Integrative Structure Validation Report

July 22, 2024 - 05:06 PM PDT

The following software was used in the production of this report:

Python-IHM Version 1.3
MolProbity Version 4.5.2
Integrative Modeling Validation Version 1.2

PDB ID	9A2T
PDB-Dev ID	PDBDEV_00000178
Structure Title	Model of E. coli CysK by in-cell photo-crosslinking MS and deep learning
Structure Authors	Stahl, K.; Graziadei, A.; Dau, T.; Brock, O.; Rappsilber, J.

This is a PDB-Dev IM Structure Validation Report for a publicly released PDB-Dev entry.

We welcome your comments at pdb-dev@mail.wwpdb.org

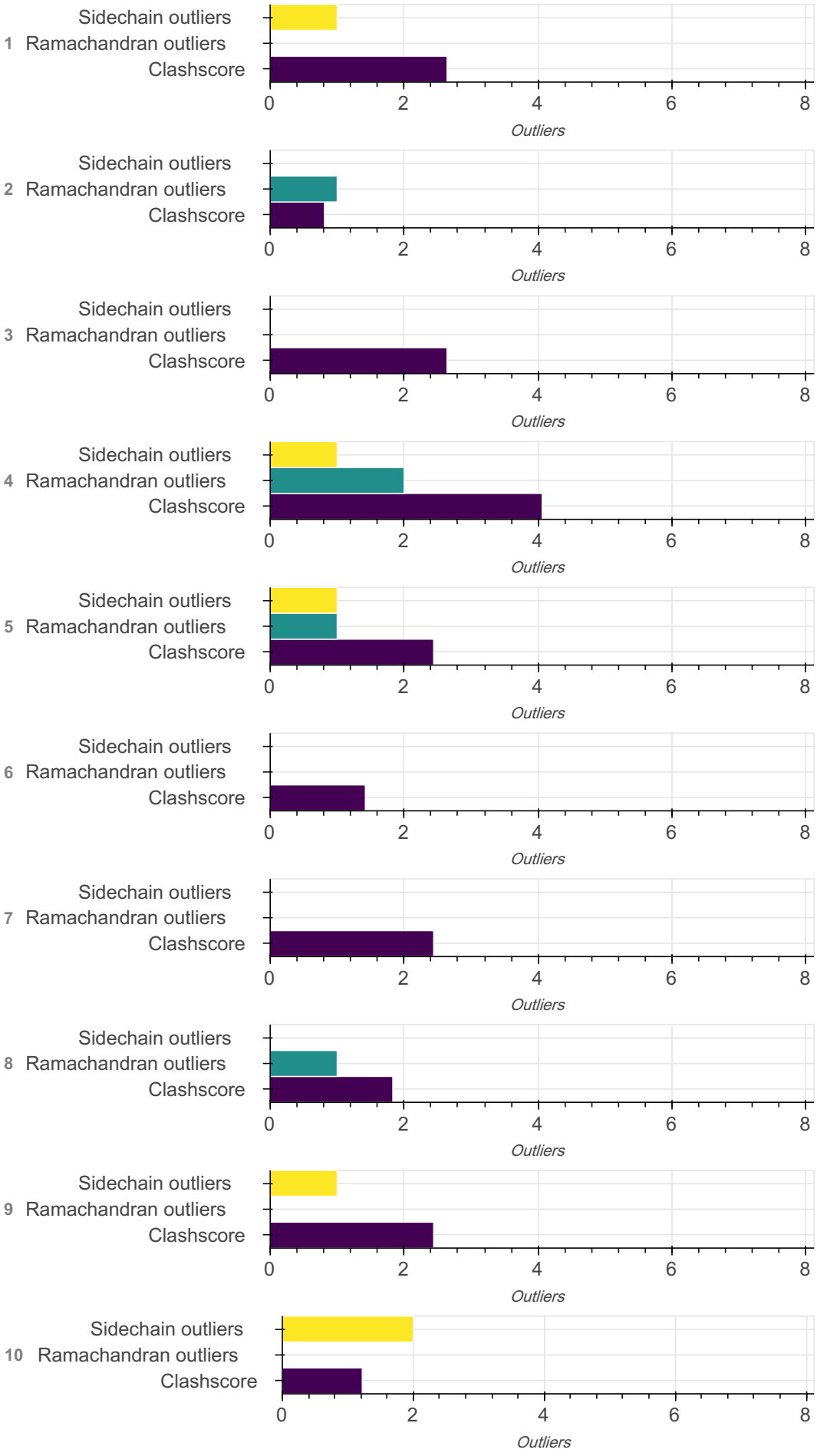
A user guide is available at https://pdb-dev.wwpdb.org/validation_help.html with specific help available everywhere you see the ? symbol.

List of references used to build this report is available here.

Overall quality

This validation report contains model quality assessments for all structures, data quality assessment for SAS datasets and fit to model assessments for SAS datasets. Data quality and fit to model assessments for other datasets and model uncertainty are under development. Number of plots is limited to 256.

Model Quality: MolProbity Analysis


1
2
3
4
5
6
7
8
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10
Sidechain outliers
Ramachandran outliers
Clashscore
0
2
4
6
8
Outliers

Ensemble information

This entry consists of 0 distinct ensemble(s).

Summary

This entry consists of 10 unique models, with 1 subunits in each model. A total of 1 datasets or restraints were used to build this entry. Each model is represented by 0 rigid bodies and 1 flexible or non-rigid units.

Entry composition

There are 10 unique types of models in this entry.These models are titled None, None, None, None, None, None, None, None, None, None respectively.

Model ID	Subunit number	Subunit ID	Subunit name	Chain ID	Chain ID [auth]	Total residues
1	1	1	P0ABK5	A	A	323
2	1	1	P0ABK5	A	A	323
3	1	1	P0ABK5	A	A	323
4	1	1	P0ABK5	A	A	323
5	1	1	P0ABK5	A	A	323
6	1	1	P0ABK5	A	A	323
7	1	1	P0ABK5	A	A	323
8	1	1	P0ABK5	A	A	323
9	1	1	P0ABK5	A	A	323
10	1	1	P0ABK5	A	A	323

Datasets used for modeling

There is 1 unique dataset used to build the models in this entry.

ID	Dataset type	Database name	Data access code
1	Crosslinking-MS data	jPOSTrepo	JPST001851

Representation

This entry has only one representation and includes 0 rigid bodies and 1 flexible units

Chain ID	Rigid bodies	Non-rigid segments
A	-	1-323

Methodology and software

This entry is a result of 1 distinct protocol(s).

Step number	Protocol ID	Method name	Method type	Method description	Number of computed models	Multi state modeling	Multi scale modeling
1	1	AlphaLink with 10 msa subsamples	AlphaLink	None	10	False	False

There is 1 software package reported in this entry.

ID	Software name	Software version	Software classification	Software location
1	AlphaLink	1.0	model building	https://github.com/lhatsk/AlphaLink

Data quality

Crosslinking-MS

Validation for this section is under development.

Model quality

For models with atomic structures, molprobity analysis is performed. For models with coarse-grained or multi-scale structures, excluded volume analysis is performed.

Standard geometry: bond outliers

There are 25030 bond outliers in this entry. A summary is provided below, and a detailed list of outliers can be found here.

Bond type	Observed distance (Å)	Ideal distance (Å)	Number of outliers
CA--HA	1.09	0.97	2910
CG2--HG21	1.09	0.97	700
CG--HG	1.09	0.97	320
CG--HG3	1.09	0.97	940
CG2--HG22	1.09	0.97	700
CB--HB3	1.09	0.97	2210
CG2--HG23	1.09	0.97	700
CE--HE2	1.09	0.97	290
CD2--HD23	1.09	0.97	320
CD1--HD11	1.09	0.97	590
CB--HB1	1.09	0.97	320
CB--HB2	1.09	0.97	2210
CD--HD2	1.09	0.97	510
CD2--HD21	1.09	0.97	320
CG1--HG13	1.09	0.97	480
CE--HE1	1.09	0.97	60
CD2--HD22	1.09	0.97	320
CG--HG2	1.09	0.97	940
CE--HE3	1.09	0.97	290
CD1--HD12	1.09	0.97	590
OG1--HG1	0.96	0.84	220
CB--HB	1.09	0.97	700

Bond type	Observed distance (Å)	Ideal distance (Å)	Number of outliers
CA--HA2	1.09	0.97	320
NZ--HZ3	1.01	0.89	230
NZ--HZ1	1.01	0.89	230
NZ--HZ2	1.01	0.89	230
CA--HA3	1.09	0.97	320
CG1--HG12	1.09	0.97	480
CD1--HD13	1.09	0.97	590
CD--HD3	1.09	0.97	510
CG1--HG11	1.09	0.97	210
OH--HH	0.96	0.84	50
OG--HG	0.96	0.84	190
N--H1	1.01	0.89	10
N--H2	1.01	0.89	10
N--H3	1.01	0.89	10
SG--HG	1.33	1.20	3
SG--HG	1.34	1.20	7
NH2--HH22	1.01	0.86	130
CZ--HZ	1.08	0.93	80
NH1--HH12	1.01	0.86	130
N--H	1.01	0.86	3070
CD2--HD2	1.08	0.93	160
NE--HE	1.01	0.86	130
NE1--HE1	1.01	0.86	20

Bond type	Observed distance (Å)	Ideal distance (Å)	Number of outliers
NE2--HE21	1.01	0.86	90
ND2--HD21	1.01	0.86	140
CE3--HE3	1.08	0.93	20
NH2--HH21	1.01	0.86	130
CE1--HE1	1.08	0.93	160
ND1--HD1	1.01	0.86	29
CZ3--HZ3	1.08	0.93	20
CZ2--HZ2	1.08	0.93	20
CE2--HE2	1.08	0.93	130
NH1--HH11	1.01	0.86	130
NE2--HE22	1.01	0.86	90
CD1--HD1	1.08	0.93	150
ND2--HD22	1.01	0.86	140
CH2--HH2	1.08	0.93	20
NE2--HE2	1.01	0.86	1

Standard geometry: angle outliers

There are 111 angle outliers in this entry. A summary is provided below, and a detailed list of outliers can be found here.

Angle type	Observed angle (°)	Ideal angle (°)	Number of outliers
CA-CB-CG	112.60	119.12	1
CA-CB-CG1	110.40	121.01	1
OE1-CD-NE2	122.60	116.46	1
OD1-CG-ND2	122.60	116.60	1
OE1-CD-NE2	122.60	116.75	1

Angle type	Observed angle (°)	Ideal angle (°)	Number of outliers
C-N-CA	121.70	131.95	1
NE-CZ-NH2	119.20	124.32	1
OE1-CD-NE2	122.60	116.91	1
OE1-CD-NE2	122.60	116.92	1
OE1-CD-NE2	122.60	116.93	1
OE1-CD-NE2	122.60	116.96	1
NH1-CZ-NH2	119.30	112.10	1
OE1-CD-NE2	122.60	117.10	1
OE1-CD-NE2	122.60	117.17	1
OE1-CD-NE2	122.60	117.31	1
OE1-CD-NE2	122.60	117.32	1
CA-CB-CG	112.60	117.86	1
CA-CB-CG	112.60	117.84	1
OD1-CG-ND2	122.60	117.38	1
CA-CB-CG	112.60	117.77	2
NE-CZ-NH2	119.20	123.85	1
CA-CB-CG	112.60	117.66	1
CA-CB-CG1	110.40	118.97	1
OE1-CD-NE2	122.60	117.58	1
CA-CB-CG	112.60	117.61	1
NH1-CZ-NH2	119.30	112.81	1
OD1-CG-ND2	122.60	117.62	1
CA-CB-CG	112.60	117.54	1

Angle type	Observed angle (°)	Ideal angle (°)	Number of outliers
NH1-CZ-NH2	119.30	112.91	1
OE1-CD-NE2	122.60	117.69	1
CA-CB-CG	112.60	117.44	1
NE-CZ-NH2	119.20	123.53	1
OD1-CG-ND2	122.60	117.79	1
OD1-CG-ND2	122.60	117.80	1
NE-CZ-NH2	119.20	123.50	1
CA-CB-CG	112.60	117.37	1
CA-CB-CG	112.60	117.33	1
OE1-CD-NE2	122.60	117.88	1
NE-CZ-NH1	121.50	126.22	1
NE-CZ-NH1	121.50	126.19	1
OE1-CD-NE2	122.60	117.96	2
OD1-CG-ND2	122.60	117.97	1
CA-CB-CG	112.60	117.21	1
OE1-CD-NE2	122.60	118.00	1
OE1-CD-NE2	122.60	118.03	1
OD1-CG-ND2	122.60	118.06	1
OE1-CD-NE2	122.60	118.06	1
CA-CB-CG	112.60	117.11	1
OE1-CD-NE2	122.60	118.12	3
C-N-CA	121.70	129.73	1
OE1-CD-NE2	122.60	118.14	1

Angle type	Observed angle (°)	Ideal angle (°)	Number of outliers
OD1-CG-ND2	122.60	118.15	1
OE1-CD-NE2	122.60	118.16	1
OE1-CD-NE2	122.60	118.17	1
OE1-CD-NE2	122.60	118.20	1
OE1-CD-NE2	122.60	118.21	1
OE1-CD-NE2	122.60	118.22	1
CA-CB-CG	112.60	116.97	1
OE1-CD-NE2	122.60	118.25	1
OE1-CD-NE2	122.60	118.27	1
OD1-CG-ND2	122.60	118.28	1
OE1-CD-NE2	122.60	118.30	1
OE1-CD-NE2	122.60	118.33	1
OD1-CG-ND2	122.60	118.33	1
OE1-CD-NE2	122.60	118.34	1
OD1-CG-ND2	122.60	118.34	1
OD1-CG-ND2	122.60	118.35	1
NH1-CZ-NH2	119.30	113.78	1
OE1-CD-NE2	122.60	118.37	1
CA-CB-CG	112.60	116.81	1
OD1-CG-ND2	122.60	118.40	2
CB-CG-CD2	131.20	125.74	1
OD1-CG-ND2	122.60	118.41	1
OE1-CD-NE2	122.60	118.43	1

Angle type	Observed angle (°)	Ideal angle (°)	Number of outliers
OD1-CG-ND2	122.60	118.43	2
CA-CB-CG	112.60	116.76	2
OE1-CD-NE2	122.60	118.44	1
OD1-CG-ND2	122.60	118.45	1
N-CA-C	111.00	122.61	1
C-N-CA	121.70	129.16	1
OE1-CD-NE2	122.60	118.48	1
OD1-CG-ND2	122.60	118.49	1
CA-CB-CG	113.80	117.91	1
CD-NE-CZ	124.40	130.15	1
CB-CG-CD2	131.20	125.87	1
OD1-CG-ND2	122.60	118.50	1
OE1-CD-NE2	122.60	118.51	1
OD1-CG-ND2	122.60	118.52	2
C-N-CA	121.70	129.05	1
OE1-CD-NE2	122.60	118.52	1
CA-CB-CG	112.60	116.67	1
CB-CG-CD2	131.20	125.91	1
CB-CG-CD2	131.20	125.92	1
CA-CB-CG	112.60	116.66	1
OD1-CG-ND2	122.60	118.55	1
NE-CZ-NH1	121.50	125.55	1
NE-CZ-NH2	119.20	115.56	1

Angle type	Observed angle (°)	Ideal angle (°)	Number of outliers
CB-CG-CD2	131.20	125.94	1
OE1-CD-NE2	122.60	118.56	1
OE1-CD-NE2	122.60	118.57	1
CA-CB-CG	112.60	116.62	1
OE1-CD-NE2	122.60	118.59	1
C-N-H	111.93	124.30	1

Too-close contacts

The following all-atom clashscore is based on a MolProbity analysis. All-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The table below contains clashscores for all the models in this entry.

Model ID	Clash score	Number of clashes
1	2.64	13
2	0.81	4
3	2.64	13
4	4.06	20
5	2.44	12
6	1.42	7
7	2.44	12
8	1.83	9
9	2.44	12
10	1.22	6

All 108 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Model ID	Atom-1	Atom-2	Clash overlap (Å)
1	A:214:ALA:HB2	A:235:ILE:HD11	0.544
1	A:131:VAL:HG21	A:140:LEU:HB2	0.504

Model ID	Atom-1	Atom-2	Clash overlap (Å)
1	A:173:ILE:HD11	A:284:LEU:HD12	0.458
1	A:59:LEU:HD21	A:65:LEU:HD21	0.442
1	A:100:ARG:HH12	A:228:GLN:NE2	0.438
1	A:71:GLY:HA3	A:96:MET:HE1	0.435
1	A:92:MET:HE1	A:111:LEU:HD22	0.427
1	A:214:ALA:CB	A:235:ILE:HD11	0.426
1	A:99:GLU:CD	A:99:GLU:H	0.423
1	A:188:TYR:CZ	A:193:LYS:HE2	0.420
1	A:225:HIS:CD2	A:231:GLY:O	0.420
1	A:270:ALA:HB1	A:274:SER:HB2	0.415
1	A:100:ARG:HH12	A:228:GLN:HE22	0.412
2	A:69:THR:HG21	A:74:GLY:HA3	0.432
2	A:59:LEU:HD21	A:65:LEU:HD21	0.430
2	A:69:THR:HG21	A:74:GLY:CA	0.419
2	A:131:VAL:HG21	A:140:LEU:HB2	0.402
3	A:41:VAL:HG13	A:153:HIS:CE1	0.655
3	A:59:LEU:HD21	A:65:LEU:HD21	0.620
3	A:214:ALA:HB2	A:235:ILE:HD11	0.599
3	A:131:VAL:HG21	A:140:LEU:HB2	0.557
3	A:51:TRP:HE1	A:84:ARG:CZ	0.547
3	A:214:ALA:CB	A:235:ILE:HD11	0.525
3	A:69:THR:HB	A:143:GLN:HE22	0.507
3	A:51:TRP:HE1	A:84:ARG:NH2	0.469

Model ID	Atom-1	Atom-2	Clash overlap (Å)
3	A:33:GLU:CD	A:300:PRO:HA	0.449
3	A:173:ILE:HD11	A:284:LEU:HD12	0.446
3	A:41:VAL:HG13	A:153:HIS:HE1	0.444
3	A:43:CYS:HA	A:76:ALA:HB1	0.441
3	A:13:GLY:CA	A:44:ARG:HH21	0.409
4	A:43:CYS:HA	A:76:ALA:HB1	0.674
4	A:8:ASN:HB3	A:39:PHE:CE2	0.646
4	A:5:PHE:HZ	A:80:VAL:HG22	0.627
4	A:59:LEU:HD21	A:65:LEU:HD21	0.606
4	A:41:VAL:HG22	A:153:HIS:HE1	0.601
4	A:41:VAL:HG22	A:153:HIS:CE1	0.579
4	A:69:THR:HB	A:143:GLN:HE22	0.565
4	A:173:ILE:HD11	A:284:LEU:HD12	0.552
4	A:8:ASN:HB3	A:39:PHE:CD2	0.549
4	A:5:PHE:CZ	A:80:VAL:HG22	0.546
4	A:274:SER:HB3	A:299:LEU:HD22	0.506
4	A:76:ALA:O	A:80:VAL:HG23	0.502
4	A:67:GLU:HG3	A:69:THR:HG22	0.492
4	A:131:VAL:HG21	A:140:LEU:HB2	0.483
4	A:15:THR:HG21	A:33:GLU:HA	0.465
4	A:8:ASN:CB	A:39:PHE:CE2	0.457
4	A:38:SER:C	A:39:PHE:CD2	0.436
4	A:69:THR:CB	A:143:GLN:HE22	0.429

Model ID	Atom-1	Atom-2	Clash overlap (Å)
4	A:13:GLY:HA2	A:44:ARG:HH22	0.425
4	A:13:GLY:HA2	A:44:ARG:NH2	0.406
5	A:272:ILE:HD11	A:311:LEU:HD13	0.549
5	A:69:THR:HB	A:143:GLN:HE22	0.537
5	A:263:MET:HE1	A:312:PHE:CE1	0.508
5	A:272:ILE:CD1	A:311:LEU:HD13	0.486
5	A:99:GLU:CD	A:99:GLU:H	0.460
5	A:310:ALA:HA	A:313:ALA:HB2	0.455
5	A:41:VAL:HG23	A:153:HIS:CE1	0.433
5	A:188:TYR:CZ	A:193:LYS:HE2	0.431
5	A:27:ARG:NH2	A:291:THR:HA	0.415
5	A:23:ILE:HD11	A:261:ARG:C	0.414
5	A:43:CYS:HA	A:76:ALA:HB1	0.411
5	A:131:VAL:HG21	A:140:LEU:HB2	0.402
6	A:214:ALA:CB	A:235:ILE:HD11	0.536
6	A:214:ALA:HB2	A:235:ILE:HD11	0.534
6	A:92:MET:HE1	A:104:LEU:HD13	0.485
6	A:15:THR:HG21	A:33:GLU:HA	0.464
6	A:274:SER:HB3	A:299:LEU:HD22	0.442
6	A:173:ILE:HD11	A:284:LEU:HD12	0.412
6	A:99:GLU:CD	A:99:GLU:H	0.402
7	A:59:LEU:HD21	A:65:LEU:HD21	0.587
7	A:272:ILE:HD11	A:311:LEU:HD22	0.529

Model ID	Atom-1	Atom-2	Clash overlap (Å)
7	A:176:VAL:HG11	A:239:LEU:HD22	0.502
7	A:69:THR:HB	A:143:GLN:HE22	0.497
7	A:173:ILE:HD11	A:284:LEU:HD12	0.474
7	A:272:ILE:CD1	A:311:LEU:HD22	0.468
7	A:260:ARG:HG2	A:315:LEU:HD21	0.458
7	A:99:GLU:CD	A:99:GLU:H	0.449
7	A:312:PHE:CD1	A:315:LEU:HD12	0.445
7	A:176:VAL:HG21	A:202:ALA:HB1	0.443
7	A:274:SER:HB3	A:299:LEU:HD22	0.443
7	A:312:PHE:CD1	A:315:LEU:CD1	0.439
8	A:59:LEU:HD21	A:65:LEU:HD21	0.743
8	A:176:VAL:HG22	A:211:ILE:CD1	0.547
8	A:176:VAL:HG22	A:211:ILE:HD11	0.517
8	A:131:VAL:HG21	A:140:LEU:HB2	0.489
8	A:188:TYR:CZ	A:193:LYS:HE2	0.427
8	A:270:ALA:HB1	A:274:SER:CB	0.417
8	A:72:ASN:HA	A:305:ARG:NH1	0.406
8	A:140:LEU:HD23	A:142:GLN:HE21	0.405
8	A:99:GLU:CD	A:99:GLU:H	0.403
9	A:176:VAL:HG13	A:230:ILE:O	0.607
9	A:76:ALA:HB2	A:305:ARG:HH12	0.589
9	A:76:ALA:HA	A:305:ARG:HH22	0.531
9	A:13:GLY:HA2	A:44:ARG:CZ	0.522

Model ID	Atom-1	Atom-2	Clash overlap (Å)
9	A:43:CYS:HA	A:76:ALA:HB1	0.489
9	A:37:PRO:HB2	A:79:TYR:CZ	0.482
9	A:23:ILE:HD11	A:261:ARG:C	0.473
9	A:36:ASN:HB3	A:39:PHE:CE2	0.470
9	A:5:PHE:CD2	A:11:THR:HG22	0.469
9	A:274:SER:HB3	A:299:LEU:HD22	0.453
9	A:37:PRO:CB	A:79:TYR:CZ	0.430
9	A:54:GLU:HG3	A:59:LEU:HD12	0.412
10	A:36:ASN:HB3	A:39:PHE:CD2	0.532
10	A:140:LEU:HD23	A:142:GLN:HE21	0.507
10	A:131:VAL:HG21	A:140:LEU:HB2	0.463
10	A:11:THR:O	A:39:PHE:CE1	0.435
10	A:173:ILE:HD11	A:284:LEU:HD12	0.433
10	A:99:GLU:CD	A:99:GLU:H	0.415

Torsion angles: Protein backbone

In the following table, Ramachandran outliers are listed. The Analysed column shows the number of residues for which the backbone conformation was analysed.

Model ID	Analyzed	Favored	Allowed	Outliers
1	321	312	9	0
2	321	307	13	1
3	321	309	12	0
4	321	309	10	2
5	321	310	10	1
6	321	312	9	0

Model ID	Analyzed	Favored	Allowed	Outliers
7	321	312	9	0
8	321	309	11	1
9	321	310	11	0
10	321	306	15	0

Detailed list of outliers are tabulated below.

Torsion angles: Protein sidechains

In the following table, sidechain outliers are listed. The Analysed column shows the number of residues for which the sidechain conformation was analysed.

Model ID	Analyzed	Favored	Allowed	Outliers
1	259	252	6	1
2	259	254	5	0
3	259	253	6	0
4	259	253	5	1
5	259	253	5	1
6	259	252	7	0
7	259	250	9	0
8	259	255	4	0
9	259	252	6	1
10	259	252	5	2

Detailed list of outliers are tabulated below.

Model ID	Chain	Residue ID	Residue type
1	A	142	GLN
4	A	41	VAL
5	A	97	SER
9	A	298	ILE

Model ID	Chain	Residue ID	Residue type
10	A	306	TYR
10	A	314	ASP

Fit of model to data used for modeling

Crosslinking-MS

Validation for this section is under development.

Fit of model to data used for validation

Validation for this section is under development.

Acknowledgements

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