There is no quick or certain algorithm to find the best [arrangement of N nodes on a sphere](), but here are three that may be good enough.

The first column shows [Dave Rusin's "disco ball"](): place the nodes along rows equally spaced by latitude, with as many in each row as will fit at that same distance from each other. (I also show what happens if the spacing is tightened to admit at least one more node without changing the number of rows.)

The other two rules each divide the sphere into bands of equal area, and place one node at some longitude in the middle of the band.
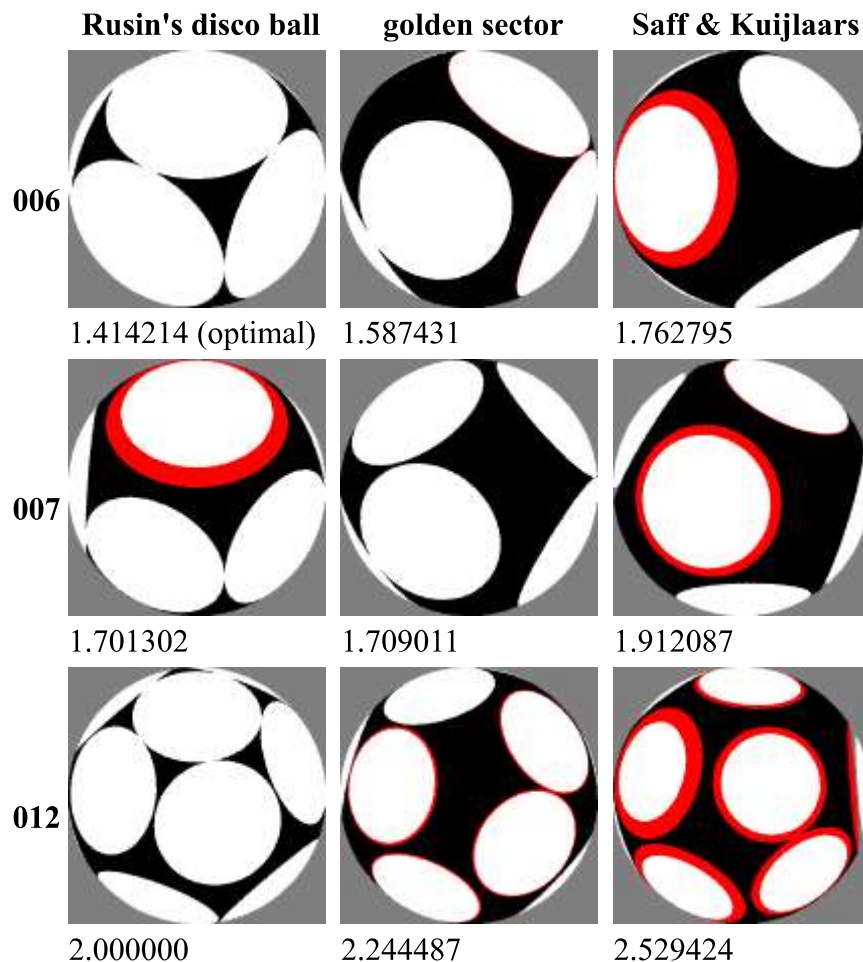
In the middle column, the longitude steps by a constant interval, a golden section of the circle. Because the golden section (sqrt(5)-1)/2 is [the most irrational number](), this avoids a near-repeat of the same longitude in any nearby band. (This method has been independently found by many amateurs including me.)
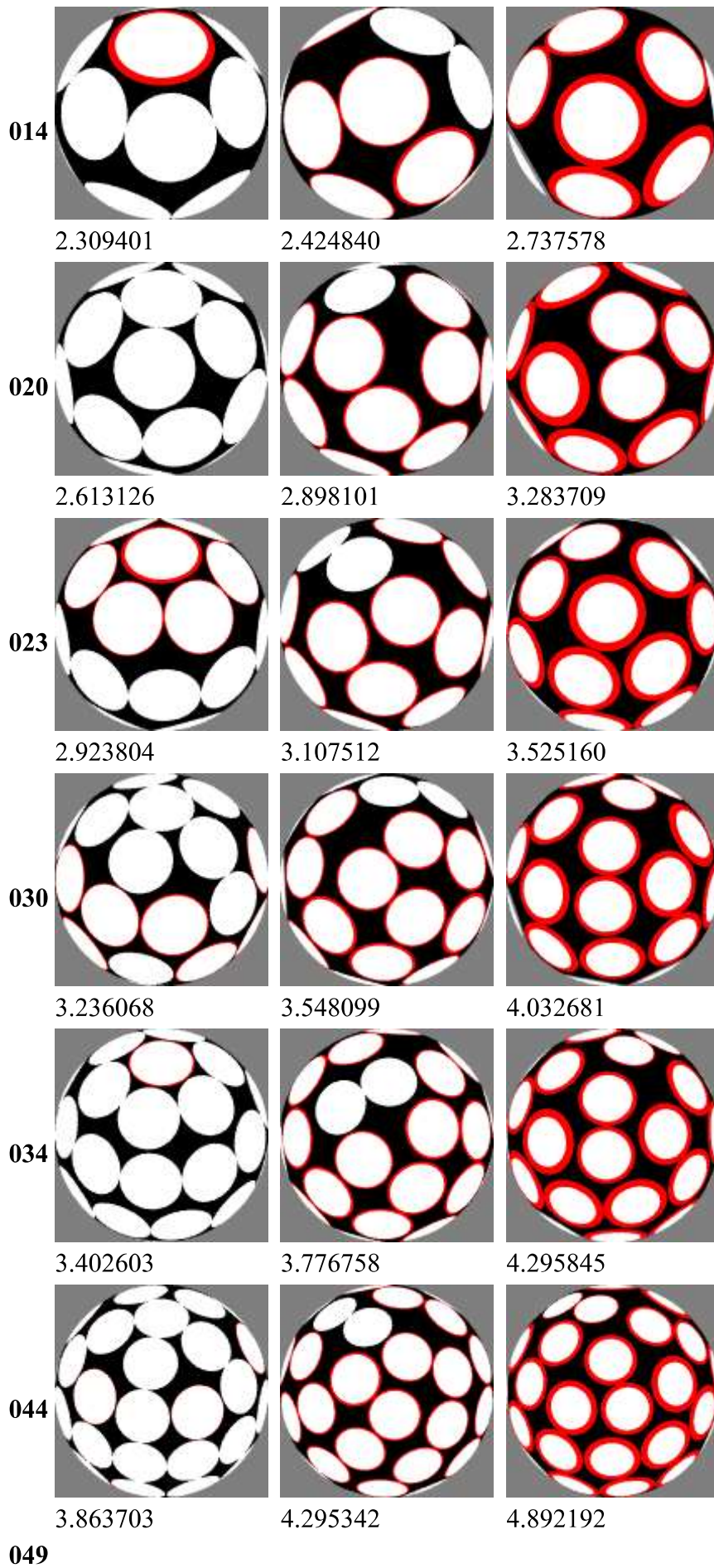
In the right column, the method of [Saff and Kuijlaars]() places the nodes in a more obvious single spiral, making the distance between adjacent nodes approximately equal to that between successive turns of the spiral. (Note: The page cited confuses *phi* with *theta*.)
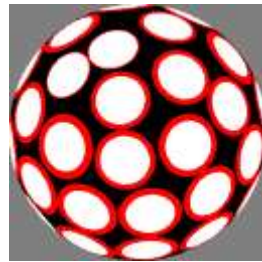
In these images the nodes are centers of white discs of equal size, chosen so that none overlap but somewhere on the sphere there is at least one point where two discs meet. The number below each image is the ratio of the diameter of the overall sphere to that of the discs.

The red rings around the white discs show the half-distance to *that* node's nearest neighbor. A perfectly even packing would show no red at all.

As you can see, Rusin's rule gives the densest packings, but because its anisotropy is more obvious I find it less pretty than the others; for the same reason I would not be surprised if it is less useful for some purposes.
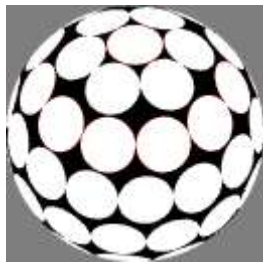
Rusin's disco ball	golden sector	Saff & Kuijlaars
1.414214 (optimal)	1.587431	1.762795
1.701302	1.709011	1.912087
2.000000	2.244487	2.529424

Row labels: **006**, **007**, **012**

014

2.309401   2.424840   2.737578

020

2.613126   2.898101   3.283709

023

2.923804   3.107512   3.525160

030

3.236068   3.548099   4.032681

034

3.402603   3.776758   4.295845

044

3.863703   4.295342   4.892192

049

4.178581   4.532396   5.164602
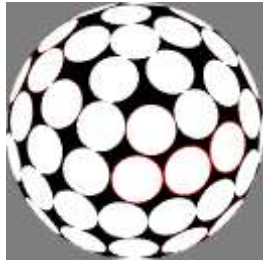
058

4.493959   4.930419   5.621770

064

4.609530   5.178784   5.906922

078
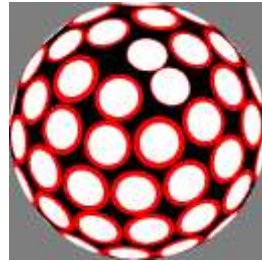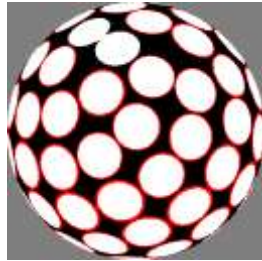
5.125831   5.716461   6.523982

085
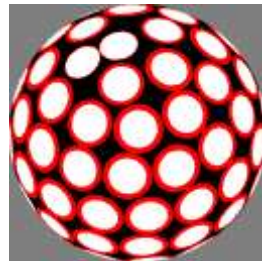
5.464102   5.967150   6.811580

098
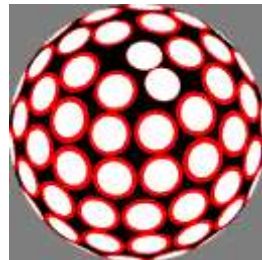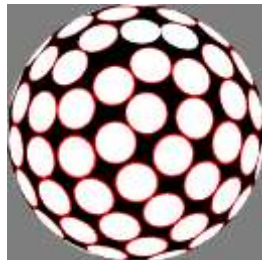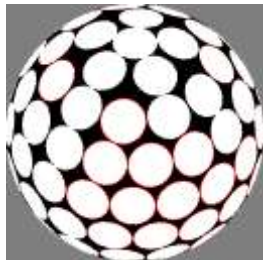
5.758770   6.406732   7.315756

106

6.010855   6.662840   7.609432

124

6.392453   7.205870   8.231983

133

6.726918   7.462578   8.526229

146
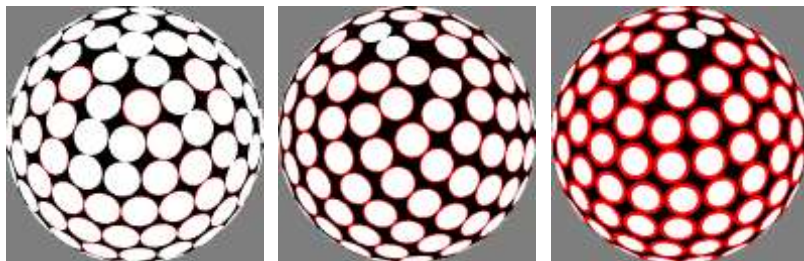
7.026674   7.818511   8.934159

156

7.201051   8.081644   9.235698

176

7.661298   8.583742   9.811012

186
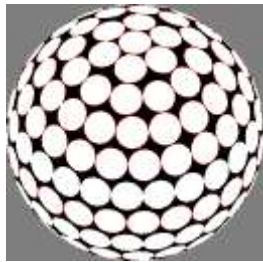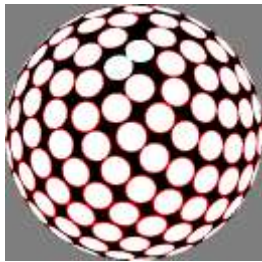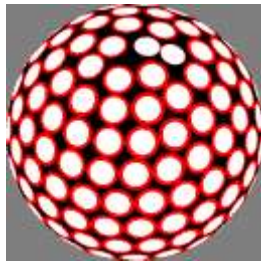
7.931559 8.824082 10.086371

208
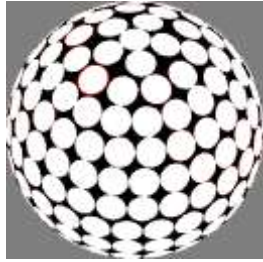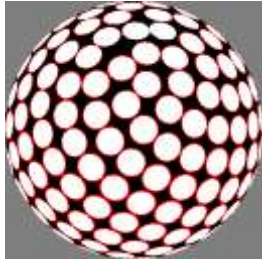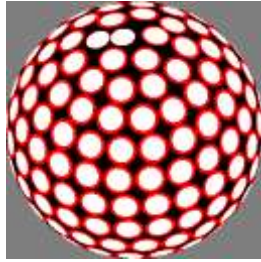
8.296230 9.331065 10.667169

222
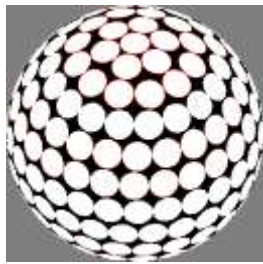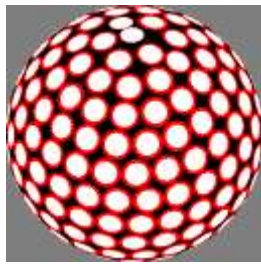
8.684322 9.639817 11.020843

244
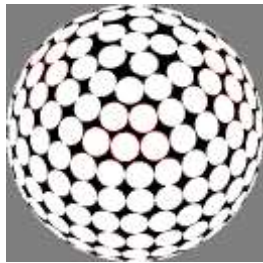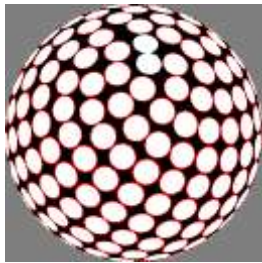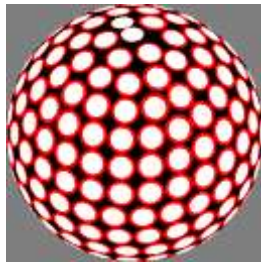
8.931404 10.105957 11.554764

255
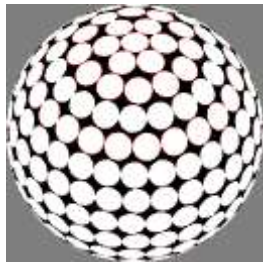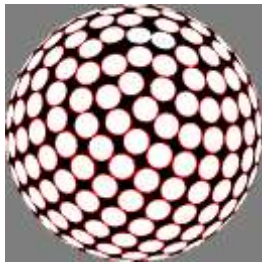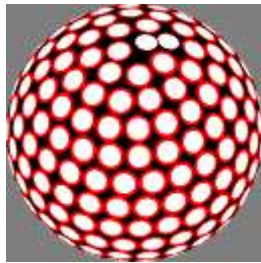
9.249067 10.331142 11.812679

278
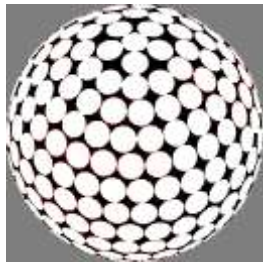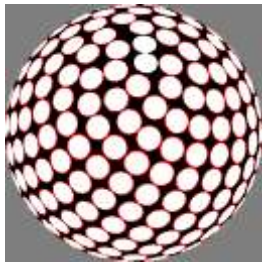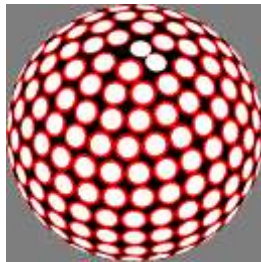
9.566772 10.786804 12.334540

290
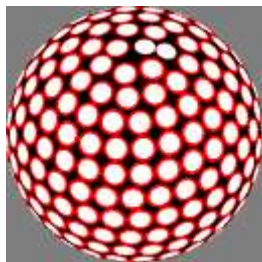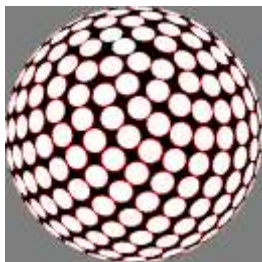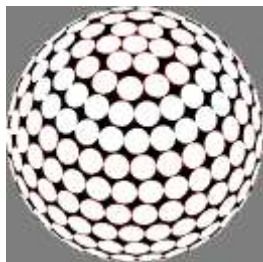
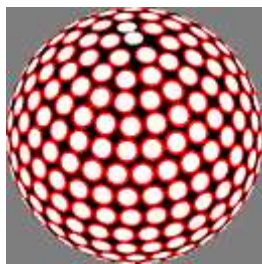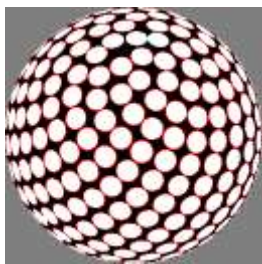9.882249   11.017061   12.598236

318
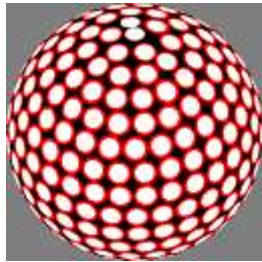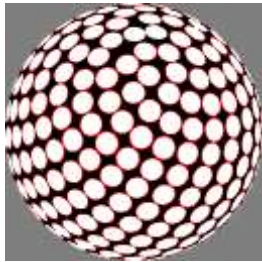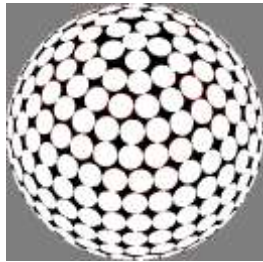
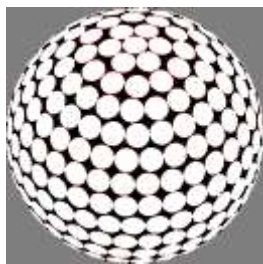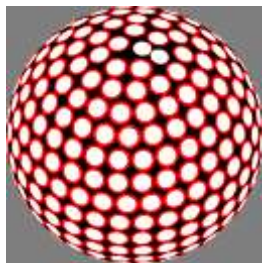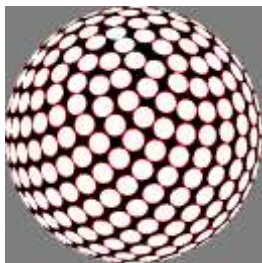10.202297   11.536470   13.193047
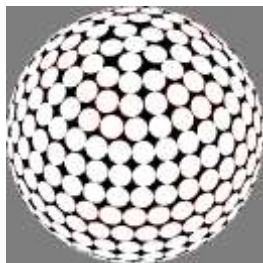
331

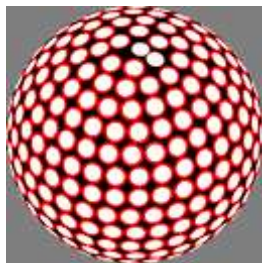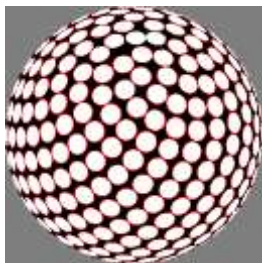

10.520110   11.769834   13.460278
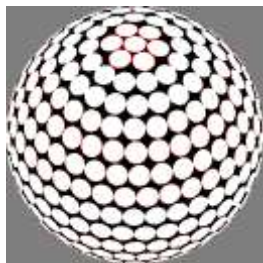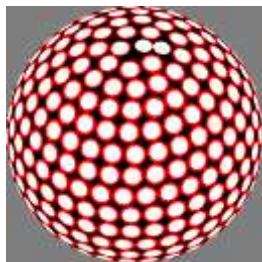
358

10.837951   12.240306   13.999004
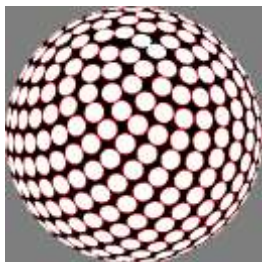
386
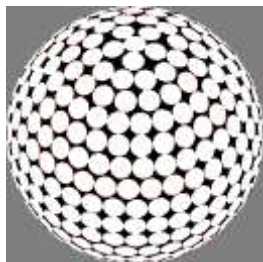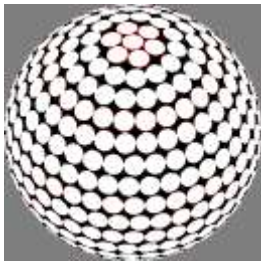

11.567274   12.709821   14.536611

404

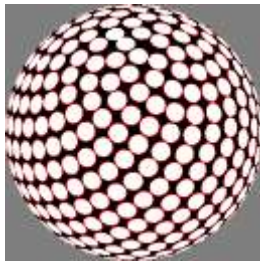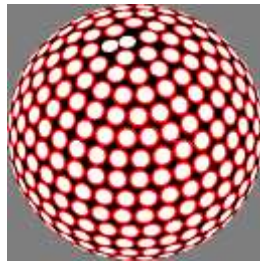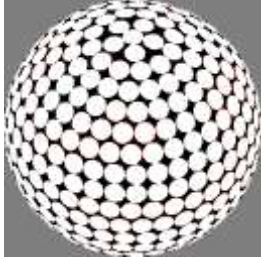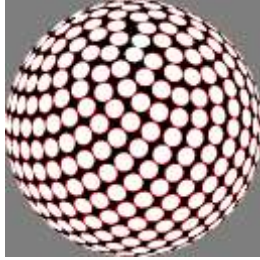11.473713   13.002702   14.871956

434

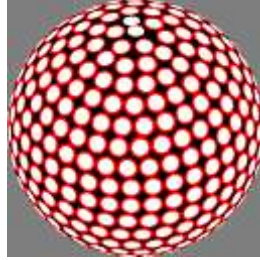12.217355   13.476700   15.414662

448

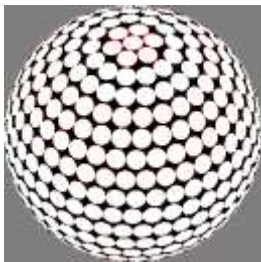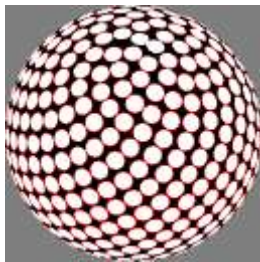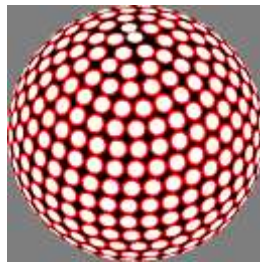12.109566   13.692285   15.661490

480

12.869074   14.172741   16.211562

[home](#) | [blog](#) | [links](#) | [Anton Sherwood](#)

this page created 2004 Aug 08, modified Aug 21; links corrected 2013 Apr 08