.49
1:C:87:ASN:ND2	2:C:3400:HEY:H2A1	2.27	0.49
1:C:344:VAL:HG13	1:D:128:VAL:HG11	1.94	0.49
1:C:2:ARG:HG3	1:C:28:SER:HB2	1.93	0.49
1:C:122:VAL:HG11	1:D:285:PHE:CE1	2.48	0.49
1:A:84:SER:HB3	1:A:89:ALA:HB2	1.93	0.49
1:B:43:LYS:HE3	3:B:2549:HOH:O	2.13	0.48
1:B:96:ALA:CB	1:B:103:ALA:HB2	2.44	0.48
1:C:276:ARG:CD	1:C:280:ARG:HH21	2.26	0.48
1:D:196:TRP:CE2	1:D:200:LYS:HD2	2.49	0.48
1:B:179:PRO:O	1:B:212:PRO:HB3	2.13	0.48
1:C:84:SER:HB3	1:C:89:ALA:HB2	1.94	0.48
1:A:1:MET:HB2	1:B:174:GLU:HG3	1.96	0.47
1:C:302:ARG:HD3	3:C:3542:HOH:O	2.14	0.47
1:A:240:ALA:HB3	1:A:289:ALA:HB2	1.96	0.47
1:D:250:GLN:NE2	1:D:250:GLN:HA	2.29	0.47
1:C:250:GLN:O	1:C:254:ARG:HG3	2.15	0.47
1:C:276:ARG:NE	1:C:280:ARG:NE	2.45	0.46
1:A:78:GLN:CA	1:A:78:GLN:HE21	2.28	0.46
1:D:139:ARG:HH11	1:D:139:ARG:HG3	1.79	0.46
1:A:26:GLU:CD	1:A:26:GLU:N	2.68	0.46
1:D:46:ARG:HB3	1:D:46:ARG:HH11	1.80	0.46
1:A:114:LEU:C	1:A:114:LEU:CD1	2.84	0.46
1:C:237:LEU:C	1:C:237:LEU:HD12	2.36	0.46
1:D:326:THR:O	1:D:329:ARG:HB2	2.17	0.45
1:A:240:ALA:HB3	1:A:289:ALA:CB	2.46	0.45
1:D:84:SER:HB3	1:D:89:ALA:HB2	1.97	0.45
1:D:274:ALA:HB1	1:D:294:MET:HB3	1.99	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:139:ARG:HH11	1:A:139:ARG:HB3	1.82	0.45
1:A:185:PRO:HB2	2:A:1400:HEY:H6	1.99	0.45
1:A:46:ARG:O	1:A:46:ARG:HG2	2.17	0.45
1:C:185:PRO:HB2	2:C:3400:HEY:H6	1.98	0.45
1:D:237:LEU:HD12	1:D:237:LEU:C	2.37	0.45
1:A:179:PRO:O	1:A:212:PRO:HB3	2.17	0.45
1:B:339:ALA:C	1:B:340:ARG:HD2	2.37	0.45
1:C:335:PRO:HG2	3:C:3530:HOH:O	2.15	0.44
1:A:114:LEU:CD1	1:B:324:PRO:HG3	2.47	0.44
1:B:43:LYS:HB3	1:B:45:ILE:HG13	1.98	0.44
1:C:229:ARG:HG2	1:C:230:PRO:CD	2.47	0.44
1:C:96:ALA:CB	1:C:103:ALA:HB2	2.47	0.44
1:B:107:LEU:HB3	1:B:112:VAL:HG21	1.99	0.44
1:D:118:ALA:HA	1:D:121:LEU:HD12	2.00	0.44
1:A:237:LEU:C	1:A:237:LEU:HD12	2.37	0.44
1:A:300:LEU:HB3	1:A:306:LEU:HG	2.00	0.44
1:C:209:LYS:HD2	3:C:3594:HOH:O	2.18	0.44
1:D:82:CYS:HB3	1:D:153:VAL:HG23	2.00	0.44
1:D:139:ARG:HG3	1:D:139:ARG:NH1	2.32	0.44
1:C:47:LEU:HD21	1:C:297:VAL:HG11	1.99	0.43
1:A:81:ALA:HA	1:A:104:ILE:O	2.18	0.43
1:C:134:PHE:CD2	1:C:243:ILE:HG12	2.52	0.43
1:D:179:PRO:O	1:D:212:PRO:HB3	2.19	0.43
1:C:67:LEU:HD23	1:C:159:HIS:O	2.18	0.43
1:B:39:GLU:HG2	3:B:2612:HOH:O	2.19	0.43
1:D:250:GLN:O	1:D:254:ARG:HG3	2.19	0.43
1:A:114:LEU:HD13	1:B:324:PRO:HB2	2.00	0.43
1:D:297:VAL:HG21	1:D:314:LEU:HD21	2.01	0.43
1:C:66:THR:HG23	1:C:67:LEU:N	2.34	0.42
1:C:16:SER:OG	1:C:18:LYS:HG2	2.19	0.42
1:C:102:LEU:HD12	1:C:103:ALA:H	1.84	0.42
1:C:1:MET:C	1:C:1:MET:SD	2.98	0.42
1:D:86:GLY:HA3	1:D:116:LYS:HD3	2.02	0.42
1:B:26:GLU:CD	1:B:26:GLU:N	2.71	0.42
1:C:162:GLU:O	1:C:165:LYS:HG2	2.20	0.42
1:C:337:VAL:O	1:D:131:GLU:HG3	2.20	0.42
1:D:167:LEU:C	1:D:167:LEU:HD23	2.40	0.42
1:A:335:PRO:HG2	3:A:1531:HOH:O	2.19	0.42
1:A:328:GLU:HG2	1:A:328:GLU:O	2.20	0.41
1:D:107:LEU:HB3	1:D:112:VAL:HG21	2.01	0.41
1:D:2:ARG:HG3	1:D:28:SER:HB2	2.03	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:17:GLU:OE2	1:A:18:LYS:HG3	2.20	0.41
1:A:276:ARG:HD3	1:A:280:ARG:NH2	2.34	0.41
1:B:183:ALA:HA	1:B:215:LEU:O	2.20	0.41
1:C:44:GLY:O	1:C:309:GLU:HA	2.20	0.41
1:D:178:ALA:HB1	1:D:212:PRO:HD3	2.01	0.41
1:B:299:LYS:O	1:B:303:GLU:HG3	2.21	0.41
1:C:179:PRO:O	1:C:212:PRO:HB3	2.21	0.41
1:A:122:VAL:HG11	1:B:285:PHE:CE1	2.56	0.41
1:A:299:LYS:O	1:A:302:ARG:HG2	2.21	0.41
1:C:107:LEU:HB3	1:C:112:VAL:HG21	2.02	0.41
1:B:17:GLU:CD	1:B:17:GLU:N	2.74	0.40
1:C:18:LYS:H	1:C:18:LYS:CE	2.33	0.40
1:C:223:ALA:HB1	1:C:226:VAL:HB	2.03	0.40
1:C:350:LEU:HB3	1:D:148:PHE:CE2	2.57	0.40
1:C:81:ALA:HA	1:C:104:ILE:O	2.21	0.40
1:C:122:VAL:HG22	1:D:279:ALA:HB3	2.04	0.40
1:D:340:ARG:HH11	1:D:340:ARG:CG	2.35	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	349/351 (99%)	342 (98%)	6 (2%)	1 (0%)	41 37
1	B	349/351 (99%)	337 (97%)	12 (3%)	0	100 100
1	C	349/351 (99%)	340 (97%)	9 (3%)	0	100 100
1	D	349/351 (99%)	337 (97%)	12 (3%)	0	100 100
All	All	1396/1404 (99%)	1356 (97%)	39 (3%)	1 (0%)	51 49

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	236	THR

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	260/260 (100%)	250 (96%)	10 (4%)	33	31
1	B	260/260 (100%)	253 (97%)	7 (3%)	44	46
1	C	260/260 (100%)	255 (98%)	5 (2%)	57	61
1	D	260/260 (100%)	252 (97%)	8 (3%)	40	40
All	All	1040/1040 (100%)	1010 (97%)	30 (3%)	42	43

All (30) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	3	PRO
1	A	26	GLU
1	A	46	ARG
1	A	51	TYR
1	A	78	GLN
1	A	114	LEU
1	A	202	TYR
1	A	229	ARG
1	A	276	ARG
1	A	350	LEU
1	B	17	GLU
1	B	26	GLU
1	B	43	LYS
1	B	51	TYR
1	B	114	LEU
1	B	202	TYR
1	B	340	ARG
1	C	18	LYS
1	C	26	GLU
1	C	51	TYR
1	C	202	TYR

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Mol	Chain	Res	Type
1	C	281	GLU
1	D	1	MET
1	D	17	GLU
1	D	26	GLU
1	D	139	ARG
1	D	143	LYS
1	D	202	TYR
1	D	276	ARG
1	D	342	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	78	GLN
1	A	159	HIS
1	A	250	GLN
1	B	250	GLN
1	C	159	HIS
1	C	250	GLN
1	D	11	ASN
1	D	250	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)

4 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	HEY	A	1400	-	26,27,27	2.31	10 (38%)	36,39,39	2.72	9 (25%)
2	HEY	C	3400	-	26,27,27	2.28	10 (38%)	36,39,39	2.69	9 (25%)
2	HEY	B	2400	-	26,27,27	2.37	10 (38%)	36,39,39	2.69	8 (22%)
2	HEY	D	4400	-	26,27,27	2.30	10 (38%)	36,39,39	2.75	9 (25%)

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	HEY	A	1400	-	-	6/22/22/22	0/1/1/1
2	HEY	C	3400	-	-	7/22/22/22	0/1/1/1
2	HEY	B	2400	-	-	7/22/22/22	0/1/1/1
2	HEY	D	4400	-	-	7/22/22/22	0/1/1/1

All (40) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1400	HEY	C5-C4	4.89	1.47	1.40
2	B	2400	HEY	C5-C4	4.89	1.47	1.40
2	D	4400	HEY	C2-N1	4.85	1.42	1.33
2	C	3400	HEY	C5-C4	4.77	1.47	1.40
2	A	1400	HEY	C2-N1	4.74	1.42	1.33
2	D	4400	HEY	C5-C4	4.70	1.47	1.40
2	B	2400	HEY	C2-N1	4.61	1.42	1.33
2	C	3400	HEY	C2-N1	4.36	1.41	1.33
2	D	4400	HEY	C3-C2	3.94	1.45	1.41
2	B	2400	HEY	C3-C2	3.91	1.45	1.41
2	C	3400	HEY	C3-C2	3.88	1.45	1.41
2	A	1400	HEY	CAI-N4A	-3.75	1.27	1.34
2	B	2400	HEY	CAI-N4A	-3.72	1.27	1.34
2	C	3400	HEY	CAI-N4A	-3.58	1.28	1.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	4400	HEY	CAI-N4A	-3.47	1.28	1.34
2	A	1400	HEY	C3-C2	3.44	1.44	1.41
2	B	2400	HEY	PG-CEI	3.28	1.82	1.78
2	B	2400	HEY	P-OP2	2.90	1.65	1.54
2	C	3400	HEY	P-OP2	2.86	1.65	1.54
2	B	2400	HEY	CAI-CBC	2.85	1.55	1.48
2	A	1400	HEY	PG-CEI	2.84	1.81	1.78
2	D	4400	HEY	P-OP2	2.82	1.65	1.54
2	A	1400	HEY	C4A-N4A	-2.79	1.40	1.46
2	C	3400	HEY	PG-CEI	2.78	1.81	1.78
2	D	4400	HEY	O2B-CBC	-2.77	1.23	1.30
2	A	1400	HEY	CAI-CBC	2.73	1.55	1.48
2	C	3400	HEY	CAI-CBC	2.72	1.55	1.48
2	D	4400	HEY	CAI-CBC	2.71	1.55	1.48
2	A	1400	HEY	P-OP2	2.70	1.64	1.54
2	B	2400	HEY	PG-OG3	-2.68	1.49	1.55
2	A	1400	HEY	PG-OG3	-2.68	1.49	1.55
2	D	4400	HEY	PG-CEI	2.61	1.81	1.78
2	C	3400	HEY	PG-OG3	-2.60	1.49	1.55
2	A	1400	HEY	O2B-CBC	-2.56	1.23	1.30
2	B	2400	HEY	C4A-N4A	-2.53	1.41	1.46
2	D	4400	HEY	C4A-N4A	-2.49	1.41	1.46
2	D	4400	HEY	PG-OG3	-2.48	1.49	1.55
2	B	2400	HEY	O2B-CBC	-2.44	1.23	1.30
2	C	3400	HEY	C4A-N4A	-2.38	1.41	1.46
2	C	3400	HEY	O2B-CBC	-2.24	1.24	1.30

All (35) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	4400	HEY	C4A-N4A-CAI	10.26	141.54	123.44
2	B	2400	HEY	C4A-N4A-CAI	9.99	141.06	123.44
2	A	1400	HEY	C4-C4A-N4A	9.95	131.72	111.26
2	C	3400	HEY	C4A-N4A-CAI	9.79	140.72	123.44
2	A	1400	HEY	C4A-N4A-CAI	9.77	140.67	123.44
2	C	3400	HEY	C4-C4A-N4A	9.69	131.19	111.26
2	B	2400	HEY	C4-C4A-N4A	9.52	130.85	111.26
2	D	4400	HEY	C4-C4A-N4A	9.48	130.76	111.26
2	A	1400	HEY	CBI-CAI-CBC	4.01	128.16	120.79
2	D	4400	HEY	CBI-CAI-CBC	3.86	127.89	120.79
2	C	3400	HEY	CBI-CAI-CBC	3.81	127.78	120.79
2	B	2400	HEY	CBI-CAI-CBC	3.66	127.51	120.79

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	4400	HEY	C5A-C5-C6	-3.23	114.10	119.36
2	D	4400	HEY	C6-C5-C4	3.16	120.45	118.06
2	A	1400	HEY	C6-C5-C4	3.09	120.40	118.06
2	A	1400	HEY	C5A-C5-C6	-3.01	114.45	119.36
2	B	2400	HEY	C6-C5-C4	2.94	120.28	118.06
2	B	2400	HEY	C5A-C5-C6	-2.90	114.64	119.36
2	C	3400	HEY	C5A-C5-C6	-2.78	114.82	119.36
2	C	3400	HEY	C6-C5-C4	2.59	120.02	118.06
2	C	3400	HEY	C2A-C2-C3	2.25	123.43	120.80
2	D	4400	HEY	OG3-PG-OG2	2.25	114.36	107.96
2	D	4400	HEY	C2A-C2-C3	2.23	123.41	120.80
2	C	3400	HEY	OG3-PG-OG2	2.22	114.28	107.96
2	A	1400	HEY	OG3-PG-OG2	2.18	114.17	107.96
2	B	2400	HEY	C2A-C2-C3	2.17	123.34	120.80
2	C	3400	HEY	OP4-C5A-C5	-2.16	105.31	109.36
2	B	2400	HEY	OG3-PG-OG2	2.14	114.07	107.96
2	A	1400	HEY	C5-C6-N1	-2.13	120.36	123.83
2	B	2400	HEY	C5-C6-N1	-2.09	120.43	123.83
2	A	1400	HEY	C2A-C2-C3	2.05	123.20	120.80
2	A	1400	HEY	OG3-PG-OG1	-2.05	107.08	112.39
2	C	3400	HEY	OG3-PG-OG1	-2.04	107.12	112.39
2	D	4400	HEY	OG3-PG-OG1	-2.03	107.14	112.39
2	D	4400	HEY	C5-C6-N1	-2.01	120.56	123.83

There are no chirality outliers.

All (27) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	1400	HEY	CBC-CAI-N4A-C4A
2	A	1400	HEY	CBI-CAI-N4A-C4A
2	A	1400	HEY	CAI-CBI-CGI-CEI
2	B	2400	HEY	CBC-CAI-N4A-C4A
2	B	2400	HEY	CBI-CAI-N4A-C4A
2	B	2400	HEY	CAI-CBI-CGI-CEI
2	C	3400	HEY	CBC-CAI-N4A-C4A
2	C	3400	HEY	CBI-CAI-N4A-C4A
2	C	3400	HEY	CAI-CBI-CGI-CEI
2	D	4400	HEY	CBC-CAI-N4A-C4A
2	D	4400	HEY	CBI-CAI-N4A-C4A
2	D	4400	HEY	CAI-CBI-CGI-CEI
2	A	1400	HEY	C5-C4-C4A-N4A
2	B	2400	HEY	C5-C4-C4A-N4A

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Mol	Chain	Res	Type	Atoms
2	C	3400	HEY	C5-C4-C4A-N4A
2	D	4400	HEY	C5-C4-C4A-N4A
2	B	2400	HEY	C3-C4-C4A-N4A
2	C	3400	HEY	C3-C4-C4A-N4A
2	A	1400	HEY	C3-C4-C4A-N4A
2	D	4400	HEY	C3-C4-C4A-N4A
2	C	3400	HEY	CGI-CEI-PG-OG2
2	B	2400	HEY	CGI-CEI-PG-OG2
2	D	4400	HEY	CGI-CEI-PG-OG2
2	D	4400	HEY	PG-CEI-CGI-CBI
2	A	1400	HEY	PG-CEI-CGI-CBI
2	B	2400	HEY	PG-CEI-CGI-CBI
2	C	3400	HEY	PG-CEI-CGI-CBI

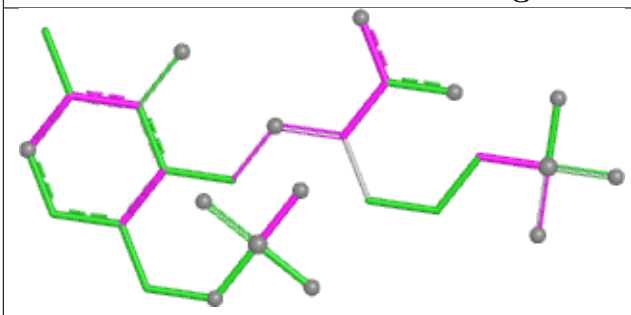
There are no ring outliers.

4 monomers are involved in 6 short contacts:

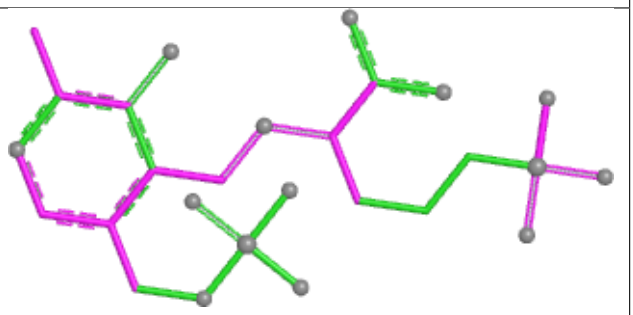
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1400	HEY	2	0
2	C	3400	HEY	2	0
2	B	2400	HEY	1	0
2	D	4400	HEY	1	0

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.

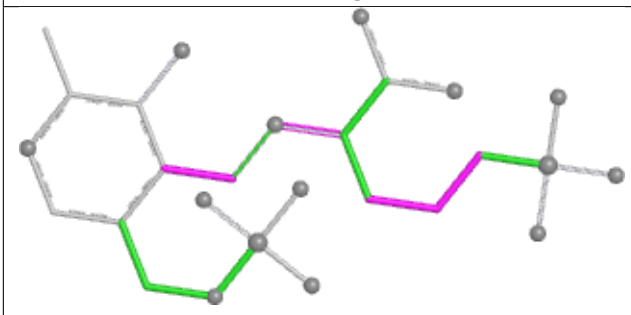
Ligand HEY A 1400



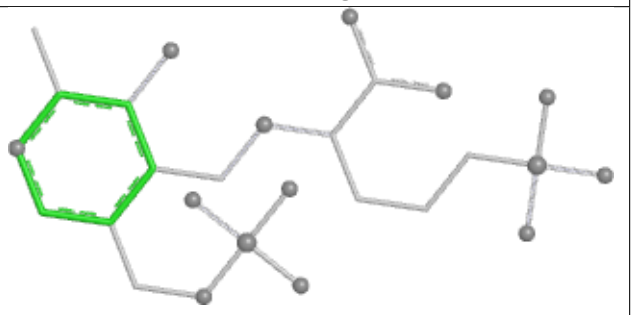
Bond lengths



Bond angles

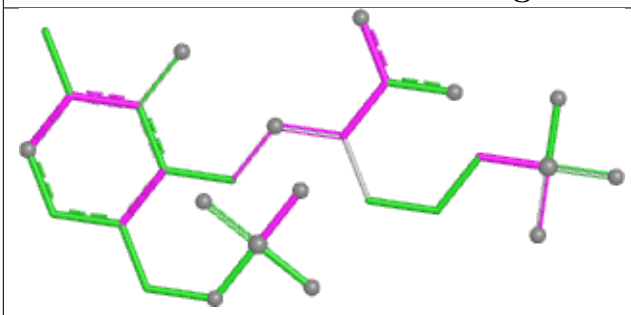


Torsions

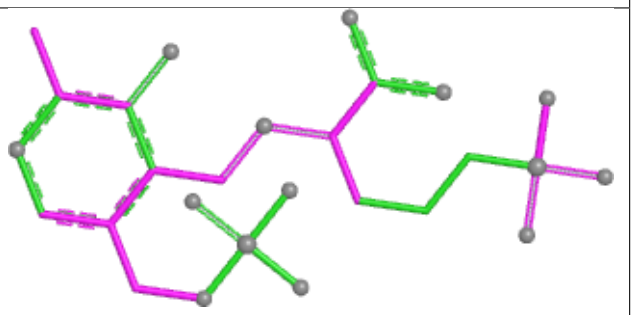


Rings

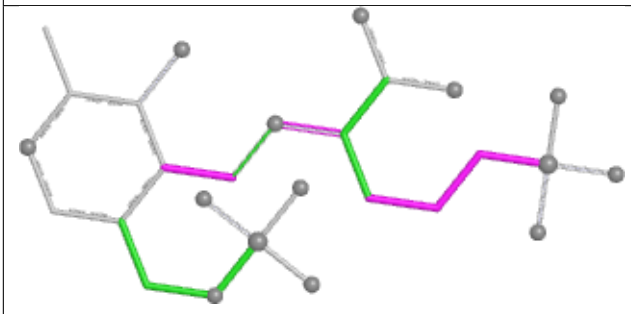
Ligand HEY C 3400



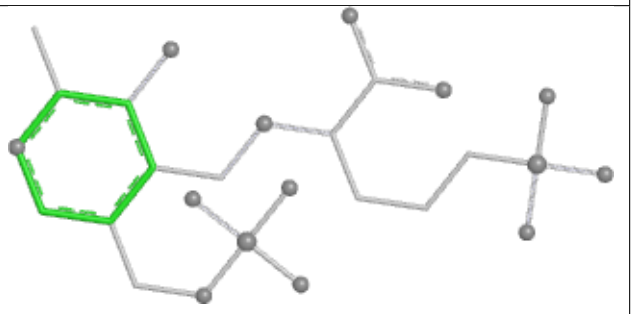
Bond lengths



Bond angles

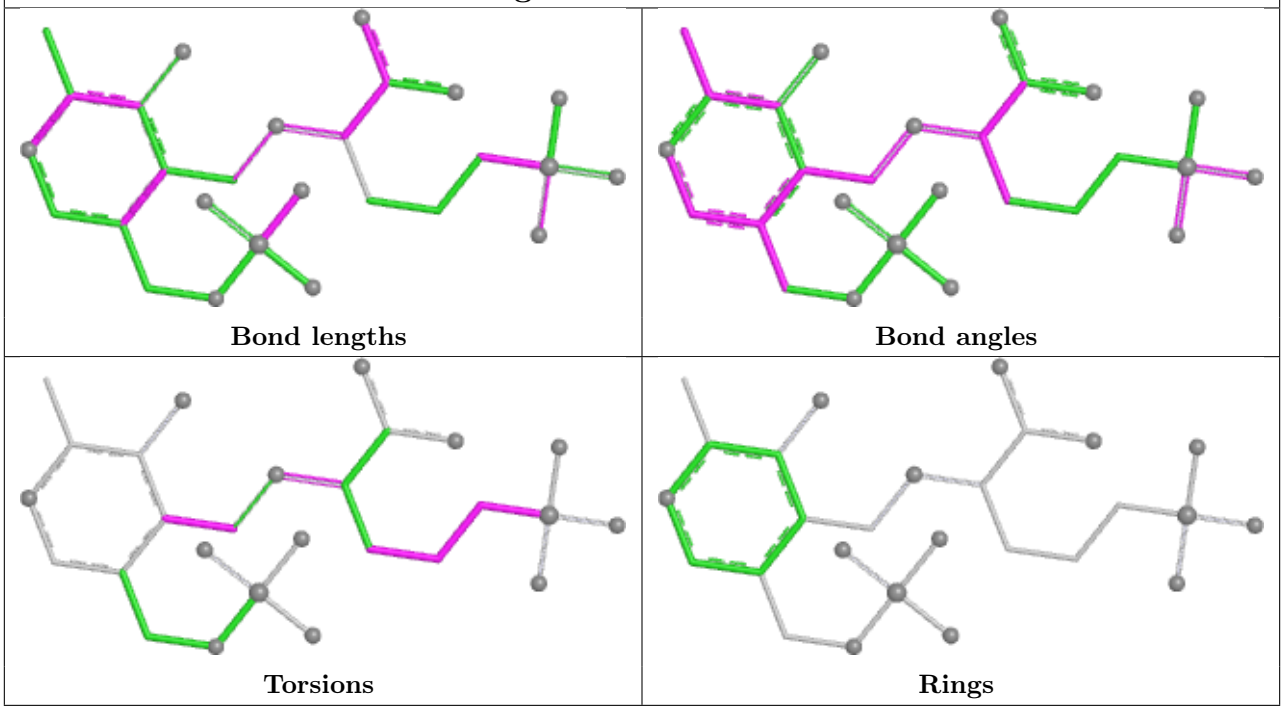


Torsions

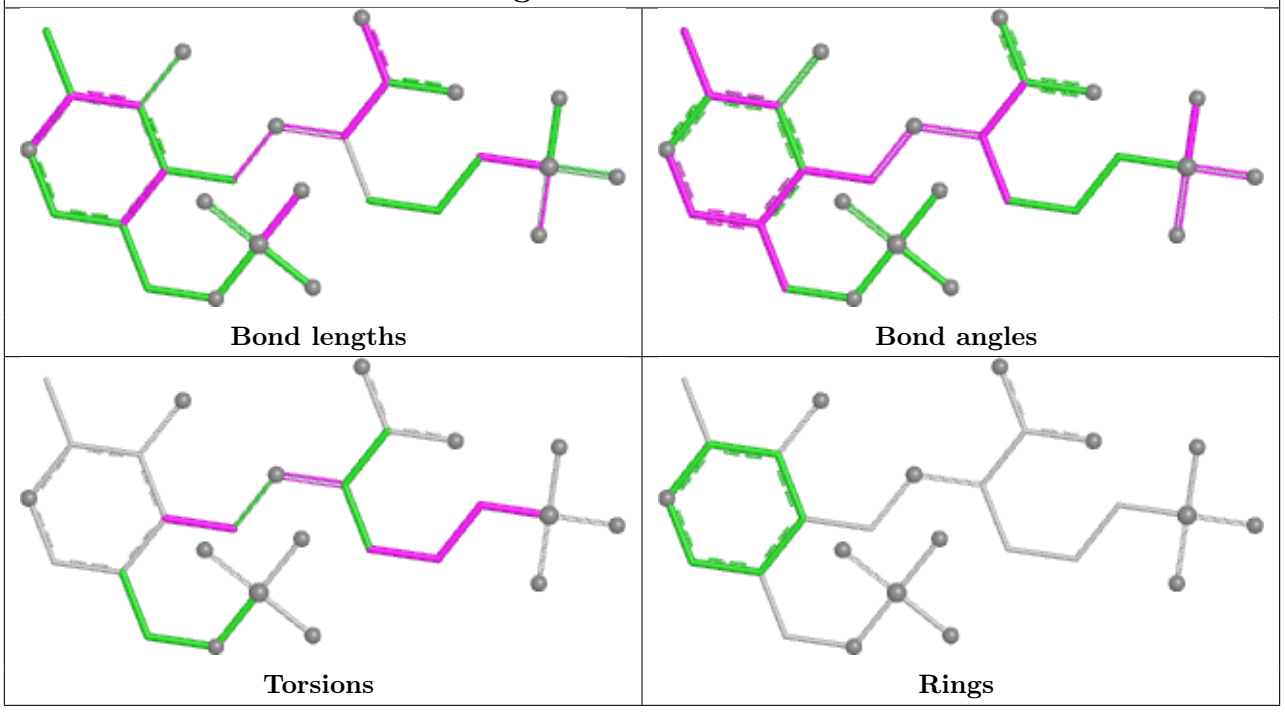


Rings

Ligand HEY B 2400



Ligand HEY D 4400



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	351/351 (100%)	-0.36	3 (0%)	84	83	9, 13, 25, 39	0
1	B	351/351 (100%)	-0.38	4 (1%)	80	79	8, 13, 27, 42	0
1	C	351/351 (100%)	-0.22	6 (1%)	70	68	10, 16, 30, 45	0
1	D	351/351 (100%)	-0.19	11 (3%)	49	48	11, 16, 33, 42	0
All	All	1404/1404 (100%)	-0.29	24 (1%)	70	68	8, 15, 29, 45	0

All (24) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	1	MET	4.5
1	D	351	LEU	4.0
1	A	1	MET	3.8
1	D	332	GLU	3.0
1	D	340	ARG	2.9
1	D	2	ARG	2.8
1	D	229	ARG	2.6
1	B	340	ARG	2.5
1	C	17	GLU	2.5
1	B	233	ARG	2.4
1	D	233	ARG	2.4
1	A	332	GLU	2.3
1	C	330	VAL	2.3
1	D	42	LYS	2.2
1	C	1	MET	2.2
1	C	18	LYS	2.2
1	A	2	ARG	2.1
1	C	332	GLU	2.1
1	D	17	GLU	2.1
1	D	330	VAL	2.1
1	B	17	GLU	2.1

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Mol	Chain	Res	Type	RSRZ
1	C	351	LEU	2.0
1	D	1	MET	2.0
1	D	342	GLU	2.0

6.2 Non-standard residues in protein, DNA, RNA chains (i)

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

6.3 Carbohydrates (i)

There are no monosaccharides in this entry.

6.4 Ligands (i)

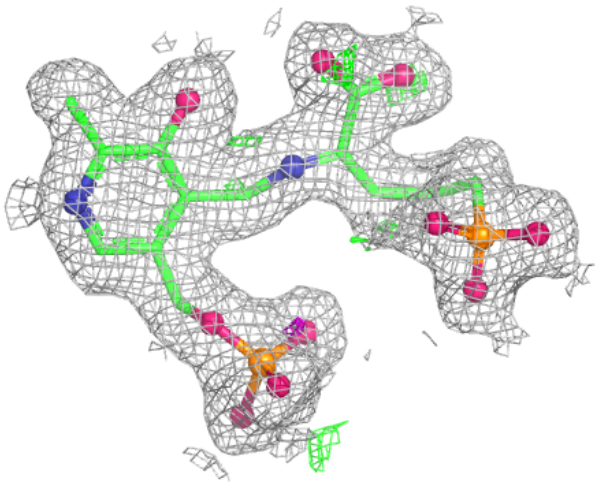
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9'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

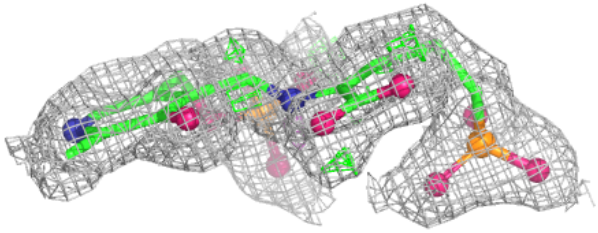
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	HEY	B	2400	27/27	0.97	0.09	10,11,12,13	0
2	HEY	A	1400	27/27	0.98	0.08	8,11,13,15	0
2	HEY	C	3400	27/27	0.98	0.09	12,14,17,18	0
2	HEY	D	4400	27/27	0.98	0.10	11,14,16,17	0

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 HEY B 2400:

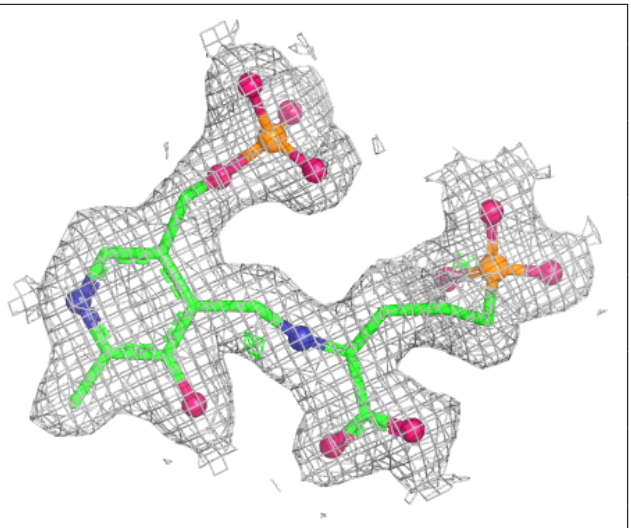
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

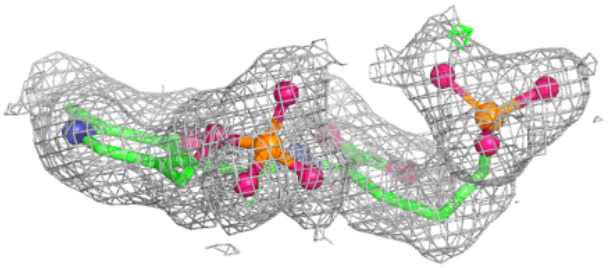


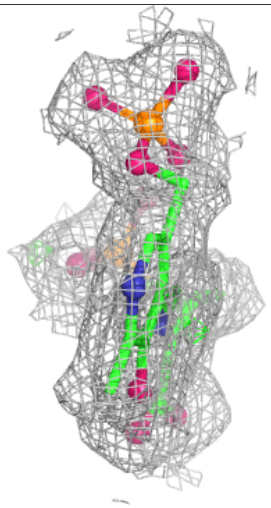


Electron density around HEY A 1400:

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

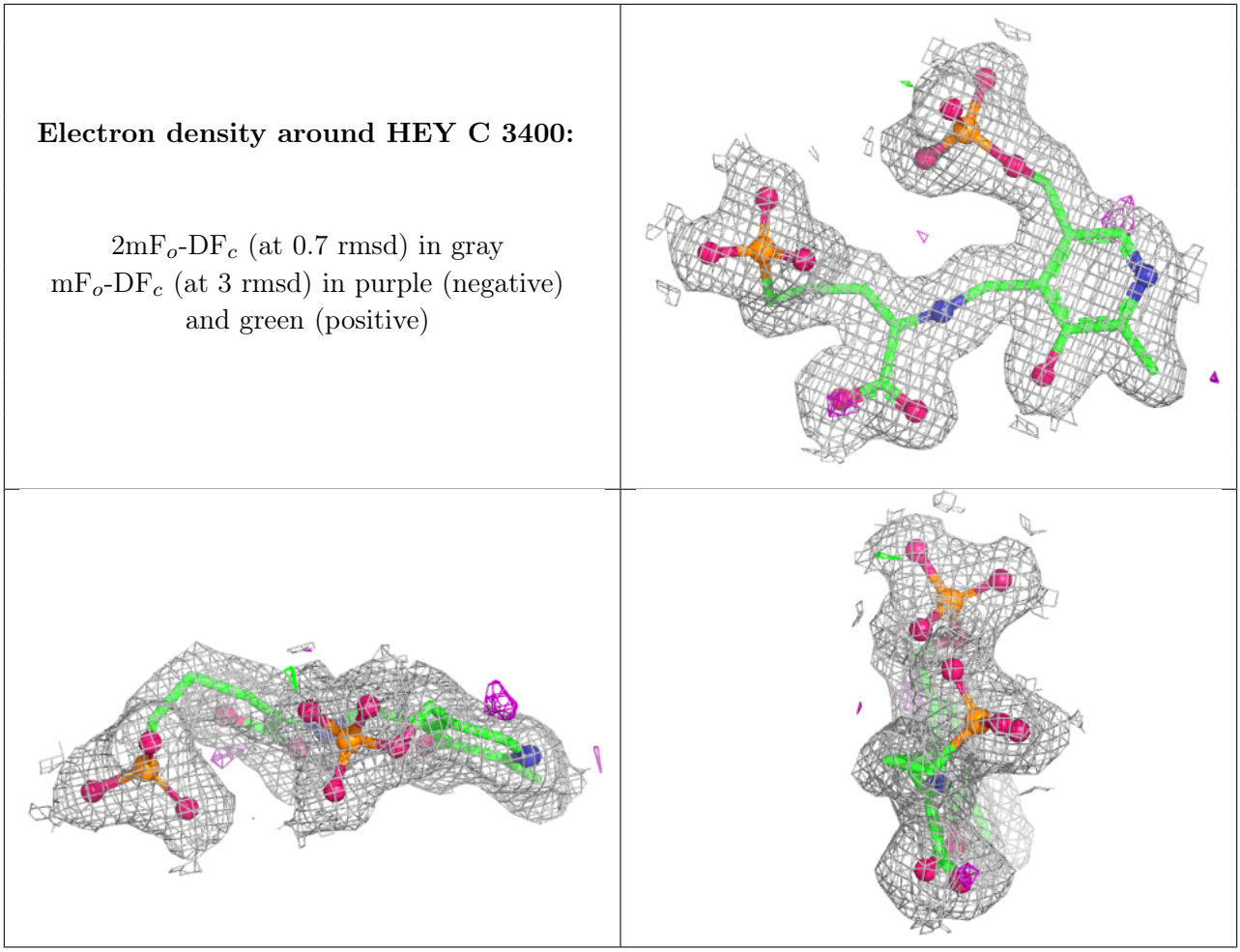






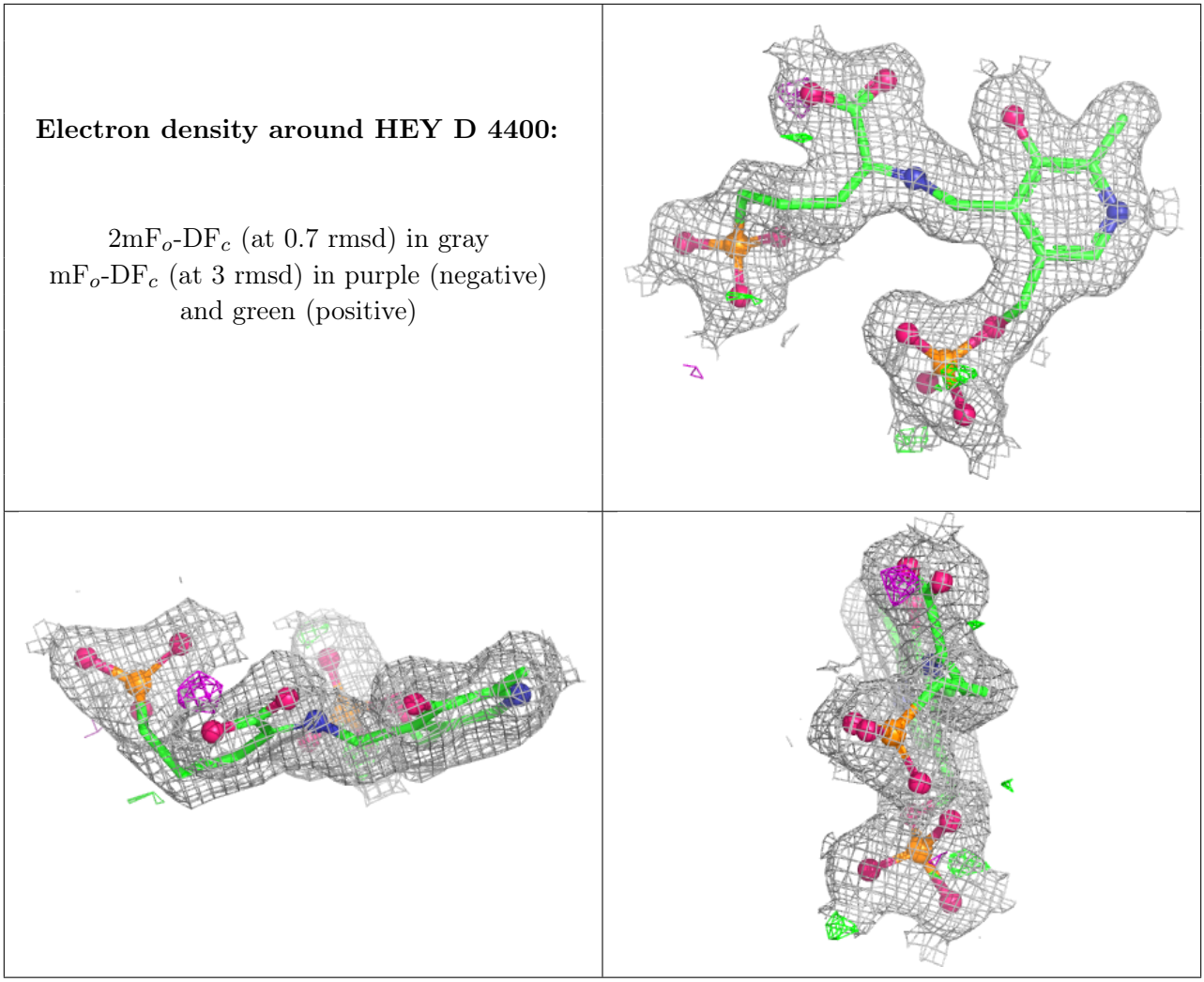
Electron density around HEY C 3400:

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



Electron density around HEY D 4400:

$2mF_o$-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

There are no such residues in this entry.