

Integrative Structure Validation Report

July 22, 2024 - 05:05 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	9A2R
PDB-Dev ID	PDBDEV_00000176
Structure Title	Model of E. coli AtpA 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

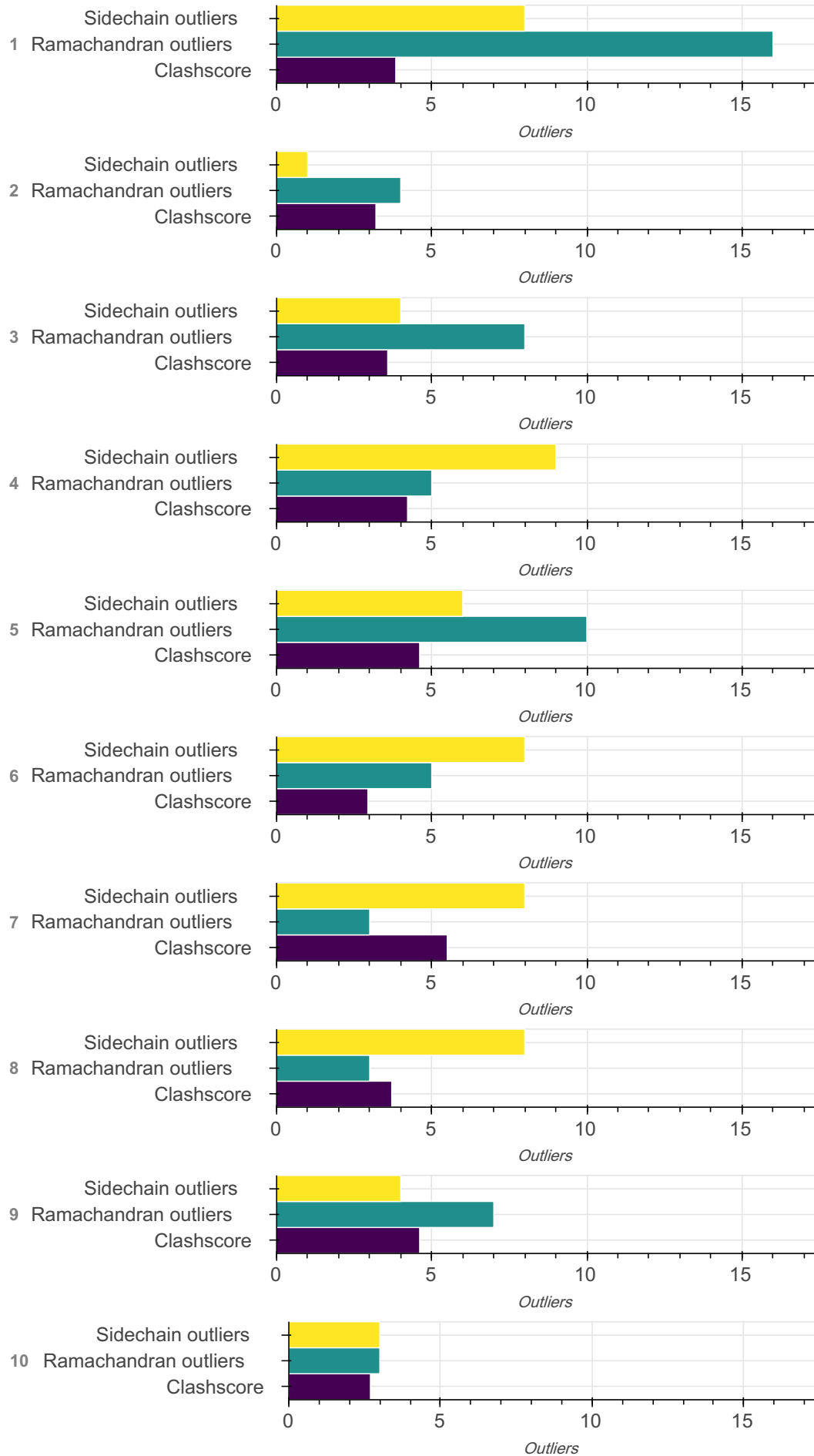
A user guide is available at https://pdb-dev.wwpdb.org/validation_help.html with specific help available everywhere you see the  symbol.

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



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	P0ABB0	A	A	513
2	1	1	P0ABB0	A	A	513
3	1	1	P0ABB0	A	A	513
4	1	1	P0ABB0	A	A	513
5	1	1	P0ABB0	A	A	513
6	1	1	P0ABB0	A	A	513
7	1	1	P0ABB0	A	A	513
8	1	1	P0ABB0	A	A	513
9	1	1	P0ABB0	A	A	513
10	1	1	P0ABB0	A	A	513

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	-	1-513

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

Standard geometry: bond outliers?

There are 39350 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
CB--HB2	1.09	0.97	3620
CB--HB3	1.09	0.97	3620
CE--HE3	1.09	0.97	340
CA--HA	1.09	0.97	4650
CB--HB	1.09	0.97	1030
CG--HG2	1.09	0.97	1400
CD2--HD22	1.09	0.97	460
CG1--HG12	1.09	0.97	800
CD--HD2	1.09	0.97	710
CD1--HD12	1.09	0.97	860
CG1--HG13	1.09	0.97	800
CD1--HD11	1.09	0.97	860
CG--HG	1.09	0.97	460
CG2--HG23	1.09	0.97	1030
CD2--HD21	1.09	0.97	460
CG--HG3	1.09	0.97	1400
CG2--HG22	1.09	0.97	1030
CD--HD3	1.09	0.97	710
CB--HB1	1.09	0.97	580
OH--HH	0.96	0.84	160
NZ--HZ2	1.01	0.89	240
CG2--HG21	1.09	0.97	1030

Bond type	Observed distance (Å)	Ideal distance (Å)	Number of outliers
CA--HA2	1.09	0.97	480
CD2--HD23	1.09	0.97	460
CA--HA3	1.09	0.97	480
CG1--HG11	1.09	0.97	400
OG--HG	0.96	0.84	320
CD1--HD13	1.09	0.97	860
NZ--HZ3	1.01	0.89	240
NZ--HZ1	1.01	0.89	240
CE--HE1	1.09	0.97	100
CE--HE2	1.09	0.97	340
OG1--HG1	0.96	0.84	230
N--H3	1.01	0.89	10
N--H2	1.01	0.89	10
N--H1	1.01	0.89	10
SG--HG	1.33	1.20	7
SG--HG	1.34	1.20	33
NH2--HH21	1.01	0.86	290
N--H	1.01	0.86	4940
NH1--HH11	1.01	0.86	290
NE2--HE22	1.01	0.86	280
CZ--HZ	1.08	0.93	140
ND2--HD22	1.01	0.86	160
CD2--HD2	1.08	0.93	370

Bond type	Observed distance (Å)	Ideal distance (Å)	Number of outliers
NH2--HH22	1.01	0.86	290
NH1--HH12	1.01	0.86	290
CE2--HE2	1.08	0.93	300
CD1--HD1	1.08	0.93	310
NE--HE	1.01	0.86	290
ND1--HD1	1.01	0.86	66
NE2--HE21	1.01	0.86	280
CE1--HE1	1.08	0.93	370
ND2--HD21	1.01	0.86	160
NE1--HE1	1.01	0.86	10
CZ2--HZ2	1.08	0.93	10
CZ3--HZ3	1.08	0.93	10
CH2--HH2	1.08	0.93	10
CE3--HE3	1.08	0.93	10
NE2--HE2	1.01	0.86	4

Standard geometry: angle outliers

There are 285 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
C-N-CA	121.70	135.81	1
C-N-CA	121.70	133.78	1
OD1-CG-ND2	122.60	116.03	1
CA-CB-CG2	110.40	121.49	1
C-N-CA	121.70	133.38	1

Angle type	Observed angle (°)	Ideal angle (°)	Number of outliers
C-N-CA	121.70	133.34	1
OE1-CD-NE2	122.60	116.47	1
C-N-CA	121.70	132.64	1
NH1-CZ-NH2	119.30	111.41	1
CD-NE-CZ	124.40	132.76	1
OE1-CD-NE2	122.60	116.64	1
OE1-CD-NE2	122.60	116.69	1
OE1-CD-NE2	122.60	116.70	1
C-CA-CB	110.50	119.30	1
OE1-CD-NE2	122.60	116.76	1
C-N-CA	121.70	132.01	1
CA-CB-CG	112.60	118.29	1
CA-CB-CG	112.60	118.27	1
OE1-CD-NE2	122.60	117.00	1
OE1-CD-NE2	122.60	117.05	1
OE1-CD-NE2	122.60	117.08	1
CA-CB-CG2	110.50	119.79	1
OE1-CD-NE2	122.60	117.14	1
C-N-CA	121.70	131.51	1
CA-N-CD	112.00	104.39	1
OE1-CD-NE2	122.60	117.17	1
OE1-CD-NE2	122.60	117.19	1
C-N-CA	121.70	131.43	1

Angle type	Observed angle (°)	Ideal angle (°)	Number of outliers
OE1-CD-NE2	122.60	117.23	1
NE-CZ-NH2	119.20	124.03	1
CA-CB-CG	113.80	108.47	1
N-CA-CB	110.40	102.43	1
OE1-CD-NE2	122.60	117.34	1
CA-CB-CG	112.60	117.78	1
OE1-CD-NE2	122.60	117.43	1
OE1-CD-NE2	122.60	117.45	1
CA-CB-CG2	110.40	119.15	1
CD-NE-CZ	124.40	131.56	1
OE1-CD-NE2	122.60	117.50	1
C-N-CA	121.70	130.86	1
OE1-CD-NE2	122.60	117.51	1
NE-CZ-NH2	119.20	123.77	1
OE1-CD-NE2	122.60	117.55	1
N-CA-C	112.10	124.65	1
NE-CZ-NH2	119.20	123.69	1
OE1-CD-NE2	122.60	117.62	1
C-N-CA	121.70	130.66	1
CA-C-N	116.20	126.14	1
N-CA-CB	103.00	108.45	1
CA-CB-CG	112.60	117.53	1
C-CA-CB	110.10	119.44	1

Angle type	Observed angle (°)	Ideal angle (°)	Number of outliers
C-N-CA	121.70	130.55	1
OE1-CD-NE2	122.60	117.69	2
OE1-CD-NE2	122.60	117.74	1
OD1-CG-ND2	122.60	117.74	1
OE1-CD-NE2	122.60	117.77	2
OE1-CD-NE2	122.60	117.78	2
OE1-CD-NE2	122.60	117.80	2
OE1-CD-NE2	122.60	117.81	1
C-N-CA	121.70	130.29	1
N-CA-CB	103.00	108.25	1
CA-CB-CG	112.60	117.37	1
OE1-CD-NE2	122.60	117.84	1
N-CA-CB	103.00	108.22	1
C-N-CA	121.70	130.24	1
OE1-CD-NE2	122.60	117.86	1
CB-CG-CD2	131.20	125.08	1
OD1-CG-ND2	122.60	117.89	1
OE1-CD-NE2	122.60	117.92	3
OE1-CD-NE2	122.60	117.93	2
N-CA-CB	110.40	103.44	1
CA-CB-CG	112.60	107.96	1
OE1-CD-NE2	122.60	117.96	1
CA-C-N	116.90	123.85	1

Angle type	Observed angle (°)	Ideal angle (°)	Number of outliers
OE1-CD-NE2	122.60	117.98	1
NE-CZ-NH2	119.20	123.36	1
CA-CB-CG2	110.50	118.34	1
C-N-CA	121.70	129.98	1
CA-CB-OG1	109.60	116.50	1
OE1-CD-NE2	122.60	118.01	4
OE1-CD-NE2	122.60	118.02	3
C-N-CA	121.70	129.93	1
OE1-CD-NE2	122.60	118.03	1
OE1-CD-NE2	122.60	118.04	3
N-CA-C	111.00	123.76	1
OE1-CD-NE2	122.60	118.05	1
NE-CZ-NH2	119.20	123.29	1
OE1-CD-NE2	122.60	118.06	1
CA-C-N	116.20	125.28	1
OE1-CD-NE2	122.60	118.08	2
OD1-CG-ND2	122.60	118.08	1
OE1-CD-NE2	122.60	118.09	1
OE1-CD-NE2	122.60	118.11	1
N-CA-CB	103.00	107.93	1
OE1-CD-NE2	122.60	118.12	1
C-CA-CB	110.10	101.59	1
OE1-CD-NE2	122.60	118.13	3

Angle type	Observed angle (°)	Ideal angle (°)	Number of outliers
OE1-CD-NE2	122.60	118.14	3
CA-CB-CG2	110.50	118.07	1
OE1-CD-NE2	122.60	118.15	2
OE1-CD-NE2	122.60	118.16	1
CA-C-N	116.90	123.55	1
CA-CB-CG	112.60	117.03	1
OE1-CD-NE2	122.60	118.17	1
OE1-CD-NE2	122.60	118.18	5
OE1-CD-NE2	122.60	118.19	3
N-CA-C	111.00	123.34	1
OE1-CD-NE2	122.60	118.20	3
C-N-CA	121.70	129.63	1
C-N-CA	121.70	129.61	1
C-CA-CB	110.10	118.45	1
OE1-CD-NE2	122.60	118.21	2
C-CA-CB	110.10	118.44	1
CA-CB-CG	113.80	118.19	1
OE1-CD-NE2	122.60	118.22	3
N-CA-CB	103.00	107.81	1
OE1-CD-NE2	122.60	118.23	3
OE1-CD-NE2	122.60	118.24	1
OE1-CD-NE2	122.60	118.25	3
OE1-CD-NE2	122.60	118.26	1

Angle type	Observed angle (°)	Ideal angle (°)	Number of outliers
OE1-CD-NE2	122.60	118.27	2
CA-CB-CG	114.10	105.45	1
OE1-CD-NE2	122.60	118.29	2
CB-CG-CD2	131.20	125.59	1
OD1-CG-ND2	122.60	118.30	1
OE1-CD-NE2	122.60	118.31	5
CB-CG-CD2	131.20	125.62	1
OE1-CD-NE2	122.60	118.32	3
OE1-CD-NE2	122.60	118.33	3
CA-CB-CG	112.60	116.87	1
OE1-CD-NE2	122.60	118.34	5
C-N-CA	121.70	129.36	1
OE1-CD-NE2	122.60	118.35	1
OE1-CD-NE2	122.60	118.36	3
NE-CZ-NH2	119.20	123.02	1
OE1-CD-NE2	122.60	118.37	4
C-N-CA	121.70	129.32	1
CB-CG-CD2	131.20	125.71	1
OE1-CD-NE2	122.60	118.38	5
OE1-CD-NE2	122.60	118.39	3
N-CA-CB	103.00	107.62	1
OE1-CD-NE2	122.60	118.40	2
C-N-CA	121.70	129.25	1

Angle type	Observed angle (°)	Ideal angle (°)	Number of outliers
OE1-CD-NE2	122.60	118.41	3
OE1-CD-NE2	122.60	118.42	2
N-CA-CB	110.40	104.13	1
CB-CG-CD2	131.20	125.77	1
C-CA-CB	110.50	116.76	1
OE1-CD-NE2	122.60	118.43	3
OE1-CD-NE2	122.60	118.44	5
CA-CB-CG	113.80	109.65	1
OE1-CD-NE2	122.60	118.45	3
OE1-CD-NE2	122.60	118.47	3
CD-NE-CZ	124.40	130.17	1
C-N-CA	121.70	129.11	1
OE1-CD-NE2	122.60	118.48	1
OE1-CD-NE2	122.60	118.49	4
CA-CB-CG	112.60	116.71	1
OE1-CD-NE2	122.60	118.50	4
CA-N-CD	112.00	106.26	1
OE1-CD-NE2	122.60	118.51	4
NE-CZ-NH1	121.50	125.58	1
CB-CG-CD2	131.20	125.90	1
OD1-CG-ND2	122.60	118.52	2
OE1-CD-NE2	122.60	118.52	2
OE1-CD-NE2	122.60	118.53	2

Angle type	Observed angle (°)	Ideal angle (°)	Number of outliers
OE1-CD-NE2	122.60	118.54	5
C-CA-CB	110.10	117.81	1
OE1-CD-NE2	122.60	118.55	2
OE1-CD-NE2	122.60	118.56	3
CA-C-N	116.90	122.96	1
OE1-CD-NE2	122.60	118.57	2
OE1-CD-NE2	122.60	118.58	2
NE-CZ-NH2	119.20	122.81	1
OE1-CD-NE2	122.60	118.60	1
C-N-CA	121.70	128.90	1
C-N-H	112.30	124.30	1
C-N-H	111.92	124.30	1
C-N-H	111.80	124.30	1
C-N-H	111.73	124.30	1
C-N-H	111.49	124.30	1
HZ1-NZ-HZ3	95.96	109.00	1
HH21-NH2-HH22	106.30	120.00	1
HH21-NH2-HH22	105.34	120.00	1
HH21-NH2-HH22	105.16	120.00	1
HH21-NH2-HH22	104.83	120.00	1
HH21-NH2-HH22	104.76	120.00	1
HH21-NH2-HH22	104.70	120.00	1
HH21-NH2-HH22	104.09	120.00	1

Angle type	Observed angle (°)	Ideal angle (°)	Number of outliers
HH21-NH2-HH22	103.88	120.00	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	3.84	30
2	3.20	25
3	3.58	28
4	4.22	33
5	4.61	36
6	2.94	23
7	5.50	43
8	3.71	29
9	4.61	36
10	2.69	21

All 304 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:179:ALA:HB2	A:329:ILE:HD12	0.713
1	A:38:VAL:HG21	A:276:LEU:HD13	0.630
1	A:180:ILE:HD11	A:208:VAL:HG22	0.579
1	A:157:ILE:HB	A:378:GLY:HA3	0.562
1	A:168:ILE:HG22	A:175:LYS:HE2	0.557
1	A:74:VAL:HG12	A:233:ALA:HB2	0.549

Model ID	Atom-1	Atom-2	Clash overlap (Å)
1	A:179:ALA:HB2	A:329:ILE:CD1	0.537
1	A:137:ILE:HD12	A:372:ILE:HD11	0.502
1	A:368:VAL:O	A:370:PRO:HD3	0.480
1	A:222:ILE:HG21	A:249:PHE:CE2	0.477
1	A:168:ILE:HD13	A:346:ILE:HD11	0.474
1	A:137:ILE:O	A:371:GLY:HA3	0.466
1	A:492:TYR:CE1	A:497:GLU:HG2	0.464
1	A:250:ARG:HG3	A:324:LEU:HD13	0.457
1	A:110:THR:HG23	A:238:ALA:HA	0.453
1	A:156:MET:CE	A:393:ILE:HG22	0.441
1	A:426:LYS:HE2	A:459:VAL:O	0.441
1	A:430:LEU:HD22	A:456:LEU:HD11	0.441
1	A:348:ILE:HG23	A:376:ARG:HA	0.440
1	A:343:THR:HB	A:354:PHE:CE2	0.439
1	A:139:ARG:HG3	A:371:GLY:HA2	0.434
1	A:74:VAL:HG12	A:233:ALA:CB	0.433
1	A:175:LYS:HB3	A:329:ILE:CG2	0.432
1	A:250:ARG:HH11	A:301:ALA:C	0.432
1	A:239:PRO:HG3	A:294:HIS:CE1	0.428
1	A:204:THR:O	A:208:VAL:HG23	0.422
1	A:65:ASN:HB2	A:277:LEU:CD2	0.414
1	A:147:GLN:H	A:186:GLN:NE2	0.408
1	A:291:PHE:CZ	A:345:VAL:HG11	0.406

Model ID	Atom-1	Atom-2	Clash overlap (Å)
1	A:76:MET:SD	A:237:LEU:CD1	0.403
2	A:393:ILE:HD13	A:448:LEU:HD22	0.789
2	A:172:GLN:CD	A:374:VAL:HG21	0.636
2	A:286:PHE:CD1	A:287:PRO:HA	0.628
2	A:306:ALA:HB2	A:321:THR:HG22	0.605
2	A:393:ILE:CD1	A:448:LEU:HD22	0.602
2	A:306:ALA:HB2	A:321:THR:CG2	0.552
2	A:166:LEU:HD11	A:367:ALA:HB2	0.546
2	A:156:MET:HG2	A:166:LEU:HB2	0.500
2	A:38:VAL:HG21	A:276:LEU:HB3	0.496
2	A:263:LEU:CD1	A:328:PRO:HG3	0.477
2	A:332:THR:HG21	A:340:PHE:CE1	0.466
2	A:65:ASN:HA	A:279:ARG:NH2	0.461
2	A:238:ALA:HB3	A:239:PRO:HD3	0.457
2	A:446:LEU:CD2	A:475:VAL:HG11	0.449
2	A:167:ILE:HD12	A:364:ILE:HG21	0.444
2	A:156:MET:HB3	A:164:ARG:HB3	0.443
2	A:175:LYS:HG3	A:348:ILE:HD12	0.442
2	A:192:LYS:HE2	A:254:GLU:OE2	0.429
2	A:294:HIS:NE2	A:345:VAL:HG11	0.426
2	A:286:PHE:CG	A:287:PRO:HA	0.413
2	A:426:LYS:HE2	A:459:VAL:O	0.412
2	A:248:TYR:CE2	A:252:ARG:CZ	0.410

Model ID	Atom-1	Atom-2	Clash overlap (Å)
2	A:267:ALA:HB2	A:295:SER:HB3	0.406
2	A:263:LEU:HD21	A:291:PHE:CE1	0.400
2	A:446:LEU:HD21	A:475:VAL:HG11	0.400
3	A:74:VAL:HG11	A:233:ALA:HB2	0.842
3	A:74:VAL:CG1	A:233:ALA:HB2	0.752
3	A:353:ILE:HG23	A:368:VAL:HG13	0.703
3	A:346:ILE:HG23	A:352:GLN:HE22	0.648
3	A:179:ALA:HB2	A:329:ILE:HD11	0.646
3	A:430:LEU:HD22	A:456:LEU:HD11	0.594
3	A:386:MET:HE1	A:444:GLN:HB2	0.549
3	A:150:TYR:CZ	A:178:LEU:HD12	0.541
3	A:151:LYS:NZ	A:447:VAL:HG11	0.515
3	A:142:VAL:HG11	A:160:GLY:HA3	0.488
3	A:179:ALA:HB1	A:259:ILE:HG21	0.481
3	A:330:ILE:HD12	A:341:VAL:CG1	0.476
3	A:62:ILE:HD11	A:95:LEU:HD22	0.467
3	A:330:ILE:HD12	A:341:VAL:HG11	0.467
3	A:153:VAL:HG22	A:368:VAL:HG11	0.466
3	A:151:LYS:HZ1	A:447:VAL:HG11	0.466
3	A:76:MET:CE	A:111:LEU:HD21	0.458
3	A:72:GLY:HA3	A:277:LEU:HD22	0.454
3	A:198:ILE:HD11	A:239:PRO:HG3	0.452
3	A:365:ARG:HH22	A:435:GLN:NE2	0.447

Model ID	Atom-1	Atom-2	Clash overlap (Å)
3	A:338:SER:O	A:342:PRO:HD2	0.444
3	A:175:LYS:HG2	A:355:LEU:HD12	0.437
3	A:386:MET:HE1	A:444:GLN:CB	0.435
3	A:167:ILE:HD11	A:327:LEU:HD21	0.430
3	A:166:LEU:HB2	A:349:THR:HG21	0.428
3	A:62:ILE:CD1	A:95:LEU:HD22	0.412
3	A:74:VAL:HG12	A:233:ALA:HB2	0.405
3	A:153:VAL:CG2	A:368:VAL:HG11	0.405
4	A:62:ILE:CD1	A:237:LEU:HD11	0.636
4	A:62:ILE:HD12	A:237:LEU:HD11	0.600
4	A:430:LEU:HD22	A:456:LEU:HD11	0.562
4	A:205:ILE:HD13	A:225:VAL:HG13	0.551
4	A:236:TYR:CD2	A:273:ILE:HD13	0.549
4	A:342:PRO:CG	A:366:PRO:HA	0.538
4	A:198:ILE:HD11	A:239:PRO:HG3	0.536
4	A:337:VAL:HG11	A:373:SER:HB3	0.526
4	A:337:VAL:HG21	A:373:SER:CB	0.510
4	A:381:ALA:HB1	A:490:GLY:HA3	0.491
4	A:72:GLY:HA3	A:276:LEU:HD22	0.472
4	A:337:VAL:HG21	A:373:SER:HB2	0.468
4	A:372:ILE:HD12	A:401:ARG:NH2	0.460
4	A:232:ALA:HB1	A:269:ALA:HA	0.457
4	A:171:ARG:HB3	A:331:GLU:CD	0.451

Model ID	Atom-1	Atom-2	Clash overlap (Å)
4	A:378:GLY:HA3	A:382:GLN:HB3	0.449
4	A:291:PHE:CG	A:347:SER:HA	0.447
4	A:372:ILE:HD12	A:401:ARG:CZ	0.445
4	A:171:ARG:HD3	A:331:GLU:OE1	0.443
4	A:205:ILE:CD1	A:225:VAL:HG13	0.443
4	A:342:PRO:CD	A:366:PRO:HA	0.443
4	A:175:LYS:HE2	A:331:GLU:HB2	0.440
4	A:238:ALA:HB3	A:239:PRO:HD3	0.439
4	A:152:ALA:O	A:156:MET:HE3	0.438
4	A:150:TYR:CE2	A:374:VAL:HG21	0.436
4	A:337:VAL:HG21	A:373:SER:HB3	0.436
4	A:426:LYS:HE2	A:459:VAL:O	0.432
4	A:236:TYR:CG	A:273:ILE:HD13	0.431
4	A:236:TYR:HB2	A:273:ILE:CD1	0.427
4	A:341:VAL:HG13	A:345:VAL:HG21	0.423
4	A:291:PHE:CD1	A:346:ILE:C	0.413
4	A:381:ALA:HB1	A:490:GLY:CA	0.411
4	A:19:PHE:C	A:21:VAL:H	0.410
5	A:74:VAL:HG11	A:233:ALA:HB2	0.862
5	A:62:ILE:HD11	A:95:LEU:HD22	0.720
5	A:180:ILE:HD11	A:208:VAL:HG22	0.677
5	A:346:ILE:HG23	A:376:ARG:HH22	0.651
5	A:346:ILE:HG23	A:376:ARG:NH2	0.648

Model ID	Atom-1	Atom-2	Clash overlap (Å)
5	A:150:TYR:CD1	A:366:PRO:HD3	0.610
5	A:317:VAL:HG12	A:318:LYS:H	0.606
5	A:386:MET:HE1	A:444:GLN:CD	0.597
5	A:155:SER:HA	A:386:MET:HE3	0.575
5	A:166:LEU:HD22	A:291:PHE:CZ	0.547
5	A:21:VAL:HG12	A:23:SER:HB2	0.533
5	A:150:TYR:CE1	A:366:PRO:HD3	0.533
5	A:179:ALA:HB1	A:259:ILE:HG21	0.525
5	A:142:VAL:HG11	A:160:GLY:HA3	0.521
5	A:151:LYS:HZ3	A:468:GLU:CD	0.501
5	A:310:GLU:CD	A:318:LYS:C	0.498
5	A:74:VAL:CG1	A:233:ALA:HB2	0.483
5	A:508:LYS:HA	A:513:TRP:CH2	0.480
5	A:281:PRO:HB2	A:285:ALA:CB	0.474
5	A:23:SER:OG	A:25:ALA:HB2	0.466
5	A:143:ASP:CG	A:303:ARG:HH12	0.464
5	A:385:ILE:HD11	A:490:GLY:C	0.464
5	A:170:ASP:OD1	A:173:THR:HG23	0.454
5	A:95:LEU:HD23	A:129:VAL:HG21	0.437
5	A:205:ILE:HD13	A:225:VAL:HG13	0.432
5	A:291:PHE:CD2	A:345:VAL:HG22	0.421
5	A:21:VAL:C	A:23:SER:H	0.417
5	A:23:SER:C	A:25:ALA:N	0.416

Model ID	Atom-1	Atom-2	Clash overlap (Å)
5	A:243:CYS:HB2	A:297:LEU:HD11	0.414
5	A:428:THR:HG22	A:432:LYS:HE3	0.410
5	A:341:VAL:HG21	A:354:PHE:CZ	0.409
5	A:377:VAL:HB	A:383:THR:HG21	0.408
5	A:309:VAL:HB	A:321:THR:HG22	0.404
5	A:426:LYS:HE2	A:459:VAL:O	0.404
5	A:310:GLU:HG2	A:317:VAL:C	0.403
5	A:341:VAL:HG21	A:354:PHE:HZ	0.401
6	A:381:ALA:HB1	A:490:GLY:O	0.606
6	A:385:ILE:HG12	A:492:TYR:HB2	0.600
6	A:159:ILE:HD11	A:166:LEU:HD22	0.595
6	A:341:VAL:HG12	A:343:THR:CG2	0.560
6	A:159:ILE:CD1	A:166:LEU:HD22	0.551
6	A:430:LEU:HD22	A:456:LEU:HD11	0.526
6	A:145:PRO:HD2	A:379:GLY:HA2	0.524
6	A:74:VAL:CG1	A:233:ALA:HB2	0.514
6	A:62:ILE:HD11	A:95:LEU:HD22	0.506
6	A:142:VAL:HG23	A:344:ASN:ND2	0.505
6	A:148:THR:CG2	A:340:PHE:CZ	0.496
6	A:343:THR:HG21	A:346:ILE:HG13	0.488
6	A:343:THR:HG21	A:346:ILE:CD1	0.483
6	A:167:ILE:HD12	A:340:PHE:HB2	0.471
6	A:458:ASP:CG	A:508:LYS:HZ1	0.469

Model ID	Atom-1	Atom-2	Clash overlap (Å)
6	A:145:PRO:HD2	A:379:GLY:N	0.460
6	A:145:PRO:HD2	A:379:GLY:CA	0.436
6	A:343:THR:HG21	A:346:ILE:HD11	0.426
6	A:145:PRO:HG2	A:378:GLY:N	0.420
6	A:205:ILE:HD13	A:225:VAL:HG13	0.412
6	A:426:LYS:HE2	A:459:VAL:O	0.408
6	A:342:PRO:CG	A:377:VAL:HG23	0.404
6	A:64:LEU:HD12	A:74:VAL:HG21	0.402
7	A:156:MET:HE1	A:390:SER:HB2	0.838
7	A:156:MET:HE1	A:390:SER:CB	0.740
7	A:177:ALA:HB3	A:365:ARG:NH2	0.737
7	A:166:LEU:CD1	A:349:THR:HB	0.702
7	A:74:VAL:CG1	A:233:ALA:HB2	0.674
7	A:177:ALA:HB3	A:365:ARG:HH21	0.641
7	A:153:VAL:HA	A:156:MET:HE2	0.633
7	A:74:VAL:HG11	A:233:ALA:HB2	0.581
7	A:166:LEU:HD13	A:349:THR:HB	0.576
7	A:173:THR:HB	A:355:LEU:HB2	0.566
7	A:153:VAL:HG11	A:448:LEU:HD22	0.562
7	A:166:LEU:HD11	A:349:THR:CG2	0.534
7	A:156:MET:CE	A:390:SER:HB2	0.525
7	A:74:VAL:HG12	A:233:ALA:HB2	0.524
7	A:145:PRO:HB3	A:378:GLY:HA2	0.524

Model ID	Atom-1	Atom-2	Clash overlap (Å)
7	A:166:LEU:C	A:372:ILE:HD11	0.522
7	A:166:LEU:HG	A:328:PRO:HG2	0.522
7	A:146:VAL:HB	A:377:VAL:CG1	0.520
7	A:134:PRO:HB3	A:303:ARG:HD3	0.509
7	A:151:LYS:HE3	A:433:GLN:HB2	0.499
7	A:174:GLY:HA3	A:360:PHE:CE2	0.493
7	A:385:ILE:HD11	A:492:TYR:H	0.489
7	A:21:VAL:O	A:22:VAL:HG22	0.478
7	A:507:PHE:CZ	A:513:TRP:CZ2	0.477
7	A:166:LEU:CD1	A:349:THR:CB	0.470
7	A:291:PHE:CD2	A:348:ILE:HD11	0.468
7	A:369:ASN:CG	A:370:PRO:HD2	0.462
7	A:291:PHE:HD2	A:348:ILE:HD11	0.457
7	A:166:LEU:HD11	A:349:THR:HB	0.446
7	A:426:LYS:HE2	A:459:VAL:O	0.444
7	A:198:ILE:HD11	A:239:PRO:HG3	0.438
7	A:385:ILE:HG12	A:492:TYR:HB2	0.438
7	A:156:MET:SD	A:394:ARG:NH2	0.437
7	A:166:LEU:HD13	A:349:THR:CB	0.434
7	A:154:ASP:OD1	A:397:LEU:HD13	0.428
7	A:134:PRO:HA	A:303:ARG:HH11	0.425
7	A:250:ARG:NH2	A:304:VAL:HG11	0.421
7	A:150:TYR:C	A:150:TYR:CD2	0.415

Model ID	Atom-1	Atom-2	Clash overlap (Å)
7	A:430:LEU:HD22	A:456:LEU:HD11	0.414
7	A:492:TYR:CE1	A:500:LEU:CD1	0.414
7	A:156:MET:CB	A:394:ARG:CZ	0.405
7	A:308:TYR:CD1	A:321:THR:HG22	0.402
7	A:137:ILE:HD13	A:303:ARG:HB2	0.401
8	A:62:ILE:HD11	A:95:LEU:HD22	0.809
8	A:153:VAL:HG22	A:448:LEU:HD21	0.750
8	A:166:LEU:HD11	A:330:ILE:HD12	0.676
8	A:166:LEU:HD11	A:330:ILE:CD1	0.656
8	A:430:LEU:HD22	A:456:LEU:HD11	0.623
8	A:381:ALA:HB1	A:490:GLY:HA3	0.607
8	A:153:VAL:HG21	A:431:LEU:HD22	0.582
8	A:153:VAL:CG2	A:448:LEU:HD21	0.518
8	A:170:ASP:C	A:175:LYS:HZ3	0.516
8	A:64:LEU:HD12	A:74:VAL:HG21	0.495
8	A:153:VAL:HG21	A:431:LEU:CD2	0.495
8	A:161:ARG:HH22	A:321:THR:HB	0.491
8	A:60:TYR:HB2	A:76:MET:HE3	0.486
8	A:145:PRO:HB3	A:158:PRO:HA	0.485
8	A:153:VAL:HG22	A:448:LEU:CD2	0.467
8	A:205:ILE:HD13	A:225:VAL:HG13	0.454
8	A:385:ILE:HG12	A:492:TYR:HB2	0.453
8	A:153:VAL:HG11	A:393:ILE:HG21	0.438

Model ID	Atom-1	Atom-2	Clash overlap (Å)
8	A:238:ALA:HB3	A:239:PRO:HD3	0.438
8	A:426:LYS:HE2	A:459:VAL:O	0.438
8	A:173:THR:HG22	A:353:ILE:CG2	0.429
8	A:381:ALA:HB1	A:490:GLY:CA	0.425
8	A:157:ILE:HG23	A:378:GLY:CA	0.423
8	A:62:ILE:HD12	A:237:LEU:HD11	0.422
8	A:282:GLY:C	A:284:GLU:H	0.420
8	A:294:HIS:NE2	A:298:LEU:HD11	0.418
8	A:381:ALA:HB1	A:490:GLY:C	0.413
8	A:378:GLY:O	A:379:GLY:C	0.412
8	A:60:TYR:CB	A:76:MET:HE3	0.409
9	A:359:LEU:HD11	A:401:ARG:HH21	0.841
9	A:62:ILE:HD11	A:95:LEU:HD22	0.697
9	A:152:ALA:O	A:156:MET:HE2	0.665
9	A:198:ILE:HD11	A:239:PRO:HG3	0.617
9	A:173:THR:CG2	A:357:THR:HG23	0.609
9	A:156:MET:SD	A:386:MET:HE1	0.586
9	A:156:MET:SD	A:368:VAL:HG22	0.584
9	A:351:GLY:HA3	A:372:ILE:HG21	0.576
9	A:377:VAL:HG11	A:386:MET:HG3	0.575
9	A:430:LEU:HD22	A:456:LEU:HD11	0.526
9	A:149:GLY:HA3	A:185:ASN:ND2	0.502
9	A:325:THR:HG22	A:342:PRO:HB2	0.493

Model ID	Atom-1	Atom-2	Clash overlap (Å)
9	A:151:LYS:HE2	A:439:MET:CE	0.482
9	A:303:ARG:HH21	A:306:ALA:HB2	0.482
9	A:355:LEU:HD22	A:366:PRO:HD2	0.479
9	A:168:ILE:HD12	A:178:LEU:HD22	0.477
9	A:151:LYS:HE2	A:439:MET:HE1	0.471
9	A:426:LYS:HE2	A:459:VAL:O	0.471
9	A:359:LEU:CD1	A:401:ARG:HH21	0.451
9	A:325:THR:CG2	A:342:PRO:HB2	0.450
9	A:183:ILE:HG13	A:259:ILE:HD12	0.443
9	A:248:TYR:CE2	A:252:ARG:CZ	0.442
9	A:205:ILE:HD13	A:225:VAL:HG13	0.437
9	A:308:TYR:CD2	A:321:THR:CG2	0.435
9	A:359:LEU:HD11	A:401:ARG:NH2	0.432
9	A:430:LEU:HD23	A:451:ALA:HB2	0.429
9	A:166:LEU:HB2	A:341:VAL:HG23	0.426
9	A:64:LEU:HD12	A:74:VAL:HG21	0.417
9	A:156:MET:SD	A:368:VAL:CG2	0.416
9	A:164:ARG:HH11	A:351:GLY:H	0.413
9	A:74:VAL:CG1	A:233:ALA:HB1	0.408
9	A:178:LEU:HD21	A:339:ALA:CB	0.407
9	A:351:GLY:HA3	A:372:ILE:CG2	0.407
9	A:23:SER:O	A:26:HIS:CD2	0.403
9	A:308:TYR:CG	A:321:THR:HG22	0.403

Model ID	Atom-1	Atom-2	Clash overlap (Å)
9	A:76:MET:HE3	A:111:LEU:HD21	0.402
10	A:281:PRO:HB2	A:286:PHE:CE2	0.564
10	A:270:TYR:CD1	A:293:LEU:HD11	0.553
10	A:270:TYR:CG	A:293:LEU:HD11	0.552
10	A:146:VAL:HB	A:367:ALA:HB2	0.541
10	A:168:ILE:CD1	A:178:LEU:HD12	0.533
10	A:74:VAL:HG11	A:233:ALA:HB2	0.474
10	A:74:VAL:CG1	A:233:ALA:HB2	0.463
10	A:407:SER:HB2	A:413:LEU:HD11	0.454
10	A:175:LYS:HG2	A:374:VAL:HG21	0.452
10	A:389:LEU:HD21	A:492:TYR:OH	0.447
10	A:38:VAL:HG21	A:276:LEU:HB3	0.439
10	A:155:SER:HB2	A:186:GLN:HE22	0.439
10	A:155:SER:CB	A:186:GLN:HE22	0.430
10	A:337:VAL:C	A:339:ALA:H	0.430
10	A:385:ILE:HG12	A:492:TYR:HB2	0.416
10	A:434:LYS:HE2	A:439:MET:HE1	0.414
10	A:134:PRO:HG3	A:303:ARG:HH12	0.412
10	A:168:ILE:HD12	A:178:LEU:HD12	0.409
10	A:403:LEU:HD11	A:417:THR:HG23	0.404
10	A:146:VAL:HB	A:367:ALA:CB	0.401
10	A:426:LYS:HE2	A:459:VAL:O	0.401

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	511	471	24	16
2	511	485	22	4
3	511	489	14	8
4	511	500	6	5
5	511	481	20	10
6	511	487	19	5
7	511	492	16	3
8	511	493	15	3
9	511	489	15	7
10	511	488	20	3

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	407	390	9	8
2	407	390	16	1
3	407	394	9	4
4	407	393	5	9
5	407	391	10	6
6	407	391	8	8
7	407	381	18	8
8	407	390	9	8
9	407	399	4	4

Model ID	Analyzed	Favored	Allowed	Outliers
10	407	392	12	3

Detailed list of outliers are tabulated below.

Model ID	Chain	Residue ID	Residue type
1	A	11	LEU
1	A	166	LEU
1	A	317	VAL
1	A	324	LEU
1	A	337	VAL
1	A	343	THR
1	A	360	PHE
1	A	374	VAL
2	A	11	LEU
3	A	11	LEU
3	A	262	ASP
3	A	357	THR
3	A	374	VAL
4	A	6	THR
4	A	11	LEU
4	A	166	LEU
4	A	243	CYS
4	A	340	PHE
4	A	349	THR
4	A	374	VAL

Model ID	Chain	Residue ID	Residue type
4	A	377	VAL
4	A	492	TYR
5	A	11	LEU
5	A	21	VAL
5	A	317	VAL
5	A	343	THR
5	A	357	THR
5	A	492	TYR
6	A	10	GLU
6	A	11	LEU
6	A	19	PHE
6	A	166	LEU
6	A	181	ASP
6	A	284	GLU
6	A	341	VAL
6	A	374	VAL
7	A	11	LEU
7	A	22	VAL
7	A	166	LEU
7	A	292	TYR
7	A	337	VAL
7	A	353	ILE
7	A	374	VAL

Model ID	Chain	Residue ID	Residue type
7	A	377	VAL
8	A	10	GLU
8	A	11	LEU
8	A	188	ASP
8	A	317	VAL
8	A	343	THR
8	A	374	VAL
8	A	377	VAL
8	A	421	LEU
9	A	11	LEU
9	A	342	PRO
9	A	368	VAL
9	A	374	VAL
10	A	11	LEU
10	A	357	THR
10	A	377	VAL

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.

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